

CAN I COMBINE SCIENCE AND BUSINESS IN A SINGLE JOB?

YES.

We'll show you how at Fraunhofer IIS.

For the »**RF and Satellite Communication Systems**« department in **Erlangen**, the Fraunhofer Institute for Integrated Circuits IIS is currently offering a

Master Thesis

»Physical Random Access Channel (PRACH) Design for 5G Non-Terrestrial Networks«

With its »**RF and Satellite Communication Systems**« department, Fraunhofer IIS has an experienced background in the design, the implementation and the test of RF and microwave systems. We focus on high speed signal-processing platforms for RF communications. Our research consists of the design and implementation of satellite communication systems including the entire physical layer of signal processing in the analog and digital domain by means of VHDL firmware and software. Our special focus is on reaching cutting-edge performance, applying and investigating latest techniques and system concepts, and developing challenge- or customer-specific solutions.

Abstract:

The goal of non-terrestrial networks (NTN) is to complement terrestrial 5G networks by providing enhanced coverage and service continuity. NTN can potentially cover unserved areas of 5G terrestrial networks, enhance 5G service reliability, and provide broadcast and/or unicast services.

Mobile satellite systems are one of the vital components of future NTN. They are able to support the required flexibility and service continuity for broadcast and broadband 5G services. One of the pivotal factors in the effective deployment of mobile satellite systems in the 5G network is to maximize the utilization of the current technology in terrestrial systems, to lower the implementation costs. The efficient design and integration of NTN to 5G systems depends on the consideration of some unique features of satellite communication systems, namely large propagation delays and large Doppler frequency shifts. Specifically, geostationary earth orbit (GEO) communication satellites experience large propagation delays, while low earth orbit (LEO) communication satellites are prone to large Doppler frequency shifts due to the fast mobility of LEO satellites and/or user equipment (UE). These factors affect some of the currently used algorithms of the radio access network (RAN) of terrestrial 5G systems. Specifically affected is the random access channel (RACH). 5G new radio (NR) uses Zadoff-Chu (ZC) sequences for the construction of preambles and the transmission via the physical random access channel (PRACH). However, the performance of the ZC sequences substantially deteriorates in the presence of large propagation delay and large Doppler frequency shift. As a result, an enhancement for PRACH of NTN is required, which will be the topic of the thesis

Your responsibilities:

- Literature review of the PRACH in 5G NR
- Extension of an existing 5G NR PRACH simulator for NTN
- Design and development of new algorithms for the enhancement of 5G NR PRACH for NTN
- Implementation of the designed algorithms in the developed simulator
- Performance evaluation and comparison of different developed NTN PRACH algorithms

Your profile:

- You are interested in hybrid terrestrial-satellite communications
- You possess good knowledge of digital and mobile communication systems, and statistical signal processing
- You have experience with the common programming language MatLab
- You are familiar with MS Office and/or LaTeX

What you can expect from us

- An open and cooperative working environment
- Collaboration in interesting and innovative projects
- Many opportunities to gain practical experience

The thesis will be assigned and carried out in accordance with the rules of your university. For this reason, please discuss the thesis with a professor who can advise you over the course of the project. The duration for the thesis should be 6 months and it can be started from October 2020.

Interested?

Please apply for this position using the following link: <https://recruiting.fraunhofer.de/Vacancies/54812/Description/2>

Applications are possible **in German and English**. Please include a cover letter, your CV and your latest transcripts of records (as PDF) and quote ID number **54812-KS**. Address your application to Nina Wörlein.

Please let us know how you learned about this job opportunity.

Additional information is available on our website: www.iis.fraunhofer.de/en