

TOPAZ-HR

Compact High-Resolution Digital MCA



BNC

Berkeley Nucleonics
Test, Measurement and Nuclear Instrumentation since 1963

Topaz-HR – A compact digital MCA for high resolution gamma-ray spectrometry

INTRODUCTION

Topaz-HR is a compact, stand-alone digital Multi-Channel Analyzer (MCA), which is able to perform Pulse Height Analysis (PHA) of the signal produced by high resolution gamma-ray semiconductor detectors, such as Hyper Pure Germanium Detectors (HPGe). Such detectors are commonly used in high-resolution gamma-ray spectrometry, a technique vastly implemented in any advanced radio-analytical laboratory or as part of comprehensive nuclear analytical methods. The MCA can be also be used with detectors with lesser energy resolution, such as scintillator detectors, like NaI(Tl), LaBr₃, CeBr₃, etc.

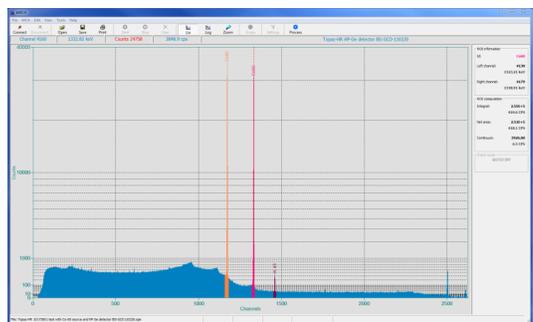
The MCA is provided with a basic software package that allows to control the device, and to acquire and visualize the energy spectrum. The software incorporates an advanced and easy-to-use “discovery”

function that can be used to detect automatically all the BrightSpec MCAs that are physically connected to the PC or in immediate network neighborhood. Alternatively the MCA can be provided with our full-featured and advance Gamma-ray spectrometry software package - bGamma. Using bGamma the user can perform data acquisition and within the same software framework the spectrum analysis, including all necessary calibrations, and radioactivity quantization per radionuclide in the sample.

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



DESCRIPTION



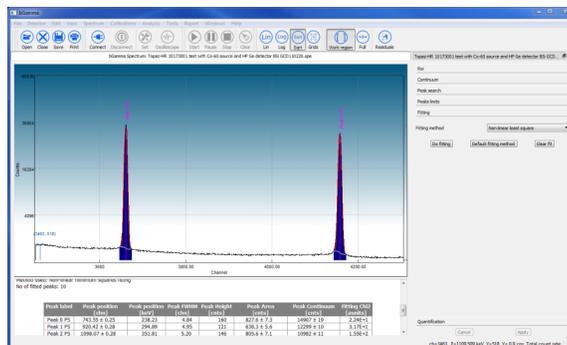
The Topaz-HR is an advanced, fully digital, compact Multi-Channel Analyzer. This device is used to process the electronic pulses typically produced by a high-resolution, semiconductor detectors such as hyper-pure germanium detectors (HPGe). However, the MCA can be also connected to other type of detectors such as scintillators (e.g. NaI(Tl), CeBr₃ or LaBr₃, etc.) making it a valuable and multi-purposes device and a “must have” in your lab.

The MCA implements several advanced modes of data acquisition, such as: Pulse Height Analysis (PHA), Multi-channel scaling (MCS), LIST and Time-LIST mode (TLIST). For the latter, each recorded pulse will be stored not only with the pulse height information (energy), but

with the arrival time stamp as well. In TLIST mode the event time resolution is better than 30 nano-seconds. The Topaz-HR design incorporates the latest advances in digital electronics. The core of the MCA is its 14-bit high-quality fast flash ADC running at 50 Ms/s, a 100 MHz DSP processor and a 200 MHz CPU. The device has a spectral memory size of up to 16 384 (16K) channels of 32-bit depth available for any acquisition mode.

The device includes a low-noise and yet power full high voltage module which is able to provide high voltages bias from 0 to 6000 Volts, as well as a power connection to most commonly used Pre-amplifiers (± 24 or ± 12 Volts), via a DB9 connector.

The Topaz-HR transfers acquired data via an ultra-fast USB connection to the PC with data transfer rates of 480 Mbit/sec. The MCA is powered using an external low-noise AC/DC power supply, which is included in the delivered package. The MCA is cased into a rugged aluminum box with all necessary connectors for the detector and one USB (mini type B) for the PC. In the front panel several LED signalizes the status of the data acquisition and the device.



The device can be controlled via our basic acquisition software (bMCA software), which can be freely downloaded from our WEB site. Alternatively, the MCA control is incorporated into our fully-featured Gamma-ray spectrometry analysis software—bGamma. An attractive package price can be obtained when ordering the MCA together with bGamma software.

This device is also available as a separate PCB only, which makes it attractive to the OEM market. The programming libraries for Windows and Linux OS are available as well.

FEATURES

- Fully digital, ultra-compact Multi-Channel Analyzer (MCA), suitable for high energy resolution semiconductor detectors like HPGe
- Fast flash 14-bit ADC (50 Hz) with a 100 MHz DSP and a 32-bit CPU at 200 MHz
- Advanced spectroscopy acquisition modes: PHA, MCS, LIST and TLIST. TLIST with 30 ns resolution**
- Hi-speed data transfer rate (480 Mbit/sec) over USB
- Up to 16K channels 32-bits depth for any acquisition mode
- Includes 6 kV 350 μ Amp detector's high voltage bias suitable with automatic ramping and signal inhibit
- Includes Pre-amplifier power supply $\pm 24V @ 125 mA$ and $\pm 12V @ 250 mA$.
- Supports both RC and pulse-reset pre-amplifiers. Implements automatic reset pulse detection.
- Miniature design combining low power consumption with low noise
- Includes two user-programmable I/O ports.
- Compact MCA with size of 126x106x56 mm in the aluminum case, weight < 200 grams
- Available programming libraries for Windows and Linux Operating System (upon request)
- Can be incorporated into full-featured and powerful Gamma-ray spectrometry software: bGamma**

Berkeley Nucleonics

In Partnership With

BRIGHTSPEC

Berkeley Nucleonics has supported the nuclear R&D and radiation measurements community for 50+ years. BNC manufactures electronics for nuclear research and innovative systems for the detection, location, and identification of radioactive sources. Comprehensive lines of specialized radiation counting and analysis tools are offered with the collaboration of key partners worldwide.



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TECHNICAL SPECIFICATIONS

Device

- ◆ 14-bit high-performance flash ADC . 50 Ms/s sampling rate
- ◆ 100 MHz DSP processor

Data acquisition

- ◆ Spectral memory sizes of 256, 512, 1024, 2048, 4096, 8192 and 16 384 (16K) channels of 32-bits depth.
- ◆ Supports both RC and pulse-reset type of Pre-Amplifiers
- ◆ Acquisition modes : PHA, MCS, LIST mode and TLIST mode
 - ◆ LIST and TLIST modes with better than 30 nsec event time resolution
- ◆ Analog gain from x1 to x256. Coarse gain with amplification factors of 1, 2, 4, 8, 16, 32, 64 and 128. Fine gain from 1 to 2 in steps of 1/16384 (~ 0.000061)
- ◆ Upper and Lower Level Discriminator settings given in channels
- ◆ Automatic reset pulse detection or via external signal.
- ◆ Preset acquisition times from 0.005 seconds to approx. 0.65 years
- ◆ Built-in several preset acquisition modes:
 - ◆ By preset time value (real or live times)
 - ◆ By counts (in ROI)
 - ◆ By external control signal or
 - ◆ Combination of any above

MCS

- ◆ Spectral memory sizes of 256, 512, 1024, 2048, 4096, 8192 and 16384 channels, depth 32-bits
- ◆ Dwell time from 0.005 seconds to "count-forever"

Digital Settings

- ◆ Trapezoidal pulse shaper
- ◆ Rise Time: from 0.1 to 12 μ s in steps of 0.2 μ s
- ◆ Flat Top: from 0.1 to 8.0 μ s in steps of 0.1 μ s
- ◆ Adjustable Fast discriminator threshold
- ◆ Digital Base Line Restorer (BLR)
- ◆ Pile-Up Rejector (PUR)
- ◆ Analog and adjustable Poles/Zero cancellation correction
- ◆ Dead time correction with fine-tuning capability

Power Supply

- ◆ Device power by external low-noise AC/DC power adaptor 9-24V (supplied), 15W max.
- ◆ Preamplifier power supply: +- 24 V @ 125 mA and +-12V @ 250 mA.
- ◆ HV power supply: 0 to 6000 V, 350 μ A with automatic ramping. Dual polarity, but fixed at factory
- ◆ External HV Inhibit control

GPIO

- ◆ Two user-programmable I/O lines
- ◆ Can be used as external counters, external data acquisition control, etc.

Data communication

- ◆ High-speed USB 2.0, up to 480 Mbit/s
- ◆ Standardly a 3-meter long USB cable is supplied.

Physical

- ◆ MCA box: length 126 mm, width 106 mm, height 56 mm
- ◆ Weight: less than 200 grams (including box)
- ◆ Connectors :
 - ◆ Front: EXT DC barrel-type, USB mini-B
 - ◆ Back: SHV for high voltage output, 3x BNC for signal and GPIO, DB9 connector for preamplifier power.
- ◆ Indicators:
 - ◆ Red LED for detector high voltage status
 - ◆ Yellow LED for incoming count rate (ICR)
 - ◆ Green color LED for power and communication status
 - ◆ Blue LED blinking in case of HV Inhibit Signal
 - ◆ Blue LED (on top of power switch) for power on indication

Other

- ◆ The device is supplied with a basic software to control operation, data acquisition and visualization.
- ◆ Upon request: Necessary programming libraries for Microsoft Windows® and Linux

Optional

- ◆ The MCA can be supplied with full-featured Gamma-ray spectrometry software—**bGAMMA**, at package cost.

Certifications

- ◆ The device is CE compliant

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