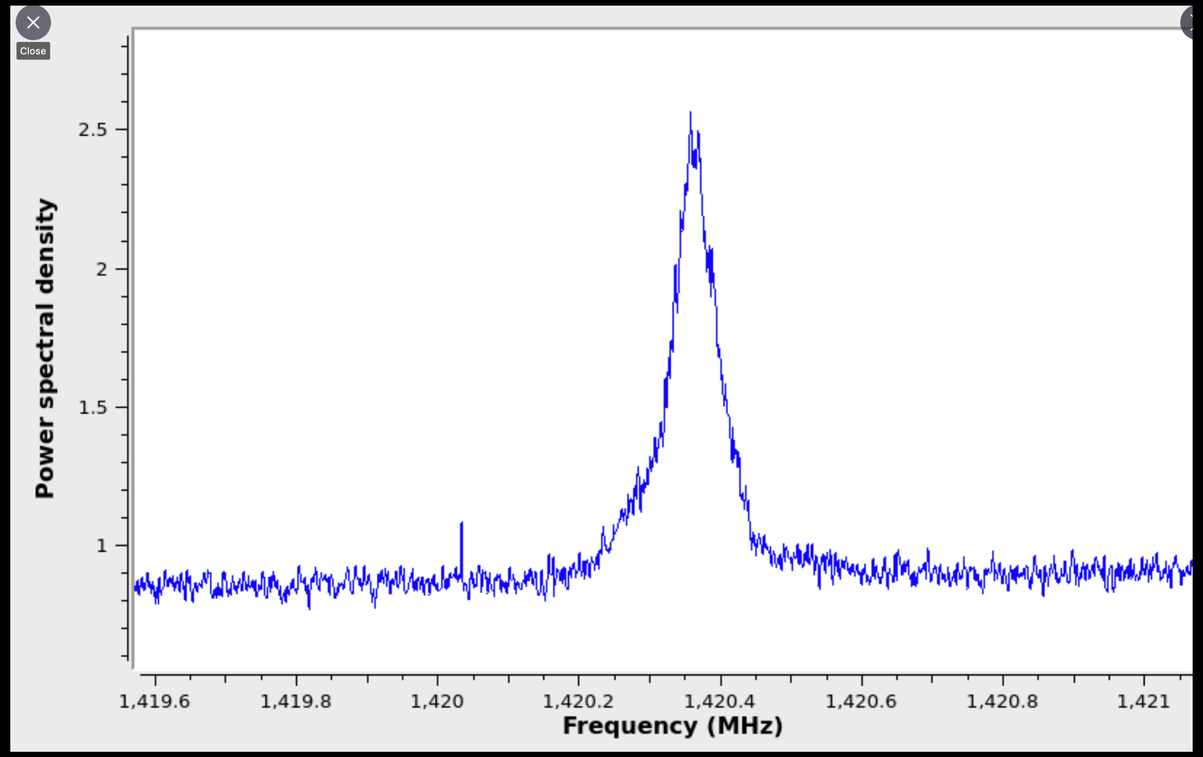
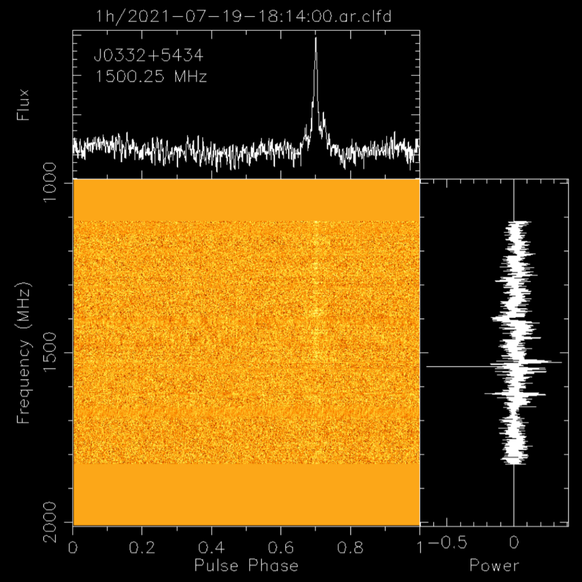
REU visit last Thur

- HI mapping with GNURadio: Measuring the HI line over different scans of the galaxy + comparing red/blue shifted line

- Pulsar observation with 12x antennas + RFI cleaning and antenna summing, etc…





RFSoC debugging

- Very small subset of packets from 2 RFSoCs had destination Mac addresses 1-bit altered.
- Causes the switch to broadcast/spam those packets in all the network
- libIBV (kernel-bypass library) filters on mac-address => receivers report packet losses

```
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on ens6d1, link-type EN10MB (Ethernet), capture size 262144 bytes
18:35:52.894600 02:02:03:01:02:02 (oui Unknown) > 0c:42:a1:ff:f1:b7 (oui Unknown), ethertype IPv4 (0x080
0), length 4154: rfsoc2-0.10000 > seti-node4-100g-1.10000: UDP, length 4112
18:35:52.895068 02:02:03:01:02:07 (oui Unknown) > 0c:42:a1:ff:f1:af (oui Unknown), ethertype IPv4 (0x080
0), length 4154: rfsoc5-0.10000 > seti-node4-100g-2.10000: UDP, length 4112
18:35:52.895131 02:02:03:01:02:07 (oui Unknown) > 0c:42:a1:ff:f1:af (oui Unknown), ethertype IPv4 (0x080
0), length 4154: rfsoc5-0.10000 > seti-node4-100g-2.10000: UDP, length 4112
18:35:52.895195 02:02:03:01:02:02 (oui Unknown) > 0c:42:a1:ff:f1:af (oui Unknown), ethertype IPv4 (0x080
0), length 4154: rfsoc2-0.10000 > seti-node4-100g-2.10000: UDP, length 4112
18:35:52.895455 02:02:03:01:02:07 (oui Unknown) > 0c:42:a1:ff:f1:b7 (oui Unknown), ethertype IPv4 (0x080
0), length 4154: rfsoc5-0.10000 > seti-node4-100g-1.10000: UDP, length 4112
5 packets captured
```

```
enp97s0f1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 9000 qdisc mq state UP group default qlen 1000
 link/ether 0c:42:a1:f7:f1:b7 brd ff:ff:ff:ff:ff:ff
 inet 10.11.1.54/24 brd 10.11.1.255 scope global enp97s0f1
    valid_lft forever preferred_lft forever
 inet6 fe80::e42:a1ff:fef7:f1b7/64 scope link
    valid_lft forever preferred_lft forever
```

```
enp225s0f1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 9000 qdisc mq state UP group default qlen 1000
 link/ether 0c:42:a1:f7:f1:af brd ff:ff:ff:ff:ff:ff
 inet 10.11.1.64/24 brd 10.11.1.255 scope global enp225s0f1
    valid_lft forever preferred_lft forever
 inet6 fe80::e42:a1ff:fef7:f1af/64 scope link
    valid_lft forever preferred_lft forever
```

RFSoC debugging

- Optimisation to packet unpacker
- Hardcoding size of packet payload helps compiler generate better code.
- Changes rolled to dev directory, packet losses were only due to the previous issue

```
#define COPY_PACKET_DATA_TO_DATABUF(\
      /*const struct datablock_stats*/    datablock_stats_pointer,\
      /*const uint8_t*/   pkt_payload,\
      /*const uint64_t*/  pkt_obs_relative_idx,\
      /*const uint16_t*/  feng_id,\
      /*const int32_t*/   stream,\
      /*const uint16_t*/  pkt_schan,\
      /*const uint32_t*/  fid_stride,\
      /*const uint32_t*/  time_stride,\
      /*const uint64_t*/  pkt_payload_size,\
      /*const uint32_t*/  pkt_ntime)\
  memcpy(datablock_stats_data(datablock_stats_pointer)+(\
        (pkt_obs_relative_idx/pkt_ntime) * time_stride\
            +  feng_id * fid_stride\
            +  stream * pkt_payload_size\
      ),\
      pkt_payload, 4096)//pkt_payload_size)
```

Device <-> Host memory

- Binding GPU process to memory on numanode #1 results in decrease in transfer rate from Device to host

  Surprisingly, doing the same membind to RAM on node #0 doesn't see the same decrease.

```
(rfsoc) sonata@seti-node4:/usr/local/cuda-11.1.1/samples/1_Utilities/bandwidthTest$ numactl -N 0 -m 0 ./
bandwidthTest -d 0 --memory=pinned
[CUDA Bandwidth Test] - Starting...
Running on...

 Device 0: GeForce RTX 3090
 Quick Mode

 Host to Device Bandwidth, 1 Device(s)
 PINNED Memory Transfers
   Transfer Size (Bytes)        Bandwidth(GB/s)
   32000000                     26.2

 Device to Host Bandwidth, 1 Device(s)
 PINNED Memory Transfers
   Transfer Size (Bytes)        Bandwidth(GB/s)
   32000000                     24.7

 Device to Device Bandwidth, 1 Device(s)
 PINNED Memory Transfers
   Transfer Size (Bytes)        Bandwidth(GB/s)
   32000000                     790.5

(rfsoc) sonata@seti-node4:/usr/local/cuda-11.1.1/samples/1_Utilities/bandwidthTest$ numactl -N 1 -m 1 ./
bandwidthTest -d 1 --memory=pinned
[CUDA Bandwidth Test] - Starting...
Running on...

 Device 0: GeForce RTX 3090
 Quick Mode

 Host to Device Bandwidth, 1 Device(s)
 PINNED Memory Transfers
   Transfer Size (Bytes)        Bandwidth(GB/s)
   32000000                     23.9

 Device to Host Bandwidth, 1 Device(s)
 PINNED Memory Transfers
   Transfer Size (Bytes)        Bandwidth(GB/s)
   32000000                     12.5

 Device to Device Bandwidth, 1 Device(s)
 PINNED Memory Transfers
   Transfer Size (Bytes)        Bandwidth(GB/s)
   32000000                     791.3
```