Scintigraphic goniometric probe.

**Priority Number**

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**Patent Type**

Patent for invention.

**Ownership**

Sapienza University of Rome 100%.

**Inventors**

Roberto Pani.

**Industrial & Commercial Reference**

Medical and surgical field, Nuclear field, Radiation detection field, Radiation protection, Homeland security.

**Time to Market**

The prototype has been developed and tested in laboratory and it is included in a clinical trial.

**Availability**

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

**Abstract**

The probe is designed to localize radiation emission in lymph node scintigraphy examinations; unlike the probes in use today, which are based on a single collimated scintillation crystal that reveals the radiation from a single direction, this probe uses more than one crystal that allow one or more radioactive sources to be located, recording information from any direction. The algorithms that process data in real time give more accuracy in the localization of the lymph node of interest (in direction and depth) decreasing false positives (and the possible consequent cases of lymphedema) and false negatives cases (which bring to incorrect diagnosis).

**Publications**

- https://www.ngdetectors.com/gonioprobe/

**KEYWORDS**

- INTRA-OPERATIVE GAMMA PROBES
- SENTINEL LYMPH NODE
- BREAST CANCER
- RADIATION 3D DETECTION
- SCINTILLATION CRYSTALS
- NUCLEAR MEDICINE IMAGING
- RADIATION DIRECTION RECONSTRUCTION ALGORITHMS

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**LICENCED**
Technical Description
The prototype is based on two integrated detection systems, the first dedicated to the search of the radioemitting tissue, the second to its precise spatial location. The probe consists of a circular crown divided into several scintillation crystals and of a smaller scintillation crystal housed inside the crown itself. The external detection crown allows to increase the detection sensitivity and its distribution in different functional units allows to extrapolate information on the radiation direction; this location is then confirmed by the central crystal. The identification of the radiation is based on the use of complex algorithms for the calculation of the radiation direction in three-dimensional space and the proximity of the emitting point.

Technologies & Advantages
The main features of this system are:

• Reducing search time and invasiveness of surgery.
• Greater precision in the localization of the lymph node of interest (in direction and depth), reducing the cases of false positives (and possible consequent cases of lymphedema due to the removal of all lymph nodes) and false negatives (which may lead to incorrect diagnosis in the extension of the tumor).
• Simplification of the current surgical procedures: the use of our system in many cases can reduce the need for pre-operative imaging systems, typically performed with very expensive instruments but with low sensitivity that require high doses of radioactive tracer.
• Innovative and improved ergonomy: reduction in size and weight due to the absence of heavy collimators; real-time visualization of what the probe sees for a better user experience that simplifies the actions and movements of the operator and thus helps to keep concentration during the surgical operation.
• Implementation of a multimedia repository of data and activities for statistical studies focused on improving the operational protocols.

Applications
The scintigraphic goniometric probe is aimed to become a next-generation intelligent system to support nuclear medicine and oncologist surgeons. We aim to the production and marketing of an innovative solution for radio-guided surgery, integrated into an advanced imaging system. Obviously, alternative probe uses are possible, in order to identify any radioactive source, for example with the purpose of higher safety in sensible areas such as the airport, in thermonuclear plants or in sites with radioactive contamination risk, even to detect radioactive waste disposed in a not correct or improper way. The presented probe could constitute a direction guiding system by integrating it with a manœuvrevable robot or by a connection to a telecamera in order to visually and dynamically localize a radioactive object (a person, a moving suitcase).

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