FRANÇAIS ENGLISH

cea leti

Sense-VNA

PATENT 1 PATENT

RF dielectric sensing powered by an integrated VNA

What it is

This CEA-Leti technology harnesses a physical property called dielectric permittivity, which describes how an electric current flows through matter. In this case, radio-frequency waves are used to measure transmitted and reflected signals, which are then decoded using a miniaturized vector network analyzer (VNA) on silicon to map the invisible signatures of cells or materials.

The result is a measurement technique that is potentially non-invasive and compatible with the demands of integration into portable and wearable devices.

What it can do

This innovation marks a step toward non-invasive detection in a wide range of industries, including:

- **Medical**: early detection of potentially cancerous cells
- **Cosmetics**: skin hydration measurement at the point of sale; product efficacy testing for cosmetics R&D
- **Wellness**: dehydration monitoring integrated into a smart watch
- **Agri-food**: fermentation process, fruit ripeness, and soil hygrometry monitoring
- **Proximity detection**: medium-distance obstacle detection for cars (for door and trunk protection, for example).

What makes it unique

CEA-Leti's on-chip analyzer marks a breakthrough compared to conventional laboratory vector network analyzers. It offers several advantages that make it ideal for embedded systems:

- Ultra-miniaturized
- Low power
- Low unit cost
- Versatile and adaptable

This innovative technology makes vector network analysis available outside the lab, creating a wide range of new opportunities for anywhere, anytime non-invasive detection and monitoring.

VNA demonstrator exhibited at CES 2026 ▼

Key figures

- Compact, at less than 2 mm²
- Low-power, in the tens of mW
- Operates from 10 MHz to 20 GHz for a wide range of applications

Scientific publication

Yaakoubi, G., et al. (2024). "Direct Magnitude and Phase Measurement in an Inductorless Integrated Vector Network Analyzer for Wideband Ambient Environment Sensing." Proc. IEEE NEWCAS Conference (NEWCAS), pp. 420-424. 2025. doi: 10.1109/NewCAS64648.2025.11107094.

Working with CEA-Leti

CEA-Leti is prepared to develop this technology for specific products in partnership with manufacturers. With partnerships ranging from bilateral R&D contracts to affiliate programs, companies of all sizes and types can work with CEA-Leti to integrate this disruptive technology into their next-generation products. CEA-Leti provides end-to-end project support, from circuit to RF design to complete system, through a unique lab-to-fab approach that keeps projects moving efficiently right up to prototyping and transfer to a commercial fab.

Interested in this technology?

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