519th ASRC Seminar

Date: 10:30 ～12:00, 19 June

Location: Meeting room 302, ASRC Building

Speaker: Prof. Timothy Ziman
(Institut Laue-Langevin, France)

Title: Muonium ions in semiconductors
: a theory for spin-dependent scattering

Beams of spin-polarised muons have long been invaluable probes of the local magnetic fields of solids. In doped semiconductors a positively charged muon can capture electrons and form neutral or charged Muonium states during the lifetime of the muon. From the precession of the muon "nucleus" we can deduce local properties of the semiconductor host and the scattering from carriers in the conducting bands. We propose a mechanism to explain the observed sensitivity of negatively charged Muonium ions to the spin-polarization of the semiconductors in terms of the coherent mixing of charge states. This leads to an Anderson-type impurity model with parameters that can be estimated for different semiconducting hosts. A small admixture of neutral muonium in the ground state may explain the influence of exchange scattering, giving a scattering time that for n-type gallium arsenide intermediate between that of neutral Muonium and the life-time of the muon.

This work is in collaboration with Bo Gu and Sadamichi Maekawa (ASRC, JAEA).

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