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Making radioactivity measurements on building materials accessible to everyone

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The CORSAIR (Cloud Oriented Radiation Sensor for Advanced Investigation of Rocks) project was born to meet the EU guidelines 2013/59/EURATOM on safety standards for protection against ionizing radiations. The project designed an automated system capable of providing a real-time measurement of the radioactive activity concentration index for building materials according to regulations of more than 20 different countries. Measurements are conducted through in situ gamma-ray spectroscopy techniques on 3 x 3 x 3 m³ blocks of rock at quarries and processing centers, and quantify the activities, the abundances and the related effective dose-rates of natural radionuclides (⁴⁰K, ²³²Th, ²³⁸U and their progenies) in stone materials for the building industry. The detector comprises a 2" x 2" cylindric CeBr₃ crystal having a 2.5% energy resolution at 1461 keV. A lateral lead shield of 1.3 cm enables a ~60% reduction of the gamma signal coming from above and beside the detector. The system is designed for providing the radiometric index in less than 30 min with an overall uncertainty of the order of 5%.

The innovative aspects of the detector are in its autonomous operation and the easy fruition of the results of the material characterization. Energy calibration and peak recognition are automatically performed on-board through an innovative stochastic method based on simulated annealing. The computation of the results is fully-automated and requires no intervention of the operator. The battery-powered detector is equipped with GPS, LoRa, Bluetooth and Wi-Fi connectivity and can be remotely controlled thanks to a dedicated Android app. Acquired data and activity indexes are synced through LoRa connectivity to a cloud database, where they can be easily accessed by sellers and buyers, thus preventing the placing on the market of blocks

hazardous to public health.

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