Proposal Identification No.: P2721
Date Received: 2012-Mar-01 18:30:54

Technical Page

Proposal Type: Regular
General Category: Pulsars
Observation Category: Galactic
Total Time Requested: 8 Hours
Minimum Useful Time: 1 hour

Proposal Title: NANOGrav precision timing: Demonstrating real-time cyclic spectroscopy

ABSTRACT:
The NANOGrav collaboration is initiating a systematic study of the ISM properties toward the best-timing pulsars in our source list. Our mid-term goal is to reduce timing noise in these pulsars down to the 10 ns level. Currently, our best-timing pulsar, J1713+0747, has an rms timing residual of 40 ns. We aim to build upon the techniques developed in previous proposals (P2676, Dolch et al.; P2627, Palliyaguru et al.) to characterize and correct for inhomogeneities in the ISM which directly impact pulsar timing residuals. Previous observations used to demonstrate the cyclic spectroscopy developed by members of our team (Demorest, van Straten) required baseband data recording which limits the practical observation bandwidth and results in large, difficult to manage datasets. We propose to demonstrate real-time computation of the cyclic spectrum by using a specialized FPGA-based filterbank and by taking advantage of the computational power now available in the GPU cluster which is part

<table>
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<tr>
<th>Name</th>
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<tbody>
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Remote Observing Request

- [X] Observer will travel to AO
- [ ] Remote Observing
- [ ] In Absentia (instructions to operator)

Instrument Setup

430 G L-wide 327

Atmospheric Observation Instruments:

Description of Observer Equipment: We plan to use a ROACH FPGA board present at the observatory connected by 10 gigabit ethernet to the PUPPI cluster via spare ports on its network switch.
**Special Equipment or setup:** We will need to connect a pair of IF signals to the ROACH. Our hardware is flexible and can accept almost any IF available. The ALFA IF frequency range is particularly convenient. We will be using the PUPPI GPU cluster for these observations. Our final data rate to disk is relatively small and will result in <100 GB of data.

**RFI Considerations**

**Frequency Ranges Planned**

- 307 - 347 MHz
- 418 - 442 MHz
- 1150 - 1730 MHz

This proposal requires coordination with Punta Salinas radar within the band 1222-1381 MHz.