Electron Temperature Measurement And observation Of Sawtooth Behavior In IR-T1 Tokamak By E.C.E Diagnostic

*E.C.E Diagnostic*

**R.Shariatzadeh **M.Ghoranneviss,**P. Khorshid, **R. Arvin**

Different diagnostics are used in IR-T1 to study the plasma behavior:
- Soft X-Ray
- Mirnov coils
- Rogowsky coils
- Langmuir Probe
- E.C.E
- ...

Due to the electron gyration around magnetic field lines, electromagnetic radiation is emitted. This radiation occurs at discrete angular frequencies \(\omega = n\omega_c\), where \(\omega_c = eB_0/\sqrt{2m}\).

\[
\theta = 0 \quad r = \left(\frac{56B_0}{f} - 1\right)
\]

\(B_0\) is in Tesla and \(f\) is in GHz.

The operational parameters of IR-T1 tokamak were:
- \(B_0 = 0.7\) T
- \(P = 3.0 \times 10^{-5}\) Torr
- \(I_p = \text{20-40KA}\)
- Loop voltage (peak) = \(\text{2-20 V}\)
- \(R_0 = 0.4 - 2 \times 10^{12}\) cm\(^{-3}\)

Channel 2: \(r = \text{2.6cm with } f = \text{38.65GHz}\)

Channel 3: \(r = \text{3.25cm with } f = \text{38.12GHz}\)

Channel 4: \(r = \text{3.7cm with } f = \text{36.25GHz}\)

IP and toroidal magnetic field for a typical IR-T1 discharge

ECE signal for 3 channels

Te versus channel 2

radial profile of Te

we don’t have a maximum value of temperature at the center of the torus, because of the high rate of recombination in the center.

* sawtooth behavior that initially occurs at the channels closer to the center.

When we use RHF, we see that radiation intensity increases, and so does the temperature. sawtooth behavior is related to the energy confinement and profiles of plasma parameters, so we can use RHF to improve internal stability property of tokamak plasma.