Priority Number

Patent Type
Patent for invention.

Co-Ownership
Sapienza University of Rome 30%, Kay System Italia (KSI) 70%.

Inventors
Roberto Pani.

Industrial & Commercial Reference
Medical and biomedical, Radiation detection field.

Time to Market
The prototype has been tested with laboratory equipments and is actually available. It will be included in a clinical trial in order to be employed in clinics.

Availability
Cession, Licensing, Research, Development, Experimentation, Collaboration, Start-up and Spin-off.

Abstract
The increasing use of scintigraphic methods, particularly in the field of oncology, requires the introduction of devices that allow the reduction of dosimetric load and the simultaneous optimization of the usability of the method itself. The invention is related to the fabrication of a collimator, made of lead or other materials, for SPET (Single Photon Emission Tomography) gamma cameras with nuclear medicine applications on humans or small animals and, more generally, for radioisotopic molecular imaging. The main feature of the invention relies in the possibility of varying the inclination angle of the collimation holes. The advantages of this application are related to the positioning in the proximity of the organ or tissue to be imaged, obtaining the highest quality of the reconstructed image. The slant collimator allows to easily obtain three-dimensional reconstructions with high spatial resolution for a limited field of view.

Publications
Technical Description

The slant-hole collimation system is characterised by the capability of tilting its holes according to variable angles. The system allows to acquire a set of planar images by a static detector placed in close proximity to the object of interest. The collimator has the remarkable feature to be modular, consisting of independent collimation elements joined together in the rotation movement. Rather than rotate the camera around the patient, the detection device is located in a fixed position, at a minimum distance from the patient, improving spatial resolution capabilities especially in the detection of small lesions.

The proposed device is able to acquire planar projection images at different angles, which are then arranged together through the Shift And Add (SAA) method to obtain a high-resolution and three-dimensional reconstruction of the studied object.

Technologies & Advantages

The characteristic of the system offer a broad view of the potential of this apparatus:

- Innovative compactness and patient comfortness: without using a detector orbiting motion, the patient-to-detector distance can be minimized as the device can be placed in contact with the organ to be examined.
- High spatial resolution: this new collimation prototype demonstrates the system feasibility in the detection and localisation of sub-centimetre lesions.

This could result in a substantial improvement of diagnostic ability compared to SPECT tomographic technique in particular for lesions placed near the patient’s skin.

- Shorten imaging time or reduction of patient's radiation dose, with high benefits on the welfare of patients and significant reduction in costs for hospitals.
- Adaptivity: ability to adapt the acquisition depending on clinical needs by tilting the collimator itself.
- Low-cost: the variable angle slant-hole collimator could be mounted on a conventional gamma camera dedicated to small organ imaging relatively inexpensively and could be made available either as an accessory at the time of scanner installation or as an optional add-on at a later date.

Applications

It is expected that the apparatus will allow to image critical regions, helping clinicians in evaluation of pathologies in oncology, cardiology, etc. in both in diagnosis and treatment. The possible fields of application are many, two examples are:

1. Diagnosis of breast cancer: the apparatus can be placed under the breast and can also determine the malignity of small lesions and their localization ensuring a precise and univocal biopsy.
2. Coronary cardio perfusion examination: it allows the prevention of heart attack and the evaluation of cardiac function to operate preventive strategies on cardiopathic patients. The apparatus allows to provide responses close to those of a PET apparatus which, due to the high costs, cannot be diffused on the national territory.

Fig. 5 Volumetric reconstruction.

Fig. 6 Comparison between imaging results of conventional SPECT and those resulting from the use of the proposed device.