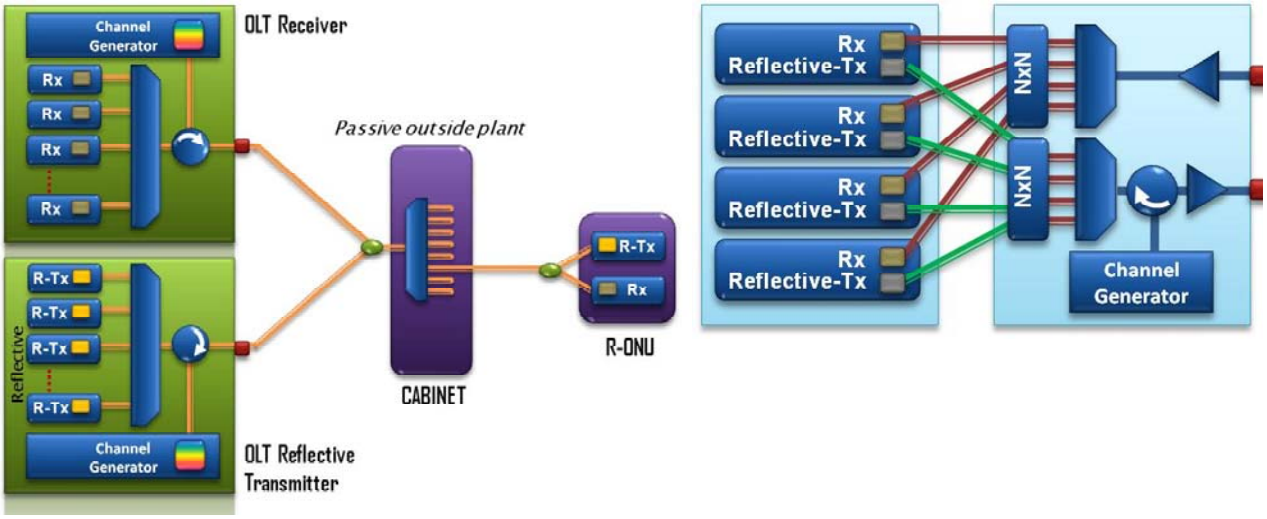
1 Publishable summary

The European R&D project C3PO (**C**olourless and **C**oolerless **C**omponents for low **P**ower **O**ptical Networks) aims to develop a completely new generation of 'green' photonic components that can reduce the overall network power consumption through their application in radically new architectures for next generation optical networks. C3PO proposes a disruptive approach on designing new generation of Gb/s access and 100Gb/s metro networks with components that reflect light in order to save power.



(a) (b)

Figure 1: (a) Fibre-to-the-Home network using reflective components at the central office (OLT) and the customer premises (ONU) and (b) 100Gb/s transceiver layout using reflective components and optical switching for patch-free reconfiguration without tuneable lasers

C3PO systematically works on the development of new hybrid reflective photonic integrated circuits that rely on arrays of monolithic chips mounted on silicon sub-mounts for final hybrid assembly on silica motherboards that interface with electronics and fibre pigtails.

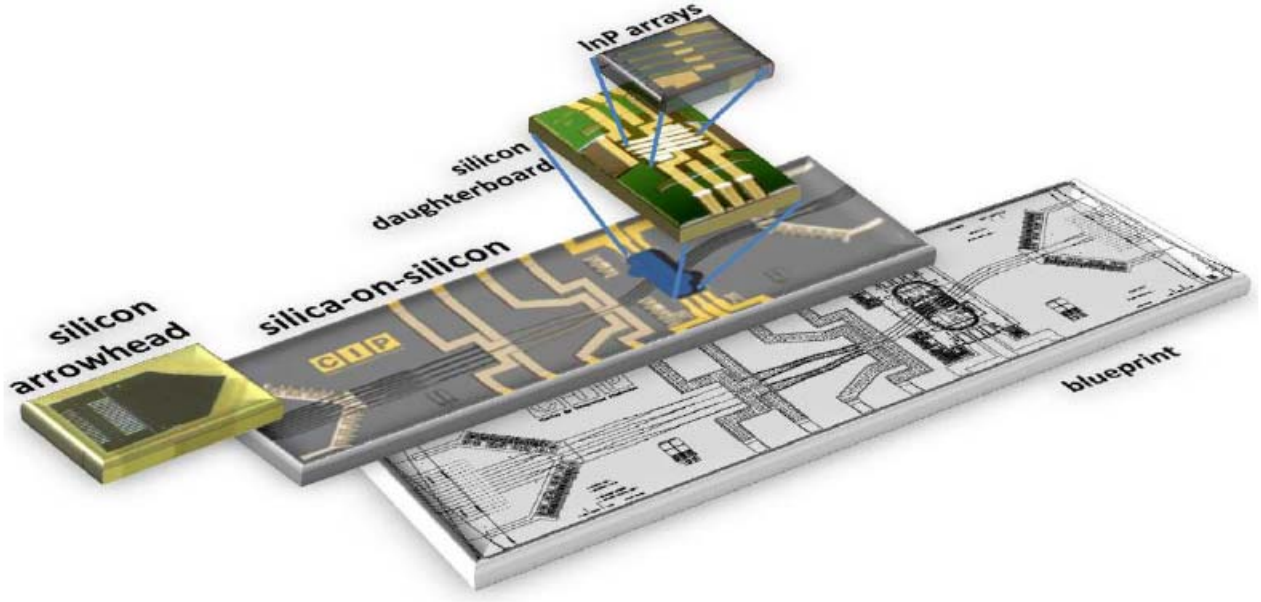


Figure 2: Hybrid photonic integration process followed within C3PO

During the second year of the project, critical milestones have been reached by developing the first generation of reflective integrated components, through the successful integration of advanced III-V monolithic arrays on planar lightwave circuits, co-integrated with driver electronics.

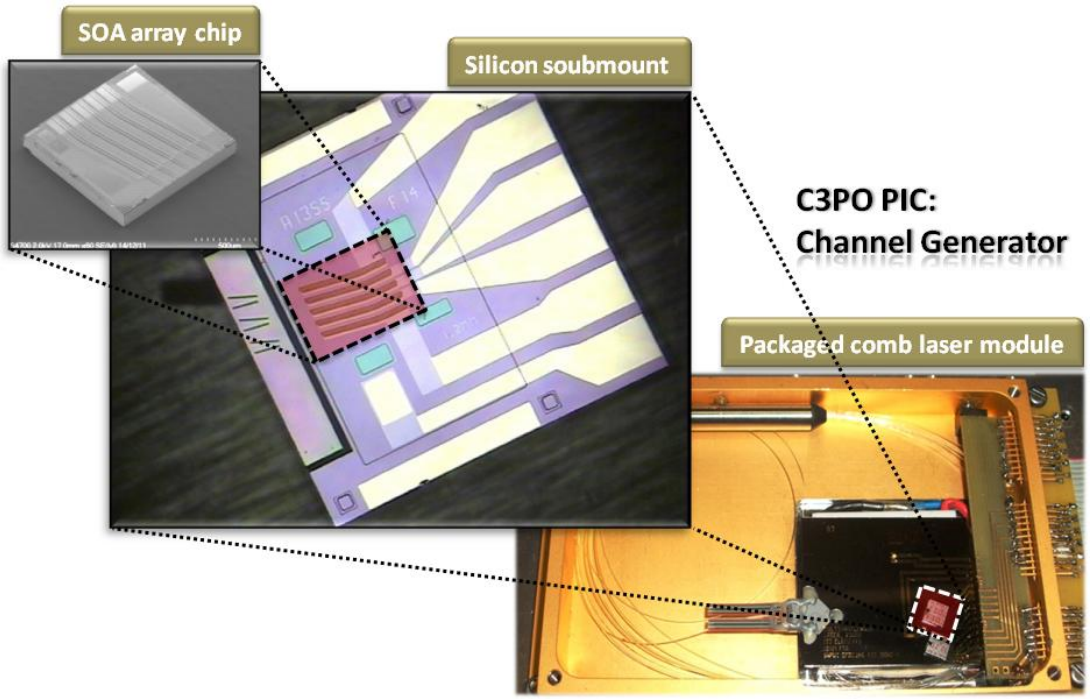


Figure 3: C3PO hybrid Photonic Integrated Circuit: 10-channel multi-wavelength laser source

New arrayed lasers, modulators and receivers were designed, fabricated and successfully assembled into modules. The first hybrid integrated reflective optical duobinary modulator prototype was realized and experimentally evaluated at 10Gb/s and 25Gb/s with colourless performance suitable for short-reach and 100Gb/s metro networks. The footprint, power consumption and potential for high-volume manufacturing, renders the device a promising candidate for both high-capacity and low-cost 100GbE metro links and high-capacity short-reach networks.

Research and development on optical switches focused on pushing the state-of-the-art in terms of size and power consumption of switching matrices reaching more than 192x192 port-count with power consumption less than 500mW/port. On the electronics side, the world's most energy efficient 10x11Gb/s modulator driver arrays were designed and fabricated targeting high-capacity Fibre-to-the-Home networks. Moreover, energy-efficient and high-performance 4x28Gb/s electronic driver and receiver arrays were designed, developed and tested targeting 100GbEthernet networks.

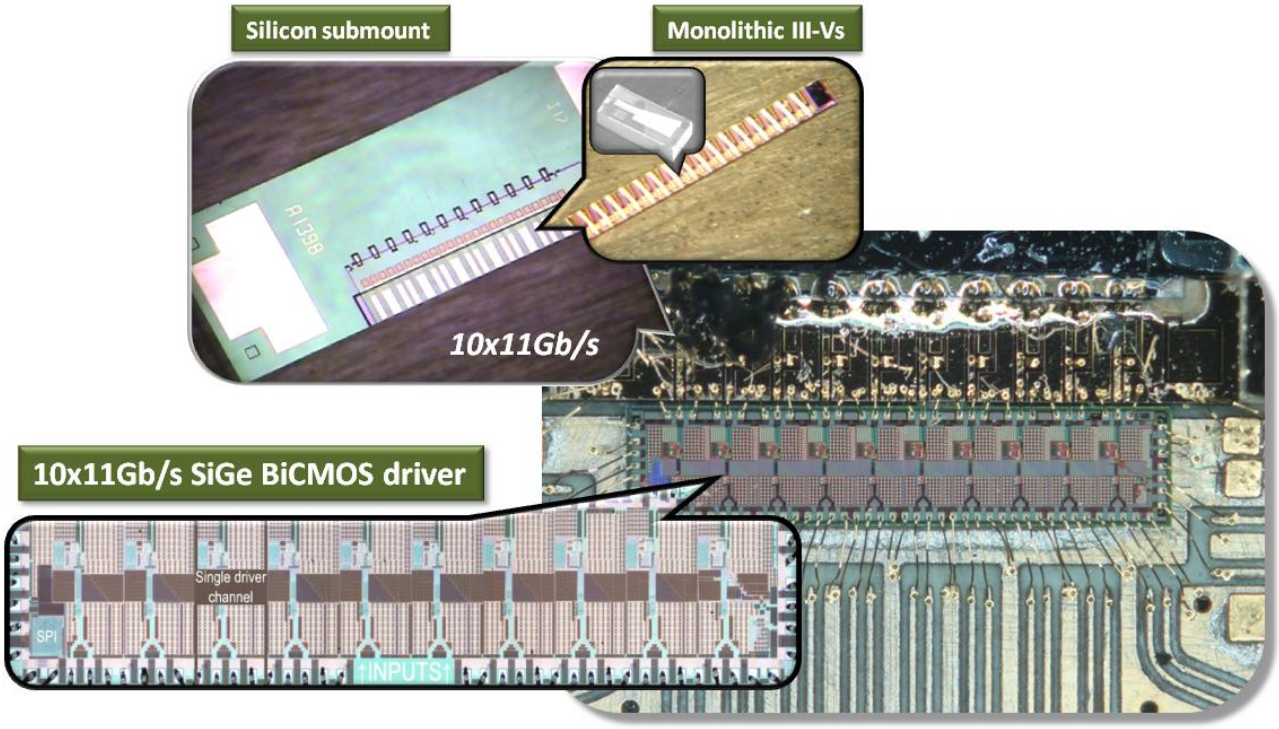


Figure 4: New photonic chips: energy-efficient 10x11Gb/s transmitter exploiting hybrid photonic integration and SiGe BiCMOS technologies suitable for Gigabit access networks

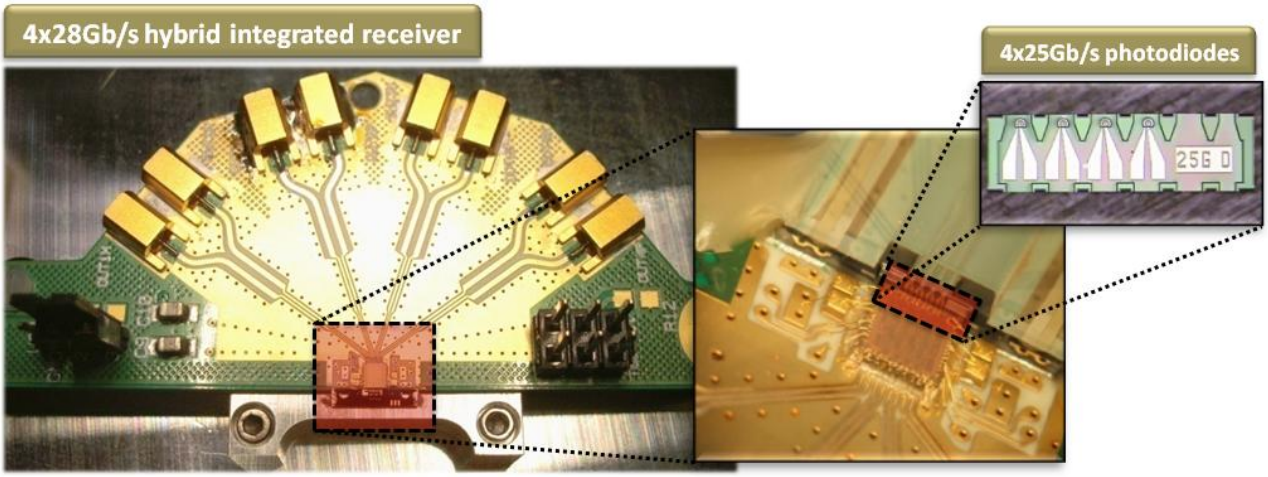


Figure 5: New photonic chips: energy-efficient 100Gb/s receiver for optical metro networks