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# Introducing the Novatron Concept

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The Novatron [1] is a novel, axisymmetric, magnetic mirror-cusp device. The magnetic field configuration produces favourable curvature at the outer plasma surface that should be inherently stable against interchange instabilities that have troubled previous magnetic mirror devices. Open field line magnetic confinement systems have faced four critical challenges: MHD interchange instabilities from unfavorable magnetic curvature, drift cyclotron loss-cone (DCLC) microinstabilities, neoclassical transport losses, and axial particle losses through mirror throats. Previous solutions like minimum-B configurations (Baseball, Yin-Yang coils) achieved stability by abandoning axisymmetry, introducing significant neoclassical losses. We present a novel axisymmetric mirror-cusp configuration that addresses all four challenges simultaneously through innovative magnetic field topology. The design features favorable curvature throughout the plasma region through the Novatron magnetic field configuration. The high ratio between the plasma size and Larmor radius enables many Larmor radii across the plasma radius, naturally suppressing DCLC modes. The axisymmetric design eliminates neoclassical transport while maintaining stability, and a high mirror ratio reduces axial losses. The N1 device, a 3.8-meter-tall prototype plasma device to validate our theoretical predictions has been built and commissioned at KTH Royal Institute of Technology. This represents the first systematic test of this magnetic configuration for fusion applications. This poster will present an overview of the Novatron and status of the N1 device.
[1] Jäderberg, J. et al., “Introducing the Novatron, a novel fusion reactor concept”. Preprint, arXiv 2310.16711, 2023.

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