

Hartebeesthoek Radio Astronomy Observatory Report

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Abstract

The 26m radio telescope of the Hartebeesthoek Radio Astronomy Observatory (HartRAO) suffered a failure of the main bearing in the polar shaft in 2008 October. This was replaced in 2010 and the telescope returned to service. Very Long Baseline Interferometry (VLBI) restarted in 2010 August. The internet link to other continents operates at 1 GB/s, permitting e-VLBI at this data rate with the European VLBI Network (EVN).

1 Introduction

HartRAO was established in 1975 from the decommissioned NASA Johannesburg tracking station DSS51. Primary research instrument is the 26m equatorially mounted radio telescope. This is equipped with dual-polarization receivers operating in the 18, 13, 6, 5, 3.5, 2.5, and 1.3cm wavelength bands. All but the last two are cryogenically cooled. It is equipped for radiometry, pulsar timing, spectroscopy, and VLBI using a Mark 5 terminal. It is used for astronomical, astrometric and geodetic VLBI and single-dish observing.

2 26m Telescope Bearing Failure

On 2008 October 03 it was realised that the large bearing at the south end of the polar shaft was failing. Observing was immediately shut down. Various options were then evaluated, and in 2009 July it was decided to replace the bearing and return the telescope to service. This major engineering task was completed on 2010 July 20 and observing restarted two days later. During the period out of service the opportunity was taken to service and upgrade most of the receivers.

3 26m Telescope Return to Service

As the only operational radio telescope in Africa, the 26m telescope is in demand for astronomical, astrometric and geodetic VLBI. A heavy schedule of VLBI's resumed after the return to service. The arrival of the SEACOM undersea cable at Mtunzini on South Africa's East coast in 2010 provided a massive increase in communications bandwidth to other continents. With this new international connection and the "last mile" fibre connection to HartRAO installed in 2009, wideband e-VLBI became possible and 1 GB/s connectivity with the EVN is regularly achieved.

4 Conversion of 15m Telescope

In 2007 the 15m "eXperimental Development Model" (XDM) for the Karoo Array Telescope was built at HartRAO, using a novel one-piece fibreglass main reflecting surface. This was equipped with an 18-21cm wavelength receiver for testing. A new 13+3.5cm receiver is being built at HartRAO to replace the original receiver, with the aim of providing a geodetic VLBI capability. This will offload the 26m telescope. Two Digital Base Band Converters (DBBC) and a second Mark 5 terminal are being purchased to permit simultaneous VLBI with both telescopes.