What is MeerKAT?

Lusaka
Harare
Mozambique
Namibia
Windhoek
Botswana
Molepolole
Gaborone
Pretoria
Johannesburg
Mbabane
Swaziland
Maseru
Lesotho
MeerKAT
Port Elizabeth
Cape Town


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Francistown
Ghanzi
Selebi-Phikwe
Windhoek
Louis Trichardt
Polokwane
Phalaborwa
Gaborone
Thabazimbi
Kanye
Xai-Xai
Nelspruit
Pretoria
Witbank
Barberton
Mafikeng
Johannesburg
Maputo
Mmbatho
Ermelo
Keetmanshoop
Piet Retief
Kroonstad
Newcastle
Bethlehem
Upington
Harrismith
Kimberley
Bloemfontein
Maseru
Durban
De Aar
Carnarvon
Williston
Calvinia
Beaufort West
Graaff-Reinet
Bisho
East London
Oudtshoorn
Robertson
Cape Town
George
Stellenbosch
Mossel Bay
Port Elizabeth

N

1:9,000,000

Legend

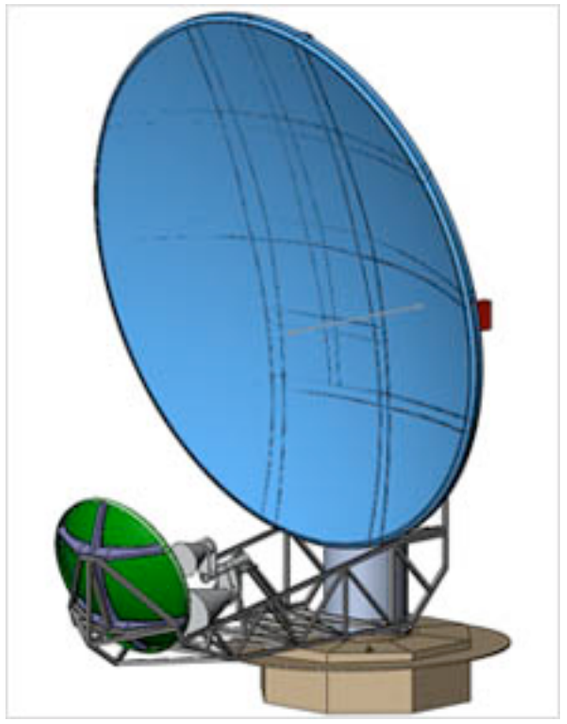
- Core Sites
- Central Sites
- Outer Sites
- Remote Sites
- Towns

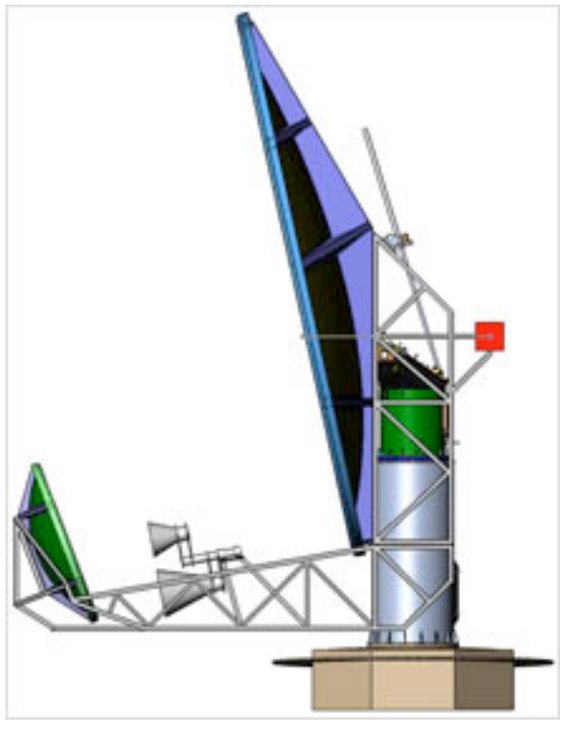
Population density/sq km

- 0 - 2
- 3 - 5
- 6 - 25
- 26 - 50
- 51 - 100
- 101 - 500
- 501 - 2500
- 2501 - 5000
- 5001 - 25000
- 25001 - 200000

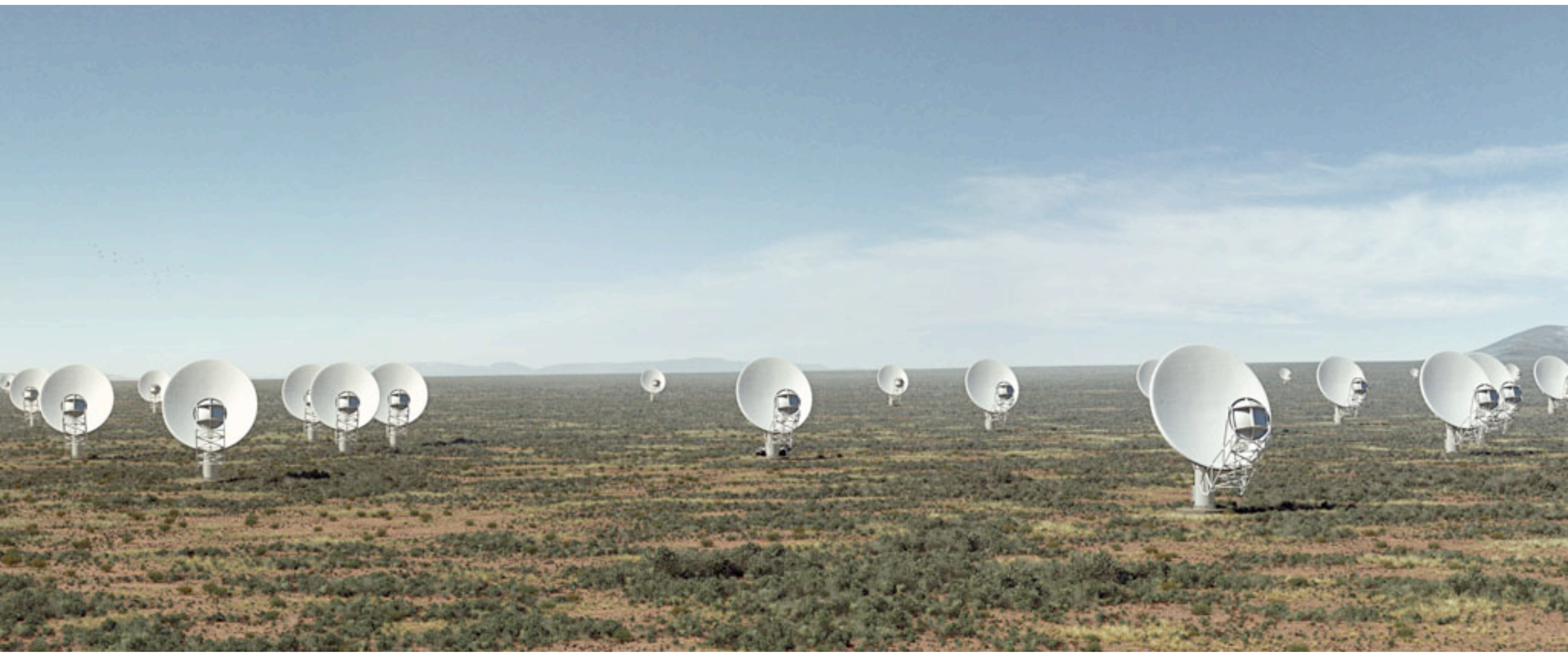
MeerKAT

- Specifications:
  - 64 dishes of 13.5 meters (equiv)
  - Offset Gregorian
  - 70% in core of ~ 1 km
  - 30% in extended configuration of 8 km
  - Single pixel cooled receivers
  - 580 MHz - 1.75 GHz and 8 - 15 GHz
  - [Long baseline “spur” (out to 20 km)]
  - Fully funded
  - Fully commissioned by 2016
- KAT-7 proto-type test bed
  - 7 dishes of 12 meters



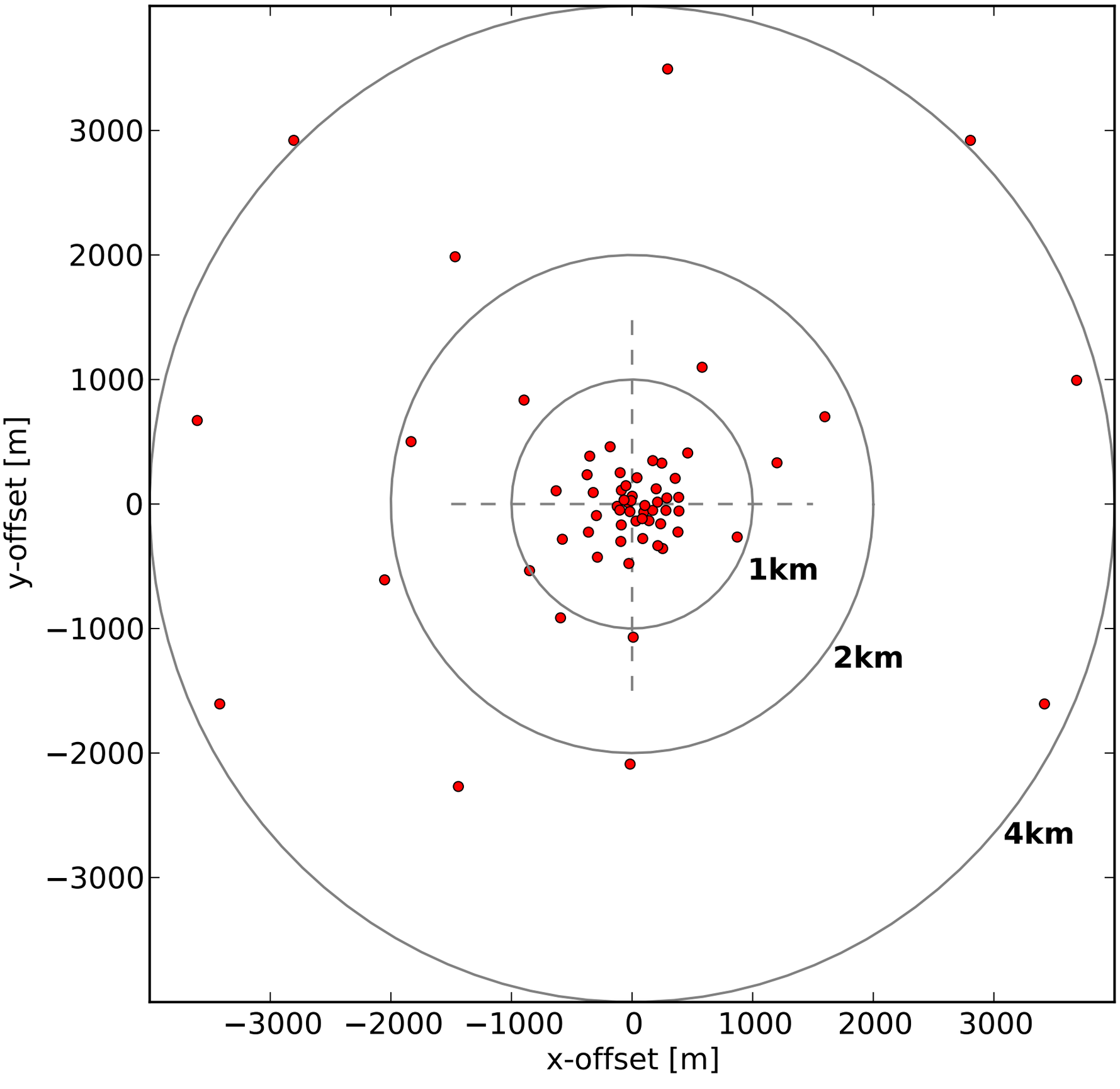


MeerKAT dishes



MeerKAT dishes

shortest baseline 27m
longest baseline 8 km



MeerKAT Goals

- Most sensitive cm instrument in the southern hemisphere
- High-fidelity imaging over >1 order of magnitude in resolution
  - 6”-60”
  - Sensitive to extended low brightness objects
- Excellent instrumental polarization purity
- Time domain capability

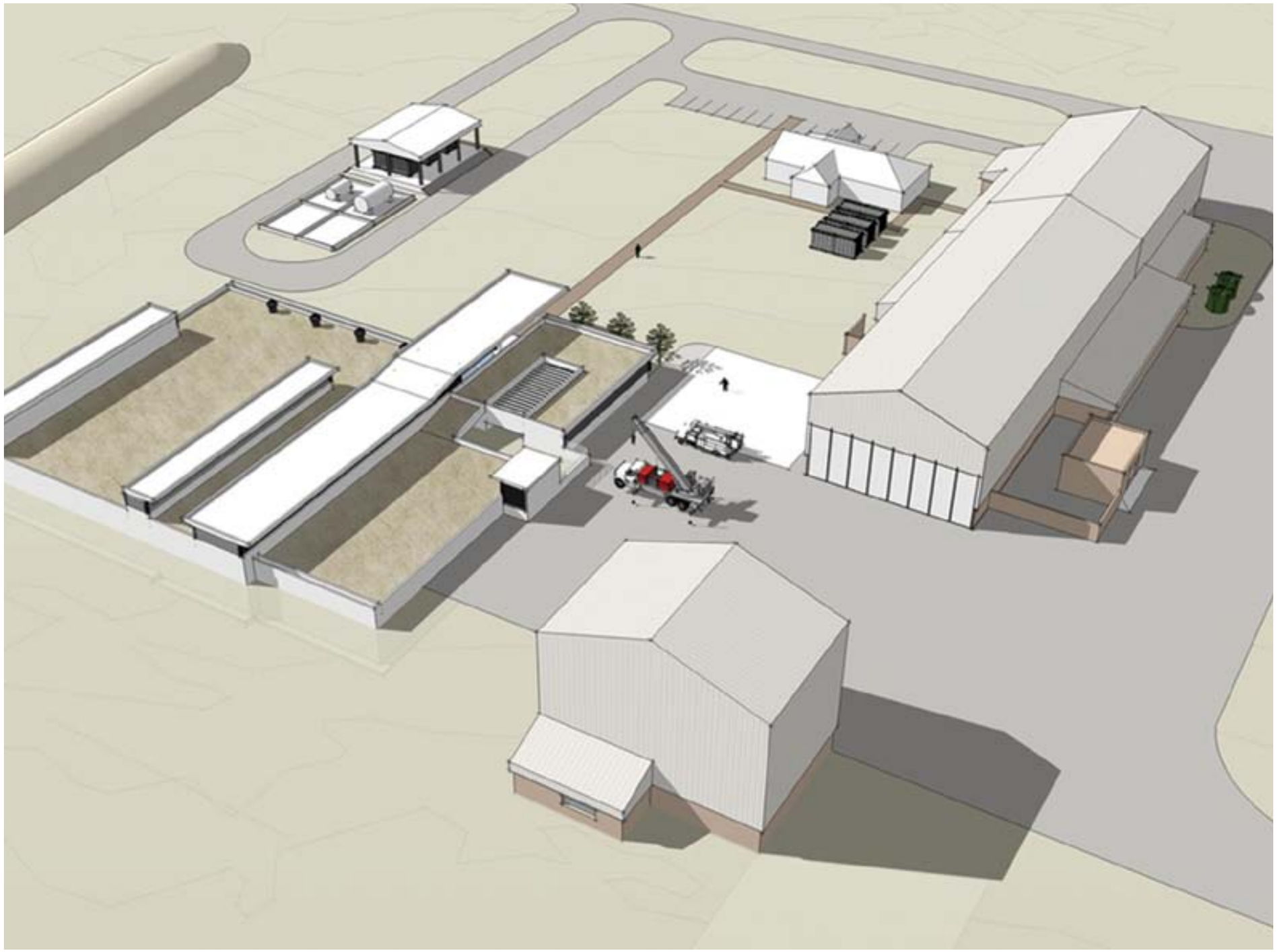
Array Configuration

- Distribution of collecting area:
  - **70% within a dense core with < 1km diameter with baselines down to 27 m**
    - Extended low surface brightness emission
    - Radio transients
  - **30% randomly scattered out to 8 km**
    - High dynamic range imaging
    - Short exposure imaging
  - **[~7 antennas out to 20 km]**
    - Rotation and bandwidth synthesis imaging
    - Source localization

Karoo Radio Astronomy Reserve

Site Complex

From next year



The Losberg Site Complex with extended dish manufacturing shed (top right), pedestal integration building (bottom right), and the bunker housing the Karoo Array processor building and the power building (bottom left).

KAT-7 Views

MeerKAT Large Proposals

- Request for Proposals in late 2009
- 75% of available time: ~43000 hours
- Projects > 1000h in 5 years
- Deadline March 15, 2010
- 21 proposals received

Approved Projects

- **Priority Group 1**
  - Radio Pulsar Timing (PI: Bailes): 7860h
  - HI Deep Field (PIs: Blyth, Holwerda, Baker): 5000h
- **Priority Group 2**
  - MESMER: MeerKAT Search for Molecules in the Epoch of Re-ionisation (PI: Heywood): 6500h
  - MeerKAT Absorption Line Survey (PIs: Gupta and Srianand): 4000h
  - MHONGOOSE: MeerKAT HI observations of Nearby Galactic Objects: Observing Southern Emitters (PI: de Blok): 6000h
  - TRAPUM: Transients and Pulsars with MeerKAT (PIs: Stappers and Kramer): 3080h
  - A MeerKAT HI Survey of Fornax (PI: Serra): 2450h
  - MeerGAL: A MeerKAT High Frequency Galactic Plane Survey (PIs: Thompson and Goedhart): 3300h
  - MeerKAT International GigaHertz Tiered Extragalactic Exploration (MIGHTEE) Survey (PIs Van der Heyden and Jarvis): 1950h
  - ThunderKAT: The Hunt for Dynamic and Explosive Radio Transients with MeerKAT (PIs: Woudt and Fender): 3000h
  - (VLBI)

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- **Neutral Hydrogen**
  - in the early Universe
  - at low column densities
- **Transients**
  - Pulsars
  - Variable sources

MeerKAT Science

- Low column density HI associated with the Cosmic Web and galaxy environments
- Ultra-deep pencil beam HI surveys: direct detections at z=0.2-0.3, stacking out to z=0.6-0.7
- High spatial dynamic range HI imaging of nearby galaxies and clusters
- HI absorption
- Ultra-deep narrow-field continuum surveys down to micro-Jansky levels
- Mapping magnetic fields in clusters
- Pulsar timing and monitoring
- Transients detection and follow-up
- OH mega-masers and Zeeman splitting
- Galactic gas dynamics and magnetic fields
- VLBI, SETI

March 2012 First Extragalactic HI