

Low Power Cryogenic Rad-hard LNAs for Space

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Abstract— We present the design and implementation of a packaged cryogenic InP HEMT MMIC LNA for space borne applications. The particular module is part of the submillimetre wave instrument (SWI) band1 and band2 receiver channel development for the ESA Jupiter ICy moons Explorer mission (JUICE) programme. The main objective of the activity has been to develop a general connectorized rad-hard LNA package for space applications, and to qualify the cryogenic InP HEMT MMIC process at Chalmers University of Tehnology which today covers a frequency range up to the W-band with state-of-the-art performance in terms of noise, gain and power dissipation.

The activity has currently moved from a pre-qualification phase to a lot acceptance test (LAT) phase and has up till now included various environmental tests e.g. vibration, total dose radiation tests up to 300kRad on die level, and thermal cycling both to hot and cold temperatures. The InP HEMT MMIC process can be operated at ultra low power with ultra low noise which makes it an excellent candidate for deep space missions and satellite communication links, but also for the next generation of radioastronomy telescopes based on cryogenic receivers e.g. HEB and SIS multipixel cameras.