**Wideband Array Receivers**

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Until recently, almost all receivers in radio astronomy have been limited by both antenna feeds and low-noise amplifiers to bandwidths less than 50% of the center frequency. New developments in log-periodic feeds (G. Engargiola *Proc. IEEE APS/URSI Symp. San Antonio*, 2002) and low noise amplifiers (S. Weinreb, *IEEE MTT Symp. Dig*, 1999) have demonstrated bandwidths with upper frequency to lower frequency ratios of 22:1. This enormous increase in bandwidth has three major benefits:

1) Searches for spectral lines or signals from extraterrestrial civilizations can simultaneously be carried out over the entire microwave spectrum with much greater efficiency.

2) Measurements of continuum sources have increased sensitivity by virtue of the root bandwidth dependence. In addition the spectral index (slope of the continuum spectrum) can be determined.

3) The number, and hence cost, of receivers required to cover a wide spectrum is reduced by an order of magnitude; this is particularly important for large arrays.

On the negative side, wideband receivers have increased susceptibility to interference; have lower aperture efficiency and higher noise temperature due to spillover, and somewhat higher LNA temperature. The Allen Telescope Array mitigates the spillover noise with offset reflector geometry and a ground shield which reduces the spillover noise. Another paper submitted to this conference (D. Ericsson, P-S Kildal, and S. Weinreb) analyzes the efficiency of the Engargiola log-periodic feed and discusses measures to increase efficiency.

A wideband feed has been developed at TRW and is being evaluated at Caltech; test data will be reported at the conference. The feed covers the 0.5 to 11 GHz band with a constant phase center location, is compact, and has terminals within 1cm of a large volume behind a ground plane that can be used to house the low noise receiver.

Both the log-periodic feeds and the TRW feed have balanced outputs with respect to ground and a wideband balanced to unbalanced transformer (balun) is required. An active MMIC balun, a low noise differential amplifier, covering the 0.5 to 11 GHz frequency range has been designed and will be reported at the conference.

It is expected that wideband receivers will be an active research topic for the next several years and a key component of the Square Kilometer Array (SKA) project. The research will include optimization of reflector optics, shields for minimization of spillover, feed design improvements for decreasing impedance variations, higher-temperature operation of the LNA, and configurations which allow cryogenic cooling of the feed, balun and LNA.

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