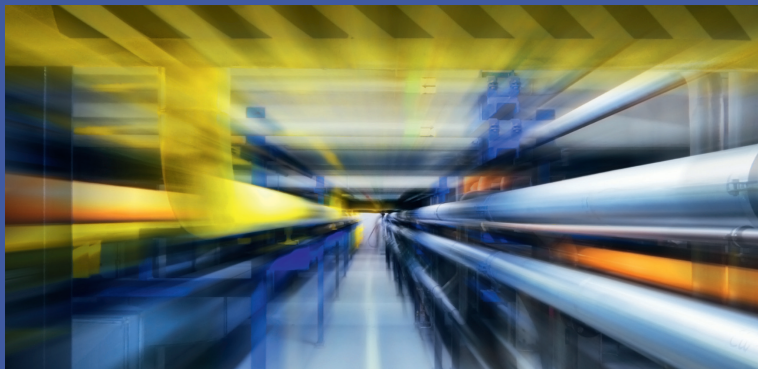




# A TEST SYSTEM FOR A FAST DATA TRANSMISSION LINE

Proposal approved by Helmholtz Alliance Detector Board



**Tobias Flick, Uni Wuppertal**  
**Ingrid-Maria Gregor, DESY**  
**Andreas Kugel, ZITI, Uni Heidelberg**  
**Dirk Wiedner, Uni Heidelberg**



3rd Annual Meeting  
Helmholtz Allianz "Terascale"  
11 – 13 November 2009  
DESY, Hamburg



# INTRODUCTION

- High-bandwidth radiation hard data-links are crucial readout components for future detector designs and upgrades (sLHC/LC).
- Radiation hard multi-GBit/s optical link has started at CERN -> GBT Project
- In all cases the links have to undergo a severe testing procedure.



- German groups working on radiation hard or radiation tolerant data-links with bandwidths of up to 10 GBit/s
  - electrical and optical components inside a severe radiation environment
  - data transmission for network purposes in trigger farms

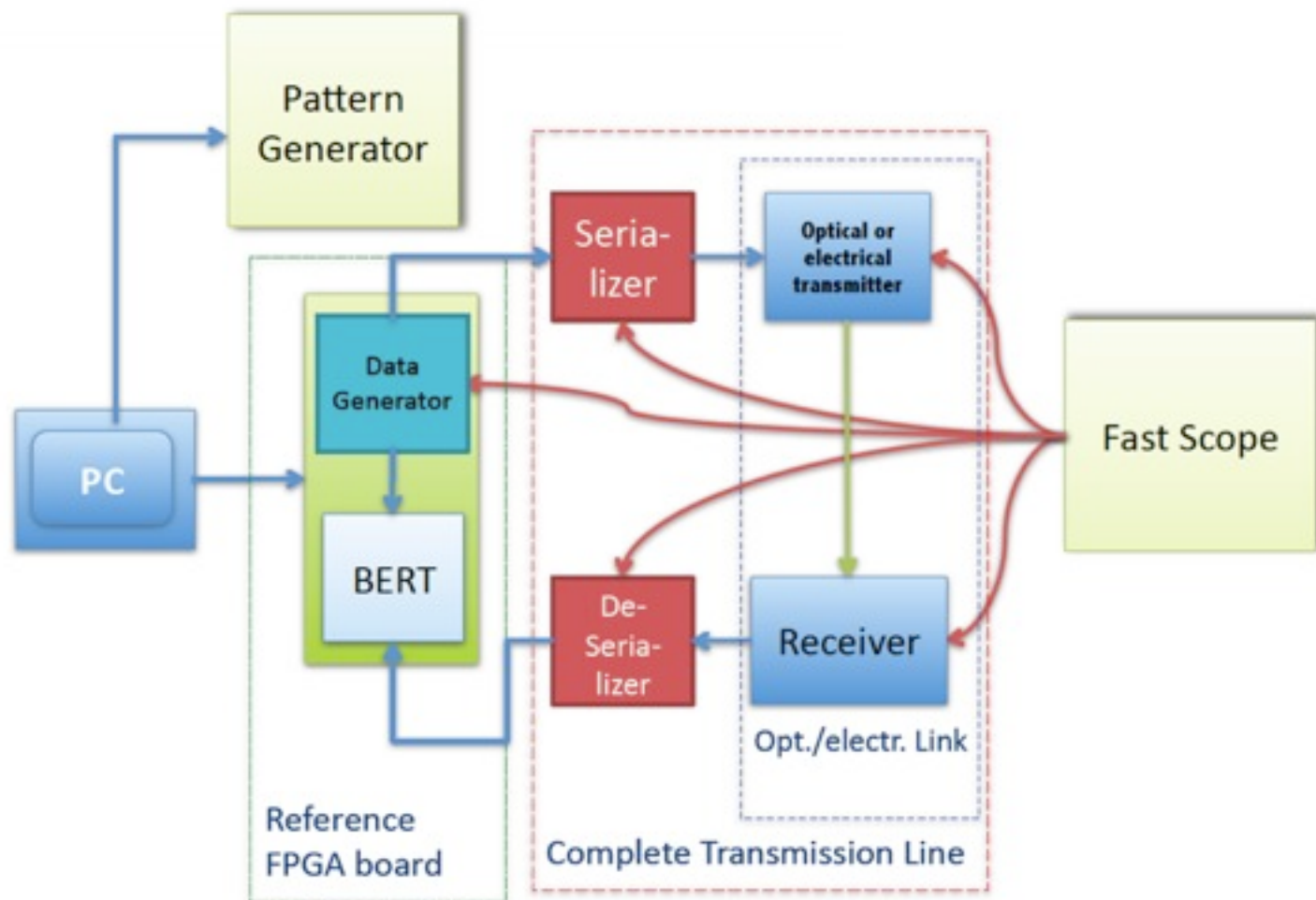


# SCOPE OF TEST SYSTEM

- to test and qualify fast data transmission link components (electrical and optical)
- capable to cope with a bandwidth higher than 10 Gbit/s
- used to test the different parts of the link individually or as a full system.
  
- Usage
  - during irradiation tests to qualify the radiation tolerance
  - to develop the target system embedding,
  - to stress-test the data-transmission.
  
- Stress-tests will check the link operation
  - in the foreseen temperature,
  - voltage and clock jitter range,
  - the test of error free data transmission and error correction,
  - and the transmission of the data with a given signal quality.



# OVERVIEW FAST LINK TESTER





## Receiving Part

- data analysis
  - High speed oscilloscope
  - FPGA implemented Bit Error Rate Tester (BERT)

- data generation
  - precision commercial pattern generator (systematic studies)
  - embedded in FPGA (protocol)
- driving the data into the link.
- electrical to optical conversion (for optical links)

- full system full digital functionality is provided with only the FPGA implemented pattern generator
- allows copies and distribution in institutes
- pattern generator and oscilloscope are travelling items



# NEXT STEPS

- Proposal submitted in July -> requested 100kEUR
  - Pattern generator 25 kEUR
  - Modular adapter boards 5 kEUR
  - FPGA generator/receiver 10 kEUR
  - Oscilloscope (12 GHz) 60 kEUR
- Granted 30kEUR will cover the FPGA boards and partially other needed material
- 2010 -> prototype of FPGA board (Heidelberg)
- 2010/11 -> production of complete system and copies (Wuppertal)
- -> set up at DESY
- Pattern generator and oscilloscope can probably be funded via institute resources

