Initial Results from the GAVRT Digital Backend

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The Goldstone Apple Valley Radio Telescope, DSS28, is a 34 meter radio telescope used to integrate radio astronomy into participating K-12 science classrooms. Recently, a novel wideband receiver system developed at Caltech has been installed on the telescope. This receiver consists of two feeds, selected by a rotatable tertiary reflector, which cover roughly 0.5 to 14 GHz in two bands. Four independently tuned, dual polarization down-conversion chains each provide 2 GHz of baseband bandwidth. To process this enormous bandwidth, a reconfigurable digital signal processor has been designed around the iBOB and BEE2 FPGA boards from the CASPER Group.[1]

Several configurations of the digital backend are currently being developed and tested for various science goals. One major goal for this system is to study giant pulses from pulsars. A trigger system which uses incoherent dedispersion to correct for dispersion due to the interstellar medium to provide increased sensitivity has been designed to facilitate this goal. This trigger controls an exceptionally deep transient capture buffer to store the baseband data for later analysis. This system offers improved sensitivity, capture depth, and duty cycle compared to previous giant pulse studies.

Another goal is to provide improved performance in the presence of radio frequency interference. A spectrometer has been developed which provides hardware based digital quadrature imbalance correction to enable wide bandwidth observations in the presence of RFI. Details about the RFI situation at DSS28, along with initial performance results, will be presented. Future planned instrument configurations include high resolution spectroscopy and coherent dedispersion for pulsar timing observations.

[1] http://casper.berkeley.edu