

Overview of the microwave reflectometry system for Compass

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Abstract

The reflectometry system to be developed for Compass should allow the measurement of plasma density profiles as well as the correlation properties of plasma turbulence. It will be equipped with 5 channels covering the K, Ka, U and E frequency bands in the frequency range 18 – 90 GHz. The four frequency bands will be combined in a quasi-optical band-combiner and the resulting wave will be transmitted to the plasma by a wideband quasi-optical transmitting antenna. An identical antenna and band-combiner will be used in the receiving path to separate again in four bands. Four channels will probe the plasma in O-mode and an additional band-combiner port is used for a Ka band channel probing the plasma in X-mode to provide data for profile initialization.

The quasi-optical part of the reflectometry system (i.e. band-combiners and antennas) will be developed in collaboration with the Institute of Radio Electronics (IRE) Kharkov, Ukraine. The delivery and testing on Compass is planned in June / July 2010.

Due to the different technical requirements of the reflectometers for plasma profile measurement and plasma turbulence studies two different schemes will be used. An homodyne scheme will be used for the plasma profile measurement because it allows the ultra-fast frequency sweeping. On the other hand the heterodyne scheme based on frequency-synthesizers and fast frequency hopping capabilities will be used for the turbulence studies because of good phase-noise properties. Both schemes will work in parallel to the common antenna system in alternated switch regime.

The microwave electronics and SW equipment will be provided by IST/IPFN Lisbon. The development of the whole system is divided to two phases. The delivery of K and Ka channels is planned in June / July 2010. The rest of the system will be provided in the second phase.