

Testing data FCC 25.202(f) and RSS-170 5.8 Field strength of spurious emissions FCC Part 25 and RSS-170, Issue 4

Test data, continued



SPR 30 MHz to 1 GHz mid channel Tx

PK+\_MAXH -13dBm theoretical limit





-13dBm theoretical limit

Figure 7.3-22: Radiated spurious emissions 1 – 18 GHz for sub-band 1, mid channel waveform Y



Testing data FCC 25.202(f) and RSS-170 5.8 Field strength of spurious emissions FCC Part 25 and RSS-170, Issue 4

#### Test data, continued



#### SPR 30 MHz to 1 GHz high channel Tx

PK+\_MAXH -13dBm theoretical limit











Testing data FCC 25.202(f) and RSS-170 5.8 Field strength of spurious emissions FCC Part 25 and RSS-170, Issue 4

Test data, continued



SPR 30 MHz to 1 GHz low channel Tx

PK+\_MAXH -13dBm theoretical limit









Testing data FCC 25.202(f) and RSS-170 5.8 Field strength of spurious emissions FCC Part 25 and RSS-170, Issue 4

Test data, continued



SPR 30 MHz to 1 GHz mid channel Tx

PK+\_MAXH

-13dBm theoretical limit

Figure 7.3-27: Radiated spurious emissions below 1 GHz for sub-band 1, mid channel waveform Z



Figure 7.3-28: Radiated spurious emissions 1 – 18 GHz for sub-band 1, mid channel waveform Z



Testing data FCC 25.202(f) and RSS-170 5.8 Field strength of spurious emissions FCC Part 25 and RSS-170, Issue 4

Test data, continued



SPR 30 MHz to 1 GHz high channel Tx

PK+\_MAXH

-13dBm theoretical limit







AVG\_MAXH PK+\_MAXH

-13dBm theoretical limit





Testing data FCC 25.202(f) and RSS-170 5.8 Field strength of spurious emissions FCC Part 25 and RSS-170, Issue 4

Test data, continued (conducted spurious emissions for waveform J)

Section 7

Test name Specification



Figure 7.3-9: Conducted spurious emissions, low channel (30-1000 MHz)



Figure 7.3-9: Conducted spurious emissions, mid channel (30-1000 MHz)





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30.0 MHz

hormon

مىلىر 5001 pts

Figure 7.3-10: Conducted spurious emissions, low channel (1-18 GHz)



18.0 GH



Testing data FCC 25.202(f) and RSS-170 5.8 Field strength of spurious emissions FCC Part 25 and RSS-170, Issue 4

Figure 7.3-9: Conducted spurious emissions, high channel (30-1000 MHz



Test data, continued (conducted spurious emissions for waveform K)



19:07:07 12.09.2023

Figure 7.3-9: Conducted spurious emissions, low channel (30-1000 MHz)



19:09:47 12.09.2023

Figure 7.3-9: Conducted spurious emissions, mid channel (30-1000 MHz)



19:06:04 12.09.2023





Figure 7.3-10: Conducted spurious emissions, mid channel (1-18 GHz)



Report reference ID: REP015465

Nemko

Section 7 Test name Specification Testing data FCC 25.202(f) and RSS-170 5.8 Field strength of spurious emissions FCC Part 25 and RSS-170, Issue 4

Figure 7.3-9: Conducted spurious emissions, high channel (30-1000 MHz)

Figure 7.3-10: Conducted spurious emissions, high channel (1-18 GHz)

Test data, continued (conducted spurious emissions for waveform T)



20:08:39 12.09.2023

Figure 7.3-9: Conducted spurious emissions, low channel (30-1000 MHz)



20:13:20 12.09.2023

Figure 7.3-9: Conducted spurious emissions, mid channel (30-1000 MHz)



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Figure 7.3-10: Conducted spurious emissions, low channel (1-18 GHz)



Figure 7.3-10: Conducted spurious emissions, mid channel (1-18 GHz)



Report reference ID: REP015465

Nemko

Section 7 Test name Specification Testing data FCC 25.202(f) and RSS-170 5.8 Field strength of spurious emissions FCC Part 25 and RSS-170, Issue 4

Figure 7.3-9: Conducted spurious emissions, high channel (30-1000 MHz)

Figure 7.3-10: Conducted spurious emissions, high channel (1-18 GHz)

Test data, continued (conducted spurious emissions for waveform Y)



20:20:00 12.09.2023

Figure 7.3-9: Conducted spurious emissions, low channel (30-1000 MHz)



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Figure 7.3-9: Conducted spurious emissions, mid channel (30-1000 MHz)



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Figure 7.3-10: Conducted spurious emissions, mid channel (1-18 GHz)



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Section 7 Test name Specification Testing data FCC 25.202(f) and RSS-170 5.8 Field strength of spurious emissions FCC Part 25 and RSS-170, Issue 4

Figure 7.3-9: Conducted spurious emissions, high channel (30-1000 MHz)



Test data, continued (conducted spurious emissions for waveform Z)



20:23:55 12.09.2023

Figure 7.3-9: Conducted spurious emissions, low channel (30-1000 MHz)



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Figure 7.3-9: Conducted spurious emissions, mid channel (30-1000 MHz)



20:26:31 12.09.2023



20:23:22 12.09.2023

Figure 7.3-10: Conducted spurious emissions, low channel (1-18 GHz)



Figure 7.3-10: Conducted spurious emissions, mid channel (1-18 GHz)



Report reference ID: REP015465



Testing data FCC 25.202(f) and RSS-170 5.8 Field strength of spurious emissions FCC Part 25 and RSS-170, Issue 4

*Figure 7.3-9:* Conducted spurious emissions, high channel (30-1000 MHz)

Figure 7.3-10: Conducted spurious emissions, high channel (1-18 GHz)



Testing data FCC 25.202(f) and RSS-170 5.8 Field strength of spurious emissions FCC Part 25 and RSS-170, Issue 4

Test data, continued

									<b></b>
MultiView	Spectrum	× Sp	ectrum 2	×					•
Ref Level -6.	90 dBm Offset	56.20 dB RB	W 1 MHz						_
Att 1 Frequency S	weep	1.01 ms VBV	W 10 MHZ MO	ae Auto Sweep				o 1Pk M	ax e2Rm Max
-8 dBm									
-10-dBm	H1 -10.000 dB	m							
-12 dBm									
-14 dBm									
-16 dBm									
-18 dBm									
-20 dBm									
-22 dBm									
-24 dBm								1	
ALL MANAL MAN	en million him ha	how the second	playun population	MM Huntun M	ManimphNhamilla	mpumphillipplik	han	Almah Marin Ma	Muladarilation
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-32 dBm									
-34 dBm									
-36 dBm			1001						
1.559 GHz			1001 pt	5	5	.1 MHZ/			1.61 GH

13:19:13 14.09.2023

Figure 7.3-31: Radiated spurious emissions 1559–1610 MHz, carrier-off

## 7.4 FCC 25.202(d) and RSS-170 5.3 Frequency tolerance, Earth stations

### 7.4.1 References, definitions and limits

#### FCC §25.202:

#### (d) Frequency tolerance, Earth stations.

The carrier frequency of each earth station transmitter authorized in these services shall be maintained within 0.001 percent (±10 ppm) of the reference frequency.

#### FCC 2.1055:

- (a) The frequency stability shall be measured with variation of ambient temperature as follows:
- (1) From -30°C to +50°C for all equipment except that specified in paragraphs (a)(2) and (3) of this section
- (b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10 °C through the range.
- (d) The frequency stability shall be measured with variation of primary supply voltage as follows:
- (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

#### RSS-170, Clause 5.3:

For mobile earth station equipment, the carrier frequency shall not depart from the reference frequency by more than ±10 ppm.

#### 7.4.2 Test summary

Verdict	Pass		
Test date	August 24, 2023	Temperature	22 °C
Tested by	Hossein Zamani	Air pressure	1011 mbar
Test location	Montreal	Relative humidity	32.1 %

#### 7.4.3 Observations, settings and special notes

Frequency stability measurements were performed with reference to ANSI 63.26 section 5.6.3 and section 5.6.5

Offset was calculated as per the following formula:  $\frac{F_{\textit{Measured}} - F_{\textit{reference}} \times 1 \cdot 10^6}{F_{\textit{Measured}} - F_{\textit{reference}} \times 1 \cdot 10^6}$ 

Waveform Z has been specifically selected to represent the worst case test scenario.

### Spectrum analyser settings:

Resolution bandwidth:	20 Hz
Video bandwidth:	≥3 × RBW
Detector mode:	Peak
Trace mode:	Max Hold



Testing data FCC 25.202(d) and RSS-170 5.3 Frequency tolerance, Earth stations FCC Part 25 and RSS-170, Issue 4

#### 7.4.4 Test data

 Table 7.4-1: Frequency tolerance measurement result – Low channel

Test conditions	Frequency, GHz	Offset, ppm	Limit, ±ppm	Margin, ppm
+50 °C, Nominal	1.626511900	1.0	10.00	9.0
+40 °C, Nominal	1.626511700	0.9	10.00	9.1
+30 °C, Nominal	1.626511100	0.5	10.00	9.5
+20 °C, +15 %	1.626511400	0.7	10.00	9.3
+20 °C, Nominal	1.626510310		Reference	
+20 °C, -15 %	1.626514100	2.3	10.00	7.7
+10 °C, Nominal	1.626509000	0.8	10.00	9.2
0 °C, Nominal	1.626510900	0.4	10.00	9.6
–10 °C, Nominal	1.626510900	0.4	10.00	9.6
–20 °C, Nominal	1.626507100	2.0	10.00	8.0
–30 °C, Nominal	1.626511900	0.2	10.00	9.8

#### Table 7.4-2: Frequency tolerance measurement result – Mid channel

Test conditions	Frequency, GHz	Offset, ppm	Limit, ±ppm	Margin, ppm
+50 °C, Nominal	1.643500000	0.1	10.00	9.9
+40 °C, Nominal	1.643501000	0.5	10.00	9.5
+30 °C, Nominal	1.643498000	1.3	10.00	8.7
+20 °C, +15 %	1.643500300	0.1	10.00	9.9
+20 °C, Nominal	1.643500100		Reference	
+20 °C, -15 %	1.643500200	0.1	10.00	9.9
+10 °C, Nominal	1.643500000	0.1	10.00	9.9
0 °C, Nominal	1.643499400	0.4	10.00	9.6
–10 °C, Nominal	1.643500300	0.1	10.00	9.9
–20 °C, Nominal	1.643500100	0.0	10.00	10.0
–30 °C, Nominal	1.643497000	1.9	10.00	8.1

### Table 7.4-3: Frequency tolerance measurement result – High channel

Test conditions	Frequency, GHz	Offset, ppm	Limit, ±ppm	Margin, ppm
+50 °C, Nominal	1.660496400	2.6	10.00	7.4
+40 °C, Nominal	1.660495400	2.0	10.00	8.0
+30 °C, Nominal	1.660495600	2.1	10.00	7.9
+20 °C, +15 %	1.660495500	2.0	10.00	8.0
+20 °C, Nominal	1.660492100		Reference	
+20 °C, -15 %	1.660495000	1.7	10.00	8.3
+10 °C, Nominal	1.660495600	2.1	10.00	7.9
0 °C, Nominal	1.660494800	1.6	10.00	8.4
–10 °C, Nominal	1.660495080	1.8	10.00	8.2
–20 °C, Nominal	1.660494000	1.1	10.00	8.9
–30 °C, Nominal	1.660496400	2.3	10.00	7.7



#### 7.5 FCC 25.216 and RSS-170 5.9 Limits on emissions from mobile earth stations for protection of aeronautical radionavigation-satellite service

#### 7.5.1 References, definitions and limits

Section 7

Test name

#### FCC §25.216:

- (c) The e.i.r.p. density of emissions from mobile earth stations with assigned uplink frequencies between 1610 MHz and 1660.5 MHz shall not exceed -70 dBW/MHz (-40 dBm/MHz), averaged over any 2 millisecond active transmission interval, in the band 1559–1605 MHz. The e.i.r.p. of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed -80 dBW (-50 dBm), averaged over any 2 millisecond active transmission interval, in the 1559–1605 MHz band.
- (f) Mobile earth stations with assigned uplink frequencies in the 1610–1660.5 MHz band shall suppress the power density of emissions in the 1605– 1610 MHz band to an extent determined by linear interpolation from -70 dBW/MHz (-40 dBm/MHz) at 1605 MHz to -10 dBW/MHz (20 dBm/MHz) at 1610 MHz.

#### RSS-170, Clause 5.9:

5.9.2 Mobile earth stations with transmitting frequencies between 1626.5 and 1660.5 MHz shall have the e.i.r.p. density of unwanted emissions in the band 1605–1610 MHz, averaged over any 2 ms active transmission interval, not exceed the following limits:

(1) -70 dBW/MHz (-40 dBm/MHz) at 1605 MHz, linearly interpolated to -46 dBW/MHz (-16 dBm/MHz) at 1610 MHz, for broadband emissions; and

(2) -80 dBW/kHz (-50 dBm/kHz) at 1605 MHz, linearly interpolated to -56 dBW/kHz (-26 dBm/kHz) at 1610 MHz, for discrete emissions.

#### 7.5.2 Test summary

Verdict	Pass		
Test date	September 12, 2023	Temperature	24 °C
Tested by	Hossein Zamani Zardehsavari	Air pressure	1008 mbar
Test location	Montreal	Relative humidity	48 %

#### 7.5.3 Observations, settings, and special notes

Spectrum analyser settings:

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	RMS
Trace mode	Max-hold



Testing data Limits on emissions from mobile earth stations for protection of aeronautical radionavigation-satellite service FCC Part 25 and RSS-170, Issue 4

7.5.4 Test data





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Figure 7.5-1: spurious emissions 1559–1610 MHz, Waveform J, low channel



~

Att 0	dB • SWT 50	ms VBW 10 MHz	Mode Auto Sweep		Count 230/10
Intequency swee	p				M1(1)
					1,608 559 0
0 d8m					
dBm				 	/
20 d8m-				 	
20 dBm				 -	/
30 d8m				 	
6 170 5 9					
+0 cam					
su asm					
and the second second					
70 d8m-					
0 d8m				 	

Figure 7.5-3: spurious emissions 1559–1610 MHz, Waveform J, high channel



Testing data Limits on emissions from mobile earth stations for protection of aeronautical radionavigation-satellite service FCC Part 25 and RSS-170, Issue 4

Test data, continued







Figure 7.5-4: spurious emissions 1559–1610 MHz, Waveform K, low channel





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Figure 7.5-6: spurious emissions 1559–1610 MHz, Waveform K, high channel



Testing data Limits on emissions from mobile earth stations for protection of aeronautical radionavigation-satellite service FCC Part 25 and RSS-170, Issue 4

Test data, continued





14:33:22 13.09.2023

Figure 7.5-7: spurious emissions 1559–1610 MHz, Waveform T, low channel

Figure 7.5-8: spurious emissions 1559–1610 MHz, Waveform T, mid channel



14:35:09 13.09.2023

Figure 7.5-9: spurious emissions 1559–1610 MHz, Waveform T, high channel



Testing data Limits on emissions from mobile earth stations for protection of aeronautical radionavigation-satellite service FCC Part 25 and RSS-170, Issue 4

Test data, continued





14:35:44 13.09.2023

Figure 7.5-10: spurious emissions 1559–1610 MHz, Waveform Y, low channel

Figure 7.5-11: spurious emissions 1559–1610 MHz, Waveform Y, mid channel

Ref Level 22	.00 dBm Offs	et 36.20 dB 🖷	RBW 1 MHz					
Att	0 dB = SWT	50 ms	VBW 10 MHz M	lode Auto Sweep			Co	unt 145/10
dBm-	weep				-	-	M1[1]	-52.37 d
							1	1,608 5840 0
dBm					 			
								1
1Bm								
l dim								
o dom								
J GBM								
J dBm								$\square$
3 270:5(9								$\mathcal{V}$
J-UBIII								
								M
) dBm								X
) dBm							-	
0 dBm			+			-	+	1
I dBm			+		 +		+	
559 GHz	·	·	1999 pt	s	 5.1 MHz/	·		1.61 G

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Figure 7.5-12: spurious emissions 1559–1610 MHz, Waveform Y, high channel



Testing data Limits on emissions from mobile earth stations for protection of aeronautical radionavigation-satellite service FCC Part 25 and RSS-170, Issue 4

Test data, continued







14:38:53 13.09.2023

Figure 7.5-14: spurious emissions 1559–1610 MHz, Waveform Z, mid channel

Att	0.48 = SWT	50 ms	VBW 10 MHz N	tode Auto Sweet			Count 154/1.00
Erequency S	Sween	50 ms	VBW 10 MIN2 IN	Tode Mato Sweet			018m Av
20 dBm	hoop						M1[1] -52.68 dB
							1,608 456 0 G
10 dBm							
							/
0 d8m							/
-10 dBm							
-20 dbm-							
-30 dBm							
55 170 5:9							V
-50 d8m							M1
30 6011							×
-60 d8m			-				
-70 d8m-			-	-		-	
-PO dPm							
00 000							
1.559 GHz			1999 pt	s	 5.1 MHz/		1.61 G

Figure 7.5-15: spurious emissions 1559–1610 MHz, Waveform Z, high channel



# Section 8. Test setup diagrams



# 8.1 Radiated emissions set-up for frequencies below 1 GHz

# 8.2 Radiated emissions set-up for frequencies above 1 GHz





# 8.3 AC mains conducted emissions set-up



# 8.4 Antenna port set-up



End of the test report