



# EU-Africa

## Ideas for collaboration in the context of SKA

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# Agreement on SKA1 and SKA2 implementation (site decision):



| <b>SKA1</b> |            | <b>SKA2</b> |            |
|-------------|------------|-------------|------------|
| SKA1_LOW    | <b>ANZ</b> | SKA2_LOW    | <b>ANZ</b> |
| SKA1_MID    | <b>RSA</b> | SKA2_MID    | <b>RSA</b> |
| SKA1_SURVEY | <b>ANZ</b> | SKA2_AA     | <b>RSA</b> |



SKA1 & SKA2 - dual site implementation  
incorporating MeerKAT & ASKAP precursors

# Evolution not revolution

e.g. *SKA\_Low*:

LOFAR/MWA/PAPER => SKA1\_Low => SKA2\_Low

e.g. *SKA1\_survey*:

APERTIF/ASKAP => SKA1\_survey

e.g. *SKA\_dish*:

AVN/MeerKAT => SKA1\_mid => SKA2\_mid

# Revolution not Evolution?

e.g. SKA2\_AA (South Africa):

FP6 EMBRACE => ??????? => SKA2\_AA

Major part of R&D and Precursor developments unfunded & undefined for SKA-2!



# Current challenges



Extending aperture arrays to higher frequencies  
~ 1420 MHz (neutral hydrogen)



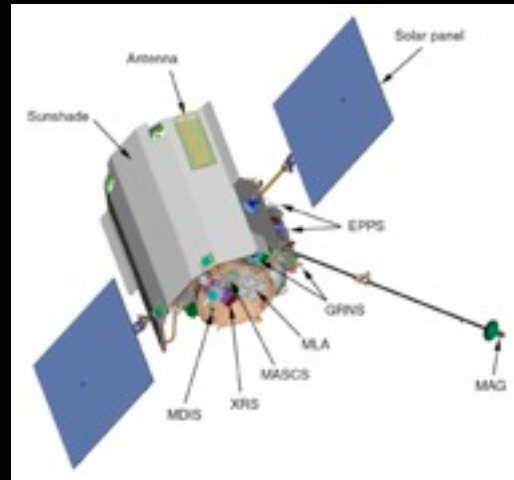




# Explosion of civilian and military applications using Aperture Arrays



Challenge facing Astronomy is how to reduce manufacturing and operating costs while maintaining performance and reliability.



**TracVision A7 - How Does It Work?**

**Easy to Install:** The TracVision A7 mounts to virtually any aftermarket in-vehicle location and is ready to use out of the box. A single cable connects the antenna to the CD receiver inside the vehicle.

**Reliable Connection:** The new antenna TracVision A7 is capable of handling up to 100 channels of 200Kbps CDMA data. All TracVision A7 antennas are factory tested and guaranteed to work for the life of the antenna.

**TracVision A7 Features:**

- 100+ channels of 200Kbps CDMA data
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- 100+ channels of 200Kbps CDMA data

**TracVision A7 Receiver:** The TracVision A7 receiver is a compact, rugged, and reliable device that can be installed in a variety of locations. It features a built-in antenna and a GPS receiver for location tracking.

(b) Beam multiplexing (c) Monopulse beam (d) SAI/SLC

# Scientific Exploitation SKA

Large fraction of SKA located in South Africa

Large fraction of radio astronomers located in Europe

=> EU-RSA connectivity (ICT)

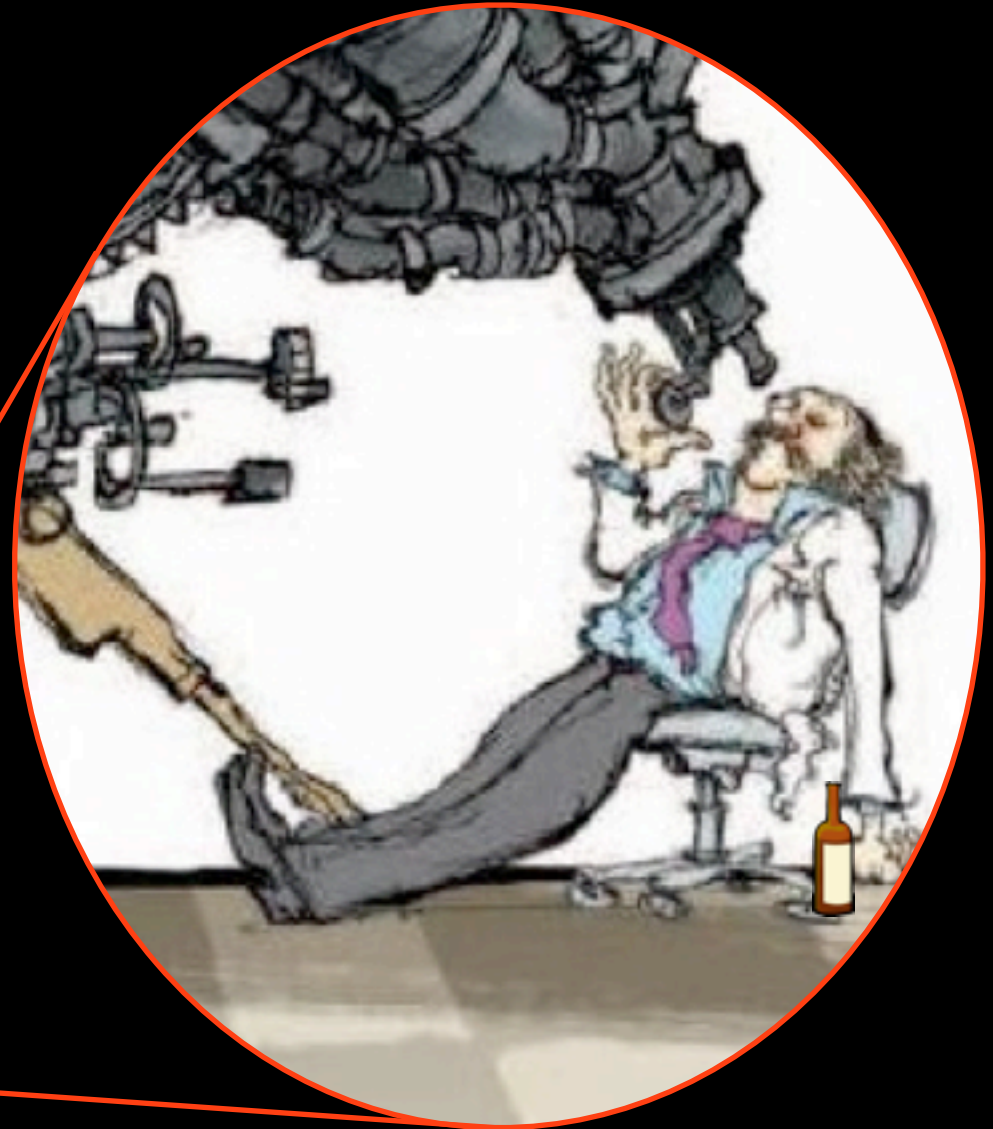
=> Big data (ICT)



# “Big Data” challenges: Exascale computing...

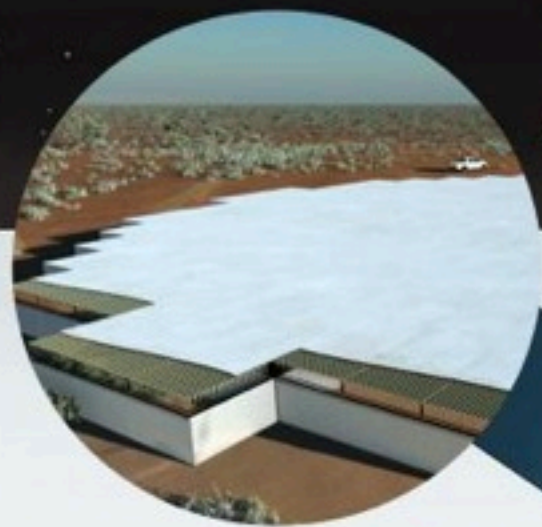


# “Big Data” challenges: Exascale computing...





# Astronomical Data Deluge



## Square Kilometre Array



€1.5b

+ A €1.5 billion global science project



+ Astronomers and engineers from more than 70 institutes in 20 countries



3000

+ 3000 dishes, each 15m wide



+ Using enough optical fibre to wrap twice around the Earth



1,000,000 m<sup>2</sup>

+ A combined collecting area of about one square kilometre



In excess of 1 Exabyte of raw data in a single day - more than the entire daily internet traffic

Megadata



Enough raw data to fill over 15 million 64GB iPods every day



## DOME Focus Areas

- + Advanced accelerators and 3D stacked chips for more energy-efficient computing
- + Novel optical interconnect technologies and nanophotonics to optimize large data transfers
- + High-performance storage systems based on next-generation tape systems and novel phase-change memory





Exascale Technology



# Scientific Exploitation SKA

Large fraction of SKA located in South Africa

Large fraction of radio astronomy community located in Europe

=> EU-RSA connectivity (ICT)

=> Big data (ICT)

=> Distributed & Coordinated Scientific support in Europe...