Contribution ID: **96** Type: **not specified**

Cherenkov Diffraction radiation from long dielectric material: An intense source of photons in the NIR-THz range

Friday, 30 September 2016 15:30 (15 minutes)

Unlike Synchrotron Radiation, which is naturally emitted as particles are deflected in undulators, wigglers or bending magnets, Diffraction Radiation (DR) [1] is produced as charged particles pass in the close vicinity of a dielectric or a metal.
For highly relativistic particles, diffraction radiation can produce non-negligible amount of photons in standard beam conditions. DR from slits and holes has been investigated during the last 15 years for beam diagnostics as non-interceptive beam size monitors [2, 3]. An experimental set-up has been developed and used already for some years on the Cornell storage ring using 2.1 GeV electrons. With a 1mm aperture slit, the radiated power becomes high enough for beam diagnostic purposes [4] but remains low enough to be considered for others applications.
We are currently preparing a test to produce incoherent Cherenkov Diffraction Radiation (CHDR) in the near infrared spectral range from a 1cm long fused silica crystal. In such conditions the light output power would be significantly large compared to the typical diffraction radiation power emitted from a slit of similar aperture. The target design and the detection set-up are presented in detail with simulations describing the expected properties of the emitted Cherenkov diffraction radiation, in terms of light intensity and spectral bandwidth. Finally, potential applications of CHDR are discussed

[1] A. P. Potylitsyn et al., "Diffraction Radiation from Relativistic Particles", (Springer, Berlin Heidelberg, 2010)
[2] P. Karataev, et al. "Beam-size measurement with Optical Diffraction Radiation at KEK Accelerator Test Facility", Phys. Rev. Lett. 93, 244802 (2004)
[3] A. Cianchi, M. Castellano, L. Catani, E. Chiadroni, K. Honkavaara, and G. Kube, "Nonintercepting electron beam size monitor using optical diffraction radiation interference", Phys. Rev. ST Accel. Beams 14, 102803 (2011)
[4] L. Bobb, T. Aumeyr, P. Karataev, E. Bravin, T. Lefevre, S. Mazzoni, H. Schmickler, M. Billing, J. Conway, "Vertical Beam Size Measurement at CESRTA Using Diffraction Radiation", IBIC 2014: Proceedings of the 3rd International Beam Instrumentation Conference, Monterey, CA, 2014

Primary author: Dr LEFEVRE, Thibaut (cern)

Co-authors: Dr SHANKS, James (Cornell University); Mr CONWAY, Joseph (Cornell University); Dr KRUCHININ, Konstantin (Royal Holloway, University of London); Mr BERGAMASCHI, Michele (CERN); Dr BILLING, Mike (Cornell University); Dr KARATAEV, Pavel (Royal Holloway, Unviersity of London); Dr JONES, Rhodri (CERN); Dr KIEFFER, Robert (CERN); Dr MAZZONI, Stefano (CERN)

Presenter: Dr LEFEVRE, Thibaut (cern)

Session Classification: W2.3: The 8th AGTaX workshop "Advanced Generation of THz and X-ray beams