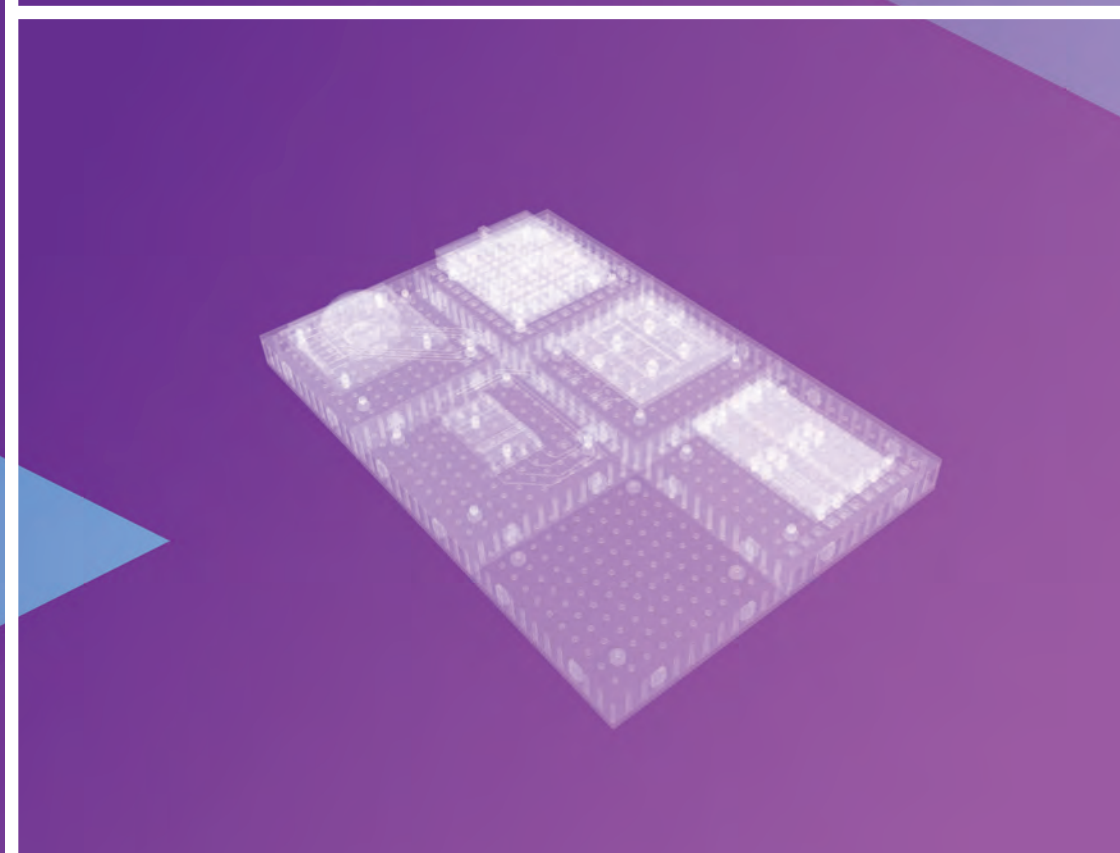


Multi-Material Sensor Demonstrator



Areas of Application

	Industry & Automation
	Medical Technologies
	Equipment Components
	Security

High Performance Computing

Multi-Material Sensor

Photonic Integration

Radio Frequency Solutions

coordinated by

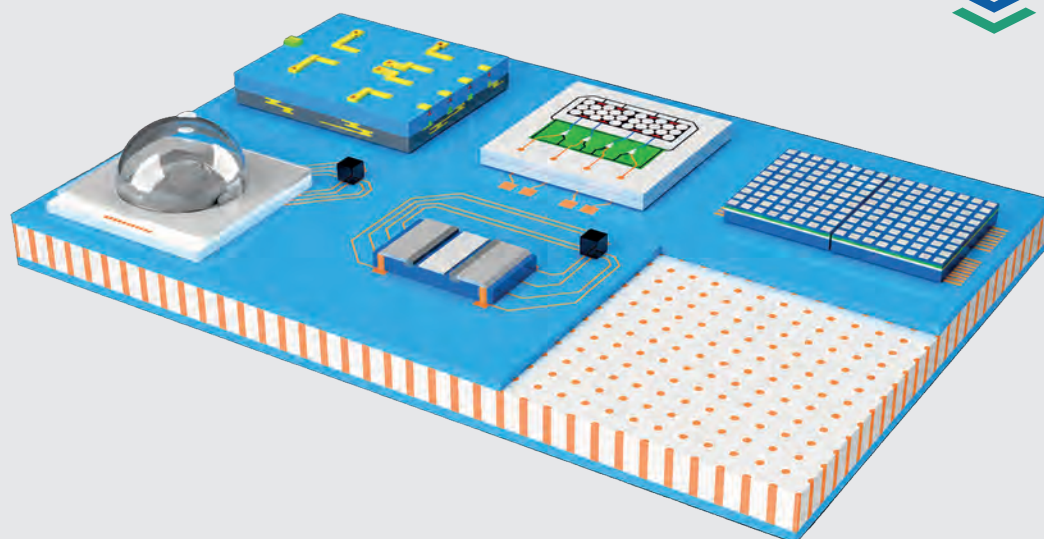


implemented by



**Co-funded by
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Sensors rarely exist in isolation. In practice, useful sensing systems need to detect more than one quantity, often using different physical or chemical principles. The technologies behind these sensors come from very different material and process environments. Today, integrating them into one system almost always means starting the packaging design from scratch.

The **Multi Materials Sensor (MMS) demonstrator** within the APECS pilot line is a direct response to that problem. Benefiting from one common silicon interposer infrastructure, which serves as the integration backbone for several sensor technologies simultaneously, without triggering a full system redesign, a whole series of sensors is developed. The MMS demonstrator highlights the capabilities of the APECS pilot line regarding design, processing, packaging, and integration in regards of modular, multi-materials sensors. The integration of components with differing material properties and combination of diverse sensors, including III-V gas sensors, optical, acoustic, and hall sensor systems, delivers industrial required sensor solutions across varied conditions. The planned integration includes QMI and 2D & 3D of multi materials.

HEMT GaN-Sensor Chiplet, featuring a high sensitivity (ppm range) & high S/N ratio > 500/1 HEMT sensors with dedicated Readout Integrated circuit (ROIC).

Electro-Optical Chiplet, displaying universal photonic-electronic co-integration through Post-CMOS photonics, using an electro-optical switch matrix at visible wavelengths (@633nm).

MEMS-Mirror Chiplet, benefiting from hermetic packaging with a glass dome, fabricated on wafer-level with high optical quality, placed on a glass interposer with Through-Glass Vias (TGVs).

Acoustic Sensor Chiplet, providing gesture recognition with closely-spaced ultrasound transducers (CMUTs) and their corresponding amplifier circuit (ASIC). Featuring airborne CMUTs (4 Tx and 4 Rx channels, Frequency $\approx$ 2 MHz, Bias $\leq$ 50 V DC, BW $\sim$ 15 %).

Silicon Hall-Array High-Resolution Platform (SHARP) Chiplet, enabling scalable high-resolution magnetic field measurement systems by stacking of monolithic high resolution (500 μ m) 3D magnetic field sensor array (5 $\times$ 8 pixels) in silicon on separate CMOS substrate with signal processing.

