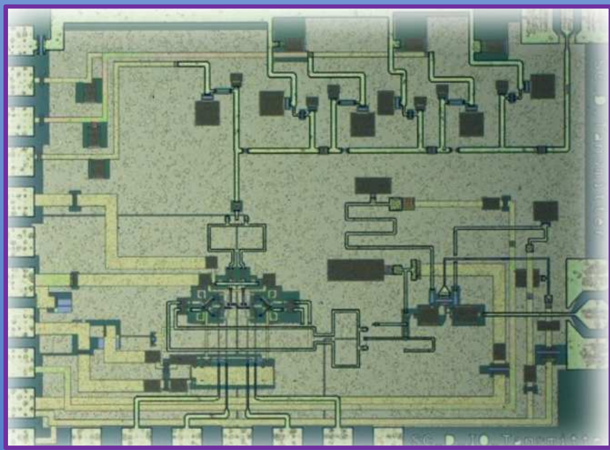
# Guest Lecture

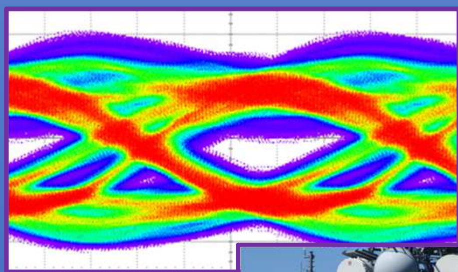
**Tuesday February 7**
**15.00 EWI**
**Lecture hall D@TA**

# Design of mm-wave, multifunction ICs for data communication and remote sensing


## Abstract

The transmission rate of wireless data in the mobile networks is doubling every year due to the increased usage of mobile multimedia services like streaming video, music, television, data transfer in smartphones and laptop-computers etc. This tendency will require continuously improved **telecom infrastructure** regarding both base-stations and the backhaul communication links. Today, the E-band (71-76, 81-86, 92-95 GHz) is employed increasingly in the networks, allowing multi Gbps data rate. In a near future however, the E-band will be crowded, and novel, higher frequency bands will have to be employed as well. Several hundred Gigahertz bandwidth is available for new communication and sensing applications just waiting to be exploited at frequencies **above 100 GHz**. Until now, components for making such 'THz-systems' have been too expensive, too bulky, too power hungry and nonsufficient in terms of generating enough power for communication systems. With newly developed RFIC-processes, it is now possible to design multifunctional integrated circuits, realizing a full '**frontend on a chip**' at frequencies well beyond 100 GHz. Recent results from ongoing projects aiming at enabling new applications for next generation mobile infrastructure, **5G**, and **security imaging**, up to 340 GHz will be reported. So far, critical building blocks such as LNA, PA, VCO, modulator and demodulator, frequency multiplier, power detector and mixer have recently been developed, and results will be reported. Multifunction front-end circuits such as complete receive and transmit RFICs, mixed signal designs for co-integrated baseband/frontend ICs, and radiometer ICs have also been developed and will be reported as well, including the newly developed **D-band (110 to 170 GHz) frontend chipset** demonstrating state-of-the-art bitrate of beyond **40 Gbps**.



## Lecturer: **Herbert Zirath**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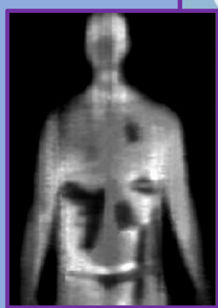

**Herbert Zirath** (M' 86-SM'08-F'11) was born in Göteborg, Sweden, on March 20, 1955. He received the M. Sc and Ph. D. degree in electrical engineering from Chalmers University, Göteborg, Sweden, in 1980 and 1986, respectively. From 1986 to 1996 he was a researcher at the Radio and Space Science at Chalmers University, engaged in developing a GaAs and InP based HEMT technology, including devices, models and circuits. In the spring-summer 1998 he was research fellow at Caltech, Pasadena, USA, engaged in the design of MMIC frequency multipliers and Class E Power amplifiers. He is since 1996 Professor in High Speed Electronics at the Department of Microtechnology and Nanoscience, MC2, at Chalmers University. He became the head of the Microwave Electronics Laboratory 2001. At present he is leading a group of approximately 40 researchers in the area of high frequency semiconductor devices and circuits. His main research interests include MMIC designs for wireless communication and sensor applications based on III-V, Graphene, and silicon devices. He is author/co-author of more than 530 refereed journal/conference papers, and holds 5 patents. He is research fellow at Ericsson AB, leading the development of a D-band (110-170 GHz) chipset for high data rate wireless communication. He is a cofounder of Gotmic AB, a company developing highly integrated frontend MMIC chip-sets for 60 GHz and E-band wireless communication.