

XEUS Payload Accommodation Challenges and Trade-offs

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The XEUS reference mission consists of a mirror spacecraft and a detector spacecraft formation flying at the L2 Lagrange point, with the telescope always pointing close to 90° from the sun direction. The unconventional design of the XEUS telescope with the mirror optics separated from the detectors means that there are a number of system issues which strongly affect the payload design, so that an efficient design can not be reached without taking a system view.

The purpose of the current industrial activity is to assess the accommodation options and the resources required for different combinations of instruments. The candidate instruments are defined in two groups, the core payload to fulfil the main science requirements, and the ancillary instruments which should be accommodated as resources allow. The core payload comprises a Wide Field Imager (WFI) and a Narrow Field Imager (NFI), presently two different NFI designs are available, both designs are being analysed to ensure payload module (PLM) compatibility with the selected technology. The ancillary instruments are: a High Time Resolution Spectrometer (HTRS), Hard X-ray Camera (HXC), and an X-ray Polarimeter (XPOL), the alternative NFI technology may also be included as an ancillary instrument.

The core and ancillary instruments present numerous challenges for the design and accommodation of the payload on the XEUS detector spacecraft. Most notably, the very low operating temperatures of the NFI (30-300mK) combined with the long lifetime (5 or 10 years) and the separation of the focal plane from the telescope optics combined with stringent contamination and stray light requirements demand novel approaches to payload accommodation integration and design.

This paper will present the key system trade-offs for XEUS. The baffle options for the overall system and the detector spacecraft will be presented and the optimum detector spacecraft configuration and instrument accommodation will be discussed.