



Annex No. 1

TECHNICAL SPECIFICATION

The subject of the public contract is the supply of a electronic instrumentation of the NIM standard for characterization of a ionizing radiation detector signal for spectrometric purposes (including 2D spectrometry) (hereinafter referred to as the “**electronic instrumentation**”).

Electronic instrumentation will be composed from follow items:

- 2 pcs pf digital multichannel analyzers (MCA),
- 2 pcs of analog MCA,
- 1 pc of digitizer (of detector signal) and
- 2 pcs of NIM bins for these MCAs and digitizer.

Digital multi-channel analyzers must meet the following minimum parameters:

- number of inputs (detector channels): ≥ 2
 - BNC connectors
 - 1 k Ω input impedance
 - accept positive and negative signal
 - coarse gain at least in the range 1-20
- sampling rate: ≥ 100 MSa/s
- types of acquisition available: Pulse-height spectrometry, list mode (including time stamping), oscilloscope
 - number of channels in PHA spectrum: $\geq 2^{14}$ (16k)
 - software/firmware enabling these acquisition modes must be included or available free
- ADC Resolution (of digital conversion): 14 bits or higher
- trapezoidal shaping
 - adjustable rise time in the range 0-10 μ s (or wider)
 - adjustable flat-top in the range 0-5 μ s (or wider)
- digital signal processing includes: PUR, live time correction, baseline restorer, PZC, digital fine gain, adjustable moving average low pass filter
- external trigger input available
 - BNC, Lemo or SMA connector
- coincidence/anticoincidence measurement available among channels and/or external trigger
- connected to PC via USB cable: USB 2.0 or USB 3.X
- constructed as a NIM module

Analog multi-channel analyzers must meet the following minimum parameters

- number of channels: ≥ 8192
- produces pulse-height spectra
- connected to PC by an USB cable: USB 2.0 or USB 3.X
- conversion time: ≤ 2 μ s
- dead time: ≤ 5 μ s
- differential non-linearity: ≤ 1 % (from 5 % to 95 % of input full resolution)
- integral non-linearity: ≤ 0.1 %
- I/O signals: NIM
- discriminator threshold selectable in range 0-500 mV (or larger)
- PUR, BUSY and GATE available
- all I/O connectors: BNC, Lemo, or SMA

- software for data acquisition is supplied (or available free)
- NIM module

Digitizer must meet the following minimum parameters:

- sampling rate: 400 MSa/s or higher
- resolution (of digital conversion): 14 bits or higher
- NIM compatible
- bandwidth: 200 MHz or higher
- minimal full scale range (of analog input): 0-1 V
- input impedance: 50 Ω or 93 Ω
- at least 2 analog input channels
- input for external trigger (50 Ω input impedance) accepting TTL and NIM fast logic signals
- triggering in analog input channels enabled, using LET (leading edge triggering)
- selectable digital record length, longest available record length is at least 1 ms long
- software/firmware included. It should enable
 - waveform recording
 - digital signal processing for
 - pulse shape discrimination
 - amplitude analysis (spectrometry)

NIM bins must meet the following minimum parameters

- minimal number of free slots for modules: 10
- minimal output: 200 W
- available voltages and currents
 - ± 6 V (current maximum at least 10 A)
 - ± 12 V (current maximum at least 3 A)
 - ± 24 V (current maximum at least 3 A)
- AC Input 220(230) V/50 Hz
- noise and ripple:
 - ≤ 5 mVpp for ± 6 V, ± 12 V, ± 24 V (pp = peak-to-peak)
- enables operation of all NIM modules from this part of the tender