Contribution ID: **68** Type: **Oral Presentation**

Application of a HEPE-oriented 4096-MAPS to time analysis of single electron distributoin in a two-slits interference experiment

Thursday 15 September 2011 16:10 (20 minutes)

Up to now, the superposition of electron waves has been demonstrated in a variety of arrangements, among which the electron biprism has been the most successful. Nevertheless, the most striking part of the experiment, i.e. the build-up of two-beam interference pattern by the single electrons arriving on the final screen, has been observed only by means of limited statistic samples and never with a two slit set-up. The reason of this fact relies on one hand on the rate limitation of the available recording systems, able to collect a relatively low number of pictures within a time interval compatible with a stable operation of the electron microscope and on the other on the difficulty of preparing well defined slits in the submicron range.
Both such restrictions have been overcome by the results presented in this paper, where the build-up of high statistics single electron interference pattern and the time distribution of electron arrivals have been measured for the first time. Nano slits are prepared by using modern nanotechnology tools, a conventional transmission electron microscope is used as a versatile optical bench, and a fast recording system, sensitive to single electrons, replaces the final viewing screen of the microscope. The detector is based on a custom CMOS chip of 4096 monolithic active pixels (MAPS), designed by the SLIM5 collaboration as vertex detector for experiments at future colliders, and equipped with a fast read-out chain able to manage up to 10exp6 frames per second (fps). This capability allows us to collect high statistic samples of single electron events within a time interval where the stable operation and the coherence conditions of the microscope are guaranteed. Moreover the large fraction of empty events makes possible to get the first measurement of the distribution of electron arrival times.

Preferred medium (Oral/poster)

Oral

Authors: Dr GABRIELLI, Alessandro (Department of Physics, University of Bologna and INFN); Prof. ZOCCOLI, Antonio (Department of Physics, University of Bologna and INFN); Dr GIORGI, Filippo Maria (Department of Physics, University of Bologna and INFN); Dr GAZZADI, Gian Carlo (CNR-Institute of Nanoscience-S3, Modena); Dr MATTEUCCI, Giorgio (Department of Physics, University of Bologna); Prof. POZZI, Giulio (Department of Physics, University of Bologna); Prof. VILLA, Mauro (Department of Physics, University of Bologna and INFN); Prof. SEMPRINI CESARI, Nicola (Department of Physics, University of Bologna and INFN); Prof. FRABBONI, Stefano (Department of Physics,University of Modena and Reggio Emilia and CNR-Institute of Nanoscience-S3)

Presenter: Dr GABRIELLI, Alessandro (Department of Physics, University of Bologna and INFN)

Session Classification: Advances in Pixel Detectors

Track Classification: Advances in Pixel Detectors