

§14. MSE Spectroscopy in CHS Heliotron/Torsatron

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The H_{α} emission from the hydrogen neutral beam injected into a plasma has 15 components (8 π lines and 7 σ lines) due to the Motional Stark Effect (MSE). The wavelength splitting between π lines and σ lines is proportional to the magnitude of Lorentz Electric Field, $v \times B$ (v :beam velocity, B :magnetic field).

Figure 1 shows the schematic arrangement of the polarization sensitive spectrometer in the CHS plasma for measuring the H_{α} spectra with the motional Stark splitting. Ferroelectric Liquid Crystal (FLC) cell is arranged in front of the object lens of the optical fiber arrays. FLC cell functions as two state electrically switchable (by applying +5V, -5V) half-wave plate. The optical axis of the FLC layer is oriented at 0(-5V) or 45(5V) degree with respect to the transmission axis of the polarizer located in between the FLC and the optical fiber array. When +5V is applied, the orientation of the polarization axis of the transmitted light is rotated by 90 degrees. By applying +5V or -5V to FLC, the MSE spectra with 0 degree polarization angle (the polarization axis is parallel to the mid-plane of CHS) and the MSE spectra with 90 degrees polarization angle (the polarization axis is perpendicular to the mid-plane) can be measured. The MSE spectra with 0 degree polarization angle in Figure 2(a) express σ component, while the MSE spectra with 90 degree polarization angle in Figure 2(b) show π component. The acceleration voltage, V_b , is 45.9kV and the beam current, I_b , is 3.5A.

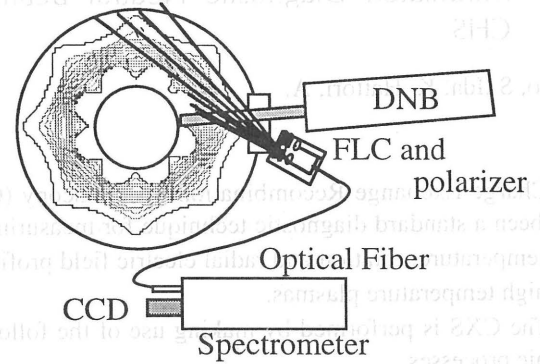


Fig.1 Schematic arrangement of experimental system.

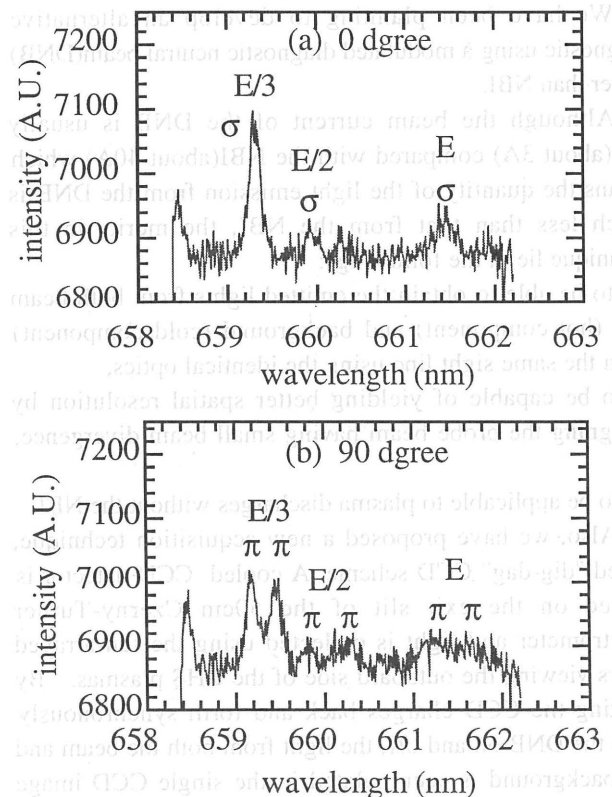


Fig.2 The 0 degree and 90 degree MSE spectra in the center of CHS plasma

References

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