

CHANGE NOTICE

Date Prepared: 3/6/02

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|---|---|--|--|------------------------------|--------------------------------|---------------------------|---|----------|
| 1. The Boeing Company Post Office Box 58747 Houston, TX 77258 | | 2. <input type="checkbox"/> Proposed <input checked="" type="checkbox"/> Approved | | 3. Code Ident. 2B945 | | 4. Doc. No. SSP 30237F | | |
| | | | | 5. Code Ident. 2B945 | | 6. CDCN No. 016 | | |
| 7. System Designation ISS | | 8. Related ECP No./Title SSCN 004785 | | | 9. Contract No. NAS15-10000 | | 10. Contractual Activity SSCN 004785 | |
| 11. Document Title Space Station Electromagnetic Emission and Susceptibility Req | | | | 12. Effectivity All Units | | | | |
| THIS NOTICE INFORMS RECIPIENTS THAT THE DOCUMENT IDENTIFIED BY THE NUMBER (AND REVISION LETTER) SHOWN IN BLOCK 4 HAS BEEN CHANGED. THE PAGES CHANGED BY THIS CDCN BEING THOSE FURNISHED HEREWITH AND CARRYING THE SAME DATE AS THIS CDCN. THE PAGES OF THE PAGE NUMBERS AND DATES LISTED BELOW IN THE SUMMARY OF CHANGED PAGES COMBINED WITH NON-LISTED PAGES OF THE ORIGINAL ISSUE OF THE REVISION SHOWN IN BLOCK 4 CONSTITUTE THE CURRENT VERSION OF THIS DOCUMENT. | | | | | | | | |
| 13. CDCN No. | 14. Pages Changed (Indicate Deletions) | | | | | S* | A* | 15. Date |
| 016 | Revision and History page Pages 3-2, 3-3, 3-4, 3-5, 3-6, and 3-8 Pages C-96, C-96a, C-105, C-105a, C-105b, C-105c, C-116 Pages C-116a, C-116b, C-118, C-118a, C-119, C-119a, C-119b Pages C-119c, C-119d, C-119e. | | | | | X X X X X | | 3/6/02 |
| 016 | Pages C-96b, C-96c, C-96d, C-96e, C-96f, C-105d, C-105e Pages C-119f, C-119g. | | | | | | X X | |
| | Order of Incorporation: DCN 017, 019, 020, 016 | | | | | | | |
| 16. Technical Concurrence (Contracting Agency) | | | | | | Date | | |

* "S" indicates supersedes earlier page. "A" indicates added page.

REVISION AND HISTORY PAGE

| REV. | DESCRIPTION | PUB. DATE |
|------|---|--------------|
| – | SDR Version | 03–07–94 |
| B | Revision B (Reference SSCBD 000008 R1, Eff. 6–03–94) Revised to Transition from Freedom to ISS. Changes include extensive simplification of requirements and scope. | 09–30–94 |
| C | Revision C (SSCD 000263, EFF. 09–04–97) Administrative Update | 01–29–97 |
| | DCN 001 incorporates ECP 263 (Supplemental Release) | 06–06–97 |
| | DCN 002 incorporates SSCN 000777 | 07–20–98 |
| | DCN 003 incorporates SSCN 001035 | 07–20–98 |
| D | Revision D incorporates SSCN 001102 | 07–21–98 |
| | DCN 004 incorporates SSCN 001462 | 02–17–99 |
| | DCN 005 incorporates SSCN 001594 | 02–22–99 |
| | DCN 006 incorporates SSCN 001662 | 06–15–99 |
| | DCN 007 incorporates SSCN 001920 | 08–25–99 |
| | DCN 008 incorporates SSCN 002045 | 08–25–99 |
| | DCN 009 incorporates SSCN 002107 | 08–30–99 |
| E | Revision E incorporates SSCN 002345 | 10–25–99 |
| | DCN 010 incorporates SSCN 002485 | 04–06–00 |
| | DCN 011 incorporates SSCD 003213 Eff. 06–28–00 | 04–13–01 |
| | DCN 013 incorporates SSCN 003690 Eff. 11–08–00 | 04–13–01 |
| | DCN 014 incorporates SSCN 003746 Eff. 11–15–00 | 04–13–01 |
| | The following DCNs have been cancelled. The content of these DCNs have been incorporated into Revision F. | |
| | DCN 015 incorporates SSCN 004676 Administrative Cancel | |
| | DCN 018 incorporates SSCN 000256 Administrative Cancel | |
| F | Revision F incorporates SSCNs 000256, 004676, and 004140. | 07–24–01 |
| | DCN 017 incorporates SSCD 005008 | 08–31–01 |
| | DCN 019 incorporates SSCN 005529 | 10–23–01 |
| | DCN 020 incorporates SSCN 005263 | 03–27–02 |
| | DCN 016 incorporates SSCN 004785 | 04–17–02 |

3.2.1.1.2 CE01 LIMITS

Electromagnetic emissions shall not appear on dc leads in excess of the following values as shown below. The emission limit shown below is for equipment drawing one amp or less. For equipment drawing more than one amp, the limit, in decibels (dB) as shown in Table 3.2.1.1.2-1 shall be raised by $20 \times \log I$, where I equals the total dc current used by the equipment under test.

TABLE 3.2.1.1.2-1 CE01 EMISSION LIMIT

| Frequency | Emissions |
|------------------|---|
| 30 Hz to 200 Hz | 110 dB above 1 microampere |
| 200 Hz to 15 kHz | Decreasing log linearly with increasing frequency from 110 to 74 dB above 1 microampere |

DCN 020

The limits shall be measured with an effective bandwidth not exceeding 100 Hz. See appendix C for exception (Electromagnetic Effects Control Board (EMECB) Tailoring/Interpretation Agreement (TIA)-0025, EMECB TIA-0134, EMECB TIA-0138, EMECB TIA-0155, EMECB TIA-0159, EMEP TIA-0265, EMEP TIA-0266, and EMEP TIA-0315) to this paragraph.

DCN 020, 016

3.2.1.2 CE03, CONDUCTED EMISSIONS

Direct current power leads, 15 kHz to 50 megahertz (MHz).

3.2.1.2.1 APPLICABILITY

CE03 is applicable only for narrowband emissions between 15 kHz and 50 MHz on dc leads which obtain power from other sources or provide power to other equipment, distribution panels or subsystems.

3.2.1.2.2 CE03 LIMITS

Electromagnetic emissions shall not appear on dc power leads in excess of the following values as shown below for narrowband emissions: The limit shown below is for equipment drawing one amp or less. For equipment drawing more than one amp, the limit as shown in Table 3.2.1.2.2-1 shall be raised by $20 \times \log I$, where I equals the total dc current used by the equipment under test. See appendix C for exception (EMECB TIA-0024, EMECB TIA-0025, EMECB TIA-0028, EMECB TIA-0039, EMECB TIA-0043, EMECB TIA-0053, EMECB TIA-0057, EMECB TIA-0064, EMECB TIA-0082, EMECB TIA-0095, EMECB TIA-0098, EMECB TIA-0101, EMECB TIA-0112, EMECB TIA-0114, EMECB TIA-0115, EMECB TIA-0118, EMECB TIA-0123, EMECB TIA-0131, EMECB TIA-0132, EMECB TIA-0134, EMECB TIA-0141, EMECB TIA-0147, EMECB TIA-0153, EMECB TIA-0167, EMECB TIA-0174, EMECB TIA-0176, EMECB TIA-0199, EMEP TIA-0203, EMEP TIA-0206, EMEP TIA-0226, EMEP TIA-0228, EMEP TIA-0244, EMEP TIA-0257, EMEP TIA-0258, EMEP TIA-0267, EMEP TIA-0268, EMEP TIA-0276, EMEP TIA-0283, EMEP TIA-0297, EMEP TIA-0301, EMEP TIA-0340, and EMEP TIA-0353) to this paragraph. **DCN 020, 016**

TABLE 3.2.1.2.2-1 CE03 EMISSION LIMITS

| Frequency | Emissions |
|-------------------|--|
| 15 kHz to 500 Hz | Decreasing log linearly with increasing frequency from 74 to 45 dB above 1 microampere |
| 500 kHz to 50 MHz | 45 dB above 1 microampere |

DCN 020

3.2.1.3 CE07, CONDUCTED EMISSIONS

Direct current power leads, spikes, time domain.

3.2.1.3.1 APPLICABILITY

CE07 is applicable for dc input power leads.

3.2.1.3.2 CE07 LIMITS

CE07 on and off and mode switching transients shall not exceed the envelope defined by the following values listed in Table 3.2.1.3.2-1. Repetitive on and off and mode switching transients shall not occur more frequently than every 100 milliseconds. See appendix C for exception (EMECB TIA-0014, EMECB TIA-0027, EMECB TIA-0049, EMECB TIA-0050, EMECB TIA-0055, EMECB TIA-0057, EMECB TIA-0072, EMECB TIA-0077, EMECB TIA-0079, EMECB TIA-0095, EMECB TIA-0104, EMECB TIA-0110, EMECB TIA-0111, EMECB TIA-0114, EMECB TIA-0116, EMECB TIA-0124, EMECB TIA-0143, EMECB TIA-0144, EMECB TIA-0155, EMECB TIA-0189, EMECB TIA-0198, EMEP TIA-0200, EMEP TIA-0202, EMEP TIA-0203, EMEP TIA-0228, EMEP TIA-0242, EMEP TIA-0282, EMEP TIA-0283, EMEP TIA-0303, EMEP TIA-0350, and EMEP TIA-0353) to this paragraph.

DCN 017, 020

TABLE 3.2.1.3.2-1 CE07 MODE SWITCHING TRANSIENTS ENVELOPE

| Time (Microseconds) | Percentage of Nominal Line Voltage |
|---------------------|--|
| 0.1 to 10 | + 50 percent |
| 10 to 50 | Decreasing log linearly with increasing time from + 50 percent to + 20 percent |
| 50 to 1000 | Decreasing log linearly with increasing time from + 20 percent to + 5 percent or + 6 volts, whichever is greater |
| 1000 to 10,000 | + 6 percent or + 0.5 volts, whichever is greater |
| 10,000 to 100,000 | + 5 percent or + 0.5 volts, whichever is greater |

3.2.2 CONDUCTED SUSCEPTIBILITY

3.2.2.1 CS01, CONDUCTED SUSCEPTIBILITY

Direct current power leads, 30 Hz to 50 kHz. See appendix C for the exception (EMEP TIA-0327, EMEP TIA-0328, EMEP TIA-0348, and EMEP TIA-0369) to this paragraph.

DCN 019, 020

3.2.2.1.1 APPLICABILITY

CS01 is applicable to equipment and subsystems using dc power.

3.2.2.1.2 CS01 LIMITS

The EUT shall not exhibit any malfunction, degradation of performance, or deviation from specified indications beyond the tolerances indicated in the individual equipment or subsystem specification when subjected to electromagnetic energy injected onto its power leads less than or equal to the values as shown in Table 3.2.2.1.2-1. See appendix C for exception (EMECB TIA-0090, EMECB TIA-0145, EMECB TIA-0161, EMECB TIA-0177, EMECB TIA-0178, EMECB TIA-0187, EMECB TIA-0188, EMEP TIA-0225, EMEP TIA-0231, EMEP TIA-0286, EMEP TIA-0297, and EMEP TIA-0354) to this paragraph.

DCN 020, 016

TABLE 3.2.2.1.2-1 CS01 ELECTROMAGNETIC ENERGY INJECTION

| Frequency | Voltage |
|-----------------|--|
| 30 Hz to 2 kHz | 5 Volts root mean square (Vrms) or 10 percent of the supply voltage (E1), whichever is less |
| 2 kHz to 50 kHz | Decreasing log linearly with increasing frequency from 5 Vrms, or E1 whichever is less, to either 1 Vrms or 1 percent of the supply voltage, whichever is less |

3.2.2.1.3 ALTERNATE CS01 LIMITS

The requirement is also met when the audio power source specified in SSP 30238 adjusted to dissipate 50 Watts in a 0.5 ohm load, cannot develop the required voltage at the EUT power input terminals, and the EUT is not susceptible to the output of the signal source.

3.2.2.2 CS02, CONDUCTED SUSCEPTIBILITY

Direct current power leads, 50 kHz to 50 MHz. See appendix C for the exception (EMEP TIA-0327, EMEP TIA-0328, EMEP TIA-0348, and EMEP TIA-0369) to this paragraph.

DCN 019, 020

3.2.2.2.1 APPLICABILITY

CS02 is applicable between 50 kHz and 50 MHz for equipment and subsystem dc power leads, including power returns which are not grounded internally to the equipment or subsystem.

3.2.2.2.2 CS02 LIMITS

The equipment subsystem shall not exhibit any malfunction, degradation of performance or deviation from specified indications beyond the tolerances indicated in the individual equipment or subsystem specification when subjected to 1 Vrms from a 50 ohm source. The test signal shall be applied to the equipment power line near the equipment input terminals. The requirement is also met under the following condition: A 1 Watt source of 50 ohms impedance cannot develop the required voltage at the EUT power input terminals, and the EUT is not susceptible to the output of the signal source. See appendix C for exception (EMECB TIA-0023, EMECB TIA-0051, EMECB TIA-0085, EMECB TIA-0110, EMECB TIA-0162, EMECB TIA-00199, EMEP TIA-0214, EMEP TIA-0215, EMEP TIA-0232, EMEP TIA-0253, EMEP TIA-0286, and EMEP TIA-0293) to this paragraph.

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3.2.2.3 CS06, CONDUCTED SUSCEPTIBILITY

Spikes, power leads. See appendix C for the exception (EMEP TIA-0327, EMEP TIA-0328, EMEP TIA-0348, and EMEP TIA-0369) to this paragraph.

DCN 019, 020

3.2.2.3.1 APPLICABILITY

CS06 is applicable to equipment and subsystem dc power leads, including grounds and returns which are not grounded internally to the equipment or subsystem.

3.2.2.3.2 CS06 LIMITS

The EUT shall not exhibit any malfunction, degradation of performance or deviation from specified indications beyond the tolerances indicated in the individual equipment or subsystem specification when the test spikes, each having the waveform shown on Figure 3.2.2.3.2-1, are applied sequentially to the dc power input leads. The values of E and t are given below. Each spike shall be superimposed on the powerline voltage waveform. See appendix C for exception (EMECB TIA-0088, EMECB TIA-0119, EMECB TIA-0124, EMECB TIA-0193, EMEP TIA-0204, EMEP TIA-0242, and EMEP TIA-0286) to this paragraph. **DCN 016**

3.2.3 RADIATED EMISSIONS

3.2.3.1 RE02, RADIATED EMISSIONS

Electric field, 14 kHz to 10 GHz (narrowband), 13.5 to 15.5 GHz.

3.2.3.1.1 APPLICABILITY

RE02 is applicable for radiated emissions from equipment and subsystems, cables (including control, pulse, intermediate frequency, power and antenna transmission lines) and interconnecting wiring of the test sample; for narrowband emissions, it applies at the fundamental frequencies and all spurious emissions including harmonics, but does not apply for radiation from antennas. This requirement is applicable for narrowband emissions from 14 kHz to 10 GHz and 13.5 to 15.5 GHz.

3.2.3.1.2 RE02 LIMITS

E-field emissions shall not be radiated in excess of those specified in the following paragraphs. Above 30 MHz, the limits shall be met for both horizontally and vertically polarized waves. Measurement shall be made in the peak detector mode. See appendix C for exception (EMECB TIA-0001, EMECB TIA-0044, EMECB TIA-0048, EMECB TIA-0052, EMECB TIA-0055, EMECB TIA-0057, EMECB TIA-0065, EMECB TIA-0073, EMECB TIA-0074, EMECB TIA-0075, EMECB TIA-0080, EMECB TIA-0095, EMECB TIA-0097, EMECB TIA-0102, EMECB TIA-0103, EMECB TIA-0105, EMECB TIA-0111, EMECB TIA-0133, EMECB TIA-0135, EMECB TIA-0137, EMECB TIA-0138, EMECB TIA-0142, EMECB TIA-0164, EMECB TIA-0165, EMECB TIA-0167, EMECB TIA-0170, EMECB TIA-0171, EMECB TIA-0183, EMECB TIA-0154, EMEP TIA-0160, EMECB TIA-0192, EMEP TIA-0203, EMEP TIA-0207, EMEP TIA-0208, EMEP TIA-0209, EMEP TIA-0212, EMEP TIA-0219, EMEP TIA-0220, EMEP TIA-0227, EMEP TIA-0237, EMEP TIA-0213, EMEP TIA-0229, EMEP TIA-0241, EMEP TIA-0252, EMEP TIA-0254, EMEP TIA-0256, EMEP TIA-0257, EMEP TIA-0258, EMEP TIA-0261, EMEP TIA-0264, EMEP TIA-0269, EMEP TIA-0270, EMEP TIA-0276, EMEP TIA-0277, EMEP TIA-0283, EMEP TIA-0287, EMEP TIA-0288, EMEP TIA-0299, EMEP TIA-0305, EMEP TIA-0307, EMEP TIA-0311, EMEP TIA-0314, EMEP TIA-0320, EMEP TIA-0326, EMEP TIA-0330, EMEP TIA-0331, EMEP TIA-0332, EMEP TIA-0335, EMEP TIA-0336, EMEP TIA-0340, EMEP TIA-0349, EMEP TIA-0353, EMEP TIA-0355, EMEP TIA-0357, and EMEP TIA-0360) to this paragraph. **DCN 017, 020, 016**

TABLE 3.2.3.1.2.1-1 FIELD EMISSION LIMITS

| Frequency | Emissions |
|-------------------|---|
| 14 kHz to 10 MHz | 56 dB μ V/m |
| 10 MHz to 259 MHz | Increasing log linearly with increasing frequency from 56 to 86 dB μ V/m (16 dB per decade) |
| 259 MHz to 10 GHz | Increasing log linearly with increasing frequency from 46 to 72 dB μ V/m (16 dB per decade) |
| 13.5 to 15.5 GHz | 72 dB μ V/m |

3.2.4 RADIATED SUSCEPTIBILITY

3.2.4.1 RS02, RADIATED SUSCEPTIBILITY

Magnetic induction field. See appendix C for the exceptions (EMEP TIA-0286, EMEP TIA-0327, EMEP TIA-0328, EMEP TIA-0348, and EMEP TIA-0369) to this paragraph.

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3.2.4.1.1 APPLICABILITY

RS02 is applicable for all equipment and subsystems. These susceptibility signals are electromagnetically coupled into the equipment or subsystem wiring. See appendix C for exception (EMEP TIA-0211, EMEP TIA-0218, and EMEP TIA-0239) to this paragraph.

3.2.4.1.2 RS02 LIMITS

The EUT shall not exhibit any malfunction, degradation of performance, or deviation from specified indications beyond the tolerances indicated in the individual equipment or subsystem specification when subjected sequentially to the test spikes, shown in Figure 3.2.2.3.2-1 each having the waveform with the values of E and t are given below:

- Spike #1 E = \pm Twice the nominal line voltage, t = 10 microseconds \pm 20 percent
- Spike #2 E = \pm Twice the nominal line voltage, t = 0.15 microseconds \pm 20 percent.

See appendix C for exception (EMECB TIA-0095, EMECB TIA-0100, EMECB TIA-0116, and EMECB TIA-0155) to this paragraph.

3.2.4.2 RS03, RADIATED SUSCEPTIBILITY

Electric field, 14 kHz to 20 GHz. See appendix C for the exception (EMEP TIA-0286, EMEP TIA-0327, EMEP TIA-0328, EMEP TIA-0348, and EMEP TIA-0369) to this paragraph.

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EMEP TIA-0261

C.3.2.3.1.2 RE02 LIMITS

Exemption: The tailoring would apply to the Portable Fan Assembly (PFA) GFE (PN 96M68020-1). The PFA may exceed 3.2.3.1.2 RE02 requirements in the vertical polarization by 2.9 dB at 46.15 MHz, 0.4 dB at 68.25 MHz, and 1.6 dB at 300 MHz. The PFA may exceed RE02 requirements in the horizontal polarization by 0.8 dB at 68.25 MHz, 5.5 dB at 69.95 MHz, 1.3 dB at 276 MHz, and 5.5 dB at 300 MHz.

Rationale: The radiated emission outages occur in frequency bands where no receivers exist and therefore will not impact the ISS operations.

EMEP TIA-0262

DCN 020

C.3.2.4.2.2 RS03 LIMITS

DCN 020

Exception: For the Space to Space Station Radio (SSSR) (PN SED16102482-303), the 3.2.4.2.2 RS03 requirements may be relaxed by the margins shown in Tables TIA-0262-1 and TIA-0262-2.

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TABLE TIA-0262-1 LOW FREQUENCY, LOW POWER

| Susceptibility Band | Threshold of Susceptibility | Relaxation Margin |
|---------------------|-----------------------------|-------------------|
| 400 MHz to 405 MHz | 4.4 V/m | 55.6 V/m |
| 405 MHz to 426 MHz | 1.8 V/m | 58.2 V/m |
| 426 MHz to 431 MHz | 46.11 V/m | 13.89 V/m |

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TABLE TIA-0262-2 HIGH FREQUENCY, LOW POWER

| Susceptibility Band | Threshold of Susceptibility | Relaxation Margin |
|---------------------|-----------------------------|-------------------|
| 207 MHz to 210 MHz | 45.2 V/m | 14.8 V/m |
| 400 MHz to 402 MHz | 44.4 V/m | 15.6 V/m |
| 402 MHz to 405 MHz | 8.0 V/m | 52.0 V/m |
| 405 MHz to 425 MHz | 1.4 V/m | 58.6 V/m |
| 425 MHz to 428 MHz | 17.1 V/m | 59.0 V/m |

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Notice: This TIA supplements TIA-0138.

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Rationale: The SSSR susceptibility mode begins with audio distortion. As the interference level increases, the radio will eventually lose lock. When the interference is removed, the radio regains lock without requiring crew intervention. No Shuttle or ISS transmitters other than those associated with the SSSR system exist in SSSR susceptibility bands. Only one ground transmitter (Research Radar at Aerocibo, Puerto Rico) operates in SSSR susceptibility band. However, the margin between the SSSR threshold of susceptibility and transmitter maximum field level is 6 dB. Additionally, interference from the Aerocibo transmitter, although not likely, would last no more than 5 seconds, and the MTBF would be approximately 93 days. The SSSR transmits on 414.2 MHz and 417.1 MHz. The 3 dB bandpass is 12 MHz and the 60 dB bandpass is 48 MHz.

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EMEP TIA-0264**C.3.2.3.1.2 RE02 LIMITS**

Exception: The Portable Computer System (PCS) (series 760 computers) with Timex Adapter Assembly (PN SEG12100477-801), COSS Audio/Video Cable (PN SEG12100475-301), and Timex Watch Assembly (PN SEG12100476-801) are allowed to pass the 3.2.3.1.2 RE02 requirements, having a maximum peak of 18.8 dB μ V above the specified limit at the frequency levels listed in Table TIA-0264-1.

TABLE TIA-0264-1 RE02 LIMIT EXCEEDANCES (PCS, COSS AUDIO/VIDEO CABLE, AND TIMEX WATCH ASSEMBLY)

| Peak Number | Frequency (MHz) | Emission (dB μ V) | Delta Exceedance (dB) |
|-------------|-----------------|-----------------------|-----------------------|
| 1 | 0.02435 | 72.5 | 16.5 |
| 2 | 0.05069 | 74.2 | 18.2 |
| 3 | 0.07367 | 58.6 | 2.6 |

Rationale: TPS 710020109 removed the COSS Hardware from the PCS Laptop and performed the test to compare the data. The results of the test were very similar to the first test. Many of the failures occurred at the same point. The PCS computer has already received waivers for these failures. Based on the test results, the deviation of the PCS should not affect other hardware.

Corrective measures, which could significantly improve the EMI emission, will have major cost impacts to the PCS program.

EMEP TIA-0265

DCN 016

C.3.2.1.1.2 CE01 LIMITS

DCN 016

Exception: For the HRF Flight Rack 1 (PN SEG46117298-301) and the EXPRESS laptop (PN SDZ39129262-301) Configuration, the 3.2.1.1.2 CE01 requirements shall be relaxed over the frequency of 0.003004 MHz and 0.003042 MHz as shown in Table TIA-0265-1.

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TABLE TIA-0265-1 CE01 EXCEEDANCE LIMITS

| CE01 Frequency (MHz) | Measured Intensity (dBµA) | Standard Intensity (dBµA) | Exceedance Delta (dB) | Standard Peak (dB) | Comments |
|----------------------|---------------------------|---------------------------|-----------------------|--------------------|-------------------------------------|
| 0.003004 | 89.5 | 87.4 | 2.1 | 3 | Empty Rack with Laptop, Hot Lead |
| 0.003042 | 90.4 | 87.3 | 3.1 | 3 | Empty Rack with Laptop, Common Mode |

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Rationale: With this configuration, both the rack and EXPRESS laptop are activated and placed in their respective operational modes. Rack health and status are active, but no subrack payloads are activated.

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Two exceedances were measured for the HRF Flight Rack 1 configured as empty with a laptop. These exceedances are attributed to the laptop power converter. These exceedances are very minor and are within the amplitude standard criteria of 3 dB and the EMI test safety margin of 6 dB.

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The conducted emissions to susceptibility margins are documented in the ongoing EPS assessment document D684-10232-01. Implementation of this TIA does not degrade the EMI safety margin required by SSP 30243, paragraph 3.2.3.

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These exceptions to the requirements in SSP 57000, paragraph 3.2.4.4, and SSP 57200 do not impose any operational constraints.

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EMEP TIA-0266

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C.3.2.1.1.2 CE01 LIMITS

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Exception: For the HRF Full Flight Rack 1 (PN SEG46117298-301) configuration, the 3.2.1.1.2 CE01 requirements shall be relaxed over the frequency range of 200 Hz to 15 kHz as listed in Tables TIA-0266-1 and TIA-0266-2.

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TABLE TIA-0266-1 RACK AND LAPTOP EQUIPMENT

| Equipment | Part Number |
|---------------------------|-----------------|
| HRF Flight Rack 1 | SEG46117298-303 |
| HRF Workstation | SEG46114189-301 |
| Ultrasound | SEG46114550-301 |
| GASMAP Calibration Module | SEG46116916-801 |
| GASMAP Analyzer | 901000-001 |
| EXPRESS Laptop | SDZ39129262-301 |

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TABLE TIA-0266-2 CE01 EXCEEDANCE LIMITS

| Comments | CE01 Frequency (MHz) | Measured Intensity (dBμA) | Standard Intensity (dBμA) | Standard Peak (dB) | Exceedance Delta (dB) | Average Delta (dB) | Median Delta (dB) |
|------------------------|----------------------|---------------------------|---------------------------|--------------------|-----------------------|--------------------|-------------------|
| Full Rack, Hot Lead | 0.000632 | 100.7 | 100.4 | 3 | 0.3 | 7.1 | 7.55 |
| Full Rack, Common Mode | 0.000953 | 104.4 | 96.9 | 3 | 7.5 | 7.1 | 7.55 |
| Full Rack, Hot Lead | 0.000953 | 105.5 | 96.9 | 3 | 8.6 | 7.1 | 7.55 |
| Full Rack, Common Mode | 0.001001 | 105.7 | 96.5 | 3 | 9.2 | 7.1 | 7.55 |
| Full Rack, Hot Lead | 0.001001 | 105.9 | 96.5 | 3 | 9.4 | 7.1 | 7.55 |
| Full Rack, Common Mode | 0.001229 | 102.3 | 94.8 | 3 | 7.5 | 7.1 | 7.55 |
| Full Rack, Hot Lead | 0.001236 | 103.7 | 94.8 | 3 | 8.9 | 7.1 | 7.55 |
| Full Rack, Hot Lead | 0.001268 | 102.6 | 94.6 | 3 | 8.0 | 7.1 | 7.55 |
| Full Rack, Hot Lead | 0.001299 | 101.5 | 94.3 | 3 | 7.2 | 7.1 | 7.55 |
| Full Rack, Common Mode | 0.001299 | 101.9 | 94.3 | 3 | 7.6 | 7.1 | 7.55 |
| Full Rack, Common Mode | 0.002986 | 93.0 | 87.4 | 3 | 5.6 | 7.1 | 7.55 |
| Full Rack, Hot Lead | 0.003004 | 92.3 | 87.4 | 3 | 4.9 | 7.1 | 7.55 |

DCN 016

Rationale: With this configuration, both the rack and EXPRESS laptop are activated and placed in their respective operational modes. Rack health and status are active and subrack payloads are activated and placed in their respective operational modes.

DCN 016

Twelve exceedances were measured for the HRF Flight Rack 1 in the full configuration. Prior to the start of EMI testing of the full rack, the operating current was 16.4 amperes.

DCN 016

The HRF Flight Rack 1 hardware has been built and it would not be reasonable to impose modification(s) to the flight hardware. Therefore SSP 30243, Revision C, paragraph 3.4.1.2, is applicable. The conducted emissions to susceptibility margins are documented in the ongoing EPS assessment document D684-10232-01. Implementation of this TIA does not degrade the EMI safety margin required by SSP 30243, paragraph 3.2.3.

DCN 016

These exceptions to the requirements in SSP 57000, paragraph 3.2.4.4, and SSP 57200 do not impose any operational constraints. **DCN 016**

EMEP TIA-0267 **DCN 016**

C.3.2.1.2.2 CE03 LIMITS **DCN 016**

Exception: For the HRF Flight Rack 1 and the EXPRESS laptop in the empty rack configuration, the 3.2.1.2.2 CE03 requirements shall be relaxed over the frequency range of 0.08848 MHz to 0.2885 MHz as listed in Table TIA-0267-1. **DCN 016**

TABLE TIA-0267-1 CE03 EXCEEDANCE LIMITS

| Comments | CE03 Frequency (MHz) | Measured Intensity (dBμA) | Standard Intensity (dBμA) | Standard Peak (dB) | Exceedance Delta (dB) | Average Delta (dB) | Median Delta (dB) |
|-------------------------------------|----------------------|---------------------------|---------------------------|--------------------|-----------------------|--------------------|-------------------|
| Empty Rack with Laptop, Hot Lead | 0.08848 | 72.5 | 59.3 | 13.2 | 3.0 | 11.9 | 12.1 |
| Empty Rack with Laptop, Common Mode | 0.08848 | 67.6 | 59.3 | 8.3 | 3.0 | 11.9 | 12.1 |
| Empty Rack with Laptop, Return Lead | 0.08848 | 67.9 | 59.3 | 8.6 | 3.0 | 11.9 | 12.1 |
| Empty Rack with Laptop, Return Lead | 0.2621 | 64.3 | 50.3 | 14.0 | 3.0 | 11.9 | 12.1 |
| Empty Rack with Laptop, Hot Lead | 0.2621 | 66.6 | 50.3 | 16.3 | 3.0 | 11.9 | 12.1 |
| Empty Rack with Laptop, Common Mode | 0.2685 | 61.1 | 50.1 | 11.0 | 3.0 | 11.9 | 12.1 |

DCN 016

Rationale: With this configuration, both the rack and EXPRESS laptop are activated and placed in their respective operational modes. Rack health and status are active, but no subrack payloads are activated. **DCN 016**

Issue 1: Six exceedances were measured for the HRF Flight Rack 1 configured as empty with a laptop. Possible reasons for these exceedances are due to the laptop power converter and the empty rack avionics, Solid State Power Controller Module (SSPCM), which had exceedances in stand alone box level tests (reference: MDH-SS-SSPCM-0058). **DCN 016**

Issue 2: The HRF Flight Rack 1 hardware has been built and it would not be reasonable to impose modification(s) to the flight hardware. Therefore SSP 30243, Revision C, paragraph 3.4.1.2, is applicable. The conducted emissions to susceptibility margins are documented in the ongoing EPS assessment document D684–10232–01. Implementation of this TIA does not degrade the EMI safety margin required by SSP 30243, paragraph 3.2.3. **DCN 016**

These exceptions to the requirements in SSP 57000, paragraph 3.2.4.4, and SSP 57200 do not impose any operational constraints. **DCN 016**

EMEP TIA–0268 **DCN 016**

C.3.2.1.2.2 CE03 LIMITS **DCN 016**

Exception: For the HRF Flight Rack 1 (PN SEG46117298–301) and the EXPRESS laptop (PN SDZ39129262–301) configuration, the 3.2.1.2.2 CE03 requirements shall be relaxed over the frequency range of 0.08848 MHz to 0.2885 MHz as listed in Tables TIA–0268–1 and TIA–0268–2. **DCN 016**

TABLE TIA–0268–1 RACK AND LAPTOP EQUIPMENT

| Equipment | Part Number |
|---------------------------|-----------------|
| HRF Flight Rack 1 | SEG46117298–303 |
| HRF Workstation | SEG46114189–301 |
| Ultrasound | SEG46114550–301 |
| GASMAP Calibration Module | SEG46116916–801 |
| GASMAP Analyzer | 901000–001 |
| EXPRESS Laptop | SDZ39129262–301 |

DCN 016

**TABLE TIA–0268–2 CE03 EXCEEDANCE LIMITS
(PAGE 1 OF 2)**

| Comments | CE03 Frequency (MHz) | Measured Intensity (dBμA) | Standard Intensity (dBμA) | Standard Peak (dB) | Exceedance Peak (dB) | Average Deviation (dB) | Median Delta (dB) |
|------------------------|----------------------|---------------------------|---------------------------|--------------------|----------------------|------------------------|-------------------|
| Full Rack, Hot Lead | 0.08848 | 70.7 | 59.3 | 3 | 11.4 | 10.1 | 10.9 |
| Full Rack, Common Mode | 0.0892 | 62.4 | 59.2 | 3 | 3.2 | 10.1 | 10.9 |
| Full Rack, Return Lead | 0.0892 | 66.3 | 59.2 | 3 | 7.1 | 10.1 | 10.9 |
| Full Rack, Return Lead | 0.2621 | 63.0 | 50.3 | 3 | 12.7 | 10.1 | 10.9 |
| Full Rack, Hot Lead | 0.2621 | 65.9 | 50.3 | 3 | 15.6 | 10.1 | 10.9 |

**TABLE TIA-0268-2 CE03 EXCEEDANCE LIMITS
(PAGE 2 OF 2)**

| Comments | CE03 Frequency (MHz) | Measured Intensity (dBμA) | Standard Intensity (dBμA) | Standard Peak (dB) | Exceedance Peak (dB) | Average Deviation (dB) | Median Delta (dB) |
|------------------------|----------------------|---------------------------|---------------------------|--------------------|----------------------|------------------------|-------------------|
| Full Rack, Common Mode | 0.2685 | 60.5 | 50.1 | 3 | 10.4 | 10.1 | 10.9 |

DCN 016

Rationale: In the full configuration, both the rack and EXPRESS laptop are activated and placed in their respective operational modes. Rack health and status are active and subrack payloads are activated and placed in their respective operational modes. The HRF Monitor interfaces with the Workstation payload, but no wand is used with the Ultrasound payload. **DCN 016**

Six exceedances were measured for the HRF Flight Rack 1 in a full configuration mode. Possible reasons for these exceedances are the dc/dc converters of the SSPCM and the laptop Power Converter. **DCN 016**

The HRF Flight Rack 1 hardware has been built and it would not be reasonable to impose modification(s) to the flight hardware. Therefore SSP 30243, Revision C, paragraph 3.4.1.2, is applicable. The conducted emissions to susceptibility margins are documented in the ongoing EPS assessment document D684-10232-01. Implementation of this TIA does not degrade the EMI safety margin required by SSP 30243, paragraph 3.2.3. **DCN 016**

These exceptions to the requirements in SSP 57000, paragraph 3.2.4.4, and SSP 57200 do not impose any operational constraints. **DCN 016**

EMEP TIA-0269

C.3.2.3.1.2 RE02 LIMITS

Exception: The Empty Rack Configuration, consisting of the HRF Flight Rack 1 (PN SEG46117298-301) and the EXPRESS Laptop (PN SDZ39129262-301), may exceed the RE02 requirements of 3.2.3.1, by the frequency levels shown in Table TIA-0269-1.

The narrowband conducted emissions measurements that were obtained from test CE03 as specified in SSP 30238, paragraph. 3.2.1.2.1, contained exceedances at two frequencies that will not affect the operation or performance of any equipment onboard the Space Station module.

The SMPA/BC does not critically exceed the required Time Domain Transient Test (CE07) envelope. The exceedances are attributed to the automatic internal power switch and the internal power routing to the Fluke 105B Scopemeter and Makita battery charging circuit.

Since this is a criticality 3 piece of equipment, NASA EC5 accepts the risk that the kit may have to be turned off (temporarily or permanently) if interference with other equipment is noted. The SMPA/Charger Kit is approved for use on US elements only.

EMEP TIA-0286**DCN 016****C.3.2.2.1.2 CS01 LIMITS****C.3.2.2.2.2 CS02 LIMITS****C.3.2.2.3.2 CS06 LIMITS****C.3.2.4.1 RS02, RADIATED SUSCEPTIBILITY****C.3.2.4.2 RS03, RADIATED SUSCEPTIBILITY****DCN 016**

Exception: The DOSMAP and TORSO equipment listed:

HRF DOSMAP Dosimetric Telescope 1 (DOSTEL1.F)

HRF DOSMAP Dosimetric Telescope 2 (DOSTEL2.F)

HRF DOSMAP Power Distribution Unit (PDU.F)

Dosimetric Mapping – E094 Control and Interface Unit (Liulin-CIU.F)

HRF DOSMAP DOSTEL 1 Power Cable (DOSTEL1PowerCable.F)

HRF DOSMAP DOSTEL 2 Power Cable (DOSTEL2PowerCable.F)

HRF DOSMAP DOSTEL 1 Data Cable (DOSTEL1DataCable.F)

HRF DOSMAP DOSTEL 2 Data Cable (DOSTEL2DataCable.F)

HRF DOSMAP CIU Power Cable (CIUPowerCable.F)

HRF DOSMAP CIU Data Cable (CIUDataCable.F)

HRF DOSMAP TLD Power Cable (TLDPowerCable.F)

HRF DOSMAP TLD Data Cable (TLDDataCable.F)

DOSMAP Mobile Dosimetry Unit 1 (Liulin-MDU1.F)

DOSMAP Mobile Dosimetry Unit 2 (Liulin-MDU2.F)

DOSMAP Mobile Dosimetry Unit 3 (Liulin-MDU3.F)

DOSMAP Mobile Dosimetry Unit 4 (Liulin-MDU4.F)

DOSMAP Nuclear Track Detector Package 1 (NTDP1.F)

DOSMAP Nuclear Track Detector Package 2 (NTDP2.F)

DOSMAP Nuclear Track Detector Package 3 (NTDP3.F)

DOSMAP Nuclear Track Detector Package 4 (NTDP4.F)

DOSMAP Nuclear Track Detector Package 5 (NTDP5.F)

Computer-Based Training PCMCIA cards (TBD)

Computer-Based Training CD ROM disks (PN SDG46117524-301, 303, 305)

Backup SW CD (PN SDG46117131-301)

Detector, Velcro Assembly (PN SED46113556-311)

Dual Switch Box Assembly (PN SEG46116937-301)

CPDS Box Assembly (PN SED46116698-303)

Harness Assy, CPDS to TEPC Power Box (PN SED46115035-301)

CPDS Data Cable Assembly (PN SEG46117172-301)

Active Dosimeter Data Cable Assembly (PN SED46117179-301)

TEPC Data Cable Assembly (PN SEG46116944-301)

Altered Item Drawing, Spectrometer Assembly (PN SED46113558-311)

TEPC Power Cable Assembly (PN SEG46116943-301)

Phantom Torso Assembly (PN SEG46117176-301)

Head (PN SEG46117170-301)

Chest (PN SEG46117170-303)

Abdomen (PN SEG46117170-305)

do not need to meet the 3.2.2.1.2 CS01, 3.2.2.2.2 CS02, 3.2.2.3.2 CS06, 3.2.4.1 RS02, and 3.2.4.2 RS03 requirements. These requirements are contained in SSP 57000, paragraph 3.2.4.4.

DCN 016

Rationale: DOSMAP and Torso are criticality 3 hardware. Any failure due to susceptibility will not cause a safety hazard or interfere with other equipment. Major components of DOSMAP and Torso have flown on Shuttle missions with no indication of functional degradation due to radiated or conducted susceptibility. DOSMAP and Torso are located downstream of the HRF power supply and 120 to 28 volt converters which should provide significant protection from ISS ESP transients. HRF plans to conduct abbreviated functional tests of the integrated Radiation Suite hardware using a simulated UOP interface prior to delivery. This should provide some evidence of the ability to withstand conducted transients. The HRF Program and Principle Investigators accept the risk of science loss due to radiated or conducted susceptibility. There are no operational constraints. **DCN 016**

EMEP TIA-0287

C.3.2.3.1.2 RE02 LIMITS

C.3.2.4.2.2 RS03 LIMITS

DCN 020

Exception: The CGBA (PN 1M103) payload may exceed the 3.2.3.1.2 (SSP 57000, paragraph 3.2.4.4) RE02 limits by 1.5 dB at 0.0225 MHz. **DCN 020**

For the ADVASC (PN 1000-ADVASC-001) payload, RS03PL electric field levels specified in 3.2.4.2.2 (SSP 57000, paragraph 3.2.4.4) may be reduced to the following levels for the specified frequencies: 2.24 V/m from 0.65 to 1.25 MHz, 2.59 V/m at 187 MHz, 2.27 V/m from 1810 to 1940 MHz, and 9.39 V/m from 3750 to 3875 MHz. **DCN 020**

For the CPCG (PN PCG-F1-0032-1) payload, RS03 electric field levels specified in 3.2.4.2.2 (SSP 57000, paragraph 3.2.4.4) may be reduced to the following levels for the specified frequencies: 11.39 V/m at 1930 MHz and 23.48 V/m at 3875 MHz. **DCN 020**

Rationale: A minimum of 55 dB margin exists between the RE02 and RS03 limits. There are no receivers at these RE02 outages. RS03 testing of criticality 3 hardware is for on-orbit trouble shooting. Risk of nonoperation due to known susceptibilities has been accepted by the equipment provider. Nonoperation due to susceptibility will not impact ISS safety or critical hardware functionality. **DCN 020**

EMEP TIA-0288

DCN 020

C.3.2.3.1.2 RE02 LIMITS

C.3.2.4.2.2 RS03 LIMITS

DCN 020

Exception: The EXPCS (PNs 60050AMA3000 and 60050UMA2000) payload may exceed the 3.2.3.1.2 RE02 limits by 8.23 dB from 32.5 to 33.75 MHz. **DCN 020**

For the ARIS ICE Shaker (PN 1J00304-1) payload, RS03PL electric field levels specified in 3.2.4.2.2 (SSP 57000, paragraph 3.2.4.4) may be reduced to the following levels for the specified frequencies: 0.30 V/m from 5.25 to 8.25 MHz and 2.50 V/m at 16.8 MHz. **DCN 020**

Rationale: The radiated exceedances for these payloads do not occur over the same frequency range and therefore should not provide any compatibility issues for the EXPRESS Rack 2. A minimum of 55 dB margin exists between the RE02 and the RS03 limits. There are no receivers at these RE02 outages. RS03 testing of criticality 3 hardware is for on-orbit trouble shooting. Risk of nonoperation due to known susceptibilities has been accepted by the equipment provider. Nonoperation due to susceptibility will not impact ISS safety or critical hardware functionality.

DCN 020

EMEP TIA-0293

C.3.2.2.2.2 CS02 LIMITS

Exception: The Video Tape Recorder (PN 683-51020, CI Number 683138A) is allowed to pass CS02 at 5.0 Vrms for 30 Hz to 339 Hz, 4.0 Vrms for 340 Hz to 500 Hz, 3.5 Vrms for 501 Hz to 700 Hz, 3.0 Vrms for 701 to 1300 Hz, 2.8 Vrms for 1301 Hz to 3800 Hz, 3.0 Vrms for 3801 Hz to 4500 Hz, 3.5 Vrms for 4501 Hz to 5300 Hz, and the standard CS02 curve above 5300 Hz.

Rationale: The VTR passed CS02 testing functionally at the standard levels. A subsequent component failure led to evaluation of electrical stress factors for components in the failed circuit. Although CS02 testing did not cause the component failure, R1 and R3 on schematic drawing 683-51059 (120 Vdc power input) were found to be overstressed with respect to their derated levels of 0.6 Watts per ISS design guidelines at some portions of the standard CS02 test curve. The CS02 limits for the VTR are being reduced to avoid component overstress instead of malfunction. The expected noise ripple on the power bus is less than 1 Vrms. The VTR is a criticality 3 item.

EMEP TIA-0297

DCN 020

C.3.2.1.2.2 CE03 LIMITS

C.3.2.2.1.2 CS01 LIMITS

DCN 020

Exception: For the Bolt Bus Controller (CI 222064A, PN 1F45012-1) the following exceptions apply:

DCN 020

- A. The Bolt Bus Controller (BBC) 3.2.1.2.2 CE03 emission limit is increased to 82 dB μ A, which is 30 dB above the specified limit in the frequency range of 190 kHz to 1 MHz.

DCN 020

- B. The motor speed change effect of CS01 interference is not considered a BBC functional problem should it occur during the bolting operation.

DCN 020

Rationale:

DCN 020

- A. Segment to Segment Attach System (SSAS) components include the BBC and the Motorized Bolt Assembly (MBA). The running time to drive a single bolt into its mating segment is approximately 8 minutes and a four bolt pattern will take less than 35 minutes to complete. The MBA is a one time use item and is not designed for on-orbit replacement. The BBC provides filtered secondary power to the MBA, and only will be utilized during the bolting operation. The BBC's CE03 exceedance is directly attributable to common mode voltage ripple. The BBC passes its power quality differential mode ripple requirement of 0.5 volts peak to peak. The actual measured voltage was 0.146 volts peak to peak. The common mode ripple voltage was measured as part of troubleshooting and was 0.92 volts peak to peak or 0.65 Vrms directly at the output terminals and was less at the output from the RPC. Each Space Station ORU is required to pass CS02 conducted susceptibility testing which imparts 1 Vrms (1.7 volts peak to peak) ripple voltage. Because the BBC common mode voltage ripple is lower than what each ORU is qualified, no risk is posed due to this exceedance. Further system level testing as part of S0 acceptance testing has been performed where the BBC operated a flight MBA with a qualification bolt. The bolting operation was performed per on-orbit procedures in the flight configuration and no functional problems or anomalies were encountered. All test objectives and requirements were met. The primary goal of conducted testing is to ensure functional self compatibility of the ORUs at the system level. This functional self compatibility has been demonstrated on the flight vehicle (including MDMs). The maximum common mode voltage ripple generated by the BBC is considerably less than the ORU conducted susceptibility requirement limit. Thus, the BBC CE03 exceedance does not pose a risk to system performance and should be accepted as is.

DCN 020

The coupled powerline interference is unlikely to affect any of the equipment that shares the power source at this time.

DCN 020

- B. CS01 threshold of upset appears from 6.5 to 7.0 volts peak to peak between 30 and 100 Hz. The failure mode is not likely to present a problem during bolting operation, should it occur.

DCN 020

EMEP TIA-0299**C.3.2.3.1.2 RE02 LIMITS**

Exception: The Portable Digital Notepad Assembly, TouchPad, Notebook Speakers, and RIO player all configured with the IBM ThinkPad 760D are allowed to pass the 3.2.3 requirements, having a maximum peak of 42.4 dB μ V above the specified limit at the frequency levels listed in Table TIA-0299-1 through TIA-0299-11.

**TABLE TIA-0299-1 RE02 RADIATED EMISSION EXCEEDANCES
(PAGE 1 OF 3)**

| Digital Notepad and Laptop | | | | Laptop Only | | | |
|----------------------------------|-----------------|-------------------------|-----------------|-------------|-----------------|-------------------------|-----------------|
| RE02 14 kHz to 25 MHz Narrowband | | | | | | | |
| Peaks | Frequency (MHz) | Emission (dB μ V/m) | Exceedence (dB) | Peaks | Frequency (MHz) | Emission (dB μ V/m) | Exceedence (dB) |
| 1 | 0.01805 | 47.2 | 2.8 | 1 | 0.01805 | 45.9 | 1.5 |
| 2 | 0.02453 | 76 | 32.2 | 2 | 0.02453 | 76.7 | 32.9 |

**TABLE TIA-0299-11 RE02 RADIATED EMISSION EXCEEDANCES
(PAGE 1 OF 1)**

| All Devices (Including RIO) | | | | Laptop Only | | | |
|----------------------------------|-----------------|-------------------|-----------------|-------------|-----------------|-------------------|-----------------|
| RE02 14 kHz to 25 MHz Narrowband | | | | | | | |
| Peaks | Frequency (MHz) | Emission (dBµV/m) | Exceedance (dB) | Peaks | Frequency (MHz) | Emission (dBµV/m) | Exceedance (dB) |
| 1 | 60.07 | 36.7 | 0.9 | 1 | 40.56 | 33.7 | 0.5 |
| 2 | 63.54 | 37.3 | 1.1 | 2 | 81.02 | 41.7 | 3.9 |
| 3 | 80.68 | 38.0 | 0.2 | 3 | 146.76 | 44.5 | 2.7 |
| 4 | 180.64 | 43.8 | 0.6 | 4 | 149.53 | 43.3 | 1.4 |
| | | | | 5 | 158.15 | 44.7 | 2.4 |

Rationale: TPS 7L0020188 also conducts a test of only the IBM Thinkpad 760D laptop. The results of the test showed that the laptop was responsible for the majority of the exceedances and that most of the exceedances are below the specifications listed in 3.2.3.1.2.1 for USL only. The crew preference items are COTS hardware and corrective measures will have major cost impacts. The emission exceedances from the crew preference items will not interfere with any other ISS operations.

EMEP TIA-0301

DCN 016

C.3.2.1.2.2 CE03 LIMITS

DCN 016

Exception: The Passive Dosimeter (PN 102433-001) is allowed to exceed the SSP 30237, Revision E, paragraph 3.2.1.2.2, CE03 limits by 6.0 dB at 195.3 kHz and 0.7 dB at 325.4 kHz, respectively, due to emissions from the low voltage power supply in the PDS/Reader Annealer.

DCN 016

Rationale: The PDS/Reader Annealer contains a low voltage dc/dc converter which operates at a frequency of 65 kHz. The exceedance at 195.3 kHz represents the third harmonic of 65 kHz, while the exceedance at 325.4 kHz represents the fifth harmonic of 65 kHz. The PDS/Reader Annealer is powered by 28 Vdc.

DCN 016

EMEP TIA-0303

DCN 020

C.3.2.1.3.2 CE07 LIMITS

DCN 020

Exception: The Intravehicular Charged Particle Directional Spectrometer (IVCPDS) (PN SEG16103191-301) is allowed to exceed the 3.2.1.3.2 CE07 limits as follows: at 425 microseconds the peak voltage excursion is -21.2 volts, an exceedance of 9.2 volts as powered off of 28 Vdc.

DCN 020

Rationale: These switch transients are of small energy. The transient is 8 percent of line voltage with a width of a few microseconds. It occurs only once per switch excitation. It would not even be out of the allowed envelope except that it occurred fairly late at 425 microseconds after actuation.

DCN 020

In addition, the operational scenario for IVCPDS calls for the switch to operated infrequently. It is a radiation monitoring instrument which is normally left on. A worst case scenario for IVCPDS is a weekly occurrence of switching it off for relocation throughout the ISS. It would not be switched off for a simple reorientation such as turning it to a new direction. Turning it off only needs to take place when the unit is being moved to a new location. Thus, as a matter of routine, the IVCPDS may not be powered down and back up for several weeks at a time.

DCN 020

EMEP TIA-0305

DCN 020

C.3.2.3.1.2 RE02 LIMITS

DCN 020

Exception: The SAMS-II ICU and ISS Laptop (PNs 60005MA17100 and SDZ39129262-303) are allowed to exceed the 3.2.3.1.2 RE02 requirements by the amount listed in Tables TIA-0305-1 and TIA-0305-2.

DCN 020

ICU Door Open and ISS Laptop Extended with Screen Closed (Vertical Plane):

DCN 020

TABLE TIA-0305-1 RE02 EXCEEDANCE LEVELS WITH SCREEN CLOSED

| Frequency (MHz) | Exceedance (dB) |
|-----------------|-----------------|
| 280 | 7.6 |
| 299.44 | 3.2 |
| 309.64 | 1.1 |
| 489.4 | 6.2 |

DCN 020

ICU Door Open and ISS Laptop Extended with Screen Open (Vertical Plane):

DCN 020

**TABLE TIA-0305-2 RE02 EXCEEDANCE LEVELS WITH SCREEN OPEN
(PAGE 1 OF 2)**

| Frequency (MHz) | Exceedance (dB) |
|-----------------|-----------------|
| 0.02447 | 16.3 |
| 0.03911 | 1.3 |
| 0.05653 | 26.8 |
| 0.07308 | 8.5 |
| 0.1688 | 4.5 |
| 280.03 | 5.6 |
| 289.57 | 5.4 |
| 327.41 | 4.9 |
| 391.46 | 1.3 |
| 457.69 | 4.1 |

**TABLE TIA-0305-2 RE02 EXCEEDANCE LEVELS WITH SCREEN OPEN
(PAGE 2 OF 2)**

| Frequency (MHz) | Exceedance (dB) |
|-----------------|-----------------|
| 598.34 | 0.9 |
| 618.72 | 3.8 |

DCN 020

Rationale: Usage of the modified ISS Laptop with the SAMS-II ICU is primarily with the ISS Laptop screen closed and off and inside a modified ISIS Drawer, which is part of the SAMS-II ICU. There are no exceedances in this configuration. Usage of the modified ISS Laptop with the screen open and on is limited to during SAMS-II ICU initial setup and reconfiguration and for some malfunction procedures.

DCN 020

EMEP TIA-0307

C.3.2.3.1.2 RE02 LIMITS

Exception: The Clio Personal Data Assistant (PDA) (PN SEG12100596-801) when utilized with the Clio Battery Pouch Assembly (PN SEG12100600-301), PCMCIA Adapter Assembly (PN SEZ33113155-801), and Calluna Card Assembly (PN SEG12100478-801) are allowed to pass the paragraph 3.2.3.1.2 requirements, having a maximum peak of 18.4 dBµV above the specified limit at the frequency levels listed in Tables TIA-0307-1 through TIA-0307-3.

TABLE TIA-0307-1 RE02 LIMIT EXCEEDANCES

| Clio PDA with Serial Cable to Laptop (Laptop Outside of Chamber) | | | |
|--|-----------------|-------------------|-------|
| Peaks | Frequency (MHz) | Emission (dBµV/m) | Delta |
| 1 | 0.04668 | 69.7 | 13.7 |
| 2 | 0.1391 | 60.3 | 4.3 |
| 3 | 282.14 | 51.4 | 4.8 |
| 4 | 506.56 | 54.9 | 4.2 |

EMEP TIA-0311

DCN 016

C.3.2.3.1.2 RE02 LIMITS

DCN 016

Exception: The Phantom Torso Assembly Support Equipment:
 Dual Switch Box (PN SEG46116937-301)
 Charge Particle Directional Spectrometer (CPDS) (PN SED46116698-303)
 CPDS data cable (PN SED46117172-301)
 CPDS power cable (PN SED46115035-303)
 Tissue Equivalent Proportional Counter (TEPC) Spectrometer (PN SED46113558-311)
 TEPC Detector (PN SED46113556-311)
 TEPC data cable (PN SED46116944-301)
 TEPC power cable (PN SED46116943-301)
 are allowed to pass the 3.2.3.1.2 RE02 requirements with a 74.7 dB spike at 827.19 MHz in the self test mode. This is 20 dB over the RE02 requirement. These requirements are contained in SSP 57000, paragraph 3.2.4.4. **DCN 016**

Rationale: In run mode, the hardware passed RE02. The self test mode is short duration, and the experiment only runs for 40 days. The hardware has been scheduled for return in four months. The CPDS and TEPC are approved hardware for use on Shuttle. The hardware was selected for this experiment for cost reasons. It would be in the best interest of the government in terms of cost and schedule to grant a waiver rather than redesign. The hardware shall be used in a rack void and must be returned when the rack hardware is installed. The duty cycle of the equipment is 8 minutes every 24 hours. There are no receivers at this frequency. **DCN 016**

EMEP TIA-0314

C.3.2.3.1.2 RE02 LIMITS

Exception: The Jazz PC Speakers Assembly (PN SEG12100594-303), which consists of the Jazz PC Speakers Assembly (PN SEG12100594-301) receiving power from an IBM Thinkpad 760XD via the PS/2 Power Cable Assembly (PN SEG12100603-801), is allowed to pass the 3.2.3 requirements, having a maximum peak of 16.8 dBµV above the specified limit at the frequency levels listed in Table TIA-0314-1.

TABLE TIA-0314-1 RE02 RADIATED EMISSIONS EXCEEDANCES

| Jazz PC Speakers Assembly (PN SEG 12100594-303) (Consists of the Jazz PC Speakers Assembly (PN SEG 12100594-301), PS/2 Power Cable Assembly (PN SEG 12100603-801), and IBM Thinkpad 760XD Laptop Computer) | | | |
|---|-----------------|-------------------|-------|
| Peaks | Frequency (MHz) | Emission (dBµV/m) | Delta |
| 1 | 0.02435 | 72.8 | 16.8 |
| 2 | 0.05107 | 67.9 | 11.9 |
| 3 | 0.07367 | 59.5 | 3.5 |

Rationale: The Jazz PC Speakers Assembly (PN SEG12100594–303) is an additional configuration of the Jazz PC Speakers Assembly (PN SEG12100594–301). It receives power from the IBM Thinkpad 760XD via the PS/2 Power Cable Assembly (PN SEG12100603–801) instead of the alkaline batteries used by the –301 configuration (two AA alkaline batteries). These items are modified COTS hardware and any modifications will have major cost impacts.

EMEP TIA–0315

DCN 020

C.3.2.1.1.2 CE01 LIMITS

DCN 020

Exception: The SAMS–II Remote Triaxial Sensor (RTS) Drawer (PN 60005MA31400) is allowed to exceed the 3.2.1.1.2 CE01 requirements by 2.7 dB at 0.006014 MHz and 0.3 dB at 0.006253 MHz.

DCN 020

Rationale: This requirement is also levied upon SAMS by its integrator EXPRESS Rack. SAMS has exceeded an EXPRESS Rack requirement. An EXPRESS Rack PIRN 52017–016 for these exceedances was submitted for approval to the EXPRESS Rack Project. Since this safety requirement is levied upon the EXPRESS Rack, it is SAMS’s understanding that an approved PIRN from the EXPRESS Rack Project verifies that there is margin for the RTS Drawer exceedances and that safety is not compromised.

DCN 020

EMEP TIA–0320

C.3.2.3.1.2 RE02 LIMITS

Exception: The Clio PDA (PN SEG12100596–801) and Clio Battery Pouch Assembly (PN SEG12100600–301), when configured with the PC Card 7401 (PN SEZ39129739–303) or the Flashcard (PN SDZ39131200–301), are allowed to pass the 3.2.3 requirements, having a maximum peak of 33.9 dBuV above the specified limit at the frequency levels listed in Table TIA–0320–1 through TIA–0320–3.

TABLE TIA–0320–1 RE02 RADIATED EMISSIONS EXCEEDANCES

| Clio PDA WITH PC CARD 7401 (3 dB Attenuation Added) (IBM Thinkpad 760 XD also in chamber) 0.014 to 25 MHz | | | |
|---|-----------------|-------------------|-------|
| Peaks | Frequency (MHz) | Emission (dBμV/m) | Delta |
| 1 | 0.04633 | 88.7 | 32.7 |
| 2 | 0.0929 | 63.8 | 7.8 |
| 3 | 0.1391 | 64.9 | 8.9 |

TABLE TIA-0320-2 RE02 RADIATED EMISSIONS EXCEEDANCES

| Clio PDA WITH PC CARD 7401 (IBM Thinkpad 760XD also in chamber) 200 MHz to 1000 MHz | | | |
|--|-----------------|-------------------|-------|
| Peaks | Frequency (MHz) | Emission (dBµV/m) | Delta |
| 1 | 281.68 | 51.5 | 5.0 |
| 2 | 564.18 | 52.2 | 0.7 |

TABLE TIA-0320-3 RE02 RADIATED EMISSIONS EXCEEDANCES

| Clio PDA WITH FLASHCARD 0.014 to 25 MHz | | | |
|--|-----------------|-------------------|-------|
| Peaks | Frequency (MHz) | Emission (dBµV/m) | Delta |
| 1 | 0.04739 | 89.9 | 33.9 |
| 2 | 0.09501 | 65.3 | 9.3 |
| 3 | 0.1423 | 66.4 | 10.4 |

Rationale: The Clio PDA, Clio Battery, PC Card 7401, and Flashcard are modified COTS hardware and any modifications will have major cost impacts. The Clio PDA has been approved for USOS use per EMEP TIA #307b when utilized with the Clio Battery Pouch Assembly, PCMCIA Adapter, and Calluna Card Assembly (Reference TPS 7L0020252 and EMEP TIA-0307b). Approval of this TIA would allow the Clio to use the PC Card 7401 to communicate with a 760XD Laptop Thinkpad as well as store data using the SAN disk Flashcard. The PC Card 7401 (RF LAN Card) has been previously certified for ISS use under GCAR 3135. The SAN disk Flashcard has been previously certified for ISS use under GCAR 3547. This is internally installed equipment. There are no receivers at these frequencies.

EMEP TIA-0326

DCN 016

C.3.2.3.1.2 RE02 LIMITS

DCN 016

Exception: The ISS Operations LAN (IOL) Hardware consisting of the following parts:
 RF Gateway with dipole antenna (PN SEZ39129738-307)
 RF Gateway with patch antenna (PN SEZ39129738-305)
 Patch antenna (PN SEZ39129738-801)
 RF PC Card (PN SEZ39129739-303)
 Power Cable (PN SEG39129263-301)
 50 Ohm Terminator (PN SED39129319-801)
 T-Connector (PN SED39129318-801)
 25 feet Ethernet Cable (PN SED39129317-301)
 3 feet Ethernet Cable (PN SED39129316-301)
 Barrel Connector (PN 528-43087-1) and
 120 volt power supply (PN SEG39129272-301)
 are allowed to pass the 3.2.3.1.2 RE02 requirements having a maximum peak of 5.3 dB above the specified limit at the frequency levels listed in Tables TIA-0326-1 and TIA-0326-2.

DCN 016

TABLE TIA-0326-1 IOL WITH PATCH ANTENNA FREQUENCY 0.014 TO 25 MHz

| (IBM Thinkpad 760 XD also in chamber) | | | |
|---------------------------------------|-----------------|-------------------------|-------|
| Peak Number | Frequency (MHz) | Emission (dB μ V/m) | Delta |
| 1 | 0.02435 | 61 | 5.0 |

DCN 016

TABLE TIA-0326-2 IOL WITH PATCH ANTENNA FREQUENCY 200 to 1000 MHz

| (IBM Thinkpad 760 XD also in chamber) | | | |
|---------------------------------------|-----------------|-------------------------|-------|
| Peak Number | Frequency (MHz) | Emission (dB μ V/m) | Delta |
| 1 | 280.78 | 51.8 | 5.3 |
| 2 | 288.1 | 49.1 | 2.4 |
| 3 | 296.56 | 48.7 | 1.8 |
| 4 | 312.21 | 49 | 1.7 |
| 5 | 336.18 | 49.7 | 1.9 |
| 6 | 456.29 | 53.2 | 3.2 |

DCN 016

TABLE TIA-0326-3 IOL WITH DIPOLE ANTENNA FREQUENCY 0.014 TO 25 MHz

| (IBM Thinkpad 760 XD also in chamber) | | | |
|---------------------------------------|-----------------|-------------------------|-------|
| Peak Number | Frequency (MHz) | Emission (dB μ V/m) | Delta |
| 1 | 0.02435 | 61.3 | 5.3 |

DCN 016

TABLE TIA-0326-4 IOL WITH DIPOLE ANTENNA FREQUENCY 200 to 1000 MHz

| (IBM Thinkpad 760 XD also in chamber) | | | |
|---------------------------------------|-----------------|-------------------------|-------|
| Peak Number | Frequency (MHz) | Emission (dB μ V/m) | Delta |
| 1 | 280.78 | 48.2 | 1.7 |
| 2 | 326.07 | 51.6 | 4.0 |
| 3 | 423.76 | 51.3 | 1.8 |
| 4 | 456.29 | 57.5 | 7.5 |

DCN 016

Rationale: The hardware that makes up the IOL is modified COTS hardware and any modifications will have major cost impacts. The previous version of the IOL hardware has been approved for USOS use in accordance with EMECB TIA-0137 (Reference TPS 8A9820008). Approval of this TIA would allow the use of the new version of the IOL RF Gateway. The new version has an input power modification which allows the RF Gateway to be compatible with both ISS 120 Vdc power and Shuttle 28 Vdc power via the same power supplies that the PCS laptop uses. The previous version of the IOL hardware has been previously certified for ISS use under GCAR G3135. There are no ISS receivers at these frequencies. **DCN 016**

EMEP TIA-0327**DCN 020****C.3.2.2.1 CS01, CONDUCTED SUSCEPTIBILITY****C.3.2.2.2 CS02, CONDUCTED SUSCEPTIBILITY****C.3.2.2.3 CS06, CONDUCTED SUSCEPTIBILITY****C.3.2.4.1 RS02, RADIATED SUSCEPTIBILITY****C.3.2.4.2 RS03, RADIATED SUSCEPTIBILITY****DCN 020**

Exception: The Biotechnology Specimen Temperature Controller (BSTC) equipment listed here: Ethernet Cable Assembly (PN SED46112592-701), Wire Harness Payload Power Cable (EXPRESS Provided) (PN 683-44024), and BSTC PCMCIA card (PN WLSI241976-603) do not need to meet the 3.2.2.1 CS01, 3.2.2.2 CS02, 3.2.2.3 CS06, 3.2.4.1 RS02, and 3.2.4.2 RS03 requirements. These requirements are contained in SSP 57000, paragraph 3.2.4.4. **DCN 020**

Rationale: BSTC is criticality 3 hardware. Therefore, any failure(s) resulting from conducted or radiated susceptibility will affect the science gathered by this particular experiment only. Any failure due to conducted or radiated susceptibility will not cause a safety hazard or interfere with other equipment. Major components of BSTC have flown on Shuttle missions with no indication of functional degradation due to radiated or conducted susceptibility. The hardware provider will accept the risk associated with not performing the test. **DCN 020**

EMEP TIA-0328**DCN 020****C.3.2.2.1 CS01, CONDUCTED SUSCEPTIBILITY****C.3.2.2.2 CS02, CONDUCTED SUSCEPTIBILITY****C.3.2.2.3 CS06, CONDUCTED SUSCEPTIBILITY****C.3.2.4.1 RS02, RADIATED SUSCEPTIBILITY****C.3.2.4.2 RS03, RADIATED SUSCEPTIBILITY****DCN 020**

Exception: The Biotechnology Refrigerator (BTR) equipment listed here: Cable Assembly, RS-422 Data (PN SED46112593-701) and Wire Harness Payload Power Cable (EXPRESS Provided) (PN 683-44024) do not need to meet the 3.2.2.1 CS01, 3.2.2.2 CS02, 3.2.2.3 CS06, 3.2.4.1 RS02, and 3.2.4.2 RS03 requirements. These requirements are contained in SSP 57000, paragraph 3.2.4.4. **DCN 020**

Rationale: BTR is criticality 3 hardware. Therefore, any failure(s) resulting from conducted or radiated susceptibility will affect the science gathered by this particular experiment only. Any failure due to conducted or radiated susceptibility will not cause a safety hazard or interfere with other equipment. Major components of BTR have flown on Shuttle missions with no indication of functional degradation due to radiated or conducted susceptibility. The hardware provider will accept the risk associated with not performing the test. **DCN 020**

EMEP TIA-0330**DCN 020****C.3.2.3.1.2 RE02 LIMITS****DCN 020**

Exception: The Remote Power Distribution Assembly (RPDA) (PN SPO-PD-020000) is allowed to exceed the level of the radiated emission specified in the 3.2.3.1.2 RE02 limits indicated in Table TIA-0330-1.

DCN 020**TABLE TIA-0330-1 RE02 EXCEEDANCE LEVELS**

| Frequency (MHz) | Specified Value (dB μ V/m) | Measured Value (dB μ V/m) | Out of Specification (dB) |
|----------------------|--------------------------------|-------------------------------|---------------------------|
| 0.324 | 56 | 61 | 5 |
| 0.589 | 56 | 66 | 10 |
| 1.002 \div 1209 | 56 | 68 | 12 |
| 5.814 \div 7.842 | 56 | 67 | 11 |
| 11.484 \div 12.944 | 58 | 66 | 8 |
| 21.125 \div 24.629 | 62 | 65 | 3 |

DCN 020

Rationale: The Remote Power Distribution Assembly (RPDA) is one of the Standard Payload Outfitting Equipment (SPOE) items, which was developed and qualified by European Industry under ESA contract to support the European payload contribution to the ISS and the first generation of the Columbus payload. There are no ISS receivers at these frequencies. The RPDA is expected to be used in the USL and Columbus only.

DCN 020

The RPDA is designed to serve as the rack interface to the ISS power distribution system (both main and auxiliary power busses are supported). It consists of an eight slot housing, which can accommodate five types of Exchangeable Standard Electronics Modules (ESEM). The internal interface cabling, between the ESEMs and the backplane connectors, are provided via the motherboard.

DCN 020

RPDA manages up to 6 kW total input power and it is primarily meant for 120 Vdc power distribution.

DCN 020

ESEM#1 (internal power supply) and ESEM#2 (MIL-1553B bus interface) are mandatory to operate the RPDA. ESEM#3 (120 Vdc power distribution), ESEM#4 (28 Vdc power conversion), and ESEM#5 (switching between the two power busses) are selectable by users, within the above constraints.

DCN 020

The referenced measurement took place in the frame of the qualification activities of the RPDA, whereas its configuration included two active ESEM#4, consuming respectively 560 watts and 480 watts (which is also their individual maximum capability), in addition to the above mentioned modules. The 120 volt lines were loaded with passive loads consuming the maximum power rating. The measurements were performed in conformity with the test methods of SSP 30238.

DCN 020

The equipment under test also successfully passed the Radiated Susceptibility test in conformity with the levels specified in SSP 30237 and with the test method specified in SSP 30238, which implies an inherent large measure of EMI margin. **DCN 020**

The equipment has in place EMI filtering, both differential and common mode. **DCN 020**

Analysis has been completed, showing that this RE effect is mainly due to the resonant topology of the converter in ESEM#4, whose MOSFET cannot be snubbed since this would impact on the converter's intrinsic performances. **DCN 020**

The frequency where out of specification has been detected is below the cut off frequency of the modules (cross section diameter assumed to be approximately 4.5 meters) so the propagation of the relevant electromagnetic radiation will be strongly attenuated at very short distances. **DCN 020**

Supporting rationale of this TIA are: **DCN 020**

- 1) The small exceedance of the specified limits,
- 2) the large EMI margin between RE and RS,
- 3) the worst case power consumption of the power supply modules during the qualification activity, and
- 4) the frequencies are below the cut off frequency of the modules. **DCN 020**

The SPOE items were developed and qualified by the European Industry under ESA contract to support the European payload contribution to the ISS and the first generation of Columbus payload. There are no ISS receivers at these frequencies. The RPDA is expected to be used in the USL and Columbus only. **DCN 020**

EMEP TIA-0331 **DCN 020**

C.3.2.3.1.2 RE02 LIMITS **DCN 020**

Exception: The EXPRESS Rack 8/2 (PN 683-46052-1 and PN 683-46052-2, CEI 683P20A and CEI 683P78A, PEI 683P21A and PEI 683P79A) are allowed to exceed the RE02 limits at the listed frequencies by the amounts indicated in Table TIA-0331-1. **DCN 020**

**TABLE TIA-0331-1 RE02 EXCEEDANCE LEVELS
(PAGE 1 OF 2)**

| Frequency | Out of Specification (dB) |
|------------------|---------------------------|
| 75 to 77 kHz | 2.0 dB |
| 230.5 kHz | 0.5 dB |
| 671 to 690 kHz | 3.0 dB |
| 824 to 834 kHz | 4.0 dB |
| 1.0 to 1.6 MHz | 2.5 dB |
| 5.0 to 5.6 MHz | 1.0 dB |
| 13.3 to 13.5 MHz | 4.5 dB |
| 14.3 to 14.7 MHz | 2.5 dB |

**TABLE TIA-0331-1 RE02 EXCEEDANCE LEVELS
(PAGE 2 OF 2)**

| Frequency | Out of Specification (dB) |
|--|---------------------------|
| 18.5 to 18.7 MHz | 2.5 dB |
| Note: 1. Ranges are provided for convenience and to provide margin. Measured exceedances were scattered sparse spot frequencies in the ranges listed. Levels have been rounded up to the next 0.5 dB increment to provide margin. | |

DCN 020

This TIA supersedes TIA-0227. The ARIS RE02 exceedances listed in TIAs-0192, -0213, and -0247 were not found and have been suppressed by installation in the rack as expected. **DCN 020**

Rationale: The measured RE02 exceedances are relatively small and are actually from two to four narrow spot frequencies in each of the ranges listed. The nearest listed ISS related receivers are the SOYUZ Rassvet 17V14 at 14.962 MHz and 17V15 at 18.06 MHz and are not expected to experience interference as a result of the narrow bandwidths used and the ISS hull shielding. The ISS hull will provide significant (40 dB or greater) shielding between the rack locations and the SOYUZ antennas. Approved for use on USL only. **DCN 020**

EMEP TIA-0332

C.3.2.3.1.2 RE02 LIMITS

Exception: The Sony DSR-PD100A Camcorder (PN SEZ16103293-301) when used in battery operated mode is allowed to exceed the 3.2.3.1 requirements of 48.3 dBµV/m by 0.1 dBµV/m at 392.29 MHz, 48.8 dBµV/m by 2.4 dBµV/m at 419.69 MHz, and 49.4 dBµV/m by 0.6 dBµV/m at 459.24 MHz.

Rationale: These outages are insignificant and they should cause no EME concerns. There are no ISS receivers at these frequencies.

EMEP TIA-0335

DCN 020

C.3.2.3.1.2 RE02 LIMITS

DCN 020

Exception: The Biotechnology Specimen Temperature Controller (BSTC) (PN SED46113420-303) payload may exceed the 3.2.3.1.2 RE02 limits by 5.0 dB at 75.0 MHz, 10.0 dB at 275.0 MHz, 1.5 dB at 280.0 MHz, and 1.0 dB at 330.0 MHz and the 3.2.4.2 RE04 limits by 5 dB at 0.040 MHz. **DCN 020**

Rationale: A minimum of 55 dB margin exists between the RE02 and RS03 limits. There are no receivers at these radiated emission outages. **DCN 020**

EMEP TIA-0336**DCN 016****C.3.2.3.1.2 RE02 LIMITS****DCN 016**

Exception: The portable DVD Player (PN Sony DVP-FX1) does not comply with the 3.2.3.1.2 RE02 requirements between the frequencies listed in Table TIA-0336-1.

DCN 016**TABLE TIA-0336-1 RE02 EXCEEDANCE LIMITS**

| Frequencies (MHz) | Maximum Radiated Emissions Delta Exceedances (dB) |
|-------------------|---|
| 0.02 to 0.03 | 3.7 (Narrow Band) |
| 350 to 370 | 0.9 (Narrow Band) |

DCN 016

Rationale: Since this hardware has a criticality 3, EC5 accepts that the DVD Player may have to be turned off (temporarily or permanently) if interference with other equipment is noted.

DCN 016**EMEP TIA-0340****DCN 020****C.3.2.1.2.2 CE03 LIMITS****C.3.2.3.1.2 RE02 LIMITS****DCN 020**

Exception: The Optical Time Domain Reflectometer (OTDR) (Model OFM1020) is allowed to exceed the 3.2.3.1.2 RE02 requirements with a series of 25 power supply switching harmonics that are below 500 kHz with a maximum of 31.3 dB above limit and recorded 23.2 kHz and 3.2.1.2.2 CE03 requirements with a single point 8.6 dB above limit at 234 kHz and 0.5 dB above limit at 116 kHz.

DCN 020

Rationale: This unit will be used as a stand alone test equipment unit with no electrical interconnections to other equipment. This is a criticality 3 portable test equipment unit. The OTDR is powered by 28 volts. This unit is GFE and COTS equipment. This unit has been denoted as applicable to RS03PL (payload) radiated susceptibility qualification limits. Compliance is adequate for a portable COTS test unit. This unit is used intermittently for trouble shooting only.

DCN 020

EMEP TIA-348**DCN 020****C.3.2.2.1 CS01, CONDUCTED SUSCEPTIBILITY****C.3.2.2.2 CS02, CONDUCTED SUSCEPTIBILITY****C.3.2.2.3 CS06, CONDUCTED SUSCEPTIBILITY****C.3.2.4.1 RS02, RADIATED SUSCEPTIBILITY****C.3.2.4.2 RS03, RADIATED SUSCEPTIBILITY****DCN 020**

Exception: The Pulmonary Function in Flight (PuFF) equipment listed:

Pressure Flow Module (44100)

PFM Data Cable (44150)

8MB Flash Storage Card (DP-ATA/B)

Fleisch #2 Flowmeter Assembly (44250)

ECG Electrodes Pack (PN SDG46117695-801)

Assembly, Single Housing PSC Unit (PN SEG46117965-801)

Cable Assembly W16 - PSC ECG Data (PN SED46112486-303)

Cable Assembly ECG Electrodes Leads (PN SED46113083-303) and

Battery Pack Assembly (PN SEG46117914-301)

does not need to meet 3.2.2.1 CS01, 3.2.2.2 CS02, 3.2.2.3 CS06, 3.2.4.1 RS02, and 3.2.4.2 RS03 requirements. These requirements are contained in SSP 57000, paragraph 3.2.4.4. **DCN 020**

Rationale: PuFF is criticality 3 hardware. Any failure due to susceptibility will not cause a safety hazard or interfere with other equipment. PuFF equipment is located downstream of the HRF Rack SSPCM which should provide significant protection from ISS ESP transients. HRF plans to conduct abbreviated functional tests of the integrated PuFF hardware using the HRF Rack prior to hardware delivery. This should provide some evidence of the ability to withstand conducted transients. The HRF Program and Principle Investigators accept the risk of science loss due to radiated or conducted susceptibility. There are no operational constraints. **DCN 020**