## **Spectral Element Dispersion for Coarse Meshes**

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It is well known that Nek5000/RS's spectral element method (SEM) delivers spectacular convergence in the limit that the solution is well-resolved. Less understood, however, is the behavior of the SEM for marginally-resolved solutions that are frequently encountered in practice, particularly in the case of large-eddy simulations, where the turbulence is inherently under-resolved. We present an extensive study of 1D dispersion error for the SEM at varying wavenumbers and varying degrees of h- and p-refinement, with the principal parameter being the number of points per wavelength (PPW). The results illustrate some surprising behaviors, particularly at low PPW. We put these results into context with other studies and other discretizations, including high-order DG, and we suggest simple error mitigation strategies that can lead to improved performance for SEM advection in higher space dimensions.

## Relevance for Nek [100 words max]

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