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Overview of KSTAR Results in 2013 Campaign

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Since the initial long-pulse H-mode operation in 2012, the H-mode has been sustained longer and the operational regime of plasma parameters has been significantly extended in KSTAR tokamak. The progress in long-pulse operation is mainly due both to the increased NBI heating power of PNBI ~ 3.5 MW and the advance in the shaping control which is not trivial with slow superconducting coils. In 2013 campaign, the duration of H-mode phase has been extended up to 25 sec with 0.5 MA of plasma current and 3 MW of PNBI and, in the coming campaign as main operational goal, it is expected to be extended up to more than 30 sec using 5 MW of PNBI. In addition, in 2014 campaign, the long-pulse operation will be in accordance with ITER requirement, i.e., in ITER similar shape, low safety factor and normalized beta (~2.0).

ELM suppression is discovered in wide range of coil configuration and the suppression window in the safety factor q_{95} has extended from 6.5 to 3.9 depending on the configuration, i.e., q_{95} ~6.5 for $n=1$, q_{95} ~5.0 for the mixed $n=1$ & $n=2$, and q_{95} ~4.0 for $n=2$ indicating the strong impact of resonant component on ELM suppression. Significant progress has been on the investigation of the underlying mechanism on RMP suppression using measurements of pedestal fluctuations and modeling of plasma response especially for $n=1$ case where field penetration is global and full response modeling is required including the shielding effect of toroidal rotation.

Since the initial 2 segment measurements in 2012, detailed evaluation of error field (EF) has been performed by 4 segment compass scan by measuring maximum current in middle internal coils for each quadrant. In agreement with the previous measurements, the measured level of intrinsic error field is at order of 10^{-5} at the magnetic axis, which is an order of magnitude lower than other tokamaks. Strong focus is on the extended identification of detailed pattern of $n=1$ error field utilizing the full poloidal sets of internal coils and its impact on the operational boundary is investigated especially for q_{95} range below three where effect of error field is critical due to the locked mode and MHD activities.

Including above topics, the presentation will address the recent results on rotation & transport physics, newly installed diagnostics, MHD activities and the future plan.

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