Application of Interferometry for Density Measurements on ITER*

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The need for a density measurement for density feedback control on ITER is well established. ITER presents unique challenges to plasma diagnostic design due to the radiation environment, physical size of the device and access. Several possible solutions to the difficult task of making a density measurement on ITER using interferometric techniques have been put forward. A review of those techniques in the framework of ITER will be presented. A design of a multi-channel system of 4–6 channels to measure line average density for ITER has been developed using interferometry and Faraday rotation measurements. The interferometry measurement provides the required density accuracy while the Faraday rotation measurement provides a steady-state capability. Both measurements use the same CO₂ laser and the interferometer uses a second wavelength laser for vibration compensation. Plasma effects on both types of measurements and ITER specific operational considerations, such as plasma start-up will be discussed. Survivability and placement of the plasma facing optics in the ITER structure are critical issues and a discussion of the material selection, cooling options and integration into ITER will be given.