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A two colors interferometer for PROTO-SPHERA experiment

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PROTO-SPHERA (Spherical Plasma for Helicity Relaxation Assessment) is a new concept of torus that aims to produce a Spherical Torus at closed flux surfaces and a force-free screw pinch (SP) at open flux surfaces and fed by electrodes [1]. By replacing the metal centrepost current of the spherical tokamaks with the SP plasma electrode current, the rod at the centre of the plasma, which represents the most critical component of spherical tokamak design configuration, can be eliminated. In this way the aspect ratio can be decreased during the experiment, meanwhile the ratio between the toroidal plasma current and the plasma electrode current, is increased. In order to verify the stability of the configuration and the technical components of the PROTO-SPHERA initial arc, a prototype facility has been constructed; this last experiment has reached its plasma current target in the recent months.

A diagnostic proposed to equip PROTO-SPHERA for the density measurement, that is of the order of $\sim 10e20$ m⁻³, is a two color interferometer [2]. It will allow to obtain integrate density line in the equatorial plane, necessary to characterize this uncommon plasma. The design and the interferometer laboratory test are described in this paper.

[1] F. Alladio et al., Nucl. Fusion 46 (2006) S613–S624

[2] J. H. Irby et al., Rev. Sci. Instrum. 59 (1988) 1568

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