The Versatile GBT Astronomical Spectrometer (VEGAS): Current Status and Future Plans

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The VEGAS multi-beam spectrometer (VEGAS) was built for the Green Bank Telescope (GBT) through a partnership between the National Radio Astronomy Observatory (NRAO) and the University of California at Berkeley. VEGAS is based on a Field Programmable Gate Array (FPGA) frontend and a heterogeneous computing backend comprised of Graphical Processing Units (GPUs) and CPUs. This system provides processing power to analyze up to 8 dual-polarization or 16 single-polarization inputs at bandwidths of up to 1.25 GHz per input. VEGAS was released for "shared-risk" observing in March 2014 and it became the default GBT spectral line backend in August 2014. Some of the early VEGAS observations include the Radio Ammonia Mid-Plane Survey, mapping of HCN/HCO+ in nearby galaxies, and a variety of radio-recombination line and pulsar projects. We will present some of the latest VEGAS science highlights.

VEGAS was constructed using hardware and firmware developed by the Center for Astronomy Signal Processing and Electronics Research (CASPER) collaboration; this approach has been extremely successful. Nevertheless, it has taken over a year to fully complete the astronomical commissioning process (some bugs undoubtedly still remain). Many of the problems encountered in practice were not anticipated at the start of the project; these included difficulties with calibration of interleaved ADCs, problems due to the complexities of the CASPER build environment, and subtle timing and data blanking issues. We will review some of the lessons learned in transforming a CASPER-based instrument from the first release version to a fully common-user facility instrument.

VEGAS is primarily a spectral line instrument. However, the hardware is fully capable of providing advanced pulsar observing modes. Our next task is to implement these modes, which will comprise a superset of the current GUPPI backend. Initial versions of these have already been developed for the DIBAS instrument, which is largely a clone of VEGAS. Some additional development and refactoring work will be required, however, and we will review the plans for this.