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CHANGE RECORD

VERSION	AUTHOR	REASON	DATE
1	S. Leff	Draft formatted & uploaded to EDMS	2019-03-29
2	S. Leff	Updated to reflect latest information	2019-04-08
A	A. Lear	Prepared document for approvals and release	2019-07-09

Key Science Goals_RVTM

#	Id	Name	Derived	Derived From
1	KSG1	Unveiling the Formation of Solar System Analogues on Terrestrial Scales	SCI0001 Frequency Coverage SCI0006 Observing Modes SCI0019 Accessible Sky	
2	KSG1.1		SCI0003 Front End Selection SCI0103 Angular Resolution SCI0108 Imaging Fidelity SCI0109 Snapshot Image Fidelity	
3	KSG1.2		SCI0100 Continuum Sensitivity	
4	KSG1.3		SCI0100 Continuum Sensitivity SCI0103 Angular Resolution	
5	KSG1.4		SCI0003 Front End Selection SCI0015 Polarization Products	
6	KSG1.5			
7	KSG1.6		SCI0104 Largest Recoverable Scale	
8	KSG2	Probing the Initial Conditions for Planetary Systems and Life with Astrochemistry	SCI0001 Frequency Coverage SCI0006 Observing Modes SCI0019 Accessible Sky	
9	KSG2.1		SCI0103 Angular Resolution	
10	KSG2.2		SCI0102 Line Sensitivity	
11	KSG2.3		SCI0002 Observing Bands SCI0003 Front End Selection SCI0105 Spectral Resolution	
12	KSG2.4		SCI0104 Largest Recoverable Scale	
13	KSG2.5		SCI0116 Spurious Spectral Features	
14	KSG2.6		SCI0107 Quality of the Synthesized Beam SCI0115 Spectral Dynamic Range (Emissive)	
15	KSG3	Charting the Assembly, Structure, and Evolution of Galaxies from the First Billion Years to the Present	SCI0001 Frequency Coverage SCI0006 Observing Modes SCI0019 Accessible Sky	
16	KSG3.1		SCI0102 Line Sensitivity	
17	KSG3.2		SCI0003 Front End Selection	
18	KSG3.3		SCI0002 Observing Bands SCI0003 Front End Selection	

19	KSG3.4		SCI0102 Line Sensitivity SCI0107 Quality of the Synthesized Beam SCI0108 Imaging Fidelity	
20	KSG3.5		SCI0102 Line Sensitivity SCI0107 Quality of the Synthesized Beam SCI0108 Imaging Fidelity SCI0109 Snapshot Image Fidelity	
21	KSG3.6		SCI0109 Snapshot Image Fidelity SCI0110 Photometric Accuracy	
22	KSG3.7		SCI0107 Quality of the Synthesized Beam SCI0108 Imaging Fidelity	
23	KSG3.8		SCI0100 Continuum Sensitivity SCI0113 Brightness Dynamic Range	
24	KSG3.9		SCI0104 Largest Recoverable Scale SCI0108 Imaging Fidelity	
25	KSG3.10		SCI0004 Mosaics and On-The-Fly Mapping	
26	KSG3.11		SCI0015 Polarization Products SCI0113 Brightness Dynamic Range SCI0114 Polarization Dynamic Range	
27	KSG3.12		SCI0119 Spectral Dynamic Range (Absorptive)	
28	KSG4	Using Pulsars in the Galactic Center to Make a Fundamental Test of Gravity	SCI0001 Frequency Coverage SCI0006 Observing Modes SCI0019 Accessible Sky	
29	KSG4.1		SCI0012 Pulsar Timing Capabilities SCI0013 Time Domain Search Capabilities SCI0014 Timing Capabilities	
30	KSG4.2		SCI0100 Continuum Sensitivity	
31	KSG4.3		SCI0112 Timing Accuracy	
32	KSG4.4		SCI0007 Phased Array Capability SCI0008 Beam Forming	
33	KSG4.5		SCI0012 Pulsar Timing Capabilities	
34	KSG5	Understanding the Formation and Evolution of Stellar and Supermassive Black Holes in the Era of Multi-Messenger Astronomy	SCI0001 Frequency Coverage SCI0006 Observing Modes SCI0019 Accessible Sky	
35	KSG5.1		SCI0103 Angular Resolution SCI0107 Quality of the Synthesized Beam SCI0111 Relative Astrometric Accuracy	

36	KSG5.2		SCI0017 VLBI Capabilities SCI0107 Quality of the Synthesized Beam SCI0111 Relative Astrometric Accuracy	
37	KSG5.3			
38	KSG5.4		SCI0007 Phased Array Capability SCI0008 Beam Forming SCI0009 Sub-Array Capabilities SCI0012 Pulsar Timing Capabilities	
39	KSG5.5		SCI0012 Pulsar Timing Capabilities SCI0014 Timing Capabilities	
40	KSG5.6		SCI0004 Mosaics and On-The-Fly Mapping SCI0106 Survey Speed	
41	KSG5.7		SCI0004 Mosaics and On-The-Fly Mapping SCI0106 Survey Speed	
42	KSG5.8		SCI0005 Triggered Observations	
43	KSG5.9		SCI0013 Time Domain Search Capabilities	
44	KSG5.10		SCI0017 VLBI Capabilities SCI0117 VLB Continuum Sensitivity SCI0118 VLB Angular Resolution	

L0 Science Requirements_RVTM

#	Id	Name	Derived	Derived From
1	SCI0001	Frequency Coverage	SYS0801 System Frequency Range SYS0806 Continuity of Frequency Coverage	KSG1 Unveiling the Formation of Solar System Analogues on Terrestrial Scales KSG5 Understanding the Formation and Evolution of Stellar and Supermassive Black Holes in the Era of Multi-Messenger Astronomy KSG4 Using Pulsars in the Galactic Center to Make a Fundamental Test of Gravity KSG3 Charting the Assembly, Structure, and Evolution of Galaxies from the First Billion Years to the Present KSG2 Probing the Initial Conditions for Planetary Systems and Life with Astrochemistry
2	SCI0002	Observing Bands	SYS0806 Continuity of Frequency Coverage	KSG2.3 KSG3.3
3	SCI0003	Front End Selection	SYS0101 Variable Spectral Resolution SYS0806 Continuity of Frequency Coverage SYS0902 Instantaneous Digitized Bandwidth SYS0904 Sub-Bands SYS0905 Frequency Tunability SYS0907 Sub-Band Step Size SYS0909 Contiguous Bandwidth	KSG1.1 KSG1.4 KSG2.3 KSG3.2 KSG3.3
4	SCI0004	Mosaics and On-The-Fly Mapping	SYS0008 On The Fly Mapping Mode SYS0106 On-The-Fly Mapping – Data & Control Rates SYS0107 On-The-Fly Mapping – Antenna Tracking Rate SYS1104 Tracking Rates SYS2001 Temporal Resolution	KSG3.10 KSG5.6 KSG5.7
5	SCI0005	Triggered Observations	SYS1103 Slew Rates SYS3004 Triggered Observations SYS3005 Triggered Observation Response SYS3006 Trigger Override	KSG5.8

6	SCI0006	Observing Modes	SYS0001 Functional Modes SYS0002 Interferometric Mode SYS0101 Variable Spectral Resolution SYS1403 Flexible Spectral Resolution	KSG1 Unveiling the Formation of Solar System Analogues on Terrestrial Scales KSG2 Probing the Initial Conditions for Planetary Systems and Life with Astrochemistry KSG3 Charting the Assembly, Structure, and Evolution of Galaxies from the First Billion Years to the Present KSG4 Using Pulsars in the Galactic Center to Make a Fundamental Test of Gravity KSG5 Understanding the Formation and Evolution of Stellar and Supermassive Black Holes in the Era of Multi-Messenger Astronomy
7	SCI0007	Phased Array Capability	SYS0003 Phased Array Mode SYS0201 Phased Aperture SYS0202 Concurrent Interferometric and Phased Array Mode	KSG4.4 KSG5.4
8	SCI0008	Beam Forming	SYS0203 Number of Beams	KSG4.4 KSG5.4
9	SCI0009	Sub-Array Capabilities	SYS0203 Number of Beams SYS0601 Sub-Array Capabilities SYS0603 Sub-Array Composition SYS0604 Sub-Array Operating Modes	KSG5.4
10	SCI0010	Sub-Array Commensality	SYS0604 Sub-Array Operating Modes SYS0605 Sub-Array Operating Mode Commensality	
11	SCI0012	Pulsar Timing Capabilities	SYS0003 Phased Array Mode SYS0004 Pulsar Timing Mode SYS0301 Timing Capabilities SYS0302 Timing Sys. Bandwidth SYS0303 Timing Sys. Frequency Resolution SYS0304 Pulse Profile Bins SYS0305 Polarization SYS0306 Pulse Period SYS0307 Dump Rate SYS0741 Pulsar Timing Data Product SYS2002 Temporal Accuracy	KSG4.1 KSG4.5 KSG5.4 KSG5.5

12	SCI0013	Time Domain Search Capabilities	SYS0003 Phased Array Mode SYS0005 Pulsar and Transient Search Mode SYS0104 Commensal Processing SYS0401 Search Capabilities SYS0402 Search Sys. Bandwidth SYS0403 Search Sys. Frequency Resolution SYS0404 Search Sys. Time Resolution SYS0405 Polarization SYS0742 Pulsar Search Data Product	KSG4.1 KSG5.9
13	SCI0014	Timing Capabilities	SYS2002 Temporal Accuracy	KSG4.1 KSG5.5
14	SCI0015	Polarization Products	SYS0102 Polarization Products	KSG1.4 KSG3.11
15	SCI0016	Solar Observation Capabilities	SYS0009 Solar Observing Mode SYS1201 Input Dynamic Range	
16	SCI0017	VLBI Capabilities	SYS0006 VLBI Mode SYS0501 VLBI Recording Capabilities	KSG5.2 KSG5.10
17	SCI0018	Multi-Frequency Observations	SYS0908 Band Switching Time	
18	SCI0019	Accessible Sky	SYS1102 Accessible Field of View	KSG1 Unveiling the Formation of Solar System Analogues on Terrestrial Scales KSG2 Probing the Initial Conditions for Planetary Systems and Life with Astrochemistry KSG3 Charting the Assembly, Structure, and Evolution of Galaxies from the First Billion Years to the Present KSG4 Using Pulsars in the Galactic Center to Make a Fundamental Test of Gravity KSG5 Understanding the Formation and Evolution of Stellar and Supermassive Black Holes in the Era of Multi-Messenger Astronomy
19	SCI0100	Continuum Sensitivity	SYS0802 Optimized Frequency Range SYS0901 Front End Bandwidth Ratio SYS0902 Instantaneous Digitized Bandwidth SYS0903 Total Instantaneous Processed Bandwidth SYS1001 Effective Area / Tsys Ratio SYS1061 Calibration Efficiency SYS1308 Distribution and Weighting of Visibilities SYS1501 Delay/Phase Variations Magnitude SYS1502 SNR Loss to Delay/Phase Variations	KSG1.2 KSG1.3 KSG3.8 KSG4.2

20	SCI0102	Line Sensitivity	SYS0802 Optimized Frequency Range SYS0901 Front End Bandwidth Ratio SYS1001 Effective Area / Tsys Ratio SYS1061 Calibration Efficiency SYS1308 Distribution and Weighting of Visibilities	KSG2.2 KSG3.1 KSG3.4 KSG3.5
21	SCI0103	Angular Resolution	SYS1301 Longest Baseline SYS1308 Distribution and Weighting of Visibilities SYS2001 Temporal Resolution	KSG1.1 KSG1.3 KSG2.1 KSG5.1
22	SCI0104	Largest Recoverable Scale	SYS0007 Total Power Mode SYS1101 Instantaneous Field of View SYS1302 Shortest Baseline SYS1303 Zero Spacing / Single Dish Total Power SYS1601 TP Antennas: Gain Stability SYS1603 TP Antennas: Gain Variations with Antenna Pointing Angle SYS1604 TP Antennas: System Temperature Stability over Time SYS1605 TP Antennas: System Temperature Variations with Antenna Pointing Angle SYS1801 TP Antennas: Gain Calibration Reference	KSG1.6 KSG2.4 KSG3.9
23	SCI0105	Spectral Resolution	SYS1401 Highest Spectral Resolution SYS1402 Number of Spectral Channels SYS1403 Flexible Spectral Resolution SYS1404 Doppler Corrections	KSG2.3
24	SCI0106	Survey Speed	SYS0106 On-The-Fly Mapping – Data & Control Rates SYS0107 On-The-Fly Mapping – Antenna Tracking Rate SYS1001 Effective Area / Tsys Ratio SYS1061 Calibration Efficiency SYS1101 Instantaneous Field of View SYS1202 Gain Calibration System Dynamic Range SYS1203 Provision of Variable Attenuators SYS1205 High-Noise Path SYS1306 Fraction of Occupied Cells	KSG5.6 KSG5.7
25	SCI0107	Quality of the Synthesized Beam		KSG2.6 KSG3.4 KSG3.5 KSG3.7 KSG5.1 KSG5.2

26	SCI0108	Imaging Fidelity	SYS1306 Fraction of Occupied Cells SYS1308 Distribution and Weighting of Visibilities SYS2105 LO Frequency and Sampler Clock Offsets	KSG1.1 KSG3.4 KSG3.5 KSG3.7 KSG3.9
27	SCI0109	Snapshot Image Fidelity	SYS1306 Fraction of Occupied Cells	KSG1.1 KSG3.5 KSG3.6
28	SCI0110	Photometric Accuracy	SYS1603 TP Antennas: Gain Variations with Antenna Pointing Angle SYS1604 TP Antennas: System Temperature Stability over Time SYS1605 TP Antennas: System Temperature Variations with Antenna Pointing Angle SYS1801 TP Antennas: Gain Calibration Reference SYS4603 Gain Variations with Antenna Pointing Angle SYS4801 Gain Calibration Reference	KSG3.6
29	SCI0111	Relative Astrometric Accuracy		KSG5.1 KSG5.2
30	SCI0112	Timing Accuracy	SYS2002 Temporal Accuracy	KSG4.3
31	SCI0113	Brightness Dynamic Range	SYS2105 LO Frequency and Sampler Clock Offsets SYS4601 Interferometric Antennas: Gain Stability SYS4801 Gain Calibration Reference	KSG3.11 KSG3.8
32	SCI0114	Polarization Dynamic Range	SYS1901 Polarization Purity SYS4601 Interferometric Antennas: Gain Stability SYS4602 Interferometric Antennas: Relative Gain Stability SYS4801 Gain Calibration Reference	KSG3.11
33	SCI0115	Spectral Dynamic Range (Emissive)	SYS2105 LO Frequency and Sampler Clock Offsets	KSG2.6
34	SCI0116	Spurious Spectral Features	SYS2104 Self-Generated Spurious Signal Power Level SYS2106 Shielding & Emission Limits EMC0310 Spurious Signal Level	KSG2.5
35	SCI0117	VLB Continuum Sensitivity		KSG5.10
36	SCI0118	VLB Angular Resolution	SYS1301 Longest Baseline SYS1308 Distribution and Weighting of Visibilities	KSG5.10
37	SCI0119	Spectral Dynamic Range (Absorptive)		KSG3.12

L0 Stakeholders Requirements_RVTM

#	Id	Name	Derived	Derived From
1	STK0100	Construction Budget (Total, Maximum)	SYS0721 Imaging Pipeline SYS2802 Cost Optimization	Directors Office, 2018
2	STK0101	Operations Budget (Annual, Maximum)	SYS2402 Array Element MTBF SYS2802 Cost Optimization	Directors Office, 2018
3	STK0102	Community Engagement		Directors Office, 2016
4	STK0103	Site / Location		Directors Office, 2016
5	STK0104	VLA Reuse		Directors Office, 2016
6	STK0105	Design & Development Timeline		Directors Office, 2016
7	STK0106	Construction Timeline		Directors Office, 2016
8	STK0107	Commissioning Scope		NM-OPS
9	STK0200	Operations Concept	SYS0001 Functional Modes	
10	STK0300	ngVLA Transition Plan		
11	STK0301	ngVLA Development Program		020.10.05.00.00-0002-PLA-Sec12-Para1
12	STK0302	Material Selection & Sustainability	SYS2803 Sustainability	
13	STK0303	Design Life	SYS2801 Design Life SYS2802 Cost Optimization	Directors Office, 2016
14	STK0304	Projected Environment	SYS2502 Safety Weather Monitoring	
15	STK0400	Provision of Assembly Verification Tools	SYS2811 Test Fixtures	
16	STK0401	Provision of Assembly/Integration Facilities		
17	STK0402	Provision of System Verification Software Tools	SYS2222 Observation Preparation - Non-Standard Observing modes SYS2305 Single Baseline Data Display SYS2306 Calibration Data Display SYS2407 Engineering Console SYS2408 Engineering Database SYS2813 System Verification Tools	
18	STK0403	Spare Parts	SYS2812 Critical Spares	
19	STK0500	First Look Science Products		020.10.05.00.00-0002-PLA-Sec6.5-Para2
20	STK0501	Availability for Early Science		020.10.05.00.00-0002-PLA-Sec6.5-Para3
21	STK0502	Provision of Commissioning Tools	SYS2222 Observation Preparation - Non-Standard Observing modes SYS2305 Single Baseline Data Display SYS2306 Calibration Data Display SYS2407 Engineering Console SYS2408 Engineering Database	
22	STK0600	Disposal Costs	SYS2802 Cost Optimization	
23	STK0700	Standard Modes: Time-Phased Availability	SYS3001 Standard Observing Modes SYS3002 Number of Standard Observing Modes	020.10.05.00.00-0002-PLA-Sec6-Para4

24	STK0701	Standard Modes: Generation of Scheduling Blocks	SYS2221 Observation Preparation – Standard Observing Modes SYS3001 Standard Observing Modes SYS3002 Number of Standard Observing Modes	020.10.05.00.00-0002-PLA-Sec6-Para4
25	STK0702	Non-Standard Observing Modes	SYS2212 Proposal Submission – non-standard observing modes. SYS3003 Non-Standard Observing Modes	020.10.05.00.00-0002-PLA-Sec6-Para5
26	STK0703	Observing Awards: Array Time on Source		020.10.05.00.00-0002-PLA-Sec6.2-Para6
27	STK0704	Standard Modes: Observing Strategy	SYS1061 Calibration Efficiency SYS1064 Relative Flux Scale Calibration Efficiency SYS1065 Polarization Calibration Efficiency SYS1066 Bandpass Calibration Efficiency	020.10.05.00.00-0002-PLA-Sec6.2-Para7
28	STK0705	Standard Modes: Flexibility	SYS2225 Observation Preparation – Standard Observing Mode Flexibility	
29	STK0800	Proposal Submission Criteria	CSW0078 Post-processing Support SYS2211 Proposal Submission – standard observing modes SYS2212 Proposal Submission – non-standard observing modes.	020.10.05.00.00-0002-PLA-Sec6-Para3
30	STK0801	Proposal Submission Tool	SYS2201 Provision of Software Tools SYS2211 Proposal Submission – standard observing modes SYS2212 Proposal Submission – non-standard observing modes.	
31	STK0802	Proposal Assessment	SYS2213 Scientific Proposal Evaluation SYS2214 Technical Proposal Evaluation	
32	STK0803	Mitigating Bias in Proposal Peer Review	SYS2213 Scientific Proposal Evaluation	020.10.05.00.00-0002-PLA-Sec6.1-Para2
33	STK0804	Proposal Attributes and Staged Capability		020.10.05.00.00-0002-PLA-Sec6.1-Para3
34	STK0805	Proposal Submission Concept	SYS2201 Provision of Software Tools SYS2211 Proposal Submission – standard observing modes SYS2221 Observation Preparation – Standard Observing Modes	
35	STK0900	Priority in Scheduling Observations	SYS2302 Observation Scheduling SYS2501 Weather Monitoring	020.10.05.00.00-0002-PLA-Sec6.1-Para4
36	STK0901	Priority for Triggered Observations	SYS2223 Observation Scheduling GUI SYS2224 Observation Interrupt SYS2302 Observation Scheduling	020.10.05.00.00-0002-PLA-Sec6.2-Para3
37	STK0902	Concurrent Maintenance and Observation	CSW0073 Observation Execution Abortion	020.10.05.00.00-0002-PLA-Sec7.1-Para1

38	STK1000	Pipeline Use for Standard Observing Modes	SYS0703 Calibration Pipeline SYS0751 Data Processing Resources	020.10.05.00.00-0002-PLA-Sec6-Para3
39	STK1001	Computing Resources for Standard Modes: Reprocessing	SYS0752 Throughput & Latency	
40	STK1002	Computing Resources for Standard Modes	SYS0752 Throughput & Latency SYS0753 Heterogeneous Arrays	020.10.05.00.00-0002-PLA-Sec6.3-Para2
41	STK1003	Delivery of Operational SRDP Pipeline for Early Science		020.10.05.00.00-0002-PLA-Sec6.3-Para3
42	STK1004	Support for Legacy Programs		020.10.05.00.00-0002-PLA-Sec6.3-Para5
43	STK1005	Data Delivery: Process in Place		
44	STK1100	Data Product Types to Archive	SYS0701 Uncalibrated Data SYS0702 Flagged Data Table SYS0732 Archive Products SYS0735 Archive Backup	020.10.05.00.00-0002-PLA-Sec6.3-Para4
45	STK1101	ngVLA Data Archive Functionality: Image selection and download	SYS0736 Archive User Reprocessing	020.10.05.00.00-0002-PLA-Sec6.4-Para3
46	STK1102	Reprocessing and Automated QA via Archive	SYS0702 Flagged Data Table SYS0731 Archive Period SYS0734 Archive Batch Reprocessing SYS0736 Archive User Reprocessing	020.10.05.00.00-0002-PLA-Sec6.4-Para2
47	STK1103	Proprietary Period for PI Data	SYS0733 Proprietary Data Rights SYS0738 Proprietary Period	020.10.05.00.00-0002-PLA-Sec6.4-Para3
48	STK1104	User Produced Data Products		020.10.05.00.00-0002-PLA-Sec6.4-Para4
49	STK1105	Proprietary Period for Legacy Program Data		020.10.05.00.00-0002-PLA-Sec6.4-Para5
50	STK1106	Data Delivery via Observatory Archive	SYS0731 Archive Period SYS0735 Archive Backup	020.10.05.00.00-0002-PLA-Sec6-Para3
51	STK1107	Interfaces to Similar Archival Systems		020.10.05.00.00-0002-PLA-Sec6.4-Para6
52	STK1200	Operational User Support		020.10.05.00.00-0002-PLA-Sec6.6-Para1
53	STK1201	Software Packages Available to User Community: Data Analysis	CSW0014 Data Analysis Software Package SYS0761 Data Analysis Resources SYS2201 Provision of Software Tools	
54	STK1202	Software Packages Available to User Community: Data Processing	CSW0013 Visibility Processing Software Package SYS0751 Data Processing Resources SYS2201 Provision of Software Tools	020.10.05.00.00-0002-PLA-Sec6.3-Para6
55	STK1300	Storage and Retrieval of Calibration Coefficients	CSW0026 Persistent Configuration Data	
56	STK1301	Automated Re-Measurement of Calibration Coefficients		020.10.05.00.00-0002-PLA-Sec6.8-Para1
57	STK1302	Inclusion of Calibration Pipelines and Supporting Systems		

58	STK1400	Subarrays for Maintenance	SYS0602 Phase Preservation SYS0606 Sub-Array Configuration	020.10.05.00.00-0002-PLA-Sec6.2-Para2
59	STK1401	Subarrays for Scheduling		020.10.05.00.00-0002-PLA-Sec6.2-Para3
60	STK1402	Observational Efficiency	CSW0003 Concurrent software versions SYS1501 Delay/Phase Variations Magnitude SYS2601 Antenna System Availability SYS2602 Centralized Systems Availability	
61	STK1403	Calibration Efficiency	SYS0602 Phase Preservation SYS0906 Fixed Analog Tunings SYS1061 Calibration Efficiency SYS1062 Calibration Parallelization SYS1063 Calibration Recall SYS1064 Relative Flux Scale Calibration Efficiency SYS1065 Polarization Calibration Efficiency SYS1066 Bandpass Calibration Efficiency SYS1067 Gain Calibration Efficiency SYS1068 Phase Calibration Efficiency SYS1304 Integration Time Ratios SYS1501 Delay/Phase Variations Magnitude SYS1502 SNR Loss to Delay/Phase Variations SYS2503 Weather Archive	
62	STK1500	Array Operations: Location		020.10.05.00.00-0002-PLA-Sec7-Para1
63	STK1501	Array Operations: Subarray Use	CSW0003 Concurrent software versions	020.10.05.00.00-0002-PLA-Sec7.1-Para2
64	STK1502	Duties of the Operator	SYS2223 Observation Scheduling GUI SYS2224 Observation Interrupt	020.10.05.00.00-0002-PLA-Sec7.2-Para1
65	STK1503	Performance Metrics Definition		
66	STK1504	Performance Metrics Reporting		020.10.05.00.00-0002-PLA-Sec7.3-Para1
67	STK1505	Array Operations Interface to Array Maintenance and Engineering		020.10.05.00.00-0002-PLA-Sec7-Para1
68	STK1506	Array Operations: Remote and Automated Functions	CSW0005 Autonomous antennas CSW0040 Autonomous Operations CSW0043 Automatic Re-configuration SYS2303 Calibration Automation SYS2304 Self-Calibrating Antenna SYS3104 Sub-System Monitoring Screens SYS3105 Fast Read-Out Modes	
69	STK1600	Remote Access of System Configuration	SYS2406 Configuration Monitoring SYS3104 Sub-System Monitoring Screens	020.10.05.00.00-0002-PLA-Sec8.2-Para2
70	STK1601	Configuration Management	SYS2406 Configuration Monitoring	020.10.05.00.00-0002-PLA-Sec10.4-Para1-3
71	STK1602	Identification by Serial Numbers		

72	STK1603	Packaging as LRUs	SYS2403 Modularization	020.10.05.00.00-0002-PLA-Sec8-Para3
73	STK1700	Performance analysis and Automated maintenance scheduling	CSW0004 Automatic maintenance scheduler SYS0103 Autocorrelation Products SYS2306 Calibration Data Display SYS2407 Engineering Console SYS2408 Engineering Database SYS3103 Monitor Archive	020.10.05.00.00-0002-PLA-Sec7.2-Para1
74	STK1701	Hot Swaps of LRUs		
75	STK1702	Intelligent LRUs and Subsystems	SYS2405 Predictive and Self-Diagnostic Function SYS2407 Engineering Console SYS2408 Engineering Database SYS2701 Sub-system self-monitoring SYS3101 LRU Monitoring SYS3104 Sub-System Monitoring Screens SYS3105 Fast Read-Out Modes	020.10.05.00.00-0002-PLA-Sec8.2-Para1
76	STK1703	Interface between Operator and Operations Software	CSW0037 Operations Interface SYS2307 Operator Console	020.10.05.00.00-0002-PLA-Sec7.2-Para1
77	STK1704	Antenna Automation	CSW0005 Autonomous antennas CSW0027 System Re-configuration SYS0103 Autocorrelation Products	
78	STK1800	Preventive Maintenance Schedules	SYS2401 Antenna Maintenance Interval	020.10.05.00.00-0002-PLA-Sec8-Para2
79	STK1801	Maintenance Tiers		020.10.05.00.00-0002-PLA-Sec8-Para3
80	STK1802	Optimization for Maintenance	SYS2402 Array Element MTBF SYS2403 Modularization	020.10.05.00.00-0002-PLA-Sec8-Para4
81	STK1803	Criteria for Scheduling Maintenance	SYS2405 Predictive and Self-Diagnostic Function SYS3101 LRU Monitoring SYS3102 LRU Alerts	020.10.05.00.00-0002-PLA-Sec8.1-Para1
82	STK1804	Use of Failure Analysis in Spares Planning		020.10.05.00.00-0002-PLA-Sec8.1-Para2
83	STK1805	Reporting of Failures and Anomalies		020.10.05.00.00-0002-PLA-Sec8.3-Para1
84	STK1806	Maintenance Personnel Duty Stations: Antenna based		020.10.05.00.00-0002-PLA-Sec10.1-Para1-2
85	STK1807	Maintenance Personnel Transportation: Array Site		
86	STK1808	Maintenance Personnel Transportation: Maintenance Center		020.10.05.00.00-0002-PLA-Sec10.1-Para3
87	STK1809	Maintenance Metrics Definition		
88	STK1810	Maintenance Metrics Reporting		020.10.05.00.00-0002-PLA-Sec8.4-Para1
89	STK1900	Quality Control Database		
90	STK1901	Quality Assurance of Repaired Items		020.10.05.00.00-0002-PLA-Sec10.3-Para3
91	STK1902	Quality Control of Repaired Items		

92	STK2000	Inclusion of a Visitor Center		020.10.05.00.00-0002-PLA-Sec9.4-Para1
93	STK2001	Inclusion of a Maintenance Operations Center		020.10.05.00.00-0002-PLA-Sec9.5-Para1
94	STK2002	Inclusion of a Warehouse		020.10.05.00.00-0002-PLA-Sec9.5-Para1
95	STK2003	Inclusion of a Repair Center		
96	STK2004	Inclusion of an Array Operations Center		020.10.05.00.00-0002-PLA-Sec9.6-Para1-2
97	STK2005	Inclusion of a Science Operations Center		020.10.05.00.00-0002-PLA-Sec9.7-Para1-2
98	STK2006	Inclusion of Remote Operations Stations		020.10.05.00.00-0002-PLA-Sec9.8-Para1-2
99	STK2007	Location of the Maintenance Operations Center		
100	STK2008	Location of the Array Operations Center		
101	STK2009	Location of the Science Operations Center		
102	STK2010	Location of the Repair Center		
103	STK2011	Location of the Warehouse		
104	STK2012	Inclusion of a Guard Booth		
105	STK2013	Inclusion of Central Support Buildings		020.10.05.00.00-0002-PLA-Sec9.2-Para1
106	STK2100	Inventory Tracking System		
107	STK2101	Inventory of Consumables		020.10.05.00.00-0002-PLA-Sec10.2-Para1
108	STK2102	Shipping and Receiving Logistics		020.10.05.00.00-0002-PLA-Sec10.2-Para2
109	STK2103	Repair and Tracking of LRUs		020.10.05.00.00-0002-PLA-Sec10.3-Para1
110	STK2104	Inventory of Component Spares		020.10.05.00.00-0002-PLA-Sec10.3-Para2
111	STK2105	Observatory-Controlled Logistics		
112	STK2106	Packaging Used for Shipping		
113	STK2200	Physical Security Systems		020.10.05.00.00-0002-PLA-Sec10.5-Para3
114	STK2201	Physical Security Plans	SYS2704 Physical Security	020.10.05.00.00-0002-PLA-Sec10.5-Para1-2
115	STK2202	Cybersecurity	SYS2702 IT Security	020.10.05.00.00-0002-PLA-Sec10.6-Para1
116	STK2400	Grassland & Water		J&S Bruton, 09/25/2018 visit by PD.
117	STK2401	Roads		J&S Bruton, 09/25/2018 visit by PD.
118	STK2402	Existing Roads		J&S Bruton, 09/25/2018 visit by PD.
119	STK2403	Fences		J&S Bruton, 09/25/2018 visit by PD.
120	STK2404	Ranching Impact		J&S Bruton, 09/25/2018 visit by PD.
121	STK2405	Core Site		J&S Bruton, 09/25/2018 visit by PD.
122	STK2500	SRDP Integration	CSW0011 SRDP Integration	(We should have J. Kern wordsmith this.)
123	STK2501	Facility Integration	SYS0502 eVLBI Capabilities	
124	STK2502	DMS Integration	CSW0075 NRAO Proposal System Integration	(We should have B. Glendenning wordsmith this.)
125	STK2600	Self-Interference		
126	STK2601	RFI Survival	SYS1204 Input Protection	
127	STK2602	RFI Mitigation		
128	STK2603	VLA Interference		
129	STK2700	Design Consideration of the -ilities""		PMD AD, 2018
130	STK2800	SSA Support		Directors Office, 2016

131	STK2801	DSN Support	SYS0802 Optimized Frequency Range	Directors Office, 2016
132	STK2900	Commensal Front-Ends	SYS0105 Commensal Low-Frequency System	NRL, LWA, 2016
133	STK2901	Commensal Back-Ends	SYS0104 Commensal Processing	

L0 Safety Requirements_RVTM

#	Id	Name	Derived	Derived From
1	SAF-28	Design for all lifecycle phases safety		
2	SAF-29	Comply with ES&S manual		
3	SAF-30	Develop safe procedures		
4	SAF-31	Follow safe design priorities		
5	SAF-32	Follow mitigation order of precedence		
6	SAF-33	Develop operational safety plan		
7	SAF-34	Follow safety design specification		
8	SAF-35	Use safety design specification for validation		
9	SAF-36	Document safety compliance		
10	SAF-37	Describe process to achieve safe state		
11	SAF-38	Describe additional safety requirements		
12	SAF-39	Design facilities for safe operational use		
13	SAF-40	Design controls for safe operation		
14	SAF-41	Ensure initial safe state for subsystem power up		
15	SAF-42	Ensure subsystems are standalone safe		
16	SAF-43	Address facility security in design		
17	SAF-44	Address sustainability in design		

L1 System Requirements_RVTM

#	Id	Name	Derived	Derived From	Refined By	Refines	Verify Method
1	SYS0001	Functional Modes		SCI0006 Observing Modes STK0200 Operations Concept			Design
2	SYS0002	Interferometric Mode	CSW0062 Continuum Interferometry Observing Mode CSW0063 Spectral Line Interferometry Observing Mode	SCI0006 Observing Modes			Demonstration
3	SYS0003	Phased Array Mode		SCI0007 Phased Array Capability SCI0012 Pulsar Timing Capabilities SCI0013 Time Domain Search Capabilities			Demonstration
4	SYS0004	Pulsar Timing Mode	CSW0065 Pulsar Timing Observing Mode	SCI0012 Pulsar Timing Capabilities			Demonstration
5	SYS0005	Pulsar and Transient Search Mode	CSW0066 Pulsar Search Observing Mode	SCI0013 Time Domain Search Capabilities			Demonstration
6	SYS0006	VLBI Mode	CSW0067 Very Long Interferometry Observing Mode CSW0072 VLBI Observations	SCI0017 VLBI Capabilities			Demonstration
7	SYS0007	Total Power Mode	CSW0064 Total Power Observing Mode	SCI0104 Largest Recoverable Scale			Demonstration
8	SYS0008	On The Fly Mapping Mode	CSW0068 On-The-Fly Mosaicking Observing Mode	SCI0004 Mosaics and On-The-Fly Mapping			Demonstration
9	SYS0009	Solar Observing Mode	CSW0069 Solar Observing Mode	SCI0016 Solar Observation Capabilities			Demonstration
10	SYS0101	Variable Spectral Resolution		SCI0006 Observing Modes SCI0003 Front End Selection			Demonstration
11	SYS0102	Polarization Products		SCI0015 Polarization Products			Demonstration
12	SYS0103	Autocorrelation Products		STK1700 Performance analysis and Automated maintenance scheduling STK1704 Antenna Automation			Demonstration
13	SYS0104	Commensal Processing		SCI0013 Time Domain Search Capabilities STK2901 Commensal Back-Ends			Inspection
14	SYS0105	Commensal Low-Frequency System		STK2900 Commensal Front-Ends			Inspection
15	SYS0106	On-The-Fly Mapping – Data & Control Rates		SCI0004 Mosaics and On-The-Fly Mapping SCI0106 Survey Speed			Demonstration
16	SYS0107	On-The-Fly Mapping – Antenna Tracking Rate		SCI0004 Mosaics and On-The-Fly Mapping SCI0106 Survey Speed			Demonstration
17	SYS0201	Phased Aperture	CSW0067 Very Long Interferometry Observing Mode	SCI0007 Phased Array Capability			Test
18	SYS0202	Concurrent Interferometric and Phased Array Mode		SCI0007 Phased Array Capability			Demonstration
19	SYS0203	Number of Beams	CSW0067 Very Long Interferometry Observing Mode	SCI0008 Beam Forming SCI0009 Sub-Array Capabilities			Demonstration
20	SYS0301	Timing Capabilities	CSW0007 Pulsar Timing Data Rate	SCI0012 Pulsar Timing Capabilities			Inspection
21	SYS0302	Timing Sys. Bandwidth	CSW0007 Pulsar Timing Data Rate	SCI0012 Pulsar Timing Capabilities			Demonstration
22	SYS0303	Timing Sys. Frequency Resolution	CSW0007 Pulsar Timing Data Rate	SCI0012 Pulsar Timing Capabilities			Demonstration
23	SYS0304	Pulse Profile Bins	CSW0007 Pulsar Timing Data Rate	SCI0012 Pulsar Timing Capabilities			Demonstration
24	SYS0305	Polarization	CSW0007 Pulsar Timing Data Rate	SCI0012 Pulsar Timing Capabilities			Design
25	SYS0306	Pulse Period	CSW0007 Pulsar Timing Data Rate	SCI0012 Pulsar Timing Capabilities			Test
26	SYS0307	Dump Rate	CSW0007 Pulsar Timing Data Rate	SCI0012 Pulsar Timing Capabilities			Demonstration
27	SYS0401	Search Capabilities	CSW0008 Pulsar Search Data Rate	SCI0013 Time Domain Search Capabilities			Inspection
28	SYS0402	Search Sys. Bandwidth	CSW0008 Pulsar Search Data Rate	SCI0013 Time Domain Search Capabilities			Demonstration
29	SYS0403	Search Sys. Frequency Resolution	CSW0008 Pulsar Search Data Rate	SCI0013 Time Domain Search Capabilities			Demonstration
30	SYS0404	Search Sys. Time Resolution	CSW0008 Pulsar Search Data Rate	SCI0013 Time Domain Search Capabilities			Demonstration
31	SYS0405	Polarization	CSW0008 Pulsar Search Data Rate	SCI0013 Time Domain Search Capabilities			Demonstration
32	SYS0501	VLBI Recording Capabilities		SCI0017 VLBI Capabilities			Demonstration
33	SYS0502	eVLBI Capabilities		STK2501 Facility Integration			Analysis
34	SYS0601	Sub-Array Capabilities		SCI0009 Sub-Array Capabilities			Demonstration
35	SYS0602	Phase Preservation		STK1400 Subarrays for Maintenance STK1403 Calibration Efficiency			Test
36	SYS0603	Sub-Array Composition		SCI0009 Sub-Array Capabilities			Demonstration
37	SYS0604	Sub-Array Operating Modes		SCI0009 Sub-Array Capabilities SCI0010 Sub-Array Commensality			Design
38	SYS0605	Sub-Array Operating Mode Commensality		SCI0010 Sub-Array Commensality			Analysis Demonstration

39	SYS0606	Sub-Array Configuration		STK1400 Subarrays for Maintenance			Demonstration
40	SYS0701	Uncalibrated Data	CSW0028 Visibility Data Format	STK1100 Data Product Types to Archive			Inspection
41	SYS0702	Flagged Data Table	CSW0028 Visibility Data Format	STK1100 Data Product Types to Archive STK1102 Reprocessing and Automated QA via Archive			Inspection
42	SYS0703	Calibration Pipeline	CSW0078 Post-processing Support	STK1000 Pipeline Use for Standard Observing Modes			Inspection
43	SYS0721	Imaging Pipeline	CSW0078 Post-processing Support	STK0100 Construction Budget (Total, Maximum)			Test
44	SYS0731	Archive Period		STK1106 Data Delivery via Observatory Archive STK1102 Reprocessing and Automated QA via Archive			Analysis
45	SYS0732	Archive Products		STK1100 Data Product Types to Archive			Design
46	SYS0733	Proprietary Data Rights		STK1103 Proprietary Period for PI Data			Inspection
47	SYS0734	Archive Batch Reprocessing	CSW0015 Reprocessing capacity	STK1102 Reprocessing and Automated QA via Archive			Inspection
48	SYS0735	Archive Backup		STK1100 Data Product Types to Archive STK1106 Data Delivery via Observatory Archive			Analysis Inspection
49	SYS0736	Archive User Reprocessing	CSW0015 Reprocessing capacity	STK1101 ngVLA Data Archive Functionality: Image selection and download STK1102 Reprocessing and Automated QA via Archive			Demonstration
50	SYS0738	Proprietary Period		STK1103 Proprietary Period for PI Data			Inspection
51	SYS0741	Pulsar Timing Data Product	CSW0029 Pulsar Timing Profile Data Format	SCI0012 Pulsar Timing Capabilities			Design
52	SYS0742	Pulsar Search Data Product	CSW0030 Offline Pulsar Search Data Format	SCI0013 Time Domain Search Capabilities			Design
53	SYS0751	Data Processing Resources		STK1000 Pipeline Use for Standard Observing Modes STK1202 Software Packages Available to User Community: Data Processing			Analysis
54	SYS0752	Throughput & Latency	CSW0006 Visibility Data Rate CSW0009 Synthesis Imaging Performance CSW0010 Pipeline Reliability	STK1001 Computing Resources for Standard Modes: Reprocessing STK1002 Computing Resources for Standard Modes			Analysis
55	SYS0753	Heterogeneous Arrays		STK1002 Computing Resources for Standard Modes		SYS1304 Integration Time Ratios	Demonstration
56	SYS0761	Data Analysis Resources	CSW0014 Data Analysis Software Package	STK1201 Software Packages Available to User Community: Data Analysis			Demonstration
57	SYS0801	System Frequency Range	CSW0051 Frequency Tuning	SCI0001 Frequency Coverage	SYS0803 Freq. Span A: SYS0804 Freq. Span B: SYS0805 Freq. Span C:		Design
58	SYS0802	Optimized Frequency Range		SCI0100 Continuum Sensitivity SCI0102 Line Sensitivity STK2801 DSN Support			Design
59	SYS0803	Freq. Span A:				SYS0801 System Frequency Range	Design
60	SYS0804	Freq. Span B:				SYS0801 System Frequency Range	Design
61	SYS0805	Freq. Span C:				SYS0801 System Frequency Range	Design
62	SYS0806	Continuity of Frequency Coverage	CSW0051 Frequency Tuning	SCI0001 Frequency Coverage SCI0002 Observing Bands SCI0003 Front End Selection			Demonstration
63	SYS0901	Front End Bandwidth Ratio		SCI0100 Continuum Sensitivity SCI0102 Line Sensitivity			Design
64	SYS0902	Instantaneous Digitized Bandwidth		SCI0003 Front End Selection SCI0100 Continuum Sensitivity			Inspection
65	SYS0903	Total Instantaneous Processed Bandwidth		SCI0100 Continuum Sensitivity			Test
66	SYS0904	Sub-Bands		SCI0003 Front End Selection			Design
67	SYS0905	Frequency Tunability		SCI0003 Front End Selection			Demonstration
68	SYS0906	Fixed Analog Tunings		STK1403 Calibration Efficiency			Design

69	SYS0907	Sub-Band Step Size		SCI0003 Front End Selection			Design
70	SYS0908	Band Switching Time		SCI0018 Multi-Frequency Observations			Test
71	SYS0909	Contiguous Bandwidth		SCI0003 Front End Selection			Design
72	SYS1001	Effective Area / Tsys Ratio		SCI0100 Continuum Sensitivity SCI0102 Line Sensitivity SCI0106 Survey Speed			Analysis
73	SYS1061	Calibration Efficiency		SCI0100 Continuum Sensitivity SCI0102 Line Sensitivity SCI0106 Survey Speed STK1403 Calibration Efficiency STK0704 Standard Modes: Observing Strategy	SYS2303 Calibration Automation SYS2304 Self-Calibrating Antenna		Analysis
74	SYS1062	Calibration Parallelization	CSW0009 Synthesis Imaging Performance	STK1403 Calibration Efficiency	SYS2303 Calibration Automation SYS2304 Self-Calibrating Antenna		Design
75	SYS1063	Calibration Recall	CSW0016 Array Calibration Tools	STK1403 Calibration Efficiency			Design
76	SYS1064	Relative Flux Scale Calibration Efficiency	CSW0018 Flux Calibration	STK1403 Calibration Efficiency STK0704 Standard Modes: Observing Strategy			Test
77	SYS1065	Polarization Calibration Efficiency	CSW0020 Polarization Calibration	STK1403 Calibration Efficiency STK0704 Standard Modes: Observing Strategy			Design
78	SYS1066	Bandpass Calibration Efficiency	CSW0019 Bandpass Calibration	STK1403 Calibration Efficiency STK0704 Standard Modes: Observing Strategy			Test
79	SYS1067	Gain Calibration Efficiency		STK1403 Calibration Efficiency			Analysis
80	SYS1068	Phase Calibration Efficiency	CSW0017 Amplitude Calibration	STK1403 Calibration Efficiency			Analysis
81	SYS1101	Instantaneous Field of View		SCI0106 Survey Speed SCI0104 Largest Recoverable Scale			Design
82	SYS1102	Accessible Field of View		SCI0019 Accessible Sky			Analysis
83	SYS1103	Slew Rates		SCI0005 Triggered Observations			Analysis
84	SYS1104	Tracking Rates		SCI0004 Mosaics and On-The-Fly Mapping			Analysis
85	SYS1201	Input Dynamic Range		SCI0016 Solar Observation Capabilities			Test
86	SYS1202	Gain Calibration System Dynamic Range		SCI0106 Survey Speed			Design
87	SYS1203	Provision of Variable Attenuators	CSW0053 Signal Path Attenuation	SCI0106 Survey Speed			Design
88	SYS1204	Input Protection		STK2601 RFI Survival			Analysis
89	SYS1205	High-Noise Path		SCI0106 Survey Speed			Design
90	SYS1301	Longest Baseline		SCI0103 Angular Resolution SCI0118 VLB Angular Resolution			Design
91	SYS1302	Shortest Baseline		SCI0104 Largest Recoverable Scale			Design
92	SYS1303	Zero Spacing / Single Dish Total Power		SCI0104 Largest Recoverable Scale			Design
93	SYS1304	Integration Time Ratios		STK1403 Calibration Efficiency	SYS0753 Heterogeneous Arrays		Analysis
94	SYS1306	Fraction of Occupied Cells		SCI0106 Survey Speed SCI0108 Imaging Fidelity SCI0109 Snapshot Image Fidelity			Analysis
95	SYS1308	Distribution and Weighting of Visibilities		SCI0100 Continuum Sensitivity SCI0102 Line Sensitivity SCI0103 Angular Resolution SCI0108 Imaging Fidelity SCI0118 VLB Angular Resolution			Analysis
96	SYS1401	Highest Spectral Resolution		SCI0105 Spectral Resolution			Design
97	SYS1402	Number of Spectral Channels		SCI0105 Spectral Resolution			Design
98	SYS1403	Flexible Spectral Resolution		SCI0105 Spectral Resolution SCI0006 Observing Modes			Design
99	SYS1404	Doppler Corrections		SCI0105 Spectral Resolution			Demonstration
100	SYS1501	Delay/Phase Variations Magnitude		STK1402 Observational Efficiency STK1403 Calibration Efficiency SCI0100 Continuum Sensitivity	SYS1504 Phase Drift Residual SYS1505 Absolute Phase Drift		Analysis
101	SYS1502	SNR Loss to Delay/Phase Variations		SCI0100 Continuum Sensitivity STK1403 Calibration Efficiency	SYS1503 Phase Noise		Analysis
102	SYS1503	Phase Noise				SYS1502 SNR Loss to Delay/Phase Variations	Analysis Test

103	SYS1504	Phase Drift Residual				SYS1501 Delay/Phase Variations Magnitude	Analysis Test
104	SYS1505	Absolute Phase Drift				SYS1501 Delay/Phase Variations Magnitude	Analysis Test
105	SYS1601	TP Antennas: Gain Stability		SCI0104 Largest Recoverable Scale			Analysis Test
106	SYS1603	TP Antennas: Gain Variations with Antenna Pointing Angle		SCI0104 Largest Recoverable Scale SCI0110 Photometric Accuracy			Analysis Test
107	SYS1604	TP Antennas: System Temperature Stability over Time		SCI0104 Largest Recoverable Scale SCI0110 Photometric Accuracy			Analysis Test
108	SYS1605	TP Antennas: System Temperature Variations with Antenna Pointing Angle		SCI0104 Largest Recoverable Scale SCI0110 Photometric Accuracy			Analysis Test
109	SYS1801	TP Antennas: Gain Calibration Reference	CSW0018 Flux Calibration	SCI0104 Largest Recoverable Scale SCI0110 Photometric Accuracy			Analysis Test
110	SYS1901	Polarization Purity	CSW0020 Polarization Calibration	SCI0114 Polarization Dynamic Range			Analysis Test
111	SYS2001	Temporal Resolution		SCI0004 Mosaics and On-The-Fly Mapping SCI0103 Angular Resolution			Design
112	SYS2002	Temporal Accuracy		SCI0112 Timing Accuracy SCI0014 Timing Capabilities SCI0012 Pulsar Timing Capabilities			Analysis
113	SYS2104	Self-Generated Spurious Signal Power Level		SCI0116 Spurious Spectral Features	EMC0310 Spurious Signal Level EMC0320 Drive System Shielding EMC0321 Relay Contact Arcing EMC0322 Amplifiers & Oscillators EMC0323 Silicone Controlled Rectifiers EMC0324 Gaseous Discharge Devices EMC0325 Static Discharge Mitigation EMC0326 Display Shielding EMC0327 Digital Equipment Shielding EMC0328 EMC Test Frequencies		Analysis Test
114	SYS2105	LO Frequency and Sampler Clock Offsets		SCI0115 Spectral Dynamic Range (Emissive) SCI0113 Brightness Dynamic Range SCI0108 Imaging Fidelity			Demonstration
115	SYS2106	Shielding & Emission Limits		SCI0116 Spurious Spectral Features			Analysis Test
116	SYS2201	Provision of Software Tools	CSW0014 Data Analysis Software Package CSW0075 NRAO Proposal System Integration	STK0801 Proposal Submission Tool STK1201 Software Packages Available to User Community: Data Analysis STK1202 Software Packages Available to User Community: Data Processing STK0805 Proposal Submission Concept			Design
117	SYS2211	Proposal Submission – standard observing modes		STK0801 Proposal Submission Tool STK0800 Proposal Submission Criteria STK0805 Proposal Submission Concept			Design
118	SYS2212	Proposal Submission – non-standard observing modes.		STK0800 Proposal Submission Criteria STK0801 Proposal Submission Tool STK0702 Non-Standard Observing Modes			Design
119	SYS2213	Scientific Proposal Evaluation		STK0802 Proposal Assessment STK0803 Mitigating Bias in Proposal Peer Review			Design
120	SYS2214	Technical Proposal Evaluation		STK0802 Proposal Assessment			Design
121	SYS2221	Observation Preparation – Standard Observing Modes	CSW0076 ngVLA Resources Model	STK0805 Proposal Submission Concept STK0701 Standard Modes: Generation of Scheduling Blocks			Design

122	SYS2222	Observation Preparation - Non-Standard Observing modes	CSW0080 Scheduling Block Generation	STK0402 Provision of System Verification Software Tools STK0502 Provision of Commissioning Tools			Design
123	SYS2223	Observation Scheduling GUI	CSW0037 Operations Interface CSW0071 Manual Scheduling Block Selection	STK0901 Priority for Triggered Observations STK1502 Duties of the Operator			Demonstration
124	SYS2224	Observation Interrupt	CSW0073 Observation Execution Abortion	STK0901 Priority for Triggered Observations STK1502 Duties of the Operator			Inspection
125	SYS2225	Observation Preparation – Standard Observing Mode Flexibility		STK0705 Standard Modes: Flexibility			Design
126	SYS2302	Observation Scheduling	CSW0070 Automatic Scheduling Block Selection CSW0074 Manual Sub-array Management CSW0077 Sub-array Management Support	STK0901 Priority for Triggered Observations STK0900 Priority in Scheduling Observations			Demonstration
127	SYS2303	Calibration Automation	CSW0049 Online Antenna Pointing Calibration	STK1506 Array Operations: Remote and Automated Functions		SYS1061 Calibration Efficiency SYS1062 Calibration Parallelization	Demonstration
128	SYS2304	Self-Calibrating Antenna	CSW0005 Autonomous antennas	STK1506 Array Operations: Remote and Automated Functions		SYS1061 Calibration Efficiency SYS1062 Calibration Parallelization	Design
129	SYS2305	Single Baseline Data Display	CSW0037 Operations Interface	STK0402 Provision of System Verification Software Tools STK0502 Provision of Commissioning Tools			Demonstration
130	SYS2306	Calibration Data Display	CSW0037 Operations Interface	STK1700 Performance analysis and Automated maintenance scheduling STK0402 Provision of System Verification Software Tools STK0502 Provision of Commissioning Tools			Demonstration
131	SYS2307	Operator Console	CSW0037 Operations Interface	STK1703 Interface between Operator and Operations Software			Demonstration
132	SYS2401	Antenna Maintenance Interval		STK1800 Preventive Maintenance Schedules			Analysis
133	SYS2402	Array Element MTBF		STK1802 Optimization for Maintenance STK0101 Operations Budget (Annual, Maximum)			Analysis
134	SYS2403	Modularization	CSW0041 Line Replaceable Unit Serial Number	STK1802 Optimization for Maintenance STK1603 Packaging as LRUs			Design
135	SYS2405	Predictive and Self-Diagnostic Function	CSW0004 Automatic maintenance scheduler CSW0045 Self-diagnostic Operations	STK1803 Criteria for Scheduling Maintenance STK1702 Intelligent LRUs and Subsystems			Demonstration
136	SYS2406	Configuration Monitoring	CSW0026 Persistent Configuration Data	STK1600 Remote Access of System Configuration STK1601 Configuration Management			Design
137	SYS2407	Engineering Console	CSW0037 Operations Interface CSW0038 Engineering Support Interface	STK1700 Performance analysis and Automated maintenance scheduling STK1702 Intelligent LRUs and Subsystems STK0402 Provision of System Verification Software Tools STK0502 Provision of Commissioning Tools			Demonstration
138	SYS2408	Engineering Database		STK1700 Performance analysis and Automated maintenance scheduling STK1702 Intelligent LRUs and Subsystems STK0402 Provision of System Verification Software Tools STK0502 Provision of Commissioning Tools			Demonstration

139	SYS2501	Weather Monitoring		STK0900 Priority in Scheduling Observations		Inspection
140	SYS2502	Safety Weather Monitoring		STK0304 Projected Environment		Inspection
141	SYS2503	Weather Archive		STK1403 Calibration Efficiency		Inspection
142	SYS2601	Antenna System Availability		STK1402 Observational Efficiency		Analysis
143	SYS2602	Centralized Systems Availability		STK1402 Observational Efficiency		Analysis
144	SYS2700	Safety Specification	CSW0046 Safety Critical Operations			Inspection
145	SYS2701	Sub-system self-monitoring		STK1702 Intelligent LRUs and Subsystems		Design
146	SYS2702	IT Security		STK2202 Cybersecurity		Inspection
147	SYS2704	Physical Security		STK2201 Physical Security Plans		Inspection
148	SYS2801	Design Life		STK0303 Design Life		Analysis
149	SYS2802	Cost Optimization		STK0303 Design Life STK0100 Construction Budget (Total, Maximum) STK0101 Operations Budget (Annual, Maximum) STK0600 Disposal Costs		Analysis
150	SYS2803	Sustainability		STK0302 Material Selection & Sustainability		Design
151	SYS2811	Test Fixtures		STK0400 Provision of Assembly Verification Tools		Inspection
152	SYS2812	Critical Spares		STK0403 Spare Parts		Inspection
153	SYS2813	System Verification Tools		STK0402 Provision of System Verification Software Tools		Demonstration
154	SYS3001	Standard Observing Modes		STK0700 Standard Modes: Time-Phased Availability STK0701 Standard Modes: Generation of Scheduling Blocks		Design
155	SYS3002	Number of Standard Observing Modes		STK0700 Standard Modes: Time-Phased Availability STK0701 Standard Modes: Generation of Scheduling Blocks		Analysis
156	SYS3003	Non-Standard Observing Modes		STK0702 Non-Standard Observing Modes		Demonstration
157	SYS3004	Triggered Observations	CSW0073 Observation Execution Abortion	SCI0005 Triggered Observations		Design
158	SYS3005	Triggered Observation Response		SCI0005 Triggered Observations		Analysis
159	SYS3006	Trigger Override		SCI0005 Triggered Observations		Demonstration
160	SYS3101	LRU Monitoring		STK1803 Criteria for Scheduling Maintenance STK1702 Intelligent LRUs and Subsystems		Design
161	SYS3102	LRU Alerts		STK1803 Criteria for Scheduling Maintenance		Inspection
162	SYS3103	Monitor Archive		STK1700 Performance analysis and Automated maintenance scheduling		Design
163	SYS3104	Sub-System Monitoring Screens		STK1600 Remote Access of System Configuration STK1702 Intelligent LRUs and Subsystems STK1506 Array Operations: Remote and Automated Functions		Demonstration
164	SYS3105	Fast Read-Out Modes		STK1702 Intelligent LRUs and Subsystems STK1506 Array Operations: Remote and Automated Functions		Demonstration
165	SYS4601	Interferometric Antennas: Gain Stability		SCI0113 Brightness Dynamic Range SCI0114 Polarization Dynamic Range		Analysis Test
166	SYS4602	Interferometric Antennas: Relative Gain Stability		SCI0114 Polarization Dynamic Range		Analysis Test
167	SYS4603	Gain Variations with Antenna Pointing Angle		SCI0110 Photometric Accuracy		Analysis Test
168	SYS4801	Gain Calibration Reference	CSW0018 Flux Calibration	SCI0110 Photometric Accuracy SCI0113 Brightness Dynamic Range SCI0114 Polarization Dynamic Range		Analysis Test

L1 Environmental Requirements_RVTM

#	Id	Name	Derived	Derived From	Refined By	Refines	Verify Method
1	ENV0311	Solar Thermal Load					
2	ENV0312	Wind Speed					
3	ENV0313	Temperature					
4	ENV0314	Temperature Rate of Change					
5	ENV0315	Precipitation					
6	ENV0321	Solar Thermal Load					
7	ENV0322	Wind Speed					
8	ENV0323	Temperature					
9	ENV0324	Temperature Rate of Change					
10	ENV0325	Precipitation					
11	ENV0330	Solar Thermal Load					
12	ENV0331	Wind					
13	ENV0332	Temperature					
14	ENV0333	Precipitation					
15	ENV0334	Ice					
16	ENV0341	Wind					
17	ENV0342	Temperature					
18	ENV0343	Radial Ice					
19	ENV0344	Rain Rate					
20	ENV0345	Snow Load, Antenna					
21	ENV0346	Snow Load, Equipment & Bldgs					
22	ENV0347	Hail Stones					
23	ENV0348	Antenna Orientation					
24	ENV0351	Altitude Range					
25	ENV0511	Lightning Protection, Structure					
26	ENV0512	Lightning Protection, Electronics Systems					
27	ENV0513	Lightning Protection, Personnel					
28	ENV0521	Seismic Protection					
29	ENV0531	Wind Vibration					
30	ENV0532	Transport Vibration					
31	ENV0541	Equipment Protection					
32	ENV0542	Building Protection					
33	ENV0551	Rodent Protection					
34	ENV0552	Large Mammal Protection					
35	ENV0561	Maximum Solar Flux					
36	ENV0562	Maximum UV Radiation					
37	ENV0571	Rain/Water Infiltration					
38	ENV0581	Transportation Environment					
39	ENV0582	Mechanical					

L1 EMC/RFI Requirements_RVTM

#	Id	Name	Derived	Derived From	Refined By	Refines	Verify Method
1	EMC0310	Spurious Signal Level		SCI0116 Spurious Spectral Features		SYS2104 Self-Generated Spurious Signal Power Level	
2	EMC0320	Drive System Shielding				SYS2104 Self-Generated Spurious Signal Power Level	
3	EMC0321	Relay Contact Arcing				SYS2104 Self-Generated Spurious Signal Power Level	
4	EMC0322	Amplifiers & Oscillators				SYS2104 Self-Generated Spurious Signal Power Level	
5	EMC0323	Silicone Controlled Rectifiers				SYS2104 Self-Generated Spurious Signal Power Level	
6	EMC0324	Gaseous Discharge Devices				SYS2104 Self-Generated Spurious Signal Power Level	
7	EMC0325	Static Discharge Mitigation				SYS2104 Self-Generated Spurious Signal Power Level	
8	EMC0326	Display Shielding				SYS2104 Self-Generated Spurious Signal Power Level	
9	EMC0327	Digital Equipment Shielding				SYS2104 Self-Generated Spurious Signal Power Level	
10	EMC0328	EMC Test Frequencies				SYS2104 Self-Generated Spurious Signal Power Level	