

The Australian SKA Pathfinder

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The Australian Square Kilometre Array Pathfinder (ASKAP) is one of the key precursor telescopes for the multinational Square Kilometer Array (SKA). ASKAP will be the fastest cm-wave survey instrument in radio astronomy, and will consist of 36 12-meter 3-axis antennas, each with a large checkerboard phased array feed (PAF) operating from 0.7 to 1.8 GHz, and digital beamformer preceding the correlator. The 96 dual-polarization elements (192 receivers) of the PAF and the subsequent beamformer will provide about 30 beams (at 1.4 GHz) to produce a 30 square degree field of view, allowing rapid, deep sky surveys. The large data rates involved (~ 2 Tb/sec per antenna) and the need to do pipeline processing has led to the antenna incorporating a third axis to fix the parallactic angle with respect to the entire optical system (blockage and phased array feed).

ASKAP is located at the Murchison Radio-astronomy Observatory (MRO), a new observatory developed as an SKA-ready site 315 kilometres north-east of Geraldton, Western Australia. The site was selected through a rigorous process assessing many characteristics, including the RFI “quietness” of the site, which was determined to be outstanding. Ensuring that the construction and operation of the facility did not degrade this resource unacceptably was a stringent constraint on the engineering design of all aspects of the facility. The primary MRO infrastructure is now complete, including installation of the fiber connection to Perth via Geraldton (with the full cable appropriate for the SKA). A unique geothermally cooled, RFI compliant control building to house the sophisticated digital systems has been commissioned. The site infrastructure and antennas were deployed during the period 2009–2012.

Commissioning using six antennas equipped with first-generation phased-array feeds has been underway since mid-2014. CSIRO is now in the process of installing second-generation phased-array feeds and receiving systems on the remaining antennas. An early science program with the new feeds will begin by early 2016. A comprehensive science survey program will follow. Guest observing time will also be available. ASKAP has attracted over 380 astronomers to join the 10 major survey projects that will form some of the key science projects. It is a precursor for the SKA1 Survey instrument.

This scientific work uses data obtained from the Murchison Radio-astronomy Observatory. We acknowledge the Wajarri Yamatji people as the traditional owners of the Observatory site.