Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Electrical modeling of the Reversed Field Pinch configuration. ROBERTO CAVAZZANA, Consorzio RFX — Starting from the Poynting theorem, a two port equivalent formulation for the Reversed Field Pinch (RFP) is obtained. At first a general formulation applicable to any sort of underlying MHD physics is derived. Then its specialization is discussed, showing that: i) the toroidal field reversal is guided from outside the plasma by the external imposed boundary conditions; ii) the classic textbook RFP derivation with the toroidal flux Φ_t conserved is only a particular choice among the many possible. Here a parametric force free MHD family of equilibria is used to derive the two port equation of a realistic RFP boundary condition. The key master parameter turns out to be the edge safety factor $q(a) = a/R \cdot B_t(a)/B_p(a)$, whereas Φ_t becomes a free variable determined by the RFP self-organization processes. As a by product a correct expression for the resistive component of the toroidal loop voltage is given. The two port model obtained is finally closed by adding the poloidal and toroidal power supply networks and evolved by means of a SPICE simulator. The results enlighten some peculiarities found in the RFP transient operations: RFP startup and formation, pulsed poloidal current drive (PPCD) and oscillating field current drive (OFCD).

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Date submitted: 18 Jul 2016 Electronic form version 1.4