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The CNESM neutron imaging diagnostic for SPIDER beam source

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The ITER neutral beam test facility under construction in Padova will host two experimental devices: SPIDER, a 100 kV negative H/D RF source, and MITICA, a full scale, 1MeV deuterium beam injector. A detection system called Close-contact Neutron Emission Surface Mapping (CNESM) is under development with the aim to resolve the horizontal beam intensity profile in MITICA and one of the eight beamlet groups in SPIDER, with a spatial resolution of 3 and 5 cm2 respectively. This is achieved by the evaluation of the map of the neutron emission due to interaction of the deuterium beam with the deuterons implanted in the beam dump surface. CNESM uses nGEM detectors, i.e. GEM detectors equipped with a cathode that also serves as neutron-proton converter foil. The diagnostic will be placed right behind the SPIDER and MITICA beam dump, i.e. in an UHV environment, but the nGEM detectors need to operate at atmospheric pressure, so to contain the detector a vacuum sealed box has been designed to be installed inside the vacuum vessel and at atmospheric pressure inside. The box design was driven by the need to minimize the neutron attenuation and the distance between the beam dump surface and the detector active area. This paper presents the status of the CNSESM diagnostics. It describes the detector box and the different phases followed during the installation of the diagnostic on the SPIDER beam dump. Also the general layout of the diagnostic as part of the SPIDER experiment will be discussed. Finally the preliminary design of MITICA CNESM diagnostic will be introduced. This work was set up in collaboration and financial support of Fusion for Energy.

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