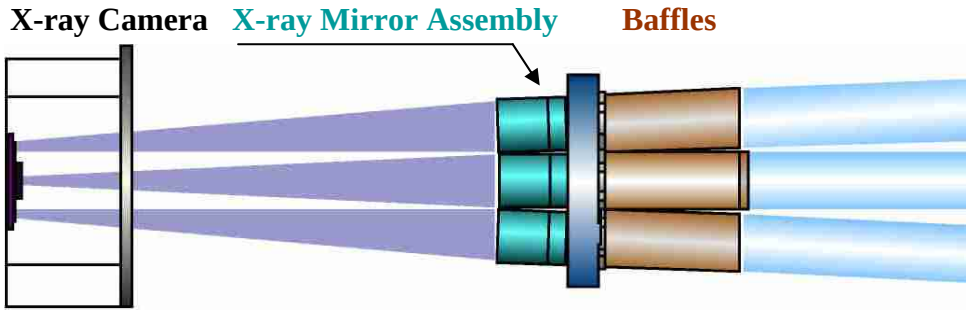
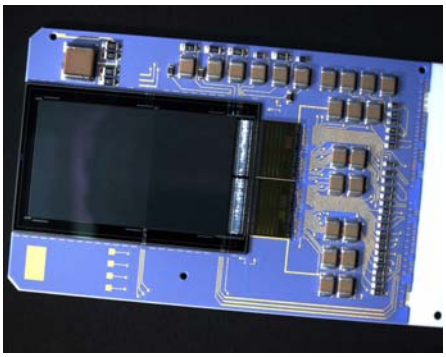
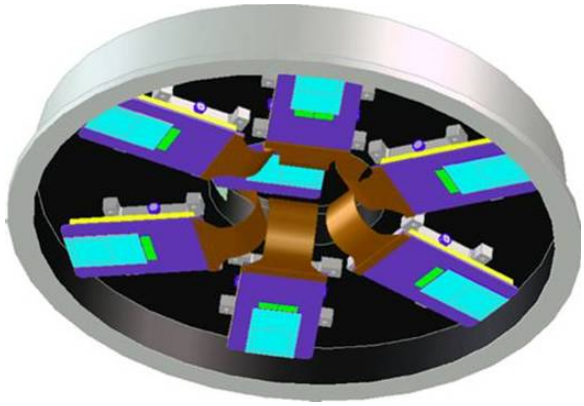
The DUO X-ray Camera

DUO (**D**ark **U**niverse **O**bservatory) requires an X-ray camera permitting a large FOV, high quantum efficiency over the 0.3–10 keV band, low background, ~75 µm spatial resolution (corresponding to less than 10 arcsec angular resolution), and adequate spectral resolution (~140 eV FWHM at 6 keV). The pn-CCDs developed in MPE's semiconductor laboratory over the past 16 years and which are flying on ESA's X-ray Observatory XMM-Newton meet these requirements . The DUO concept of individual telescopes requires a modular layout of the camera assembly. The camera includes 7 "CCD-modules" mounted in a single "camera housing" which, together with all the necessary electronics, forms the camera assembly.



Schematic drawing of the DUO instrumentation





CCD-Module: Each frame-store CCD together with two CAMEX readout chips and passive front end electronics are mounted on a newly developed ceramic (Al_2O_3) carrier which demonstrates excellent mechanical and thermal properties. The operating temperature of the CCD is at -80 °C, provided by a thermoelectric cooler. Flex leads connect the CCD-modules with the supply and readout electronics

Camera Head: Seven CCD-modules are placed in a hexagonal arrangement corresponding to the foci of the seven mirror modules. The rigid mechanical structure also provides a proton shield against cosmic particles. This adaptation of the XMM-Newton camera design is optimized for reduced thermal conductivity. An additional graded shield of all near-CCD surfaces prevents the detection of induced fluorescence X-rays.

References:
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• Friedrich et al. 2004, "The Dark Universe Observatory (DUO): telescope concept", SPIE 5488-44
• Meidinger et al. 2004, "CCD-detector development for the DUO and ROSITA Mission", 2004, SPIE 5501-09
• Pfeffermann et al. 2004, "Shielding of cosmic ray induced background in CCD detectors for X-ray astronomy", SPIE 5501-39

The DUO team