ASPIICS, a giant externally occulted coronagraph for the PROBA-3 formation flyer mission

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Formation flyers open new perspectives and allow to conceive giant, externally-occulted coronagraphs using a two-component space system with the external occulter on one spacecraft and the optical instrument on the other spacecraft at approximately 100 m from the first one. ASPIICS (Association de Satellites Pour l'Imagerie et l'Interférométrie de la Couronne Solaire) is a mission proposed to ESA in the framework of the PROBA-3 program of formation flyers which is presently in phase A to exploit this technique for coronal observations. ASPIICS is composed of a single coronagraph which performs high spatial resolution imaging of the corona as well as 2-dimensional spectroscopy of several emission lines from the coronal base out to 3 Rs. The selected lines allow to address different coronal regions: the forbidden line of FeXIV at 530.285 nm (coronal matter), Fe IX/X at 637.4 nm (coronal holes), HeI at 587.6 (cold matter). An additional broad spectral channel will image the white light corona and derive electron densities. The classical design of an externally occulted coronagraph is adapted to the detection of the very inner corona as close as 1.01 Rs and the addition of a Fabry-Perot interferometer using a so-called etalon. ASPIICS will address the question of the coronal heating and the role of waves by characterizing propagating fluctuations (waves and turbulence) in the solar wind acceleration region and by looking for oscillations in the intensity and Doppler shift of spectral lines. The combined imaging and spectral diagnostics capabilities available with ASPIICS will allow to map the velocity field of the corona both in the sky plane (directly on the images) and along the line of sight by measuring the Doppler shifts of emission lines. This will attempt to determine how the different components of the solar wind, slow and fast are accelerated. ASPIICS will observe the corona during the maximum of solar activity, insuring the detection of many Coronal Mass Ejections (CMEs). By rapidly alternating high resolution imaging and spectroscopy, CMEs will be thoroughly characterized. In addition, ASPIICS will attempt to characterize the topology of the magnetic field in the corona.