

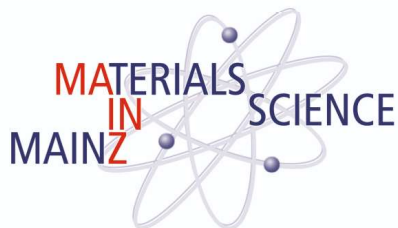


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# SPIN WAVE DYNAMICS IN ARTIFICIAL ANTI-SPIN-ICE SYSTEMS

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Reversed structures of artificial spin-ice, where elongated holes (antidots) are arranged into a square array, are referred to as anti squared spin-ice (ASSI). Using the Brillouin light scattering spectroscopy and the plane wave method, we investigate the spin wave (SW) propagation perpendicular to the applied field direction for two 20 nm thick Permalloy nanostructures with single and double elliptical antidots. For the SW propagation along the principal antidot lattice axis, the spectrum consists of flat bands separated by several frequency gaps which are the effect of the SW amplitude confinement in regions between antidots. For 45° propagation straight and narrow propagation channels are formed, leading to broadening of bands and closing of gaps. In this case, extra band gaps occur due to the additional periodicity along this direction. The width and the position of these gaps depend on the presence of single or double antidots. In this context, we discuss possibilities for the tuning of SW spectra in ASSI structures [1].

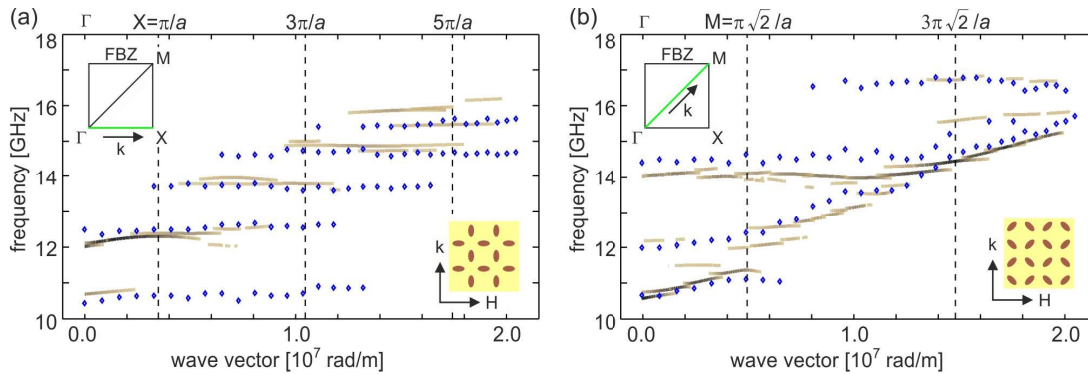


Fig. 1 : Frequency dispersion for the ASSI along the direction shown in the insets for (a)  $\phi = 0^\circ$  and (b)  $\phi = 45^\circ$ , where  $\phi$  is the angle between the external field  $H$  and the crystallographic axis of the ASSI. Brown lines mark BLS intensity calculated by means of PWM (darker color means higher intensity) and blue diamonds represent experimental data. Borders of the successive Brillouin zones are drawn as vertical dashed lines

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## References:

- [1] S. Mamica, X. Zhou, A. Adeyeye, M. Krawczyk, G. Gubbiotti, *Phys. Rev. B* (accepted, 2018)