

Development and validation of synthetic diagnostics and inference models

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Preparing to interpret the data arising from ITER plasma operation requires the development and validation of models for each of the diagnostic systems installed.

Prioritising the development of synthetic diagnostics for the Start of Research Operations (SRO) has focused attention initially on models for the interferometers (TIP and DIP), polarimeter (PoPola, including full Stokes vector calculation, Faraday and Cotton-Mouton effects), the full magnetic systems (magnetic probes, flux loops, saddle coils and Rogowskis including white or coloured (1/f) noise on observations), Thomson scattering (core and edge), soft x-rays, XRCS (core, edge, and survey), hard X-rays and ECE. These models have been developed with the Minerva modelling framework.

Since all these models have been developed following the IMAS paradigm, they are applicable to any device whose configuration (Machine Description data) and data can be mapped to follow the IMAS Data Dictionary. This allows these models to be validated by comparing their predictions with experimental measurements. In Minerva, these synthetic diagnostic models can also easily be combined to construct inference models to infer key physics parameters such as the electron density and temperature profiles

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