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On Fer and Floquet-Magnus expansions: Application in solid-state nuclear magnetic resonance and physics

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We present two alternative expansion scheme called Floquet-Magnus expansion used to solve a time-dependent linear differential equation which is a central problem in quantum physics in general and solid-state nuclear magnetic resonance (NMR) in particular. The commonly used methods to treat theoretical problems in solid-state NMR are the average Hamiltonian theory and the Floquet theory, which have been successful for designing sophisticated pulse sequences and understanding of different experiments. The topic of the talk opens a way to an infinite number of suggestions. However, it is very important to remember that the Fer and Floquet-Magnus expansions method have recently found new major areas of applications such as topological materials. Researchers, dealing with those new applications, are not usually acquainted with the achievements of the magnetic resonance theory, where those methods were developed more than 30 years ago. They repeat the same mistakes that were made when the methods of spin dynamics and thermodynamics were developed in the past. This talk is very useful not only for the NMR and physics communities but for the new communities in several younger fields. It will be very useful for scientists working in different directions. In this talk, I will compare both approaches (Fer and Floquet-Magnus expansions) and present their use for the calculation of effective Hamiltonians and propagators, the performance of explicit calculation for the Bloch-Siegert shift, heteronuclear dipolar decoupling, cross-polarization, and rotary-resonance recoupling. This presentation contributes theoretically and numerically in the general field of spin dynamics and physics.

Biography

Eugene Stephane Mananga is a Faculty Member in the Physics Doctorate Program at the Graduate Center of the City University of New York, an Assistant Professor of Physics and Nuclear Medicine at BCC of CUNY, and an Adjunct Professor of Applied Physics at New York University. He completed his PH.D in Physics from the Graduate Center of the City University of New York, and holds 6 additional graduate degrees and training from various institutions including Harvard Medical School, Massachusetts General Hospital, and City College of New York. Eugene did his postdoctoral studies in the National High Magnetic Field Laboratory of USA, Harvard Medical School, and Massachusetts General Hospital. He was an "Ingenieur de Recherche" in the French Atomic Energy Commission and Alternative Energies (CEA-SACLAY-NEUROSPIN). Eugene has published more than 30 articles mainly as first author in major peer-review journals and has been serving as an editorial board member of several journals.

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