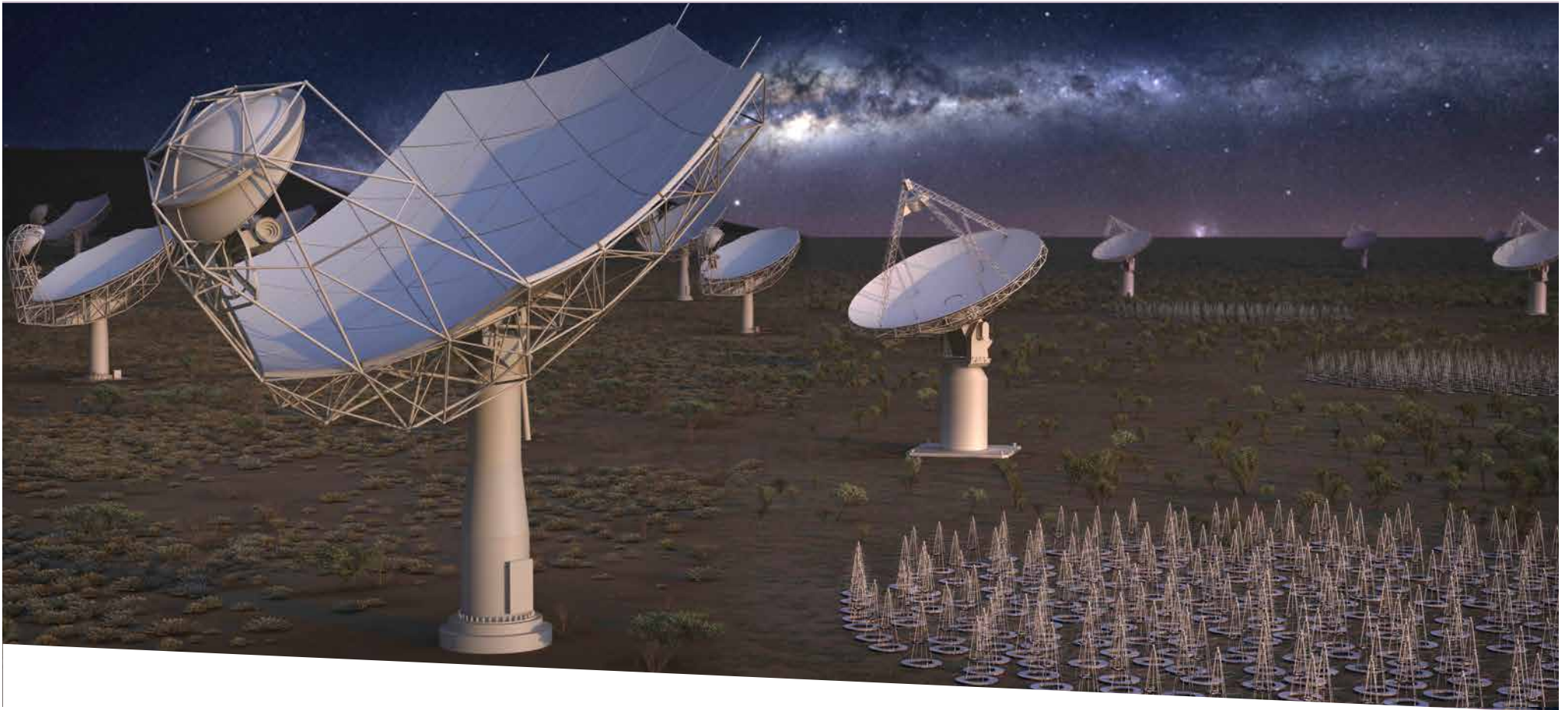


SKA SWG Update



SQUARE KILOMETRE ARRAY

Exploring the Universe with the world's largest radio telescope

Robert Braun, Science Director

10 October 2017

SKA Science Working Groups and Focus Groups



SWGs and FGs	Co-Chairs
Extragalactic (non-HI) Spectral Line	Rob Beswick (04/15), Francoise Combes (03/17)
Our Galaxy	Grazia Umana (03/15), Erik Rosolowsky (10,17)
Solar, Heliospheric & Ionospheric Physics	Eduard Kontar (08/15), Divya Oberoi (08/15)
Epoch of Reionization	Garrelt Mellema (08/15), Gianni Bernardi (09/17)
Cosmology	Mario Santos (03/15), Xuele Chen (03/15) Richard Battye (~12/17), Laura Wolz (~12,17)
Extragalactic Continuum	Rosella Cassano (06/15), Minh Huynh (06/15) Mark Sargent (10/17), Nathasha Hurly-Walker (02/18)
Cradle of Life	Di Li (08/15), Izaskun Jimenez-Serra (08/17)
HI galaxy science	Sarah Blyth (10/17), Lourdes Verdes-Montenegro (11/17)
Magnetism	Ann Mao (12/15), George Heald (10/17)
Pulsars	Andrea Possenti (10/15), Ingrid Stairs (02/16)
Transients	Michael Rupen (08/15), Jason Hessels (08/17)
VLBI	Cormac Reynolds (08/15), Tao An (11/17)
High Energy Cosmic Particles	Justin Bray (08/15), Clancy James (08/15)

- Refresh of SWG Co-Chairs every ~two years, **appointments almost fully implemented**



SKA Science Working Groups and Focus Groups

- Feed-back from SWG Survey (Jeff)



SWG feedback survey: executive summary

- 107 respondents (out of ~600 SWG members)
- 8 questions on subjects ranging from career status to communication with the working groups
- breakdown by career stage: postdocs (22.2%), faculty (55.5%), observatory staff (17.2%), other (5.1%)

General feedback

- monthly chair telecons were viewed positively and we intend to distribute more widely the notes from these (to *swg-all@*)

SWG feedback survey: executive summary

- desire for more insight into KSP policies and timeline – forthcoming as some aspects depend on IGO council being in place – SWG members are encouraged to read terms of reference
- some uncertainty on the role of SWGs in the design work - enormous contributions from scientific community to HPSOs, use cases, telescope resolution teams (calibration, configuration, etc.)

Communication, SWG structure and code of conduct

- the majority of SWG members who responded were happy that their ideas were taken on board during breakout discussions – great
- very positive feedback with regards to enforcement of the SKAO code of conduct during meetings – some were unaware of it and so we will distribute more widely

SWG feedback survey: executive summary

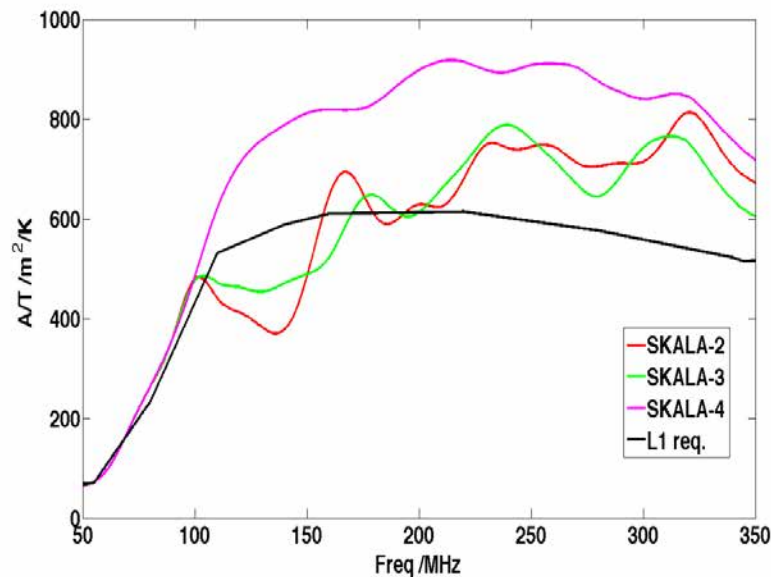
- concern that communication within (some) SWGs is sporadic – very positive feedback for groups that organize regular telecons including all core and associate members
- core members tend to be more active, but associate members would also like to be kept up to date of ongoing activities
- highlighted need for better representation of women in working group core teams
- A need for a formal protocol for bringing code of conduct violations to the attention of SKAO is required – forthcoming (Fiona Davenport, new SKAO HR director)

Design Baseline / Deployment Baseline

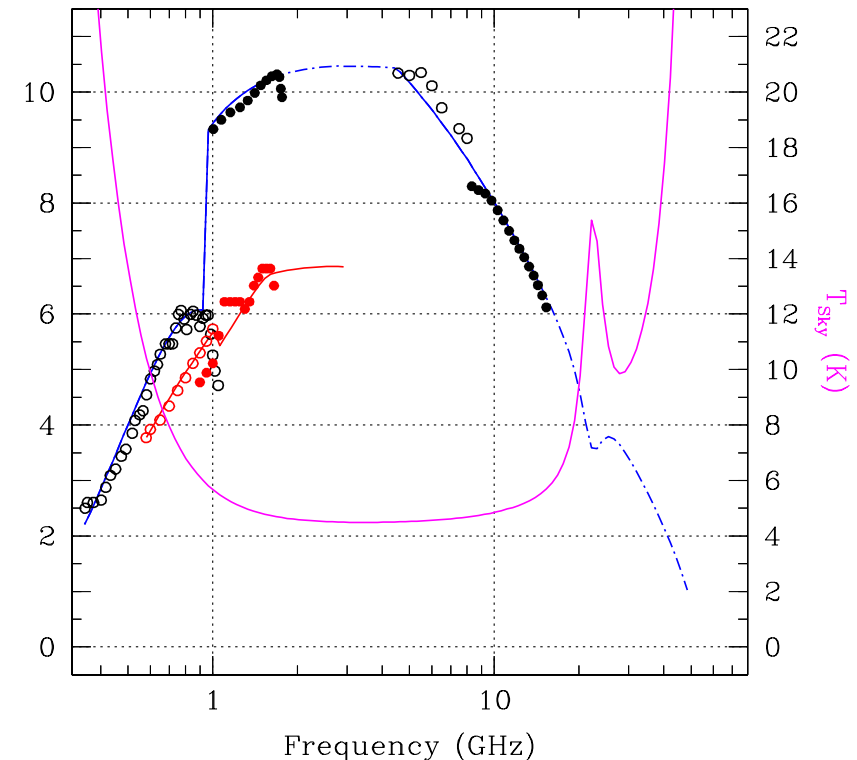
	Design Baseline	Deployment Baseline	Re-instatement '+' means add to system
SKA1-Mid			
No. dishes	133	130	+3 dishes at 150 km
Max. Baseline	150 km	120 km	+ infra to 150 km
Band 1 Feeds	133	130	+3 Band 1 Feeds for 3 dishes
Band 2 Feeds	133	130	+3 Band 2 Feeds for 3 dishes
Band 5 Feeds	133	67	+66 Band 5 feeds
Pulsar Search (PSS)	500 nodes	375 nodes	+125 nodes
SKA1-Low			
No. stations	512	476	+36 stations (18 stns at 49 & 65 km)
Max. Baseline	65 km	40 km	+infra to 65km
Pulsar Search	167 nodes	125 nodes	+42 nodes
Common			
Compute Power	260 PFLOPs	50 PFLOPs	+210 PFLOPs

- Outcome of July SKA Board Meeting
 - Design Baseline for which CDRs will be undertaken is unchanged
 - Deployment Baseline is scoped for cost-capped Construction budget
 - Further analysis of Low B_{Max} underway
 - **Re-instatement of HPC and PSS already part of Operational budget**
 - **Re-instatement of all other items as soon as funding permits**

SKA1 Science Performance Update

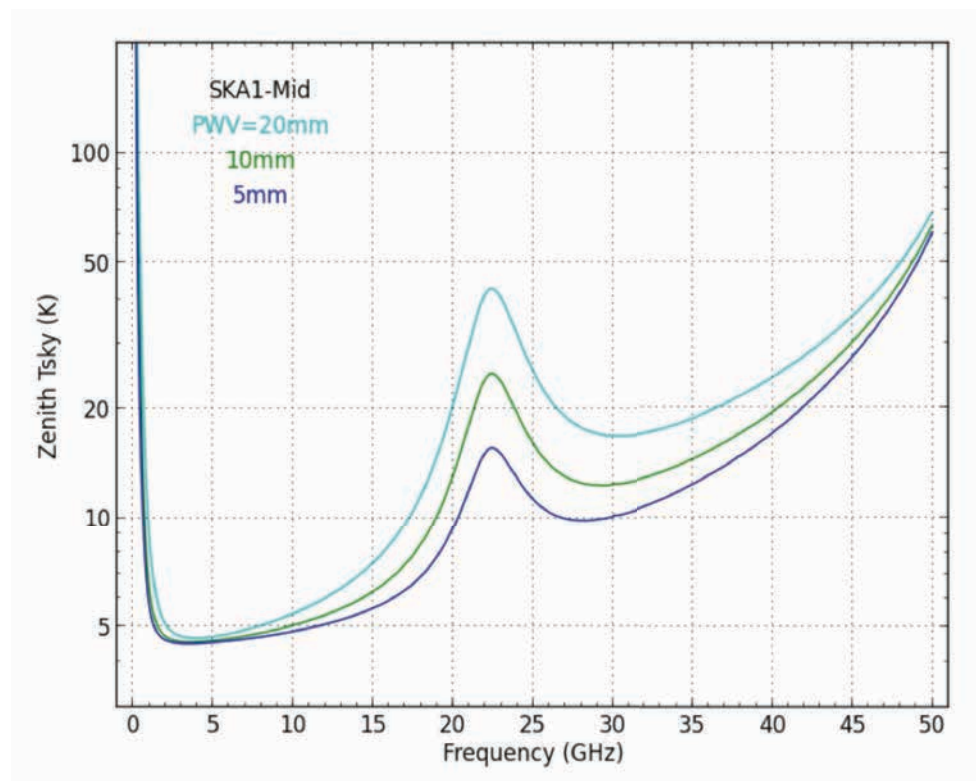
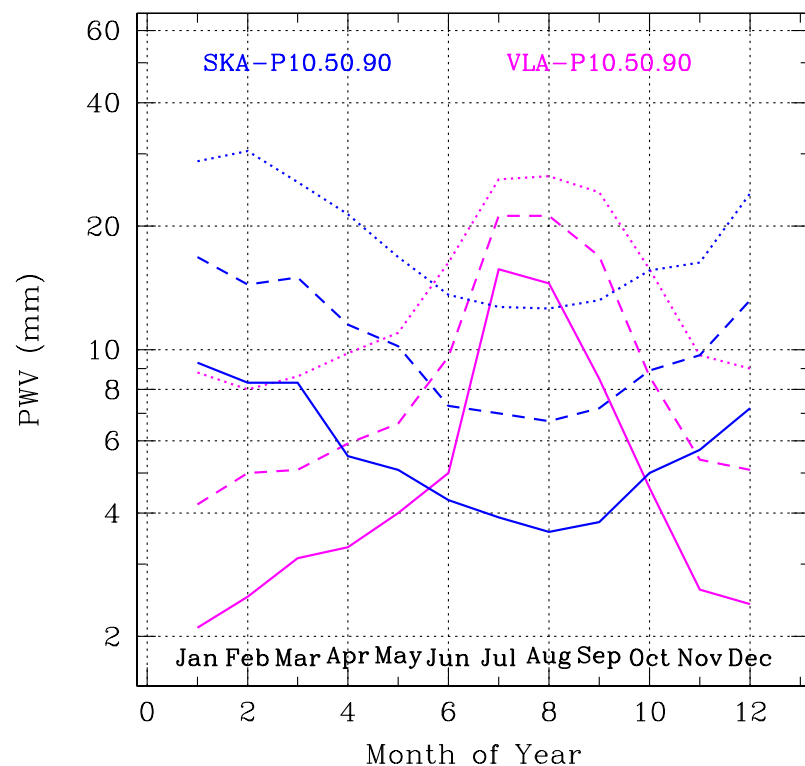


SKA1 Dish A_e/T_{sys} (m^2/K) @ PWV=5mm



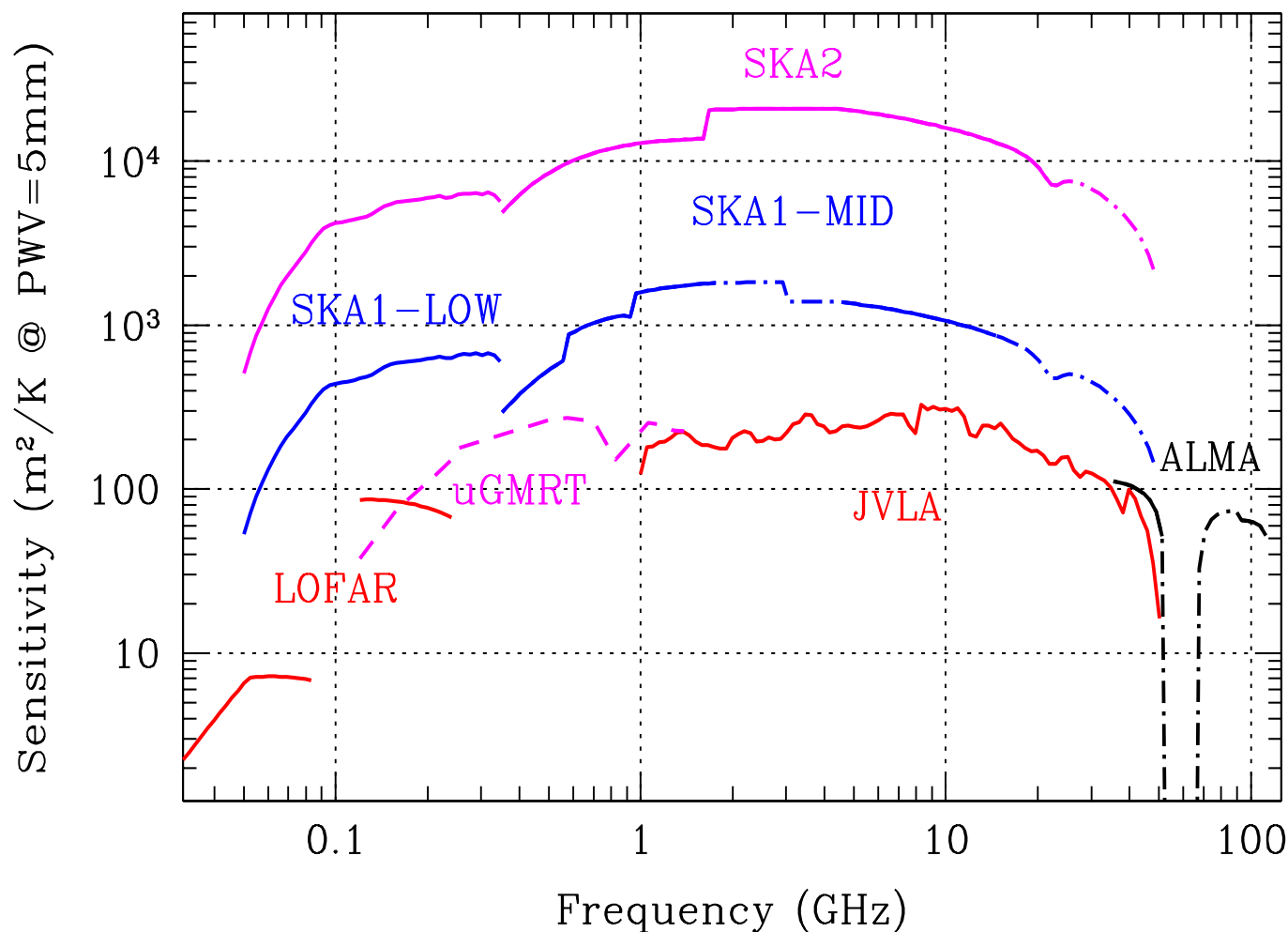
- SKALA4 design for SKA1-Low antenna
 - Improved: sensitivity, smoothness, polarisation purity, beam shape
- SKA1-Mid dish data from DDR documentation
 - Total surface RMS < 350 μm , relative pointing RMS < 1.3 arcsec

SKA1 Science Performance Update



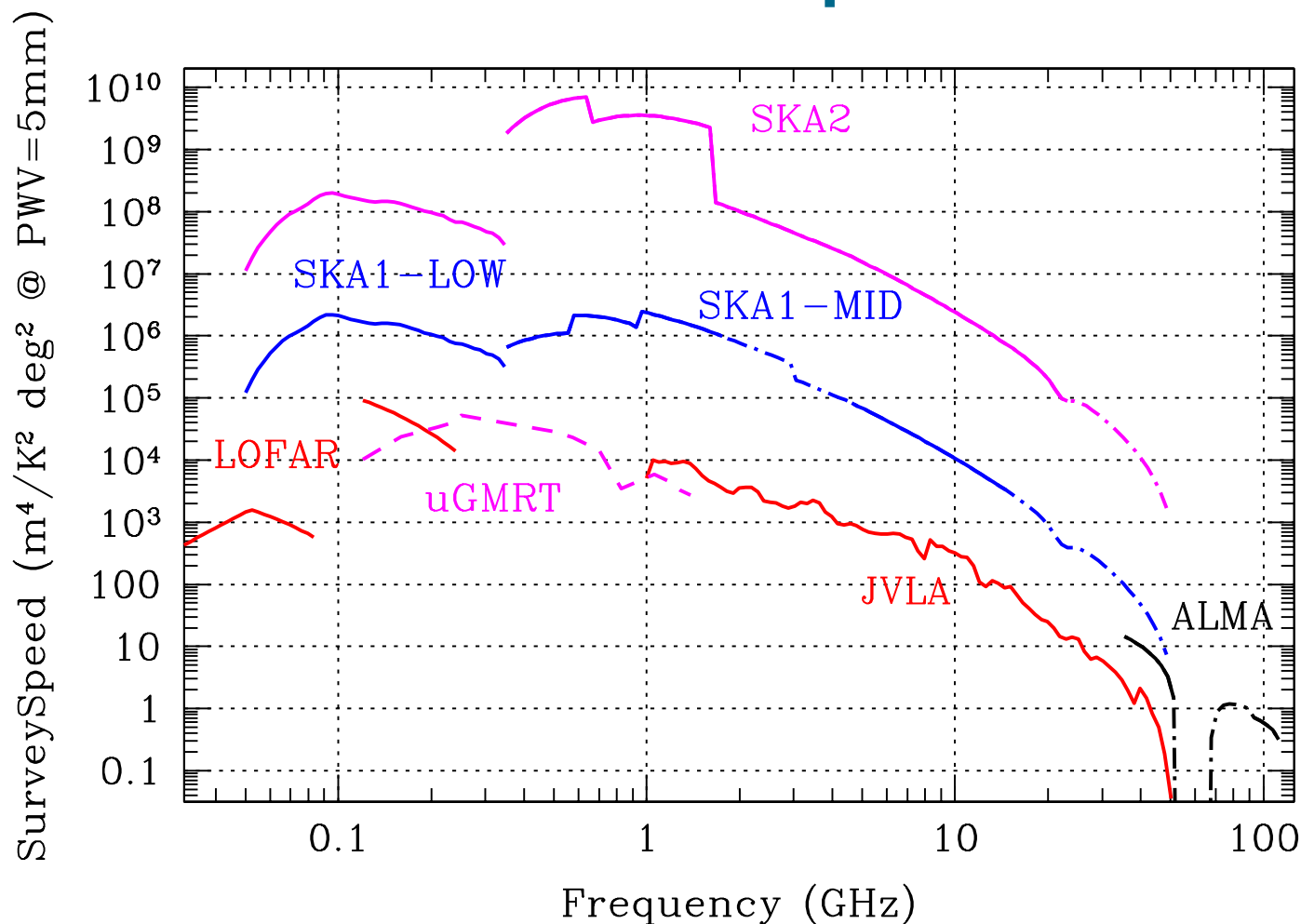
- SKA1-Mid site weather statistics (2010 – 2015) by Forkman & Conway
- ATM (casa) model for improved emission and absorption predictions

SKA1 Science Performance Update



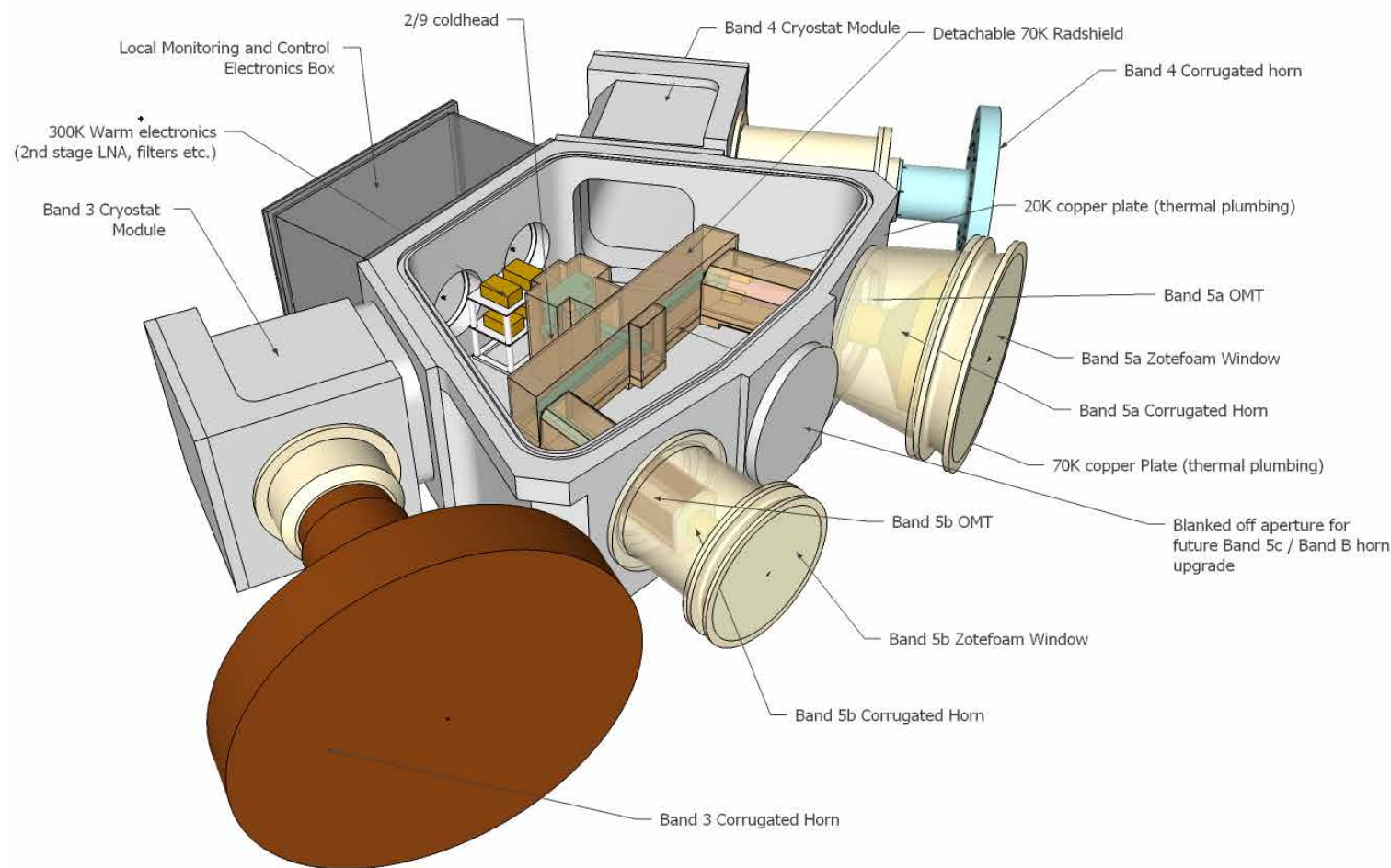
- Improved performance predictions now available at all frequencies
- Opportunity for seamless interface of SKA to ALMA capabilities

SKA1 Science Performance Update



- Improved performance predictions now available at all frequencies
- Opportunity for seamless interface of SKA to ALMA capabilities

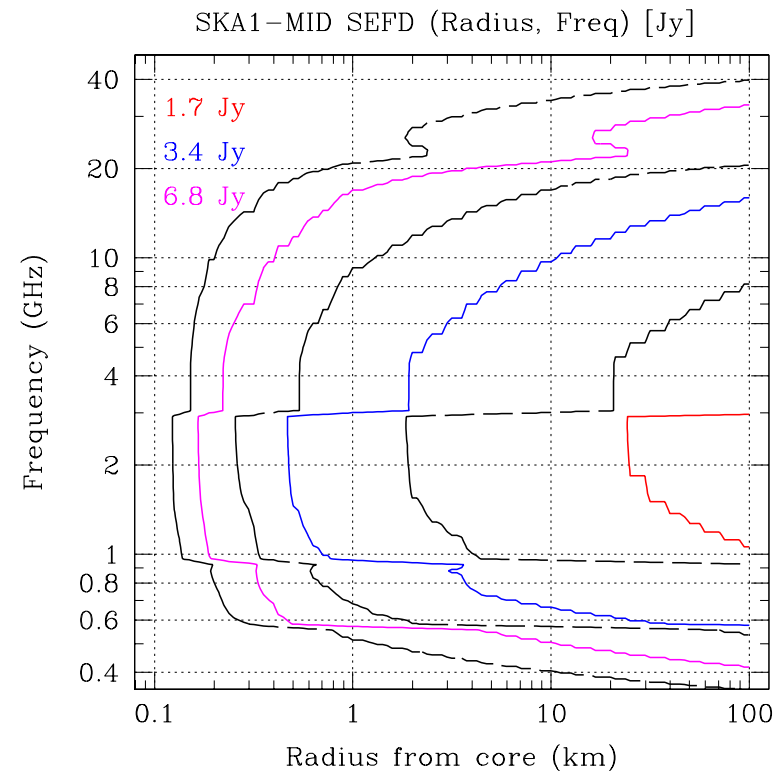
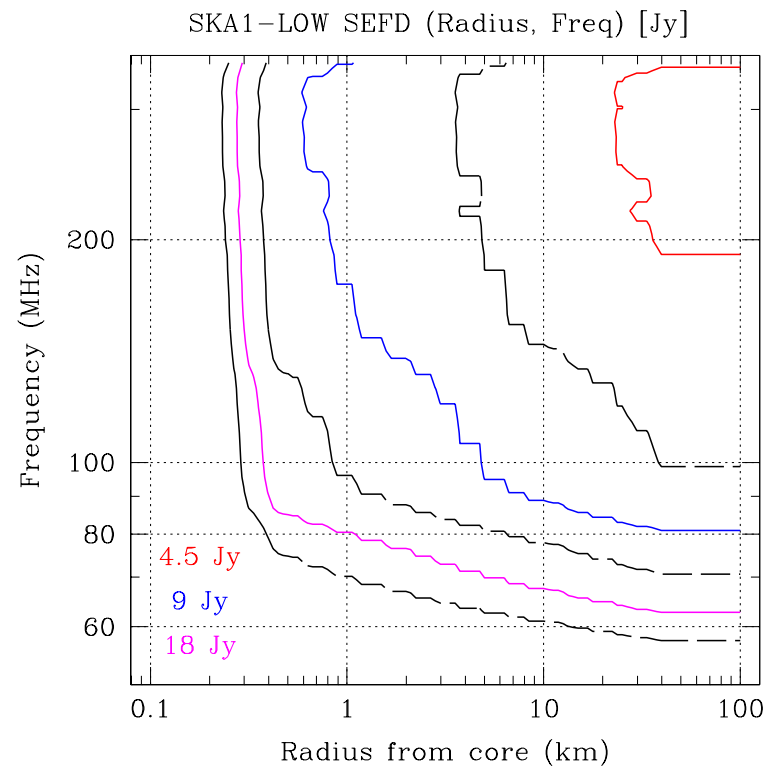
SKA1 Science Performance Update



- Current cryostat design supports 5a/5b plus three additional feeds
- Opportunity for seamless interface of SKA to ALMA capabilities



SKA1 Science Performance Update



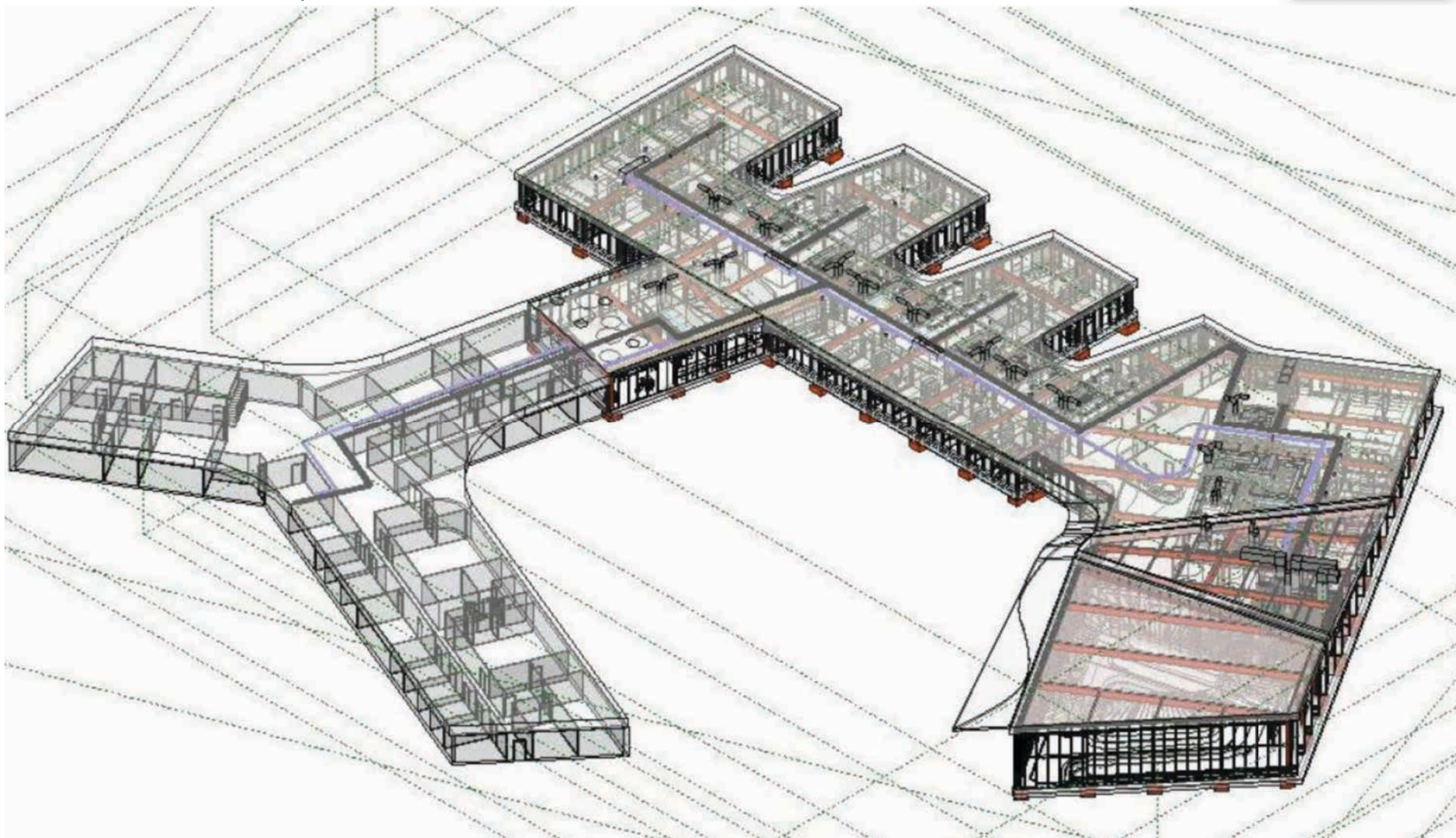
- Tied-array Beam SEFD as function of radius and frequency
- Pulsar searching & timing plus VLBI



SKA1 Science Performance Update

- Questions to SWG/FG Membership:
 - What else would you like to see?
 - What other Figures of Merit should be documented?

SKA HQ Construction



View from Lovell Telescope tower, 30/08/2017



Critical Design Review Schedule

Milestone	Date
AIV CDR close	December 2018
CSP CDR close	July 2018
DSH CDR close (Bands 1 & 2)	March 2019
DSH CDR close (Band 5)	April 2019
INAU CDR close	July 2018
INSA CDR close	July 2018
LFAA CDR close (SKALA4 delays?)	July 2018 (TBC)
SaDT CDR close	April 2018
SDP CDR close	December 2018
TM CDR close	June 2018
System CDR close	December 2018
Construction Proposal submission	March 2019

- Based on “frozen” requirements (L1 Revision 11)



Key Document List

Created by Casson, Andrea, last modified on Feb 02, 2017

This page contains the documents being produced across the project together with owners and status.

- System CDR document list is contained in a child page
- Configuration Management's view of documents is contained on these pages:

<https://confluence.skatelescope.org/display/CMI/New+SKA+Office+Documents+in+eB>

<https://confluence.skatelescope.org/display/CMI/Element+Level+CDR+Documents+linked+to+PBS+in+eB> (being worked on by Consortia CMs February 2017)

<https://confluence.skatelescope.org/display/CMI/System+Level+Documents>

- The Element CDR list of 17 document types from the Statement of Work is replicated here:

1. A formal statement of compliance with the specifications (i.e. compliance matrix)

2. A complete documentation package for the procurement of the Element including as a minimum:

- a. The statement of work, including all applicable and reference documentation
- b. Technical specifications for the system and subsystems, including all applicable and reference documentation
- c. Detailed engineering drawings and schematics
- d. Interface control documentation[A1] [A2] .

3. Specific design reports for all subsystems down to at least the third tier (the Element being first tier). Design reports shall include transport, integration and verification.

4. All finite element models

5. Software architecture models and use cases

6. Software libraries required to demonstrate compliance

7. Software configuration information (operating system, libraries, compilers etc.) for demonstration of compliance.

8. Parametric models used for the optimization of the design.

9. Analysis report: Finite element modelling including all mechanical and thermal load cases, thermal analysis, fluid dynamics, EMC analysis, safety analysis, hazard analysis. In case that specific construction or assembly equipment is required the analysis shall cover these and their operation as well.

10. Integrated Logistics (RAMS/FMECA) report

11. End-to-end detailed cost breakdown. Itemized costs for standard procurements shall be backed by market surveys and/or offers for supply (e.g. steel costs, lines of code)

12. Construction plan, including an acceptance test plan and acceptance test procedures[A3] .

13. Operations plan including maintenance plan

14. Logistics requirements for construction, training requirements

15. Configuration items list

16. Schedule for construction

17. Detailed risk register

Design Compliance Matrix w.r.t. Requirements



- Preliminary versions of compliance matrices received in conjunction with October cost updates from most consortia
- Compilation (and follow-up) now underway to provide system level compliance review

Recent and Upcoming Meetings

- URSI-GA-2017, Montreal, 25 & 26 August
 - “The SKA and its pre-cursors”
 - Well attended and good discussion
- UK SKA Science Community Meeting, Edinburgh, 7 September
 - <https://uk-ska-edinburgh-2017.herokuapp.com/>
- Canadian Radio Astronomy: Surveying the Present and Shaping the Future, Montreal, 13 & 14 September
 - <http://skatelescope.ca/radiofuture/>
- Physics opportunities with a new universe’s view: the SKA radio telescope, Valencia, 6 & 7 November
 - <http://riastronomia.es/en/physics-opportunities-with-new-universes-view-the-ska-radio-telescope/>
- EWASS-2018, Liverpool, 3 – 6 April 2018, session proposals
 - “Radio Connections to the Transient Universe”: Stairs et al.
 - **Proposal was not successful**
 - “Opening new frontiers in cosmology with the Square Kilometre Array”: Harrison et al.
 - **Accepted**
- SKA Key Science Project Workshop ? SKA HQ, Q4 2018 ??

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www.skatelescope.org