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Key Issues Towards Long Pulse High beta-N Operation on EAST Tokamak

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The ITER baseline scenario of the standard H-mode operation ($\beta\text{-N} = 1.8$) will be mainly sustained by inductive plasma current drive with the limited pulse duration. Two advanced scenarios of the hybrid scenario ($\beta\text{-N} = 2 \sim 2.5$) and steady-state scenario ($\beta\text{-N} > 2.6$) are being developed towards long pulse operation in present tokamak devices. A pulse duration of 32 s (about $20\tau_{\text{R}}$, where τ_{R} is current diffusion time) H-mode plasma with small ELMs and lower normalized beta ($\beta\text{-N} < 1$) was achieved on EAST superconducting tokamak in 2012. Long pulse H mode with higher normalized beta ($\beta\text{-N} = 1.8 \sim 2$) plasma scenario has also been suggested on EAST tokamak recently. In 2015 campaign, long pulse high power heating discharges with the NBI system (PNBI < 4 MW) and the 4.6 GHz LHW system (PLHW < 3 MW) were carried out on EAST tokamak. Higher normalized beta ($\beta\text{-N} = 1.5 \sim 2$) plasmas were achieved on EAST experiments. Key issues towards long pulse high beta-N operation on EAST tokamak are discussed and summarized in this paper. This work was supported by National Magnetic Confinement Fusion Program of China (No. 2014GB106000 and 2014GB106003) and the National Natural Science Foundation of China (No. 11275234, 11321092).

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