

## 3D structure of density fluctuations in T-10 tokamak and new approach for current profile estimation

**Goals**: confirmation of the different turbulence types and complete characterization

poloidal angles and the longitudinal propagation of different fluctuation types along

the magnetic field line by means of LRC at High and Low Field Side (HFS/LFS)

of their properties by means of the radial correlation measurements at several

Density fluctuations were investigated with reflectometry at 4 pololoidal angles and 5 channel Heavy Ion Beam Probe Long Range Correlation (LRC) measured at LFS (red line) and HFS (blue line)

Principles of LRC experiments Reflection radius variation by Simultaneous probing with several HFS "A" HIBP change of launched frequency antennas (stars) at fixed frequency LFS "A' LFS "D" HFS Poloidal angle [degree] Magnetic field lin 40 20 FS "B V. Reflectometr = Experiment a) BB (top) and 10 nplitude SLF 30 60 Toroidal angle [degree] 90 I F OC HIBP Fourier Results of LRC with several antennas at (bottom) 0.6 Results of LRC with radius variation at b) HFS for quasi-coherent fluctuations observe LFS for quasi-coherent fluctuations 6.4 guck 10 a) Quasi-Cohen 0.2 B<sub>T</sub> - counter clockwise, I<sub>n</sub>- clockwise [ˈns] α 6 α3 Coherent clockwise 1 - counter cloc 10 0.0 Delay 5 -300 -200 -100 Ó 100 200 300 Delay [µs]  $\alpha_{\text{field line}}$ \_ = 220 kA (QC) and Frequency [kHz] HIBP current spectrum PSD [a.u.] Stochastic 1.8 QC Low -10 Coherency 20 I\_ = 250 kA Frequency Delay [µs] 0 10 0.2 (SLF) [rad] turbulence b -10 85 80 75 70 65 60 55 Poloidal angle between antennas [degrees] 90 50 types 12 13 14 15 16 17 18 19 20 21 22 23 24 Minor radius [cm] 200 100 Frequency (kHz) 50 150

**Results**: Previous classification of fluctuation types was confirmed with HIBP; BB fluctuations have low correlation length and generated locally at each poloidal angle; QC and SLF fluctuations have longitudinal correlation length that is significantly higher than 2.5 m.; QC resulted from the excitation of the modes with high poloidal *m* number; LRC was successful. Thus such technique was proposed for future experiments to estimate current profiles, using TAE modes.