The NHXM observatory

Exploration of the X-ray sky has established X-ray astronomy as a fundamental astrophysical discipline. While our knowledge of the sky below 10 keV has increased dramatically (~8 orders of magnitude) by use of grazing incidence optics, we still await a similar improvement above 10 keV, where to date only collimated instruments have been used. Also ripe for exploration is the field of X-ray polarimetry, an unused fundamental tool to understand the physics and morphology of X-ray sources. Here we present a novel mission, the New Hard X-ray Mission (NHXM) that brings together for the first time simultaneous high-sensitivity, hard-X-ray imaging, broadband spectroscopy and polarimetry. NHXM will perform groundbreaking science in key scientific areas, including: black hole cosmic evolution, census and accretion physics; acceleration mechanism and non-thermal emission; physics of matter under extreme conditions. NHXM is designed specifically to address these topics via: broad 0.5–80 (120) keV band for imaging and spectroscopy; 20 arcsec (15 goal) Half Energy Width (HEW) angular resolution at 30 keV; sensitivity limits more than 3 orders of magnitude better than those available in present day instruments; broadband (2–35 keV) imaging polarimetry. In addition, NHXM has the ability to locate and actively monitor sources in different states of activity and to repoint within 1 to 2 h. This mission has been proposed to ESA in response to the Cosmic Vision M3 call. Its satellite configuration and payload subsystems were studied as part of previous national efforts permitting us to design a mature configuration that is compatible with a VEGA launch already by 2020.

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