

Master 2021

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Design of a 10 W Ultra Wide Band Power Amplifier for the 1 GHz to 6 GHz Frequency Range.

ABSTRACT - Masterthesis

This thesis contains practical considerations on high power (10 W) wide band (1 GHz to 6 GHz) amplifier design under limited access to latest manufacturing technologies. Only off the shelf components and the common RO4003 Printed Circuit Board (PCB) material were used. After comparing previous work on amplifier design and commercially available products, two power amplifiers were built. One using a single discrete Gallium Nitride (GaN) High Electron Mobility Transistor (HEMT). The second one using two of them. The 10 W target was reached in the two transistor design, but it suffered from problems in gain flatness and does not provide any gain at frequencies above 5.5 GHz. More gain at high frequencies was obtained in the single transistor design. Its output power was limited to around 5 W. So one design was able to deliver the target power but its frequency response was bad. The other design does not deliver the target output power but its frequency response was closer to the expected one. The main problems with these two amplifiers were caused by the way the prototypes were constructed.

To reach the total gain target of more than 30 dB, two preamplifiers were built using already matched amplifier modules. They showed the expected output capabilities.

Detailed information is given on the design process and tools used to layout the matching networks. Additionally amplifier stability and ways to improve it have been discussed in detail for the two prototypes. Information is also given on the measurement setups used to verify the performance of all amplifiers built in this project.