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# The reSPECT project: an innovative SPECT detection system based on high-Z organic scintillators

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The Global Cancer Observatory reports that in 2020 the European population had a 28.2% risk of developing cancer before the age of 75 years, with a 11.7% mortality risk. Such mortality rate can be reduced through early detection of tumours by means of imaging techniques. Among them, nuclear imaging scans play a pivotal role for noninvasive diagnosis. This contribution is focused on Single Photon Emission Computed Tomography (SPECT), a nuclear imaging technique that allows to inspect physiological processes inside the patient's body through the detection of the gamma rays emitted by a radiopharmaceutical administered to the patient.

Conventional SPECT detection systems consist of a monolithic inorganic scintillation crystal, typically Thallium-activated sodium iodide, whose scintillation signal is read by an array of photomultiplier tubes. The innovative gamma detector concept investigated in this contribution, instead, relies on a Tungsten metal frame that serves both as a collimator and as a container for the scintillator segments. The reSPECT project involves the development of innovative organic scintillators doped with high-Z impurities, to profit from the extremely fast scintillation process, while maintaining a remarkable photoelectric effect probability (despite the plastic substrate) and a low cost. Moreover, the process of polymerization used to produce such scintillator segments permits to give them any desired size and geometrical shape.

Our project involves a custom readout system tuned for fast scintillation events and high rates, with an independent channel for each scintillator segment to improve the spatial resolution of the detector. A silicon readout system allows for a combination with MRI systems, while the ability to sustain high event rates opens the way to a possible theragnostic use.

In this contribution, the preliminary results obtained with the scintillator prototypes will be presented, in comparison with the solutions currently available on the market.

## Collaboration

## Role of Submitter

I am the presenter

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