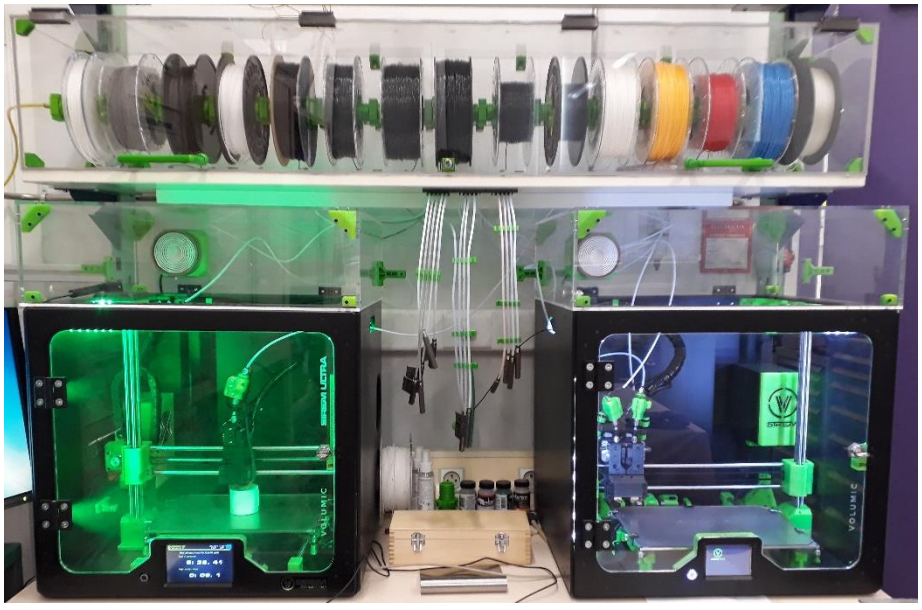
Additive manufacturing for gamma spectrometry

FDM 3D printing technologies have greatly evolved in recent years and have become more widely available. The LNHB has thus equipped itself, with machines manufactured in France by the company VOLUMIC 3D in 2017, in order to take advantage of this technology for various developments taking place in the laboratory.

This type of manufacturing has been particularly useful for X/γ spectrometry in the design of sample holders. Indeed, in the past, such a manufacturing process required, after drawing up the plans, to go through a request for machining PMMA parts. This step was expensive but also took a certain amount of time for administration and manufacturing. The laboratory's 3D printers have thus made it possible to produce hundreds of sample supports, at a very low cost, adapted to each of our GeHP detectors (all are different in dimensions).

The printing precision of these machines, of the order of 10 µm, has enabled us to design a large number of holders but also to improve the quality of our results. The improvement has been visible on the calibration of our detectors, especially for the SG500 geometry, whose positioning has been greatly improved. The relative standard uncertainty on the SG500 efficiency curve has been reduced from 5% to 1.6% in the energy range from 30 to 2000 keV. Finally, these machines allow us to manufacture, simply and with a short time period, sample holders that are adapted to the various measurement calibration services or within the framework of our research. The gain in time has become consequent; 1 month for a machining reduced to a few hours by 3D printing.

For the environmental measurements, the PLA material was measured in very low background X/γ spectrometry: no contributions of ^{40}K or other radionuclides were identified. This type of material is therefore suitable for low-level environmental measurements. These 3D printers have also enabled the development of new measuring instruments in the laboratory that were not possible without this technology and will be the subject of further presentations.



Additive manufacturing set-up in LNHB