

Geiger Counter

Microcontroller based GM counter with USB Communications and ASCII command interface



- * Voltage range coverage includes the avalanche region.
- * Software for Windows/Ubuntu
- * Access via serial terminal is also available
- * Python Library included

Contents

1	Introduction	3
1.1	Example applications for the GM Counter	3
2	Software	4
2.1	Introduction to the graphical utility	4
3	Serial console commands	4
3.1	Installation	5
3.2	Installation from source (Work in Progress)	5
4	Links to source codes and design files	6



Figure 1: Geiger counter hardware

1 Introduction

This Geiger Counter (/kŪtipAI/) instrument contains a programmable high voltage power supply, a counting unit, a Geiger tube, and a USB communications interface for radiation detection applications.

The graphical utility allows setting the bias voltage for the tube, and the time interval during which counts should be acquired. A Python library is also included for users to write their own code. The unit can also be operated from a serial console such as minicom.

The entire circuitry is enclosed in an aluminium enclosure, with a USB port, a power supply input, and the entry window for the GM tube.

The tube window is very fragile, and must not come in contact with hard/sharp objects such as pencil tips, screwdrivers etc.

1.1 Example applications for the GM Counter

- Study the characteristics of the GM tube by ranging the voltage through the active region, and into the avalanche region.
- Calculate radiation dose by measuring counts.

2 Software

The software is capable of real-time access to the GM Counter hardware as shown in [Figure 2](#).

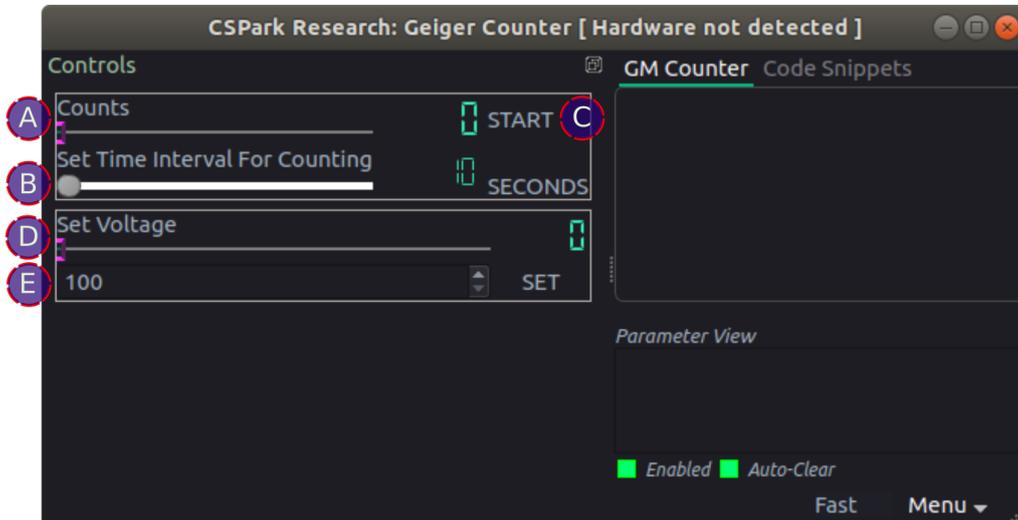


Figure 2: Software for the GM Counter

2.1 Introduction to the graphical utility

- (A) Total Counts recorded
- (B) Total time interval to record counts
- (C) Start the counter
- (D) Readback of the bias voltage. This is a continuous monitor, and you observe a drop in the level while connecting an external probe due to the high output impedance of the HV supply.
- (E) Set the voltage. Enter a value between 5000 and 40000 which will then be scaled to voltage units.

3 Serial console commands

The GM counter can be operated via simple serial commands via a serial console such as Minicom, Putty etc . Connect the instrument to a host PC, and launch the serial console with the following settings

- BAUD rate : 115200 8N1 (8 data bits, no parity, 1 stop bit)
- enable automatic appending of carriage return at the end of each line.
- to launch minicom from a terminal on Ubuntu: **minicom -D \dev\ttyUSBx -b 115200**

The following commands have been implemented. type them, and press the return(enter) key to execute.

- **V?** : Short version string is returned
- **VER?** : Elaborate version string is returned
- **START**: Starts the counter. In case a time interval is specified using the **TIME x** command, it will automatically stop after that interval. Otherwise it will count eternally.
- **STOP** : Stop the counter.
- **CLEAR** : Reset the counter to zero.
- **COUNT?** : Returns counts, time elapsed in millisecond units.
- **VOLTS?** : Returns the voltage in ADC code units. This must be scaled to HV units .
 $HV = 500 * 3.3 * int(volts)/16./4095.$
- **SET 1 x** : Set the bias voltage in ADC code units. e.g. **SET 1 20000** will set a value proportional to the voltage that can be read back via **VOLTS?** **The actual bias present on the input of the tube may vary due to external parameters such as additional multimeters. The output impedance of the source is 15M Ohms as per the schematic, and a drop in the voltage can be observed when a probe is externally connected**

3.1 Installation

The software has been packaged for Ubuntu, and is also available as source.

- **Installation on Ubuntu** Download the deb file from <https://csparkresearch.in/assets/installers/gmcounter-1.0.0.deb>, and install it using a package installer such as Gdebi.
- **Installation on Windows** Download the setup file from the [drive link](#), and follow the instructions to install it.

3.2 Installation from source (Work in Progress)

The source code for the software is Python based, and can be downloaded from github. On Ubuntu :

Install dependencies (Command to be run only once. requires an internet connection)

- `sudo apt-get install python3-pyqt5 python3-pyqt5.qtsvg python3-serial`

Run the software:

- `python3 GMC.py`

4 Links to source codes and design files

- <https://csparkresearch.in/gmcounter>