Detailed Specification of Portable Gamma Ray Spectrometer

- 256 channels scalable to 512 channels.
- Sunlight readable Display (Minimum 700 nits brightness).
- 3"x3" NaI(Tl) scintillation detector along with PM tube (Integrated assembly) with plug-on 14-pin voltage divider.
- Integral nonlinearity <±0.07%.
- Large internal storage memory with capacity of storing more than 4000 spectrums.
- On board GPS with online recording and display of GPS co-ordinates.
- Inbuilt temperature sensor. System/detector temperature is shown on screen.
- 3.5 inches or bigger sunlight readable colourcapacitive touch panel display.
- Auto-calibration Feature: Should work in manual and auto calibration mode (with inbuilt Cs-137 andexternal K-40 sources). In auto calibration mode, it should be calibrated with either sources. No user adjustment of amplifier gain is required.
- Data can be exported to USB mass storagedevice after acquisition.
- PC based software for system configuration and data retrieval.
- PC based software for offline analysis of acquired data.
- Battery life: 8 hours of continuous data acquisition from 2600 mAHor bigger Li-ion battery.
- Weight Max (including batteries): 4.0 kg.
- Maximum Dimension of the instrument (LxWxH): 265mm x115 mmx125 mm(Detector and electronics should be housed in a single assembly.)
- Thermal isolation for NaI(Tl) detector.
- Enclosure housing should be of Aluminium/ABS to maintain low weight

Following Digital board and display with Capacitive Touch panel have to be supplied for theabove mentionedGamma Ray Spectrometer. The configuration of the boards should be as per the specifications mentioned below.

➢ **Digital Board, Display and Software Specifications:**

Processor and OS : ARM Cortex A processor with 1GHzor more with latest embedded Linux OS Kernel.Lag free operation.

Memory : 16GBflash, expandable to32GB

Interface : USB 2.0 or higher Host, USB 2.0 or higher Client

ADC :DNL: 0.0823 , 12-Bit, 1.25Msps Sampling rate A/D converter (Conversion time should be less than 1 micro second)/ in case of a DSP MCA minimum 10MSPS

Display and Keypad: 3.5" or bigger QVGA TFT with capacitive Touch panelLED andON/OFF LED

Other features :RTC and EPPROM, Intelligent charger circuitry for rechargeableLi Ion battery.

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Battery :Li-ion 2600 mAhor bigger Battery

Charger power rating : >15 watt

Note: Vendor has to provide all the device drivers for peripherals (Above mentioned Touch panel, display, ADC, RTC, USB Mass storage media and communication, Digital Potentiometer on analog board for auto calibration, GPS receiver).

➢ **Analog/DSP Board Specifications:**
System must have either an analog or a DSP based MCA (min. 512 channel or higher).

Analog MCA Specifications:

- Voltage range of programmable HV module for NaI(Tl) detector : 100 Volts to 1200 Volts
- Max droop rate of Peak detector and measurement circuit :**5 millivolts/micro second**
- Pulse shaping circuit type: Semi Gaussian
- Preamplifier for NaI(Tl): Voltage/Charge sensitive preamplifier.
- Preamplifier must have a programmable variable resistance in the feedback circuit for the purpose of auto-calibration.
- Energy Resolution: <8% at 662 keV.

or

DSP based MCA Specifications:

- Processing Unit: FPGA/DSP processor
- Sampling ADC sampling rate: Minimum 10 Mhz
- Energy Resolution: <8% at 662 keV.
- Dead time during a pulse processing: 2 microsecond Max.
- DNL : 0.3 LSB max
- INL: 0.7% max

Application Specification/ features

- System application provides radio-elemental concentration of K(%),U(PPM) and Th(PPM) immeddiately after the data acquisition.
- Applications have the provision to enter the calibration factors for recalibration of the instrument .
- Applications have the provision for the continuous auto-calibration with Cs-137 and K-40 sources to avoid MCA spectrum shift.
- Applications have the option to use spectrometer mode.
- Applications have the software mode to enter the instrument calibration factors as per requirement.
- Acquisition time for spectrometer mode should be from 40 seconds to 10000 seconds.
- Applications have the provision for the manual energy calibration through digital potentiometer.
- Have the indicator for low battery and memory full.
- System will go to sleep mode to conserve the battery in case it's idle.
- User interface/software is running as an application on the Linux OS.User can be able to install/Uninstall it as a part of upgrading.

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