

# High-Resolution Solar Physics Network

Solar astrophysics technologies:  
opportunities for the exchange of  
knowledge with high-tech industries

## SOLARNET

### High Resolution Solar Physics Network

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SOLARNET brings together and integrates the major European research infrastructures in the field of high-resolution solar physics, in order to promote their coordinated use and development. This network involves all pertinent European research institutions, infrastructures, and data repositories. Together, these represent first-class facilities. The additional participation by private companies and non-European research institutions maximizes the impact on the world-wide scale.

Networking activities, access to first-class infrastructures and joint research and development activities are covered under SOLARNET to improve, in quantity and quality, the service provided by this European community.

The consortium is led by the Instituto de Astrofísica de Canarias (IAC).



In summary, SOLARNET involves:

- More than 500 solar physics researchers.
- 32 partners from 16 countries: 24 EU research institutions; 6 EU private companies; 2 USA research institutions.
- SOLARNET Project achievements will be of paramount relevance to contribute towards the realization of the 4m European Solar Telescope (EST).

Further project information:  
<http://www.solarnet-east.eu/>

### Innovation Towards Industry

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Alongside the open access and joint research activities, one of the networking activities within SOLARNET is focused on a strategic approach to innovation, aligned with the Innovation Union initiative, to reinforce the partnership with industry by promoting the transfer of knowledge to high-technology industries.

Currently, solar physics is very dependent on high technology and robust partnerships with industry are needed to confront the large scale engineering challenges of the present and next generation telescopes and instruments. This discipline is also an excellent provider of new concepts and technologies for other fields of wide industrial and socio-economic impact.

### Technology Transfer Opportunities

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This document describes the collaborative opportunities available to high technology industries, as well as other infrastructures related to solar astrophysics research, through the exchange of knowledge and technologies.

The SOLARNET consortium members have identified and compiled a list of technologies that are available for transfer from the solar astrophysics community for development into other industrial applications.

**All interested parties are invited to contact the consortium for further details.**

Similarly a list of key enabling technologies has been identified for ongoing and future solar research related projects. These technologies are essential for the further development of solar research programs.

**Suitable solutions continue to be identified. The consortium invites interested technology providers to contact the Innovation WP Leader (Tecnalia) or Project Coordinator (IAC) in order to present their enabling technology, as well as to express their interest and/or to request further information on any of the technology requests in this document.**

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Cover image credit: Swedish 1-m Solar Telescope (SST) operated by the Royal Swedish Academy of Sciences (Oddbjorn Engvold, Jun Elin Wiik, Luc Rouppe van der Voort).

## Solar Astrophysics Technologies

The table describes a list of technologies from the SOLARNET consortium (and associated partners) that are available for development into other industrial fields.

For further details, or to express an interest in any of the listed technologies, please contact the consortium representatives (see final page for contact details.)

No:	Technology Description
SO-01	Prediction-based servo closed loop control algorithm for adaptive optics systems
SO-02	High-cadence high-spectral resolution Fabry-Perot Interferometer prototype
SO-03	Precision optics design methodology ( $10^{-4}$ positioning)
SO-04	Primary mirror with cavities for advanced cooling
SO-05	Mirror cooling system for reduction of optical aberration-perturbation
SO-06	Hexapod mechanism with integrated cooling system
SO-07	Continuous rotary mechanism with integrated optics transfer for large telescope structures
SO-08	Coating with high polarimetric performance and reflectivity
SO-09	Data control loop for multi mirrors and their actuation mechanism
SO-10	Correlating Wave front Sensor (CWS) for image stabilisation and fine guiding
SO-11	High resolution multi-slicers
SO-12	Image acquisition and processing (synchronisation at microsecond level)
SO-13	CCD sensors
SO-14	Method for optical design with polarimetry compensation.

## Requests for enabling technologies

The SOLARNET consortium members have also identified a list of essential technology requirements for ongoing and future solar research programs.

*The requests represent an opportunity for interested parties to offer enabling technologies to the solar astrophysics community.*

No:	Technology Request Description
SN-01	Multi micro actuator network
SN-02	Primary mirror: Novel high stability material
SN-03	Radiative-convective thermal analysis
SN-04	Large structure rotation stabilisation (including optical part)
SN-05	Integration of multiple actuators for adaptive optics
SN-06	Solutions for manufacturing and mounting large (200mm diameter, 7kg) etalon glass mirror to required precision
SN-07	Micro-machining of microlenses
SN-08	Thin image slicer (30 microns) for 2D spectroscopy
SN-09	Visible and near infrared detectors capable of integrating multi-image signals on chip
SN-10	Ferroelectric liquid crystal for optical and near-infrared polarimetry
SN-15	IR detector - close to visible range (2,5 $\mu\text{m}$ )
SN-17	Neural network for fast data processing
SN-18	Big data signal management and video data compression solution without degradation or data perturbation losses
SN-19	Common data base for standardisation of big data processing and management



## SOLARNET Consortium Members

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Instituto de Astrofísica de Canarias	Spain	University of Graz	Austria
Kiepenheuer-Institut für Sonnenphysik	Germany	Astronomical Institute University of Wrocław	Poland
Istituto Nazionale di Astrofisica	Italy	Università di Calabria	Italy
Centre National de la Recherche Scientifique	France	Universiteit Wageningen	The Netherlands
Università degli Studi di Roma Tor Vergata	Italy	Istituto Ricerche Solari Locarno	Switzerland
Utrecht University	The Netherlands	Consejo Superior de Investigaciones Científicas - Instituto de Astrofísica de Andalucía	Spain
Max-Planck-Gesellschaft	Germany	CNR - Istituto Nazionale di Ottica	Italy
Universitetet i Oslo	Norway	University of Birmingham	United Kingdom
Leibniz Institute for Astrophysics	Germany	HANKOM-Engineering	The Netherlands
Kungliga Vetenskapsakademien	Sweden	Centre International de Méthodes Numériques en Ingénierie	Spain
Université de Paul Sabatier (Toulouse III)	France	S.R.S. Engineering Design S.r.l.	Italy
Queens University Belfast	United Kingdom	Gran Telescopio de Canarias, S.A.	Spain
University College London – MSSL	United Kingdom	PNSensor, GmbH	Germany
Astronomical Institute of the Slovak Academy of Sciences	Slovakia	Winlight Optics	France
Astronomický ústav ASCR vvi	Czech Republic	Tecnalia Research and Innovation	Spain
Hvar Observatory	Croatia	National Solar Observatory	USA
Royal Observatory of Belgium	Belgium	Harvard Smithsonian Center for Astrophysics	USA

## Contact and Further Information

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For information related to the technology opportunities and requests, as well as all future listings, please contact the Innovation Towards Industry WP Leader:

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