Contribution ID: **20** Type: **Oral**

Extrusion of Hydrogen Ice for Thin Targets

Wednesday, 10 October 2018 11:50 (20 minutes)

We have developed a new device for production of thin hydrogen cryogenic targets. Gas at room temperature is introduced in the cryostat and cooled down near the triple point to create a volume of hydrogen in an amorphous phase. When the required volume is obtained, and endless screw is used to generate the mechanical pressure (around 100 bars) necessary for extrusion of hydrogen through a nozzle, the geometry of which will define the final geometry, a hydrogen ribbon in our case. Then the ribbon can flow with gravity in the vacuum of a reaction chamber in a continuous way. In the reaction chamber at room temperature, the hydrogen ribbon is subject to sublimation and a powerful pumping device has to be installed to eliminate hydrogen gas and maintain the room pressure. Two different domains, at least, are concerned by such a target: nuclear physics with direct reactions and laser-hydrogen interaction for production of proton beams. In both cases, the effective target thickness has to be smaller or equal 50 microns. A very small thickness is a challenge for the nozzle technology and the extrusion process.

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Session Classification: Session 6-Cryogenic and Poarized Targets

Track Classification: 8 - Cryogenic and polarized targets