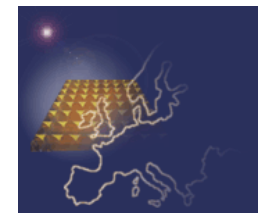




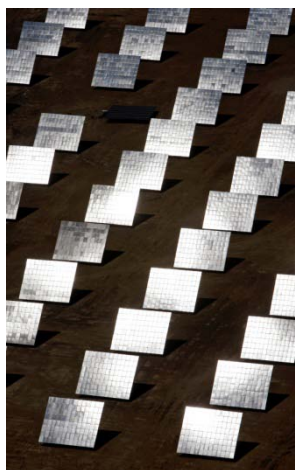
AAVP 2011: Moura Developments



Domingos Barbosa, Dalmiro Maia*, Nuno Pereira§



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INSTITUTO SUPERIOR TÉCNICO



Faculdade de Ciências e Tecnologia da Universidade de Coimbra



Inovação



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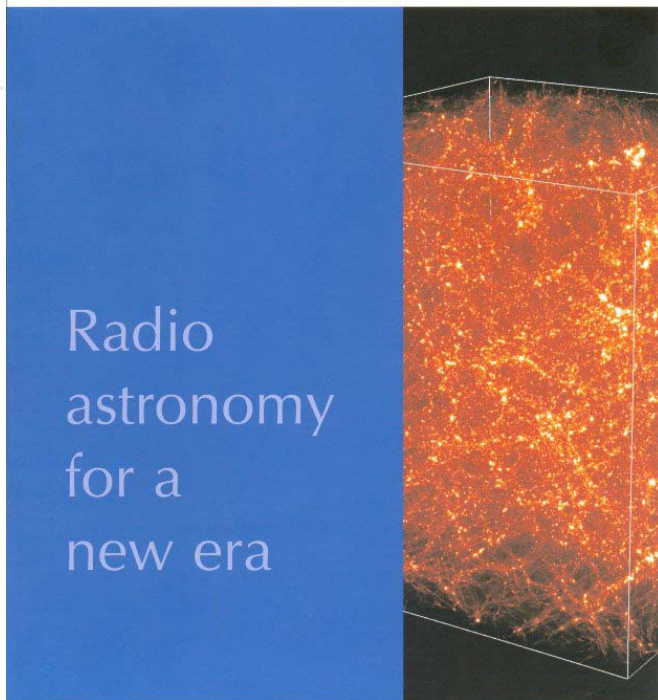
creating and sharing knowledge for telecommunications

Power ? Sustainability ? Green ICT ? (EU Horizon 2020 / Digital Agenda - the only way to get funds for SKA ?)



Aperture Array Verification Programme

Radio astronomy for a new era

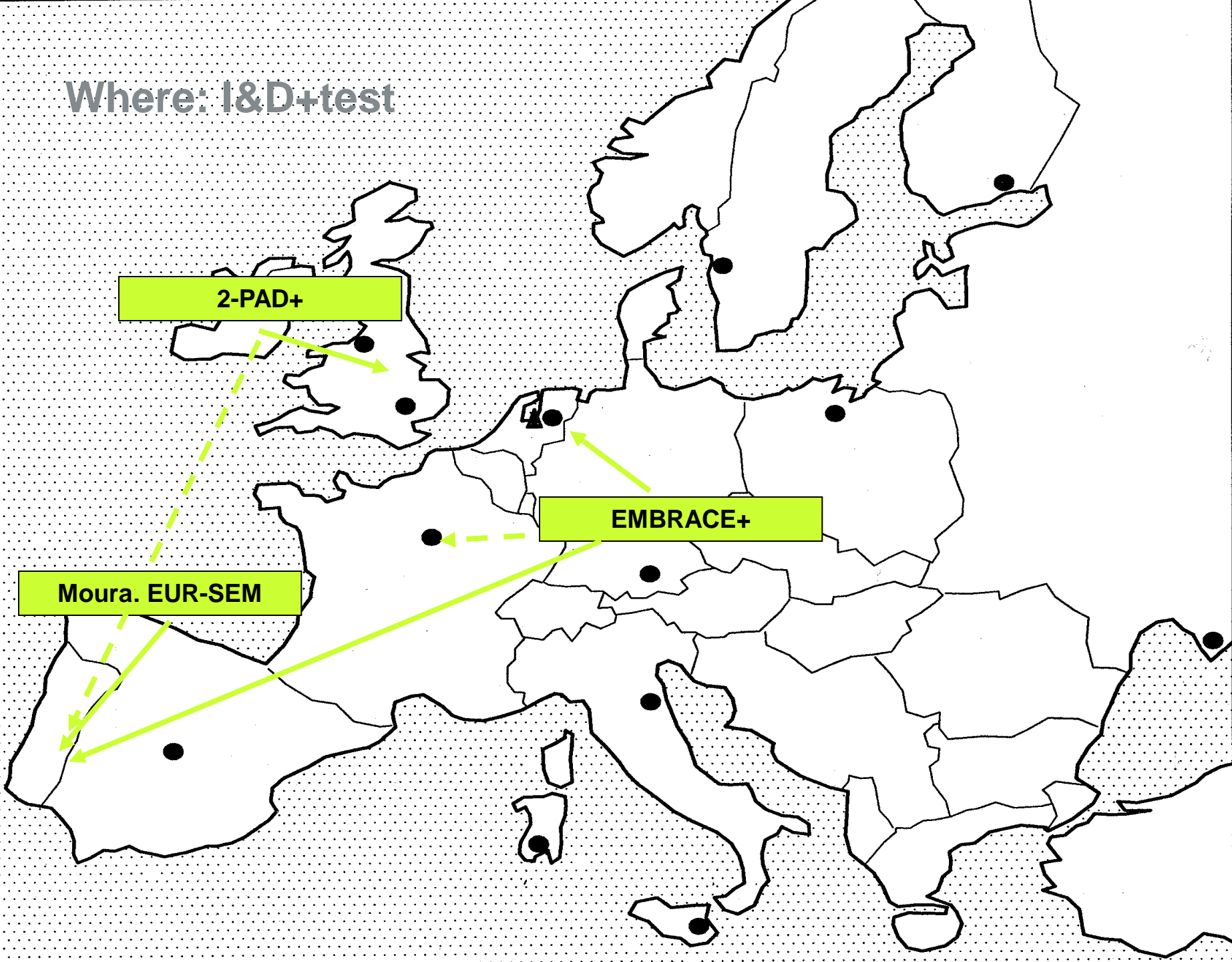


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Where: I&D+test





Herdade da Contenda (no people leaving within 54km²)

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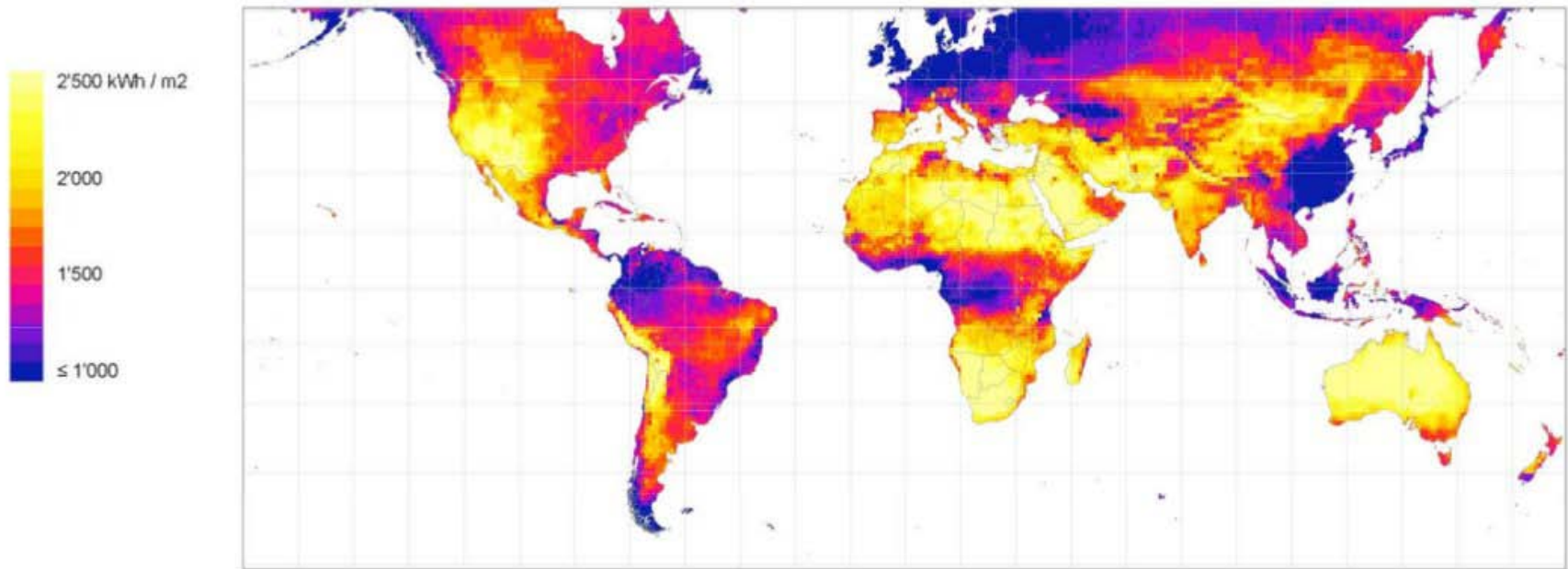


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Many significant regions where CPV dominates other solar

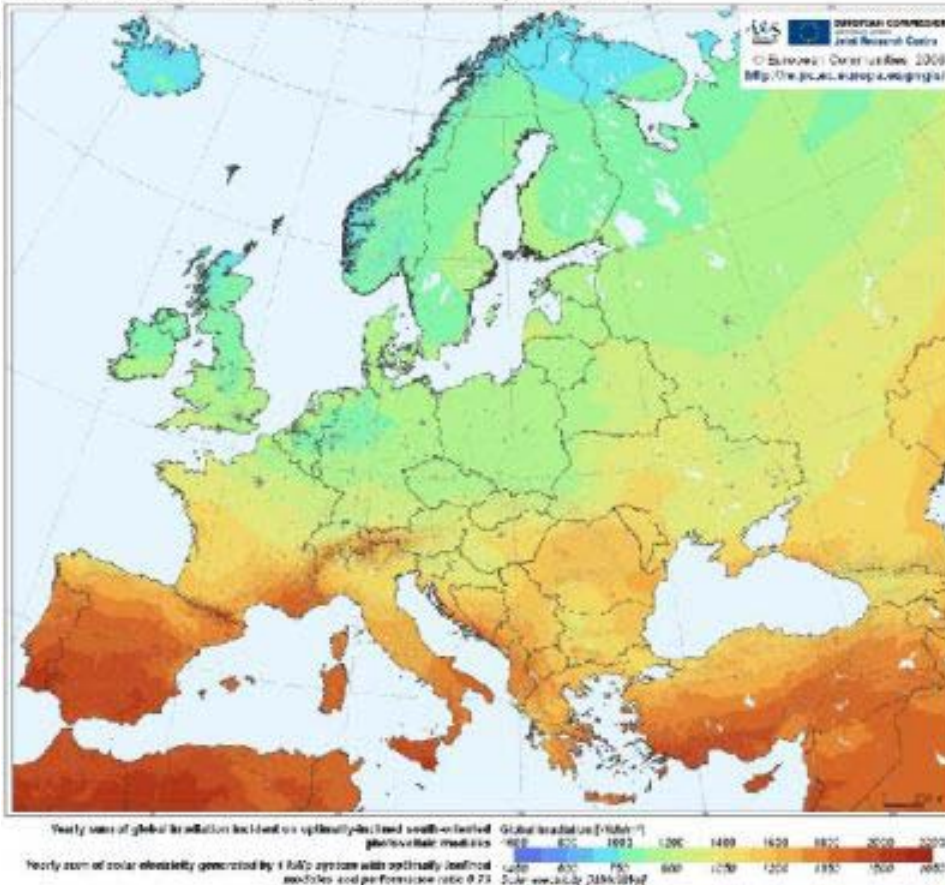


CPV is the PV technology of choice in regions with high direct irradiation (>1800 kWh/m²):

- Southern Europe,
- Northern & Southern Africa
- The US South-west and parts of South America
- Middle East
- Australia

From M. Vettel, PITF,
Manchester 2009

Photovoltaic Solar Electricity Potential in European Countries



Source: European Committee, IES- Institute for Environment and Sustainability Joint Research Centre

The region has the highest levels of solar radiation in Europe

2.200 KWh/m²

Sum of the annual incident irradiation on photovoltaic modules oriented to the south.

1.650 KWh/KWp

Annual sum of the electricity generated by 1kWp for a system with the optimal inclination.

Suitable Orography

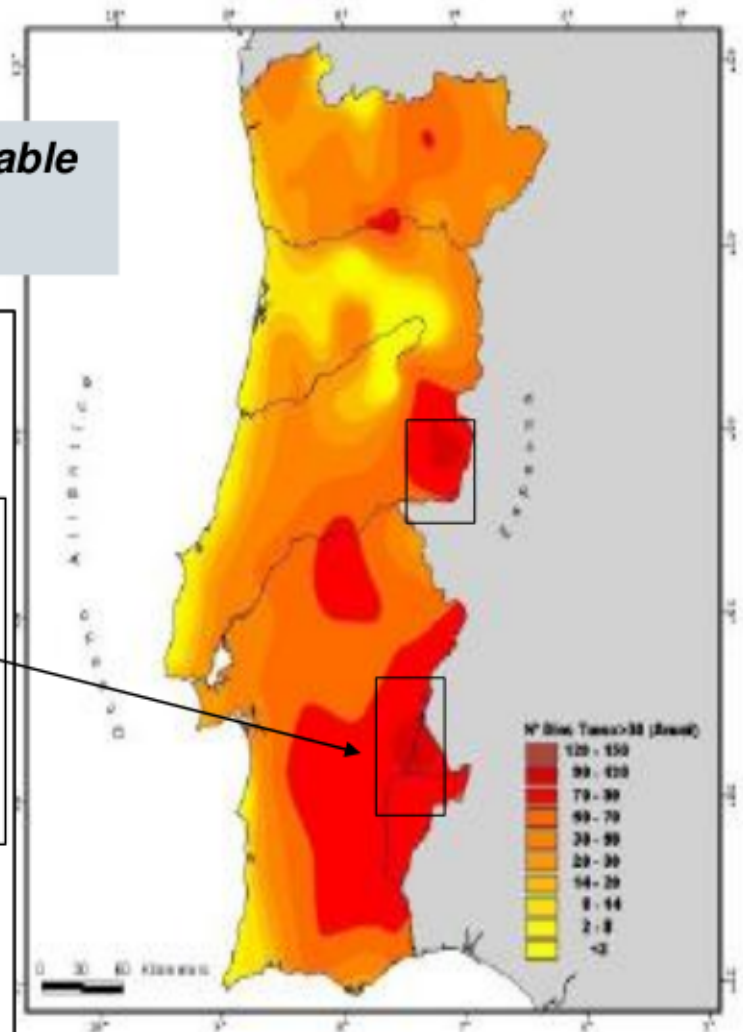
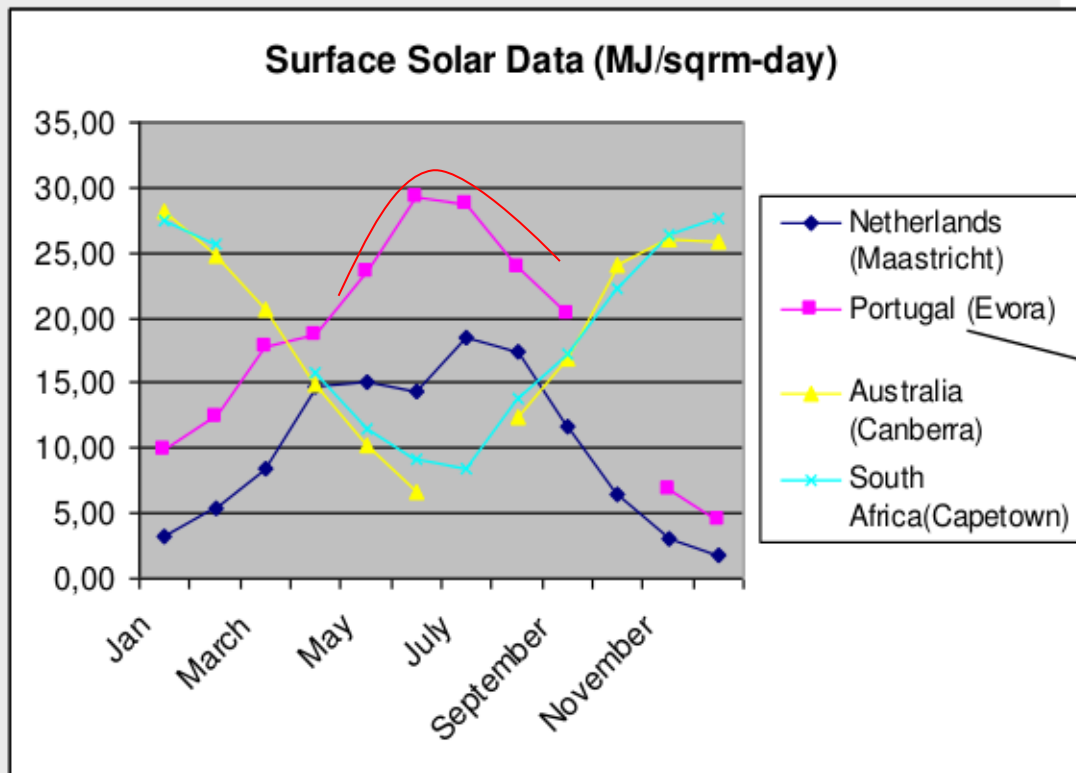
Optimal Sun Exposure



Moura

Conclusion: Solar Energy levels Evora roughly comparable with the larger potential SKA site areas

Source: Solar Energy Pocket reference (Int.Solar Energy Soc.) 2005, ISBN 0-997128



Hot days Tmax>30; dark red – 120-150 days; red – 90-120 days

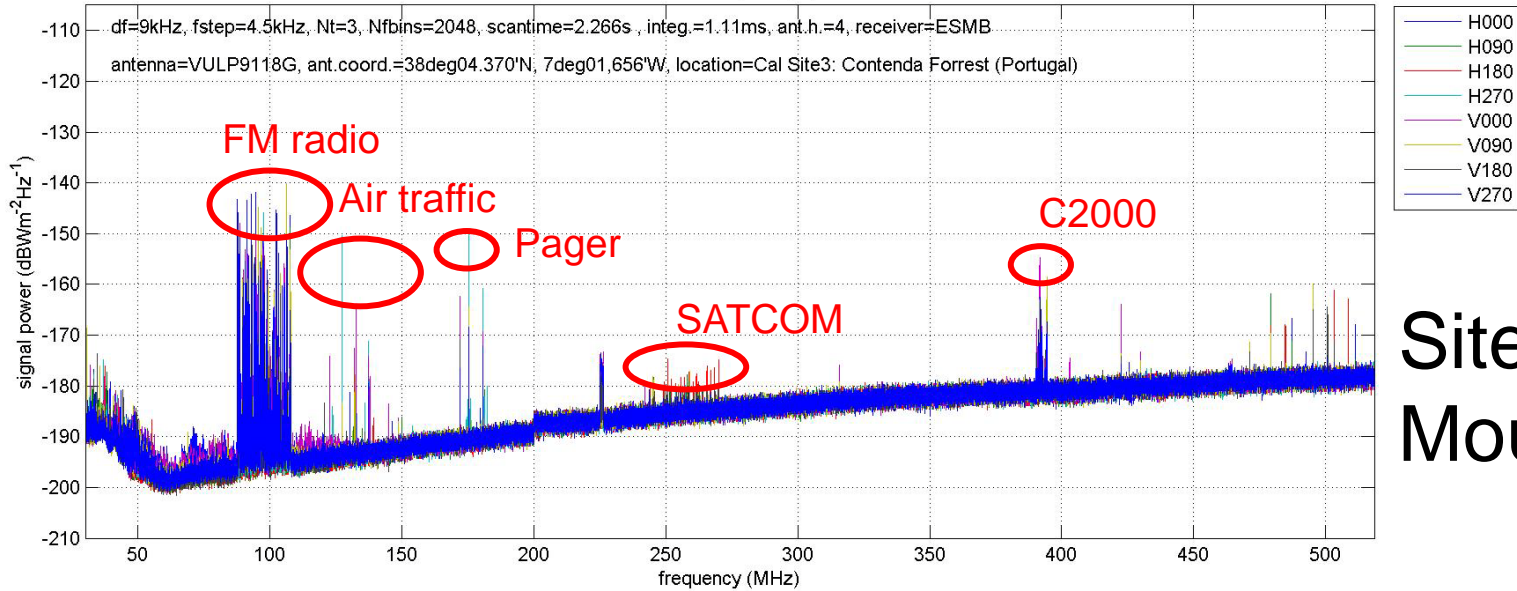
Moura (2h30 from Lisbon by car)

Site (45mins away from Moura; 20km)

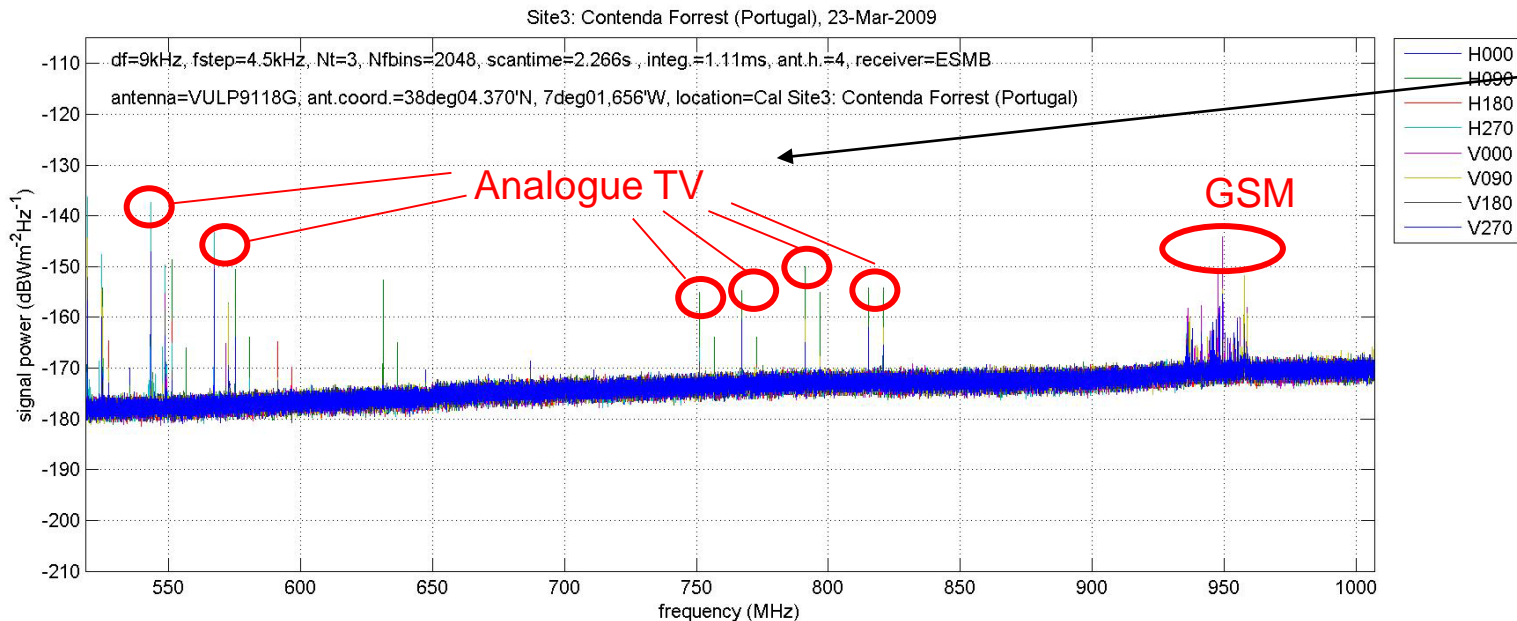
Portugal/Spanish border - 10km; Sevilha - 120Km

Moura RFI environment: (Boonstra, bij de Vaate)

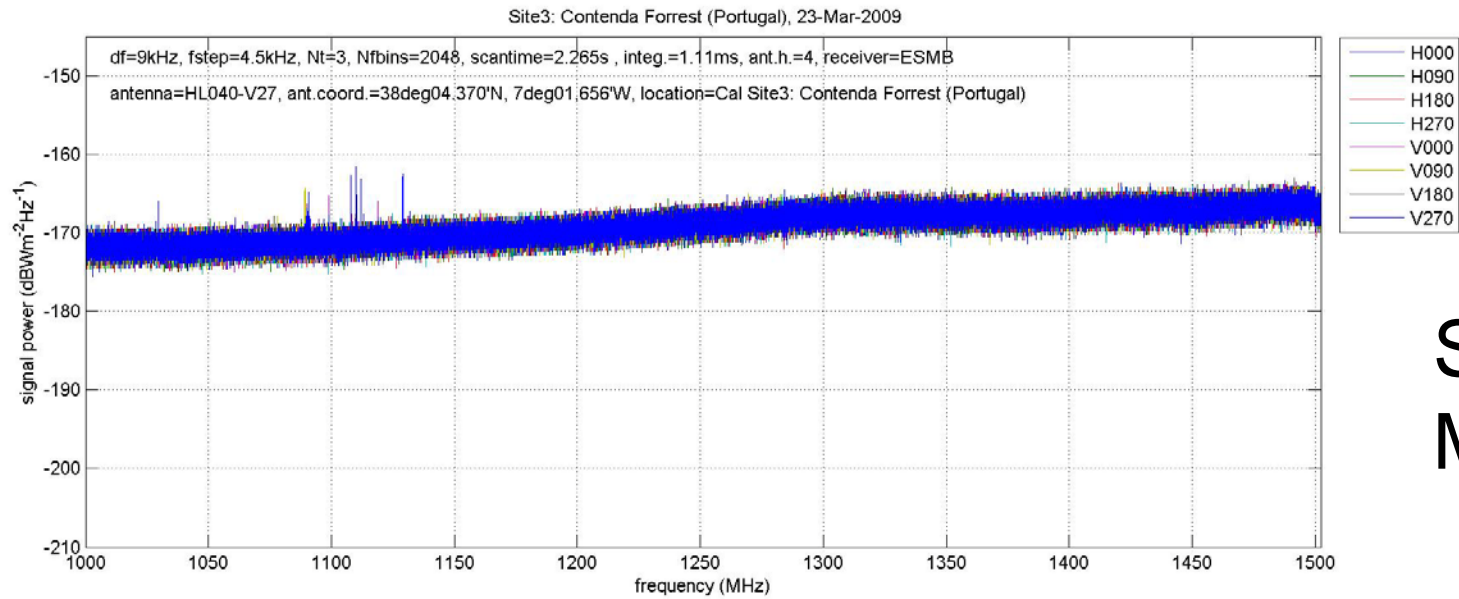
Site3: Contenda Forrest (Portugal), 23-Mar-2009



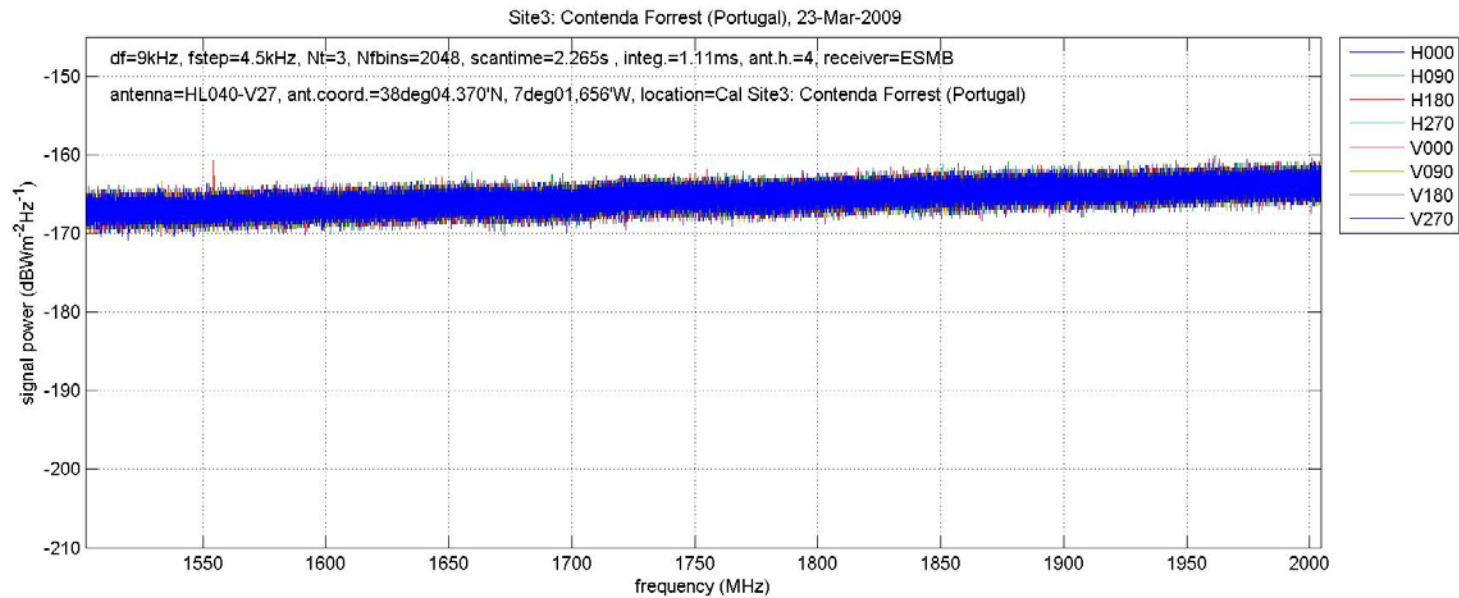
Site 3, Moura



Killed

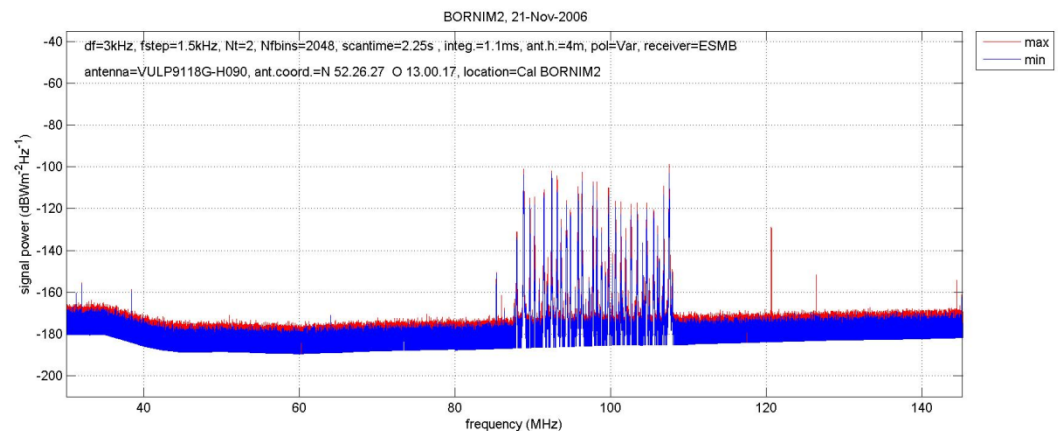


Site 3,
Moura



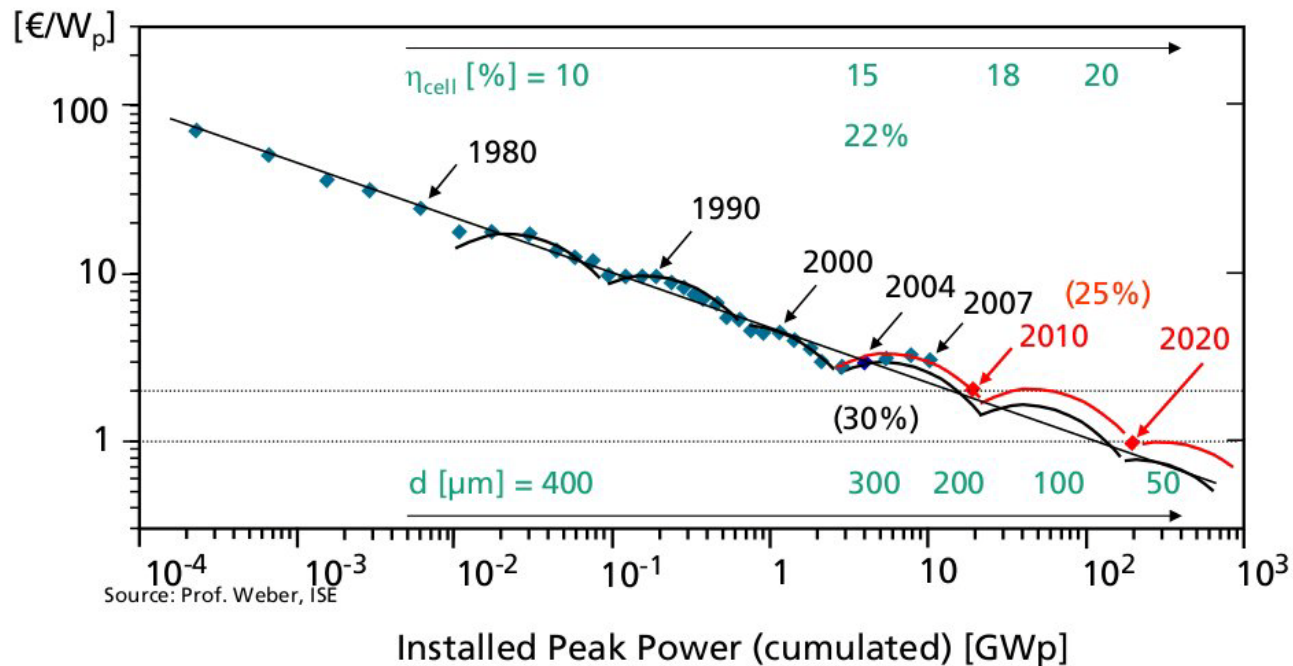
RFI Conclusions

- Moura around 15-20dB improvement over WSRT (improvement on Tsys and AtD)
- Digital tv : in Portugal one carrier, synchro. (ch. 56 – 750-758MHz). Kills analogue TV- (resurrects in other bands, but with lower amplitudes).
- AA-lo requires 100MHz filter preceding ADC (or 12 bits)



Solar Energy considerations : Motivations

Price learn curve of crystalline Si PV-modules



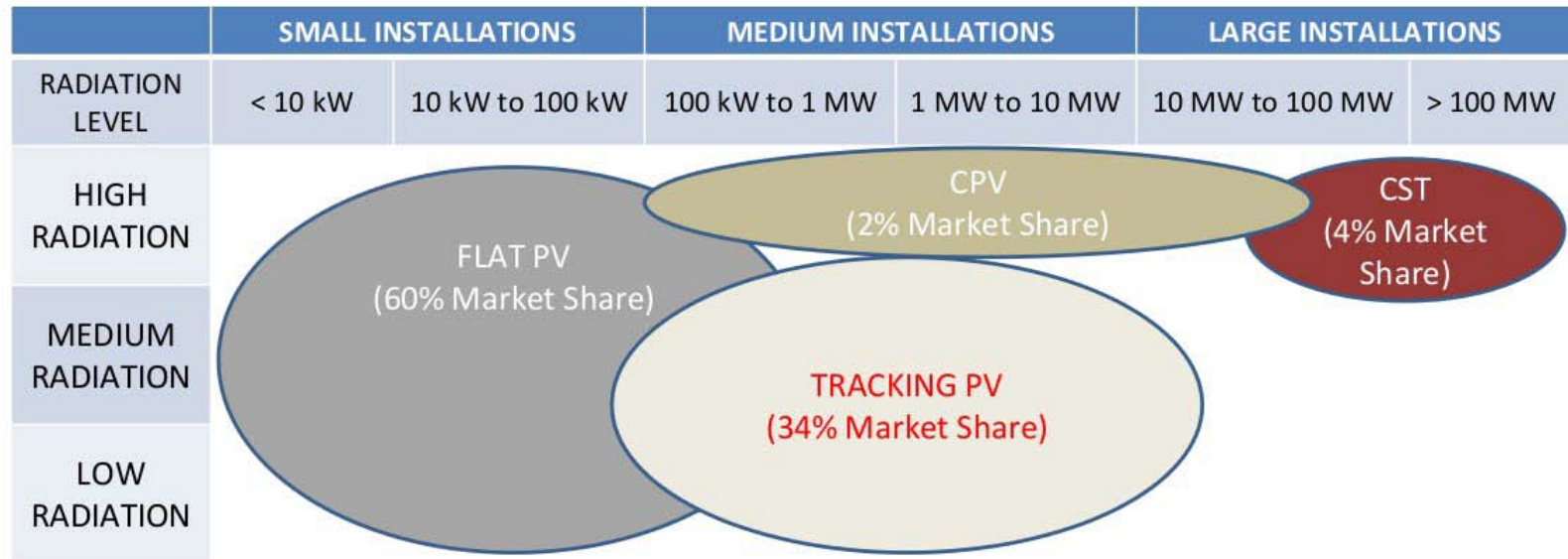
Solar Energy considerations : Motivations

ENERGY MIX

Overview on some possible solutions

MARTIFER
ENERGY SYSTEMS

Markets and Applications Shares for Solar Power in 2020...



2006 On October 30 it is launched the first stone of the **Factory of Solar Panels of Moura** with the presence of the Prime Minister of Portugal

2007 October starts the construction of the **64 MW Power Plant** in Amareleja, Moura



History



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Facts and Figures of the territory

- Amareleja's PV power plant (44 MWp)
- MFS: factory of panels' assembly (40 MWp/year)
- Lógica's PV Laboratory: certification, R&D
- Dissemination of photovoltaics units (> 60)



Moura's Technological Park - PTM

- Support to entrepreneurship
- Attraction of directed investment
- Availability of resources: land, financial solutions, R&D



- Network of supporting equipments
- Installation of University Level units within the frame of Alentejo's Park of Science & Technology (PCTA)
- Entrepreneurs list for settlement in the park
- Ideas Exchange

- Area of the Park: 35 Ha**
- Green Area: ≈ 20%**
- Subscribed Entrepreneurs: 60**



the

Logica's Fields of Intervention

- Technologic Park
- Production of Solar Electricity
- Testing & Certification PV Laboratory
- R&D Projects & Cooperation
- RE Education & Divulagation



PV Laboratory

Industry Support

Quality control
Development of new products
Development of experimental solutions
Tests and trials

Certification

Quality Management System – NP/ISO/IEC 17025
(under accreditation)

Full verification of the IEC standards



61215 Crystalline silicon PV modules
61646 Thin film PV modules

Partial verification of the IEC standards



62108 CPV
61730-2 PV Safety (Tests)

Cooperation

INEGI
LNEGE
Energy-In
IT-Aveiro
ADFCUP | Porto
IST - Lisboa
Polytechnic Institute of Beja
FCTER – Renewable Energies Science and
Technology Foundation | Brazil
Instituto IDEAL | Brazil

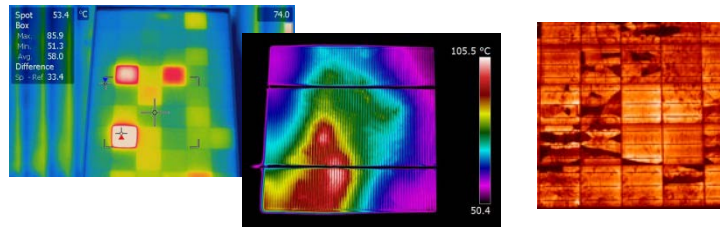
Ongoing Projects

Electroluminescence
Stirling Concentrators
BIPV – Building Integrated PV
Experimenta Energia
SKA-Moura
Autonomous Units of Energy
IDEAL House
Solar Radiation Monitoring

PV Laboratory testing & UV Degradation



Thermal Image & Electroluminescence



Hail Test



Visual Inspection



Cell Tester (Class AAA)



&

Sun Simulator climatization (Class AAA)

with



Automatic Weather Station & Solar Radiation Monitoring

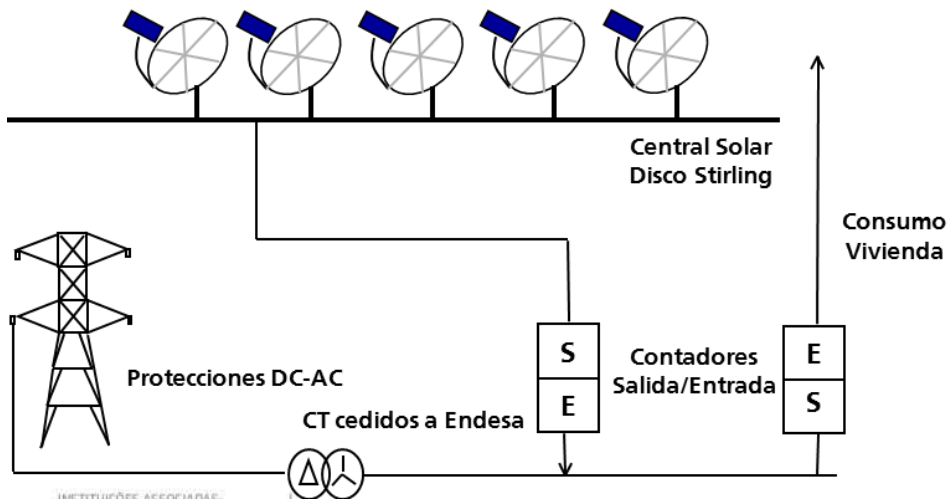


Iberian Collaboration + EU (FP7) : BIOSTIRLING-4SKA

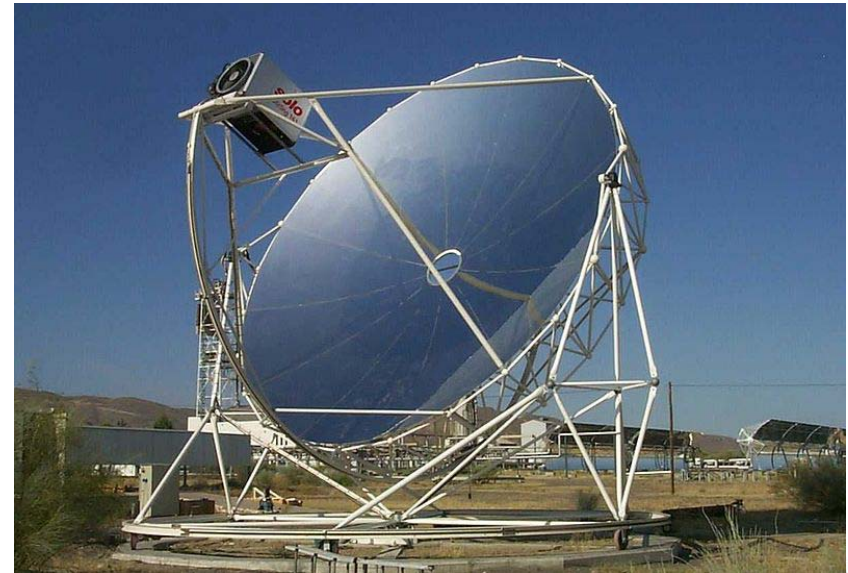
1st Stage FP7 proposal (2011): SP (lead), PT, NL, SE, FIN, BE
Improvement in the efficiency and reduction of costs
of solar dish systems, with specific application
as renewable energy option for the SKA telescope.
2nd Stage (2012)

**Iberian X-border Collaboration: EU-Region INTEREG program ;
Energy+ ICT/e-science (with IAA) [ie Madrid SKA SP event 2011]**

Design of a SD power plant conected to grid.

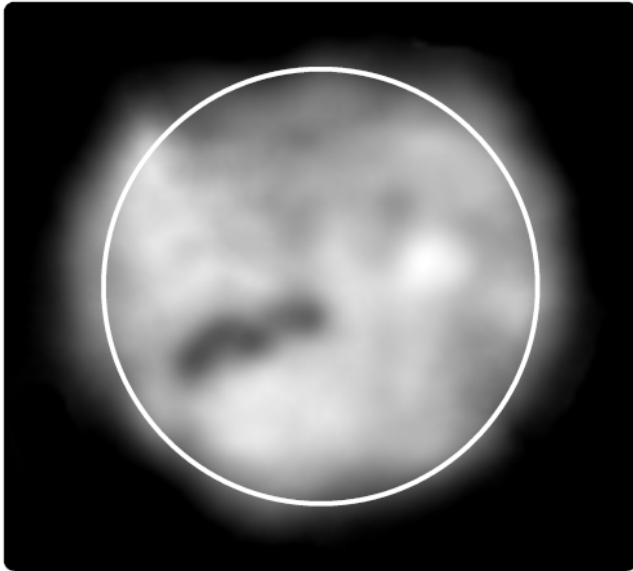


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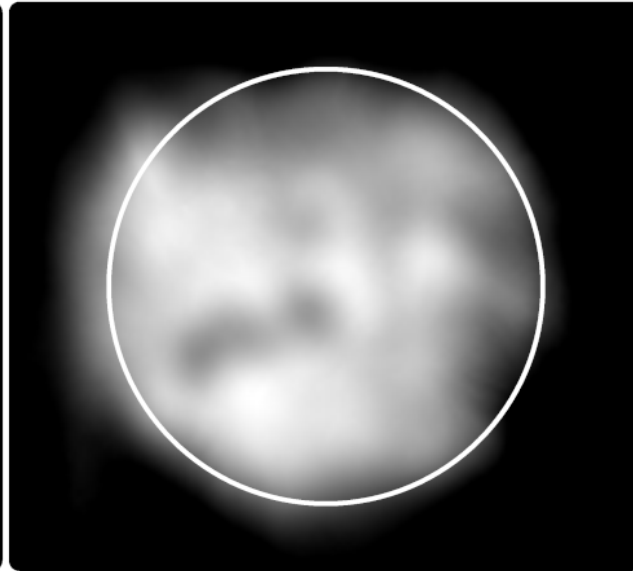


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Potential science: a 14 stations zeroth order experiment:

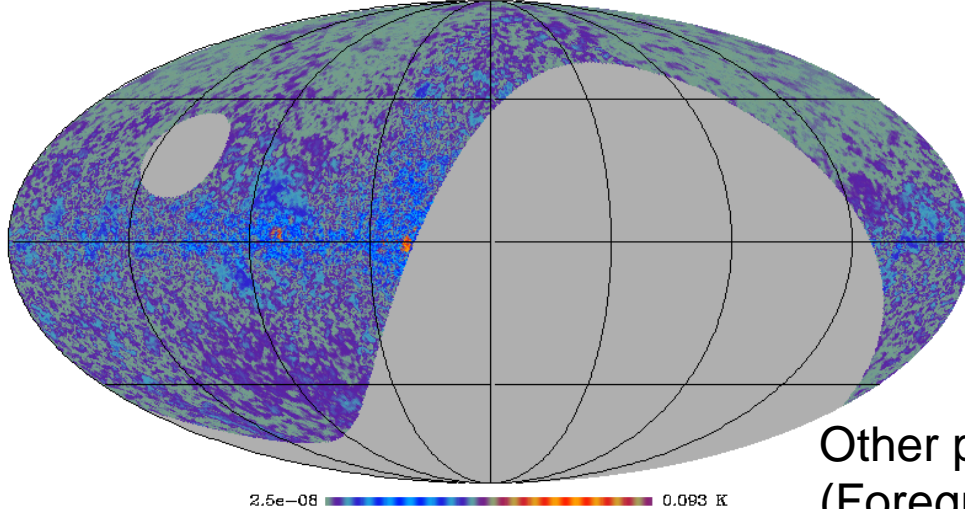


All baselines, 569 harmonics



only <500m baselines, 138 harmonics

GEM synchrotron coverage simulation Stokes Q: 5.0GHz
Portugal Site (long= 8.17 lat= 36.13) fwhm= 30 arcmin



14 stations; a 30+arcmin field
(here we took the Sun)

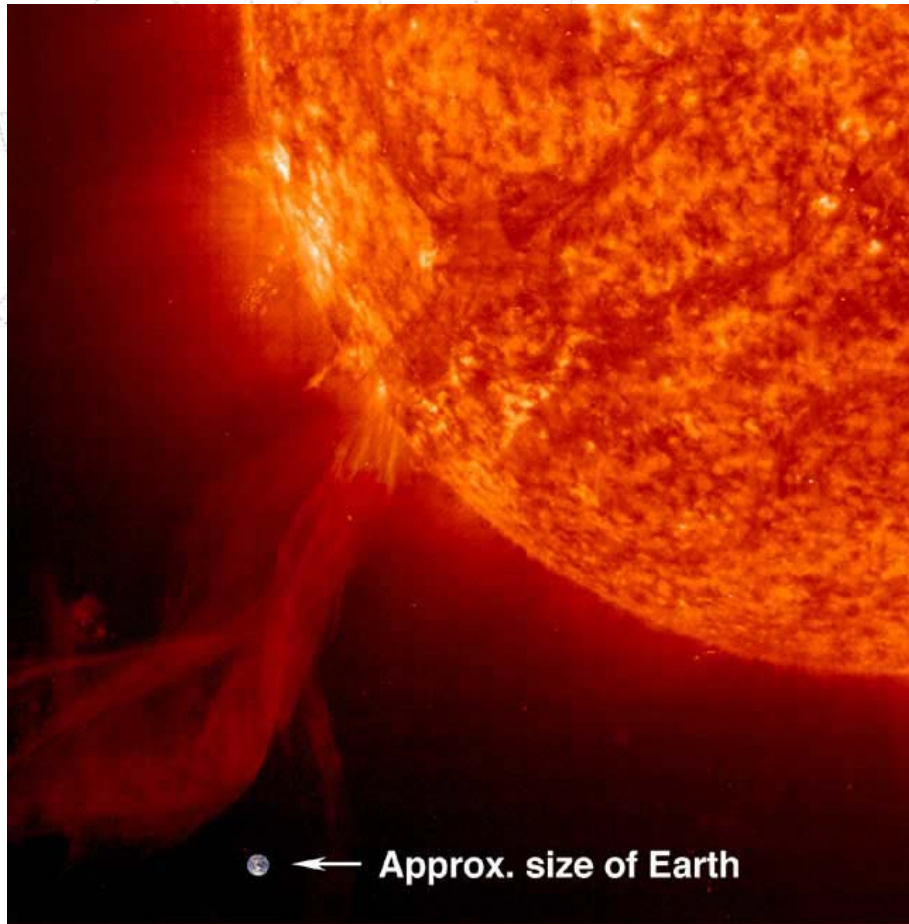
Right: 1.5km baseline.

Left: 500m longest baseline with
dense UV coverage. Care with
aliasing...Nançay data

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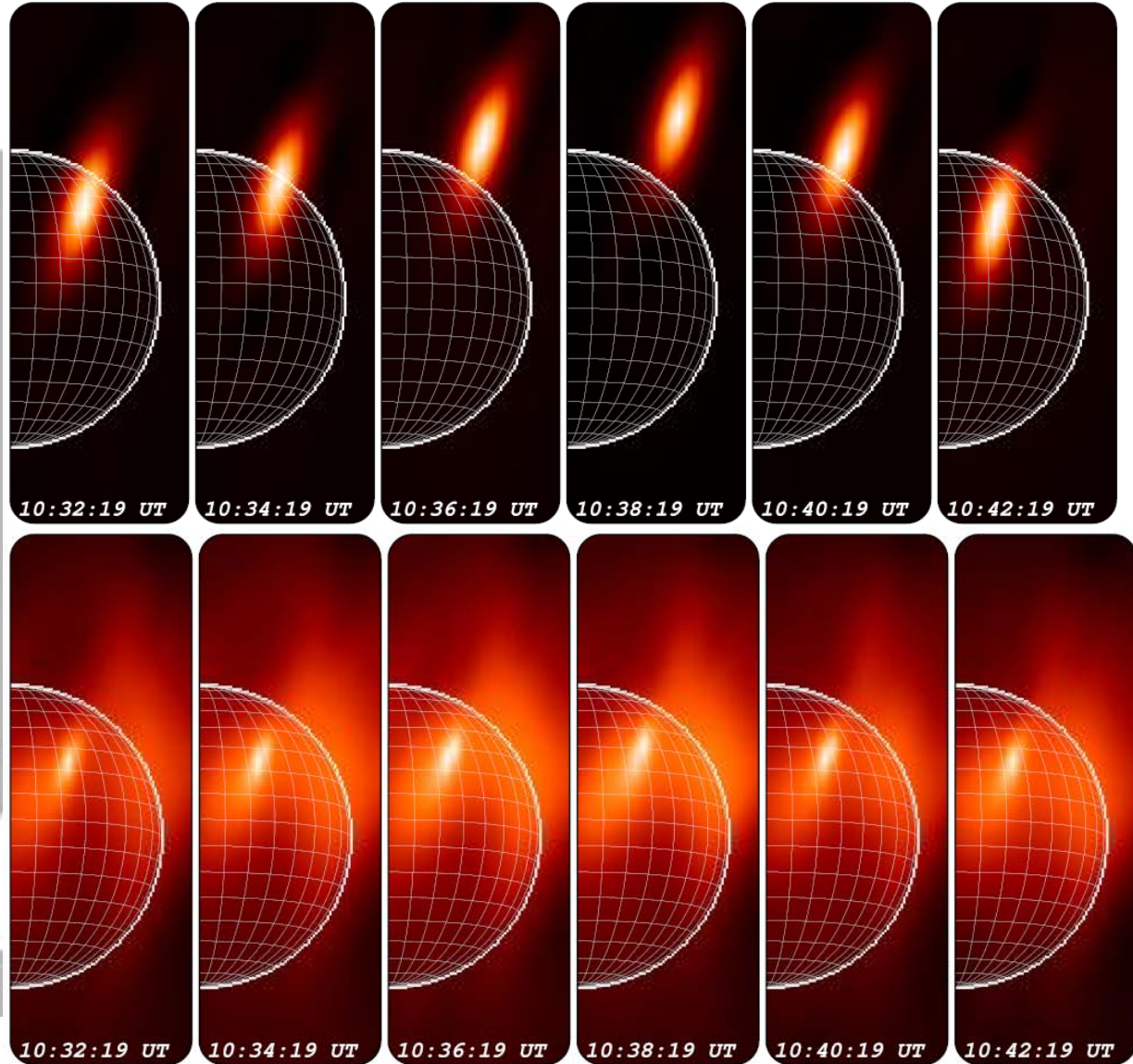
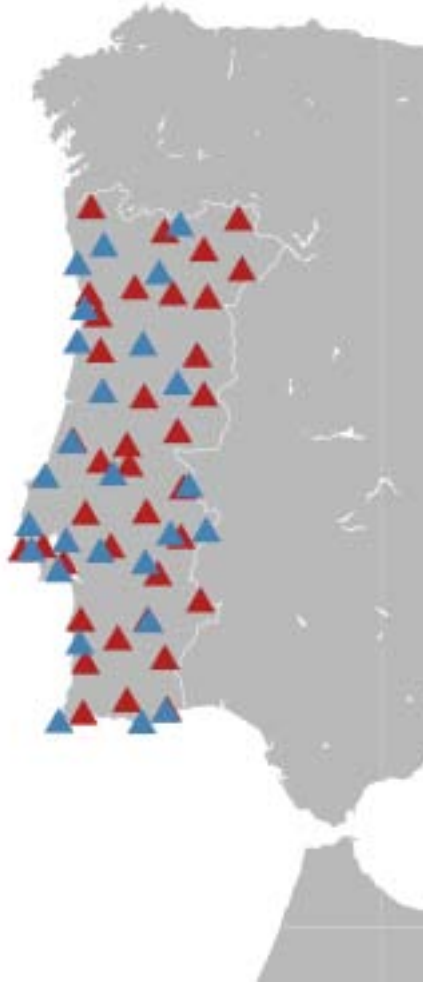
Other potential science: Polarization Studies !
(Foregrounds+ post-Planck science)

Bonus science ? (from a nuisance source)



- Sun: Space Weather Tool
- A nuisance source for most RAs, but a calibration target
- A funding source ? : Space Situational Awareness (See FP8/Horizon 2020)
- In North Hemisphere : Cyg Cas A, Tau A as calibrators.
- Ionosphere latitude and properties comparable to final sites in SA / Au.
- (anyway, you do not care too much with ionosphere for a compact Wide Field Imager @ 1GHz)

Ionosphere study/calibration : GPS stations grid (thought at 1GHz not that nuising v^{-2})



Nançay Radioheliograph 2011/01/01 432.0 MHz

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- λ Infrastructure : power, telephone, nearby, inside Contenda.
- λ No “environmental risks” : ie, limited impact, on a huge natural area near border PT-SP
- λ Optical Infrastructure soon (Nokia Siemens Networks PT, Min. Innovation, PT Telecom) <- Biggest Cloud Computing Center in Europe
- λ Iberian Collaboration basis (IAA just around the corner)
- λ Solar energy cluster nearby : Logica EM, with support from TICE and EnergyIn (Comp. Poles on ICT and Energy)



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WITT approach.

Visibility. Start VIP coverage



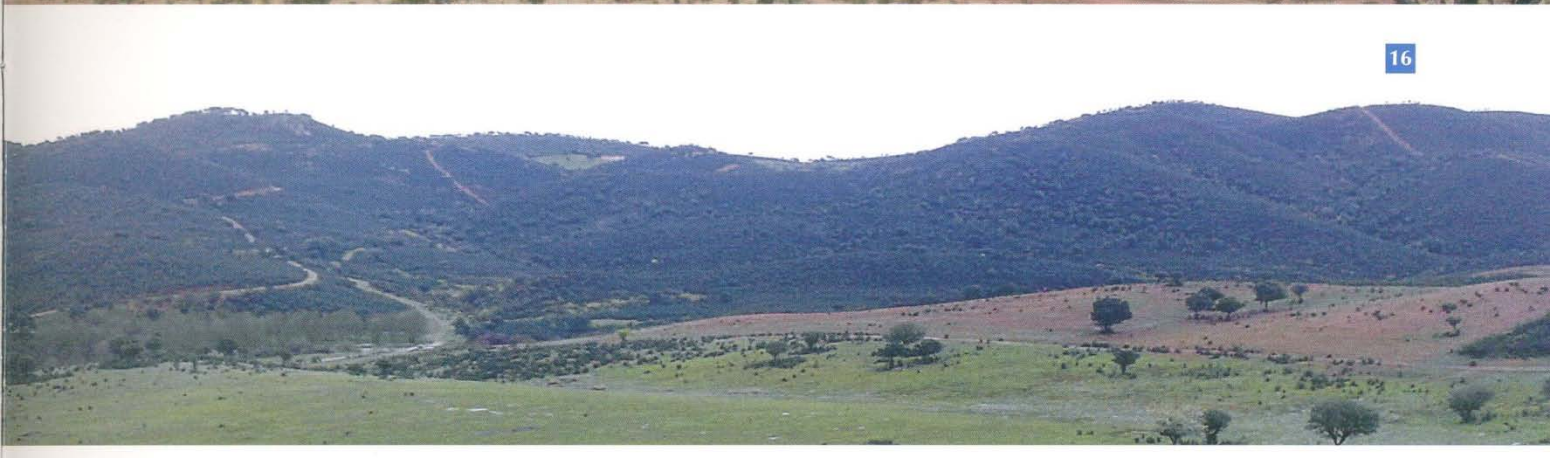


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