

§22. New Combination of the Liquid Metal Divertor REVOLVER-D and the Cartridge-type Blanket FAST-B for FFHR-d1

Miyazawa, J., Goto, T.

A new liquid metal divertor system named the REVOLVER-D (Reactor-oriented Effectively VOLUMetric VERTICAL Divertor) has been proposed for the helical fusion reactor FFHR-d1 [1,2], based on the idea discussed in [3]. The REVOLVER-D is an ergodic limiter/divertor, where molten tin shower jets stabilized by chains/wires/tapes are inserted to the ergodic layers at 10 inner ports. Molten tin is selected as the liquid metal because of its low melting point, low vapor pressure, low material cost, and high safety. The liquid metal pumps, cryopump, and turbo molecular pumps are installed in the central vacuum vessel connected to the main vacuum vessel via 10 inner ports equipped with maze neutron shields. Central solenoid coils made of high-temperature superconductor are installed inside the central vacuum vessel to shield the pumps from the strong magnetic field. The REVOLVER-D has five important characteristics required for the divertor system in a fusion reactor, *i.e.*, safety, high maintainability, a small amount of radioactive wastes, high pumping efficiency, and high

permissible heat load.

Since the REVOLVER-D works as a limiter and makes the usual full helical divertor less necessary, the breeding blanket can be simplified. Based on the idea of the T-shell blanket [4], which is divided by the planes at every 2-3 degrees of toroidal angle, we are considering a new cartridge-type breeding blanket named the “Fold-And-Slide T-shell Blanket (FAST-B)”. In the FAST-B, the blanket cartridges can be easily replaced by the radial motion alone. Pipes of the each units supplying molten salt can be cut and re-welded near the port flange, not deep inside the vacuum vessel. Details of the FAST-BB is now under discussion.

This work was supported by JSPS KAKENHI Grant Number 15H04233 and the budget of NIFS15UFFF038 of the National Institute for Fusion Science.

- 1) Miyazawa, J., et al., 1st IAEA Technical Meeting on Divertor Concepts, P-7 (29 Sep. - 2 Oct., 2015, IAEA Headquarter, Vienna).
- 2) Shimada, M. and Miyazawa J., J. Plasma Fusion Res. **92** (2016) 119.
- 3) Miyazawa, J., Goto, T., Tamura, H., Yagi, J. and Yanagi, N., Ann. Rep. NIFS (2014-2015) 245.
- 4) Goto, T., et al., Plasma Fusion Res. **11** (2015) 2405047.

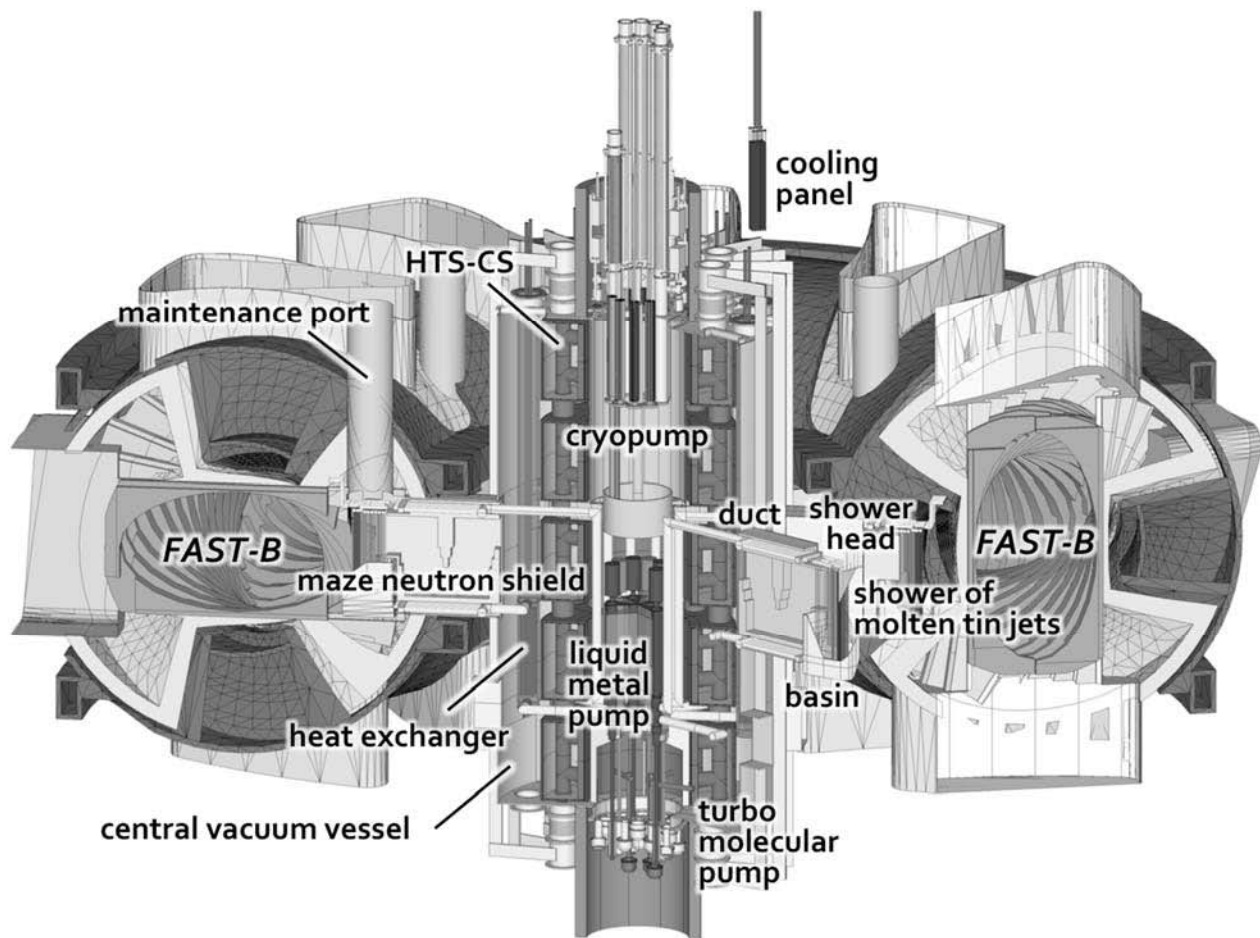


Fig. 1. A bird's eye view of the FFHR-d1 equipped with the REVOLVER-D and the FAST-B.