# Abstracts

## Cryogenic indium-phosphide HEMT low-noise amplifiers at V-band

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Indium-phosphide (InP) high electron-mobility transistors potentially have the lowest noise at frequencies below 100 GHz, especially when cryogenically cooled. We have designed monolithically integrated InP millimeter-wave low-noise amplifiers (LNAs) for the European Space Agency (ESA) science Planck mission. The Planck LNA's design goal for noise temperature is 35 K at the ambient temperature of 20 K. The operation bandwidth is over 20% at 70 GHz. The maximum allowable power consumption for a Planck LNA (gain 20 dB) is P/sub be/=5 mW at 20 K. The chosen foundry for these LNA's was DaimlerChrysler Research, Ulm, Germany. The DaimlerChrysler 0.18-/spl mu/m InP process was used. This process is well suited for V-band LNA design, giving sufficient gain with very low noise. Several one-, two-, and three-stage amplifiers were designed. The best of them exhibited a noise figure lower than 5.5 dB with a gain higher than 14 dB over the 50-68-GHz range at room temperature. The best single-stage amplifier demonstrated a noise figure of 4.5 dB and a gain higher than 5 dS from 50 to 60 GHz at room temperature. On-wafer measurements on these monolithic-microwave integrated circuits (MMIC's) have been done at MilliLab, Espoo, Finland. For the module fabrication, MMIC chips will be mounted in a WR-15 waveguide split-block housing.

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