Plasma Spectroscopy Group Research Plan

Many spectrometers are installed in the LHD, and they can measure spectra from the visible to the X-ray region. Some of the spectrometers can also measure the spatial distribution. The following is an overview of the main research topics of the Plasma Spectroscopy Group.

- **Collisional-radiative properties of heavy ions**

  In the LHD, various heavy ions such as tungsten can be introduced into the plasma by the method of impurity pellet injection, which enables us to measure the emission spectrum of those ions over a wide wavelength range. The atomic data related research based on the spectroscopic measurement of such heavy ions will continue to be a central issue for the Plasma Spectroscopy Group.

- **Neutral particle transport in divertor and in plasma boundary regions**

  Molecular hydrogen and hydrogen atoms originating from hydrogen gas supplied to the plasma as fuel are considered to play an important role in the plasma confinement characteristics. Understanding the transport properties of those neutral particles is an important issue to be promoted by the Plasma Spectroscopy Group.

- **Non-Maxwell and anisotropic velocity distribution function of particles**

  Deviations of the velocity distribution function of particles from thermal equilibrium are important from the following points of view.

  1. Direct effect on the confinement properties of particles
  2. Impact on collisional radiation model calculations through rate coefficients for electron impact ionization and excitation
  3. Understanding the non-uniformity or asymmetry of heat exchange between particles and waves

  The Plasma Spectroscopy Group will also be actively involved in research related to the non-thermal or anisotropic velocity distribution functions of such particles.

  The existence of non-thermal and anisotropic particles is not a problem unique to fusion plasmas but has been recognized in various plasma studies. The Plasma Spectroscopy Group considers the promotion of collaborative research based on such common subjects with other fields to be an important theme.