

## Status of NBI for ITER and the related test facility

Monday, 14 March 2016 12:00 (30 minutes)

Two Neutral Beam Injectors (NBI) will provide a substantial fraction of the heating power necessary to ignite thermonuclear fusion reactions in ITER. The development of the NBI system at unprecedented parameters (40 A of negative ion current accelerated up to 1 MV) requires a strong demonstration activity, which was endorsed by ITER to optimise the crucial components and systems. A test facility, PRIMA (Padova Research on ITER Megavolt Accelerator), is presently in the final phase of construction at Consorzio RFX (Padova, Italy) in the CNR research area and will house two experiments, named SPIDER and MITICA. A full-size negative ion source, SPIDER (Source for the Production of Ions of Deuterium Extracted from Rf plasma), will be operated in the facility to demonstrate the creation and extraction of a D-/H- current up to 50/60A on a wide surface (more than 1m<sup>2</sup>) with uniformity within 10%. The second experimental device is the prototype of the whole ITER injector, MITICA (Megavolt ITeR Injector and Concept Advancement), aiming to develop the knowledge and the technologies to guarantee the successful operation of the two injectors to be installed in ITER, including the capability of 1MV voltage holding at low pressure. The beam source is the key component of the system, whose design results from a tradeoff between requirements of the optics and real grids with finite thickness and thermo-mechanical constraints due to the cooling needs and the presence of permanent magnets. The experimental effort is supplemented by numerical simulations devoted to the optimisation of the accelerator optics and to the estimation of heat loads and currents on the various surfaces. In this contribution the main physics aspects of NBIs and the requirements of the test facilities MITICA and SPIDER will be discussed and the design and the status of the main components and systems will be described. Particularly a review of the accelerator physics and a comparison between the designs of the SPIDER and MITICA accelerators will be presented.

### If a proceedings is prepared, will you submit a contribution?

yes

**Primary author:** SERIANNI, Gianluigi (Consorzio RFX (CNR, ENEA, INFN, UNIPD, Acciaierie Venete SpA))

**Co-author:** &, the NBI team (Consorzio RFX (CNR, ENEA, INFN, UNIPD, Acciaierie Venete SpA))

**Presenter:** SERIANNI, Gianluigi (Consorzio RFX (CNR, ENEA, INFN, UNIPD, Acciaierie Venete SpA))

**Session Classification:** Morning Session (Chair: P. Veltri)