

Design and Development of a X band Low Noise Amplifier for LEO Satellite Ground Station

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Ground stations are part of any satellite network, providing communication with satellites. The communication quality depends on the performance of the satellite ground station and the satellite. Low Earth Orbit (LEO) satellites are also used for public communication and scientific purposes [1]. LEO satellites generally communicate with ground stations at X-band. The front-end device at the downlink is the Low Noise Amplifier (LNA). LNA is characterized by its gain and noise[2].

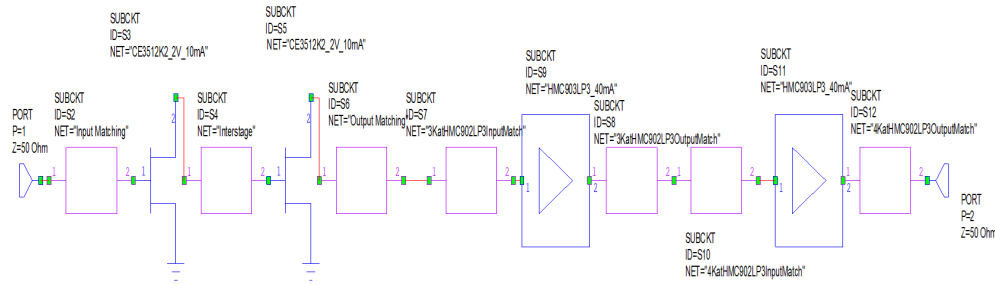


Figure 1. Fourth Stage of Proposed LNA

This study's proposed design in Figure 1 achieves less than 0.7 dB noise at 8-8.5 GHz and receives a band of X band satellite communications systems. Four stage amplifier using CE3512K2 FET transistors and HMC903LP4E MMIC amplifier is designed for 60 dB gain. As a result, the proposed design has a very low noise compared to its commercial counterparts [3].

The measurement setup is set up, and the measurements are taken (Figure 2). The s21 parameter, which is 64dB. Reflection coefficient values s11 and s22 are measured as -16dB and -14dB, respectively, which coincided with target specs and simulation results. Another essential measurement parameter, the noise figure, is measured as 0.623dB. Pdb1 is measured as 14 dBm.

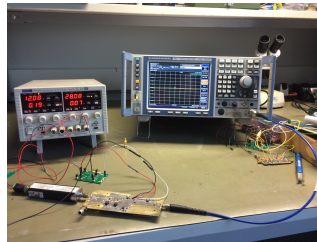


Figure 2. Measurement Set-up of Proposed LNA

References

- [1] R.E. Zee, P. Stibrany, The MOST Microsatellite: A low – cost enabling technology for future space science and technology missions, Canadian Aeronautics and Space Journal, Vol. 48, No. 1, Canada, 2002, pp. 1-10.
- [2] S. Cakaj, W. Keim, K. Malaric, Communication duration with low Earth orbiting satellites, Proc.IEEE, IASTED, 4th International Conference on Antennas, Radar and Wave Propagation, Montreal, Canada, 2007, pp. 85-88.
- [3] <https://www.analog.com/media/en/technical-documentation/data-sheets/hmc902.pdf>