Contribution ID: **82** Type: **Posters**

New diagnostics for density measurement on Frascati Tokamak Upgrade.

Tuesday, 29 November 2011 15:03 (1 minute)

The plasma density in tokamaks, as in many laboratory plasmas, is measured using plasma optical properties at appropriate wavelength. The mostly applied technique is the interferometry but also other techniques as the reflectometry, polarimetry and time-of-flight radar are employed. Recently in FTU, a CO/CO2 scanning interferometer and a time-of-flight radar (denominated refractometry) has been installed. The first, using two scanning beams, can provide a plasma density profile every 62.5 μs (8 kHz scanning frequency). Two lasers are employed a 10 W CO2 (λ=10.6 μm) as main wavelegth and a 1W CO (λ = 5.4 μm) for compensation of mechanical vibration of optical components. The scanning component is a small mirror (∅=5 mm) resonantly tilting at 8 kHz. The oscillation is compensated by a double pass into this mirror. The time-of- flight refractometer is a two frequencies radar (50.5 and 60.5 GHz) which measures the plasma refractive index from the delay time of an RF pulse that goes through the plasma and is reflected back by the metallic vacuum vessel. A brief description of various techniques for the density measurements in tokamaks will be presented analyzing in details the two diagnostics recently installed in FTU.

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Session Classification: Poster Session: presentation of posters