

Low Noise Amplifiers for Radio Astronomy Applications

Gaurav Parikh*(gaurav@gmrt.ncra.tifr.res.in), Anil Raut (anil@gmrt.ncra.tifr.res.in)
GMRT Observatory, NCRA-TIFR, Post Bag No. 3, Ganeshkhind, Pune – 411007, Maharashtra, India,
<http://www.gmrt.ncra.tifr.res.in>

Extended Abstract – The low noise amplifiers (LNA) are the most critical elements in modern day receivers. LNA is the closest device to the antenna and thus plays a key role in the receivers. The main purpose of the LNA is to increase the signal to noise ratio, i.e., amplifying the signal without adding significant noise to the output signal relative to the input signal. Therefore, the noise figure (NF) is a crucial factor for LNA design. Being the 1st stage of any receiver, the signal strength encountered is very weak, especially in radio astronomy applications. To detect these signals, LNAs must have very low noise figure (NF), high gain and high dynamic range over the band of interest. The low noise figure and high gain of LNAs effectively reduces the overall system noise temperature (T_{sys}), thereby improving the sensitivity of the receiver. This paper mainly discusses various performance parameters viz Gain, NF, stability, input/output matching and linearity of the LNA. Various design methodologies are described along with the available device technologies with their pros and cons. The paper concludes with some of the broadband room temperature LNAs designed inhouse with less than 0.5 dB noise figure, gain better than 30 dB and good input output matching for the various uGMRT bands. With this upgrade, the overall sensitivity of the uGMRT is improved significantly.

References:

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