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Quasidiscrete spectrum Cherenkov radiation from a charge moving inside a dielectric waveguide

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We investigate the radiation from a charge moving inside a dielectric cylinder parallel to its axis. It is assumed that the cylinder is immersed in a homogeneous medium. Depending on dielectric permittivities of the cylinder and surrounding medium different types of radiations are emitted. They include the Cherenkov radiation propagating outside the cylinder, the Cherenkov radiation confined inside the cylinder and the radiation in the form of surface polaritons confined on the cylindrical interface. The latter radiation has been investigated recently and our main concern will be the Cherenkov radiation outside and inside the cylindrical waveguide. We show that under certain conditions on the dielectric permittivities strong narrow peaks appear in spectral distribution of the Cherenkov radiation propagating in the exterior medium. The location of those peaks are specified on the base of dispersion equation for the electromagnetic eigenmodes of the cylinder.

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