Narrow Band HI System for the Parkes Telescope Multibeam Package

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Abstract. A narrow-band translater and filter system has been constructed for the Parkes Multibeam receiver. This brief note outlines the characteristics of the system and indicates the range of new projects that will be possible in studies of the Magellanic Clouds.

1. Introduction

In a proposal funded by the ATNF, the University of Queensland and the University of Bonn, the ATNF has now developed a narrow-band back-end system for the Parkes Multi-Beam system.

The project has provided a narrow-band back-end filter and correlation-system able to use the inner 7-beams of the multi-beam system for observations of spectral lines over 2048 channels with a total bandwidth across each spectrum of either 4 or 8 MHz. This will provide a spectral resolution of down to 0.4km s^{-1} for each of the two polarization channels on the inner 7-beams of the multi-beam system.

This makes an important addition to the multi-beam system which can then be used to obtain 'zero-spacing' data at Parkes on the multi-beam system to complement Australia Telescope Compact Array (ATCA) data or to map larger areas of the sky in HI with the observing speed-advantage obtained by multi-beaming the Parkes Telescope.

2. System Characteristics

The new Parkes narrow-band HI system will provide:

1. 7 beams on the sky;
2. 14.4 arc min beam-width on each beam;
3. Ts on the sky on each beam 24K
4. 2 orthogonal polarizations per beam;
5. 14 IF channels of 4 or 8MHz bandwidth;
6. 2048 channels of spectral resolution;
7. velocity coverage is -800 to 800km s^{-1} (in 8 MHz bandwidth);
8. velocity resolution down to 0.4km s^{-1} per channel.

3. Projects

Initial projects being undertaken with the facility by the team will include: a study of the stray-radiation problems at 21-cm wavelength with the Parkes Telescope and the multi-beam system preparatory to using the facility for mapping of HI in the Galaxy; a project to map the HI in a test region along the Galactic Plane; and a project to survey the extended HI in the LMC region at Parkes.

In the future other feasible projects with the system will include: fully sampled surveys of the Magellanic System (including the the LMC and SMC, Magellanic Bridge and Stream); gas flow into the Magellanic Stream from the Magellanic Bridge; searches for HI gas in the neighborhood of the discrete HI clouds in the Magellanic Stream; projects related to the interaction of Magellanic Cloud gas and HI in the halo of the Galaxy[1]; high-velocity HI cloud[1] studies; surveys of HI in the Galactic plane[1]; rotation curves of larger galaxies discovered in the HIPASS and ZOA surveys; simultaneous HI and continuum polarization studies at 1420 MHz; HI observations of newly discovered galaxies in the Zone of Avoidance survey[1]; HI observations of galaxies found in the HIPASS multi-beam survey; and 'zero-spacing' data acquisition to complement HI studies on the ATCA.

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[1]this project requires a good understanding of stray-radiation effects at the Parkes Telescope