Wideband Pulsar Instrumentation at Green Bank

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A new wideband pulsar instrument, GUPPI, the Green Bank Ultimate Pulsar Processing Instrument, has been built and installed at the Green Bank Telescope (GBT), and is available for shared risk observations. GUPPI is built with off the shelf hardware using Field Programmable Gate Arrays (FPGA's) to perform digital signal processing. An industry standard 10 gigabit Ethernet connection connects the hardware with a computer providing control, data acquisition, processing, formatting, and storage. The entire system is housed in a 36" tall standard 19" rack, and includes the pulsar processor, a host computer with 8 processing cores, 13 terabytes of RAID storage, and a UPS. GUPPI currently provides 8 bit sampling, 2048 spectral channels, 800 MHz of bandwidth, full Stokes parameters, and integration times as short as 20.48 microseconds. Various processing options in the data acquisition software allow some on-line real time processing of the incoming data.

We will present the first results from GUPPI including comparisons of simultaneous observations with GUPPI and the GBT Pulsar Spigot and other backends at Green Bank. These results show the power of the new machine for pulsar search applications.

Since GUPPI is based on a standard hardware platform, new pulsar machines can be built by simply designing and loading new FPGA personalities into the hardware. We will present the next steps along the path to realizing the full potential of the machine, including turning the machine into a pulsar timing machine using coherent dedispersion.