Newsletter Focus

INFN TECHNOLOGY ON BOARD CSHARK'S PICO-SATELLITES



As well as a technological frontier, space is increasingly becoming an opportunity for economic growth, not just for the big corporate players but also for new and innovative startups.

CShark is well aware of this. The Piacenza company just won the 2022 DigithON (https://www.digithon.it/), the biggest Italian digital marathon, and is INFN's partner in developing apps for the ArduSiPM project. Last 13 January, in fact, CShark launched Pilot-1,

precursor of a fleet composed of 100 pico-satellites (satellites weighing less than 1 kg) dedicated to the Internet of Things (IoT) communication that should be launched in the course of the next three years. Once completed, the constellation of satellites will make it possible to create a global network for connecting IoT devices, including remote regions where the absence of an internet connection makes land connection impossible.

The term "Internet of Things" (IoT) refers to the network formed from all intelligent objects (sensors, intelligent devices, self-driving car systems, etc.) that exchange data with each other and users. Unlike internet connections of smartphones and computers, these objects do not require much bandwidth, but they require reliable and secure connections, also in areas not served by network operators. For this reason, the use of satellite systems that exchange data bidirectionally, regardless of the state of the land connections, is particularly effective in these areas.

Small (10 X 5 X 5 cm³), light (600 g) and low consumption, the Pilot perfectly corresponds to the idea with which a team of INFN Rome Division researchers, led by Valerio Bocci, developed ArduSiPM, the first radiation detector based on silicon photomultipliers (SiPM) completely integrated into a chip. Given the affinity of approach and intent, it was almost impossible not to collaborate: so, in 2020, CShark made the first step towards INFN, through Microchip Technology, the company that produced the chips for the ArduSiPM developed by the Rome INFN group. From that day, exploring the sky united the two research groups around a single goal: integrating a space version of ArduSiPM in the on board computers of the Pilot satellite fleet that will be launched in the coming years.

ArduSiPM is an extremely compact and light radiation detector, with low energy consumption and, thus, suitable for being integrated into small satellites like the Pilots. The idea behind it is to transform the radiation detector from payload to on-board tool. Continuously measuring the level of radiation to which the satellite is subject, ArduSiPM can send an alarm signal to the rest of the systems, ordering them, for example, to shut off when the particle flow is too high, as in the case of solar storms.

The miniaturisation of the electronics made space accessible to small businesses too and, on the other hand, it makes it possible to integrate several systems and tools in a single chip, thus revolutionising the way in which satellite systems are built.

The collaboration with INFN is not, however, restricted just to space orbit; the business has, in fact, signed a licence agreement that will enable it to use this technology on land too. CShark will be able to integrate ArduSiPM in all its systems used in applications that require a system for continuous and completely automated radiation monitoring.