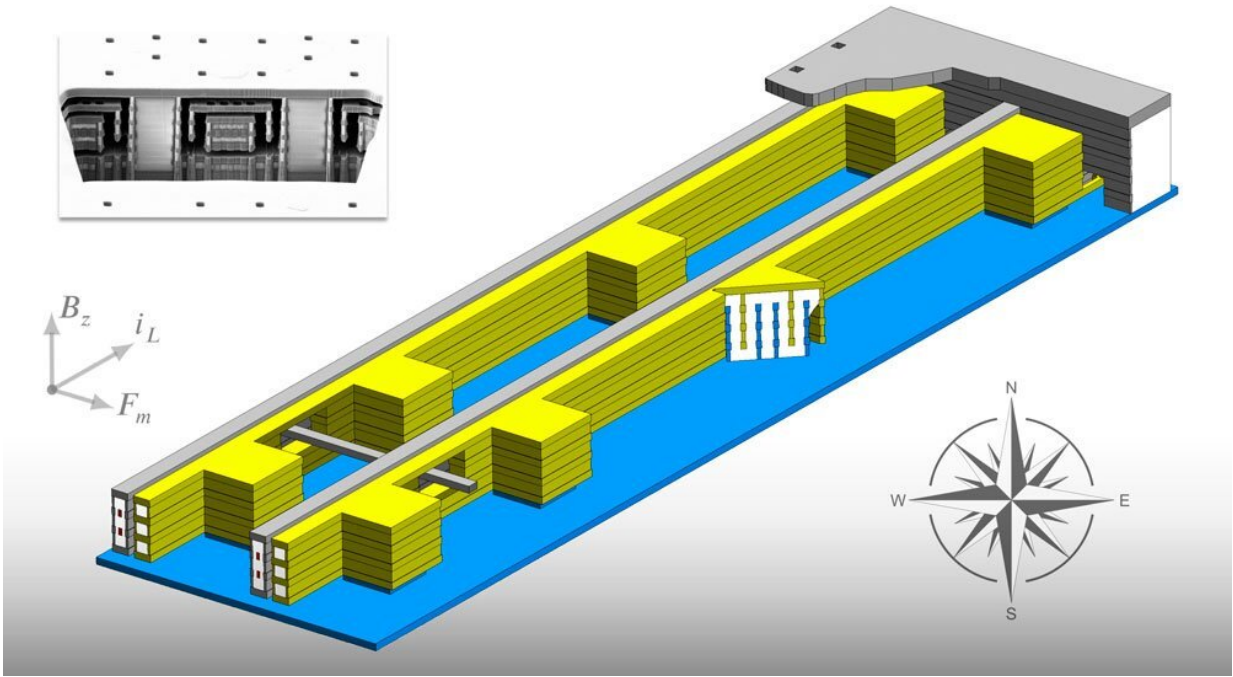


# New magnetometer designed to be integrated into microelectronic chips

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Developed by UPC researchers, the magnetometer can be integrated into a microelectronic chip and is compatible with the current integrated circuits. Credit: Universitat Politècnica de Catalunya

Researchers at the UPC's Department of Electronic Engineering have developed a new type of magnetometer that can be integrated into microelectronic chips and that is fully compatible with the current integrated circuits. Of great interest for the miniaturization of electronic

systems and sensors, the study has been recently published in *Microsystems & Nanoengineering*.

Microelectromechanical systems (MEMS) are electromechanical systems miniaturized to the maximum, so much so that they can be integrated into a chip. They are found in most of our day-to-day devices, such as computers, car braking systems and mobile phones. Integrating them into [electronic systems](#) has clear advantages in terms of size, cost, speed and energy efficiency. But developing them is expensive, and their performance is often compromised by incompatibilities with other electronic systems within a device.

MEMS can be used, among many others, to develop magnetometers—a device that measures [magnetic field](#) to provide direction during navigation, much like a compass—for integration into smartphones and wearables or for use in the automotive industry. Therefore, one of the most promising lines of work are Lorentz force MEMS magnetometers.

"This leveraging technology provides a large measuring range without limitations because it does not require ferromagnetic materials. Ferromagnets make it difficult to take measurements because they retain a memory of previous measurements, which is known as hysteresis," explains Jordi Madrenas, a researcher at the Universitat Politècnica de Catalunya-BarcelonaTech (UPC).

This technology has also been applied by the Intelligent Sensors and Integrated Systems (IS2) research group to develop a magnetometer that could be integrated into a microelectronic chip as well. "This allows us to combine electronic and mechanical parts into a [single chip](#), unlike the current standard procedure, which consists of manufacturing chips separately and then combining them," adds Madrenas, who also teaches at the Barcelona School of Telecommunications Engineering (ETSETB).

In addition to the magnetometer, the group has also developed accelerometers and pressure sensors using the same technology. This research opens the door to chips with multiple sensors and electronics.

**More information:** J. J. Valle et al, Design, fabrication, characterization and reliability study of CMOS-MEMS Lorentz-force magnetometers, *Microsystems & Nanoengineering* (2022). [DOI: 10.1038/s41378-022-00423-w](https://doi.org/10.1038/s41378-022-00423-w)

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