INVITATION

Department of Condensed Matter Physics

Is pleased to invite you to the lecture

THz magnetic resonance ellipsometry: Bloch equations, paramagnetic Lyddane-Sachs-Teller relation, and magnetic susceptibility sum rules

by

prof. Mathias Schubert

University of Nebraska-Lincoln, USA and Lund University, Sweden

Date: **23 April 2025**

Time: **11:00**

Venue: **Lecture room F1, Building 6, Faculty of Science, Kotlářská 2, Brno**

A new optical technique is presented to detect the signatures of magnetic resonances in materials at terahertz frequencies and high magnetic fields using generalized spectroscopic ellipsometry. Measurements dispense with the need for modulation techniques and resonance cavities in traditional NMR and EPR methods. The elements of the normalized Mueller matrix are determined, which contain hitherto undetected information about the polarization, frequency, and field response, e.g., of unpaired electron spin moments including nuclear magnetic coupling. Approaches to model analysis of the frequency dependent magnetic susceptibility tensor are discussed, Bloch equations are revisited, and an analogue to the Lyddane-Sachs-Teller relationship is shown from theory and experiment. Magnetic sum rules are derived from the Kramers Kronig relations and discussed. The new method permits detailed defect characterization in emerging semiconductor materials, demonstrated for low-symmetry ultrawideband gap metal oxides and group-III nitrides.

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Brief biography:

Mathias Schubert received Dipl.-Phys., Dr. rer. nat., and Dr. habil. (Physics) degrees from the University of Leipzig, Leipzig, Germany, in 1994, 1997, and 2003, respectively. He became associate and full professor at the University of Nebraska, Lincoln, USA, in 2005 and 2012, respectively. From 2016 to 2022 Mathias was appointed IFM guest professor at Linkoping University. From 2016 to 2020 he was named Fellow of the Leibniz Institute fuer Polymerforschung Dresden. In 2015 he received an honorary doctorate from Linkoping University, Sweden. Since 2017 Mathias holds the J.A. Woollam Distinguished Professorship Chair. Since 2023 he is appointed guest professor at the physics department of Lund University, Sweden, and WACQT Professor in the Wallenberg Centre for Quantum Technology. His research interests cover development and applications of advanced ellipsometry spectroscopy. He is also Commissioning Editor of Applied Physics Letters.

Recent references:

http://dx.doi.org/10.1103/PhysRevLett.134.086703
http://dx.doi.org/10.1063/5.0255802
http://dx.doi.org/10.1103/PhysRevB.110.054413
http://dx.doi.org/10.1103/PhysRevB.109.214106
http://dx.doi.org/10.1063/5.0082353

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