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Detailed design of the main flanges of the LHD vacuum vessel has been completed with the help of a CAD system. There are five types of ports in the vacuum vessel, as shown in Fig. 1. They are upper, lower, inner, outer, and tangential ports, and the main flanges are used to seal up these ports. Since the first plasma is planned to be produced just after the leak test of the vacuum vessel and cryostat, the main flanges have many small ports for plasma production, heating, plasma diagnostics, and so on. In other words, the plane flanges are not used in the leak test of the vacuum vessel and cryostat.

The size and special usage of the main flanges are as follows:

- The sizes of the upper and lower flanges are 1,210 mm × 1,880 mm and 970 mm × 1,560 mm, respectively, and their thicknesses are 50 mm and 80 mm, respectively.
- The diameter of the outer flange is 2,410 mm or 2,210 mm, and the thickness is 60 mm.
- The tangential ports are used for the neutral beam injection. The diameter of these ports is 1,070 mm and the thickness is 40 mm.
- The shape of the inner ports is like a racetrack, and their size is 480 mm × 700 mm.

The main flanges except for the tangential ports are used for any purpose, that is, wall conditioning, plasma heating, diagnostics, and so on.

Figures 2 and 3 show the main flanges of the lower and outer ports, called 3.5-L and 4-O ports, respectively. The vacuum seals of these main flanges except for the inner ones are performed by welding them to the ports of the vacuum vessel directly. The relatively-large, and quadrilateral ports on the main flanges are also sealed up by this method. The flange can be changed by grinding and removing the portion welded. The other small-size, circular, and racetrack-shape ports are sealed up with metal seals.

Seven main flanges for the lower ports have already been fabricated and installed in the vacuum vessel. The rest of the main flanges will be, of

course, fabricated before the leak test of the vacuum vessel.

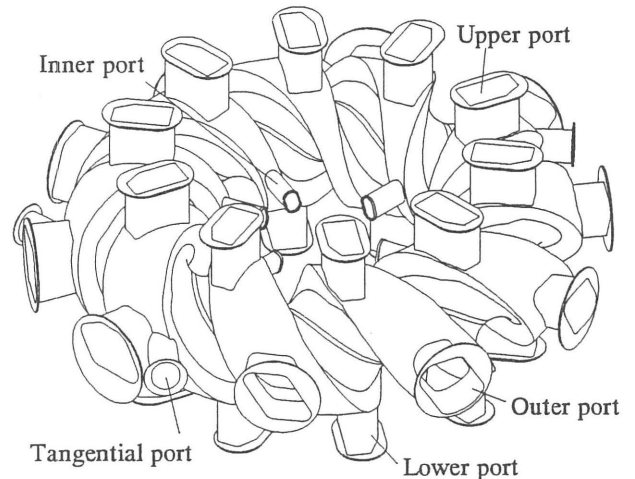


Fig. 1. LHD plasma vacuum vessel.

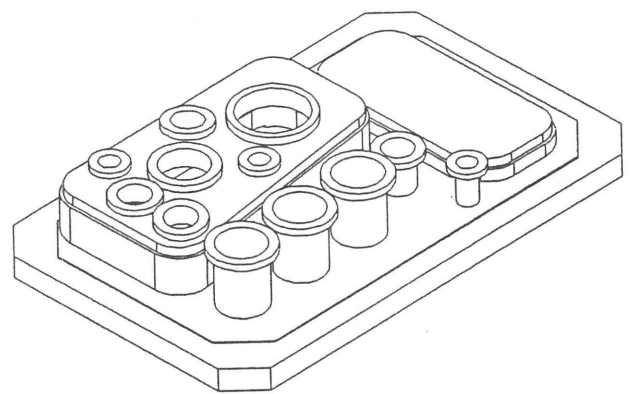


Fig. 2. 3.5-L port.

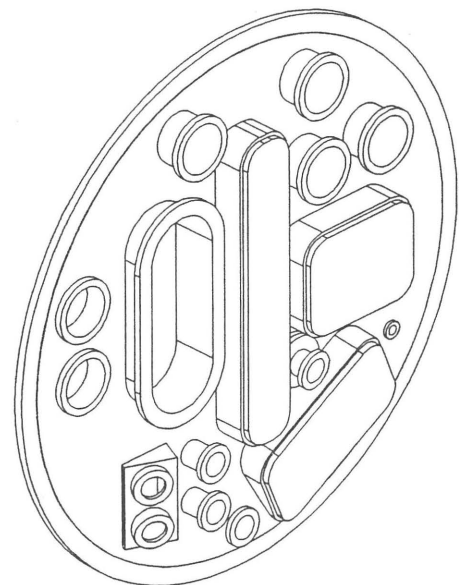


Fig. 3. 4-O port.