

**Project Number:** 223989  
**Funding scheme:** STREP

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**Web site**

[www.icu-eu.com](http://www.icu-eu.com)

**Timeline**

Start Date: May 1<sup>st</sup>, 2008  
 End Date: October 31<sup>th</sup>, 2010

**Budget**

Overall Cost: 3.094.970 €  
 Funding: 2.028.882 €

**Project Partners**

- KTH-Royal Institute of Technology, SE
- ACREO AB, SE
- Infineon Technologies Sensor AS, NO
- Autoliv Development AB, SE
- Umicore NV, BE
- Vrije Universiteit Brussel, BE

**Vision & Aim**

The objective of ICU is to develop the core photonic components for a Far Infrared (FIR) camera module aimed at high volume automotive Night Vision Enhancement Systems (NVE) of the future. FIR imaging provides a high-contrast signal for warm (living) objects. This makes FIR systems very attractive for the detection of living objects and thereby helping to reduce fatalities and injuries. However, the cost of FIR NVE for automotive use must come down significantly to enable high volume fitment rates. At the same time they need to be capable of detecting a person from a distance of up to 120 m.

The photonic components developed in ICU include an infrared lens system, an infrared bolometer array, a wafer-level vacuum package and the component assembly. The infrared components are matched to achieve optimum cost and performance. The functionality of the individual photonic components can be evaluated in a combined system or alternatively independent of each other.

The essential novelty in ICU are infrared bolometer arrays made of a new, mono-crystalline SiGe/Si quantum well material, providing increased temperature coefficient of resistance (TCR) and improved 1/f noise properties as compared to state-of-the-art infrared bolometers. The bolometers will be manufactured using heterogeneous 3D MEMS integration that is compatible with standard MEMS foundry services. A low-cost wafer-level vacuum packaging process will be developed that can consistently achieve vacuum levels in the sealed cavities on the order of 0.001 mbar. The system will be the first application of multilevel diffractive optics in FIR, with the added feature that the optics can be integrated in the package using MEMS-based 1st level camera integration. Furthermore the developed lenses will be compatible with low-cost processes and lens material.