Master Thesis / Masterarbeit

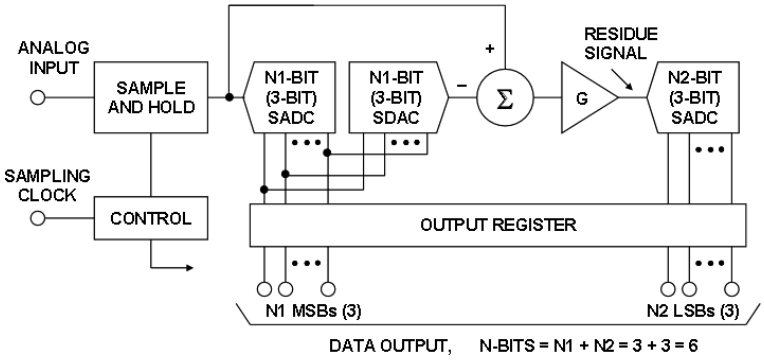
Circuit Design of Key Components for an Analog-to-Digital Converter in Optical Communications

Integrated Mixed-Signal Circuit Design	
Type of Work: - Practical Work in our CAD Lab - Design Key Circuit Diagrams - Implement Schematics with High-Performance SiGe-HBTs - Verify Designs by Time- and Frequency-Domain Simulations	**Favored Skills & Interests:** - Experience with Circuit Design & Simulation Tool (best: Cadence Virtuoso) - Integrated Mixed-Signal Circuits - Basic Transistor Amplifiers - Interest in High-Frequency Electronics

Background: Mass use of mobile internet services and cloud computing thrives the need for ultra-high data rate transmission. Therefore, intra- and interconnections of powerful data centers are equipped with optical transmission systems, using the highest bandwidth available. Optoelectronic receivers must convert the optical signal back into a digital, electrical signal to process data. Photodiodes and often heavily parallelized analog-to-digital converters (ADCs) are main components of these optoelectronic receivers.

For a 4-fold ADC parallelization concept, we are designing a 40 Gigasample per second (GS/s) ADC-core with an effective resolution of 6 bits (ENOB), to reach record data transmission rates near 1 Tbit/s!

Description of Work: We combine the high data rate of a flash ADC with the higher resolution of a pipeline concept. In this thesis, you will design key components for both parts in a high-performance SiGe BiCMOS technology that is not yet commercially accessible. A sampling front-end and clock driver is already available.



Exemplary Architecture of a 6-bit Pipelined ADC

Additional components include, but are not limited to, comparators, buffer amplifiers and a digital encoder in current-mode logic. You will optimize your design through simulations and gather profound knowledge of time- and frequency-domain analysis. Upon completion of the circuit schematic, it can be tested for robustness with corner and mismatch simulations.

This work provides insights into the design processes that you find in semiconductor industry or research institutions all over the world and prepares for a career in these areas. The master thesis can be prepared in English or German language.

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