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Challenges and prospects for radio transients detection with the Phased Array Feeds

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Jodrell Bank Centre for Astrophysics

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The people

- JBCA: M. Keith, B. Stappers
- MPIfR: R. Karuppusamy, M. Kramer, L. Spitler, G. Wieching
- CSIRO: A. Chippendale, X. Deng, D. George, G. Hobbs, S. Johnston, C. Philips

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Why PAF?

- Larger field of view than with the standard receivers
- Digital beamforming
- Greater control over the beam separation – can improve localisation effort

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- Larger field of view than with the standard receivers
- Digital beamforming
- Greater control over the beam separation – can improve localisation effort

- New technology with a lot of room for improvements (e.g. T_{SYS})

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Why not PAF?

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Why not PAF?

- Bit difficult

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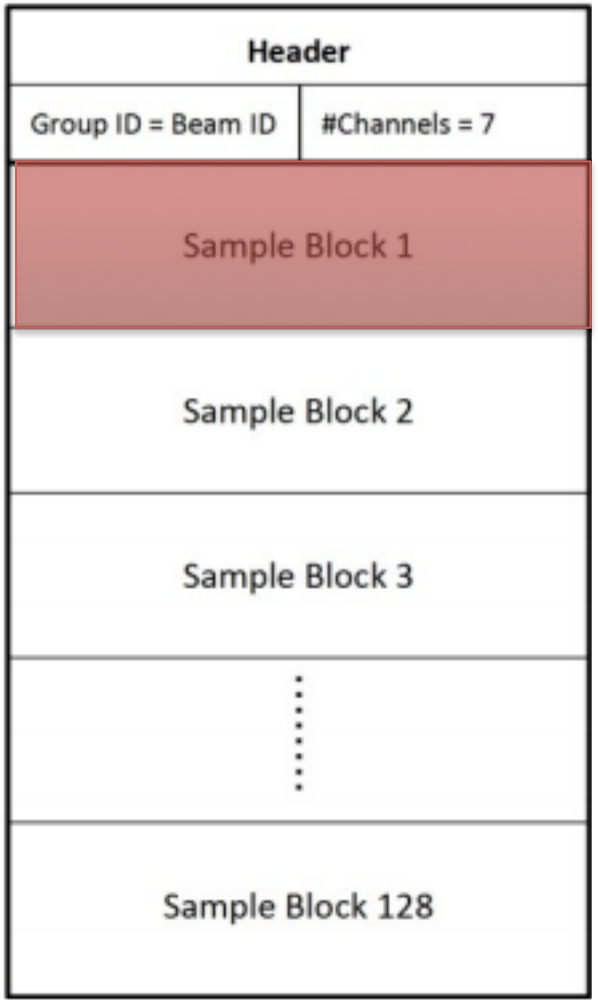
What we work with

- Pre-channelised data: 336 ‘1MHz’ channels
- 2 polarisations, complex sampled 16-bit data
- Beamforming done using 48 FPGAs
- Currently using 17(~50%) beams

~~VDIF2~~, ~~PDIF~~, CODIF

- 7 channels, 128 time samples per packet



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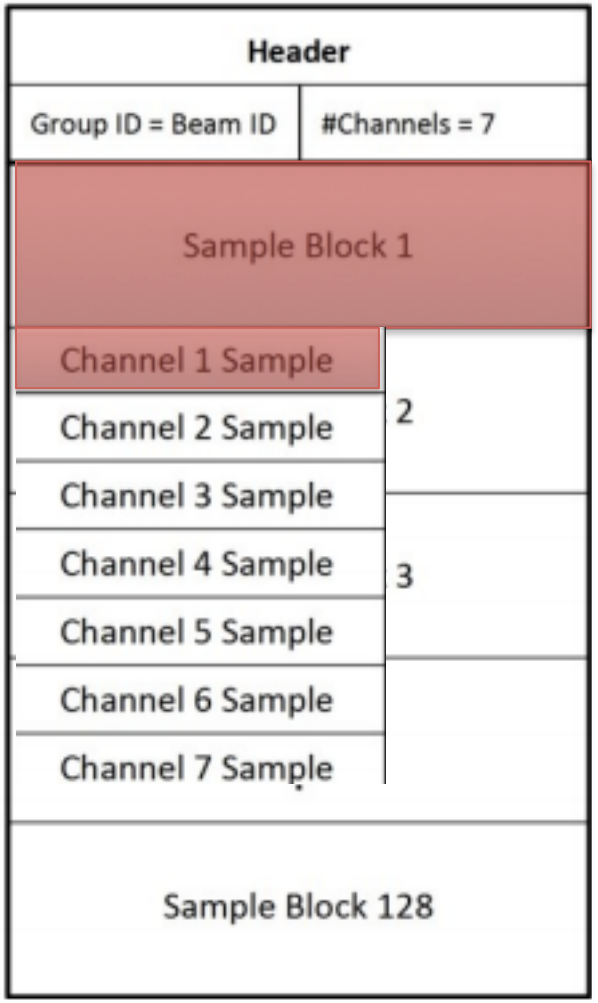

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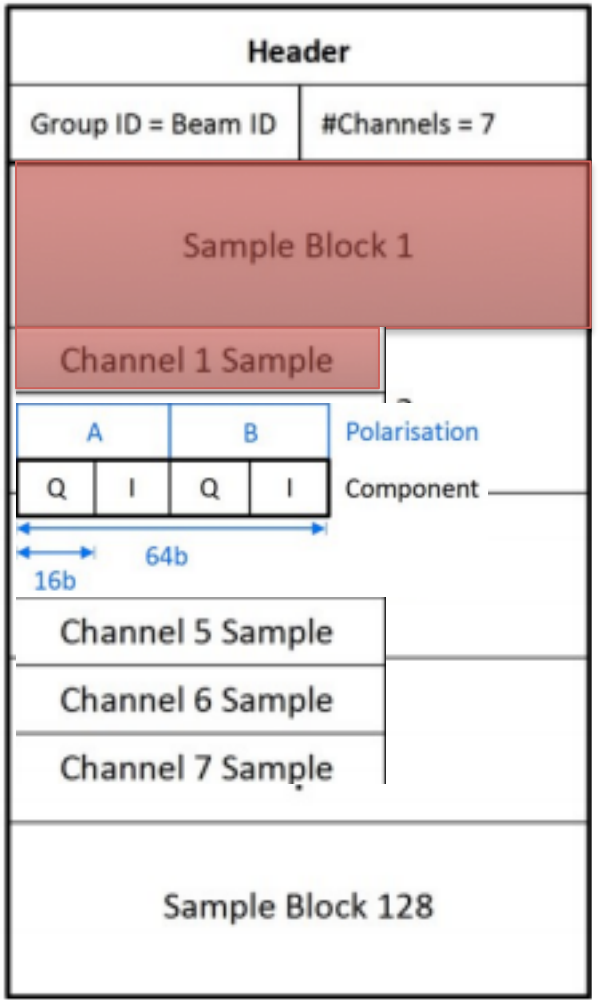
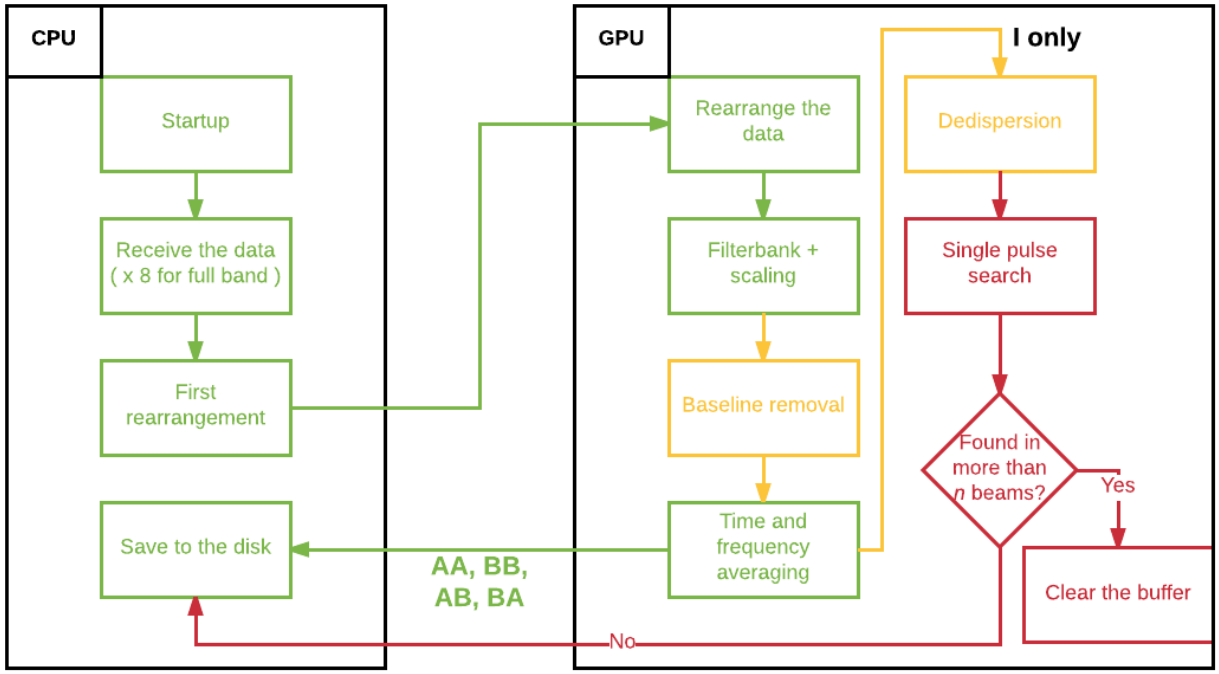


How we (aim to) search for FRBs



- Most of the work done on the GPUs
- Limit the amount of communication between CPU and GPU
- Eventually a real-time processing system

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Main challenges

- **Data comes at high rates (~25Gbps per beam) – challenging to capture and process in real time**
- Work done on GPUs: takes time to launch and copy the data – need to combine the processing in larger batches
- The output data rate is still large – need a lot of RAM and disk space
- Need to coordinate processing between multiple beams

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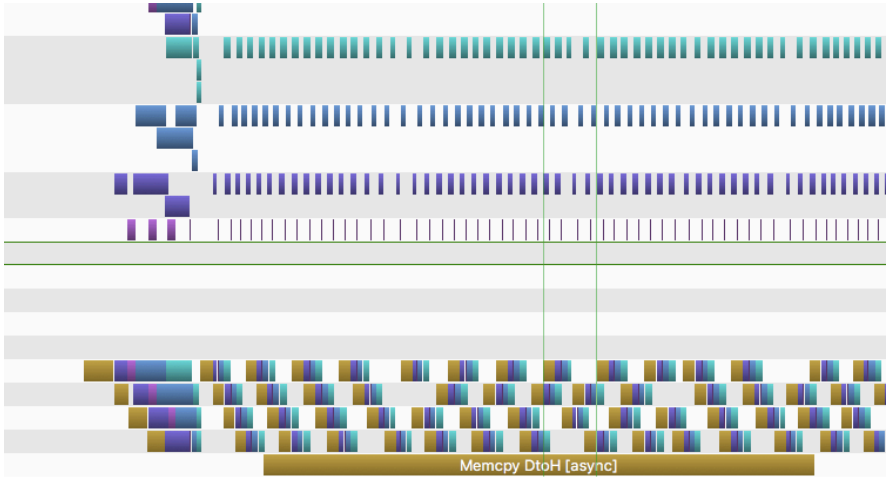
Milestones achieved



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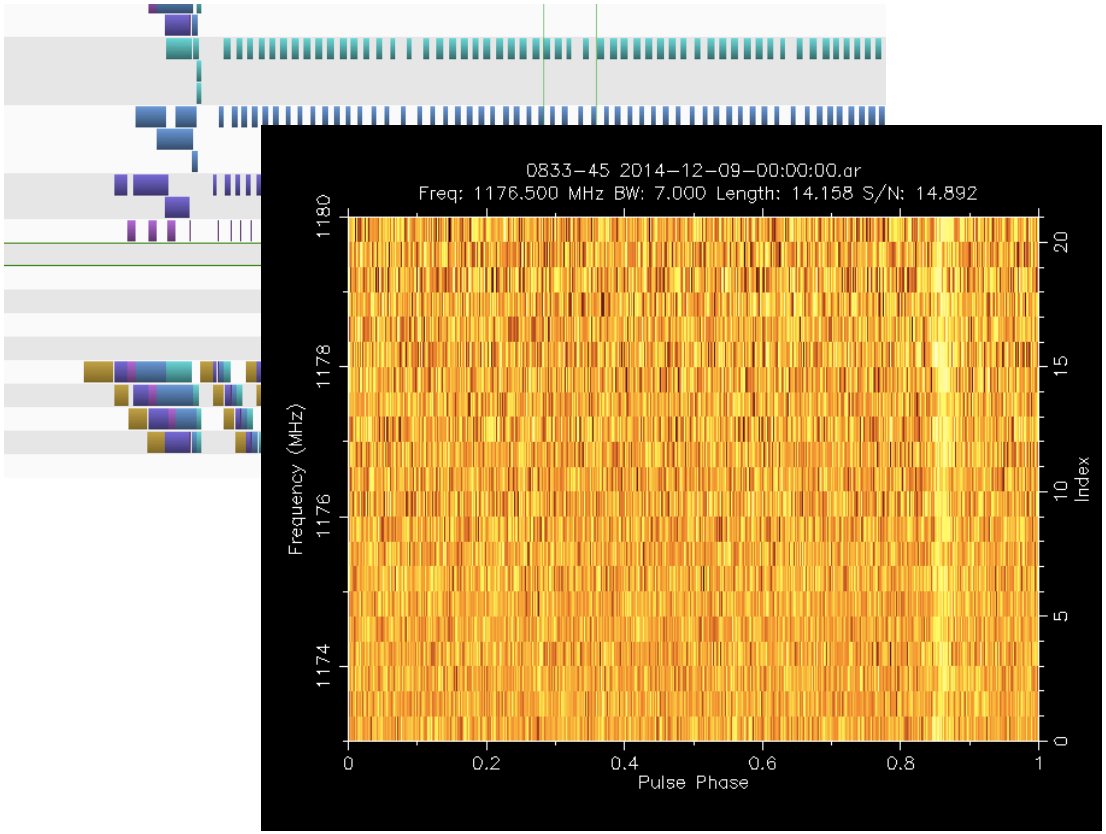

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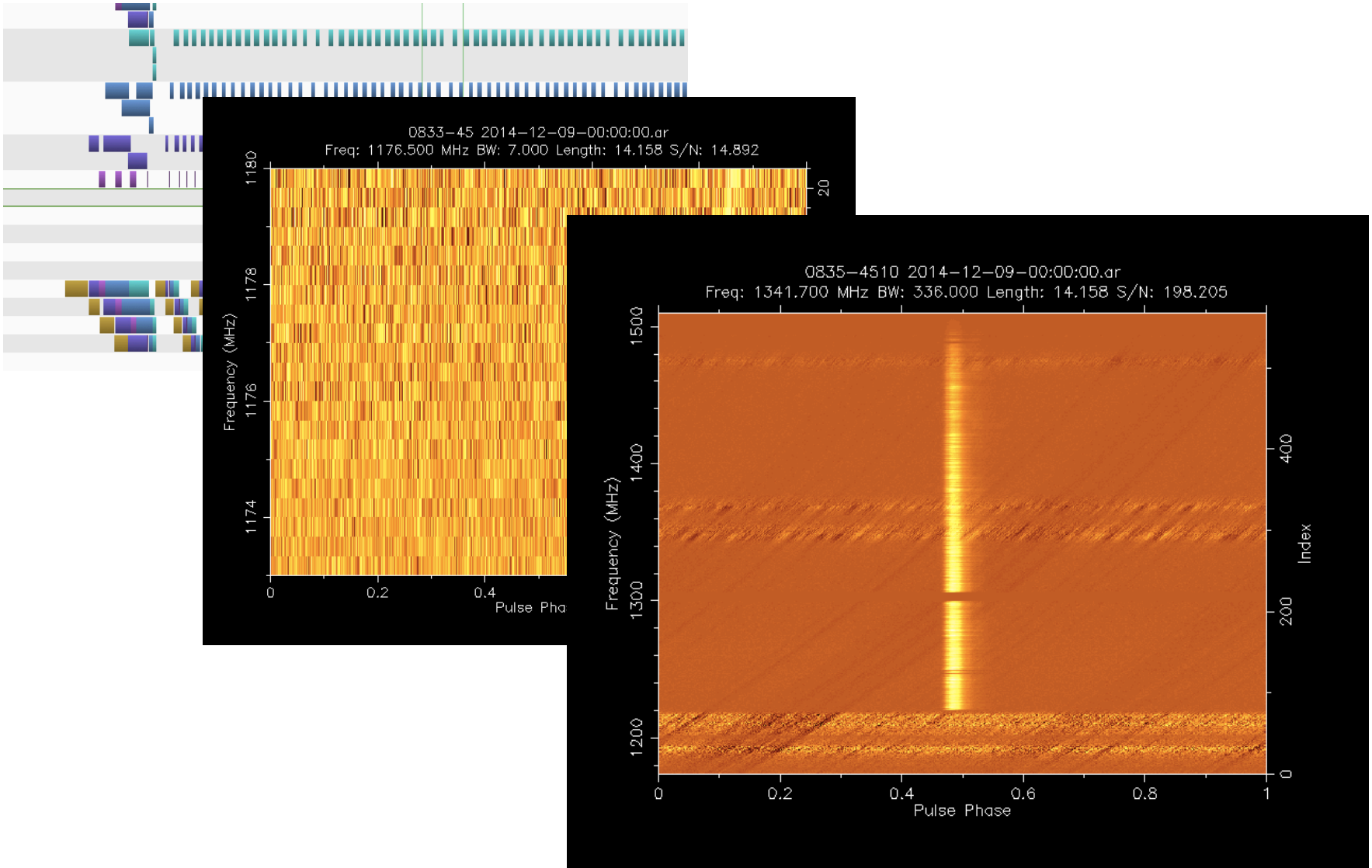

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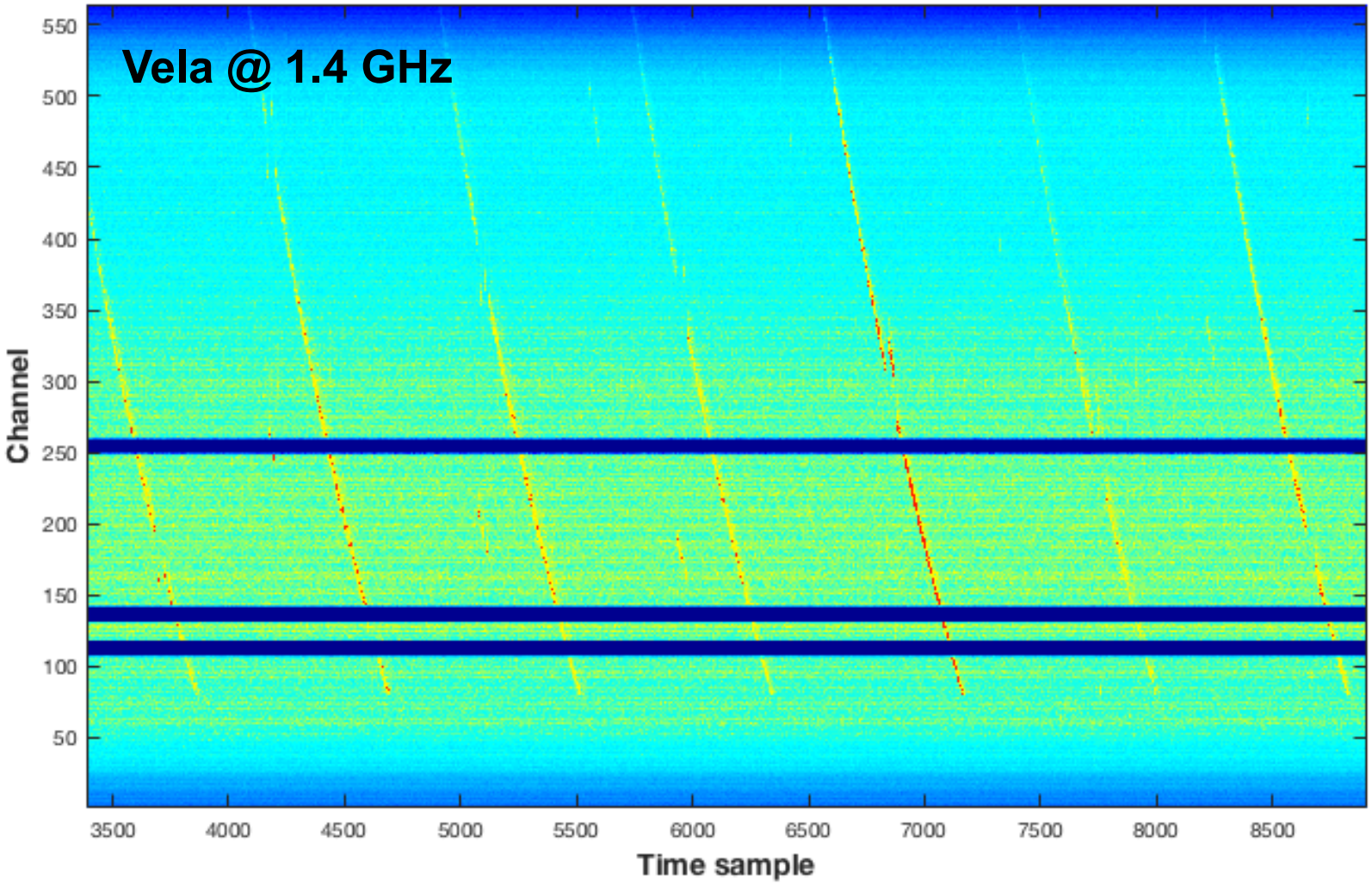
First results



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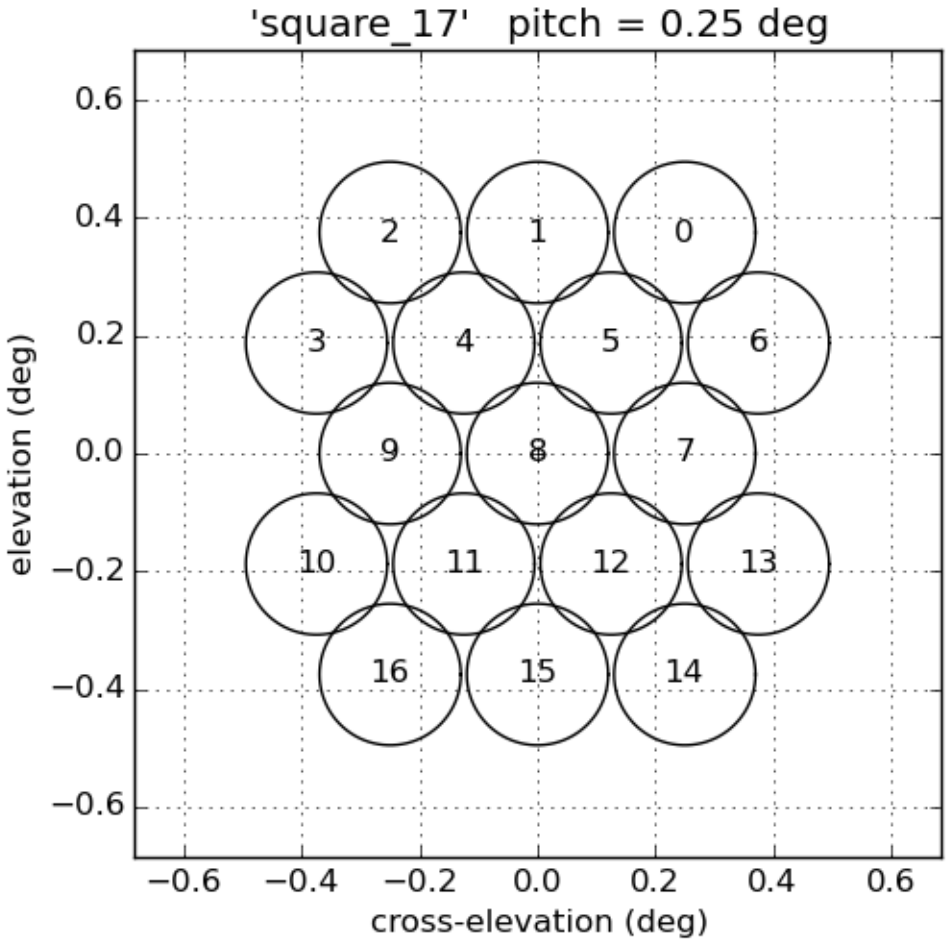

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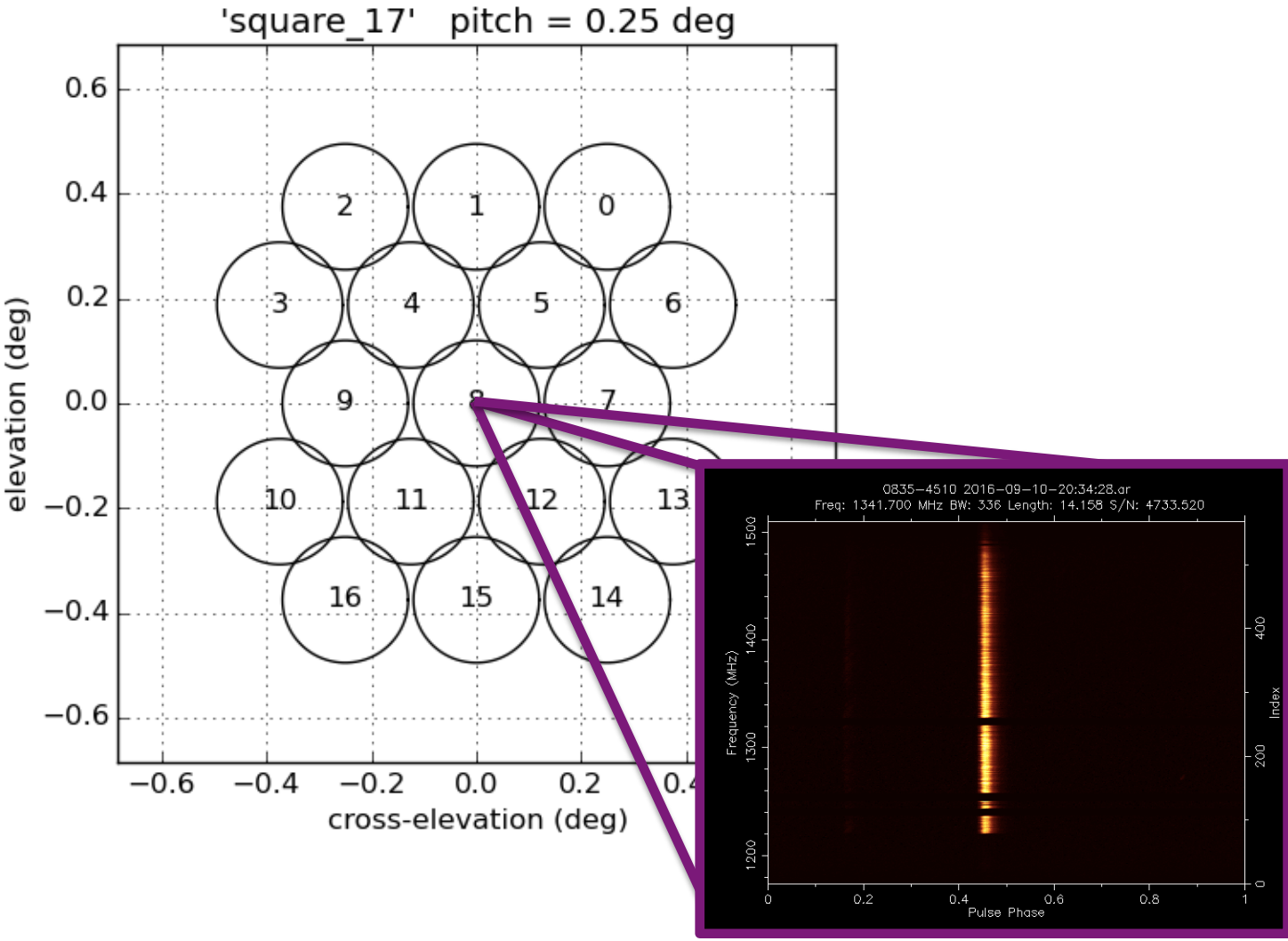

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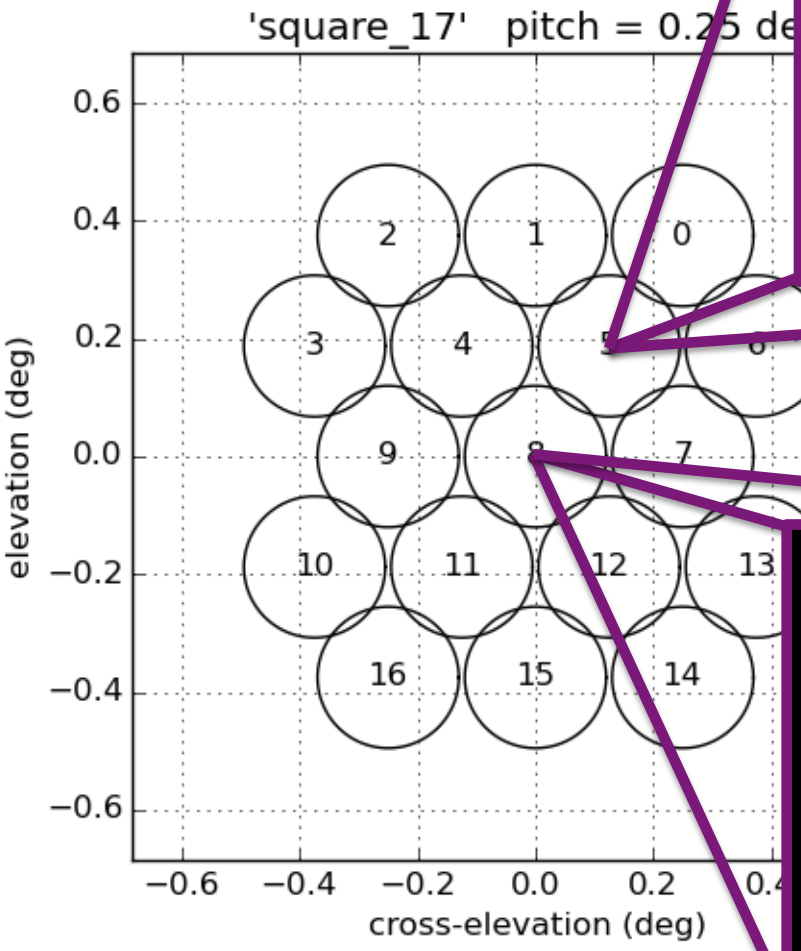

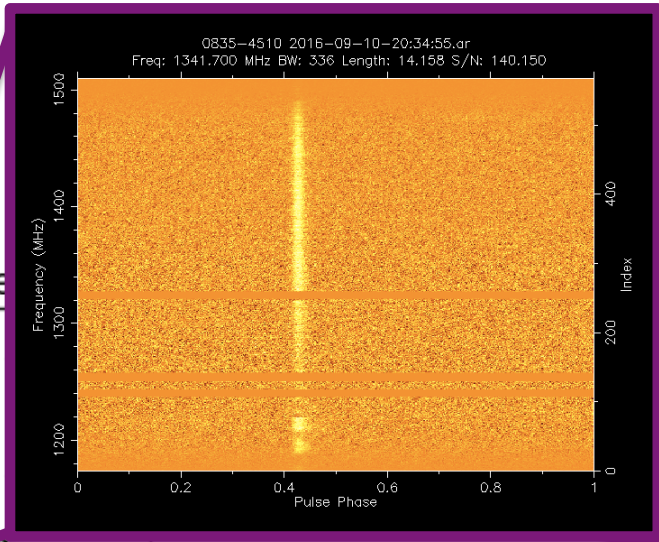

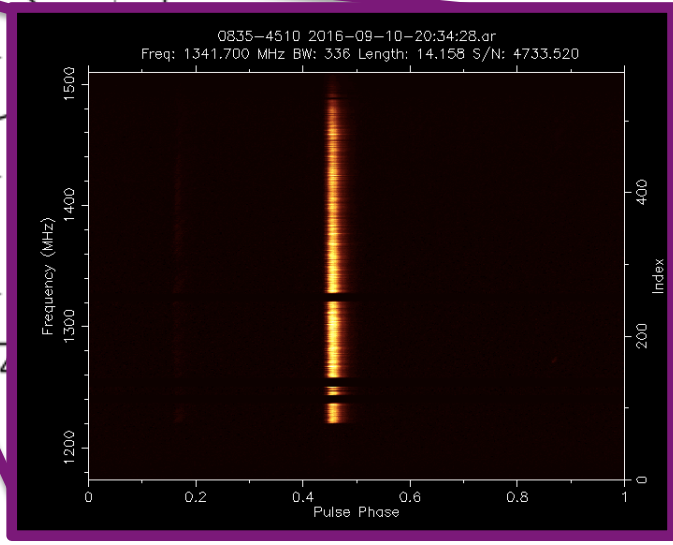

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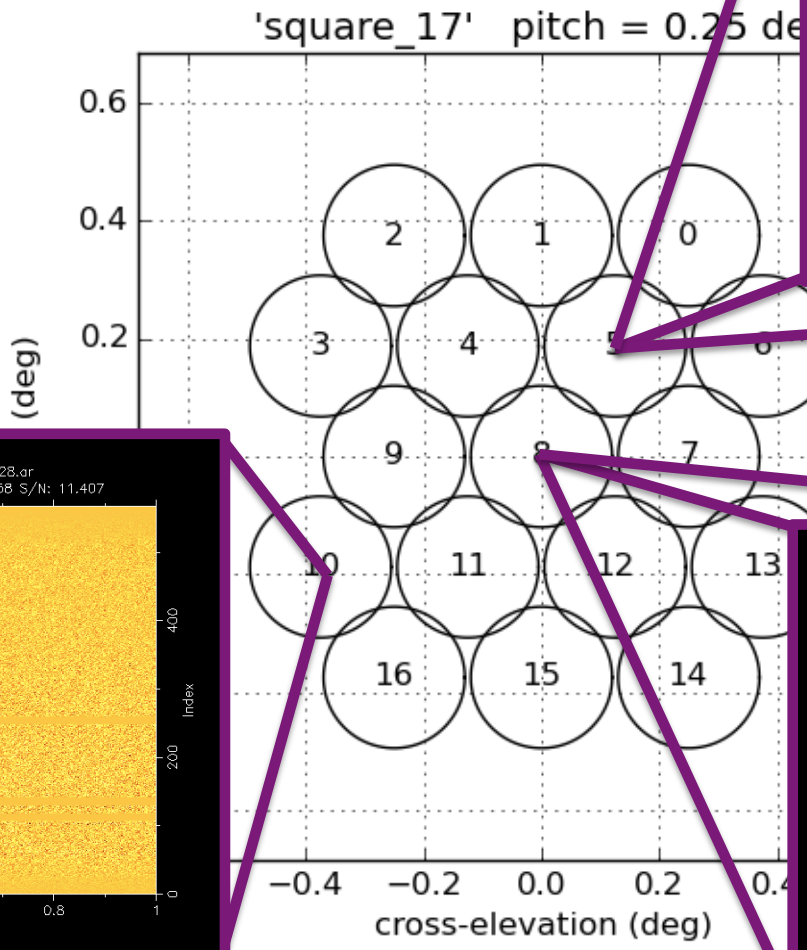
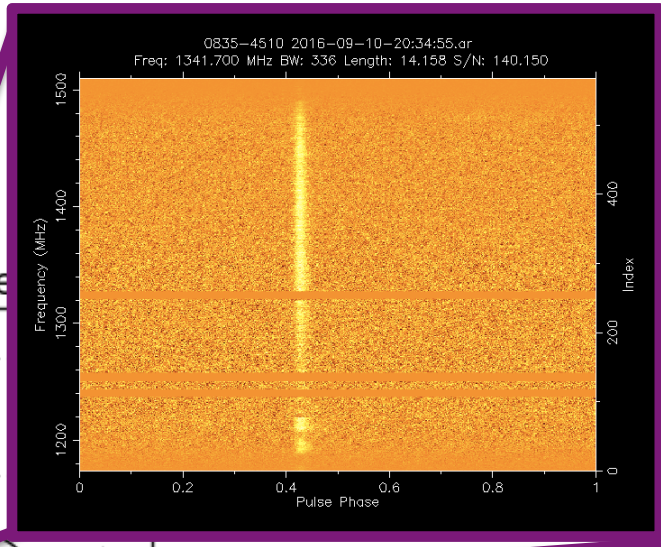
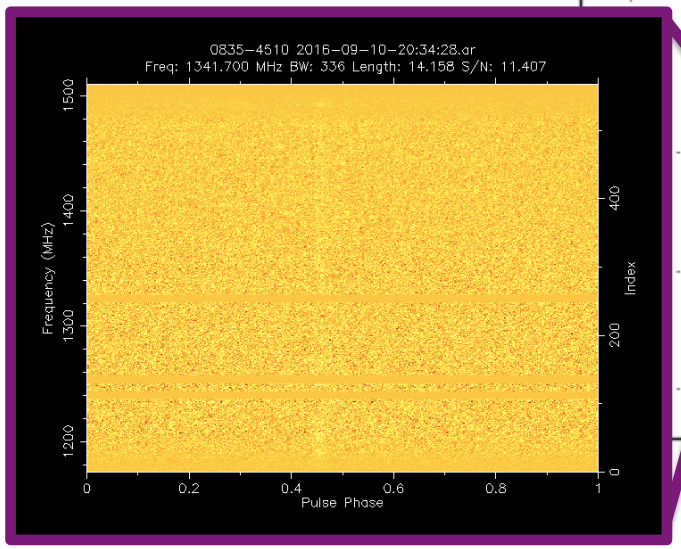
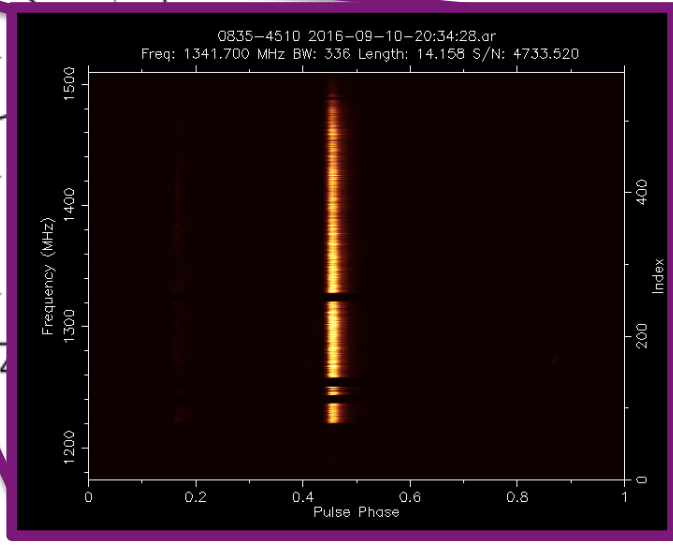


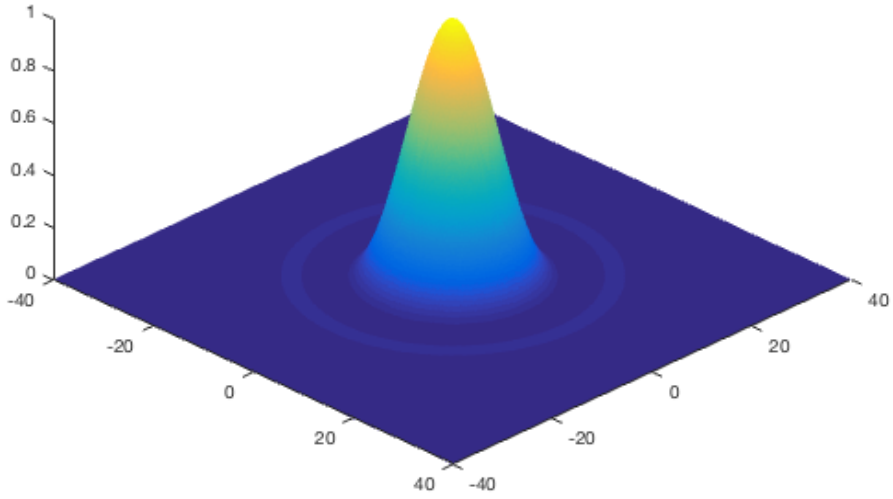






New localisation possibilities

Building on the work done by Obrocka et al., 2015



- Will provide better localisation at the cost of the survey speed
- Currently trying to find the ‘sweet spot’
- Experimental data will be added to the model for the first time

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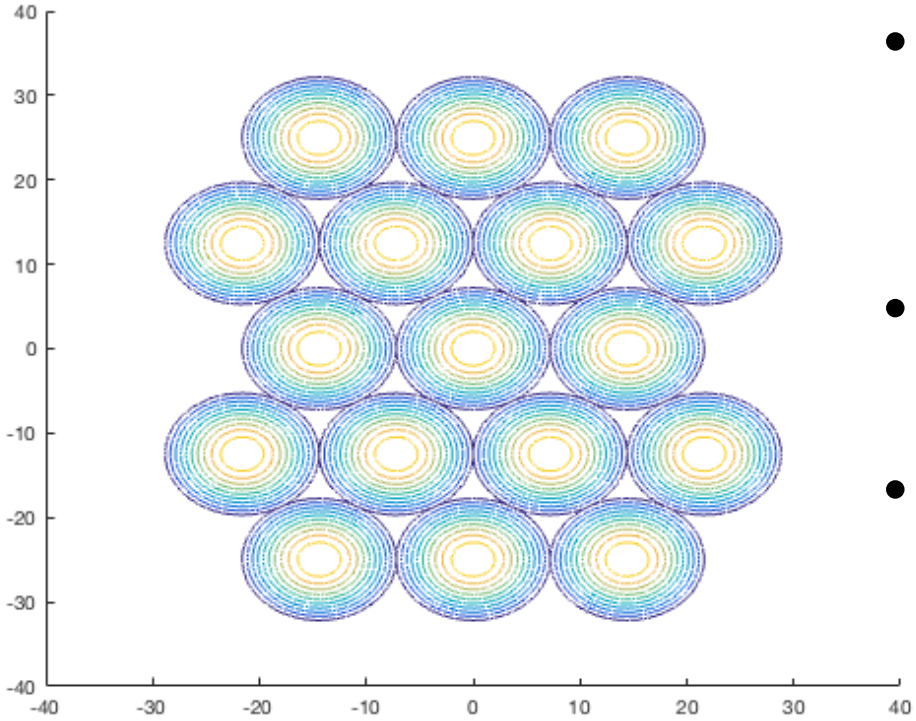

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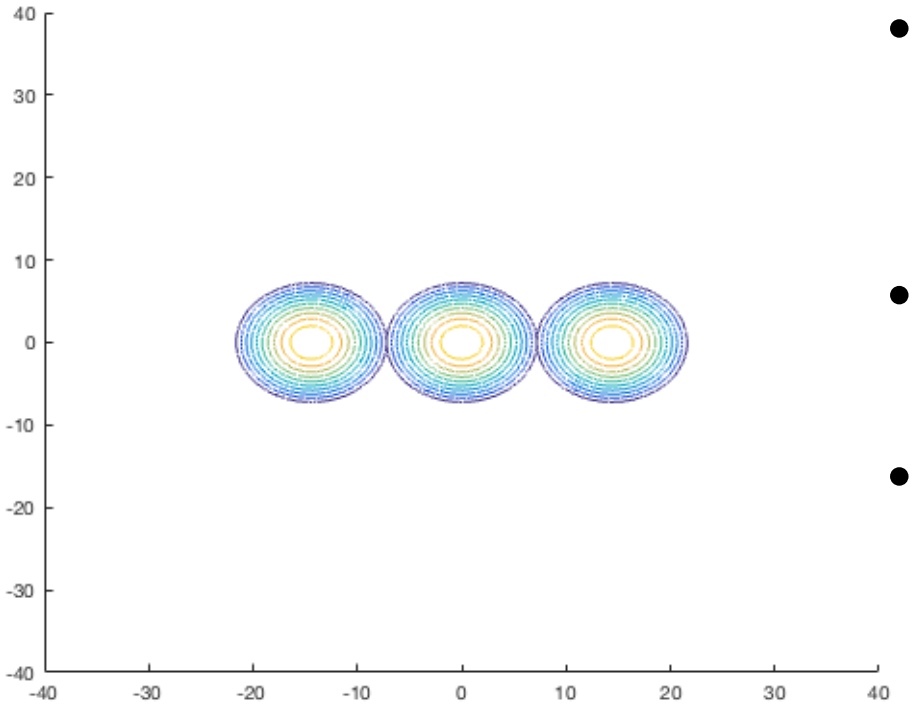

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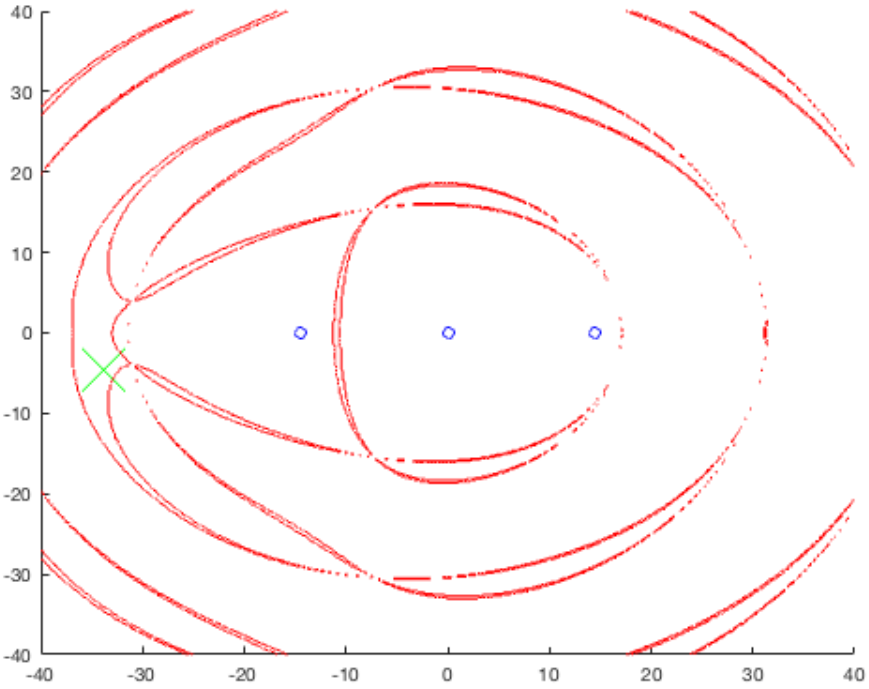

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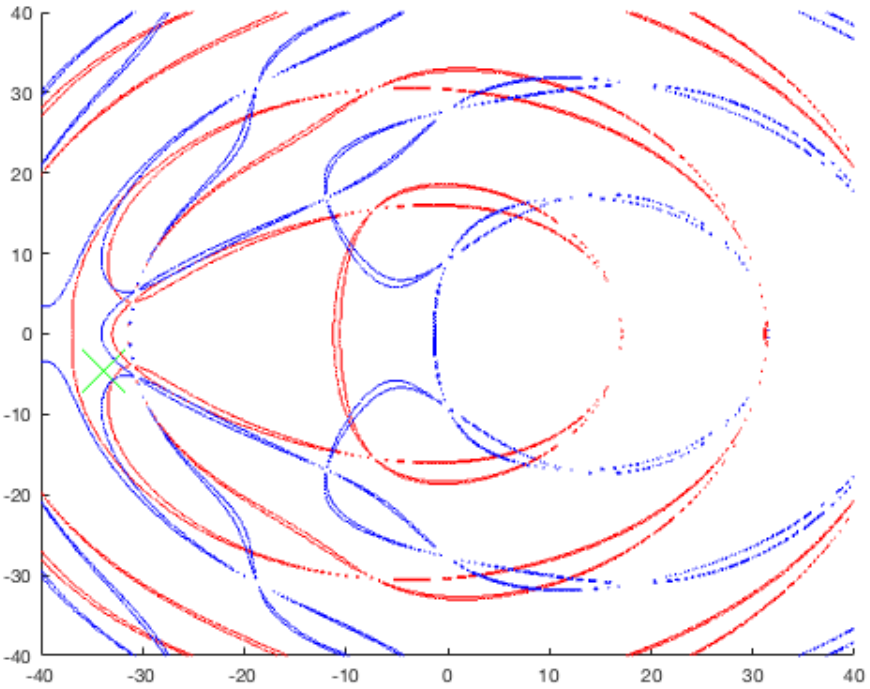

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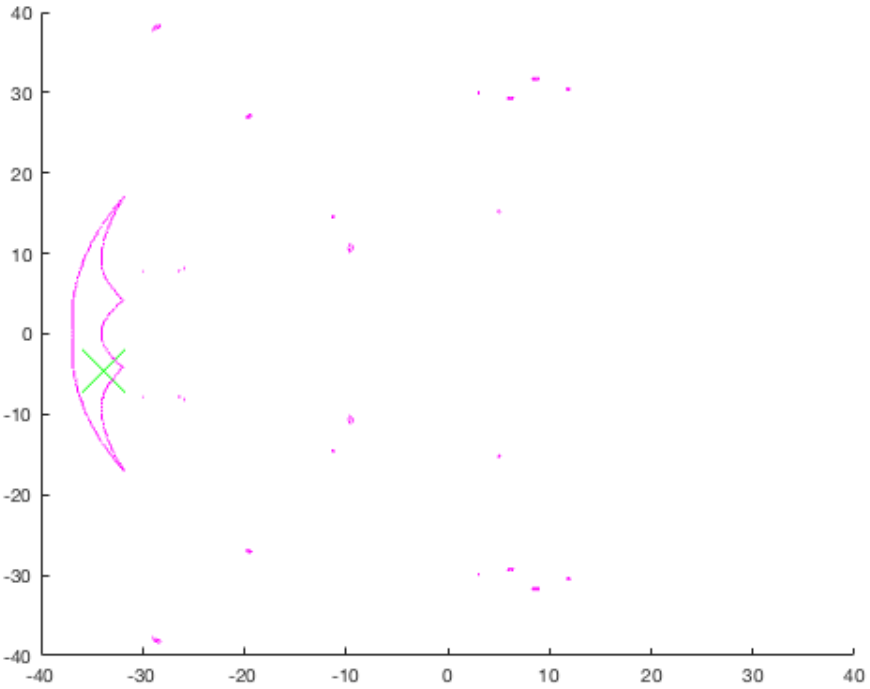

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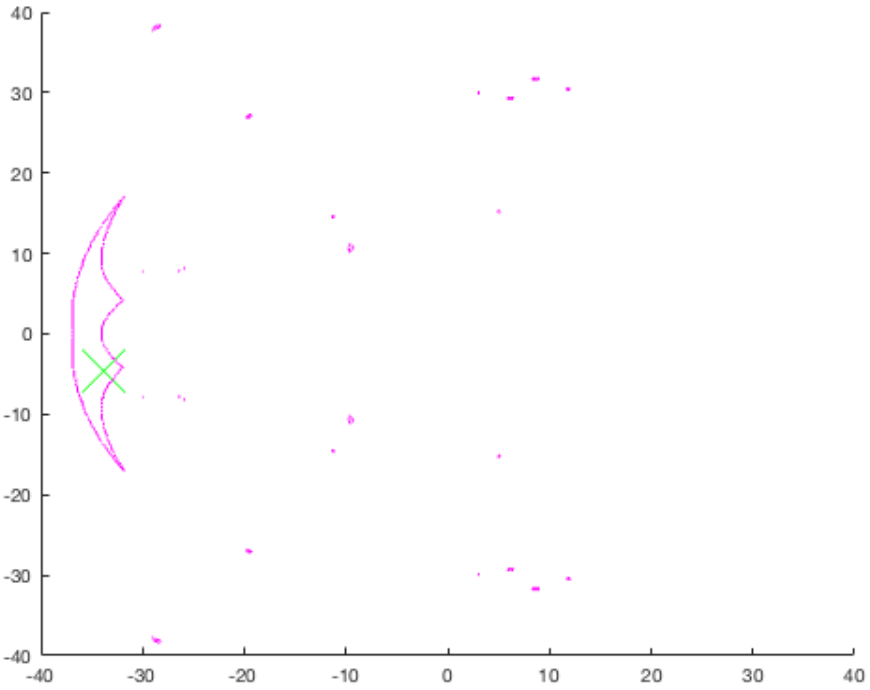

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“Localisation down to 1’ with PAF is **no brainer** and we should try something harder ”

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Future plans

- Use the remaining time on actual science
- Apply the knowledge from Parkes to Effelsberg deployment
- Apply the knowledge from Parkes and Effelsberg to Jodrell Bank deployment

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Thank you!