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SOPHISM: A software simulator for SO/PHI

Julián Blanco[1], Valentín Martínez[2], and SO/PHI Team

[1] GACE/IPL, Universidad de Valencia, Spain
[2] Instituto de Astrofísica de Canarias, Spain

Abstract

PHI, Polarimetric and Helioseismic Imager, is an instrument for solar observations that will go on board the Solar Orbiter mission (ESA/NASA), to be launched on 2017. This mission will orbit the Sun getting as close as 0.28 AU. It is also an out of the ecliptic mission which will provide a better, more direct observation of high solar latitudes.
SO/PHI is in development by an international consortium (Germany, France, USA, Sweden, Norway, Switzerland, Australia), with ample spanish participation (INTA, IAC, IAA/CSIC, GACE/UV, UPM, UB). It is a complex instrument comprising two telescopes (High Resolution Telescope and Full Disk Telescope) for spectropolarimetric observations at the selected wavelength of FeI at 6173 Å. It is based on the use of a Fabry-Pérot etalon in telecentric mounting and liquid crystals (LCVRs) for the spectral and polarimetric analyses, respectively.

Due to the complexity of the instrument and the Solar Orbiter mission, which will travel through a wide range of distances to the Sun and will endure large thermal gradients, a software simulator of the instrument (SOPHISM) is being developed. Taking at present MHD simulations as input data, the simulator reproduces the instrument effects including diffraction, spectral curves of prefilter and etalon, polarization modulation, detectors, etc. The simulator will also take into account deviations from the instrument's nominal behaviour, like instrumental polarization, thermal effects, aberrations, etc.

This poster shows an example of such deviations -random errors on the LCVRs behaviour- and the impact on the resulting observed Stokes parameters for different degrees of the deviation, thus being able to analyse the tolerance to this error.