Synthetic reflectometry probing of gyrofuid edge turbulence

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An important tool for the progress of reflectometry is numerical simulation. It enables to assess the measuring capabilities of existing systems and to predict the performance of future ones in machines such as ITER and DEMO. To exploit this concept, one should use sophisticated models for the plasma turbulence. A coupling between a 2D full-wave finite-differences time-domain code (REFMUL) [1] and 3D gyrofluid turbulence code has been made in order to implement a complete synthetic diagnostic capable of coping with the complex signature of turbulence. The turbulence code used is a six moments gyrofluid electromagnetic model with global geometry (GEMR) [2, 3]. This two-dimensional synthetic reflectometer is applied to three-dimensional numerical simulations of edge plasma turbulence. Two cutoff densities are considered, corresponding to the regions inside and outside the last close flux surface, respectively. The electron density fluctuations' frequency spectra, accessible directly from the numerical turbulence data, are compared to the reflecting layer displacements' spectra measured by reflectometry in fixed frequency regime. This approach to a synthetic diagnostic contributes to a better understanding of the complexity associated with reflectometry measurements.

[1] F. da Silva, S. Heuraux, S. Hacquin, M. E. Manso, *J. Comput. Phys* **203** 467-492 (2005).
[2] B. D. Scott, *Phys. Plasmas* **12**, 102307 (2005).
[3] S. J. Zweben, B. D. Scott, J. L. Terry, B. LaBombard, J. W. Hughes, and D. P. Stotler, *Phys. Plasmas* **16**, 082505 (2009).