

Abstract Submitted
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Observation of Undulator Radiation Generated by a Single Electron Circulating in a Storage Ring and Possible Applications IHAR LOBACH, University of Chicago, SERGEI NAGAITSEV, University of Chicago, Fermilab, GIULIO STANCARI, ALEKSANDR ROMANOV, ALEXANDER VALISHEV, Fermilab, ALIAKSEI HALAVANAU, ZHIRONG HUANG, SLAC — Experimental study into the undulator radiation generated by a single electron was carried out at the Integrable Optics Test Accelerator (IOTA) storage ring at Fermilab. The individual photons were detected by a Single Photon Avalanche Diode (SPAD) at an average rate of 1 detection per 300 revolutions in the ring. The photodetection events were continuously recorded by a picosecond event timer for as long as 1 minute at a time. The collected data were used to test if there is any deviation from the classically predicted Poissonian photostatistics. It was motivated by the observation * of sub-Poissonian statistics in a similar experiment. The observation * could be an instrumentation effect related to low detection efficiency and long detector dead time. In our experiment, the detector (SPAD) has a much higher efficiency (65%) and a much lower dead time. In addition, we show that the collected data (recorded detection times) can be used to study the synchrotron motion of a single electron and infer some parameters of the ring. For example, by comparing the results of simulation and measurement for the synchrotron motion we were able to estimate the magnitude of the RF phase jitter in IOTA. * Teng Chen and John M. J. Madey, Phys. Rev. Lett. 86, 5906, June 2001

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