

PROJECT

## **2WIDE\_SENSE**

### **WIDE spectral band & WIDE dynamics multifunctional imaging SENSOR Enabling safer car transportation**

**Funding:** European (7th RTD Framework Programme)

**Duration:** Jan 2010 - Dec 2012

**Status:** Complete with results

**Total project cost:** €5,022,526

**EU contribution:** €3,200,000



**Call for proposal:** FP7-ICT-2009-4

[CORDIS RCN : 93770](#)

#### **Background & policy context:**

The White Paper on EU Transport Policy for 2010 states a key objective: 50% reduction of casualties due to road accidents by the end of 2010. Improvements on road safety are achievable through increasing the EU market penetration of eSafety systems, currently limited by performance and cost of sensor technologies. According to ICT-2009.6.1, 2WIDE\_SENSE addresses research challenges in the area of Intelligent Vehicle Systems for further improving road safety. This includes advanced in-vehicle safety systems with improved performance and reduced costs.

#### **Objectives:**

The project aimed at providing the European automotive industry with the next generation of imaging sensors beyond the current CMOS imagers. The core sensing technology is a cost-effective InGaAs focal plane array with wide spectral response (VIS-NIR-SWIR) and wide dynamic range (120dB). The benefits deriving from the additional SWIR bandwidth allow enhancing preventive safety functions and car energy efficiency.

The specific objectives are:

- implementation of the paradigm of application independent multifunctional camera;
- hybridisation of InGaAs detector on silicon read out circuits;
- deposition of low cost interferential bandpass optical filters at pixel level;
- design of AR coatings and plastic lenses;
- development of multi-spectral wide dynamic range camera engine;
- algorithm development for predictive road status monitoring;
- sensor validation adapting existing ADAS software platforms (LDW, NV, HBA, TSR, VRU);
- synergies and complementary actions with on-going and new projects in FP7 on road safety.

The innovations claimed are:

- wide dynamic range and wide spectral response InGaAs focal plane array;
- collective process for hybridisation, including the substrate removal step, of InGaAs arrays on silicon read-out circuit;
- use of wide spectral band cameras in safety applications;
- cost-effective large spectrum plastic lenses;
- road status monitoring for preventive and active safety.

#### **Methodology:**

Project activities:

Requirements and Specifications: aimed to provide the foundations for the development of the sensor addressed in the project. Starting from the application scenarios, the sensor requirements and specifications will be defined.

FPA Development: aimed to develop a InGaAs Focal Plane Module at a VGA format with extension of the spectral sensitivity in the visible range, and to implement at the pixel level filters in order to get information in at least 3 spectral bands. A way to develop an affordable device will be to reduce the pitch of the array, hence a 15µm pitch will be considered.

Camera development: aimed to supply State of the Art cameras for initial camera integration and testing; develop a new and high performance camera engine integrating a novel SWIR sensor (based on InGaAs technology with extension of the spectral sensitivity in the visible range and specific filters at the pixel level); develop and implement a FPGA based pre-processing algorithms for the functional control of the imager as well as the image processing pipeline for visualization; design and fabrication of a low cost objective working in the VIS-SWIR spectral range.

Multifunctional and multispectral image sensor: the objectives were the definition of the concept design of the multifunctional image sensor; the definition of ice and water absorption wavelengths bandwidths and selection of the optical filter pattern; the definition of the physical model characterizing the water/ice SWIR radiation absorption and development of the software algorithm to implement the road condition monitoring function; the adaptation of the ADAS software platforms (to integrate the LDW, HBA and night vision functions); the adaptation of low level code of TSR and VRUs detections to the new sensor; and finally, the testing and verification of the hardware components, the sub-modules and the camera module.

Evaluation and validation: during the last year of the project, the technologies developed inside 2WIDE\_SENSE will be demonstrated in real-life applications:

- Setting up of a vehicle demonstrator
- Execution of indoor and outdoor tests
- Validation and demonstration activities to assess the multifunctional and multispectral image sensor functionalities with respects to the defined baseline performances.

### **Parent Programmes:**

[FP7-ICT - Information and Communication Technologies](#)

**Institute type:** Public institution

**Institute name:** European Commission

**Funding type:** Public (EU)

### **Lead Organisation:**

#### **lil-V Lab**

**Address:**

1 AVENUE AUGUSTIN FRESNEL CAMPUS POLYTECHNIQUE  
91767 PALAISEAU CEDEX  
France

**Organisation Website:**

<http://www.3-5lab.fr>

**EU Contribution:** €940,428

### **Partner Organisations:**

#### **Universita Degli Studi Di Parma**

**Address:**

VIA UNIVERSITA 12  
43100 PARMA  
Italy

**Organisation Website:**

<http://www.unipr.it>

**EU Contribution:** €451,852

#### **Centro Ricerche Fiat - Societa Consortile Per Azioni**

**Address:**

Strada Torino, 50  
10043 ORBASSANO (TO)  
Italy

**Organisation Website:**

<http://www.crf.it>

**EU Contribution:** €117,848

**Adasens Automotive GmbH****Address:**

Oberhof  
88138 Weissensberg  
Germany

**EU Contribution:** €446,868

**Raptor Photonics Ltd****Address:**

Willowbank Business Park Unit  
Larne  
BT40 2SF  
United Kingdom

**EU Contribution:** €487,000

**New Imaging Technologies Sa****Address:**

IMPASSE LA NOISETTE - ZA DES GODETS 1  
91370 VERRIERES LE BUISSON  
France

**Organisation Website:**

<http://www.new-imaging-technologies.com>

**EU Contribution:** €486,184

**Optec Spa****Address:**

Via Scavini  
28100 Novara  
Italy

**EU Contribution:** €269,820

**Technologies:**

Sensor technologies  
Next generation imaging sensors

**Development phase:** Validation

**Key Results:**

The study does not demonstrate any final results yet as it is still ongoing at the time of publishing this text. However, it has borne intermediate results, including:

- Requirements, specifications and test cases for the imaging sensor.
- Functional, optical, mechanical specifications with respect to the target objectives for the Road condition sensor concept design.

- The design optimisation of the New Focal Plane Arrays (FPA). This was improved in terms of reliability of dark current and spectral quantum efficiency in the visible range.
- The functional, optical and mechanical specifications of camera module featuring WDR and VIS-SWIR spectral sensitivity enhancing night vision applications (as SWIR allows better perception at night and in critical atmospheric conditions)
- The adaptation of ADAS SW platform and algorithms to include the night vision function.
- A cost analysis to demonstrate the cost-efficiency of the solution.

## Strategy targets

An efficient and integrated mobility system: Acting in transport safety: saving thousands of lives

Documents:

 [D1.1 - Sensor requirements and specifications.pdf \(Other project deliverable\)](#)

**STRIA Roadmaps:** Cooperative, connected and automated transport

**Transport mode:** Road transport

**Transport sectors:** Passenger transport, Freight transport

**Transport policies:** Safety/Security

**Geo-spatial type:** Other