

Magnon Caustics

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Magnons are the quantised excitations of magnetisation and are also known as spin waves. Magnons can be used to carry information and, as they are waves, they can be added and manipulated in ways that are similar to photons. The typical wavelength range for magnons in ferromagnets is from nm up to microns and this offers an exciting possibility: by patterning an appropriate material at the right length scale, a magnonic crystal can be made. In this structure the magnon interference will give rise to well-known dispersion phenomena such as band gaps and variations of group velocity. The dispersion means that the magnon wavevector can be controlled and the energy is determined by the excitation frequency and hence, control of the magnons is possible. Particularly interesting is the opportunity of controlling *caustics* where the direction of phase and group velocities is not coincident – which usually occurs when there is an anisotropy in the medium. The cusp of a caustic has a very high intensity and could be a way of focusing spin waves. This PhD project will aim to discover the underlying physics of these phenomena.