

P5.1047 Finite beta effects on the island bundle diverter of CFQS

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CFQS is a new stellarator program proposed in China with the magnetic configuration of the quasi-axisymmetry. This program is an international joint project (NSJP) conducted by NIFS (National Institute for Fusion Science), Japan and SWJTU (Southwest Jiaotong University), Chengdu China. The number of toroidal period is 2 and the major radius of the device is 1 m. The magnetic strength is 1 T targeting an ECH plasma with high electron temperature.

Magnetic configuration of CFQS is designed based on the CHS-qa design [1], which was completed in NIFS for the succeeding program to the CHS experiment. The quasi-axisymmetry was successfully designed for CHS-qa giving strongly improved neo-classical transport. The design of modular coils for the device was also completed with the engineering supporting structure design. However, the work for the magnetic diverter configuration was not sufficiently done except a preliminary study of magnetic field line structures outside the last closed magnetic surface.

For CFQS, a special type of the island diverter configuration is studied more intensively. This island diverter has very large islands surrounding the core confinement region with a clear interface of magnetic separatrix [2]. However, the formation of islands strongly depends on the rotational transform, which changes very much with the bootstrap current. Because the quasi-axisymmetric stellarator has a large bootstrap current similar to standard tokamaks, it is important to study the effect of plasma beta on the island diverter. In this paper, we show various conditions of the formation of the island bundle diverter (IDB) and will propose the possible scenarios of high beta experiment with IDB in CFQS.

[1] S. Okamura, et. al., Nucl. Fusion 41 (2001) 1865.

[2] S. Okamura, et. al., EPS conference 2018, paper P5.1034.

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Presenter: OKAMURA, S. (EPS 2019)

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