



# Development of new POF transmission technologies within the EU-IST-project POF-ALL

Speaker: Bernd Offenbeck

[www.ist-pof-all.org](http://www.ist-pof-all.org)

- Project structure
- WP 1 activities
- WP 2 activities
- Conclusion
- Contacts

---

# Project structure

- POF-ALL is a research project inside EU Sixth Framework Program, in the IST branch (Information Society Technologies), in call “Broadband for all”
  - **POF-ALL** means:
    - “**P**aving the **O**ptical **F**uture with **A**ffordable **L**ightning-fast **L**inks”
  - Duration: 01/2006 – 06/2008 (30 mo.)
  - Total Cost: €2.6 m
  - EC Contribution: €1.6 m
  
- The POF-ALL “motto”:
  - “*POF-ALL shall develop a technology based on Plastic Optical Fiber (POF) to allow delivery of 100+ Mbit/s symmetrically to residential users at costs far lower than existing alternatives.*”

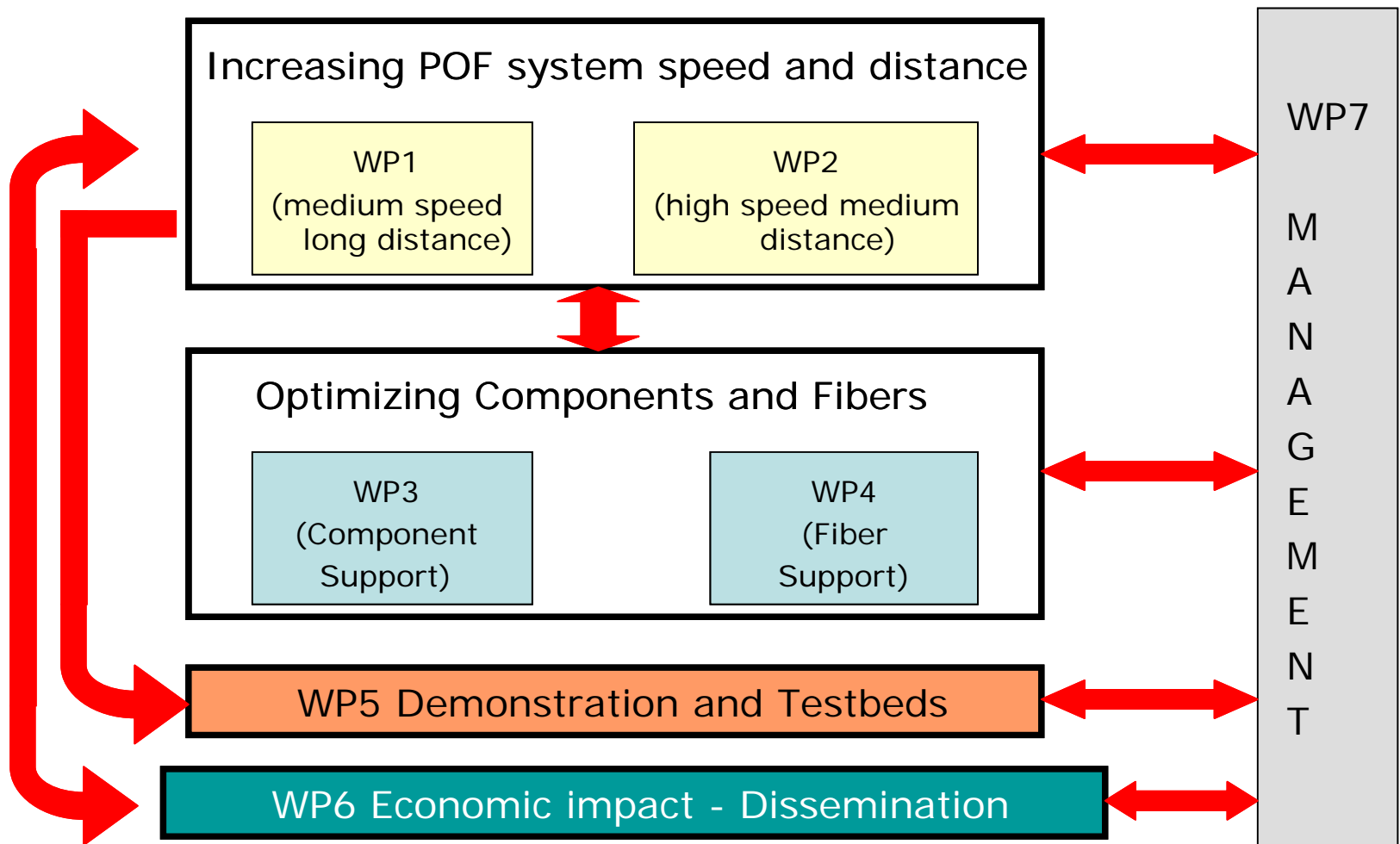


1. *Istituto Superiore "Mario Boella" (Italy)*
2. *Luceat SpA (Italy)*
3. *DieMount GmbH (Germany)*
4. *Plastic Optical Fiber Application Center (Germany)*
5. *Fraunhofer Institute (Germany)*
6. *Universität Duisburg-Essen (Germany)*
7. *Technische Universiteit Eindhoven (The Netherlands)*
8. *Fastweb SpA (Italy)*
9. *STMicroelectronics (Italy)*



Fraunhofer  
Institut  
Integrierte Schaltungen





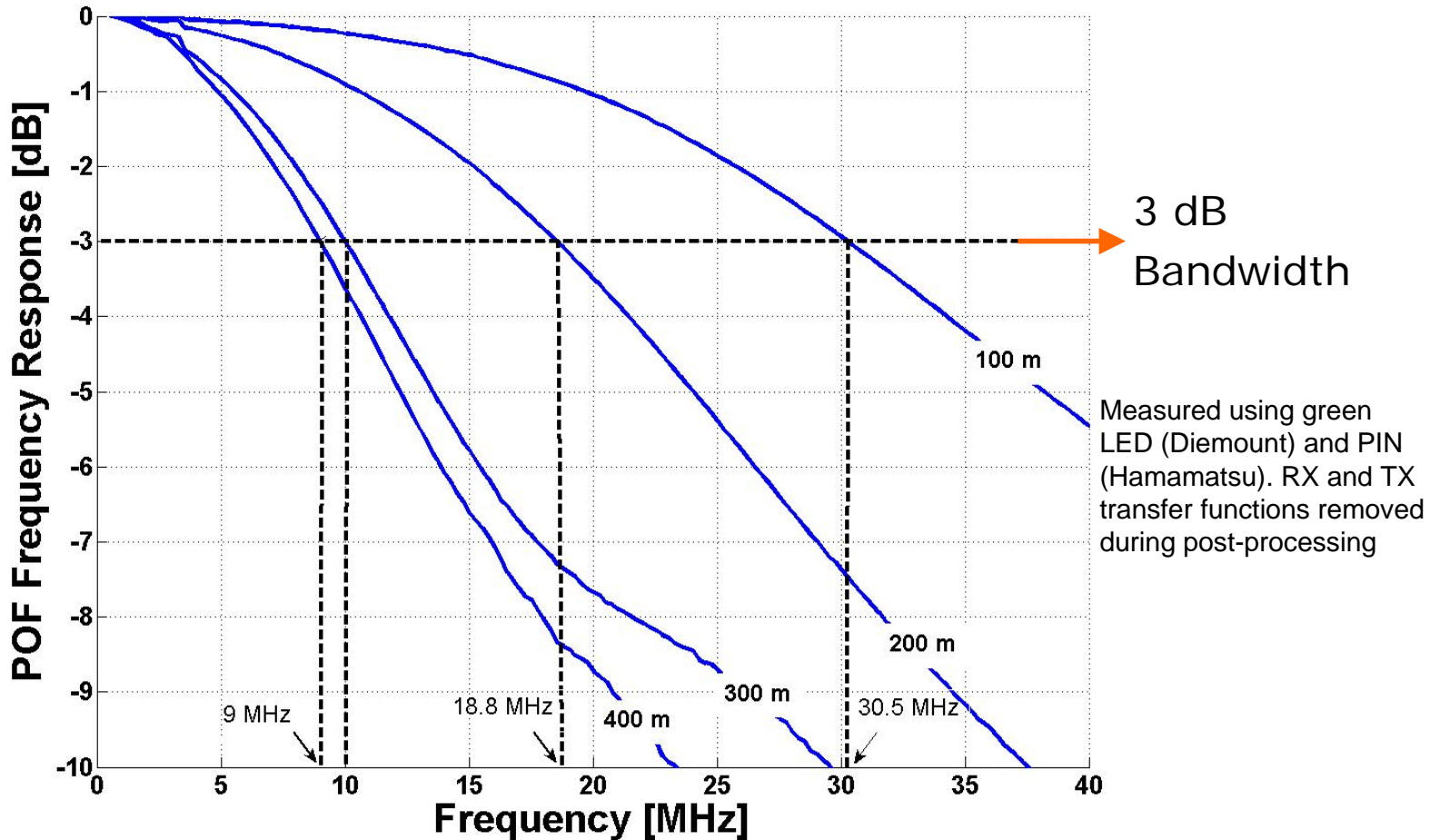
---

# WP 1 activities

## *WP1 – Advanced transmission techniques for 100 Mbit/s over long distances (300+ m)*

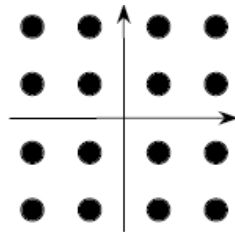
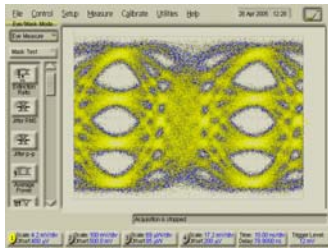
- This workpackage focuses on standard 1mm SI-PMMA-POF
- The approach is quite innovative and different from usual approaches in POF (and even GOF)
- Most efforts in WP1 are, in fact, focused on digital signal processing at the transmitter and receivers, in order to overcome bandwidth limitation and noise accumulation

- 1 mm SI-POF bandwidth measurement over long distance

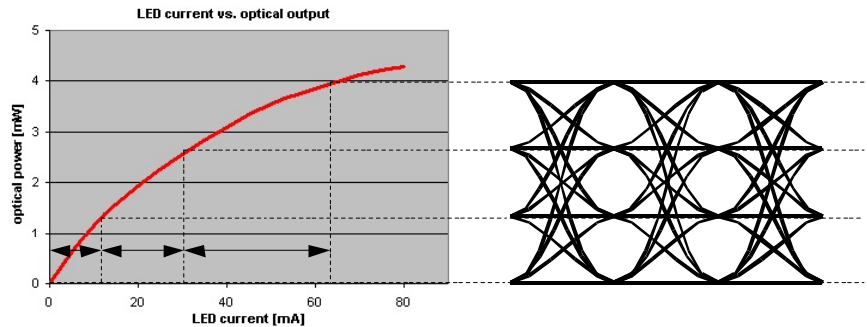


Bandwidth limitation of fiber

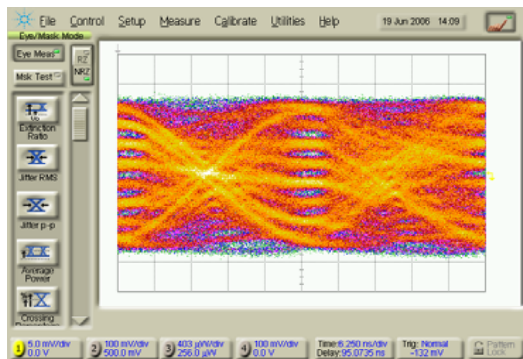
Solution: Coding



Linearity of devices (LED)  
Solution: Digital pre-distortion



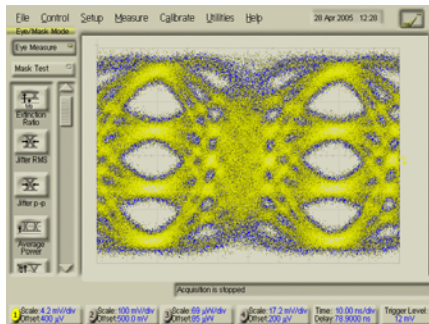
Attenuation of fiber, noise  
Solution: Forward-Error Correction



33MBaud  
8PAM  
signal  
after  
250 m of  
POF

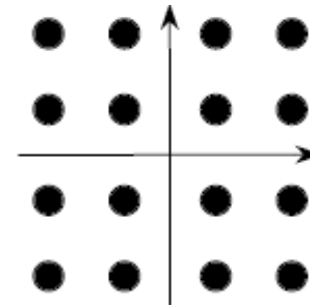
## ISMB

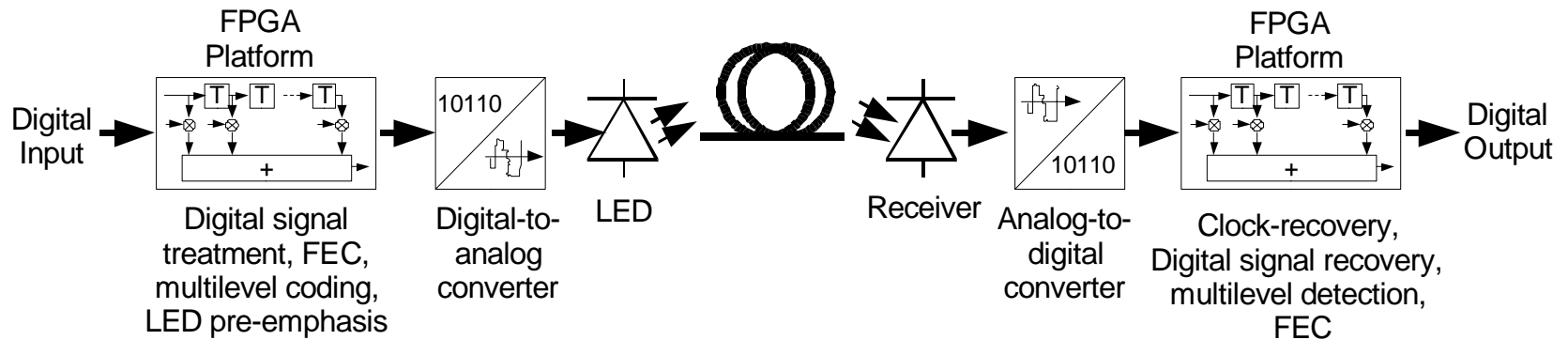
Baseband modulation formats  
4-PAM, 8-PAM and similar amplitude-modulation formats



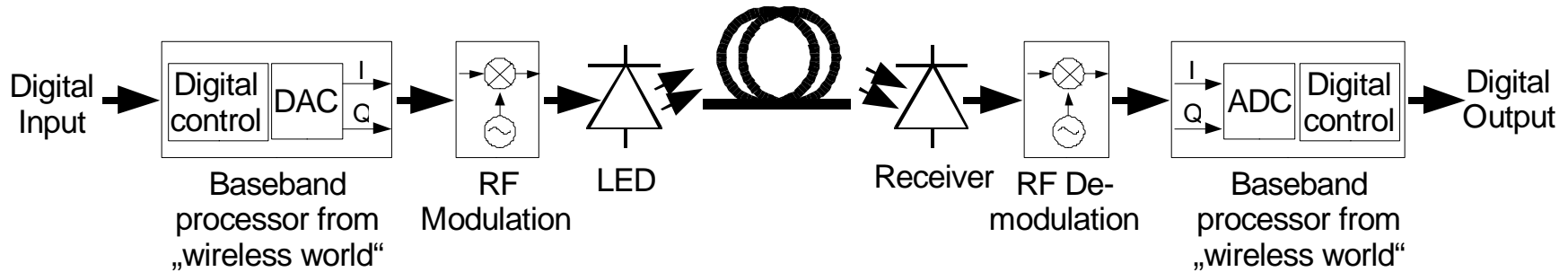
## Eindhoven University of Technology

Quadrature-like modulation formats  
QPSK, QAM-x





- Complete signal processing is done in digital domain on FPGA platform
- Different coding schemes, error correction mechanisms, etc. can be simply tested by changing software
- Implementation in application specific IC (ASIC) will be evaluated for future cheap mass production



- A “baseband processor”, a mass product from the “wireless world” is used. It already contains all necessary stages like digital logic, ADC etc.
- Different ways of “RF-modulation” techniques are examined to transmit the signal either in baseband or on a high-frequency carrier

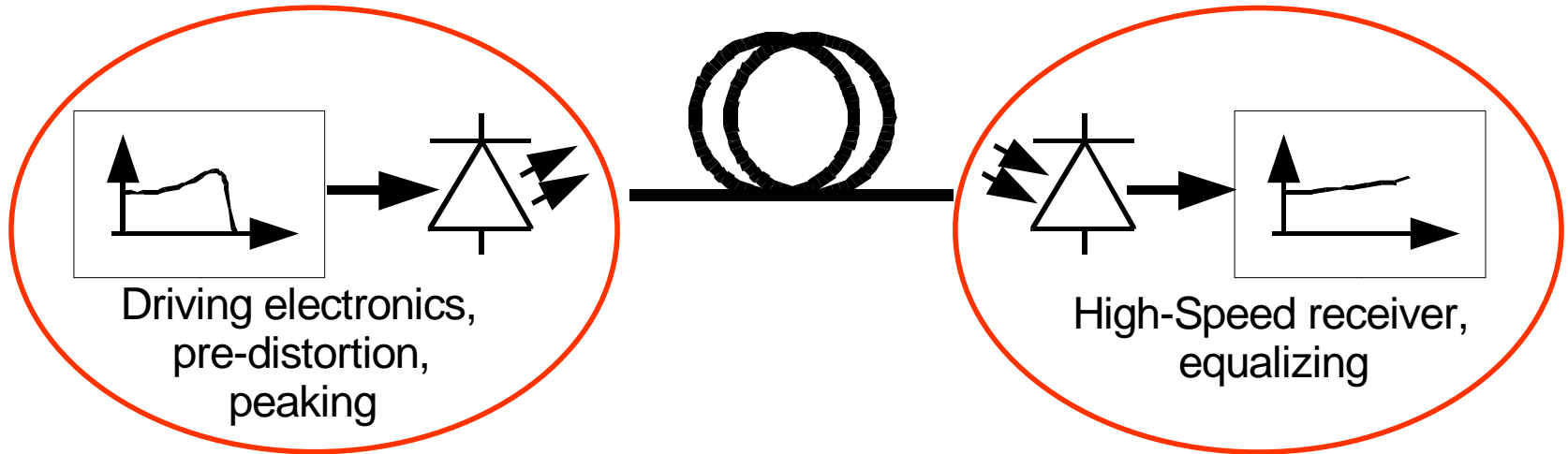
---

# WP 2 activities

## *WP2 – Module conception and transmission experiments of high speed data transmission over medium distances*

- Target is 1 Gbit/s (or more) over at least 100 meters, still large core POF
- A “high-speed, large-core” fiber will be used, e.g.:
  - OM-Giga (Optimedia)
  - Multi-Core POF (Asahi)
- The approach will be more “traditional”, and thus mostly focused on optimization of optoelectronic components
- Analog transmission (Radio-over-fiber) will also be investigated

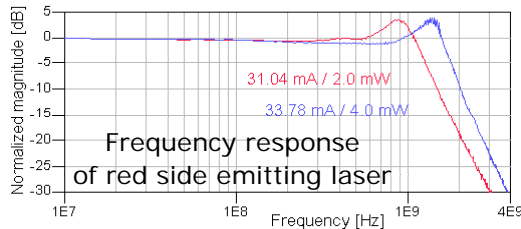
Work is focused on optimization of optoelectronic components and driving circuitry and test of the link



- Pre-distortion circuitry to increase speed of lasers / LEDs
- Test of new devices (e.g. red VCSELs)
- Analysis of linearity and HF-behavior concerning radio-over fiber (RoF)
- Comparison of different receiver circuitry & new concepts
- Increase of speed of large-area photodiodes

## Workpackage 2 & 3

### Evaluation of light-sources

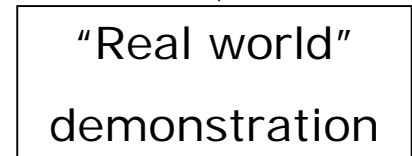
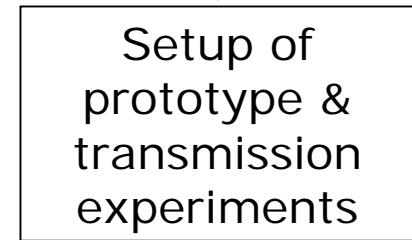
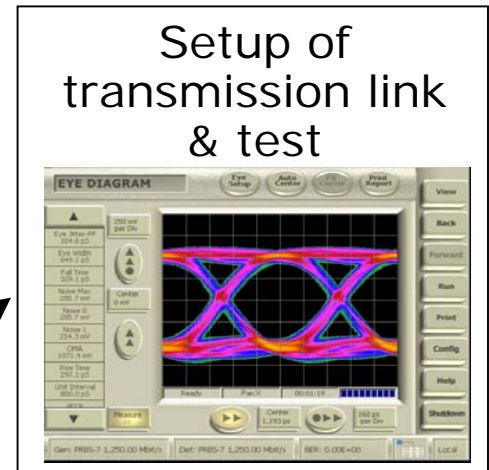
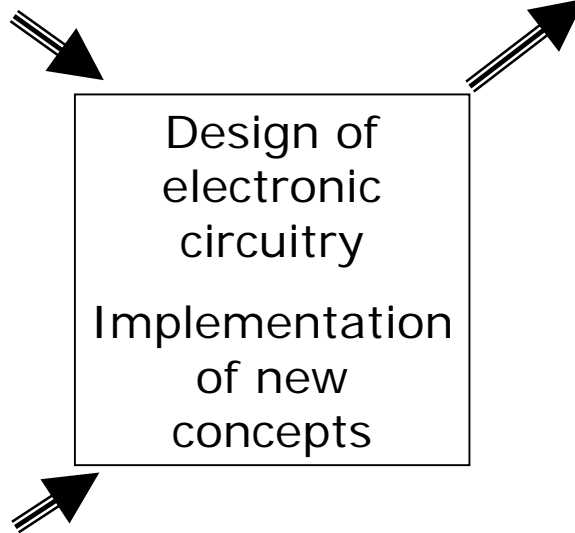


e.g. red VCSEL, side emitting laser, LED

### Evaluation of large-area receivers



e.g. Photodiode in Die-Mount concentrator



# Conclusion

- In conclusion, the project has the following targets:
  - 100 Mbit/s transmission over 200+ meters using standard PMMA SI-POF
  - 1Gbit/s+ transmission over 100+ meters, sticking with large core POF
  - Demonstration and dissemination of POF technologies
  
- The technical research will always be carried out having in mind the very low-cost requirement of this market
  - Later on, cost studies will be carried out in WP6

# Contacts



- WEB site: [www.ist-pof-all.org](http://www.ist-pof-all.org)

- For any info regarding the project: [info@ist-pof-all.org](mailto:info@ist-pof-all.org)

- To contact the POF-ALL coordinator  
Dr. Roberto Gaudino  
E-mail: [gaudino@polito.it](mailto:gaudino@polito.it)

Thank you for your attention.

Please visit the "POF-Booth" on the "Systems"  
Hall 5, A5.125