III. Device Concepts & Sensor Functionality

(C2) Quantum-Effect Based Detection Modalities and Advanced Functionality

Co-Chairs: **Stephen Goodnick, Arizona State University, stephen.goodnick@asu.edu**
Supriyo Bandyopadhyay, VCU, sbandy@vcu.edu
David Janes, Purdue University, janes@ecn.purdue.edu
Nongjian Tao, Arizona State University, njtao@asu.edu

The focus of this session is chemical and biological sensing based on quantum mechanical effects such as reduced dimensionality and control of the quantum mechanical transmission properties. Molecular-level sensing modalities that make use of such quantum effects are of interest. One example is the use of built-in fields to produce a quantum confined Stark effect that shifts the fluorescence peak of a target molecule to stand out against the background. Another is the use of Terahertz radiation to detect the vibrational modes of bioagents. A third example is the novel use of spintronics to enhance the sensitivity of detectors. These examples are not meant to be restrictive. Another area of interest is in chem-bio sensing, for bioagents, molecular sensing, and chemical sensing using reduced dimensionality structures such as CNTs, nanowires, molecular wires, etc. Magnetic-particle based sensors are of interest as a way to bypass the trade-off between conjugation stability and charge screening. The modeling and simulation aspects must be quantum based given the size scales involved. Papers that propose novel approaches that make use of quantum effects or reduced dimensionality for chemobio sensing are sought. This session will also include papers on advanced functionalities that augment the functionalities of known detection methodologies by incorporating quantum effects, spin, etc. Papers on new architectures will also be considered - if they have a very definite detection and processing roles. Analog-digital architectures based on arrays of nano-devices in neuromorphic structures, such as CNN, is one class of examples.