The PAF at Effelsberg

X. Deng and PAF collaboration

16 Jan 2020
CASS Co-learnium

Max-Planck-Institut
für
Radioastronomie

CSIRO

Background

- MPIfR and CASS cooperate to do experiment with a PAF receiver system on high-gain, single-dish radio telescope;
- The receiver system was installed at Parkes radio telescope in February 2016 and uninstalled at the end of 2016;
- At least three journal paper were published with Parkes result;
- The receiver system was shipped to Effelsberg at the beginning of 2017;
- We installed the receiver system at Effelsberg in April 2017, but the frontend has to be reinstalled every time we want to use it;
- I took over the pipeline development at the beginning of 2019 and I used my pipelines observed pulsars, searched for single pulses and did spectroscopy at March 2019;
- We are preparing papers with the Effelsberg result;

Phased Array Feed

- An **array** of antenna **feeds** installed at the focal plane of a radio telescope to collect the incoming radio waves **simultaneously**.
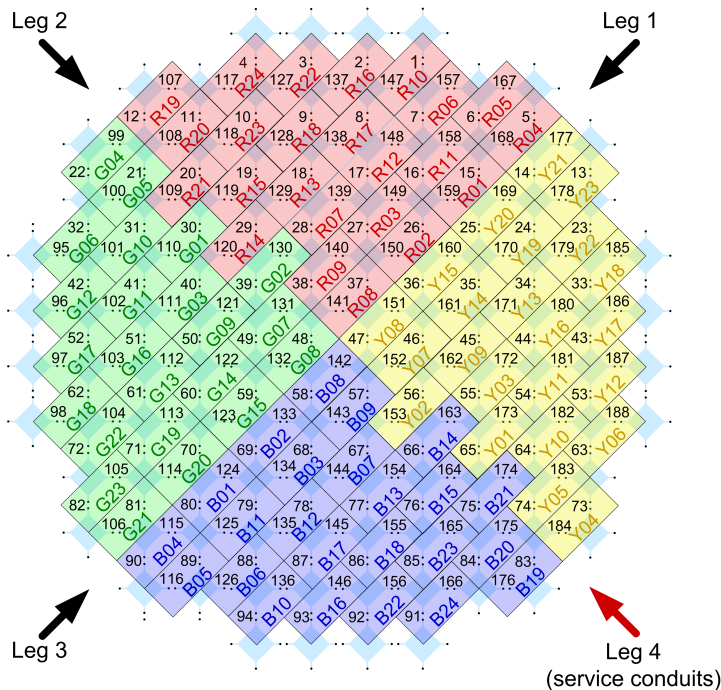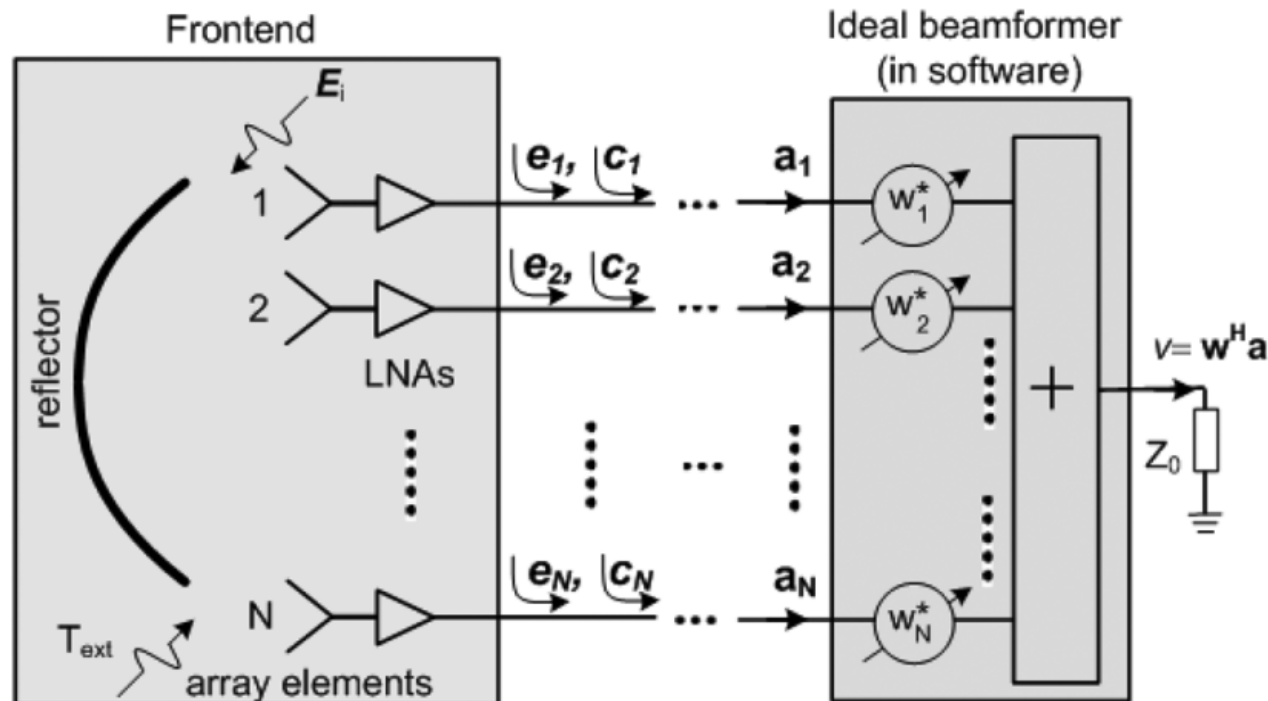

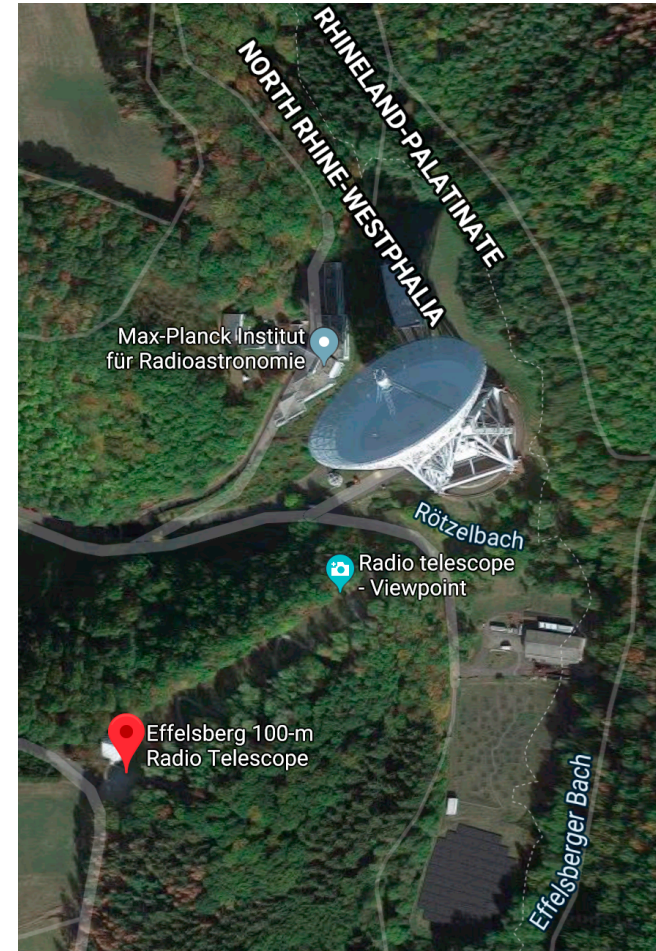MkII PAF port and domino numbering
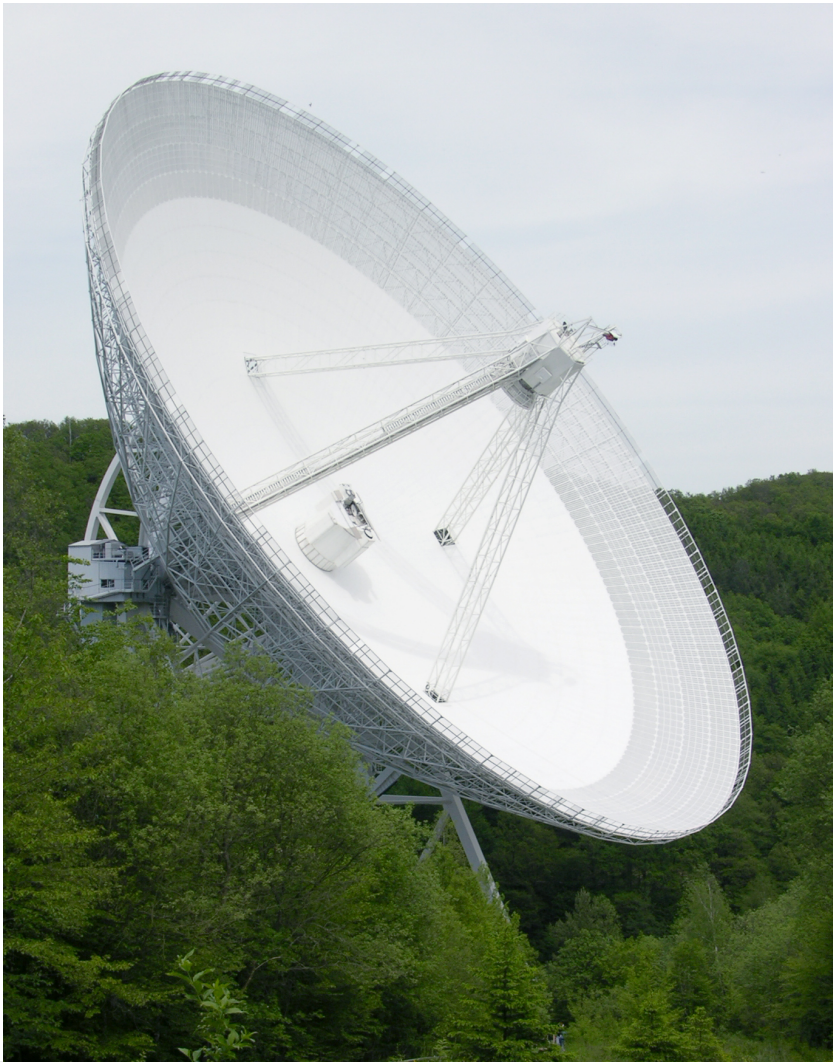top view (rear of feed)

Phased Array Feed

- The output of these feeds is **computationally phased** with weights to form multiple beams with independent directions.
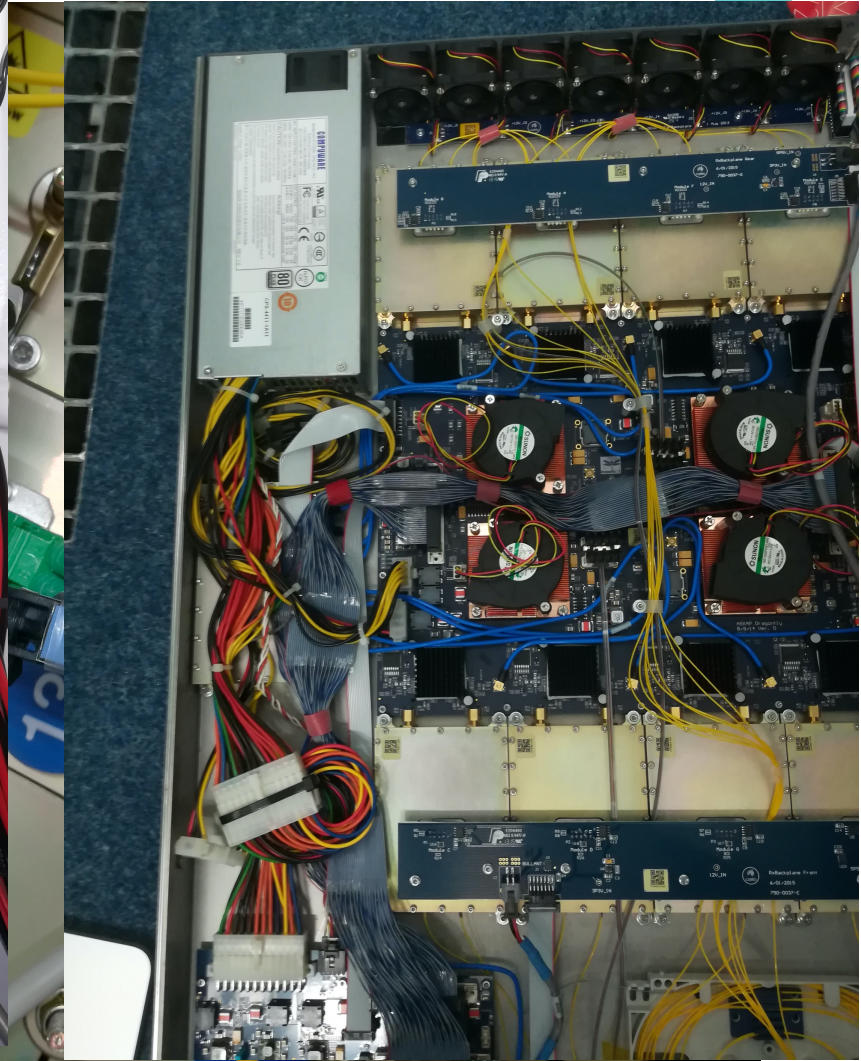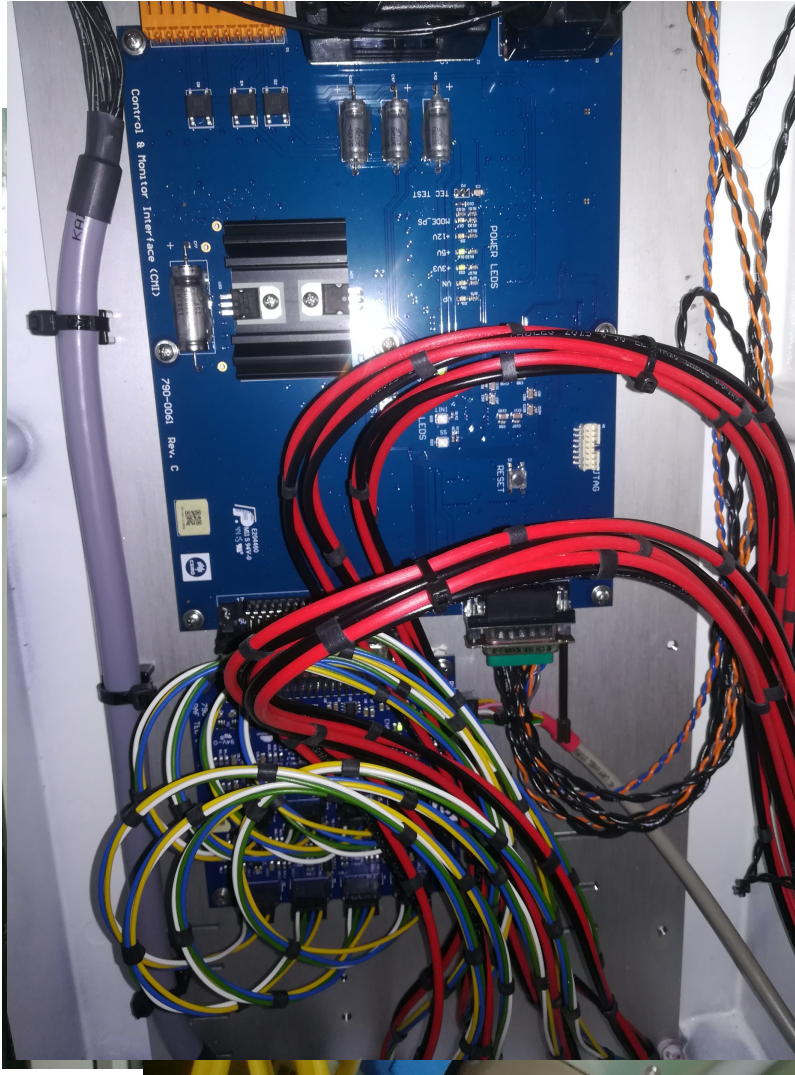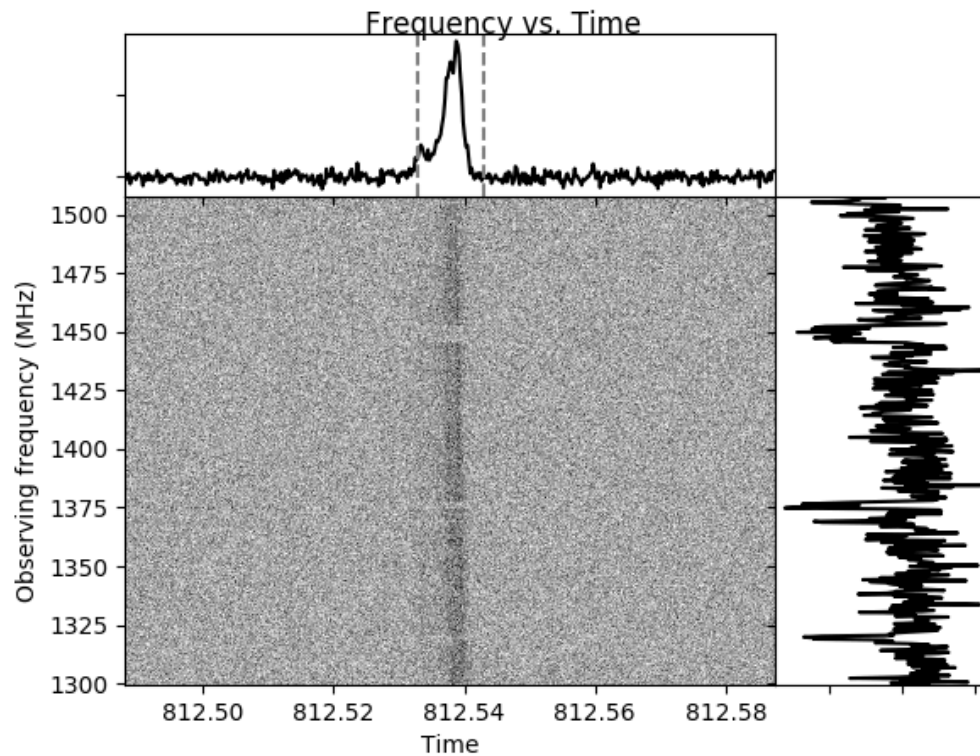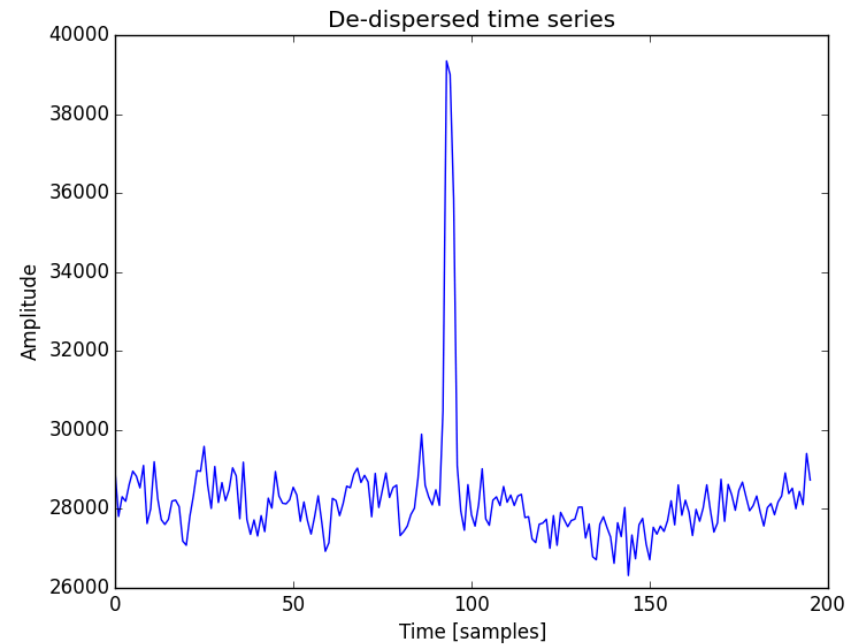
Effelsberg

PAF at Effelsberg

Max-Planck-Institut
für
Radioastronomie
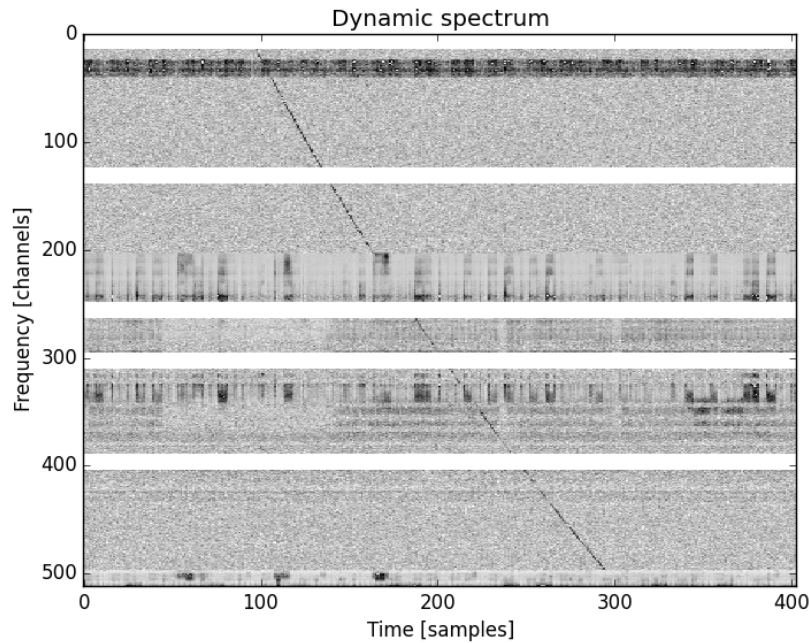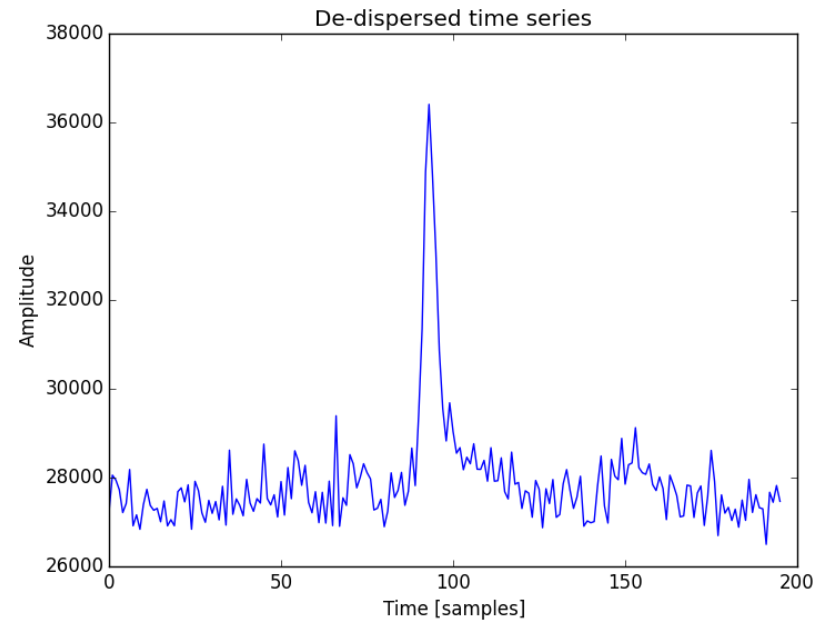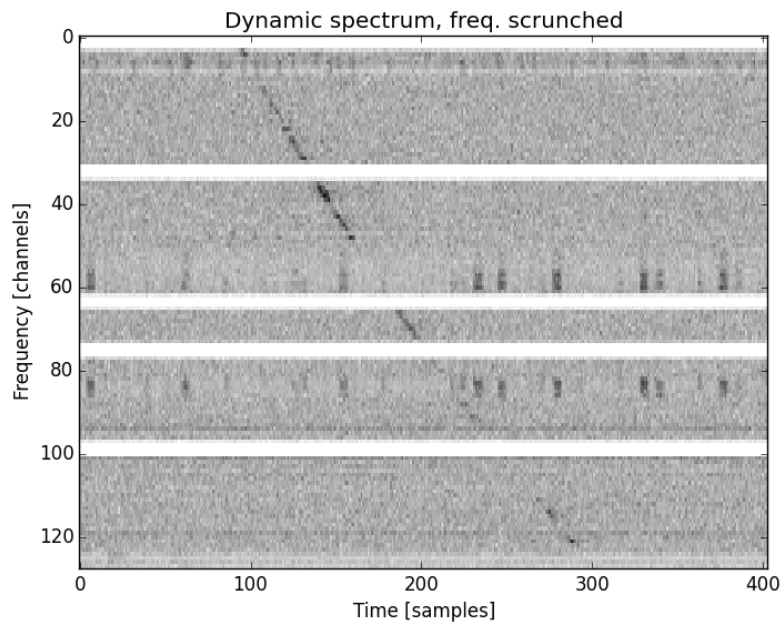

CSIRO

PAF at Effelsberg

Search, I

- Single pulses from RRAT J1819-1458
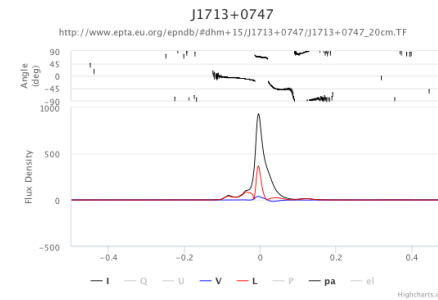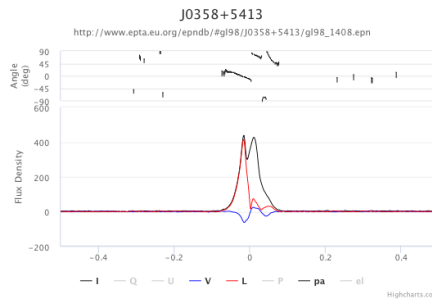
Search, II

- Single pulse from Crab pulsar

Dynamic spectrum

De-dispersed time series

Search, III

- Single pulse from PSR B0355+54

Dynamic spectrum, freq. scrunched

De-dispersed time series
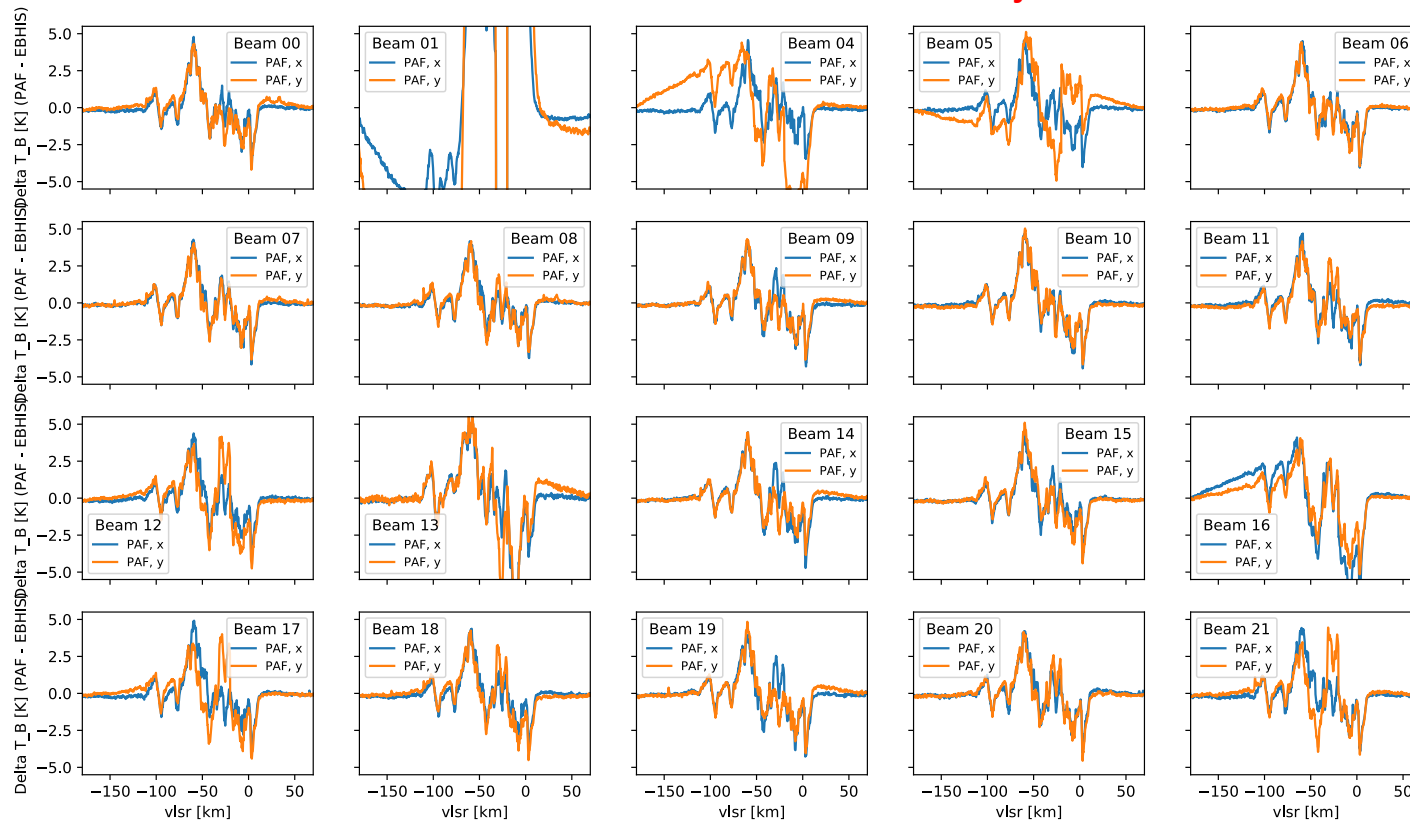
Pulsar pulse profiles
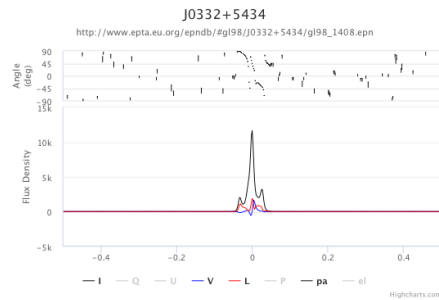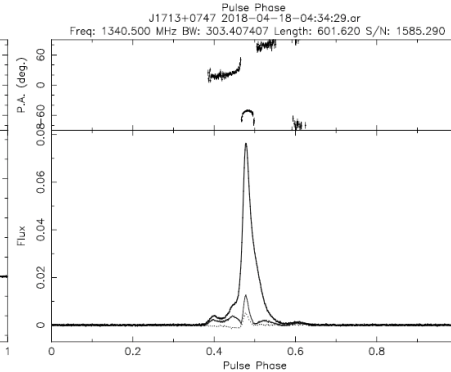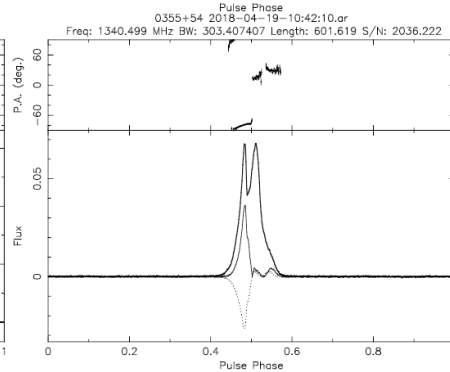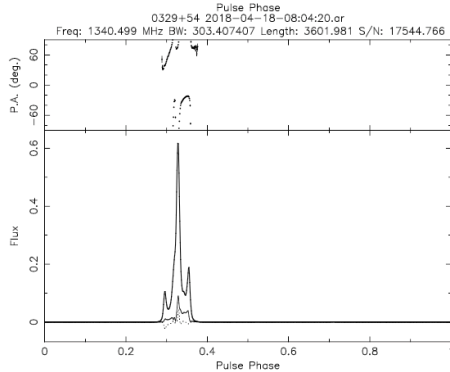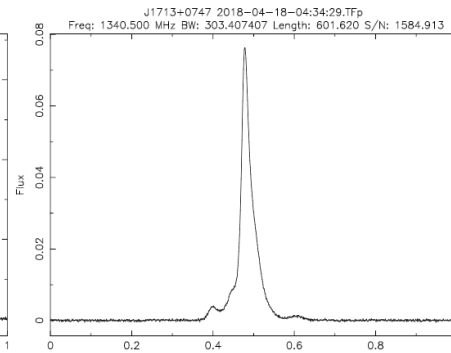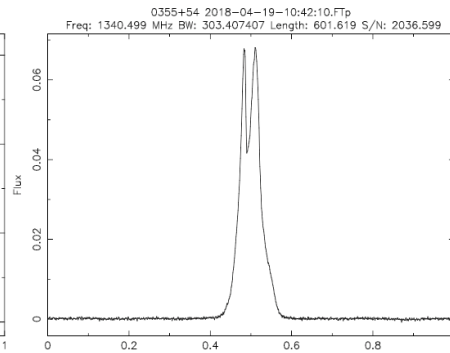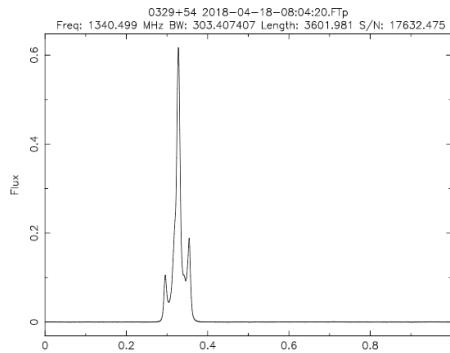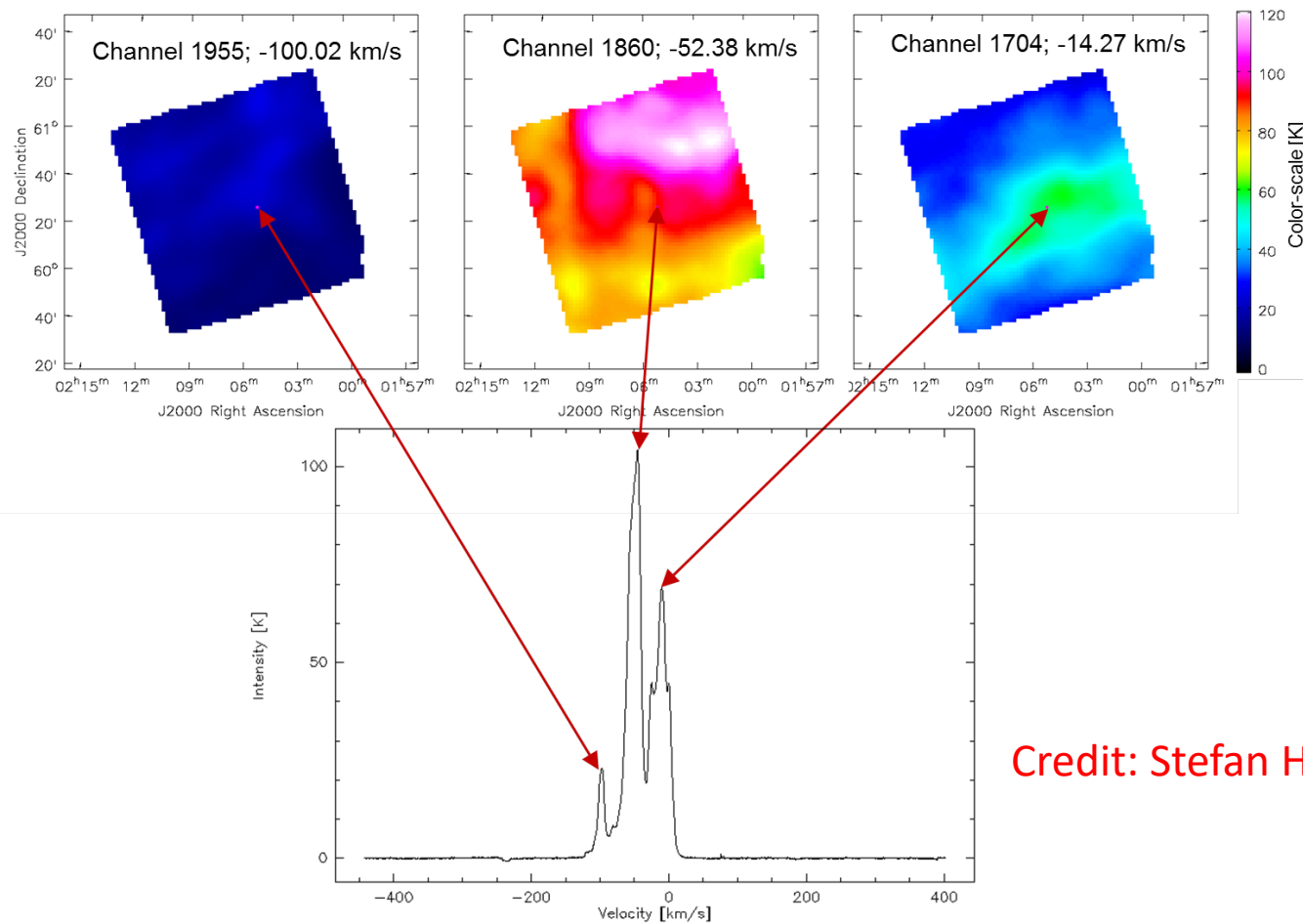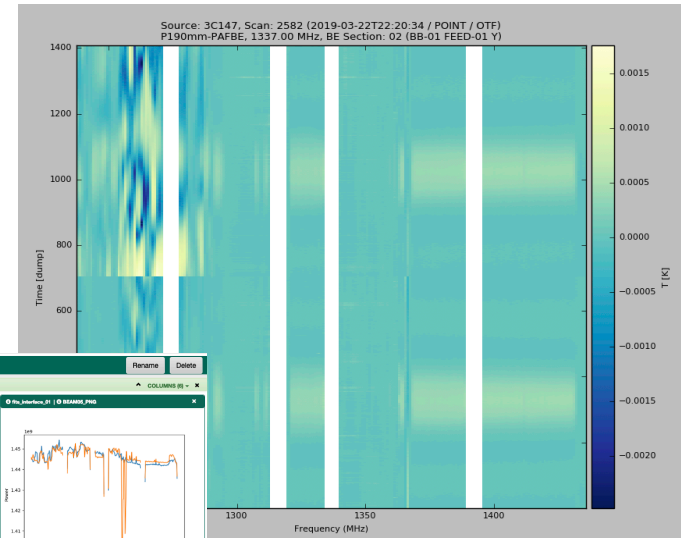
Pulsar timing
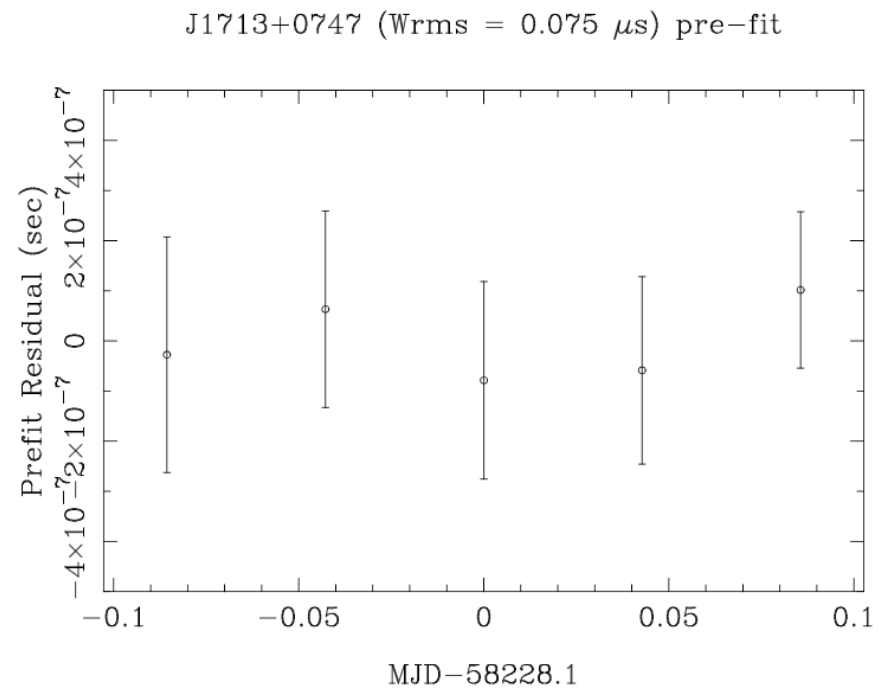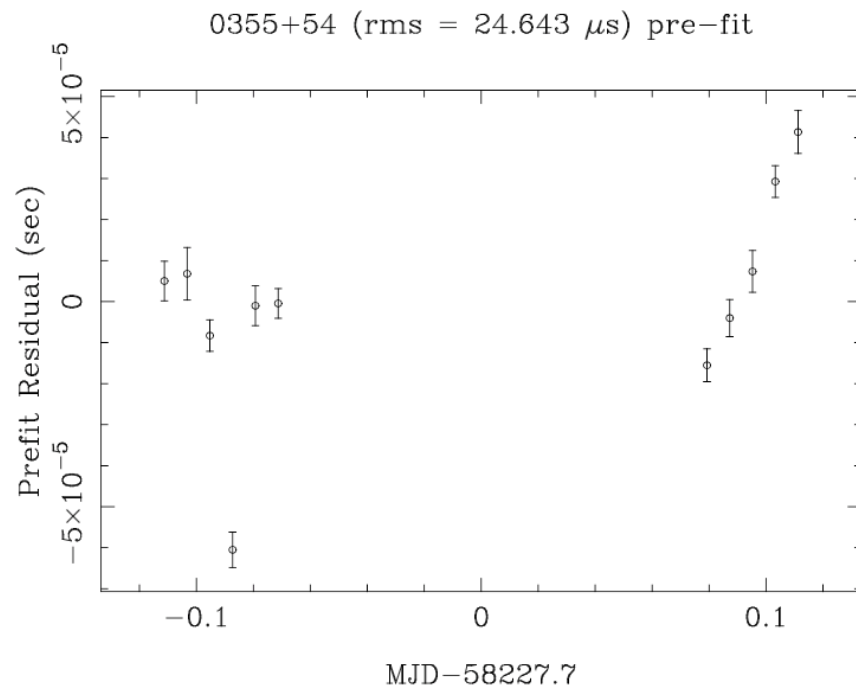
Spectroscopy on S7, I

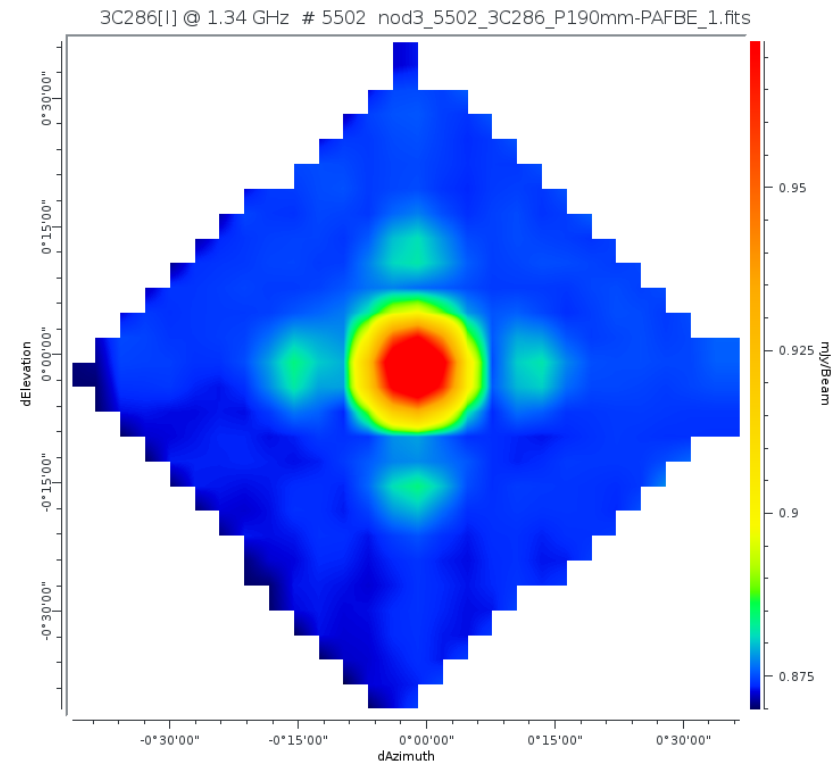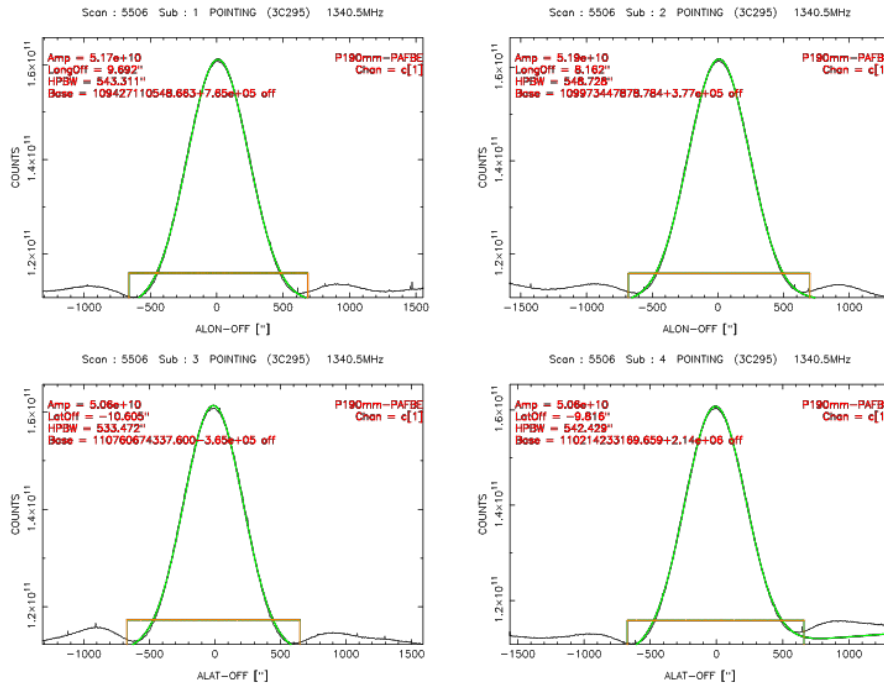Credit: Benjamin Winkel

Spectroscopy on S7, II

Credit: Stefan Heyminck

Engineering, I
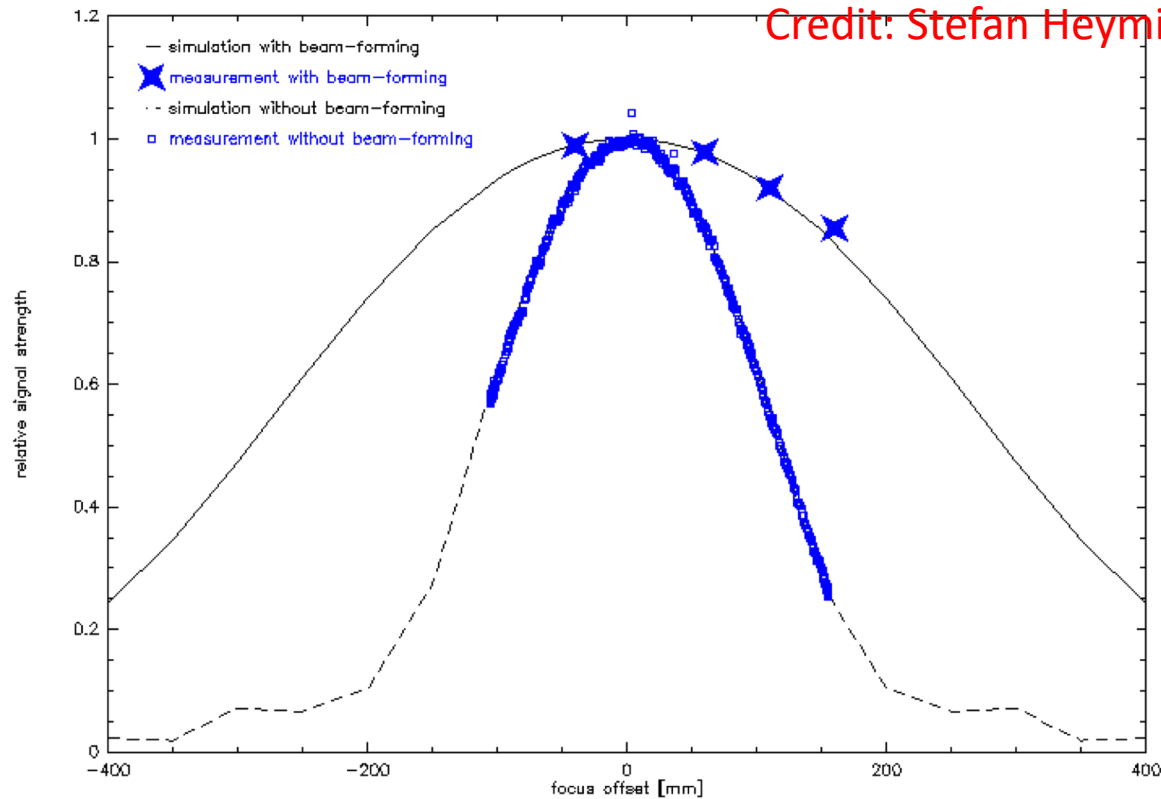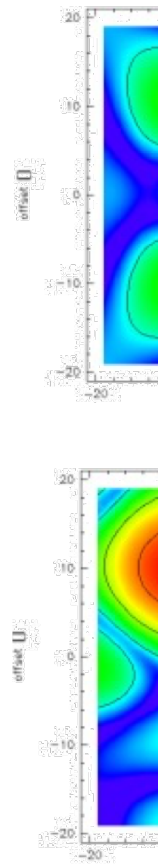
- Waterfall of cross scan on 3C147
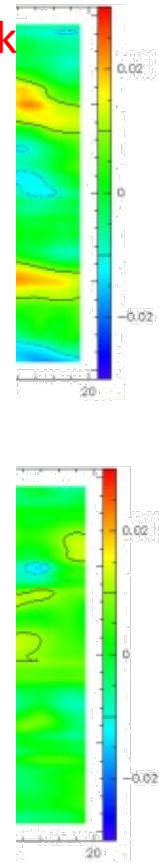- Realtime bandpass of all active beams

Engineering, II

- Pointing and map on calibration sources (3C295 and 3C286)

Engineering, III

- From left to right: simulated beam shape, measured beam pattern and the difference between them;

Credit: Stefan Heyminck

Engineering

- A small "pointing session" over the full El-range (black marks) shows a good pointing accuracy (< 0.5')

- Rotator axis is also close to nominal pointing (red marks / circle)

Credit: Stefan Heyminck
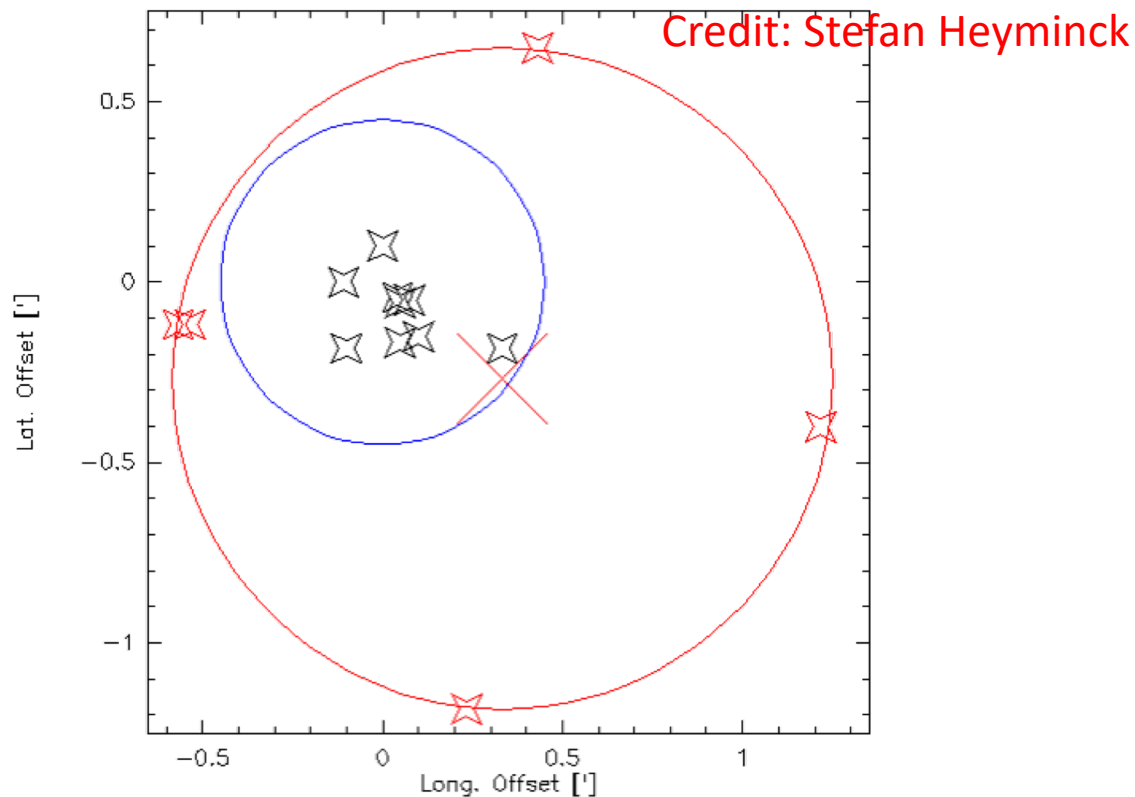
To finish

- To make a receiver system works on a telescope is very interesting;
- To develop pipelines from scratch and get result with them is also a great experience;
- Great to move back and keep working on pipeline development with GPU and FPGA;
- Cyro-PAF?

Thank you

Max-Planck-Institut
für
Radioastronomie

CSIRO