

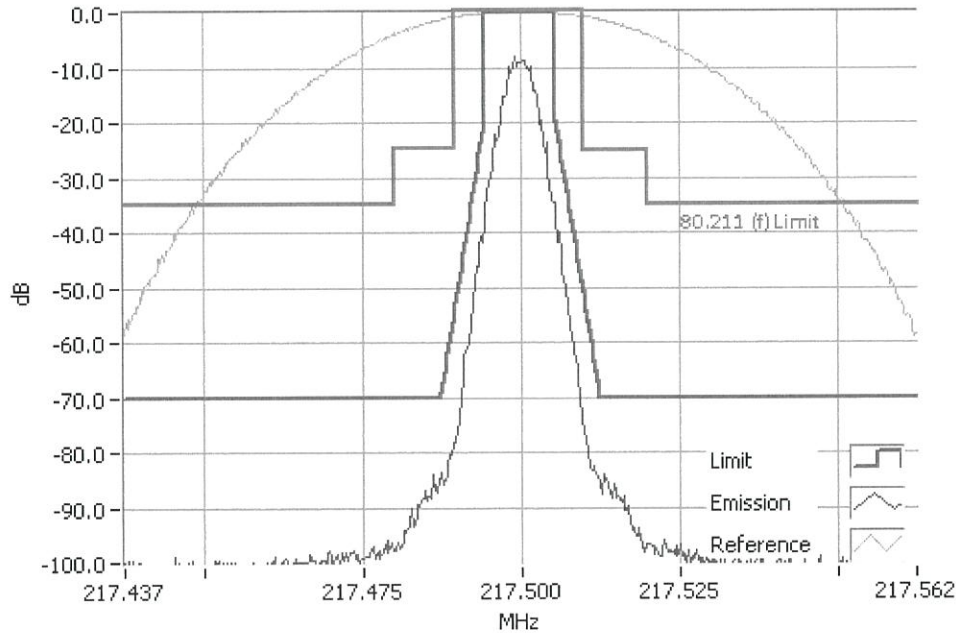
Occupied Bandwidth and Spectrum Masks

SPECIFICATION: FCC CFR 2.1049 (c)

RSS-119 5.5

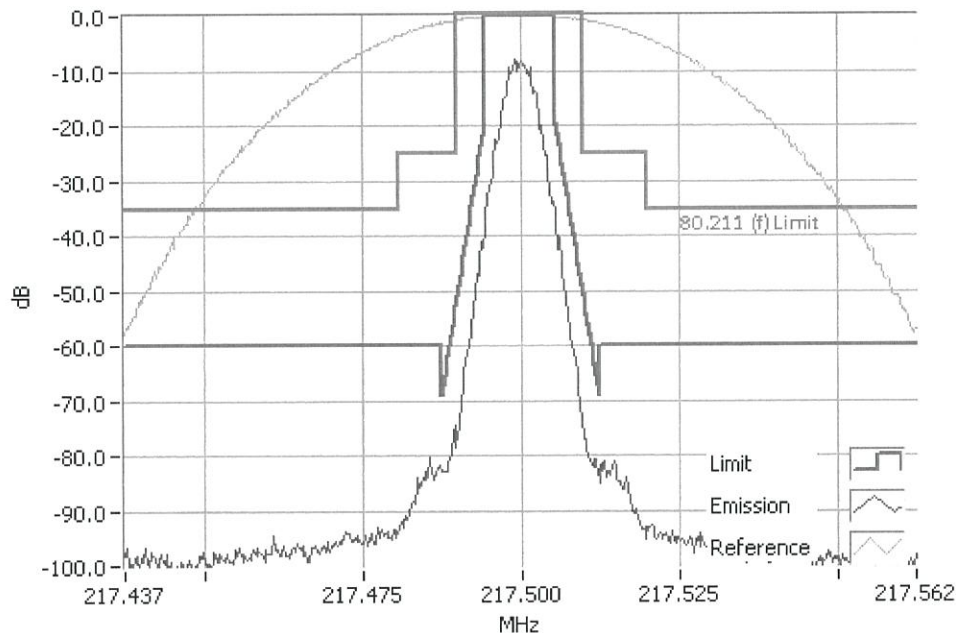
DMR Modulation

Tx FREQUENCY: 217.5 MHz 100 W 12.5 kHz Channel Spacing



DMR 217.5000MHz Mask D 100W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 217.5 MHz 10 W 12.5 kHz Channel Spacing



DMR 217.5000MHz Mask D 10W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

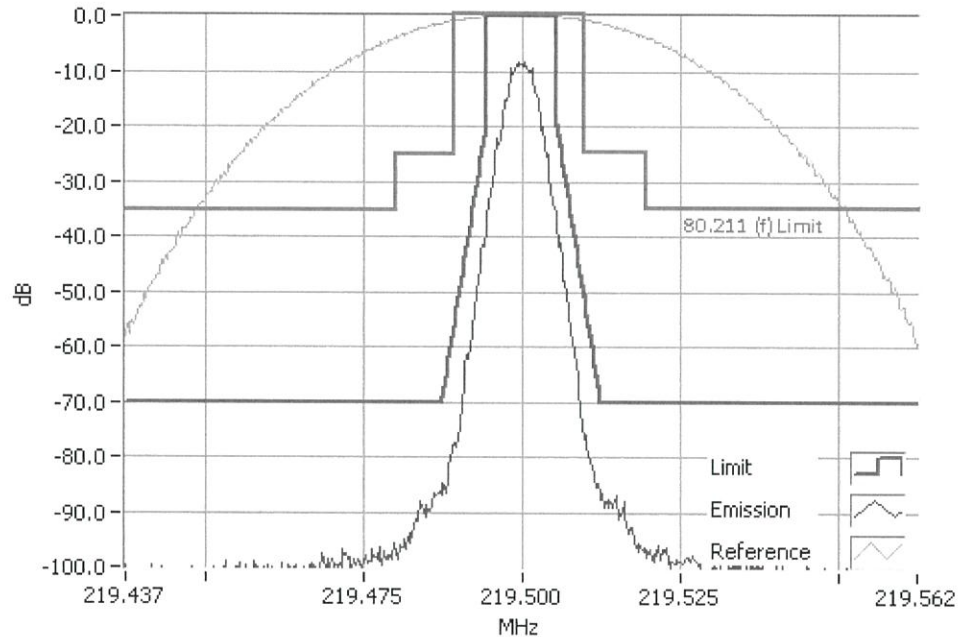
Occupied Bandwidth and Spectrum Masks

SPECIFICATION: FCC CFR 2.1049 (c)

RSS-119 5.5

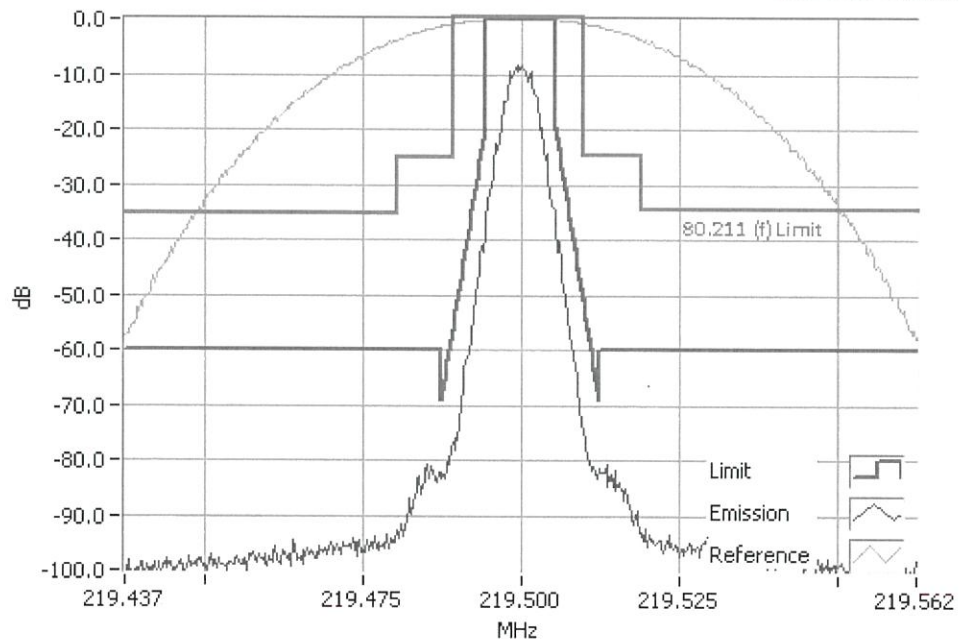
DMR Modulation

Tx FREQUENCY: 219.5 MHz 100 W 12.5 kHz Channel Spacing



DMR 219.5000MHz Mask D 100W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 219.5 MHz 10 W 12.5 kHz Channel Spacing



DMR 219.5000MHz Mask D 10W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

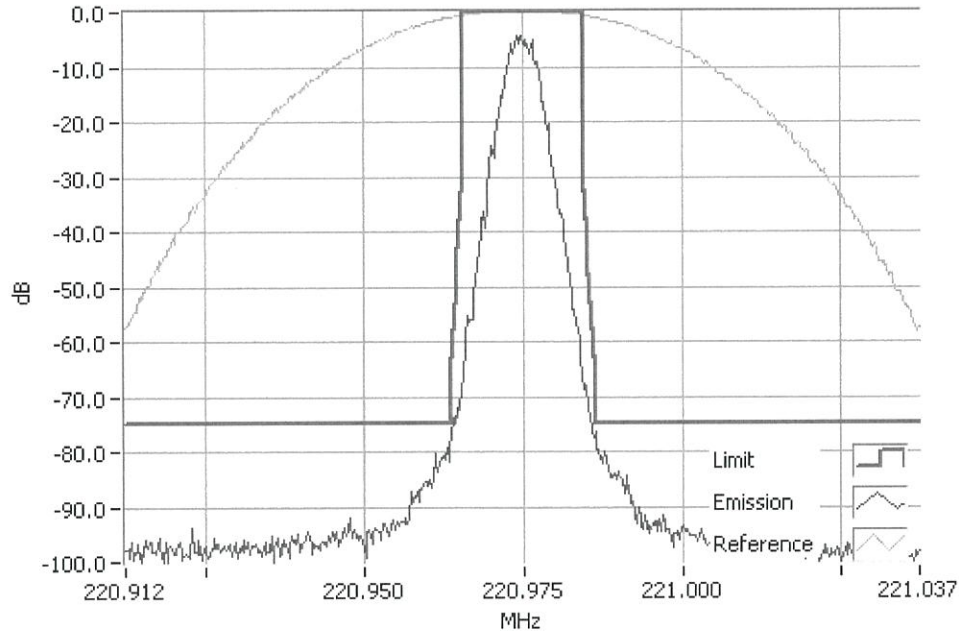
Occupied Bandwidth and Spectrum Masks

SPECIFICATION: FCC CFR 2.1049 (c)

RSS-119 5.5

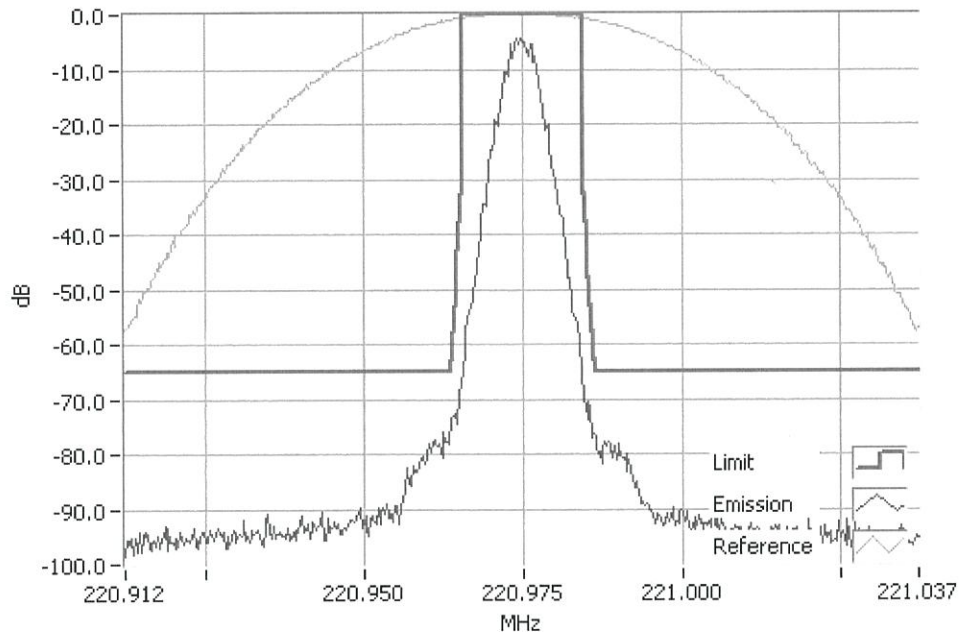
DMR Modulation

Tx FREQUENCY: 220.975 MHz 100 W 12.5 kHz Channel Spacing



DMR 220.9750MHz Mask Fx4 100W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 220.975 MHz 10 W 12.5 kHz Channel Spacing



DMR 220.9750MHz Mask Fx4 10W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

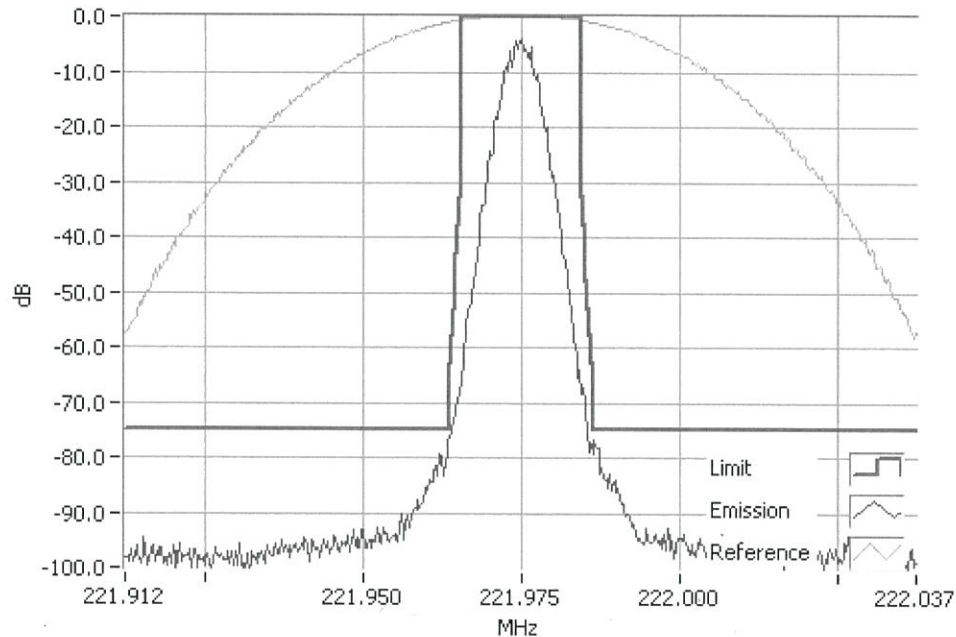
Occupied Bandwidth and Spectrum Masks

SPECIFICATION: FCC CFR 2.1049 (c)

RSS-119 5.5

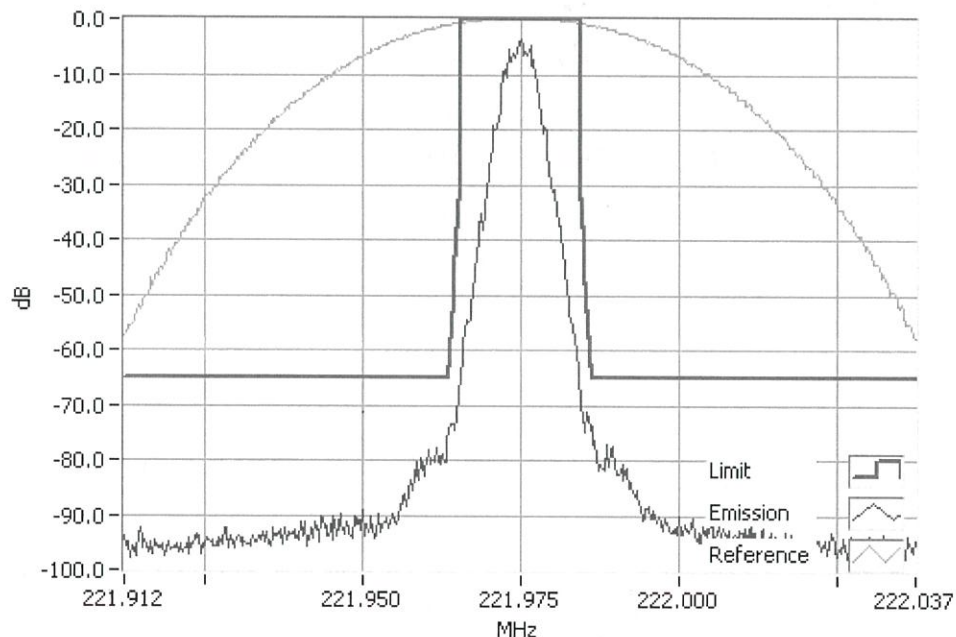
DMR Modulation

Tx FREQUENCY: 221.975 MHz 100 W 12.5 kHz Channel Spacing



DMR 221.9750MHz Mask Fx4 100W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 221.975 MHz 10 W 12.5 kHz Channel Spacing



DMR 221.9750MHz Mask Fx4 10W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

TRANSMITTER SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATIONS: FCC 47 CFR 2.1051

RSS-119 5.8

GUIDE: TIA-102.CAAA-C 2.2.7

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:

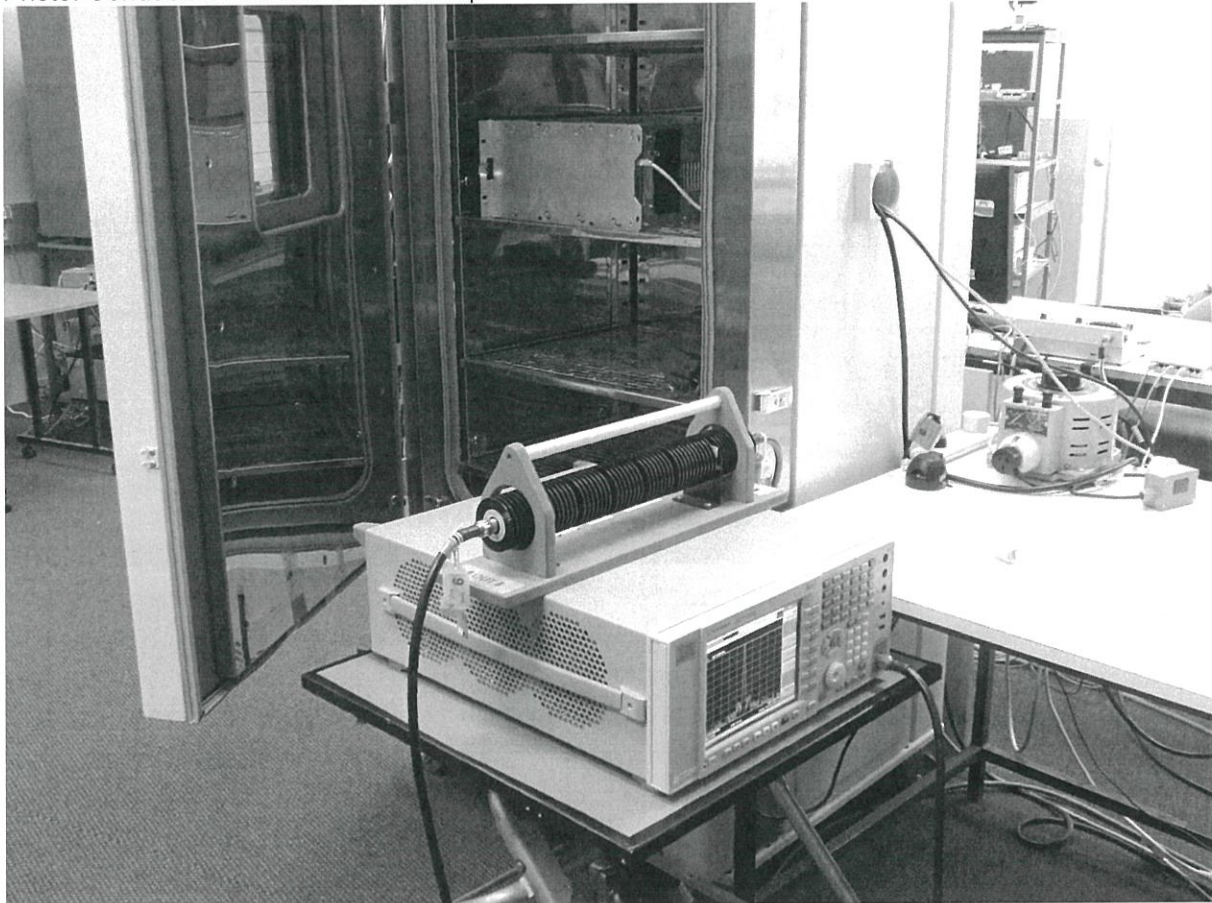
See the tables and plots on the following pages for 12.5 kHz channel spacing.

LIMIT CLAUSES: FCC 47 CFR 90.210

RSS-119 5.8

MEASUREMENT UNCERTAINTY: $\pm 3.0\text{dB}$

Photo: Conducted Emissions Test Setup



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

Tx FREQUENCY: 217.5 MHz

12.5 kHz Channel Spacing

217.5 MHz @ 100 W

Emission Mask D

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

12.5 kHz Channel Spacing

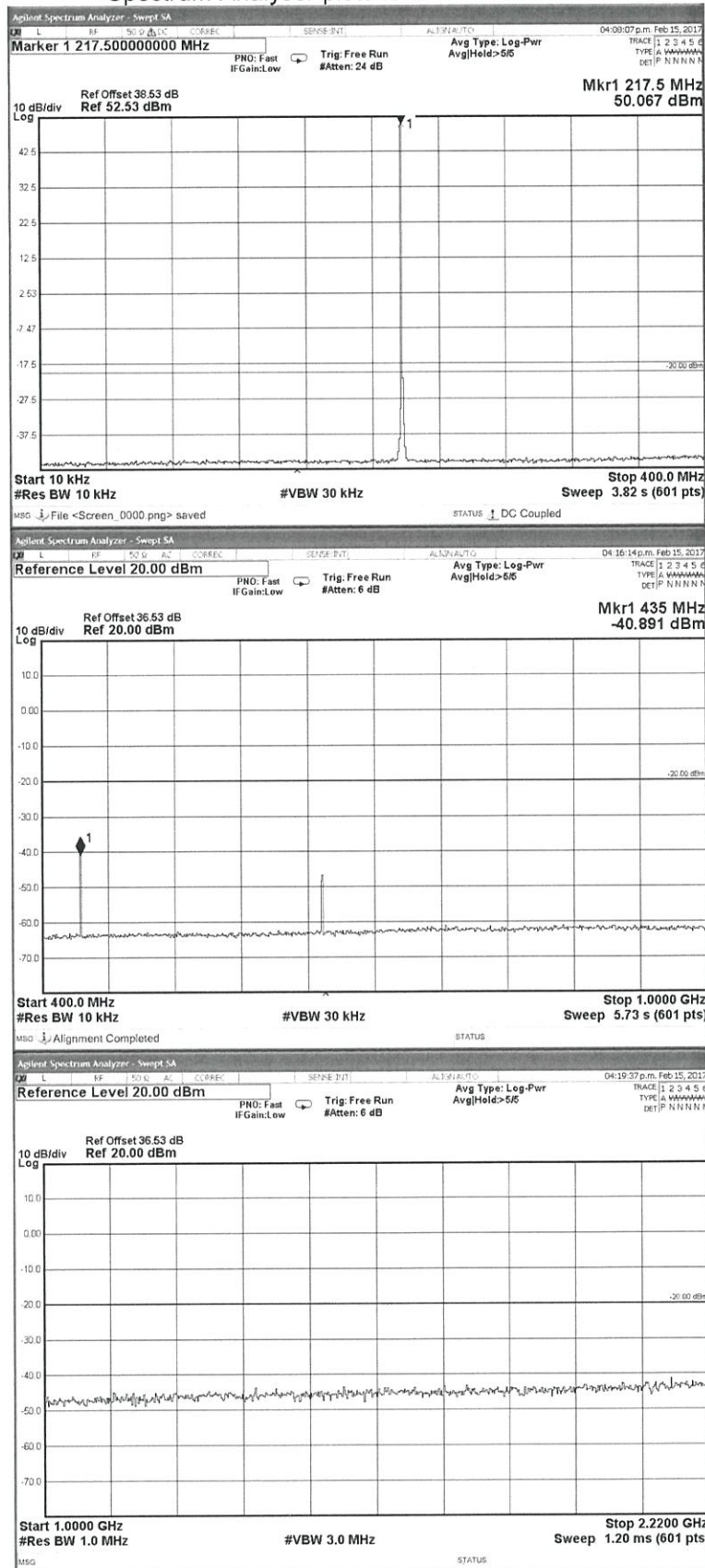
217.5 MHz @ 10 W

Emission Mask D

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

Spurious Emissions (Tx Conducted)

Spectrum Analyser plots for 217.5 MHz 100W



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

219.5 MHz @ 100 W

Emission Mask D

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

12.5 kHz Channel Spacing

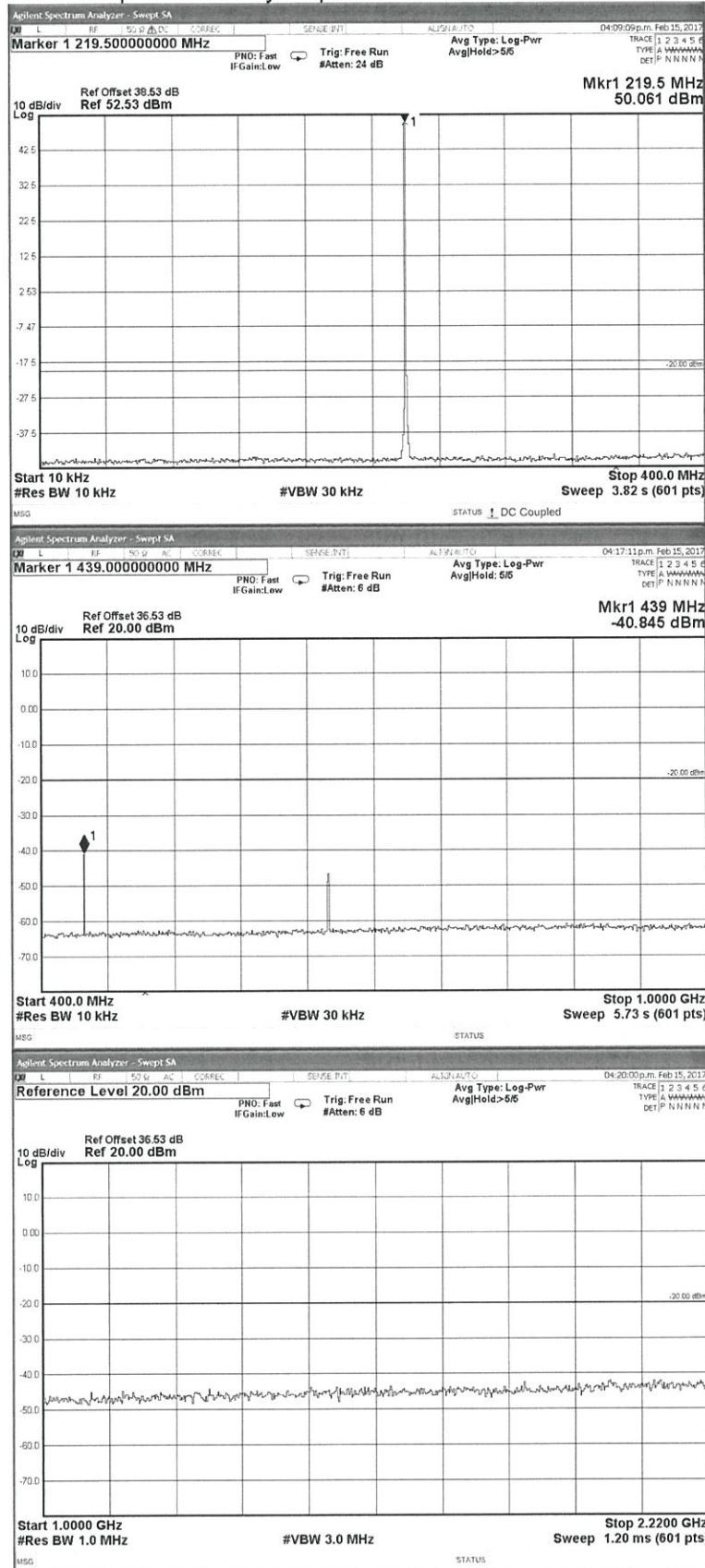
219.5 MHz @ 10 W

Emission Mask D

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

Spurious Emissions (Tx Conducted)

Spectrum Analyser plots for 219.5 MHz 100 W



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

220.975 MHz @ 100 W

Emission Mask Fx4

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

12.5 kHz Channel Spacing

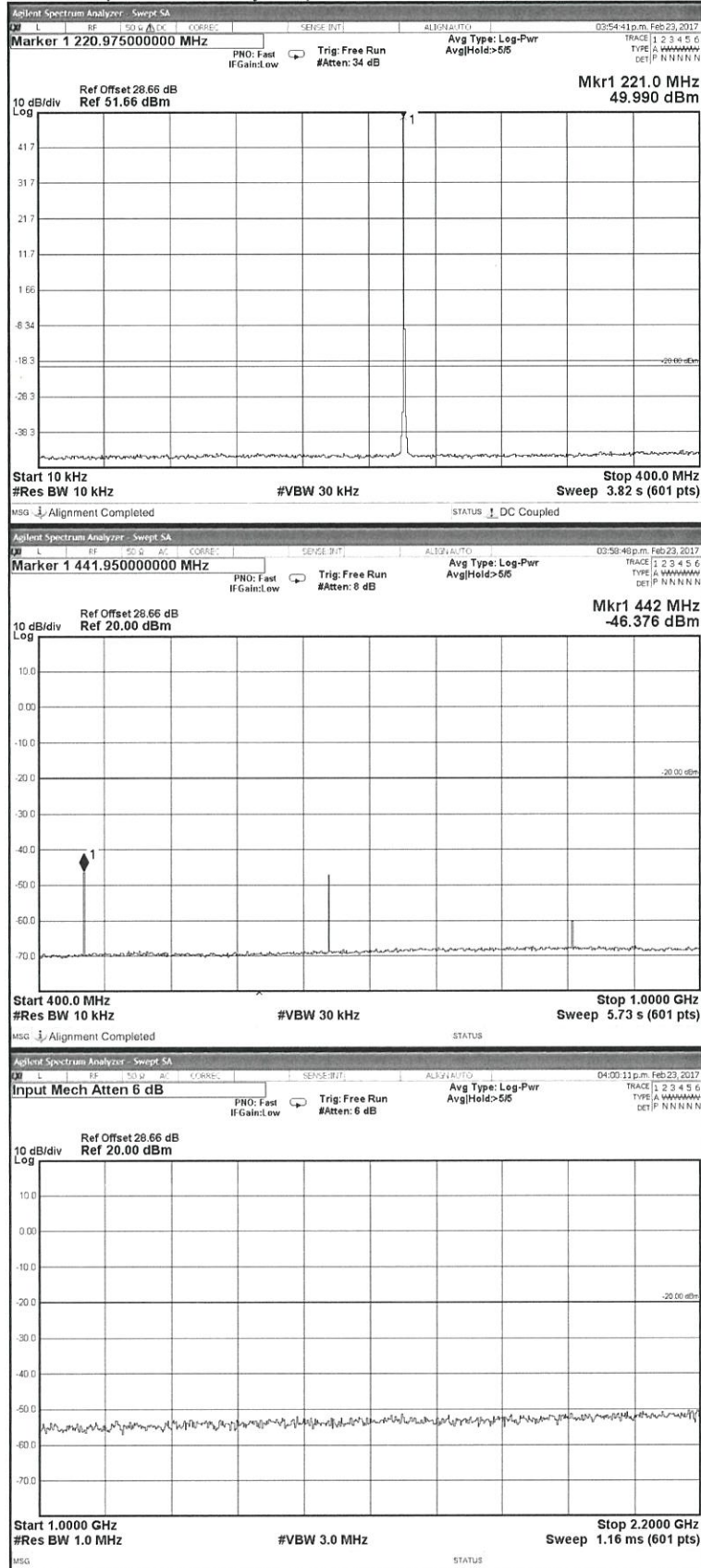
220.975 MHz @ 10 W

Emission Mask Fx4

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)

Spectrum Analyser plots for 220.975 MHz 100 W



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

221.975 MHz @ 100 W

Emission Mask Fx4

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

12.5 kHz Channel Spacing

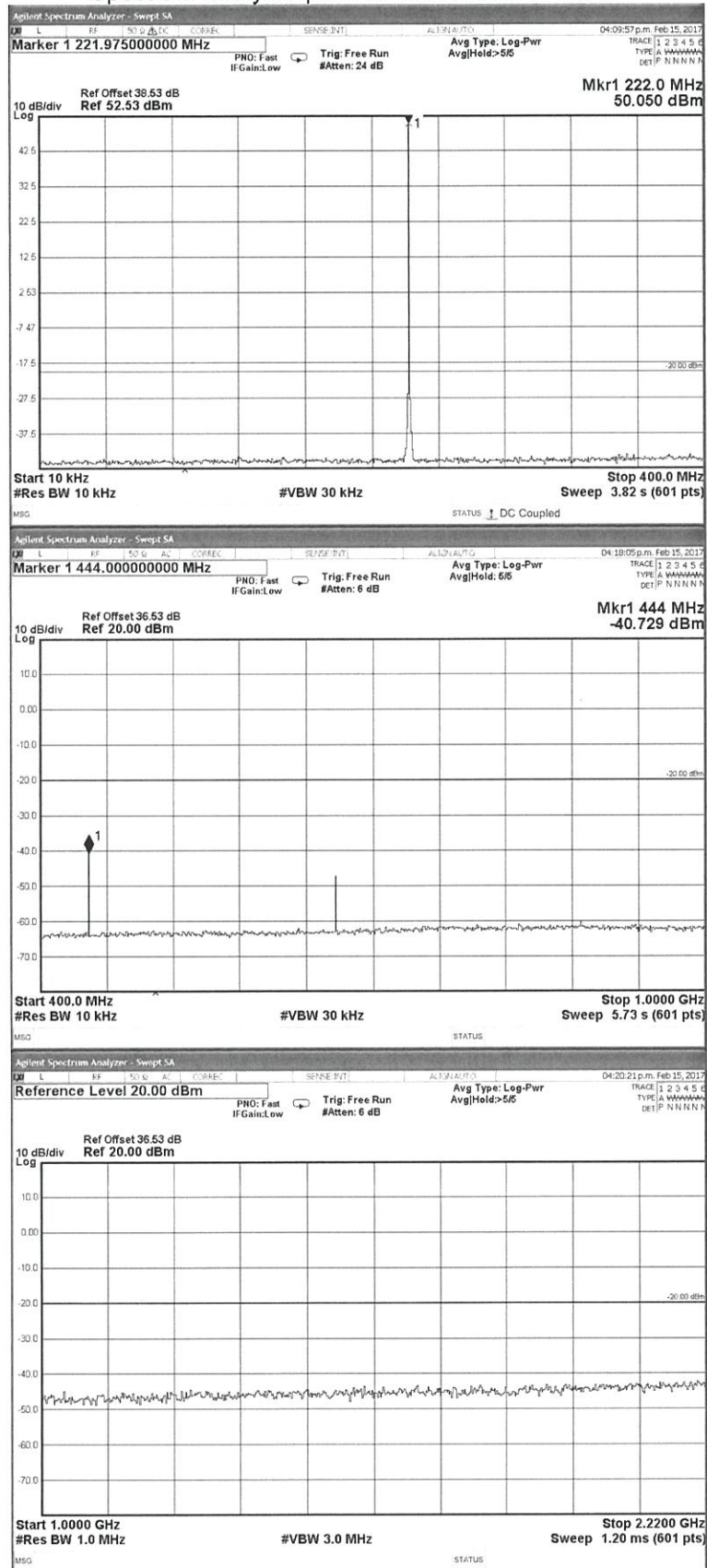
221.975 MHz @ 10 W

Emission Mask Fx4

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)

Spectrum Analyser plots for 221.975 MHz 100 W



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	-70 dBc
100 W	-20 dBm	-70 dBc
10 W	-20 dBm	-60 dBc

TRANSMITTER SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC 47 CFR 2.1053

GUIDE: TIA-102.CAAA-C 2.2.6

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. 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

MEASUREMENT UNCERTAINTY: $\pm 4.6\text{dB}$

Spurious Emissions (Tx Radiated)

SPECIFICATION: FCC CFR 2.1053

12.5 kHz Channel Spacing 217.5 MHz @ 100 W Emission Mask D

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

12.5 kHz Channel Spacing 217.5 MHz @ 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.		

12.5 kHz Channel Spacing 219.5 MHz @ 100 W Emission Mask D

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

12.5 kHz Channel Spacing 219.5 MHz @ 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.		

12.5 kHz Channel Spacing 220.975 MHz @ 100 W Emission Mask Fx4

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

12.5 kHz Channel Spacing 220.975 MHz @ 10 W Emission Mask Fx4

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

221.975 MHz @ 100 W

Emission Mask Fx4

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

12.5 kHz Channel Spacing

221.975 MHz @ 10 W

Emission Mask Fx4

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 & Fx4 12.5 kHz Channel Spacing $50 + 10 \log_{10}(P_{\text{Watts}})$	
100 W	-20 dBm	-70 dBc
10 W	-20 dBm	-60 dBc

Tx Radiated Emissions - Continued

Open Area Test Site Results:

12.5 kHz Channel Spacing

219.5 MHz @ 100 W

Emission Mask D

Harmonics Emission Frequency (MHz)	Level (dBm)	Level (dBc)
439.0	-84.53	-134.53
658.5	-68.43	-118.43
878.0	-58.43	-108.43
1097.5	-68.38	-118.38
1317.0	-58.90	-108.90
1536.5	-72.24	-122.24

Photo: OATS Setup



TRANSMITTER FREQUENCY STABILITY - TEMPERATURE

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

RSS-119 5.3

GUIDE: TIA-102.CAAA-C 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:

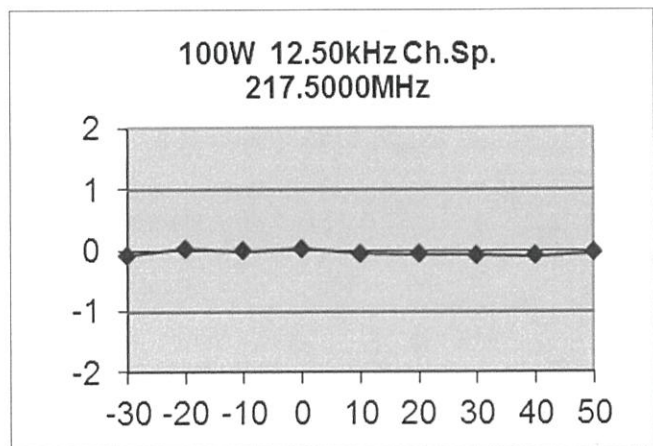
See the plots on the following pages for 12.5 kHz channel spacing.

MEASUREMENT UNCERTAINTY: $\pm 7 \times 10^{-8}$

217.5 MHz 100 W

Temperature ($^{\circ}\text{C}$)	Error (ppm)
-30	-0.08
-20	0.02
-10	-0.02
0	0.03
10	-0.05
20	-0.07
30	-0.08
40	-0.09
50	-0.04

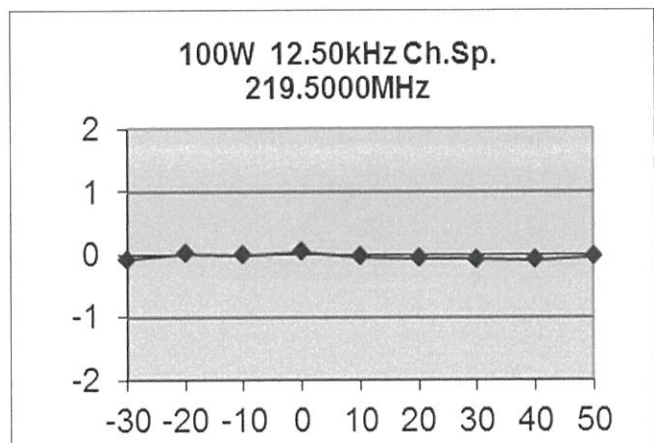
12.5 kHz channel spacing



219.5 MHz 100 W

Temperature ($^{\circ}\text{C}$)	Error (ppm)
-30	-0.08
-20	0.01
-10	-0.01
0	0.04
10	-0.04
20	-0.06
30	-0.08
40	-0.09
50	-0.04

12.5 kHz channel spacing

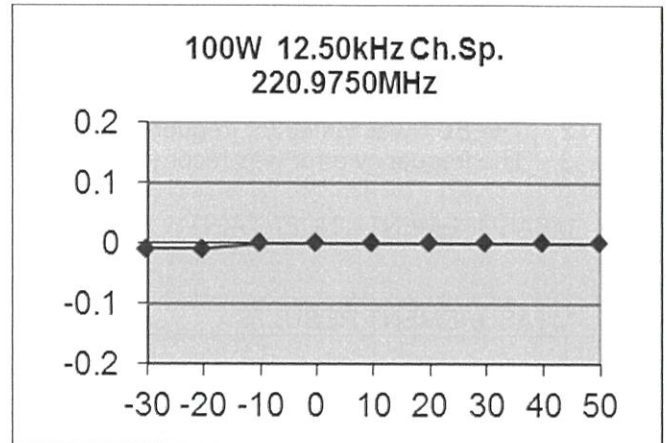


Transmitter Frequency Stability - Temperature

220.975 MHz 100 W

Temperature (°C)	Error (ppm)
-30	-0.01
-20	-0.01
-10	0.00
0	0.00
10	0.00
20	0.00
30	0.00
40	0.00
50	0.00

12.5 kHz channel spacing

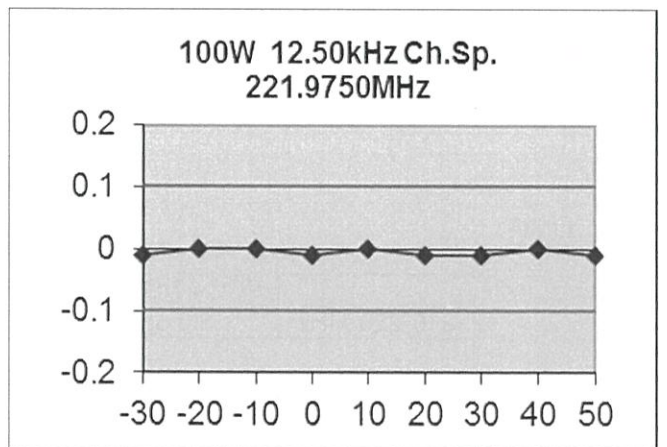


External 10 MHz reference provided to EUT for this test

221.975 MHz 100 W

Temperature (°C)	Error (ppm)
-30	-0.01
-20	0.00
-10	0.00
0	-0.01
10	0.00
20	-0.01
30	-0.01
40	0.00
50	-0.01

12.5 kHz channel spacing



External 10 MHz reference provided to EUT for this test

LIMIT:

	FCC 47 CFR 80
216-220 MHz	5.0 ppm
	FCC 47 CFR 90
220-222 MHz	0.1 ppm

	RSS-119 5.3
217-218 & 219-220 MHz	1.0 ppm
	RSS-119 5.3
220-222 MHz	0.1 ppm

TRANSMITTER FREQUENCY STABILITY - VOLTAGE

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

RSS-119 5.3

GUIDE: TIA-102.CAAA-C 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 UNCERTAINTY: $\pm 7 \times 10^{-8}$

MEASUREMENT RESULTS:

Voltage	FREQUENCY ERROR (ppm) for 12.5 kHz			
	217.5 MHz	219.5 MHz	220.975 MHz	221.975 MHz
120 V _{AC}	-0.11	-0.07	-0.08	-0.05
102 V _{AC}	-0.13	-0.06	-0.07	-0.05
138 V _{AC}	-0.13	-0.06	-0.07	-0.05
Maximum Freq. Error (ppm)	-0.13	-0.07	-0.08	-0.05

LIMIT:

	FCC 47 CFR 80
216-220 MHz	5.0 ppm
	FCC 47 CFR 90
220-222 MHz	0.1 ppm

	RSS-119 5.3
217-218 & 219-220 MHz	1.0 ppm
	RSS-119 5.3
220-222 MHz	0.1 ppm