DSO-NTU PhD Research Award
New Topics Proposed for Academic Year 2012/2013

RESEARCH TOPIC/ AREA	SUPERVISORS	RESEARCH OBJECTIVE/COMMENT
Photonic Technique for Instantaneous Microwave Frequency Measurement	DSO Supervisors Dr Lim Peng Huei Dr Goh Swee Eng University Supervisor A/P Perry Shum Ping (NTU)	Research topic: to investigate, implement and demonstrate photonic technique for instantaneous frequency measurement in the microwave frequency band. Instantaneous frequency measurement (IFM) system is a critical component of modern electronic defence systems. IFM is used to evaluate the carrier frequency of radar pulses over a wide frequency range and on a pulse-by-pulse basis. The introduction of photonic technique for IFM may offer advantages such as wider instantaneous frequency band coverage and simpler in implementation. The research will be supervised by Dr Lim Peng Huei and Dr Goh Swee Eng in DSO.

RESEARCH TOPIC/AREA	SUPERVISORS	RESEARCH OBJECTIVE/COMMENT
Lithium Niobate Integrated Optics / Photonics	DSO Supervisor Dr Lim Peng Huei University Supervisor A/P Perry Shum Ping (NTU)	To explore advanced designs for Mach Zehnder modulators such as: • Low Vpi • Integrated Single Sideband Modulation with phase shifter • Non-birefringent crystals. LiNbO3 is the prevalent material for high speed modulators used in microwave photonics. This single device has the largest performance enhancement factor in an optical fiber link and is currently one of the main bottlenecks of COTS. The research will be supervised by Dr Lim Peng Huei in DSO.

RESEARCH TOPIC/AREA	SUPERVISORS	RESEARCH OBJECTIVE/COMMENT
Machine Learning for Information Extraction	DSO Supervisor Dr Chieu Hai Leong University Supervisor To Be Advised	The problem of information extraction (IE) is to “read” text from a variety of different sources, and extract important information from it into structured databases that can be automatically and efficiently processed or visualized using automated tools. The primary technique for solving IE problems is machine learning: given a set of examples of text and the extracted information, a machine-learning algorithm learns a statistical model that can be used to extract information from new text. In this project, the student will investigate the use of machine learning approaches to solve the information extraction problem. The research will be supervised by Dr Chieu Hai Leong in DSO.

RESEARCH TOPIC/ AREA	SUPERVISORS	RESEARCH OBJECTIVE/COMMENT
Generation of near perfect laser beam quality in Novel Solid-state Thin Disk Lasers	**DSO Supervisor** Dr Lai Kin Seng **University Supervisor** Dr Tang Dingyuan, EEE, NTU	Solid-state lasers are one of the most successful and versatile lasers that has seen widespread use in wide ranging areas from heavy industry and material processing, medical and aesthetics, military, remote sensing, to entertainment, and now, everyone who uses the cool green laser pointer are literally carrying such solid-state laser technology in their hands. The workhorse for such solid state lasers are based on the crystalline YAG host, with Nd(Neodymium) or Yb(Ytterbium) as the lasing dopant ion. The objective of this research is to investigate solid state lasers build from newer materials and hosts (eg LuAG), including the promising ceramics materials, which has better properties (including high thermal conductivity) and versatility, with the potential for higher power, higher efficiency and better beam quality laser generation. An interesting and relatively new and promising laser architecture based on the thin disk geometry will be the basis for such laser investigations in this work. Another part of this research, relevant to the generation of good laser beam quality, will investigate the use of adaptive optics, such as deformable mirrors coupled with wavefront sensors, to engineer and shape the laser wavefront to remove undesirable aberrations and generate desired wavefronts close to the diffraction limit, which will allow for long distance collimated propagation with lowest possible divergence, one of the key useful property of the laser.