JEM Payload Accommodation Handbook

- Vol. 8 -

Small Satellite Deployment Interface Control Document

Initial Release: March 2013
Revision A: May 2013
Revision B: January 2015
Revision C: November 2018
Revision D: July 2020

Revision E: April 2023

Japan Aerospace Exploration Agency (JAXA)

CONCURRENCE

Human Spaceflight Technology Center

Director

酒井　純一

Rev. E: 2023/ 4/28

CCB Member

和田 勝

CCB Member

渡辺 英幸

CCB Member

山口 正光ピヨトル

CCB Member

吉岡 奈紗

CONCURRENCE

Human Space Safety and Mission Assurance Office
Director

小林 亮二

Rev. E: 2023/ 4/20

CONCURRENCE

JEM Utilization Center

Director

白川 正輝

Rev. E: 2023/4/27

Effective Page List

Page	Effective page
12	E-1
15	E-1
18	E-1
B-3	E-1
D1-5	E-1
D2-5	E-1
All pages except for above	E

REVISION HISTORY

Rev.	Date	Description	Remarks
NC	2013/03		Initial Release
A	2013/05	Changes of interface requirement based on technical demonstration results	
B	2015/01	Changes and addition of interface requirement associated with the results of the 2nd Deployment Mission and the Deployment mechanism corresponding to the 50 cm Class Satellite Deployment Mission	
C	2018/11	Changes and addition of interface requirement associated with the results until the J-SSOD#7 and addition of specifications of the Deployer for the 6U Wide Type CubeSat Deployment Mission	
D	2020/7	Addition of interface requirement for J-SSOD-R	
E	2023/5	Changes and addition for interface requirement associated with the result until the J-SSOD#20. Changes Appendix-D and addition Appendix-G and H.	

Contents

Appendices

1. Introduction

1.1. Overview

This document defines the technical interface requirements and safety requirements for a satellite to be released from the JEMRMS using the JEM Small Satellite Orbital Deployer (J-SSOD).

The satellite provider shall show compliance that the satellite meets the requirements defined in this document.

Deployment systems are classified two types as shown in Table1.1.

Table 1.1 Type of Deployment System

Type of deployment system	Overview
J-SSOD Type (J-SSOD: JEM Small Satellite Orbital Deployer)	Satellite can be loaded into the Satellite Deploy Case only on the ground.
J-SSOD-R Type (J-SSOD-R: JEM Small Satellite Orbital Deployer Resuppliable)	Satellite can be loaded into the Satellite Deploy Case by the Intra-Vehicular Activity (IVA) operation in the JEM pressurized module.

The interface requirements for the J-SSOD and a satellite are developed based on the reference document (1) CubeSat Design Specification rev.13 published on February 20, 2014 by the California Polytechnic State University with JEM unique requirements. (Refer to Appendix B “Correspondence to CubeSat Design Specification, Rev.13.” 1.5U The CubeSat applies only to J-SSOD-R; the 3U+CubeSat is not applicable.)

1.2. Scope

The requirements in this document of the interface between the J-SSOD and a satellite are applied to the satellite to be deployed from the JEMRMS.

The requirements defined in this document assume that the satellites will be unpowered from launch to deployment, so, if a satellite needs to be activated before deployment, a crew member will access the satellite to activate it; the additional requirements such as the EMC will be addressed, and the satellite shall meet these requirements.

1.3. Documents

1.3.1. Applicable Documents

The latest versions of the following documents form part of this document to the extent specified in this document. If there is a conflict between the documents referenced here and the contents of this specification, the contents of this specification shall be considered the superseding requirement.

(1)	JMR-006	Configuration Control Standard (Japanese Only)
(2)	CR-99117	JAXA Requirements for ISS Program Materials and Process Control (Japanese Only)
(3)	N/A	
(4)	N/A	
(5)	N/A	
(6)	ASTM-E595-84	Standard Test Method for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment
(7)	MIL-A-8625	Anodic Coatings for Aluminum and Aluminum Alloys
(8)	JMX-2012164	JSC Radio Frequency Spectrum Management HP, Application Guidelines (Japanese Only)
(9)	JSC-20793	Crewed Space Vehicle Battery Safety Requirements
(10)	ATV/HTV/KSC Form 100	Integrated Safety Checklist for ISS Cargo at Launch or Processing Sites
(11)	JMX-2012694	Structure Verification and Fracture Control Plan for JAXA Selected Small Satellite Released from J-SSOD
(12)	SSP51721	ISS Safety Requirements Document
(13)	SSP52005	Payload Flight Equipment Requirements and Guidelines for Safety-Critical Structures
(14)	N/A	
(15)	JSX-2003510	JAXA Safety Review Process (Japanese Only)
(16)	ISS PPD 1011 Rev. C	Multilateral International Space Station (ISS) and ISS Visiting Vehicle Jettison Policy
(17)	JSX-2012029	Toxic and Biological Management Standard (Japanese Only)

1.3.2. Reference Documents

The following documents are referenced to develop this document.

(1) NASDA-ESPC-1681A JEM Payload Safety & Product Assurance Requirements (Japanese Only)

(2) CubeSat Design Specification rev.13(issued by the California Polytechnic State University on 2014/02/20)

(3) SSP57003 Attached Payload Interface Requirements Document (57003-NA-0115A, Add Deployable Payload Requirements to SSP 57003 and SSP 57004)

(4) SSP50835 ISS Pressurized Volume Hardware Common Interface Requirements Document

(5) NASDA-ESPC-2857 HTV Cargo Standard Interface Requirements Document

(6) SSP57000 Pressurized Payload Interface Requirements Document

(7) IEEE C95.1-2005 IEEE Standard for Safety Levels with Respect to Human Expose to Radio Frequency Electromagnetic Fields (Sections 4.2.1, 4.2.3, and 4.3)

(8) SSP30243 Space Station Requirements for Electromagnetic Compatibility (Section 3.2.3)

(9) SSP30237 Space Station Electromagnetic Emission and Susceptibility Requirements" (Section 3.2.4.2.2)

(10) 6354-GD7100 Cygnus Pressurized Cargo Module to Internally Carried Payload Interface Definition Document (IDD)

(11) JHX-2017034A HTV-X/Pressurized Cargo Standard Interface Requirements Document

(12) SPX-00043761 Dragon 2 Pressurized Cargo Interface Requirements Document (IRD) E

(13) JMR-003 Space Debris Mitigation Standard (Japanese Only)

1.3.3. Reference Documents

Reference documents are shown below.

(1) JDX-2017078 Battery and EPS Safety Design and Verification Plan for Small Satellites Deployed from J-SSOD (Japanese Only)

(2) JSX-2009032 Safety Review Report Standard (Japanese Only)

(3) JDX-2017427 Safety Review Report Guideline for J-SSOD mission (Japanese Only)

(4) JDX-2019570 JEM Small Satellite Deploy Mission Verification Document Template

(5) CAA-111021 Residual Analysis Tool Manual for CubeSat (Japanese Only) E

2. Interface Requirements for 10 cm Class Satellite

Satellite Install Case described in the requirements, include Satellite Deploy Case and Satellite Launch Case. E

2.1. Mechanical Interfaces

2.1.1. Coordinate System

The definitions of the coordinate systems are as follows.

- J-SSOD Coordinate System: (Xs、Ys、Zs)
- Satellite Body Coordinate System: (X、Y、Z)
- Zs and Z axes are along the center line of the Satellite Install Case and the Satellite, respectively.
- Satellite Launch Case Coordinate System: (X_L, Y_L, Z_L)

(1) When a satellite is in the Satellite Install Case of the J-SSOD, all axes for both coordinate systems are aligned.

(2) +Z (+Zs) is in the direction of deployment. -Z (-Zs) is in the direction of installation into the case. +Y (+Ys) is toward the basepoint of the case.

(3) The coordinate system of the satellite launch case is defined in Figure 2.1.1-2.

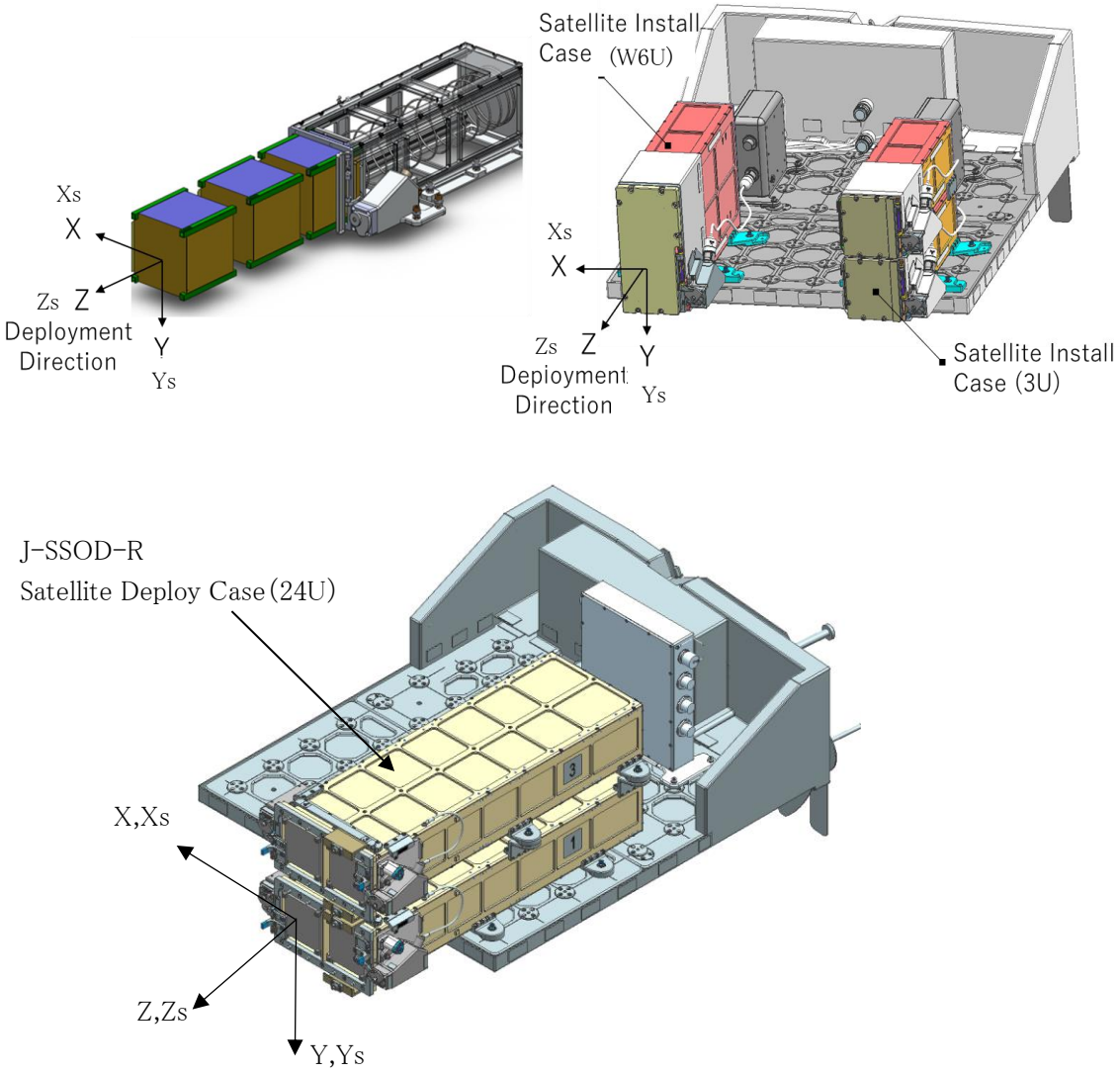


Figure 2.1.1-1 Coordinate System Definitions

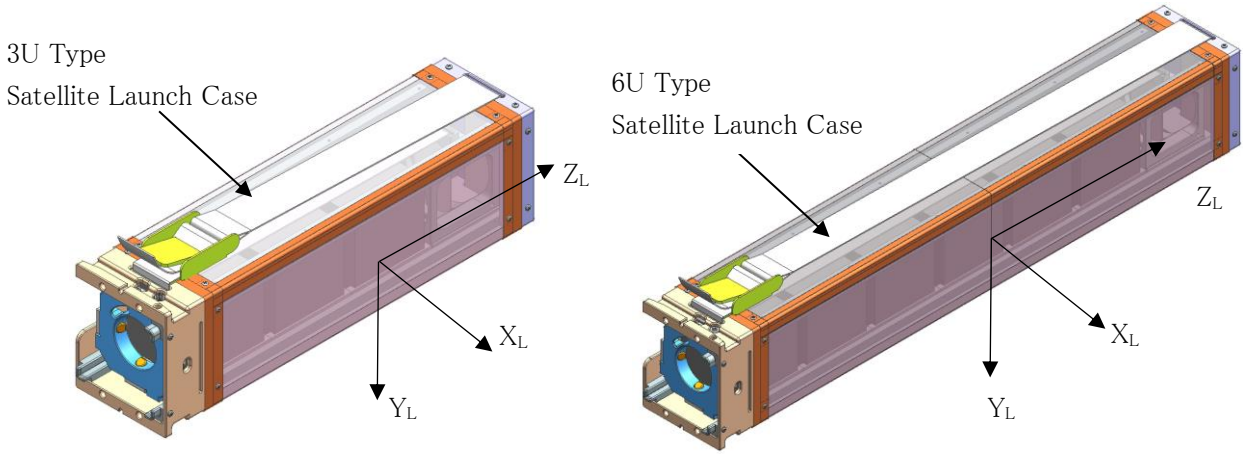


Figure 2.1.1-2 Coordinate System Definitions of J-SSOD-R Launch Case

2.1.2. Dimensional Requirements

(1) The types of satellites that can be accommodated in the J-SSOD are listed in Table 2.1.2-1, and the dimensional requirements are shown in Figure 2.1.2-1.
(2) A 1U to 6U type satellite shall be 100+/-0.1 mm wide in X and Y per Figure 2.1.2-1.
(3) A 1U type satellite shall be 113.5+/-0.1 mm tall in Z per Figure 2.1.2-1.
(4) A 1.5U type satellite shall be 170.2+/-0.1 mm tall in Z per Figure 2.1.2-1.
(5) A 2U type satellite shall be 227.0+/-0.2 mm tall in Z per Figure 2.1.2-1. E
(6) A 3U type satellite shall be 340.5+/-0.3 mm tall in Z per Figure 2.1.2-1.
(7) A 4U type satellite shall be 454.0+/-0.4 mm tall in Z per Figure 2.1.2-1.
(8) A 5U type satellite shall be 567.5+/-0.5 mm tall in Z per Figure 2.1.2-1.
(9) A 6U type satellite shall be 681.0+/-0.6 mm tall in Z per Figure 2.1.2-1.
(10) A W6U type satellite shall be 100+/-0.1 mm long (X direction), 226.3+/-0.1 mm wide (Y direction), and 340.5+/-0.3 mm or 366.0 mm+/-0.3 mm tall (Z direction) per Figure 2.1.2-1.

Table 2.1.2-1 Satellite Types

		Exterior Dimensions (*1)	Rail Dimension	Remarks	Reference Figure
10cm class satellite	1U	X: 100 × Y:100 × Z:113.5 mm	8.5 mm squres or more	For both J-SSOD and J-SSOD-R	Figure 2.1.2-1
	1.5U	X: 100 × Y:100 × Z:170.2 mm		For J-SSOD-R only	
	2U	X: 100 × Y: 100 × Z:227.0 mm		For both J-SSOD and J-SSOD-R	
	3U	X: 100 × Y: 100 × Z:340.5 mm		For both J-SSOD and J-SSOD-R	
	4U	X: 100 × Y: 100 × Z:454.0 mm		For J-SSOD-R only	
	5U	X: 100 × Y: 100 × Z:567.5 mm		For J-SSOD-R only	
	6U	X: 100 × Y: 100 × Z:681 mm		For J-SSOD-R only	
	W6U	X: 100 × Y: 226.3× Z: 340.5 mm or X: 100 × Y: 226.3× Z: 366.0 mm		For J-SSOD only	

(*1)Nominal dimensions including rails

2.1.3. Rails

(1) A satellite shall have four rails on each corner along the Z axis to slide along the rail guides in the Satellite Install Case of the J-SSOD during ejection into orbit.

(2) The dimensional requirements and geometric tolerances are given in Section 2.1.2 and Figure 2.1.2-1.

Requirements ① to ⑤ shown in Figure 2.1.2-1 are as follows.

① The end surface of the four rails of the +Z plane are within two parallel planes with a spacing of 0.2 mm or less while satisfying the dimensional tolerances of Ha, and this plane is defined as the datum Z plane. E

② The +Y surfaces of the two rails are two planes that are perpendicular to each other and within 0.2 mm of the datum Z plane defined in ① while satisfying the dimensional tolerance of 100±0.1 or 226.3±0.1 mm. This surface is defined as the datum Y plane.

③ The +X surfaces of the two rails are in two parallel planes that are perpendicular to both the datum Z and datum Y planes and within 0.2 mm of each other, while meeting the dimensional tolerance of 100 ± 0.1 mm.

④ The -X surfaces of the two rails are in two parallel planes that are perpendicular to both the datum Z and datum Y planes and within 0.2 mm spacing, while meeting dimensional tolerances of 100 ± 0.1 mm.

⑤ The -Y surfaces of the two rails are in two parallel planes that are perpendicular to the datum Z plane and spaced within 0.2 mm, while meeting the dimensional tolerance of 100 ± 0.1 or 226.3 ± 0.1 mm. Included, and within two parallel planes that are geometrically parallel to the datum Y plane and have a spacing of 0.2 mm or less.

(3) The rails shall have a minimum width of 8.5 mm.

(4) The rails shall not have a surface roughness greater than Ra1.6 μm.

(5) Chamfering shall be performed so that there are no burrs as shown in Fig. 2.1.2-1 for the rail edge (+/- Z end surface and edges of divided rails). (As for sharp edges on surfaces of a satellite that the crew may access, refer to Section 4.2.2(1).) E

(6) The edges of the rails on the +Z face shall have a minimum surface area of 6.5 mm × 6.5 mm for contacting the adjacent satellite.

(7) At least 75% of the rail surfaces except for +/-Z surfaces shall be in contact with the rail guides of the Satellite Install Case of the J-SSOD; 25% of the rails can be recessed.

For the 1U type satellite, at least 85.1 mm of the rail contacts the rail guide.
For the 1.5U type satellite, at least 127.7 mm of the rail contacts the rail guide.
For the 2U type satellite, at least 170.3 mm of the rail contacts the rail guide.
For the 3U type satellite, at least 255.4 mm of the rail contacts the rail guide.
For the 4U type satellite, at least 340.5 mm of the rail contacts the rail guide.
For the 5U type satellite, at least 425.6 mm of the rail contacts the rail guide.
For the 6U type satellite, at least 510.8 mm of the rail contacts the rail guide.
For the W6U (Z: 340.5 mm) type, at least 255.4 mm of the rail contacts the rail guide.
For the W6U (Z: 366.0 mm) type, at least 274.5 mm of the rail contacts the rail guide.

(8) N/A E

(9) The rail surfaces that contact the rail guides of the J-SSOD Satellite Install Case and the rail standoffs that contact adjacent satellites shall be hard anodized aluminum after machining.

2.1.4. Envelope Requirements

(1) The dynamic envelope of a satellite shall meet specifications as shown in Figure 2.1.4-1.

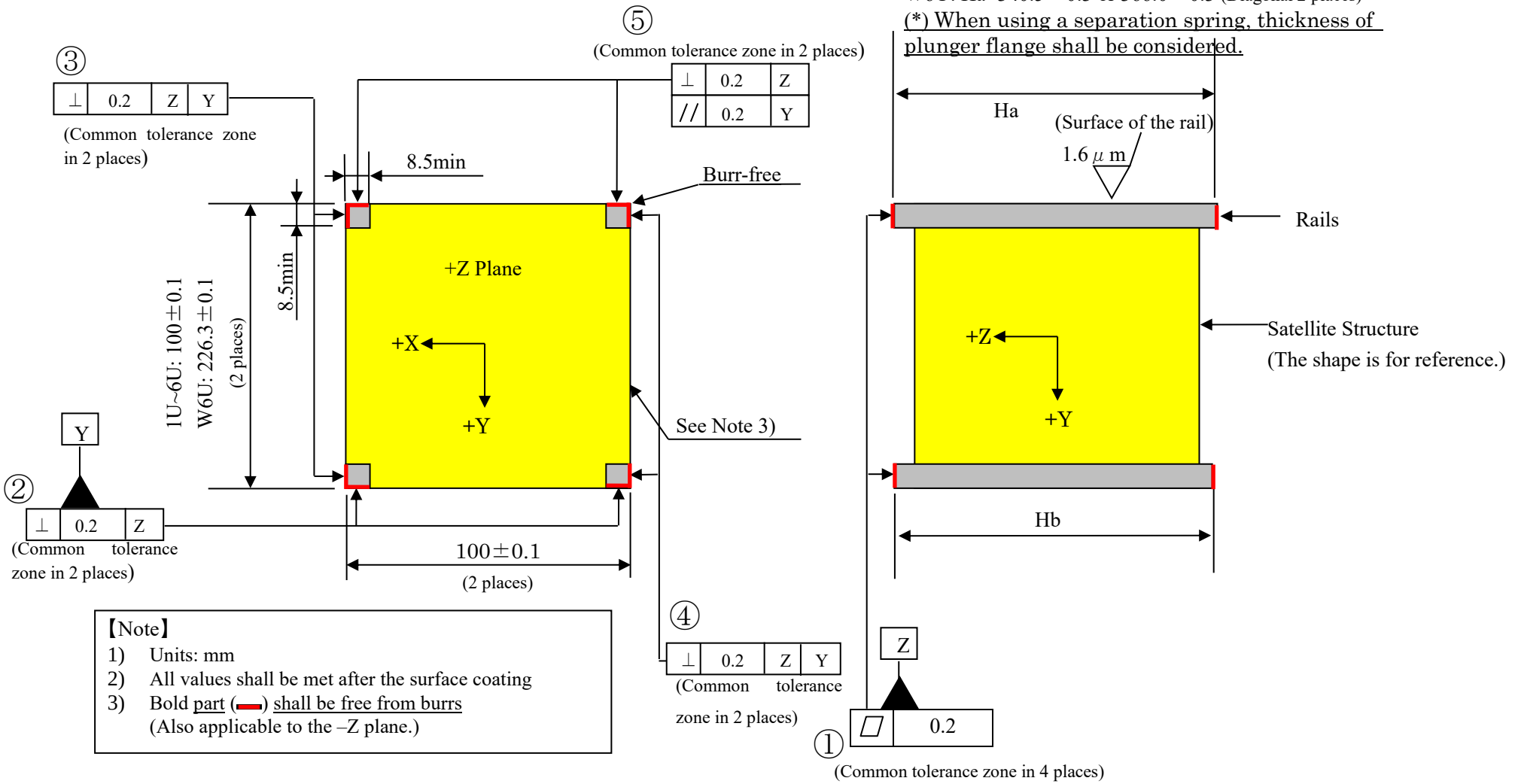
(2) All components of the +Z plane shall be recessed 0.5 mm or more from the edges of the rails.

(3) All components of the -Z plane shall be recessed from the edges of the rails.

(4) Any components of the +/-X and +/-Y planes shall not exceed 6.5 mm to the side of the rails. For W6U satellites, any components of the +/- Y planes shall not exceed 12.5mm from the side of the rails. E

(5) All deployable components shall be constrained by the satellite itself. The J-SSOD rail guides and walls shall not be used to constrain deployable components.

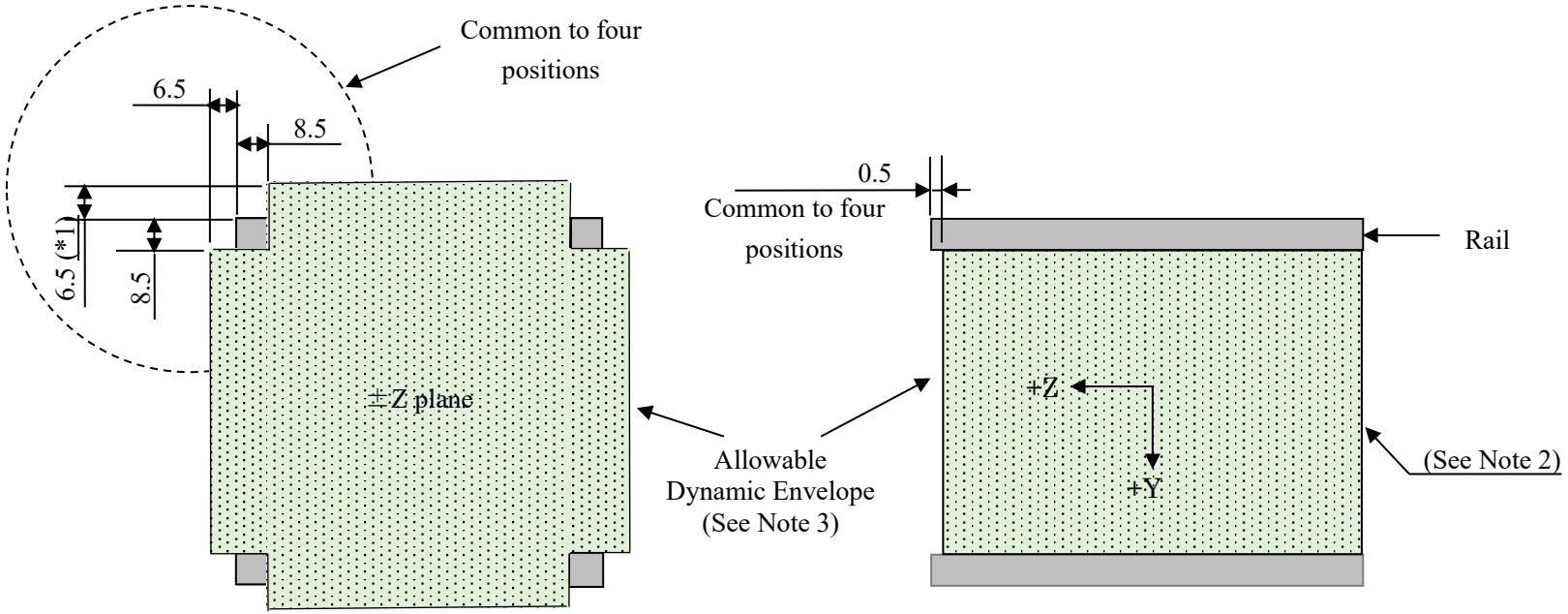
1U: Ha=113.5±0.1 (*)
1.5U:Ha=170.2±0.1 (*)、2U:Ha=227±0.2 (*)
3U: Ha=340.5±0.3 (*)、4U:Ha=454.0±0.4 (*)
5U:Ha=567.5±0.5 (*)、6U:Ha=681.0±0.6 (*)
W6U: Ha=340.5±0.3 or 366.0±0.3 (Diagonal 2 places)
(*) When using a separation spring, thickness of plunger flange shall be considered.



【Note】
1) Units: mm
2) All values shall be met after the surface coating
3) Bold part (▬) shall be free from burrs
(Also applicable to the –Z plane.)

Figure 2.1.2-1 Dimensional Requirements for Satellites

E



(*1) For W6U satellite, any components of the +/- Y planes shall not exceed 12.5mm from the side of the rails.

【Note】
1) Unit: mm
2) All components shall be recessed from the edge of the -Z standoffs.
3) All external components shall be within the dynamic envelope.

Figure 2.1.4-1 Allowable Dynamic Envelope

2.1.5. Mass Properties

(1) The satellite mass shall be between 0.13 kg and 1.33 kg per 1U.
For W6U size satellites, the mass shall be the following[1]

・W6U (X:100×Y:226.3×Z:340.5 mm) shall weigh 10.2 kg or less. E
・W6U (X:100×Y:226.3×Z:366.0 mm) shall weigh 10.8 kg or less.

(2) The ballistic number (BN) of a satellite in the configuration of the satellite in the J-SSOD Satellite Install Case (i.e., where all deployables are stowed) shall be no greater than 115 kg/m^2. BN shall be calculated by the following formula.

BN = M/(Cd・A) [kg/m^2]
M: The mass of a satellite [kg]
Cd: Coefficient of Drag (=2) [ND]
A: Average of all orthogonal frontal areas [m^2]
(It shall be the average value of the XY, YZ, and ZX faces of the satellite)

(3) N/A

[1] Since the mass of individual satellites is substantially constrained by the ballistic coefficient, a satellite mass needs to have a ballistic coefficient of 115 kg/m^2 or less. E

2.1.6. Separation Spring

For 1U to 5U satellites, as specified in 2.2.1 (10), the satellite must have spring force at the rail edges in the -Z direction to prevent a collision with the adjacent satellite in the -Z direction during satellite deployment . If sufficient spring force is not provided with deployment switches, the satellite can use separation springs. Check Attachment G if using separation springs provided by JAXA. E-1

2.1.7. Access Window

(1) After storing the satellite in the Satellite Install Case or Satellite Launch Case, do not schedule operations that require access to the satellite.

2.1.8. Structural Strength

(1) A satellite shall have a sufficient structural strength with a necessary margin of safety through the ground operation, testing, ground handling, launch, and on-orbit operations. The launch environment is defined in Section 2.4.1.

(2) Each rail shall have sufficient structural strength to withstand a compression force of 46.6 N from preloading from the backplate and the main spring of J-SSOD.

2.1.9. Stiffness

The minimum fundamental frequency of a satellite shall be no less than 30 [Hz] if the four rails +/-Z standoffs are rigidly fixed. If the minimum fundamental frequency of the satellite is less than 30 [Hz], coordination with JAXA is needed since a random vibration applied to the satellite may exceed the allowable environment defined in Section 2.4.1(1) (b). E

2.2. Electrical Interface

2.2.1. Deployment Switch

(1) A satellite shall employ fault-tolerant design according to Section 1.3.1 (12) SSP51721, because a safety feature prevents the activation of the satellite while it is stored in the Satellite Install Case or Satellite Launch Case from launch to satellite deployment by J-SSOD.

E

(2) A satellite can have deployment switches located on the rail end surface (-Z plane) and/or the rail side surface in order to prevent the operation of the satellite when it is stored in the Satellite Install Case. When installed on the end surface of the rail (-Z plane), the tip of the switch (the point of contact with the rail) should be within the shaded area shown in Figure 2.2.1-1.

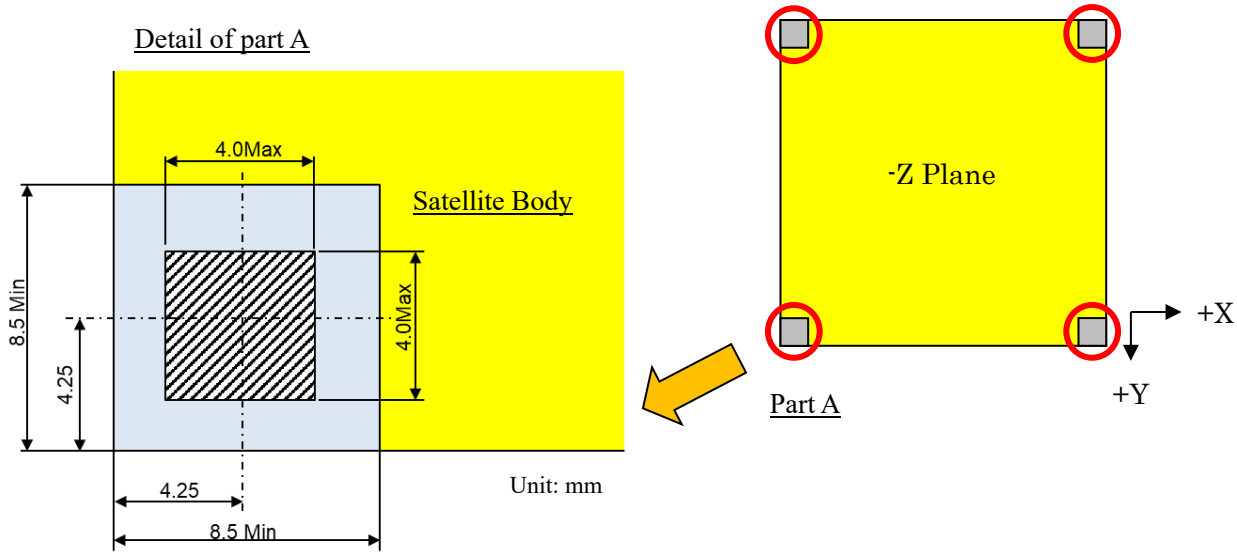


Figure 2.2.1-1 Deployment switch position on the end surface of the rail

(3) Figure 2.2.1-2 shows the configuration when the deployment switches are located on the side of the rail. Since there is no rail on the deploy side of the satellite deploy case, no switch shall be located on the side within +20 mm of the +Z surface. (Some deployment switches shall not be located near the rail sides [X and Y planes] because the Satellite Launch Case of the J-SSOD-R type has rails to avoid the lock door of the satellite deploy case.)[2]
For W6U satellite, the switch shall be installed in the position shown in Figure 2.2.1-3. Since there is no rail on the deploy side of the satellite deploy case, no switch shall be located on the side within 20 mm from the +Z surface.

[2] When the satellite is transferred from the Satellite Launch Case to the satellite deploy case in the JEM pressurized module, the hazard control by the deployment switches located on the side rail is released due to the gap of part of the rail. For this reason, no deployment switch shall be installed on the red-shaded areas (X and Y planes). If there are no restrictions on any coordinate axis of the satellite when the satellite is transferred to the deploy case, it may be possible to locate deployment switches on the side of the three rails. Consult with JAXA if installation of deployment switches is required.

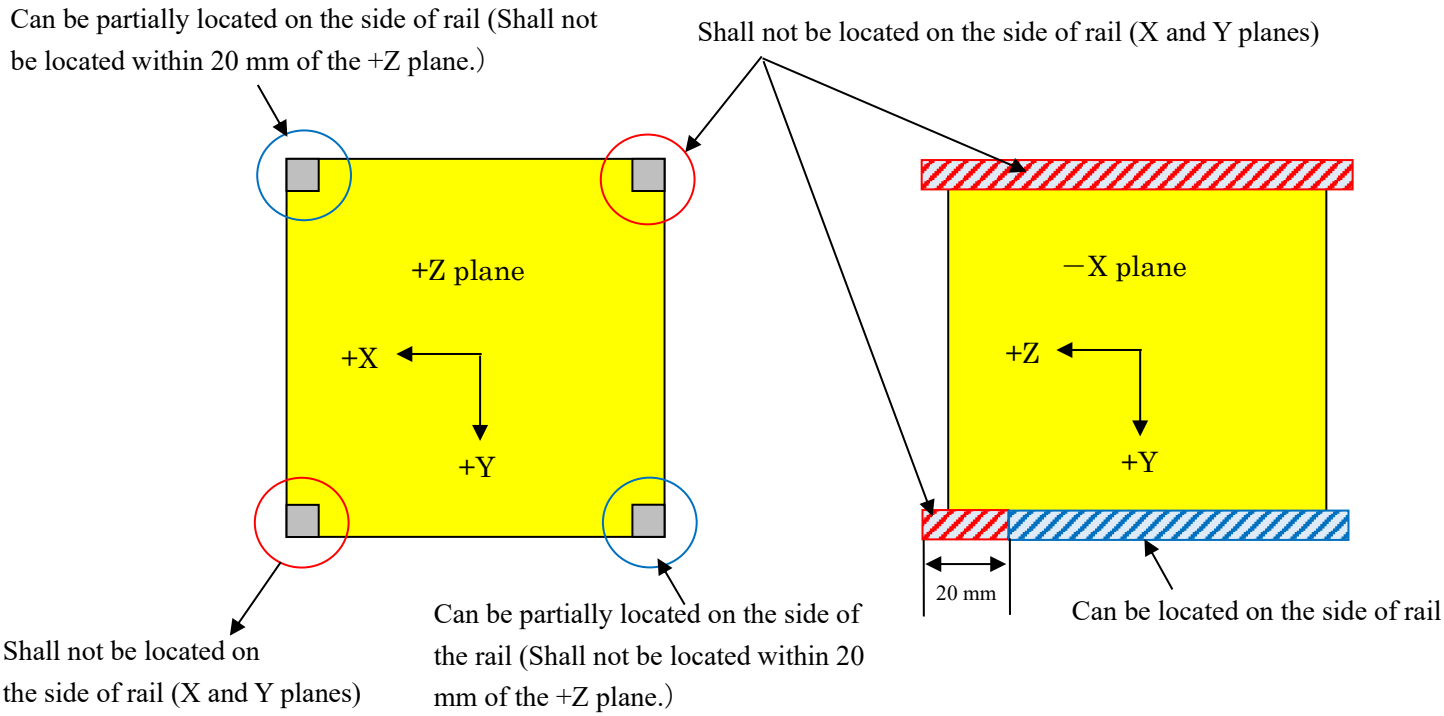


Figure 2.2.1-2 Deployment Switches on the Side of a Rail (except W6U size satellite)

E

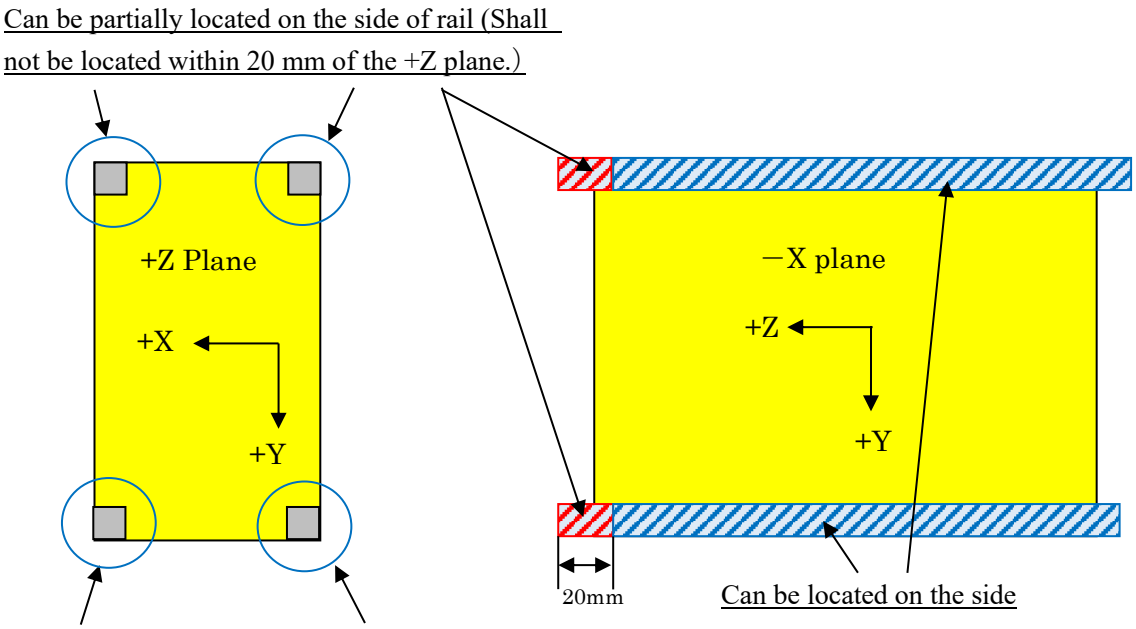


Figure2.2.1-3 Deployment Switches on the Side of a Rail (W6U size satellite)

(4) The tip of a deployment switch on the side of the rail shall be R2.4 or more.
For W6U satellite, shall be R1 or more.

(5) The sum of the reaction force of deployment switches on the side of the rail shall be 0.26 [N] in total or less per 1U. For W6U satellite, it shall be 1.4 [N] in total or less. E-1

(6) N/A

(7) When one of the deployment switches remains depressed, its satellite shall not be activated. Regarding a switch on the end of the rail, the satellite shall be inactive until it protrudes at least 0.75 mm from the end of the rail on the -Z plane, as shown in Figure 2.2.1-4.

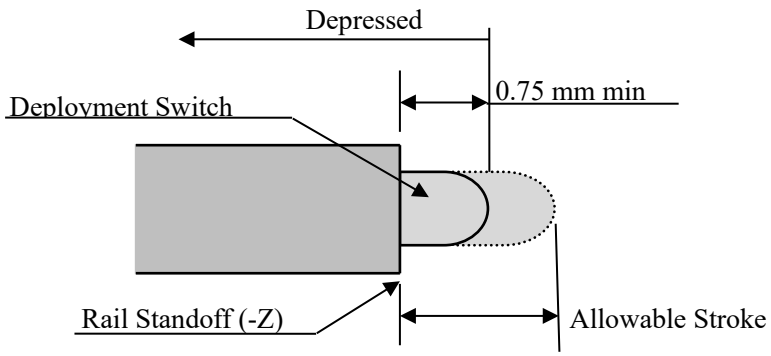
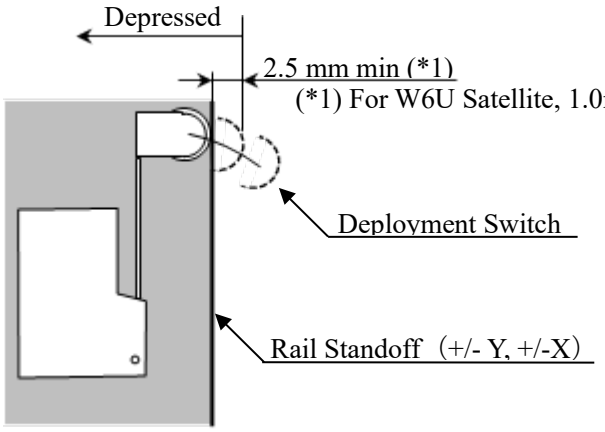


Figure 2.2.1-4 Maximum Allowable Stroke of Deployment Switches on the end of the rail

(8) Regarding a switch on the side of the rail, the satellite shall be inactive until it protrudes at least 2.5 mm from the side of the rail on the +/- Y plane and +/- X plane, as shown in Figure 2.2.1-5. E-1



E-1

Figure 2.2.1-5 Maximum Allowable Stroke of Deployment Switches on the side of the rail

E-1

(9) There is no restriction on the maximum stroke of switches located at the end of the rail on the -Z side, except the following. (Refer to Figure 2.2.1-1.)

(a) The deployment switch can be located the end of the rail on the -Z side while the satellite is moved into the Satellite Launch Case or satellite deploy case.
(b) Structural deformation or destruction shall not occur from launch to satellite deployment.
(c) Do not interact with other satellites installed in the -Z direction on deployment.

(10) The total spring force of switches installed in the -Z plane of the satellite shall be 1.08 to 5.3 [N]. For W6U satellite, shall be 6 [N] or less. E

2.2.2. Ground Handling Pin E

The following pins are defined for satellite handling on the ground.
RBF (Remove Before Flight) pin: A pin that is removed from the satellite before it is stored into the Satellite Install Case.
Flight pin: A pin that is attached to the satellite before it is stored into the Satellite Install Case.

(1) Do not use a Ground Handling Pin that changes the state of the power supply circuit depending on the stored condition as the hazard control specified in Section 4.1. However, the Ground Handling Pin may be used for ground handling.
(2) After installing the Flight Pin in the satellite on the ground, the Flight Pin shall not be unintentionally come off from the satellite

2.2.3. N/A

2.2.4. RF

Refer to 4.2.2.2(2).

2.2.5. N/A

2.3. Operational Requirements

(1) A satellite provider shall assume that the maximum stowage may be as long as a year until the deployment after installation in the J-SSOD Satellite Install Case on the ground.

(2) A satellite provider will not plan any activation, checkout, or maintenance after installation in the J-SSOD Satellite Install Case on the ground.

(3) A satellite shall be able to survive in a cold launch environment. The satellite shall remain deactivated from installation in the J-SSOD Satellite Install Case on the ground to deployment.

(4) All deployables such as booms, antennas, and solar panels shall wait to be deployed for 30 minutes or more after the deployment switches are activated the satellite is deployed from the J-SSOD. Pressing any of the deployment switches again resets the timer.

(5) RF transmissions shall be held for 30 minutes or more after the deployment switches are activated at ejection of the satellite from the J-SSOD. Pressing any of the deployment switches resets the timer.

(6) The order of satellite installation into the J-SSOD Satellite Install Case and a satellite deployment window will not be constrained by a satellite design. If such consideration is required for the mission success, additional coordination with JAXA is required.

2.4. Environmental Requirements

A satellite shall be designed, analyzed, and/or tested under the following environmental conditions based on the reference documents (4) - (6), (11) for a JAXA-selected satellite, the launch vehicle will be determined by JAXA.

2.4.1. Random Vibration and Acceleration

(1) Launch

(a) The maximum design load resulting from a combination of random vibration acceleration and quasistatic acceleration is 9.0 [g] in any direction.
The analysis shall confirm that the margin of safety is positive.
A factor of safety shall be 1.5 for yield and 2.0 for ultimate load. E-1

(b) Random Vibration: When performing a vibration test on the launch environment as part of the verification of the safety design shown in Section 4.2.2, the vibration environment shown in Table 2.4.1-1 shall be applied to each axis in a hard-mounted configuration. In addition, when the vibration test is performed, the design for a unique hazard shown in Section 4.2.2.2 shall be confirmed.
(Ref.) The vibration environment shown in Table 2.4.1-1 is what the outer surface of a CTB with satellites packed inside is exposed to. E-1

Table 2.4.1-1 Random Vibration of Each Launch Vehicle

HTV-X		Dragon2		Cygnus	
Freq. (Hz)	PSD (g^2/Hz)	Freq. (Hz)	PSD (g^2/Hz)	Freq. (Hz)	PSD (g^2/Hz)
20	0.005	20	0.025	20	0.004
50	0.02	30	0.025	30	0.004
120	0.031	40	0.015	70	0.015
230	0.031	80	0.015	150	0.015
1000	0.0045	100	0.009	2000	0.0006
2000	0.0013	300	0.009		
		800	0.0055		
		1200	0.0055		
		2000	0.0025		
Overall (grms)	4.05	Overall (grms)	3.41	Overall (grms)	2.44
Duration (sec)	60	Duration (sec)	60	Duration (sec)	60

E

2.4.2. On-orbit Acceleration

(a) The maximum value of the On-orbit Acceleration is 0.2 [g]. (Direction is arbitrary)

2.4.3. Pressure Environment

(a) At launch, the maximum pressure inside the vehicle is 104.8 [kPa].

E-1

(b) Depressurization Rates

At launch, the pressure change rate inside the vehicle is 0.878 [kPa/sec](7.64[psi/min]). E

Structural analysis is needed to determine the differential pressure between the inside and the outside of a satellite by the depressurization during launch and inside the ISS and the JEM Airlock, only if the satellite's internal volume (V [m^3]) and the area of exhaust ports (A [m^2]) do not meet the following condition. (Refer to JSC Form 1230, Section 3 c.)

$V/A \leqq 50.8$ [m] (2000 [inch])

2.4.4. Thermal Environment

- Inside the ISS: +16.7 ~ +29.4 [° C]
- Outside the ISS : -15 ~+60 [°C] (When the satellite is in the J-SSOD)

2.4.5. Humidity Environment

- In the ISS: Dew point: +4.4 ~ +15.6 [°C] Relative Humidity: 25 ~ 75 [%]

2.5. Out-gassing

To prevent contamination of the ISS, the satellite developer shall provide for JAXA the information of non-metallic materials which exposure area exceeds 0.1 m^2. E

3. Interface Requirements for 50cm Class Satellite

3.1. Mechanical Interfaces

3.1.1. Coordinate System

The definitions of the coordinate systems are as follows.

- J-SSOD Coordinate System:(Xs, Ys, Zs)
  The origin of the J-SSOD coordinate system is the same as the one of the Satellite Body Coordinate System when the satellite is in the J-SSOD.
- Satellite Body Coordinate System:(X, Y, Z)
  The origin of the Satellite Body coordinate system is shown in Figure 3.1.5-1.

(1) When a satellite is in the Satellite Install Case of the J-SSOD, all axes for both coordinate systems are aligned.

(2) +Z (+Zs) is in the direction of the deployment. -Z (-Zs) in the direction of insertion into the case. +Y (+Ys) towards the basepoint of the case.

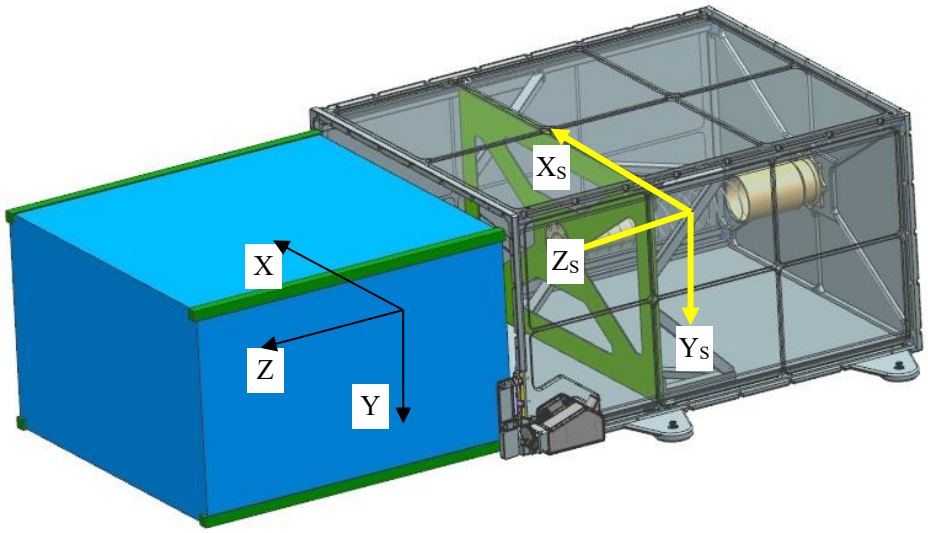


Figure 3.1.1-1 Definition of the Coordinate Systems

3.1.2. Dimensional Requirements

(1) The type of 50cm class satellite that can be accommodated in the J-SSOD is listed in Table 3.1.2-1 and the dimensional requirements are given in Figure 5.1.2-1.

(2) A 50cm class satellite shall be 350+/-0.5 mm wide in Y per Figure 3.1.2-1.

(3) A 50cm class satellite shall be 550+/-0.5 mm wide in X per Figure 3.1.2-1.

(4) A 50cm class satellite shall be 550+/-0.25 mm tall in Z per Figure 3.1.2-1.

Table 3.1.2-1 Satellite Dimensions

	Exterior Dimensions (*1)	Rail Dimension	Reference Figure
50cm class satellite	X:550 × Y:350 × Z:550 mm	17mm or more squares	Figure 5.1.2-1

(*1)Nominal dimension including rails

3.1.3. Rails

(1) A 50cm class satellite shall have four rails on each corner along the Z axis to slide along the rail guides in the Satellite Install Case of the J-SSOD during ejection into orbit.

(2) The dimensional requirements are defined in Section 3.1.2 and Figure 3.1.2-1.

(3) The rails shall have a minimum width of 17 mm.

(4) The rails shall not have a surface roughness greater than Ra1.6 μm.

(5) Chamfering shall be performed so that there are no burrs for the edges of the rails (+/-Z standoffs). (Refer to Section 4.2.2(1) for information about sharp edges in a satellite that crewmembers may come into contact with.) E

(6) (N/A)

(7) At least 75% of the rail surfaces except for +/-Z surfaces shall be in contact with the rail guides (rail length: 550 mm) of the Satellite Install Case of the J-SSOD. 25% of the rails can be recessed. This means that at least 412.5 mm of rail contacts the rail guide.

(8) The rail surfaces that contact the rail guides of the J-SSOD Satellite Install Case and the rail standoffs that contact the J-SSOD Back Plate shall be hard anodized after machining. The thickness of the hard anodized coating shall be 10 μm or more.

3.1.4. Envelope Requirements

(1) The dynamic envelope of a satellite shall meet requirements shown in Figure 3.1.4-1.

(2) All components in +/-Z shall be recessed 0.5 mm or more from the edges of the rails.

(3) All components in +/-X and +/-Y shall not exceed 6.5 mm normal to the side surface of the rails.

(4) A 50cm satellite shall not contact the inside wall of the Satellite Install Case of the J-SSOD except the rail surface.

(5) Any deployable components shall be constrained by the satellite itself. The J-SSOD rail guides and walls shall not be used to constrain these deployable components.

E

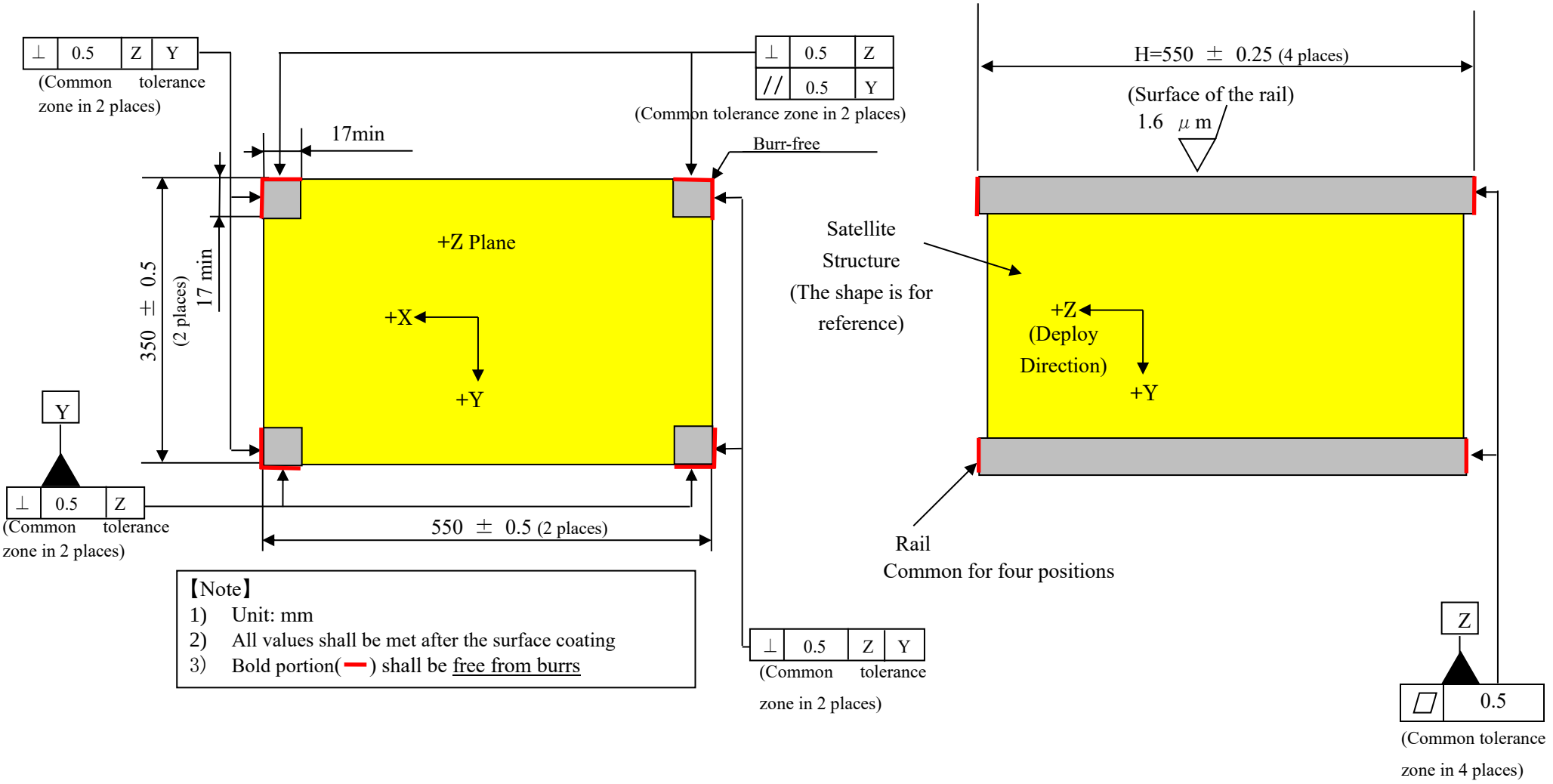
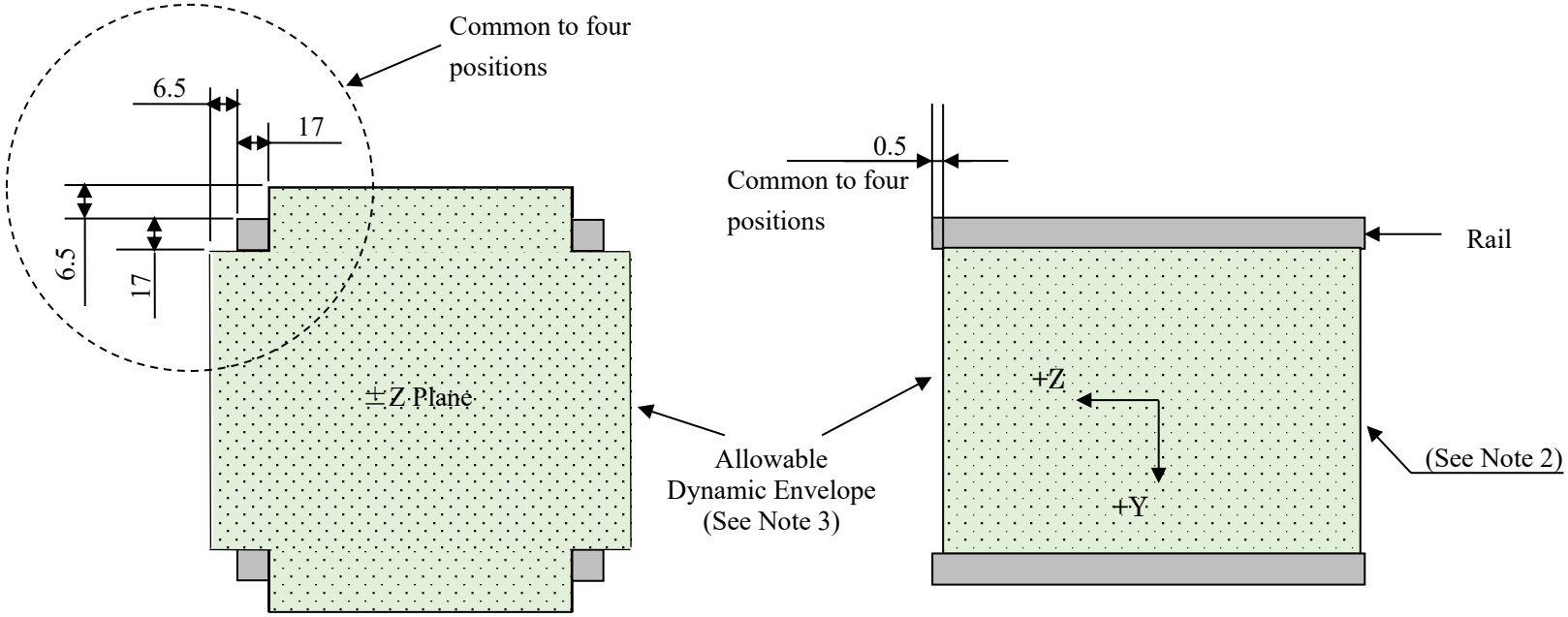


Figure 3.1.2-1 Dimensional Requirements for 50cm Class Satellite



【Note】
1) Unit: mm
2) All components shall be recessed from the edge of the -Z rail ends.
3) All external components shall be within the dynamic envelope.

Figure 3.1.4-1 Dimensional Requirements for 50cm Class Satellite

E

3.1.5. Mass Properties

(1) The mass of 50 cm class satellite shall be 47 kg or less[5].

(2) The ballistic number (BN) of a satellite in the configuration of the satellite in the J-SSOD Satellite Install Case (i.e., all deployables are stowed) shall be no greater than 105 kg/m^2. BN shall be calculated by the following formula.

BN = M/(Cd・A) [kg/m^2]

M: The mass of a satellite [kg]

Cd: Coefficient of Drag (=2) [ND]

A: Average of all orthogonal frontal areas [m^2]

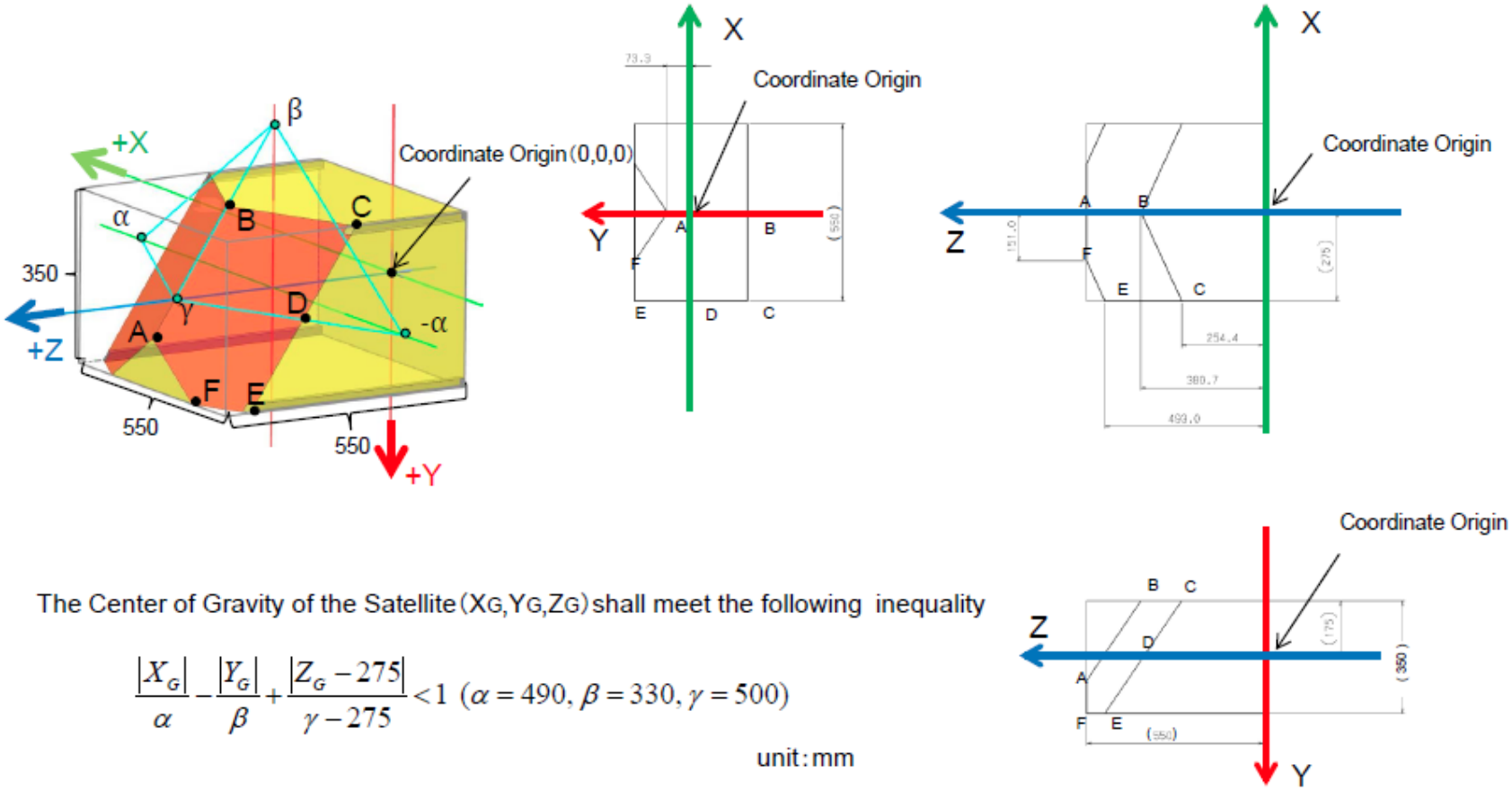
(It shall be the average value of the XY, YZ, and ZX faces of the satellite.)

(3) The center of gravity (CG) of a satellite shall be located as defined in Figure 3.1.5-1.

3.1.6. Separation Spring

Separation springs are not required for the 50 cm class satellite.

[5] Since the mass of each satellite is restricted by the ballistic number, the mass of the satellite's ballistic number must be 105kg/m^2 or less.



The Center of Gravity of the Satellite (X_G, Y_G, Z_G) shall meet the following inequality

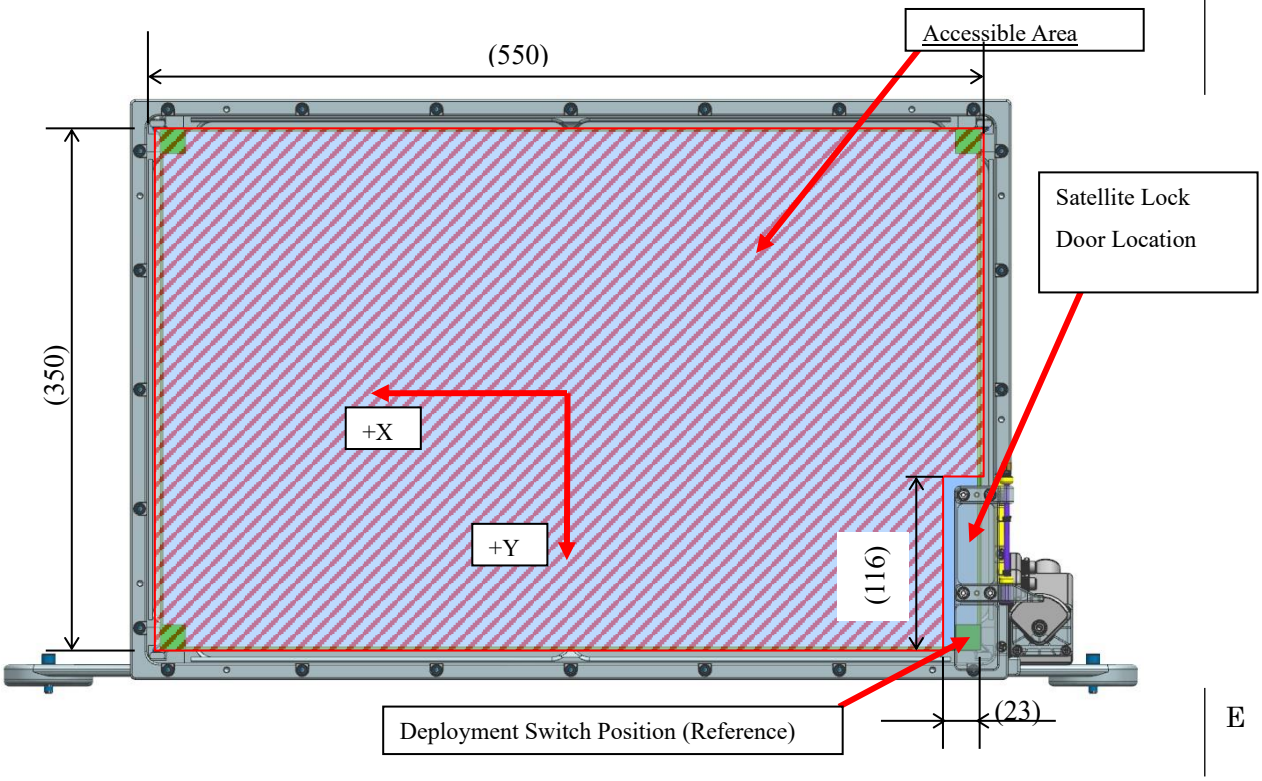
$$\frac{|X_G|}{\alpha} - \frac{|Y_G|}{\beta} + \frac{|Z_G - 275|}{\gamma - 275} < 1 \quad (\alpha = 490, \beta = 330, \gamma = 500)$$

unit : mm

Figure 3.1.5-1 The Center of Gravity Requirements for 50cm Class Satellite

3.1.7. Accessible Area

The satellite can be accessed after installation in the J-SSOD Satellite Install Case only from the deployment direction surface (+Z end face) as shown in Figure 3.1.7-1. E



E

Figure 3.1.7-1 Satellite Access Window after Removing the Launch Lock Cover

3.1.8. Structural Strength

Refer to 2.1.8.

3.1.9. Stiffness

Refer to 2.1.9.

3.1.10. Ground Handling

The satellite developer shall prepared following items to store the satellite by lifting to the 50cm class satellite install case with the satellite deployment surface facing up. A safety factor of 5.0 shall be applied for the ultimate strength against the hoisting loads. E

・Interfaces to attach JIS standard eyebolts to the satellite deployment surface (+Z plane)
・Hoisting accessory
・Crane Scales

3.2. Electrical Interfaces

3.2.1. Deployment Switch

(1) A satellite shall be designed for fault tolerant design according to Section 1.3.1 (12) SSP51721, because a safety design prevents activation of the satellite when it is stowed in the Satellite Install Case from launch to satellite deployment by J-SSOD. E

(2) A satellite can be have two deployment switches on the rail standoffs in –Z and one deployment switch on the rail standoff in front of the lock door to prevent the activation of the satellite in the J-SSOD Satellite Install Case. Figures 3.2.1-1 and 3.1.7-1 show the positions of the deployment switches.

(3) When one of the deployment switches stays depressed, its satellite shall not be activated. Regarding a switch on the end of the rail, the satellite shall be inactive until it protrudes at least 1.25 mm from the end of the rail on the +/-Z plane, as shown in Figure 3.2.1-2

(4) The total spring force of switches installed in the -Z plane of the satellite shall be less than 6[N].

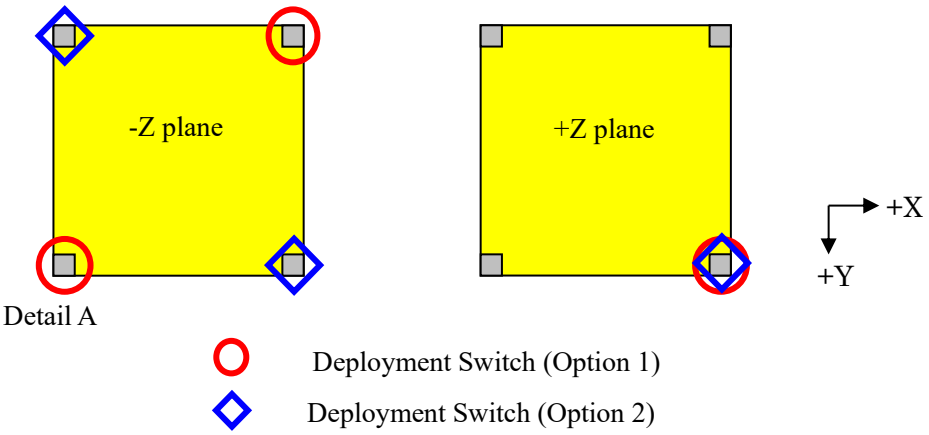


Figure 3.2.1-1 Position of Deployment Switches

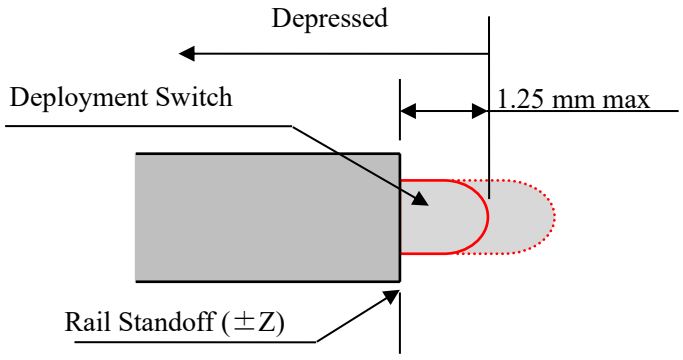


Figure 3.2.1-2 Maximum Allowable Stroke of Deployment Switches on the end of the rail E

(5) Figure 3.2.1-3 shows the configuration when the deployment switches are located on the side of the rail. Since there is no rail on the deploy side of the satellite deploy case, no switch shall be located on the side within 20 mm from the +Z surface.

(6) The tip of a deployment switch on the side of the rail shall be R1.0 or more.

(7) The reaction force of a deployment switch on the side of the rail shall be 1.8[N] or less.

(8) Regarding a switch on the side of the rail, the satellite shall be inactive until it protrudes at least 3.5mm from the side of the rail on the +/- Y plane and +/- X plane, as shown in Figure 3.2.1-4.

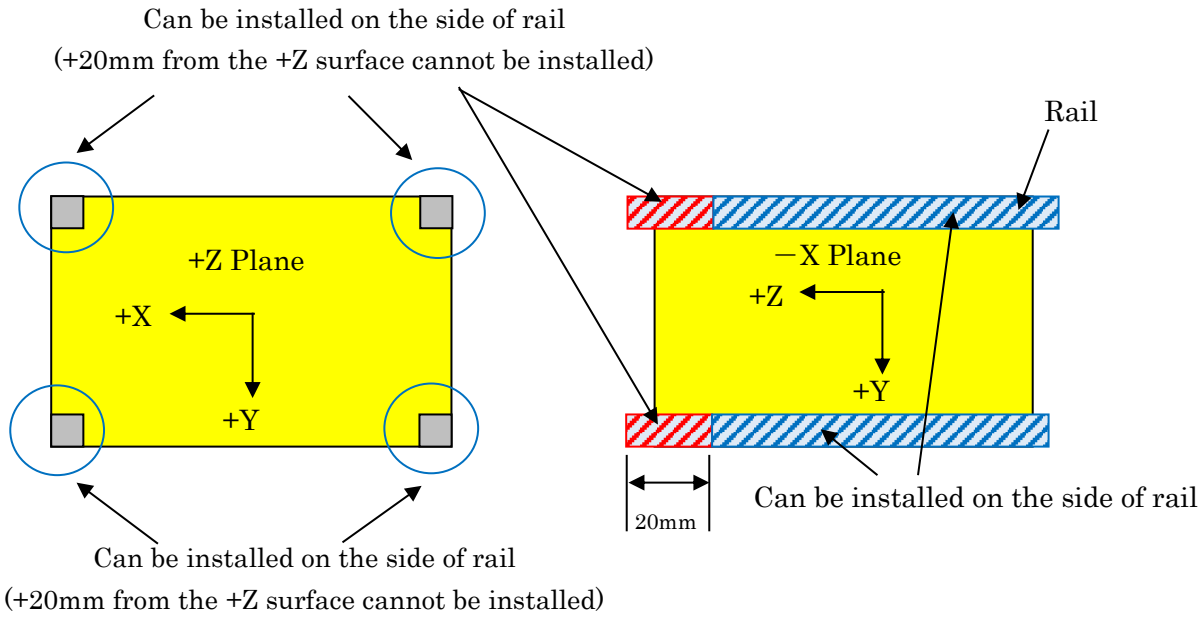


Figure 3.2.1-3 Deployment switches on the side rail

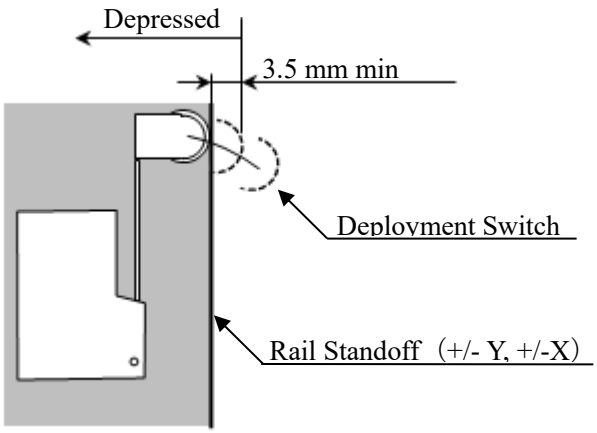


Figure 3.2.1-4 Maximum Allowable Srtoke of Deployment Switch on the side of the rail

E

3.2.2. Ground Handling Pin

N/A

3.2.3. RF

Refer to 4.2.2.2(2)

3.3. Operational Requirements

Refer to 2.3.

3.4. Environmental Requirements

Refer to 2.4.

3.5. Out-gassing

Refer to 2.5.

4. Safety Assurance Requirements

4.1. Generic Requirements

(1) Significance of System Safety

System Safety is to assure that measures are taken to minimize risk by clarifying and evaluating categories for safety assessment from the design to operation phase.

Therefore, the following processes are implemented for System Safety.

(a) To conduct safety analyses and identify hazards related to hardware, software, and their operation in all mission phase.

(b) To eliminate or control identified hazards. To assure that the design is documented and implemented, and its progress is clear.

(c) To conduct integrated safety risk assessments including identifying ineliminable hazards/risks. To inform the project manager and JAXA of residual hazards/risks attaching to corroborative evidence and rationales. To submit materials for JAXA deciding acceptance of the residual hazards/risk.

(2) Generic Requirements for Materials and Processes

Materials used in the JEM and the like shall be selected with due regard to the following operational requirements, technical properties of materials, and MSDS (Material Safety Data Sheet) information in accordance with 3.1.1 of Applicable Document (2), CR - 99117 "JAXA Space Station Program Material and Process Requirement Form;". The conditions that influence the deterioration of materials during hardware operation shall be of special concern E

a) Operational Requirements

- Operating Temperature Limit
- Loads
- Contaminations
- Lifetime Limit
- Natural Environment
- Induced Environment
- Others

b) Technical Properties of Materials

- Mechanical Properties
- Fracture Toughness
- Flammable Properties
- Offgassing Properties
- Corrosion
- Electrolytic Corrosion
- Stress Corrosion
- Thermal Fatigue Properties
- Mechanical Fatigue Properties

- Vacuum Outgassing
- Fluid Compatibility
- Abrasion
- Seizing
- Others

(3) Proxy of JAXA

If JAXA employs a third party to implement Safety and Product Assurance, the satellite developer shall accept this third party as JAXA's proxy.

(4) Deviations and Waivers

The satellite provider shall submit a deviation or a waiver in accordance with JMR-006 to JAXA for approval if a satellite cannot meet the requirements identified in this document.

4.2. Safety Assessment

4.2.1. Implementation of Safety Assessment

(1) Safety Assessment

The satellite provider shall make a Safety Assessment Report (SAR) based on reference documents 1.3.3 (2), (3) for on-orbit operations. It shall be reviewed and approved by JAXA.

If the satellite provider needs to work on the launch site or is planning a launch by HTV-X, the provider shall fill out the ATV/HTV/KSC Form 100 checklist for the launch site and vehicle safety assessment corresponding to the planned launch vehicle. If a satellite contains pressure vessels (including those containers that can become highly pressurized under environmental conditions from launch site to on-orbit), pyrotechnic materials, or toxic materials, additional coordination is required with JAXA.

(2) MIUL (Material Identification Usage List)

The satellite provider shall submit a material identification and use list (MIUL) to JAXA in accordance with 3.1.1 of Applicable Document (2), CR - 99117 "JAXA Space Station Program Material and Process Requirement Form;" the identification and use list shall be reviewed and approved by JAXA.

For reference, Appendix H shows metallic materials that have been used for satellite in the past mission. However, since there may be conditions or restrictions for approval, official coordination is required with MIUL. E

(3) MUA (Materials Usage Agreement)

When materials or processes that do not conform to CR-99117 are used, the satellite provider shall submit the Material use agreement (MUA) to JAXA in accordance with 3.1.1 of Applicable Document (2), CR-99117 "JAXA Requirements for ISS Program Materials and Process Control," which shall be reviewed and approved by JAXA.

(4) VUA (Volatile Organic Compound Usage Agreement)

When using a Water-Soluble Volatile Organic Compound (including equipment with WSVOC) in a pressurized module, the satellite provider shall submit a Volatile Organic Compound Use Agreement (VUA) to JAXA in accordance with 3.1.1 of Applicable Document (2), CR-99117 "JAXA Requirements for ISS Program Materials and Process Control," which shall be reviewed and approved by NASA or JAXA.

(5) HMST (Hazardous Material Summary Tables) E

Chemical (including electrolyte in batteries) and biological materials used in satellite shall submit the data used for toxic and biosafety assessment to JAXA in accordance Applicable Document (17) for checking Toxic Hazard Level (THL) and Bio Safety Level (BSL) prior to finalizing the design.

4.2.2. Safety Design Guidelines

This Section shows the safety design guidelines for major safety requirements about on-orbit operations imposed on a general small satellite. Since not all requirements are given in this Section, SSP51721 Payloads Safety Policy and Requirements for the International Space Station shall be referred to for detailed requirements. E

4.2.2.1. Standard Hazards

Hazards that shall be considered for satellite safety regardless of the satellite design. E

(1) Flammable Materials

Refer to Section 4.2.1 (2),(3)

(2) Materials Offgassing

Applicable if the satellite uses materials that generate off gases. If the evaluated material is 9kg (20lbs) or less, the off gas test may be exempted. Refer to section 4.2.1 (2),(3) for exceptions.

(3) Inadvertent Release of Dust, Toxic, or Biological Hazardous Material

When launch, use and storage items containing chemical (including electrolyte in batteries) and biological materials in a pressurized module and spacecraft pressurized module, the satellite provider refer to 4.2.1 (5).

(4) Shatterable Material Release

Shatterable materials such as glass shall be inspected for their integrity after a vibration test. Because there is a chance of shattering due to impact (launch environment and inadvertent contact by crew, etc), the materials shall be contained or other measures shall be taken to prevent breakage.

E

(5) IVA Sharp Edges / Holes

To protect crewmembers during operations, sharp edges and protrusions shall be rounded or planed greater than 0.7 mm as far as possible. If a satellite has any edges that cannot be rounded or planed (e.g., the edge of a solar cell), the satellite provider shall identify each sharp edge and its location with an acceptable rationale for JAXA approval.

Holes (round, slotted) without covers shall be 25 mm or greater or to be 10 mm or smaller in diameter.

(6) IVA Touch Temperatures

If the satellite has heating sources or cooling sources, analysis and testing should be conducted to verify that the possible contact points are within the temperature criterion (0degC-45degC) to prevent damage to the crew by inadvertent activation of the satellite. Refer to 2.4.4 for the temperature and humidity environment on the ISS. As a control method for this hazard, a single fault tolerant design may be used, assuming the power supply is off.

(7) Laser / Incoherent Electromagnetic Radiation Emissions

If the satellite is capable of emitting laser, satellite provider shall submit the data of the laser class (standard: IEC 60825-1, JIS C-6802) to JAXA. The failure tolerant design and operational constraints required for the hazard control due to inadvertent emission to the crew in a pressurized module or inadvertent emission to the ISS and Visiting Vehicle should be discussed with JAXA in advance.

If the satellite uses incoherent light, the light source luminance shall be less than 10,000 nits (cd/m^2). When the threshold value is exceeded, further data may be required for JAXA to evaluate in detail.

(8) Electromagnetic Compatibility

If the satellite is to mount components that may be affected by electromagnetic radiation in the ISS, such as MOSFETs, it shall be verified that the equipment does not malfunction due to electromagnetic radiation. The verification method shall be discussed with JAXA.

If permanent magnets or magnetorquer are used for attitude control, it shall be verified by analysis or measurement that they do not affect the equipment on the ISS.

- (For DC magnetic field) Less than 1pT (170dB, 3.16G) at a distance of 7cm from the satellite surface.

- (For AC magnetic field) Less than the following specified value at a distance of 7 cm from the satellite surface.

Table 4.2.2.1-1 AC magnetic field requirement

Frequency	Magnitude (dBpT)
30Hz	140
30Hz to 3.5kHz	Falling 26.5 dB/decade from 140 to 85
3.5kHz to 50kHz	85

(9) Rotating Equipment

Rotating equipment such as a motor needs to meet both of the following requirements. If the following requirements are not met, the design shall be 2-failure tolerant against unexpected rotation, assuming the power supply is off.

- Enclosure providing an acceptable level of containment.
- The part shall not exceed 200 mm in diameter or rotate any faster than 8000 rpm under all conditions, or the kinetic energy shall not exceed 14,240 ft-lbs (19,307 Joules).

(10) Sealed container

If the satellite has a sealed container, all of the following requirements shall be met.

- No hazardous fluid (gas or liquid) is contained inside, and the internal pressure is less than 100 psi (689.5kPa)
- The internal energy must be less than 19,310J (14,240 ft-lbf)

E

4.2.2.2. Unique Hazards

Hazards may be identified due to satellite specific design. Examples are as follows.

(1) Structural Failure

If a satellite is deformed or broken as it is loaded into the J-SSOD Satellite Install Case, there is a risk of collision with the ISS after deployment because the deploy direction can be shifted by contact with the satellite and the J-SSOD Satellite Install Case. Therefore, structural design and fracture control shall be done according to JMX-2012694.

(2) Radio Frequency (RF) Radiation

The RF radiation level of the satellite shall not exceed the levels shown in Table 4.2.2.2-1.

For effects on the crew (heating, shock, etc.) due to RF misradiation in the satellite case or equipment malfunction due to RF radiation to surrounding ISS equipment, it is not considered a hazard as long as the limits shown in Table 4.2.2.2-1 are met.

If the levels shown in Table 4.2.2-1 cannot be met, a two-fault tolerant design in accordance with Section 1.3.1 "Applicable Documents" (12) SSP51721 shall be designed for unexpected RF emissions in the satellite install case.

If a two-failure tolerant design is designed for the entire period from launch to deploy of the satellite by the J-SSOD, the satellite is considered to have adequate safety control over the hazard of RF false emissions. In this case, the two-failure tolerant design should be described in the Safety Assessment Report (SAR).

E

Table 4.2.2.2-1 Maximum allowable level for RF radiation*

Frequency Range	Allowable Electic Filed level	Allowable Power Density	Output Power (only reference)
14kHz to 110kHz	1.58 V/m (124dB μ V/m)	0.0066 (W/m2)	0.075 (W)
110kHz to 200MHz	1.58 V/m (124dB μ V/m)	0.0066 (W/m2)	0.075 (W)
200MHz to 450MHz	19 V/m (145.6dB μ V/m)	0.955 (W/m2)	7 (W)
450MHz to 1500MHz	19 V/m (145.6dBμV/m)	0.955 (W/m2)	7W*450/Frequency(MHz)
1500MHz to 8GHz	19 V/m (145.6dBμV/m)	0.955 (W/m2)	Specific Absorption rate 0.4W/kg or less
8GHz to 10GHz	6.3 V/m (136dBμV/m)	0.106 (W/m2)	
10GHz to 13.3GHz	(Linear increase)	(Linear increase)	
13.3GHz to 15.2GHz[5]	58 V/m (155dBμV/m)	8.93 (W/m2)	

*Hazard severity shall be determined by “Allowable Electric Field level” or “Allowable power density.” However, if output power does not exceed “Output power (only reference)” with antenna gain included, hazard severity can be regarded as marginal.

[5] Maximum allowable level for RF radiation(13.3 GHz to 15.2 GHz) based on the evaluation result of JMX-2011002 Section 6.2, 5-3) Hazard severity criterion of RF radiation hazard for ISS system.

(3) Deployable Structure

All deployables shall be designed two-fault tolerance according to Section 1.3.1 “Applicable Document” (12) SSP51721 during the period from launch to deployment by the J-SSOD. There shall be sufficient safety control to prevent hazards such as recontact to the ISS due to inadvertent deployment caused by deployable structures hooked with the Satellite Deploy Case, and crew death/injury due to deployable structures protruding through gaps of Satellite Launch Case. In this case, control of the restraining wire for the deployable components is required according to the applicable document (11), JMX-2012694 “Structure Verification and Fracture Control Plan for JAXA Selected Small Satellite Released from J-SSOD.” E

(4) Battery Failure

Battery usage must comply with JSC-20793 Crewed Space Vehicle Battery Safety Requirement. Battery Failure. Also, the HR Battery Description Form needs to be submitted for review and approval of the validity of their design and verification plan.

(5) Propulsion system or separable subcomponents E

If the satellite has a propulsion system or separable subcomponents, it shall be evaluated that the malfunction of the propulsion system or separation subcomponents does not cause a hazard during all phases (launch to post-deploy).

The propulsion system of the satellite shall have three safety controls against propellant misfiring (including not only after satellite deploy but also during the preparation phase before satellite deploy).

(6) Other Failures

For satellites that will be deployed from the J-SSOD, the requirements of SSP 52005[7] for validation of workmanship errors shall be met by implementing the vibration test on the flight hardware under a random vibration environment with the hard mounting described in Section 2.4.1 and based on the applicable document (11), JMX-2012694 “Structure Verification and Fracture Control Plan for JAXA Selected Small Satellite Released from J-SSOD” as an alternative to vibration testing.

[7] In the applicable document (13), SSP 52005 “Payload Flight Equipment Requirements and Guidelines for Safety-Critical Structures,” a vibration test are required for flight items at Maximum Expected Flight Level (MEFL) + 3 dB and at Minimum Workmanship Level (MWL) with hard mounting can be used as verification of safety design and workmanship of structures and components that were identified as potentially catastrophic hazards (Safety Critical).

4.3. Compatibility with Safety Requirements for a Deployable Satellite from ISS and Space Debris Mitigation Guidelines

Sections 4.3.1 and 4.3.2 show the safety requirements for a satellite based on the ISS PPD 1011 "Multilateral International Space Station (ISS) and ISS Visiting Vehicle Jettison Policy" and JMR-003. The necessary verification categories of each requirement and data submittal are defined in Appendix C "Verification Matrix."

4.3.1. Compatibility with Safety Requirements for Deployable Satellite from the ISS

The satellite shall comply with the following requirements in order to be deployed safely from the ISS.

4.3.1.1. Deployable Satellite Design Requirements

4.3.1.1.1. Ballistic Number

Refer to Section 2.1.5 (2).

4.3.1.1.2. Deployment Analysis

The satellite shall comply with the following requirements.

(1) The minimum cross section of a satellite (any cross section that can be physically or electromagnetically sighted) shall be no less than 78.5 cm^2 in order to be trackable by the Space Surveillance Network (SSN).[8] E

(2) N/A

(3) N/A

4.3.1.1.3. Propulsion System

If the satellite has a propulsion system or performs operations with orbital maneuvers, the following requirements shall be met.

(1) Satellite developers shall establish a SSA sharing agreement (Space Situational Awareness) with USSPACECOM and submit the certificate to JAXA.

(2) Coordinate with NASA on the operational process and prepare Payload Integration Agreements (PIA), Operations Interface Procedures (OIP), Operations Agreements (OA), etc., and submit the NASA-approved documents to JAXA.

[8] Since the SSN can track objects larger than 10 cm and satellite size must be at least 10 cm, 78.5 cm^2 is set as the minimum requirement..
(Reference: http://www.stratcom.mil/factsheets/USSTRATCOM_Space_Control_and_Space_Surveillance/)

4.3.1.1.4. Deployable Subcomponents

If a satellite includes a deployable subcomponent, the subcomponent shall only be deployed once the following conditions are met:

(1) The satellite has achieved a downtrack range of ≥500 km.

(2) The primary satellite's and subcomponent's apogees are less than the ISS perigee.

4.3.1.2. N/A E

4.3.2. Compliance with Space Debris Mitigation Guidelines

The satellite shall comply with JMR-003. Major requirements are shown below.

(1) Limit Debris Released during Normal Operations

In all operational orbit regimes, the satellite shall be designed to release no debris during normal operations.

(2) Minimize the Potential for On-Orbit Break-ups

On-orbit break-ups caused by the following factors shall be prevented:

a) The potential for break-ups during the mission shall be minimized.

b) All space systems shall be designed and operated so as to prevent accidental explosions and ruptures at the end of the mission.

c) Intentional destructions that will create long-lived orbital debris shall not be scheduled or conducted.

Batteries in particular shall be adequately designed and manufactured, both structurally and electrically, to prevent break-ups. Any pressure increase in battery cells and assemblies shall be prevented by mechanical measures unless these measures cause an excessive reduction of mission assurance.

(3) Post Mission Disposal

There shall be no greater than a 1/10,000 chance of human injury on the ground. In addition, a satellite will be judged to meet the requirement if a satellite does not load radioactive substances, toxic substances, or any environmental pollutants resulting from on-board items in order to prevent ground environmental pollution.

(4) N/A E

5. Requirements for Control

5.1. Quality and Reliability Control

A satellite provider shall ensure the satellite's quality and reliability (including any products prepared by the satellite provider).

5.2. Application for Approval and Authorization

A satellite provider shall go through the following procedures:

(1) Intentional Radiating and Receiving Authorization

A satellite that has intentional RF radiating and/or receiving devices shall be approved and certified by the NASA JSC Frequency Spectrum Manager for the use on a specified frequency band. Approval/Certification can be obtained via electronic submittal through the JSC Frequency Management Home Page.

For any satellite selected by JAXA, the satellite provider shall apply to the NASA JSC Frequency Spectrum Manager and submit a JSC Frequency Authorization Input Form identified in JMX-2012164 (Appendix-F) to JAXA or contractor.

(2) Radio Frequency Capability and Emission/Operation Authority

A satellite with radio frequency capability shall be certified for space operation in the desired/planned operating frequency bands prior to integration into the launch vehicle. Certification is obtained by an equipment operating license for the satellite from the National Regulatory Agency. The license, along with the positions of any ground station assets that will be used to communicate with the satellite, shall be submitted to the NASA JSC Frequency Spectrum Manager for notification.

For any satellite selected by JAXA, the satellite provider shall submit a copy of the approved license to JAXA for submittal to the NASA JSC Frequency Spectrum Manager.

(3) Law in Outer Space

(This requirement is only for a satellite that will be operated from Japan)

All procedures shall comply with all space activities and satellite remote sensing related laws, and supporting documentation shall be presented to the organization.

(4) Registration of Objects Launched into Outer Space

(5) Other Legal Procedures

5.3. Verification

The satellite provider shall be responsible for development and implementation of satellite verification according to the verification matrix of the document in Appendix C "Verification Matrix." Verification methods are classified into the following categories.

(1) Analysis

The method of validating and evaluating a design or a product to satisfy given requirements by calculations based on a mathematical model (including computer simulations) that have been

guaranteed or whose reliability has been evaluated with techniques or tools academically widely recognized, with logical rules, etc.

This method is used when verification by inspection or testing is difficult and when compliance with stated requirements can be proved by analysis and calculation.

(2) Inspection

The method of verifying and evaluating that the physical properties of a product comply with the requirements without using special testing equipment, procedures, test tools, or test support.

Ordinarily, the finished product is visually inspected and examined with suitable measurement equipment according to documents or drawings that specify physical conditions or standards.

(3) Test

Method of verifying compliance with functional and environmental durability requirements using hardware based on measurement data.

(4) Review of Design

The method of verifying compliance with requirements and confirming design documents or drawings.

5.4. Safety Review and Design Review

The satellite provider shall attend the following review panels and report on results of a satellite design, manufacture, testing, and so on.

(1) Safety Review

For a satellite selected by JAXA, JAXA shall be responsible for conducting safety reviews of the satellite in the primary design phase (phase 0/I), in the detailed design phase (phase II), and in the acceptance test phase (phase III).

The satellite provider shall submit a Safety Assessment Report (SAR) and necessary supporting documentation for review by JAXA.

Other satellites shall meet the safety review process defined in NSTS/ISS-13830C.

(2) Compatibility Verification Review

JAXA or the contractor shall be responsible for conducting a review to confirm that the satellite verification results comply with the requirements defined in this document before the satellite is delivered to JAXA or a contractor.

The satellite provider shall conduct necessary verifications and submit necessary documentation such as drawings, analysis reports, and test reports for review by JAXA or a contractor.

(3) Confirmation before a Satellite Installation

JAXA or a contractor shall be responsible for confirming that all remaining action items that are identified in the Safety Reviews and Compatibility Verification Reviews have been closed before a satellite is loaded into the J-SSOD Satellite Install Case.

The satellite provider shall close all the action items and show that the necessary documentation processes have been completed.

5.5. Process Control

The satellite developer shall submit a progress schedule promptly after a satellite is selected from the public appeal. Also, the satellite provider shall manage its progress and report the current situation to JAXA or a contractor.

5.6. Preparation for Delivery to JAXA or contractor

(1) The satellite developer shall be fully aware of requirements related to safety, the method of transport, and maintenance of transport environment. Also, the difficulty of work after shipment shall be fully considered.

E

(2) N/A

(3) N/A

(4) If there are special handling precautions, a user's manual for work on the ground shall be submitted to JAXA or a contractor when a satellite is delivered to JAXA or the contractor.

Appendix A: System Description and Operational Overview

A.1 Overview

The J-SSOD is the launcher system that deploys small satellites from the JEMRMS, as shown in Figure A1.1-1.

The J-SSOD consists of the three main components shown in Figure A1.1-2: the Satellite Install Case with the spring deployer mechanism; the Separation Mechanism to hold the satellites in place inside the case by securing the hinged door of the Satellite Install Case; and the Electronics Box. The J-SSOD shall be installed on the Multipurpose Experiment Platforms for movement through the JEM AL and for JEMRMS handling. The JEMRMS will position the platform with the J-SSOD in the aft-nadir direction to assure retrograde deployment.

When the trigger commands are issued, the separation mechanism rotates and opens the hinged door of the Satellite Install Case. The spring deployer mechanism in the case pushes out satellites by the spring, and the satellites are finally deployed. The Separation Mechanism and the Electronics Box are reusable on-orbit. The Satellite Install Case has no heater but is covered by Multi-Layer Insulation for passive thermal control.

The Satellite Install Case can be re-used. In this case, new satellite will be installed in the Satellite Install Case by crewmembers using the Satellite Handling Tool (OSE).

A.2 Deployer Mechanism

A Separation Mechanism is installed in the Satellite Install Case. The Satellite Install Case consists of one compressed spring, the back plate, and the hinged spring door. When satellites are loaded, the spring is compressed and the satellites are held in the case by the hinged spring door. Once the Separation Mechanism receives the release command, the cam of the mechanism turns. The hook of the hinged spring door is pushed away by the cam, and the door opens. Finally, the satellites in the case are ejected by the spring.

The accuracy of the deployment direction is controlled by guides in the Satellite Install Case and the rail equipment on releasing satellites.

(Refer to Figure A1.2-1 and A1.2-2.)

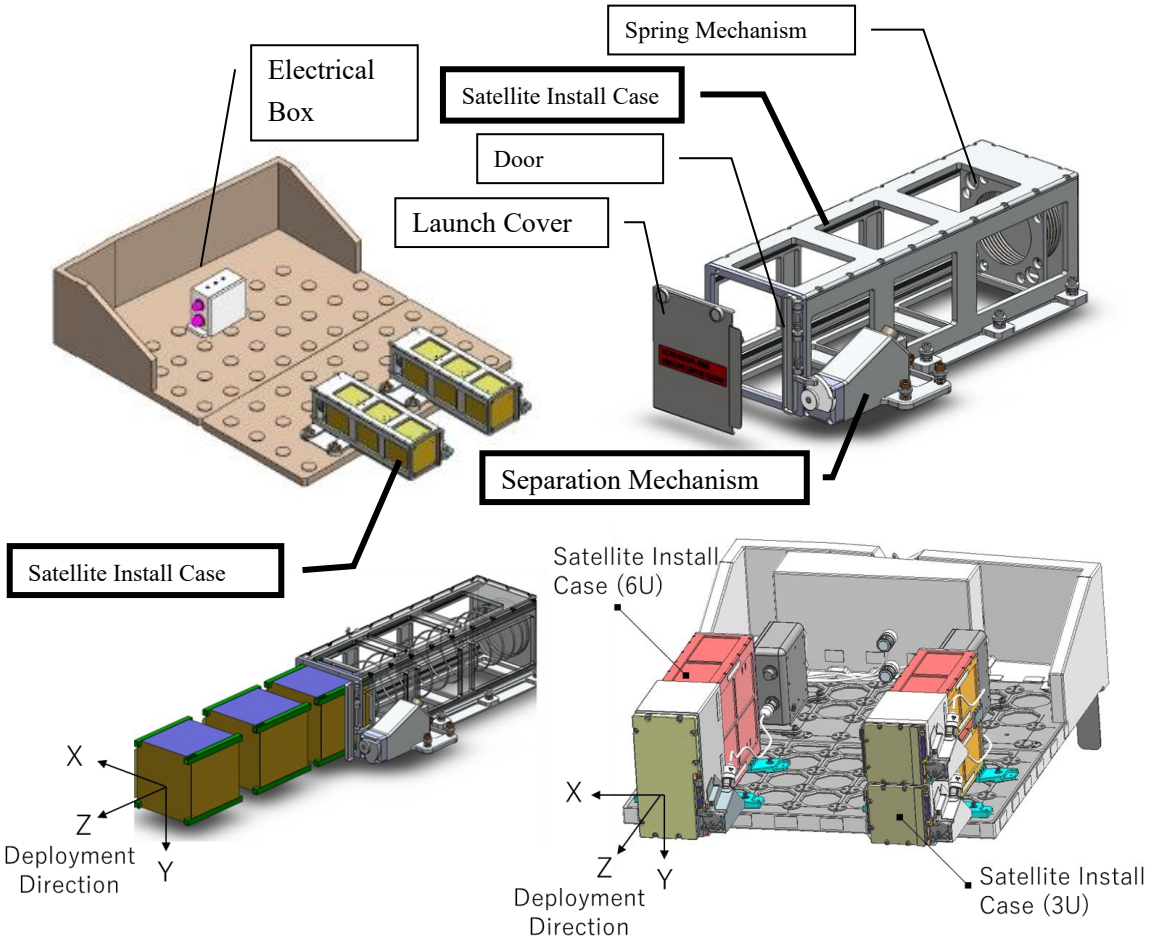


Figure A.2-1 External View of the Ejection System

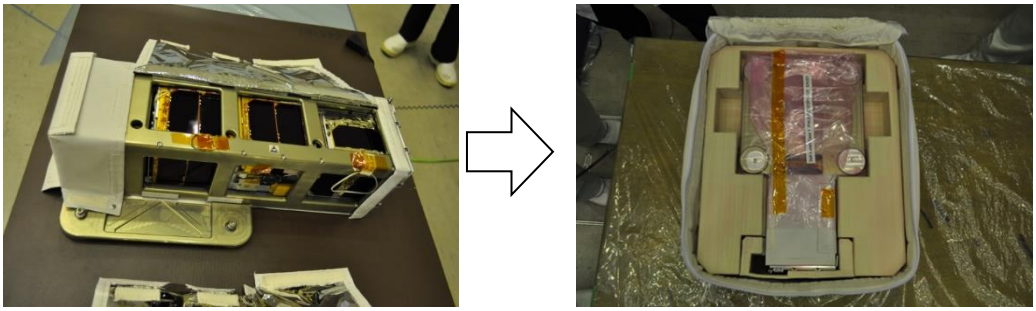
A.3 Operation Scenario

Operation scenario on the ground after receiving a satellite is shown below.

(1) Preparation for Launch

(i) The satellite is installed in the Satellite Install Case and stowed inside the Cargo Transfer Bag (CTB) packed with soft material.

(ii) The CTB is handed over to the cargo integrator of a Transfer Vehicle such as an HTV-X. E



(2) Launch

(i) After launch, the CTB is moved into the on-orbit JEM PM.

(3) Installation on the JEM Airlock table in JEM PM

(i) The CTB is unpacked.

(ii) The inner hatch of the Airlock is opened and the Airlock slide table is extended into the JEM PM

(iii) All Satellite Cases with their Electric Box and Separation Mechanisms on the Multi-Purpose Experiment Platform (MPEP) are installed in the Airlock and then electric cables and signal cables are connected.

(4) J-SSOD Checkout and Setup for Deployment

(i) The Checkout (C/O) cable is connected to the MPEP.

(ii) The JEMRMS console (or the ground) commands the separation mechanism to operate and check the Separation Mechanism.

(iii) The separation mechanism is confirmed to have gone back to the initial position. The C/O cable is disconnected.

(iv) The launch cover is removed from the Satellite Install Case.

(v) The RBF pin is removed from each satellite.

(vi) The access-window cover is put on the Satellite Install Case for each satellite.

(vii) The JEM Airlock table is retrieved into the JEM Airlock and the inner hatch is closed.

(5) Deployment

(i) The Airlock is depressurized.

(ii) The outer hatch of the Airlock is opened and the slide table is extended outside, into outer space.

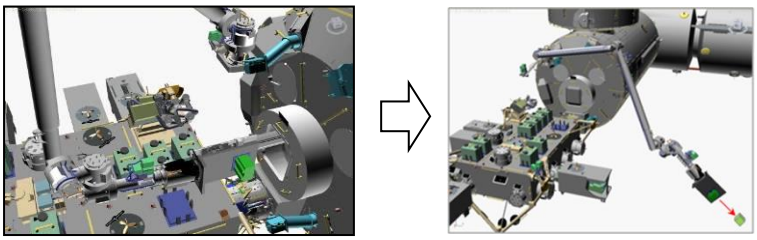
(iii) The MPEP is grasped by the JEMRMS.

(iv) Heater power to is supplied to the J-SSOD by the JEMRMS

(v) The MPEP is maneuvered into the prescribed deployment position.

(vi) The first set of satellites is deployed upon command from the JEMRMS console (or the ground).

(vii) The second set of satellites is deployed upon command from the JEMRMS console (or the ground).



(6) Stowage after deployment

(i) The MPEP is installed on the JEM Airlock slide table by the JEMRMS.

(ii) The JEM Airlock table is pulled back into the JEM Airlock and the outer hatch closed. Then the Airlock is repressurized.

A.4 JEM Small Satellite Orbital Deployer, Resuppliable (J-SSOD-R)

A.4-1 J-SSOD-R Overview

The J-SSOD-R is the launcher system that deploys small satellites from the JEMRMS, as shown in Figure A4-1-1.

The J-SSOD-R consists of the components shown in Figure A4.1-1: the Satellite Deploy Case with a spring deployer mechanism; the Separation Mechanism to hold satellites inside the case by a latched Lock door of the Satellite Deploy Case; the Electronics Box (10 ch compatible); and the Satellite Launch Case with Launch Cover. The satellite shall be loaded in the Satellite Launch Case while on the ground, then transferred from the Satellite Launch Case to the Satellite Deploy Case in the JEM pressurized module. When launching the Satellite Deploy Case for the first time, the satellite can already be loaded in the Satellite Deploy Case.

The J-SSOD-R will be installed on the Multipurpose Experiment Platforms for movement through the JEM AL and for the JEMRMS handling. After the satellite is transferred in the JEM pressurized module, it is kept in the deploy case by the Lock Door that is closed and restrained by the cam of the separating mechanism until it is ejected. When the trigger commands are issued, the separation mechanism rotates and opens the Lock Door of the Satellite Deploy Case. The spring deployer mechanism in the case ejects the satellites, and satellites are finally deployed. The satellite deploy case (24U) can hold up to 24U of satellites at a time, and each separation mechanism is driven individually.

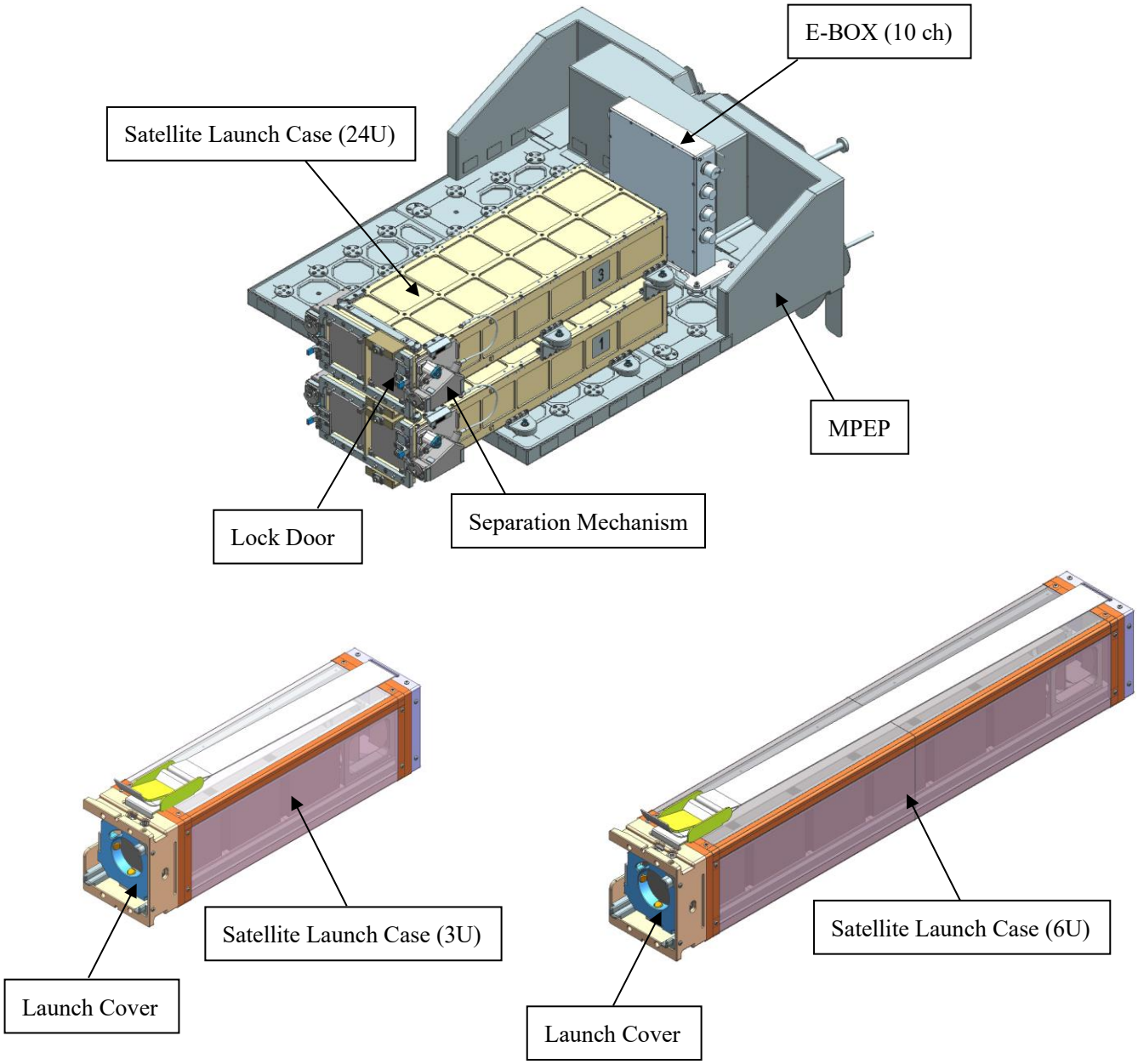


Figure A.4-1-1 J-SSOD-R

A.4-2 J-SSOD-R Operation Scenario

The operation scenario after receiving satellite on ground is shown as below.

(1) Preparation for Launch
  (i) The satellite is installed in the Satellite Launch Case and stowed inside Cargo Transfer Bag (CTB) with soft packing material.
  (ii) The CTB is handed over to the cargo integrator of the Transfer Vehicle such as an HTV-X. E

(2) Launch
  (i) After launch, the CTB is moved into the JEM PM.

(3) Installation on the JEM Airlock table in JEM PM
  (i) The CTB is unpacked.
  (ii) The inner hatch of the Airlock is opened and the Airlock slide table is extended into the JEM PM
  (iii) The Satellite Deploy Cases with Electric Box and Separation Mechanisms is installed on the Multipurpose Experiment Platform (MPEP) on the Airlock and then the electric cables and signal cables are connected.

(4) J-SSOD-R Checkout and Setup for Deployment
  (i) The Checkout (C/O) cable is connected to the MPEP.
  (ii) The separation mechanism is driven according to commands from the ground and the Separation Mechanism checked out.
  (iii) The separation mechanism is confirmed to have gone back to its initial position. The C/O cable is disconnected.
  (iv) The checkout connector of the 10-channel compatible Electric box is connected to a multimeter to confirm that there is no ON failure.

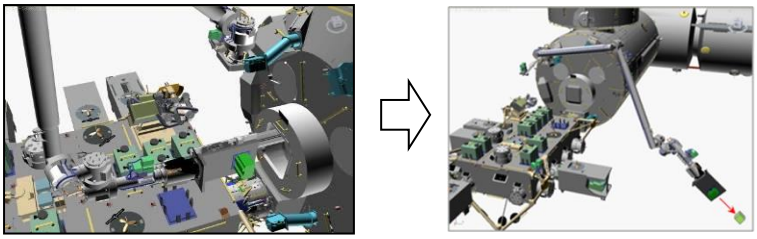
  The following (v) to (x) are not required when the satellite is loaded in the satellite deploy case on the ground.

  (v) If required, from the appearance of the Satellite Launch Case, the satellites inside are confirmed to have not been misdeployed. E
  (vi) The Satellite Deploy Case and Satellite Launch Case are connected and locked by the Slide Lock Mechanism.
  (vii) Since the Launch Lock Cover of the Satellite Launch Case and the back plate of the satellite deploy case are connected, the bolts of the Launch Lock Cover are removed.
  (viii) Pull the belt of the Satellite Launch Case and transfer the satellite to the Satellite Deploy Case.
  (ix) The Satellite Lock Door of the Satellite Deploy Case is pushed down and locked in place by the Separation Mechanism.

(x) The Slide Lock Mechanism of Satellite Deploy Case is slid and the Satellite Launch Case is removed from the Satellite Deploy Case.

(xi) The launch cover is removed from the Satellite Deploy Case. (Only for the first operation)
(xii) The MLI is installed.
(xiii) The JEM Airlock table is retrieved into the JEM Airlock and the inner hatch is closed.

(5) Deployment
(i) The Airlock is depressurized.
(ii) The outer hatch of the Airlock is opened and the slide table is extended outside, into outer space.
(iii) The MPEP is grasped by the JEMRMS.
(iv) Heater power is supplied to the J-SSOD-R by the JEMRMS.
(v) The MPEP is maneuvered into a suitable deployment position.
(vi) The satellites are deployed by commands from the the ground.



(6) Stowage after deployment
(i) The MPEP is installed on the JEM Airlock slide table by the JEMRMS.
(ii) The JEM Airlock table is retrieved into the JEM Airlock and the outer hatch closed. Then the Airlock is repressurized.
(iii) The Launch Lock Cover attached to the back plate of the Satellite Deploy Case is removed.

Appendix B: Correspondence to CubeSat Design Specification Rev.13

This document Section 2.1 Mechanical Interfaces and 2.2 Electrical Interface reference CubeSat Design Specification Rev.12 were issued by the California Polytechnic State University on 2009/08/01. Correspondence to CubeSat Design Specification Rev.12 is shown in Table B-1. The following correspondences are specified in this Table.

A (Applicable): CubeSat Design Specification is applied to this document without any modification.

A/M (Applicable with modification): CubeSat Design Specification is applied to this document with partial modification due to J-SSOD design.

E (Equivalent): ISS/JEM unique provision is applied to this document.

NA (Not Applicable): CubeSat Design Specification is not applied to this document

Corresponding Section numbers in this document are also shown in the Table.

Table B-1Correspondence to CubeSat Design Specification Rev.13 (1/7)

No.	Requirement Description	Correspondence	Note (Corresponding Section numbers, etc.)
1.	Introduction	-	[Title]
1.1	Overview	NA	Explanation of P-POD
1.2	Purpose	NA	
1.3	Waiver Process	E	Section 4.1 (4)
1.4	Interface	NA	Explanation of P-POD
2.	Poly Picosatellite Orbital Deployer	-	[Title]
2.1	Interface	NA	Explanation of P-POD
3.	CubeSat Specification	-	[Title]
3.1	General Requirements	-	[Title]
3.	CubeSat Specification	-	[Title]
3.1	General Requirements	-	[Title]
3.1.1	CubeSats which incorporate any deviation from the CDS shall submit a DAR and adhere to the waiver process (see Section 1.3 and Appendix A).	E	Section 4.1(4) JMR-006
3.1.2	All parts shall remain attached to the CubeSats during launch, ejection, and operation. No additional space debris shall be created.	A/M	Section 4.3.2(1)
3.1.3	No pyrotechnic materials shall be permitted.	E	Section 4.2.1(1)
3.1.4	Any propulsion systems shall be designed, integrated, and tested in accordance with AFSPCMAN 91-710 Volume 3.	E	Section 4.3.1.1.3
3.1.5	Propulsion systems shall have at least 3 inhibits to activation.	E	Section 4.2.2.2(5)
3.1.6	Total stored chemical energy will not exceed 100 Watt-Hours.	E	Section 4.2.2(4)
3.1.6.1	Note: Higher capacities may be permitted but could potentially limit launch opportunities.	NA	Information Only
3.1.7	CubeSat hazardous materials shall conform to AFSPCMAN 91-710, Volume 3.	E	Section 4.2.1(2)～(4)
3.1.8	CubeSat materials shall satisfy the following low-outgassing criterion to prevent contamination of other spacecraft during integration, testing, and launch. A list of NASA-approved low-outgassing materials can be found at: http://outgassing.nasa.gov	E	Section 2.5
3.1.8.1	CubeSats materials shall have a Total Mass Loss (TML) < 1.0 %	E	Section 2.5
3.1.8.2	CubeSat materials shall have a Collected Volatile Condensable Material (CVCM) <0.1%	E	Section 2.5
3.1.9	The latest revision of the CubeSat Design Specification will be the official version which all CubeSat developers will adhere to. The latest revision is available at http://www.cubesat.org.	NA	Information Only

E

Table B-1 Correspondence to CubeSat Design Specification Rev.13 (2/7)

No.	Requirement Description	Correspondence	Note (Corresponding Section numbers, etc.)	
3.1.9.1	Cal Poly will send updates to the CubeSat mailing list upon any changes to the specification. You can sign up for the CubeSat mailing list here: www.cubesat.org/index.php/about-us/how-to-join	NA	Information Only	
3.1.10	Note: Some launch vehicles hold requirements on magnetic field strength. Additionally, strong magnets can interfere with the separation between CubeSat spacecraft in the same P-POD. As a general guideline, it is advised that magnetic fields outside the CubeSat static envelope be limited to 0.5 Gauss above Earth's magnetic field.	NA	Information Only	
3.1.11	The CubeSat shall be designed to accommodate ascent venting per ventable volume/area < 2000 inches.	A/M	Section 2.4.3(b)	
3.2	CubeSat Mechanical Requirements	NA	Explanation of P-POD	
3.2.1	The CubeSat shall use the coordinate system as defined in Appendix B for the appropriate size. The CubeSat coordinate system will match the P-POD coordinate system while integrated into the P-POD. The origin of the CubeSat coordinate system is located at the geometric center of the CubeSat.	A/M	Section 2.1.1	
3.2.1.1	The CubeSat configuration and physical dimensions shall be per the applicable Section of Appendix B.	A/M	Section 2.1.2(1)	
3.2.1.2	The extra volume available for 3U+ CubeSats is shown in Figure 6.	N/A		
3.2.2	The –Z face of the CubeSat will be inserted first into the P-POD.	A	Section 2.1.1	
3.2.3	No components on the green and yellow shaded sides shall exceed 6.5 mm normal to the surface.	A	Section 2.1.4(1) Up to 12.5 mm is allowed in the ±Y direction for a W6U satellite.	E-1
3.2.3.1	When completing a CubeSat Acceptance Checklist (CAC), protrusions will be measured from the plane of the rails.	E	Appendix C	
3.2.4	Deployables shall be constrained by the CubeSat, not the P-POD.	A	Section 2.1.4(5)	
3.2.5	Rails shall have a minimum width of 8.5 mm.	A	Section 2.1.3(3)	
3.2.6	Rails will have a surface roughness less than 1.6 μm.	A	Section 2.1.3(4)	
3.2.7	The edges of the rails will be rounded to a radius of at least 1 mm	A	Section 2.1.3(5)	

E-1

Table B-1 Correspondence to CubeSat Design Specification Rev.13 (3/7)

No.	Requirement Description	Correspondence	Note (Corresponding Section numbers, etc.)
3.2.8	The ends of the rails on the +/- Z face shall have a minimum surface area of 6.5 mm x 6.5 mm contact area for neighboring CubeSat rails (as per Figure 6).	A/M	Section 2.1.3(6)
3.2.9	At least 75% of the rail will be in contact with the P-POD rails. 25% of the rails may be recessed and no part of the rails will exceed the specification	A	Section 2.1.3(7)
3.2.10	The maximum mass of a 1U CubeSat shall be 1.33 kg.	A/M	Section 2.1.5l(1)
3.2.10.1	Note: Larger masses may be evaluated on a mission-to-mission basis.	NA	Information Only
3.2.11	The maximum mass of a 1.5U CubeSat shall be 2.00 kg.	A/M	1.5U satellite applies only to J-SSOD-R.
3.2.11.1	Note: Larger masses may be evaluated on a mission-to-mission basis.	NA	Information Only
3.2.12	The maximum mass of a 2U CubeSat shall be 2.66 kg.	A/M	Section 2.1.5(1)
3.2.12.1	Note: Larger masses may be evaluated on a mission-to-mission basis.	NA	Information Only
3.2.13	The maximum mass of a 3U CubeSat shall be 4.00 kg.	A/M	Section 2.1.5(1)
3.2.13.1	Note: Larger masses may be evaluated on a mission-to-mission basis.	NA	Information Only
3.2.14	The CubeSat center of gravity shall be located within 2 cm from its geometric center in the X and Y directions.	NA	
3.2.14.1	The 1U CubeSat center of gravity shall be located within 2 cm from its geometric center in the Z direction.	NA	
3.2.14.2	The 1.5U CubeSat center of gravity shall be located within 3 cm from its geometric center in the Z direction.	NA	
3.2.14.3	The 2U CubeSat center of gravity shall be located within 4.5 cm from its geometric center in the Z direction.	NA	
3.2.14.4	3U and 3U+ CubeSats' center of gravity shall be located within 7 cm from its geometric center in the Z direction.	NA	
3.2.15	Aluminum 7075, 6061, 5005, and/or 5052 will be used for both the main CubeSat structure and the rails.	A/M	Section 4.2.1(2)
3.2.15.1	If other materials are used the developer will submit a DAR and adhere to the waiver process.	A/M	Section 4.2.1(2)

E

Table B-1 Correspondence to CubeSat Design Specification Rev.13 (4/7)

No.	Requirement Description	Correspondence	Note (Corresponding Section numbers, etc.)
3.2.16	The CubeSat rails and standoff, which contact the P-POD rails and adjacent CubeSat standoffs, shall be hard anodized aluminum to prevent any cold welding within the P-POD.	A	Section 2.1.3(9)
3.2.17	The 1U, 1.5U, and 2U CubeSats shall use separation springs to ensure adequate separation.	A/M	Section 2.1.6
3.2.17.1	Note: Recommended separation spring specifications are shown below in Table 1. These are a custom part available through Cal Poly. Contact cubesat@gmail.com in order to obtain these separation springs.	A/M	Section 2.1.6
3.2.17.2	The compressed separation springs shall be at or below the level of the standoff.	A/M	Section 2.1.6
3.2.17.3	The 1U, 1.5U, and 2U CubeSat separation spring will be centered on the end of the standoff on the CubeSat's –Z face as per Figure 7.	A/M	Section 2.1.6
3.2.17.4	Separation springs are not required for 3U CubeSats.	A	Section 2.1.6

E

Table B-1 Correspondence to CubeSat Design Specification Rev.13 (5/7)

No.	Requirement Description	Correspondence	Note (Corresponding Section numbers, etc.)
3.3	Electrical Requirements	-	[Title]
3.3.1	The CubeSat power system shall be at a power off state to prevent CubeSat from activating any powered functions while integrated in the P-POD from the time of delivery to the LV through on-orbit deployment. CubeSat powered function include the variety of subsystems such as Command and Data Handling (C&DH), RF Communication, Attitude Determine and Control (ADC), deployable mechanism actuation. CubeSat power systems include all battery assemblies, solar cells, and coin cell batteries.	A/M	Section 2.2.1
3.3.2	The CubeSat shall have, at a minimum, one deployment switch on a rail standoff, per Figure 7.	A/M	Section 2.2.1
3.3.3	In the actuated state, the CubeSat deployment switch shall electrically disconnect the power system from the powered functions; this includes real time clocks (RTC).	A/M	Section 2.2.1 Section 2.3(4)
3.3.4	The deployment switch shall be in the actuated state at all times while integrated in the PPOD.	A/M	Section 2.2.1 Section 2.3(4)
3.3.4.1	In the actuated state, the CubeSat deployment switch will be at or below the level of the standoff.	A/M	Section 2.2.1 Section 2.3(4)
3.3.5	If the CubeSat deployment switch toggles from the actuated state and back, the transmission and deployable timers shall reset to t=0.	A	Section 2.3(5)
3.3.6	The RBF pin and all CubeSat umbilical connectors shall be within the designated Access Port locations, green shaded areas shown in Appendix B.	A/M	Section 2.2.2 Use the RBF pin only on the ground.
3.3.6.1	Note: All diagnostics and battery charging within the P-POD will be done while the deployment switch is depressed.	NA	
3.3.7	The CubeSat shall include an RBF pin.	A/M	Section 2.2.2 Use the RBF pin only on the ground.
3.3.7.1	The RBF pin shall cut all power to the satellite once it is inserted into the satellite.	NA	
3.3.7.2	The RBF pin shall be removed from the CubeSat after integration into the P-POD.	NA	Section 2.2.2(4)
3.3.7.3	The RBF pin shall protrude no more than 6.5 mm from the rails when it is fully inserted into the satellite.	A/M	Section 2.2.2(2)
3.3.8	CubeSats shall incorporate battery circuit protection for charging/discharging to avoid unbalanced cell conditions.	A/M	Section 4.2.2.2(4)

E

Table B-1 Correspondence to CubeSat Design Specification Rev.13 (6/7)

No.	Requirement Description	Correspondence	Note (Corresponding Section numbers, etc.)
3.3.9	The CubeSat shall be designed to meet at least one of the following requirements to prohibit inadvertent radio frequency (RF) transmission. The use of three independent inhibits is highly recommended and can reduce required documentation and analysis. An inhibit is a physical device between a power source and a hazard. A timer is not considered an independent inhibit.	A/M	Section 4.2.2.2(2)
3.3.9.1	The CubeSat will have one RF inhibit and RF power output of no greater than 1.5W at the transmitting antenna's RF input.	NA	Information Only
3.3.9.2	The CubeSat will have two independent RF inhibits	A/M	4.2.2.2(2)
3.4	Operational Requirements	-	[Title]
3.4.1	Operators will obtain and provide documentation of proper licenses for use of radio frequencies.	A/M	Section 5.2(1) (2). The intentional RF approval/certification process in ISS and the nation of a satellite developer is applied.
3.4.1.1	For amateur frequency use, this requires proof of frequency coordination by the International Amateur Radio Union (IARU). Applications can be found at www.iaru.org.	A	Section 5.2(1)(2)
3.4.2	CubeSats will comply with their country's radio license agreements and restrictions.	A	Section 5.2(1)(2)
3.4.3	CubeSats mission design and hardware shall be in accordance with NPR 8715.6 to limit orbital debris.	A/M	Section 4.3.2
3.4.3.1	Any CubeSat component shall re-enter with energy less than 15 Joules.	A/M	Section 4.3.2
3.4.3.2	Developers will obtain and provide documentation of approval of an orbital debris mitigation plan from the FCC (or NOAA if imager is present).	N/A	Information Only
3.4.3.2.1	Note: To view FCC amateur radio regulations, go to http://www.arrl.org/part-97-amateur radio	N/A	Information Only
3.4.3.3	Note: Analysis can be conducted to satisfy the above with NASA DAS, available at http://orbitaldebris.jsc.nasa.gov/mitigate/das.html	N/A	Information Only
3.4.4	All deployables such as booms, antennas, and solar panels shall wait to deploy a minimum of 30 minutes after the CubeSat's deployment switch(es) are activated from P-POD ejection.	A	Section 2.3(4)(5)
3.4.5	No CubeSats shall generate or transmit any signal from the time of integration into the P-POD through 45 minutes after on-orbit deployment from the P-POD. However, the CubeSat can be powered on following deployment form the P-POD.	A/M	Section 2.3(5)

Table B-1 Correspondence to CubeSat Design Specification Rev.13 (7/7)

No.	Requirement Description	Correspondence	Note (Corresponding Section numbers, etc.)
3.4.6	Private entities (non-U.S. Government) under the jurisdiction or control of the United States who propose to operate a remote sensing space system (satellite) may need to have a license as required by U.S. law. For more information visit http://www.nesdis.noaa.gov/CRSRA/licenseHome.html. Click on the Application Process link under the Applying for a License drop down Section to begin the process.	N/A	
3.4.7	Cal Poly will conduct a minimum of one fit check in which developer hardware will be inspected and integrated into the P-POD or TestPOD. A final fit check will be conducted prior to launch. The CubeSat Acceptance Checklist (CAC) will be used to verify compliance of the specification (Found in the appendix of this document or online at http://cubesat.org/index.php/documents/developers).	A/M	Appendix C
4	Testing Requirements	E	Appendix C
4.1	Random Vibration	E	Appendix C
4.2	Thermal Vacuum Bake out	E	Appendix C
4.3	Shock Testing	E	Appendix C
4.4	Visual Inspection	E	Appendix C
4.5	CubeSat Testing Philosophy	E	Appendix C
4.5.1	Qualification	E	Appendix C
4.5.2	Protoflight	E	Appendix C
4.5.3	Acceptance	E	Appendix C

Note) In this table, P - POD is replaced with J - SSOD and Cal Poly is replaced by JAXA.

Appendix C: Verification Matrix

Table C-1 Verification Matrix for the interface requirements and safety requirements (1/8) E

Section No.	Section	Analysis	Inspection	Test	ROD	Remarks
2	Interface Requirements for 10cm Class Satellite	NA	NA	NA	NA	[Title]
2.1	Mechanical Interfaces	NA	NA	NA	NA	[Title]
2.1.1	Coordinate System	NA	NA	NA	NA	[Definition]
2.1.2	Dimensional Requirements	NA	NA	NA	NA	[Title]
(1)	The type of satellite	—	—	—	○	To clarify the type of satellite (1U, 1.5U,2U, 3U,4U,5U,6U or W6U)
(2)	Width (X, Y direction)	—	○	—	—	Perform dimensional inspection.
(3) - (9)	Rail Length : Z direction	—	○	—	—	Same as the above.
(10)	W6U Dimensional Requirements	—	○	—	—	Same as the above.
2.1.3	Rails	NA	NA	NA	NA	[Title]
(1)	The number and position of the rails	—	—	—	○	
(2)	Dimension	—	○	—	—	Perform dimensional inspection.
(3)	Rails Width	—	○	—	—	
(4)	Rails Surface Roughness	—	—	—	○	E
(5)	Rails Edges Rounding	—	○	—	—	
(6)	Rails Surface Area (+Z Plane)	—	○	—	—	
(7)	Rails Contact Length with J-SSOD Rail Guides	○	○	—	—	Calculate rails contact length.
(8)	N/A	—	—	—	—	
(9)	Rails Finishing	—	—	—	○	

ROD: Review of Design

（○）: Conditions identified in concerned Section are used in an analysis or a test.

Table C-1 Verification Matrix for the interface requirements and safety requirements (2/8) E

Section No.	Section	Analysis	Inspection	Test	ROD	Remarks
2.1.4	Envelope Requirements	NA	NA	NA	NA	[Title]
(1)	Dynamic Envelope	—	—	—	—	Refer to Section 2.1.4(2) - (4)
(2)	Dynamic Envelope (+Z Plane)	—	○	—	—	Perform dimensional inspection.
(3)	Dynamic Envelope (-Z Plane)	—	○	—	—	Same as the above.
(4)	Dynamic Envelope (+/-X and +/-Y Plane)	—	○	—	—	Same as the above.
(5)	Constraints on deployable components	—	—	—	○	
2.1.5	Mass Properties	NA	NA	NA	NA	[Title]
(1)	Mass	—	○	—	—	
(2)	Ballistic Number	○	—	—	—	
(3)	N/A	—	—	—	—	
2.1.6	Separation Spring	NA	NA	NA	NA	If used, a compatibility assessment as described in Appendix G should be performed. E
(1)	Requirement for 1U to 5U	—	○	—	—	
(2)	Total spring force	—	○	—	—	
(3)	Location of separation spring	—	○	—	—	
(4)	Flange of the spring plunger	—	○	—	○	
(5)	Requirement for 6U, W6U size satellite	NA	NA	NA	NA	NA
2.1.7	Access Window	NA	NA	NA	NA	[Title]
(1)	Do not plan operations that require access to the satellite.	—	—	—	○	
2.1.8	Structural Strength	NA	NA	NA	NA	[Title]
(1)	Main Structure Strength	○	—	—	—	
(2)	Rails Strength	○	—	—	—	

（○）: Conditions identified in concerned Section are used in an analysis or a test.

Table C-1 Verification Matrix for the interface requirements and safety requirements (3/8) E

Section No.	Section	Analysis	Inspection	Test	ROD	Remarks
2.1.9	Stiffness	○	—	—	—	
2.2	Electrical Interface	NA	NA	NA	NA	[Title]
2.2.1	Deployment Switch	NA	NA	NA	NA	[Title]
(1)	Fault tolerant design	—	—	—	○	
(2)	Location of end rail switch	—	○	—	○	
(3)	Location of side rail switch	—	○	—	○	
(4)	Tip shape of side rail switch	—	○	—	○	E
(5)	Reaction force of side rail switch	—	○	—	○	
(6)	N/A	—	—	—	○	
(7)	Power interruption function of end rail switch	—	—	○	—	Perform cross testing.
(8)	Power interruption function of side rail switch	—	—	○	—	Perform cross testing.
(9)	Movable stroke	—	○	—	—	Perform dimensional inspection.
(10)	Total spring force	—	○	—	(○)	For home-made switches, evaluation based on design verification is not allowed.
2.2.2	Ground Handling Pin	NA	NA	NA	NA	[Title]
(1)	Use	—	—	—	○	
(2)	Constraints	—	—	—	○	
2.2.3	N/A	NA	NA	NA	NA	[Title]
2.2.4	RF	NA	NA	NA	NA	[Title] Refer to Section 4.2.2.2(2).
2.2.5	N/A	NA	NA	NA	NA	[Title]

(○) : Conditions identified in concerned Section are used in an analysis or a test.

Table C-1 Verification Matrix for the interface requirements and safety requirements (4/8)

Section No.	Section	Analysis	Inspection	Test	ROD	Remarks
2.3	Operational Requirements	NA	NA	NA	NA	[Title]
(1)	Maximum Stowage Duration	—	—	—	○	
(2)	On-orbit Maintenance Limitation	—	—	—	○	
(3)	Cold Launch Requirements	—	—	—	○	
(4)	Minimum Time until Mechanism Deployment	—	—	○	—	
(5)	Minimum Time until RF Radiation	—	—	○	—	
(6)	Satellite Deployment Window	—	—	—	○	If limitation of the satellite deployment window exists, a satellite provider shall coordinate with JAXA or contractor.
2.4	Environmental Requirements	NA	NA	NA	NA	[Title]
2.4.1	Random Vibration and Acceleration	NA	NA	NA	NA	[Title]
(a)	Quasi-static Acceleration	○	—	—	—	
(b)	Random Vibration	—	—	○	—	Allows testing on hard mounts to simplify testing. If the launch configuration can be simulated, a soft mount test is also allowed.
2.4.2	On-orbit Acceleration	NA	NA	NA	NA	[Title]
(a)	On-orbit Acceleration	(○)	—	—	—	Included in the analysis conditions in Section 2.4.1(a)
2.4.3	Pressure Environment	NA	NA	NA	NA	[Title]
(a)	Pressure	—	—	—	○	
(b)	J Depressurization Rate	(○)	—	—	○	Only if V/A > 50.8m (2000 inch), Stress Analysis Report is needed.
2.4.4	Thermal Environment	—	—	(○)	○	
2.4.5	Humidity Environment	—	—	—	○	
2.5	Out-gassing	—	(○)	—	○	

(○) : Conditions identified in concerned Section are used in an analysis or a test.

Table C-1 Verification Matrix for the interface requirements and safety requirements (5/8) E

Section No.	Section	Analysis	Inspection	Test	ROD	Remarks
3	Interface Requirements for 50cm Class Satellite	NA	NA	NA	NA	[Title]
3.1	Mechanical Interfaces	NA	NA	NA	NA	[Title]
3.1.1	Coordinate System	NA	NA	NA	NA	[Definition]
3.1.2	Dimensional Requirements	NA	NA	NA	NA	[Title]
(1)	The type of satellite	—	—	—	○	To clarify the type of satellite (50cm Class Satellite)
(2) - (4)	Dimensional requirements	—	○	—	—	Perform dimensional inspection.
3.1.3	Rails	NA	NA	NA	NA	[Title]
(1)	The number and position of the rails	—	—	—	○	
(2)	Dimension	—	○	—	—	Perform dimensional inspection.
(3)	Rails Width	—	○	—	—	
(4)	Rails Surface Roughness	—	—	—	(○)	E
(5)	Rails Edges Rounding	—	○	—	—	JAXA will conduct Sharp Edge Touch Test as needed.
(6)	Rails Surface Area (+Z Plane)	—	○	—	—	
(7)	Rails Contact Length with J-SSOD Rail Guides	○	○	—	—	Calculate contact surface of the rail
(8)	Rails Finishing	—	○	—	○	

（○）: Conditions identified in concerned Section are used in an analysis or a test.

Table C-1 Verification Matrix for the interface requirements and safety requirements (6/8) E

Section No.	Section	Analysis	Inspection	Test	ROD	Remarks
3.1.4	Envelope Requirements	NA	NA	NA	NA	[Title]
(1)	Dynamic Envelope	—	○	—	—	Refer to Section 3.1.4(2) - (4).
(2)	Dynamic Envelope (+/-Z Plane)	—	○	—	—	Perform dimensional inspection.
(3)	Dynamic Envelope (+/-X and +/-Y Plane)	—	○	—	—	Same as the above.
(4)	No contact	—	○	—	—	Same as the above.
(5)	Constraints on deployable components	—	—	—	○	
3.1.5	Mass Properties	NA	NA	NA	NA	[Title]
(1)	Mass	—	○	—	—	
(2)	Ballistic Number	○	—	—	—	
(3)	Center of Gravity	○	—	(○)	—	
3.1.6	Separation Spring	NA	NA	NA	NA	Not applicable.
3.1.7	Accessible Area	—	○	—	—	Perform dimensional inspection. E
3.1.8	Structural Strength	○	—	—	—	Refer to Section 2.1.8
3.1.9	Stiffness	○	—	—	—	Refer to Section 2.1.9
3.1.10	Ground Handling	○	—	—	○	
3.2	Electrical Interface	NA	NA	NA	NA	[Title]

(○) : Conditions identified in concerned Section are used in an analysis or a test.

E

Table C-1 Verification Matrix for the interface requirements and safety requirements (7/8)

Section No.	Section	Analysis	Inspection	Test	ROD	Remarks
3.2.1	Deployment Switch	NA	NA	NA	NA	[Title]
(1)	Fault tolerant design	—	—	—	○	
(2)	Position of end rail switch	—	○	—	○	
(3)	Power interruption function of end rail switch	—	—	○	—	Perform cross testing.
(4)	Spring force of end rail switch	—	○	—	○	
(5)	Position of side rail switch	—	○	—	○	
(6)	Tip of side rail switch	—	○	—	○	
(7)	Spring force of side rail switch	—	○	—	○	
(8)	Power interruption function of side rail switch	—	—	○	—	Perform cross testing.
3.2.2	Ground Handling Pin	NA	NA	NA	NA	[Title]
3.2.3	RF	NA	NA	NA	NA	Refer to Section 4.2.2.2(2)
3.3	Operational Requirements	NA	NA	NA	NA	Refer to Section 2.3
3.4	Environmental Requirements	NA	NA	NA	NA	Refer to 2.4
3.5	Out-gassing	NA	NA	NA	NA	Refer to 2.5
4	Safety and Product Assurance	NA	NA	NA	NA	[Title]
4.1	Generic Requirements	NA	NA	NA	NA	Provision for policy and procedure for safety & product assurance.
4.2	Safety Assessment	NA	NA	NA	NA	[Title]

（○）: Conditions identified in concerned Section are used in an analysis or a test.

Table C-1 Verification Matrix for the interface requirements and safety requirements (8/8) E

Section No.	Section	Analysis	Inspection	Test	ROD	Remarks
4.2.1	Implementation of Safety Analysis and Safety Assessment	○	(○) Refer to the Note.	(○) Refer to the Note.	—	● A satellite provider shall conduct safety analysis and submit an SAR. Necessary inspections and tests for safety assessment shall be also conducted. ● A satellite provider shall submit ATV/HTV/KSC Form 100 check list for launch site & vehicle safety assessment. ● Submit the verification documents, for the safety review panel conducted by JAXA.
4.2.2	Safety Design Guidelines	NA	NA	NA	NA	[Guidelines]
4.3	Compatibility with Safety Requirements for Deployable Satellite from ISS and Space Debris Mitigation Guidelines	NA	NA	NA	NA	[Title]
4.3.1	Compatibility with Safety Requirements for Deployable Satellite from ISS	NA	NA	NA	NA	[Title]
4.3.1.1	Deployable Satellite Design Requirements	NA	NA	NA	NA	[Title]
4.3.1.1.1	Ballistic Number	NA	NA	NA	NA	Refer to Section 2.1.5 (2).
4.3.1.1.2	Deployment Analysis	NA	NA	NA	NA	[Title]
(1)	Space Surveillance Network (SSN)	—	○	—	—	This requirement is satisfied under Section 2.1.2 Dimensional Requirements.
(2)	N/A	—	—	—	—	E
(3)	N/A	—	—	—	—	
4.3.1.1.3	Propulsion Systems	○	—	○	○	
4.3.1.1.4	Deployable Subcomponents	○	—	—	○	
4.3.1.2	N/A	—	—	—	—	[Title]
4.3.2	Compatibility with Space Debris Mitigation Guidelines	○	—	—	—	JAXA will conduct re-entry analysis and a satellite orbital lifetime analysis.

J-SSOD & [Satellite Name] Interface Verification Record （For 10cm-sized Satellite Design）

E

Satellite Developer Name ; [Defined by Satellite Developer]
Satellite Name ; [Defined by Satellite Developer]
P/N ; [Defined by Satellite Developer]
S/N ; [Defined by Satellite Developer]

SIGNATURES / Satellite Development, Sponsor agency

NAME	DATE
Satellite Development Team (Initiate)	

NAME	DATE
Satellite Development Team (Reviewed)	

NAME	DATE
Satellite Development Team (Approved)	

NAME	DATE
Sponsor Agency (Approved)	

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2	Interface Requirements for 10cm-sized Satellite		[Title]			
2.1	Mechanical Interfaces		[Title]			
2.1.1	Coordinate System		[Definition]			
2.1.2	Dimensional Requirements		[Title]			
2.1.2(1)	**Satellite Type**	1U / 1.5U / 2U / 3U 4U / 5U/ 6U	1U, 1.5U, 2U, 3U, 4U ,5U, 6U	Review of Design		
2.1.2(2)	**Width in -Z Plane**		100.0+/-0.1mm	Review of Design		Figure2.1.2-1, 1a~1d
	a. +X Plane	mm				
	b. +Y Plane	mm				
	c. -X Plane	mm				
	d. -Y Plane	mm				
	Width in +Z Plane		100.0+/-0.1mm	Review of Design		Figure2.1.2-1, 2a~2d
	a. +X Plane	mm				
	b. +Y Plane	mm				
	c. -X Plane	mm				
	d. -Y Plane	mm				
2.1.2(3)-(9)	**Rails Length**		113.5+/-0.1mm (1U) 170.2+/-0.1mm (1.5U) 227.0+/-0.2mm (2U) 340.5+/-0.3mm (3U) 454.0+/-0.4mm (4U) 567.5+/-0.5mm (5U) 681.0+/-0.6mm (6U)	Review of Design		Figure2.1.2-1, 3a~3d
	a. Rail 1	mm				
	b. Rail 2	mm				
	c. Rail 3	mm				
	d. Rail 4	mm				

E

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2.1.3	Rails		[Title]			
2.1.3(1)	**Number of rails**		4	Review of Design		
2.1.3(2)	**Rails Perpendicularity against +Z Plane**		≦ 0.2mm	Review of Design		Figure 2.1.2-1, 4a~4h
	a. Rail 1, +X	OK / NG				
	b. Rail 1, -Y	OK / NG				
	c. Rail 2, -Y	OK / NG				
	d. Rail 2, -X	OK / NG				
	e. Rail 3, -X	OK / NG				
	f. Rail 3, +Y	OK / NG				
	g. Rail 4, +Y	OK / NG				
	h. Rail 4, +X	OK / NG				
	Rails Perpendicularity against +Y Plane		≦ 0.2mm	Review of Design		Figure 2.1.2-1, 5a~5d
	a. Rail 1, +X	OK / NG				
	b. Rail 2, -X	OK / NG				
	c. Rail 3, -X	OK / NG				
	d. Rail 4, +X	OK / NG				
	Rails Parallelism to +Y Plane		≦ 0.2mm	Review of Design		Figure 2.1.2-1, 6a~6b
	a. Rail 1, -Y	OK / NG				
	b. Rail 2, -Y	OK / NG				
	Rail Edges Flatness on +Z Plane		≦ 0.2mm	Review of Design		Figure 2.1.2-1, 7a~7d
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
2.1.3(3)	**Rails Width**		Min 8.5 x 8.5 mm	Review of Design		Figure 2.1.2-1, 8a~8d
	a. Rail 1	x mm				
	b. Rail 2	x mm				
	c. Rail 3	x mm				
	d. Rail 4	x mm				
2.1.3(4)	**Rails Surface Roughness**		≦ 1.6 μm (Ra) (*1) (*1) Arithmetic average of the roughness profile.	Review of Design		Figure2.1.2-1, 9a~9d
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2.1.3(5)	**Rails Edges Rounding**		Burr-free	Review of Design		Figure2.1.2-1, 10a~10d
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
2.1.3(6)	**Rails Surface Area (+Z Plane)**		Min 6.5 x 6.5 mm	Review of Design		
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
2.1.3(7)	**Rails Contact Length with J-SSOD Rail Guides**		≧ 85.1mm (1U) ≧ 127.7mm (1.5U) ≧ 170.3mm (2U) ≧ 255.4mm (3U) ≧ 340.5mm (4U) ≧ 425.6mm (5U) ≧ 510.8mm (6U)	Analysis		
	a. Rail 1, +X	mm				
	b. Rail 1, -Y	mm				
	c. Rail 2, -Y	mm				
	d. Rail 2, -X	mm				
	e. Rail 3, -X	mm				
	f. Rail 3, +Y	mm				
	g. Rail 4, +Y	mm				
	h. Rail 4, +X	mm				
2.1.3(8)	**(N/A)**					
2.1.3(9)	**Rail Surface Finish**		Anodized	Review of Design		
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
2.1.4	Envelope Requirements		[Title]			
2.1.4(1)	Dynamic Envelope		[Definition]			
2.1.4(2)	**Dynamic Envelope (+Z Plane)**	mm	≧ 0.5mm from rail surfaces (+ Z)	Review of Design (*2)		Figure 2.1.4-1, 11a
2.1.4(3)	**Dynamic Envelope (-Z Plane)**	OK / NG	No protrusion from rail surfaces (- Z)	Review of Design (*2)		Figure 2.1.4-1, 11b
2.1.4(4)	**Dynamic Envelope (+/- X and +/- Y Plane)**		≦ 6.5mm from rail surface (+/- X, +/- Y)	Review of Design (*2)		Figure 2.1.4-1, 12a~12d
	a. +X Plane	mm				
	b. +Y Plane	mm				
	c. -X Plane	mm				
	d. -Y Plane	mm				
2.1.4(5)	**Constraints on deployable**	OK/NG	Any deployable components shall be constrained by the satellite itself.	Review of Design (*2)		
			(*2) Dynamic deformation shall be considered.			

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2.1.5	Mass Properties		[Title]			
2.1.5(1)	**Mass**	Kg	0.13～1.33kg/1U (1U,1.5U,2U,3U,4U,5U,6U)	Analysis		
2.1.5(2)	**Ballistic Number**	kg/m2	≦ 115 kg/m2	Analysis		
2.1.5(3)	**(N/A)**					
2.1.6	Separation Spring		Refer to Appendix G			
2.1.7	Access Window		[Title]			
2.1.7(1)	**Operation**	OK / NG	Do not access the satellite after storing the case.	Review of Design		
2.1.8	Structural Strength		[Title]			
2.1.8(1)	**Main Structure Strength**	OK / NG	A satellite shall have a sufficient structural strength with a necessary safety margin through the ground operation, testing, ground handling, and on-orbit operations	Analysis		
2.1.8(2)	**Rails Strength**	OK / NG	Each rail shall have a sufficient structural strength with 46.6N of a combined load of the preload and the spring load by the main spring.	Analysis		
2.1.9	**Stiffness**	Hz	Minimum fundamental frequency ≧ 30 [Hz]	Analysis		
2.2	**Electrical Interface**		[Title]			
2.2.1	**Deployment Switch**		[Title]			
2.2.1(1)	**Fault tolerant design**	OK / NG	Fault tolerant design according to SSP51721.	Review of Design		
2.2.1(2)	**Location of end rail switch**	OK / NG	Location of end rail switch shall conform to Figure 2.2.1-1	Review of Design		Figure 2.2.1-1 13
2.2.1(3)	**Location of side rail switch**	OK / NG	Location of side rail switch shall conform to Figure 2.2.1-2	Review of Design		Figure 2.2.1-2 14
2.2.1(4)	**Tip shape of side rail switch**	OK / NG	≧ R2.4	Review of Design		
2.2.1(5)	**Reaction force of side rail**	OK / NG	≦ 0.26 [N] per 1U size satellite.	Review of Design		
2.2.1(6)	**(N/A)**					
2.2.1(7)	**Power interruption function of end rail switch**	OK / NG	The end rail switch shall be set does not operate until it protrudes 0.75mm min. from rail surfaces (-Z)	Review of Design		Figure 2.2.1-4, 15
2.2.1(8)	**Power interruption function of side rail switch**	OK / NG	The side rail switch shall be set does not operate until it protrudes 2.5mm min . from rail surfaces (+/- X, +/- Y)	Review of Design		Figure 2.2.1-5, 16
2.2.1(9)	**Movable Stroke of end rail switch**					
	a. Stroke(a)	OK / NG	Deployment Switches shall store up to rail end face (-Z plane) while loading the satellite into the satellite launch case and satellite deploy case.	Review of Design		
	b. Stroke(b)	OK / NG	No structural deformation and destruction occur during the phase from launch to satellite deploy operation.	Review of Design		
	c. Stroke(c)	OK / NG	Do not affect the satellite in the -Z direction when the satellite deploy operation.	Review of Design		
2.2.1(10)	**Total spring force (-Z plane)**	OK / NG	1.08 ~ 5.3N	Review of Design		

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2.2.2	**Ground Handling Pin**		[Title]			
2.2.2(1)	**Design**	OK / NA / NG	Do not use the Ground Handling pin as a hazard control except for handling on the ground.	Review of Design		
2.2.2(2)	**Operation**	OK / NA / NG	Flight pin shall not be unintentionally separated from the satellite.	Review of Design		
2.2.3	**(N/A)**					
2.2.4	**RF**		Refer to 4.2.2.2(2)			
2.2.5	**(N/A)**					
2.3	**Operation Requirements**		[Title]			
2.3(1)	**Maximum Stowage Duration**	OK / NG	Maximum stowage duration shall assume the max stowage duration may be about 1 year.	Review of Design (*3)		
2.3(2)	**On-orbit Maintenance Limitation**	OK / NG	On-orbit maintenance limitation will not plan any activation, checkout, or maintenance after the delivery.	Review of Design (*3)		
2.3(3)	**Cold Launch Requirements**	OK / NG	A satellite shall have a capability to survive in the cold launch environment (i.e. w/o power).	Review of Design (*3)		
			(*3) It is allowed to describe a rationale in "Evidence document" instead of providing a document.			
2.3(4),(5)	**Minimum Time until Appendage Deployment & RF Radiation**					
	a. Timer Setting	OK / NG	≧ 30 minutes	Review of Design		
	b. Function Test	OK / NG	Whenever either of two deployment switches is re-depressed, the timer shall be reset.	Review of Design		
2.3(6)	**Limitation of the satellite**	OK / NG	A satellite deployment window shall not be restricted by a satellite design.	Review of Design		
2.4	**Environmental Requirements**		[Title]			
2.4.1	**Random Vibration and Acceleration**		[Title]			
2.4.1(a)	**Quasi-static Acceleration**	OK / NG	A satellite shall assume the condition defined in the section 2.4.1(a)	Analysis		
2.4.1(b)	**Random Vibration**	N/A	A satellite shall assume the condition defined in the section 2.4.1(b)	N/A		
2.4.2	**On-orbit Acceleration**		[Title]			
2.4.2(a)	**On-orbit Acceleration**	OK / NG	A satellite shall assume the condition defined in the section 2.4.2(a)	(Analysis)		
2.4.3	**Pressure Environment**		[Title]			
2.4.3(a)	**Pressure**	OK / NG	A satellite shall assume the condition defined in the section 2.4.3(a)	Review of Design (*4)		
2.4.3(b)	**Depressurization Rate**	m(*5)	If V/A > 50.8m (2000inch), Stress Analysis Report is needed.	Review of Design (or Analysis)		
			*(*4) It is allowed to write the purport of no problem in "Evidence document" instead of providing a document.* *(*5) Please fill in V/A.*			
2.4.4	**Thermal Environment**	OK / NG	A satellite shall assume the condition defined in the section 2.4.4.	Review of Design (or test)		
2.4.5	**Humidity Environment**	OK / NG	A satellite shall assume the condition defined in the section 2.4.5.	Review of Design (*4)		
2.5	**Out-gassing**	OK / NG	A satellite shall assume the condition defined in the section 2.5.	Review of Design (or Test)		

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
4	**Safety and Product Assurance**		[Title]			
4.1	**Generic Requirements**		[Guidelines]			
4.2	**Safety Assessment**		[Title]			
4.2.1	**Implementation of Safety Analysis and Safety Assessment**					
4.2.1(1)	**(a) On-orbit Safety**	Applied / NA	The satellite provider shall conduct safety analysis and submit an SAR. Necessary inspections and tests for safety assessment shall be also conducted.	Review of Design		
	(b) Launch Site & Vehicle Safety	Applied / NA	The satellite provider shall submit ATV/HTV/KSC Form 100 for launch site & vehicle safety assessment.	Review of Design		
4.2.1(2)	**Material Identification Usage List (MIUL)**	Applied / NA	The satellite provider shall submit MIUL.	Review of Design		
4.2.1(3)	**Materials Usage Agreement (MUA)**	Applied / NA	The satellite provider shall submit MUA.	Review of Design		
4.2.1(4)	**Volatile Organic Compound Usage Agreement (VUA)**	Applied / NA	The satellite provider shall submit VUA.	Review of Design		
4.2.1(5)	**Hazardous Material Summary Tables (HMST)**	Applied / NA	The satellite provider shall submit HMST.	Review of Design		
4.2.2	**Safety Design Guidelines**		[Guidelines]			
4.2.2.1	**Standard Hazard**		[Guidelines]			
4.2.2.1(1)	**Flammable Material**	Applied / NA	If the satellite has flammability materials such as non-metallic materials.	Review of Design		
4.2.2.1(2)	**Material Offgassing**	Applied / NA	If the satellite has offgassing materials such as non-metallic materials.	Review of Design		
4.2.2.1(3)	**Hazardous Material**	Applied / NA	If the satellite has toxic, or biological hazardous materials.	Review of Design		
4.2.2.1(4)	**Sharp Particles**	Applied / NA	If the satellite has glass or shatterable materials.	Review of Design		
4.2.2.1(5)	**Mechanical Hazards**	Applied / NA	If the satellite has sharp edges, corners, holes, etc.	Review of Design		
4.2.2.1(6)	**Touch Temperature**	Applied / NA	If the satellite has sources of heating and/or cooling.	Review of Design		
4.2.2.1(7)	**Laser and/or Incoherent Emissions**	Applied / NA	If the satellite has laser and/or incoherent emissions.	Review of Design		
4.2.2.1(8)	**Radiation Interference**	Applied / NA	If the satellite has non-ionizing radiation sources (electrical power supplies, batteries, antennas/transmitters).	Review of Design		
4.2.2.1(9)	**Rotating Equipment**	Applied / NA	If the satellite has rotating equipments.	Review of Design		
4.2.2.1(10)	**Sealed Container**	Applied / NA	If the satellite has sealed containers.	Review of Design		

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
4.2.2.2	**Unique Hazard**		[Guidelines]			
4.2.2.2(1)	**Structural Failure**	Applied / NA	To perform structural design and fracture control of the satellite.	Review of Design		
4.2.2.2(2)	**Radio Frequency (RF) Radiation**	Hz μV/m W/m2	Satellite RF emission levels do not exceed the levels in 4.2.2.2(2).	Review of Design		
4.2.2.2(3)	**Deployable Structure**	Applied / NA	If the satellite has deployable structures.	Review of Design		
4.2.2.2(4)	**Battery Failure**	Applied / NA	If the satellite has batteries.	Review of Design		
4.2.2.2(5)	**Propulsion, Deployable Subcomponents**	Applied / NA	If the satellite has propulsion system and/or deployable subcomponents.	Review of Design		
4.2.2.2(6)	**Other Failures**	Applied / NA	If the satellite may occur other hazards.	Review of Design		
4.3	**Safety Requirements for Deployable Satellite from ISS and Space Debris Mitigation Guidelines**		[Title]			
4.3.1	**Safety Requirements for Deployable Satellite**		[Title]			
4.3.1.1	**Deployable Satellite Design Requirements**		[Title]			
4.3.1.1.1	**Ballistic Number**		Refer to [2.1.5(2)]			
4.3.1.1.2	**Deployment Analysis**		[Title]			
4.3.1.1.2(1)	**Trackability of Satellite**	Applied / NA	The Satellite shall have a minimum flight cross section at least 78.5 cm2.	Review of Design		
4.3.1.1.3	**Propulsion Systems**		[Title]			
4.3.1.1.3(1)	**SSA Sharing Agreement**	Applied / NA	The satellite developer shall conclude a SSA sharing agreement (Space Situational Awareness) with USSPACECOM and submit the certificate to JAXA.	Review of Design		
4.3.1.1.3(2)	**Operation Process**	Applied / NA	The satellite developer shall coordinate with NASA of the operational process and prepare PIA, OIP, OA, etc., and submit the approved documents to JAXA.	Review of Design		
4.3.1.1.4	**Deployable Subcomponents**		[Title]			
4.3.1.1.4(1)	**Deploy distance**	Applied / NA	The satellite is more than 500 km forward or backward from the ISS relative to the ISS's forward direction.	Review of Design		
4.3.1.1.4(2)	**Deploy altitude**	Applied / NA	The apogee altitude of the main satellite and subcomponents must be lower than the perigee altitude of the ISS.	Review of Design		
4.3.2	**Compatibility with Space Debris Mitigation Guidelines**		[Guidelines]			

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference

【Note】
1) Unite:mm
2) All values shall be met after the surface coating
3) Bold portion (±Z plane) (━) shall be free from burrs (Also applicable for -Z plane.) 10a 10b 10c 10d

1U: Ha=113.5±0.1 (*)
1.5U:Ha=170.2±0.1 (*)、2U:Ha=227±0.2 (*)
3U: Ha=340.5±0.3(*)、4U:Ha=454.0±0.4(*)
5U:Ha=567.5±0.5(*), 6U:Ha=681.0±0.6(*)
(*)When using a separation spring, thickness of plunger flange shall be considered.

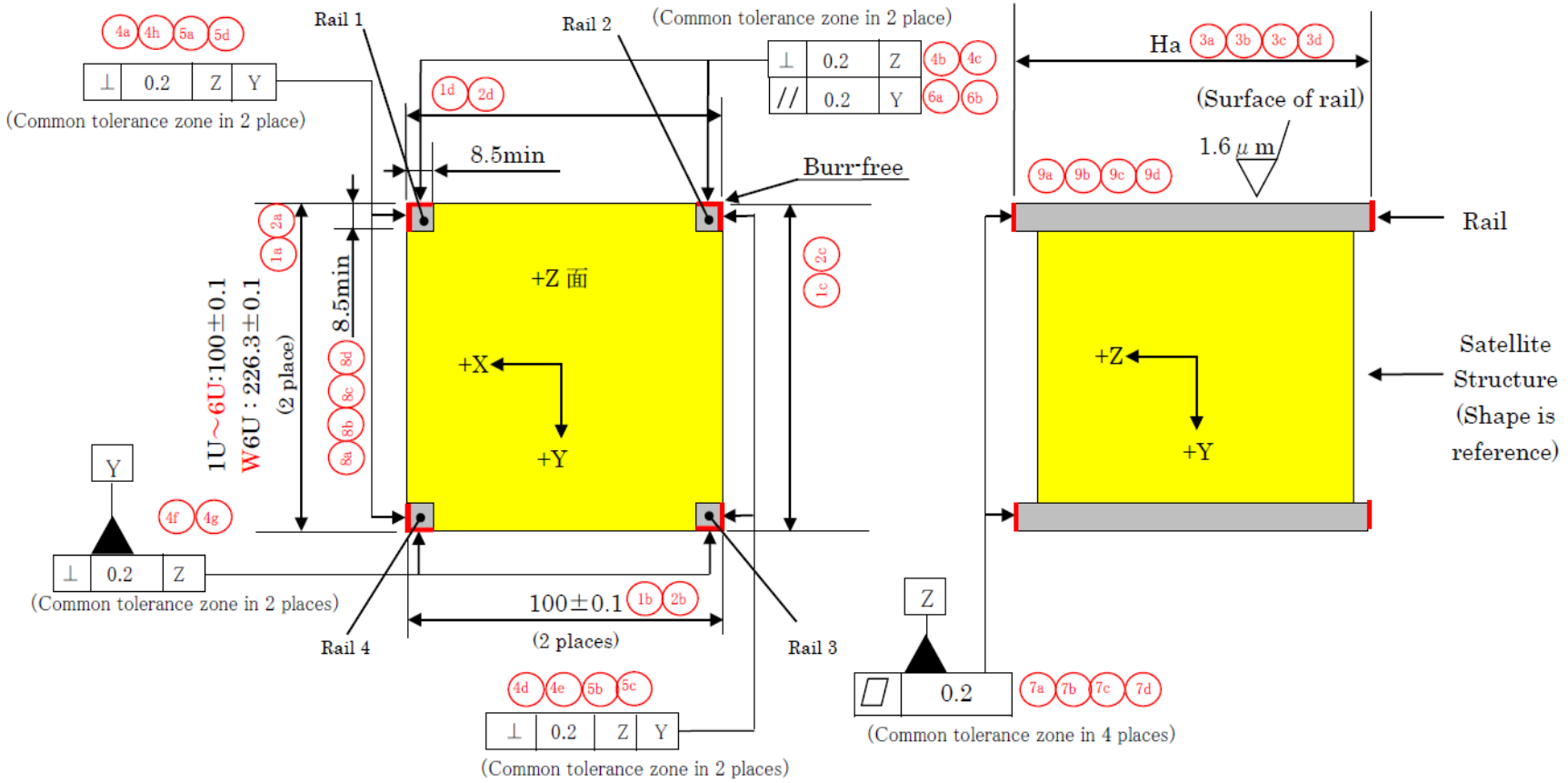
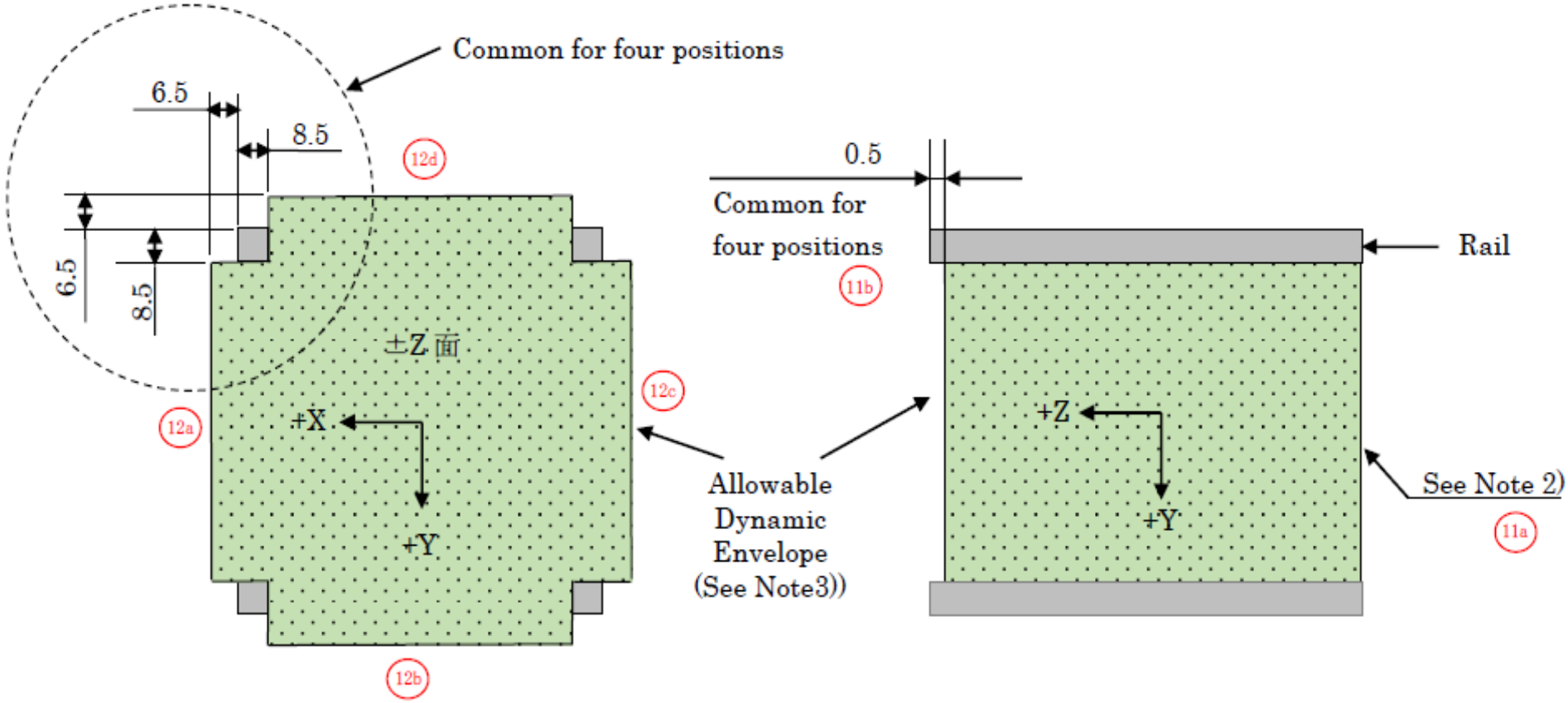


Figure 2.1.2-1 Dimensional Requierments for Satellite

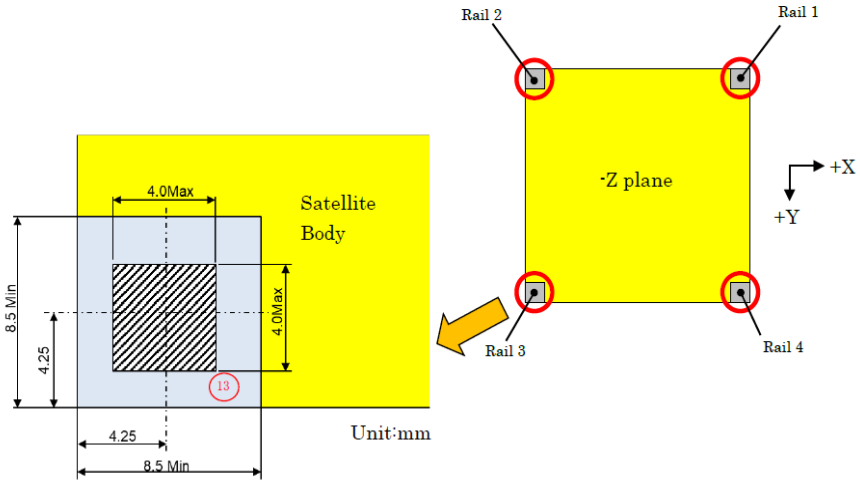
Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference



【Note】
1) Unit:mm
2) Any components shall be recessed from the edge of the −Z rail ends.
3) All external components shall be within the dynamic envelope.

Figure 2.1.4-1 Allowable Dynamic Envelope

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference



Detail Information for Separation Spring Interface

Figure 2.2.1-1 Location of Deployment Switch of end rail

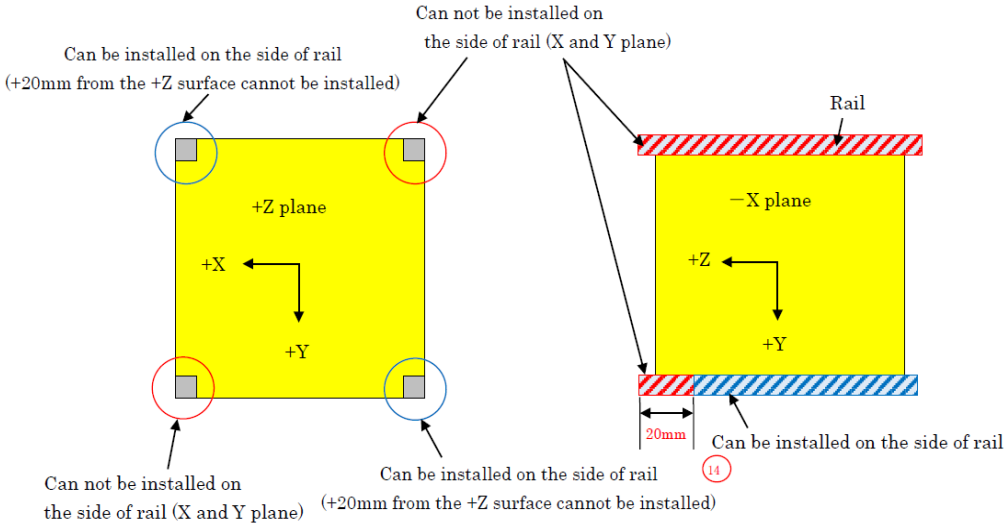


Figure2.2.1-2 Deployment Switch of side rail

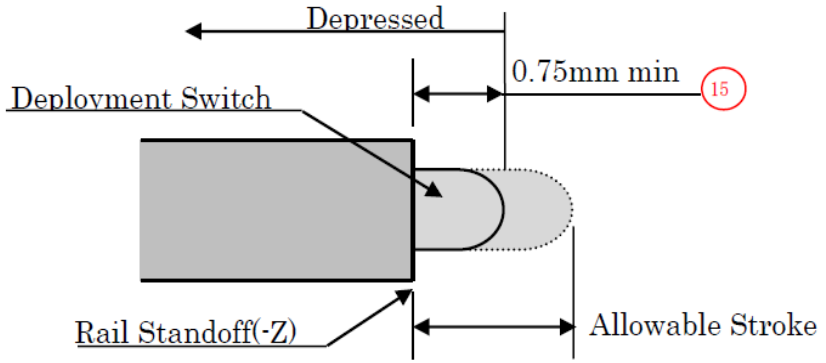


Figure2.2.1-4 Maximum Allowable Stroke of Deployment Switch on the end of the rail

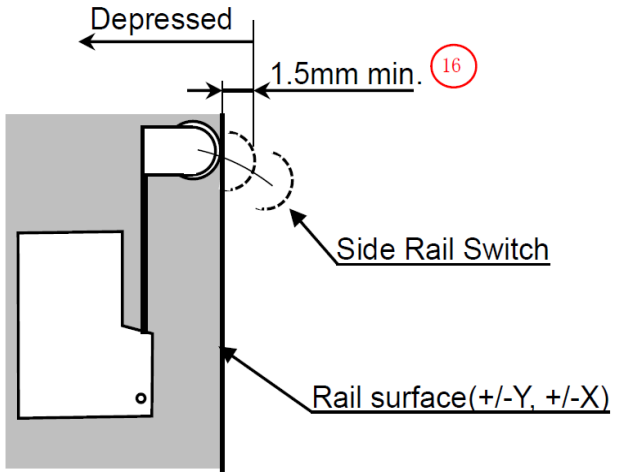


Figure 2.2.1-5 Maximum Allowable Stroke of Deployment Switches on the side of the rail

J-SSOD & [Satellite Name] Interface Verification Record
（For 10cm-sized Satellite Flight Model）

E

Satellite Developer Name ; [Defined by Satellite Developer]
Satellite Name ; [Defined by Satellite Developer]
P/N ; [Defined by Satellite Developer]
S/N ; [Defined by Satellite Developer]

SIGNATURES / Satellite Development, Sponsor agency

NAME	DATE
Satellite Development Team (Initiate)	

NAME	DATE
Satellite Development Team (Reviewed)	

NAME	DATE
Satellite Development Team (Approved)	

NAME	DATE
Sponsor Agency (Approved)	

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2	Interface Requirements for 10cm-sized Satellite		[Title]			
2.1	Mechanical Interfaces		[Title]			
2.1.1	Coordinate System		[Definition]			
2.1.2	Dimensional Requirements		[Title]			
2.1.2(1)	**Satellite Type**	1U / 1.5U / 2U / 3U 4U / 5U/ 6U	1U, 1.5U, 2U, 3U, 4U ,5U, 6U	Review of Design		
2.1.2(2)	**Width in -Z Plane**		100.0+/-0.1mm	Inspection (Measurement)		Figure2.1.2-1, 1a~1d
	a. +X Plane	mm				
	b. +Y Plane	mm				
	c. -X Plane	mm				
	d. -Y Plane	mm				
	Width in +Z Plane		100.0+/-0.1mm	Inspection (Measurement)		Figure2.1.2-1, 2a~2d
	a. +X Plane	mm				
	b. +Y Plane	mm				
	c. -X Plane	mm				
	d. -Y Plane	mm				
2.1.2(3)-(9)	**Rails Length**		113.5+/-0.1mm (1U) 170.2+/-0.1mm (1.5U) 227.0+/-0.2mm (2U) 340.5+/-0.3mm (3U) 454.0+/-0.4mm (4U) 567.5+/-0.5mm (5U) 681.0+/-0.6mm (6U)	Inspection (Measurement)		Figure2.1.2-1, 3a~3d
	a. Rail 1	mm				
	b. Rail 2	mm				
	c. Rail 3	mm				
	d. Rail 4	mm				

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2.1.3	Rails		[Title]			
2.1.3(1)	**Number of rails**		4	Review of Design		
2.1.3(2)	**Rails Perpendicularity against +Z Plane**		≦ 0.2mm	Inspection (Machine work order, Inspection report,etc.)		Figure 2.1.2-1, 4a~4h
	a. Rail 1, +X	OK / NG				
	b. Rail 1, -Y	OK / NG				
	c. Rail 2, -Y	OK / NG				
	d. Rail 2, -X	OK / NG				
	e. Rail 3, -X	OK / NG				
	f. Rail 3, +Y	OK / NG				
	g. Rail 4, +Y	OK / NG				
	h. Rail 4, +X	OK / NG				
	Rails Perpendicularity against +Y Plane		≦ 0.2mm	Inspection (Machine work order, Inspection report,etc.)		Figure 2.1.2-1, 5a~5d
	a. Rail 1, +X	OK / NG				
	b. Rail 2, -X	OK / NG				
	c. Rail 3, -X	OK / NG				
	d. Rail 4, +X	OK / NG				
	Rails Parallelism to +Y Plane		≦ 0.2mm	Inspection (Machine work order, Inspection report,etc.)		Figure 2.1.2-1, 6a~6b
	a. Rail 1, -Y	OK / NG				
	b. Rail 2, -Y	OK / NG				
	Rail Edges Flatness on +Z Plane		≦ 0.2mm	Inspection (Machine work order, Inspection report,etc.)		Figure 2.1.2-1, 7a~7d
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
2.1.3(3)	**Rails Width**		Min 8.5 x 8.5 mm	Inspection (Measurement)		Figure 2.1.2-1, 8a~8d
	a. Rail 1	x mm				
	b. Rail 2	x mm				
	c. Rail 3	x mm				
	d. Rail 4	x mm				
2.1.3(4)	**Rails Surface Roughness**		≦ 1.6 μm (Ra) (*1) (*1) Arithmetic average of the roughness profile.	Review of Design		Figure2.1.2-1, 9a~9d
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				

E

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2.1.3(5)	**Rails Edges Rounding**		Burr-free	Inspection (Machine work order, Inspection report,etc.)		Figure2.1.2-1, 10a~10d
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
2.1.3(6)	**Rails Surface Area (+Z Plane)**		Min 6.5 x 6.5 mm	Inspection (Manufacture drawing, etc.)		
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
2.1.3(7)	**Rails Contact Length with J-SSOD Rail Guides**		≧ 85.1mm (1U) ≧ 127.7mm (1.5U) ≧ 170.3mm (2U) ≧ 255.4mm (3U) ≧ 340.5mm (4U) ≧ 425.6mm (5U) ≧ 510.8mm (6U)	Analysis, Inspection (Assessment based on Manufacture drawing, etc.)		
	a. Rail 1, +X	mm				
	b. Rail 1, -Y	mm				
	c. Rail 2, -Y	mm				
	d. Rail 2, -X	mm				
	e. Rail 3, -X	mm				
	f. Rail 3, +Y	mm				
	g. Rail 4, +Y	mm				
	h. Rail 4, +X	mm				
2.1.3(8)	**(N/A)**					
2.1.3(9)	**Rail Surface Finish**		Anodized	Inspection, Review of Design (Machine work order, Inspection report,etc.)		
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
2.1.4	Envelope Requirements		[Title]			
2.1.4(1)	Dynamic Envelope		[Definition]			
2.1.4(2)	**Dynamic Envelope (±Z Plane)**	mm	≧ 0.5mm from rail surfaces (+ Z)	Inspection (*2) (Measurement)		Figure 2.1.4-1, 11a
2.1.4(3)	**Dynamic Envelope (-Z Plane)**	OK / NG	No protrusion from rail surfaces (- Z)	Inspection (*2) (Measurement)		Figure 2.1.4-1, 11b
2.1.4(4)	**Dynamic Envelope (+/- X and +/- Y Plane)**		≦ 6.5mm from rail surface (+/- X, +/- Y)	Inspection (*2) (Measurement)		Figure 2.1.4-1, 12a~12d
	a. +X Plane	mm				
	b. +Y Plane	mm				
	c. -X Plane	mm				
	d. -Y Plane	mm				
2.1.4(5)	**Constraints on deployable**	OK/NG	Any deployable components shall be constrained by the satellite itself.	Review of Design (*2)		
			(*2) Dynamic deformation shall be considered.			

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference	
2.1.5	Mass Properties		[Title]				
2.1.5(1)	**Mass**	Kg	0.13～1.33kg/1U (1U,1.5U,2U,3U,4U,5U,6U)	Inspection (Measurement)			
2.1.5(2)	**Ballistic Number**	kg/m2	≦ 115 kg/m2	Analysis			
2.1.5(3)	**(N/A)**			Analysis (or Test)			
2.1.6	Separation Spring		Refer to Appendix G				
2.1.7	Access Window		[Title]				
2.1.7(1)	**Operation**	OK / NG	Do not access the satellite after storing the case.	Review of Design			
2.1.8	Structural Strength		[Title]				
2.1.8(1)	**Main Structure Strength**	OK / NG	A satellite shall have a sufficient structural strength with a necessary safety margin through the ground operation, testing, ground handling, and on-orbit operations.	Analysis (Stress Analysis Report)			
2.1.8(2)	**Rails Strength**	OK / NG	Each rail shall have a sufficient structural strength with 46.6N of a combined load of the preload and the spring load by the main spring.	Analysis (Stress Analysis Report)			
2.1.9	**Stiffness**	Hz	Minimum fundamental frequency ≧ 30 [Hz]	Analysis (Stress Analysis Report)			
2.2	**Electrical Interface**		[Title]				
2.2.1	**Deployment Switch**		[Title]				
2.2.1(1)	**Fault tolerant design**	OK / NG	Fault tolerant design according to SSP51721.	Review of Design			
2.2.1(2)	**Location of end rail switch**	OK / NG	Location of end rail switch shall conform to Figure 2.2.1-1	Inspection, Review of Design		Figure 2.2.1-1 13	
2.2.1(3)	**Location of side rail switch**	OK / NG	Location of side rail switch shall conform to Figure 2.2.1-2	Inspection, Review of Design		Figure 2.2.1-2 14	
2.2.1(4)	**Tip shape of side rail switch**	OK / NG	≧ R2.4	Inspection, Review of Design			
2.2.1(5)	**Reaction force of side rail switch**	OK / NG	≦ 0.26 [N] per 1U size satellite.	Inspection, Review of Design			
2.2.1(6)	**(N/A)**						
2.2.1(7)	**Power interruption function of end rail switch**	OK / NG	The end rail switch shall be set does not operate until it protrudes 0.75mm min. from rail surfaces (-Z)	Test		Figure 2.2.1-4, 15	
2.2.1(8)	**Power interruption function of side rail switch**	OK / NG	The side rail switch shall be set does not operate until it protrudes 2.5mm min. from rail surfaces (+/- X, +/- Y)	Inspection, Test		Figure 2.2.1-5, 16	E-1

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2.2.1(9)	**Movable Stroke of end rail switch**					
	a. Stroke(a)	OK / NG	Deployment Switches shall store up to rail end face (-Z plane) while loading the satellite into the satellite launch case and satellite deploy case.	Inspection		
	b. Stroke(b)	OK / NG	No structural deformation and destruction occur during the phase from launch to satellite deploy operation.	Inspection		
	c. Stroke(c)	OK / NG	Do not affect the satellite in the -Z direction when the satellite deploy operation.	Inspection		
2.2.1(10)	**Total spring force (-Z plane)**	OK / NG	1.08 ~ 5.3N	Inspection (or Review of Design)		
2.2.2	**Ground Handling Pin**		[Title]			
2.2.2(1)	**Design**	OK / NA / NG	Do not use the Ground Handling pin as a hazard control except for handling on the ground.	Review of Design		
2.2.2(2)	**Operation**	OK / NA / NG	Flight pin shall not be unintentionally separated from the satellite.	Review of Design		
2.2.3	**(N/A)**					
2.2.4	**RF**		Refer to 4.2.2.2(2)			
2.2.5	**(N/A)**					
2.3	**Operation Requirements**		[Title]			
2.3(1)	**Maximum Stowage Duration**	OK / NG	Maximum stowage duration shall assume the max stowage duration may be about 1 year.	Review of Design (*3)		
2.3(2)	**On-orbit Maintenance Limitation**	OK / NG	On-orbit maintenance limitation will not plan any activation, checkout, or maintenance after the delivery.	Review of Design (*3)		
2.3(3)	**Cold Launch Requirements**	OK / NG	A satellite shall have a capability to survive in the cold launch environment (i.e. w/o power).	Review of Design (*3)		
			(*3) It is allowed to describe a rationale in "Evidence document" instead of providing a document.			
2.3(4),(5)	**Minimum Time until Appendage Deployment & RF Radiation**					
	a. Timer Setting	OK / NG	≧ 30 minutes	Test		
	b. Function Test	OK / NG	Whenever either of two deployment switches is re-depressed, the timer shall be reset.	Test		
2.3(6)	**Limitation of the satellite**	OK / NG	A satellite deployment window shall not be restricted by a satellite design.	Review of Design		

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2.4	**Environmental Requirements**		[Title]			
2.4.1	**Random Vibration and Acceleration**		[Title]			
2.4.1(a)	**Quasi-static Acceleration**	OK / NG	A satellite shall assume the condition defined in the section 2.4.1(a)	Analysis (Stress Analysis Report)		
2.4.1(b)	**Random Vibration**	OK / NG	A satellite shall assume the condition defined in the section 2.4.1(b)	Test (Vibration Test Report)		
2.4.2	**On-orbit Acceleration**		[Title]			
2.4.2(a)	**On-orbit Acceleration**	OK / NG	A satellite shall assume the condition defined in the section 2.4.2(a)	(Analysis) (Stress Analysis Report)		
2.4.3	**Pressure Environment**		[Title]			
2.4.3(a)	**Pressure**	OK / NG	A satellite shall assume the condition defined in the section 2.4.3(a)	Review of Design (*4)		
2.4.3(b)	**Depressurization Rate**	m(*5)	If V/A > 50.8m (2000inch), Stress Analysis Report is needed.	Review of Design (or Analysis)		
			*(*4) It is allowed to write the purport of no problem in "Evidence document" instead of providing a document.* *(*5) Please fill in V/A.*			
2.4.4	**Thermal Environment**	OK / NG	A satellite shall assume the condition defined in the section 2.4.4.	Review of Design (or test)		
2.4.5	**Humidity Environment**	OK / NG	A satellite shall assume the condition defined in the section 2.4.5.	Review of Design (*4)		
2.5	**Out-gassing**	OK / NG	A satellite shall assume the condition defined in the section 2.5.	Review of Design (or Inspection)		

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference	E
4	**Safety and Product Assurance**		[Title]				
4.1	**Generic Requirements**		[Guidelines]				
4.2	**Safety Assessment**		[Title]				
4.2.1	**Implementation of Safety Analysis and Safety Assessment**						
4.2.1(1)	**(a) On-orbit Safety**	OK / NA	The satellite provider shall conduct safety analysis and submit an SAR. Necessary inspections and tests for safety assessment shall be also conducted.	Analysis, test, Inspection (Phase III approved SAR)			
	(b) Launch Site & Vehicle Safety	OK / NA	The satellite provider shall submit ATV/HTV/KSC Form 100 for launch site & vehicle safety assessment.	Analysis, Test, Inspection (ATV/HTV/KSC Form 100 check list)			
4.2.1(2)	**Material Identification Usage List (MIUL)**	OK / NA	The satellite provider shall submit MIUL.	Analysis, Test, Inspection (MIUL)			
4.2.1(3)	**Materials Usage Agreement (MUA)**	OK / NA	The satellite provider shall submit MUA.	Analysis, Test, Inspection (MUA)			
4.2.1(4)	**Volatile Organic Compound Usage Agreement (VUA)**	OK / NA	The satellite provider shall submit VUA.	Analysis, Test, Inspection (VUA)			
4.2.1(5)	**Hazardous Material Summary Tables (HMST)**	OK / NA	The satellite provider shall submit HMST.	Analysis, Test, Inspection (HMST)			

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
4.2.2	**Safety Design Guidelines**		[Guidelines]			
4.2.2.1	**Standard Hazard**		[Guidelines]			
4.2.2.1(1)	**Flammable Material**	OK / NA	If the satellite has flammability materials such as non-metallic materials.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(2)	**Material Offgassing**	OK / NA	If the satellite has offgassing materials such as non-metallic materials.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(3)	**Hazardous Material**	OK / NA	If the satellite has toxic, or biological hazardous materials.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(4)	**Sharp Particles**	OK / NA	If the satellite has glass or shatterable materials.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(5)	**Mechanical Hazards**	OK / NA	If the satellite has sharp edges, corners, holes, etc.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(6)	**Touch Temperature**	OK / NA	If the satellite has sources of heating and/or cooling.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(7)	**Laser and/or Incoherent Emissions**	OK / NA	If the satellite has laser and/or incoherent emissions.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(8)	**Radiation Interference**	OK / NA	If the satellite has non-ionizing radiation sources (electrical power supplies, batteries, antennas/transmitters).	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(9)	**Rotating Equipment**	OK / NA	If the satellite has rotating equipments.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(10)	**Sealed Container**	OK / NA	If the satellite has sealed containers.	Analysis, test, Inspection (Phase III approved SAR)		

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference	E
4.2.2.2	**Unique Hazard**		[Guidelines]				
4.2.2.2(1)	**Structural Failure**	Applied / NA	To perform structural design and fracture control of the satellite.	Analysis, test, Inspection (Phase III approved SAR)			
4.2.2.2(2)	**Radio Frequency (RF) Radiation**	Hz μV/m W/m2	Satellite RF emission levels do not exceed the levels in 4.2.2.2(2).	Analysis, test, Inspection (Phase III approved SAR)			
4.2.2.2(3)	**Deployable Structure**	Applied / NA	If the satellite has deployable structures.	Analysis, test, Inspection (Phase III approved SAR)			
4.2.2.2(4)	**Battery Failure**	Applied / NA	If the satellite has batteries.	Analysis, test, Inspection (Phase III approved SAR)			
4.2.2.2(5)	**Propulsion, Deployable Subcomponents**	Applied / NA	If the satellite has propulsion system and/or deployable subcomponents.	Analysis, test, Inspection (Phase III approved SAR)			
4.2.2.2(6)	**Other Failures**	Applied / NA	If the satellite may occur other hazards.	Analysis, test, Inspection (Phase III approved SAR)			
4.3	**Safety Requirements for Deployable Satellite from ISS and Space Debris Mitigation Guidelines**		[Title]				
4.3.1	**Safety Requirements for Deployable Satellite**		[Title]				
4.3.1.1	**Deployable Satellite Design Requirements**		[Title]				
4.3.1.1.1	**Ballistic Number**		Refer to [2.1.5(2)]				
4.3.1.1.2	**Deployment Analysis**		[Title]				
4.3.1.1.2(1)	**Trackability of Satellite**	Applied / NA	The Satellite shall have a minimum flight cross section at least 78.5 cm2.	Inspection			
4.3.1.1.3	**Propulsion Systems**		[Title]				
4.3.1.1.3(1)	**SSA Sharing Agreement**	Applied / NA	The satellite developer shall conclude a SSA sharing agreement (Space Situational Awareness) with USSPACECOM and submit the certificate to JAXA.	Analysis, Test, Review of Design			
4.3.1.1.3(2)	**Operation Process**	Applied / NA	The satellite developer shall coordinate with NASA of the operational process and prepare PIA, OIP, OA, etc., and submit the approved documents to JAXA.	Analysis, Test, Review of Design			
4.3.1.1.4	**Deployable Subcomponents**		[Title]				
4.3.1.1.4(1)	**Deploy distance**	Applied / NA	The satellite is more than 500 km forward or backward from the ISS relative to the ISS's forward direction.	Analysis, Review of Design			
4.3.1.1.4(2)	**Deploy altitude**	Applied / NA	The apogee altitude of the main satellite and subcomponents must be lower than the perigee altitude of the ISS.	Analysis, Review of Design			
4.3.2	**Compatibility with Space Debris Mitigation Guidelines**		[Guidelines]				

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference

【Note】
1) Unite:mm
2) All values shall be met after the surface coating
3) Bold portion (±Z plane) (━) shall be free from burrs (Also applicable for −Z plane.) 10a 10b 10c 10d

1U: Ha=113.5±0.1 (*)
1.5U:Ha=170.2±0.1 (*)、2U:Ha=227±0.2 (*)
3U: Ha=340.5±0.3(*)、4U:Ha=454.0±0.4(*)
5U:Ha=567.5±0.5(*), 6U:Ha=681.0±0.6(*)
(*)When using a separation spring, thickness of plunger flange shall be considered.

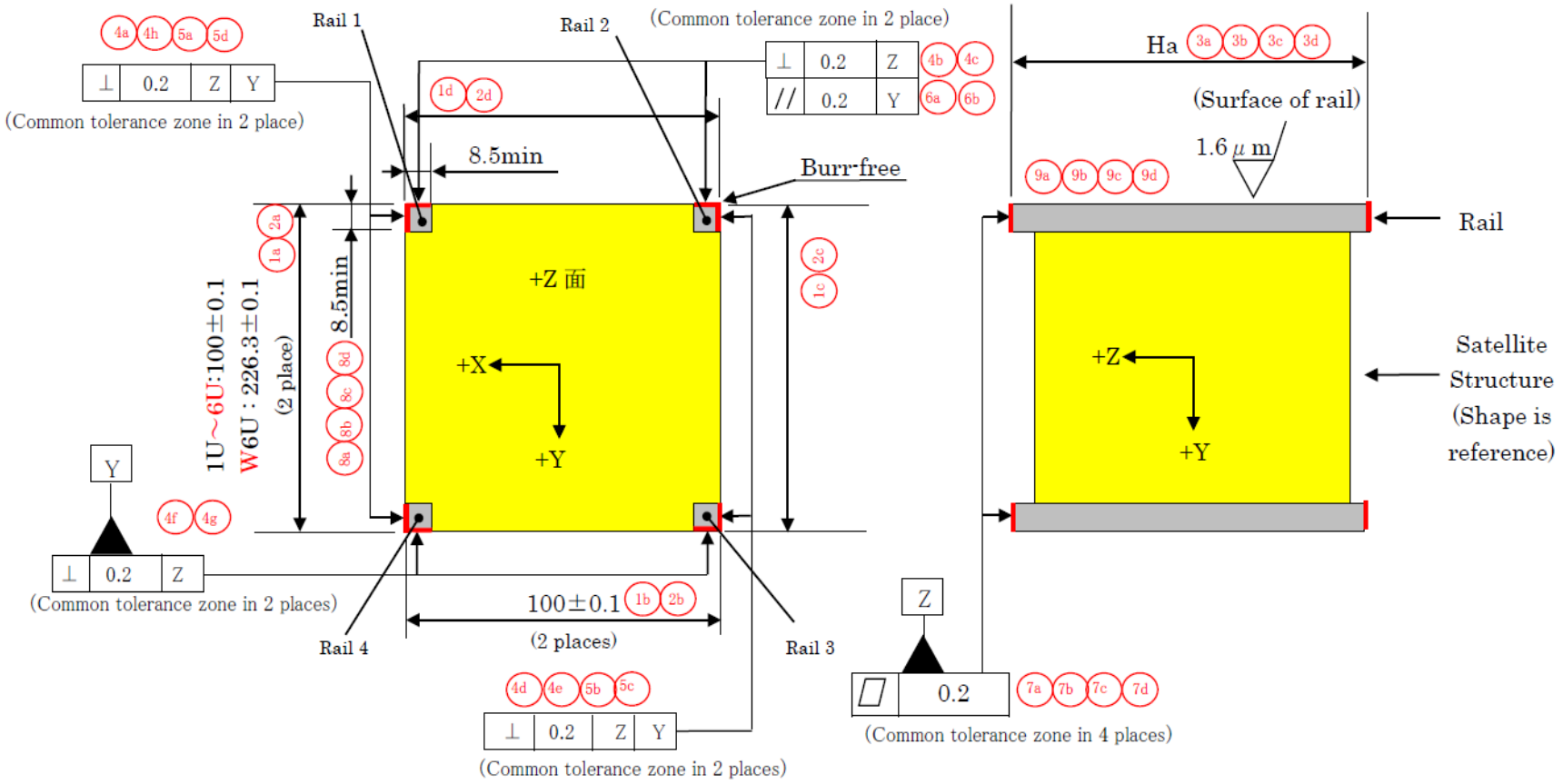
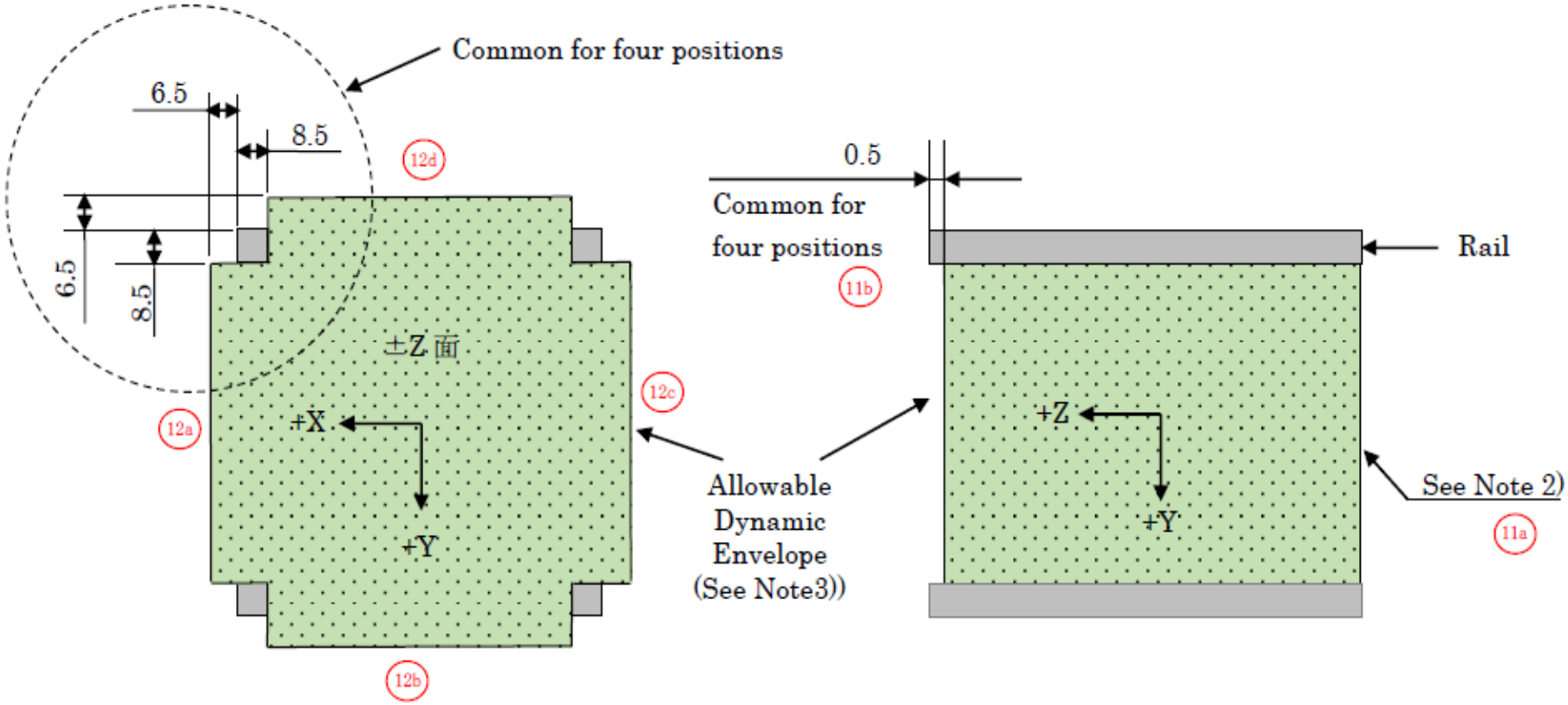


Figure 2.1.2-1 Dimensional Requierments for Satellite

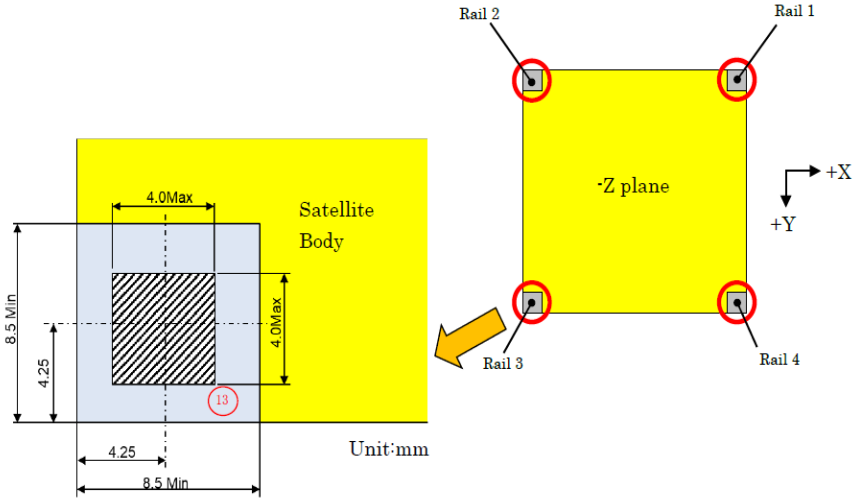
Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference	E



【Note】
1) Unit:mm
2) Any components shall be recessed from the edge of the −Z rail ends.
3) All external components shall be within the dynamic envelope.

Figure 2.1.4-1 Allowable Dynamic Envelope

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference	E



Detail Information for Separation Spring Interface

Figure 2.2.1-1 Location of Deployment Switch of end rail

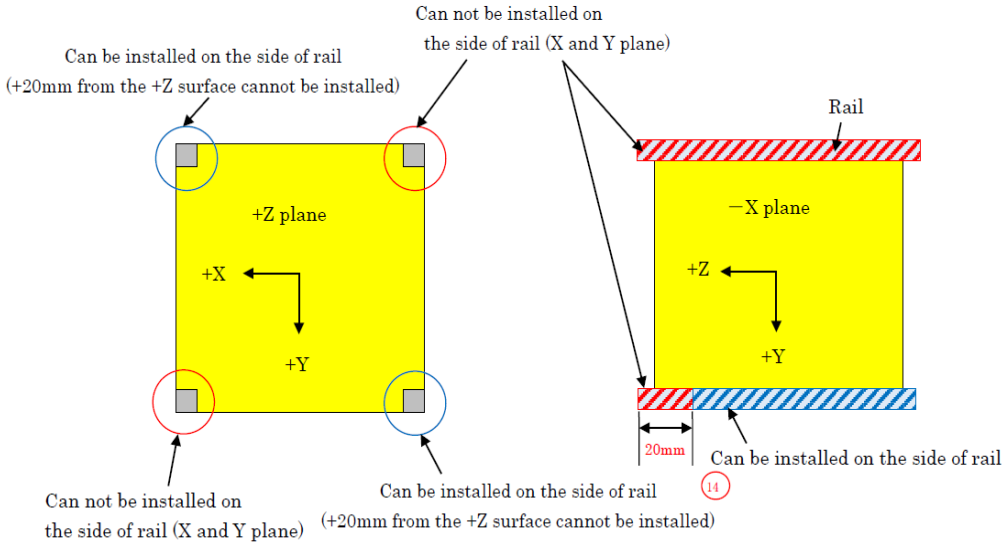


Figure2.2.1-2 Deployment Switch of side rail

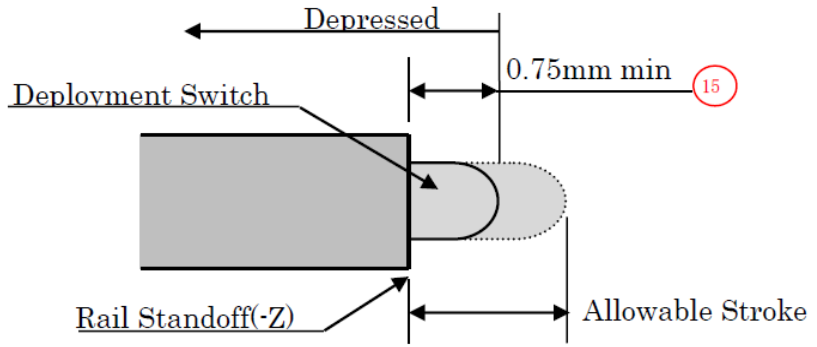


Figure2.2.1-4 Maximum Allowable Stroke of Deployment Switch on the end of the rail

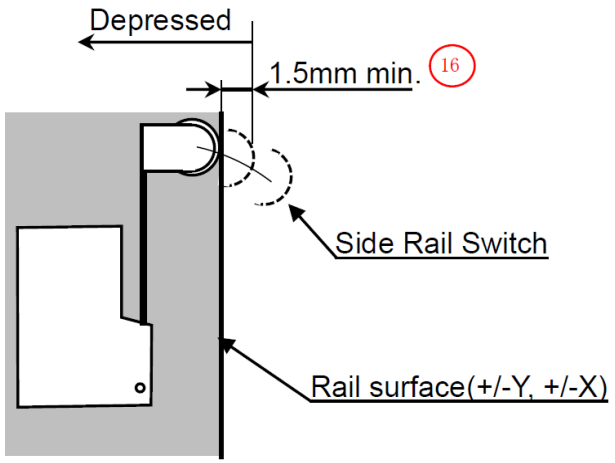


Figure 2.2.1-5 Maximum Allowable Stroke of Deployment Switches on the side of the rail

J-SSOD & [Satellite Name] Interface Verification Record
（For W6U-sized Satellite Design）

E

Satellite Developer Name ; [Defined by Satellite Developer]
Satellite Name ; [Defined by Satellite Developer]
P/N ; [Defined by Satellite Developer]
S/N ; [Defined by Satellite Developer]

SIGNATURES / Satellite Development, Sponsor agency

NAME	DATE
Satellite Development Team (Initiate)	

NAME	DATE
Satellite Development Team (Reviewed)	

NAME	DATE
Satellite Development Team (Approved)	

NAME	DATE
Sponsor Agency (Approved)	

Document No.

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2	Interface Requirements for W6U-sized Satellite		[Title]			
2.1	Mechanical Interfaces		[Title]			
2.1.1	Coordinate System		[Definition]			
2.1.2	Dimensional Requirements		[Title]			
2.1.2(1)	**Satellite Type**	W6U	W6U	Review of Design		
2.1.2(2)	**Width in -Z Plane**					
	a. +X Plane	mm	100.0+/-0.1mm	Review of Design		Figure2.1.2-1, 1a~1d
	b. -X Plane	mm				
	c. +Y Plane	mm	226.3+/-0.1mm			
	d. -Y Plane	mm				
	Width in +Z Plane					
	a. +X Plane	mm	100.0+/-0.1mm	Review of Design		Figure2.1.2-1, 2a~2d
	b. -X Plane	mm				
	c. +Y Plane	mm	226.3+/-0.1mm			
	d. -Y Plane	mm				
2.1.2(10)	**Rails Length**					
	a. Rail 1	mm	340.5+/-0.3mm or 366.0+/-0.3mm	Review of Design		Figure2.1.2-1, 3a~3d
	b. Rail 2	mm				
	c. Rail 3	mm				
	d. Rail 4	mm				

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2.1.3	Rails		[Title]			
2.1.3(1)	**Number of rails**		4	Review of Design		
2.1.3(2)	**Rails Perpendicularity against +Z Plane**		≦ 0.2mm	Review of Design		Figure 2.1.2-1, 4a~4h
	a. Rail 1, +X	OK / NG				
	b. Rail 1, -Y	OK / NG				
	c. Rail 2, -Y	OK / NG				
	d. Rail 2, -X	OK / NG				
	e. Rail 3, -X	OK / NG				
	f. Rail 3, +Y	OK / NG				
	g. Rail 4, +Y	OK / NG				
	h. Rail 4, +X	OK / NG				
	Rails Perpendicularity against +Y Plane		≦ 0.2mm	Review of Design		Figure 2.1.2-1, 5a~5d
	a. Rail 1, +X	OK / NG				
	b. Rail 2, -X	OK / NG				
	c. Rail 3, -X	OK / NG				
	d. Rail 4, +X	OK / NG				
	Rails Parallelism to +Y Plane		≦ 0.2mm	Review of Design		Figure 2.1.2-1, 6a~6b
	a. Rail 1, -Y	OK / NG				
	b. Rail 2, -Y	OK / NG				
	Rail Edges Flatness on +Z Plane		≦ 0.2mm	Review of Design		Figure 2.1.2-1, 7a~7d
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
2.1.3(3)	**Rails Width**		Min 8.5 x 8.5 mm	Review of Design		Figure 2.1.2-1, 8a~8d
	a. Rail 1	x mm				
	b. Rail 2	x mm				
	c. Rail 3	x mm				
	d. Rail 4	x mm				
2.1.3(4)	**Rails Surface Roughness**		≦ 1.6 μm (Ra) (*1) (*1) Arithmetic average of the roughness profile.	Review of Design		Figure2.1.2-1, 9a~9d
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2.1.3(5)	**Rails Edges Rounding**		Burr-free	Review of Design		Figure2.1.2-1, 10a~10d
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
2.1.3(6)	**Rails Surface Area (+Z Plane)**		Min 6.5 x 6.5 mm	Review of Design		
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
2.1.3(7)	**Rails Contact Length with J-SSOD Rail Guides**		≧ 255.4mm (340.5mm(+Z)) ≧ 274.5mm (366.0mm(+Z))	Analysis		
	a. Rail 1, +X	mm				
	b. Rail 1, -Y	mm				
	c. Rail 2, -Y	mm				
	d. Rail 2, -X	mm				
	e. Rail 3, -X	mm				
	f. Rail 3, +Y	mm				
	g. Rail 4, +Y	mm				
	h. Rail 4, +X	mm				
2.1.3(8)	**(N/A)**					
2.1.3(9)	**Rail Surface Finish**		Anodized	Review of Design		
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
2.1.4	Envelope Requirements		[Title]			
2.1.4(1)	Dynamic Envelope		[Definition]			
2.1.4(2)	**Dynamic Envelope (+Z Plane)**	mm	≧ 0.5mm from rail surfaces (+ Z)	Review of Design (*2)		Figure 2.1.4-1, 11a
2.1.4(3)	**Dynamic Envelope (-Z Plane)**	OK / NG	No protrusion from rail surfaces (- Z)	Review of Design (*2)		Figure 2.1.4-1, 11b
2.1.4(4)	**Dynamic Envelope (+/- X and +/- Y Plane)**			Review of Design (*2)		Figure 2.1.4-1, 12a~12d
	a. +X Plane	mm	≦ 6.5mm from rail surface			
	b. +Y Plane	mm	≦ 12.5mm from rail surface			
	c. -X Plane	mm	≦ 6.5mm from rail surface			
	d. -Y Plane	mm	≦ 12.5mm from rail surface			
2.1.4(5)	**Constraints on deployable**	OK/NG	Any deployable components shall be constrained by the satellite itself.	Review of Design (*2)		
			(*2) Dynamic deformation shall be considered.			

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2.1.5	Mass Properties		[Title]			
2.1.5(1)	**Mass**	Kg	W6U(X:100xY:226.3xZ:340.5)≦10.2kg W6U(X:100xY:226.3xZ:340.5)≦10.8kg	Analysis		
2.1.5(2)	**Ballistic Number**	kg/m2	≦ 115 kg/m2	Analysis		
2.1.5(3)	**(N/A)**					
2.1.6	Separation Spring		Refer to Appendix G			
2.1.7	Access Window		[Title]			
2.1.7(1)	**Operation**	OK / NG	Do not access the satellite after storing the case.	Review of Design		
2.1.8	Structural Strength		[Title]			
2.1.8(1)	**Main Structure Strength**	OK / NG	A satellite shall have a sufficient structural strength with a necessary safety margin through the ground operation, testing, ground handling, and on-orbit operations.	Analysis		
2.1.8(2)	**Rails Strength**	OK / NG	Each rail shall have a sufficient structural strength with 46.6N of a combined load of the preload and the spring load by the main spring.	Analysis		
2.1.9	**Stiffness**	Hz	Minimum fundamental frequency ≧ 30 [Hz]	Analysis		
2.2	**Electrical Interface**		[Title]			
2.2.1	**Deployment Switch**		[Title]			
2.2.1(1)	**Fault tolerant design**	OK / NG	Fault tolerant design according to SSP51721.	Review of Design		
2.2.1(2)	**Location of end rail switch**	OK / NG	Location of end rail switch shall conform to Figure 2.2.1-1	Review of Design		Figure 2.2.1-1 13
2.2.1(3)	**Location of side rail switch**	OK / NG	Location of side rail switch shall conform to Figure 2.2.1-3	Review of Design		Figure 2.2.1-3 14
2.2.1(4)	**Tip shape of side rail switch**	OK / NG	≧ R1	Review of Design		
2.2.1(5)	**Reaction force of side rail switch**	OK / NG	≦ 1.4 [N]	Review of Design		
2.2.1(6)	**(N/A)**					
2.2.1(7)	**Power interruption function of end rail switch**	OK / NG	The end rail switch shall be set does not operate until it protrudes 0.75mm min. from rail surfaces (-Z)	Review of Design		Figure 2.2.1-4, 15
2.2.1(8)	**Power interruption function of side rail switch**	OK / NG	The side rail switch shall be set does not operate until it protrudes 1.0mm min. from rail surfaces (+/- X, +/- Y)	Review of Design		Figure 2.2.1-5, 16
2.2.1(9)	**Movable Stroke of end rail switch**					
	a. Stroke(a)	OK / NG	Deployment Switches shall store up to rail end face (-Z plane) while loading the satellite into the satellite launch case and satellite deploy case.	Review of Design		
	b. Stroke(b)	OK / NG	No structural deformation and destruction occur during the phase from launch to satellite deploy operation.	Review of Design		
	c. Stroke(c)	OK / NG	Do not affect the satellite in the -Z direction when the satellite deploy operation.	Review of Design		
2.2.1(10)	**Total spring force (-Z plane)**	OK / NG	≦6N	Review of Design		

E

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2.2.2	**Ground Handling Pin**		[Title]			
2.2.2(1)	**Design**	OK / NA / NG	Do not use the Ground Handling pin as a hazard control except for handling on the ground.	Review of Design		
2.2.2(2)	**Operation**	OK / NA / NG	Flight pin shall not be unintentionally separated from the satellite.	Review of Design		
2.2.3	**(N/A)**					
2.2.4	**RF**		Refer to 4.2.2.2(2)			
2.2.5	**(N/A)**					
2.3	**Operation Requirements**		[Title]			
2.3(1)	**Maximum Stowage Duration**	OK / NG	Maximum stowage duration shall assume the max stowage duration may be about 1 year.	Review of Design (*3)		
2.3(2)	**On-orbit Maintenance Limitation**	OK / NG	On-orbit maintenance limitation will not plan any activation, checkout, or maintenance after the delivery.	Review of Design (*3)		
2.3(3)	**Cold Launch Requirements**	OK / NG	A satellite shall have a capability to survive in the cold launch environment (i.e. w/o power).	Review of Design (*3)		
			(*3) It is allowed to describe a rationale in "Evidence document" instead of providing a document.			
2.3(4),(5)	**Minimum Time until Appendage Deployment & RF Radiation**					
	a. Timer Setting	OK / NG	≧ 30 minutes	Review of Design		
	b. Function Test	OK / NG	Whenever either of two deployment switches is re-depressed, the timer shall be reset.	Review of Design		
2.3(6)	**Limitation of the satellite**	OK / NG	A satellite deployment window shall not be restricted by a satellite design.	Review of Design		
2.4	**Environmental Requirements**		[Title]			
2.4.1	**Random Vibration and Acceleration**		[Title]			
2.4.1(a)	**Quasi-static Acceleration**	OK / NG	A satellite shall assume the condition defined in the section 2.4.1(a)	Analysis		
2.4.1(b)	**Random Vibration**	N/A	A satellite shall assume the condition defined in the section 2.4.1(b)	N/A		
2.4.2	**On-orbit Acceleration**		[Title]			
2.4.2(a)	**On-orbit Acceleration**	OK / NG	A satellite shall assume the condition defined in the section 2.4.2(a)	(Analysis)		
2.4.3	**Pressure Environment**		[Title]			
2.4.3(a)	**Pressure**	OK / NG	A satellite shall assume the condition defined in the section 2.4.3(a)	Review of Design (*4)		
2.4.3(b)	**Depressurization Rate**	m(*5)	If V/A > 50.8m (2000inch), Stress Analysis Report is needed.	Review of Design (or Analysis)		
			*(*4) It is allowed to write the purport of no problem in "Evidence document" instead of providing a document.* *(*5) Please fill in V/A.*			
2.4.4	**Thermal Environment**	OK / NG	A satellite shall assume the condition defined in the section 2.4.4.	Review of Design (or test)		
2.4.5	**Humidity Environment**	OK / NG	A satellite shall assume the condition defined in the section 2.4.5.	Review of Design (*4)		
2.5	**Out-gassing**	OK / NG	A satellite shall assume the condition defined in the section 2.5.	Review of Design (or Test)		

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
4	**Safety and Product Assurance**		[Title]			
4.1	**Generic Requirements**		[Guidelines]			
4.2	**Safety Assessment**		[Title]			
4.2.1	**Implementation of Safety Analysis and Safety Assessment**					
4.2.1(1)	**(a) On-orbit Safety**	Applied / NA	The satellite provider shall conduct safety analysis and submit an SAR. Necessary inspections and tests for safety assessment shall be also conducted.	Review of Design		
	(b) Launch Site & Vehicle Safety	Applied / NA	The satellite provider shall submit ATV/HTV/KSC Form 100 for launch site & vehicle safety assessment.	Review of Design		
4.2.1(2)	**Material Identification Usage List (MIUL)**	Applied / NA	The satellite provider shall submit MIUL.	Review of Design		
4.2.1(3)	**Materials Usage Agreement (MUA)**	Applied / NA	The satellite provider shall submit MUA.	Review of Design		
4.2.1(4)	**Volatile Organic Compound Usage Agreement (VUA)**	Applied / NA	The satellite provider shall submit VUA.	Review of Design		
4.2.1(5)	**Hazardous Material Summary Tables (HMST)**	Applied / NA	The satellite provider shall submit HMST.	Review of Design		
4.2.2	**Safety Design Guidelines**		[Guidelines]			
4.2.2.1	**Standard Hazard**		[Guidelines]			
4.2.2.1(1)	**Flammable Material**	Applied / NA	If the satellite has flammability materials such as non-metallic materials.	Review of Design		
4.2.2.1(2)	**Material Offgassing**	Applied / NA	If the satellite has offgassing materials such as non-metallic materials.	Review of Design		
4.2.2.1(3)	**Hazardous Material**	Applied / NA	If the satellite has toxic, or biological hazardous materials.	Review of Design		
4.2.2.1(4)	**Sharp Particles**	Applied / NA	If the satellite has glass or shatterable materials.	Review of Design		
4.2.2.1(5)	**Mechanical Hazards**	Applied / NA	If the satellite has sharp edges, corners, holes, etc.	Review of Design		
4.2.2.1(6)	**Touch Temperature**	Applied / NA	If the satellite has sources of heating and/or cooling.	Review of Design		
4.2.2.1(7)	**Laser and/or Incoherent Emissions**	Applied / NA	If the satellite has laser and/or incoherent emissions.	Review of Design		
4.2.2.1(8)	**Radiation Interference**	Applied / NA	If the satellite has non-ionizing radiation sources (electrical power supplies, batteries, antennas/transmitters).	Review of Design		
4.2.2.1(9)	**Rotating Equipment**	Applied / NA	If the satellite has rotating equipments.	Review of Design		
4.2.2.1(10)	**Sealed Container**	Applied / NA	If the satellite has sealed containers.	Review of Design		

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
4.2.2.2	**Unique Hazard**		[Guidelines]			
4.2.2.2(1)	**Structural Failure**	Applied / NA	To perform structural design and fracture control of the satellite.	Review of Design		
4.2.2.2(2)	**Radio Frequency (RF) Radiation**	Hz μV/m W/m2	Satellite RF emission levels do not exceed the levels in 4.2.2.2(2).	Review of Design		
4.2.2.2(3)	**Deployable Structure**	Applied / NA	If the satellite has deployable structures.	Review of Design		
4.2.2.2(4)	**Battery Failure**	Applied / NA	If the satellite has batteries.	Review of Design		
4.2.2.2(5)	**Propulsion, Deployable Subcomponents**	Applied / NA	If the satellite has propulsion system and/or deployable subcomponents.	Review of Design		
4.2.2.2(6)	**Other Failures**	Applied / NA	If the satellite may occur other hazards.	Review of Design		
4.3	**Safety Requirements for Deployable Satellite from ISS and Space Debris Mitigation Guidelines**		[Title]			
4.3.1	**Safety Requirements for Deployable Satellite**		[Title]			
4.3.1.1	**Deployable Satellite Design Requirements**		[Title]			
4.3.1.1.1	**Ballistic Number**		Refer to [2.1.5(2)]			
4.3.1.1.2	**Deployment Analysis**		[Title]			
4.3.1.1.2(1)	**Trackability of Satellite**	Applied / NA	The Satellite shall have a minimum flight cross section at least 78.5 cm2.	Review of Design		
4.3.1.1.3	**Propulsion Systems**		[Title]			
4.3.1.1.3(1)	**SSA Sharing Agreement**	Applied / NA	The satellite developer shall conclude a SSA sharing agreement (Space Situational Awareness) with USSPACECOM and submit the certificate to JAXA.	Review of Design		
4.3.1.1.3(2)	**Operation Process**	Applied / NA	The satellite developer shall coordinate with NASA of the operational process and prepare PIA, OIP, OA, etc., and submit the approved documents to JAXA.	Review of Design		
4.3.1.1.4	**Deployable Subcomponents**		[Title]			
4.3.1.1.4(1)	**Deploy distance**	Applied / NA	The satellite is more than 500 km forward or backward from the ISS relative to the ISS's forward direction.	Review of Design		
4.3.1.1.4(2)	**Deploy altitude**	Applied / NA	The apogee altitude of the main satellite and subcomponents must be lower than the perigee altitude of the ISS.	Review of Design		
4.3.2	**Compatibility with Space Debris Mitigation Guidelines**		[Guidelines]			

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference

【Note】
4) Unite:mm
5) All values shall be met after the surface coating
6) Bold portion (±Z plane) (━) shall be free from burrs (Also applicable for −Z plane.) 10a 10b 10c 10d

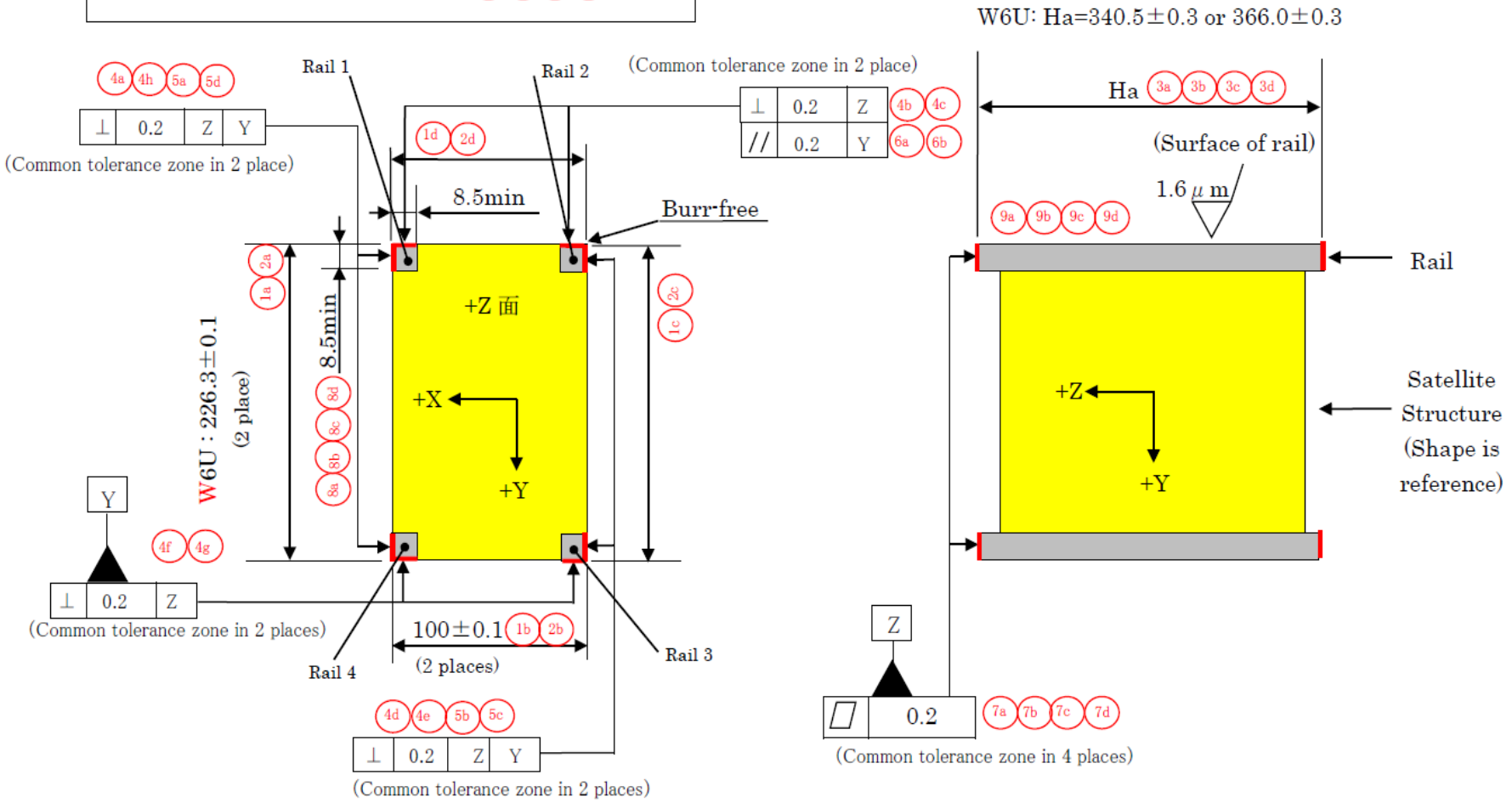
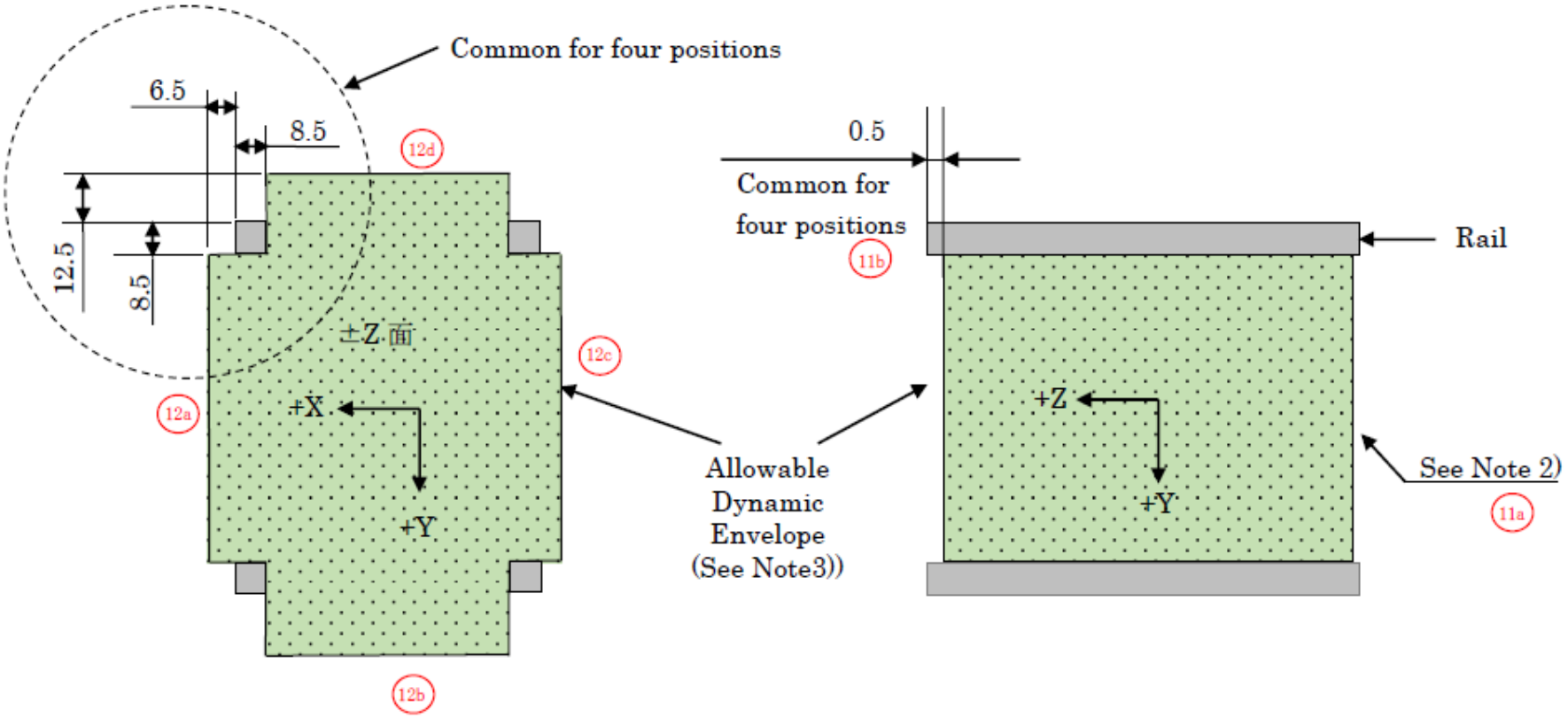


Figure 2.1.2-1 Dimensional Requierments for Satellite

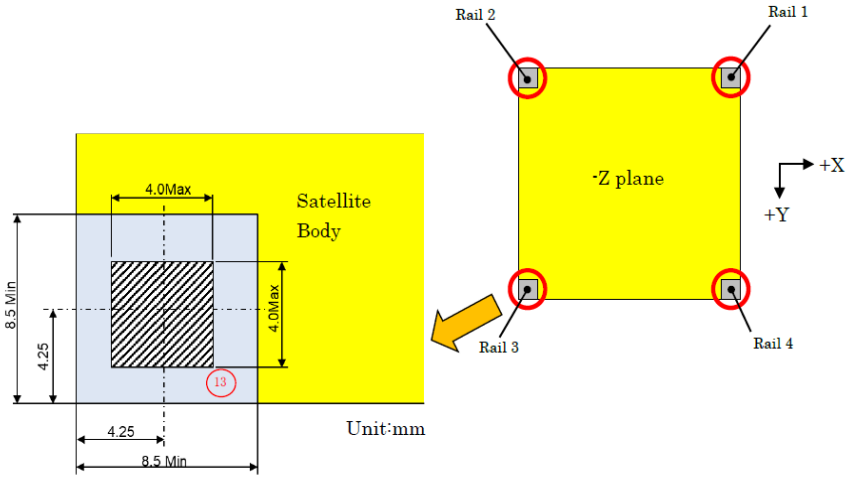
Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference



【Note】
4) Unit:mm
5) Any components shall be recessed from the edge of the −Z rail ends.
6) All external components shall be within the dynamic envelope.

Figure 2.1.4-1 Allowable Dynamic Envelope (W6U Satellite)

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference



Detail Information for Separation Spring Interface

Figure 2.2.1-1 Location of Deployment Switch of end rail

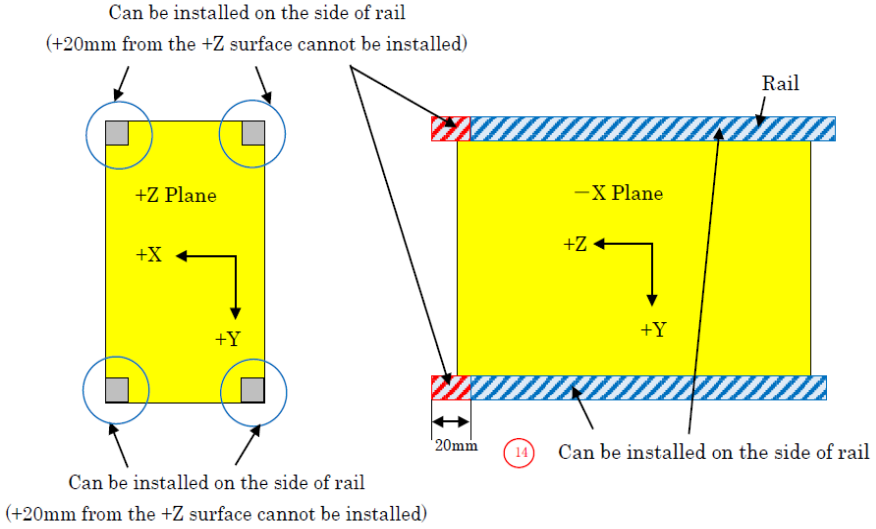


Figure 2.2.1-3 Deployment Switch of side rail (W6U satellite)

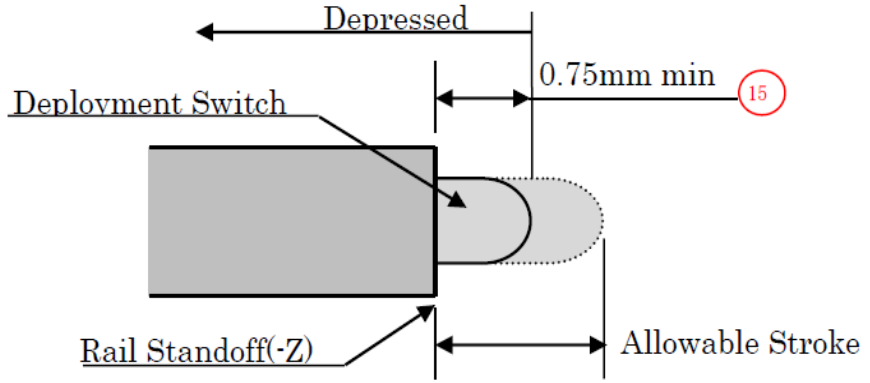


Figure2.2.1-4 Maximum Allowable Stroke of Deployment Switch on the end of the rail

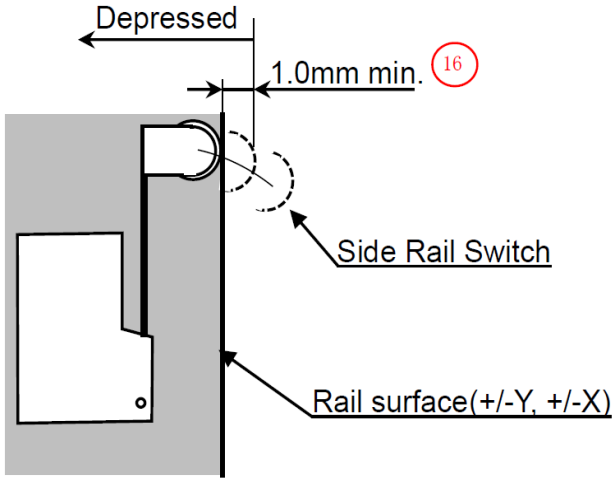


Figure 2.2.1-5 Maximum Allowable Stroke of Deployment Switches on the side of the rail (W6U Satellite)

J-SSOD & [Satellite Name] Interface Verification Record
（For W6U-sized Satellite Flight Model）

E

Satellite Developer Name ; [Defined by Satellite Developer]
Satellite Name ; [Defined by Satellite Developer]
P/N ; [Defined by Satellite Developer]
S/N ; [Defined by Satellite Developer]

SIGNATURES / Satellite Development, Sponsor agency

NAME	DATE
Satellite Development Team (Initiate)	

NAME	DATE
Satellite Development Team (Reviewed)	

NAME	DATE
Satellite Development Team (Approved)	

NAME	DATE
Sponsor Agency (Approved)	

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2	Interface Requirements for W6U-sized Satellite		[Title]			
2.1	Mechanical Interfaces		[Title]			
2.1.1	Coordinate System		[Definition]			
2.1.2	Dimensional Requirements		[Title]			
2.1.2(1)	**Satellite Type**	W6U	W6U	Review of Design		
2.1.2(2)	**Width in -Z Plane**					
	a. +X Plane	mm	100.0+/-0.1mm	Inspection (Measurement)		Figure2.1.2-1, 1a~1d
	b. +Y Plane	mm				
	c. -X Plane	mm	226.3+/-0.1mm			
	d. -Y Plane	mm				
	Width in +Z Plane					
	a. +X Plane	mm	100.0+/-0.1mm	Inspection (Measurement)		Figure2.1.2-1, 2a~2d
	b. +Y Plane	mm				
	c. -X Plane	mm	226.3+/-0.1mm			
	d. -Y Plane	mm				
2.1.2(10)	**Rails Length**					
	a. Rail 1	mm	340.5+/-0.3mm or 366.0+/-0.3mm	Inspection (Measurement)		Figure2.1.2-1, 3a~3d
	b. Rail 2	mm				
	c. Rail 3	mm				
	d. Rail 4	mm				

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2.1.3	Rails		[Title]			
2.1.3(1)	**Number of rails**		4	Review of Design		
2.1.3(2)	**Rails Perpendicularity against +Z Plane**		≦ 0.2mm	Inspection (Machine work order, Inspection report,etc.)		Figure 2.1.2-1, 4a~4h
	a. Rail 1, +X	OK / NG				
	b. Rail 1, -Y	OK / NG				
	c. Rail 2, -Y	OK / NG				
	d. Rail 2, -X	OK / NG				
	e. Rail 3, -X	OK / NG				
	f. Rail 3, +Y	OK / NG				
	g. Rail 4, +Y	OK / NG				
	h. Rail 4, +X	OK / NG				
	Rails Perpendicularity against +Y Plane		≦ 0.2mm	Inspection (Machine work order, Inspection report,etc.)		Figure 2.1.2-1, 5a~5d
	a. Rail 1, +X	OK / NG				
	b. Rail 2, -X	OK / NG				
	c. Rail 3, -X	OK / NG				
	d. Rail 4, +X	OK / NG				
	Rails Parallelism to +Y Plane		≦ 0.2mm	Inspection (Machine work order, Inspection report,etc.)		Figure 2.1.2-1, 6a~6b
	a. Rail 1, -Y	OK / NG				
	b. Rail 2, -Y	OK / NG				
	Rail Edges Flatness on +Z Plane		≦ 0.2mm	Inspection (Machine work order, Inspection report,etc.)		Figure 2.1.2-1, 7a~7d
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
2.1.3(3)	**Rails Width**		Min 8.5 x 8.5 mm	Inspection (Measurement)		Figure 2.1.2-1, 8a~8d
	a. Rail 1	x mm				
	b. Rail 2	x mm				
	c. Rail 3	x mm				
	d. Rail 4	x mm				
2.1.3(4)	**Rails Surface Roughness**		≦ 1.6 μ m (Ra) (*1) (*1) Arithmetic average of the roughness profile.	Review of Design		Figure2.1.2-1, 9a~9d
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				

E

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2.1.3(5)	**Rails Edges Rounding**		Burr-free	Inspection (Machine work order, Inspection report,etc.)		Figure2.1.2-1, 10a~10d
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
2.1.3(6)	**Rails Surface Area (+Z Plane)**		Min 6.5 x 6.5 mm	Inspection (Manufacture drawing, etc.)		
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
2.1.3(7)	**Rails Contact Length with J-SSOD Rail Guides**		≧ 255.4mm (350.5mm(+Z)) ≧ 274.5mm (366.0mm(+Z))	Analysis, Inspection (Assessment based on Manufacture drawing, etc.)		
	a. Rail 1, +X	mm				
	b. Rail 1, -Y	mm				
	c. Rail 2, -Y	mm				
	d. Rail 2, -X	mm				
	e. Rail 3, -X	mm				
	f. Rail 3, +Y	mm				
	g. Rail 4, +Y	mm				
	h. Rail 4, +X	mm				
2.1.3(8)	**(N/A)**					
2.1.3(9)	**Rail Surface Finish**		Anodized	Inspection, Review of Design (Machine work order, Inspection report,etc.)		
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
2.1.4	Envelope Requirements		[Title]			
2.1.4(1)	Dynamic Envelope		[Definition]			
2.1.4(2)	**Dynamic Envelope (±Z Plane)**	mm	≧ 0.5mm from rail surfaces (+ Z)	Inspection (*2) (Measurement)		Figure 2.1.4-1, 11a
2.1.4(3)	**Dynamic Envelope (-Z Plane)**	OK / NG	No protrusion from rail surfaces (- Z)	Inspection (*2) (Measurement)		Figure 2.1.4-1, 11b
2.1.4(4)	**Dynamic Envelope (+/- X and +/- Y Plane)**			Inspection (*2) (Measurement)		Figure 2.1.4-1, 12a~12d
	a. +X Plane	mm	≦ 6.5mm from rail surface			
	b. +Y Plane	mm	≦ 12.5mm from rail surface			
	c. -X Plane	mm	≦ 6.5mm from rail surface			
	d. -Y Plane	mm	≦ 12.5mm from rail surface			
2.1.4(5)	**Constraints on deployable**	OK/NG	Any deployable components shall be constrained by the satellite itself.	Review of Design (*2)		
			(*2) Dynamic deformation shall be considered.			

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2.1.5	Mass Properties		[Title]			
2.1.5(1)	**Mass**	Kg	W6U(X:100xY:226.3xZ:340.5)≦10.2kg W6U(X:100xY:226.3xZ:340.5)≦10.8kg	Inspection (Measurement)		
2.1.5(2)	**Ballistic Number**	kg/m2	≦ 115 kg/m2	Analysis		
2.1.5(3)	**(N/A)**					
2.1.6	Separation Spring		Refer to Appendix G			
2.1.7	Access Window		[Title]			
2.1.7(1)	**Operation**	OK / NG	Do not access the satellite after storing the case.	Review of Design		
2.1.8	Structural Strength		[Title]			
2.1.8(1)	**Main Structure Strength**	OK / NG	A satellite shall have a sufficient structural strength with a necessary safety margin through the ground operation, testing, ground handling, and on-orbit operations.	Analysis (Stress Analysis Report)		
2.1.8(2)	**Rails Strength**	OK / NG	Each rail shall have a sufficient structural strength with 46.6N of a combined load of the preload and the spring load by the main spring.	Analysis (Stress Analysis Report)		
2.1.9	**Stiffness**	Hz	Minimum fundamental frequency ≧ 30 [Hz]	Analysis (Stress Analysis Report)		
2.2	**Electrical Interface**		[Title]			
2.2.1	**Deployment Switch**		[Title]			
2.2.1(1)	**Fault tolerant design**	OK / NG	Fault tolerant design according to SSP51721.	Review of Design		
2.2.1(2)	**Location of end rail switch**	OK / NG	Location of end rail switch shall conform to Figure 2.2.1-1	Inspection, Review of Design		Figure 2.2.1-1 13
2.2.1(3)	**Location of side rail switch**	OK / NG	Location of side rail switch shall conform to Figure 2.2.1-3	Inspection, Review of Design		Figure 2.2.1-3 14
2.2.1(4)	**Tip shape of side rail switch**	OK / NG	≧ R1	Inspection, Review of Design		
2.2.1(5)	**Reaction force of side rail switch**	OK / NG	≦ 1.4 [N]	Inspection, Review of Design		
2.2.1(6)	**(N/A)**					
2.2.1(7)	**Power interruption function of end rail switch**	OK / NG	The end rail switch shall be set does not operate until it protrudes 0.75mm min. from rail surfaces (-Z)	Test		Figure 2.2.1-4, 15
2.2.1(8)	**Power interruption function of side rail switch**	OK / NG	The side rail switch shall be set does not operate until it protrudes 1.0mm min. from rail surfaces (+/- X, +/- Y)	Inspection, Test		Figure 2.2.1-5, 16

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2.2.1(9)	**Movable Stroke of end rail switch**					
	a. Stroke(a)	OK / NG	Deployment Switches shall store up to rail end face (-Z plane) while loading the satellite into the satellite launch case and satellite deploy case.	Inspection		
	b. Stroke(b)	OK / NG	No structural deformation and destruction occur during the phase from launch to satellite deploy operation.	Inspection		
	c. Stroke(c)	OK / NG	Do not affect the satellite in the -Z direction when the satellite deploy operation.	Inspection		
2.2.1(10)	**Total spring force (-Z plane)**	OK / NG	≦6N	Inspection (or Review of Design)		
2.2.2	**Ground Handling Pin**		[Title]			
2.2.2(1)	**Design**	OK / NA / NG	Do not use the Ground Handling pin as a hazard control except for handling on the ground.	Review of Design		
2.2.2(2)	**Operation**	OK / NA / NG	Flight pin shall not be unintentionally separated from the satellite.	Review of Design		
2.2.3	**(N/A)**					
2.2.4	**RF**		Refer to 4.2.2.2(2)			
2.2.5	**(N/A)**					
2.3	**Operation Requirements**		[Title]			
2.3(1)	**Maximum Stowage Duration**	OK / NG	Maximum stowage duration shall assume the max stowage duration may be about 1 year.	Review of Design (*3)		
2.3(2)	**On-orbit Maintenance Limitation**	OK / NG	On-orbit maintenance limitation will not plan any activation, checkout, or maintenance after the delivery.	Review of Design (*3)		
2.3(3)	**Cold Launch Requirements**	OK / NG	A satellite shall have a capability to survive in the cold launch environment (i.e. w/o power).	Review of Design (*3)		
			(*3) It is allowed to describe a rationale in "Evidence document" instead of providing a document.			
2.3(4),(5)	**Minimum Time until Appendage Deployment & RF Radiation**					
	a. Timer Setting	OK / NG	≧ 30 minutes	Test		
	b. Function Test	OK / NG	Whenever either of two deployment switches is re-depressed, the timer shall be reset.	Test		
2.3(6)	**Limitation of the satellite**	OK / NG	A satellite deployment window shall not be restricted by a satellite design.	Review of Design		

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
2.4	**Environmental Requirements**		[Title]			
2.4.1	**Random Vibration and Acceleration**		[Title]			
2.4.1(a)	**Quasi-static Acceleration**	OK / NG	A satellite shall assume the condition defined in the section 2.4.1(a)	Analysis (Stress Analysis Report)		
2.4.1(b)	**Random Vibration**	OK / NG	A satellite shall assume the condition defined in the section 2.4.1(b)	Test (Vibration Test Report)		
2.4.2	**On-orbit Acceleration**		[Title]			
2.4.2(a)	**On-orbit Acceleration**	OK / NG	A satellite shall assume the condition defined in the section 2.4.2(a)	(Analysis) (Stress Analysis Report)		
2.4.3	**Pressure Environment**		[Title]			
2.4.3(a)	**Pressure**	OK / NG	A satellite shall assume the condition defined in the section 2.4.3(a)	Review of Design (*4)		
2.4.3(b)	**Depressurization Rate**	m(*5)	If V/A > 50.8m (2000inch), Stress Analysis Report is needed.	Review of Design (or Analysis)		
			*(*4) It is allowed to write the purport of no problem in "Evidence document" instead of providing a document.* *(*5) Please fill in V/A.*			
2.4.4	**Thermal Environment**	OK / NG	A satellite shall assume the condition defined in the section 2.4.4.	Review of Design (or test)		
2.4.5	**Humidity Environment**	OK / NG	A satellite shall assume the condition defined in the section 2.4.5.	Review of Design (*4)		
2.5	**Out-gassing**	OK / NG	A satellite shall assume the condition defined in the section 2.5.	Review of Design (or Inspection)		

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
4	**Safety and Product Assurance**		[Title]			
4.1	**Generic Requirements**		[Guidelines]			
4.2	**Safety Assessment**		[Title]			
4.2.1	**Implementation of Safety Analysis and Safety Assessment**					
4.2.1(1)	**(a) On-orbit Safety**	OK / NA	The satellite provider shall conduct safety analysis and submit an SAR. Necessary inspections and tests for safety assessment shall be also conducted.	Analysis, test, Inspection (Phase III approved SAR)		
	(b) Launch Site & Vehicle Safety	OK / NA	The satellite provider shall submit ATV/HTV/KSC Form 100 for launch site & vehicle safety assessment.	Analysis, Test, Inspection (ATV/HTV/KSC Form 100 check list)		
4.2.1(2)	**Material Identification Usage List (MIUL)**	OK / NA	The satellite provider shall submit MIUL.	Analysis, Test, Inspection (MIUL)		
4.2.1(3)	**Materials Usage Agreement (MUA)**	OK / NA	The satellite provider shall submit MUA.	Analysis, Test, Inspection (MUA)		
4.2.1(4)	**Volatile Organic Compound Usage Agreement (VUA)**	OK / NA	The satellite provider shall submit VUA.	Analysis, Test, Inspection (VUA)		
4.2.1(5)	**Hazardous Material Summary Tables (HMST)**	OK / NA	The satellite provider shall submit HMST.	Analysis, Test, Inspection (HMST)		

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
4.2.2	**Safety Design Guidelines**		[Guidelines]			
4.2.2.1	**Standard Hazard**		[Guidelines]			
4.2.2.1(1)	**Flammable Material**	OK / NA	If the satellite has flammability materials such as non-metallic materials.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(2)	**Material Offgassing**	OK / NA	If the satellite has offgassing materials such as non-metallic materials.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(3)	**Hazardous Material**	OK / NA	If the satellite has toxic, or biological hazardous materials.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(4)	**Sharp Particles**	OK / NA	If the satellite has glass or shatterable materials.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(5)	**Mechanical Hazards**	OK / NA	If the satellite has sharp edges, corners, holes, etc.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(6)	**Touch Temperature**	OK / NA	If the satellite has sources of heating and/or cooling.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(7)	**Laser and/or Incoherent Emissions**	OK / NA	If the satellite has laser and/or incoherent emissions.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(8)	**Radiation Interference**	OK / NA	If the satellite has non-ionizing radiation sources (electrical power supplies, batteries, antennas/transmitters).	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(9)	**Rotating Equipment**	OK / NA	If the satellite has rotating equipments.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(10)	**Sealed Container**	OK / NA	If the satellite has sealed containers.	Analysis, test, Inspection (Phase III approved SAR)		

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
4.2.2.2	**Unique Hazard**		[Guidelines]			
4.2.2.2(1)	**Structural Failure**	Applied / NA	To perform structural design and fracture control of the satellite.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.2(2)	**Radio Frequency (RF) Radiation**	Hz μV/m W/m2	Satellite RF emission levels do not exceed the levels in 4.2.2.2(2).	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.2(3)	**Deployable Structure**	Applied / NA	If the satellite has deployable structures.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.2(4)	**Battery Failure**	Applied / NA	If the satellite has batteries.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.2(5)	**Propulsion, Deployable Subcomponents**	Applied / NA	If the satellite has propulsion system and/or deployable subcomponents.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.2(6)	**Other Failures**	Applied / NA	If the satellite may occur other hazards.	Analysis, test, Inspection (Phase III approved SAR)		
4.3	**Safety Requirements for Deployable Satellite from ISS and Space Debris Mitigation Guidelines**		[Title]			
4.3.1	**Safety Requirements for Deployable Satellite**		[Title]			
4.3.1.1	**Deployable Satellite Design Requirements**		[Title]			
4.3.1.1.1	**Ballistic Number**		Refer to [2.1.5(2)]			
4.3.1.1.2	**Deployment Analysis**		[Title]			
4.3.1.1.2(1)	**Trackability of Satellite**	Applied / NA	The Satellite shall have a minimum flight cross section at least 78.5 cm2.	Inspection		
4.3.1.1.3	**Propulsion Systems**		[Title]			
4.3.1.1.3(1)	**SSA Sharing Agreement**	Applied / NA	The satellite developer shall conclude a SSA sharing agreement (Space Situational Awareness) with USSPACECOM and submit the certificate to JAXA.	Analysis, Test, Review of Design		
4.3.1.1.3(2)	**Operation Process**	Applied / NA	The satellite developer shall coordinate with NASA of the operational process and prepare PIA, OIP, OA, etc., and submit the approved documents to JAXA.	Analysis, Test, Review of Design		
4.3.1.1.4	**Deployable Subcomponents**		[Title]			
4.3.1.1.4(1)	**Deploy distance**	Applied / NA	The satellite is more than 500 km forward or backward from the ISS relative to the ISS's forward direction.	Analysis, Review of Design		
4.3.1.1.4(2)	**Deploy altitude**	Applied / NA	The apogee altitude of the main satellite and subcomponents must be lower than the perigee altitude of the ISS.	Analysis, Review of Design		
4.3.2	**Compatibility with Space Debris Mitigation Guidelines**		[Guidelines]			

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference

【Note】
4) Unite:mm
5) All values shall be met after the surface coating
6) Bold portion (±Z plane) (━) shall be free from burrs (Also applicable for −Z plane.) 10a 10b 10c 10d

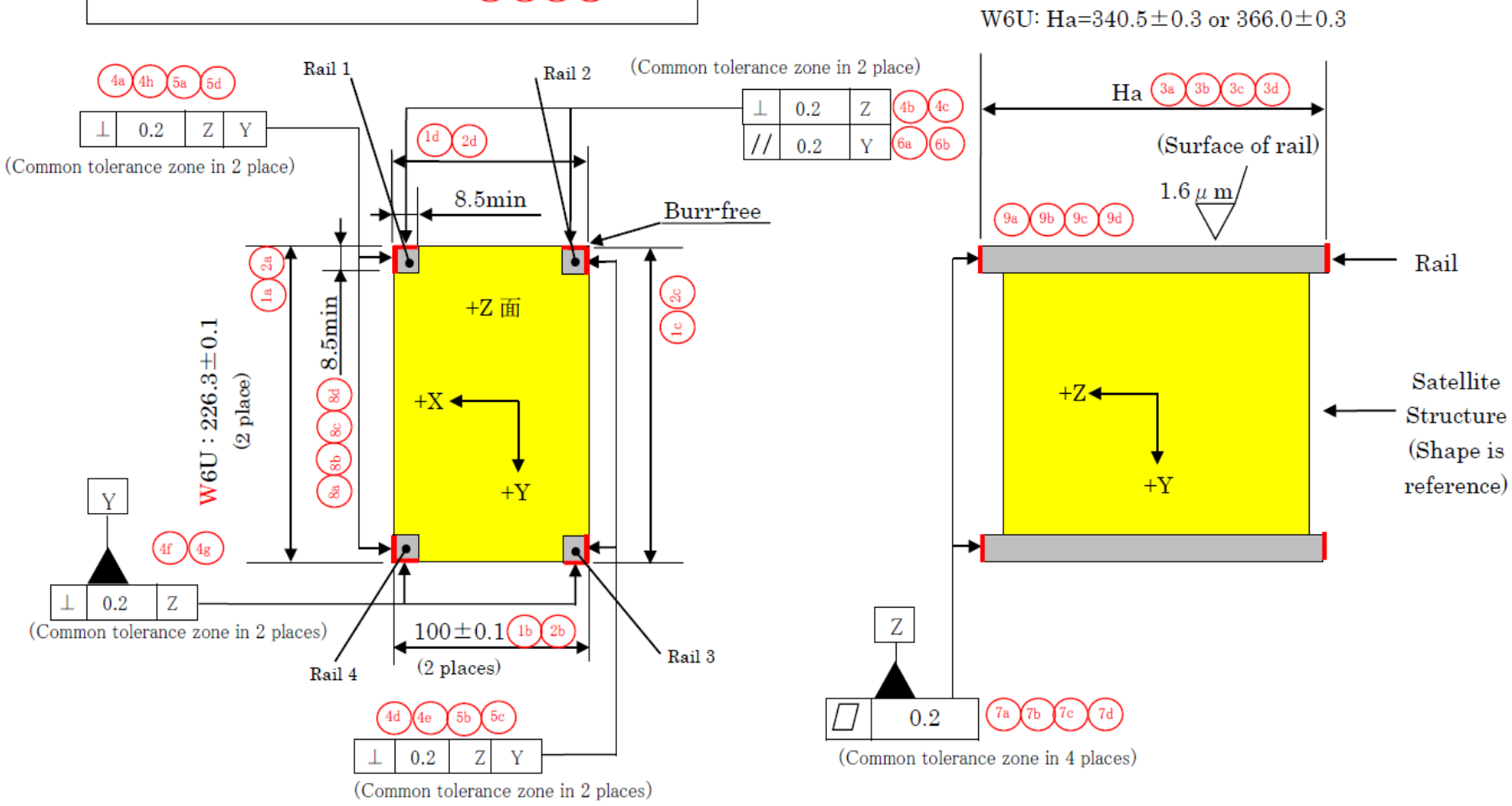
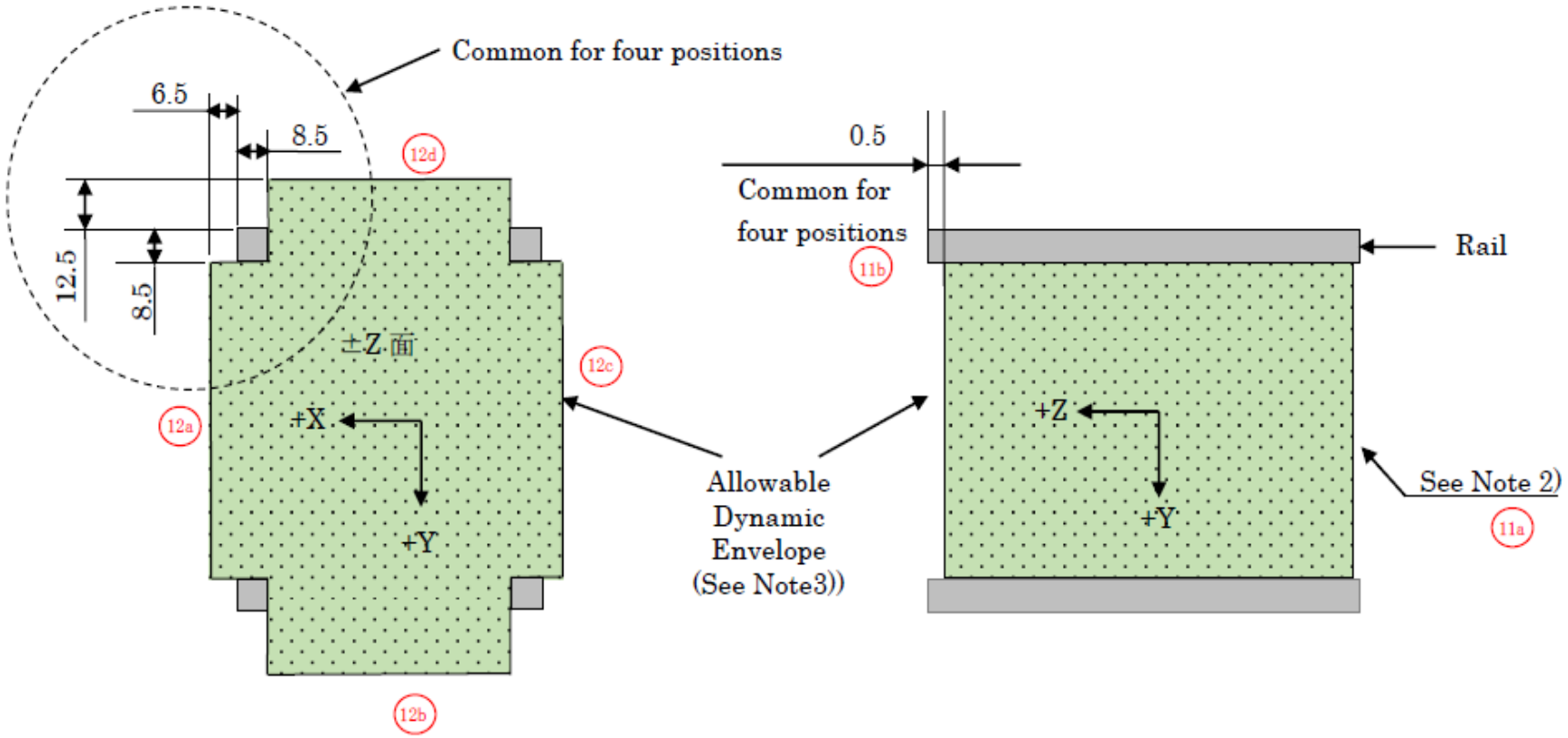


Figure 2.1.2-1 Dimensional Requierments for Satellite

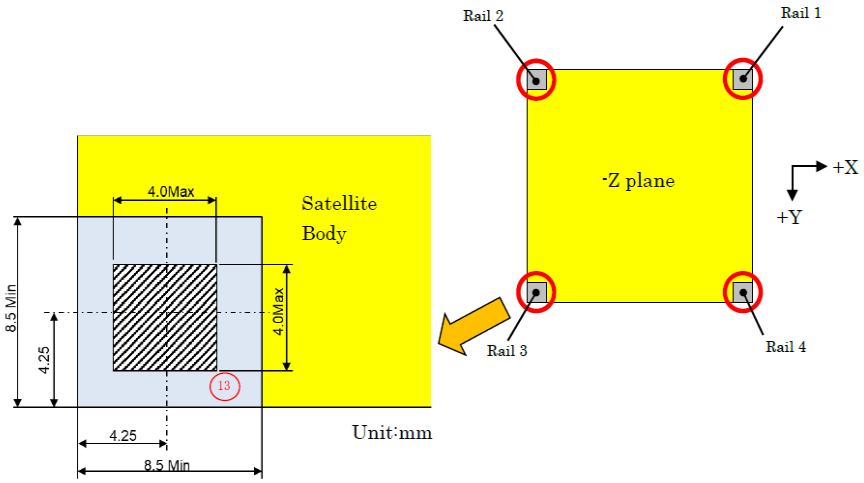
Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference



【Note】
4) Unit:mm
5) Any components shall be recessed from the edge of the −Z rail ends.
6) All external components shall be within the dynamic envelope.

Figure 2.1.4-1 Allowable Dynamic Envelope (W6U Satellite)

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference



Detail Information for Separation Spring Interface

Figure 2.2.1-1 Location of Deployment Switch of end rail

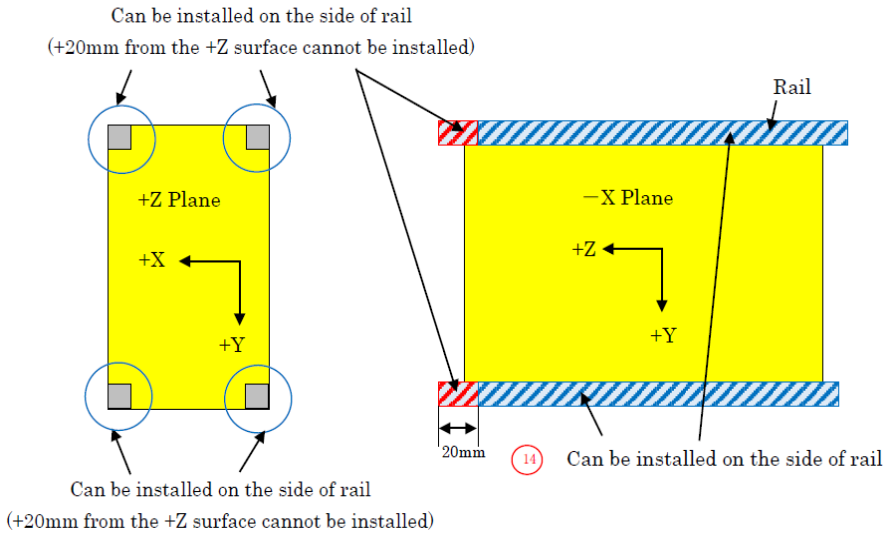


Figure 2.2.1-3 Deployment Switch of side rail (W6U satellite)

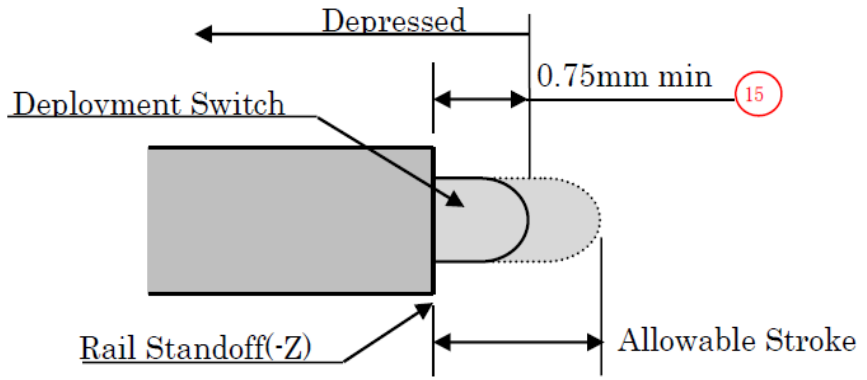


Figure2.2.1-4 Maximum Allowable Stroke of Deployment Switch on the end of the rail

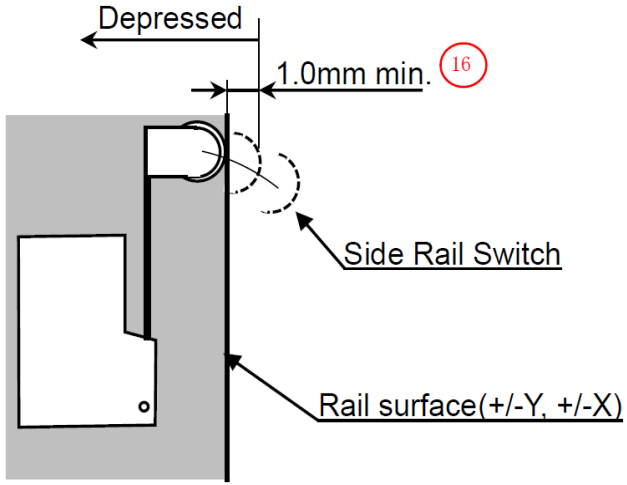


Figure 2.2.1-5 Maximum Allowable Stroke of Deployment Switches on the side of the rail (W6U Satellite)

J-SSOD & [Satellite Name] Interface Verification Record （For 50cm-sized Satellite Design）

E

Satellite Developer Name ; [Defined by Satellite Developer]
Satellite Name ; [Defined by Satellite Developer]
P/N ; [Defined by Satellite Developer]
S/N ; [Defined by Satellite Developer]

SIGNATURES / Satellite Development, Sponsor agency

NAME	DATE
Satellite Development Team (Initiate)	

NAME	DATE
Satellite Development Team (Reviewed)	

NAME	DATE
Satellite Development Team (Approved)	

NAME	DATE
Sponsor Agency (Approved)	

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
3	Interface Requirements for 50cm-sized Satellite		[Title]			
3.1	Mechanical Interfaces		[Title]			
3.1.1	Coordinate System		[Definition]			
3.1.2	Dimensional Requirements		[Title]			
3.1.2(1)	**Satellite Type**	50cm class satellite	50cm class satellite	Review of Design		
3.1.2(2),(3)	**Width in -Z Plane**					
	a. +X Plane	mm	350.0+/-0.5mm	Review of Design		Figure3.1.2-1, 1a~1d
	b. -X Plane	mm				
	c. +Y Plane	mm	550.0+/-0.5mm			
	d. -Y Plane	mm				
	Width in +Z Plane					
	a. +X Plane	mm	350.0+/-0.5mm	Review of Design		Figure3.1.2-1, 2a~2d
	b. -X Plane	mm				
	c. +Y Plane	mm	550.0+/-0.5mm			
	d. -Y Plane	mm				
3.1.2(4)	**Rails Length**					
	a. Rail 1	mm	550.0+/-0.25mm	Review of Design		Figure3.1.2-1, 3a~3d
	b. Rail 2	mm				
	c. Rail 3	mm				
	d. Rail 4	mm				
3.1.3	Rails		[Title]			
3.1.3(1)	**Number of rails**		4	Review of Design		

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
3.1.3(2)	**Rails Perpendicularity against +Z Plane**		≦ 0.5mm	Review of Design		Figure3.1.2-1, 4a~4h
	a. Rail 1, +X	OK / NG				
	b. Rail 1, -Y	OK / NG				
	c. Rail 2, -Y	OK / NG				
	d. Rail 2, -X	OK / NG				
	e. Rail 3, -X	OK / NG				
	f. Rail 3, +Y	OK / NG				
	g. Rail 4, +Y	OK / NG				
	h. Rail 4, +X	OK / NG				
	Rails Perpendicularity against +Y Plane		≦ 0.5mm	Review of Design		Figure3.1.2-1, 5a~5d
	a. Rail 1, +X	OK / NG				
	b. Rail 2, -X	OK / NG				
	c. Rail 3, -X	OK / NG				
	d. Rail 4, +X	OK / NG				
	Rails Parallelism to +Y Plane		≦ 0.5mm	Review of Design		Figure3.1.2-1, 6a~6b
	a. Rail 1, -Y	OK / NG				
	b. Rail 2, -Y	OK / NG				
	Rail Edges Flatness on +Z Plane		≦ 0.5mm	Review of Design		Figure3.1.2-1, 7a~7d
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
3.1.3(3)	**Rails Width**		Min 17 x 17 mm	Review of Design		Figure3.1.2-1, 8a~8d
	a. Rail 1	x mm				
	b. Rail 2	x mm				
	c. Rail 3	x mm				
	d. Rail 4	x mm				

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
3.1.3(4)	**Rails Surface Roughness**		≦ 1.6μm (Ra) (*1) (*1) Arithmetic average of the roughness profile.	Review of Design		Figure3.1.2-1, 9a~9d
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
3.1.3(5)	**Rails Edges Rounding**		Burr-free	Review of Design		Figure3.1.2-1, 10a~10d
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
2.1.3(6)	**(N/A)**					
3.1.3(7)	**Rails Contact Length with J-SSOD Rail Guides**		≧ 412.5mm	Analysis		
	a. Rail 1, +X	mm				
	b. Rail 1, -Y	mm				
	c. Rail 2, -Y	mm				
	d. Rail 2, -X	mm				
	e. Rail 3, -X	mm				
	f. Rail 3, +Y	mm				
	g. Rail 4, +Y	mm				
	h. Rail 4, +X	mm				
3.1.3(8)	**Rail Surface Finish**		Anodized	Review of Design		
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
3.1.4	Envelope Requirements		[Title]			
3.1.4(1)	Dynamic Envelope		[Definition]			
3.1.4(1)	**Dynamic Envelope (-Z Plane)**	OK/NG	No protrusion from rail surfaces (- Z)	Review of Design (*2)		Figure 3.1.4-1, 11a
3.1.4(2)	**Dynamic Envelope (+Z Plane)**	mm	≧ 0.5mm from rail surfaces (+Z)	Review of Design (*2)		Figure 3.1.4-1, 11b
3.1.4(3) 3.1.4(4)	**Dynamic Envelope (+/- X and +/- Y Plane)**		≦ 6.5mm from rail surface	Review of Design (*2)		Figure 3.1.4-1, 12a~12d
	a. +X Plane	mm				
	b. +Y Plane	mm				
	c. -X Plane	mm				
	d. -Y Plane	mm				
3.1.4(5)	**Constraints on deployable**	OK/NG	Any deployable components shall be constrained by the satellite itself.	Review of Design (*2)		
			(*2) Dynamic deformation shall be considered.			
3.1.5	**Mass Properties**		[Title]			
3.1.5(1)	**Mass**	Kg	≦ 47kg	Analysis		
3.1.5(2)	**Ballistic Number**	kg/m2	≦ 105 kg/m2	Analysis		
3.1.5(3)	**Center of Gravity**	OK / NG	The center of gravity of the satellite should be located in figure 3.1.5-1	Analysis		
3.1.6	**Separation Spring**		No need to install.			
3.1.7	**Accessible Area**	OK / NG	Accessible area is only +Z surface of the satellite	Review of Design		
3.1.8	Structural Strength		[Title]			
2.1.8(1)	**Main Structure Strength**	OK / NG	A satellite shall have a sufficient structural strength with a necessary safety margin through the ground operation, testing, ground handling, and on-orbit operations.	Analysis		Refer to 2.1.8(1)
2.1.8(2)	**Rails Strength**	OK / NG	Each rail shall have a sufficient structural strength with 46.6N of a combined load of the preload and the spring load by the main spring.	Analysis		Refer to 2.1.8(2)
3.1.9	**Stiffness**	Hz	Minimum fundamental frequency ≧ 30 [Hz]	Analysis		Refer to 2.1.9
3.1.10	**Ground Handling Request**	OK / NG	Prepare the following ・Bolt hole for eyebolt on +Z surface ・Sling Belt ・Crane Scale	Review of Design		

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
3.2	**Electrical Interface**		[Title]			
3.2.1	**Deployment Switch**		[Title]			
3.2.1(1)	**Fault tolerant design**	OK / NG	Fault tolerant design according to SSP51721.	Review of Design		
3.2.1(2)	**Location of end rail switch**	OK / NG	Location of end rail switch shall conform to Figure 3.2.1-1	Review of Design		Figure 3.2.1-1 13
3.2.1(3)	**Power interruption function of end rail switch**	OK / NG	The end rail switch shall be set does not operate until it protrudes 1.25mm min. from rail surfaces (+/- Z)	Review of Design		Figure 3.2.1-2 14
3.2.1(4)	**Total spring force (-Z surface)**	OK / NG	≧ 6N	Review of Design		
3.2.1(5)	**Location of side rail switch**	OK / NG	Location of side rail switch shall conform to Figure 3.2.1-3			Figure 3.2.1-3
3.2.1(6)	**Tip shape of side rail switch**	OK / NG	≧ R1	Review of Design		
3.2.1(7)	**Reaction force of side rail**	OK / NG	≦ 1.8 [N]	Review of Design		
3.2.1(8)	**Power interruption function of side rail switch**	OK / NG	The side rail switch shall be set does not operate until it protrudes 3.5mm min. from rail surfaces (+/- X, +/- Y)	Review of Design		Figure 3.2.1-4 15
3.2.2	**Ground Handling Pin**		N/A			
3.2.3	**RF**		Refer to 4.2.2.2(2)			
3.3	**Operation Requirements**		Refer to 2.3			
	Maximum Stowage Duration	OK / NG	Maximum stowage duration shall assume the max stowage duration may be about 1 year.	Review of Design (*3)		Refer to 2.3(1)
	On-orbit Maintenance Limitation	OK / NG	On-orbit maintenance limitation will not plan any activation, checkout, or maintenance after the delivery.	Review of Design (*3)		Refer to 2.3(2)
	Cold Launch Requirements	OK / NG	A satellite shall have a capability to survive in the cold launch environment (i.e. w/o power).	Review of Design (*3)		Refer to 2.3(3)
			(*3) It is allowed to describe a rationale in "Evidence document" instead of providing a document.			
	Minimum Time until Appendage Deployment & RF Radiation					
	a. Timer Setting	OK / NG	≧ 30 minutes	Review of Design		Refer to 2.3(4),(5)
	b. Function Test	OK / NG	Whenever either of two deployment switches is re-depressed, the timer shall be reset.	Review of Design		
	Limitation of the satellite	OK / NG	A satellite deployment window shall not be restricted by a satellite design.	Review of Design		Refer to 2.3(6)

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
3.4	**Environmental Requirements**		Refer to 2.4			
	Random Vibration and Acceleration		[Title]			Refer to 2.4.1
	Quasi-static Acceleration	OK / NG	A satellite shall assume the condition defined in the section 2.4.1(a)	Analysis		Refer to 2.4.1(a)
	Random Vibration	N/A	A satellite shall assume the condition defined in the section 2.4.1(b)	N/A		Refer to 2.4.1(b)
	On-orbit Acceleration		[Title]			Refer to 2.4.2
	On-orbit Acceleration	OK / NG	A satellite shall assume the condition defined in the section 2.4.2(a)	(Analysis)		Refer to 2.4.2(a)
	Pressure Environment		[Title]			Refer to 2.4.3
	Pressure	OK / NG	A satellite shall assume the condition defined in the section 2.4.3(a)	Review of Design (*4)		Refer to 2.4.3(a)
	Depressurization Rate	m(*5)	If V/A > 50.8m (2000inch), Stress Analysis Report is needed.	Review of Design (or Analysis)		Refer to 2.4.3(b)
			*(*4) It is allowed to write the purport of no problem in "Evidence document" instead of providing a document.* *(*5) Please fill in V/A.*			
	Thermal Environment	OK / NG	A satellite shall assume the condition defined in the section 2.4.4.	Review of Design (or test)		Refer to 2.4.4
	Humidity Environment	OK / NG	A satellite shall assume the condition defined in the section 2.4.5.	Review of Design (*4)		Refer to 2.4.5
	Out-gassing	OK / NG	A satellite shall assume the condition defined in the section 2.5.	Review of Design (or Test)		Refer to 2.5

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
4	**Safety and Product Assurance**		[Title]			
4.1	**Generic Requirements**		[Guidelines]			
4.2	**Safety Assessment**		[Title]			
4.2.1	**Implementation of Safety Analysis and Safety Assessment**					
4.2.1(1)	**(a) On-orbit Safety**	Applied / NA	The satellite provider shall conduct safety analysis and submit an SAR. Necessary inspections and tests for safety assessment shall be also conducted.	Review of Design		
	(b) Launch Site & Vehicle Safety	Applied / NA	The satellite provider shall submit ATV/HTV/KSC Form 100 for launch site & vehicle safety assessment.	Review of Design		
4.2.1(2)	**Material Identification Usage List (MIUL)**	Applied / NA	The satellite provider shall submit MIUL.	Review of Design		
4.2.1(3)	**Materials Usage Agreement (MUA)**	Applied / NA	The satellite provider shall submit MUA.	Review of Design		
4.2.1(4)	**Volatile Organic Compound Usage Agreement (VUA)**	Applied / NA	The satellite provider shall submit VUA.	Review of Design		
4.2.1(5)	**Hazardous Material Summary Tables (HMST)**	Applied / NA	The satellite provider shall submit HMST.	Review of Design		
4.2.2	**Safety Design Guidelines**		[Guidelines]			
4.2.2.1	**Standard Hazard**		[Guidelines]			
4.2.2.1(1)	**Flammable Material**	Applied / NA	If the satellite has flammability materials such as non-metallic materials.	Review of Design		
4.2.2.1(2)	**Material Offgassing**	Applied / NA	If the satellite has offgassing materials such as non-metallic materials.	Review of Design		
4.2.2.1(3)	**Hazardous Material**	Applied / NA	If the satellite has toxic, or biological hazardous materials.	Review of Design		
4.2.2.1(4)	**Sharp Particles**	Applied / NA	If the satellite has glass or shatterable materials.	Review of Design		
4.2.2.1(5)	**Mechanical Hazards**	Applied / NA	If the satellite has sharp edges, corners, holes, etc.	Review of Design		
4.2.2.1(6)	**Touch Temperature**	Applied / NA	If the satellite has sources of heating and/or cooling.	Review of Design		
4.2.2.1(7)	**Laser and/or Incoherent Emissions**	Applied / NA	If the satellite has laser and/or incoherent emissions.	Review of Design		
4.2.2.1(8)	**Radiation Interference**	Applied / NA	If the satellite has non-ionizing radiation sources (electrical power supplies, batteries, antennas/transmitters).	Review of Design		
4.2.2.1(9)	**Rotating Equipment**	Applied / NA	If the satellite has rotating equipments.	Review of Design		
4.2.2.1(10)	**Sealed Container**	Applied / NA	If the satellite has sealed containers.	Review of Design		

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
4.2.2.2	**Unique Hazard**		[Guidelines]			
4.2.2.2(1)	**Structural Failure**	Applied / NA	To perform structural design and fracture control of the satellite.	Review of Design		
4.2.2.2(2)	**Radio Frequency (RF) Radiation**	Hz μV/m W/m2	Satellite RF emission levels do not exceed the levels in 4.2.2.2(2).	Review of Design		
4.2.2.2(3)	**Deployable Structure**	Applied / NA	If the satellite has deployable structures.	Review of Design		
4.2.2.2(4)	**Battery Failure**	Applied / NA	If the satellite has batteries.	Review of Design		
4.2.2.2(5)	**Propulsion, Deployable Subcomponents**	Applied / NA	If the satellite has propulsion system and/or deployable subcomponents.	Review of Design		
4.2.2.2(6)	**Other Failures**	Applied / NA	If the satellite may occur other hazards.	Review of Design		
4.3	**Safety Requirements for Deployable Satellite from ISS and Space Debris Mitigation Guidelines**		[Title]			
4.3.1	**Safety Requirements for Deployable Satellite**		[Title]			
4.3.1.1	**Deployable Satellite Design Requirements**		[Title]			
4.3.1.1.1	**Ballistic Number**		Refer to [2.1.5(2)]			
4.3.1.1.2	**Deployment Analysis**		[Title]			
4.3.1.1.2(1)	**Trackability of Satellite**	Applied / NA	The Satellite shall have a minimum flight cross section at least 78.5 cm2.	Review of Design		
4.3.1.1.3	**Propulsion Systems**		[Title]			
4.3.1.1.3(1)	**SSA Sharing Agreement**	Applied / NA	The satellite developer shall conclude a SSA sharing agreement (Space Situational Awareness) with USSPACECOM and submit the certificate to JAXA.	Review of Design		
4.3.1.1.3(2)	**Operation Process**	Applied / NA	The satellite developer shall coordinate with NASA of the operational process and prepare PIA, OIP, OA, etc., and submit the approved documents to JAXA.	Review of Design		
4.3.1.1.4	**Deployable Subcomponents**		[Title]			
4.3.1.1.4(1)	**Deploy distance**	Applied / NA	The satellite is more than 500 km forward or backward from the ISS relative to the ISS's forward direction.	Review of Design		
4.3.1.1.4(2)	**Deploy altitude**	Applied / NA	The apogee altitude of the main satellite and subcomponents must be lower than the perigee altitude of the ISS.	Review of Design		
4.3.2	**Compatibility with Space Debris Mitigation Guidelines**		[Guidelines]			

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference

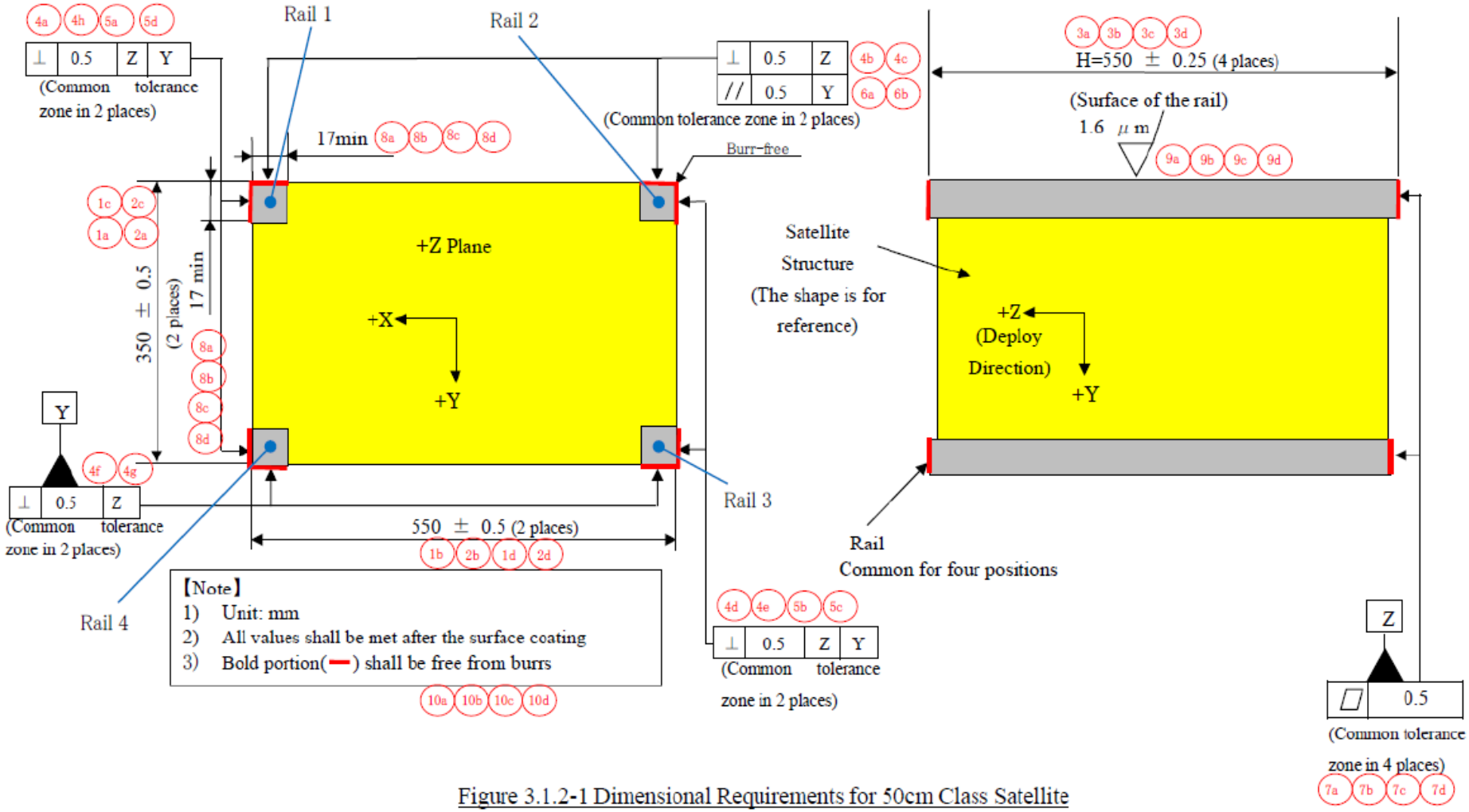
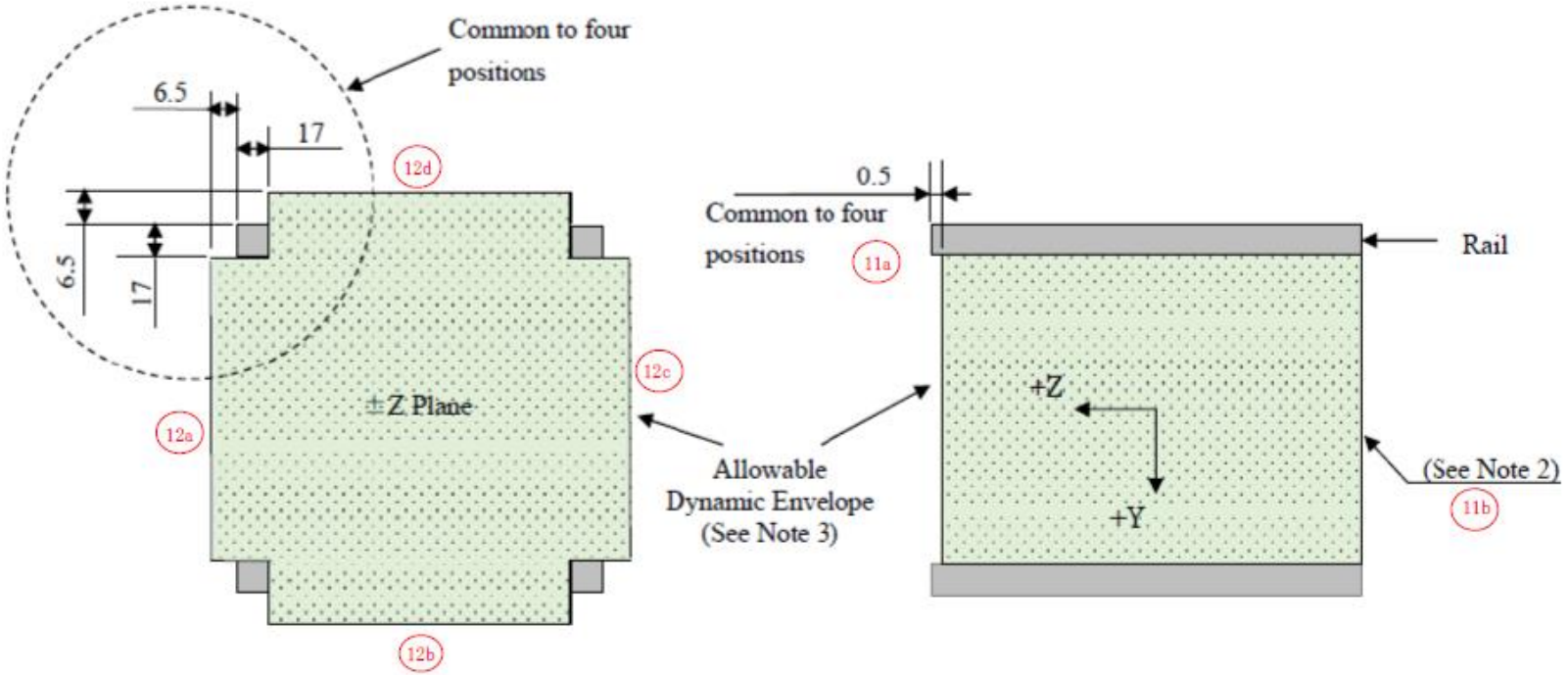


Figure 3.1.2-1 Dimensional Requirements for 50cm Class Satellite

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference



【Note】
1) Unit: mm
2) All components shall be recessed from the edge of the -Z rail ends.
3) All external components shall be within the dynamic envelope.

Figure 3.1.4-1 Dimensional Requirements for 50cm Class Satellite

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference

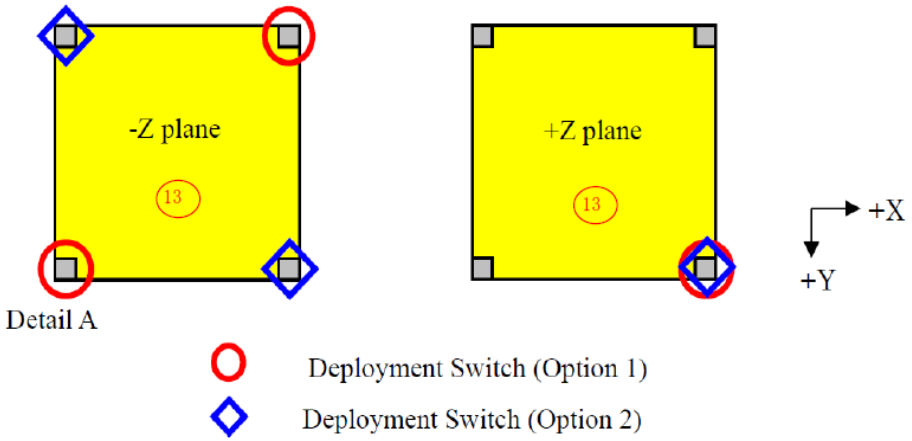


Figure 3.2.1-1 Position of Deployment Switches

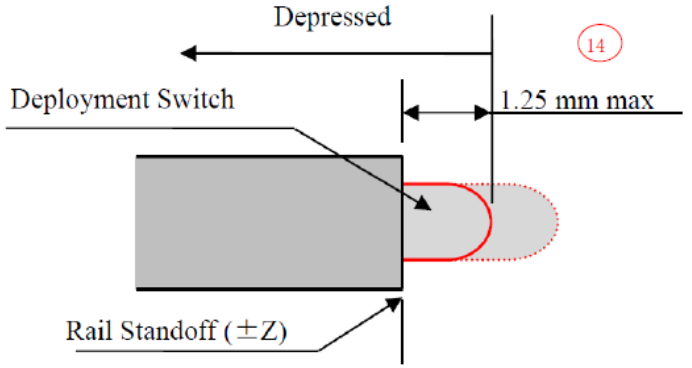


Figure3.2.1-2 Maximum Allowable Stroke of Deployment Switches on the end of the rail

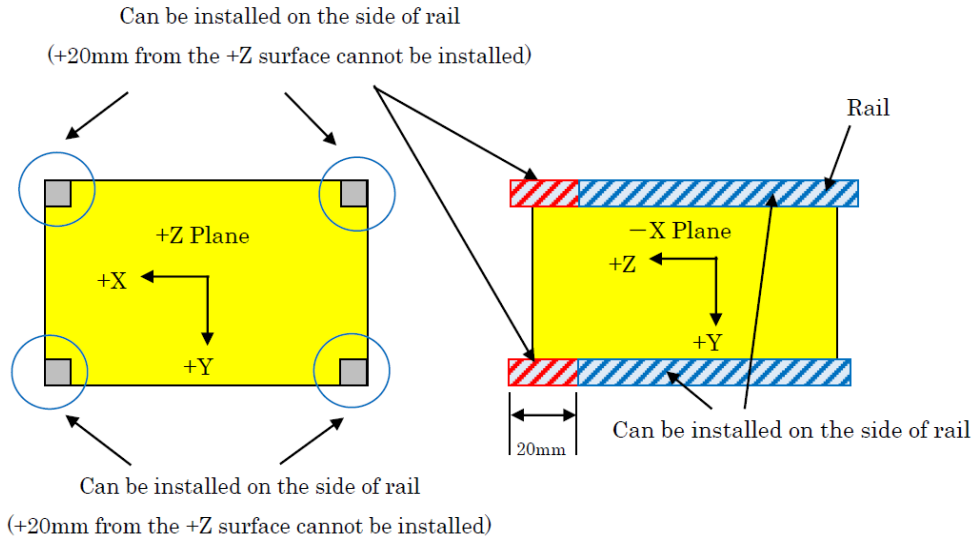


Figure 3.2.1-3 Deployment switches on the side rail

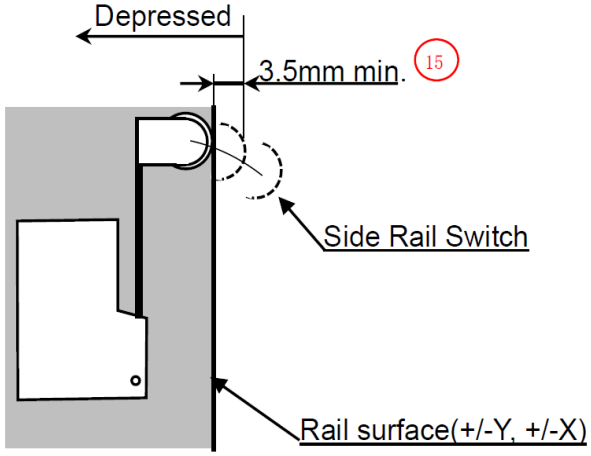


Figure 3.2.1-4 Maximum Allowable Srtoke ot Deployment Switch on the side of the rail

J-SSOD & [Satellite Name] Interface Verification Record
（For 50cm-sized Satellite Flight Model）

E

Satellite Developer Name ; [Defined by Satellite Developer]
Satellite Name ; [Defined by Satellite Developer]
P/N ; [Defined by Satellite Developer]
S/N ; [Defined by Satellite Developer]

SIGNATURES / Satellite Development, Sponsor agency

NAME	DATE
Satellite Development Team (Initiate)	

NAME	DATE
Satellite Development Team (Reviewed)	

NAME	DATE
Satellite Development Team (Approved)	

NAME	DATE
Sponsor Agency (Approved)	

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
3	Interface Requirements for 50cm-sized Satellite		[Title]			
3.1	Mechanical Interfaces		[Title]			
3.1.1	Coordinate System		[Definition]			
3.1.2	Dimensional Requirements		[Title]			
3.1.2(1)	**Satellite Type**	50cm class satellite	50cm class satellite	Review of Design		
3.1.2(2),(3)	**Width in -Z Plane**					
	a. +X Plane	mm	350.0+/-0.5mm	Inspection (Measurement)		Figure3.1.2-1, 1a~1d
	b. -X Plane	mm				
	c. +Y Plane	mm	550.0+/-0.5mm			
	d. -Y Plane	mm				
	Width in +Z Plane					
	a. +X Plane	mm	350.0+/-0.5mm	Inspection (Measurement)		Figure3.1.2-1, 2a~2d
	b. -X Plane	mm				
	c. +Y Plane	mm	550.0+/-0.5mm			
	d. -Y Plane	mm				
3.1.2(4)	**Rails Length**					
	a. Rail 1	mm	550.0+/-0.25mm	Inspection (Measurement)		Figure3.1.2-1, 3a~3d
	b. Rail 2	mm				
	c. Rail 3	mm				
	d. Rail 4	mm				
3.1.3	Rails		[Title]			
3.1.3(1)	**Number of rails**		4	Review of Design		

E

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
3.1.3(2)	**Rails Perpendicularity against +Z Plane**		≦ 0.5mm	Inspection (Machine work order, Inspection report,etc.)		Figure3.1.2-1, 4a~4h
	a. Rail 1, +X	OK / NG				
	b. Rail 1, -Y	OK / NG				
	c. Rail 2, -Y	OK / NG				
	d. Rail 2, -X	OK / NG				
	e. Rail 3, -X	OK / NG				
	f. Rail 3, +Y	OK / NG				
	g. Rail 4, +Y	OK / NG				
	h. Rail 4, +X	OK / NG				
	Rails Perpendicularity against +Y Plane		≦ 0.5mm	Inspection (Machine work order, Inspection report,etc.)		Figure3.1.2-1, 5a~5d
	a. Rail 1, +X	OK / NG				
	b. Rail 2, -X	OK / NG				
	c. Rail 3, -X	OK / NG				
	d. Rail 4, +X	OK / NG				
	Rails Parallelism to +Y Plane		≦ 0.5mm	Inspection (Machine work order, Inspection report,etc.)		Figure3.1.2-1, 6a~6b
	a. Rail 1, -Y	OK / NG				
	b. Rail 2, -Y	OK / NG				
	Rail Edges Flatness on +Z Plane		≦ 0.5mm	Inspection (Machine work order, Inspection report,etc.)		Figure3.1.2-1, 7a~7d
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
3.1.3(3)	**Rails Width**		Min 17 x 17 mm	Inspection (Measurement)		Figure3.1.2-1, 8a~8d
	a. Rail 1	x mm				
	b. Rail 2	x mm				
	c. Rail 3	x mm				
	d. Rail 4	x mm				

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
3.1.3(4)	**Rails Surface Roughness**		≦ 1.6μm (Ra) (*1) (*1) Arithmetic average of the roughness profile.	Review of Design		Figure3.1.2-1, 9a~9d
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
3.1.3(5)	**Rails Edges Rounding**		Burr-free	Inspection (Machine work order, Inspection report,etc.)		Figure3.1.2-1, 10a~10d
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				
2.1.3(6)	**(N/A)**					
3.1.3(7)	**Rails Contact Length with J-SSOD Rail Guides**		≧ 412.5mm	Analysis, Inspection (Assessment based on Manufacture drawing, etc.)		
	a. Rail 1, +X	mm				
	b. Rail 1, -Y	mm				
	c. Rail 2, -Y	mm				
	d. Rail 2, -X	mm				
	e. Rail 3, -X	mm				
	f. Rail 3, +Y	mm				
	g. Rail 4, +Y	mm				
	h. Rail 4, +X	mm				
3.1.3(8)	**Rail Surface Finish**		Anodized	Inspection, Review of Design (Machine work order, Inspection report,etc.)		
	a. Rail 1	OK / NG				
	b. Rail 2	OK / NG				
	c. Rail 3	OK / NG				
	d. Rail 4	OK / NG				

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
3.1.4	Envelope Requirements		[Title]			
3.1.4(1)	Dynamic Envelope		[Definition]			
3.1.4(1)	**Dynamic Envelope (-Z Plane)**	OK/NG	No protrusion from rail surfaces (- Z)	Inspection (Measurement)		Figure 3.1.4-1, 11a
3.1.4(2)	**Dynamic Envelope (+Z Plane)**	mm	≧ 0.5mm from rail surfaces (+Z)	Inspection (Measurement)		Figure 3.1.4-1, 11b
3.1.4(3) 3.1.4(4)	**Dynamic Envelope (+/- X and +/- Y Plane)**		≦ 6.5mm from rail surface	Inspection (Measurement)		Figure 3.1.4-1, 12a~12d
	a. +X Plane	mm				
	b. +Y Plane	mm				
	c. -X Plane	mm				
	d. -Y Plane	mm				
3.1.4(5)	**Constraints on deployable**	OK/NG	Any deployable components shall be constrained by the satellite itself.	Review of Design		
			(*2) Dynamic deformation shall be considered.			
3.1.5	**Mass Properties**		[Title]			
3.1.5(1)	**Mass**	Kg	≦ 47kg	Inspection (Measurement)		
3.1.5(2)	**Ballistic Number**	kg/m2	≦ 105 kg/m2	Analysis		
3.1.5(3)	**Center of Gravity**	OK / NG	The center of gravity of the satellite should be located in figure 3.1.5-1	Analysis (or Test)		
3.1.6	**Separation Spring**		No need to install.			
3.1.7	**Accessible Area**	OK / NG	Accessible area is only +Z surface of the satellite	Inspection (Measurement)		
3.1.8	Structural Strength		[Title]			
	Main Structure Strength	OK / NG	A satellite shall have a sufficient structural strength with a necessary safety margin through the ground operation, testing, ground handling, and on-orbit operations.	Analysis (Stress Analysis Report)		Refer to 2.1.8(1)
	Rails Strength	OK / NG	Each rail shall have a sufficient structural strength with 46.6N of a combined load of the preload and the spring load by the main spring.	Analysis (Stress Analysis Report)		Refer to 2.1.8(2)
3.1.9	**Stiffness**	Hz	Minimum fundamental frequency ≧ 30 [Hz]	Analysis (Stress Analysis Report)		Refer to 2.1.9
3.1.10	**Ground Handling Request**	OK / NG	Prepare the following ・Bolt hole for eyebolt on +Z surface ・Sling Belt ・Crane Scale	Analysis, Review of Design		

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
3.2	**Electrical Interface**		[Title]			
3.2.1	**Deployment Switch**		[Title]			
3.2.1(1)	**Fault tolerant design**	OK / NG	Fault tolerant design according to SSP51721.	Review of Design		
3.2.1(2)	**Location of end rail switch**	OK / NG	Location of end rail switch shall conform to Figure 3.2.1-1	Review of Design		Figure 3.2.1-1 13
3.2.1(3)	**Power interruption function of end rail switch**	OK / NG	The end rail switch shall be set does not operate until it protrudes 1.25mm min. from rail surfaces (+/- Z)	Review of Design		Figure 3.2.1-2 14
3.2.1(4)	**Total spring force (-Z surface)**	OK / NG	≧ 6N	Review of Design		
3.2.1(5)	**Location of side rail switch**	OK / NG	Location of side rail switch shall conform to Figure 3.2.1-3			Figure 3.2.1-3
3.2.1(6)	**Tip shape of side rail switch**	OK / NG	≧ R1	Review of Design		
3.2.1(7)	**Reaction force of side rail**	OK / NG	≦ 1.8 [N]	Review of Design		
3.2.1(8)	**Power interruption function of side rail switch**	OK / NG	The side rail switch shall be set does not operate until it protrudes 3.5mm min. from rail surfaces (+/- X, +/- Y)	Review of Design		Figure 3.2.1-4 15
3.2.2	**Ground Handling Pin**		N/A			
3.2.3	**RF**		Refer to 4.2.2.2(2)			
3.3	**Operation Requirements**		Refer to 2.3			
	Maximum Stowage Duration	OK / NG	Maximum stowage duration shall assume the max stowage duration may be about 1 year.	Review of Design (*3)		Refer to 2.3(1)
	On-orbit Maintenance Limitation	OK / NG	On-orbit maintenance limitation will not plan any activation, checkout, or maintenance after the delivery.	Review of Design (*3)		Refer to 2.3(2)
	Cold Launch Requirements	OK / NG	A satellite shall have a capability to survive in the cold launch environment (i.e. w/o power).	Review of Design (*3)		Refer to 2.3(3)
			(*3) It is allowed to describe a rationale in "Evidence document" instead of providing a document.			
	Minimum Time until Appendage Deployment & RF Radiation					
	a. Timer Setting	OK / NG	≧ 30 minutes	Test		Refer to 2.3(4),(5)
	b. Function Test	OK / NG	Whenever either of two deployment switches is re-depressed, the timer shall be reset.	Test		
	Limitation of the satellite	OK / NG	A satellite deployment window shall not be restricted by a satellite design.	Review of Design		Refer to 2.3(6)

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
3.4	**Environmental Requirements**		Refer to 2.4			
	Random Vibration and Acceleration		[Title]			Refer to 2.4.1
	Quasi-static Acceleration	OK / NG	A satellite shall assume the condition defined in the section 2.4.1(a)	Analysis (Stress Analysis Report)		Refer to 2.4.1(a)
	Random Vibration	N/A	A satellite shall assume the condition defined in the section 2.4.1(b)	Test (Vibration Test Report)		Refer to 2.4.1(b)
	On-orbit Acceleration		[Title]			Refer to 2.4.2
	On-orbit Acceleration	OK / NG	A satellite shall assume the condition defined in the section 2.4.2(a)	(Analysis) (Stress Analysis Report)		Refer to 2.4.2(a)
	Pressure Environment		[Title]			Refer to 2.4.3
	Pressure	OK / NG	A satellite shall assume the condition defined in the section 2.4.3(a)	Review of Design (*4)		Refer to 2.4.3(a)
	Depressurization Rate	m(*5)	If V/A > 50.8m (2000inch), Stress Analysis Report is needed.	Review of Design (or Analysis)		Refer to 2.4.3(b)
			*(*4) It is allowed to write the purport of no problem in "Evidence document" instead of providing a document.* *(*5) Please fill in V/A.*			
	Thermal Environment	OK / NG	A satellite shall assume the condition defined in the section 2.4.4.	Review of Design (or test)		Refer to 2.4.4
	Humidity Environment	OK / NG	A satellite shall assume the condition defined in the section 2.4.5.	Review of Design (*4)		Refer to 2.4.5
	Out-gassing	OK / NG	A satellite shall assume the condition defined in the section 2.5.	Review of Design (or Test)		Refer to 2.5

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
4	**Safety and Product Assurance**		[Title]			
4.1	**Generic Requirements**		[Guidelines]			
4.2	**Safety Assessment**		[Title]			
4.2.1	**Implementation of Safety Analysis and Safety Assessment**					
4.2.1(1)	**(a) On-orbit Safety**	OK / NA	The satellite provider shall conduct safety analysis and submit an SAR. Necessary inspections and tests for safety assessment shall be also conducted.	Analysis, test, Inspection (Phase III approved SAR)		
	(b) Launch Site & Vehicle Safety	OK / NA	The satellite provider shall submit ATV/HTV/KSC Form 100 for launch site & vehicle safety assessment.	Analysis, Test, Inspection (ATV/HTV/KSC Form 100 check list)		
4.2.1(2)	**Material Identification Usage List (MIUL)**	OK / NA	The satellite provider shall submit MIUL.	Analysis, Test, Inspection (MIUL)		
4.2.1(3)	**Materials Usage Agreement (MUA)**	OK / NA	The satellite provider shall submit MUA.	Analysis, Test, Inspection (MUA)		
4.2.1(4)	**Volatile Organic Compound Usage Agreement (VUA)**	OK / NA	The satellite provider shall submit VUA.	Analysis, Test, Inspection (VUA)		
4.2.1(5)	**Hazardous Material Summary Tables (HMST)**	OK / NA	The satellite provider shall submit HMST.	Analysis, Test, Inspection (HMST)		

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
4.2.2	**Safety Design Guidelines**		[Guidelines]			
4.2.2.1	**Standard Hazard**		[Guidelines]			
4.2.2.1(1)	**Flammable Material**	OK / NA	If the satellite has flammability materials such as non-metallic materials.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(2)	**Material Offgassing**	OK / NA	If the satellite has offgassing materials such as non-metallic materials.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(3)	**Hazardous Material**	OK / NA	If the satellite has toxic, or biological hazardous materials.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(4)	**Sharp Particles**	OK / NA	If the satellite has glass or shatterable materials.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(5)	**Mechanical Hazards**	OK / NA	If the satellite has sharp edges, corners, holes, etc.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(6)	**Touch Temperature**	OK / NA	If the satellite has sources of heating and/or cooling.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(7)	**Laser and/or Incoherent Emissions**	OK / NA	If the satellite has laser and/or incoherent emissions.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(8)	**Radiation Interference**	OK / NA	If the satellite has non-ionizing radiation sources (electrical power supplies, batteries, antennas/transmitters).	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(9)	**Rotating Equipment**	OK / NA	If the satellite has rotating equipments.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.1(10)	**Sealed Container**	OK / NA	If the satellite has sealed containers.	Analysis, test, Inspection (Phase III approved SAR)		

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
4.2.2.2	**Unique Hazard**		[Guidelines]			
4.2.2.2(1)	**Structural Failure**	Applied / NA	To perform structural design and fracture control of the satellite.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.2(2)	**Radio Frequency (RF) Radiation**	Hz μV/m W/m2	Satellite RF emission levels do not exceed the levels in 4.2.2.2(2).	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.2(3)	**Deployable Structure**	Applied / NA	If the satellite has deployable structures.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.2(4)	**Battery Failure**	Applied / NA	If the satellite has batteries.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.2(5)	**Propulsion, Deployable Subcomponents**	Applied / NA	If the satellite has propulsion system and/or deployable subcomponents.	Analysis, test, Inspection (Phase III approved SAR)		
4.2.2.2(6)	**Other Failures**	Applied / NA	If the satellite may occur other hazards.	Analysis, test, Inspection (Phase III approved SAR)		
4.3	**Safety Requirements for Deployable Satellite from ISS and Space Debris Mitigation Guidelines**		[Title]			
4.3.1	**Safety Requirements for Deployable Satellite**		[Title]			
4.3.1.1	**Deployable Satellite Design Requirements**		[Title]			
4.3.1.1.1	**Ballistic Number**		Refer to [2.1.5(2)]			
4.3.1.1.2	**Deployment Analysis**		[Title]			
4.3.1.1.2(1)	**Trackability of Satellite**	Applied / NA	The Satellite shall have a minimum flight cross section at least 78.5 cm2.	Inspection		
4.3.1.1.3	**Propulsion Systems**		[Title]			
4.3.1.1.3(1)	**SSA Sharing Agreement**	Applied / NA	The satellite developer shall conclude a SSA sharing agreement (Space Situational Awareness) with USSPACECOM and submit the certificate to JAXA.	Analysis, Test, Review of Design		
4.3.1.1.3(2)	**Operation Process**	Applied / NA	The satellite developer shall coordinate with NASA of the operational process and prepare PIA, OIP, OA, etc., and submit the approved documents to JAXA.	Analysis, Test, Review of Design		
4.3.1.1.4	**Deployable Subcomponents**		[Title]			
4.3.1.1.4(1)	**Deploy distance**	Applied / NA	The satellite is more than 500 km forward or backward from the ISS relative to the ISS's forward direction.	Analysis, Review of Design		
4.3.1.1.4(2)	**Deploy altitude**	Applied / NA	The apogee altitude of the main satellite and subcomponents must be lower than the perigee altitude of the ISS.	Analysis, Review of Design		
4.3.2	**Compatibility with Space Debris Mitigation Guidelines**		[Guidelines]			

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference

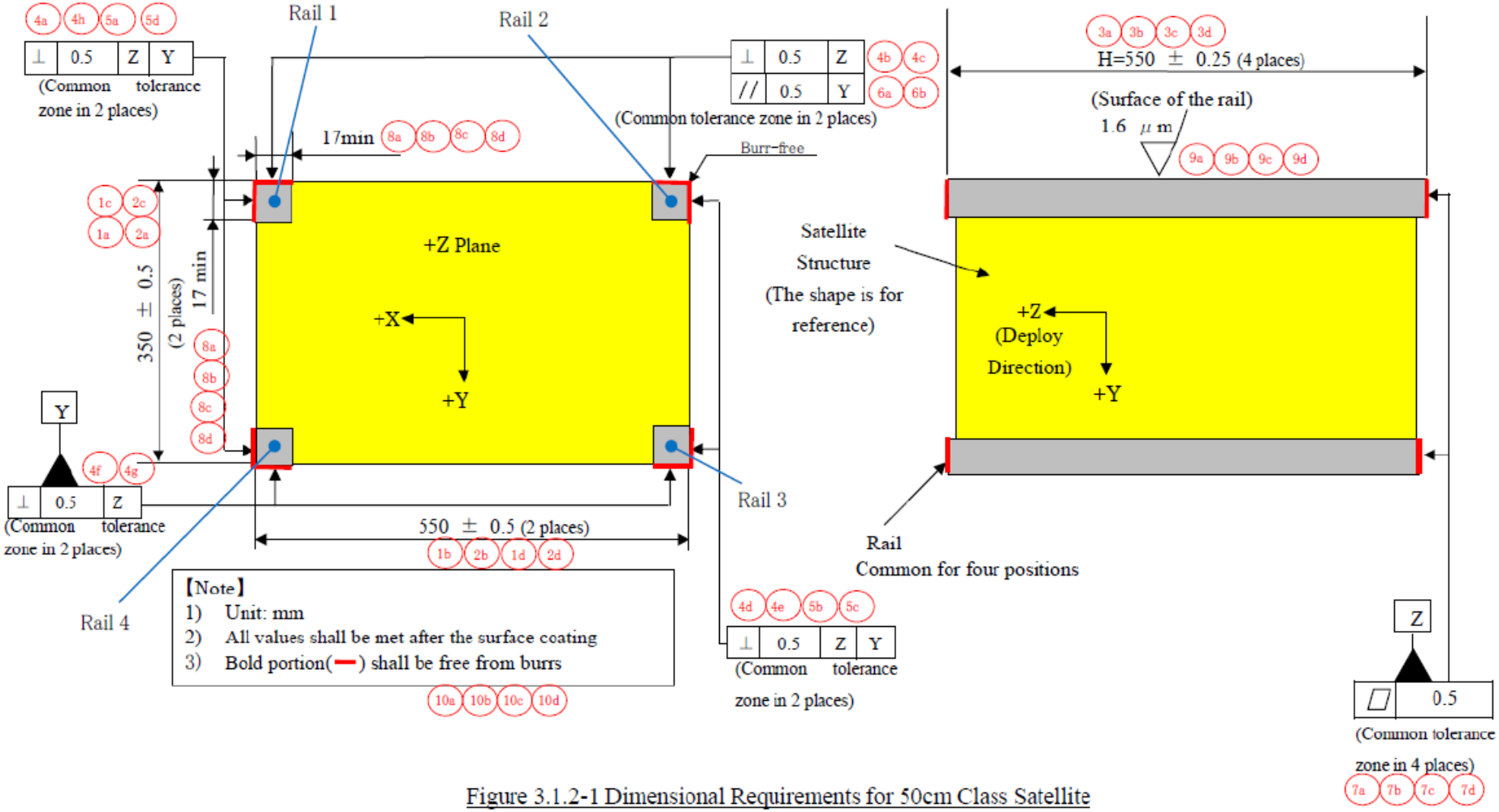
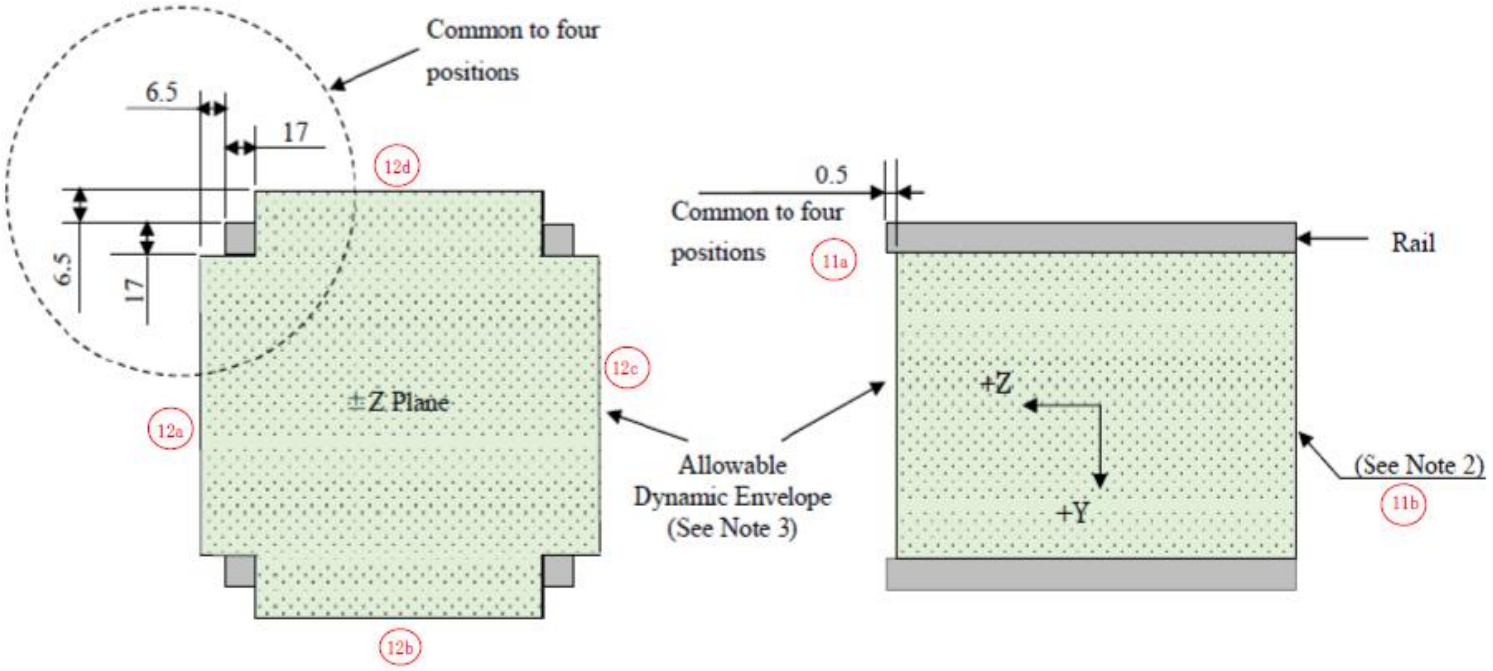


Figure 3.1.2-1 Dimensional Requirements for 50cm Class Satellite

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference	E



【Note】
1) Unit: mm
2) All components shall be recessed from the edge of the -Z rail ends.
3) All external components shall be within the dynamic envelope.

Figure 3.1.4-1 Dimensional Requirements for 50cm Class Satellite

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference	E

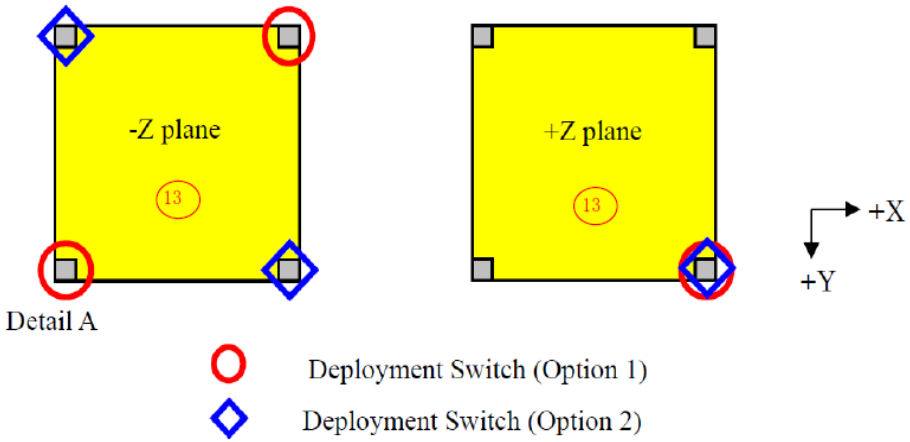


Figure 3.2.1-1 Position of Deployment Switches

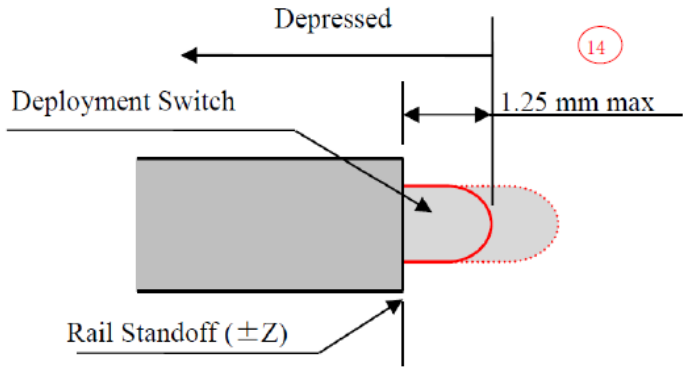


Figure3.2.1-2 Maximum Allowable Stroke of Deployment Switches on the end of the rail

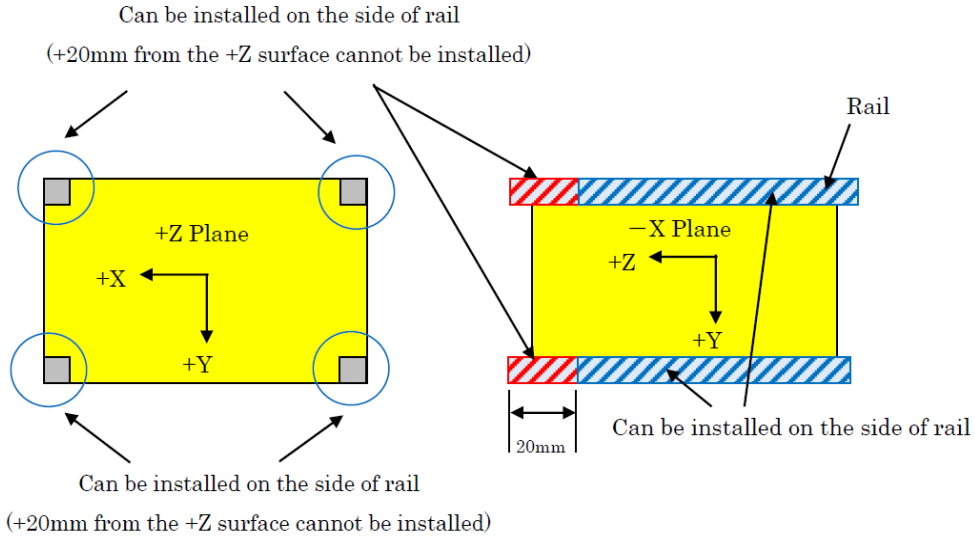


Figure 3.2.1-3 Deployment switches on the side rail

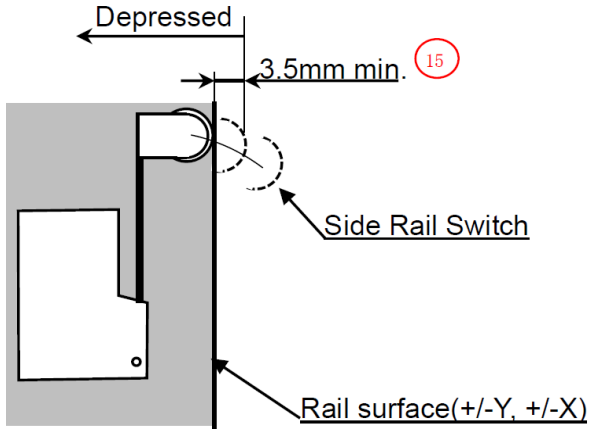


Figure 3.2.1-4 Maximum Allowable Srtoke ot Deployment Switch on the side of the rail

Appendix E: Abbreviations and Acronyms

ATV: Automated Transfer Vehicle
BN: Ballistic Number
Cd: Coefficient of Drag
CIL: Critical Item List
C/O: Check-Out
CTB: Common Transfer Bag
EMC: Electromagnetic Compatibility
EMGF: Electrical and Mechanical Grapple Fixture
FMEA: Failure Mode Effect Analysis
FT: Fault Tolerant
HMST: Hazardoous Material Summary Tables
HTV: H-II B Transfer Vehicle
ICS: Inter-Communication System
IP: International Partner
ISS: Internatioanl Space Station
IVA: Intra-Vehicular Activity
JEM: Japanese Experiment Module
JEMRMS: JEM Remote Manipulator System
J-SSOD: JEM Small Satellite Orbital Deployer
MAPTIS: Materials and Processes Technical Information System
MOSFET: Metai Oxide Semiconductor Field Effect Transistor
MS: Margin of Safety
MSDS: Material Safety Data Sheet
MUA: Material Usage Agreement
RBF: Remove Before Flight
RF: Radio Frequency
SAR: Safety Analysis Report
SSN: Space Surveillance Network
SpX: Space-X Dragon
TBD: To Be Determined
TML: Total Mass Loss
USSPACECOM: United States Space Command. This office manages the operation of the U.S. Space Surveillance Network.
VCM: Volatile Condensable Material
VUA: Volatile Organic Compound Usage Agreement
VV: Velocity Vector

1. Purpose of this Input sheet

Frequencies of Transmitters(Tx) and Receivers(Rx) used at ISS are controlled by NASA/JSC Frequency manager.
Therefore, small satellite developer is required to have an approval from JSC Frequency manager to use their Tx/Rx mounted in their satellite.

JAXA is responsible to submit the JSC frequency authorization input form to have an approval for small satellte deployed from J-SSOD.
And the information for the JSC frequency authorization input form is required to all small satellite developer.

2. Input Rules

JSC frequency authorization input form is consist of three sheets.
(1) GENERAL SYSTEM INFORMATION
(2) TRANSMITTER(TX)INFORMATION
(3) RECEIVER (RX) INFORMATION

When small satellite has more than one Tx/Rx,
payload developer need to copy (2)/(3) sheet for additional Tx/Rx in the same excel file.
(One sheet is required for one Tx/Rx as follows in the same excel file)

[Example]
Transmitter Info(1),Transmitter Info(2),...
Receiver Info(1), Receiver Info(2),...

JSC Frequency Authorization Input Form

GENERAL SYSTEM INFORMATION		
1	System Name:	
2	System Description:	
3	System Intended Use:	
4	Activation Date (mm/dd/yyyy):	

JSC Frequency Authorization Input Form

	TRANSMITTER INFORMATION	
5	**Frequency (Upper):**	[MHz]
6	**Frequency (Lower):**	[MHz]
7	**Transmit Power**	[W]
8	**TX Manufacturer/Model No**	
9	**TX Antenna Manufacturer**	
10	**Circuit Loss**	[dB]
11	**Antenna Type**	**Select Antenna type from followings:** ・Dipole ・Helix ・Horn ・Loop ・Monopole ・Patch ・Phased_Array ・Reflector ・Slot ・Spiral ・Other
12	**Antenna Gain**	[dBi]
13	**Antenna Polarization**	**Select Polarization type from followings:** ・Horizontal ・Left_Handed_Elliptical ・Right_Handed_Elliptical ・Vertical ・Other
14	**Antenna Axial Ratio:**	[dB]
15	**Antenna Location**	[If antenna is attached to the satellite structure, please fill the satellite name]
16	**Data Rate (Digital) or Bandwidth (Analog):**	[Mbps for Digital] or [MHz for Analog] **For Spread Spectrum System, enter the data rate in Mcps:** [Mcps]
17	**Modulation Scheme:**	**Select Modulation Scheme from followings:** ・AM ・ASK ・BPSK ・FM ・FSK ・GMSK ・MSK ・QAM ・QPSK ・Other **For Analog FM** Modulation Index: Deviation: [MHz] Max.Mod.Freq [MHz]
18	**Emission Bandwidth:**	−3dB: [MHz] −20dB: [MHz] −40dB: [MHz] −60dB: [MHz]
19	**Transmission Bandwidth:**	−3dB: [MHz] −20dB: [MHz] −40dB: [MHz] −60dB: [MHz]

JSC Frequency Authorization Input Form

	RECEIVER (RX) INFORMATION		Remarks
20	**Frequency (Upper):**	[MHz]	Receiver frequency (upper limit)
21	**Frequency (Lower):**	[MHz]	Receiver frequency (lower limit)
22	**RX Manufacturer/Model No**		Product maker (model No)
23	**RX Antenna Manufacturer**		Product maker
24	**Circuit Loss:**	[dB]	[= Feedr Loss] Power loss due to the transmission line from output port of Tx to the feed point of the antenna.
25	**Antenna Type:**	**Select Antenna type from followings:** ・Dipole ・Helix ・Horn ・Loop ・Monopole ・Patch ・Phased_Array ・Reflector ・Slot ・Spiral ・Other	Select from options. If there is nothing to fit, please select "Other".
26	**Antenna Gain:**	[dBi]	[dBi] = ($P_{isotolopic}$ / $P_{small\ satellite\ antenna}$)
27	**Antenna Polarization:**	**Select Polarization type from followings:** ・Horizontal ・Left_Handed_Elliptical ・Right_Handed_Elliptical ・Vertical ・Other	Select from options. If there is nothing to fit, please select "Other".
28	**Antenna Axial Ratio:**	[dB]	**Only apply to circularly polarized antenna.** If small satellite does not have circularly polarized antenna, this item is N/A. AR = (|EL|+|ER|) / (|EL|−|ER|) --> $20\log_{10}\|AR\|$ (dB) Here, |EL| : Electrical field density of Left-handed circularly polarized wave |ER| : Electrical field density of Right-handed circularly polarized wave
29	**Receiver Noise Figure:**	[dB]	Please show the NF (Noise figure) of receiver itself. [Reference] Noise figure is defined as follow: the ratio of the signal-to-noise power ratio at the input to the signal-to-noise power ratio at the output. F = (Si/Ni)/(So/No) (1) NF= 10logF = 10log (Si/Ni) − 10log (So/No) (2)
30	**Receiver Noise Temperature**	[dBK]	Te (Noise Temperature) = To(F−1), where To is 290K (reference/room temperature)
31	**Antenna Location**	[If antenna is attached to the satellite structure, please fill the satellite name]	
32	**RF Selectivity:**	−3dB: [MHz] −20dB: [MHz] −40dB: [MHz] −60dB: [MHz]	RF selctivity is derived as frequency bandwidth according to the power degrdations (−3dB, −20dB, −40dB, −60dB) from the reference level (Average attenuated level of the received band region).

E

Attachment G User Manual of Separation Spring

G-1 Separation Spring

For 1U to 5U satellites, a total spring force of 1.08 to 5.3 [N] must be generated on the -Z end face of the satellite rail to prevent collision with subsequent satellites in the -Z direction during satellite deploy.In addition to the deployment switch, a separation spring provided by JAXA may be used. When using this separation spring, the following information should be used in the design.

(1) The spring force of separatopn spring (P/N 251D939002-1) is 0.6±0.06 [N].
(2) For the installation of the separation spring, the flange of the separation spring shall closely contact the -Z end face of the satellite rail, as shown in Figure G-1. The thickness of the flange is 2 mm.
(3) The mounting position of the separation spring shall be such that the tip of the spring is within the shaded area shown in Figure G-2.
(4) If a deployment switch and separation spring are to be installed, the total spring force of the separation spring and the deployment switch on the -Z side shall be 1.08 to 5.3 [N]. (For the deployment switch, refer to Section 2.2.1.)

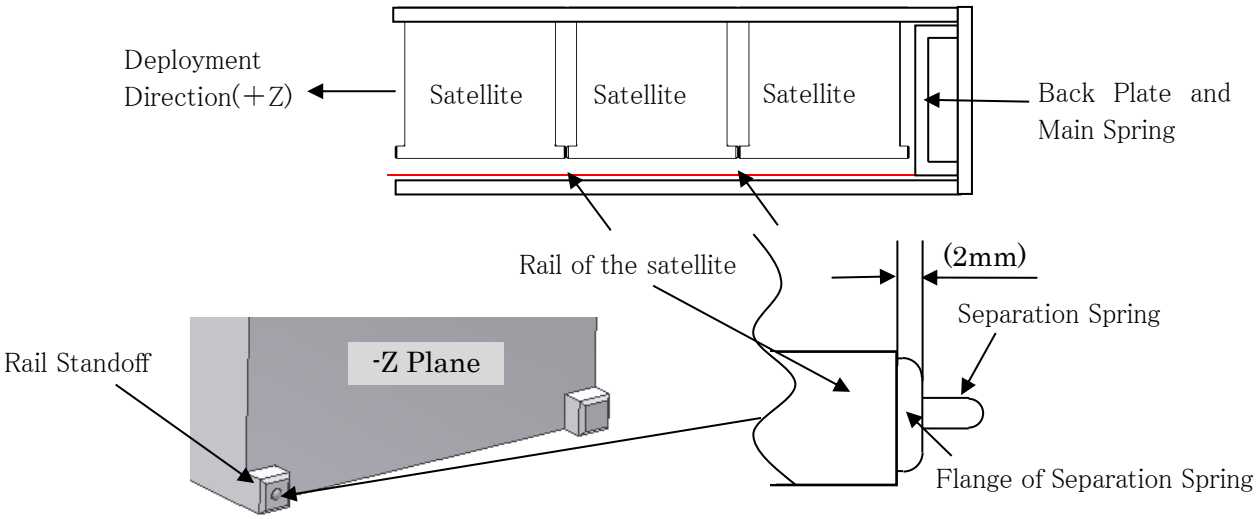


Figure G-1 Overview of Multiple Satellites with Separation Spring

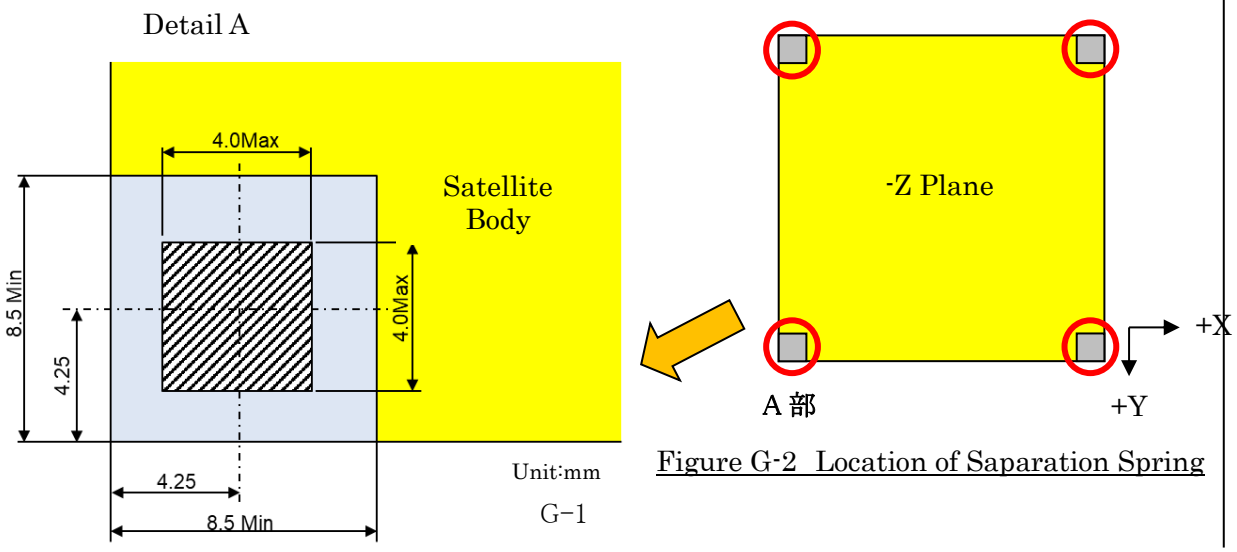
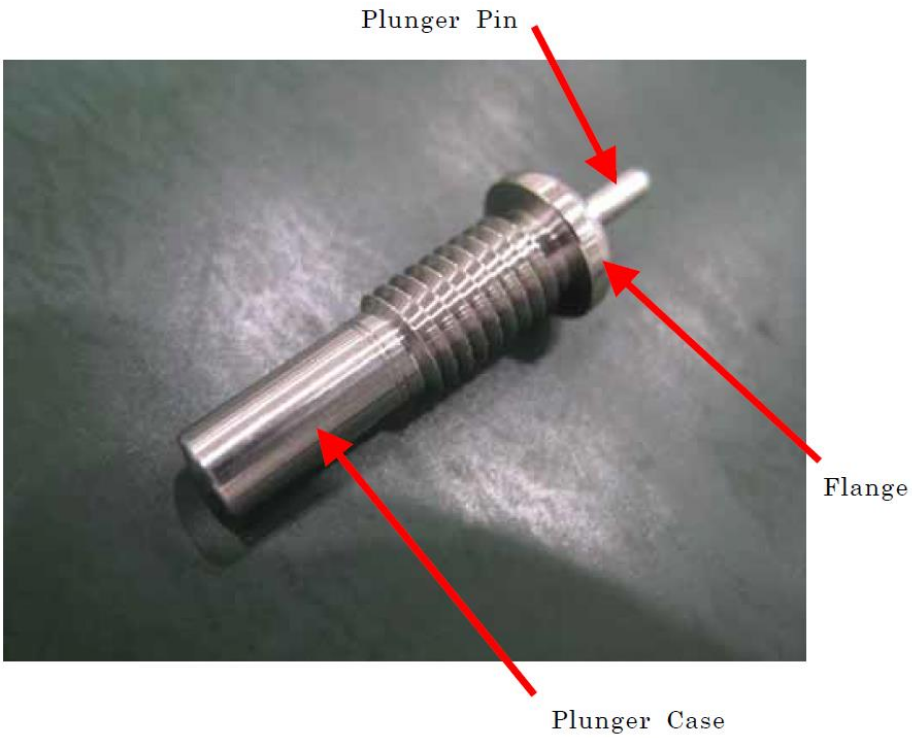


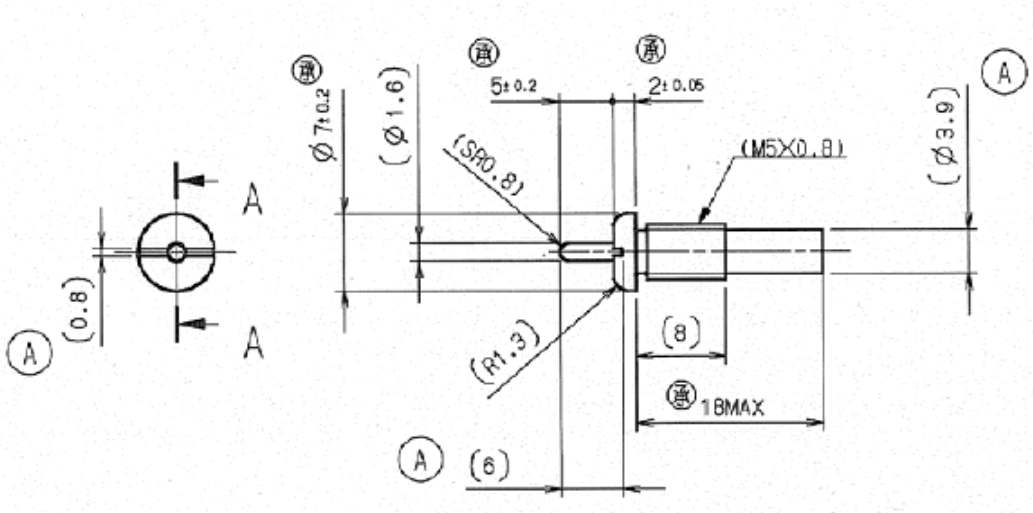
Figure G-2 Location of Saparation Spring

E

【Specifications of Separation Spring】

Material ： SUS303、304
Mass ： About 2.0 g (per piece)
Storage environment（Ground）：
Temperature：-5 ~ 40 deg.C
Humidity：No request (condensation is not allowed)
Pressure：Atomospheric pressure
Cleanliness：Better than ISO-14644-1 Class8 (recommended)





【Separation Spring installation procedure】

[Notes]
- Wear clean gloves when handling
- If there is dust on the Separation Spring, remove it with a clean cotton swab, etc.

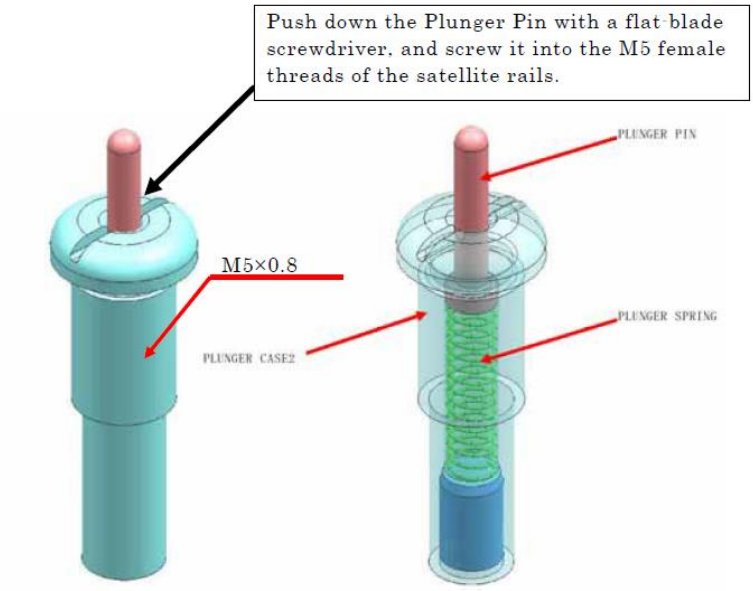
1. Before installation, check the following.
   - Separation Spring surface free of dust.
   - The tip of the flat-blade screwdriver used to install the Separation Spring should be free of dust.
   - The tip of the flat-blade screwdriver used to install the Separation Spring should be free from burrs.
     ※If the flat-blade screwdriver has burrs on the tip, be careful not to damage the Separation Spring during installation.

2. Using a flat-blade screwdriver, push down the pin of the Separation Spring and insert it into the M5 female screw on the end face of the satellite rail.
   ※Torque management is not required.

3. Apply Loctite (LOCTITE 222, 242 recommended) or equivalent adhesive to prevent loosening.

4. Check the following after installation

   - The flange of the Separation Spring must contact the end face of the satellite rail without any gap.
   - Separation Spring should be free of dust.
   - Separation Spring should be free from burrs.
   - The pin should operate smoothly when the tip of the Separation Spring is pressed with a finger wearing clean gloves.



E

J-SSOD/Satellite Interface Verification Recoed (for Design)

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
G-1	Separation Spring		[Title]			
G-1(1),(2)	**Location**	OK / NG	A satellite shall have separation spring of -Z rail end face.	Review of Design		Figure G-1
G-2(2)	**Location of end rail switch**	OK / NG	Location of end rail switch shall conform to Figure G-2	Review of Design		Figure G-2
G-3(3)	**Spring force**	N	The total spring force of the separation spring shall be 1.08 to 5.3 [N].	Review of Design		

J-SSOD/Satellite Interface Verification Recoed (for Flight Model)

Section No.	Item	Results	Requirement	Verification Method	Evidence document (Document No)	Reference
G-1	Separation Spring		[Title]			
G-1(1),(2)	**Location**	OK / NG	A satellite shall have separation spring of -Z rail end face.	Inspection, Review of Design		Figure G-1
G-2(2)	**Location of end rail switch**	OK / NG	Location of end rail switch shall conform to Figure G-2	Inspection, Review of Design		Figure G-2
G-3(3)	**Spring force**	N	The total spring force of the separation spring shall be 1.08 to 5.3 [N].	Inspection (or Review of Design)		

Appendix H List of Metal Material Used

E

Aluminum Alloys	Titanium Alloys	Other Alloys
2017	TAB6400H	
2017-T4		
2017-T451		
2024-T4		
5052		
5052O		
5052-H112		
6061		
6061-T6		
6061-T651		
6063		
6063-T5		
6063-T6		
6082		
6082-T651		
7075		
7075-T3		
7075-T6		
7075-T651		
7075-T73		
7075-T7351		