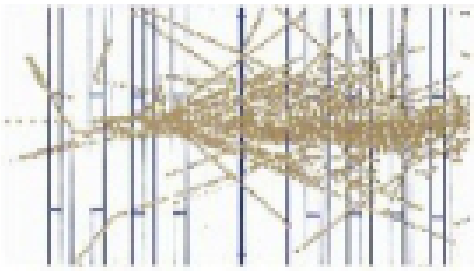

Contribution ID: **11** Type: **oral presentation**

New crystal technologies for novel calorimeter concepts

Monday, May 26, 2008 5:30 PM (20 minutes)

Summary

Present calorimetric systems give a global information on the total energy deposit at a given time in large detector cells but provide no details on the cascade mechanism of this energy deposition in space and time, as well as on the physics of the signal generation.
In the domain of High Energy Physics (HEP) high-precision measurement of hadrons and
jets is one of the detector challenges at future high energy colliders. It has been shown that higher segmentation of the calorimter and/or the simultaneous recording of
the scintillation light produced in an active medium, which is proportional to the total energy deposited by the shower particles, and the Cherenkov light, which is only produced by the charged, relativistic shower particles, can significantly improve the performance of present hadron calorimeters.
At low energy, for instance for medical imaging devices, the detailed recording of the whole Compton-photoelectric interaction chain would have a strong impact on the spatial resolution, energy resolution and sensitivity of the imaging cameras.
Recent progress in heavy scintillating crystal production methods as well as in nanotechnologies applied to photonic crystals and to quantum dots (nanocrystals) introduce interesting perspectives for he development of innovative strategies for an homogeneous but finely structured calorimeter. We will describe in this talk how a new class of metamaterials based on these technologies can open the way to new calorimeter concepts allowing to simultaneously record with high precision the maximum of information on the shower such as its direction, the spatial distribution of the energy deposition and its composition in terms of electromagnetic, charged and neutral hadron contents.

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Session Classification: Calorimetric Techniques

Track Classification: Calorimetric Techniques