ABSTRACT

Black coatings proposed by the company Acktar present very high light absorbance in a broad wavelength range (13 nm to 14 µm). Various types exist presenting their own advantages and characteristics.

For 2 separate projects, CSL implemented the Fractal Black coating from Acktar on flight hardware in order to reach the expected straylight suppression performances. The first project is the S1 mission of the European Space Agency named CHEOPS. This instrument is observing exoplanets via the transit method in order to determine with high accuracy their characteristics. The small telescope is protected from straylight by a baffle of about 600 mm in diameter and 700 mm long, whose design and manufacturing are under responsibility of CSL. In order to reach the high suppression requirement, the Fractal Black coating by Acktar was selected as blackening solution for the internal surfaces. Due to size limitation inherent to the coating process, 5 vanes have been selected for the application of the coating. The vanes’ size and the presence of a sharp edge challenged the provider but excellent results were achieved. In the frame of this project, samples have been coated and several optical measurements have been performed: BRDF measurements, hemireflectance measurements and edge measurements. Rapid thermal cycling and adhesion tests have also been performed on edge samples in order to confirm the coating adhesion in thermal environment. All these results will be presented in the paper. This baffle has passed all qualification steps at sub-system level and instrument level. CHEOPS will be ready for launch end 2018.

The second instrument is the embedded calibration assembly of the UVN instrument of Sentinel-4. Sentinel-4 is part of the Copernicus programme of the European Space Agency that will observe from space the atmosphere pollutants. The calibration assembly, which is under responsibility of CSL, will provide calibration references of the instrument at regular intervals. The reference is obtained from sun-light scattered by a stack of diffusers and illuminating the instrument. The calibration system is preceded by a baffle that should attenuate the stray-light from external sources and mainly Earth limb that will be close to the field of view. On the other hand, it shall avoid any impact of the baffle to the absolute transmission of the diffusers and so it shall reject the light from the Sun which will inevitably scatter inside the baffle. Straylight analyses performed at CSL showed that if a large part of the baffle can use classical black coatings, the last conical sections as well as the diffusers holders need to be darker. Different coatings were considered but Fractal Black was again a better candidate for this purpose and this solution was selected. The coating was applied by Acktar on these parts. A first qualification model was submitted, among others, to a straylight test which confirms the rejection performance of the overall assembly. The full qualification campaign has also been run successfully on the calibration assembly and acceptance test are running on 2 flight models. The results of the straylight analyses and of the straylight tests on various models will be presented in the paper.