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The development and validation of a multi-purpose cryostat for cryogenic pellet experiments

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In fusion devices cryogenic has a crucial role, not only in superconductive magnet cooling, but also in the formation of cryogenic pellets. These pellets are used for fueling and other solidified matter injection of fusion reactors. At the HUN-REN Centre for Energy Research Fusion Plasma Physics Department, a support laboratory has been set up to study pellet production, launch and shattering of cryogenic protium, deuterium, neon, and neon-protium mixture pellets.

The development of an efficient cryogenic system is essential for the success of this pellet production research, thus a new cryostat has been designed. The purpose of this cryostat is to test new types of equipment, to make simplified modelling and measurement of the pellet formation and other cryogenic tests related to fusion devices. For this reason, the cryostat has multiple ports, a reconfigurable structure and large viewports, thus even in-depth visual inspection is achievable.

In this contribution, we introduce the cryogenic pellet formation process in fusion devices and discuss the results of the development and validation of this cryostat. In that cryostat highly relevant parameters of desublimation of protium were studied.

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