
Contribution ID: **1116** Type: **not specified**

# P3.069 - Study for the microwave interferometer for high densities on COMPASS-U tokamak

*Wednesday, 19 September 2018 11:00 (2 hours)*

The present COMPASS tokamak at the Institute of Plasma Physics in Prague is equipped with the 2-mm interferometer, which gives a possibility to measure line average electron densities up to 1.2x1020 m-3 (the critical density for the interferometer probing waves is 2.43x1020 m-3). A high magnetic field tokamak, COMPASS-U [Panek et al., Fus. Eng.des. 123 (2017) 11-16], will be designed and built there replacing COMPASS. Higher plasma densities in COMPASS-U about 5x1020 m-3 will require a new design of the interferometer. A new microwave interferometer scheme will provide precise measurements in a wide density range and allow using a real-time gas puff density feedback. A solution for real-time line-average electron density measurements based on the solid-state elements is proposed. Among the main features of this system will be use of the two microwave transceivers with close sub-millimeter frequencies and the principle of the "unambiguous" measurement [Varavin M. et al., Telecommunications and Radio Engineering 73 (10) (2014) 935–942]. A study of both vertical and horizontal orientations of the interferometer with respect to plasma shape and mechanical vibration influence for the plasma density measurement is presented. Ray tracing calculations using the FIESTA-8 code are shown for both configurations, demonstrating the propagation of the probing waves through COMPASS-U plasmas. The plasmas (equilibrium, profiles) are going to be simulated using METIS and that we use a range of plasma densities. An assessment of signal corrections corresponding to different vertical and radial plasma positions, different plasma shapes, and non-linearity effects connected with refractive index of the plasma is performed. The interferometer will provide information on the line-average electron density in real-time and will be used in the plasma discharge control system. Coefficients for real-time correction will be calculated based on ray tracing using numerical methods that were tested on COMPASS tokamak.

**Presenter:** VARAVIN, Mykyta (Tokamak COMPASS Institute of Plasma Physics of the Czech Academy of Sciences)

**Session Classification:** P3