

LABORATORY TEST REPORT

RADIO PERFORMANCE MEASUREMENTS

for the

TBCB1E Base Station Transceiver

Tested in accordance with:

FCC 47 CFR Part 22, 74 & 90

RSS-119 Issue 11
RSS-Gen Issue 3

Report Revision: 1

Issue Date: 4-July-2012

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TABLE OF CONTENTS

REVISION	3
INTRODUCTION	4
STATEMENT OF COMPLIANCE.....	5
MODULATION TYPES, NECESSARY BANDWIDTH, and EMISSION DESIGNATORS	6
TEST RESULTS	7
TRANSMITTER OUTPUT POWER (CONDUCTED)	7
OCCUPIED BANDWIDTH AND SPECTRUM MASKS	8
SPURIOUS EMISSIONS (Tx CONDUCTED)	13
SPURIOUS EMISSIONS (Tx RADIATED).....	16
TRANSMITTER FREQUENCY STABILITY - TEMPERATURE	20
TRANSMITTER FREQUENCY STABILITY - VOLTAGE	25
SPURIOUS EMISSIONS (Tx STANDBY / Rx CONDUCTED)	26
TRANSIENT FREQUENCY BEHAVIOUR	29
TEST EQUIPMENT LIST	38
ANNEX 1– RADIATED EMISSIONS TEST SETUP DETAILS.....	39
ANNEX 2– AUTOMATED EMISSIONS TEST SETUP DETAILS	39
ANNEX 3 – TX CONDUCTED EMISSION PLOTS	40
ANNEX 4 – TX STANDBY / RX CONDUCTED EMISSION PLOTS	48

REVISION

Date	Revision	Comments
4-July-2012	1	Initial test report

INTRODUCTION

This report covers the requirements of FCC 47 Part 22, 74, 90 and RSS-119 Issue 11 & RSS-Gen Issue 3.

REASON FOR REPORT
The TB9300 B1 100W Base Station is a new addition to the Tait Ltd product line capable of Digital Mobile Radio (DMR) modulation.

Type Approval Testing of the
TBCB1E DMR Base Station
Transceiver

Frequency Range (MHz)	F.C.C. Part No.
150.800-152.855	22
157.450-162.0125	22
152.855-154.000	74
157.450-161.575	74
161.625-161.775	74
162.0125-173.200	74
150.8-156.2475	90, 90.210
157.0375-161.575	90, 90.210
161.775-173.400	90, 90.210

in accordance with: FCC 47 CFR Part 22, 74, 90
RSS-119 Issue 11 & RSS-Gen Issue 3

REPORT PREPARED FOR
Tait Ltd
PO Box 1645
558 Wairakei Road
Christchurch
New Zealand

DESCRIPTION OF SAMPLE

Manufacturer: Tait Limited
Equipment: Base Station Transceiver
Type: TBCB1E
TBCB1E Base Station Transceiver consisting of:

FUNCTIONAL DESCRIPTION	PRODUCT DESIGNATION CODE	SERIAL NUMBER (S)
Reciter	T01-01105-DAAA	18149983
Power Amplifier	TBA90B1-0000	18151079
Power Management Unit	TBA30A0-0100	18150942
Front Panel	T01-01110-CAAA	18149991
Sub Rack	T01-01131-0003	18149976

Quantity: 1 of each

Hardware & Software Details:

FUNCTIONAL DESCRIPTION	FIRMWARE VERSION	HARDWARE VERSION
Reciter	dmr-0.04.00.0003	00.00
Power Amplifier	0312	00.02
Power Management Unit	0314	00.03
Front Panel	0.01.00.trunk.20120417163306-r4.5	00.01

TEST CONDITIONS

All testing was performed between 11th June → 2nd July 2012, and under the following conditions:

Ambient temperature: 20°C → 30°C
Relative Humidity: 20% → 75%
Standard Test Voltage 120 V_{AC}

STATEMENT OF COMPLIANCE

The TBCB1E base station transceiver as tested in this report was found to conform to the following standards:

FCC CFR 47 Parts 22, 74 & 90

RSS-119 Issue 11 & RSS-Gen Issue 3

MODULATION TYPES, NECESSARY BANDWIDTH, and EMISSION DESIGNATORS

MODULATION TYPES:

4 Level FSK (as per ETSI TS 102 361-1) 4800 symbols/sec 9600 bps

CHANNEL SPACING: 12.5 kHz

NECESSARY BANDWIDTH: The necessary bandwidth has been measured using the 99% energy rule, and in accordance with TIA/EIA 102 CAAB 2.2.5.2 and RSS-Gen 4.6.1

99% bandwidth = 7.6 kHz

EMISSION DESIGNATORS:

Data and Voice	7K60FXW
Data Only	7K60FXD

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 2 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 UNCERTAINTY: ± 0.6 dB

MEASUREMENT RESULTS:

Manufacturer's Rated Output Power: Switchable: 100 W and 10 W

Nominal 100 W Unmodulated	152.1 MHz	153.1 MHz	158.1 MHz	173.1 MHz
Measured (Watts)	105.2	105.4	105.2	107.8
Variation (%)	5.2	5.4	5.2	7.8
Variation (dB)	0.22	0.23	0.22	0.33

Nominal 10 W Unmodulated	152.1 MHz	153.1 MHz	158.1 MHz	173.1 MHz
Measured (Watts)	10.4	10.4	10.4	10.6
Variation (%)	4.0	4.0	4.0	6.0
Variation (dB)	0.17	0.17	0.17	0.25

LIMIT CLAUSES:

FCC 47 CFR 90.205 (s)

The output power shall not exceed by more than 20% of 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.

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 2 for Equipment Set up.
2. The EUT was modulated with an internally generated pseudo random bit sequence at the appropriate Baud rates.
3. The Occupied Bandwidth was measured on the Spectrum Analyser, with bandwidth settings as follows.

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

MEASUREMENT RESULTS:

See the plots on the following pages.

LIMIT CLAUSE: FCC 47 CFR 90.210 RSS-119 5.5

EMISSION MASKS

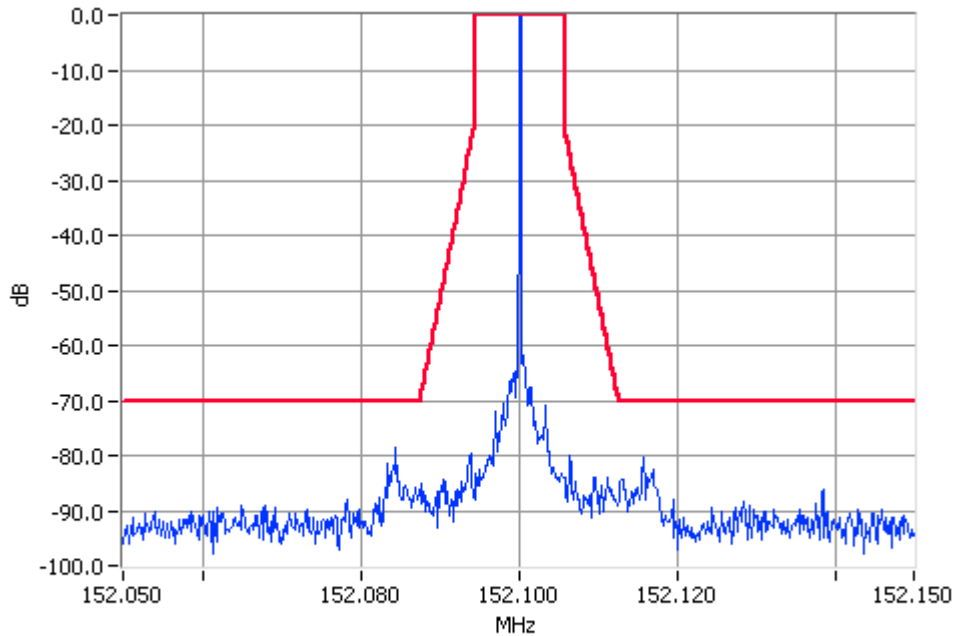
Emission Mask D 12.5 kHz Channel Spacing

DATA SPEED 12.5 kHz Channel Spacing 9600 bps

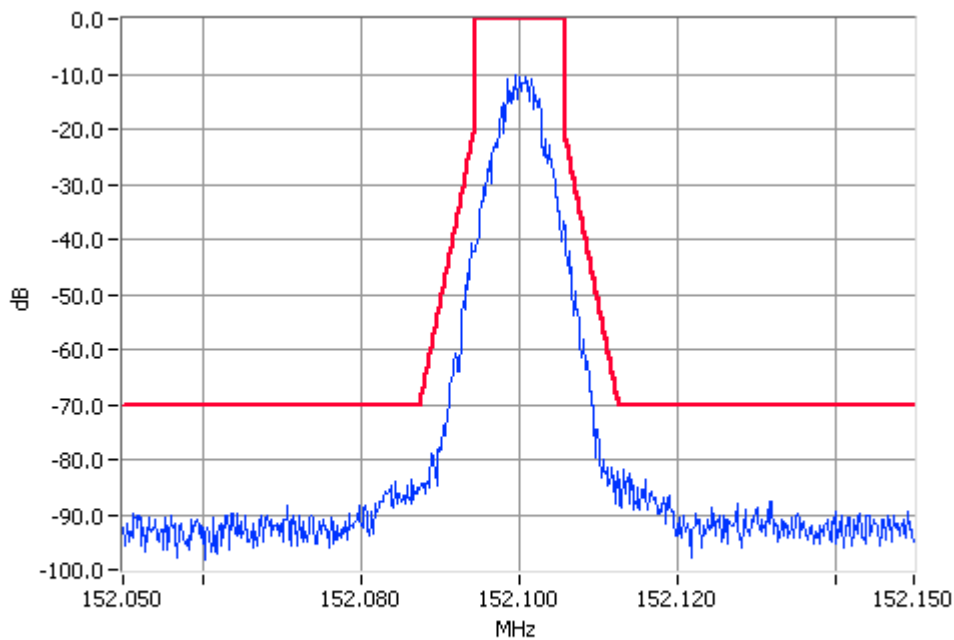
Occupied Bandwidth and Spectrum Masks

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

Tx FREQUENCY: 152.1 MHz 100 W 12.5 kHz Channel Spacing



Unmodulated 152.1000MHz Mask D 100W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

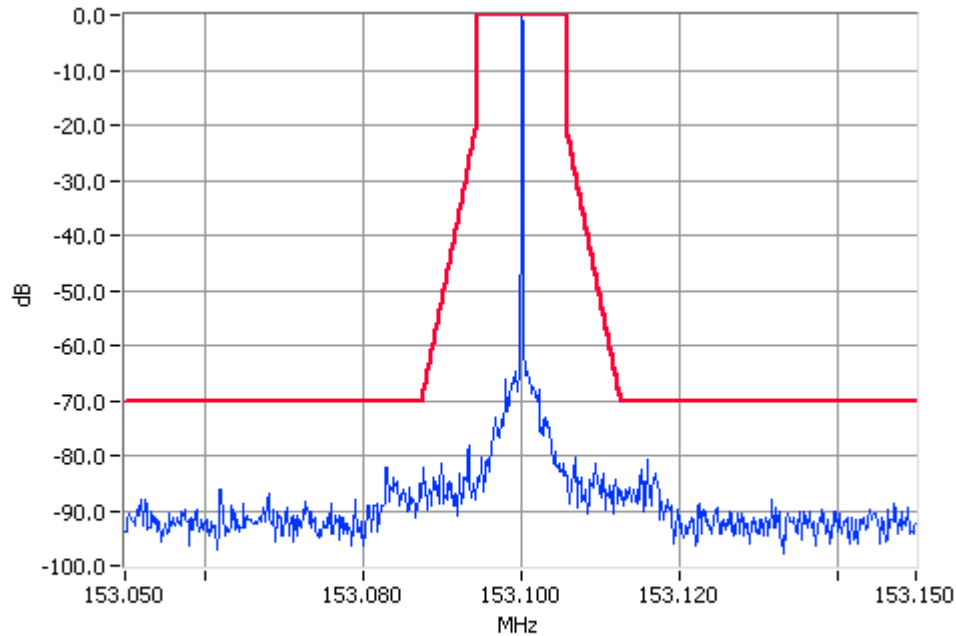


DMR 152.1000MHz Mask D 100W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

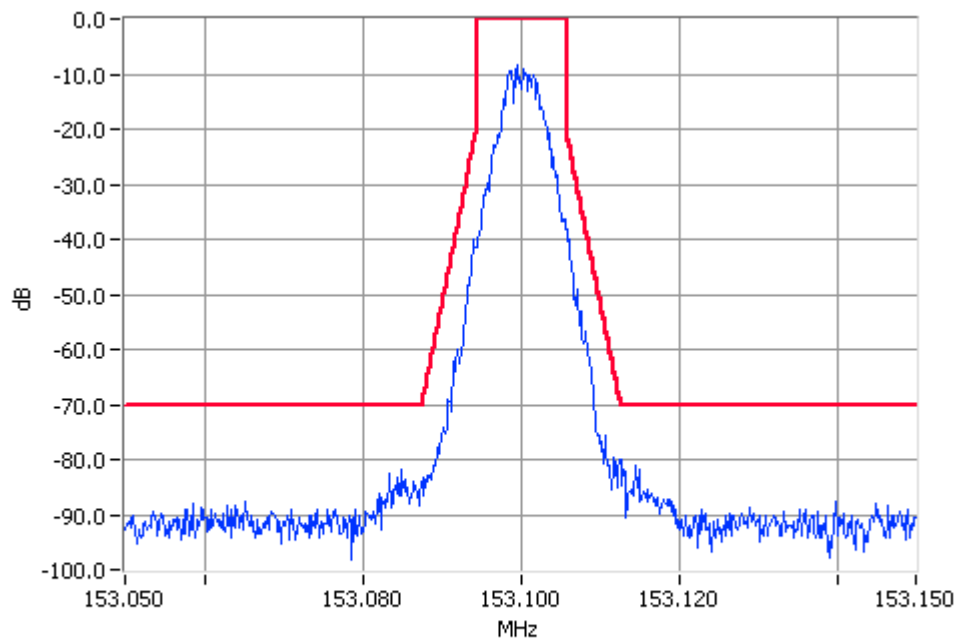
Occupied Bandwidth and Spectrum Masks

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

Tx FREQUENCY: 153.1 MHz 100 W 12.5 kHz Channel Spacing



Unmodulated 153.1000MHz Mask D 100W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

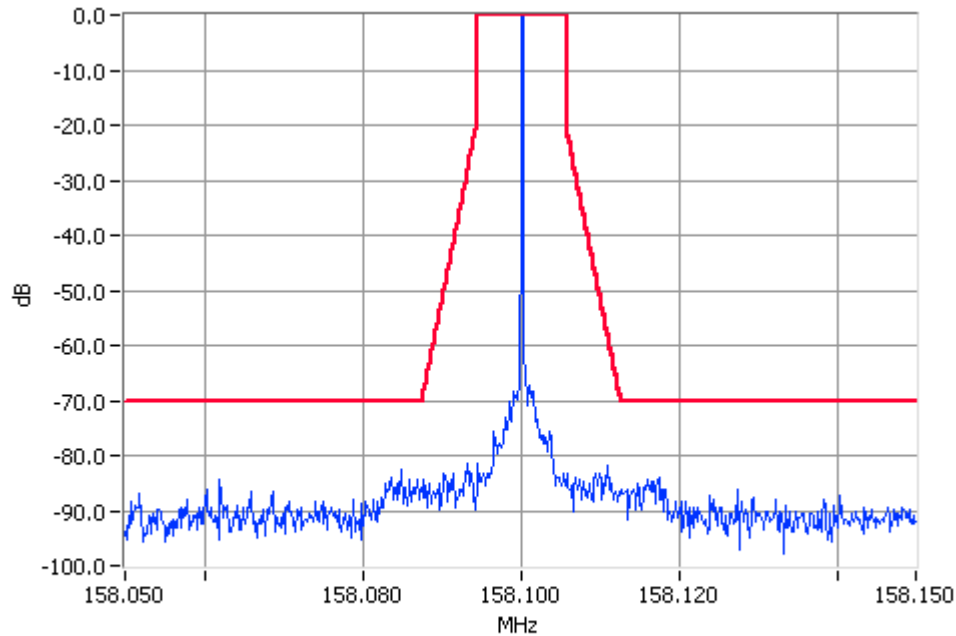


DMR 153.1000MHz Mask D 100W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

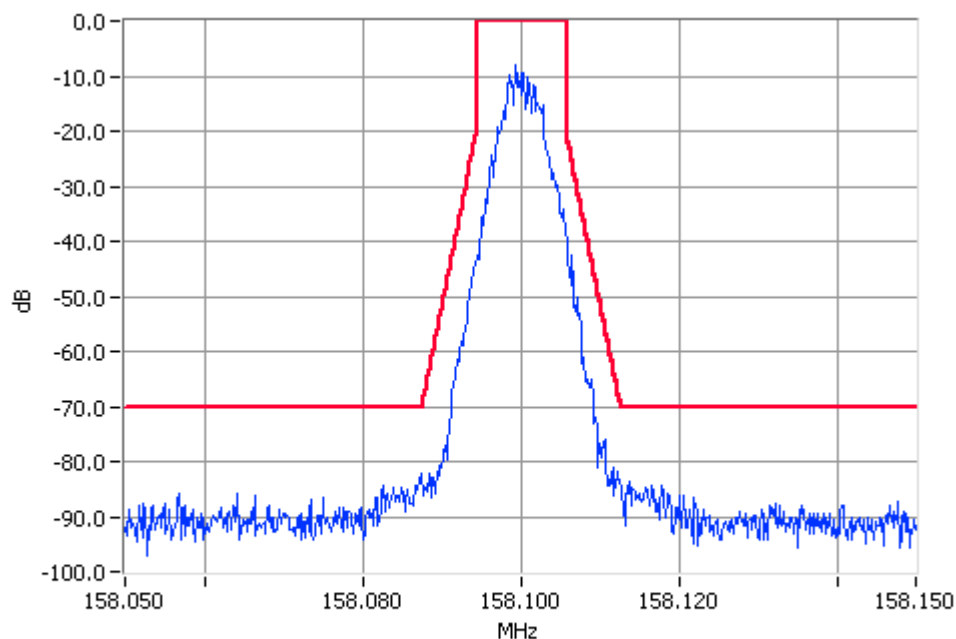
Occupied Bandwidth and Spectrum Masks

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

Tx FREQUENCY: 158.1 MHz 100 W 12.5 kHz Channel Spacing



Unmodulated 158.1000MHz Mask D 100W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

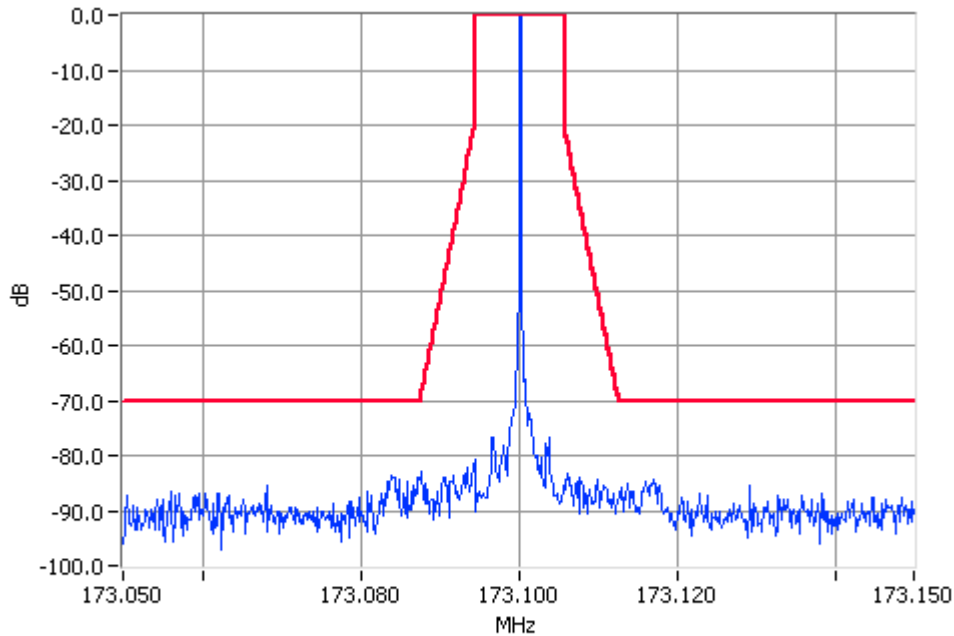


DMR 158.1000MHz Mask D 100W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

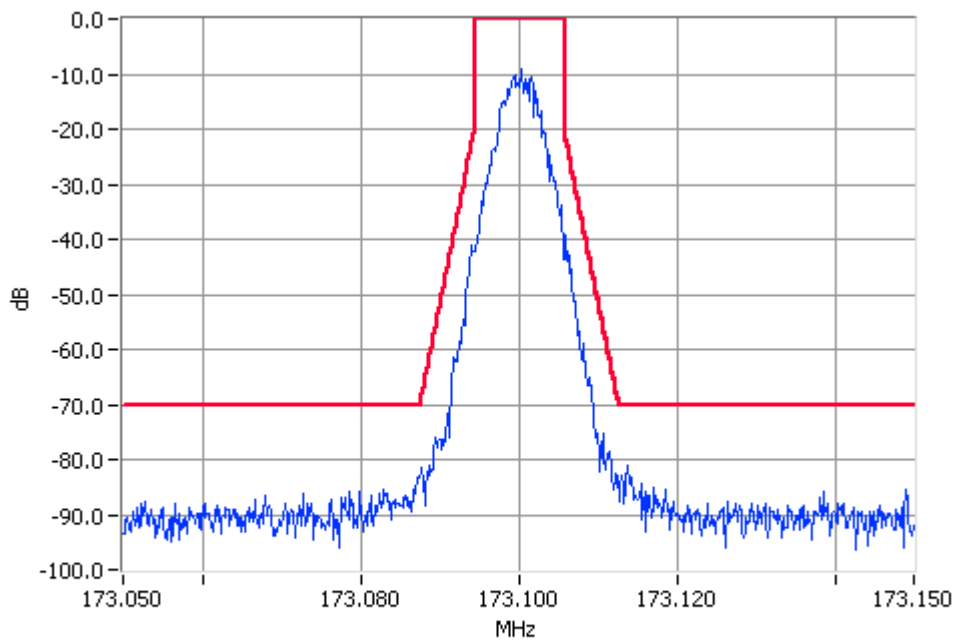
Occupied Bandwidth and Spectrum Masks

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

Tx FREQUENCY: 173.1 MHz 100 W 12.5 kHz Channel Spacing



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



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

SPURIOUS EMISSIONS (Tx CONDUCTED)

SPECIFICATIONS: FCC 47 CFR 2.1051 RSS-119 5.8

GUIDE: TIA/EIA-603D 2.2.13

MEASUREMENT PROCEDURE:

1. Refer Annex 2 for equipment set up.
The frequency range examined was from the lowest frequency generated within the EUT, to a frequency higher than the 10th Harmonic: 100kHz to Fc-BW
Fc+ BW to 10Fc GHz
2. 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 20dB 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.

MEASUREMENT RESULTS:

See the tables on the following pages. Spectrum Analyser plots appear in Annex 3.

LIMIT CLAUSES: FCC 47 CFR 90.210 RSS-119 5.8

MEASUREMENT UNCERTAINTY: ± 3.0 dB

SPURIOUS EMISSIONS (Tx CONDUCTED)

SPECIFICATION: FCC CFR 2.1051 RSS-119 5.8

Tx FREQUENCY: 152.1 MHz

100 W		Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
304.2	-37.7	-87.7
No other emissions were detected at a level greater than 20 dB below the limit.		

10 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 FREQUENCY: 153.1 MHz

100 W		Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
306.2	-37.6	-87.6
No other emissions were detected at a level greater than 20 dB below the limit.		

10 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.		

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Tait Limited
Report Number 3377

Tx FREQUENCY: 158.1 MHz

100 W		Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
316.2	-39.9	-89.9
No other emissions were detected at a level greater than 20 dB below the limit.		

10 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 FREQUENCY: 173.1 MHz

100 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.		

10 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 47 CFR 90.210 RSS-119 5.8

Carrier Output Power Watts	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \log_{10}(P_{\text{Watts}})$	
100 W	-20 dBm	-70 dBc
10 W	-20 dBm	-60 dBc

SPURIOUS EMISSIONS (Tx 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 30MHz to 1000MHz. Any emission within 20dB of the limit is then re-tested on the OATS along with measurements from 1000MHz to the 10th harmonic of the fundamental frequency.
2. The EUT is then placed on a wooden turntable at a distance of 0.5 metres from the test antenna and emissions are measured from 1000MHz to the upper frequency required. Any emission within 20dB of the limit or at least six measurements are then re-tested on the OATS.

OATS Measurement:

1. Refer Annex 1 for equipment set up
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 1m to 4m 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

MEASUREMENT UNCERTAINTY: ± 4.6 dB

Spurious Emissions (Tx Radiated)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 152.1 MHz

100 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.		

10 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 FREQUENCY: 153.1 MHz

100 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.		

10 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.		

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Tait Limited
Report Number 3377

Tx FREQUENCY: 158.1 MHz

100 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.		

10 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.		

Open Area Test Site Results		
100 W		Emission Mask D
158.1 MHz		
Harmonics Emission Frequency (MHz)	Level (dBm)	Level (dBc)
316.2	-87.33	-137.33
474.3	-84.99	-134.99
632.4	-62.13	-112.13
790.5	-69.16	-119.16
948.6	-50.97	-100.97
1106.7	-76.22	-126.22

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Report Number 3377

Tx FREQUENCY: 173.1 MHz

100 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.		

10 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 47 CFR 90.210

Carrier Output Power Watts	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \log_{10}(P_{\text{Watts}})$	
100 W	-20 dBm	-70 dBc
10 W	-20 dBm	-60 dBc

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 2 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.

MEASUREMENT UNCERTAINTY: ± 50 Hz

Nominal Tx FREQUENCY: 152.1 MHz 100 W 12.5 kHz channel Spacing

Temperature ($^{\circ}\text{C}$)	Frequency (MHz)	Error (ppm)
-30	152.100003	0.02
-20	152.100003	0.02
-10	152.100025	0.16
0	152.100001	0.01
10	152.100005	0.03
20	152.100005	0.03
30	152.100001	0.01
40	152.100011	0.07
50	152.100020	0.13

Nominal Tx FREQUENCY: 153.1 MHz 100 W 12.5 kHz channel Spacing

Temperature ($^{\circ}\text{C}$)	Frequency (MHz)	Error (ppm)
-300	153.100003	0.02
-20	153.100003	0.02
-10	153.100025	0.16
0	153.100001	0.01
10	153.100005	0.03
20	153.100005	0.03
30	153.100001	0.01
40	153.100011	0.07
50	153.100019	0.12

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Report Number 3377

Nominal Tx FREQUENCY: 158.1 MHz 100 W 12.5 kHz channel Spacing

Temperature (°C)	Frequency (MHz)	Error (ppm)
-30	158.100003	0.02
-20	158.100002	0.01
-10	158.100025	0.16
0	158.100000	0.00
10	158.100005	0.03
20	158.100004	0.03
30	158.100002	0.01
40	158.100011	0.07
50	158.100020	0.13

Nominal Tx FREQUENCY: 173.1 MHz 100 W 12.5 kHz channel Spacing

Temperature (°C)	Frequency (MHz)	Error (ppm)
-30	173.100003	0.02
-20	173.100005	0.03
-10	173.100029	0.17
0	173.100000	0.00
10	173.100005	0.03
20	173.100005	0.03
30	173.100002	0.01
40	173.100011	0.06
50	173.100023	0.13

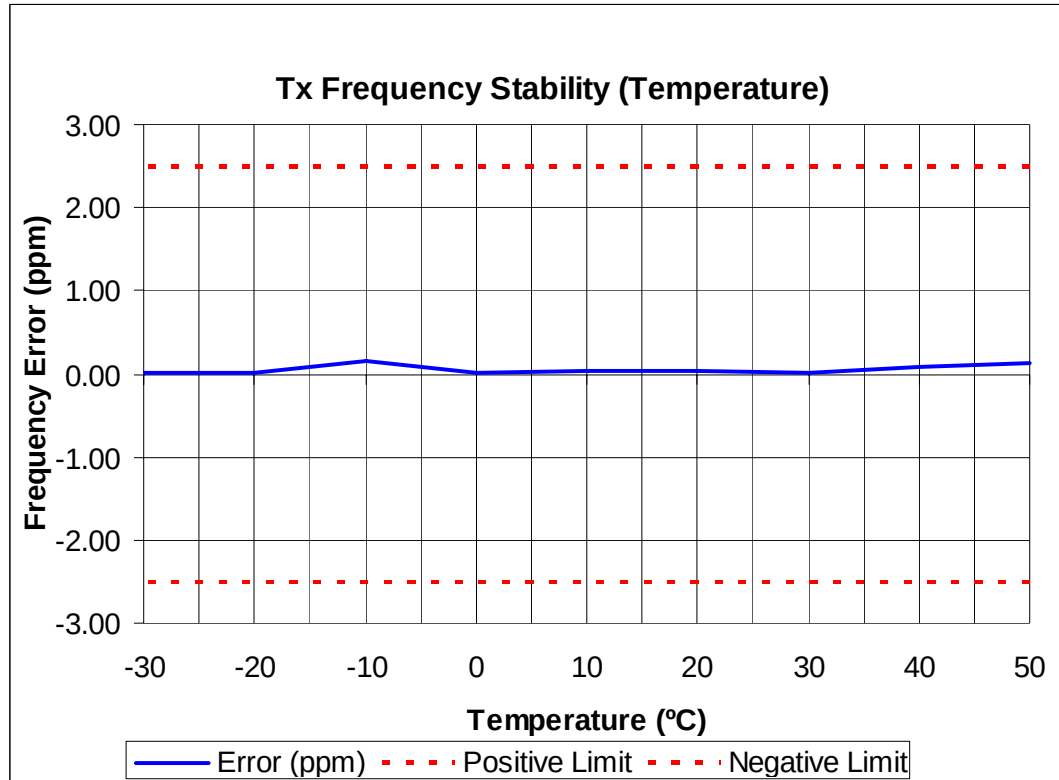
Transmitter Frequency Stability - Temperature

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

Tx FREQUENCY: 152.1 MHz

100 W

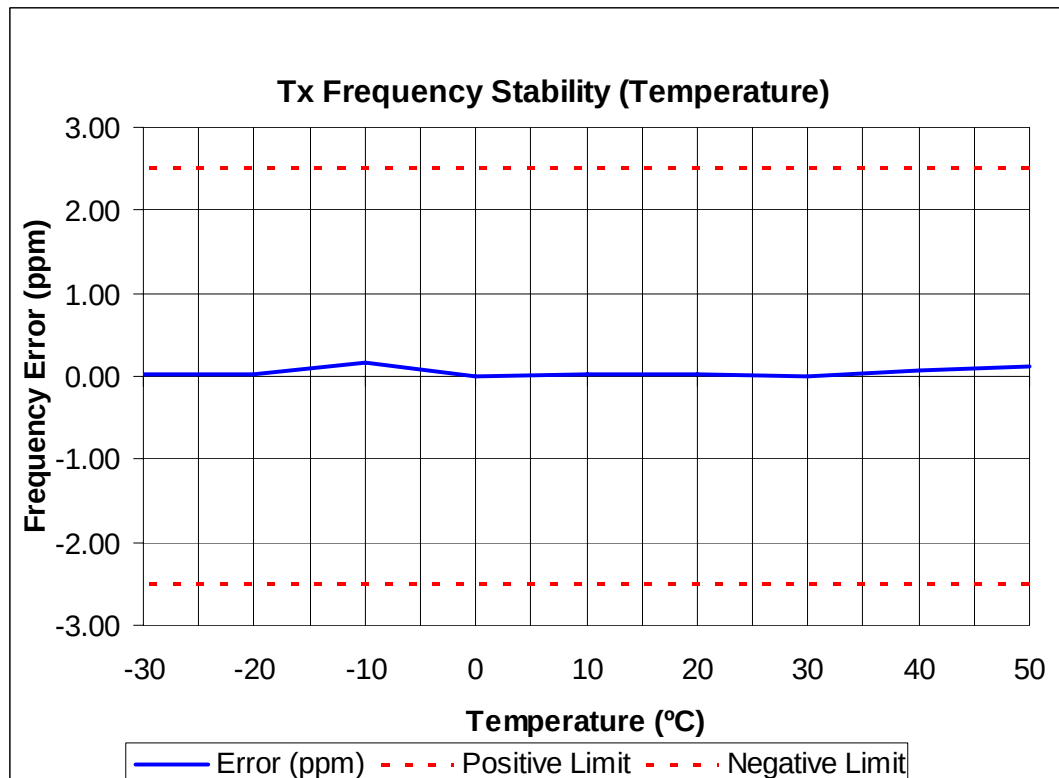
12.5 kHz channel Spacing



Tx FREQUENCY: 153.1 MHz

100 W

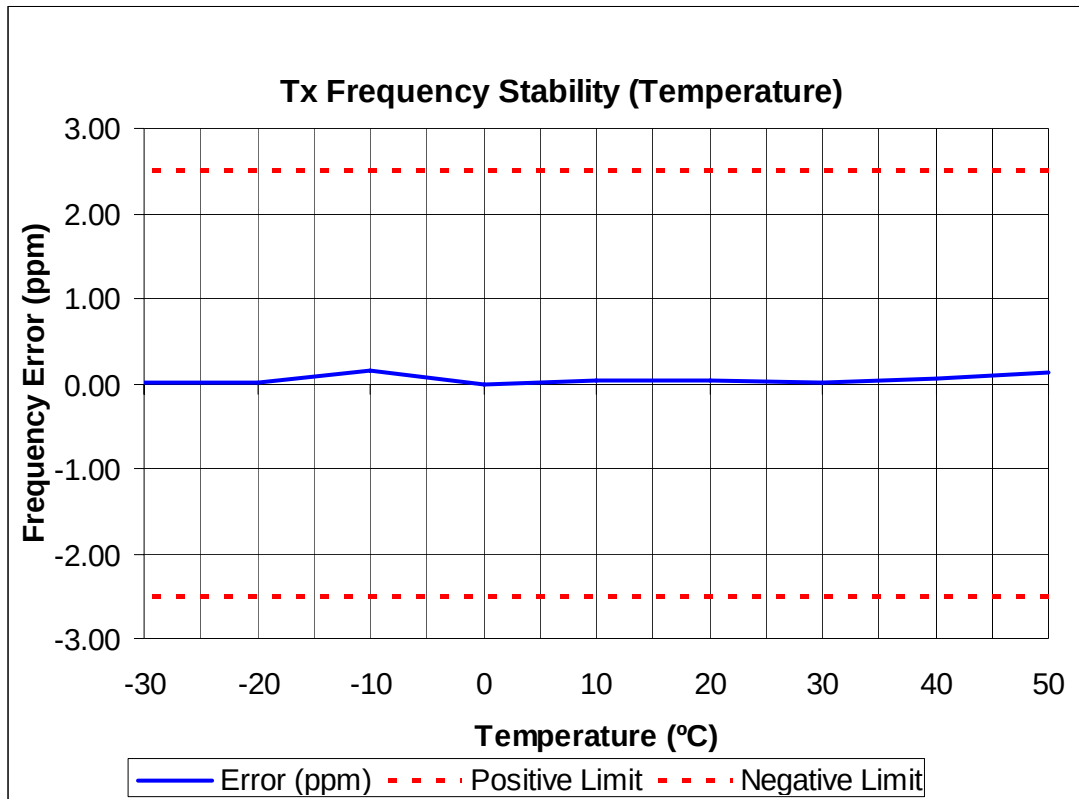
12.5 kHz channel Spacing



Tx FREQUENCY: 158.1 MHz

100 W

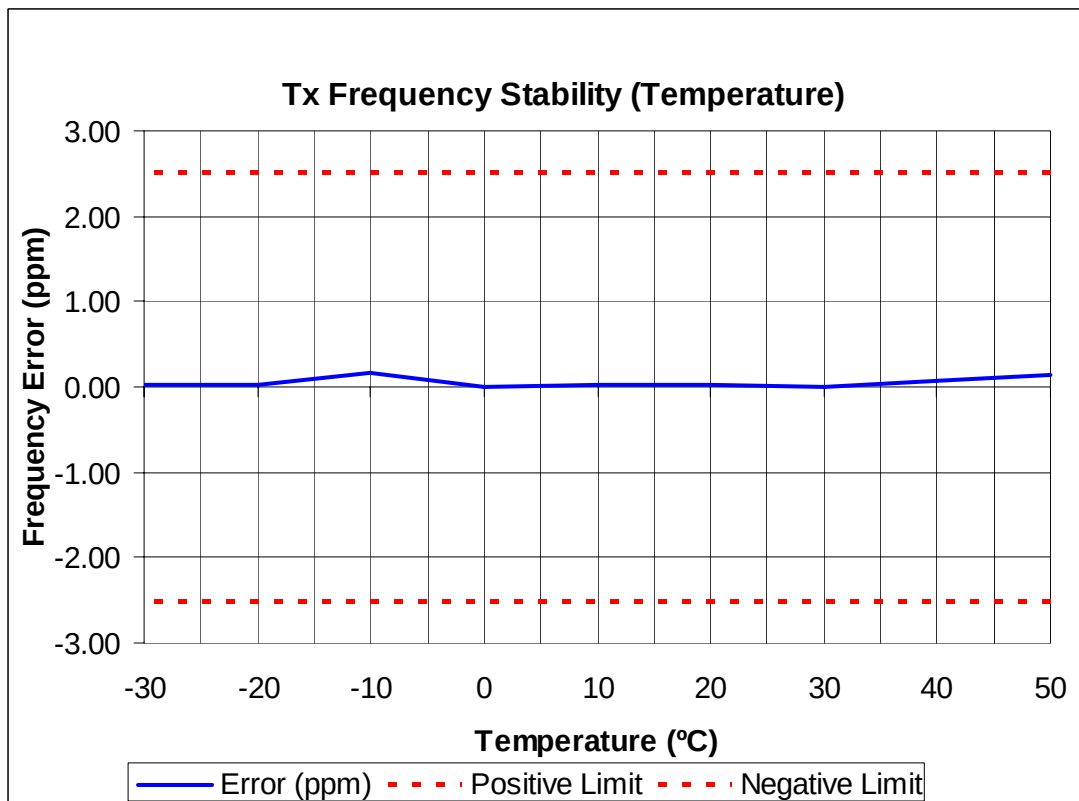
12.5 kHz channel Spacing



Tx FREQUENCY: 173.1 MHz

100 W

12.5 kHz channel Spacing



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Report Number 3377

LIMIT CLAUSES: RSS-119 5.3

Frequency Band (MHz)	Frequency Error (ppm)
138-174	2.5

LIMIT CLAUSES: FCC 47 CFR 90.539(b) / FCC 47 CFR 90.213

Assigned Frequency (MHz)	Frequency Error (ppm)
138-174	2.5

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 2 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 UNCERTAINTY: ± 50 Hz

MEASUREMENT RESULTS: 100 W

Voltage	FREQUENCY ERROR (ppm) for 12.5 kHz			
	152.1 MHz	153.1MHz	158.1 MHz	173.1 MHz
120 V _{AC}	0.00	-0.01	-0.02	-0.01
102 V _{AC}	-0.01	-0.01	-0.01	-0.01
138 V _{AC}	-0.01	-0.01	-0.01	-0.02

LIMIT CLAUSES: RSS-119 5.3

Frequency Band (MHz)	Frequency Error (ppm)
138-174	2.5

LIMIT CLAUSES: FCC 47 CFR 90.539(b) / FCC 47 CFR 90.213

Frequency Range (MHz)	Frequency Error (ppm)
150-174 MHz	2.5

SPURIOUS EMISSIONS (Tx STANDBY / Rx CONDUCTED)

SPECIFICATION: RSS-119 5.11

GUIDE: TIA/EIA-603D 2.1.2

NOTE: This product has a detachable antenna. Receiver spurious emissions were measured using the conducted method at the antenna port as per RSS-Gen 4.10.

MEASUREMENT PROCEDURE:

1. Refer Annex 2 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 20dB below the limit were not recorded.

MEASUREMENT UNCERTAINTY: ± 2.5 dB

MEASUREMENT RESULTS: See the tables on the following pages. Spectrum Analyser plots appear in Annex 4.

Transmit Port:

152.1 MHz TX Port (TX Standby)		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
No emissions were detected within 20 dB of Limit.		

153.1 MHz TX Port (TX Standby)		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
No emissions were detected within 20 dB of Limit.		

158.1 MHz TX Port (TX Standby)		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
No emissions were detected within 20 dB of Limit.		

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

Receive Port:

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

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

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

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

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

LIMIT CLAUSE: RSS-Gen 6.2			
LIMIT	30 → 1000 MHz	2 nW	- 57 dBm
	> 1000 MHz	5 nW	- 53 dBm

TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

GUIDE: TIA/EIA-603D 2.2.19

MEASUREMENT PROCEDURE:

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

MEASUREMENT UNCERTAINTY: ± 130 Hz

MEASUREMENT RESULTS:

See the tables and plots on the following pages.

LIMIT CLAUSE: FCC 47 CFR 90.214

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Tx Frequency: 152.1 MHz

100 W

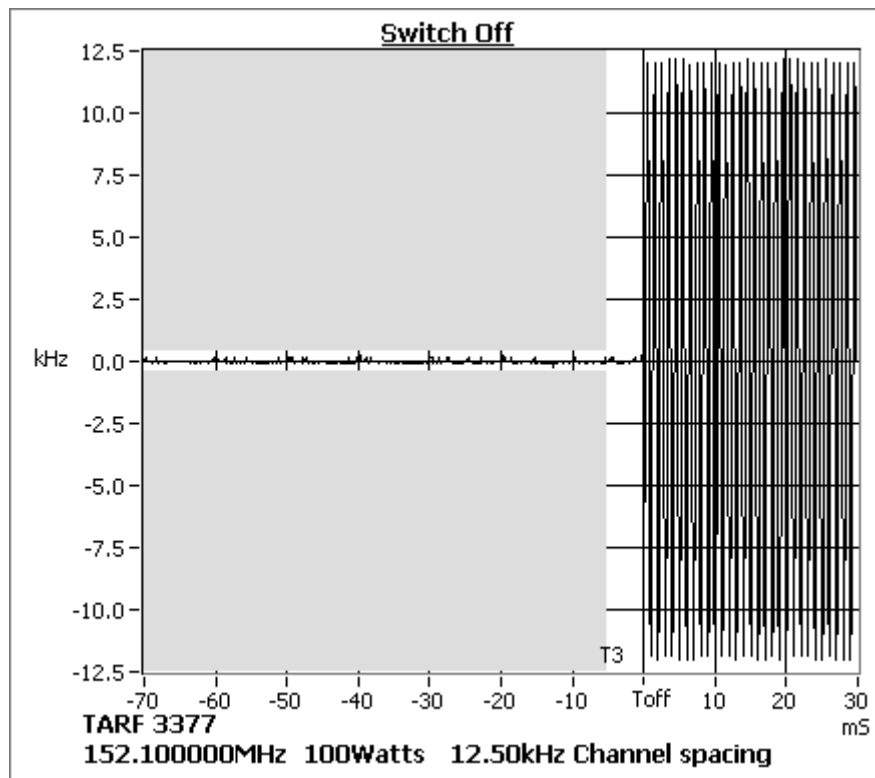
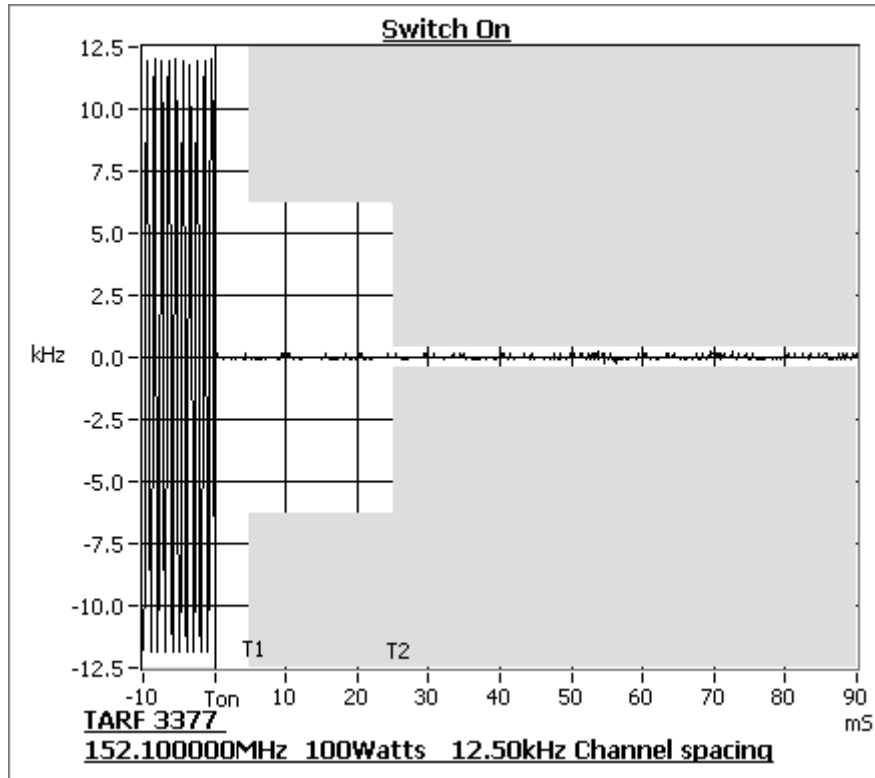
12.5 kHz Channel Spacing

FREQUENCY	152.1 MHz @ 100 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-0.9	N/A
t2	0.1	N/A
t3	N/A	0.3
t2 → t3 ppm	1.7	
ERROR LIMIT (t2 → t3) ppm	2.5	

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	YES
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	YES

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Report Number 3377

Tx Frequency: 152.1 MHz 100 W 12.5 kHz Channel Spacing



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Report Number 3377

Tx Frequency: 153.1 MHz

100 W

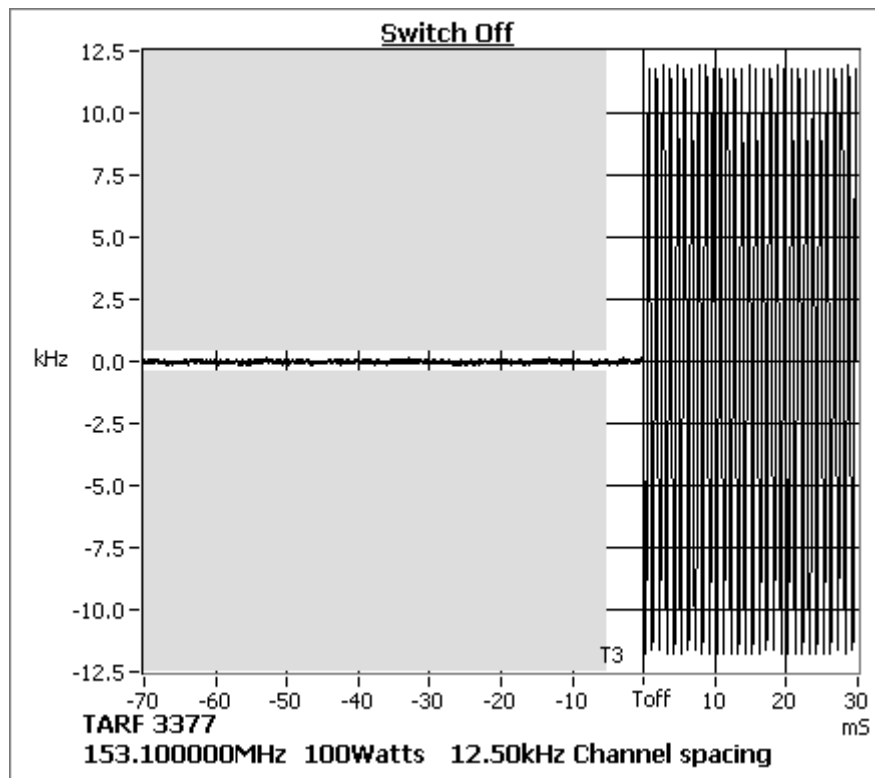
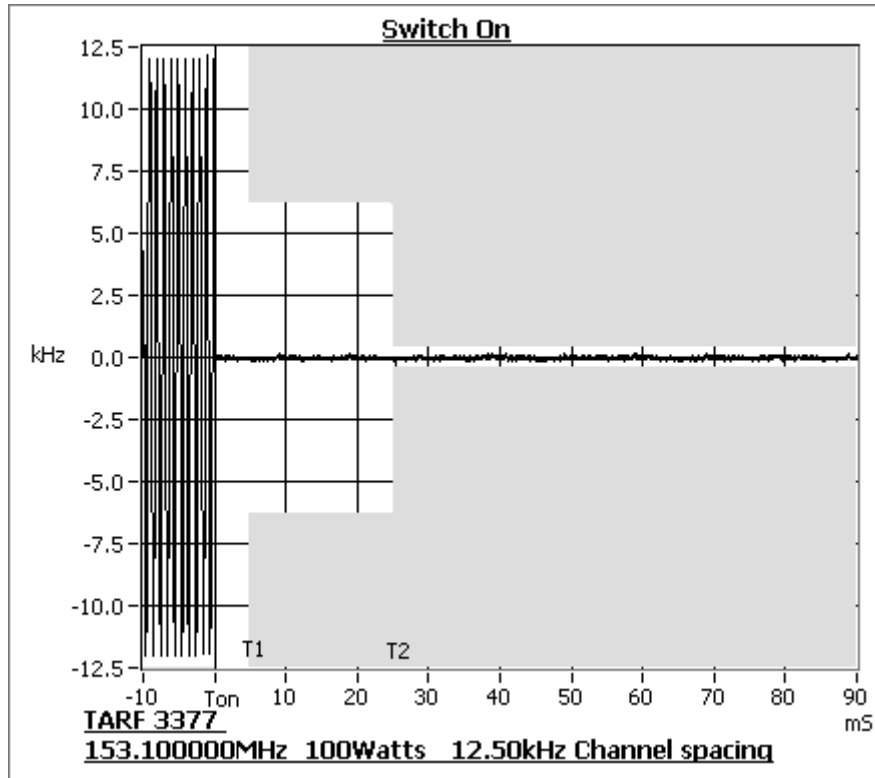
12.5 kHz Channel Spacing

FREQUENCY	153.1 MHz @ 100 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	4.1	N/A
t2	0.2	N/A
t3	N/A	0.2
t2 → t3 ppm	-2.0	
ERROR LIMIT (t2 → t3) ppm	2.5	

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	YES
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	YES

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Report Number 3377

Tx Frequency: 153.1 MHz 100 W 12.5 kHz Channel Spacing



TELTEST Laboratories
Tait Limited
Report Number 3377

Tx Frequency: 158.1 MHz

100 W

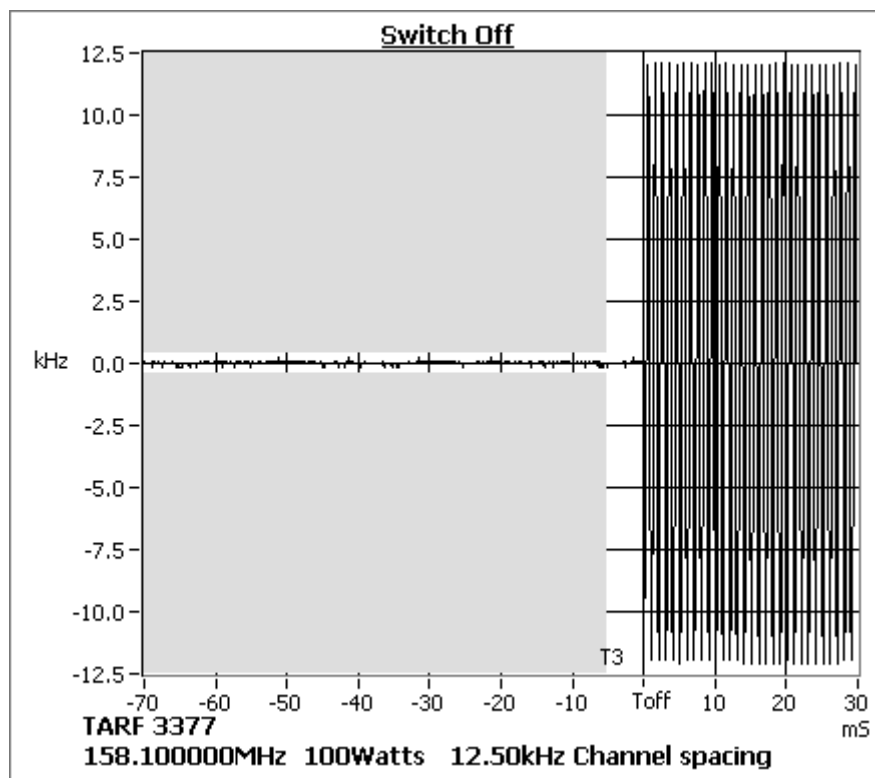
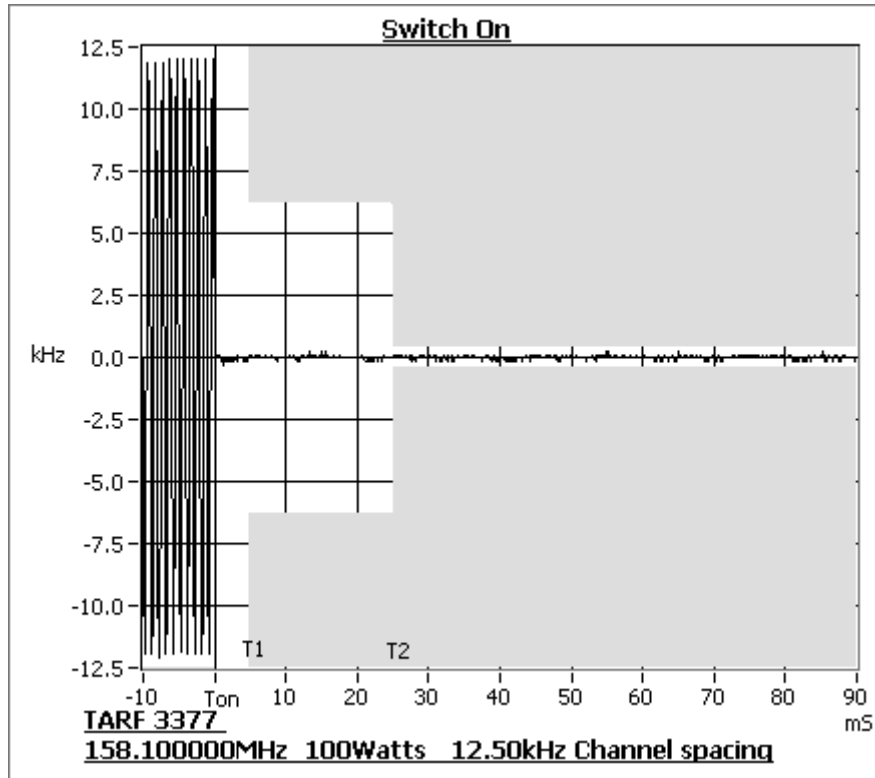
12.5 kHz Channel Spacing

FREQUENCY	158.1 MHz @ 100 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	1.3	N/A
t2	0.2	N/A
t3	N/A	0.2
t2 → t3 ppm	1.3	
ERROR LIMIT (t2 → t3) ppm	2.5	

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	YES
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	YES

TELTEST Laboratories
Tait Limited
Report Number 3377

Tx Frequency: 158.1 MHz 100 W 12.5 kHz Channel Spacing



Tx Frequency: 173.1 MHz

100 W

12.5 kHz Channel Spacing

FREQUENCY	173.1 MHz @ 100 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	6.7	N/A
t2	0.6	N/A
t3	N/A	0.2
t2 → t3 ppm	1.8	
ERROR LIMIT (t2 → t3) ppm	2.5	

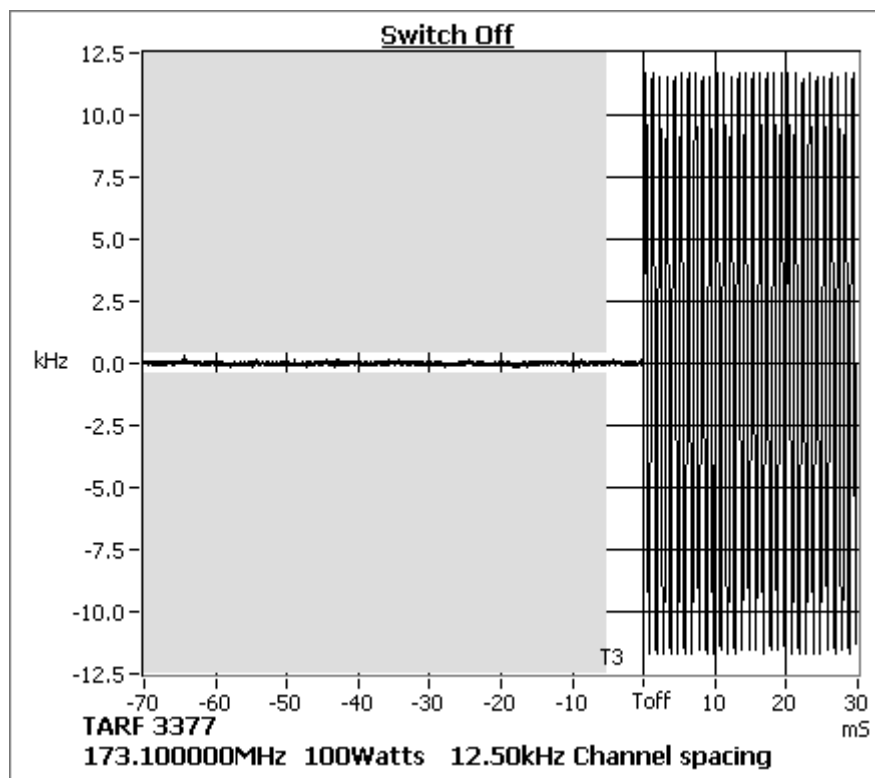
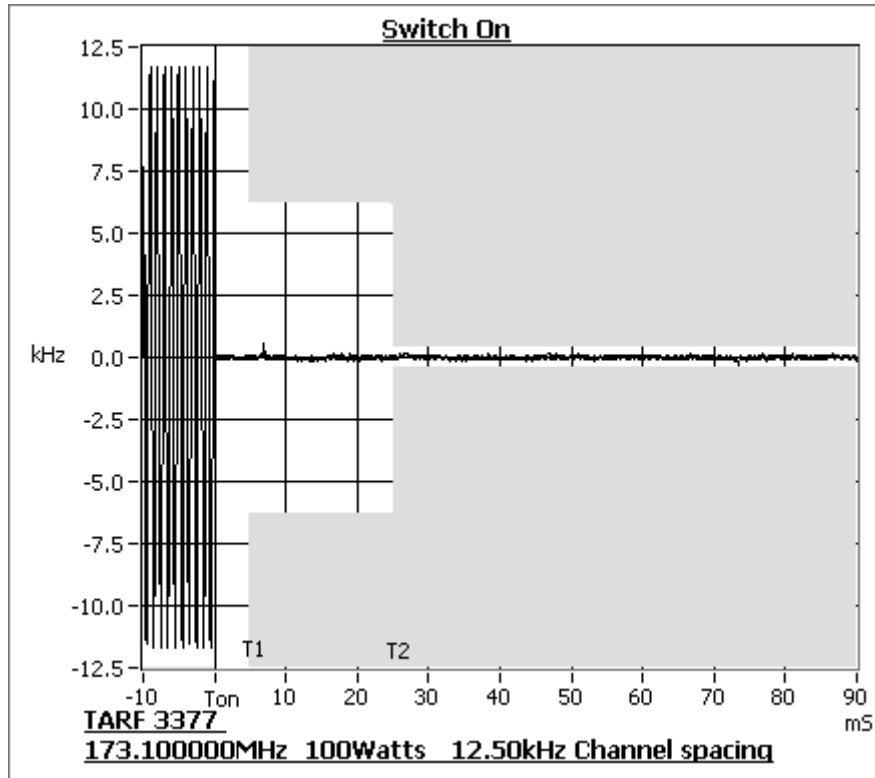
Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	YES
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	YES

LIMIT CLAUSE: RSS-119 5.9 Channel Spacing 12.5 kHz

TRANSIENT PERIODS	MAXIMUM FREQUENCY DIFFERENCE (kHz)	FREQUENCY RANGE 138 – 174 MHz
t1 (ms)	±12.5	5 ms
t2 (ms)	±6.25	20 ms
t3 (ms)	±12.5	5 ms

TELTEST Laboratories
Tait Limited
Report Number 3377

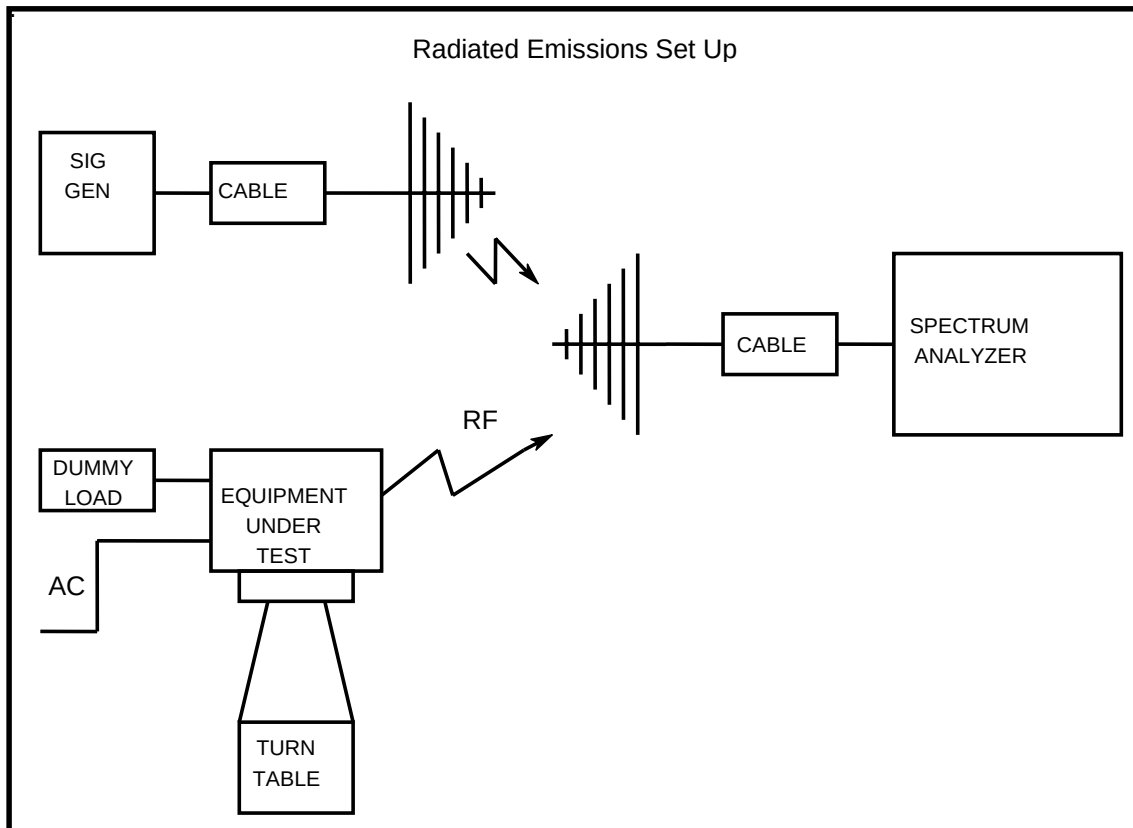
Tx Frequency: 173.1 MHz 100 W 12.5 kHz Channel Spacing



TEST EQUIPMENT LIST

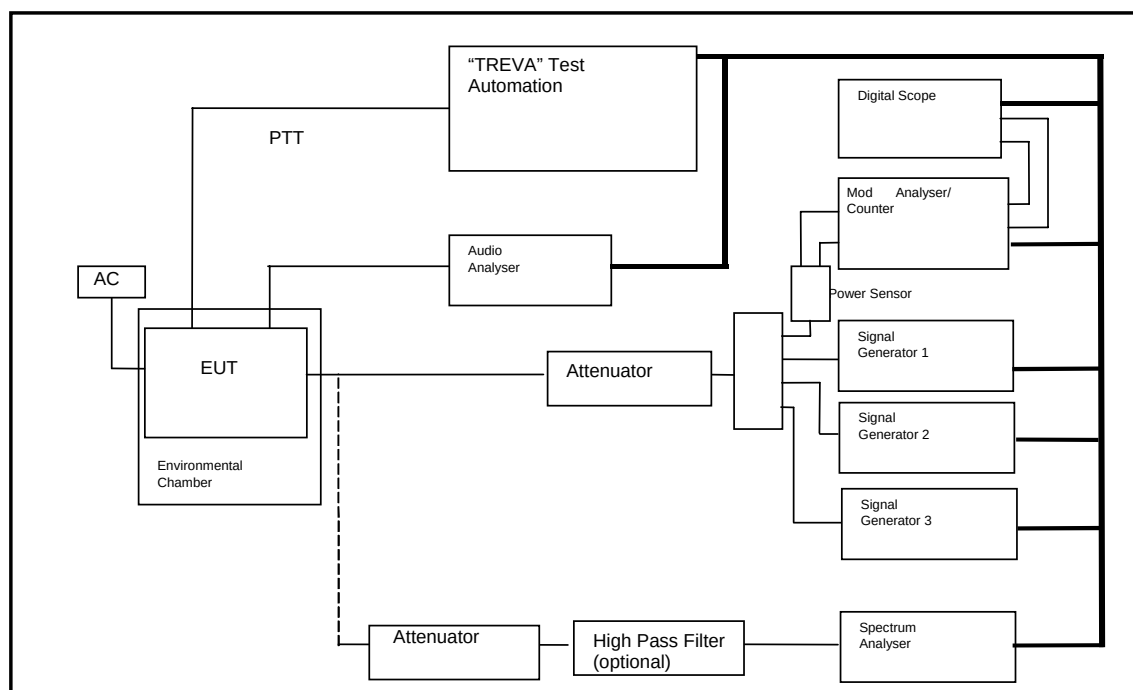
Equipment	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
1m Coax (Blue)	Suhner	Sucoflex 104A	44610/4A	E4619	8-Oct-12
2m Coax (Black3)	Suhner	RG214HF/Nm/Nm/2000	Black3	E4624	8-Oct-12
2m Coax (Black5)	Suhner	RG214HF/Nm/Nm/2000	Black5	E4850	8-Oct-12
2m Coax (Black6)	Suhner	RG214HF/Nm/Nm/2000	Black6	E4849	8-Oct-12
3m Coax (Blue)	Suhner	Sucoflex 104A	44611/4A	E4620	8-Oct-12
AC Voltmeter 1	Tait				1-Sep-12
AC Voltmeter 2	Tait				1-Sep-12
Amplifier +21.7 dB	Tait	ZFL-1000LN	E3660	E3360	2-Dec-12
Antenna Tower	Electrometrics	EM-4720-2	112	E4447	Cal on Use
Audio Analyser	Hewlett Packard	HP8903A	2308A02597	E3074	14-Oct-12
Audio Analyser	Hewlett Packard	HP8903B	2818A04275	E3710	13-Oct-12
Controller	Electrometrics	EM-4700	119	E4445	Cal on Use
Environ. Chamber	Contherm	5400 RHSLT.M	1416	E4051	12-Jul-12
Filter High Pass	Tait	HPF	N/A	E3382	Cal on Use
Horn Antenna	Emco	DRG3115	2084	E3076	6-Jan-13
Modulation Analyser	Hewlett Packard	HP8901B (Opt 002)	2441A00393	E3073	14-Oct-12
Modulation Analyser	Hewlett Packard	HP8901B (Opt 002)	3704A05837	E3786	13-Oct-12
Multimeter	Fluke	77	35069359	E3237	10-Oct-12
OATS Tower Cable	Intelcom	RG214	OATS1	E4621	12-Oct-12
OATS Turntable Cable	Intelcom	RG215	OATS2	E4622	12-Oct-12
Oscilloscope	Tektronics	TDS340	B013611	E3585	10-Oct-12
Oscilloscope	Tektronics	TDS380	B017095	E3782	12-Oct-12
Power Supply	Agilent	N5767A	US09F4901H	E4656	13-Oct-12
Power Supply	Hewlett Packard	HP6032A	2441A00412	E3075	13-Oct-12
RF Attenuator 10dB	Weinschel	57-10-34	LB590	E3674	4-Oct-12
RF Attenuator 10dB	Weinschel	24-10-34	AZ0401	E3388	17-Oct-12
RF Attenuator 20dB	Weinschel	24-20-44	AW1266	E3562	11-Oct-12
RF Attenuator 20dB	Weinschel	40-20-33	BL9950	E4080	Cal on Use
RF Attenuator 20dB	Weinschel	40-20-33	MF817	E4082	Cal on Use
RF Attenuator 30dB	Weinschel	67-30-33	BR0531	E4280	10-Oct-12
RF Attenuator 6dB	Weinschel	40-06-34	KV457	E3561	8-Oct-12
RF Load 150W	Bird	8166	524	E3625	8-Oct-12
RF Splitter Combiner	Minicircuits	ZFSC-4-1	-	E4083	Cal on Use
RF Splitter Combiner	Minicircuits	ZFSC-4-1	-	E4084	Cal on Use
Signal Generator	Rohde & Schwarz	SMY01 1062.5502.11	841736/019	E3553	20-Oct-12
Signal Generator	Rohde & Schwarz	SML03 1090.3000.13	100597	E4050	17-Nov-12
Signal Generator	Agilent	E4433B	US38440446	E4147	4-Oct-12
Signal Generator	Agilent	E8663D	MY50420224	E4908	14-Oct-12
S-Line TEM Cell	Rohde & Schwarz	1089.9296.02	338232/003	E3636	15-Aug-12
Spectrum Analyser	Agilent	PXA N9030A	MY49432161	E4907	30-Mar-14
Spectrum Analyser	Agilent	PSA E4445A	MY42510072	E4139	26-Aug-12
Temp & Humidity datalogger	Hobo	H8		E4441	7-Aug-12
Temp & Humidity datalogger	Hobo	H8		E4442	7-Aug-12
Turntable	Electrometrics	EM-4704A	105	E4446	Cal on Use
Variac	Dimmerstat	10 D-1P	801/D90736/110		Cal on Use
Variac	Dimmerstat	10 D-1P	801/D90736/111		Cal on Use
Variac	Yamabishi	S-260-5	TX-533	E1737	1-Sep-12

ANNEX 1– RADIATED EMISSIONS TEST SETUP DETAILS



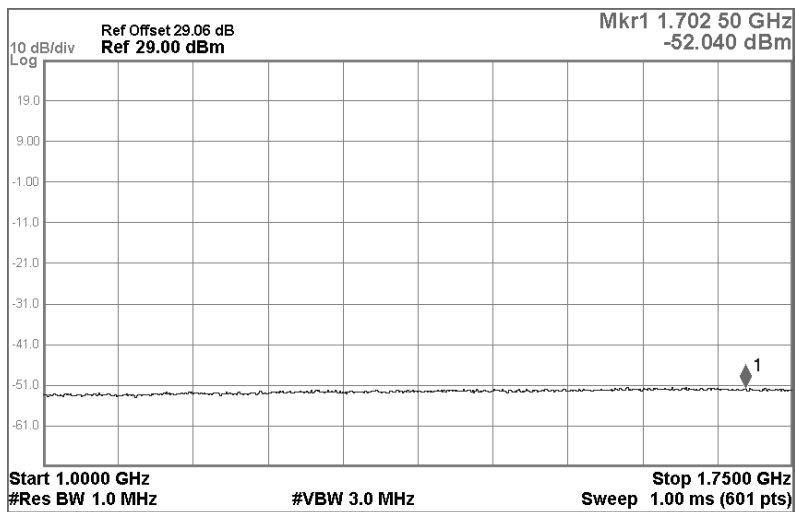
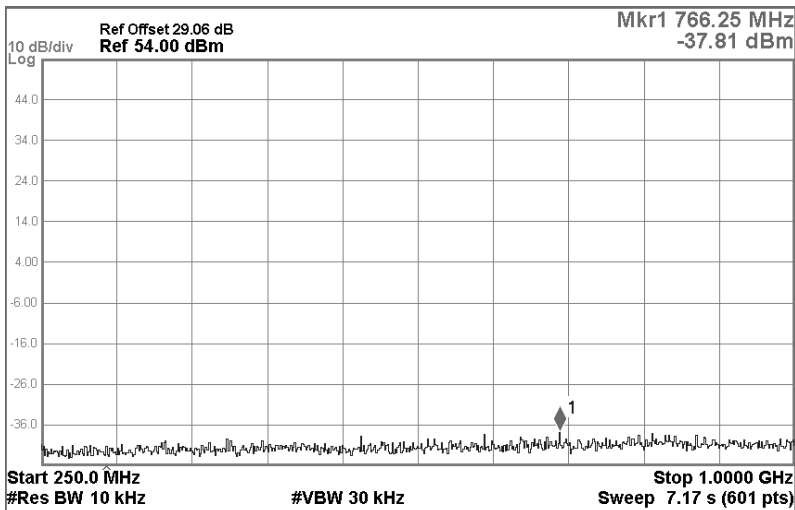
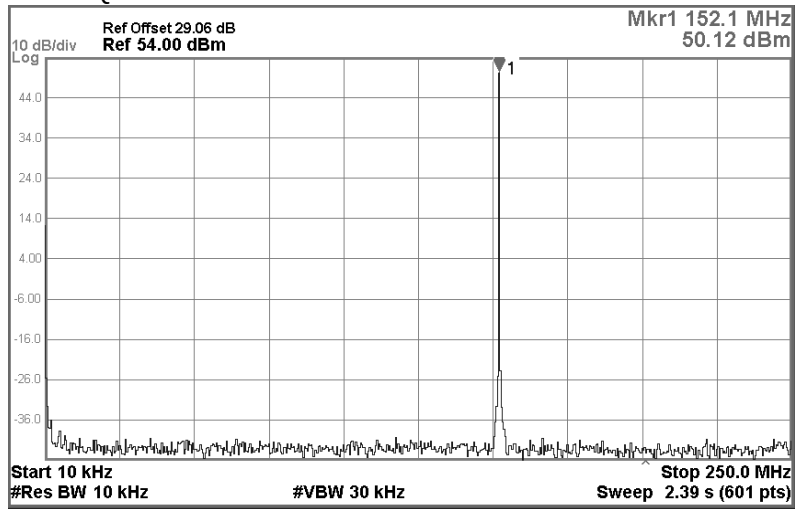
ANNEX 2– AUTOMATED EMISSIONS TEST SETUP DETAILS

All other testing is performed using the Teltest Radio **E**valuation 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.



ANNEX 3 – TX CONDUCTED EMISSION PLOTS

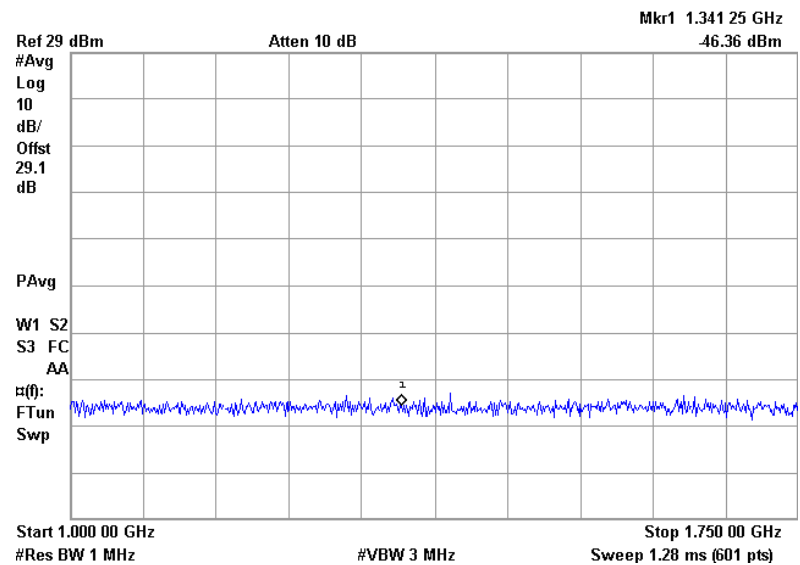
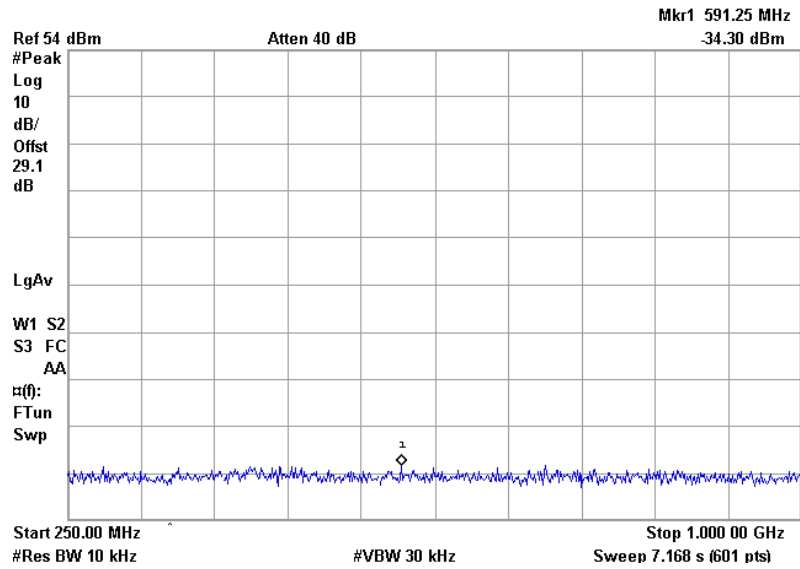
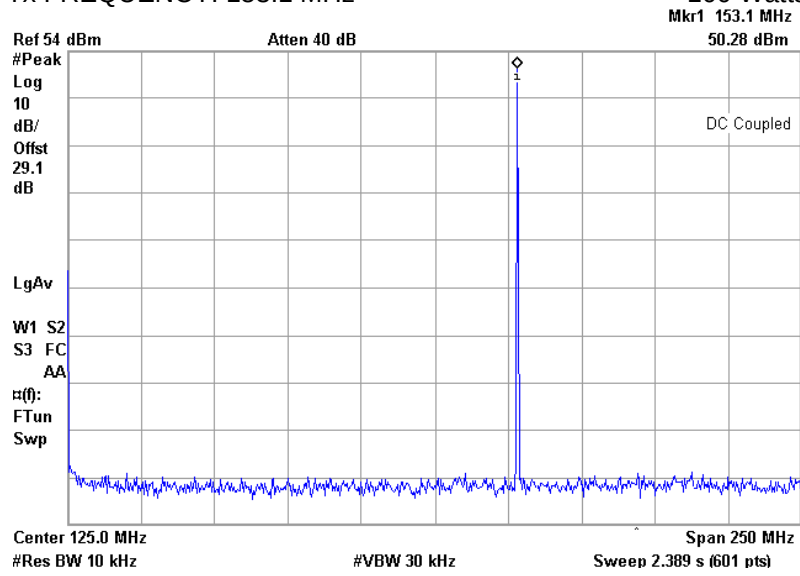
SPECIFICATION: FCC 47 CFR 2.1051 RSS-119 5.8
Tx FREQUENCY: 152.1 MHz 100 Watts



TELTEST Laboratories
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Report Number 3377

Tx FREQUENCY: 153.1 MHz

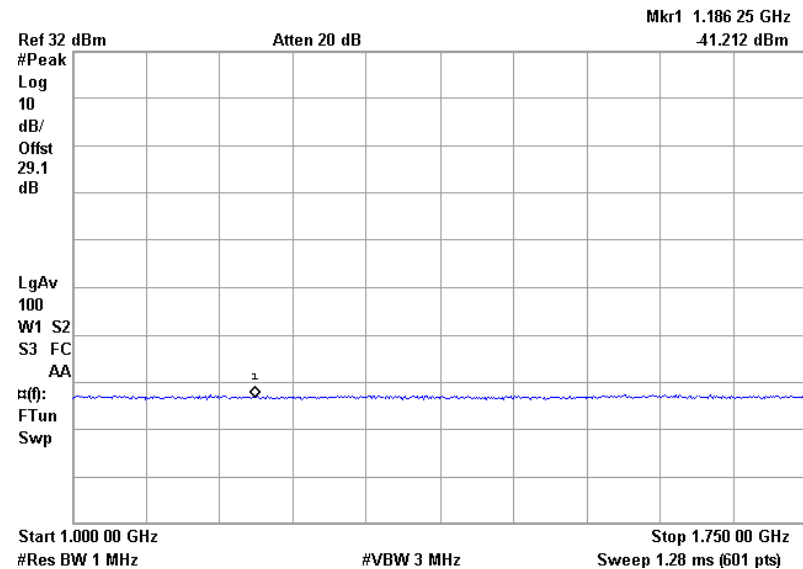
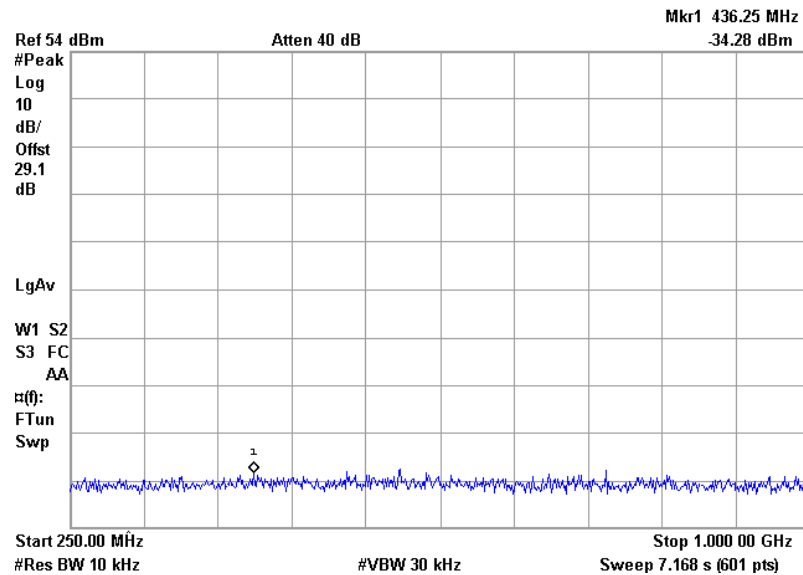
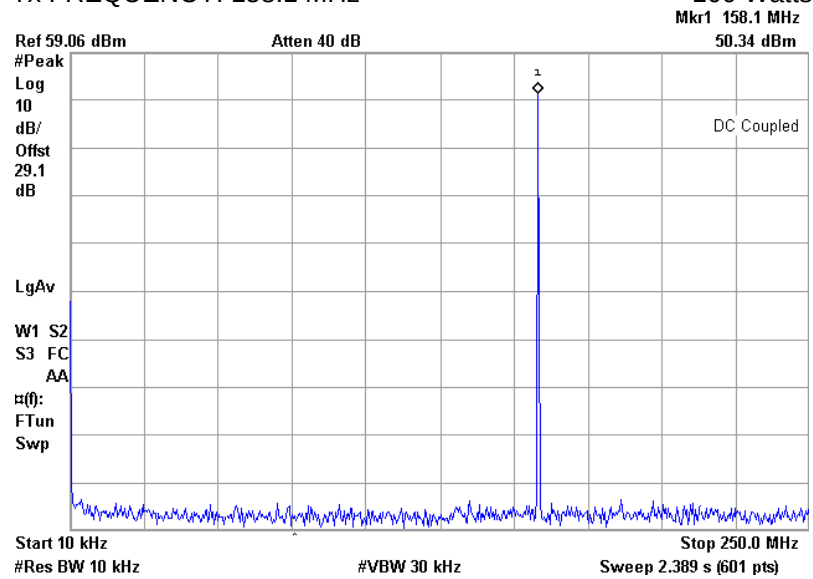
100 Watts



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Report Number 3377

Tx FREQUENCY: 158.1 MHz

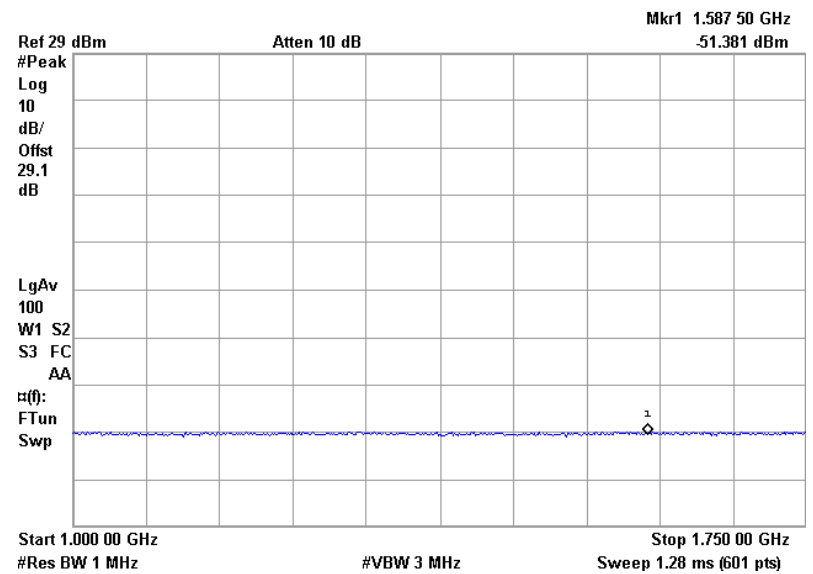
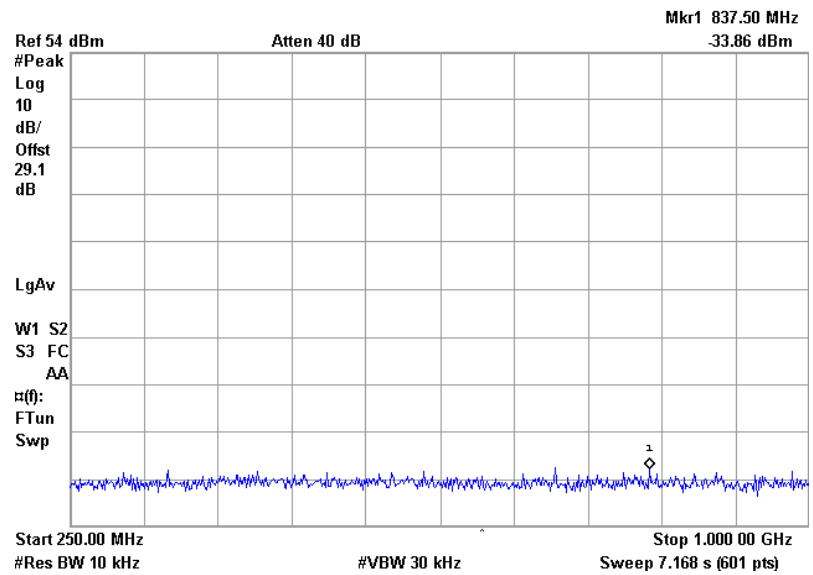
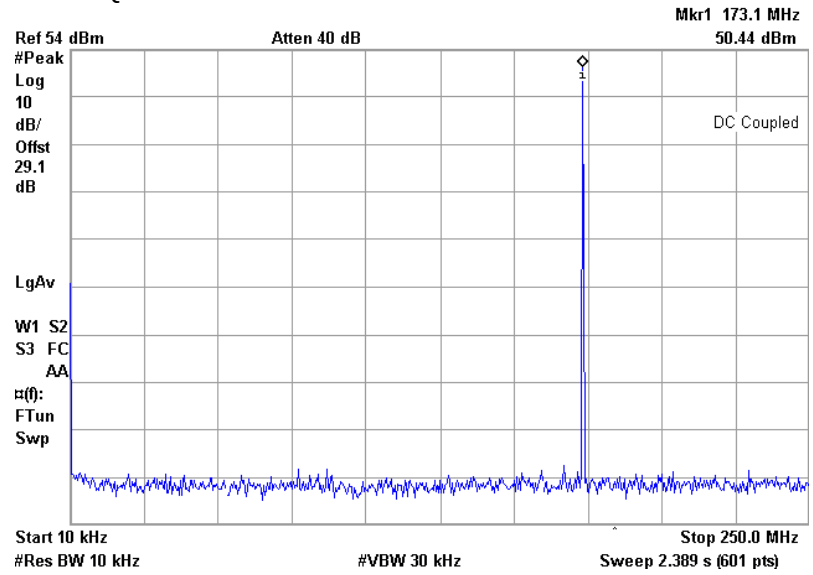
100 Watts



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Tait Limited
Report Number 3377

Tx FREQUENCY: 173.1 MHz

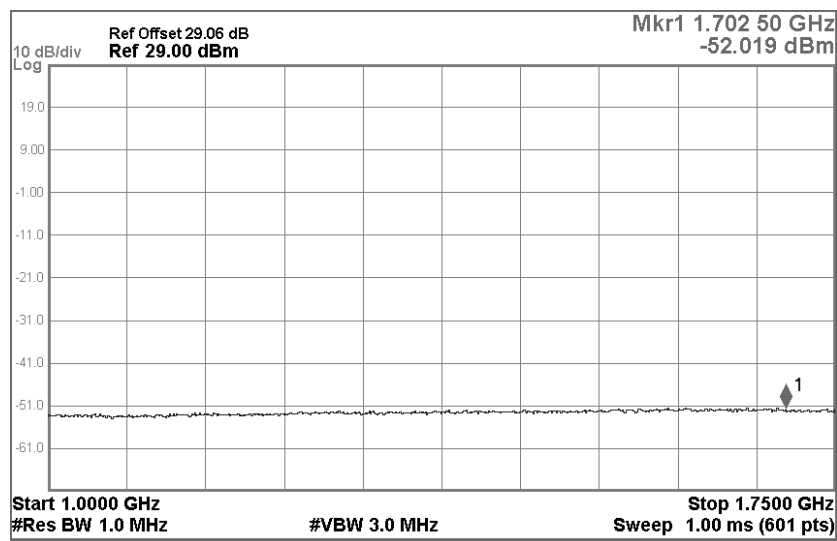
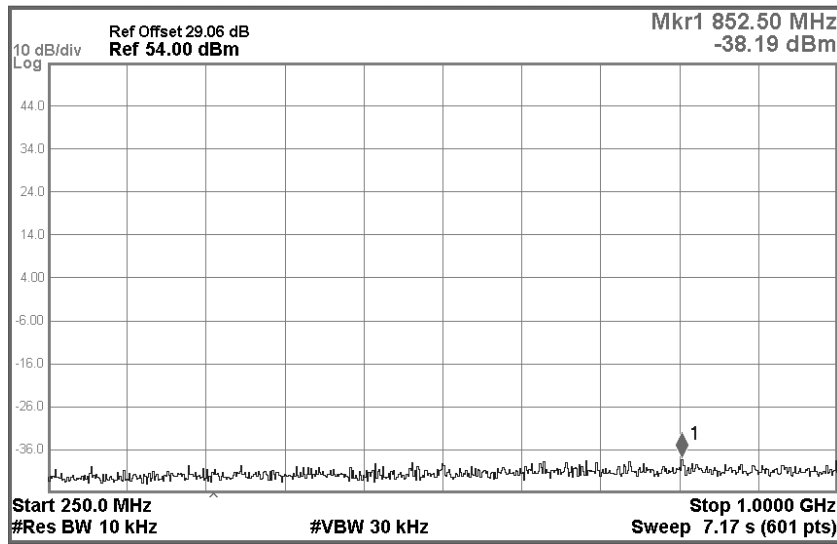
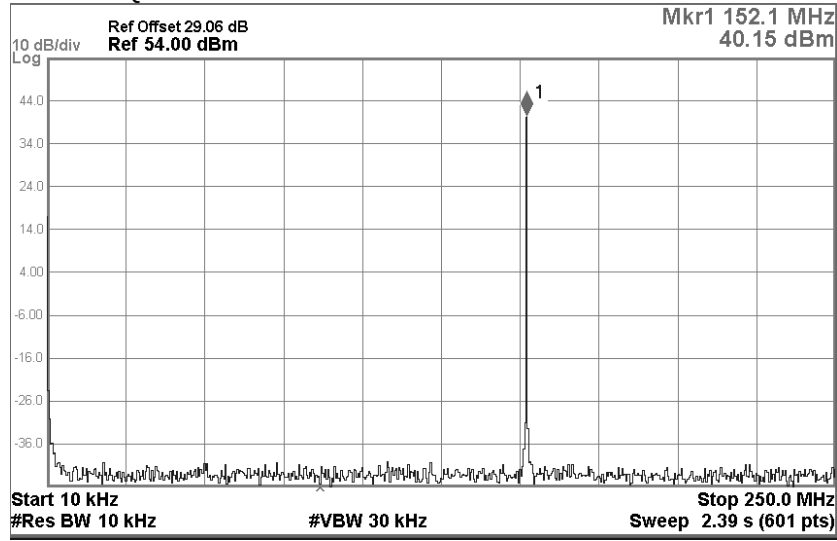
100 Watts



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Tait Limited
Report Number 3377

Tx FREQUENCY: 152.1 MHz

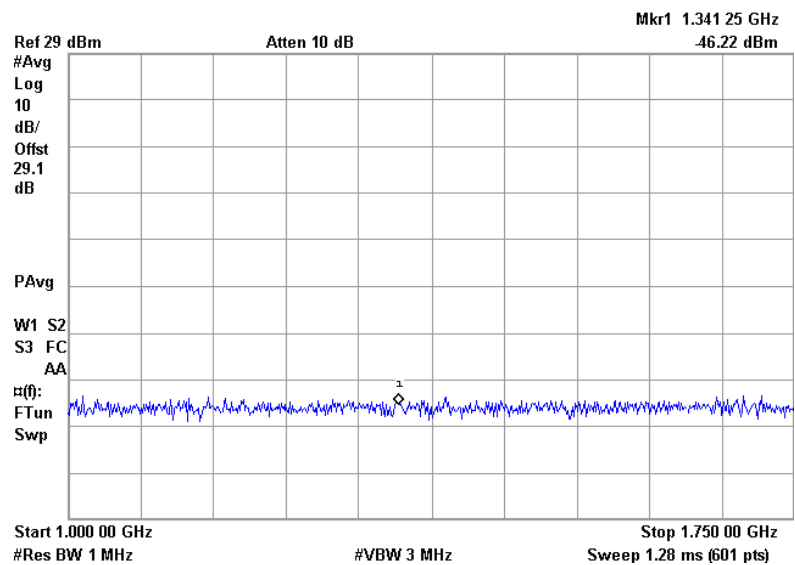
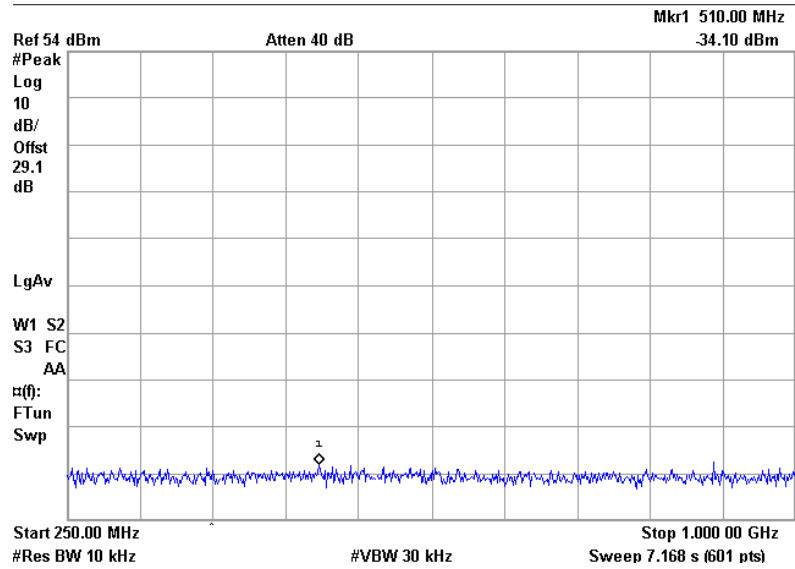
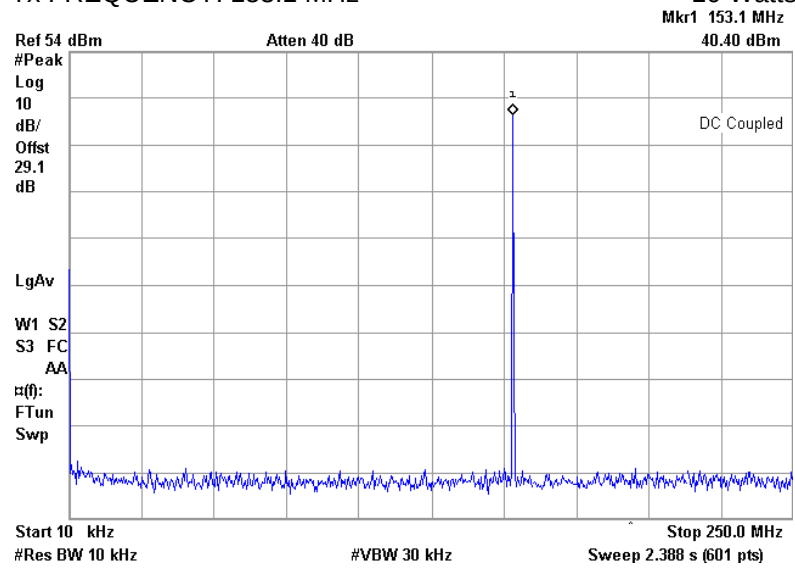
10 Watts



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Report Number 3377

Tx FREQUENCY: 153.1 MHz

10 Watts

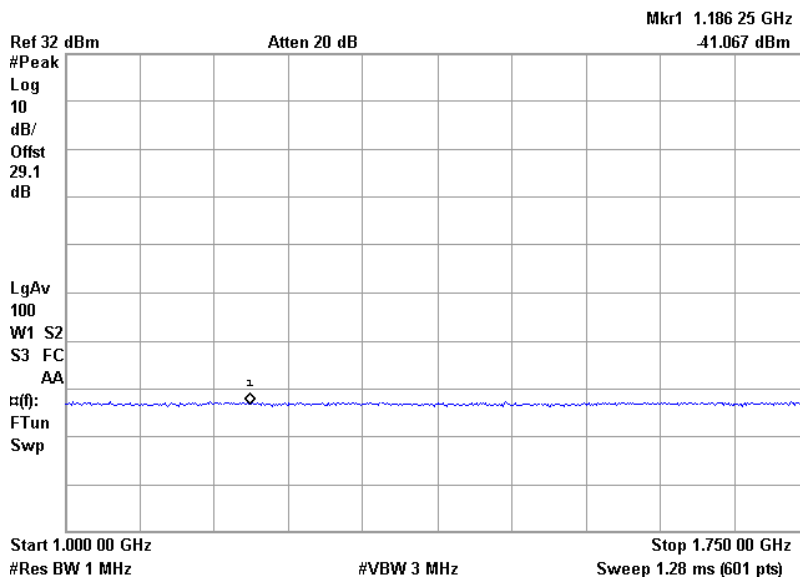
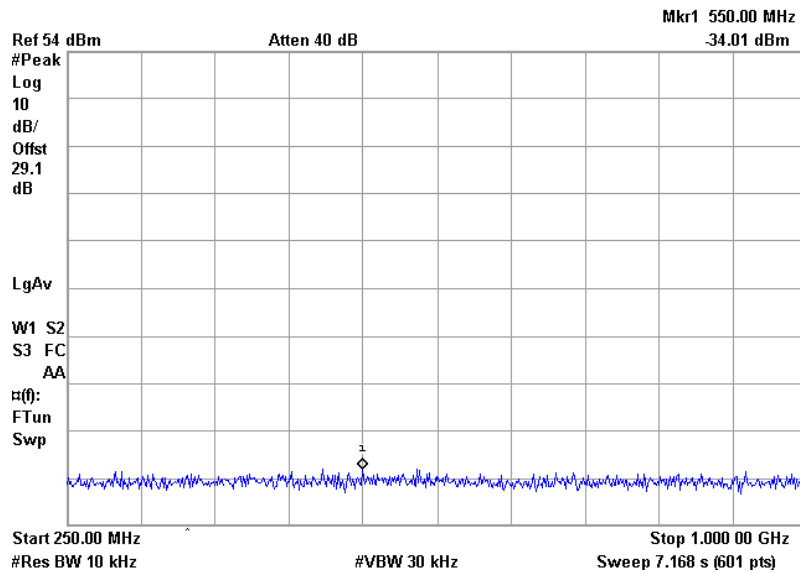
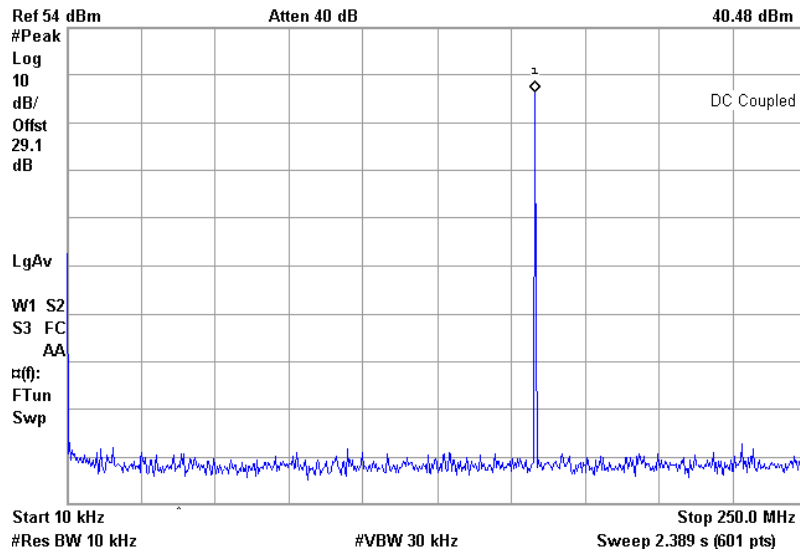


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Report Number 3377

Tx FREQUENCY: 158.1 MHz

10 Watts

Mkr1 158.1 MHz



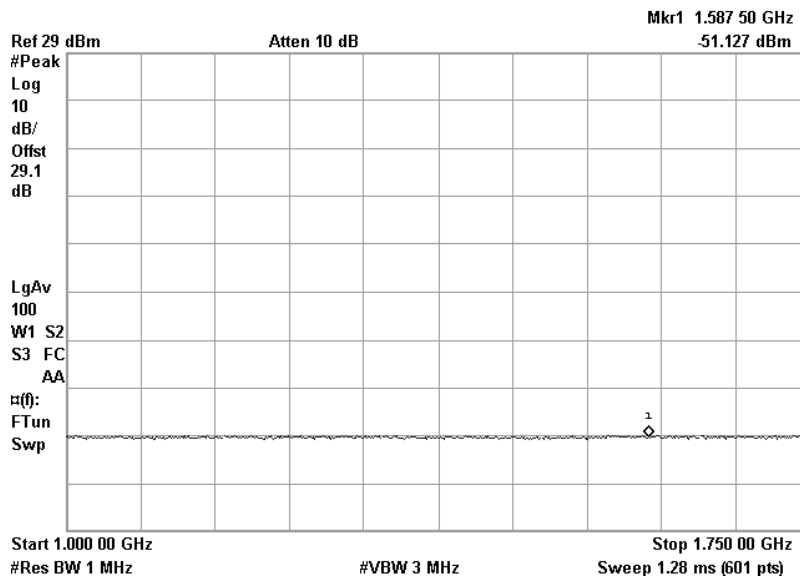
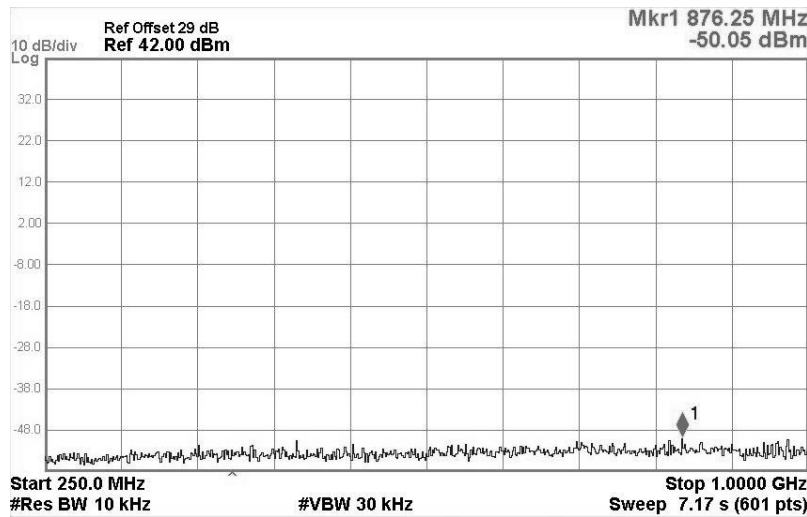
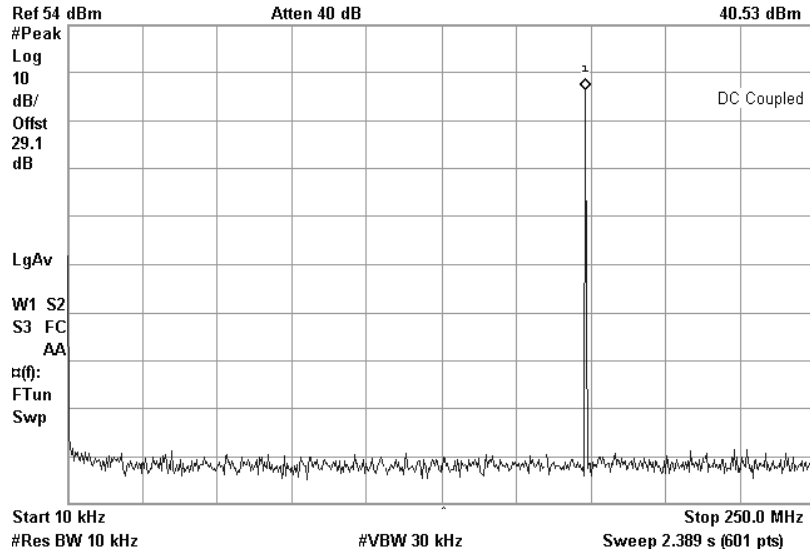
TELTEST Laboratories
Tait Limited
Report Number 3377

Tx FREQUENCY: 173.1 MHz

10 Watts

Mkr1 173.1 MHz

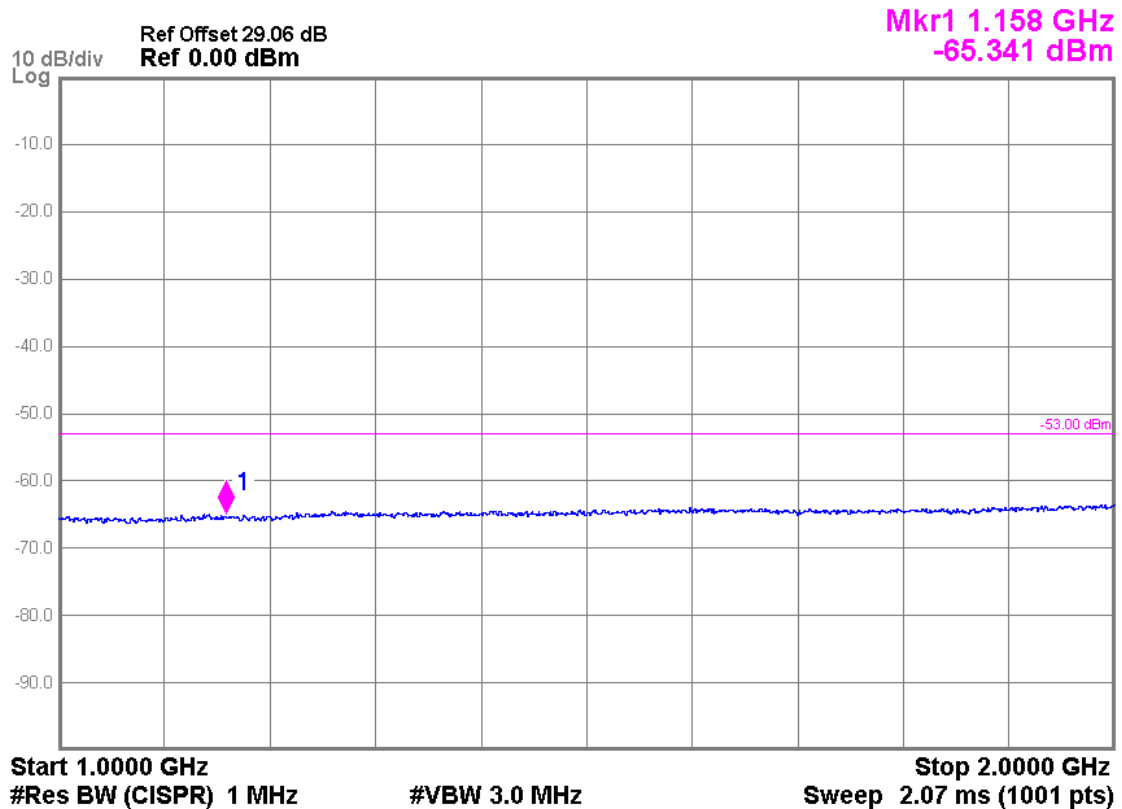
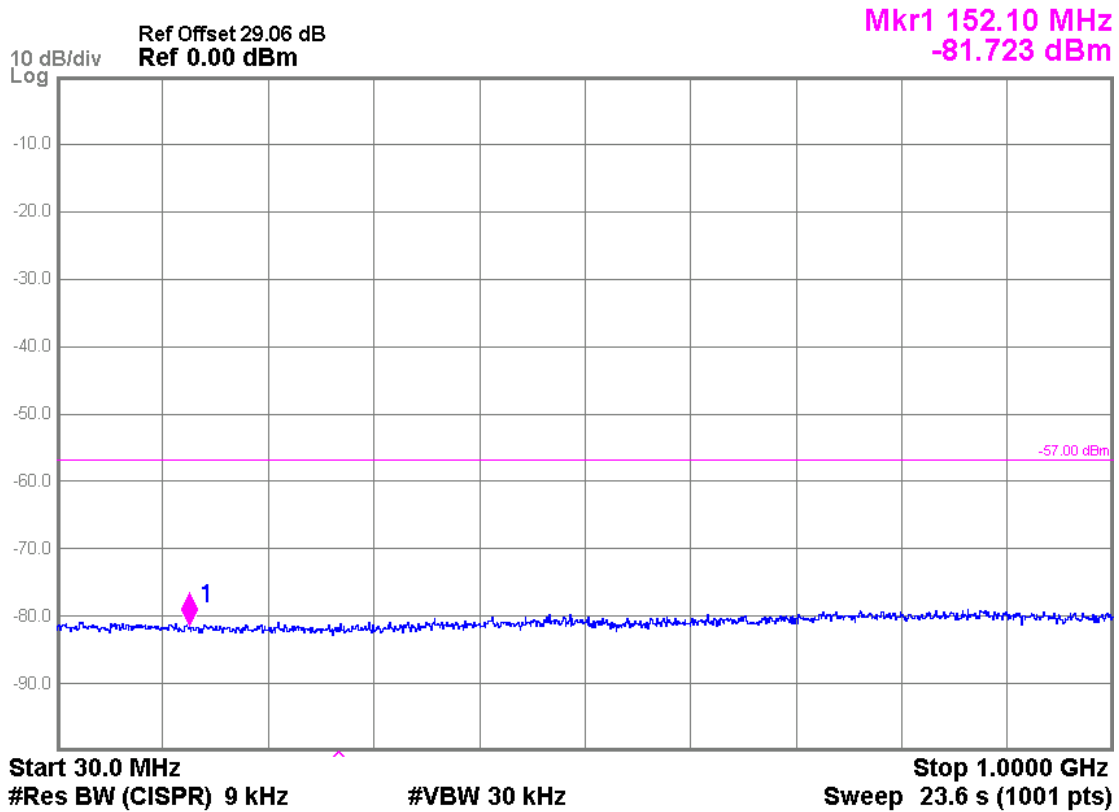
40.53 dBm



ANNEX 4 – TX STANDBY / RX CONDUCTED EMISSION PLOTS

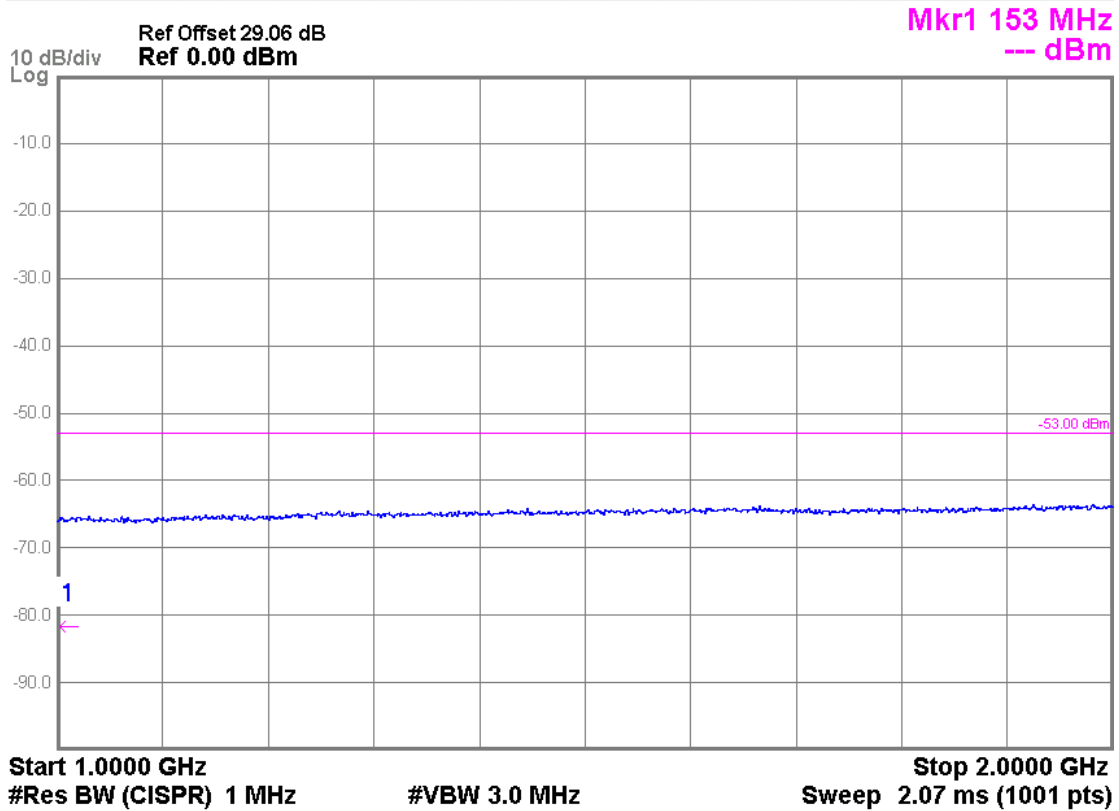
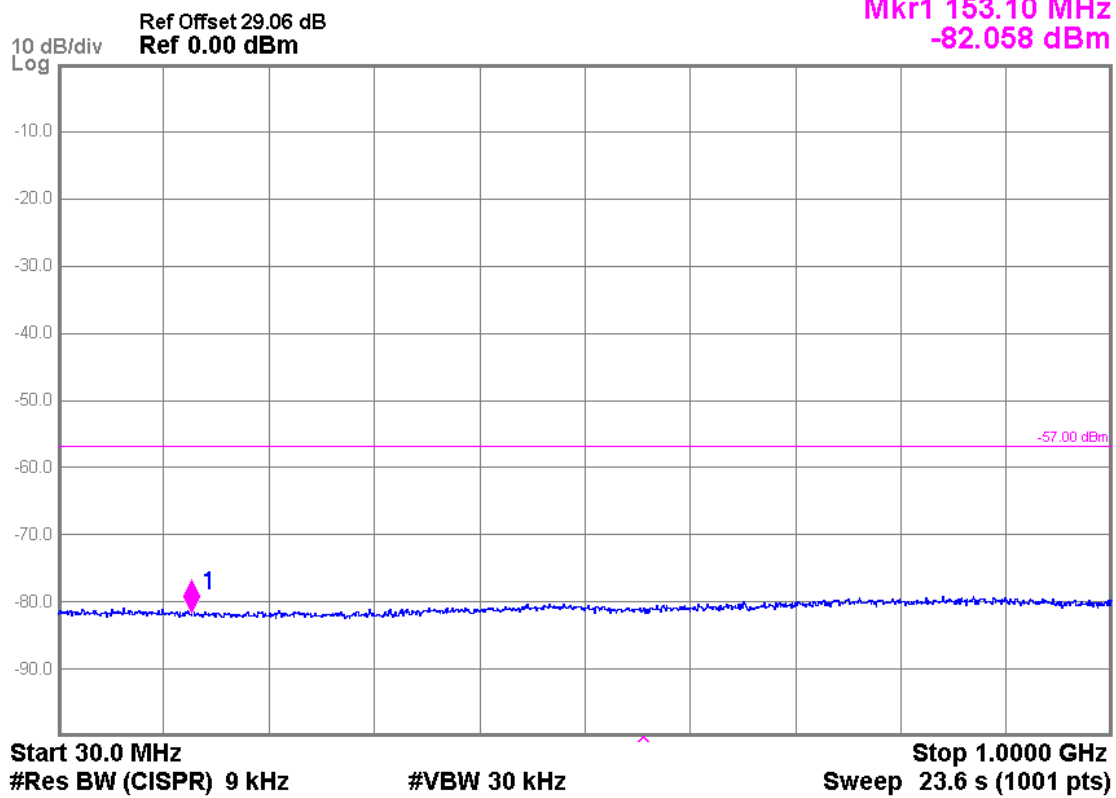
SPECIFICATION: FCC 47 CFR 2.1051
Tx FREQUENCY: 152.1 MHz

RSS-119 5.8
0 W/Tx standby – Tx Port



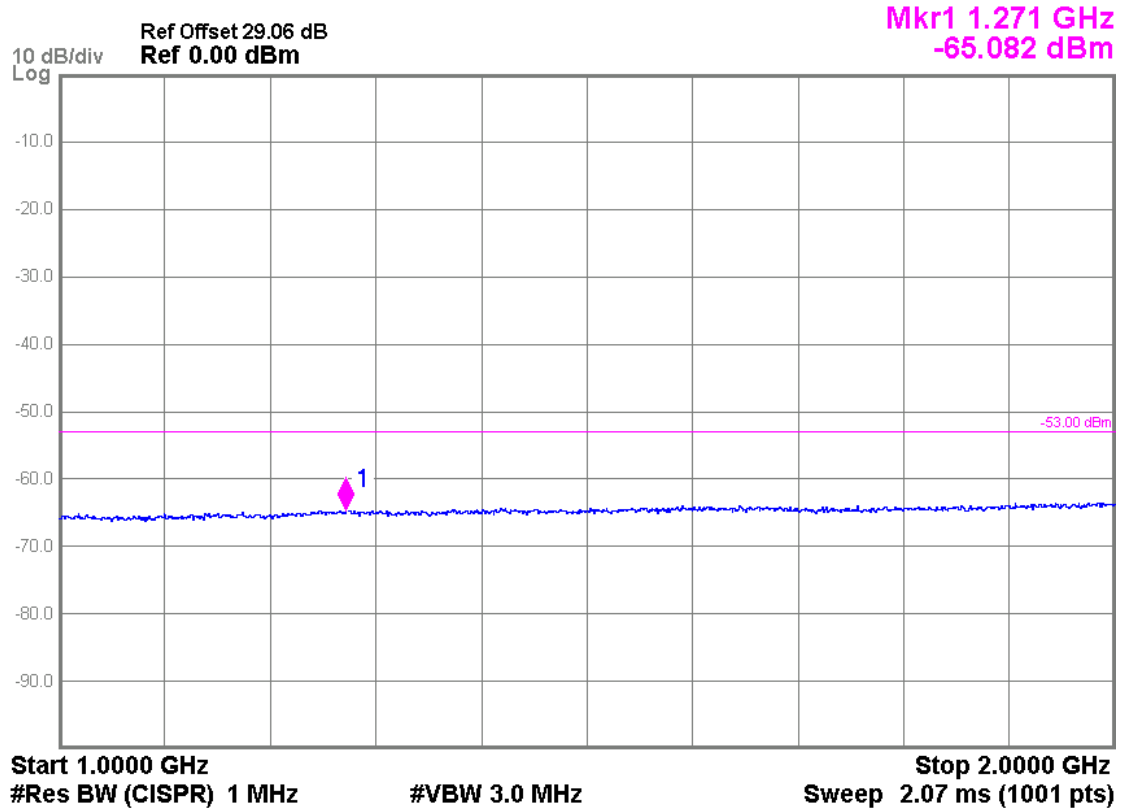
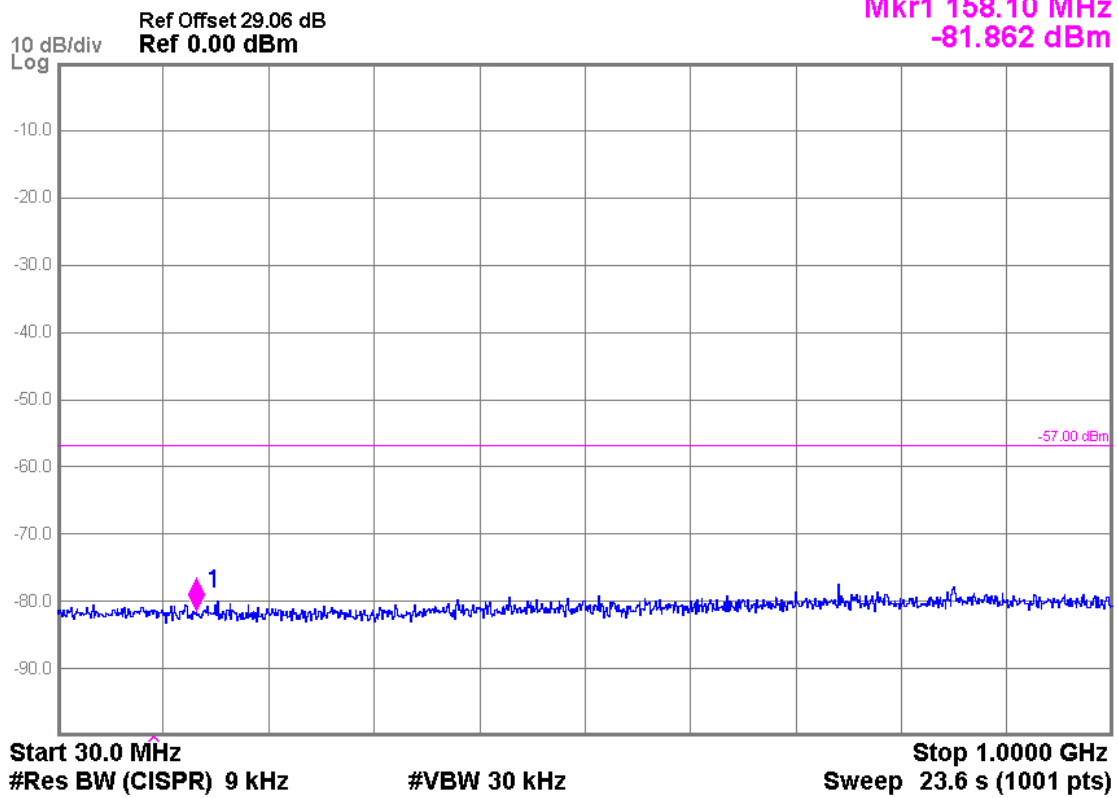
Tx FREQUENCY: 153.1 MHz

0 W/Tx standby – Tx Port



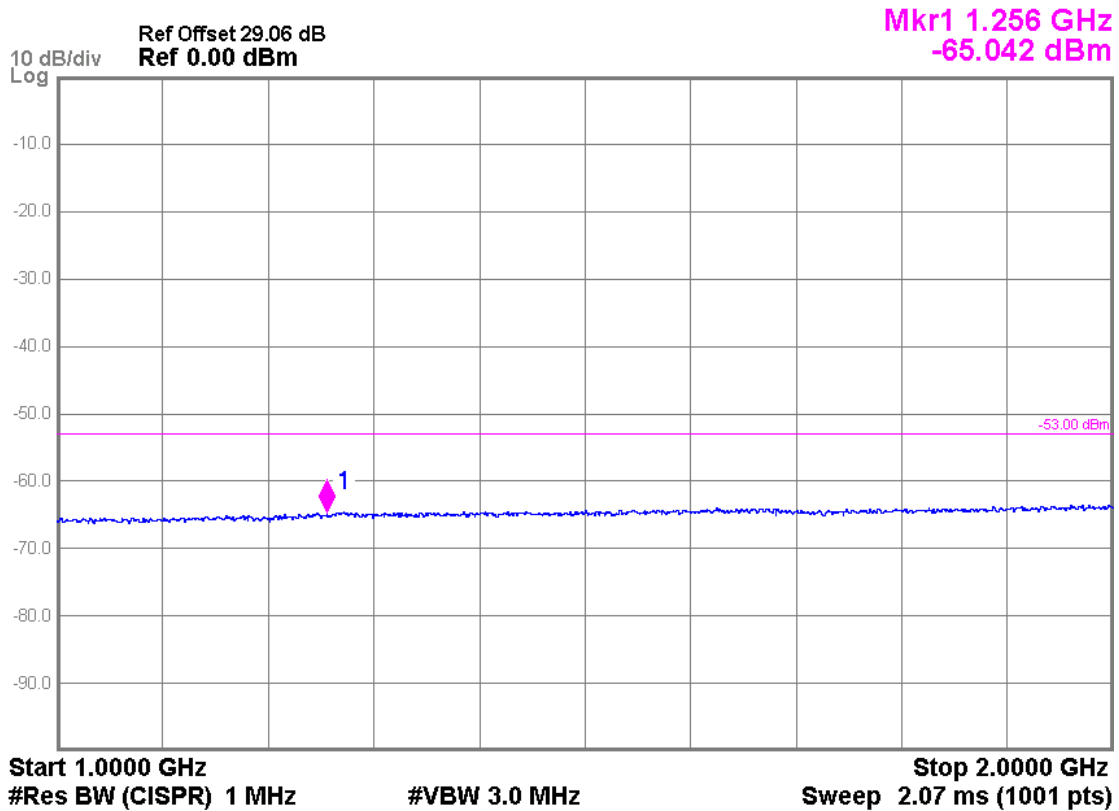
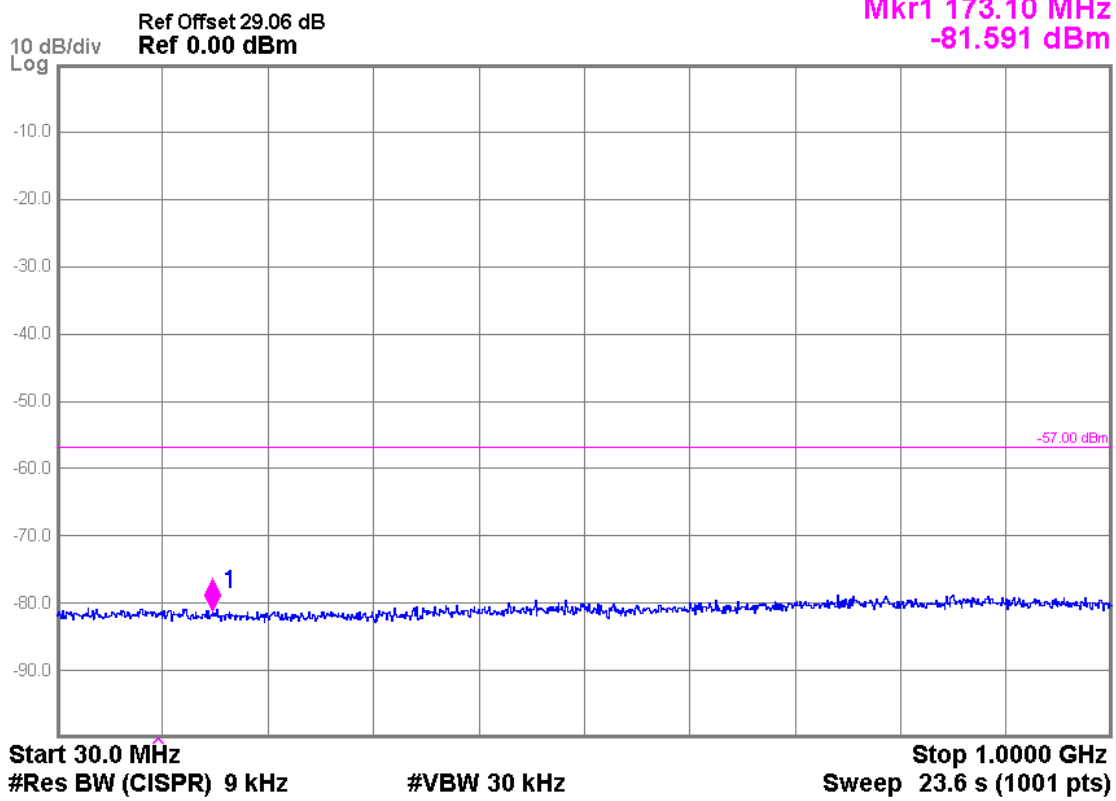
Tx FREQUENCY: 158.1 MHz

0 W/Tx standby – Tx Port



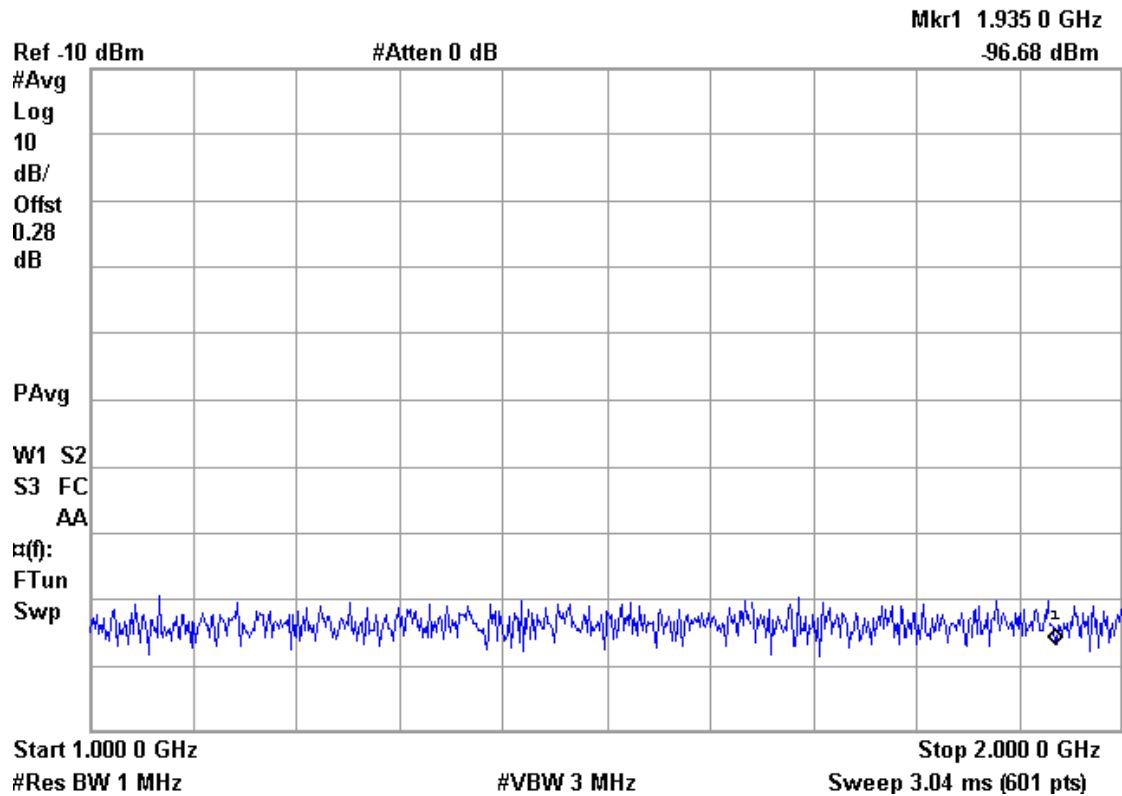
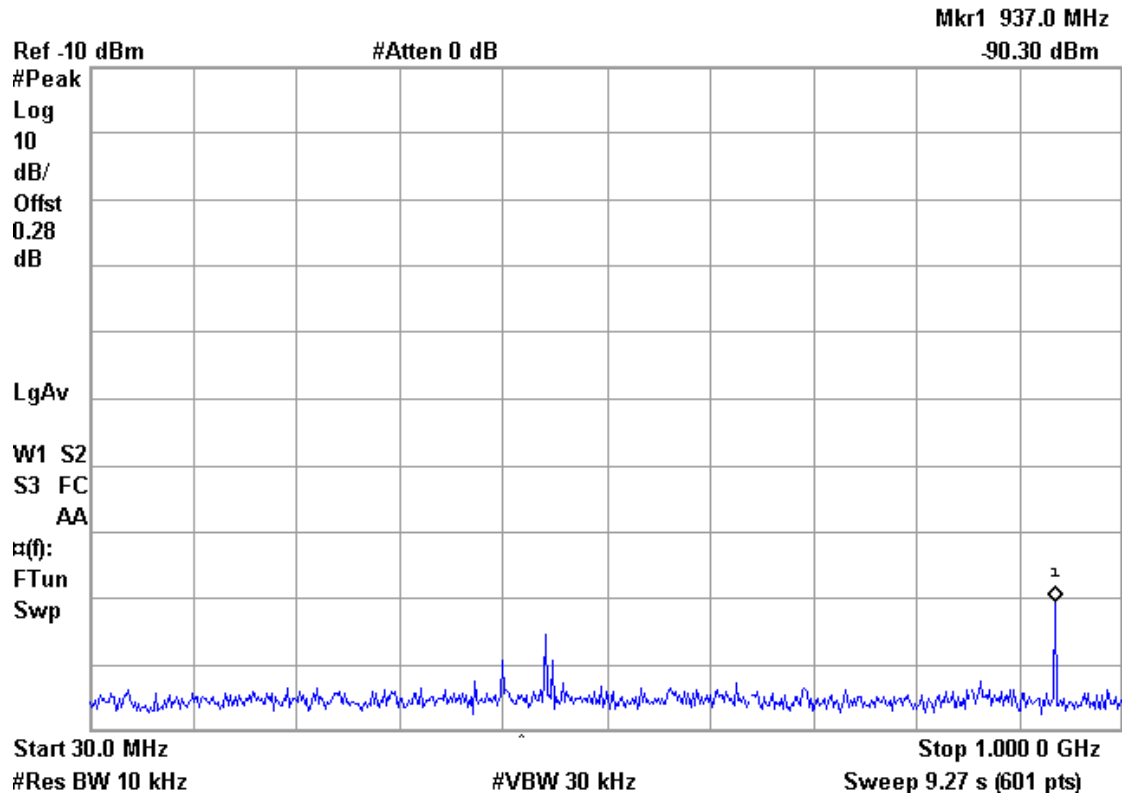
Tx FREQUENCY: 173.1 MHz

0 W/Tx standby – Tx Port



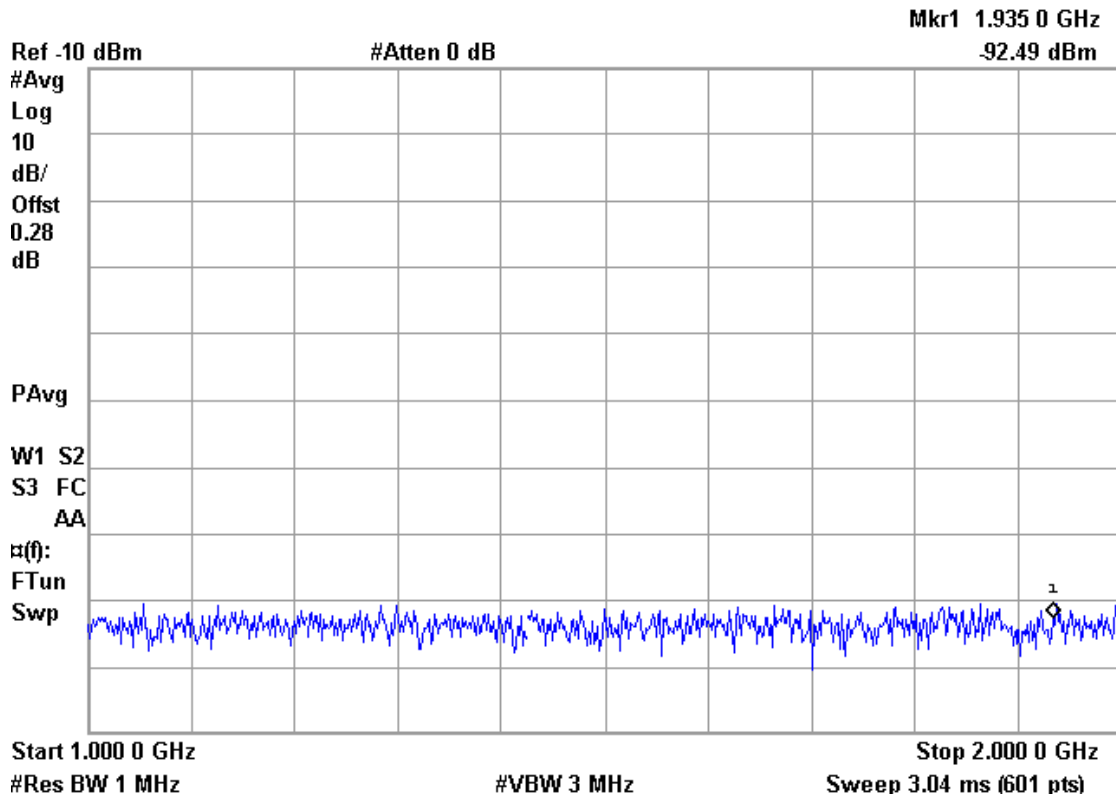
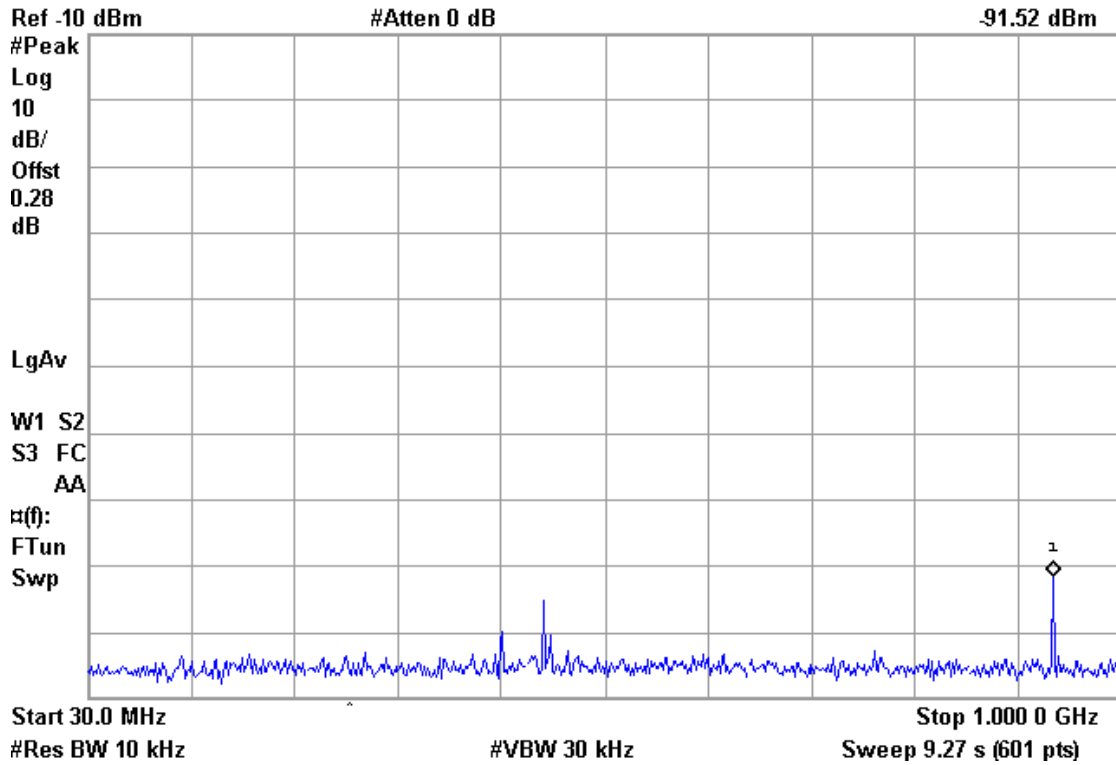
TELTEST Laboratories
Tait Limited
Report Number 3377

SPECIFICATION: RSS-119 5.11 RSS-Gen 4.10
Rx FREQUENCY: 152.1 MHz Receive Port



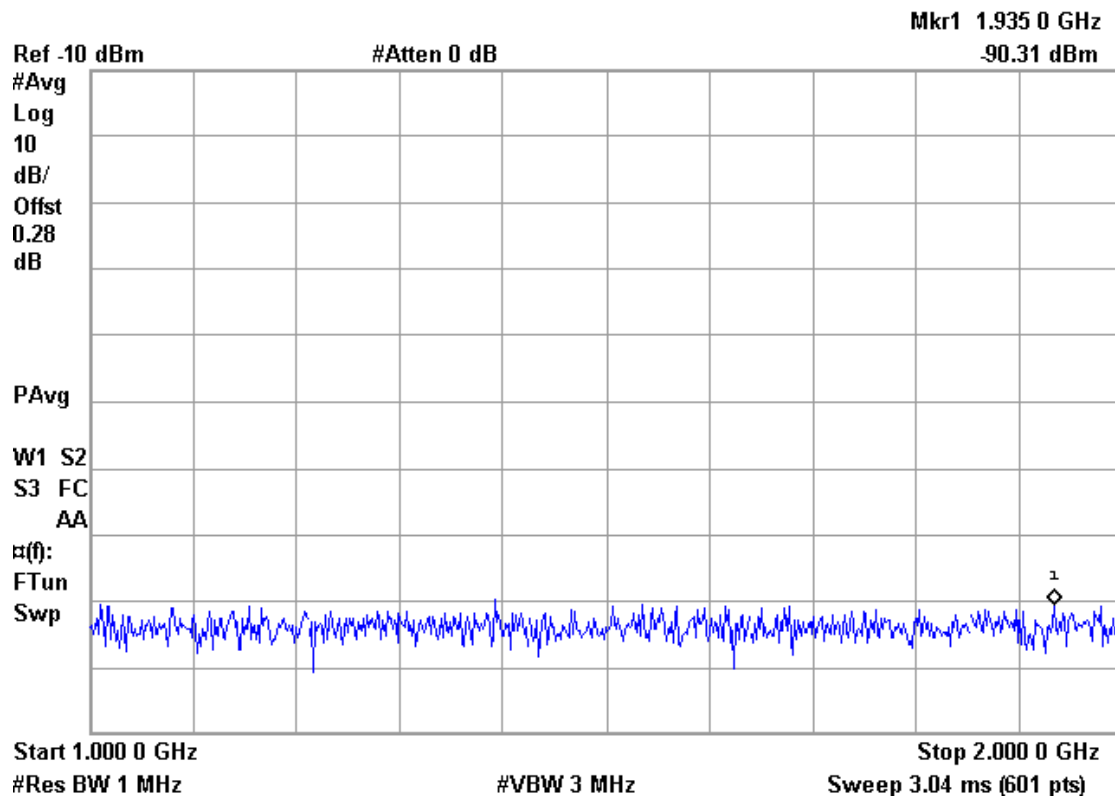
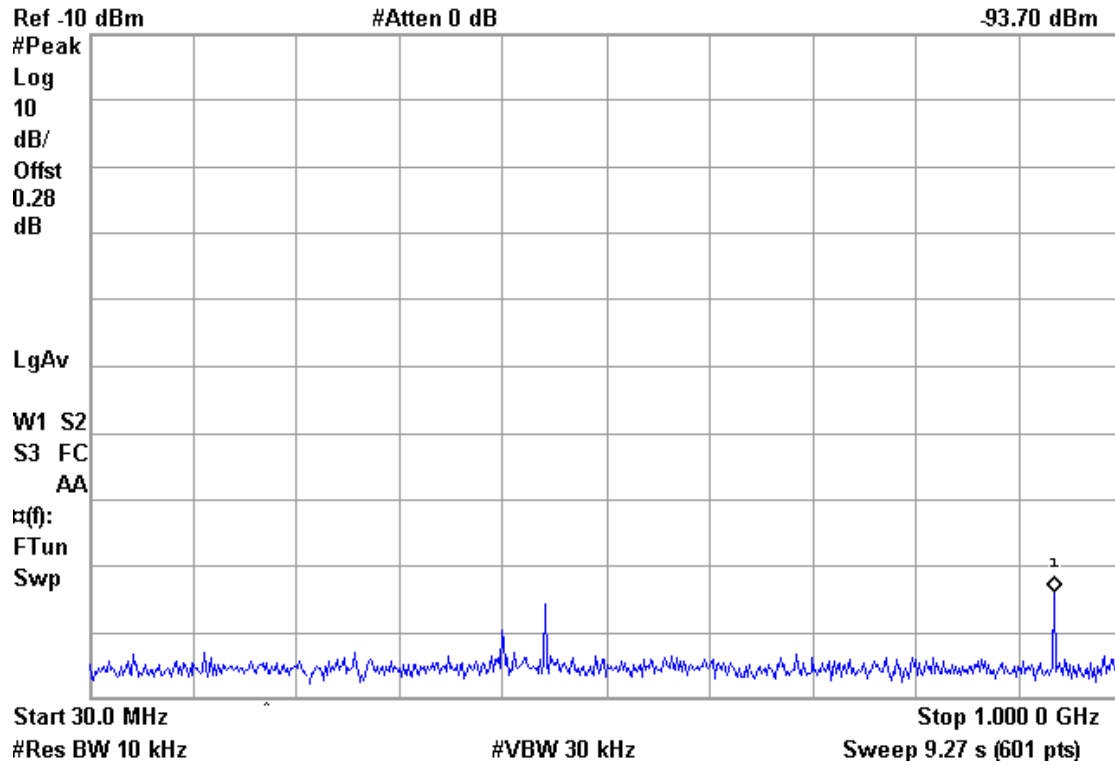
Rx FREQUENCY: 153.1 MHz

Receive Port
Mkr1 937.0 MHz



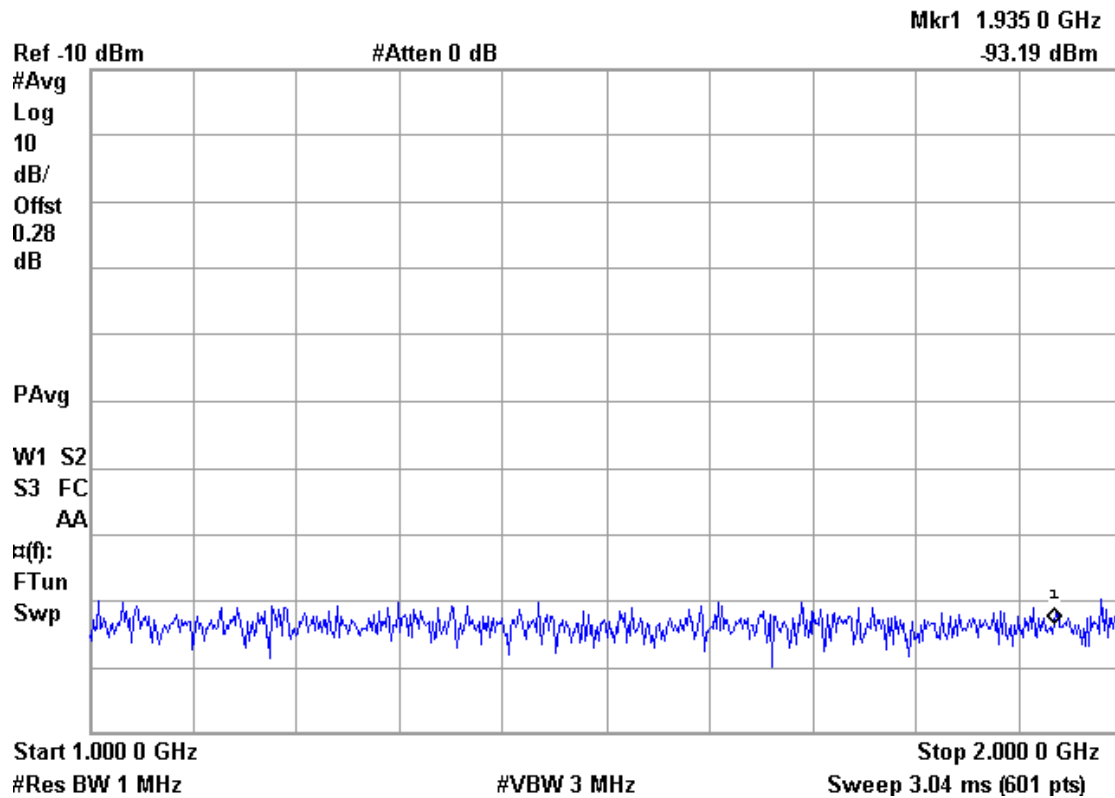
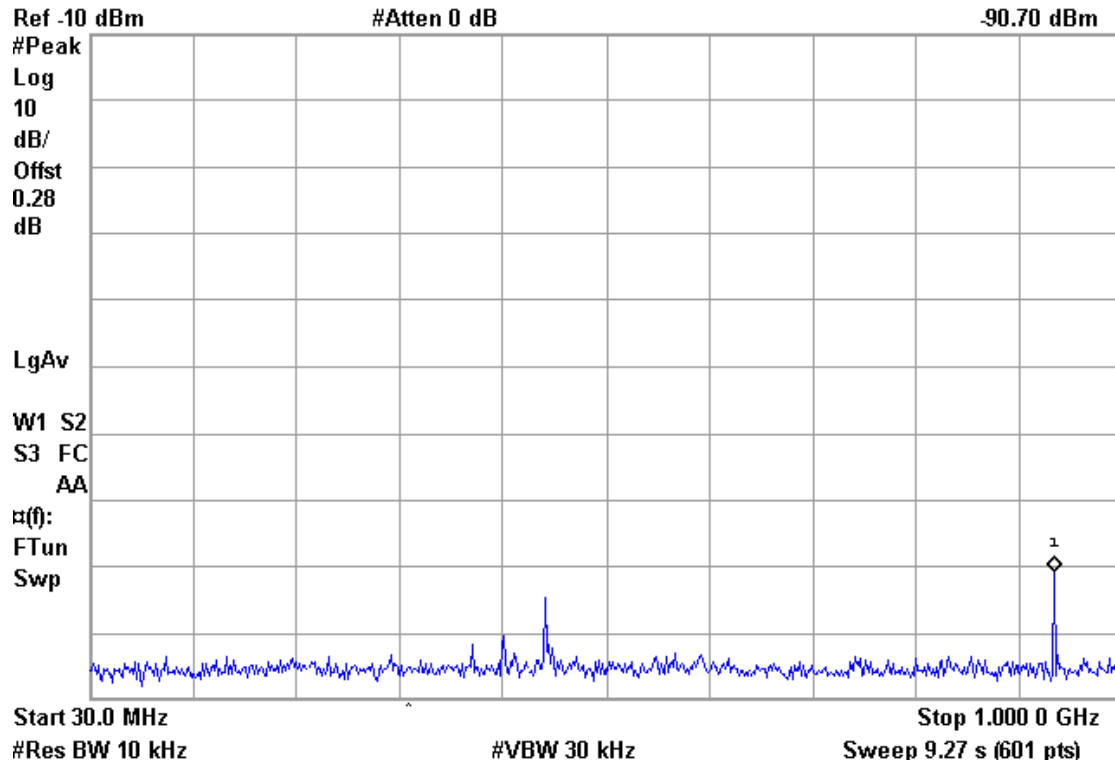
Rx FREQUENCY: 156.1 MHz

Receive Port
Mkr1 937.0 MHz
-93.70 dBm



Rx FREQUENCY: 158.1 MHz

Receive Port
Mkr1 937.0 MHz
-90.70 dBm



Rx FREQUENCY: 173.1 MHz

Receive Port
Mkr1 937.0 MHz
-90.77 dBm

