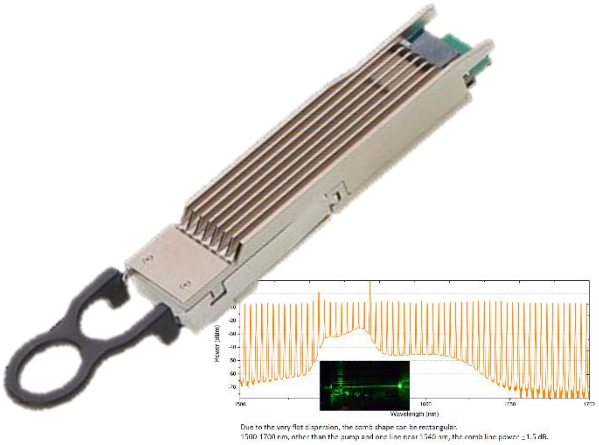
Pilot PHOTONICS

ExCELS

External Comb-Enhanced Laser Source



ExCELS is a pluggable external laser source to enable highly parallel IM/DD and highly parallel coherent CPO applications

Features

- Up to 16 wavelengths on 200 GHz grid
- Output power of 14 dBm per channel
- Per channel SMSR >30 dB
- Linewidth <100 kHz
- OFC locked wavelengths enable vastly reduced DSP complexity and reduced thermal and electronic control complexity
- Pluggable form factor complying with OIF ELSFP IA. Enables field serviceability and easy replacement.

Target Specifications	
Wavelength Grid	CW-WDM 200 GHz
Centre Wavelength	1300.05 nm
Number of Channels	16
Output Power per channel	14 dBm
Linewidth	<100 kHz
Channel SMSR	>30 dB
Relative Intensity Noise	<-150 dB/kHz
Wavelength Stability	+/- 2.5 pm
Operating Case Temperature	-40 to 85 °C

The explosion of Artificial Intelligence (AI) and Machine Learning (ML) applications has led to immense pressure on data centre optical networks and has driven the rollout of Co-Packaged Optics (CPO) solutions. In CPO systems transceiver optical engines (usually Silicon Photonics) are integrated into the system enclosure near to the ASIC chip. Optical power is fibre coupled into the optical engines from faceplate pluggable external laser source (ELS) modules. Successive generations of CPO architectures will rely on vast increases in parallelism and channel rates. The capacity of today's CWDM IM/DD solutions will be rapidly exhausted in the coming years necessitating a move to denser wavelength grids and higher modulation formats. Commensurate improvements in the quality of the optical power supply is crucial to enabling this development.

In anticipation of this shift, Pilot Photonics is excited to unveil our External Comb-enhanced Laser Source (ExCELS). This pluggable module will combine Pilot Photonics' proven expertise in optical frequency comb (OFC) and laser technologies to deliver a low-linewidth high power multi-wavelength laser source in a single package. The hybrid integration of a high-Q Silicon Nitrite micro-resonator with Indium Phosphide based pump, demultiplexing and amplifying photonic integrated circuits (PICs) combines the frequency precision of an optical frequency comb with output powers comparable to a laser array.

This module will, for the first time, allow highly parallel high bit rate coherent communication to be brought to the data centre.

Applications

External Laser source to support CPO systems in hyperscale data centres for both:

- Highly parallel IM/DD communications
- Highly parallel coherent communications

COCOPOP

Coherent Comb for Co-Packaged Optics

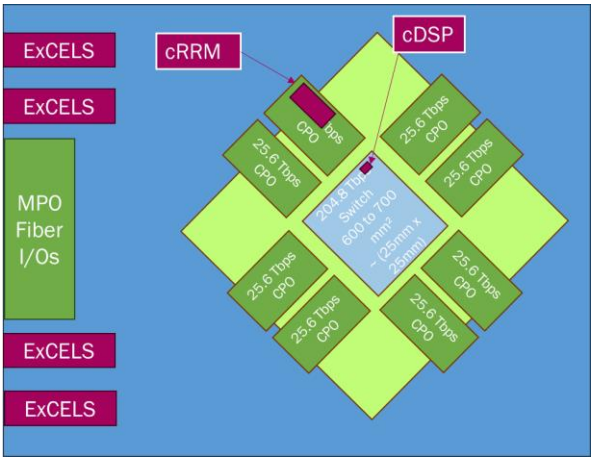
Pilot Photonics is excited to announce the beginning of a new EU funded project to develop optical frequency comb (OFC) technologies for coherent co-packaged optics (CPO) applications.

The enormous growth in artificial intelligence (AI), machine learning (ML) and high-performance computing (HPC) applications in recent years has caused an explosion in demand for data processing, placing ever-increasing pressure on the hyperscale data centres that are now a fundamental part of the digital economy.

Data transfer (I/O) within the data centre is fast becoming a bottleneck for system performance. Co-packaged optics technologies are being developed to alleviate these issues. Instead of the traditional pluggable transceivers, CPO makes use of optical engines directly co-packaged onto an interposer with the ASIC itself, allowing short traces between the electronics and optics. The optical engines incorporate photonic integrated circuits (PICs), typically silicon photonics, along with driver ICs into a single unit, with multiple optical engines servicing a single ASIC. Continuous wave (CW) optical power is fibre coupled to the optical engines from pluggable external laser source modules in the front panel of the rack unit.

I/O scaling can be approached along three dimensions: number of fibers, number of wavelengths and data rate per wavelength. To date, CPO solutions have utilised intensity modulation with direct detection (IM/DD) along with single wavelength (1311 nm) or few wavelength (CWDM4) architectures, necessitating heavy reliance on fibre number to achieve scale. Although we are now only a few years into the CPO paradigm scaling issues are already starting to emerge. The only possibility to enable continued scaling is to increase the wavelength density and increase the data rate per channel.

Funded by the European Union's Horizon Europe EIC Transition Programme under grant agreement No. 101159210



Pilot Photonics' c3PO technology suite incorporating the External Comb-enhanced Laser Source (ExCELS), coherent Ring Resonator Modulator (cRRM), and coherent Digital Signal Processing (cDSP).

c3PO

The COCOPOP project aims to address these issues and set a course to unprecedented levels of I/O scaling by unlocking coherent communications in the data centre for the first time. With €2.5 million in funding from the European Innovation Council (EIC), Pilot Photonics will develop a suite of technologies to meet this goal, which we call Coherent Combs for Co-Packaged Optics (c3PO). This will entail:

- The External Comb-Enhanced Laser Source (ExCELS), the world's first coherent-capable external laser source - a pluggable module that will deliver low-linewidth high power multi-wavelength laser light from a single package.
- The coherent Ring Resonator Modulator (cRRM) - the world's smallest coherent modulator, enabling CPO tiles with unprecedented density.
- Comb-enhanced coherent Digital Signal Processing (cDSP) – leveraging laser comb properties to reduce the size, cost and complexity of DSP

Funded by the European Union