

Data Processing School :: Exercise psr 02

Source directory	/data/lofarschool/data/Exercise-PSR-02
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Context

This exercise simultaneously illustrates two fundamental steps in pulsar data reduction: dedispersion and folding.

Prerequisite

Little prerequisite knowledge required, except perhaps knowing what a pulsar is, which you should know already! 😊

Description

In this exercise, the user takes a number of subbands and both folds and dedisperses these with respect to each other in order to bring a pulsar signal out of the noise. This is done in a number of steps, which illustrate how one can optimize the detected signal, starting from a rough estimate of the spin ephemeris. This exercise uses the PRESTO routine “prepfold”, which produces a detailed diagnostic plot with signal properties. Such plots are the cornerstone of pulsar searches, in which one must separate potential astronomical signals for a background of RFI signals, some of which are particularly good at masquerading as pulsars. There are `_many_` options one can use with `prepfold`, so feel free to try these out!

Files & Directories

DATA:

The “raw” data is a set of LOFAR subbands:

B0809+74_081220_4tiles.sub(000,283-327)

with corresponding meta-data:

B0809+74_081220_4tiles.sub.inf

Using a python script, these subbands were extracted to PRESTO format from a beam-formed HDF5 file, which in turn was created with the DAL routine “bf2h5”. When running `bf2h5` on the truly raw, station data, the time resolution is downsampled by a factor of 128.

OTHER FILES:

B0809+74.par: This ascii file contains the rotational ephemeris of the pulsar, necessary for predicting the required folding period at the observation epoch.

COMMANDS.txt: The commands that the user should run (in order).

PULSAR_ENV: Required environment variables for running PRESTO (bash shell assumed).

Step-by-step instructions

1. Fold the data using a parameter file:

```
prepfold -timing B0809+74.par B0809+74_081220_4tiles.sub[0-9]*
```

2. Re-fold the data, dropping the first 2% of the dataset:

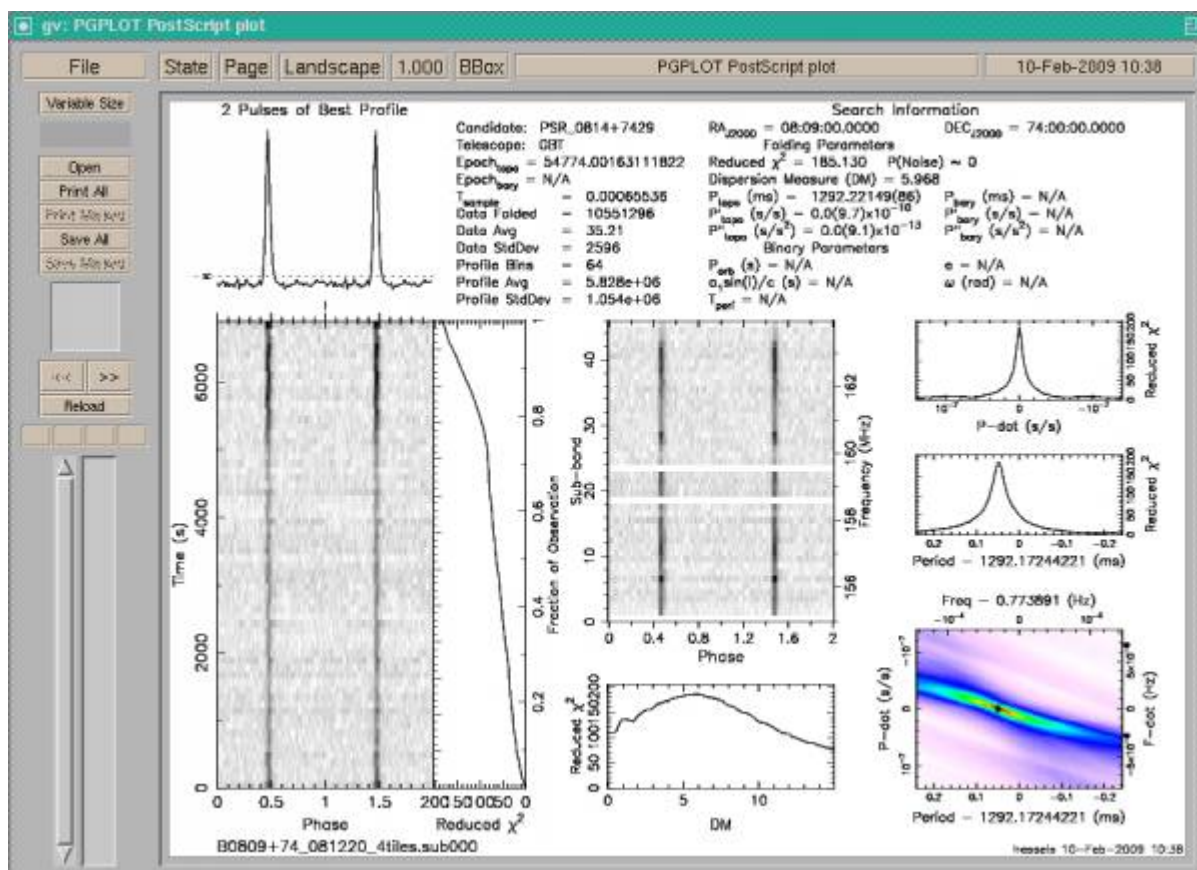
```
prepfold -start 0.02 -timing B0809+74.par  
B0809+74_081220_4tiles.sub[0-9]*
```

3. Re-fold the data again, allowing the program to optimize the pulse period:

```
prepfold -o BEST_FOLD -start 0.02 -topo -par B0809+74.par -fine  
B0809+74_081220_4tiles.sub[0-9]*
```

4. Play with prepfold to produce different plots (run simply "prepfold" to get a list of command line options).

Example outputs



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