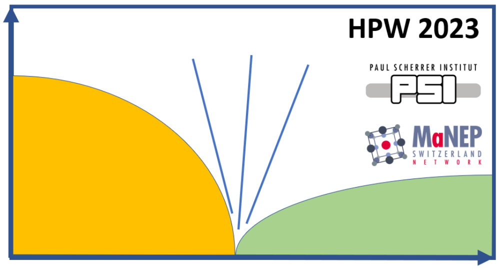

Contribution ID: **9** Type: **Talk**

THz control of quantum materials under pressure

Wednesday 22 November 2023 13:15 (15 minutes)

Quantum materials exhibit rich phase diagrams, strongly sensitive to external parameters, which include intriguing properties such as magnetic and ferroelectric order, electronic correlations, superconductivity, and spin and charge order. These macroscopic properties arise from the complex interactions between electronic, structural, spin and orbital degrees of freedom. While key in defining the unique response of quantum materials, the complexity of these couplings and interactions poses a tremendous challenge for the physical understanding, theoretical modeling and technological device applications of these systems.
One approach that has proven successful in decoupling the effect of different degrees of freedom is to perform time-resolved measurements, which yield the out-of-equilibrium response of different components of the system following an ultrafast perturbation. Of particular interest is photoexcitation by a terahertz pulse, where the low photon energy ensures that the out-of-equilibrium sample remains closer to its electronic ground state than when e.g. an optical pump is used. Another approach to address the complexity of quantum materials is to reduce the available parameter space by choosing one external parameter, such as pressure, which can be continuously controlled (contrary to doping) while preserving thermal equilibrium (contrary to temperature). Pressure has been used extensively to draw phase diagrams in equilibrium but only to some extent with ultrafast measurements.
Combining terahertz spectroscopy or terahertz photoexcitation with pressure poses significant technological challenges, which has led to slow progress in this field despite its great potential. I will discuss our preliminary results in mapping out the pressure and temperature dependence of the THz response of Cr-doped V_2O_3, a canonical Mott insulator.

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Session Classification: Afternoon Session 1