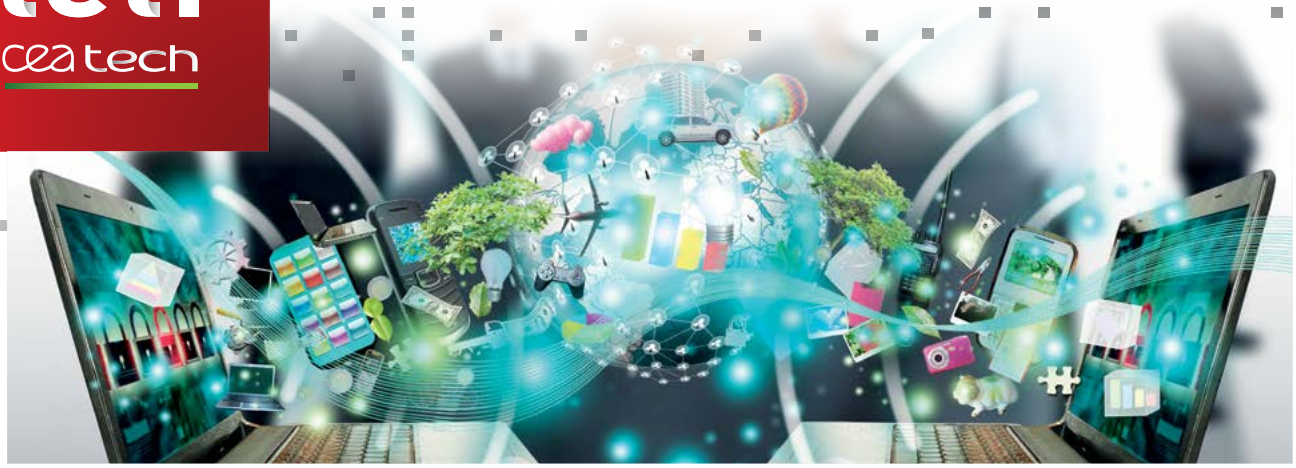


WAKE-UP RADIO

ALWAYS-RESPONSIVE, ULTRA-LOW-POWER RADIO RECEIVER

WHAT IS WAKE-UP RADIO?

This technology provides ultra-low-power (ULP), always-responsive radio receiver.
It is part of the virtual demonstrator called L-IoT, which provides a single SoC integrating low-power connectivity, processor and real-time sensing for IoT devices.

To get efficient radio communications in the context of low-power IoT, the radio transceiver is split into the main radio and a wake-up radio receiver. The role of the wake-up receiver is to sense the data channel. This prevents the main receiver to continuously listen to the channel, lowering power consumption. To be effective, the power consumption of this wake-up device must be at least a decade below the most efficient BTLE Receiver, and has been measured at 50µW in active mode in FD-SOI 28nm.

APPLICATIONS

All the IoT radio applications using wireless sensor nodes: environment monitoring, node maintenance and configuration services.

Leti is providing the expertise covering all the necessary IoT mixed-signal integrated circuits.
Multiple applications: instead of focusing on a single application, L-IoT can answer a large set of IoT apps, allowing low-energy consumption due to high flexibility capabilities.

Flexibility is brought to the L-IoT node by:

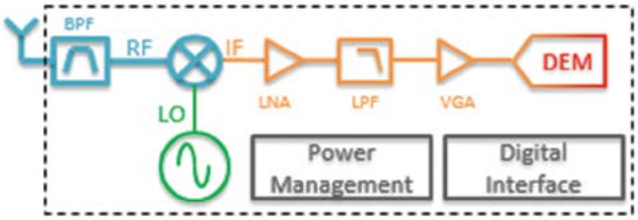
- Design, architecture and software innovations
- FD-SOI technology
- Power-performance trade-off at all levels (technology, design, architecture, software, applications)

WHAT'S NEW?

48µW power consumption is achieved due to:

- Local oscillator (LO) (which does not embed any PLL): the mixer is an N-path mixer (N=3) that requires a 3-phase LO signal with 120° phase difference and a 1/6 duty-cycle. This LO signal is generated by a current-starved 3-stage ring oscillator. Wake-up receiver input matching and LO tuning range are wide enough to cover all bands from 433MHz to 2.4GHz, which makes it suitable for most of today's IoT standards.

Wake-Up Receiver architecture

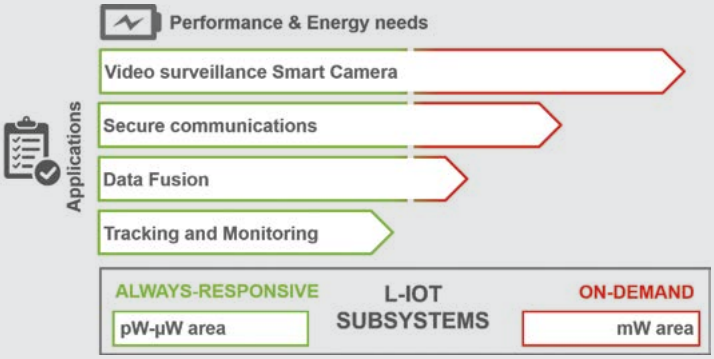


- Dynamic frequency scanning (patent pending): the RX has been designed with generic leverages such as gain, LO frequency and bandwidth that are all tunable. They are controlled by a digital circuit hosting the dynamic scanning algorithm. This algorithm consists in scanning the band of interest seeking for RF signal. Therefore, the overall performance depends on the algorithm itself, which makes this solution agile and reconfigurable.

Power-sensitivity trade-off is improved by the innovative frequency-scanning algorithm implemented in the digital interface.

ABOUT L-IOT:

L-IoT is a complete adaptable & flexible system that is energy and application-driven thanks to an architecture split into always-responsive and on-demand subsystems.



WHAT'S NEXT?

The analog RF receiver has been fabricated and measured in FD-SOI 28nm. Low-power LDO is embedded and included in the power consumption results. Digital base band and frequency-scanning algorithms will be integrated in the L-IoT platform in Q2 2017.

Key challenges:

- Improve the power-sensitivity trade-off
- Reduce the stand-by power below 300nW

INTERESTED IN THIS TECHNOLOGY?

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