

The Karoo Array Telescope MeerKAT



SKA SOUTH AFRICA
SQUARE KILOMETRE ARRAY

Justin Jonas

Associate Director: Science & Engineering
SKA SA Project Office

&

Dept. Physics & Electronics
Rhodes University



PRA 2009

MeerKAT Overview



- Most sensitive centimetre instrument in the southern hemisphere
 - With matching dynamic range
- Imaging over an order of magnitude in resolution
 - 6" - 60"
 - Sensitive to extended low brightness objects
- Excellent polarization purity
- Time domain capability
- Expressions of interest to be issued soon
 - Complementary to ASKAP

High Level Specifications



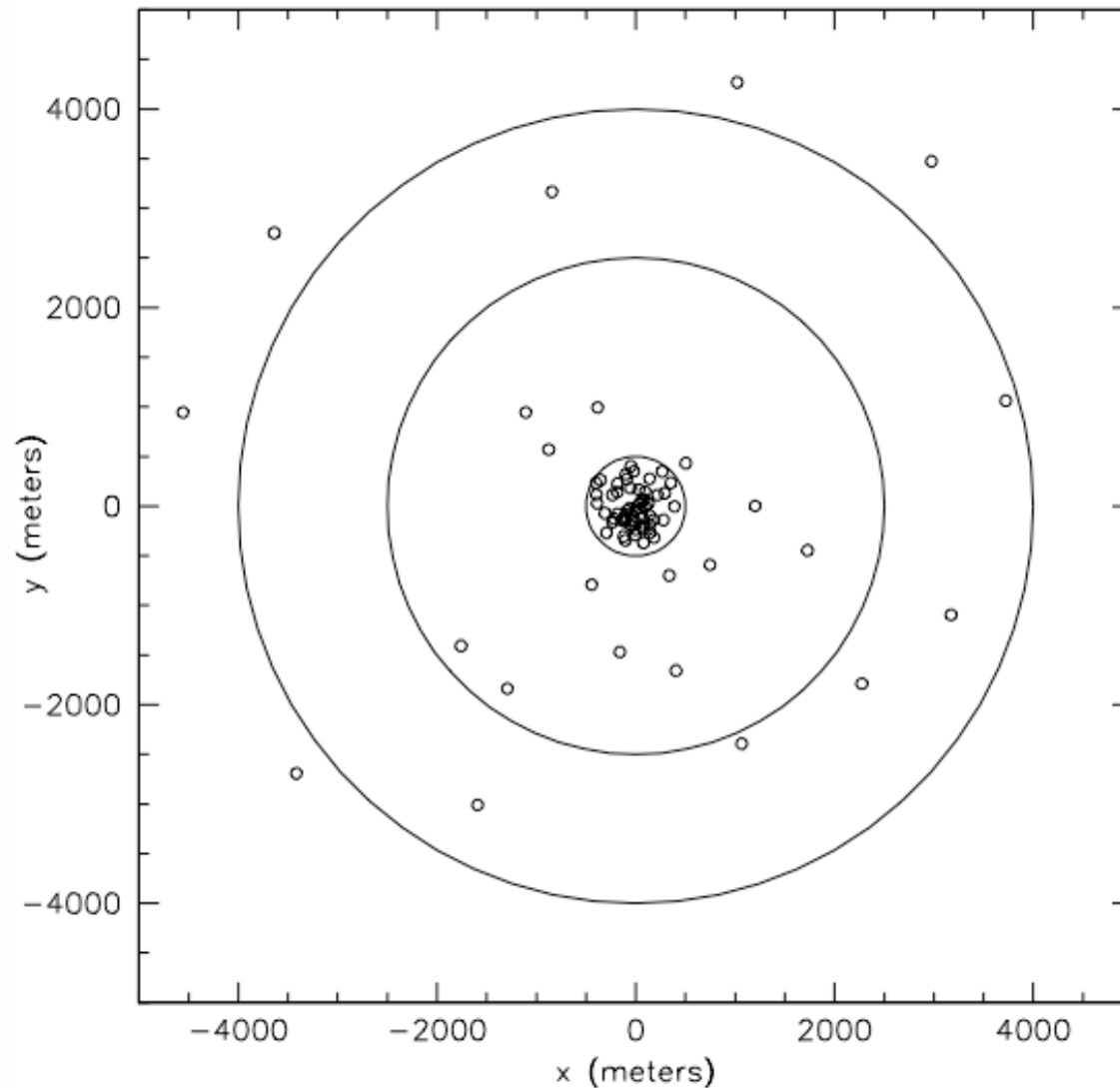
Metric	SKA P1	Full SKA	KAT-7	MeerKAT
F_{low}	500 MHz	500 MHz	1.2 GHz	700 MHz
F_{high}	10 GHz	10 GHz	1.95 GHz	10 GHz
A_e/T_{sys}	2 000 m ² /K	12 000 m ² /K	16 m ² /K	200 m ² /K
DR_{imag}	60 dB	70 dB	30 dB	60 dB
DR_{spec}	50 dB	50 dB	30 dB	50 dB
X_{pol}	-25 dB	-25 (30) dB	-20 dB	-25 dB
BW	512 MHz	2 048 MHz	256 MHz	1 024 MHz
N_{chan}	16 384	32 768	4 096	32 768
T_{int}	0.1 ms	0.1 ms	<1 s	0.1 ms

Frequency Coverage

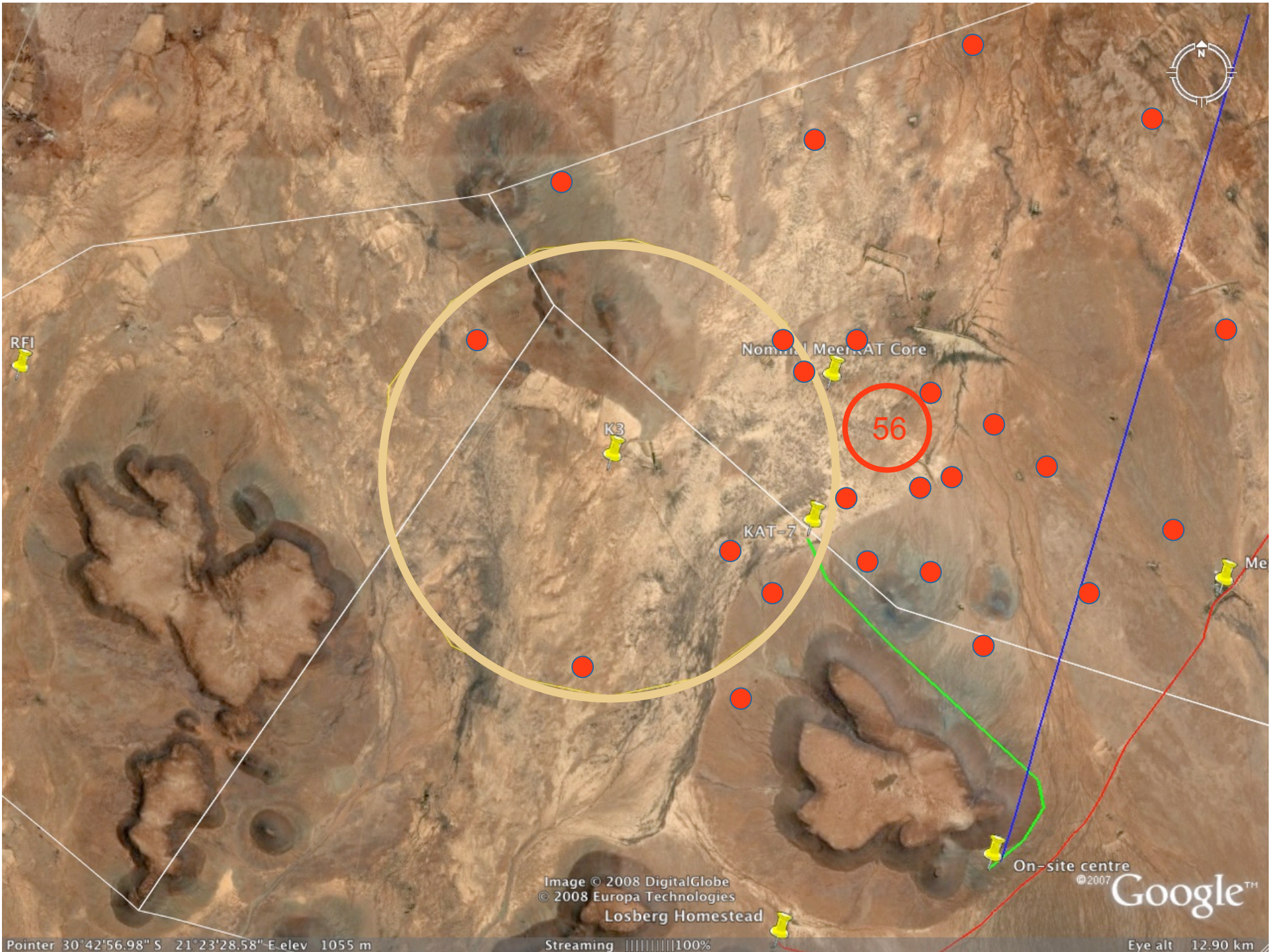


WBFs	V-WBFs	U-WBFs
0.9-1.48 GHz	0.7-1.3 GHz	0.7-2.5 GHz
1.5-2.4 GHz	1.3-2.5 GHz	
4-6.5 GHz		2.8-10 GHz
6.2-10 GHz	5-9 GHz	

Reference Configuration



- Circles:
 - 1 km
 - 5 km
 - 8 km



RFI

Nominal Meen AT Core

56

K3

KAT-7

Me

On-site centre

Image © 2008 DigitalGlobe
© 2008 Europa Technologies
Losberg Homestead

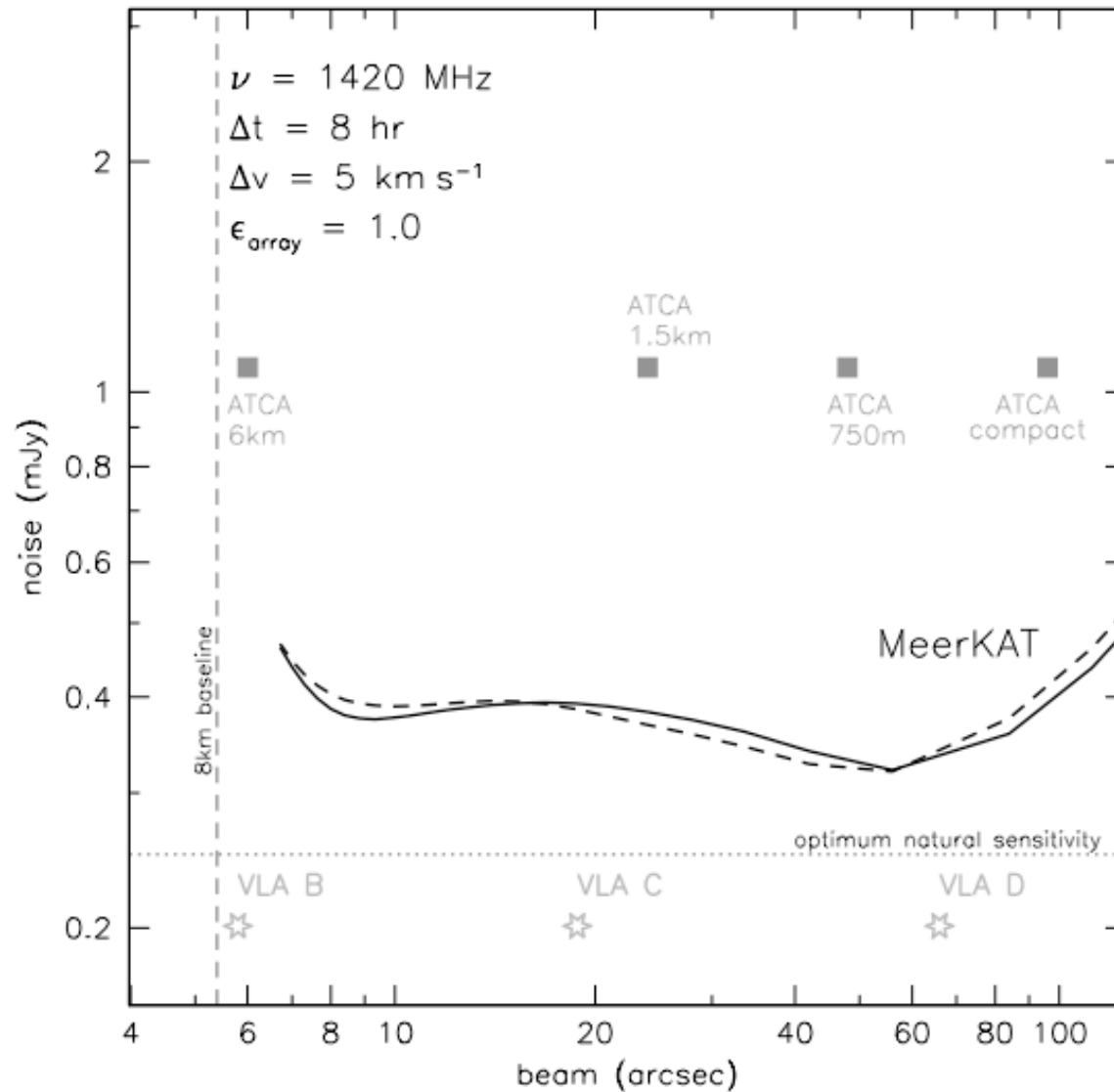
Google™

Pointer 30°42'56.98" S 21°23'28.58" E elev 1055 m

Streaming ||||| 100%

Eye alt 12.90 km

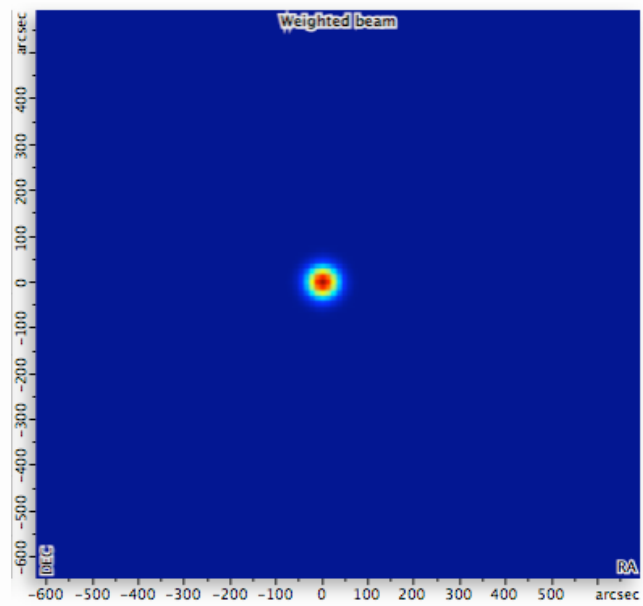
Reference Configuration



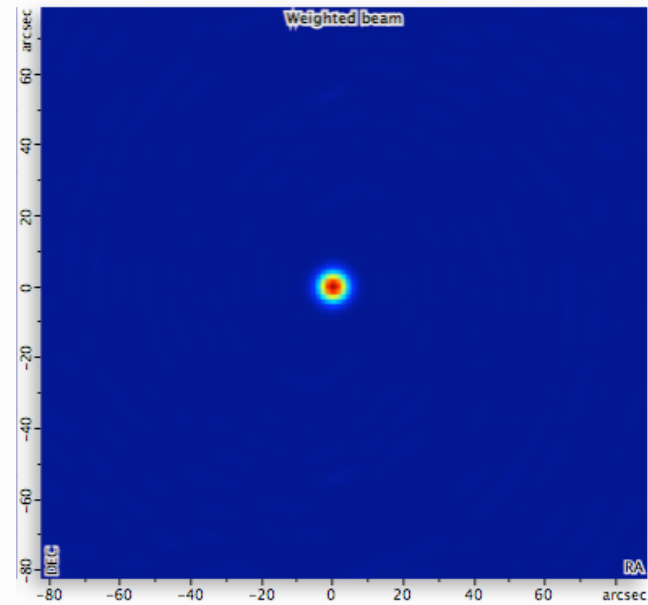
Beam Performance



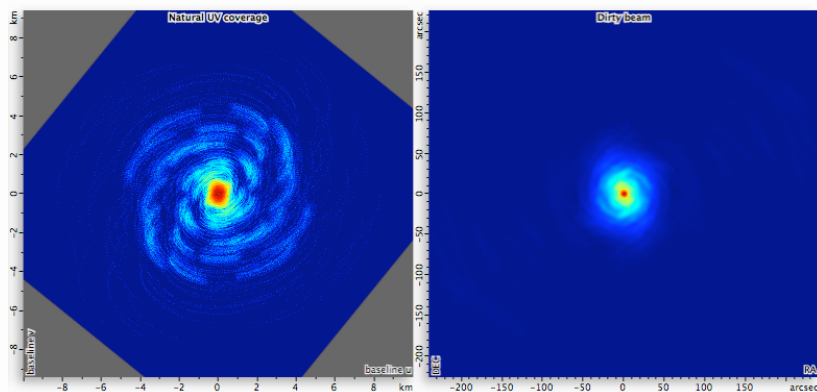
Compact Core (weighted)



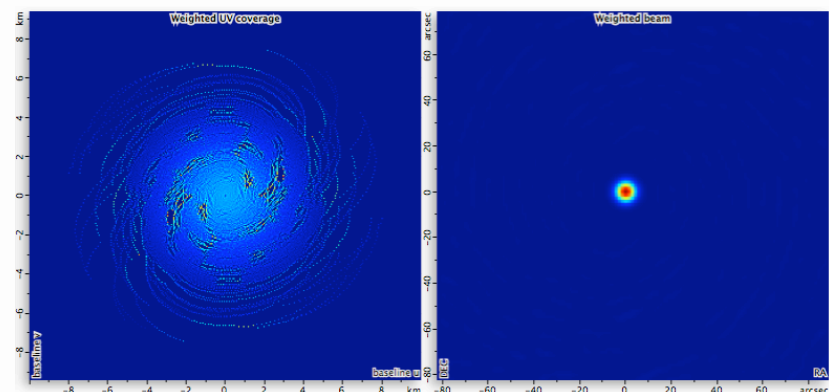
Full Array (weighted)

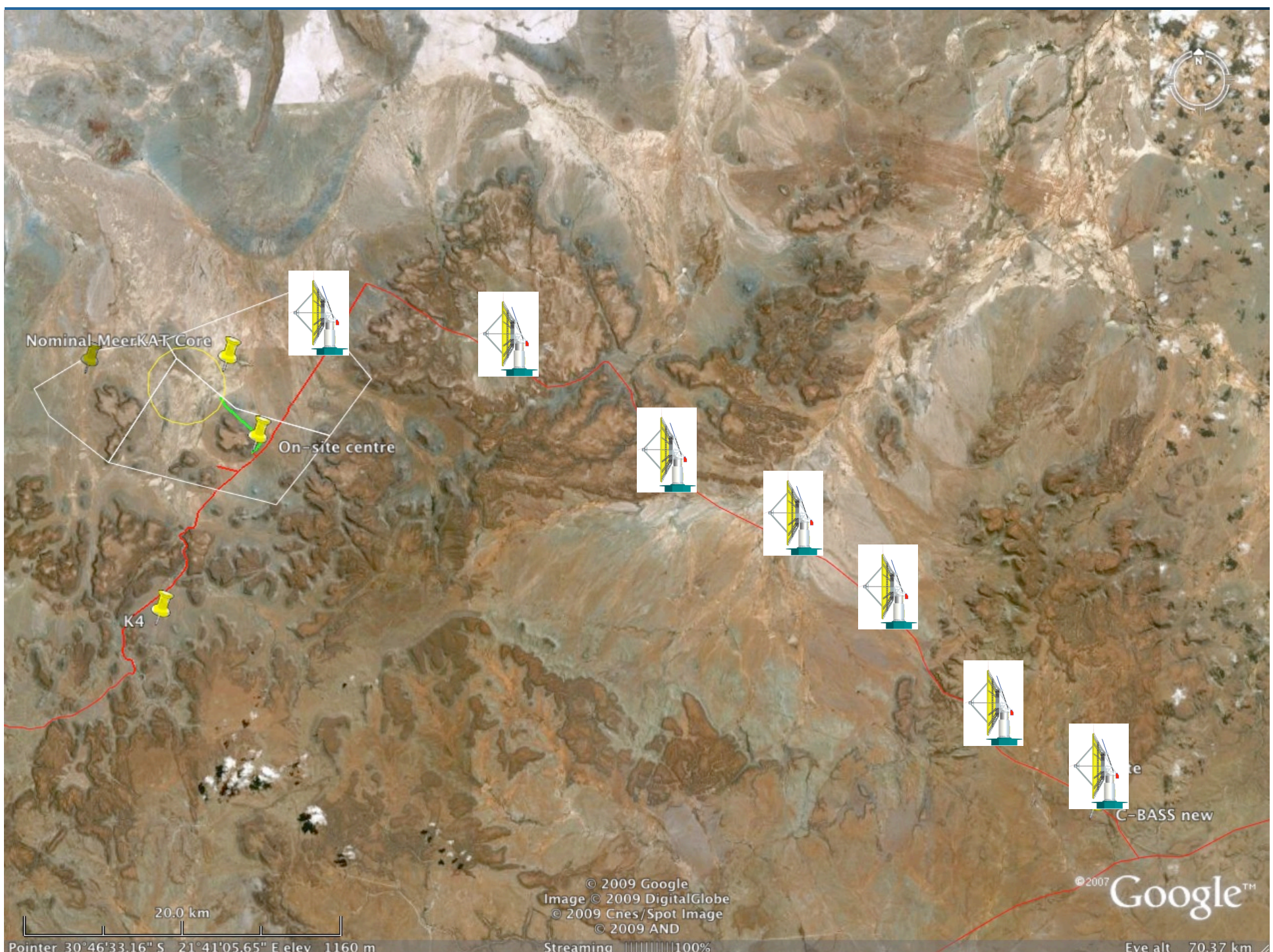


Full Array (no weighting)



Full Array (weighted)





Nominal MeerKAT Core

On-site centre

K4

C-BASS new

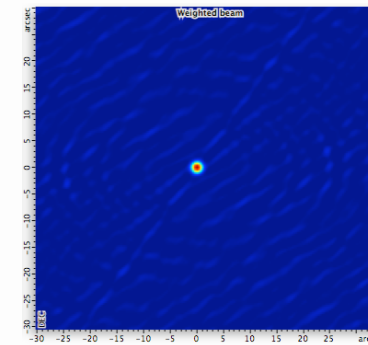
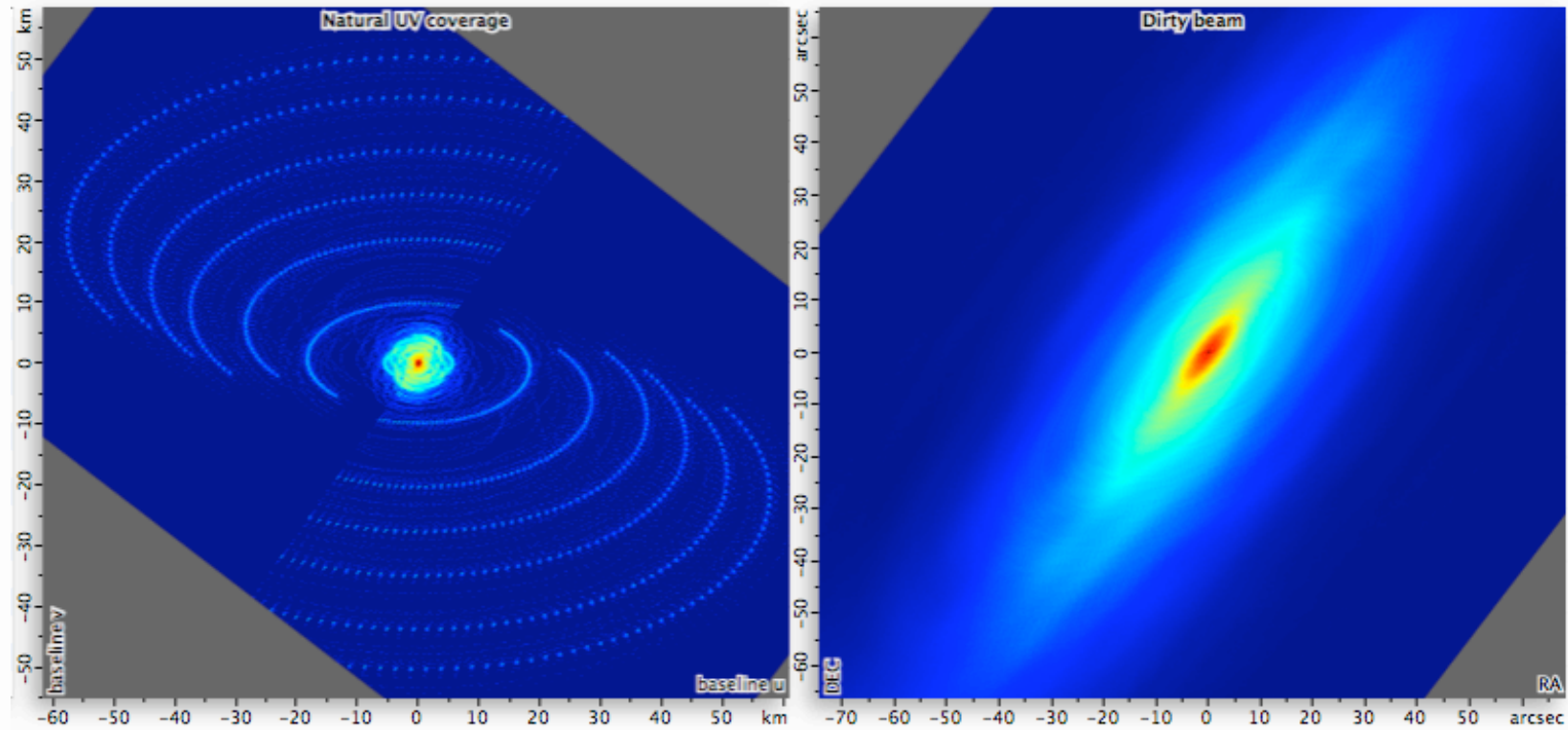
20.0 km
Pointer 30°46'33.16" S 21°41'05.65" E elev 1160 m

© 2009 Google
Image © 2009 DigitalGlobe
© 2009 Cnes/Spot Image
© 2009 AND
Streaming 100%

© 2007 Google™

Eye alt 70.37 km

Extended “E-W” Array



Observing Modes



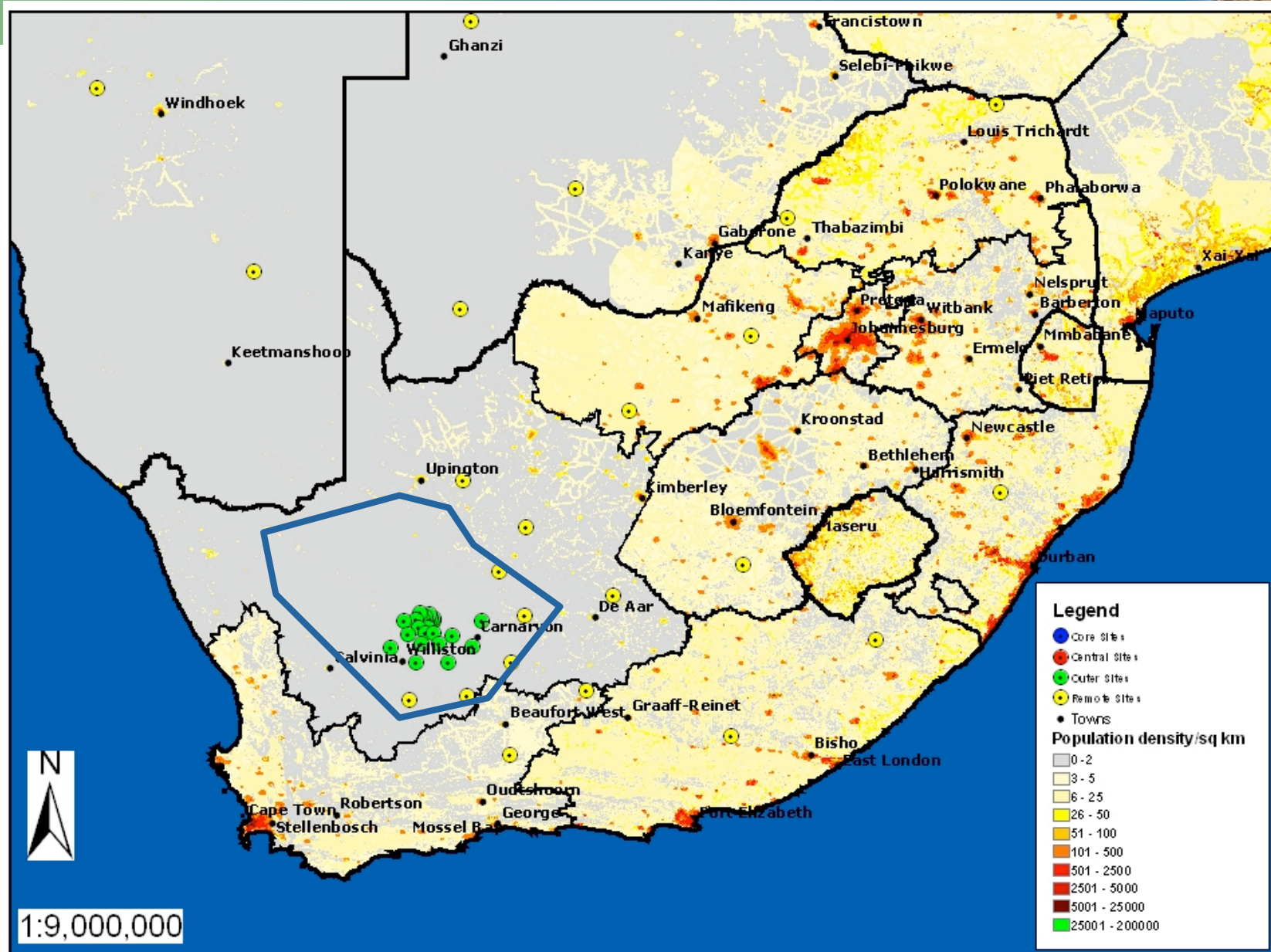
- Continuum and line imaging
 - Stokes IQUV
- Array beamforming
 - Stokes IQUV
 - Voltage signal recording
- Queue-scheduled
 - Sub-array capability
- Spigots
 - V signal recording
 - On-line back end “user instruments”

Observing Programmes

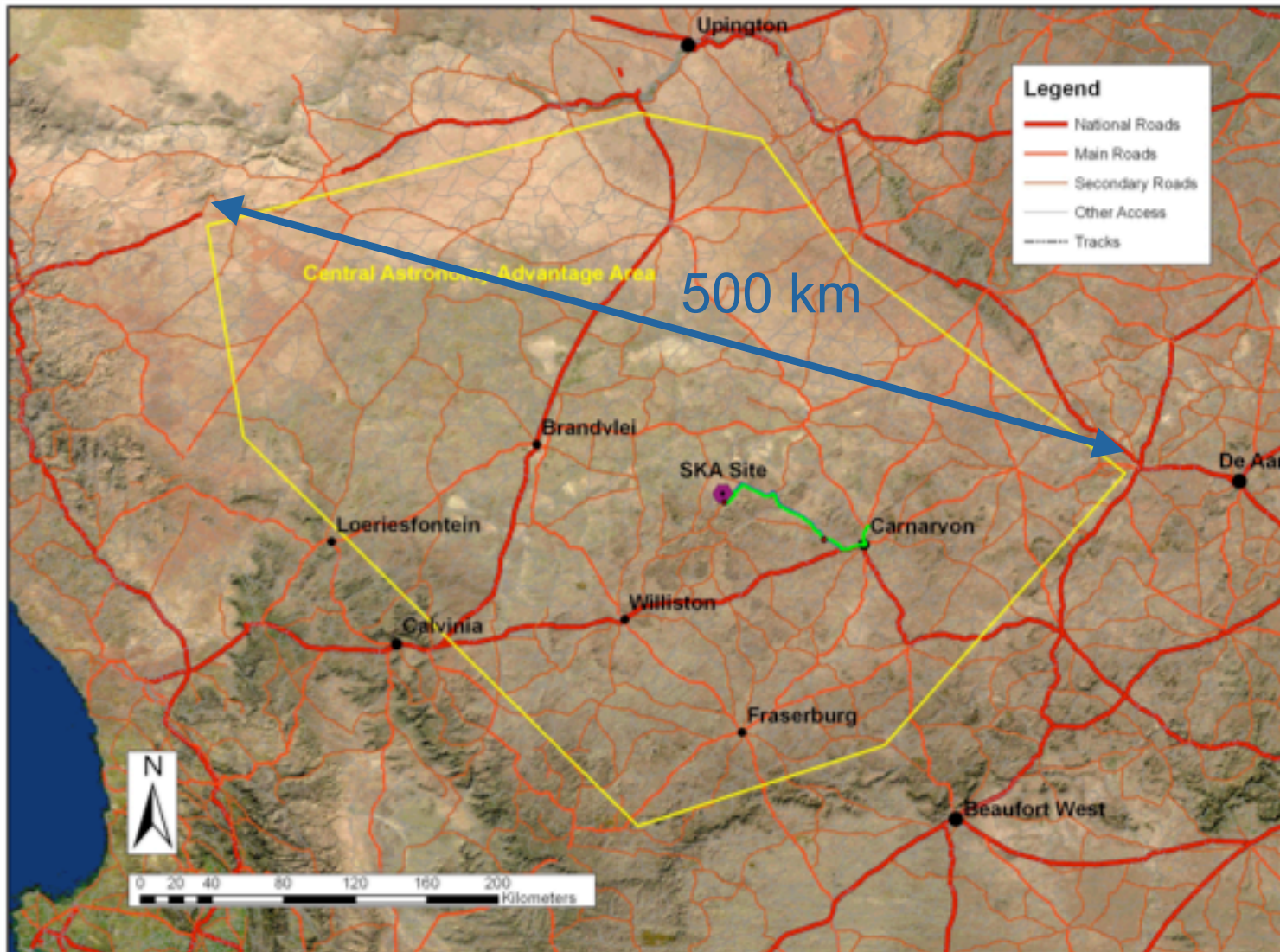


- HI emission & absorption point source surveys
- Continuum & HI mapping of extended low-brightness emission
 - Extragalactic and Galactic
- Continuum Stokes IQUV mapping
- Faraday rotation synthesis
- Radio transients
 - Compact array core
 - Voltage signal recording (10 Ge spigots)
- Other line emission
 - OH
 - H recombination

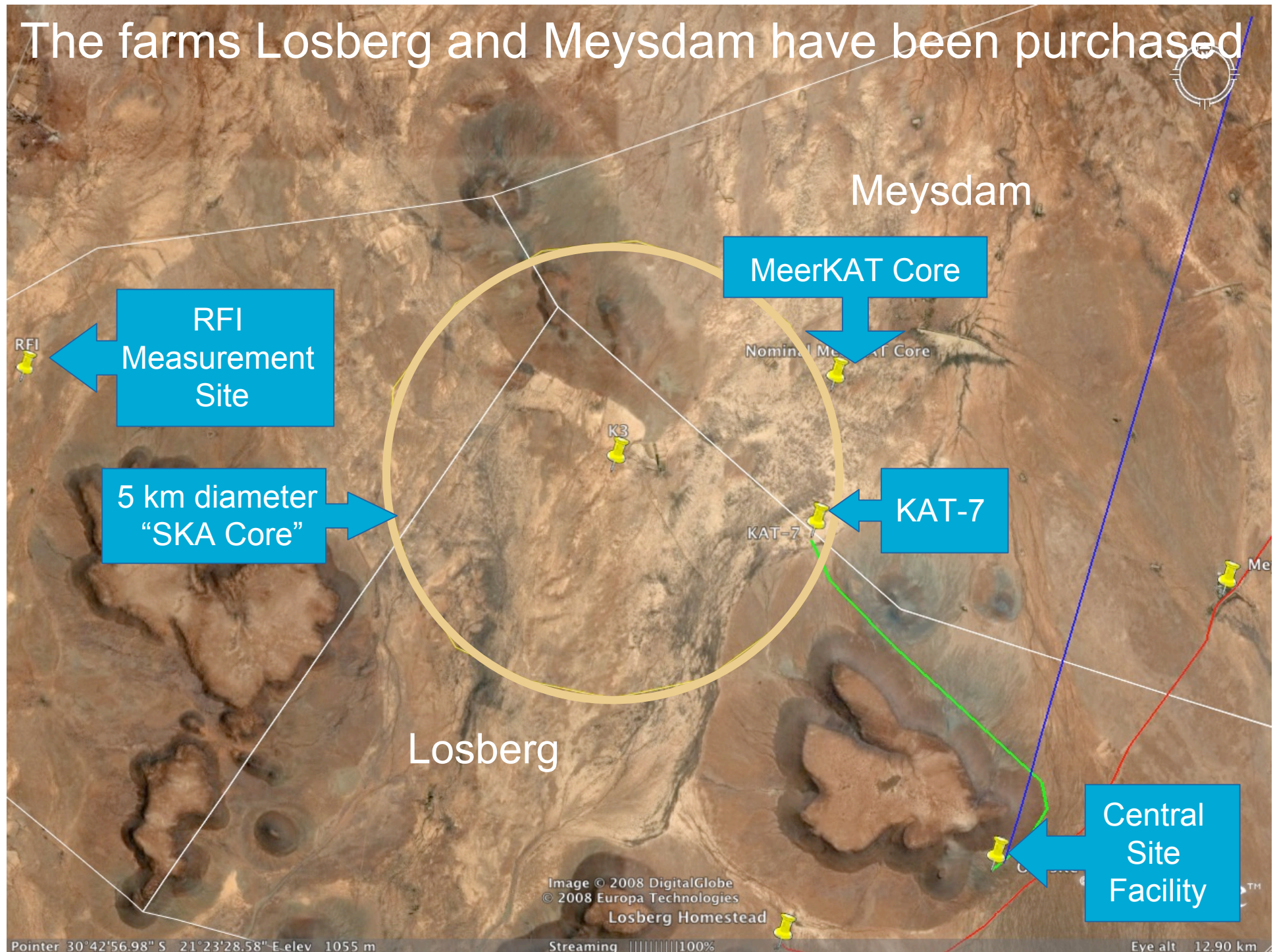
Karoo Radio Astronomy Reserve



Karoo Radio Astronomy Reserve



The farms Losberg and Meysdam have been purchased



KAT-7 Site



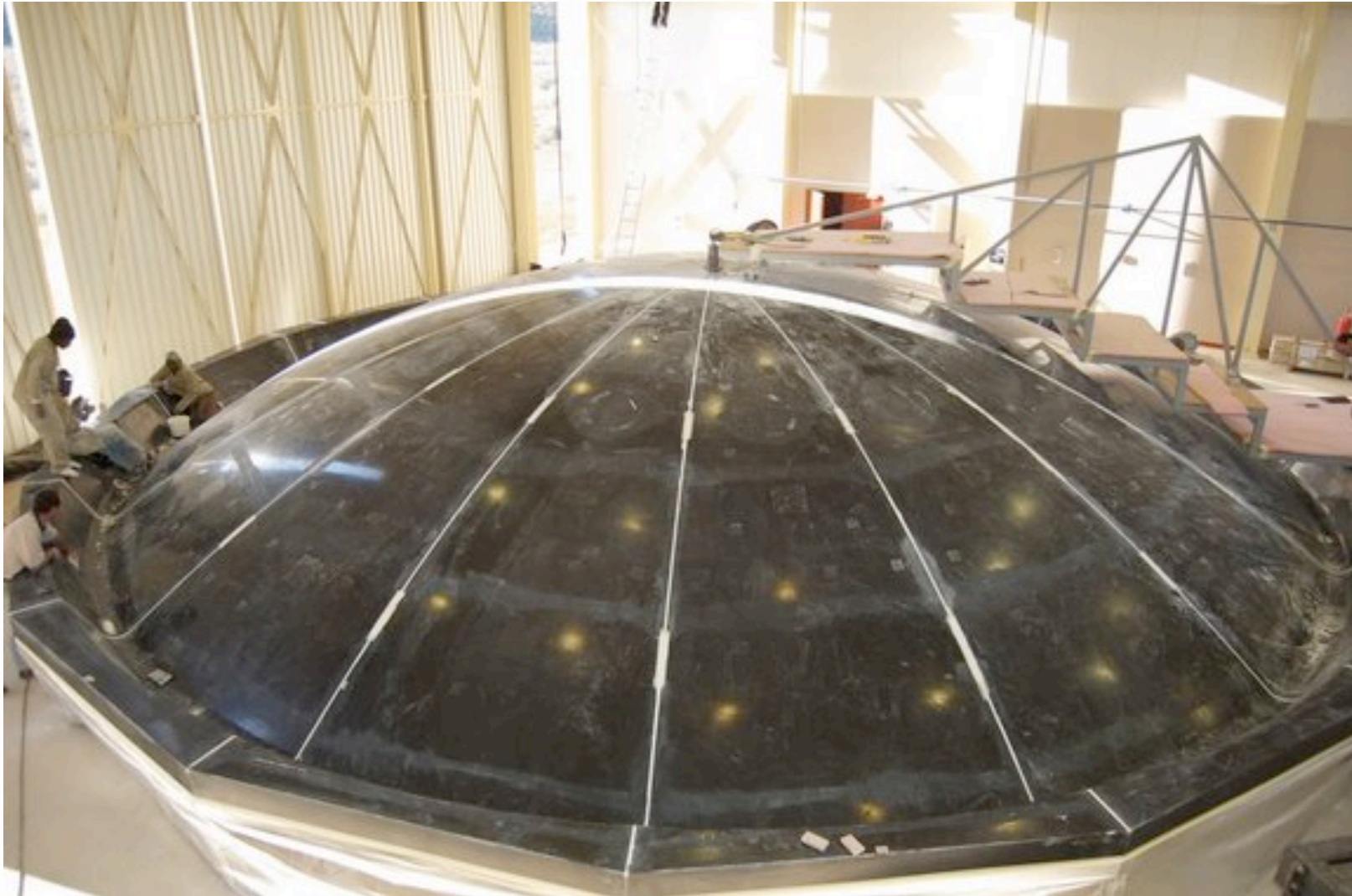
Central Site Facility



Dish Fabrication Facility



Dish Mould



Dish Backing Structure



Dish Transporter



KAT-7 12-m Dish



“Industrialization model”
being constructed at BAe
(formerly IST) premises in
Pretoria









On-site Accommodation



Accommodation



www.ska.ac.za



Meerkat

