Tipo di tesi: Magistrale
Corso di Laurea: Physics
Tipologia: sperimentale-modellistica
Titolo della tesi: 3D plasma-wall interaction in the RFX-mod device
Proponente/Relatore RFX: Gianluca Spizzo, Lionello Marrelli
Relatore Accademico: Matteo Zuin
Capogruppo: David Terranova
Responsabile di Programma: Lionello Marrelli
Argomento della tesi: Plasma-wall interactions (PWI) in nuclear fusion devices are often shaped in regular patterns which reflect in detail the complicated 3D structure of the magnetic field in the plasma: pioneering work in the TEXTOR tokamak has shown in the past that a good proxy to compare experiment with 3D field modelling is the connection length to the wall, measured parallel to the magnetic field line, Lc (Schmitz, 2008). In that work, it was shown that the deposition pattern on the wall of TEXTOR was strictly related to the pattern of Lc, so that a careful control of plasma instabilities could reduce the power deposition on the wall. Recent camera images of the PWI pattern on the RFX-mod reversed-field pinch operated by Consorzio RFX (Padova, Italy) have been made available. Topic of the thesis will be to calculate the full, 3D pattern of connection length $L_c(r, \theta, \phi)$ in RFX-mod by means of the guiding-center code ORBIT (White & Chance, 1984) and to relate this map to the images of PWI. Final purpose of the thesis is finding what magnetic instabilities are responsible for most severe energy and particle flux to the wall. This information is important in view of the refurbished RFX-mod2 device which is under realization at Consorzio RFX (Marrelli, 2019).

Competenze richieste (se necessarie): elettromagnetismo/fisica dei plasmi, programmazione (IDL e/o python, fortran non strettamente necessario, ma preferibile).
Data della proposta: 10/11/2021
Stato: non assegnata
Laureando/a: t.b.d.

Bibliography

Marrelli, L. (2019). Upgrades of the RFX-mod reversed field pinch and expected scenario improvements. (IAEA, Ed.) *Nuclear Fusion, 59*(7), 076027.

Schmitz, O. (2008). Identification and analysis of transport domains in the stochastic boundary of TEXTOR DED for different mode spectra. *Nuclear Fusion, 42*(2), 024009.

White , R. B., & Chance, M. S. (1984, October). Hamiltonian guiding center drift orbit calculation for plasmas of arbitrary cross section. *Phys. Fluids, 27*(10), 2455.