# Terahertz coherent magnonics in canted antiferromagnets

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Magnonics aims to employ quanta of spin waves, magnons, to carry, transport and process information, avoiding the dissipation of energy inherent to electronics. Experiments on magnons in regular (ferro)magnets have yielded demonstrations of basic logic devices, albeit macroscopic (mm-scale) in size and operating at GHz frequencies. Recently, the spotlight has shifted towards the use of antiferromagnets, in which neighbouring spins are aligned antiparallel to each other. This alternating order leads to significantly higher spin wave propagation velocities and might enable devices operating at terahertz (trillion of hertz) clock-rates. However, the absence of the net magnetisation also makes antiferromagnets magnetically ‘invisible’: it is very hard to detect and influence the antiferromagnetic order. Yet, in some antiferromagnets strong spin–orbit coupling results in canting of the spins, thereby producing net magnetization. The canted antiferromagnets combine antiferromagnetic order with phenomena typical for ferromagnets and hold a great potential for spintronics and magnonics. In this way they can be identified as closely related to the recently proposed novel class of magnetic materials, called altermagnets. In my talk I will discuss a new functionality of canted antiferromagnets and altermagnets for magnonics and show that these materials facilitate mechanisms allowing to generate, detect and nonlinearly convert propagating magnons at the nanoscale [1-3].

## References

[1] Hortensius, et al. Nature Physics 17, 1001 (2021);
[2] Leenders and Mikhaylovskiy. Phys. Rev. B 107, 094423 (2023);
[3] Leenders, Afanasiev, Kimel, and Mikhaylovskiy. Nature 630, 335–339 (2024).