



# Seminar announcement

**Tuesday, December 12, 2023  
2 pm**

**WSI, Seminar room S 101**

## **“Probing low-dimensional magnetism with a quantum sensor”**

A common theme in the study of magnetic materials is the ever-reducing spatial and magnetic footprints which promises novel properties at reduced dimensions and the miniaturization of technology. Supporting this research progress is the timely development of quantum sensing based on nitrogen-vacancies in diamond which provides micro-tesla sensitivity, nanometre resolution and minimal perturbation amongst other advantages [1-3].

Here, I will cover unique adaptations of quantum sensing with dichroic X-ray and reversal field techniques to explore non-trivial spin textures in both antiferromagnetic and magnetic films down to an atomic layer [4-6]. I will highlight the intriguing insights enabled by quantum sensing including the vorticity readout of antiferromagnetic textures and the nucleation of domains in two-dimensional magnets. Finally, I will provide an overview of the prospective developments and adaptations of quantum sensing as a versatile platform to explore magnetic phenomena in low dimensional systems.

[1] Taylor, Jacob M., Paola Cappellaro, Lilian Childress, Liang Jiang, Dmitry Budker, P. R. Hemmer, Amir Yacoby, Ronald Walsworth, and M. D. Lukin. *Nature Physics* 4, 10 (2008).

[2] Balasubramanian, G., Chan, I.Y., Kolesov, R., Al-Hmoud, M., Tisler, J., Shin, C., Kim, C., Wojcik, A., Hemmer, P.R., Krueger, A. and Hanke, T. *Nature* 455, 7213 (2008).

[3] CL Degen. *Applied Physics Letters* 92, 24 (2008).

[4] Anthony K. C. Tan, H. Jani, M. Högen, L. Stefan, C. Castelnovo, D. Braund, A. Geim, M. S. G. Feuer, H. S. Knowles, A. Ariando, P. G. Radaelli, M. Atatüre. *Nature Materials*. (Accepted)

[5] L. Stefan, Anthony K. C. Tan, B. Vindole, M. Högen, D. Thian, H. K. Tan, L. Rondin, H. S. Knowles, J.-F. Roch, A. Soumyanarayanan, and M. Atatüre. *Physical Review Applied* 16, 014054 (2021).

[6] M. Högen, R. Fujita, Anthony K. C. Tan, A. Geim, M. Pitts, Z. Li, Y. Guo, L. Stefan, T. Hesjedal, M. Atatüre. *ACS nano* 17, 17 (2023).

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