

§3. Numerical System for Lines of Force and Particle Orbit in Conjunction with 3D CAD System

Watanabe, T., Yoshida, M., Masuzaki, S., Emoto, M., Nagayama, Y.

Various devices are installed/will be installed in the vacuum vessel as the LHD experimental study progresses. When a device is designed or is set up, it is necessary to confirm that the device is kept off chaotic field lines, diverter legs and high energetic particle orbits. This confirmation studies become more important along with the enhancement of the heating power of the LHD. Therefore, the numerical system for lines of force ¹⁾ and particle orbit ²⁾ is made to cooperate with 3D CAD systems. The numerical systems for lines of force and particle orbit become possible to output computational results in the DXF format which is a de-facto standard for the 3D CAD system. It become easy, also, to study the relation between the lines of force and the particle orbit through the display of 3D CAD system.

Tritium deposition profile of a D-D fusion burning experiment in the LHD has been analyzed by this new numerical system.

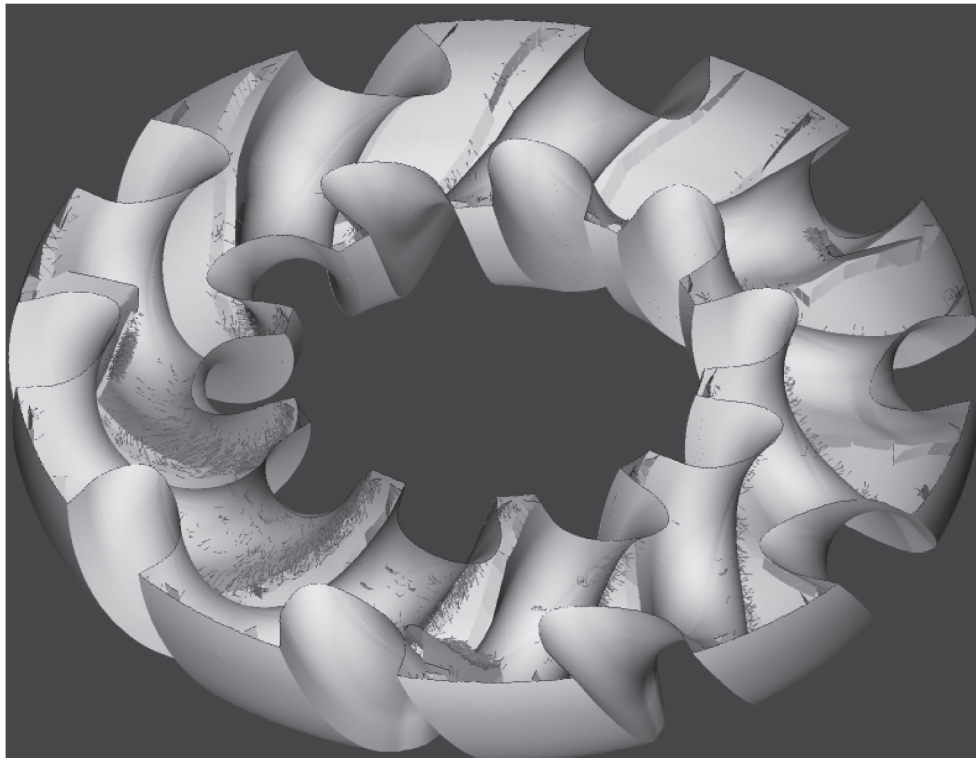
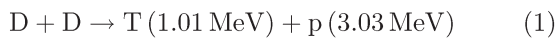


Fig.1 3D view of tritium deposition profile in DD experiment in the LHD.

Collisionless orbits of D-D fusion products, 1.01 MeV tritium, are studied numerically in a magnetic field configuration ($R_{ax} = 3.65 \text{ m}$, $B_{ax} = 2.7 \text{ T}$, $\gamma = 1.254$). Birth points of the fusion products are assumed to be uniform inside the magnetic surface designated by normalized minor radius $\rho \simeq 0.8$. Initial pitch angles are isotropically distributed. 3D view of tritium deposition profile is shown in Fig.1. Summary of computations is as follows.

Total number of T	20,013	100.00 %
confined T	11,569	57.81 %
deposit on vacuum vessel wall	4,696	23.47 %
deposit on diverter tile	2,466	12.32 %
deposit on NBI#1 armor tile	259	1.29 %
deposit on NBI#2 armor tile	262	1.31 %
deposit on NBI#3 armor tile	761	3.80 %

¹⁾ Watanabe,T., Yoshida,M., Masuzaki,S., Emoto,M., and Nagayama,Y.,

<http://dgeg3.nifs.ac.jp/~batch/linesofforce/>

²⁾ Watanabe,T., Yoshida,M., Masuzaki,S., Emoto,M., and Nagayama,Y.,

<http://dgeg3.nifs.ac.jp/~batch/orbit/>