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21 February 2014 - 11 am

Room “Remy Lemaire” K233 (1st floor, building K - Institut Néel) [Access Map]

Aliance 2 “Spintronique”

STATIC AND DYNAMIC DIPOLAR COUPLING IN PERIODIC MAGNETIC

Summary : In modern magnetism research and application deals more and more with fundamental properties like the spin in spintronics, while the first thing that comes to everybody’s mind when talking about magnetism is probably the stray field. The stray field lead to the first applications like the compass and remains important in magnetic hard drives or magnonics. The magnetic moment scales with the volume such that fields are supposed to be rather weak when going “nano”. On the other hand nano devices become more and more compact, such that even small field interactions become important again (magnonics, spin ice, etc). Moreover, the different properties of competing interactions, such as exchange, anisotropy, and stray field, i.e. long range vs. short range, makes magnetism quite complicated. While it is rather simple to write down the fundamental equations of micromagnetism one needs complicated numerical calculation already to solve the most simple permalloy square.

It will be shown that even in such simple cases of static magnetization, the stray field can result in unexpected behavior and ground state properties. In periodic structures this becomes even more evident, as one has to consider the long range character of stray field interactions. This is true for structured samples as well as for natural periodic structures, as e.g. spin spirals caused by Dzialoshinskii-Moriya interaction, which will be discussed as well.

In case of dynamic magnetization the stray fields or field variations are due to small excitations of the ground state. The excitations are usually small and such are the according coupling effects; yet they have significant influence on magnetic resonances and spin wave modes and are, therefore, fundamental for magnonics. A second application, presented here, are microwave absorbing materials. It is shown how structuring and fine tuning the dipolar coupling results in tailored absorbing properties.