

标题: Surface impedance formalism for a metallic beam pipe with small corrugations

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摘要: A metallic pipe with wall corrugations is of special interest in light of recent proposals to use such a pipe for the generation of terahertz radiation and for energy dechirping of electron bunches in free electron lasers. In this paper we calculate the surface impedance of a corrugated metal wall and show that it can be reduced to that of a thin layer with dielectric constant ϵ and magnetic permeability μ . We develop a technique for the calculation of these constants, given the geometrical parameters of the corrugations. We then calculate, for the specific case of a round metallic pipe with small corrugations, the frequency and strength of the resonant mode excited by a relativistic beam. Our analytical results are compared with numerical simulations, and are shown to agree well. They are also shown to be more accurate when compared to the earlier used analytical model. DOI: 10.1103/PhysRevSTAB.15.124401

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