

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: B

Proposed Co-Op Service Facility: Bruker Innova Atomic force microscope

Description of Services: An AFM can provide accurate, high-resolution imaging and a wide range of functionality for advanced research in physical, life, and material sciences with submicron resolution. The funding is requested to repair a bad controller and few other missing cartridge and probes. The system will be made available for service to all our members. This AFM will be located in Rm. 809 of General Building II, NTHU MicroTechnology Laboratory.



Budget Request: 100,000 NT (for replacing bad controller)

Result: to be updated

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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 SiO₂ (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

Applicant: 黃衍介

Eligibility:

- Affiliation: Institute of Photonics Tech/EE Department, NTHU
- Research: I have been working on THz nonlinear optics and vacuum electronics since 1990.

Proposal Category: A

Service Requests to TOP Center:

- Teaching lab training (done): 孔祥龍、劉峰麒、陳傑儒、彭珞豪、王傑立 (15k NT paid to the TOP)
- Optical coatings: AR coating on KTP crystals, AR coating on lithium niobate crystals (35K NT to be paid to TOP by Oct.)
- A computer account (50k NT will be paid to TOP by Nov.)

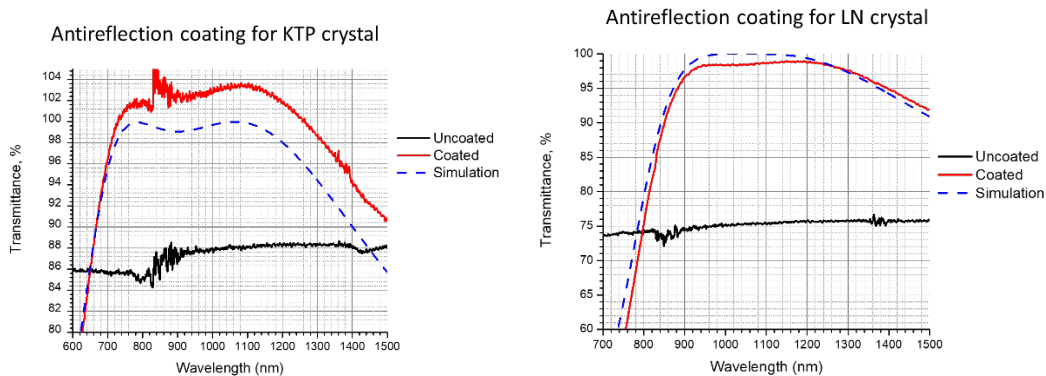
Budget Request to TOP Center: 100k NT

Results:

- Service fee paid to the teaching-lab training

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1090706	10916383	0003476	逢甲大學 52005505	5,200	6月份晶圓切割技術服務	已收	109H6066NC	
1090619	10915102	0003227	中國砂輪企業股份有限公司 03089008	50,000	兆赫光電研究中心技術服務收入	已收	109H6066NC	
1090619	10915103	0003228	中國砂輪企業股份有限公司 03089008	40,000	兆赫光電研究中心技術服務收入	已收	109H6066NC	

- Coating service provided by the TOP



(To be further updated)

Proposal Category: B (*a template only, no budget request from Huang)

Proposed Co-Op Service Facility: 120 kV transmission electron microscope (TEM)

Description of Services: A TEM is a modern tool to view nano-materials. My group will be setting up a Jeol JEM 1200EXII TEM by the end of this year and make it available for service to our members. This TEM will be located in Rm. 402 of the HOPE Laboratory, NTHU Photonics Research Center.



Budget Request: 0 NT (for setting up air conditioner, chiller, gas/water conduits, equipment transportation etc.)

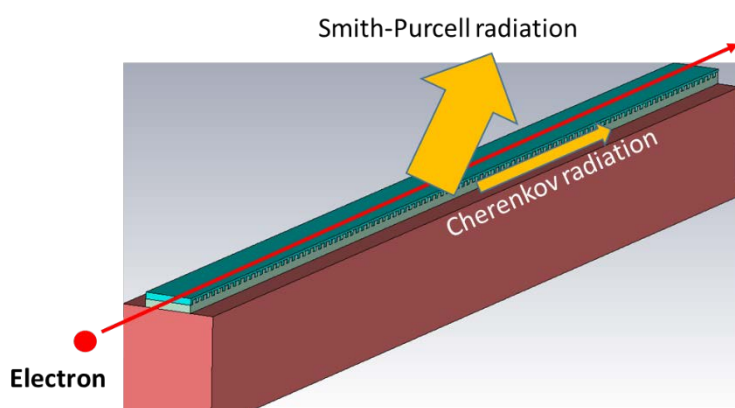
Result: to be updated

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, I will build a >100 keV electron beam line with a pulsed current > 1mA in the next few months. On the beam pipe, we will install beam control elements, such as dipole, quadruple magnets and steering coils, along with a large vacuum chamber for radiation generation from micro- and nano-structure. Since we plan a broad radiation band covering IR and THz, sensitive detectors, such as PMT, Golay cell, and bolometer etc., are among our considerations. Spectral measurement is crucial to confirm laser radiation. We are building a scanning Michelson interferometer for this purpose.

Budget Request: 100k NT

Result: to be updated

Date: Sep. 9th, 2020

Applicant: 陳家祥

Eligibility:

- Affiliation: adjunct professor, Institute of photonics technologies/Electrical Engineering, NTHU; assistant engineer, Beam dynamics group/light source division, NSRRC
- Research: THz optics, beam and radiation simulation

Proposal Category: A

Project note: I plan to design a keV-level beam injector for THz radiation generation. The electron beam injector design relies on using simulation codes for the particle tracking and EM wave generation. I will be doing computer simulations by using the simulation cluster in the TOP Center.

Service Requests to TOP Center: A computer account (50k NT from my research project will be paid to TOP by this Nov. for this computer account)

Budget Request to TOP Center: 50k NT

Results: to be updated

Proposal Category: B

Service delivered and to be delivered to the TOP Center: I have offered the Optics Lab course for the TOP Center in two consecutive years. I will continue to maintain, improve, and run the lab course in EE420 for students during summers.

Budget Request to TOP Center: 50k NT

Results:



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. I will be responsible for establishing the CST simulation tools to study the physics and provide guideline for structure fabrication.

Budget Request to TOP Center: 100k NT

Result: to be updated

Date: Sep. 9th, 2020

Applicant: 劉怡君

Eligibility:

- Affiliation: Institute of Electronics Engineering/Department of Electrical Engineering, NTHU.
- Research: I have been working on millimeter-wave/THz ICs since 2006.

Proposal Category: B

Proposed Co-Op Service Facility: computer cluster in EECS 420.

Description of Services:

The computer cluster with 80 cores, 192GB memory will be set up by Nov. 2020 with simulation tools that facilitate research in high-frequency electromagnetics and optics. The cluster will be in a computer room located in EECS building, room 420, THz Optics & Photonics (TOP) Center.

Budget Request: 100k NT (for computer hardware and software maintenance.)

Result: to be updated

Date: Sep. 14, 2020

Applicant: Masahito Oh-e (大江昌人)

Eligibility:

- Affiliation: Institute of Photonics Tech/EE Department, NTHU
- Research: I have been working in the field of organic optoelectronic materials and devices such as liquid crystals, organic semiconductors and displays. In the past, I worked on THz–TDS transmission measurements on liquid crystal colloids.

Proposal Category: A

Service Requests to TOP Center:

- A computer account (50k NT will be paid to TOP by Nov.)

Budget Request to TOP Center: 50k NT

Results:

(To be updated)

Date: Sep. 16th, 2020

Applicant: Shang-Hua Yang

Eligibility:

- Affiliation: Institute of Electronics Engineering/EE Department, NTHU
- Research: THz active/passive devices, THz communication and THz imaging.

Proposal Category: A

Service Requests to TOP Center:

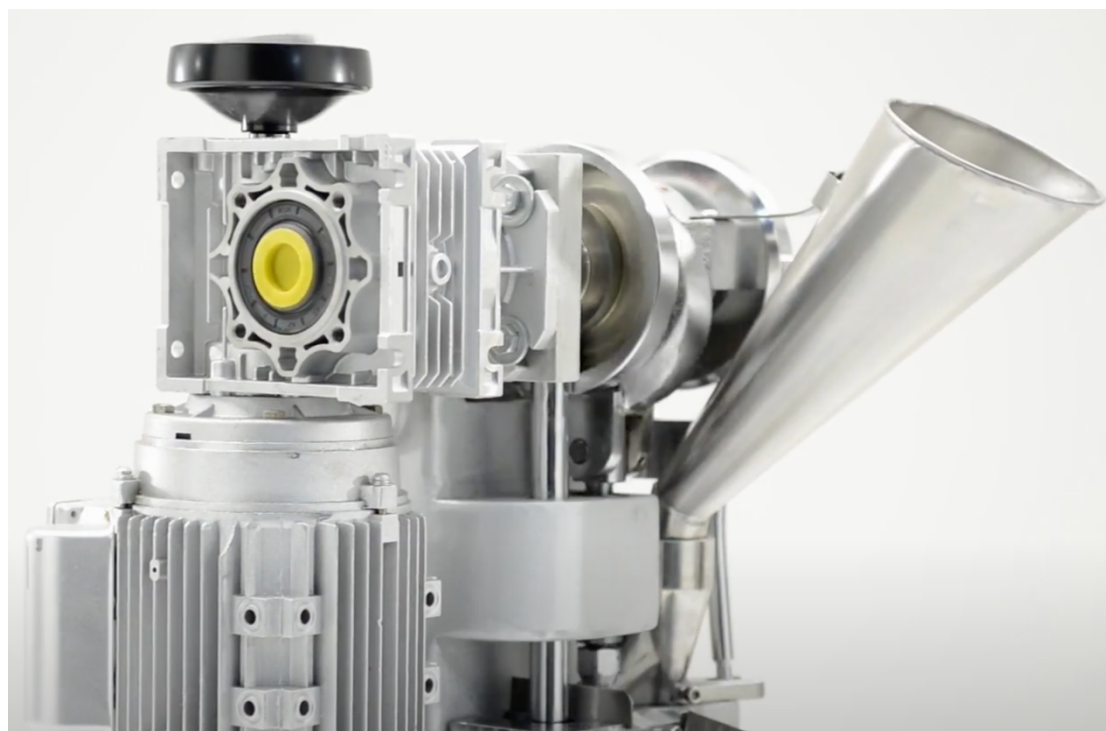
- A computer account

Budget Request to TOP Center: 50k NT

Proposal Category: B

Proposed Co-Op Service Facility: Pill Press Machine

Description of Services: A pill press machine is a precision tool for the preparation of solid-based chemical identification setup. My research group will build up a high precision chemical identification system covering the frequency range from 0.1THz to 3THz by the end of this year and make it available for service to our members. This pill press machine will be located in EECS building, room 420, THz Optics & Photonics (TOP) Center.



Budget Request: 100k NT (for setting up pill press machine and maintenance)

Result: to be updated

Date: Sep. 15th, 2020

Applicant: 潘犀靈

Eligibility:

- Affiliation: Department of Physics/Institute of Photonics Tech, NTHU
- Research:
 1. Laser Science
 2. Ultrafast Optics and Optoelectronics
 3. THz Optics and Photonics
 4. Liquid Crystal Optics and Photonics

Proposal Category: A

Service Requests to TOP Center:

- Optical coatings: HR coating on HR silicon wafer, PR coating on fused silica substrate (100K NT to be paid to TOP by Oct.)

1. HR coating on HR silicon wafer:

substrate: HR silicon wafer from CLPan lab (diameter:4 inches, thickness:300um)

coating: HR(R>95% for AOI: 45deg) @750-850nm (for ultrafast Ti:sapphire laser used)

number: 5pcs

2. PR coating on fused silica substrate:

substrate: UVFS substrate from CLPan lab (diameter: 25.4mm, thickness: 6 mm)

coating:

S1:

(1)PR(R=5% for AOI: 0deg) @910-1000nm

(2)PR(R=10% for AOI: 0deg) @910-1000nm

(3)PR(R=15% for AOI: 0deg) @910-1000nm

S2:

AR coating <0.3%

number: 6 pcs in total (2pcs for each S1 coating)

Budget Request to TOP Center: 100k NT

Results:

(To be further updated)

Date: Sep. 24, 2020

Applicant: Masahito Oh-e (大江昌人)

Eligibility:

- Affiliation: Institute of Photonics Tech/EE Department, NTHU
- Research: I have been working in the field of organic optoelectronic materials and devices such as liquid crystals, organic semiconductors and displays. In the past, I worked on THz–TDS transmission measurements on liquid crystal colloids.

Proposal Category: C

Team Members: Masahito Oh-e, Ci-Ling Pan, Shang-Hua Yang

Joint Project: Soft-matter THz

Project Description: Advancing terahertz (THz) technology requires developing many THz-device components such as phase shifters and polarizers. This project is a joint effort to study potential applications of soft-matter materials such as liquid crystals (LCs) to THz-related components, through the studies of which we also investigate the structures and dynamics of soft-matter, which self-organizes into mesoscopic structures that are much larger than the microscopic scale and yet are much smaller than the macroscopic scale of target materials. Prof. Ci-Ling Pan will support the THz spectroscopic analysis of LC and other organic materials as well as device characterization, and advice on the physics of some of these materials as well. He is one of the pioneers in the field of THz LC optics and photonics. Prof. Shang-Hua Yang will be responsible for exploring high-speed dynamics of soft-matter interacting with THz wave. Prof. Masahito Oh-e will be responsible for conducting experiments and simulating on LC directors in LC cells. We expect this collaboration will last a few years. In the next 6-12 months, we will be establishing the basis of this collaboration.

For my part, we will simulate on the orientation of LC directors in bidirectional switching LC cells or others that have potential to achieve fast phase-shifting of THz light, through which we explore the possibilities of how to improve device characteristics such as the driving voltage and amount of phase shift for THz devices. Further, we also explore soft-matter such as cellulose for THz spectroscopy to unveil mesoscopic structures and properties.

Budget Request: 100k NT

Result: to be updated

Date: Sep. 24, 2020

Applicant: Ci-Ling Pan (潘犀靈)

Eligibility:

- Affiliation: Department of Physics and Institute of Photonics Tech/EE Department, NTHU
- Research: Ultrafast and THz Photonics, Liquid Crystal photonics, Fiber Photonics

Proposal Category: C

Team Members: Ci-Ling Pan, Masahito Oh-e, Shang-Hua Yang

Joint Project: Soft-matter THz

Project Description: Advancing terahertz (THz) technology requires developing many THz-device components such as phase shifters and polarizers. This project is a joint effort to study potential applications of soft-matter materials such as liquid crystals (LCs) to THz-related components, through the studies of which we also investigate the structures and dynamics of soft-matter, which self-organizes into mesoscopic structures that are much larger than the microscopic scale and yet are much smaller than the macroscopic scale of target materials. Prof. Masahito Oh-e will be responsible for conducting experiments and simulating on LC directors in LC cells. Prof. Shang-Hua Yang will be responsible for exploring high-speed dynamics of soft-matter interacting with THz wave. Prof. Ci-Ling Pan will support the collaboration as one of the pioneers in the field of THz LC optics and photonics. We expect this collaboration will last a few years. In the next 6-12 months, we will be establishing the basis of this collaboration.

For my part, I will support the THz spectroscopic analysis of LC and other organic materials as well as device characterization, and advice on the physics of some of these materials as well.

Budget Request: 100k NT

Result: to be updated

Date: Sep. 24th, 2020

Applicant: Shang-Hua Yang

Eligibility:

- Affiliation: Institute of Electronics Engineering/EE Department, NTHU
- Research: THz active/passive devices, THz communication and THz imaging.

Proposal Category: C

Team Members: Masahito Oh-e, Ci-Ling Pan, Shang-Hua Yang

Joint Project: Soft-matter THz

Project Description: Advancing terahertz (THz) technology requires developing many THz-device components such as phase shifters and polarizers. This project is a joint effort to study potential applications of soft-matter materials such as liquid crystals (LCs) to THz-related components, through the studies of which we also investigate the structures and dynamics of soft-matter, which self-organizes into mesoscopic structures that are much larger than the microscopic scale and yet are much smaller than the macroscopic scale of target materials. Prof. Ci-Ling Pan will support the THz spectroscopic analysis and LC and other organic materials as well as device characterization, and advice on the physics of some of these materials as well. He is one of the pioneers in the field of THz LC optics and photonics. Prof. Shang-Hua Yang will be responsible for exploring high-speed dynamics of soft-matter interacting with THz wave. Prof. Masahito Oh-e will be responsible for conducting experiments and simulating on LC directors in LC cells. We expect this collaboration will last a few years. In the next 6-12 months, we will be establishing the basis of this collaboration.

In terms of this collaboration, Yang Research Group leading by Prof. Shang-Hua Yang will construct pattern-encoded quasi-CW THz systems to study THz passive components. Based on designed patterned modality and high frame switching rate, a real-time THz inspection system covering several THz frequency range will be further developed to unveil soft-matter-related mesoscopic structures and properties.

Budget Request: 50k NT

Result: to be updated