Status of RADI - a RF source size-scaling experiment towards the ITER source

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IPP Garching is currently developing a RF source for the ITER neutral beam system. The principle suitability concerning current density, pressure and electron content has been demonstrated with the test facility BATMAN, but with only small extraction area (~70 cm^2) and limited pulse length (<6 s). The further development concentrates now on long pulse operation (at the test facility MANITU, operational this spring) and source size extension.

A third test facility (RADI) is being constructed in order to prepare this size-scaling demonstration. The new test facility will be using one of the injector boxes of the decommissioned W7-AS injectors and is devoted to testing the geometry and the optimum number of drivers as well as the required homogeneity of large plasmas. It is scheduled to be ready for commissioning in summer 2005.

The source will roughly have the width and half the height of the ITER source; its modular concept will allow an easy extrapolation to the full size ITER source. It will be equipped with a dummy grid matching the conductance of the ITER source grid. Full size extraction will not be possible due to the lack of a big insulator, of a large size extraction system and of a beam dump. The RF power supply consists of 2 1 MHz RF generators rated for 180 kW each and 10 seconds. Both generators are currently being commissioned at IPP.

The main parameters determining the performance of the source are the H- and electron density profiles across the grid. Those will be measured by spectroscopy, probes, laser detachment and cavity ring down. These methods are/will be actually calibrated to the extracted current density in BATMAN. However, in order to get some information about the possible ion currents, local extraction with a Faraday cup system from single holes is planned.