

§26. Viewing Chord Dependence of Effective High Energy Proton Temperature T_{eff} during ICRF Heating on LHD

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We report Stix parameter [1] dependence of effective temperature T_{eff} of ICRF-driven high energy proton tail as regards two types of ICRF resonance layer configuration in case of toroidal magnetic field B_t 2.5T and 2.75T, respectively, of $R_{\text{ax}} = 3.6\text{m}$. The high energy proton spectra by taking into account of charge exchange cross sections are obtained from the fast neutral spectra measured with Natural Diamond Detectors (NDDs) [2]. The discharge scenario is self-sustained by ICRF with hydrogen minority and helium majority. The NDDs are installed with perpendicular viewing channel at major radius $R = 3.68\text{m}$ (center chord) and 3.92m (outer chord) as shown in Fig. 1.

Fig. 2. shows effective ion temperature of ICRF-driven minority proton T_{eff} versus Stix parameter [3] defined as ICRF energy given per a minority proton. The electron density is $(0.4\sim 0.8) \times 10^{19} \text{m}^{-3}$. The minority concentration is 10 ~ 20% because the ICRF heating efficiency has maximum value at the concentration 0 ~ 20% [4]. As to viewing chord dependence, in case of both $B_t = 2.5\text{T}$ and 2.75T , the T_{eff} on center chord was higher than that on outer chord. T_{eff} of high energy proton are increasing with Stix parameter. The two linear dash lines on Fig.2. show the proportional region of T_{eff} on center chord. In case of both $B_t = 2.5\text{T}$ and 2.75T T_{eff} on center chord were put in the same proportional region. However saturation states of T_{eff} on center chord are different in both ICRF resonance layer configuration. The mechanism why T_{eff} of high energy proton are saturated on Stix parameter dependence is mainly under investigation.

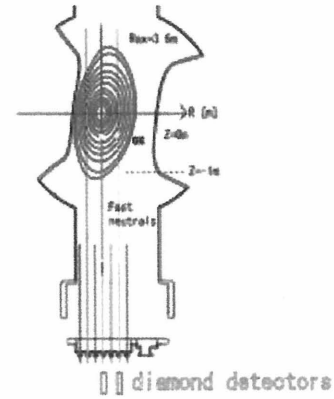


Fig.1. Line of sights of NDDs on a perpendicular diagnostics port on LHD.

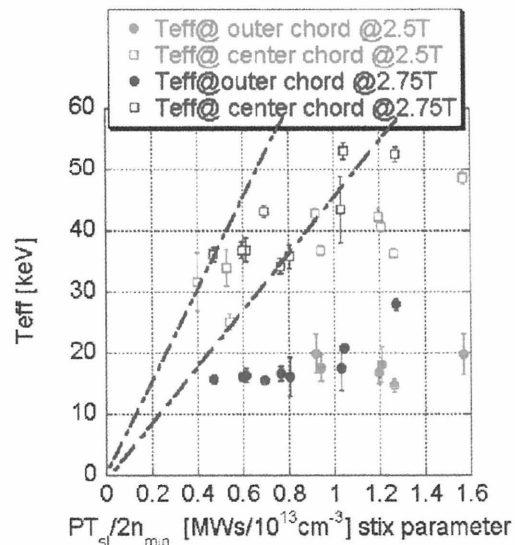


Fig.2. Stix parameter dependence of effective temperature of ICRF-driven high energy proton T_{eff} .

- 1) Stix.T.H, Nucl.Fus. **15**, (1975) 737
- 2) Isobe. M, Rev. Sci. Instrum. **72**, (2000) 611
- 3) A.V.Krasilnikov, Nucl.Fus. **42**, (2002) 759
- 4) Saito.K, PhD thesis , Nagoya Univ