

## §54. Measurement of the Relative Line Intensity for OV Multiplet Lines

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The line intensity ratios between multiplet lines are interested. It had been thought that the relative ratio is predicted from the statistical weights of the  $J$  states in the initial level. The multiplet transition  $2s3s\ ^3S_1 - 2s3p\ ^3P_{2,1,0}$  of Be-like oxygen ion is one of them, those spectra are frequently used in this investigation since they are strong and in the UV-Visible range. If a statistical weight is valid to the population of the initial states, the relative line intensity ratios are predicted as follows:  $I(J=1)/I(J=2)$ ,  $I(J=0)/I(J=2)$  and  $I(J=0)/I(J=1)$  are 0.60, 0.20 and 0.33, respectively. However, the experimental results deviate from the prediction.

The O V lines have been measured also in LHD and have been investigated the property for the conditions of discharge. Shown in Fig. 1 is the time evolution of line intensity for the above transition. The line intensities are measured from the ECH+NBI plasma for 2.2 sec, and are observed for 4 frames with exposure time of 0.6 sec/frame. The intensity is used the integral value of the line profile which is taken from the gaussian fitting using the least squares method. Notice that the three lines independently change. Especially, it is seen in the third frame as following: although  $I(J=2)$  and  $I(J=1)$  become decreasing,  $I(J=0)$  keeps increasing. Therefore, it is shown that the states are independently populated for time. It is expected that the relative intensity ratios don't depend on the statistical weight for the initial state.

Shown in Fig. 2 is the time evolution of the relative intensity ratios. Horizontal dot-lines in the diagram show the ratio predicted by the statistical weights. The observed results deviate from the horizontal lines as follows: the ratios in the first frame are below it, but in the last frame the ratios transit to above it. It is shown that the relative line intensities don't depend on the statistical weights. It is thought that a populating process or a depopulating process makes the deviation from the ratio predicted by the statistical weights.

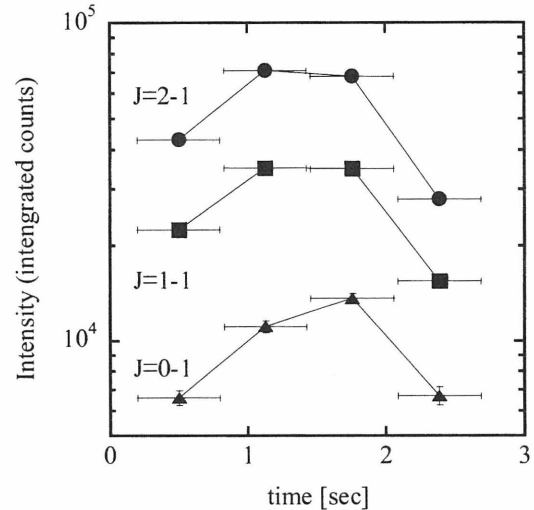


Fig. 1 Time evolution of the line intensity.

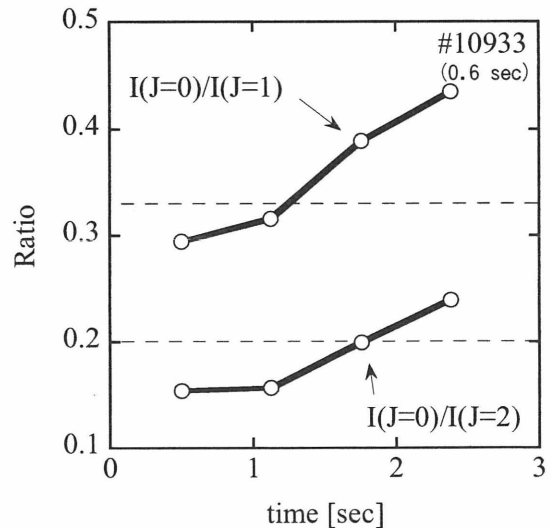


Fig. 2 Time evolution of the relative intensity ratio.