APPLIED PHYSICS LETTERS VOLUME 80, NUMBER 16 22 APRIL 2002

Analytic method for evaluation of the field of a charge traversing a geometric discontinuity

S. Banna and L. Schächter[a)]
Department of Electrical Engineering, Technion-Israel Institute of Technology, Haifa 32000, Israel

(Received 3 December 2001; accepted for publication 6 March 2002)

An analytic time-domain method is developed for the electromagnetic field generated by a charge traversing a geometric discontinuity. The essence of the method employed here is to use the linear independence of the exponential functions, that control the temporal behavior of the field. As a result, we avoid the large (“infinite”) matrix inversion necessary for a frequency-domain solution. This method was utilized for the investigation of the wake generated by electrons in an optical accelerator as well as evaluation of the emittance growth and energy spread. [DOI: 10.1063/1.1472477]