Master student project in Optical Communications

*Design, realization and experimental evaluation of scalable optical label processors for next-generation Terabits optical packet switched networks*

The exponential growth of the Internet data traffic will demand the realization of the next-generation optical networks capable to support 100’s of Terabit/s of traffic. The increase of power consumption and dissipation as the required capacity increases will impose a limit to the scalability of current electronic circuit switching. Optical packet switches (OPS) that transparently route the packets in the optical domain is a technology under investigation by research centers and industries. This technology has the potential of solving the bottleneck between the fibre bandwidth and the electronic router capacity by exploiting high speed and parallel all-optical signal processing.

To realize scalable OPS systems that support Terabit/s of traffic, optical packet switches with a large number of inputs/output ports should be realized. In the OPS operation, the addressing of the output ports, and thus the packet forwarding criteria, is determined by the optical labels attached to the optical packets. Therefore, to address an OPS with a large number of ports, a label processor that can process a large number of optical labels is essential.

The group of electro-optical communication systems (ECO), COBRA Research Institute, has developed a new concept of label processor for in-band labels, i.e. labels are represented by wavelengths that are within the spectrum of the packet. Each label has a binary value, thus by using $N$ labels up to $2^N$ addresses can be encoded. Although the addresses are doubled for each added label, the increase of the number of labels will be limited physically by the maximum number of wavelengths (labels) that can be allocated in the spectrum of the optical packet.

**Tasks:** The candidate is tasked to investigate novel multi-levels encoding/decoding techniques that allow for processing a large number of addressed by using fewer in-band wavelengths with respect to the existing technique. Then, the candidate should realize the optoelectronic label processor and test experimentally the device in optical transmission system trials at data rate beyond 160 Gbit/s. Successful completion of this traineeship will be published in a journal or conference paper.

**Duration:** 6 months

**Requirements:** The candidate should have a background in data coding and electronics circuits, optoelectronic devices, and optical communication systems. Experience of using optical instrumentation is a plus.

**Contact for further information:**
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