

## Colloquium

● The event has passed

# Linnaeus Colloquium with Franco Nori

Title: Topological origin of surface Maxwell waves and surface acoustic modes

Coffee is served from 09:45

## December

# 9

10:00 - 11:00

### Overview

● The event has passed

**Date:**

Starts 9 December 2024, 10:00

Ends 9 December 2024, 11:00

**Location:**

📍 Kollektorn, MC2

**Language:**

English

**Abstract:** Interfaces between optical media (including dielectrics, metals, negative-index materials) can support surface electromagnetic waves, which now play crucial roles in plasmonics, metamaterials, and nano-photonics. We have shown [K. Y. Bliokh et al., Nat. Commun. 10, 580 (2019)] that surface Maxwell waves at interfaces between homogeneous isotropic media described by real permittivities and permeabilities have a topological origin explained by the bulk-boundary correspondence. This is explained by the nontrivial topology of the non-Hermitian photon helicity operator in the Weyl-like representation of Maxwell equations. The corresponding topological invariant, which determines the number of surface modes, describes the winding of the complex helicity spectrum across the interface. Our theory provides a new twist and insights for several areas of wave physics: Maxwell electromagnetism, topological quantum states, non-Hermitian wave physics, and metamaterials. We have also analyzed [K. Y. Bliokh et al., Phys. Rev. Lett. (2019)] another type of classical waves: longitudinal acoustic waves corresponding to spinless phonons. We show that surface acoustic waves, which appear at interfaces between media with opposite-sign densities, can be explained by similar topological features and the bulk-boundary correspondence. However, in contrast to photons, the topological properties of sound waves originate from the non-Hermitian four-momentum operator in the Klein-Gordon representation of acoustic fields.

**About the speaker:** Franco Nori is a RIKEN Chief Scientist, leading the "Theoretical Quantum Physics Laboratory" at RIKEN (the Japanese National Laboratory). He is also a Team Leader of the "Quantum Information Theory Research Team", in the RIKEN Quantum Computing Center.

His research group has done pioneering interdisciplinary studies at the interface between nanoscience, dissipative quantum open systems, quantum information processing, superconducting quantum circuitry for quantum computing, photonics, quantum optics, atomic physics, nano-mechanics, computational physics, and condensed matter physics.

His research group has produced numerous highly cited papers (i.e., top 1% most cited publications among all papers in all areas of Physics) according to the Web of Science. Also, more than 143 publications in Physical Review Letters, over 76 in Science and Nature journals, as well as numerous ones in other top journals. According to the Web of Science: ~70K citations and h-index > 120 (Google Scholar: ~102,000 citations and h-index ~142).

He has been listed by the Web of Science as a "Highly Cited Researcher" in Physics (covering all areas of Physics) for the past eight consecutive years: from 2017 to 2024 (Less than 0.1% of physicists are selected).



He is an Elected Fellow of the: American Physics Society (APS), Institute of Physics (IoP), American Association for the Advancement of Science (AAAS), and Optical Society of America (OSA) [this last one "for fundamental contributions to quantum information science and optics, including

circuit quantum electrodynamics, and the interface between quantum optics and quantum circuits"]. He received the 2014 Prize for Research in Physics, from the Matsuo Foundation, Japan; and the 2013 Prize for Science, by the Minister of Education, Culture, Sports, Science and Technology, Japan. Also, an "Excellence in Research Award" and an "Excellence in Education Award" from the University of Michigan. He is an Elected Member of the Academia Europaea, the Latin American Academy of Sciences, and a Foreign Member of the Swedish Royal Society of Arts and Sciences in Gothenburg, Sweden. He won the 2023 W.E. Lamb Medal, and the 2024 Charles H. Townes Medal (from Optica, formerly the Optical Society of America); both for fundamental contributions to research on Quantum Optics, Quantum Electronics, and Quantum Information. In June 2024, he received a Research Doctorate Honoris Causa (i.e., an Honorary Doctorate) in Physics, from the University of Messina, Italy, founded in 1548.



## Anton Frisk Kockum

Associate Professor, Applied Quantum Physics, Microtechnology and Nanoscience

### Contact

✉ [anton.frisk.kockum@chalmers.se](mailto:anton.frisk.kockum@chalmers.se)

☎ [+46 31 772 31 90](tel:+46317723190)

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### Tags:

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