

MHD Analysis for Divertor Integration Subtask

Need quantitative description of field and geometry

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| 3c.11 Analyze flow along a deflector in the divertor (similar to NSTX center stack calculation) with real field direction (e.g. poloidal and radial fields and gradients) for ARIES-Cliff. Also, do a hydrodynamic calculation for the Flibe case | This can be done using flow3D-mod with flow treated as axisymmetric. Hulin will do work on it before april meeting.

Flibe case will continue to be deferred for now |
| 3c.12 Analyze exit flow (inertial+gravity) through the strong magnetic field gradient for our exhaust configuration. | This can be done together using approximate methods for looking at the effect of gradient and pipe wall drag. Sergey will do these estimates before the april meeting. |
| 3c.13 Analyze exit flow schemes that utilize (a) MHD flow coupling or (b) E-M propulsion assist. | 3D free jet flow will be treated by 3D tools as they become available.

Deferred for now. |
| 3c.14 Analyze a jet flow, including the flow downstream from the nozzle (stream convection), nozzle pressure and effects of plasma coupling (see III-c.5). Couple this with (or use it as input for) the analysis of exit flow. | |
| 3c.14+ 3c14 part 2 | |

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| 3c.15 | Analyze the enhanced circulation in streams and droplets associated with the change in the surface due to a local applied heat flux (Marangoni effect). | Can be initially analyzed with previous analytic solution to droplet convection. Neil will provide necessary information to Nygren. |
| 3c.16 | Analyze collision of fluid streams in the divertor (splashing or coalescence of streams). Can this be exploited? | |
| 3c.17 | Analyze flow around an RF/pump-duct penetration. | Approximate methods can be used to look at the averaged affect of MHD around RF/pump ducts (similar to exit pipe problem). But this 3D problem will require more model development for a satisfactory answer. |
| 3c.18 | Extend results of analyses of plasma coupling/stability to include the divertor flow. | |
| 3c.19 | Evaluate the effects of EM transients (disruptions) on the liquid metal flow in the divertor. | Will require current and field distributions from TSC code for ARIES reactor. First work on this area will be for NSTX, can possibly be extended for ARIES if necessary. |
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