**Tipo di tesi:** Laurea magistrale

**Corso di Laurea:** Ingegneria

**Tipologia:** numerica

**Titolo della tesi:** Electromagnetic circuit modelling of RFP configuration in the RFX-mod2 experiment

**Proponente:** Domenico Abate, (Matteo Bonotto, Roberto Cavazzana)

**Relatore Accademico:** Paolo Bettini

**Capogruppo:** Matteo Brombin

**Argomento della tesi:** The present thesis focuses on studying the evolution of the Reversed Field Pinch (RFP) configuration in connection with both coils and power supply circuits by using 0D electromagnetic modelling (i.e. circuit modelling). The power of circuit modelling is in its smart approach that leads to relatively simple models easy to be implemented in computer simulators such as LTSPICE or SIMULINK. The focus is to investigate the evolution of RFP plasmas from two complementary point of views: from the plasma side by modelling its MHD evolution, and from the machine side (i.e. electromagnetic systems) by considering plasma evolution effects on the coils and integrated safety system. The proposed thesis would require a preliminary review of some of the most important contributions on this topic, individuating lacks and inconsistencies in the present available models by applying them to experimental RFX-mod data. Then, a more rigorous derivation will be derived starting from fundamental electromagnetic laws; then the reference RFP equilibrium can be inserted in the evolution equations only at a later stage of the derivation. This approach leads to clean equations in explicit formulation, which can be used for immediate practical purposes like the calculation of the dissipative loop voltage, or to be inserted directly in a circuit simulator. Several upgrades can be implemented to the model: from the plasma side, a 1D evolution of the plasma current density can be coupled to circuit equations; from the magnet system side, the magnet fault detection system (RGM, Rilevamento Guasti del sistema Magnetico) can be included and tested to different plasma evolutions. In general, the model would allow to predict the macroscopic behaviour of the RFP experimental discharges and/or to allow verifications on the proper functionality of the magnet fault detection system. All the activity would be helpful for the future operations of the RFX-mod2 experiment located in Padua at Consorzio RFX laboratories.

**Competenze richieste:** Elettrotecnica (analisi di circuiti lineari), conoscenza base di linguaggi di programmazione e ambienti di sviluppo (SIMULINK/MATLAB, LTSPICE)

**Data della proposta:** 24/09/2021

**Stato:** non assegnata

**Laureando/a:** (quando sarà assegnata)