

USB - MCA: A High-Resolution 8K MCA with USB Interface

Technical Data



FEATURES :

- ❑ Excellent MCA performance in terms of resolution, DNL, etc.
- ❑ Universal connectivity to a wide range of PCs and notebook computers
- ❑ Unlike ISA / PCI cards, it stands outside a PC
- ❑ Simple to install, operate and handle
- ❑ Low power operation, operate and handle
- ❑ Suitable for portable as well as laboratory class instrumentation
- ❑ Easy to manufacture and maintain

A 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 lap-top 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.

Thus USB-MCA, along with external HP-Ge detector, spectroscopy amplifier and HV supply, forms a complete system for high-resolution spectroscopy applications.

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 smoothing: 3,5,7,9 & 11 point smoothing functions have been provided.

ROI Option: Insert, Delete, Hide Etc.,

Scale: X-axis can be chosen 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 isotope selection & matching.

PHA Mode features :

- Exp Time : The time for acquisition in seconds (for PHA and MCS both)
- Timer Mode : Live / clock mode (for PHA only) (Default : Live).

- Conversion Gain : This is used to set conversion gain of the MCA (for PHA only) (Default : 1K)
- LLD (volts) : This is used to set lower discrimination level of the MCA (Set range : 0.1 to 10volts)
- ULD (volts) : This is used to set upper level discrimination level of the MCA (set range : 0.1 to 10 volts)
- Baseline (volts) : This is used to set baseline of the MCA (range : 2 to 2 volts).

MCS Mode features :

- Dwell Time : MCA supports dwell time of 10ms to 999 seconds.
- Pass Length : Displays the no. of channels for one sweep. (1024 channels fixed).
- Max Pass Count : Displays the maximum number of MCS cycles supported by MCS. This number is fixed and should be taken as an information.
- AQC Mode : Add / Overwrite (Default : Add)
Add : Sums the previous counts and present counts on channel to channel basis.
Overwrite : Replaces the previous counts with fresh counts on channel to channel basis.
- Sync pulse : Internal / External
External : Sync pulse is applied through external hardware (only this option is supported for actual use).
Internal : Not supported (only for debugging).
- Channel Advance : Internal / External (Default : Internal)
Internal : The channel advance is realized by internal hardware dwell timer (only this option is supported for actual use).

External : Not supported.

- Acq stop mode : By Acq time only
Acquisition stops when the preset acquisition time (exp time) is completed.

Advantages:

The USB-MCA is designed with state of art technologies to meet the stringent requirements of nuclear instrumentation and hence offers many distinct advantages including the following:

- Excellent MCA performance in terms of resolution, DNL, etc.
- Universal connectivity to a wide range of PCs and notebook computers.
- Unlike ISA/PCI cards, it stands outside a PC.
- Simple to install, operate and handle.
- Low power operation, operates with USB bus power only.

Applications:

The USB-MCA is useful for high resolution pulse height analysis (up to 8K channels) and high count rate systems (with a typical dead time of 7 μ sec maximum). The hardware with associated software installed in a pc makes state of art Multi-Channel Analyzer system. It is useful for high resolution X-ray and gamma ray spectrometry work in following areas:

- Isotope research
- Nuclear reactors
- Accelerators
- Universities
- Other R&D