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High Power Experimental Results of a Multicell Dielectric Disk Accelerating Structure

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A Dielectric Disk Accelerator (DDA) is an accelerating structure designed to be loaded with dielectric disks to increase its shunt impedance. These structures use short RF pulses of ~ 9 ns to achieve accelerating gradients of more than 100 MV/m. A single cell and a multicell clamped structure have been designed and high power tested at the Argonne Wakefield Accelerator. During testing, the single cell clamped DDA structure achieved an accelerating gradient of 102 MV/m with no visible damage in the rf volume region. The minimal damage that was seen outside the RF volume was likely due to uneven clamping during assembly. Based on the success of that experiment, a clamped multicell DDA structure has been designed and tested at high power. Simulation results for this new structure show a 108 MV/m accelerating gradient with 400 MW of input power with high shunt impedance and group velocity. Engineering designs were improved from the single cell structure to ensure consistent clamping over the entire structure. The results of the high power test will be presented. After this test an additional multicell structure will be designed and beam tested to measure the energy gain from the structure.

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