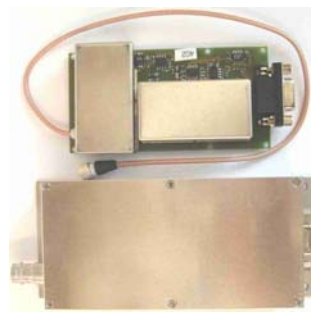


mesytec MCA-2 is a dual channel shaper, discriminator and multi channel analyzer. Together with the MCA-PH charge sensitive preamplifier with built in HV source it provides a complete readout system for high resolution and high rate X-ray, alpha or beta spectroscopy with proportional counter or silicon detectors.

All device parameters and functions (gains, thresholds, HV, histogram-download) are remote controlled via RS-232 or USB 2.0 interface.

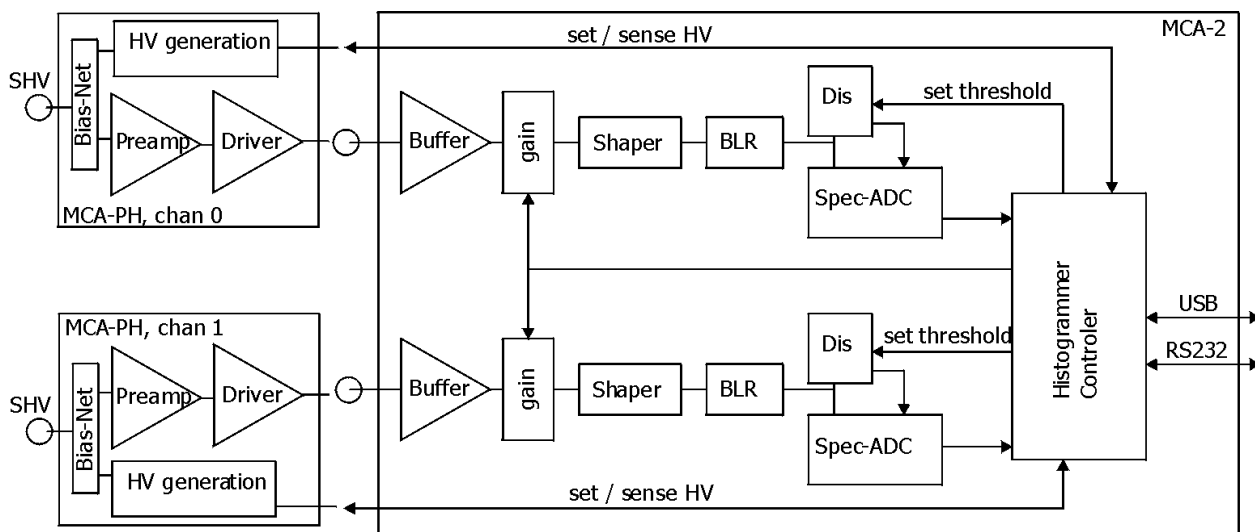
### Features:

- Compact dual channel MCA module (MCA-2)
- Compact external preamps with built in HV source (MCA-PH)
- Sensitivities, thresholds and HV and other parameters are remote controllable.
- Real time clock
- 1Mbit non volatile histogram memory
- 10 bit spectroscopy ADC
- Data interfaces: RS232 and USB
- Additional 8 I/O ports and 4 ADC inputs for process control.
- Online ROI calculation



Main module MCA-2 and two preamp units MCA-PH

### Schematics



## Technical Data:

### Preamplifiers

available as fully shielded PCB or in aluminum case

#### Input

- Negative charge input (anode readout).
- sensitivities available for proportional detectors / silicon detectors (MCA-PH\_SI) and for photo multipliers (MCA-PH\_PM).

#### High voltage generation

- Positive bias voltage up to 950 V (for Si-detectors max 150V). (special version up to 2000V)

#### Conversion factors:

##### 950V version

- conversion factor write HV:  $\text{set\_val} * 0.225$
- conversion factor read HV:  $\text{read\_val} * 0.731$

##### 150V version

- conversion factor write HV:  $\text{set\_val} * 36\text{mV}$
- conversion factor read HV:  $\text{rd\_val} * 110\text{mV}$

#### Noise (for MCA-PH\_SI)

- 400 e- rms @ 20 cm of RG59 Detector cable + Detector (10pF)

#### Sensitivity:

SW1, SW2 are switches on the Preamp board

for MCA-PH\_SI type: (up to 10MeV)

| SW1<br>gain 3.3 | SW2<br>gain 5.5 | MCA2<br>gain | maximum range |
|-----------------|-----------------|--------------|---------------|
| off             | off             | 50           | 9MeV / 360fC  |
| off             | off             | 128          | 4MeV / 180fC  |
| on              | off             | 128          | 1.2MeV / 55fC |
| on              | on              | 128          | 250keV / 11fC |
| on              | on              | 255          | 125keV / 6fC  |

for MCA-PH\_PM type: (up to 10MeV)

| SW1<br>gain 3.3 | SW2<br>gain 5.5 | MCA2<br>gain | maximum range |
|-----------------|-----------------|--------------|---------------|
| off             | off             | 50           | 700pC         |
| off             | off             | 128          | 300pC         |
| on              | off             | 128          | 90pC          |
| on              | on              | 128          | 16pC          |
| on              | on              | 255          | 8pC           |

Output connector: Subd9 male

- 1: gnd
- 2: set -HV
- 3: +6..12 V
- 4: +10 V
- 5: -5V
- 6: Agnd
- 7: sense HV
- 8: out+
- 9: out-

### MCA settings:

*Thresholds* for the two channels can be set from 1 to 100. Values are in percent of the histogram full scale. (Value 50 is threshold to 50%)

Valid *gain* range is 20 to 255.

### MCA extra outputs:

4x TTL (CMOS) outputs

4x TTL inputs

4x ADC input, 0..5V, 3kOhm

Connector on PCB or front panel:

| pin | name                                   | pin | name    |
|-----|----------------------------------------|-----|---------|
| 1   | gnd                                    | 14  | gnd     |
| 2   | +5V (max 50mA)                         | 15  | TTL1 in |
| 3   | gnd                                    | 16  | TTL2 in |
| 4   | supply voltage out (6..10V, max 100mA) | 17  | TTL3 in |
| 5   | gnd                                    | 18  | TTL4 in |
| 6   | gnd                                    | 19  | NC      |
| 7   | TTL1 out                               | 20  | NC      |
| 8   | TTL2 out                               | 21  | gnd     |
| 9   | TTL3 out                               | 22  | gnd     |
| 10  | TTL4 out                               | 23  | ADC1 in |
| 11  | NC                                     | 24  | ADC2 in |
| 12  | NC                                     | 25  | ADC3 in |
| 13  | gnd                                    | 26  | ADC4 in |

NC pins should be left floating!!

**Remote control and histogram download via RS232 or USB:**

RS232 connector: SubD9 female, standard pinout:

pin2: TXD

pin3: RXD

pin5: gnd

other pins not connected

USB chip: FTDI with driver download from  
[www.ftdichip.com/FTDrivers.htm](http://www.ftdichip.com/FTDrivers.htm)

**Histogrammer controller unit**

- Accumulates histograms with one of 6 selectable resolutions / bin widths:  
960, 480, 240, 120, 60, 30 channels full range  
Missing channels to full binary numbers (e.g. 1024-960) are used by the sliding scale ADC.
- Optional: setting of regions of interest

**Multi Channel Analyser**

- 10 bit sliding scale spectroscopy ADC
- 10 bit histogramming with 32 bit counter depth.

**High Rate Capability**

- Baseline restorer
- More than 20kHz per channel without baseline shift
- More than 500kHz counting (Si-detectors)

**Power Supply**

Connector:

*SubD 9 male.*

pin 1,2 : gnd,

pin 3 : 6..10 V

other pins not connected

Power consumption including 2 preamps:

- +6 V, 260 mA = 1.6 W

**Dimensions MCA2:**

( also available as PCB module)

- Length: 173 mm (without connectors)
- Width: 105 mm
- Height: 46 mm

**Dimensions MCA2-Preamplifiers:**

In aluminum case

- Length: 140 mm
- Width: 60 mm
- Height: 30 mm

PCB version

- Length: 111 mm
- Width: 54 mm
- Height: 20 mm

**CMD-List MCA-2:**
**High Voltage Source:**

Set Voltage:

SV chan val

Set Voltage

chan = 0,1

val = 0...4095

Read back actual voltage:

GV chan

Get Voltage

chan = 0,1

Switch HV on/off:

V1 chan

Voltage on

chan = 0,1

V0 chan

Voltage off

Read actual switch state (both channels):

V?

Answer is n n

n=1: on, n=0: off

**Gains/Thresholds:**

Set:

SG chan val

Set gain

chan = 0,1

val = 0...255

ST chan val

Set threshold

chan = 0,1

val = 0...255

Gain and threshold values are written into permanent memory and will be restored automatically on power up.

Read back:

GG chan

Get gain

chan = 0,1

GT chan

Get threshold

chan = 0,1

**Histogram, Binning:**

(operate only when histogramming is stopped)

SB val

Set Binning

val = 0...6 with:

| val | chans        |
|-----|--------------|
| 0   | 960          |
| 1   | 480          |
| 2   | 240          |
| 3   | 120          |
| 4   | 60           |
| 5   | 30           |
| 6   | 1 (counting) |

DB

Display binning

CH

Clear histogram

Bin counters are set to zero, binning value persists.

DH start range

Dump histogram

start = start bin

0...959,

range = number of

bins = 0...959, de-

pending on binning

value.

Output is in rows:

n cts0 cts1

n = bin number

cts0 = counts in chan-

nel i

GH bin

Get single histogram

bin

bin = 0...959, depen-

ding on binning value.

Output like DH.

**Start/Stop:**

GO

Start data acquisition

HA

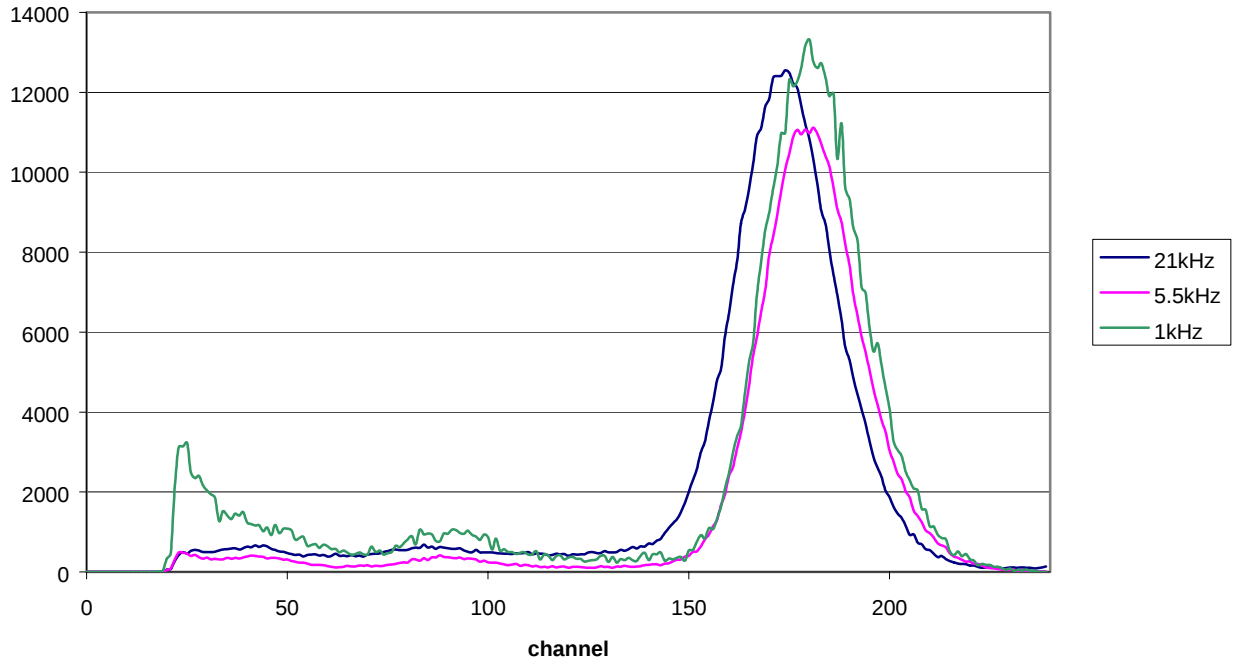
Stop data acquisition

**CMD-List MCA-2: "Tracerlab cmds"**

|              |                                                          |      |                                                                         |
|--------------|----------------------------------------------------------|------|-------------------------------------------------------------------------|
|              |                                                          | D1   | Delete results + Histograms                                             |
| T=YYMMDDHHSS | Set date and time                                        | D2   | Delete results, histograms + configuration                              |
| T=tttttt     | Set counting time (sec)                                  | A    | Display ROI sum counts                                                  |
| RT=tttttt    | Set refresh time (sec)                                   | V    | Display ROI s results                                                   |
| M=mmmmm      | Set # of measurement runs<br>0 = infinite                | B    | Start measurements                                                      |
| P1           | Pump on<br>(= O1=1)                                      | Z    | Stop measurements                                                       |
| P0           | Pump off<br>(= O1=0)                                     | SC   | Save configuration                                                      |
|              |                                                          | RC   | Restore saved Configuration                                             |
| R1=lllluuu   | Set lower and upper Border for ROI1<br>(R2...R5 similar) | O1=1 | TTL Output 1 on<br>(2-4 similar)                                        |
| R            | Show ROI borders                                         | O1=0 | TTL Output 1 off<br>(2-4 similar)                                       |
| C1=ccc       | Set calibration factor for ROI1<br>(C2...C5 similar)     | I    | Show TTL Inputs 4321<br>(1 = start/stop)                                |
| C            | Show calib. factors                                      | A1   | Automatically start measurements on power up                            |
| K1=ccc       | Set correction factor for ROI1<br>(K2...K5 similar)      | A0   | No Autostart                                                            |
| K            | Show corr. Factors                                       | di   | Display raw spectrum<br>(compressed to 64 chans)                        |
| L            | List setup                                               |      |                                                                         |
| L1           | List results                                             |      |                                                                         |
| L2           | List histograms                                          | X    | delete saved config<br>(device will start next with firmware de faults) |

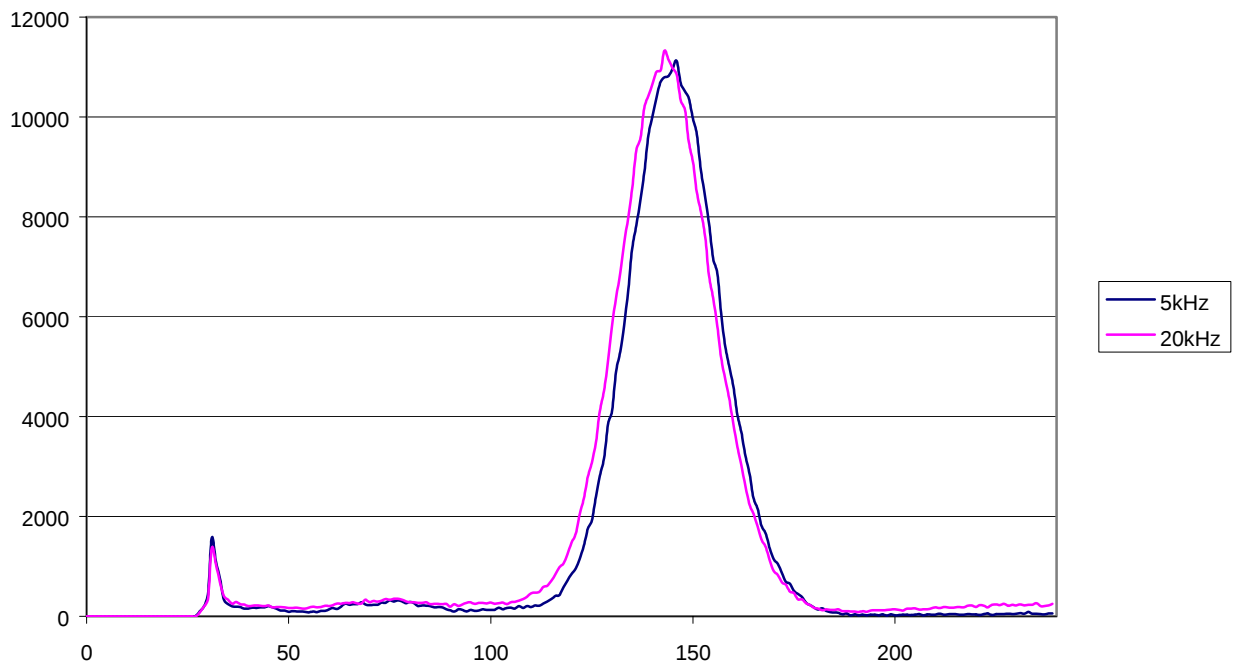
## Measurements with proportional counter and Fe55 y source

Fe55 source



HV= 742V (set val = 3300), gain = 1 (set val=128). Peak shift from 5kHz to 20kHz of 3.3%

Fe55, low HV



HV = 675V (set val = 3000), gain = 2 (set val= 255). Minor shift from 5kHz to 20 kHz of 1.5%