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Initial operation of the tangential x-ray pinhole camera diagnostic system for KSTAR plasma

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A fast, two-dimensional (2-D) tangential soft x-ray pinhole camera (TXPC), which is a soft x-ray imaging diagnostic system with a wide angle toroidal view, has been developed for KSTAR plasmas. It consists of 50x50 channel multi-wire proportional counter (MWPC) filled with a gas mixture of 78% Kr, 20% C2H6, and 2% CF4 at atmospheric pressure and a selection of beryllium filters for discriminating low-energy photons. It can measure 2-D x-ray emissivity with a high and controllable intrinsic gain (> 10^4), high spatial (< 2 cm) and high temporal (> 10 kHz) resolution with a 100 MHz DAQ system. They can assist analysis of plasma profile, MHD modes, effects of auxiliary heating and transport phenomena from core to edge. Also, the TXPC employs a duplex multi-wire proportional x-ray (DMPX) detector that combines two MWPCs in series. It will provide simultaneous measurements of plasma x-ray emission in two spectral ranges using the first MWPC as an absorber filter for the second one. The signals of the first and the second MWPC allow providing the fast 2-D measurement of electron temperature by the two-absorber method. The TXPC system has been installed on KSTAR in 2011, and the initial plasma data and an assessment of the system performance are presented.

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