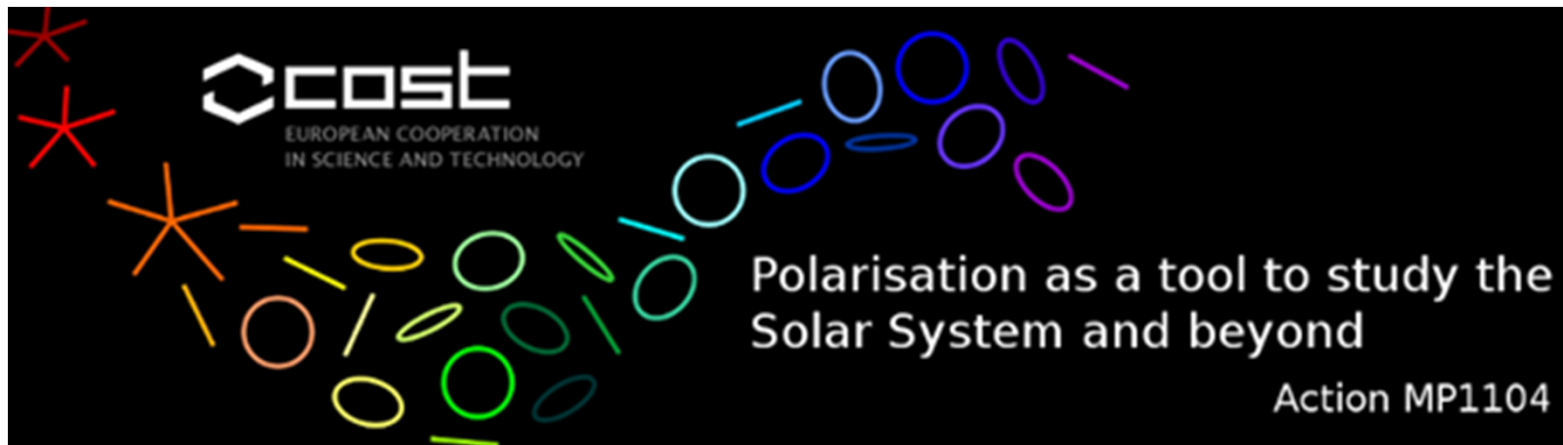




COST ACTION MP1104 : A SUMMARY AND SELF-EVALUATION

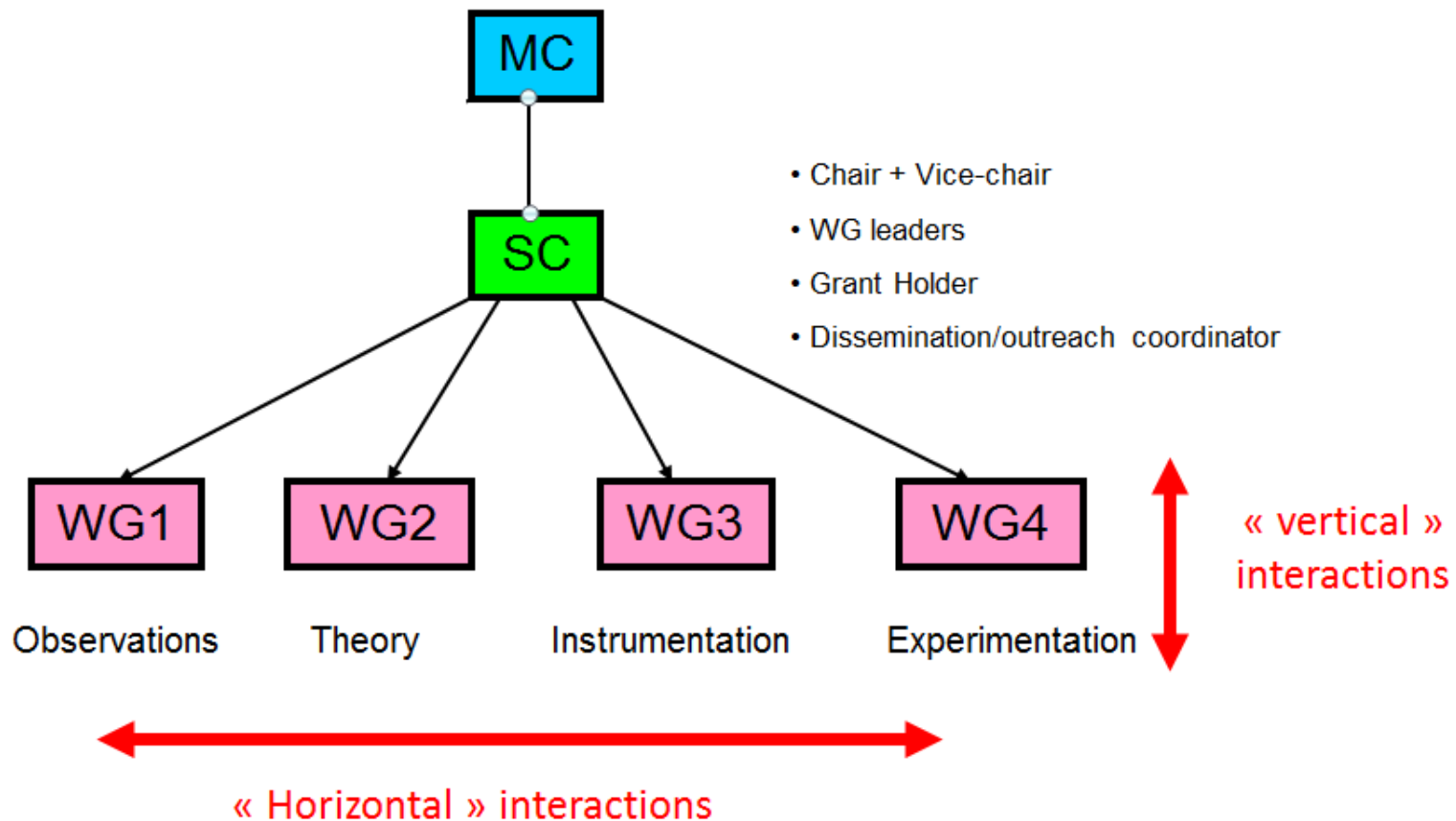
H. Lamy, Chairman
Belgian Institute for Space Aeronomy





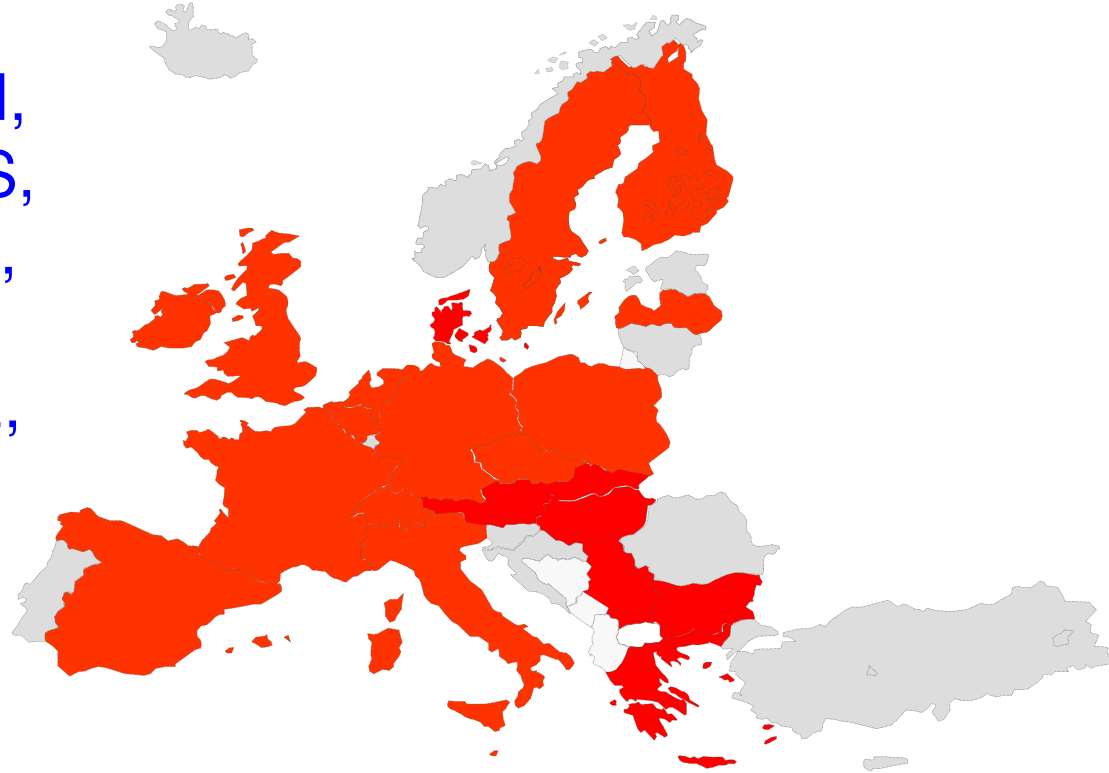
- Pre-proposal submitted in March 2010 (rejected) than submitted again in September 2010 (successful)
- Full proposal submitted in January 2011
- Presentation in front of the DC hearing in March 2011
- Final approval on 17/05/2011
- Kick-off meeting in Brussels on 21/11/2011

Organisation of the Action



PARTICIPATING COUNTRIES

AT, BE, BG, CH,
CZ, DE, DK, ES,
FI, FR, GR, HU,
IE, IT, LV, MT,
NL, PL, RS, SE,
SK, UK



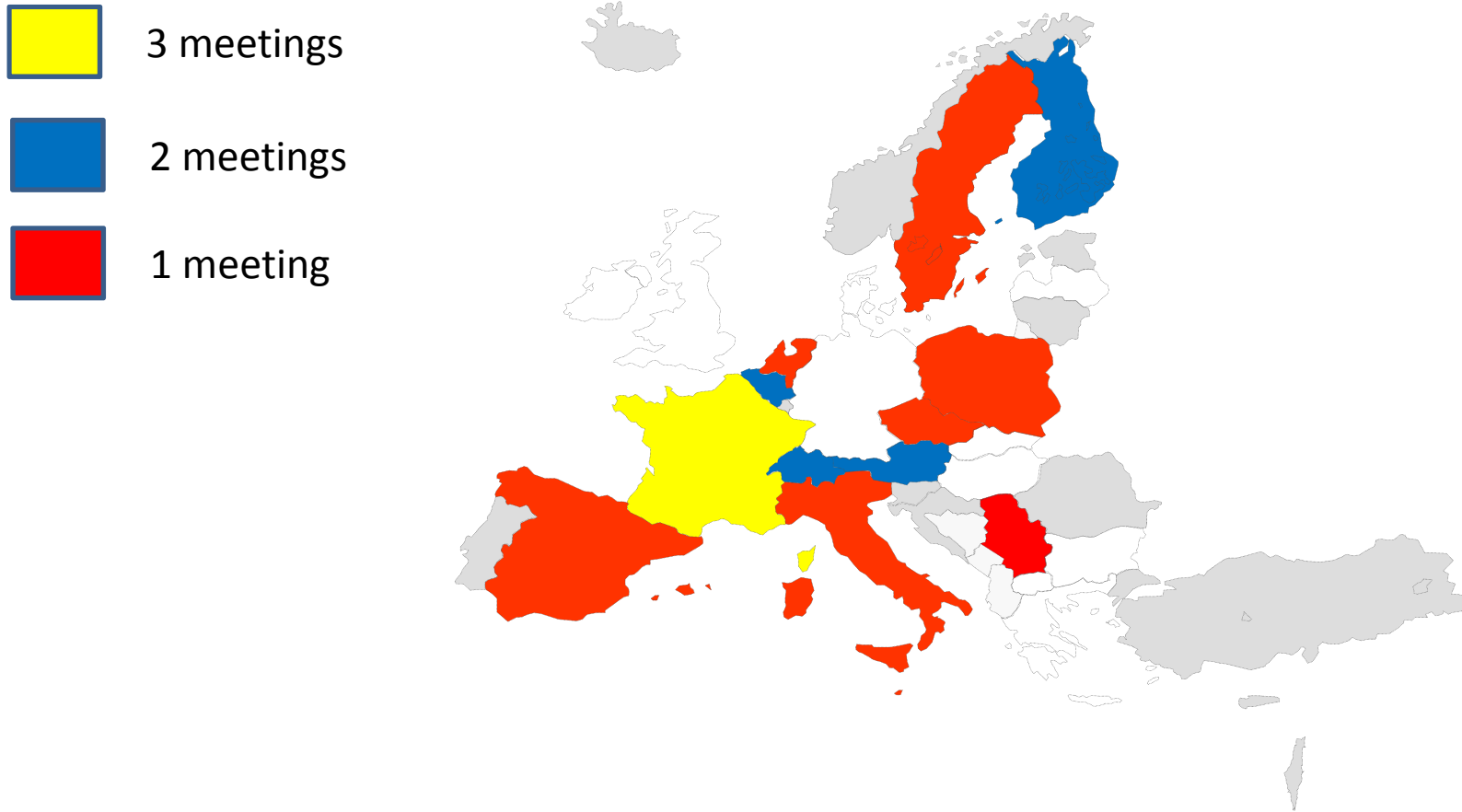
1. South African Astronomical Observatory,
Cape Town, South Africa
2. Main Astronomical Observatory of
National Academy of Sciences, Kyiv,
Ukraine
3. University of Southern Queensland,
Toowoomba, Australia

4. V.N. Karazin Kharkiv National
University, Kharkiv, Ukraine
5. California Institute of Technology,
USA
6. High Altitude Observatory, USA

MP1104 IN A FEW NUMBERS

- 337 e-mails in the mailing list / 247 people registered on our website
- 10 meetings / 2 joint meetings / 3 special sessions / co-organisation of ASTROPOL 2014, 2 stand-alone MC meetings
- 82 STSMs
- 1 international school on Astrophysical Polarimetry
- Total budget ~ 580 K€

MEETINGS PER COUNTRY



Meetings in 11 different countries

MEETINGS 2012



Polarisation & AGN
Brussels, BE
16-17 October 2012
48 participants
Joint meeting MP0905



General WG meeting
Warsaw, PL
07-09 May 2012
60 participants

MEETINGS 2013

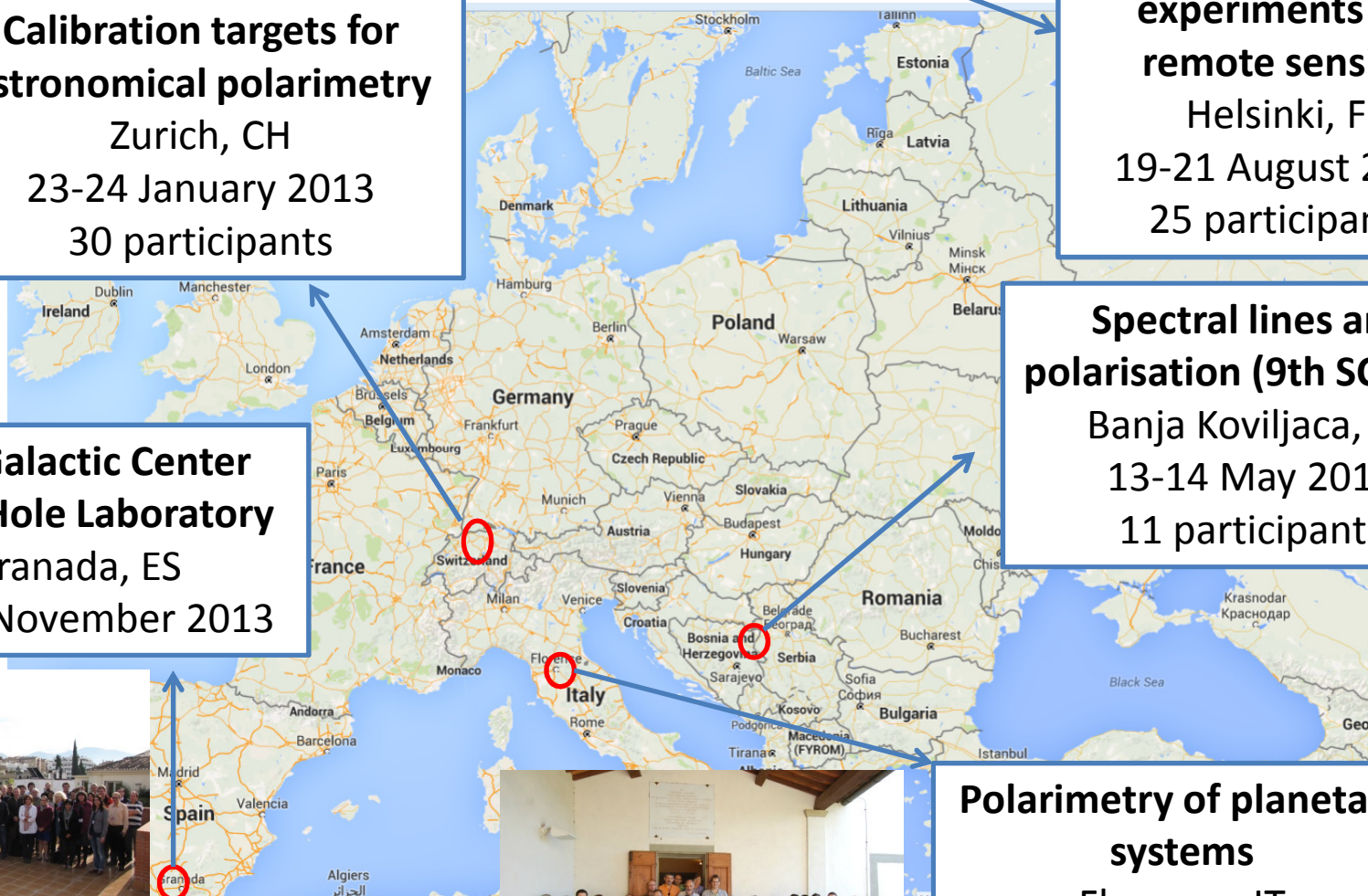
**Calibration targets for
astronomical polarimetry**
Zurich, CH
23-24 January 2013
30 participants

**Spectropolarimetric
experiments for
remote sensing**
Helsinki, FI
19-21 August 2013
25 participants

**The Galactic Center
Black Hole Laboratory**
Granada, ES
19-22 November 2013

**Spectral lines and
polarisation (9th SCSLSA)**
Banja Koviljaca, RS
13-14 May 2013
11 participants

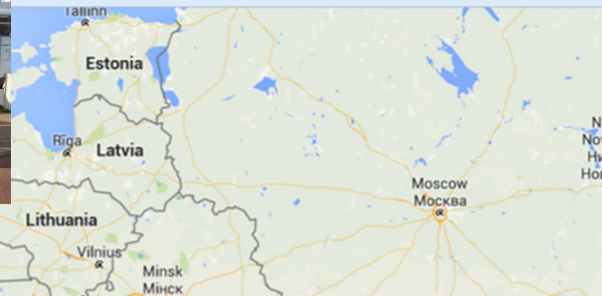
**Polarimetry of planetary
systems**
Florence, IT
23-26 September 2013
35 participants



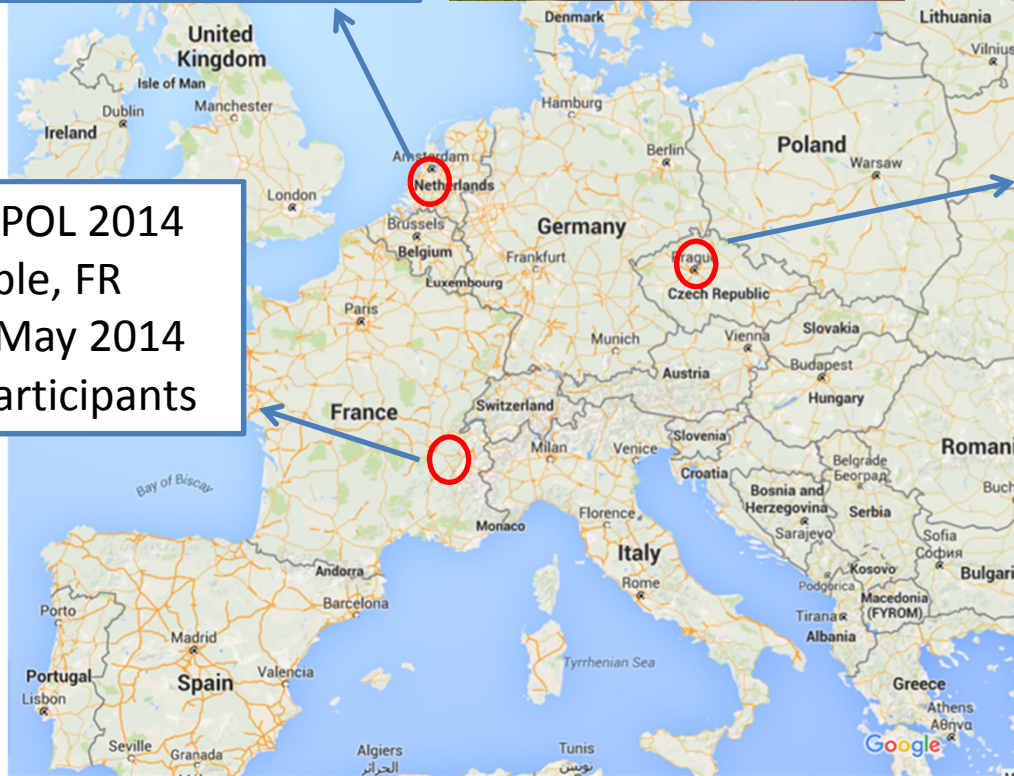
MEETINGS 2014

Polarisation techniques & technology

Leiden, NL
24-28 March 2014
56 participants



ASTROPOL 2014
Grenoble, FR
26-30 May 2014
~ 94 participants



Theory and modelling of polarisation in astrophysics

Prague, CZ
5-8 May 2014
35 participants



MEETINGS 2014

**X-ray polarisation in
astrophysics : a window
about to open?**

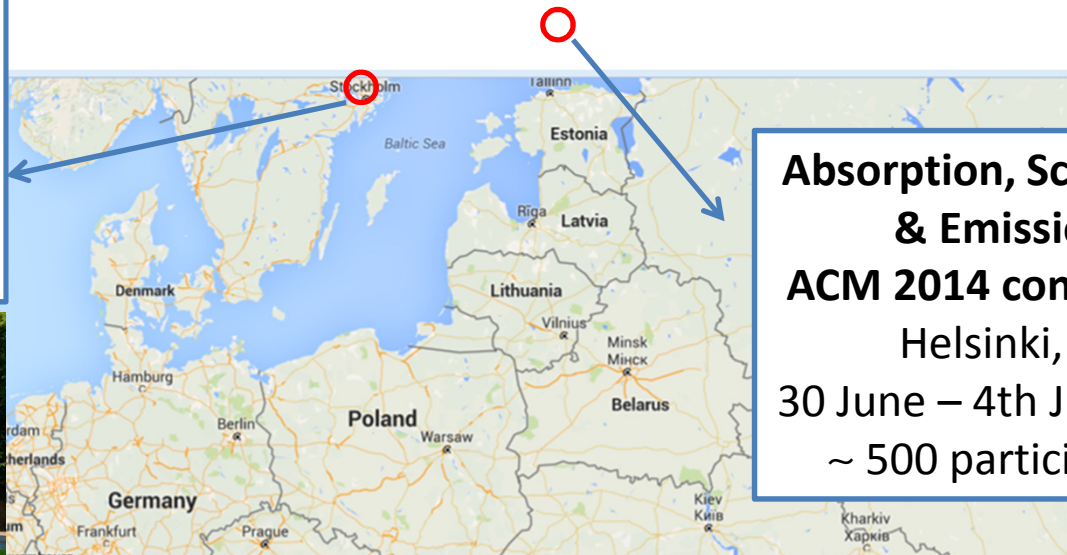
Stockholm, SE
25-28 August 2014



**Absorption, Scattering
& Emission**

ACM 2014 conference

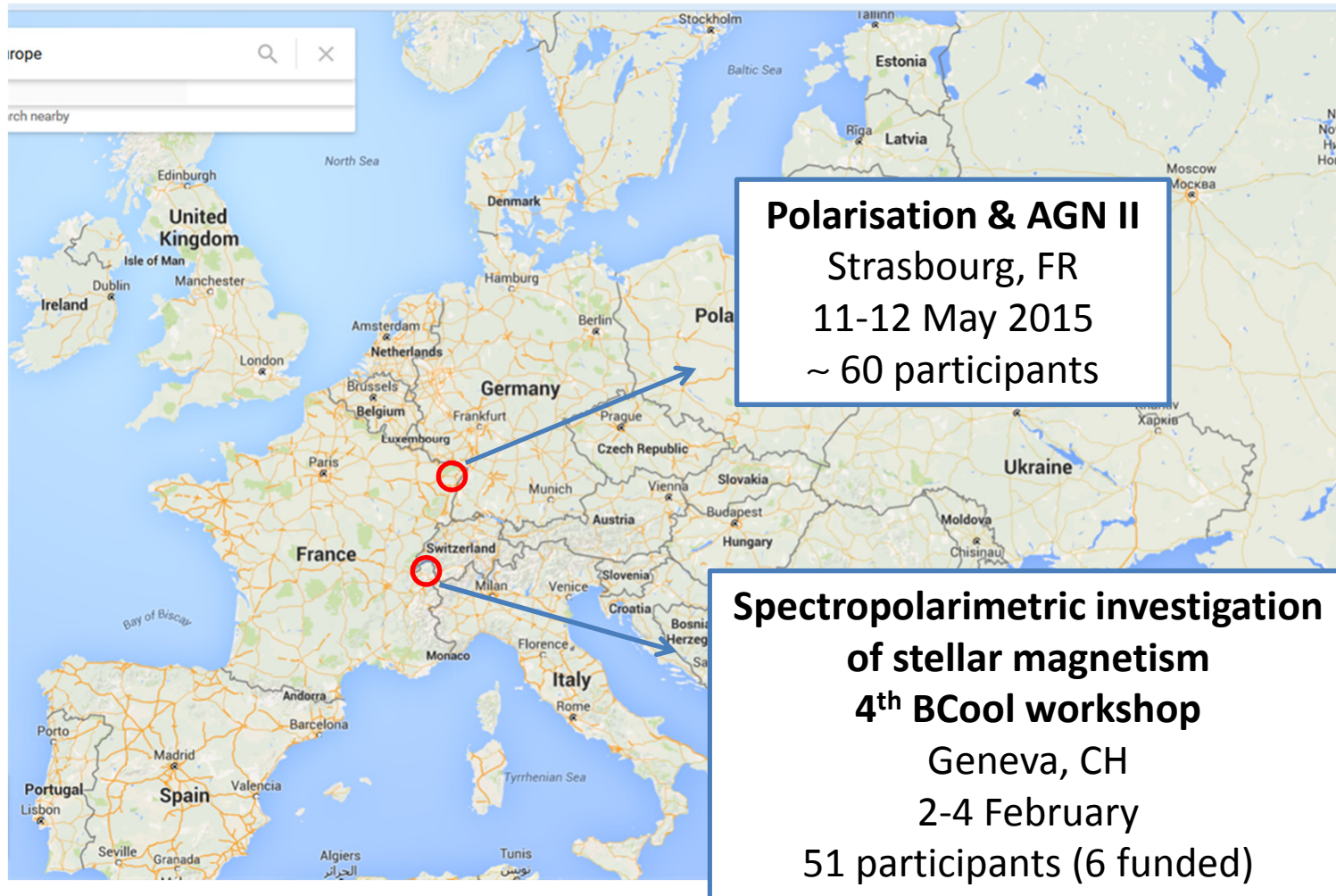
Helsinki, FI
30 June – 4th July 2014
~ 500 participants



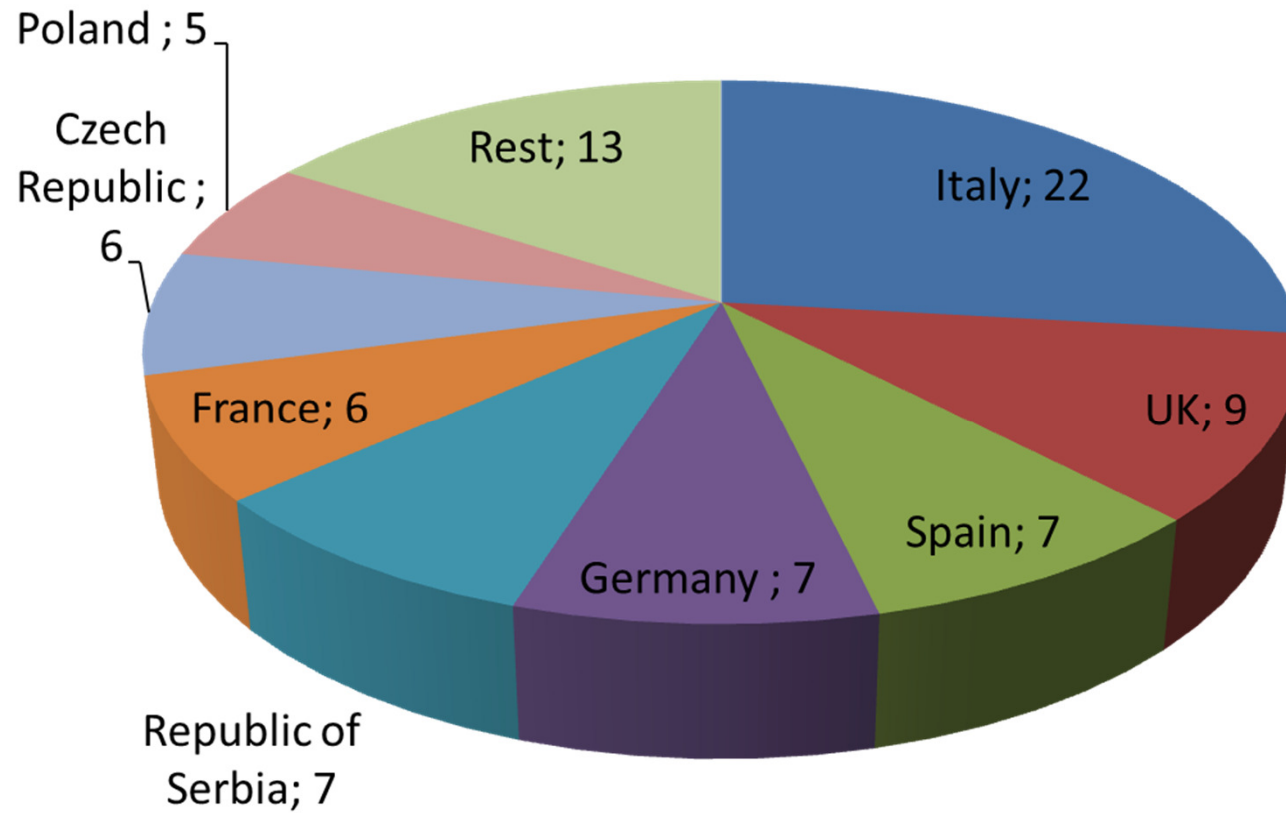
**The magnetic solar corona
as revealed by polarimetry**

Toulouse, FR
4-6 November 2014
~ 30 participants

MEETINGS 2015

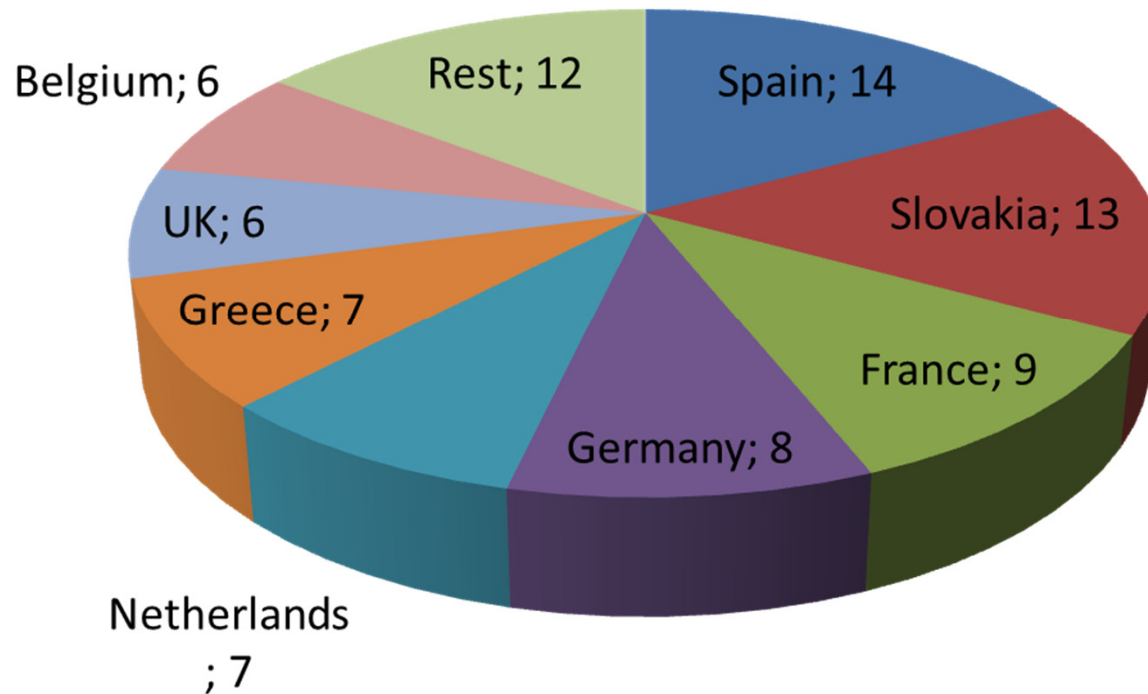


STSM : Home institutions



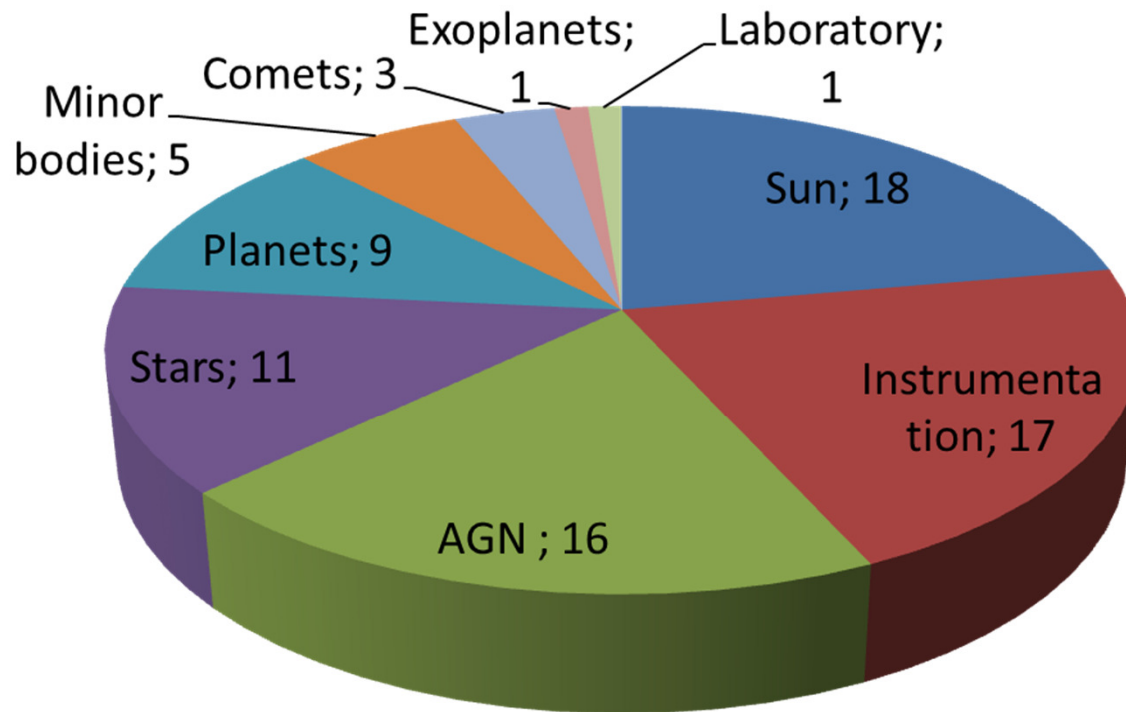
Rest : Finland (4), Ukraine (3), Belgium (1), Bulgaria (1), Greece (1), Netherlands (1), Sweden (1), Switzerland (1)

STSM : Host institutions



Rest : Switzerland (4), Ukraine (3), Belgium (1), Bulgaria (1), Greece (1), Netherlands (1), Sweden (1), Switzerland (1)

STSM : Topics



SCHOOL ON ASTROPHYSICAL POLARIMETRY

**International school
on astrophysical
polarimetry**

3-8 june 2013
Centre Paul Langevin
Aussois, France

**Program
(lectures and practical works):**

- Introduction to polarisation
- Instrumentation & techniques
- Polarisation of specific objects:
*AGN, stellar polarisation,
planetary atmospheres,
sun, minor bodies*
- Modelling &
data processing
- Polarisation from radio
to X rays.

Registration:
[www.polarisation.eu/
index.php/school](http://www.polarisation.eu/index.php/school)

Contacts:
Mathieu Barthélemy
mathieu.barthelemy@obs.ujf-grenoble.fr
and/or Hervé Lamy
hervé.lamy@aeronomie.be

Financial support
can be provided
for around 35 people
from some European
countries.
For more information:
www.polarisation.eu
* Only people from a country
who signed the MoU of the
COST action MP1104 can be funded

SOC:

Mathieu Barthélemy
Hervé Lamy
Javier Trujillo Bueno
Arturo Lopez Ariste
Silvano Fineschi
Theresa Luftinger
Daniel Guirado Rodriguez
Frans Nik
Gabor Horvath

Partnership :
COST action MP1104,
OSUG, IPAG, BIRA

Logos: IPAG, A, OSUG, COST



- Aussois (FR)
- 3-7 June 2013
- 13 courses + practical sessions
- ~ 30 participants (mostly funded by our COST Action)

Three main initial objectives

- Promote polarisation among scientific community. Specific attention given to Early Stage Researchers.
- Make recommendations for ESA / ESO / National Space Agencies / Policy-makers to add spectro-polarimeters to future ground-based facilities and space missions.
- Foster collaborations between various communities, as well as multi-wavelength and cross-disciplinary activities.

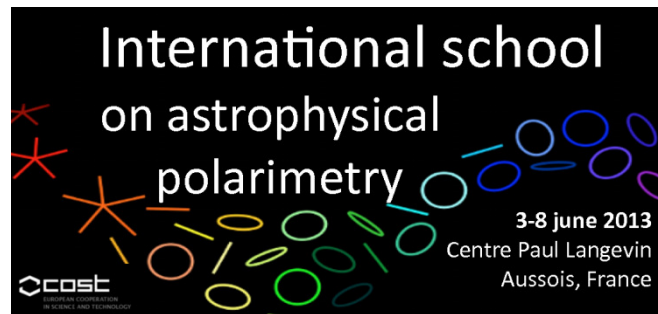
Promotion of polarimetry

- **For the astrophysical scientific community :**
 - Three specific sessions on « Polarimetry & emission lines » (9th SCSLSA), « Absorption, scattering and emission » (ACM 2014 conference), « spectropolarimetric investigation of stellar magnetism » (4th Bcool meeting).
 - Two joint meetings with COST MP0905 (« Black Holes in a Violent Universe ») : Polarisation & AGN, The Galactic Center Black Hole Laboratory
 - Organisation of sessions on « Polarimetry in the solar system and beyond » at big meetings such as AGU/EGU (not COST funded). Now nicely taken over to AGU/AOGS by Dr. Panamandra-Fisher

Promotion of polarimetry

- **For Early Stage Researchers:**

- International school on Astrophysical Polarimetry in Aussois (FR)



- An online book « Universe in polarised light »
- ~ 50% of STSMs (41/83)
- A STSM session during this meeting
- We tried to fund as many ESRs as possible during our meetings.

Promotion of polarimetry

- **For other scientific communities & industry :**
 - Meeting « Polarisation techniques & technology » with polarimetrists from medical research, atmospheric remote sensing, military target detection, etc... & industrial representatives
- **For the general public :**
 - Two ESO movies : « A polarised view of exoplanets », « A polarised view of stellar magnetism »
 - Outreach section of the website Still needs to be completed!
 - Measurements of aerosols with iSpex (add-on and applet for iPhone)



Three main initial objectives

- Promote polarisation among scientific community. Specific attention given to Early Stage Researchers.
- Make recommendations for ESA / ESO / National Space Agencies / Policy-makers to add spectro-polarimeters to future ground-based facilities and space missions.
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Three main initial objectives

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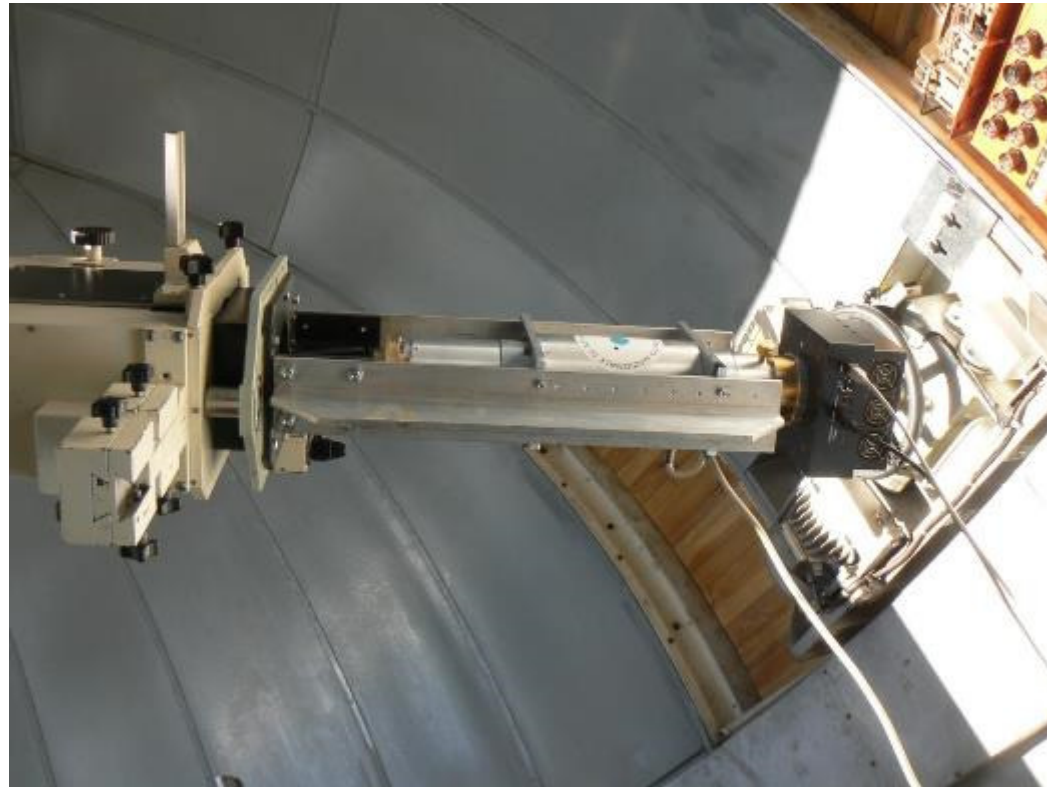
Foster collaborations

- Via Meetings :
 - **Polarisation & AGN I & II** : with scientists from COST Action MP0905 « Black Holes in a violent Universe »
 - **Calibration targets for astronomical polarimetry** : between observers and instrumentalists
 - **Spectropolarimetric experiments for remote sensing** : between observers, laboratory experiments and modellers.
 - **Polarisation techniques & technology** : between polarimetrists from various fields & with industrial partners
 - **Polarimetry of planetary systems** : between communities working on Solar System and exoplanets.
 -

Foster collaborations

Via STSM

IT → SK



Turin CorMag, comprising the Lyot Filter (center) and the CCD camera (right), on the mechanical interface installed at the focal plane of the 20-cm Zeiss coronagraph at Lomnický Observatory

Cross-disciplinary activities

An Overview of Polarimetric Sensing Techniques and Technology with Applications to Different Research Fields

Frans Snik^a, Julia Craven-Jones^b, Michael Escuti^c, Silvano Fineschi^d, David Harrington^e, Antonello de Martino^f, Dimitri Mawet^g, Jérôme Riedi^h, J. Scott Tyoⁱ

^aSterrewacht Leiden, Universiteit Leiden, Niels Bohrweg 2, 2333 CA, Leiden, the Netherlands;

^bSandia National Laboratories, PO Box 5800-0406, Albuquerque, NM 87185-0406, USA;

^cNorth Carolina State University, 432 Monteith, Campus Box 7914, Raleigh, NC 27695-7914, USA;

^dINAF - Osservatorio Astronomico di Torino, Strada Osservatorio 20, 10025 Pino Torinese (TO), Italy;

^eUniversity of Hawaii, Institute for Astronomy, 2680 Woodlawn Drive, Honolulu, HI 96822-1839, USA;

^fEcole Polytechnique - PICM, Route de Saclay, 91128 Palaiseau, France;

^gEuropean Southern Observatory, Alonso de Cordova 3107, Vitacura, 763 0355, Santiago, Chile;

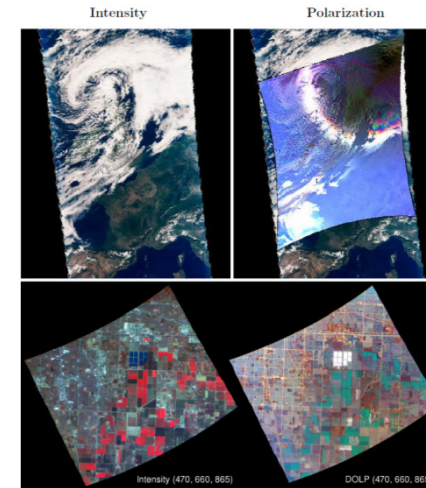
^hLaboratoire d'Optique Atmosphérique, Université Lille1, Cité Scientifique, 59655 - Villeneuve d'Ascq Cédex, France;

ⁱCollege of Optical Sciences, Univ. of Arizona, 1630 E. University Blvd., PO Box 210094, Tucson, AZ 85721-0094, USA.

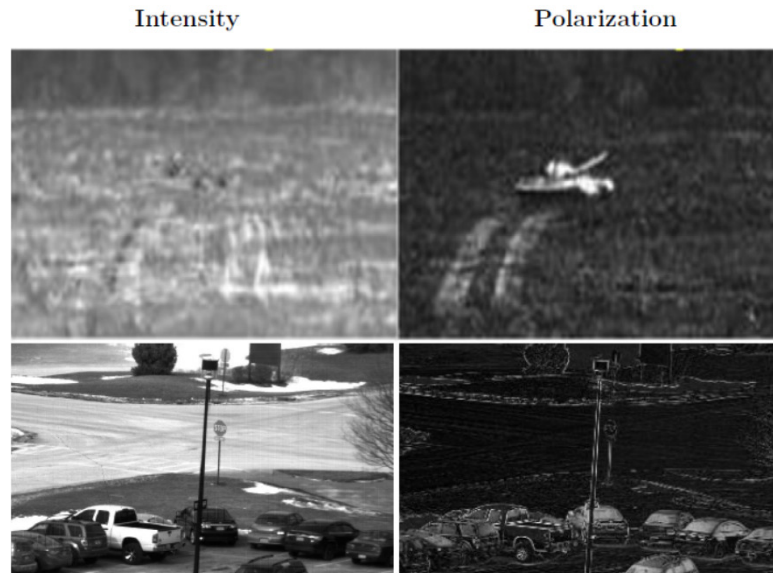
ABSTRACT

We report the main conclusions from an interactive, multidisciplinary workshop on "Polarimetric Techniques and Technology", held on March 24-28 2014 at the Lorentz Center in Leiden, the Netherlands. The workshop brought together polarimetrists from different research fields. Participants had backgrounds ranging from academia to industrial R&D. Here we provide an overview of polarimetric instrumentation in the optical regime geared towards a wide range of applications: atmospheric remote sensing, target detection, astronomy, biomedical applications, etc. We identify common approaches and challenges. We list novel polarimetric techniques and polarization technologies that enable promising new solutions. We conclude with recommendations to the polarimetric community at large on joint efforts for exchanging expertise.

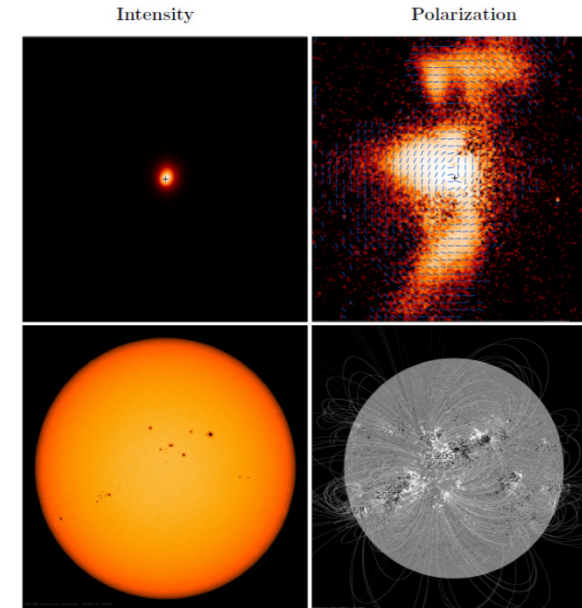
Keywords: polarimetry



Atmospheric
remote sensing

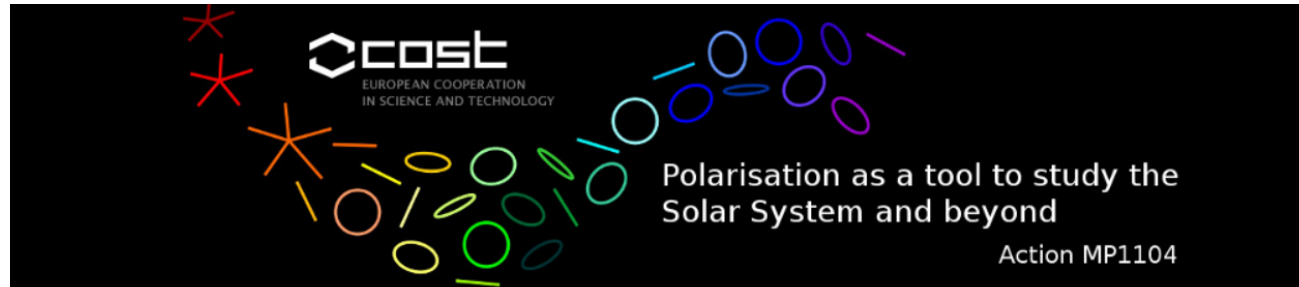


Target detection



Astronomy

Deliverables



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Password

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Home

Polarization of light is a key observable to access essential information that lies encoded in the electromagnetic radiation reaching us from astronomical objects. Polarimetry is a powerful observational tool that augments and complements the capabilities of imaging, photometry and spectroscopy in many fields of planetology and astrophysics.



Deliverables WG1 : observations

- Catalogs of existing (spectro-)polarimetric observations : new web page soon with links e.g. to Second Solar Spectrum, AGN broadband polarimetry, etc ... + list of papers → call on the mailing list
- List of objects or procedures for calibrations + outcomes of the online questionnaire on polarimetric standard targets (TBD)
- Recommendations for processing of data : mostly depends on the instruments, so links to existing papers will be added in the list of instruments section + contact person for each instrument

Deliverables WG2 : theory & modeling

- List of links to existing codes : page to be created, call to mailing list shortly after
- List of papers : we will start with the bibliography of the book + look at submitted papers + call to the mailing list
- List of papers with COST Acknowledgment : look at submitted papers + call to the mailing list

The screenshot shows a website interface with the following components:

- Main Menu:** A list of links including Home, Hot news, Working groups, Participating countries, FAQ, Structure of the Action, List of instruments, **List of papers** (highlighted), Outreach, STSM, Astropol 2014, Meetings, School, and Links.
- Search:** A search bar with 'Go' and 'Reset' buttons.
- Papers List:** A table with three columns: Title, Author, and a third column (likely a link or status). The papers listed are:
 - Modeling optical and UV polarization of AGNs. III. From uniform-density to clumpy regions
 - Reflection nebulae in the Galactic center: soft X-ray imaging polarimetry
 - X-ray polarization fluctuations induced by cloud eclipses in active galactic nuclei
 - Prospects of 3D mapping of the Galactic Centre clouds with X-ray polarimetry
 - SpS 5 – II: Stellar and wind parameters
 - Eigenfunctions and Green's Function for Radiative Transfer Equation in Curvilinear Geometries
 - Spectropolarimetric monitoring of active galaxy 3C 390.3 with 6-m telescope SAO RAS in the period 2009-2014
 - Polarization in Lines—A New Method for Measuring Black Hole Masses in Active Galaxies
 - Variability in spectropolarimetric properties of Sy 1.5 galaxy Mrk 6
 - Preflight calibration of the Imaging Magnetograph eXperiment polarization modulation package based on liquid-crystal variable retarders
 - Polarization degree and direction angle effects on a CdZnTe focal plane performance
 - Submillimeter Polarimetry with PolKa, a reflection-type modulator for the APEX telescope
 - Reflectance and polarization characteristics of various vegetation types
 - Technical notes: A detailed study for the provision of measurement uncertainty and traceability for goniospectrometers
 - A compendium of AGN inclinations with corresponding UV/optical continuum polarization measurements
 - Polarized radiative transfer equation in some curvilinear coordinate systems
 - Review on Mueller matrix algebra for the analysis of polarimetric measurements
 - J-state interference signatures in the second solar spectrum. Modeling the Cr i triplet at 5204-5208 Å
 - The project of installing a ZIMPOL 3 polarimeter at GREGOR in Tenerife
 - Calibration of the 6302/6301 Stokes V line ratio in terms of the 5250/5247 ratio
- Author:** A list of authors corresponding to the papers, including Frederic Marin, Juris Freimanis, Victor L. Afanasiev, Fabrice Martins, Néstor Uribe-Patarroyo, Rui Curado da Silva, Helmut Wiesemeyer, Jouni Peltoniemi, Jose J. Gil, Smitha H. N, Bianda Michele, and Stenflo J. O.
- Login:** A section with fields for Username and Password, and a 'Start' button.

Deliverables WG3 : instrumentation

- A review of polarimetric techniques : list of good chapters references + contact person
- List of existing facilities + characteristics : the tool is online (needs to be upgraded to more user-friendly version + call to mailing list)

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- > Meetings
- > School
- > Links

Login

Username

Password

Search

Name	Telescope	Status
ZIMPOL-3	IRSOL-Gregory-Coudé	Operational
RINGO3	Liverpool Telescope	Operational
PolKa	APEX	Operational
TFOSC	RTT150	Operational
TFOSC	RTT150	Operational
ESPADONS	CFHT	Operational
Narval	Telescope Bernard Lyot	Operational
CAPS	C2PU-Omicron/Calern Observatory	Operational
RoboPol	Skinakas Observatory	Operational
NIKA2	IRAM 30m telescope	Under Construction
NACO	VLT	Operational
PEPSI	LBT	Under Construction
FORS2	Very Large Telescope	Operational
CanariCam	Gran Telescopio Canarias (GTC)	Operational
FIGIFIGO	not	Operational
HiVIS	AEOS	Operational
POLAR	POLAR	Under Construction
PAOLO	Telescopio Nazionale Galileo (TNG)	Operational
POL3	THEMIS	Operational
The Extreme Polarimeter (ExPo)	William Herschel Telescope (WHT) La Palma	Operational

Deliverables WG4 : laboratory experiments

- List of existing facilities (not that many, Granada, Helsinki, Bremen, ...)
- List of past relevant laboratory experiments (call to the mailing list as well)

Additional pages to the website

- Paper by Snik, Bagnulo, Lopez Ariste, Schmid on definition of Stokes Parameters, efficiencies, etc ...
- An interactive map of Europe showing the activities of each country (a summary of my previous slides)
- Outreach part : needs to be completed

Conclusions

- Very successful and active COST Action
- Nice use of COST Tools (Meetings, STSM, school)
- Deliverables : still a lot of work to do, need input from the community

If light is man's most useful tool, polarised light is the quintessence of utility.

W.A. Shurcliff (1962)