



SNS COLLEGE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)

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Department of Biomedical Engineering

RADIOLOGICAL EQUIPMENT

III Year : V Semester

TITLE: PULSE – HEIGHT ANALYZERS



Pulse – Height Analyzers



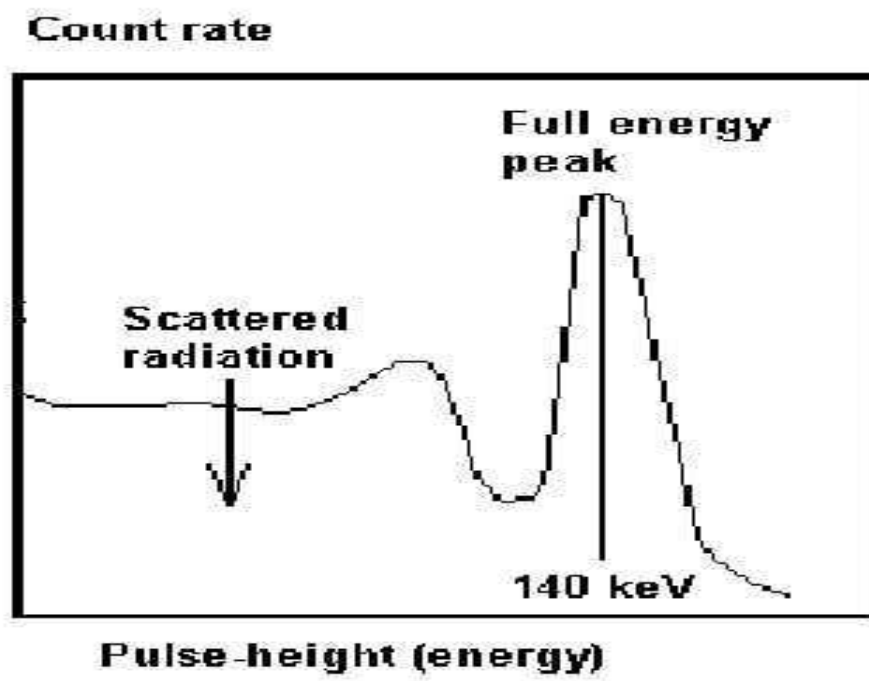
- Basic Functions
- Single Channel Analyzers
- Time Methods
- Multi-Channel Analyzers

V 2

Vision Title 3



Pulse Height Analyzer



itle 3



- ❑ Selective counting of only those pulses within a certain amplitude range makes it possible to restrict counting to a selected energy range and to discriminate against background, scattered radiation, and so forth outside the desired energy range
- ❑ A device used for this purpose is called a pulse-height analyzer (PHA)
- ❑ A PHA is used to select for counting only those pulses from the amplifier falling within selected voltage amplitude intervals or “channels”
- ❑ This is done for only one channel at a time , the device is called a single-channel analyzer
- ❑ A device that is capable of analyzing simultaneously within many different intervals or channels is called a multichannel analyzer.



Basic Function



- The amplitude of output signal is proportional to the energy of the radiation event detected
- Selective counting of those pulses within certain amplitude resulted in counting of selective energy range
- A certain energy range or interval is called energy channel

Vision Title 3



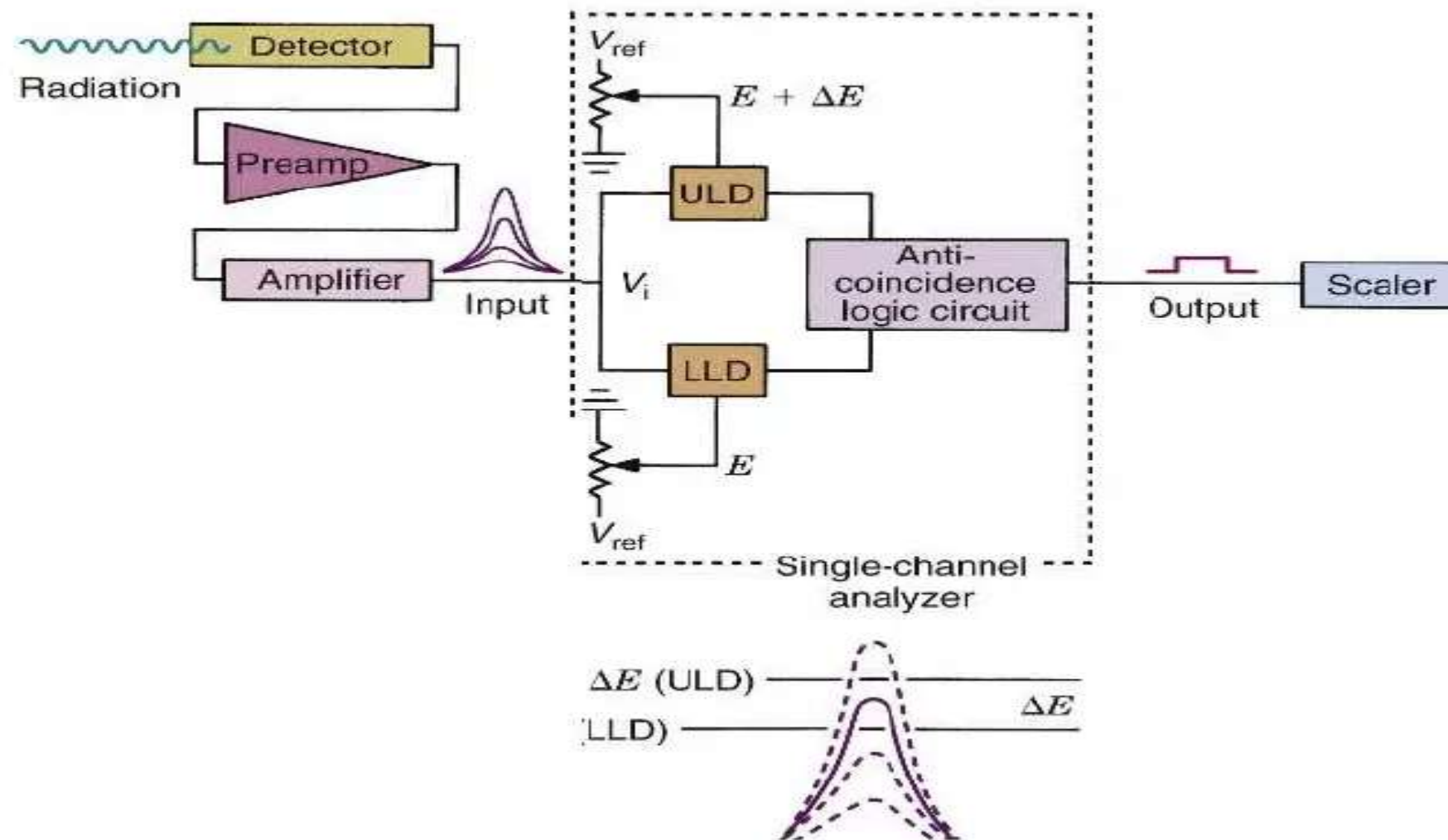
PHOTO MULTIPLIER TUB



- 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.



Single Channel Analyzers



Title 3



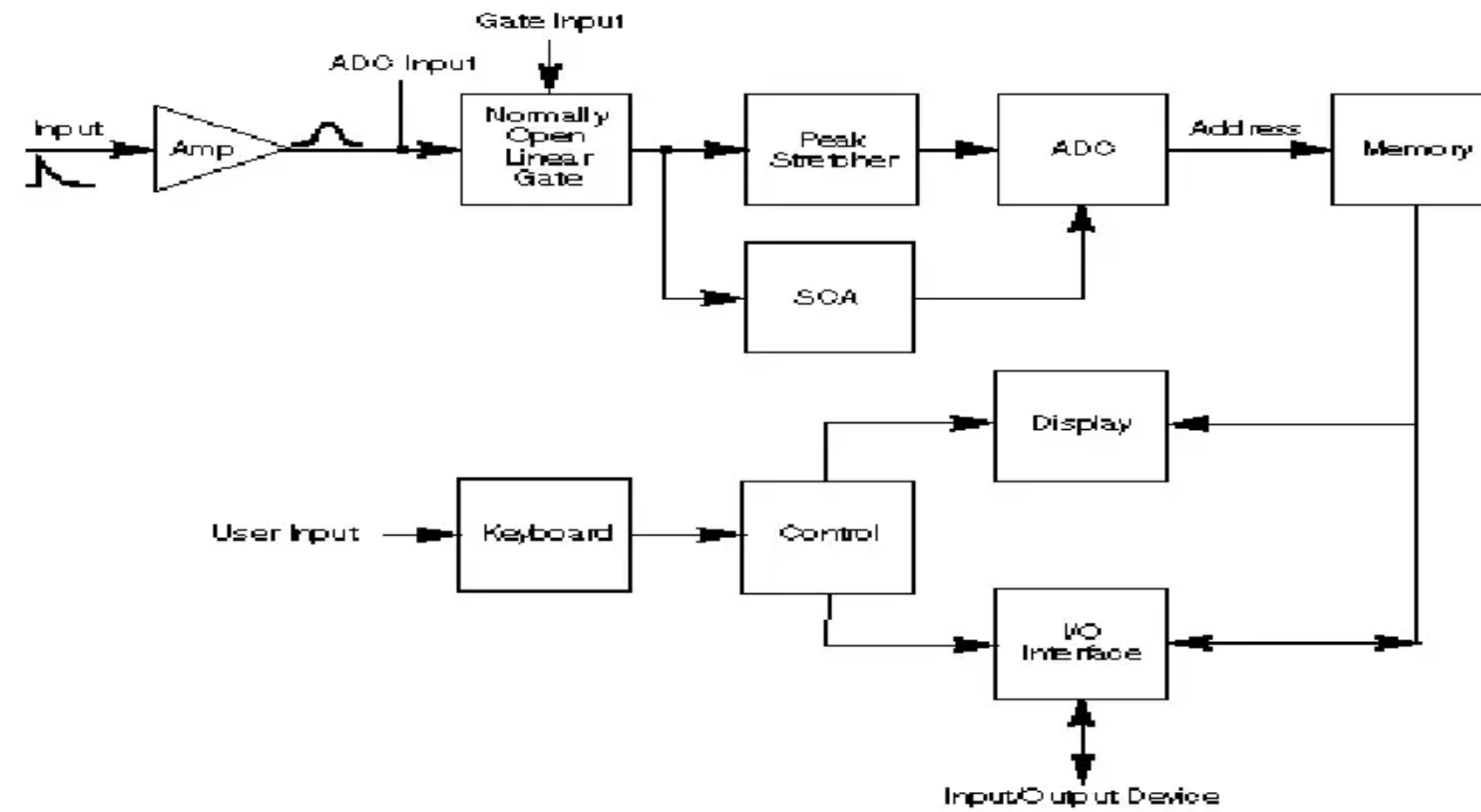
Single Channel Analyzers



- Counting only those within a single energy range
- Composed of three parts : Lower level Discriminator (LLD), Upper Level Discriminator (ULD) and Anticoincidence
- Percentage window : a certain percentage of the window's central voltage
- A single channel analyzer without ULD is a circuit called didcriminator



Multichannel Analyzers





- The single channel analyzer (SCA) has a lower and an upper level discriminator, and produces an output logic pulse whenever an input pulse falls between the discriminator levels
- With this device, all voltage pulses in a specific range can be selected and counted
- If additional voltage ranges are of interest, additional SCAs and counters (i.e. scalers) can be added as required, but the expense and complexity of multiple S&As and counters usually make this configuration impractical



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