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Electron-scale turbulence in fusion plasmas: direct measurements and simulation validation SALOMON JANHUNEN, GABRIELE MERLO, University of Texas at Austin, ALEXEY GURCHENKO, EVGENYI GUSAKOV, Ioffe Institute, FRANK JENKO, Max-Planck Institute, TIMO KIVINIEMI, Aalto University — A lot of indirect evidence suggests that electron temperature gradient (ETG) turbulence is a key player in magnetized fusion plasmas. ETG turbulence is considered to contribute to the overall electron heat flux and to affect ion-scale turbulence by reducing the effectiveness of shear-flow stabilization. The FT-2 tokamak provides unique opportunities for making direct measurements of electron-scale density fluctuations via enhanced microwave scattering. Here, we present experimental data of this type, together with direct comparisons with high-realism gyrokinetic simulations using the GENE code. Simulated fluctuation wavenumber spectra at electron scales, subjected to synthetic diagnostics, are found to be in good agreement with the observations. Interestingly, the ETG turbulence in the simulations exhibits a spontaneous symmetry breaking as a result of the presence of a low-Z impurity species at significant density, and the experimental data supports the existence of this effect. We also address the effect of significant dilution on linear mode structure.

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