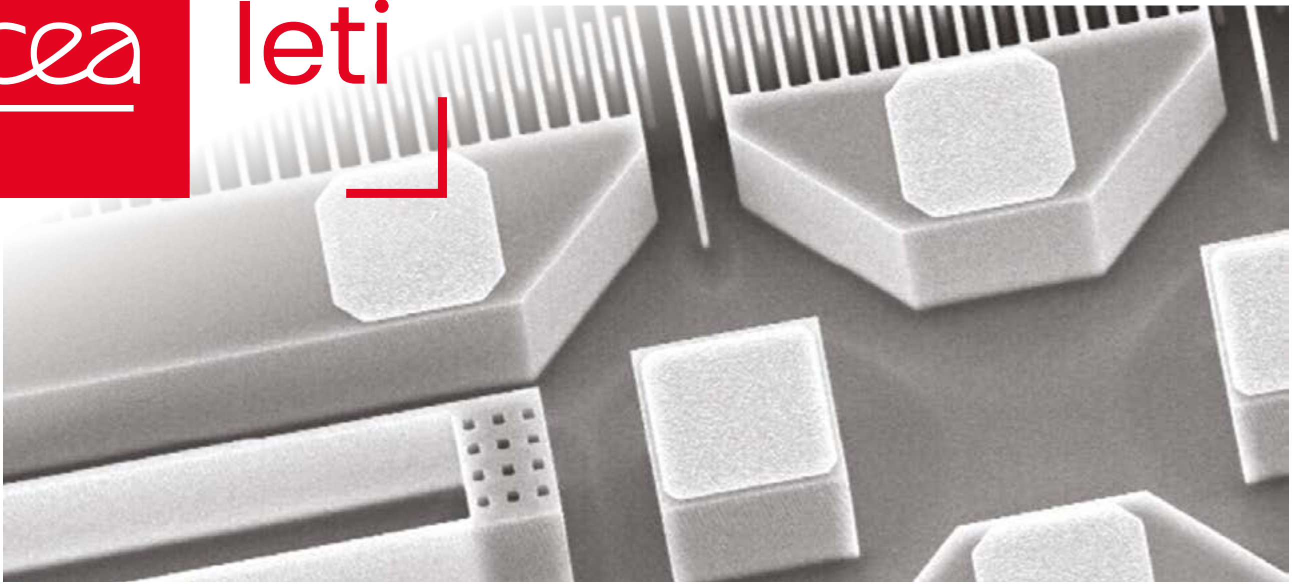


MEMS

Micro sensors, micro-actuators and RF devices manufactured with microelectronic based technologies

What is MEMS?

MEMS = Micro Electro Mechanical Systems

As one of the world's pioneers in MEMS technologies, CEA-Leti is constantly pushing the limits of MEMS expertise to stay a step ahead in technology know-how. Today, CEA-Leti offers you estensive capabilities to develop ultrasensitive, multifunctional and robust MEMS & NEMS, designed for integration into your specific products and application fields.

Applications

- Consumer (smartphones, tablets, etc.)
- IoT (smart wearable devices)
- Automotive (airbags, navigation systems, etc.)
- Aerospace (RF switches, etc.)
- Industry (process monitoring: pressure, flow, etc.)

What's new?

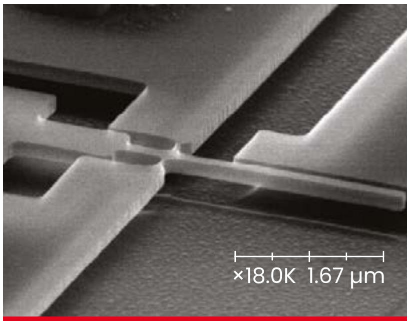
- The combination of MEMS and nanoscale technology: **first ever generic M&NEMS platform**
- Introduction of nanoscale sensing: NEMS transferred to industry for gas sensing (Apix Analytics)
- Miniaturization of many types of sensors: ultrasonic transducers, pressure sensors, humidity sensors, etc.
- Various transduction modes: capacitive, piezoresistive, piezoelectric, magnetic, etc.
- Piezoelectric actuators integration on 8'' wafers—large spectrum of piezoelectric materials developed (AlN, PZT, doped PZT, gradient-free PZT / Thickness from 200 nm to 2 µm)
- MEMS packaging on wafer level (wafer bonding, thin film packaging, TSV, RDL, etc.)
- Wideband RF devices (RF MEMS switches and phase shifters)

Key figures

- 30 years of MEMS experience
- Staff of 200 developing MEMS (sensors, actuators, RF, packaging, process, characterization)
- All 8" and 12" MEMS technologies in-house
- Portfolio of 330 MEMS patents
- 30 new patents and 65 publications every year
- 25 ongoing industrial collaborations
- 10 long-term strategic partnerships
- 18 co-developed solutions running in industry
- 4 startups created in MEMS technologies (Tronix, Apix, Wavelens, Primo1D)

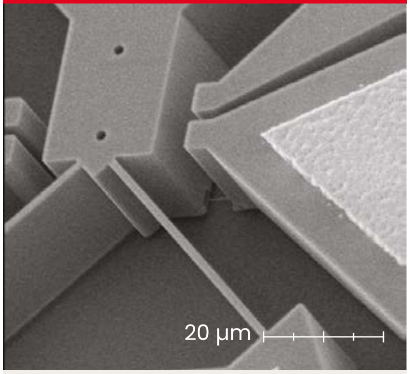
What's next?

- Improvement of piezoelectric and magnetic materials stacks: **push beyond existing limits**
- New type of sensor to the M&NEMS portfolio (ex. microphones): **increase the high potential of the technology to become a standard in the MEMS industry**
- Combination of silicon photonic and nano-scale sensing: **improved resolution for high performance sensors (mass-spectroscopy, inertial, etc.)**
- Introduction of new materials (2D materials = graphene, MoS2, etc.): **explore the high potential to make new sensors (bio-sensors, ultrasonic transducers, etc.)**



Key MEMS date

- 1984: World's first comb drive patent
- 1996: CEA-Leti spins out Tronics, a full-service MEMS manufacturer
- 2011: Creation of Apix, a CEA-Leti startup developing multigas sensing based on NEMS
- 2012: Creation of Wavelens, a CEA-Leti startup developing optical solutions based on PZT actuation
- 2015: CEA-Leti reinforces pioneering position by manufacturing the world's first MEMS on 12" wafers



Interested in this technology?

Contact:
Pierre-Damien Berger
pierre-damien.berger@cea.fr
+33 438 789 900

Research for industrial innovation

CEA-Leti, technology research institute
17 avenue des Martyrs, 38054 Grenoble Cedex 9, France
cea-leti.com

@CEA-Leti