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Coherent Unipolar Cherenkov and Diffraction Radiation Generated by Relativistic Electrons

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For usual (bipolar) radiation the integral of the electric field strength over the time is zero. First time the possibility of unipolar radiation (strange electromagnetic waves) generation has been considered theoretically in 1990 [1]. According to this work the unipolar radiation is radiation for which the integral of the electric field strength over the time differs significantly from zero. Further a number of theoretical articles (for example [2,3]) have been devoted to this problem mainly in respect to a synchrotron radiation. However up to now there are no experimental investigations of this phenomenon except the work [4].

In this report we present the results of experimental observation of the unipolar Cherenkov and diffraction radiation generated by relativistic electrons. For this purpose the detector sensitive to the selected direction of the electric field strength has been elaborated. We observed the coherent Cherenkov radiation and backward diffraction radiation of bunched electron beam when the electrons moving near the targets. The partial unipolarity effect has been registered for the Cherenkov radiation and almost full unipolarity has been observed for the backward diffraction radiation.

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- [1] Preprint No 76 of the Lebedev Physical Institute of the Academy of Science of the USSR, Moscow, 1990.
- [2] M. Schwarz, P. Basler, M. v. Borstel, and A.S. Müller. Analytic calculation of the electric field of a coherent THz pulse Phys. Rev. st AB 17 050701 (2014)
- [3] V.L. Bratmana, D.A. Jaroszynskib, S.V. Samsonova, A.V. Savilova. Generation of ultra-short quasi-unipolar electromagnetic pulses from quasi-planar electron bunches. NIM A 475 (2001) 436-440
- [4] G. Naumenko and M. Shevelev. First indication of the coherent unipolar diffraction radiation generated by relativistic electrons. Journal of Instrumentation, Volume 13, 2018

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