

## Abstract

A design is presented for a repetitive-fire compact toroid injection fuelling system for the ITER (2001) tokamak. Advantages of central over edge fuelling include plasma density control and higher deposition rates, implying lower tritium usage. The reference design offers  $50 \text{ Pa m}^3 \text{ s}^{-1}$  of 90%D/10%T fuelling. 1.29 mg CTs are injected at a rate of 50 Hz (in order to synchronize with the European power grid) and a speed of  $300 \text{ km s}^{-1}$ . A new six-degree-of-freedom model of CT trajectory in the tokamak is developed and applied to the proposed injector design. The fueller is intended to work in parallel with the  $500 \text{ Pa m}^3 \text{ s}^{-1}$  edge gas puffing system and to replace the centrifuge pellet-injection system in the ITER (2001) reference design. Each injected CT adds only 0.68% to the plasma inventory, implying that the injection process will be non-disruptive. Power consumption will be approximately 15 MWe. The strengths of the design compared to the current pellet injection system are highlighted.