

As the test on our server, The pulsars applied by kiyo could be found ,while,the different ways.
We have test :

B0329+54:

B0329+54-00db.fits,
B0329+54-10db.fits,
B0329+54-15db.fits,
B0329+54-25db.fits

B1859+03 (Big DM):

B1859+03-00db.fits
B1859+03-10db.fits
B1859+03-15db.fits
B1859+03-25db.fits

B1929+10:

B1929+10-00db.fits
B1929+10-15db.fits

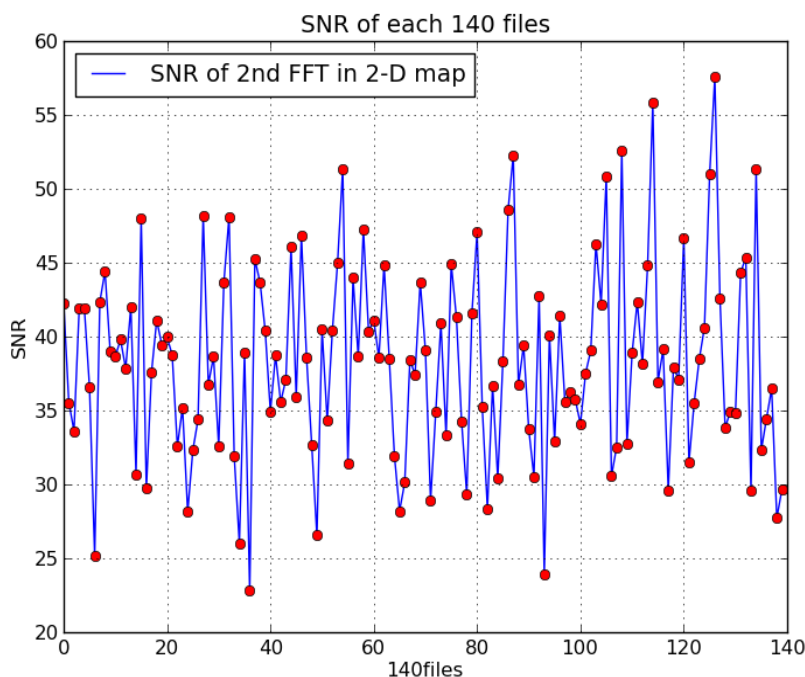
B2319+60(Calibrated, Found in FRB110523 data sets)

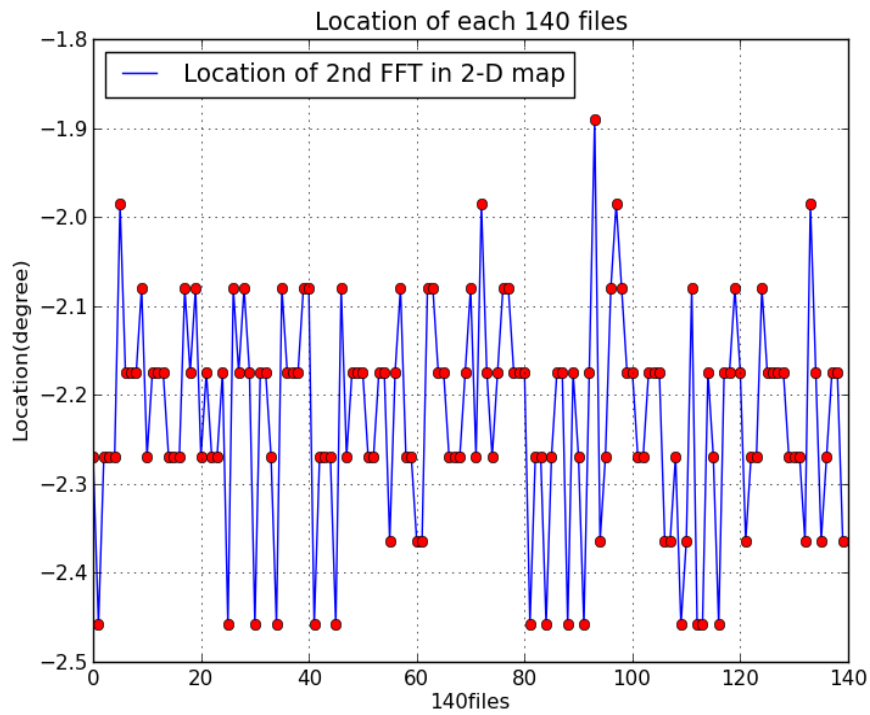
For B0329,

we could found the pulsar signal until -15dB, when it reduced to -25 dB, the signal is disappeared.
As the time is too long , I cut the data along time axis into $2048 \times \text{time_resolution}$ seconds pieces ,
and distribute them to different processes to run by MPI. I called each piece of data as block, and
calculate the SNR and Location of the biggest value for each block.

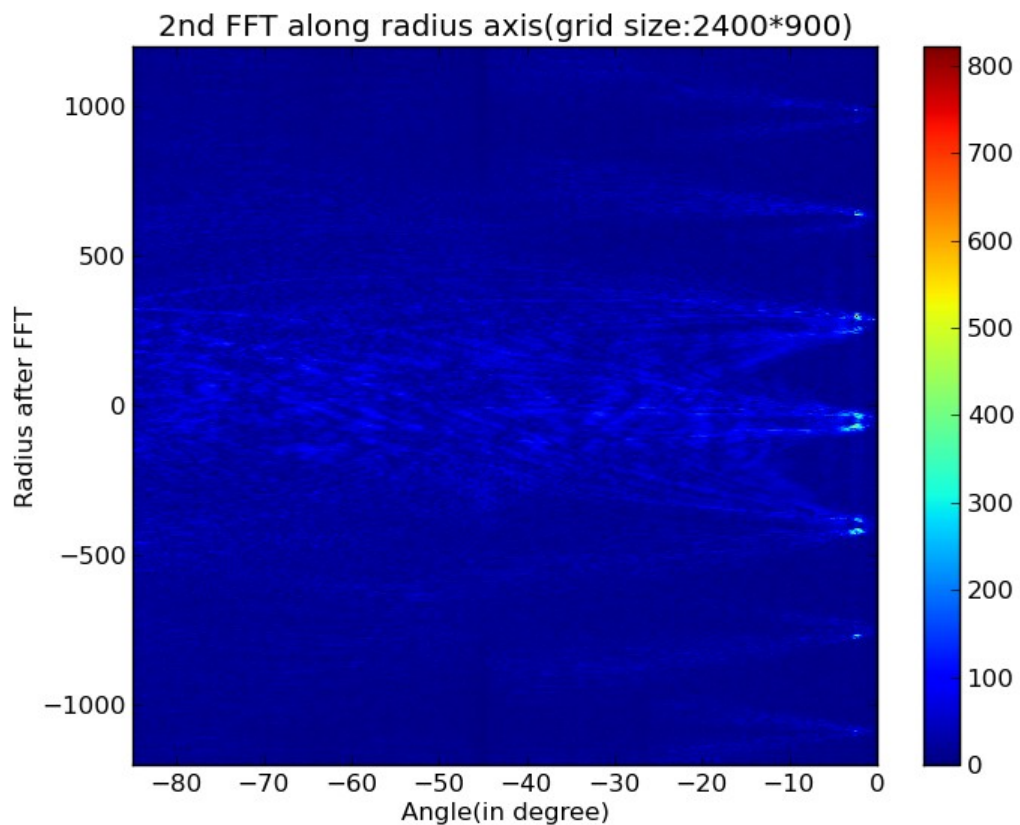
Attenuation 0dB:

total B0329+54-00db.fits time length.





2nd 2-D FFT map Of One block of 0dB data



We could see that SNR is different ,because different pulsar pulses has different energy. The Location of the biggest value are in the range of -2.0~-2.5 degree, the pulses approximately locate same position.

{go over the method :

1st step :each block ,is from raw data, is in size of 2048*4096. After rebin procedure,make the frequency to time line,which is a curve as the dispersion formula, to a straight line.

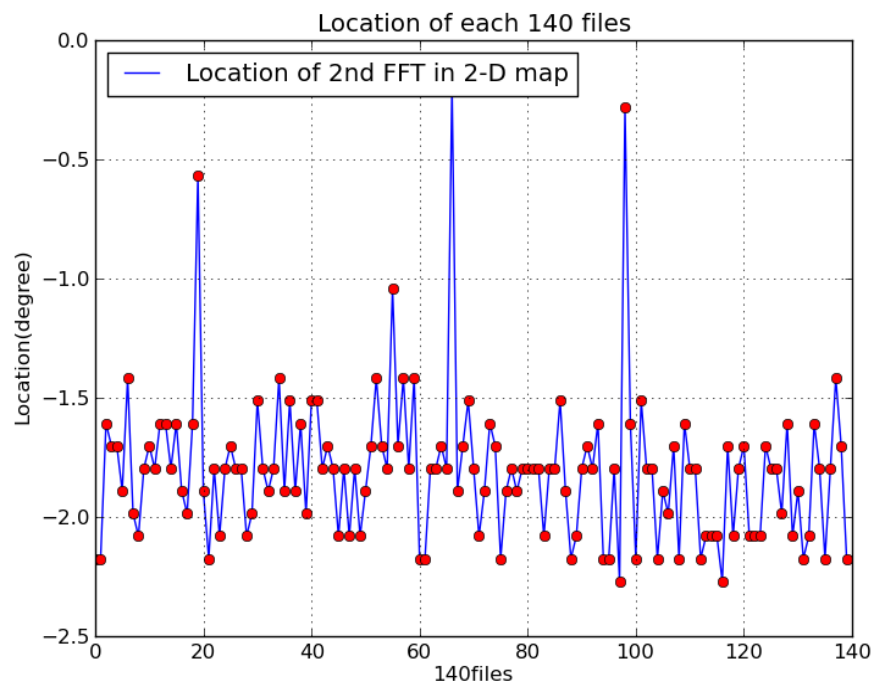
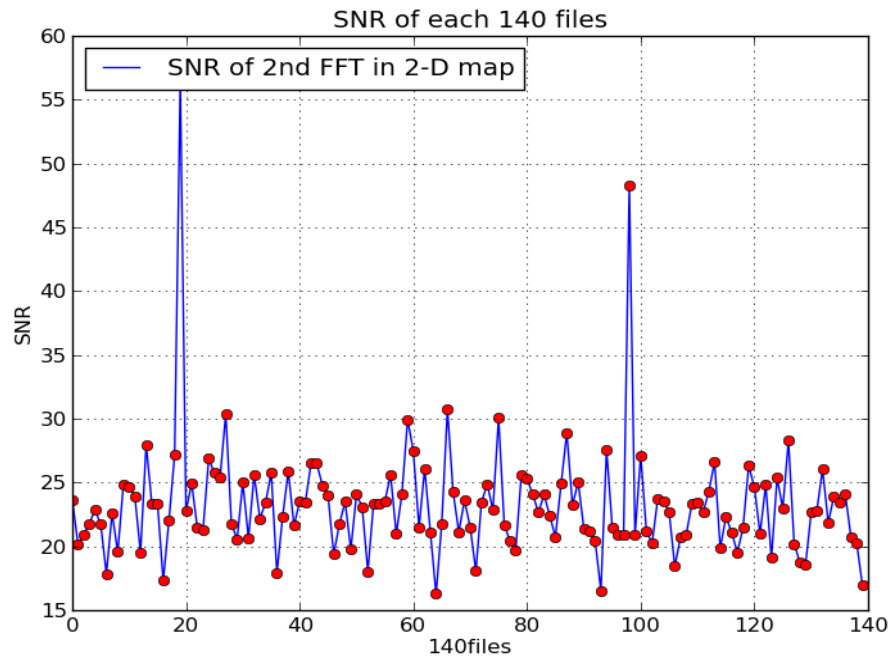
2nd step : Do 2-D FFT to the rebin data ,after that, the straight line is cross the center of the map.

3rd step : Transform it into polar coordinates. After that , the map could re-plot as radius in y-axis and degree for X-axis.

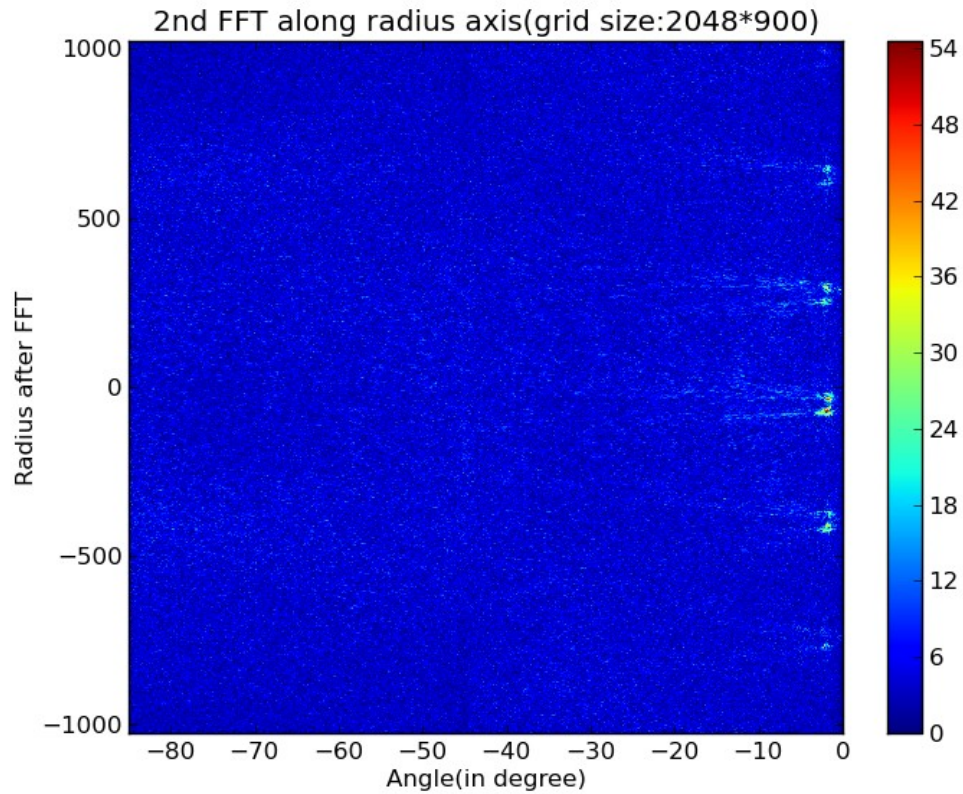
4th step: Do 1-D FFT along radius direction. Then the signal ,if it exists, will become several spots along the radius in some exact degrees.

So there the position concept is said to degree.}

Attenuation -10dB:

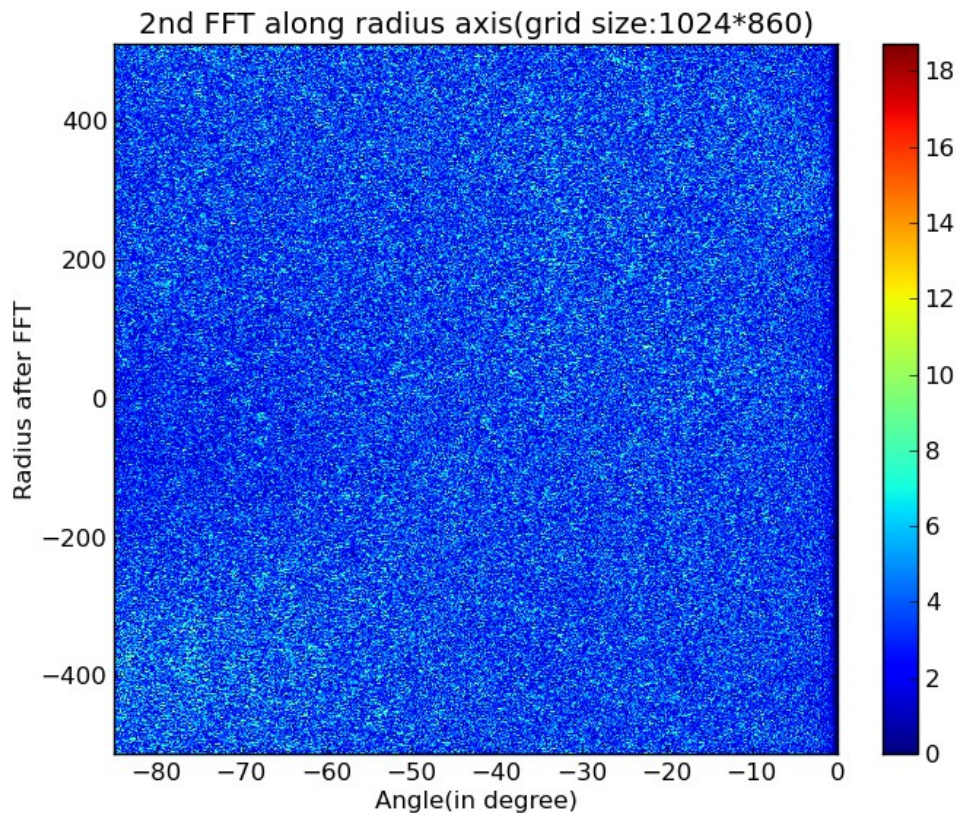


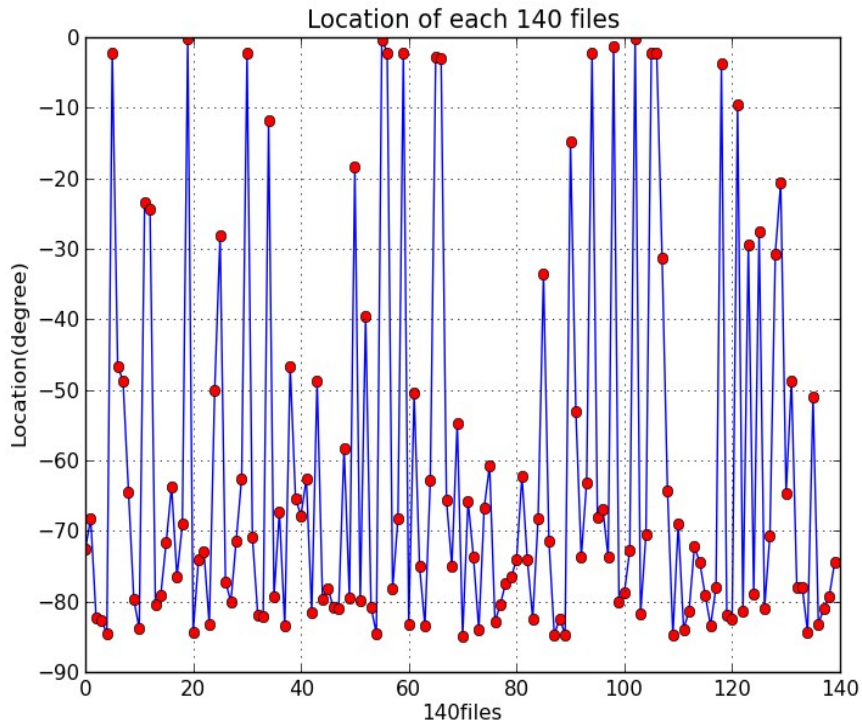
SNR:290 Location:[-1.70189099]



We could see the location is fluctuated along the -2 degree. So, We could say the pulsar could be found.

When continue to reduce to -15dB, we could see no sign of signal.

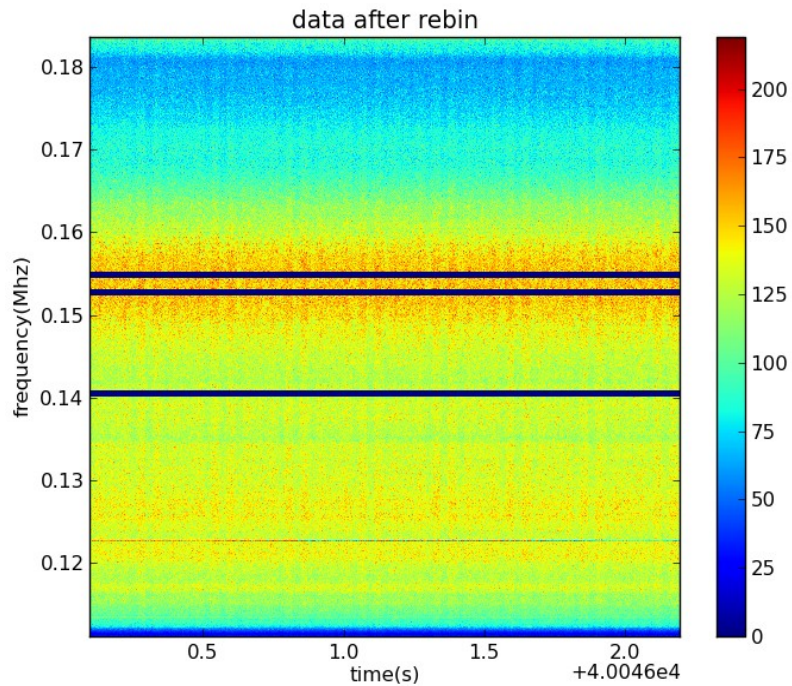


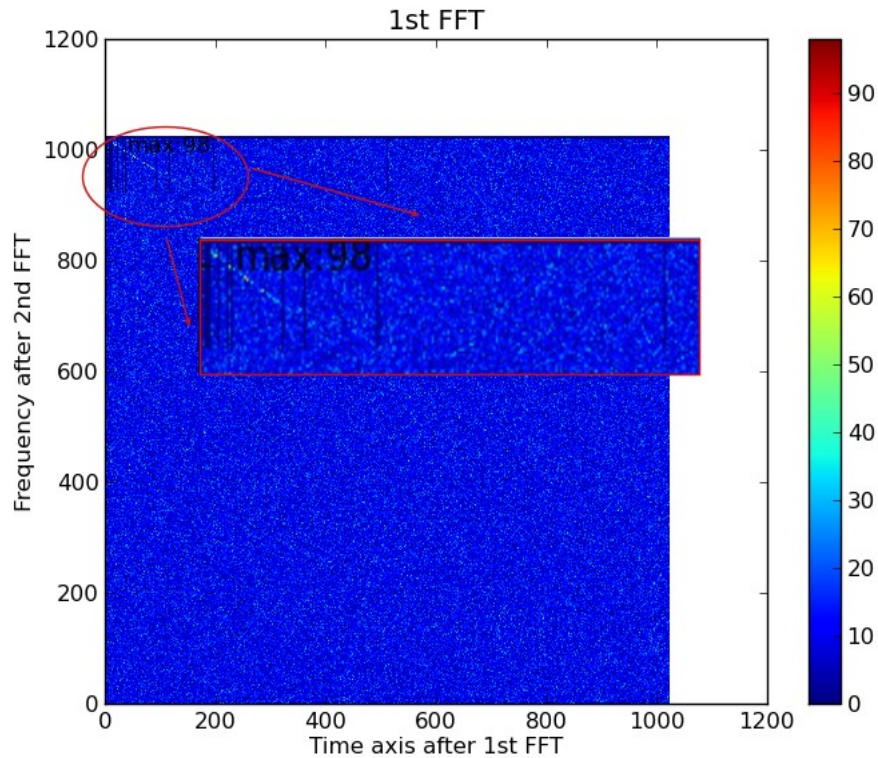


We could see the Location of biggest value for each block varied randomly.

B1859+03 :

B1859+03 has a big DM, which could forbid the 0 degree interference, but the uncalibrated raw data indeed influence the finding. I found the 2nd or 3rd frequency components of 2-D FFT could bring disastrous damage to found signal, so I zeros some vertical and horizontal lines of rebin map. I just sum them along horizon(vertical) up and make the maximum lines zeros .

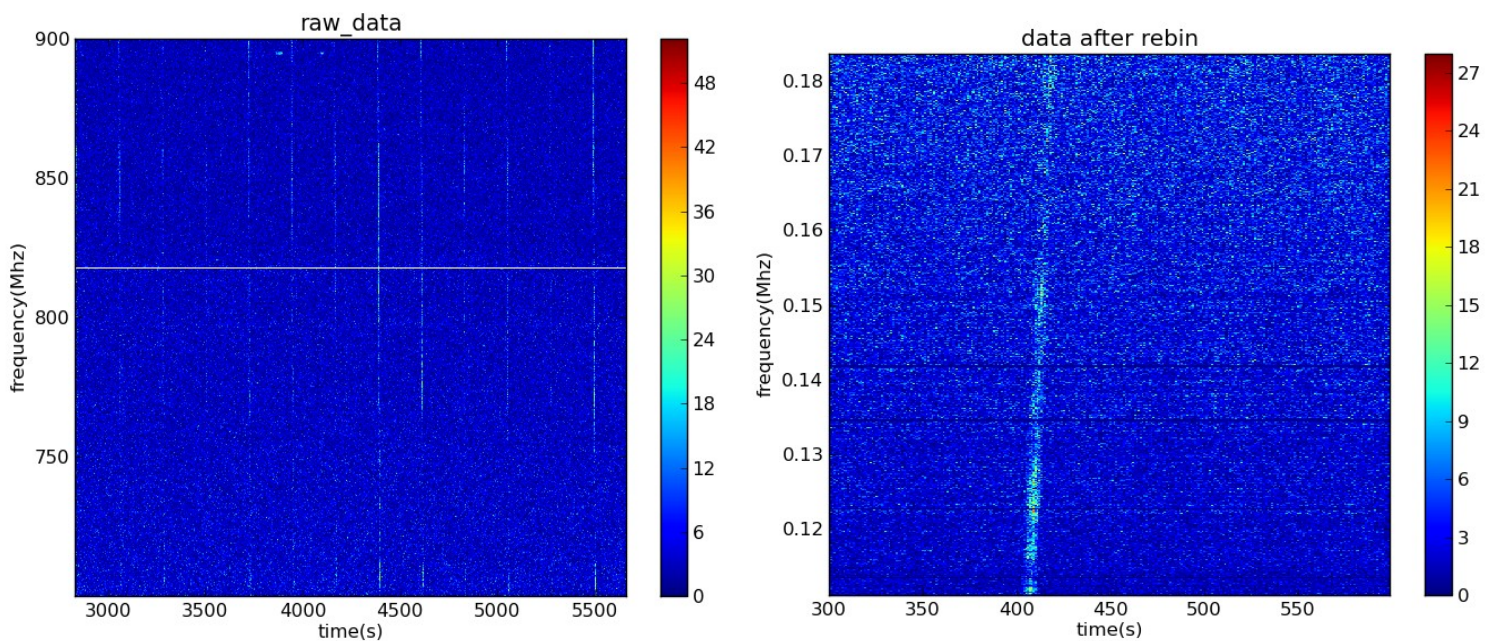




The same as B0329+54, The B1859+03 could found signal at -10dB attenuation, and no more lower.

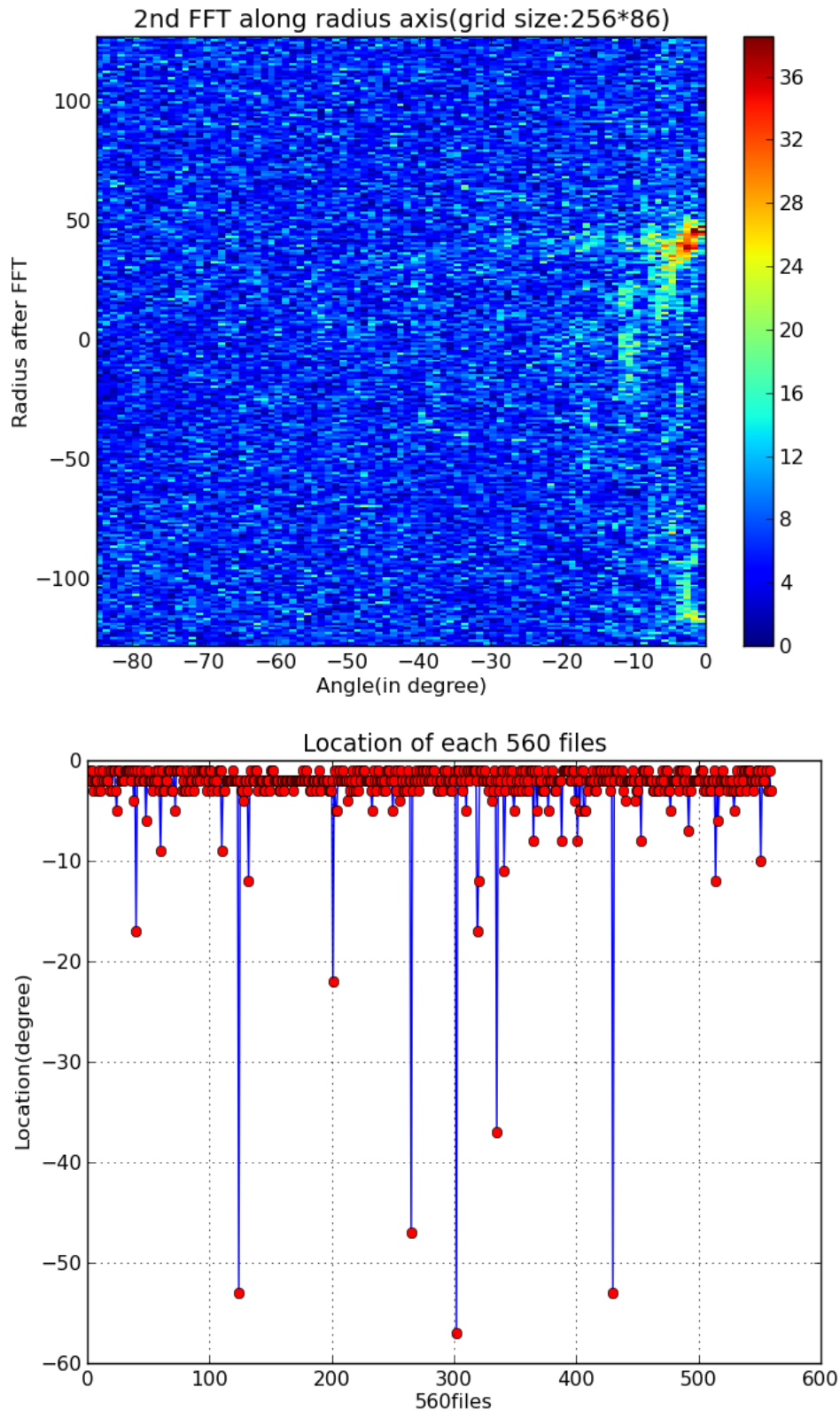
B1929+10:

B1929+10 is a little special ,because the DM of it is too small. So the pulses are almost vertical lines. That will be mixture with the 0 frequency components After FFT. So I make the time block size smaller, That will stretch the vertical line more gradient.



We make the size of time block to 300*4096 instead of 2048*4096 of raw data. so the line will appear more sloped.

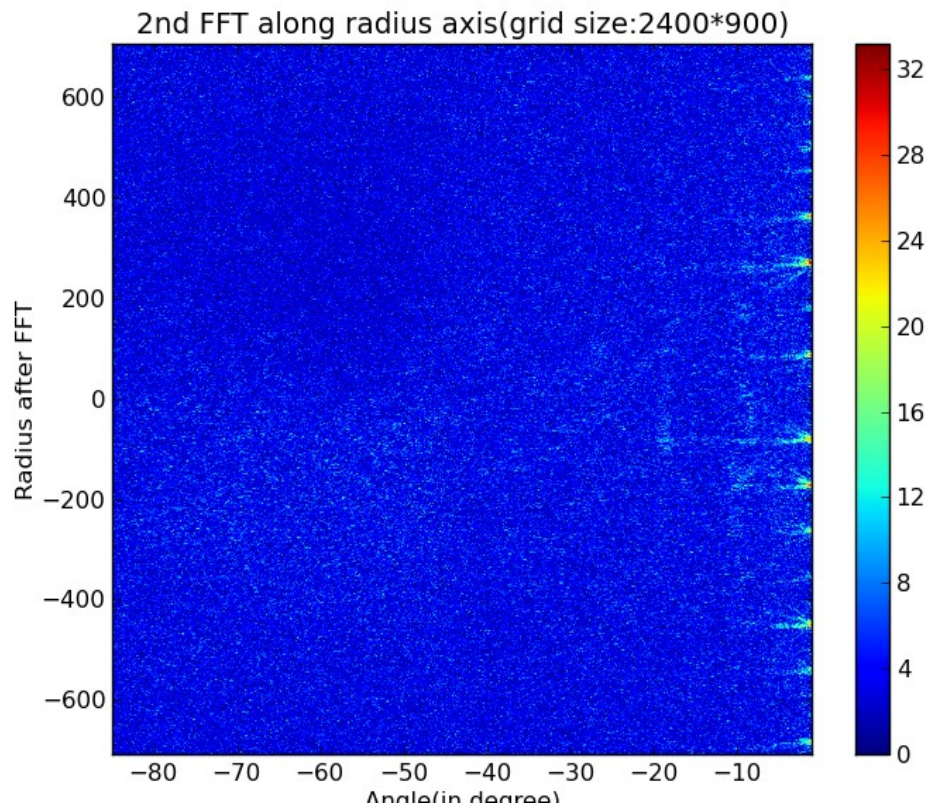
In the short time process, the pulsar could be found .



And the Location is almost along the -1 degree.

While ,it is only for the raw data **B1929+10.fits**, I also compare the **B1929+10_filtered.npy** in the

FRB110523 datasets, Though the signal is also in a small DM, the 0 frequency components of 2-D FFT is not that much. We could also found the signal in the 2048*4096 time block data.



So I think the calibration is important.

Summary:

This method may found the -10dB signal. And it is better at big DM data search. Maybe calibration could advance the result. Now,I also have done a test to search FRB or pulsars by limits the degree of the known pulsars. Like the B0329+54, the location maybe -2 degree, then when I interpolate the rectangular coordinates to polar coordinates, I limit the grid only to -85 to -10. so that we could exclude the pulsar data. However , the influence of pulsar is too strong ,like the picture above, the spot may be last to several degrees. The pulsar survey data which not attempt to point to specific pulsar may be more effective to this method test.