Quantum Light applications

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Quantum light proprieties have been extremely exploited in the last years to improve technology in unprecedented ways. The control of light at the quantum level performs tasks such as secure communications, high-precision measurements, and powerful computations. A key aspect is the use of photons as carriers of information and generation of specific quantum states.

The CNR-ISASI optics laboratory is engaged in two lines of research in a strong synergy with CNR-INO. The former concerns the structured light generation in isotropic materials and the study of birefringence effects in mechanical media on the light orbital angular momentum propagation for quantum optical communication purposes. We are developing this activity in the context of two experiments funded by the PNRR, involving wider collaborations. The latter proposes the optimization of optical design for the development of a compact quantum light source. The activity is supported by SMART_Q_ET project that aims to generate squeezed state of light in a smart device. Squeezed states are a class of quantum states with a small uncertainty in one observable and now, they are a key tool to improve any precision measurement experiment reaching standard limits of sensitivity.

Overall, light generation and manipulation for quantum applications promises to revolutionize fields ranging from cryptography to metrology, harnessing the peculiarities of the quantum realm to push the boundaries of what is technologically possible.

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