

# UTMOST-2D

**Arcsecond-level FRB localisation with Molonglo**

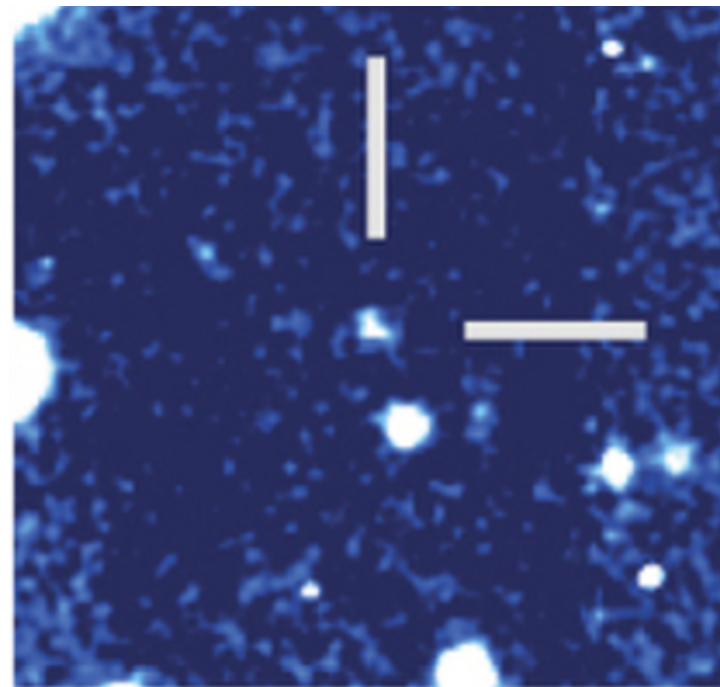
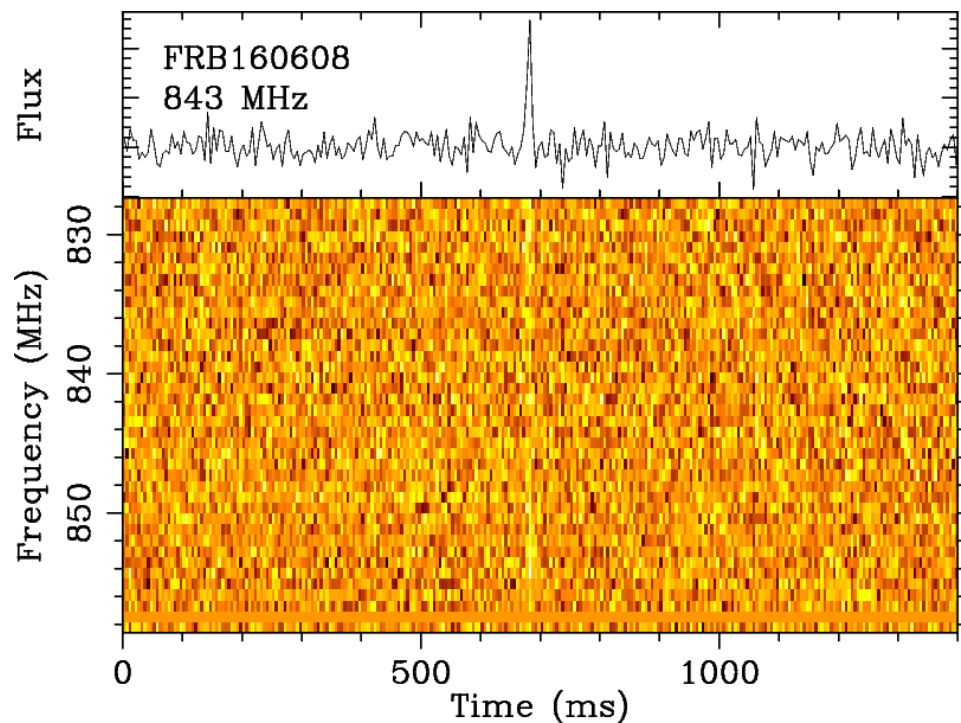


Adam Deller  
Aspen, 16 Feb 2017



# UTMOST-2D: What is it?

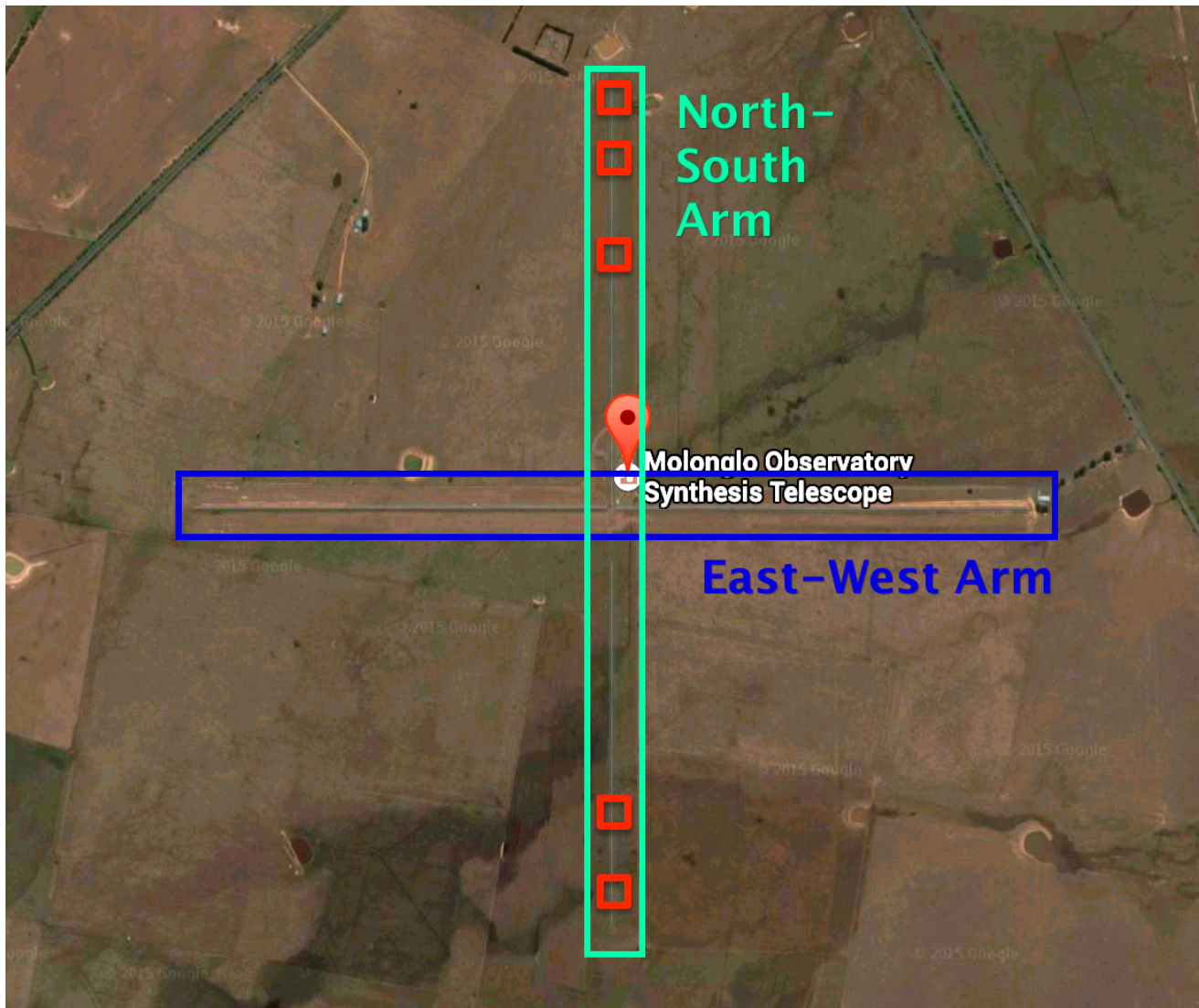
A project to get dozens of FRB host galaxies  
( $>40\%$  of the FRBs detected by UTMOST)



# What does it look like?

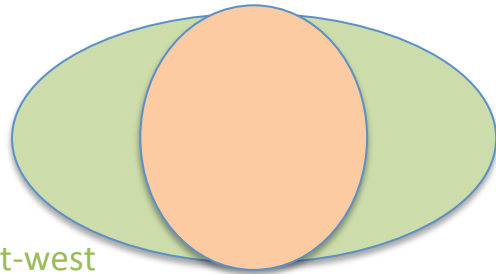


# What does it look like?

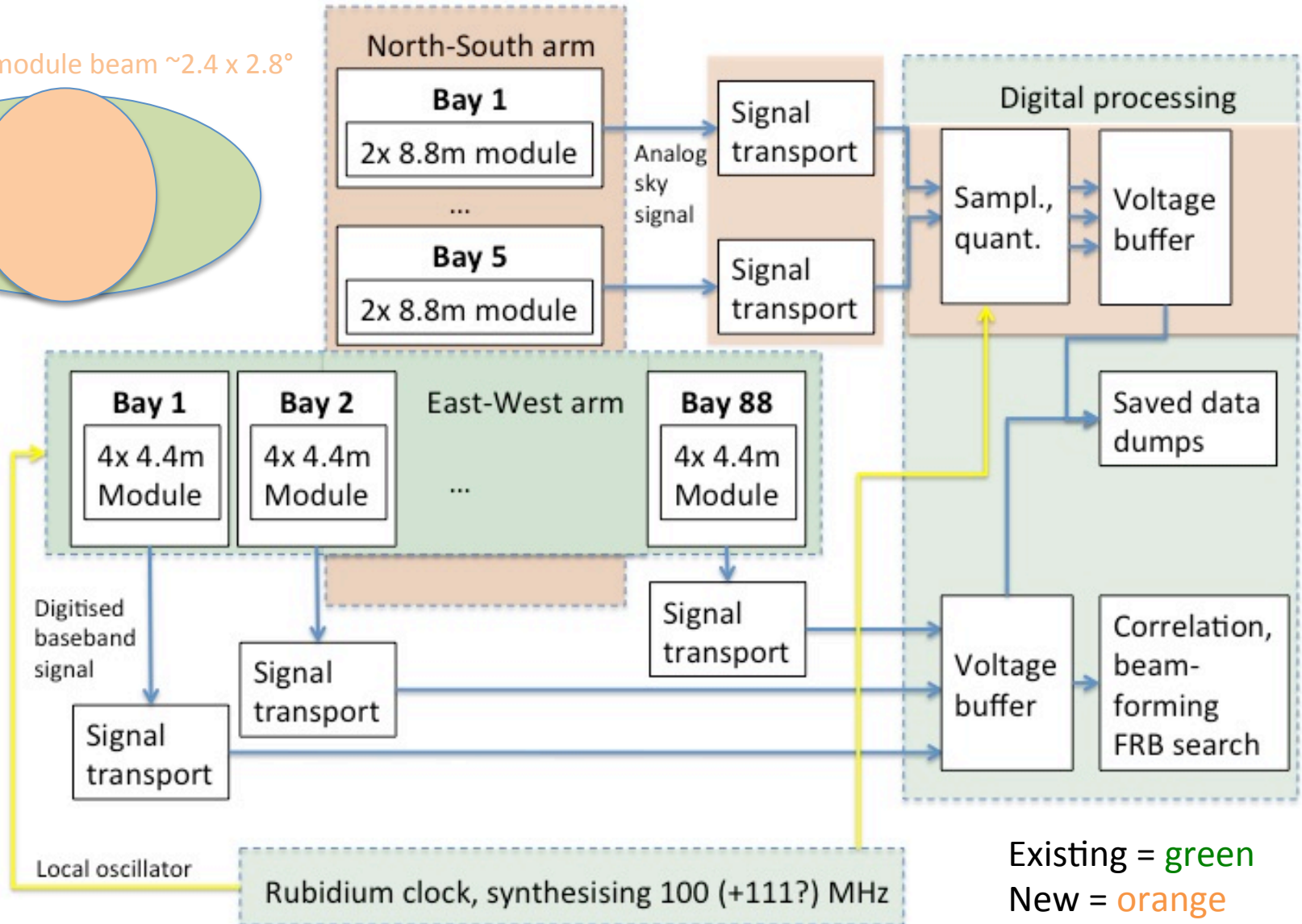


# How will it localise FRBs?

North-south module beam  $\sim 2.4 \times 2.8^\circ$

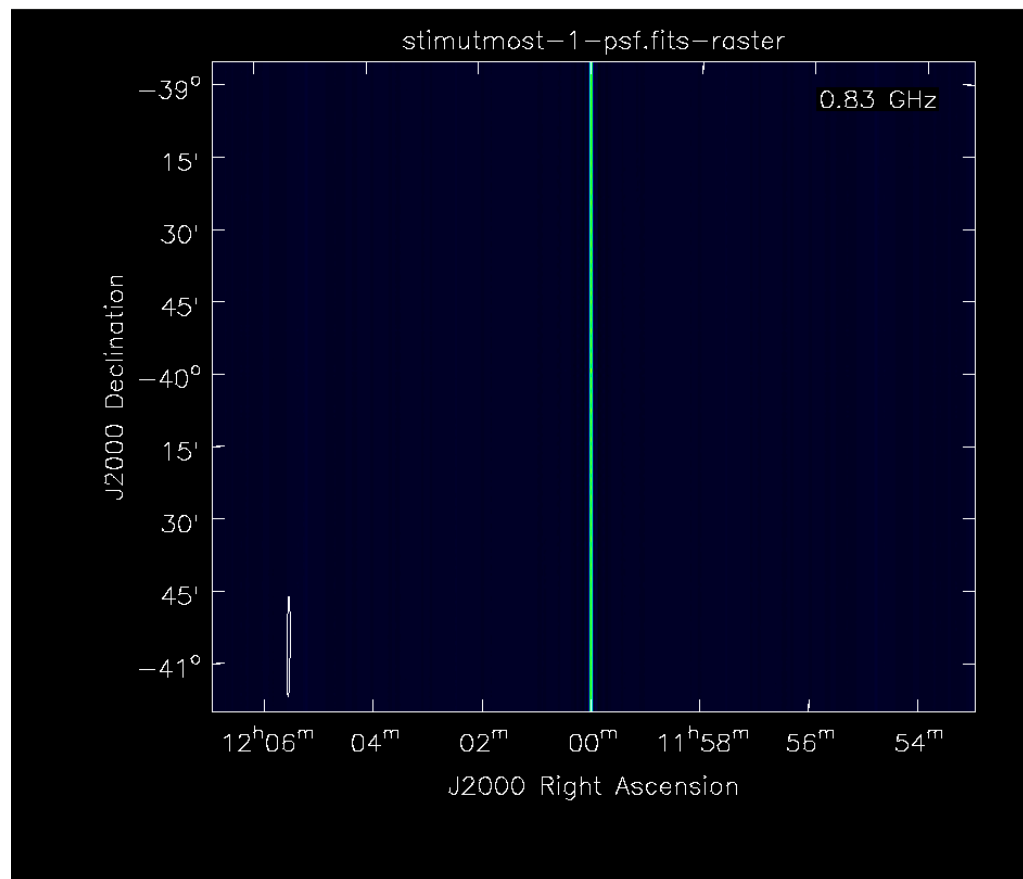
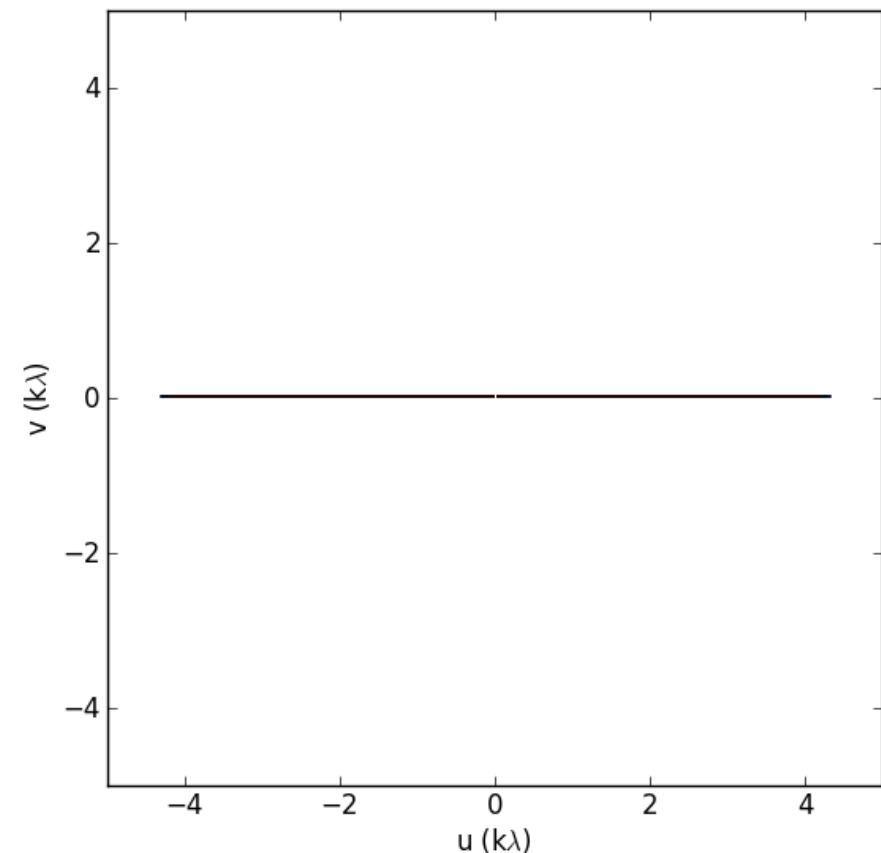


East-west module beam  
 $\sim 5 \times 2.6^\circ$



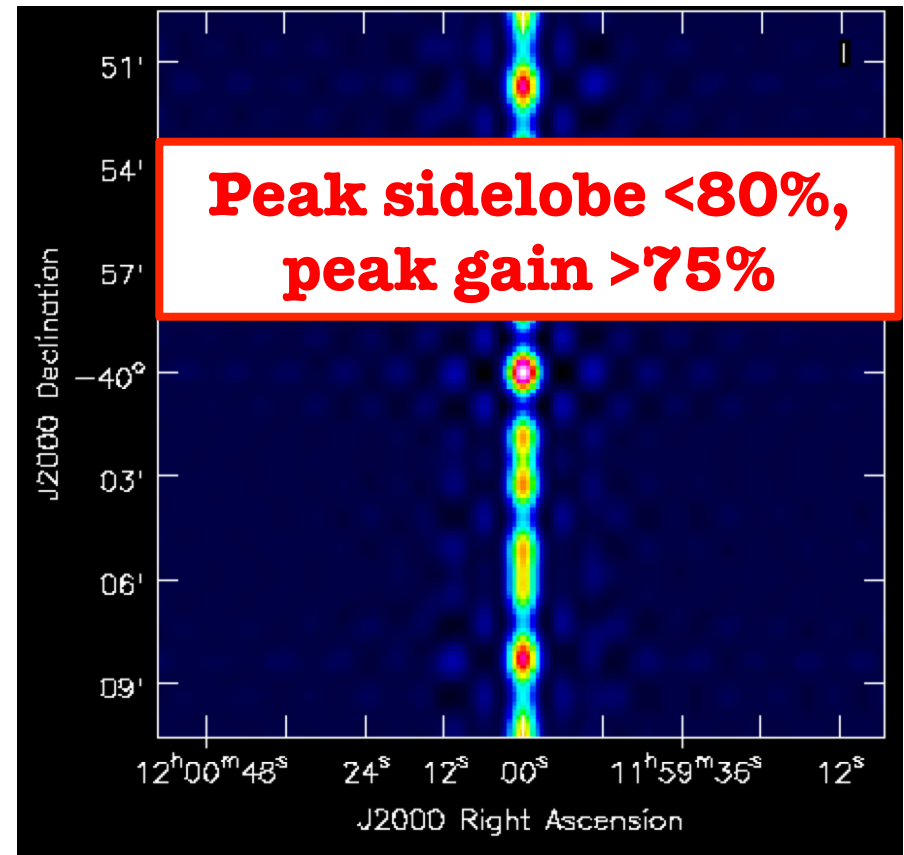
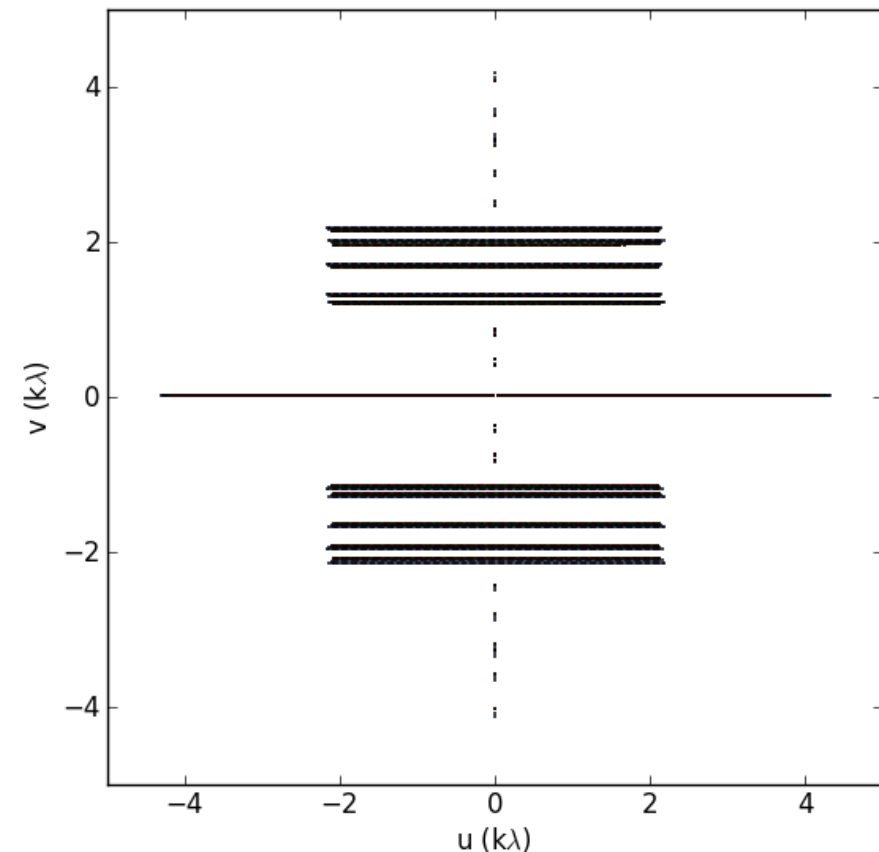
# What are the new capabilities?

UTMOST-EW: 0 non-east/west baselines,  
 $45'' \times 2.8^\circ$  synthesised beam



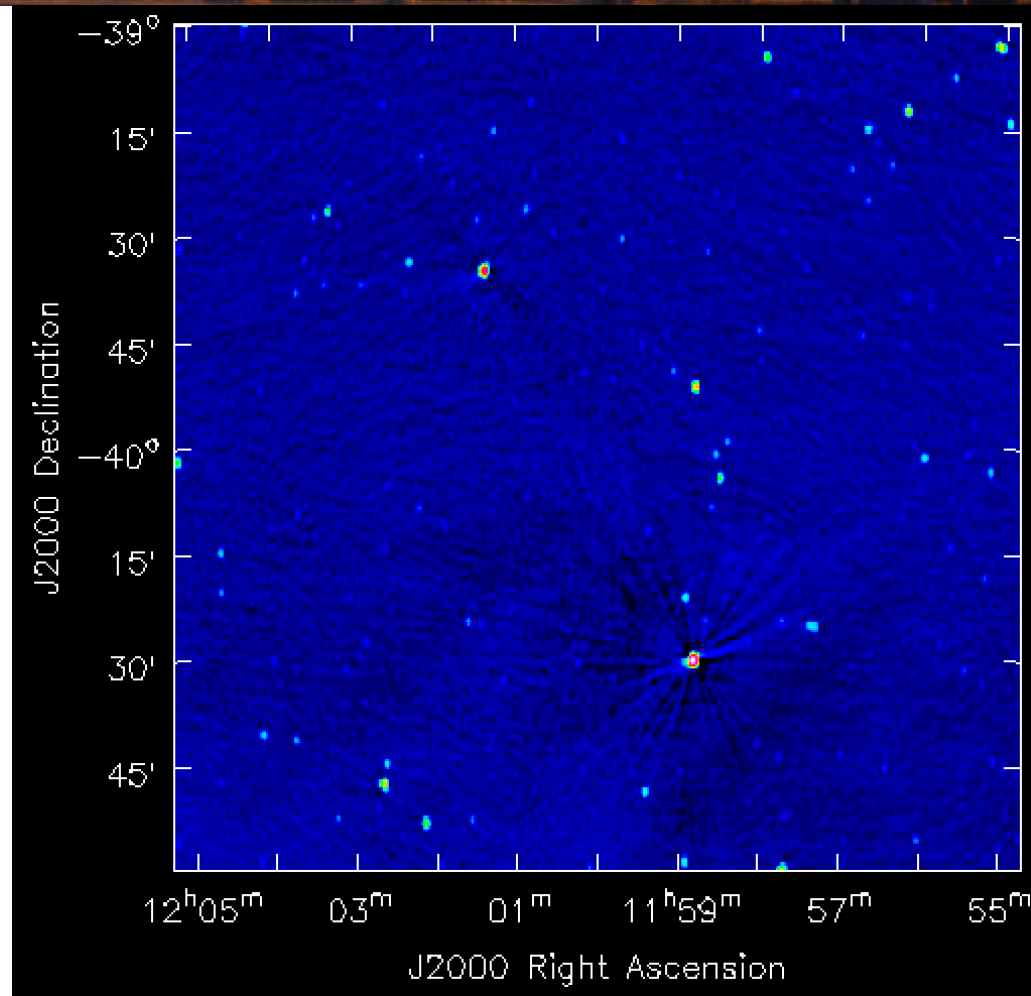
# What are the new capabilities?

UTMOST-2D: >3500 non-east/west baselines,  
60" x 45" synthesised beam



# How do we get the positions?

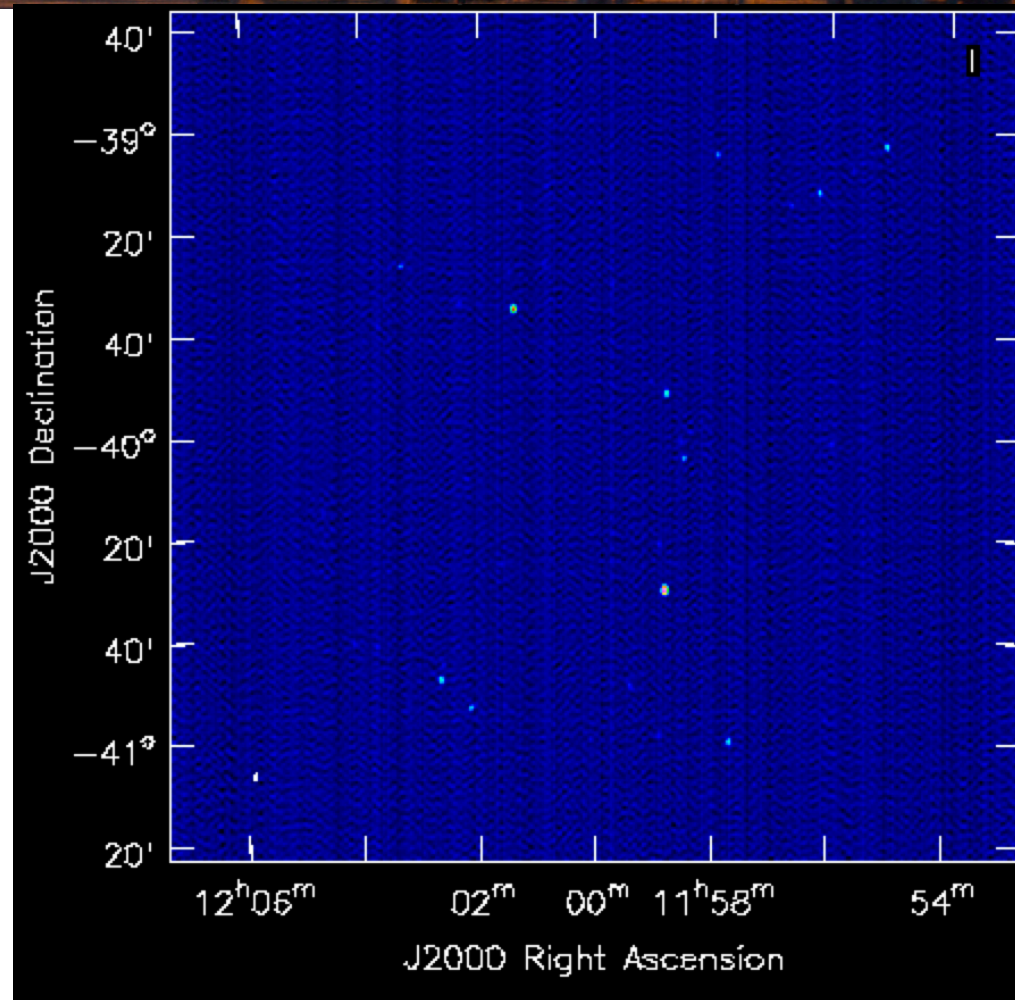
- Image dumped visibility data (1-2s)
- Calibrate using reference image (SUMSS/NVSS)



SUMSS image 12h00m00s -40d00'00"

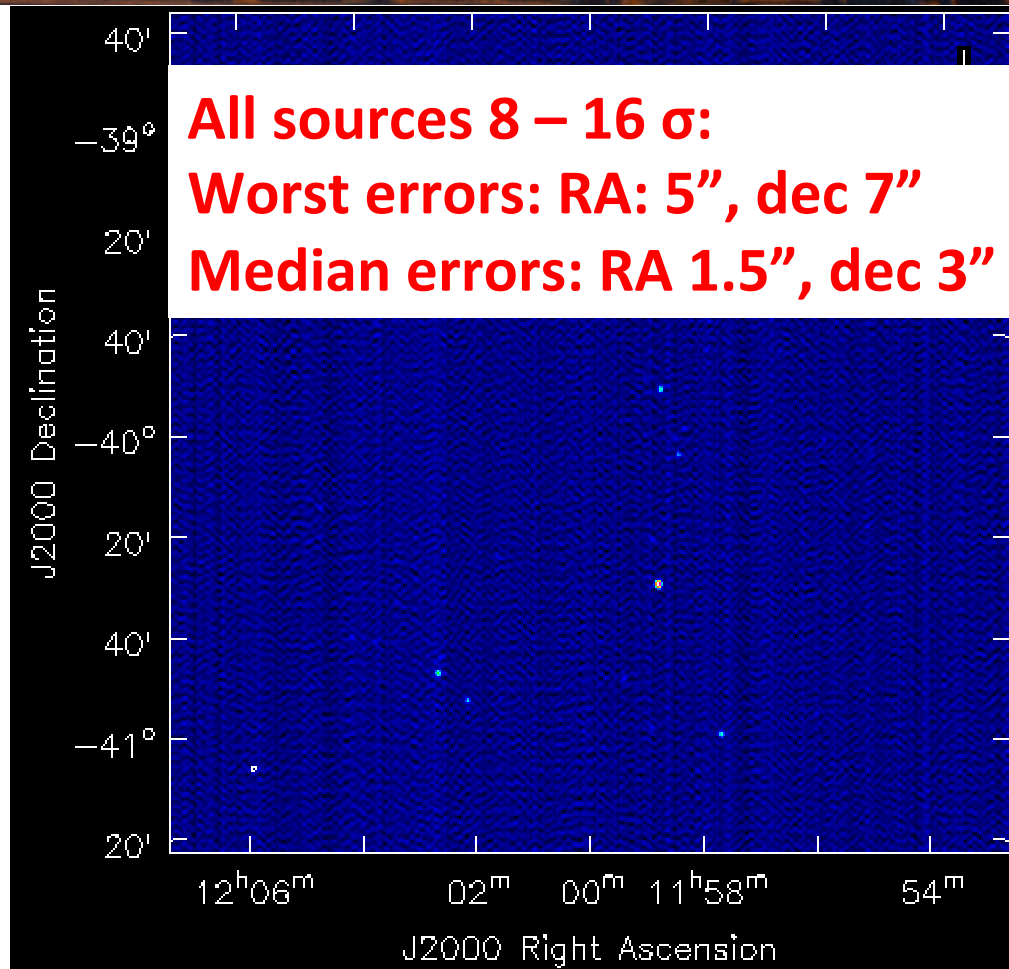
# How do we get the positions?

- Image dumped visibility data (1-2s)
- Simulated image (with noise, no gain errors)



# How do we get the positions?

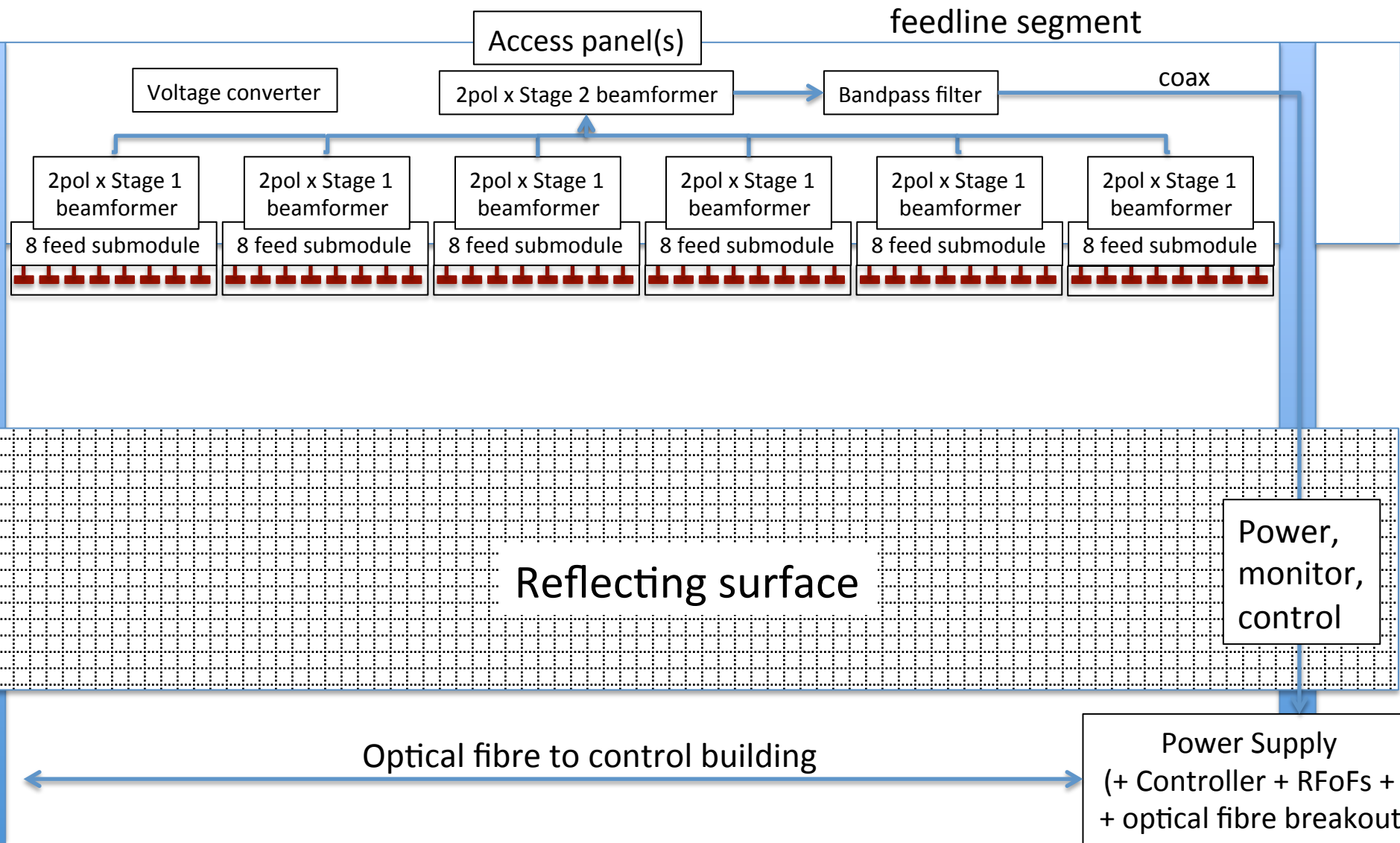
- Image dumped visibility data (1-2s)
- Simulated image (with noise + gain errors up to 50% and  $90^\circ$ , self-calibrated)



# How will we build it?



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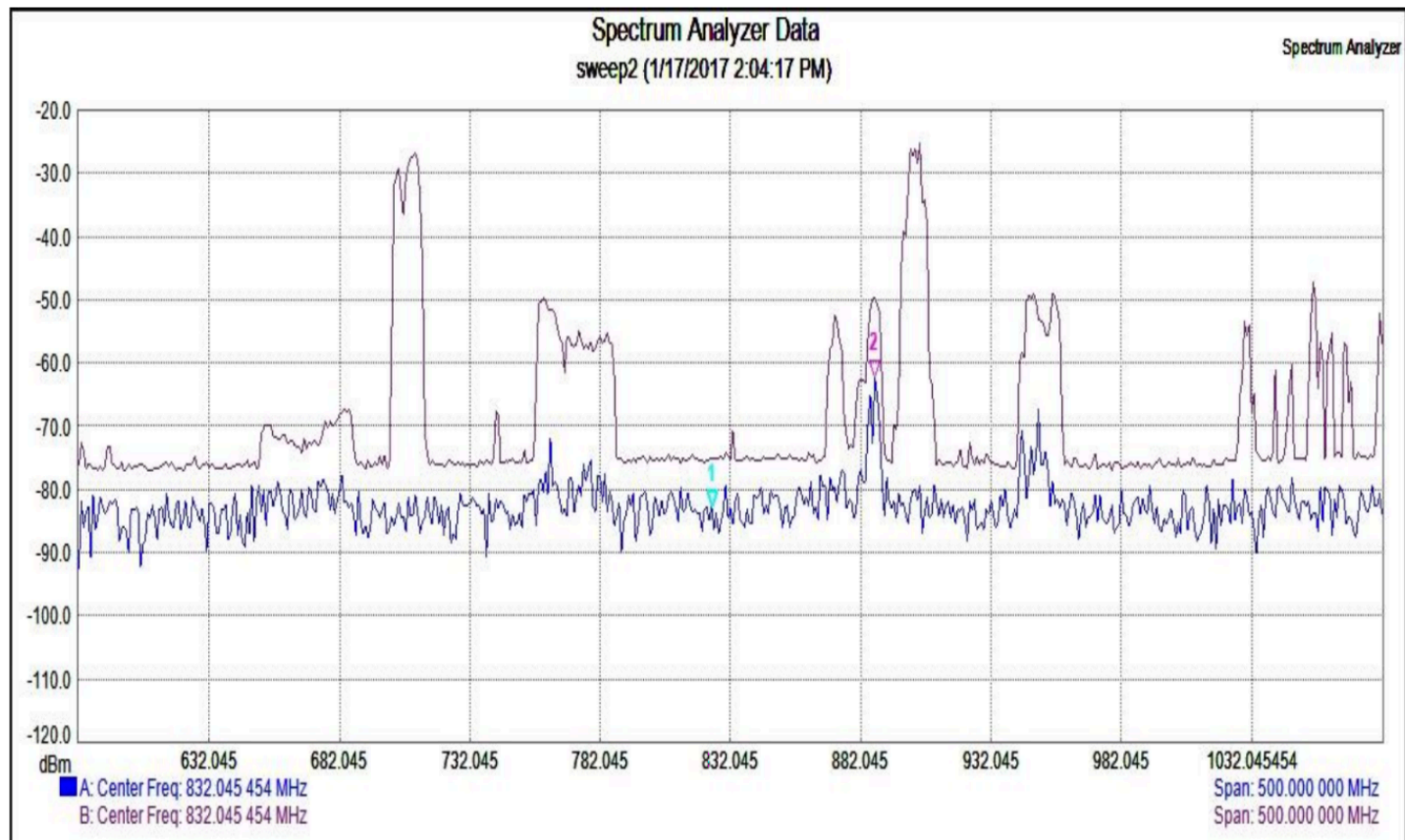
A photograph of a large radio telescope array, likely the Murchison Widefield Array (MWA), at dusk. The image shows a long row of yellow support structures for the antenna elements, stretching into the distance. The sky is a mix of orange and blue, and the overall scene is illuminated by the low light of the setting or rising sun.

# Module specifications

- $T_{\text{sys}}$ : 80K
- Size: 8.8 x 11.6 m
- FoV:  $2.8 \times 2.2^\circ$
- SEFD: 4500 Jy
- Polarisation: dual linear
- Bandwidth: 790 – 865 MHz
- Zenith angle coverage:  $>45^\circ$

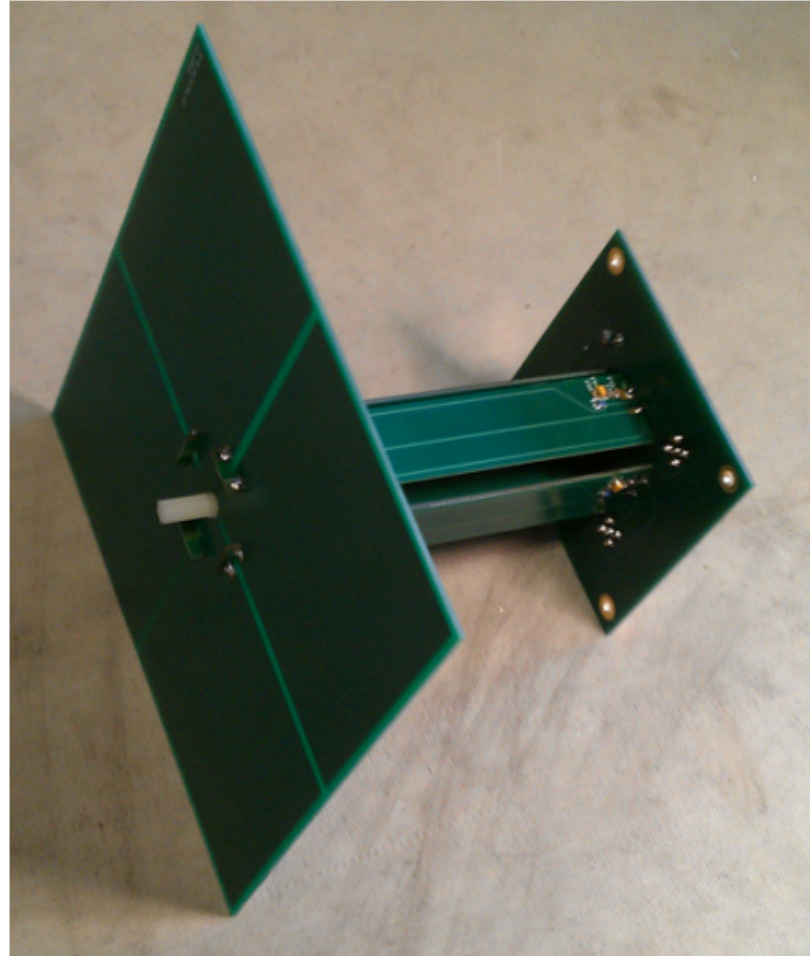
# What are the challenges?

- RFI on-site



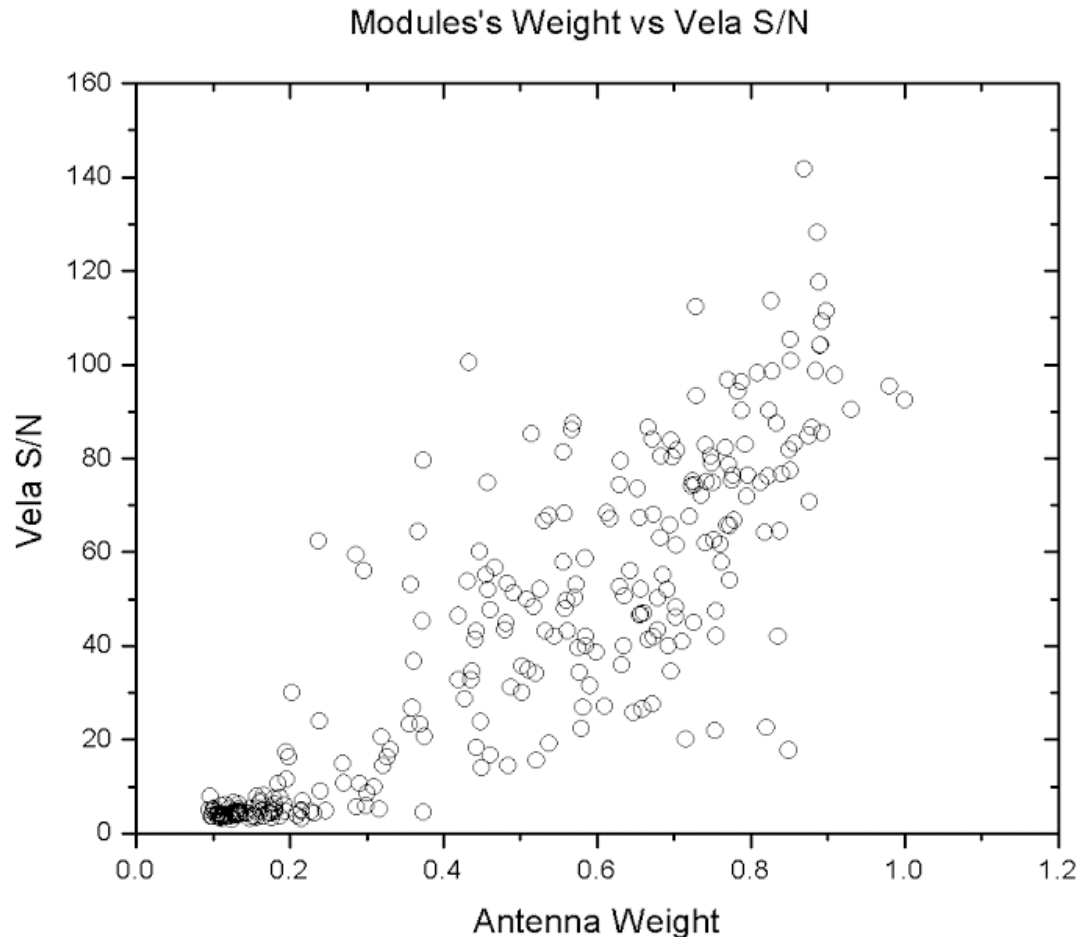
# What are the challenges?

- RFI on-site
- RF engineer time



# What are the challenges?

- RFI on-site
- RF engineer time
- UTMOST sensitivity



A photograph of a large radio telescope array, likely the Square Kilometer Array, with many yellow support structures and long cables stretching across a landscape under a sunset sky. The word "Timeline" is overlaid in white text.

# Timeline

- Project commenced: October 2016
- Requirements: Q4 2016
- Component design: Q1, Q2 2017
- Manufacturing / prototyping: Q3 2017
- Module testing: Q4 2017
- Science commissioning: Q1 2018