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Wall roughness effects on an electron bunch

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The effect of the surface roughness on a moving electron bunch is considered by resorting to a model of a metallic structure with random perturbations on its surface. Based upon this model, analytic expressions have been derived for the average energy emitted per groove (EPG) and for its standard deviation. For a relativistic bunch, both quantities are shown to be virtually independent of the momentum. Moreover, it has been found that the standard deviation of the EPG is proportional to that of the roughness parameter to the power of 1/4. © *2004 American Institute of Physics*. [DOI: 10.1063/1.1644031]