

NaI SCINTILLATION DETECTOR (WELL TYPE) BASED GAMMA RAY SPECTROSCOPY SYSTEM WITH 8K MCA

Technical Data

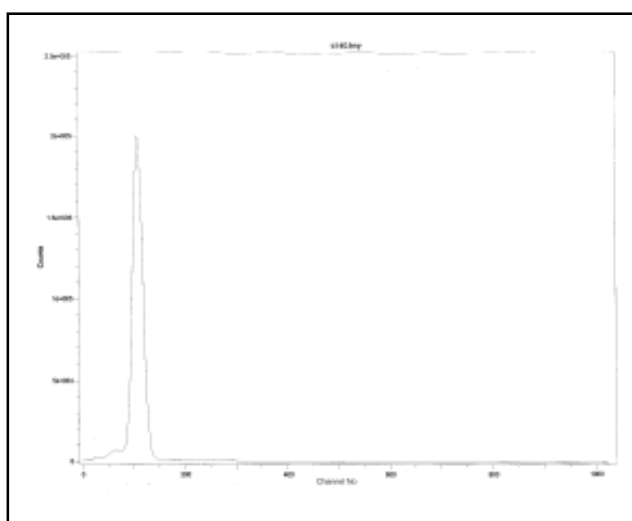


FEATURES :

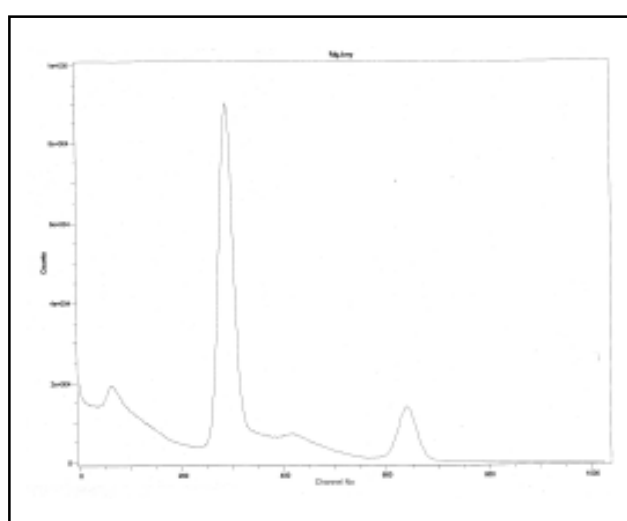
- ❑ This system is an ideal choice for medical cyclotron facility to test isotope purity & energy identification of the medical isotopes produced, for use in PET-CT centres.
- ❑ 2"x2" NaI well detector facilitates loading of the samples in a vial or test tube for spectrum acquisition.
- ❑ FDG / F-18 or Tc-99, I-131 etc., or other isotopes produced can be checked for isotope purity & energy identification.
- ❑ System has 1K/4K/8K MCA with USB interface.
- ❑ Software has energy, efficiency activity calculation menus.
- ❑ Detector resolution is better than 8.5% for Cs-137.

NaI Scintillation detector (well type) based gamma ray spectroscopy system is a versatile essential system required in the Q.C Lab of medical cyclotron facility. This system is used to test isotope purity & energy of the Radio-nuclides such as FDG / F-18 or Tc-99, I-131 etc., produced in a medical cyclotron. These isotopes are sent to PET-CT centres & Nuclear medicine centres for applications & use on patients. Basically isotope produced is loaded into the vial & is placed into the well of the 2"x2" NaI scintillation detector to acquire PHA spectrum of the Radio-Nuclide which will indicate purity of the isotope & indicate the energy.

Essentially this system consists of the following constituent units (1) a 2"x2" well type NaI integral assembly detector with lead shielding arrangement (2) High voltage unit (3) Shaping amplifier, (4) Instrumentation bin with power supply, (5) 1K/4K/8K MCA (USB based) (6) Personal computer with data acquisition & processing software.



Technetium-99m, 140keV peak



FDG (F-18), 510keV peak

SPECIFICATION

MINIBIN AND POWER SUPPLY MB 403:

Mini bin : Accommodates SIX / EIGHT single bit modules or combination of multiple widths with Amphenol connectors. Minibin is primarily designed with the objective of conserving bench space and to achieve significant saving in cost of the Minibin based systems. Bussed wiring is provided to the power connectors to distribute +/- 12V and +/- 24V. A control panel with ON/OFF switch, low voltage test sockets is provided on the right extreme side of the bin.

Minibin Dimensions : 11.75"width X 11.00 depth (upto connectors) X 8.75" height.

Power supply : This is either two and half bit module or a compact box type enclosure fitted at the back of this bin, which generates highly regulated D.C voltages.

Input : (230V + 10%) a.c, 50Hz.

D.C Output : +12V @ 1A, -12V @ 1A, +24V @ 0.5A, -24V @ 0.5A 48 watts maximum.

Regulation : Better than +/- 0.1%

Noise & Ripple : Less than 3 mv

Stability : +/- 0.5% after a 24 hr warmup at constant line, load & ambient temp.

HIGH VOLTAGE UNIT (HV 501) :

- a. Output voltage variable continuously from 0V to 1500 volts
- b. Output current (max) 1mA
- c. Load & Line regulations : Better than 0.005% of full scale
- d. Indefinite over load & short circuit protections and self recovery
- e. Output ripple less than 20mv.
- f. Dimensions : Single / Two bit module

LINEAR AMPLIFIER (LA 520) :

- a. Input Polarity : Positive or Negative
- b. Total gain (Typical) : 1000 (approx)
- c. Output (Unipolar) : 0 to 8V
- d. Max. output (Unipolar) : 12V
- e. Dimensions : Two bit module

LEAD CASTLE : This Lead Shield is designed to shield 2"x2" NaI detector Scintillation Detectors of NUCLEONIX make. It is built-up of interlocking rings with bottom and top plates. The bottom ring is provided with a small opening so that the cables from the Scintillation Detector Pre-amplifier base could be taken out for connecting to the Gamma ray spectrometer counting system.

The inside of the lead shield is lined with Aluminium to minimise scattering.

Thickness 40mm, accommodate 2" scintillation detector including sample.

WELL TYPE SCINTILLATION DETECTOR (SD151W): This detector assembly consists of a vertical housing with built-in preamplifier in to which 2"x2" well type integral assembly is plugged in.

This is designed to be table top mountable assembly. This load samples in test tubes for counting.

- a. Crystal Sizes : 2" x 2"
- b. Well Size : 0.656" dia x 1.546" deep
- c. Resulation : Better than 8.5 %
- d. Noise (RMS. referred to input) : Less than 50µV
- e. Operating Voltage : 700 to 900V
- f. Out put : Positive Tail Pulse
- g. Output impedance : 90 Ohms
- h. Power Requirement (Typical) : -12V @ 12mA

MULTI-CHANNEL ANALYZER (8K MCA) WITH PROCESSING SOFTWARE : Multi-Channel Analyzer (MCA) is an important part of nuclear spectroscopy system. The major requirement of MCA is for nuclear pulse height analysis in energy spectroscopy. The USB-MCA presented here, incorporates state of art technologies like FPGA, USB bus interface and precision analog electronics to meet the stringent system requirements in nuclear pulse spectroscopy. The resolution supported by the USB-MCA ranges from 256 channels to 8K channels selectable via software, making it suitable for all spectroscopy applications from low resolution (e.g. NaI-PMT) to high resolution (e.g. HP-Ge) systems.

The USB bus interface of the MCA provides an excellent connectivity with most of the new PCs and laptop computers. The PHAST application software provided with the USB-MCA, seamlessly integrates with the hardware, featuring a range of standard functions required for analysis and acquisition.

SPECIFICATIONS :

Hardware features:

- MCA resolution: 256, 512, 1K, 2K, 4K and 8K channels.
- Spectrum memory : 128K bytes single port SRAM.
- Max counts / channel: 31 bit (2 Giga counts).
- Pulse processing time : 7 μ s including ADC conversion time of 5 μ s.
- Pile up rejection: Active high TTL input from spectroscopy amplifier
- DNL: + 1%
- INL : + 0.05% F.S.
- MCA Input: Single channel, 0 to +10 volts
- Power requirement: 5V, ~500 mA through USB cable directly (No external power supply required)

Software features: Important software features include * spectrum display in two windows * marker selection (two) for ROI Detection & bracketing the peaks of interest, multiple ROI selection, deletion of ROIs etc.,

File Handling: Involves storing, loading of complete spectrum.

Print: Print of Total graph, selective graph, peak report

Acquisition: With pause option

Erase: Erasing spectrum from memory

Spectrum Analysis: Find peak, Shape calibration, Energy calibration, Approx Calib, Efficiency Calibration, Activity Calculation, etc.,

Spectrum smothing: 3,5,7,9 &11 point smothing functions have been provided

ROI Option: Insert, Delect, Hide Etc.,

Scale: X-axis can be choosen as Channel number (or) Energy axis (in Kev) & Y - axis has range from 256 to 64M in binary steps with auto scaling option. Y-scale can be linear or log LLD, ULD & base line are soft selectable In built Isotope library for istope selection & matching.

PERSONAL COMPUTER SYSTEM WITH PRINTER : Any standard pentium IV computer configuration with printer is adequate to run MCA software.



NaI Scintillation Detector (well type) based gamma ray spectroscopy system with 8k MCA, installed in QC lab of a medical cyclotron facility. System is used to test isotope purity & energy of the Radio-nuclides such as FDG / F-18 or Tc-99, I-131etc., produced