Contribution ID: **162** Type: **Poster**

# FTP/P7-32: Divertor Design and Physics Issues of Huge Power Handling for SlimCS Demo Reactor

*Friday, 12 October 2012 08:30 (4 hours)*

Power exhaust scenario for a 3 GW class fusion reactor with the ITER-size plasma has been developed with enhancing the radiation loss from seeding impurity. Transport of plasma, impurity and neutrals was simulated self-consistently, for the first time, under the Demo divertor condition using an integrated divertor simulation code SONIC. The total heat load, q_target, was evaluated including radiation power load and neutral load, in addition to the plasma heat load. It was found that heat and particle diffusion coefficients significantly affect the plasma detachment. For the case of increasing the coefficients by the factor of two, peak q_target is reduced from 18 MW/mˆ2 to below the engineering design level of 10 MW/mˆ2, while the characteristic width of the heat flux at the midplane SOL increases slightly from 2.2 to 2.7 mm. It was also found that that enhancement of the local χ and D at the outer SOL affects a reduction in the peak q_target near the separatrix. Effects of the divertor geometry such as the divertor leg were investigated. Outer divertor leg length was extended to 2.7 m, while the magnetic flux expansion at the target is reduced to a half compared to the reference case of 1.8 m. Large radiation volume is shifted further upstream from the target due to a reduction in T_e . The peak q_target decreases to 10 MW/mˆ2 due to reduction in both the plasma heat load and the radiation power load.

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**Session Classification:** Poster: P7

**Track Classification:** FTP - Fusion Technology and Power Plant Design