SO/PHI data request form

(Cruise phase + first science orbit; SO/PHI-Team internal version)

Differences between limb-side and center-side penumbra

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Science case (stay on one slide):
Please also state, why is PHI needed; why is the science unique?

We aim to study the differences between limb-side and center-side penumbra by performing stereoscopic observations using PHI and instruments from Earth.

This is the first time that the penumbra will be observed from two different vantage points, so one half of the penumbra will be seen as the limb-side penumbra from Solar Orbiter and, simultaneously, as the center-side penumbra from the Earth, allowing a direct comparison of the different morphology and physical properties due solely to projection effects. This will allow us to determine which differences arise due to intrinsic asymmetries in the penumbra and which ones are due to projection effects. Two approaches are necessary:

1) Stereoscopic observations of the full Stokes vector in the different parts of the penumbra to analyze the different shifts and shapes of the line bisectors (e.g., Rimmele 1995; Westendorp Plaza et al. 2001), as well as different magnitudes and signs of the net circular polarization (e.g., Martinez Pillet 2000). This should best be done when the spot is roughly at the same mu from Earth and from SO.

2) Stereoscopic observations of the sunspot penumbra during the passage of the sunspot across the solar disc to compare the two penumbral sides at different heliocentric angles.

Requirements/data (use additional slide if needed)

Besides best guess requirements, you may also list minimum requirements on the data

- Type of solar feature: Sunspot penumbra
- HRT or FDT: HRT
- Physical parameters needed (available: B_LOS, vector B, v_LOS, I_c, raw data): 1) Raw data: full Stokes vector; 2) vector B, v_LOS, I_c
- Total length of observation: 1) 30 min; 2) 30 min per day during the sunspot passage across the solar disc
- Cadence (maximum 1 dataset/min): 1 min
- Pointing needs (disc centre, limb, active region location, particular μ): 1) active region location; 2) active region location + particular μ (at different heliocentric angles)
- Orbit needs (spatial resolution/co-rotation/angle to Earth/angle to other spacecraft): Near perihelion to secure the highest spatial resolution. 1). When the sunspot is located at a similar mu angle from Earth and from PHI.
- Total number of datasets: 1) 30; 2) 30 per day
- Full frame 2k x 2k or partial frame 1kx1k, 0.5kx0.5: Full frame, or partial frame if sunspot is small and fits the 0.5kx0.5k FOV.
- Full resolution or 2x2, 4x4 binned data: Full resolution
- noise level (default 10^{-3}): Default
- Co-observations with other instruments: 1) CRISP/SST (Fe 6173 across same wavelength range as PHI); 2) HMI and Hinode SOT
- Special requests: