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Extracting physical quantities from BES data[1] MICHAEL FOX, University of Oxford , ANTHONY FIELD, CCFE, ALEXANDER SCHEKOCHIHIN, FERDINAND VAN WYK, University of Oxford, MAST TEAM — We propose a method to extract the underlying physical properties of turbulence from measurements, thereby facilitating quantitative comparisons between theory and experiment. Beam Emission Spectroscopy (BES) diagnostics record fluctuating intensity time series, which are related to the density field in the plasma through Point-Spread Functions (PSFs). Assuming a suitable form for the correlation function of the underlying turbulence, analytical expressions are derived that relate the correlation parameters of the intensity field: the radial and poloidal correlation lengths and wavenumbers, the correlation time and the fluctuation amplitude, to the equivalent correlation properties of the density field. In many cases, the modification caused by the PSFs is substantial enough to change conclusions about physics. Our method is tested by applying PSFs to the "real" density field, generated by non-linear gyrokinetic simulations of MAST, to create synthetic turbulence data, from which the method successfully recovers the correlation function of the "real" density field. This method is applied to BES data from MAST to determine the scaling of the 2D structure of the ion-scale turbulence with equilibrium parameters, including the ExB flow shear.

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