



SKAMP - the Molonglo SKA Demonstrator



M.J. Kesteven *CSIRO ATNF*, T. J. Adams, D. Campbell-Wilson, A.J. Green *University of Sydney*, E.M. Sadler *CSIRO TIP*, J.D. Bunton, *CSIRO TIP*

Introduction

Two substantial demonstrator projects have been funded for installation on the Molonglo Telescope:

A 96-station, wideband FX correlator

A broad-band line feed system for a cylindrical paraboloid.

These two projects constitute the SKA Molonglo Prototype – SKAMP. Installed on the Molonglo Telescope they will result in a significant trial of key SKA engineering elements and also significantly enhance the scientific value of the Molonglo Telescope

Background

The Molonglo Telescope was commissioned in 1965 as a 408 MHz Mills Cross with 1600m long arms. It was converted in 1982 to a 843 MHz synthesis telescope, using just the E-W arm. The structure was designed to suit a possible extension to 1400 MHz, which makes the telescope an excellent platform to demonstrate the feasibility of a cylindrical paraboloid for the SKA station.

Cylindrical SKA

The cylindrical reflector provides a low cost reflector for the SKA while providing a large FOV and high speed survey capabilities. However a number of novel design aspects are needed

Wide bandwidth feeds, RF beamformers, Digital beamformers and High capacity spectral line correlators

SKAMP will prototype these and validate their application to the SKA.

Science Goals

Low-frequency radio spectrometry (300-1420 MHz)

Selection of objects via their radio spectral shape, e.g. candidate high redshift ($z > 3$) galaxies with ultra-steep radio spectra (de Breuck et al. 2000), study the formation of galaxies and massive black holes.

Redshifted HI (300-1420 MHz)

HI in absorption against bright continuum sources over a wide redshift range ($z=0$ to 3). HI in emission - evolution of the HI mass function from $z=0$ to 0.5.

Low-frequency Galactic recombination lines

Recombination lines of carbon and hydrogen can be used to probe the partially-ionized ISM.

Gamma Ray Bursters

Electronic beam steering gives a 5% chance of capturing a random event.

Concurrent SETI search, and Pulsars and Source Flux Monitoring

18 to 400 deg^2 accessible around main beam. Real time de-dispersion.



Continuum Correlator Performance Enhancement

The continuum correlator will run in parallel with and eventually replace the current imaging system. It will measure all correlations and recover all redundant information allowing at least a 10:1 increase in imaging dynamic range. The extra correlation and reduced correlator losses increase sensitivity, while RFI inputs to the correlator will allow us to test RFI mitigation strategies.

Project Status and Plan

2002-2003 : Continuum Operation (being installed)

New IF Samplers; Digital delay lines; Fringe tracking.

Continuum correlator (96 station; 4 MHz), *companion poster*.

2004-2005 : Spectral Line Operation

New LO

New IF distribution

2048 channel polyphase filter/antenna

Spectral line cross-correlator engine (50 MHz BW)

2004-2007: Wide Band Operation

Wide band feed (300-1400 MHz)

RF beamformers distributed along the cylinder

New frontend

Digital beamformer + increased correlator BW

Sensitivity of the Molonglo telescope for high-redshift HI observations.

