Galactic Hydrogen Line Observations Using a 3-element Small Radio Telescope Interferometer

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Overview

21-cm line – Why is it important?

Initial Goals

Experiment Setup and Methods

Conclusion

Acknowledgments
First discovered in 1951 by Ewen and Purcell

Results from a hyperfine spin-flip energy transition in the ground state of neutral hydrogen

Corresponding frequency of 1420.4 MHz (well in radio spectrum)

Useful for determining the structure and velocity of galactic hydrogen
Initial Goals

Explore viability of SRT interferometry on the hydrogen line

More specifically...

SRT interferometry on galactic sources

Galactic map of 21-cm emission
Experimental Setup

Three-element SRT array

- Long Baseline: ~70 meters
- Short Baseline: ~25 meters
- ~8 meters

Each SRT equipped with a GPS

- Synchronized Clock
- Spatial Positioning
Experimental Setup, contd.

C-written GUI to remotely control SRTs
Method

Interferometry

Vlbiproc.c
Plotdata.m

Single-Dish

Plotsingle.m
Metaspec.m
Results

SRT interferometry was found to be unworkable, for two main reasons:

- Not enough sensitivity
- Manmade interference (RFI)
Results, contd.

Galactic 21-cm emission map was more successful:
Conclusions and Possible Future Work

Unfortunately, SRT interferometry was unsuccessful due to low 21-cm brightness and RFI. However, future efforts to reduce the effects of RFI, followed by longer integration times to increase SNR, may still yield good results.

Galactic mapping of 21-cm emission can easily be carried out with the software foundation built this summer.
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