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Long-lived pressure-driven MHD mode in KSTAR plasmas

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Highly coherent structures associated with an extremely long-lived saturated magnetohydrodynamic (MHD) instability have been observed in KSTAR tokamak under a long-pulse and steady-state operation. As the plasma performance is increased in advanced tokamak regimes, possible deleterious effects of MHD modes become more important, especially for steady-state burning plasmas in the next-step devices such as ITER and DEMO. One of the commonly seen modes is the m = 2, n = 1 resistive kink mode that either leads to confinement degradation, or mode locking followed by a full disruption. In KSTAR, however, long-pulse discharges regularly exhibit a coherent structure in the form of a saturated pressure-driven MHD mode that can be sustained as long as 40 seconds, the full discharge duration, when the mode is located near the plasma core region with a broad safety factor profile with q0 larger than 2.

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