



E-NEWSLETTER n° 3

Microelectronic Single-Photon 3D Imaging Arrays for low-light high-speed Safety and Security Applications

MiSPiA

Project 257646

Contact

Name: Prof. Zappa Franco
Tel: +39 (0)2 2399 6149
Fax: +39 (0)2 2399 3699
E-mail: franco.zappa@polimi.it

Affiliation and Address:

PoliMI - Politecnico di Milano
DEI - Dip. Elettronica e
Informazione
Piazza Leonardo da Vinci 32-I
20133 Milan ITALY

www.mispia.eu



PARTNERS



INTRODUCTION

MiSPiA aims to develop advanced microelectronic SPAD array chips able not only to count single photons (“single-photoncounting”), but also to accurately tag them with their arrival time (“single-photon timing”) and so provide a full image (“single-photon imaging”) of the object under investigation. Therefore, MiSPiA aims to conceive, develop and fabricate photonic and microelectronic technologies for cost-effective manufacturing of very fast, highly sensitive, two-dimensional (2D) and three-dimensional (3D) SPAD cameras running at higher speed than standard video-rate.

Project progress towards MiSPiA objectives

During the **first year** of the project the Consortium has reached the following most important results objectives:

- definition of the requirements for long-range 2D intruder imaging;
- definition of the designs and layouts of the first test-structures to be used for the fabrication of the SPAD-structure and the smart pixel to be used in this project;
- designed and fabricated several different types of SPAD detector;
- tested the best processing steps for optimizing optical and electrical SPAD performance;
- characterized all test structures and measured all main performance like Photon –detection Efficiency, Dark-Count Rate, Afterpulsing, and Timer jitter;
- identified the most promising SPAD structures and the trade-offs among performances and also versus the operating condition (mainly the excess bias);
- designed the “analog” front-end electronics, and the overall smart-pixels and mini arrays for 2D imaging, based on photon-counting;
- started the fabrication smart pixels and mini-arrays for 2D imaging.

NEWS & EVENTS

We invite YOU to visit our website

www.mispia.eu

MiSPiA participation to Exhibitions and Workshop

- **23 August 2010** QEP 19 Conference (UK);
- **25 October 2010** EOS Annual Meeting;
- **28 October 2010** Frontiers in Optics (USA);
- **January 2011** MiSPiA Workshop (Israel);
- **23 January 2011** SPIE Photonics West Conference (USA);
- **22-27 January 2011** SPIE Photonics West 2011 Exhibition (USA);
- **27 January 2011** IS&T/SPIE Electronic Imaging 2011 (USA);
- **27 April 2011** SPIE Defence Security and Sensing 2011 (USA);
- **01 May 2011** CLEO QELS Conference 2011 (USA);
- **23-26 May 2011** Laser World of Photonics 2011 Exhibition (Germany);
- **5 June 2011** IEEE Intelligent Vehicles Symposium 2011 Workshop (Germany).

During the **second year** of the project the results reached are:

- Design and fabrication of smart-pixels and miniarrays for iTOF and dTOF 3D ranging
- Testing of smart-pixels and miniarrays for 2D imaging
- Testing of smart-pixels and miniarrays for 3D ranging
- Design and fabrication of prototype illuminator for laboratory iTOF 3D ranging tests
- First laboratory test of iTOF 3D ranging
- Design and fabrication of final FrontSPAD arrays for dTOF and iTOF 3D ranging
- Definition of BackSPAD process
- Design and fabrication of test structures for BackSPAD detectors

