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**SIMULATION OF HIGH FREQUENCY MODES AND THEIR
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The Pulse Line Ion Accelerator (PLIA) produces a traveling EM wave by applying a voltage pulse to one end of a helix that accelerates and axially confines the heavy ion beam pulse. An anomalous flashover phenomenon has been observed on the vacuum-insulator surface which limits the amplitude of the accelerating field. It has been suspected that a small component of high frequency modes in the input pulse may be the cause of the breakdown. Simulation using MAFIA (MAXwell's equations by Finite Integration Algorithm) was conducted to investigate the fields on the insulator surface. A scaling law was proposed to reduce substantially the computational time in simulation. It is based on the hypothesis that the pattern of EM field for a given wavelength is independent of the wire spacing provided that the wavelength is much longer than the inter-wire spacing and the termination resistors are adjusted to maintain impedance matching. Simulation shows that at low frequencies ($ka \ll 1$, where k is the wave number, and a the pipe radius) the field strengths on axis as well as on the insulator grow linearly with frequency. At high frequencies ($ka \gg 1$), the field on axis nearly vanishes, while the field on the insulator continue to grow at a rate faster than linearly with frequency. At medium frequencies and above ($ka \gtrsim 1$), we see clear signs of reflections from the terminating resistors, which are impedance matched only at low frequencies. These wave reflections, which are consistent with experimental observations, lead to further enhancements of the fields on the insulator surface. On the basis of these numerical simulations, we conclude that high frequency modes, even at very low amplitudes, may indeed lead to the observed insulator flashover.