ANNUAL HIGHLIGHTS

SPOC has had a very exciting 2022, where the last researchers were hired and started, so we're up to full speed again. Our physical meetings resumed their almost pre-covid intensity. We were able to host our annual SPOC Workshop and make it international again – with participants from Europe, the US and Australia. This took place in the scenic setting of the Kokkedal Castle in northern Jutland and was once again inspirational and rewarding. We came out with great plans for our future collaborative research. One outcome of our international relations is that PI, Leif Katsuo Oxenløwe, is international collaborator in the newly granted Australian Research Council Centre of Excellence, COMBS, initiated by long-term SPOC partners David Moss and Bill Corcoran.

Research-wise, SPOC demonstrated and published some of our biggest results to date. In 2022 we published our experimental and theoretical investigations of how much data a single-chip light source can carry. We had already experimentally shown that a single optical frequency comb source could carry more than the total internet's data, and in 2022 we completed our theoretical analysis revealing a staggering 100x more potential, which means this is a truly scalable solution. The result was published in Nature Photonics in October 2022 and by November the paper was the most online "talked about" paper, according to the Altmetric online attention score, NPHOT refers to. This score is on average 25 for NPHOT papers, but our paper soared to a value of 680, making it the highest scored NPHOT paper of a similar age, the second highest scored paper of all NPHOT's publications and among the top-2‰ of all 22 million registred papers from all sources. This is really a hot topic, which we believe is due to the potential energy savings of this technology. Many online services brought the story, some just echoing others, but several with their own take on it, and we were interviewed by many sources, e.g. BBC Newshour, Washington Post, and New Scientist. Excerpts of the global media coverage of the result are to be found in the SPOC webpage under news.

Other research highlights include the, for SPOC, so important postdeadline conference papers. At our most important conference, the European Conference on Optical Communication, ECOC, we had a paper selected in the highly selective postdeadline competition – the work was on the first ever high-dimensional quantum key distribution (QKD) system tested in the field on installed fibre in the Italian city of L'Aguila. At the IEEE Photonics Conference, IPC, we had another paper selected. This was joint work between SPOC and the Hy-Q centre at the Niels Bohr Institute. We showed for the first time that a single-photon source, as developed by Hy-Q, could indeed be used in a field-deployed QKD link. Based on this finding, we continued to make a full video-app, encrypted by the quantum keys, and arranged a grand opening of the link in late November. This was the first QKD field demo in Denmark, and the first worldwide using on-demand single photons, created quite a stir, and was vividly reported on in Danish news and social media. We even conducted what may be the world's first live quantum-encrypted TV interview over this line. The article and the interview are accessible under news in the SPOC website.

All in all, SPOC has all hands on deck now, and is producing world record results and interesting insights that may be used for more energy-efficient and secure communication systems. SPOC'ers were involved in several successful research applications, including an IFD Grand Solutions (GreenCOM), a Villum Young Investigator (DONN), EU ITN PhD projects (HOMTech, MicrocombSys), and an EU quantum test-infrastructure (QCI.dk).