MAR08-2008-020522

Abstract for an Invited Paper
for the MAR08 Meeting of
the American Physical Society

THz generation using Fluxon dynamics in high temperature superconductor Josephson junctions

N.F. PEDERSEN, Oersted-DTU, Technical University of Denmark, DK-2800 Lyngby, Denmark

Ever since the Josephson junction was discovered, the possibility of generating high frequency radiation has been considered. Such radiation could have many applications, for example as a local oscillator in an integrated receiver, a spectrometer, an imaging device etc. A brief historical overview of methods and results will be presented. Special emphasis will be given to the BSCCO–type high temperature superconductors that may be considered as a stack of coupled Josephson junctions - potentially having applications as terahertz oscillators. The stack of inductively coupled long Josephson junctions is modeled as a system of coupled sine-Gordon equations. The key point for oscillator applications is to have in-phase coherent motion of fluxons in the different Josephson junctions in the stack. This may be obtained by applying a (large) magnetic field parallel to the layers, or by having the system interacting with a cavity. In both cases the fluxon dynamics is very non-linear, and numerical simulations are necessary. We will also present a few cases where analytical results have provided a new insight in this complicated non-linear system.