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The Latest Results from the Focal L-Band Array for the Green Bank Telescope (FLAG), the World's Most Senstive Phased Array Feed

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The ability to significantly increase the survey speed makes Phased Array Feeds (PAFs) the next revolution in radio astronomy instrumentation. This paper will present the latest commissioning and science results from the Focal L-Band Array for the Green Bank telescope (FLAG), which holds the current world record for PAF sensitivity. Since we are able to operate at system temperatures comparable with the traditional GBT single pixel L-Band feed, the increase in the field-of-view provided by the beamforming capabilities of PAFs results in a dramatic (~ a factor of 5-7) increase in survey speeds. In particular, FLAG can probe similar neutral hydrogen column density regimes over a 4 sq. deg region in ~ 30 minutes as opposed to four hours in an equivalent single pixel map. The multi-beam nature of PAFs also benefit radio transient science such as pulsar timing, blind pulsar surveys, and the search for elusive Fast Radio Bursts.

In addition to the science results, I will summarize the digital signal processing algorithms implemented in the backend, and how the raw correlation matrices are handled (e.g. offline beamforming) to create the scientific quality images. In particular, I will discuss the full suite of observing modes available to astronomers that range from the calibration mode for deriving complex beam weights, the fine channelization of the coarse (303 kHz) channels for spectral line observations, and how the raw bandpasses are produced in the real-time beamformer.

These FLAG results provide a very encouraging outlook on how the GBT will continue its status as a premiere radio telescope instrument.