AADC: Aperture Array Design & Construction Consortium

Low Frequency Aperture Array

UNIVERSITY OF MALTA
L-Università ta' Malta

ASTRON

ICRAR International Centre for Radio Astronomy Research

INAF ISTITUTO NAZIONALE DI ASTROFISICA NATIONAL INSTITUTE FOR ASTROPHYSICS

KLAASA Key Lab of Aperture Array and Space Application

Station de Radioastronomie de Nançay

Science & Technology Facilities Council

UNIVERSITY OF CAMBRIDGE

UNIVERSITY OF OXFORD

Observatoire de la CÔTE d'AZUR

Outline

- LFAA Status
- AAVS1 deployment
- Antenna selection
- Lessons learned

Status LFAA -1

	Nominal date	Deliverable	Status
1	15st April 2015	Kick-off Stage 2	Done
2	10th July 2 2015	PMP and SEMP review	Done
3	15th Sept 2015	Updated costs Draft RAM and ILS report	Done
4	12th Oct 2015	AA Verification System 1 (AAVS1) Detailed Design Review	Done
5	31st Dec 2015	LFAA station design report and Technical compliance update	Done
6	15th March 2016	Preliminary installation plan of a LFAA station	Done
7	1st May 2016	Report on RFoF performance over the max. length expected for both surface laid and trenched cable to demonstrate achieving the stability requirements.	Done
8	1st July 2016	Installation plan of a LFAA station	Done
9	30th Sep 2016	Draft of LFAA system requirement specification based on Rev 08 L2 compliance and traceability after Rev 08	Done
10	17th Oct 2016	CAPEX costing update	Done
11	31st Oct 2016	ICDs consistent with Rev 08	Done
12	30st Dec 2016	Input to SKAO ILS plan LFAA station design report (EM performance report) AAVS1 production data package	Done
13	10th Feb 2017	L2 compliance and traceability after Rev 10 Costing update	Done
14	27th Feb 2017	LFAA-INFRA.AUS ICD consistent with Rev 10, CDR version	Done
15	15th July 2017	LFAA system requirement specification based on Rev 10, draft	
16	22nd May 2017	Installation and functional test report of AAVS1	

Status LFAA -1

19	6th June 2017	LFAA-CSP, SaDT-LFAA and TM-LFAA ICDs consistent with Rev 10	50%
20	21st August 2017	LFAA system requirement specification based on Rev 10	
21	13th Oct 2017	Validation and evaluation report of AAVS1 CDR SKA1 data package submission Costing update	
22	Feb 2017	CDR SKA1	
23	31st March 2018	Closure of Stage 2	

- CDR moved to 2018
  - AAVS1
  - Detailed design and System Engineering work
  - Cost Control Project

LFAA costing

- €111M in June release
  - €30M reduction compared to Oct. 2016

– Updated Tile processing modules costs	€17M
– Updated RFoF costs	€8M
– Removed concrete ring	€7M
– Optimizations (cable etc.)	€2M
– COTS units cost update	
– WBS updates	+€3M

    - Most prices confirmed by industry
    - Further cost reductions investigated

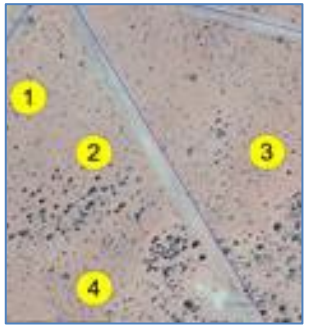
Why AAVS1?

- Substantial Verification system
  - Design verification: station performance, key components
  - Verification of production techniques
  - Verification of deployment aspects
  - Test bed for (limited) design options

  - Verification against requirements, e.g. station calibration

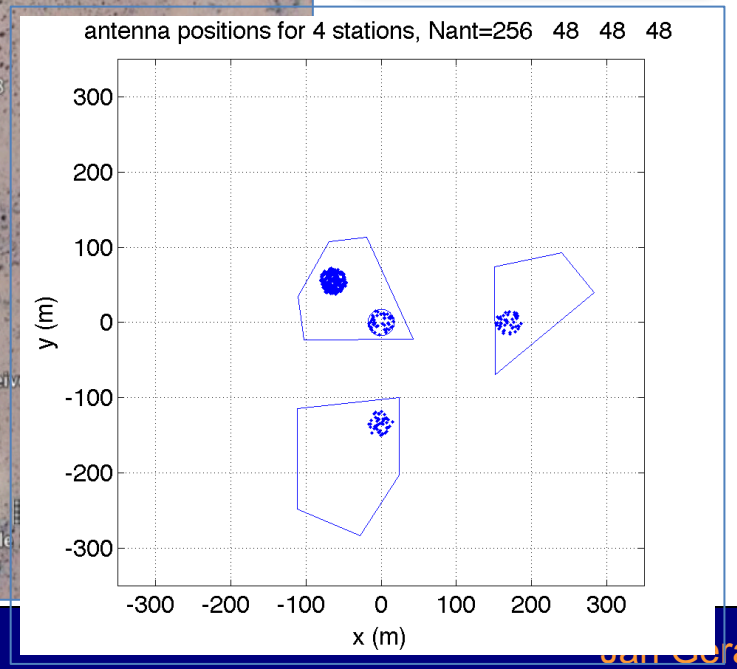
AAVS1

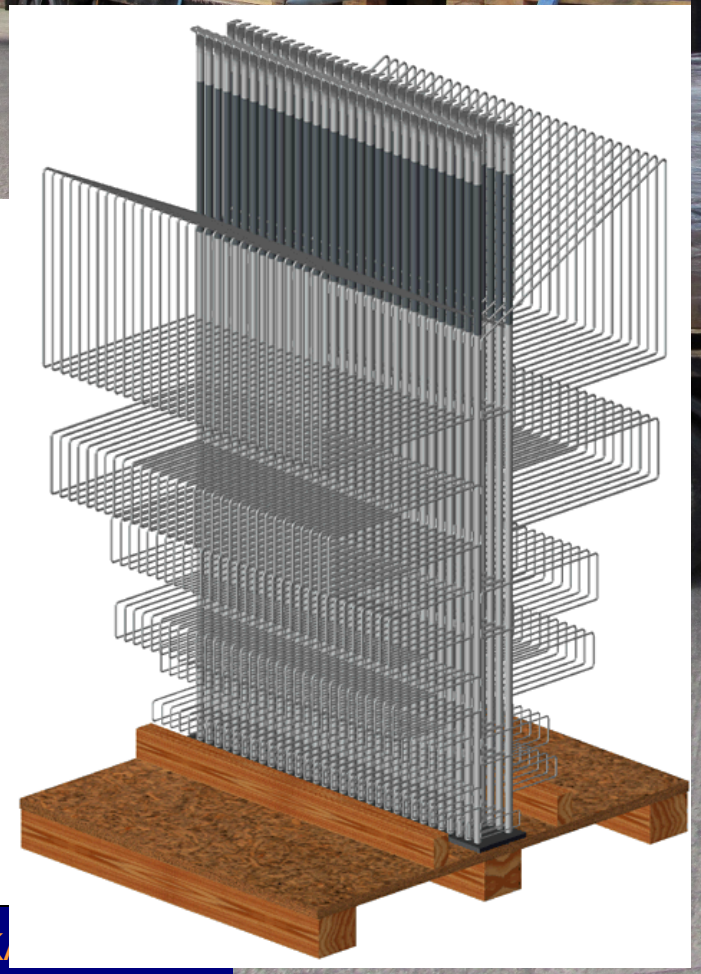
- At the MRO
- Hosted by MWA
- MWA correlator



1: 256 antennas

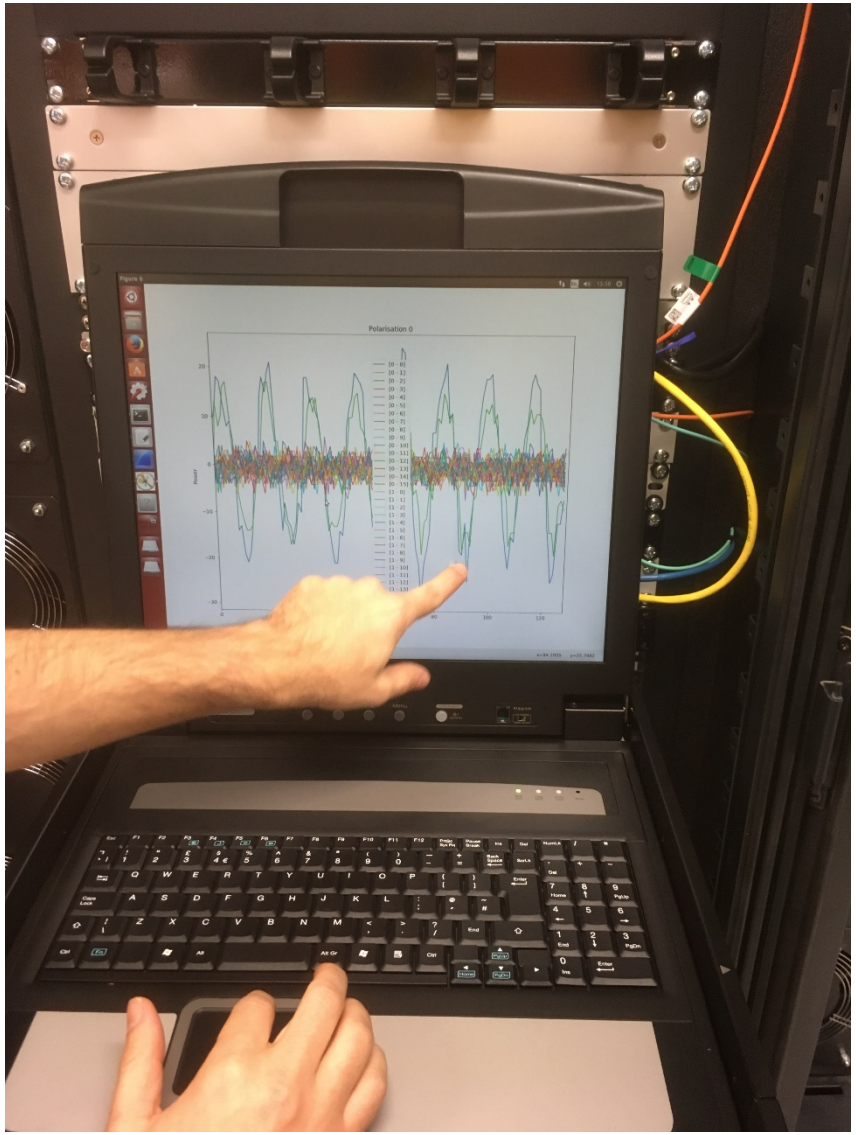
2-4: 48 antennas





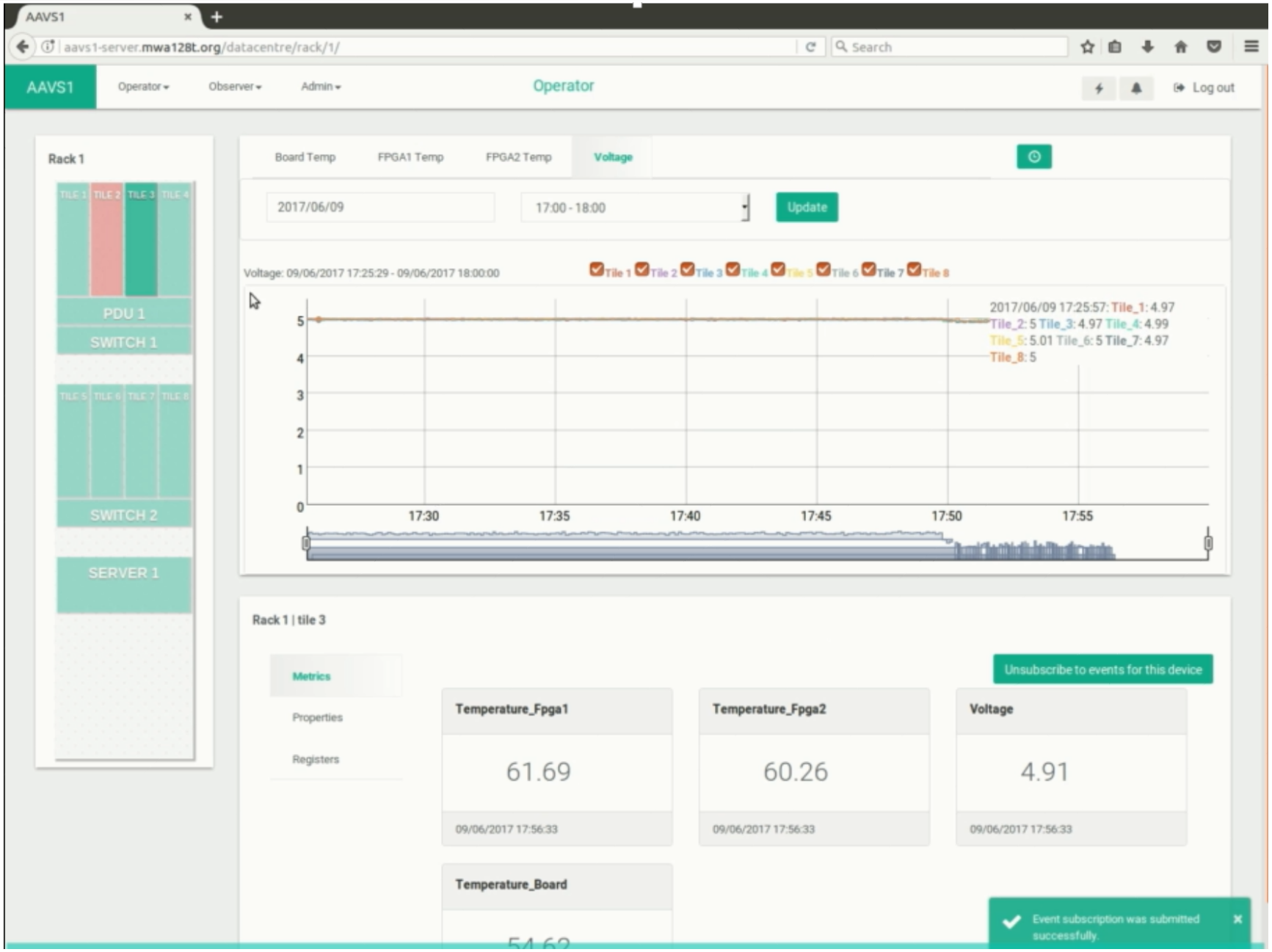
Truck load with 444 antennas on its way to the MRO

AAVS1



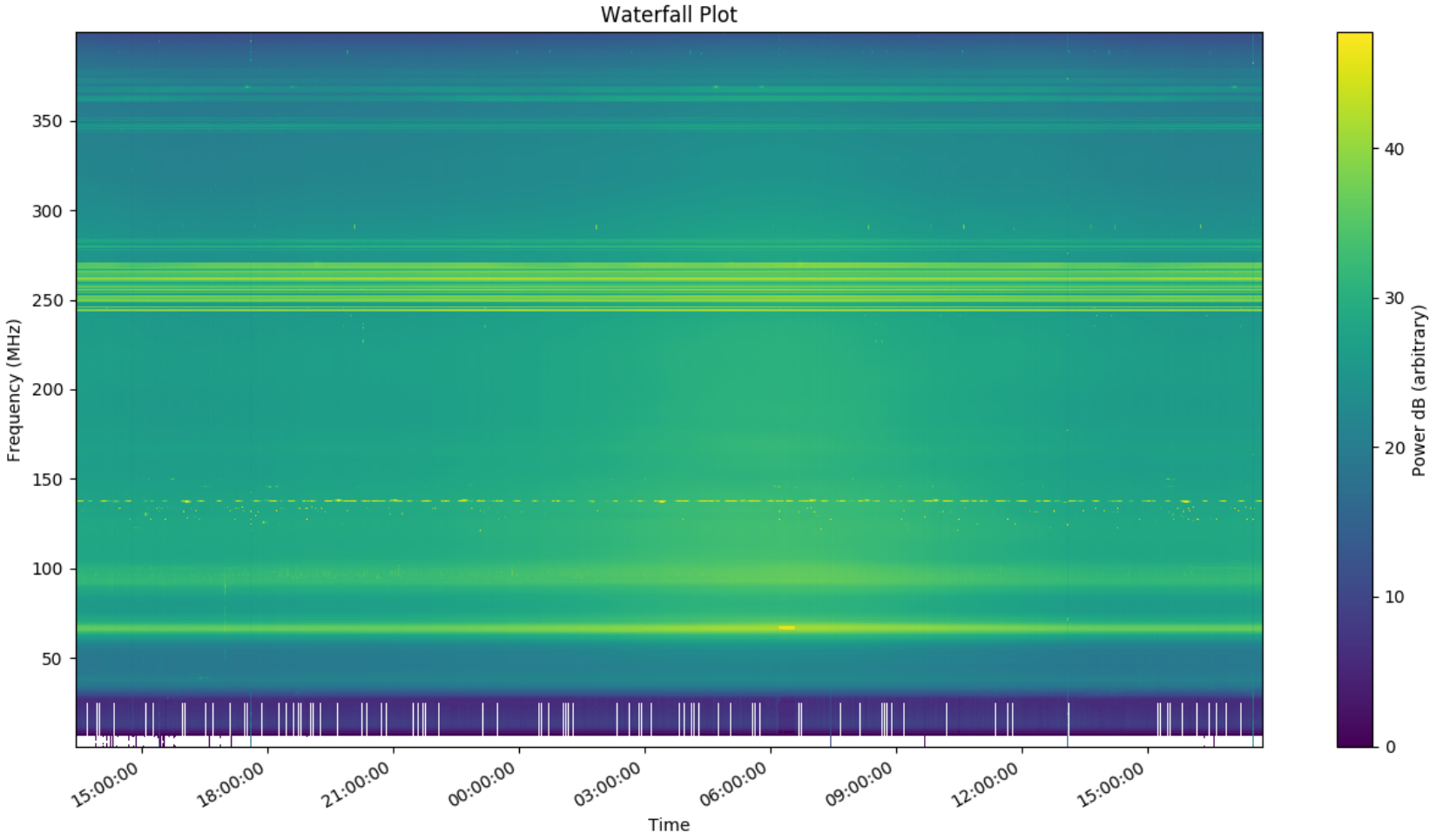
AAVS1

- TM Emulator

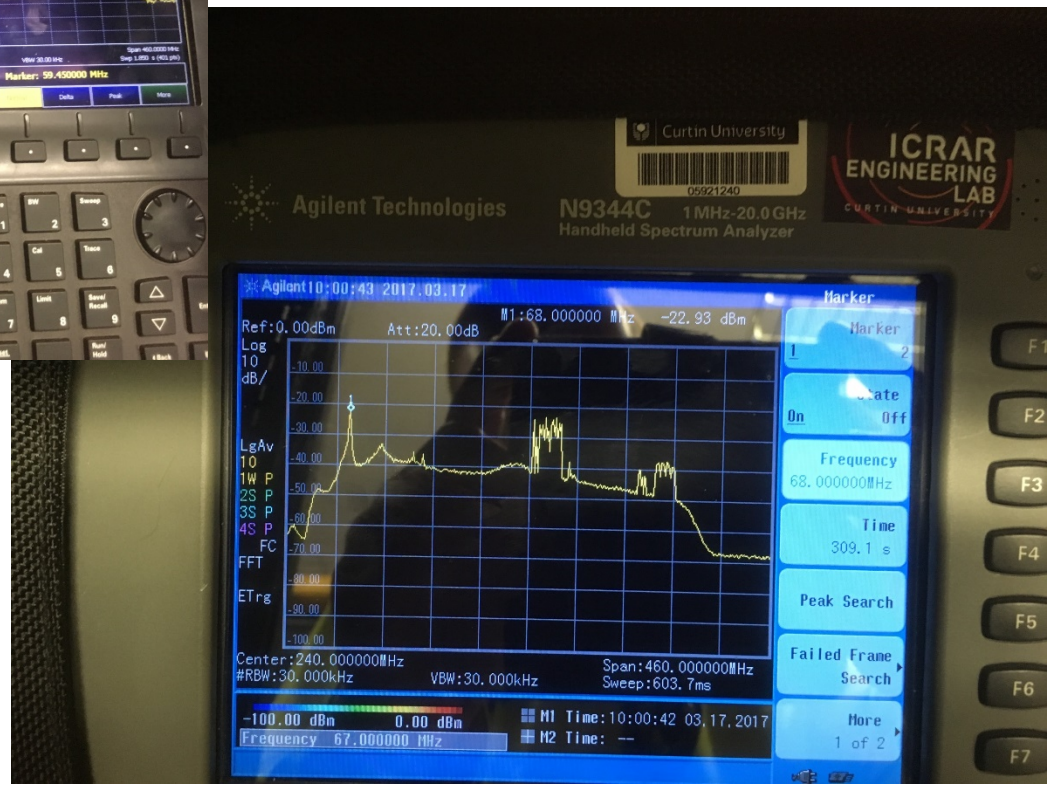


Early results

- Single antenna, waterfall plot



Antenna assembly: problems to resolve



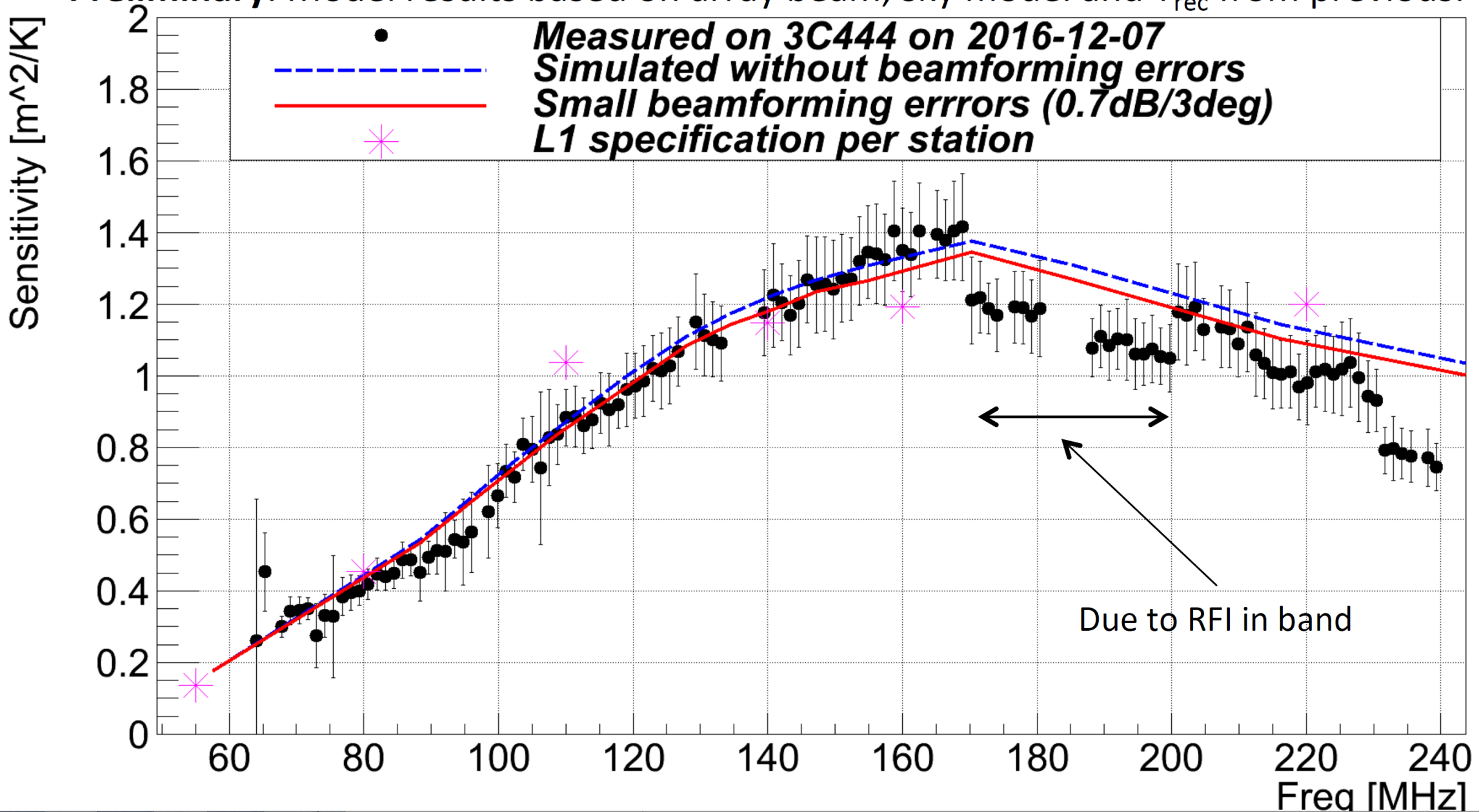
AAVS1

- 96 antennas installed

- The Engineering Development Array
  - Based on MWA design

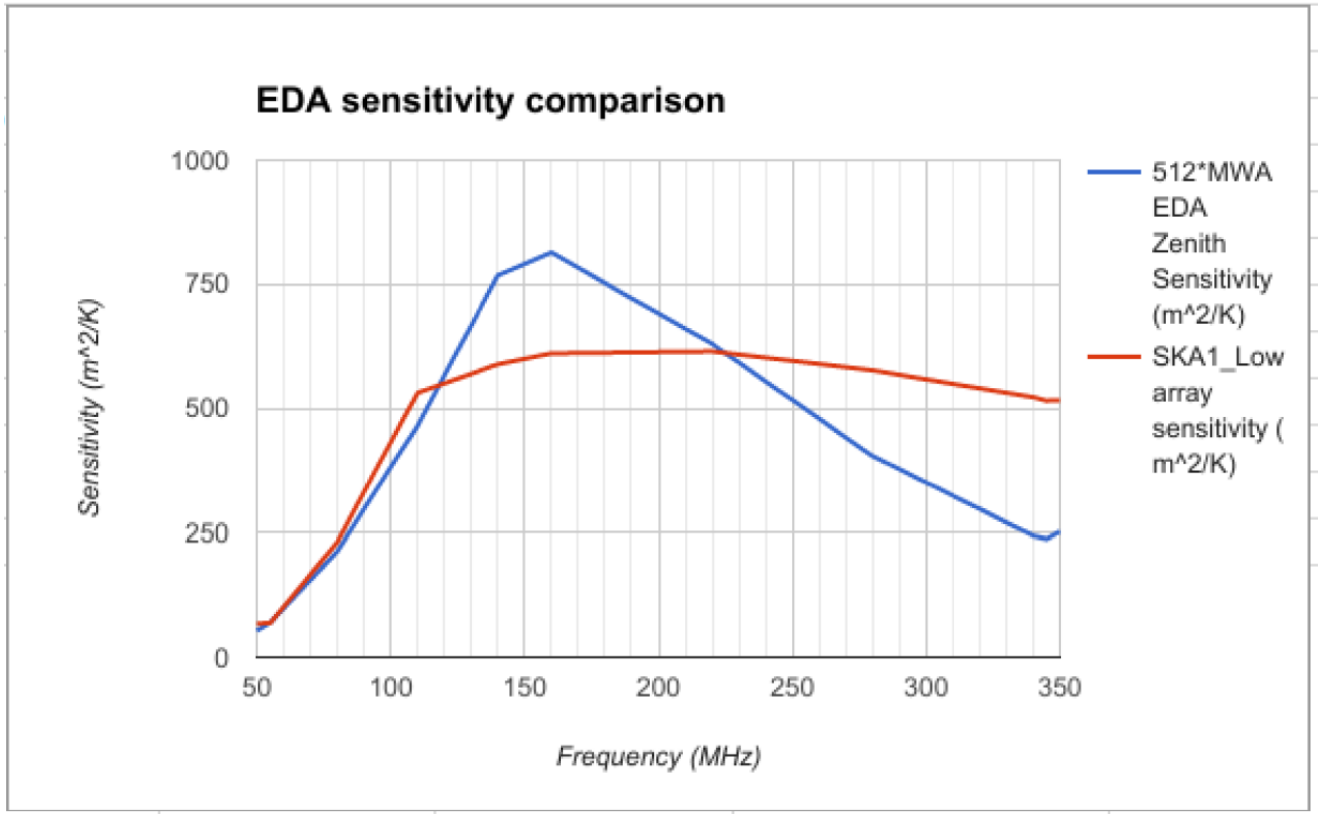
EDA measured vs model sensitivity

Preliminary. Model results based on array beam, sky model and T_{rec} from previous.



Cost Control Project: Antenna selection

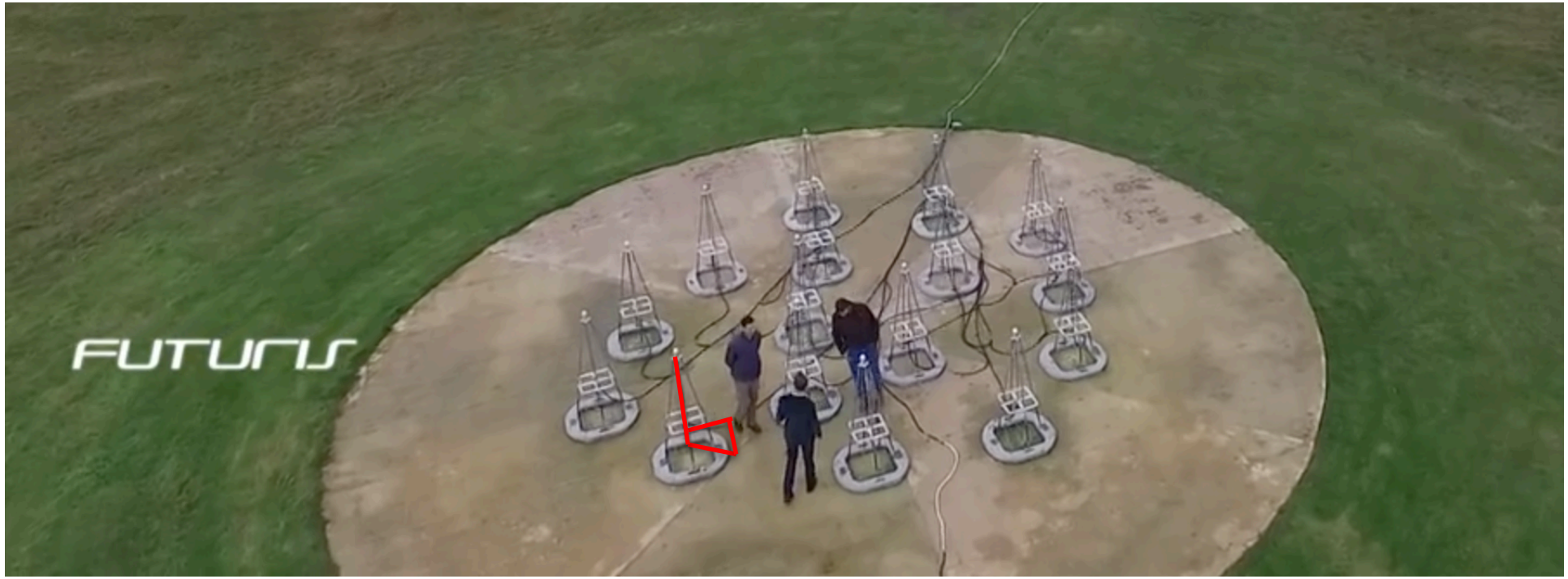
- Down selected from 3 to 2
  - Full evaluation in process
  - Concept selection end of July



Next Phase

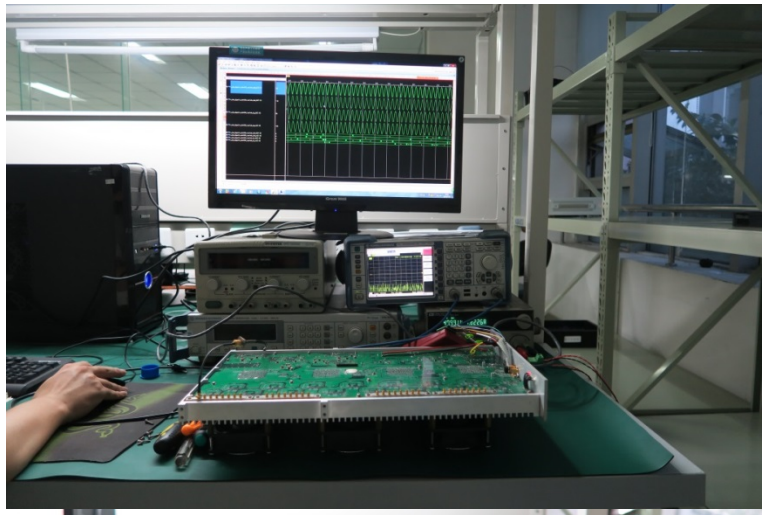
- Prepare CDR
  - AAVS1 completion
    - Antenna assembly
    - Software
    - System performance tests
  - Requirements update, internal ICDs update
  - System implementation update
  - Hardware and software design documentation
  - Cabinet design
  - SKALAx testing
  - C-TPM testing

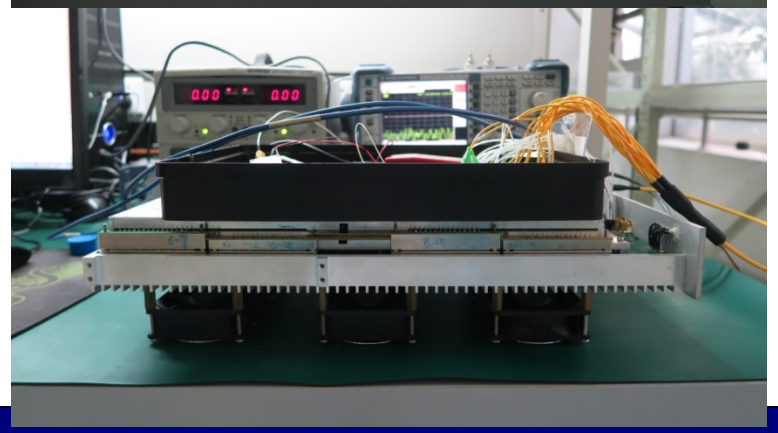
AAVS0, Cambridge (SKALA2/3).



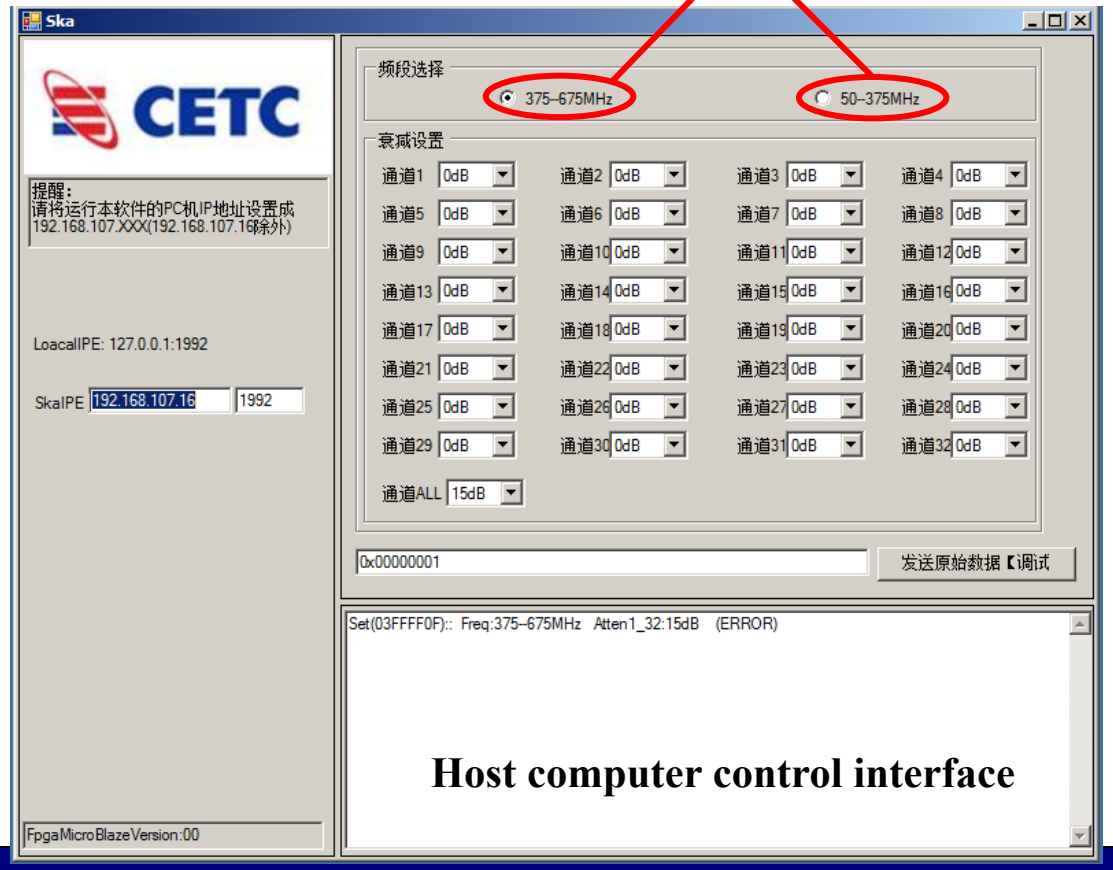
TPM Test

- **32 RF channels, AD sampling, channelizer and DBF of CTPM are tested**





50MHz-375MHz or
375MHz-675MHz



AAVS1 lessons learned

- Engineering and roll-out aspects: *of-course*
- System integration: *of-course*

- A micro SKA
  - In-kind contributions
    - (Dutch: kind = child)
  - (local) Tender issues
  - Shipping issues / storage / insurance
  - Communication
  - Site work (accessibility)
  - IP