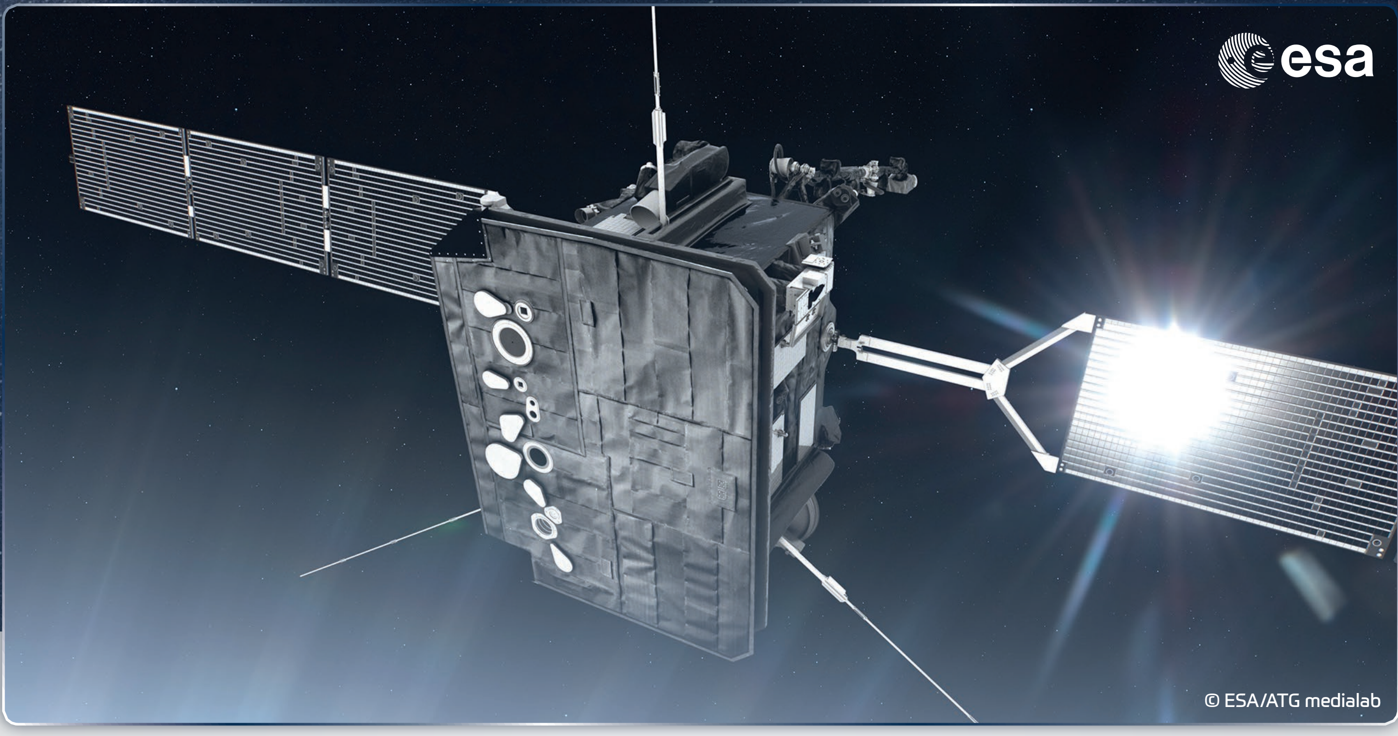
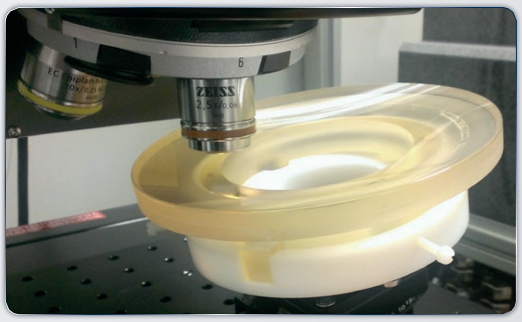
The METIS Coronagraph

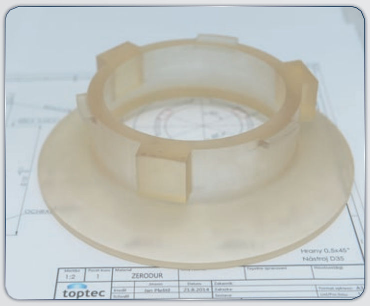


The METIS project (The Multi-Element Telescope for Imaging and Spectroscopy) is one of ten main experiments on the Solar Orbiter satellite to be launched to the Sun in 2018. The Solar Orbiter will come unprecedentedly close to our parent star, to a distance of 42 million kilometres and the 25° slope of the satellite to the Equator will allow us to explore even the less known solar pole regions.

METIS will image the solar corona in three different spectral regions: in the He II spectral line at 30.4 nm, in the HI spectral line at 121.4 nm, and in visible polarized light at 590 - 650 nm. The structure and dynamics of the solar corona will be imaged in the angular range of 1.4 to 3.0 solar radii.

The TOPTEC Centre is responsible for the realization of the two main mirrors (M1 and M2) of the METIS telescope and of a shield element, which are have been delivered to the OHB Italia company. Both mirrors are annulus shaped and feature a mild asphere with a departure of approx. 40 mm from the best-fit sphere. It is, therefore, necessary to apply sub-aperture grinding and polishing techniques, which are part of TOPTEC's know-how. The M1 mirror has an outer diameter of 218 mm and an inner diameter of 128 mm, the M2 mirror features a 125-mm outer diameter and an 88-mm inner diameter.





The biggest challenge of the project lays in the necessity to meet the requirements on the optical quality of the mirrors – surface form (120 nm PV) and microroughness (0.3 nm) – while keeping their combined total weight below one kilogram. For these purposes, TOPTEC is equipped with a state-of-the-art stitching interferometer (enabling aspheric surface form characterization) and a white light interferometer (measurement of microroughness with 0.1 nm resolution). Light-weighted mirror baseplate structures are computed using NASTRAN software, which enables us to design mirrors which retain sufficient strength and rigidity despite a reduced weight.

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