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High voltage operation of helical pulseline structures for ion acceleration

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ABSTRACT: The basic concept for the acceleration of heavy ions using a helical pulseline requires the launching of a high voltage traveling wave with a waveform determined by the beam transport physics in order to maintain stability and acceleration**. This waveform is applied to the front of the helix creating a constant axial acceleration electric field over the region of the ion bunch that travels down the line in synchronism with the ions. Several methods of driving the helix have been considered. Presently, the best method of generating the waveform and also maintaining the high voltage integrity appears to be a transformer primary loosely coupled to the front of the helix, generating the desired waveform and achieving a voltage step-up from primary to secondary (the helix). This can reduce the drive voltage that must be brought into the helix enclosure through the feedthroughs by factors of 5 or more. The accelerating gradient is limited by the voltage holding of the vacuum insulator, and the material and helix geometry must be chosen appropriately. The helix must also be terminated in its characteristic impedance, and designs of terminations incorporated into the helix internal enclosure are presented in the paper.

FOOTNOTES: *SAIC, Alamo, CA.

** Briggs, et al, "Helical Pulseline Structures for Ion Acceleration", this conference.

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