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Expected performances of the ASPIICS/Proba-3 solar coronagraph: Simulated data

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ASPIICS/Proba-3 is a giant white-light coronagraph developed by ESA and will be launched in mid-2013. Proba-3 will consist of two satellites flying synchronously, the first one carrying the external occulter (EO) and the second one ~150 km behind, carrying the optical telescope. The telescope will be placed in the shadow of the EO with high accuracy. The coronagraph is equipped with a filter wheel (3 spectral filters, 3 linear polarizers), a multi-exposure regime with provisional exposure times 0.1 s, 1.0 s and 10.0 s, is foreseen. The on-ground processing of the registered data will include correction of all the instrument-related effects such as stray light, detector dark current and bias, perform radiometric calibration, include further processing steps –merging of different exposure times, retrieval of polarized data products, separation of signal in spectral lines.

Our initial aim was to prepare test data for validation of the processing algorithms. For this we have developed a physical model/software which takes into account all the known effects: we start with input coronal images and “propagate” them down to the detector taking into account diffraction, scattering and ghost light, total optical throughput, detector performance (quantum efficiency, nonlinearity, gain, dark current), and introduce noises based on their physical mechanisms.

The developed model allowed us to better understand performance of the coronagraph, estimate its radiometric sensitivity, analyze potential influence of random noise and systematic uncertainties. We analyze signal-to-noise ratio and propose optimized exposure times.

We present the model and discuss main characteristics of the coronagraph.

Student poster?

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