MeerKAT and KAT-7

A.C.Schröder[1,2] and the MeerKAT team[2]

[1]HartRAO, [2]SKA-SA/KAT

Abstract

MeerKAT is the South African SKA precursor and KAT-7 is its 7-dish prototype currently being commissioned. Here is an overview of the MeerKAT design and time line and some results of the KAT-7 commissioning.

MeerKAT Design

Antennas:
- Gregorian offset
- 13.5 m equivalent diameter
- 15 degree lower elevation limit

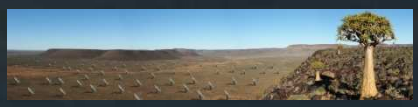
Array:
- min baseline 29 m
- max baseline 8 km (Phase 1)
- max baseline 20 km (Phase 2)

Receiver:
- 3 receivers:
  - 0.58 – 1 GHz (Phase 2)
  - 1 – 1.75 GHz (alternatively 0.9 – 1.5 GHz) (Phase 1)
  - 8 – 14.5 GHz (Phase 2)
- possible upgrade later with 1.7 – 3.0 GHz

General:
- FOV @ 1.4 GHz: 1 degree
- dynamic range @ 1.4 GHz: 10^6 : 1
- processed bandwidth: up to 2 GHz (goal 4 GHz) in Phase 2
- 220 m^2/T_{sys} @ 1.4 GHz
- spectral line mode: Δv = 0.5 – 10 km/s (goal 0.15 km/s) depending on BW
- fastest dump rate for imaging: 100 ms
- fastest imaging snapshots: 1s

MeerKAT

The Karoo Array Telescope, MeerKAT, is South Africa's SKA precursor and will consist of 64 dishes with a 13.5m diameter. The dual-polarization single-pixel receivers will have a desired T_{sys} = 30K. The array will be located near the proposed SKA core site in the Karoo region of the Northern Cape Province. Key sciences include the evolution of galaxies and large-scale structures, dark matter, cosmic magnetism and the nature of transient radio sources.



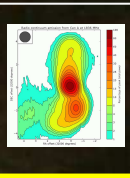
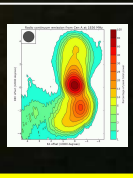
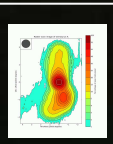
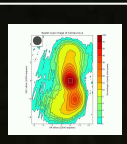
KAT-7

MeerKAT antenna:

MeerKAT time line

MeerKAT preliminary design phase	until July 2011
MeerKAT detailed design phase	July 2011 – end 2012
Antenna prototype and commissioning	2013
Antenna and receiver (phase 1) production	2013 - 2016
Commissioning (in parallel to production)	2014 - 2016
First science with first subarray	2015
First science with full array	end 2016
Phase 2 receivers available for science	2018/19 (estimated)

KAT-7 Commissioning results for warm feeds

	Ant 1 HH	Ant2 VV	Ant 2 HH	Ant2 VV	Ant 3 HH	Ant 3 VV	Ant 4 HH	Ant 4 VV
Aperture efficiency	54.9%	59.8%	63.4%	63.5%	54.1%	58.7%	46.7%	47.0%
stdev	5.1	4.5	5.5	5.5	6.0	4.4	4.3	3.4
T_sys	74.7 K	80.5 K	77.7 K	76.7 K	74.7 K	80.5 K	74.6 K	72.3 K
stdev	3.6	3.5	4.3	3.7	3.6	3.5	7.4	6.8
All-sky pointing rms	0.′ 76		0.′ 76		0.′ 79		0.′ 91	
Cen A raster map								

Cen A interferometric image, 4 antennas, single polarisation: