

Meerkat dish prototype tested

By Staff writer

Posted: 2 October 2007

The Hartebeesthoek Radio Astronomy Observatory (Hartrao) and contractor IST are conducting tests on the prototype Meerkat 15m reflector antenna dish, which could form the core of the world's largest radio telescope.

SA and Australia are on the shortlist to host the R10 billion Square Kilometre Array. Once operational in the decade after 2010, the telescope will give scientists new insight into how the universe was formed.

Writing in the latest edition of the SKA SA newsletter, Willem Esterhuyse, of the Meerkat project office in Cape Town, said his team has installed the last of the control system components on the Meerkat prototype at Hartrao and commissioned and tested the dish.

"A myriad of tests were performed, the most important of which were related to proof of the surface and the pointing/tracking capability of the dish," he says.

"The conclusion from all these tests were that the ... surface performs very well, the surface accuracy is better than 2mm RMS (the original specs were 4mm RMS) and that the dish efficiency is as expected," he adds. "IST also performed a number of pointing and tracking tests in order to refine the pointing model.

"The pointing and tracking performance of the antenna seems to be significantly better than the specified 0.04 deg."

Esterhuyse says the better-than-specified surface accuracy and pointing performance will allow operation to higher frequencies than originally specified, which may be imported to SKA, depending on the SKA science case.

He says the "rest of the year will be spent on changing the design of the prototype to that of 12m (as that is the likely size of the dishes); as well as to optimise the antenna structure for cost, since achieving the SKA cost target is the main remaining challenge".

Further tests and specs

At present, the antenna is being configured for two more tests, both related to the unwanted multiple bounce of energy between the parabolic reflector surface – especially the area around the vertex – and the feed cluster package at prime focus.

In a related development, designers have also been refining Meerkat's scope, specifications and development strategy, which echoes plans for the SKA.

The draft SKA specifications document outlines various scenarios for the implementation of the various phases of the SKA. One scenario specifies the use of medium-sized dishes, 10m to 15m wide, with "single-pixel wideband

feeds" as the receptor for the SKA mid-frequency band (500MHz to 3GHz).

The Meerkat scope document specifies Meerkat as a demonstrator for this SKA concept. The reference design specification for Meerkat is an array of 80 12m dishes, with single-pixel wideband feeds covering the 500MHz to 2.5GHz frequency range.

The receivers will be cryogenically cooled to achieve the best sensitivity possible. The array configuration will be centrally concentrated to provide good brightness temperature sensitivity, but will also extend out to nearly 10km in order to provide sufficient resolution for optical cross-identification.

The Meerkat scope document also outlines the development path necessary to ensure Meerkat is implemented successfully, within budget, and on time. An important phase in this development path is the construction of the KAT-7 prototype array at the Karoo site. KAT-7 will, primarily, be an engineering test-bed, but it will also be capable of scientific observations and will be the first seven antennas of the full Meerkat array.

This document is not yet in the public domain. It is undergoing review and will be made public once that process is complete, the SKA newsletter says.

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