

# Gamma camera

A scintillation camera (gamma camera, Anger camera) is a device used in nuclear medicine to detect radiation  $\gamma$  and its subsequent visualization on the oscilloscope screen.

## Construction and principle of gamma camera

A gamma camera is a large rectangular or circular device with a scintillation crystal inside, using **scintigraphy**. This device is stationary and more sensitive than moving scintigraphs. It enables the registration of radiation coming from a large area of the patient, both during static and dynamic events.

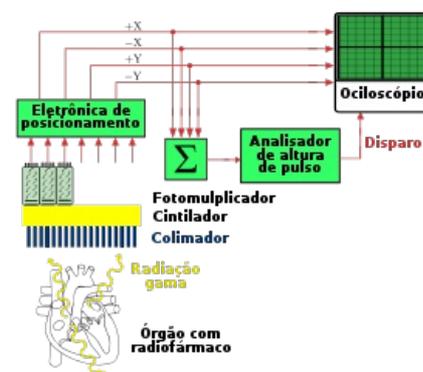
The scintillation crystal is enclosed in a lead and light-tight housing. Behind the crystal is then a light-conducting material that connects to many **photomultipliers**. Each scintillation from the crystal illuminates all photomultipliers, however, the intensity of illumination of these photomultipliers depends on the position of the scintillation. The pulses of all the photomultipliers are then converted into a **resistive matrix**, which is a system of resistors that acts as a filter for the input pulses. It always sorts the two largest impulses for the coordinates  $x$  and  $y$ . These pulses are then highlighted by the deflection plates of the oscilloscope, when a point of light appears on the screen. This point of light corresponds to the spot of scintillation in the crystal.<sup>[1]</sup>

Scintillations can either be displayed on an oscilloscope screen, highlighted on photographic material or stored in an electronic device.

The gamma camera, like any scintillation detection system, contains a number of other elements, such as a collimator, preamplifier, amplifier, and amplitude analyzer.



Modern gamma camera



The principle of the gamma camera.

## Gamma Camera Features

Here are the parameters affecting the image of the scintillation camera:<sup>[2]</sup>

- **Homogeneity** - the ability of the camera to display a homogeneous distribution of a substance in a tissue as a homogeneous image. When a homogeneous distribution of a substance is displayed heterogeneously, this is a disorder that leads to an incorrect examination.
- **Spatial resolution** - the ability to recognize two point or line sources of radiation as different if they are separated by the minimum spatial resolution FWHM (full width at half maximum - the width of the profile in the image of a point or line source in half the height of the profile)
- **System spatial resolution of the detector** - deteriorates (FWHM increases) if the collimator with parallel holes is further from the radiation source. Therefore, it is desirable to have the gamma camera as close as possible to the surface of the patient's body.
- **Sensitivity** - indicates the number of pulses of a surface source with a diameter of 10 cm per 1 MBq, most often given for  $^{99m}\text{Tc}$ .

## Using scintillation camera

It is mainly used in scintillation detectors to acquire **two-dimensional images**, in **SPECT**, sometimes they are also used modified as a cheaper variant of detectors in **PET** (with worse results).

## Links

### Related articles

- Scintigraphy
- SPECT
- Collimator

### External Links

- Gamma camera - Czech Wikipedia (<https://cs.wikipedia.org/wiki/Gamakamera>)
- Gamma camera animation - Youtube video (<https://www.youtube.com/watch?v=I0re3ncCKvM>)

## Bibliography

- NAVRÁTIL, Leoš – ROSINA, Jozef, et al. *Medicínská biofyzika*. 1. edition. Praha : Grada, 2005. 524 pp. pp. 430-432. ISBN 80-247-1152-4.
- KUPKA, Karel – KUBINYI, Jozef – ŠÁMAL, Martin, et al. *Nukleární medicína*. 1. edition. vydavatel, 2007. 185 pp. pp. 37-38. ISBN 978-80-903584-9-2.

## Reference

1. NAVRÁTIL, Leoš – ROSINA, Jozef, et al. *Medicínská biofyzika*. 1. edition. Praha : Grada, 2005. 524 pp. pp. 431. ISBN 80-247-1152-4.
2. KUPKA, Karel – KUBINYI, Jozef – ŠÁMAL, Martin, et al. *Nukleární medicína*. 1. edition. vydavatel, 2007. 185 pp. pp. 38. ISBN 978-80-903584-9-2.