

INtelligent, Fast, Interconnected and Efficient devices, for frontier exploitation in Research and Industry

Funding Scheme: FP7-PEOPLE-2012-ITN

Grant Agreement number: 317446

Project acronym: INFIERI



DELIVERABLE NAME: Design of a novel Optical Wireless Communication link applied to Particle Physics Tracking detectors.

DELIVERABLE REF. N°: 3.2

WORK PACKAGE: 3

NATURE OF THE DELIVERABLE: R= Report, P = Prototype, D = Demonstrator, O = Other

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DELIVERY DATE FROM ANNEX 1: M24

DISSEMINATION LEVEL: RE, CO

PU = Public N/A IN THE INFIERI CONTEXT

PP = Restricted to other programme participants (including the Commission Services) N/A IN THE INFIERI CONTEXT

RE = Restricted to a group specified by the consortium (including the Commission Services) **HIGHLY SUGGESTED IN THE INFIERI CONTEXT**

CO = Confidential, only for members of the consortium (including the Commission Services) **HIGHLY SUGGESTED IN THE INFIERI CONTEXT**

Abstract: We are aiming to develop novel high speed (2.5 Gb/s) Optical Wireless Communication (OWC) link for particle detectors in High Energy Physics (HEP). We considered Compact Muon Solenoid (CMS) at CERN LHC, where we will provide OWC link between inner layers of silicon strip

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Period covered: from 01/02/2013 to 31/01/2017

Project website: <http://infiere-network.eu>

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sensors to outer layer. The proposed OWC can provide high data rates while it can also result in reduction of the complex optical fiber network.

We started with selection of source wavelength of 1550nm and tolerance to misalignment study of different beam waist collimators. 2.5 Gb/s OWC setup is designed by performing simulations using ray tracing software. We have successfully demonstrated experiment of OWC system with 2.5 Gb/s data rate at 10 cm transmission distance using VCSEL at 1550nm and photodiode with ball lens. Our next aim is to develop a prototype of OWC link.

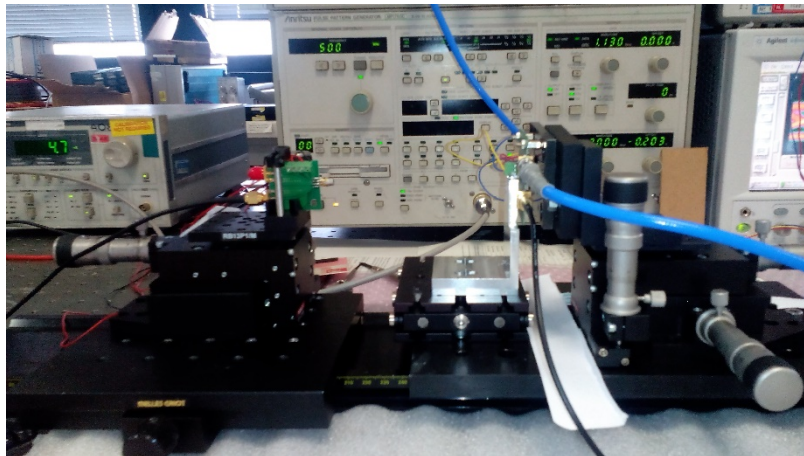


Figure 1 2.5 Gb/s OWC Setup at 10 cm distance.

Talks

- [1] Presentation on “Optical Wireless for data transmission” 1st INFIERI Summer school Oxford July 2013
- [2] PhD introductory presentation, 3rd INFIERI Workshop Madrid January 20-22 2014.
<https://indico.cern.ch/event/281636/contribution/3/8/material/slides/1.pdf>
- [3] Presentation on “Optical wireless multi-gigabit data transfer for CMS silicon tracker” 3rd INFIERI Workshop Madrid January 20-22 2014.
- [4] Presentation on “Feasibility of Optical Wireless transmission systems for CTA” 3rd INFIERI Workshop Madrid January 20-22 2014.
- [5] PhD progress report presentation for midterm review, 4th INFIERI Workshop Amsterdam December 2014.

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- [6] Presentation on "Lab Test For OWC at SSSA and CERN Secondment prospects" 5th INFIERI Workshop Geneva April 27-29 2014
- [7] Presentation on "Recent Progress in Optical Wireless Communication" 5th INFIERI Workshop Geneva April 27-29 2014
- [8] Presentation on "SSSA ESR WP3 progress report and perspectives" 6th INFIERI Workshop Pisa October 27th-29th 2015.

Poster Presentations

- [1] W.Ali., "High Speed Data Transmission and Processing" , at the 2nd International Summer School on "Intelligent Signal Processing for Frontier Research and Industry, INFIERI2014, Paris, July 14-25, 2014; <https://indico.cern.ch/event/305730/session/28/contribution/74/material/slides/0.pdf>
- [2] W.Ali, "High Speed Data Transmission and Processing", at 4th "Intelligent Signal Processing for Frontier Research and Industry" (INFIERI) Workshop Amsterdam (The Netherlands) December 10-12, 2014. <http://infieri-network.eu/sites/default/files/PosterWajahatAli.pdf>
- [3] W. Ali et al, " Optical Wireless Communication System for Particle Detectors in High Energy Physics" 13th Pisa Meeting Isola d'Elba May 24th-30th 2015.
- [4] W.Ali et al, "2.5 Gb/s Optical Wireless Communication Systems for Particle detectors in High Energy Physics", 3rd International Summer School on "Intelligent Signal Processing for Frontier Research and Industry, INFIERI 2015, Hamburg, September 14-25, 2015;

Publications:

- [1] Giulio Cossu, Ali Wajahat, Raffaele Corsini, Ernesto Ciaramella, "5.6 Gbit/s Downlink and 1.5 Gbit/s Uplink Optical Wireless Transmission at Indoor Distances (≥ 1.5 m)" Optical Communication (ECOC, 2014), 40th European Conference and Exhibition on Sept. 2014.
- [2] W. Ali et al., "High Speed Optical Wireless Data Transmission System for Particle Sensors in High Energy Physics" INFIERI Proceedings (To be published in Journal of Instrumentation)
- [3] W. Ali, et.al., "Optical Wireless Communication System for Particle Detectors in High Energy Physics" doi:10.1016/j.nima.2015.10.058
- [4] Giulio Cossu, Wajahat Ali, Raffaele Corsini, and Ernesto Ciaramella, "Gigabit-class optical wireless communication system at indoor distances (1.5 – 4 m)," Opt. Express 23, 15700-15705 (2015)

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