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The Resonance Bremsstrahlung of a Fast Charged Particle in a Medium

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Abstract: The bremsstrahlung of a fast charged particle in the medium with dielectric permittivity ε at velocities $v \ge \frac{c}{n}$ ($\mbox{Re}\varepsilon = n^2$) was considered. Bremsstrahlung radiation has singularity at $\beta = \frac{1}{n \cos\theta}$ ($\beta = \frac{v}{c}$, θ is an angle of the bremsstrahlung.) and is interpreted as resonance bremsstrahlung with the width characterized by $\mathrm{Im}\varepsilon = \varepsilon_2$; and smaller ε_2 is, the higher the peak of the resonance. The angle distribution of the bremsstrahlung is determined by $\cos\theta = \frac{1}{n\beta}$ and θ coincides with the angle of Cherenkov radiation. At $\beta = \frac{1}{n}$ the resonance bremsstrahlung goes in the forward direction. The resonance bremsstrahlung depends on frequency ω ($\varepsilon \equiv \varepsilon(\omega)$).

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