RADIOPHARMACY DETECTION EQUIPMENT

OBJECTIVES:

1. DESCRIBE THE GENERAL MAKEUP OF A GAS-FILLED DETECTOR
2. DISCUSS HOW A GAS-FILLED DETECTOR OPERATES
3. DESCRIBE THE TWO MAJOR REGIONS WHERE THE GAS-FILLED DETECTORS FUNCTION
4. EXPLAIN THE USAGE OF THE TWO RADIOPHARMACY GAS-FILLED DETECTORS
5. DESCRIBE THE STRUCTURE OF A DOSE CALIBRATOR
6. DISCUSS HOW TO MEASURE A RADIONUCLIDE

10 CFR 35.50 STATES: "A LICENSEE SHALL POSSESS AND USE A DOSE CALIBRATOR TO MEASURE THE ACTIVITY OF DOSAGES OF PHOTON-EMITTING RADIONUCLIDES PRIOR TO ADMINISTRATION TO EACH PATIENT OR HUMAN RESEARCH SUBJECT."

GAS-FILLED DETECTOR

MAKEUP:

SEALED CHAMBER ENCLOSES GAS

POSITIVE AND NEGATIVE ELECTRODES

HIGH VOLTAGE POWER SUPPLY

CURRENT METER MEASURES RADIATION

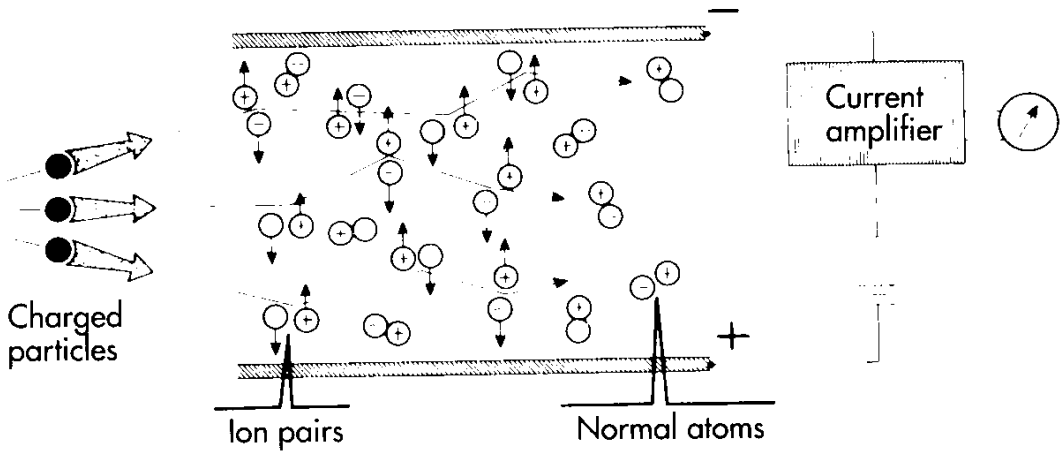
PRINCIPLE OF OPERATION:

RADIATION ENTERS ENCLOSED GAS

RADIATION CAUSES IONIZATION

IONS MOVE TOWARD RESPECTIVE POLES

IONS MEASURED ON CURRENT METER



Incoming particles ionize atoms
Electrodes attract ions
Arrival of ions constitutes current
Current is measure of particles

GAS DETECTOR RESPONSE TO HIGH VOLTAGE

IONIZATION REGION:

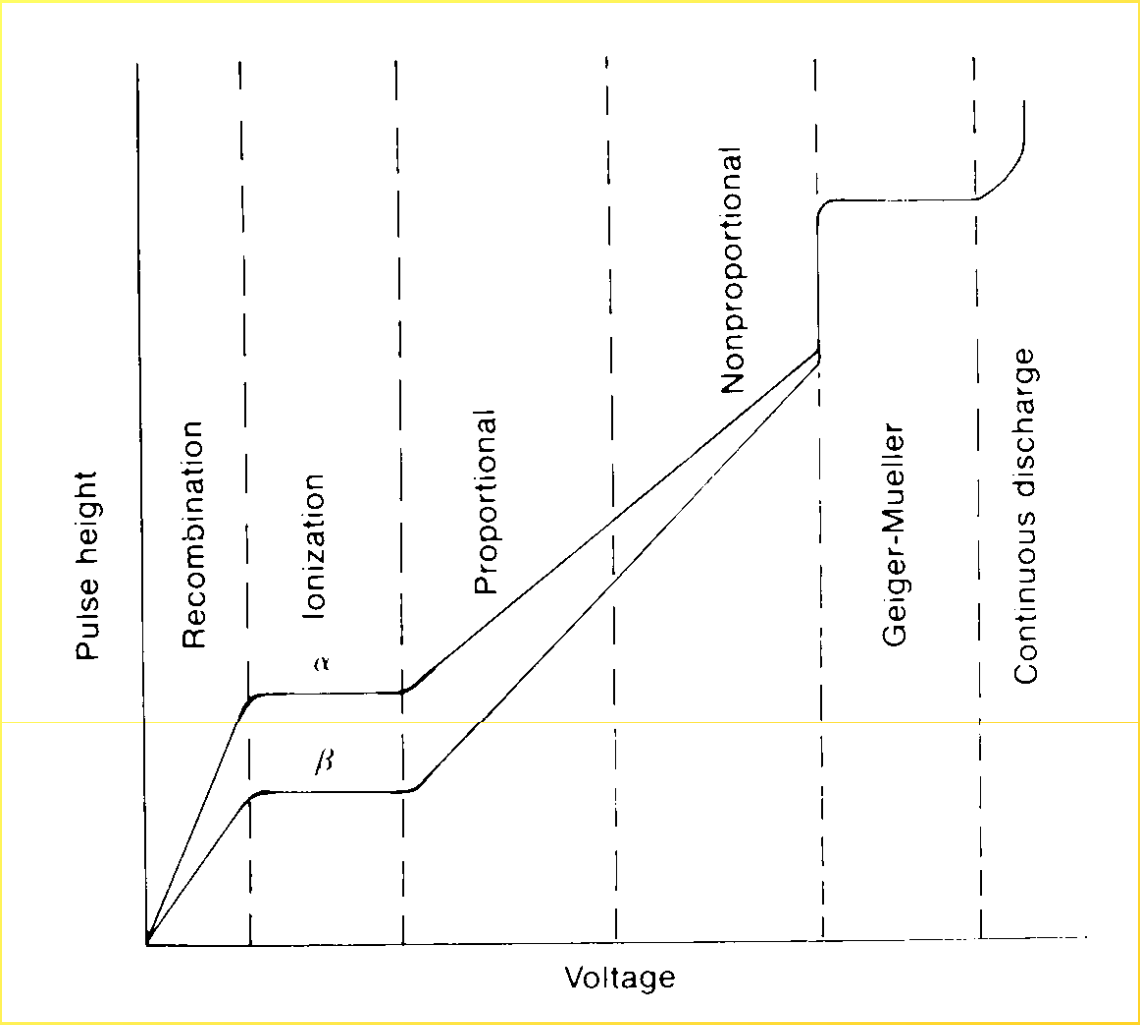
USED TO MEASURE LARGER AMOUNTS OF RADIATION

SATURATION VOLTAGE APPLIED

ALL PRIMARY IONS COLLECTED

ALPHAS, BETAS, AND GAMMAS SEPARATED

DIFFERENT ENERGY GAMMAS SEPARATED


Pulse height
Recombination
Ionization
Proportional
Nonproportional
Geiger-Mueller
Continuous discharge
α
β
Voltage

GEIGER-MUELLER REGION:

USED TO MEASURE SMALL AMOUNTS OF RADIOACTIVITY

THRESHOLD VOLTAGE APPLIED

PRIMARY AND SECONDARY IONIZATION

GAS VOLUME COMPLETELY IONIZED

CAN'T SEPARATE TYPES AND ENERGIES OF RADIATIONS ABSORBED

DOSE CALIBRATOR

- CYLINDRICALLY SHAPED, SEALED CHAMBER WITH A WELL CONTAINING GAS
- HIGH VOLTAGE APPLIED TO ELECTRODES
- ENERGY SPECIFIC SETTINGS
- ACTIVITY READOUT IN uCi, mCi, Ci

HOW TO USE A DOSE CALIBRATOR: TURN ON MAIN POWER

PLACE SYRINGE OR VIAL HOLDER IN WELL

SELECT APPROPRIATE SETTING

ZERO THE DOSE CALIBRATOR

MEASURE SYRINGE OR VIAL

READ ACTIVITY