Contribution ID: **336** Type: **Poster**

# Advances in Plasma-Wall Interaction Control for H-mode Operation over 100s with ITER-like Tungsten Divertor on EAST

*Tuesday 23 October 2018 14:00 (20 minutes)*

Managing excessively high divertor power and particle fluxes and related plasma-wall interactions (PWI) is one of the most critical issues for the steady-state operation of the EAST superconducting tokamak and future fusion devices, such as ITER and CFETR. A world record long pulse H-mode operation of 101.2 seconds with H_98=1.1 and total power injection of 0.3 GJ has been successfully achieved in EAST with ITER-like top tungsten (W) divertor, which has steady-state power exhaust capability of 10 MWm-2. The peak temperature of W target T≈500 oC and a heat flux ≈3 MWm-2 was maintained stably. Great efforts have been made to simultaneously control peak heat flux and particle/impurity exhaust towards the long pulse of 100 s time scale. Particle exhaust was optimized by preferentially directing the plasma flow toward the outer target with the ion BxVB drift away from the W divertor and improving divertor pumping with the top cryo-pump. Effective power dispersal was achieved by tailoring the three dimensional (3D) divertor plasma footprint using lower hybrid wave (LHW) through induced edge magnetic topology change and broadened plasma wetted area, thus reducing peak heat flux and W sputtering. Extensive lithium coating was employed to lower edge recycling, low-Z impurity content and W sputtering. In addition, divertor detachment in H-mode for PWI handling was achieved for the first time with W divertor in EAST. Compared with previous L-mode in EAST, in H-mode the detachment has a higher density threshold with n_e/n_G~ 0.65. Active feedback control of radiative divertor with neon impurity seeding was successfully achieved with f_rad ~ 18 - 36%, and a slight loss of plasma stored energy ~ 7-11%, offering a promising technique for steady-state divertor radiation and heat flux control. The upgrade plan and status of EAST bottom divertor from graphite to water-cooled W to accommodate more challenging PWI for steady-state H-mode over 400 s and L-mode operation over 1000 s will also be presented.

## Country or International Organization

China, People's Republic of

## Paper Number

EX/P2-8

**Author:** Dr WANG, Liang (Institute of Plasma Physics, Chinese Academy of Sciences (ASIPP))

**Co-authors:** Dr WAN, Baonian (Institute of Plasma Physics, Chinese Academy of Sciences); Mr ZHANG, Bin (Institute of Plasma Physics, Chinese Academy of Sciences); Prof. XIAO, Bingjia (Institute of Plasma Physics, Chinese Academy of Sciences); Dr DING, Fang (Institute of Plasma Physics, Chinese Academy of Sciences); Prof. LUO, Guangnan (Institute of Plasma Physics, Chinese Academy of Sciences); Dr XU, Guosheng (Institute of Plasma Physics, Chinese Academy of Sciences); Mr DENG, Guozhong (Institute of Plasma Physics, Chinese Academy of Sciences); Prof. GUO, Houyang (Institute of Plasma Physics, Chinese Academy of Sciences); Dr LIU, Jianbin (Institute of Plasma Physics, Chinese Academy of Sciences); Prof. LI, Jiangang (Institute of Plasma Physics, Chinese Academy of Sciences); Prof. HU, Jiansheng (Institute of Plasma Physics, Chinese Academy of Sciences); Mr XU, Jichan (Institute of Plasma Physics, Chinese Academy of Sciences); Mr WU, Kai (Institute of Plasma Physics, Chinese Academy of Sciences); Ms ZHANG, Ling (Institute of Plasma Physics, Chinese Academy of Sciences); Dr DING, Rui (Institute of Plasma Physics, Chinese Academy of Sciences); Mr FENG, Wei (Institute of Plasma Physics, Chinese Academy of Sciences); Prof. GONG, Xianzu (Insititute of Plasma Physics, Chinese Academy Sciences); Dr YU, Yaowei (Institute of Plasma Physics, Chinese Academy of Sciences); Dr SUN, Youwen (Institute of Plasma Physics, Chinese Academy of Scienses); Prof. LIANG, Yunfeng (Forschungszentrum Jülich GmbH, Germany); Dr LUO, Zhengping (Institute of Plasma Physics, Chinese Academy of Sciences); Dr ZOU, xiaolan (CEA)

**Presenter:** Dr WANG, Liang (Institute of Plasma Physics, Chinese Academy of Sciences (ASIPP))

**Session Classification:** P2 Posters