New Horizons Observational Geometry

This document summarizes some of the information from the New Horizons (NH) Payload Space Science Reviews paper [WEAVERETAL2008] to show the location of instruments on the NH spacecraft, the remote instruments' boresights, and different types of observations as well as how they are taken.

Fig. 2 from [WEAVERETAL2008]: This drawing shows the locations of the instruments on the New Horizons spacecraft. The SDC is mounted on the bottom panel, which is hidden from view, roughly underneath the Star Trackers. The boresights of LORRI (sketched in figure), Ralph, and the Alice airglow channel are all approximately along the –X direction. The boresights of the Alice solar occultation channel and the antenna are approximately along the +Y direction. SWAP covers a swath that is ~200° in the XY plane and ~10° in the YZ plane. PEPSSI's field-of-view is a ~160° by ~12° swath whose central axis is canted with respect to the principal spacecraft axes to avoid obstruction by the backside of the antenna. The black structure with fins located at +X is the RTG, which supplies power to the observatory. The star trackers, which are used to determine the attitude, can also be seen. The antenna diameter is 2.1 m, which provides a scale for the figure.

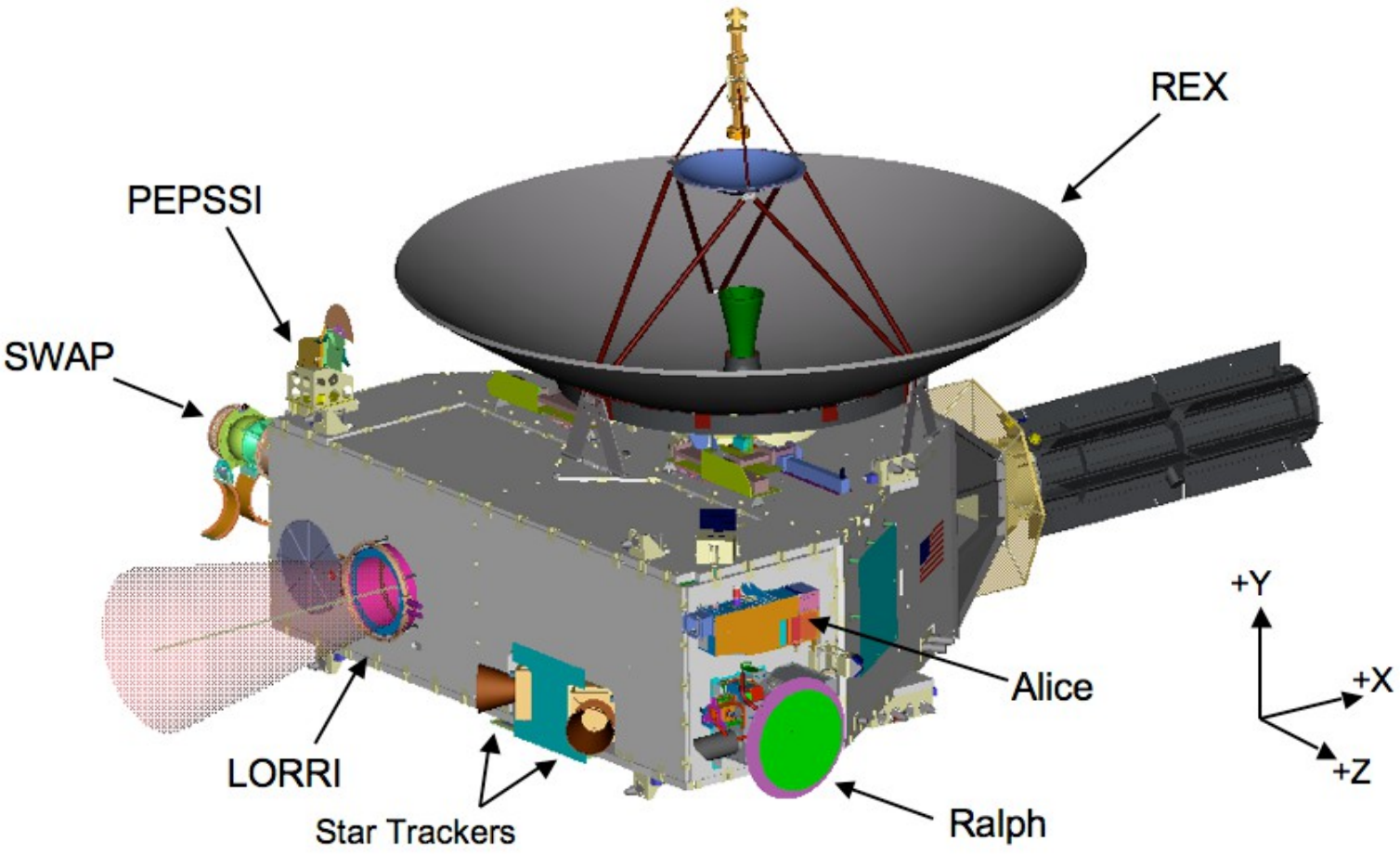

Fig. 3 from [WEAVERETAL2008] (modified): The fields of view (FOVs) of the MVIC, LEISA, Alice airglow, and LORRI instruments are projected onto the sky plane, looking down (along) the -X axis; the listed boresights are measured in-flight values. The angular extent of each instrument's FOV is also listed. The spacecraft +X direction is out of the page, the +Y direction is up, and the +Z direction is to the left. The LORRI field FOV overlaps the narrow portion of the Alice airglow channel, and the MVIC FOV overlaps the wide portion. The LEISA FOV overlaps the MVIC FOV.

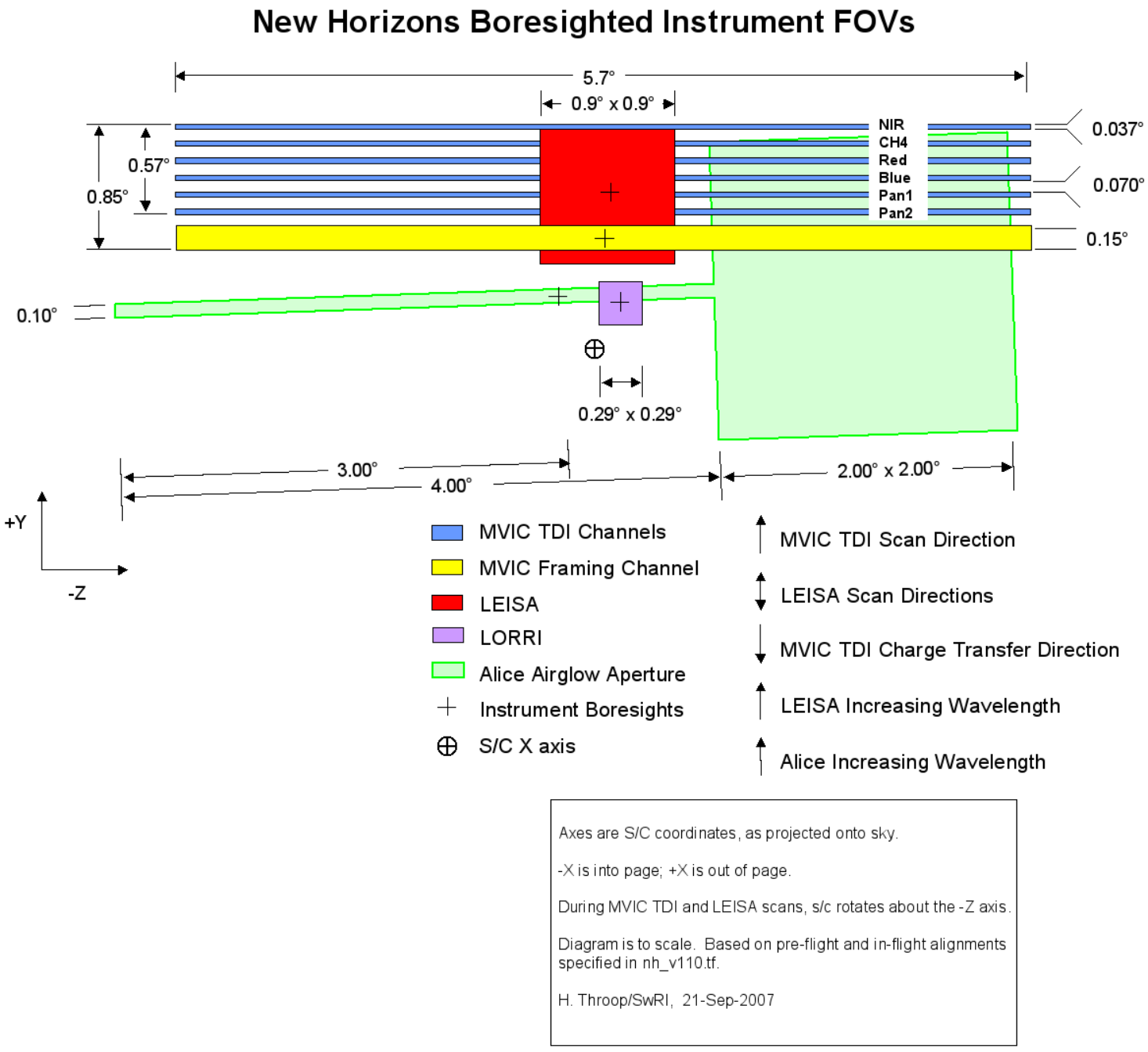

Fig. 4 from [WEAVERETAL2008]: Types of New Horizons observations. Typical Ralph MVIC Time Delay Integration (TDI) and LEISA observations (upper left) are performed by rotating the spacecraft about the Z-axis. Typical Ralph MVIC frame, LORRI, and Alice airglow observations (lower left) are made with the spacecraft staring in a particular direction. The Alice and REX occultation observations (upper right) are performed by pointing the antenna at the Earth and the Alice occultation channel at the sun, so that radio signals from the DSN on Earth can be received by REX at the same time that Alice observes the Sun. Observations by the particle instruments (SWAP, PEPSSI, and SDC; lower right) can occur essentially anytime, in either spinning or 3-axis mode. However, most of the SDC data will be collected during cruise mode, when the other instruments are in hibernation mode and the spacecraft is passively spinning, because thruster firings add a large background noise level to the SDC's data.