Mechanical design of the cavity ring down spectroscopy diagnostic for the negative ion source SPIDER

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The SPIDER experiment, part of the Neutral Beam Test facility at Consorzio RFX, hosts the prototype of the negative ion source for the neutral beam injectors of ITER. The source, coupled to a three-grid acceleration system, is required to deliver a beam current density of 355 A/m^2 (H)/285 A/m^2 (D) for at least 1h. In order to maximize the negative ion current, the H^-/D^- density is measured in proximity of the plasma-facing grid by means of a Cavity Ring Down Spectroscopy (CRDS) diagnostic. The CRDS technique is based on the absorption of light due to photo-detachment reactions involving negative ions. The absorption length is multiplied thousands of times by trapping a laser pulse inside an optical cavity, in which negative ions are present. The present paper presents the mechanical setup of the CRDS diagnostic and its integration in SPIDER, in particular the fine adjustment support for the high reflectivity mirrors of the cavity, which act as air-vacuum interface. The paper also discusses the mechanical design of the CRDS components, in relation to the requirements of the diagnostic in terms of alignment precision and stability.