

# FISSION NEUTRONS FOR FUSION DIAGNOSTICS

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## Abstract

Neutrons are an exceptional diagnostic tool in magnetic fusion experiments with high temperature plasma. A part of neutron detection approaches rely on detecting the various nuclear reaction products, which are signatures by which neutrons may be detected. Among different possibilities, the neutron-induced fission reactions can be used. These methods use the specific properties of the radioactive decay phenomena induced by neutrons of heavy elements like uranium or thorium. The neutron-induced fission reactions can serve as a mean of converting slow neutrons into ionizing reaction products that can be detected in conventional means. A fission reaction may be adapted to the specific case of an activation method for a neutron flux measurement. A dedicated target-sample made from fissionable isotopes (like  $^{235}\text{U}$  or  $^{238}\text{U}$ ), irradiated by neutrons, is the source of prompt and delayed neutrons. These neutrons can serve as a primary signature of neutrons generated in fusion reaction.

The lecture gives the introduction to the nuclear fission process and the particular attention is done to the phenomenon and physics of delayed neutrons which are generated during the fission reaction.