

The power losses in the ICRF system at ASDEX Upgrade

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The ICRF system at ASDEX Upgrade consists of four antennas with two antenna straps each. As the typical antenna impedance is in the range of a few Ohm and the transmission line impedance is 25 Ohm, a matching system is a necessity to transmit the RF-power to the antenna. Due to this an ICRF system features a matched line section from the RF-generator, a matching system and an unmatched antenna feeding line. The coupling properties of ICRF antennas depend on the plasma boundary conditions like density and density profile, which are for example modified by transitions from L- to H-mode. A change in the antenna coupling alters the power transmitted to the antenna, because the matching system can only be optimized for a specific antenna impedance. Other antenna impedances are causing reflected power on the normally matched transmission line to the RF-generator. This reflected power is absorbed in a dummy load to protect the generator. Beside this power loss due to mismatching there are also noteworthy losses in the antenna feeding lines which are induced by the current nodes of the standing wave in this section. These losses in the unmatched feeding lines can be at the moment only roughly estimated, due to the errors caused by the directivity of the directional couplers currently used. Using voltage and current probes in this line section can increase the accuracy of the power measurements in a significant way. A complete power balance of the ICRF system from the power of the generators to the power coupled with all the losses and error bars will be given.