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ITER Density Interferometer Polarimeter: design update and synthetic diagnostic development

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A phase-modulated dispersion interferometer combined with a polarimeter is currently being designed in ITER. This diagnostic, called DIP (Density Interferometer Polarimeter), aims at performing reliable electron density (n_e) measurements with a time resolution of 1 ms and an accuracy of 10% during ramp up/down phases, and 2% during flat-top, serving as a complementary system for ITER's main n_e diagnostic, the TIP (Toroidal Interferometer/Polarimeter) [1]. ITER's DIP is based on a CO₂ laser ($\lambda = 9.6 \mu\text{m}$). It is inherently insensitive to mechanical vibrations and, thanks to the combined polarimeter, can correct fringe jump errors [2]. Phase-modulation is performed using a photo-elastic modulator (PEM) [3].

This work presents recent updates on the system design and synthetic diagnostic development. In particular, a model that takes into account the variations of air [4] and ZnSe optical windows [5] refractive index due to environmental parameters (temperature, pressure and humidity), eventually affecting phase measurements, is here described.

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