VUV spectroscopy in impurity injection experiment at KSTAR

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To optimize the design of ITER VUV core survey spectrometer, a two-channel prototype survey spectrometer was developed adopting channel #3 (14.4 nm – 31.8 nm) and channel #4 (29.0 nm – 60.0 nm) among the five channels (2.4 nm – 160 nm). For the application of the prototype ITER VUV spectrometer, the prototype spectrometer has been operated from KSTAR 2012 campaign. Various impurity species have been measured using this VUV spectrometer. Intrinsic impurities such as carbon, oxygen, helium, and iron have been measured, and the typical photon number of impurity emission at KSTAR is about 10^{14} - 10^{15} photons/cm^2.s. Using argon injected by piezo valve as a tracer gas, impurity transport study has also been performed to verify the effect of on-axis ECH injection on the impurity distribution profile. The on-axis ECH injection on the plasma reduced the argon density in the plasma core, and the argon distribution profile was changed to a hollow profile by on-axis ECH injection in 400 kA L-mode plasmas. To estimate Z (atomic number) dependence of impurity transport, furthermore, gas lines for neon, krypton, and tungsten dust injector system were installed at KSTAR in 2015. From the krypton injection experiments, Kr XXV line of 15.8 nm and Kr XXVI line of 17.9 nm could be measured from the VUV spectrometer. From tungsten dust injection experiment, multiple overlapped spectral lines around 15 – 22 nm could be measured successfully.