Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Enhancement of macroscopic quantum tunneling in Josephson junctions with multigap superconductors through zero-point fluctuations of Josephson-Leggett mode[1] YUKIHIRO OTA, MASAHIKO MACHIDA, Japan Atomic Energy Agency, TOMIO KOYAMA, Tohoku Univ. — We theoretically study macroscopic quantum tunneling (MQT) in a hetero Josephson junction formed by a conventional single-gap superconductor and a multigap one such as MgB_2 and iron-based superconductors. In such a Josephson junction, multiple phase differences are defined and MQT dynamics are extended on a space expanded by the multiple phases. We clarify the quantum dynamics of the multiple phase differences and construct a theory for the MQT in Josephson junctions with multiple gaps. The dynamics of the phase differences are strongly affected by Josephson-Leggett mode, i.e., the fluctuation mode between the multiple phase differences and the escape rate characterizing MQT dynamics is calculated based on the effective action renormalized by the Josephson-Leggett mode. We show that the escape rate is drastically enhanced when the frequency of the Josephson-Leggett mode is less than the Josephson-plasma frequency.

[1]CREST(JST), JST-TRIP

Yukihiro Ota
Japan Atomic Energy Agency

Date submitted: 18 Nov 2010 Electronic form version 1.4