KTL Radio Test Report : 2G6476GUS1

Applicant : RACOM s.r.o

Apparatus Assessed : MR400 Radio Modems

Standard Tested To : 47CFR Parts 2 and 90

Summary:

The apparatus detailed above is compliant with the above standard as tested
(see section 2.1 of this report for full details)

Authorised by :
: M Render, EMC and Radio Group Manager

Issue Date : *20th December 2004*

Authorised Copy Number : *CD*

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Contents

Section 1: Introduction

1.1 General

This report contains an assessment of an apparatus against 47CFR Parts 2and 90 based upon tests carried out on samples submitted to the Laboratory.

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Tests performed by:

K J Anderson, Senior EMC Group Engineer

Report author: As above.

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1.2 Tests Requested By (Manufacturer)

This testing in this report was requested by:

RACOM s.r.o
Mirova 1283
592 31 Nove Mesto na Morave
Czech Republic

1.3 Manufacturer

As above.

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1.4 Notes Relating To The Assessment

With regard to this assessment, the following points should be noted:

a) The apparatus was set up and exercised using the configurations, modes of operation and arrangements defined in this report only.

b) All testing was performed under the following conditions:

DC Power Supply : 13.8 Vdc (where applicable)
Barometric Pressure : 86 to 106 kPa

Note that temperature and humidity conditions can be found in the relevant test results appendix B.

c) All dates used in this report are in the format dd/mm/yy.

d) All testing was performed in accordance with ISO17025.

1.5 Variations In Test Methods

There were no variations from normal KTL test procedures. Testing was performed in accordance with the relevant parts of TIA-603-B and ANSI C63.4.

Section 2: **Results Summary**

2.1 Result Table

The following table summarises the tests as described in 47CFR Parts 2 and 90:

Test Type	Application	Reference clauses in 47CFR	Appendix No.s in this report	Notes
RF Power Output at terminals	RF Terminal	2.1046	A1	No Limits Specified
Occupied Bandwidth	RF Terminal	2.1049 and 90.210 (c)/(d)	A2	PASS
Spurious emissions at antenna terminals	RF Terminal	2.1051& 90.210	A3	PASS
Field strength of spurious radiation	Antenna	2.1053& 90.210	A4	PASS
Frequency stability with temperature variation	RF Terminal	2.1055 (a)(i) & 90.213	A5	PASS
Frequency stability with primary voltage variation	RF Terminal	2.1055 (d)(i) & 90.213	A6	PASS
Transmitter Transient Frequency Behaviour	RF Terminal	90.214	A7	Pass

Note: The EUT was tested in one single build state i.e. was not modified during the testing detailed in this test report.

2.2 Summary Of Compliance

The samples, as assessed, satisfied the relevant requirements of 47CFR Parts 2 and 90, as detailed in section 2.1 of this test report.

2.3 Record Of Marginal Test Measurements

No marginal results were recorded during the assessment.

Appendix A **Formal Test Results**

A1 RF Power Output at terminals

Test Details	
Standard	47CFR Part 2
Reference Clause	2.1046
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	See Table Below
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

Modulation: None

Sample No.	Carrier Frequency (MHz)	Carrier Power (W)
S02	409.025	4.95
S03	409.025	4.95
S04	511.975	4.9
S05	511.975	4.9
S06	421.025	4.85
S07	466.525	4.9
S08	421.025	4.9
S09	466.525	4.85

Plots are contained in Appendix B, Figures B.1 to B.3

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Measurement Uncertainty

Quantity	Quantity Range	Expanded uncertainty
Amplitude	30 MHz to 1 GHz	±0.6dB

A2 Occupied Band width

Test Details 409.025 MHz 12.5 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1049 and 90.210 (d)
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S02
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions are within the limits defined in 47CFR 90.210 (d)

Emissions plots are contained in Appendix B,

Equipment Details (refer to Appendix D for further details)

Test equipment used : See Appendix D2.

Test Details 409.025 MHz 25 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1049 and 90.210 (c)
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S03
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions are within the limits defined in 47CFR 90.210 (c)

Emissions plots contained in Appendix B, Figures

Equipment Details (refer to Appendix D for further details)

Test equipment used : See Appendix D2.

Test Details 421.025 MHz 12.5 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1049 and 90.210 (d)
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S06
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions are within the limits defined in 47CFR 90.210 (d)

Emissions plots contained in Appendix B, Figures

Equipment Details (refer to Appendix D for further details)

Test equipment used : See Appendix D2.

Test Details 421.025 MHz 25 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1049 and 90.210 (c)
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S08
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions are within the limits defined in 47CFR 90.210 (c)

Emissions plots contained in Appendix B, Figures

Equipment Details (refer to Appendix D for further details)

Test equipment used : See Appendix D2.

Test Details 466.525 MHz 12.5 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1049 and 90.210 (d)
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S06
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions are within the limits defined in 47CFR 90.210 (d)

Emissions plots contained in Appendix B, Figures

Equipment Details (refer to Appendix D for further details)

Test equipment used : See Appendix D2.

Test Details 466.525 MHz 25 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1049 and 90.210 (c)
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S07
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions are within the limits defined in 47CFR 90.210 (c)

Emissions plots contained in Appendix B, Figures

Equipment Details (refer to Appendix D for further details)

Test equipment used : See Appendix D2.

Test Details 511.975 MHz 12.5 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1049 and 90.210 (d)
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S04
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions are within the limits defined in 47CFR 90.210 (d)

Emissions plots contained in Appendix B, Figures

Equipment Details (refer to Appendix D for further details)

Test equipment used : See Appendix D2.

Test Details 511.975 MHz 25 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1049 and 90.210 (c)
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S05
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions are within the limits defined in 47CFR 90.210 (c)

Emissions plots contained in Appendix B, Figures

Equipment Details (refer to Appendix D for further details)

Test equipment used : See Appendix D2.

Measurement Uncertainty

Quantity	Quantity Range	Expanded uncertainty
Amplitude	30MHz to 200MHz	±2.0dB
	200 MHz to 1 GHz	±3.0dB
	1GHz to 26.5 GHz	±3.3dB

A3 Spurious Emissions at antenna terminals

Test Details 409.025 MHz 12.5 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1051 and 90.210
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S02
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions were at least 20 dB below the test limit

Limit $P_{(dBm)} – (43+10 \log (P))$ P = Carrier power in watts
= - 13dBm

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 409.025 MHz 25 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1051 and 90.210
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S03
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions were at least 20 dB below the test limit

Limit $P_{(dBm)} – (43+10 \log (P))$ P = Carrier power in watts
= - 13dBm

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 421.025 MHz 12.5 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1051 and 90.210
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S06
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions were at least 20 dB below the test limit

Limit $P_{(dBm)} – (43+10 \log (P))$ P = Carrier power in watts
= - 13dBm

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 421.025 MHz 25 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1051 and 90.210
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S08
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions were at least 20 dB below the test limit

Limit $P_{(dBm)}$ – (43+10 log (P)) P = Carrier power in watts
= - 13dBm

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 466.525 MHz 12.5 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1051 and 90.210
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S09
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions were at least 20 dB below the test limit

Limit $P_{(dBm)} – (43+10 \log (P))$ P = Carrier power in watts
= - 13dBm

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 466.525 MHz 25 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1051 and 90.210
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S07
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions were at least 20 dB below the test limit

Limit $P_{(dBm)} – (43+10 \log (P))$ P = Carrier power in watts
= - 13dBm

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 511.975 MHz 12.5 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1051 and 90.210
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S04
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions were at least 20 dB below the test limit

Limit $P_{(dBm)} – (43+10 \log (P))$ P = Carrier power in watts
= - 13dBm

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 511.975 MHz 25 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1051 and 90.210
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S05
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions were at least 20 dB below the test limit

Limit $P_{(dBm)}$ – (43+10 log (P)) P = Carrier power in watts
= - 13dBm

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Measurement Uncertainty

Quantity	Quantity Range	Expanded uncertainty
Amplitude	30MHz to 200MHz	±2.0dB
	200 MHz to 1 GHz	±3.0dB
	1GHz to 26.5 GHz	±3.3dB

A4 Transmitter Spurious Radiated Emissions

Test Details 409.025 MHz 12.5 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1053 and 90.210
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S02
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions were at least 20 dB below the test limit

Limit = -13 dBm (TIA 603B Section 3.2.12.2)

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 409.025 MHz 25 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1053 and 90.210
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S03
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions were at least 20 dB below the test limit

Limit = -13 dBm (TIA 603B Section 3.2.12.2)

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 421.025 MHz 12.5 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1053 and 90.210
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S06
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions were at least 20 dB below the test limit

Limit = -13 dBm (TIA 603B Section 3.2.12.2)

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 421.025 MHz 25 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1053 and 90.210
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S08
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions were at least 20 dB below the test limit

Limit = -13 dBm (TIA 603B Section 3.2.12.2)

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 466.525 MHz 12.5 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1053 and 90.210
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S09
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions were at least 20 dB below the test limit

Limit = -13 dBm (TIA 603B Section 3.2.12.2)

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 466.525 MHz 25 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1053 and 90.210
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S07
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions were at least 20 dB below the test limit

Limit = -13 dBm (TIA 603B Section 3.2.12.2)

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 511.975 MHz 12.5 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1053 and 90.210
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S04
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions were at least 20 dB below the test limit

Limit = -13 dBm (TIA 603B Section 3.2.12.2)

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 511.975 MHz 25 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1053 and 90.210
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S05
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

All emissions were at least 20 dB below the test limit

Limit = -13 dBm (TIA 603B Section 3.2.12.2)

Equipment Details (refer to Appendix D for further details)
Test equipment used See Appendix D2.

Measurement Uncertainty

Quantity	Quantity range	Expanded uncertainty
Amplitude	30MHz to 1GHz	±2.6 dB
	1GHz to 26.5 GHz	±5 dB

A5 Frequency Stability with Temperature Variation

Test Details 409.025 MHz 12.5 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1055 and 90.213
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S02
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	-230.0	-0.6
-20	-200.0	-0.5
-10	-150.0	-0.4
0	-100.0	-0.2
10	100.0	0.2
20	0.0	0.0
30	250.0	0.6
40	390.0	1.0
50	410.0	1.0

Limit: ± 2.5 ppm

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 409.025 MHz 25 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1055 and 90.213
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S03
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	-280.0	-0.7
-20	-200.0	-0.5
-10	-200.0	-0.5
0	-700.0	-1.7
10	0.0	0.0
20	600.0	1.5
30	290.0	0.7
40	440.0	1.1
50	480.0	1.2

Limit: ± 2.5 ppm

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 421.025 MHz 12.5 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1055 and 90.213
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S06
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	10.0	0.0
-20	190.0	0.5
-10	240.0	0.6
0	270.0	0.6
10	290.0	0.7
20	330.0	0.8
30	370.0	0.9
40	410.0	1.0
50	430.0	1.0

Limit: ± 2.5 ppm

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 421.025 MHz 25 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1055 and 90.213
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S08
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	-10.0	0.0
-20	100.0	0.2
-10	150.0	0.4
0	200.0	0.5
10	230.0	0.5
20	280.0	0.7
30	300.0	0.7
40	340.0	0.8
50	390.0	0.9

Limit: ± 2.5 ppm

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 466.525 MHz 12.5 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1055 and 90.213
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S09
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	170.0	0.4
-20	230.0	0.5
-10	280.0	0.6
0	320.0	0.7
10	350.0	0.8
20	380.0	0.8
30	400.0	0.9
40	430.0	0.9
50	490.0	1.1

Limit: ± 2.5 ppm

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 466.525 MHz 25 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1055 and 90.213
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S07
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	130.0	0.3
-20	180.0	0.4
-10	220.0	0.5
0	280.0	0.6
10	300.0	0.6
20	330.0	0.7
30	380.0	0.8
40	440.0	0.9
50	480.0	1.0

Limit: ± 2.5 ppm

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 511.975 MHz 12.5 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1055 and 90.213
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S04
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	-300.0	-0.6
-20	-190.0	-0.4
-10	-190.0	-0.4
0	-150.0	-0.3
10	60.0	0.1
20	130.0	0.3
30	190.0	0.4
40	230.0	0.4
50	270.0	0.5

Limit: ± 2.5 ppm

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 511.975 MHz 25 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1055 and 90.213
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S05
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	-800.0	-1.6
-20	-400.0	-0.8
-10	-390.0	-0.8
0	-200.0	-0.4
10	10.0	0.0
20	160.0	0.3
30	220.0	0.4
40	290.0	0.6
50	380.0	0.7

Limit: ± 2.5 ppm

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Measurement Uncertainty

Quantity	Quantity Range	Expanded uncertainty
Frequency	25MHz to 26.5 GHz	0.09ppm

A6 Frequency Stability with Primary Voltage Variation

Test Details 409.025 MHz 12.5 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1055 and 90.213
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S02
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

Primary Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
11.73(V_{nom} x 0.85)	-150.0	-0.4
12.42(V_{nom} x 0.9)	-130.0	-0.3
13.11(V_{nom} x 0.95)	-70.0	-0.2
13.8 V (V_{nom})	20.0	0.0
14.49(V_{nom} x 1.05)	150.0	0.4
15.18(V_{nom} x 1.1)	200.0	0.5
15.87(V_{nom} x 1.15)	250.0	0.6

Limit: 2.5 ppm

Equipment Details (refer to Appendix D for further details)

Test equipment used See Appendix D2.

Test Details 409.025 MHz 25 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1055 and 90.213
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S03
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

Primary Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
11.73(V_{nom} x 0.85)	-130.0	-0.3
12.42(V_{nom} x 0.9)	-90.0	-0.2
13.11(V_{nom} x 0.95)	-30.0	-0.1
13.8 V (V_{nom})	40.0	0.1
14.49(V_{nom} x 1.05)	180.0	0.4
15.18(V_{nom} x 1.1)	240.0	0.6
15.87(V_{nom} x 1.15)	310.0	0.8

Limit: ± 2.5 ppm

Equipment Details (refer to Appendix D for further details)

Apparatus Sample Number : S02

Test equipment used See Appendix D2.

Test Details 421.025 MHz 12.5 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1055 and 90.213
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S06
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

Primary Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
11.73(V_{nom} x 0.85)	50.0	0.1
12.42(V_{nom} x 0.9)	100.0	0.2
13.11(V_{nom} x 0.95)	160.0	0.4
13.8 V (V_{nom})	180.0	0.4
14.49(V_{nom} x 1.05)	220.0	0.5
15.18(V_{nom} x 1.1)	270.0	0.6
15.87(V_{nom} x 1.15)	330.0	0.8

Limit: ± 2.5 ppm

Equipment Details (refer to Appendix D for further details)

Apparatus Sample Number : S02

Test equipment used See Appendix D2.

Test Details 421.025 MHz 25 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1055 and 90.213
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S08
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

Primary Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
11.73(V_{nom} x 0.85)	70.0	0.2
12.42(V_{nom} x 0.9)	110.0	0.3
13.11(V_{nom} x 0.95)	140.0	0.3
13.8 V (V_{nom})	190.0	0.5
14.49(V_{nom} x 1.05)	200.0	0.5
15.18(V_{nom} x 1.1)	220.0	0.5
15.87(V_{nom} x 1.15)	280.0	0.7

Limit: ± 2.5 ppm

Equipment Details (refer to Appendix D for further details)

Apparatus Sample Number : S02

Test equipment used See Appendix D2.

Test Details 466.525 MHz 12.5 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1055 and 90.213
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S09
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

Primary Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
11.73(V_{nom} x 0.85)	80.0	0.2
12.42(V_{nom} x 0.9)	100.0	0.2
13.11(V_{nom} x 0.95)	130.0	0.3
13.8 V (V_{nom})	160.0	0.3
14.49(V_{nom} x 1.05)	180.0	0.4
15.18(V_{nom} x 1.1)	200.0	0.4
15.87(V_{nom} x 1.15)	230.0	0.5

Limit: ± 2.5 ppm

Equipment Details (refer to Appendix D for further details)

Apparatus Sample Number : S02

Test equipment used See Appendix D2.

Test Details 466.525 MHz 25 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1055 and 90.213
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S07
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

Primary Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
11.73(V_{nom} x 0.85)	100.0	0.2
12.42(V_{nom} x 0.9)	150.0	0.3
13.11(V_{nom} x 0.95)	180.0	0.4
13.8 V (V_{nom})	200.0	0.4
14.49(V_{nom} x 1.05)	210.0	0.5
15.18(V_{nom} x 1.1)	220.0	0.5
15.87(V_{nom} x 1.15)	250.0	0.5

Limit: ± 2.5 ppm

Equipment Details (refer to Appendix D for further details)

Apparatus Sample Number : S02

Test equipment used See Appendix D2.

Test Details 511.975 MHz 12.5 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1055 and 90.213
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S04
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

Primary Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
11.73(V_{nom} x 0.85)	-250.0	-0.5
12.42(V_{nom} x 0.9)	-170.0	-0.3
13.11(V_{nom} x 0.95)	-120.0	-0.2
13.8 V (V_{nom})	-50.0	-0.1
14.49(V_{nom} x 1.05)	40.0	0.1
15.18(V_{nom} x 1.1)	90.0	0.2
15.87(V_{nom} x 1.15)	150.0	0.3

Limit: ± 2.5 ppm

Equipment Details (refer to Appendix D for further details)

Apparatus Sample Number : S02

Test equipment used See Appendix D2.

Test Details 511.975 MHz 25 kHz Channel Spacing	
Standard	47CFR Parts 2 and 90
Reference Clause	2.1055 and 90.213
Test Method	TIA-603-B
Test Application	Antenna Terminal
EUT sample number	S05
Modification state	0
SE in test environment	None
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

Primary Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
11.73(V_{nom} x 0.85)	-230.0	-0.4
12.42(V_{nom} x 0.9)	-190.0	-0.4
13.11(V_{nom} x 0.95)	-150.0	-0.3
13.8 V (V_{nom})	-100.0	-0.2
14.49(V_{nom} x 1.05)	10.0	0.0
15.18(V_{nom} x 1.1)	100.0	0.2
15.87(V_{nom} x 1.15)	170.0	0.3

Limit: ± 2.5 ppm

Equipment Details (refer to Appendix D for further details)
Test equipment used See Appendix D2.

Measurement Uncertainty

Quantity	Quantity Range	Expanded uncertainty
Frequency	25MHz to 26.5 GHz	0.09ppm

A7 Transmitter Transient Frequency Behaviour

Test Details	
Standard	47CFR Part 90
Reference Clause	90.214
Test Method	TIA-603-B Section 2.2.19
Test Application	Antenna Terminal
EUT sample number	S02 to S09
Modification state	0
SE in test environment	S01
SE isolated from EUT	EMC Laptop
EUT set up	Refer to Appendix D

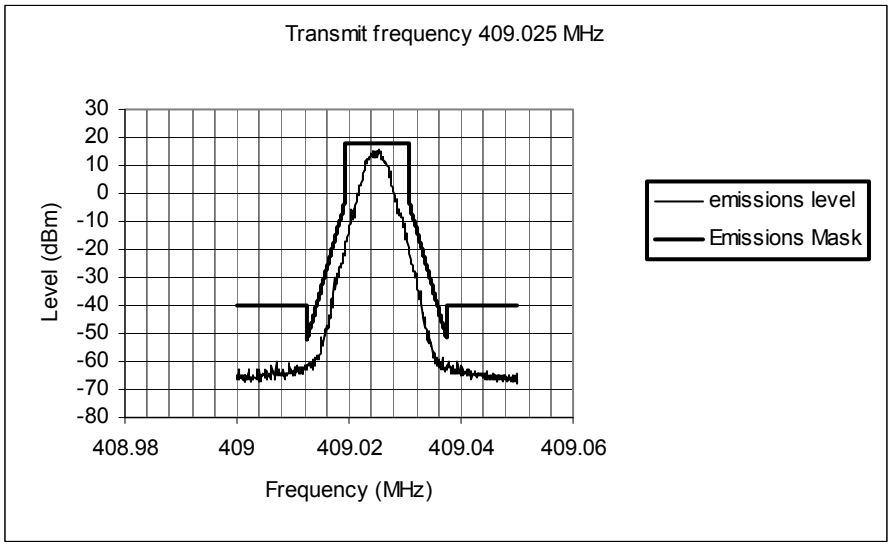
All samples were within the test limit profiles contained within 47CFR90.214 for 12.5 and 25 kHz spaced equipment. Test plots demonstrating compliance are contained in Appendix B.

Equipment Details (refer to Appendix D for further details)

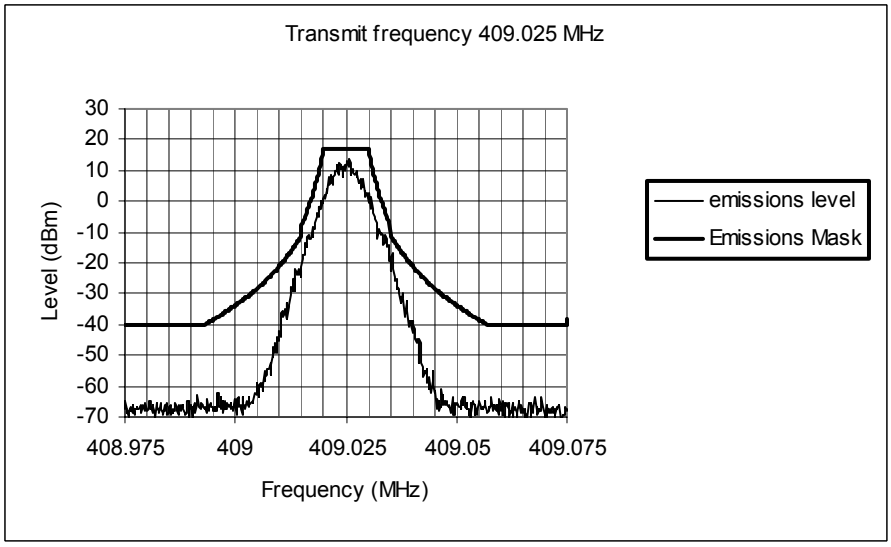
Test equipment used See Appendix D2.

Quantity	Quantity Range	Expanded uncertainty
Frequency	25MHz to GHz	100 Hz

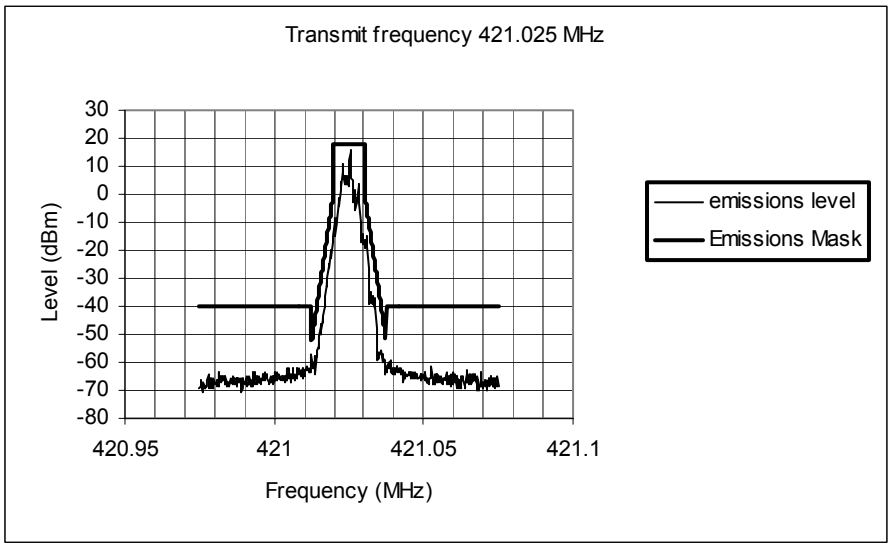
Appendix B: **Supporting Graphical Data**



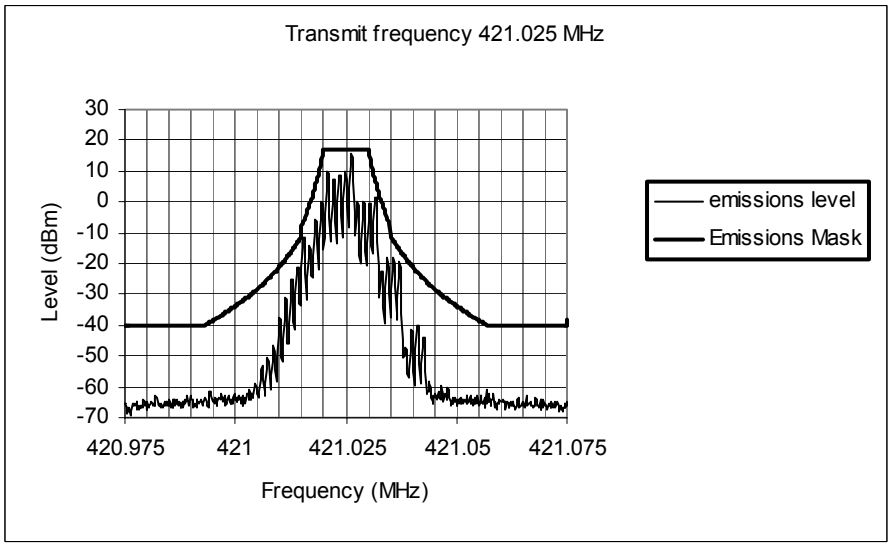
12.5 kHz Mask



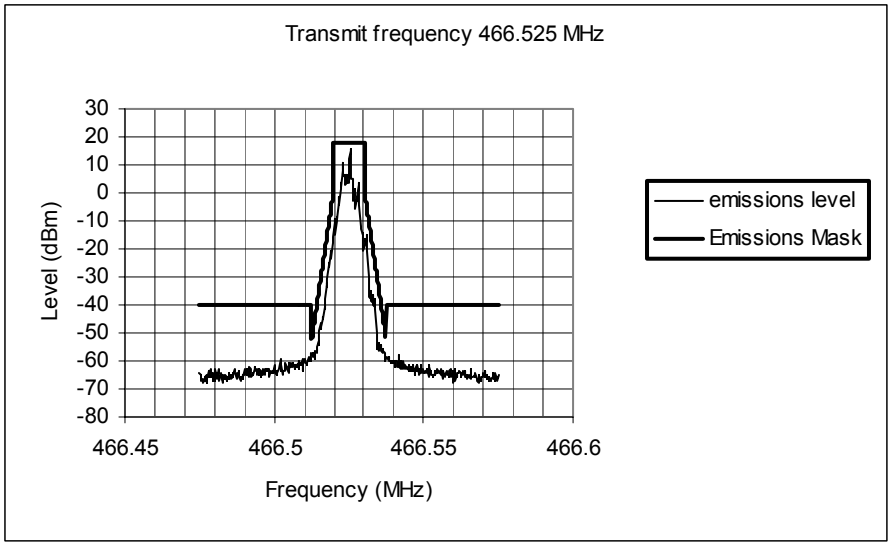
25 kHz Mask



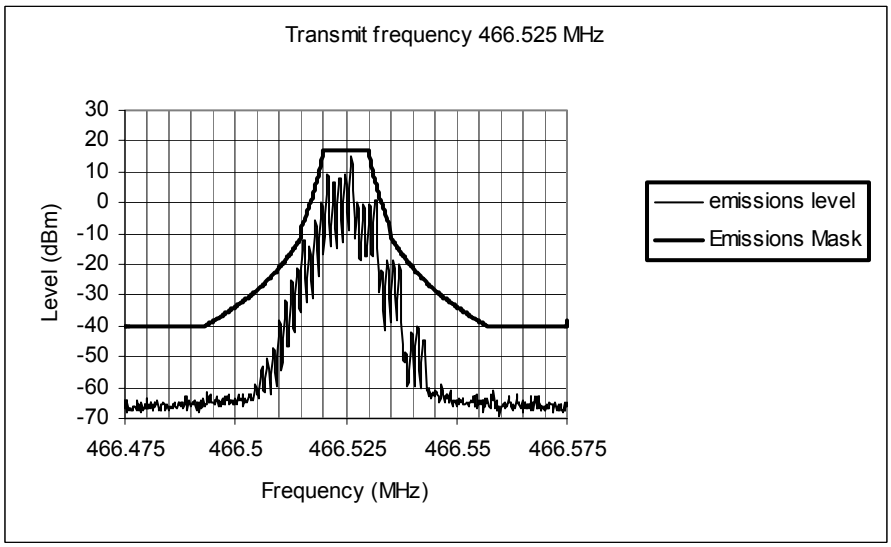
12.5 kHz Mask



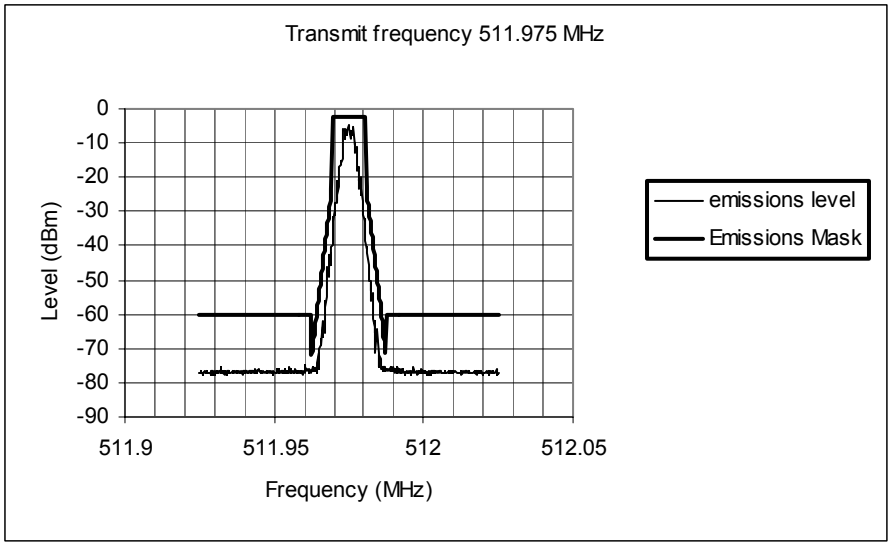
25 kHz Mask



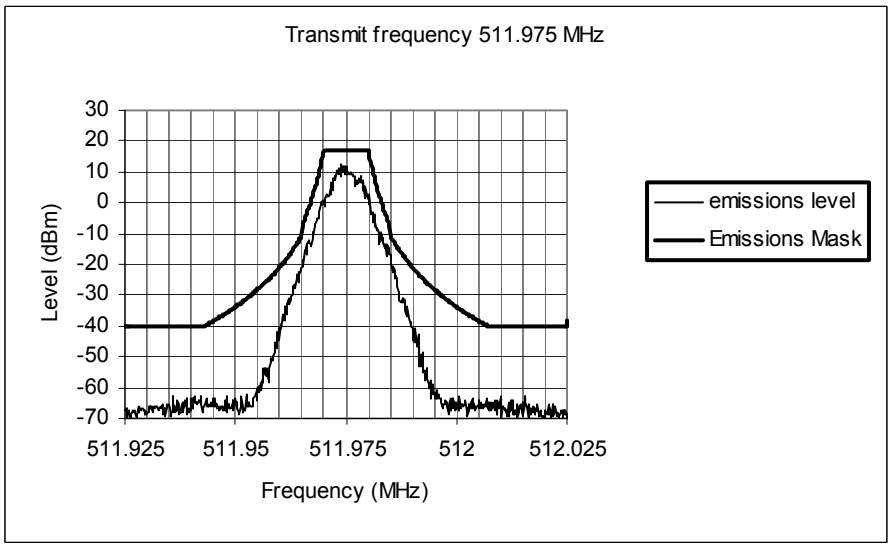
12.5 kHz Mask



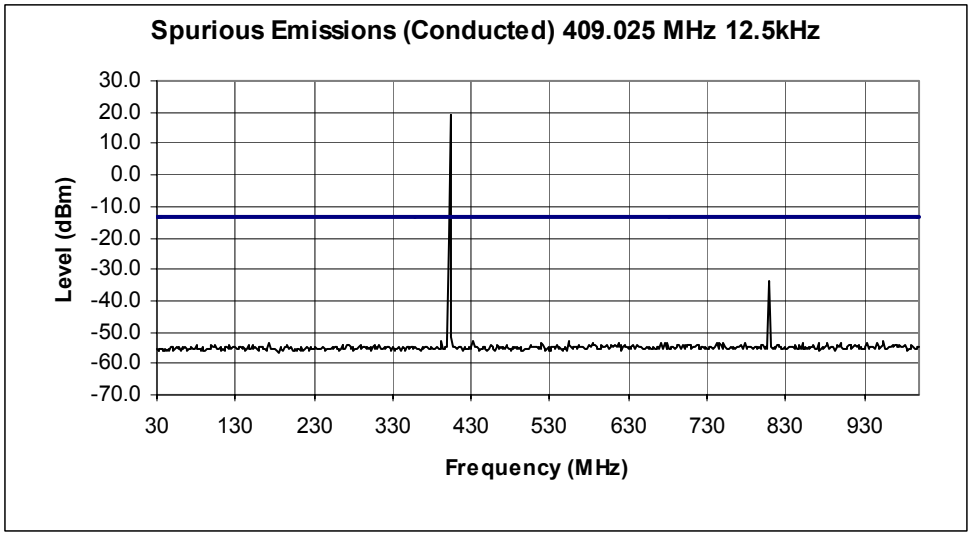
25 kHz Mask

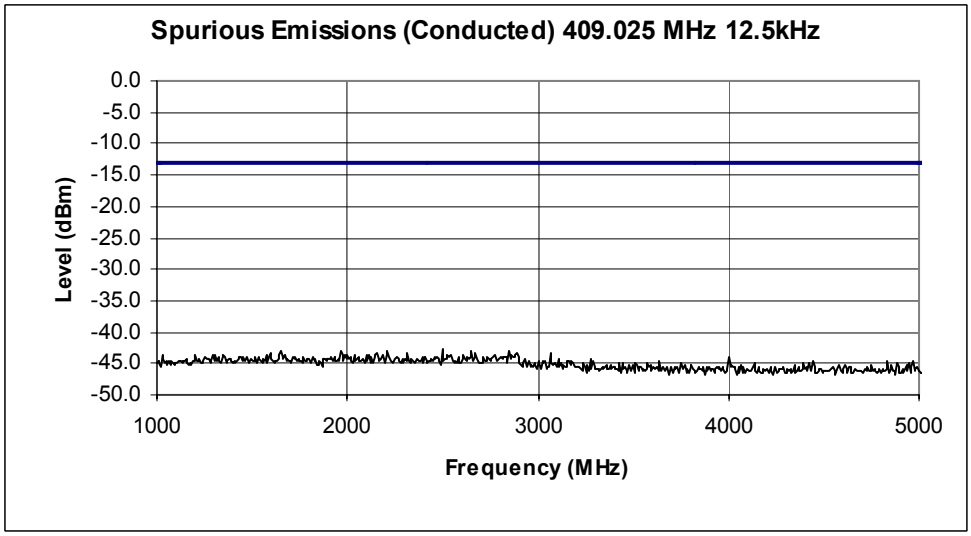


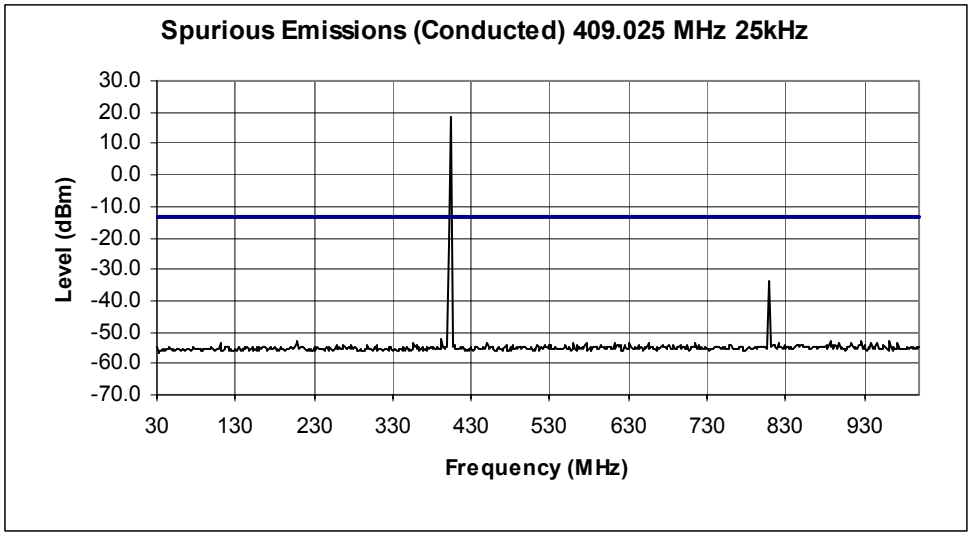
12.5 kHz Mask

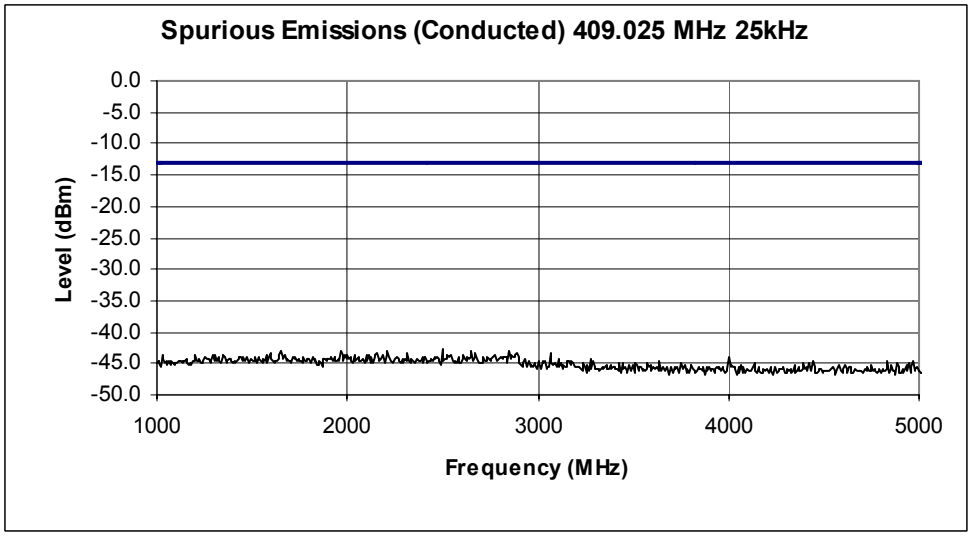


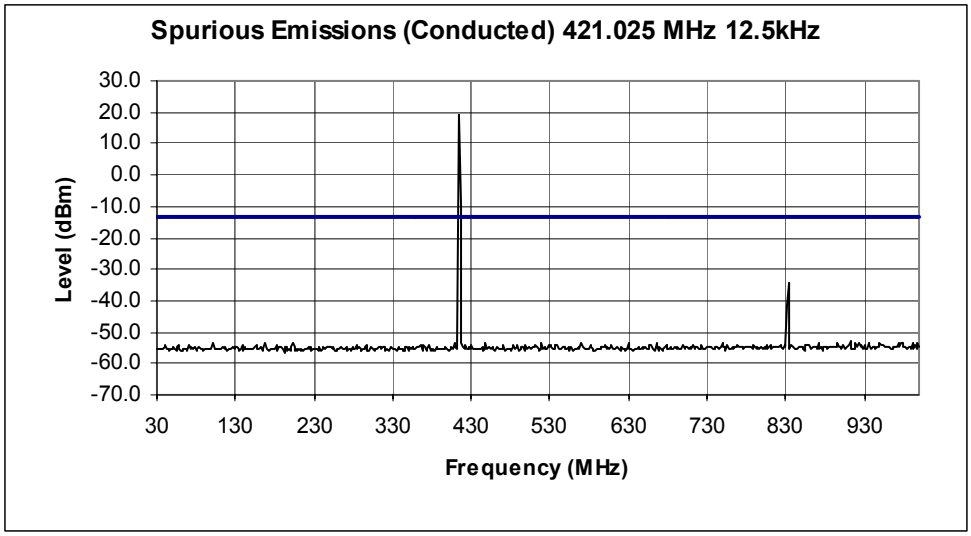
25 kHz Mask

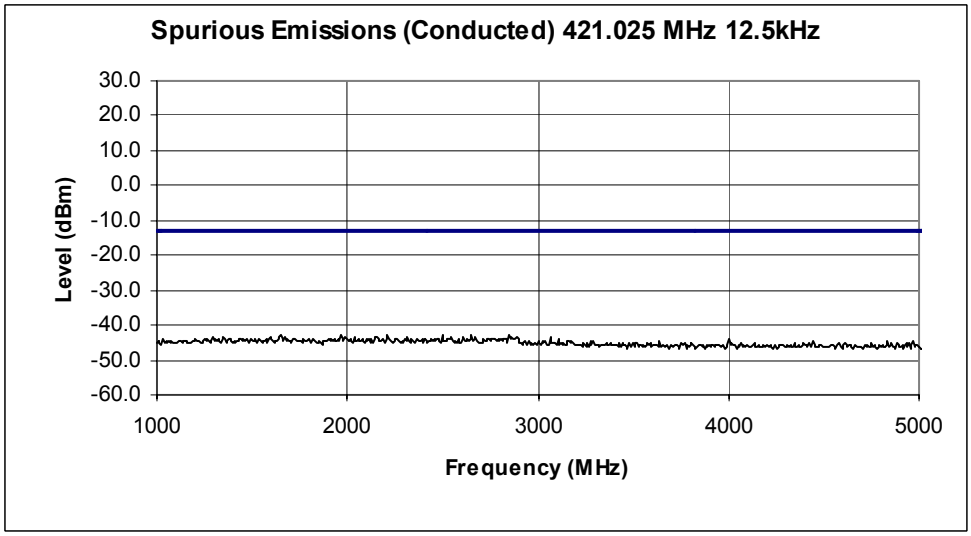

Spurious Emissions (Conducted) 409.025 MHz 12.5kHz
Level (dBm)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
30
130
230
330
430
530
630
730
830
930
Frequency (MHz)

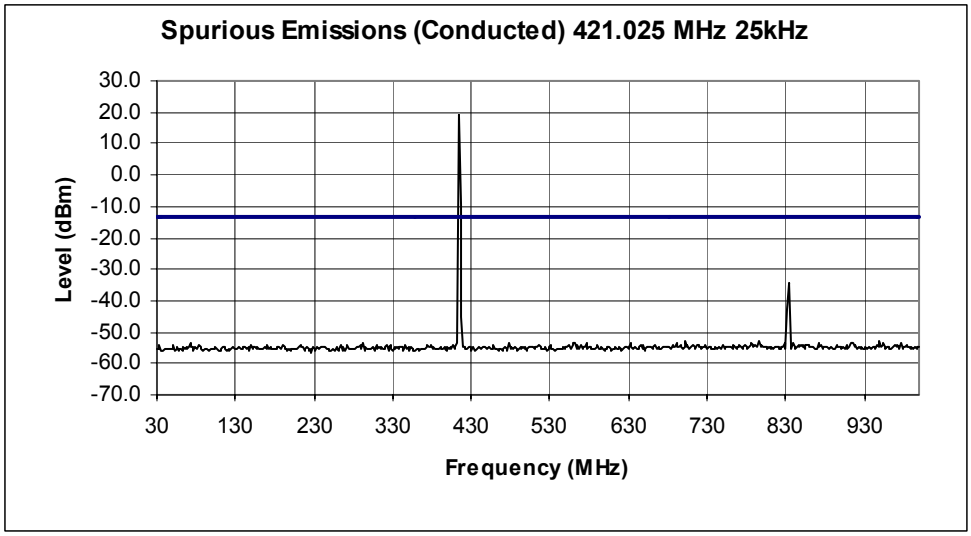

Spurious Emissions (Conducted) 409.025 MHz 12.5kHz
Level (dBm)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
1000
2000
3000
4000
5000
Frequency (MHz)

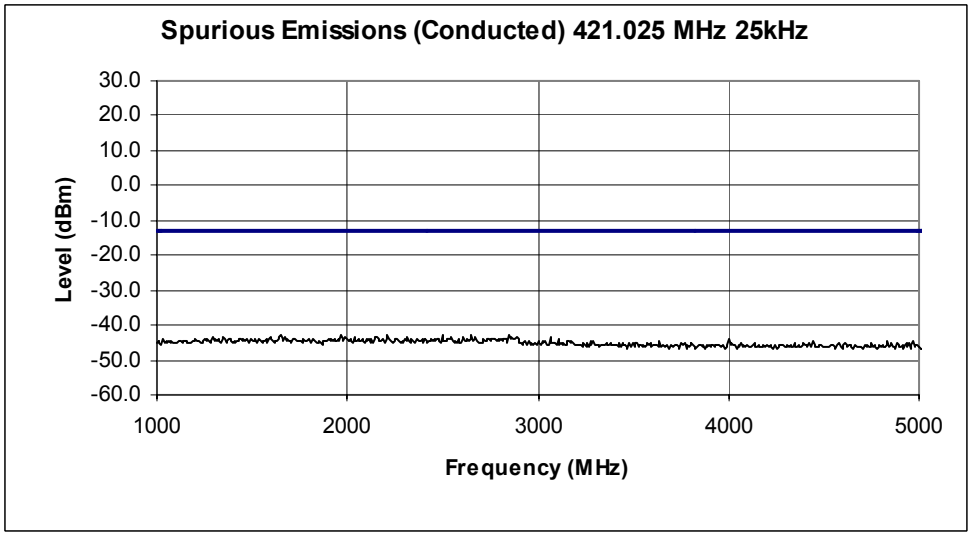

Spurious Emissions (Conducted) 409.025 MHz 25kHz
Level (dBm)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
30
130
230
330
430
530
630
730
830
930
Frequency (MHz)

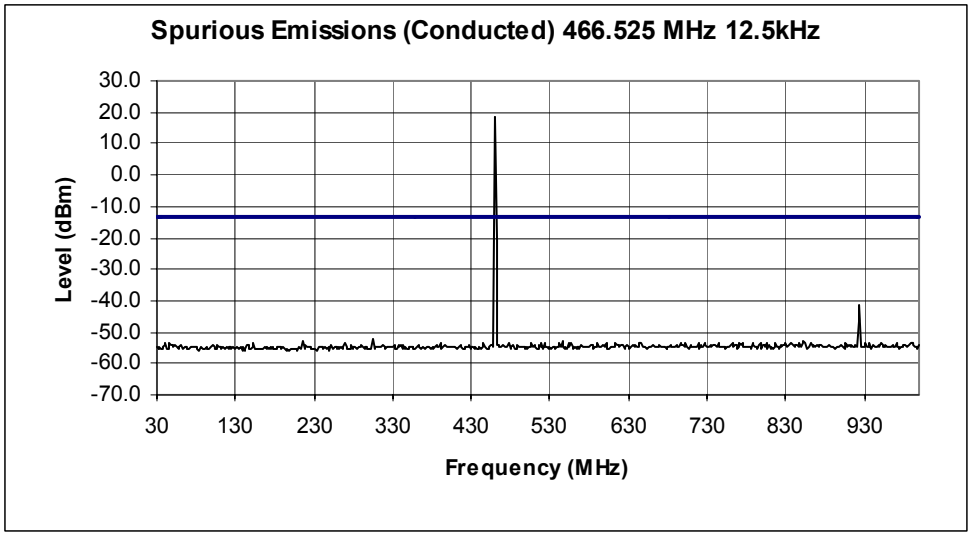

Spurious Emissions (Conducted) 409.025 MHz 25kHz
Level (dBm)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
1000
2000
3000
4000
5000
Frequency (MHz)

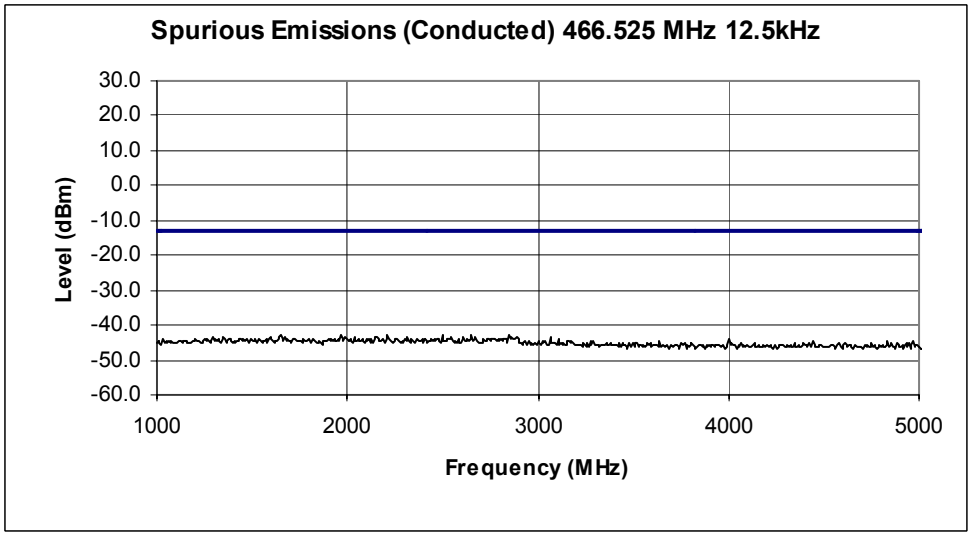

Spurious Emissions (Conducted) 421.025 MHz 12.5kHz
Level (dBm)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
30
130
230
330
430
530
630
730
830
930
Frequency (MHz)

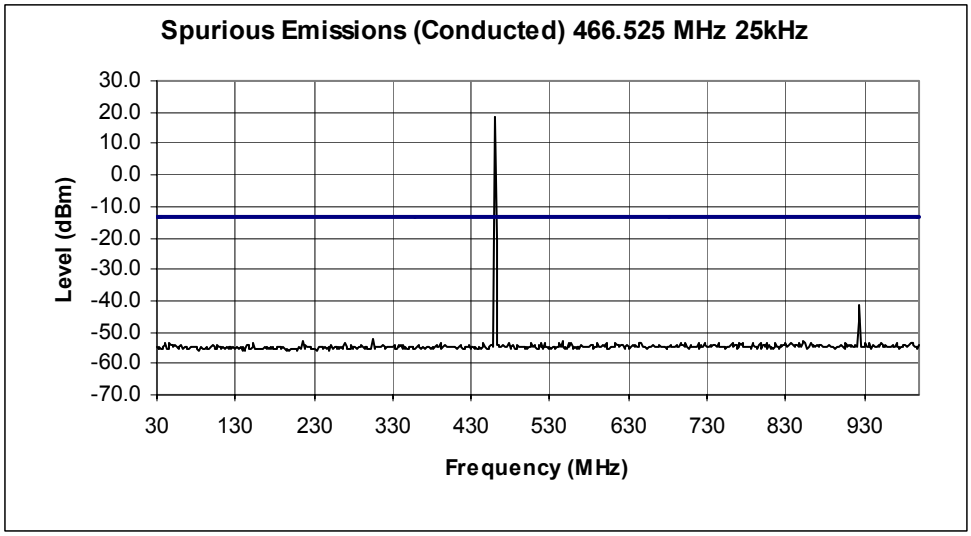

Spurious Emissions (Conducted) 421.025 MHz 12.5kHz
Level (dBm)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
1000
2000
3000
4000
5000
Frequency (MHz)

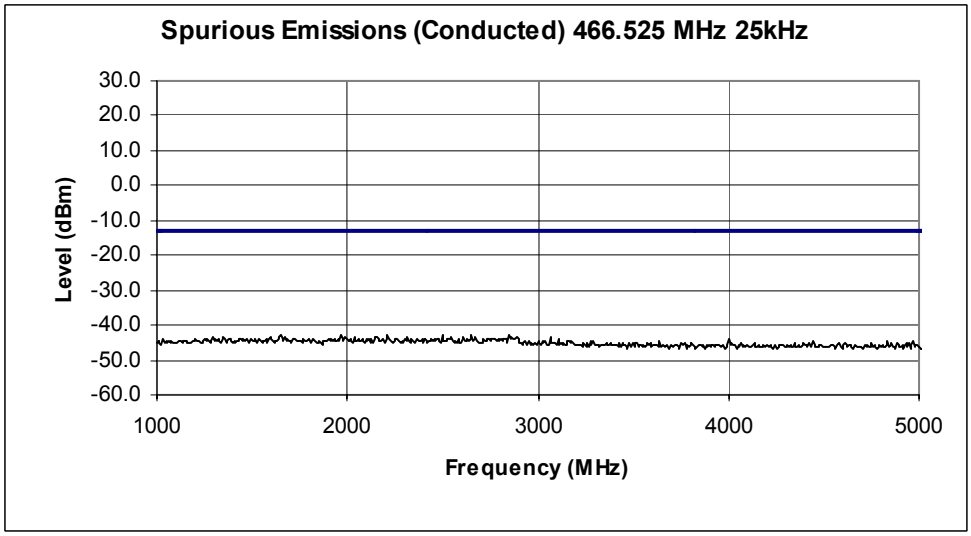

Spurious Emissions (Conducted) 421.025 MHz 25kHz
Level (dBm)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
30
130
230
330
430
530
630
730
830
930
Frequency (MHz)

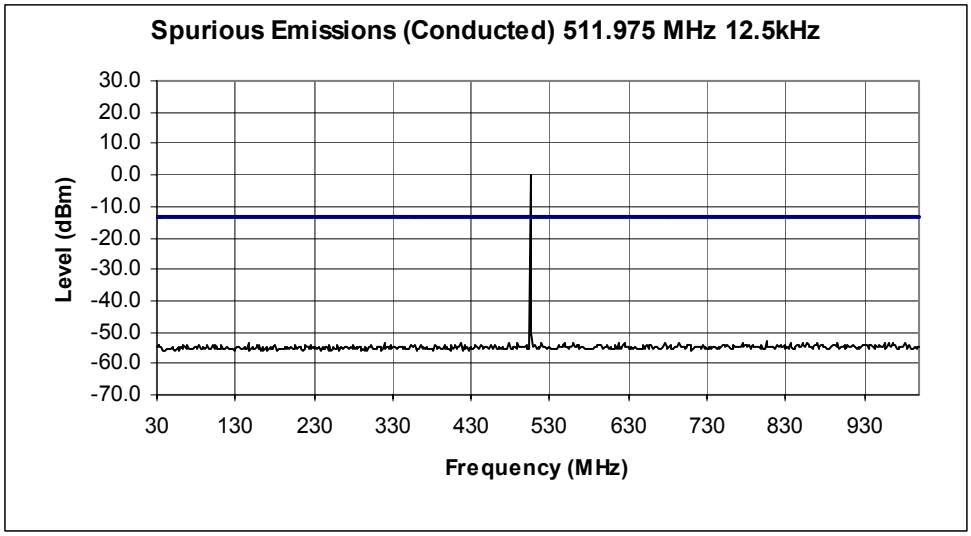

Spurious Emissions (Conducted) 421.025 MHz 25kHz
Level (dBm)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
1000
2000
3000
4000
5000
Frequency (MHz)

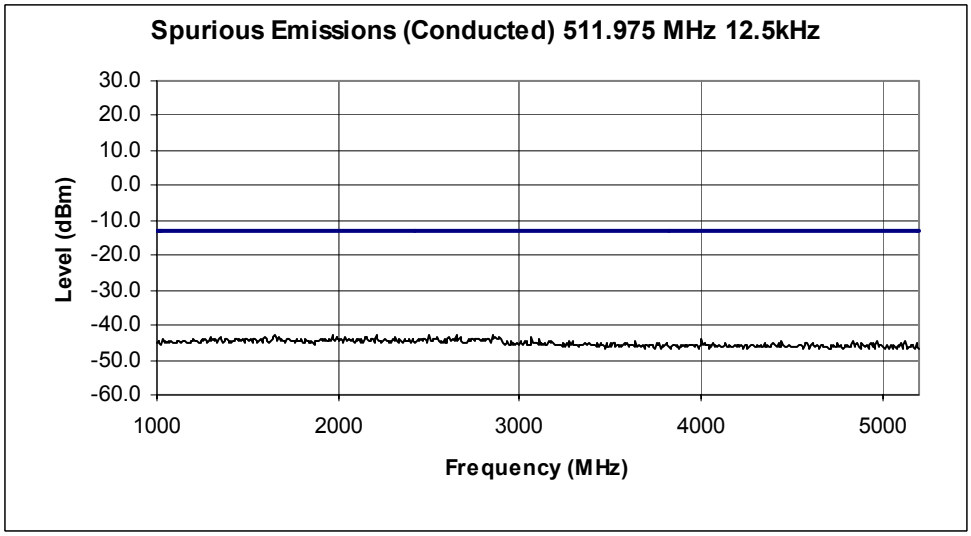

Spurious Emissions (Conducted) 466.525 MHz 12.5kHz
Level (dBm)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
30
130
230
330
430
530
630
730
830
930
Frequency (MHz)

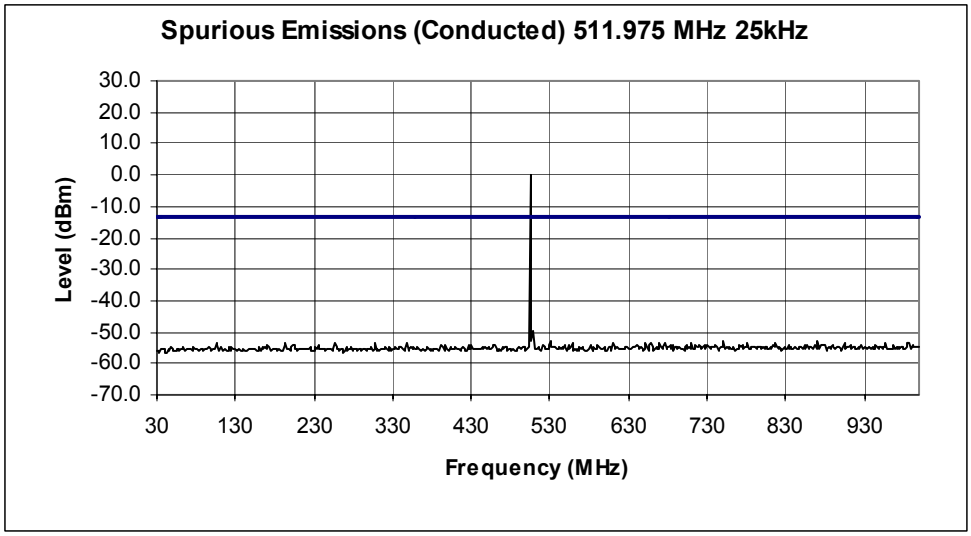

Spurious Emissions (Conducted) 466.525 MHz 12.5kHz
Level (dBm)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
1000
2000
3000
4000
5000
Frequency (MHz)

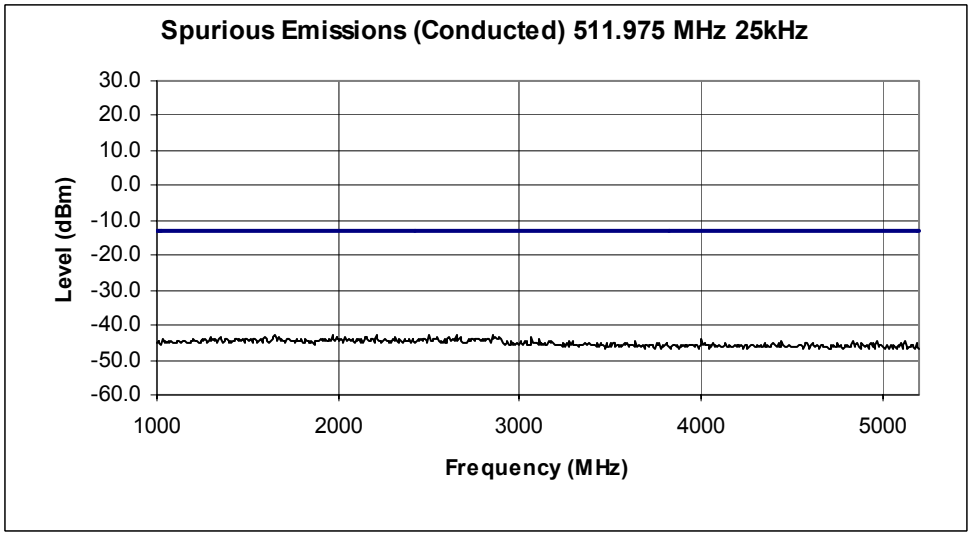

Spurious Emissions (Conducted) 466.525 MHz 25kHz
Level (dBm)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
30
130
230
330
430
530
630
730
830
930
Frequency (MHz)

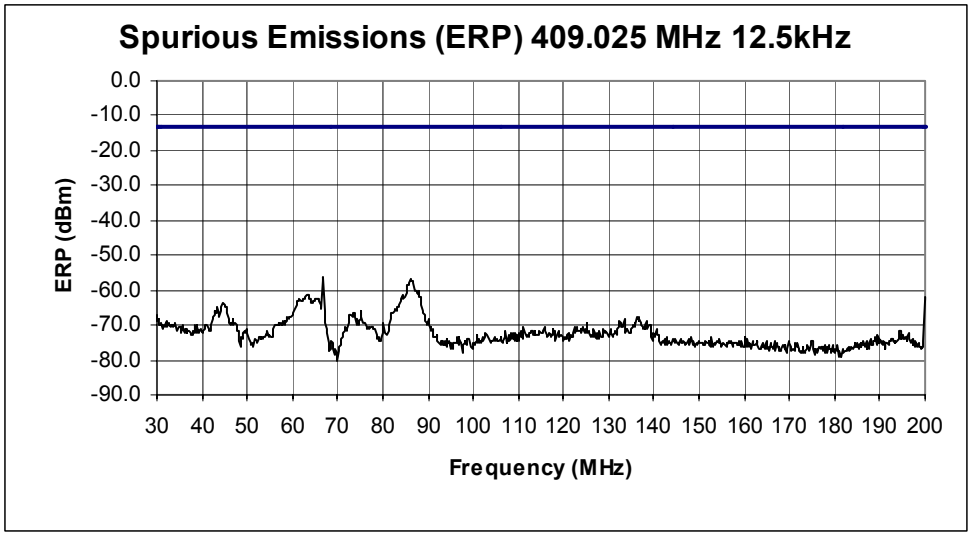

Spurious Emissions (Conducted) 466.525 MHz 25kHz
Level (dBm)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
1000
2000
3000
4000
5000
Frequency (MHz)

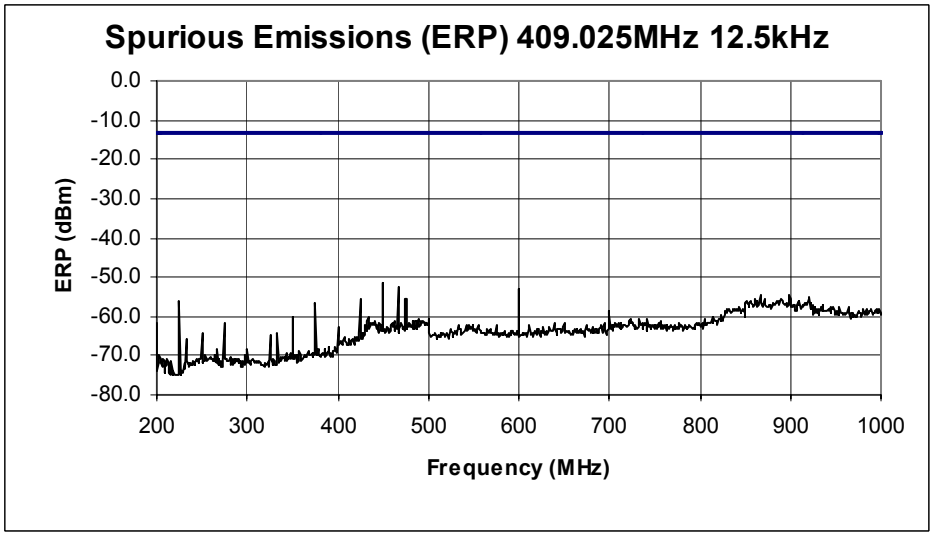

Spurious Emissions (Conducted) 511.975 MHz 12.5kHz
Level (dBm)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
30
130
230
330
430
530
630
730
830
930
Frequency (MHz)

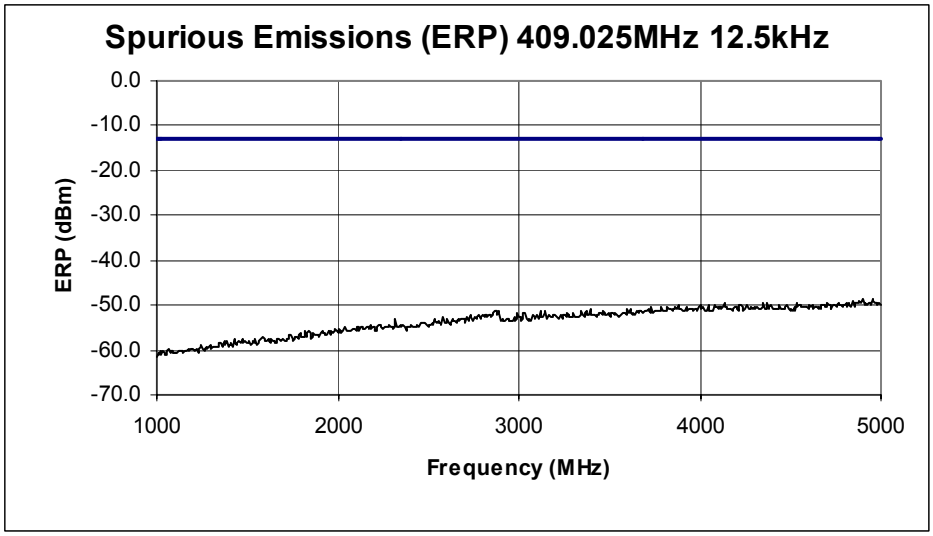

Spurious Emissions (Conducted) 511.975 MHz 12.5kHz
Level (dBm)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
1000
2000
3000
4000
5000
Frequency (MHz)

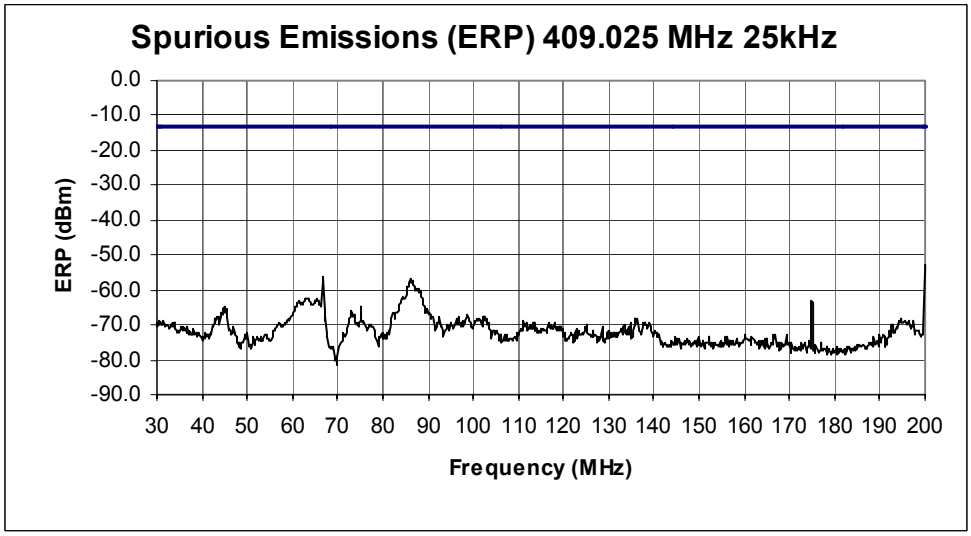

Spurious Emissions (Conducted) 511.975 MHz 25kHz
Level (dBm)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
30
130
230
330
430
530
630
730
830
930
Frequency (MHz)

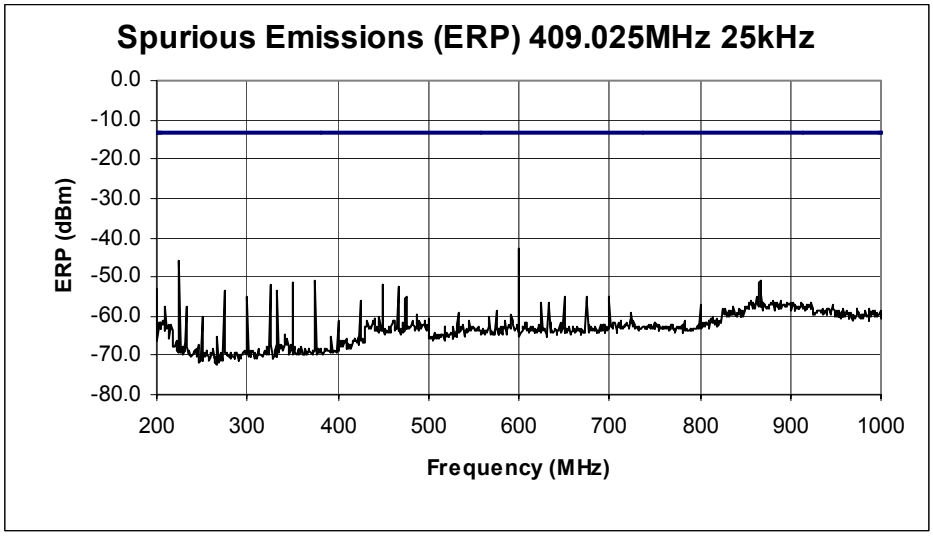

Spurious Emissions (Conducted) 511.975 MHz 25kHz
Level (dBm)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
1000
2000
3000
4000
5000
Frequency (MHz)

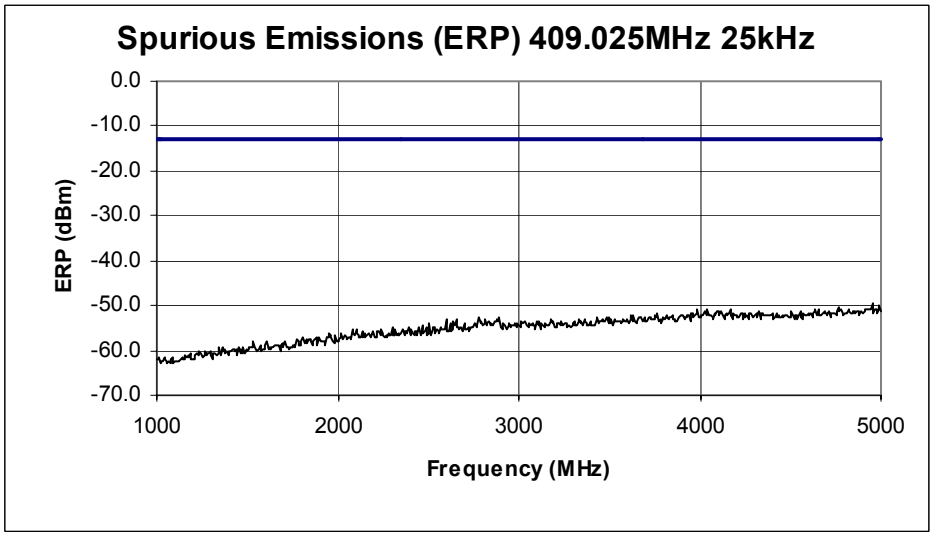

Spurious Emissions (ERP) 409.025 MHz 12.5kHz
ERP (dBm)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Frequency (MHz)

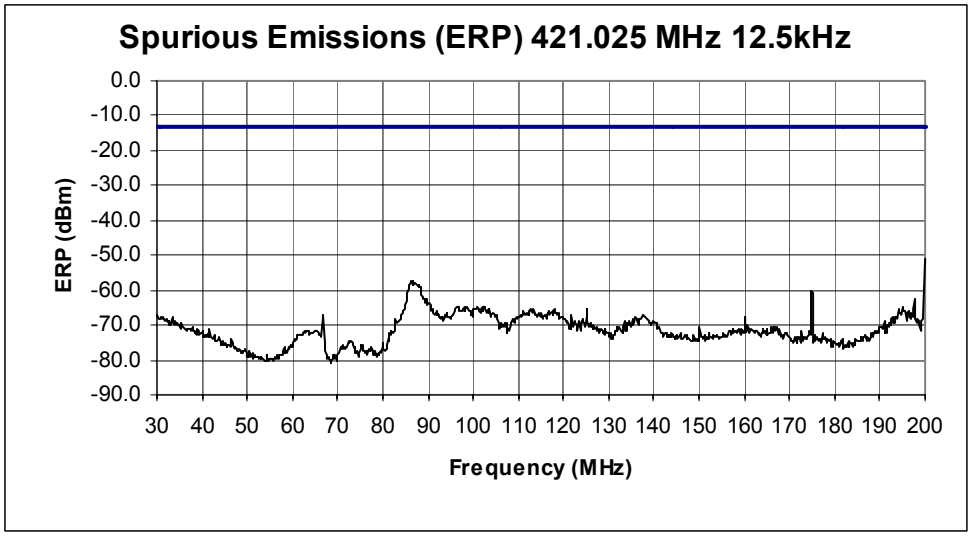

Spurious Emissions (ERP) 409.025MHz 12.5kHz
ERP (dBm)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
200 300 400 500 600 700 800 900 1000
Frequency (MHz)

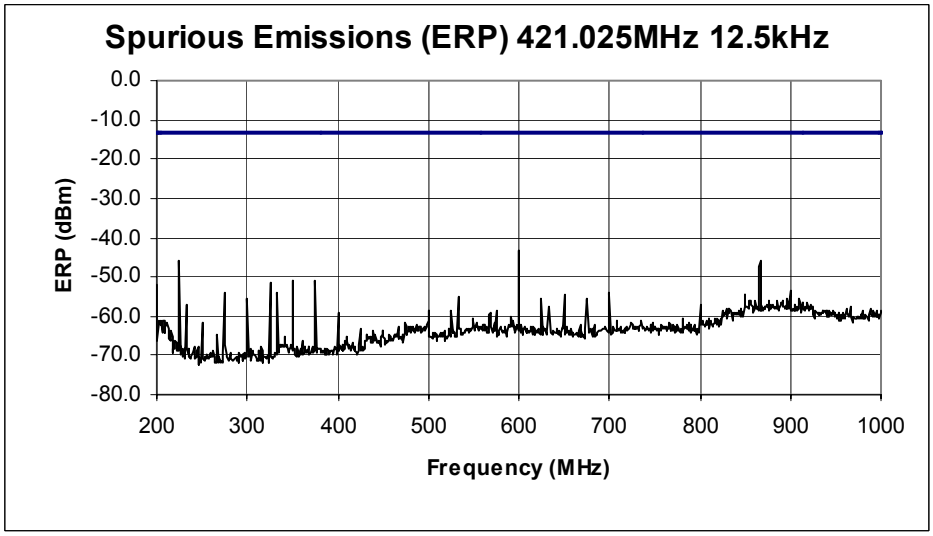

Spurious Emissions (ERP) 409.025MHz 12.5kHz
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
ERP (dBm)
1000
2000
3000
4000
5000
Frequency (MHz)

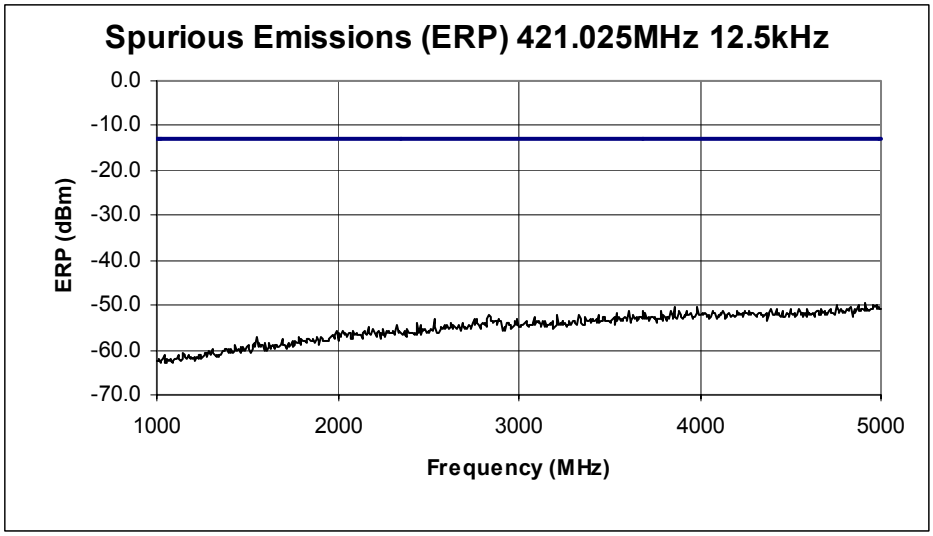

Spurious Emissions (ERP) 409.025 MHz 25kHz
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
ERP (dBm)
30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Frequency (MHz)

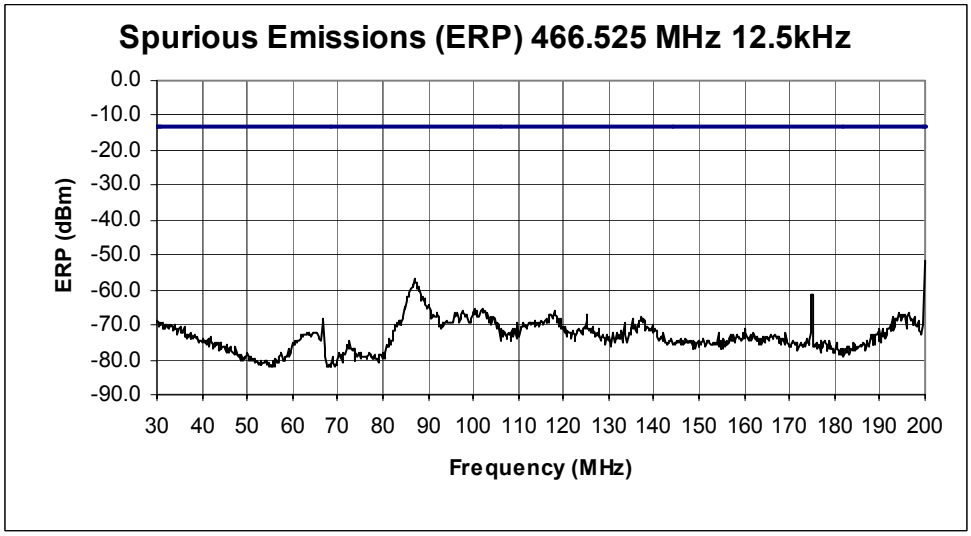

Spurious Emissions (ERP) 409.025MHz 25kHz
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
ERP (dBm)
200
300
400
500
600
700
800
900
1000
Frequency (MHz)

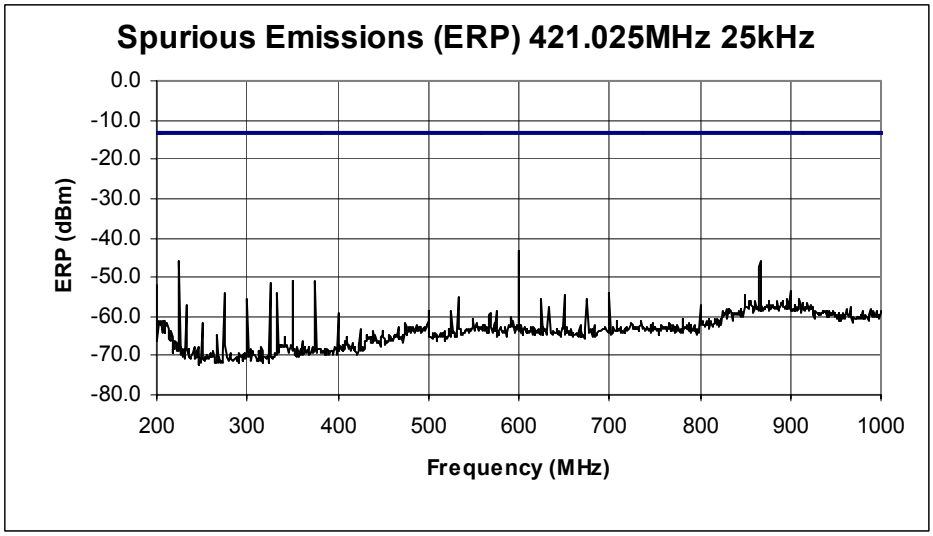

Spurious Emissions (ERP) 409.025MHz 25kHz
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
ERP (dBm)
1000
2000
3000
4000
5000
Frequency (MHz)

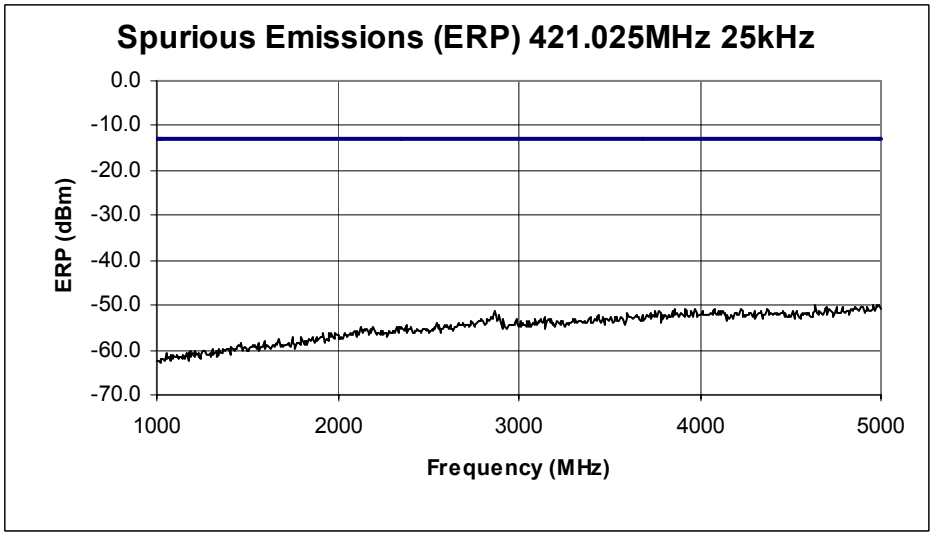

Spurious Emissions (ERP) 421.025 MHz 12.5kHz
ERP (dBm)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Frequency (MHz)

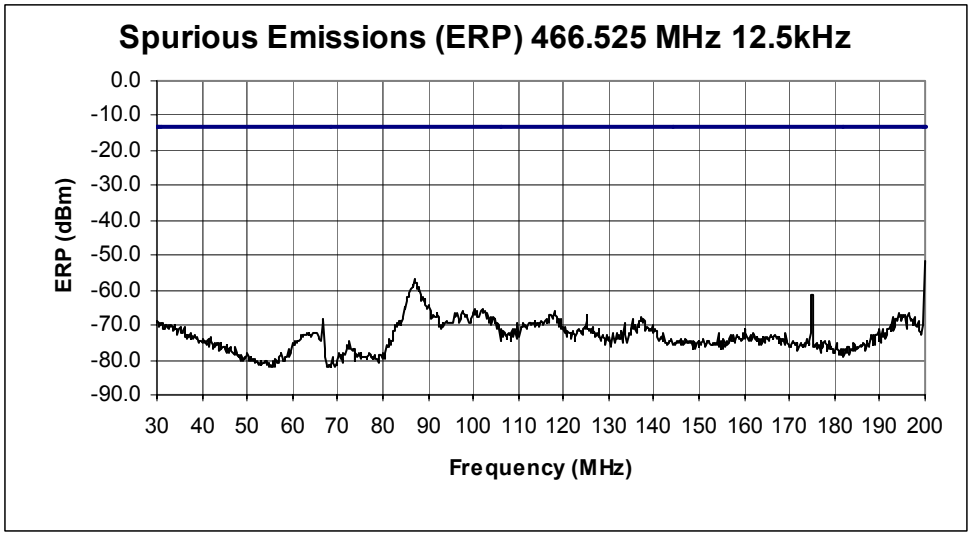

Spurious Emissions (ERP) 421.025MHz 12.5kHz
ERP (dBm)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
200 300 400 500 600 700 800 900 1000
Frequency (MHz)

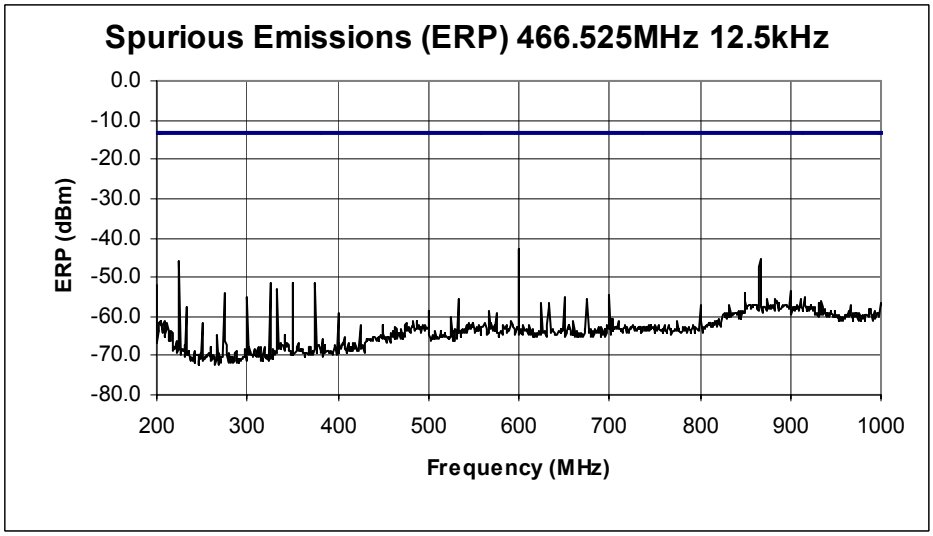

Spurious Emissions (ERP) 421.025MHz 12.5kHz
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
ERP (dBm)
1000
2000
3000
4000
5000
Frequency (MHz)

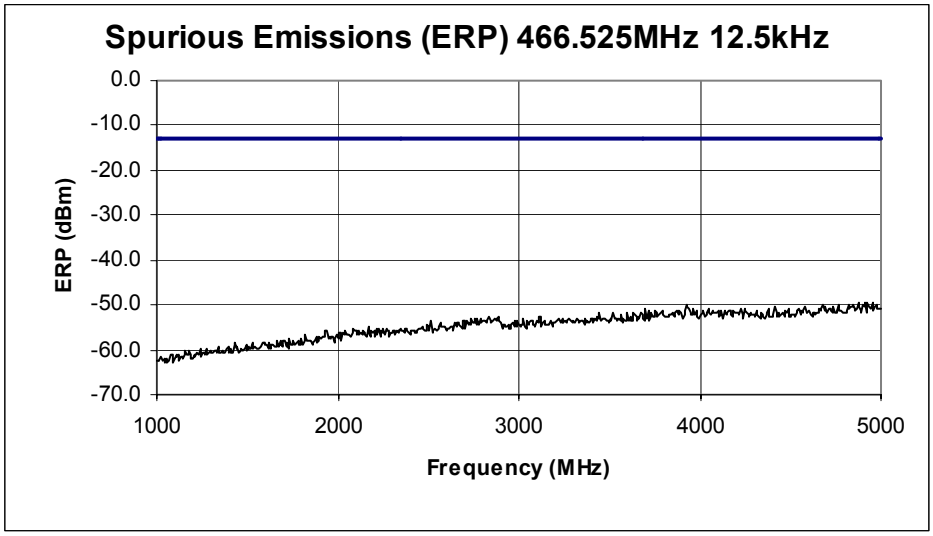

Spurious Emissions (ERP) 466.525 MHz 12.5kHz
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
ERP (dBm)
30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Frequency (MHz)

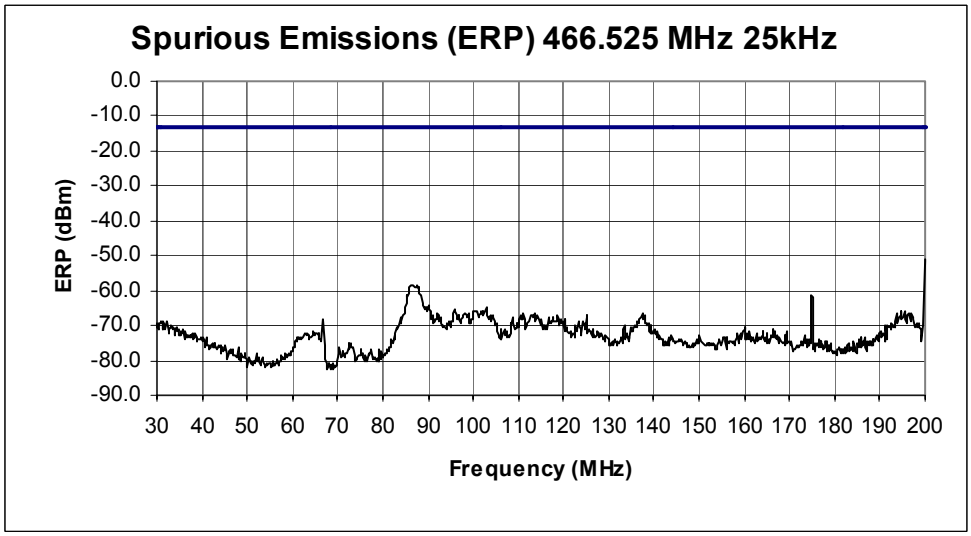

Spurious Emissions (ERP) 421.025MHz 25kHz
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
ERP (dBm)
200
300
400
500
600
700
800
900
1000
Frequency (MHz)

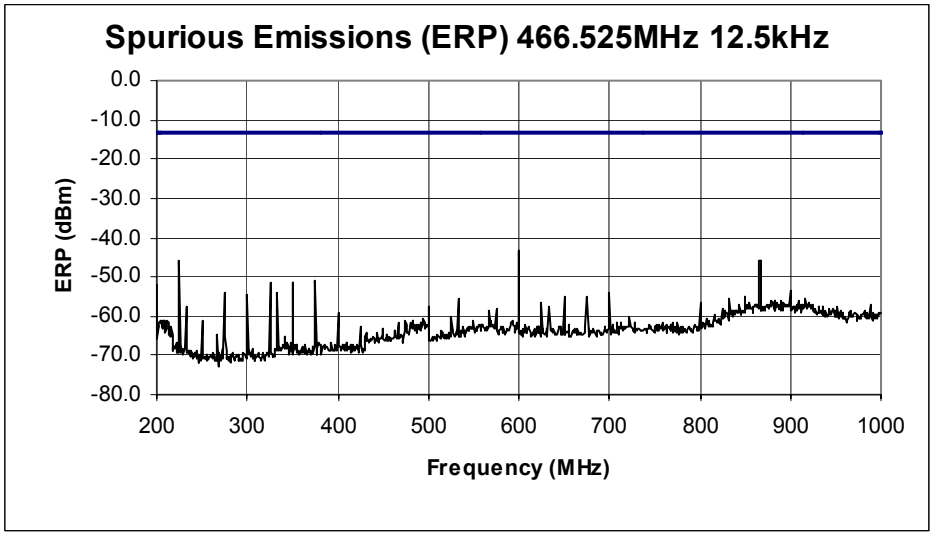

Spurious Emissions (ERP) 421.025MHz 25kHz
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
ERP (dBm)
1000
2000
3000
4000
5000
Frequency (MHz)

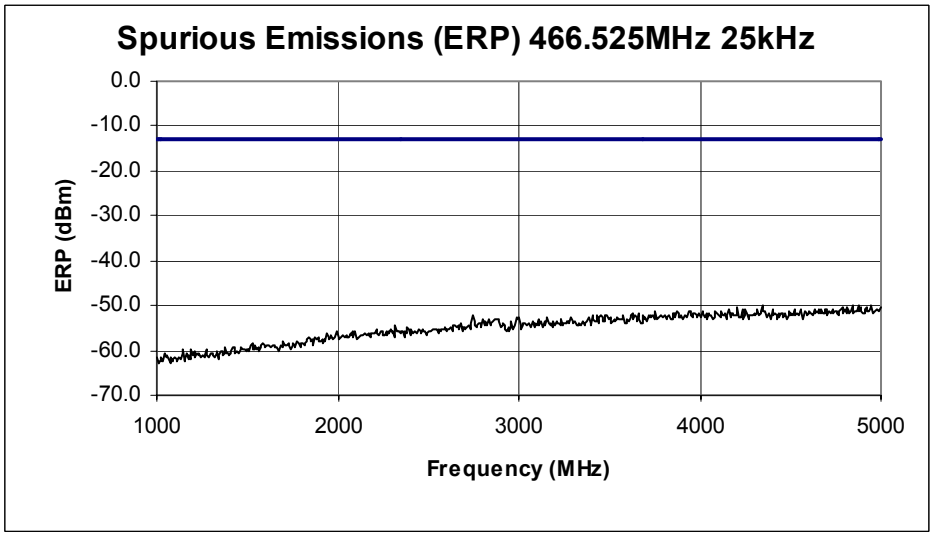

Spurious Emissions (ERP) 466.525 MHz 12.5kHz
ERP (dBm)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Frequency (MHz)

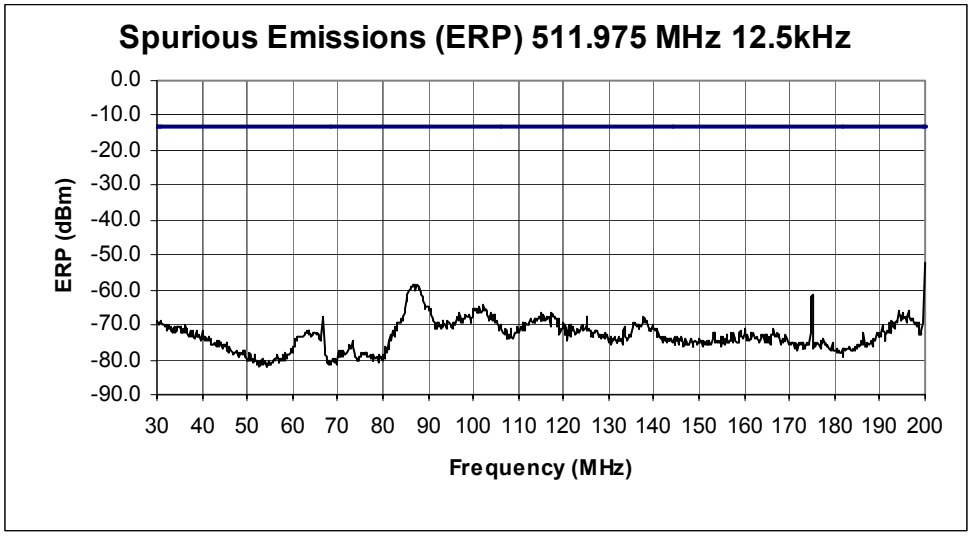

Spurious Emissions (ERP) 466.525MHz 12.5kHz
ERP (dBm)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
200 300 400 500 600 700 800 900 1000
Frequency (MHz)

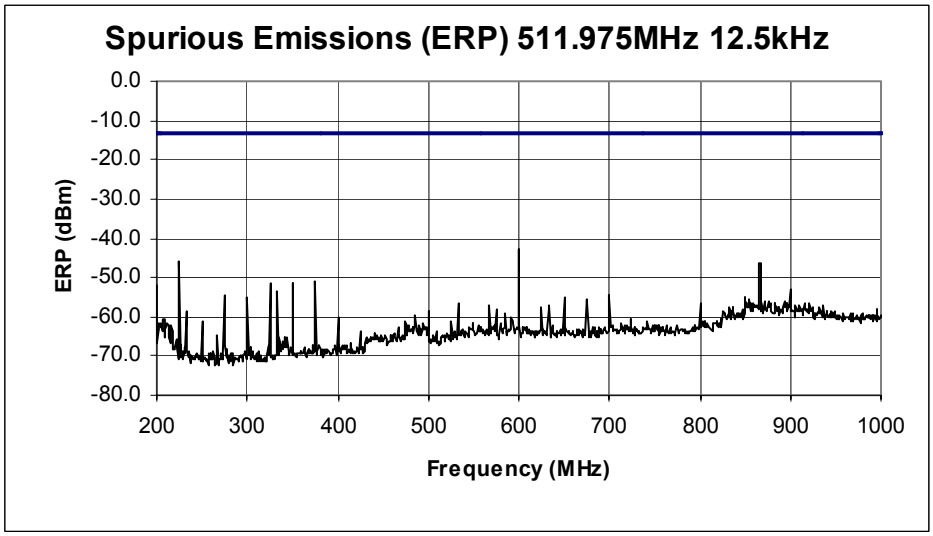

Spurious Emissions (ERP) 466.525MHz 12.5kHz
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
ERP (dBm)
1000
2000
3000
4000
5000
Frequency (MHz)

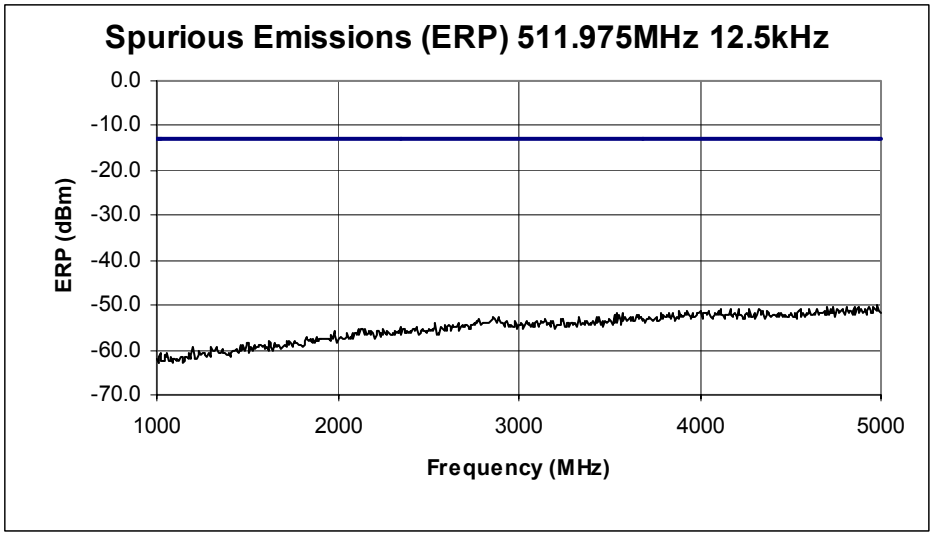

Spurious Emissions (ERP) 466.525 MHz 25kHz
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
ERP (dBm)
30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Frequency (MHz)

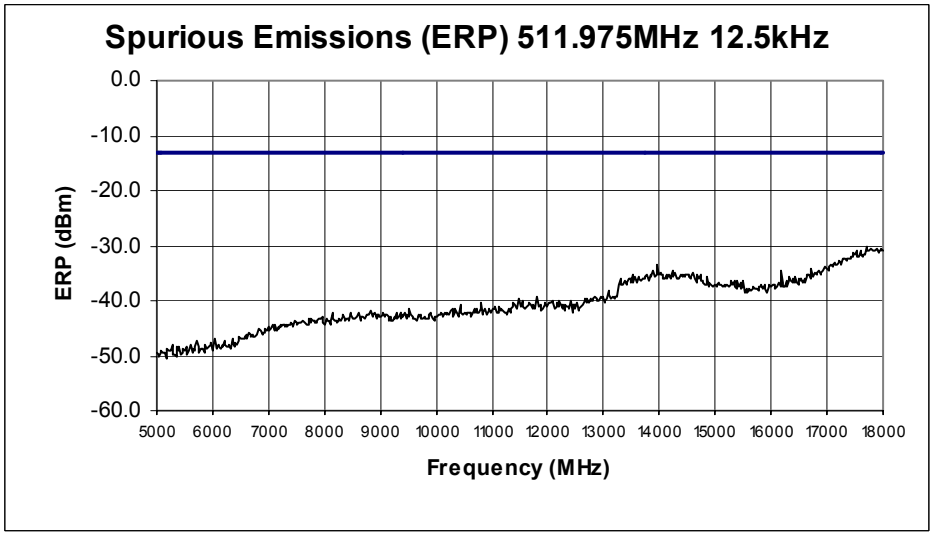

Spurious Emissions (ERP) 466.525MHz 12.5kHz
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
ERP (dBm)
200
300
400
500
600
700
800
900
1000
Frequency (MHz)

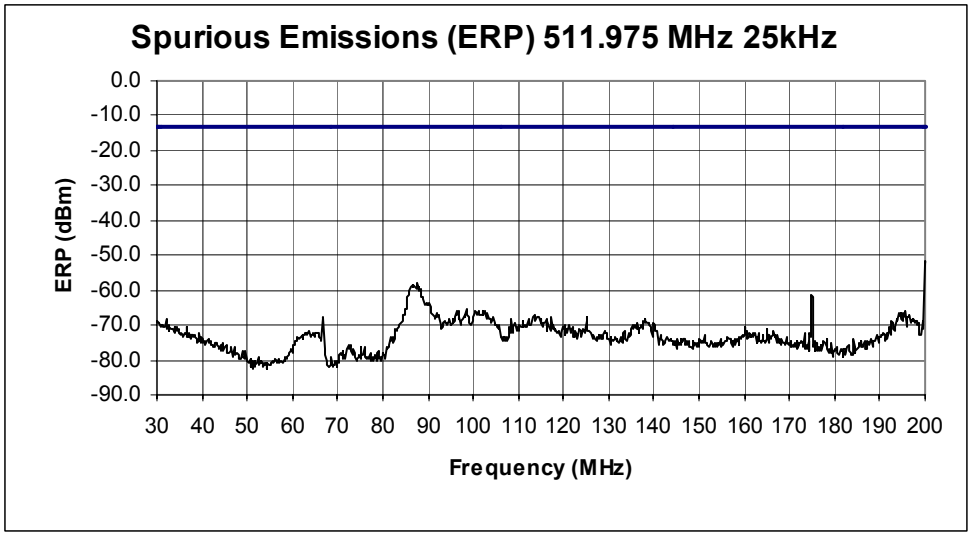

Spurious Emissions (ERP) 466.525MHz 25kHz
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
ERP (dBm)
1000
2000
3000
4000
5000
Frequency (MHz)

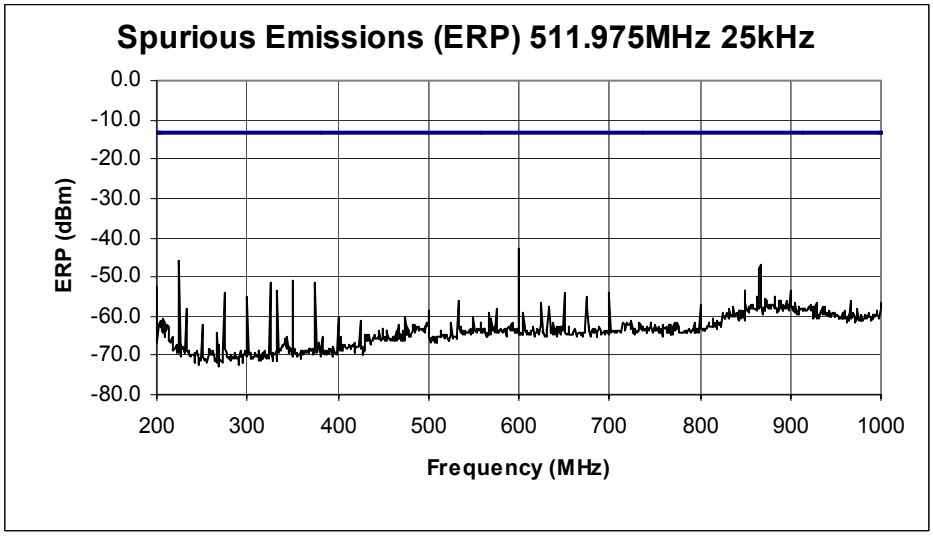

Spurious Emissions (ERP) 511.975 MHz 12.5kHz
ERP (dBm)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Frequency (MHz)

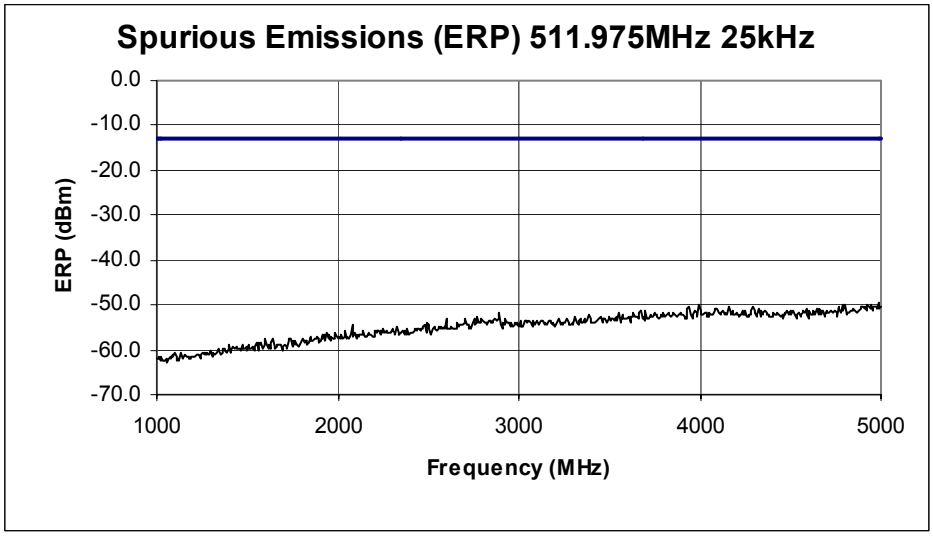

Spurious Emissions (ERP) 511.975MHz 12.5kHz
ERP (dBm)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
200 300 400 500 600 700 800 900 1000
Frequency (MHz)

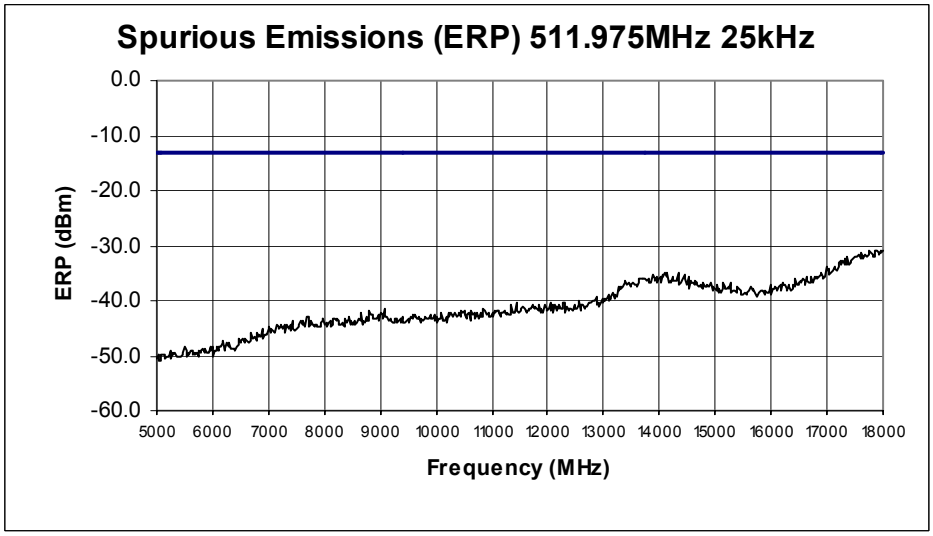

Spurious Emissions (ERP) 511.975MHz 12.5kHz
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
ERP (dBm)
1000
2000
3000
4000
5000
Frequency (MHz)

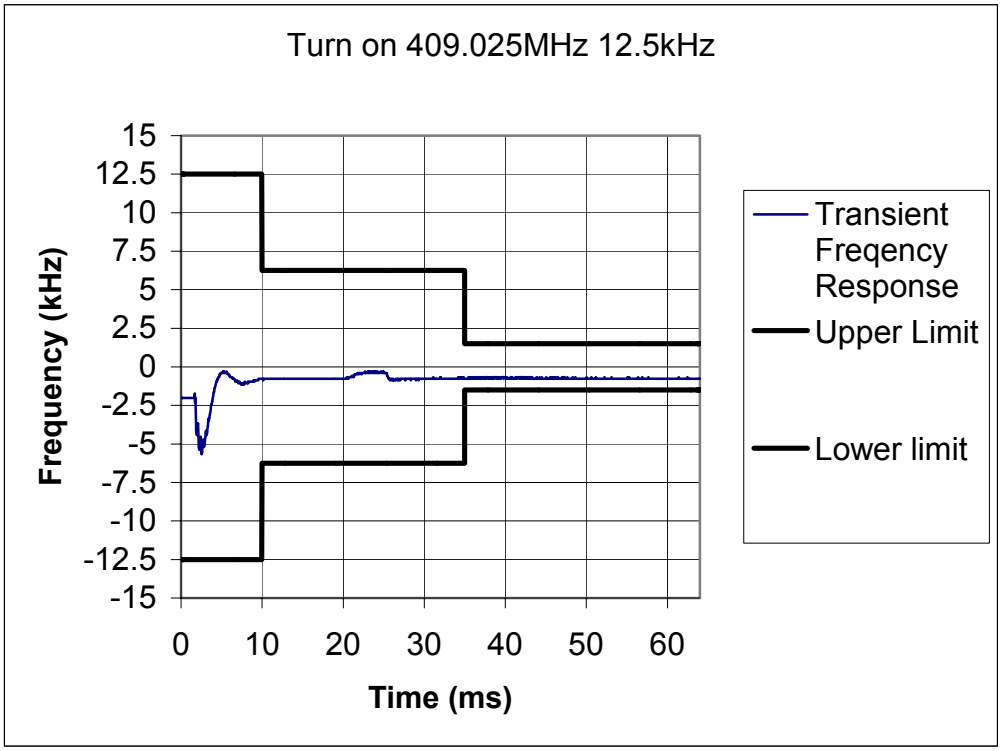

Spurious Emissions (ERP) 511.975MHz 12.5kHz
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
ERP (dBm)
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
18000
Frequency (MHz)

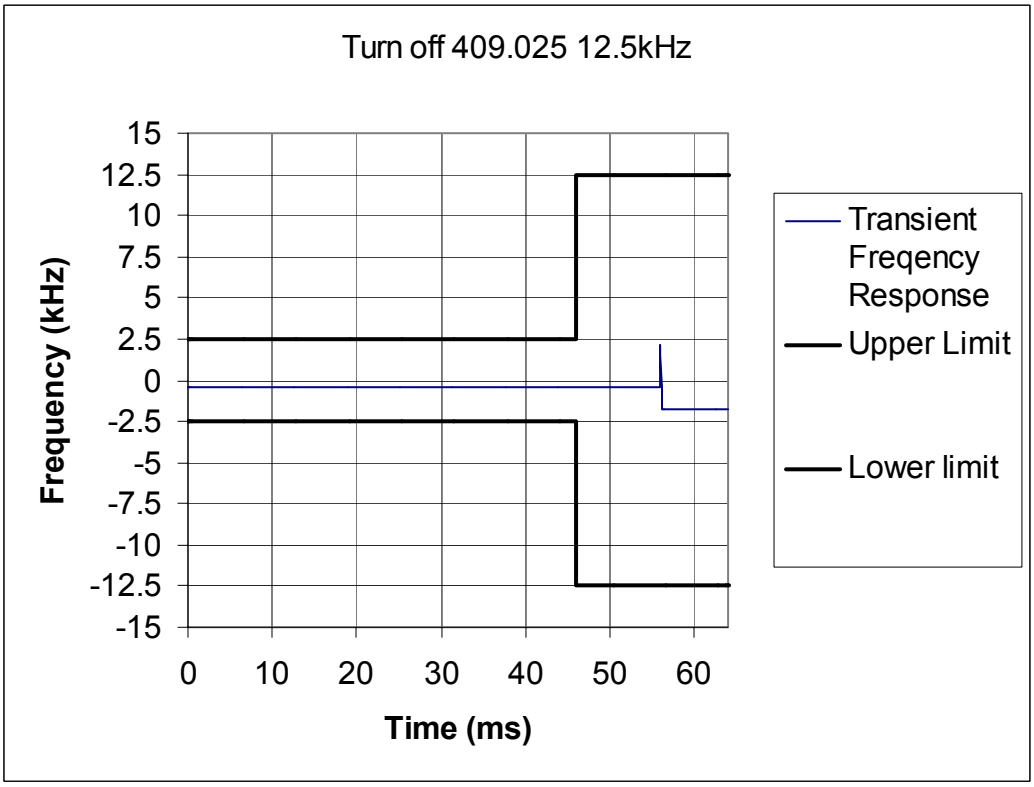

Spurious Emissions (ERP) 511.975 MHz 25kHz
ERP (dBm)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Frequency (MHz)

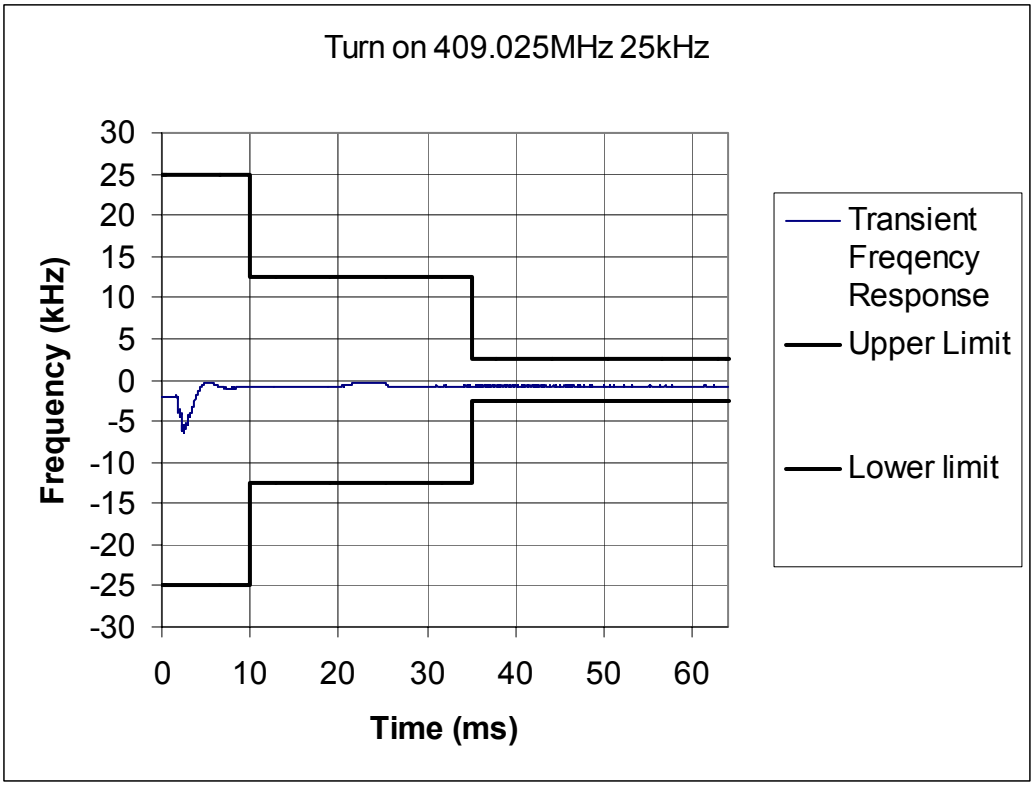

Spurious Emissions (ERP) 511.975MHz 25kHz
ERP (dBm)
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
200 300 400 500 600 700 800 900 1000
Frequency (MHz)

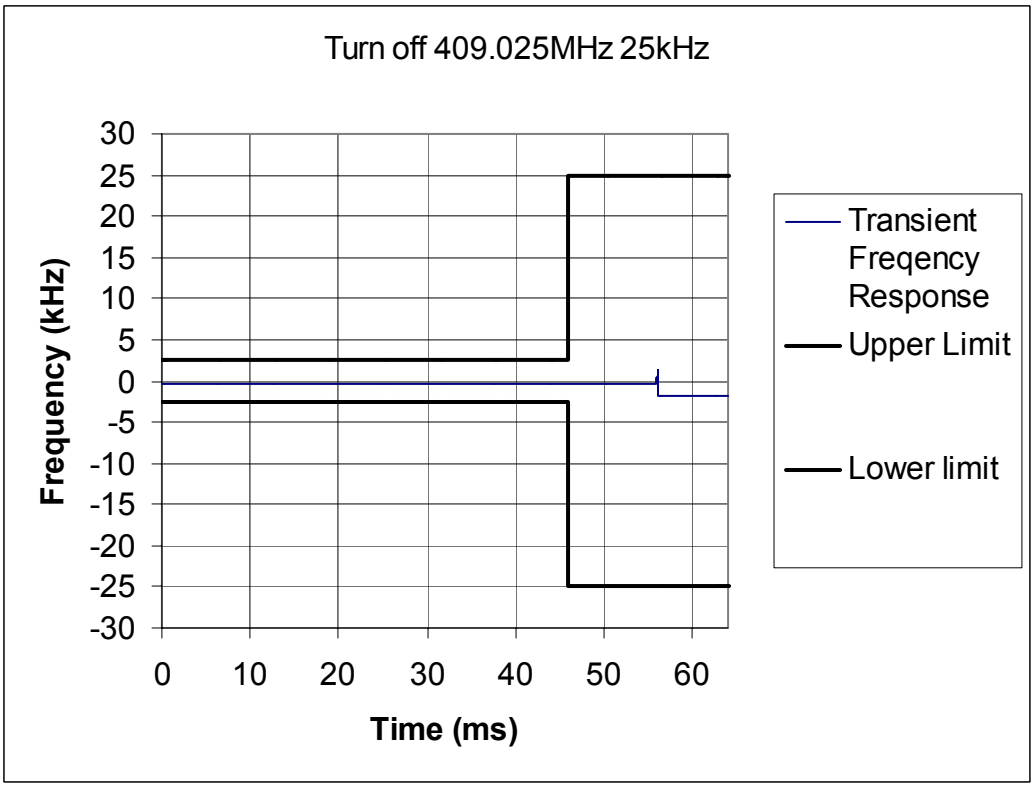

Spurious Emissions (ERP) 511.975MHz 25kHz
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
ERP (dBm)
1000
2000
3000
4000
5000
Frequency (MHz)

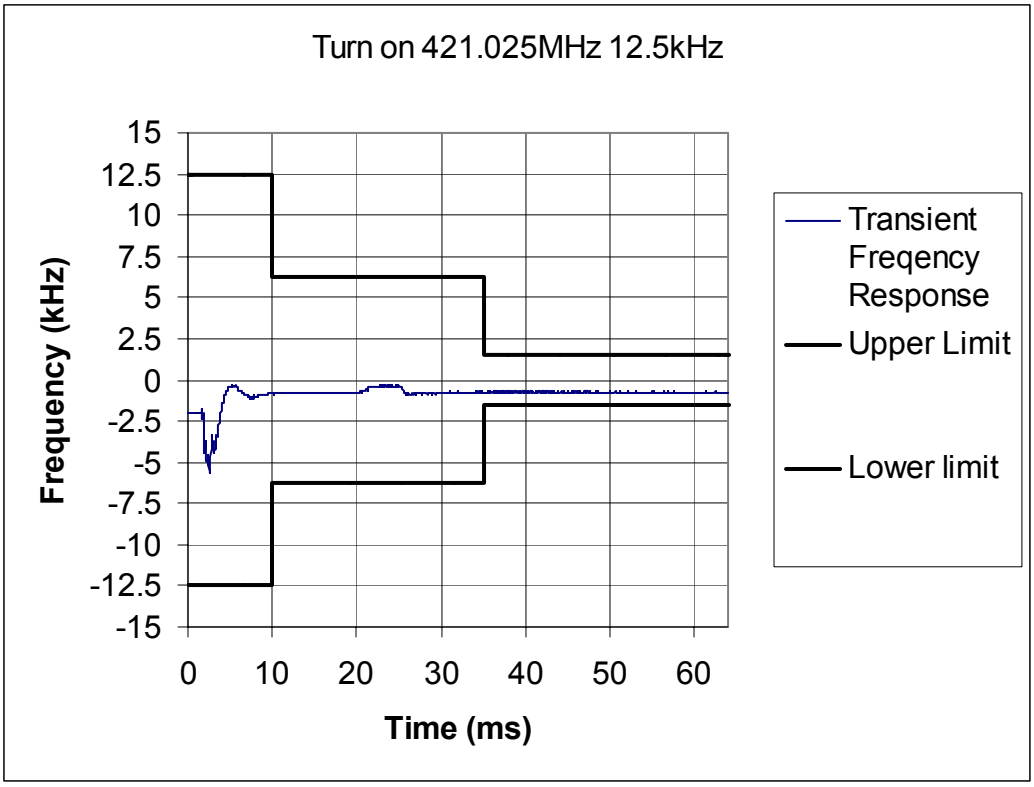

Spurious Emissions (ERP) 511.975MHz 25kHz
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
ERP (dBm)
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
18000
Frequency (MHz)

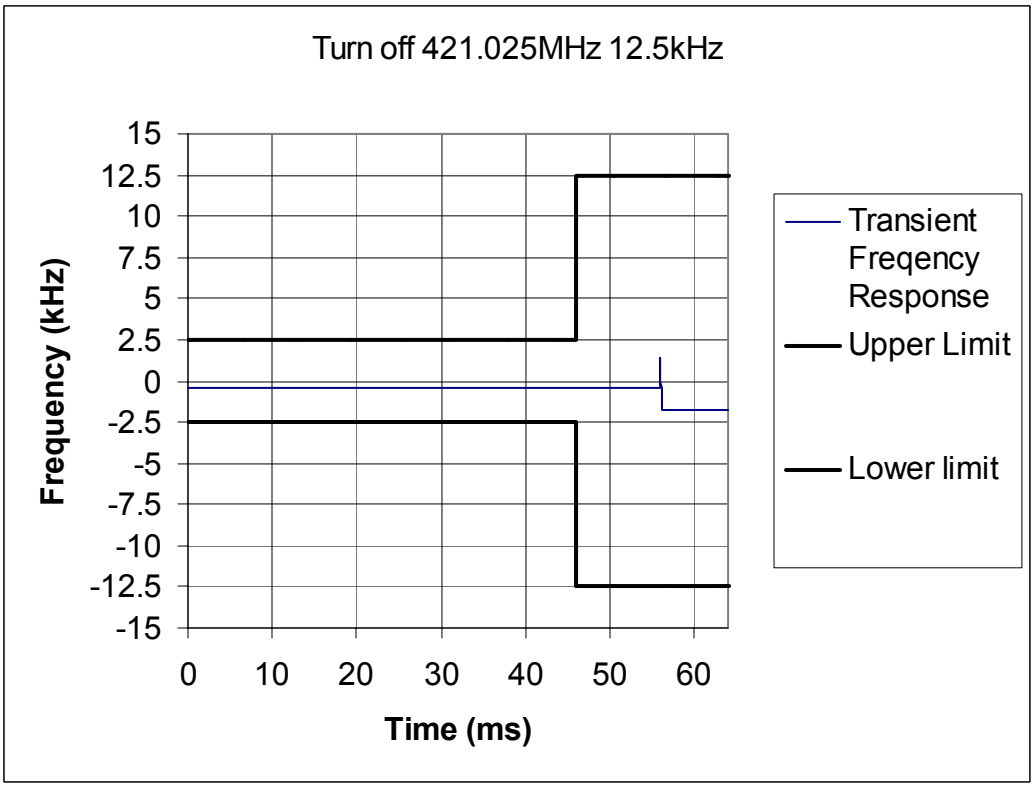

Turn on 409.025MHz 12.5kHz
Frequency (kHz)
15
12.5
10
7.5
5
2.5
0
-2.5
-5
-7.5
-10
-12.5
-15
0
10
20
30
40
50
60
Time (ms)
Transient Freqency Response
Upper Limit
Lower limit

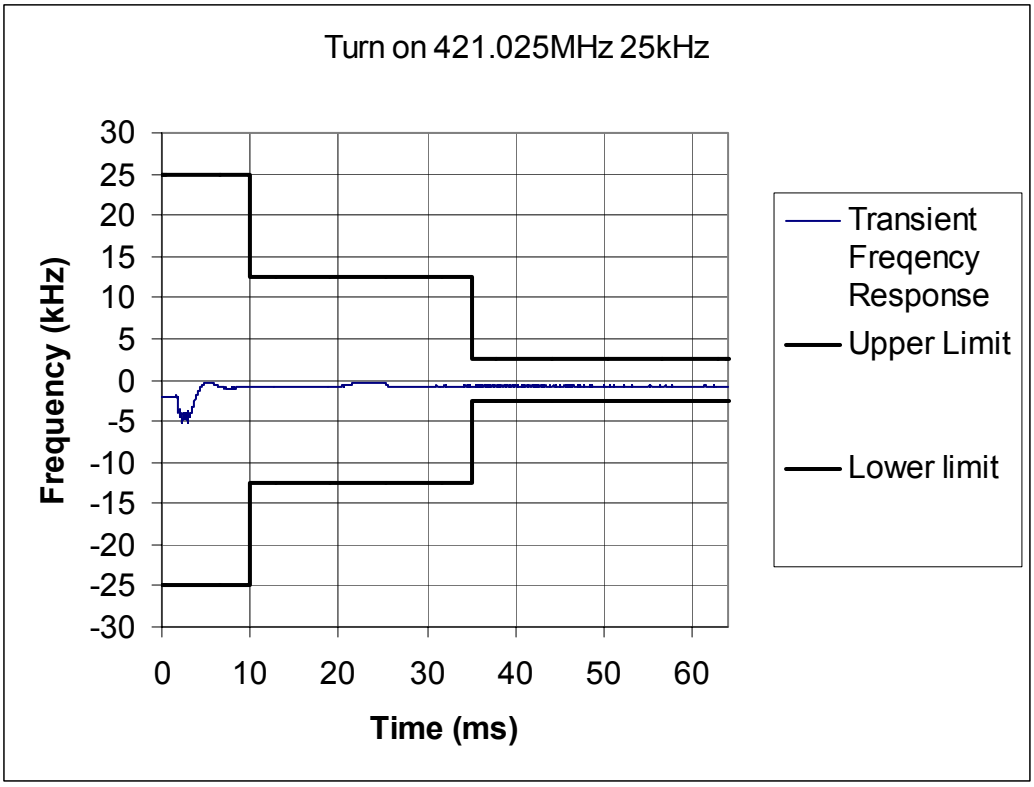

Turn off 409.025 12.5kHz
Frequency (kHz)
15
12.5
10
7.5
5
2.5
0
-2.5
-5
-7.5
-10
-12.5
-15
0
10
20
30
40
50
60
Time (ms)
Transient Freqency Response
Upper Limit
Lower limit

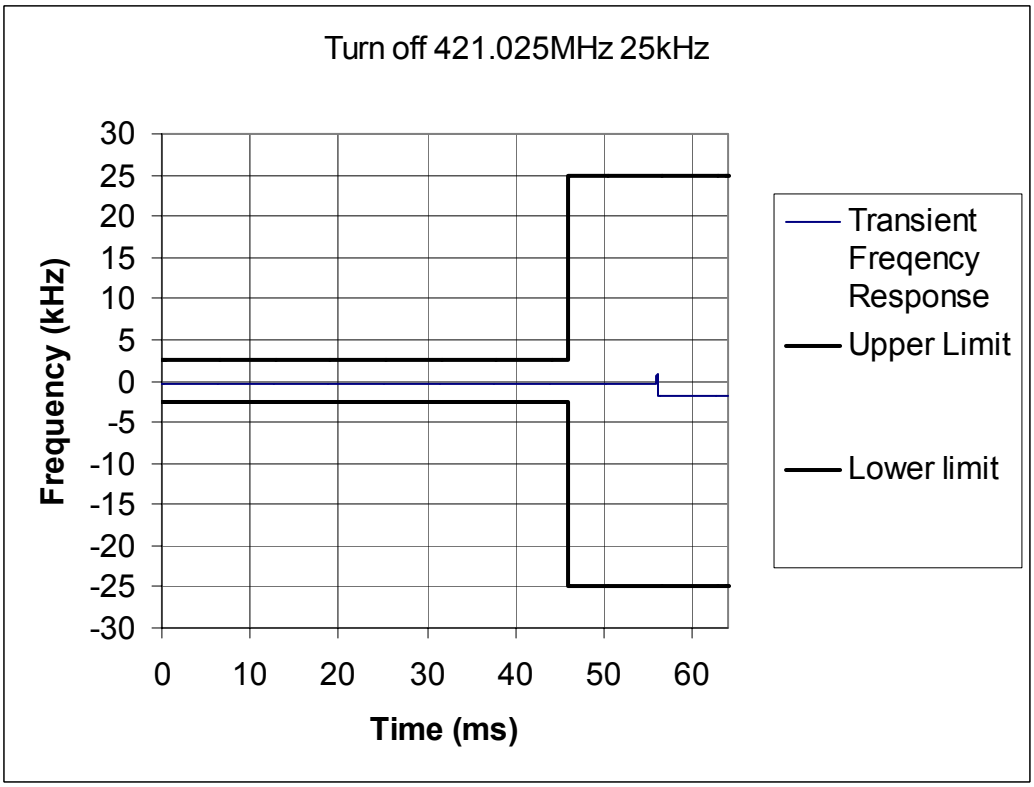

Turn on 409.025MHz 25kHz
Frequency (kHz)
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
0
10
20
30
40
50
60
Time (ms)
Transient Freqency Response
Upper Limit
Lower limit

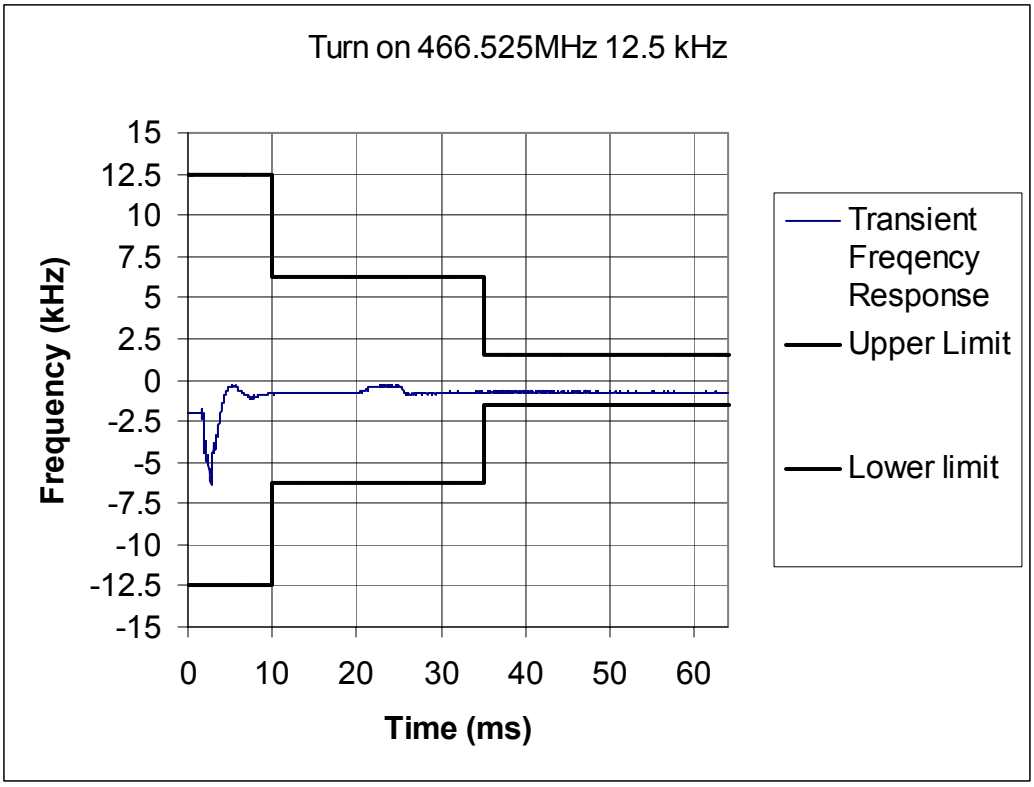

Turn off 409.025MHz 25kHz
Frequency (kHz)
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
0
10
20
30
40
50
60
Time (ms)
Transient Freqency Response
Upper Limit
Lower limit

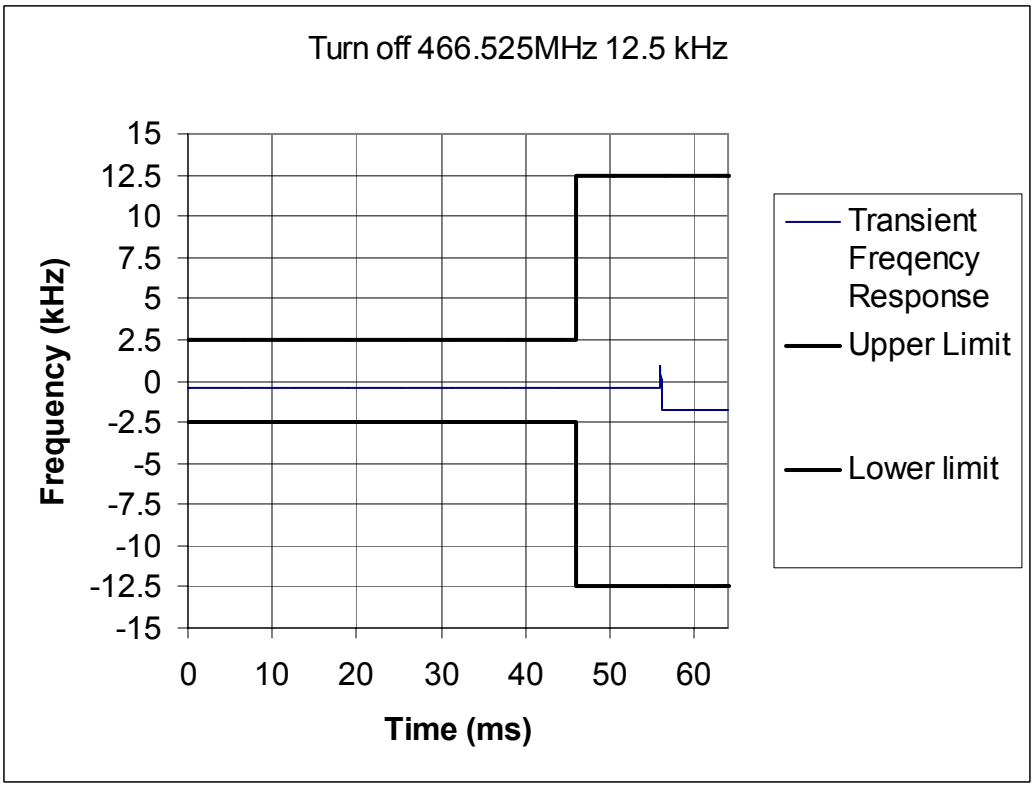

Turn on 421.025MHz 12.5kHz
Frequency (kHz)
15
12.5
10
7.5
5
2.5
0
-2.5
-5
-7.5
-10
-12.5
-15
0
10
20
30
40
50
60
Time (ms)
Transient Freqency Response
Upper Limit
Lower limit

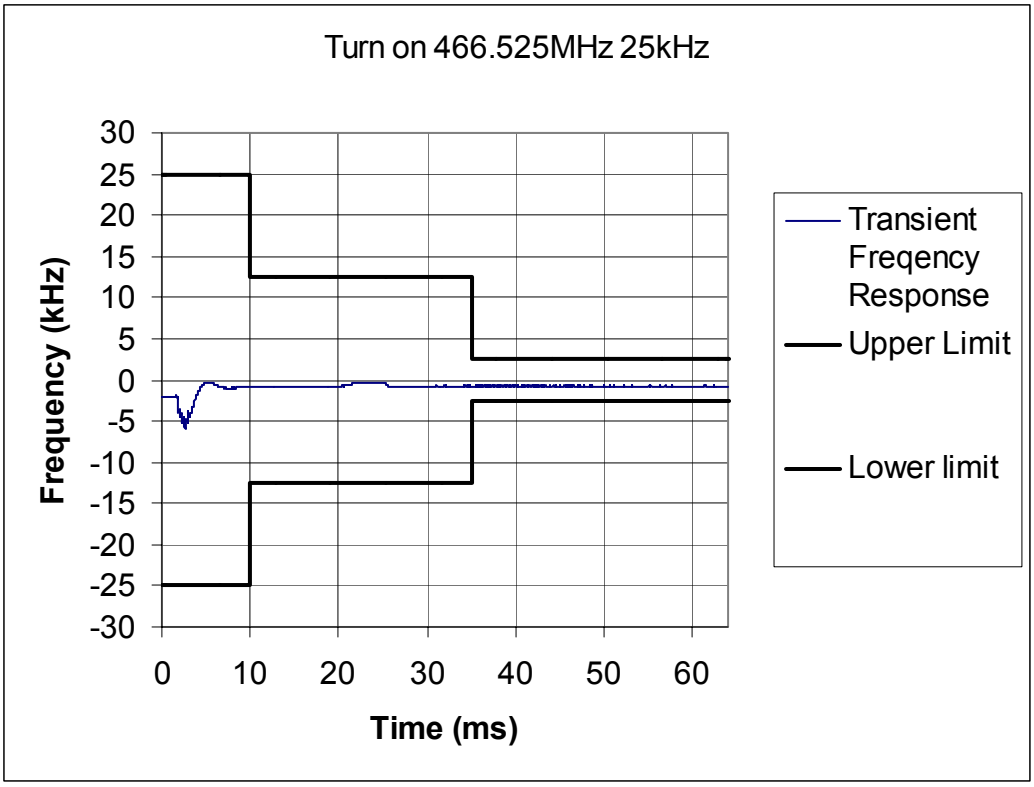

Turn off 421.025MHz 12.5kHz
Frequency (kHz)
15
12.5
10
7.5
5
2.5
0
-2.5
-5
-7.5
-10
-12.5
-15
0
10
20
30
40
50
60
Time (ms)
Transient Freqency Response
Upper Limit
Lower limit

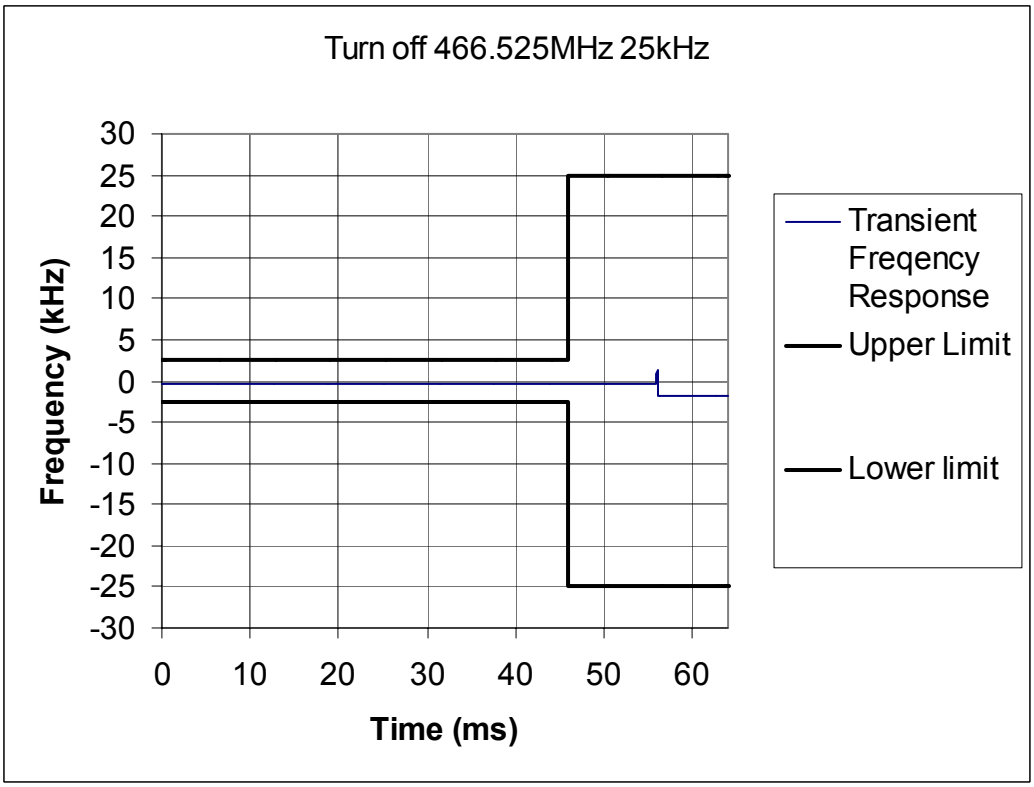

Turn on 421.025MHz 25kHz
Frequency (kHz)
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
0
10
20
30
40
50
60
Time (ms)
Transient Freqency Response
Upper Limit
Lower limit

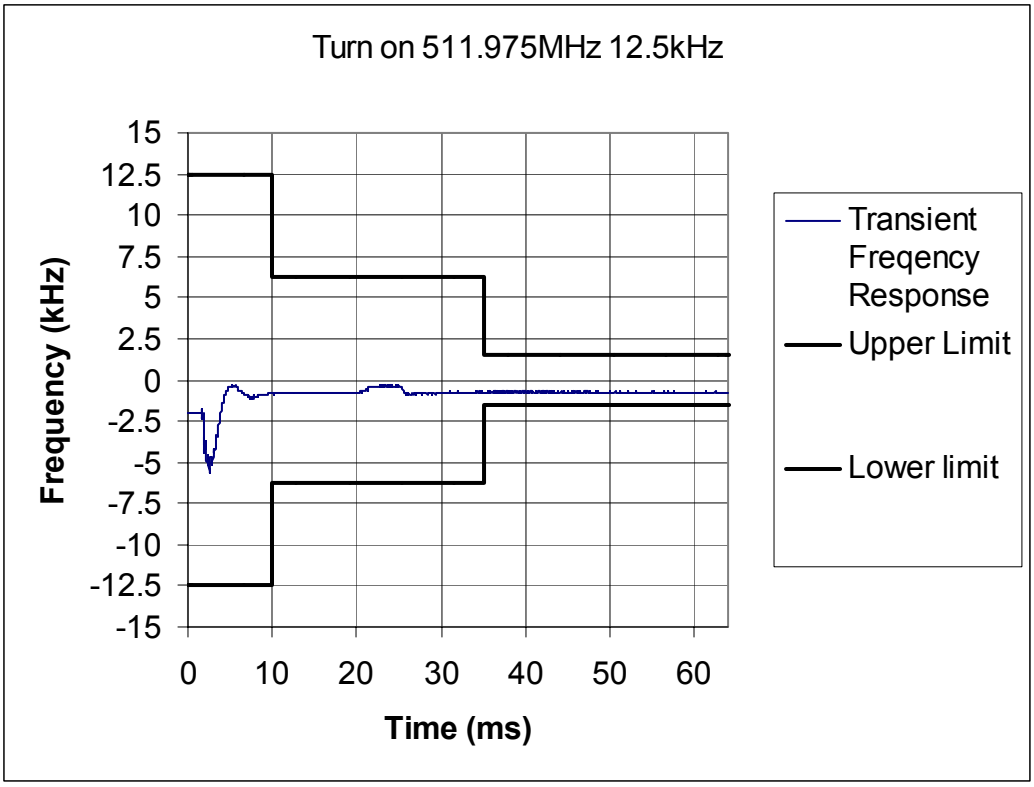

Turn off 421.025MHz 25kHz
Frequency (kHz)
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
0
10
20
30
40
50
60
Time (ms)
Transient Freqency Response
Upper Limit
Lower limit

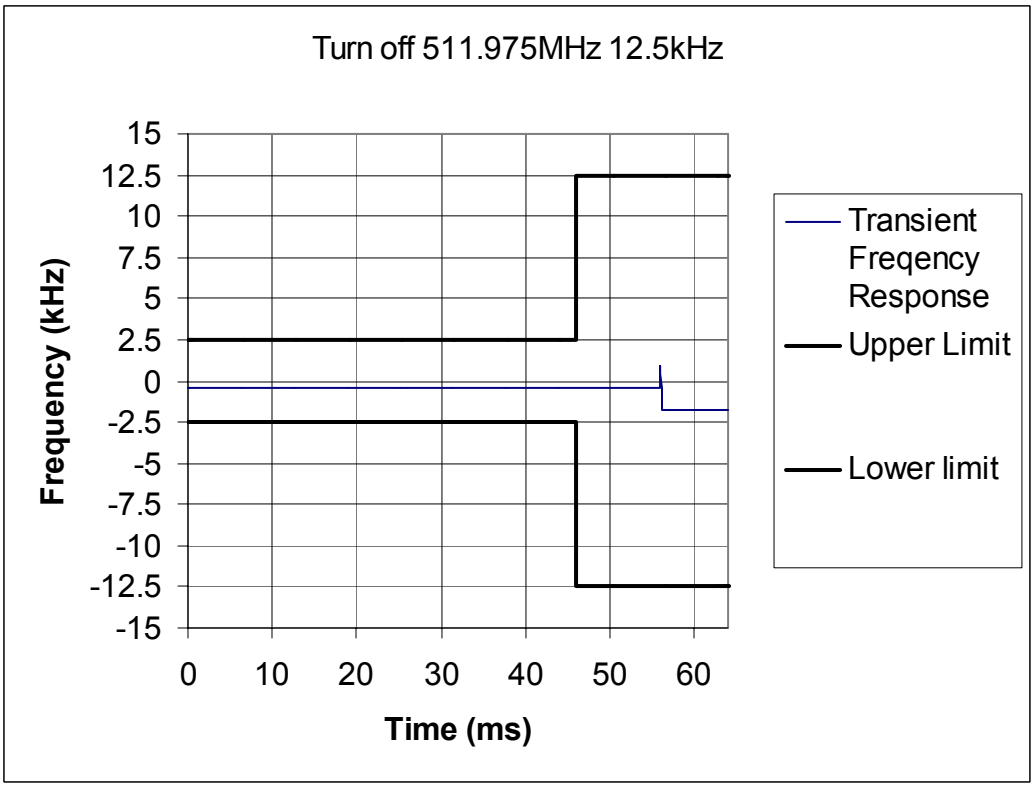

Turn on 466.525MHz 12.5 kHz
Frequency (kHz)
15
12.5
10
7.5
5
2.5
0
-2.5
-5
-7.5
-10
-12.5
-15
0
10
20
30
40
50
60
Time (ms)
Transient Freqency Response
Upper Limit
Lower limit

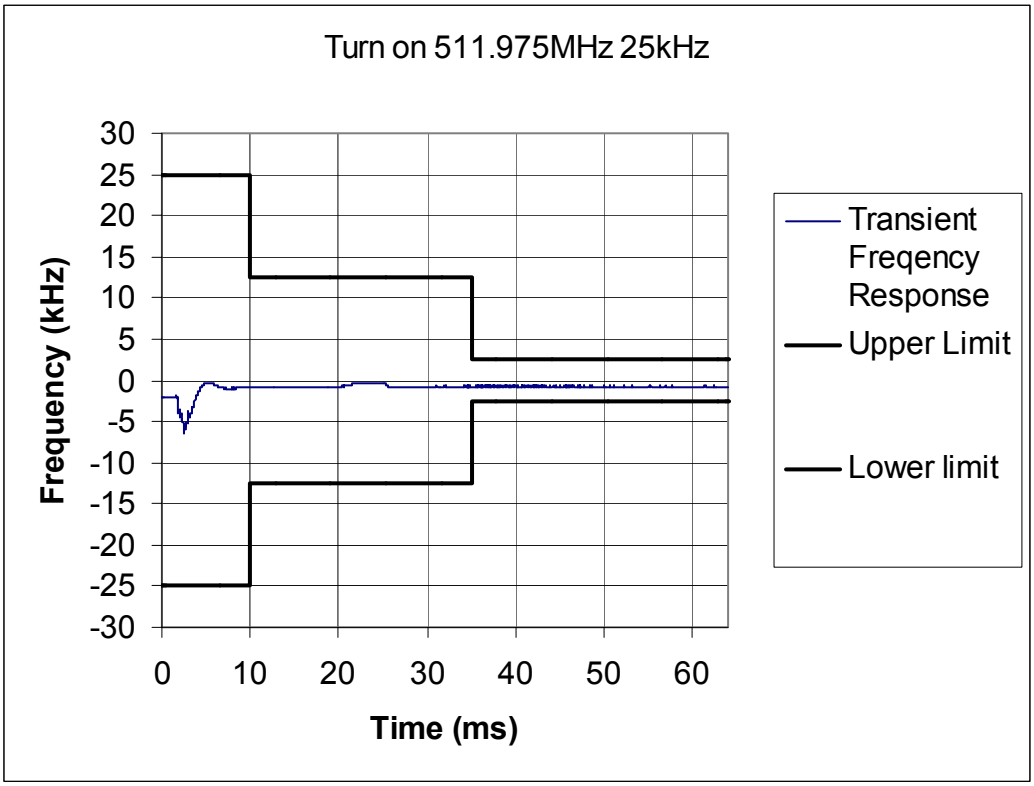

Turn off 466.525MHz 12.5 kHz
Frequency (kHz)
15
12.5
10
7.5
5
2.5
0
-2.5
-5
-7.5
-10
-12.5
-15
0
10
20
30
40
50
60
Time (ms)
Transient Freqency Response
Upper Limit
Lower limit

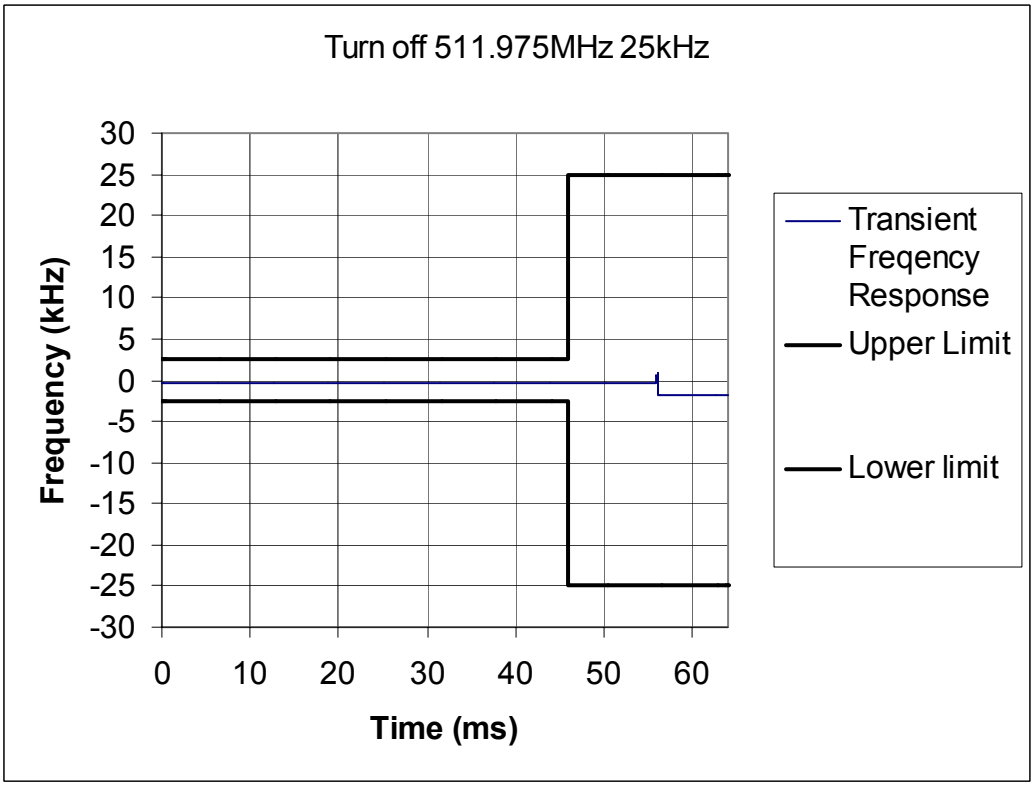

Turn on 466.525MHz 25kHz
Frequency (kHz)
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
0
10
20
30
40
50
60
Time (ms)
Transient Freqency Response
Upper Limit
Lower limit


Turn off 466.525MHz 25kHz
Frequency (kHz)
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
0
10
20
30
40
50
60
Time (ms)
Transient Freqency Response
Upper Limit
Lower limit


Turn on 511.975MHz 12.5kHz
Frequency (kHz)
15
12.5
10
7.5
5
2.5
0
-2.5
-5
-7.5
-10
-12.5
-15
0
10
20
30
40
50
60
Time (ms)
Transient Freqency Response
Upper Limit
Lower limit


Turn off 511.975MHz 12.5kHz
Frequency (kHz)
15
12.5
10
7.5
5
2.5
0
-2.5
-5
-7.5
-10
-12.5
-15
0
10
20
30
40
50
60
Time (ms)
Transient Freqency Response
Upper Limit
Lower limit


Turn on 511.975MHz 25kHz
Frequency (kHz)
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
0
10
20
30
40
50
60
Time (ms)
Transient Freqency Response
Upper Limit
Lower limit


Turn off 511.975MHz 25kHz
Frequency (kHz)
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
0
10
20
30
40
50
60
Time (ms)
Transient Freqency Response
Upper Limit
Lower limit

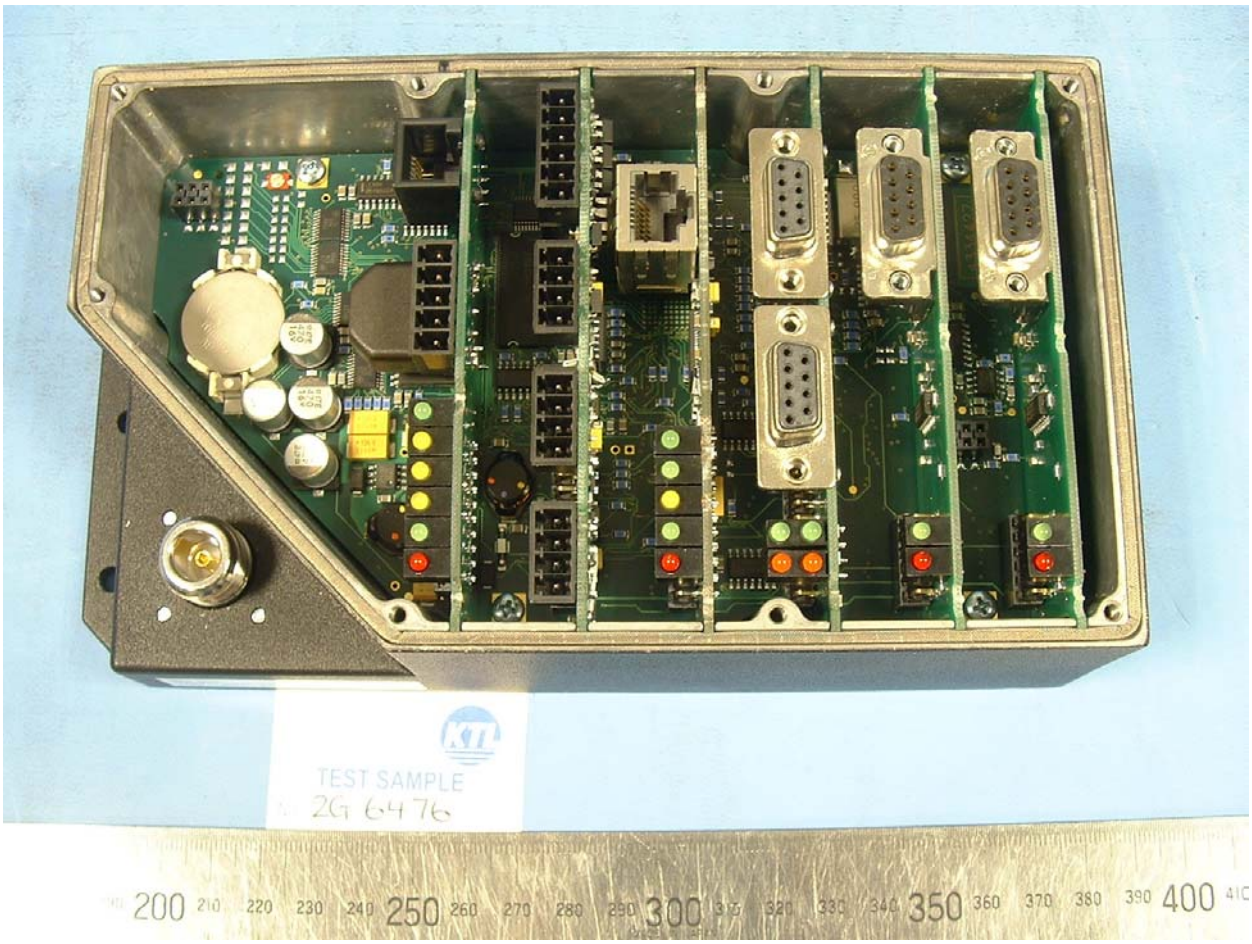
Appendix C: **Photographs**

The following photographs were taken of the test samples:

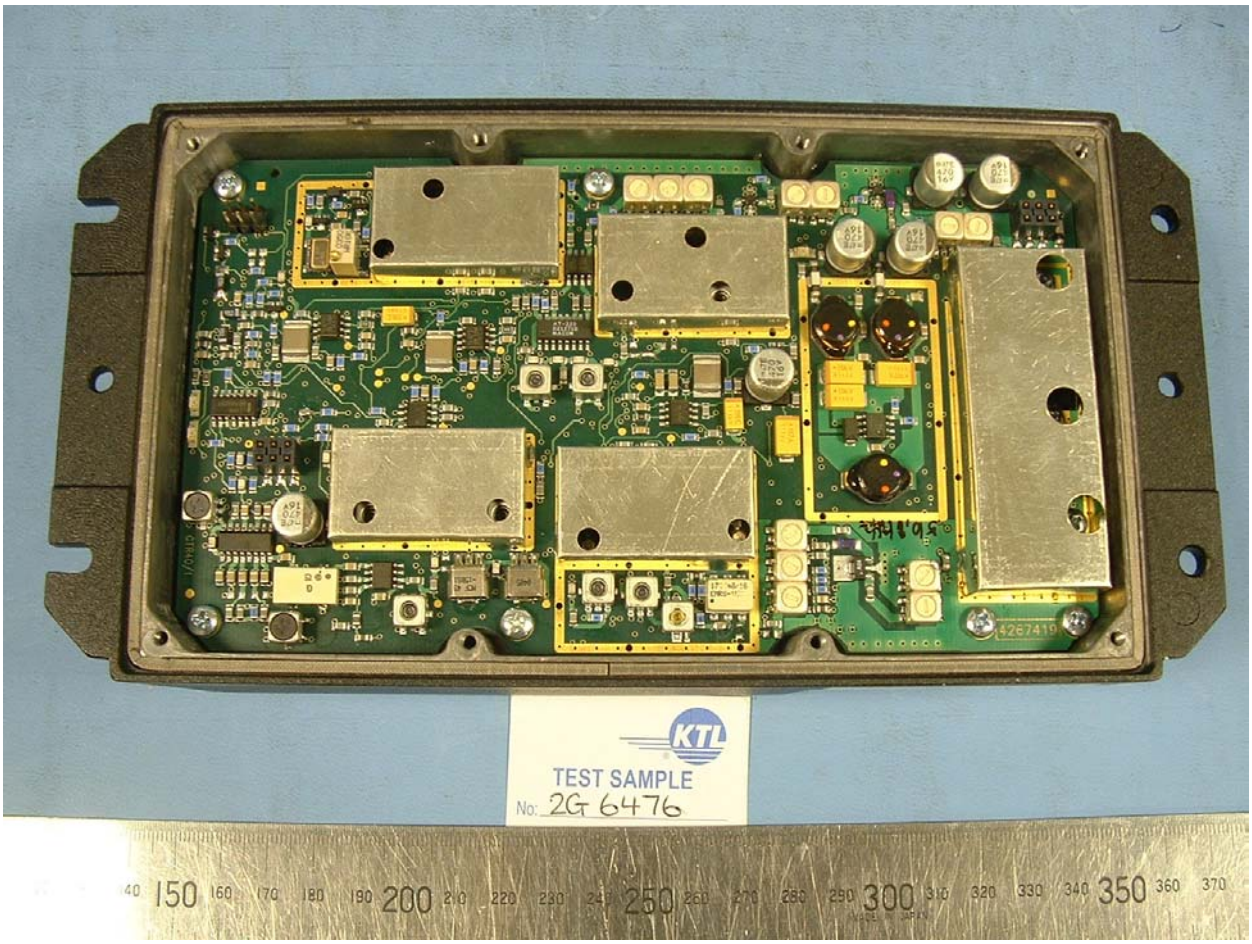
1. Spurious radiated emissions
2. EUT External view
3. EUT Internal top view
4. EUT Internal bottom view

Photograph 1

Photograph 2



Photograph 3



Photograph 4

Appendix D: Equipment Used For Testing

To facilitate inclusion on each page of the test equipment used for related tests, each item of equipment used during testing (including test samples, support equipment, test equipment and ancillaries such as cables) are identified/numbered by the Test Laboratory.

D1) The following samples of apparatus were available for testing or use as drive equipment (and used as detailed in Appendix A):

Sample No.	Description	Identification
S01	13.8 V dc PSU Type MS2000/12	Serial No. 4015926
S02	MR400 Radio Modem 409.025 MHz 12.5 kHz Channel Spacing	Serial No. 4319427/7402
S03	MR400 Radio Modem 409.025 MHz 25 kHz Channel Spacing	Serial No. 5951416/7380
S04	MR400 Radio Modem 511.975 MHz 12.5 kHz Channel Spacing	Serial No. 434427/7419
S05	MR400 Radio Modem 511.975 MHz 25 kHz Channel Spacing	Serial No. 5972416/7423
S06	MR400 Radio Modem 421.025 MHz 12.5 kHz Channel Spacing	Serial No. 4310427/7389
S07	MR400 Radio Modem 466.525 MHz 25 kHz Channel Spacing	Serial No. 4296427/7459
S08	MR400 Radio Modem 421.025 MHz 25 kHz Channel Spacing	Serial No. 6281427/7395
S09	MR400 Radio Modem 466.525 MHz 12.5 kHz Channel Spacing	Serial No. 4292477/7464
N/A	EMC Laptop (Compaq Armada V300)	Serial No AV3 C1466T2S6DM6458

D2) EUT Operating Mode During Testing.

During testing, the EUT was exercised as described in the following table :

Test	Description of Operating Mode
12.5kHz models	The EUT was transmitting using a 4 level FSK modulation at maximum data rate of 10.84kB/s and 100% duty cycle. The EUT was controlled using SETR Control Software version 6.73.
25kHz models	The EUT was transmitting using a 4 level FSK modulation at maximum data rate of 21.68kB/s and 100% duty cycle. The EUT was controlled using SETR Control Software version 6.73.

D3) EUT Configuration Information.

The EUT was submitted for testing in a single possible configuration.

D4) The following test equipment was available for use during testing (and used as detailed in appendix B):

* Indicates equipment used.

Frequency stability :

RFG / REF	Type	Description	Manufacturer	Used
RFG001	2A	Off Air Frequency Standard	Quartzlock	*
REF496	34401	Multimeter	HP	*
REF239	310	Power supply	Farnell	*
RFG327	CMTA	Radiocommunications analyser	R & S	
RFG 365		Temperature Chamber	JTS	*

RF Power output at terminals

RFG / REF	Type	Description	Manufacturer	Used
REF496	34401	Multimeter	HP	*
REF239	310	Power supply	Farnell	*
RFG327	CMTA	Radiocommunications analyser	R & S	*

Occupied Bandwidth and Spurious emissions at antenna terminals:

RFG / REF	Type	Description	Manufacturer	Used
RFG127	HP8563E	Spectrum analyser	HP	*
RFG067	R3261A	Spectrum analyser	Advantest	
RFG214	ESAI	Analyser / Receiver	R & S	
REF496	34401	Multimeter	HP	
REF239	310	Power supply	Farnell	*
RFG 273	Model 2	Attenuator 20 dB	Wienschel	*

Field strength of spurious radiation (effective radiated power) :

RFG No	Type	Description	Manufacturer	Used
274	Lab 10	Large anechoic chamber	KTL	*
142	Lab 13	Medium anechoic Chamber		
	OATS	10m test site	KTL	
231	Blue Bilog	Bilog antenna	Chase	*
244	CBL6111			
095	3109	Bicon antenna	EMCO	
131		Bicon antenna		
132		Bicon antenna		
025	3146	Log periodic antenna	EMCO	
081		Log periodic antenna		
191		Log periodic antenna		
129		Horn antenna		*
130		Horn antenna		*
		Dipole set	EMCO	*
		Dipole set	EMCO	
007	8447F	Dual pre amp	HP	
008	8447D	Pre Amp	HP	*
307	8449B	Microwave pre amp	HP	*
067	R3261A	Spectrum analyser	Advantest	
127	HP8563E	Spectrum analyser	HP	*
214	ESAI	Spec Analyser/Test Receiver (LF/HF)	R & S	*
013	ESVP	Test Receiver	R & S	
126	ESVS 20	Test Receiver	R & S	
016	SMG	Signal generator	R & S	
227	MI2024	Signal generator	Marconi	
349	MI2032	Signal generator	Marconi	*
351		High pass filter set	Mini circuits	
276	N	RF coaxial cable 1.0m		
277	N	RF coaxial cable 1.0m		
280	N	RF coaxial cable 2.0m		
303	N	RF coaxial cable 2.0m		
249	N	RF coaxial cable 3.0m		*
255	N	RF coaxial cable		*
264	N	RF coaxial cable 1.0m		*
270	N	RF coaxial cable 4.5m		
137	N	HF coaxial cable 2.0m		*
158	N	HF coaxial cable 7.0m		*
312	Adapter	HF coaxial cable		*
313	Adapter	HF coaxial cable		*
247	N	RF coaxial cable		
251	N	RF coaxial cable		
REF239	310	Power supply	Farnell	*

Appendix E: **Additional Information**

This appendix contains no additional information