SKA SWG Update





SQUARE KILOMETRE ARRAY

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21 Jan 2020

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Science Activity Updates

- Countdown to Construction
 - Deployment Baseline Definition
- SKA related meetings
 - SKA Science Meeting and KSP Workshop
- Round table SWG updates (All)
- AOB



Countdown to Construction



- Deliver Construction Proposal and Operations Plan
 - Construction Proposal
 - Deployment Baseline Reference Design
 - Integration, Acceptance, Commissioning, Science Verification Plans
 - Schedule
 - Cost book
 - Management Plans for Monitor and Control
 - Operations Plan
 - Observatory Design (science/engineering operations)
 - Planning, Scheduling and Execution
 - Observing, Observing Modes
 - Science Data Products
 - KPIs

Countdown to Construction





Countdown to Construction

- Development of Deployment Baseline
 - Updated sequence of cost savings measures now drafted
 - SWG consultation Jan/Feb
 - SEAC consultation: January 28
 - SKA Board Science Reps consultation: January 31
 - SKA Council Preparatory Task Force: February 5+6
 - Establish target cost
 - SKA Board Meeting 28 February 2020
 - Establish budget
 - Finalise definition, integrate into Construction/Ops Plans: March/April
 - Three Information Sessions to communicate outcome to science/engineering/industry:
 - Perth: 30 April
 - Cape Town: 4 May
 - SKAO HQ: 7 May

Deployment Baseline



- Updated draft sequence of cost savings measures based on:
 - Minimising adverse science impact
 - Maximising reinstatement potential
 - Grading: 1=No Loss, 2=Fast Reinstatement, 3=Science Risk, 4=Science Loss
- Start with 2017 table after technical review by PMs
- Add new measures (element CDRs) that do not damage science to top
- Shift most HPC cuts (all but final slice) to top of next tier
 - Ops budget permits full recovery of HPC and PSS within two years of construction end
 - Final HPC slice held back since this significantly degrades science productivity (see Docs 941 and 951)
- Introduce partial deployment of MID SPF Band 1 feeds (as for Band 5)
 - Placement to be determined following consultation (as for Band 5)
 - Straightforward reinstatement path as funds allow
- Introduce some step-wise reductions in LOW station number
 - Offset by (~20%) enhanced performance of SKALA4.1 antennas over specifications
- Introduce replacement of LOW SKALA4.1 with dipole antenna
 - Placement based on relative science impact

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Cost Savings Ladder

WS / Origin	Description	LOW / MID / COMMON	Science Implication	Science Impact
2.1	Replace MID power cables with PV (7/arm from 5/arm)	MID		1
1.1	Replace LOW power cables outside core with local PV	LOW		1
1.2	Replace LOW buried fibre with poles	LOW	Fibre performance needs careful assessment	1
1.2	Move offices from shielded CPF	LOW		1
8	SDP- HPC: Deploy 200 Pflops (rather than 260 Pflops)	соммон	Lower allowed duty cycle for HPC-intensive observations.	2
8	SDP- HPC: Deploy 150 Pflops (from 200 Pflops)	COMMON	Lower allowed duty cycle for HPC-intensive observations.	2
8	SDP- HPC: Deploy 100 Pflops (from 150 Pflops)	соммон	Lower allowed duty cycle for HPC-intensive observations.	2
5.25.2	Reduce PSS-MID: B, 500 nodes to 375 nodes	MID	Likely reduction in processed PSS beam number (1.3x) or pulsar search parameter space	2
5.25.2	Reduce PSS-LOW: B, 167 nodes to 125 nodes	LOW	Likely reduction in processed PSS beam number (1.3x) or pulsar search parameter space	2
5.24.3	Reduce Bmax MID from 150 to 120 km: Case A, remove 3 dishes, but keep infra to 150km	MID	Reduction of maximum achievable resolution by 20%, although can be partially recovered with data weighting and longer integration times.	3
5.24.1	Reduce Bmax MID from 150 to 120 km: Case C, remove infra	MID	As above, but more difficult to reinstate	3
5.5.1	Reduce MID Band 1 feeds: from 130 to 67	MID	Placement to be determined based on full community consultation.	3
5.5.2	Reduce MID Band 5 feeds: A, from 130 to 67	MID	Placement to be determined based on full community consultation.	3
8	SDP- HPC: Deploy 50 Pflops (from 100 Pflops)	COMMON	Lower allowed duty cycle for HPC-intensive observations.	3
10	Reduce LOW station number to 470 from 512 (5 per clump from 6 outside Core)	LOW	10% Array sensitivity loss at large BMax	3
10	Reduce LOW station number to 427 from 470 (5/6 in Core)	LOW	10% Array sensitivity loss in Core	3
5.30.0	Reduce Bmax LOW to 50km: A, remove infra, move 15 stations to core	LOW	Science Risk to EoR: Bmax.	3
5.30.0	Reduce Bmax LOW to 50km: B, remove 15 stations (to 412)	LOW	Science Risk to EoR: Bmax	3
5.5.1	Remove MID Band 1 feeds: from 67 to 0	MID	Lose Science (Cosmology, Galaxy Evolution)	4
5.5.2	Reduce MID Band 5 feeds: B, from 67 to 0	MID	Lose Science (Planetary disks, Star Formation)	4
5.30a	Reduce Bmax LOW to 40km: C, remove next 15 stations (to 397)	LOW	High Science Risk to EoR: Bmax	4
5.24	Remove 11 MID Dishes from core (to 119)	MID	10% Array sensitivity loss in core	4
5.30	Remove 54 LOW stations from core (to 343)	LOW	10% Array sensitivity loss in core	4
5.24	Remove additional 11 MID Dishes from core (to 108)	MID	10% Array sensitivity loss in core	4
5.30	Remove additional 54 LOW stations from core (to 289)	LOW	10% Array sensitivity loss in core	4
5.24.2	Reduce Bmax MID from 120 to 100 km: D, remove infra, remove next 3 dishes (to 105)	MID	Lose Science (Planetary disks, High resolution Star Formation)	4
ECP190017	Replace SKALA4.1 with EDA antenna (in 289 stations)	LOW	60% sensitivity loss <100MHz & > 200MHz (Pulsar Search, Cosmic Dawn,)	4

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SKA1-Low Antenna

- SKALA4.1 is the Design Baseline and has been through System Critical Design Review
 - Some concerns expressed in Element CDR regarding Station beam forming and calibration more generally
 - Test data still being acquired, but conclusion to date is that SKALA4.1 will be compliant with requirements
 - Ongoing work to better understand calibration of polarisation properties



Next Science Meeting

- SKA Science Meeting and KSP Workshop, September/October ?
 - Stellenbosch University
 - Up to 350 participants
 - Title: "The Precursor View of the SKA Sky"
 - Insufficient hotel availability in target week
 - Alternate dates being explored now, possibly into 2021



Photo Credit: Jefri Tamba 2018



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Upcoming SKA-related Meetings



- "Observing the First Billion Years of the Universe using Next-Generation Telescopes", 21 – 24 Jan, Indore
- Cosmology SWG meeting, 22 24 Jan, Paris
- EoR/CD Meeting, 27 31 Jan, Sexten

http://www.sexten-cfa.eu/event/next-generationcosmology-with-next-generation-radio-telescopes-ii/

- SKA Pre-TO Information Sessions
 - Perth: 30 April
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- PHISCC 2020 Meeting, 11 13 May, Cagliari https://sites.google.com/inaf.it/phiscc2020/

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