ACTION 1: TELECOM

STEERING COMMITTEE 08/02/2018

- Faculty members: 6
  - Prof. Pierluigi Poggiolini, Full Professor
  - Prof. Gabriella Bosco, Associate Professor
  - Prof. Andrea Carena, Associate Professor
  - Prof. Vittorio Curri, Associate Professor
  - Prof. Roberto Gaudino, Associate Professor
  - Prof. Valter Ferrero, Assistant Professor

- Ph.D. students and post-docs: ≈10

OPTCOM @ PHOTONEXT
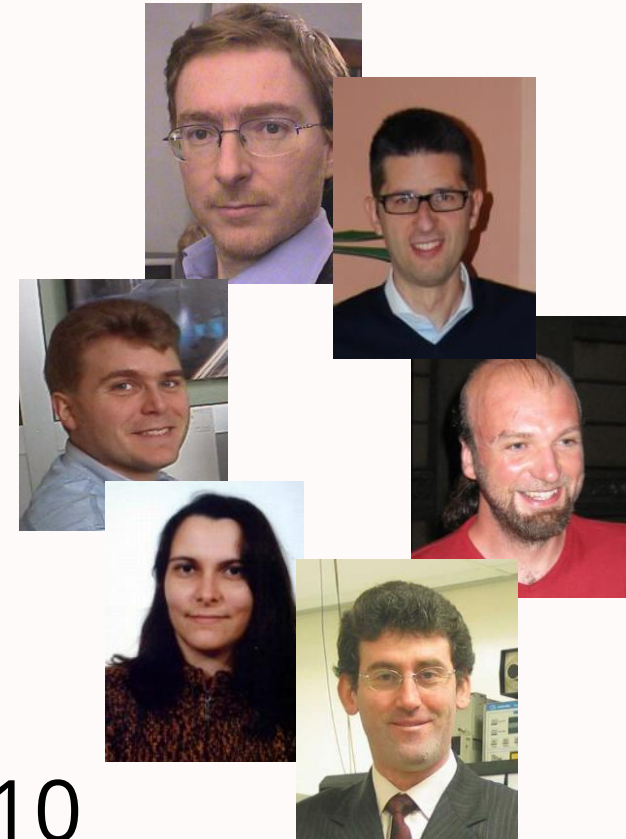
- Focus on <u>fiber optic communications from a system level perspective</u>

  - Our main interest are in the physical layer

    - Analysis of fiber propagation

    - Transmission techniques

- **<u>Two main research areas</u>**

  - Long haul and high capacity fiber systems

    - Capacity of 20-50 Tbit/s per fiber over very long distances (from 200 km to 9000 km)

  - Optical access networks and support to 5G networks

    - Short distance optical fiber systems

      - Optical access networks and support to 5G mobile (PON, 20 Km)

      - Ultra high-capacity transmission over short links (<2Km)

LONG HAUL AND HIGH CAPACITY FIBER SYSTEMS

- Simulation and modeling of nonlinear fiber propagation
  - OptCom members are involved in the development of OptSim (Synopsys product)
    - One of the few commercial simulators fully focused on fiber transmission systems

- Experimental demonstration of high-capacity long-haul system
  - From PM-QPSK to PM-64QAM
  - Probabilistic Shaping
  - Multi-Carrier Systems
  - Spatial Division Multiplexed system (SDM)
    - Multi-Mode and Multi-Core fibers

- Optical Network optimization using a cross-layer approach: joint optimization of physical and network layer

Short-reach optical networks

Three main areas of interest

- Plastic Optical Fiber (POF) for very short reach (100 meters) ultra low cost optical links

    - Under past EU projects on home networking, today likely more interesting for industrial applications

- Passive Optical Networks (PON)

    - Very high capacity Fiber To The Home (FTTH) networks

        - Currently working on next generation solution for PON (research with TIM for 25Gbps solutions over PON)

    - Recently, we have started to work also on fixed-mobile convergence over optical access networks

- Short reach, direct detection links

    - Toward 100+ Gbps per lambda inside data center

COLLABORATIONS

- ISMB: joint lab / joint projects
- Industrial partners
  - Component and system vendor
    - Cisco, Oclaro, SM-Optics, Sumitomo Electric
  - Software vendor
    - Synopsys
  - Telecom operators
    - TIM, Orange

- Academic/Institutional
  - Several EU and extra-EU universities and research institutes

- Cisco Photonics

- Telecom Italia (TIM)

- OCLARO

- Synopsis

- SM Optics

- Most of these activities are carried out
  - Experimentally in PhotoNext
  - In close collaboration with the Applied Optics team at ISMB

- EU H2020 "Marie Curie" Individual Fellowship action
  - Call: H2020-MSCA-IF-2017, deadline September 2017
  - On distributed optical sensing in access networks
  - POLITO Budget: 168.277,20 €
    - One Post-doc for 2 years

- EU H2020 "Marie Curie" Innovative Training Networks (ITN)
  - Call: H2020-MSCA-ITN-2018, deadline Jamuary 2018
  - On fronthauling for "beyond 5G" fixed-mobile convergence
 - POLITO budget: 522.999,36 €
    - Two PhD students, 3 years each
- Andrea, che tu sappia c'è qualcos'altro di dichiarabile???

- MIUR PRIN Project

- AVALON (Principal Investigator R. Gaudino)
  - On alternative usage of Optical Access Networks
    - Sensing and optical monitoring
    - Time and frequency distribution
    - Radio over fiber (for radar applications)
    - Quantum key distribution

- Andrea, aggiungi il tuo

- **MAIN GOAL for PhotoNext year 1**
  - **Achieve capability for <u>running transmission experiments at 64 Gbaud</u>**
    - **That means complex "telecom" signals "digitally changing" every 15 picoseconds!**
  - **Achieve capability to generate multiple signals in parallel**
    - **For the new trend of "Space Division Multiplexing" (SDM)**

- Before PhotoNext:
  - we have the capability to run experiments up to symbol-rates of 32 Gbaud, with some limitations
  - SDM capabilities only after important tricks

ARBITRARY WAVEFORM GENERATOR (AWG)

- **Requirements**
  - **4 channels**
  - **Sampling rate >80 GSa/s**
  - **Bandwidth >32 GHz**

- Tender procedure closed on December 2017
  - And the winner is…

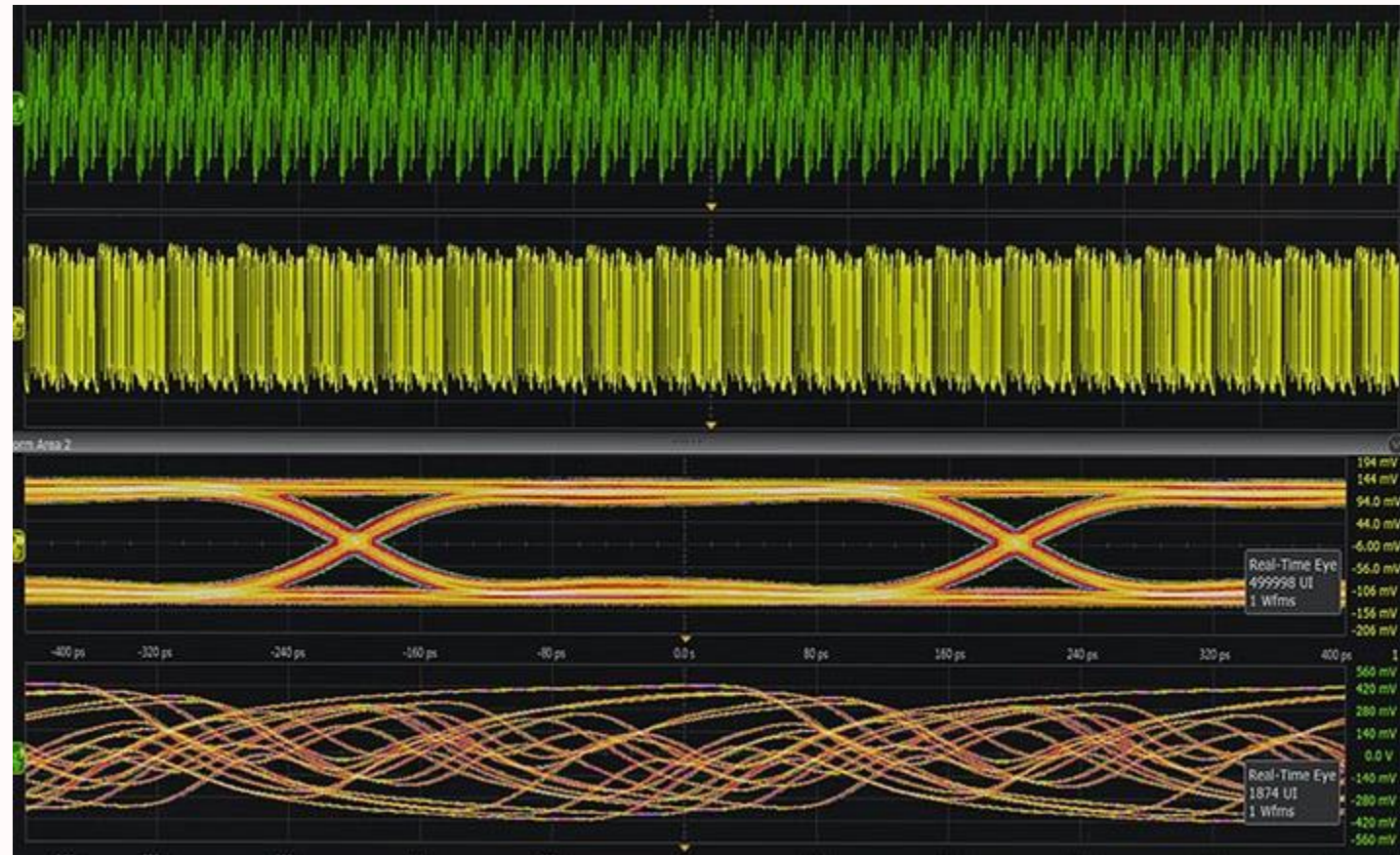- We saved more than 50 kEuro with respect to budget plans
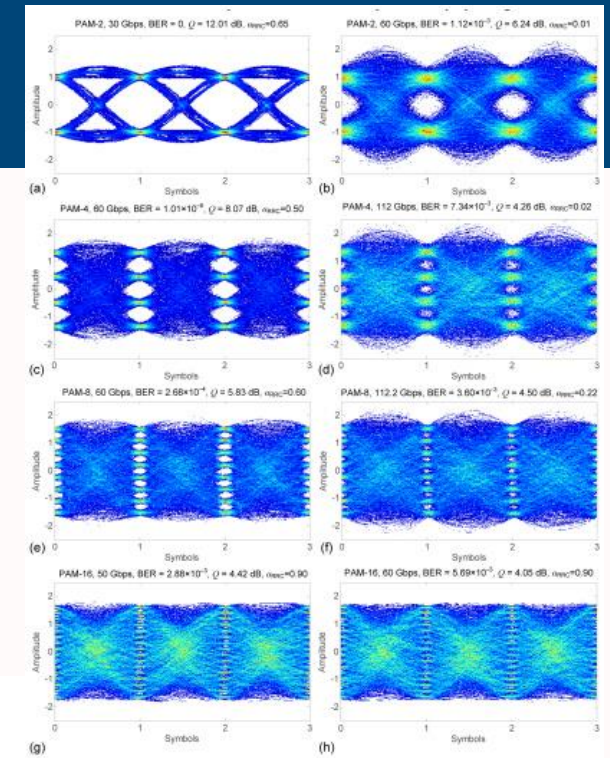
Keysight Technologies
M8196A 92 GSa/s Arbitrary Waveform Generator

REAL-TIME OSCILLOSCOPE (RTO)

- **Requirements**
  - 4 channels
  - Sampling rate >150 GSa/s
  - Bandwidth >60 GHz

- Tender procedure to be closed by February 15th

PUBLICATIONS: FOCUS ON OFC 2018

OptCom@OFC18

OptCom will present the following 12 contributions at next OFC in San Diego, CA from March 11, 2018 to March, 15 2018

- Gabriella Bosco, "Flexible Transponders and the Rate/Reach Trade-off," Tutorial Paper M1G.1, Monday, March 12 from 8:00 AM to 9:00 AM

- Mattia Cantono, Stefano Piciaccia, Alberto Tanzi, Gabriele Maria Galimberti, Brian Smith, Marcello Bianchi, Vittorio Curri, "A Statistical Assessment of Networking Merit of 2MxN WSS," Oral Paper M1A.3; Monday, March 12 from 8:30 AM to 8:45 AM

- Mattia Cantono, Jean-Luc Auge, Vittorio Curri, "Modelling the Impact of SRS on NLI Generation in Commercial Equipment: an Experimental Investigation," Oral Paper M1D.2; Monday, March 12, 9:00 AM to 9:15 AM

- Gert Grammel, Vittorio Curri, Jean-Luc Auge, "Physical Simulation Environment of The Telecommunications Infrastructure Project (TIP)," Oral Paper M1D.3; Monday, March 12 from 9:15 AM to 9:30 AM

- Fernando Guiomar, Luca Bertignono, Antonello Nespola, Pierluigi Poggiolini, Fabrizio Forghieri, Andrea Carena, "Combining Probabilistic Shaping and Nonlinear Mitigation: Potential Gains and Challenges," Oral Paper M3C.3, Monday, March 12 from 3:00 PM to 3:15 PM

- Antonello Nespola, Sean Anderson, Paolo Savio, Dario Pilori, Luca Bertignono, Matt Traverso, Mark Webster, Fabrizio Forghieri, Roberto Gaudino, "Real-Time Demonstration of Polarization-Multiplexed PAM using Compact Silicon Photonics Device,"Oral Paper Tu2C.6; Tuesday, March 13 from 3:30 PM to 3:45 PM

- Dario Pilori, Fabrizio Forghieri, Gabriella Bosco, "Residual Non-Linear Phase Noise in Probabilistically Shaped 64-QAM Optical Links," Oral paper M3C.6; Monday, March 12 3:45PM to 4.00 PM

- Mattia Cantono, Fernando Guiomar, Andrea Carena, Vittorio Curri, "Networking Benefit of Multi-Subcarrier Transceivers," Oral Paper Tu3E.1; Tuesday, March 13 from 4:30 PM to 4:45 PM

- Brian Taylor, Gilad Goldfarb, Saumil Bandyopadhyay, Vittorio Curri, Hans-Juergen Schmidtke, "Towards a Route Planning Tool for Open Optical Networks in the Telecom Infrastructure Project," Oral Paper Tu3E.4; Tuesday, March 13 from 5:30 PM to 5:45 PM

- Pierluigi Poggiolini, Gabriella Bosco, Andrea Carena, Fernando Guiomar, Mahdi Ranjbar Zefreh, Fabrizio Forghieri, Stefano Piciaccia, "Non-Linearity Modeling at Ultra-High Symbol Rates," Oral Paper W1G.3; Wednesday, March 14, 9:00 AM to 9:15 AM

- Mattia Cantono, Dario Pilori, Alessio Ferrari, Andrea Carena, Vittorio Curri, "Observing the Interaction of PMD with Generation of NLI in Uncompensated Amplified Optical Links," Oral Paper W1G.4; Wednesday, March 14 from 9:15 AM to 9:30 AM

- Celestino Sanches Martins, Luca Bertignono, Antonello Nespola, Andrea Carena, Fernando Guiomar, Armando Pinto "Efficient Time-Domain DBP using Random Step-Size and Multi-Band Quantization," Oral Paper W3A.5, Wednesday, March 14 from 3:45 PM to 4:00 PM

OFC

The Optical Networking and Communication Conference
11 – 15 March 2018
San Diego Convention Center, San Diego, California, USA

- Find skilled young researchers!
- Prosecute the existing research activities

- New directions for the near future
  - Space division multiplexing on novel fiber types
  - Alternative usage of Optical Access Networks
    - Link with the "optical sensing" PhotoNext team (see later)

PHOTONEXT

Grazie per l'attenzione!

Per ulteriori informazioni:

www.photonext.polito.it

info.photonext@polito.it

Linked in   https://goo.gl/PVx4GY