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A Neutron Spectrometer for General Fusion

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General Fusion is developing a prototype fusion machine under its Lawson Machine 2026 (LM26) program, leveraging the principles of magnetized target fusion. A key objective of LM26 is achieving an ion temperature of ≥10 keV, which presents significant challenges in accurate temperature measurement. To address this, a time-of-flight neutron spectrometer is proposed.

In deuterium-deuterium fusion reactions, monoenergetic 2.45 MeV neutrons are produced. However, the plasma's ion temperature causes a dispersion in neutron energy in the lab frame via the Doppler effect, with the standard deviation proportional to the square root of the ion temperature in keV. The proposed neutron spectrometer utilizes two layers of plastic scintillator coupled with Silicon Photomultipliers (SiPMs) to measure neutron energies. By recording the scattering angle and time-of-flight between interactions in the two scintillator layers, this setup should enable sufficiently precise neutron energy measurements to reconstruct the ion temperature.

Designing this spectrometer poses challenges due to the low total neutron count and high neutron incidence rate. Therefore, extensive modelling, simulation, and testing of the spectrometer's position and timing sensitivity are crucial to ensure accurate plasma temperature measurements. Ongoing laboratory tests are focused on verifying that the selected detector materials and readout electronics meet the stringent requirements necessary for successful ion temperature measurements.

Do you need a VISA letter for traveling to Canada ?

No

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