TECHNICAL SPECIFICATIONS

bMCA-Ethernet — a compact digital MCA

INTRODUCTION

bMCA is a compact, digital Multi-Channel Analyzer (MCA), which is able to perform Pulse Height Analysis (PHA) of the signal produced by a standard 14-pin standard photomultiplier coupled to a scintillation detector such as NaI(Tl), CsI(Tl), CeBr$_3$, LaBr$_3$ (Ce), LaCl$_3$(Ce), etc.

The device is therefore useful for obtaining the energy spectrum from the photon radiation detected by the scintillator, and can be connected into the local network via a standard Ethernet connection. The device is powered via Ethernet using Power-over-Ethernet (PoE) technology.

The bMCA is provided with a basic software package that allows to control the device, and to acquire and visualize the energy spectrum. The software incorporates an advanced and easy-to-use "discovery" function that can be used to detect automatically all the bMCAs (USB or Ethernet) in the neighborhood of the PC that are available for connection.

A set of programming libraries are also offered, which makes the incorporation of the bMCA into existing radiation systems or setups very easy. The programming libraries are available for both MS Windows and Linux operating systems.

DESCRIPTION

The bMCA is an advanced, fully digital, compact Multi-Channel Analyzer (MCA). This device is used to process the electronic pulses produced by a photo-multiplier that is coupled to a scintillator detector. Such detectors are commonly used in the detection of gamma-ray radiation due to their high detection efficiency, medium energy resolution and relatively low price. This kind of MCA is able to produce an energy spectrum from the radiation events detected by the scintillator, storing it in the device's memory for further retrieval and analysis by the PC.


The bMCA implements two modes of data acquisition:

- Pulse Height Analysis (PHA)

- Multi-channel scaling (MCS)

PHA mode is regularly used in nuclear spectrometry and radiometry, while MCS is a very useful feature for following photon detections in a particular specific energy regions in function of time. MCS acquisition mode is useful to both laboratory and industrial applications that make use of radioactive sources or seek for radioactive materials.

The bMCA design makes use of the latest advances in digital electronics. The device utilizes powerful digital processing techniques and algorithms to better separate the useful signal from noise and to maximize performance under high count rate conditions. It also contains a miniaturized high-voltage power supply optimized for low consumption that provides the necessary power for the PMT tube, including those used with large scintillator detectors. The bMCA has a spectral memory size of up to 4096 channels and can perform MCS in addition to PHA. On the data communications side, this device features lighting-fast transfer rates, with a 1024-channel spectrum being transmitted typically in less than 30 microseconds.

A basic acquisition software package is provided for managing such device operations as setup, control, data acquisition and visualization. A digital oscilloscope function allows monitoring the input and filtered pulses to aid in fine-tuning the MCA parameters. The program also includes a few spectrometry-related functions for processing the spectral data: calibration, ROI analysis and peak search, to mention a few.
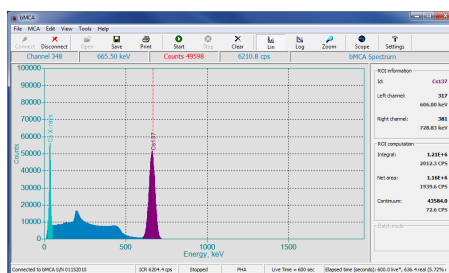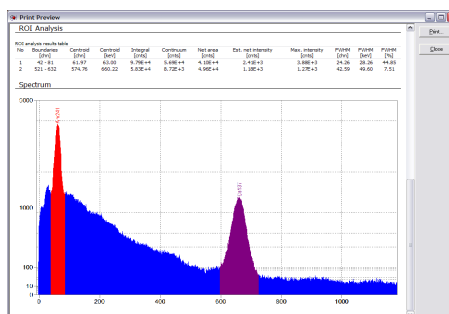
FEATURES

- Fully digital Multi-Channel Analyzer (MCA) built into a compact 14-pin photo-multiplier tube base

- Full Pulse-Height Analysis (PHA) and Multi-Channel Scaling (MCS) modes of data acquisition

- Up to 4096 channels for PHA and MCS acquisition

- Advanced electronic noise reduction algorithms

- Compact MCA with sizes of H 68 mm x D 56 mm

- Ethernet data communications with device IP address set via DHCP or fixed

- Extremely fast data communication rates with 1K PHA spectrum being to the PC sent in 30 microseconds

- Miniature design combining low power consumption with low noise

- Basic spectrum acquisition and device control software included

- Available programming libraries for Windows and Linux Operating System (upon request).

- LED indicators for communications and device power, HV power and incoming count rate (ICR)

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TECHNICAL SPECIFICATIONS

PHA acquisition mode

♦ Spectral memory size of 256, 512, 1024, 2048 and 4096 channels

♦ Coarse gain with amplification factors of 1, 2, 4 and 8. Fine gain from 1 to 2 in steps of 1/4096

♦ Upper and Lower Level Discriminator settings given in channels

MCS acquisition mode

♦ Spectral memory size of 256, 512, 1024, 2048 and 4096 channels

♦ Dwell time from 0.1 sec to "count-forever"

♦ Easy to setup from ROIs or nuclide information.

Digital Settings

♦ Rise Time: from 0.1 to 12 μsec in steps of 0.2 μsec

♦ Flat Top: from 0.1 to 8.0 in steps of 0.1 μsec

♦ Threshold: 1 to 255

♦ Digital Base Line Restorer (BLR)

♦ Pile-Up Rejector (PUR)

High Voltage Power Supply

♦ Miniature HV power supply embedded into the MCA assembly

♦ Voltage: 0 to positive + 1 500 Volts in 4096 steps

Data communication

♦ Ethernet, IP address fixed or set via DHCP

♦ Fast transfer rates: 30μs typical for a 1024-channel energy spectrum.

♦ Optional, set of cables and PoE injector

Physical

♦ Size: height 65 mm, diameter 56 mm

♦ Weight: approximately 120 grams

♦ Connectors: Ethernet RJ45

♦ Indicators:

　◊ Red LED for detector high voltage

　◊ Yellow LED for incoming count rate (ICR)

　◊ Green color LED for power and communication status

Other

♦ The device is supplied with a basic software to control operation, data acquisition and visualization.

♦ (OPTION) **bGamma** full-featured software for gamma-ray spectrum analysis and radioactivity quantification

Certifications

♦ The device is CE compliant

CE
CERTIFIED