# European Space Agency Research and Science Support Department Planetary Missions Division

# **Rosetta - ROMAP**

To Planetary Science Archive Interface Control Document

RLGS-SPEC-SONC\_DPS-SCIE-9065-CNES

## **RO-ROL-ROMAP-EAICD**

Issue 1 Revision 1

01 July 2015

Prepared by: Instrument Archive Responsible and SONC

> Approved by: U. Auster I. Apathy





Document No.	RO-ROL-ROMAP-EAICD
Issue/Rev. No.	1/1
Date	01-July-2015
Page	2

#### **Distribution List**

Recipient	Organisation



Document No.RIssue/Rev. No.1Date01Page3

## Change Log

Date	Sections Changed	Reasons for Change
23 December 2010	Creation of Issue 1 Revision 0	Delivery of Issue 1.0 to PSA after peer review
01/07/2015	Updated: 2.4.5 In-Flight data products 2.4.8 Ancillary Data Usage 3.2.3 Reference systems 4.2 Datasets, Definition and Content Added: 2.2.2.2.5 Spacecraft Clock Count in RDS	Delivery of Issue 1.1 updated for the Comet phase
	3.2.2.2.5 Spacecraft Clock Count in PDS Labels	
	Deleted: 3.4.3.4.2 Geometric Index File SPM derived data references	



Document No.	RO-ROL-ROMAP-EAICD
Issue/Rev. No.	1 / 1
Date	01-July-2015
Page	4

#### **TBD ITEMS**

Section	Description



# **Table Of Contents**

1	Intr	oduction	3	
	1.1	Purpose and Scope	3	
	1.2	Archiving Authorities	3	
	1.3			
	1.4	Intended Readership		
	1.5			
		Applicable Documents		
	1.6	Acronyms and Abbreviations		
	1.7	Contact Names and Addresses	5	
2	Ove	rview of Scientific Objectives, Instrument Design, Data Handling Process and Product Generation	5	
	2.1	Scientific Objectives	6	
	2.2	Instrument Design	8	
	2.2.			
	2.2.2	2 ROMAP Electronics	11	
	2.3	Data Handling Process	13	
	2.4	Overview of Data Products	13	
	2.4.	1 Pre-Flight Data Products	13	
	2.4.2	J		
	2.4.	3 Instrument Calibrations	14	
	2.4.	4 Other Files written during Calibration	14	
	2.4.	5 In-Flight Data Products	14	
	2.4.	6 Documentation	17	
	2.4.			
	2.4.	8 Ancillary Data Usage	18	
3	Arci	hive Format and Content	18	
	3.1	Format and Conventions	18	
	3.1.			
	3.1.			
	3.1.	J U		
	3.1.4	4 Filenaming Convention	19	
	3.2	Standards Used in Data Product Generation		
	3.2.		20	
	3.2.2		21	
	3.2.	3 Reference Systems	24	
	3.3	Data Validation	25	
	3.3.	1 MAG quality parameter	25	
	3.3.	2 SPM quality parameter	26	
	3.4	Content	26	
	3.4.	Volume Set	26	
	3.4.	2 Data Set	26	
	3.4.	3 Directories	27	



RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 2

4	4 Detailed Interface Specifications		31
4	4.1 Structure and Organization Overview		31
4	4.2	Data Sets, Definition and Content	31
4	4.3	Data Product Design	33
	4.3.	1 Magnetometer Science Edited Data Product Design (Level 2)	33
	4.3.	2 Simple Plasma Monitor Science Edited Data Product Design (Level 2)	35
	4.3.	3 Housekeeping Edited Data Product Design (Level 2)	64
	4.3.4	4 Magnetometer Science calibrated Data Product Design (Level 3)	69
	4.3.	5 Simple Plasma Monitor Science Draft Calibrated Data Product Design (Level 3)	76
	4.3.	6 Housekeeping Calibrated Data Product Design (Level 3)	120
	4.3.	7 Magnetometer Science calibrated Data Product Design (Level 5)	125
5	Appendix: Available Software to read PDS files       1		132
6	Appendix: Example of PDS detached label for ROMAP MAG level 2 data product       1.		132
7	Appendix: Example of PDS combined detached label for ROMAP SPM level 2 data product13		133
8	Appendix: Example of Directory Listing of Data Set RL-CAL-ROMAP-2-CVP-SPM-V1.0 136		136



RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 3

# **1** Introduction

## 1.1 Purpose and Scope

The purpose of this EAICD (Experimenter to Planetary Science Archive Interface Control Document) is two fold. First it provides users of the ROMAP instrument with detailed description of the product and a description of how it was generated, including data sources and destinations. Secondly, it is the official interface document between ROMAP and Planetary Science Archive (PSA) of ESA.

## **1.2** Archiving Authorities

The *Planetary Data System* Standard is used as archiving standard by:

- NASA for U.S. planetary missions, implemented by PDS
- ESA for European planetary missions, implemented by the Research and Scientific Support Department (RSSD) of ESA

ESA's Planetary Science Archive (PSA)

ESA implements an online science archive, the PSA

- to support and ease data ingestion
- to offer additional services to the scientific user community and science operations teams as e.g.:
  - o search queries that allow searches across instruments, missions and scientific disciplines
    - several data delivery options as:
      - direct download of data products, linked files and data sets
      - ftp download of data products, linked files and data sets

The PSA aims for online ingestion of logical archive volumes and offers the creation of physical archive volumes on request.

## 1.3 Contents

This document describes the data flow of the ROMAP instrument on Rosetta from data acquisition until the insertion into the PSA for ESA. It includes information on how data were processed, formatted, labeled and uniquely identified. The document discusses general naming schemes for data volumes, data sets, data and label files. Standards used to generate the product are explained. Software that may be used to access the product is explained further on.

The design of the data set structure and the data product is given. Examples of these are given in the appendix.

## 1.4 Intended Readership

The staff of the archiving authority (Planetary Science Archive, ESA, RSSD, Lander team, design team) and any potential user of the ROMAP data.



## **1.5 Applicable Documents**

- AD 1. Planetary Data System Preparation Workbook, February 17, 1995, Version 3.1, JPL, D-7669, Part1
- AD 2. Planetary Data System Standards Reference, August 1, 2003, Version 3.6, JPL, D-7669, Part 2
- AD 3. Rosetta Archive Generation, Validation and Transfer Plan, January 10, 2006, Issue 2, Rev. 3, RO-EST-PL-5011
- AD 4. ROSETTA Archive Conventions RO-EST-TN-3372 Issue 7, Rev. 9, 06 April 2015
- AD 5. ROSETTA-RPC-MAG To Planetary Science Archive Interface Control Document EAICD RO-IGEP-TR0009 Issue 2.1
- AD 6. ROMAP Electronics FM2 ADP, RO-LRO-DP-300002-UA, Issue 1, Revision 0, 16/05/2001
- AD 7. ROMAP Boom & Sensor FM2 ADP, RO-LRO-DP-300003-UA, Issue 1, Revision 1, 16/07/.2001
- AD 8. ROMAP Instrument Calibration Report FM2, RO-LRO-TR-300010-WM, Issue 1, Rev. 1, 15/11/2000
- AD 9. CDMS Command and Data Management System Subsystem Specification RO-LCD-SP-3101 29/08/2001, Issue 3, Rev. 5
- AD 10. CDMS Command and Data Management System Operation Manual RO-LCD-SW-3402 12/02/2001, Issue 1, Rev. 2
- AD 11. Rosetta Time handling RO-EST-TN-3165, issue 1 rev 0, February 9, 2004
- AD 12. DDID- Data Delivery Interface Document RO-ESC-IF-5003 Issue B6 23/10/2003

## 1.6 Acronyms and Abbreviations

CDMS CEM CNES CODMAC COSAC DDS DECW EAICD EGSE ESA ESOC ESTEC ESS FM	Command and Data Management System Channel Electron Multiplier Centre National d'Etudes Spatiales Committee On Data Management, Archiving, and Computation Cometary Sampling And Composition Data Delivery System (ESOC server) Data Error Control Word Experiment Archive Interface Control Document Electronic Ground Support Equipment European Space Agency European Space Operation Center European Space Research and Technology Center Electrical Support System Flight Model
FPGA	Field-Programmable Gate Array
GRM	Ground Reference Model
HK	Housekeeping
IWF	Institut für Weltraumforschung (IWF) in Graz
LOBT	Lander On Board Time
MPS	Max-Planck-Institut für Sonnensystemforschung
N/A	Not Applicable
NASA	National Aeronautics and Space Administration
OBDH	On Board Data Handling
OOBT	Orbiter On Board Time
OBT	On Board Time
PDS	Planetary Data System
PECW	Packet Error Control Word
PI	Principal Investigator
PID	Process Identifier
PSA	Planetary Science Archive
PVV	PSA Volume Verifier
SC	Science
QM	Qualification Model



RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 5

RF	Radio Frequency
ROMAP	Rosetta Magnetometer and Plasma Monitor
S/C	Spacecraft
SCET	Spacecraft Event Time
SFDU	Standard Formatted Data Unit
SONC	Science Operations and Navigation Center(CNES-Toulouse)
TBC	To Be Confirmed
TBD	To Be Defined
тс	Telecomand
UTC	Universal Time Coordinated

## 1.7 Contact Names and Addresses

Daniel Popescu, GFI Toulouse data processing software responsible <u>dpopescu@gfi.fr</u>

Hans Ulrich Auster, IGeP, TU-Braunschweig Magnetometer PI <u>uli.auster@tu-bs.de</u> +49 531 391 5241

Istvan Apathy, KFKI Budapest SPM PI <u>apathy.istvan@energia.mta.hu</u> +36 209611030 +36 13922291

Gerhard Berghofer, IWF Graz Controller responsible <u>Gerhard.Berghofer@oeaw.ac.at</u> +43 316 4120 564

Anatoly Remizov, IKI Moscow SPM sensor responsible tolia.remizov@gmail.com +49 551 384 979 164

Reinhard Roll, MPS Lindau Pressure sensor responsible roll@mps.mpg.de +49 551 384 979 166

# 2 Overview of Scientific Objectives, Instrument Design, Data Handling Process and Product Generation

Main scientific goals of ROMAP are (1) long term measurements on the surface to study the cometary activity as function of the distance from the Sun and (2) magnetic measurements during the descent phase of the Lander to investigate the structure of the remnant magnetization of the nucleus. The ROMAP sensors (fluxgate magnetometer, electrostatic analyser and Faraday cup) measure the

magnetic field from 0 to 32Hz, ions up to 8.0 keV and electrons up to 4.2 keV. High integration level of



sensors and electronics. That is the basic for a combined field/plasma measurement instrument with less than 1 Watt power consumption and 1 kg mass. Additional two pressure sensors are included in the ROMAP sensor arrangement. The sensors are moved from COSAC to ROMAP to optimise long term operation of pressure sensors. Data of both pressure sensors are transmitted within the housekeeping frame and are handled / archived as housekeeping values

#### 2.1 Scientific Objectives

The Magnetometer (MAG) and the Simple Plasma Monitor (SPM) are the two experiments of the Small Instrument Package ROMAP, which complement the plasma packages onboard the ROSETTA Orbiter. Both instruments deliver data about the comet / solar wind interaction and the cometary activity as function of the distance from the sun and the onset of the diamagnetic cavity formation. The SPM sensor is able to determine the major solar wind parameters like density, speed, temperature, and flow direction. The Magnetometer sensor is able to determine the magnetic field vector.

Based on camera data from the flybys of the VEGA/GIOTTO spacecrafts at comet p/Halley in 1986, it was found that only a small part of the nucleus is active. As a consequence, new models about the internal structure of the nucleus were developed, in which the heat conductivity of the surface material is a key parameter. Up to the present, however, there are no direct measurements. On the background of such models, the gas production rate Q of the target comet p/Wirtanen was calculated as function of its radial distance to the Sun [Fuselier 1995; Kührt 1995]. Whereas the predictions of both models for perihelion distances are almost identical, they significantly differ for greater distances. For R=3.5AU, for example, there is a discrepancy of about four orders of magnitude:  $Q=10^{23}$  s<sup>-1</sup> according to Fuselier's model and  $Q=10^{27}$  s<sup>-1</sup> from Kührt. This great discrepancy is an example, which demonstrates the large uncertainties about the internal structure of the nucleus.

To date, most of the studies of comet-solar wind interaction address a well-developed cometary atmosphere. During the last decade, however, it has become apparent from both observation and theory that even weakly outgassing (or weakly magnetized) bodies may act as obstacles to the solar wind, creating effects that spacecraft magnetometers can resolve. As a result of bi-ion fluid simulations of the solar wind interaction with a weakly outgassing comet (Bogdanov et al. 1995), for example, one can distinguish between three main interaction regimes ordered with increasing neutral gas production rate Q. For Q<10<sup>25</sup> s<sup>-1</sup> the cometary activity is negligible and the body behaves like an asteroid. In the range  $10^{25}$  s<sup>-1</sup> < Q <  $10^{27}$  s<sup>-1</sup> effects become important that cannot be explained in the framework of classical one-fluid MHD theory since the characteristic scale lengths are smaller than the heavy ion gyro-radius. There is no bow shock, only Mach cone-like structures, and the heavy ion fluid flows along a cycloidal orbit accompanied by a small-scale structuring (heavy ion bunching). This structuring is sensitive to the parameters involved (Alfven Mach number, plasma beta, production rate). In the range  $10^{27}$  s<sup>-1</sup> <Q one is confronted with a well-developed cometary atmosphere as, for example, found at p/Grigg-Skjellerup, p/Giacobini-Zinner and p/Halley. Characteristic features are the formation of a diamagnetic cavity in the immediate vicinity of the nucleus, a cometopause (ion composition boundary) and a bow shock.

For the formation of a magnetic cavity around the nucleus, from which the solar wind is excluded, a rough estimate can be derived. According to the momentum flux balance of solar wind and purely cometary plasma at the interface, the cavity radius is given by

 $R_{cavity} = \frac{\mu \sigma Q}{4\pi n_{sw} v_{sw}^2} (\sigma \text{ ionisation rate, } \mu \text{ mass ratio cometary ions to protons, } n_{sw} \text{ solar wind density, } v_{sw} \text{ solar wind velocity; see also Haerendel 1987}). A cavity with a radius of 10km (as a reasonable lower limit) requires a production rate Q=5×10<sup>27</sup> s<sup>-1</sup>, which appears to be a threshold value for the existence of a cavity. After landing, magnetometer and plasma monitor shall operate in a common mode (surface mode). Aim is to measure during a full cometary rotation period (8h). If the operation time is limited for energy reasons operation during a full cometary day (4h) is planed. The measurement shall be repeated in regular intervals (e.g. each 4 days) to monitor the plasma evolution with closer distance to Sun. Measurements have to be done synchronously with RPC onboard the orbiter.$ 

For the first time ever, the ROSETTA mission provides magnetic field measurements at very low distances from a cometary nucleus in a situation where the cometary activity is not yet fully developed. If the nucleus is

Institut für Geophysik und extraterrestrische Physik ROMAP E	ICD Document No. ISsue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 7
--	--	--

not protected by an atmosphere produced by outgassing, the solar wind interacts directly with the intrinsic field and one can expect a situation similar to that observed at GALILEO's flyby at the asteroids Gaspra and Ida. Whereas the closest approach at these flybys was of the order of 1000 km, the situation here is much better because the surface field can be measured directly, practically not affected by the solar wind. In addition, during the approach to the nucleus, the probe can measure the variation of the magnetic field with distance and thus one should be able to clearly identify the type of the possible remnant magnetization.

Magnetometer data from GALILEO's flyby at the two asteroids Gaspra and Ida [Kivelson et al. 1993] together with model calculations [Baumgärtel et al. 1994, Kivelson et al. 1995a,b] have been interpreted in terms of an intrinsic magnetization of these bodies. It is generally assumed that this is remnant magnetization due to magnetic minerals such as iron-nickel, magnetite, and pyrrhotite, which were magnetized by relatively strong magnetic fields in the early solar nebula [e.g., Sugiura and Strangway 1988]. In the case of a generic relationship between asteroids and comets as to their refractory components, the magnetism of cometary nuclei could be caused by material exhibiting a natural remnant magnetization (NRM) in much the same way. Whether or not such material is present in cometary nuclei is still under debate.

Both, experimental results (mass spectrometry of particles escaped from p/Halley) and theoretical models point out primary magnetic minerals and possibly secondary magnetic material as well. One should expect the more pristine bright cometary regions to be characterized by rather primary magnetic material whereas the dark fractionated regions should be enriched by secondary magnetic material. More specifically, the following magnetic minerals/materials are being considered:  $Fe_3 O_4$  (magnetite), Fe-Ni (metal) and (Fe,Ni)<sub>0.9</sub> S (pyrrhotite) as major carriers in the light regions and magnetite and a Fe-S-Ni-Si-O-rich phase in the dark regions. This is probably the main carrier of the NRM in bulk samples of C1-chondrites.

The growth of fractal aggregates from collisions between small dust grains is generally accepted to be the first step in the formation of planetesimals and cometesimals in the early solar system. Until now, the graingrain interactions considered within this scenario were of mechanical and electrostatic nature only. If magnetized material were present at this stage, as is suggested by meteoritic and asteroidal evidence, magnetic interactions between dust particles should be taken into account as well. It has been shown experimentally [Nuth et al. 1994] and numerically [Nübold and Glassmeier 1999, 2000] that magnetized grains tend to build elongated structures of low fractal dimension and non-vanishing magnetic moment (see Figure 1). In case of enough magnetic material is available, this process may lead to centimetre or even metre sized magnetic structures, which ROMAP might be able to detect. Remnant magnetization of primitive objects such as comets could thus be called "accretional remanence".



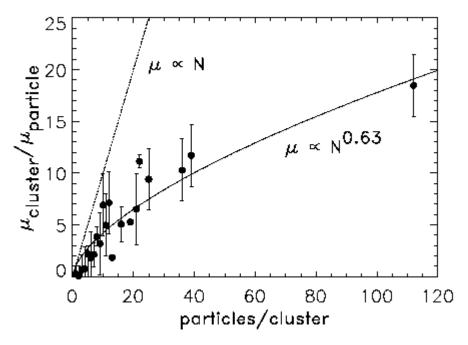


Figure 1 . Accretional remanence of growing magnetic dust aggregates in a numerical simulation [Nübold and Glassmeier, 2000].

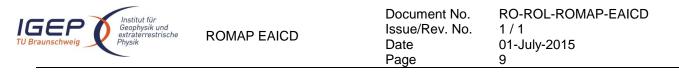
#### 2.2 Instrument Design

The ROMAP hardware consists of a combined magnetic field (MAG) and plasma (SPM) sensor mounted on a small boom, the near sensor electronics, a high-voltage generator (HV-part) and a small DPU (controller).

#### 2.2.1 ROMAP Sensors

The magnetic field is measured with a vector compensated ringcore fluxgate magnetometer designed by the TU-Braunschweig and manufactured by the MPE Garching. The sensor consists of two ringcores (crossed in to each other) as well as pick-up coils and Helmholtz coils for each sensor axis. The coil system design without mechanical support allows the compensation of the external field on the ringcore position with high homogeneity and low weight (the overall sensor weight is 30g). Dynamic feedback fields as well as offset fields up to 2000nT can be generated in order to compensate Lander and/or Orbiter DC stray fields. The determination of Lander and Orbiter offsets could be done during the cruise phase using non compressible waves in the solar wind [Hedgecock 1975]. Parallel measurements of Lander and Orbiter magnetometer during Lander eject, descent and during measurement campaigns on the cometary surface gives an additional input for the inflight calibration.

The main part of the SPM-sensor is a hemispherical electrostatic analyzer with two channeltrons (CEM's) for ions measurement and one for electrons measurement. The entry of the ion channels is equipped with deflection plates to realize the spatial resolution. Despite the small size of the sensor, the sensitivity and resolution of the instrument are high and its field of view wide (appr. 100 degree). The E/q-range extends from 0 to 8 kV. Using CEMs in counting mode the electrostatic analyzer measures electron and ion distribution in a wide energy range. Hemispherical deflection plates analyze the energy in 32 or 64 steps. All major plasma parameters as bulk velocity, density and isotropic temperature of electrons and protons can be derived. A retarding-grid Faraday cup sensor is implemented to measure currents due to fluxes of low energy charged particles on a collector plate. The Faraday cup measures the "reduced" velocity distribution of the plasma due



to its inherent integration over velocities contained in a plane of differential thickness perpendicular to the axis of the sensor. Because the sensor is not differential in angle, the Faraday cup requires relatively low data rates. But for a given orientation it provides differential information in velocity space only along a direction perpendicular to the retarding grid [Lazarus et al. 1993].

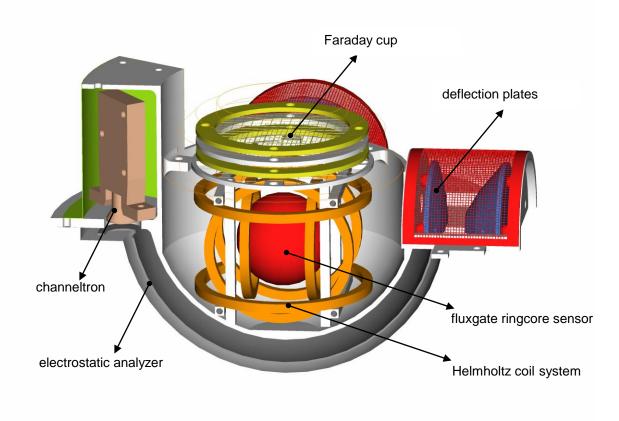


Figure 2 ROMAP MAG and SPM sensors compartment.

SPM sensor and fluxgate sensor integrated within one spherical sensor head. Figure 2 shows the sensor compartment. The sensor head is mounted on a 60 cm boom which is fixed with a hinge on the upper edge of the Lander structure and with a launch lock on the Lander balcony. After opening the launch lock, the boom

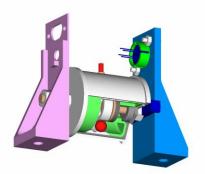


Figure 3 Pressure sensors

is deployed by two springs inside the hinge.

Institut für Geophysik und extraterrestrische Physik ROMAP E	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 10
--	--	---

Two pressure sensors are selected to cover the whole pressure range from 10<sup>-8</sup>mbar to 10<sup>1</sup>mbar. For the range from 10<sup>-8</sup>mbar to 10<sup>-3</sup>mbar an ionising system (Penning) is deployed while for the range from 10<sup>-3</sup>mbar to 10<sup>1</sup>mbar a heat conduction sensor (Minipirani) is available. The pressure data are transmitted in the housekeeping frames. They are handled and archived as housekeeping and not as scientific values. The combined magnetometer / SPM sensor is mounted on a 60 cm boom which is fixed with a hinge on the upper edge of the Lander structure and with a launch lock on the Lander balcony. After opening the launch lock, the boom is deployed by two springs inside the hinge. Boom and the related coordinate systems are shown in Figure 4.

The SPM sensor, the Pressure sensors and all boom parts are designed by the MPS Lindau.

#### **ROMAP** sensor orientation

Coordinates (in L rotation centre:	ander system) of
X:	186.82mm
Y:	-315.0mm
Z:	526.2mm
Sensor centre in X: Y: Z:	stowed position: 20.2mm -315.0mm 58.7mm
Sensor centre in	fully deployed position:

X:	-329.1mm
Y:	-315.0mm
Z:	526.2mm

Convertion of ROMAP system (R) in Lander System (L):

#### Stowed:

	(0	0.336	-0.942	
(L) =	1	0	0	(R)
	0		0.336	

### Deployed:

	$\left( 0 \right)$	1	0)	
(L) =	1	0	0	(R)
	0	0	1)	

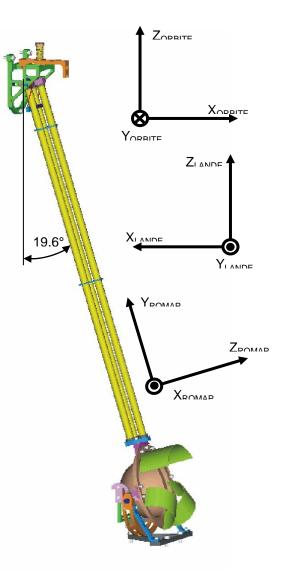


Figure 4 ROMAP sensors orientation



## 2.2.2 ROMAP Electronics

The ROMAP electronics consists of two boards placed inside the common electronics box. The central part of the near sensor electronics on the first board is a FPGA which controls AD and DA-converters. The 16-bit AD converters are digitising science and housekeeping data from all three sensors. In the block diagram (Figure 5) this data flow is drawn with dotted lines.

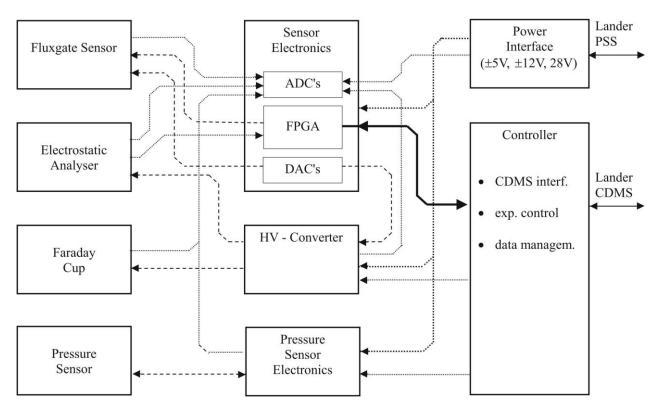


Figure 5 ROMAP electronics

Typical analogue parts of fluxgate magnetometers like filters or phase-sensitive integrators are substituted by fast digitalization of the sensor AC-signal and the following data processing in FPGA's (which overtakes the functions of the former analogue parts) [Auster et al. 1995]. In this way mass is saved without any loss of accuracy. The resolution is still restricted by sensor noise (less than 5pT/ $\sqrt{Hz}$  at 1Hz) [Fornacon et al. 1999], not by electronics. Compensation fields for the magnetometer and high voltage steps for electrostatic analyser and Faraday cup are controlled via DA-converters (dashed lines). The near sensor electronics is developed by Magson GmbH Berlin The high voltage generator (developed by the KFKI) is in a separate shielded box on the front panel of the common electronics box..

The controller is located on the second ROMAP board. It controls MAG and SPM, stores their data output and implements the interface to the Lander Command and Data Management System (CDMS). It triggers the measurement cycle of the magnetometer, implements the digital magnetometer algorithm, controls the magnetometer feedback and generates data frames. For the SPM sensors the controller has implemented the counting logic for electrons and ions, samples Faraday cup data, generates SPM data frames, controls the high voltage parameters (energy, elevation), controls the channeltron HV-supply and computes the plasma parameters. In the parameter mode only the sums of the rows and columns of the sampled ion and ion-current arrays are transmitted. The controller is based on a RTX2010. Address decoder, reset logic, clock generators, control signals generator, watchdog logic and CDMS interface are integrated within a FPGA. Hard- and software are developed by the IWF Graz.

The instrument parameters and the required recourses are given in the following tables:



#### Instrument parameters:

type of sensor	parameter		value
Fluxgate	dynamic range		±2.000nT
Magnetometer	resolution		10pT
	sensor noise		<5pT/√Hz
	frequency range		032Hz
	offset drift		<0.1nT/°C
Electrostatic,	channels	ions	2 CEM
Hemispherical		electrons	1 CEM
Analyzer	energy range	ions	40 8000eV
		electrons	0,35 4200eV
	field of view	ions	100° x 100°
		electrons	10° x 60°
	energy steps		32 or 64, log. scaled
	max. count rate		10 <sup>6</sup> counts/s
	exposition time		40 1.000ms
Faraday cup	ion integral energy	distribution	up to 2000 eV
	resolution (current	mode)	±1.5 10 <sup>-12</sup> - ±5.10 <sup>-10</sup> A
	field of view		$140^{\circ} \times 140^{\circ}$
	energy steps		16 steps
	entrance area		$6 \text{ cm}^2$
Penning Sensor	range		10 <sup>-8</sup> – 10 <sup>-3</sup> mbar
-	electric Field		10 <sup>6</sup> V/m
	magnetic field		700 Gauss
Pirani Sensor	range		10 <sup>-3</sup> – 10 mbar
	bridge resistors		1kOhm

#### **ROMAP** Resources

recourses	experiment part	requirements	Σ
mass	MAG sensor	40g	
	SPM sensor	120g	
	Pressure sensor	110g	
	boom + hinge + cable	80g	
	launch lock	40g	
	pressure harness	50g	
	electronics in CEB	360g	
	(interface, analogue,		
	controller, HV-box, connectors,		
	frontplate)		
	Pressure E-Box	130g	930g
power	sensor electronics	350550mW	
	controller	180mW	
	penning electronics	100mW	
	pirani electronics	50mW	
	HV-part	200mW	<900mW
telemetry rate	surface mode		
	MAG	70 bits/s	
	SPM	30 bits/s	80 bits/s
	slow mode		
	MAG	70 bits/s	68 bits/s
	fast mode		
	MAG	4400 bits/s	4369 bits/s



## 2.3 Data Handling Process

SONC is responsible for data preparation and TU-BS is responsible for the distribution to Col's. The relevant contact information is provided in section 1.7.

The SONC is responsible for PDS ROMAP data sets generation and delivery to the PSA.

The ROMAP telemetry data are provided by the ESA DDS (Data Distribution Server). Following the operations plan the SONC pulls out archived packets (Science and HK) by direct request to the DDS via FTP and stores them into SONC database.

SONC also handles Auxiliary data (Attitude and Orbit files) pushed by the ESA DDS (data distribution system) server.

As soon as they are received, the Science and HK data raw packets are passed through data processing software. The SONC data processing system takes as input raw telemetry data (packets) and raw attitude and orbit files. The SPM raw data are decommutated into ions energy and angle distributions (currents and counts), Faraday cup current and electron energy distribution (counts) and preliminary calibrated. The magnetic field vectors in instrument frame are extracted, time stamped in UTC, converted to physical units (nT) and stored in the SONC database. These data are furthermore draft calibrated (offset, sensitivity and alignment calculation) and rotated into different coordinate systems (EMEJ2000, ECLIPJ2000, SM, GSM, GSE, MSO). The calibration can be performed with different sets of calibration data (alignment and sensitivity matrices and offset vectors) that are stored in the SONC data base. This allows the use of different calibrations for different time intervals. The calibrated data are not stored in the SONC database but produced on the fly from the raw data and a selected calibration set.

Consequently, the following data are immediately available through W3-SONC server (<u>http://soncv2-rosetta.cnes.fr</u>) and the authorized<sup>1</sup> users can get them for a selected time interval :

- Science (SC) and Housekeeping (HK) raw packets as binary files
- Preliminary calibrated magnetometer data (SONC level 1) in selectable coordinate systems as ASCII files

- Preliminary calibrated plasma monitor data (SONC level 1)

Calibrated HK data as ASCII files

Moreover, the W3-SONC provides interactive plots of ROMAP science and housekeeping data.

After the proprietary period, the SONC team provides the raw data, preliminary calibrated data to the PSA team.

ROMAP-MAG Final calibration (SONC level 1\_lab) has to be done by TU-BS using RPC data. Only some selected data intervals are provided to SONC and PDS during cruise.

The delivery format is described in this document.

## 2.4 Overview of Data Products

### 2.4.1 Pre-Flight Data Products

Preflight data are not subject of archiving. MAG as well as SPM data measured on ground are not representative due to environmental conditions (Earth field, stray fields, non vacuum): All relevant calibration results are summarized in the ADP.

<sup>&</sup>lt;sup>1</sup> The authorization is controlled by PI (TU-BS). At his request, SONC delivers a login/password to the authorized user.



RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 14

## 2.4.2 Sub-System Tests

No sub-system test data are provided.

### 2.4.3 Instrument Calibrations

MAG : Only selected calibration data (interpretable with limited setup information) are archived. SPM : Instrument calibration data are not archived.

The file ROMAP\_CALIBRATION\_DESC.TXT (located in the DOCUMENT directory) contains information about MAG and SPM calibration.

## 2.4.4 Other Files written during Calibration

No additional files are available.

## 2.4.5 In-Flight Data Products

The in-flight data correspond to all the on board data. They can be produced during following mission phases :

#### Table 2-1 Mission phases

MISSION_PHASE_NAME	Abbreviation	Start Date	End Date	ROMAP d	lata (1)
		(dd/mm/yyyy)	(dd/mm/yyyy)	MAG	SPM
Commissioning (part 1)	CVP1	05/03/2004	06/06/2004	Х	
Cruise 1	CR1	07/06/2004	05/09/2004		
Commissioning (part 2)	CVP2	06/09/2004	16/10/2004	Х	
Earth Swing-by 1 (including PC#0)	EAR1	17/10/2004	04/04/2005	X	
Cruise 2 (including PC#1,2)	CR2	05/04/2005	28/07/2006	x	
Mars Swing-by (including PC#3,4,5)	MARS	29/07/2006	28/05/2007	X	
Cruise 3	CR3	29/05/2007	12/09/2007		
Earth Swing-by 2 (including PC#6,7)	EAR2	13/09/2007	27/01/2008	x	
Cruise 4-1 (including PC#8)	CR4A	28/01/2008	03/08/2008	Х	
Steins Flyby	AST1	04/08/2008	05/10/2008	Х	
Cruise 4-2 (including PC#9)	CR4B	06/10/2008	13/09/2009	X	
Earth Swing-by 3 (including PC#10)	EAR3	14/09/2009	13/12/2009	X	
Cruise 5 (including PC#12)	CR5	14/12/2009	06/06/2010	Х	
Lutetia Flyby	AST2	07/06/2010	10/09/2010	Х	
RV Manoeuver 1 (including PC#13)	RVM1	11/09/2010	13/07/2011	Х	
Cruise 6	CR6	14/07/2011	22/01/2014		



Document No. Issue/Rev. No. Date Page RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 15

Post Hibernation Commissionning	PHC	09/04/2014	24/04/2014	Х	X
Pre-delivery calibration Science	PDCS	25/04/2014	11/11/2014	Х	

(1) The last column indicates if ROMAP data are available

After the release of the Lander, we distinguish four phases, characterized by:

- The Start and Stop dates need to be expressed in seconds
- The Lander has its own Auxiliary data

Separation/Descent/Landing	SDL	2014/11/12 08:35:02	2014/11/12 15:34:04	Х	
Rebounds	RBD	2014/11/12 15:34:05	2014/11/12 17:30:20	Х	Х
First Science Sequence	FSS	2014/11/12 17:30:21	2014/11/15 01:00:00	Х	Х
Long Term Science	LTS	tbd	tbd	tbc	

Note that ROMAP data just before the separation (from 2014/11/12 03:35:05) will be included into SDL phase.

The data, both scientific and housekeeping, are listed in document AD 6.

#### Data products :

#### ROMAP-MAG

Edited (digital units) and draft calibrated data (in nT) are available for all mission phases. Calibrated data (in nT and cleaned from interferences) are available only for selected time intervals. The time intervals are selected when data from the Orbiter magnetometer (RPC-MAG) are available (see table Table 2-2 and §3.3.1). Only calibrated data are useful for scientific interpretation.

**Edited** (raw) data (in ADC units) provided by SONC Science : UTC, OBT, BX, BY, BZ

**Draft Calibrated Data** (in physical units, draft aligned and very draft offset corrected), provided by SONC

Science_A (in Mag Coordinates) :	UTC, OBT, POS_X, POS_Y, POS_Z, BX, BY, BZ
Science_B (in Lander Coordinates):	UTC, OBT, POS_X, POS_Y, POS_Z, BX, BY, BZ
Science_C (in S/C Coordinates):	UTC, OBT, POS_X, POS_Y, POS_Z, BX, BY, BZ
Science_D (in ECLIPJ2000):	UTC, OBT, POS_X, POS_Y, POS_Z, BX, BY, BZ

**Final calibrated Data** (in physical units, cleaned from offset and spacecraft disturbances), provided by IGeP (TU-BS)

Science\_E (in Mag Coordinates): Science\_F (in Lander Coordinates): Science\_G (in S/C Coordinates): Science\_H (in ECLIPJ2000): UTC, OBT, POS\_X, POS\_Y, POS\_Z, BX, BY, BZ UTC, OBT, POS\_X, POS\_Y, POS\_Z, BX, BY, BZ UTC, OBT, POS\_X, POS\_Y, POS\_Z, BX, BY, BZ UTC, OBT, POS\_X, POS\_Y, POS\_Z, BX, BY, BZ

Mission phase	Start time (UTC)	Stop time (UTC)	Remarks
Mars swing-by	2007-02-25T01:28:04	2007-02-25T02:28:01	
Steins fly-by	2008-09-05T18:08:17	2008-09-05T19:08:16	ROMAP-MAG is switched into fast mode (64 Hz). However these data are reduced to 1Hz because correction has been derived from RPC-



Document No. Issue/Rev. No. Date Page RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 16

			ROMAP comparison.
Post Hibernation Commissioning	2014-04-17T02:50:12	2014-04-17T05:39:11	
Pre-delivery calibration	2014-07-14T03:05:07	2014-07-14T10:54:31	
Science	2014-09-08T00:50:05	2014-09-08T06:10:30	
	2014-09-15T13:15:06	2014-09-16T20:24:02	
	2014-09-25T05:50:06	2014-09-25T11:10:00	
	2014-10-06T20:45:06	2014-10-07T19:54:30	
	2014-10-16T21:15:06	2014-10-17T08:24:00	
Separation/Descent/Landing	2014-11-12T08:56:30	2014-11-12T15:34:06	After boom
			deployment
Rebounds	2014-11-12T15:34:10	2014-11-12T17:30:21	

Table 2-2 Final calibrated ROMAP-MAG data time intervals

The centre of the ecliptic J2000 frame is chosen according to the mission phase. During the cruise, the centre is the Sun, except for the flybys of the Earth, Mars and asteroids where the centre is the Earth, or Mars or asteroids.

Although, additional to the S/C system, local systems might be preferred if solar wind interaction or remnant magnetization should be analysed, transformations in those systems are not foreseen for asteroid flybys. It could be done by user. Note, that ROMAP data are used primarily for correction of RPC data. This has been done in S/C system.

The center for different time intervals is given in Table 2-3. Only centers different from Sun are given in the table.

Start time (UTC)	Stop time (UTC)	ECLIP J2000 center
2005/03/01 01:00:09	2005/03/07 23:29:42	Earth
2007/11/07 01:30:18	2007/11/13 22:38:18	Earth
2007/11/13 22:38:18	2007/11/20 13:19:01	Earth
2007/02/24 01:01:08	2007/02/25 13:53:32	Mars

Table 2-3 The center of the ECLIP J2000 reference system for different time intervals

#### ROMAP-SPM

Edited data (in instrument coordinates)

The ROMAP electronics generates 2 types of data frames - Raw Data Frames and Parameter Data frames. The SPM data products are separated accordingly, in RAW and SPM files. The sampling procedure is the same for both modes. Only the way of transmitting the data differs.

In the **RAW mode**, the sampled data of one measurement cycle for the ion and ion-current channels are held in arrays (energy-elevation) in the ROMAP-Controller RAM.

After sampling for one measurement cycle is finished, data is packet into a specific amount of science data frames and transmitted via the CDMS interface.

For reducing the data amount, even and odd energies of both ion and ion-current channels can be transmitted alternating in consecutive Raw Data measurement cycles (at one measurement cycle the even energies of one ion channel and the odd energies of the other ion channel are transmitted and at the next measurement cycle vice versa). This is the default setting for SPM.

But also a full transmission of all energies can be selected. In this case for one cycle all data of one ion channel is transmitted and at the next cycle all of the other.

In the **PAR mode**, for reducing the amount of data to transmit, only the sums of the rows and columns of the sampled ion and ion-current arrays are transmitted. The sampling procedure is the same as for Raw Data transmission. The sums are computed when the sampling is finished.

Further details about ROMAP modes can be found in AD 6.



RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 17

#### SC data products

For every science cycle:

UTC, OBT, Status of SPM (from HK parameters in SC data frame),

Raw Data

- 16 (for different angles) energy distributions (counts and current) for Ion1 and Ion2 sensors,
  - 1 energy distributions (current) for Faraday Cup sensors,
  - 1 energy distributions (counts) for Electron sensors

Parameter Data

- 1 energy distributions (counts and current) for lon1 and lon2 sensors,
- 1 angle distributions (counts and current) for lon1 and lon2 sensors,
- 1 energy distributions (current) for Faraday Cup sensors,
- 1 energy distributions (counts) for Electron sensors

**Calibrated data** : the same as for SC data, but in physical units: energy - in keV, angle - deg, count - in sm2, current - in nA - all in accordance with calibration data. Moreover for the calibrated data the orientation of sensors in ECLIPJ2000 coordinates is added for each distribution.

Derived data generated by SPM science group.

HK data products

Edited data (ADC counts)

16 housekeeping parameters : UTC, OBT, HK1, HK2, ..., HK16

Calibrated data (in physical units)

Same parameters as for edited data but in physical units : UTC, OBT, HK1, HK2, ..., HK16

#### 2.4.6 Documentation

The documentation directory contains the following documents:

- ROMAP Electronics FM2 ADP, RO-LRO-DP-300002-UA, Issue 1, Revision 0, 16/05/2001
- EAICD (this document)
- ROMAP\_CALIBRATION\_DESC.TXT
- TIMELINE\_ph.TXT, timeline Ascii file for phase ph
- TIMELINE\_ph\_DESC.TXT, description of the timeline file for phase ph
- TIMELINE\_ph\_obty.PNG, timeline Image file for phase ph and observation type obty

### 2.4.7 Derived and other Data Products

MAG : The final calibrated data are considered as CODMAC level 5 (derived product) since the correction procedure can not be described sufficiently and is not reproducible. It depends on detailed situation on board (temperatures, variable currents ...) and on availability of RPC data (for the detection of changing supply currents).



RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 18

SPM : derived products are not generated

# 2.4.8 Ancillary Data Usage

The Lander Auxiliary Data on the comet (Position/Orientation/Illumination at any time + Comet models + Ancillary Data from the instruments) will be available in an ANCDR (Ancillary Data Record) whose definition is in progress, pending the Lander auxiliary data reconstruction.

# 3 Archive Format and Content

# 3.1 Format and Conventions

Data processing level number used in ROMAP naming scheme conforms to CODMAC norm :

2: Edited Data Corrected for telemetry errors and split or decommutated into a data set for a given instrument. Sometimes called Experimental Data Record. Data are also tagged with time and location of acquisition. Corresponds to NASA Level 0 data.

3: Calibrated Data Edited data that are still in units produced by instrument, but that have been corrected so that values are expressed in or are proportional to some physical unit such as radiance. No resampling, so edited data can be reconstructed. NASA Level 1A.

5: Derived Data Derived results, as maps, reports, graphics, etc. NASA Levels 2 through 5.

### 3.1.1 Deliveries and Archive Volume Format

A data set is delivered for each **simple mission phase.** Each data set contains **only one level data processing**. The ROMAP MAG and SPM data are archived in a separate data sets.

The list of simple mission phases is given in

A data set is level-stamped as below :

- Level 2 when it contains :

- Uncalibrated SC or HK data (CODMAC level 2)
- Level 3 when it contains :
  - Calibrated SC or HK data (CODMAC level 3)
- Level 5 when it contains derived data (CODMAC level 5)

In addition a data set contains :

- Documents (see chapter 3.4.3.9)
- A new version of a data set is provided when :
- calibration information refining
- new data processing
- higher levels production.



## 3.1.2 Data Set ID Formation

DATA\_SET\_ID = <INSTRUMENT\_HOST\_ID>-<target id>-<INSTRUMENT\_ID>-<data processing level number>-<mission phase abbreviation>-<description>-<version>

DATA\_SET\_NAME = <INSTRUMENT\_HOST\_NAME> <target name> <INSTRUMENT\_ID> <data processing level number> <mission phase abbreviation> <description> <version>

Note: The description field is used to distinguish ROMAP-MAG and ROMAP-SPM datasets.

See appendix F (16.1.1, 16.1.2) of Archive Plan Issue 2/2.

Examples of DATA\_SET\_ID and DATA\_SET\_NAME for ROMAP-MAG data obtained in-flight during CVP :

DATA\_SET\_NAME = "ROSETTA-LANDER CAL ROMAP 3 CVP MAG V1.0"

DATA\_SET\_ID = "RL-CAL-ROMAP-3-CVP-MAG-V1.0"

## 3.1.3 Data Directory Naming Convention

See § 3.4.3.

## 3.1.4 Filenaming Convention

The following file **naming scheme** is used:

### {exp}\_{datatype}\_{begin of observation}\_{length of observation}\_{modeSPM}.{ext}

- exp (3 character) = RHK (HK), MAG or SPM (SC)
- datatype (3 character) = XYZ
  - $\circ \quad X = G \text{ for Ground, } F \text{ for Flight}$ 
    - Y = S for Science Data, H for Housekeeping Data,
  - Z = Data processing level :
    - <u>MAG</u> :

**2** for edited data (HK, SC)

**3** for calibrated data (HK)

A for preliminary calibrated SC data, in physical units, draft aligned and very draft offset corrected, <u>in MAG coordinates</u>

**B** for preliminary calibrated SC data, in physical units, draft aligned and very draft offset corrected, <u>in Lander coordinates</u>

**C** for preliminary calibrated SC data, in physical units, draft aligned and very draft offset corrected, <u>in S/C coordinates</u>

**D** for preliminary calibrated SC data, in physical units, draft aligned and very draft offset corrected, <u>in ECLIPJ2000 coordinates</u>

**E** for final calibrated SC data, in physical units, cleaned from offset and spacecraft disturbances, <u>in MAG coordinates</u>

**F** for final calibrated SC data, in physical units, cleaned from offset and spacecraft disturbances, <u>in Lander coordinates</u>

**G** for final calibrated SC data, in physical units, cleaned from offset and spacecraft disturbances, <u>in S/C coordinates</u>

H for final calibrated SC data, in physical units, cleaned from offset and spacecraft



disturbances, in ECLIPJ2000 coordinates

<u>SPM :</u>

2 for edited data (HK, SC), in MAG coordinates

3 for calibrated data (HK, SC), in Lander coordinates

- 5 for derived data (SC), in Lander coordinates
- begin of observation (12 characters) = time of test or working session in UTC yymmddhhmmss:
  - yy = year
  - $\circ$  mm = month
  - $\circ$  dd = day
  - $\circ$  hh = hour
  - o mm = minute
  - $\circ$  ss = second
- length of observation (5 characters) = duration of test or working session expressed in minutes. A file do not contain more than 10 day of data Two working sessions are separated by a gap greater than 100 seconds for MAG (SC), greater than 200 seconds for SPM (SC). A gap of 500 secondes is used for HK data.
- modeSPM = data type for SPM label file .LBL (only). Not encountered for MAG file or other extension of files. Possible values:
  - o RAW
  - o PAR
- **ext** = extension of file. For ROMAP possible extensions are:
  - ROL for Raw Data containing HK and SC data mixed together (CODMAC level 1)
  - TAB for SC or HK Data (CODMAC level 2, 3 and 5)
  - LBL for label file associated to file .TAB

Examples :

MAG\_FSA\_040603123400\_01542.TAB

Data included in this file are ROMAP-MAG Science data recorded on flight on 03 June 2004 beginning at 12:34:00 (UTC) for a duration of 1542 minutes. They are preliminary calibrated, in MAG coordinates.

SPM\_FS2\_050103123400\_00220.TAB

Data included in this file are ROMAP-SPM Science data recorded on flight on 03 Jan 2005 beginning at 12:34:00 (UTC) for a duration of 220 minutes. These are edited data.

RHK\_FH3\_040903121000\_00800.TAB

Data included in this file are calibrated HK flight data recorded on 09 Sep 2004 beginning at 12:10:00 (UTC) for a duration of 800 minutes.

# 3.2 Standards Used in Data Product Generation

### 3.2.1 PDS Standards

The archive structure given in this document complies with PDS standard version 3.6.



## 3.2.2 Time Standards

### 3.2.2.1 Generalities

This paragraph gives a summary of the different existing formats in the Rosetta Ground segment, from their generation by the instruments to their availability at SONC :

- The Lander CDMS requires the scientific instruments to transmit the data by bursts of 8 or 64 bytes (4 or 32 16-bit words)
- When sufficient data are received, the CDMS builds packets containing 256 bytes of instrument data. The CDMS adds 18 bytes header (unit PID, sequence count, OOBT : Orbiter OBT, data type) and a 2 bytes checksum (DECW) and creates packets with a fixed length of 276 bytes<sup>2</sup>. For transmission between Lander and Orbiter, a 4 bytes synchro header and a 2 bytes trailing checksum (PECW) are added, increasing the packet size to 282 bytes. The extra bytes are removed by the ESS.

To comply with ESA requirements, the time registered in the CDMS packets is the **OOBT**. It is reconstituted from the LOBT, as shown in Figure 6:

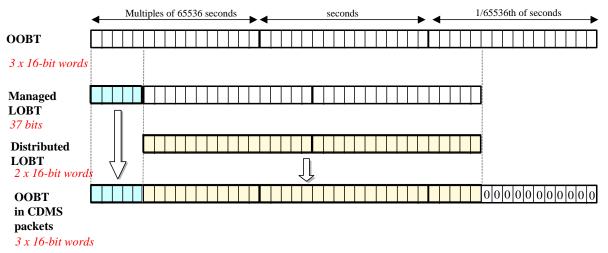


Figure 6 Reconstruction of on board time in CDMS packets

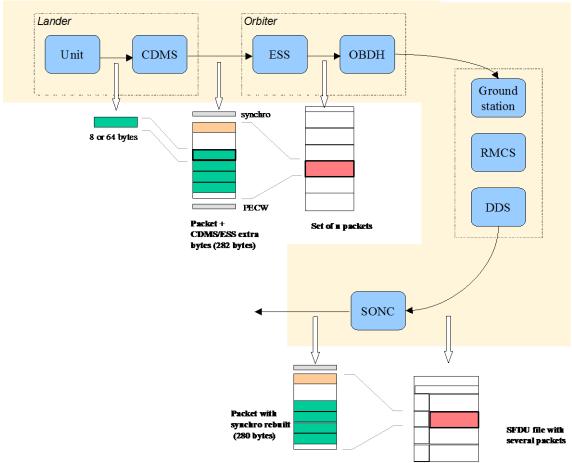
- The ESS groups together several packets and passes them to the Orbiter OBDH, which transmits them according to the Space/Ground interface. This part is transparent for the Lander ground segment.
- The data are delivered by the Rosetta Data Distribution System (DDS) to the SONC in SFDU format. A SFDU file is basically a collection of 276-byte packets interspersed with auxiliary information records. An 18 bytes SFDU header is added to the CDMS 276-byte packets. This header contains information added at the ground station (time correlated OBT, ground station id, virtual channel id, service channel, type of data, time quality)

<sup>&</sup>lt;sup>2</sup> The Lander CDMS header and the headers of the telemetry source packets from the Orbiter instruments are quite similar. There is a difference in the data field header. The byte containing PUS version, checksum flag and spare fields is set to zero in the CDMS header. Besides the last byte of the OOBT is set to zero in the CDMS header. The CDMS header has an additional word (2 bytes) after the data field header named "FORMAT ID". This word is mainly used for HK data and it contains the HK scanning period and the SID (structure identification).



RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 22

SONC processes the SFDU files to retrieve the 276-byte packets. This format is available in the SONC database.



#### Figure 7 On board data flow

• Afterwards, SONC processes science raw packets in order to recompose the science measurement (e.g. an image, a spectrum, ...).

Figure 7 gives an overview of this data flow.

Only the following principles are applied :

- the packet wrapping is removed, and science frames that had to be split into several raw data packets are rebuilt. Basic error detection controls are applied, to recover from possible problems in the transmission chain.

- the Lander On-Board time (LOBT) (synchronised with OOBT) extracted from the packet, and corresponding UTC time coming from the SFDU header, are added.

- UTC time is calculated from the On-Board time taking into account the On-Board clock drift as following : UTC (seconds since 01/01/1970) = LOBT(seconds) \* Gradient + Offset (these coefficients are extracted from



#### TCP packets delivered by DDS).

LOBT is either the LOBT extracted from CDMS header or the Experiment internal clock when it exists (CIVA, COSAC, PTOLEMY, ROMAP, ROLIS, SESAME). In the last case, it must be taken into account that the Internal clock (32 bits) resets all 4 years, 4 months, 3 days (first reset : 03/04/2007 10 :42 :07).

UTC time-stamped Science and HK data are available in the SONC database and used to generate PDS format.

## 3.2.2.2 ROMAP Time standards

The time standards used in the ROMAP data products are :

- the ROMAP on-board time,
- the Lander on-board time,
- the DDS header time correlated,
- the UTC.

#### 3.2.2.2.1 The ROMAP On-Board Time

ROMAP puts a time stamp of the first vector in a science data frame (MAG) or of the beginning of a data collection cycle (SPM) into the frame header. The timing information for subsequent data in the frame can be computed with the time stamp as reference. Because the interval of the received OBT is too low, the ROMAP-Controller integrates a 16bit counter with 1/32s resolution that is reset when a new OBT is received. For getting accurate time stamps, the value of the internal counter is read and added to the last received OBT. Then the time is stored to the data frame.

#### 3.2.2.2.2 The Lander On-Board Time (LOBT)

The instruments on board the spacecraft (Orbiter) generate telemetry source packets with an OOBT (orbiter on board time) time stamp in the header.

The OOBT written into the packet header specifies the time, when CDMS can complete a packet.

In terms of HK packets this is the time of the last HK word. Using the HK scanning rate, which is given in word #9 of the packet, one can calculate the OBT of every individual word in this packet. Note that this is only valid if packets with SID (word #9) 1 or 2 are generated. Packets with SID 4 and 5 are "snapshots", which means you can apply the packet OOBT for every word in this packet. SID 3 packets have to be analysed case by case.

In terms of SC packets this is the reception of the last 32 word block by CDMS, which also completes the SC packet. How often 32 word blocks are created (and sent) by the unit, and corresponding to this the delta time between each block, might be different for each unit. So, re-calculation of OOBT for SC words depends on this unit feature.

**The Orbiter On-Board Time (OOBT)** is a linear binary counter having a resolution of 1/65536 sec stored in 3 16-bit words.

The <u>Lander On-Board Time</u> (LOBT) is a linear binary counter having a resolution of 1/32 sec, kept in 37 bits. Only the 32 least significant bits are distributed to the instruments, in 2 16-bit words. The 5 most significant bits are supposed constant during most of the mission, they are available through a specific service.

The LOBT is derived from the Orbiter On-Board Time (OOBT) : the 11 least significant bits of the OOBT are discarded to obtain the LOBT, hence the reduced resolution. A re-synchronization between OOBT and LOBT is performed regularly (see AD 9).

The Lander is synchronized prior to Separation and during every RF link after landing. So, during descent



and the First Science Sequence this should not be a problem, since LOBT is kept synchronized as long as the Lander is powered.

#### Technical details about sychronisation of Lander On-board Time can be found in § 2.3.2.6 of AD 9.

For a description of time handling in the Rosetta project see AD 11. For a description of Lander on board time handling see AD 9 : § 2.3.2.6 Synchronisation and Adjustment of Lander On-board Time § 2.3.2.6.1 Absolute vs. relative time references § 2.3.2.6.2 On-board Time Failure Modes and Recovery Procedures and AD 10 § 6. About Lander On-board Time.

#### 3.2.2.2.3 The DDS header time correlated

The OOBT is converted to UTC (Coordinated Universal Time) by means of time correlation and included in the additional DDS packet header when the packets are distributed via the DDS server. The **DDS header time correlated** (SCET field in the DDS header) is the UTC of the start of measurement derived from the OOBT by time correlation.

Its format is the Sun Modified Julian Time (MJT) i.e. two 32 bit integers. The first (MSB) contains the number of seconds since 00:00:00 on 1<sup>st</sup> January 1970 and the second (LSB) integer the number of microseconds from seconds in the first field.

Time correlation is described in AD 12 § 18.1.2.1.

#### 3.2.2.2.4 The UTC (Coordinated Universal Time)

The <u>UTC</u> used as time stamp for SC and HK ROMAP data products (from level 2 to level 3) is calculated from the experiment on-board time taking into account the drift and reset clock.

3.2.2.2.5 Spacecraft Clock Count in PDS Labels

The PDS keywords SPACECRAFT\_CLOCK\_START\_COUNT and SPACECRAFT\_CLOCK\_STOP\_COUNT refer to LOBT.

The LOBT is represented in the following format:

SPACECRAFT\_CLOCK\_START/STOP\_COUNT = "<reset number>/<unit seconds>.<fractional seconds>" The unit seconds and the fractional seconds are separated by the full stop character. **Note that this is not a decimal point.** The fractional seconds are expressed as multiples of  $2 \cdot 5 = 0,03125$ . seconds and count from 0 to  $25 \cdot 1 = 31$ . E.g. in SPACECRAFT\_CLOCK\_START\_COUNT = "3/356281394.21" the 21 fractional seconds correspond to  $21 \times 2 \cdot 5 = 0.65625$  decimal seconds.

The reset number is an integer starting at 1, i.e. "1/" means LOBT = 0 at 2003-01-01T00:00:00 UTC.

### 3.2.3 Reference Systems

The reference systems used for ROMAP data products are either hardware related or systems related to solar system bodies.

Instrument coordinates (defined by the feedback system of the magnetometer sensor), Rosetta Orbiter coordinates and Rosetta Lander coordinates are used as hardware related reference systems. See 2.1 and INSTHOST.CAT file for more details.

The GSE, GSM, and SM systems are Earth-centered coordinate systems, they are used to study the space ionized environment of the Earth and its interaction with the interplanetary medium (solar wind and its embedded interplanetary magnetic field).

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 25
-------------------------	-------------	--	---

The geocentric solar ecliptic system, GSE, has its X-axis and Y-axis in the ecliptic plane. The X-axis points from the Earth towards the Sun and the Y-axis points towards dusk. The Z-axis is therefore parallel to the ecliptic north pole. Relative to an inertial system this system has a yearly rotation (one Earth's year).

The geocentric solar magnetospheric system, GSM, has its X-axis in common with the GSE, while now the Y-axis is defined to be perpendicular to the Earth's magnetic dipole. In this way, the X-Z plane turns out to contain the dipole axis. It is worth noting that the GSM is then deduced from the GSE by a rotation about the X-axis.

In the solar magnetic coordinates SM the Z-axis is parallel to the north magnetic pole and the Y-axis is perpendicular to the Earth-Sun line towards dusk. The difference between this system and the GSM system is a rotation about the Y-axis. The amount of rotation is the dipole tilt angle.

The MSO is a Mars-centered coordinate system, it is the one actually used to study the space environment of Mars and its interaction with the solar wind. The X-axis and Y-axis of the Mars solar orbital system, MSO, are in the Mars solar orbital plane. This plane is inclined at 1.9 degree above the ecliptic plane. The X-axis points to the Sun, the Z-axis is the cross-product of the X-axis and Y-axis, and points to the North Mars solar orbital plane. The Y-axis is thus in the Mars solar orbital plane and points towards dusk (opposing planetary motion). Relative to an inertial system this system has a yearly rotation (two Earth's years).

At the comet the CFF system (Comet Fixed Frame), a body-centered coordinate systems is used. The positive Z-axis of the CFF system is pointing along the cometary rotation axis, and the X-axis is in the equatorial plane, parallel to the longest axis of the nucleus, in the direction of the small lobe of the nucleus. The Y-axis completes the right-handed system; the X-axis prime meridian is through the CHEOPS boulder

For cruise phases the ECLIPJ2000 is used. (Ecliptic coordinates based upon the J2000 frame, i.e. the Earth mean equator and dynamical equinox of J2000). The X-axis is aligned with the cross product of the north-pointing vectors normal to the Earth's mean equator and mean orbital plane of J2000 epoch. The Z-axis is aligned with the second of these normal vectors. The Y axis is the cross product of the Z and X axes.

## 3.3 Data Validation

The ROMAP data products are delivered to PSA by SONC. All the levels SC and HK data produced by SONC are validated by ROMAP PIs. These data are also distributed via the W3-SONC server and used by all the experiment team.

#### 3.3.1 MAG quality parameter

Magnetometer quality parameter are given for edited (CODMAC level 2), draft calibrated (CODMAC level 3) and final calibrated data (CODMAC level 5). Five levels are defined as follow.

- Level 0: absolute error less than 1nT
- Level 1: absolute error less than 5nT
- Level 2: absolute error less than 10nT
- Level 3: absolute error less than 100nT
- Level 4: absolute error exceed 100nT

Draft calibrated data are processed from edited data by linear transformation using a default calibration matrix and a preliminary offset (averaged value). As long the Lander is not released the data are disturbed by an offset drift due to changing balcony temperatures (temperature coefficient of compensation magnet) and the magnetic field caused by the supply current of the



Lander (GND loop due to electrical contact between orbiter and lander structure). Especially the dependency on supply current can be in the order of several hundred nT (1mA corresponds to about 1nT) and leads sometimes to saturation of the magnetic field measurement. Therefore for most of the intervals in which the lander is active (AFT's) are draft calibrated data are level 4 data. Some quite intervals can be archived as level 3 data.

Final calibrated data are processed by draft calibrated data by applying a manually generated correction function. Drifts are related to TCU temperature measurements, signatures of changing supply currents are detected by comparison of RPC-MAG and Romap data. This part of the procedure can not be automated. It is done for selected intervals and only the calibrated data and not procedure and correction function are subject of archiving. Expected levels are 0-2.

## 3.3.2 SPM quality parameter

Three data quality levels are defined for SPM. We keep however four levels (with level 2 not used) in order to have the same scheme for quality definition as for MAG data, i.e. quality ID goes from level 0 – best quality to level 4 - worst quality.

- Level 0: data quality is perfect, that means counts doesn't depends on high voltage level
- Level 1: data are scientifically of interest, but calibration could be wrong due to too low high voltage level (degradation of channeltrons might be the reason)
- Level 2: not used for SPM
- Level 3: data are scientifically wrong e.g. because sensor is directed to orbiter (all times during cruise) but technologically usable
- Level 4: data are scientifically and technologically wrong

## 3.4 Content

#### 3.4.1 Volume Set

One volume corresponds to one data set. The possible values of VOLUME keywords can be found in AD 4. The volume keyword values for the Mars mission phase are given in the following example.

VOLUME_NAME	= "ROMAP MAG RAW DATA FOR THE MARS SWING-BY"
VOLUME SERIES NAME	= "ROSETTA SCIENCE ARCHIVE"
VOLUME_SET_ID	<pre>= "DE_TUBS_IGEP_RLMAG_10XX"</pre>
VOLUME SET NAME	= "ROSETTA ROMAP MAG DATA"
VOLUME ID	= "RLMAG2 1023"
VOLUME VERSION ID	= "VERSION 1"
VOLUME FORMAT	= "ISO-9660"
MEDIUM TYPE	= "ONLINE"
VOLUMES	= 35
PUBLICATION DATE	= 2009-06-29
DESCRIPTION	= " This volume contains data
	and supporting documentation
	from the Rosetta Mars swing by
mi	naion nhana "

#### mission phase

### 3.4.2 Data Set

The ROMAP data are archived in as many Data Sets as simple mission phase and level data processing. The MAG and SPM data are archived in a separate data sets



RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 27

Name element	Data Set ID	Data Set Name
INSTRUMENT_HOST_ID / INSTRUMENT_HOST_NAME	RL (Rosetta Lander)	ROSETTA-LANDER
Target id / target name	See AD 4	AD 4
INSTRUMENT_NAME	ROSETTA LANDER MAGNETOME	TER AND PLASMA MONITOR
INSTRUMENT_ID	ROMAP	
Data processing level number	<ul> <li>* Level 2 contains level 2 SC and HK</li> <li>* Level 3 contains preliminary level 3 SC and level 3 HK</li> <li>* Level 5 contains derived data</li> <li><u>Remark</u>: Level 2 and preliminary level 3 data are delivered directly after the end of the proprietary period. Level 5 data are delivered when ready.</li> </ul>	
mission phase abbreviation	See	
description	N/A	N/A.
version	The first version of a data set is V1.	0

The archive contains 5 types of data sets.

- two for Level 2 data (edited data) :

DATA\_SET\_ID = "RL>-<target name>-ROMAP-2>-<mission phase abbreviation>-<MAG>-Vx.x" DATA\_SET\_ID = "RL>-<target name>-ROMAP-2>-<mission phase abbreviation>-<SPM>-Vx.x"

- two for Level 3 data (preliminary and final calibrated data) :

DATA\_SET\_ID = "RL>-<target name>-ROMAP-3>-<mission phase abbreviation>-<MAG>-Vx.x" DATA\_SET\_ID = "RL>-<target name>-ROMAP-3>-<mission phase abbreviation>-<SPM>-Vx.x"

- one for Level 5 data (derived data) :

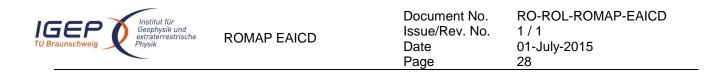
DATA\_SET\_ID = "RL>-<target name>-ROMAP-5>-<mission phase abbreviation>-<SPM>-Vx.x"

### 3.4.3 Directories

The organisation (directories) of each dataset type is shown below.

Level 2 datasets :

|-AAREADME.TXT |-CATALOG-| |-SC (Level 2 SC data files) |-DATA-----| | |-HK (Level 2 HK data files) |-DOCUMENT-|-INDEX-|-LABEL-|-VOLDESC.CAT



Level 3 datasets :

Level 5 datasets :

|-AAREADME.TXT |-CATALOG-| |-SC\_FINAL (MAG E,F,G,H) |-DATA-----| | |-HK (Level 3 HK data files) |-root directory------| | |-DOCUMENT-|-INDEX-|-LABEL-|-VOLDESC.CAT

Remark : The name of Root Directory is the DATA\_SET\_ID.

#### 3.4.3.1 Root Directory

The root directory contains the following files

File Name	Contents
AAREADME.TXT	Volume content and format information
VOLDESC.CAT	A description of the contents of this volume in
	PDS format readable by both humans and
	computers

The name of the root directory is the data set ID.

#### 3.4.3.2 Calibration Directory

Calibration information can be found in the file ROMAP\_CALIBRATION\_DESC.TXT located in the DOCUMENT directory.

### 3.4.3.3 Catalog Directory

The catalog directory provides a top level understanding of the mission, spacecraft, instruments and data sets. The catalog directory contains the following files:



File Name	Contents
CATINFO.TXT	A description of the contents of the catalog directory
DATASET.CAT	Data set information
INST.CAT	Instrument information
INSTHOST.CAT	Instrument host (spacecraft) information
MISSION.CAT	Mission information
PERSON.CAT	PDS personnel catalog information about the
	instrument team responsible for generating the data
	products. There is one file for each instrument team
	providing data to this data set.
REF.CAT	Full citations for references mentioned in any and
	all of the catalog files, or in any associated label
	files
SOFTWARE.CAT	Information about the software included in the
	SOFTWARE directory

### 3.4.3.4 Index Directory

The index directory contains the indices for all data products on the data set. The following files are included in the index directory :

File Name	Contents
INDEX.LBL	PDS label for the volume index file, INDEX.TAB
INDEX.TAB	Volume index in tabular format
INDXINFO.TXT	A description of the contents of the Index Directory

## 3.4.3.5 Geometry Directory

There is no geometry directory.

#### 3.4.3.6 Software Directory

There is no software directory.

### 3.4.3.7 Gazetter Directory

There is no Gazetter directory.

#### 3.4.3.8 Label Directory

The label directory contains include files (.FMT files with label definitions) referenced by data files on the data set. The following files are included in the index directory :

File Name	Contents
LABINFO.TXT	A description of the contents of this directory (.FMT files)
ROMAP_RAWHK.FMT	Edited (raw) HK data
ROMAP_CALHK.FMT	Calibrated HK data



RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 30

	Edited (rew) Calenda data
ROMAP_MAG_RAWSC.FMT	Edited (raw) Science data
ROMAP_MAG_CALSCA.FMT	Draft Calibrated Data, Instrument coordinates
ROMAP_MAG_CALSCB.FMT	Draft Calibrated Data, Lander coordinates
ROMAP_MAG_CALSCC.FMT	Draft Calibrated Data, Orbiter coordinates
ROMAP_MAG_CALSCD.FMT	Draft Calibrated Data, ECLIP J2000 coordinates
ROMAP_MAG_CALSCE.FMT	Final Calibrated Data, Instrument coordinates
ROMAP_MAG_CALSCF.FMT	Final Calibrated Data, Lander coordinates
ROMAP_MAG_CALSCG.FMT	Final Calibrated Data, Orbiter coordinates
ROMAP_MAG_CALSCH.FMT	Final Calibrated Data, ECLIP J2000 coordinates
ROMAP_SPM_RAW_ION_CN.FMT	raw mode
	Ion spectrum definition (counts-energy-angle
	distribution, channels 1 or 2) ; Level 2
ROMAP_SPM_RAW_ION_CR.FMT	raw mode
	Ion spectrum definition (current-energy- angle),
	(channels 1 or 2) ; Level 2
ROMAP_SPM_PAR_ION_CNE.FMT	parameter mode
	Ion spectrum definition (counts-energy distribution),
	(channels 1 or 2) ; Level 2
ROMAP_SPM_PAR_ION_CRE.FMT	parameter mode
	Ion spectrum definition (current-energy distribution),
	(channels 1 or 2) ; Level 2
ROMAP_SPM_PAR_ION_CNA.FMT	parameter mode
	Ion spectrum definition (counts-angle distribution),
	(channels 1 or 2) ; Level 2
ROMAP_SPM_PAR_ION_CRA.FMT	parameter mode
	Ion spectrum definition (current-angle), (channels 1 or 2)
	; Level 2
ROMAP_SPM_FC.FMT	Faraday cup current-energy distribution ; Level 2
ROMAP_SPM_ELEC.FMT	Electron spectrum (count-energy distribution)
	Level 2
ROMAP_SPM_RAWC_ION_CN.FMT	raw mode
	Ion spectrum definition (counts-energy-angle
	distribution), (channels 1 or 2) ; Level 3
ROMAP SPM RAWC ION CR.FMT	raw mode
	Ion spectrum definition (current-energy-angle),
	(channels 1 or 2) ; Level 3
ROMAP_SPM_PARC_ICNT_CNE.FMT	parameter mode
	Ion spectrum definition (counts-energy distribution),
	(channels 1 or 2) ; Level 3
ROMAP SPM PARC ION CRE.FMT	parameter mode
	Ion spectrum definition (current-energy distribution),
	(channels 1 or 2) ; Level 3angles)
ROMAP_SPM_PARC_ION_CNA.FMT	parameter mode
	Ion spectrum definition (counts-angle distribution),
	(channels 1 or 2) ; Level 3
ROMAP_SPM_PARC_ION_CRA.FMT	parameter mode
	Ion spectrum definition (current-angle), (channels 1 or 2)
	: Level 3
ROMAP_SPM_FCC.FMT	Faraday cup current-energy distribution ; Level 3
ROMAP_SPM_FCC.FMT	Electron spectrum (count-energy distribution)
	Level 3

# 3.4.3.9 Document Directory

This directory contains documentation to help the user to understand and use the archive data. The following



RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 31

files are contained in the document directory:

File Name	Contents
DOCINFO.TXT	A description of the contents of this directory
RO-LRO-DP-300002-UA.PDF	ROMAP FM2 ADP
RO-LRO-DP-300002-UA.LBL	PDS label for file RO-LRO-DP-300002-UA
EAICD_ROMAP.PDF	This document
EAICD_ROMAP.LBL	PDS label for file EAICD_ROMAP.PDF
ROMAP_CALIBRATION_DESC.TXT	Description of the calibration of MAG and SPM
ROMAP_CALIBRATION_DESC.LBL	PDS label for ROMAP_CALIBRATION_DESC.TXT
TIMELINE_ph.TXT	Timeline Ascii file with the PDS label attached for phase ph
TIMELINE_ph_DESC.TXT	Description of the timeline file for phase ph
TIMELINE_ph_obty.PNG	Timeline Image file for phase <i>ph</i> and observation type <i>obty</i>
TIMELINE_ph_obty.LBL	PDS label for image TIMELINE_ph_obty.PNG

## 3.4.3.10 Data Directory

The structure and naming scheme of the data directory is described in chapter 3.4.3.

# 4 Detailed Interface Specifications

## 4.1 Structure and Organization Overview

The ROMAP MAG and SPM data are archived in a separate data sets on the basis mission phase relative to the production of the data. The ROMAP MAG DATA directory contains subdirectories with preliminary and final calibrated data.

## 4.2 Data Sets, Definition and Content

The following table gives the definition of the name and id of the ROMAP data sets :

Data Set ID	Data Set Name
RL-CAL-ROMAP-2-CVP-MAG-V1.0	ROSETTA-LANDER CAL ROMAP 2 CVP MAG V1.0
RL-CAL-ROMAP-2-CR2-MAG-V1.0	ROSETTA-LANDER CAL ROMAP 2 CR2 MAG V1.0
RL-CAL-ROMAP-2-CR4A-MAG-V1.0	ROSETTA-LANDER CAL ROMAP 2 CR4A MAG V1.0
RL-CAL-ROMAP-2-CR4B-MAG-V1.0	ROSETTA-LANDER CAL ROMAP 2 CR4B MAG V1.0
RL-CAL-ROMAP-2-CR5-MAG-V1.0	ROSETTA-LANDER CAL ROMAP 2 CR5 MAG V1.0
RL-CAL-ROMAP-2-RVM1-MAG-V1.0	ROSETTA-LANDER CAL ROMAP 2 RVM1 MAG V1.0
RL-CAL-ROMAP-2-RVM2-MAG-V1.0	ROSETTA-LANDER CAL ROMAP 2 RVM2 MAG V1.0
RL-CAL-ROMAP-3-CR2-MAG-V1.0	ROSETTA-LANDER CAL ROMAP 3 CR2 MAG V1.0
RL-CAL-ROMAP-3-CR4A-MAG-V1.0	ROSETTA-LANDER CAL ROMAP 3 CR4A MAG V1.0
RL-CAL-ROMAP-3-CR4B-MAG-V1.0	ROSETTA-LANDER CAL ROMAP 3 CR4B MAG V1.0
RL-CAL-ROMAP-3-CR5-MAG-V1.0	ROSETTA-LANDER CAL ROMAP 3 CR5 MAG V1.0
RL-CAL-ROMAP-3-RVM1-MAG-V1.0	ROSETTA-LANDER CAL ROMAP 3 RVM1 MAG V1.0
RL-CAL-ROMAP-3-RVM2-MAG-V1.0	ROSETTA-LANDER CAL ROMAP 3 RVM2 MAG V1.0
RL-E-ROMAP-2-EAR1-MAG-V1.0	ROSETTA-LANDER EARTH ROMAP 2 EAR1 MAG V1.0
RL-E-ROMAP-2-EAR2-MAG-V1.0	ROSETTA-LANDER EARTH ROMAP 2 EAR2 MAG V1.0
RL-E-ROMAP-2-EAR3-MAG-V1.0	ROSETTA-LANDER EARTH ROMAP 2 EAR3 MAG V1.0
RL-E-ROMAP-3-EAR1-MAG-V1.0	ROSETTA-LANDER EARTH ROMAP 3 EAR1 MAG V1.0
RL-E-ROMAP-3-EAR2-MAG-V1.0	ROSETTA-LANDER EARTH ROMAP 3 EAR2 MAG V1.0



RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 32

RL-E-ROMAP-3-EAR3-MAG-V1.0	ROSETTA-LANDER EARTH ROMAP 3 EAR3 MAG V1.0
RL-M-ROMAP-2-MARS-MAG-V1.0	ROSETTA-LANDER MARS ROMAP 2 MARS MAG V1.0
RL-M-ROMAP-3-MARS-MAG-V1.0	ROSETTA-LANDER MARS ROMAP 3 MARS MAG V1.0
RL-M-ROMAP-5-MARS-MAG-V1.0	ROSETTA-LANDER MARS ROMAP 5 MARS MAG V1.0
RL-A-ROMAP-2-AST1-MAG-V1.0	ROSETTA-LANDER STEINS ROMAP 2 AST1 MAG V1.0
RL-A-ROMAP-3-AST1-MAG-V1.0	ROSETTA-LANDER STEINS ROMAP 3 AST1 MAG V1.0
RL-A-ROMAP-5-AST1-MAG-V1.0	ROSETTA-LANDER STEINS ROMAP 5 AST1 MAG V1.0
RL-A-ROMAP-2-AST2-MAG-V1.0	ROSETTA-LANDER LUTETIA ROMAP 2 AST2 MAG V1.0
RL-A-ROMAP-3-AST2-MAG-V1.0	ROSETTA-LANDER LUTETIA ROMAP 3 AST2 MAG V1.0
RL-CAL-ROMAP-2-PHC-MAG-V1.0	ROSETTA-LANDER 67P ROMAP 2 PHC MAG V1.0
RL-CAL-ROMAP-2-PDCS-MAG-V1.0	ROSETTA-LANDER 67P ROMAP 2 PDCS MAG V1.0
RL-C-ROMAP-2-SDL-MAG-V1.0	ROSETTA-LANDER 67P ROMAP 2 SDL MAG V1.0
RL-C-ROMAP-2-RBD-MAG-V1.0	ROSETTA-LANDER 67P ROMAP 2 RBD MAG V1.0
RL-C-ROMAP-2-FSS-MAG-V1.0	ROSETTA-LANDER 67P ROMAP 2 FSS MAG V1.0
RL-CAL-ROMAP-3-PHC-MAG-V1.0	ROSETTA-LANDER 67P ROMAP 3 PHC MAG V1.0
RL-CAL-ROMAP-3-PDCS-MAG-V1.0	ROSETTA-LANDER 67P ROMAP 3 PDCS MAG V1.0
RL-C-ROMAP-3-SDL-MAG-V1.0	ROSETTA-LANDER 67P ROMAP 3 SDL MAG V1.0
RL-C-ROMAP-3-RBD-MAG-V1.0	ROSETTA-LANDER 67P ROMAP 3 RBD MAG V1.0
RL-C-ROMAP-3-FSS-MAG-V1.0	ROSETTA-LANDER 67P ROMAP 3 FSS MAG V1.0
RL-CAL-ROMAP-5-PHC-MAG-V1.0	ROSETTA-LANDER 67P ROMAP 5 PHC MAG V1.0
RL-CAL-ROMAP-5-PDCS-MAG-V1.0	ROSETTA-LANDER 67P ROMAP 5 PDCS MAG V1.0
RL-C-ROMAP-5-SDL-MAG-V1.0	ROSETTA-LANDER 67P ROMAP 5 SDL MAG V1.0
RL-C-ROMAP-5-RBD-MAG-V1.0	ROSETTA-LANDER 67P ROMAP 5 RBD MAG V1.0
RL-C-ROMAP-5-FSS-MAG-V1.0	ROSETTA-LANDER 67P ROMAP 5 FSS MAG V1.0
RL-CAL-ROMAP-2-CVP-SPM-V1.0	ROSETTA-LANDER CAL ROMAP 2 CVP SPM V1.0
RL-CAL-ROMAP-2-CR4A-SPM-V1.0	ROSETTA-LANDER CAL ROMAP 2 CR4A SPM V1.0
RL-CAL-ROMAP-2-RVM2-SPM-V1.0	ROSETTA-LANDER CAL ROMAP 3 RVM2 SPM V1.0
RL-CAL-ROMAP-3-CR4A-SPM-V1.0	ROSETTA-LANDER CAL ROMAP 3 CR4A SPM V1.0
RL-CAL-ROMAP-3-RVM2-SPM-V1.0	ROSETTA-LANDER CAL ROMAP 3 RVM2 SPM V1.0
RL-E-ROMAP-2-EAR3-SPM-V1.0	ROSETTA-LANDER EARTH ROMAP 2 EAR3 SPM V1.0
RL-E-ROMAP-3-EAR3-SPM-V1.0	ROSETTA-LANDER EARTH ROMAP 3 EAR3 SPM V1.0
RL-M-ROMAP-2-MARS-SPM-V1.0	ROSETTA-LANDER MARS ROMAP 2 MARS SPM V1.0
RL-M-ROMAP-3-MARS-SPM-V1.0	ROSETTA-LANDER MARS ROMAP 3 MARS SPM V1.0
RL-CAL-ROMAP-2-PHC-SPM-V1.0	ROSETTA-LANDER 67P ROMAP 2 PHC SPM V1.0
RL-CAL-ROMAP-2-PDCS-SPM-V1.0	ROSETTA-LANDER 67P ROMAP 2 PDCS SPM V1.0
RL-C-ROMAP-2-SDL-SPM-V1.0	ROSETTA-LANDER 67P ROMAP 2 SDL SPM V1.0
RL-C-ROMAP-2-RBD-SPM-V1.0	ROSETTA-LANDER 67P ROMAP 2 RBD SPM V1.0
RL-C-ROMAP-2-FSS-SPM-V1.0	ROSETTA-LANDER 67P ROMAP 2 FSS SPM V1.0
RL-CAL-ROMAP-3-PHC-SPM-V1.0	ROSETTA-LANDER 67P ROMAP 3 PHC SPM V1.0
RL-CAL-ROMAP-3-PDCS-SPM-V1.0	ROSETTA-LANDER 67P ROMAP 3 PDCS SPM V1.0
RL-C-ROMAP-3-SDL-SPM-V1.0	ROSETTA-LANDER 67P ROMAP 3 SDL SPM V1.0
RL-C-ROMAP-3-RBD-SPM-V1.0	ROSETTA-LANDER 67P ROMAP 3 RBD SPM V1.0
RL-C-ROMAP-3-FSS-SPM-V1.0	ROSETTA-LANDER 67P ROMAP 3 FSS SPM V1.0
RL-CAL-ROMAP-5-PHC-SPM-V1.0	ROSETTA-LANDER 67P ROMAP 5 PHC SPM V1.0
RL-CAL-ROMAP-5-PDCS-SPM-V1.0	ROSETTA-LANDER 67P ROMAP 5 PDCS SPM V1.0
RL-C-ROMAP-5-SDL-SPM-V1.0	ROSETTA-LANDER 67P ROMAP 5 SDL SPM V1.0
RL-C-ROMAP-5-RBD-SPM-V1.0	ROSETTA-LANDER 67P ROMAP 5 RBD SPM V1.0
RL-C-ROMAP-5-FSS-SPM-V1.0	ROSETTA-LANDER 67P ROMAP 5 FSS SPM V1.0

The contents of the ROMAP data sets is as follows:

RL-CAL-ROMAP-x-CVP-xxx-Vx.x contains data from commisioning (2004) RL-CAL-ROMAP-x-CRx-xxx-Vx.x contains data from cruise phases 1 to 6 (2004-2014)



RL-E-ROMAP-x-EARx-xxx-Vx.x contains data from the 3 Earth swing-by (03/2005, 11/2007, 11/2009) RL-M-ROMAP-x-MARS-xxx-Vx.x contains data from the Mars swing-by (02/2007) RL-A-ROMAP-x-AST1-xxx-Vx.x contains data from asteroid Steins fly by (2008) RL-A-ROMAP-x-AST2-xxx-Vx.x contains data from asteroid Lutetia fly by (2010) RL-C-ROMAP-x-SDL-xxx-Vx.x contains data from SDL comet phase (11/2014).

## 4.3 Data Product Design

The following types of data products are defined for ROMAP:

- Magnetometer data products: edited data (CODMAC level 2) in ADC units, preliminary calibrated data (CODMAC level 3) and final calibrated data (CODMAC level 5).
- Simple plasma monitor data products: edited data (CODMAC level 2), preliminary calibrated and final calibrated (CODMAC level 3).
- Housekeeping data. The HK data are common for MAG and SPM and include the pressure values.

All ROMAP data products have PDS detached labels.

### 4.3.1 Magnetometer Science Edited Data Product Design (Level 2)

A ROMAP edited Science file contains magnetic field vectors time stamped in UTC and ROMAP on board time.

## 4.3.1.1 File Characteristics Data Elements

The PDS file characteristic data elements for ROMAP MAG edited science data (level 2) are:

RECORD\_TYPE = FIXED\_LENGTH RECORD\_BYTES FILE\_RECORDS LABEL\_RECORDS

## 4.3.1.2 Data Object Pointers Identification Data Elements

The ROMAP SC edited data are organized as ASCII tables. The data object pointers (^TABLE) reference TAB files.

## 4.3.1.3 Instrument and Detector Descriptive Data Elements

The following data identification elements provide additional information about the ROMAP-MAG data products.

INSTRUMENT HOST NAME	= "ROSETTA-LANDER"
INSTRUMENT_HOST_ID	= RL
INSTRUMENT_ID	= ROMAP
INSTRUMENT NAME	= "ROSETTA LANDER MAGNETOMETER AND PLASMA MONITOR"
INSTRUMENT_TYPE	<pre>= { "FLUXGATE MAGNETOMETER", "ELECTROSTATIC ANALYZER",</pre>
DETECTOR_ID	= MAG
INSTRUMENT_MODE_ID	= "N/A"
INSTRUMENT_MODE_DESC	= "N/A"

## 4.3.1.4 Data Object Definition

Each TAB file contains a five columns table with the raw magnetic field in Instrument frame and in ADC units: UTC, OBT, Bx, By, Bz.

OBJECT	=	TABLE
NAME	=	"ROMAP MAG RAWSC TABLE"
INTERCHANGE_FORMAT	=	ASCII



Document No. Issue/Rev. No. Date Page RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 34

ROWS	=
COLUMNS	= 5
ROW BYTES	= 65
^STRUCTURE	= "ROMAP MAG RAWSC.FMT"
END_OBJECT	= TABLE

## The structure of the TABLE object is described in the file ROMAP\_MAG\_RAWSC.FMT as follows:

/* Contents of	format file "ROMAP_MAG_RAWSC.FMT" (Edited Science data) */
OBJECT NAME DATA_TYPE START_BYTE BYTES DESCRIPTION	= 1 = 23
END_OBJECT	= COLUMN
OBJECT NAME DATA_TYPE START_BYTE BYTES UNIT FORMAT DESCRIPTION	= 25 = 15 = SECOND = "F15.5"
END_OBJECT	= COLUMN
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "BX" = ASCII_INTEGER = 41 = 7 = "I7" = "ADC_COUNTS" = "Magnetic field X component, Uncalibrated raw data in instrument coordinates"</pre>
END_OBJECT	= COLUMN
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "BY" = ASCII_INTEGER = 49 = 7 = "I7" = "ADC_COUNTS" = "Magnetic field Y component,     Uncalibrated raw data in instrument coordinates"</pre>
END_OBJECT	= COLUMN
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END OBJECT	<pre>= COLUMN = "BZ" = ASCII_INTEGER = 57 = 7 = "I7" = "ADC_COUNTS" = "Magnetic field Z component,     Uncalibrated raw data in instrument coordinates" = COLUMN</pre>



## 4.3.1.5 Description of Instrument

The description of the instrument is done in above and as a brief overview in the INST.CAT catalog file.

## 4.3.2 Simple Plasma Monitor Science Edited Data Product Design (Level 2)

A ROMAP SPM edited science file contains data for several measurement cycles.

One cycle contains the following data (in raw or parameter modes):

### Raw mode

SPM header:

- UTC,
- OBT,
- Status of SPM (from HK parameters in SC data frame)

16 (for different angles) energy distributions (counts and current) for lon1 and lon2 sensors,

1 energy distribution (current) for Faraday Cup sensors,

1 energy distribution (counts) for Electron sensors

### Parameter mode

SPM header (same as for raw mode)

- 1 energy distribution (counts and currents) for lon1 and lon2 sensors,
- 1 angle distributions (counts and currents) for Ion1 and Ion2 sensors,
- 1 energy distribution (current) for Faraday Cup sensors (same format as for raw mode),
- 1 energy distribution (counts) for Electron sensors (same format as for raw mode)

Each measurement cycle is described by a "combined detached label" (.LBL) containing pointers to corresponding data files (.TAB).

Examples:

### Raw mode:

SPM\_FS2\_041007004354\_RAW.LBL

SPMR_FS2_041007004354_CN.TAB	(ion energy-angle distribution, counts)
SPMR_FS2_041007004354_CR.TAB	(ion energy-angle distribution, current)
SPMF_FS2_041007004354.TAB	(Faraday cup energy distribution, current)
SPME_FS2_041007004354.TAB	(electron energy distribution, counts)

Param mode:

SPM\_FS2\_040514013124\_PAR.LBL

SPMP\_FS2\_040514013124\_CNA.TAB (ion angle distribution, counts)SPMP\_FS2\_040514013124\_CNE.TAB (ion energy distribution, counts)SPMP\_FS2\_040514013124\_CRA.TAB (ion angle distribution, current)SPMP\_FS2\_040514013124\_CRE.TAB (ion energy distribution, current)SPMF\_FS2\_040514013124\_TABSPME\_FS2\_040514013124.TAB(Faraday cup energy distribution, current)SPME\_FS2\_040514013124.TAB(electron energy distribution, counts)

The table objects corresponding to the distributions are detailed in the following paragraphs.

### 4.3.2.1 File Characteristics Data Elements

The PDS file characteristic data elements for ROMAP SPM edited science data (level 2) are:

RECORD\_TYPE = FIXED\_LENGTH RECORD\_BYTES FILE\_RECORDS LABEL\_RECORDS



Document No. Issue/Rev. No. 1/1Date 01-July-2015 Page 36

RO-ROL-ROMAP-EAICD

## 4.3.2.2 Data Object Pointers Identification Data Elements

The ROMAP SPM SC edited data are organized as ASCII tables. The data object pointers (^TABLE) reference TAB files.

## 4.3.2.3 Instrument and Detector Descriptive Data Elements

The following data identification elements provide additional information about the ROMAP-SPM data products.

INSTRUMENT_HOST_NAME	= "ROSETTA-LANDER"
INSTRUMENT HOST ID	= RL
INSTRUMENT_ID	= ROMAP
INSTRUMENT NAME	= "ROSETTA LANDER MAGNETOMETER AND PLASMA MONITOR"
INSTRUMENT_TYPE	<pre>= {"FLUXGATE MAGNETOMETER","ELECTROSTATIC ANALYZER",</pre>
DETECTOR ID	= SPM
INSTRUMENT MODE ID	= "N/A"
INSTRUMENT_MODE_DESC	= "N/A"

## 4.3.2.4 Data Object Definition

Each TAB file contains a header describing the Instrument status and the energy and angle distributions.

lon spectrum definition (counts-energy-angle distribution), raw mode (channels 1 or 2) 4.3.2.4.1

OBJECT	=	ROMAP_SPM_RAW_ION_CN_TABLE
NAME	=	ROMAP SPM RAW ION CN
INTERCHANGE FORMAT	=	ASCII
ROWS	=	256
^STRUCTURE	=	"ROMAP SPM RAW ION CN.FMT"
COLUMNS	=	28
ROW BYTES	=	232
END_OBJECT	=	ROMAP_SPM_RAW_ION_CN_TABLE

The structure of the TABLE object is described in the file ROMAP\_SPM\_RAW\_ION\_CN.FMT as follows:

```
/*
             Contents of format file "ROMAP SPM RAW ION CN.FMT"
/*
              Ion spectrum definition
                                                              */
                                       (Level 3)
/*
                                                              */
       (I1CNT or I2CNT),
                      raw mode (channels 1 or 2)
/* Include the HEADER at the beginning of each measurement
                                                      * /
OBJECT
                 = COLUMN
                  = "UTC"
   NAME
                  = TIME
   DATA TYPE
   START BYTE
                  = 1
   BYTES
                  = 23
                  = "This column represents the UTC
   DESCRIPTION
                    Of the SPM spectrum in PDS standard format
                    YYYY-MM-DDThh:mm:ss.sss"
END OBJECT
                  = COLUMN
OBJECT
               = COLUMN
                 = "OBT"
   NAME
   DATA TYPE
                 = ASCII REAL
   START BYTE
                 = 25
   BYTES
                 = 15
   UNIT
                 = SECOND
                 = "F15.5"
   FORMAT
   DESCRIPTION
                 = "ROMAP 4 bytes counter representing the measurement
                    time synchronized with Lander On Board Time.
                    The time resolution is 0.03125 s"
```

Institut für Geophysik und extraterrestrist Physik	che ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 37
ND_OBJECT	= COLUMN		
DBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION			
END_OBJECT	raw or parameter" = COLUMN		
DATA_TYPE START_BYTE BYTES FORMAT UNIT	<pre>= COLUMN = "EXPOSITION_TIME" = CHARACTER = 54 = 5 = "N/A" = "N/A" = "SPM exposition time short or long"</pre>	setting:	
END_OBJECT	= COLUMN		
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT	<pre>= COLUMN = "CALIBRATION" = CHARACTER = 62 = 8 = "N/A" = "N/A" = "SPM calibration stat active or inactive"</pre>	cus:	
END_OBJECT	= COLUMN		
BYTES FORMAT	= "N/A" = "SPM CEM supply setti	ing:	
END_OBJECT		20 5"	
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT	<pre>= CHARACTER = 75 = 4 = "N/A" = "N/A" = "SPM resolution setti low or high"</pre>	ing:	
UNIT	<pre>= COLUMN = "ION_CHANNEL" = CHARACTER = 82 = 8 = "N/A" = "N/A" = "Ion channel status: Both_off Ion1</pre>		

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 38
END_OBJECT =	Ion2 Both_on" = COLUMN		
	COLORIN		
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "EVEN_ODD" = CHARACTER = 93 = 8 = "N/A" = "N/A" = "Indicates whether all e are transmitted (64 for f 32 for low resolution) or alternatively. Takes the even odd or full"</pre>	full resolution a even/odd energi	
END_OBJECT =	= COLUMN		
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "I1_X_ECLIPJ2000" = ASCII_REAL = 103 = 6 = "F6.3" = "N/A" = "X component of unit vec in ECLIPJ2000 coordinat</pre>		h Ion 1 detector
END_OBJECT =	= COLUMN		
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "I1 Y_ECLIPJ2000" = ASCII_REAL = 110 = 6 = "F6.3" = "N/A" = "Y component of unit vec in ECLIPJ2000 coordinat</pre>		h Ion 1 detector
END_OBJECT =	= COLUMN		
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= 117 = 6 = "F6.3" = "N/A" = "Z component of unit vec in ECLIPJ2000 coordinat</pre>	-	h Ion 1 detector
END_OBJECT =	= COLUMN		
NAME DATA_TYPE START_BYTE BYTES	<pre>= COLUMN = "I2_X_ECLIPJ2000" = ASCII_REAL = 124 = 6 = "F6.3" = "N/A" = "X component of unit vec in ECLIPJ2000 coordinat</pre>		h Ion 2 detector
END_OBJECT =	= COLUMN		
NAME	= COLUMN = "I2_Y_ECLIPJ2000" = ASCII_REAL = 131 = 6		

Institut für Geophysik und extraterrestrisch Physik	• ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 39
FORMAT	= "F6.3"		
UNIT	= "N/A"		
DESCRIPTION	<pre>= "Y component of unit ve in ECLIPJ2000 coordina</pre>		n Ion 2 detector
END_OBJECT	= COLUMN	Les	
OBJECT	= COLUMN		
NAME	= "I2 Z ECLIPJ2000"		
DATA_TYPE	= ASCĪI_REAL		
START_BYTE	= 138		
BYTES FORMAT	= 6 = "F6.3"		
UNIT	= "N/A"		
DESCRIPTION	= "Z component of unit ve		n Ion 2 detector
END OBJECT	in ECLIPJ2000 coordina = COLUMN	tes"	
-			
OBJECT NAME	= COLUMN = "EL X ECLIPJ2000"		
DATA_TYPE	= ASCII REAL		
START BYTE	= 145		
BYTES	= 6		
FORMAT	= "F6.3"		
UNIT DESCRIPTION	<pre>= "N/A" = "X component of unit ve</pre>	ctor aligned with	electron
DESCRIPTION	detector in ECLIPJ200		refection
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "EL_Y_ECLIPJ2000"		
DATA_TYPE	= ASCII_REAL		
START_BYTE BYTES	= 152 = 6		
FORMAT	= "F6.3"		
UNIT	= "N/A"		
DESCRIPTION	= "Y component of unit ve detector in ECLIPJ200		n electron
END_OBJECT	= COLUMN	0 00014114005	
OBJECT	= COLUMN		
NAME	= "EL Z ECLIPJ2000"		
DATA_TYPE	= ASCII_REAL		
START_BYTE	= 159		
BYTES FORMAT	= 6 = "F6.3"		
UNIT	= "N/A"		
DESCRIPTION	1		n electron
END OBJECT	detector in ECLIPJ200 = COLUMN	0 coordinates"	
END_ODOLCI			
	= COLUMN		
NAME data type	= "FC_X_ECLIPJ2000" = ASCII_REAL		
DATA_TYPE START BYTE	= 166		
BYTES	= 6		
FORMAT	= "F6.3"		
UNIT DESCRIPTION	= "N/A" = "X component of unit we	ctor aligned with	Faraday cur
	= "X component of unit ve in ECLIPJ2000 coordina		i raraday cup
END_OBJECT	= COLUMN		
	= COLUMN		
NAME	= "FC_Y_ECLIPJ2000"		
DATA_TYPE START BYTE	= ASCII_REAL = 173		
BYTES	= 6		
	= "F6.3"		

Institut für Geophysik und extraterrestrische Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 40
UNIT	= "N/A"		
DESCRIPTION END OBJECT =	<pre>= "Y component of unit vec in ECLIPJ2000 coordinat : COLUMN</pre>		Faraday cup
NAME	<pre>COLUMN = "FC_Z_ECLIPJ2000" = ASCII_REAL = 180 = 6 = "F6.3" = "N/A" = "Z component of unit vec</pre>		Faraday cup
END_OBJECT =	in ECLIPJ2000 coordinat COLUMN	es"	
/* Add index and typ /* Index column /* Type column	<pre>************************************</pre>	or I2CNT)	*/ */ */
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>COLUMN = "INDEX" = INTEGER = 187 = 5 = "I5" = "N/A" = "Measurement index" : COLUMN</pre>		
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "TYPE" = CHARACTER = 194 = 5 = "N/A" = "N/A" = "Measurement type (I1CNT	or I2CNT)"	
—	COLUMN		,
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT	= "F7.2"		/
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT	<pre>COLUMN = "COUNTS_ELEVATION_1" = ASCII_REAL = 209 = 8</pre>	ep 1"	
OBJECT = NAME DATA_TYPE	COLUMN = "COUNTS_ELEVATION_2" = ASCII_REAL		

Institut für Geophysik und extraterrestrisch Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 41
START_BYTE BYTES	= 218 = 8		
	= "F8.2"		
UNIT DESCRIPTION	<pre>= "CM**-2*S**-1" = "counts for elevation</pre>	stop 2"	
END_OBJECT	= COLUMN	300p 2	
OBJECT	= COLUMN		
NAME	<pre>= "COUNTS_ELEVATION_3" = ASCII_REAL</pre>		
	= ASCII_REAL		
START_BYTE BYTES	= 227 = 8		
FORMAT	- ° = "F8.2"		
UNIT	= "CM**-2*S**-1"		
	= "counts for elevation	step 3"	
END_OBJECT	= COLUMN		
	= COLUMN		
NAME	<pre>= "COUNTS_ELEVATION_4" = ASCII_REAL</pre>		
DATA_TYPE START BYTE	$= ASCII_REAL$ $= 236$		
BYTES	= 8		
FORMAT	= "F8.2"		
UNIT	= "CM**-2*S**-1"		
DESCRIPTION END OBJECT	= "counts for elevation = COLUMN	step 4"	
	COLONN,		
	= COLUMN		
NAME DATA TYPE	<pre>= "COUNTS_ELEVATION_5" = ASCII_REAL</pre>		
START BYTE	= 245		
BYTES	= 8		
FORMAT	= "F8.2"		
UNIT DESCRIPTION	<pre>= "CM**-2*S**-1" = "counts for elevation</pre>	step 5"	
END_OBJECT	= COLUMN	556F 0	
OBJECT	= COLUMN		
NAME	= "COUNTS_ELEVATION_6"		
DATA_TYPE	= ASCII_REAL		
START_BYTE BYTES	= 254 = 8		
FORMAT	= 8 = "F8.2"		
UNIT	<pre>= "CM**-2*S**-1" = "counts for elevation</pre>		
DESCRIPTION		step 6 "	
END_OBJECT	= COLUMN		
	= COLUMN		
NAME	<pre>= "COUNTS_ELEVATION_7" = ASCII_REAL = 263</pre>		
START BYTE	= 263		
BYTES	= 8 = "F8.2"		
FORMAT	= "F8.2"		
UNI'I' DESCRIPTION	<pre>= "CM**-2*S**-1" = "counts for elevation</pre>	sten 7 "	
	= COLUMN	500p /	
OBJECT	= COLUMN		
DATA_TYPE	<pre>= "COUNTS_ELEVATION_8" = ASCII_REAL = 272</pre>		
START_BYTE BYTES	= 2/2		
FORMAT	= 8 = "F8.2"		
	= "CM**-2*S**-1"		
ONTI			
	= "counts for elevation	step 8 "	

Institut für Geophysik und extraterrestrische Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 42
OBJECT	= COLUMN		
NAME	= "COUNTS_ELEVATION_9"		
DATA_TYPE	= ASCII REAL		
START BYTE	= 281		
BYTES	= 8		
FORMAT	= "F8.2" = "CM**-2*S**-1"		
UNIT	= "CM**-2*S**-1"		
DESCRIPTION	= "counts for elevation s	step 9 "	
END_OBJECT :	= COLUMN		
OBJECT	= COLUMN		
NAME	= "COUNTS ELEVATION 10"		
DATA TYPE	= ASCII REAL		
START BYTE	<pre>= "COUNTS_ELEVATION_10" = ASCII_REAL = 290</pre>		
BYTES	= 8		
UNIT	= "F8.2" = "CM**-2*S**-1"		
DESCRIPTION	= "counts for elevation s	step 10 "	
	= COLUMN	-	
OBJECT :	= COLUMN		
DATA TYPE	<pre>= "COUNTS_ELEVATION_11" = ASCII_REAL</pre>		
START BYTE	= 299		
BYTES	= 8		
UNIT	= "F8.2" = "CM**-2*S**-1"		
DESCRIPTION	= "counts for elevation s	step 11 "	
END_OBJECT :	= COLUMN		
OBJECT	= COLUMN		
NAME	= "COUNTS ELEVATION 12"		
DATA TYPE	= ASCII_REAL		
START BYTE	= 308 -		
BYTES	= 8		
FORMAT	= "F8.2"		
UNIT	= "CM**-2*S**-1"		
DESCRIPTION	= "counts for elevation s	step 12 "	
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "COUNTS ELEVATION 13"		
DATA TYPE	= ASCII REAL		
START BYTE	= ASCII_REAL = 317		
BYTES	= 8		
	= "F8.2"		
UNIT	= "CM**-2*S**-1"		
	= "counts for elevation s	step 13 "	
END_OBJECT :	= COLUMN		
OBJECT	= COLUMN		
NAME	= "COUNTS ELEVATION 14"		
DATA TYPE	= ASCII REAL		
START BYTE	= ASCII_REAL = 326		
BYTES	= 8		
	= "F8.2"		
UNIT	= "CM**-2*S**-1"		
	= "counts for elevation s	step 14 "	
END_OBJECT :	= COLUMN		
OBJECT	= COLUMN		
NAME	= "COUNTS ELEVATION 15"		
	= ASCII_REAL		
	= 335		
	= 8		
BYTES	0		
	= "F8.2" = "CM**-2*S**-1"		

Institut für Geophysik u extraterrest Physik	nd ische ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 43
DESCRIPTION END_OBJECT	= "counts for elevation = COLUMN	n step 15 "	
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT	<pre>= COLUMN = "COUNTS_ELEVATION_16" = ASCII_REAL = 344 = 8 = "F8.2" = "CM**-2*S**-1" = "counts for elevation = COLUMN</pre>		
4.3.2.4.2 Ion spect OBJECT NAME INTERCHANGE	rum definition (current-energy-an = ROMAP_SPM_RAW_ = ROMAP_SPM_RAW_ FORMAT = ASCII	ION_CR_TABLE	els 1 or 2)
ROWS ^STRUCTURE COLUMNS	= 96 = "ROMAP_SPM_RAW = 28	J_ION_CR.FMT"	
ROW_BYTES END_OBJECT	= 200 = ROMAP_SPM_RAW_	ION_CR_TABLE	
The structure of the	TABLE object is described in the	file ROMAP_SPM_RA	W_ION_CR.FMT as follows:
/* /* (I1CRT c /* ************* /* Include the HE	<pre>ontents of format file "RC Ion spectrum definition r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) nels 1 or 2)	*/ */ */
/* (I1CRT c /* ************** /* Include the HE /* ***********************************	<pre>Ion spectrum definition r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) nels 1 or 2)	*/ */ */
/* (I1CRT c /* ************** /* Include the HE /* ***********************************	<pre>Ion spectrum definition r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) nels 1 or 2)	*/ */ */
/* (I1CRT c /* ************** /* Include the HE /* ***********************************	<pre>Ion spectrum definition r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) nels 1 or 2)	*/ */ */
/* (I1CRT c /* ************** /* Include the HE /* ***********************************	<pre>Ion spectrum definition r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) hels 1 or 2)	*/ */ */
/* /* (I1CRT c /* ************* /* Include the HE /* ***********************************	<pre>Ion spectrum definition r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) hels 1 or 2) terms the UTC hels the UTC hents the UTC herts the UTC herts the UTC herts the UTC	*/ */ */ * */
/* (I1CRT c /* ************** /* Include the HE /* ***********************************	<pre>Ion spectrum definition r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) hels 1 or 2) terms the UTC hels the UTC hents the UTC herts the UTC herts the UTC herts the UTC	*/ */ */ * */
/* (I1CRT c /* **********************************	<pre>Ion spectrum definition r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) hels 1 or 2) terms the UTC hels the UTC hents the UTC herts the UTC herts the UTC herts the UTC	*/ */ */ * */
/* (I1CRT c /* **********************************	<pre>Ion spectrum definition r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) hels 1 or 2) terms the UTC hels the UTC hents the UTC herts the UTC herts the UTC herts the UTC	*/ */ */ * */
/* (I1CRT c /* **********************************	<pre>Ion spectrum definition r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) hels 1 or 2) terms the UTC hels the UTC hents the UTC herts the UTC herts the UTC herts the UTC	*/ */ */ * */
/* (I1CRT c /* **********************************	<pre>Ion spectrum definition r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) hels 1 or 2) terms the UTC hels the UTC hents the UTC herts the UTC herts the UTC herts the UTC	*/ */ */ * */
/* (I1CRT c /* **********************************	<pre>Ion spectrum definition r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) hels 1 or 2) terms the UTC hels the UTC hents the UTC herts the UTC herts the UTC herts the UTC	*/ */ */ * */
/* (I1CRT c /* (I1CRT c /* **********************************	<pre>Ion spectrum definition r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) hels 1 or 2) the state of the st	*/ */ * */ * */ ormat measurement
/* (I1CRT c /* (I1CRT c /* **********************************	<pre>Ion spectrum definition r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) hels 1 or 2) the state of the st	*/ */ * */ * */ ormat measurement
/* (I1CRT c /* (I1CRT c /* **********************************	<pre>Ion spectrum definition r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) hels 1 or 2) the state of the st	*/ */ * */ * */ ormat measurement
<pre>/* /* /* /* /* /* /* /* /* /* /* /* /* /</pre>	<pre>Ion spectrum definition r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) hels 1 or 2) the state of the st	*/ */ * */ * */ ormat measurement
<pre>/* /* /* /* /* /* /* /* /* /* /* /* /* /</pre>	<pre>Ion spectrum definition r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) hels 1 or 2) the state of the st	*/ */ * */ * */ ormat measurement
<pre>/* /* /* /* /* /* /* /* /* /* /* /* /* /</pre>	<pre>Ion spectrum definition r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) hels 1 or 2) the state of the st	*/ */ * */ * */ ormat measurement
<pre>/* /* /* /* /* /* /* /* /* /* /* /* /* /</pre>	<pre>Ion spectrum definition r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) hels 1 or 2) the state of the st	*/ */ * */ * */ ormat measurement
<pre>/* /* /* /* /* /* /* /* /* /* /* /* /* /</pre>	<pre>Ion spectrum definition r I2CRT), raw mode (chann r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) hels 1 or 2) the state of the st	*/ */ * */ * */ ormat measurement
<pre>/* /* /* /* /* /* /* /* /* /* /* /* /* /</pre>	<pre>Ion spectrum definition r I2CRT), raw mode (chann r I2CRT), raw mode (chann ***********************************</pre>	(Level 2) hels 1 or 2) the state of the st	*/ */ * */ * */ ormat measurement

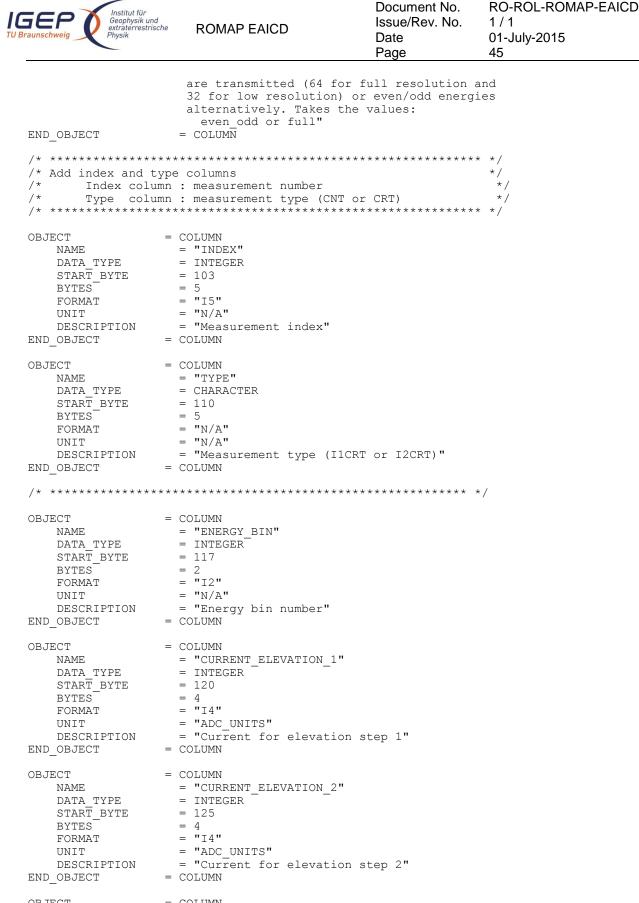


ROMAP EAICD Issue/Rev. No. Date Page

Document No.

RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 44

BYTES FORMAT UNIT	<pre>= 54 = 5 = "N/A" = "N/A" = "SPM exposition time setting:</pre>
END_OBJECT	short or long" = COLUMN
DATA_TYPE START_BYTE BYTES FORMAT UNIT	<pre>= COLUMN = "CALIBRATION" = CHARACTER = 62 = 8 = "N/A" = "N/A" = "SPM calibration status: active or inactive"</pre>
END_OBJECT	= COLUMN
START_BYTE BYTES FORMAT UNIT	<pre>= COLUMN = "CEM_SUPPLY" = ASCII_INTEGER = 72 = 1 = "I1" = "N/A" = "SPM CEM supply setting:</pre>
END_OBJECT	step number from 1 to 5" = COLUMN
DATA_TYPE START_BYTE BYTES FORMAT UNIT	<pre>= COLUMN = "RESOLUTION" = CHARACTER = 75 = 4 = "N/A" = "N/A" = "SPM resolution setting: low or high"</pre>
END_OBJECT	= COLUMN
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "ION_CHANNEL" = CHARACTER = 82 = 8 = "N/A" = "N/A" = "Ion channel status:     Both_off     Ion1     Ion2     Puble "</pre>
END_OBJECT	Both_on" = COLUMN
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "EVEN_ODD" = CHARACTER = 93 = 8 = "N/A" = "N/A" = "Indicates whether all energies</pre>



OBJECT = COLUMN NAME = "CURRENT\_ELEVATION\_3" DATA\_TYPE = INTEGER

Institut für Geophysik und extraterrestrise Physik	che ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 46
BYTES FORMAT	<pre>= 130 = 4 = "I4" = "ADC_UNITS" = "Current for elevation = COLUMN</pre>	step 3"	
NAME DATA_TYPE START_BYTE BYTES FORMAT	<pre>= COLUMN = "CURRENT_ELEVATION_4" = INTEGER = 135 = 4 = "I4" = "ADC_UNITS" = "Current for elevation = COLUMN</pre>	step 4"	
NAME DATA_TYPE START_BYTE BYTES FORMAT	<pre>= COLUMN = "CURRENT_ELEVATION_5" = INTEGER = 140 = 4 = "I4" = "ADC_UNITS" = "Current for elevation = COLUMN</pre>	step 5"	
NAME DATA_TYPE START_BYTE BYTES FORMAT	<pre>= COLUMN = "CURRENT_ELEVATION_6" = INTEGER = 145 = 4 = "I4" = "ADC_UNITS" = "Current for elevation = COLUMN</pre>	step 6 "	
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT	= 4	step 7 "	
OBJECT NAME DATA_TYPE START_BYTE BYTES BYTES	<pre>= COLUMN = "CURRENT_ELEVATION_8" = INTEGER</pre>		
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT	= COLUMN = "CURRENT_ELEVATION_9" = INTEGER		

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 47
NAME DATA_TYPE START_BYTE BYTES FORMAT	COLUMN = "CURRENT_ELEVATION_10" = INTEGER = 165 = 4 = "I4" = "ADC_UNITS" = "Current for elevation s COLUMN	tep 10 "	
BYTES FORMAT	COLUMN = "CURRENT_ELEVATION_11" = INTEGER = 170 = 4 = "I4" = "ADC_UNITS" = "Current for elevation s COLUMN	tep 11 "	
FORMAT	COLUMN = "CURRENT_ELEVATION_12" = INTEGER = 175 = 4 = "I4" = "ADC_UNITS" = "Current for elevation s COLUMN	tep 12 "	
START_BYTE BYTES FORMAT	COLUMN = "CURRENT_ELEVATION_13" = INTEGER = 180 = 4 = "I4" = "ADC_UNITS" = "Current for elevation s COLUMN	tep 13 "	
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT	COLUMN = "CURRENT_ELEVATION_14" = INTEGER = 185 = 4		
FORMAT	COLUMN = "CURRENT_ELEVATION_15" = INTEGER = 190 = 4 = "I4" = "ADC_UNITS" = "Current for elevation s COLUMN	tep 15 "	
F'ORMA'I'	COLUMN = "CURRENT_ELEVATION_16" = INTEGER = 195 = 4 = "I4" = "ADC_UNITS"		



Document No.RO-IIssue/Rev. No.1 / 1Date01-JPage48

...

RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 48

	DESCRIPTION		= "Current	for	elevation	step	16
END	OBJECT	=	COLUMN				

ROMAP EAICD

#### 4.3.2.4.3 Ion spectrum definition (counts-energy distribution), parameter mode (channels 1 or 2)

OBJECT	= ROMAP SPM PAR ION CNE TABLE
NAME	= ROMAP SPM PAR ION CNE
INTERCHANGE_FORMAT	= ASCII
ROWS	= 192
^STRUCTURE	= "ROMAP_SPM_PAR_ION_CNE.FMT"
COLUMNS	= 14
ROW_BYTES	= 148
END_OBJECT	<pre>= ROMAP_SPM_PAR_ION_CNE_TABLE</pre>

The structure of the TABLE object is described in the file ROMAP\_SPM\_PAR\_ION\_CNE.FMT as follows:

/\* Contents of format file " ROMAP SPM PAR ION CNE.FMT" \*/ /\* Ion spectrum definition (Level 2) \*/ /\* \*/ (I1CNTE or I2CNTE), parameter mode (channels 1 or 2) /\* Include the HEADER at the beginning of each measurement \*/ \*\*\*\* \*/ OBJECT = COLUMN NAME = "UTC" = TIME DATA TYPE START\_BYTE = 1 BYTES = 23 = "This column represents the UTC DESCRIPTION Of the SPM spectrum in PDS standard format YYYY-MM-DDThh:mm:ss.sss" END OBJECT = COLUMN OBJECT = COLUMN NAME = "OBT" DATA TYPE = ASCII\_REAL START BYTE = 25 BYTES = 15 UNIT = SECOND = "F15.5" FORMAT DESCRIPTION = "ROMAP 4 bytes counter representing the measurement time synchronized with Lander On Board Time. The time resolution is 0.03125 s" END OBJECT = COLUMN OBJECT = COLUMN = "MODE" NAME DATA TYPE = CHARACTER START BYTE = 42 = 9 BYTES = "N/A" FORMAT = "N/A" UNIT = "SPM mode: DESCRIPTION raw or parameter" = COLUMN END OBJECT OBJECT = COLUMN NAME = "EXPOSITION TIME" DATA\_TYPE START\_BYTE = CHARACTER = 54 BYTES = 5 = "N/A" FORMAT = "N/A" UNIT DESCRIPTION = "SPM exposition time setting: short or long"

Institut für Geophysik und extraterrestrische Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 49
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "CALIBRATION"		
_	= CHARACTER		
START_BYTE	= 62		
BYTES			
FORMAT	= "N/A" = "N/A"		
UNIT DESCRIPTION	= "SPM calibration status:		
DEDCIVITION	active or inactive"		
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "CEM_SUPPLY"		
DATA_TYPE	= ASCII_INTEGER		
START_BYTE	= 72		
BYTES	= 1		
FORMAT	= "I1"		
UNIT DESCRIPTION	<pre>= "N/A" = "SPM CEM supply setting:</pre>		
DESCRIPTION	step number from 1 to 5	,	
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "RESOLUTION"		
DATA_TYPE	= CHARACTER		
START_BYTE	= 75		
BYTES	=4		
FORMAT	= "N/A"		
UNIT DESCRIPTION	<pre>= "N/A" = "SPM resolution setting:</pre>		
DEDCIVITION	low or high"		
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "ION_CHANNEL"		
DATA_TYPE	= CHARACTER		
START_BYTE	= 82		
BYTES			
FORMAT	= "N/A"		
UNIT DESCRIPTION	= "N/A" = "Ion channel status:		
Disciti i ion	Both_off Ion1		
	Ion2		
	Both on"		
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "EVEN_ODD"		
	= CHARACTER		
START_BYTE	= 93		
BYTES	= 8 = "N/A"		
FORMAT UNIT	= "N/A"		
DESCRIPTION	= "Indicates whether all er	nergies	
2200101111010	are transmitted (64 for fu		and
	32 for low resolution) or		
	alternatively. Takes the v		
	even_odd or full"		
END_OBJECT	= COLUMN		
	***************************************	*****	
/* Add index and typ			*/ */
/* Index column	: measurement number		



#### 4.3.2.4.4 Ion spectrum definition (current-energy distribution), parameter mode (channels 1 or 2)

OBJECT	= ROMAP SPM PAR ION CRE TABLE
NAME	= ROMAP_SPM_PAR_ION_CRE
INTERCHANGE FORMAT	= ASCII
ROWS	= 192
^STRUCTURE	= "ROMAP SPM PAR ION CRE.FMT"
COLUMNS	= 14
ROW BYTES	= 145
END_OBJECT	= ROMAP_SPM_PAR_ION_CRE_TABLE



Contents of format file "ROMAP\_SPM\_PAR\_ION\_CRE.FMT" /\* \*/ /\* Ion spectrum definition (Level 2) \*/ /\* \*/ (I1CRTE or I2CRTE), parameter mode (channels 1 or 2) /\* Include the HEADER at the beginning of each measurement \* / OBJECT = COLUMN = "UTC" NAME DATA TYPE = TIME START BYTE = 1 BYTES = 23 = "This column represents the UTC DESCRIPTION Of the SPM spectrum in PDS standard format YYYY-MM-DDThh:mm:ss.sss" END OBJECT = COLUMN OBJECT = COLUMN NAME = "OBT" DATA TYPE = ASCII REAL START BYTE = 25 = 15 BYTES - SECOND = "F15.5" DESCRIPTION = "POWER UNIT = SECOND = "ROMAP 4 bytes counter representing the measurement time synchronized with Lander On Board Time. The time resolution is 0.03125 s"  $% \left[ 1 + 1 \right] = 0.03125$ END OBJECT = COLUMN OBJECT = COLUMN NAME = "MODE" = CHARACTER DATA TYPE START\_BYTE = 42 = 9 BYTES FORMAT = "N/A" = "N/A" UNIT = "SPM mode: DESCRIPTION raw or parameter" END OBJECT = COLUMN OBJECT = COLUMN NAME = "EXPOSITION TIME"

The structure of the TABLE object is described in the file ROMAP\_SPM\_PAR\_ION\_CRE.FMT as follows:

DATA\_TYPE START\_BYTE = CHARACTER = 54 BYTES = 5 FORMAT = "N/A" = "N/A" UNIT = "SPM exposition time setting: DESCRIPTION short or long" END OBJECT = COLUMN OBJECT = COLUMN = "CALIBRATION" NAME DATA TYPE = CHARACTER START BYTE = 62 BYTES = 8 = "N/A" FORMAT = "N/A" UNIT = "SPM calibration status: DESCRIPTION active or inactive"

= COLUMN

END OBJECT

Institut für Geophysik und extraterrestrische Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 52
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "CEM_SUPPLY" = ASCII_INTEGER = 72 = 1 = "I1" = "N/A" = "SPM CEM supply setting:</pre>		
END_OBJECT	step number from 1 to 5 = COLUMN	,	
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "RESOLUTION" = CHARACTER = 75 = 4 = "N/A" = "N/A" = "SPM resolution setting: low or high" column:</pre>		
END_OBJECT	= COLUMN		
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "ION_CHANNEL" = CHARACTER = 82 = 8 = "N/A" = "Ion channel status:    Both_off    Ion1    Ion2</pre>		
END_OBJECT	Both_on" = COLUMN		
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "EVEN_ODD" = CHARACTER = 93 = 8 = "N/A" = "N/A" = "Indicates whether all e are transmitted (64 for f 32 for low resolution) or alternatively. Takes the </pre>	ull resolution a even/odd energ:	
END_OBJECT	even_odd or full" = COLUMN		
/* Add index and type /* Index column /* Type column	<pre>************************************</pre>	or I2CRTE)	*/ */ */
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "INDEX" = INTEGER = 103 = 5 = "I5" = "N/A" = "Measurement index" COLUMN		
-	COLUMN		

		Date Page	1 / 1 01-July-2015 53
NAME DATA_TYPE START_BYTE BYTES FORMAT	= "TYPE" = CHARACTER = 110 = 6 = "N/A"		
DESCRIPTION	= "N/A" = "Measurement type (I1CF = COLUMN	RTE or I2CRTE)"	
/* ***********	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * *	*/
START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "ENERGY_BIN" = INTEGER = 118 = 2 = "I2" = "N/A" = "Energy bin number"</pre>		
END_OBJECT	= COLUMN		
START_BYTE BYTES FORMAT	<pre>= COLUMN = "CURRENT" = INTEGER = 121 = 5 = "I5" = "ADC_UNITS" = "Sum of currents for el = COLUMN</pre>	evation steps 1.	to 16"
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "OVERFLOW FLAG" = CHARACTER = 128 = 16 = "N/A" = "N/A" = "String of 16 character to an elevation step a values : 0 : No overf 1 : Overflow</pre>	and may take one	
END_OBJECT	= COLUMN		
4.3.2.4.5 Ion spectrum OBJECT NAME INTERCHANGE_FO ROWS ^STRUCTURE COLUMNS ROW BYTES	a definition (counts-angle distribut = ROMAP_SPM_PAR_IC = ROMAP_SPM_PAR_IC DRMAT = ASCII = 96 = "ROMAP_SPM_PAR_I = 14 = 196	ON_CNA_TABLE ON_CNA	ode (channels 1 or 2)

The structure of the TABLE object is described in the file ROMAP\_SPM\_PAR\_ION\_CNA.FMT as follows:

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 54
NAME DATA_TYPE START_BYTE BYTES DESCRIPTION	<pre>= "UTC" = TIME = 1 = 23 = "This column represents</pre>	n PDS standard fo	ormat
END_OBJECT	= COLUMN	55	
OBJECT NAME DATA_TYPE START_BYTE BYTES UNIT FORMAT DESCRIPTION	<pre>= COLUMN = "OBT" = ASCII_REAL = 25 = 15 = SECOND = "F15.5" = "ROMAP 4 bytes counter r time synchronized with</pre>	Lander On Board	
END_OBJECT =	The time resolution is COLUMN	0.03125 s"	
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "MODE" = CHARACTER = 42 = 9 = "N/A" = "N/A" = "SPM mode: raw or parameter" = COLUMN</pre>		
END_OBJECT	= COLUMN		
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "EXPOSITION_TIME" = CHARACTER = 54 = 5 = "N/A" = "N/A" = "SPM exposition time set short or long"</pre>	ting:	
END_OBJECT	= COLUMN		
DATA_TYPE START_BYTE BYTES FORMAT UNIT	= 62		
FORMAT UNIT	<pre>= 1 = "I1" = "N/A" = "SPM CEM supply setting:</pre>	<b>11</b>	
END_OBJECT	step number from 1 to 5 = COLUMN	,	
OBJECT NAME	= COLUMN = "RESOLUTION"		

U Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 55
DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT	<pre>= CHARACTER = 75 = 4 = "N/A" = "N/A" = "SPM resolution settir low or high" = COLUMN</pre>	ıd:	
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "ION_CHANNEL" = CHARACTER = 82 = 8 = "N/A" = "N/A" = "Ion channel status:     Both_off     Ion1     Ion2     Doth_on"</pre>		
END_OBJECT	Both_on" = COLUMN		
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "EVEN_ODD" = CHARACTER = 93 = 8 = "N/A" = "N/A" = "Indicates whether all are transmitted (64 for 32 for low resolution) alternatively. Takes th </pre>	full resolution or even/odd energ	
END_OBJECT	even_odd or full" = COLUMN		
/* Add index and t /* Index colu /* Type colu /* ***********************************	<pre>mn : measurement number mn : measurement type (I1CN ************************************</pre>	ITA or I2CNTA)	*/ */ */
DATA_TYPE START_BYTE BYTES FORMAT UNIT	<pre>= "INDEX" = INTEGER = 103 = 5 = "I5" = "N/A" = "Measurement index"</pre>		
END_OBJECT	= "Measurement index" = COLUMN		
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT	<pre>= COLUMN = "TYPE" = CHARACTER = 110 = 6 = "N/A" = "N/A" = "Measurement type (I10) = COLUMN</pre>	NTA or I2CNTA)"	
_			
,	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * *	*/
OBJECT NAME	= COLUMN = "ANGLE_BIN"		

Institut für Geophysik und extraterrestrische Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 56
DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT	<pre>= INTEGER = 118 = 2 = "I2" = "N/A" = "Elevation step" = COLUMN</pre>		
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT	<pre>= COLUMN = "COUNTS" = INTEGER = 121 = 8 = "I8" = "N/A" = "Sum of counts for ener Or 0 to 63" = COLUMN</pre>	gy steps 0 to 31	
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "OVERFLOW FLAG" = CHARACTER = 131 = 64 = "N/A" = "N/A" = "String of 64 character to a step of energy an values : 0 : No overf 1 : Overflow In low resolution the and set to blank "</pre>	d may take one o: low	f the following
END_OBJECT 4.3.2.4.6 Ion spectrum	= COLUMN definition (current-angle), parar	neter mode (channe	ls 1 or 2)
OBJECT NAME INTERCHANGE_FOI ROWS ^STRUCTURE COLUMNS ROW_BYTES END_OBJECT	= ROMAP_SPM_PAR_IO = ROMAP_SPM_PAR_IO	N_CRA_TABLE N_CRA ON_CRA.FMT"	
/* Conte /*	LE object is described in the file ents of format file "ROMA Ion spectrum definition	P_SPM_PAR_ION_CRA (Level 2)	A.FMT" */ */
/* ***********************************	RTA), parameter mode (chan ************************************	**************************************	* /
OBJECT NAME DATA_TYPE START_BYTE BYTES DESCRIPTION	<pre>= COLUMN = "UTC" = TIME = 1 = 23 = "This column represent</pre>	n PDS standard fo	ormat
END_OBJECT	YYYY-MM-DDThh:mm:ss.s = COLUMN	ss"	
OBJECT	= COLUMN		

Institut für Geophysik und extraterrestrische Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 57
NAME DATA_TYPE START_BYTE BYTES UNIT FORMAT DESCRIPTION	<pre>= "OBT" = ASCII_REAL = 25 = 15 = SECOND = "F15.5" = "ROMAP 4 bytes counter r time synchronized with</pre>	epresenting the Lander On Board	measurement Time.
END_OBJECT =	The time resolution is = COLUMN	0.03125 s"	
DATA_TYPE START_BYTE BYTES	<pre>= COLUMN = "MODE" = CHARACTER = 42 = 9 = "N/A" = "N/A"</pre>		
DESCRIPTION END OBJECT	<pre>= "SPM mode: raw or parameter" = COLUMN</pre>		
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "EXPOSITION_TIME" = CHARACTER = 54 = 5 = "N/A" = "N/A" = "SPM exposition time set</pre>	ting:	
END_OBJECT	short or long" = COLUMN		
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT	<pre>= COLUMN = "CALIBRATION" = CHARACTER = 62 = 8 = "N/A" = "N/A" = "SPM calibration status: active or inactive" = COLUMN</pre>		
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT	<pre>= COLUMN = "CEM_SUPPLY" = ASCII_INTEGER = 72 = 1 = "I1" = "N/A" = "SPM CEM supply setting: step number from 1 to 5</pre>	, <b>"</b>	
END_OBJECT			
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT	= 75 = 4 = "N/A" = "N/A" = "SPM resolution setting:		
END_OBJECT	low or high" = COLUMN		
OBJECT	= COLUMN		

Figure Antitut für Geophysik ter eaunschweig Extraterrest Physik	nd rische ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 58
NAME	= "ION CHANNEL"		
DATA_TYPE	= CHARACTER		
START_BYTE	= 82		
BYTES	= 8		
FORMAT	= "N/A"		
UNIT DESCRIPTION	= "N/A" = "Ion channel status:		
DESCRIPTION	Both_off Ion1 Ion2		
END_OBJECT	Both_on" = COLUMN		
OBJECT	= COLUMN		
NAME	= "EVEN_ODD"		
DATA_TYPE	= CHARACTER		
START_BYTE	= 93		
BYTES	= 8 = "N/A"		
FORMAT UNIT	= "N/A"		
DESCRIPTION	= "Indicates whether all	energies	
	are transmitted (64 for 32 for low resolution) alternatively. Takes th	full resolution or even/odd energ	
END OBJECT	even_odd or full" = COLUMN		
/* Add index and /* Index col /* Type col	umn : measurement number umn : measurement type (I1CR	TA or I2CRTA)	*/ */ */
/* Add index and /* Index col /* Type col	type columns umn : measurement number	TA or I2CRTA)	*/ */ */
/* Add index and /* Index col /* Type col /* ***********	type columns umn : measurement number umn : measurement type (I1CR ***********	TA or I2CRTA)	*/ */ */
/* Add index and /* Index col /* Type col /* ***********************************	<pre>type columns umn : measurement number umn : measurement type (I1CR ************************************</pre>	TA or I2CRTA)	*/ */ */
/* Add index and /* Index col /* Type col /* ***********************************	<pre>type columns umn : measurement number umn : measurement type (I1CR ************************************</pre>	TA or I2CRTA)	*/ */ */
/* Add index and /* Index col /* Type col /* ***********************************	<pre>type columns umn : measurement number umn : measurement type (I1CR ************************************</pre>	TA or I2CRTA)	*/ */ */
/* Add index and /* Index col /* Type col /* ***********************************	<pre>type columns umn : measurement number umn : measurement type (IICR ***********************************</pre>	TA or I2CRTA)	*/ */ */
/* Add index and /* Index col /* Type col /* ***********************************	<pre>type columns umn : measurement number umn : measurement type (IICR ***********************************</pre>	TA or I2CRTA)	*/ */ */
<pre>/* Add index and /* Index col /* Type col /* ***********************************</pre>	<pre>type columns umn : measurement number umn : measurement type (IICR ***********************************</pre>	TA or I2CRTA)	*/ */ */
/* Add index and /* Index col /* Type col /* ***********************************	<pre>type columns umn : measurement number umn : measurement type (I1CR ************************************</pre>	TA or I2CRTA)	*/ */ */
/* Add index and /* Index col /* Type col /* ***********************************	<pre>type columns umn : measurement number umn : measurement type (I1CR ************************************</pre>	TA or I2CRTA)	*/ */ */
/* Add index and /* Index col /* Type col /* Type col /* ***********************************	<pre>type columns umn : measurement number umn : measurement type (IICR ***********************************</pre>	TA or I2CRTA)	*/ */ */
/* Add index and /* Index col /* Type col /* Type col /* ***********************************	<pre>type columns umn : measurement number umn : measurement type (IICR ***********************************</pre>	TA or I2CRTA)	*/ */ */
<pre>/* Add index and /* Index col /* Type col /* Type col /* ***********************************</pre>	<pre>type columns umn : measurement number umn : measurement type (IICR ***********************************</pre>	TA or I2CRTA)	*/ */ */
<pre>/* Add index and /* Index col /* Type col /* Type col /* ***********************************</pre>	<pre>type columns umn : measurement number umn : measurement type (IICR ***********************************</pre>	TA or I2CRTA)	*/ */ */
<pre>/* Add index and /* Index col /* Type col /* Type col /* ***********************************</pre>	<pre>type columns umn : measurement number umn : measurement type (IICR ***********************************</pre>	TA or I2CRTA)	*/ */ */
<pre>/* Add index and /* Index col /* Type col /* Type col /* ***********************************</pre>	<pre>type columns umn : measurement number umn : measurement type (IICR ***********************************</pre>	TA or I2CRTA) *****	*/ */ */
<pre>/* Add index and /* Index col /* Type col /* Type col /* ***********************************</pre>	<pre>type columns umn : measurement number umn : measurement type (IICR ***********************************</pre>	TA or I2CRTA) *****	*/ */ */
<pre>/* Add index and /* Index col /* Type col /* Type col /* ***********************************</pre>	<pre>type columns umn : measurement number umn : measurement type (IICR ***********************************</pre>	TA or I2CRTA) ************************************	*/ */ */ * */
<pre>/* Add index and /* Index col /* Type col /* Type col /* ***********************************</pre>	<pre>type columns umn : measurement number umn : measurement type (IICR ***********************************</pre>	TA or I2CRTA) ************************************	*/ */ */ * */
<pre>/* Add index and /* Index col /* Type col /* Type col /* ***********************************</pre>	<pre>type columns umn : measurement number umn : measurement type (IICR ***********************************</pre>	TA or I2CRTA) ************************************	*/ */ */ * */
<pre>/* Add index and /* Index col /* Type col /* Type col /* ***********************************</pre>	<pre>type columns umn : measurement number umn : measurement type (IICR ***********************************</pre>	TA or I2CRTA) ************************************	*/ */ */ * */
<pre>/* Add index and /* Index col /* Type col /* Type col /* ***********************************</pre>	<pre>type columns umn : measurement number umn : measurement type (IICR ***********************************</pre>	TA or I2CRTA) ************************************	*/ */ */ * */
<pre>/* Add index and /* Index col /* Type col /* Type col /* ***********************************</pre>	<pre>type columns umn : measurement number umn : measurement type (IICR ***********************************</pre>	TA or I2CRTA) ************************************	*/ */ */ * */
<pre>/* Add index and /* Index col /* Type col /* Type col /* ***********************************</pre>	<pre>type columns umn : measurement number umn : measurement type (IICR ***********************************</pre>	TA or I2CRTA) ************************************	*/ */ */ * */
<pre>/* Add index and /* Index col /* Type col /* Type col /* ***********************************</pre>	<pre>type columns umn : measurement number umn : measurement type (IICR ***********************************</pre>	TA or I2CRTA) ************************************	*/ */ */ * */
<pre>/* Add index and /* Index col /* Type col /* Type col /* ***********************************</pre>	<pre>type columns umn : measurement number umn : measurement type (IICR ***********************************</pre>	TA or I2CRTA) ************************************	*/ */ */ * */
<pre>/* Add index and /* Index col /* Type col /* Type col /* ***********************************</pre>	<pre>type columns umn : measurement number umn : measurement type (IICR ***********************************</pre>	TA or I2CRTA) ************************************	*/ */ */ * */

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 59
DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT	<pre>= INTEGER = 121 = 6 = "I6" = "N/A" = "Sum of currents for ene         Or 0 to 63" = COLUMN</pre>	rgy steps 0 to 3	1
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "OVERFLOW FLAG" = CHARACTER = 129 = 64 = "N/A" = "N/A" = "String of 64 characters to a step of energy and values :</pre>	may take one of ow	the following
END_OBJECT	= COLUMN		

### 4.3.2.4.7 Faraday cup current-energy distribution

#### FC TABLE object for PAR mode

OBJECT	= ROMAP_SPM_PAR_FC_TABLE
NAME	= ROMAP SPM PAR FC
INTERCHANGE_FORMAT	= ASCII
ROWS	= 54
COLUMNS	= 12
ROW BYTES	= 119
^STRUCTURE	= "ROMAP SPM FC.FMT"
END_OBJECT	= ROMAP_SPM_PAR_FC_TABLE

#### FC TABLE object for RAW mode

OBJECT	= ROMAP SPM RAW FC TABLE
NAME	= ROMAP SPM RAW FC
INTERCHANGE_FORMAT	= ASCII
ROWS	= 272
COLUMNS	= 12
ROW BYTES	= 119
^STRUCTURE	= "ROMAP SPM FC.FMT"
END_OBJECT	= ROMAP_SPM_RAW_FC_TABLE

### The structure of the TABLE object is described in the file ROMAP\_SPM\_FC.FMT as follows:

\*/

\*/

Institut für Geophysik und extraterrestrisch Physik	e ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 60
	YYYY-MM-DDThh:mm:ss	.sss"	
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "OBT"		
DATA_TYPE	= ASCII_REAL		
START_BYTE	= 25		
BYTES	= 15		
UNIT	= SECOND		
FORMAT	= "F15.5"		
DESCRIPTION	= "ROMAP 4 bytes counter time synchronized wit The time resolution :	th Lander On Board	
END_OBJECT	= COLUMN	15 0.03123 5	
OBJECT	= COLUMN		
NAME	= "MODE"		
DATA_TYPE	= CHARACTER		
START_BYTE	= 42		
BYTES	= 9		
FORMAT	= "N/A"		
UNIT	= "N/A"		
DESCRIPTION	= "SPM mode:		
END OBJECT	raw or parameter" = COLUMN		
OBJECT	= COLUMN		
NAME	= "EXPOSITION_TIME"		
DATA_TYPE	= CHARACTER		
START_BYTE	= 54		
BYTES	= 5		
FORMAT UNIT	= "N/A" = "N/A"		
DESCRIPTION	= "SPM exposition time s	sotting.	
DESCRIPTION	short or long"	seccing.	
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "CALIBRATION"		
DATA_TYPE	= CHARACTER		
START BYTE	= 62		
BYTES	= 8		
	= "N/A"		
UNIT	= "N/A" = "SPM calibration statu		
DESCRIPTION		us:	
END OBJECT	active or inactive" = COLUMN		
-			
OBJECT	= COLUMN		
NAME DAMA MYDE	= "CEM_SUPPLY"		
DATA TIPE START RVTT	= "CEM_SUPPLY" = ASCII_INTEGER = 72		
BYTES	$= 1^{2}$		
FORMAT UNIT	= "I1" = "N/A"		
	= "SPM CEM supply setting	ng:	
	step number from 1 to		
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "RESOLUTION"		
DATA TYPE	= CHARACTER		
START BYTE			
BYTES	= 4		
	= "N/A"		
UNIT	= "N/A"		
	= "SPM resolution setting	• n n	

Institut für Geophysik u extraterrest Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 61
END_OBJECT	low or high" = COLUMN		
OBJECT	= COLUMN		
NAME	= "ION_CHANNEL"		
DATA_TYPE	= CHARACTER		
START_BYTE BYTES	= 82 = 8		
FORMAT	= "N/A"		
UNIT	= "N/A"		
DESCRIPTION	= "Ion channel status: Both_off Ion1 Ion2		
END_OBJECT	Both_on" = COLUMN		
OBJECT	= COLUMN		
NAME	= "EVEN ODD"		
DATA_TYPE	= CHARACTER		
START_BYTE	= 93		
BYTES	= 8 = "N/A"		
FORMAT UNIT	= "N/A"		
DESCRIPTION	= "Indicates whether a	all energies	
	are transmitted (64 f 32 for low resolutior alternatively. Takes	for full resolution n) or even/odd energ	
		the values.	
END_OBJECT /* ***********	even_odd or full" = COLUMN		,
<pre>_ /* **************** /* Add index colu /* Index col /* ***********************************</pre>	<pre>even_odd or full" = COLUMN ************************************</pre>	*****	*/ */
<pre>_ /* ************* /* Add index colu /* Index col /* Index col /* ****************** OBJECT</pre>	<pre>even_odd or full" = COLUMN ************************************</pre>	*****	*/ */
<pre>_ /* ************* /* Add index colu /* Index col /* Index col /* ****************** OBJECT</pre>	<pre>even_odd or full" = COLUMN ************************************</pre>	*****	*/ */
<pre>_ /* ************** /* Add index colu /* Index col /* Index col /* OBJECT     NAME     DATA_TYPE     START_BYTE     BYTES     FORMAT     UNIT     DESCRIPTION END_OBJECT</pre>	<pre>even_odd or full" = COLUMN ************************************</pre>	*******	*/ */ ** */
<pre>- /* ***********************************</pre>	<pre>even_odd or full" = COLUMN ************************************</pre>	*******	*/ */ ** */
<pre>- /* ***********************************</pre>	<pre>even_odd or full" = COLUMN ************************************</pre>	*******	*/ */ ** */
<pre>/* ***********************************</pre>	<pre>even_odd or full" = COLUMN ************************************</pre>	*******	*/ */ ** */
<pre>- /* ***********************************</pre>	<pre>even_odd or full" = COLUMN ************************************</pre>	*******	*/ */ ** */
<pre> /* **********************************</pre>	<pre>even_odd or full" = COLUMN ************************************</pre>	*******	*/ */ ** */
<pre> /* **********************************</pre>	<pre>even_odd or full" = COLUMN ************************************</pre>	*******	*/ */ ** */
<pre>- /* ***********************************</pre>	<pre>even_odd or full" = COLUMN ************************************</pre>	*******	*/ */ ** */
<pre>- /* ***********************************</pre>	<pre>even_odd or full" = COLUMN ************************************</pre>	*******	*/ */ ** */
<pre>- /* ***********************************</pre>	<pre>even_odd or full" = COLUMN ************************************</pre>	*******	*/ */ ** */
<pre></pre>	<pre>even_odd or full" = COLUMN ************************************</pre>	*******	*/ */ ** */
<pre>- /* ***********************************</pre>	<pre>even_odd or full" = COLUMN ************************************</pre>	*******	*/ */ ** */
<pre>- /* ***********************************</pre>	<pre>even_odd or full" = COLUMN ************************************</pre>	*******	*/ */ ** */
<pre>- /* ***********************************</pre>	<pre>even_odd or full" = COLUMN ************************************</pre>	*******	*/ */ ** */
<pre>- /* ***********************************</pre>	<pre>even_odd or full" = COLUMN ************************************</pre>	*****	*/ */ ** */



Document No. Issue/Rev. No. Date Page RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 62

END\_OBJECT = COLUMN

### 4.3.2.4.8 Electron spectrum (count-energy distribution)

### Electron spectrum TABLE object for PAR mode.

OBJECT	= ROMAP_SPM_PAR_ELEC_TABLE
NAME	= ROMAP SPM PAR ELEC
INTERCHANGE FORMAT	= ASCII
ROWS	= 96
COLUMNS	= 12
ROW BYTES	= 119
^STRUCTURE	= "ROMAP SPM ELEC.FMT"
END_OBJECT	= ROMAP_SPM_PAR_ELEC_TABLE

### Electron spectrum TABLE object for RAW mode.

OBJECT	= ROMAP SPM RAW ELEC TABLE
NAME	= ROMĀP SPM RĀW ELĒC
INTERCHANGE FORMAT	= ASCII
ROWS	= 256
COLUMNS	= 12
ROW_BYTES	= 119
^STRUCTURE	= "ROMAP_SPM_ELEC.FMT"
END_OBJECT	= ROMAP_SPM_RAW_ELEC_TABLE

### The structure of the TABLE object is described in the file ROMAP\_SPM\_ELEC.FMT as follows:

	tents of format file "ROMAP_SPM_ELEC.FMT" * spectrum (count-energy distribution) (Level 2) *	·
/* Include the HEAD	**************************************	
OBJECT NAME DATA_TYPE START_BYTE BYTES DESCRIPTION END OBJECT	<pre>= COLUMN = "UTC" = TIME = 1 = 23 = "This column represents the UTC</pre>	
- OBJECT NAME	<pre>= COLUMN = "OBT" = ASCII_REAL = 25 = 15 = SECOND = "F15.5" = "ROMAP 4 bytes counter representing the measurement    time synchronized with Lander On Board Time.    The time resolution is 0.03125 s"</pre>	
END_OBJECT OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "MODE" = CHARACTER = 42 = 9 = "N/A" = "N/A" = "SPM mode:</pre>	
END_OBJECT	raw or parameter" = COLUMN	



OBJECT

NAME

BYTES

FORMAT UNIT

END OBJECT

NAME

BYTES

FORMAT

UNTT

END OBJECT

NAME

BYTES

FORMAT

UNIT

END OBJECT

NAME

BYTES

UNIT

END OBJECT

NAME

BYTES

UNTT

END OBJECT

FORMAT

OBJECT

FORMAT

OBJECT

OBJECT

OBJECT

= COLUMN = "EXPOSITION TIME" = CHARACTER= 54DATA\_TYPE START BYTE = 5 = "N/A" = "N/A" = "SPM exposition time setting: DESCRIPTION short or long" = COLUMN = COLUMN = "CALIBRATION" DATA TYPE = CHARACTER START\_BYTE = 62 = 8 = "N/A" = "N/A" = "SPM calibration status: DESCRIPTION active or inactive" = COLUMN = COLUMN = "CEM SUPPLY" DATA TYPE = ASCII\_INTEGER START BYTE = 72 = 1 = "I1" = "N/A" = "SPM CEM supply setting: DESCRIPTION step number from 1 to 5" = COLUMN = COLUMN = "RESOLUTION" DATA TYPE = CHARACTER = 75 START\_BYTE = 4 = "N/A" = "N/A" DESCRIPTION = "SPM resolution setting: low or high" = COLUMN = COLUMN = "ION CHANNEL" = CHARACTER DATA TYPE = 82 START\_BYTE = 8 = "N/A" = "N/A" DESCRIPTION = "Ion channel status: Both\_off Ion1 Ion2 Both on" = COLUMN = COLUMN = "EVEN ODD"

ROMAP EAICD

Document No.

Issue/Rev. No.

Date

Page

**RO-ROL-ROMAP-EAICD** 

1/1

63

01-July-2015

OBJECT NAME = CHARACTER DATA TYPE START\_BYTE = 93 = 8 BYTES FORMAT = "N/A" = "N/A" UNTT DESCRIPTION = "Indicates whether all energies

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 64
END_OBJECT	<pre>are transmitted (64 for f 32 for low resolution) or alternatively. Takes the even_odd or full" = COLUMN</pre>	even/odd energ	
/* Add index column /* Index columr	**************************************		*/
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT =	<pre>= COLUMN = "INDEX" = INTEGER = 103 = 5 = "I5" = "N/A" = "Measurement index" = COLUMN</pre>	****	* /
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END OBJECT	<pre>= COLUMN = "ENERGY_BIN" = INTEGER = 109 = 2 = "I2" = "N/A" = "Energy bin number" = COLUMN</pre>		
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT	<pre>= COLUMN = "COUNTS" = INTEGER = 112 = 6 = "I6" = "ADC_UNITS" = "Electron counts" = COLUMN</pre>		

## 4.3.2.5 Description of Instrument

The description of the instrument is done in above and as a brief overview in the INST.CAT catalog file.

4.3.3 Housekeeping Edited Data Product Design (Level 2)

## 4.3.3.1 File Characteristics Data Elements

The PDS file characteristic data elements for ROMAP HK edited data (level 2) are:

```
RECORD_TYPE = FIXED_LENGTH
RECORD_BYTES
FILE_RECORDS
LABEL_RECORDS
```

## 4.3.3.2 Data Object Pointers Identification Data Elements

The ROMAP HK edited data are organized as ASCII tables. The data object pointers (^TABLE) reference TAB files.



RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 65

## 4.3.3.3 Instrument and Detector Descriptive Data Elements

INSTRUMENT HOST NAME	= "ROSETTA-LANDER"
INSTRUMENT HOST ID	= RL
INSTRUMENT ID	= ROMAP
INSTRUMENT_NAME	= "ROSETTA LANDER MAGNETOMETER AND PLASMA MONITOR"
INSTRUMENT_TYPE	<pre>= { "FLUXGATE MAGNETOMETER", "ELECTROSTATIC ANALYZER",</pre>
INSTRUMENT MODE ID	= "N/A"
INSTRUMENT_MODE_DESC	= "N/A"

# 4.3.3.4 Data Object Definition

Each TAB file contains a 16 columns table with the uncalibrated HK data (ADC units).

OBJECT	=	TABLE
NAME	=	"ROMAP_RAWHK_TABLE"
INTERCHANGE_FORMAT	=	ASCII
ROWS	=	
COLUMNS	=	8
ROW BYTES	=	153
^STRUCTURE	=	"ROMAP RAWHK.FMT"
END_OBJECT	=	TABLE
—		

## The structure of the TABLE object is described in the file ROMAP\_RAWHK.FMT as follows:

/*	Contents of	format file	"ROMAP_RAWHK.FMT"	(Uncalibrated HK data) */
OBJ. EN	ECT NAME DATA_TYPE START_BYTE BYTES DESCRIPTION D_OBJECT	= 1 = 23 = "This Of	" s column represents the HK parameters s Y-MM-DDThh:mm:ss.ss	et in PDS standard format
OBJ	ECT DATA_TYPE START_BYTE BYTES UNIT FORMAT DESCRIPTION	= 15 = SECONI = "F15." = "ROMA" time	_REAL D 5" P 4 bytes counter r	epresenting the measurement Lander On Board Time. 0.03125 s"
END	_OBJECT	= COLUM	N	
OBJ:	ECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	= CHARA0 = 42 = 4 = "N/A" = "N/A"	ROLLER STATUS" CTER	in Hexadecimal Format :
		Bit		Description
		0 1 3	at : Status flag : MAG TC-	trument Mode was loaded power-up from TC-Buffer setting was loaded from Buffer TC-Buffer error at power-up



Institut für Geophysik und extraterrestrische Physik	ROMAP EAICD		Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 66
	4	-	write BRAM error; cl successfully writin	g BRAM
	5	Error flag :	TC-Buffer content er (illegal checksum)	ror
	6	Error flag :	SPM Ion 1 counter ov (cleared after displ overflow error flag	aying SPM
	7	Error flag :	SPM Ion 2 counter ov (cleared after displ overflow errorflag	erflow occurred aying SPM
	8	Error flag :	SPM Electron counter occurred (cleared af	overflow ter displaying
	9	Status flag :	SPM overflow error f Penning pressure se	
	10 11		: Pirani pressure sen : DUMMY FPGA output o	
	1213	Not used	. DOMMI FFGA Output O	
	1415	Status flags:	: IO, I1 identify ins	trument mode
END OBJECT		the instrumer	0 5 is set once, nt is switched off."	it stays active
—	001100			
OBJECT NAME	= COLUMN = "LAST	RECEIVED TC (V	NORD 1)"	
DATA_TYPE	= CHARAC			
START_BYTE BYTES	= 49 = 4			
FORMAT	= "N/A"			
UNIT DESCRIPTION	= "N/A" = "Last	received TC (v	word 1) in Hexadecima	l Format"
END_OBJECT	= COLUMN		- ,	
OBJECT	= COLUMN	I		
NAME		RECEIVED TC (V	NORD 2)"	
DATA_TYPE START BYTE	= CHARAC = 56	TER		
BYTES	= 4			
FORMAT UNIT	= "N/A" = "N/A"			
		received TC (w	word 2 )in Hexadecima	l Format"
END_OBJECT	= COLUMN			
	= COLUMN			
NAME data type	= "POWER = ASCII	CONSUMPTION"		
DATA_TYPE START_BYTE	= 62			
DIIES	= 6 = "I6"			
	= "ADC C	OUNTS"		
DESCRIPTION	= "Overa	ll instrument	power consumption	
END_OBJECT	P = N = COLUMN	i * 76.3E-3 * 4 i	4 [mw]"	
OBJECT	= COLUMN			
	= "+5V C = ASCII			
DATA_TYPE START_BYTE				
BYTES	= 6 = "I6"			
	= "16" = "ADC C	OUNTS"		
DESCRIPTION	= "+5V_c	urrent		
END_OBJECT	I = N = COLUMN	1 * 76.3E-3 * ( 1	J.5 [mA]"	
OBJECT NAME	= COLUMN = "-5V C			

Institut für Geophysik und extraterrestrische Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 67
DATA_TYPE	= ASCII_INTEGER		
START_BYTE	= 76		
BYTES	= 6 = "I6"		
FORMAT UNIT	= 10 = "ADC_COUNTS"		
DESCRIPTION	= "-5V current	[ 7] II	
END_OBJECT	I = N * 76.3E-3 * 0.05 = COLUMN		
OBJECT	= COLUMN		
	= "ELECTRONICS TEMPERATURN	Ξ"	
DATA_TYPE	= ASCII_INTEGER		
START_BYTE	= 83		
BYTES	= 6		
FORMAT	= "I6" - "ADC COUNTER"		
UNIT DESCRIPTION	<pre>= "ADC_COUNTS" = "electronics temperature"</pre>		
END_OBJECT	T = (N * 76.3E-6 - 0.5) = COLUMN	35) * 472.9 [°C]'	1
_			
OBJECT NAME	= COLUMN = "+28V CURRENT"		
DATA TYPE	= ASCII INTEGER		
START BYTE	= 90		
BYTES	= 6		
FORMAT	= "I6"		
UNIT	= "ADC_COUNTS"		
DESCRIPTION	= "+28 $\overline{V}$ current I = N * 76.3E-3 * 0.02	5 [mA]"	
END_OBJECT	= COLUMN	. []	
OBJECT	= COLUMN		
NAME	= "SPM HV STATUS 1"		
DATA_TYPE	= CHARACTER		
START_BYTE	= 98		
BYTES FORMAT	= 4 = "N/A"		
UNIT	= "N/A"		
DESCRIPTION	= "SPM HV status 1 in Hexa	adecimal Format"	
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME DATA TYPE	= "SPM HV STATUS 2" = CHARACTER = 105		
START BYTE	= 105		
BYTES	= 4		
FORMAT	= "N/A"		
UNIT	= "N/A"		
DESCRIPTION END_OBJECT	= "SPM HV status 2 in Hexa = COLUMN	adecimal Format"	
NAME	<pre>= COLUMN = "SPM HV STATUS 3" = CHARACTER = 112 = 4 = "N(2)"</pre>		
DATA_TYPE	= CHARACTER		
START_BYTE	= 112		
BYTES	= 4		
FURMAI	= "N/A" = "N/A"		
DESCRIPTION	= "SPM HV status 3 in Hexa	adecimal Format"	
END_OBJECT	= "SPM HV status 3 in Hexa = COLUMN		
OBJECT	= COLUMN		
NAME	= "SPM HV STATUS 4"		
DATA_TYPE START_BYTE	= CHARACTER $= 119$		
STURI DITE	= 119 = 4		
BYTES	= 4		

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 68
UNIT DESCRIPTION END_OBJECT	= "N/A" = "SPM HV status 4 i = COLUMN	in Hexadecimal Format"	
DATA_TYPE START_BYTE BYTES FORMAT UNIT	<pre>= COLUMN = "PENNING PRESSURE' = ASCII_INTEGER = 125 = 6 = "I6" = "ADC_COUNTS" = "Penning pressure' = COLUMN</pre>		
DATA_TYPE START_BYTE BYTES FORMAT	<pre>= COLUMN = "PIRANI PRESSURE" = ASCII_INTEGER = 132 = 6 = "I6" = "ADC_COUNTS" = "Pirani pressure" = COLUMN</pre>		
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "PROM CHECKSUM" = CHARACTER = 140 = 4 = "N/A" = "N/A" = "PROM checksum (contin Hexadecimal Form)</pre>		
	<pre>= COLUMN = COLUMN = "INSTRUMENT ERROR = CHARACTER = 147 = 4 = "N/A" = "N/A" = " Instrument Error</pre>	FLAGS" 5 Flags in Hexadecimal	Format :
		escription	
	0Command over1CDMS illega2CDMS messad3General CDM4General CDM5Wrong teleda6CDMS reques7Frame buffer8MAG vector9CDMS error10CDMS checks11checksum er12SPM counter13ADC samplir14SPM transmit	erflow (a TC was receiv former was prod al word count ge error MS receiving error MS transmission error command received st overflow (a CDMS rec before the former was er overflow sampling overflow code word received sum error cror in received CDMS S c overflow mg overflow ission overflow	ressed) quest occurs as processed)
END_OBJECT	15 SPM setup e = COLUMN	error"	



## 4.3.3.5 Description of Instrument

The description of the instrument is done in above and as a brief overview in the INST.CAT catalog file.

# 4.3.4 Magnetometer Science calibrated Data Product Design (Level 3)

There are two kinds of calibrated science data for the ROMAP MAG instrument, draft calibrated and calibrated. The draft calibration refers to that data are in physical units (like nanoTesla), scaled, rotated into different coordinates and preliminary offsets subtracted. The different frames are Magnetometer, Lander, Orbiter and Ecliptic J2000. Level 3 contains draft calibrated MAG data.

# 4.3.4.1 File Characteristics Data Elements

The PDS file characteristic data elements for ROMAP MAG science calibrated data are:

```
RECORD_TYPE = FIXED_LENGTH
RECORD_BYTES = 119
FILE_RECORDS
LABEL_RECORDS
```

# 4.3.4.2 Data Object Pointers Identification Data Elements

The ROMAP MAG SC calibrated data are organized as ASCII tables. The data object pointers (^TABLE) reference TAB files.

## 4.3.4.3 Instrument and Detector Descriptive Data Elements

The following data identification elements provide additional information about the ROMAP-MAG data products.

INSTRUMENT HOST NAME	=	"ROSETTA-LANDER"
INSTRUMENT HOST ID	=	RL
INSTRUMENT ID	=	ROMAP
INSTRUMENT NAME	=	"ROSETTA LANDER MAGNETOMETER AND PLASMA MONITOR"
INSTRUMENT_TYPE	=	<pre>{"FLUXGATE MAGNETOMETER","ELECTROSTATIC ANALYZER", "FARADAY CUP"}</pre>
DETECTOR ID	=	MAG
INSTRUMENT MODE ID	=	"N/A"
INSTRUMENT_MODE_DESC	=	"N/A"

# 4.3.4.4 Data Object Definition

4.3.4.4.1 Level A data object definition (draft calibrated in instrument coordinates)

Each TAB file contains an eight columns table with the magnetic field and the spacecraft position.

OBJECT NAME INTERCHANGE_FORMAT	<pre>= TABLE = "ROMAP_MAG_CALSCA_TABLE" = ASCII</pre>
ROWS	=
COLUMNS	= 8
ROW BYTES	= 119
^STRUCTURE	= "ROMAP MAG CALSCA.FMT"
END_OBJECT	= TABLE

The structure of the TABLE object is described in the file ROMAP\_MAG\_CALSCA.FMT as follows:

/*	Contents of format file "ROMAP MAG CALSCA.FMT"	*/
/*	Level A data object definition :	*/
/*	draft calibrated in instrument coordinates	*/

Institut für Geophysik und extraterrestrische Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 70
OBJECT NAME DATA_TYPE START_BYTE	= COLUMN = "UTC" = TIME = 1		
BYTES DESCRIPTION	<pre>= 23 = "This column represents     Of the magnetic field     YYYY-MM-DDThh:mm:ss.ss</pre>	vector in PDS s	tandard format
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "OBT" = ASCII REAL		
DATA_TYPE START BYTE	= 25		
BYTES	= 15		
UNIT	= SECOND		
FORMAT DESCRIPTION	<pre>= "F15.5" = "ROMAP 4 bytes counter n    time synchronized with    The time resolution is</pre>	Lander On Board	
END_OBJECT	= COLUMN	0.03125 5	
OBJECT	= COLUMN		
NAME	= "POS_X"		
DATA_TYPE	= ASCII_REAL		
START_BYTE BYTES	= 41 = 16		
FORMAT	= "F16.3"		
UNIT	= KILOMETER		
DESCRIPTION	= "X component of the Space ECLIPJ2000 coordinates"		position,
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	$=$ "POS_Y"		
DATA_TYPE START BYTE	= ASCII_REAL = 58		
BYTES	= 16		
FORMAT	= "F16.3"		
UNIT	= KILOMETER		
DESCRIPTION	<pre>= "Y component of the Spac ECLIPJ2000 coordinates' COLUMN</pre>		position,
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "POS_Z"		
DATA_TYPE START BYTE	= ASCII_REAL = 75		
BYTES	= 16		
FORMAT	= "F16.3"		
UNIT	= KILOMETER		
DESCRIPTION	= "Z component of the Space ECLIPJ2000 coordinates"		position,
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "BX"		
DATA_TYPE	= ASCII_REAL		
START_BYTE BYTES	= 92 = 8		
FORMAT	- 0 = "F8.2"		
UNIT	= NANOTESLA		
DESCRIPTION	<pre>= "Magnetic field X compor</pre>		es"
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 71
NAME	= "BY"		
—	= ASCII_REAL		
	= 101		
	= 8		
	= "F8.2" = NANOTESLA		
	= "Magnetic field Y c	component	
		.nstrument coordinates'	1
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "BZ"		
	= ASCII_REAL		
	= 110		
01100	= 8 = "F8.2"		
	= NANOTESLA		
	= "Magnetic field Z c	component.	
220011111011		.nstrument coordinates'	1
END_OBJECT	= COLUMN		

4.3.4.4.2 Level B data object definition (draft calibrated in Lander coordinates)

Each TAB file contains an eight columns table with the magnetic field and the spacecraft position.

OBJECT NAME INTERCHANGE_FORMAT	<pre>= TABLE = "ROMAP_MAG_CALSCB_TABLE" = ASCII</pre>
ROWS	=
COLUMNS	= 8
ROW BYTES	= 119
^STRUCTURE	= "ROMAP MAG CALSCB.FMT"
END_OBJECT	= TABLE

The structure of the TABLE object is described in the file ROMAP\_MAG\_CALSCB.FMT as follows:

```
/* Contents of format file "ROMAP_MAG_CALSCB.FMT" */
/* Level B data object definition : */
/* draft calibrated in Lander coordinates */
```

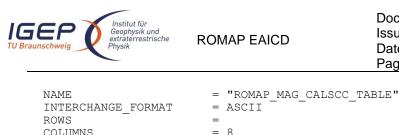
```
OBJECT
                      = COLUMN
                      = "UTC"
    NAME
                    = TIME
    DATA TYPE
    START_BYTE
                      = 1
    BYTES
                      = 23
                      = "This column represents the UTC
    DESCRIPTION
                        Of the magnetic field vector in PDS standard format
                          YYYY-MM-DDThh:mm:ss.sss"
END OBJECT
                      = COLUMN
OBJECT
                     = COLUMN
                     = "OBT"
   NAME
                    = ASCII_REAL
    DATA TYPE
    START_BYTE
                    = 25
    BYTES
                     = 15
    UNIT
                     = SECOND
   FORMAT = "F15.5"
DESCRIPTION = "ROMAP 4 bytes counter representing the measurement
time synchronized with the days
                         time synchronized with Lander On Board Time.
                        The time resolution is 0.03125 s"
END OBJECT
                     = COLUMN
OBJECT
                     = COLUMN
    NAME
                     = "POS X"
    DATA_TYPE
START_BYTE
                     = ASCII REAL
                     = 41
```

Institut für Geophysik und extraterrestrische Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 72
BYTES	= 16 = "F16.3"		
FORMAT UNIT	= FI0.5 = KILOMETER		
DESCRIPTION	= "X component of the S	pacecraft (Lander)	position,
END_OBJECT	ECLIPJ2000 coordinat = COLUMN		
OBJECT	= COLUMN		
NAME	= "POS Y"		
DATA TYPE	= ASCII REAL		
START BYTE	= 58		
BYTES	= 16		
FORMAT	= "F16.3"		
UNIT	= KILOMETER		
DESCRIPTION	= "Y component of the S ECLIPJ2000 coordinat		position,
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "POS Z"		
DATA TYPE	= ASCII REAL		
START BYTE	= 75 —		
BYTES	= 16		
FORMAT	= "F16.3"		
UNIT	= KILOMETER		
DESCRIPTION	= "Z component of the S ECLIPJ2000 coordinat		position,
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "BX"		
DATA_TYPE	= ASCII_REAL		
START_BYTE	= 92		
BYTES	= 8		
FORMAT	= "F8.2"		
UNIT	= NANOTESLA		
DESCRIPTION	= "Magnetic field X com		
	draft calibrated, La	nder coordinates"	
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "BY"		
DATA_TYPE			
START_BYTE	= 101		
BYTES	= 8		
FORMAT	= "F8.2"		
UNIT	= NANOTESLA		
DESCRIPTION	= "Magnetic field Y com		
END_OBJECT	<pre>draft calibrated, Lan = COLUMN</pre>	der coordinates"	
OBJECT	= COLUMN		
NAME	= "BZ"		
DATA TYPE	= ASCII REAL		
START BYTE	= 110		
BYTES	= 8		
FORMAT	= "F8.2"		
UNIT	= NANOTESLA		
DESCRIPTION	= "Magnetic field Z com	ponent,	
	draft calibrated, Lan	der coordinates"	
END_OBJECT	= COLUMN		

4.3.4.4.3 Level C data object definition (draft calibrated in Orbiter coordinates)

Each TAB file contains an eight columns table with the magnetic field and the spacecraft position.

OBJECT



ROW BYTES

END OBJECT

= 8 = 119 = "ROMAP\_MAG\_CALSCC.FMT" ^STRUCTURE = TABLE

The structure of the TABLE object is described in the file ROMAP\_MAG\_CALSCC.FMT as follows:

Document No.

Issue/Rev. No.

Date

Page

**RO-ROL-ROMAP-EAICD** 

1/1

73

01-July-2015

/\* Contents of format file "ROMAP MAG CALSCC.FMT" \*/ /\* Level C data object definition : /\* draft calibrated in Orbiter coordinates \*/ OBJECT = COLUMN = "UTC" NAME DATA TYPE = TIME START BYTE = 1 = 23 BYTES = "This column represents the UTC DESCRIPTION Of the magnetic field vector in PDS standard format YYYY-MM-DDThh:mm:ss.sss" = COLUMN END OBJECT OBJECT = COLUMN = "OBT" NAME = ASCII REAL DATA TYPE START BYTE = 25 BYTES = 15 UNIT = SECOND FORMAT = "F15.5" = "ROMAP 4 bytes counter representing the measurement DESCRIPTION time synchronized with Lander On Board Time. The time resolution is 0.03125 s" END OBJECT = COLUMN OBJECT = COLUMN = "POS X" NAME DATA TYPE = ASCII\_REAL START BYTE = 41 BYTES = 16 = "F16.3" FORMAT UNIT = KILOMETER = "X component of the Spacecraft (Lander) position, DESCRIPTION ECLIPJ2000 coordinates" = COLUMN END\_OBJECT OBJECT = COLUMN = "POS\_Y" NAME DATA TYPE = ASCII REAL START BYTE = 58 BYTES = 16 = "F16.3" FORMAT UNIT = KILOMETER DESCRIPTION = "Y component of the Spacecraft (Lander) position, ECLIPJ2000 coordinates" END OBJECT = COLUMN OBJECT = COLUMN = "POS Z" NAME = ASCII\_REAL DATA TYPE = 75 START\_BYTE = 16 BYTES = "F16.3" FORMAT = KILOMETER UNTT = "Z component of the Spacecraft (Lander) position, DESCRIPTION

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 74
end_object	ECLIPJ2000 coordinates' = COLUMN	,	
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "BX" = ASCII_REAL = 92 = 8 = "F8.2" = NANOTESLA = "Magnetic field X compor     draft calibrated, Orbit</pre>		
END_OBJECT	= COLUMN		
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END OBJECT	<pre>= COLUMN = "BY" = ASCII_REAL = 101 = 8 = "F8.2" = NANOTESLA = "Magnetic field Y compor draft calibrated, Orbite</pre>		
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT	<pre>= COLUMN = "BZ" = ASCII_REAL = 110 = 8 = "F8.2" = NANOTESLA = "Magnetic field Z comport draft calibrated, Orbite = COLUMN</pre>		

4.3.4.4.4 Level D data object definition (draft calibrated in ECLIP J2000 coordinates) Each TAB file contains an eight columns table with the magnetic field and the spacecraft position.

OBJECT NAME INTERCHANGE_FORMAT	= TABLE = "ROMAP_MAG_CALSCD_TABLE" = ASCII
ROWS	=
COLUMNS	= 8
ROW_BYTES	= 119
^STRUCTURE	= "ROMAP MAG CALSCD.FMT"
END_OBJECT	= TABLE

The structure of the TABLE object is described in the file ROMAP\_MAG\_CALSCD.FMT as follows:

```
/* Contents of format file "ROMAP_MAG_CALSCD.FMT" */
/* Level D data object definition : */
/* draft calibrated in ECLIP J2000 coordinates */
```

OBJECT	= COLUMN
NAME	= "UTC"
DATA_TYPE	= TIME
START_BYTE	= 1
BYTES	= 23
DESCRIPTION	= "This column represents the UTC
	Of the magnetic field vector in PDS standard format YYYY-MM-DDThh:mm:ss.sss"
END_OBJECT	= COLUMN
OBJECT	= COLUMN

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 75
NAME DATA_TYPE START_BYTE BYTES UNIT FORMAT DESCRIPTION	<pre>= "OBT" = ASCII_REAL = 25 = 15 = SECOND = "F15.5" = "ROMAP 4 bytes counter r time synchronized with</pre>	Lander On Board	
END_OBJECT	The time resolution is = COLUMN	0.03125 s"	
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "POS_X" = ASCII_REAL = 41 = 16 = "F16.3" = KILOMETER = "X component of the Space</pre>	ecraft (Lander)	position,
END_OBJECT	ECLIPJ2000 coordinates" = COLUMN	,	·····,
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "POS_Y" = ASCII_REAL = 58 = 16 = "F16.3" = KILOMETER = "Y component of the Space </pre>		position,
END_OBJECT	ECLIPJ2000 coordinates" = COLUMN		
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT	<pre>= COLUMN = "POS_Z" = ASCII_REAL = 75 = 16 = "F16.3" = KILOMETER = "Z component of the Space ECLIPJ2000 coordinates" = COLUMN</pre>		position,
OBJECT NAME	= COLUMN = "BX"		
DATA_TYPE START_BYTE BYTES	<pre>= ASCII_REAL = 92 = 8 = "F8.2" = NANOTESLA = "Magnetic field X componention"</pre>		~~"
END_OBJECT	<pre>draft calibrated, ECLIF = COLUMN</pre>	J2000 Coordinate	es "
START_BYTE	<pre>= COLUMN = "BY" = ASCII_REAL = 101 = 8 = "F8.2" = NANOTESLA = "Magnetic field Y compon draft calibrated ECLIPT</pre>		- <b>"</b>
END_OBJECT	<pre>draft calibrated, ECLIPJ = COLUMN</pre>	2000 coordinates	5
OBJECT	= COLUMN		

Institut für	ROMAP EAICD	Document No.	RO-ROL-ROMAP-EAICD
Geophysik und		Issue/Rev. No.	1 / 1
extraterrestrische		Date	01-July-2015
Physik		Page	76
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END OBJECT	<pre>= "BZ" = ASCII_REAL = 110 = 8 = "F8.2" = NANOTESLA = "Magnetic field Z compon draft calibrated, ECLIPJ = COLUMN</pre>		5"

# 4.3.4.5 Description of Instrument

The description of the instrument is done in above and as a brief overview in the INST.CAT catalog file.

# 4.3.5 Simple Plasma Monitor Science Draft Calibrated Data Product Design (Level 3)

We understand by draft calibrated data energy and angle distributions in  $cm^{-2}s^{-1}$ , ion currents in ADC units (signed 16 integers, no physical values since the CEM amplifications are not clear), Faraday cup currents in  $cm^{-2}$ , energy in eV and angle (elevation) in degrees. The energy tables and the correspondences between step numbers and energy and between step numbers and angle (elevation) is given in the following tables (Table 4-1, Table 4-2).

Step No	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
lon1/2 (deg)	-52	-47	-41	-34	-27	-21	-16	-11	-6	0	5	10	15	20	25	31
Table 4-1 Corl	respor	ndence	e betw	een st	ep nur	nber a	nd ele	vation								

Step No "64"	0	1	2	3	4	5	6	7	8	9	10	11
Step No "32"		0		1		2		3		4		5
lon1/2 (eV)	38.6	42.6	46.6	50.6	54.6	59.9	65.3	70.6	77.3	83.9	90.6	98.6
Electron (eV)	0.35	0.42	0.49	0.56	0.63	0.7	0.84	0.98	1.12	1.3	1.47	1.75
Step No "64"	12	13	14	15	16	17	18	19	20	21	22	23
Step No "32"		6		7		8		9		10		11
lon1/2 (eV)	107	117	127	138	150	163	178	194	211	230	250	271
Electron (eV)	2.03	2.38	2.74	3.16	3.72	4.28	4.98	5.82	6.73	7.79	9.05	10.5
Step No "64"	24	25	26	27	28	29	30	31	32	33	34	35
Step No "32"		12		13		14		15		16		17
lon1/2 (eV)	295	321	350	381	414	450	490	533	580	640	700	760
Electron (eV)	12.3	14.2	16.5	19.2	22.3	25.9	30.1	34.9	41.0	47.4	54.7	63.1
Step No "64"	36	37	38	39	40	41	42	43	44	45	46	47
Step No "32"		18		19		20		21		22		23
lon1/2 (eV)	820	900	980	1060	1160	1260	1360	1480	1620	1760	1920	2080
Electron (eV)	73.7	86.3	100	116	135	156	181	211	245	284	330	383
Step No "64"	48	49	50	51	52	53	54	55	56	57	58	59
Step No "32"		24		25		26		27		28		29
lon1/2 (eV)	2260	2460	2680	2920	3180	3460	3760	4080	4440	4820	5260	5720
Electron (eV)	445	517	600	695	810	937	1095	1274	1474	1716	1989	2316
Step No "64"	60	61	62	63	]							
0/ NI ((00)												

		•.		
Step No "32"		30		31
lon1/2 (eV)	6220	6760	7360	8000



**RO-ROL-ROMAP-EAICD** 1/101-July-2015 77

#### 2684 3115 3621 4210 Electron (eV)

Step No "64"	0	1	2	3	4	5	6	7	8	9
Step No "32"		0		1		2		3		4
Far.Cup -"lons" (eV)	10.7	12.7	15	17.6	20.8	24.6	29.2	34.6	40.8	48.6
Far.Cup -"Electrons" (eV)	1	2								
Step No "64"	10	11	12	13	14	15	16	17	18	19
Step No "32"		5		6		7		8		9
Far.Cup -"lons" (eV)	57.6	67.8	80.2	95.2	113	133	160	190	224	264
Step No "64"	20	21	22	23	24	25	26	27	28	29
Step No "32"		10		11		12		13		14
Far.Cup -"lons" (eV)	314	370	440	520	614	730	864	1020	1204	1430
			-							

Step No "64"	30	31
Step No "32"		15
Far.Cup -"Ions" (eV)	1690	2000

Table 4-2 Correspondence between step number and energy

The ROMAP SPM draft calibrated science files have a format similar to the edited (level 2) data, i.e; each file contains data from several measurement cycles. The level 3 files contain in addition detectors orientation in ECLIP J2000 frame.

One cycle contains the following data (in raw or parameter modes):

#### Raw mode

SPM header:

- UTC,
- OBT.
- Status of SPM (from HK parameters in SC data frame)
- Orientation of detectors in ECLIPJ2000 (see §2.2.1 for the orientation of sensors relative to S/C)

16 (for different angles) energy distributions (cm<sup>-2</sup>s<sup>-1</sup> and current in nA) for lon1 and lon2 sensors,

- 1 energy distribution (current in nA) for Faraday Cup sensors,
- 1 energy distribution (cm<sup>-2</sup>s<sup>1</sup>) for Electron sensors

### Parameter mode

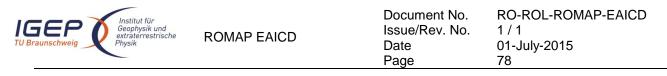
- SPM header (same as for raw mode)
- 1 energy distribution (cm<sup>-2</sup>s<sup>1</sup> and currents in nA) for lon1 and lon2 sensors, 1 angle distributions (cm<sup>-2</sup>s<sup>1</sup> and currents in nA) for lon1 and lon2 sensors,
- 1 energy distribution (current in nA) for Faraday Cup sensors (same format as raw mode),
- 1 energy distribution (cm<sup>-2</sup>s<sup>1</sup>) for Electron sensors (same format as raw mode)

The table objects corresponding to the distributions are detailed in the following paragraphs.

# 4.3.5.1 File Characteristics Data Elements

The PDS file characteristic data elements for ROMAP SPM draft calibrated science data (level 3) are:

RECORD TYPE = FIXED LENGTH RECORD BYTES FILE RECORDS LABEL RECORDS



## 4.3.5.2 Data Object Pointers Identification Data Elements

The ROMAP SPM SC draft calibrated data are organized as ASCII tables. The data object pointers (^TABLE) reference TAB files.

## 4.3.5.3 Instrument and Detector Descriptive Data Elements

The following data identification elements provide additional information about the ROMAP-SPM data products.

INSTRUMENT_HOST_NAME	=	"ROSETTA-LANDER"
INSTRUMENT HOST ID	=	RL
INSTRUMENT ID	=	ROMAP
INSTRUMENT NAME	=	"ROSETTA LANDER MAGNETOMETER AND PLASMA MONITOR"
INSTRUMENT_TYPE	=	{"FLUXGATE MAGNETOMETER","ELECTROSTATIC ANALYZER", "FARADAY CUP"}
DETECTOR ID	=	SPM
INSTRUMENT_MODE_ID	=	"N/A"
INSTRUMENT_MODE_DESC	=	"N/A"

# 4.3.5.4 Data Object Definition

Each TAB file contains a header describing the Instrument status and detectors orientation followed by the energy and angle distributions.

4.3.5.4.1	Ion spectrum definition	(counts-energy-angle distribution),	, raw mode (channels 1 or 2)

OBJECT	= ROMAP_SPM_RAW_ION_CN_TABLE
NAME	= ROMAP SPM RAW ION CN
INTERCHANGE FORMAT	= ASCII
ROWS	= 32
^STRUCTURE	= "ROMAP SPM RAWC ION CN.FMT"
COLUMNS	= 40
ROW_BYTES	= 353
END_OBJECT	= ROMAP_SPM_RAW_ION_CN_TABLE

The structure of the TABLE object is described in the file ROMAP\_SPM\_RAWC\_ION\_CN.FMT as follows:

```
/*
             Contents of format file "ROMAP SPM RAWC ION CN.FMT"
                                                             */
/*
                                                             */
*/
               Ion spectrum definition
                                       (Level 3)
.
/*
       (I1CNT or I2CNT),
                       raw mode (channels 1 or 2)
/* Include the HEADER at the beginning of each measurement
                                                      */
OBJECT
                 = COLUMN
                  = "UTC"
   NAME
                  = TIME
   DATA TYPE
   START_BYTE
                  = 1
                  = 23
   BYTES
                  = "This column represents the UTC
   DESCRIPTION
                    Of the SPM spectrum in PDS standard format
                    YYYY-MM-DDThh:mm:ss.sss"
END_OBJECT
                  = COLUMN
OBJECT
               = COLUMN
                 = "OBT"
   NAME
   DATA TYPE
                 = ASCII_REAL
   START BYTE
                 = 25
   BYTES
                 = 15
   UNIT
                 = SECOND
   FORMAT
                 = "F15.5"
                 = "ROMAP 4 bytes counter representing the measurement
   DESCRIPTION
                    time synchronized with Lander On Board Time.
```

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 79
END_OBJECT =	The time resolution i COLUMN	s 0.03125 s"	
NAME	<pre>: COLUMN = "MODE" = CHARACTER = 42 = 9 = "N/A" = "N/A" = "SPM mode: raw or parameter"</pre>		
END_OBJECT =	COLUMN		
	<pre>COLUMN = "EXPOSITION_TIME" = CHARACTER = 54 = 5 = "N/A" = "N/A" = "SPM exposition time set"</pre>	etting:	
END_OBJECT =	short or long" • COLUMN		
	<pre>COLUMN = "CALIBRATION" = CHARACTER = 62 = 8 = "N/A" = "N/A" = "SPM calibration statu</pre>	s:	
END_OBJECT =	active or inactive" • COLUMN		
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT	<pre>COLUMN = "CEM_SUPPLY" = ASCII_INTEGER = 72 = 1 = "I1" = "N/A" = "SPM CEM supply settingstep number from 1 to</pre>	g: 5"	
END_OBJECT =	COLUMN		
UNIT	<pre>= "RESOLUTION" = CHARACTER = 75 = 4 = "N/A" = "N/A" = "SPM resolution setting"</pre>	g:	
	low or high" = COLUMN		
START_BYTE BYTES FORMAT	= "N/A" = "N/A"		

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 80
end_object =	Ion1 Ion2 Both_on" COLUMN		
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>COLUMN = "EVEN_ODD" = CHARACTER = 93 = 8 = "N/A" = "N/A" = "Indicates whether all e are transmitted (64 for f 32 for low resolution) or alternatively. Takes the</pre>	ull resolution a even/odd energi	
END_OBJECT =	even_odd or full" COLUMN		
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>COLUMN = "I1_X_ECLIPJ2000" = ASCII_REAL = 103 = 6 = "F6.3" = "N/A" = "X_component of unit vec</pre>		Ion 1 detector
END_OBJECT =	in ECLIPJ2000 coordinat COLUMN	es"	
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>COLUMN = "I1_Y_ECLIPJ2000" = ASCII_REAL = 110 = 6 = "F6.3" = "N/A" = "Y component of unit vec in ECLIPJ2000 coordinat COLUMN</pre>		Ion 1 detector
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT	<pre>COLUMN = "I1_Z_ECLIPJ2000" = ASCII_REAL = 117 = 6 = "F6.3" = "N/A" = "Z component of unit vec in ECLIPJ2000 coordinat</pre>	tor aligned with	Ion 1 detector
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT	<pre>in ECLIPJ2000 coordinat COLUMN COLUMN = "I2_X_ECLIPJ2000" = ASCTI_REAL = 124 = 6 = "F6.3" = "N/A" = "X component of unit vec in ECLIPJ2000 coordinat</pre>	tor aligned with	Ion 2 detector
END_OBJECT =	COLUMN	~~	
NAME DATA TYPE	<pre>COLUMN = "I2_Y_ECLIPJ2000" = ASCII_REAL = 131 = 6</pre>		

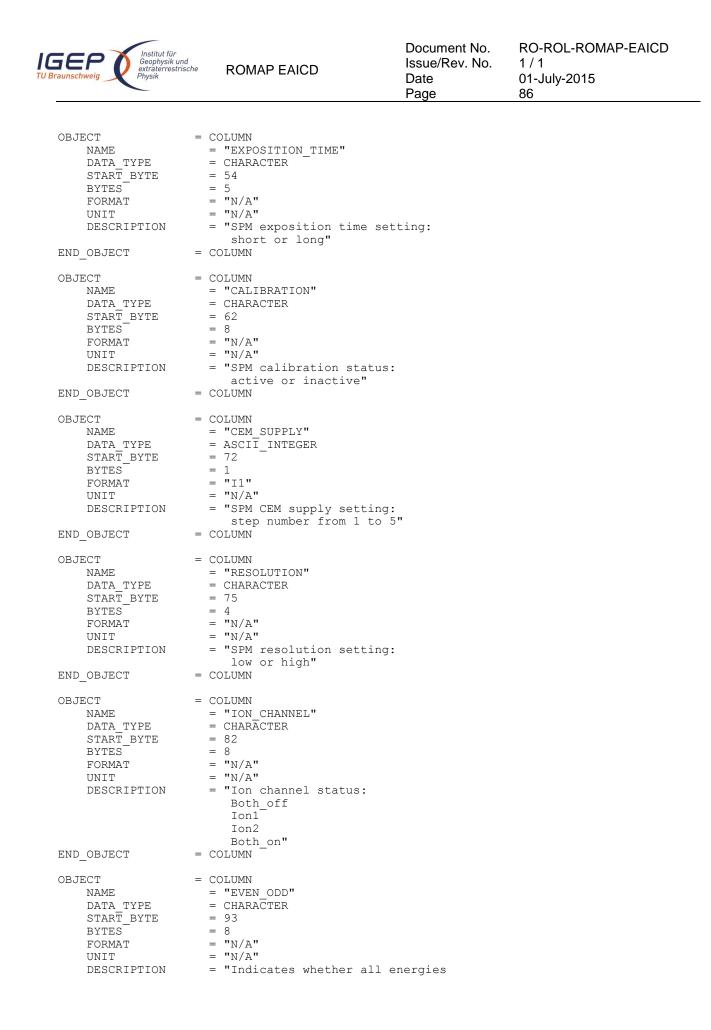
Institut für Geophysik und extraterrestrisc Physik	he ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 81
FORMAT	= "F6.3"		
UNIT	= "N/A"		
DESCRIPTION	= "Y component of unit ve in ECLIPJ2000 coordina		n Ion 2 detector
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "I2_Z_ECLIPJ2000"		
DATA_TYPE START BYTE	= ASCII_REAL = 138		
BYTES	= 130		
FORMAT	= "F6.3"		
UNIT DESCRIPTION	= "N/A" = "Z component of unit ve	ector aligned with	1 Ion 2 detector
	in ECLIPJ2000 coordina		
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME DATA_TYPE	= "EL_X_ECLIPJ2000" = ASCII REAL		
START BYTE	= 145		
BYTES	= 6		
FORMAT UNIT	= "F6.3" = "N/A"		
DESCRIPTION	= "X component of unit ve	ector aligned with	n electron
	detector in ECLIPJ200		
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME DATA TYPE	= "EL_Y_ECLIPJ2000" = ASCII REAL		
START BYTE	= 152		
BYTES	= 6		
FORMAT UNIT	= "F6.3" = "N/A"		
DESCRIPTION	= "Y component of unit ve	ector aligned with	n electron
END OB TECT	detector in ECLIPJ200 = COLUMN	0 coordinates"	
END_OBJECT			
OBJECT	= COLUMN		
NAME DATA TYPE	= "EL_Z_ECLIPJ2000" = ASCII REAL		
START_BYTE	= 159		
BYTES	= 6		
FORMAT UNIT	= "F6.3" = "N/A"		
DESCRIPTION	= "Z component of unit ve		n electron
END OBJECT	detector in ECLIPJ200 = COLUMN	0 coordinates"	
-			
OBJECT NAME	= COLUMN = "FC_X_ECLIPJ2000"		
DATA TYPE	= ASCII REAL		
DATA_TYPE START_BYTE	= 166		
BYTES FORMAT	= 6 = "F6.3"		
UNIT	= "N/A"		
DESCRIPTION	= "X component of unit ve		n Faraday cup
END_OBJECT	in ECLIPJ2000 coordina = COLUMN	1005	
OBJECT	= COLUMN		
NAME	= "FC_Y_ECLIPJ2000"		
DATA TYPE	= ASCII_REAL		
START_BYTE BYTES	= 173 = 6		
FORMAT	= "F6.3"		

Institut für Geophysik und extraterrestrisch Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 82
UNIT	= "N/A"		
DESCRIPTION END OBJECT	<pre>= "Y component of unit vec in ECLIPJ2000 coordinat = COLUMN</pre>		Faraday Cup
-			
	= COLUMN = "FC Z ECLIPJ2000"		
DATA_TYPE	= ASCII_REAL		
START_BYTE	= 180		
BYTES FORMAT	= 6 = "F6.3"		
UNIT	= "N/A"		
DESCRIPTION	= "Z component of unit vec in ECLIPJ2000 coordinat		Faraday cup
END_OBJECT	= COLUMN		
/* Add index and ty /* Index colum /* Type colum	<pre>************************************</pre>	or I2CNT)	*/ */ */
DBJECT	= COLUMN		
NAME	= "INDEX"		
DATA_TYPE	= INTEGER		
START_BYTE	= 187		
BYTES FORMAT	= 5 = "I5"		
UNIT	= "N/A"		
	= "Measurement index"		
END_OBJECT	= COLUMN		
DBJECT	= COLUMN		
NAME	= "TYPE"		
DATA_TYPE	= CHARACTER		
START_BYTE BYTES	= 194 = 5		
FORMAT	= "N/A"		
UNIT	= "N/A"		
DESCRIPTION	= "Measurement type (I1CN	T or I2CNT)"	
-	= COLUMN		
/* **************	· * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * *	/
DBJECT NAME	= COLUMN		
NAME	= "ENERGY"		
DA'I'A 'I'YPE Start rvtt	$= ASCII_REAL$ $= 201$		
BYTES	= 7		
FORMAT	= "F7.2"		
UNIT	<pre>= COLOMN = "ENERGY" = ASCII_REAL = 201 = 7 = "F7.2" = "ELECTRONVOLT" = "ELECTRONVOLT"</pre>		
DESCRIPTION END_OBJECT	= "Energy step"		
_			
NAME	<pre>= COLUMN = "COUNTS_ELEVATION_1" = ASCII_REAL = 209 = 8 = "F8.2" = "CM**-2*S**-1" = "counts_for_oloution_st</pre>		
DATA TYPE	= ASCII_REAL		
START_BYTE	= 209		
BYTES	= 8		
F ORMAT UNTT	- Ľö.2 = "CM**-2*S**-1"		
Q 1 3 T T	= "counts for elevation st	tep 1"	
DESCRIPTION		-	
DESCRIPTION	= COLUMN		
END_OBJECT	= COLUMN		
END_OBJECT	<pre>= COLUMN = COLUMN = "COUNTS_ELEVATION_2" = ASCII_REAL</pre>		

Institut für Geophysik und extraterrestrisch Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 83
START_BYTE BYTES	= 218 = 8		
	- o = "F8.2"		
UNIT	= "CM**-2*S**-1"		
	= "counts for elevation	step 2"	
END_OBJECT	= COLUMN		
	= COLUMN		
NAME	<pre>= "COUNTS_ELEVATION_3" = ASCII_REAL = 227</pre>		
DATA_TYPE START BYTE	$= ASCII_REAL$		
BYTES	= 227		
FORMAT	= "F8.2"		
UNIT	= "CM**-2*S**-1"		
	= "counts for elevation	step 3"	
END_OBJECT	= COLUMN		
	= COLUMN		
NAME	<pre>= "COUNTS_ELEVATION_4" = ASCII REAL</pre>		
DATA_TYPE START BYTE	= ASCII_REAL = 236		
BYTES	= 8		
FORMAT	= "F8.2"		
UNIT	= "CM**-2*S**-1"		
	= "counts for elevation	step 4"	
END_OBJECT	= COLUMN		
	= COLUMN		
NAME Dama myde	<pre>= "COUNTS_ELEVATION_5" = ASCII_REAL</pre>		
DATA_TYPE START BYTE	= 245		
BYTES	= 8		
FORMAT	= "F8.2"		
UNIT	= "CM**-2*S**-1"		
DESCRIPTION END OBJECT	= "counts for elevation = COLUMN	step 5"	
	COLORIN		
OBJECT	= COLUMN		
NAME DATA TYPE	<pre>= "COUNTS_ELEVATION_6" = ASCII_REAL</pre>		
	- 254		
BYTES	= 8		
FORMAT	= "F8.2"		
UNIT	= 234 = 8 = "F8.2" = "CM**-2*S**-1" = "counts for elevation		
DEDCIVITION	<pre>= "counts for elevation = COLUMN</pre>	step 6 "	
	002011		
OBJECT	= COLUMN		
NAME data type	= "COUNTS_ELEVATION_/" = ASCII REAL		
START BYTE	= 263		
BYTES	= 8		
FORMAT	= "F8.2"		
UNIT	= "CM**-2*S**-1" $= "counts for elevation$	ston 7 "	
END_OBJECT	<pre>= COLUMN = "COUNTS_ELEVATION_7" = ASCII_REAL = 263 = 8 = "F8.2" = "CM**-2*S**-1" = "counts for elevation = COLUMN</pre>	Scep /	
	= COLUMN		
DATA_TYPE	<pre>= "COUNTS_ELEVATION_8" = ASCII_REAL = 272</pre>		
START_BYTE	= 272		
BYTES	= 8 = "F8.2"		
FORMAT UNIT	= "CM**-2*S**-1"		
	= "counts for elevation = COLUMN	step 8 "	
	0011001	-	

Institut für Geophysik und extraterrestrische Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 84
NAME DATA_TYPE START_BYTE BYTES FORMAT	<pre>= COLUMN = "COUNTS_ELEVATION_9" = ASCII_REAL = 281 = 8 = "F8.2" = "CM**-2*S**-1"</pre>		
DESCRIPTION	<pre>= "CM**-2*S**-1" = "counts for elevation s = COLUMN</pre>	tep 9 "	
NAME DATA_TYPE START_BYTE BYTES FORMAT	<pre>= COLUMN = "COUNTS_ELEVATION_10" = ASCII_REAL = 290 = 8 = "F8.2" = "CM**-2*S**-1"</pre>		
	<pre>= "CM**-2*S**-1" = "counts for elevation s = COLUMN</pre>	tep 10 "	
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "COUNTS_ELEVATION_11" = ASCII_REAL = 299 = 8 = "F8.2" = "CM**-2*S**-1" = "counts for elevation s = COLUMN</pre>	tep 11 "	
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT	<pre>= COLUMN = "COUNTS_ELEVATION_12" = ASCII_REAL = 308 = 8 = "F8.2" = "CM**-2*S**-1" = "counts for elevation s</pre>	tep 12 "	
END_OBJECT =	= COLUMN		
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "COUNTS_ELEVATION_13" = ASCII_REAL = 317 = 8 = "F8.2" = "CM**-2*S**-1" = "counts for elevation s = COLUMN</pre>	tep 13 "	
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "COUNTS_ELEVATION_14" = ASCII_REAL = 326 = 8 = "F8.2" = "CM**-2*S**-1" = "counts for elevation s</pre>	tep 14 "	
_	= COLUMN = COLUMN		
NAME DATA_TYPE START_BYTE BYTES	= "COUNTS_ELEVATION_15" = ASCII_REAL = 335 = 8 = "F8.2"		

Institut für Geophysik u extraterresti Physik	nd rische ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 85
DESCRIPTION END_OBJECT	= "counts for elevat" = COLUMN	ion step 15 "	
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT	<pre>= COLUMN = "COUNTS_ELEVATION_1 = ASCII_REAL = 344 = 8 = "F8.2" = "CM**-2*S**-1" = "counts for elevati = COLUMN</pre>		
4.3.5.4.2 Ion spect	rum definition (current-energy-	angle), raw mode (chann	els 1 or 2)
OBJECT		AW_ION_CR_TABLE	
NAME INTERCHANGE	= ROMAP_SPM_RA S FORMAT = ASCII	AW_ION_CR	
ROWS	= 32		
^STRUCTURE		RAWC_ION_CR.FMT"	
COLUMNS ROW BYTES	= 40 = 321		
END OBJECT		AW ION CR TABLE	
			WC_ION_CR.FMT as follows:
/* C	ontents of format file !	'ROMAP SPM RAWC ION C	R.FMT" */
-			* /
/* /* (I1CRT o /* ******	Ion spectrum definition or I2CRT), raw mode (cha	(Level 3)	· .
/* /* (I1CRT o /* ************* /* Include the HE	Ion spectrum definition or I2CRT), raw mode (cha	(Level 3) – – annels 1 or 2)	* */ */
/* /* (I1CRT o /* ************** /* Include the HE /* *****************	Ion spectrum definition or I2CRT), raw mode (cha ************************************	(Level 3) – – annels 1 or 2)	*/ * */
/* (I1CRT o /* ************** /* Include the HE /* ***********************************	<pre>Ion spectrum definition or I2CRT), raw mode (cha ************************************</pre>	(Level 3) – – annels 1 or 2)	*/ * */
/* /* (I1CRT o /* ************** /* Include the HE /* *****************	Ion spectrum definition or I2CRT), raw mode (cha ************************************	(Level 3) – – annels 1 or 2)	*/ * */
/* (I1CRT o /* ************** /* Include the HE /* ***********************************	<pre>Ion spectrum definition or I2CRT), raw mode (cha ************************************</pre>	(Level 3) annels 1 or 2)	* */ */
/* /* (I1CRT o /* ************* /* Include the HE /* ***********************************	<pre>Ion spectrum definition or I2CRT), raw mode (cha ************************************</pre>	(Level 3) annels 1 or 2) ************************************	*/ */ * */
/* (I1CRT o /* ************** /* Include the HE /* ***********************************	<pre>Ion spectrum definition or I2CRT), raw mode (cha ************************************</pre>	(Level 3) annels 1 or 2) ************************************	*/ */ * */
/* (I1CRT o /* **********************************	<pre>Ion spectrum definition or I2CRT), raw mode (cha ************************************</pre>	(Level 3) annels 1 or 2) ************************************	* */ */ * */
/* (I1CRT o /* **************** /* Include the HE /* ***********************************	<pre>Ion spectrum definition or I2CRT), raw mode (cha ************************************</pre>	(Level 3) annels 1 or 2) ************************************	* */ */ * */
/* (I1CRT o /* **********************************	<pre>Ion spectrum definition or I2CRT), raw mode (cha ************************************</pre>	(Level 3) annels 1 or 2) ************************************	* */ */ * */
/* (I1CRT o /* **********************************	<pre>Ion spectrum definition or I2CRT), raw mode (cha ************************************</pre>	(Level 3) annels 1 or 2) ************************************	* */ */ * */
/* (I1CRT o /* **********************************	<pre>Ion spectrum definition or I2CRT), raw mode (cha ************************************</pre>	(Level 3) annels 1 or 2) ************************************	*/ */ */ * */
/* (I1CRT o /* **********************************	<pre>Ion spectrum definition or I2CRT), raw mode (cha ************************************</pre>	(Level 3) annels 1 or 2) ************************************	*/ */ */ * */
/* (I1CRT o /* **********************************	<pre>Ion spectrum definition or I2CRT), raw mode (cha ************************************</pre>	(Level 3) annels 1 or 2) ************************************	*/ * */ * */ ormat measurement
/* (I1CRT o /* **********************************	<pre>Ion spectrum definition or I2CRT), raw mode (cha ************************************</pre>	(Level 3) annels 1 or 2) ************************************	*/ * */ * */ ormat measurement
/* (I1CRT o /* **********************************	<pre>Ion spectrum definition or I2CRT), raw mode (cha ************************************</pre>	(Level 3) annels 1 or 2) ************************************	*/ * */ * */ ormat measurement
/* (I1CRT o /* **********************************	<pre>Ion spectrum definition or I2CRT), raw mode (cha ************************************</pre>	(Level 3) annels 1 or 2) ************************************	*/ * */ * */ format measurement
/* (I1CRT o /* **********************************	<pre>Ion spectrum definition or I2CRT), raw mode (cha ************************************</pre>	(Level 3) annels 1 or 2) ************************************	*/ * */ * */ ormat measurement
/* (I1CRT o /* **********************************	<pre>Ion spectrum definition or I2CRT), raw mode (cha ************************************</pre>	(Level 3) annels 1 or 2) ************************************	*/ * */ * */ ormat measurement
/* (I1CRT o /* (I1CRT o /* ***********************************	<pre>Ion spectrum definition or I2CRT), raw mode (cha ************************************</pre>	(Level 3) annels 1 or 2) ************************************	*/ * */ * */ ormat measurement
/* (I1CRT o /* **********************************	<pre>Ion spectrum definition or I2CRT), raw mode (cha ************************************</pre>	(Level 3) annels 1 or 2) ************************************	*/ * */ * */ ormat measurement
/* (I1CRT o /* (I1CRT o /* **********************************	<pre>Ion spectrum definition or I2CRT), raw mode (cha ************************************</pre>	(Level 3) annels 1 or 2) ************************************	*/ * */ * */ format measurement
<pre>/* /* /* /* /* /* /* /* /* /* /* /* /* /</pre>	<pre>Ion spectrum definition or I2CRT), raw mode (cha ************************************</pre>	(Level 3) annels 1 or 2) ************************************	*/ * */ * */ format measurement





IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 88
DESCRIPTION	= "Z component of unit vect in ECLIPJ2000 coordinate		Ion 2 detector
END_OBJECT =	COLUMN		
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "EL X_ECLIPJ2000" = ASCII_REAL = 145 = 6 = "F6.3" = "N/A" = "X component of unit vect detector in ECLIPJ2000		electron
END_OBJECT =	COLUMN	coordinates	
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "EL_Y_ECLIPJ2000" = ASCII_REAL = 152 = 6 = "F6.3" = "N/A" = "Y component of unit vect detector in ECLIPJ2000		electron
END_OBJECT =	COLUMN	coordinates	
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "EL_Z_ECLIPJ2000" = ASCII_REAL = 159 = 6 = "F6.3" = "N/A" = "Z component of unit vect detector in ECLIPJ2000		electron
END_OBJECT =	COLUMN		
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT	COLUMN = "FC_X_ECLIPJ2000" = ASCII_REAL = 166 = 6 = "F6.3" = "N/A" = "X component of unit vect in ECLIPJ2000 coordinate		Faraday cup
END_OBJECT =	COLUMN		
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT	COLUMN = "FC_Y_ECLIPJ2000" = ASCII_REAL = 173 = 6 = "F6.3" = "N/A" = "Y component of unit vect in ECLIPJ2000 coordinate		Faraday cup
END_OBJECT =	COLUMN		
NAME DATA_TYPE START_BYTE BYTES FORMAT	COLUMN = "FC_Z_ECLIPJ2000" = ASCII_REAL = 180 = 6 = "F6.3" = "N/A" = "Z component of unit vect	tor aligned with	Faraday cup



ROMAP EAICD

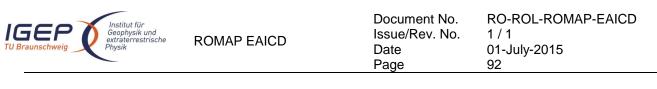
Document No. Issue/Rev. No. Date Page

RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 89

in ECLIPJ2000 coordinates" END OBJECT = COLUMN \*/ \*/ /\* Add index and type columns /\* Index column : measurement number
/\* Type column : measurement type (I1CRT or I2CRT) \*/ \*/ OBJECT = COLUMN = "INDEX" NAME = INTEGER = 187 DATA\_TYPE START BYTE = 5 BYTES = "I5" FORMAT UNIT = "N/A" = "Measurement index" DESCRIPTION END OBJECT = COLUMN OBJECT = COLUMN = "TYPE" = CHARACTER NAME DATA TYPE START BYTE = 194 = 5 BYTES FORMAT = "N/A" UNIT = "N/A" = "Measurement type (I1CRT or I2CRT)" DESCRIPTION = COLUMN END OBJECT OBJECT = COLUMN = "ENERGY" NAME DATA\_TYPE = ASCII\_REAL START\_BYTE = 201 = 7 BYTES = "F7.2" FORMAT = "ELECTRONVOLT" UNIT = "Energy step" DESCRIPTION = COLUMN END OBJECT OBJECT = COLUMN = "CURRENT ELEVATION 1" NAME DATA TYPE = ASCII REAL = 209 START\_BYTE = 6 BYTES FORMAT = "F6.3" = "MICROAMPERE" UNTT = "Current for elevation step 1 (-31 deg)" DESCRIPTION END OBJECT = COLUMN OBJECT = COLUMN = "CURRENT\_ELEVATION\_2" NAME DATA TYPE = ASCII REAL START\_BYTE = 216 = 6 BYTES = "F6.3" FORMAT = "MICROAMPERE" UNIT DESCRIPTION = "Current for elevation step 2" = COLUMN END OBJECT OBJECT = COLUMN = "CURRENT ELEVATION 3" NAME = ASCII REAL DATA TYPE = 223 START BYTE BYTES = 6 FORMAT = "F6.3" UNIT = "MICROAMPERE"

Institut für Geophysik und extraterrestrische Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	
DESCRIPTION END_OBJECT	<pre>= "Current for elevation = COLUMN</pre>	step 3"	
BYTES FORMAT UNIT	<pre>= COLUMN = "CURRENT_ELEVATION_4" = ASCII_REAL = 230 = 6 = "F6.3" = "MICROAMPERE" = "Current for cloudion</pre>	otop 4"	
END_OBJECT	<pre>= "Current for elevation = COLUMN</pre>	step 4"	
NAME DATA_TYPE START_BYTE BYTES FORMAT	<pre>= COLUMN = "CURRENT_ELEVATION_5" = ASCII_REAL = 237 = 6 = "F6.3" = "MICROAMPERE" = "Current for elevation = COLUMN</pre>	step 5"	
BYTES FORMAT	<pre>= COLUMN = "CURRENT_ELEVATION_6" = ASCII_REAL = 244 = 6 = "F6.3" = "MICROAMPERE" = "Current for elevation = COLUMN</pre>	step 6 "	
START_BYTE BYTES FORMAT	<pre>= COLUMN = "CURRENT_ELEVATION_7" = ASCII_REAL = 251 = 6 = "F6.3" = "MICROAMPERE" = "Current for elevation = COLUMN</pre>	step 7 "	
FORMAT UNIT DESCRIPTION	<pre>= "MICROAMPERE" = "Current for elevation</pre>	step 8 "	
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT	<pre>= COLUMN = "CURRENT_ELEVATION_9" = ASCII_REAL = 265 = 6</pre>		
END_OBJECT OBJECT NAME	<pre>= COLUMN = COLUMN = "CURRENT_ELEVATION_10"</pre>		

Institut für Geophysik und extraterrestrische Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 91
START_BYTE BYTES FORMAT UNIT	<pre>= ASCII_REAL = 272 = 6 = "F6.3" = "MICROAMPERE" = "Current for elevation s = COLUMN</pre>	step 10 "	
DATA_TYPE START_BYTE BYTES FORMAT UNIT	<pre>= COLUMN = "CURRENT_ELEVATION_11" = ASCII_REAL = 279 = 6 = "F6.3" = "MICROAMPERE" = "Current for elevation = = COLUMN</pre>	step 11 "	
	<pre>= COLUMN = "CURRENT_ELEVATION_12" = ASCII_REAL = 286 = 6 = "F6.3" = "MICROAMPERE" = "Current for elevation s = COLUMN</pre>	step 12 "	
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT	<pre>= COLUMN = "CURRENT_ELEVATION_13" = ASCII_REAL = 293 = 6 = "F6.3" = "MICROAMPERE" = "Current for elevation = = COLUMN</pre>	step 13 "	
OBJECT NAME DATA_TYPE START_BYTE BYTES	<pre>= COLUMN = "CURRENT_ELEVATION_14" = ASCII_REAL = 300 = 6 = "F6.3" = "MICROAMPERE" = "Current for elevation as = COLUMN</pre>	step 14 "	
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT	<pre>= COLUMN = "CURRENT_ELEVATION_15" = ASCII_REAL = 307 = 6 = "F6.3" = "MICROAMPERE" = "Current for elevation s = COLUMN</pre>	step 15 "	
- OBJECT DATA_TYPE START_BYTE BYTES FORMAT UNIT	<pre>= COLUMN = "CURRENT_ELEVATION_16" = ASCII_REAL = 314 = 6 = "F6.3" = "MICROAMPERE" = "Current for elevation settings"</pre>	step 16"	



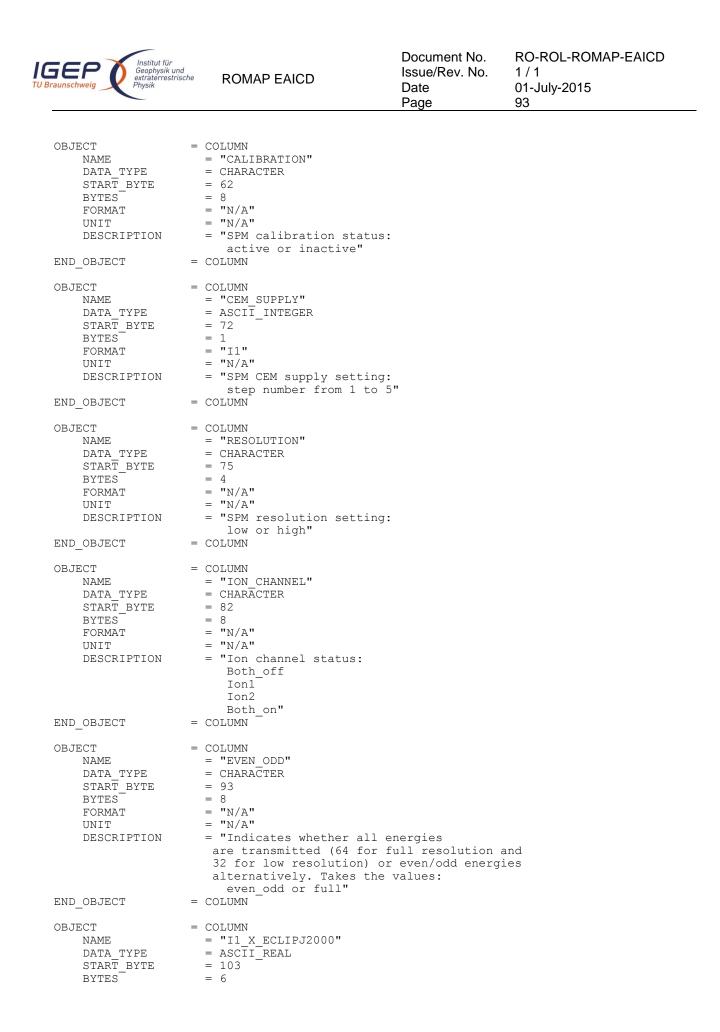
END OBJECT = COLUMN

#### 4.3.5.4.3 Ion spectrum definition (counts-energy distribution), parameter mode (channels 1 or 2)

OBJECT	<pre>= ROMAP_SPM_PAR_ION_CNE_TABLE</pre>
NAME	= ROMAP SPM PAR ION CNE
INTERCHANGE FORMAT	= ASCII
ROWS	= 640
^STRUCTURE	= "ROMAP SPM PARC ION CNE.FMT"
COLUMNS	= 26
ROW BYTES	= 239
end_object	= ROMAP_SPM_PAR_ION_CNE_TABLE

The structure of the TABLE object is described in the file ROMAP\_SPM\_PARC\_ION\_CNE.FMT as follows:

```
Contents of format file "ROMAP SPM_PARC_ION_CNE.FMT"
/*
                                                                  * /
/*
                  Ion spectrum definition
                                          (Level 3)
                                                                  */
/*
     (I1CNTE, I2CNTE), parameter mode (channels 1 or 2)
                                                                  */
/* Include the HEADER at the beginning of each measurement
                                                         */
                                                       ** */
OBJECT
                  = COLUMN
                   = "UTC"
   NAME
   DATA_TYPE
                   = TIME
   START BYTE
                   = 1
   BYTES
                   = 23
                   = "This column represents the UTC
   DESCRIPTION
                     Of the SPM spectrum in PDS standard format
                      YYYY-MM-DDThh:mm:ss.sss"
END OBJECT
                   = COLUMN
OBJECT
                 = COLUMN
                  = "OBT"
   NAME
                  = ASCII_REAL
   DATA TYPE
   START BYTE
                  = 25
   BYTES
                  = 15
   UNIT
                  = SECOND
                  = "F15.5"
   FORMAT
                  = "ROMAP 4 bytes counter representing the measurement
   DESCRIPTION
                     time synchronized with Lander On Board Time.
                     The time resolution is 0.03125 s"
END OBJECT
                = COLUMN
OBJECT
                = COLUMN
                 = "MODE"
   NAME
                 = CHARACTER
   DATA TYPE
   START_BYTE
                  = 42
                  = 9
   BYTES
                  = "N/A"
   FORMAT
                  = "N/A"
   UNTT
                  = "SPM mode:
   DESCRIPTION
                    raw or parameter"
END OBJECT
                = COLUMN
OBJECT
                = COLUMN
   NAME
                  = "EXPOSITION TIME"
                  = CHARACTER
   DATA TYPE
   START BYTE
                  = 54
                  = 5
   BYTES
                  = "N/A"
   FORMAT
                  = "N/A"
   UNTT
                  = "SPM exposition time setting:
   DESCRIPTION
                    short or long"
                = COLUMN
END OBJECT
```



IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 94
FORMAT UNIT DESCRIPTION END OBJECT =	<pre>= "F6.3" = "N/A" = "X component of unit vec     in ECLIPJ2000 coordinat COLUMN</pre>		Ion 1 detector
- OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "I1 Y_ECLIPJ2000" = ASCII_REAL = 110 = 6 = "F6.3" = "N/A" = "Y component of unit vec in ECLIPJ2000 coordinat COLUMN		Ion 1 detector
—	COLUMN = "I1_Z_ECLIPJ2000" = ASCII_REAL = 117 = 6 = "F6.3" = "N/A" = "Z component of unit vec in ECLIPJ2000 coordinat		Ion 1 detector
—	COLUMN = "I2_X_ECLIPJ2000" = ASCII_REAL = 124 = 6 = "F6.3" = "N/A" = "X component of unit vectors of the second se		Ion 2 detector
- OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT	<pre>in ECLIPJ2000 coordinat COLUMN = "I2_Y_ECLIPJ2000" = ASCII_REAL = 131 = 6 = "F6.3" = "N/A" = "Y_component of unit vec in ECLIPJ2000 coordinat</pre>	tor aligned with	Ion 2 detector
OBJECT = NAME DATA_TYPE START_BYTE BYTES	COLUMN COLUMN	.65	
UNIT DESCRIPTION END_OBJECT =	<pre>- 'IO.3 = "N/A" = "Z component of unit vec in ECLIPJ2000 coordinat COLUMN COLUMN = "EL_X_ECLIPJ2000" = ASCII REAL</pre>		Ion 2 detector
START_BYTE BYTES FORMAT	= 145 = 6 = "F6.3"		

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 95
UNIT DESCRIPTION	<pre>= "N/A" = "X component of unit vect detector in ECLIPJ2000 COLUMN</pre>	tor aligned with coordinates"	electron
END_OBJECT =	COLUMN		
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "EL_Y_ECLIPJ2000" = ASCII_REAL = 152 = 6 = "F6.3" = "N/A" = "Y component of unit vector detector in ECLIPJ2000		electron
END_OBJECT =	COLUMN		
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "EL Z_ECLIPJ2000" = ASCII_REAL = 159 = 6 = "F6.3" = "N/A" = "Z component of unit vector detector in ECLIPJ2000	tor aligned with	electron
END_OBJECT =	COLUMN	coordinates	
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "FC_X_ECLIPJ2000" = ASCII_REAL = 166 = 6 = "F6.3" = "N/A" = "X component of unit vectors in ECLIPJ2000 coordinated		Faraday cup
END_OBJECT =	COLUMN		
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "FC_Y_ECLIPJ2000" = ASCII_REAL = 173 = 6 = "F6.3" = "N/A" = "Y component of unit vect in ECLIPJ2000 coordinate		Faraday cup
END_OBJECT =	COLUMN	25	
NAME DATA_TYPE START_BYTE BYTES FORMAT	COLUMN = "FC_Z_ECLIPJ2000" = ASCII_REAL = 180 = 6 = "F6.3" = "N/A" = "Z component of unit vectors	or aligned with	Faraday cup
	in ECLIPJ2000 coordinate		
- /* ***********************************	* * * * * * * * * * * * * * * * * * * *	, I2CNTE)	*/ */ */

Institut für Geophysik und extraterrestris Physik	sche ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 96
NAME DATA TYPE	= "INDEX" = INTEGER		
START_BYTE BYTES	= 187 = 5		
FORMAT UNIT	= "I5" = "N/A"		
	<pre>= "Measurement index" = COLUMN</pre>		
DBJECT NAME	= COLUMN = "TYPE"		
	= CHARACTER = 194		
_			
BYTES FORMAT	= 6 = "N/A"		
UNIT	= "N/A"		
DESCRIPTION	= "Measurement type (I	I1CNTE, I2CNTE)"	
_	= COLUMN		-t. <i>1</i>
	= COLUMN	* * * * ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^	*/
NAME	= COLOMN = "ENERGY"		
DATA_TYPE	= ASCII_REAL		
START_BYTE	= 202		
BYTES FORMAT	= 7 = "F7.2"		
UNIT	= "ELECTRONVOLT"		
DESCRIPTION	= "Energy step"		
END_OBJECT	= COLUMN		
	= COLUMN		
NAME DATA TYPE	= "COUNTS" = ASCII REAL		
START BYTE	= 210		
BYTES	= 10		
FORMAT	= "F10.2"		
UNIT DESCRIPTION	= "CM**-2*S**-1" = "Sum of counts for e	alovation steps 1 to	∴ 16"
END_OBJECT	= COLUMN	STEVACION SCOPE I CO	
OBJECT NAME	= COLUMN = "OVERFLOW FLAG"		
DATA TYPE			
START_BYTE	= 222		
BYTES	= 16		
FORMAT UNIT	= "N/A" = "N/A"		
DESCRIPTION	= "String of 16 charac	cters ; each charact ep and may take one	
	0 : No ov 1 : Overi		
END_OBJECT	= COLUMN		
•	um definition (current-energy d	<i>,</i> .	node (channels 1 or 2)
OBJECT NAME	= ROMAP_SPM_PAN = ROMAP_SPM_PAN	R_ION_CRE_TABLE	

OBJECT	=	ROMAP SPM PAR ION CRE TABLE
NAME	=	ROMAP_SPM_PAR_ION_CRE
INTERCHANGE_FORMAT	=	ASCII
ROWS	=	640
^STRUCTURE	=	"ROMAP_SPM_PARC_ION_CRE.FMT"
COLUMNS	=	26
ROW BYTES	=	235
END_OBJECT	=	ROMAP_SPM_PAR_ION_CRE_TABLE



ROMAP EAICD

The structure of the TABLE object is described in the file ROMAP\_ROMAP\_SPM\_PARC\_ION\_CRE.FMT as follows:

Contents of format file "ROMAP\_SPM\_PARC\_ION\_CRE.FMT" /\* \*/ /\* Ion spectrum definition (Level 3) \*/ /\* \*/ (I1CRTE, I2CRTE), parameter mode (channels 1 or 2) /\* Include the HEADER at the beginning of each measurement \*/ OBJECT = COLUMN NAME = "UTC" DATA TYPE = TIME START\_BYTE = 1 BYTES = 23 DESCRIPTION = "This column represents the UTC Of the SPM spectrum in PDS standard format YYYY-MM-DDThh:mm:ss.sss" END OBJECT = COLUMN OBJECT = COLUMN NAME = "OBT" DATA TYPE = ASCII REAL START BYTE = 25 BYTES = 15 = SECOND UNIT = "F15.5" FORMAT = "ROMAP 4 bytes counter representing the measurement DESCRIPTION time synchronized with Lander On Board Time. The time resolution is 0.03125 s" = COLUMN END OBJECT OBJECT = COLUMN = "MODE" NAME DATA TYPE = CHARACTER START\_BYTE = 42 BYTES = 9 = "N/A" FORMAT = "N/A" UNIT DESCRIPTION = "SPM mode: raw or parameter" END OBJECT = COLUMN OBJECT = COLUMN = "EXPOSITION TIME" NAME DATA TYPE = CHARACTER START\_BYTE = 54 = 5 BYTES FORMAT = "N/A" = "N/A" UNTT DESCRIPTION = "SPM exposition time setting: short or long" = COLUMN END OBJECT OBJECT = COLUMN = "CALIBRATION" NAME = CHARACTER DATA TYPE START BYTE = 62 BYTES = 8 = "N/A" FORMAT = "N/A" UNIT = "SPM calibration status: DESCRIPTION active or inactive" END OBJECT = COLUMN OBJECT = COLUMN

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 98
START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= "CEM_SUPPLY" = ASCII_INTEGER = 72 = 1 = "I1" = "N/A" = "SPM CEM supply setting: step number from 1 to 5</pre>		
END_OBJECT =	COLUMN		
NAME DATA_TYPE START_BYTE BYTES FORMAT	COLUMN = "RESOLUTION" = CHARACTER = 75 = 4 = "N/A" = "N/A" = "SPM resolution setting: low or high"		
END_OBJECT =	COLUMN		
NAME	COLUMN = "ION_CHANNEL" = CHARACTER = 82 = 8 = "N/A" = "Ion channel status: Both_off Ion1 Ion2 Ton2		
END_OBJECT =	Both_on" COLUMN		
- OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT	COLUMN = "EVEN_ODD" = CHARACTER = 93 = 8 = "N/A" = "Indicates whether all e are transmitted (64 for f 32 for low resolution) or alternatively. Takes the even odd or full"	ull resolution a even/odd energi	
END_OBJECT =	COLUMN		
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT	COLUMN = "I1_X_ECLIPJ2000" = ASCII_REAL = 103 = 6 = "F6.3" = "N/A" = "X component of unit vec in ECLIPJ2000 coordinat		n Ion 1 detector
END_OBJECT =	COLUMN		
NAME	COLUMN = "I1_Y_ECLIPJ2000" = ASCII_REAL = 110 = 6 = "F6.3" = "N/A"		

Institut für Geophysik und extraterrestrisc Physik	he ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICE 1 / 1 01-July-2015 99
DESCRIPTION	= "Y component of unit ver		Ion 1 detector
END OBJECT	in ECLIPJ2000 coordina = COLUMN	tes"	
OBJECT NAME	= COLUMN = "I1 Z ECLIPJ2000"		
	= ASCII REAL		
START BYTE	= 117		
BYTES	= 6		
FORMAT	= "F6.3"		
UNIT	= "N/A"		- 1
DESCRIPTION	= "Z component of unit vec in ECLIPJ2000 coordination		lon 1 detector
END OBJECT	= COLUMN	LES	
OBJECT	= COLUMN		
NAME	= "I2 X ECLIPJ2000"		
DATA_TYPE	= ASCII_REAL		
START_BYTE	= 124		
BYTES FORMAT	= 6 = "F6.3"		
UNIT	= "N/A"		
DESCRIPTION	= "X component of unit ve	ctor aligned with	Ion 2 detector
	in ECLIPJ2000 coordina		
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "12 Y ECLIPJ2000"		
DATA_TYPE	= ASCII_REAL		
START_BYTE	= 131		
BYTES	= 6		
FORMAT UNIT	= "F6.3" = "N/A"		
DESCRIPTION	= "Y component of unit ve	ctor aligned with	Ion 2 detector
	in ECLIPJ2000 coordina = COLUMN		
END_OBJECT			
OBJECT	= COLUMN		
NAME	= "I2_Z_ECLIPJ2000"		
DATA_TYPE START BYTE	= ASCII_REAL = 138		
BYTES	= 130		
	= "F6.3"		
UNIT	= "N/A"		
DESCRIPTION	= "Z component of unit ve		Ion 2 detector
END OD TEOM	in ECLIPJ2000 coordina	tes"	
END_OBJECT			
OBJECT	= COLUMN		
NAME	= "EL_X_ECLIPJ2000"		
DATA_TYPE	= ASCII_REAL		
START_BYTE BYTES	= 145 = 6		
FORMAT	- 0 = "F6.3"		
UNIT	= "N/A"		
DESCRIPTION	= "X component of unit ve		electron
END OBJECT	detector in ECLIPJ200 = COLUMN	0 coordinates"	
_			
OBJECT NAME	= COLUMN = "EL Y ECLIPJ2000"		
DATA TYPE	= "EL_Y_ECLIPJ2000" = ASCII REAL		
START BYTE	= 152		
BYTES	= 6		
FORMAT	= "F6.3"		
UNIT	= "N/A"	atom olimeta atta	
DESCRIPTION	= "Y component of unit ve	clor aligned with	erectron

Institut für Geophysik und extraterrestris Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 100
END_OBJECT	= COLUMN		
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION			n electron
END_OBJECT	detector in ECLIPJ200 = COLUMN	U coordinates"	
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "FC_X_ECLIPJ2000" = ASCII_REAL = 166 = 6 = "F6.3" = "N/A" = "X component of unit ve in ECLIPJ2000 coordina</pre>		n Faraday cup
END_OBJECT	= COLUMN	LES	
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END OBJECT	<pre>= COLUMN = "FC_Y_ECLIPJ2000" = ASCII_REAL = 173 = 6 = "F6.3" = "N/A" = "Y component of unit ve</pre>		n Faraday cup
- OBJECT DATA_TYPE START_BYTE BYTES FORMAT UNIT	<pre>= COLUMN = "FC_Z_ECLIPJ2000" = ASCII_REAL = 180 = 6 = "F6.3" = "N/A" = "Z component of unit ve in ECLIPJ2000 coordina</pre>	ctor aligned with	n Faraday cup
END_OBJECT	= COLUMN		
/* Add index and t /* Index colu /* Type colu	<pre>************************************</pre>	E, I2CRTE)	*/ */ */
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "INDEX" = INTEGER = 187 = 5 = "I5" = "N/A" = "Measurement index" = COLUMN</pre>		
NAME	= COLUMN = "TYPE" = CHARACTER = 194		

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 101
—	<pre>= 6 = "N/A" = "N/A" = "Measurement type (I1CRT COLUMN ************************************</pre>		. /
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "ENERGY" = ASCII_REAL = 202 = 7 = "F7.2" = "ELECTRONVOLT" = "Energy bin number" COLUMN		
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "CURRENT" = ASCII_REAL = 210 = 6 = "F6.3" = "MICROAMPERE" = "Sum of currents for elected COLUMN	vation steps 1 t	:o 16"
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "OVERFLOW FLAG" = CHARACTER = 218 = 16 = "N/A" = "N/A" = "String of 16 characters to an elevation step an values : 0 : No overfl 1 : Overflow"</pre>	d may take one c ow	
END_OBJECT	= COLUMN		

#### 4.3.5.4.5 Ion spectrum definition (counts-angle distribution), parameter mode (channels 1 or 2)

OBJECT	=	ROMAP SPM PAR ION CNA TABLE
NAME	=	ROMAP_SPM_PAR_ION_CNA
INTERCHANGE_FORMAT	=	ASCII
ROWS	=	320
^STRUCTURE	=	"ROMAP SPM PARC ION CNA.FMT"
COLUMNS	=	26
ROW_BYTES	=	287
END_OBJECT	=	ROMAP_SPM_PAR_ION_CNA_TABLE
—		

The structure of the TABLE object is described in the file ROMAP\_SPM\_PARC\_ION\_CNA.FMT as follows:

```
Contents of format file "ROMAP_SPM_PARC_ION_CNA.FMT"
Ion spectrum definition (Level 3)
/*
                                                 */
                                                 */
*/
/*
   (I1CNTA, I2CNTA), parameter mode (channels 1 or 2)
/*
*/
OBJECT
             = COLUMN
              = "UTC"
  NAME
  DATA_TYPE
              = TIME
```

IGEP Institut für Geophysik und extraterrestrische Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 102
START_BYTE BYTES DESCRIPTION END OBJECT	<pre>= 1 = 23 = "This column represents     Of the SPM spectrum in     YYYY-MM-DDThh:mm:ss.ss = COLUMN</pre>	n PDS standard fo	rmat
NAME	COLUMN = "OBT" = ASCII_REAL = 25 = 15 = SECOND = "F15.5" = "ROMAP 4 bytes counter r time synchronized with The time resolution is	Lander On Board	measurement Time.
END_OBJECT =	COLUMN	0.03125 5"	
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "MODE" = CHARACTER = 42 = 9 = "N/A" = "N/A" = "SPM mode:		
END_OBJECT =	raw or parameter" COLUMN		
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "EXPOSITION_TIME" = CHARACTER = 54 = 5 = "N/A" = "N/A" = "SPM exposition time set short or long" COLUMN	ting:	
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT	COLUMN = "CALIBRATION" = CHARACTER = 62 = 8 = "N/A" = "N/A" = "SPM calibration status: active or inactive"		
END_OBJECT =	active or inactive" COLUMN		
DESCRIPTION	COLUMN = "CEM_SUPPLY" = ASCIT_INTEGER = 72 = 1 = "I1" = "N/A" = "SPM CEM supply setting: step number from 1 to 5	. 11	
END_OBJECT =	COLUMN	,	
OBJECT = NAME DATA_TYPE START_BYTE	COLUMN = "RESOLUTION" = CHARACTER = 75		

IGEP TU Braunschweig	e ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 103
BYTES FORMAT UNIT DESCRIPTION	<pre>= 4 = "N/A" = "N/A" = "SPM resolution setting:     low or high"</pre>		
END_OBJECT	= COLUMN		
NAME	<pre>= COLUMN = "ION_CHANNEL" = CHARACTER = 82 = 8 = "N/A" = "N/A" = "Ion channel status: Both_off Ion1 Ion2 Both on"</pre>		
END_OBJECT	= COLUMN		
	<pre>= COLUMN = "EVEN_ODD" = CHARACTER = 93 = 8 = "N/A" = "N/A" = "Indicates whether all e are transmitted (64 for f 32 for low resolution) or alternatively. Takes the even odd or full"</pre>	ull resolution a even/odd energi	
END_OBJECT	= COLUMN		
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT	<pre>= COLUMN = "I1_X_ECLIPJ2000" = ASCII_REAL = 103 = 6 = "F6.3" = "N/A" = "X component of unit vec in ECLIPJ2000 coordinat</pre>		n Ion 1 detector
END_OBJECT	= COLUMN		
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT	<pre>= COLUMN = "I1_Y_ECLIPJ2000" = ASCII_REAL = 110 = 6 = "F6.3" = "N/A" = "Y component of unit vec in ECLIPJ2000 coordinat</pre>	tor aligned with	n Ion 1 detector
END_OBJECT			
NAME DATA_TYPE START_BYTE BYTES	<pre>= COLUMN = "I1_Z_ECLIPJ2000" = ASCII_REAL = 117 = 6 = "F6.3" = "N/A" = "Z component of unit vec in ECLIPJ2000 coordinat</pre>		n Ion 1 detector

Institut für Geophysik und extraterrestrisc Physik	he ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 104
END_OBJECT	= COLUMN		
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	= 124 = 6 = "F6.3" = "N/A"		n Ion 2 detector
END_OBJECT	= COLUMN		
	<pre>= COLUMN = "I2_Y_ECLIPJ2000" = ASCII_REAL = 131 = 6 = "F6.3" = "N/A" = "Y component of unit vec in ECLIPJ2000 coordinat</pre>		n Ion 2 detector
END_OBJECT	= COLUMN	Les	
DBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT	<pre>= COLUMN = "I2_Z_ECLIPJ2000" = ASCII_REAL = 138 = 6 = "F6.3" = "N/A" = "Z component of unit vec in ECLIPJ2000 coordinat = COLUMN</pre>		n Ion 2 detector
DBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END OBJECT	= COLUMN = "EL_X_ECLIPJ2000" = ASCII_REAL = 145 = 6 = "F6.3" = "N/A"		n electron
- DBJECT NAME DATA_TYPE START_BYTE BYTES	= COLUMN = "EL_Y_ECLIPJ2000" = ASCII REAL		n electron
- OBJECT NAME DATA_TYPE START_BYTE BYTES	= 6 = "F6.3" = "N/A"		n electron

Institut für Geophysik Braunschweig	nd ische ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 105
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT	<pre>= COLUMN = "FC_X_ECLIPJ2000" = ASCII_REAL = 166 = 6 = "F6.3" = "N/A"</pre>		
DESCRIPTION END OBJECT	<pre>= "X component of unit v</pre>		h Faraday cup
- OBJECT DATA_TYPE START_BYTE BYTES FORMAT	<pre>= COLUMN = "FC_Y_ECLIPJ2000" = ASCII_REAL = 173 = 6 = "F6.3"</pre>		
UNIT DESCRIPTION	<pre>= "N/A" = "Y component of unit v in ECLIPJ2000 coordir</pre>		h Faraday cup
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "FC_Z_ECLIPJ2000" = ASCII_REAL = 180 = 6 = "F6.3" = "N/A" = "Z component of unit ways and a second second</pre>		h Faraday cup
/* Add index and /* Index col /* Type col	umn : measurement number umn : measurement type (I1CN	**************************************	*/ */ */
, OBJECT DATA_TYPE START_BYTE BYTES FORMAT UNIT	<pre>************************************</pre>	*****	* */
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END OBJECT	<pre>= COLUMN = "TYPE" = CHARACTER = 194 = 6 = "N/A" = "Measurement type (I10 = COLUMN</pre>	CNTA or I2CNTA)"	
—	****		* /
OBJECT NAME DATA_TYPE START_BYTE BYTES	= COLUMN = "ANGLE " = ASCII_REAL = 202 = 7		

IGEP (Institut für Geophysik und extraterrestrische Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 106
DESCRIPTION	<pre>= "F7.2" = "DEGREE" = "Elevation step" COLUMN</pre>		
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	= 210 - = 10 = "F10.2" = "CM**-2*S**-1"	gy steps 0 to 31	
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "OVERFLOW FLAG" = CHARACTER = 222 = 64 = "N/A" = "N/A" = "String of 64 character to a step of energy an values : 0 : No overf 1 : Overflow</pre>	nd may take one of	
END_OBJECT 4.3.5.4.6 Ion spectrum OBJECT NAME INTERCHANGE_FO ROWS ^STRUCTURE COLUMNS ROW_BYTES END_OBJECT	In low resolution the and set to blank " = COLUMN definition (current-angle), parar = ROMAP_SPM_PAR_IC = ROMAP_SPM_PAR_IC RMAT = ASCII = 320 = "ROMAP_SPM_PARC_ = 26 = 283 = ROMAP_SPM_PAR_IC	meter mode (channel DN_CRA_TABLE DN_CRA ION_CRA.FMT"	
/* Cont /* /* (I1CRTA, I2CRT /* *************** /* Include the HEADE	LE object is described in the file ents of format file "ROMA Ion spectrum definition A), parameter mode (channe ***********************************	AP_SPM_PARC_ION_CH (Level 3) els 1 or 2) */	RA.FMT" */ */ */
OBJECT NAME DATA_TYPE START_BYTE BYTES DESCRIPTION END_OBJECT	<pre>************************************</pre>	s the UTC n PDS standard fo	
OBJECT = NAME DATA_TYPE START_BYTE	COLUMN = "OBT" = ASCII_REAL = 25		

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 107
BYTES UNIT FORMAT DESCRIPTION	<pre>= 15 = SECOND = "F15.5" = "ROMAP 4 bytes counter    time synchronized with    The time resolution is</pre>	n Lander On Board	
END_OBJECT =	COLUMN	5 0.03123 5	
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "MODE" = CHARACTER = 42 = 9 = "N/A" = "N/A" = "SPM mode: raw or parameter" COLUMN		
—			
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "EXPOSITION_TIME" = CHARACTER = 54 = 5 = "N/A" = "N/A" = "SPM exposition time set	etting:	
END_OBJECT =	short or long" COLUMN		
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "CALIBRATION" = CHARACTER = 62 = 8 = "N/A" = "N/A" = "SPM calibration status active or inactive" COLUMN	5:	
—			
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	= "SPM CEM supply setting	9: -	
END_OBJECT =	step number from 1 to COLUMN	5"	
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "RESOLUTION" = CHARACTER = 75 = 4 = "N/A" = "N/A" = "SPM resolution setting low or high" COLUMN	g:	
END_OBJECT =	COLUMN		
OBJECT = NAME DATA_TYPE START_BYTE	COLUMN = "ION_CHANNEL" = CHARACTER = 82		

IGEP TU Braunschweig	he ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 108
BYTES FORMAT UNIT DESCRIPTION	<pre>= 8 = "N/A" = "N/A" = "Ion channel status:     Both_off     Ion1     Ion2 </pre>		
END_OBJECT	Both_on" = COLUMN		
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "EVEN_ODD" = CHARACTER = 93 = 8 = "N/A" = "N/A" = "Indicates whether all e are transmitted (64 for f 32 for low resolution) or alternatively. Takes the even odd or full"</pre>	full resolution a r even/odd energ:	
END_OBJECT	= COLUMN		
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "I1_X_ECLIPJ2000" = ASCII_REAL = 103 = 6 = "F6.3" = "N/A" = "X component of unit vec in ECLIPJ2000 coordinat</pre>		h Ion 1 detector
END_OBJECT	= COLUMN		
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END OBJECT	<pre>= COLUMN = "I1_Y_ECLIPJ2000" = ASCII_REAL = 110 = 6 = "F6.3" = "N/A" = "Y component of unit vec in ECLIPJ2000 coordinat = COLUMN</pre>		h Ion 1 detector
- OBJECT DATA_TYPE START_BYTE BYTES	<pre>= COLUMN = "I1_Z_ECLIPJ2000" = ASCII_REAL = 117 = 6 = "F6.3" = "N/A" = "Z_component of unit vec in ECLIPJ2000 coordinat</pre>		h Ion 1 detector
BYTES	<pre>In ECLIPJ2000 coordinat = COLUMN = "I2_X_ECLIPJ2000" = ASCII_REAL = 124 = 6 = "F6.3" = "N/A" = "X component of unit vec in ECLIPJ2000 coordinat = COLUMN</pre>	ctor aligned with	h Ion 2 detector

IGEP Institut für Geophysik und extraterrestrische Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 109
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "I2_Y_ECLIPJ2000" = ASCII_REAL = 131 = 6 = "F6.3" = "N/A" = "Y component of unit vec in ECLIPJ2000 coordinat		Ion 2 detector
END_OBJECT =	COLUMN		
NAME	COLUMN = "I2_Z_ECLIPJ2000" = ASCII_REAL = 138 = 6 = "F6.3" = "N/A" = "Z_component of unit vec in ECLIPJ2000 coordinat		Ion 2 detector
END_OBJECT =	COLUMN		
NAME	COLUMN = "EL_X_ECLIPJ2000" = ASCII_REAL = 145 = 6 = "F6.3" = "N/A" = "X component of unit vec detector in ECLIPJ2000		electron
END_OBJECT =	COLUMN		
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "EL Y_ECLIPJ2000" = ASCII_REAL = 152 = 6 = "F6.3" = "N/A" = "Y component of unit vec detector in ECLIPJ2000 COLUMN	tor aligned with coordinates"	electron
NAME	COLUMN = "EL_Z_ECLIPJ2000" = ASCII_REAL = 159 = 6 = "F6.3" = "N/A" = "Z component of unit vec	2	electron
END_OBJECT =	detector in ECLIPJ2000 COLUMN	coordinates	
NAME DATA_TYPE START_BYTE BYTES FORMAT	= 166 = 6 = "F6.3" = "N/A"		Faraday cup
END_OBJECT =	COLUMN	~~	
OBJECT =	COLUMN		

Institut für Geophysik u extraterrestr Physik	nd ische ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICE 1 / 1 01-July-2015 110
NAME DATA_TYPE	= "FC_Y_ECLIPJ2000" = ASCII REAL		
START BYTE	= 173		
BYTES	= 6		
FORMAT	= "F6.3"		
UNIT DESCRIPTION	= "N/A" = "Y component of unit w	vector aligned with	n Faraday cun
DESCIVITION	in ECLIPJ2000 coordin		i faladay cup
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME DATA TYPE	= "FC_Z_ECLIPJ2000" = ASCII_REAL		
START BYTE	= 180		
BYTES	= 6		
FORMAT	= "F6.3"		
UNIT DESCRIPTION	= "N/A"	water aligned with	- Faraday our
DESCRIPTION	= "Z component of unit w in ECLIPJ2000 coordin		i raraday Cup
END_OBJECT	= COLUMN		
1	*****	* * * * * * * * * * * * * * * * * * * *	/
/* Add index and /* Index col	umn : measurement number		*/
	umn : measurement type (I1CH	RTA, I2CRTA)	*/
/* *********	******	* * * * * * * * * * * * * * * * * * * *	* */
OBJECT	= COLUMN		
NAME	= "INDEX"		
DATA_TYPE START BYTE	= INTEGER = 187		
BYTES	= 5		
FORMAT	= "I5"		
UNIT	= "N/A"		
DESCRIPTION END OBJECT	<pre>= "Measurement index" = COLUMN</pre>		
-	COLORIN		
OBJECT	= COLUMN		
NAME DATA TYPE	= "TYPE" = CHARACTER		
START_BYTE	= 194		
BYTES	= 6		
FORMAT			
UNIT	= "N/A" = "Measurement type (I10		
END_OBJECT	= COLUMN	CRIA, IZCRIA)	
/* **********	* * * * * * * * * * * * * * * * * * * *	*****	* /
OBJECT	= COLUMN		
NAME	= "ANGLE"		
DATA TYPE	= COLUMN = "ANGLE" = ASCII_REAL = 202 = 7		
START_BITE BYTES	- 202 = 7		
FORMAT	= "F7.2"		
UNIT	= "DEGREE"		
DESCRIPTION	= "DEGREE" = "Elevation step" = COLUMN		
OBJECT	= COLUMN		
NAME	= "CURRENT"		
	$= ASCII_KEAL$ $= 210$		
START RVTT	<u> </u>		
NAME DATA_TYPE START_BYTE BYTES	= 6		
FORMAT	= "F6.3"		
FORMAT UNIT	= 0		

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 111
	Or 0 to 63" COLUMN		
OBJECT NAME	= COLUMN = "OVERFLOW FLAG"		
DATA TYPE	= CHARACTER		
START BYTE	= 218		
BYTES	= 64		
FORMAT	= "N/A"		
UNIT	= "N/A"		
DESCRIPTION	<pre>= "String of 64 characters    to a step of energy and    values :         0 : No overfl         1 : Overflow</pre>	may take one of	
	In low resolution the 3	2 last character	rs are unused
	and set to blank "		
END_OBJECT	= COLUMN		

#### 4.3.5.4.7 Faraday cup current-energy distribution

#### FC TABLE object for PAR mode

= ROMAP SPM PAR FC TABLE
= ROMAP_SPM_PAR_FC
= ASCII
= 180
= 24
= 212
= "ROMAP_SPM_FCC.FMT"
= ROMAP_SPM_PAR_FC_TABLE

#### FC TABLE object for RAW mode

OBJECT	= ROMAP SPM RAW FC TABLE
NAME	= ROMAP_SPM_RAW_FC
INTERCHANGE_FORMAT	= ASCII
ROWS	= 34
COLUMNS	= 24
ROW BYTES	= 212
^STRUCTURE	= "ROMAP SPM FCC.FMT"
END_OBJECT	= ROMAP_SPM_RAW_FC_TABLE

The structure of the TABLE object is described in the file ROMAP\_SPM\_FCC.FMT as follows:

	ontents of format file "ROMAP_SPM_FCC.FMT" current-energy distribution (Level 3)	* / * /
/* Include the HEA	**************************************	
OBJECT NAME DATA_TYPE START_BYTE BYTES DESCRIPTION	= 1 = 23	
END_OBJECT	= COLUMN	
NAME DATA_TYPE	= COLUMN = "OBT" = ASCII_REAL = 25 = 15	

Institut für Geophysik und extraterrestrisch Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 112
UNIT	= SECOND		
FORMAT DESCRIPTION	<pre>= "F15.5" = "ROMAP 4 bytes counter    time synchronized with</pre>	Lander On Board	e measurement l Time.
END_OBJECT	The time resolution is = COLUMN	0.03125 5	
OBJECT	= COLUMN		
NAME	= "MODE"		
DATA_TYPE	= CHARACTER		
START_BYTE	= 42		
BYTES	= 9		
FORMAT UNIT	= "N/A" = "N/A"		
DESCRIPTION	= "SPM mode:		
DESCRIPTION	raw or parameter"		
END_OBJECT	= COLUMN		
	= COLUMN		
	= "EXPOSITION_TIME" = CHARACTER		
START BYTE	= 54		
BYTES	= 5		
FORMAT	= "N/A"		
UNIT	= "N/A"		
DESCRIPTION	= "SPM exposition time se short or long"	tting:	
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "CALIBRATION"		
DATA TYPE	= CHARACTER		
START BYTE	= 62		
BYTES	= 8		
FORMAT	= "N/A"		
UNIT	= "N/A"		
DESCRIPTION	= "SPM calibration status active or inactive"	:	
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "CEM SUPPLY"		
DATA TYPE	= "CEM_SUPPLY" = ASCIT_INTEGER		
DATA_TYPE START_BYTE	= 72		
BYTES	= 1		
	= "I1"		
UNIT	= "N/A"		
DESCRIPTION	= "SPM CEM supply setting		
END_OBJECT	step number from 1 to = COLUMN	2	
OBJECT	= COLUMN		
OBJECT NAME	= "RESOLUTION"		
DATA TYPE	= CHARACTER		
START_BYTE	= 75		
BYTES	= 75 = 4		
FORMAT UNIT	= "N/A"		
DESCRIPTION	= "SPM resolution setting	:	
END_OBJECT	low or high" = COLUMN		
OBJECT	= COLUMN		
	= "ION_CHANNEL"		
DATA TYPE	= CHARACTER		
DATA_TYPE START_BYTE	= 82		
BYTES	= 8		

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 113
FORMAT UNIT DESCRIPTION	<pre>= "N/A" = "N/A" = "Ion channel status:     Both_off     Ion1     Ion2     Both on"</pre>		
END_OBJECT =	= COLUMN		
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "EVEN_ODD" = CHARACTER = 93 = 8 = "N/A" = "N/A" = "Indicates whether all of are transmitted (64 for 3 32 for low resolution) of alternatively. Takes the</pre>	full resolution a r even/odd energi	
END_OBJECT =	even_odd or full" = COLUMN		
OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "I1_X_ECLIPJ2000" = ASCII_REAL = 103 = 6 = "F6.3" = "N/A" = "X component of unit veg in ECLIPJ2000 coordina;</pre>		n Ion 1 detector
END_OBJECT =	= COLUMN		
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "I1 Y_ECLIPJ2000" = ASCII_REAL = 110 = 6 = "F6.3" = "N/A" = "Y component of unit very in ECLIPJ2000 coordinated"</pre>	ctor aligned with tes"	n Ion 1 detector
_	= COLUMN		
NAME DATA_TYPE	<pre>= COLUMN = "I1_Z_ECLIPJ2000" = ASCII_REAL = 117 = 6 = "F6.3" = "N/A" = "Z component of unit very in ECLIPJ2000 coordina:</pre>		n Ion 1 detector
OBJECT = NAME	<pre>= COLUMN = COLUMN = "I2 X_ECLIPJ2000" = ASCII_REAL = 124 = 6 = "F6.3" = "N/A" = "X component of unit veg in ECLIPJ2000 coordina;</pre>	ctor aligned with	n Ion 2 detector
END_OBJECT =	= COLUMN	LED	
OBJECT =	- COLUMN		

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 114
NAME DATA TYPE	= "I2_Y_ECLIPJ2000" = ASCII REAL		
START BYTE	= 131		
BYTES	= 6		
FORMAT	= "F6.3"		
UNIT	= "N/A"		
DESCRIPTION	= "Y component of unit ve		1 Ion 2 detector
END_OBJECT =	in ECLIPJ2000 coordina = COLUMN	ates"	
OBJECT =	= COLUMN		
NAME	= "I2 Z ECLIPJ2000"		
DATA TYPE	= ASCII REAL		
START BYTE	= 138		
BYTES	= 6		
FORMAT	= "F6.3"		
UNIT	= "N/A"		
DESCRIPTION	= "Z component of unit ve		1 Ion 2 detector
END OBJECT =	in ECLIPJ2000 coordina = COLUMN	ites"	
—			
	= COLUMN		
NAME	= "EL_X_ECLIPJ2000"		
DATA_TYPE	= ASCII_REAL		
START_BYTE BYTES	= 145 = 6		
FORMAT	- 0 = "F6.3"		
UNIT	= "N/A"		
DESCRIPTION	= "X component of unit ve	ector aligned with	n electron
	detector in ECLIPJ200	0 coordinates"	
END_OBJECT =	= COLUMN		
OBJECT =	= COLUMN		
NAME	= "EL Y ECLIPJ2000"		
DATA_TYPE	= ASCII_REAL		
START_BYTE	= 152		
BYTES	= 6		
FORMAT UNIT	= "F6.3" = "N/A"		
DESCRIPTION	= "Y component of unit ve	ctor aligned with	electron
DEDORTITION	detector in ECLIPJ200		
END_OBJECT =			
00 JD 00			
OBJECT =	= COLUMN		
NAME DAWA WYDE	- ASCII PEAT		
DAIA_IIPE Start rvtr	= COLUMN = "EL_Z_ECLIPJ2000" = ASCII_REAL = 159 = 6		
BYTES	= 6		
FORMAT	= "F6.3"		
UNIT	= "N/A"		
DESCRIPTION	= "Z component of unit ve	ector aligned with	n electron
END OBJECT =	detector in ECLIPJ200 = COLUMN	0 coordinates"	
—			
	= COLUMN		
NAME DATA TYPE	= "FC_X_ECLIPJ2000" = ASCII_REAL		
NAME DATA_TYPE START_BYTE	= 166		
BYTES	= 6		
FORMAT	= "F6.3"		
UNTT	= "N/A"		
DESCRIPTION	= "X component of unit ve	ector aligned with	n Faraday cup
	in ECLIPJ2000 coordina	ates"	
END_OBJECT =	= COLUMN		
OBJECT =	= COLUMN		
NAME	= "FC Y ECLIPJ2000"		

Institut für Geophysik und extraterrestrische Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 115
DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= ASCII_REAL = 173 = 6 = "F6.3" = "N/A" = "Y component of unit ved</pre>	ctor aligned with	Faraday cup
	in ECLIPJ2000 coordinat = COLUMN		
NAME	<pre>= COLUMN = "FC_Z_ECLIPJ2000" = ASCII_REAL = 180 = 6 = "F6.3" = "N/A" = "Z component of unit vec</pre>		n Faraday cup
END_OBJECT	in ECLIPJ2000 coordinat = COLUMN	tes"	
/* ***********************************	<pre>n : measurement number ************************************</pre>		
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT	= COLUMN = "ENERGY" = ASCII_REAL		
START_BYTE BYTES FORMAT UNIT	<pre>= COLUMN = "CURRENT" = ASCII_REAL = 201 = 10 = "F10.2" = "NANOAMPERE" = "Faraday cup Current " = COLUMN</pre>		

### 4.3.5.4.8 Electron spectrum (count-energy distribution)

Electron spectrum TABLE object for PAR mode

OBJECT	= ROMAP_SPM_PAR_ELEC_TABLE
NAME	= ROMAP SPM PAR ELEC
INTERCHANGE_FORMAT	= ASCII
ROWS	= 320



Document No. Issue/Rev. No. Date Page RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 116

COLUMNS	= 24
ROW BYTES	= 210
^STRUCTURE	= "ROMAP SPM ELECC.FMT"
END_OBJECT	= ROMAP_SPM_PAR_ELEC_TABLE

#### Electron spectrum TABLE object for RAW mode

OBJECT	= ROMAP_SPM_RAW_ELEC_TABLE
NAME	= ROMAP_SPM_RAW_ELEC
INTERCHANGE FORMAT	= ASCII
ROWS	= 32
COLUMNS	= 24
ROW BYTES	= 210
^STRUCTURE	= "ROMAP SPM ELECC.FMT"
END_OBJECT	= ROMAP_SPM_RAW_ELEC_TABLE

The structure of the TABLE object is described in the file ROMAP\_SPM\_ELECC.FMT as follows:

	ontents of format file "ROMAP_SPM_ELECC.FMT" */ on spectrum (count-energy distribution) (Level 3) */
/* Include the HEA	x*************************************
OBJECT NAME DATA_TYPE START_BYTE BYTES DESCRIPTION END_OBJECT	<pre>= COLUMN = "UTC" = TIME = 1 = 23 = "This column represents the UTC</pre>
OBJECT NAME DATA_TYPE START_BYTE BYTES UNIT FORMAT DESCRIPTION	<pre>= COLUMN = "OBT" = ASCII_REAL = 25 = 15 = SECOND = "F15.5" = "ROMAP 4 bytes counter representing the measurement     time synchronized with Lander On Board Time.     The time resolution is 0.03125 s"</pre>
END_OBJECT OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = COLUMN = "MODE" = CHARACTER = 42 = 9 = "N/A" = "N/A" = "SPM mode:     raw or parameter"</pre>
END_OBJECT OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT	= COLUMN = "EXPOSITION_TIME" = CHARACTER = 54 = 5 = "N/A"

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 117
UNIT DESCRIPTION END_OBJECT =	<pre>= "N/A" = "SPM exposition time set     short or long" = COLUMN</pre>	ting:	
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "CALIBRATION" = CHARACTER = 62 = 8 = "N/A" = "N/A" = "SPM calibration status:</pre>		
NAME DATA_TYPE START_BYTE BYTES FORMAT	<pre>= COLUMN = "CEM_SUPPLY" = ASCII_INTEGER = 72 = 1 = "I1" = "N/A" = "SPM_CEM_supply_setting:     step_number_from 1 to 5</pre>		
END_OBJECT =	= COLUMN		
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "RESOLUTION" = CHARACTER = 75 = 4 = "N/A" = "N/A" = "SPM resolution setting:</pre>		
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT	<pre>= COLUMN = "ION_CHANNEL" = CHARACTER = 82 = 8 = "N/A" = "N/A" = "Ion channel status: Both_off Ion1 Ion2 Both on"</pre>		
END_OBJECT =	= COLUMN		
NAME DATA_TYPE START_BYTE BYTES FORMAT	<pre>= COLUMN = "EVEN_ODD" = CHARACTER = 93 = 8 = "N/A" = "N/A" = "Indicates whether all e are transmitted (64 for f 32 for low resolution) or alternatively. Takes the even odd or full"</pre>	ull resolution a even/odd energi	
END_OBJECT =	= COLUMN		
OBJECT =	= COLUMN		

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 118
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT =	<pre>= "I1_X_ECLIPJ2000" = ASCII_REAL = 103 = 6 = "F6.3" = "N/A" = "X component of unit vec in ECLIPJ2000 coordinat COLUMN</pre>		Ion 1 detector
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "I1_Y_ECLIPJ2000" = ASCII_REAL = 110 = 6 = "F6.3" = "N/A" = "Y component of unit vec in ECLIPJ2000 coordinat COLUMN		Ion 1 detector
- OBJECT = NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "I1_Z_ECLIPJ2000" = ASCII_REAL = 117 = 6 = "F6.3" = "N/A" = "Z component of unit vec in ECLIPJ2000 coordinat COLUMN		Ion 1 detector
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	COLUMN = "I2_X_ECLIPJ2000" = ASCII_REAL = 124 = 6 = "F6.3" = "N/A" = "X component of unit vector in ECLIPJ2000 coordinat		Ion 2 detector
FORMAT UNIT DESCRIPTION	COLUMN = "I2_Y_ECLIPJ2000" = ASCII_REAL = 131 = 6 = "F6.3" = "N/A" = "Y component of unit vec in ECLIPJ2000 coordinat COLUMN	ctor aligned with ces"	Ion 2 detector
START_BYTE BYTES FORMAT UNIT	COLUMN = "I2_Z_ECLIPJ2000" = ASCII_REAL = 138 = 6 = "F6.3" = "N/A" = "Z component of unit vec in ECLIPJ2000 coordinat	ctor aligned with	Ion 2 detector
END_OBJECT = OBJECT = NAME			

Institut für Geophysik un extraterrestri Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 119
DATA TYPE	= ASCII REAL		
START BYTE	= 145 -		
BYTES	= 6		
FORMAT	= "F6.3"		
UNIT	= "N/A"		
DESCRIPTION	= "X component of unit ve	ector aligned with	h electron
DEDUCITIIION	detector in ECLIPJ20		
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "EL Y ECLIPJ2000"		
DATA TYPE	= ASCII REAL		
START BYTE	= "EL_Y_ECLIPJ2000" = ASCII_REAL = 152		
BYTES	= 6		
FORMAT	= "F6.3"		
UNIT	= "N/A"		
DESCRIPTION	= "Y component of unit ve	ctor aligned with	electron
	detector in ECLIPJ20	00 coordinates"	
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "EL Z ECLIPJ2000"		
DATA TYPE	= ASCII REAL		
START BYTE	= 159		
BYTES	= 6		
FORMAT	= "F6.3"		
UNIT	= "N/A"		
DESCRIPTION	= "Z component of unit ve	octor aligned with	h oloctron
DESCRIPTION	detector in ECLIPJ20		
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "FC_X_ECLIPJ2000"		
DATA_TYPE	= ASCII_REAL		
START_BYTE	= 166		
BYTES	= 6		
FORMAT	= "F6.3"		
UNIT	= "N/A"		
DESCRIPTION	= "X component of unit ve	ector aligned with	h Faraday cup
	in ECLIPJ2000 coordina		
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	$=$ "FC_Y_ECLIPJ2000"		
DATA TYPE	= ASCII_REAL		
START_BYTE	= COLUMN = "FC_Y_ECLIPJ2000" = ASCII_REAL = 173		
BITES	= 6		
FORMAT	= "F6.3"		
UNIT	= "N/A"		
DESCRIPTION	<pre>= "Y component of unit ve in ECLIPJ2000 coordina</pre>		h Faraday cup
END_OBJECT			
OBJECT	= COLUMN		
373 3 (T)			
NAME DATA_TYPE START_BYTE	= "FC_Z_ECLIPJ2000" = ASCII_REAL		
START BYTE	= 180		
BYTES	= 6		
FORMAT	= "F6.3"		
UNIT	= "N/A"		
DESCRIPTION		ector alianod with	h Faraday cun
DESCRITION	in ECLIPJ2000 coordina	ates"	n raraday cup
END OD TECH	= COLUMN		

Institut für Geophysik und extra terrestrische Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 120
/* Index column /* **************	: measurement number	* * * * * * * * * * * * * * * * * *	*/ */
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT =	COLUMN = "INDEX" = INTEGER = 187 = 5 = "I5" = "N/A" = "Measurement index" COLUMN	*****	/
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT	<pre>= COLUMN = "ENERGY" = ASCII_REAL = 193 = 7 = "F7.2" = "ELECTRONVOLT" = "Energy step" = COLUMN</pre>		
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT	<pre>= COLUMN = "COUNTS" = ASCII_REAL = 201 = 8 = "F8.2" = "CM**-2*S**-1" = "Electron counts" = COLUMN</pre>		

#### 4.3.5.5 Description of Instrument

The description of the instrument is done in above and as a brief overview in the INST.CAT catalog file.

#### 4.3.5.6 Mission Specific Keywords

There is no mission specific keywords for ROMAP.

#### 4.3.6 Housekeeping Calibrated Data Product Design (Level 3)

#### 4.3.6.1 File Characteristics Data Elements

The PDS file characteristic data elements for ROMAP HK calibrated data (level 3) are:

```
RECORD_TYPE = FIXED_LENGTH
RECORD_BYTES = 165
FILE_RECORDS
LABEL_RECORDS
```

#### 4.3.6.2 Data Object Pointers Identification Data Elements

The ROMAP HK calibrated data are organized as ASCII tables. The data object pointers (^TABLE) reference TAB files.



RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 121

#### 4.3.6.3 Instrument and Detector Descriptive Data Elements

INSTRUMENT HOST NAME	=	"ROSETTA-LANDER"
INSTRUMENT HOST ID	=	RL
INSTRUMENT_ID	=	ROMAP
INSTRUMENT NAME	=	"ROSETTA LANDER MAGNETOMETER AND PLASMA MONITOR"
INSTRUMENT_TYPE	=	{"FLUXGATE MAGNETOMETER","ELECTROSTATIC ANALYZER",
—		"FARADAY CUP" }
INSTRUMENT_MODE_ID	=	"N/A"
INSTRUMENT_MODE_DESC	=	"N/A"

### 4.3.6.4 Data Object Definition

Each TAB file contains a 18 columns table with the calibrated HK data (ADC units).

OBJECT NAME INTERCHANGE_FORMAT	= TABLE = "ROMAP_CALHK_TABLE" = ASCII
ROWS	=
COLUMNS	= 18
ROW BYTES	= 165
^STRUCTURE	= "ROMAP CALHK.FMT"
END_OBJECT	= TABLE

#### The structure of the TABLE object is described in the file ROMAP\_CALHK.FMT as follows:

/* Contents of fo	ormat file "ROMAP_CALHK.FMT" (Calibrated HK data) */
OBJECT NAME DATA_TYPE START_BYTE BYTES DESCRIPTION END_OBJECT	= 23
OBJECT NAME DATA_TYPE START_BYTE BYTES UNIT FORMAT DESCRIPTION	<pre>= COLUMN = "OBT" = ASCII_REAL = 25 = 15 = SECOND = "F15.5" = "ROMAP 4 bytes counter representing the measurement     time synchronized with Lander On Board Time.     The time resolution is 0.03125 s"</pre>
END_OBJECT	= COLUMN
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	= 4 = "Hexadecimal Format" = "N/A"
	Bit Description
	<ol> <li>Status flag : Instrument Mode was loaded at power-up from TC-Buffer</li> <li>Status flag : MAG setting was loaded from TC-Buffer</li> </ol>



OBJECT

= COLUMN

Institut für Geophysik und extraterrestrische Physik	ROMA	P EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 122
	3 4	Error flag : wr	ead TC-Buffer error rite BRAM error; cl. successfully writin	eared after
	5	Error flag : TO	C-Buffer content er Llegal checksum)	
	6	Error flag : SH	PM Ion 1 counter ov cleared after displ	
	7	CError flag : SE	overflow error flag PM Ion 2 counter ov cleared after displ	in HK data) erflow occurred aying SPM
	8	Error flag : SH	overflow errorflag PM Electron counter ccurred (cleared af PM overflow error f	overflow ter displaying
	9	Status flag : B	enning pressure se	nsor on/off
	10 11		Pirani pressure sen DUMMY FPGA output o	
	1213	Not used	Johni FIGA Output O	
	1415		IO, I1 identify ins	trument mode
END_OBJECT			5 is set once, is switched off."	it stays active
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION END_OBJECT	= CHARAC' = 49 = 4 = "N/A" = "N/A" = "Last : = COLUMN		RD 1)" cd 1)in Hexadecimal	Format"
	= CHARAC' = 56 = 4 = "N/A" = "N/A"		RD 2)" cd 2 ) in Hexadecim	al Format"
NAME DATA_TYPE START_BYTE BYTES FORMAT	= ASCII_1 = 62 = 8 = "F8.2" = MILLIW = "Overal	ATT		
- OBJECT DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	= COLUMN = "+5V CI = ASCII_1 = 71 = 7 = "F7.2" = VOLT = "+5V CT I = N	URRENT" REAL	5 [mA]"	
END_OBJECT	= COLUMN			

IGE TU Braunsch	lnstitut für Geophysik und extraterrestrische Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 123
	NAME	= "-5V CURRENT"		
	DATA_TYPE			
	START_BYTE	= 79		
	BYTES	= 7		
	FORMAT	= "F7.2"		
		= VOLT		
	DESCRIPTION	= "-5V  current	۲. اسما <b>ا</b>	
END_	OBJECT	I = N * 76.3E-3 * 0.0		
OBJE		= COLUMN		
	NAME	= "ELECTRONICS TEMPERATU	RE"	
		= ASCII_REAL		
	START_BYTE	= 87		
	BYTES	= 6		
		= "F6.2"		
	UNIT	= KELVIN	<b>r</b> 0	
	DESCRIPTION	= "electronics temperatu: T = (N * 76.3E-6 - 0.1)		"
END_	OBJECT	= COLUMN		
OBJE	С.Т.	= COLUMN		
0000	NAME	= "+28V CURRENT"		
	DATA TYPE	= ASCII REAL		
	START BYTE	= 94		
	BYTES	= 7		
	FORMAT	= "F7.2"		
	UNIT	= MILLIAMPERE		
	DESCRIPTION	= "+28V current	05 5 7 1	
END_	OBJECT	I = N * 76.3E-3 * 0.03 = COLUMN	25 [mA]"	
OBJE	сm	= COLUMN		
ODOL	NAME	= "SPM HV STATUS 1"		
		= ASCII REAL		
	START BYTE	= 102		
	BYTES	= 5		
	FORMAT	= "F5.2"		
	UNIT	= VOLT		
		= "SPM HV status 1"		
END_	OBJECT	= COLUMN		
OBJE	ICT	= COLUMN		
	NAME	= "SPM HV STATUS 2"		
	DATA_TYPE	= ASCII_REAL		
	START_BITE	= "SPM HV STATUS 2" = ASCII_REAL = 108 = 8		
	FORMAT	= 8 = "F8.4"		
		= VOLT		
	DESCRIPTION	= "SPM HV status 2"		
END_	OBJECT	= "SPM HV status 2" = COLUMN		
OBJF	ICT	= COLUMN		
	NAME	= COLOMN = "SPM HV STATUS 3" = ASCII_REAL = 117 = 8		
	DATA_TYPE	= ASCII_REAL		
	START_BYTE	= 117		
	BYTES	= 8		
	FORMAT	= "F8.4"		
	UNIT	= VOLT		
END_	OBJECT	= "SPM HV status 3" = COLUMN		
OBJE	SCT	= COLUMN		
	NAME	= "SPM HV STATUS 4"		
	DATA TVPF	= ASCII REAL		
	DATA_TYPE START_BYTE			

Institut für Geophysik und extraterrestrisch Physik	ROMAP EAICD	Document No. ssue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 124
FORMAT	= "F8.4"		
UNIT	= VOLT		
DESCRIPTION	= "SPM HV status 4"		
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "PENNING PRESSURE"		
DATA_TYPE	= ASCII_INTEGER		
START_BYTE	= 135		
BYTES	= 7 = "I7"		
FORMAT UNIT	= 17 = PASCAL		
DESCRIPTION	= "Penning pressure"		
END_OBJECT	= COLUMN		
OBJECT NAME	= COLUMN = "PIRANI PRESSURE"		
DATA TYPE	= ASCII INTEGER		
START BYTE	= 143		
BYTES	= 7		
FORMAT	= "I7"		
UNIT	= PASCAL		
DESCRIPTION	= "Pirani pressure"		
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "PROM CHECKSUM"		
DATA_TYPE	= CHARACTER		
START_BYTE BYTES	= 152 = 4		
FORMAT	= 4 = "N/A"		
UNIT	= "N/A"		
DESCRIPTION	= "PROM checksum (computed a	t power-up)	
	in Hexadecimal Format"		
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "INSTRUMENT ERROR FLAGS"		
DATA TYPE	= CHARACTER		
START_BYTE	= 159		
BYTES	= 4		
FORMAT	= "N/A"		
UNIT DESCRIPTION	<pre>= "N/A" = " Instrument Error Flags i</pre>	n Hexadecimal	Format :
	-		
	±		
	0 Command overflow (a f	a TC was receiv Former was proc	
	1 CDMS illegal word c	-	
	2 CDMS message error		
	3 General CDMS receiv		
	4 General CDMS transm		
	5 Wrong telecommand r		
	6 CDMS request overfl		
	belore 7 Frame buffer overfl	e the former wa	as processed)
	8 MAG vector sampling		
	9 CDMS error code wor		
	10 CDMS checksum error		
	11 checksum error in r		SST word
	11 01100110 All 01101 111 1		
	12 SPM counter overflo	W	
	12SPM counter overflo13ADC sampling overfl	W .OW	
	12 SPM counter overflo	W .OW	



#### 4.3.7 Magnetometer Science calibrated Data Product Design (Level 5)

There are two kinds of calibrated science data for the ROMAP MAG instrument, draft calibrated and calibrated. The level 5 contains calibrated data. The calibration includes removal of spacecraft influence, of all kinds of AC disturbances and taking into account of temperature dependency of magnets. Both data products (draft calibrated and calibrated) have the same format, i.e. the UTC, the OBT, the spacecraft position (X, Y, Z) and the magnetic field (Bx, By, Bz) in Instrument, Lander, Orbiter and ECLIP J2000 coordinates.

#### 4.3.7.1 File Characteristics Data Elements

The PDS file characteristic data elements for ROMAP MAG science calibrated data are:

```
RECORD_TYPE = FIXED_LENGTH
RECORD_BYTES = 119
FILE_RECORDS
LABEL_RECORDS
```

#### 4.3.7.2 Data Object Pointers Identification Data Elements

The ROMAP MAG SC calibrated data are organized as ASCII tables. The data object pointers (^TABLE) reference TAB files.

#### 4.3.7.3 Instrument and Detector Descriptive Data Elements

The following data identification elements provide additional information about the ROMAP-MAG data products.

INSTRUMENT_HOST_NAME	= "ROSETTA-LANDER"
INSTRUMENT HOST ID	= RL
INSTRUMENT ID	= ROMAP
INSTRUMENT NAME	= "ROSETTA LANDER MAGNETOMETER AND PLASMA MONITOR"
INSTRUMENT_TYPE	<pre>= {"FLUXGATE MAGNETOMETER","ELECTROSTATIC ANALYZER",</pre>
DETECTOR ID	= MAG
INSTRUMENT MODE ID	= "N/A"
INSTRUMENT_MODE_DESC	= "N/A"

#### 4.3.7.4 Data Object Definition

4.3.7.4.1 Level E data object definition (calibrated in instrument coordinates)

Each TAB file contains an eight columns table with the magnetic field and the spacecraft position.

OBJECT NAME INTERCHANGE_FORMAT	<pre>= TABLE = "ROMAP_MAG_CALSCE_TABLE" = ASCII</pre>
ROWS	=
COLUMNS	= 8
ROW_BYTES	= 119
^STRUCTURE	= "ROMAP_MAG_CALSCE.FMT"
END_OBJECT	= TABLE

The structure of the TABLE object is described in the file ROMAP\_MAG\_CALSCE.FMT as follows:

```
/* Contents of format file "ROMAP_MAG_CALSCE.FMT" */
/* Level E data object definition : */
/* calibrated in instrument coordinates */
```

Institut für Geophysik und extraterrestrische Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 126
OBJECT	- 001 11001		
NAME	= COLUMN = "UTC"		
DATA TYPE	= TIME		
START BYTE	= 1		
BYTES	= 23		
DESCRIPTION	= "This column represent Of the magnetic field		tandard format
	YYYY-MM-DDThh:mm:ss.s		
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "OBT"		
DATA_TYPE	= ASCII_REAL		
START_BYTE	= 25		
BYTES	= 15 - SECOND		
UNIT	= SECOND		
FORMAT	= "F15.5" = "POMAR 4 bytes counter	roprogonting the	maaguramant
DESCRIPTION	= "ROMAP 4 bytes counter time synchronized with		
	The time resolution is		
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "POS X"		
DATA TYPE	= ASCII REAL		
START BYTE	= 41		
BYTES	= 16		
FORMAT	= "F16.3"		
UNIT	= KILOMETER		
DESCRIPTION	= "X component of the Spa		position,
END OBJECT	ECLIPJ2000 coordinates = COLUMN		
—			
OBJECT	= COLUMN		
NAME	= "POS Y"		
DATA TYPE	= ASCIT_REAL		
START_BYTE	= 58		
BYTES	= 16 = "F16 3"		
FORMAT	= "F16.3" - KIIOMETER		
UNIT	= KILOMETER = "V component of the Spa	cocraft (Iandor)	position
DESCRIPTION	= "Y component of the Spa ECLIPJ2000 coordinates		POSTCION,
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "POS Z"		
DATA_TYPE			
START BYTE	= 75		
BYTES	= 16		
FORMAT	= "F16.3"		
UNIT	= KILOMETER		
DESCRIPTION	= "Z component of the Spa	cecraft (Lander)	position,
	ECLIPJ2000 coordinates		
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "BX"		
DATA_TYPE	= ASCII_REAL		
START_BYTE	= 92		
BYTES	= 8		
FORMAT	= "F8.2"		
UNIT	= NANOTESLA		
DESCRIPTION	5		
	calibrated, instrument	coordinates"	
END_OBJECT	= COLUMN		

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 127
NAME DATA TYPE START_BYTE BYTES FORMAT UNIT	<pre>= COLUMN = "BY" = ASCII_REAL = 101 = 8 = "F8.2" = NANOTESLA = "Magnetic field Y compon calibrated, instrument components</pre>		
END_OBJECT	= COLUMN	Jordinates	
NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT	<pre>= COLUMN = "BZ" = ASCII_REAL = 110 = 8 = "F8.2" = NANOTESLA = "Magnetic field Z comport calibrated, instrument comport calibrated</pre>		
END_OBJECT	= COLUMN		

#### 4.3.7.4.2 Level F data object definition (calibrated in Lander coordinates)

Each TAB file contains an eight columns table with the magnetic field and the spacecraft position.

OBJECT NAME INTERCHANGE_FORMAT	= TABLE = "ROMAP_MAG_CALSCF_TABLE" = ASCII
ROWS	=
COLUMNS	= 8
ROW BYTES	= 119
^STRUCTURE	= "ROMAP MAG CALSCF.FMT"
END_OBJECT	= TABLE

The structure of the TABLE object is described in the file ROMAP\_MAG\_CALSCF.FMT as follows:

```
/*
                Contents of format file "ROMAP_MAG_CALSCF.FMT"
                                                                               * /
                                                                               */
*/
/*
      Level F data object definition :
/*
      calibrated in Lander coordinates
OBJECT
                       = COLUMN
                     = "UTC"
    NAME
    DATA_TYPE
                      = TIME
    START_BYTE
                      = 1
                      = 23
    BYTES
                       = "This column represents the UTC % \left( {{{\left( {{{{{{}}}} \right)}}}} \right)
    DESCRIPTION
                          Of the magnetic field vector in PDS standard format
                          YYYY-MM-DDThh:mm:ss.sss"
END OBJECT
                       = COLUMN
OBJECT
                     = COLUMN
                     = "OBT"
   NAME
    DATA TYPE
                     = ASCII_REAL
    START_BYTE
                     = 25
                     = 15
    BYTES
    UNIT
                     = SECOND
                     = "F15.5"
    FORMAT
    DESCRIPTION
                    = "ROMAP 4 bytes counter representing the measurement
                        time synchronized with Lander On Board Time.
                        The time resolution is 0.03125 s"
END_OBJECT
                     = COLUMN
OBJECT
                      = COLUMN
                      = "POS_X"
   NAME
```

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 128
DATA TYPE	= ASCII REAL		
START_BYTE	= 41		
BYTES	= 16		
FORMAT	= "F16.3"		
UNIT DESCRIPTION	<pre>= KILOMETER = "X component of the Sr</pre>	nacecraft (Lander)	nosition
END_OBJECT	<pre>ECLIPJ2000 coordinate = COLUMN</pre>		
OBJECT NAME	= COLUMN = "POS Y"		
	= ASCII REAL		
	= 58		
BYTES	= 16		
	= "F16.3"		
UNIT	= KILOMETER		
DESCRIPTION	= "Y component of the Sp ECLIPJ2000 coordinate	pacecraft (Lander) es"	position,
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "POS_Z"		
	= ASCII_REAL		
START_BYTE	= 75		
BYTES	= 16 = "F16.3"		
FORMAT UNIT	= FI0.3 = KILOMETER		
DESCRIPTION	= "Z component of the Sp ECLIPJ2000 coordinate		position,
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "BX"		
DATA TYPE	= ASCII REAL		
START_BYTE	= 92		
BYTES	= 8		
FORMAT	= "F8.2"		
UNIT	= NANOTESLA	<b>.</b>	
DESCRIPTION END OBJECT	<pre>= "Magnetic field X comp calibrated, Lander co = COLUMN</pre>		
	COLORIN		
	= COLUMN		
	= "BY"		
DATA_TYPE START_BYTE	= ASCII_REAL		
BYTES	= 101 = 8		
	- o = "F8.2"		
	= NANOTESLA		
	= "Magnetic field Y comp calibrated, Lander coo		
END_OBJECT	= COLUMN		
OBJECT	= COLUMN		
NAME	= "BZ"		
DATA TYPE	= ASCII_REAL		
START_BYTE BYTES	= 110 = 8		
FORMAT	= "F8.2"		
	= NANOTESLA	aanant	
DESCRIPTION	= "Magnetic field Z comp calibrated, Lander coo		
END OBJECT	= COLUMN	JI UIIIUCED	



4.3.7.4.3 Level G data object definition (calibrated in Orbiter coordinates)

Each TAB file contains an eight columns table with the magnetic field and the spacecraft position.

OBJECT	= TABLE
NAME	= "ROMAP MAG CALSCG TABLE"
INTERCHANGE FORMAT	= ASCII
ROWS	=
COLUMNS	= 8
ROW BYTES	= 119
^STRUCTURE	= "ROMAP MAG CALSCG.FMT"
END_OBJECT	= TABLE

The structure of the TABLE object is described in the file ROMAP\_MAG\_CALSCG.FMT as follows:

/* Level F data d	tents of format file "ROMAP_MAG_CALSCG.FMT" */ object definition : */ Orbiter coordinates */
OBJECT NAME DATA_TYPE START_BYTE BYTES DESCRIPTION	<pre>= COLUMN = "UTC" = TIME = 1 = 23 = "This column represents the UTC Of the magnetic field vector in PDS standard format YYYY-MM-DDThh:mm:ss.sss"</pre>
END_OBJECT	= COLUMN
OBJECT NAME DATA_TYPE START_BYTE BYTES UNIT FORMAT DESCRIPTION	<pre>= COLUMN = "OBT" = ASCII_REAL = 25 = 15 = SECOND = "F15.5" = "ROMAP 4 bytes counter representing the measurement    time synchronized with Lander On Board Time.    The time resolution is 0.03125 s"</pre>
END_OBJECT	= COLUMN
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "POS X" = ASCII_REAL = 41 = 16 = "F16.3" = KILOMETER = "X component of the Spacecraft (Lander) position,</pre>
END_OBJECT	= COLUMN
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "POS_Y" = ASCII_REAL = 58 = 16 = "F16.3" = KILOMETER = "Y component of the Spacecraft (Lander) position,</pre>
END_OBJECT	ECLIPJ2000 coordinates" = COLUMN
OBJECT NAME DATA_TYPE	= COLUMN = "POS_Z" = ASCII_REAL

IGEF TU Braunschwe	ig Institut für Geophysik und extraterrestrische Physik	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 130		
S	TART BYTE =	= 75				
	_	= 16				
		= "F16.3"				
		= KILOMETER				
		= "Z component of the Spac ECLIPJ2000 coordinates"		position,		
END_O	BJECT =	= COLUMN				
OBJEC	т =	= COLUMN				
N	AME =	= "BX"				
		= ASCII_REAL				
S	_	= 92				
В		= 8				
		= "F8.2"				
		= NANOTESLA				
		"Magnetic field X compon calibrated, Orbiter coo	ent, rdinates"			
end_o	BJECT =	= COLUMN				
OBJEC	т =	= COLUMN				
		= "BY"				
D	ATA TYPE =	= ASCII REAL				
S		= 101				
В	YTES =	= 8				
F	ORMAT =	= "F8.2"				
U		= NANOTESLA				
D	ESCRIPTION =	= "Magnetic field Y compon				
		calibrated, Orbiter coordinates"				
END_O	BJECT =	= COLUMN				
OBJEC	т =	= COLUMN				
N	AME =	= "BZ"				
D	ATA TYPE =	= ASCII REAL				
S	TART BYTE =	= 110				
В		= 8				
F		= "F8.2"				
		= NANOTESLA				
D	ESCRIPTION =	"Magnetic field Z compon calibrated, Orbiter coor				
END_O	BJECT =	= COLUMN				

4.3.7.4.4 Level H data object definition (calibrated in ECLIP J2000 coordinates)

Each TAB file contains an eight columns table with the magnetic field and the spacecraft position.

OBJECT	=	TABLE
NAME	=	"ROMAP MAG CALSCH TABLE"
INTERCHANGE_FORMAT	=	ASCII
ROWS	=	
COLUMNS	=	8
ROW BYTES	=	119
^STRUCTURE	=	"ROMAP MAG CALSCH.FMT"
END_OBJECT	=	TABLE

The structure of the TABLE object is described in the file ROMAP\_MAG\_CALSCH.FMT as follows:

/*	Contents of format file "ROMAP MAG CALSCH.FMT"	*/
/*	Level F data object definition :	*/
/*	calibrated in ECLIP J2000 coordinates	*/

=	COLUMN
=	"UTC"
=	TIME
=	1
=	23
	= = =

IGEP TU Braunschweig	ROMAP EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 131
DESCRIPTION	"This column represent Of the magnetic field YYYY-MM-DDThh:mm:ss.s	d vector in PDS st	andard format
END_OBJECT	= COLUMN		
OBJECT NAME DATA_TYPE START_BYTE BYTES UNIT FORMAT DESCRIPTION END OBJECT	<pre>= COLUMN = "OBT" = ASCII_REAL = 25 = 15 = SECOND = "F15.5" = "ROMAP 4 bytes counter    time synchronized with    The time resolution is = COLUMN</pre>	n Lander On Board	
—			
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "POS_X" = ASCII_REAL = 41 = 16 = "F16.3" = KILOMETER = "X component of the Spa ECLIPJ2000 coordinat</pre>		position,
END_OBJECT	= COLUMN	Jes "	
OBJECT NAME DATA_TYPE START_BYTE BYTES FORMAT UNIT DESCRIPTION	<pre>= COLUMN = "POS_Y" = ASCII_REAL = 58 = 16 = "F16.3" = KILOMETER = "Y component of the Spannerse Statement of the Spannerse Statement Statemen</pre>		position,
END_OBJECT	ECLIPJ2000 coordinates = COLUMN	5"	
START_BYTE BYTES	<pre>= COLUMN = "POS_Z" = ASCII_REAL = 75 = 16 = "F16.3" = KILOMETER = "Z component of the Spa ECLIPJ2000 coordinates</pre>		position,
END_OBJECT	= COLUMN	, ,	
START_BYTE BYTES FORMAT	<pre>= COLUMN = "BX" = ASCII_REAL = 92 = 8 = "F8.2" = NANOTESLA = "Magnetic field X component compared, ECLIPJ2000</pre>		
END_OBJECT	= COLUMN		
—	= COLUMN = "BY" = ASCII_REAL = 101 = 8 = "F8.2"		

	Page	01-July-2015 132
etic field Y compone rated, ECLIPJ2000 co		
_REAL " ESLA etic field Z compone rated, ECLIPJ2000 cc		

#### 4.3.7.5 Description of Instrument

The description of the instrument is done in above and as a brief overview in the INST.CAT catalog file.

### 5 Appendix: Available Software to read PDS files

The level 3 housekeeping and science PDS files can be read with the PDS table verifier tool "tbtool" and readpds (Small Bodies Node tool).

## 6 Appendix: Example of PDS detached label for ROMAP MAG level 2 data product

PDS VERSION ID = PDS3 LABEL REVISION NOTE = "2007-07-16, SONC, version 1.0" /\* PVV version 3.0 \*/ /\* Edited Science data \*/ /\* FILE CHARACTERISTIC DATA ELEMENTS \*/ Indextd\_TYPE= FIXED\_LENGTHFILE\_RECORDS= 18990RECORD\_BYTES= 65FILE\_NAME= "MAG\_FS2\_075" = "MAG\_FS2\_070225015459\_00004.TAB" /\* DATA OBJECT POINTERS \*/ ^ROMAP MAG RAWSC TABLE = ("MAG FS2 070225015459 00004.TAB",1 <BYTES>) DATA\_SET\_ID = "RL-CAL-ROMAP-2-MARS-MAG-V1.0" DATA\_SET\_NAME = "ROSETTA-LANDER MARS ROMAP 2 MARS MAG V1.0" PRODUCT\_ID = "MAG\_FS2\_070225015459\_00004" PRODUCT\_CREATION\_TIME = 2008-03-17T10:20:01 MISSION\_NAME = "INTERNATIONAL ROSETTA MISSION" MISSION\_PHASE\_NAME = "MARS SWING-BY" MISSION ID = ROSETTA = ROSETTA INSTRUMENT HOST NAME = "ROSETTA-LANDER" INSTRUMENT\_HOST\_ID = RL PRODUCT\_TYPE = EDR START\_TIME = 2007-02-25T01:54:59.194



Document No. Issue/Rev. No. Date Page RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 133

STOP TIME = 2007-02-25T01:59:55.303 SPACECRAFT\_CLOCK\_START\_COUNT = "1/130989270.09" SPACECRAFT\_CLOCK\_STOP\_COUNT = "1/130989566.12" PRODUCER ID = "SONC" PRODUCER FULL NAME = "SCIENCE OPERATIONS AND NAVIGATION CENTER" PRODUCER\_INSTITUTION\_NAME = "CNES" INSTRUMENT ID = ROMAP INSTRUMENT NAME = UNK = {"FLUXGATE MAGNETOMETER", "ELECTROSTATIC ANALYZER", INSTRUMENT TYPE "FARADAY CUP"} DETECTOR ID = MAG DETECTOR DESC = "Magnetometer" INSTRUMENT MODE ID = "N/A" INSTRUMENT\_MODE\_DESC = "N/A" TARGET\_NAME = "PLANET" TARGET TYPE PROCESSING\_LEVEL\_ID = "2" = "-1" DATA QUALITY ID = "-1 : NOT QUALIFIED" DATA\_QUALITY DESC /\* GEOMETRY PARAMETERS \*/ /\* SPACECRAFT LOCATION: Position <km> \*/ SC\_SUN\_POSITION\_VECTOR = ( -18553289.9, 195616341.6, 90223877.3) TARGET PARAMETERS: Position <km>, Velocity <km/s> \*/ 

 SC\_TARGET\_POSITION\_VECTOR = ( -153787159.6, 250943772.8, 114210041.1)

 SC\_TARGET\_VELOCITY\_VECTOR = ( -35.3, -20.1, -8.6)

 /\* SPACECRAFT POSITION WITH RESPECT TO CENTRAL BODY \*/ SPACECRAFT ALTITUDE = 315694750.8 <km> SUB\_SPACECRAFT\_LATITUDE = -21.06 <deg> SUB\_SPACECRAFT\_LONGITUDE = 122.76 <deg> NOTE = "The values of the keywords SC SUN\_POSITION\_VECTOR, SC\_TARGET\_POSITION\_VECTOR and SC\_TARGET\_VELOCITY\_VECTOR are related to the EMEJ2000 reference frame. The values of SUB SPACECRAFT LATITUDE and SUB SPACECRAFT LONGITUDE are northern latitude and eastern longitude in the standard planetocentric IAU <TARGET NAME> frame. All values are computed for the time = START TIME. Distances are given in <km> velocities in <km/s>, Angles in <deg>" /\* DATA OBJECT DEFINITION \*/ OBJECT = ROMAP MAG RAWSC TABLE = "ROMAP MAG EDITED SCIENCE DATA" NAME INTERCHANGE FORMAT = ASCII ROWS = 18990COLUMNS = 5 = 65 ROW BYTES = "ROMAP MAG RAWSC.FMT" ^STRUCTURE = ROMAP\_MAG\_RAWSC\_TABLE END OBJECT

END

### 7 Appendix: Example of PDS combined detached label for ROMAP SPM level 2 data product

PDS\_VERSION\_ID = PDS3
LABEL\_REVISION\_NOTE = "2009-03-16, SONC, version 1.0"
/\* PVV version 3.0 \*/

**RO-ROL-ROMAP-EAICD** Document No. Institut für IGEP Geophysik und extraterrestrische Physik Issue/Rev. No. 1/1ROMAP EAICD Date 01-July-2015 Page 134 Edited Science data (Level 2) /\* \*/ = "RL-CAL-ROMAP-2-CVP-SPM-V1.0" DATA SET ID DATA\_SET\_NAME PRODUCT\_ID = "ROSETTA-LANDER CAL ROMAP 2 CVP SPM V1.0" = "SPM FS2 040514013124" PRODUCT CREATION TIME = 2009-03-11T08:29:37 = "INTERNATIONAL ROSETTA MISSION" MISSION NAME = "COMMISSIONING" = ROSETTA MISSION\_PHASE\_NAME MISSION\_ID INSTRUMENT HOST NAME = "ROSETTA-LANDER" INSTRUMENT\_HOST\_ID = RL PRODUCT TYPE = EDR = 2004-05-14T01:31:24.815 START TIME STOP TIME = 2004-05-14T01:34:17.627 SPACECRAFT CLOCK START COUNT = "031312529.93750" SPACECRAFT CLOCK STOP COUNT = "042637969.93750" = "SONC" PRODUCER ID PRODUCER FULL NAME = "SCIENCE OPERATIONS AND NAVIGATION CENTER" PRODUCER\_INSTITUTION\_NAME = "CNES" INSTRUMENT ID = ROMAP INSTRUMENT NAME = "N/A" INSTRUMENT\_TYPE = {"FLUXGATE MAGNETOMETER", "ELECTROSTATIC ANALYZER", "FARADAY CUP" } DETECTOR ID = SPM = "Simple Plasma Monitor" DETECTOR DESC = "N/A" INSTRUMENT MODE ID INSTRUMENT\_MODE\_DESC = "N/A" = "CALIBRATION" TARGET NAME TARGET TYPE = "CALIBRATION" PROCESSING\_LEVEL\_ID = "2" DATA QUALITY ID = -1''DATA\_QUALITY\_DESC = "-1 : NOT QUALIFIED" /\* GEOMETRY PARAMETERS \*/ /\* SPACECRAFT LOCATION: Position <km> \*/ SC SUN POSITION VECTOR = ( 58256145.8, 110046457.3, 46674031.2) /\* TARGET PARAMETERS: Position <km>, Velocity <km/s> \*/ SC\_TARGET\_POSITION\_VECTOR = ("N/A","N/A","N/A") SC\_TARGET\_VELOCITY\_VECTOR = ("N/A","N/A","N/A") /\* SPACECRAFT POSITION WITH RESPECT TO CENTRAL BODY \*/ SPACECRAFT ALTITUDE = 31680363.9 <km> SUB\_SPACECRAFT\_LATITUDE = SUB\_SPACECRAFT\_LONGITUDE = 3.08 <deg> 108.33 <deg> NOTE = "The values of the keywords SC SUN POSITION VECTOR, SC\_TARGET\_POSITION\_VECTOR and SC\_TARGET\_VELOCITY VECTOR are related to the EMEJ2000 reference frame. The values of SUB SPACECRAFT LATITUDE and SUB SPACECRAFT LONGITUDE are northern latitude and eastern longitude in the standard planetocentric IAU <TARGET NAME> frame. All values are computed for the time = START\_TIME. Distances are given in <km> velocities in <km/s>, Angles in <deg>" /\* DATA OBJECT DEFINITION \*/ OBJECT = FILE = FIXED LENGTH RECORD TYPE FILE RECORDS = 96 RECORD BYTES = 196 ^ROMAP\_SPM\_PAR\_ION\_CNA\_TABLE = "SPMP FS2 040514013124 CNA.TAB" OBJECT = ROMAP SPM PAR ION CNA TABLE



Document No. Issue/Rev. No. Date Page RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 135

INTERCHANGE_FORMAT ROWS	= 96
^STRUCTURE COLUMNS	<pre>= "ROMAP_SPM_PAR_ION_CNA.FMT" = 14</pre>
	= 14 = 196
	<pre>= ROMAP_SPM_PAR_ION_CNA_TABLE = FILE</pre>
END_OBJECT	= FILE
OBJECT	= FILE
RECORD_TYPE	= FIXED_LENGTH
FILE_RECORDS RECORD_BYTES	= 192
^ROMAP SPM PAR ION CNE TA	= 148 ABLE = "SPMP_FS2_040514013124_CNE.TAB"
OBJECT	= ROMAP_SPM_PAR_ION_CNE_TABLE = ROMAP_SPM_PAR_ION_CNE
NAME INTERCHANGE FORMAT	
ROWS	= 192
	<pre>= "ROMAP_SPM_PAR_ION_CNE.FMT" = 14</pre>
	= 14 = 148
ROW_BYTES END OBJECT	= ROMAP SPM PAR ION CNE TABLE
END_OBJECT	<pre>= ROMAP_SPM_PAR_ION_CNE_TABLE = FILE</pre>
OBJECT	= FILE
	= FIXED_LENGTH
FILE RECORDS	= 96
	= 194
OBJECT	ABLE = "SPMP_FS2_040514013124_CRA.TAB" = ROMAP_SPM_PAR_ION_CRA_TABLE
NAME	= ROMAP_SPM_PAR_ION_CRA_TABLE = ROMAP_SPM_PAR_ION_CRA
INTERCHANGE_FORMAT ROWS	= ASCII
^STRUCTURE	= 90 = "Romap spm par ion cra.fmt"
COLUMNS	= "ROMAP_SPM_PAR_ION_CRA.FMT" = 14
ROW_BYTES	= 194 - DOMAR SEM RAR TON CRA MARIE
END_OBJECT END OBJECT	<pre>= ROMAP_SPM_PAR_ION_CRA_TABLE = FILE</pre>
_	
OBJECT RECORD_TYPE	= FILE = FIXED LENGTH
FILE RECORDS	= 192
RECORD BYTES	= 145
^ROMAP_SPM_PAR_ION_CRE_TA OBJECT	ABLE = "SPMP_FS2_040514013124_CRE.TAB" = ROMAP_SPM_PAR_ION_CRE_TABLE
NAME	= ROMAP_SPM_PAR_ION_CRE
INTERCHANGE_FORMAT	= ASCII
ROWS ^STRUCTURE	= 192 = "ROMAP SPM PAR ION CRE.FMT"
COLUMNS	= 14
ROW_BYTES	= 145
END_OBJECT END_OBJECT	= ROMAP_SPM_PAR_ION_CRE_TABLE = FILE
OBJECT	= FILE
RECORD_TYPE FILE RECORDS	= FIXED_LENGTH = 54
RECORD BYTES	= 119
^ROMAP_SPM_PAR_FC_TABLE	= "SPMF_FS2_040514013124.TAB" = ROMAP_SPM_PAR_FC_TABLE
NAME	= ROMAP_SPM_PAR_FC_TABLE = ROMAP_SPM_PAR_FC
INTERCHANGE_FORMAT	
ROWS	= 54
COLUMNS ROW BYTES	= 12 = 119
^STRUCTURE	= "ROMAP_SPM_FC.FMT"
END_OBJECT	= ROMAP_SPM_PAR_FC_TABLE

END_OBJECT = FILE OBJECT = FILE RECORD_TYPE = FIXED_LENGTH FILE_RECORDS = 96 RECORD_BYTES = 119 ^ROMAP_SPM_PAR_ELEC_TABLE = "SPME_FS2_040 OBJECT = ROMAP_SPM_PAR NAME = ROMAP_SPM_PAR		
RECORD_TYPE= FIXED_LENGTHFILE_RECORDS= 96RECORD_BYTES= 119^ROMAP_SPM_PAR_ELEC_TABLE= "SPME_FS2_040OBJECT= ROMAP_SPM_PAR		
INTERCHANGE_FORMAT = ASCII ROWS = 96 COLUMNS = 12 ROW_BYTES = 119 ^STRUCTURE = "ROMAP_SPM_EL END_OBJECT = ROMAP_SPM_PAR END_OBJECT = FILE	ELEC_TABLE ELEC .FMT"	

```
END
```

# 8 Appendix: Example of Directory Listing of Data Set RL-CAL-ROMAP-2-CVP-SPM-V1.0

	-AAREADME.TXT		
	    -CATALOG     	-CATINFO.T.  -DATASET.C.  -INST.CAT  -INSTHOST  -MISSION.C.  -PERSON.CA  -REF.CAT  -SOFTWARE.	AT CAT AT T
			-RHK_FH2_040908120217_02155.LBL  -RHK_FH2_040908120217_02155.TAB
-RL-CAL-ROMAP-2-CVP-SPM-V1.0-	 	             -SC	-SPME_FS2_040514013124.TAB  -SPME_FS2_041007004354.TAB  -SPME_FS2_041007004502.TAB  -SPME_FS2_041009001317.TAB  -SPMF_FS2_040514013124.TAB  -SPMF_FS2_040514013124.TAB  -SPMF_FS2_041007004354.TAB  -SPMF_FS2_041007004502.TAB  -SPMF_FS2_041009001317.TAB  -SPMF_FS2_041009001425.TAB  -SPMP_FS2_040514013124_CNA.TAB  -SPMP_FS2_040514013124_CNA.TAB  -SPMP_FS2_040514013124_CRA.TAB  -SPMP_FS2_040514013124_CRA.TAB  -SPMP_FS2_041007004502_CNA.TAB  -SPMP_FS2_041007004502_CNA.TAB  -SPMP_FS2_041007004502_CNA.TAB  -SPMP_FS2_041007004502_CNA.TAB  -SPMP_FS2_041007004502_CRA.TAB  -SPMP_FS2_041007004502_CRA.TAB  -SPMP_FS2_041007004502_CRA.TAB  -SPMP_FS2_041007004502_CRA.TAB  -SPMP_FS2_041009001425_CNA.TAB  -SPMP_FS2_041009001425_CRA.TAB  -SPMP_FS2_041009001425_CRA.TAB  -SPMP_FS2_041007004354_CN.TAB  -SPMR_FS2_041007004354_CR.TAB  -SPMR_FS2_041009001317_CN.TAB  -SPMR_FS2_041009001317_CR.TAB  -SPMR_FS2_040514013124_PAR.LBL



5	EAICD	Document No. Issue/Rev. No. Date Page	RO-ROL-ROMAP-EAICD 1 / 1 01-July-2015 137
	     	-SPM_  -SPM_  -SPM_	FS2_041007004354_RAW.LBL FS2_041007004502_PAR.LBL FS2_041009001317_RAW.LBL FS2_041009001425_PAR.LBL
		DOCINFO.TXT EAICD_ROMAP.DOC EAICD_ROMAP.LBL RO-LRO-DP-30000 ROMAP_CALIBRATI ROMAP_CALIBRATI TIMELINE_CVP_DE TIMELINE_CVP_PA TIMELINE_CVP_PA TIMELINE_CVP_PA TIMELINE_CVP_PA TIMELINE_CVP_PA	2-UA.PDF DN_DESC.TXT DN_DESC.LBL F SC.TXT RT1.LBL RT1.PNG RT2.LBL
	-INDEX	INDXINFO.TXT INDEX.LBL INDEX.TAB	
	             -LABEL  -         -         -         -	LABINFO.TXT ROMAP_RAWHK.FMT ROMAP_SPM_ELEC. ROMAP_SPM_FC.FM ROMAP_SPM_PAR_I ROMAP_SPM_PAR_I ROMAP_SPM_PAR_I ROMAP_SPM_PAR_I ROMAP_SPM_RAW_I	F DN_CNA.FMT DN_CNE.FMT DN_CRA.FMT DN_CRE.FMT DN_CN.FMT
	ן  -ערו הדפר כמיי	IVORIAE_DEM_IVAW_IV	

-VOLDESC.CAT