Consortium

Logo	Organisation Name	Short Name/URL	Country
200	Instituto de Astrofísica de Canarias	IAC	Spain
200	Instituto Nazionale Di Astrofisica	INAF	Italy
200	Universita Degli Studi Di Roma Torvergata	UNITOV	Italy
200	Max Planck Gesellschaft Zur Foerderung Der Wissenschaften E.V	MPG	Germany
200	Stockholms Universitet	SU	Sweden
200	The Queen's University of Belfast	QUB	United Kingdom
200	University College London	UCL	United Kingdom
200	Agencia Estatal Consejo Superior de Investigaciones Científicas	CSIC	Spain
200	Consiglio Nazionale Delle Ricerche	CNR	Italy
200	Instituto Nacional de Técnica Aeroespacial "Esteban Terradas"	INTA	Spain
200	A.D.S. International SRL	ADS	Italy
200	Arcoptix SA	Arcoptix	Switzerland
200	Andor Technology limited	Andor	United Kingdom

Files

andor_logo_blue.png	93.5 KB	2016-02-24	GREST EST
logo-iac.png	54.8 KB	2016-02-24	GREST EST
inaf.png	24.1 KB	2016-02-24	GREST EST
INTA.png	30.2 KB	2016-02-24	GREST EST
logo_tor_vergata.png	17.8 KB	2016-02-24	GREST EST
logo_MPS.png	32.2 KB	2016-02-24	GREST EST
Stockholms_universitet_seal.png	91.8 KB	2016-02-24	GREST EST
UCLlogo.png	37.5 KB	2016-02-24	GREST EST
QUB.png	94.9 KB	2016-02-24	GREST EST
cnr_logo.png	80.7 KB	2016-02-24	GREST EST
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logoAds.png	4.93 KB	2016-02-24	GREST EST
logoArcoptix.png	61.3 KB	2016-02-24	GREST EST
CSIC_logo.png	104 KB	2016-02-24	GREST EST

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European Solar Telescope

EST European Solar Telescope is a 4-meter class solar telescope, to be located in the Canary Islands. It will be optimised for studies of the magnetic coupling between the deep photosphere and upper chromosphere. This will require diagnostics of the thermal, dynamic and magnetic properties of the plasma over many scale heights, by using multiple wavelength imaging, spectroscopy and spectropolarimetry. To achieve these goals, EST will specialize in high spatial and temporal resolution using instruments that can efficiently produce two-dimensional spectral information.

Check more information at: http://www.est-east.eu/

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Files

H2020Logo.png	59.3 KB	2016-03-28	GREST EST
twitter.png	916 Bytes	2016-03-28	GREST EST
youtube.png	2.59 KB	2016-03-28	GREST EST

News & Events

Check EST project news & events

Outreach

Check EST project outreach

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Files

grest_logo.png	6.44 KB	2016-02-17	GREST EST

GREST project Wiki

GREST details

- Consortium behind GREST.
- Details of the Work packages.
- Contact information of the project.
- Public deliverables

Dissemination

Some of the contents of GREST can be found at EST website:

- News & Events
- Outreach

Public deliverables

Deliverables for WP1

Deliverable	Deliverable Title	Lead Beneficiary	Type	Link
D1.6	GREST website	IAC	Websites, patents public filling, etc.	D1.6: GREST website
D1.7	On-line documents, dissemination reports and publications	IAC	Report	D1.7: On-line documents, dissemination reports and publications

Deliverables for WP2

Deliverable	Deliverable Title	Lead Beneficiary	Type	Link
D2.6	DEPFET numerical performance simulation	MPG	Report	D2.6: DEPFET numerical performance simulation
D2.7	Electrical pre-characterization of prototype sensors	MPG	Report	D2.7: Electrical pre-characterization of prototype sensors
D2.12	Test report on the rolling shutter mode and related polarimetric modulation schemes and performances	INAF	Report	D2.12: Test report on the rolling shutter mode and related polarimetric modulation schemes and performances
D2.13	Test related to the polarimetric noise behaviour of the camera	INAF	Report	D2.13: Test related to the polarimetric noise behaviour of the camera

Deliverables for WP3

Deliverable	Deliverable Title	Lead Beneficiary	Type	Link
D3.8	Spectral test	UNITOV	Report	D3.8: Spectral test

Deliverables for WP4

Deliverable	Deliverable Title	Lead Beneficiary	Type	Link
D4.5	Multi-slit IFU final opto-mechanical design	IAC	Demonstrator	D4.5: Multi-slit IFU final opto-mechanical design
D4.6	Multi-slit IFU: Evaluation of fabrication costs	IAC	Report	D4.6: Multi-slit IFU: Evaluation of fabrication costs
D4.7	Microlens-fed spectrograph: modelling study	MPG	Report	D4.7: Microlens-fed spectrograph: modelling study
D4.9	Microlens-fed spectrograph: prototype design	MPG	Other	D4.9: Microlens-fed spectrograph: prototype design

Work packages

The block diagram shows all workpackages and sub-workpackages, with their interdependences and leading institutions:

{{iframe(http://est-east.eu/grest/htmls/OrganigramaGREST.html,950,700)}}

The following table sumarizes the information of the work packages:

WPx	Description	Institution
WP1	Project Coordination	IAC
sWP1.1	Project Coordination & Management	IAC
sWP1.2	Dissemination & Exploitation of results	IAC
WP2	Large-format high-speed low-noise detectors	MPG
sWP2.1	Imaging large-format camera	QUB UCL-MSSL ANDOR
sWP2.2	High-precision polarimetric camera	MPG
sWP2.3	Large format wavefront sensing camera	INAF
WP3	Capacitance-Stabilised Fabry-Perot	UNITOV SU CNR ACS
WP4	New techniques for 2D solar spectro-polarimetry	IAC
sWP4.1	Multi-slit integral field unit design	IAC
sWP4.2	Spectro-polarimetry using a microlens-fed spectrograph	MPG
WP5	Large format liquid-crystal modulators	CSIC IAC MPG INTA ARCOPTIX
WP6	Deformable mirrors and the EST-MCAO performance	INAF IAC UNITOV SU
WP7	Strategic work. Industrial, financial and legal issues	IAC

WP1: Project Coordination

Description

Work package number	WP1	Lead beneficiary	1 - IAC
Work package title	Project Coordination, management and dissemination		
Start month	1	End month	36

Objectives

- Effective coordination and management of the whole project.
- Implementation of an effective and transparent management of the project, ensuring appropriate project control and monitoring: schedule, budget & scope (milestones and deliverables).
- Effective communication with the project office of EST
- Contractual and financial follow-up of the project.
- Coordination of dissemination activities.

Description of work and role of partners

WP1 - Project Coordination, management and dissemination [Months: 1-36] (IAC)

Sub-WP1.1. Project Coordination and Management

The organisational structure and procedures to guarantee the most appropriate and high-standard project management and coordination, as well as the main roles and responsibilities of all beneficiaries.

The Coordinator and the Manager will ensure management support towards a global and coordinated achievement of the GREST objectives, through the different work-packages deployed under this project. This includes the overall coordination and continuous monitoring of the work plan, the organisation of meetings for the governing and advisory bodies (Board and General Assembly), as well as the preparation of other general meetings (annual meetings and Midterm Review), financial management of the budget, communication with the European Commission on administrative and technical aspects of the project, reporting, etc.

The coordinator, who will be assisted by the Project Manager, will ensure the overview of activities encompassing simultaneously several Work Packages. The responsibilities will also comprise the administrative, financial and contractual follow-up of the project, according to the EC Annotated Grant Agreement and its annexes. This work will cover the preparation of the periodic and final activity reports and the reviewing of the Deliverable and Milestone reports. The financial follow-up will consist of distribution and payments of the EU funding, resource utilisation control, internal cost reporting and collection, review and submission of Certificates on Financial Statements.

As coordinator, the IAC will take the responsibility to provide useful Information Technology tools in order to ensure the effective management of the project and excellent communication among partners and work-packages.

Specific tasks: Fulfilment of EC Grant Agreement; interaction with Governing bodies; coordination and monitoring of the whole project; financial management; internal communication of the consortium Actions on dissemination and exploitation of results will be also carried out under this WP.

Sub-WP1.2 Dissemination and exploitation of results.

While dissemination activities will be based on the implementation of a Dissemination and Communication Plan, the exploitation of results will be achieved through mobilizing the best expertise, in particular researchers involved in the evaluation of the scientific potential of the tested key enabling technologies and engineers involved in the design of prototypes.

Specific tasks: project website; promotional material, participation in relevant events and relevant EU mass media, to increase awareness on Solar Physics.

WP2: Large-format high-speed low-noise detectors

Description

Work package number	WP2	Lead beneficiary	4 - MPG
Work package title	Large-format high-speed low-noise detectors		
Start month	1	End month	36

Objectives

- Development of an imaging large-format camera
- Development of a high-precision polarimetric camera
- Study and testing of a large-format wavefront sensing camera

Description of work and role of partners

WP2 - Large-format high-speed low-noise detectors [Months: 1-36] (MPG, IAC, INAF, QUB, UCL, ANDOR TECHNOLOGY PLC)

WP2 is divided into the three sub-WPs according to the different purpose cameras that are proposed for development, study, and testing:

- sub-WPs 2.1: Development of an imaging large-format camera (QUB, UCL-MSSL, ANDOR)
- sub-WPs 2.2: Development of a high-precision polarimetric camera (MPG)
- sub-WPs 2.3: Study and testing of large format wavefront sensing camera (INAF)

The sub-WPs are distributed among the different partners according to their expertise. IAC will have a close contact with all of the partners involved to ensure the contact with the EST project, to make sure that the sub-WPs are made in accordance to the EST requirement and to coordinate the impact the results may have on the EST design.

Sub-WP 2.1: Development of an imaging BSI large format camera (ANDOR, QUB, UCLMSSL)

The development the large-format back-side illuminated (BSI) prototype will be based on the scientific Complementary Metal Oxide Semiconductor (sCMOS) technology. We will work with a sensor design house that has the capability to provide a fully depleted high quantum efficiency (QE) sCMOS sensor that will match closely current CCD QE and Modulation Transfer Function (MTF) for an equivalent thickness. In order to keep the costs to a minimum, we work on the adaptation of a pre-existing format and apply suitable modifications so that it meets the required specifications.

The main tasks that will be undertaken for the development of the BSI sensor can be summarized as follows:

- Agree and approve a final set of sensor specification.
- Develop the sensor architecture using a detailed design and simulations.
- Tape-out, manufacture, wafer test, die slicing and packaging.
- Design the camera electronics for the sensor, manufacture and test.
- Adapt the FPGA to accommodate the BSI sensor pinout.
- Implement changes an existing mechanical design to compensate the BSI sensor.
- Modify optical tests required to characterize the BSI sensor and analysis of results.
- Build camera prototype for evaluation and test.
- Integration of SW, FPGA and HW and detailed testing of same.
- Acceptance tests in the laboratory prior to prototype camera delivery.
- Acceptance tests in a solar telescope facility.

tip. *You can check the descriptive brochure at the bottom of this page.

Sub-WP 2.2: Development of a high-precision polarimetric camera (MPG)

The Zurich Imaging Polarimeter (ZIMPOL, e.g. Gandorfer et al. 2004), is so far the only available charge-caching polarimeter. It is based on charge-shifting between open and covered CCD columns and has a proven photon-limited polarimetric accuracy of order 10-5. However, this CCD technology from the 1990s can by far not fulfill the requirements in terms of spatial resolution, FOV and time cadence, and thus an investment in new technology is clearly needed. We propose to explore the novel DEPFET charge-caching technology in terms of a feasibility study, which will lay the foundation of a potential next-generation science-ready camera for high precision spectro-polarimetry.

The study will be limited to the investigation of a small test sensor of about 32 x 32 superpixels, which will allow testing the practicality of the concept for high-precision polarimetry in the lab. Based on the existing prototype design study, different layout variants will be generated and verified. Based on simulation results, the most promising layout variants will be used to produce the prototype sensor. The produced sensors will then be functionally verified, and the best variants will be tested with respect to their application in high-precision polarimetry.

The outcome of the study will be a solid feasibility statement including:

- Scalability of a potential science-ready sensor array in terms of format (number of pixels)
- Scalability of the sensor in terms of pixel sizes
- Definition of optimised fabrication technology
- Evaluation and tradeoff analyses of different layout options

- Costs

Sub-WP 2.3: Study and testing of large format wavefront sensing camera (INAF)

This sub-WP consists of the study and testing for the purpose of potential application in EST of the sCMOS technology currently under development and testing at the ESO for the wavefront sensing system of the night-time E-ELT, specifically the massively parallel sCMOS camera such as the NGSD (Natural Guide Star Detector), a 880x840 pixels, large field-of-view, high QE (>90%), low read out noise (< 3 e-), and very fast frame rate sensor.

sub-WP 2.3 includes the following activities:

- Definition of study and test procedures. Definition of evaluation criteria.
- Laboratory setup.
- Study and laboratory tests of the modulation schemes (rolling shutter).
- Study and laboratory tests of the data handling (data compression, FPGA real-time preprocessing).
- Study and laboratory tests of the camera specifications in Shack-Hartmann wavefront sensing of extended sources.
- Study and laboratory tests of the camera performance in high precision polarimetry with 10-4 noise level measurements (camera noise, possible systematic errors and artifacts).

Documentation

At the footer of this page you can find next documentation of this workpackage:

- OT EST QuB.pdf: "High-speed & high-sensitivity imaging in Astronomy" Technical brochure.

Files

OT EST QuB.pdf	532 KB	2018-01-09	GREST EST

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 protype.

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

WP4: New techniques for 2D solar spectro-polarimetry

Description

Work package number	WP4	Lead beneficiary	1 - IAC
Work package title	New techniques for 2D solar spectro-polarimetry		
Start month	1	End month	36

Objectives

- Design of multi-slit integral field unit
- Design of a microlens-fed spectrograph adapted to polarimetry

Description of work and role of partners

WP4 - New techniques for 2D solar spectro-polarimetry [Months: 1-36] (IAC, MPG)

Long-slit spectrographs suffer from the drawback that spatial scanning perpendicular to the slit orientation is required to measure all the points of a 2D FoV. As spatial resolution increases, the steps are smaller and the time required for the scan gets larger, which reduces the possibility to study the connectivity and relation between nearby points in the direction perpendicular to the slit. Thus, highresolution observations with a spectrograph demand alternative configurations of these instruments.

Under this project, two possibilities will be studied, one based on image slicers and the other on the use of microlenses to separate all points of the 2D FoV, divided in two natural sWPs, distributed between the partners according to their expertise. This is the natural division given that the first steps of these tasks are presently in progress under SOLARNET: Single-slit IFU (IAC) and microlens-fed spectrograph (MPG).

Sub-WP 4.1 Multi-slit integral field unit design (IAC)

During the last years, image slicers have been incorporated to advanced night-time instruments as a new technology applied to Astronomy to achieve integral field spectroscopy. Image slicers are composed by a number of reflecting elements that cut a two dimensional field of view and reorganize it as a long slit to feed a standard spectrograph. This allows the simultaneous observation of different points of the field of view to give a data cube where the spectrum of each element is obtained. A design of an eight-slit integral field unit (MuSICa) has been proposed as a future state-of-the-art instrument for EST (Calcines et al, 2013). A single-slit unit prototype is presently under development in the framework of SOLARNET as a first demonstrator that this technology can be applied to high resolution solar observations. An intermediate step with the design of an image slicer that produces three or four output slits will be addressed in this project. The feasibility demonstration of this option, minimising aberrations and following the experience obtained with the construction of the single-slit IFU, will represent a big step for the application of this technique to the eight-slit proposal for EST.

Sub-WP 4.2 Spectro-polarimetry using a microlens-fed spectrograph (MPG)

The feasibility of a microlens-fed spectrograph has already been demonstrated ¡. The microlens concept needs, however, to be adapted and optimized for polarimetric measurements. At present, static polarimeters typically employ only 2 beams, the so-called dual beam polarimeter setup. This configuration is very effective at suppressing the crosstalk from Stokes I to the other Stokes parameters, but does not suppress the crosstalk from any of the other Stokes parameters to each other. Static modulation can be accomplished in a different way from that in a typical polarimeter in a microlens based imaging spectrograph, because the individual image pixels are accessible after the image has been sampled. One therefore does not need to care about introducing static aberrations in the beam, sub-pixel alignment, etc., problems that usually limit the crosstalk suppression of a traditional multi-beam polarimeter. In this case, however, strict co-spatiality is guaranteed by construction, although the spectral and polarimetric properties after the splitting are not perfectly identical and need to be well calibrated and stable over time. In this task, it is proposed to split the individual pixels of a microlens imaging spectrograph at the pixel level, and modulate each of the sub-pixels differently, in order to suppress seeing induced cross-talk from the Earth's atmosphere, as well as changes induced by the time evolution of the solar atmosphere.

Documentation

At the footer of this page you can find next documentation of this workpackage:

- OT EST IAC.pdf: "Multi-slit IFU based in image slicer concept" Technical brochure.

Files

OT EST IAC.pdf	404 KB	2018-01-09	GREST EST

Multi-IFU {draft}

Check this picture.....

WP5: Large format liquid-crystal modulators

Description

Work package number	WP5	Lead beneficiary	8 - CSIC
Work package title	Large format liquid-crystal modulators		
Start month	1	End month	36

Objectives

- Construction and testing of large format liquid crystal variable retarders

Description of work and role of partners

WP5 - Large format liquid-crystal modulators [Months: 1-36] (CSIC, IAC, MPG, INTA, ARCOPTIX SA)

Fabrication and testing of large format LCVRs:

The advantages of employing these devices are many. Their easy driving with low-voltage electric signals avoids the use of traditional rotating waveplates (using motors), hence enabling stable optical paths with low power consumption and no mechanical noise in the systems. They also have quick response times that are very useful for fast modulation of the polarization state of light. Their low weight makes them ideal for space applications as well. In addition, very good polarimetric efficiencies can be achieved with LCVR-based polarimeters. The tasks to be undertaken in this WP are:

- Definition of requirements and test procedures
  - Birefringence and type of the different LCs for the various wavelengths. Thickness
  - Homogeneity and optical quality
  - Fixed retardances and variable angles for the F-LCVRs
  - Thickness homogeneity
  - Necessary number of samples per wavelength and LC type
  - Laboratory setup material
  - Test procedures and protocols. Acceptance and disproval criteria
- Test of samples
  - Wavefront errors
  - Polarimetric behaviour
  - Chromaticity

Documentation

At the footer of this page you can find next documentation of this workpackage:

- OT EST IAA.pdf: "New generation LCVRs for astronomical polarimetry" Technical brochure.

Files

OT EST IAA.pdf	1.39 MB	2018-01-09	GREST EST

WP6: Deformable mirrors and the EST-MCAO performance

Description

Work package number	WP6	Lead beneficiary	2 - INAF
Work package title	Deformable mirrors and the EST-MCAO performance		
Start month	1	End month	36

Objectives

- Investigate the effects of 45-degree inclined DMs in the performance of the EST/MCAO system.
- Feasibility study of the DMs proposed in the EST/MCAO.
- Implement techniques to reduce and correct the wavefront distortion at EST.
- Optimise the design of the EST/MCAO system

Description of work and role of partners

WP6 - Deformable mirrors and the EST-MCAO performance [Months: 1-36] (INAF, IAC, UNITOV, SU)

In order to achieve its objectives, WP6 will carry out numerical simulations, software development, and laboratory tests.

WP6 will study the effects of large tilt angle DMs with an elliptic pupil in the EST/MCAO performances by carrying out end-to-end numerical simulations of the system with software available to the project partners. The numerical simulations will make it possible the evaluation of the main error sources of the EST/DMs configuration. In addition, they will also provide a first evaluation of the tolerances of the system. More in depth, WP6 plans to estimate the tolerances to small misalignment errors in the orientation of the DM pupil with respect the WFS pattern in order to identify the required alignment accuracy that maximises the system performances. Starting from the end-to-end simulations and their results, new numerical control methods will be developed to take into account for misalignment errors and the pupil elongation. Secondly, because of the 45-degree inclination of the DMs in the system, the conjugation height of the mirror depends on the position on the mirror itself. For this reason, a proper wavefront reconstruction scheme able to limit the unwanted effects of this will be studied and tested.

The end-to-end simulation code will be developed in IDL language by using the well-tested and freely available Optical Propagation library, which allows the easy integration of external codes into the same simulation environment. The main advantage of using an end-to-end simulation code is the ability of simulating non-linear effects which may play a significant role in the overall system performances. In addition, the well tested Zemax software and the CAOS code available to the partners will be also used to study the case of 45-degree inclined DMs of the EST/MCAO. These software tools have been already successfully employed by the partners in the study of the adaptive optics of the night-time Large Binocular Telescope (LBT) when used in conjunction with the forthcoming SHARK (System for coronagraphy with High order Adaptive optics from R to K band for high contrast imaging and exoplanets search. The main advantage of using a combination of different codes is the resulting flexibility, which allows the simulation of different optical components in detail.

Within the simulation environment, the numerical methods (the DM control scheme) will be refined before being exported and applied to the control of a DM already available for the laboratory tests in closed loop conditions. This activity will imply the development of a custom control software DM interface, which will be realised using the Labview language. Different numerical control schemes will then be tested in the laboratory to evaluate their performances. More in detail, both a modal and zonal control schemes will be tested in 45-degree inclined DMs. The results of these studies will be of paramount importance for the refinement of the MCAO system of EST and will eventually provide important information for the realization of custom DMs with a distribution of actuators that properly samples the wavefront.

WP6 will include the following tasks:

- Definition of study and test procedures. Definition of evaluation criteria.
- Numerical simulation setup.
- Numerical study. Analysis on the effects of 45-degree inclined DMs on the EST/MCAO performances and wavefront reconstruction. Assessment of the pupil rotation tolerances and detailed information for the realization of custom DMs with a non-circular distribution of actuators.
- Design of the laboratory tests.
- Laboratory setup.
- Study and development of the control software and interfaces for testing the performances of 45-degree inclined DMs.
- Study and laboratory tests of wavefront reconstruction with 45-degree inclined DMs.
- Study and laboratory tests of modal and zonal control schemes with 45-degree inclined DMs.
- Study of the technical feasibility of 45-degree inclined DMs with a distribution of actuators that properly samples the wavefront.
- Reporting.

WP7: Strategic work. Industrial, financial and legal issues

Description

Work package number	WP7	Lead beneficiary	1 - IAC
Work package title	Strategic work. Industrial, financial and legal issues		
Start month	1	End month	36

Objectives

- Evaluate the expertise and size of the scientific community in the field of solar physics in each country.
- Analyse the technological expertise of European companies and how it can fit the construction needs of EST.
- Study the impact of the potential involvement of the industry of the different European countries participating in EST.
- Revise and update the construction budget of EST.
- Promote a discussion of all these aspects within the consortium EAST that may finally lead to a proposal of construction and operation funding scheme that best fits the scientific and technological goals of all countries involved, together with the different options for a legal governance body.

Description of work and role of partners

WP7 - Strategic work. Industrial, financial and legal issues [Months: 1-36] (IAC)

The IAC will lead this multidisciplinary work package, but all partners will be involved to provide key inputs or to act as national contact point for gathering relevant information. The specific task to be executed are:

Task 7.1 Determination of the European Solar Physics Community and expertise.

It is essential that the expected provision of resources provided by EST (instruments, observing time, services) will match (in both qualitative and quantitative terms) the size of the European solar physics community. In addition, it is a big value to policymakers as they seek to develop balanced and coherent research portfolios. Under this task we will carry out a census of active researchers (PhD students, post-docs and senior researchers) in the field of solar physics, including statistical information about expertise, international collaborations, involved research institutions, gender, etc.). To that aim, the national astronomy societies of all countries will be contacted. The continuous contact of the IAC with many researchers and research centres as a result of its management of the Canarian observatories, hosting the most advanced solar telescopes, of the coordination of the EST-DS and SOLARNET projects and its active participation in the EAST association ensures the feasibility of this task.

Task 7.2 To highlight the technological expertise throughout Europe which matches with EST requirements.

Innovations of technological and industrial interest from a telescope of this kind, include, during the construction phase, the production of the mirrors, actuators and sensors, large mechanical structures, adaptive optics and postfocal instruments, active support systems and high precision large mass pointing and guiding mechanisms. The critical technologies for the telescope's instruments will include precision mechanics, highly dimensionally stable materials, mechanical integration and thermal regulation and multi-conjugate optics. This task will provide a list of all the companies in Europe hosting the expertise and/or innovation capacity to actively participate in EST construction. A
matrix correlation between the degree of specialization required for an identified technology, expected business size and estimated expertise occupied by each identified company will be reported.

Task 7.3 Industrial impact associated to EST construction and operation.

The technologies needed to build EST will largely be developed during the telescope's construction phase and will come from across the whole of Europe. It is hoped that the construction of the telescope will create new applications for technology and creation of highly skilled jobs and related industry. EST, viewed worldwide as one of the most important projects for ground-based solar physics, is a highly
technological project. It will give rise to many new technologies with potential applications for industry and will provide opportunities for companies to work on contracts with unprecedented technological challenges. We will carried out an exhaustive analysis of such industrial opportunities an its expected impacts in related sectors.

Task 7.4 Update of the EST construction and operation budget

The 2011 estimate for the cost of building EST was approximately € 135 million. This included the costs of civil works, optics, mechanics, control systems, the dome, etc. and allows for a construction period of 6 years. The budget also included development of the main instruments that will operate during the life of the telescope, a reasonable allowance for contingencies and assembly and testing costs during the last year of construction. Subsequent progress already carried out in several aspects of the telescope, including the proposed analysis of the technologies for its instruments require now to deliver un updated estimate for the EST construction and operation budget.

Task 7.5 Financial model and legal framework to operate EST

The consortium unanimously agrees that the appropriate legal framework for EST must be formalised before any kind of initial investment is made for its construction. This step will assure effective governance, resource management and optimal operation for EST. Most relevant legal bodies will be discussed, compared, and classified according EST particular circumstances. Likewise we will analyse the feasibility of cash versus in-kind contributions to discern the most likely financial model for EST.

Documentation

At the footer of this page you can find next documentation of this workpackage:

- GREST_D7.4_Summary.pdf: "Legal entity, Governance bodies and operation, Funding scheme for EST" brochure.

Files

GREST_D7.4_Summary.pdf	4.62 MB	2017-09-18	GREST EST