MCCXXX-XX-XX - Master thesis on:

Fingerprint scanning using graphene transistors at terahertz frequency

Background – The unique property of intrinsically high carrier velocity in graphene enables the possibility of much faster electronics than with traditional semiconductors. Combination of the high carrier velocity with graphene flexibility, offers many novel exciting applications, such as in biometric sensors for terahertz radiation. The terahertz radiation consists of electromagnetic waves within the band of frequencies from 0.1 to 30 terahertz (THz). Unlike X-rays, terahertz radiation is not ionizing and do not damage living tissues and DNA. The terahertz waves can penetrate the drier outer skin layers and provide anatomical information on the underlying structures, which cannot be duplicated, as the artificial fake fingerprints. Therefore, the terahertz imaging can serve as a novel method of advanced fingerprint identification, with a significantly higher security level.

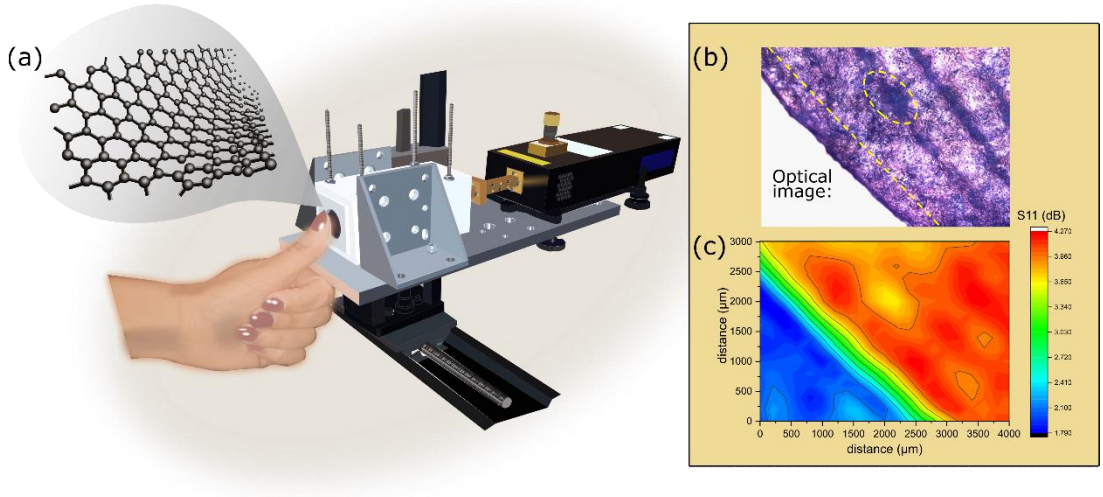

Figure 1(a) Schematic of experimental set-up for scanning fingerprint using THz frequency with indicated placement of graphene sensor. (b) Optical image of an area of a fingerprint. (c) Terahertz image of corresponding fingerprint area as (b).

Project description – This project includes development and optimization of the state-of-the-art graphene field-effect transistors (GFETs) for high frequency applications, as well as implementation and development of experimental set-up for fingerprints scanning in a laboratory setting, see Fig. 1 (a). Figure 1 (b) and (c) illustrate initial imaging experiments already done using THz detection, by a vector network analyzer. The objective of the project involves theoretically and experimentally assessing the feasibility of using a GFET terahertz biometric sensors for advanced smartphone authentication.

Activities – The content of the work includes the following specific tasks: study of literature in the field of graphene for high frequency and flexible electronics including the nano-fabrication and high frequency characterization techniques and test of the idea of fingerprint scanning using in-house flexible graphene terahertz receivers. This work will be carried out at Chalmers, but in close vicinity to and in collaboration with Fingerprint Cards AB, a world leading company in the area of biometric sensors for smartphones.

Group size:
1 student, 30 hec.

Target audience: E, F, or corresponding GU programs

Supervisors:

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