

# The 99<sup>th</sup> MANA Special Seminar



## GENERATION OF ELECTROMAGNETIC WAVES USING INTRINSIC JOSEPHSON JUNCTIONS

Chair: Dr. Xiao Hu (MANA Principal Investigator)

**Dr. A. E. Koshelev**

*Materials Science Division, Argonne National Laboratory, USA*

Layered high-temperature superconductors behave as stacks of intrinsic Josephson junctions. Due to the ac Josephson effect, they may generate powerful and coherent electromagnetic radiation in terahertz frequency range provided Josephson oscillations are synchronized in all junctions in the stack. A promising way to facilitate such synchronization is to excite the in-phase Fiske mode (cavity resonance) with the frequency set by stack lateral size. Resonant continuous-wave terahertz radiation of sizable power has been recently extracted from mesas fabricated on the top of crystals of the layered high-temperature superconductor  $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_8$  [1]. The observed resonance frequencies scale roughly inversely proportional to the mesa widths suggesting the internal-cavity resonance mechanism. I will discuss several scientific issues related by excitation of electromagnetic waves by the intrinsic junctions including (i) mechanisms of coupling to the internal mode, (ii) structures and stability of coherent states, (iii) limits of achievable radiation powers, and (iv) mechanisms of resonance damping. [1] L. Ozyuzer, A. E. Koshelev, et al., Science 318, 1291 (2007)

**Venue: Seminar Room #431, MANA Bldg.**

**Date: Sep 1<sup>st</sup> Tuesday**

**Time: 15:30-16:15**

Contact: International Center for Materials Nanoarchitectonics (MANA), Nakata (ex. 8806)

