

LABORATORY TEST REPORT

RADIO PERFORMANCE MEASUREMENTS

for the

TDAB1A Data Terminal Transceiver

Tested in accordance with:

FCC 47 CFR Parts 22, 74 and 90

RSS-119 Issue 11
RSS-Gen Issue 4

Report Revision: 1

Issue Date: 16-March-2015

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Laboratory Technical Manager



OATS FCC LISTING REGISTRATION: 837095
OATS IC LISTING REGISTRATION: SITE# 737A-1

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.

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REVISION

Date	Revision	Comments
16-March-2015	1	Initial test report

INTRODUCTION

REASON FOR REPORT

Type approval testing of the TDAB1A, 25 Watt, data terminal transceiver in order to demonstrate compliance with FCC 47 Parts 22, 74 & 90, and RSS-119 Issue 11 & RSS-Gen Issue 4. This radio supports Digital Mobile Radio modulation (DMR).

Modulation		Channel Spacing	Speech Channels	Symbol Rate (symbols/sec)	Data Rate (bps)
Digital Mobile Radio (DMR)	4 Level FSK 2 slot TDMA (ETSI TS102 361-1)	12.5 kHz	2	4800	9600

REPORT PREPARED FOR

Tait Communications
PO Box 1645
558 Wairakei Road
Christchurch
New Zealand

DESCRIPTION OF SAMPLE

Manufacturer: Tait Limited
Equipment: Data Terminal Transceiver
Type: TDAB1A
Product Code: T04-00002-BAAA
Serial Number(s): 29000030
Quantity: 1

HARDWARE & SOFTWARE

Hardware ID	TMBB12-B100_0006
Boot Code	QMB1B_S00_3.01.03.0001
DSP	QMB1A_E00_2.01.00.0018
Radio Application	QMB1F_E00_2.01.00.0018
FPGA Image	QMB1G_S00_1.07.00.0002
Platform software	01.00.01

TEST CONDITIONS

All testing was performed between 23/02/2015 → 16/03/2015 under the following conditions:

Ambient temperature: 15°C → 30°C
Relative Humidity: 20% → 75%
Standard Test Voltage 24 V_{DC}

STATEMENT OF COMPLIANCE

We, TELTEST LABORATORIES of 558 Wairakei Road, Christchurch, New Zealand, declare under our sole responsibility that the product:

Equipment: Data Terminal Transceiver
Type: TDAB1A
Product Code: T04-00002-BAAA
Serial Number(s): 29000030
Quantity: 1

to which this declaration relates, is in conformity with the following standards:

FCC 47 CFR Parts 22, 74 and 90

RSS-119 Issue 11 & RSS-Gen Issue 4

Signature: _____

M.C. James
Laboratory Technical Manager

Date: _____

MODULATION TYPES, NECESSARY BANDWIDTH & EMISSION DESIGNATORS

MODULATION TYPES:

FXW	DMR Digital Voice	9600 bps
FXD	DMR Digital Data	9600 bps

CHANNEL SPACING: 12.5 kHz

EMISSION DESIGNATORS:

Digital Voice DMR	7K60FXW
Digital Data DMR	7K60FXD

CALCULATIONS

Digital Voice 12.5 kHz Bandwidth DMR
99% bandwidth
= 7.6 kHz

Emission Designator

7K60FXW

FXW represents a FM Time Division Multiple Access (TDMA) combination of data and telephony

Digital Data 12.5 kHz Bandwidth DMR
99% bandwidth
= 7.6 kHz

Emission Designator

7K60FXD

FXD represents FM Time Division Multiple Access (TDMA) data only

TEST RESULTS

TRANSMITTER OUTPUT POWER (CONDUCTED)

SPECIFICATION: FCC 47 CFR 2.1046
RSS-119 5.4

GUIDE: TIA/EIA-603D 2.2.1

MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment set up.
2. The coaxial attenuator has an impedance of 50 Ohms.
3. The unmodulated output power was measured with an RF Power meter.

MEASUREMENT RESULTS:

Manufacturer's Rated Output Power: Switchable: 25 W and 1 W

Nominal 25 W	138.1 MHz	143.9 MHz	148.1 MHz	149.8 MHz	151.1 MHz
Measured	26.5	27.2	26.6	26.4	26.2
Variation (%)	6.2	8.7	6.4	5.6	4.8
Variation (dB)	0.3	0.4	0.3	0.2	0.2

Nominal 1 W	138.1 MHz	143.9 MHz	148.1 MHz	149.8 MHz	151.1 MHz
Measured	1.0	1.0	1.0	1.0	1.0
Variation (%)	1.5	2.9	3.4	2.7	2.5
Variation (dB)	0.1	0.1	0.1	0.1	0.1
Measurement Uncertainty			± 0.6 dB		

TRANSMITTER OUTPUT POWER (CONDUCTED)

SPECIFICATION: FCC 47 CFR 2.1046
RSS-119 5.4

Manufacturer's Rated Output Power: Switchable: 25 W and 1 W

Nominal 25 W	155.1 MHz	159.1 MHz	173.1 MHz
Measured	24.9	24.0	23.5
Variation (%)	-0.4	-3.8	-5.9
Variation (dB)	0.0	-0.2	-0.3

Nominal 1 W	155.1 MHz	159.1 MHz	173.1 MHz
Measured	1.0	1.0	1.0
Variation (%)	-0.4	-2.9	-3.9
Variation (dB)	0.0	-0.1	-0.2
Measurement Uncertainty	± 0.6 dB		

LIMIT CLAUSES:

FCC 47 CFR 90.205 (s)

The output power shall not exceed by more than 20%... the manufacturer's rated output power for the particular transmitter specifically listed on the authorization.

RSS-119 5.4

The output power shall be within ± 1.0 dB of the manufacturer's rated power.

TRANSMITTER OCCUPIED BANDWIDTH AND SPECTRUM MASKS

SPECIFICATION: FCC 47 CFR 2.1049 (c) RSS-119 5.5

GUIDE: TIA/EIA-603D 2.2.11

MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment Set up.
For Data measurements: The EUT was modulated with an internally generated pseudo random bit sequence at the appropriate Baud rates.
2. The Occupied Bandwidth was measured on the Spectrum Analyser, with bandwidth settings as follows.

Emission Mask D – Resolution Bandwidth = 100 Hz, Video Bandwidth = 1 kHz

MEASUREMENT RESULTS:

See the plots on the following pages for 12.5 kHz channel spacing.

LIMIT CLAUSE: FCC 47 CFR 90.210 RSS-119 5.5

EMISSION MASKS

Emission Mask D 12.5 kHz Channel Spacing Digital Voice/Data

DATA SPEED

Digital Voice/Data 12.5 kHz Channel Spacing 9600 bps

Occupied Bandwidth and Spectrum Masks

DMR

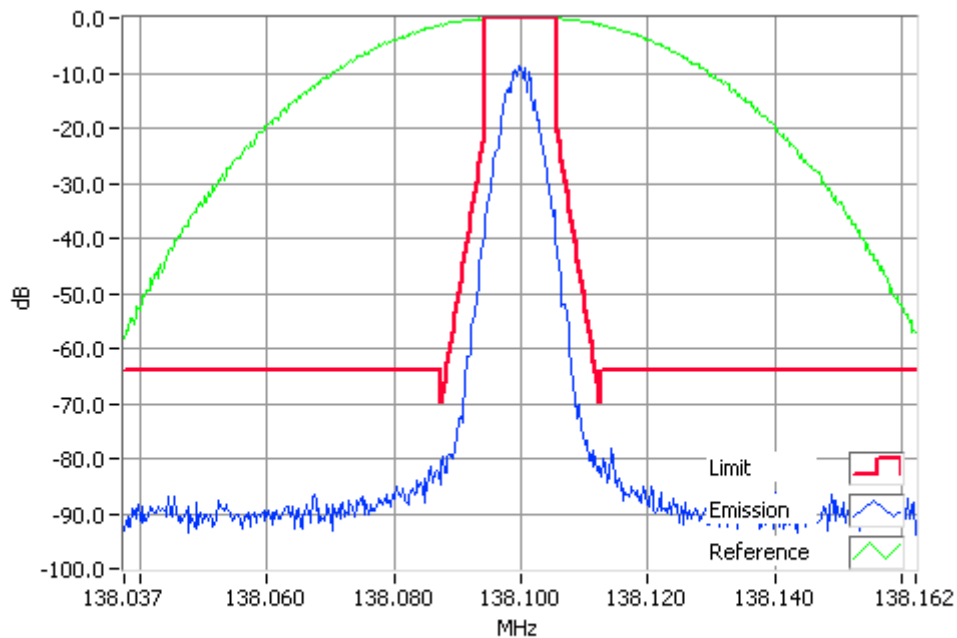
SPECIFICATION: FCC CFR 2.1049 (c)

RSS-119 5.5

Tx FREQUENCY: 138.1 MHz

25 W

12.5 kHz Channel Spacing

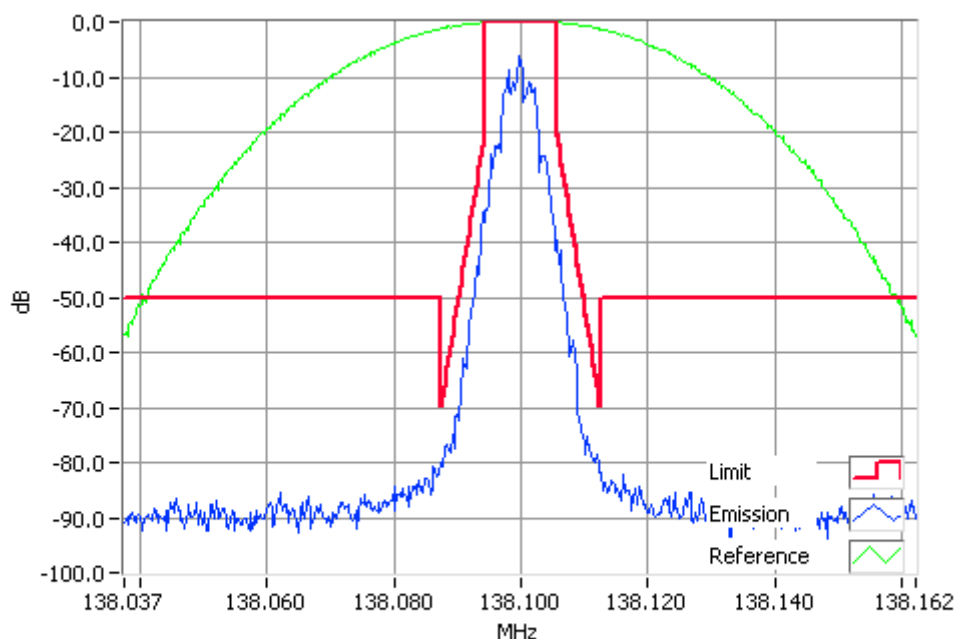


DMR 138.1000MHz Mask D 25W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 138.1 MHz

1 W

12.5 kHz Channel Spacing



DMR 138.1000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

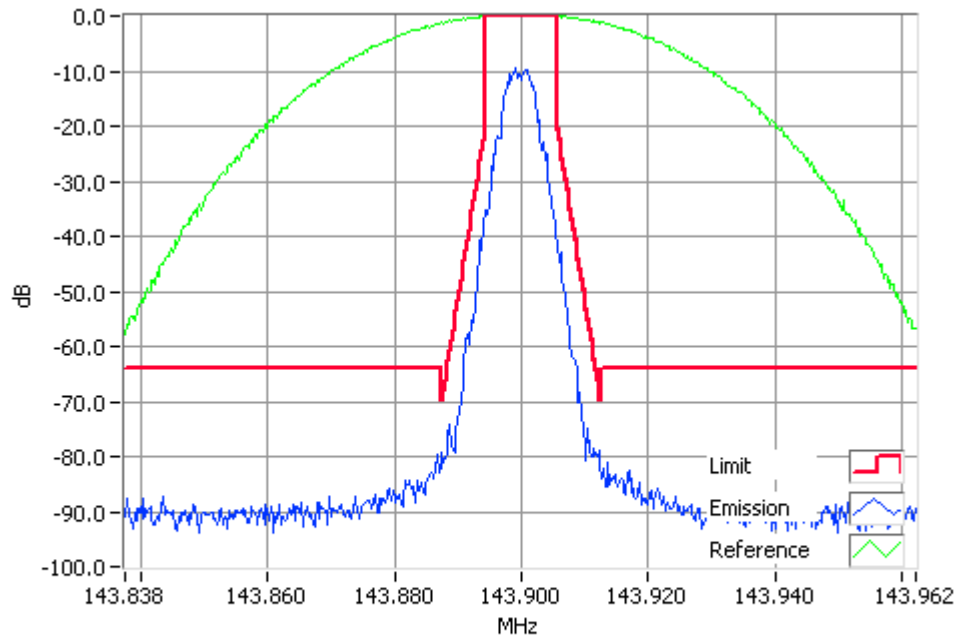
Occupied Bandwidth and Spectrum Masks

DMR

SPECIFICATION: FCC CFR 2.1049 (c)

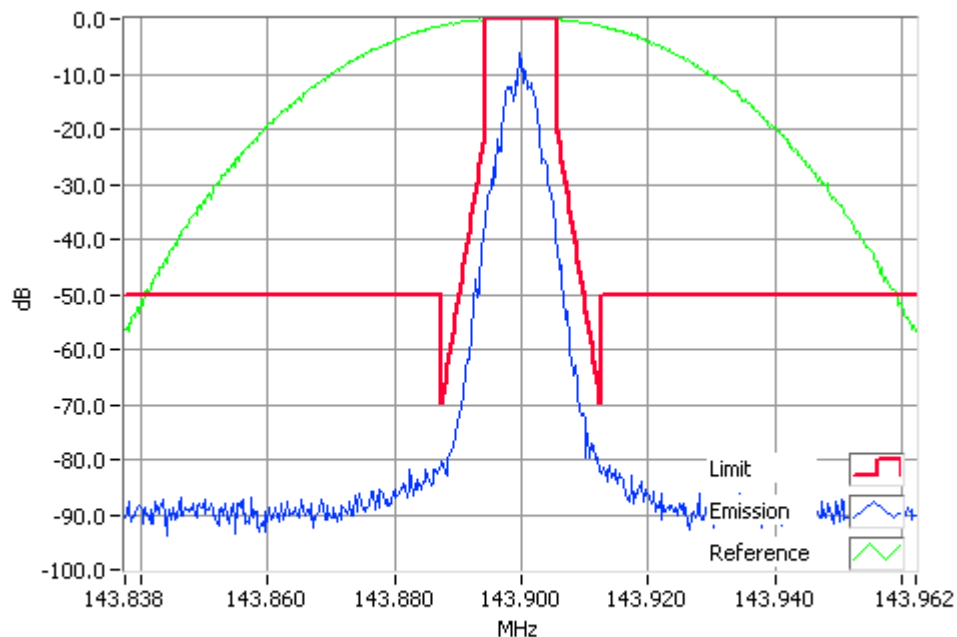
RSS-119 5.5

Tx FREQUENCY: 143.9 MHz 25 W 12.5 kHz Channel Spacing



DMR 143.9000MHz Mask D 25W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 143.9 MHz 1 W 12.5 kHz Channel Spacing



DMR 143.9000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

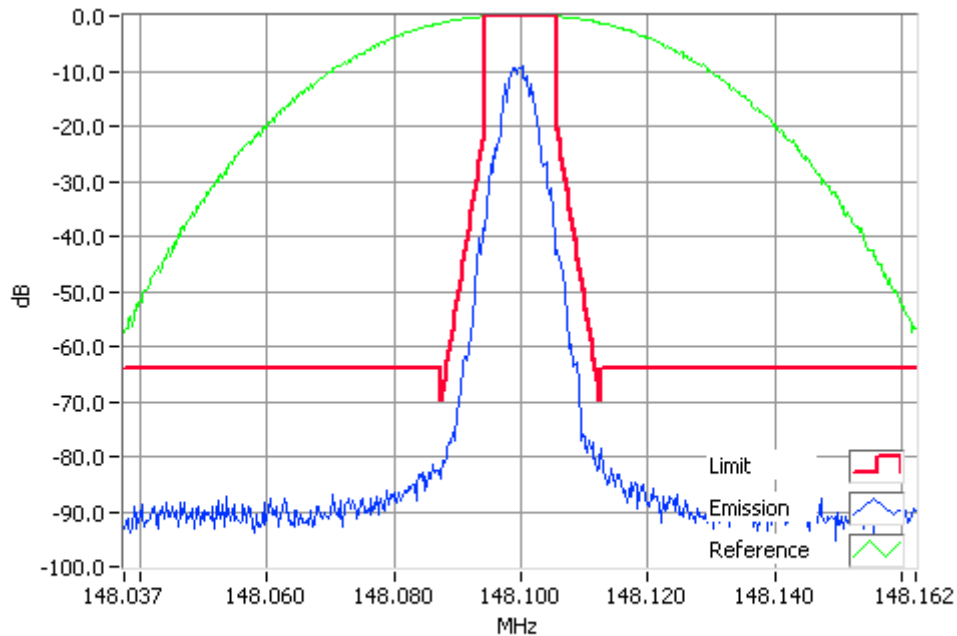
Occupied Bandwidth and Spectrum Masks

DMR

SPECIFICATION: FCC CFR 2.1049 (c)

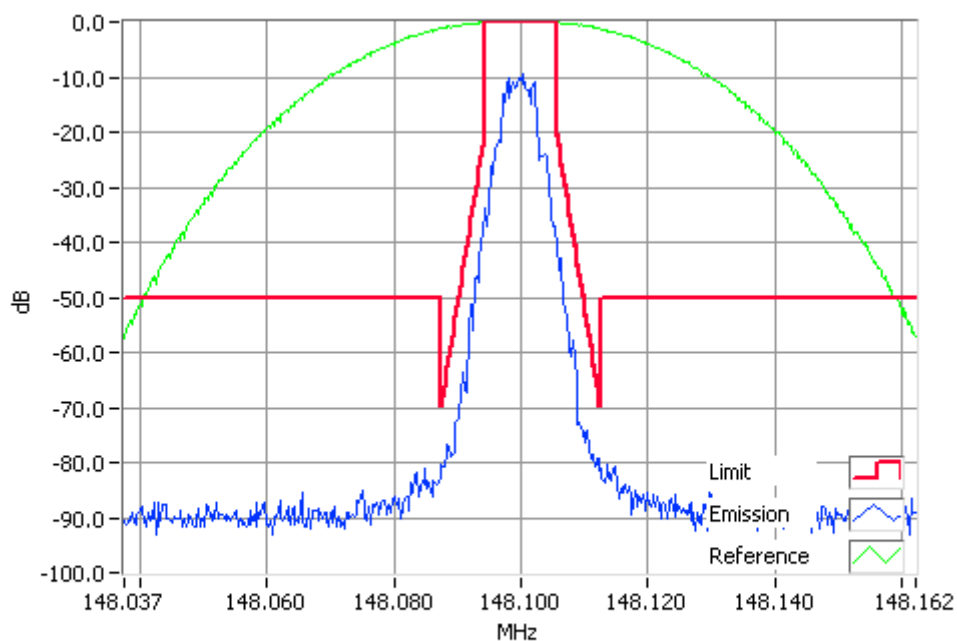
RSS-119 5.5

Tx FREQUENCY: 148.1 MHz 25 W 12.5 kHz Channel Spacing



DMR 148.1000MHz Mask D 25W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 148.1 MHz 1 W 12.5 kHz Channel Spacing



DMR 148.1000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

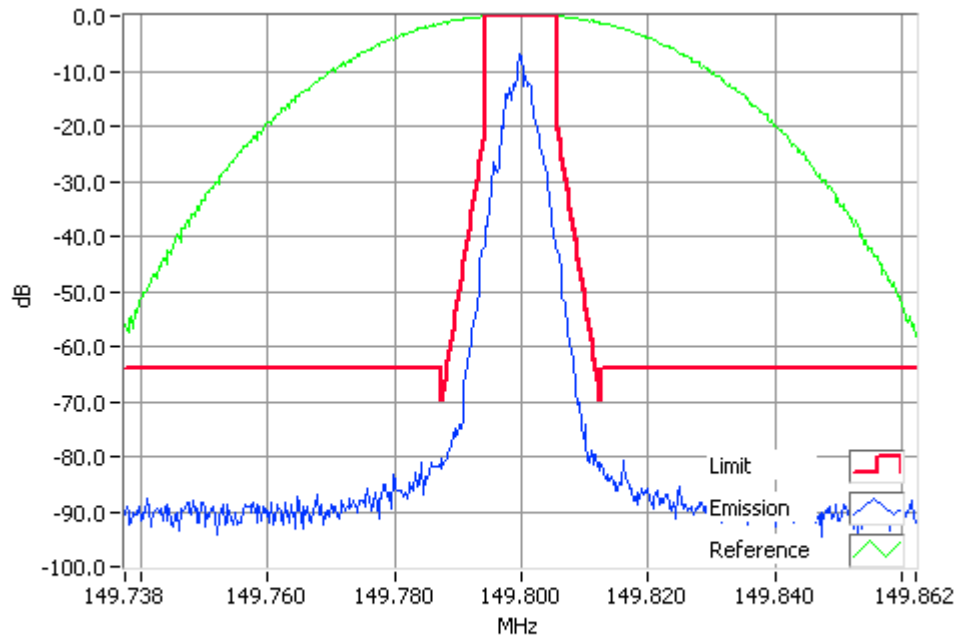
Occupied Bandwidth and Spectrum Masks

DMR

SPECIFICATION: FCC CFR 2.1049 (c)

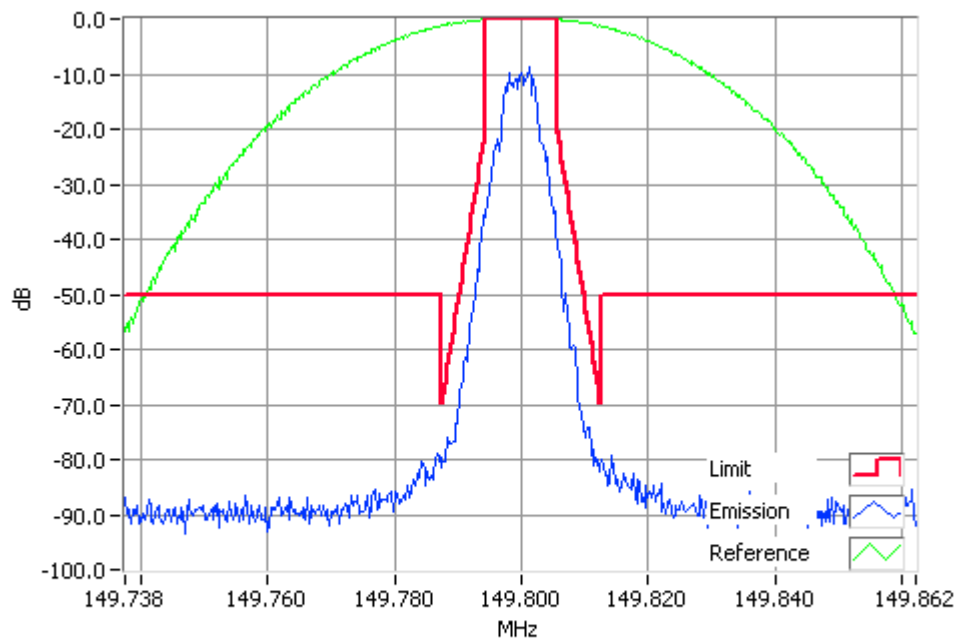
RSS-119 5.5

Tx FREQUENCY: 149.8 MHz 25 W 12.5 kHz Channel Spacing



DMR 149.8000MHz Mask D 25W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 149.8 MHz 1 W 12.5 kHz Channel Spacing



DMR 149.8000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

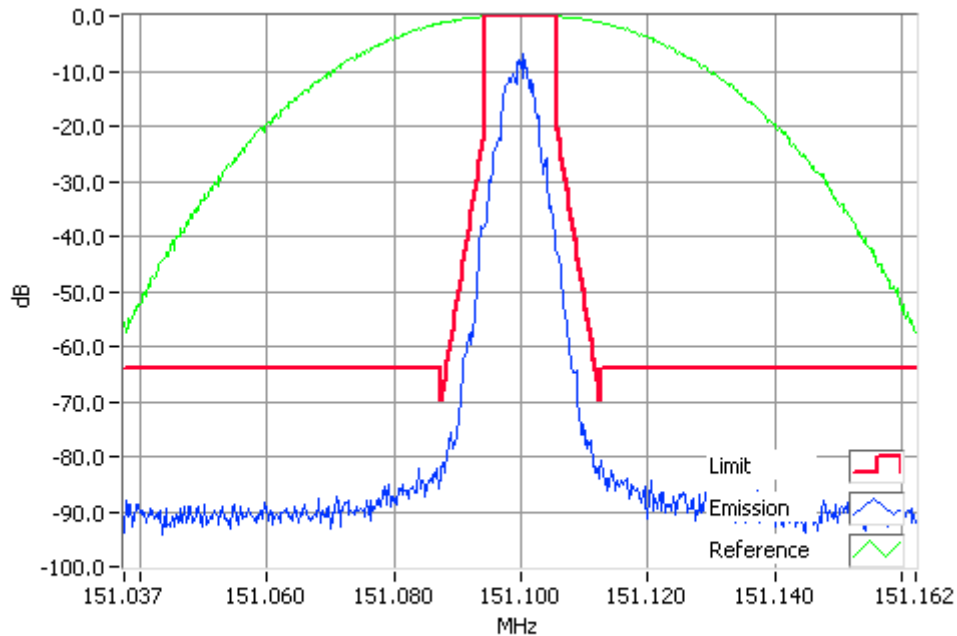
Occupied Bandwidth and Spectrum Masks

DMR

SPECIFICATION: FCC CFR 2.1049 (c)

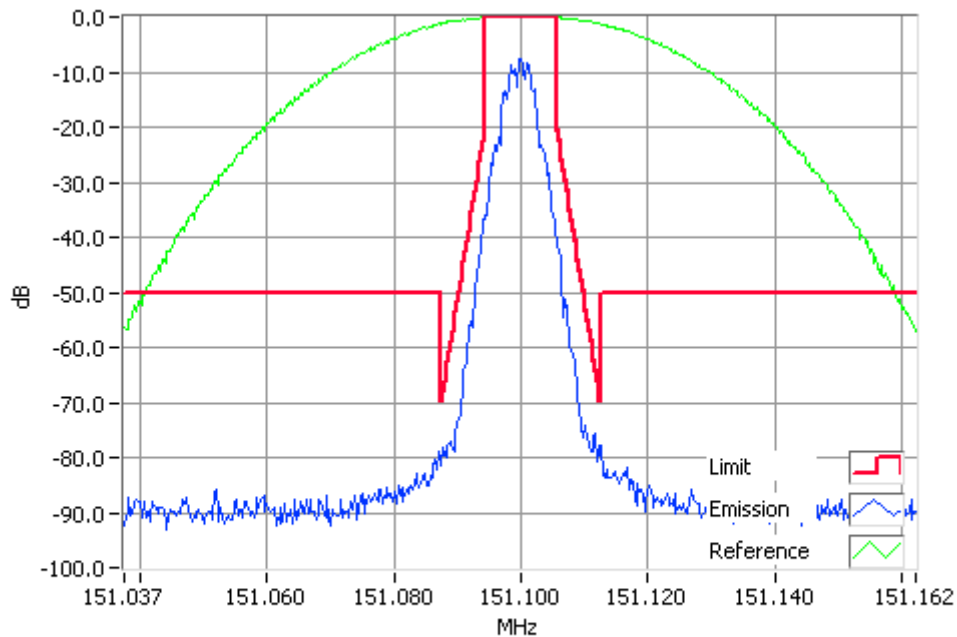
RSS-119 5.5

Tx FREQUENCY: 151.1 MHz 25 W 12.5 kHz Channel Spacing



DMR 151.1000MHz Mask D 25W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 151.1 MHz 1 W 12.5 kHz Channel Spacing



DMR 151.1000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

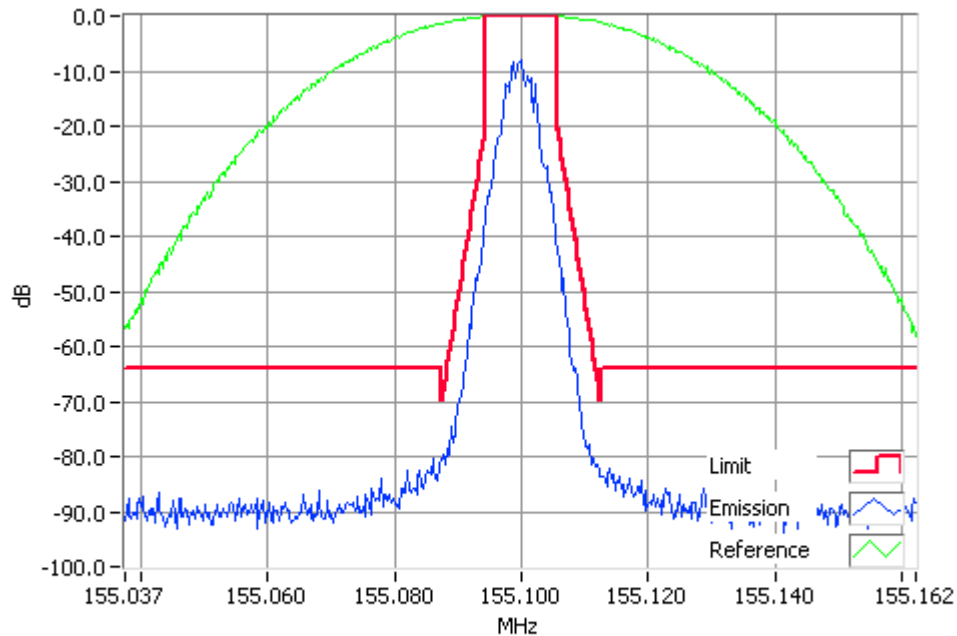
Occupied Bandwidth and Spectrum Masks

DMR

SPECIFICATION: FCC CFR 2.1049 (c)

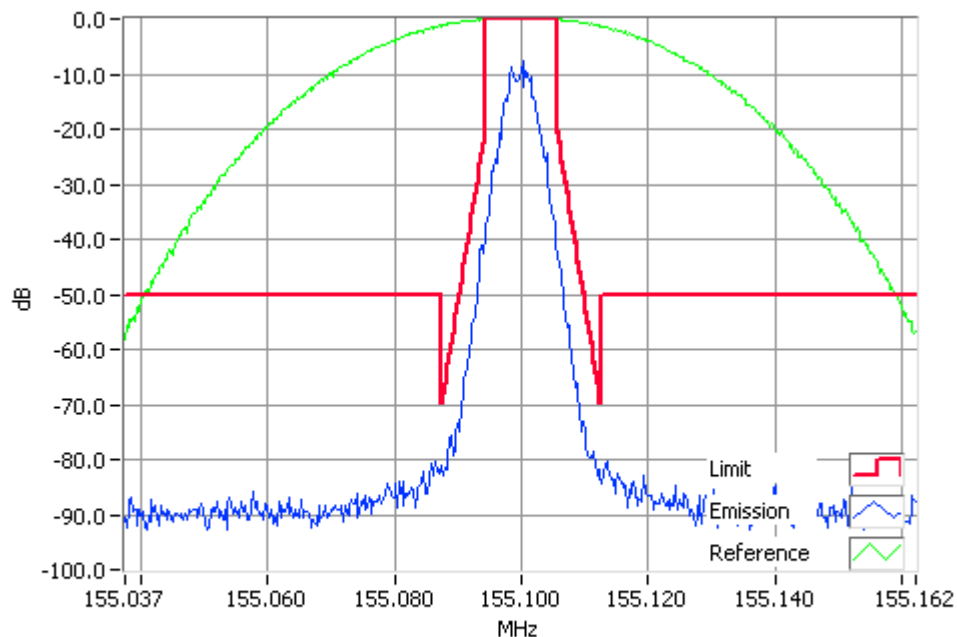
RSS-119 5.5

Tx FREQUENCY: 155.1 MHz 25 W 12.5 kHz Channel Spacing



DMR 155.1000MHz Mask D 25W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 155.1 MHz 1 W 12.5 kHz Channel Spacing



DMR 155.1000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

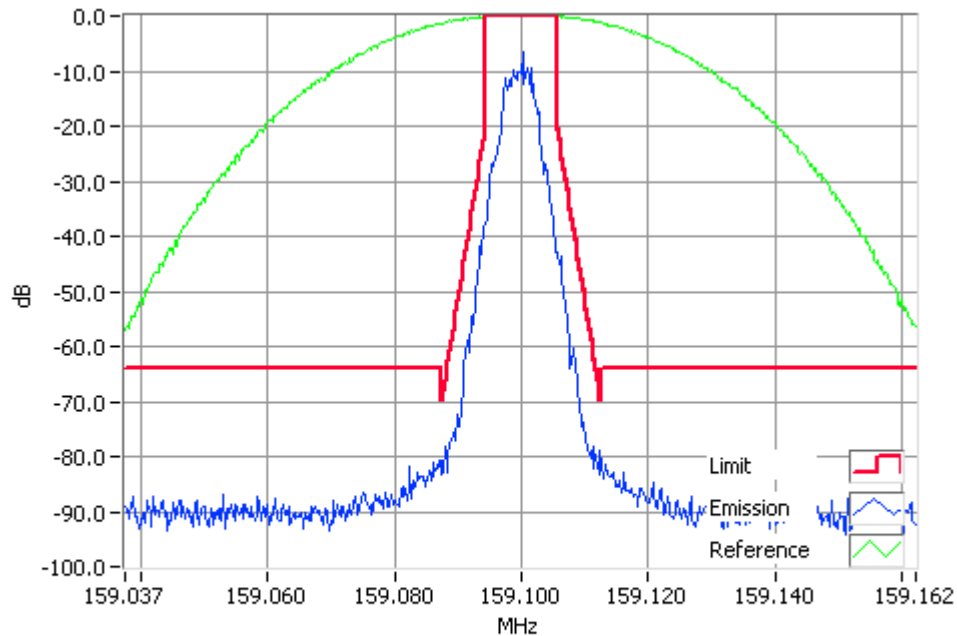
Occupied Bandwidth and Spectrum Masks

DMR

SPECIFICATION: FCC CFR 2.1049 (c)

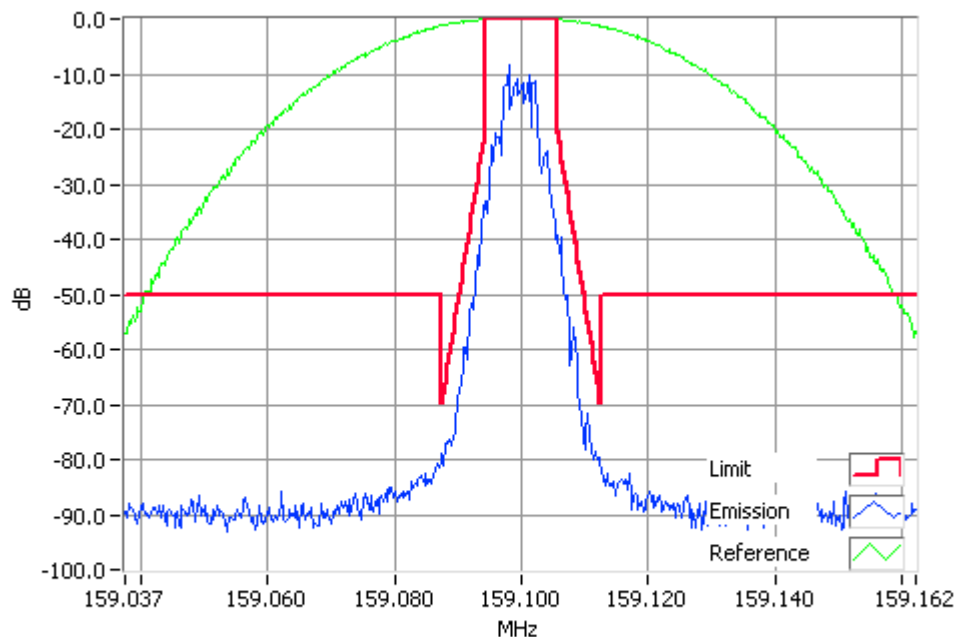
RSS-119 5.5

Tx FREQUENCY: 159.1 MHz 25 W 12.5 kHz Channel Spacing



DMR 159.1000MHz Mask D 25W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 159.1 MHz 1 W 12.5 kHz Channel Spacing



DMR 159.1000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

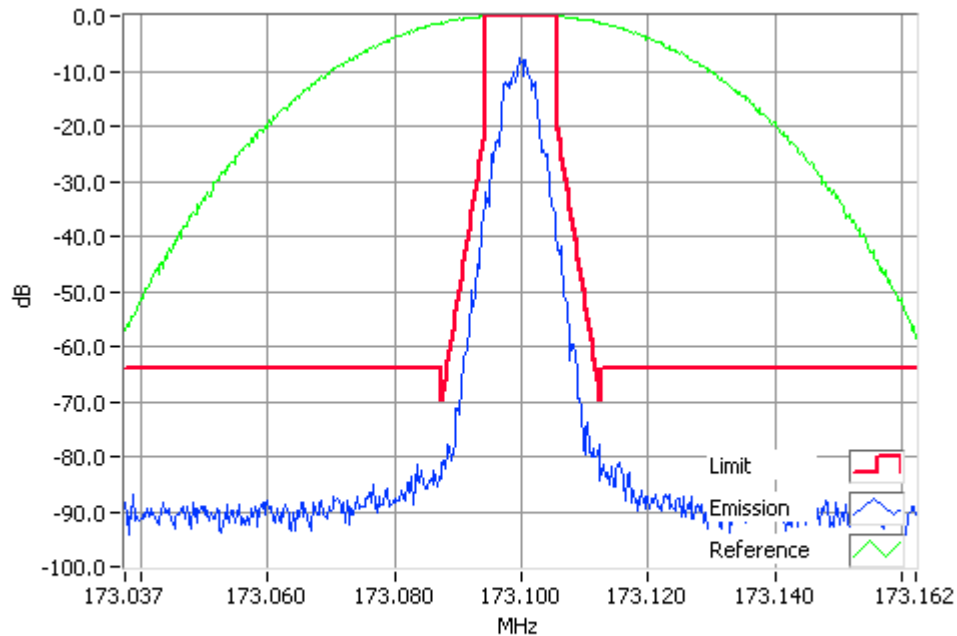
Occupied Bandwidth and Spectrum Masks

DMR

SPECIFICATION: FCC CFR 2.1049 (c)

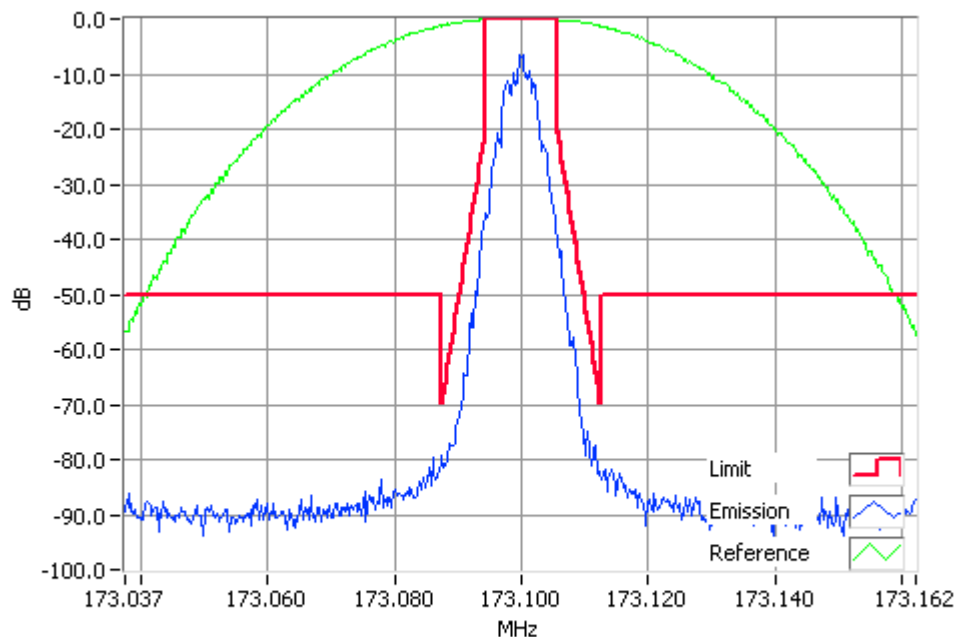
RSS-119 5.5

Tx FREQUENCY: 173.1 MHz 25 W 12.5 kHz Channel Spacing



DMR 173.1000MHz Mask D 25W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 173.1 MHz 1 W 12.5 kHz Channel Spacing



DMR 173.1000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

TRANSMITTER SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATIONS: FCC 47 CFR 2.1051

RSS-119 5.8

GUIDE: TIA/EIA-603D 2.2.13

MEASUREMENT PROCEDURE:

1. Refer Annex A for equipment set up.
2. The frequency range examined was from the lowest frequency generated within the EUT, to a frequency higher than the 10th Harmonic: 100 kHz to Fc-BW
Fc+ BW to 10Fc GHz
3. A Pre-scan is performed with a resolution bandwidth of 1 kHz, and a video bandwidth of 3 kHz. If any emissions are found to be within 20 dB of the limit a second measurement is made with the carrier modulated, and a resolution bandwidth of 10 kHz, and a video bandwidth of 30 kHz.

Spurious emissions which were attenuated by more than 20 dB below the limit were not recorded.

A photograph of the test set-up is included below.

MEASUREMENT RESULTS:

See the tables and plots on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

LIMIT CLAUSES: FCC 47 CFR 90.210

RSS-119 5.8

Photo: Conducted Emissions Test Setup



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

138.1 MHz @ 25 W

Emission Mask D

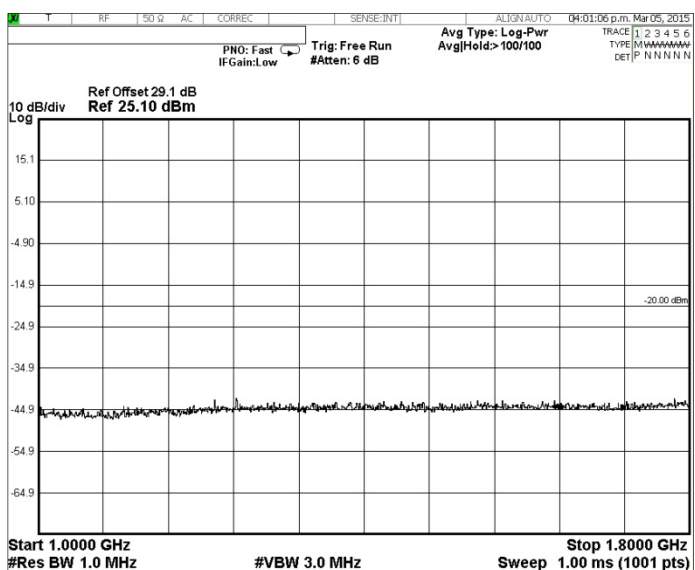
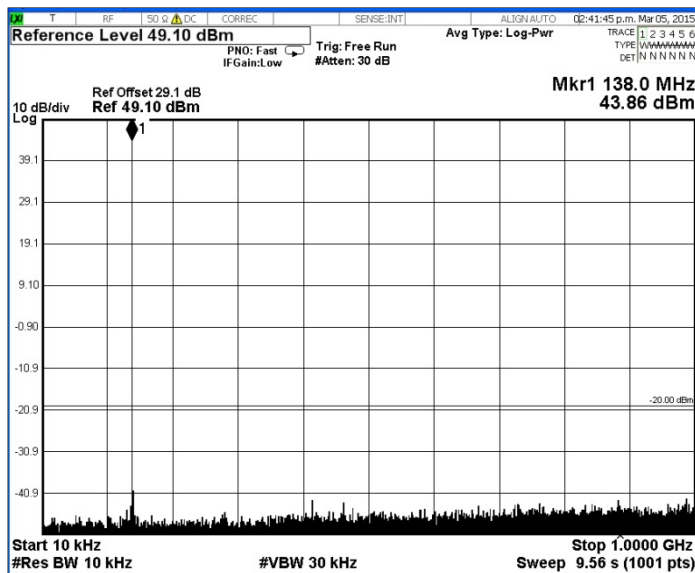
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing

138.1 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)

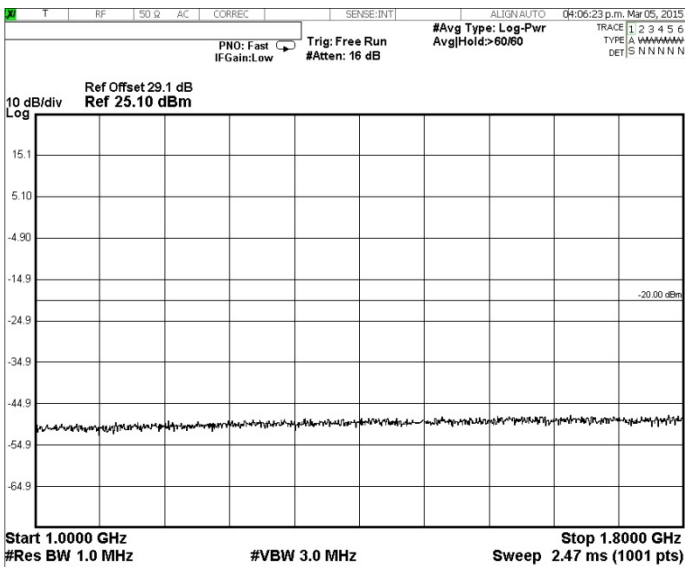
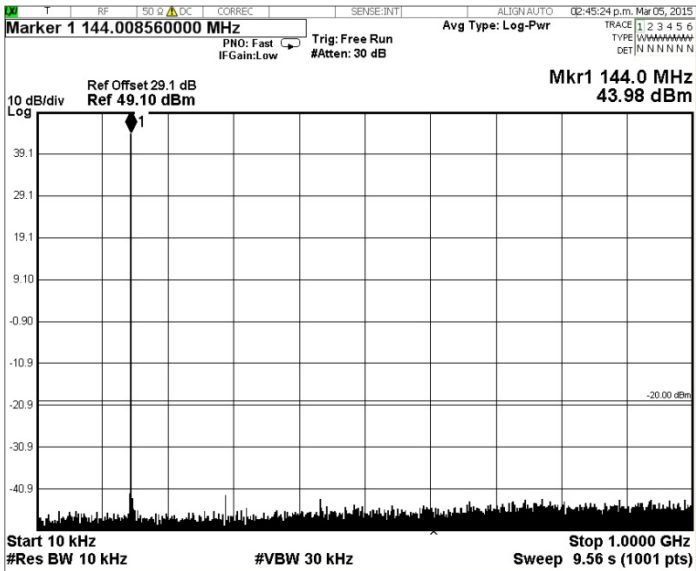
SPECIFICATION: FCC CFR 2.1051 RSS-119 5.8

12.5 kHz Channel Spacing 143.9 MHz @ 25 W Emission Mask D

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

12.5 kHz Channel Spacing 143.9 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)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

148.1 MHz @ 25 W

Emission Mask D

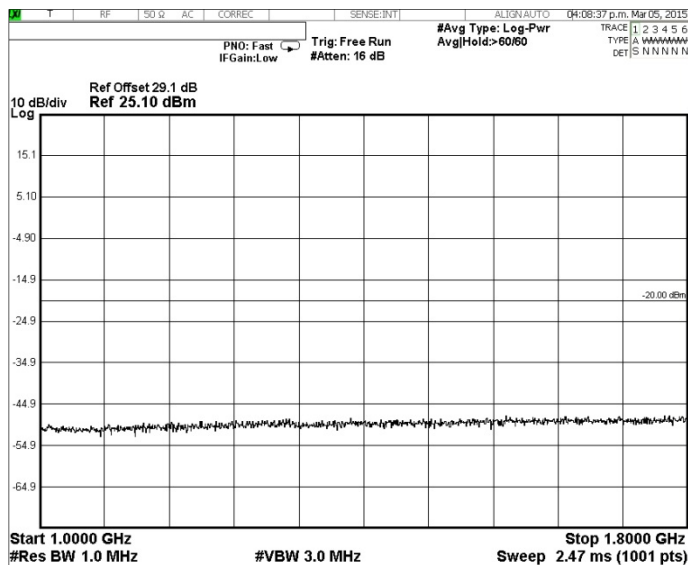
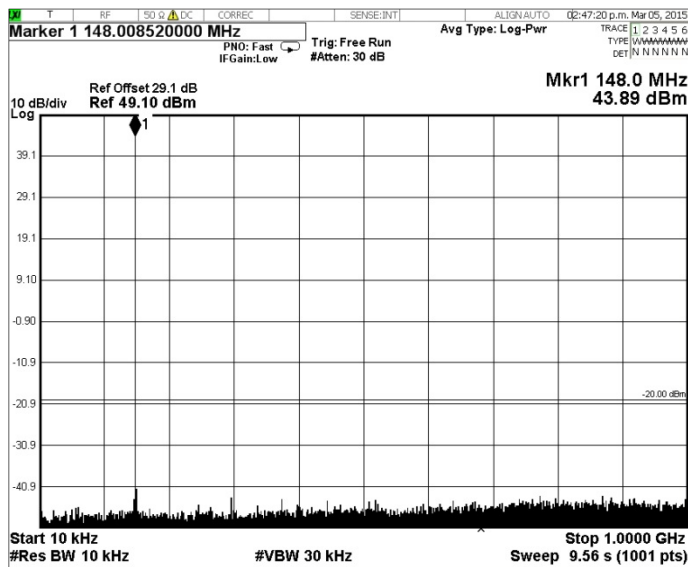
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing

148.1 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)

SPECIFICATION: FCC CFR 2.1051 RSS-119 5.8

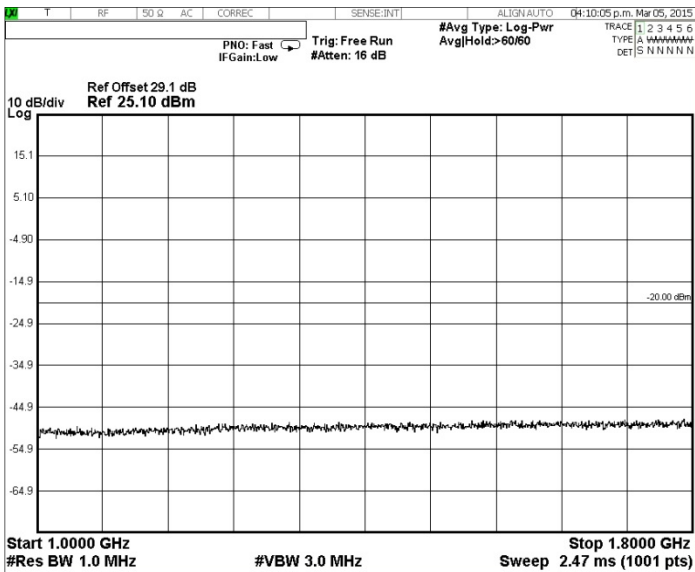
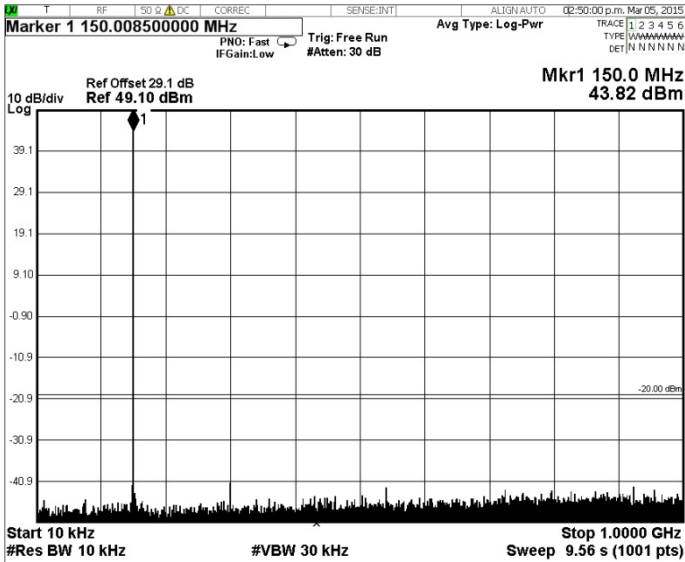
12.5 kHz Channel Spacing 149.8 MHz @ 25 W Emission Mask D

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

12.5 kHz Channel Spacing 149.8 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)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

151.1 MHz @ 25 W

Emission Mask D

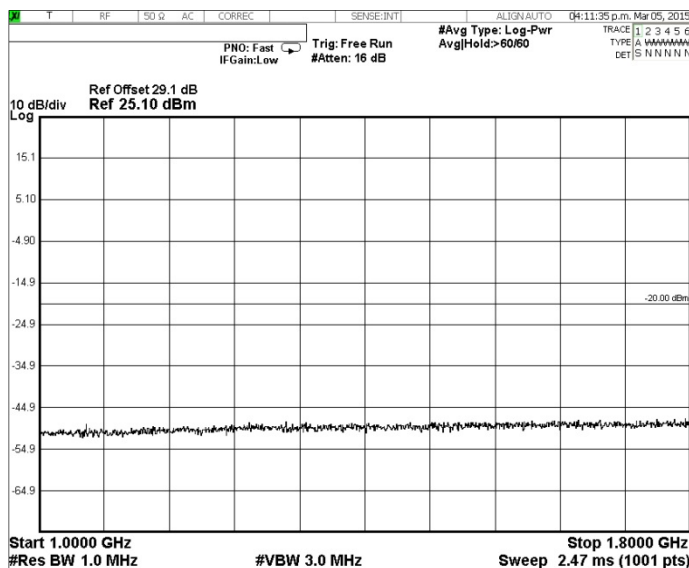
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing

151.1 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)

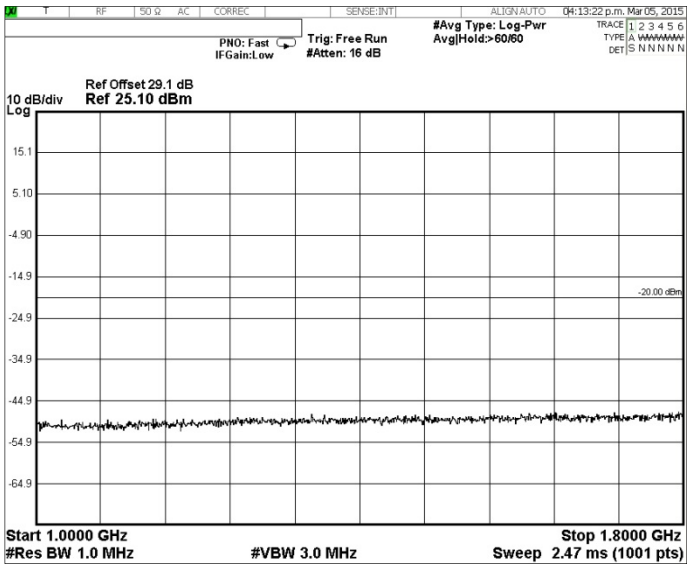
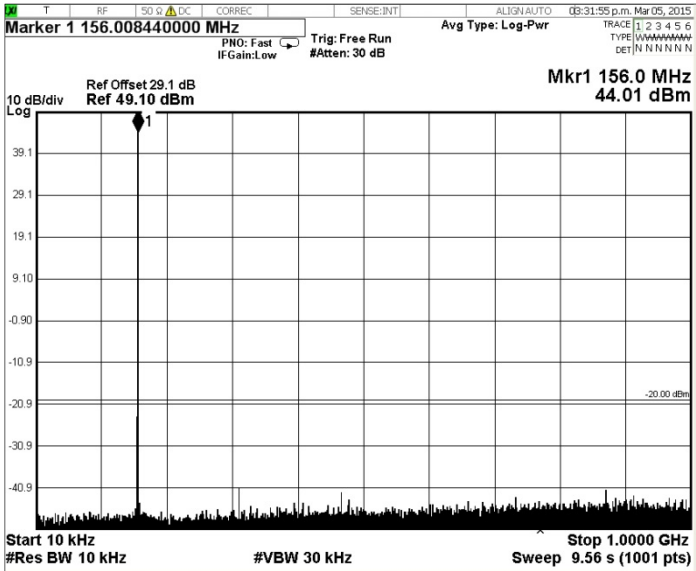
SPECIFICATION: FCC CFR 2.1051 RSS-119 5.8

12.5 kHz Channel Spacing 155.1 MHz @ 25 W Emission Mask D

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

12.5 kHz Channel Spacing 155.1 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)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

159.1 MHz @ 25 W

Emission Mask D

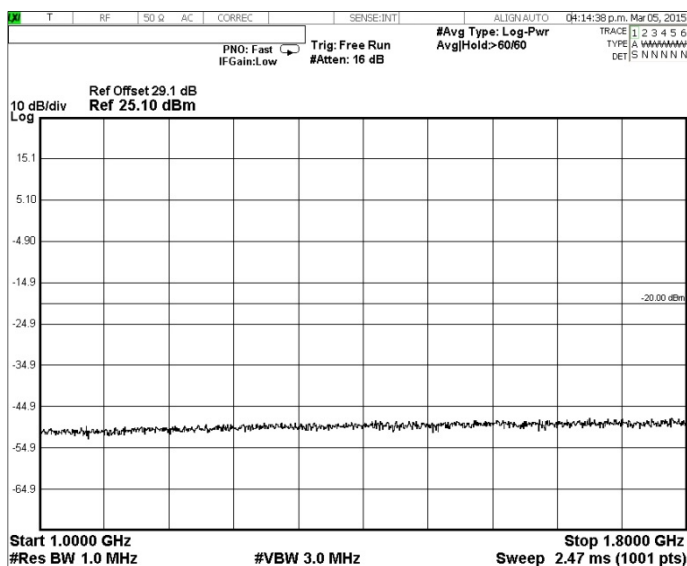
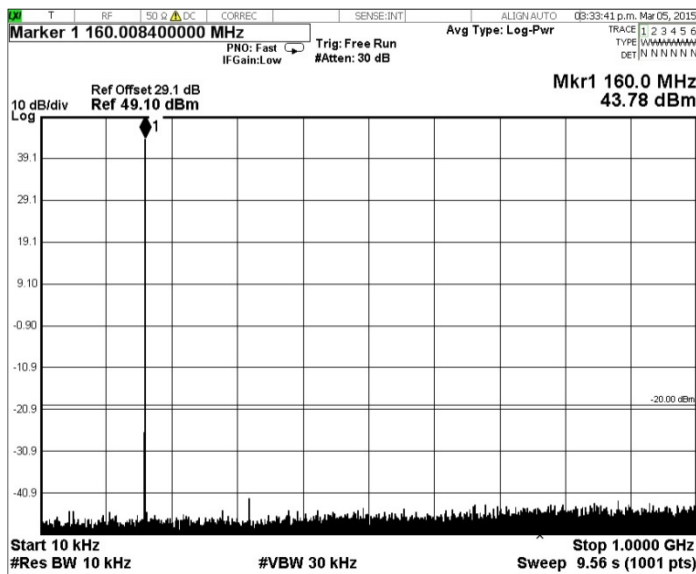
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing

159.1 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)

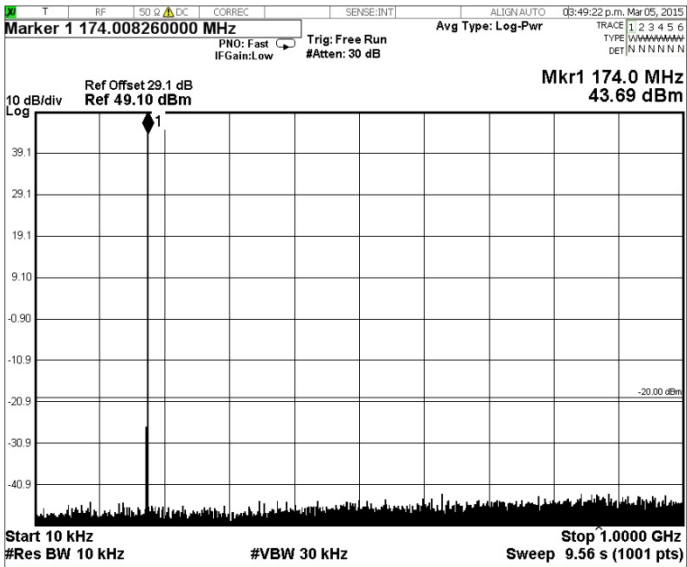
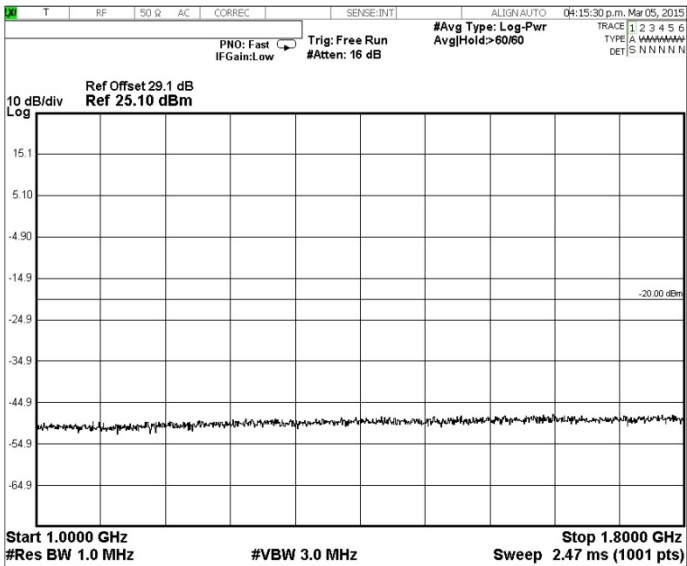
SPECIFICATION: FCC CFR 2.1051 RSS-119 5.8

12.5 kHz Channel Spacing 173.1 MHz @ 25 W Emission Mask D

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

12.5 kHz Channel Spacing 173.1 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)

SPECIFICATION: FCC 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 $50 + 10 \log_{10} (P_{\text{Watts}})$	
	-20 dBm	-64 dBc
25 W	-20 dBm	-64 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 1000 MHz. Any emission within 20 dB of the limit is then re-tested on the OATS along with measurements from 1000 MHz to the 10th harmonic of the fundamental frequency.
2. The EUT is placed in the reverberation chamber and emissions are measured from 1000 MHz to the upper frequency required. 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° 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 RESULTS:

See the tables on the following pages

LIMIT CLAUSE: FCC 47 CFR 90.210

Spurious Emissions (Tx Radiated)

SPECIFICATION: FCC CFR 2.1053

12.5 kHz Channel Spacing

138.1 MHz @ 25 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

138.1 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

143.9 MHz @ 25 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

143.9 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.		

LIMITS: FCC CFR 2.1053

Carrier Output Power	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \log_{10}(P_{\text{Watts}})$	
25 W	-20 dBm	-64 dBc
1 W	-20 dBm	-50 dBc

Spurious Emissions (Tx Radiated)

SPECIFICATION: FCC CFR 2.1053

12.5 kHz Channel Spacing

148.1 MHz @ 25 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

148.1 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

149.8 MHz @ 25 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

149.8 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)

SPECIFICATION: FCC CFR 2.1053

12.5 kHz Channel Spacing

151.1 MHz @ 25 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

151.1 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

155.1 MHz @ 25 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

155.1 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)

SPECIFICATION: FCC CFR 2.1053

12.5 kHz Channel Spacing

159.1 MHz @ 25 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

159.1 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

173.1 MHz @ 25 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

173.1 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.		

Tx Radiated Emissions - Continued

Open Area Test Site Results:

12.5 kHz Channel Spacing

151.1 MHz @ 25 W

Emission Mask D

Harmonics Emission Frequency (MHz)	Level (dBm)	Level (dBc)
302.2	-94.8	-138.8
453.3	-85.4	-129.4
604.4	-93.8	-137.8
755.5	-88.6	-132.6
906.6	-82.5	-126.5
1057.7	-80.8	-124.7

Photo: OATS Setup



TRANSIENT FREQUENCY BEHAVIOR

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

GUIDE: TIA/EIA-603D 2.2.19

MEASUREMENT PROCEDURE:

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

MEASUREMENT RESULTS:

See the tables and plots on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

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: 138.1 MHz 25 W 12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-0.8	N/A
t2	-0.3	N/A
t3	N/A	0.5

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	✓	☐
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.

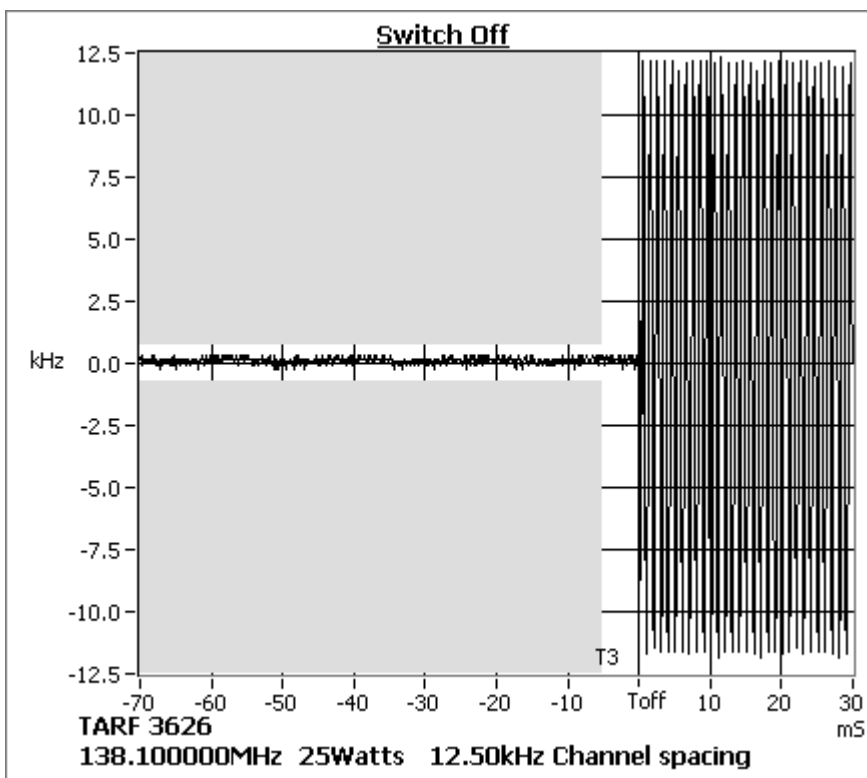
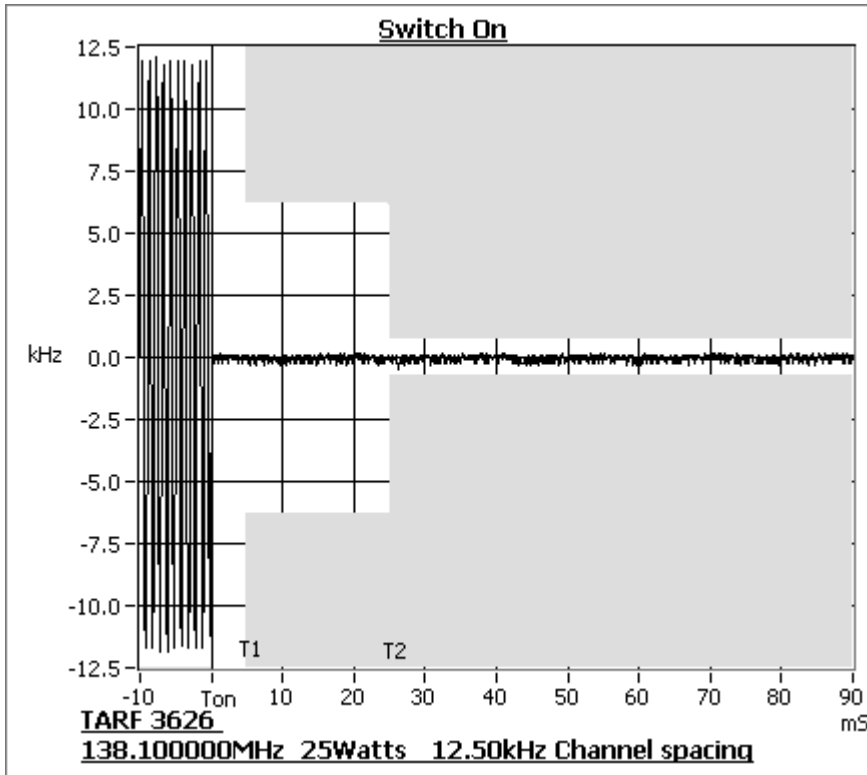
Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 138.1 MHz 25 W

12.5 kHz Channel Spacing



Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 143.9 MHz

25 W

12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-0.8	N/A
t2	-0.4	N/A
t3	N/A	0.4

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	✓	☐
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

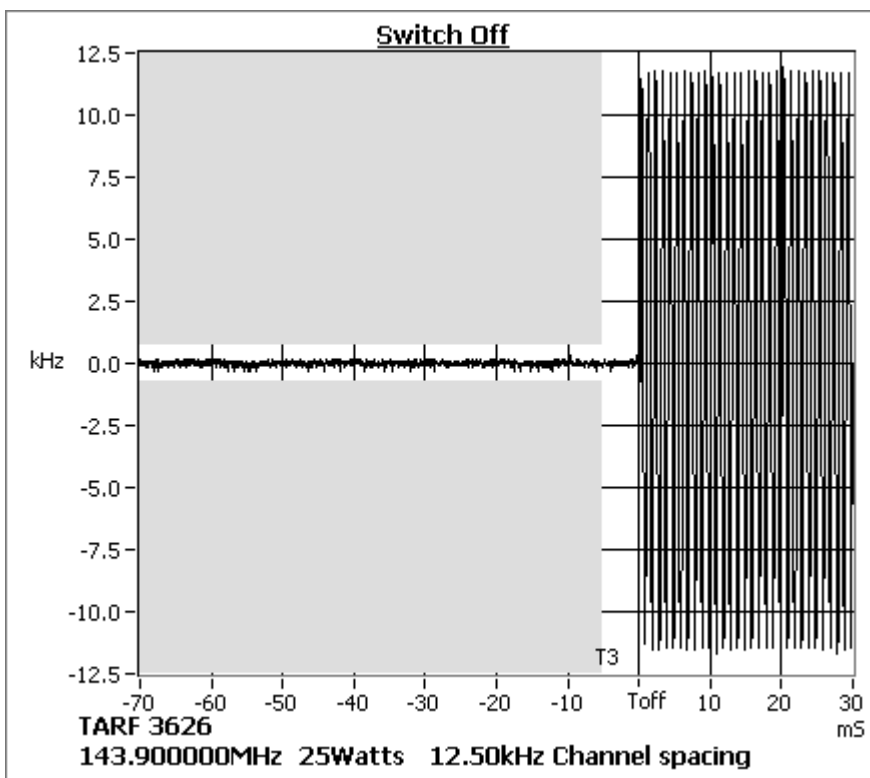
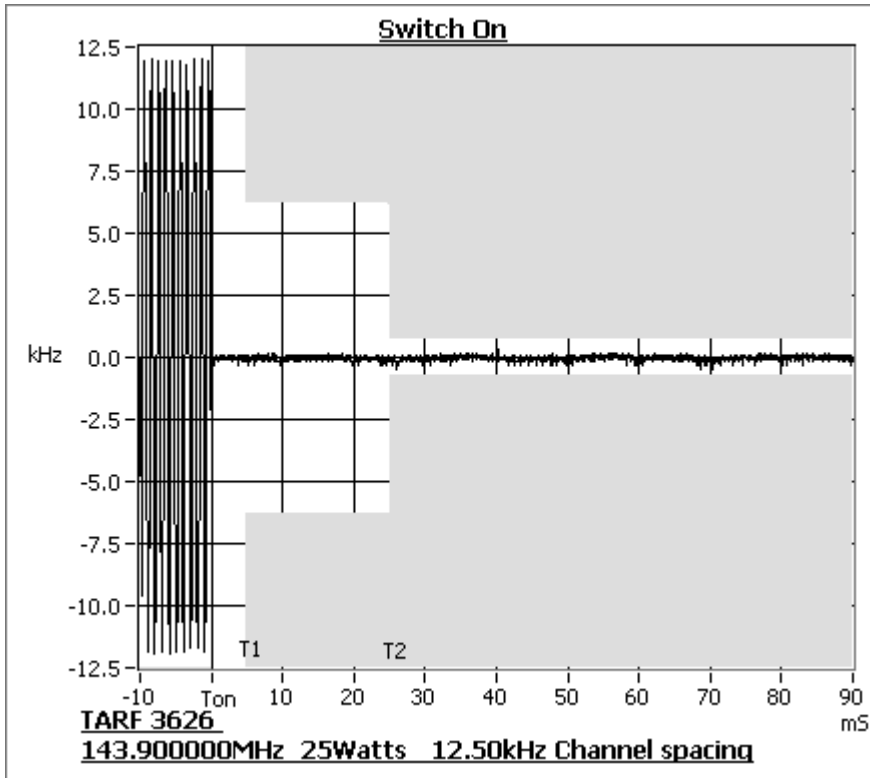
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	± 12.5 kHz	5 ms	10 ms
t2 (ms)	± 6.25 kHz	20 ms	25 ms
t3 (ms)	± 12.5 kHz	5 ms	10 ms

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

Tx FREQUENCY: 143.9 MHz 25 W 12.5 kHz Channel Spacing



Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 148.1 MHz

25 W

12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-0.4	N/A
t2	-0.4	N/A
t3	N/A	0.3

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	✓	☐
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

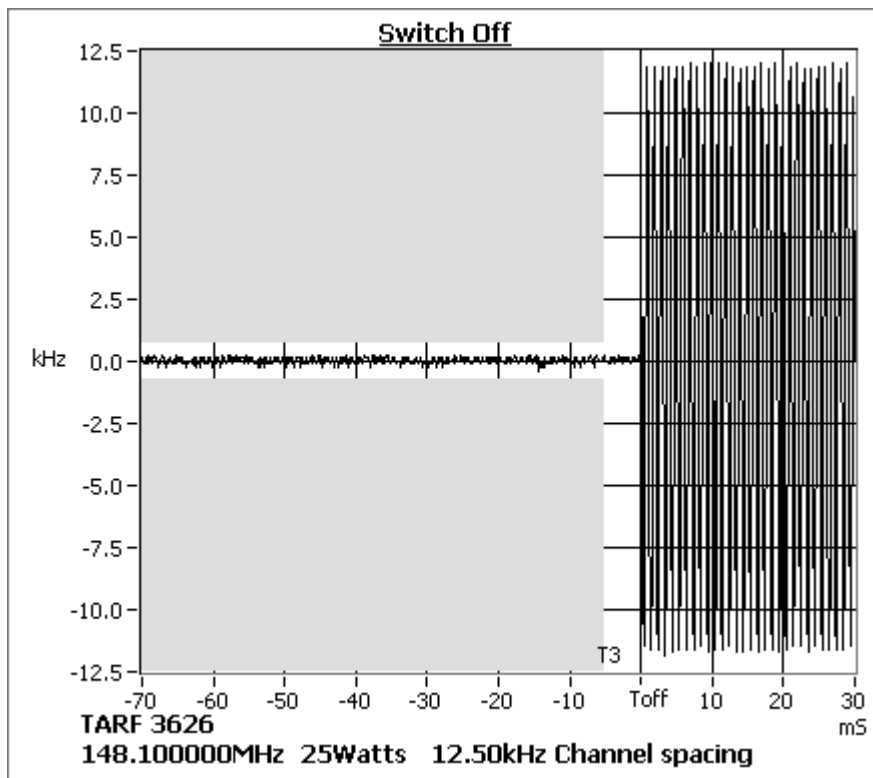
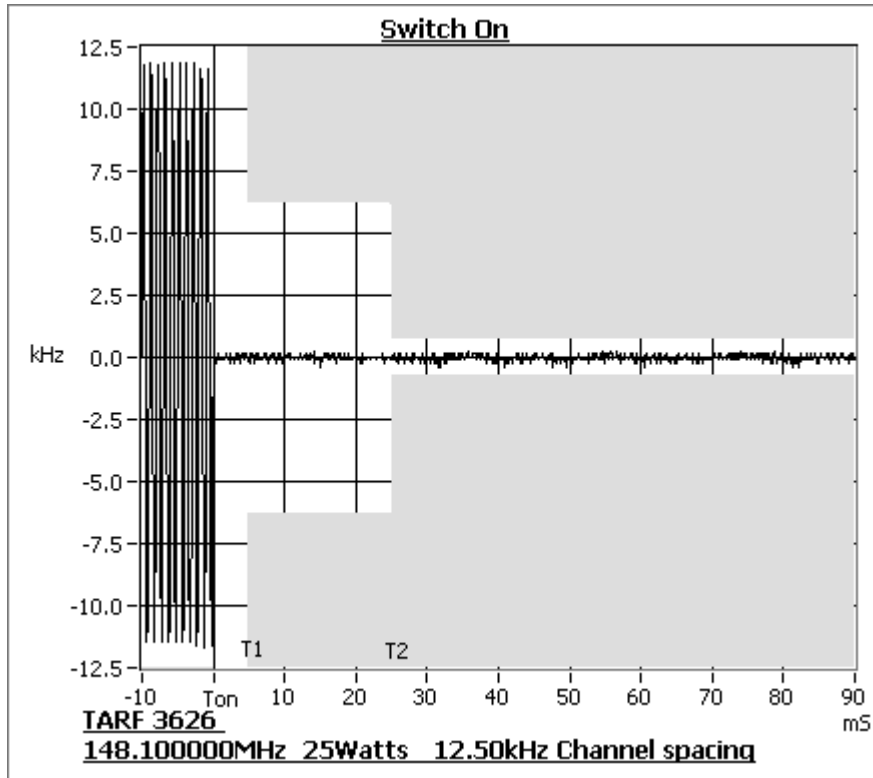
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	± 12.5 kHz	5 ms	10 ms
t2 (ms)	± 6.25 kHz	20 ms	25 ms
t3 (ms)	± 12.5 kHz	5 ms	10 ms

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

Tx FREQUENCY: 148.1 MHz 25 W 12.5 kHz Channel Spacing



Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 149.8 MHz

25 W

12.5 kHz Channel Spacing

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

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	✓	☐
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

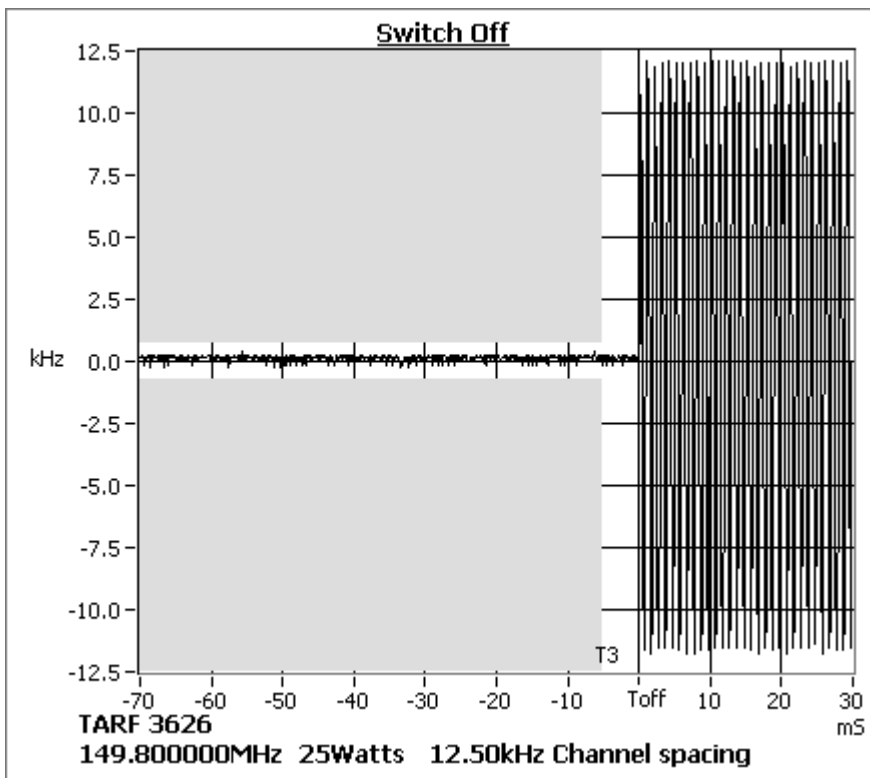
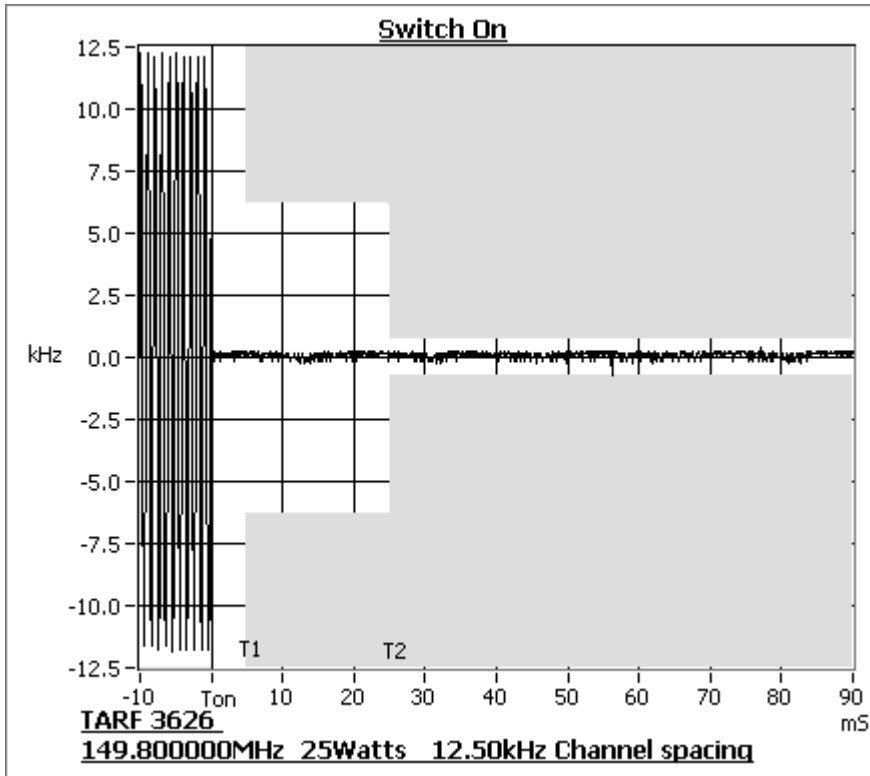
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	± 12.5 kHz	5 ms	10 ms
t2 (ms)	± 6.25 kHz	20 ms	25 ms
t3 (ms)	± 12.5 kHz	5 ms	10 ms

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

Tx FREQUENCY: 149.8 MHz 25 W 12.5 kHz Channel Spacing



Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 151.1 MHz

25 W

12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-0.7	N/A
t2	1.2	N/A
t3	N/A	0.7

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	✓	☐
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

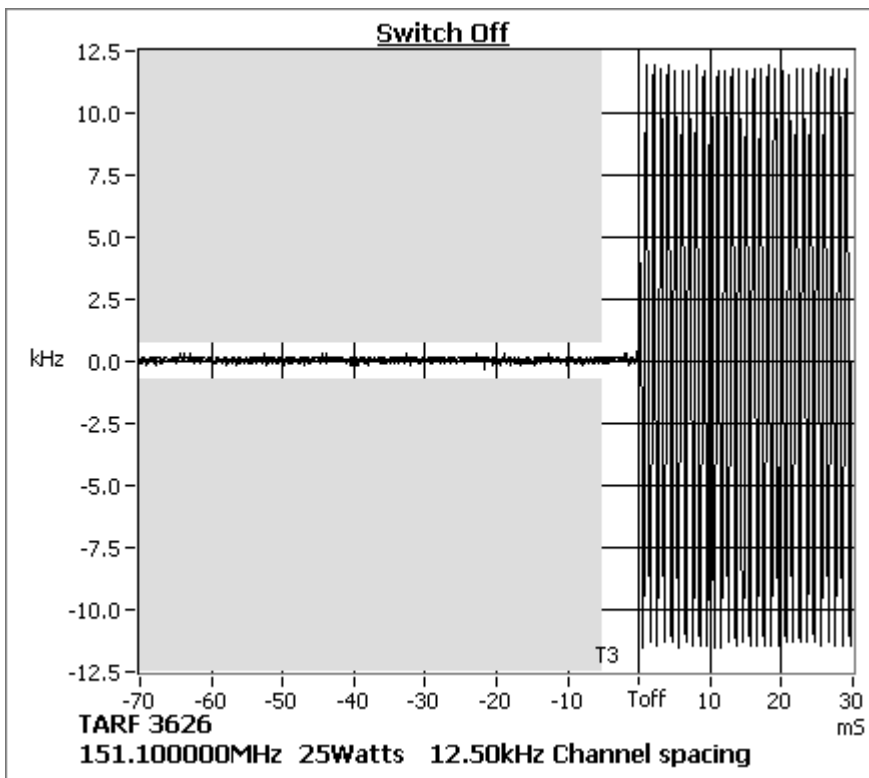
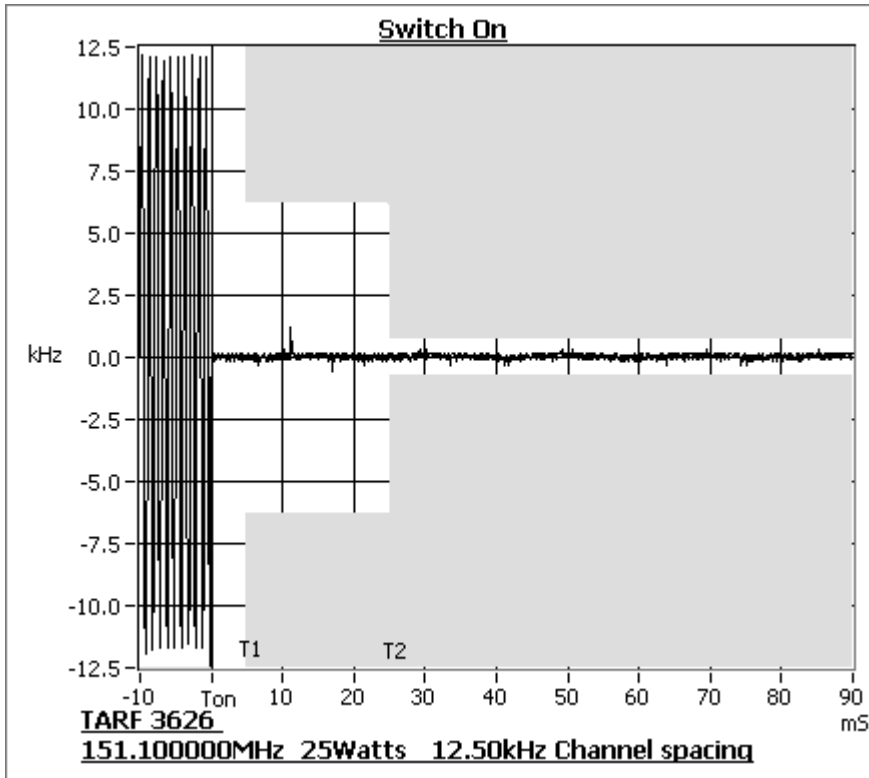
Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods,

Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 151.1 MHz 25 W

12.5 kHz Channel Spacing



Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 155.1 MHz

25 W

12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-1.2	N/A
t2	-0.4	N/A
t3	N/A	-0.3

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	✓	☐
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

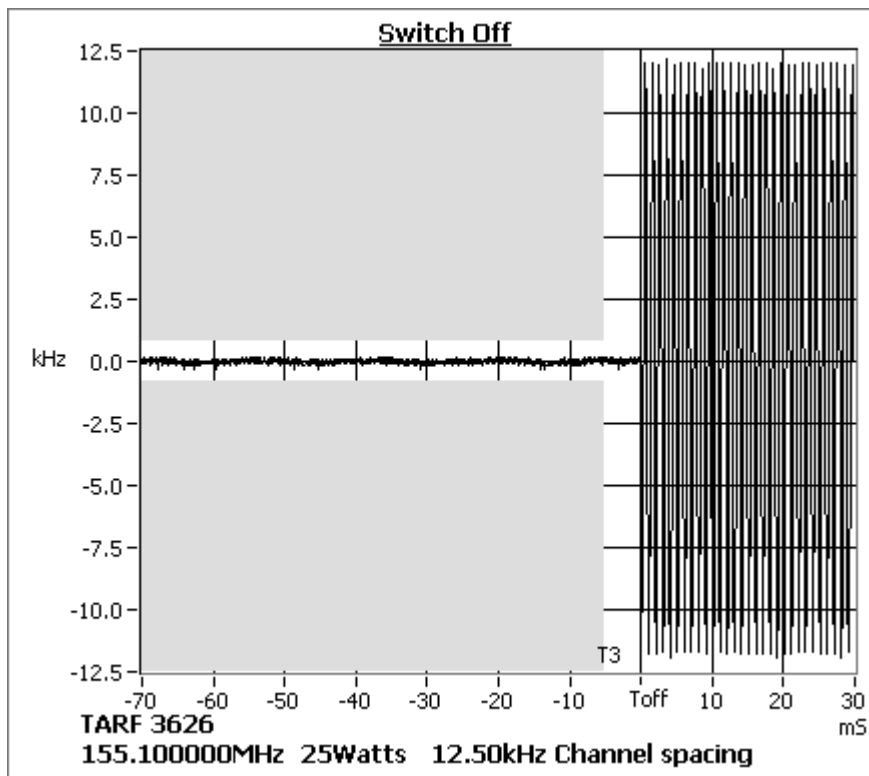
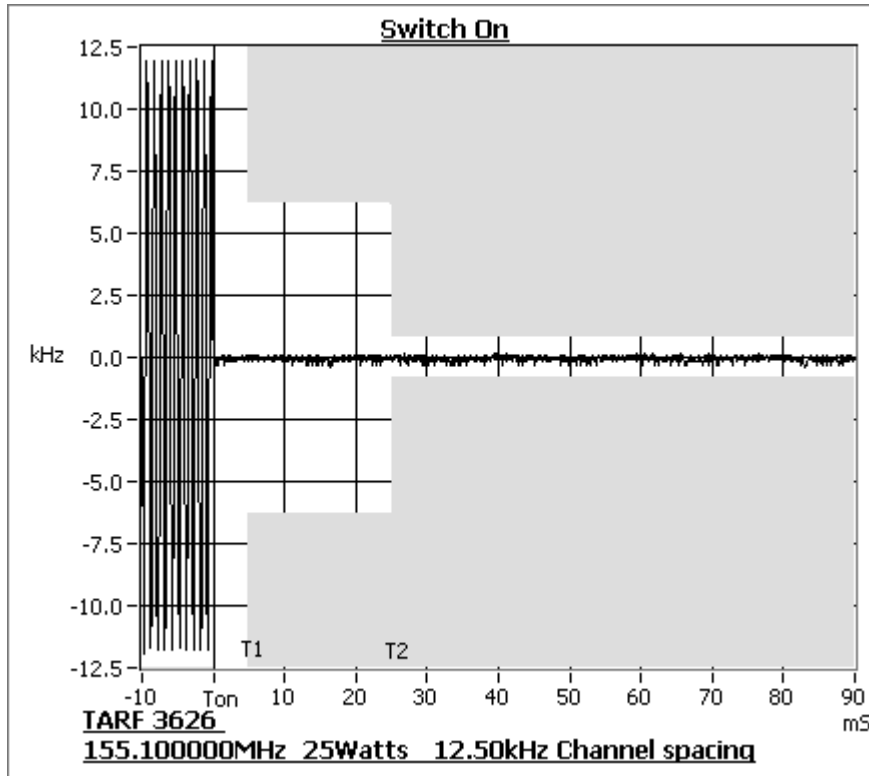
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	± 12.5 kHz	5 ms	10 ms
t2 (ms)	± 6.25 kHz	20 ms	25 ms
t3 (ms)	± 12.5 kHz	5 ms	10 ms

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

Tx FREQUENCY: 155.1 MHz 25 W 12.5 kHz Channel Spacing



Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 159.1 MHz

25 W

12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-1.9	N/A
t2	-0.4	N/A
t3	N/A	-0.3

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	✓	☐
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

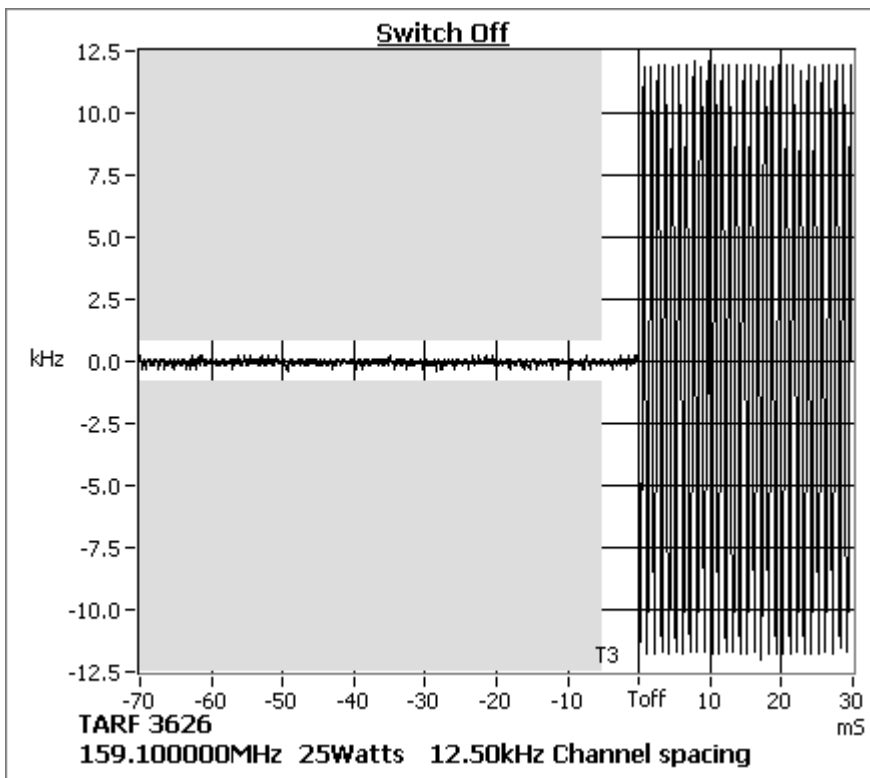
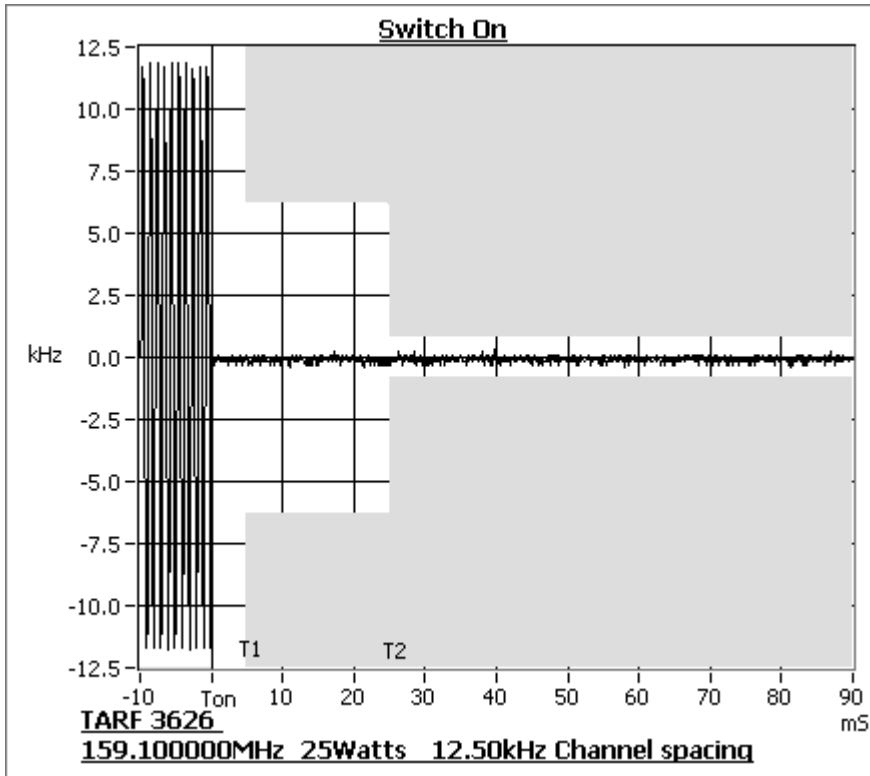
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	± 12.5 kHz	5 ms	10 ms
t2 (ms)	± 6.25 kHz	20 ms	25 ms
t3 (ms)	± 12.5 kHz	5 ms	10 ms

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

Tx FREQUENCY: 159.1 MHz 25 W 12.5 kHz Channel Spacing



Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

Tx FREQUENCY: 173.1 MHz

25 W

12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	1.1	N/A
t2	-0.4	N/A
t3	N/A	-0.3

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	✓	☐
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

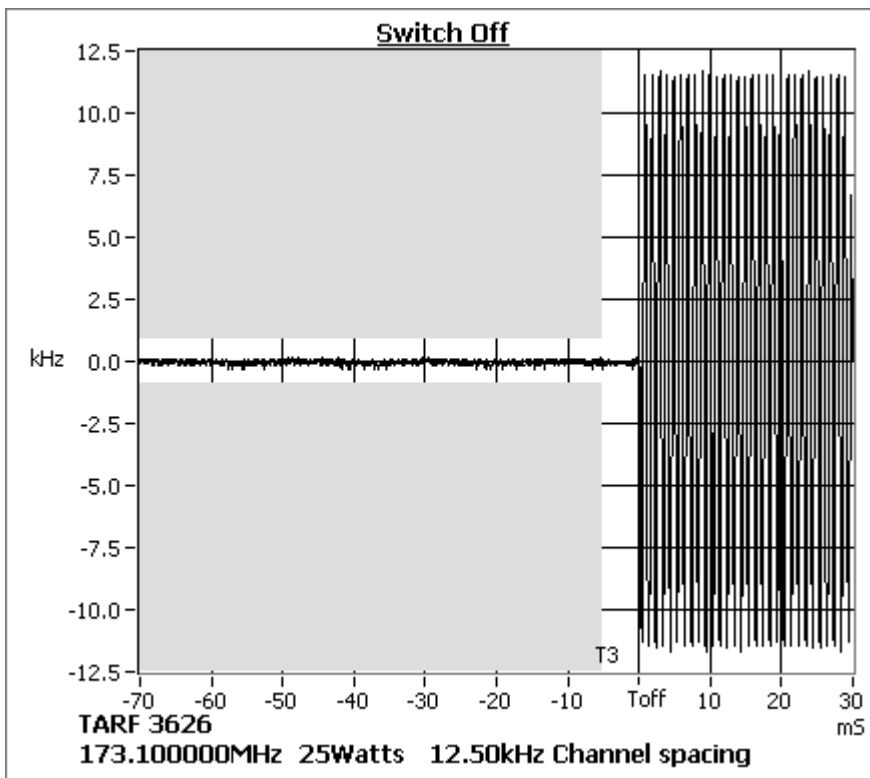
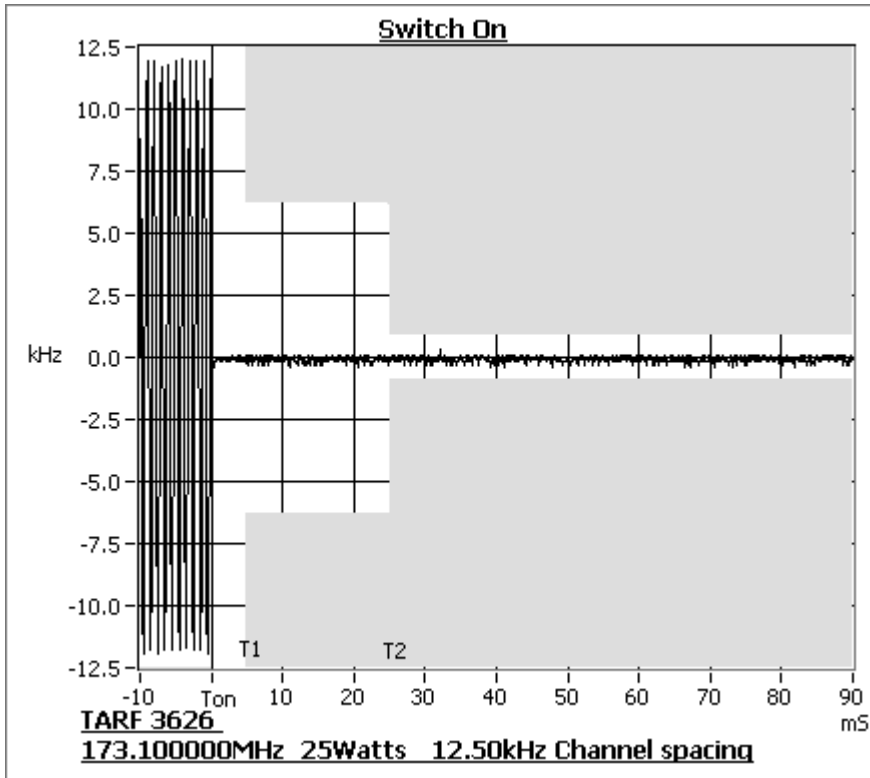
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	± 12.5 kHz	5 ms	10 ms
t2 (ms)	± 6.25 kHz	20 ms	25 ms
t3 (ms)	± 12.5 kHz	5 ms	10 ms

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

Tx FREQUENCY: 173.1 MHz 25 W 12.5 kHz Channel Spacing



TRANSMITTER FREQUENCY STABILITY - TEMPERATURE

SPECIFICATION: FCC 47 CFR 2.1055 (a) (1)

RSS-119 5.3

GUIDE: TIA/EIA-603D 2.2.2

MEASUREMENT PROCEDURE:

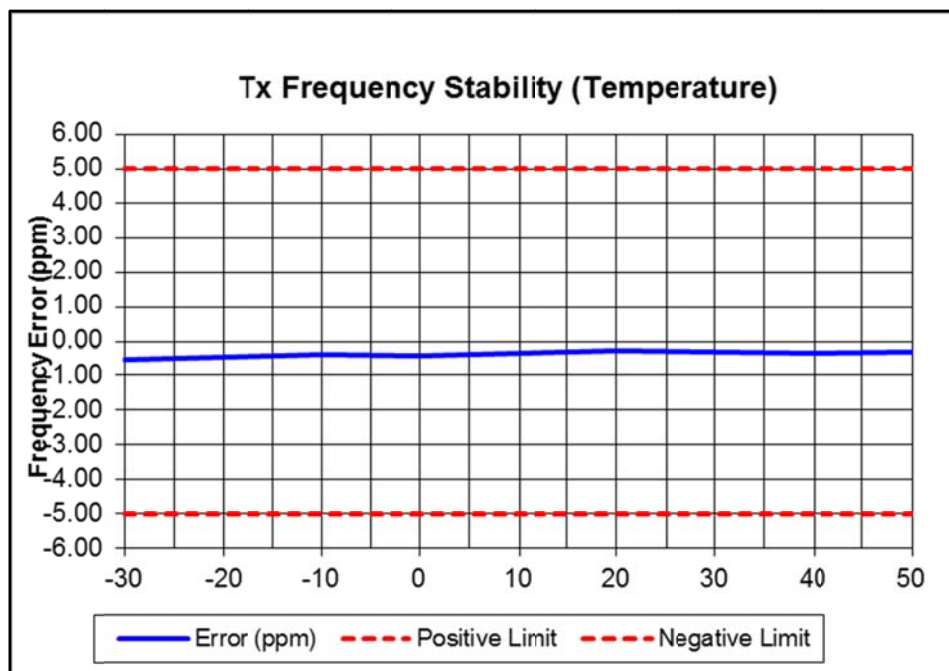
1. Refer Annex A for equipment set up.
2. The EUT was tested for frequency error from -30°C to $+50^{\circ}\text{C}$ in 10°C increments
3. The frequency error was recorded in parts per million (ppm).

MEASUREMENT RESULTS:

See the plots on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

138.1 MHz

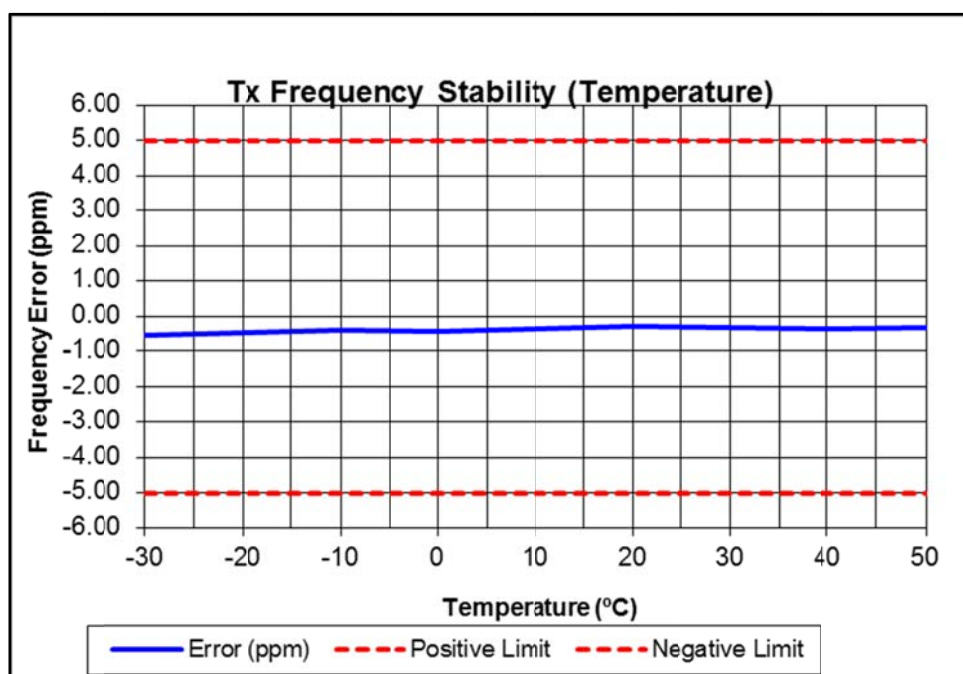
Temperature ($^{\circ}\text{C}$)	Frequency (MHz)	Error (ppm)
50	138.099955	-0.33
40	138.099948	-0.38
30	138.099955	-0.33
20	138.099961	-0.28
10	138.099947	-0.38
0	138.099940	-0.43
-10	138.099946	-0.39
-20	138.099932	-0.49
-30	138.099924	-0.55



Transmitter Frequency Stability - Temperature

143.9 MHz

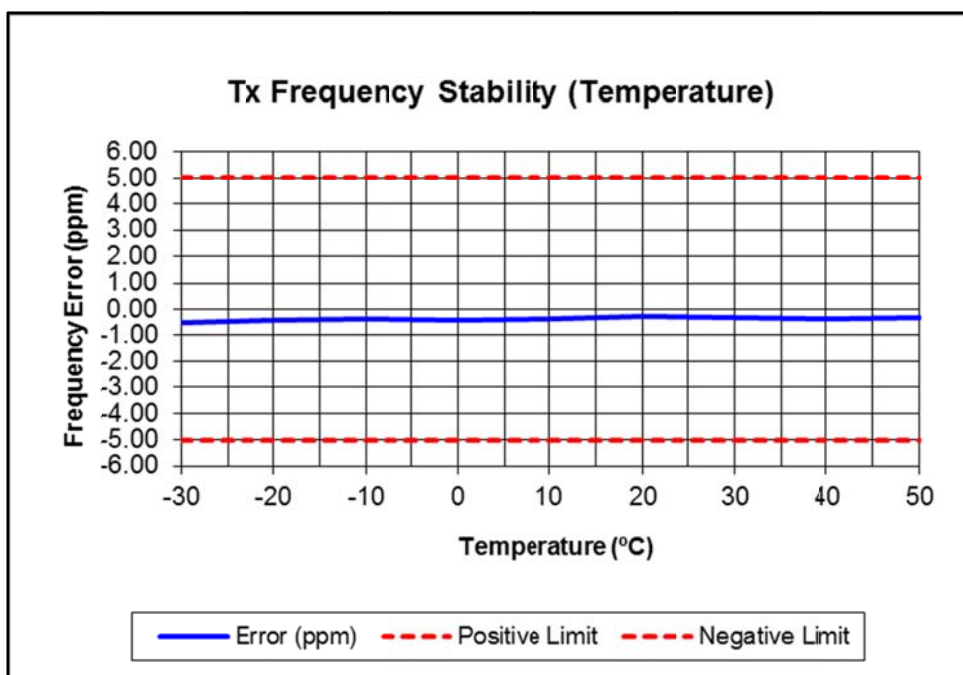
Temperature (°C)	Frequency (MHz)	Error (ppm)
50	143.899954	-0.32
40	143.899949	-0.35
30	143.899955	-0.31
20	143.899960	-0.28
10	143.899946	-0.38
0	143.899940	-0.42
-10	143.899945	-0.38
-20	143.899934	-0.46
-30	143.899924	-0.53



Transmitter Frequency Stability - Temperature

148.1 MHz

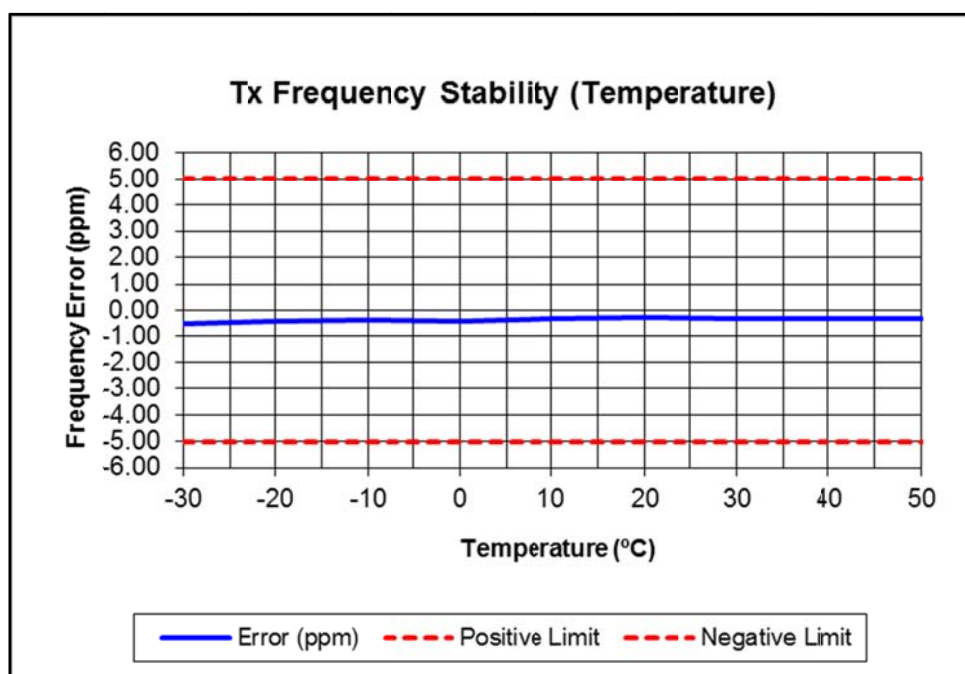
Temperature (°C)	Frequency (MHz)	Error (ppm)
50	148.099953	-0.32
40	148.099948	-0.35
30	148.099954	-0.31
20	148.099960	-0.27
10	148.099947	-0.36
0	148.099937	-0.43
-10	148.099947	-0.36
-20	148.099938	-0.42
-30	148.099922	-0.53



Transmitter Frequency Stability - Temperature

149.8 MHz

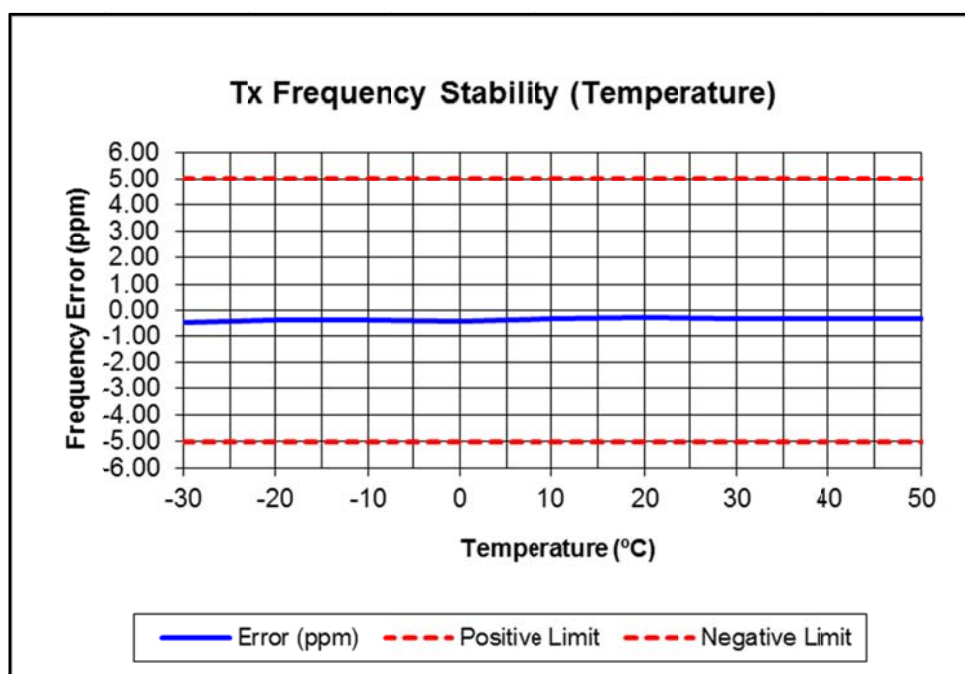
Temperature (°C)	Frequency (MHz)	Error (ppm)
50	149.799954	-0.31
40	149.799949	-0.34
30	149.799950	-0.33
20	149.799961	-0.26
10	149.799949	-0.34
0	149.799934	-0.44
-10	149.799945	-0.37
-20	149.799938	-0.41
-30	149.799923	-0.51



Transmitter Frequency Stability - Temperature

151.1 MHz

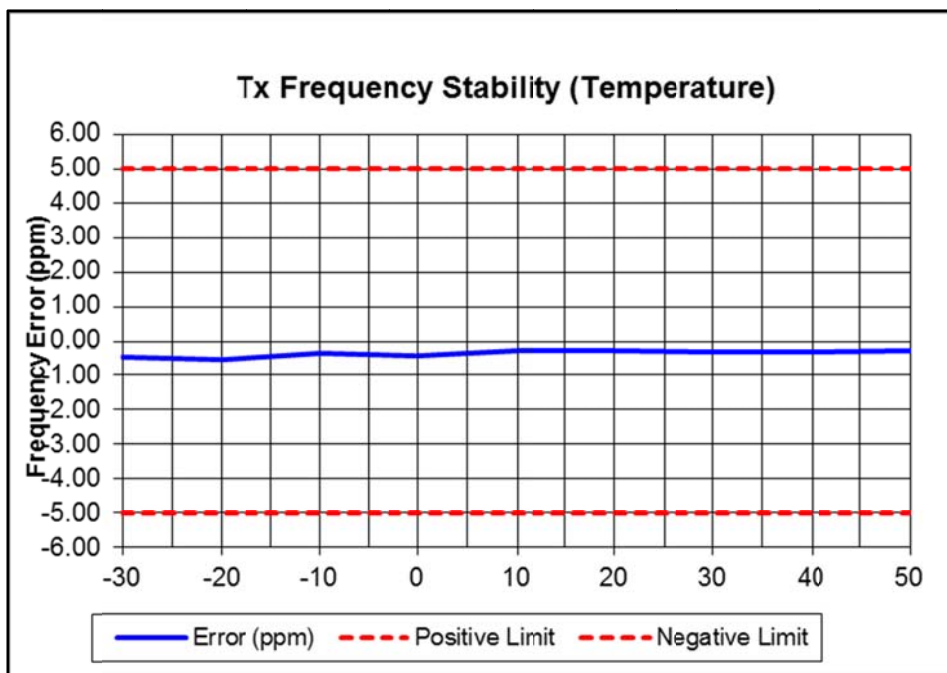
Temperature (°C)	Frequency (MHz)	Error (ppm)
50	151.099955	-0.30
40	151.099950	-0.33
30	151.099950	-0.33
20	151.099960	-0.26
10	151.099950	-0.33
0	151.099936	-0.42
-10	151.099944	-0.37
-20	151.099942	-0.38
-30	151.099926	-0.49



Transmitter Frequency Stability - Temperature

155.1 MHz

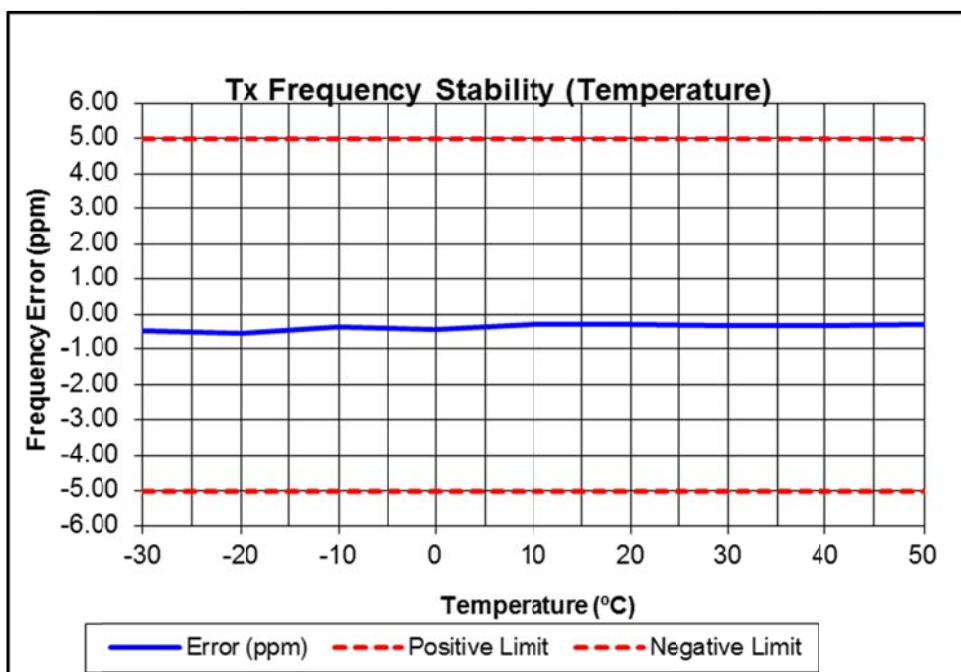
Temperature (°C)	Frequency (MHz)	Error (ppm)
50	155.099952	-0.31
40	155.099947	-0.34
30	155.099947	-0.34
20	155.099957	-0.28
10	155.099952	-0.31
0	155.099933	-0.43
-10	155.099943	-0.37
-20	155.099912	-0.57
-30	155.099928	-0.46



Transmitter Frequency Stability - Temperature

159.1 MHz

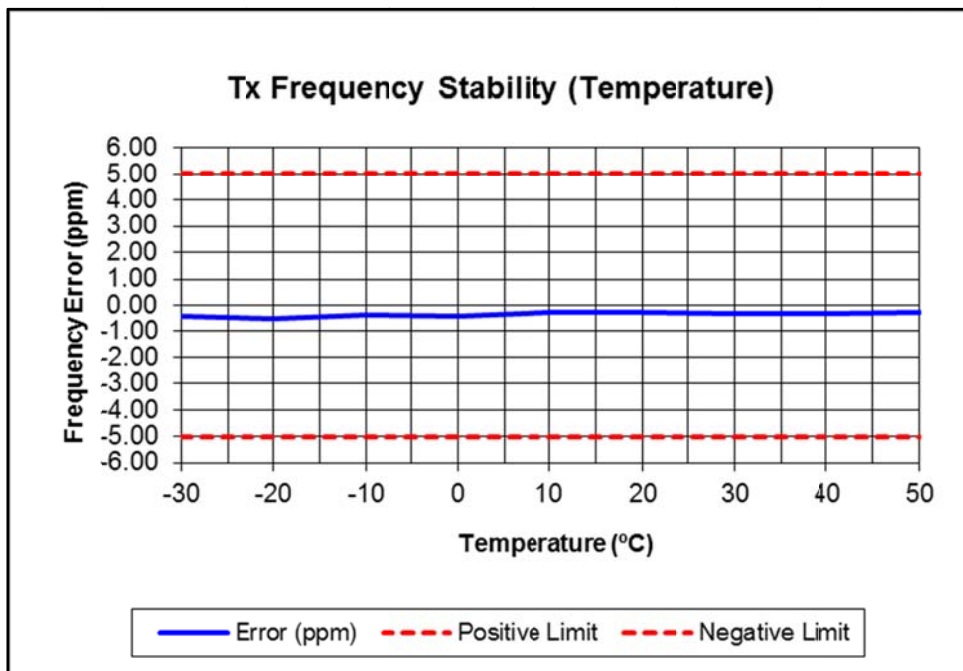
Temperature (°C)	Frequency (MHz)	Error (ppm)
50	159.099952	-0.30
40	159.099947	-0.33
30	159.099946	-0.34
20	159.099954	-0.29
10	159.099952	-0.30
0	159.099934	-0.41
-10	159.099941	-0.37
-20	159.099914	-0.54
-30	159.099928	-0.45



Transmitter Frequency Stability - Temperature

173.1 MHz

Temperature (°C)	Frequency (MHz)	Error (ppm)
50	173.099952	-0.28
40	173.099943	-0.33
30	173.099944	-0.32
20	173.099952	-0.28
10	173.099951	-0.28
0	173.099929	-0.41
-10	173.099934	-0.38
-20	173.099914	-0.50
-30	173.099924	-0.44



LIMIT:	FCC 47 CFR 90.213	RSS-119 5.3
	Channel Spacing (kHz)	Frequency Error (ppm)
	12.5	5

TRANSMITTER FREQUENCY STABILITY - VOLTAGE

SPECIFICATION: FCC 47 CFR 2.1055 (d) (1)

RSS-119 5.3

GUIDE: TIA/EIA-603D 2.2.2

MEASUREMENT PROCEDURE:

1. Refer Annex A for equipment set up.
2. The EUT was tested for frequency error at an input voltage to the radio of 85% to 115%.
3. The frequency error was recorded in parts per million (ppm).

MEASUREMENT RESULTS:

Voltage	FREQUENCY ERROR (ppm) for 12.5 kHz			
	138.1 MHz	143.9 MHz	148.1 MHz	149.8 MHz
24.0 V _{DC}	-0.43	-0.40	-0.40	-0.41
9.0 V _{DC}	-0.37	-0.39	-0.38	-0.40
36.0 V _{DC}	-0.40	-0.39	-0.38	-0.40

Voltage	FREQUENCY ERROR (ppm) for 12.5 kHz			
	151.1 MHz	155.1 MHz	159.1 MHz	173.1 MHz
24.0 V _{DC}	-0.41	-0.40	-0.36	-0.34
9.0 V _{DC}	-0.39	-0.37	-0.34	-0.34
36.0 V _{DC}	-0.39	-0.43	-0.33	-0.34

LIMIT CLAUSES: FCC 47 CFR 90.213

RSS-119 5.3

Channel Spacing (kHz)	Frequency Error (ppm)
12.5	5.0

RECEIVER SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: RSS-119 5.11

GUIDE: TIA/EIA-603D 2.1.2

MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment set up diagram.
2. The frequency range examined was from 30 MHz to 3 times highest tunable frequency.
3. Spurious emissions which were attenuated more than 20 dB below the limit were not recorded.

138.1 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
No emissions were detected within 20 dB of Limit.		

143.9 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
No emissions were detected within 20 dB of Limit.		

148.1 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
No emissions were detected within 20 dB of Limit.		

149.8 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
No emissions were detected within 20 dB of Limit.		

RECEIVER SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: RSS-119 5.11

151.1 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
No emissions were detected within 20 dB of Limit.		

155.1 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
No emissions were detected within 20 dB of Limit.		

159.1 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
No emissions were detected within 20 dB of Limit.		

173.1 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
No emissions were detected within 20 dB of Limit.		

LIMIT CLAUSE: RSS-Gen 6(b)

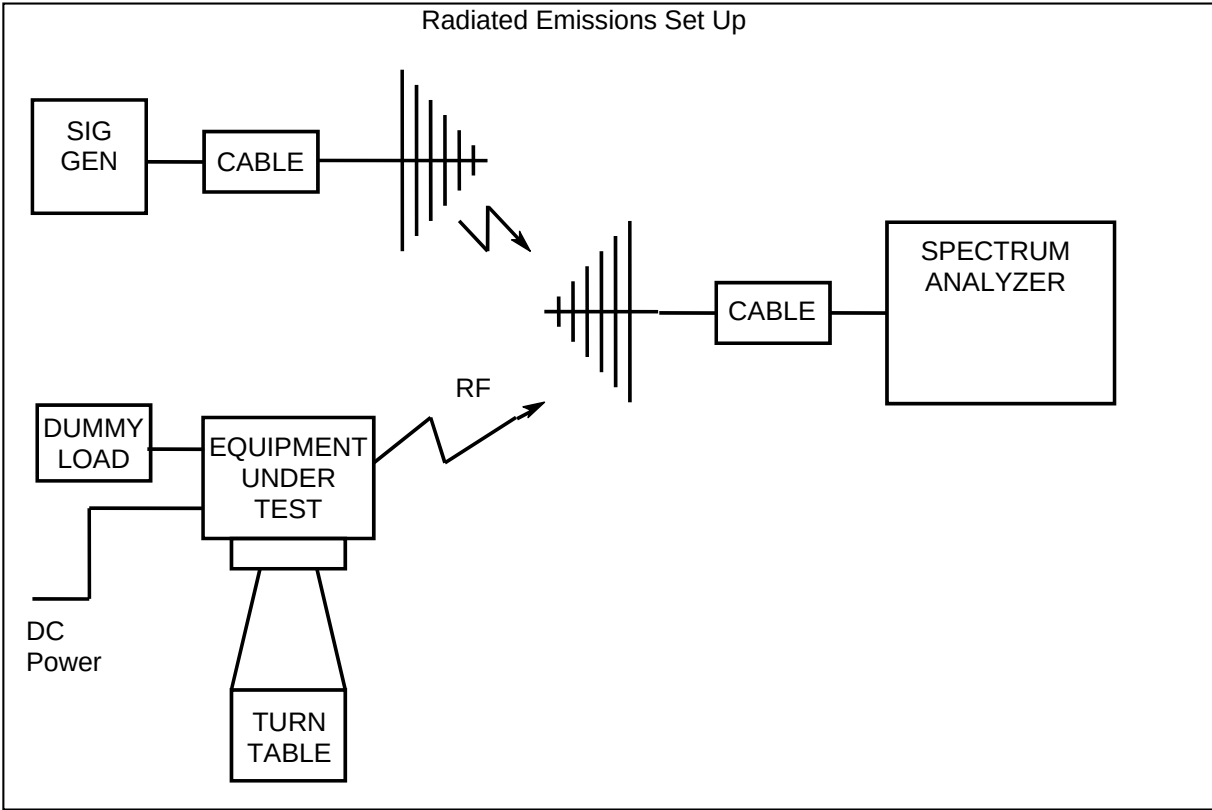
LIMIT	30 → 1000 MHz	2 nW	- 57 dBm
	> 1000 MHz	5 nW	- 53 dBm

TEST EQUIPMENT LIST

Equipment Type	Information	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
Oscilloscope	100MHz Digital	Tektronics	TDS340	B013611	E3585	16-Oct-15
Environ. Chamber	Chest	Contherm	Chest	E3397	E3397	2-Aug-15
Environ. Chamber	Chest	Contherm	Chest	E3397	E3397	1-Aug-15
Power Supply	TREVA2 60V/25A	Agilent	N5767A	US09F4901H	E4656	16-Oct-15
Antenna	Reference Dipoles	Emco	3121C DB1	9510-1164	E3559	30-Jan-16
Antenna	18GHz DRG	Emco	DRG3115	9512-4638	E3560	6-Mar-16
Antenna	18GHz DRG	Emco	DRG3115	2084	E3076	6-Mar-16
Spectrum Analyser	26.5GHz	Agilent	PXA N9030A	MY49432161	E4907	6-Jul-16
Transient Limiter	9kHz to 200MHz	Agilent	11947A	3107A03657	E4982	8-Apr-15
RF Chamber	S-LINE TEM CELL	Rohde & Schwarz	1089.9296.02	338232/003	E3636	31-Aug-15
RF Amplifier	+21.7 dB 1GHz	Tait	ZFL-1000LN	E3660	E3360	19-Jan-16
RF Attenuator	20dB 25W	Weinschel	33-20-33	BD5871	E3673	14-Oct-15
RF Attenuator	TREVA2 20dB 150W	Weinschel	40-20-33	CJ405	E3733	15-Oct-15
Coax Cable	2m Black	Suhner	RG214HF/Nm/Nm/2000	TeltestBlack3	E4624	15-Oct-15
Audio Analyser	TREVA2	Hewlett Packard	HP8903B	2818A04275	E3710	16-Oct-15
Power Supply	60V/50A/1000W	Hewlett Packard	HP6012B	2524A00616	E3712	16-Oct-15
Modulation Analyser	TREVA2	Hewlett Packard	HP8901B (Opt 002)	3704A05837	E3786	18-Oct-15
Signal Generator	Digital 4GHz	Agilent	E4433B	US38440446	E4147	22-Oct-16
Signal Generator	TREVA2 Analog 3.3GHz	Rohde & Schwarz	SML03 1090.3000.13	100597	E4050	24-Oct-15
RF Attenuator	TREVA2 3dB	Weinschel	Model 1	BL9950	E4080	
RF Combiner	TREVA2	Minicircuits	ZFSC-4-1	-	E4084	
Spectrum Analyser	13.2GHz	Agilent	E4445A	MY42510072	E4139	22-Oct-16
Coax Cable	OATS Turntable Cable 1	Intelcom	RG214	OATS1	E4621	23-Oct-15
Coax Cable	OATS Tower Cable	Intelcom	RG214	OATS2	E4622	23-Oct-15
OATS	Antenna Tower	Electrometrics	EM-4720-2	112	E4447	
OATS	Controller	Electrometrics	EM-4700	119	E4445	
OATS	Turntable	Electrometrics	EM-4704A	105	E4446	
RF Attenuator	30dB 350W	Weinschel	67-30-33	BR0531	E4280	18-Oct-15
Coax Cable	2m Black	Suhner	RG214HF/Nm/Nm/2000	TeltestBlack5	E4850	14-Oct-15
Power Meter	TREVA2 Power Head for HP8901	Hewlett Packard	HP11722A	2716A02037	1575	18-Oct-15
Antenna	Log Periodic	Schwarzbeck	VUSLP	9111-219	E4617	
TREVA 2		Teltest	-	2	-	4-May-15
Coax Cable	Reverb - 4.5m Multiflex 141	TeltestBlue6	MF 141	TeltestBlue6	E4843	13-Oct-16
Coax Cable	Reverb - 2m Multiflex 141	TeltestBlue5	MF 141	TeltestBlue5	E4844	14-Oct-15
Coax Cable	Reverb - 2m Multiflex 141	TeltestBlue4	MF 141	TeltestBlue4	E4845	14-Oct-15
Coax Cable	Reverb - 1m Multiflex 141	TeltestBlue3	MF 141	TeltestBlue3	E4846	14-Oct-15
Coax Cable	Reverb - 1m Multiflex 141	TeltestBlue2	MF 141	TeltestBlue2	E4847	14-Oct-15
Coax Cable	Reverb - 1m Multiflex 141	TeltestBlue1	MF 141	TeltestBlue1	E4848	14-Oct-15
RF Chamber	Reverb - Stirrer controller for reverb chamber	Teseq	Stirrer Controller	29765.1	E4854	
RF Chamber	Reverb - 0.5 - 18GHz Reverberation Chamber	Teseq	RVC XS	29765	E4855	
Antenna	Reverb - 1-18GHz DRG	Schwarzbeck	BBHA 9120 D	9120D-885	E4857	
Antenna	Reverb - 1-18GHz DRG	Schwarzbeck	BBHA 9120 D	9120D-884	E4858	
RF Amplifier	Pre-amplifier	Agilent	87405C	MY47010688	E4941	16-Oct-15
OATS	FCC Listing Registration			837095		12-May-16
Power Supply	60V/25A	Agilent	N5767A	3111A05573	E4979	21-Oct-15
LISN	32A 50ohm//50µH	Cranage	VN3-635	3527	E4996	9-Jan-16

NOTE: Items without calibration dates are calibrated immediately before use, or set using calibrated instruments.

ANNEX A – TEST SETUP DETAILS



All other testing is performed using the Teltest Radio **EVA**luation system (TREVA), which is configured as shown below. The Spectrum Analyser is connected to the EUT via the attenuator network for Conducted Emissions testing, and Occupied Bandwidth.

