GSI Colloquium

Main Lecture Hall (SB1 1.120), 64291 Darmstadt, Planckstraße 1

Dienstag, den 01 December 2015, 16:15 Uhr (Tee ab 15:45)

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Microcalorimeters
a novel concept for energy detection in heavy ion physics

For many experiments in heavy ion physics, the precise determination of the energy of a photon or a charged particle, which are emitted during an atomic or nuclear interaction, provides important information on the reaction mechanism and the underlying physics. However, conventional charge-collecting detectors may suffer from incomplete energy detection like pulse height defects, bad energy resolution for low ion or photon energies, or limited detection efficiency. To overcome these limitations, a novel concept for energy detection has been introduced in heavy ion experiments [1].
Microcalorimeters detect the energy of an incoming particle as heat rather than charge, i.e. by determining the temperature change of a suitable absorber. The presentation will first introduce the detector concept in general, then it will focus on microcalorimeters applied in heavy ion physics. Microcalorimeters for X-rays have been shown to obtain a considerably better energy resolution than germanium detectors. They have been successfully applied in experiments at the Experimental Storage Ring at GSI, and hold great potential for applications at the storage rings of FAIR. On the other hand, for microcalorimeters for the direct, energy-sensitive detection of heavy ions a considerable improvement in energy linearity and absence of any pulse height defect are additional benefits. Applications include the determination of stopping powers of heavy ions in solids, investigation of the nuclear charge distribution of fission fragments as well as direct mass identification of reaction products by means of a combined energy/time-of-flight measurement. Detector setup as well as results of key experiments will be presented, and perspectives for future applications will be discussed.

[1] P. Egelhof and S. Kraft-Bermuth, Heavy Ion Physics *in Cryogenic Particle Detection, C. Enss (ed.), Topics Appl. Phys.* ***99****, 469, Springer-Verlag Berlin, Heidelberg (2005)*

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