# Progress in the development of a RF Driven D- Ion Source for ITER NBI

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For the past two years, IPP Garching has been under the framework of an EFDA contract developing a RF driven D- ion source to meet the requirements for Neutral Beam Heating (NBH) of the ITER Tokamak. ITER NBH requires a D- beam current density of 20 $mAcm^{-2}$, produced at a filling pressure of 0.3 Pa, with a ratio of co-extracted electron to negative ions of 1: 1 and for pulse duration of 3600 seconds. The Type VI-1 ion source on the test stand BATMAN (Bavarian Test Machine for Negative Ions) has now met or exceeded all ITER requirements excepting that of pulse length. Pulse length is the main operational parameter that cannot be investigated on BATMAN due to technical limitations of the high voltage and pumping systems, which limit the pulse length to less than six seconds. This paper will report on the latest value of deuterium current density (23 $mAcm^{-2}$) achieved in caesium seeded operation as well as the changes made to the TYPE VI-1 ion source that are believed to be responsible for this enhanced current density. The results from studies into the effect of magnetic confinement and filter field strength on the current density, electron to ion ratio, and source efficiency will be reported. A critical component for ITER NBH is reliable source operation at high current densities. Therefore the procedure used to obtain in a reproducible manner source operation on BATMAN at the ITER target values will be detailed and discussed. The current operational parameters have an additional positive aspect as in general a lower grid temperature (<150 C) is now in use and this could simplify the cooling of a future ITER source grid. Additionally, stripping losses are a topic of extreme interest to the design of the accelerator and the beamline. A new investigation using $H\alpha$ beam emission spectroscopy has been begun to investigate stripping losses in BATMAN the first results of which will be presented in this paper. The future plans for the BATMAN test stand will be given including investigations into RF power efficiency, effect of extraction aperture size, modifications to the filter magnet field, caesium deposition techniques, etc.