

ED-243C Change 1

MINIMUM OPERATIONAL PERFORMANCE STANDARDS FOR AVIONICS SUPPORTING NEXT GENERATION SATELLITE SYSTEMS (NGSS)

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FOREWORD

1. This document was developed jointly by EUROCAE Working Group 82 “New Air-Ground Data Link Technologies” and RTCA SC-222 “INMARSAT AMS(R)S”, and was approved by the Council of EUROCAE on 15 September 2022.
2. This document complete ED-243C Minimum Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS) (2021).
Several issues have been identified that will require Change 1 documentation to the existing Appendix F Iridium Certus MOPS. The modifications are listed in Technical Summary of Changes Required.
3. This document is technically identical to RTCA DO-262F Change 1 Minimum Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS).
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TECHNICAL SUMMARY OF CHANGES REQUIRED

Iridium, in working with aviation Value Added Manufacturers (VAMs), has identified several errors in the published version of DO-262E/ED-243C Minimum Operational Performance Specification (MOPS). Given the scope of the changes, Iridium lead the development of this document. A summary of the changes are listed below with additional details following for each item covering both the needed change and also the reason behind the change.

Any added text will be highlighted in **gray**. Deleted text is ~~struck through in red~~.

Changes include:

1. Changes to Section F.2.3.5 for Lightning Induced Transient Testing required in DO-160 – missing note and table F-32 update
2. Changes to Receiver Susceptibility requirements and test in Sections F.2.2.3.1.3.2.6. and F.2.4.3.1.2.2.6
3. Changes to Harmonic, Spurious and Noise Requirements Table F-18 and associated Notes in Section F.2.2.3.1.3.1.4).
4. Changes to f_{max}/f_{min} frequency range calculation in Section F.2.4.3.1.2.1.4
5. Changes to f_{max}/f_{min} frequency range calculation in Section F.2.4.3.1.2.1.8
6. Change to Rejection of Signals Outside the NGSS Receive Band Test in Section F.2.4.3.1.2.2.3
7. Changes to Receiver Operation in Moving Aircraft requirement in Section F.2.2.3.1.3.2.5
8. Changes to Receiver Operation in Moving Aircraft Test in Section F.2.4.3.1.2.2.5
9. Change in Transmitter Operation in Moving Aircraft Requirement in Section F.2.2.3.1.3.1.9
10. Change in Transmitter Operation in Moving Aircraft Test in Section F.2.4.3.1.2.1.9
11. Change in Error Vector Magnitude Requirement in Section F.2.2.3.1.3.1.10

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1. CHANGES TO F.2.3.5 FOR LIGHTNING INDUCED TRANSIENT TESTING REQUIRED IN DO-160 – MISSING NOTE AND TABLE F-32 UPDATE

F.2.3.5 Performance Vs. Environmental Requirements Matrix

TABLE F-32: DO-160G / ED-14G PERFORMANCE VS. ENVIRONMENTAL REQUIREMENTS MATRIX

ANTENNA SUBSYSTEM		DO-160G / ED-14G Section																							
Section	Title	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
		TEMPERATURE / ALTITUDE	TEMP VARIATION	HUMIDITY	OPERATIONAL SHOCKS /CRASH SAFETY	VIBRATION	EXPLOSIVE ATMOSPHERE	WATERPROOFNESS	FLUIDS SUSCEPTIBILITY	SAND AND DUST	FUNGUS RESISTANCE	SALT FOG	MAGNETIC EFFECT	POWER INPUT	VOLTAGE SPIKE	AUDIO FREQ. CONDUCTED SUSC.	INDUCED SIGNAL SUSCEPTIBILITY	RADIO FREQ. SUSC. (COND. & RAD)	EMISSION OF RADIO FREQUENCY ENERGY	LIGHTNING INDUCED TRANSIENT SUSC.	LIGHTNING DIRECT EFFECTS	ICING	ESD	FIRE/FLAMMABILITY	
L / M / H Class Antennas																									
F.2.2.3.1.2.1.1	G/T (Coverage Volume)	1 14	1 23	2	2 4	1	-	2	2	2	2	2	-	-	-	-	-	2	-	-	2 16	2	2	-	
F.2.2.3.1.2.1.2	EIRP (Coverage Volume)	1 14	1 23	2	2 4	1	-	2	2	2	2	2	-	-	-	-	-	2	-	-	2 16	2	2	-	
F.2.2.3.1.2.1.3	Polarization (Coverage Volume)	1 14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F.2.2.3.1.2.2	Axial Ratio	1 14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F.2.4.3.1.1.5	Power Handling Capabilities	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

F.2.2.3.1.2.4	Passband	1 14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F.2.2.3.1.2.9. 2	Switching Time	1 14 21	-	-	-	-	-	-	-	-	-	-	-	1 21 22	1 21 22	1 21 22	1 21 22	1 21 22	-	1 21 22	-	-	-	-

TRANSMITTER SUBSYSTEM		DO-160G Section																							
Section	Title	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
F.2.2.3.1.3.1.4	Transmitter Harmonics, Discrete Spurious and Noise Density	1 14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F.2.2.3.1.3.1.6	Carrier-Off and Carrier-On Levels	1 14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F.2.2.3.1.3.1.7	Power Control	1 14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F.2.2.3.1.3.1.8	On-Channel Output Spectrum	1 14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F.2.2.3.1.3.1.9	Transmitter Operation in Moving Aircraft	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F.2.2.3.1.3.1.10	Error Vector Magnitude	1 14	-	-	-	1	-	-	-	-	-	-	-	1	1	1	1	-	-	1 22	-	-	-	-	

RECEIVER SUBSYSTEM		DO-160G Section																							
Section	Title	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
F.2.2.3.1.3.2 .1.1	Data Sensitivity	1 14 15	-	-	-	1 15	-	-	-	-	-	-	-	1 15	1 15	1 15	1 15	-	-	1 15 22	-	-	2	-	
F.2.2.3.1.3.2 .3	Rejection of Signals Outside the NGSS Receive Band	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F.2.2.3.1.3.2 .4.1	Rejection of Carrier Signals Generated by Other AMS(R)S Equipment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F.2.2.3.1.3.2 .4.2	Rejection of Carrier Signals Generated by Co-Located AMS(R)S Equipment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F.2.2.3.1.3.2 .6	Receiver Susceptibility	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F.2.2.3.1.3.2 .6.1	Receiver Damage	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F.2.2.3.1.3.2 .7	Acquisition	1 14	-	-	-	1 15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

OTHER REQUIREMENTS		DO-160G Section																							
Section	Title	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
F.2.2.3.1.4	Required Aircraft Interfaces	14	X	X	X	X	-	-	-	-	-	-	-	X	X	X	X	X	25	X22	-	-	2	-	
F.2.2.3.2	AMS(R)S Prioritization of Services & following subsections	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F.2.2.3.3	Satellite Subnetwork Data Protocol & following subsections	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

F.2.2.3.4	Voice Protocol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F.2.2.3.5	User Data Interfaces & following subsections	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F.2.2.3.6	Voice Service & following subsections	14 17	-	17	-	17	-	-	-	-	-	-	-	17 19	-	17	17	17	17	-	-	-	-	-
F.2.2.3.7	Recovery from Primary Power Interruption	-	-	-	-	-	-	-	-	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-
F.2.2.3.8	Failure/Status Indication	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F.2.2.3.9	Information Security	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Update this note only.

NOTE 22. ~~<Note Removed>~~ Equipment is not required to meet performance specifications during the period of application of the Lightning Induced Transient test but must meet all requirements following the test.

1.1. RATIONALE FOR CHANGE

This note is missing from the current document. A similar note is found in Appendix D and Appendix E, however it is missing from this Appendix F. Correcting this will align the requirements for all L-Band satcom requirements. Table F-32 requires updates to indicate the Note 22 as shown and also to remove this note reference from other tests that are not applicable.

2. CHANGES TO RECEIVER SUSCEPTIBILITY REQUIREMENTS AND TEST (SECTIONS F.2.2.3.1.3.2.6. AND F.2.4.3.1.2.2.6)

F.2.2.3.1.3.2.6 Receiver Susceptibility

The AES shall meet the performance of Table F-24 with no more than 1 dB degradation in the presence of a wideband interference across the entire AES receive band of -164.5 dBW/m²/Hz for AES8/9 and -170.4 dBW/m²/Hz for AES 10/11 (SUW in Table F-11) at A' in Figure F-9 with the receiver power level for each waveform listed in the Table F-28 below.

TABLE F-28: RECEIVER POWER LEVEL AT A'

AES	C1 Q Receiver Power at A' (dBW/m ²)	C2 Q Receiver Power at A' (dBW/m ²)	C8 Q Receiver Power at A' (dBW/m ²)	C8 16A Receiver Power at A' (dBW/m ²)
AES8 & AES9	-134.3	-134.8	-128.9	--
AES10 & AES11	-139.7	-140.2	--	-127.6
Noise Equivalent Bandwidth	36kHz	72kHz	288kHz	288kHz

For narrowband testing, the data sensitivity measurement approach in Section F.2.2.3.1.3.2.1.1 shall be used for testing of CW interference resilience testing in this section.

The receiver reported Es/No and associated 'Corrected' value requirements given in section (F.2.2.3.1.3.2.1) shall not be degraded by more than 1.0 dB while in the presence of an interfering CW signal at a level of -44.4 dBW/m², offset from the center of the wanted signal by +5.0 MHz or more so that the CW is outside the Iridium band. This requirement is from ETSI 301 473 Section 11.3 Receiver Blocking Characteristics. The reference point for the interfering signal is point A' in Figure F-9.

The receiver reported Es/No and associated 'Corrected' value requirements given in section (F.2.2.3.1.3.2.1) shall not be degraded by more than 1.0 dB while in the presence of an interfering CW signal at a level of -65 dBW/m², offset from the nearest edge of the Rx channel center of the wanted signal by 500 kHz or more. The reference point for the interfering signal is point A' in Figure F-9.

For adjacent channel testing as per ETSI 301 473, the receiver reported Es/No shall not be degraded by more than 0.5dB in the presence of a modulated interferer of the same bandwidth of wanted channel on any adjacent channel at +12dB above the wanted signal level.

NOTE: ~~This number (-65 dBW/m²) assumes a total front-end gain budget, including antenna gain, of no more than 31 dB.~~

F.2.4.3.1.2.2.6 Receiver Susceptibility

See Section F.2.4.3.1.2.2.6

Equipment Required

- Vector Signal Generator – Wanted Signal
- Vector Signal Generator – Modulated Interferer Signal
- Noise Generator – Wideband Interferer Signal
- Analog Signal Generator – CW Interferer Signal
- Directional Coupler, 20 dB Coupling, 18 GHz
- Low-Pass Filter (Optional)
- Pulse Generator