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A DSRD-Based Pulse Forming Network for a Dielectric Wall Accelerator

Tuesday, 9 May 2023 16:30 (2 hours)

Purpose: In the effort to develop a compact dielectric wall accelerator (DWA) system for proton radiotherapy, this work aims to demonstrate the feasibility of a drift step recovery diode (DSRD) based pulse forming network (PFN) to generate high magnitude, nanosecond scale voltage pulses at high repetition rates.
Methods: An initial numerical feasibility study was conducted in order to demonstrate the possibility of generating a 17 kV, nanosecond scale pulse with a DSRD-based standard PFN (forward and reverse current branch). Then, a DSRD-based PFN was designed using a magnetic switch, seen in Figure 1 (https://bit.ly/3iMCOHs). Saturation of a transformer discharges a storage capacitor. At maximum current, the DSRD turns off, commuting stored energy to a load. A low energy prototype was developed at SLAC. A 20 kV, high repetition rate (1-10 kHz) prototype is currently being developed.
Results: The numerical study demonstrated that a max output of 16505 V with a rise time of 1.11 ns can be generated with a stack of 19 DSRDs. Figure 2 (https://bit.ly/3VGPuhS) presents a 4.9 kV pulse of the low energy prototype.

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Footnotes

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