



eMorpho MCA for Scintillator Detectors



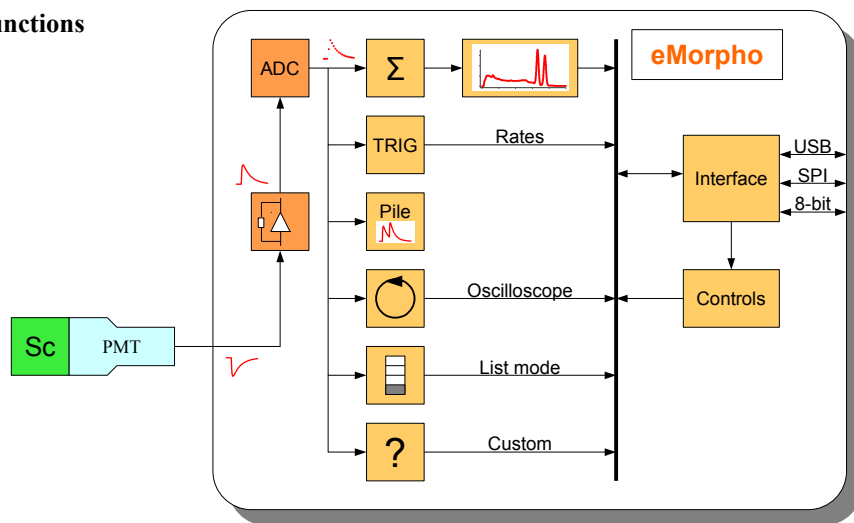
The eMorpho is a single-input multichannel analyser, designed to work with all scintillators.

Open source software, modular firmware structure and the additional resources of the on-board FPGA make the eMorpho an ideal component to create unique instrumentation.

Low-level detector control relies on the Morpho Data Server (written in C++/STL) 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.

Functions



Using the eMorpho you can:

- Work with any scintillator
- Make full use of the great precision and speed of LaCl₃ and LaBr₃
- Perform gated spectroscopy
- Perform real time pulse shape analysis for particle discrimination
- Have functionality added to the MCA to create a unique instrument

- **Small, low-power MCA**
 - 2.50 x 1.25 PCB
 - USB-Powered / controlled 150 to 200mA
- **Easy to use and integrate**
 - No preamplifier required
 - GPIO for interconnect and reprogramming
 - Open-source software
 - Morpho Data Server accessible in over 40 programming languages
 - Accessible via web-browser
- **MCA**
 - 4096 channels, 32-bit
 - Best energy resolution and highest histogramming rate for any scintillator
 - Maximum rate: >13 Mcps
 - Uses pulse shape information for pile-up rejection
 - Split histogram memory for zero-deadtime DAQ
- **Added features**
 - Oscilloscope, list mode, n/γ, β/γ, α/β discrimination
 - User-specified signal processing
- **Ideal for embedded systems:**
 - Very low power consumption
 - Tight integration with HV supply
 - Programmable I/O
- **Code extensions:**
 - Gain stabilization
 - Multi-detector support
 - MCA with 8192 32-bit bins
 - 5440-event listmode buffer

eMorpho Data Sheet

Principle of operation

- I → V input amplifier
- 80 MSPS, 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

Conversion time

- Programmable conversion time
- Minimum conversion time: 0.067μs
- Maximum conversion time: 65535 steps

Best for	ADC	Conversion Time = Integration Time	
		Recommended	Step
CsI(Na)	20	10μs	50ns
NaI(Tl)	40	1.0μs	25ns
LaBr3	120	0.20μs	8.33ns

Capabilities

- Suitable for any scintillator
- External trigger and veto
- Dual-port MCA memory: Read data while acquiring
- Split MCA memory and dual set of counters for latency-free data reads

High voltage

- Built-in control for hvBase

Connectors

- BNC signal input
- hvBase control (EN3-P8)
- GPIO (EN3-P8)
- JTAG (EN3-P8)
- USB (mini-B)

Open-source server-side software

- Communication via USB (libusb) on Win XP/7 and Linux; x86/x64 & ARM architectures (MIPS in prep.)
- Morpho Data Server encapsulates device operation (mds_public)
- XML-ASCII command interface
- Client can be written in any programming language
- Application programmers interface (API) in C, C++, Python, PHP
- Ethernet communication via robust transport layer using zeroMQ.

Client software

- Web-apps using PHP/html
- Graphical user interface in Qt
- API in C and C++, with bindings to Python
- Ethernet communication via XML command and data packets using zeroMQ: <http://www.zeromq.org/>

Power supply

- Powered via USB, 4.3V to 5.5V
- Idd = 110mA to 175mA

Environmental

- Operational from -40°C to +60°C

Mechanical

- 102 x 82 x 30mm
- Mass: 150g

PCB

- 2.50 x 1.25 inch (slimMorpho)

