

Workshop on Mathematical Physics and Pseudo-Differential Operators –  
Celebrating Jean Nourrigat's 80th birthday

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## The Helffer-Nourrigat Conjecture : Smoothness of solutions to linear PDEs

*Wednesday, November 5, 2025 3:05 PM (45 minutes)*

In 1979, Helffer and Nourrigat proved the Rockland conjecture, which proposes a sufficient and necessary condition for the hypo-ellipticity (smoothness of solutions) of a left-invariant differential operator on a graded nilpotent Lie group. The condition is stated in terms of the representation theory of the nilpotent group. Helffer and Nourrigat quickly realized that this conjecture can be vastly generalized to arbitrary polynomials in bracket-generating vector fields, extending Hörmander's famous sums-of-squares theorem. In this talk, I will present the Helffer-Nourrigat conjecture, as well as its solution using groupoid techniques. Joint work with I. Androulidakis and O. Mohsen.

**Presenter:** YUNKEN, Robert (Université de Metz)