

DESIGN INTEGRATION OF SINGAP ACCELERATOR AND RF SOURCE IN THE ITER NB INJECTOR

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The paper deals with the design integration of two alternative solutions for the ion accelerator and negative Ion Source of the ITER Neutral Beam Injector. The first alternative concerns the new 1 MV accelerator, named SINGAP, which has a single grid instead of the five steps of the reference design; the second modification introduces a RF negative ion source replacing the traditional filament solution.

An overall layout of the NB injector in SINGAP configuration is described. The main advantages and drawbacks of this configuration with respect to the ITER NB reference design are described.

A modified 1 MV Bushing, which consists in a HV feedthrough for all the electrical bus bars and the water cooling tube of both Ion Source and Accelerator, has to be redesigned. The Bushing, which acts as a barrier between the gas insulated HV line and the ITER primary vacuum, in the new design has also the function of supporting the Beam Source: a detailed description of the Source support structure and positioning system is presented together with critical points and design criteria.

The two different options of SINGAP and Arc Driven Source and SINGAP and RF source were designed: some considerations of the two new layouts are presented.

The integration of the new Extractor assembly, composed by Plasma and Extraction Grids together with their support structure, is described, with particular emphasis to connections of electrical bus bars and cooling pipes, mechanical supports, electrical insulations and electrostatic requirements.

The design of the new Grounded Grid is also illustrated, comprehensive of a remotely operated support and adjustment system, necessary for the beam steering.

The alternative design of a RF ion source has been also developed. The hydraulic and electric circuits have been designed taking care of thermal, electrostatic and material issues. The actively cooled drivers are described in detail and the integration in SINGAP configuration is finally shown.