Empirical study of Alfven eigenmodes and fast ions on the Large Helical Device

W.H.J. Hayashi, W.W. Heidbrink (UC-Irvine); M. Osakabe, K. Ogawa, H. Yamaguchi, R. Seki, H. Nuga, M. Isobe, Y. Kawamoto (NIFS); Y. Fujiwara, S. Kamio (TAE)

Instabilities measured in the Large Helical Device (LHD) are studied for the presence of Alfven eigenmodes and their effects on the fast-ion distribution. LHD is equipped with an array of magnetic probes that measure fluctuations in the toroidal component of the B-field up to 500 kHz. Magnetohydrodynamic instabilities have been measured at various frequencies ranging from 50 kHz up to 350 kHz. The low frequency modes appear close to the frequency of toroidal Alfven eigenmodes (TAE) with mode numbers m=2, n=1. Instability interactions with fast ions are measured using various fast-ion diagnostics: fast-ion charge exchange spectroscopy (FICXS), fast-ion loss detector (FILD), and vertical neutron camera (VNC) for Deuterium cases. Measured fast-ion signals are compared to synthetic signals simulated by FIDASIM using quiescent fast-ion distributions from GNET and TASKFP. The difference between measured and simulated signals are classified according to the observed mode.

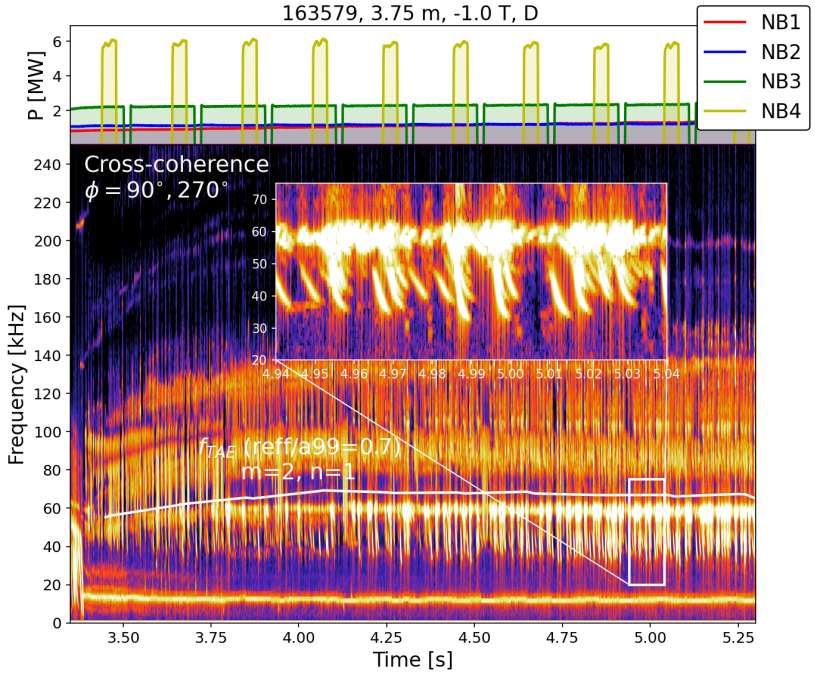

Figure 1. Beam pattern and magnetic cross-power coherence between two toroidal locations. The white line corresponds to the frequency of an m=2, n=1 TAE. Downsweeping of the mode frequencies are shown in the inset view.