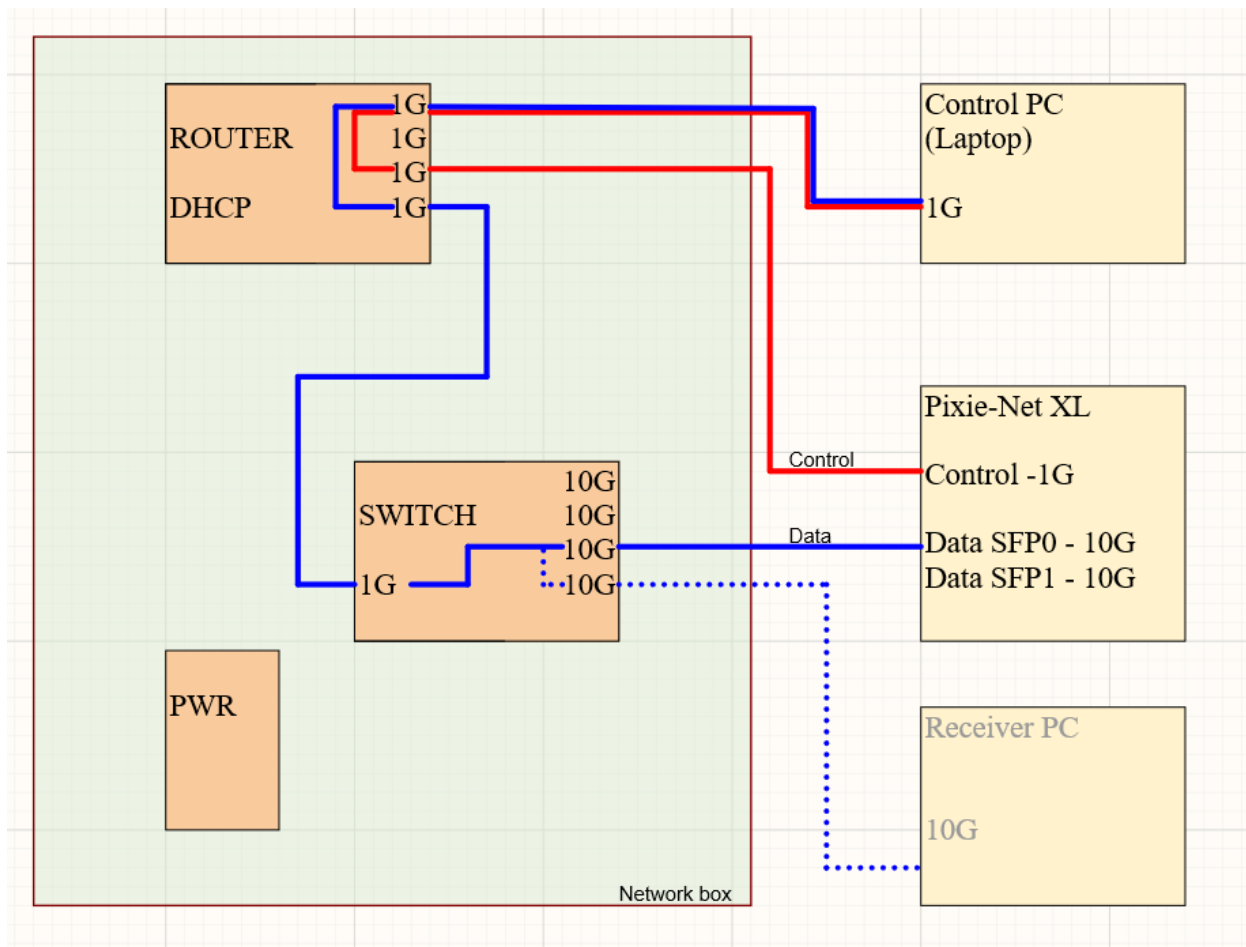


Illustrated Setup of Pixie-Net XL

Physical Network setup:

The Pixie-Net XL uses a “control network” (red) to operate the data acquisition, and a “data network” (blue) to receive list mode data.

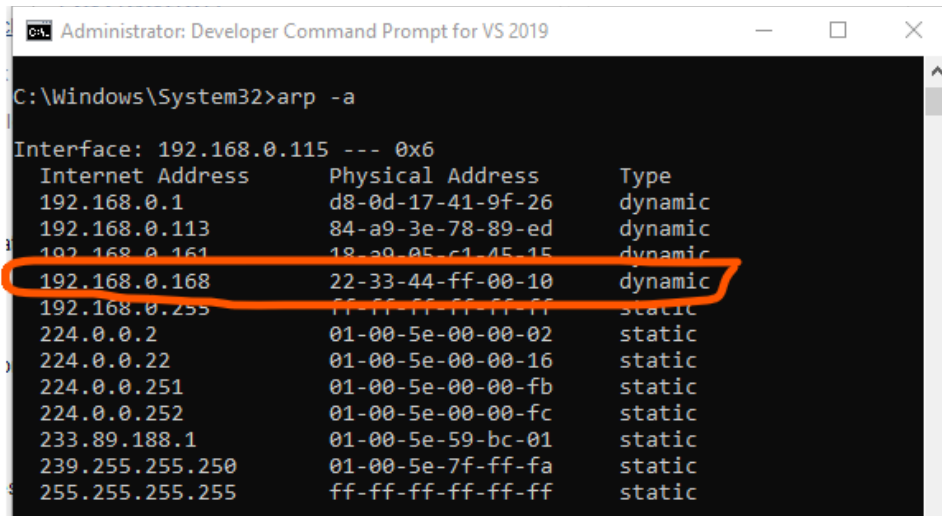
The sketch below shows a common test setup where the control and data networks are merged using a 1/10G switch for a single control PC (laptop). A generic 1G router assigns IP addresses through DHCP. Optionally, a dedicated receiver PC can receive the full rate 10G data stream (dotted blue connection).



For this example, we assume that the Pixie-Net XL’s built in pulser is connected to one of its analog inputs and the default settings file is used. For other input signals, the DAQ parameters have to be adjusted to match the signal characteristic (gain, offset, polarity; and energy filter for best resolution).

Control PC setup:

1. Find the Pixie-Net XL IP address: execute `arp -a` in a Windows command prompt and match the physical MAC address from the Pixie-Net XL's label with the IP address reported.

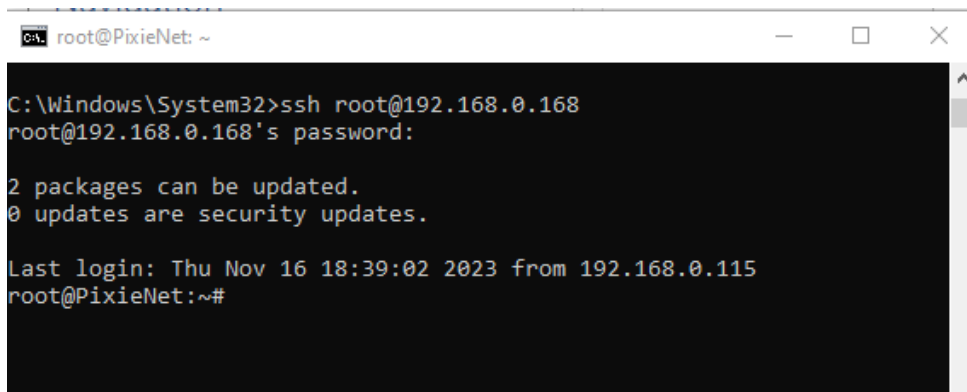


```
Administrator: Developer Command Prompt for VS 2019
C:\Windows\System32>arp -a

Interface: 192.168.0.115 --- 0x6
Internet Address      Physical Address      Type
192.168.0.1           d8-0d-17-41-9f-26     dynamic
192.168.0.113         84-a9-3e-78-89-ed     dynamic
192.168.0.161         18-a0-05-c1-45-15     dynamic
192.168.0.168         22-33-44-ff-00-10     dynamic
192.168.0.255         ff-ff-ff-ff-ff-ff     static
224.0.0.2             01-00-5e-00-00-02     static
224.0.0.22            01-00-5e-00-00-16     static
224.0.0.251           01-00-5e-00-00-fb     static
224.0.0.252           01-00-5e-00-00-fc     static
233.89.188.1          01-00-5e-59-bc-01     static
239.255.255.250       01-00-5e-7f-ff-fa     static
255.255.255.255       ff-ff-ff-ff-ff-ff     static
```

2. SSH log in to Pixie-Net XL: type `ssh root@<IP>`

Many terminal tools can be used for the SSH connection. The screenshot below shows Windows command prompt with the built in ssh function. Other options include Tera Term (also for serial port connection)



```
root@PixieNet: ~
C:\Windows\System32>ssh root@192.168.0.168
root@192.168.0.168's password:

2 packages can be updated.
0 updates are security updates.

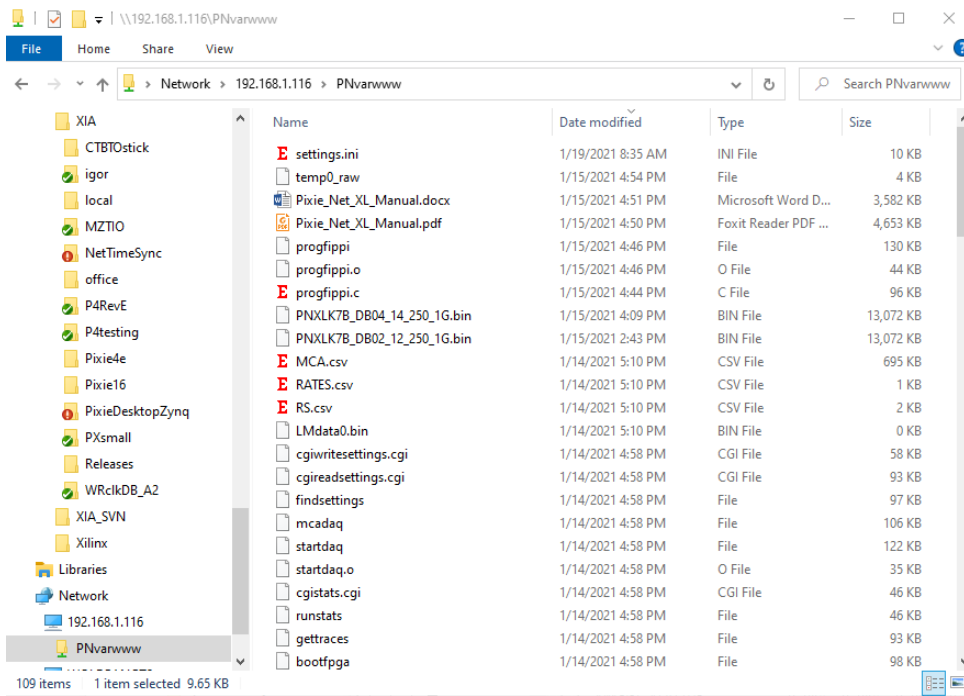
Last login: Thu Nov 16 18:39:02 2023 from 192.168.0.115
root@PixieNet:~#
```

3. Open Windows Explorer and go to the shared working directory on the Pixie-Net XL:

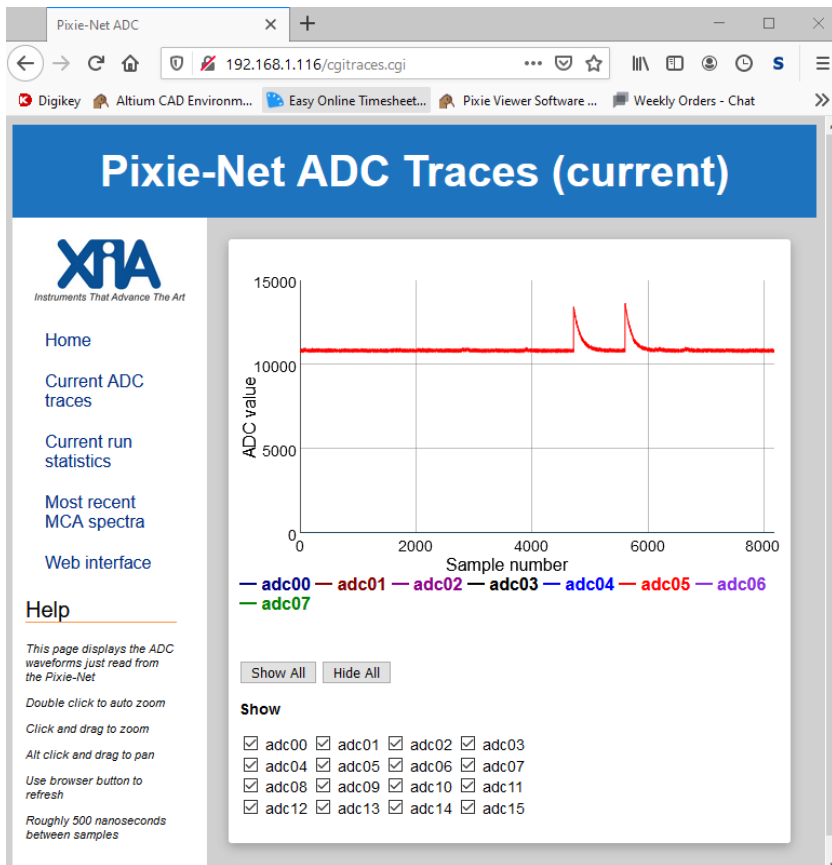
- Type the Pixie-Net XL IP address in the address bar.
- open folder PNvarwww. This is folder `/var/www` in the on the Pixie-Net XL's SD card

Note the following:

- `setting.ini` contains the DAQ parameters. It can be edited with any text editor (even from the Pixie Net Linux terminal)
- `LMdata0.bin` is the list mode data for data acquisitions that save data to the SD card.
- `MCA.csv` and `RS.csv` are MCA spectra and run statistics from the most recent data acquisition



4. Open a web browser, navigate to the Pixie-Net XL's IP and go to "current ADC traces" to check detector signal. Signals should show a fast rising edge and a slow decay, no clipping.

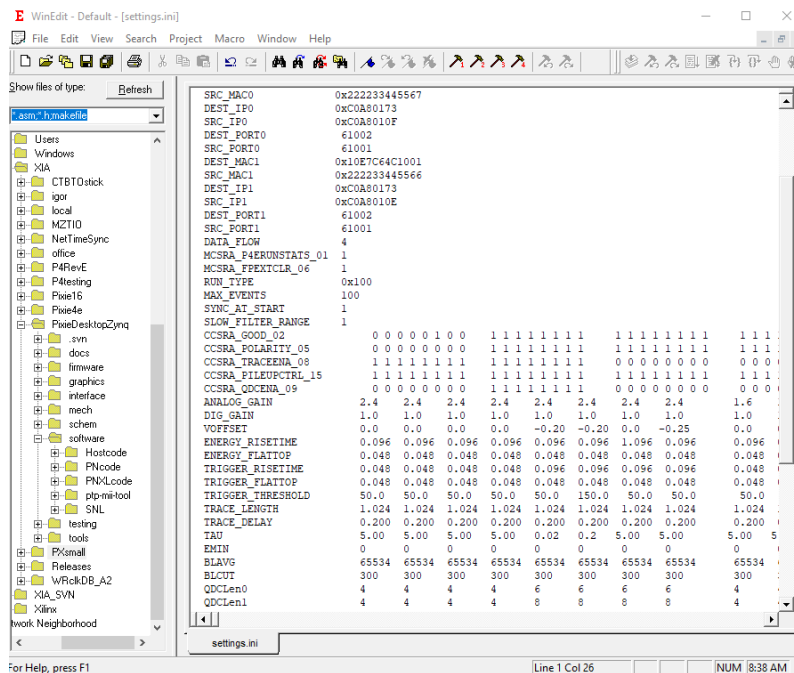


Pixie-Net XL setup

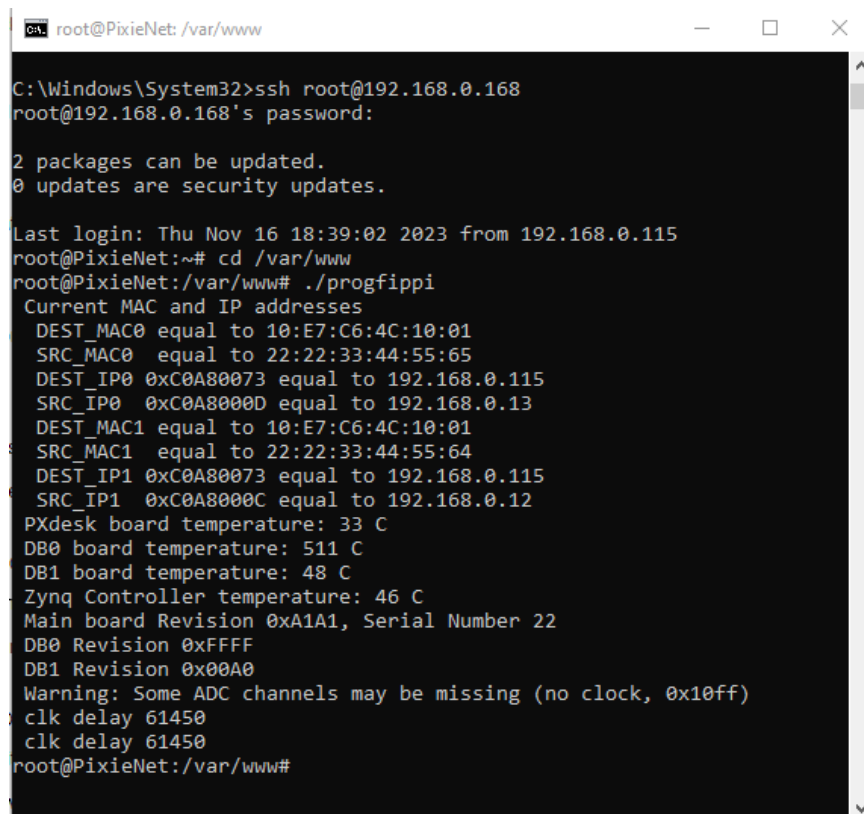
5. Optional: Edit settings.ini, for example to adjust analog gain, offset, run type ...

Parameters [mostly] match the Pixie-16 in meaning and value range. See manual for details!

For 10G data streaming, the file MUST specify correct destination IP and MAC of the receiver PC



6. After any change in settings.ini, apply settings from file by running “progfippi” in the command prompt



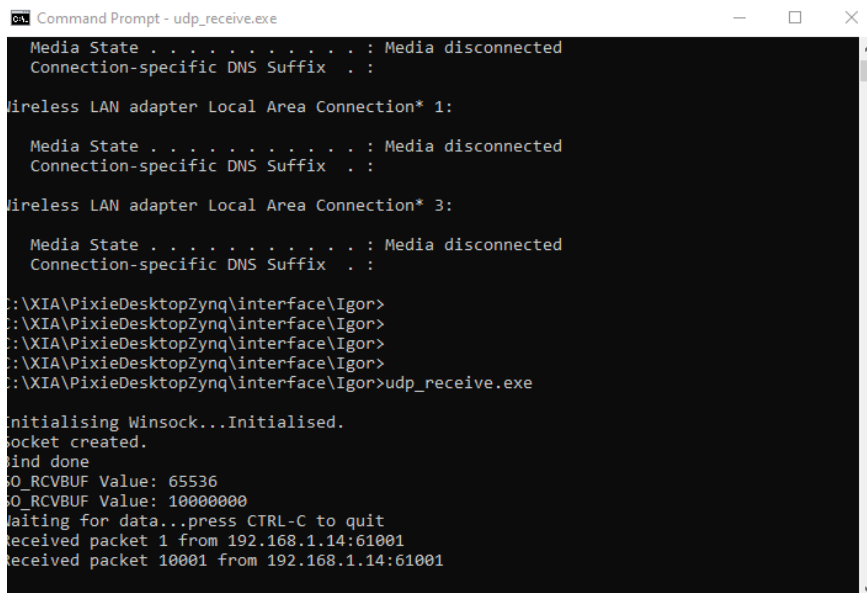
Receiver PC Setup and Data Acquisition

7. Open a new command prompt on the [receiver] PC and start the udp receiver program “udp_receive.exe”. It can be downloaded from XIA’s website (see “hostcode”)

Window may ask for Firewall permission: allow

The receiver program will then be “waiting for data ...”

The UDP receiver program exists for Windows and Linux. It’s basically copied from a socket programming tutorial, 1-2 pages of code. It is expected that users modify or integrate this in their overall data acquisition system.



```
Command Prompt - udp_receive.exe

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix  . :

Wireless LAN adapter Local Area Connection* 1:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix  . :

Wireless LAN adapter Local Area Connection* 3:

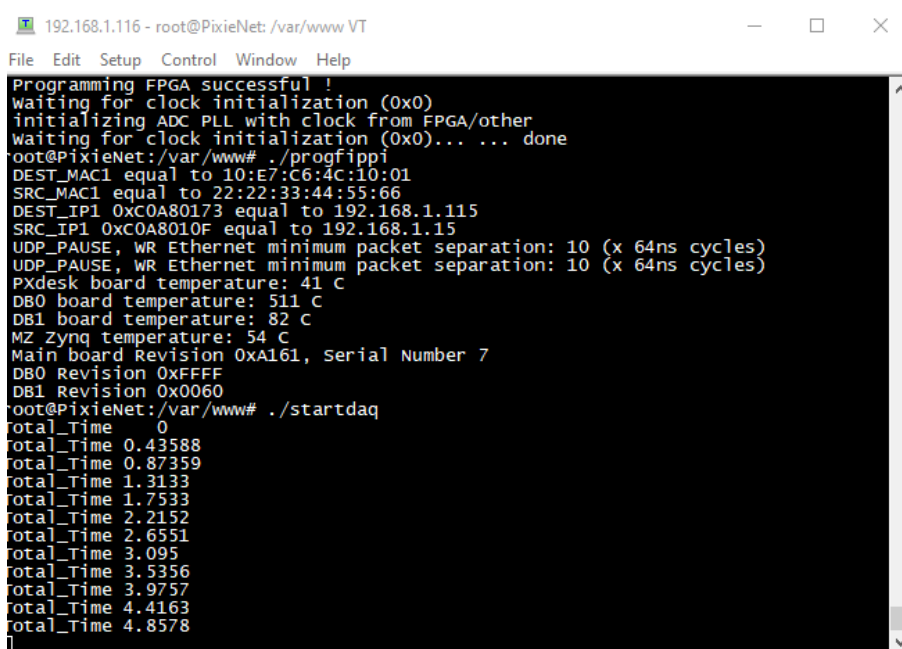
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix  . :

C:\XIA\PixieDesktopZynq\interface\Igor>
C:\XIA\PixieDesktopZynq\interface\Igor>
C:\XIA\PixieDesktopZynq\interface\Igor>
C:\XIA\PixieDesktopZynq\interface\Igor>
C:\XIA\PixieDesktopZynq\interface\Igor>udp_receive.exe

Initialising Winsock...Initialised.
Socket created.
Bind done
SO_RCVBUF Value: 65536
SO_RCVBUF Value: 1000000
Waiting for data...press CTRL-C to quit
Received packet 1 from 192.168.1.14:61001
Received packet 10001 from 192.168.1.14:61001
```

8. Start DAQ by typing “./startdaq” in the first (Pixie-Net XL) command prompt ...

The [receiver] PC will now receive packets and Pixie-Net XL will count the run time

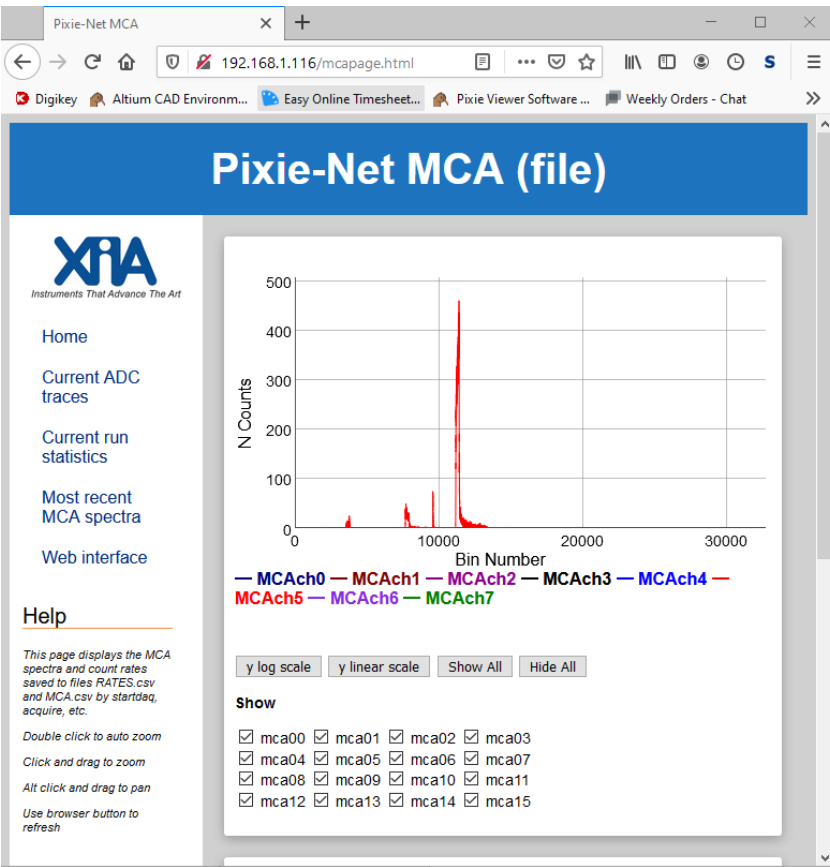


```
192.168.1.116 - root@PixieNet: /var/www VT
File Edit Setup Control Window Help

Programming FPGA successful !
waiting for clock initialization (0x0)
initializing ADC PLL with clock from FPGA/other
waiting for clock initialization (0x0)... .. done
root@PixieNet:/var/www# ./progfippi
DEST_MAC1 equal to 10:E7:C6:4C:10:01
SRC_MAC1 equal to 22:22:33:44:55:66
DEST_IP1 0xC0A80173 equal to 192.168.1.115
SRC_IP1 0xC0A8010F equal to 192.168.1.15
UDP_PAUSE, WR Ethernet minimum packet separation: 10 (x 64ns cycles)
UDP_PAUSE, WR Ethernet minimum packet separation: 10 (x 64ns cycles)
PXdesk board temperature: 41 C
DB0 board temperature: 511 C
DB1 board temperature: 82 C
MZ Zynq temperature: 54 C
Main board Revision 0xA161, Serial Number 7
DB0 Revision 0xFFFF
DB1 Revision 0x0060
root@PixieNet:/var/www# ./startdaq
total_Time 0
total_Time 0.43588
total_Time 0.87359
total_Time 1.3133
total_Time 1.7533
total_Time 2.2152
total_Time 2.6551
total_Time 3.095
total_Time 3.5356
total_Time 3.9757
total_Time 4.4163
total_Time 4.8578
```

9. Results:

MCA spectra can be seen on the webpage ...



.. and the LM file increases in size in Windows Explorer in the same location as the UDP receiver program

Name	Date modified	Type	Size
LMdata.bin	1/19/2021 8:53 AM	BIN File	55,742 KB
Pixie.nxn	1/15/2021 4:35 PM	PXP File	8,305 KB

The default DAQ period is set to 10s with the parameter REQ_RUNTIME in the settings file.

See the user manual for a description of the list mode data format. XIA provides an experimental Igor Pro GUI to read and display the data.

Next step: try the web interface to set parameters and start runs. (see user manual)

