



Contribution ID: **10**

Type: **Talk**

Tritium breeding capabilities & progress at the tritium breeding research facilities by the University of Bristol & Astral Systems

Tuesday 3 February 2026 14:35 (30 minutes)

The University of Bristol and Astral Systems are establishing a tritium breeding research facility in the north of Bristol. This leverages the expertise of the University of Bristol on material manufacture and instrumentation design and Astral's revolutionary compact neutron sources.

The facility consists of a gas management system (GMS), a breeder blanket module (BBM) and a DD neutron source. The GMS has been developed to manage the purging gas flow through the breeder material during neutron irradiation. Flow, pressure, and gas composition can be modified in real-time within the breeder module. The temperature of the breeder can also be controlled via an inductive heater. The BBM encloses the vessel where the breeder material is encapsulated and conditions the neutrons to maximise breeding efficiency. The current neutron source leverages Inertial Electrostatic Confinement Fusion (IECF) technology and is capable of generating $I \approx 1 \times 10^8$ n/s DD neutrons ($E = 2.45$ MeV).

The current research on the facility is exploring the use of 6LiD as a tritium breeder material, fabricating solid pellets of various sizes to prevent contamination. These pellets will be tested under quasi-operational conditions to study tritium production.

An overview of the results obtained to date will be presented as well as and status update and future steps of the whole facility.

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Session Classification: Session 1-3

Track Classification: LIBRTI Conference