



WPSA Enhancements: Neutron and Gamma Diagnostics

Performance study of a high-resolution DD neutron spectrometer for JT60SA

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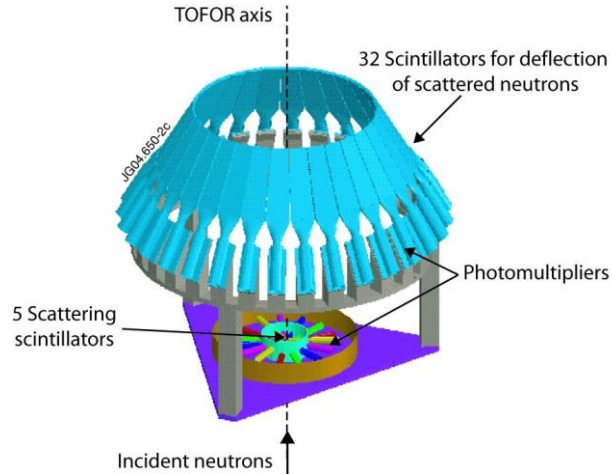


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Overview

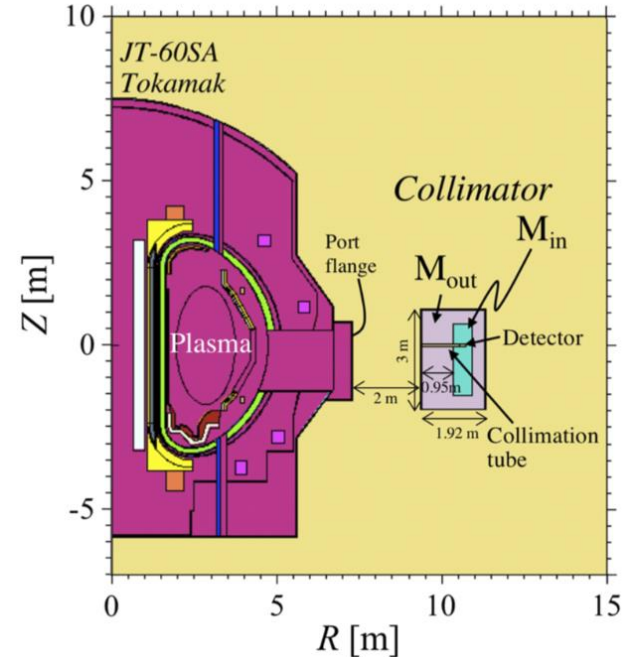


- Study the performance of a DD neutron spectrometer, for studying fast ion physics in the main JT60SA scenarios
 - Propose to place the spectrometer at the **end of the collimator system for the horizontal neutron camera (HNC)**, in order to minimize interfacing issues etc



Schematics of the TOFOR diagnostic at JET that is proposed to be relocated to JT-60SA

Viewing geometry of HNC central channel
[Sumida et al 2020 *Rev. Sci. Instrum.* **91** 113504]

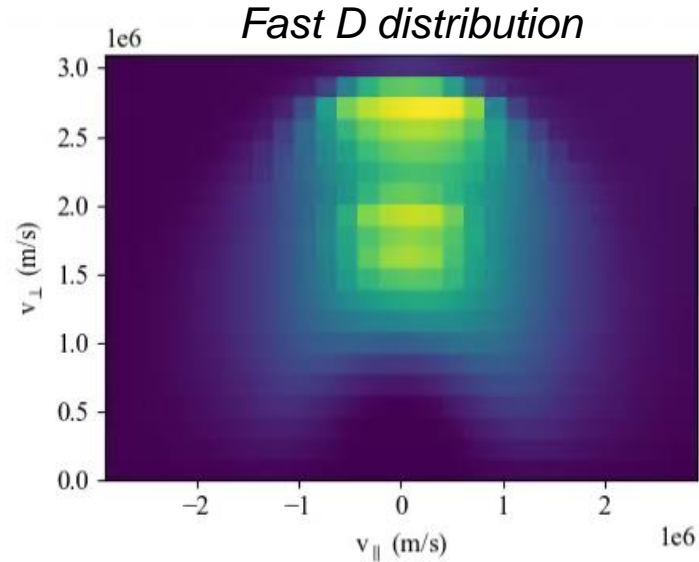
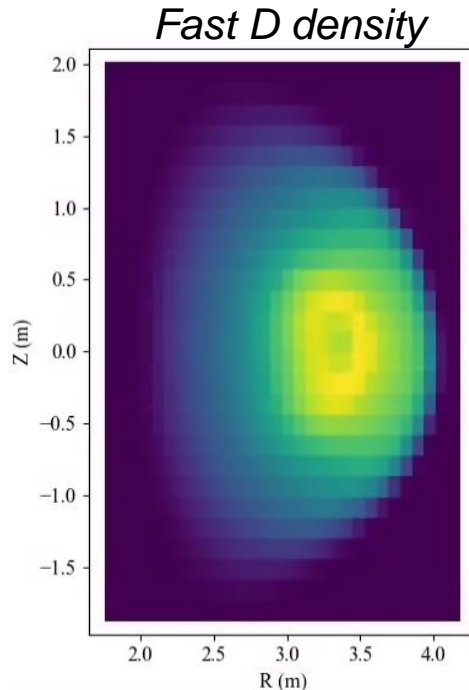




Calculation of neutron spectra for different plasma scenarios

ASCOT simulation of Scenario 5.1

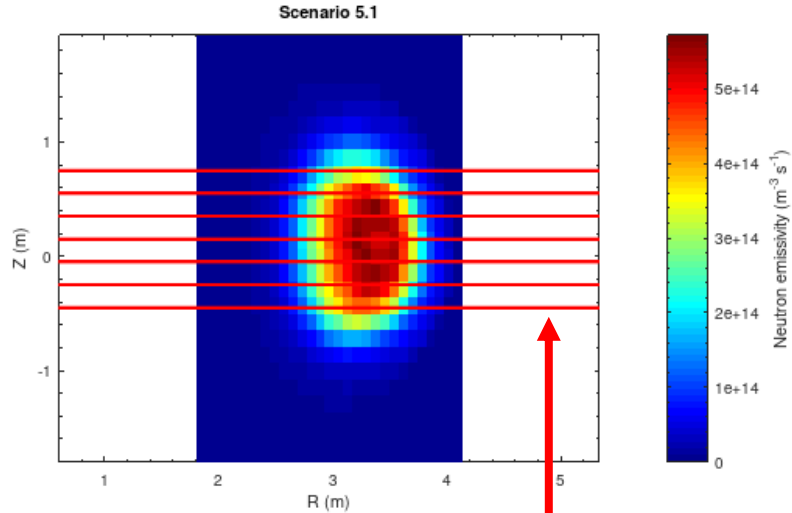
(L. Garzotti et al 2018 *Nucl. Fusion* 58 026029)





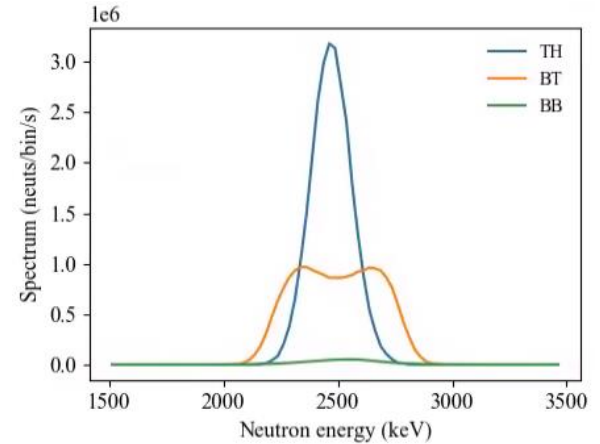
Calculation of neutron spectra for different plasma scenarios

DD neutron emissivity profile



HNC sightlines

DD neutron energy spectrum in HNC central sightline





- Use computational framework to evaluate spectrometer performance in different scenarios (using the known instrumental response function of the TOFOR spectrometer)
 - Time resolution and accuracy for determining
 - thermal/supra-thermal contributions to the neutron emission
 - ion temperature
- Use JT60SA MCNP model to make preliminary assessment of the contribution from scattered neutrons (however, HNC viewing geometry presently not implemented)
- Preliminary study of spectrometer integration





- More refined evaluations of scattered neutrons at the spectrometer positions (requires additions to the existing MCNP geometry)
- More detailed study of spectrometer integration
- More detailed performance investigation
 - Transient events (instabilities etc) and their effect on the measured neutron spectrum

