

Test data, continued

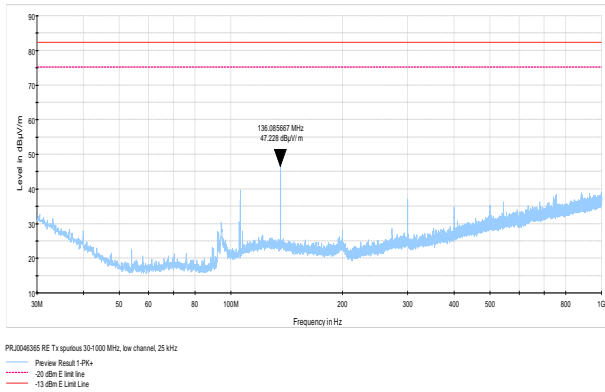


Figure 7.5-70: Radiated spurious emissions 0.03-1 GHz, low channel, 25 kHz, analog

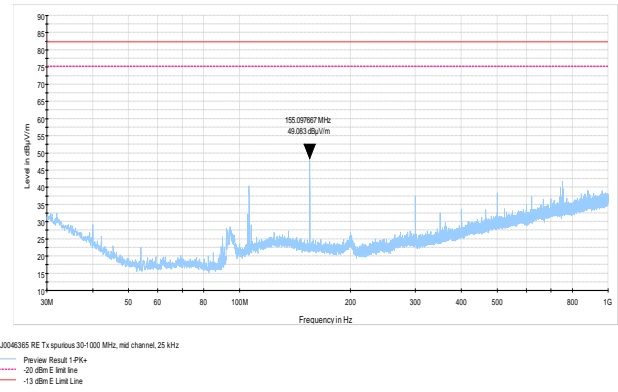


Figure 7.5-71: Radiated spurious emissions 0.03-1 GHz, mid channel, 25 kHz, analog

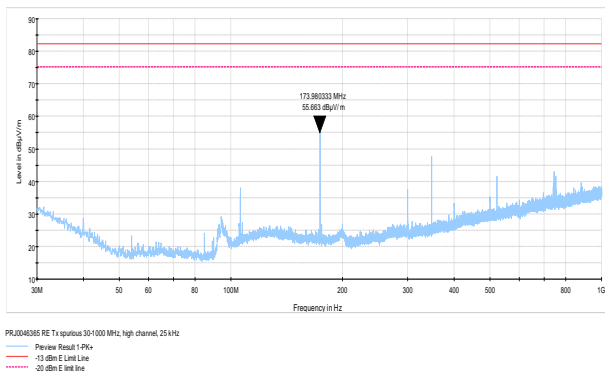


Figure 7.5-72: Radiated spurious emissions 0.03-1 GHz, high channel, 25 kHz, analog

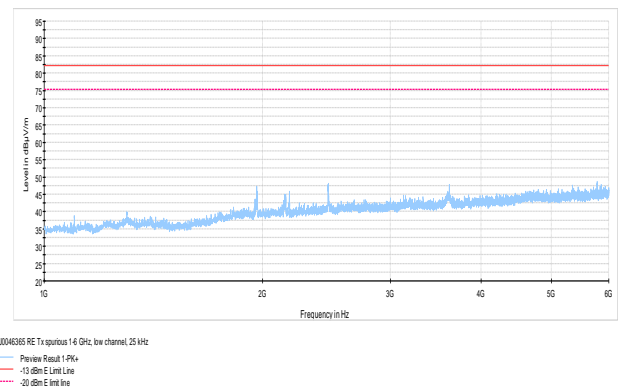


Figure 7.5-73: Radiated spurious emissions 1-6 GHz, low channel, 25 kHz, analog

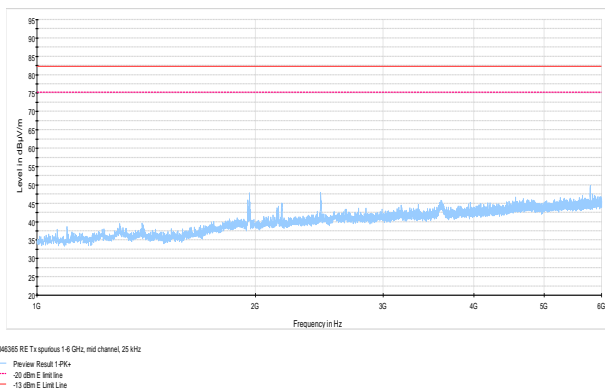


Figure 7.5-74: Radiated spurious emissions 1-6 GHz, mid channel, 25 kHz, analog

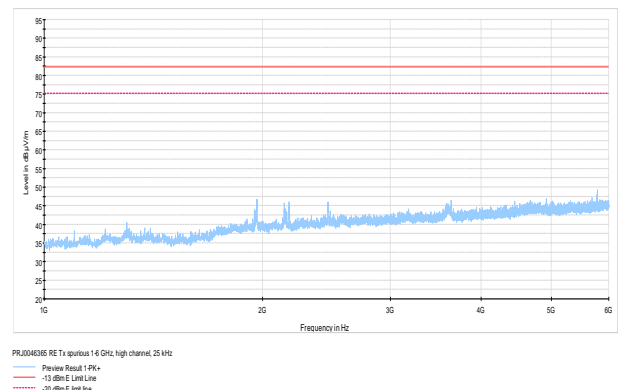


Figure 7.5-75: Radiated spurious emissions 1-6 GHz, high channel, 25 kHz, analog

Test data, continued

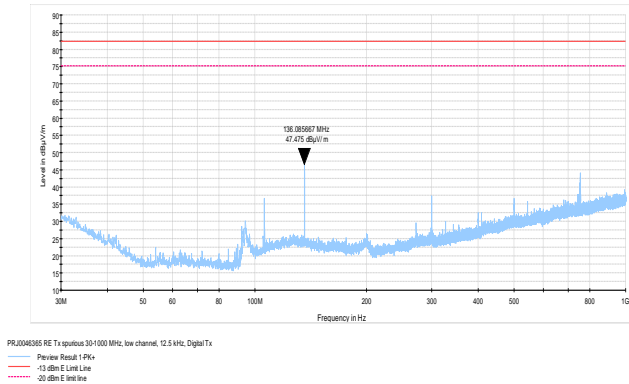


Figure 7.5-76: Radiated spurious emissions 0.03-1 GHz, low channel, 12.5 kHz, digital

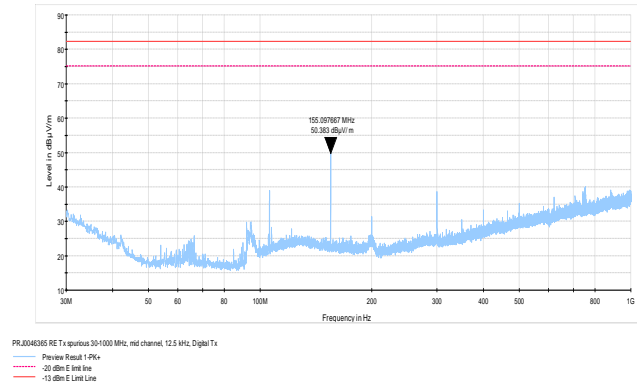


Figure 7.5-77: Radiated spurious emissions 0.03-1 GHz, mid channel, 12.5 kHz, digital

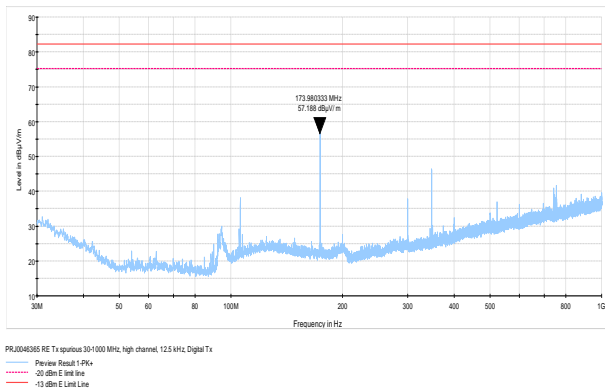


Figure 7.5-78: Radiated spurious emissions 0.03-1 GHz, high channel, 12.5 kHz, digital

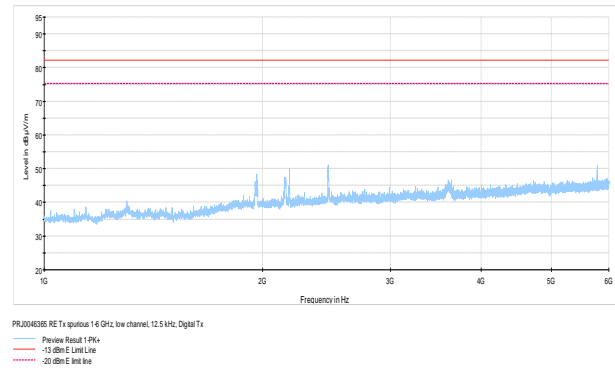


Figure 7.5-79: Radiated spurious emissions 1-6 GHz, low channel, 12.5 kHz, digital

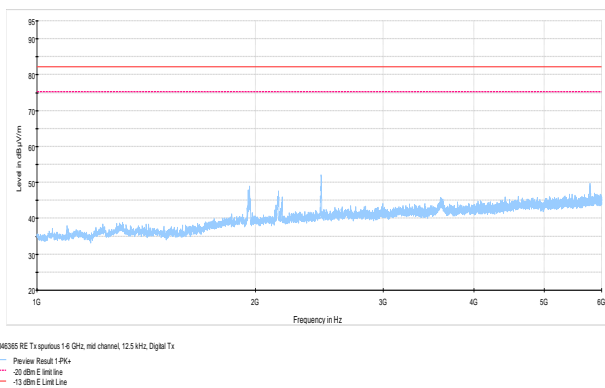


Figure 7.5-80: Radiated spurious emissions 1-6 GHz, mid channel, 12.5 kHz, digital

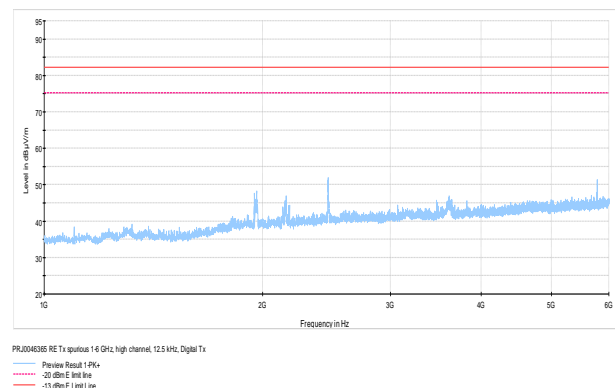


Figure 7.5-81: Radiated spurious emissions 1-6 GHz, high channel, 12.5 kHz, digital

7.6 Transient frequency behavior

7.6.1 References, definitions and limits

FCC §90.214:

Transmitters designed to operate in the 150–174 MHz frequency band must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Table 7.6-1: *Transient frequency behavior*

Time intervals ^{1,2}	Maximum frequency difference ³	Transient duration limit
Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels		
t_1^4	±25.0 kHz	5.0 ms
t_2	±12.5 kHz	20.0 ms
t_3^4	±25.0 kHz	5.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels		
t_1^4	±12.5 kHz	5.0 ms
t_2	±6.25 kHz	20.0 ms
t_3^4	±12.5 kHz	5.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels		
t_1^4	±6.25 kHz	5.0 ms
t_2	±3.125 kHz	20.0 ms
t_3^4	±6.25 kHz	5.0 ms

Notes: ¹ t_{on} is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.

t_1 is the time period immediately following t_{on} .

t_2 is the time period immediately following t_1 .

t_3 is the time period from the instant when the transmitter is turned off until t_{off} .

t_{off} is the instant when the 1 kHz test signal starts to rise.

²During the time from the end of t_2 to the beginning of t_3 , the frequency difference must not exceed the limits specified in §90.213.

³Difference between the actual transmitter frequency and the assigned transmitter frequency.

⁴If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

References, definitions and limits, continued

RSS-119, Clause 5.9:

When a transmitter is turned on, the radio frequency may take some time to stabilize. During this initial period, the frequency error or frequency difference (i.e., between the instantaneous and the steady state frequencies) shall not exceed the limits specified in Table below. Any suitable method of measurement can be used provided that it is fully described in the test report. A suitable and recommended method is given in TIA Standard 603.

Table 7.6-2: *Transient frequency behavior*

Channel Bandwidth, kHz	Time intervals ^{1,2}	Maximum frequency difference	Transient duration limit
25	t ₁	±25.0 kHz	5.0 ms
	t ₂	±12.5 kHz	20.0 ms
	t ₃	±25.0 kHz	5.0 ms
12.5	t ₁	±12.5 kHz	5.0 ms
	t ₂	±6.25 kHz	20.0 ms
	t ₃	±12.5 kHz	5.0 ms
6.25	t ₁	±6.25 kHz	5.0 ms
	t ₂	±3.125 kHz	20.0 ms
	t ₃	±6.25 kHz	5.0 ms

Notes: ¹t_{on}: the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.

t₁: the time period immediately following t_{on}.

t₂: the time period immediately following t₁.

t₃: the time period from the instant when the transmitter is turned off until t_{off}.

t_{off}: the instant when the 1 kHz test signal starts to rise.

²If the transmitter carrier output power rating is 6 W or less, the frequency difference during the time periods t₁ and t₃ may exceed the maximum frequency difference for these time periods. The corresponding plot of frequency versus time during t₁ and t₃ shall be recorded in the test report.

7.6.2 Test summary

Verdict	Pass		
Tested by	Ketav Jani	Test date	February 8, 2024

7.6.3 Observations, settings and special notes

None

7.6.4 Transient frequency behavior-Test data

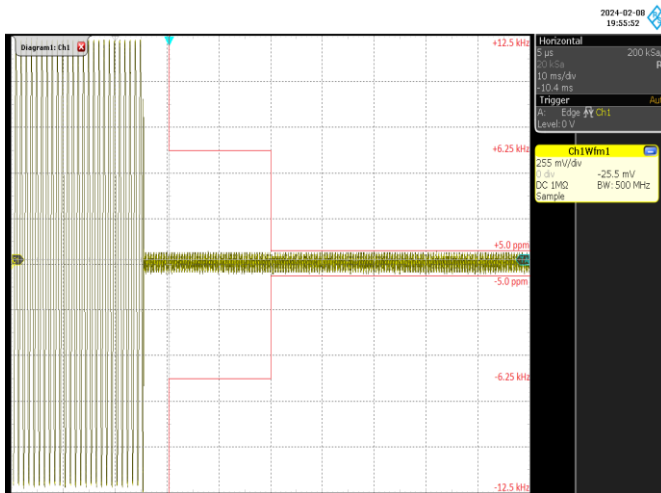


Figure 7.6-1: Transient Frequency behavior, low channel,12.5 kHz, switch ON

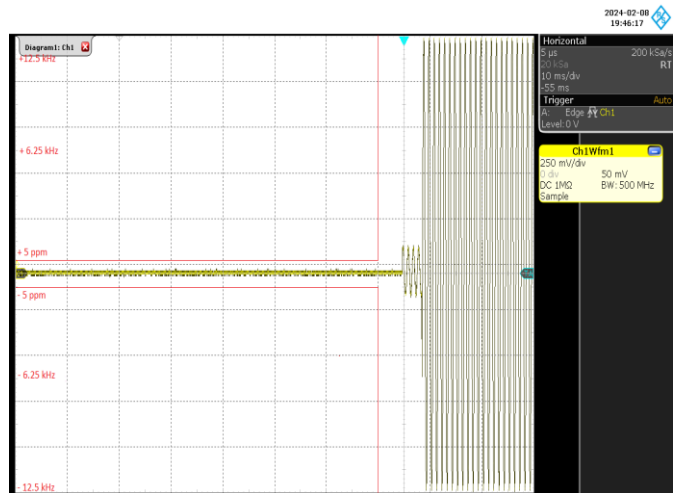


Figure 7.6-2: Transient Frequency behavior, low channel,12.5 kHz, switch OFF

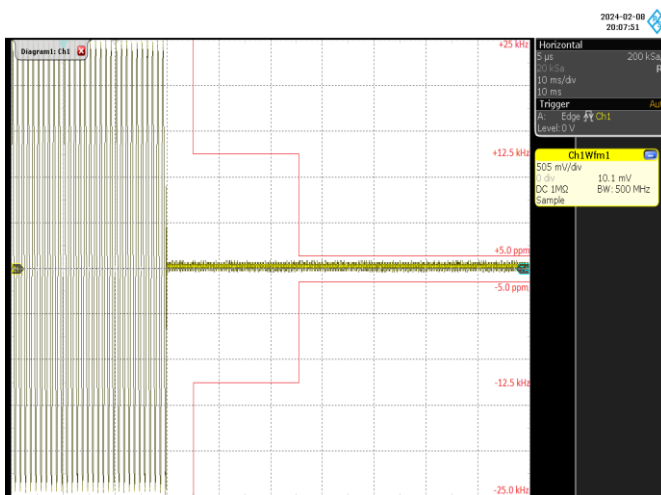


Figure 7.6-3: Transient Frequency behavior, low channel 25 kHz, switch ON

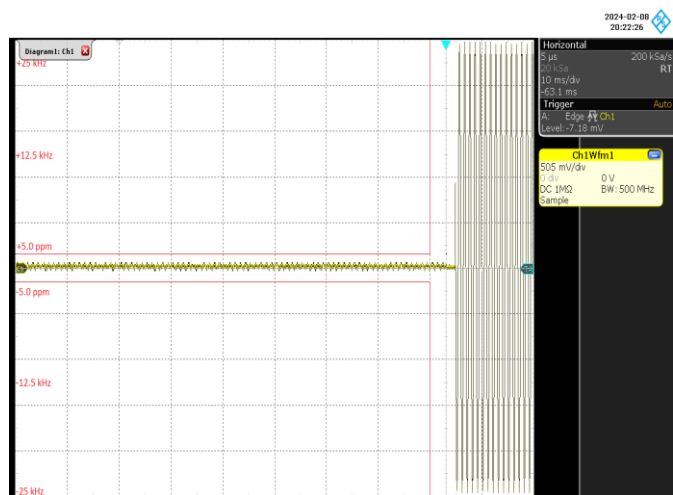


Figure 7.6-4: Transient Frequency behavior, low channel,25 kHz, switch OFF

7.7 Transmitter frequency stability

7.7.1 References, definitions and limits

FCC §90.213:

- (a) Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table.

Table 7.7-1: Minimum frequency stability

Frequency range (MHz)	Fixed and base stations	Mobile stations over 2 watts output power	Mobile stations 2 watts or less output power
150–174	±5 ppm ¹	±5 ppm ²	±50 ppm ²

Notes: ¹In the 150–174 MHz band, fixed and base stations with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm. Fixed and base stations with a 6.25 kHz channel bandwidth must have a frequency stability of 1.0 ppm.

²In the 150–174 MHz band, mobile stations designed to operate with a 12.5 kHz channel bandwidth or designed to operate on a frequency specifically designated for itinerant use or designed for low-power operation of two watts or less, must have a frequency stability of 5.0 ppm. Mobile stations designed to operate with a 6.25 kHz channel bandwidth must have a frequency stability of 2.0 ppm.

RSS-119, Clause 5.3:

The carrier frequency shall not depart from the reference frequency in excess of the values given in Table below. For transmitters that have an output power of less than 120 mW, the frequency stability shall comply with the limits listed in Table below or, alternatively, with the conditions in Section 5.10.

For fixed and base station equipment, in lieu of meeting the frequency stability limit specified in Table below, the test report can show that the frequency stability is met by demonstrating that the unwanted emission limits, related to the equipment's nominal carrier frequency measured under normal operation, are met when the equipment is tested at the temperature and supply voltage variations specified for the frequency stability measurement in RSS-Gen.

Table 7.7-2: Transmitter frequency stability

Frequency range (MHz)	Channel bandwidth (kHz)	Frequency stability for Base/Fixed stations (±ppm)	Frequency stability for mobile stations with output power >2 W (±ppm)	Frequency stability for mobile stations with output power ≤2 W (±ppm)
138–174	30	5	5	5
	15	2.5	5	5
	7.5	1	2	5

FCC §22.355:

Table 7.7-3: Minimum frequency stability

Frequency range (MHz)	Fixed and base stations	Mobile stations over 3 watts output power	Mobile stations 3 watts or less output power
50–450	±5 ppm	±5 ppm	±5 ppm

FCC §74.464:

For operations on frequencies above 25 MHz using authorized bandwidths up to 30 kHz, the licensee of a remote pickup broadcast station or system shall maintain the operating frequency of each station in compliance with the frequency tolerance requirements of § 90.213 of this chapter

**Section 7***Testing data**Transmitter frequency stability**FCC Part 90 Subpart I, FCC part 22 Subpart E, FCC part 74 Subpart D and RSS-119, Issue 12***7.7.2 Test summary**

Verdict	Pass		
Tested by	Ketav Jani	Test date	January 26, 2024

7.7.3 Observations, settings and special notes

Test was performed on supply voltage variations as per client rated, no frequency deviation was observed.

7.7.4 Test data**Table 7.7-4: Transmitter frequency stability results, Low channel, 12.5 kHz, Analog, FCC part 90, 74, RSS 119**

Test conditions	Frequency, Hz	Drift, Hz	Drift, ppm	Limit ±ppm	Margin, ±ppm
+70 °C, Nominal	136.099946440	-30.03	-0.51	2.50	1.99
+60 °C, Nominal	136.099914966	-61.50	-0.74	2.50	1.76
+50 °C, Nominal	136.099913569	-62.90	-0.75	2.50	1.75
+40 °C, Nominal	136.099937653	-38.82	-0.57	2.50	1.93
+30 °C, Nominal	136.099969323	-7.15	-0.34	2.50	2.16
+20 °C, @ +15% Voltage	136.099964514	-11.96	-0.37	2.50	2.13
+20 °C, Nominal	136.099976470 (Ref.)	Reference	Reference	Reference	Reference
-20 °C, @ -15% Voltage	136.099978469	2.00	-0.27	2.50	2.23
+10 °C, Nominal	136.099938309	-38.16	-0.57	2.50	1.93
0 °C, Nominal	136.099945044	-31.43	-0.52	2.50	1.98
-10 °C, Nominal	136.099948331	-28.14	-0.49	2.50	2.01
-20 °C, Nominal	136.099929077	-47.39	-0.63	2.50	1.87
-30 °C, Nominal	136.099937021	-39.45	-0.58	2.50	1.92
-40 °C, Nominal	136.100002543	26.07	-0.09	2.50	2.41
-45 °C, Nominal	136.099953791	-22.68	-0.45	2.50	2.05

Table 7.7-5: Transmitter frequency stability results, Low channel, 12.5 kHz, Digital, FCC part 90, 74, RSS 119

Test conditions	Frequency, Hz	Drift, Hz	Drift, ppm	Limit ±ppm	Margin, ±ppm
+70 °C, Nominal	136.099944920	-22.86	-0.52	2.50	1.98
+60 °C, Nominal	136.099923842	-43.94	-0.67	2.50	1.83
+50 °C, Nominal	136.099928409	-39.37	-0.64	2.50	1.86
+40 °C, Nominal	136.099948109	-19.67	-0.49	2.50	2.01
+30 °C, Nominal	136.099981978	14.20	-0.24	2.50	2.26
+20 °C, @ +15% Voltage	136.099972858	5.08	-0.31	2.50	2.19
+20 °C, Nominal	136.099967778 (Ref.)	Reference	Reference	Reference	Reference
-20 °C, @ -15% Voltage	136.099976683	8.90	-0.28	2.50	2.22
+10 °C, Nominal	136.099966942	-0.84	-0.36	2.50	2.14
0 °C, Nominal	136.099957313	-10.47	-0.43	2.50	2.07
-10 °C, Nominal	136.099969429	1.65	-0.34	2.50	2.16
-20 °C, Nominal	136.099965289	-2.49	-0.37	2.50	2.13
-30 °C, Nominal	136.099941288	-26.49	-0.54	2.50	1.96
-40 °C, Nominal	136.100032843	65.07	0.13	2.50	2.37
-45 °C, Nominal	136.100001420	33.64	-0.10	2.50	2.40

Test data, continued

Table 7.7-6: Transmitter frequency stability results, Low channel, 25 kHz, Analog, FCC part 90, 74 & 22, RSS 119

Test conditions	Frequency, Hz	Drift, Hz	Drift, ppm	Limit ±ppm	Margin, ±ppm
+70 °C, Nominal	136.099927453	-87.83	-0.65	5.00	4.35
+60 °C, Nominal	136.100000203	-15.08	-0.11	5.00	4.89
+50 °C, Nominal	136.100013897	-1.38	-0.01	5.00	4.99
+40 °C, Nominal	136.100007263	-8.02	-0.06	5.00	4.94
+30 °C, Nominal	136.100006942	-8.34	-0.06	5.00	4.94
+20 °C, @+15% Voltage	136.099996993	-18.29	-0.13	5.00	4.87
+20 °C, Nominal	136.100015279(Ref.)	Reference	Reference	Reference	Reference
-20 °C, @ -15% Voltage	136.099999919	-15.36	-0.11	5.00	4.89
+10 °C, Nominal	136.100036662	21.38	0.16	5.00	4.84
0 °C, Nominal	136.100008346	-6.93	-0.05	5.00	4.95
-10 °C, Nominal	136.099994797	-20.48	-0.15	5.00	4.85
-20 °C, Nominal	136.100031374	16.10	0.12	5.00	4.88
-30 °C, Nominal	136.100035178	19.90	0.15	5.00	4.85
-40 °C, Nominal	136.100038048	22.77	0.17	5.00	4.83
-45 °C, Nominal	136.100002819	-12.46	-0.09	5.00	4.91

Table 7.7-7: Transmitter frequency stability results, Low channel, 12.5 kHz, Analog, FCC part 22

Test conditions	Frequency, Hz	Drift, Hz	Drift, ppm	Limit ±ppm	Margin, ±ppm
+70 °C, Nominal	136.099946440	-30.03	-0.51	5.00	4.49
+60 °C, Nominal	136.099914966	-61.50	-0.74	5.00	4.26
+50 °C, Nominal	136.099913569	-62.90	-0.75	5.00	4.25
+40 °C, Nominal	136.099937653	-38.82	-0.57	5.00	4.43
+30 °C, Nominal	136.099969323	-7.15	-0.34	5.00	4.66
+20 °C, @+15% Voltage	136.099964514	-11.96	-0.37	5.00	4.63
+20 °C, Nominal	136.099976470 (Ref.)	Reference	Reference	Reference	Reference
-20 °C, @ -15% Voltage	136.099978469	2.00	-0.27	5.00	4.73
+10 °C, Nominal	136.099938309	-38.16	-0.57	5.00	4.43
0 °C, Nominal	136.099945044	-31.43	-0.52	5.00	4.48
-10 °C, Nominal	136.099948331	-28.14	-0.49	5.00	4.51
-20 °C, Nominal	136.099929077	-47.39	-0.63	5.00	4.37
-30 °C, Nominal	136.099937021	-39.45	-0.58	5.00	4.42
-40 °C, Nominal	136.100002543	26.07	-0.09	5.00	4.91
-45 °C, Nominal	136.099953791	-22.68	-0.45	5.00	4.55

Test data, continued

Table 7.7-8: Transmitter frequency stability results, Low channel, 12.5 kHz, Digital, FCC part 22

Test conditions	Frequency, Hz	Drift, Hz	Drift, ppm	Limit ±ppm	Margin, ±ppm
+70 °C, Nominal	136.099944920	-22.86	-0.52	5.00	4.48
+60 °C, Nominal	136.099923842	-43.94	-0.67	5.00	4.33
+50 °C, Nominal	136.099928409	-39.37	-0.64	5.00	4.36
+40 °C, Nominal	136.099948109	-19.67	-0.49	5.00	4.51
+30 °C, Nominal	136.099981978	14.20	-0.24	5.00	4.76
+20 °C, @+15% Voltage	136.099972858	5.08	-0.31	5.00	4.69
+20 °C, Nominal	136.099967778 (Ref.)	Reference	Reference	Reference	Reference
-20 °C, @ -15% Voltage	136.099976683	8.90	-0.28	5.00	4.72
+10 °C, Nominal	136.099966942	-0.84	-0.36	5.00	4.64
0 °C, Nominal	136.099957313	-10.47	-0.43	5.00	4.57
-10 °C, Nominal	136.099969429	1.65	-0.34	5.00	4.66
-20 °C, Nominal	136.099965289	-2.49	-0.37	5.00	4.63
-30 °C, Nominal	136.099941288	-26.49	-0.54	5.00	4.46
-40 °C, Nominal	136.100032843	65.07	0.13	5.00	4.87
-45 °C, Nominal	136.100001420	33.64	-0.10	5.00	4.90

End of the test report