

Subject: MATERIALS SCIENCE COLLOQUIUM, Ulrich Welp, Materials Science Division, Argonne National Laboratory, "Emission of coherent THz-radiation from Superconductors", Thursday, January 10, 2008, 11:00 a.m., Building 212, Room A-157, Suzanne te Velthuis
From: Marlene Metz <metz@anl.gov>
Date: Thu, 03 Jan 2008 09:42:12 -0600
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MATERIALS SCIENCE COLLOQUIUM

SPEAKER: Ulrich Welp
Materials Science Division
Argonne National Laboratory

TITLE: "Emission of coherent THz-radiation from Superconductors"

DATE: Thursday, January 10, 2008

TIME: 11:00 a.m.

PLACE: Building 212, Room A-157

HOST: Suzanne te Velthuis

Refreshments will be available at 10:45 a.m

Abstract:

Superconducting Josephson junctions naturally convert dc-voltages into high-frequency electromagnetic radiation, with 1 mV corresponding to 0.483 THz, and many such junctions emitting in phase at the same frequency can produce useful emission power. In this talk I will present our recent work on the generation of coherent continuous-wave THz-radiation of sizable power from large stacks of intrinsic Josephson junctions in the high-temperature superconductor Bi₂Sr₂CaCu₂O₈. In analogy to a laser cavity, the excitation of an electromagnetic cavity resonance inside the sample generates a macroscopic coherent state in which a large number of junctions are synchronized to oscillate in phase. The emission power is found to increase as the square of the number of junctions reaching values of 0.5 μ W at frequencies up to 0.85 THz. Emission at frequencies larger than 2 THz is observed for harmonics of the fundamental emission line. Prospects for realizing sources of high-frequency electromagnetic radiation that cover the THz-gap will be discussed.

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