



## Physical Sciences Seminar

# Manipulating matter with vacuum fields: cavity-mediated transport in disordered quantum Hall systems

**Cristiano Ciuti (Université de Paris, CNRS, Laboratoire Matériaux et  
Phénomènes Quantiques, France)**

**Host: Johannes Fink**

The manipulation of matter by giant vacuum fields in electromagnetic resonators is an emergent topic in physics and chemistry [1]. In this seminar, after a general introduction, we will see how the cavity vacuum fluctuations can dramatically affect the physics of disordered quantum Hall systems. In particular, we will show how, in the presence of electronic disorder, the cavity can mediate long-range electron hopping via the exchange of virtual photons, involving both edge and bulk states [2]. Such an effect can produce a breakdown of the topological protection of the integer quantum Hall effect as demonstrated in recent transport experiments [3]. Future perspectives will be discussed.

[1] F. J. Garcia-Vidal, C. Ciuti, T. W. Ebbesen, Manipulating matter by strong coupling to vacuum fields, *Science* 373,178 (2021).

[2] C. Ciuti, Cavity-mediated electron hopping in disordered quantum Hall systems, *Phys. Rev. B* 104, 155307 (2021).

[3] F. Appugliese, J. Enkner, G. L. Paravicini-Bagliani, M. Beck, C. Reichl, W. Wegscheider, G. Scalari, C. Ciuti, J. Faist, Breakdown of the topological protection by cavity vacuum fields in the integer quantum Hall effect, preprint arXiv:2107.14145 (2021)

**Monday, December 6, 2021 11:00am - 12:00pm**

IST Austria Campus Heinzl Seminar Room / Office Bldg West (I21.EG.101) & Online  
via Zoom



This invitation is valid as a ticket for the IST Shuttle from and to Heiligenstadt Station. Please find a schedule of the IST Shuttle on our webpage: <https://ist.ac.at/en/campus/how-to-get-here/> The IST Shuttle bus is marked IST Shuttle (#142) and has the Institute Logo printed on the side.