

Wideband CMOS Integrated Receivers for Phased Array Applications

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Abstract

New silicon CMOS processes, developed primarily for the burgeoning wireless networking market, offer significant promise as a vehicle for the implementation of highly integrated receivers, especially in the frequency range proposed for the Square Kilometre Array, of around 1 to 20 GHz.

As part of an ongoing development program for technologies associated with this next generation of radio telescopes, a large over-sampled focal plane array receptor is to be constructed. This receptor will comprise 64 dual-polarisation elements, with each element covering an RF bandwidth of 500 MHz to 1700 MHz, an instantaneous IF bandwidth of 500 MHz, and an input noise temperature of 50 K. The receiver will be highly integrated, with all active circuitry for each polarisation of each element (including LNA, bandpass filter, quadrature mixer, anti-aliasing filter, and digitiser) on one RF-CMOS integrated circuit.

Balanced CMOS LNA topologies will be investigated in an effort to maximise the bandwidth of the accompanying tapered slot antenna. Local oscillator, sample clocks, and digitised baseband signals will be transferred to the back-end using inexpensive multi-mode optical fibre, to ensure good isolation between elements.