

Fachbereich Ingenieurwissenschaften
Abteilung Elektrotechnik und Informationstechnik
Institut für Nachrichten- und Kommunikationstechnik

Prof. Dr.-Ing. K. Solbach
Prof. Dr.-Ing. A. Beyer

Studienarbeit / Bachelorarbeit

Aufgabe der Abschlussarbeit im ISE Bachelor/Masterstudiengang

für: Herrn Laurent Sonlui

gestellt von: Prof. Dr.-Ing. K. Solbach
Fakultät für Ingenieurwissenschaften - Hochfrequenztechnik

Thema: **Power Amplifier for Campus Radio 105,6 MHz**

Thesis Task:

The University Duisburg-Essen operates its own FM campus radio station "Radio DuE" at VHF 105.6 MHz. Presently, the program is radiated from a building in Essen using a transmitter of 20 W maximum output power to the cable feeding the antenna. The allowed (license) effective radiated power is 50 W to an omnidirectional antenna, which means that a booster amplifier may be employed in order to produce up to 100 W to the feed point of the antenna-cable assembly. The increase of transmit power is desired to improve the signal strength of the program and increase the coverage of the station over Essen and neighboring cities.

The Bachelor thesis task is to design, build and test a power amplifier that boosts the 20 W transmitter power to 50 W up to 100 W. The amplifier requirements are

- 0 to 20 W input / 0 to 50W (100 W as far as possible) output
- FM 105,6 MHz +/- 1 MHz
- 2nd and 3rd harmonic suppression by better than 40 dB
- Variable output power using input power variation
- Single stage class-C push-pull amplifier circuit using bipolar transistor pair SD4590
- Printed circuit board technology and mounting to a air-cooling chassis
- External power supply (commercial component, not part of the thesis)
- If time allows: Circuit for the detection of output signal level (directional coupler)

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The thesis work is to be performed in the following steps:

1. Search of applicable amplifier text book chapters, circuit design literature, component designs, application notes and project descriptions
2. Concept and detail design of amplifier circuit to be built including bias network, transformers, directional coupler and low-pass filter (output)
3. Design and test of components, in particular the transmission line transformer, low-pass filter and directional coupler
4. Design and test of bias circuit
5. Layout of printed circuit board (PCB)
6. Assembly of PCB, transistors and components
7. Test of completed amplifier circuit for functionality
8. Test for compliance with requirements and of efficiency as a function of drain voltage / output power

After completion of thesis work a public presentation of results is to be given at the department.