THE EUROPEAN CONTRIBUTION TO THE DEVELOPMENT OF THE ITER NB INJECTOR

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The ITER Heating Neutral Beam injector (HNB) is based on the electrostatic acceleration of a negative ion (H or D) beam of 40A to 1MeV, obtained in five stages of 200kV each. In terms of accelerated current, ions energy and its rated pulse length of 3600sec, it represents a big extrapolation from the presently operating neutral beam injectors based on negative ions. Therefore the strategy for the development of the HNB had foreseen a full size test facility to allow enough experimentation before the manufacturing and operation of the ITER injector.
The NB test facility was not originally in the ITER baseline and in November 2009, by decision of the ITER Council, the financial support was approved for its establishment. This facility will consist in an ion source test bed, named SPIDER, to test and optimize the negative ion source of the HNB and to be also used to support the development of the ITER Diagnostic Neutral Beam (DNB), in collaboration with the Indian Domestic Agency (DA) responsible for the DNB. Moreover a full size ITER HNB prototype, called MITICA, will be established to tests the various solutions adopted for HNB's design.
The accompanying program to the establishment of the NB test facility supported by F4E also includes the setting up of the ELISE facility, which is capitalises on the long experience of the IPP-Garching laboratories in the field of the radio frequency negative ion source experiments. The final commissioning of ELISE is presently foreseen by the second half of 2011, therefore it will be the first of the new experiments to be operated. Important information for the design of the SPIDER ion source and accelerator has been already gathered from the ELISE design and manufacturing and it is expected that the first experiments of ELISE will be both useful for SPIDER experimental campaign and for the design of the MITICA beam source.
SPIDER is presently foreseen to be operative in the latter half of 2013 while MITICA experiments would start in 2016. At present time the procurement procedures for the main components of SPIDER in the EU-DA scope, namely the power supplies of the ion source along with the high voltage deck where they are installed, the transmission line, the vessel and the beam source, have been already launched and it is foreseen to sign most of the contracts necessary for its establishment by the end of 2010. The acceleration grid power supplies and the full pulse calorimeter are in the Indian DA scope of procurement and it is expected that their procurement will start very soon.
R&D and activities towards the definition of the design of the other ITER-Site relevant HNB components which will not be installed at the NB test facility are also on-going. In particular they are focused on components such as the Vessels, the Fast Shutter, the Absolute Valve, the Passive Magnetic Shield and the Active Compensation and Correction Coils.
This paper will review the ongoing design and R&D activities that are carried out by means of F4E contracts with the European Fusion Associations. This paper will also report on implementation progress, focusing on upcoming and already initiated procurements for the NB Test Facility components and infrastructures.