

Annexure-C

Radiometric Assay Unit (Complete Set)

Quantity- 01 No.

Gamma Ray Spectrometer microcontroller based modular unit consisting of High Voltage Unit, Linear Amplifier, Single Channel Analyser and Counter timer (Microcontroller based) and a Scintillation Detector. The Spectrometer can be used for Gamma counting applications especially for powdered rock samples for the analysis of radioactive geological materials.

Technical Specifications:

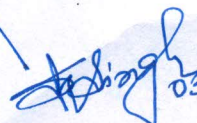
Microcontroller based, compact, rugged, light weight, portable and modular in construction. Along with Scintillation Detector it may be used as Gamma Ray Spectrometer or as a Gamma counting system. Technical details of complete set of Instrument are as follows:

POWER SUPPLY:

- Input voltage: 230V AC + 10% AC
- Frequency: 50Hz
- Stability: For +/- 12V & +/- 24V, +/- 0.3% over any 24 Hours period at constant ambient temperature. Over the combined range of no load to full load and specified mains variation after 60 min.
- Temperature range: 0 to 50°C ambient
- Temperature coefficient: 0.02% per °C over 0 to 50°C ambient.
- Noise and ripple: for +/- 12V & +/- 24V, 20mV peak to peak
- Regulation: Better than + 0.5%
- Voltage adjustments: +/- 2% minimum range. Reset ability +/- 0.5% of supply voltage
- Recovery time: +/- 12V & +/- 24V outputs will recover within +/- 0.1% of steady state values within 100 sec following any change in specified line Voltage or between 10 to 100 % full load.
- Circuit protection: Provision of circuit protection

HIGH VOLTAGE UNIT TYPE:

- Output voltage variable continuously from 0 to 2000 Volts.
- Output current (maximum) 1mA.
- Load and Line Regulations: better than 0.05% of full scale
- Indefinite overload and short circuit protections and self-recovery.
- Output ripple less than 50 mV
- Dimensions: Two bit Module.
- HV is adjustable by ten turn helipot with knob.

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LINEAR AMPLIFIER TYPE:

- Input Polarity: Positive/Negative
- Total Gain (Typical): 250 (approx.)
- Output (Unipolar/Bipolar): 0-8V (usable recommended linear range)
- Max. Output (Bipolar): 10V (Saturation Level)

SINGLE CHANNEL ANALYSER TYPE:

- Input: Unipolar or Bipolar with a +ve leading edge 0 to 10V
- Pulse Pair Resolution (approx.): 1 μ sec
- Output Pulse Polarity: Positive
- Pulse Amplitude: +5V
- Pulse Width: 1 μ sec
- LLD output pulse amplitude: +5V
- Output pulse width: 1 μ sec
- LLD/Base line variable by: 10 turn helipot/Dial
- Window width: Continuously variable by helical potentiometer/Dial
- Window: 0-1V in WINDOW mode
- ULD range: 0-10V in NORMAL mode
- Dimensions of module: 1 Bit

COUNTER TIMER TYPE:

- Input: 100mV to 10V, unipolar or positive bipolar semi Gaussian/Gaussian pulse
- Pulse width: 1 μ sec (min)
- Polarity: Positive or Negative
- Input Impedance: 10 K ohms
- Input counts capacity: 999999 counts
- Pulse height Discriminator: 100mV to 10V by a preset provided on front panel
- Display: 16 \times 2 LCD dot-matrix display has been provided to indicate data counts and Elapsed time
- Preset time: 0-9999 seconds
- Command Buttons: START, STOP, PROG, STORE, INC & DEC command buttons have been provided on the front panel key board
- Modes of Data Acquisition: (a) Counts for a preset time (b) CPS (c) CPM
- Preset Time Selection : Programmable through switch control buttons
- Data storage: Up to 999 readings
- Programmability: includes selection of preset time storing/recalling of data, starting and stopping of acquisition, label assignment for data counts such as BG (background), ST(standard) and SM (sample).
- Printing option: This module has built in parallel port for Data transfer
- Serial port: This module additionally has built-in RS232C serial port for downloading the data into PC.

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SCINTILLATION DETECTOR (S):

Scintillation detector 2" × 2" NaI(Tl) integral assemblies with built-in pre-amplifiers to meet the requirements of wide range of Gamma counting applications especially for powdered rock samples for the analysis of radioactive geological materials with better accuracy. The detector assemblies give excellent stability, superior performance and good resolution in the range of 8.0 to 9.5% for Cs-137. Complete Integral assembly with base pin has following specifications:

Detector Size:		NaI(Tl), 2 × 2 inches crystal	
Photomultiplier:		51 mm diameter Phototube with Mu-metal magnetic/light shielding.	
Operating Voltage:		700 - 900V	
Resolution:		Better than 8.5% with Cs-137	
Pre-amplifier:		Built-in	
Gain (Approx):		7×10^6 or better	
Aluminium crystal housing		0.5 mm	
Solid Mu-Metal light shield around PMT		0.63 mm	
External dimension of Integral assembly of crystal and PMT	Length: (Approx):	185.0 mm	OR dimensions shall be specify by the supplier to meet the requirements of wide range of Gamma counting applications especially for powdered rock samples for the analysis of radioactive geological materials with better accuracy.
	Diameter: (Approx):	58.8 mm	
Temperature Range:		-20°C to $+65^{\circ}\text{C}$	

GAMMA REFERENCE STANDARD SET TYPE:

Consists of a set of FIVE Gamma sources evaporated and sealed on 25 mm dia × 5 mm plastic disc covering SIX photo peak energies in the range of 2 to 5 micro curie. The accuracy of these sources is in the range of +/-10%. All these disc sources are enclosed in a box.

LEAD CASTLE FOR SCINTILLATION DETECTOR:

Consists of 40 mm lead shielding cylindrical rings assembled according to the detector. There is a provision in the bottom ring through which system connections are given to the detector, which is placed in the lead shield. The top ring has a holding knob through which sample can be loaded on to the scintillation detector and this closes the lead castle from top side. The inside of the lead shield is lined with Aluminium to minimize scattering.

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