Current Status of the Tidbinbilla 70m Radio Telescope

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The Tidbinbilla 70m radio telescope, also known as Deep Space Station 43 (DSS-43), is one of the antennas at the Canberra Deep Space Communication Complex (CDSCC) located at Tidbinbilla near Canberra. The CDSCC is one of three stations that make up the NASA Deep Space Network (DSN), and the primary purpose of station's antennas is to track spacecraft and space probes for NASA and other space agencies. Some antenna time not used for space communication is scheduled for Host Country radio-astronomy observations and is open to the astronomical community. In this paper, I report the current status of the 70m dish and highlight two recent development projects: the OTF mode and the wideband K-band receiver system.

The Tidbinbilla 70m dish is the most sensitive single antenna in the southern hemisphere, and has played a unique role for many different projects such as VLBI experiments to increase imaging sensitivity and single dish surveys to detect weak sources. Such single dish projects include observations of water maser sources toward Galactic and extra-galactic objects, both using the DSS-43 K-Band receiver system which covers 18-26.5 GHz. Despite its superb sensitivity, the 70m had two limitations that reduce its effectiveness for certain key scientific projects, such as mapping large areas of the sky and observing many different transitions simultaneously. These limitations have been: first, a lack of an On-The-Fly (OTF) mapping mode, which allows observers to generate maps with raster scans (mapping is currently conducted point by point); and second, the current analogue spectrometer (correlator) can only process a limited bandwidth (64 MHz at two IFs with the existing ATNF correlator). These limitations, however, have now been overcome with the implementation of the OTF mode as well as installation of the new K-Band system.

We have recently installed a new, NASA/JPL-developed, wide band K-band receiver system on the 70m dish. These system has 2 beams, with dual-polarisation feeds for each beam, with the new wideband down-converter, which is capable to process 2 beams x 2 side bands x 2 polarizations x 1 GHz band at once, i.e. an 8 GHz instantaneous band. The system covers 17-27 GHz. In addition, we set up a new wide band spectroscopy backend. The system adopted four CASPER/ROACH spectrometers that cover 1 GHz band by each. This new backend with the K-Band frontend will be used for the Tidbinbilla AGN Maser Survey (TAMS) project. The system is also suited for multi-transitional mapping projects, taking advantage of wide band and dual beam capability.