

Designing the Tunable Imaging Spectropolarimeters for the future European Solar Telescope

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The European Solar Telescope (EST) will be equipped with a suite of state-of-the-art instruments designed to observe the solar atmosphere at high spatial and temporal resolution. Among them are three Tunable-Imaging Spectropolarimeters/Fixed-Band Imagers (TIS/FBIs) that will provide diffraction-limited measurements of photospheric and chromospheric magnetic fields over large fields of view. Each of these instruments consists of a narrow-band imaging spectropolarimeter and a broad-band imager. The spectropolarimeter is based on a dual Fabry-Pérot etalon system and a polarimeter incorporating two nematic liquid-crystal variable retarders. The imager uses two fast cameras for image reconstruction via multi-frame blind deconvolution and phase diversity. The three TIS/FBIs will operate in parallel to monitor the lower solar atmosphere at high cadence in three or more spectral lines simultaneously, greatly improving the capabilities of existing filtergraphs that measure individual lines sequentially.

The TIS/FBIs are being developed by a consortium of 6 European institutions led by the Instituto de Astrofísica de Andalucía (IAA-CSIC). IAA-CSIC coordinates the consortium, manages interfaces with the EST Project Office, defines instrument requirements, and performs critical technical work. The activities carried out at IAA-CSIC have been possible thanks to the Plan Complementario de Astrofísica y Física de Altas Energías, funded jointly by the Ministerio de Ciencia, Innovación y Universidades and the Junta de Andalucía. Key technical work included the procurement and laboratory characterization of large-format, ultra-narrow-band interference filters and nematic liquid-crystal retarder prototypes, as well as a market survey of high-speed scientific CMOS cameras leading to the procurement of a candidate unit for laboratory and telescope tests. The TIS/FBI project has recently passed its Conceptual Design Review, demonstrating the level of maturity reached during this design phase and the successful coordination of the international consortium.

This talk will present the TIS/FBI concept and summarize the main contributions and results achieved by IAA-CSIC under the Plan Complementario funding.

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