Iron ions are one of major impurities in various plasmas. Especially in astrophysical plasmas, Fe is important index of heavy element abundance. It is needed to determine ion density, electron density and other properties precisely from spectral lines for astrophysical plasmas such as the sun, so we need good model to estimate the electron density and other parameters. We have developed a set of collisional-radiative models (CR models) for Fe ions in order to analyze spectral lines from plasmas such as solar transition regions.

Here we are interested in Fe XXI spectral lines measured in extreme ultra violet spectra of LHD plasmas, in which many Fe ions are observed. We focus on the two lines, \( \lambda 12.12 \text{ nm} \) \((2s^2 2p^3 P_2 - 2s2p^3 D_1)\) and \( \lambda 12.875 \text{ nm} \) \((2s^2 2p^3 P_0 - 2s2p^3 D_1)\), since the intensity ratio of these lines show electron density dependence and can be used for density diagnostics. Figure 1 shows the calculated intensity ratio as a function of electron density by using the CR model\(^1\). Dependence on electron temperature and different atomic data set is small for electron density region of LHD plasmas.

Figure 2 shows the temporal distribution of the line intensities and intensity ratio for the shot \#64921 in which Fe pellet was injected at \( t=1.8 \) sec, and Fig.3(a) shows estimated electron density by using the result of the CR model. Comparing with the measured electron density distribution by the FIR interferometer, we can estimate the location of emitting region of Fe XXI as shown in Fig. 3(b).

We found that the Fe XXI emitting region moved toward a low density peripheral region after staying at \( \rho \sim 0.75 \) for about 0.08 sec. The electron temperature of these emitting region is lower than one expected for ionization equilibrium, and we could expect Fe ions are not in ionization equilibrium.

\[^1\] Murakami, I. et al.: accepted for PFR (2010)