

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



**3D cameras, based on the measurement of the Time-of-Flight of single photons by means of Single-Photon Avalanche Diode imagers, for automotive safety driving and security surveillance application**

MiSPIA will develop beyond state-of-the-art photonics technology for array imagers of smart-pixels able to detect single photons. Intelligent in-pixel pre-processing will simultaneously provide ultra high sensitivity (single-photon level), very high frame-rate (up to 200,000fps) and advanced multi-spectral (300-900nm) three-dimensional (3D) distance ranging and two-dimensional (2D) imaging of fast moving objects. MiSPIA detectors will be used in two key applications: long-range (200-1,000m) 2D and 3D active identification in low light level surveillance operations; and very fast (over 200fps) short-range (10-50m) 3D monitoring in automotive pre-crash safety systems. Instead of (slow and noisy) CCDs and CMOS active pixels (with poor sensitivity and noisy electronics), MiSPIA will exploit the ultimate performances of truly-single photon detectors: the Single-Photon Avalanche Diodes (SPAD). MiSPIA imagers will be based on four different SPAD smart-pixels: "photon-counting" pixels for 2D imaging; LIDAR pixels for 3D direct "time-of-flight" (dTOF); two different phase-sensitive pixels for 3D indirect time-of-flight (iTOF) depth acquisitions. Full-size imager chips will be manufactured, characterized and eventually integrated into two 3D ranging cameras deployed into the two end-users applications for validation. MiSPIA technologies will be both highly-advanced and cost-effective: a high-voltage 0.35µm CMOS processing for front-side illuminated imagers; and a new flipped-chip Silicon-on-Insulator (SOI) CMOS technology for back-side illuminated imagers. Both will prove beyond state-of-the-art co-integration of photonic SPAD detectors and CMOS microelectronics for intelligent and dense 2D imaging and 3D ranging high-performance cameras. Such cameras will provide imaging at the quantum limit and on-chip pre-processing at the most effective speed at a drastic reduction of manufacturing costs, down to 5€ per imager chip. The developments of the MiSPIA Project will be published on the official website [www.mispia.eu](http://www.mispia.eu).

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## Participants

Coordinator: POLITECNICO DI MILANO, ITALY

## Participating partners:

Organisation	Country
POLITECNICO DI MILANO	ITALY

## Project ID card

- Funded under: [Information and Communication Technologies](#)
- Area: ICT-2009.3.7 - Photonics
- Total Cost: €3.40m
- EU Contribution: €2.63m
- Project Reference: 257646
- Execution: From 01/06/2010 to 31/05/2013
- Project status: Running
- Contract type: Information and Communication Technologies CP Collaborative Project

## Links

- [MiSPIA](#)

## Multimedia

- [Poster](#)  
JPG | 1740 kBytes

## News

- [E-newsletter 2011](#)  
01/07/2011
- [MISPIA news](#)  
01/01/2011

## Publications

- [FP7-257646-MISPIA:](#)

<b>FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V</b>	GERMANY
<b>EMZA VISUAL SENSE LTD</b>	ISRAEL
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Last update: 12/12/2011

[Press Releases \(First\)](#)  
 2 | 5030 kBytes |  
 13/08/2010

- [MISPIA Leaflet](#)  
 PDF | 6842 kBytes |  
 07/12/2011
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