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Customizing quantum light sources for emerging quantum technologies (I)

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Light is our best medium for sending information over long distances—it moves at nature's speed limit, and doesn't degrade for hundreds of kilometers. As quantum technologies become more prevalent, we will strive to transmit quantum information, and for this, we will require high quality sources of quantum light.

Sources of quantum light based on nonlinear optical processes, which mediate interactions between photons, are becoming an established standard for generating single photons and other important quantum states of light. While existing sources were sufficient for proof-of-principle experiments, and to demonstrate the feasibility of optics for quantum technologies, significant progress in the field will require a much higher degree of control over quantum light. In this talk, I will discuss theoretical work that expands the capabilities of nonlinear optics by offering this higher degree of control. In particular, I will introduce novel techniques—such as customized poling, Moire gratings, and engineered loss—for shaping the spectrum of quantum light at the source.

Primary author: Dr BRANCZYK, Agata (Perimeter Institute)

Presenter: Dr BRANCZYK, Agata (Perimeter Institute)

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