SPECIFICATION

Oscilloscope

1. Scope

This specification describes the requirements for **one laboratory oscilloscope**. The equipment is to be used for testing detectors (e.g. fission chambers, He-3 tubes, solid-state detectors) and the relative electronics (preamplifier) against their performances in terms of signal-to-noise ratio and signal characteristics (amplitude, width, rise time). It is also intended to be used to diagnose glitches and/or anomalies in the detector and/or electronics behaviour. It is to be used in indoor laboratories and offices.

2. Definitions, Acronyms, and Abbreviations

The following definitions, acronyms, and abbreviations shall apply throughout this Specification unless defined otherwise hereinafter:

- Hz shall mean Hertz;
- G (suffix) shall mean Giga;
- M (suffix) shall mean Mega;
- s shall mean second;
- p (suffix) shall mean pico;
- n (suffix) shall mean nano;
- m (suffix) shall mean milli;
- µ (suffix) shall mean micro;
- GS/s shall mean Giga Sample per second;
- " shall mean inch;
- Ch shall mean channel;
- Mpts shall mean Mega points;
- FFT shall mean Fast Fourier Transform;
- Ω shall mean Ohm;
- AC shall mean alternate current;
- DC shall mean direct current;
- GND shall mean ground.

3. Requirements

3.1. Functional and Performance Requirements

The System shall meet the following functional and performance requirements:

3.1.1. Capture frequency components up to at least 1 GHz;
3.1.2. Capture analogue signals with a pulse width of 1 ns or lower;
3.1.3. Display analogue signals in a ms-long time window without loss of precision with respect to shorter time windows;
3.1.4. Display signals with 12V DC offset;
3.1.5. Display at least 4 analogue inputs simultaneously;

3.1.6. Performe online analysis on single channels with math functions as FFT and with measurement capabilities able to live measure and display signal characteristics as mean, minimum, maximum and standard deviation;
3.1.7. Provide an user-friendly interface, including a colour touch-screen display where the most important information as the ON channels vertical settings, the horizontal settings and the trigger settings are visible;
3.1.8. Ethernet and USB connectivity;
3.1.9. Remote control;
3.1.10. Storage of data on internal and external disk, possibility to recall old waveforms and settings;
3.1.11. Acquisition in sequence-mode with time-stamp of every acquired trigger to assure the possibility of off-line analysis;
3.1.12. Provide the output file also in ASCII or CSV format;
3.1.13. External trigger capabilities;
3.1.14. Autosetup capability;
3.1.15. Provide software analysis tool to analyse acquired waveforms off-line, and a tool for documentation and generation of report.

3.2. Technical Requirements

The System shall meet the following technical requirements:

Vertical System:

3.2.1. Bandwidth ≥ 1 GHz @ 50Ω;
3.2.2. Input channels ≥ 4;
3.2.3. Vertical resolution ≥ 8 bits;
3.2.4. Lower sensitivity ≤ 1 mV/div;
3.2.5. Offset range ≥ ±6 V @ 10 to 20 mV/div, ≥ ±10 V @ above 20 mV/div;
3.2.6. Selectable input coupling channel by channel at 1MΩ - AC, DC, GND and at 50Ω - DC, GND;
3.2.7. Max voltage ≥ 5 V_{RMS} with peaks ±10V @ 50Ω.

Horizontal System:

3.2.8. Internal timebase common to all the analogue channels with a range of at least 200 ps/div to 1000 s/div;
3.2.9. Timebase accuracy at production less than 3 ppm.

Acquisition System:

3.2.10. Sample rate ≥ 5 GS/s;
3.2.11. Record length: at least 16 Mpts/ch for all channels;
3.2.12. Summed and continuous averaging up to at least 10^5 sweeps;
3.2.13. Time between end of one acquisition and beginning of the following (intersegment time): max 1.5 µs;

Triggering system

3.2.14. Triggering modes: Auto, Normal and Single;
3.2.15. Trigger on positive or negative edges, pulse width and glitches;
3.2.16. Triggering source can be any input channel or external;

3.2.17. Trigger rate up to at least 10^6 waveforms/s;

Front panel:

3.2.18. Touch-screen display at least 12", able to display at least 8 traces, among which channel, zoom, memory and math traces simultaneously;
3.2.19. BNC connectors for channels;
3.2.20. Horizontal, Vertical, Trigger and Cursor control knobs and buttons;
3.2.21. Channel selection buttons.

Miscellaneous:

3.2.22. Display at least up to 2 math function traces;
3.2.23. Math operators for basic math: average (both summed and continuous), difference, rescale with units;
3.2.24. Math operators for frequency analysis: FFT;
3.2.25. At least 3 USB ports and 1 Ethernet port;
3.2.26. CE compliant.

4. Marking

The System shall have all safety markings in English language.

5. Packing

The System, for the shipment to the IAEA, shall be packed in accordance with international standards that are applicable for the shipment of this kind of equipment.

6. Quality Requirements

6.1. The System shall be manufactured and shipped in accordance with the Contractor's ISO quality assurance system or an equivalent quality assurance system.

6.2. The Contractor shall document the compliance with this quality assurance system.

7. Testing and Acceptance

The System, prior to shipment, shall be tested for conformance of the System with manufacturer's performance specifications and the minimum requirements specified herein.

8. Installation and Training

No installation nor training are required.

9. Deliverable Data Items

The Contractor shall provide one complete set of operation and servicing manuals in the English language. One electronic copy shall also be provided.
