[2] M. Kläui et al., Phys. Rev. Lett. 90, 97202 (2003)
[3] M. Kläui et al., Appl. Phys. Lett. 83, 105 (2003)

5.3 AT&S Preis

Vorgetragen im HS 5, am Dienstag, den 28.9.2004 von 14:00-14:30

Applicability of Conducting Atomic-Force Microscopy for nanometer scale studies of dielectric thin films

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Conducting Atomic-Force Microscopy (C-AFM) is an advantageous method for the characterization of novel dielectric thin films on the nanometer scale. In this technique, a conductive tip is used to scan the sample surface in contact mode. Simultaneously with the topography measurement, a voltage is applied to the sample and the resulting current tunneling through the dielectric thin film into the AFM tip is recorded. Both, local current-voltage (I-V) characteristics and two-dimensional (2D) current images (at fixed a voltage) are acquired. From extensive testing of C-AFM on the system SiO_2 on Si it has been derived that reliable C-AFM experiments have to be performed under ultra-high vacuum (UHV) conditions. Here, the applicability of C-AFM for the characterization of high-k dielectric thin films is demonstrated. For this purpose, I-V curves as well as 2D current images are recorded on ZrO_2 and HfO_2 films of different thicknesses grown by atomic layer deposition on Si. From the I-V statistics it is found that the electrical homogeneity decreases with increasing thickness. This effect can partly be attributed to an increasing surface roughness. The combination of 2D current images with I-V characteristics allows to demonstrate an additional influence of sample crystallinity and interface roughening on the electrical inhomogeneity. In the last part, 2D current measurements on CaF_2, a major candidate for resonant tunneling diodes, will be presented. Here, a strong correlation between topography and current images is observed demonstrating the high lateral resolution of current imaging in UHV.

5.4 Victor-Hess-Preis

Vorgetragen in Weyer, Oberösterreich, am Montag 27.9.2004 von 11:30-12:00

How to test entanglement for meson-antimeson systems?

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Also in particle physics basic questions of quantum mechanics can be raised and the peculiar behaviour of entanglement can be investigated, which is the basic ingredient for the future technologies such as quantum information and quantum communication. A Bell inequality

- analogous to the entangled photon system - can be derived, however, the inequality is not violated because of the ”unfortunate” constants in these systems. However, these entangled meson-antimeson systems offer other properties - not analogous to other known spin-1/2 systems - which open new insights, e.g. that the violation of the CP symmetry is related to entanglement. Another approach to study entanglement is via decoherence models. New data from the B-meson factory of the KEKB collider in Japan (BELLE detector) or the new data from the K-meson factory of the DAPHNE maschine in Italy can be used to get upper bounds on decoherence and to test/exclude different decoherence models. Surprisingly, it turns out, that the parameter extracted from the experiments are in simple connections to mathematical and theoretical concepts which in this way are directly confronted with experimental data.

5.5 Roman-Ulrich-Sexl-Preis der ÖPG

Vorgetragen im HS 10, am Donnertag, den 30.9.2004 von 10:00-10:30

Guter Physikunterricht - wer ist verantwortlich?

E. Stütz[1]

[1] BRG Linz Hamerlingstraße

Ausgehend von TIMSS und PISA wird zuerst die Entwicklung skizziert, was als guter Physikunterricht gesehen wird. Welche Möglichkeiten und Grenzen zeigen Beiträge der Physikdidaktik? Was kann die Lehreraus- und Fortbildung leisten? Der Universitätslehrgang Pädagogik und Fachdidaktik für LehrerInnen (PFL) - Naturwissenschaften, die Mitarbeit bei IMST[2], Seminare am Kerschensteiner Kolleg und die Teilnahme an GIREP-Konferenzen haben die persönliche Sicht von Physikunterricht beeinflusst. Ausgehend von der eigenen Unterrichtserfahrung konnte nach neuen Wegen im Physikunterricht gesucht werden. Die Physikolympiadekurse boten zusätzlich ein ideales Trainingsfeld zum Erproben neuer Ideen.

5.6 Bruker AXS - Posterpreis

Die Firma Bruker AXS sponsert EUR 300,– als Preis für die beste Posterpräsentation. Die Preisverleihung findet am Mittwoch, den 29. Sept. 2004 um 19:30 Uhr statt.