

# **$Z_{eff}$ Profile Analysis from Visible Bremsstrahlung Measurement under Different Density Profiles in LHD**

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Effective ion charge,  $Z_{eff}$ , is one of basic plasma parameters for estimating impurity content in high-temperature plasmas and its profile measurement is important for studying impurity transport in central column of the plasma. The value of the  $Z_{eff}$  has been measured from visible bremsstrahlung continuum. In Large Helical Device (LHD), a visible spectrometer system is newly installed for  $Z_{eff}$  profile measurement instead of an old system using interference filter. The new system has the advantage of clear elimination of line emissions from the detected signal. The visible spectrometer system consists of a 30cm visible spectrometer, a charge-coupled device (CCD) and 44 optical fibers array. The chord-integrated visible bremsstrahlung intensity profile is measured with vertically arranged optical fibers array ( $-0.6\text{m} \leq Z \leq 0.6\text{m}$ ). The signals from the lower part of the fiber array ( $-0.6\text{m} \leq Z \leq 0\text{m}$ ) show the bremsstrahlung profile free from edge strong bremsstrahlung emission, especially from inboard ergodic layer, whereas the bremsstrahlung profile is strongly influenced by nonuniform edge bremsstrahlung emission. The  $Z_{eff}$  profiles analyzed from the visible bremsstrahlung emissivity profiles, which is obtained using Abel inversion technique, with electron density and temperature profiles are studied in NBI discharges with peaked, flat and hollow electron density profiles. In NBI discharges with peaked electron density profile after  $\text{H}_2$  pellet injection, the  $Z_{eff}$  profile becomes flat with a value of 1.1, which indicates no impurity accumulation. Data are being analyzed also for cases of the flat and hollow electron density profiles. The result is also presented for discharges with impurity pellet injection.