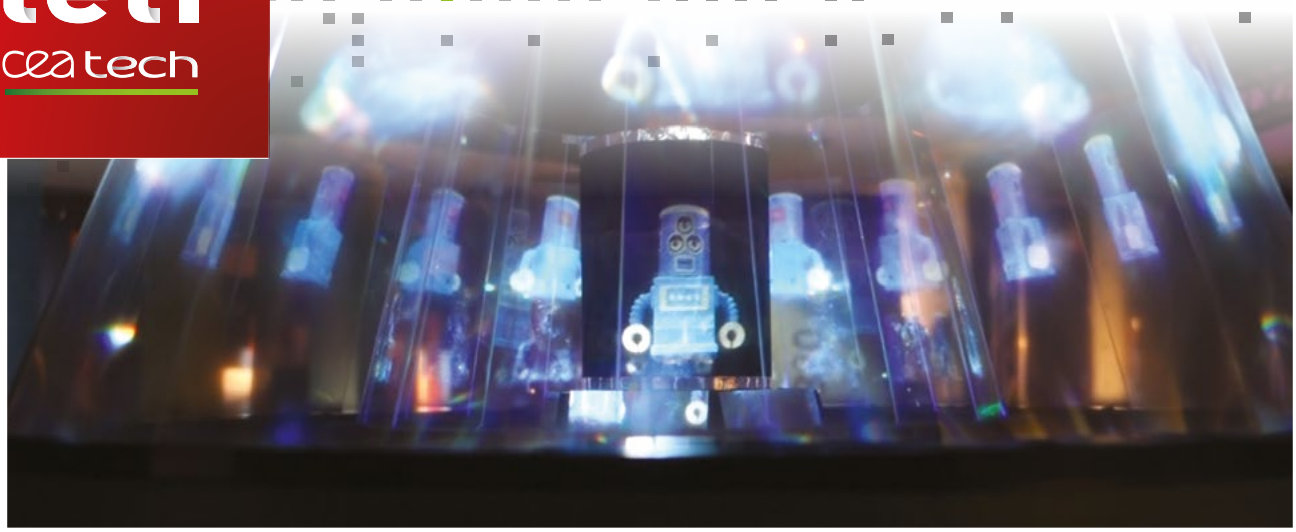


Advanced Optical Systems

Disruptive photonic components for the next generation of imaging and sensing applications

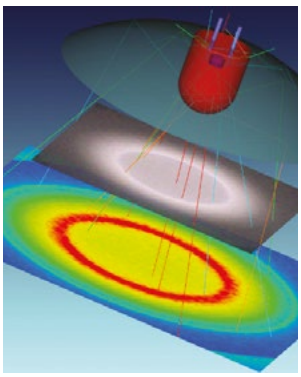
What are advanced optical systems at CEA-Leti?

CEA-Leti develops disruptive photonic components for its industrial partners, from silicon chips to smart optical systems, enabling various industrial and everyday life applications. Miniaturization, integration and energy efficiency are CEA-Leti's team main drivers.

Their expertise covers the entire value chain, from system architecture, advanced CMOS circuits to final fully packaged system. This includes the development of advanced system, which help identify key innovations at an early stage.

Applications

- Automotive & consumer: LIDARs
- AR systems: Compact near eye device (retinal projection)
- Air quality/monitoring systems: Gas and particles detection
- Odor identification: Optoelectronic nose
- Medical diagnosis or baggage screening: Efficient RX/gamma imagers



Expertise

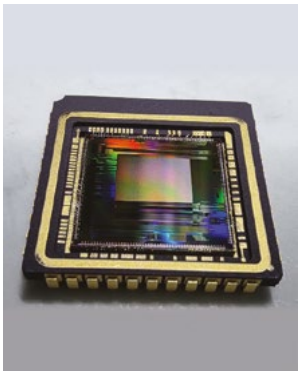
Optical Design and Simulation

Visible range

- Design of complex and non-conventional optical systems (fly eyes, aspheric, free-form and waveguides), thin film coatings and holographic components
- State-of-the-art, commercially available design software : LightTools, Zemax and Matlab

X-Ray range

- In-house simulation platform for the entire XR chain design, from the source to the detector (Sinbad) or more deeply for the imager and treatments (Tasmania)
- Definition of image quality analyzing and tolerance on behalf of CEA-Leti's partners



CMOS Conception

Image sensor design

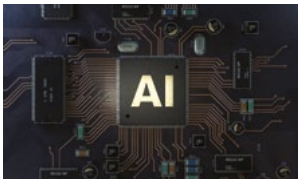
- Low-noise, low-power, from X to IR & THz
- High dynamic range, event-driven, compressive sensing
- Photon counting, TOF, gating, burst
- ADC: pixel/column level, 8-16 bits, Delta-sigma

Algorithm & image processing architecture

- Image improvement, detection, ROI, wake-up, low latency perception
- Column-based operators, 3D-stack architecture

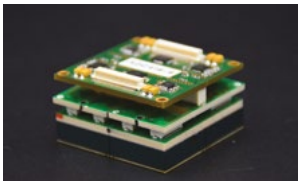
Advanced processing

- HW acceleration, configurable ISP, deep neural networks



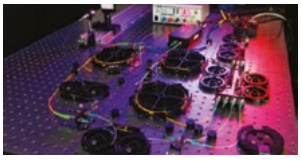
Electronic and Signal Processing

- Tailor-made developed depending the targeted application. Low noise, low consumption, FPGA controlled
- Implementation of software routine to improve the signal quality that can integrate AI at different levels of treatment.



Opto-mechanical Design and Packaging

- Wafer level packaging: Fine pitch flip-chip interconnects (in-bump, copper pillars, micro-inserts), silicon optical bench. Die level packaging: wire bonding, dicing
- Module integration: system in package, micro-optics, optical fiber pig tailing, micro-lenses assembly



System Characterization

- In-house benches computerized with specific adapted and performant programs: Labview interface, Python or C coding

Interested in this technology?

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