

Arecibo Observatory  
William E. Gordon Telescope  
Observing Time Request  
COVER SHEET

## Section I - General Information

Submitted for Mar 1 2015.

This proposal has been submitted before.

The previous proposal number is P2950.

Proposal Type:	Regular
General Category:	Pulsars
Observation Category:	
Time Requested this semester:	34
Hours Next Semester:	68
Hours already used for this project:	0
Additional Hours required to complete project:	
Minimum Useful Time:	45
Expected Data Storage:	less than 100 GB

**Proposal Title:** Spectral Indices of Millisecond Pulsars

*ABSTRACT:*

Although millisecond pulsars (MSPs) are extremely important for several experiments, the spectra of these pulsars have not been measured often. Particularly, the lack of accurate spectral index measurements for a majority of the known MSPs leads to a large uncertainty in the estimation of survey yields. We propose to measure the spectral indices of 33 MSPs for which spectral index measurements are currently not available. In combination with an ongoing, complementary proposal at Effelseberg and using data from the EPTA and NANOGrav archives, we propose to measure the spectral indices of 62 MSPs in all, more than 40% of the known galactic population. Apart from the primary goal of measuring spectral indices, these observations will also be useful for determining the best observing frequencies for pulsar timing experiments, probing the inter-stellar medium and understanding the fundamental similarities and differences between young pulsars and MSPs.

*Outreach Abstract:*

Pulsars are extremely dense and compact stars (much older than the Sun) which spin at very high speeds. They have a peculiar property of radiating large amounts of energy in tight *beams*. When these beams cross the Earth, we observe a *radio pulse*. The time between any two consecutive pulses differs by less than a fraction of a second even for measurements made over a million years. We use these pulsars to test how time and space change under the influence of gravity, a fundamental prediction of Einstein's theory of General Relativity. However, the fastest spinning pulsars are among the least understood objects in the universe. We propose to make detailed observations of the energy emitted by the so-called *millisecond pulsars* at different radio frequencies. This will improve our chances of finding more of these fascinating objects and improve our understanding of these lighthouses-in-the-sky.

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This work is part of a PhD thesis.

**Remote Observing Request**

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

**Section II - Time Request**

The following times are in LST.

For these observations night-time is not needed.

Begin – End Interval–Interval	Days Needed at This Interval
–	
–	
–	
–	

**Time Constraints (Must Be Justified in the Proposal Text)**

We request a total of 102 hours of observing time, split into six epochs for low-DM pulsars and three epochs for high-DM pulsars . The epochs distribution is described in greater detail in the proposal and 'could' be suborganised into the following LST ranges.

DayNo	Start LST	End LST	Time Requested(min)
1	04:00	06:00	45
1	10:50	11:40	20
1	15:20	16:10	15
1	17:00	01:00	315
2	17:00	01:00	300
3,4,5	18:00	21:00	155

Note - The day numbers are only indicative.

### Next Semester Time Request

Begin – End Interval–Interval	Days Needed at This Interval
–	
–	
–	
–	

### Time Constraints (Must Be Justified in the Proposal Text)

As described above. Ref. proposal for details.

### Section III - Instruments Needed

L-wide                      S-low 327

#### Atmospheric Observation Instruments:

**Special Equipment or setup:** We propose to use the 327, S-low and L-wide receivers. All receivers are necessary. The exact schedule will depend on the allocated time.

### Section IV - RFI Considerations

#### Frequency Ranges Planned

312 - 342  
1150 - 1730  
1800 - 3100

This proposal requires Iridium RFI protection at 1612 MHz between 10pm and 6am EST.

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

This proposal requires coordination with GPS L3 at 1381 MHz.

## **Section V - Observing List**

### **Target List**

List in proposal.