SNS COLLEGE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)

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Department of Biomedical Engineering

RADIOLOGICAL EQUIPMENT

III Year : V Semester

TITLE: GAMMA CAMERA

CONTENTS

- Introduction
- Principle of operation
- Collimator
- Photo multiplier tube
- X-Y positioning circuit

INTRODUCTION

- Gamma camera is a device that uses gamma rays to carry out functional scans on patients body and produces an image to examine the area of interest.

✓Gamma rays are a form of electromagnetic radiation.

✓Gamma rays have the highest frequency and lowest wavelength in the electromagnatic spectrum.

COLLIMATOR

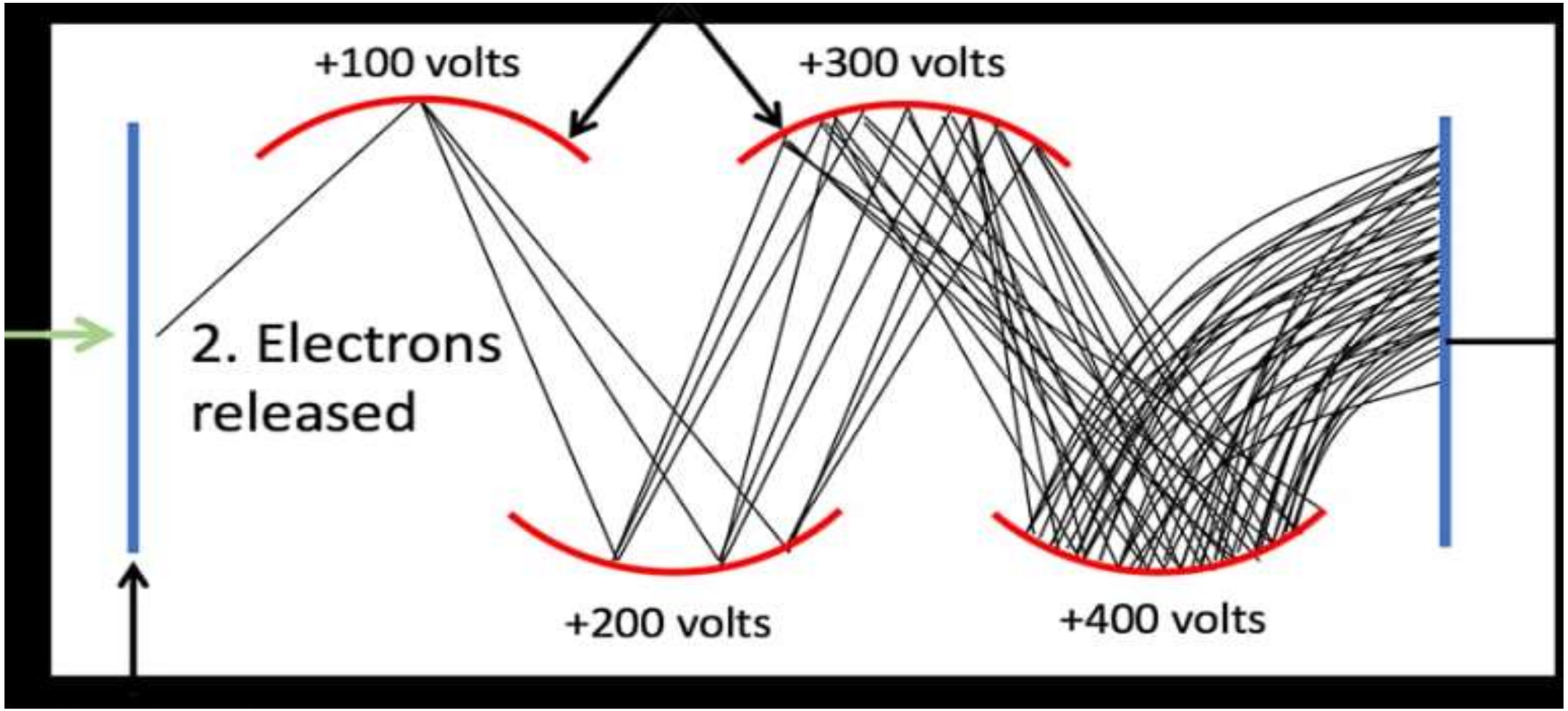
- The collimator of a Gamma camera used in nuclear medicine differs in structure and function to the beam collimators used in general radiography.
- They typically consist of a lead disc drilled with tens of thousands of closely packed holes, separated from each other by septa.
- Each hole only accepts Gamma rays to travel through a narrow channel. The path of these rays, and therefore their origin of location, can be accurately mapped. All other rays traveling in various other directions are absorbed by the septa, and do not contribute to the image.

TYPES OF COLLIMATOR

- Collimator types vary based on the specific photopeaks of the radionuclides being used.
- low energy - used for nuclides emitting photons up to 160 keV
- medium energy - used for nuclides emitting photons up to 250 keV
- high energy - used for nuclides emitting photons > 250 keV

PHOTO MULTIPLIER TUB

- 30-100 PMTs sit behind the scintillation crystal
- The purpose of these is to multiply the small amount of light detected from the scintillation crystal to a large signal.
- The light photons hit a photocathode at the entrance to the PMT.
- The photocathode releases electrons in proportion to the amount of light that hits it.
- The electrons are attracted to the electrodes (dynodes) which have an increasingly positive charge along the PMT. This accelerates the electrons. As they accelerate, they gain kinetic energy resulting in multiple electrons being released from the dynode for each electron that hits it. This serves to multiply the original signal.
- The total electrons hit the final anode and the current produced forms the signal received by the pre-amplifier.


+100 volts
+300 volts
2. Electrons released
+200 volts
+400 volts

X-Y POSITIONING CIRCUIT

- The gamma camera also can be used for dynamic imaging studies, in which changes in the radionuclide distribution can be observed, as rapidly as several images per second. This allows physiologic information to be obtained, such as the rate of tracer uptake or clearance from an organ of interest.

THANKYOU