

## ***REPORT ON THE RADIO.NET3 NETWORKING ACTIVITY***

**TITLE: THE POWER CHALLENGES OF MEGA-SCIENCE INFRASTRUCTURES: THE EXAMPLE OF THE SKA**

**DATE:** *20-21/6/2012* **TIME:** (WHOLE DAY)

**LOCATION:** *MOURA, PORTUGAL & SAN LUCAR, SPAIN*

**MEETING WEBPAGE** *<http://www.av.it.pt/workshops/pcska/index.html>*

**HOST INSTITUTE:** *INSTITUTO DE TELECOMUNICAÇÕES*

**PARTICIPANTS NO:** *33*

## REPORT:

### 1. Agenda and/or programme of the meeting

#### Wednesday, June 20, 2013:

José Maria Pós de Mina (Mayor of Moura) – Welcome Notes  
Thomas Parker (European Spallation Source) - [Green large scale research infrastructures](#)  
Andrew Faulkner (UCAMB, UK) - [Aperture Array Power Challenges](#)  
Arnold van Ardenne (ASTRON, NL) - [A planned Green Powered high-frequency array demonstrator](#)  
Michael Kramer (MPIfR, Germany; Videolink) - [SKA as a green infrastructure](#)  
Larry D'Addario (JPL/Caltech, USA) - [How to implement SKA digital signal processing so that it uses very little power](#)  
Reinhard Keller (MPIfR, Germany) - [RFI from Solar Power Equipment](#)  
Riaan Smit (SKA South Africa; Video link) - [Renewable Energy, Grid Integration and SKA High Voltage supply](#)  
Phil Crosby (SKA Office) - [Powering the SKA: An Industry Briefing](#)  
Manuel Silva (CTAER, Spain) - Thermal Solar Energy and Power Plants  
Yu Nam-cheol (KEPCO KDN, Korea) - [Korea Smart Grid Program and SKA Power System](#)  
Antonio Mano (EDP & EnergyIn, Portugal) - [Industry Forecasts](#)  
Carlos Blanco (ALENER, Spain) - [BIOSTIRLING4SKA: Exploring Stirling dishes and energy storage for a 24/7 solar powered SKA](#)  
Domingos Barbosa (IT Aveiro, Portugal) – [AAVS Moura Developments](#)  
Matthew Simmons (Arvus Group, New Zealand) - [Arvus key projects](#)  
Arnold van Ardenne (ASTRON) - [Closure Remarks and Discussion](#)

#### Thursday, June 21, 2013:

In the morning - Visit to Amareleja Photovoltaic Power Plant, Amareleja Moura, Portugal  
In the afternoon - Visit to PS10/PS20 Thermal Solar Plants (ABENGOA), Sanlucar, Sevilla, Spain

### 2. Scientific Summary

All future major science infrastructures will consider their carbon footprint into the respective development path and lifetimes. [The Square Kilometer Array \(SKA\)](#), an international continental sized ICT machine to be built in the Southern Hemisphere in high irradiance zones (Australia and/or South Africa) presents an ideal scenario to aggregate renewable energy know-how and become a major Green Infrastructure during its lifetime. SKA may set an example for self-sustainable mega-science production and infrastructure operation as was recognized by the COST 2010 action ["Benefits of Research Infrastructures beyond Science"](#), with an expected direct economic and indirect societal impacts. Additionally, the [Roadmap of the European Strategy Forum on Research Infrastructures \(ESFRI\)](#) has indicated that a multitude of test facilities and Research Infrastructures are paramount to lead the world in the efficient use of energy, in promoting new and renewable forms of energy, and in the development of low carbon emission technologies, as part of a Strategic Energy Technology Plan (SET-Plan) adopted by the European Union.

Current energy consumption projections for SKA and recent experiences from pathfinders and precursors (LOFAR, ASKAP, Meerkat) reveal that an important part of the life cycle cost of these large-scale radio astronomy projects will be power. Energy transport infrastructure and generation to supply the electronics and the associated cooling are key factors. This last aspect has a direct impact on the system sensitivity, since any potential power caps would limit performance of frontend Low Noise Amplifiers. Thus, power generation and power efficiency (innovative form of passive cooling) become a paramount ingredient of these projects.

This workshop reviewed current R&D trends, industry forecasts for solar energy options and experiences

that may respond to the challenges set by Mega Science Infrastructures and in particular by the Square Kilometer Array project. The Workshop will also review the convergence with the Horizon 2020 EC roadmap and is open to all parties. The topics covered Green Energy experiences with a focus on Solar Photovoltaic, Solar Thermal installations and smart Grid management.

To foster discussions between scientists and power engineers, the social program included visits to major Photovoltaic Plant in Moura, on the Portuguese side and to a Solar Thermal Complex Plant in SanLucar, on Spanish sides of the common border. This region is the most illuminated region of Europe, counting with several large-scale examples of solar energy exploitation.



### 3. Attendance list (incl. participant names, affiliation and country) signed by the participants and confirmed by the organizer

Rui Agostinho (OAL/CAAUL, Portugal)  
 Sonia Antón (CICGE-UP, Portugal)  
 Arnold van Ardenne (ASTRON, Netherlands)  
 Domingos Barbosa (IT, Portugal)  
 André Cartaxo (LOGICA, Portugal)  
 Rui Carvalho (SunBD, Portugal)  
 João Costa (SelfEnergy, Portugal)  
 Phil Crosby (SKA Organization)  
 Larry D'Addario (JPL/Caltech, USA)  
 António Duarte (LOGICA, Portugal)  
 Andrew Faulkner (Cambridge, UK)  
 Karl Gypstra (MPfiR, Germany)  
 Reinhard Keller (MPfiR, Germany)  
 Michael Kramer (MPfiR, Germany - Videolink)  
 Ana Magalhães (INEGI, Portugal)  
 Dalmiro Maia (CICGE-UP, Portugal)  
 António Mano (EnergyIn / EDP Renewables, Portugal)  
 Miguel Matias (SelfEnergy, Portugal)  
 Rob Milenaar (SKA Organization)  
 Yu Nam-cheol, (KEPCO KDN, South KOREA)  
 Mariana Oliveira (EnergyIn, Portugal)  
 Thomas Parker (European Spallation Source, Sweden)  
 Nuno Pereira (Logica EM, Portugal)  
 Fabienne ROCHE (Methode Electronics, UK)

Juande Santander-Vela (IAA-CSIC, Spain)  
Vitor Silva (Logica EM, Portugal)  
André Simão (SunBD, Portugal)  
Bong Won Sohn (KASI, South Korea)  
Matthew Simmons (Arvus Group International Ltd, New Zealand)  
Riaan Smit (ESKOM, South Africa - Videolink)  
Lourdes Verdes-Montenegro (IAA-CSIC, Spain)  
Jan van de Donk (Ministry of Education, Culture and Science, Netherlands)  
Andre van Es (ASTRON, Netherlands)

#### **4. Financial Report / RadioNet3 contribution**

##### ***Local Cost:***

Copy and Material Cost for the Moura Workshop by Reinhard Keller (MPIfR):	85,90
Local Cost at the Solucar visit site in Sanluca la Mayor by Domingos Barbosa (IT):	553,80

##### ***Travel Cost:***

Juan de Dios Santander Vela (IAA):	241,96
Domingos Barbosa (IT):	553,80
Karl Grypstra (MPIfR):	740,77
Reinhard Keller (MPIfR):	85,90