POLITECNICO DI TORINO

THESIS proposal in the area of optical fiber communications

OPTCOM GROUP
Politecnico di Torino

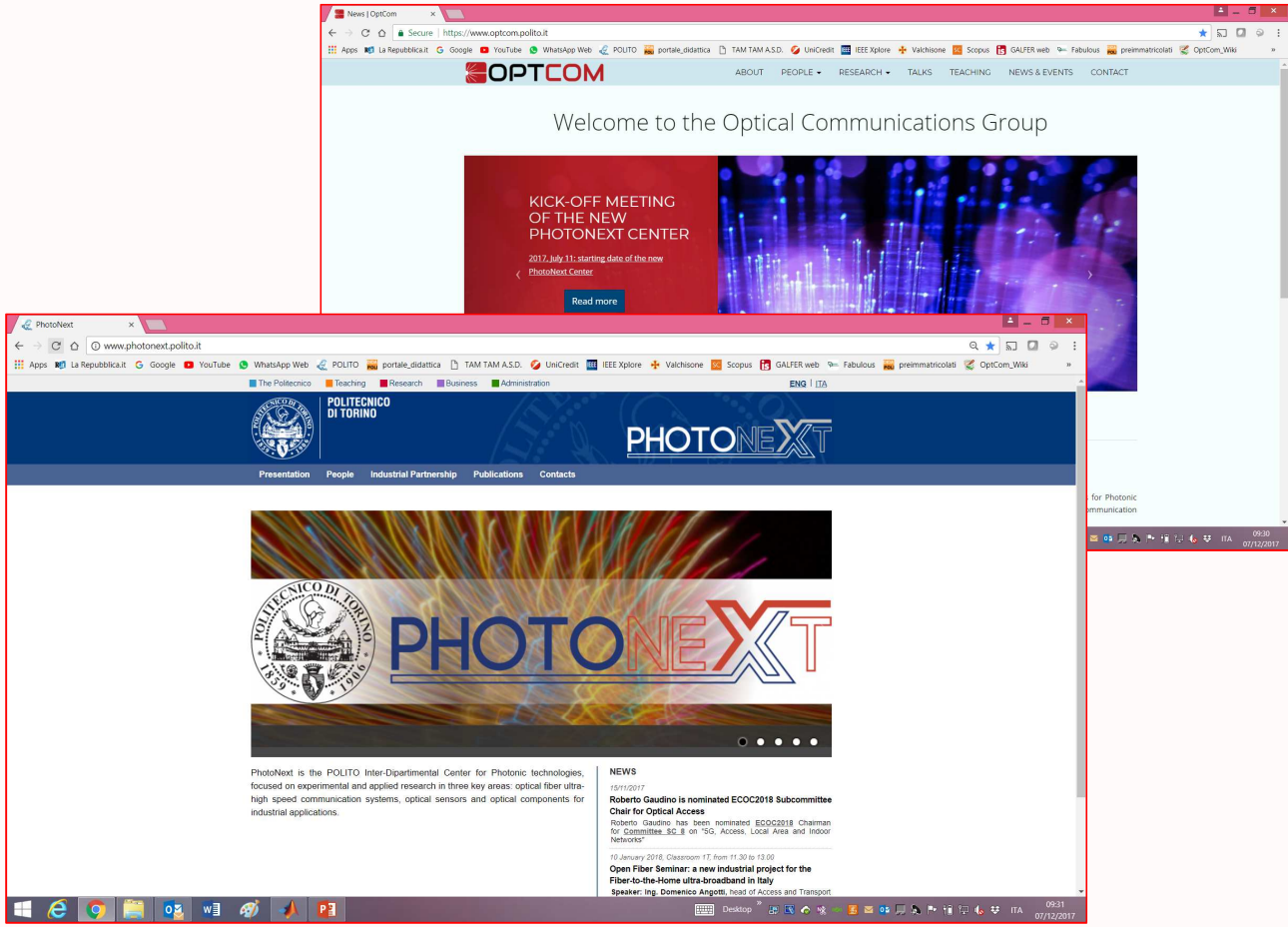
2017 December 17th

PHOTONEXT

…for information on our group activities

- Web site of the OptCom group: www.optcom.polito.it
  - The POLITO reference group for optical fiber communications
    - Pierluigi Poggiolini
    - Roberto Gaudino
    - Andrea Carena
    - Vittorio Curri
    - Gabriella Bosco
    - Valter Ferrero

- Web site of the PhotoNext Center: www.photonext.polito.it



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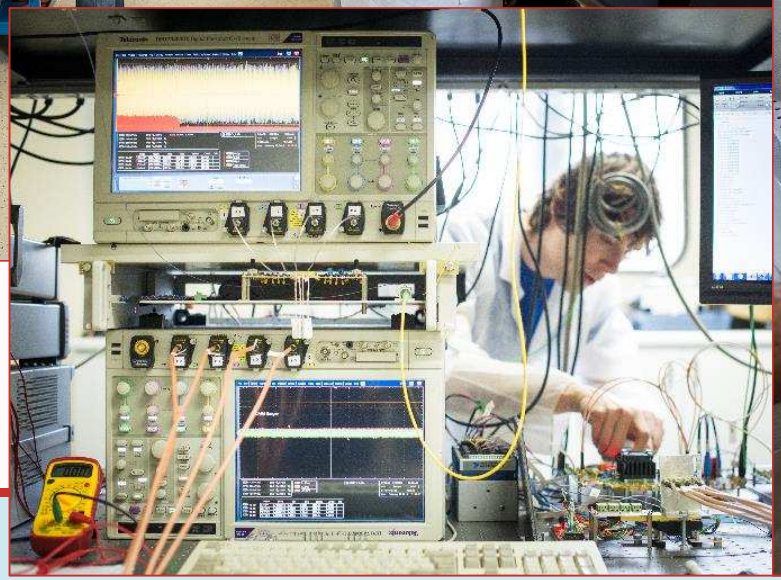
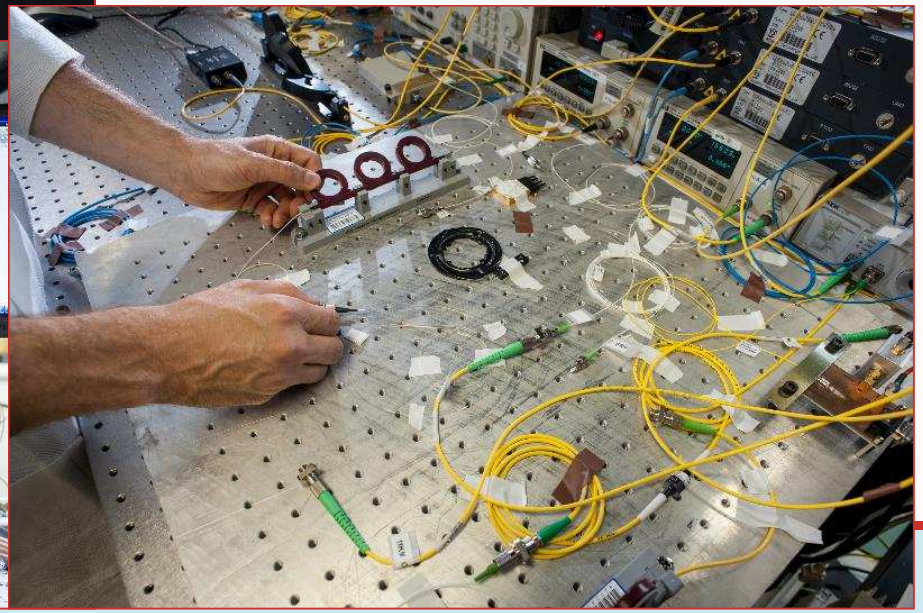
One of the 11 POLITO Interdepartmental centers
http://www.polito.it/ricerca/centri/

- PhotoNext is a large experimental laboratory on Photonics





The laboratory on Photonics

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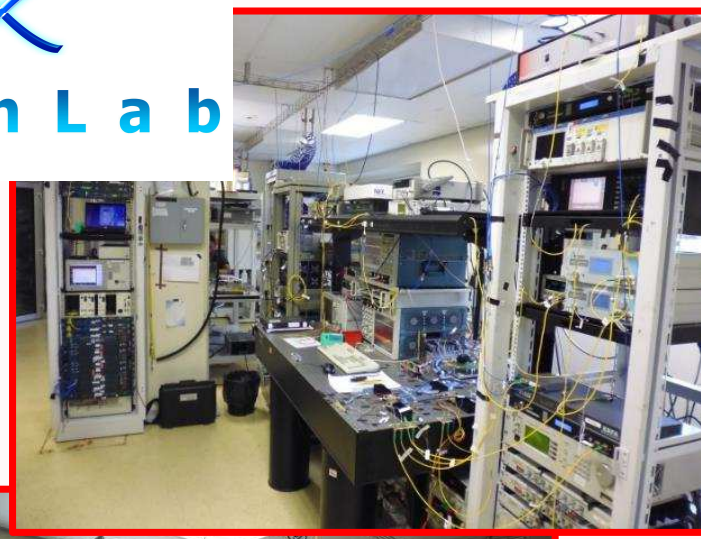
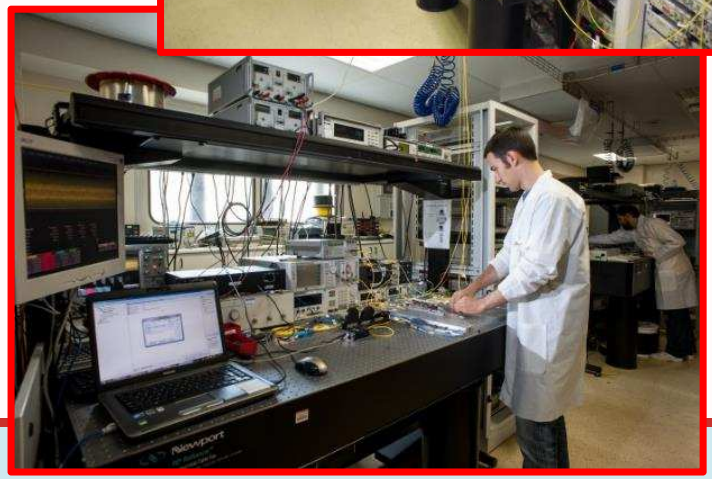
- PhotoNext will use the same spaces of the previously exhisting PhotonLab
  - PhotonLab was opened in 2002 thanks to another similar “big Lab” initiative@POLITO

PhotonLab



- PhotonLab is inside has a strong synergy with Istituto Superiore “Mario Boella” (ISMB)
  - A non-profit research center on ICT
    - POLITO is one of the two key founders
  - ISMB is focused on technology transfer (toward TRL 6)

ISMB Istituto Superiore Mario Boella



PhotoNext budget (1.8 M€ in 2017-2020)

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- Most of the budget will be used to acquire large experimental laboratory facilities

PhotoNext 2018 Best Thesis Award

- The PhotoNext Inter-Departmental Center is currently working on activating a “Best Thesis Award” for 2018
  - We are still working on it… further details at beginning of 2018

Very likely the prize will be a 3 month paid internship in our group during the end of the Thesis work… to be confirmed!

- The Award will be given in the “Day of Photonic” event

DAY OF PHOTONICS
21 OCTOBER ~~2016~~ → 2018

OPTCOM GROUP
THESIS PROPOSALS FOR 2018

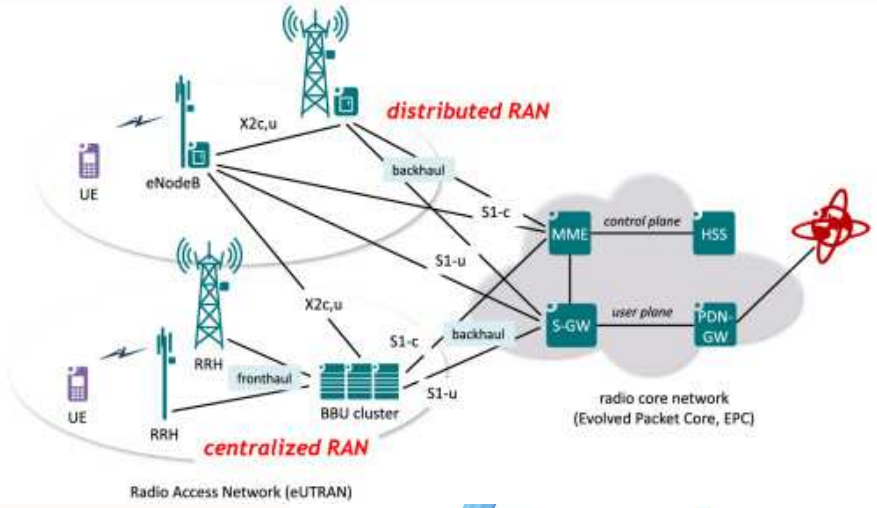
Fixed-mobile convergence on optical access networks

- **General area of interest**:
  - convergence of 5G physical layers for mobile networks and optical access networks

- **Specific work of this thesis**
  - Alternative solutions to transport 5G mobile ultra-broadband radio signal over access optical networks
    - Radio-over-Fiber (RoF approach)

- **Type of work**
  - Study of the 5G expected physical layer technologies (such as filtered OFDM)
  - Physical layer simulations using Matlab
  - Possibility for laboratory real experiments
  - At least six months full-time activity

- **Reference person**
  - Roberto Gaudino, roberto.gaudino@polito.it



Alternative modulation formats and equalization for short reach optical communications

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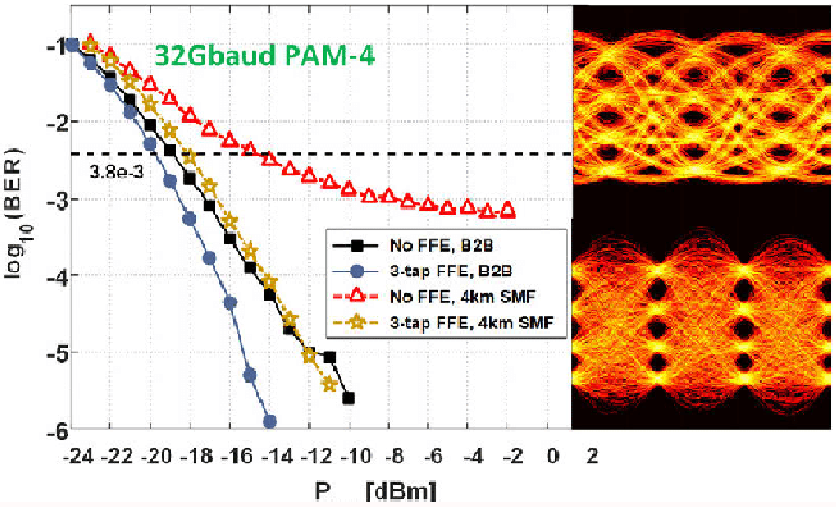
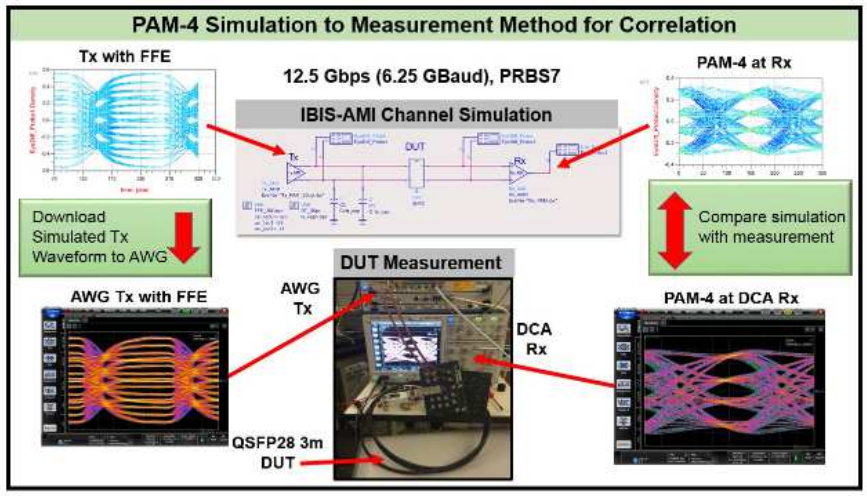
- **General area of interest**:
  - Ultra-high bit rate (from 50 to 200 Gbps) on a single wavelength on short reach optical systems
- **Specific work of this thesis**
  - Alternative modulation formats for ultra-high speed, low-cost direct detection short reach systems
- **Type of work**
  - Study of different kinds of modulations and equalization strategies
  - Physical layer simulations using Matlab
  - Possibility for laboratory real experiments
  - At least six months full-time activity
- **Reference person**
  - Roberto Gaudino, roberto.gaudino@polito.it
  - In collaboration with TIM (Telecom Italia) but carried out inside POLITO

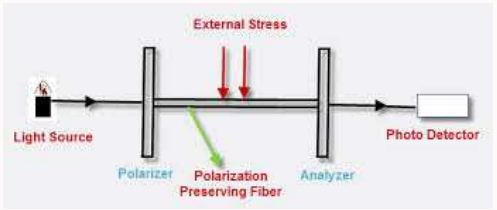


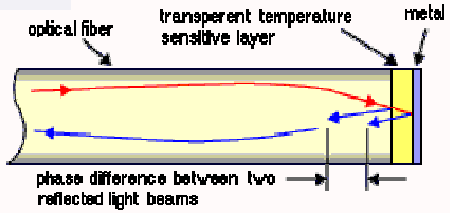


PHOTONEXT

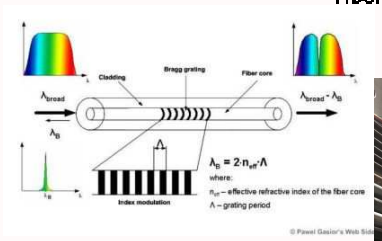
Optical sensors inside optical access networks

- **General area of interest**:
  - Inserting optical sensors inside existing optical access networks
    - Can we use “telecom fibers” also for sensing applications?
- **Specific work of this thesis**
  - The key questions to be investigated are:
    - What are the interesting applications? Such as: remote monitoring of long tunnels, disaster prevention in large cities, etc
    - Can existing optical sensors be remotely interrogated?
    - Is the techno-economic feasible?
- **Type of work**
  - Experimental activity in the lab
  - Practical measurements on optical sensors (for temperature, mechanical stress and vibrations)
- **Reference person**
  - Roberto Gaudino, roberto.gaudino@polito.it





Fiber Optic Temperature Sensor Using Phase Interference



Multi-subcarrier optical transmission

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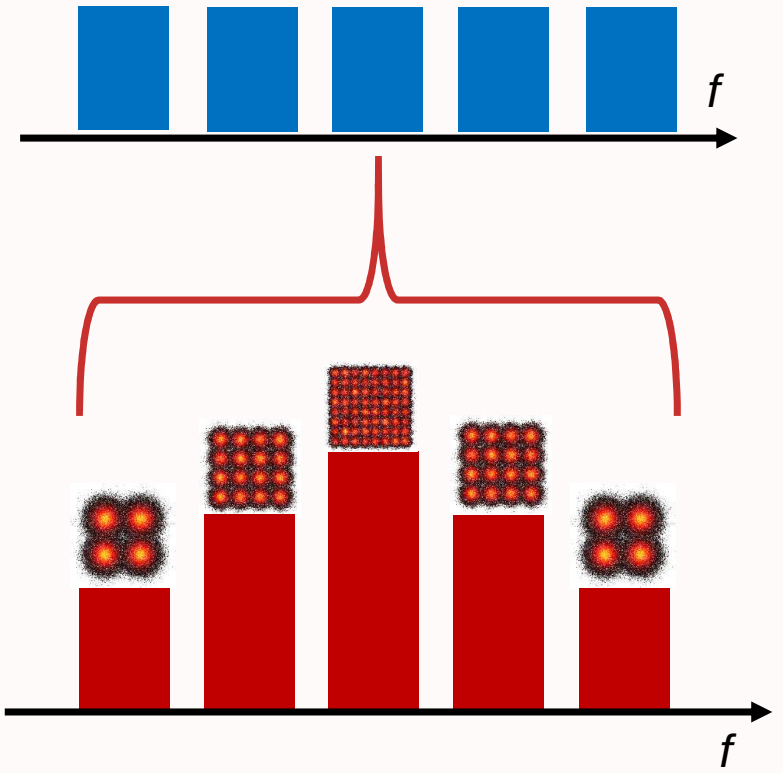
- **General area of interest**:
  - Long-haul (> 1000 km) high-capacity (> 10 Tbit/s) systems
- **Specific work of this thesis**
  - Control and performance optimization of an optical transmitter based on sub-carrier multiplexing
    - i.e. many closely spaced optical channels using frequency division multiplexing (FDM)
- **Type of work**
  - Study of different control algorithm for transmitter optimization
  - Physical layer simulations using Matlab
  - Possibility to analyze from real laboratory experiments
  - At least six months full-time activity
- **Reference person**
  - Andrea Carena, andrea.carena@polito.it

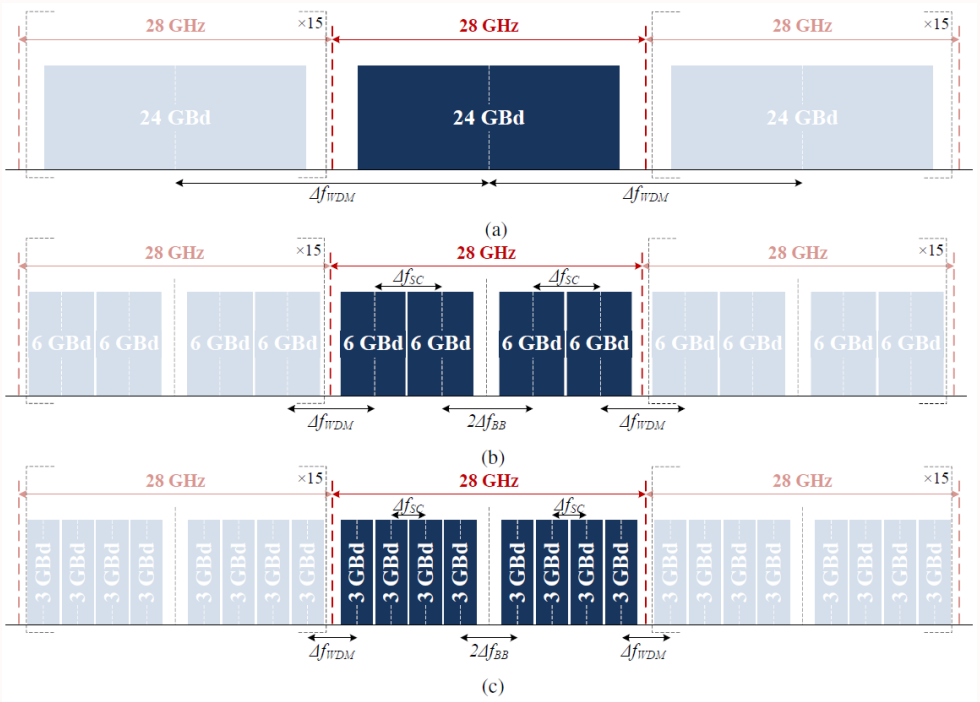
Optical multi-subcarrier systems



Mitigating NL distortions in long-haul transmission

- **General area of interest**:
  - Long-haul (> 1000 km) high-capacity (> 10 Tbit/s) systems
- **Specific work of this thesis**
  - Characterization and mitigation of non-linear interference (NLI)
- **Type of work**
  - Physical layer simulations using Matlab
  - Possibility to analyze from real laboratory experiments
  - At least six months full-time activity
- **Reference person**
  - Andrea Carena, andrea.carena@polito.it

Optical multi-subcarrier systems



Ultra-Long-Haul High Capacity Transmission

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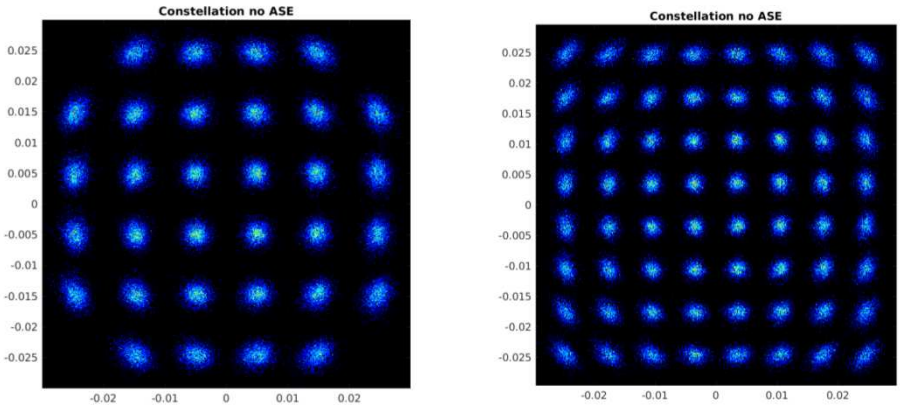
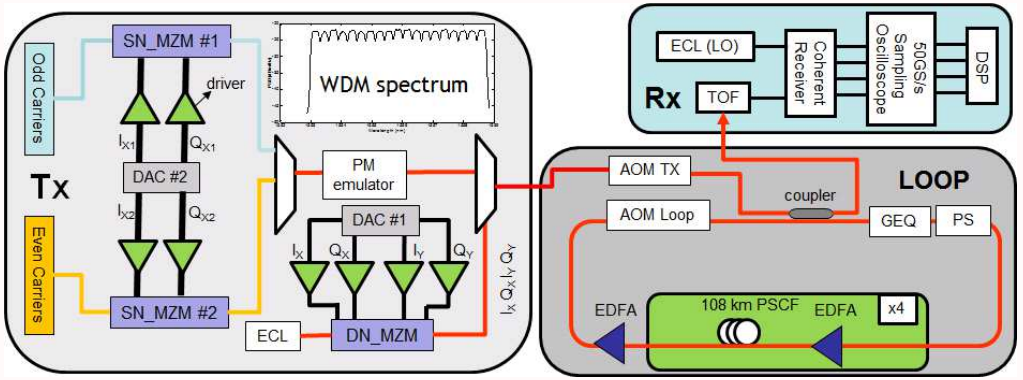
- **General area of interest**:
  - Ultra-high bit rate (from 100 to 1000 Gbps) on a single wavelength on long-haul optical systems

- **Specific work of this thesis**
  - modeling of fiber non-linear effects
  - non-linearity mitigation techniques
  - advanced transmission techniques
  - new super-high-capacity transmission media (multicore and few-mode fibers)

- **Type of work**
  - Study of different kinds of modulations and reception strategies
  - Physical layer modeling and simulations using Matlab
  - Possibility of cooperating on actual laboratory experiments
  - At least six months full-time activity

- **Reference person**
  - Pierluigi Poggiolini, pierluigi.poggiolini@polito.it
  - In collaboration with CISCO Photonics but carried out inside POLITO





experiment