DESIGN OF THE DIAGNOSTIC INSTRUMENTED CALORIMETER FOR THE 100 KV NEGATIVE ION SOURCE SPIDER

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In the ITER project, an important feature is represented by additional heating via injection of neutral beams from accelerated negative ions. To study and optimise their production, the SPIDER test facility is under construction in Padova, with the aim of testing beam characteristics and to verify the source proper operation, according to ITER requirements concerning beam uniformity and divergence, accelerated current, co-extracted electron current, and beam position [1].
The Instrumented Calorimeter, which measures the beam power and energy density by directly intercepting the beam, is a very useful diagnostics for beam characterization.
The paper is dedicated to the description of STRIKE, which is the diagnostic calorimeter to be installed in SPIDER. STRIKE is formed of 16 tiles arranged in two separate panels which can be moved along the beam direction, to estimate beam divergence, and off-beam, to permit long pulse operations.
IR cameras observe the thermal pattern at the rear side so that the thermal signal in the spectral range of interest is not affected by the radiation due to beam-gas interaction in front of the calorimeter.
STRIKE is equipped with: thermocouples, for calibrating IR cameras and controlling the temperature in some key points; current sensors, for measuring the beam negative ion current and assessing the stripping losses; and electrostatic probes for investigating the plasma formed in front of the calorimeter.
Different design solutions in terms of material and geometry are presented and discussed in the paper. Particular care has been taken to minimise the distortion as the beam thermal pattern is transferred from the front side to the rear side of the tiles. This result can be accomplished by using a material with anisotropic thermal properties or by suitable design with an isotropic material. Both solutions are described and compared in the paper, as well as alternative solutions based on different exposure angles.
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[1] P. Sonato *et al*., *The ITER full size plasma source device design*, Fusion Eng. Des., **84**, 2009, 269

Topic D: Diagnostics, Data Acquisition and Remote Participation