Microscopic Structure of Turbulence in the Torsatron TJ-K

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Equilibrium Plasma Parameters

Equilibrium quantities at the same time

Probe Diagnostics

Equilibrium quantities, calculation-based

Turbulent Wave Number Spectra

Total energy density (in radially resolved measurements)

Spectral Index

Spectra shifted according to $p_p$, spectral index $-3\Rightarrow$ Enstrophy cascade
No space left for inverse energy cascade

$\rho_p$-Scaling of Structure Sizes

Correlation length $L_{corr}$ calculated by Fourier transform, averaged over poloidal
Circumference increases with drift scale $\rho_p = \frac{\omega_{corr}}{f_{pe}}$

References and Acknowledgements


Requests for Reprints

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Turbulent Mean $E\times B$ Transport

$F(G) = \frac{\tilde{n} \times \tilde{E} \times \tilde{B}}{|E| |B|}$

Transport maximum at correlation length of fluctuations

Cross Phases = 0: Drift Waves in TJ-K

$\rho_{\phi} \approx \frac{\omega_{corr}}{f_{pe}}$

Spectral Scaling of Structure Sizes

$\rho_{\phi} \approx \frac{\omega_{corr}}{f_{pe}}$

Tilted view from above

2D Microscopic Stage for Probes

Helium, $\rho_p = 10$ mm

Large open-solenoid or small (2D) resonator, cross phase measurement of turbulence power

MHD-Drift turbulence

Helium, $\rho_p = 10$ mm

Dilute turbulence, cross phase zero, mode not in spectrum

Transport maximum at correlation length of fluctuations

Highpass filtered data: smaller structures

Argon, $\rho_p = 31$ mm

Dilute turbulence, cross phase zero, mode not in spectrum

Transport maximum at correlation length of fluctuations

Highpass filtered data: smaller structures

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