**Outlines from the FSD Science meeting - 3D effects**

Tue. 01.Feb.2022 10:00 CET

<https://indico.euro-fusion.org/event/1455/>

The meeting was focused on 3D physics, with particular emphasis on modelling tools. Four presentations were discussing the current status, validation and application of numerical tools (GBS, BEAMS3D, VENUS-LEVIS, ASCOT, JOREK and SPEC). One presentation was focused on engineering aspects of RMP coils for DEMO.

Over decades a number of codes have been developed by the community. Whereas some codes were originally planned for tokamak physics (2D) and others for the stellarator (3D), with time more and more overlap occurs in the physics covered by them.

* Codes share same V&V cases, when stellarator codes are applied to tokamak cases and the tokamak one (by integrating 3D effects) to stellarator.
* Establish a simple code catalog, where the code validity (physics) and applicability ranges can be indicated.
* Standardization of V&V exercises shall be promoted.
* Easy data exchange through the standardized data structures between such codes was brought for discussion. Most obvious approach to this problem would be the use of the IMAS.
* Currently IMAS data dictionary does not allow for 3D equilibria. The required extension needs to be discussed (FSD SC meeting on IMAS)
* Another important aspect is the consequence of 3D perturbation to the engineering design of DEMO. Do 3D effects eventually reduce needed assembly accuracy?
* Further studies on the penetration of the perturbation and its effect on the turbulent transport will be needed.
* Modelling tools often consider only a limited number of 3D effects )on particle orbits, on equilibria, on mode stability, etc) an integrated way to address these including effects on profiles (particle pump out) is still missing.