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### **On-chip quantum frequency combs for scalable quantum state generation**

Optical quantum states are fundamental for several applications ranging from sensing and secure communications to quantum computation. The generation of such quantum states on a compact integrated platform will allow for customizable, low-cost, and large-scale implementations, enabling accessible advances for quantum technologies. With current advances in optical quantum information processing (e.g. the realization of the first commercial quantum cryptography systems and computers), it is foreseeable that such reliable, low-cost and scalable on-chip sources of single and entangled photons will represent a key enabling technology for quantum applications. Therefore, the realization of integrated quantum sources has attracted considerable attention from the scientific community. However, major difficulties arise when sources need to satisfy several requirements at the same time, i.e. a narrow spectral bandwidth, high-purity single-mode generation, high production rates, stable long-term operation, multiplexed broadband operation, and high-quality entanglement shared between photons. We show that integrated quantum frequency comb sources can address these important requirements. We demonstrate the generation of pure heralded single photons, cross-polarized photon pairs, as well as entangled two- and multi-photon photon states, distributed over many frequency modes and spanning the complete fiber-optical telecommunications band. Integrated quantum frequency combs therefore provide a scalable and versatile platform for quantum information processing.

### **Biography**

Roberto Morandotti has received his MSc in 1993 from the University of Genoa (Italy) and his PhD in 1999 from the University of Glasgow (UK). Since 2008, he is a Full Professor at Institute national de la recherche scientifique (INRS-EMT). Since 2015, he has been working as an Adjunct Professor at the University of Electronic Science and Technology of China (Chengdu, China) and is a Visiting Professor at ITMO (St. Petersburg, Russia). He is an E W R Steacie Memorial Fellow, a Fellow of the Royal Society of Canada, APS, OSA, IoP and SPIE, as well as the General Co-chair of CLEO QELS 2016.

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