

Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Fields and Particle Dynamics in the Vicinity of a MITL Load¹

MARK HESS, EVSTATI EVSTATIEV, Sandia National Laboratories — The fields and associated electron flow for magnetically insulated transmission lines (MITLs) have been studied in great detail in previous works. However, much of the previous work has focused attention on electron flow in locations away from a load, i.e. where the circuit voltage goes to zero. In this work, we compute the vacuum electric fields within cylindrically symmetric MITLs for specific geometries containing a load. The field calculations are performed in the limit that the speed of light is infinite, but that the time-dependent MITL current is arbitrary. We show that the field calculations are in excellent agreement with the code EMPIRE developed at Sandia National Laboratories. Additionally, we simulate the motion of charged particles in a MITL due to the vacuum fields using a Runge-Kutta solver, and compare these simulations to results from EMPIRE. In general, we find that while the motion of charged particles in a MITL near a load can be highly nonlinear, using guiding center drift theory in conjunction with relativistic adiabatic invariants can be an excellent tool for approximating a particle's motion.

¹SNL is managed and operated by NTESS under DOE NNSA contract DE-NA0003525. Partial support is provided by the SNL GC-LDRD.

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Date submitted: 29 Jun 2020

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