The Westerbork Survey of HI in Spiral Galaxies

(WHISP)

Observations proposed for 1993

13 March 1993

1 Introduction

WHISP is a survey of the neutral hydrogen component in spiral galaxies with the WSRT. Its aim is to obtain maps of the distribution and velocity structure of HI in 500 to 1000 galaxies. The results will serve as a basis for research in many areas, for example: dark halo's, the effects of environment on the structure and growth of HI disks, and galaxy distances. Further information on WHISP is given in our original observing proposal of 12 March 1992 (project WH 1103) and in the 'Project Report', dated 13 March 1993.

2 Observations done in 1992

Four weeks of observing time were allocated to WHISP in 1992. During this period 40 galaxies were observed for 12 hours; we also obtained shorter observations for a number of other galaxies. The UV data have been calibrated in Dwingeloo. For two galaxies the calibration was done in Groningen using NEWSTAR. Further data reduction has only just been started. The delay is due to problems with NEWSTAR (FITS header problem; this has now been solved) and lack of man power: appointment of a data manager and, hopefully, a PhD student will take place this summer.

3 Observations proposed for 1993

For 1993 we request 3 months of observing time. In this period approximately 100 to 120 galaxies can be observed, depending on the need to do multiple 12 hour observations for large objects.

Our aim is to present a 'block schedule' for the WSRT observations, such that no further scheduling is necessary. For the first 100 galaxies or so this can be done fairly easily, but because the distribution in right ascension of the candidate galaxies is quite non-uniform, see Table 5 of the Project Report, it will not be possible to do this at later times. Therefore we include a proposal to observe a cluster region near 24 hours right ascension requiring long integration times. In this way one can fill the hour angle gaps in the block schedule.

Our priorities for the 1993 observations are as follows:

- From the UGC sample of galaxies with $\delta > 20°$ and blue diameters > 2.0 arcmin, we will first select galaxies with flux densities in excess of 200 mJy which have not yet been observed with the WSRT or the VLA (see Project Report). These are mainly late-type spirals and dwarfs. HI data for a larger sample of these types are urgently needed. Nearly all of these galaxies lie within 1000 km/s, thus, in this way, we also contribute to the build-up of a volume-limited sample.
- As in 1992, we will also include a selection of high-luminosity galaxies that may have falling rotation curves.
- A number of egde-on systems will be included to study the occurrence warps. These edge-on systems will at the same time enlarge the sample of galaxies for which distances can be derived with the Tully-Fisher relation.
- M.H. Rhee and M. Verheijen are PhD students at the Kapteyn Institute; both work on the Tully-Fisher relation. They propose to observe 6 galaxies occurring in the observing list of the HST key project aimed at finding Cepheid variables in nearby galaxies, and for which HI synthesis data are not yet available. Together with other nearby galaxies these galaxies serve as calibrators for the Tully-Fisher relation. Thus, it is important to obtain kinematic inclinations from HI data - which are superior to photometric inclinations - and to obtain accurate rota-

tion curves. We will include these galaxies in our block schedule for the WSRT.

- In order to study the Tully-Fisher relation in the Ursa Major cluster, Verheijen, Sancisi and Tully are currently observing all spiral galaxies with suitable inclinations, sizes and HI flux densities in that region. The resulting velocity fields will be used to derive kinematical inclinations and rotation curves. 25 galaxies have been observed already for 12 hours with the WSRT (project WH 1046). The UV data have been processed and quality cheks of the resulting data cubes have been made. A follow-up proposal will be submitted aimed at repairing and improving the data for some of these galaxies.

  To complete the Ursa Major sample we propose to observe 9 other galaxies as part of the WHISP project. All of these satisfy the selection criteria presently used for WHISP, and inclusion in WHISP facilitates the scheduling.

- Short observations will be done for a number of galaxies for which no HI fluxes are known. In part these can be scheduled in hour-angle gaps between 12 hour observations.

- As discussed above, in the long run it will not be possible to schedule the observations of WHISP galaxies as a block because of their non-uniform distribution in right ascension. Therefore we propose to include a number of fields near 24 hours RA to fill the hour angle gaps in the schedule. Details of this proposal are given below.

  During August 1991, Braun and Henning have observed the Abell clusters 1383 and 2626, both at cz = 18,000 km/s. They achieved the expected thermal sensitivity of 0.14 and 0.17 mJy per 25 arcsec beam per 76 km/s channel over a 2775 km/s velocity coverage on these fields. These two clusters were selected because of their contrasting properties. Only 5 marginal detections were made in the field of A2626, but 17 fairly solid and 5 marginal detections of HI emission were made in the field of A1383. Four extremely gas rich systems with HI masses in excess of $10^{10}\mathrm{M}_\odot$ were found around the periphery of this cluster.

  We wish to pursue the un-biased exploration of the high mass-density regions between rich clusters by considering the more accessible region at velocities between 8000 and 9000 km/s in the super-cluster ridge between the Abell clusters 2634 (at 23^h35^m and $26°45'$) and A2666 (at 23^h48^m and $26°52'$). Both of these clusters, separated by 3 degrees and 1100 km/s, are dominated by cD galaxies, while the ridge between them is populated with a string of Zwicky galaxies at intermediate velocity. A single 12 hour observation with the WSRT will provide a sensitivity of 0.63 mJy/beam per 66 km/s channel over a 2100 km/s band. In view of the experience with the more distant clusters, one can predict with some confidence that this sensitivity will allow the detection of 6×10^8 $M_\odot$ HI masses at a significance better than 6 σ.

We propose to image the entire ridge between the two dense cores of 3 degree length with a triple strip of pointings at 18 arcmin intervals, for a total of 30 $\times$ 12 hours. This degree of sampling will provide both uniform sensitivity over a region of about 50 $\times$ 180 arcmin^2 (i.e. 1.2 $\times$ 4.5 Mpc^2), as well as almost a factor two improvement in the combined sensitivity, so that even a large fraction of the dwarf galaxies becomes accessible. Comparison with deep optical imagery and diffuse X-ray emission from the cluster cores should allow interesting conclusions on the formation and evolution of galaxies in a range of environments.

4 Project team

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