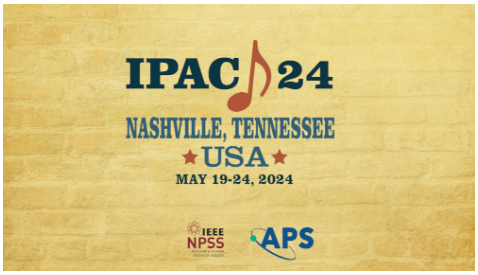

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Novel ion cyclotron auto-resonance accelerator

Tuesday, 21 May 2024 16:00 (2 hours)

A novel deuteron accelerator concept, the deuteron cyclotron auto-resonance accelerator (dCARA) is presented here, with (a) an analytical theory to characterize a simplified model for dCARA, (b) simulated tracks of deuteron orbits in a more realistic model for dCARA, and (c) CST-Studio particle-in-cell simulations for high-current deuteron beams in a realistic dCARA. These predict that dCARA will produce a high-current multi-MeV beam of accelerated deuterons along an axis parallel to, but displaced from, the center conductor of a coaxial resonator immersed in a uniform static magnetic field. The example presented, where the magnetic field strength is 7.0 T (for cyclotron auto-resonance at 53.0 MHz), acceleration of a 100 mA deuteron beam from 60 keV to 35 MeV is predicted to occur along a 2.8 m long half-wave resonant cavity, with an efficiency of 88%. Such a beam could be highly competitive with that produced either with linacs or cyclotrons for an application to produce, via deuteron stripping, a high flux of neutrons with an energy spectrum centered near 14.1 MeV, as needed for testing inner-wall materials for a future deuterium-tritium fusion power reactor.

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