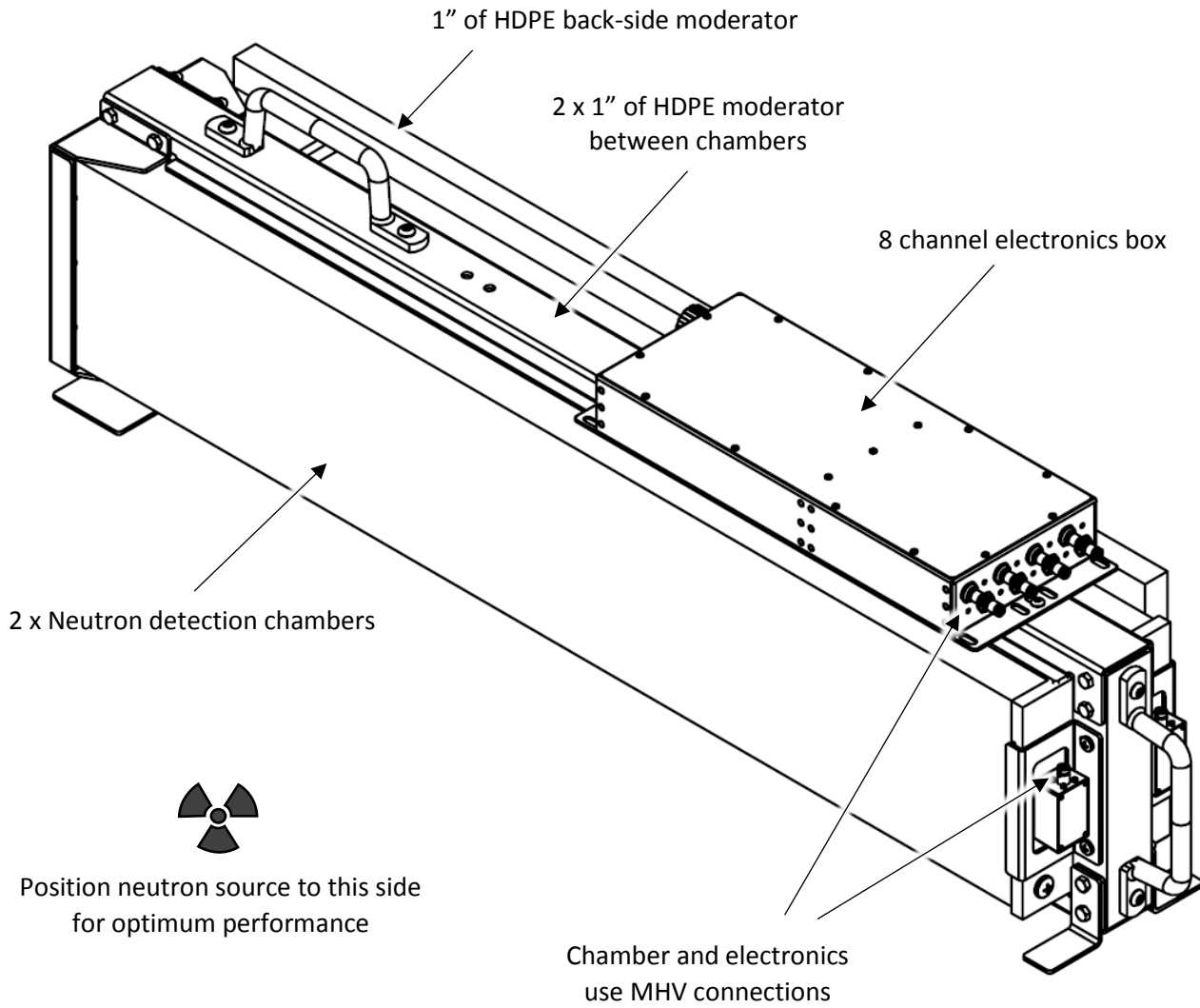


Neutron Detector Developer Unit Manual

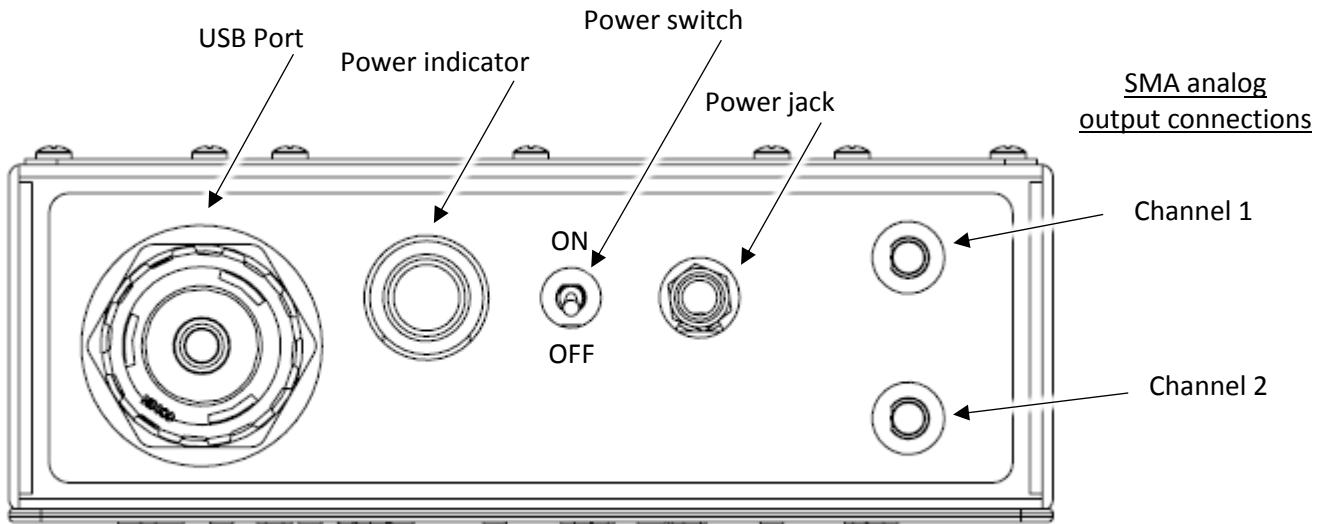
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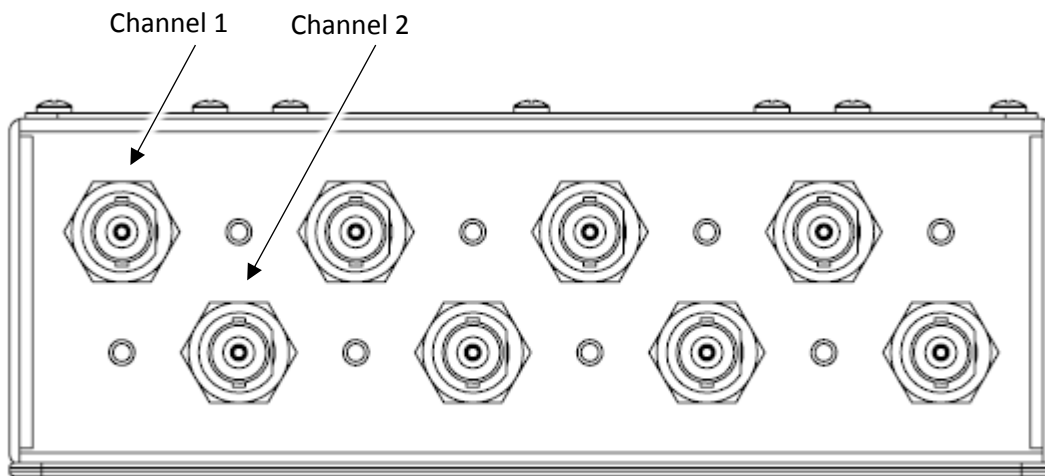
1 Silverside Developer Unit - Features



2 Silverside Read - Electronics Connections



MHV connections (Warning - High Voltage)



3 Safe Handling

1. Do not open the electronics box to avoid high voltage shock.
2. All 8 MHV connections are at high voltage, do not touch or allow to get wet.
3. Always assume the high voltage is always on. The software will turn off the high voltage upon exiting, but it is safest to assume that the high voltage is on when the electronics box is powered.
4. Always, power down and wait one minute before connecting or disconnecting MHV cables. There is a slight chance that not powering down will burn-out a MHV channel.
5. The Develop Unit is designed to be carried by two people.
6. Make sure the unit is securely supported at all times to prevent pinch and crush injuries.

4 Installation Procedure and Operating Instructions

1. To power on the detector, plug-in the 15 V power cable, and flip the power switch. Power indicator should light up. Note that the unit has a battery and can run for approximately 12 hours without AC power. See section 6 for software instructions.
2. Silverside Read is equipped with two analog channel outputs. Connect an oscilloscope to the SMA connectors on Silverside Read. Pulses will be a max of 5 V with a 0.45 V baseline.
3. The Developer Unit is equipped with asymmetric reflective moderator. This moderator should be placed furthest from the source.

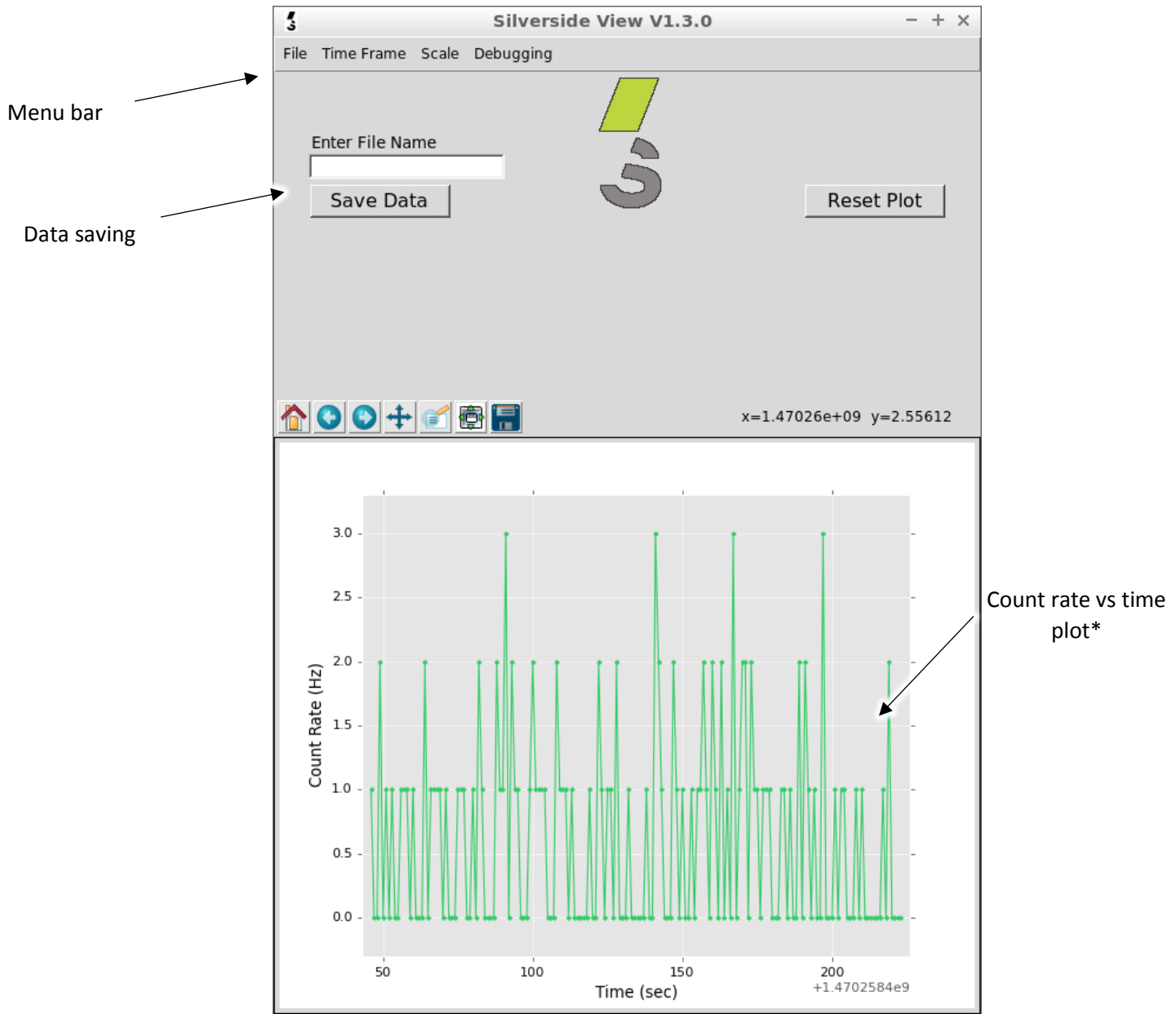
5 Silverside View - Software Installation

1. Computer must have internet access and be running Linux
 - a. We recommend Ubuntu. This installation has been tested on Ubuntu 15.10, 16.06 LTS, 14.04 LTS, and Debian 8.5.0.
2. You must have sudo privileges
3. Download or obtain Silverside View code and unzip the folder
4. Open a terminal and move into the sigma-device-master/ folder with the cd command
5. Run all commands with sudo. If you don't have sudo privileges, type as root:
`adduser [your-username] sudo`
6. Run lland-install.sh with the command:
`sudo ./lland-install.sh`
7. Respond with Y to any prompts
8. An icon will be installed on your desktop.

- Restart your computer. See the Silverside View Trouble Shooting Tips section if you have problems with installation

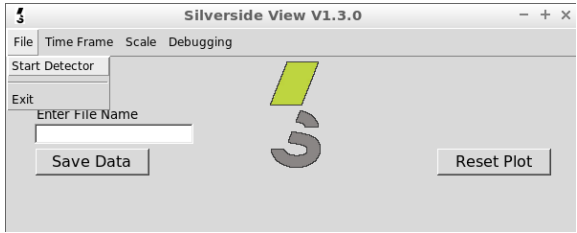
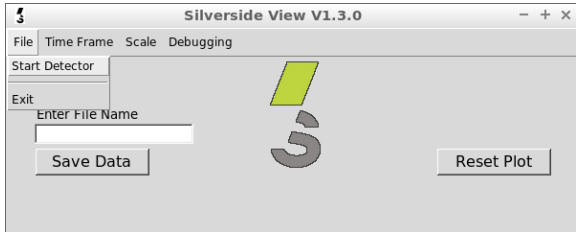
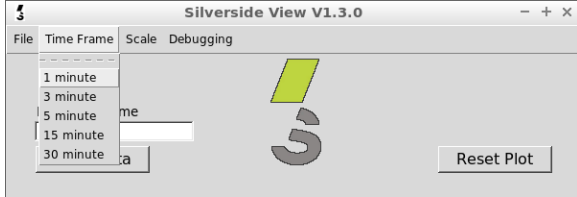
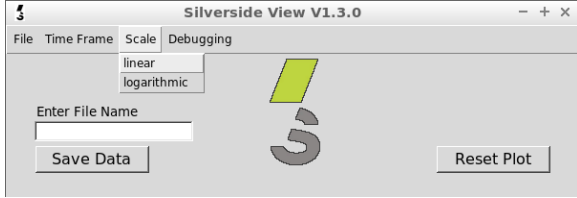
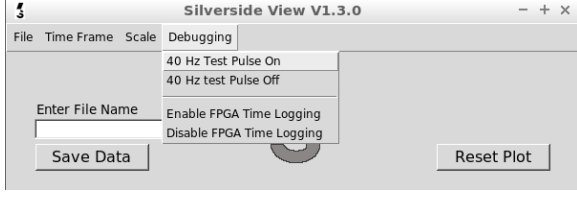
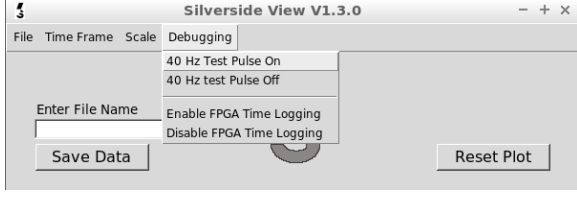
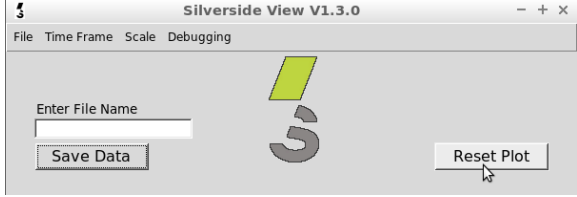
6 Silverside View - Instructions

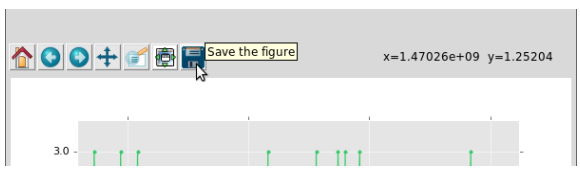
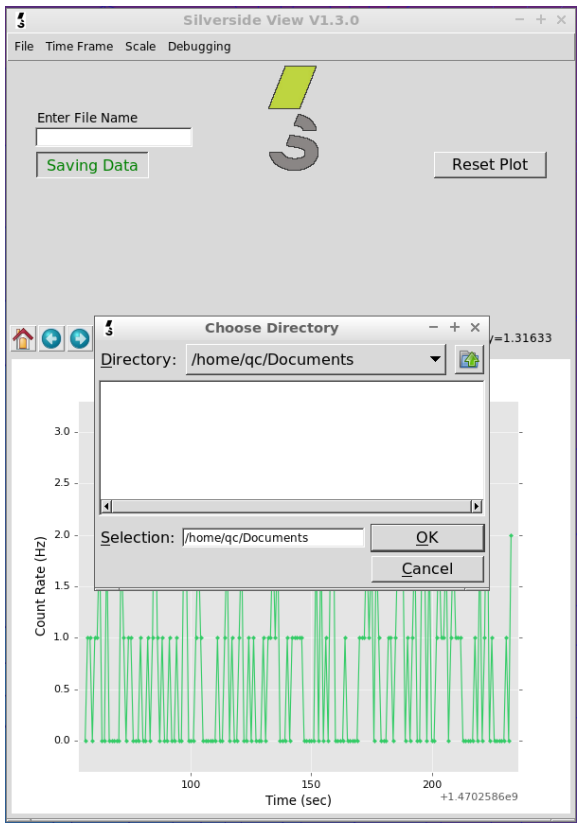
- Double click the Silverside View icon on the desktop
- The following window will appear:



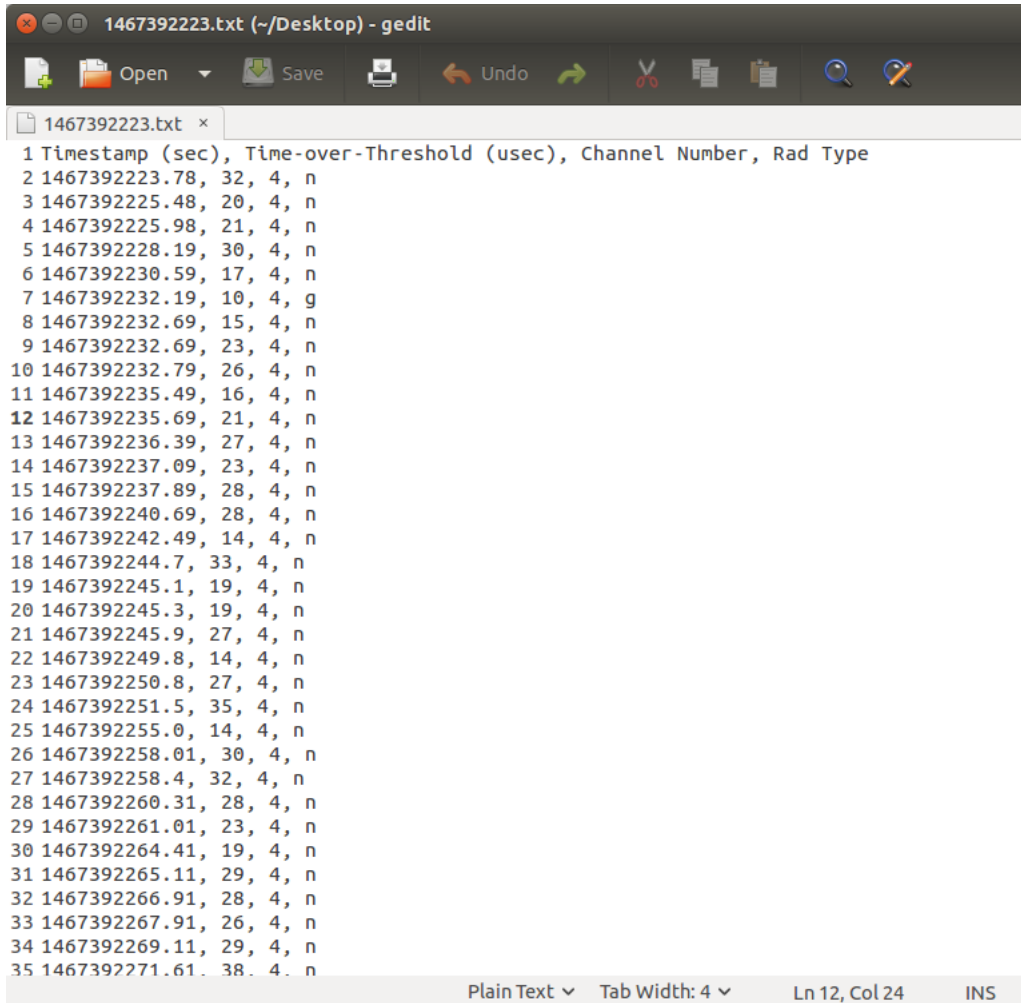
* The count rate is plotted every second, but is not displayed in real-time. Expect a 1-2 second delay between readings and the plot update. For more precise timing event data, the data file timestamps will be accurate to +/- 0.1 sec.

3. Program functionality is explained in the following table:

Function	Location	Description
Start Detector		Starts the detector electronics including turning on the high voltage. Once started, if Silverside Read is connected to a chamber, the count rate will be plotted
Exit		Exits out of the program and shuts –off the detector electronics
Time Frame		The time frame defines the limits of the x-axis in the count rate plot. Up to 30 min of data will be recallable if the timeframe is changed
Scale		The y-axis can be switched between linear and logarithmic
Debugging - Test Pulse		A 40 Hz test pulse can be turned on or off for debugging. (see trouble shooting tips section)
Debugging – FPGA Time Logging		Logging of the internal FPGA Timestamp can be turned on or off. Toggling this mode while saving data will change the data file format mid-file
Reset Plot		The count rate plot can be reset with this button. It will not alter or affect the data saving function

<p>Save Figure</p>		<p>A screenshot of the count rate plot can be saved at anytime</p>
<p>Save Data</p>		<p>Select the Save Data button to begin saving data. Enter a file name or else a Unix timestamp will be assigned as the file name. The program will prevent you from saving over existing files. After pressing the button, a popup window will ask you to select a directory to save the file to. While saving, the Save Button will read 'Saving Data' and appear green. To stop saving data, select the button again</p>

4. An example data file is below:



```
1467392223.txt x
1 Timestamp (sec), Time-over-Threshold (usec), Channel Number, Rad Type
2 1467392223.78, 32, 4, n
3 1467392225.48, 20, 4, n
4 1467392225.98, 21, 4, n
5 1467392228.19, 30, 4, n
6 1467392230.59, 17, 4, n
7 1467392232.19, 10, 4, g
8 1467392232.69, 15, 4, n
9 1467392232.69, 23, 4, n
10 1467392232.79, 26, 4, n
11 1467392235.49, 16, 4, n
12 1467392235.69, 21, 4, n
13 1467392236.39, 27, 4, n
14 1467392237.09, 23, 4, n
15 1467392237.89, 28, 4, n
16 1467392240.69, 28, 4, n
17 1467392242.49, 14, 4, n
18 1467392244.7, 33, 4, n
19 1467392245.1, 19, 4, n
20 1467392245.3, 19, 4, n
21 1467392245.9, 27, 4, n
22 1467392249.8, 14, 4, n
23 1467392250.8, 27, 4, n
24 1467392251.5, 35, 4, n
25 1467392255.0, 14, 4, n
26 1467392258.01, 30, 4, n
27 1467392258.4, 32, 4, n
28 1467392260.31, 28, 4, n
29 1467392261.01, 23, 4, n
30 1467392264.41, 19, 4, n
31 1467392265.11, 29, 4, n
32 1467392266.91, 28, 4, n
33 1467392267.91, 26, 4, n
34 1467392269.11, 29, 4, n
35 1467392271.61, 38, 4, n
Plain Text Tab Width: 4 Ln 12, Col 24 INS
```

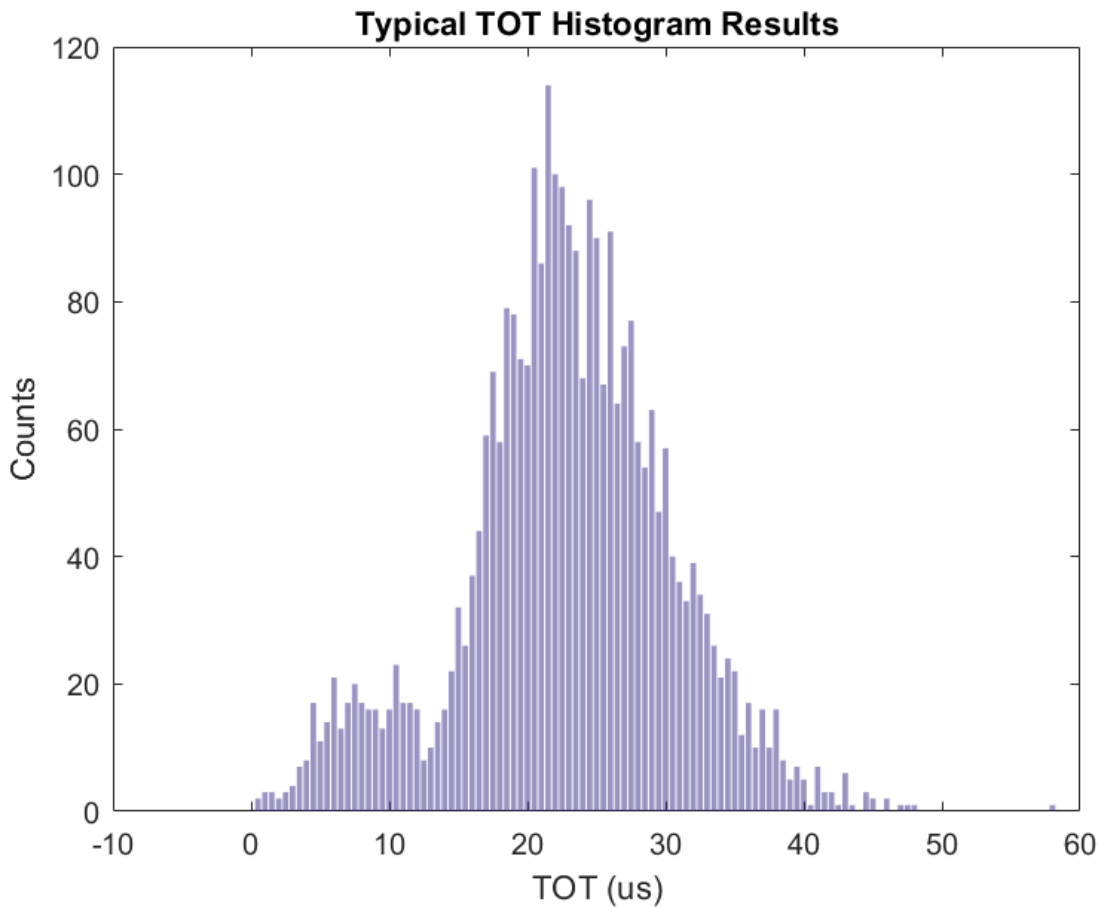
Timestamp is the Unix time that the event occurred, this is accurate to +/- 0.1 sec. The Time-over-Threshold is the amount of time the event pulse was above a voltage threshold, it is relatable to the pulse height. The channel number is the MHV channel the chamber was connected to. Rad Type is a neutron or gamma designation based on the Time-over-Threshold.

7 Silverside View Trouble Shooting Tips

1. If you run into problems with the install, try installing twice before running the software
2. If a Silverside View Icon does not appear on your desktop following installation, look in your sigma-device folder for the lland.desktop file and copy it to a convenient location
3. If on a new install of debian, edit /etc/apt/sources.list and prepend a '#' to the line:
deb cdrom:[Debian GNU/Linux 7.0.0 _Wheezy_ - Official amd64 CD
Binary-1 20130504-14:44]/ wheezy main
so that it becomes:
deb cdrom:[Debian GNU/Linux 7.0.0 _Wheezy_ - Official amd64 CD
Binary 1 20130504-14:44]/ wheezy main

4. If the UI fails to open or opens and does not behave as anticipated, run 'sudo lland.py' from the command line, errors will print to the terminal for debugging purposes
5. The 40 Hz test pulse can be turned on in the drop-down menu for debugging purposes if problems arise. It can be run with or without chambers connected to Silverside Read's MHV connections. Note that it takes a few seconds to switch off the HV before the test pulse starts and if connected to a chamber, a few residual pulses may appear while the chamber(s) discharge. If the test pulse fails to start, after a few seconds, select "40 Hz Test Pulse On" again.
6. If there is no count rate, turn on the test pulse (see 4.). If there is a count rate with the test pulse, check MHV cable connections. Next, try saving data to file, check that the MHV channels which the chambers are connected to are present in the data under "channel number". If they are not, power off, wait one minute, and then change chamber's cable to a functional MHV channel.
7. If the detector fails to start, run the program from the command line (see 3.). Power and USB connection issues will result in a "USB Connection Error". Power cycle, confirm power indicator lights up and confirm USB cable is connected

8 Performance



Typical single chamber histogram of counts vs. TOT (us).

9 Dimensions

