

## Magnetic nano-structures and metamaterials for high-frequency communications

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Ferromagnetic nano-structures (for example nanowires) and metamaterials exhibit high magnetic moments and offer high operating frequencies and magnetic permeabilities. These unique properties make them prime candidates for applications in the next generation of communication systems, electromagnetic wave absorption, noise suppression and in microwave devices. Their compatibility with semiconductor fabrication methods also make them attractive for the next generation of low-power spintronic devices.

The frequency response and scattering properties of the magnetic metamaterial can be tailored and tuned by the shape, size and volume fraction of the nano-scale magnetic constituents, and by using external fields. This project involves the use and further development of a novel numerical algorithm, based on the finite-difference time-domain method, to simulate and study the interaction of electromagnetic waves with single and arrays of magnetic nano-structures for the purpose of designing high-frequency, tuneable metamaterials and communication devices.

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