Contribution ID: **226** Type: **Poster**

Numerical analysis of fracture behavior of first wall subjected to electromagnetic force during plasma disruption

Wednesday 7 June 2017 13:40 (2 hours)

Plasma disruption would induce large eddy current in the first wall (FW) and other in-vessel components of the Tokamak system. With the huge confinement magnetic field in the Tokamak structure, huge electromagnetic force may generate in the in-vessel components. The study on the relationship between the plasma disruption and mechanical stress and strain in the FW and other in-vessel components can help to ensure that operation of the Tokamak system is confined to a region of operating space where threats to structural integrity are acceptable. Until now, many researches on the electromagnetic force in the FW without existing crack due to plasma disruption have been reported. However, if an initial crack exists on or near the surface of the FW, the flow of the eddy current would be disturbed, and the current density would increases at the crack tip. Therefore, more serious stress concentration would happen at the crack tip and may lead to crack propagation. To evaluate the fracture behavior of the FW with an initial crack under plasma disruption, a numerical model based on finite element method is developed to study the distribution of electric current and stress near the crack. A singularity of the current density distribution at the crack tip is observed. The stress intensity factor at the crack tip under different magnetic fields is applied to analyze the trend of crack propagation. Finally, the fracture behavior of cracks with different length and direction is also studied.

Eligible for student paper award?

No

Authors: Prof. PEI, Cuixiang (Xi'an Jiaotong University); Mr WANG, Yongxiang (Xi'an Jiaotong University); Prof. CHEN, Zhenmao (Xi'an Jiaotong University)

Presenter: Prof. PEI, Cuixiang (Xi'an Jiaotong University)

Session Classification: W.POS: Poster Session W

Track Classification: Neutronics and multiphysics simulation