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## Latest progress on ACE3P modeling capabilities

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SLAC developed ACE3P is a parallel multi-physics electromagnetics (EM) simulation toolkit aiming for virtual prototyping of accelerator and RF component design, optimization and analysis. In this paper, we will present the latest progress on ACE3P modeling capabilities. First, for the time domain solver T3P, modeling of nonlinear materials with higher-order electric susceptibilities has been developed. It can be used to design the devices for THz accelerators and quantum information science. Second, for the particle tracking module Track3P, external DC fields calculated by the electrostatic solver embedded in the DC gun module Gun3P can be read in to model the use of DC bias in mitigating multipacting in accelerator structures. Third, a surface impedance boundary condition to treat a thin layer of lossy materials has been implemented in the frequency domain S-parameter module S3P. This enables calculation without explicitly building an extremely fine mesh in the layer and substantially reduces the computational cost when a much larger mesh would have been needed to resolve the field in the layer. Fourth, a code integration effort has been embarked to integrate Track3P with the radiation transport code Geant4 for modeling radiation effects for dark current in accelerator structures. The applications using these new model capabilities will be presented in the paper as well.

### Footnotes

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