

WP3: Capacitance-Stabilised Fabry-Perot

Description

Work package number	WP3	Lead beneficiary	3 - UNITOV
Work package title	Capacitance-Stabilised Fabry-Perot Development		
Start month	1	End month	36

Objectives

Design and realization of a customised Capacitance-Stabilised control system for future 200 mm diameter FPI. The main goal is to build a 50 mm FPI prototype engineering prototype to be tested in laboratory by interferometry to demonstrate the feasibility of the proposed optomechanical design and new cavity controller.

Description of work and role of partners

WP3 - Capacitance-Stabilised Fabry-Perot Development [Months: 1-36] (UNITOV, IAC, SU, CNR, ADS)

WP3 is focussed on the development of a 50 mm CSE prototype to validate the opto-mechanical design of the etalon and to test the capability of the digital electronic controller to be developed in this project. Accurate etalons are required for large solar telescopes to ensure the nanometric accuracy of the parallelism of the plates that form the interferometer and make the spectral transmission profile as close to the theoretical curve as possible. The variation of the distance between the plates must also be subject to repeatability with a high-degree of precision to make long observing runs possible.

This WP is divided into four tasks to account for the design, manufacturing, assembly, integration and test of the prototype.

Task 3.1 FEA thermo-mechanical design of FPI mount (ADS, UToV, SU)

The main activities that will be undertaken in this task are related to the design of the mount and control system of the etalon

- Review of the functional requirements
- Review of the optics manufacturing and integration constraints
- Trade-off among different mounting concepts of the optical pieces plus sensors and actuators arrangements performed by static and dynamic FEA
- Selected actuators power and control HW design
- Position sensors electronics design
- Trade-off among controllers HW solutions
- Perform on the selected configuration detailed FE analysis to simulate the different operational modes of the etalon and predict its optical performances
- Power and Control Unit (PCU) design
- COMM protocol and user interface design

Task 3.2 Manufacturing of a FPI prototype (UToV, ADS)

With this task, the mechanical parts of the prototype will be built following the design obtained in task 3.1.

- Procurement of the commercial components: actuators, PCU electronics, etc
- Procurement the optical pieces
- Manufacture the mechanical parts of the FPI50 prototype

Task 3.3 Design and realization of a Capacitance-Stabilised control system (ADS, UToV, SU)

This task will be devoted to the integration of the different parts following the steps below

- Perform / support the opto-mechanical integration of the FPI50 prototype
- Make the integration of the PCU
- SW coding, including User Interface

Task 3.4 Laboratory and Interferometer tests (CNR-INO; UToV)

Finally, the CSE prototype will be tested at the lab.

- Set-up a calibration bench
- Perform absolute calibration of the FPI50 prototype embedded sensors with external truth ones
- Optimise the PCU gains
- Perform dynamic tests of the FPI50 prototype
- Parallelism and stability tests
- Cavity tests