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PROGRESS IN THE DEVELOPMENT OF RF DRIVEN NEGATIVE ION SOURCES FOR ITER NBI

M. Fröschle, H. Falter, U. Fantz, P. Franzen, A. Encheva, B. Heinemann, D. Holtum, W. Kraus, Ch. Martens, P. McNeely, R. Riedl, Dr. E. Speth, A. Tanga

Max-Planck-Institute fuer Plasmaphysik, Euratom Association,
Boltzmannstr. 2, D-85748 Garching, Germany
markus.froeschle@ipp.mpg.de

The Neutral Beam Injection (NBI) system for ITER is at present based on an arc source, delivering 20mA/cm^2 accelerated D^- ion current density at a source filling pressure of <0.3Pa, the total extraction area is 0.89 m^2. The main problem of arc sources is the limited lifetime of the filaments.

With this respect Radio Frequency (RF) sources, which have successfully been developed at IPP for positive ion based NBI, offer substantial advantages for ITER. Since December 2002 the development of a large area RF source for negative ions is supported through an official EFDA task agreement.

This development is carried out on three different test stands:

"BATMAN" is devoted to small extraction areas (<100cm^2) and short pulses (<10s). Influences of RF power, cesium evaporation, confinement and filter field, geometry and voltage of the grids have been studied. Reliable and reproducible calorimetric current densities of up to 23 mA/cm^2 accelerated D^- ions within the right pressure range and electron to ion ratio <1 have been reached.

"MANITU" focuses mainly on long pulses operation up to 3600s with larger extraction areas up to 300cm^2.

The "RADI" testbed is dedicated to demonstrate plasma uniformity by scaling up the size of the source to half the ITER size. A new source with about the width and half the height of the ITER source has been built. Different numbers and shapes of the drivers will be tested as well as influences of the geometry of the expansion volume and different arrangements of filter magnets. Full size extraction will not be possible, but a dummy grid will simulate the conductance of the ITER source.

The poster will present design details of the half size ITER source, actual devices of cesium evaporation, filter fields and extraction geometries and the latest results which have been reached on the different test stands.