Astronomy 423 Homework Set 1

Due: by 4pm on Monday, Feb 3

1. Come up with an observing project for the LWA either using one or more LWA stations as a stand-alone instrument (using mode DRX, TBN, TBF, TBW, or EPIC) or using all three stations in NM as an interferometer. Note that you can talk to anybody at all about this assignment. Some people in the department that might be good to talk to are grad students Craig Taylor, Charlie Siders, Evan Sheldahl, Logan Cordonnier, Rajorshi Bhattacharya, or postdoc Sarah Chastain, and research faculty Jayce Dowell. You can also look at the list of LWA projects at http://www.phys.unm.edu/~lwa/obssched.html. You may only submit one proposal. All targets should be north of -10 degrees in Declination. Your proposal must include the following elements:

a) Title, e.g. "LWA Study of giant pulses from the Crab Pulsar"

b) your name

c) Justification with length between 100-300 words (less than half a page). Must include some idea of what we are going to learn from this experiment.

d) The preferred target source or class of sources

e) The RA and Dec of the target, or range if there are more than one.

f) Indication of the observing mode and frequency for observation

g) The expected flux density of the target

h) Any special requirements that you are aware of.

i) Any relevant references that you are aware of.

All projects should be submitted electronically to gbtaylor@unm.edu by 4pm on Feb 3. Please use text or Word (especially if you include a figure). I will assemble the projects, and do a quick technical evaluation for each and let you know if your project is feasible. You will also be grouped into teams.

Here is an example project:
LWA Study of giant pulses from the Crab Pulsar – Logan Cordonnier

The Crab Pulsar (PSR B0531+21) is known to emit giant pulses, which are emissions with at least 10 times the average pulse energy. These giant pulses are readily detectable in radio frequencies, making them a good candidate for observation. The Crab Pulsar is located at RA: 05h 34m 31.97s, Dec: +22° 00' 52.1", so there is an ample observation window. Prior observations of these giant pulses have been made with LWA1 over a wide range of frequencies (20-84 MHz), with more detections occurring at the higher end of this range. These giant pulses had peak flux densities between 400 – 2000 Jy. For the sake of comparison, I propose this study use the same frequency range. The detections from this study could then be compared to the prior LWA results (as well as other low frequency measurements) in terms of number of pulses per frequency band, flux densities, and duration. Additional comparisons could be drawn with observations from other frequencies of the EM spectrum, such as gamma (Fermi). This study seeks to provide an understanding of how these giant pulses have evolved from previous detections (if at all) as well as how radio observations provide a different perspective than other, higher frequencies.

Prior LWA1 publications:

Eftekhari, T., et al. 2016, ApJ, **829**, 62 (arXiv:1607.08612)

Ellingson, S.W., et al. 2013, ApJ, **768**, 136 (arXiv:1304.0812)