【特別セミナー **Special Seminar**】

The seminar is in English.

Microresonators for Sensing Applications　マイクロ共振子のセンサ応用
~ Gyroscopes, Temperature & Infrared Sensors, Magnetic Sensors, and Chemical & Biological Sensors ~

日　時：2018年10月15日（月曜日）　16:20～17:50
15 October 2018 (Monday)　16:20～17:50
参加無料，事前申込不要　Admission free, No advanced registration required

場　所：東北大学　青葉山キャンパス　マイクロ・ナノマシニング研究教育センター　3階　セミナー室
Tohoku University, Aobayama Campus, Micro-Nanomachining Research & Education Center (MNC), 3rd floor, Seminar room
（田中(秀)研究室ウェブサイト「アクセス」ページの地図上A14の建物）
（Building A14 on the map at http://www.mems.mech.tohoku.ac.jp/access/index_e.html）

主　催：田中(秀)研究室，マイクロ・ナノマシニング研究教育センター
Organized by S. Tanaka Laboratory and MNC, Tohoku University

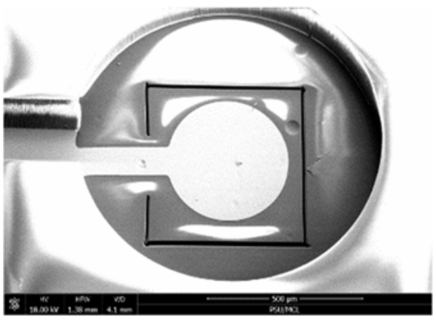
講　師：

Prof. Srinivas Tadigadapa
Department of Electrical and Computer Engineering at Northeastern University in Boston, USA

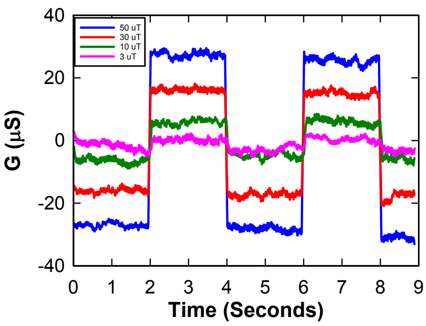
Prof. Srinivas Tadigadapa is a Professor and Chair of the Department of Electrical and Computer Engineering at Northeastern University in Boston, USA. From 2000 to 2017 he was a Professor of Electrical Engineering at the Pennsylvania State University. Prior to that, he was the Vice President of Manufacturing at Integrated Sensing Systems Inc., and was involved with the design, fabrication, packaging, reliability, and manufacturing of micromachined silicon pressure and Coriolis flow sensors. Dr. Tadigadapa's primary research interest is in the interdisciplinary field of microelectromechanical systems (MEMS) and in the design, optimization, fabrication, and testing of MEMS transducers. Specifically his research focus is on fabrication of novel micro and nano-sensors and actuators by integrating non-traditional materials using silicon microfabrication techniques and exploring phenomenon at the micro-nano interfaces. He has published over 180 peer reviewed papers in the field of MEMS and is the inventor on ten patents. He has been a research fellow at the University of Karlsruhe, Germany and a Visiting Professor at Otto von Guericke University, Magdeburg, Germany, and University College, Cork, Ireland. He was awarded the Alexander von Humboldt fellowship in Germany and the Walton fellowship by the Science Foundation of Ireland. He is a Fellow of the IEEE, The Institute of Physics, London, and a Life-Fellow of the Cambridge Philosophical Society. He was the Chair of the Technical Program Committee for IEEE SENSORS 2015–2017 conferences and the founding editor of IEEE Sensors Letters.

概　要：

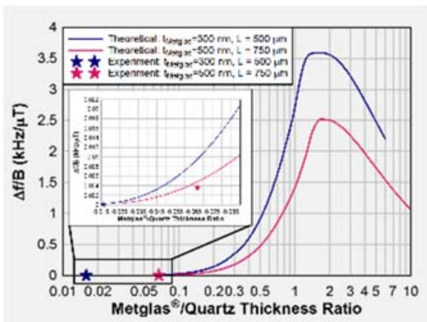
The field of micro and nano sensors has rapidly evolved over the last couple of decades with many of the highest performance devices exploiting the phenomenon of resonance for sensing. Micro and nano scale designs, fabrication, and integration of new materials offer unique opportunities for innovative, novel, and robust sensor configurations. Examples of micromachined electromechanical, acoustic, optical, and nanoscale resonator devices will be presented. Resonator based sensors including gyroscopes, temperature and infrared sensors, magnetic sensors, and chemical and biological sensors will be discussed. An overview of critical design considerations such as resonator geometry, the Q-factor, and performance advantages of these devices will be presented.



SEM image of the fabricated inverted mesa micromachined quartz resonator (circular region) with a thickness of 19 µm and a 300 nm Metglas® layer defined on the backside of the plate. The entire resonator is released into a clamped-free structure using focused ion beam milling (500 µm × 500 µm) as seen by the cutlines defining the square.



Conductance of the quartz resonator at f_0 as a function of time for square wave magnetic flux density signals for four different amplitudes as shown.



The theoretical sensitivity of the Metglas®/AT-cut Quartz laminate resonator structure as function of the ratio of thickness of Metglas®/Quartz based on the magnetoflexoelastic effect. The maximum sensitivity that can be achieved in the case of the blue curve assuming a frequency resolution of 0.1 Hz, is 28 pT/√Hz for a quartz thickness of 180 nm.