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Development of intraoperative β– probes for RGS

Radioguided surgery (RSG) is an established technique within the field of oncology surgery.
In this technique a radio-marked tracer, a substance that is preferentially uptaken by tumour cells, is administered to the patient before the surgical operation. A nuclear probe provides the surgeon a precise information about the distribution of a radioactive labelled structure improving the surgery outcome, minimizing the surgical invasiveness thus maximizing benefit to the patient.

I'm working on an innovation of the radio-guided surgery exploiting beta- emitters.
The characteristics of this radiation allow the possibility of extending the technique even to cases with a large uptake from surrounding healthy organs.

I developed different prototypes of intraoperative probes (handy counter for low energy electrons).
All the probes were constituted of a millimetric cylindrical scintillator made of doped para-terphenyl coupled to a light collection device (PMT or SiPM). The readout electronics was portable and customized to match the surgeon needs.
Automated preclinical tests on medical phantoms were used to estimate the detector performances. In this way it was possible to simulate finite size remnants, with activities and topologies close to those expected in clinical cases. Phantoms were also useful to going through different kinds of feedback to evaluate the best assist for the surgeons during the operation.

Simulations finalized to application in cases of brain tumours (meningioma and glioma) and neuroendocrine tumours (liver) showed promising results.

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