Exploring the Quantum–Classical Interface for Revolutionary Quantum Materials and Technologies

Jochen Mannhart

Max Planck Institute for Solid State Research

Stuttgart, Germany

Does nature fundamentally prohibit valves from operating without an external driving force —i.e., functioning in the linear response regime? We have developed quantum devices and metamaterials that achieve precisely this, leveraging breakthroughs at the intersection of quantum and classical physics. These advances challenge conventional physical principles and open the door to transformative innovations. By defying established concepts such as the Landauer erasure principle, these novel approaches pave the way for revolutionary quantum materials and technologies (see, e.g., [1,2]).

[1] P. Bredol *et al.*, Phys. Rev. B **104**, 115413 (2021)

[2] J. Mannhart *et al.*, Nano Express **2**, 014998 (2021)