

SIPM packaged intelligent probe User manual

Instructions for use

Any personnel using or maintaining this system must carefully read these operating instructions. This system can only achieve design performance when operated strictly in accordance with the manufacturer's instructions.

This system is a customized product for users and meets their usage requirements. The multi-channel system is designed without a casing and contains a small high-voltage power supply. During the use of the system, users should not touch the equipment without authorization to avoid the risk of high-voltage electric shock, which may cause damage to important components or affect the service life. If the system is working abnormally, please contact the manufacturer's after-sales service department in a timely manner.



For safety reasons, this system is only operated and maintained by qualified personnel who have received professional training. Before using

and maintaining this system, carefully and completely read and understand these operating instructions.

The system contains easily damaged scintillation crystals, please handle with care when using!

Static electricity hazard: Only allow to wipe the instrument with a damp cloth.

High voltage hazard: Do not touch multiple systems without casings during equipment operation to avoid high voltage hazards. Long term

storage: The stable operation of this system is based on normal use. If the system needs to be stored for a long time,

Attention should be paid to dust and moisture prevention.

catalogue

1 OverviewDescribe	1
1.1 useTu	1
1.2 System groupbecome	1
2 The main performance refers tomark	2
3 Operation makesuse	3
3.1 Appearance knotstructure	3
3.2 securitypretend	4
3.2.1 Check the complete set of equipmentprepare	4
3.2.2 System to computer connectionmeet	4
3.2.2 Secondary Development 4	
4 Maintenance theorybright	4
4.1 Maintenance guaranteerraise	4
4.2 Common faultsreason	4

1 summary

1.1 purpose

The intelligent integrated series of products is a miniaturized and integrated product γ Intelligent X-ray detection probe, integrated with high stability high voltage, preamplifier electronic module, digital multi-channel pulse amplitude analyzer, energy spectrum analysis and control, power conversion and communication electronic modules inside the probe, can achieve γ Continuous measurement and analysis of energy spectra.

The intelligent integrated probe can be equipped with different specifications of scintillation crystal detectors such as NaI (TI), CeBr₃, LaBr₃, or SrI₂ (Eu), and integrated with multiple channels. In addition to traditional PMT options, the optical converter in the probe packaging can also be selected by users according to their needs, making the intelligent probe smaller and more exquisite; For extended γ The measurement of high dose rate range can be achieved by adding an additional GM tube through an extended interface.

The DNI7676U-S intelligent probe is a customized product for users. The system is equipped with a 3-inch sodium iodide crystal packaged in SiPM, and is designed separately from a digital multi-channel analysis system (including embedded energy spectrum measurement software). It adopts an RS232 communication interface and is suitable for energy spectrum measurement and recognition tasks over a wide temperature range. Built in U-235, U-238, Cs-137, Co-60, Co-57, Ba-133, Am-241, Ra-226, Cs-134, Eu-152, Th-232, K-40 A nuclide library composed of numerous nuclides, equipped with automatic energy spectrum collection, automatic spectrum stabilization, and spectrum analysis functions, can quickly and accurately distinguish the types and radiation

levels of radioactive nuclides.

1.2 system composition

The complete system includes 1 sodium iodide (NaI (TI)) probe (SiPM package), 1 set of high-performance digital multi-channel system, 1 set of wiring, and 1 software CD (including γ One user manual for the energy spectrum measurement and analysis system software,

One copy of the system operation manual, with instructions for each component as shown in Table 1.

Table 1 System Components and Description

Number	name	quantity	Schematic diagram	explain
1	Sodium iodide SiPM encapsulated probe	1 piece		SiPM encapsulates the sodium iodide probe, with interfaces for power (DC) and signal (SIG).
2	Digital multi-channel system	1 set		
3	connection	1 set		The wiring cable is used for load integration, and the wiring harness can be found in the wiring instructions.
4	Software CD	1 sheet	/	Upper computer testing software.

5	γ Energy Spectrum Measurement and Analysis Department Software User Manual	1 copy	/	Electronic document, attached to the software CD.
6	System Operation Manual	1 copy	/	Electronic document, attached to the software CD.

2 Main performance indicators

- 1) Probe: $\phi 3 \times 3$ inches of sodium iodide;
- 2) Optoelectronic converter component: SiPM (with automatic gain correction);
- 3) Energy range: 30keV~3MeV;
- 4) Energy resolution: $\leq 7.5\%$ (@ 662keV);
- 5) Multi channel conversion gain: 1 k/2k/4k can be set;
- 6) Recognizable Radionuclides: Recognizable Radionuclides: Compliant with the requirements for radioactive nuclide identification in GB/T 31837-2015 Handheld Radiation Monitor for Detection, Alarm, and Identification of Radioactive Materials, capable of identifying 16 types of radioactive nuclides in four major categories: U-235, Cs-137, Co-60, Co-57, Ba-133, Am-241, Ra-226 (special nuclear materials, medical, industrial, and natural);
- 6) Element recognition time: $\leq 30s$ (the equivalent dose rate of the surrounding dose at the detector position is 0.5 higher than the

background) $\mu\text{Gy/h}$,

At least 9 out of 10 tests are considered successful recognition;

- 7) Working temperature: $-40^{\circ}\text{C}\sim+55^{\circ}\text{C}$;
- 8) Storage temperature: $-43^{\circ}\text{C}\sim+65^{\circ}\text{C}$;
- 9) Maximum relative humidity: 95% relative humidity ($+30^{\circ}\text{C}$);
- 10) Communication method: RS232;
- 11) Power supply: DC5.5V~24V;
- 12) Weight: 2kg;
- 13) Size: $\leq \Phi 90\text{mm} \times 120\text{mm}$ (probe);
 $68\text{mm} \times 55\text{mm} \times 50\text{mm}$ (multiple hosts);

3 Operation usage

3.1 Appearance structure

Figure 1 shows the complete set of 1.5-inch lanthanum bromide intelligent probes, and Figure 2 shows the physical picture of the 3-inch sodium iodide intelligent probe equipment.

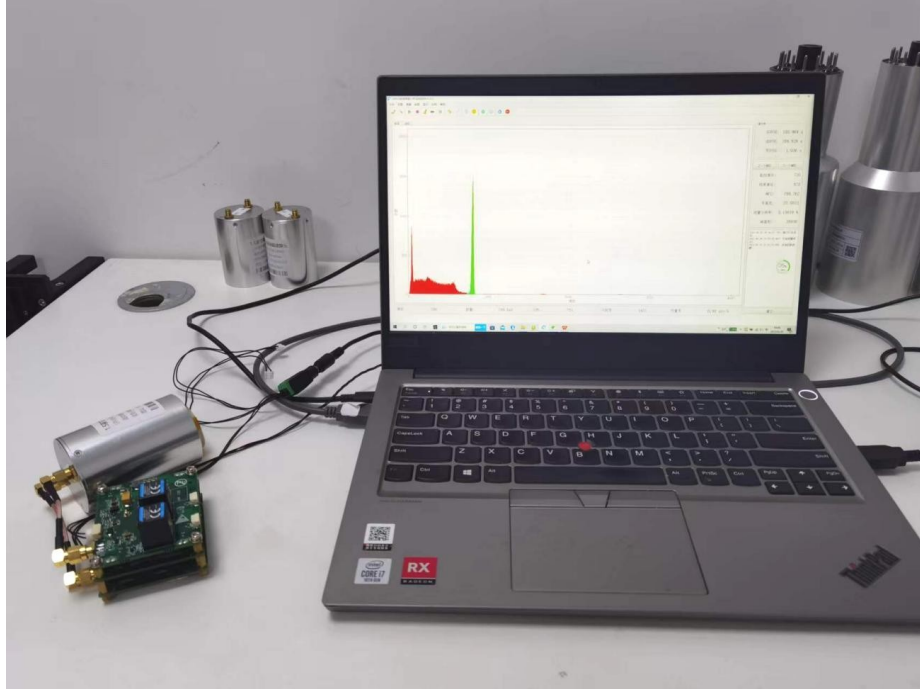


Figure 1 Product Composition Diagram Appearance Structure



Figure 23 inch sodium iodide intelligent probe (customized product) physical image

3.2 install

3.2.1 Check the complete set of equipment

Before installation, check the complete set of equipment. The required components are listed in items 1-3 of Table 1: sodium iodide detector, digital multi-channel system, and wiring.

3.2.2 System to computer connection

γThe energy spectrum measurement and analysis system software is green software and does not require installation.

Before connecting the device to the computer, first compress the files on the CD“ γExtract the "Energy Spectrum Measurement and Analysis System Software. rar" to any non C drive directory and enter it“ γ"Energy spectrum measurement and analysis system software" folder, click to open it“ γThe energy spectrum measurement and analysis system software.exe can be used.

The equipment is connected to the power supply and communication cables. The power supply adopts DC5.5V-24V power supply, and the communication cable adopts RS232 interface. After installing the power and communication cables, power on the device, open the software, connect the device hardware, and load the high voltage to carry out the test. Please refer to the software usage instructions for more information 《 γEnergy Spectrum Measurement and Analysis System Software User Manual.

4 Maintenance instructions

4.1 Maintenance and upkeep

When using and installing smart probes, the following points should be noted:

- (1) The equipment power supply should be used within the power supply range to prevent voltage overload or reverse connection of positive and negative power sources;
- (2) During the process of starting and stabilizing the spectrum of the equipment, it should be ensured that there is no interference from radioactive sources or radiation devices near the equipment;
- (3) During use, it is important to avoid plugging and unplugging cables without power interruption;
- (4) Users are not allowed to open the device packaging without authorization during use, and maintenance must be carried out by professionally trained personnel.

4.2 Common fault handling

During the use of the equipment, the following common fault phenomena may occur, as shown in Table 2. If other malfunctions occur, please contact the after-sales department in a timely manner and return to the factory for repair.

Table 2 Common Fault Diagnosis and Troubleshooting

phenomenon	Possible reasons	Troubleshooting
Device connection failure	Loose wiring and equipment not powered on	Check if there are any omissions in the system wiring and if the equipment is connected electric
No spectral data available	Probe not connected correctly	Check if the detector wiring is accurate



Warning: This system should only be repaired by qualified personnel who have received professional training. Users should not open the instrument for

maintenance without authorization while using the system.