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Crossed Octagonal Ring Antenna (C-ORA) Array and Analogue Beamformer Demonstration

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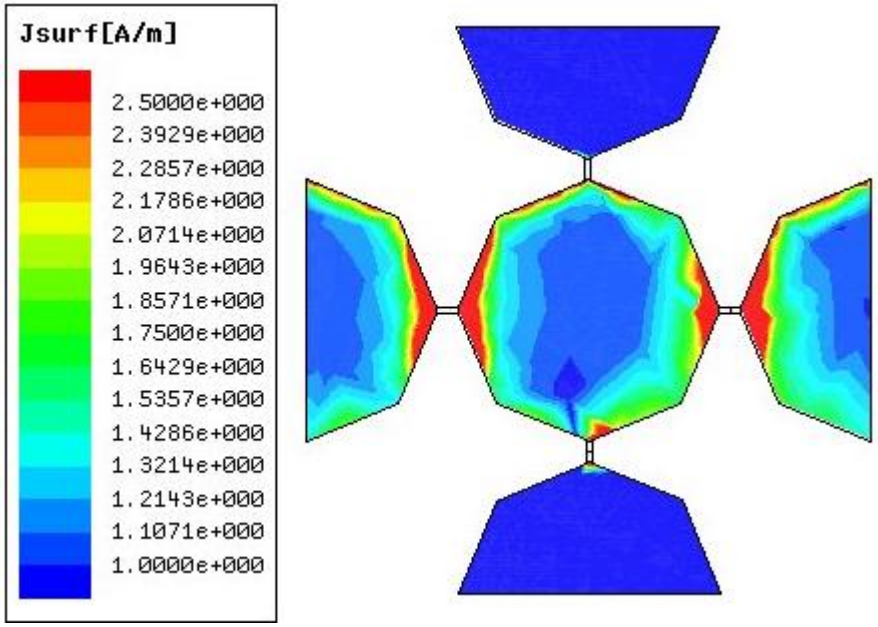
SKA SQUARE KILOMETRE ARRAY

Introduction

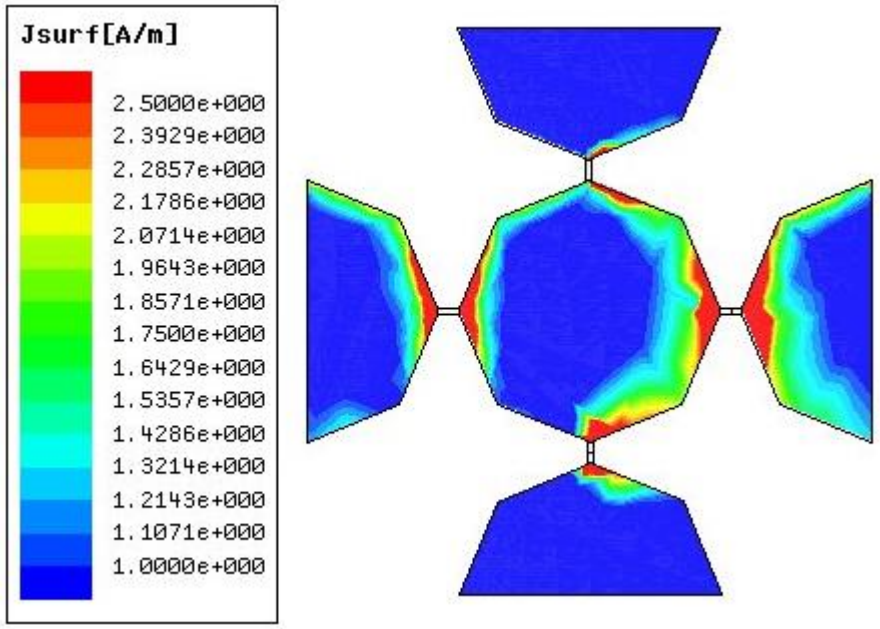
- This Lab aims to demonstrate the basic capability of the dense aperture array and introduce the participants to the measurement procedure that will compliment some of the key background antenna theoretical knowledge.
- It will use the Octagonal Ring Antenna (ORA) Array which was designed for performance study and analysis for the SKA.

Surface current on solid radiators

The fields at the centre of the radiators is low



700MHz



1000MHz

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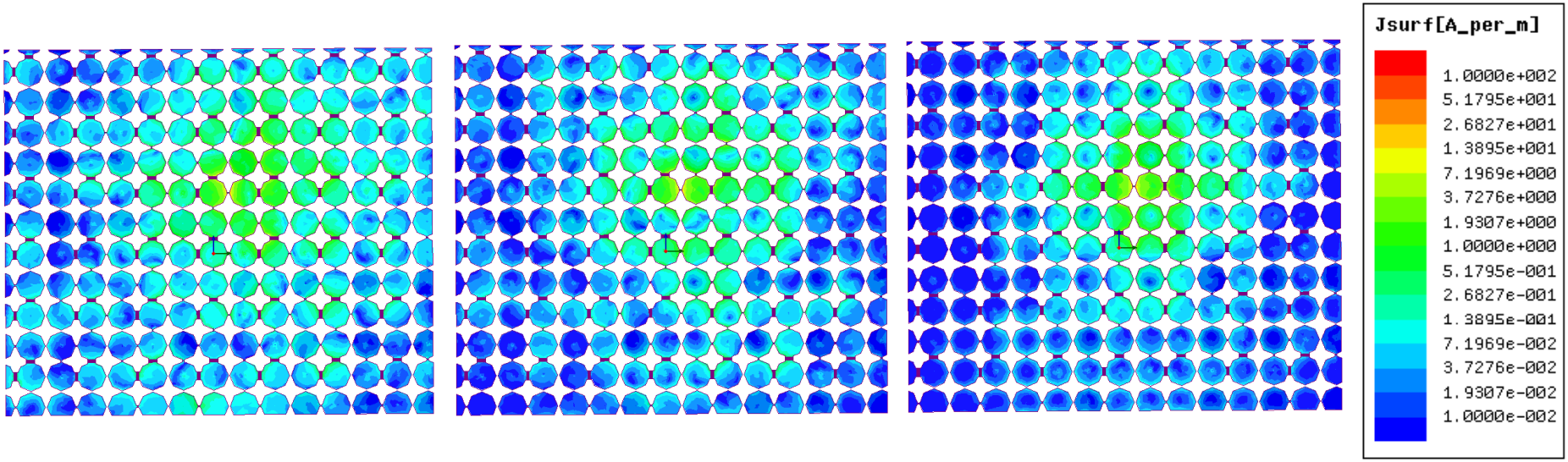
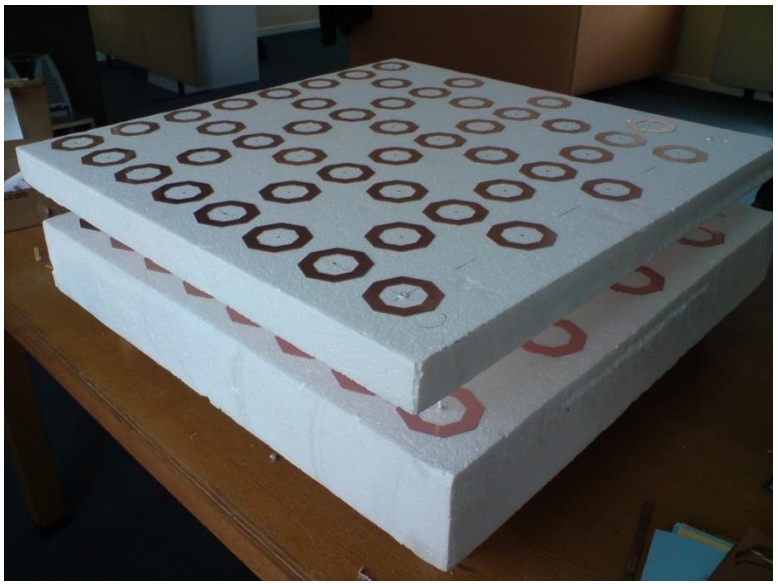
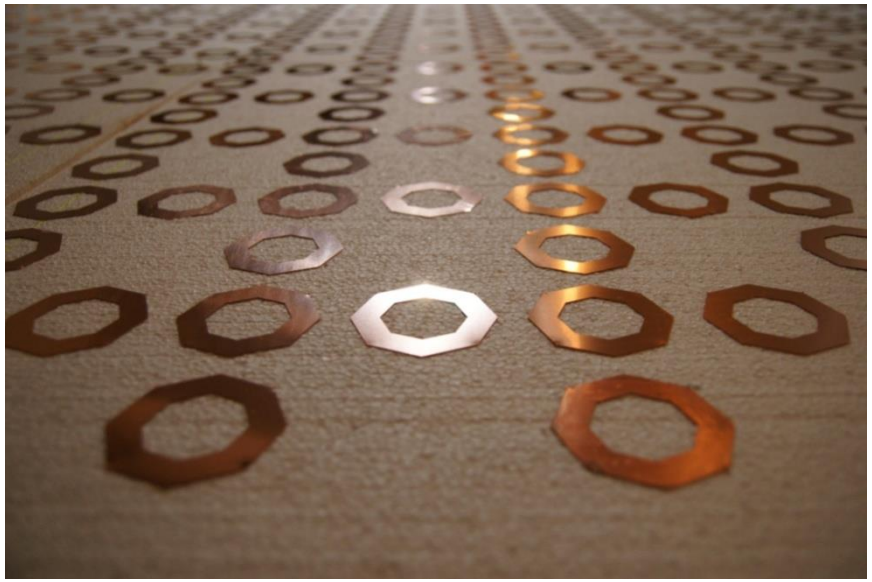
Surface current on the conducting sheets for a single element excitation



400MHz **900MHz** **1400MHz**

Planar structure – copper rings





The rings are attached to the surface of the expanded polystyrene foam (EPS) with a defined separation between two layers and the groundplane

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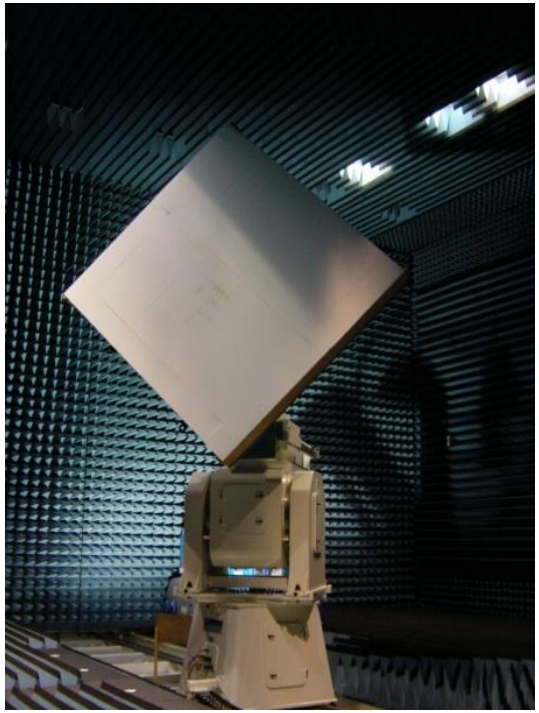
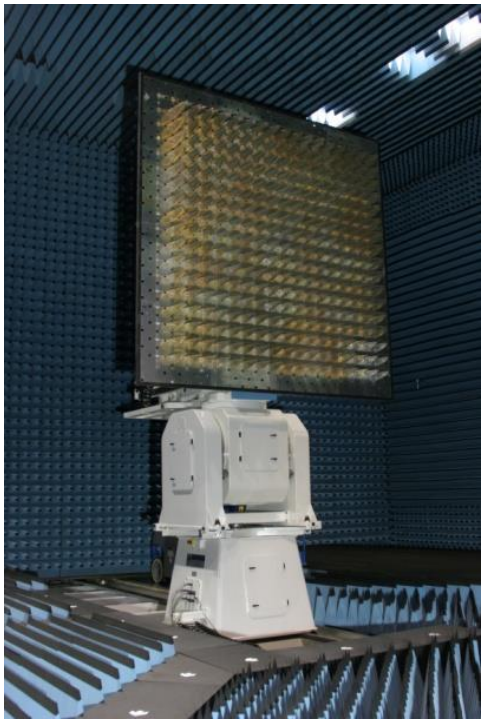
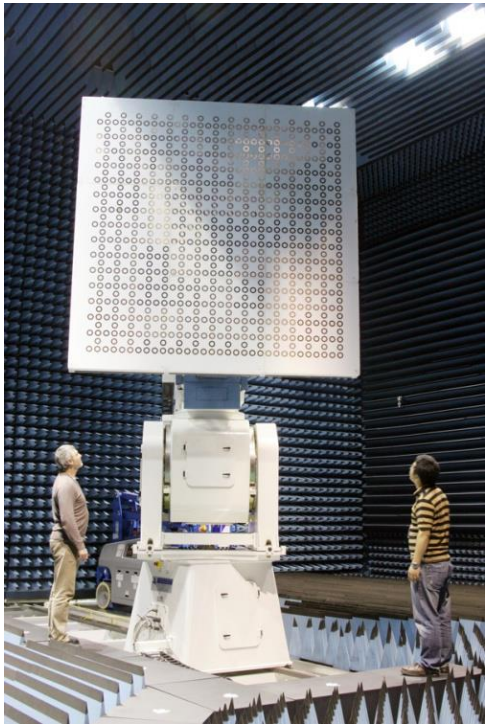
Three candidate Aperture Array Antenna designs



FLOTT



BECA



ORA

16×16 finite arrays, 300MHz-1GHz

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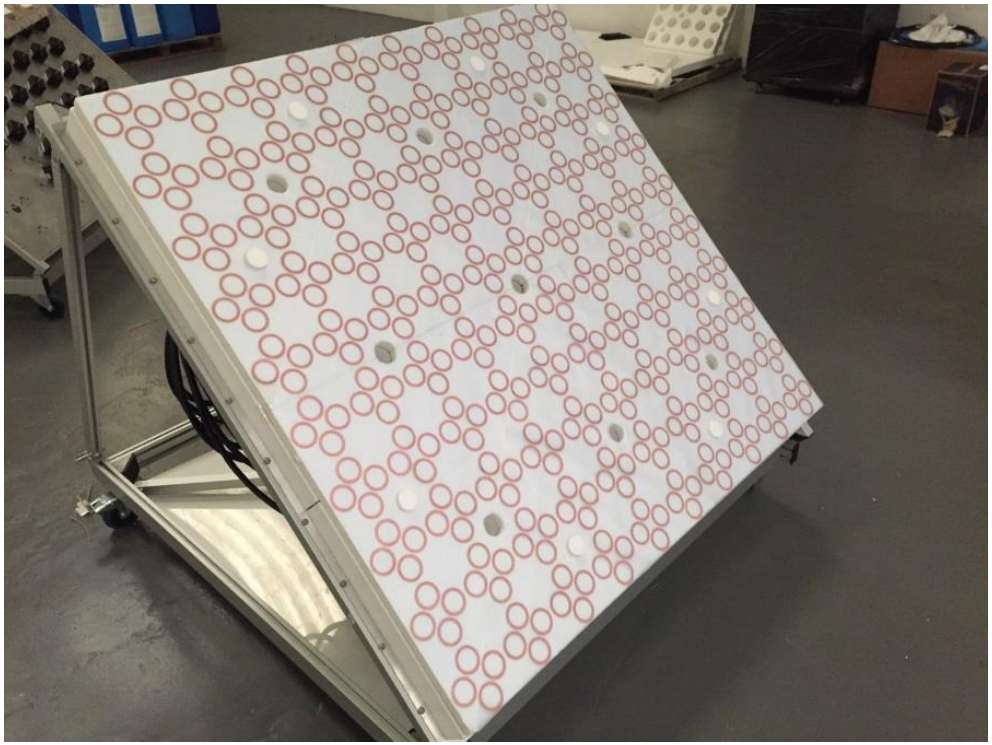
The Prototypes without Cover



The Square Grid Array (10×10)
1.25m × 1.25m

Fully differential front-end design

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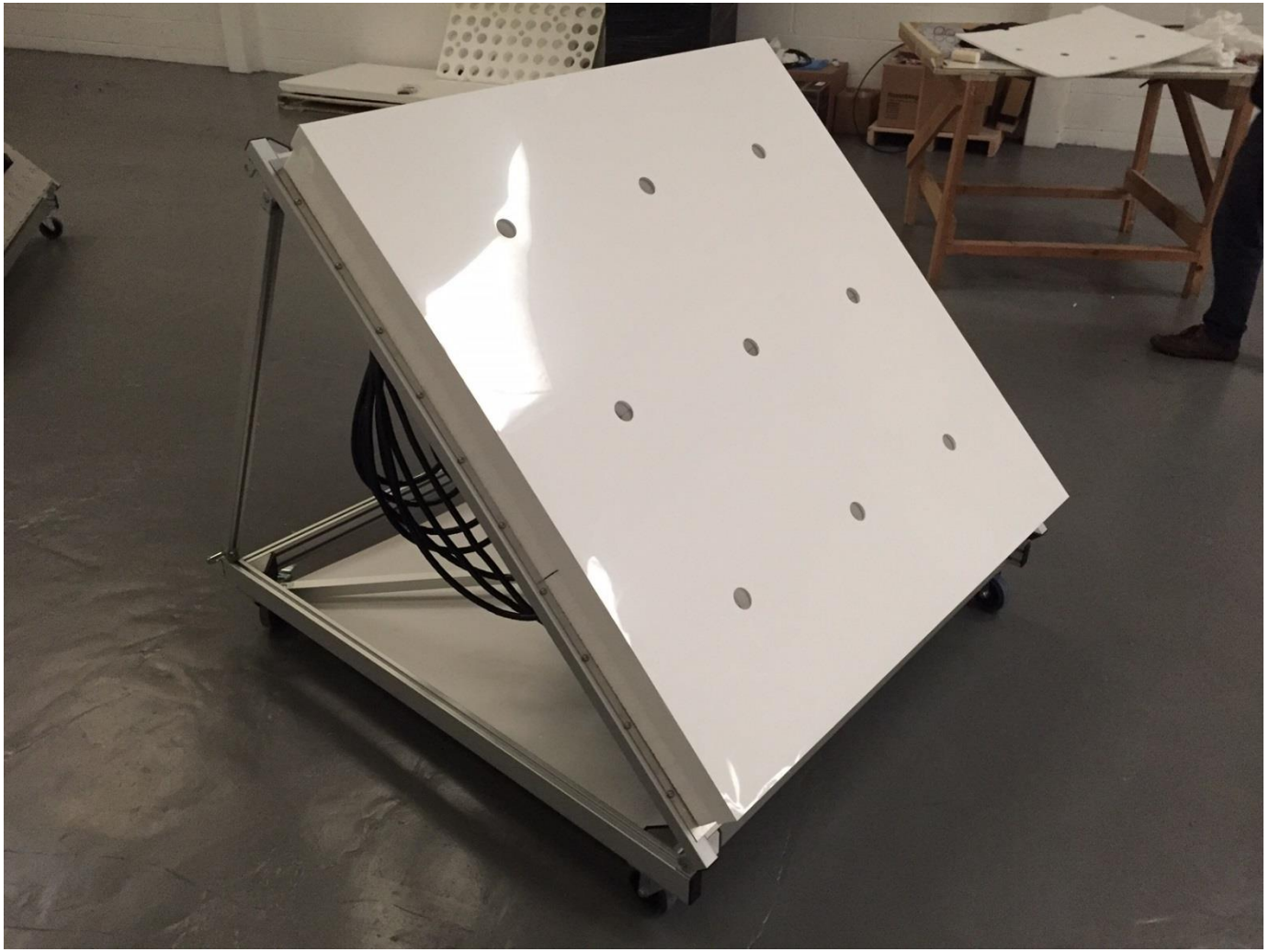
The Square grid prototype with cover (polypropylene)



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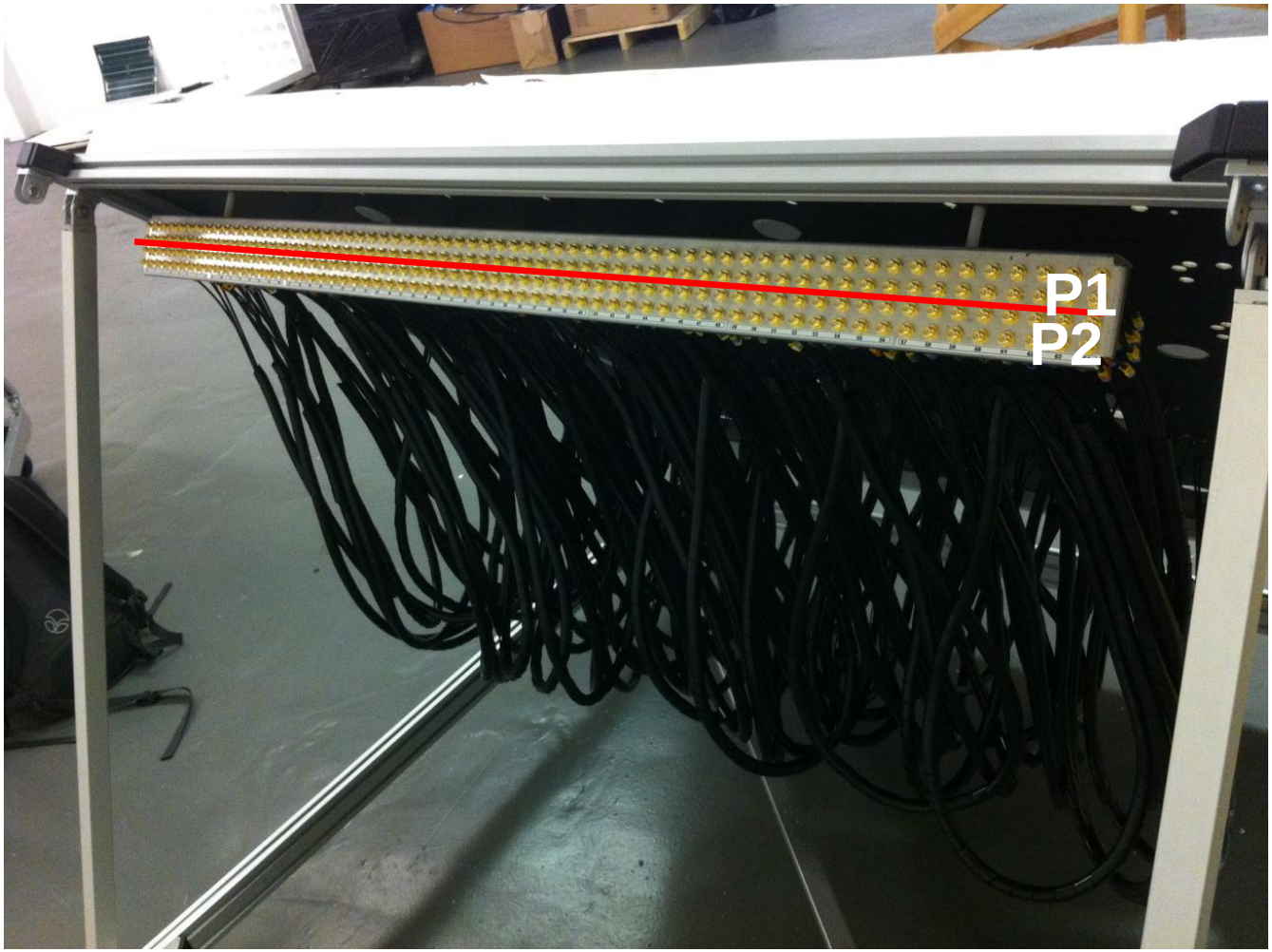
The dual-pol differential outputs



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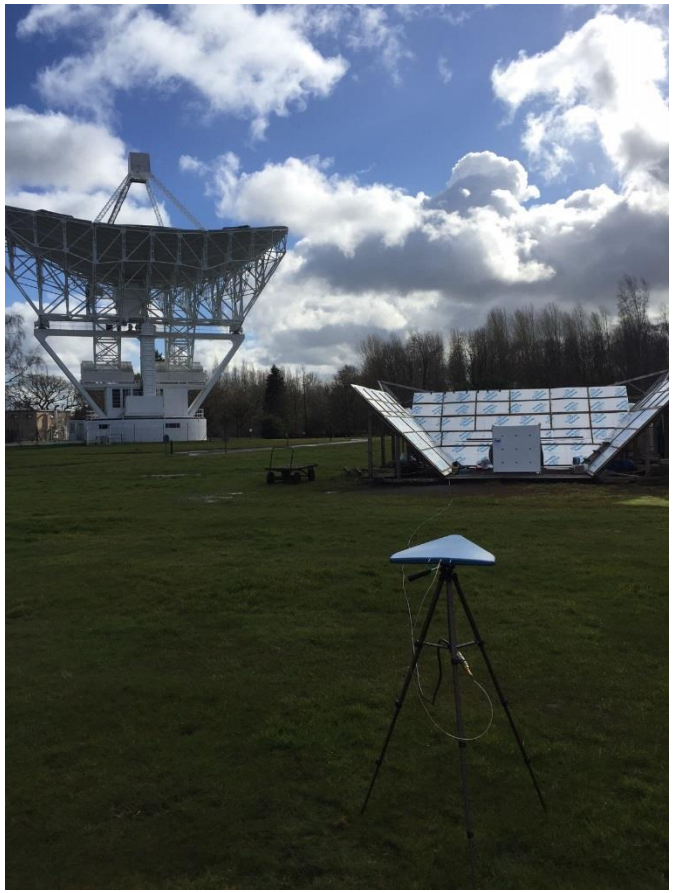
Lineality Test at JBO



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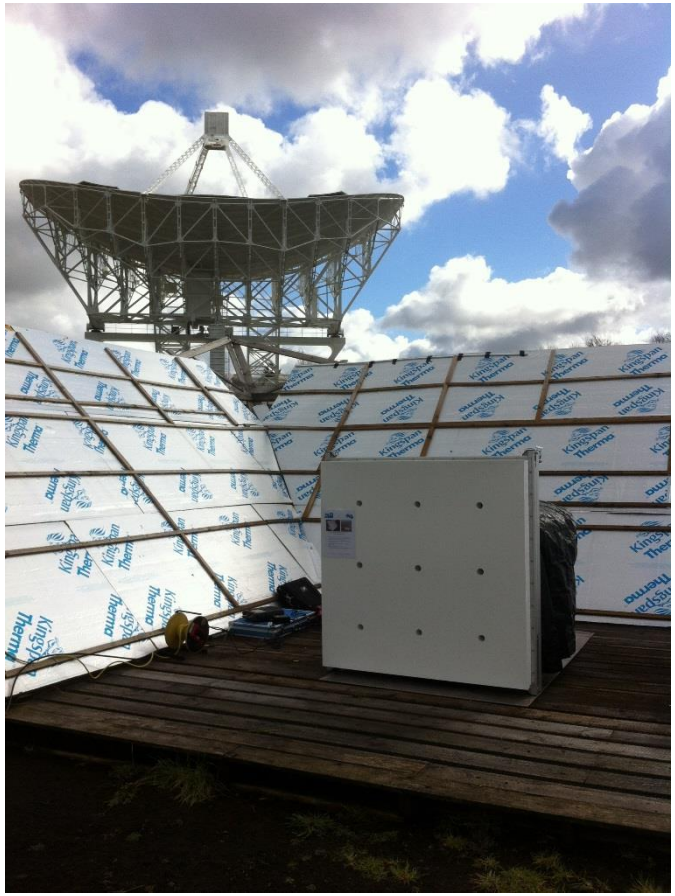

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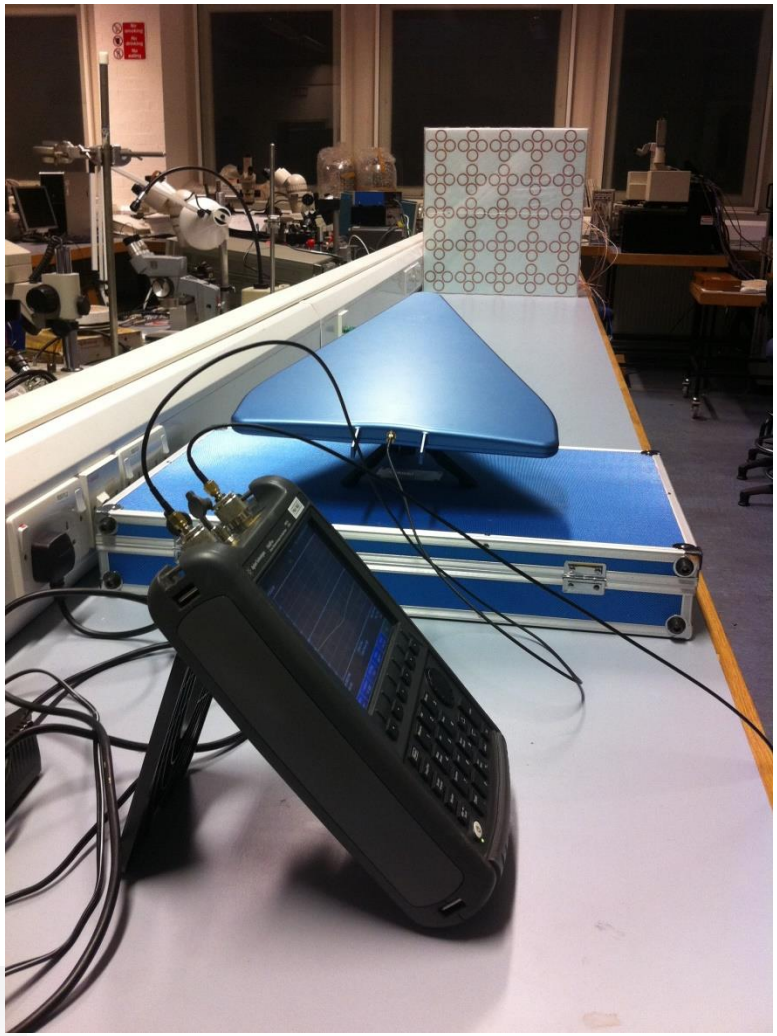

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Lab Tutorial Outline

- This Lab is to demonstrate the basic capability of the dense aperture array.
- The Agilent Fieldfox Vector Network Analyser (VNA) will be used to measure the actual gain of the finite array.
- An analogue beamformer and a reference high gain antenna will be used to measure the front-end system.
- The calibration method of the beamformer loss will be investigated and a LNA will be used to compensate the beamformer loss.
- The derivation method of the actual gain of the front-end system from the measurements will be demonstrated.

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Lab Tutorial Schedule

- Tuesday 24th January 2017
- Wednesday 25th January 2017
- Thursday 26th January 2017
- Monday 30th January 2017
- Tuesday 31st January 2017
- Wednesday 1st February 2017

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