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Long pulse and steady state operation activities at KSTAR YOUNG-SOON BAE, National Fusion Research Institute, KSTAR TEAM, KAERI COLLABORATION, JAEA COLLABORATION, PPPL COLLABORATION, SNU COLLABORATION — The mission of Korea Superconducting Tokamak Advanced Research (KSTAR) is to develop a steady state capable advanced tokamak (AT) operation. The original AT operation mode at KSTAR is a reversed shear scenario with the plasma current of 2 MA, the toroidal magnetic field of 3.5 T, β_N of 5, safety factor q_{95} of 3.7. Recently, the stationary long pulse H-mode discharge is sustained for maximum pulse duration of 20 s using heating of 2.5-MW NBI and 0.7-MW, X3 170 GHz ECH with low density level $<n_e> \sim 0.3 \times 10^{20}/m^3$. The main activities of long pulse and steady state operation in KSTAR are the density feedback control, optimization of plasma shape and vertical control, real-time β control, and steady state capable heating upgrade. For the longer pulse H-mode discharge at the increased plasma current upcoming KSTAR campaign, there have been improvements in plasma control system and upgraded heating systems. Meanwhile, steady state operation scenario in KSTAR next 4-year is being investigated using time-dependent integrated transport simulation code with possible heating upgrade-schemes. The promising steady state scenario near future is a reversed shear using a new 4 MW off-axis neutral beam injector for broad pressure profile peaked at off-axis, and using ECH for local current profile control aiming at $\beta_N > 3$ with Ip $\sim$ 1 MA. This paper present activities and plan for steady state operation in KSTAR as well as the long pulse H-mode discharge results in the recent KSTAR campaign.

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