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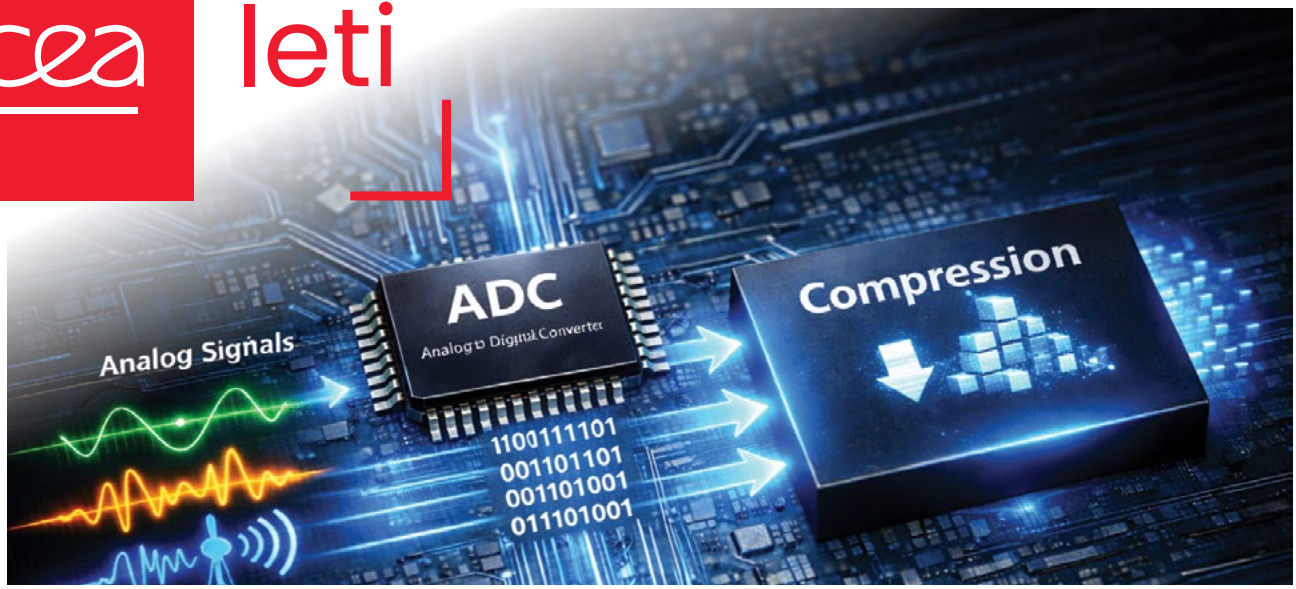
cea leti



Smart RF Compression

Optimizing the performance/complexity tradeoff for broadband RF acquisition

What it is

This advanced wideband signal processing solution leverages a data compression technique called non-uniform sampling to significantly reduce the amount of data generated by ultra-high-speed analog-to-digital converters (ADCs). Using this data compression technique preserves signal detection, identification, and demodulation capabilities, providing an effective response to the critical demands of monitoring large radio frequency spectra, whose massive data streams generally require costly, power-hungry, difficult-to-embed architectures.

This technology enables more compact, efficient RF systems that are better suited to the needs of deployment in the field.

What it can do

This solution can be implemented on commercial ADCs, enabling more compact and energy efficient wireless communication systems for:

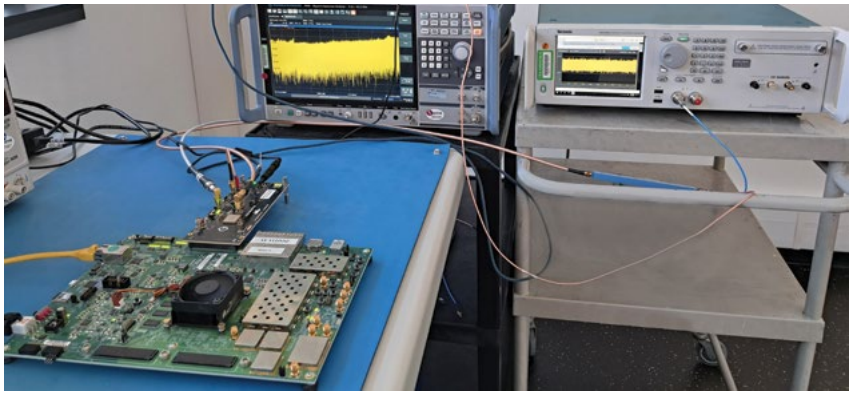
- **Defense & spectral monitoring**: lower complexity for real-time processing of wide RF bands for signal detection and identification capabilities that are easier to integrate into embedded field systems, enabling large-scale deployment.
- **Satellite communications**: compact, energy-efficient broadband receiver chains that enable optimized embedded processing for digital uplink reception, digital channelization, active antenna processing, etc.
- **Embedded RF systems**: implementation on commercial off-the-shelf (COTS) ADCs for low-cost architectures.

What makes it unique

This CEA-Leti innovation is based on a pseudo-random sampling technique and algorithms developed specifically for compressed RF signal processing:

- The volume of data is reduced significantly, with a configurable compression rate.
- Degradation is controlled, with no significant loss of detection capability (SNR degradation of 5 dB for a compression rate of 4).
- Computing is less complex, and the associated power consumption is reduced.
- Compatible with commercial off-the-shelf (COTS) ADCs.
- Architecture suited to low-cost and/or highly constrained embedded systems.

Demonstrator of narrowband signal detection and demodulation from the output of a wideband converter ▼



Working with CEA-Leti

With the proof of concept now demonstrated, this technology is ready for development in partnership with manufacturers seeking to optimize their wideband RF chains or integrate advanced embedded processing capabilities into their products. CEA-Leti partners benefit from:

- Expertise in advanced signal processing for communication systems and RF architectures
- Solid knowledge of commercial off-the-shelf (COTS) components
- Optimized hardware architecture design capabilities
- Demonstrator development
- Support preparing new developments for industrial transfer

CEA-Leti's flexible partnerships can be adapted to the needs of the target use case.

Key figures

- Ultra-high-speed ADC: 12.8 Gsamples/s
- Configurable data stream compression
- A compression ratio of 4 reduces data from 128 Gb/s for direct acquisition to 32 Gb/s, with:
  - Less than a 20% reduction in detection speed
  - SNR degradation of around 5 dB for demodulation

Success story

The efficiency of this technology, developed and validated in collaboration with Teledyne, has been demonstrated on the acquisition of very-wideband signals, as well as for the associated processing (detection, identification, and demodulation), with successful testing on DVB-S2 signals.

Interested in this technology?

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