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## **Progress in the ITER Integrated Modelling Programme and the use and validation of IMAS within the ITER Members**

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The ITER Integrated Modelling (IM) Programme will not only support the ITER Project in the development and execution of the ITER Research Plan (IRP) but also provide support for the design basis of the ITER facility during construction, in particular for diagnostics. Strategically, the ITER IM Programme is implemented using expertise and technologies developed within the ITER Members' research programmes with annual reviews by an Integrated Modelling Expert Group (IMEG) comprised of experts from all the ITER Parties. The Integrated Modelling & Analysis Suite (IMAS) is the software infrastructure that has been developed in response to the needs of the IM Programme and which will support the requirements of both plasma operations and research activities. An agile approach is taken to the development of IMAS and a software management framework consisting of linked issue tracking, source code repositories and a continuous integration server to automatically build and regression test revisions has been established. It is essential that results generated for ITER are reproducible and so software hosting and rigorous version control are prerequisites and already ensured, whilst provenance tracking for handling inputs is still in development.

The unifying element of IMAS is its use of a standardized data model capable of describing both experimental and simulation data. This enables the development of workflows that can flexibly use different software components as well as being independent of the device being modelled. This makes IMAS an ideal framework for conducting code benchmarking exercises, such as that within the ITPA Energetic Particle Physics Topical Group on the calculation of fast ion distributions. In this paper, some of the initial software adaptations are presented to indicate the use, and consequent validation, of IMAS within the ITER Members. This has been facilitated by the release this year of a local installer for IMAS which has already allowed installation within the research facilities of the majority of the ITER Members including the EU, India, Japan, Korea and the US. For the most part, these workflows are predictive in nature with interpretive workflows expected to follow from the development of plugins to the IMAS data access tools to securely read and map remote experimental data from existing devices into the standardised data model.

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