# **Bachelor thesis** available

## Surface-Plasmon Enhancement of Brillouin Light Spectroscopy

Spin waves are the elementary excitations of the spin system in magnetically ordered materials. Brillouin light scattering (BLS) spectroscopy is an established tool for the characterization of spin waves. BLS utilizes the inelastic scattering of light from spin waves and it is able to simultaneously map the spin-wave intensity, frequency and wave vector. BLS allows for the detection of thermally activated, incoherent spin waves in systems without external excitation down to monolayers of magnetic material and even counting single photons. Yet, the maximal spatial resolution of BLS microscopy is defined by the fundamental diffraction limit of light. This is why new approaches (such as near-field optics) are being explored to achieve a substantial increase of the BLS spatial resolution. Unfortunately, this benefit comes at the cost of a strongly decreased signal strength and, as a result, very time-consuming measurements. As an alternative approach, enhancement of electromagnetic fields through resonant coupling to surface plasmons (collective oscillations of the free electron gas density) has been employed to increase signals in a number of optical spectroscopies, including Raman, Rayleigh, and fluorescence spectroscopies. In BLS, the utilization of light-to-surface-plasmon coupling is a hot topic of research nowadays.

In **your Bachelor thesis**, which is a “**Literaturarbeit**”, you will

- introduce the physical principles of BLS and the notion “plasmon”,
- present methods of fabrication of surface plasmon resonators, and
- make a summary of materials and geometries exhibiting a strong photon-plasmon coupling.

In addition, it will be possible to get involved in the designing of surface plasmon resonators by 3D nanoprinting, and to test them experimentally in the BLS system operated in our group. Continuation of this topic as part of a future Master project is also possible.

From a broader perspective, the formulated Bachelor project tackles aspects of light-matter interaction with application to probing nanomagnets. Its successful accomplishment will be fortunate for eventual follow-up study and research work in the fields of magnonics, plasmonics, nanofabrication, and optics.

For more information, please inquire Oleksandr Dobrovolskiy (oleksandr.dobrovolskiy @univie.ac.at) at your earliest convenience.

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