ECE Imaging for KSTAR

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Fluctuating plasma quantities are important subjects of tokamak diagnostics in the context of plasma instabilities, transport, MHDs, and waves. Electron cyclotron emission (ECE) radiometry has been widely used to measure 1D radial temperature profiles and fluctuations, providing useful but limited information on complex phenomena such as sawtooth crash, which involves magnetic reconnection and heat transport in 3D geometry. Recently, visualization of temperature fluctuations in 2D poloidal cross-section via ECE imaging (ECEI) in the TEXTOR revealed the physics of sawtooth crash in unprecedented detail, including the first observation of high-field-side crash [1]. This paper introduces the ECEI system being developed for the KSTAR. The KSTAR ECEI system is aimed at visualizing both high- and low-field sides of q~1 flux surface simultaneously to capture the full picture of sawtooth crash dynamics. Spatial coverage and resolution required for the visualization are achieved by combining two large arrays of heterodyne detectors and imaging optics with flexible zoom and focus controls. Benefits of simultaneous measurement of high- and low-field sides for resolving the sawtooth dynamics in 3D geometry are discussed.
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[1] H. K. Park, et al., PRL **96**, 195003 (2006).