Project sheet

Programme: Horizon 2020

STSAW Sub-THz Surface Acoustic Waves	
Le Mans investigator: Vitali GUSEV- Changxiu LI	Laboratory: LAUM
Duration: 24 months (1st of February 2022- 31st of January 2023)	Grant ID: 101025424
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Summary:
The rapid development of not only optoelectronics and electrical signal processing for information and communication technologies, but also fundamental/applied science for nanometrology and nanoimaging, requires monitoring coherent surface acoustic waves (SAWs) with deeply sub-optical localization depths in the currently unexplored frequency range of 100 GHz - 1 THz. While bulk acoustic waves can be monitored up to THz frequencies by ultrafast lasers in superlattices (SLs) with nanometer periodicity, the highest SAW frequencies recorded in metallic gratings deposited on surfaces lie below 100 GHz. The use of SLs cleaved along their growth direction for optical SAW excitation has been proposed though not achieved experimentally. The goal of this project is to demonstrate, for the first time, optical monitoring of sub-THz SAWs (STSAWs) by developing original optoacoustic (OA) and acousto-optic (AO) transducers based on such cleaved SLs and an efficient non-thermoelastic OA conversion. Dedicated numerical modeling will optimize the SL design (dispersion characteristics, OA/AO conversion efficiencies) for STSAW propagation, generation and detection. The atomic-precision fabrication of SLs and use of advanced ultrafast pump-probe laser techniques will fulfill this objective. STSAW interactions with charge carriers and 2D materials will be showcased. The project relies on complementarity and knowledge transfer between applicant (numerical modeling, coherent acoustics control) and host institution (SAW theory, laser monitoring of SAWs); it will expand the applicant's experience and skills, shaping the applicant's career as an independent researcher. Results will be disseminated via networking, conferences and peer-reviewed publications. This project will greatly enhance Europe's technological competitiveness by pioneering controllable STSAWs and providing a platform to explore the fundamentals of OA/AO conversions at picosecond temporal scale and nanometer spatial scale.

Mandatory logos:

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Internet site: https://cordis.europa.eu/project/id/101025424/fr

Project Coordinator: University of Le Mans