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Observation and simulation of TAEs in KSTAR plasmas

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Toroidicity induced Alfvén eigenmodes (TAE) [1-3] can be driven unstable by fast particles from neutral beam heating or fusion reactions and have been observed in different tokamaks [4-5]. We report the observation of TAEs in KSTAR plasmas during the 2013-2015 campaigns by the fast particles produced by the neutral beam injection and global gyrokinetic simulations of them by using the GTC and GENE codes. Mode analysis indicates that the TAEs in KSTAR have low n numbers, mainly $n=1$, differently from the cases of other tokamaks which showed rather high n toroidal mode numbers. This seems to indicate that the finite Larmor radius (FLR) stabilizing effects are playing in KSTAR. To understand the TAE mode characteristics and finite orbit Larmor radius stabilization effects, we carried out linear simulations by using the GTC and GENE codes, which give results in agreement. The mode frequency, growth rate, poloidal and radial mode structures analyzed by using these two codes are presented.

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