Date: Sep. 4th, 2020

Applicant: Wei-Chih Wang

Eligibility:

- Affiliation: Power Mechanical Engineering and Institute of Nanoengineering and Microsystems, NTHU
- Research: Active research in THz devices and electronics (solid-state devices and THz signal generation, energy harvesting devices, imaging devices and components)

Proposal Category: C

Team Members: 黃衍介、王威智、陳家祥

Joint Project: Smith-Purcell/Cherenkov laser

Project Description: This is a joint effort to generate coherent IR and THz radiations from keV electron pumped micro and nano photonics structures. The radiation mechanism is so-called Smith-Purcell radiation above a grating structure or Cherenkov radiation inside a dielectric. Prof. 陳家祥 will be responsible for establishing the CST simulation tools, Prof. 王威智 will be responsible for fabricating the structures, and Prof. Yen-Chieh Huang will be responsible for conducting the experiment and generating and radiations. We expect this collaboration will last a few years. In the next 6-12 months, we will be establishing the infrastructure for this collaboration.

For my part, this research is to design and fabricate an efficient tunable THz/far-IR coherent radiator using Smith-Purcell laser generation from Si (Thz) or Si02 (near-IR) or metal coated gratings periodic structures. The first year of research will involve investigating several critical design and fabrication parameters of the basic nano and micro scale periodic structures. The periodicity of the structure is about the driving or radiation wavelength (Bragg resonance). The range will be in THz to mid-IR (for THz radiation generation) or in the near-IR/visible (for eventual VUV/EUV sources and the reason later in second objective to generate attosecond electron bunches in the electron acceleration). One of the studies will involve investigation of basic geometries of the periodic structure and corresponding fabrication, in this case several high resolution E-beam lithography (EBL), focus ion beam (FIB), Deep ion etching (DRIE)and X ray lithography equipment will be required, thus additional funding are requested to ensure successfully fabrication of these submicron 3D devices.

Budget Request: 100k NT

Result: to be updated