



Team Bell

Pulsar Search Collaboratory Summer Institute 2010



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Abstract

On Wednesday evening, Pulsar Search Collaboratory Summer Institute students were assigned certain ranges through new data to search for potential candidates. Team Bell sifted through all of the data sets available to them within the time allowed. Although the night and into the following morning, the students were granted time to use the Green Bank Telescope. At 5:45 a.m. on Thursday morning, July 29, Team Bell began to collect data on the telescope. The team took with them five candidates and two known pulsars to continue research and get a second look at potential pulsars. The Crab Pulsar was within their time slot and they were able to observe and gather data on this well known pulsar. Throughout the rest of the day, the students analyzed and organized the new data.

Aim

The aim of Team Bell was to use the time allotted at the GBT to analyze data presented by the group. Bell also took into consideration the use of the Crab Pulsar as a reference to help give a greater aspect of what is really out there to what isn't. Team Bell didn't find anything new, but had great candidates that unfortunately turned out to be nothing. These plots were eventually used to be in comparison of the Crab Pulsar and RFI that they "discovered". This helped give the group greater knowledge of what can be accomplished if one keeps analyzing.

Method

Searching through data and pointings in hopes of finding a pulsar is a long and tedious task. As all scientific adventurers, Team Bell formulated a plan to efficiently sort through data.

Data Pointing

There are several pointings to look through in the right ascension 00:55 -02:10. In splitting into teams of one or two people, Team Bell successfully looked through their 120 pointings.

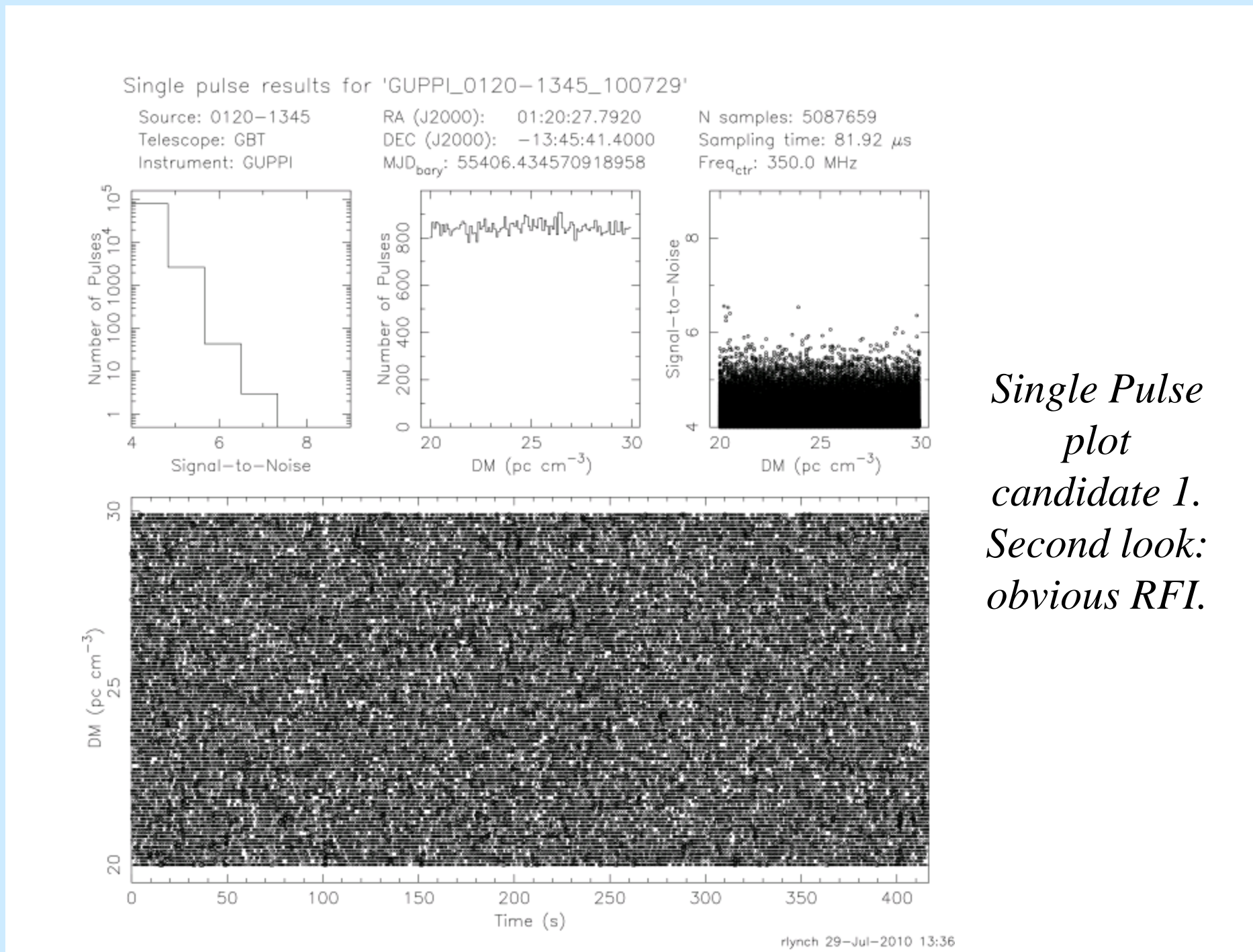
Analyzing Data

With promising candidates found by each group of Team Bell, they went through all possible plots, presenting to all members why each person thought their candidate could be a pulsar. After much deliberation this team came to a unanimous decision on six plots.

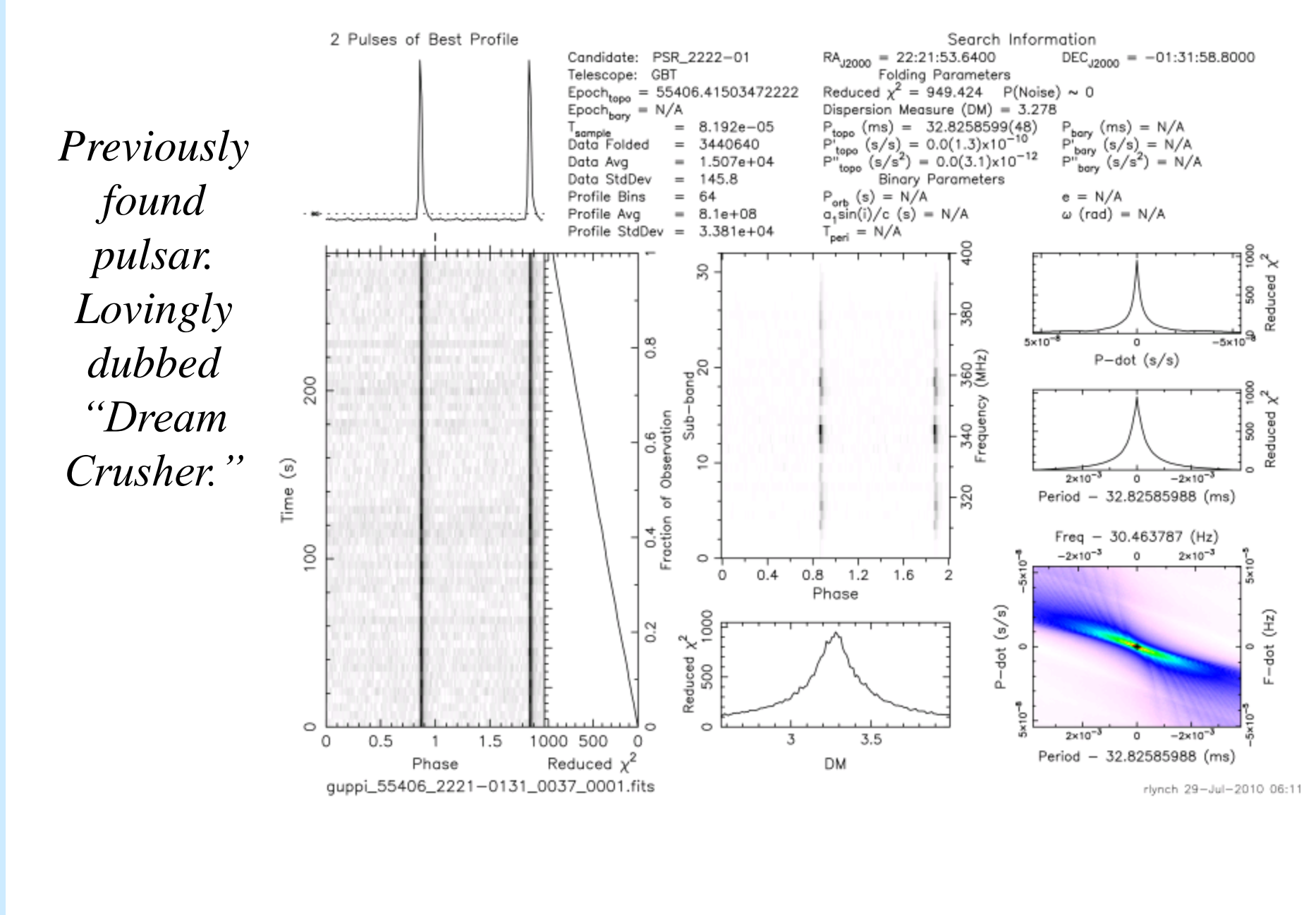


Green Bank Telescope

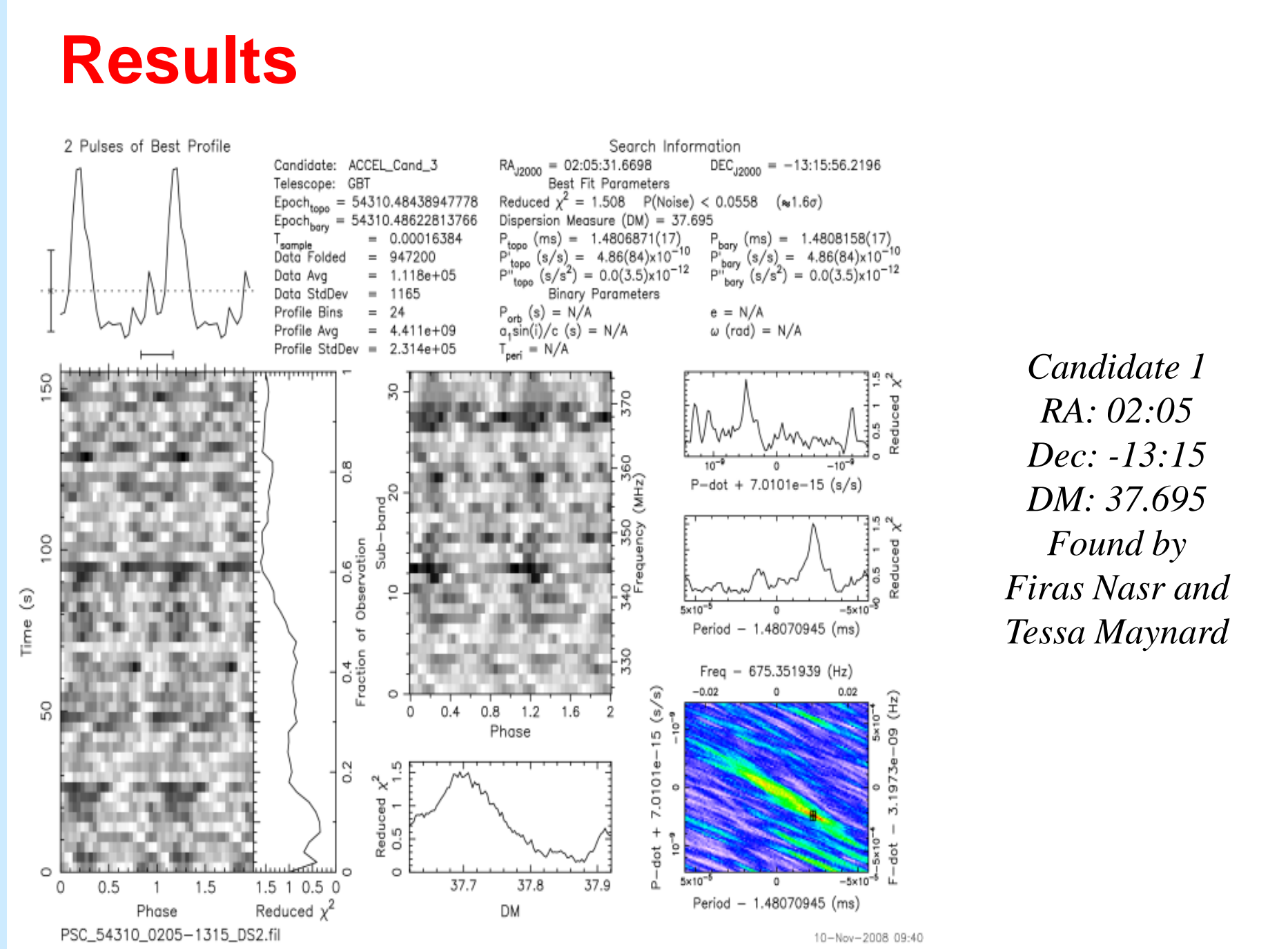
picture from URL: <http://discovermagazine.com/2006/nov/life-begin-space/byrdtelescope420.jpg>



Single Pulse plot candidate 1. Second look: obvious RFI.

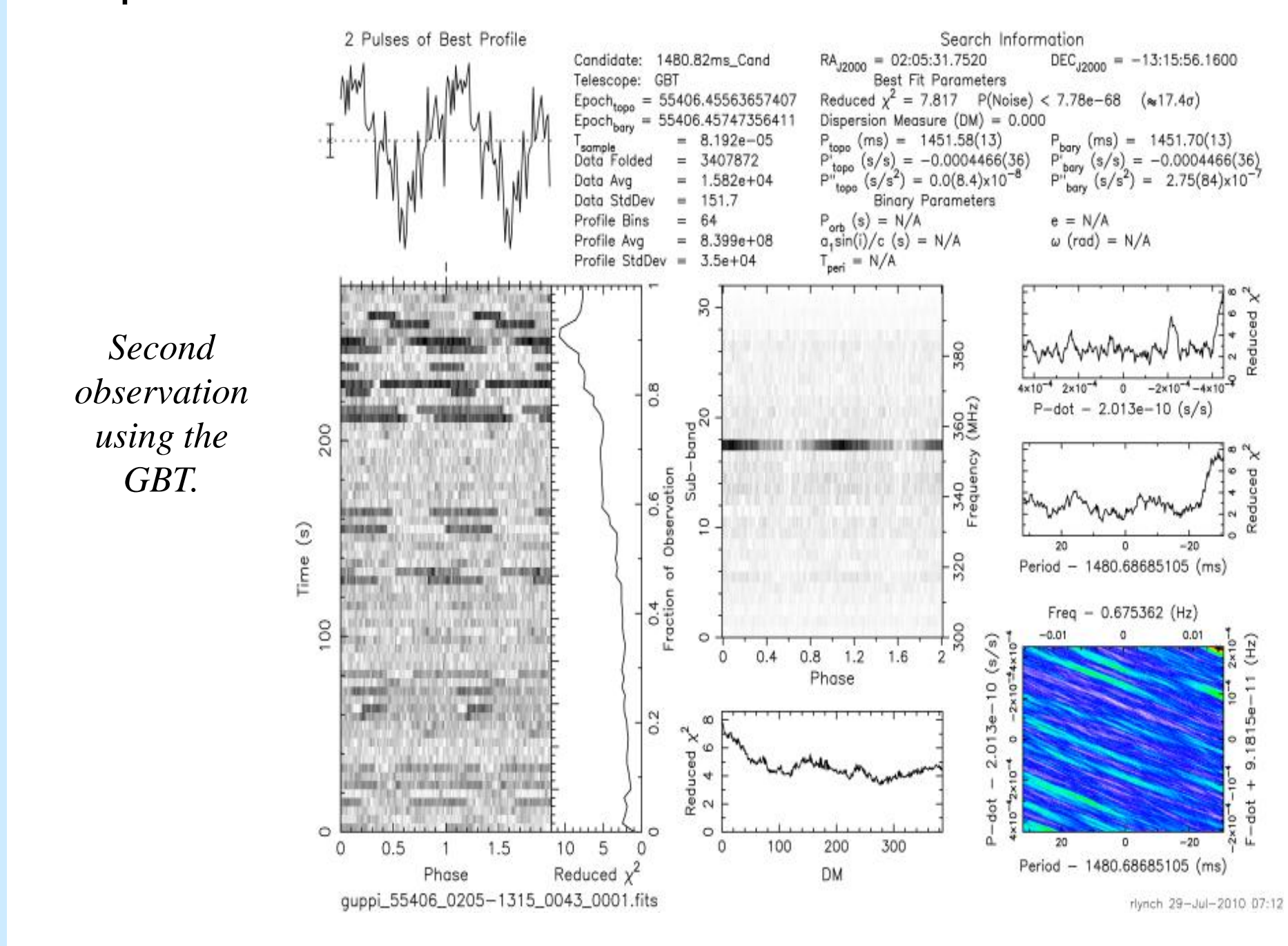


Previously found pulsar. Lovingly dubbed "Dream Crusher."

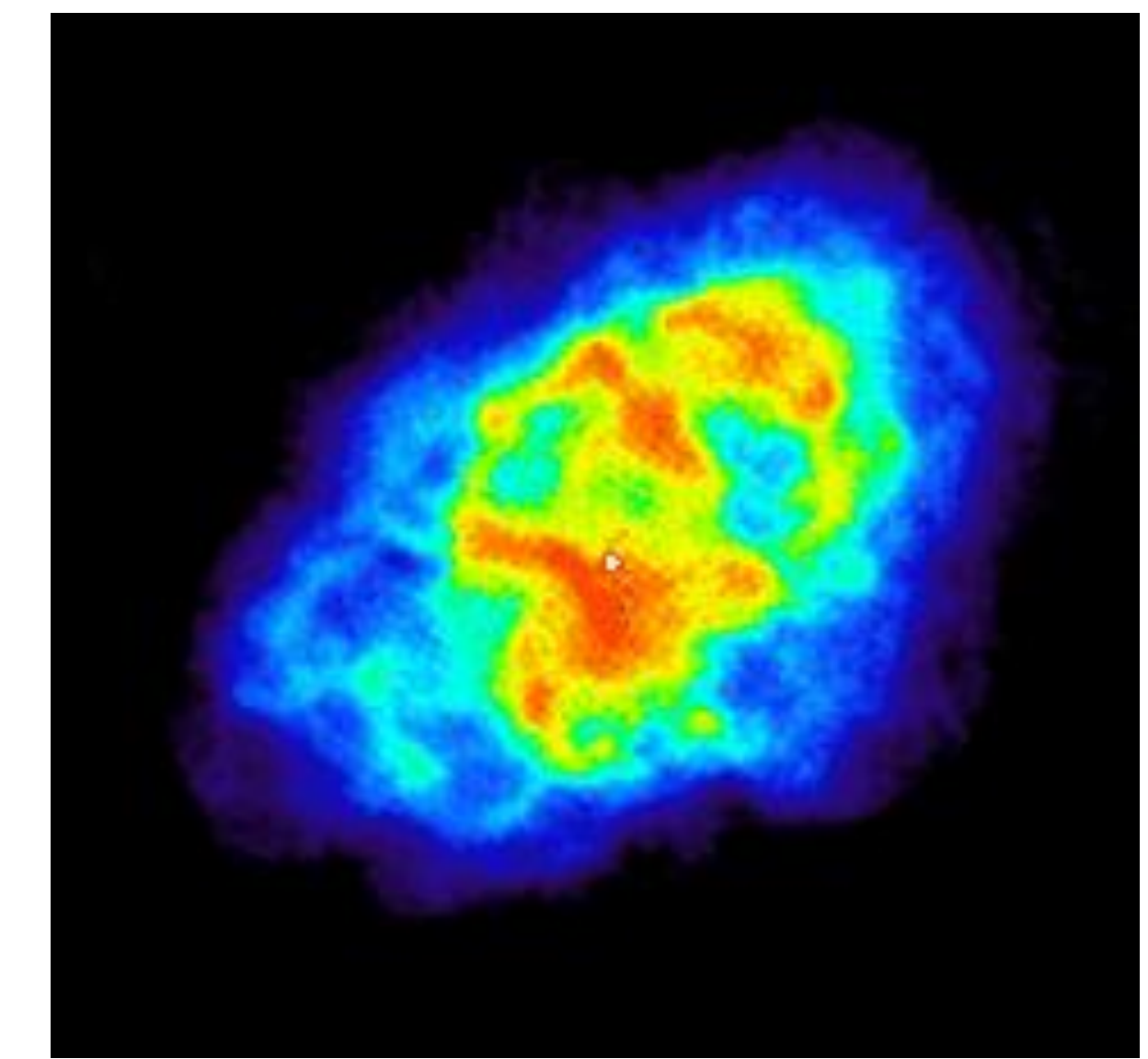


Candidate 1 RA: 02:05 Dec: -13:15 DM: 37.695 Found by Firas Nasr and Tessa Maynard

The plot shown above is one of the candidates Team Bell took to be reevaluated at the GBT. The pulse profile had two promising peaks and there was correlation to the peaks in both the time phase and sub-band plots. The peak in the dispersion measure was also promising and showed that it wasn't too far away. However, when the results arrived from the GBT it was discovered that what the team thought might be a pulsar, was really radio frequency interference (RFI), shown below. Most of the plots taken were of RFI.



Second observation using the GBT.

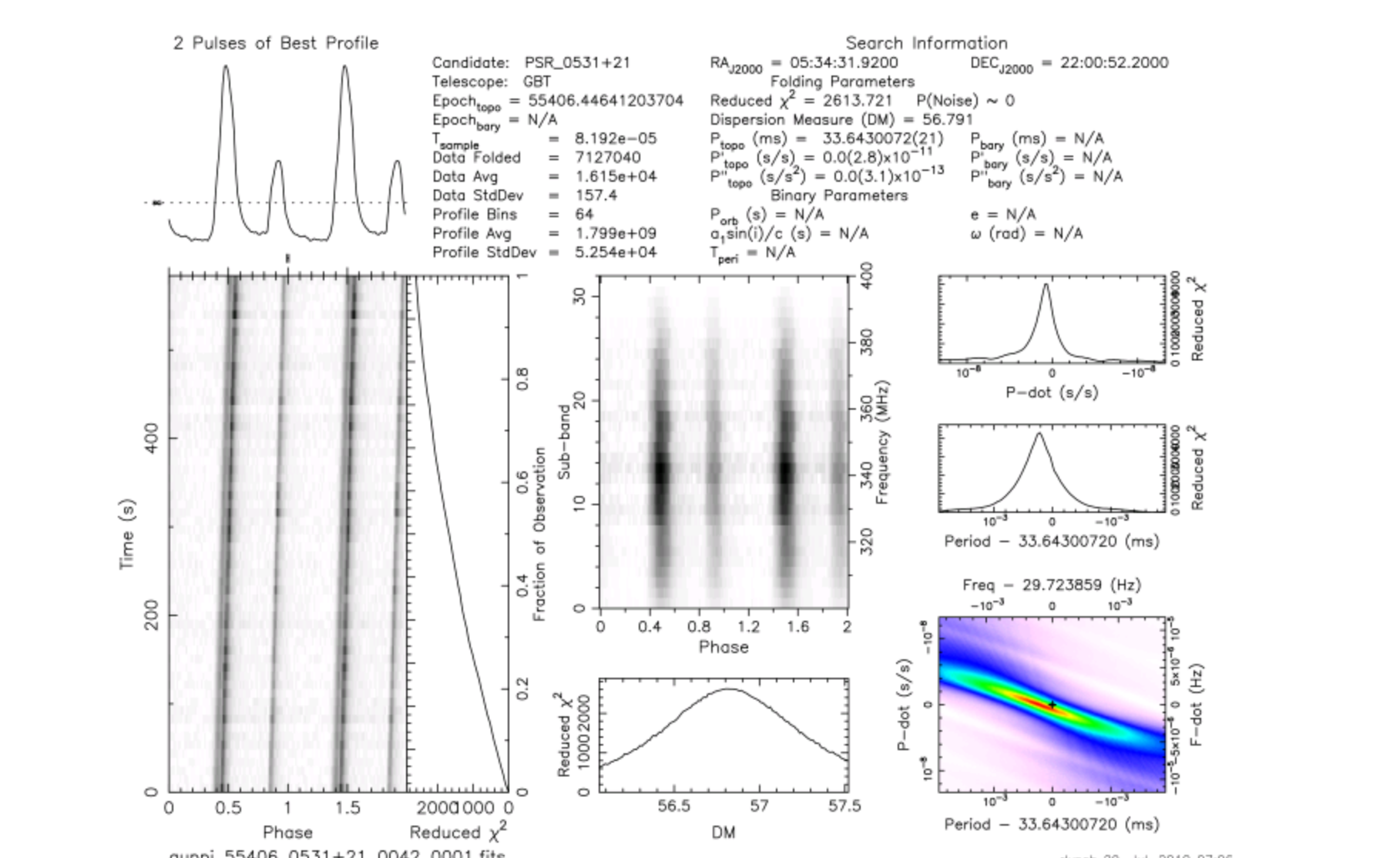


Crab Nebula Radio Image URL: http://imagine.gsfc.nasa.gov/images/introduction/crab_radio.gif

The Crab Pulsar

The Crab Nebula was first seen in the skies of July 5, 1054 where it was observed and recorded by Chinese astronomers and depicted by Native Americans in Arizona. After being rediscovered by John Bevis in 1731 and Charles Messier in 1738 it was dubbed "Crab" by Lord Rosse in 1844.

The Crab Pulsar was officially discovered by David H. Staelin and Edward C. Reifenstin III. This well known pulsar is twenty-five kilometers in diameter and rotates once every millisecond or thirty times in one second. Due to the large amount of energy being given out, the Crab Pulsar is slowing down by thirty-eight nanoseconds every day.



The Crab Pulsar as seen from the GBT.

Conclusion

Team Bell looked through all possible data that fit the granted time slot, but found no new pulsars. Bell found four known pulsars, including the Crab Pulsar. Having another session at the GBT would give them the chance to take a second look at some of the pointings that came back as RFI.

Acknowledgements

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