

Mapping Alcator C-Mod data into IMAS using the UDA JSON mapping plugin

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To facilitate the interoperability and reusability of analysis codes, and general interoperability of data from different fusion experiments, work has been undertaken to map the data from these experiments into the IMAS (ITER Integrated Modelling and Analysis Suite) data model[1]. This mapping can be done on an adhoc basis with the generated IDs being then made available locally or via remote data access, or can be done on-the-fly by leveraging the power of the UDA[2] plugin mechanism to map the ID data requests as they are received into the relevant experimental signal, performing any required data manipulations.

Previous efforts to map some EUROfusion experiments into IMAS were based on the EXP2ITM[3] XML mappings, and a custom plugin that was able to make use of these mapping files. Data was successfully mapped in this way but the technology stack was inefficient and brittle. With the development and release of IMAS Access Layer version 5 a new JSON mapping plugin[4] has been developed to codify the mappings for each experiment in a more maintainable and simpler format, and to provide common plugin code that can be used by most if not all experiments.

So far, the work to provide mapped data to IMAS has had a focus on EUROfusion experimental machines, driven by the EUROfusion DMP (Data Management Project), whose work is based on implementing the recommendations made by the FAIR4Fusion project[5]. For this project multiple experiments have generated IDs or created mappings to allow for on-the-fly generation of Summary IDs. These IDs can then be used to populate a web-based catalogue to facilitate the exploration of the data from these machines in a standardised and comparable format.

To extend these mappings beyond Europe work has been undertaken to provide similar mappings for the MIT Alcator C-Mod experiment[6], focusing first on the Summary ID, but with plans to extend into other IDs to allow for running of analysis codes using the IMAS infrastructure. As part of this work, an MDSplus[7] data access plugin has been created for reading the experimental data, and JSON mapping files have been created to codify the mapping of IMAS paths into MDSplus expressions.

[1] IMAS, F. Imbeaux et al., 2015, Nucl. Fusion 55 123006

[2] UDA, J. Hollocombe et al., 2024, GitHub repository, <https://github.com/ukaea/UDA>

[3] Exp2ITM, J. Signoret, F. Imbeaux, 2010, https://www.eufus.eu/documentation/ITM/imports/edrg/public/md_and_dm/edrg_Basics_on_

[4] JSON mapping plugin, A. Parker et al., 2024, GitHub repository, <https://github.com/ukaea/JSON-mapping-plugin>

[5] DMP, P. Strand et al., 2022, Plasma Phys. Control. Fusion 64 104001

[6] Alcator C-Mod, Hutchinson et al., Phys. Plasma 1(1994)1511, and Marmor, Fusion Sci. Technol 51(2007)261

[7] MDSplus, 2024, GitHub repository, <https://github.com/MDSplus/mdsplus>

Speaker's Affiliation

UKAEA

Member State or IGO

United Kingdom

Primary author: HOLLOCOMBE, Jonathan (UKAEA)

Co-authors: Mr PARKER, Adam (UKAEA); STILLERMAN, Josh (MIT PSFC); CUMMINGS, Nathan (UKAEA); LANE-WALSH, Stephen (MIT)

Presenter: HOLLOCOMBE, Jonathan (UKAEA)

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