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PS2-02: Parametric X-Ray Radiation from Composite Bunches

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Parametric X-ray radiation (PXR) occurring when charged particles move in a crystal was predicted theoretically by M.L. Ter-Mikaelyan in 1972 [1], and then observed experimentally at the Tomsk Synchrotron Sirius in 1985 [2]. Since then PXR has been studied very well, both theoretically and experimentally (see, for example, the monograph [3]). However, up to now PXR is not used in practice owing to rather weak brightness. Nevertheless, PXR is intensive enough to be detected experimentally, and can serve as a source of information about the radiating bunches of charged particles.

In this report we consider PXR from a composite bunch of ions passing a crystal, on the basis of the clear physically the picture of radiation based on polarization currents conception (see, for example, Chapter 4 in monograph [4]). The composite bunch is thought to be mixture of two bunches of charged particles with, generally speaking, different distributions and different properties of the single particles which they consist of. Interference between two fractions of the composite bunch can be used to get the information of the structure and ionic composition of the bunch, and therefore this radiation. We suggest that PXR can be a good candidate for the composite bunch diagnostics in the processes of channeling of the charged particles beams in modern experiments on the beam control with help of channeling phenomenon in bent crystals [5]. The spectral-angular distribution of PXR from the composite bunch is obtained in kinematical approximation and analysed from point of view of control of the bunch composition.

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