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Extensions of FIDASIM capabilities: Passive signals, 3D geometry and neutron collimator signals

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FIDASIM is a synthetic diagnostic code that simulates fast ion D-alpha (FIDA) and neutral particle analyzer (NPA) signals produced by charge exchange (CX) with neutrals. The experimental configuration and a theoretical distribution function are inputs to the code. Previously, FIDASIM only simulated CX with injected neutrals in axisymmetric devices. However, the magnitude of passive signals produced by CX with edge-cold neutrals can be of comparable magnitude to active signals. Therefore, FIDASIM is modified to accept a cold neutral population, calculate their atomic states and predict passive signals. The effect of 3D magnetic fields on fast ion confinement is important in stellarators and in tokamaks with ELM-control coils. Also, the cold neutrals that produce passive signals often vary toroidally. Thus, FIDASIM is improved to predict signals in 3D geometry. Neutrons emitted in beam-thermal reactions depend upon the fast-ion distribution function. To model FIDA, NPA and neutron collimator signals in a common framework, forward models for neutron collimator signals are incorporated into the code. This poster discusses the improvements made to FIDASIM and their benchmarks.

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