

1 - TECHNICAL SPECIFICATIONS OF BETA GAMMA HAND FOOT & CLOTHING MONITORS :

The Beta Gamma Hand, Foot and clothing monitor shall comprise a set of Detector, HMI and electronic unit (microcontroller based).

1.1 GENERAL:

- **Radiation Detector** : Beta & Gamma
- **Detector** : GM Tube
- **Measurement Range** : 0 to 9999 counts/CPS/Bq for hand and feet
9999CPM/CPS for clothing. and overflow display to be provided.
- **Channels** : 13 detectors are distributed in 7 channels
- **Monitoring Time** : 1 to 99 sec.
- **Alarm range** : 1 to 9999 Counts/CPS/Bq
- **Alarm Indication** : By LED, LCD message & Audio
- **Back ground time** : 1 to 99 sec
- **Power Supply** : 230V AC +/-10%, 50 Hz
- **Environment** : 0 to 55deg cent, RH up to 90%
- **Cabinet** : All detector, electronics board etc shall be mounted in suitable cabinet with trolley.

1.2 FACILITIES:

- **Power ON Self** : For checking certain peripherals.
- **Background measurement** : Automatically performed at regular intervals when Instrument is idle.
- **High Background Checking:** Background level is compared with settable limits to be indicated.
- **Automatic Background Subtraction:** Background counts are automatically subtracted while contamination is being measured
- **Efficiency calculation** : channel wise efficiency will be automatically calculated. Source value to be entered by keypad.
- **Auto Monitoring Start** : Monitoring starts automatically as soon as both hands are positioned properly. Till then, guidance messages are given on LCD, e.g. 'Keep Right Hand'. Sensors can also be disabled if required.
- **Readings** : Readings of individual channels are available upon Pressing 'Read' switch.
- **Data storage** : Performed continuously. Data Storage with Date & Time: Data Records of about 100 persons with real time & date

- **Hardware test diagnostics:** Hardware test diagnostics for checking complete hardware are performed by the Control Unit. The various checks performed are EHT check, Power supplies check, Detector Failure Check, High Background Check, Counter Electronics Check, etc. Complete diagnostics are performed at power-up.
- **Counters** :- Individual counter should be used for counting pulses coming from each of the detector channels with facilities to set alarm levels ,display for elapsed time with facilities of set time.
- **Audio & visual alarms:-** Clear or active indications should be generated if the net counts or count rate exceeds for any one channel. Counting will run for preset time. Incomplete operation & high background should generate alarms immediately.

- **Alarm indications: -**
 CLEAR: GREEN LED WINDOW for counts less than set limit - Short Audio Sound
 ACTIVE: RED LED WINDOW for each channel - COUNTS greater than set limit - Long audio tone
 INCOMPLETE: AMBER LED WINDOW - counting interrupted operation - Short Audio Sound.
- **Computer interface:** The monitor should have an Ethernet 10/100 Mbps port using MODBUS protocols to allow centralized monitoring and fault diagnostics.
- **Test: -** Test mode should be provided.
- **Fitting/ casing:** All PCB, circuit board and cable should be properly mounted in ventilated and sealed box for **entry restriction of rat, rodent and insect.**
- Designed as per IEC 61000 (EMC) and IEC 61098 (radiation)
- **HV Failure detection:** Performed continuously.
- **High voltage:** Range 300V to 1500V (adjustable)
- **KEY PAD:** Detachable type key pad should be provided.

1.3 HUMAN MACHINE INTERFACE (HMI):

- The signal processing & display unit should be system on chip based and 10 inch or better TFT color display to give user friendly message for guidance in two languages Hindi, English & display of contamination values giving picture of hands, clothing, feet shall be provided. Also ready, clear, contaminated, count ON, Incomplete Operation, Left hand contaminated, Right hand contaminated, Left foot contaminated, Right foot contaminated signal display to be provided.

1.4 DETECTOR ASSEMBLIES:

a) **HAND DETECTOR ASSEMBLY:**

- **Detector :** Set of 8 GM tube (areal density 30-45 mg/cm², effective length 9.0", effect dia 0.625", 90CPS/mR/hr) LND 719 or equivalent for Left Hand Upper & Lower and Right Hand Upper Lower.
- **Detector Housing:** The detectors shall be provided with necessary Lead shielding of 12mm thickness. The whole detector assembly should be given adequate protection against contaminated hand touching the detector body with a thin metallic SS grill, which permits maximum viewing area.

b) **FOOT DETECTOR ASSEMBLY:**

- **Detector:** Set of 4 GM tube (areal density 30-45 mg/cm², effective length 9.0", effect dia 0.625", 90CPS/mR/hr) LND 719 or equivalent for Right foot & Left foot.
- **Detector Housing:** Detector housing with SS grill window & lead shielding of 12mm thickness. The whole detector assembly is given adequate protection with a thin metallic SS grill, which permits maximum viewing area. An SS tray should be provided just below the foot detectors, which facilitate, periodical cleaning of foot dust that may fall into it.

c) **CLOTHING PROBE :-**

- **Detector :** GM tube (areal density 30-45 mg/cm², effective length 9.0", effect dia 0.625", 90CPS/mR/hr) LND 719 or equivalent
- **Probe construction:** Hand-Held type. It should have side window probe in a ss protective housing with a routable shutter for cutting off Beta particles. It has to be placed in a holder with micro-switch assembly on the side of the monitor. On removing the detector from the holder the monitoring will be initiated. Optical switch should be reliable.

2 - TECHNICAL SPECIFICATIONS OF ALPHA HAND AND CLOTHING MONITOR

The Alpha Hand and clothing monitor shall comprise a set of detector, HMI and an electronic unit (microcontroller based).

2.1 GENERAL:

- **Radiation Detector** : Alpha
- **Detector** : ZnS Scintillator with PM Tube
- **Measurement Range** : 0 to 9999 counts/DPM/Bq for hand
0 to 9999 CPM for clothing.
In case of over flow, OR or OF display to be provided.
- **Channels** : 5 detectors (Upper right hand, Lower right hand, Upper left hand, Lower left hand and clothing) are distributed in 3 channels
- **Monitoring Time** : 1 to 99 sec.
- **Alarm range** : 1 to 9999 Counts/DPM/Bq
- **Alarm Indication** : By LED, LCD message & Audio
- **Back ground time** : 1 to 99 sec
- **Power Supply** : 230V AC +/-10%, 50 Hz
- **Environment** : 0 to 55deg cent, RH up to 90%
- **Cabinet** : All detector, electronics board etc shall be mounted in suitable cabinet with trolley.

2.2 FACILITIES:

- **Power ON Self** : For checking certain peripherals.
- **Background measurement** : Automatically performed at regular intervals when Instrument is idle.
- **High Background Checking:** Background level is compared with settable limits to be indicated.
- **Automatic Background Subtraction:** Background counts are automatically subtracted while contamination is being measured
- **Efficiency calculation** : channel wise efficiency will be automatically calculated. Source value to be entered by keypad.
- **Auto Monitoring Start** : Monitoring starts automatically as soon as both hands are positioned properly. Till then, guidance messages are given on LCD, e.g. 'Keep Right Hand'. Sensors can also be disabled if required.
- **Readings** : Readings of individual channels are available upon pressing 'Read' switch.
- **Data storage** : Performed continuously. Data Storage with Date & Time: Data Records of about 100 persons with real time & date
- **Hardware test diagnostics:** Hardware test diagnostics for checking complete hardware are performed by the Control Unit. The various checks performed are EHT check, Power supplies check, Detector Failure Check, High Background Check, Counter Electronics Check, etc. Complete diagnostics are performed at power-up.
- **Counters** :- Individual counter should be used for counting pulses coming from each of the detector channels with facilities to set alarm levels ,display for elapsed time with facilities of set time.

- **Audio & visual alarms :-** Clear or active indications should be generated if the net counts or count rate exceeds for any one channel. Counting will run for preset time. Incomplete operation & high background should generate alarms immediately.
- **Alarm indications:-**
 CLEAR: GREEN LED WINDOW for counts less than set limit - Short Audio Sound
 ACTIVE : RED LED WINDOW for each channel - COUNTS greater than set limit - Long audio tone
 INCOMPLETE: AMBER LED WINDOW - counting interrupted operation - Short Audio Sound.
- **Human machine interface:-** Human Machine Interface Is provided through a detachable hand- held keypad.
- **Computer interface: -** The monitor should have an Ethernet 10/100 Mbps port using MODBUS protocols to allow centralized monitoring and fault diagnostics.
- **Test: -** Test mode should be provided.
- **Fitting/ casing :-**All PCB, circuit board and cable should be properly mounted in ventilated and sealed box for **entry restriction of rat, rodent and insect.**
- Designed as per IEC 61000 (EMC) and IEC 61098 (radiation)
- **HV Failure detection:** Performed continuously.
- **High voltage:** Range 300V to 1500V(adjustable)
- **KEY PAD:-** Detachable type key pad should be provided.

2.3 HUMAN MACHINE INTERFACE (HMI):

The signal processing & display unit should be system on chip based and 10 inch TFT color display to give user friendly message for guidance in two languages Hindi, English & display of contamination values giving picture of hands, clothing, feet shall be provided. Also ready, clear, contaminated, count ON, Incomplete Operation, Left hand contaminated, Right hand contaminated, Left foot contaminated, Right foot contaminated signal display to be provided.

2.4 DETECTOR ASSEMBLIES:-

a) HAND DETECTOR ASSEMBLY:

- **Detector :** Alpha Scintillator comprising of aluminised mylar, ZnS screen, suitable size of PM tube with 11 dynodes, Gain: 2.7×10^6 typical, dark current: 2nA typical, Shock:30g/11ms/3 shocks per axis, sinusoidal vibration: 10-32 Hz:10mm, 32-2000hz:20g, 2 octaves/min) with SS window mesh.
 - **Detector Efficiency:** Greater than 25% of overall for Am-241
 - **Light Tightness :** The Scintillator should be light tight upto 10,000 lux
 - **Protection Grill:** The whole detector assembly should be given adequate protection against contaminated hand touching the detector body with a thin metallic SS grill

b) CLOTHING DETECTOR ASSEMBLY:

- **Detector:** Alpha Probe type comprising of aluminised mylar, ZnS screen, suitable size of PM tube-10 dynodes, gain 0.6×10^6 typical dark current:0.3nA typical, Shock:30g/11ms/3 shocks per axis, sinusoidal vibration: 10-32 Hz:10mm, 32-2000hz:20g, 2 octaves/min) with SS window mesh of 50 mm diameter for sensing.
- **Detector Efficiency:** Greater than 25% overall for Am-241
- **Probe construction:** Hand-Held type. It should have side window probe in a ss protective housing. It has to be placed in a holder with micro-switch assembly on the side of the monitor. On removing the detector from the holder the monitoring will be initiated. Optical switch should be reliable.

- 3- INSPECTION :** Successful tenderer will have to present all the items for inspection to the Purchaser and shall carry out necessary tests in his presence free of cost to demonstrate the performance of the item as per specifications. Purchaser, however reserves the right to carry out additional tests at his own cost for the above purchase. Advance intimation shall be sent when the items ordered are ready in all respect for pre dispatch inspection.

- 4- GUARANTEE**:- All the items including GM tube & scintillator detector should be guaranteed For trouble free performance for a minimum period of one year from the date of final Commissioning and free replacement of defective parts if any, during guarantee period.

NOTE :-

- 1) Details service manual, wiring diagram, circuit diagram, circuit layout, component detail and fault finding procedure must be provided in both hard and soft copy along with each instrument.
- 2) It is mandatory for the suppliers to quote, different accessories, special tools, software required and recommended spare parts and their costs, separately
- 3) All the technical specifications quoted should be supported by relevant technical documents, graphs, data sheets and test certificates from recognized technical institutions.
- 4) Installation of Item No. 1& 3 should be carried out by the supplier at AWTSF, WM Tarapur.
- 5) The tenderer shall list all non-conformities to the specifications separately. Purchaser has the right to conduct factory evaluation if necessary.