

**Wednesday, April 24 at 4pm in Room 2-105**  
**Prof. Ugur Abdulla, Okinawa Institute of  
Science and Technology**

**Bang-bang optimal control in coherent spin dynamics of  
radical pairs in quantum biology**



We analyze optimal control of the external electromagnetic field for the maximization of the quantum triplet born singlet yield of radical pairs in biochemical reactions. The model is a Schrödinger system with spin Hamiltonians given by the sum of Zeeman interaction and hyperfine coupling interaction terms. The Pontryagin Maximum Principle in Hilbert space is proved, establishing the bang-bang structure of the optimal controller. A new two-step algorithm for the calculation of the bang-bang optimal control is developed. Numerical simulations are pursued, demonstrating convergence and stability.

The results contribute towards understanding the structure-function relationship of the magnetoreceptor to manipulate and enhance quantum coherences at room temperature, and leveraging biofidelic function to inspire novel quantum devices.

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