# Space Acceleration Measurement Systems (SAMS)

## System Specification Document

**January, 2005**


*Prepared For:*
**National Aeronautics and Space Administration**
**John H. Glenn Research Center at Lewis Field**
**Microgravity Science Division**
**Cleveland, Ohio 44135**

*Prepared By:*
**ZIN Technologies, Incorporated**
**3000 Aerospace Parkway**
**Brook Park, Ohio 44142**
**Under Contract NAS3-99154, 60005-DO-061**

# Approvals

| | | | |
|---|---|---|---|
| Prepared by: | /s/ Judith A. Anthony<br>Judith A. Anthony<br>ZIN Technologies, Inc.<br>SAMS Integration Engineer | Date: | 02-26-03 |
| Reviewed by: | /s/ Helen C. Brown<br>Helen C. Brown<br>ZIN Technologies, Inc.<br>SAMS Integration Lead | Date: | 02-27-03 |
| Reviewed by: | /s/ Alan Chmiel<br>Alan Chmiel<br>ZIN Technologies, Inc.<br>SAMS Electrical Lead | Date: | 02-28-03 |
| Reviewed by: | /s/ David B. Manner<br>David B. Manner<br>ZIN Technologies, Inc.<br>SAMS Software Lead | Date: | 03-03-03 |
| Reviewed by: | /s/ James S. Ogrin<br>James S. Ogrin<br>ZIN Technologies, Inc.<br>SAMS Mechanical Lead | Date: | 03-04-03 |
| Approved by: | /s/ Raymond K. Pavlik<br>Raymond K. Pavlik<br>ZIN Technologies, Inc.<br>SAMS Project Lead | Date: | 03-04-03 |
| Accepted by: | /s/ William M. Foster II<br>William M. Foster, II<br>NASA GRC<br>SAMS Project Manager | Date: | 03-05-03 |

# Revisions

| Revision Letter | Publication Date | Change Description | Approval |
|---|---|---|---|
| -- | 3/03 | Baseline Release | |
| A | 10/03 | SAMS-ECO-438: Additional info. Added; TBD's changed; clarification of wording | SYC 10/2/03<br>RKP 10/2/03 |
| B | 03/04 | SAMS-ECO-484: Revised to match Verification Plan changes in SAMS-ECO-467 | SYC 3/4/04<br>RKP 3/4/04 |
| C | 10/04 | SAMS-ECO-512: Revised Risk Management tracking | SYC 10/19/0<br>RKP 10/19/04 |
| D | 1/05 | SAMS-ECO-520: Stowage requirement was incorrectly dispositioned as 'applicable' instead of 'not a requirement'. | SYC 1/10/05<br>RKP 1/11/05 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# Table of Contents

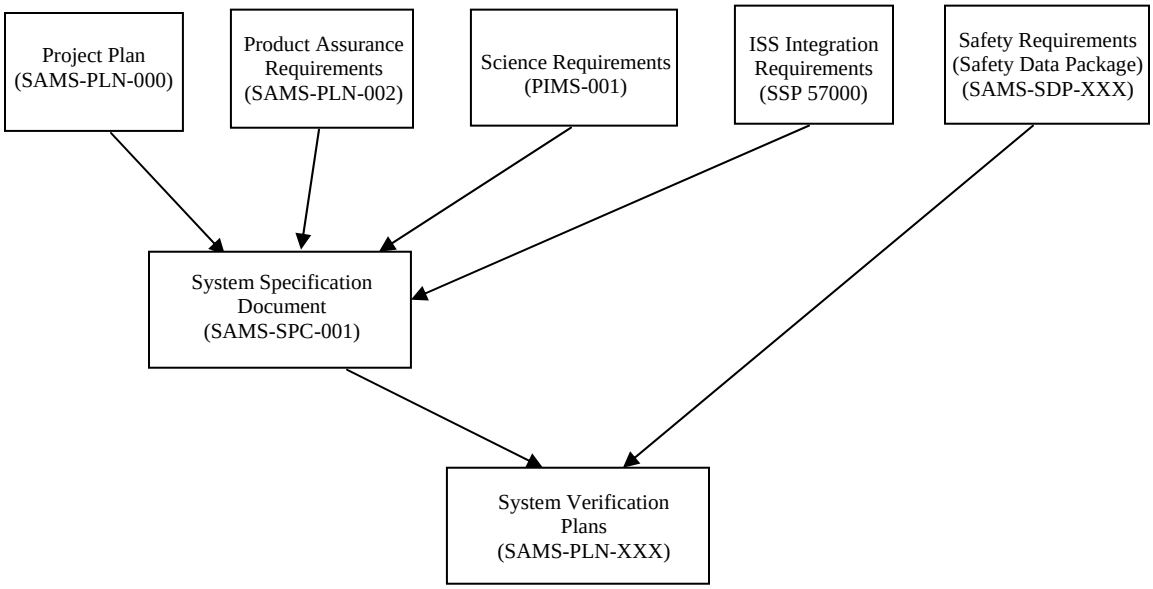
# 1.0 INTRODUCTION

The Space Acceleration Measurement Systems (SAMS) project will provide several microgravity acceleration measurement systems to support the NASA Office of Biological and Physical Sciences Research science experiments onboard the STS (Space Transportation System), ISS (International Space Station) and ELVs (Expandable Launch Vehicles). The microgravity acceleration measurement systems include vibratory sensor subsystems, angular acceleration subsystems and quasi-steady subsystems.

# 2.0 SCOPE

The purpose of this document is to establish the system requirements to be met by the SAMS project for the design, fabrication, verification, and operation of the microgravity accelerometer systems. All microgravity acceleration measurement systems that have been previously fabricated are not subject to the specifications in this document. For those items, refer to previous SAMS requirement documentation.

The following flow chart depicts the document flow for the design, fabrication, verification and operation of the SAMS systems.




# 3.0 APPLICABLE DOCUMENTS

The specifications have been derived from the following documents:

PIMS-001, Experiment Support Requirements Document for SAMS-II, September 25, 1995.

SAMS-PLN-000 Draft, Project Plan, October 2002.

SAMS-PLN-002, Product Assurance Plan, November 2002.

SSP 57000 Rev E, Pressurized Payloads Interface Requirements Document, November 1, 2000.

Information from the documents listed above that is not included in this document will not be formally verified. The specifications included in this document will be verified via the specific System Verification Plans.

# 4.0 REQUIREMENTS

Table I, below, describes each design requirement, its source, its source requirement, its rationale, its applicability (carrier that applies/subsystem that applies) and the verification number. For platform applicability, the choices are:

ISS - International Space Station

STS - Space Transportation System

ELV - Expendable Launch Vehicle

ESF – External Space Flight

All - All of the above

For subsystem applicability, the choices are:

VSS - Vibratory Sensor Subsystem (e.g. RTS, TSH-ES)

AAS - Angular Acceleration Subsystem (e.g. Roll Rate Sensor)

QSS - Quasi-Steady Subsystem (e.g. MAMS/OARE)

CDHS - Control and Data Handling Subsystem (e.g. Software and associated hardware)

GS - Ground Subsystem (e.g. TSC hardware and software)

All - All of the above (excludes GSES)

GSES - Ground Support Equipment Subsystem (Checkout and shipping hardware)

The tracking numbers are assigned for ease of tracking and referencing each requirement. These numbers are grouped by source documents, which are indicated by the first number in the tracking number. The following details the numbering scheme:

0xxx – PIMS-001, Experiment Support Requirement Document for SAMS-II

1xxx – SAMS-PLN-000, Project Plan

2xxx – SAMS-PLN-002, Product Assurance Plan

3xxx – SSP 57000, Pressurized Payload Interface Requirements Document

The verification numbers are assigned through the verification plans. An explanation of the numbering scheme is described in each verification plan. For consistency the verification number is tied to a requirement; therefore, the different verification plans' verification numbers have the same last three digits for a common requirement. The middle three digits represented by "xxx" are the document number of the verification plan. Using this convention, the VRDSs can be tracked by the verification plan and the requirement for which they are applicable. The verification numbers with "tbd" have not been assigned a number because an applicable verification plan has not been created. These numbers will be assigned in the future. The verification number for SSP 57000 requirements are listed on the table in Appendix A.

| Tracking # | Verification # | Source Document #, Location | Source Requirement | Design Requirement | Rationale | Applicability (Platform/ Subsystem) |
|---|---|---|---|---|---|---|
| | | | | | | |
| 0001 | VRD-xxx-001 | PIMS-001, Table 2, 1. | Acquire microgravity acceleration data. | Acquire microgravity acceleration data. | When performing microgravity experiments, disturbances caused by various inputs affect the experiments' results. Thus the acceleration data must be collected so it can be used to help understand the results. | All*/All |
| 0002 | VRD-xxx-100 | PIMS-001, Table 2, 1.a | Measure accelerations with an accuracy and resolution better than the acceleration environment envelope of the ISS program. | The system shall provide measurements in three axes of the microgravity acceleration where the noise level for each axis is 10dB below the curve defined by: 1.8 µgrms for data from 0.01 Hz to 0.1 Hz, 18 µgrms x frequency for data from 0.1 to 100 Hz, 1.8 mgrms for data from 100Hz to 300 Hz. | For experiments on ISS, a specification for the required environment was defined. The acceleration systems need to be able to resolve the specified environment. | All*/VSS |
| 0003 | VRD-xxx-002 | PIMS-001, Table 2, 1.a | Measure accelerations with an accuracy and resolution better than the acceleration environment envelope of the ISS program. | The system shall provide acceleration measurements in which the maximum error is less than 10% of the measured value for measurements that exceed the system noise floor requirement (reference 3.1.1) across the frequency range of 0.01Hz to 300 Hz. | For experiments on ISS, a specification for the required environment was defined. The acceleration systems need to be able to resolve the specified environment. | All*/VSS |
| 0004 | VRD-xxx-101 | PIMS-001, Table 2, 1.a | Measure accelerations with an accuracy and resolution better than the acceleration environment envelope of the ISS program. | The magnitude of the system's frequency response shall be within 1 dB of/or 1 (output/input) over the frequency range of 0.01 Hz to 300 Hz. | For experiments on ISS, a specification for the required environment was defined. The acceleration systems need to be able to resolve the specified environment. | All*/VSS |
| 0005 | VRD-xxx-tbd | PIMS-001, Table 2, 1.a | Measure accelerations with an accuracy and resolution better than the acceleration environment envelope of the ISS program. | The magnitude of the system's frequency response shall be within 1 dB of/or 1 (output/input) over the frequency range of 0.00018 Hz to 0.01 Hz. | For experiments on ISS, a specification for the required environment was defined. The acceleration systems need to be able to resolve the specified environment. | All*/QSS |
| 0006 | VRD-xxx-200 | PIMS-001, Table 2, 1.a | Measure accelerations with an accuracy and resolution better than the acceleration environment envelope of the ISS program. | The system shall produce measurement data from accelerometers with measurement axes mutually orthogonal within plus or minus 0.1 degree. | For experiments on ISS, a specification for the required environment was defined. The acceleration systems need to be able to resolve the specified environment. | All*/VSS, AAS |
| 0007 | VRD-xxx-300 | PIMS-001, Table 2, 1.a | Measure accelerations with an accuracy and resolution better than the acceleration environment envelope of the ISS program. | SAMS shall produce a matrix for each sensor system that includes all software coefficients and location coordinates. | Software coefficients and location coordinates are necessary for the accuracy of the data. This matrix will insure all values are recorded and filed for each sensor system. | All*/VSS, AAS, QSS |
| 0008 | VRD-xxx-301 | PIMS-001, Table 2, 1.b | Acquire the acceleration data with correlated time information | SAMS shall correlate time by acquiring time from the command and data handling subsystem host rack (or central timer) and syncing all sensors to it. Provisions will be made to sync with sensor host rack (or central timer) when rack to rack communications are down. | Experiment data needs to be correlated with the acceleration data. It is proposed that it be done by correlating to ISS time. | All*/VSS, AAS, QSS, CDHS |

| Tracking # | Verification # | Source Document #, Location | Source Requirement | Design Requirement | Rationale | Applicability (Platform/ Subsystem) |
|---|---|---|---|---|---|---|
| 0009 | VRD-xxx-003 | PIMS-001, Table 2, 1.c | Measure acceleration within selectable frequency range | The following selectable frequency ranges shall be provided:<br>3 Hz ± 1 Hz<br>6 Hz ± 2 Hz<br>12 Hz ± 2 Hz<br>15 Hz ± 2 Hz<br>25 Hz ± 10 Hz<br>50 Hz ± 25 Hz<br>100 Hz ± 50 Hz<br>200 Hz ± 75 Hz<br>300 Hz ± 100 Hz | Selectable frequency ranges are desired. The requirement is written to not restrict the user by the use of filters. PIMS has defined these frequencies to be comparable to SE frequencies and meet processing needs. | All*/VSS |
| 0010 | VRD-xxx-004 | PIMS-001, Table 2, 1.d | Measure acceleration in, on and/or near the experiment sample/ chamber/ apparatus. | As small as technology and cost allows. An agreement of the location shall be made with the customer. | Sensor subsystem must be small in order to be located in the area of interest , but it is realized that technology, cost and schedule limit the ability to minimize the size. Design needs to show options. | All*/VSS, AAS, QSS |
| 0011 | VRD-xxx-302 | PIMS-001, Table 2, 2. | Allocate control of SAMS-II. | Allocate control of acceleration systems/subsystems. | In order to minimize operational requirements on the project team, it is desired to have other parties such as the cadre, science team, or other user be able to adjust the parameters on the sensor they are using. | All/CDHS |
| 0012 | VRD-xxx-005 | PIMS-001, Table 2, 2. | Allocate control of SAMS-II. | Shall provide external triggers. | To allow SAMS to initiate experiment operations. Functionality to be incorporated with first customer request and funding availability. | All/CDHS |
| 0013 | VRD-xxx-302 | PIMS-001, Table 2, 2.a | PI control of parameters. | The command and data handling subsystem or the sensors shall have the ability to allow PI users to command with the proper security/safety measures. | The desire is to have the PI control the parameters from their remote site, limiting SAMS involvement. This is a maturing requirement based on customer requests and funding. Note: For ISS, due to restrictions a PI will command systems through their own payload. | All/CDHS |
| 0014 | VRD-xxx-303 | PIMS-001, Table 2, 2.b | On-orbit crew control of parameters. | The command and data handling subsystem or the sensors shall be able to accept commands directly from the crew laptops with the proper security/safety measures. | The desire is to have the crew control the parameters on board, limiting SAMS involvement. | ISS, STS/CDHS |
| 0015 | VRD-xxx-304 | PIMS-001, Table 2, 3. | Supply acceleration information to users. | Supply acceleration information to users. | Supply data to users in near real time and archive data for future use by the users. | All/All |
| 0016 | VRD-xxx-305 | PIMS-001, Table 2, 3.a | Supply information in a selectable format. | Supply information in a selectable format. | This refers to the near real time data. There should be standard data displays. | As required/CDHS, GS |
| 0017 | VRD-xxx-306 | PIMS-001, Table 2, 3.b | Supply information within a selectable amount of time. | Supply information within a selectable amount of time. | User needs to be able to display archived data. | All/CDHS, GS |
| | | | | | | |

| Tracking # | Verification # | Source Document #, Location | Source Requirement | Design Requirement | Rationale | Applicability (Platform/ Subsystem) |
|---|---|---|---|---|---|---|
| 1001 | VRD-xxx-tbd | SAMS-PLN-000, Section 2.2 | SAMS shall have systems that are available 90% of the time when there is microgravity research being performed. | A system shall be developed so an availability of 90% can be achieved. | Success criteria in project plan. | All/All |
| 1002 | VRD-xxx-307 | SAMS-PLN-000, Section 2.2 | SAMS shall have systems that are available 90% of the time when there is microgravity research being performed. | Data flow shall minimize single point failures. | This is to limit adverse affects of non functioning carrier/facility systems. Since the data flow paths can be interrupted on ISS, multiple data paths should be utilized when practical. | ISS/All |
| 1003 | VRD-xxx-tbd | SAMS-PLN-000, Section 2.2 | SAMS shall have systems that are available 90% of the time when there is microgravity research being performed. | Ground software shall be checked with flight software using a carrier/facility simulator. | This will reduce troubleshooting during the mission. | ISS/All, GSES |
| 1004 | VRD-xxx-308 | SAMS-PLN-000, Section 2.2 | SAMS shall have systems that are available 90% of the time when there is microgravity research being performed. | All uploads shall be verifiable on orbit prior to implementing on orbit. | Before executing anything on orbit, the upload needs to be verified to reduce down time. | All/All |
| 1005 | VRD-xxx-006 | SAMS-PLN-000, Section 6.2, 1 | All systems shall follow the SAMS System Philosophy shown in figure 6.2-1. | All systems shall follow the SAMS System Philosophy shown in figure 6.2-1. | A consistent approach is required to maximize the usage of every developed item. This is especially important in long lead items such as software. | All/All, GSES |
| 1006 | VRD-xxx-007 | SAMS-PLN-000, Section 6.2, 2 | Systems shall be designed to create the least impact on the supported experiment or facility. | Any new developed system shall have less volume, less mass, less power than the system it is replacing. | The SAMS System is a support instrument to measure one parameter of the research experiment. Therefore, the system needs to minimally use resources. This requirement will be applied to development of new systems compared to existing systems. | All/All |
| 1007 | VRD-xxx-309 | SAMS-PLN-000, Section 6.3, 1 | For remote operations, the ground crew shall be able to easily access system health and status, troubleshooting data, and error information. | All commands shall have acknowledgements sent to SAMS remote operations that will tell who sent the command, when was it sent, what it was, and was it executed. In addition, all processes will notify the ground when they start and stop or completed a task. | Several users may be sending commands to the system. The acknowledgements will allow the SAMS team to verify the system activity is nominal. This is a lesson learned. | All/CDHS |
| 1008 | VRD-xxx-309 | SAMS-PLN-000, Section 6.3, 1 | For remote operations, the ground crew shall be able to easily access system health and status, troubleshooting data, and error information. | Temperature readings shall be downlinked. When output by the system hardware, voltages and currents shall be downlinked. | In order to minimize operations and save costs, the health and status of the remote systems need to be accessed quickly. This is especially important when performing off-nominal trouble shooting. Previous experience shows that data such as temperatures, voltages, status readings, unique packet identifiers for data types and replay data, variable indication, diagnostic messages from processes, and incrementing indicator in the packet are required to minimize troubleshooting time. | All/CDHS |
| 1009 | VRD-xxx-309 | SAMS-PLN-000, Section 6.3, 1 | For remote operations, the ground crew shall be able to easily access system health and status, troubleshooting data, and error information. | Unique packet identifiers shall be assigned for each different data structure. | To identify different data structure. | All/All |

| Tracking # | Verification # | Source Document #, Location | Source Requirement | Design Requirement | Rationale | Applicability (Platform/ Subsystem) |
|---|---|---|---|---|---|---|
| 1010 | VRD-xxx-tbd | SAMS-PLN-000, Section 6.3, 1 | For remote operations, the ground crew shall be able to easily access system health and status, troubleshooting data, and error information. | For replay data, a unique packet identifier shall be assigned which is different from the realtime data. | To identify replay data from realtime data. | All/All |
| 1011 | VRD-xxx-309 | SAMS-PLN-000, Section 6.3, 1 | For remote operations, the ground crew shall be able to easily access system health and status, troubleshooting data, and error information. | The ability to downlink diagnostic data shall be incorporated. In addition, a subset of data shall be placed in housekeeping health data. | Current status is always known. | All/All |
| 1012 | VRD-xxx-310 | SAMS-PLN-000, Section 6.3, 1 | For remote operations, the ground crew shall be able to easily access system health and status, troubleshooting data, and error information. | An incrementing indicator shall be given to every packet. | This is to verify that the data is updating | All/All |
| 1013 | VRD-xxx-311 | SAMS-PLN-000, Section 6.3, 1 | For remote operations, the ground crew shall be able to easily access system health and status, troubleshooting data, and error information. | System shall have file downlink capability. | Additional troubleshooting tool. This is a lesson learned. | ISS/All |
| 1014 | VRD-xxx-312 | SAMS-PLN-000, Section 6.3, 2 | The system software shall have the capability to be updated by uplinking new system software. | The system software shall have the capability to be updated by uplinking new system software. | SAMS will be able to make marginal upgrades without any up mass. This will allow for more customer focus for each mission and minimize trying to develop a system software that does it all from the beginning. | ISS/All |
| | | | | | | |
| 2001 | VRD-xxx-400 | SAMS-PLN-002, Section 1.4 | SAMS shall issue assurance status reports of deliverables at Pre-Ship reviews. | Issue assurance status reports of deliverables at Pre-Ship reviews. | | All/All |
| 2002 | | Deleted Requirement | | | | |
| 2003 | VRD-xxx-201 | SAMS-PLN-002, Section 3.4.1 | All structural elements including associated interfaces, fasteners, and welds in the primary load path are considered safety critical and shall be analyzed per the guidelines of SSP 52005. | Safety critical hardware shall be analyzed per the guidelines of SSP 52005. | The extensive verifications required for Safety-Critical Structures (SCS) are a due to the critical flight safety concern of the structural integrity of the Space Transportation System (STS) and International Space Station (ISS) payloads. | All/VSS, AAS, QSS, CDHS |
| 2004 | VRD-xxx-202 | SAMS-PLN-002, Section 3.4.5 | A Fracture Control Program shall be implemented to meet the requirements of NASA-STD-5003 and SSP 30558. | Implement a Fracture Control Program (minimally Plan and Summary) to meet the requirements of NASA-STD-5003 and SSP 30558. | To ensure components whose failure would represent a catastrophic hazard are safe from failure throughout the mission. | All/VSS, AAS, QSS, CDHS |
| 2005 | VRD-xxx-201 | SAMS-PLN-002, Section 3.4.7 | The SAMS Project will verify structural integrity by analysis alone without strength testing using the criteria and design factors specified in SSP 52005. Criteria and rationale shall be reviewed and approved by the GRC Verification Readiness Review Panel and the Payload Carrier. | Design shall encompass load factors and random vibration environments for various carrier locations. Maximum allowable quasi-static and random vibration loads will be determined for the sensor subsystem. | Maximize locations where the sensor subsystems can be mounted. | All/VSS, AAS, QSS, CDHS |

| Tracking # | Verification # | Source Document #, Location | Source Requirement | Design Requirement | Rationale | Applicability (Platform/ Subsystem) |
|---|---|---|---|---|---|---|
| 2006 | VRD-xxx-203 | SAMS-PLN-002, Section 3.4.8 | Qualification random vibration tests shall be performed on dedicated test hardware. NASA-STD-7001 will be used in conjunction with carrier mission requirements to define the random vibration environment. | Perform qualification test on dedicated test. hardware (engineering/prototype units), produced from the same drawings and using the same materials, tooling, manufacturing processes, inspection methods, and level of personnel competency as used for the flight hardware. | Qualification tests demonstrate, with margin, the design adequacy of the hardware for its intended mission use. | All/VSS, AAS, QSS, CDHS |
| 2007 | VRD-xxx-204 | SAMS-PLN-002, Section 3.4.8 | Acceptance or workmanship random vibration tests shall be performed on flight system. NASA-STD-7001 will be used in conjunction with carrier mission requirements to define the random vibration environment. | Perform an acceptance or workmanship random vibration test on all units designated for flight. | To demonstrate satisfactory performance relative to the expected environment and to reveal inadequacies in workmanship and material integrity. | All/VSS, AAS, QSS, CDHS |
| 2008 | VRD-xxx-205 | SAMS-PLN-002, Section 3.4.8 | Low-Level sine-sweep testing shall be performed on engineering hardware. | Low-Level sine-sweep testing shall be performed on prototype hardware. | Low-Level sine-sweep tests performed to determine natural frequencies and provide finite element model validation. | All/VSS, AAS, QSS, CDHS |
| 2009 | VRD-xxx-206 | SAMS-PLN-002, Section 3.4.10 | A kinematics analysis shall be performed on all experiment mechanical operations. | Perform kinematics analysis. | To show that each mechanism can perform satisfactorily and has adequate design margin under worst-case conditions; satisfactory mechanical component clearances exist for stowed, operational configuration and mechanical operation and all mechanical elements are capable of withstanding the worst-case loads that may be encountered. | All/VSS, AAS, QSS, CDHS |
| 2010 | VRD-xxx-206 | SAMS-PLN-002, Section 3.4.10 | Qualification testing for each mechanical operation shall only be performed for integration in which the hardware is subjected to thermal gradients greater than 60º. | Perform qualification testing for each mechanical operation for integration in which the hardware is subjected to thermal gradients greater than 60º. | To show that each mechanism can perform satisfactorily and has adequate design margin under worst-case conditions; satisfactory mechanical component clearances exist for stowed, operational configuration and mechanical operation and all mechanical elements are capable of withstanding the worst-case loads that may be encountered. | All/VSS, AAS, QSS, CDHS |
| 2011 | VRD-xxx-206 | SAMS-PLN-002, Section 3.4.10 | Acceptance testing shall be performed to demonstrate that the installation of each mechanical device is correct and that no problems exist that will prevent the proper operation of the mechanism during mission life. | Perform verification testing. | To show that each mechanism can perform satisfactorily and has adequate design margin under worst-case conditions; satisfactory mechanical component clearances exist for stowed, operational configuration and mechanical operation and all mechanical elements are capable of withstanding the worst-case loads that may be encountered. | All/VSS, AAS, QSS, CDHS |
| 2012 | VRD-xxx-207 | SAMS-PLN-002, Section 3.4.11 | Verification of payload structures containing trapped volumes shall be by analysis. | Design & analyze payload structures containing trapped volumes per NSTS 1700.7 and ISS Addendum, NSTS 18798, and SSP 52005 when exposed to the worst-case depressurization/re-pressurization environments based on carrier location. | Verification that payload structure is designed to maintain positive margins of safety when exposed to the worst-case depressurization/re-pressurization environments based on carrier location. | All/VSS, AAS, QSS, CDHS |

| Tracking # | Verification # | Source Document #, Location | Source Requirement | Design Requirement | Rationale | Applicability (Platform/ Subsystem) |
|---|---|---|---|---|---|---|
| 2013 | VRD-xxx-208 | SAMS-PLN-002, Section 3.4.12 | The SAMS Project shall develop a Fastener Control Plan as a Phase I safety submittal. | Develop a Fastener Control Plan. | Maintain fastener integrity. | All/VSS, AAS, QSS, CDHS |
| 2014 | VRD-xxx-tbd | SAMS-PLN-002, Section 3.4.14 | All Ground Support Equipment (GSE) shall meet the facility requirements where it will operate. | Perform verification testing/analyses on GSE. | This requirement identifies the need to meet safety and integration requirements at applicable facilities. | All/GSES |
| 2015 | VRD-xxx-102 | SAMS-PLN-002, Section 3.5 | EMC verifications shall be demonstrated via test to the levels required by the Carrier or customer. | EMC verifications shall be demonstrated via test to the levels required by the carrier or customer. | To ensure the system will not generate electromagnetic interference that interferes with its own missing objectives or the operation and safety of concurrently operating systems. Secondly, to ensure the system can operate in the mission's defined electromagnetic environment. | All/VSS, AAS, QSS, CDHS |
| 2016 | VRD-xxx-209 | SAMS-PLN-002, Section 3.6 | Vacuum (if applicable per carrier), thermal and humidity test shall demonstrate the system under test will:a. Properly operate in the flight environment, specifically vacuum, temperature, and humidity.b. Properly control the thermal environment of temperature sensitive items or levy that requirement on an integrator.c. Survive the temperature and humidity conditions of transportation (e.g. truck, plane, space vehicle), storage and pre and post conditions of the carrier. | Perform vacuum (if applicable per carrier), thermal and humidity tests. | Tests shall demonstrate the system under test will: a.) Properly operate in the flight environment, specifically vacuum, temperature, and humidity. b.) Properly control the thermal environment of temperature sensitive items or levy that requirement on an integrator. c.) Survive the temperature and humidity conditions of transportation (e.g. truck, plane, space vehicle), storage and pre and post conditions of the carrier.These tests will also act as an environmental screening to stimulate latent defects to maximize infant mortality failures. | All/VSS, AAS, QSS, CDHS |
| 2017 | VRD-xxx-210 | SAMS-PLN-002, Section 3.6.4 | The SAMS project shall perform Thermal Analysis on all systems. | Perform Thermal Analysis on all systems. The analysis shall identify the following:<br>a.) Heat sources and magnitude<br>b.) Methods employed to dissipate the heat from the sources.<br>c.) List of operating temperature ranges of the components.<br>d.) Environmental conditions and design criteria.<br>e.) An assessment of the thermal design and identification of additional analysis needed.<br>f.) An evaluation of the susceptibility to humidity extremes.<br>g.) Identification of any special testing requirements or conditions. | | All/VSS, AAS, QSS, CDHS |
| 2018 | VRD-xxx-103 | SAMS-PLN-002, Section 3.7.1 | A minimum of one hundred hours of failure-free operation shall be accumulated for SAMS components, subsystems or systems prior to hardware turnover. | Verify a minimum of one hundred hours of failure-free operation is accumulated on SAMS components, subsystems or systems prior to hardware turnover. Life of each component/subsystem shall be checked that there is enough life to perform mission. | For systems under test that contain electronic parts, a burn-in is required to stimulate infant mortality failures. | All/VSS, AAS, QSS, CDHS |

| Tracking # | Verification # | Source Document #, Location | Source Requirement | Design Requirement | Rationale | Applicability (Platform/ Subsystem) |
|---|---|---|---|---|---|---|
| 2019 | VRD-xxx-313 | SAMS-PLN-002, Section 3.7.2 | SAMS shall perform a mission simulation test. | A minimum continuous four-day operational test shall be conducted which exercises all equipment and software commands for missions exceeding four days. | | ISS/All |
| 2020 | VRD-xxx-tbd | SAMS-PLN-002, Section 3.7.2 | SAMS shall perform a mission simulation test. | For other missions, the mission simulation test shall be defined by the duration and operation constraints of the mission. | | STS, ELV, ESF/All |
| 2021 | VRD-xxx-313 | SAMS-PLN-002, Section 3.7.3 | SAMS shall perform End-to-End compatibility tests per customer requirements. | Perform End-to-End compatibility tests per customer requirements. | This may require simulation of the carrier/facility interface. This is meant to test data flow from initiation to user delivery. Test may be performed in parts. | All/All |
| 2022 | VRD-xxx-401 | SAMS-PLN-002, Section 4.1 | SAMS shall conduct appropriate safety analyses both at the system and subsystem levels. | Perform a flight safety analysis per NSTS 1700.7, NSTS 1700.7 ISS Addendum and NSTS/ISS 13830C. | | All/VSS, AAS, QSS, CDHS |
| 2023 | VRD-xxx-104 | SAMS-PLN-002, Section 5.2.5 | All new flight hardware shall be tested for single-event effects. | Test all new flight hardware for single-event effects radiation. | | All/VSS, AAS, QSS, CDHS |
| 2024 | VRD-xxx-105 | SAMS-PLN-002, Section 5.2.8 | EEE parts shall be inspected prior to their assembly into flight systems or subsystems to ensure they are free of any debris, defects or other manufacturing faults that would interfere with their form, fit, and function. | EEE parts shall be inspected prior to their assembly into flight systems or subsystems. | To ensure they are free of any debris, defects or other manufacturing faults that would interfere with their form, fit, and function. | All/VSS, AAS, QSS, CDHS |
| 2025 | VRD-xxx-106 | SAMS-PLN-002, Section 5.2.8 | EEE parts that are safety or mission critical shall be tested to verify and certify their electrical performance and protect against counterfeit or noncompliant parts prior to assembly into flight systems or subsystems. | Test components made with EEE parts that are safety or mission critical. To verify and certify their electrical performance and protect against counterfeit or noncompliant parts prior to assembly into flight systems or subsystems. | To verify and certify their electrical performance and protect against counterfeit or noncompliant parts prior to assembly into flight systems or subsystems. | All/VSS, AAS, QSS, CDHS |
| 2026 | VRD-xxx-211 | SAMS-PLN-002, Section 5.3.2 | All mechanical parts shall be inspected prior to their assembly into flight systems or subsystems to ensure they are free of any debris, defect or other material or substance that would interfere with their function. | Inspect all mechanical parts prior to their assembly into flight systems or subsystems. | To ensure they are free of any debris, defect or other material or substance that would interfere with their function. | All/VSS, AAS, QSS, CDHS |
| 2027 | VRD-xxx-211 | SAMS-PLN-002, Section 5.3.2 | All mechanical parts that provide rotational, translational or other movements shall be tested for full range of motion, and inspected for freedom of motion (resistance) if inaccessible after assembly. | Test all mechanical parts that provide rotational, translational or other movements. | To ensure full range of motion and freedom of motion (resistance) . | All/VSS, AAS, QSS, CDHS |
| 2028 | | Deleted Requirement | | | | |

| Tracking # | Verification # | Source Document #, Location | Source Requirement | Design Requirement | Rationale | Applicability (Platform/ Subsystem) |
|---|---|---|---|---|---|---|
| 2029 | VRD-xxx-212 | SAMS-PLN-002, Section 6.1 | SAMS shall compile a Material Identification Usage List (MIUL) during the design process. | The MIUL will identify individual material applications specified in design drawings; their respective pertinent material ratings; and other pertinent material application features essential for evaluation of the material application. | To provide the framework to assure proper selection, application, processing, inspection, and testing of the chosen materials for the project subsystems and equipment. | All/VSS, AAS, QSS, CDHS |
| 2030 | VRD-xxx-212 | SAMS-PLN-002, Section 6.1 | SAMS shall prepare MUAs for materials that are not A-rated. | Prepare rationale and gain approval for non-A-rated materials usage. | Ensure the materials selected for space flight hardware meet safety requirements. | All/VSS, AAS, QSS, CDHS |
| 2031 | VRD-xxx-220 | SAMS-PLN-002, Section 6.4.h | Closeout photographs shall be taken during assembly to show materials and configurations hidden after final assembly. | Prior to final assembly, closeout photographs shall be taken of the hardware showing materials and configurations of internal hardware. | Document areas of assembly no longer able to be visually inspected. | All/VSS, AAS, QSS, CDHS |
| 2032 | VRD-xxx-tbd | SAMS-PLN-002, Section 6.4.1 | All organic materials used in the pressurized environment on the International Space Station shall be evaluated for fungus resistance prior to selection. | SAMS does not use organic materials. | Since SAMS does not use organic materials, this requirement will not be part of the verification plans. | None |
| 2033 | VRD-xxx-214 | SAMS-PLN-002, Section 6.4.1.3 | In the event that a SAMS system is used in exterior applications, the system shall meet the out-gassing requirements of JSC SP-R-0022A that establishes the out-gassing requirements and test guidelines for materials used in the space thermal vacuum environment. | SAMS shall meet the out-gassing requirements of JSC SP-R-0022A if the hardware is to be used in exterior applications. | | ESF/VSS, AAS, QSS, CDHS |
| 2034 | VRD-xxx-tbd | SAMS-PLN-002, Section 6.4.1.5 | If the fluid is other than LOX or GOX, the project shall develop a fluid compatibility test plan and submit it to the GRC M&P engineer prior to testing. When a material fails the criteria of either NASA-STD-6001 tests or project specific test plan, the project manager with GRC M&P concurrence shall determine how to proceed. | SAMS does not use fluid systems. | Since SAMS does not use fluid systems, this requirement will not be part of the verification plans. | None |
| 2035 | VRD-xxx-215 | SAMS-PLN-002, Section 6.4.1.6 | SAMS will design systems such that all materials used in habitable flight compartments shall meet the off-gassing requirement of NASA-STD-6001 Test 7 or by analysis. | SAMS shall meet the off-gassing requirement of NASA-STD-6001 Test 7 or by analysis. | Excessive off-gassing can cause a health issue for the crew. | All/VSS, AAS, QSS, CDHS |
| 2036 | VRD-xxx-216 | SAMS-PLN-002, Section 6.4.1.7 | The SAMS project shall perform a Fungus Assessment on all International Space Station developed elements or payloads per SSP 30233. | A Fungus Assessment shall be performed on all ISS hardware. | Fungus can cause a health issue for the crew. | ISS/VSS, AAS, QSS, CDHS |

| Tracking # | Verification # | Source Document #, Location | Source Requirement | Design Requirement | Rationale | Applicability (Platform/ Subsystem) |
|---|---|---|---|---|---|---|
| 2037 | VRD-xxx-217 | SAMS-PLN-002, Section 6.4.1.8 | The SAMS project shall perform an Atomic Oxygen (AO) assessment on all elements or payloads exposed to the Low Earth Orbit (LEO) environment. | Perform an Atomic Oxygen (AO) assessment on all elements or payloads exposed to the LEO environment. | The AO assessment will indicate that the performance requirements are not compromised in the LEO environment. | ESF/VSS, AAS, QSS, CDHS |
| 2038 | VRD-xxx-402 | SAMS-PLN-002, Section 7.2.1 | SAMS subsystems shall have a reliability of 90% with a mission duration and duty cycle appropriate for the specific hardware. | Design subsystem to provide an MTBF in excess of the mission duration, considering duty cycle, with a 90% confidence level. | Provide confidence of mission success balanced against cost and availability of parts. | All/VSS, AAS, QSS, CDHS |
| 2038.1 | VRD-xxx-402 | SAMS-PLN-002, Section 7.2.1 | SAMS subsystems shall have a reliability of 90% with a mission duration and duty cycle appropriate for the specific hardware. | Vibratory sensor subsystems shall be designed for a 12 year life with a 50% duty cycle. | Values choosen to support availability analysis. | All/VSS |
| 2038.2 | VRD-xxx-tbd | SAMS-PLN-002, Section 7.2.1 | SAMS subsystems shall have a reliability of 90% with a mission duration and duty cycle appropriate for the specific hardware. | Quasi-steady subsystems shall be designed for a 10 year safety life and 5 year functional life with a 90% duty cycle. | Values choosen to support availability analysis. | All/QSS |
| 2038.3 | VRD-xxx-tbd | SAMS-PLN-002, Section 7.2.1 | SAMS subsystems shall have a reliability of 90% with a mission duration and duty cycle appropriate for the specific hardware. | Angular acceleration subsystems shall be designed for a 12 year safety life and 10 year functional life with a 90% duty cycle. | Values choosen to support availability analysis. | All/AAS |
| 2038.4 | VRD-xxx-tbd | SAMS-PLN-002, Section 7.2.1 | SAMS subsystems shall have a reliability of 90% with a mission duration and duty cycle appropriate for the specific hardware. | Control and data handling subsystem shall be designed for a 10 year safety life and 5 year functional life with a 90% duty cycle. | Values choosen to support availability analysis. | All/CDHS |
| 2039 | VRD-xxx-314 | SAMS-PLN-002, Section 7.2.2 | The SAMS project shall monitor operating times of all flight subsystems and relate it to the overall equipment life. | Provide a summation of operating life on components. | Document and review operating time on flight subsystems. | All/All |
| 2040 | VRD-xxx-403 | SAMS-PLN-002, Section 7.2.3 | The SAMS project shall perform a Failure Modes and Effects Analysis (FMEA) on select systems or subsystems based on initial reliability analysis and criticality to mission success and safety. Whenever an FMEA is performed, a Critical Items List (CIL) shall be compiled to document the safety critical and mission critical failure modes. | Perform a FMEA and compile a CIL per SSP 30234. | Analyze and document failure modes and assess criticality. | All/All |
| 2041 | VRD-xxx-404 | SAMS-PLN-002, Section 7.2.4 | The project shall provide a list of single point failures that would lead to loss of life, vehicle, or critical mission support capability. | Compile a list of single point failures that would lead to loss of life, vehicle, or critical mission support capability. | Analyze and document single point failure scenarios. | All/All |
| 2042 | VRD-xxx-405 | SAMS-PLN-002, Section 7.2.5 | SAMS shall provide a description of the automatic or manual failure detection, isolation and recovery methods supported by the design under analysis. | Report the automatic or manual failure detection, isolation and recovery methods supported by the design under analysis. | Document the automatic or manual failure detection, isolation and recovery methods supported by the design under analysis. | All/VSS, AAS, QSS, CDHS |

| Tracking # | Verification # | Source Document #, Location | Source Requirement | Design Requirement | Rationale | Applicability (Platform/ Subsystem) |
|---|---|---|---|---|---|---|
| 2043 | VRD-xxx-406 | SAMS-PLN-002, Section 7.2.6 | A fault tree analysis shall be performed on flight hardware per carrier. | Perform a fault tree analysis per SSP 30309. (Reference GRC-W0510.060 for a guildline in constructing the fault tree.) | Requirement per SSP 30309 determines all events and combination of events that can lead to an undesired event. | ISS/All |
| 2044 | VRD-xxx-218 | SAMS-PLN-002, Section 7.2.7.1 | Thermographic mapping or thermal analysis shall be performed on safety critical components (per CIL). | Perform thermographic mapping or thermal analysis on safety critical components (per CIL) to use in the de-rating of the component. | Determine actual thermal operating environment for safety critical components. | All/VSS, AAS, QSS, CDHS |
| 2045 | VRD-xxx-107 | SAMS-PLN-002, Section 7.2.8 | Worst-case analysis shall be performed by the project on all circuits that support safety and mission critical functions. | Perform worst-case analysis on all circuits that support safety and mission critical functions. | Analyze circuits that support safety and mission critical functions by the most conservative method. | All/VSS, AAS, QSS, CDHS |
| 2046 | VRD-xxx-407 | SAMS-PLN-002, Section 7.2.9 | Performance trending shall be performed by the SAMS project on bias shift and scale factor, which is measured during calibration of the sensor head. | Perform performance trending on bias shift and scale factor, which is measured during calibration of the sensor head. | Document a project performance indicator. | All/VSS, AAS, QSS |
| 2047 | VRD-xxx-tbd | SAMS-PLN-002, Section 7.3.1 | SAMS shall have an availability of 90% for ISS missions. | Perform availability analysis | Document that availability is greater than 90% | ISS/All |
| 2048 | VRD-xxx-408 | SAMS-PLN-002, Section 7.4.1 | Based upon the system availability requirement, MTTR (Mean Time To Repair) allocations to the component/ORU/LRU level shall be developed. | Develop MTTR allocations to the component/ORU/LRU level . | | All,/VSS, AAS, QSS, CDHS |
| 2049 | VRD-xxx-408 | SAMS-PLN-002, Section 7.4.2 | Limited-life items shall be identified and managed by means of a Limited-Life Plan. | Compile a Limited-Life Plan, which will be submitted to the NASA Project Manager for acceptance. | Document the procedure for handling limited life items. | All/All |
| 2050 | VRD-xxx-408 | SAMS-PLN-002, Section 7.4.3 | When there are anticipated maintenance activities during the mission, the project shall perform a qualitative maintainability analysis. | Perform qualitative maintainability analysis when maintenance activities are anticipated during the mission. | When indicated, quantitatively analyze maintainability. | All/All |
| 2051 | VRD-xxx-408 | SAMS-PLN-002, Section 7.4.4 | Provisions for failure detection, isolation, annunciation, and recovery processes may include manual control of the automated processes and shall provide the following:<br>a. Capability to detect and isolate failures that could manifest a catastrophic or critical hazard<br>b. Confirmation of a restored function | When manual control of the automated processes is included, provide the following:<br>a. Capability to detect and isolate failures that could manifest a catastrophic or critical hazard<br>b. Confirmation of a restored function | Provisions for when manual control is used to control automated processes. | All/VSS, AAS, QSS, CDHS |
| 2052 | VRD-xxx-408 | SAMS-PLN-002, Section 7.4.5 | When there are anticipated maintenance activities during the mission, the project shall prepare a Maintainability Assessment Report. | Prepare a Maintainability Assessment Report | Meet the maintainability requirement | All/All |

| Tracking # | Verification # | Source Document #, Location | Source Requirement | Design Requirement | Rationale | Applicability (Platform/ Subsystem) |
|---|---|---|---|---|---|---|
| 2053 | VRD-xxx-408 | SAMS-PLN-002, Section 7.4.6 | When there are anticipated maintenance activities during the mission, the project shall conduct an analysis to determine which items require a preventive maintenance schedule that will minimize the amount of system down time. | Conduct an analysis to determine which items require a preventive maintenance schedule that will minimize the amount of system down time. | Meet the maintainability requirement | All/All |
| 2054 | VRD-xxx-219 | SAMS-PLN-002, Section 8.7.1 | This assures that before approving the unit for shipment, all components to be turned over shall meet the surface level cleanliness requirements of the particular project. Quality Assurance or project representative, as required, shall inspect and certify that the unit(s) being shipped meet the requirements. | Certify that all units being shipped meet the surface level cleanliness requirements stipulated by the carrier or customer. Certification shall be per quality assurance or project representative, as required. | Verification that units shipped are externally clean. | All/VSS, AAS, QSS, CDHS |
| 2055 | VRD-xxx-409 | SAMS-PLN-002, Section 8.10 | The project shall review NASA Parts Advisories and GIDEP Failure Experience reports according to the requirements of NPG 8735.1 and respond to project review teams as to the applicability to project systems, location of affected system, criticality identification from the FMEA/CIL and disposition for design reviews. | Perform GIDEP Check for design reviews, verification readiness reviews and pre-ship reviews. | Increase system reliability by identifying components that have known defects. | All/All |
| 2056 | VRD-xxx-220 | SAMS-PLN-002, Section 8.14 | Formal verification and sign-off that flight as-built systems conform to as-designed documentation shall be the responsibility of the project. | Verify that flight as-build systems conform to as-designed documentation. | | All/All |
| 2057 | VRD-xxx-410 | SAMS-PLN-002, Section 8.15 | Prior to the Pre-ship Review the SAMS project shall assure that all deliverable end-items including the Acceptance Data Package are in accordance with program/project requirements. | Provide all deliverable end-items, including the Acceptance Data Package, in accordance with program/project requirements. | Meets contractual obligations, as well as, ensures a quality product is delivered. | All/All |
| 2058 | (Deleted) | (Deleted) | (Deleted) | (Deleted) | (Deleted) | (Deleted) |
| 2059 | VRD-xxx-315 | SAMS-PLN-002 section 10.1.2 | SAMS shall develop the software documentation shown in the table in section 10.1.2 of the PAP for medium and low control level SAMS software efforts. | SAMS shall develop the software documentation shown in the table in section 10.1.2 of the PAP for medium and low control level SAMS software efforts. | These products help ensure a better quality software product. | All/All |
| 2060 | VRD-xxx-316 | SAMS-PLN-002 section 10.3 | All SAMS software controlled items shall have hardware controls in the event of a hazardous condition. | All SAMS software controlled items shall have hardware controls in the event of a hazardous condition. | Software is zero fault tolerant, need hardware backup. | All/All |
| 2061 | VRD-xxx-317 | SAMS-PLN-002 section 10.4 | SAMS software shall undergo a minimum of 100 continuous hours of failure-free burn-in testing. | SAMS software shall undergo a minimum of 100 continuous hours of failure-free burn-in testing. | Burn-in tests help to ensure a reliable product. | All/All |

| Tracking # | Verification # | Source Document #, Location | Source Requirement | Design Requirement | Rationale | Applicability (Platform/ Subsystem) |
|---|---|---|---|---|---|---|
| 2062 | VRD-xxx-317 | SAMS-PLN-002 section 10.4 | SAMS software shall undergo a detailed functional acceptance test that will test both nominal and boundary conditions. | SAMS software shall undergo a detailed functional acceptance test that will test both nominal and boundary conditions. | Functional acceptance tests not only verify and validate the software, but helps to ensure a reliable product. | All/All |
| 2063 | VRD-xxx-317 | SAMS-PLN-002 section 10.7.3 | SAMS software shall undergo a functional acceptance test prior to release. This test shall verify each capability of the software and ensure all software performance requirements have been satisfied as well as testing non-nominal and boundary conditions. Results of tests will be documented in a test report. | SAMS software shall undergo a functional acceptance test prior to release. This test shall verify each capability of the software and ensure all software performance requirements have been satisfied as well as testing non-nominal and boundary conditions. Results of tests will be documented in a test report. | Functional acceptance tests help to verify and validate the software. | All/All |
| 2064 | VRD-xxx-318 | SAMS-PLN-002 section 10.7.4 | Medium control level software efforts for SAMS shall undergo a Functional Configuration Audit (FCA) prior to the release of the software. | Medium control level software efforts for SAMS shall undergo a Functional Configuration Audit (FCA) prior to the release of the software. | Audits help to verify and validate the software. | All/All |
| 2065 | VRD-xxx-319 | SAMS-PLN-002 section 10.7.4 | Medium control level software efforts for SAMS shall undergo a Physical Configuration Audit (PCA) prior to the release of the software. | Medium control level software efforts for SAMS will undergo a Physical Configuration Audit (PCA) prior to the release of the software. | Audits help to verify and validate the software. | All/All |
| | | | | | | |
| 3001 | See App. A | SSP 57000 | SAMS shall meet ISS integrator requirements per Appendix A. | Reference Appendix A. | Necessary to meet carrier requirements in order to fly hardware. | ISS/VSS, AAS, QSS, CDHS |

# APPENDIX A – ISS REQUIREMENT APPLICABILITY MATRIX

The following table is derived from SSP 57000, Pressurized Payloads Interface Requirements Document, November 1, 2000, Revision E. For each requirement from SSP 57000, this table lists the requirement number, requirement title, the applicability, the applicable hardware, and comments. For applicability the choices are:

A – Applicable

F – Levied by the facility

NAR – Not a requirement

N/A – Not applicable

For hardware applicability the choices are:

EE – Electronics Enclosure (60005MA12200 Rev F or equivalent)

SE – Sensor Enclosure (60005MA12100 Rev E or equivalent)

TSH-ES – Triaxial Sensor Head – Ethernet Standalone (60005MA50000 Rev A or equivalent)

Cables – Cables between EE and SE or TSH-ES to facility

The hardware applicability category includes only subsystem hardware that is flying or planned to fly on ISS. All hardware that is considered a payload (ie ICU Drawer, RTS Drawer, MAMS, etc.) will be subject to the specific carrier requirements. If a design change occurs on the EE, SE or TSH-ES hardware/software, all requirements shall be reviewed for applicability.

The comments section lists only design specifications in SSP 57000 or lists SSP 57000 itself, as well as any other applicable information.

| SSP 57000 Req. # | Verification # | Title | Applicability | Hardware Applicability | | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | EE | SE | TSH-ES | Cables | |
| 1.0 | **N/A** | **Introduction** | NAR | - | - | - | - | |
| 1.1 | N/A | Purpose | NAR | - | - | - | - | |
| 1.2 | N/A | Scope | NAR | - | - | - | - | |
| 1.3 | N/A | Use | NAR | - | - | - | - | |
| 1.4 | N/A | Exceptions | NAR | - | - | - | - | |
| 1.5 | N/A | Control and Maintenance | NAR | - | - | - | - | |
| 2.0 | N/A | Documentation | NAR | - | - | - | - | |
| 2.1 | N/A | Applicable Documents | NAR | - | - | - | - | |
| 2.2 | N/A | Reference Documents | NAR | - | - | - | - | |
| 3.0 | N/A | Payload Interface Requirements and Guidance | NAR | - | - | - | - | |
| 3.1 | N/A | Structural/Mechanical, and Microgravity and Stowage Interface Requirements | NAR | - | - | - | - | |
| 3.1.1 | N/A | Structural/Mechanical | NAR | - | - | - | - | |
| 3.1.1.1 (A-D) | N/A | GSE Interfaces | N/A | - | - | - | - | SAMS is planning to interface to a rack/payload. |
| 3.1.1.2 (A,E) | N/A | MPLM Interfaces | N/A | - | - | - | - | SAMS is planning to interface to a rack/payload. |
| 3.1.1.2 (B) | VRD-xxx-250 | MPLM Interfaces | A | X | X | X | - | Depress/repress rates, SSP 57000. |
| 3.1.1.2 (C,D) | N/A | MPLM Interfaces | NAR | - | - | - | - | These requirements have been deleted. |
| 3.1.1.2.1 | N/A | MPLM Late/Early Access Requirements | N/A | - | - | - | - | SAMS has no plan to need late/early access. |
| 3.1.1.2.1.1 (A-C) | N/A | MPLM Late Access Envelope (KSC) | N/A | - | - | - | - | SAMS has no plans to need late access. |
| 3.1.1.2.1.2 (A,B) | N/A | MPLM Early Access Envelopes (KSC and DFRC) | N/A | - | - | - | - | SAMS has no plans to need early access. |
| 3.1.1.3 (A,B,F) | VRD-xxx-201 | Loads Requirements | F | X | X | X | - | A – SSP 41017 Part 1, para. 3.2.1.4.2, Part 2, para. 3.1.3,<br>B – SSP 57000, F – SSP 57000, SSP 52005. Facility requirements shall be negotiated in the ICAD. |
| 3.1.1.3 (C,E) | N/A | Loads Requirements | N/A | - | - | - | - | C – SAMS has no plans to have Rack Utility Panel umbilicals. E – SAMS has no plans to be mounted on ISPR posts. |
| 3.1.1.3 (D) | VRD-xxx-251 | Loads Requirements | A | X | X | X | - | Crew induced loads. SSP 57000. |
| 3.1.1.4 (A,C,E,F,I,K,L, M) | N/A | Rack Requirements | N/A | - | - | - | - | SAMS has no plans to be an integrated rack. |
| 3.1.1.4 (B) | VRD-xxx-207 | Rack Requirements | F | X | X | X | - | On-orbit depress/repress rates. SSP 41002, par. 3.1.7.2.1. Facility requirements shall be negotiated in the ICAD. |
| 3.1.1.4 (D) | VRD-xxx-205 | Rack Requirements | A | X | X | X | - | Modal frequency, SSP 57000. |
| 3.1.1.4 (G,H,J) | N/A | Rack Requirements | NAR | - | - | - | - | These requirements have been deleted. |
| 3.1.1.4.1 (A-C) | N/A | Lab Window Rack Location Requirements | N/A | - | - | - | - | SAMS has no requirement for utilizing the lab window rack location. |
| 3.1.1.5 (A) | VRD-xxx-201 | Safety Critical Structures Requirements | A | X | X | X | | SSP 52005. |
| 3.1.1.5 (B-D) | N/A | Safety Critical Structures Requirements | NAR | - | - | - | - | These requirements have been deleted. |

KEY: **A – Applicable;** **F – Levied by facility;** **NAR – Not a requirement;** **N/A – Not applicable**

| SSP 57000 Req. # | Verification # | Title | Applicability | Hardware Applicability | | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | EE | SE | TSH-ES | Cables | |
| 3.1.1.6 | N/A | Connector and Umbilical Physical Mate | NAR | - | - | - | - | |
| 3.1.1.6.1 | N/A | Connector Physical Mate | N/A | - | - | - | - | SAMS has no plans to mate to ISS directly. |
| 3.1.1.6.2 | N/A | Umbilical Physical Mate | N/A | - | - | - | - | SAMS has no plans to mate to ISS directly. |
| 3.1.1.7 (A,B) | N/A | On-orbit Payload Protrusions | N/A | - | - | - | - | Protrusions are dependent on the mounting position for which the SAMS integrator will be responsible. |
| 3.1.1.7.1 | N/A | On-orbit Permanent Protrusions | N/A | - | - | - | - | Protrusions are dependent on the mounting position for which the SAMS integrator will be responsible. |
| 3.1.1.7.2 (A-C) | N/A | On-orbit Semi-Permanent Protrusions | N/A | - | - | - | - | Protrusions are dependent on the mounting position for which the SAMS integrator will be responsible. |
| 3.1.1.7.3 (A-B) | N/A | On-orbit Temporary Protrusions | N/A | - | - | - | - | Protrusions are dependent on the mounting position for which the SAMS integrator will be responsible. |
| 3.1.1.7.4 | N/A | On-orbit Momentary Protrusions | N/A | - | - | - | - | Protrusions are dependent on the mounting position for which the SAMS integrator will be responsible. |
| 3.1.1.7.5 (A-B) | N/A | On-orbit Protrusions for Keep Alive Payloads | N/A | - | - | - | - | SAMS has no plans to be a keep alive payload. |
| 3.1.2 | N/A | Microgravity | NAR | - | - | - | - | |
| 3.1.2.1 (A, B) | N/A | Quasi-steady Requirements | N/A | - | - | - | - | SAMS has no plans to have any disturbers. |
| 3.1.2.2 (A,B) | N/A | Vibratory Requirements | N/A | - | - | - | - | SAMS has no plans to have any disturbers. |
| 3.1.2.3 (A,B) | N/A | Transient Requirements | N/A | - | - | - | - | SAMS has no plans to have any disturbers. |
| 3.1.2.4 | N/A | Microgravity Environment | NAR | - | - | - | - | |
| 3.1.2.5 | N/A | ARIS Interfaces | NAR | - | - | - | - | |
| 3.1.3 | N/A | Stowage | NAR | - | - | - | - | |
| 3.2 | N/A | Electrical Interface Requirements | NAR | - | - | - | - | |
| 3.2.1 | N/A | Electrical Power Characteristics | NAR | - | - | - | - | |
| 3.2.1.1 | N/A | Steady-State Voltage Characteristics | NAR | - | - | - | - | |
| 3.2.1.1.1 | VRD-xxx-150 | Interface B | F | X | - | X | - | SAMS is planning to interface to a rack with 28VDC or $\pm$ 15VDC output. Facility requirements shall be negotiated in the ICAD. |
| 3.2.1.1.2 | VRD-xxx-150 | Interface C | F | X | - | X | - | SAMS is planning to interface to a rack with 28VDC or $\pm$ 15VDC output. Facility requirements shall be negotiated in the ICAD. |
| 3.2.1.2 | | Ripple Voltage Characteristics | NAR | - | - | - | - | |
| 3.2.1.2.1 | VRD-xxx-102 | Ripple Voltage and Noise | F | X | X | X | X | SAMS is planning to interface to a rack. Performed as a system level test per verifications stated in AIDD, SAMS-INT-001. |
| 3.2.1.2.2 | VRD-xxx-102 | Ripple Voltage Spectrum | F | X | X | X | X | SAMS is planning to interface to a rack. Performed as a system level test per verifications stated in AIDD, SAMS-INT-001. |
| 3.2.1.3 | N/A | Transient Voltages | NAR | - | - | - | - | |
| 3.2.1.3.1 | VRD-xxx-102 | Interface B | F | X | X | X | - | SAMS is planning to interface to a rack. Performed as a system level test per verifications stated in AIDD, SAMS-INT-001. |

KEY: **A – Applicable;** **F – Levied by facility;** **NAR – Not a requirement;** **N/A – Not applicable**

| SSP 57000 Req. # | Verification # | Title | Applicability | Hardware Applicability | | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | EE | SE | TSH-ES | Cables | |
| 3.2.1.3.2 | VRD-xxx-102 | Interface C | F | X | X | X | - | SAMS is planning to interface to a rack. Performed as a system level test per verifications stated in AIDD, SAMS-INT-001. |
| 3.2.1.3.3 | VRD-xxx-151 | Fault Clearing and Protection | F | X | X | X | - | SAMS is planning to interface to a rack. Performed as a system level test per verifications stated in AIDD, SAMS-INT-001. |
| 3.2.1.3.4 (A,B) | VRD-xxx-150 | Non-Normal Voltage Range | F | X | X | X | - | SAMS is planning to interface to a rack. Performed as a system level test per verifications stated in AIDD, SAMS-INT-001. |
| 3.2.1.4 | N/A | Deleted | NAR | - | - | - | - | |
| 3.2.2 | N/A | Electrical Power Interface | NAR | - | - | - | - | |
| 3.2.2.1 (A-F) | N/A | UIP and UOP Connectors and Pin Assignments | N/A | - | - | - | - | SAMS is planning to interface to a rack. |
| 3.2.2.2 (A,B) | N/A | Power Bus Isolation | N/A | - | - | - | - | SAMS does not plan to require power from 2 buses. |
| 3.2.2.3 | VRD-xxx-152 | Compatibility with Soft Start/Stop RPC | F | X | X | X | - | SAMS is planning to interface to a rack. Performed as a system level test per verifications stated in AIDD, SAMS-INT-001. |
| 3.2.2.4 | VRD-xxx-152 | Surge Current | F | X | X | X | - | SAMS is planning to interface to a rack. Performed as a system level test per verifications stated in AIDD, SAMS-INT-001. |
| 3.2.2.5 | N/A | Reverse Energy/Current | N/A | - | - | - | - | SAMS has no plans to have energy storage devices. |
| 3.2.2.6 | N/A | Circuit Protection Devices | NAR | - | - | - | - | |
| 3.2.2.6.1 | N/A | ISS EPS Circuit Protection Characteristics | NAR | - | - | - | - | |
| 3.2.2.6.1.1 (A-E) | N/A | Remote Power Controllers (RPCS) | N/A | - | - | - | - | SAMS has no plans to have a RPCS. |
| 3.2.2.6.2 | N/A | EPCE RPC Interface Req. | NAR | - | - | - | - | |
| 3.2.2.6.2.1 | N/A | RPC Trip Coordination | NAR | - | - | - | - | |
| 3.2.2.6.2.1.1 | N/A | Payload Trip Ratings | N/A | - | - | - | - | SAMS does not plan to connect to Interface B. |
| 3.2.2.6.2.1.2 | N/A | Deleted | NAR | - | - | - | - | |
| 3.2.2.7 | N/A | EPCE Complex Load Impedances | NAR | - | - | - | - | |
| 3.2.2.7.1 (A,B) | VRD-xxx-153 | Interface B | F | X | X | X | - | Since SAMS has a specific impedance, it is up to the facility to incorporate SAMS into their design. |
| 3.2.2.7.2 | VRD-xxx-153 | Interface C | F | X | X | X | - | Since SAMS has a specific impedance, it is up to the facility to incorporate SAMS into their design. |
| 3.2.2.8 | VRD-xxx-154 | Large Signal Stability | F | X | X | X | - | SAMS has no plans to connect directly to interface B or C. Since SAMS hardware is low power, and voltage, it has no effect on the large signal stability. This requirement will be levied on the integrator per the AIDD, SAMS-INT-001. |
| 3.2.2.9 | VRD-xxx-102 | Maximum Ripple Voltage Emissions | F | X | - | X | - | SAMS will characterize the system to verify hardware meets limits stated in AIDD, SAMS-INT-001. |

KEY: **A – Applicable;** **F – Levied by facility;** **NAR – Not a requirement;** **N/A – Not applicable**

| SSP 57000 Req. # | Verification # | Title | Applicability | Hardware Applicability | | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | EE | SE | TSH-ES | Cables | |
| 3.2.2.10 (A-C) | VRD-xxx-102 | Electrical Load-stand Alone Stability | F | X | X | X | - | SAMS will characterize the system to verify hardware meets limits stated in AIDD, SAMS-INT-001. |
| 3.2.2.11 | VRD-xxx-160 | Electrical Load Inductance | F | X | X | X | - | SAMS will characterize the system to verify hardware meets limits stated in AIDD, SAMS-INT-001. |
| 3.2.3 | N/A | Electrical Power Consumer Constraints | NAR | - | - | - | - | |
| 3.2.3.1(A,C) | N/A | Wire Derating | N/A | - | - | - | - | A – SAMS has no plans to have a connection between EPCE and the UOP. C - SAMS is planning to interface to a rack. |
| 3.2.3.1 (B) | VRD-xxx-163 | Wire Derating | A | X | X | - | X | SSP 57000, TM 102179 interpreted by NSTS 18798, TA-92-038. |
| 3.2.3.2 (A,B) | | Exclusive Power Feeds | N/A | - | - | - | - | SAMS is planning to interface to a rack. |
| 3.2.3.3 | VRD-xxx-155 | Loss Of Power | A | X | X | X | - | NSTS 1700.7. |
| 3.2.4 | VRD-xxx-102 | Electromagnetic Compatibility | F | X | X | X | X | SSP 30243, para. 3.1 & 3.6.2. |
| 3.2.4.1 | VRD-xxx-156 | Electrical Grounding | A & F | X | X | X | - | SSP 30240, section 3. Any further requirements will be defined in the AIDD, SAMS-INT-001. |
| 3.2.4.2 | VRD-xxx-157 | Electrical Bonding | A & F | X | X | X | X | SSP 30245 & NSTS 1700.7, sections 213 & 220. Any further requirements will be defined in the ICAD. |
| 3.2.4.3 | N/A | Cable/Wire Design and Control Requirements | N/A | - | - | - | - | SAMS does not plan to connect to Interface B or Interface C. |
| 3.2.4.4 | VRD-xxx-102 | Electromagnetic Interference | A | X | X | X | X | SSP 30237, SSP 57000. |
| 3.2.4.5 | VRD-xxx-158 | Electrostatic Discharge | A | X | X | X | - | SSP 57000. |
| 3.2.4.6 | VRD-xxx-102 | Alternating Current (AC) Magnetic Fields | A | X | X | X | X | SSP 57000. |
| 3.2.4.7 | VRD-xxx-102 | Direct Current (DC) Magnetic Fields | A | X | X | X | X | SSP 57000. |
| 3.2.4.8 | N/A | Corona | N/A | - | - | - | - | SAMS is planning to have low voltage. |
| 3.2.4.9 | N/A | Lightning | N/A | - | - | - | - | SAMS has no plans to power on during launch. |
| 3.2.4.10 | N/A | EMI Susceptibility for Safety-Critical Circuits | N/A | - | - | - | - | SAMS does not plan to have any safety-critical circuits. |
| 3.2.5 | N/A | Safety Requirements | NAR | - | - | - | - | |
| 3.2.5.1 | N/A | Payload Electrical Safety | NAR | - | - | - | - | |
| 3.2.5.1.1 | VRD-xxx-161 | Mating/Demating of Powered Connectors | A | X | X | X | X | NSTS 1700.7 Addendum, NSTS 18798, MA2-97-093. |
| 3.2.5.1.2 | N/A | Safety-Critical Circuits Redundancy | N/A | - | - | - | - | SAMS does not plan to have any safety-critical circuits. |
| 3.2.5.2 | N/A | Rack Maintenance Switch (Rack Power Switch) | N/A | - | - | - | - | SAMS is planning to interface to a rack. |
| 3.2.5.3 (A-C) | N/A | Power Switches/Controls | N/A | - | - | - | - | SAMS has no plans for voltage >30 Vrms. |
| 3.2.5.4 (A-G) | N/A | Ground Fault Circuit Interrupters (GFCI)/Portable Equipment DC Sourcing Voltage | N/A | - | - | - | - | SAMS has no GFCI because SAMS has no plans for voltage >30 Vrms. |
| 3.2.5.5 (A-B) | N/A | Portable Equipment/Power Cords | N/A | - | - | - | - | SAMS has no plans for portable equipment/power cords. |
| 3.2.5.6 | N/A | Deleted | NAR | - | - | - | - | |
| 3.2.6 | N/A | MPLM | N/A | - | - | - | - | SAMS has no plans to use power in the MPLM. |
| 3.2.6.1 (A-G) | N/A | MPLM Electrical Power Characteristics | N/A | - | - | - | - | SAMS has no plans to use power in the MPLM. |
| 3.2.6.1 (H,I) | N/A | MPLM Electrical Power Characteristics | NAR | - | - | - | - | These requirements have been deleted. |

KEY: **A – Applicable;** **F – Levied by facility;** **NAR – Not a requirement;** **N/A – Not applicable**

| SSP 57000 Req. # | Verification # | Title | Applicability | Hardware Applicability | | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | EE | SE | TSH-ES | Cables | |
| 3.2.6.2 (A-F) | N/A | MPLM Electrical Power Interface | N/A | - | - | - | - | SAMS has no plans to use power in the MPLM. |
| 3.2.6.2.1 (A-C) | N/A | MPLM UIP Connectors and Pin Assignments | N/A | - | - | - | - | SAMS has no plans to use power in the MPLM. |
| 3.2.6.2.2 | N/A | Compatibility with RPC Soft Start/Stop in MPLM | N/A | - | - | - | - | SAMS has no plans to use power in the MPLM. |
| 3.2.6.2.3 (A-D) | N/A | MPLM Surge Current | N/A | - | - | - | - | SAMS has no plans to use power in the MPLM. |
| 3.2.6.2.4 | N/A | MPLM Reverse Energy/Current | N/A | - | - | - | - | SAMS has no plans to use power in the MPLM. |
| 3.2.6.2.5 | N/A | MPLM Payload Trip Ratings | N/A | - | - | - | - | SAMS has no plans to use power in the MPLM. |
| 3.2.6.3 (A-D) | N/A | MPLM Electrical Power Consumer Constraints | N/A | - | - | - | - | SAMS has no plans to use power in the MPLM. |
| 3.2.6.4 (A-J) | N/A | MPLM Electromagnetic Compatibility | N/A | - | - | - | - | SAMS has no plans to use power in the MPLM. |
| 3.2.6.4.1 | N/A | MPLM Bonding | N/A | - | - | - | - | SAMS has no plans to use power in the MPLM. |
| 3.2.6.5 (A-F) | N/A | MPLM Safety Requirements | N/A | - | - | - | - | SAMS has no plans to use power in the MPLM. |
| 3.3 | N/A | Command and Data Handling Interface Requirements | NAR | - | - | - | - | |
| 3.3.1 | N/A | General Requirements | NAR | - | - | - | - | |
| 3.3.2 | VRD-xxx-tbd | Word/Byte Notations, Types and Data Transmissions | A | - | - | X | - | SSP 57000. |
| 3.3.2.1 | VRD-xxx-tbd | Word/Byte Notations | A | - | - | X | - | SSP 52050, para. 3.1.1. |
| 3.3.2.2 | VRD-xxx-tbd | Data Types | A | - | - | X | - | SSP 52050, para. 3.2.1. |
| 3.3.2.3 (B) | VRD-xxx-tbd | Data Transmissions | A | - | - | X | - | SSP 52050, para. 3.3.3.1. |
| 3.3.2.3 (A,C) | N/A | Data Transmissions | N/A | - | - | - | - | SAMS has no plans for using Medium Rate Data Link. |
| 3.3.3 | N/A | Deleted | NAR | - | - | - | - | |
| 3.3.4 | VRD-xxx-tbd | Consultative Committee for Space Data Systems | A | - | - | X | - | SSP 57000. |
| 3.3.4.1 (A-C) | VRD-xxx-tbd | CCSDS Data | A | - | - | X | - | SSP 57000. |
| 3.3.4.1.1 | VRD-xxx-tbd | CCSDS Data Packets | A | - | - | X | - | SSP 52050 para. 3.1.3. |
| 3.3.4.2.1.1 | VRD-xxx-tbd | CCSDS Primary Header | A | - | - | X | - | SSP 52050 para. 3.1.3.1. |
| 3.3.4.2.1.2 (A,B) | VRD-xxx-tbd | CCSDS Secondary Header | A | - | - | X | - | SSP 52050 para. 3.1.3.2, SSP 57000. |
| 3.3.4.2.2 | VRD-xxx-tbd | CCSDS Data Field | A | - | - | X | - | SSP 52050 para. 3.1 |
| 3.3.4.2.3 | VRD-xxx-tbd | CCSDS Data Bitstream | A | - | - | X | - | 701.0-B-2, para. 2.3.2.3. |
| 3.3.4.2.4 | VRD-xxx-tbd | CCSDS Application Process Identification Field | A | - | - | X | - | SSP 41175-2, para. 3.3.2.1.3 & Table 3.3.2.1.1-1. |
| 3.3.4.3 | N/A | CCSDS Time Codes | NAR | - | - | - | - | |
| 3.3.4.3.1 | VRD-xxx-tbd | CCSDS Unsegmented Time | A | - | - | X | - | CCSDS 301.0-B-2, para. 2.2. |
| 3.3.4.3.2 | VRD-xxx-tbd | CCSDS Segmented Time | A | - | - | X | - | SSP 57000, CCSDS 301.0-B-2. |
| 3.3.5 | N/A | MIL-STD-1553B Low Rate Data Link (LRDL) | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.1 | N/A | MIL-STD-1553B Protocol | NAR | - | - | - | - | |
| 3.3.5.1.1 | N/A | Standard Messages | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.1.2 | N/A | Commanding | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.1.3 | N/A | Health and Status Data | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.1.4 (A,B) | N/A | Safety Data | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.1.4.1 | N/A | Caution and Warning | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.1.4.1.1 | N/A | Class 1 – Emergency | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.1.4.1.2 | N/A | Class 2 – Warning | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.1.4.1.3 | N/A | Class 3 – Caution | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.1.4.1.4 | N/A | Class 4 – Advisory | N/A | - | - | - | - | SAMS is not planning on using LRDL. |

KEY: **A – Applicable;** **F – Levied by facility;** **NAR – Not a requirement;** **N/A – Not applicable**

| SSP 57000 Req. # | Verification # | Title | Applicability | Hardware Applicability | | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | EE | SE | TSH-ES | Cables | |
| 3.3.5.1.5 | N/A | Service Requests | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.1.6 | N/A | Ancillary Data | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.1.7 | N/A | File Transfer | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.1.8 | N/A | Low Rate Telemetry | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.1.9 | N/A | Defined Mode Codes | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.1.10 | N/A | Implemented Mode Codes | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.1.11 | N/A | Unimplemented/Undefined Mode Codes | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.1.12 | N/A | Illegal Commands | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.2 | N/A | MIL-STD-1553B Low Rate Data Link (LRDL) Interface Characteristics | NAR | - | - | - | - | |
| 3.3.5.2.1 | N/A | LRDL Remote Terminal Assignment | NAR | - | - | - | - | |
| 3.3.5.2.1.1 | N/A | LRDL Connector/Pin Assignments | NAR | - | - | - | - | |
| 3.3.5.2.1.2 (A-C) | N/A | MIL-STD-1553B Bus A and B Connector/Pin Assignment | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.2.1.3 | N/A | Deleted | NAR | - | - | - | - | |
| 3.3.5.2.1.4 (A-E) | N/A | Remote Terminal Hardwired Address Coding | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.2.2 | N/A | LRDL Signal Characteristics | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.2.3 | N/A | LRDL Cabling | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.5.2.4 | N/A | Multi-Bus Isolation | N/A | - | - | - | - | SAMS is not planning on using LRDL. |
| 3.3.6 | N/A | Medium Rate Data Link (MRDL) | NAR | - | - | - | - | |
| 3.3.6.1 | VRD-xxx-tbd | MRDL Protocol | A | - | - | X | - | SSP 52050, para. 3.3. |
| 3.3.6.1.1 | VRD-xxx-tbd | Integrated Rack Protocols on the MRDL | A | - | - | X | - | SSP 52050, para. 3.3, 3.3.4, 3.3.7. |
| 3.3.6.1.2 (A-C) | VRD-xxx-tbd | MRDL Address | A | - | - | X | - | SSP 57000. B – Applies to TSH-ES that does not downlink data directly through ISS. |
| 3.3.6.1.3 (A-C) | N/A | ISPR MRDL Connectivity | N/A | - | - | - | - | Provided by integrator as per AIDD. |
| 3.3.6.1.4 (A-D) | N/A | MRDL Connector/Pin Assignments and Wire Requirements | N/A | - | - | - | - | Provided by integrator as per AIDD. |
| 3.3.6.1.4.1 | N/A | Deleted | NAR | - | - | - | - | |
| 3.3.6.1.4.2 | N/A | Deleted | NAR | - | - | - | - | |
| 3.3.6.1.5 | N/A | MRDL Signal Characteristics | N/A | - | - | - | - | Provided by integrator as per AIDD. |
| 3.3.6.1.6 | N/A | MRDL Cable Characteristics | N/A | - | - | - | - | Provided by integrator as per AIDD. |
| 3.3.6.1.6.1 | N/A | Insertion Loss | N/A | - | - | - | - | Provided by integrator as per AIDD. |
| 3.3.6.1.6.2 | N/A | Differential Characteristic Impedance | N/A | - | - | - | - | Provided by integrator as per AIDD. |
| 3.3.6.1.6.3 | N/A | Medium Timing Jitter | N/A | - | - | - | - | Provided by integrator as per AIDD. |
| 3.3.7 | N/A | High Rate Data Link (HRDL) | NAR | - | - | - | - | |
| 3.3.7.1 | N/A | Payload to High Rate Frame Multiplexer (HRFM) Protocols | N/A | - | - | - | - | SAMS is not planning on using HRDL. |
| 3.3.7.2 | N/A | HRDL Interface Characteristics | NAR | - | - | - | - | |
| 3.3.7.2.1 | N/A | Physical Signaling | N/A | - | - | - | - | SAMS is not planning on using HRDL. |
| 3.3.7.2.1.1 (A-C) | N/A | Physical Signaling Date Rates | N/A | - | - | - | - | SAMS is not planning on using HRDL. |
| 3.3.7.2.2 | N/A | Encoding | N/A | - | - | - | - | SAMS is not planning on using HRDL. |
| 3.3.7.2.3 | N/A | Deleted | NAR | - | - | - | - | |
| 3.3.7.3 | N/A | Integrated Rack HRDL Optical Power | NAR | - | - | - | - | |

KEY: **A – Applicable;** **F – Levied by facility;** **NAR – Not a requirement;** **N/A – Not applicable**

| SSP 57000 Req. # | Verification # | Title | Applicability | Hardware Applicability | | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | EE | SE | TSH-ES | Cables | |
| 3.3.7.3.1 | N/A | Integrated Rack HRDL Transmitted Optical Power | N/A | - | - | - | - | SAMS is not planning on using HRDL. |
| 3.3.7.3.2 | N/A | Integrated Rack HRDL Received Optical Power | N/A | - | - | - | - | SAMS is not planning on using HRDL. |
| 3.3.7.4 | N/A | HRDL Fiber Optic Cable | N/A | - | - | - | - | SAMS is not planning on using HRDL. |
| 3.3.7.5 | N/A | HRDL Fiber Optic Cable Bend Radius | N/A | - | - | - | - | SAMS is not planning on using HRDL. |
| 3.3.7.6 (A-D) | N/A | HRDL Connectors and Fiber | N/A | - | - | - | - | SAMS is not planning on using HRDL. |
| 3.3.7.7 | N/A | Deleted | NAR | - | - | - | - | |
| 3.3.8 | N/A | Personal Computers | NAR | - | - | - | - | |
| 3.3.8.1 (A-H) | N/A | Payload Laptop | N/A | - | - | - | - | SAMS is not planning to provide a laptop to directly talk to a TSH-ES. |
| 3.3.8.2 (A-C) | N/A | PCS | N/A | - | - | - | - | SAMS is not planning to provide a laptop to directly talk to a TSH-ES. |
| 3.3.8.2.1 (A,B) | N/A | PCS to UOP Interface | N/A | - | - | - | - | SAMS is not planning to provide a laptop to directly talk to a TSH-ES. |
| 3.3.8.2.2 (A-D) | N/A | 760XD Laptop to Rack Interface | N/A | - | - | - | - | SAMS is not planning to provide a laptop to directly talk to a TSH-ES. |
| 3.3.8.3 (A,B) | N/A | SSC | N/A | - | - | - | - | SAMS is not planning to use the SSC to directly talk to a TSH-ES. |
| 3.3.9 | N/A | UOP | N/A | - | - | - | - | Provided by integrator as per AIDD. |
| 3.3.10 | N/A | Maintenance Switch, Smoke Detector, Smoke Indicator, and Integrated Rack Fan Interfaces | NAR | - | - | - | - | |
| 3.3.10.1 (A,B) | N/A | Rack Maintenance Switch (Rack Power Switch) Interfaces | N/A | - | - | - | - | Provided by integrator as per AIDD. |
| 3.3.10.2 | N/A | Smoke Detector Interfaces | N/A | - | - | - | - | Provided by integrator as per AIDD. |
| 3.3.10.2.1 | N/A | Analog Interface Characteristics | N/A | - | - | - | - | Provided by integrator as per AIDD. |
| 3.3.10.2.2 | N/A | Discrete Command Built-In-Test Interface Characteristics | N/A | - | - | - | - | Provided by integrator as per AIDD. |
| 3.3.10.2.3 | N/A | Smoke Indicator Electrical Interfaces | N/A | - | - | - | - | Provided by integrator as per AIDD. |
| 3.3.10.2.4 | N/A | Fan Ventilation Status Electrical Interfaces | N/A | - | - | - | - | Provided by integrator as per AIDD. |
| 3.3.10.3 (A-C) | N/A | Rack Maintenance Switch (Rack Power Switch)/Fire Detection Support Interface Connector | N/A | - | - | - | - | Provided by integrator as per AIDD. |
| 3.4 | N/A | Payload NTSC Video and Audio Interface Requirements | N/A | - | - | - | - | SAMS has no plans to use NTSC Video and Audio. |
| 3.4.1 | N/A | Payload NTSC Video Interface Requirements | NAR | - | - | - | - | |
| 3.4.1.1 (A-C) | N/A | Payload NTSC Optical Video Characteristics | N/A | - | - | - | - | SAMS has no plans to use NTSC Video and Audio. |
| 3.4.1.2 | N/A | NTSC Fiber Optic Video | NAR | - | - | - | - | |
| 3.4.1.2.1 (A,B) | N/A | Pulse Frequency Modulation NTSC Fiber Optic Video Characteristics | N/A | - | - | - | - | SAMS has no plans to use NTSC Video and Audio. |
| 3.4.1.2.2 | N/A | Integrated Rack NTSC PFM Video Transmitted Optical Power | N/A | - | - | - | - | SAMS has no plans to use NTSC Video and Audio. |
| 3.4.1.2.3 | N/A | Integrated Rack NTSC PFM Video and Sync Signal Received Optical Power | N/A | - | - | - | - | SAMS has no plans to use NTSC Video and Audio. |
| 3.4.1.2.4 | N/A | Fiber Optic Cable Characteristics | N/A | - | - | - | - | SAMS has no plans to use NTSC Video and Audio. |

KEY: **A – Applicable;** **F – Levied by facility;** **NAR – Not a requirement;** **N/A – Not applicable**

| SSP 57000 Req. # | Verification # | Title | Applicability | Hardware Applicability | | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | EE | SE | TSH-ES | Cables | |
| 3.4.1.2.5 | N/A | PFM NTSC Video Fiber Optic Cable Bend Radius | N/A | - | - | - | - | SAMS has no plans to use NTSC Video and Audio. |
| 3.4.1.2.6 | N/A | Deleted | NAR | - | - | - | - | |
| 3.4.1.2.7 (A-C) | N/A | PFM NTSC Optical Connector/Pin Assignments | N/A | - | - | - | - | SAMS has no plans to use NTSC Video and Audio. |
| 3.4.1.3 | N/A | NTSC Electrical Video Interfaces | NAR | - | - | - | - | |
| 3.4.1.3.1 | N/A | Cables | N/A | - | - | - | - | SAMS has no plans to use NTSC Video and Audio. |
| 3.4.1.3.2 | N/A | Signal Standard | N/A | - | - | - | - | SAMS has no plans to use NTSC Video and Audio. |
| 3.4.1.3.3 | N/A | Interface Circuit | N/A | - | - | - | - | SAMS has no plans to use NTSC Video and Audio. |
| 3.4.1.3.4 | N/A | Cross Talk | N/A | - | - | - | - | SAMS has no plans to use NTSC Video and Audio. |
| 3.4.1.4 (A-C) | N/A | NTSC Electrical Connector/Pin Assignments | N/A | - | - | - | - | SAMS has no plans to use NTSC Video and Audio. |
| 3.4.2 | N/A | U.S. Element Audio Interface Requirements | N/A | - | - | - | - | SAMS has no plans to use NTSC Video and Audio. |
| 3.5 | N/A | Thermal Control Interface Requirements | NAR | - | - | - | - | |
| 3.5.1 | N/A | Internal Thermal Control System (ITCS) Interface Requirements | NAR | - | - | - | - | |
| 3.5.1.1 (A,B) | N/A | Physical Interface | N/A | - | - | - | - | SAMS is not planning to be actively cooled. |
| 3.5.1.2 (A,B) | N/A | ITCS Fluid Use and Charging | N/A | - | - | - | - | SAMS is not planning to be actively cooled. |
| 3.5.1.3 | N/A | ITCS Pressure Drop | NAR | - | - | - | - | |
| 3.5.1.3.1 (A,B) | N/A | On-Orbit Interfaces | N/A | - | - | - | - | SAMS is not planning to be actively cooled. |
| 3.5.1.3.2 | N/A | MPLM Interfaces | N/A | - | - | - | - | SAMS is not planning to be actively cooled. |
| 3.5.1.4 (A,B) | N/A | Coolant Flow Rate | N/A | - | - | - | - | SAMS is not planning to be actively cooled. |
| 3.5.1.5 (A,B) | N/A | Coolant Supply Temperature | N/A | - | - | - | - | SAMS is not planning to be actively cooled. |
| 3.5.1.6 (A-D) | N/A | Coolant Return Temperature | N/A | - | - | - | - | SAMS is not planning to be actively cooled. |
| 3.5.1.7 (A-C) | N/A | Coolant Maximum Design Pressure | N/A | - | - | - | - | SAMS is not planning to be actively cooled. |
| 3.5.1.8 | N/A | Fail Safe Design | N/A | - | - | - | - | SAMS is not planning to be actively cooled. |
| 3.5.1.9 (A,B) | N/A | Leakage | N/A | - | - | - | - | SAMS is not planning to be actively cooled. |
| 3.5.1.10 | N/A | Quick-Disconnect Air Inclusion | N/A | - | - | - | - | SAMS is not planning to be actively cooled. |
| 3.5.1.11 | N/A | Rack Front Surface Temperature | N/A | - | - | - | - | SAMS is not planning to be actively cooled. |
| 3.5.1.12 | N/A | Cabin Air Heat Leak | N/A | - | - | - | - | SAMS is not planning to be actively cooled. |
| 3.5.1.13 | N/A | MPLM Cabin Air Cooling | N/A | - | - | - | - | SAMS is not planning to be actively cooled. |
| 3.5.1.14 (A,B) | N/A | Simultaneous Cooling | N/A | - | - | - | - | SAMS is not planning to be actively cooled. |
| 3.5.1.15 | N/A | Control System Time Constant | N/A | - | - | - | - | SAMS is not planning to be actively cooled. |
| 3.5.1.16 | N/A | Payload Coolant Quantity | N/A | - | - | - | - | SAMS is not planning to be actively cooled. |
| 3.5.1.17 | N/A | Payload Gas Inclusion (TBR #6) | N/A | - | - | - | - | SAMS is not planning to be actively cooled. |
| 3.6 | N/A | Vacuum System Requirements | NAR | - | - | - | - | |
| 3.6.1 | N/A | Vacuum Exhaust System (VES)/Waste Gas System (WGS) Requirements | NAR | - | - | - | - | |
| 3.6.1.1 | N/A | VES/WGS Physical Interface | N/A | - | - | - | - | SAMS is not planning to need the VES or WGS. |
| 3.6.1.2 (A-C) | N/A | Input Pressure Limit | N/A | - | - | - | - | SAMS is not planning to need the VES or WGS. |
| 3.6.1.3 | N/A | Input Temperature Limit | N/A | - | - | - | - | SAMS is not planning to need the VES or WGS. |

KEY: **A – Applicable;** **F – Levied by facility;** **NAR – Not a requirement;** **N/A – Not applicable**

| SSP 57000 Req. # | Verification # | Title | Applicability | Hardware Applicability | | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | EE | SE | TSH-ES | Cables | |
| 3.6.1.4 | N/A | Input Dewpoint Limit | N/A | - | - | - | - | SAMS is not planning to need the VES or WGS. |
| 3.6.1.5 (A-D) | N/A | Acceptable Exhaust Gases | N/A | - | - | - | - | SAMS is not planning to need the VES or WGS. |
| 3.6.1.5.1 (A-C) | N/A | Acceptable Gases – List | N/A | - | - | - | - | SAMS is not planning to need the VES or WGS. |
| 3.6.1.5.2 | N/A | External Contamination Control | N/A | - | - | - | - | SAMS is not planning to need the VES or WGS. |
| 3.6.1.5.3 (A,B) | N/A | Incompatible Gases | N/A | - | - | - | - | SAMS is not planning to need the VES or WGS. |
| 3.6.1.6 | N/A | Payload Vacuum System Access Valve | N/A | - | - | - | - | SAMS is not planning to need the VES or WGS. |
| 3.6.2 | N/A | Vacuum Resource System (VRS)/Vacuum Vent System (VVS) Requirements | NAR | - | - | - | - | |
| 3.6.2.1 | N/A | VRS/VVS Physical Interface | N/A | - | - | - | - | SAMS is not planning to need the VRS or VVS. |
| 3.6.2.2 (A-C) | N/A | Input Pressure Limit | N/A | - | - | - | - | SAMS is not planning to need the VRS or VVS. |
| 3.6.2.3 | N/A | VRS/VVS Through-put Limit | N/A | - | - | - | - | SAMS is not planning to need the VRS or VVS. |
| 3.6.2.4 | N/A | Acceptable Gases | N/A | - | - | - | - | SAMS is not planning to need the VRS or VVS. |
| 3.7 | N/A | Pressurized Gases Interface Requirement | NAR | - | - | - | - | |
| 3.7.1 | N/A | Nitrogen Interface Requirements | NAR | - | - | - | - | |
| 3.7.1.1 | N/A | Nitrogen Interface Control | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.1.2 | N/A | Nitrogen Interface MDP | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.1.3 | N/A | Nitrogen Interface Temperature | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.1.4 | N/A | Nitrogen Leakage | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.1.5 | N/A | Nitrogen Physical Interface | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.2 | N/A | Argon Interface Requirements | NAR | - | - | - | - | |
| 3.7.2.1 | N/A | Argon Interface Control | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.2.2 | N/A | Argon Interface MDP | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.2.3 | N/A | Argon Interface Temperature | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.2.4 | N/A | Argon Leakage | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.2.5 | N/A | Argon Physical Interface | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.3 | N/A | Carbon Dioxide Interface Requirements | NAR | - | - | - | - | |
| 3.7.3.1 | N/A | Carbon Dioxide Interface Control | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.3.2 | N/A | Carbon Dioxide Interface MDP | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.3.3 | N/A | Carbon Dioxide Interface Temperature | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.3.4 | N/A | Carbon Dioxide Interface Leakage | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.3.5 | N/A | Carbon Dioxide Physical Interface | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.4 | N/A | Helium Interface Requirements | NAR | - | - | - | - | |
| 3.7.4.1 | N/A | Helium Interface Control | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.4.2 | N/A | Helium Interface MDP | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.4.3 | N/A | Helium Interface Temperature | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.4.4 | N/A | Helium Leakage | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.4.5 | N/A | Helium Physical Interface | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.5 | N/A | Pressurized Gas Systems | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.7.6 | N/A | Manual Valves | N/A | - | - | - | - | SAMS has no plans to use pressurized gases. |
| 3.8 | N/A | Payload Support Services Interfaces Requirements | NAR | - | - | - | - | |
| 3.8.1 | N/A | Potable Water | NAR | - | - | - | - | |
| 3.8.1.1 | N/A | Potable Water Interface Connection | N/A | - | - | - | - | SAMS does not plan to use any payload support services. |
| 3.8.1.2 | N/A | Potable Water Interface Pressure | N/A | - | - | - | - | SAMS does not plan to use any payload support services. |

KEY: **A – Applicable;** **F – Levied by facility;** **NAR – Not a requirement;** **N/A – Not applicable**

| SSP 57000 Req. # | Verification # | Title | Applicability | Hardware Applicability | | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | EE | SE | TSH-ES | Cables | |
| 3.8.1.3 (A,B) | N/A | Potable Water Use | N/A | - | - | - | - | SAMS does not plan to use any payload support services. |
| 3.8.2 | N/A | Fluid System Servicer | N/A | - | - | - | - | SAMS does not plan to use any payload support services. |
| 3.9 | N/A | Environment Interface Requirements | NAR | - | - | - | - | |
| 3.9.1 | N/A | Atmosphere Requirements | NAR | - | - | - | - | |
| 3.9.1.1 | VRD-xxx-252 | Pressure | A | X | X | X | - | SSP 57000. |
| 3.9.1.2 | VRD-xxx-209 | Temperature | A | X | X | X | X | SSP 57000. |
| 3.9.1.3 | VRD-xxx-209 | Humidity | A | X | X | X | X | SSP 57000. |
| 3.9.2 | N/A | Integrated Rack Use of Cabin Atmosphere | NAR | - | - | - | - | |
| 3.9.2.1 (A,B) | N/A | Active Air Exchange | N/A | - | - | - | - | SAMS does not plan to need active air exchange. |
| 3.9.2.2 | N/A | Oxygen Consumption | N/A | - | - | - | - | SAMS is planning to interface to a rack. |
| 3.9.2.3 | N/A | Chemical Releases | N/A | - | - | - | - | SAMS does not plan to release chemicals to the cabin air. |
| 3.9.3 | N/A | Radiation Requirements | NAR | - | - | - | - | |
| 3.9.3.1 | N/A | Integrated Rack Contained or Generated Ionizing Radiation | N/A | - | - | - | - | SAMS does not plan on containing or generating ionizing radiation. |
| 3.9.3.2 | N/A | Ionizing Radiation Dose | N/A | - | - | - | - | The shielding of any ISS module is adequate to absorb the ionizing radiation dose. |
| 3.9.3.3 | VRD-xxx-104 | Single Event Effect (SEE) Ionizing Radiation | A | X | X | X | - | SSP 57000. |
| 3.9.3.4 | N/A | Lab Window Rack Location Radiation Requirements | N/A | - | - | - | - | SAMS does not plan to remove the protective shield. |
| 3.9.3.4.1 | N/A | Window Rack Infrared Radiation Requirements | N/A | - | - | - | - | SAMS does not plan to remove the protective shield. |
| 3.9.3.4.2 | N/A | Window Rack Ultraviolet Radiation Requirements | N/A | - | - | - | - | SAMS does not plan to remove the protective shield. |
| 3.9.4 | VRD-xxx-253 | Additional Environmental Conditions | A | X | X | X | - | SSP 57000. SAMS will verify pressures from 13.0 psia – 15.0 psia and humidity from 20% to 80%. |
| 3.10 | N/A | Fire Protection Interface Requirements | NAR | - | - | - | - | |
| 3.10.1 | VRD-xxx-451 | Fire Prevention | A | X | X | X | - | NSTS 1700.7, Addendum, par. 220.10a. The cable is part of the system, alone this requirement is N/A for cables. |
| 3.10.2 | N/A | Payload Monitoring and Detection Requirements | NAR | - | - | - | - | |
| 3.10.2.1 | N/A | Smoke Detection | NAR | - | - | - | - | |
| 3.10.2.1.1 (A,B) | VRD-xxx-451 | Smoke Detector | F | X | X | X | - | SAMS does not plan to have a smoke detector. The integrator will be responsible for this requirement dependent on the PSRP review. |
| 3.10.2.1.2 | N/A | Forced Air Circulation Indication | N/A | - | - | - | - | SAMS does not plan on having forced air circulation. The integrator will be responsible for this requirement dependent on the PSRP review. |
| 3.10.2.1.3 (A,B) | N/A | Fire Detection Indicator | N/A | - | - | - | - | SAMS does not plan to have a fire detection indicator. The integrator will be responsible for this requirement dependent on the PSRP review. |
| 3.10.2.2 | N/A | Parameter Monitoring (TBR #10) | NAR | - | - | - | - | |

KEY: **A – Applicable;** **F – Levied by facility;** **NAR – Not a requirement;** **N/A – Not applicable**

| SSP 57000 Req. # | Verification # | Title | Applicability | Hardware Applicability | | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | EE | SE | TSH-ES | Cables | |
| 3.10.2.2.1 | VRD-xxx-451 | Parameter Monitoring Use | A | X | X | X | - | SSP 57000. This is dependent on the PSRP review. |
| 3.10.2.2.2 | N/A | Parameter Monitoring in Response | NAR | - | - | - | - | |
| 3.10.2.2.2.1 (A,B) | N/A | Parameter Monitoring in Subrack | N/A | - | - | - | - | SAMS is planning to interface to a rack. |
| 3.10.2.2.2.2 (A,B) | N/A | Parameter Monitoring in Integrated Rack | N/A | - | - | - | - | SAMS is planning to interface to a rack. |
| 3.10.3 | N/A | Fire Suppression | NAR | - | - | - | - | |
| 3.10.3.1 (A,B) | VRD-xxx-451 | Portable Fire Extinguisher | F | X | X | X | - | The requirement of access ports will be dependent on the PSRP review. |
| 3.10.3.2 | VRD-xxx-451 | Fire Suppression Access Port Accessibility | F | X | X | X | - | The requirement of access ports will be dependent on the PSRP review. |
| 3.10.3.3 | N/A | Fire Suppressant Distribution | N/A | - | - | - | - | SAMS is planning to interface to a rack. |
| 3.10.3.4 | N/A | Deleted | NAR | - | - | - | - | |
| 3.10.3.4.1 | N/A | Deleted | NAR | - | - | - | - | |
| 3.10.3.4.2 | N/A | Deleted | NAR | - | - | - | - | |
| 3.10.4 (A,B) | VRD-xxx-451 | Labeling | F | X | X | X | - | The requirement of labeling the access ports will be dependent on the PSRP review. |
| 3.11 | N/A | Materials and Parts Interface Requirements | NAR | - | - | - | - | |
| 3.11.1 | VRD-xxx-254 | Materials and Parts Use and Selection | A | X | X | X | X | NSTS 1700.7, ISS Addendum. |
| 3.11.1.1 | VRD-xxx-254 | Commercial Parts | A | X | X | X | X | NSTS 1700.7, ISS Addendum. |
| 3.11.2 (A-C) | N/A | Fluids | N/A | - | - | - | - | SAMS does not plan to have any fluids. |
| 3.11.3 | VRD-xxx-219 | Cleanliness | A | X | X | X | X | Visibly Clean – Sensitive as per SN-C-0005. |
| 3.11.4 | VRD-xxx-216 | Fungus Resistant Material | A | X | X | X | X | SSP 30233, par. 4.2.10. |
| 3.12 | N/A | Human Factors Interface Requirements | NAR | - | - | - | - | |
| 3.12.1 (A,B) | VRD-xxx-255 | Strength Requirements | A | X | X | X | X | SSP 57000. |
| 3.12.2 | N/A | Body Envelope and Reach Accessibility | NAR | - | - | - | - | |
| 3.12.2.1 | N/A | Adequate Clearance | N/A | - | - | - | - | Clearance is dependent on a mounting position for which the SAMS integrator will be responsible. |
| 3.12.2.2 (A,B) | VRD-xxx-256 | Accessibility | A | X | X | X | X | SSP 57000. SAMS is designed for accessibility. The integrator is responsible for the accessibility in a specific mounted location. |
| 3.12.2.3 | VRD-xxx-256 | Full Size Range Accommodation | A | X | X | X | X | SSP 57000. SAMS is designed for full size range accommodation. The integrator is responsible for the full size range accommodation in a specific mounted location. |
| 3.12.3 | N/A | Habitability | NAR | - | - | - | - | |
| 3.12.3.1 | N/A | Housekeeping | NAR | - | - | - | - | |
| 3.12.3.1.1 | VRD-xxx-tbd | Closures or Covers | A | X | X | - | - | SSP 57000. No covers needed for TSH-ES and cables. |
| 3.12.3.1.2 (A,B) | N/A | Built-in Control | N/A | - | - | - | - | A – SAMS does not have plans to contain any liquids or particulate matter. B – SAMS does not have plans to incorporate a capture element. |
| 3.12.3.1.2 (C) | N/A | Built-in Control | NAR | - | - | - | - | This requirement has been deleted. |
| 3.12.3.1.3 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.3.1.4 | N/A | Deleted | NAR | - | - | - | - | |

KEY: **A – Applicable;** **F – Levied by facility;** **NAR – Not a requirement;** **N/A – Not applicable**

| SSP 57000 Req. # | Verification # | Title | Applicability | Hardware Applicability | | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | EE | SE | TSH-ES | Cables | |
| 3.12.3.1.5 | N/A | One-handed Operation | N/A | - | - | - | - | SAMS has no plans for cleaning equipment. |
| 3.12.3.1.6 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.3.2 | N/A | Touch Temperature | NAR | - | - | - | - | |
| 3.12.3.2.1 | VRD-xxx-210 | Continuous/Incidental Contact-High Temperature | A | X | X | X | - | SSP 57000, NASA interpretation letter JSC, MA2-95-048. |
| 3.12.3.2.2 | N/A | Continuous/Incidental Contact-Low Temperature | N/A | - | - | - | - | SAMS has no plans for a refrigeration system. |
| 3.12.3.3 | N/A | Acoustic Requirements | N/A | - | - | - | - | SAMS has no plans for a noise source. |
| 3.12.3.3.1 (A-C) | N/A | Continuous Noise Limits | N/A | - | - | - | - | SAMS has no plans for a noise source. |
| 3.12.3.3.2 | N/A | Intermittent Noise Limits | N/A | - | - | - | - | SAMS has no plans for a noise source. |
| 3.12.3.4 (A) | N/A | Lighting Design | N/A | - | - | - | - | The EE is not in an exposed area. The SE and TSH-ES are small and can be located in various places. The traditional color of a SAMS sensor head is gold. |
| 3.12.3.4 (B-E) | N/A | Lighting Design | N/A | - | - | - | - | The SAMS integrator is responsible for lighting conditions. |
| 3.12.4 | N/A | Structural/Mechanical Interfaces | NAR | - | - | - | - | |
| 3.12.4.1 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.4.1.1 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.4.2 | N/A | Payload Hardware Mounting | NAR | - | - | - | - | |
| 3.12.4.2.1 | VRD-xxx-256 | Equipment Mounting | A | X | X | X | X | SSP 57000. |
| 3.12.4.2.2 | N/A | Drawers and Hinged Panels | N/A | - | - | - | - | SAMS does not plan to use drawers or hinged panels. |
| 3.12.4.2.3 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.4.2.4 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.4.2.5 | N/A | Alignment | N/A | - | - | - | - | SAMS does not plan to use blind mate connectors. |
| 3.12.4.2.5.1 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.4.2.6 | N/A | Slide-out Stops | N/A | - | - | - | - | SAMS does not plan to use slide or pivot mounted hardware. |
| 3.12.4.2.7 | N/A | Push-pull Force | N/A | - | - | - | - | SAMS does not plan to require a push-pull action. |
| 3.12.4.2.8 | N/A | Access | N/A | - | - | - | - | SAMS does not plan to be accessed on a daily/weekly basis. |
| 3.12.4.2.8.1 (A,B) | N/A | Covers | N/A | - | - | - | - | SAMS does not plan to need any covers. |
| 3.12.4.2.8.2 | N/A | Self-supporting Covers | N/A | - | - | - | - | SAMS does not plan to have covers. |
| 3.12.4.2.8.3 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.4.2.8.4 | N/A | Unique Tools | N/A | - | - | - | - | SAMS does not plan to use any unique tools. |
| 3.12.4.3 | N/A | Connectors | NAR | - | - | - | - | |
| 3.12.4.3.1 | VRD-xxx-161 | One-Handed Operation | A | X | X | X | - | SSP 57000. The SAMS integrator is responsible for the accessibility of the SAMS unit in its mounted location. |
| 3.12.4.3.2 (A,B) | VRD-xxx-161 | Accessibility | A | X | X | X | X | SSP 57000. The SAMS integrator is responsible for the accessibility of the SAMS unit in its mounted location. |

KEY: **A – Applicable;** **F – Levied by facility;** **NAR – Not a requirement;** **N/A – Not applicable**

| SSP 57000 Req. # | Verification # | Title | Applicability | Hardware Applicability | | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | EE | SE | TSH-ES | Cables | |
| 3.12.4.3.3 (A,B) | VRD-xxx-161 | Ease of Disconnect | A | X | X | X | X | SSP 57000. For cables connecting to the SAMS integrator, SAMS will not inspect the integrator provided connector. |
| 3.12.4.3.4 | N/A | Indication of Pressure/Flow | N/A | - | - | - | - | SAMS has no planned fluid or gas lines. |
| 3.12.4.3.5 | VRD-xxx-161 | Self Locking | A | X | X | X | X | SSP 57000. |
| 3.12.4.3.6 (A,B) | VRD-xxx-161 | Connector Arrangement | A | X | X | X | - | SSP 57000. The SAMS integrator is responsible for the arrangement of the SAMS designated connector(s) mounted on their hardware. |
| 3.12.4.3.7 | VRD-xxx-161 | Arc Containment | A | X | X | X | X | SSP 57000. |
| 3.12.4.3.8 | VRD-xxx-161 | Connector Protection | A | X | X | X | X | SSP 57000. |
| 3.12.4.3.9 | VRD-xxx-161 | Connector Shape | A | X | X | X | X | SSP 57000. |
| 3.12.4.3.10 | N/A | Fluid and Gas Line Connectors | N/A | - | - | - | - | SAMS has no planned fluid or gas lines. |
| 3.12.4.3.11 (A) | VRD-xxx-161 | Alignment Marks or Guide Pins | A | X | X | X | X | SSP 57000. |
| 3.12.4.3.11 (B) | N/A | Alignment Marks or Guide Pins | NAR | - | - | - | - | This requirement has been deleted. |
| 3.12.4.3.12 (A,B) | VRD-xxx-161 | Coding | A | X | X | X | X | SSP 57000. |
| 3.12.4.3.13 | VRD-xxx-161 | Pin Identification | A | X | X | X | X | SSP 57000. |
| 3.12.4.3.14 | VRD-xxx-161 | Orientation | A | X | X | X | X | SSP 57000. |
| 3.12.4.3.15 | N/A | Hose/Cable Restraints | N/A | - | - | - | - | The routing and restraining of SAMS cables is dependent on the mounting position of the SAMS unit for which the SAMS integrator will be responsible. |
| 3.12.4.4 | N/A | Fasteners | NAR | - | - | - | - | |
| 3.12.4.4.1 | N/A | Non-Threaded Fasteners Status Indication | N/A | - | - | - | - | SAMS has no plans for non-threaded fasteners. |
| 3.12.4.4.2 | VRD-xxx-257 | Mounting Bolt/Fastener Spacing | A | X | X | X | - | SSP 57000. |
| 3.12.4.4.3 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.4.4.4 (A) | VRD-xxx-257 | Multiple Fasteners | A | X | X | X | - | SSP 57000. This requirement applies to mounting fasteners only. |
| 3.12.4.4.4 (B) | N/A | Multiple Fasteners | NAR | - | - | - | - | This requirement has been deleted. |
| 3.12.4.4.5 | VRD-xxx-257 | Captive Fasteners | A | X | X | X | - | SSP 57000. |
| 3.12.4.4.6 (A, B) | N/A | Quick Release Fasteners | N/A | - | - | - | - | SAMS has no plans to use quick release fasteners. |
| 3.12.4.4.7 | VRD-xxx-257 | Threaded Fasteners | A | X | X | X | - | SSP 57000. |
| 3.12.4.4.8 (A-C) | N/A | Over Center Latches | N/A | - | - | - | - | SAMS has no plans to use latches. |
| 3.12.4.4.9 | N/A | Winghead Fasteners | N/A | - | - | - | - | SAMS has no plans to use winghead fasteners. |
| 3.12.4.4.10 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.4.4.11 (A-C) | VRD-xxx-257 | Fastener Head Type | A | X | X | X | - | SSP 57000. |
| 3.12.4.4.12 | VRD-xxx-257 | One-Handed Actuation | A | X | X | X | - | SSP 57000. |
| 3.12.4.4.13 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.4.4.14 | N/A | Access Holes | N/A | - | - | - | - | SAMS has no plans for covers or shields. All SAMS mounting fasteners are in plain sight. |
| 3.12.5 | N/A | Controls and Displays | NAR | - | - | - | - | |
| 3.12.5.1 | VRD-xxx-tbd | Controls Spacing Design Requirements | A | X | - | - | - | SSP 57000. Applies to SAMS hardware that contains switches. |

KEY: **A – Applicable;** **F – Levied by facility;** **NAR – Not a requirement;** **N/A – Not applicable**

| SSP 57000 Req. # | Verification # | Title | Applicability | Hardware Applicability | | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | EE | SE | TSH-ES | Cables | |
| 3.12.5.2 | VRD-xxx-tbd | Accidental Actuation | A | X | - | - | - | SSP 57000. Applies to SAMS hardware that contains switches. |
| 3.12.5.2.1 (A-G) | VRD-xxx-tbd | Protective Methods | A | X | - | - | - | SSP 57000. Applies to SAMS hardware that contains switches. |
| 3.12.5.2.2 | VRD-xxx-tbd | Noninterference | A | X | - | - | - | SSP 57000. Applies to SAMS hardware that contains switches. |
| 3.12.5.2.3 | N/A | Dead-Man Controls | N/A | - | - | - | - | SAMS is a benign payload and does not require dead-man controls. |
| 3.12.5.2.4 | VRD-xxx-tbd | Barrier Guards | A | X | - | - | - | SSP 57000. Applies to SAMS hardware that contains switches. |
| 3.12.5.2.5 | N/A | Recessed Switch Protection | N/A | - | - | - | - | SAMS has no plans for rotary switches. |
| 3.12.5.2.6 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.5.2.7 | N/A | Position Indication | N/A | - | - | - | - | SAMS has no plans for switch protective covers. |
| 3.12.5.2.8 | N/A | Hidden Controls | N/A | - | - | - | - | SAMS has no plans for hidden controls. |
| 3.12.5.2.9 | N/A | Hand Controllers | N/A | - | - | - | - | SAMS has no plans for hand controllers. |
| 3.12.5.3 (A-E) | N/A | Valve Controls | N/A | - | - | - | - | SAMS has no plans for valves. |
| 3.12.5.4 | VRD-xxx-tbd | Toggle Switches | A | X | - | - | - | SSP 57000. |
| 3.12.6 | N/A | Restraints and Mobility Aids | N/A | - | - | - | - | SAMS is planning to interface to a rack. |
| 3.12.6.1 (A-C) | N/A | Stowage Drawer Contents Restraints | N/A | - | - | - | - | SAMS does not have plans for a stowage drawer. |
| 3.12.6.2 (A,B) | N/A | Stowage and Equipment Drawers/Trays | N/A | - | - | - | - | SAMS does not have plans for stowage and equipment drawers/trays. |
| 3.12.6.3 | VRD-xxx-452 | Captive Parts | A | X | X | X | X | SSP 57000. |
| 3.12.6.4 | N/A | Handle and Grasp Area Design Requirements | NAR | - | - | - | - | |
| 3.12.6.4.1 | N/A | Handles and Restraints | N/A | - | - | - | - | All SAMS hardware, except the EE, is planning to be grasped with one hand. The integrator of the EE is responsible, if it chooses to move an EE during nominal operations. |
| 3.12.6.4.2 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.6.4.3 | N/A | Handle Location/Front Access | N/A | - | - | - | - | All SAMS hardware, except the EE, is planning to be grasped with one hand. The integrator of the EE is responsible, if it chooses to move an EE during nominal operations. |
| 3.12.6.4.4 | N/A | Handle Dimensions | N/A | - | - | - | - | All SAMS hardware, except the EE, is planning to be grasped with one hand. The integrator of the EE is responsible, if it chooses to move an EE during nominal operations. |
| 3.12.6.4.5 (A-C) | N/A | Non-Fixed Handles Design Requirements | N/A | - | - | - | - | SAMS has no plans for non-fixed handles. |
| 3.12.7 | VRD-xxx-453 | Identification Labeling | A | X | X | X | X | SSP 57000, Appendix C. |
| 3.12.7.1 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.7.2 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.7.3 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.7.4 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.7.5 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.7.6 | N/A | Deleted | NAR | - | - | - | - | |

KEY: **A – Applicable;** **F – Levied by facility;** **NAR – Not a requirement;** **N/A – Not applicable**

| SSP 57000 Req. # | Verification # | Title | Applicability | Hardware Applicability | | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | EE | SE | TSH-ES | Cables | |
| 3.12.8 | N/A | Color | N/A | - | - | - | - | SAMS color will be defined in the AIDD, SAMS-INT-001. |
| 3.12.9 | N/A | Crew Safety | NAR | - | - | - | - | |
| 3.12.9.1 (A-E) | VRD-xxx-162 | Electrical Hazards | A | X | X | X | - | SSP 57000. The cable is part of the system, alone this requirement is N/A for cables. |
| 3.12.9.1.1 | VRD-xxx-161 | Mismatched | A | X | X | X | X | SSP 57000. |
| 3.12.9.1.2 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.9.1.3 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.9.1.4 | N/A | Overload Protection | NAR | - | - | - | - | |
| 3.12.9.1.4.1 | VRD-xxx-tbd | Device Accessibility | A | X | - | - | - | SSP 57000. |
| 3.12.9.1.4.2 | N/A | Extractor-Type Fuse Holder | N/A | - | - | - | - | SAMS has no plans to replace fuses on orbit. |
| 3.12.9.1.4.3 | VRD-xxx-tbd | Overload Protection Location | A | X | - | - | - | SSP 57000. |
| 3.12.9.1.4.4 | VRD-xxx-tbd | Overload Protection Identification | A | X | - | - | - | SSP 57000. |
| 3.12.9.1.4.5 | VRD-xxx-tbd | Automatic Restart Protection | A | X | - | - | - | SSP 57000. |
| 3.12.9.1.5 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.9.1.5.1 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.9.2 | VRD-xxx-258 | Sharp Edges and Corners Protection | A | X | X | X | X | NSTS 1700.7, ISS Addendum, paragraph 222.1. |
| 3.12.9.3 | VRD-xxx-258 | Holes | A | X | X | X | - | SSP 57000. |
| 3.12.9.4 | N/A | Latches | N/A | - | - | - | - | SAMS has no plans for latches. |
| 3.12.9.5 | VRD-xxx-258 | Screws and Bolts | A | X | X | - | X | SSP 57000. |
| 3.12.9.6 | N/A | Securing Pins | N/A | - | - | - | - | SAMS has no plans for securing pins. |
| 3.12.9.7 | VRD-xxx-tbd | Levers, Cranks, Hooks, and Controls | A | X | - | - | - | SSP 57000. |
| 3.12.9.8 | VRD-xxx-258 | Burrs | A | X | X | X | X | SSP 57000. |
| 3.12.9.9 (A,B) | VRD-xxx-257 | Locking Wires | A | X | X | X | - | SSP 57000, SSP 52005 para. 5.6. |
| 3.12.9.10 (A, C,D) | N/A | Audio Devices (Displays) | N/A | - | - | - | - | SAMS has no plans for audio devices. |
| 3.12.9.10 (B) | N/A | Audio Devices (Displays) | NAR | - | - | - | - | This requirement has been deleted. |
| 3.12.9.11 | N/A | Deleted | NAR | - | - | - | - | |
| 3.12.9.12 | N/A | Egress | N/A | - | - | - | - | This is a responsibility of the SAMS integrator as per the ICAD. |
| 3.12.10 | VRD-xxx-454 | Payload In-Flight Maintenance | A | X | X | X | - | SSP 57000. |
| 3.12.11 | N/A | Deleted | NAR | - | - | - | - | |

KEY: **A – Applicable;** **F – Levied by facility;** **NAR – Not a requirement;** **N/A – Not applicable**