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Measurement of the accelerator beam parameters using Cherenkov radiation intensity dependence on the radiator refractive index "n"

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Cherenkov radiation (CHR) occurs when velocities of charged particles in a medium exceed the phase velocity of light in it. I M Frank (Nobel laureate together with P A Cherenkov and I. E. Tamm) once remarked: CHR radiators were the first macroscopic coherent emitters. The report provides a method of finding the velocity distribution of particles (VDP) in accelerator's beams. VDP is obtained from the solution of the Volterra integral equation of the first kind of the convolution type. The right-hand side of this equation presents a nonlinear part of the experimental dependence of CHR intensity on refractive index magnitudes for the given beam. VDP is the second derivative of this dependence on the inverse value of "n". The solution is stable when at taking into account a priori information about its properties. The usage of radiators with an optical dispersion is discussed. The dispersion hampers the use of Cherenkov methods somewhat but here it turns into a "friendly phenomenon" which may serve to determine VDP even in single bunch of particles. The possibility of finding VDP with the help of holographic methods for rapid processing of information will be discussed. The determination of VDP distribution over the beam cross section is analyzed. The determination of VDP is possible also at a case of beams with non-zero transverse particle velocities. The proposed method is particularly useful when the VDP is narrow which is typical for high energy beams. Essentially the method is non-destructive in most applications.

Biography

K A Trukhanov is a Doctor of Technical Science (the Radiation and Electromagnetic Safety in Space, 2006). He is the Principal Researcher of Institute of Biomedical Problems RAS. He has published more than 25 papers in reputed journals.

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