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Helical Modes Induced by Localized Current Perturbations in Sawtoothing KSTAR Plasmas

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A variety of helical structures such as dual or multiple flux tubes, distinct from the normal m=1 internal kink, are commonly observed in sawtoothing plasmas in the KSTAR tokamak assisted by electron cyclotron heating (ECH). Detailed 2D and quasi-3D images have shown that the dual flux tubes have m/n=1/1 helicity, co-rotate around the magnetic axis, and later merge into a single m=1 mode prior to the crash. Similar evolution is observed for the cases of triple or more flux tubes, where the mode helicity is ambiguous. A strong correlation has been found between the ECH position and the mode structure. A reduced MHD simulation code with a heuristic current source model has been developed to understand this correlation.

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