TECHNISCHE UNIVERSITÄT DRESDEN

Fakultät Elektrotechnik und Informationstechnik

Task Formulation for a Master Thesis

Student´s Name:	Lavakumar Navilipuri
Matriculation Number:	4821932
Studies:	Nanoelectronic Systems
Subject:	**Design and Layout of a Transimpedance Amplifier (TIA) at 50 GHz for Optical Receivers in IHP 130nm SiGe BiCMOS Technology**

Objectives of work

Optical fiber communication has emerged as a critical contributor to today's industrial development, economic progress, and modern society. Extending the bandwidth of analog front-end circuits for optical communications is critical to cope with the ever-increasing traffic. The transimpedance amplifier (TIA), acting as the electrical front-end of an optical receiver, is an essential block in optical communication systems.

In the Optical receiver, the photodetector converts incident light into a small photocurrent. The transimpedance amplifier (TIA) amplifies the current received from the photodiode to an adequate voltage level for the following stages. Front-end circuits for high-speed applications usually require the characteristics of low-noise and broad-bandwidth. With no exception, the TIA design entails many trade-offs between total input-referred noise, bandwidth, transimpedance gain, supply voltage, and power dissipation, presenting difficult challenges.

Focus of the work

This thesis focuses on the design and layout of a transimpedance amplifier (TIA) for optical receivers in IHP 130nm SiGe BiCMOS technology at a 50 GHz frequency range. The designed TIA should have a minimum transimpedance gain of 60 dBOhms, a minimum bandwidth of 40 GHz, and a maximum input-referred noise of 20 $pA/\sqrt{Hz}$. To achieve this, the following sub-tasks have to be followed:

- Literature review of state-of-the-art transimpedance amplifier (TIA) architectures.
- Comparison of different architectures will be used to decide on a certain topology.
- Designing the schematic in IHP 130nm SiGe BiCMOS technology.
- Designing the layout in IHP 130nm SiGe BiCMOS technology.
- The pre and post-layout results will be compared with one another alongside the theoretical considerations where ever possible.
- The performance will be measured against the state-of-the-art architectures.

Master thesis will be written in English.

Advisor:	Mr. Andy Heinig
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Start: 23.05.2022 Thesis due: 31.10.2022

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