



Spanish technological participation in the Square Kilometer Array (SKA) design: VIA-SKA project

Feasibility study of the Spanish Technological Participation in the SKA

(Subprograma Actuaciones Infraestructuras Científicas Internacionales)

PI. Lourdes Verdes-Montenegro

PM. Juande Santander-Vela

Support: Julián Garrido

(Instituto de Astrofísica de Andalucía-CSIC)



Encuentro RIA-AstroMadrid, 25-27 Sept 2013

OUTLINE

- Quick overview of SKA



- Technological Challenges



- Current Status & Spanish participation



WHAT WILL SKA BE?

A revolutionary radio telescope made of **1000s of receivers**

Linked together across an area the **size of a continent.**

Total combined collecting area: **1 KM²**

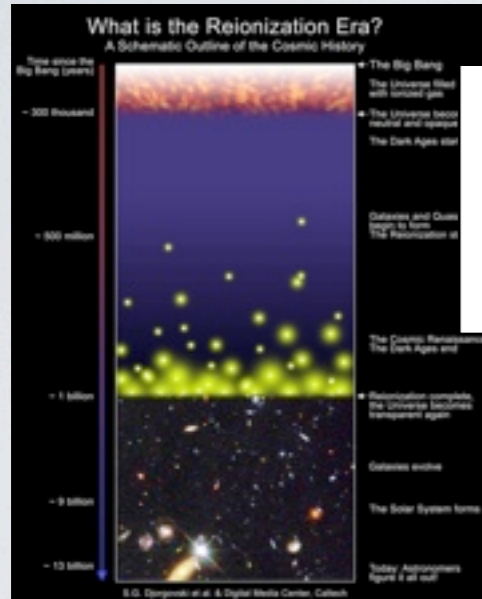
SKA, a Green ICT machine



- Its core: a city!
- Remote stations: spread villages
- The Universe camera, after an Exabyte and an Exaflop

WHAT FOR? KEY SCIENCE

- HISTORY OF ATOMIC GAS (HI):
REIONIZATION - TODAY



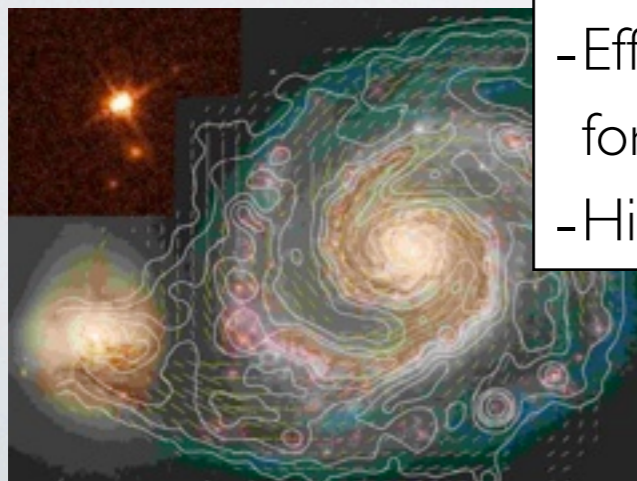
- Detailed picture of structure formation
- Most HI in galaxies: $z=7$

- GRAVITY TEST



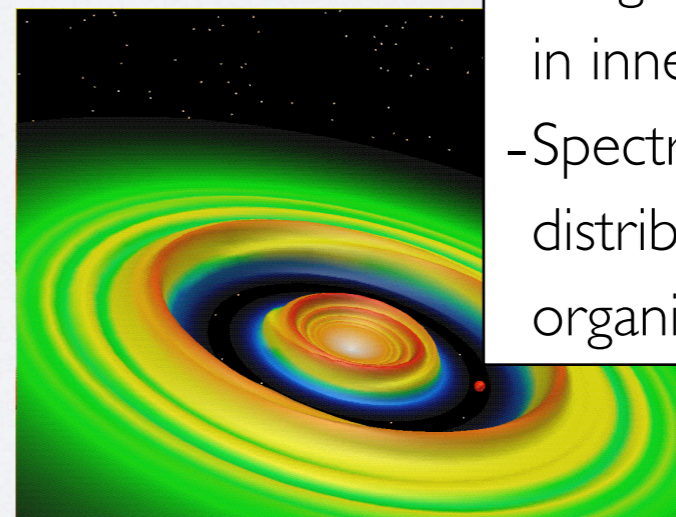
- Discovery of
- 2000 (SKA1) pulsars
- 10,000 - 20,000 (SKA2) pulsars
- High precision timing
- Arms of gravitational wave detector

- ORIGIN & EVOLUTION OF COSMIC MAGNETISM



- Origin and evolution
- Effect on star and galaxy formation
- Hierarchical distribution

- PROTOPLANETARY DISKS



- Imaging of thermal emission in inner regions of disks
- Spectroscopy to map out the distribution of complex organic molecules

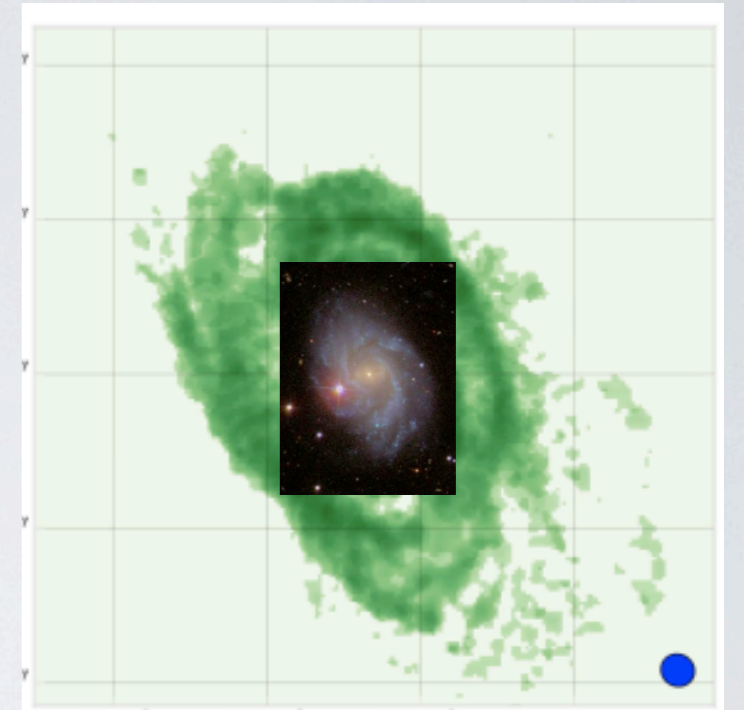
HISTORY OF HI: LOCAL UNIVERSE

SKA1: Dishes SKA2: AIP

Faint/extended HI required to tell the full story

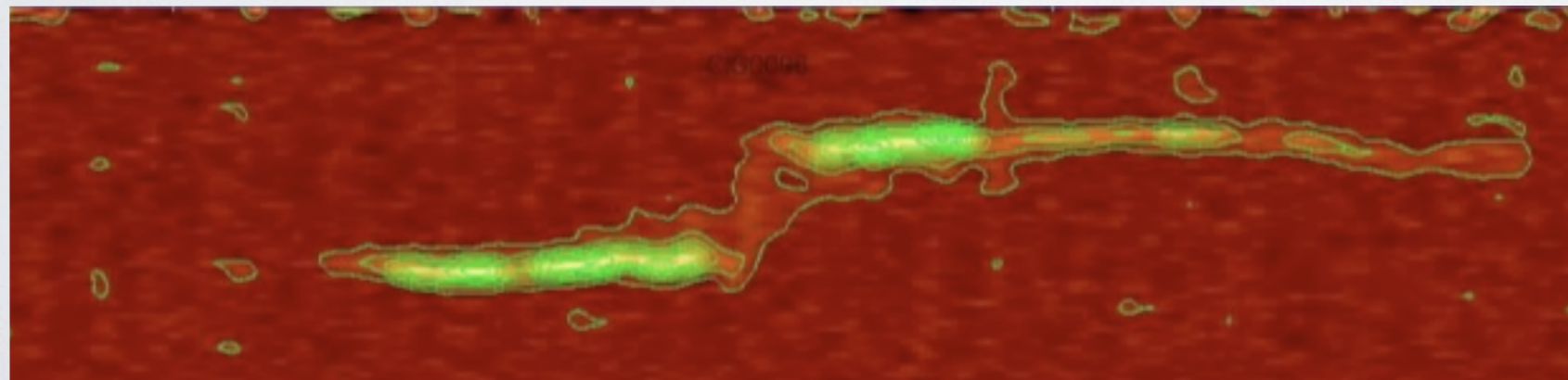
How do galaxies get their gas:

cold clouds formation 1st step towards galaxy formation



AMIGA PROJECT <http://amiga.iaa.es>

Analysis of the interstellar Medium of Isolated GALaxies



HI data VLA C+D configuration: $N(\text{HI}) =$
 $5 \times 10^{20} \text{ cm}^{-2} \text{ --- } < 3 \times 10^{19}$

Espada et al 2006, 2011,
new EVLA data

QUICK OVERVIEW OF SKA

- 1000 - 1500 antennas x 15m in ~100 km
- 1000 - 1500 antennas x 15m up to 3000 km

70 MHz - \geq 25 GHz
4-3m - 1.2 cm

200 - 1 SQ² FOV
0.1" - 0.001" resolution

interferometer: escalable

SKA1 = 10% collecting area, 70 Mhz - 3 GHz , 400-650 M€, 2017 -2020

SKA2 = 100% collecting area, 70MHz-10 GHz, ~1500 M€, 2018 -2024

SKA3 = High frequencies: \geq 25 GHz. No defined dates

ANTENNAS

- Frequency range $>$ two decades:
- Combination of different types of antennas



Can observe towards several directions simultaneously

Aperture Array

70 - 450 MHz

Baselines 100 km

2017 -2020

SKA1

single pixel feed
450 MHz - 3GHz
baselines 100 km



Enhancing FOV



+ focal plane array

dense aperture array

200 - 500 MHz
200 deg²

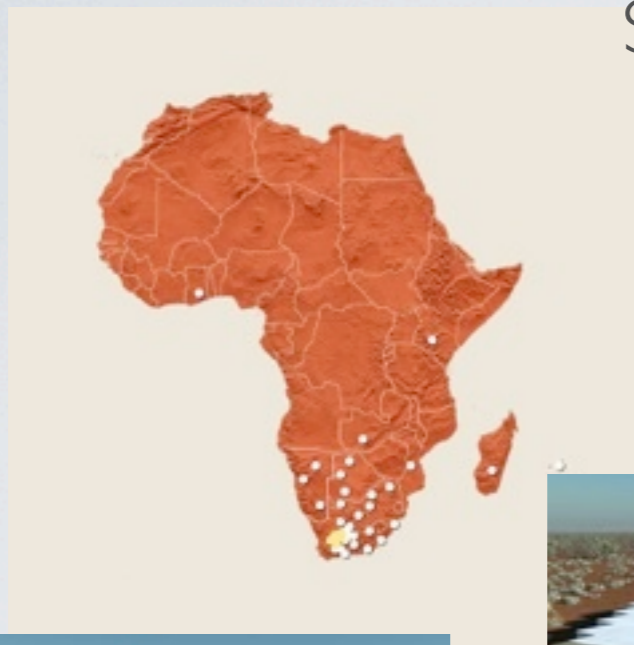
SKA2

2018 - 2024

A Distributed Sensor Network at the Scale of Two Continents

DUAL SITE

South-Africa & Australia/
New Zealand Joint Site



SKA2 AAs



SKA2 MID



SKA1 Low



SKA1&2 MID

SKA1 SURVEY



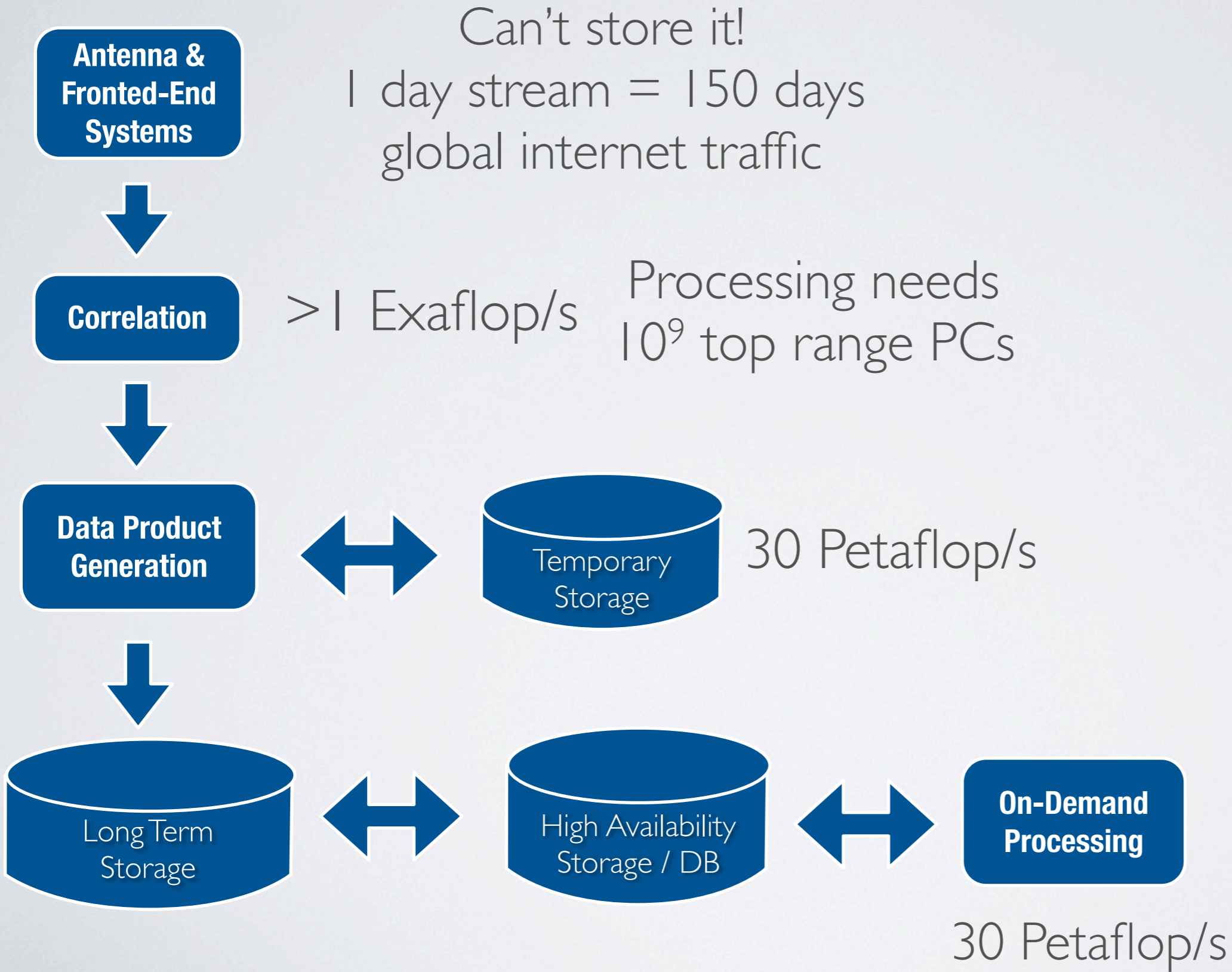
SKA I		SKA2	
SKA I_LOW		SKA2_LOW	
SKA I_MID		SKA2_MID	
SKA I_SURVEY		SKA2_AA	

CHALLENGES

A GLOBAL challenge:

- Antennas
- Materials (expected life 40-50 yrs)
- Massive data transport, storage and processing
- Power supply: towards a GREEN SKA
- System engineering
- Science extraction
- Outreach

MASSIVE DATA FLOW, STORAGE & PROCESSING



TOP 500[®]

NOVEMBER 2012

PRESENTED BY
UNIVERSITY OF
MANNHEIM

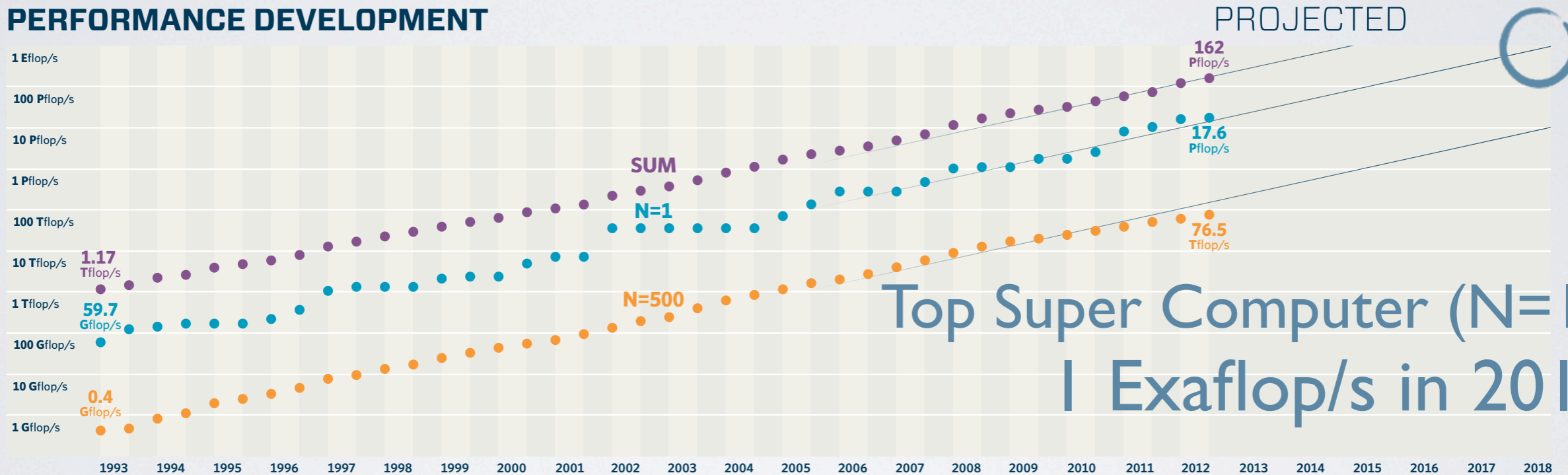
ICL
INNOVATIVE
COMPUTING LABORATORY
THE UNIVERSITY OF TENNESSEE

BERKELEY LAB
Lawrence Berkeley
National Laboratory

FIND OUT MORE AT
www.top500.org

	NAME	SPECS	SITE	COUNTRY	CORES	RMAX PFLOP/S	POWER MW
1	TITAN	Cray XK7, Operon 6274 16C 2.2 GHz + Nvidia Kepler GPU, Custom interconnect	DOE/OS/ORNL	USA	560,640	17.6	8.3
2	SEQUOIA	IBM BlueGene/Q, Power BQC 16C 1.60 GHz, Custom interconnect	DOE/NNSA/LLNL	USA	1,572,864	16.3	7.9
3	K COMPUTER	Fujitsu SPARC64 VIIIfx 2.0GHz, Custom interconnect	RIKEN AICS	Japan	705,024	10.5	12.7
4	MIRA	IBM BlueGene/Q, Power BQC 16C 1.60 GHz, Custom interconnect	DOE/OS/ANL	USA	786,432	8.16	3.95
5	JUQUEEN	IBM BlueGene/Q, Power BQC 16C 1.60 GHz, Custom interconnect	Forschungszentrum Jülich	Germany	393,216	4.14	1.97

PERFORMANCE DEVELOPMENT



1 Gigaflop/s = 0,5W

1 Exaflop/s = 500MW

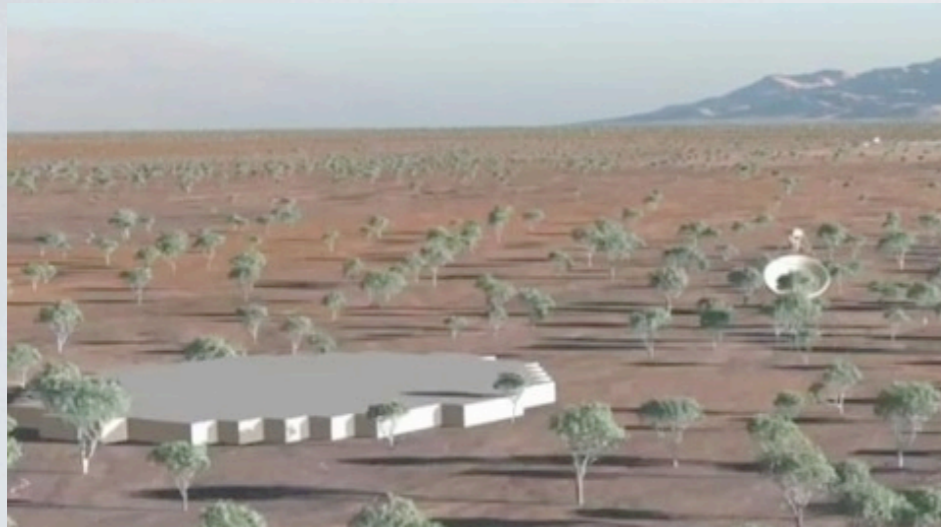
Target: 50MW

NOT ONLY HOW MUCH, BUT HOW

- Far from man-made radio frequency emission (hence power supplies)
- Geographically distributed
- 24/7 operation
- Cooling of digital electronic
- Sustainable
- Reliable
- Affordable
- Projections from pathfinders and precursors: SKA will be power limited

With Renewable Energy

SKA Remote Station

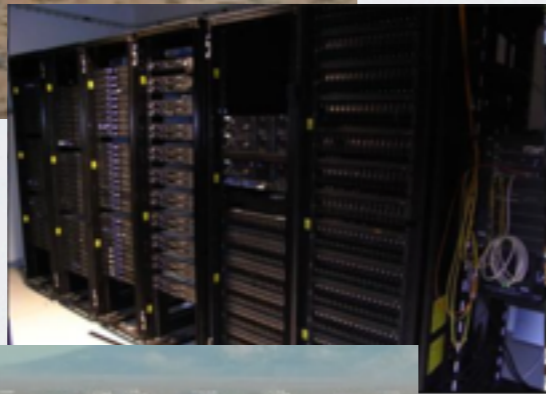


Energy Consumption:
~ 20 GWh/year

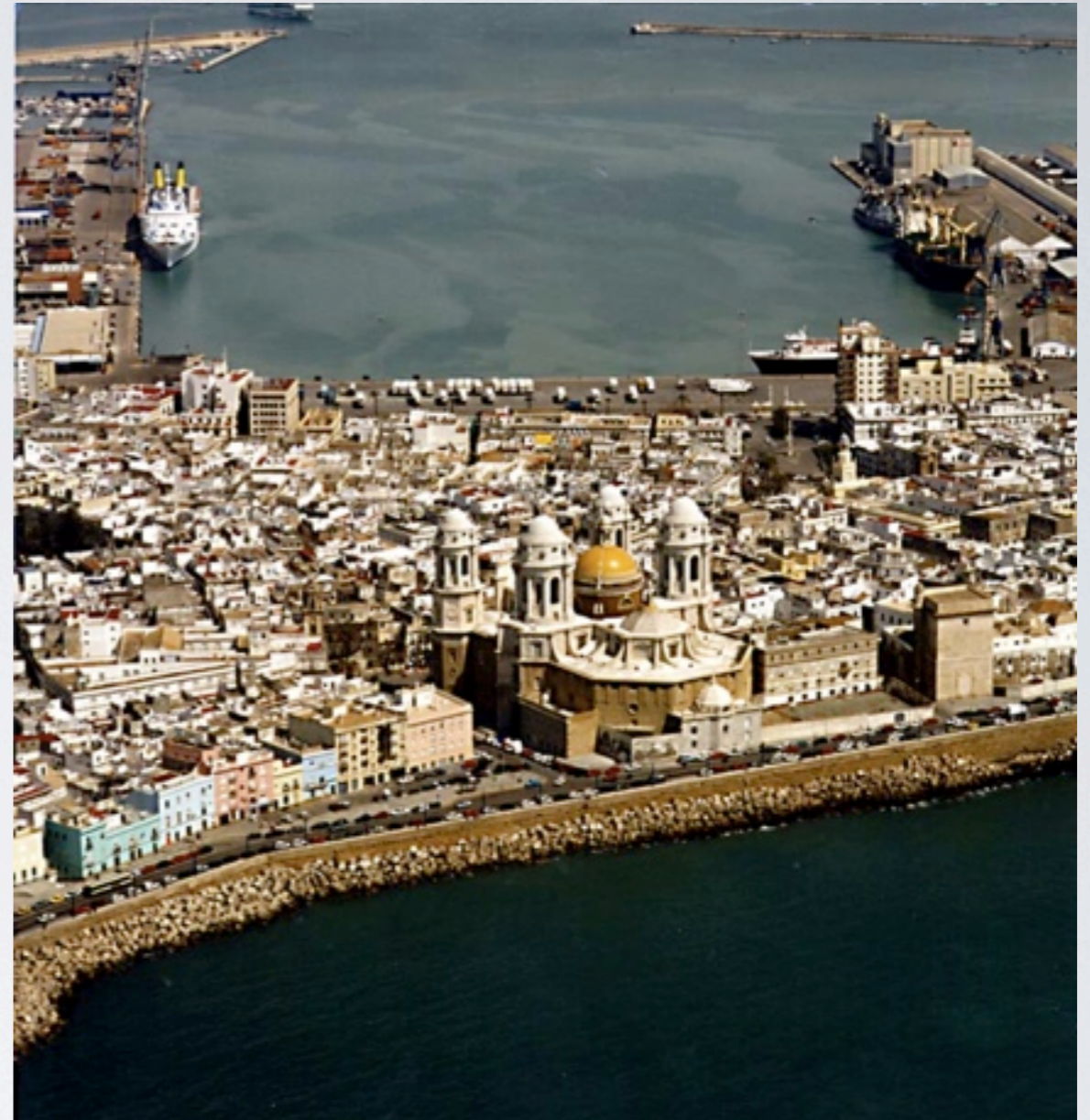


Miraflores de la Sierra 5000 People Town

SKA Core



Energy Consumption:
~ 400 GWh/year



Cádiz

100.000 People City

STRATEGIC VALUE

- **SKA only global project on ESFRI** (European Strategy Forum on Research Infrastructures)
 - 67 institutes in 20 countries participating (and increasing)
- **Highest priority in EU ASTRONET roadmap together with ELT**
- **European Parliament Written Declaration 45/2011** promoting European-African radio astronomy partnerships
- **Aligned with H2020**
 - Better society (**green** power/sustainability, **TIC**)
 - European industry + cutting edge science, Internet of the Future technologies
 - **Union for innovation:** industry + basic research for commercial solutions
- **High-priority in MICINN document**
 - “Construyendo la Ciencia del Siglo XXI”

INTERNATIONAL CONTEXT & SKA-SPAIN

SKA Project Development Office: Jan 2008 - Dec 2011

The SKA Organization: Dec 2011

Non-for-profit limited liability company, incorporated in the UK

Full Member: 250k€/yr × 4 yrs (starting 2012; 1M€ before 2016)

Australia, Canada, China, Germany, Italy, New Zealand, South Africa,
Netherlands, UK, Sweden

Associate Member: no downright payment, but firm intention to become a Full Member in the future (India)

In process: Portugal (opportunity for an Iberian membership)

- Member contributions fund directly the SKA Office
- Countries fund their contribution to (Pre-)Construction tasks

SKA Project Development Office: Jan 2008 - Dec 2011

The SKA Organization: Dec 2011

Non-for-profit limited liability company, incorporated in the UK

Full Member: 250k€/yr × 4 yrs (starting 2012; 1M€ before 2016)

Australia, Canada, China, Germany, Italy, New Zealand, South Africa,
Netherlands, UK, Sweden

Associate Member: no downright payment, but firm intention to become a Full Member in the future (India)

In process: Portugal (opportunity for an Iberian membership)

- Member contributions fund directly the SKA Office
- Countries fund their contribution to (Pre-)Construction tasks

• **2008-2013 Preparatory Phase: system design and costing**

• **~2013-16 Detailed design & pre-construction phase**

- **MINECO-funded Scientific Network**

UV, IAA, CAB, OAN, UB, IEEC, UGR, UJ, IAC, IFCA, UPTC

- **June 2011**: kick-off meeting in CSIC showed broad and strong scientific interest of Spanish researchers in SKA

- **September 2011**: MICINN request Spain to participate in SKA as an Observer

- **November 2011**: MINECO funds



“Feasibility study of the Spanish technological participation in SKA” (Lead by IAA-CSIC; 75.000€)

Subprograma Infraestructuras Científicas Internacionales

--> extended until 31-1-2014, to support participation in consortia

Participants: 7 research institutions (4 from CSIC) + 8 Universities

- ▶ CSIC: **IAA**, CAB, ICE, IFCA
- ▶ IGN - OAN
- ▶ Instituto de Astrofísica de Canarias
- ▶ Universities of Granada, Barcelona, Cantabria, Valencia, Jaén, Carlos III, and Politécnica de Cartagena
- ▶ National Institute for Aerospace Technology (INTA)

In collaboration with

- ▶ CTAER (Advanced Technological Center for Renewable Energies)
- ▶ FRACTAL SLNE
- ▶ CIEMAT (Plataforma Solar de Almería)
- ▶ **Development of a national SKA interest group (GE-SKA).**

SCIENTIFIC INVOLVEMENT

- Providing **feedback to specifications** of Science Data Processor for local HI studies
- **Scientific preparation** by early involvement in precursors/pathfinders
 - EVLA
 - MeerKAT (SoutAfrica precursor)
 - Apertif (WSRT pathfinder)
 - LOFAR
 - ASKAP (Australian precursor)



VIA-SKA Home

https://www.via-ska.es/ska/

Más visitados Gmail FRACTAL DOCMA MANATEE LLAMA MEGARA DOCMA MEGARA MANATEE MEGA Google Maps Marcadores

VIA-SKA

VIA-SKA is the name of the project led by the Instituto de Astrofísica de Andalucía (CSIC) for studying the feasibility of the Spanish Industrial Participation in the Square Kilometre Array (SKA). This project has been funded by the Ministerio de Ciencia e Innovación (MICINN) and includes researchers and engineers from the Instituto Geográfico Nacional, Universidad de Granada, Universidad de Barcelona, Universidad Carlos III, Instituto de Física de Cantabria / Universidad de Cantabria, Universidad de Valencia, Centro de Astrobiología and Instituto Astrofísico de Canarias.

Lastest news

BIOSTIRLING4SKA project at the "Radio Astronomy: a driver for innovation in renewable energy" workshop
 Lourdes Verdes-Montenegro (VIA-SKA Principal Investigator, IAA-CSIC) was invited to present the BIOSTIRLING4SKA project at the "Radio Astronomy: a driver for innovation in renewable energy" workshop that took place the 9th of October at Brussels.

SKA precursor telescope ASKAP opens in Australia
 The official opening ceremony of CSIRO's Australian Square Kilometre Array Pathfinder (ASKAP) and the Murchison Radio-astronomy Observatory (MRO) took place the 5th of October 2012 in Western Australia.

More news ...

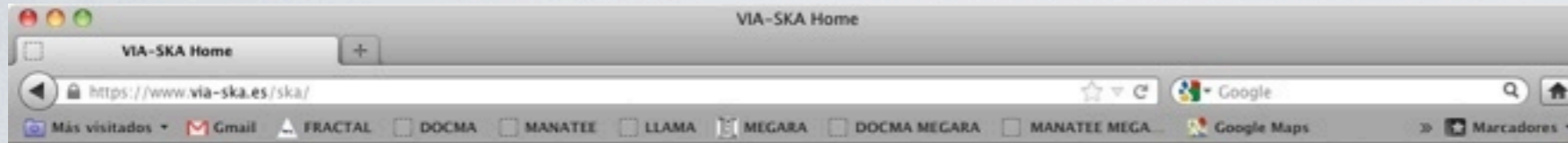
November 2012
 Current Month

Mon	Tue	Wed	Thu	Fri	Sat	Sun
29	30	31	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	1	2

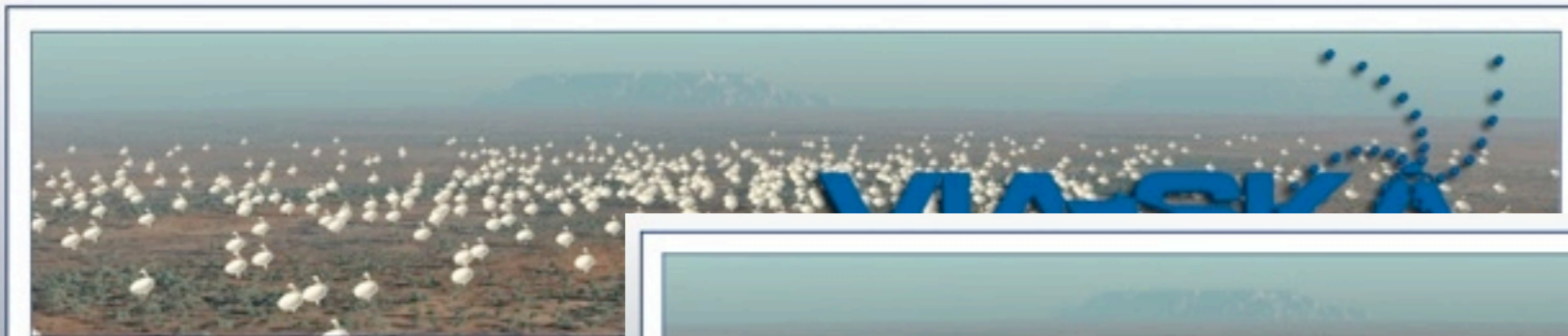
Events

- SKA: Strategic Position and Future Opportunities for Spanish Industry (2012-11-23 - Instituto de Física y Química Rocasolano (CSIC, Serrano, 119 - Madrid))
- RadioNet Advanced Radio Astronomy (2012-11-13 - JBCA, University of Manchester, UK)

VIA-SKA + SKA INFORMATION



VIA-SKA + SKA INFORMATION



Site Search

VIA-SKA is the name of (CSIC) for studying the Square Kilometre Array (SKA) in the framework of the Plan Nacional sobre Ciencia e Innovación (MINECO) through the Instituto Geográfico Nacional (IGN) and the Universidad Carlos III, I+D+i and the Universidad de Valencia.

[Home](#)

[Introducing SKA](#)

[SKA in Spain](#)

[Events](#)

[News](#)

[Documents](#)

[Gallery](#)

[How to join](#)

[Contact](#)

[Links](#)

[Directo Area](#)

Lastest news



renewable energy" work



[More news ...](#)



Site Search

Introducing SKA

The Square Kilometer Array (SKA) will be a multi-purpore interferometer with capability to detect radio waves using dishes and other antennas, called aperture arrays, using a collecting area of 1 million square metres, distributed over a distance of at least 3000 km.

The SKA will be one of the key net generation instruments, with potential for fundamental breakthroughs in Radioastronomy, and, at the same time, will drive technological development in other areas of social impact, such as high-speed data distribution, massive data processing, or in the generation, storage and distribution of renewable energy, among others (see the article in El Pais)

The SKA is one of the highlighted large infrastructures included in the European Strategy Forum on Reaserch Infrastructure (ESFRI).

Follow these links to know more about the project.

- [What is SKA?](#)
- [Science with SKA](#)
- [Industrial Overview](#)
- [Work Organization](#)

[Home](#)

[Introducing SKA](#)

[What is SKA?](#)

[Science with SKA](#)

[Industrial overview](#)

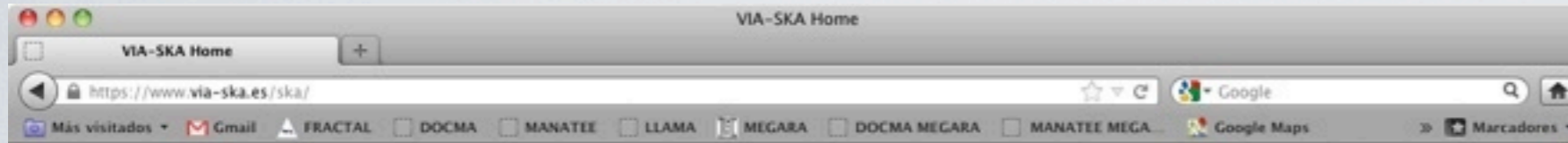
[Work Organisation](#)

[SKA in Spain](#)

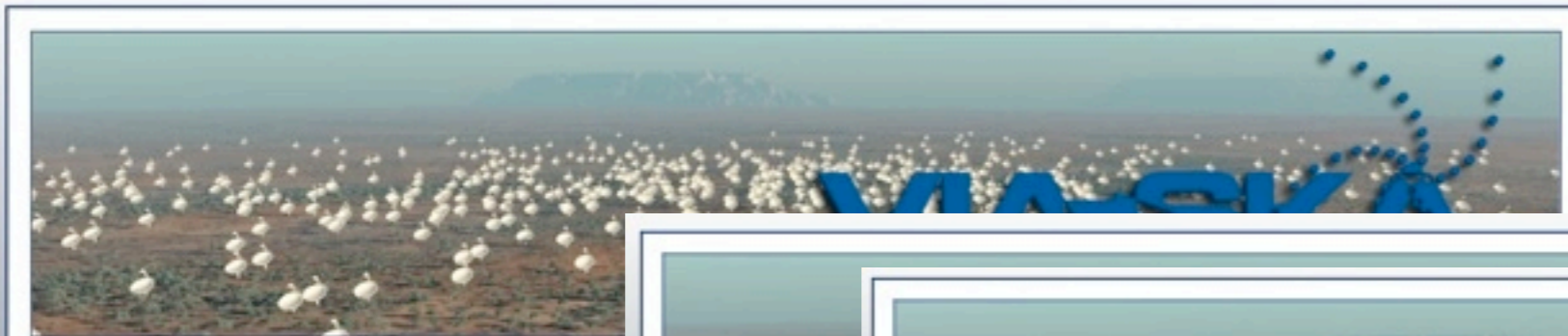
[Events](#)

[News](#)

[Documents](#)



VIA-SKA + SKA INFORMATION



Site Search

VIA-SKA is the name of (CSIC) for studying the Square Kilometre Array (SKA) project. It is led by the Instituto Geográfico Nacional (IGN), Universidad Carlos III, Universidad de Valencia, and the Instituto de Astrofísica de Andalucía (IAA-CSIC).

- Home
- Introducing SKA**
- SKA in Spain**
- Events
- News
- Documents
- Gallery
- How to join
- Contact
- Links

Latest news



renewable energy" work



[More news ...](#)



Site Search

- Home
- Introducing SKA
- What is SKA?
- Science with SKA
- Industrial overview
- Work Organisations
- SKA in Spain**
- Events
- News
- Documents

Site Search

- Home
- Introducing SKA
- SKA in Spain**
- Current situation
- Public centers
- Industry
- Capacity map
- Events
- News
- Documents
- Gallery

SKA in Spain

VIA-SKA is the name of the project led by the Instituto de Astrofísica de Andalucía (IAA-CSIC) for studying the feasibility of the Spanish Industrial Participation in the Square Kilometre Array (SKA). This project has been funded by the Ministerio de Ciencia e Innovación (MCIINN) and includes researchers and engineers from the Instituto Geográfico Nacional (IGN), Universidad de Granada (UGR), Universidad de Barcelona (UB), Universidad Carlos III de Madrid (UC3M), Instituto de Física de Cantabria (IFCA-CSIC), Universidad de Cantabria (UC), Universidad de Valencia (UV), Centro de Astrobiología (CAB-INTA/CSIC) and Instituto Astrofísico de Canarias (IAC).

VIA-SKA is funded by an action of the Subprograma de Actuaciones Relativas a Infraestructuras Científicas Internacionales (Programa Nacional de Internacionalización de la I+D, Convocatoria 2011).

As part of the actions of the VIA-SKA project, a survey of Spanish industry is being performed in order to identify the actors that could have technological profiles relevant to the SKA project. The intention is to introduce the SKA project to Spanish industry and identify companies interested in a prospective participation in SKA.

In case of interest, companies are invited to participate in VIA-SKA in the following way: companies will be requested to provide their contact details that will be included in the VIA-SKA mailing lists and the company information that shall be registered in the VIA-SKA web portal, where the company technological skills and SKA work packages best matching those skills will be identified.

The identification of Spanish industry's interest and capabilities is a necessary step to support the official Spanish participation in the SKA project.

The need for a quick response by Spanish industry at this point is driven by the SKA schedule. The preparation of the SKA WBS/SOW for the Pre-construction Phase Work Packages has been performed during 2012 and the preparation of Stage 1 is on-going, with the proto-consortia self-organizing in order to participate in the Request

CAPACITY MAP OF SPANISH INDUSTRY

Identification of technological niches for Spanish Contributions to SKA Working Packages



Site Search

Search

- Home
- Introducing SKA
- SKA in Spain
- Current situation
- Public centers
- Industry**
- Capacity map
- Events
- News
- Documents
- Gallery
- How to join
- Contact

The following form allows obtaining very... that have expressed their interest in... (expertise domain).

The list of Work Packages includes the W...

The list of expertise domains includes all Packages.

Each organization registered in the VIA-SKA... and their technical capabilities, providing... out. All provided information has been... registered data, filtering organizations... capabilities of the registered organization...

Capacity map form

Name

Institution type

SKA Work Package of interest

Expertise domains

Industry

The following industrial firms, organizations or associations have confirmed their interest in SKA project and are registered in the VIA-SKA web portal.

- ACITURRI
- ALTRAN INNOVACIÓN, S.L.
- ARIEMA Energía y Medioambier
- Asociación Industrial de Óptica,
- Asturfeito
- CRISA
- Cryovac S.L.
- DEIMOS Space S.L.U.
- EMPRESARIOS AGRUPADOS Inte
- **Fractal SLNE**
- GMV Aerospace and Defence S.
- GTD
- HTS (High Technology Solutions,
- IDOM
- IK4-TEKNIKER
- INEUSTAR
- INSA, Ingeniería y Servicios Aero

Site Search

Search

- Home
- Introducing SKA
- SKA in Spain
- Current situation
- Public centers
- Industry
- Capacity map
- Events
- News
- Documents
- Gallery

Fractal

Fractal S.L.N.E. is a private technological company specialized in astronomical instrumentation and scientific software.

We use the know-how accumulated by our team during more than 20 years working at public Research Centers and Universities to develop our customer's projects. We focus our services mainly on the Research Centers and Universities that need to carry out Instrumentation and Software projects, establishing fruitful relationships to fulfill the goals.

FRACTAL has an expert, stable and committed team. We cover the subjects of Astronomy, Management, System Engineering, Optics, Opto-mechanics, Mechanics, Electro-mechanics, Cryogenics, Detectors, Data Acquisition Systems, and Software (Real Time Systems, Distributed Systems, Mechanisms Control, Data Base, Telescope's Control Systems and Data Reduction).

Web page link: <http://www.fractal-es.com/>

VIA-SKA: Estado de viabilidad de la participación industrial española en el SKA

What is SKA?

The Square Kilometer Array (SKA) will be a multi-purpose interferometer of thousands of antennas linked together to provide a collecting area of one square kilometre and distributed in an area nearly the size of a continent. The SKA will be 50 times more sensitive than any other radio instrument and will survey the sky at least 10,000 times faster than the best current-day telescopes. Signals from separated antennas shall be combined via high-speed data links to a central processor, providing an angular resolution equivalent to that of a telescope with a diameter of more than 3000 km.

In order to achieve both high sensitivity and high-resolution images of the radio sky, the antennas of the SKA will be densely distributed in the central region of the array, and then sparsely positioned in groups (more spaced at extremes) along several spiral arms extending up to 3000 km from the central core.

Three antenna types, high-frequency dishes and mid- & low-frequency aperture arrays, will be used to provide continuous frequency coverage from 70 MHz to 10 GHz. In the lower (70-400 MHz) and middle (400-1400 MHz) part of the frequency band, two different types of antenna, aperture arrays, will act as a radio wide-angle lens and will be used to observe very large areas of the sky simultaneously. In the higher (1.5-10 GHz) part of the frequency band, the SKA will use 3000 dish antennas, each about 15 m wide, which will operate as a radio camera to provide high quality images.

The signal from the receiving elements will be transported back by optical fibres carrying up to 425 Gbit/sec per dish and 16 Tbit/sec per aperture array to a central processing engine where the data will be handled to form images and time series, and to correct the effect of radio frequency interference (RFI) signals.

Frequency Range	70 MHz To 10 GHz
Sensitivity Area / System Temp	5000 m ² (400 juy in 1 minute) between 70 And 300 MHz
Survey Figure-Of-Merit	4-10 ⁷ - 2x10 ⁷ m ² sr ² depending on sensor technology and frequency
Field-Of-View	200 square degrees between 70 And 300 MHz
Field-Of-View	1-200 square degrees between 0.3 And 1 GHz
Angular Resolution	1 square degree maximum between 1 And 10 GHz
Instantaneous Bandwidth	Band Centre ± 50%
Spectral (Frequency) Channels	10004 per band per baseline
Calibrated Polarization Purity	10000:1
Dynamical Range	>100000
Imaging Processor Computation	~10 ⁷ operations/second
Final Processed Data Output	10 Gbit/second

Two locations are under consideration: Southern Africa and Australia-New Zealand. In Australia the SKA would stretch all the way to New Zealand, and in Southern Africa it would stretch to the Indian Ocean islands. The final site decision will be made in 2012 and will be based on several factors including the operating and infrastructure costs, as well as levels of radio interference.

The SKA will be one of the key net generation instruments, with potential for fundamental breakthroughs in radioastronomy, and, at the same time, will drive technological development in other areas of social impact, such as high-speed data distribution, massive data processing, or in the generation, storage and distribution of renewable energy, among others.

The total target cost for SKA is 1500 M€.

January 2012: List of 80 Spanish companies and technological centres with SKA-related capabilities

May 2012: Interested ~40 companies sent the information to be registered in the VIA-SKA web portal



Site Search

Search

[Home](#)

[Introducing SKA](#)

[SKA in Spain](#)

[Current situation](#)

[Public centers](#)

[Industry](#)

[Capacity map](#)

[Events](#)

[News](#)

[Documents](#)

[Gallery](#)

[How to join](#)

[Contact](#)

The following form allows obtaining very easily the list of public and/or private organizations that have expressed their interest in a particular Work Package and/or could be interested in a particular expertise domain.

The list of Work Packages includes the Work Packages, as defined by the SKA Project.


The list of expertise domains includes all the capacities that shall be required for carrying out the Work Packages.

Each organization registered in the VIA-SKA web portal has identified their interests and their technical capabilities, providing also an overview about previous projects that this organization has carried out. All provided information has been reviewed before being registered. This form facilitates the access to the registered data, filtering organizations by Work Packages and/or areas of expertise in order to quickly map the capabilities of the registered organizations.

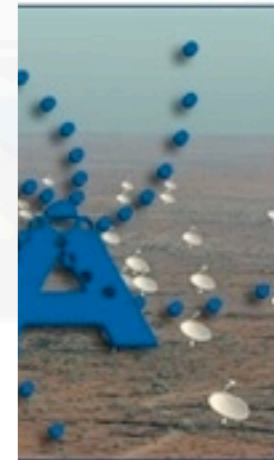
Form allowing an easy search of public and/or private organizations registered in VIA-SKA filtering by Working Package or Expertise domains

Capacity map form

Name	<input type="text"/>
Institution type	<input type="text"/>
SKA Work Package of interest	<input checked="" type="checkbox"/> Low Frequency Aperture Array
Expertise domains	<input type="checkbox"/> Dish-array element <input type="checkbox"/> Signal and Data Transport / Sync and Timing <input type="checkbox"/> Central Signal Processor <input type="checkbox"/> Science Data Processor <input type="checkbox"/> Telescope Manager <input type="checkbox"/> Power <input type="checkbox"/> Site and Infrastructure <input type="checkbox"/> Science <input type="checkbox"/> Management and Engineering



Cancel Search



Site Search

Search

Home

Introducing SKA

SKA in Spain

Current situation

Public centers

Industry

Capacity map

Events

News

Documents

Gallery

How to join

Contact

The following form allows obtaining ver that have expressed their interest in (expertise domain).

The list of Work Packages includes the V

The list of expertise domains includes a Packages.

Each organization registered in the VIA and their technical capabilities, providin out. All provided information has been registered data, filtering organizations capabilities of the registered organizatio

Capacity map form

Name

Institution type

SKA Work Package of interest

Expertise domains



- Analog ASIC design
- Analog beamforming hardware
- Analog beamforming software
- Analog filterbank design
- Analog sensors
- Analog signal processing
- Antenna system beam profile measurement
- Antenna system sensitivity measurement
- Cabling
- Civil engineering
- Control system design
- Cooling: Cryogenics
- Cooling: Heat recovery
- Cooling: Thermal insulation
- Cost modelling
- Cryogenic LNAs (450MHz-2GHz)
- Digital ASIC design
- Digital beamforming
- Digital Fieldbuses
- Digital filterbank design
- Digital sensors
- Digital signal processing
- Digital signal transport networks
- Dipole antenna array construction
- Dipole antenna array design
- Dish antenna construction
- Dish antenna design
- Electro-magnetic compatibility design
- FFT digital signal processing
- FPGA computing
- FPGA design
- High Performance Computing: event-based computing
- High Performance Computing: GPU computing
- High Performance Computing: grid computing
- High-accuracy timing systems
- High-voltage electrical engineering
- Logistics engineering
- Low-RFI Power conversion
- Mechatronics
- Mechanical engineering
- Mechanical tooling
- Monitoring software and systems
- Non-cryogenic LNAs (70MHz-450MHz)
- Photovoltaic solar thermal energy
- Power engineering
- Power engineering: budgeting
- Project management

n VIA-SKA

: capacity

ige 1.

ge 1 Work

Packages

as carried

ess to the

map the

Cancel

Search



VIA-SKA Workshop

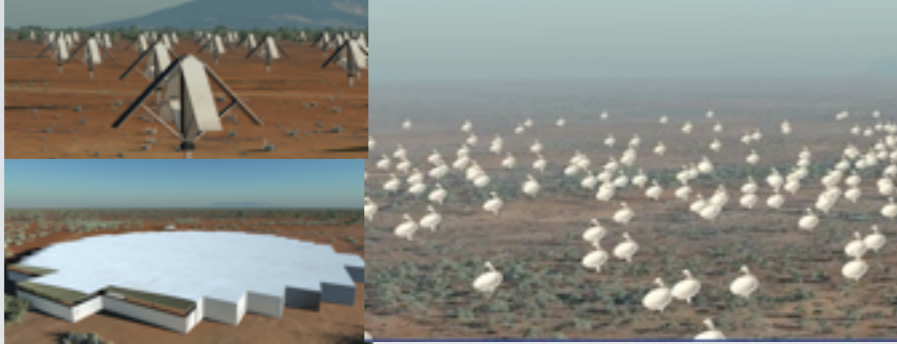
SKA: Strategic Position & Future Opportunities for Spanish Industry



Instituto de Química Física Rocasolano,
CSIC, Madrid, 23/11/2012



MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD



Manuel Gallas

Abengoa NT

15 presentations from companies

Interaction with international consortia for strategic alliances

- ▶ Active presence in virtually all SKA events
- ▶ Membership to the European SKA Consortium (ESKAC):
- ▶ Membership to African-European Radio Astronomy Platform (AERAP)
- ▶ First contacts with Technapoli (Italy) consortium
- ▶ Spanish participation in SKACON, named SKACON-ES
 - ▶ Led by IAA-CSIC Outreach Unit Head: Emilio García + Obs Valencia

INTERNATIONAL CONTEXT

2008-2013 Preparatory Phase: system design and costing

- ▶ SKA I Definition, and Project Execution Plan (PEP)
 - ▶ New legal entity: the SKA Organisation (incorporated in South Africa)
 - ▶ Transition from SPDO towards SKA Org
 - ▶ Work Breakdown Structure & Statements of Work **Jan 2012**
 - ▶ Call for Expressions of Interest **May 2012**
 - ▶ Site decision
 - ▶ Request for Proposals & Evaluation **(Released March 2013 - 10th June)**
- SKA Project Office accepted to include **9 VIA-SKA members in the WBS Working Groups**

~2013-16 Detailed design & pre-construction phase

- ▶ (Pre-construction Phase) Stage 1 - Preliminary Design
- ▶ Stage 2 : Detailed design

~2016-19 Phase I construction

INTERNATIONAL CONTEXT

2008-2013 Preparatory Phase: system design and costing

- ▶ SKA I Definition, and Project Execution Plan (PEP)
- ▶ New legal entity: the SKA Organisation (incorporated in South Africa)
- ▶ Transition from SPDO towards SKA Org
- ▶ Work Breakdown Structure & Statements
- ▶ Call for Expressions of Interest **May 2012**
 - Dishes: IFCA/DICOM+NTE-SENER
 - AAs: IFCA/DICOM+UC3M
 - SDP: IAA-CSIC
 - Power: Spain, + Portugal, Netherlands, Germany
- ▶ Site decision
- ▶ Request for Proposals & Evaluation **(Released March 2013 - 10th June)**

~2013-16 Detailed design & pre-construction phase

- ▶ (Pre-construction Phase) Stage 1 - Preliminary Design
- ▶ Stage 2 : Detailed design

~2016-19 Phase I construction

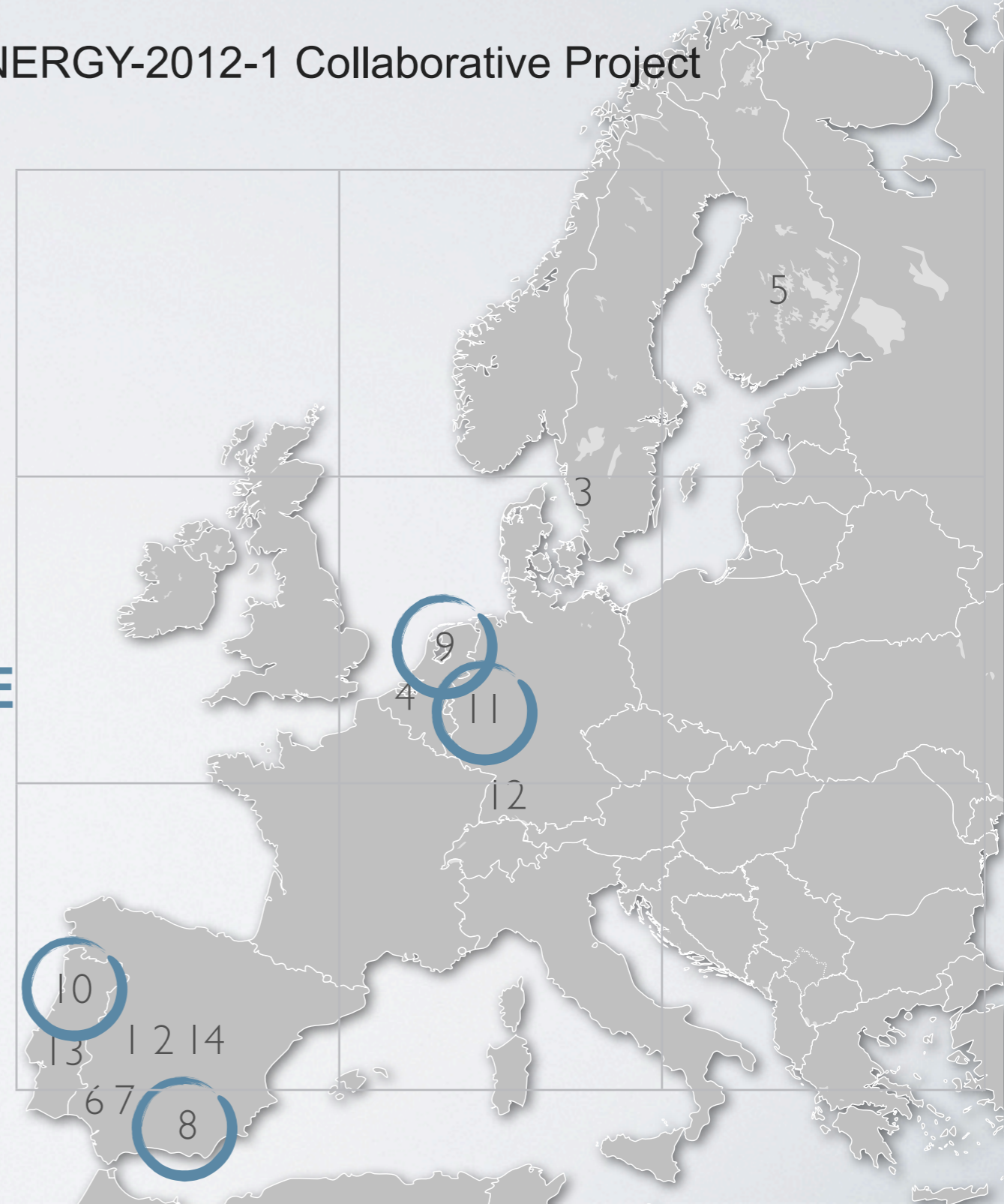
- **Positioning of Spanish industry at international level**

Link of BIOSTIRLING proposal to SKA

BIOSTIRLING4SKA

Dish Stirling systems for SKA. FP7-ENERGY-2012-1 Collaborative Project

- | | |
|--|--------------------------------------|
| 1. GESTAMP RENEWABLE INDUSTRIES (GRI) | 7. U. SEVILLE (US) |
| 2. ALENER SOLAR | 8. CSIC-IAA |
| 3. CLEANERGY | 9. ASTRON |
| 4. AGC GLASSEUROPE | 10. IT AVEIRO |
| 5. UNIVERSITY OF JYVÄSKYLÄ (JYU) | 11. MPIfR |
| 6. CENTRO TECNOLÓGICO AVANZADO DE ENERGÍAS RENOVABLES (CTAER) | 12. FRAUNHOFER-ISE |
| | 13. LÓGICA |
| | 14. GESTAMP SOLAR STEEL (GSS) |



Positioning Spanish industry at international level

- ▶ Invitation to present BOSTIRLING4SKA in AERAP events - European Parliament
- ▶ Visits to Sevilla: SKA Office (May 2012)

Co-organizers of the workshop (June 2012)

The Power Challenges of Mega-Science Infrastructures: the example of SKA

- ▶ End May:
 - ▶ started collaboration with Plataforma Solar Almería (CIEMAT)
 - ▶ **contact with Australia+ SouthAfrica Consortium**
 - ▶ **Involving 8 companies**



INTERNATIONAL CONTEXT

2008-2013 PREPARATORY PHASE: SYSTEM DESIGN AND COSTING

- ▶ SKA I Definition, and Project Execution Plan (PEP)
- ▶ New legal entity: the SKA Organisation (incorporated in the UK)
- ▶ Work Breakdown Structure & Statements of Work **Jan 2012**
- ▶ Call for Expressions of Interest **May 2012**
- ▶ Site decision **May 2012**
- ▶ Request for Proposals & Evaluation (**Released March 2013 - 10th June**)

~2013-16 Detailed design & pre-construction phase

- ▶ (Pre-construction Phase) Stage 1 - Preliminary Design
- ▶ Stage 2 : Detailed design

~2017-20 SKA I construction

INTERNATIONAL CONTEXT

2008-2013 PREPARATORY PHASE: SYSTEM DESIGN AND COSTING

- ▶ SKA I Definition, and Project Execution Plan (PEP)
- ▶ New legal entity: the SKA Organisation (incorporated in the UK)
- ▶ Work Breakdown Structure & Statements of Work **Jan 2012**
- ▶ Call for Expressions of Interest **May 2012**
- ▶ Site decision **May 2012**
- ▶ Request for Proposals & Evaluation (**Released March 2013 - 10th June**)

~2013-16 Detailed design & pre-construction phase

- ▶ (Pre-construction Phase) Stage 1 - Preliminary Design
- ▶ Stage 2 : Detailed design

~2017-20 SKA I construction

Each WP in pre-construction Phase will go to an International Consortium

SKA WORKING PACKAGES

Spanish Participation in bidding consortia

- ▶ Science 
- ▶ Management 
- ▶ System Engineering & Requirements 
- ▶ Dish Arrays 
- ▶ Aperture Arrays 
- ▶ Signal & Data Transport 
- ▶ Sync & Timing 
- ▶ Central Signal Processor 
- ▶ Science Data Processor 
- ▶ Telescope Manager 
- ▶ Site & Infrastructure  
- ▶ Power







SKA WORKING PACKAGES

Spanish Participation in bidding consortia

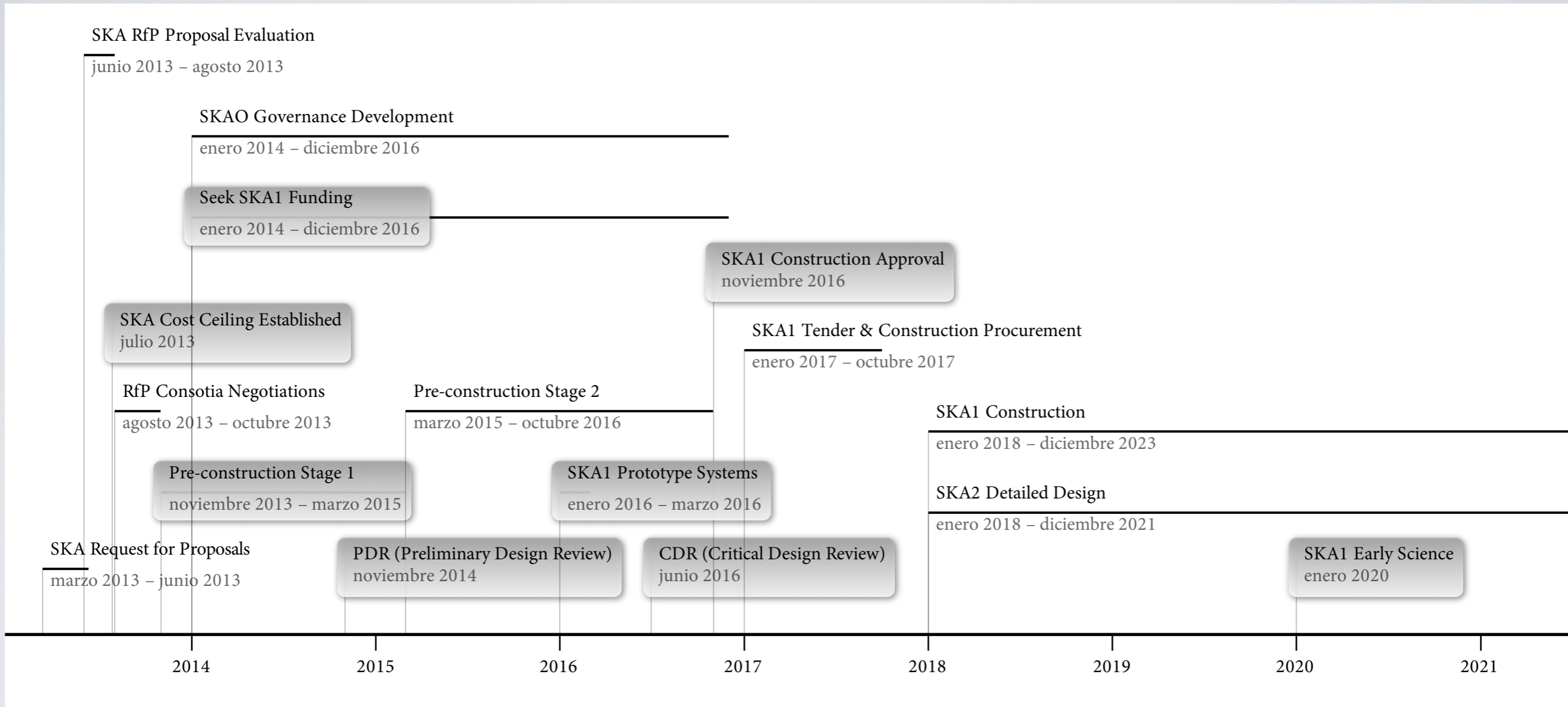
- ▶ Science  
- ▶ Management 
- ▶ System Engineering & Requirements 
- ▶ Dish Arrays  
- ▶ Aperture Arrays  
- ▶ Signal & Data Transport  
- ▶ Sync & Timing  
- ▶ Central Signal Processor  
- ▶ Science Data Processor  
- ▶ Telescope Manager  
- ▶ Site & Infrastructure  
- ▶ Power 

PRE-CONSTRUCTION PARTICIPATION

Most consortia have accepted Spanish members as Associate Members in their consortia;
CSP only accepts participants from SKA member states

	Lead Org.	Spanish Partners (Companies)	Person- years	Funds (k€)
Dishes		IFCA-CSIC, DICOM-UC, UPNA, OAN-IGN (TTI Norte, Anteral)	6,29	471,5
Signal & Data Transport		UGR (7Solutions, DAS Photonics)	4,43	189,3
Central Signal Processor		UPM → U. Berkeley → RSA (INSA/ISDEFE)	2,43	255,0
Science Data Processor		IAA-CSIC, FSCL, BSC	10,59	1.333,8
Telescope Manager		GTD	1,50	90,0
Infrastructure		CIEMAT, IAA-CSIC → CSIRO/SKA-SA	1,60	168,0
	Power Companies?	Total	26,84	2.507,7

OFFICIAL TIMELINE



OFFICIAL TIMELINE

SKA RfP Proposal Evaluation

junio 2013 – agosto 2013

SKAO Governance Development

enero 2014 – diciembre 2016

Seek SKA1 Funding

enero 2014 – diciembre 2016

SKA Cost Ceiling Established
julio 2013

RfP Consortia Negotiations

agosto 2013 – octubre 2013

Pre-construction Stage 1

noviembre 2013 – marzo 2015

Pre-construction Stage 2

marzo 2015 – octubre 2016

SKA1 Prototype Systems

enero 2016 – marzo 2016

SKA1 Construction Approval
noviembre 2016

SKA1 Tender & Construction Procurement

enero 2017 – octubre 2017

SKA1 Construction

enero 2018 – diciembre 2023

SKA2 Detailed Design

enero 2018 – diciembre 2021

SKA Request for Proposals

marzo 2013 – junio 2013

PDR (Preliminary Design Review)
noviembre 2014

CDR (Critical Design Review)
junio 2016

SKA1 Early Science
enero 2020

2014

2015

2016

2017

2018

2019

2020

2021

OFFICIAL TIMELINE

SKA RfP Proposal Evaluation

junio 2013 – agosto 2013

SKAO Governance Development

enero 2014 – diciembre 2016

Seek SKA1 Funding

enero 2014 – diciembre 2016

SKA Cost Ceiling Established
julio 2013

RfP Consortia Negotiations

agosto 2013 – octubre 2013

Pre-construction Stage 1

noviembre 2013 – marzo 2015

Pre-construction Stage 2

marzo 2015 – octubre 2016

SKA1 Prototype Systems

enero 2016 – marzo 2016

SKA1 Construction Approval
noviembre 2016

SKA1 Tender & Construction Procurement

enero 2017 – octubre 2017

SKA1 Construction

enero 2018 – diciembre 2023

SKA2 Detailed Design

enero 2018 – diciembre 2021

SKA Request for Proposals

marzo 2013 – junio 2013

PDR (Preliminary Design Review)
noviembre 2014

CDR (Critical Design Review)
junio 2016

SKA1 Early Science
enero 2020

2014

2015

2016

2017

2018

2019

2020

2021

OFFICIAL TIMELINE

SKA RfP Proposal Evaluation

junio 2013 – agosto 2013

SKAO Governance Development

enero 2014 – diciembre 2016

Seek SKA1 Funding

enero 2014 – diciembre 2016

SKA Cost Ceiling Established
julio 2013

RfP Consortia Negotiations

agosto 2013 – octubre 2013

Pre-construction Stage 1

noviembre 2013 – marzo 2015

Pre-construction Stage 2

marzo 2015 – octubre 2016

SKA1 Prototype Systems

enero 2016 – marzo 2016

SKA1 Construction Approval
noviembre 2016

SKA1 Tender & Construction Procurement

enero 2017 – octubre 2017

SKA1 Construction

enero 2018 – diciembre 2023

SKA2 Detailed Design

enero 2018 – diciembre 2021

SKA Request for Proposals

marzo 2013 – junio 2013

PDR (Preliminary Design Review)
noviembre 2014

CDR (Critical Design Review)
junio 2016

SKA1 Early Science
enero 2020

2014

2015

2016

2017

2018

2019

2020

2021

OFFICIAL TIMELINE

SKA RfP Proposal Evaluation

junio 2013 – agosto 2013

SKAO Governance Development

enero 2014 – diciembre 2016

Seek SKA1 Funding

enero 2014 – diciembre 2016

SKA Cost Ceiling Established
julio 2013

RfP Consortia Negotiations

agosto 2013 – octubre 2013

Pre-construction Stage 1

noviembre 2013 – marzo 2015

Pre-construction Stage 2

marzo 2015 – octubre 2016

SKA1 Prototype Systems

enero 2016 – marzo 2016

SKA1 Construction Approval
noviembre 2016

SKA1 Tender & Construction Procurement

enero 2017 – octubre 2017

SKA1 Construction

enero 2018 – diciembre 2023

SKA2 Detailed Design

enero 2018 – diciembre 2021

SKA Request for Proposals

marzo 2013 – junio 2013

PDR (Preliminary Design Review)
noviembre 2014

CDR (Critical Design Review)
junio 2016

SKA1 Early Science
enero 2020

2014

2015

2016

2017

2018

2019

2020

2021

OFFICIAL TIMELINE

SKA RfP Proposal Evaluation

junio 2013 – agosto 2013

SKAO Governance Development

enero 2014 – diciembre 2016

Seek SKA1 Funding

enero 2014 – diciembre 2016

SKA Cost Ceiling Established
julio 2013

RfP Consortia Negotiations

agosto 2013 – octubre 2013

Pre-construction Stage 1

noviembre 2013 – marzo 2015

SKA Request for Proposals

marzo 2013 – junio 2013

PDR (Preliminary Design Review)
noviembre 2014

Pre-construction Stage 2

marzo 2015 – octubre 2016

SKA1 Prototype Systems

enero 2016 – marzo 2016

CDR (Critical Design Review)
junio 2016

SKA1 Construction Approval
noviembre 2016

SKA1 Tender & Construction Procurement

enero 2017 – octubre 2017

SKA1 Construction

enero 2018 – diciembre 2023

SKA2 Detailed Design

enero 2018 – diciembre 2021

SKA1 Early Science
enero 2020

2014

2015

2016

2017

2018

2019

2020

2021

OFFICIAL TIMELINE

SKA RfP Proposal Evaluation

junio 2013 – agosto 2013

SKAO Governance Development

enero 2014 – diciembre 2016

Seek SKA1 Funding

enero 2014 – diciembre 2016

SKA Cost Ceiling Established
julio 2013

RfP Consortia Negotiations

agosto 2013 – octubre 2013

Pre-construction Stage 1

noviembre 2013 – marzo 2015

Pre-construction Stage 2

marzo 2015 – octubre 2016

SKA1 Prototype Systems

enero 2016 – marzo 2016

SKA1 Construction Approval
noviembre 2016

SKA1 Tender & Construction Procurement

enero 2017 – octubre 2017

SKA1 Construction

enero 2018 – diciembre 2023

SKA2 Detailed Design

enero 2018 – diciembre 2021

SKA Request for Proposals

marzo 2013 – junio 2013

PDR (Preliminary Design Review)
noviembre 2014

CDR (Critical Design Review)
junio 2016

SKA1 Early Science
enero 2020

2014

2015

2016

2017

2018

2019

2020

2021

CURRENT SITUATION AND NEXT STEPS

- **Envelope of Spanish participation above 2.5Million€**
- OSKAO evaluated RfP responses for completeness and compliance, and getting clarifications from bidding consortia:
 - In some weeks accepted Spanish participation will be known
- **Spain has been invited to October SKA Board meeting:**
 - Funding Scheme for Construction will be discussed
 - Support Spanish self-funded Participation in Pre-construction