

usbBase SGC-600-7889 Plug-on MCA

Plug-on MCA with Negative HV for R623x PMTs



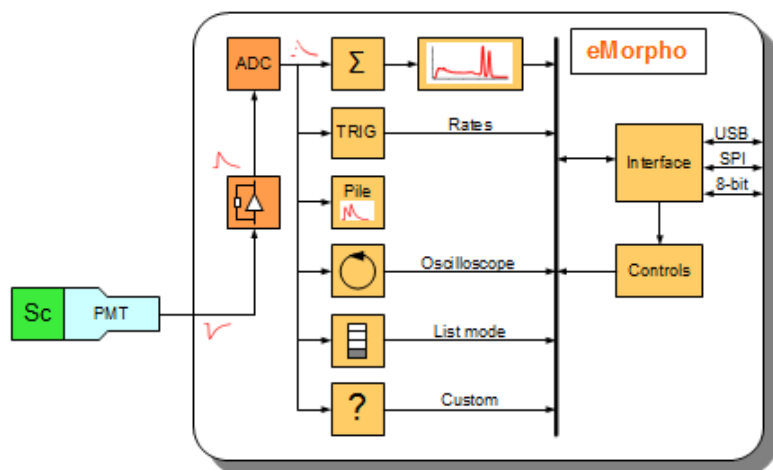
usbBase: eMorpho
MCA + HV with USB
& GPIO.

The usbBase is a PMT plug-on with a digital MCA, embedded high-voltage generator and divider.

Its open-source software and modular firmware structure have been designed to let engineers design radiation detection instruments specifically for their target market and application. We support our customers with a rich library of firmware extensions and customization to create a particular functionality.

Low-level detector control relies on the Morpho Data Server (written in Python) that has been implemented on x86/x64 and ARM architectures under Win XP/7/8, Linux and Android operating systems.

Client software, when using web-apps, can run on any device that supports a web-browser – from industrial data terminal to desktop computer.



Using the usbBase you can:

- Make full use of the great precision and speed of LaCl₃ and LaBr₃
- Use NaI(Tl), CsI(Na), LYSO, BGO and many more
- Rely on gain stabilization via LED-pulser or prediction methods
- Operate specialty detectors such as β/γ phoswich detectors
- Access your instrument by web-browser from any device:
 - Industrial data terminal, smart phone, tablet, laptop, desktop

Low-power MCA with HV

- SGC-600-7889 for 8-stage 14-pin detectors supplied by Saint-Gobain Crystals using HPK R623x PMTs
- Powered and controlled by USB, 250 mA
- HV with active divider for high linearity at low power
- GPIO for interconnect and reprogramming
- IP67 watertight, threaded connectors

Rugged

- Sealed against intrusion of moisture and dust

MCA

- 4096 channels, 32-bit depth
- Best energy resolution and highest histogramming rate for any scintillator
- Maximum rate: 18 Mcps
- Uses pulse shape information for pile-up rejection

Rugged

- Oscilloscope, list mode, β/γ discrimination
- Optional custom signal processing and functionality.

Ideal for embedded systems:

- USB driver based on libusb, used on all Win, Linux and Android OS x86/x64, ARM
- Control interface is TCP/IP via zeroMQ, accessible in over 40 programming languages.

Principle of operation

- $I \rightarrow V$ input amplifier
- 20 MSPS to 120 MSPS, 10 to 12-bit digitizer
- Parallel digital signal processing in FPGA
- USB data interface

Functions

- MCA with 4096 32-bit bins
- 32-bit time and event counters
- 1024 sample trace capture
- 340-event list mode buffer

Common Firmware Extensions

- MCA with 8192 32-bit bins
- 5440-event listmode buffer
- GPS time stamping

Conversion times

- Only as long as the scintillator light pulse
- 0.20 μ s for LaBr₃ or plastic scintillator
- 1.0 μ s for NaI(Tl)
- 10 μ s for CsI(Na)

High voltage

- Fixed negative polarity
- 8-stage PMT pinout
- HV-range: -500V to -1400V
- Active divider for low power and high DC-currents
- Power consumption: 70mW at HV=1000V

| K | F | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | A |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 2.2 | 2.2 | 1 | 1 | 1 | 1 | 1 | 1 | 2.2 | 2.2 |
| 1.0k | 850 | 705 | 635 | 570 | 500 | 430 | 365 | 295 | 150 | 0 |

Table 1: Voltage distribution

Server-side software

- Sensor communicates via USB on Win XP/7 and Linux; x86 & ARM architectures, using libusb
- Morpho Data Server encapsulates device operation
- XML-ASCII command interface
- Client can be written in any programming language
- Ethernet communication via robust transport layer using zeroMQ.

Client software

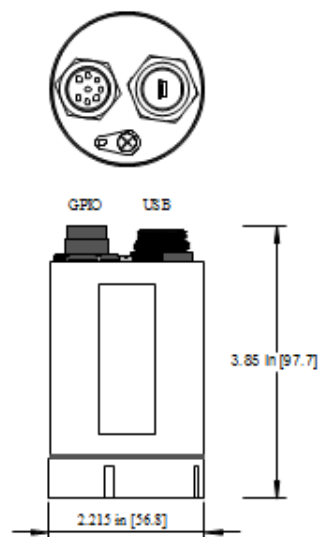
- Web-Apps in PHP/html
- Example clients in C, C++, Python
- API in C and C++, with bindings to C and Python

Power supply

- Powered via USB, 4.3V to 5.5V @ 250mA

Environmental

- Operational from -40°C to +60°C



Outline drawing