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Simulating the IISM to improve PTAs noise modelling

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The Ionised interstellar medium (IISM) is a major source of unmodelled noise in Pulsar Timing Array (PTA) data. Spatial effects like scattering and scintillation lead to short-term diffractive and long-term refractive noise. These overlaid with variations in electron density further complicate and bias PTA noise models - directly impacting sensitivity to low-frequency gravitational waves. Achieving a more precise characterization of the IISM is essential for a proper characterization of the gravitational wave background. In this talk, I will introduce a novel method for simulating the IISM and noise in pulsar timing data. This approach begins with simulating IISM screens and imprinting the computed group and scattering delays on pulsar timing data. These simulated data are used to test the efficacy of current noise algorithms and how they can be improved. I will present the results obtained and the future perspective of this technique.

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