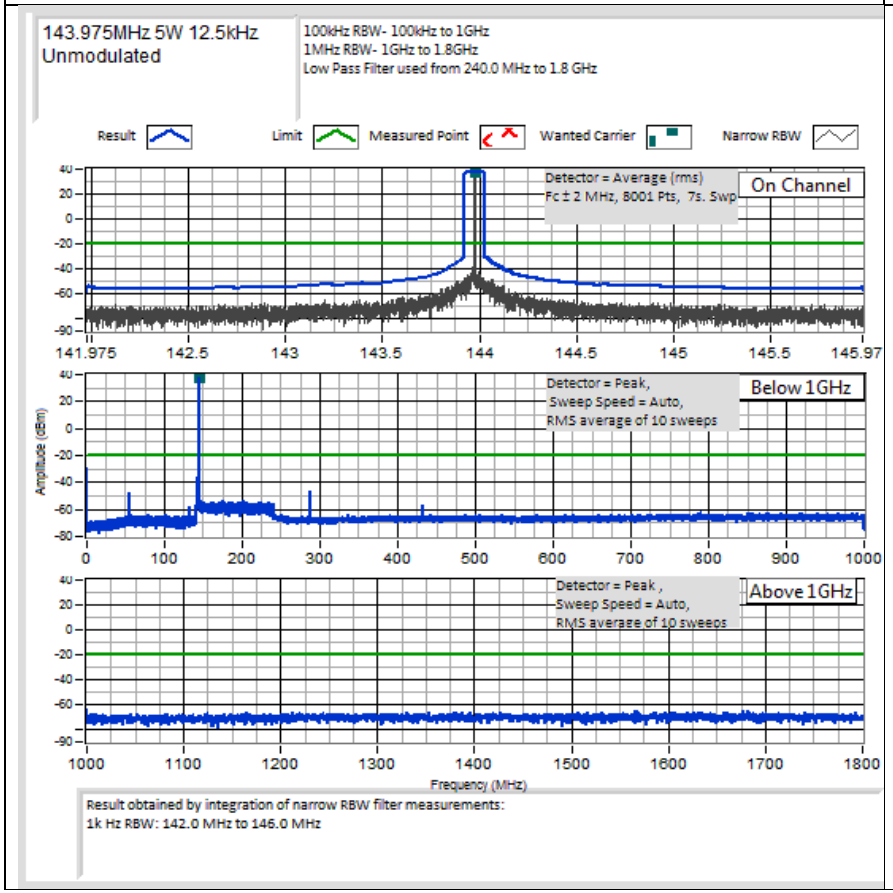
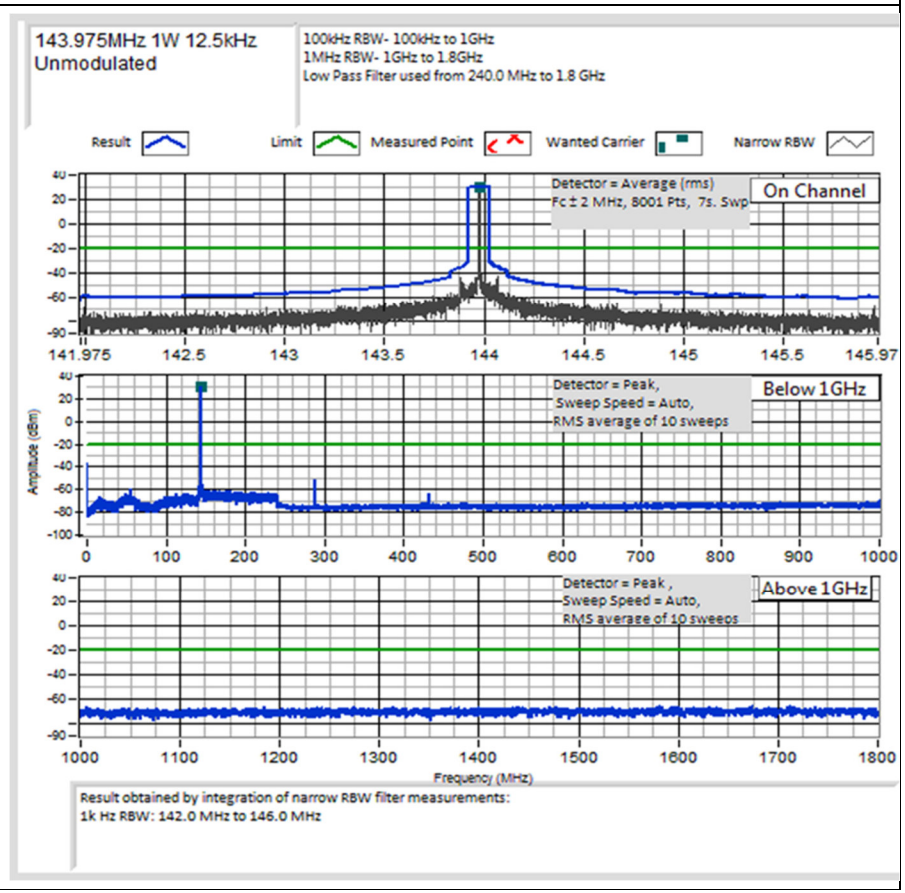
Spurious Emissions (Tx Conducted)

143.975 MHz, 9 kHz to 1.8 GHz scans

5 W	1 W





Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051 RSS-119 5.8

12.5 kHz Channel Spacing 150.025 MHz @ 5 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

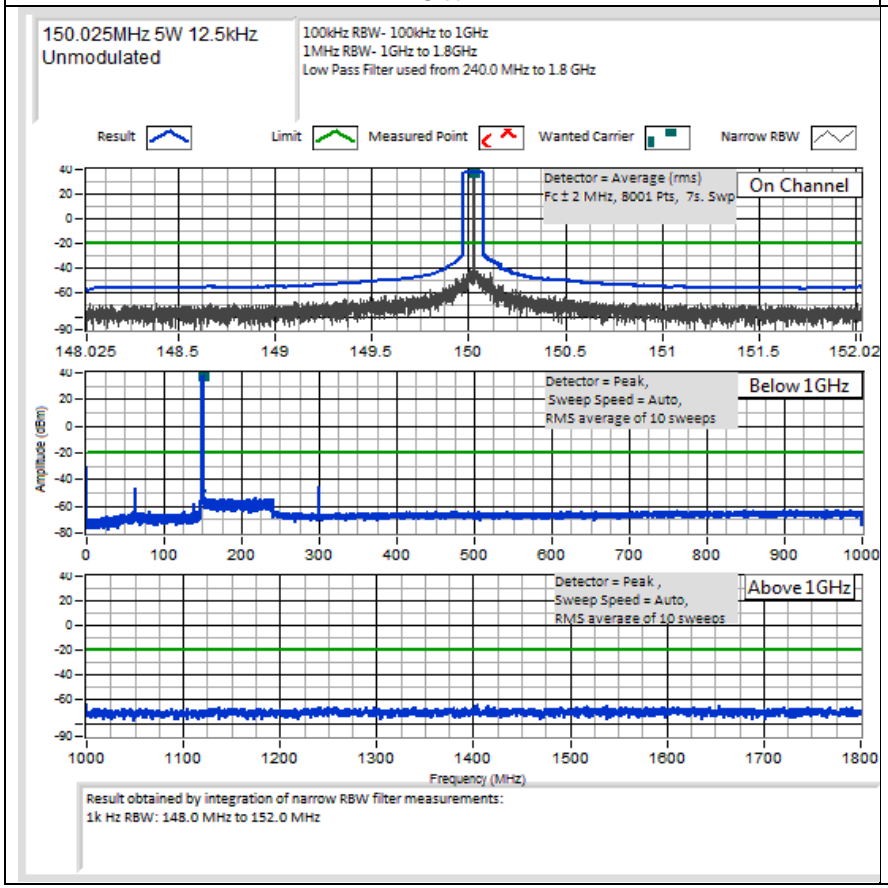
12.5 kHz Channel Spacing 150.025 MHz @ 1 W Emission Mask D

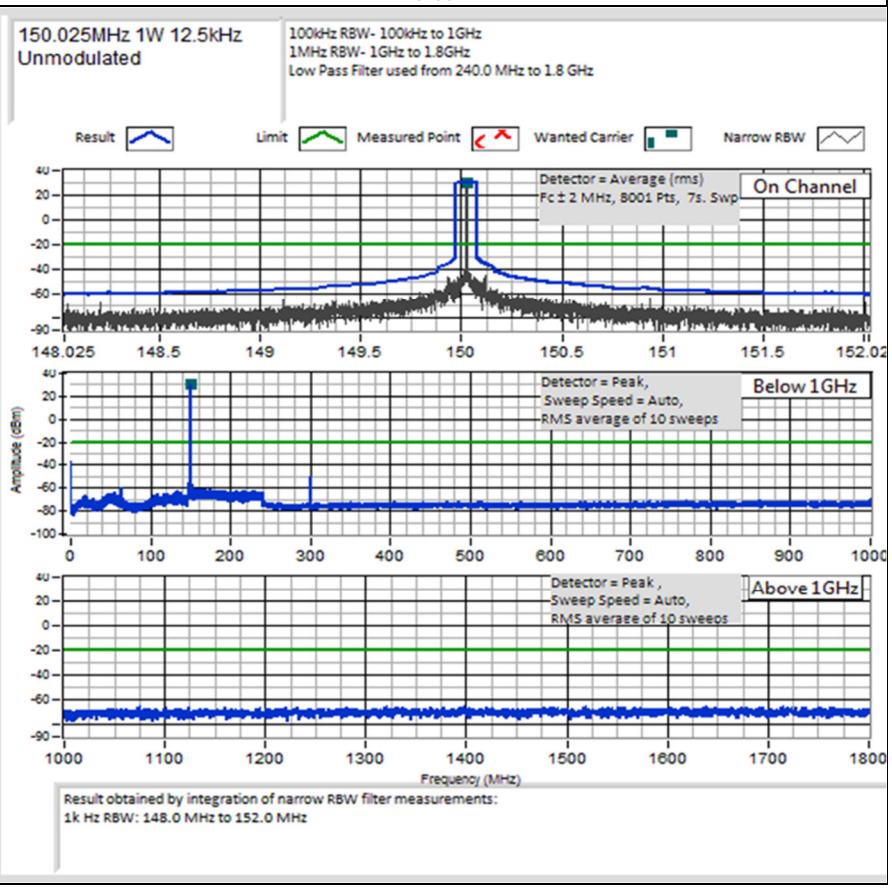
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Conducted)

150.025 MHz, 9 kHz to 1.8 GHz scans

5 W	1 W





Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051 RSS-119 5.8

12.5 kHz Channel Spacing 150.05 MHz @ 5 W Emission Mask D

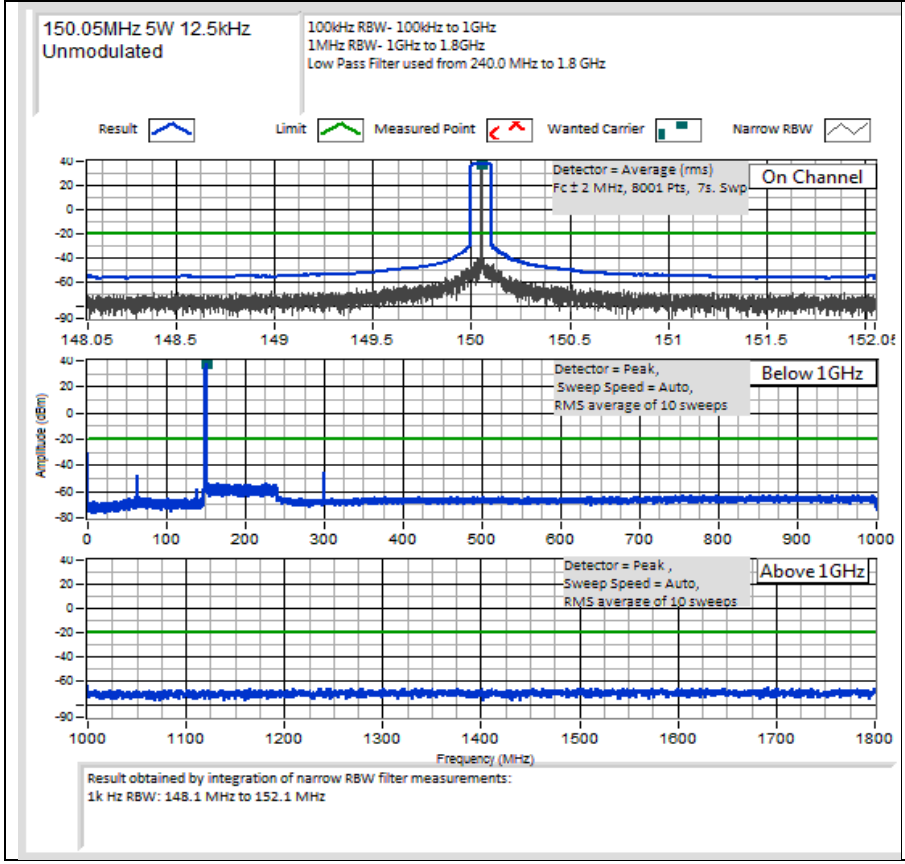
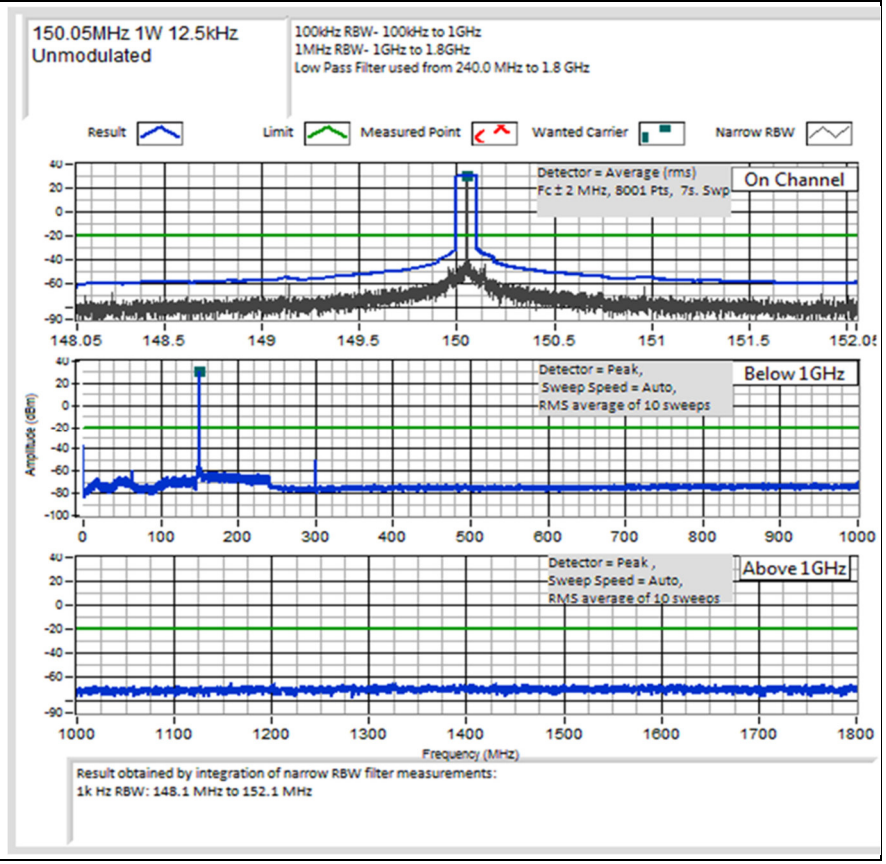
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing 150.05 MHz @ 1 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Conducted)

150.05 MHz, 9 kHz to 1.8 GHz scans

5 W	1 W
	

Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051 RSS-119 5.8

12.5 kHz Channel Spacing 162.025 MHz @ 5 W Emission Mask D

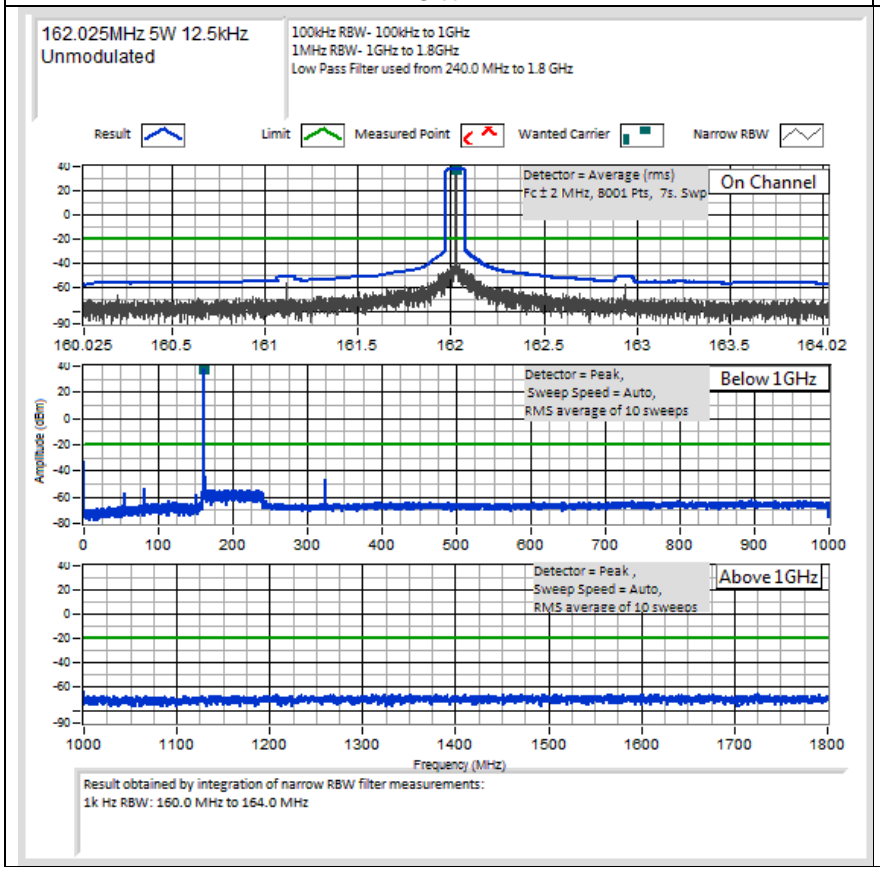
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

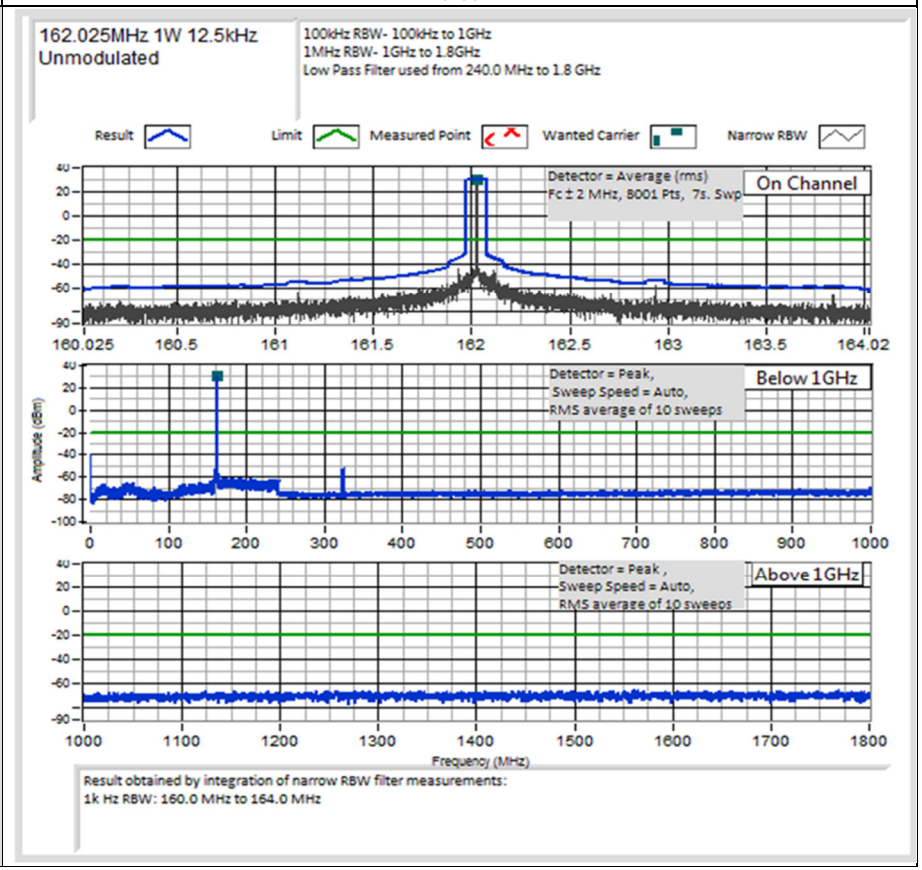
12.5 kHz Channel Spacing 162.025 MHz @ 1 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Conducted)

162.025 MHz, 9 kHz to 1.8 GHz scans	
5 W	1 W





Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051 RSS-119 5.8

12.5 kHz Channel Spacing 173.975 MHz @ 5 W Emission Mask D

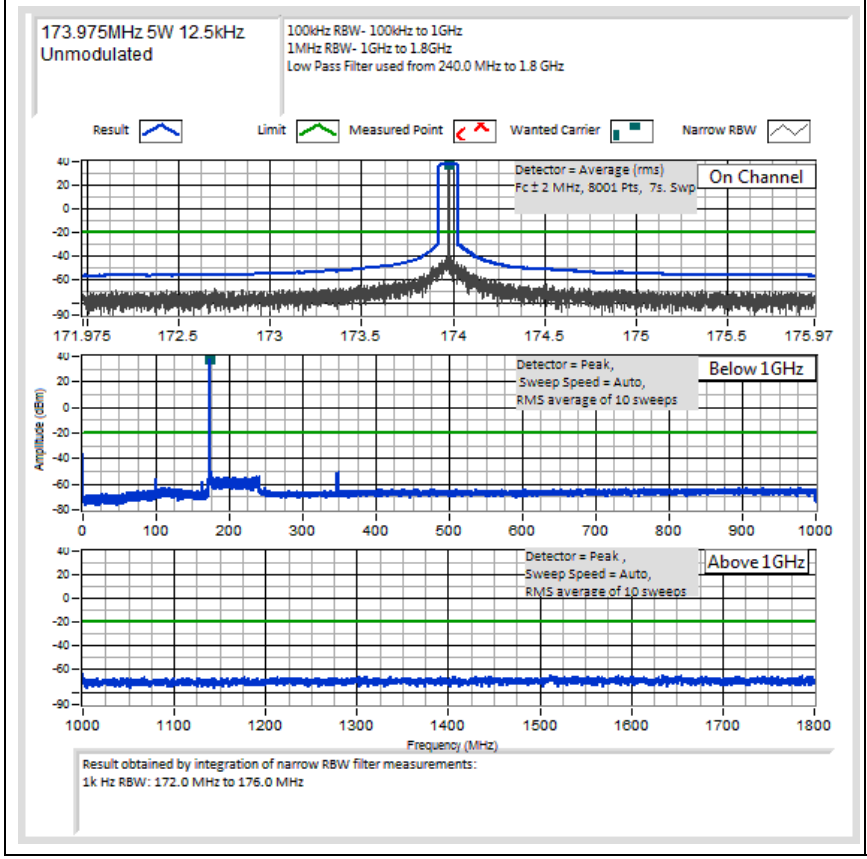
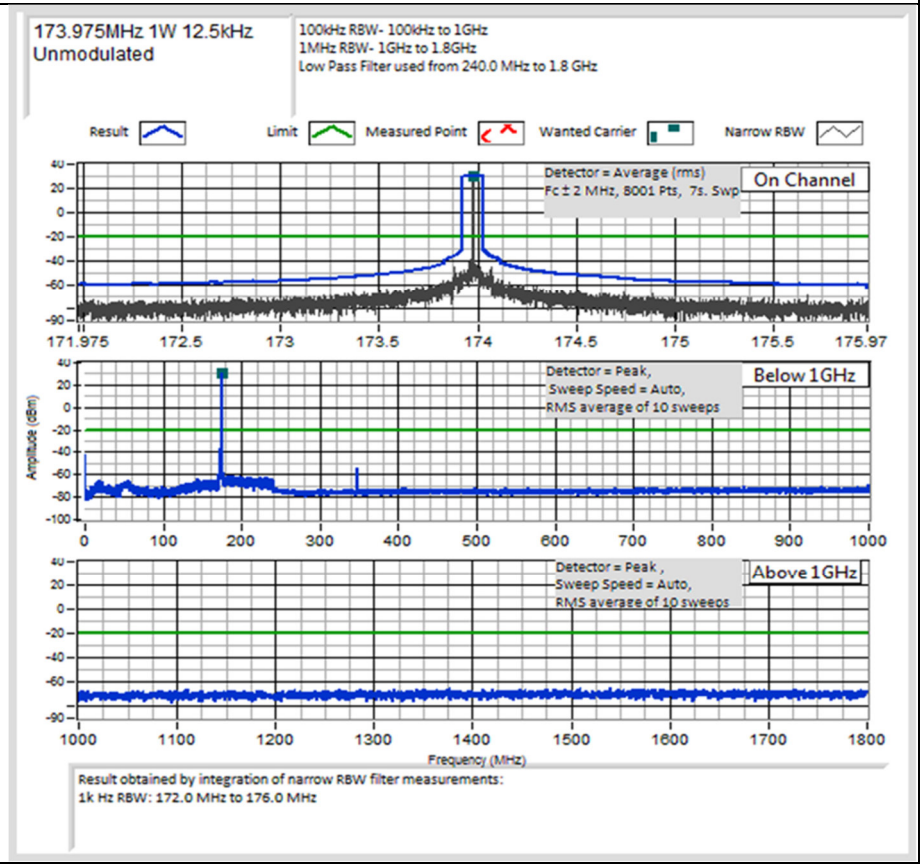
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing 173.975 MHz @ 1 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Conducted)

173.975 MHz, 9 kHz to 1.8 GHz scans

5 W	1 W
	

Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051 RSS-119 5.8

12.5 kHz Channel Spacing 148.025 MHz @ 5 W Emission Mask D

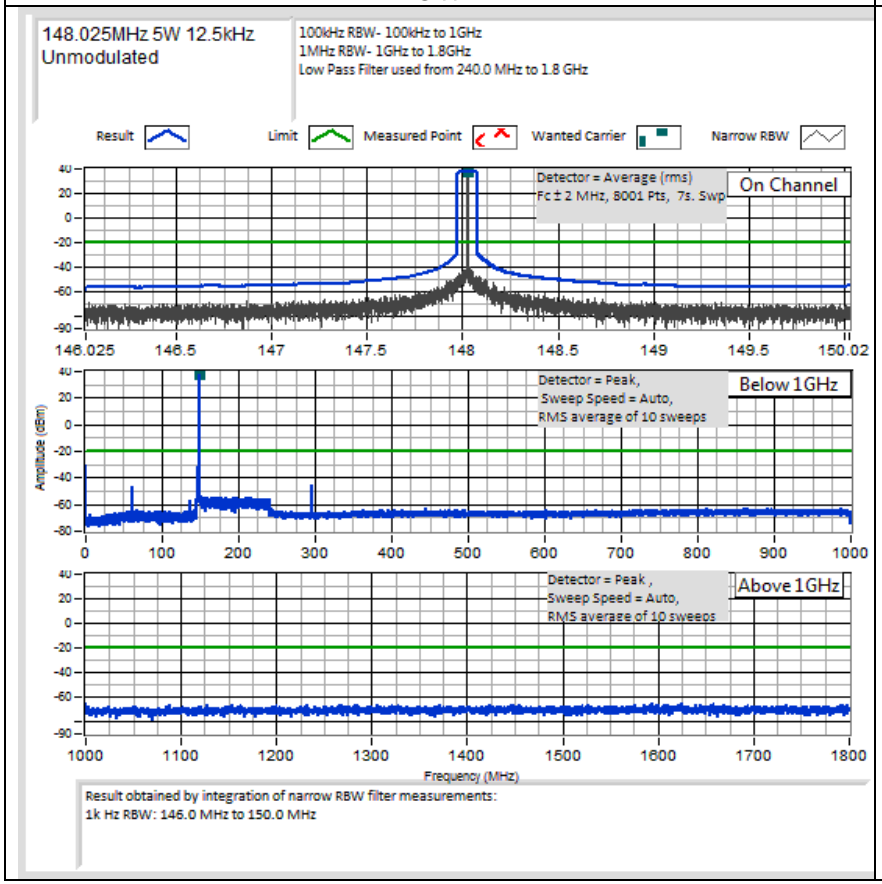
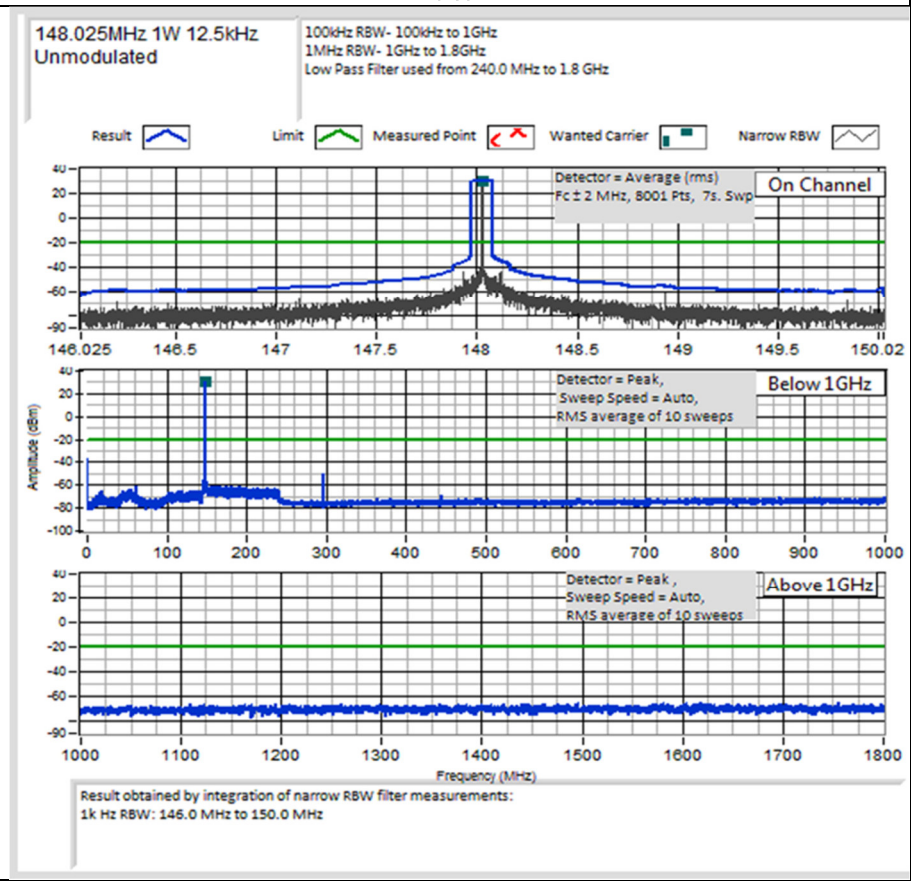
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing 148.025 MHz @ 1 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Conducted)

148.025 MHz, 9 kHz to 1.8 GHz scans

5 W	1 W
	

Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051 RSS-119 5.8

LIMITS: FCC 47 CFR 90.210 RSS-119 5.8

Carrier Output Power	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \text{ Log}_{10} (P_{Watts})$	
5 W	-20 dBm	- 57 dBc
1 W	-20 dBm	- 50 dBc

TRANSMITTER SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC 47 CFR 2.1053

GUIDE: TIA/EIA-603D 2.2.12

MEASUREMENT PROCEDURE:
Initial Scan:

1. The EUT is placed in the S-Line TEM cell and emissions are measured from 30 MHz to 800 MHz. Any emission within 20 dB of the limit is then re-tested on the OATS.
2. The EUT is placed in the reverberation chamber and emissions are measured from 800 MHz to the upper frequency required (10 x Fc). Any emission within 20 dB of the limit is then re-tested on the OATS.
3. The harmonics emissions up to the 6th harmonic of the fundamental frequency are measured on the OATS

OATS Measurement:

1. The EUT is placed on a wooden turntable at a distance of three metres from the test antenna. The output terminal is connected to an RF dummy load.
2. The test antenna is raised from 1 m to 4 m to obtain a maximum reading; the turntable is then rotated through 360^{o} to obtain the maximum response of each spurious emission. Valid emissions are determined by switching the EUT on and off.
3. The EUT is then replaced by a signal generator and substitution antenna to make measurements by the substitution method.

MEASUREMENT UNCERTAINTY: ≤12.75 GHz ± 4.6 dB

MEASUREMENT RESULTS:
See the tables on the following pages

Spurious Emissions (Tx Radiated) - Continued

SPECIFICATION: FCC 47 CFR 2.1053

12.5 kHz Channel Spacing 138.025 MHz @ 5 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing 138.025 MHz @ 1 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 20 dB below the limit.		

12.5 kHz Channel Spacing 143.975 MHz @ 5 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing 143.975 MHz @ 1 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 20 dB below the limit.		

12.5 kHz Channel Spacing 150.025 MHz @ 5 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing 150.025 MHz @ 1 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Radiated) - Continued

12.5 kHz Channel Spacing 150.05 MHz @ 5 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing 150.05 MHz @ 1 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 20 dB below the limit.		

12.5 kHz Channel Spacing 162.025 MHz @ 5 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing 162.025 MHz @ 1 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 20 dB below the limit.		

12.5 kHz Channel Spacing 173.975 MHz @ 5 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing 173.975 MHz @ 1 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Radiated) - Continued

12.5 kHz Channel Spacing 148.025 MHz @ 5 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing 148.025 MHz @ 1 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Radiated) - Continued

LIMITS: FCC 47 CFR 2.1053

Carrier Output Power	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \text{ Log}_{10} (P_{Watts})$	
5 W	-20 dBm	-57 dBc
1 W	-20 dBm	-50 dBc

Spurious Emissions (Tx Radiated) - Continued

Open Area Test Site Results:

12.5 kHz Channel Spacing | 150.05 MHz @ 5 W | Emission Mask D

Harmonics Emission Frequency (MHz)	Level (dBm)	Level (dBc)
300.10	-55.52	-92.52
450.15	-59.30	-96.30
600.20	-70.80	-107.8
750.25	-73.73	-110.73
900.3	-69.70	-106.7
1051.05	No emission detected	No emission detected

Sample Calculation	Measurement					Result
	Reference	Substitution				
Emission Frequency (MHz)	Reference Level (dBm)	Sig-gen Level	Cable and Attenuator Gain	Antenna Gain (dBd)	Path and Boresight corrections	dBm
300.10	-97.0	-42.0	-13.17	-0.35	0.0	-55.52
		A	B	C	D	E

Result (E) = A+B+C+D

OATS Setup

TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

GUIDE: ANSI C63.26 6.5.2.2

MEASUREMENT PROCEDURE:
1. Refer Annex A for equipment set up.
2. Measurements and plots were made following the TIA/EIA procedure.

MEASUREMENT UNCERTAINTY: 130Hz

MEASUREMENT RESULTS:
See the tables and plots on the following pages for 12.5 kHz channel spacing.

LIMIT CLAUSES: FCC 47 CFR 90.214 RSS-119 5.9

Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 138.025 MHz 5 W 12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-0.6	N/A
t2	0.5	N/A
t3	N/A	2.6

	YES	NO
Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	✓	☐
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	YES	NO
	✓	☐
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	YES	NO
	✓	☐

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE	
	150 MHz – 174 MHz	421 MHz – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

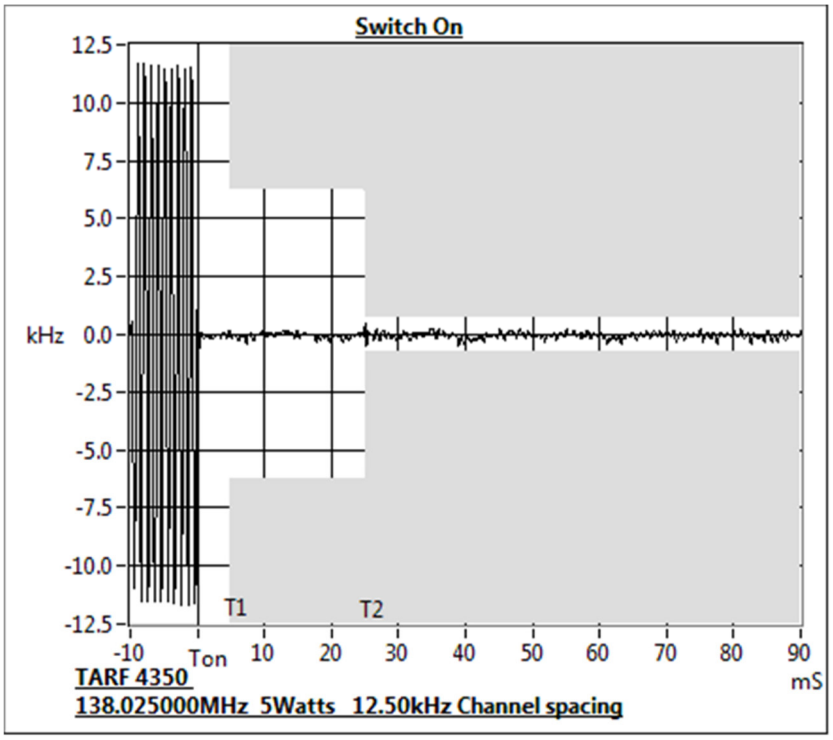
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	± 12.5 kHz	5 ms	10 ms
t2 (ms)	± 6.25 kHz	20 ms	25 ms
t3 (ms)	± 12.5 kHz	5 ms	10 ms

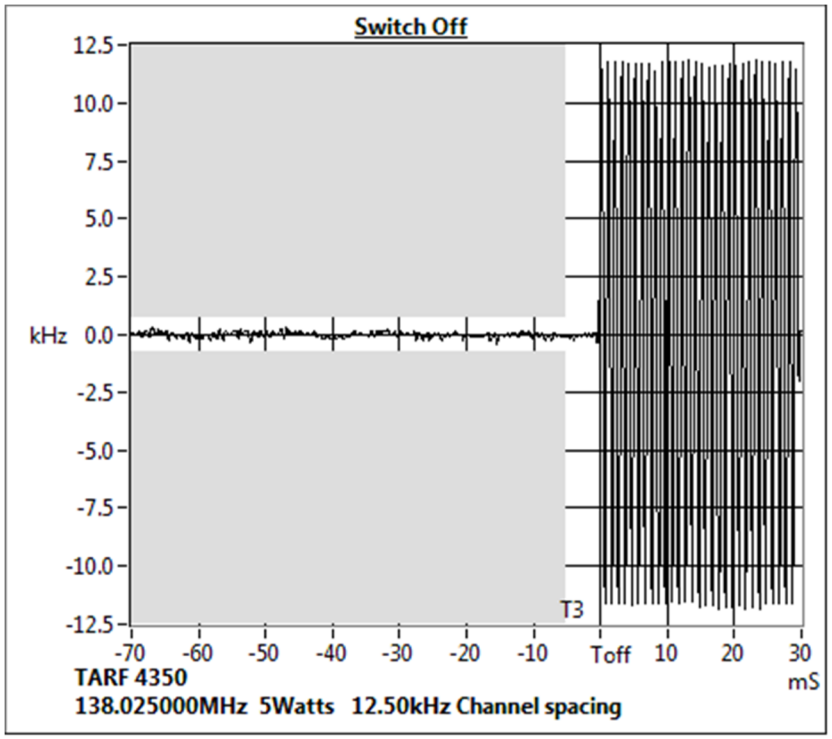
Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods.

Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 138.025 MHz 5 W 12.5 kHz Channel Spacing





Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 143.975 MHz 5 W 12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-0.5	N/A
t2	-0.3	N/A
t3	N/A	3.4

	YES	NO
Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	✓	☐
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	✓	☐
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	✓	☐

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE	
	150 MHz – 174 MHz	421 MHz – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

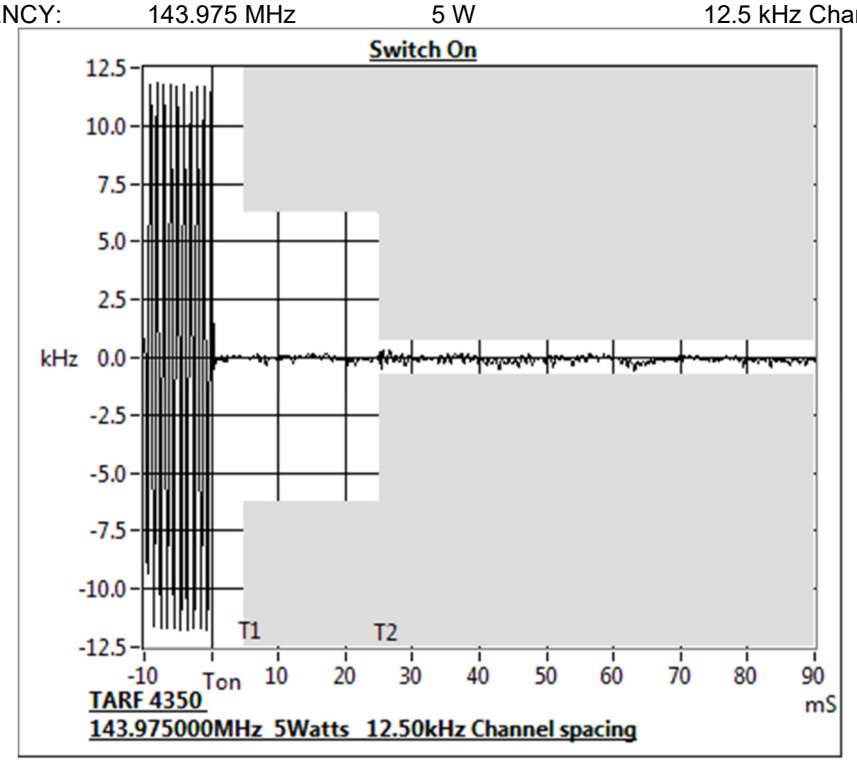
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	± 12.5 kHz	5 ms	10 ms
t2 (ms)	± 6.25 kHz	20 ms	25 ms
t3 (ms)	± 12.5 kHz	5 ms	10 ms

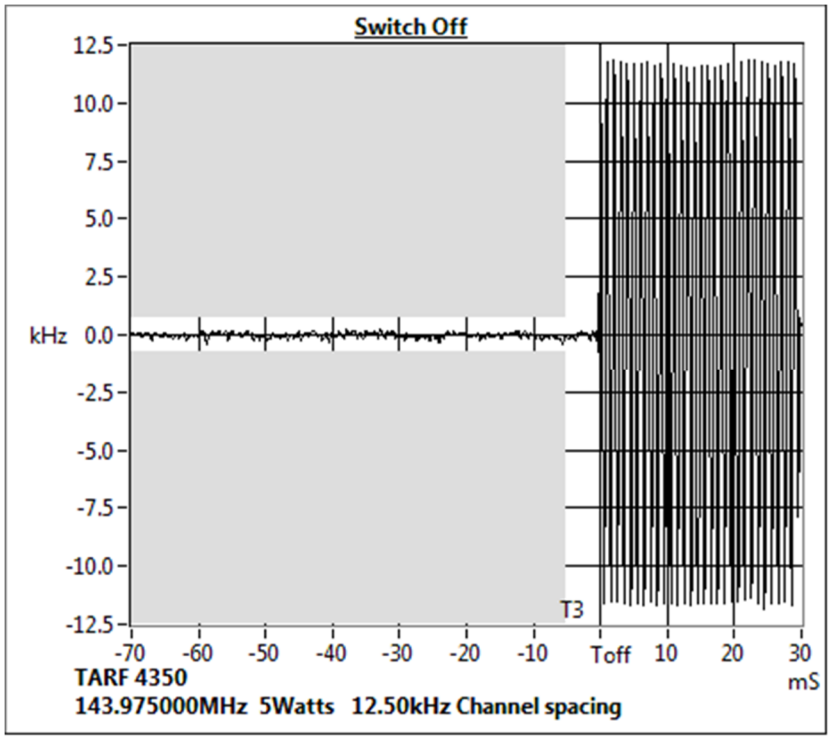
Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods,

Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 143.975 MHz 5 W 12.5 kHz Channel Spacing





Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 150.025 MHz 5 W 12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-0.5	N/A
t2	-0.3	N/A
t3	N/A	1.0

	YES	NO
Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	✓	☐
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	✓	☐
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	✓	☐

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE	
	150 MHz – 174 MHz	421 MHz – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

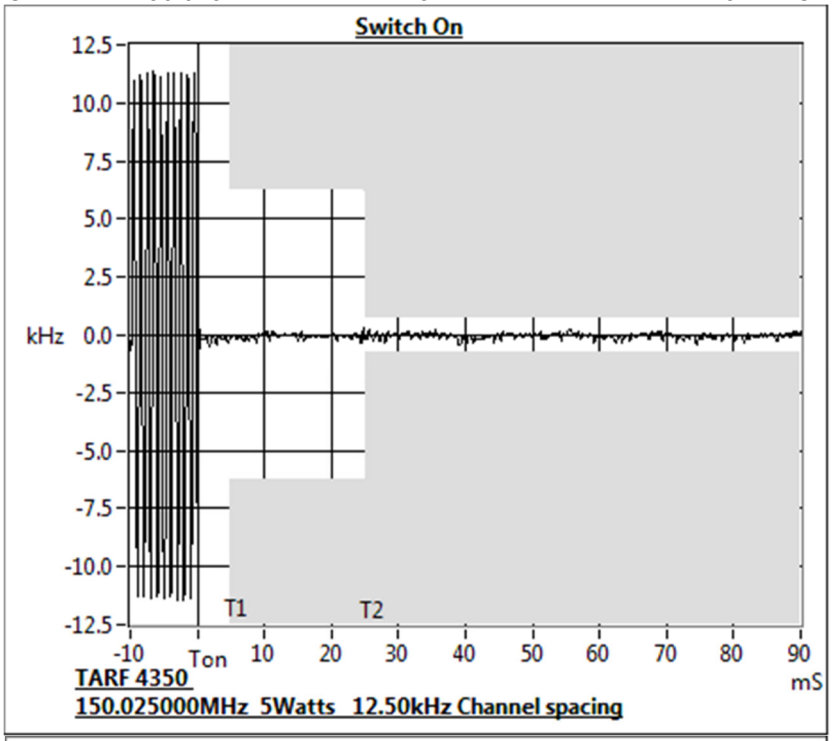
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	± 12.5 kHz	5 ms	10 ms
t2 (ms)	± 6.25 kHz	20 ms	25 ms
t3 (ms)	± 12.5 kHz	5 ms	10 ms

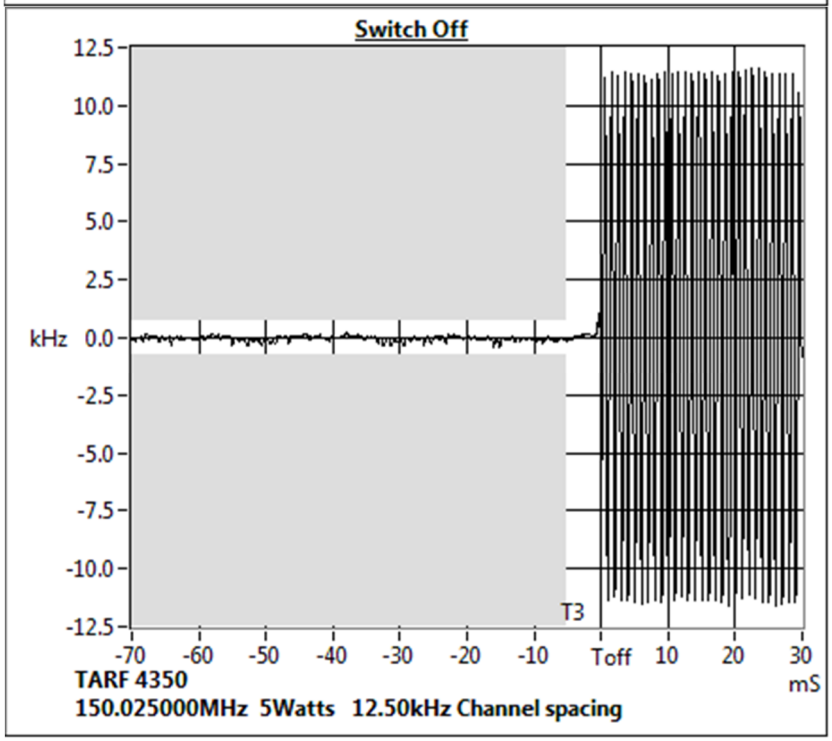
Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods.

Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 150.025 MHz 5 W 12.5 kHz Channel Spacing





Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 150.05 MHz 5 W 12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-0.5	N/A
t2	-0.4	N/A
t3	N/A	-1.9

	YES	NO
Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	✓	☐
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	✓	☐
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	✓	☐

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE	
	150 MHz – 174 MHz	421 MHz – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

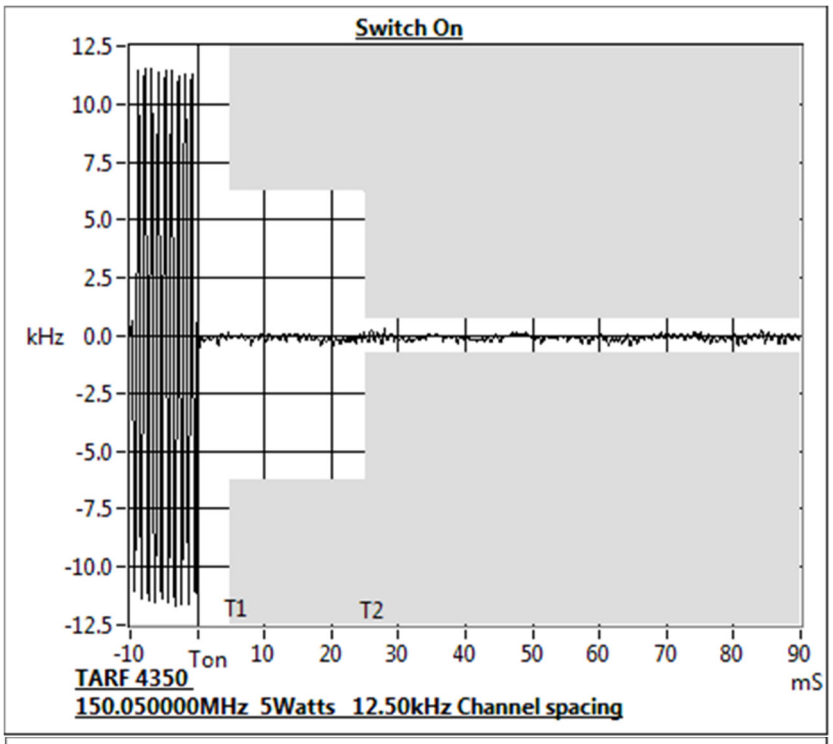
LIMIT: RSS-119 5.9

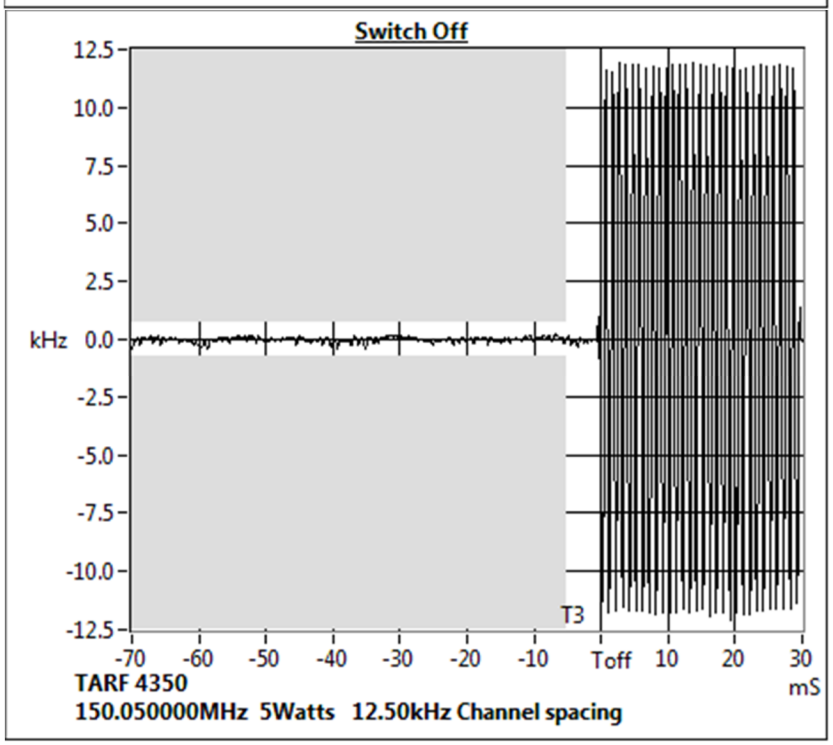
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	± 12.5 kHz	5 ms	10 ms
t2 (ms)	± 6.25 kHz	20 ms	25 ms
t3 (ms)	± 12.5 kHz	5 ms	10 ms

Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods.

Transient Frequency Behaviour

SPECIFICATION:	FCC 47 CFR 90.214		RSS-119 5.9
Tx FREQUENCY:	150.05 MHz	5 W	12.5 kHz Channel Spacing





Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 162.025 MHz 5 W 12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-0.9	N/A
t2	-0.5	N/A
t3	N/A	3.3

	YES	NO
Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	✓	☐
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	✓	☐
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	✓	☐

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE	
	150 MHz – 174 MHz	421 MHz – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

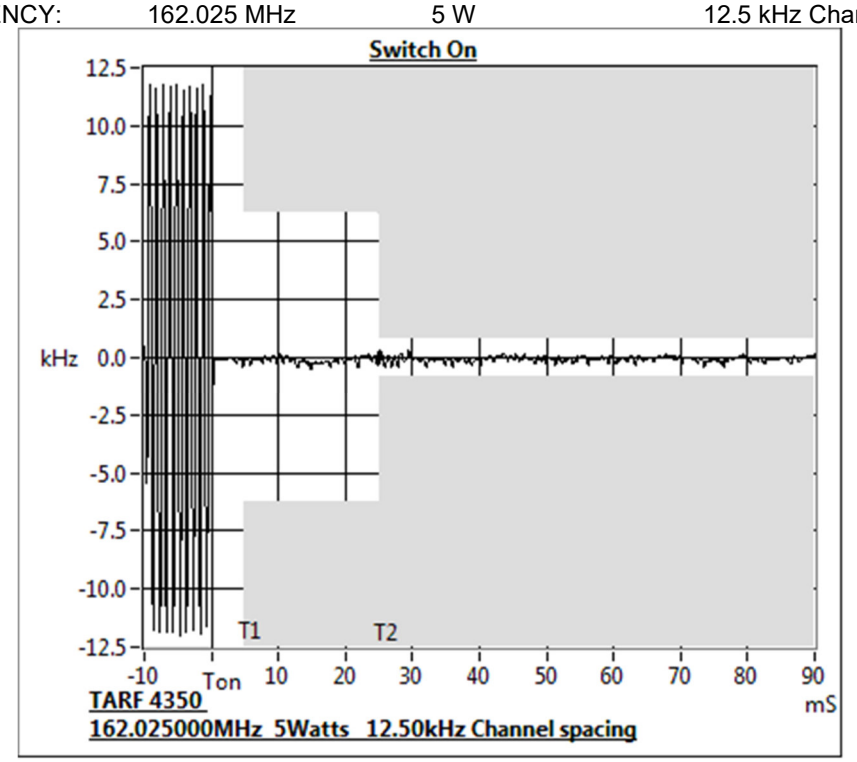
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	± 12.5 kHz	5 ms	10 ms
t2 (ms)	± 6.25 kHz	20 ms	25 ms
t3 (ms)	± 12.5 kHz	5 ms	10 ms

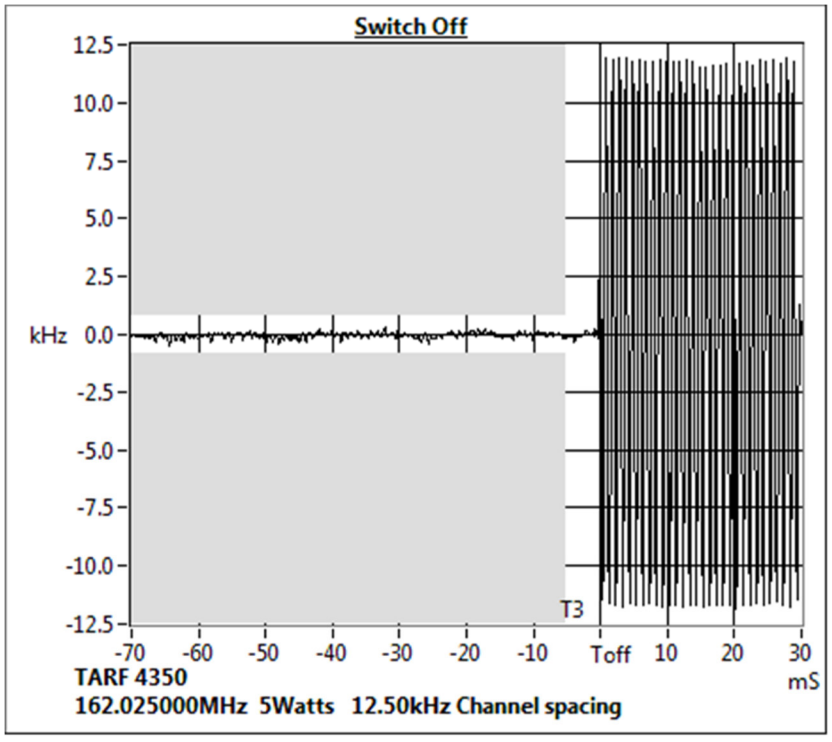
Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods.

Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 162.025 MHz 5 W 12.5 kHz Channel Spacing





Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 173.975 MHz 5 W 12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-0.6	N/A
t2	-0.5	N/A
t3	N/A	3.1

	YES	NO
Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	✓	☐
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	✓	☐
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	✓	☐

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE	
	150 MHz – 174 MHz	421 MHz – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	± 12.5 kHz	5 ms	10 ms
t2 (ms)	± 6.25 kHz	20 ms	25 ms
t3 (ms)	± 12.5 kHz	5 ms	10 ms

Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods.