



# TECHNICAL SPECIFICATIONS

## TOPAZ-SiPM— a miniature digital MCA

### INTRODUCTION

TOPAZ-SiPM is a compact, stand-alone digital Multi-Channel Analyzer (MCA), that is able to perform Pulse Height Analysis (PHA) of the signal produced by scintillation detectors which incorporates Si devices as photomultipliers (so called SiPMs). These type of scintillators can use standard crystals such as NaI(Tl), CsI(Tl), BGO, LaBr<sub>3</sub>(Ce), LaCl<sub>3</sub>(Ce), etc.

The device is useful for obtaining the energy spectrum from the photon radiation detected by the scintillator detector and can be easily interfaced to a typical PC or notebook via a standard USB port for further data transfer and analysis.

A “free-to-download” basic software is provided with the device, but this spectroscopy device is compatible with our full-featured gamma-ray spectrum analysis software—bGAMMA.

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

The device is available either in a rugged, pocket-size aluminum box with input and output connectors, or it is available as a separate Printed-Circuit Board (PCB) for OEM distribution.



### DESCRIPTION

The TOPAZ-SiPM is an advanced, fully digital, **miniature**, and compact Multi-Channel Analyzer. This device is used to process the electronic pulses produced by a Si-device as photomultiplier which 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.

The MCA implements two modes of data acquisition: Pulse Height Analysis (PHA) and Multi-Channel Scaling (MCS). PHA mode is regularly used in nuclear spectrometry and radiometry, while MCS is used to follow photon detections in a particular specific energy regions in function of time. MCS acquisition mode is useful in both laboratory and industrial applications which make use of radioactive sources or seek for radioactive materials.

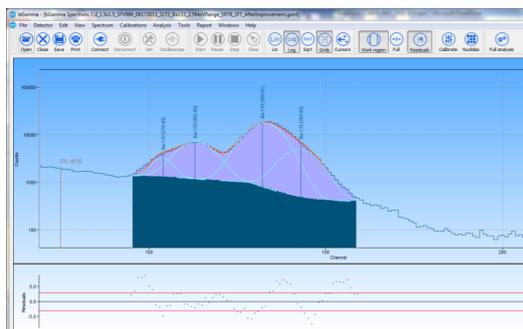
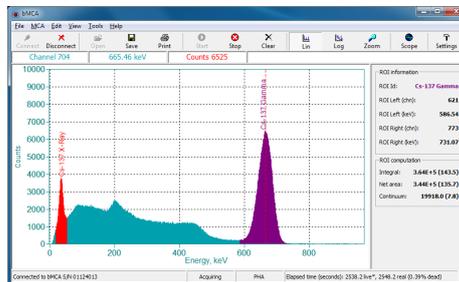
The TOPAZ-SiPM design makes use of the latest advances in digital electronics. Its footprint (both PCB and boxed version) are to minimal sizes, yet it still provides a large range of selection of settings and device capabilities, which warrants its exceptional spectroscopy performance independently from the scintillator being connected. The device automatically provides the necessary power for the SiPM to operate. The MCA has a spectral memory size of up to 4096 channels and can perform MCS in addition to PHA.

The MCA comes with a basic and free-to-download software package which allows the user to control and acquire the energy spectrum and perform a few basic visualization and spectrum computations.

**The TOPAZ-SiPM MCA is fully supported and compatible by our fully-featured gamma-ray spectrum analysis software bGAMMA.**

The MCA is cased into a rugged miniature aluminum box with one input connector (detector signal) and output/control connector (USB mini type B). Additionally, the MCA has an extra connection for programmable input/output signals (GPIO). The functionality of the GPIO port can be conveniently set using the bMCA or bGamma software.

A set of programming libraries can be requested for interfacing this device into existing instruments or software. This SDK is available for Windows and Linux.



### FEATURES

- Fully digital Multi-Channel Analyzer (MCA), suitable for medium-energy resolution scintillator detectors which incorporates Si-devices as photomultipliers (SiPM).
- **Miniature sizes 70x45x26 mm (LxWxH)**
- Up to 4096 channels for PHA and MCS acquisition
- Compact and advanced design combining low-power consumption with low-noise
- Full Pulse-Height Analysis (PHA) and Multi-Channel Scaling (MCS) modes of data acquisition
- Acquisition presets on time (Live or real), on ROI counts, external start/stop (via GPIO) or combination of all.
- Additional input/output connection for programmable GPIO functions.
- Advanced electronic noise reduction algorithms
- USB 2.0 for data communication and device control
- Basic spectrum acquisition and device control software included
- Available programming libraries for Windows and Linux Operating System (upon request)
- **PCB available for OEMs**

## Berkeley Nucleonics

is a dynamic engineering company providing novel designs and innovative solutions in the field of nuclear electronics and software development for radiation detection.

### Front panel view



### Rear panel view



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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  $\mu$ sec in steps of 0.2  $\mu$ sec
- ◆ Flat Top: from 0.1 to 8.0  $\mu$ sec in steps of 0.1  $\mu$ sec
- ◆ Threshold: 1 to 255
- ◆ Digital Base Line Restorer (BLR)
- ◆ Pile-Up Rejector (PUR)

### Preamp Power Supply

- ◆ Provision of necessary voltage supply to operate the SiPM preamplifier of the detector: 5V 20 mA

### Data communication

- ◆ USB 2.0, cable (standardly 1.5 m length) included

### Physical

- ◆ Sizes:
  - ◆ MCA box: length 70 mm, width 45 mm, height 26 mm
  - ◆ PCB only: 63 mm x 39 mm
- ◆ Weight: less than 70 grams (including box)
- ◆ Connectors :
  - ◆ USB type mini B (to computer)
  - ◆ Lemo connector. Type ERN.03.302.CLL for both detector signal and SiPM power
  - ◆ Lemo connector Type ERN.00.250.CTL for GPIO
- ◆ Indicators:
  - ◆ Yellow LED for incoming count rate (ICR)
  - ◆ Green LED for power and communication status
- ◆ Power consumption: typically 1.1 W

### Other

- ◆ Device is supplied with a basic software to control operation, data acquisition and visualization.
- ◆ Full featured gamma-ray spectroscopy software—bGAMMA (optional)
- ◆ Necessary programming libraries for Microsoft Windows and Linux (upon request)

### Certifications

- ◆ The device is CE compliant

CE  
CERTIFIED

Version 1.03, Date: 01 2020.

