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MQ Photonics Research Centre Seminar

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(Online via the zoom link below)

Light trapping with unusual waves: Bound states in the continuum

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Abstract:

Destructive interference governs the principle of operation of optical resonators. Resonators are used to confine light but for only a limited time because of unavoidable light emission. Recently, an unusual form of destructive interference was discovered, associated with so-called bound state in the continuum (BICs), which allow to trap a light wave in a confined space for, in theory, endless time. BICs are formed by the destructive interference of several ordinary light waves that have a similar wave's velocity and direction of propagation. In the BIC regime, the resonator is characterized with infinite quality factor – a quantity which means the ratio of the light trapping time to the period of the wave's oscillation. For real resonators, the quality factor of BICs is very high yet finite, dramatically improving their properties.

I will review the recent developments in the BIC physics with applications to photonics, including novel opportunities for the development of on-chip biosensors, compact quantum sources, and lasers that consume little power. I will pay a special attention to our contribution to this field [1] highlighting the recent demonstration of the record-high efficiency of light frequency conversion at the nanoscale using a nonlinear nanoantenna with BIC waves [2].

[1] K. Koshelev, Yuri Kivshar, Dielectric Resonant Metaphotonics, *ACS Photonics* **8**, 102–112 (2021).

[2] K. Koshelev et al, Subwavelength dielectric resonators for nonlinear nanophotonics, *Science* **367**, 288 (2020).

Speaker biography:

Kirill Koshelev is a senior PhD candidate at the Nonlinear Physics Centre of the Australian National University. His research interests include nonlinear optics, dielectric nanophotonics, resonant metasurfaces. He is a long-term member of SPIE and OSA student chapters as well as the student member of IEEE, IEEE Photonics, MRS-S and ANZOS societies. He received a number of international awards for students including Optics and Photonics Education and Travel Scholarships (SPIE), Photonics Society Graduate Student Scholarship (IEEE), Postgraduate Student Prize (ANZOS). His conference presentations are widely recognised by the best presentation awards including ICMAT and PIERS conferences.

URL to join: <https://macquarie.zoom.us/j/85829287435>
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