Overview of Resonant Helical Magnetic Field Experiments on the IR–T1 Tokamak

P. Khorshid[1], M. Ghoranneviss[1], A. Lahazi[1], H. Bolourian[1], R. Arvin[2], S. Mohammadi[2], and A. Nikmohammadi[2]

[1] *Islamic Azad University, Mashhad Branch, Mashhad, Iran*
[2] *Plasma Physics Research Center, Islamic Azad University, Tehran, Iran*
Corresponding Author: pkhorshid@gmail.com

The Experimental studies during externally applied resonant helical magnetic field (RHF) perturbation in IR-T1 tokamak have been investigated. The experiments have been done in various directions of plasma current and toroidal magnetic field to finding the role of I_p and B_t direction in RHF application. The Morlet wavelet spectra, Fourier coefficient decomposition (FCD) and Singular value decomposition (SVD) analysis have been used to perform time-frequency and spatial-wave number harmonics analyses on the measured MHD fluctuations. The profiles of electron temperature, floating potential, radial electric field, poloidal and toroidal rotation velocity have been measured in the edge of plasma by using of a movable Langmuir probes, Rake probe and Mach probe. In RHF application during $L = 2/n = 1$ and $q_a = 3.7$, the $m = 2$ MHD mode oscillations amplified and $m = 3$ mode suppressed. Also by applying $L = 3/n = 1$ the $m = 2$ MHD mode oscillations has been disappeared. The toroidal velocity changes after a short delay time of about $t_d = 1 - 1.5$ ms during RHF application while poloidal velocity changes just after RHF. Results of visible line emissions of O(II), C(III) impurities and H_α radiation with and without RHF $L = 2$ show that the addition of a relatively small amount of resonant magnetic helical field could be effective for improving the quality of the discharge by reducing of light impurities radiation and possible suppressing major disruptions. The resonant field induced a phase with reduced H_α radiation level.