

Preliminary Drift Scan Survey using the New 9-foot Dish Neutral Hydrogen Measurement System

Richard A. Russel

Deep Space Exploration Society

Abstract

The Deep Space Exploration Society set up a 9 -foot dish with a 1420 MHz feed system in order to conduct detailed neutral hydrogen spectrum measurements. The installation details are documented as well as the results of a sky scan of neutral hydrogen.

Introduction

A 9-ft diameter dish was obtained and set up with a 1420 MHz feed at Colorado Springs, Colorado. (Figure 1)



Figure 1: 9- Foot dish in Colorado Springs, Colorado

The feed (figure 2) is mounted with the input of the tube at the prime focus. The distance of the prime focus is calculated using equation (1).

$$\text{focus distance} = \frac{D^2}{16H} \quad (1)$$

D= 9 ft x 12 in/ft = 108 in

H is the depth of the dish from rim to base measured at 22 in

Focus distance = 33.1 in above center of dish



Figure 2: Dish feed

The feed uses only one of the 2 polarization outputs. There are two 26 dBi low noise amplifiers (LNAs) installed in series. Two LNAs were used to make up for the 130 foot line loss from the dish to the operator station.

Antenna Alignment

The antenna was aligned to 180 degrees azimuth for drift scan. The time of the sun's position at 180 degrees was obtained using Stellarium. The dish was pointed so that the shadow of the feed post was vertical to the ground. This was accomplished using a level as shown in figure 3 to calibrate the azimuth.

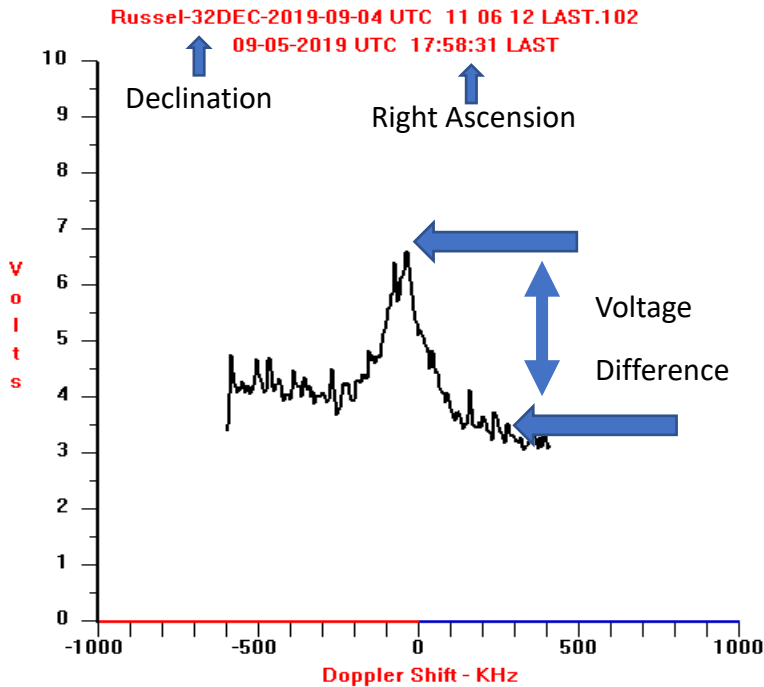


Figure 3: Azimuth Calibration using the Sun



Obtaining Drift Scan Data

The output of the dish was hooked to a Spectracyber 1 receiver. The output is shown in figure 4.



ONLINE STATUS	
Mode	= SPEC
Autosave	= On
Noise Signal	= Off
ReScan	= On
Scan Rate	= 1x
Que	= Off
Spec Gain	= 05
Cont Gain	= 01
Rest Corr	= 00
IF BW KHz	= 30
Upper KHz	= + 0600
Lower KHz	= - 0600
Spec Int	= 001.00
Cont Int	= 000.30
Spec Offset V	= 002.70
Cont Offset V	= 000.00
IF Gain dB	= 025.00
Time/Step	= 001.00

KHz = 405 Vdc = 3.145

Figure 4: Measuring Peak Hydrogen above Background Noise

The Hydrogen peak and a standard noise level at +300 kHz Doppler were measured. The difference was collected. The drift scan required that the dish was moved by 10 degrees declination daily to obtain the data. Note that the output in figure 4 provides the right ascension and declination of each output.

Results

The data plotted in figure 5 clearly shows the peak hydrogen content of the Milky Way. Figure 6 converts the same data from celestial coordinates to galactic coordinates.

Russel Observatory HI Spectrum Peak Map Survey

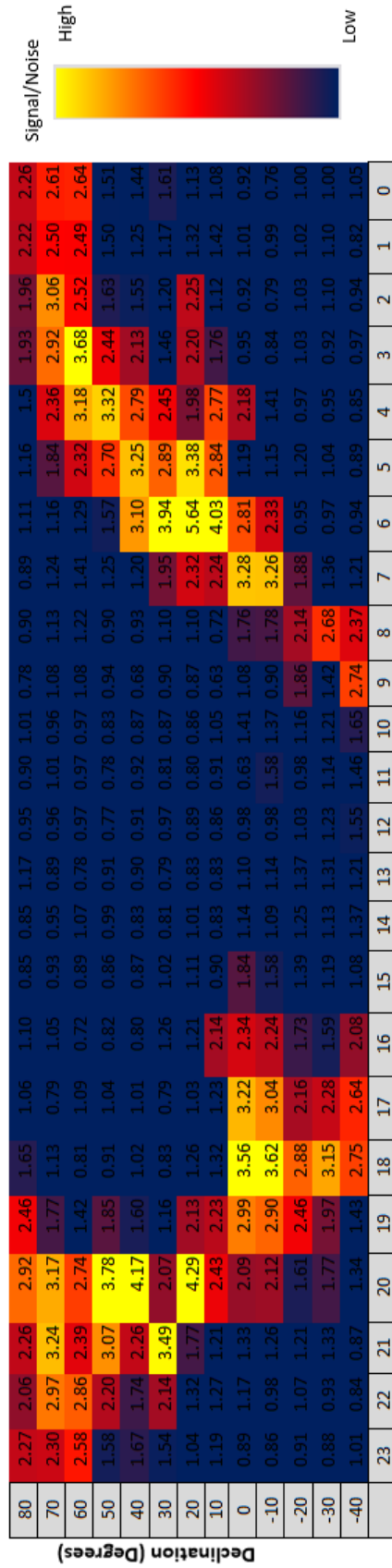


Figure 5: Results of HI Spectrum Peak Map Sky Survey

Russel Observatory
HI Spectrum Peak Map Survey

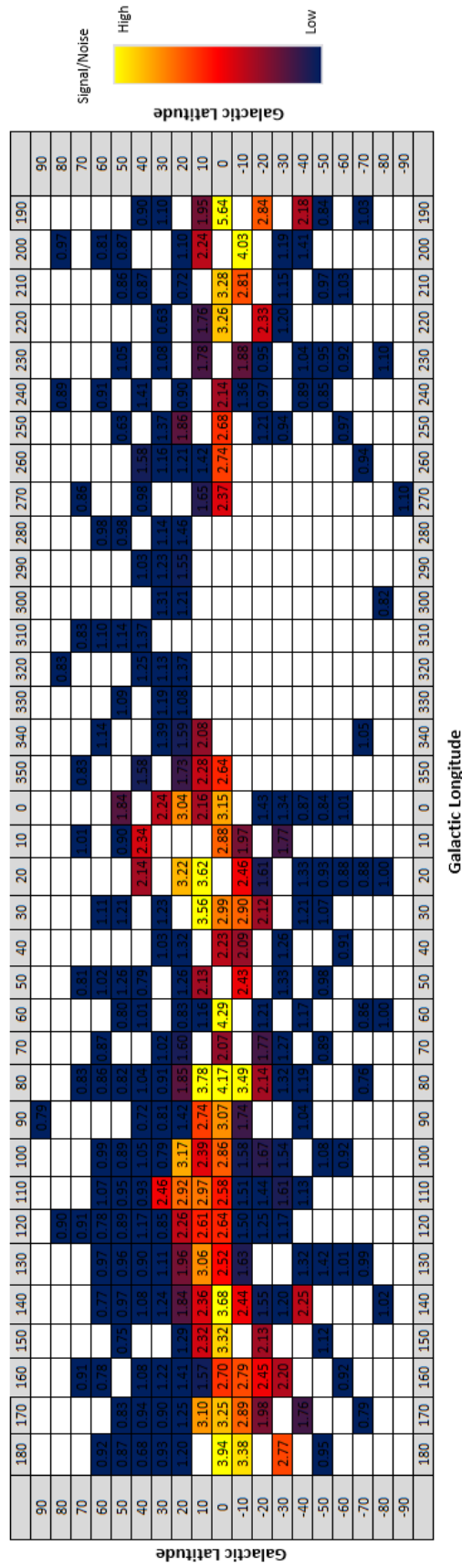


Figure 6: Galactic Coordinate Output

Summary

The 9- foot dish setup had the sensitivity to perform the Milk Way drift scan with good results. The galactic coordinate plot in figure 6 clearly shows the hydrogen signal strength along the galactic 0 latitude.

The next steps will involve plotting Doppler measurements and automating the data plotting.

Special Thanks

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For more information

Dr. Richard Russel DrRichRussel@netscape.net

Deep Space Exploration Society: www.DSES.science