

Synthetic diagnostic for neutrons emitted from a thermonuclear plasma on the High Resolution Neutron Spectrometer example

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About 50 individual measurement systems will help to control, evaluate, optimize plasma performance and further will help understanding of plasma physics in thermonuclear reactor. The diagnostic systems dedicated to fusion product measurement and especially neutrons are one of the important systems to measure fusion power generation in ITER, the neutron fluence near first wall, the neutron spectrum and further to control fuel ion ratio. A Synthetic Diagnostic Platform (SDP) for neutron diagnostics dedicated to controlled thermonuclear reactor project should be considered on the basis of ITER plasma simulation codes, enabling detailed validation of these codes.

In this lecture, introduction and capabilities to the synthetic diagnostic modules will be given. Then, on the example of the neutron diagnostic system for ITER i.e. High Resolution Neutron Spectrometer [1], an work flow of the SDP for this system will be presented. Based on synthetic data a method of the target accuracy evaluation has been done. Furthermore, results based on synthetic data suggest that the working range of fuel ratio measurements with an accuracy not worse than 20% could be reached with a time resolution of about 100 ms.

Finally, the list of neutron diagnostics will be shown with some conclusions about common for workflow of SDP to diagnostic systems for neutrons emitted from thermonuclear plasma

[1] Scholz M. et al 2019 Nucl. Fusion 59 065001