Tipo di tesi: Laurea Magistrale
Corso di Laurea: Fisica
Tipologia: Modellistica / analisi dati
Titolo della tesi: Magnetohydrodynamic stability of negative triangularity plasmas
Proponente: Tommaso Bolzonella , Leonardo Pigatto
Relatore Accademico: Tommaso Bolzonella
Capogruppo: Paolo Innocente

Responsabile di Programma: M. Valisa

Argomento della tesi:

Negative triangularity tokamak (NTT) plasmas are the subject of increasing interest both in existing experiments and in view of fusion demonstration reactors. In fact, negative triangularity tokamaks are the result of a modern reactor research line where the solution of the heat exhaust is recognized as the first issue. H-mode negative triangularity plasmas have lower edge stability thresholds, leading to increased frequency and significant mitigation of type-I ELM peak power losses (ΔW_{ELM} ~ 21 MJ in ITER leading to scaled amplitudes not acceptable in a DEMO fusion reactor). At the same time present experimental results seem to indicate that negative triangularity plasmas keep L-mode edge characteristics for higher heating power with respect to positive triangularity, which makes this configuration appealing for power-handling. Negative triangularity changes significantly the plasma stability properties, with respect to conventional shapes. For example, the ideal kink MHD beta limit is often relatively low, due to the absence of a magnetic well for elongated plasma cross-sections. Stability of these scenarios is usually a complex mixture of pressure gradient optimization and magnetic shear.

The thesis would like to explore the stability properties of negative triangularity, starting with a perspective scenario for RFX-mod2 tokamak operation. A complete stability study for this scenario may include analysis of ideal (low and high *n*) modes, tearing mode, wall stabilization and feedback control. This shall allow familiarization with the key physics of tokamak stability and with the proposed modeling tools. In particular, the MARS-F linear resistive-MHD code will be applied. As a second step, experimental data analysis and preparation for interpretative modeling is proposed for negative triangularity discharges recently carried out in tokamak à configuration variable (TCV). These experiments show interesting MHD activity that can be modeled with the proposed tools.

Competenze richieste (se necessarie):
Ambienti Python e Matlab
Conoscenza degli argomenti trattati nei seguenti corsi della Laurea Magistrale in Fisica:
- Physics of fluids and plasmas
- Physics of nuclear fusion and plasma applications

Data della proposta: --/--/--

Stato: non assegnata

Laureando/a: (quando sarà assegnata)