

## ***Argus*: A W-band 16-Pixel Focal Plane Array for the Green Bank Telescope**

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We are building *Argus*, a 16-pixel square-packed focal plane array that will cover the 75-115.3 GHz frequency range on the Robert C. Byrd Green Bank Telescope (GBT). The primary research area for *Argus* is the study of star formation within our Galaxy and nearby galaxies. *Argus* will map key molecules that trace star formation, including carbon monoxide (CO) and hydrogen cyanide (HCN). An additional key science area is astrochemistry, which will be addressed by observing complex molecules in the interstellar medium, and the study of formation of solar systems, which will be addressed by identifying dense pre-stellar cores and by observing comets in our solar system. *Argus* has a highly scalable architecture and will be a technology path finder for larger arrays. The array is modular in construction, which will allow easy replacement of malfunctioning and poorly performing components.

Each *Argus* pixel consists of a smooth-walled feed-horn antenna that couples the incoming radio frequency (RF) radiation to a miniaturized heterodyne receiver module. The receiver module amplifies the incoming signal using a chain of monolithic microwave integrated circuit (MMIC) low noise amplifiers and down-converts the RF signal to a lower frequency intermediate frequency (IF) signal, which is easier to route and process, by mixing with a local oscillator (LO) signal. A second-harmonic Schottky diode mixer is used for the down-conversion to produce the in-phase (I) and quadrature-phase (Q) IF signals, which allow for side-band separation. The entire array is cooled to 20K. The LO and IF signals are distributed and routed on microstrip and stripline transmission lines patterned on multilayer printed circuit boards with high-frequency Taconic<sup>®</sup> laminate. Flexible low-loss cables are used for IF routing and coaxial cables are used for LO routing between the 20K stage and the cryostat wall. GBT's VEratile GBT Astronomical Spectrometer (VEGAS) and the microwave transmission lines from the GBT receiver cabin will be used as the backend. The projected band-averaged receiver noise temperature is 40 K. *Argus* will be fielded at the GBT by late 2014, providing a powerful millimeter-wave mapping system that will be available (collaboratively with the *Argus* team) through the GBT proposal and time allocation peer review process.