TIMING OBSERVATIONS WITH THE PULSAR DIGITAL FILTERBANK

1. To **log in to the DFB machine** enter

[Xterm] `mycomputer:~> ssh -X corr@134.104.64.137`

(ask ajessner@mpifr-bonn.mpg.de if you don't know the password)

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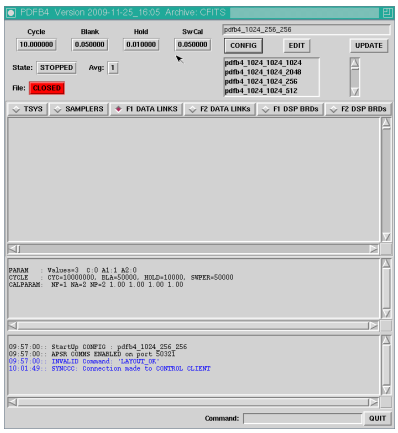
2. In a terminal **on the DFB type**

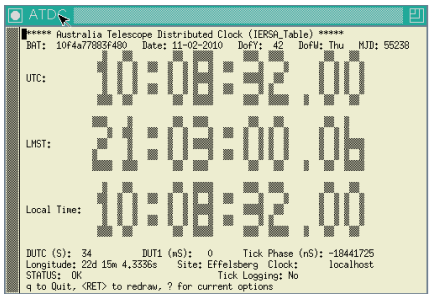
[Xterm] `psrdfb:~> dfbcontrol`

The `DFB CONTROL` window appears together with the `CFG` configuration window, the `ATDC` distributed-clock window and finally the `PDFB4` configuration GUI.

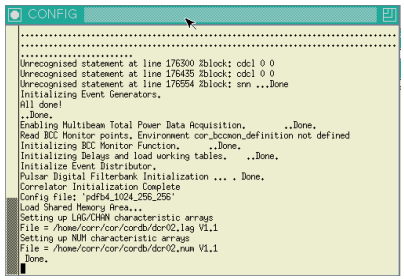
PDFB4



ATDC



CONFIG

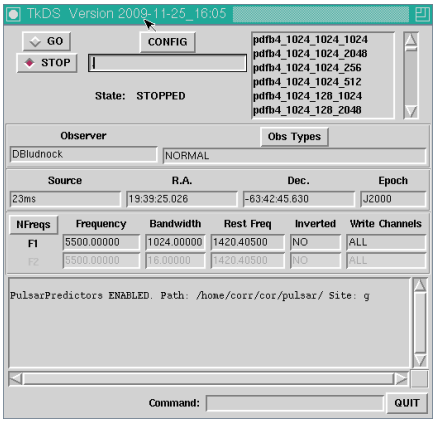


3. After a few seconds, **place the mouse on the `DFB CONTROL` window and press `RETURN`.**

DFB CONTROL

The `DFB CONTROL` environment can be a nuisance: when typing capital letters in it, make sure you lift your finger off the `SHIFT` key in between strokes; otherwise the `SHIFT` stroke will not be recognised which will result in a small letter.

A new GUI window appears titled TkDS



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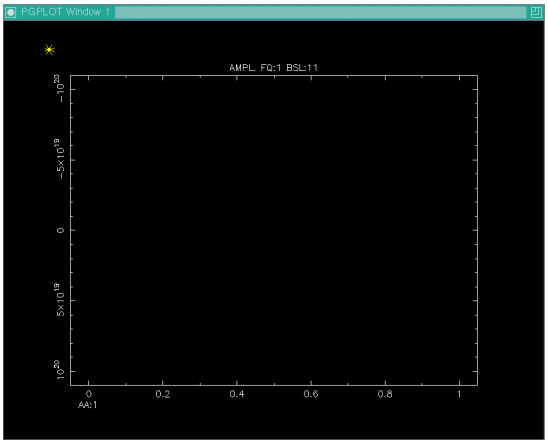
4. Before you start observing/recording, you need to **configure the DFB**.
For the 7-beam observations enter

[DFB CONTROL] `> @setup7beam.dfb`

The SPD (plotting) window appears



and the DFB programs itself. You can see the details of the programming in the CFG window that appears.

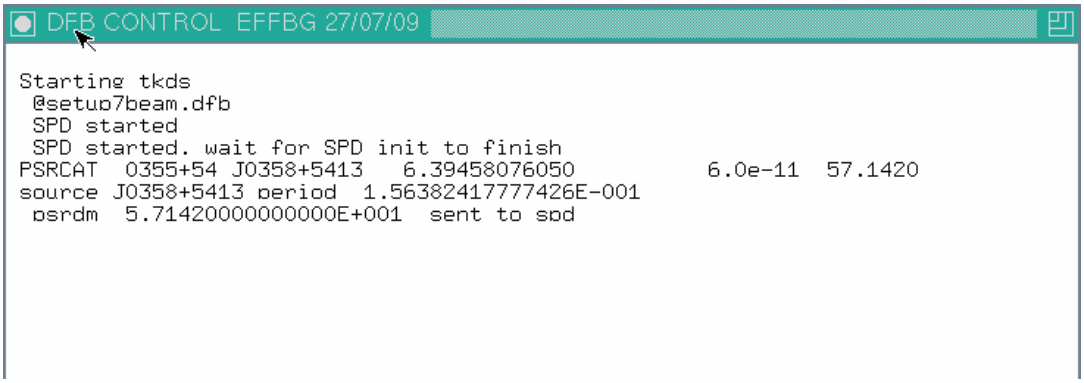
```
        -- PROGRAMMING MENU: pdfb4_1024_256_256 --
BLOCK    PORT              PROGRESS OPERATION          ERROR
BLOCK02  localhost::400             CFG_Done
BLOCK05  l-bcc11::4000   o          CFG_Bus_Calibrate[]
Type any character to interrupt programming.
```

Apart from the 7-beam configuration script, other scripts include:

Config script	Receiver
setup610mhz.dfb	(0.6-GHz primary)
setup11cm.dfb	(2.6-GHz secondary)
setup6cm.dfb	(4.6-GHz secondary)

Wait until the programming finishes (the CFG window is minimised).

In the DFB CONTROL window, a default pulsar ephemeris appears (PSR B0355+54).



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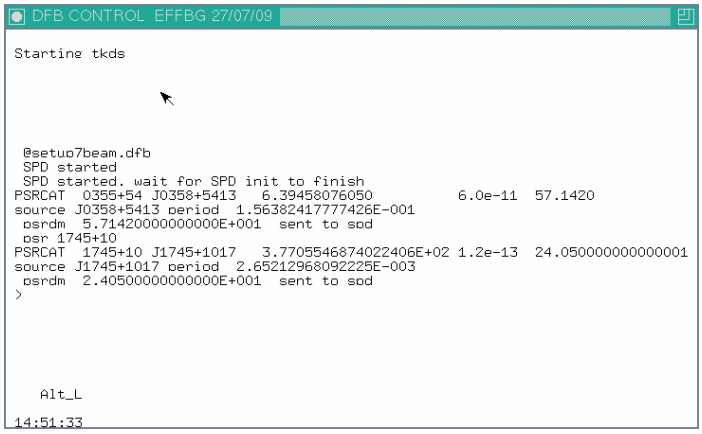
5. Now you need to **load the ephemeris of the pulsar you are observing** (e.g. PSR J1745+1017) with

[DFB CONTROL] `> psr 1745+10`

You should see something like this, in the DFB CONTROL window



When entering the pulsar name, in many cases you need to use the JNAME, e.g.

> psr 2043+2740

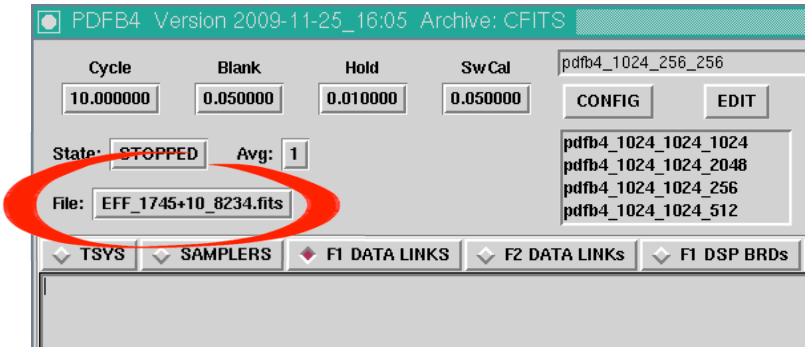
while in others only the BNAME is recognised e.g.

> psr 1745+10

6. At this point, you need to **open a file in which the DFB data will be written**. To do this, you need to enter

[DFB CONTROL] `> fo EFF_<pulsar name>_<scan number>.fits`

It is good to use a common naming scheme for timing observations, where the `<pulsar name>` and the `<scan number>` are filled in appropriately.



After opening the file, the TkDS window shows the name of the file being used

You are now ready to start recording …

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7. Begin observations

[DFB CONTROL] `> go`

After entering the go command it is common that the following error appears in the PDFB4 and TkDS windows:

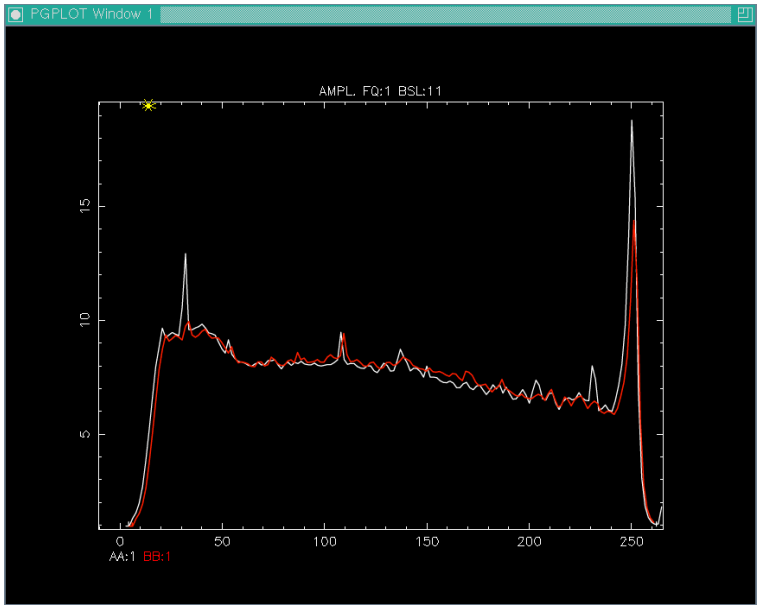
```
CORR_ERR:   SYNCCC:   Correlator CONFIG BAND  1 BW = 256.000
```

this is normal and no cause for alarm. It is simply caused by the discrepancy between the the bandwidth set in the TkDS window (normally 1024 MHz) and that requested.

8. After the DFB has begun taking data, you should **check the bandpass, the dedispersed profile, etc.**
To do this, you may enter

[DFB CONTROL] `> spd sel aa,bb`

The SPD window should display the bandpass between the channels that are set in the configuration file (e.g. 2–253).



If you are <u>not</u> happy with the channel range, you may change it by entering

[DFB CONTROL] `> spd chan <first channel>,<last channel>`

where `<first channel>` and `<last channel>` should be chosen to include the entire bandpass.
Unfortunately, this only changes the displayed range of channels and not that which is used for the recording. In order to change the latter, you need to stop the DFB (**steps 10 & 11**) and then enter

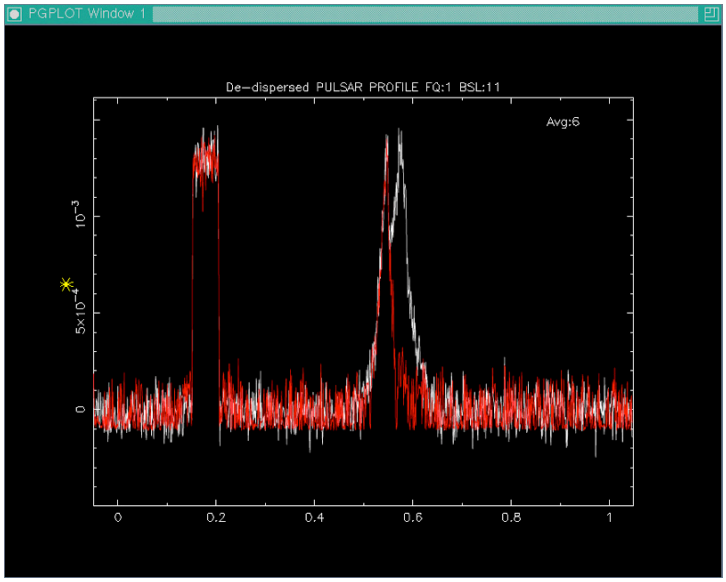
[DFB CONTROL] `> chan <first channel>,<last channel>`

Following that, you can open a different file (the DFB <u>will not</u> let you use the same filename) and follow **steps 7—** .

9. After checking that you have the correct bandpass, you are ready to **display the dedispersed pulsar profile**.
Enter

```
[DFB CONTROL] > spd sel dp
[DFB CONTROL] > spd avg
```

The first command displays the dedispersed profile, and the second, begins the averaging of all future data.



You may stop averaging by entering

```
[DFB CONTROL] > spd noavg
```

Another useful view of the data is a “waterfall” plot. You can display this by entering

```
[DFB CONTROL] > spd sel bi
```

☠ ERRORS ☠

There are several errors that can occur during a DFB observation. These appear in the lower parts of the PDFB4 and TkDS windows in **red** or **blue**.
If the following error appears

```
MISSING DELBAT timer timeout - ATTEMPT A RESTART !!!!
```

you may in principle continue, as it is usually the case that the missing DELBAT does not affect the rest of the observation.
However, one can encounter more serious errors, like

```
XFER:  ERROR from l-bcc11:  10009255, 10009255 != 10000000 BadBanks=964, 964
```

or

```
PSREPHEM-entry DM2(or P4 or...) not in table
```

```
CORDAT:Error writing SUBINT to FITS file
```

or, even worse,

```
SYNCCC:CLIENT DISCONNECTED
```

In those cases, you have to kill and restart. This can be easily done by entering

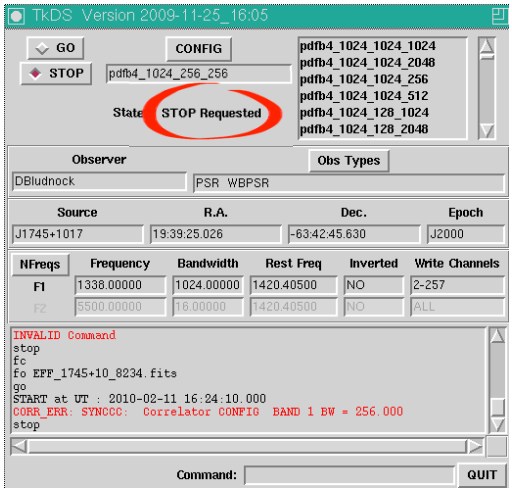
[DFB CONTROL] `> kill`

in the DFB CONTROL window and following **steps 12 & 13**.

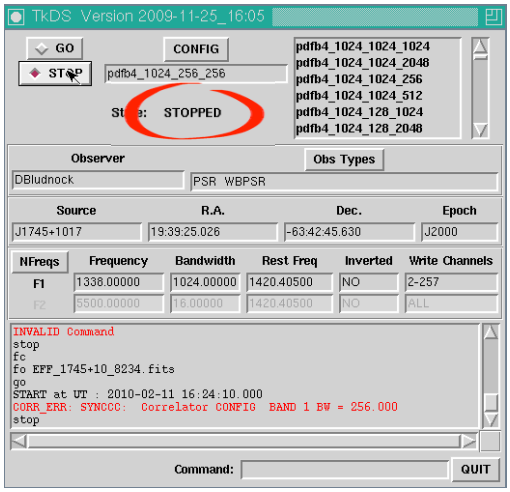
10. At the end of the observation, you can **stop recording** by simply entering

[DFB CONTROL] `> stop`

At this point, you have to wait until all data currently in the buffer are written in the file. The `TkDS` window reports that a `STOP` command has been issued but the DFB has not stopped recording yet. The DFB stops recording only when the `State:` field changes to `STOPPED`.



... 10 sec ...

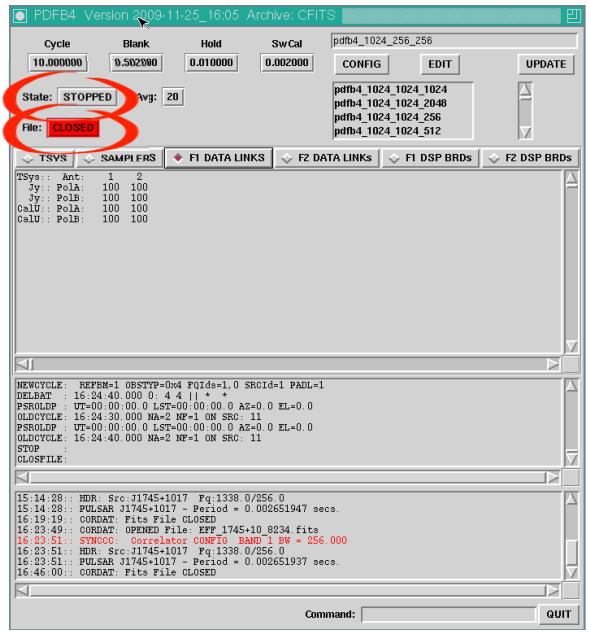


. . . . . .

11. After you have made sure that the DFB has stopped, you may **close the file**. Just enter

[DFB CONTROL] `> fc`

The `PDFB4` window should report that the `State:` is `STOPPED` and that the `File:` is `CLOSED`



12. If the observations are finished, you can **Quit by entering**

[DFB CONTROL] `> quit`

in the `DFB CONTROL` window. Then, click on the `QUIT` buttons in the `PDFB4` and `TkDS` GUI windows.

If you are just changing source, you only need to go back to **step 5**.

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13. Finally, **you can make sure that no processes are still left running** by typing in the terminal (at the `$HOME` location)

[Xterm] `psrdfb:~> corkill; corkill`

Some of the windows will remain despite having killed and quit. To get rid of the `ATDC` window place the mouse on it and press `Ctrl-C`. The `PGPLOT` server needs to be killed with

[Xterm] `psrdfb:~> kill -9 <process ID>`

The data you obtained can be found in `/DATA1/PDFB4_1/`.