



# OBSERVING WITH BIGCAT

## Quick Start Guide

V 3.2, June 2026

## Copyright

© Commonwealth Scientific and Industrial Research Organisation 2025. To the extent permitted by law, all rights are reserved and no part of this publication covered by copyright may be reproduced or copied in any form or by any means except with the written permission of CSIRO.

## Important disclaimer

CSIRO advises that the information contained in this publication comprises general statements based on scientific research. The reader is advised and needs to be aware that such information may be incomplete or unable to be used in any specific situation. No reliance or actions must therefore be made on that information without seeking prior expert professional, scientific and technical advice. To the extent permitted by law, CSIRO (including its employees and consultants) excludes all liability to any person for any consequences, including but not limited to all losses, damages, costs, expenses and any other compensation, arising directly or indirectly from using this publication (in part or in whole) and any information or material contained in it.

CSIRO is committed to providing web accessible content wherever possible. If you are having difficulties with accessing this document, please contact [csiro.au/contact](https://csiro.au/contact).

## Acknowledgement of Country

CSIRO acknowledges the Traditional Owners of the lands, seas and waters of the area that we live and work on across Australia and pays its respects to Elders past and present. CSIRO recognises that Aboriginal and Torres Strait Islander peoples have made, and will continue to make, extraordinary contributions to Australian life including in cultural, economic, and scientific domains.

# Contents

1	Before you start .....	3
2	Key differences to CABB.....	4
3	Step by step guide.....	4
3.1	Finding your way around the different VNC desktops.....	4
3.2	NVIS – the web-based replacement of VIS .....	9
3.3	Step by Step Guide.....	9

# 1 Before you start

1. make sure you have VNC access (see info box below)
2. Schedule file prepared and deployed (which should store it on skull ~/sched)
  - if you have a schedule from the pre-8GHz era, update it with the new frequencies and re-deploy it!
3. Log into the ATCA observing portal and check-in / announce your plans (<https://ca-ops.atnf.csiro.au/jPORTAL/login>)
4. familiarize yourself with the key differences to CABB observations listed below
5. All the good information in the ATCA users guide is still valid, **except the bits for CABB** : [https://www.narrabri.atnf.csiro.au/observing/users\\_guide/html/atug.html](https://www.narrabri.atnf.csiro.au/observing/users_guide/html/atug.html) .

## Access the VNC

Accessing the Telescope for remote observations remains largely unchanged to before.

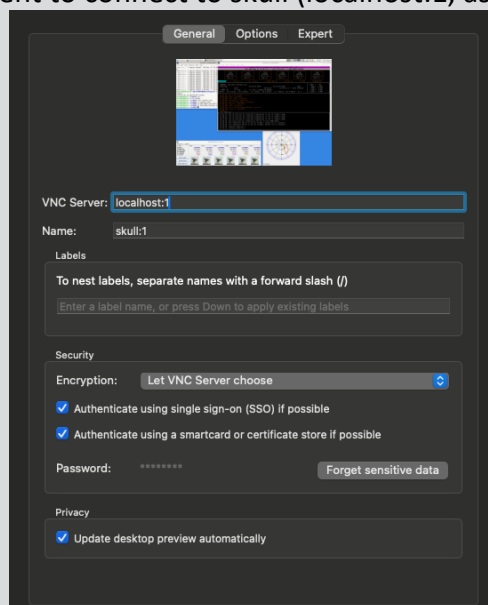
Please read through the instructions here:

[https://www.narrabri.atnf.csiro.au/observing/rem\\_obs.html](https://www.narrabri.atnf.csiro.au/observing/rem_obs.html)

The only difference is that now skull is used instead of xbones.

- IF you are outside the CSIRO VPN, open the SSH tunnel via venice, using your ATNF Linux credentials to access it:
 

```
ssh your_username@venice.atnf.csiro.au -L 5901:skull.atnf.csiro.au:5901
```
- Sometimes a SSH tunnel is even needed when inside the VPN, depending of the network zone you are in
- use your preferred VNC client to connect to skull (localhost:1, as you connected via venice)



## 2 Key differences to CABB

While the experienced ATCA observer will find their way around BIGCAT quickly, there are a few differences. Some of them are currently in development and will be available soon (e.g. VIS), while others are not necessary anymore or have disappeared completely.

Here is a list of differences between observing with BIGCAT and CABB that are relevant:

Here are the key differences a user familiar with CABB will experience when using BIGCAT:

- Client based CAOBS – you can kill the client or run your own. As long as the server is ticking over, it does not matter what happens to the CAOBS client window
- No CACOR GUI, the correlator(s) is (are) controlled via terminal(s).
- No delay and amplitude calibration by the user. The user may do a phase calibration to check phases are stable and aligned. But at this stage we recommend that users do not calibrate. The delay and amplitude calibrations are system inherent and regularly maintained by observatory staff.
- There are four IFs, with two GHz each. To see how they cover the receiver bands and how they can be positioned, see [here](#).
- Currently there is no assistance. We are working on this; please be patient We recommend users keep an eye on SSPD to assess the data quality.

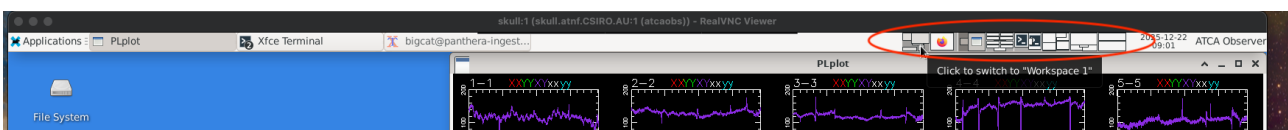
## 3 Step by step guide

Before continuing from here, please log into the Skull VNC (see the info box above regarding VNC access).

### 3.1 Finding your way around the different VNC desktops

Once you accessed the Skull VNC, you will find that there are 8 virtual desktop windows.

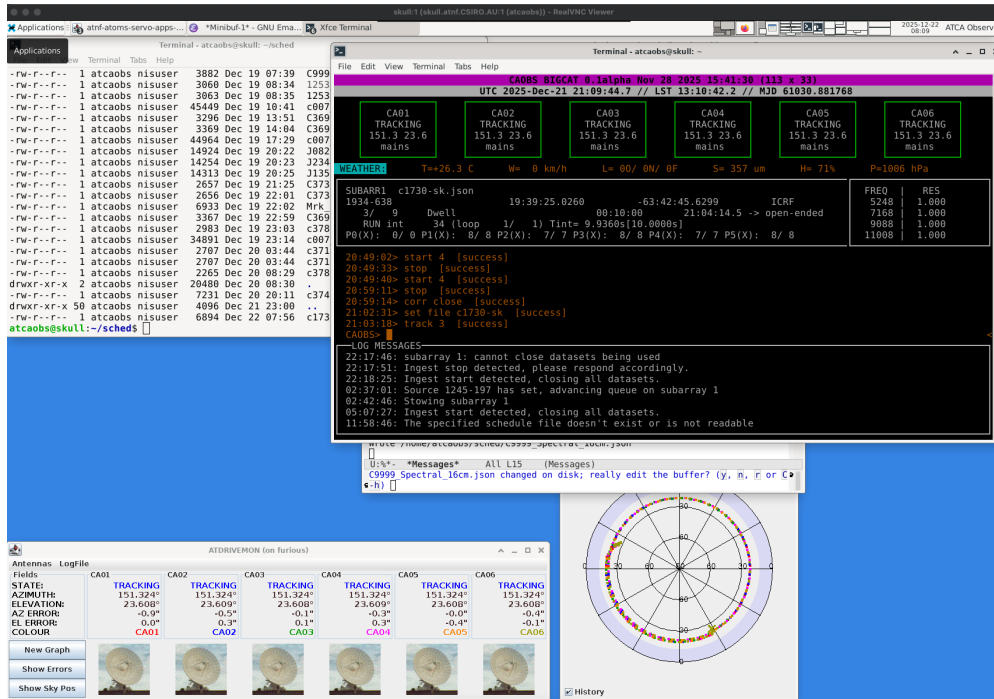
You can jump between them on the right side of the top menu bar:



**As an observer, you generally only need to check desktop 1-6**

### 3.1.1 Virtual Desktop Window 1: CAOBS and ATDRIVEMON

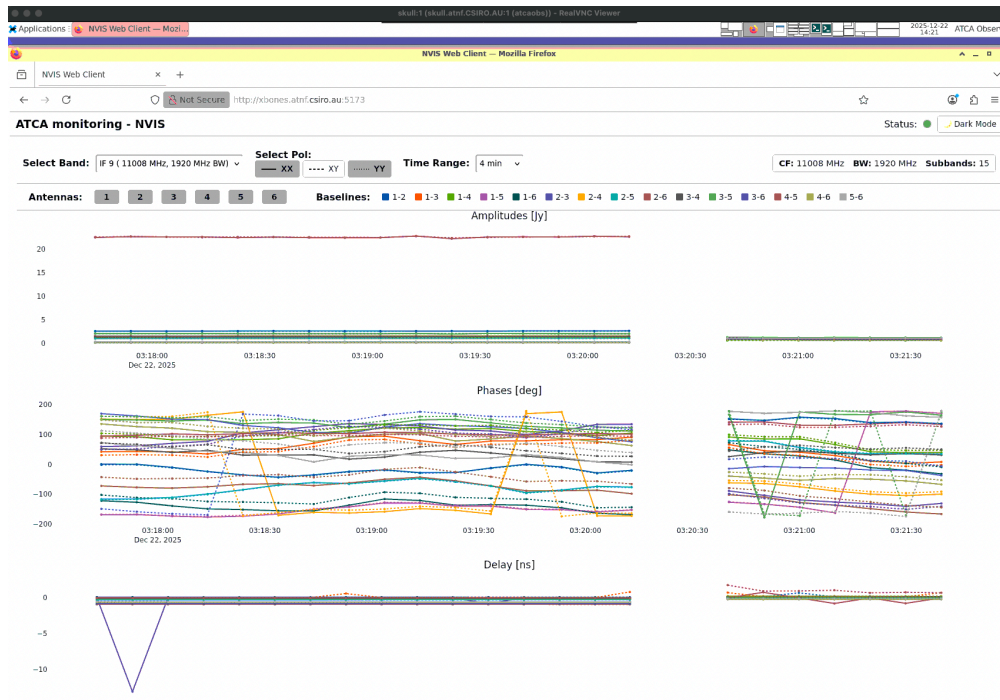
On the first desktop you will find CAOBS, ATDRIVEMON and some terminals:



This is where you control the array and load files and so on. Like in the old days with CABB. There is no ASSISTANCE yet. It is still being re-implemented into the new environment. But CAOBS has a lot of additional information and options. VIS has moved to a web – based implementation. (See section 3.1.2 and 3.2 below. )

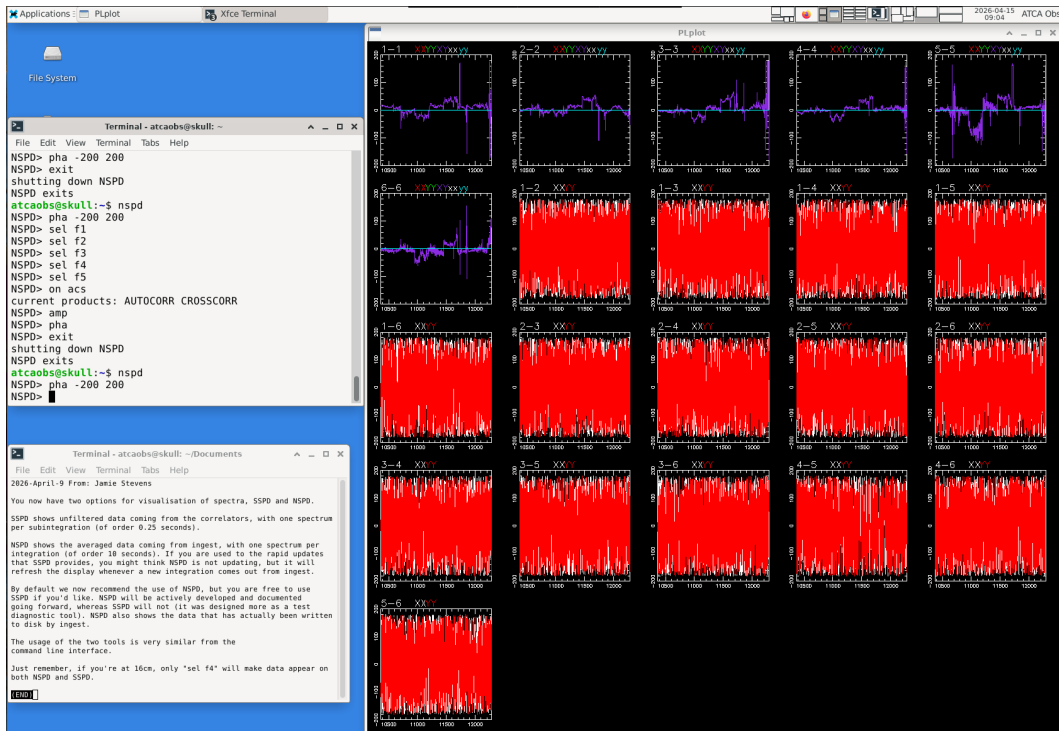
### 3.1.2 Virtual Desktop Window 2: NVIS

On the second virtual desktop you will find a browser window connected with NVIS:



### 3.1.3 Virtual Desktop Window 3: Spectral Display - NSPD

On the third virtual desktop you will find NSPD with the plots and a terminal to control it:



You have two options for visualisation of spectra, SSPD and NSPD.

SSPD shows unfiltered data coming from the correlators, with one spectrum per subintegration (of order 0.25 seconds).

NSPD shows the averaged data coming from ingest, with one spectrum per integration (of order 10 seconds). If you are used to the rapid updates that SSPD provides, you might think NSPD is not updating, but it will refresh the display whenever a new integration comes out from ingest.

By default, **we recommend the use of NSPD**, but you are free to use SSPD if you'd like. NSPD will be actively developed and documented going forward, whereas SSPD will not (it was designed more as a test diagnostic tool). NSPD also shows the data that has been written to disk by ingest.

The usage of the two tools is very similar from the command line interface. Just remember, if you're at 16cm, only "sel f4" will make data appear on both NSPD and SSPD.

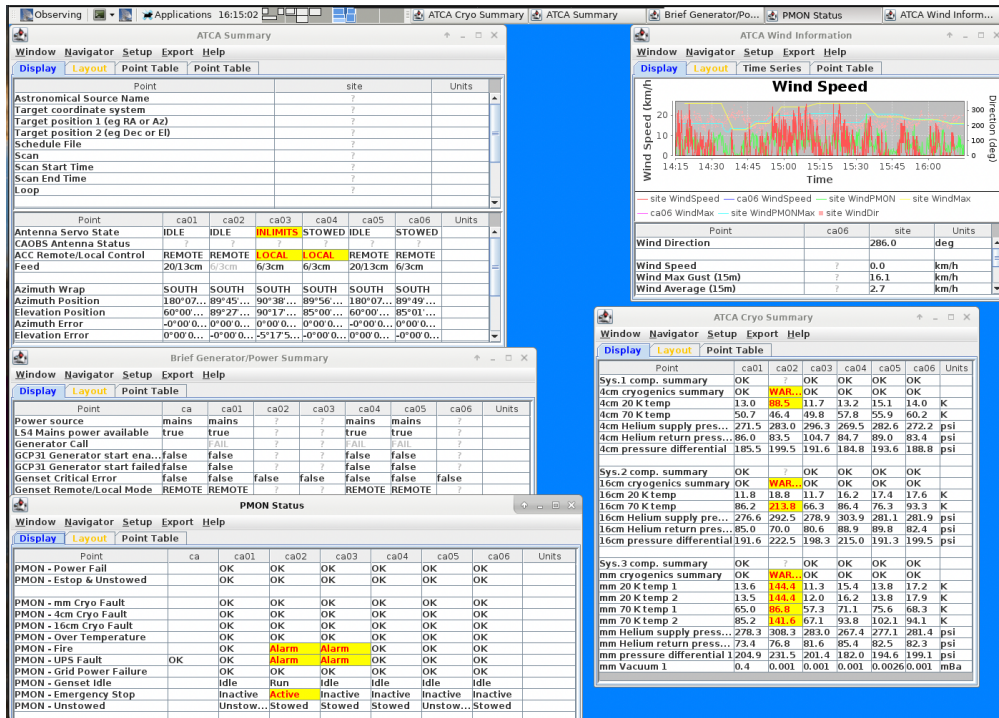
### 3.1.4 Virtual Desktop Window 4: Correlators

On the third virtual desktop to the right, you have the eight terminals controlling the correlators running on four different GPU servers.



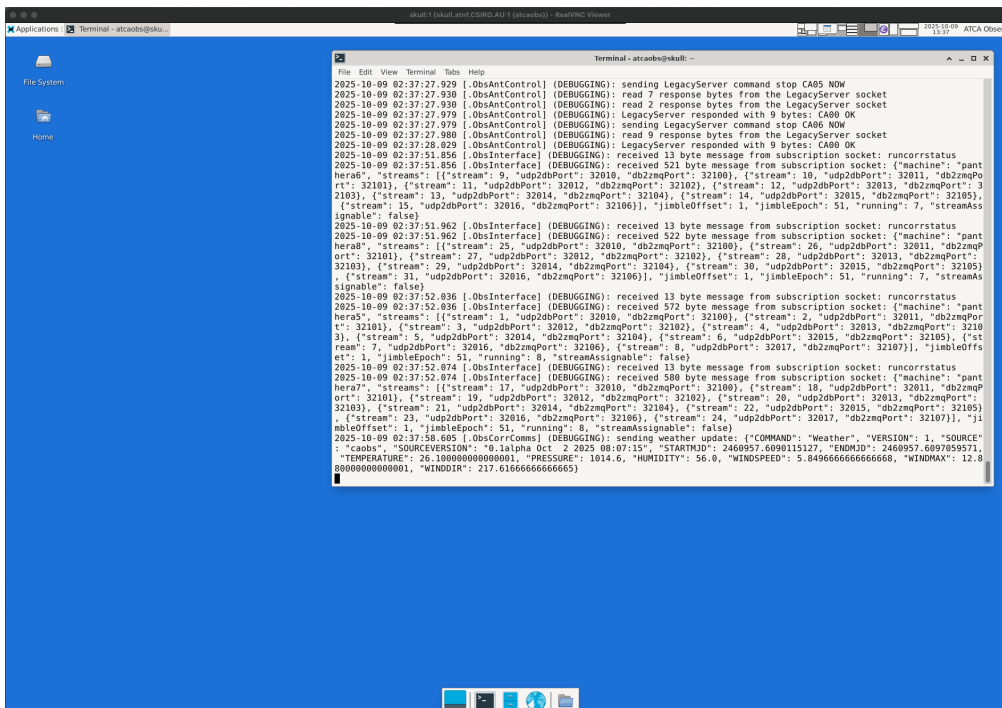
### 3.1.6 Virtual Desktop Window 6: Monica

On this desktop you have different GUI Windows with various monitoring points. Here you keep an eye on the weather, generators, cryogenics, or anything you want to monitor on the array.



### 3.1.7 Virtual Desktop Window 7: CAOBS Server (OEs only!)

On this desktop one can find the CAOBS server terminal. Do not interact with this one, unless you know what you are doing. To stop it: CTRL C, to restart: up arrow, or: caobs\_server -C

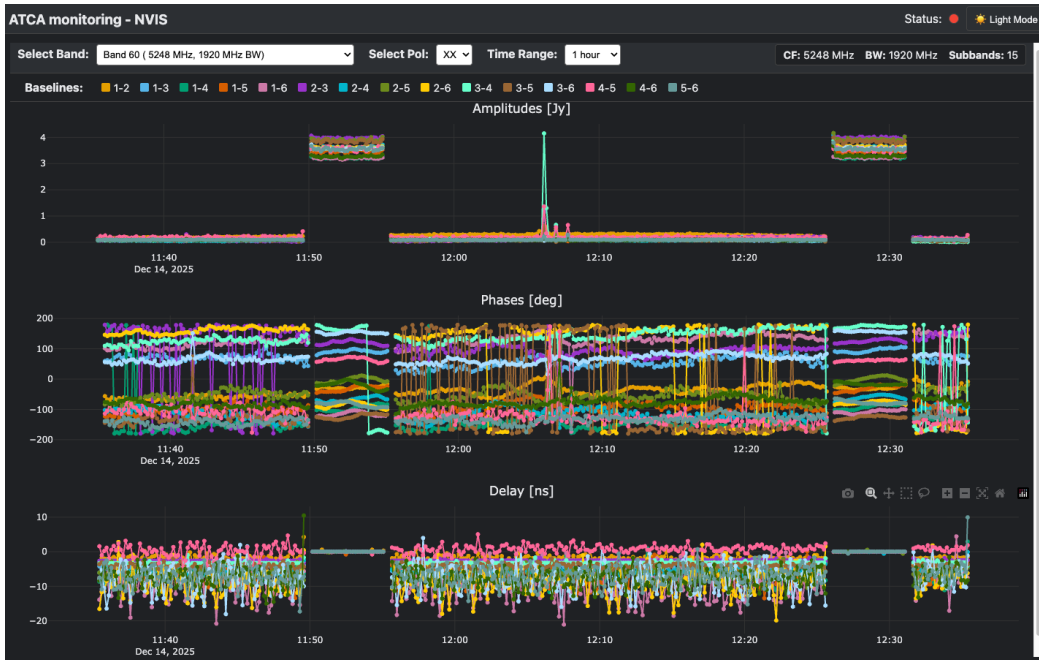


### 3.1.8 Digitiser Utils [DO NOT TOUCH - OBSERVATORY STAFF ONLY]

Utilities for the control of the BIGCAT digitisers. Do not touch this one, unless authorised to do so

### 3.2 NVIS – the web-based replacement of VIS

NVIS is the replacement of VIS. In the top bar you can select the IF, Pol, as well as time range.



### 3.3 Step by Step Guide

1.) log into the skull VNC and find the CAOBS client on the first virtual desktop:

```

Terminal - atcaobs@skull: ~
File Edit View Terminal Tabs Help
CAOBS BIGCAT 0.1alpha Nov 28 2025 15:41:30 (113 x 33)
UTC 2025-Dec-21 21:09:44.7 // LST 13:10:42.2 // MJD 61030.881768

CA01 TRACKING 151.3 23.6 mains
CA02 TRACKING 151.3 23.6 mains
CA03 TRACKING 151.3 23.6 mains
CA04 TRACKING 151.3 23.6 mains
CA05 TRACKING 151.3 23.6 mains
CA06 TRACKING 151.3 23.6 mains

WEATHER: T=+26.3 C W= 0 km/h L= 00/ 0N/ 0F S= 357 um H= 71% P=1006 hPa

SUBARR1 c1730-sk.json
1934-638 19:39:25.0260 -63:42:45.6299 ICRF
3/ 9 Dwell 00:10:00 21:04:14.5 -> open-ended
RUN int 34 (loop 1/ 1) Tint= 9.9360s[10.0000s]
P0(X): 0/ 0 P1(X): 8/ 8 P2(X): 7/ 7 P3(X): 8/ 8 P4(X): 7/ 7 P5(X): 8/ 8
FREQ | RES
5248 | 1.000
7168 | 1.000
9088 | 1.000
11008 | 1.000

20:49:02> start 4 [success]
20:49:33> stop [success]
20:49:40> start 4 [success]
20:59:11> stop [success]
20:59:14> corr close [success]
21:02:31> set file c1730-sk [success]
21:03:18> track 3 [success]
CAOBS> █

-LOG MESSAGES-
22:17:46: subarray 1: cannot close datasets being used
22:17:51: Ingest stop detected, please respond accordingly.
22:18:25: Ingest start detected, closing all datasets.
02:37:01: Source 1245-197 has set, advancing queue on subarray 1
02:42:46: Stowing subarray 1
05:07:27: Ingest start detected, closing all datasets.
11:58:46: The specified schedule file doesn't exist or is not readable
    
```

2.) load your schedule file in CAOBS. → CAOBS will confirm with [success] if the file has been loaded correctly:

```

03:57:21> set file chris_4cm [success]
CAOBS> █
    
```

### If loading your file in CAOBS fails

If loading your schedule file in CAOBS fails, open a terminal on skull and check that your prepared schedule file is in the correct folder location on skull, which is ~/sched.

If it is not there, copy it manually or ask observatory staff for help.

**Make sure you have updated and re-deployed your pre-8GHz schedule with the new frequencies**

3.) On the third virtual desktop, check that the terminals with the 8 correlators running on Panthera 1 to 8 are all ticking over:

Process Name	Count	Errors	I/O	Other
3375557 atcaobs	20	0	19668	13116 7292 R 0.7 0.1 111.45.84 ssh
77445 atcaobs	20	0	22660	14156 6172 S 0.3 0.1 1:03.92 xterm
77447 atcaobs	20	0	21924	13856 6320 S 0.3 0.1 1:01.75 xterm
77448 atcaobs	20	0	21928	13844 6312 S 0.3 0.1 1:06.69 xterm
161494 atcaobs	20	0	721400	20548 8120 S 0.3 0.1 2:05.55 xcube
269941 atcaobs	20	0	469828	50800 30404 S 0.3 0.3 3:35.00 efcd-t+
393791 root	20	0	0	0 0 I 0.3 0.0 0:01.35 kworke+

The thing to look out for, is that all 8 processes indicate that there is no packet loss and that the subints are being processed:

```

2025-12-22 21:54:48.024 [BIGCAT_FX-2111046.main] (INFO): processed 2140 subint(s) in scan 88
2025-12-22 21:54:48.026 [BIGCAT_FX-2111042.main] (INFO): processed 2140 subint(s) in scan 88
2025-12-22 21:54:48.054 [BIGCAT_UDP2DB57-2111055.bigcat_udp2db] (INFO): number of times the output ring buffer was full is 0
2025-12-22 21:54:48.054 [BIGCAT_UDP2DB57-2111055.bigcat_udp2db] (INFO): frames received = 883200, expected = 883200, lost = 0 (0.000%)
2025-12-22 21:54:48.054 [BIGCAT_UDP2DB60-2111066.bigcat_udp2db] (INFO): number of times the output ring buffer was full is 0
2025-12-22 21:54:48.054 [BIGCAT_UDP2DB60-2111066.bigcat_udp2db] (INFO): frames received = 883200, expected = 883200, lost = 0 (0.000%)
2025-12-22 21:54:48.078 [BIGCAT_UDP2DB58-2111059.bigcat_udp2db] (INFO): number of times the output ring buffer was full is 0
2025-12-22 21:54:48.078 [BIGCAT_UDP2DB58-2111059.bigcat_udp2db] (INFO): frames received = 883200, expected = 883200, lost = 0 (0.000%)
2025-12-22 21:54:48.115 [BIGCAT_UDP2DB59-2111063.bigcat_udp2db] (INFO): number of times the output ring buffer was full is 0
2025-12-22 21:54:48.115 [BIGCAT_UDP2DB59-2111063.bigcat_udp2db] (INFO): frames received = 883200, expected = 883200, lost = 0 (0.000%)
2025-12-22 21:54:48.122 [BIGCAT_FX-2111038.main] (INFO): processed 2140 subint(s) in scan 88
2025-12-22 21:54:48.123 [BIGCAT_FX-2111030.main] (INFO): processed 2140 subint(s) in scan 88
2025-12-22 21:54:48.124 [BIGCAT_FX-2111034.main] (INFO): processed 2140 subint(s) in scan 88
2025-12-22 21:54:48.125 [BIGCAT_FX-2111026.main] (INFO): processed 2140 subint(s) in scan 88
  
```

## What to do if ingest or one / all of the correlator(s) is / are not running

- If ingest is not running, start it by typing ingest-warn in the terminal (or just up-arrow)
- Note that CAOBS will issue a warning in the LOG Messages if Ingest has stopped

```

20:59:14> corr close [success]
21:02:31> set file c1730-3k [success]
21:03:18> track 3 [success]
21:14:13> stop [success]
21:14:23> cor stop [success]
21:14:30> cor close [success]
21:15:37> track 3 [success]
CAOBS>
--LOG MESSAGES
22:17:51: Ingest stop detected, please respond accordingly.
22:18:25: Ingest start detected, closing all datasets.
02:37:01: Source 1245-197 has set, advancing queue on subarray 1
02:42:46: Stowing subarray 1
05:07:27: Ingest start detected, closing all datasets.
11:58:46: The specified schedule file doesn't exist or is not readable
21:15:09: Ingest start detected, closing all datasets.
  
```

If one or several of the correlators have stopped or are hanging, in CAOBS stop your observations [stop], stop the correlator [cor stop], and close the file [cor close]. All eight correlator processes should exit cleanly and display the following message that they wait for messages from CAOBS:

```
Destroyed DADA data and header blocks
Destroyed DADA data and header blocks
2025-12-23 21:26:07.764: Waiting for messages from caobs at tcp://skull.atnf.csiro.au:32004
```

- If one or more of the correlators were not shutting down cleanly, you can ctrl-c in the affected terminal(s) and then restart by typing: start\_correlator in the relevant /affected terminals.
- E.g.: to start the correlator on Panthera 5:  
`bigcat@panthera5:~$ start_correlator`
- Each Panthera machine should have a correlator ticking over, **except when observing on 16cm - then only two correlators are used (with the output ending up in IF4).**

4.) go back to CAOBS and tell it to track a source in your schedule:

```
04:36:45> track 1 [success]
CAOBS> █
```

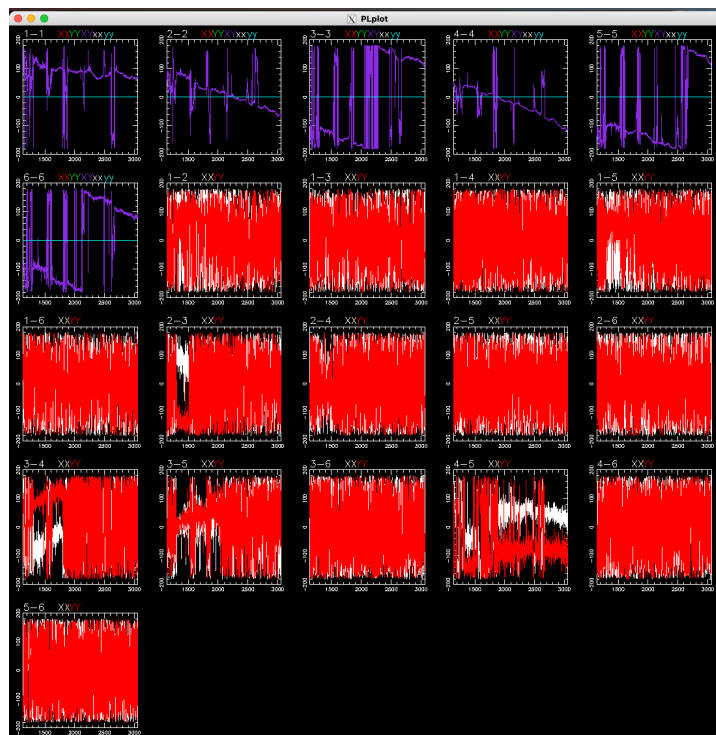
5.) On the Second virtual desktop check if nspd is running.

If SSPD is not running yet, you can start it from a terminal:

```
atcaobs@skull:~$ nspd
```

If it is hanging, type q or exit in the NSPD terminal, and restart as per above.

Once on source and after a little while, the plot window will start updating like the old SPD in the CABB days:



## NSPD

To change what you see, it is very similar to the old SPD or SSPD

- check phases: SSPD> pha -200 200
- to check amplitudes: SSPD> am
- to change between the different IFs: NSPD> sel fn, where n is 1-4
- use: NSPD> sel f\*, to display the full 8GHz of bandwidth
- to select a zoom: NSPD> sel Z1 (If you happen to observe more than one zoom band, you can select several to be displayed, by typing: sel Z1 Z2 Z3)
- To turn on / off the display of autocorrelations: NSPD> on acs / off acs
- Typing: x changes the x axis between frequency and channel
- To “zoom in” you can specify a frequency or channel range: NSPD> freq fn f1 f2, where n is the IF band, f1 is the start frequency and f2 is the stop frequency. For example, if you want to look at a range between 4GHz and 5 GHz in IF1: NSPD> freq f1 4000 5000. If you have selected a zoom window, you can further “zoom in” by using: NSPD> sel zn f1 f2
- To “un-zoom”: NSPD> freq fn, or NSPD> freq Zn, where n is the desired IF or zoom band

Please take note that when observing on **16cm**, it only uses one conversion base band (IF) 2GHz wide, which **ends up in IF4** of the correlator for technical reasons. So, you will not see anything meaningful in the other three IFs.

6.) Once you are content, that it all works, type stop in CAOBS, and then you can start your observations by typing:

CAOBS> start x-y/nn, where x is the first scan number, y is the last scan number and nn is the number of iterations.

```
23:47:13> track 2 [success]
23:47:22> stop [success]
23:47:39> start 5-6/99 [success]
CAOBS> 
```

Once started, go back to SSPD and check that it all looks good. **Regularly check on the correlators and INGEST**, to see if they are ticking over as described above.

7.) Once finished, find the directory where the data was written to on Panthera Ingest.

cd into your directory. You can access and convert your data as well as download it, by following the instructions here:

[https://www.narrabri.atnf.csiro.au/observing/bigcat/data\\_transfer.html](https://www.narrabri.atnf.csiro.au/observing/bigcat/data_transfer.html)

**That is it.... 😊**

Good luck with your observations.

**As Australia's national science agency, CSIRO is solving the greatest challenges through innovative science and technology.**

CSIRO. Creating a better future for everyone.

**Contact us**

1300 363 400  
+61 3 9545 2176  
[csiro.au/contact](https://csiro.au/contact)  
[csiro.au](https://csiro.au)

**For further information**

**Australia Telescope National Facility**

Christoph Brem  
+61 2 6790 4008  
[Christoph.Brem@csiro.au](mailto:Christoph.Brem@csiro.au)  
<https://www.atnf.csiro.au/facilities/australia-telescope-compact-array/>

**Australia Telescope National Facility**

Jamie Stevens  
+61 2 6790 4064  
[Jamie.Stevens@csiro.au](mailto:Jamie.Stevens@csiro.au)  
<https://www.atnf.csiro.au/facilities/australia-telescope-compact-array/>