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MEDIA INFORMATION

Leonardo's space atomic clocks

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Leonardo makes the most accurate and stable atomic clocks in the world for space applications.

Atomic clocks are a key element for navigation and positioning satellites. In order to determine the position of a user on the ground, through triangulation, it is necessary to accurately measure the flight time of the signals emitted by satellites of a known position.

Leonardo's hydrogen clocks (Passive Hydrogen Maser - PHM) are at the heart of the European constellation Galileo, and they guarantee the correct functioning of the system with an error of only one billionth of a second per day (one second every 3 million years). A flight time error of 1 millionth would imply a positioning error of as much as 300 metres.

With over 2 billion users worldwide, Galileo is considered the most sophisticated satellite navigation system ever built for civilian use with a ground accuracy of about 30 cm. The satellites currently in space have two PHMs on board (for redundancy reasons), and the Second Generation satellites will soon join the constellation. Leonardo's PHM hydrogen atomic clocks were also chosen for the new 12 satellites.

In the near future there will be an increasing need for compact and high-performance clocks, not only for terrestrial navigation, but also for other applications such as autonomous navigation in deep space, space exploration, and scientific experiments. Even in everyday life, precise atomic clocks will be increasingly requested, just think of the management of electricity networks, transport security, secure banking transactions or data encryption, for which the clocks can verify the validity of electronic keys.

At the **Italian Pavilion of Expo 2020 - Dubai** it will be possible to discover Leonardo's new project: the rubidium atomic clock RbPOP (Rubidium Pulsed Optically Pumped). Developed by the company in partnership with INRiM – Italian National Institute of Metrological Research - this clock exploits the interaction between Rubidium vapours and laser rays according to an innovative pulse sequence, hence the name "Pulsed", guaranteeing unprecedented compactness: it weighs about 10 kg, almost half the weight of PHM.

The RbPOP is designed to accumulate less than a second of delay every 3 million years, it is a real example of Italian technology that has no equivalent in the world in relation to reliability and precision.

The atomic clocks are symbols of Italian know-how and feature in the documentary "Saper Fare" filmed by Oscar-winning director Gabriele Salvatores for the Italian Pavilion.