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Feasibility study of the use of CMOS image sensors in radioguided surgery with β^- emitters

A feasibility study about the employment of widely and commercially avaliable CMOS imager sensors in a radioguided surgery probe for β^- detection is presented.
The radioguided surgery is a medical technique, which involves the use of a manageable probe for the intraoperative detection of the radiation emission of radiopharmaceuticals. The probe support the visual inspection of the surgeon, helping him to localize the tumor tissue extension with the highest possible resolution.
The use of β^--emitters as tracers, instead of the more commonly employed γ-emitters, increases the ratio between the signal from diseased tissue and the background from the surrounding healty tissues. This is due to the shorter means free path of the electrons if compared to photons.
CMOS imager sensors have shown suitable features to be employed as active elements in a pen-shape probe for β^- direct detection.
The performances of several CMOS sensor (Aptina products) have been tested in terms of stability of response as a funcion of time, temperature, and radiation exposure. Campaigns of measurement have been performed under the emission of sources of ^{90}Y diluted in agar agar, featuring different activities, dimensions, and shapes, in order to estimate the detection relative efficiency, the spatial resolution, and the attainable sensitivity during an acquisition time of a few seconds.

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