



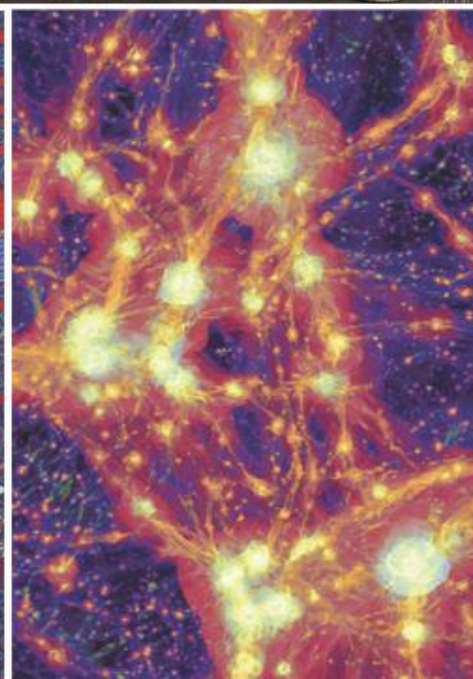
La Maison SKA France

ENS Ulm, Paris, October 16th, 2017



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Towards « Maison SKA France »

- SKA France Factsheet
- Technology challenges
 - Need for a systemic approach
 - The added value of SKA France to the SKA
- From the SKA France Coordination to the Maison SKA France
 - Rationale
 - Objectives
 - A new paradigm of research-industry relations



SKA France factsheet



French contribution to the SKA:

- Observer at SKA Board and Strategy Committee
- Chair of AENEAS GA & 1/3 Members of Ext. Adv. Board
- Invitees to all SKA scientific and technological conferences
- 55 scientific experts in SWG (including 2 co-chair)
- French ILO in SKA Industry Liaison Group and member of PSOW
- Contributor to SKA tech. consortia: LFAA, MFAA, WSBF, DISH, SDP

SKA France actions in 2 years:

- 2 French industry days (> 50 organisations)
- 2 presentations to HC TGIR
- SKA France visits at SKA Office and SKAO visits in French companies
- 10 scientific and technology workshops: SP, Energy, HPC/Big data

French SKA community:

- 176 contributors to the French White Book
- > 250 scientists involved today, 400 by the end of 2017
- > 40 French labs involved
- > 50 experts from the industry
- 6 LE, 3 SMEs involved in RfI & collaborative projects for SKA

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Technological challenges

SKA1 LOW - the SKA's low-frequency instrument

The Square Kilometre Array (SKA) will be the world's largest radio telescope, revolutionising our understanding of the Universe. The SKA will be built in two phases - SKA1 and SKA2 - starting in 2018, with SKA1 representing a fraction of the full SKA. SKA1 will include two instruments - SKA1 MID and SKA1 LOW - observing the Universe at different frequencies.



Total collecting area: **0.4km²**



Total raw data output:
157 terabytes per second
4.9 zettabytes per year

Enough to fill up **35,000 DVDs** every second

5x the estimated global internet traffic in 2015 (source: Cisco)



Compared to LOFAR Netherlands, the current best similar instrument in the world



25% better resolution

8x more sensitive

135x the survey speed

SKA1 MID - the SKA's mid-frequency instrument

The Square Kilometre Array (SKA) will be the world's largest radio telescope, revolutionising our understanding of the Universe. The SKA will be built in two phases - SKA1 and SKA2 - starting in 2018, with SKA1 representing a fraction of the full SKA. SKA1 will include two instruments - SKA1 MID and SKA1 LOW - observing the Universe at different frequencies.



Total collecting area: **33,000m²**

or **126 tennis courts**



Total raw data output:
2 terabytes per second
62 exabytes per year

x340,000

Enough to fill **340,000** average laptops with content **every day**

Compared to the JVLA, the current best similar instrument in the world:



4x the resolution

5x more sensitive

60x the survey speed

Technological challenges



SKA1-MID



SKA1-LOW

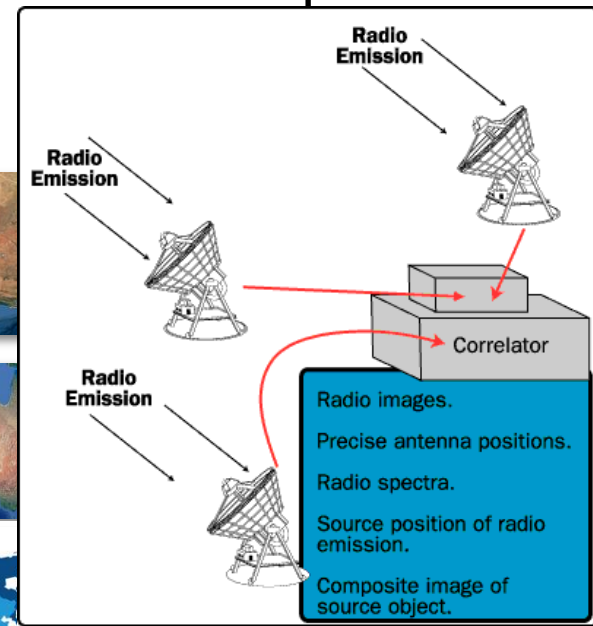
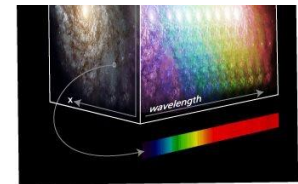
8.8 Tb/s



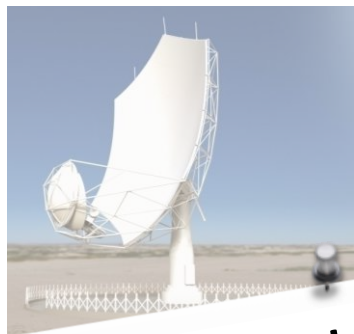
~2 Pb/s



7.2 Tb/s

Need for a systemic approach



Energy in harsh environment

8.8 Tb/s



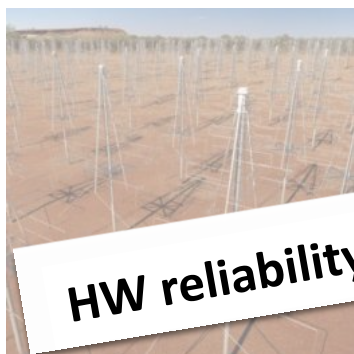
Complex signal processing



5 Tb/s

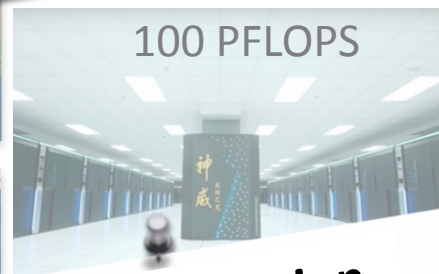
Data traffic management

7.2 Tb/s



HW reliability and maintenance

~2 Pb/s



100 PFLOPS

SKA2 preparation

~300 PB/yr

SKA1-LOW

Real time control

Users



Added value of SKA France to the SKA

Scientific and technology workshops:

- Energy
- Energy and Cryogeny
- HPC/Big Data
- Signal processing
- System integration

French companies involvement:

- Rfl Energy for SKA RSA: Engie
- French industry meets with SKAO:
ArianeGroup, Callisto, Air Liquide, Bull Atos
- and more to come: Thalès, Kalray, Fedd



French industry contributors



ThalesAlenia Space
a Thales / Leonardo company

8.8 Tb/s
Callisto

System engineering



arianeGROUP



ThalesAlenia Space
a Thales / Leonardo company

Cryogenics systems

Data science for monitoring

Telecommunications

5 Tb/s Bull
atos technologies

Hardware and application integration

ThalesAlenia Space
a Thales / Leonardo company



Energy production and storage

Air Liquide
creative oxygen

KALRAY



DDN STORAGE

Receiving technologies

Antenna design

ENGIE

Data storage, distribution, preservation
500 PB/yr

Users

ThalesAlenia Space Day 2017
a Thales / Leonardo company

SKA FRANCE
SQUARE KILOMETRE ARRAY

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From SKA France Coordination to the « Maison SKA France »

- SKA is a fantastic test bench and use case with a global perspective facing a huge worldwide competition
- One year after the creation of SKA France Coordination, the French partners decide to move because they need to increase:
 - direct contact with SKA Organisation
 - image/communication at global scale
 - expertise and technology developments necessary to reach SKA challenges through strong PPPs.
 - the financing capacity for preliminary studies with SKA:
 - direct contracting with SKA countries
 - through collaborative projects, thanks to:
 - regional and national programs: ANR, PIA3, DIM, FUI
 - at European level: H2020, EUREKA Clusters (ITEA3, EUROGIA...)
 - financial engineering: BPI, EIB, WB, AfDB
- Q4 2017: Creation of the Maison SKA France

Rationale

SKA France private and public partners have proposed to organize themselves within a light but efficient legal structure to:

- Acknowledge the capacity and power of academic and industry partners to help achieve SKA's goals
- Be an attractor of the French competencies and expertise to strengthen the potential of SKA
- Be a recognized body to interface with the ministries in France and with the organization SKA
- Be a force of proposition to evolve the SKA program in the best interests of the international astro community.

Objectives

- Demonstrate to the French Research Ministry public-private mobilization to bring France into the Project Office SKA as soon as possible, aiming at 2018
- Promote and recognize the excellence of French scientific teams and industry to be at the fore-front of the science to be developed in SKA
- Develop the expertise and technologies needed to meet the challenges of SKA through strong Private-Public Partnerships. Implementation through theses/postdocs and collaborative research projects on public, private, shared cost or own funds.

The added value of the Maison SKA France

1. Access for companies to SKA in making industry expertise/competence known and acknowledged
2. Get a better insight of SKAO and SKA structure and operations
3. Have industry experts working for and with SKAO in technological consortia
4. Optimize resources engagement for technological solutions preparation corresponding to SKA needs
5. Media impact of the Maison SKA France partners in France and in SKAO.

SKA, new paradigm of research- industry relations

Maison SKA France:

- A MoU, strong real equilibrated PPP, between research organisations and their industry partners
- A means to participate to the SKAO Board works
- A science and technology roadmap
- A forum to develop fundamental research and R&D projects
- A 3-year action, until France becomes SKA country

A precursor of a new business model for Large Research Infrastructures :

- Public-private financing, for both CAPEX and OPEX
- Unique interface between industry partners and SKAO
- Long term, multi-partners, interdisciplinary relationships

A new collaboration scheme for Large Research Infrastructures in France : astro, HPC, energy

- French White Book: 170+ contributors (incl. 20 industry experts)
- 400+ researchers and industry experts

The “Maison SKA France” is ready to put into action this unique opportunity for France and SKA



Thank you !

