LUND UNIVERSITY

NANOLUND

AT THE FOREFRONT OF NANO SCIENCE

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NANOSCIENCE COLLOQUIUM

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III-V Nanowire MOSFETs on Si for Millimeter-Wave Applications

III-V Nanowire transistors are candidates to extend the transistor scaling roadmaps. In particular the nMOSFETs have shown a dramatic performance increase the last few years and today their on-state performance is comparable or even superior to other transistor technologies. In particular, the performance strength of the nMOSFETs may be used to enhance the CMOS RF-capabilities what is essential to increase performance and reduce power consumption in millimeter wave systems.

In this talk, we will review efforts made in Lund to realize high-performance III-V nanowire transistors in lateral and vertical geometry. We will present state-of-the-art DC (g_m>3 mS/μm) and RF (f_t/f_{max}> 300 GHz) performance in both geometries. Nanowire capacitor CV data demonstrating $D_{it}<10^{12}$ cm^{-2} will be presented and we will discuss the influence of border traps on the transistor frequency response. We will introduce the benefits of source/drain heterostructure design and also present the very first RF-circuits using vertical nanowire MOSFETs. We will also present a III-V vertical nanowire CMOS implementation using InAs and GaSb in a dual channel, single gate stack approach and demonstrate high performance TunnelFEETs using the GaSb/GaAsSb/InAs heterojunction. The latter demonstrating 100*x* improvement as compared to previous state-of-the-art devices. These results provide key technology for the EU-projects INSIGHT and E^2SWITCH.

Host: Heiner Linke (Solid State Physics)

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