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| J-SSOD & 001J DRAGONFLY Interface Verification Record | | | | | | | | |
|  |
|  | （For 10cm-sized Small Satellite Flight Model） | | | | | | |  |  |
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|  |  |  | Satellite Developer Name ; | Kyushu Institute of Technology | | |  |  |  |
|  |  |  | Satellite Name ; | DRAGONFLY | | |  |  |  |
|  |  |  | P/N ; | DRAGONFLY-FM-01 | |  |  |  |  |
|  |  |  | S/N ; | 001J |  |  |  |  |  |
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|  | SIGNATURES / Satellite Development, Sponsor agency | | | | | | |  |  |
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|  | Satellite Development Team (Initiate) | | | |  |  |  |  |  |
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|  | Satellite Development Team (Reviewed) | | | |  |  |  |  |  |
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|  | **No.** | **Item** | | |  |  | **Results** | |  | **Requirement** | | **Verification Method** | **Evidence document (Document No.)** | **Reference** |
|  | **2** | **Intercace 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** | | | 2U | | | |  | 1U, 1.5U, 2U, 3U, 4U, 5U, 6U | | Review of Design | (16\_BIRDSX-SAR-02) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.2(2)** | **Width in -Z Plane(-Z** | | |  |  |  |  |  |  |  |  |  |  |
|  |  | a. | +X Plane | 99.93 | | | mm |  | 100.0+/-0.1mm | | Inspection (Measurement) | (19\_BIRDSX-IVR-Attachment1) | Figure2.1.2-1,  1a~1d |
|  |  | b. | +Y Plane | 99.93 | | | mm |  |
|  |  | c. | -X Plane | 99.94 | | | mm |  |
|  |  | d. | -Y Plane | 99.94 | | | mm |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **Width in +Z Plane** | | |  |  |  |  |  |  |  |  |  |  |
|  |  | a. | +X Plane | 99.92 | | | mm |  | 100.0+/-0.1mm | | Inspection (Measurement) | (19\_BIRDSX-IVR-Attachment1) | Figure2.1.2-1,  2a~2d |
|  |  | b. | +Y Plane | 99.93 | | | mm |  |
|  |  | c. | -X Plane | 99.94 | | | mm |  |
|  |  | d. | -Y Plane | 99.95 | | | mm |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.2 (3) - (9)** | **Rails Length** | | |  |  |  |  |  |  |  |  |  |  |
|  |  | a. | Rail 1 | 227.02 | | | mm |  | [For Deployment S/W] | [For Separation Spring] | Inspection (Measurement) | (19\_BIRDSX-IVR-Attachment1) | Figure2.1.2-1,  3a~3d |
|  |  | (S/W) | | |  |  | 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) | 111.5+/-0.1mm (1U) 168.2+/-0.1mm (1.5U) 225.0+/-0.2mm (2U) 338.5+/-0.3mm (3U) 452.0+/-0.4mm (4U) 565.5+/-0.5mm (5U) 679.0+/-0.6mm (6U) |
|  |  | b. | Rail 2 | 227.00 | | | mm |  |
|  |  | (S/W) | | |  |  |
|  |  | c. | Rail 3 | 226.99 | | | mm |  |
|  |  | (S/W) | | |  |  |
|  |  | d. | Rail 4 | 224.97 | | | mm |  |
|  |  | (Separation Spring) | | |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.3** | **Rails** |  |  |  |  |  |  |  | [Title] | |  |  |  |
|  | **2.1.3(1)** | **Number of rails** | | | 4 | | | |  | 4 | | Review of Design | (16\_BIRDSX-SAR-02) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.3(2)** | **Rails Perpendicularity against +Z Plane** | | |  |  |  |  |  |  |  |  |  |  |
|  |  | a. | Rail 1, +X | OK | | | |  | ≦ 0.2mm | | Inspection (Measurement.) | (19\_BIRDSX-IVR-Attachment1) | Figure 2.1.2-1, 4a~4h |
|  |  | - | | | mm |  |
|  |  | b. | Rail 1, -Y | OK | | | |  |
|  |  | - | | | mm |  |
|  |  | c. | Rail 2, -Y | OK | | | |  |
|  |  | - | | | mm |  |
|  |  | d. | Rail 2, -X | OK | | | |  |
|  |  | - | | | mm |  |
|  |  | e. | Rail 3, -X | OK | | | |  |
|  |  | - | | | mm |  |
|  |  | f. | Rail 3, +Y | OK | | | |  |
|  |  | - | | | mm |  |
|  |  | g. | Rail 4, +Y | OK | | | |  |
|  |  | - | | | mm |  |
|  |  | h. | Rail 4, +X | OK | | | |  |
|  |  | - | | | mm |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **Rails Perpendicularity against +Y Plane** | | |  |  |  |  |  |  |  |  |  |  |
|  |  | a. | Rail 1, +X | OK | | | |  | ≦ 0.2mm | | Inspection (Measurement.) | (19\_BIRDSX-IVR-Attachment1) | Figure 2.1.2-1, 5a~5d |
|  |  | - | | | mm |  |
|  |  | b. | Rail 2, -X | OK | | | |  |
|  |  | - | | | mm |  |
|  |  | c. | Rail 3, -X | OK | | | |  |
|  |  | - | | | mm |  |
|  |  | d. | Rail 4, +X | OK | | | |  |
|  |  | - | | | mm |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **Rails Parallelism against +Y Plane** | | |  |  |  |  |  |  |  |  |  |  |
|  |  | a. | Rail 1, -Y | OK | | | |  | ≦ 0.2mm | | Inspection (Measurement.) | (19\_BIRDSX-IVR-Attachment1) | Figure 2.1.2-1, 6a~6b |
|  |  | - | | | mm |  |
|  |  | b. | Rail 2, -Y | OK | | | |  |
|  |  | - | | | mm |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **Rail Edges Flatness on +Z Plane** | | |  |  |  |  |  |  |  |  |  |  |
|  |  | a. | Rail 1 | OK | | | |  | ≦ 0.2mm | | Inspection (Measurement.) | (19\_BIRDSX-IVR-Attachment1) | Figure 2.1.2-1, 7a~7d |
|  |  | - | | | mm |  |
|  |  | b. | Rail 2 | OK | | | |  |
|  |  | - | | | mm |  |
|  |  | c. | Rail 3 | OK | | | |  |
|  |  | - | | | mm |  |
|  |  | d. | Rail 4 | OK | | | |  |
|  |  | - | | | mm |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.3(3)** | **Rails Width** | | |  |  |  |  |  |  |  |  |  |  |
|  |  | a. | Rail 1 (+X, -Y) | 8.52 | x | 8.52 | mm |  | Min 8.5 x 8.5 mm | | Inspection (Measurement) | (19\_BIRDSX-IVR-Attachment1) | Figure2.1.2-1,  8a~8d |
|  |  | b. | Rail 2 (-X, -Y) | 8.52 | x | 8.52 | mm |  |
|  |  | c. | Rail 3 (-X, +Y) | 8.51 | x | 8.51 | mm |  |
|  |  | d. | Rail 4 (+X, +Y) | 8.52 | x | 8.52 | mm |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.3(4)** | **Rails Surface Roughness** | | |  |  |  |  |  |  |  |  |  |  |
|  |  | a. | Rail 1 | OK | | | |  | ≦ 1.6μm (Ra) (\*1) | | Inspection  (Measurment) | (19\_BIRDSX-IVR-Attachment1) | Figure2.1.2-1,  9a~9d |
|  |  | - | | | μm(Ra) | |
|  |  | b. | Rail 2 | OK | | | |  |
|  |  | - | | | μm(Ra) | |
|  |  | c. | Rail 3 | OK | | | |  |
|  |  | - | | | μm(Ra) | |
|  |  | d. | Rail 4 | OK | | | |  |
|  |  | - | | | μm(Ra) | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.3(5)** | **Rails Edges Rounding** | | |  |  |  |  |  |  |  |  |  |  |
|  |  | a. | Rail 1 | OK | | | |  | Burr-free | | Inspection | (19\_BIRDSX-IVR-Attachment1) | Figure2.1.2-1,  10a~10d |
|  |  | b. | Rail 2 | OK | | | |  |
|  |  | c. | Rail 3 | OK | | | |  |
|  |  | d. | Rail 4 | OK | | | |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.3(6)** | **Rails Surface Area (+Z Plane)** | | |  |  |  |  |  |  |  |  |  |  |
|  |  | a. | Rail 1 | OK | | | |  | Min 6.5 x 6.5 mm | | Inspection (Measurement) | (19\_BIRDSX-IVR-Attachment1) |  |
|  |  | 6.50 | x | 6.50 | mm |  |
|  |  | b. | Rail 2 | OK | | | |  |
|  |  | 6.50 | x | 6.50 | mm |  |
|  |  | c. | Rail 3 | OK | | | |  |
|  |  | 6.50 | x | 6.50 | mm |  |
|  |  | d. | Rail 4 | OK | | | |  |
|  |  | 6.50 | x | 6.50 | mm |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.3(7)** | **Rails Contact Length with J-SSOD Rail Guides** | | | | | |  |  |  |  |  |  |  |
|  |  | a. | Rail 1, +X | 226.79 | | | mm |  | ≧ 85.1mm (1U) ≧ 127.7mm (1.5U) ≧ 170.3mm (2U) ≧ 255.4mm (3U) ≧ 340.5mm (4U) ≧ 425.6mm (5U) ≧ 510.8mm (6U) | | Inspection (Measurement) | (19\_BIRDSX-IVR-Attachment1) |  |
|  |  | b. | Rail 1, -Y | 226.80 | | | mm |  |
|  |  | c. | Rail 2, -Y | 226.83 | | | mm |  |
|  |  | d. | Rail 2, -X | 226.80 | | | mm |  |
|  |  | e. | Rail 3, -X | 226.85 | | | mm |  |
|  |  | f. | Rail 3, +Y | 226.85 | | | mm |  |
|  |  | g. | Rail 4, +Y | 224.63 | | | mm |  |
|  |  | h. | Rail 4, +X | 224.62 | | | mm |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.3(8)** | **(N/A)** |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.3(9)** | **Rail Surface Finish** | | |  |  |  |  |  |  |  |  |  |  |
|  |  | a. | Rail 1 | OK | | | |  | Hard Anodized | | Inspection, Review of Design (Machine work order, Inspection report,etc.) | (19\_BIRDSX-IVR-Attachment1) |  |
|  |  |  | Type: | - | | |  |  |
|  |  | b. | Rail 2 | OK | | | |  |
|  |  |  | Type: | - | | |  |  |
|  |  | c. | Rail 3 | OK | | | |  |
|  |  |  | Type: | - | | |  |  |
|  |  | d. | Rail 4 | OK | | | |  |
|  |  |  | Type: | - | | |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.4** | **Envelope Requirements** | | |  |  |  |  |  | [Title] | |  |  |  |
|  | **2.1.4(1)** | **Dynamic Envelope** | | |  |  |  |  |  | [Definition] | |  |  |  |
|  | **2.1.4(2)** | **Dynamic Envelope (±Z Plane)** | | |  |  |  |  |  |  | |  |  |  |
|  |  |  | +Z: | 0.56 | | | mm |  | ≧ 0.5mm from rail surfaces (+ Z)  No protrusion from rail surfaces(-Z) | | Inspection (Measurement) | (19\_BIRDSX-IVR-Attachment1) | Figure 2.1.4-1, 11 |
|  |  |  | -Z: | OK | | | mm |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.4(3)** | **(N/A)** |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.4(4)** | **Dynamic Envelope (+/-X and +/- Y Plane)** | | | | | |  |  |  |  |  |  |  |
|  |  | a. | +X Plane | 2.00 | | | mm |  | ≦ 6.5mm from rail surface (+/-X, +/-Y) | | Inspection (Measurement) | (19\_BIRDSX-IVR-Attachment1) | Figure 2.1.4-1, 13a~13d |
|  |  | b. | +Y Plane | 6.42 | | | mm |  |
|  |  | c. | -X Plane | 2.00 | | | mm |  |
|  |  | d. | -Y Plane | 6.44 | | | mm |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.4(5)** | **Constraints on deployable components** | | | OK | | | |  | Any deployable components shall be constrained by the satellite itself. The J-SSOD rails and walls shall not be used to constrain these deployables. | | Review of Design | Fit Check Report (20\_BIRDSX-FCR-01) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.5** | **Mass Properties** | | |  |  |  |  |  | [Title] | |  |  |  |
|  | **2.1.5(1)** | **Mass** |  |  | 1.758 | | | kg |  | 0.13～1.33kg/1U (1U,1.5U,2U,3U,4U,5U,6U) | | Inspection (Measurement) | (19\_BIRDSX-IVR-Attachment1) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.5(2)** | **Ballistic Number** | | | 48.83 | | | kg/m2 |  | ≦ 115 kg/m2 | | Analysis | Structural Analysis Report (02\_BIRDSX-SR-01) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.5(3)** | **(N/A)** |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.6** | **Separation Spring** | | |  |  |  |  |  | Refer to AppendixG | |  |  |  |
|  | **2.1.7** | **Access Window** | | |  |  |  |  |  | [Title] | |  |  |  |
|  | **2.1.7(1)** | **Operation** | |  | OK | | | |  | Do not access the satellite after storing the case. | | Review of Design | Safety Assessment Report (15\_BIRDSX-SAR-02) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.8** | **Structural Strength** | | |  |  |  |  |  | [Title] | |  |  |  |
|  | **2.1.8(1)** | **Main Structure Strength** | | | OK | | | |  | 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) | Structural Analysis Report (02\_ BIRDSX-SR-01) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.8(2)** | **Rails Strength** | | | OK | | | |  | Each rail shall have a sufficient structural strength with 46.6 N of a combined load of the preload and the spring load by the main spring. | | Analysis (Stress Analysis Report) | Structural Analysis Report (02\_ BIRDSX-SR-01) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.1.9** | **Stiffness** | | | 258.4 | | | Hz |  | Minimum fundamental frequency ≧ 30 [Hz] | | Analysis (Stress Analysis Report) | Structural Analysis Report (02\_ BIRDSX-SR-01) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.2** | **Electrical Interface** | | |  |  |  |  |  | [Title] | |  |  |  |
|  | **2.2.1** | **Deployment Switch** | | |  |  |  |  |  | [Title] | |  |  |  |
|  | **2.2.1(1)** | **Fault tolerant design** | | | OK | | | |  | Satellite shall not be activated when either of two switches depressed. Fault tolerant design according to SSP51721. | | Review of Design | Safety Assessment Report for Phase3 (15\_BIRDSX-SAR-02) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.2.1(2)** | **Location of end rail switch** | | | OK | | | |  | Location of end rail switch shall conform to Figure 2.2.1-1 | | Inspection, Review of Design | (15\_BIRDSX-SAR-02) | Figure 2.2.1-1, 14 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.2.1(3)** | **Location of side rail switch** | | | N/A | | | |  | Location of side rail switchshall conform to Figure 2.2.1-2 | | Inspection, Review of Design | - | Figure 2.2.1-1, 15 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.2.1(4)** | **Tip shape of side rail switch** | | | N/A | | | |  | ≧ R2.4 | | Inspection, Review of Design | - |  |
|  |  | | | mm(R) | |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.2.1(5)** | **Reaction force of side rail** | | | N/A | | | |  | ≦ 0.26 [N] per 1U size satellite. | | Inspection, Review of Design | - |  |
|  |  | | | N |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.2.1(6)** | **(N/A)** |  |  |  |  |  |  |  |  | |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.2.1(7)** | **Power interruption function of end rail switch** | | | OK | | | |  | The end rail switch shall be set does not operate until it protrudes 0.75mm min. from rail surfaces | | Inspection  (Measurement) | Inhibit Function Test Report (21\_BIRDSX-IFTR-01) | Figure 2.2.1-4, 16 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.2.1(8)** | **Power interruption function of side rail switch** | | | N/A | | | |  | The side rail switch shall be set does not operate until it protrudes 1.5mm min. from rail surfaces | | Inspection, Test | - | Figure 2.2.1-4, 17 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.2.1(9)** | **Movable Stroke of end rail switch** |  |  |  |  |  |  |  |  | |  |  |  |
|  |  | a. | Stroke (a) | OK | | | |  | 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 | (19\_BIRDSX-IVR-Attachment1) |  |
|  |  | b. | Stroke (b) | OK | | | |  | No structural deformation and destruction occur during the phase from launch to satellite deploy operation. | | Inspection | Vibration Test Report(25\_BIRDSX-VT-01) |  |
|  |  | c. | Stroke (c) | OK | | | |  | Do not affect the satellite in the -Z direction when the satellite deploy operation. | | Inspection | Safety Assessment Report for Phase3 (15\_BIRDSX-SAR-02(Φ3))) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.2.1(10)** | **Total spring force (-Z plane)** | | | OK | | | |  | 1.08 ~ 5.3N | | Inspection (or Review of Design) | Safety Assessment Report for Phase3 (15\_BIRDSX-SAR-02(Φ3))) |  |
|  | OK | | | N |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.2.2** | **Ground Handling Pin** | | |  |  |  |  |  | [Title] | |  |  |  |
|  | **2.2.2(1)** | **Design** | |  | OK | | | |  | Do not use the Ground Handling pin as a hazard control except for handling on the ground. | | Review of Design | Safety Assessment Report (15\_BIRDSX-SAR-02) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.2.2(2)** | **Operation** | |  | N/A | | | |  | Remove the Ground Handling pin before install the satellite in the J-SSOD | | Review of Design | Safety Assessment Report (15\_BIRDSX-SAR-02) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **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 | | | |  | Maximum stowage duration shall assume the max stowage duration may be about 1 year. | | Review of Design (\*2) | The satellite is designed based on proper stowage duration |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.3(2)** | **On-orbit Maintenance Limitation** | | | OK | | | |  | On-orbit maintenance limitation will not plan any activation, checkout, or maintenance after the delivery. | | Review of Design (\*2) | No maintenance required |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.3(3)** | **Cold Launch Requirements** | | | OK | | | |  | A satellite shall have a capability to survive in the cold launch environment (i.e. w/o power). | | Review of Design (\*2) | No power required |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.3(4),(5)** | **Minimum Time until Appendage Deployment & RF Radiation** | | | | | |  |  |  | |  |  |  |
|  |  | a. | Timer Setting | OK | | | |  | ≧ 30 minutes | | Function Test | Antenna Deployment and RF transmission Test (22\_BIRDSX-AD&RFT-01) |  |
|  |  |  | Minimum Time until Mechanism Deployment | OK | | | min |  |  |
|  |  |  | Minimum Time until RF Radiation | 33 | | | min |  |  |
|  |  | b. | Function Test | OK | | | |  | Whenever either of two deployment switches is re-depressed, the timer shall be reset. | | Function Test | Antenna Deployment and RF transmission Test (22\_BIRDSX -AD&RFT-01) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.3(6)** | **Limitation of the satellite** | | | OK | | | |  | A satellite deployment window shall not be restricted by a satellite design. | | Review of Design | No strict requirement |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.4** | **Environmental Requirements** | | |  |  |  |  |  | [Title] | |  |  |  |
|  | **2.4.1** | **Random Vibration and Acceleration** | | |  |  |  |  |  | [Title] | |  |  |  |
|  | **2.4.1(a)** | **Quasi-static Acceleration** | | | OK | | | |  | A satellite shall assume the condition defined in the section 2.4.1(a). | | Analysis(Stress Analysis Report) | Structural Analysis Report(02\_BIRDSX-SR-01) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.4.1(b)** | **Random Vibration** | | | OK | | | |  | A satellite shall assume the condition defined in the section 2.4.1(b). | | Test (Vibration Test Report) | Vibration Test Report (25\_BIRDSX-VT-01) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.4.2** | **On-orbit Acceleration** | | |  |  |  |  |  | [Title] | |  |  |  |
|  | **2.4.2(a)** | **On-orbit Acceleration** | | | OK | | | |  | A satellite shall assume the condition defined in the section 2.4.2(a). | | Analysis (Stress Analysis Report) | Structural Analysis Report (02\_BIRDSX-SR-01) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.4.3** | **Pressure Environment** | | |  |  |  |  |  | [Title] | |  |  |  |
|  | **2.4.3(a)** | **Pressure** | |  | OK | | | |  | A satellite shall assume the condition defined in the section 2.4.3(a). | | Review of Design (\*3) | Structural Analysis Report (02\_BIRDSX-SR-01) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.4.3(b)** | **Depressurization Rate** | | | 0.83 | | | m (\*4) |  | If V/A > 50.8m (2000inch),  Stress Analysis Report is needed. | | Review of Design (or Analysis) | Structural Analysis Report (02\_BIRDSX-SR-01) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.4.4** | **Thermal Environment** | | | OK | | | |  | A satellite shall assume the condition defined in the section 2.4.4. | | Review of Design (or Test) | Thermal Test Report (26\_BIRDSX-TVT-01) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.4.5** | **Humidity Environment** | | | OK | | | |  | A satellite shall assume the condition defined in the section 2.4.5. | | Review of Design (\*3) | The satellite is designed based on humidity condition |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **2.5** | **Out-gassing** | | | OK | | | |  | A satellite shall assume the condition defined in the section 2.5. | | Review of Design(or Inspection) | MIUL(03\_BIRDSX-MIUL-01) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4** | **Safety and Product Assurance** | | |  |  |  |  |  | [Title] | |  |  |  |
|  | **4.1** | **Generic Requirements** | | |  |  |  |  |  |  | |  |  |  |
|  | **4.2** | **Safety Assessment** | | |  |  |  |  |  | [Title] | |  |  |  |
|  | **4.2.1** | **Implementation of Safety Analysis and Safety Assessment** | | | | | |  |  |  | |  |  |  |
|  | **4.2.1(1)** |  | a. | On-orbit Safety | Applied | | | |  | A satellite provider shall conduct safety analysis and submit a SAR. Necessary inspections and tests for safety assessment shall be also conducted. | | Analysis, test, Inspection (Phase III approved SAR) | Safety Assessment Report for Phase3 (16\_BIRDSX-SAR-02(Φ3))) |  |
|  |  | b. | Launch Site & Vehicle Safety | N/A | | | |  | A 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)** | | | Applied | | | |  | The satellite provider shall submit MIUL. | | Analysis, Test, Inspection (MIUL) | MIUL (03\_BIRDSX-MIUL-01) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.2.1(3)** | **Materials Usage Agreement (MUA)** | | | N/A | | | |  | The satellite provider shall submit MUA. | | Analysis, Test, Inspection (MUA) | N/A |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.2.1(4)** | **Volatile Organic Compound Usage Agreement (VUA)** | | | N/A | | | |  | The satellite provider shall submit VUA. | | Analysis, Test, Inspection (VUA) | N/A |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.2.1(5)** | **Hazardoous Material Summary Tables (HMST)** | | | Applied | | | |  | The satellite provider shall submit HMST. | | Analysis, Test, Inspection (HMST) | HMST (04\_BIRDSX-HMST-01) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.2.2** | **Safety Design Guidelines** | | | | | |  |  | [Guidelines] | |  |  |  |
|  | **4.2.2.1** | **Standard Hazard** | | | | | |  |  | [Guidelines] | |  |  |  |
|  | **4.2.2.1(1)** | **Flammable Material** | | | Applied | | | |  | If the satellite has flammability materials such as non-metaric materials. | | Analysis, test, Inspection  (Phase III approved SAR) | Safety Assessment Report (15\_BIRDSX-SAR-02) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.2.2.1(2)** | **Material Offgassing** | | | Applied | | | |  | If the satellite has offgassing materials such as non-metaric materials. | | Analysis, test, Inspection  (Phase III approved SAR) | Safety Assessment Report (15\_BIRDSX-SAR-02) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.2.2.1(3)** | **Hazardous Material** | | | Applied | | | |  | If the satellite has toxic, or biological hazardous materials. | | Analysis, test, Inspection (Phase III approved SAR) | Safety Assessment Report(15\_BIRDSX-SAR-02) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.2.2.1(4)** | **Sharp Particles** | | | Applied | | | |  | If the satellite has glass or shatterable materials. | | Analysis, test, Inspection  (Phase III approved SAR) | Safety Assessment Report (15\_BIRDSX-SAR-02) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.2.2.1(5)** | **Mechanical Hazards** | | | Applied | | | |  | If the satellite has sharp edges, corners, holes, etc. | | Analysis, test, Inspection  (Phase III approved SAR) | Safety Assessment Report (15\_BIRDSX-SAR-02) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.2.2.1(6)** | **Touch Temperature** | | | N/A | | | |  | If the satellite has sources of heating and/or cooling. | | Analysis, test, Inspection  (Phase III approved SAR) | N/A |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.2.2.1(7)** | **Laser and/or Incoherent Emissions** | | | N/A | | | |  | If the satellite has laser and/or incoherent emissions. | | Analysis, test, Inspection  (Phase III approved SAR) | N/A |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.2.2.1(8)** | **Radiation Interderence** | | | Applied | | | |  | If the satellite has non-ionizing radiation sources (electrical power supplies, batteries, antennas/transmitters) | | Analysis, test, Inspection (Phase III approved SAR) | Safety Assessment Report(15\_BIRDSX-SAR-02) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.2.2.1(9)** | **Rotating Equipment** | | | N/A | | | |  | If the satellite has rotating equipments. | | Analysis, test, Inspection  (Phase III approved SAR) | N/A |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.2.2.1(10)** | **Seald Container** | | | N/A | | | |  | If the satellie has sealed containers. | | Analysis, test, Inspection  (Phase III approved SAR) | N/A |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.2.2.2** | **Unique Hazard** | | | | | |  |  | [Guidelines] | |  |  |  |
|  | **4.2.2.2(1)** | **Structural Failure** | | | Applied | | | |  | To perform structural design and fracture control of the satellite. | | Analysis, test, Inspection  (Phase III approved SAR) | Safety Assessment Report (15\_BIRDSX-SAR-02) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.2.2.2(2)** | **Radio Frequency (RF) Radiation** | | | Applied | | | |  | Satellite RF emission levels do not exceed the levels in 4.2.2.2(2). | | Analysis, test, Inspection  (Phase III approved SAR) | Safety Assessment Report (15\_BIRDSX-SAR-02) |  |
|  | 5.19×106, 4.88×106 | | | μV/m |  | RF radiation levels shall not exceed values of Table 4.2.2.2-1. | | Catlog Spec. | Safety Assessment Report (15\_BIRDSX-SAR-02) |  |
|  | 437.050, 145.825 | | | MHz |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.2.2.2(3)** | **Deployable Structure** | | | Applied | | | |  | If the satellite has deployable structures. | | Analysis, test, Inspection  (Phase III approved SAR) | Safety Assessment Report (15\_BIRDSX-SAR-02) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.2.2.2(4)** | **Battery Failure** | | | Applied | | | |  | If the satellite has batteries. | | Analysis, test, Inspection  (Phase III approved SAR) | Safety Assessment Report (15\_BIRDSX-SAR-02) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.2.2.2(5)** | **Propulsion, Deployable Subcomponents** | | | N/A | | | |  | If the satellite has propulsion system and/or deployable subcomponents. | | Analysis, test, Inspection  (Phase III approved SAR) | N/A |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.2.2.2(6)** | **Other Failures** | | | N/A | | | |  | If the satellite may occur other hazards. | | Analysis, test, Inspection  (Phase III approved SAR) | N/A |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **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 | | | |  | The Satellite shall have a minimum flight cross section at least 78.5 cm2. | | Inspection | N/A |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.3.1.1.3** | **Propulsion Systems** | | | | | |  |  | [Title] | |  |  |  |
|  | **4.3.1.1.3(1)** | **SSA Sharing Agreement** | | | N/A | | | |  | 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 | N/A |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.3.1.1.3(2)** | **Operation Process** | | | N/A | | | |  | 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 | N/A |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.3.1.1.4** | **Deployable Subcomponents** | | | | | |  |  | [Title] | |  |  |  |
|  | **4.3.1.1.4(1)** | **Deploy distance** | | | N/A | | | |  | The satellite is more than 500 km forward or backward from the ISS relative to the ISS's forward direction. | | Analysis, Test, Review of Design | N/A |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.3.1.1.4(2)** | **Deploy altitude** | | | N/A | | | |  | The apogee altitude of the main satellite and subcomponents must be lower than the perigee altitude of the ISS. | | Analysis, Test, Review of Design | N/A |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **4.3.2** | **Compatibility with Space Debris Mitigation Guidelines** | | | | | |  |  | JAXA will perform this section. | |  |  |  |
|  | **5** | **Requirements for Control** | | | | | |  |  | [Title] | |  |  |  |
|  | **5.2** | **Application for Approval and Authorization** | | | | | |  |  | [Title] | |  |  |  |
|  |  | **(1) IARU coordination** | | | Complete | | | |  | Currently Status(\*5) | |  | mail from IARU |  |
|  |  | **(2) ITU coordination** | | | In progress | | | |  | Currently Status(\*5) | |  | API/A published |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **G-1** | **Separation Spring** | | |  |  |  |  |  | [Title] | |  |  |  |
|  | **G-1(1),(2)** | **Location** | |  | OK | | | |  | A satellite shall have separation spring of -Z rail end face. | | Inspection, Review of Design | Assembly Drawing (05-BIRDSX-AD-01) | Figure G-1 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **G-2(2)** | **Location of end rail switch** | | | OK | | | |  | Location of end rail switch shall conform to Figure 2.2.1-1 | | Inspection, Review of Design | Assembly Drawing (05-BIRDSX-AD-01) | Figure G-2 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **G-3(3)** | **Spring force** | | | 1.13 | | | N |  | The total spring force of the separation spring shall be 1.08 to 5.3 [N]. | | Inspection (or Review of Design) | Safety Assessment Report for Phase3 (15\_BIRDSX-SAR-02(Φ3)) |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | (\*1) Arithmetic average of the roughness profile. | |  |  |  |
|  |  |  |  |  |  |  |  |  |  | (\*2) It is allowed to describe a rationale in "Evidence document" instead of providing a document. | | |  |  |
|  |  |  |  |  |  |  |  |  |  | (\*3) It is allowed to write the purport of no problem in "Evidence document" instead of providing a document. | | | |  |
|  |  |  |  |  |  |  |  |  |  | (\*4) Please fill in V/A. |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | (\*5)Describe coordination status: for example, “API/A published” and so on. | | |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |