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P4.067 Modification of neutron emission spectrum by Alfven eigenmodes in a deuterium-tritium plasma

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Understanding of resonant interaction between particles and Alfven eigenmodes is one of the most important issues for fusion plasma research. Destabilization of modes by energetic ion population and energetic ion redistribution by unstable modes have been studied by many researchers. However, the interaction of bulk ions with modes has almost not been investigated. Because some bulk ions also satisfy resonance conditions, unstable Alfven eigenmodes can create energetic ion tails in fuel-ion velocity distribution functions in the parallel and antiparallel directions to a magnetic field line. When energetic ion tails are formed in fuel-ion velocity distribution functions, an emission spectrum of fusion-produced neutrons are distorted from the Gaussian distribution. The modification of the neutron emission spectrum may affect neutron wall loading. By detecting the non-Gaussian component in a neutron emission spectrum, the energetic ion tails can indirectly be determined. If the energetic ion tails are create by Alfven eigenmodes, it is important to clarify the degree of the modification of the neutron spectrum for energetic ion diagnostics by measuring the non-Gaussian neutrons and grasping effects of Alfven eigenmodes on the neutronics in the structural materials. In this study, neutron emission spectra are evaluated for several unstable Alfven eigenmodes assuming an ITER-like deuterium-tritium plasma. It is shown that the neutron emission spectrum is modified in the parallel and antiparallel directions to a magnetic field when mode amplitude is large enough to create energetic ion tails.

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