DOC-235260-01
2 x ACQ2106+ACQ482

Requirement
32 channels, 20MSPS.
Transient Capture to limit of memory
Example capture, offload, store, plot.

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First Steps

- Each ACQ2106 is a NETWORK device, connect ETH0 to a gigabit switch.
- Device defaults to DHCP, else falls back to a static ip address on shipping doc.
- If you're unable to contact the device on Ethernet, please refer to
- 4GUG Getting Started #5
  - you may need to use the serial console to access the unit
- Example Software support, use git to get LATEST versions
  - API: HAPI
  - GUI: ACQ400CSS

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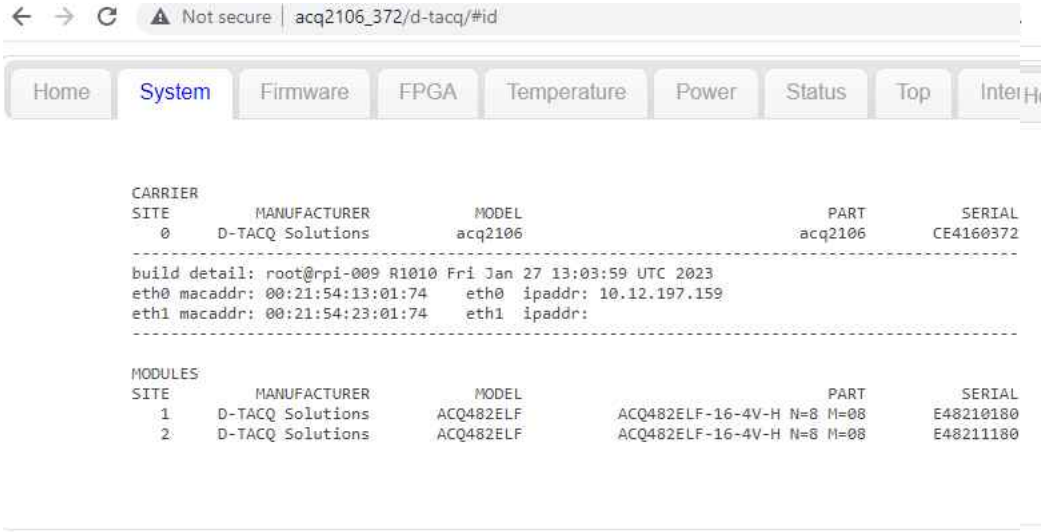
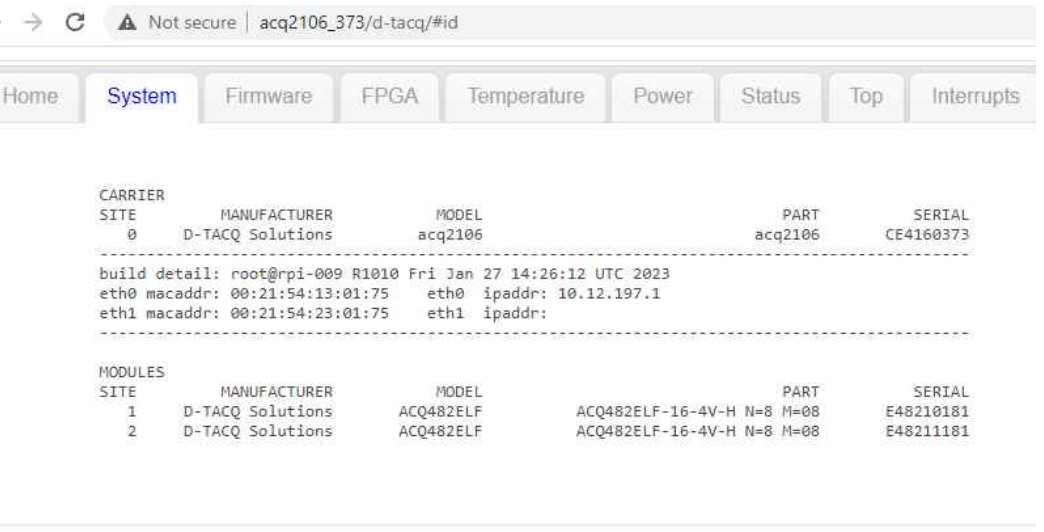
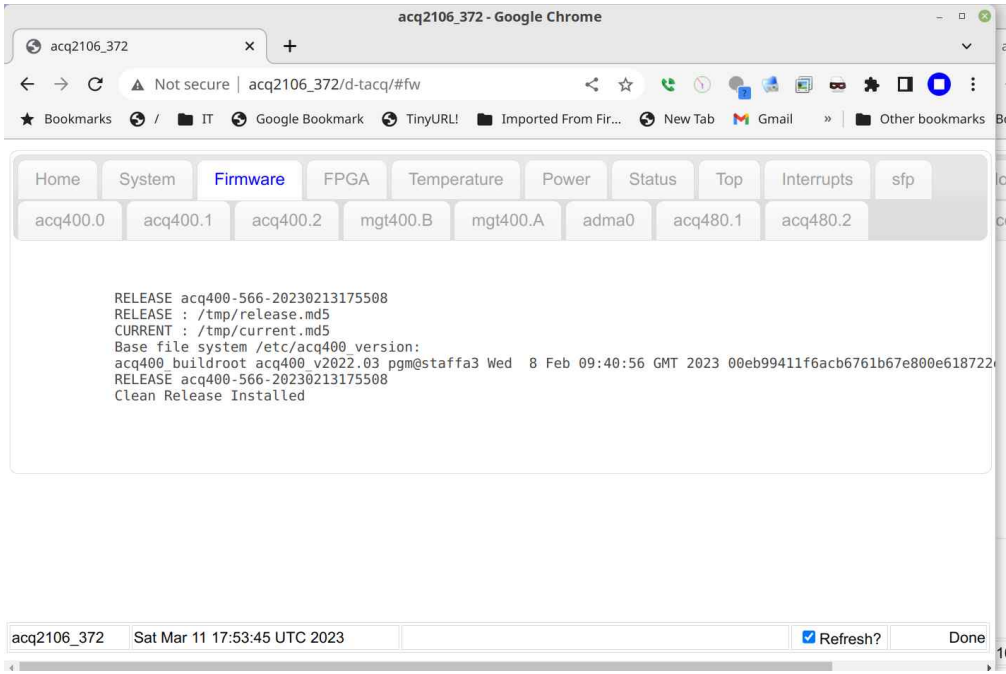
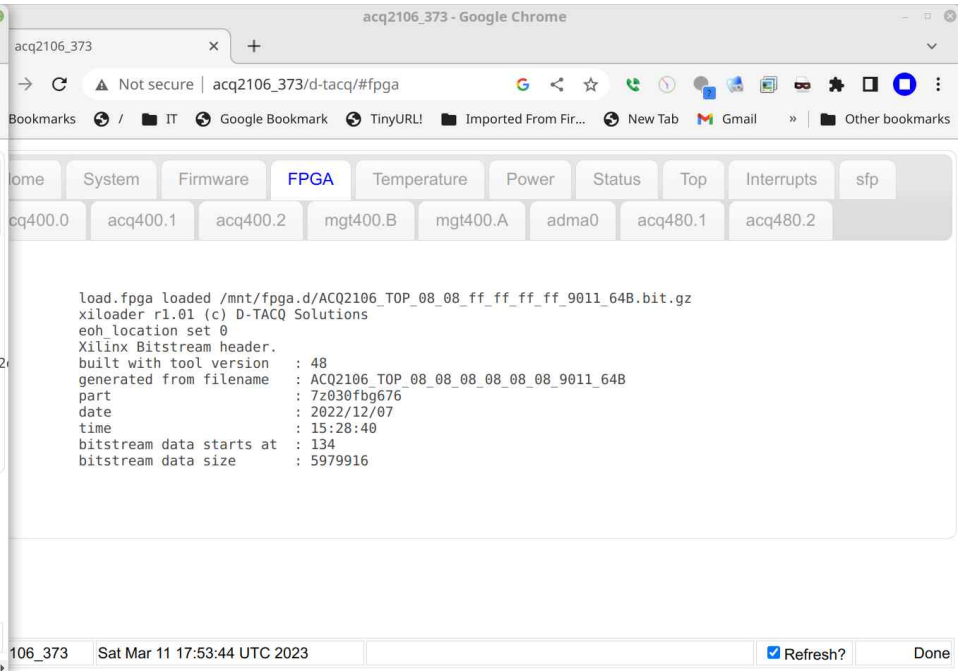
Configuration: Embedded Web pages









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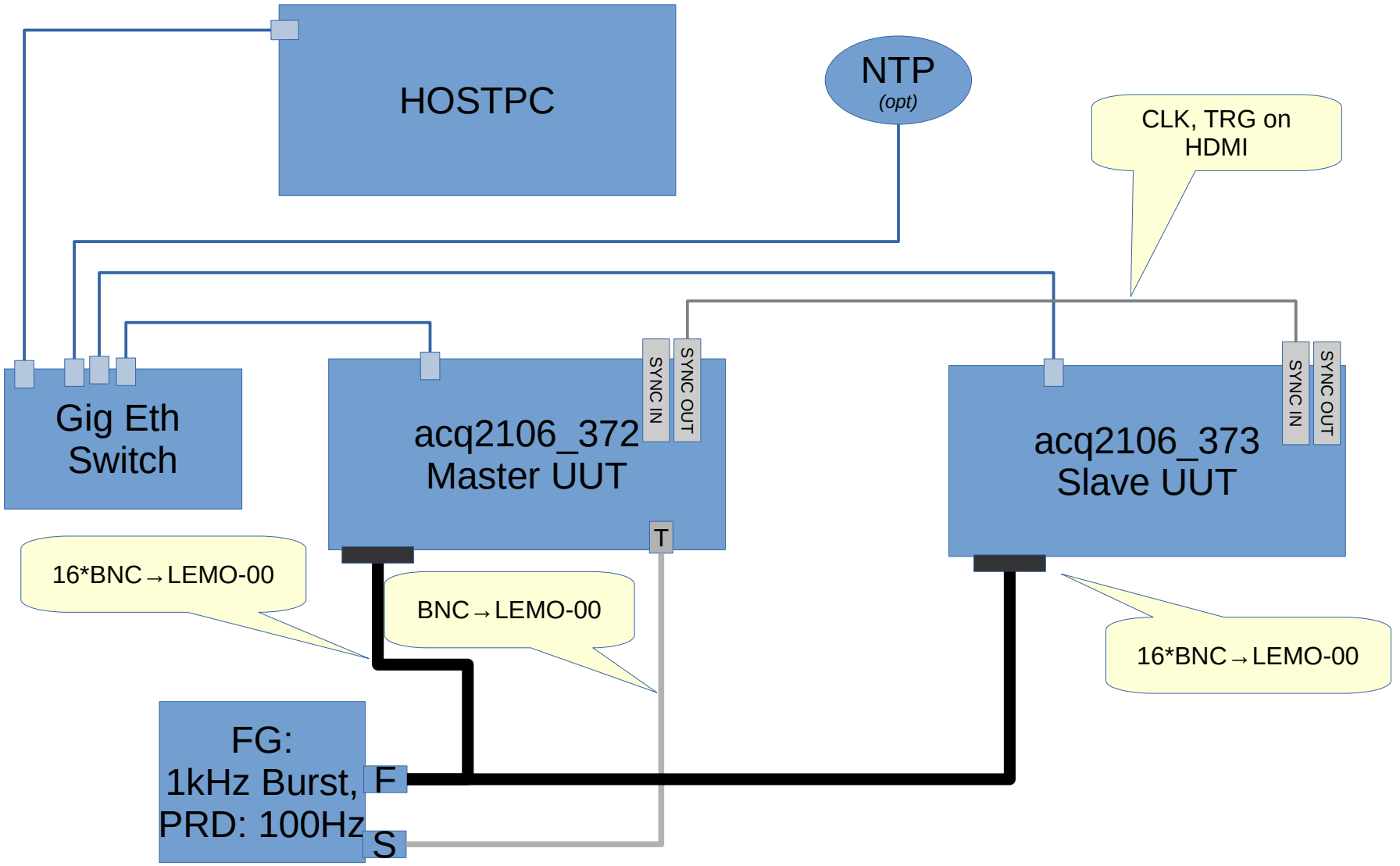
Test Configuration



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UUT Firmware Customization

```
acq2106_372> cat /mnt/local/rc.user

/usr/local/CARE/acq2106\+acq480.init
# Local clock and front panel trigger
set.site 0 sync_role master 20M 1M TRG:DX=d0
```

Common config,
suitable for using one UUT at a time (simplest to get started)

```
acq2106_372> cat /mnt/local/sysconfig/acq400.sh
REBOOT_KNOB=y
ACQ480_CUSTOM_BUF=y
BLEN=4194304
NBUF=166
```

Memory Customization:
Allocate 640MB to capture
16ch x 2b x 20M = 640MB/s
maximum shot time: 1s
common to both boxes

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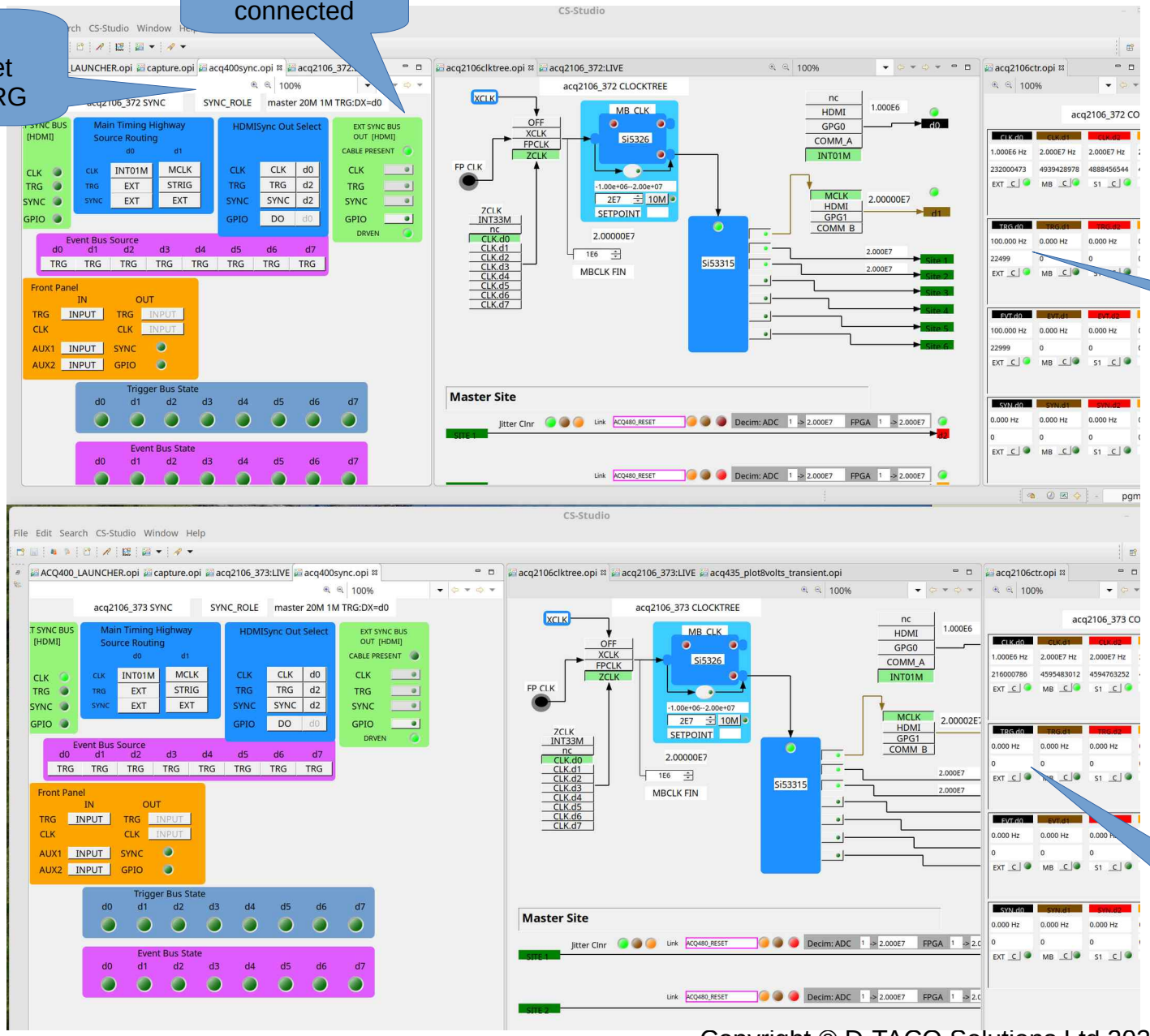
GUI: Not essential, but very useful

Default Boot
Both UUTs are set
master 20M ext TRG

SYNC_OUT
connected



EXT TRG
connected

EXT TRG
NOT connected
(normal)

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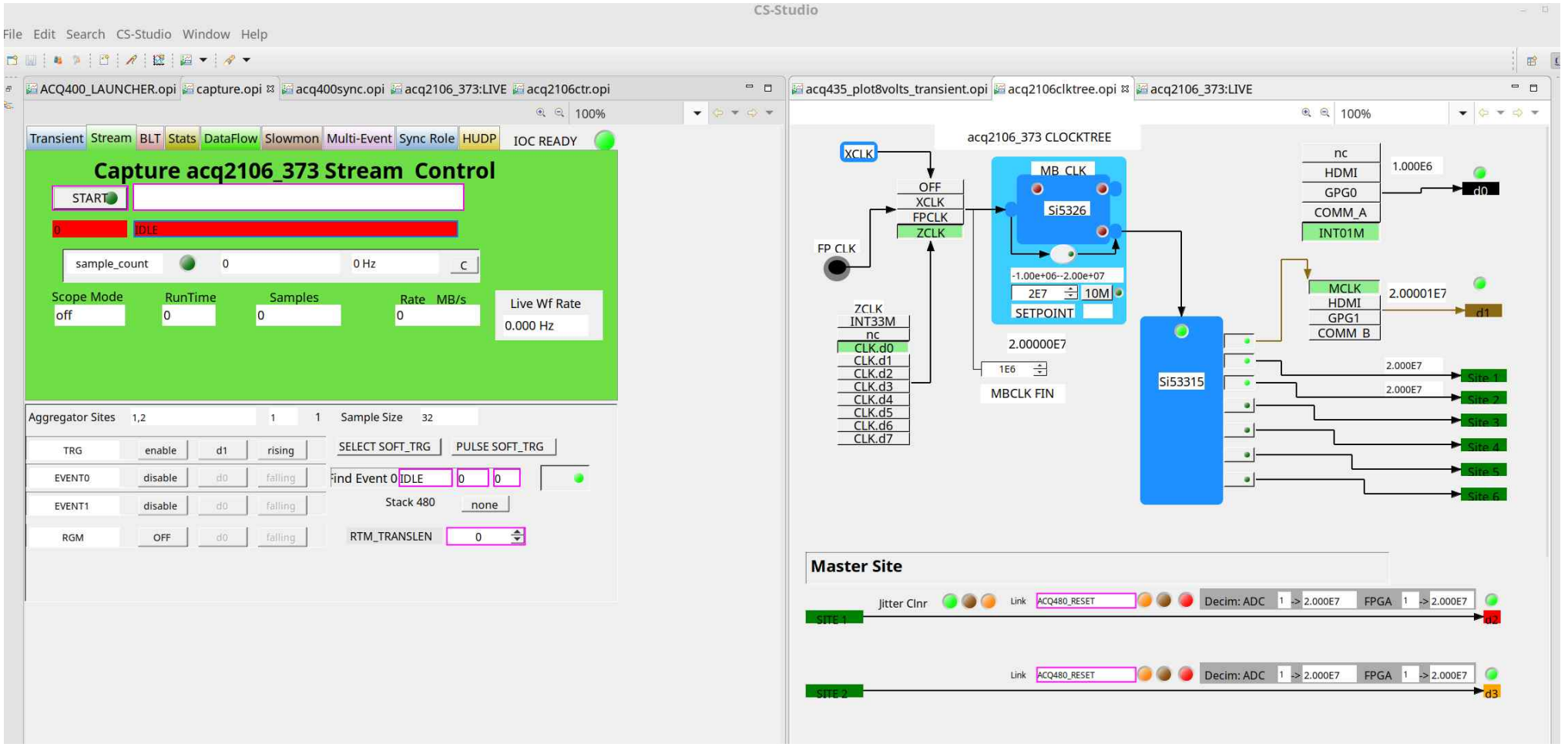
Push Button Livestream From GUI




```
acq2106_373> /mnt/local/enable_streaming
```

UUT is optimized for Transient, run this for best Stream experience

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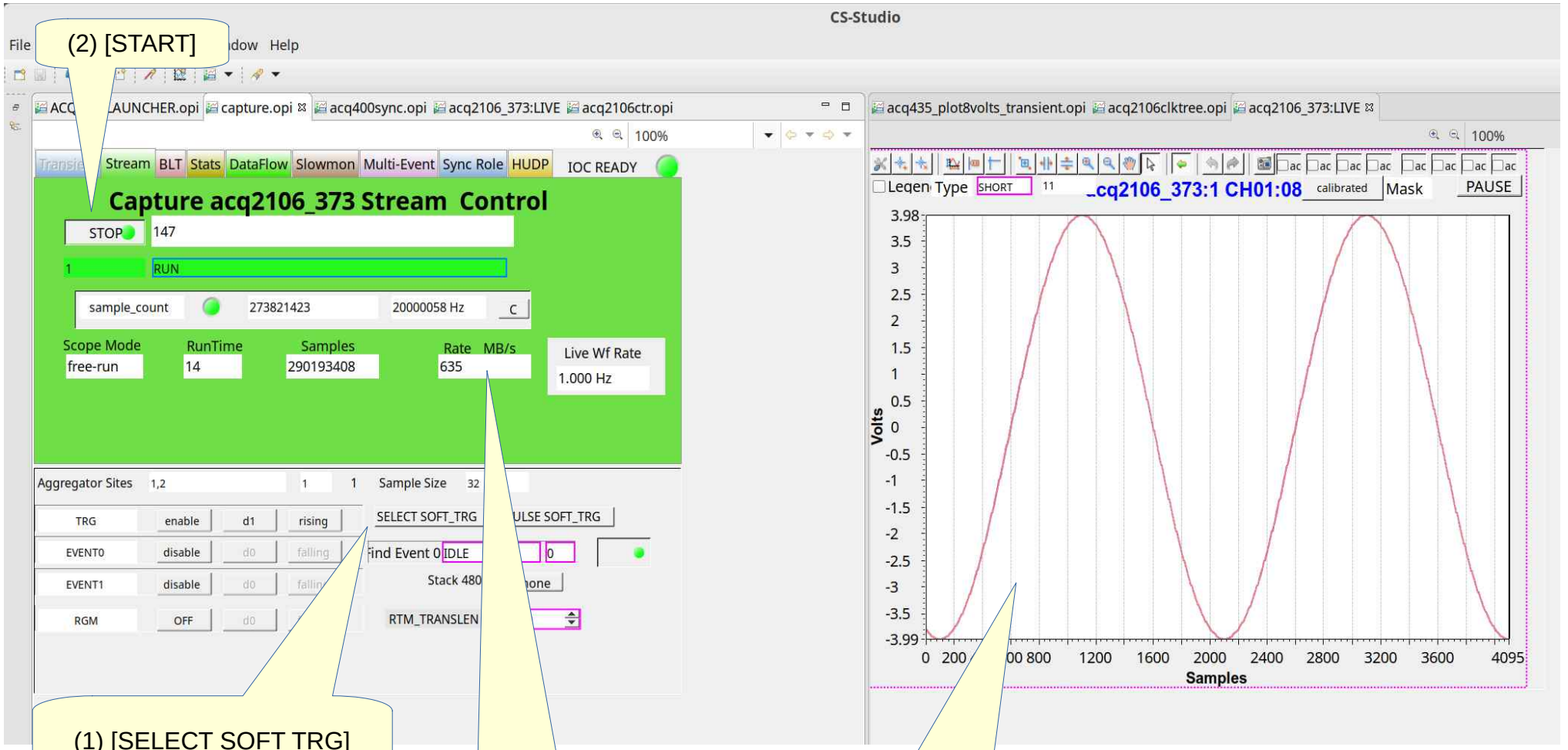
Push Button Livestream From GUI (2)



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Push Button Transient From GUI

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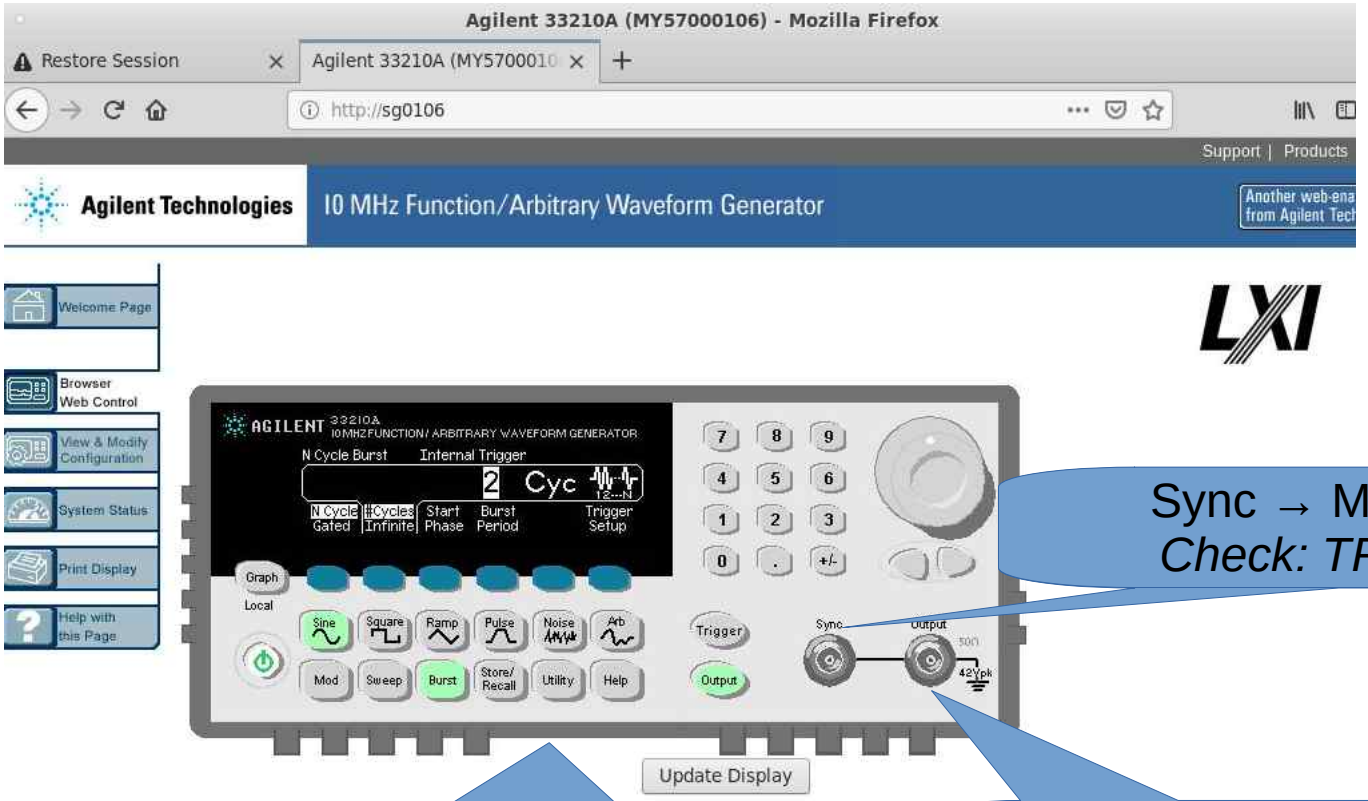
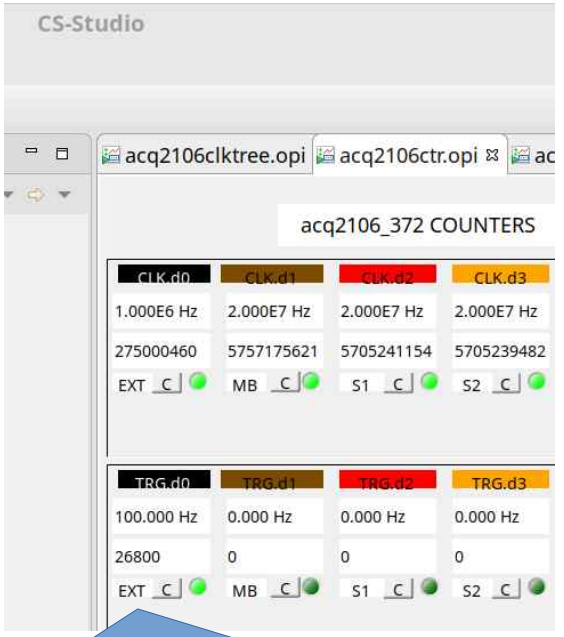
Long Duration Capture





Sync → Master FP TRG
Check: TRG.d0=100Hz

FG fires a short
10kHz burst every 10msec.
(100Hz)

Output (Func) to Analog
Inputs, both UUTs.

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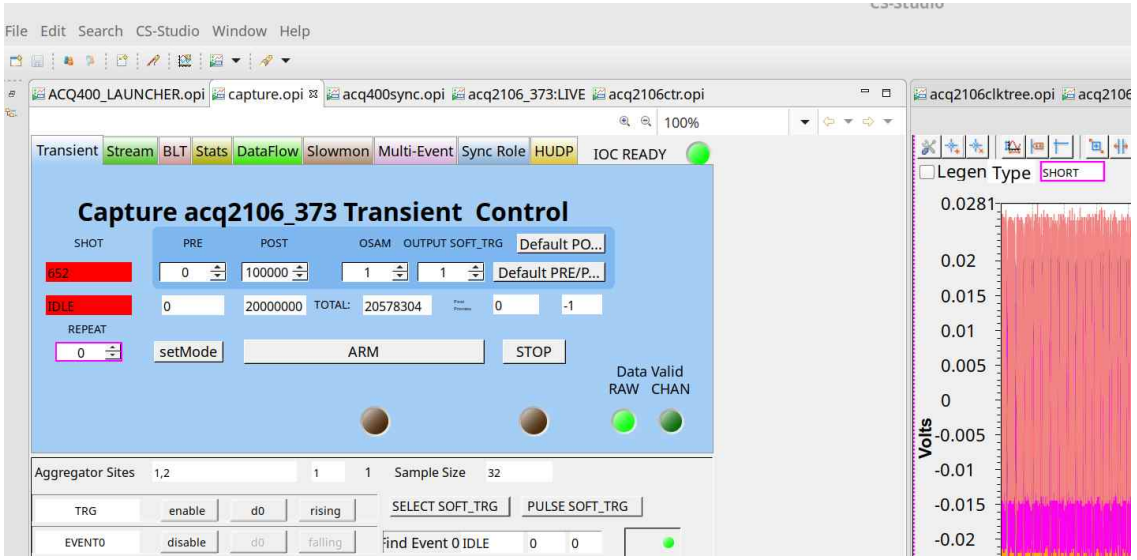
Automated Capture With HAPI

```
[dt100@naboo acq400_hapi]$ python3 \
     ./user_apps/acq400/acq400_upload.py \
      --demux=0 --capture=1 --trg=ext,rising \
      --post=20M --save_data /mnt/ --shots=1 acq2106_373
host shot 0 uut shot 652
acq2106_373 soft_trigger
acq2106_373 SHOT COMPLETE shot:652
INFO: Shotcontroller.handle_data() acq2106_373 data valid: DATA_VALID
TIMING:func:'handle_data' took: 22.48 sec
Finally, going down
TIMING:func:'run_shot' took: 35.79 sec
TIMING:func:'upload' took: 37.11 sec
TIMING:func:'run_main' took: 37.11 sec
[dt100@naboo acq400_hapi]$ ls -l /mnt/
total 625008
-rw-r--r-- 1 dt100 d-tacq 640000000 Mar 11 18:58 acq2106_373_CH00
```

SINGLE UUT
keep it simple..

ATTENTION!
SINGLE UUT
Works with either box, but please ensure that the external trigger is applied to the UUT
.. also run single UUT fresh from reboot without changing clocking (p16)



Output (Func) to Analog Inputs, both UUTs.

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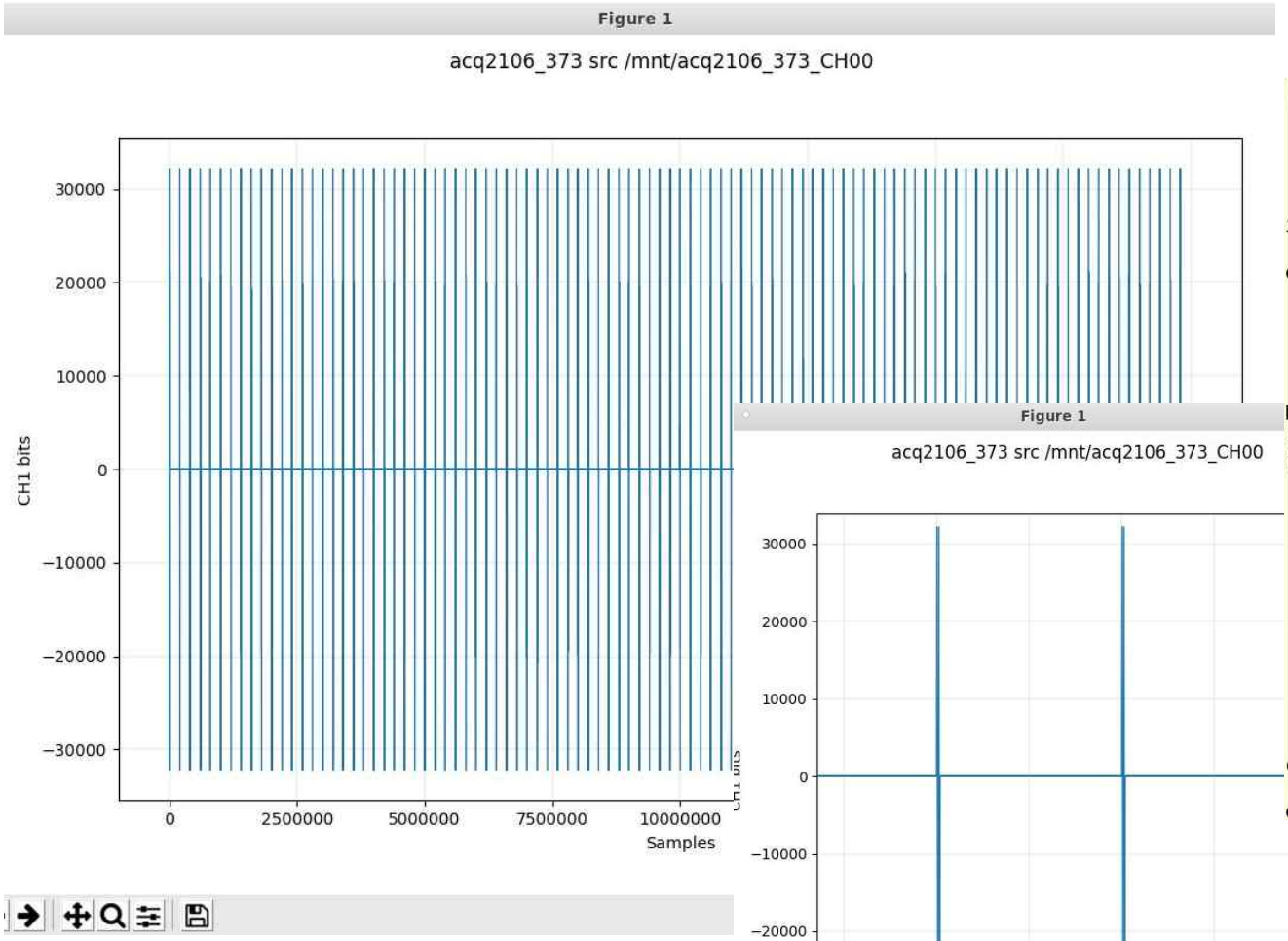
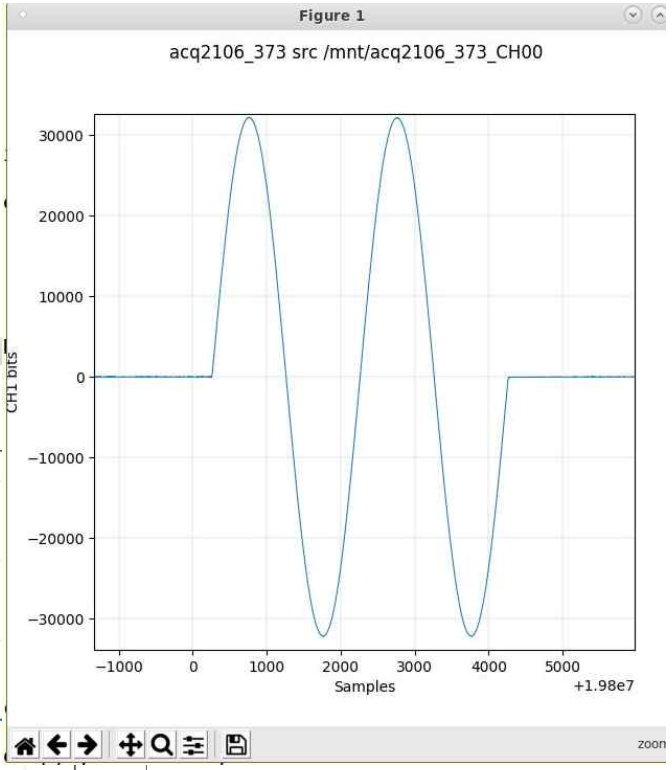
Plot Data from HAPI

```
python3 ./user_apps/analysis/host_demux.py \
    --src /mnt/acq2106_373_CH00 --pchan 1 acq2106_373
```





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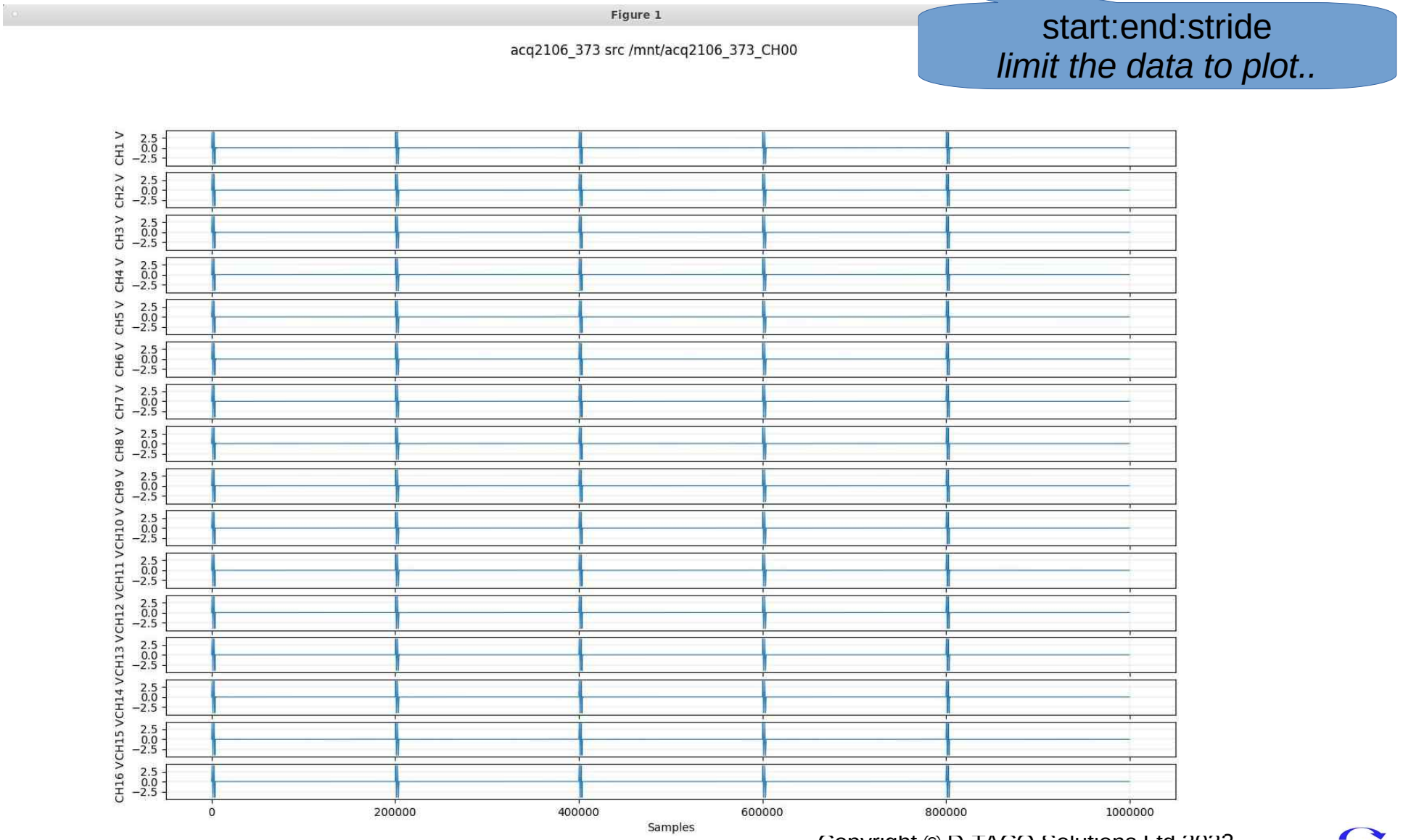
Plot Multiple channels restrict period

```
python3 ./user_apps/analysis/host_demux.py \
        --src /mnt/acq2106_373_CH00 --pses=0:1000000:1 acq2106_373
```

start:end:stride
limit the data to plot..



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Command Trace (capture, upload)

record the commands and use in your own program..

```
[dt100@naboo acq400_hapi]$ SITECLIENT_TRACE=1 NETCLIENT_TRACE=1 python3 \
    ./user_apps/acq400/acq400_upload.py --demux=0 --capture=1 \
     --trg=ext,rising --post=20M --save_data /mnt/ --shots=1 acq2106_373
Netclient.init acq2106_373 4220
Siteclient(acq2106_373, 4220) >SITELIST
...
Siteclient(acq2106_373, 4220) >state
Siteclient(acq2106_373, 4220) <0 0 20000000 20578304 0
Netclient.init acq2106_373 2235
Siteclient(acq2106_373, 4220) >sync_role
Siteclient(acq2106_373, 4220) <master 20000000
Siteclient(acq2106_373, 4221) >event0=0,0,0
Siteclient(acq2106_373, 4221) <
Siteclient(acq2106_373, 4221) >trg=1,0,1
Siteclient(acq2106_373, 4221) <
Siteclient(acq2106_373, 4220) >transient=PRE=0 POST=20000000 SOFT_TRIGGER=0 DEMUX=0
Siteclient(acq2106_373, 4220) <
Siteclient(acq2106_373, 4221) >trg=1,0,1
Siteclient(acq2106_373, 4221) <
Siteclient(acq2106_373, 4221) >event0=0,0,0
Siteclient(acq2106_373, 4221) <
Siteclient(acq2106_373, 4220) >TRANSIENT:SET_ABORT=1
Siteclient(acq2106_373, 4220) <
Siteclient(acq2106_373, 4220) >TRANS_ACT:STATE
Siteclient(acq2106_373, 4220) <TRANS_ACT:STATE IDLE
Siteclient(acq2106_373, 4220) >shot
Siteclient(acq2106_373, 4220) <1
Siteclient(acq2106_373, 4221) >shot=1
Siteclient(acq2106_373, 4221) <
Siteclient(acq2106_373, 4220) >TRANSIENT:SET_ARM=1
Siteclient(acq2106_373, 4220) <
Siteclient(acq2106_373, 4220) >soft_trigger=1
Siteclient(acq2106_373, 4220) <
Siteclient(acq2106_373, 4220) >NCHAN
Siteclient(acq2106_373, 4220) <16
Siteclient(acq2106_373, 4220) >data32
Siteclient(acq2106_373, 4220) <0
Siteclient(acq2106_373, 4220) >transient
Siteclient(acq2106_373, 4220) <PRE=0 POST=20000000 OSAM=1 DEMUX=0 SOFT_TRIGGER=0
Siteclient(acq2106_373, 4220) >raw_data_size
Siteclient(acq2106_373, 4220) <640000000
Netclient.init acq2106_373 53000
TIMING:func:'handle_data' took: 18.10 sec
```

Trace shows commands a user program would need to execute

or..
run python from Labview?

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Command Trace (plot egu)

record the commands and use in your own program..

```
Siteclient(acq2106_373, 4220) <640000000
Netclient.init acq2106_373 53000
TIMING:func:'handle_data' took: 18.10 sec
```

(1) after the shot, connect to port 53000/TCP and read RAW data: 640e6 bytes on each UUT.

```
[dt100@naboo ~]$ hexdump -e '16/2 "%04x," "\n"' /mnt/acq2106_373_CH00  | head
fff7,ff8f,ffa7,ff6f,005f,0003,002f,00ab,002b,ffd3,0077,fff3,0023,005b,0003,ffbb,
ffef,ff8f,ff9f,ff67,005b,000f,001f,00a3,0023,ffd7,0077,fff3,0023,005f,0003,ffc7,
ffef,ff93,ffa3,ff63,005b,0007,001f,009f,0027,ffcb,007b,fff7,0023,005f,ffff,ffc3,
ffeb,ff97,ff9f,ff6b,005b,0007,002b,00a3,001f,ffd7,007b,fffb,001f,0063,ffff,ffc
ffeb,ff97,ffa3,ff6f,0063,000b,002b,00a7,002b,ffd7,006f,fff7,0023,0063,fffb,ff
ffef,ff93,ffa3,ff6f,005b,0007,0023,009b,0027,ffd3,007b,fff3,0027,005f,fff
ffeb,ff93,ffa7,ff6f,0063,000f,002b,00af,0027,ffd3,0077,fffb,0027,0063,000b,f
fff3,ffa3,ff9f,ff6b,005f,000b,001b,009f,002f,ffd7,007f,fff7,0023,006b,0003,ff
ffef,ff97,ffab,ff6f,0063,000b,0037,00a3,002f,ffcf,0077,fffb,0023,0063,0007,ff
fff7,ff97,ffab,ff73,005b,0013,0033,00af,002f,ffd7,0077,fffb,002b,0063,000b,ff
```

We can see the reshape is correct, because the (floating) inputs track, on the left, a channel with a small negative offset, on the right, a channel with a small positive offset.

(2) The raw data is very simply: 16 columns of int16, one row per sample, 20e6 rows

NB: this data is “Little Endian”, INTEL-style format. It’s our understanding that Labview was “Big Endian”, so a byte swap would be required.

(3) Read calibrated ESLO (Slope) and EOFF (Offset) value to convert to volts
V = Raw * ESLO - EOFF

```
[dt100@naboo acq400_hapi]$ SITECLIENT_TRACE=1 python3 \
              ./user_apps/analysis/host_demux.py --src /mnt/acq2106_373_CH00 --pses=0:1000000:1 --egu=1 acq2106_373

Siteclient(acq2106_373, 4221) >AI:CAL:ESLO
Siteclient(acq2106_373, 4221) <AI:CAL:ESLO 9 0 0.00012389 0.00012354 0.000123467 0.000123442 0.000123729 0.000123455 0.00012376 0.000123876
Siteclient(acq2106_373, 4221) >AI:CAL:EOFF
Siteclient(acq2106_373, 4221) <AI:CAL:EOFF 9 0 -0.000218326 0.0112563 0.00950572 0.0159721 -0.0138621 -0.00309993 -0.00654523 -0.0223364
Siteclient(acq2106_373, 4222) >AI:CAL:ESLO
Siteclient(acq2106_373, 4222) <AI:CAL:ESLO 9 0 0.000123621 0.000123313 0.000123194 0.00012316 0.000123405 0.000123189 0.000123557 0.00012353
Siteclient(acq2106_373, 4222) >AI:CAL:EOFF
Siteclient(acq2106_373, 4222) <AI:CAL:EOFF 9 0 -0.00745583 0.00306922 -0.0175009 -0.000814031 -0.00650478 -0.0139123 -0.00247568 0.00503548
```

Control Two UUTS M,S: Clocking

```
[peter@andros acq400_hapi]$ SITECLIENT_TRACE=1 python3 \
     ./user_apps/acq400/sync_role.py --toprole master,fptrg --fclk=20M \
     --downstream_bypass=1 acq2106_372 acq2106_373
Siteclient(acq2106_372, 4220) >SITELIST
Siteclient(acq2106_372, 4220) <216,1=482,2=482
Siteclient(acq2106_372, 4221) >module_name
Siteclient(acq2106_372, 4222) >module_name
Siteclient(acq2106_372, 4221) <acq480fmc
Siteclient(acq2106_372, 4222) <acq480fmc
Siteclient(acq2106_372, 4220) >state
Siteclient(acq2106_372, 4220) <0 0 0 0 0
Siteclient(acq2106_372, 4220) >sync_role=master 20M 1000000 TRG:DX=d0 TRG:SENSE=rising
Siteclient(acq2106_372, 4220) <
Siteclient(acq2106_372, 4220) >SIG:SYNC_OUT:CLK:DX=d1
Siteclient(acq2106_372, 4220) <
Siteclient(acq2106_372, 4220) >SIG:SRC:TRG:0=NONE
Siteclient(acq2106_372, 4220) <
Siteclient(acq2106_372, 4220) >SIG:SRC:TRG:1=NONE
Siteclient(acq2106_372, 4220) <
Siteclient(acq2106_373, 4220) >SITELIST
Siteclient(acq2106_373, 4220) <216,1=482,2=482
Siteclient(acq2106_373, 4221) >module_name
Siteclient(acq2106_373, 4222) >module_name
Siteclient(acq2106_373, 4221) <acq480fmc
Siteclient(acq2106_373, 4222) <acq480fmc
Siteclient(acq2106_373, 4220) >state
Siteclient(acq2106_373, 4220) <0 0 0 0 0
Siteclient(acq2106_373, 4220) >sync_role=slave 20M 1000000
Siteclient(acq2106_373, 4220) <
Siteclient(acq2106_373, 4220) >si5326bypass
Siteclient(acq2106_373, 4220) <0
Siteclient(acq2106_373, 4220) >set_si5326_bypass=1
```

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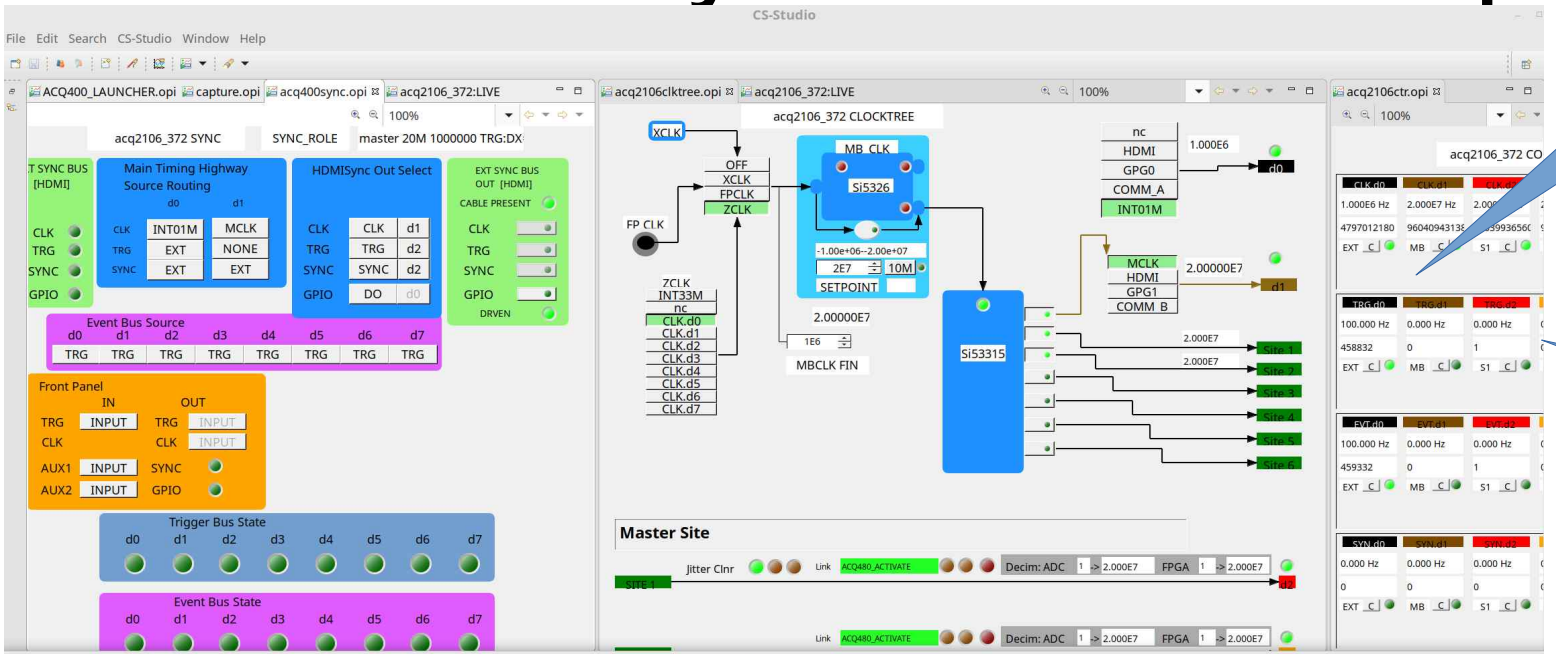
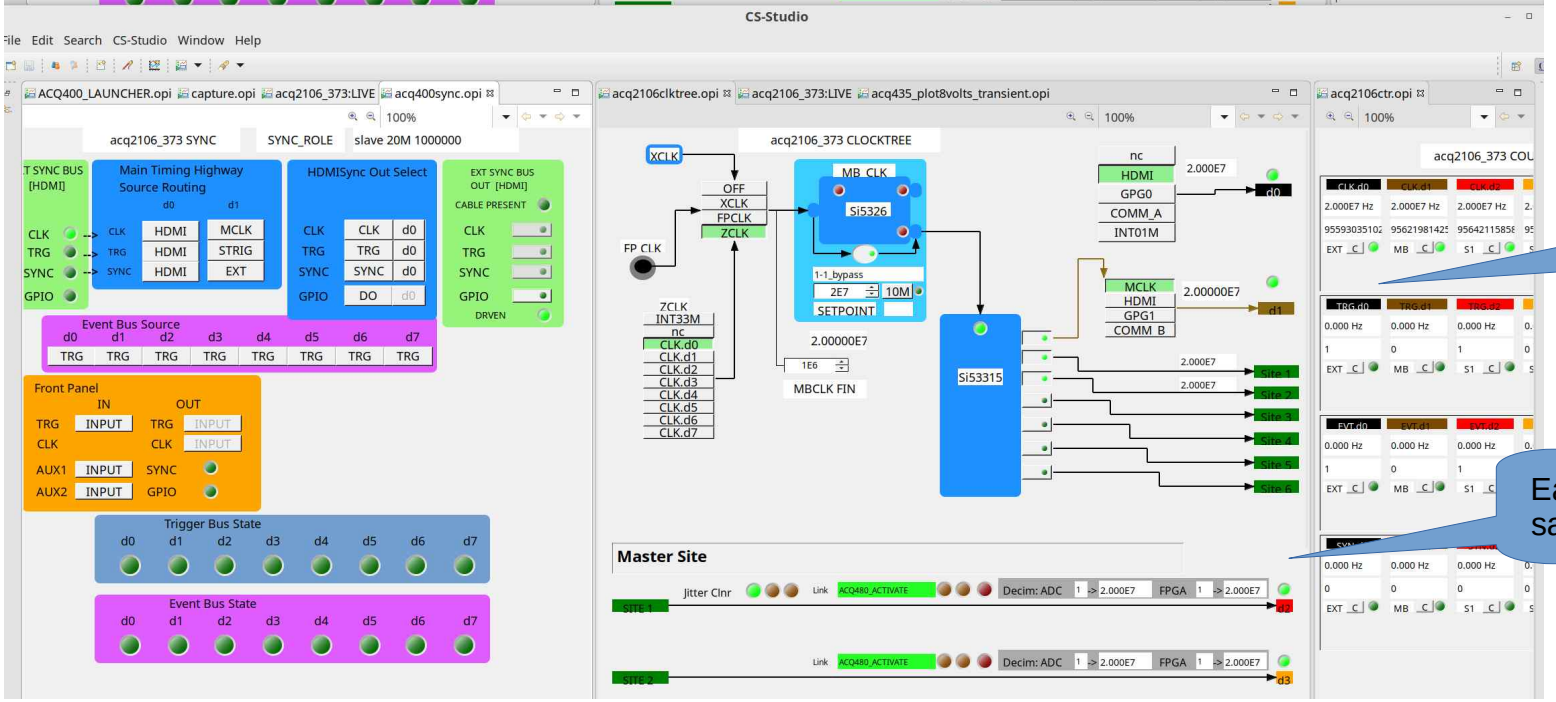
Summary of Clock Setup





M: EXT TRG
Free run

M: after ONE Shot,
ONE output trigger

S: after ONE Shot,
ONE input trigger

Each site sees the
same 20MHz clock

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Run Multi-UUT shot

```
SITECLIENT_TRACE=1 python3 ./user_apps/acq400/acq400_upload.py \
     --demux=0 --capture=1 --post=20M --save_data /mnt/ --shots=1 --remote_trigger=EXT \
     acq2106_372 acq2106_373
ost shot 0 uut shot 2
acq2106_372 SHOT COMPLETE shot:3
acq2106_373 SHOT COMPLETE shot:3
INFO: Shotcontroller.handle_data() acq2106_372 data valid: DATA_VALID
TIMING:func:'handle_data' took: 41.56 sec
Finally, going down
TIMING:func:'run_shot' took: 55.14 sec
TIMING:func:'upload' took: 59.11 sec
TIMING:func:'run_main' took: 59.11 sec

[peter@andros acq400_hapi]$ ls -l /mnt/
total 1250008
-rw-r--r--. 1 peter d-tacq 640000000 Mar 13 13:56 acq2106_372_CH00
-rw-r--r--. 1 peter d-tacq 640000000 Mar 13 13:56 acq2106_373_CH00



Plot Data:
python3 ./user_apps/analysis/host_demux.py     \
     --src /mnt/acq2106_372_CH00 --pchan 1 acq2106_372 &
python3 ./user_apps/analysis/host_demux.py     \
     --src /mnt/acq2106_373_CH00 --pchan 1 acq2106_373

python3 ./user_apps/analysis/host_demux.py     \
     --src /mnt/acq2106_372_CH00 --pchan 1 --pses=18000000:18250000:1 acq2106_372 &
python3 ./user_apps/analysis/host_demux.py     \
     --src /mnt/acq2106_373_CH00 --pchan 1 --pses=18000000:18250000:1 acq2106_373
```

42s to offload two UUTS.
could be faster if multi-threaded.

604MB data per UUT.

Plot full duration

Plot end of data for easier plot exam.

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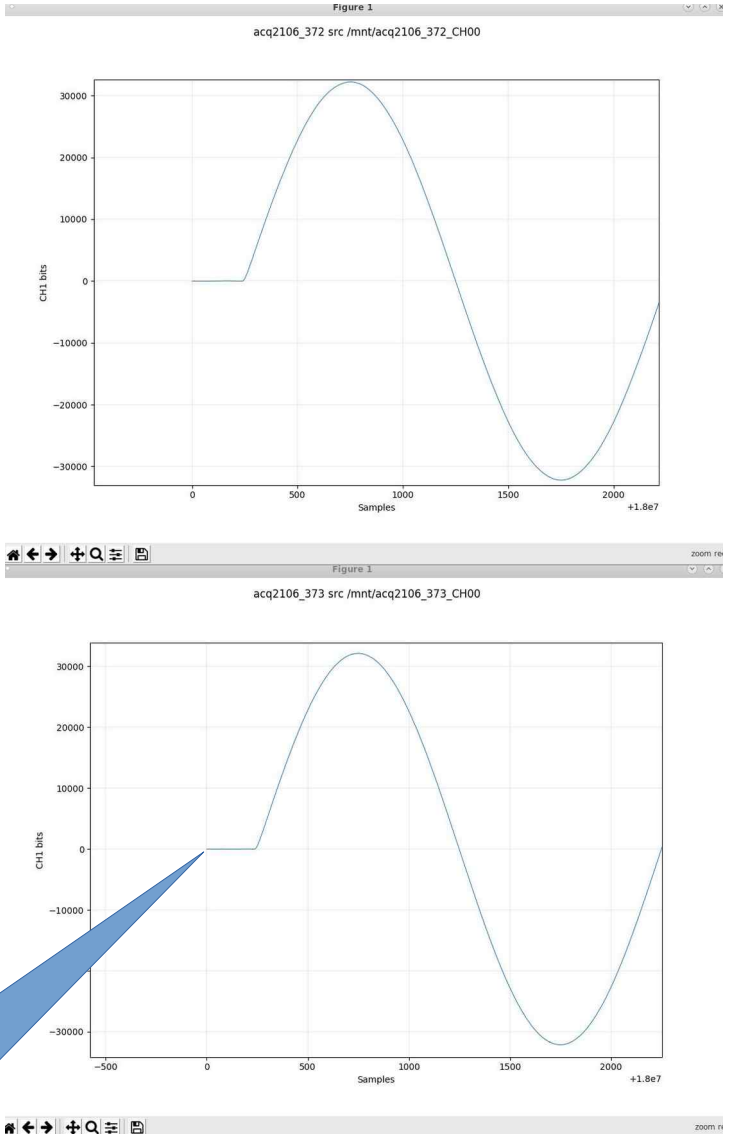
Plotting Multi-UUT data..



Zoom to last pulse.
Pulse start is identical on both UUTS

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