Quantum frequency combs: generation, characterization and applications to scalable quantum information processing

Colloquium given by
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Abstract
The development of Wavelength Division Multiplexing has been at the origin of a revolution in communication, that has even changed our everyday life. It is natural to investigate now whether this way of encoding and processing classical information can be extended to the domain of quantum information. We show that parametrically generated optical frequency combs, spanning over more than one million wavelength components, exhibit highly multipartite entanglement between the quantum fluctuations of its frequency modes. We introduce the tools that are needed to completely characterize such highly multimode quantum states of light and discuss the ways to utilize them in Measurement Based Quantum Computing. We finally show how to produce, by mode-selective photon subtraction, frequency comb quantum states exhibiting non-Gaussian statistics that are needed to provide a quantum advantage in Quantum Computing tasks.

Short Biography
Claude Fabre is an emeritus Professor at Sorbonne Université, Paris. He got his PhD in 1981 under the supervision of Serge Haroche (Nobel prize awarded in 2012). In 1984-85, he was visiting Scientist at IBM laboratories, San Jose, California and became Research Director at the CNRS in 1986. In 1996 he took a full professor position at the Université Pierre et Marie Curie, Paris.

Claude Fabre is a world known scientist in Quantum optics. In particular, he investigate quantum effects in highly multimode systems like optical images and ultrashort light pulses. He found applications to quantum metrology and to quantum information processing and computing. He is also an expert in atomic physic and did experimental work on highly excited atomic states (Rydberg states) and their interaction with light.

Claude Fabre is fellow of the Optical Society of America, fellow of the European Optical Society and honorary professor at the east China Normal University, Shanghai