

GRAL Research proposal for PhD projects

Institute and Group: IBS- Solid-state NMR and protein dynamics

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Title of the thesis project: Structural basis of membrane-protein insertion into the mitochondrial outer membrane by MIM

Keywords: mitochondria, NMR spectroscopy, dynamics

Summary of the project:

Mitochondria are involved in many cellular processes, from energy generation, ageing and cell death to key metabolic reactions. The vast majority of their proteins are synthesized outside these organelles, in the cytosol, and must be imported via sophisticated machineries composed of chaperones, receptors, membrane translocases and insertases. While many of the components and mechanisms along this import pathway have been characterized on a biochemical level, little is known about the structural basis of their actions at the atomic level. Gaining insight into the mechanisms of these machineries is severely complicated by the fact that they are often highly dynamic, as the imported proteins are thought to undergo large conformational changes along the way. The goal of this project is to provide a functional understanding of protein import at the atomic level, in particular the insertion of alpha-helical mitochondrial outer-membrane into the membrane by the mitochondrial import protein (MIM) machinery. We will use solid-state NMR to determine the high-resolution structure of this protein in a lipid bilayer, and probe the dynamics and interactions with preproteins that are inserted by MIM.