ESA's MIXS Team Builds Model to Predict X-Ray Spectrometer Count Rates on Arrival

Studying Mercury Messenger Data with STK

MERCURY MISSION: ESA's BepiColombo will carry the Mercury Imaging X-ray Spectrometer (MIXS) developed at the University of Leicester.

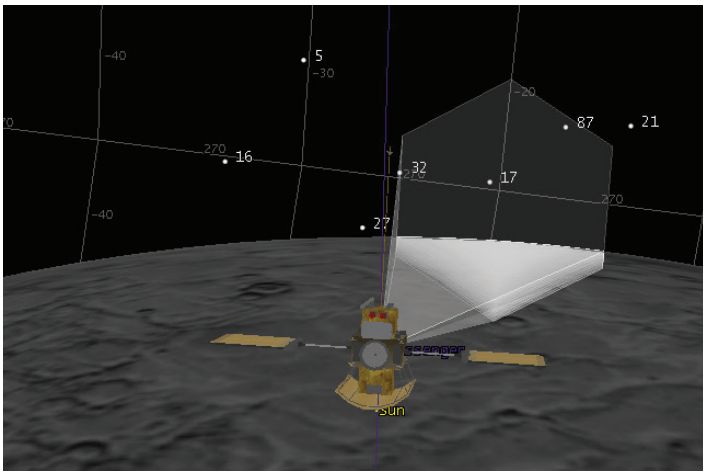
In preparation, the team studied data from NASA's current Mercury MESSENGER mission because their instrument will be in the same environment. They cite observations from MESSENGER's X-Ray Spectrometer (XRS) showing enhanced X-ray emission from sources trapped in the planet's magnetosphere.

DATA ANALYSIS: Using STK with MESSENGER attitude and ephemeris data allowed operators to identify bright astrophysical X-ray objects from Mercury flybys. Operators could then make correlations between these sources and the XRS peaks and model the expected signal. Events from astrophysical sources could contaminate measurements of particle populations in the magnetosphere.

Using STK Pro, the team visualized the spacecraft attitude to determine where the instrument was pointing in relation to the celestial sphere and the planet.

"STK's highly customizable fields of view and reports allowed us to generate high fidelity output which was read directly into our model, producing a simulated XRS signal which we could compare to the observations. The ability to visualize the scenario was enormously beneficial."

— NIGEL BANNISTER, SENIOR LECTURER, ESA BEPICOLOMBO



When the University of Leicester developed the Mercury Imaging X-ray Spectrometer for BepiColombo, they analyzed MESSENGER data to identify astrophysical X-ray sources in the signal. With STK Pro, the team produced a detailed recreation and identification of signal origins and produced plans for observations their instrument will make.

DETAILED PREPARATIONS: Analysts identified the moment a source entered the field of view, how close it passed from the boresight, whether maneuvers caused the object to wander, when and where the object left the field, and whether Mercury occulted the object. They combined these data with spectral models identified by STK and corrected for off-axis response using STK's output for the position of the source in the field as a function of time. This produced simulated spectra and count rate time series. In the modeling phase, STK allowed them to generate data to identify the cause of certain features. As a result, STK enabled the team to produce research output and understand and plan for the kind of observations MIXS will make when it reaches Mercury.

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