

SiPM Photon Counting System Software Instructions

JPCS-S-S1

1. Software name:

Silicon photomultiplier (SiPM) photon counting system

2. Software version number:

V1.0

3. Hardware environment requirements:

- (1) PC: CPU above 1GHz, memory above 1GB, required hard disk space above 1GB, including USB 2.0 and above interface, screen resolution is not less than 1366×768.
- (2) Hardware equipment of silicon photomultiplier (SiPM) photon counting system.

4. Software environment requirements:

Windows7 Service Pack 1 or higher operating system

5. Software function description:

Adapt to the self-developed silicon photomultiplier (SiPM) photon counting system hardware equipment, realize the real-time transmission of data sent by the photon counting system hardware equipment to the PC, and perform automatic display, automatic data storage, chart storage and other operations. Meanwhile, the hardware of the silicon photomultiplier (SiPM) photon-counting system

can be controlled by operating the software of the system. The following is a detailed functional description combining with the software interface of silicon photomultiplier (SiPM) photon counting system.

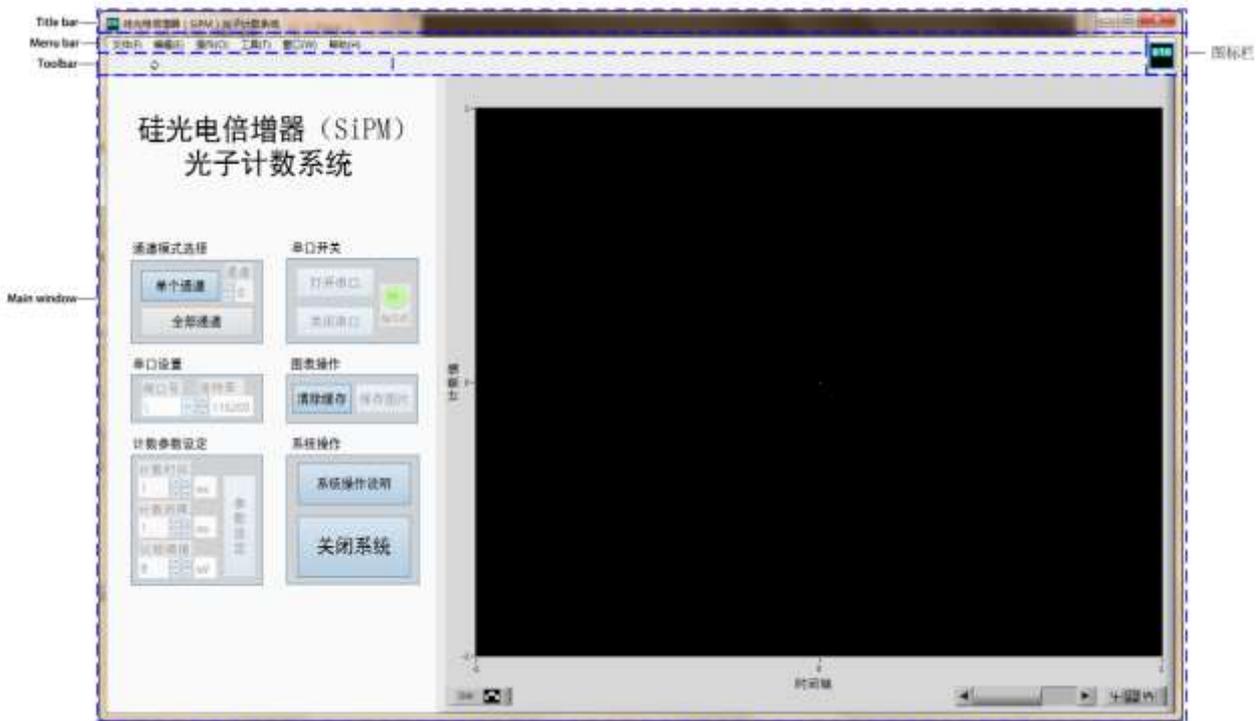


Figure1 Software window of silicon photomultiplier (SiPM) photon counting system

The software window of the silicon photomultiplier (SiPM) photon counting system is shown in Figure 1, which is composed of the title bar, menu bar, tool bar, icon bar and the main window of the software interface. Among them, the title bar displays "Silicon Photomultiplier (SiPM) Photon Counting System" and window size control buttons: maximize, minimize and close the window.

The menu bar displays "File", "Edit", "Operation", "Tools", "Window", "Help" options.

The toolbar displays the "Run" button, used to start the software.

The icon bar displays the desktop icons of the software.

The main window of the software interface is composed of three parts, namely the system name, interface operation area and display area, as shown in Figure 2.

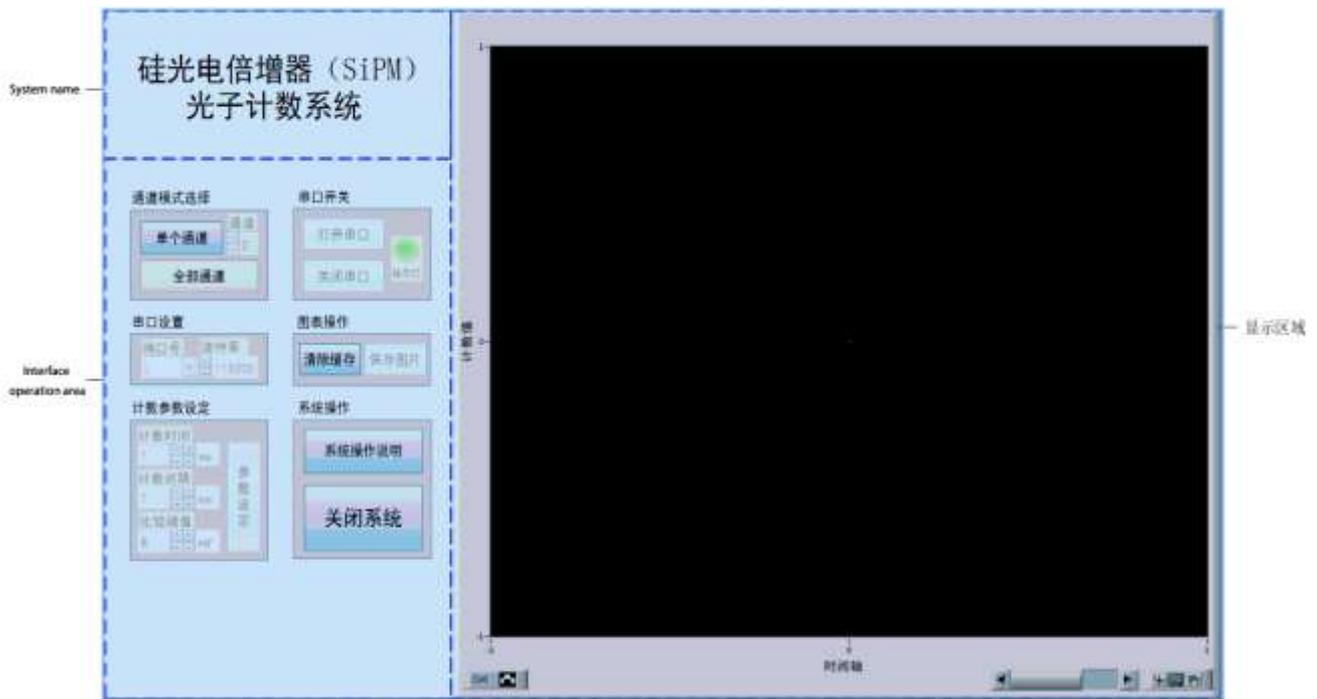


Figure2 The main window of the software interface of the silicon photomultiplier (SiPM) photon counting system

The system name is displayed as "SiPM Photon Counting System".

The display content of the display area is the real-time change of the pulse count value with time. It is a histogram display. The vertical coordinate is the "count value" and the horizontal coordinate is the "time axis".

The interface operation area includes six function modules: "channel mode selection", "serial port switch", "serial port setting", "chart operation", "counting parameter setting" and "system operation". Among them, the "channel mode selection" function module can be used to select and set "single channel" and "all channels". After each operation of the system, only one selection setting can be made; if the "single channel" mode is selected, further select the specific "channel"; if you select "all channels", all channels on the hardware device of the silicon photomultiplier (SiPM) photon counting system are turned on by default. When the "single channel" mode is selected, the display area displays only the count value of a single channel; when the "all channels" mode is selected, the display area displays the count value of all channels, and its interface is shown in Figure 3.

It should be noted that the setting of the channel mode needs to be selected according to the specific configuration of the hardware device of the silicon photomultiplier (SiPM) photon counting system.

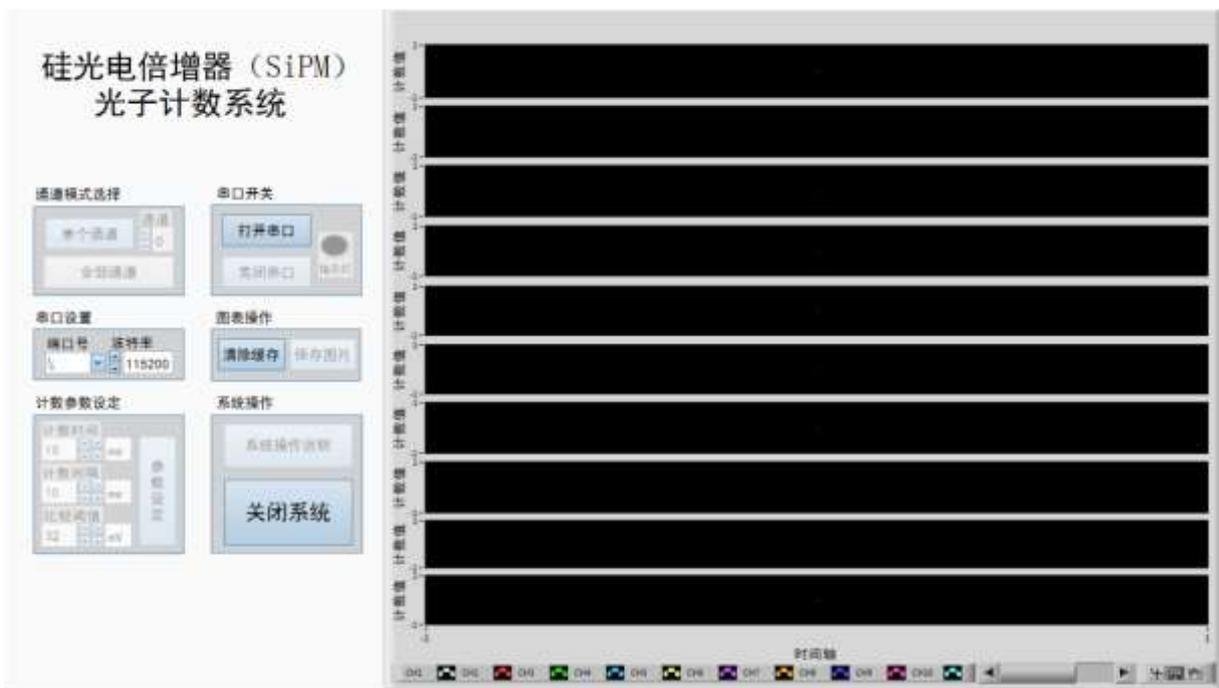


Figure3 The interface of the "All Channels" mode of the silicon photomultiplier (SiPM) photon counting system

"Serial port setting" function module can set two serial port parameters "port number" and "baud rate". "Port number" can be selected from the drop-down menu; "Baud rate" can be selected from "4800", "9600", "19200", "38400" and "115200". It should be noted that the baud rate setting also needs to be selected according to the specific configuration of the hardware device of the silicon photomultiplier (SiPM) photon counting system.

"Serial switch" function module can opening and closing of the serial port. When "open serial port", the corresponding "indicator" will turn on (green, showing "ON"), and the "open serial port" button cannot be operated again; when "close serial port", the corresponding "indicator" becomes dark (gray), and the "close serial port" button cannot be operated again and the "open serial port" button becomes operational mode. It should be noted that if "port number" is not selected or "Port Number" is occupied, "open serial port" will prompt serial port fails to open and exit the system at the same time. Run the system again and select the appropriate "port number".

"Counting parameter setting" function module can set the "counting time", "counting interval" and "comparison threshold" of the hardware equipment of the silicon photomultiplier (SiPM) photon counting system. "Counting time" refers to the counting duration, and "counting interval" refers to the counting interruption time, such as counting time 1s, counting interval 4s, which means that each count

lasts for 1s and pauses for 4s, and then counts again for 1s and pauses for 4s and cycle through. The setting range of "counting time" is 1~1000, and the unit is "s" or "ms". The setting range of "counting interval" is 0~1000, and the unit is optional as "s" or "ms". "Comparison threshold" is the threshold of the comparator on the hardware device of the silicon photomultiplier (SiPM) photon counting system. The setting range is 8~1016, the step length is 8, and the unit is fixed as "mV". After setting the "count time", "count interval" and "comparison threshold", the "parameter setting" button can be set. The default value of "count time" is 10ms, the default value of "count interval" is 10ms, and the default value of "comparison threshold" is 32mV. It should be noted that if the "counting time" and "counting interval" are too small, the rate of counting value will be too fast, and a large amount of data will be cached in the serial port. At this point, closing the serial port will cause incomplete data transmission. "Chart operation" function module can clear the chart and save. When the system runs, only the chart can be "cleared cache", that is, the historical data in the chart can be cleared. When "open serial port", the "save picture" button can be operated. At this time, the chart can be saved. The default saving path of the picture is the installation directory of the program.

The "system operation" function module can open the system operation instructions and close the system. After the system is running, you can operate the "system operation instructions", and click to display the operation instruction dialog box. If the "channel mode selection" is first performed after the system is running, the "system operation instructions" cannot be operated until the system is re-run after exiting the system. After the system runs, click "exit system" to exit the running state. If the serial port is open, click "Exit system" and it will prompt "please close the serial port first!", please click the "close serial port" button and then click "exit system" to exit the running state.

6. Description of operation steps:

Step 1: Run the system: Click the arrow in the upper left corner of the system to run the system.

Step 2: Operation instructions: click the "system operation instructions" button to display the operation instructions dialog box. After closing the operating instructions dialog box, the "system operating instructions" button will become inoperable. If you want to re-operate the "System Operating Instructions" button, please exit or close the system and re-run the system.

Step 3: Select the channel mode: click the "single channel" or "all channels" button to select the channel mode. If "single channel" is selected, please specify the corresponding channel. The channel mode is

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related to the data format sent by the hardware of the silicon photomultiplier (SiPM) photon counting system, and the default is the "single channel" mode.

Step 4: Serial port configuration: After the channel mode is selected, serial port parameters can be configured. Select the corresponding serial port number and set the serial port baud rate. Please configure according to the baud rate set by the hardware of silicon photomultiplier (SiPM) photon counting system. The default baud rate is 115200.

Step 5: Open the serial port: After configuring the serial port, click the "open serial port" button to open the serial port. At this time, the "indicator light" is on, indicating that the serial port has been opened. If the prompt "the serial port fails to open, please select the correct serial port!", please confirm whether the serial port number and baud rate are selected correctly.

Step 6: Counting parameter setting: After opening the serial port, you can set the "counting time", "counting interval" and "comparison threshold". "Counting time" setting range is 1~1000, the unit is "s" or "ms"; "counting interval" setting range is 0~1000, its unit is "s" or "ms" optional. The setting range of "comparison threshold" is 8~1016, and the step length is 8. The bit is fixed at "mV". After setting the counting parameters, click the "parameter setting" button to set. Please note that if the count rate is greater than the rate of serial port transmission, the data will be cached in the serial port, and closing the serial port will result in incomplete data transmission.

Part 7, Data transmission: Press the start (pause) button set on the hardware of the silicon photomultiplier (SiPM) photon counting system to start data transmission. The sent data will be updated and displayed on the program interface in real time.

Step 8. Chart operation: After running the system, click the "clear cache" button to clear the chart cache; after opening the serial port, click "save picture" to save the waveform picture of the current view.

Step 9: Close the serial port: If you need to end the data transmission, please click the "close serial port" button. At this time, the "indicator light" becomes dark, indicating that the serial port has been closed.

Step 10: Exit the system; click "exit system" to exit the running state. If you are prompted "please close the serial port first!", please click the "close serial port" button as prompted, and then click "exit system" to exit the running state.

Regarding data storage: After the system runs, if data is received, the system automatically saves the data in a txt file in the system's operating directory. The data file is created every time the system runs,

named according to the format shown in Figure 4.

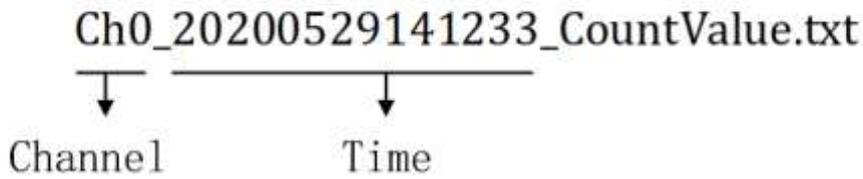


Figure4 Data saving format description

7. Software program installation instructions:

The software program needs to be installed and run on Windows7 Service Pack 1 or later operating system. The path of the software program installation package is "PhotonCS Installer/Volume/", which contains the following files or folders: bin (folder), license (folder), supportfiles (folder), install.exe, install.ini, nidist.id, as shown in Figure 5 below. The installation package contains the official driver installation package for serial communication, including 32-bit system drivers and 64-bit system drivers for Win7 and Win10 systems. The path is "PhotonCS Installer/SeriesPortDriver/". After decompression, select 32 according to the PC operating system. bit or 64-bit driver can be installed.



Figure5 Software program installation package directory

Double-click install.exe to install the software program. The installation process is the same as the general windows software program installation process, that is check the protocol, select the path, and wait for the installation to complete. It should be noted that the corresponding driver needs to be installed during the first installation, so the installation time is a little longer. The installation path includes the installation path of the software program and the installation path of the corresponding driver. Please select an appropriate installation path in order to save the data (the count data generated after the system runs will be saved in the installation directory).

The desktop icon of the software program is shown in Figure 6. After the software program is installed,

double-click the software program desktop icon to open the silicon photomultiplier (SiPM) photon counting system.



Figure6 Software program desktop icon

8. Other instructions:

If after the silicon photomultiplier (SiPM) photon counting system is running, you cannot find the "port number" or "open serial port" prompt "Serial port opening failed!", please reinstall the serial driver, or try to shut down the system and then restart the system. If the serial port driver version with when the former PC operating system is inconsistent, please go to the following website to select the appropriate driver for download and installation according to the operating system version:

<https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcip-drivers>

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