

The new plasma position reflectometric system for the RFXmod2 device: technical and design progress

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RFXmod2 [1,2] ($R=2.0$ m, $a=0.49$ m), the upgraded version of the previous RFXmod fusion device, will be equipped with a new reflectometry system specifically designed for plasma position control purposes.

The diagnostic system will consist of four bistatic ultrafast independent reflectometric units working in the K band (18-26 GHz) and installed in four different poloidal locations at the same toroidal angle: two on the equatorial plane (High Field Side / Low Field Side) and two at the vertical top/bottom ports.

The main features of the system have been already introduced at the last ECPD conference in 2019 [3] and will be discussed in the light of the more recent modifications. In this contribution, we also present the advances in the antennae design and in the technical solutions investigated to integrate the subsystems with the RFXmod2 mechanical structure.

Concerning the antennae, a COMSOL MultiPhysics model has been developed in order to optimize the design of the Hogg horn (to be installed in the RFXmod2 HFS) and the pyramidal horn (to be installed in LFS) antennae. Their radiative pattern has been studied and the relative performance evaluated with respect to the available physical space within the RFXmod2 structures. 3D additive manufacturing technique will be exploited for their production.

Specific electrical insulation solutions, involving a ZrO paint coating, has been also proposed for the waveguides routing inside the vacuum chamber and the preliminary tests will be discussed.

The first K band unit has been designed and will be operational for bench tests from mid 2021.

References

[1] S. Peruzzo et al., Fus. Eng. Des., Vol. 123, Pages 59-62 (2017)

[2] L.Marrelli et al., Nuclear Fusion 59 (2019) 076027 (14pp)

[3] G. De Masi et al., "Design of a new reflectometric system for real time plasma position control on the RFX-mod2 device", ECPD, Lisbon (Portugal), 2019