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Advanced operation scenarios toward high-beta, steady-state plasmas in KSTAR SI-WOO YOON, Y. M. JEON, M. H. WOO, Y. S. BAE, H. S. KIM, Y. K. OH, National Fusion Research Institute, J. M. PARK, General Atomics, Y. S. PARK, Princeton Plasma Physics Laboratory, KSTAR TEAM — For the realization of the fusion reactor, solving issues for high-beta steady-state operation is one of the essential topics for the present superconducting tokamaks and in this regard, KSTAR has been focusing on maximizing performance and increasing pulse length simultaneously. Typically, study on high beta operation has been focusing on advanced scenario limited at relatively short pulse discharge and partial success has been reported previously. However, it must be stressed that it is critical to verify compatibility of the developed scenario to long-pulse operation and compared with that of the short-pulse, it is turned out stable long-pulse operation is possible only with a reduced level of beta. In this work, the results of recent approaches in long-pulse operation are presented focusing respectively on high betaN, high betap and high li scenarios. For high betaN, the achieved level is close to 3 with Ip=0.4 MA, BT=1.4T and Pext ˜6MW and it is found to be limited by m/n=2/1 tearing mode and is also sensitive on the internal inductance. For high betap, conditions of the maximum betap is investigated mainly by parametric scans of plasma current (Ip=0.4-0.7 MA) and also neutral beam injection power (3-5MW). The achieved betap is also close to 3 with Ip=0.4 MA, BT=2.9T and Pext ˜6MW and it is found to be limited by heating power and without indication of MHD activities. Finally, attempt for high li discharge will be addressed on scenario development and transient results.

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