

## ANNUAL HIGHLIGHTS

In 2018, SPOC saw the highest impact year so far, in terms of high impact scientific publications, new high profile research grants to SPOC team members, and peer recognition.

At our all-important conferences, SPOC obtained 5 prestigious *hot topic* papers, 4 postdeadline papers and 1 upgrade-to-plenary paper, and the centre leader was selected to give two Tutorial talks in addition to several invited presentations. SPOC had a significant presence in Nature and Science journals, with a key result on optical regeneration of data signals on multiple colours published in Nature Communications, a detailed account of our record result on transmitting more than all the internet traffic on the light from a single chip published in Nature Photonics, and a record “large” quantum chip with 500 individual components, enabling 15-dimensional quantum entanglement published in Science. This prompted an Editorial and a News&Views article in Nature Photonics. SPOC published a paper on the nonlinear aluminium-gallium-arsenide-on-insulator (AlGaAs-OI) chips in the prestigious journal Laser&Photonics Reviews, where we demonstrated the optical processing of the highest number (128) of optical data channels to date. This is only possible with our nonlinear chips, and holds a massive potential for energy savings in data processing. Energy efficiency is a main pillar in SPOC. Spectral efficiency is another, and we can now boast a demonstration of the most spectrally efficient 200-km long data link in the world (15.7 bits/symbol). Only Bell Labs has shown a slightly higher efficiency, albeit only over 50 km. Additionally, when combining our most efficient data encoding with 30 cores in a single fibre, we obtained a record-high aggregate spectral efficiency of 297.8 bit/s/Hz.

SPOC is now clearly at the frontier of its field. As testimonies of this, SPOC has been selected (again) to contribute a chapter on optical signal processing to the seventh edition of the highly esteemed and exclusive 40-year running book series *Optical Fiber Telecommunications (OFT VII)*, and the International Editor of Nature Photonics, Dr. Rachel Won, joined the annual SPOC Workshop, and presented an official Nature Photonics Best Poster Award. Two other SPOC’ers won acclaim in 2018 by winning the PhD Poster Award at the International Conference on Integrated Quantum Photonics, and the Best Student Paper Award at the Asia Communications and Photonics Conference.

SPOC was once again present at Kulturnatten with our live demo of a quantum key distribution (QKD) system inside the Science Ministry. It was very well attended, and great fun for the SPOC’ers.

Leif Katsuo Oxenløwe was granted 60 mio DKK from the Innovation Fund Denmark (IFD) for the Grand Solutions project INCOM, which, with its innovation focus, complements SPOC perfectly. Karsten Rottwitt won a QuantERA project, SQUARE), involving 8 partners across Europe. Karsten is the coordinator of the project. Dr. Darko Zibar, was awarded an ERC Consolidator grant for his project FRECOM. Dr. Yunhong Ding, was awarded a Villum Young Investigator (VYI) grant for his project. Together with CoE BigQ, SPOC is a partner in the only EU infrastructure grant for a QKD testbed that was selected in 2018, project OPENQKD, counting 38 partners across Europe with a budget of 15 mio Euro.

Finally, in 2018 Leif Katsuo Oxenløwe was elected Fellow of the Optical Society, the OSA in recognition of his ““outstanding contributions to the harnessing of nonlinear optics applied to optical communications as energy-efficient light sources and ultra-broadband advanced optical signal processors.”