

Spurious Emissions (Tx Conducted)

Emission Frequency (MHz)		173.975 MHz, 12.5 kHz Channel Spacing, 5 W	173.975 MHz, 12.5 kHz Channel Spacing, 1 W
Level (dBm)		Level (dBc)	Level (dBc)
~		~	~
No emissions were detected at a level greater than 20 dB below the limit.			
173.975MHz 5W 12.5kHz Unmodulated 100kHz RBW- 100kHz to 1GHz 1MHz RBW- 1GHz to 1.8GHz Low Pass Filter used from 310.0 MHz to 1.8 GHz Result Limit Measured Point Wanted Carrier Narrow RBW Detector = Average (rms) Fc ± 2 MHz, 8001 Pts, 7s. Swp On Channel Below 1GHz Above 1GHz Amplitude (dbm) Frequency (MHz) Result obtained by integration of narrow RBW filter measurements: 1k Hz RBW: 172.0 MHz to 176.0 MHz		173.975MHz 1W 12.5kHz Unmodulated 100kHz RBW- 100kHz to 1GHz 1MHz RBW- 1GHz to 1.8GHz Low Pass Filter used from 310.0 MHz to 1.8 GHz Result Limit Measured Point Wanted Carrier Narrow RBW Detector = Average (rms) Fc ± 2 MHz, 8001 Pts, 7s. Swp On Channel Below 1GHz Above 1GHz Amplitude (dbm) Frequency (MHz) Result obtained by integration of narrow RBW filter measurements: 1k Hz RBW: 172.0 MHz to 176.0 MHz	

Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051 RSS-119 5.8

LIMITS: FCC 47 CFR 90.210 RSS-119 5.8

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

TRANSMITTER SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC 47 CFR 2.1053

GUIDE: ANSI C63.26 5.5.3

MEASUREMENT PROCEDURE: Semi Anechoic Chamber

1. The EUT is placed on a polystyrene turntable at a distance of three meters 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. For measurements above 1 GHz, RF absorption tiles are placed on the ground plane, and antenna bore-sighting is enabled with the receiving antenna tilted in a way that it is directed towards the EUT.
4. Emissions are measured on a spectrum analyser and the levels corrected using a pre-measured site path loss. This correction is made as per ANSI C63.26 Annex B and combines the effects of the path loss, antenna, cables and amplifier used in the measurement.

MEASUREMENT UNCERTAINTY: ≤ 12.75 GHz ± 4.6 dB

MEASUREMENT RESULTS:

See the tables on the following pages.

Spurious Emissions (Tx Radiated) – Continued

SPECIFICATION: FCC 47 CFR 2.1053

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

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

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

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

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

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

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

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

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

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

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

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

Spurious Emissions (Tx Radiated) – Continued

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

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

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

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

12.5 kHz Channel Spacing 150.050 MHz @ 5 W Emission Mask D

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

12.5 kHz Channel Spacing 150.050 MHz @ 1 W Emission Mask D

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

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

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

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

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

Spurious Emissions (Tx Radiated) – Continued

12.5 kHz Channel Spacing

173.975 MHz @ 5 W

Emission Mask D

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

12.5 kHz Channel Spacing

173.975 MHz @ 1 W

Emission Mask D

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

LIMITS: FCC 47 CFR 2.1053

Carrier Output Power	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \log_{10}(P_{\text{Watts}})$	
5 W	-20 dBm	-56 dBc
1 W	-20 dBm	-50 dBc

Spurious Emissions (Tx Radiated) - Continued

Harmonics Measurement Results:

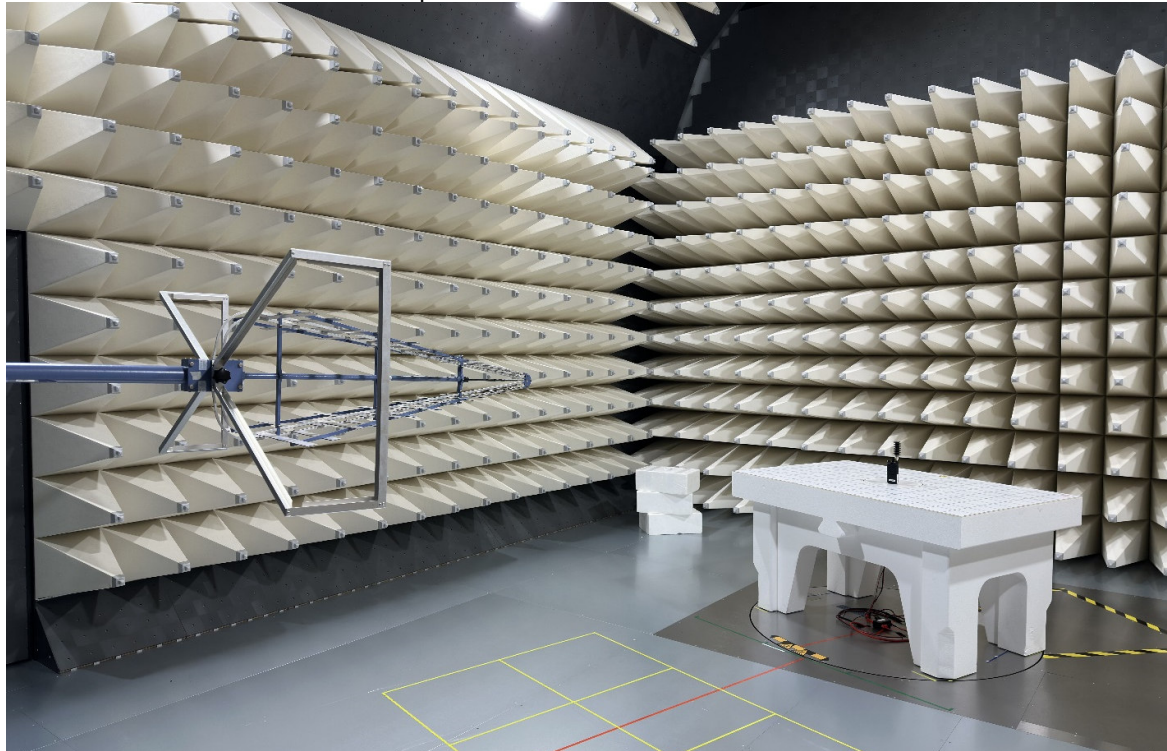
12.5 kHz Channel Spacing	138.025 MHz @ 5 W	Emission Mask D
Harmonics Emission Frequency (MHz)	Level (dBm)	Level (dBc)
276.050	-58.34	-95.3
414.075	-71.70	-108.7
552.100	-76.09	-113.1
690.125	-89.36	-126.3
828.150	-84.79	-121.8
966.175	-85.35	-122.3

Sample Calculation:

	Measured Value	System Loss/Gain				Result	
Emission Frequency (MHz)	Analyser Level (dBm)	Correction (dB)	Polarization	Azimuth (Degrees)	Antenna Height (m)	Emission Level (dBm)	Emission Level (dBc)
966.175	-71.89	-13.46	Horizontal	58	1.00	-85.35	-122.3

Result Emission Level = Measured Value + Correction (Pre-measured site path loss characterization)

Photo: Semi-anechoic Chamber Setup



TRANSIENT FREQUENCY BEHAVIOR

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

GUIDE: ANSI C63.26 6.5.2.2

MEASUREMENT PROCEDURE:

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

MEASUREMENT UNCERTAINTY: 130Hz

MEASUREMENT RESULTS:

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

LIMIT CLAUSES:

FCC 47 CFR 90.214

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

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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

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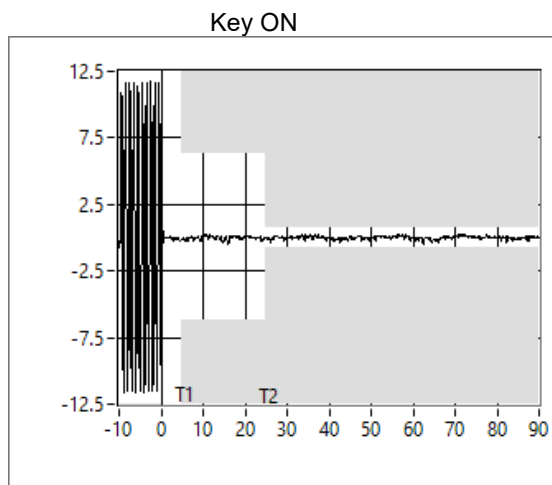
Tx FREQUENCY: 138.025 MHz

5 W

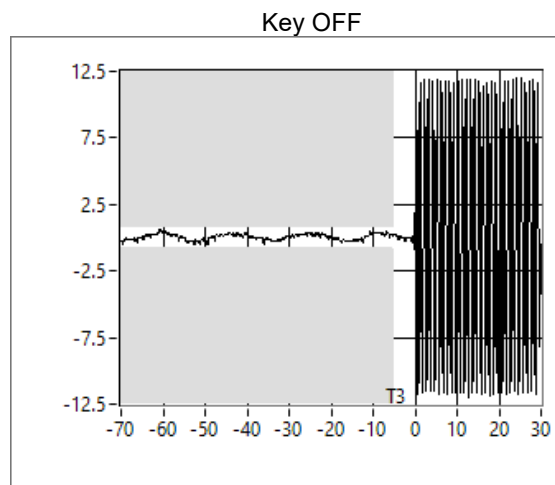
12.5 kHz Channel Spacing

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

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
	✓	☐



TARF 4503
138.025000MHz 5Watts 12.50kHz Channel spacing



TARF 4503
138.025000MHz 5Watts 12.50kHz Channel spacing

Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

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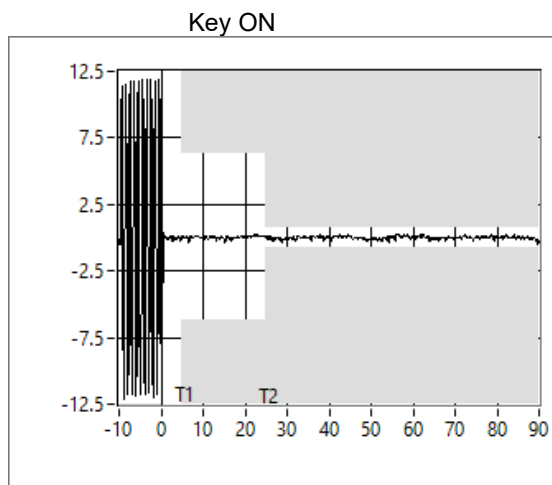
Tx FREQUENCY: 143.975 MHz

5 W

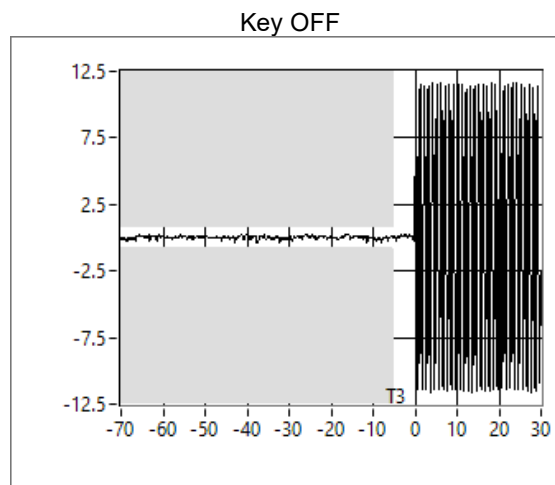
12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	0.3	N/A
t2	-0.4	N/A
t3	N/A	2.5

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
	✓	☐



TARF 4503
143.975000MHz 5Watts 12.50kHz Channel spacing



TARF 4503
143.975000MHz 5Watts 12.50kHz Channel spacing

Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

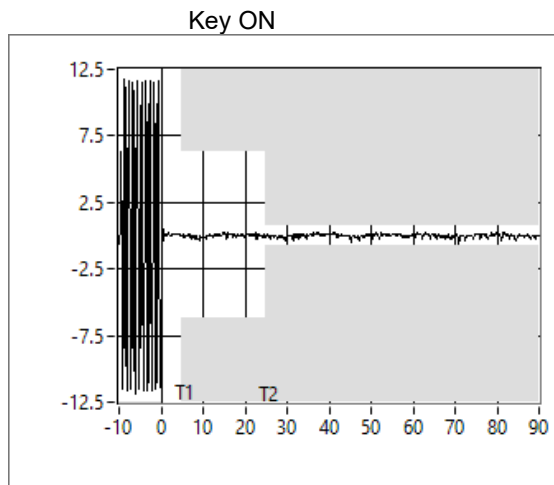
Tx FREQUENCY: 148.025 MHz

5 W

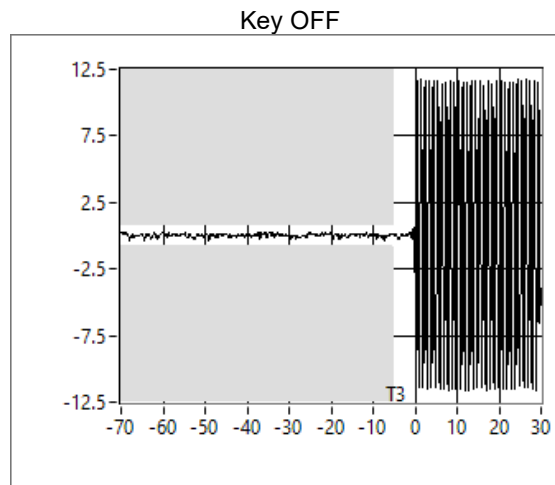
12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-0.3	N/A
t2	-0.3	N/A
t3	N/A	-2.3

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
	✓	☐



TARF 4503
148.025000MHz 5Watts 12.50kHz Channel spacing



TARF 4503
148.025000MHz 5Watts 12.50kHz Channel spacing

Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

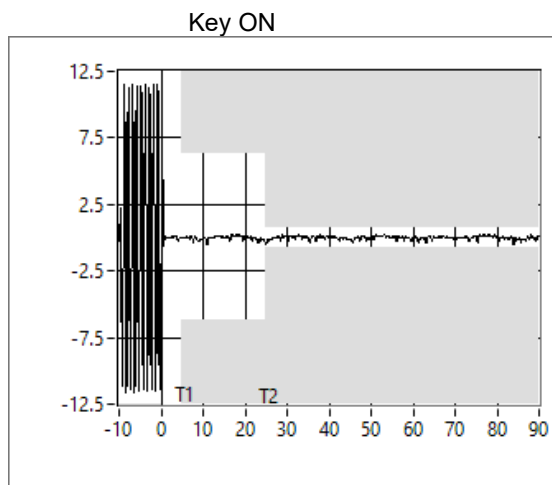
Tx FREQUENCY: 150.025 MHz

5 W

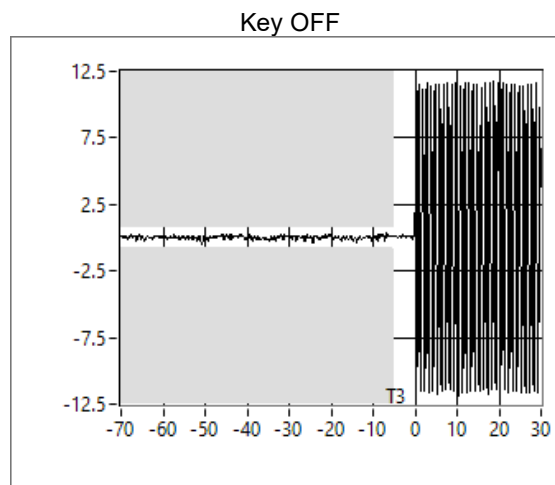
12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	0.9	N/A
t2	-0.5	N/A
t3	N/A	1.8

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
	✓	☐



TARF 4503
150.025000MHz 5Watts 12.50kHz Channel spacing



TARF 4503
150.025000MHz 5Watts 12.50kHz Channel spacing

Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

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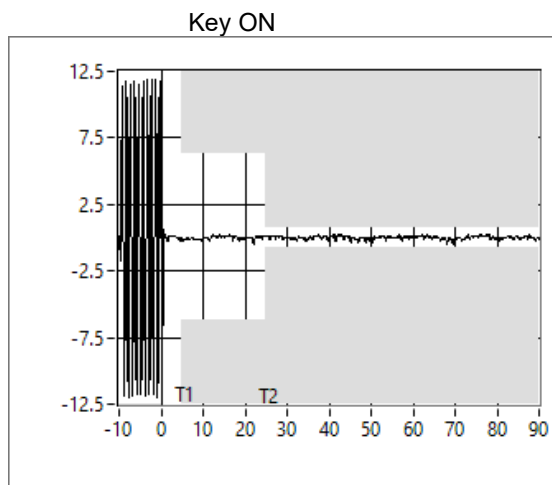
Tx FREQUENCY: 150.050 MHz

5 W

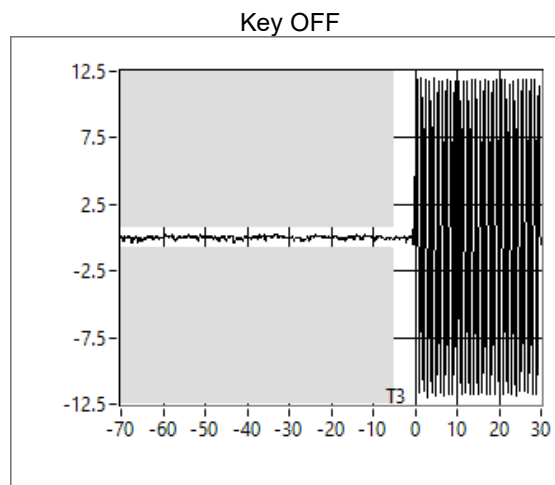
12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	0.6	N/A
t2	-0.5	N/A
t3	N/A	4.6

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
	✓	☐



TARF 4503
150.050000MHz 5Watts 12.50kHz Channel spacing



TARF 4503
150.050000MHz 5Watts 12.50kHz Channel spacing

Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

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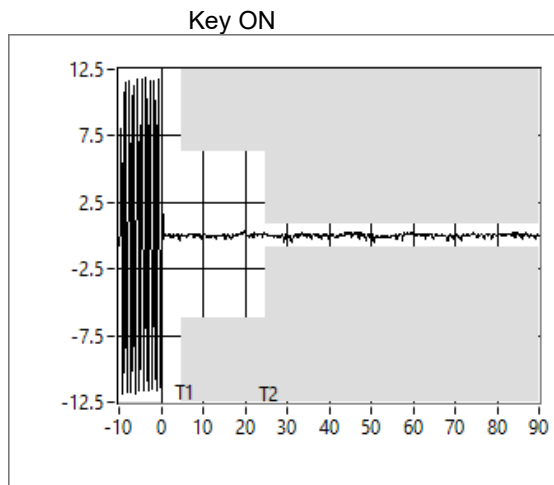
Tx FREQUENCY: 162.025 MHz

5 W

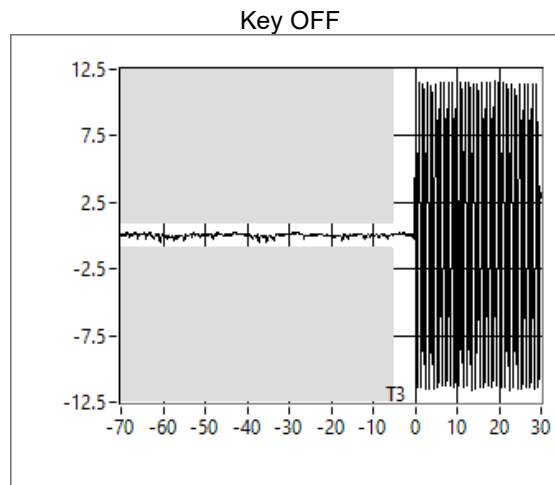
12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	1.0	N/A
t2	0.3	N/A
t3	N/A	3.2

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
	✓	☐



TARF 4503
162.025000MHz 5Watts 12.50kHz Channel spacing



TARF 4503
162.025000MHz 5Watts 12.50kHz Channel spacing

Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

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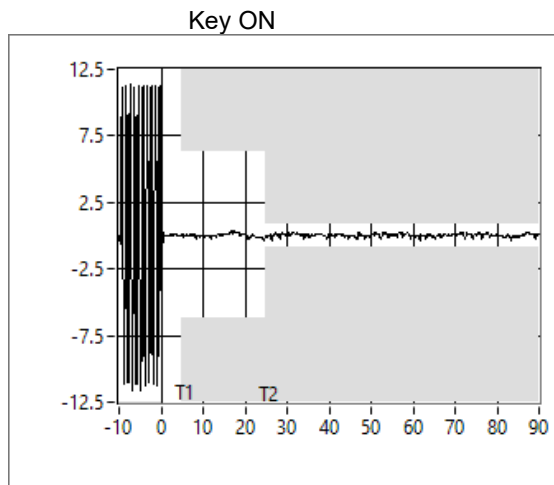
Tx FREQUENCY: 173.975 MHz

5 W

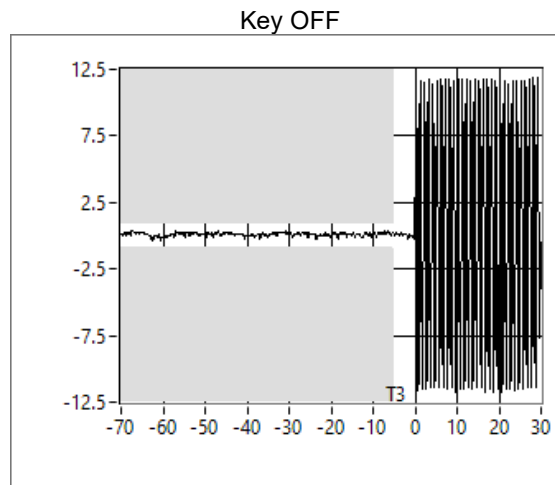
12.5 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	0.3	N/A
t2	-0.4	N/A
t3	N/A	1.3

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
	✓	☐



TARF 4503
173.975000MHz 5Watts 12.50kHz Channel spacing



TARF 4503
173.975000MHz 5Watts 12.50kHz Channel spacing

Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

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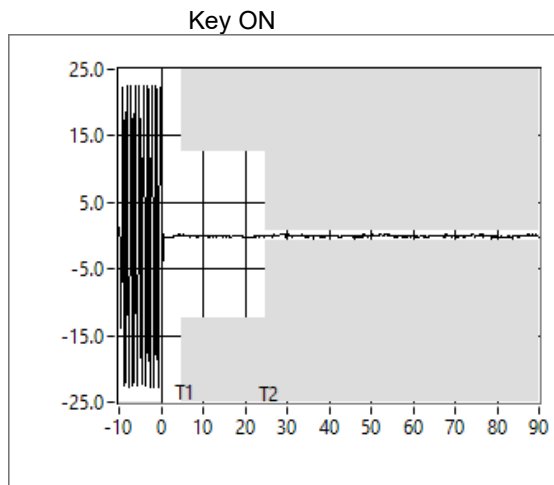
Tx FREQUENCY: 138.025 MHz

5 W

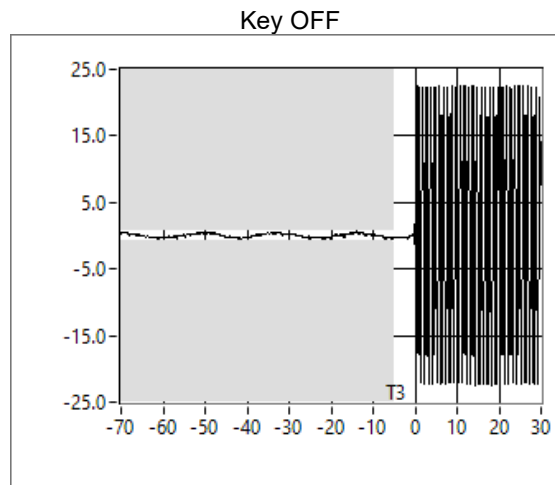
25.0 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-1.9	N/A
t2	-0.3	N/A
t3	N/A	1.8

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
	✓	☐



TARF 4503
138.025000MHz 5Watts 25.00kHz Channel spacing



TARF 4503
138.025000MHz 5Watts 25.00kHz Channel spacing

Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

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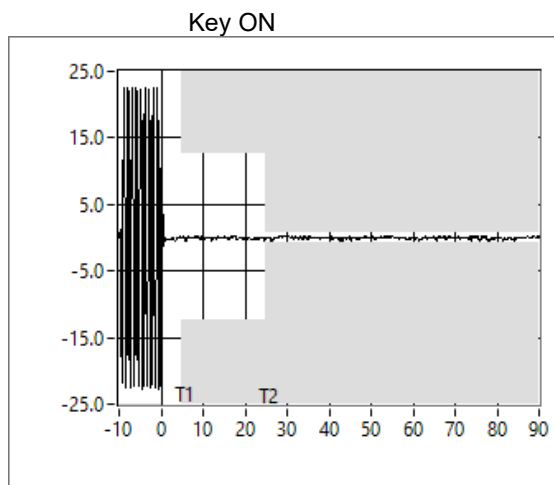
Tx FREQUENCY: 143.975 MHz

5 W

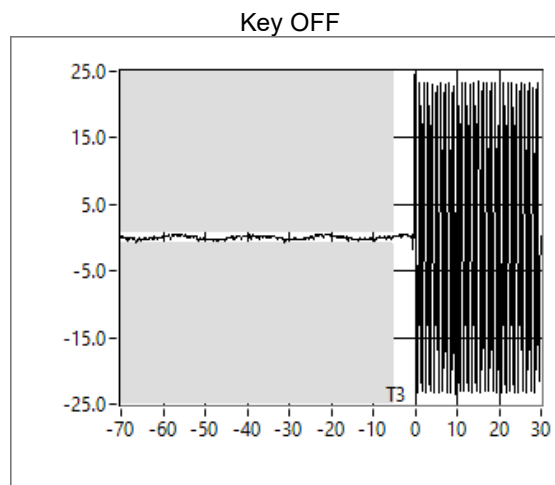
25.0 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-1.3	N/A
t2	-0.5	N/A
t3	N/A	21.5

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
	✓	☐



TARF 4503
143.975000MHz 5Watts 25.00kHz Channel spacing



TARF 4503
143.975000MHz 5Watts 25.00kHz Channel spacing

Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

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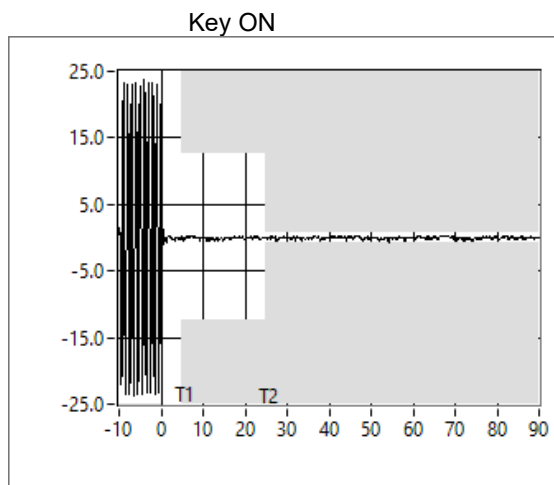
Tx FREQUENCY: 148.025 MHz

5 W

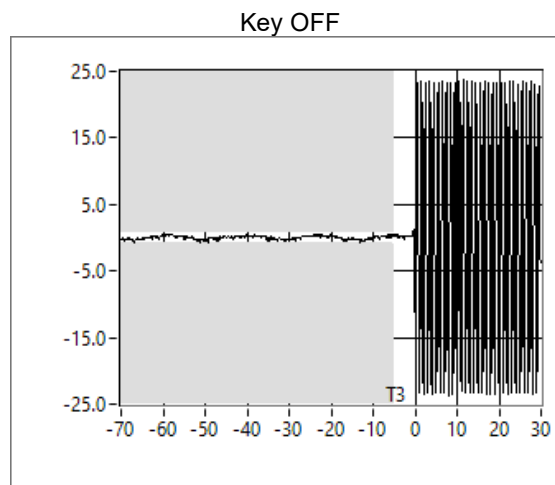
25.0 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-0.9	N/A
t2	-0.6	N/A
t3	N/A	-7.4

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
	✓	☐



TARF 4503
148.025000MHz 5Watts 25.00kHz Channel spacing



TARF 4503
148.025000MHz 5Watts 25.00kHz Channel spacing

Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

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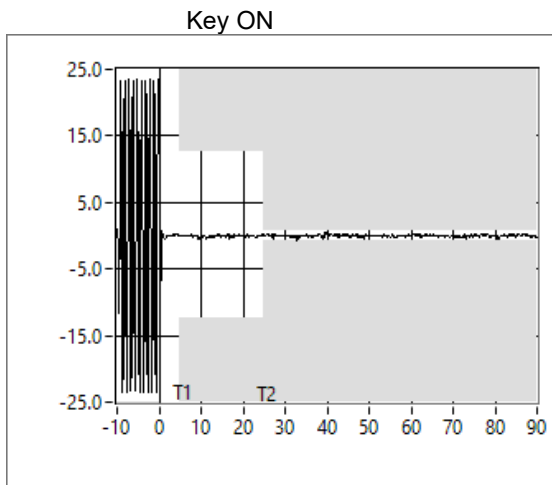
Tx FREQUENCY: 150.025 MHz

5 W

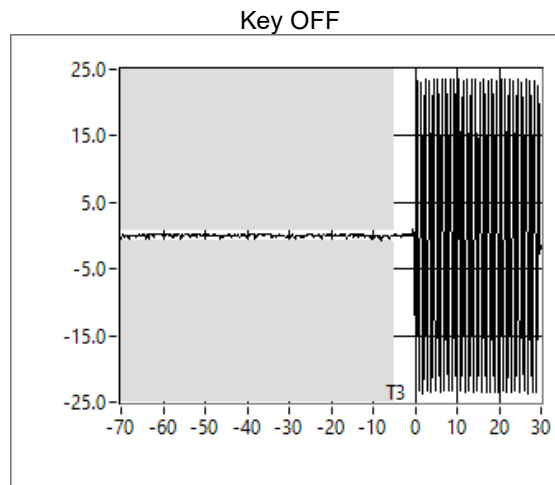
25.0 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-2.6	N/A
t2	-0.5	N/A
t3	N/A	-10.6

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
	✓	☐



TARF 4503
150.025000MHz 5Watts 25.00kHz Channel spacing



TARF 4503
150.025000MHz 5Watts 25.00kHz Channel spacing

Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

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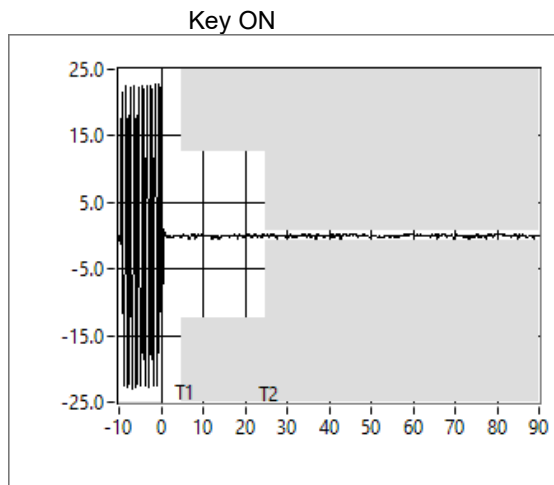
Tx FREQUENCY: 150.050 MHz

5 W

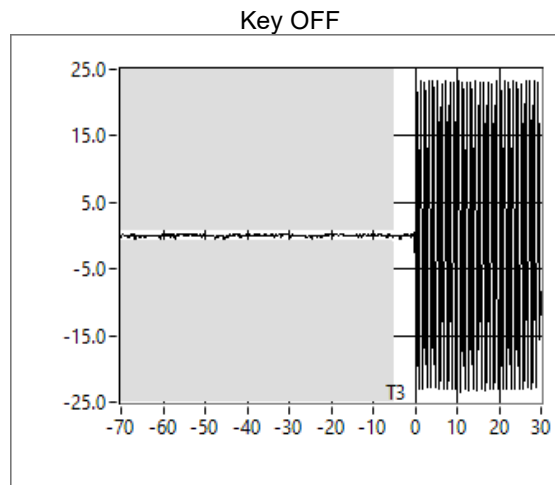
25.0 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	0.9	N/A
t2	-0.6	N/A
t3	N/A	-2.6

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
	✓	☐



TARF 4503
150.050000MHz 5Watts 25.00kHz Channel spacing



TARF 4503
150.050000MHz 5Watts 25.00kHz Channel spacing

Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

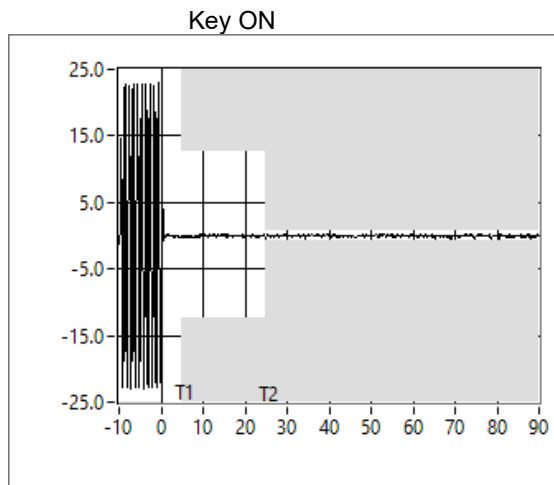
Tx FREQUENCY: 162.025 MHz

5 W

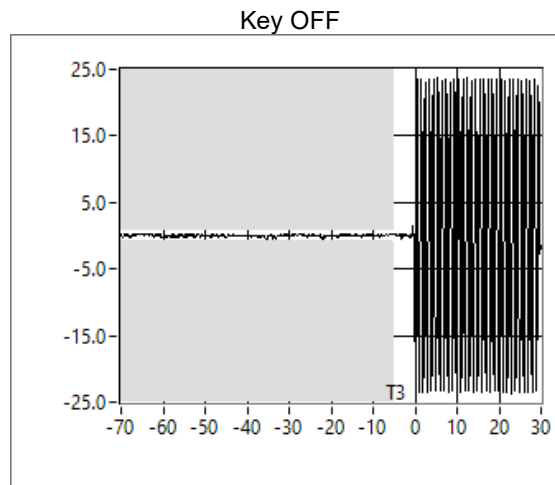
25.0 kHz Channel Spacing

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	-14.8

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
	✓	☐



TARF 4503
162.025000MHz 5Watts 25.00kHz Channel spacing



TARF 4503
162.025000MHz 5Watts 25.00kHz Channel spacing

Transient Frequency Behaviour

SPECIFICATION: FCC 47 CFR 90.214

RSS-119 5.9

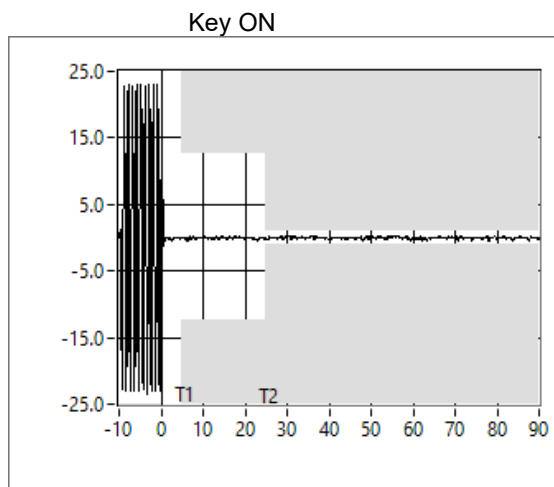
Tx FREQUENCY: 173.975 MHz

5 W

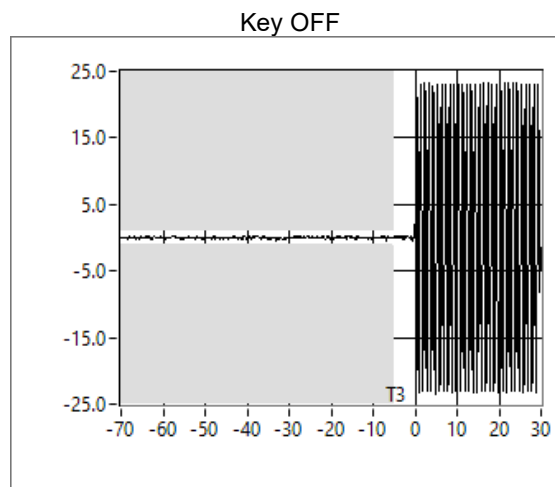
25.0 kHz Channel Spacing

TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	2.0	N/A
t2	-0.4	N/A
t3	N/A	0.8

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
	✓	☐



TARF 4503
173.975000MHz 5Watts 25.00kHz Channel spacing



TARF 4503
173.975000MHz 5Watts 25.00kHz Channel spacing

TRANSMITTER FREQUENCY STABILITY - TEMPERATURE

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

RSS-119 5.3

GUIDE: ANSI C63.26 5.6.4

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 UNCERTAINTY: $\pm 0.05\text{ppm}$

MEASUREMENT RESULTS:

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

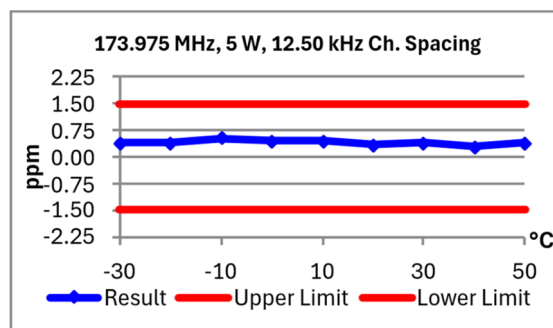
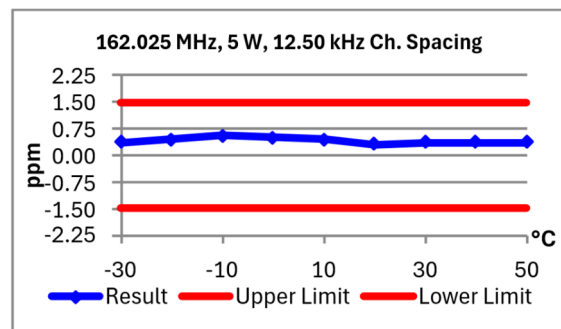
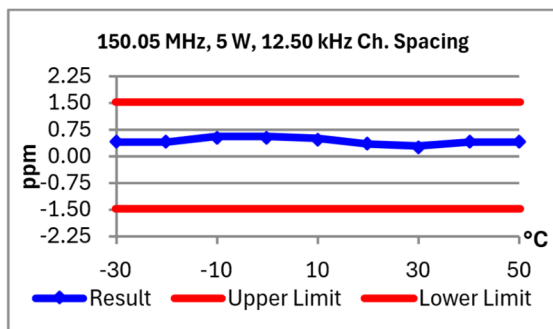
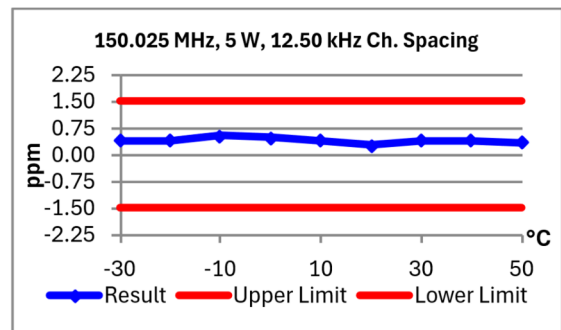
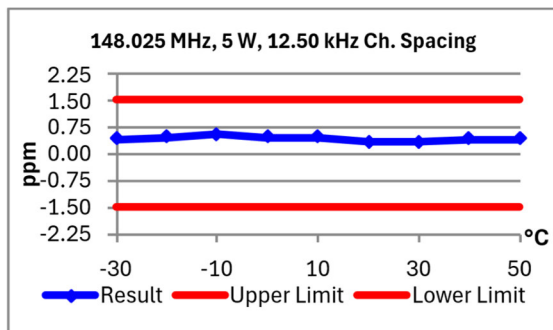
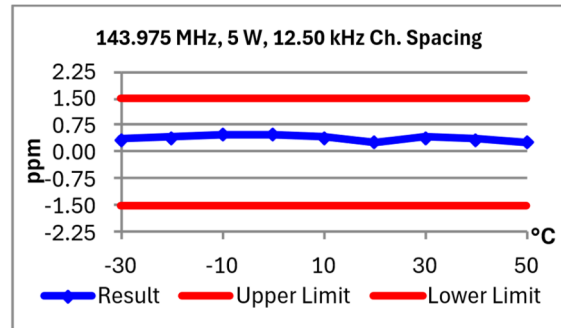
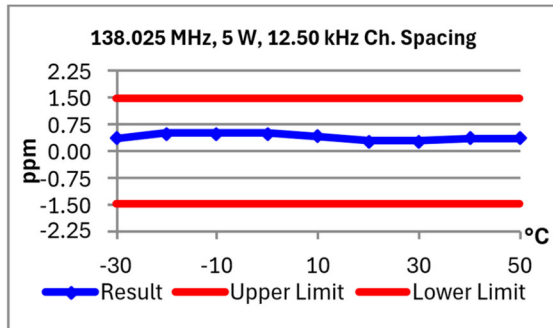
Temperature ($^{\circ}\text{C}$)	Error (ppm)						
	138.025 MHz	143.975 MHz	148.025 MHz	150.025 MHz	150.050 MHz	162.025 MHz	173.975 MHz
-30	0.36	0.35	0.41	0.40	0.40	0.37	0.40
-20	0.51	0.42	0.47	0.40	0.40	0.43	0.40
-10	0.51	0.49	0.54	0.53	0.53	0.56	0.52
0	0.51	0.49	0.47	0.47	0.53	0.49	0.46
10	0.43	0.42	0.47	0.40	0.47	0.43	0.46
20	0.29	0.28	0.34	0.27	0.33	0.31	0.34
30	0.29	0.42	0.34	0.40	0.27	0.37	0.40
40	0.36	0.35	0.41	0.40	0.40	0.37	0.29
50	0.36	0.28	0.41	0.33	0.40	0.37	0.40

LIMIT: FCC 47 CFR 90.213

RSS-119 5.3

Channel Spacing (kHz)	Frequency Error (ppm)
12.5	1.5

Transmitter Frequency Stability - Temperature



TRANSMITTER FREQUENCY STABILITY - VOLTAGE

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

RSS-119 5.3

GUIDE: ANSI C63.26 5.6.5

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: $\pm 0.05\text{ppm}$

MEASUREMENT RESULTS:

	FREQUENCY ERROR (ppm) 12.5 kHz Ch. Spacing, 5 W Tx Power	
	6.38 V _{DC}	7.50 V _{DC}
138.025 MHz	0.56	0.52
143.975 MHz	0.56	0.53
148.025 MHz	0.55	0.54
150.025 MHz	0.57	0.54
150.050 MHz	0.58	0.53
162.025 MHz	0.56	0.52
173.975 MHz	0.55	0.52

LIMIT CLAUSES: FCC 47 CFR 90.213

RSS-119 5.3

Channel Spacing (kHz)	Frequency Error (ppm)
12.5	2.5

RECEIVER SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC 47CFR 15.111

RSS-Gen 7.4

GUIDE: ANSI C63.26 5.7

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.
4. A scan is performed with a resolution bandwidth of 100 kHz and a video bandwidth of 300 kHz for frequencies up to 1 GHz, and a resolution bandwidth of 1 MHz and a video bandwidth of 3 MHz for frequencies above 1 GHz
5. For each frequency range the spectrum analyser was loaded with the appropriate calibration figures to compensate for the cables and attenuator losses allowing the emission levels to be read directly with no further calculation.
The calibrations are loaded as an overall reference level offset plus a set of correction factors for the required frequency band.

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

Example of attenuation correction: (dB)

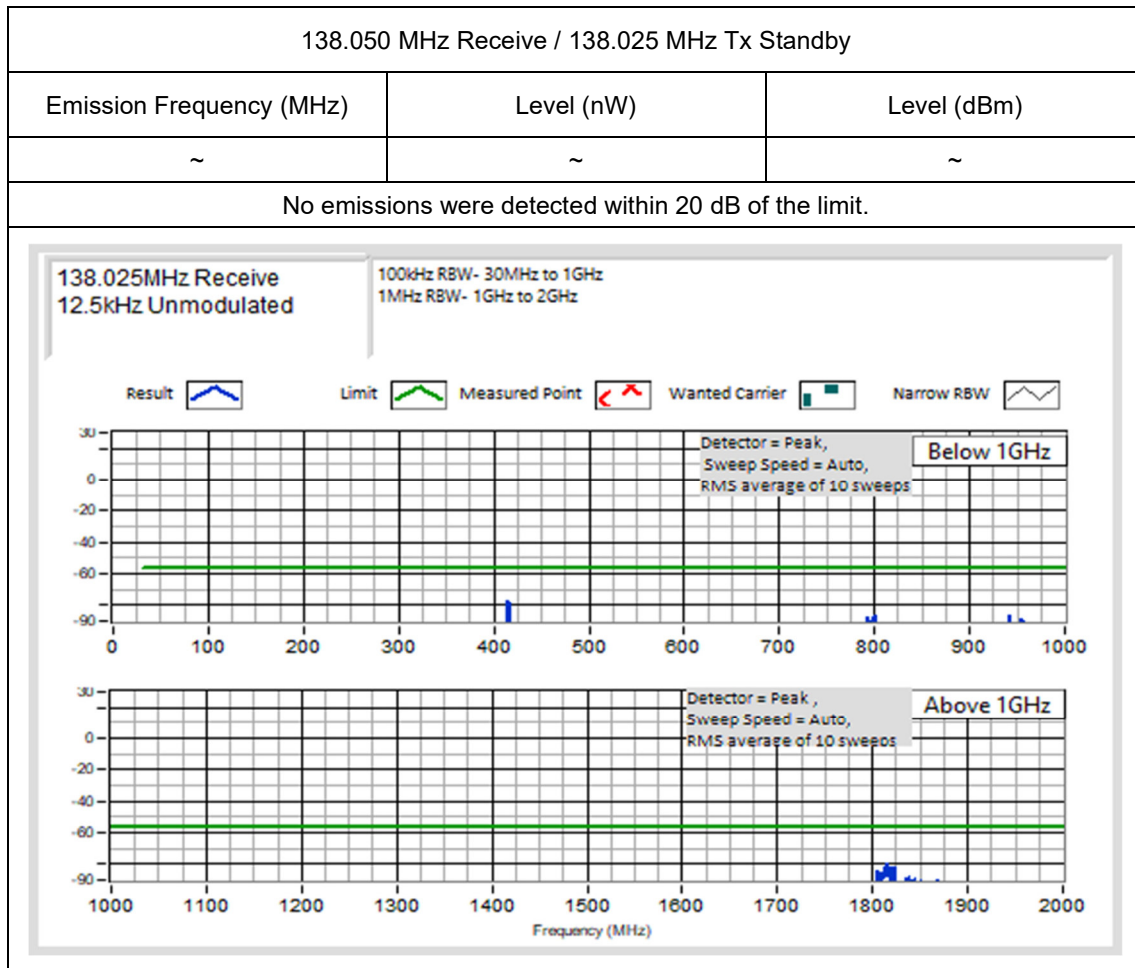
E5023 30dB 350W CK9178	31.97	
E5015 3m Blue	0.65	
E5028 1m5 Blue	0.24	
E3382 135_175MHz HPBRF	5.63	
Total Attenuation @ 812.250 MHz	38.48	Sum of component attenuation (a)
Amplitude offset	40.91	(b)
Correction @ 276.050 MHz	-2.43	(a-b)

MEASUREMENT UNCERTAINTY: $\pm 2.8\text{dB}$

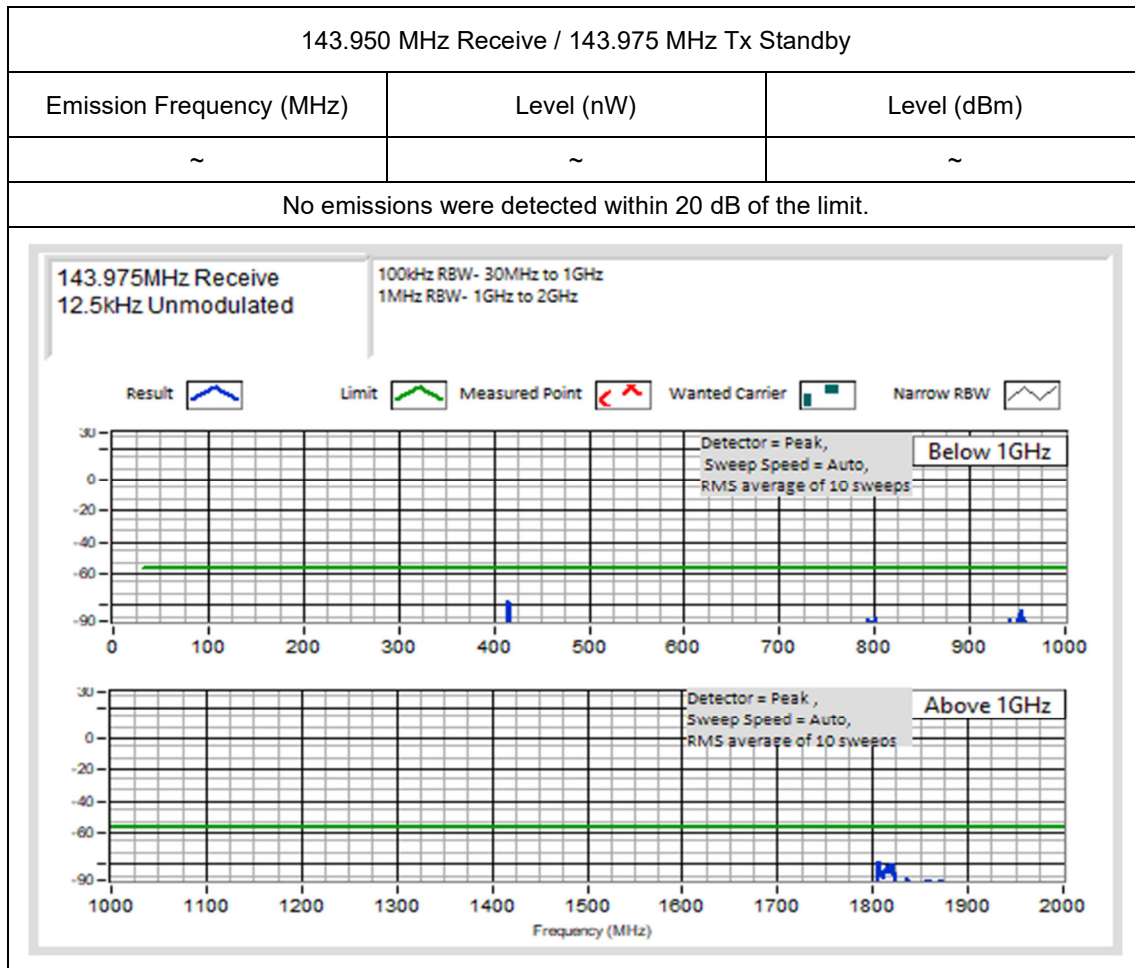
LIMIT CLAUSE: RSS-Gen 7.4

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

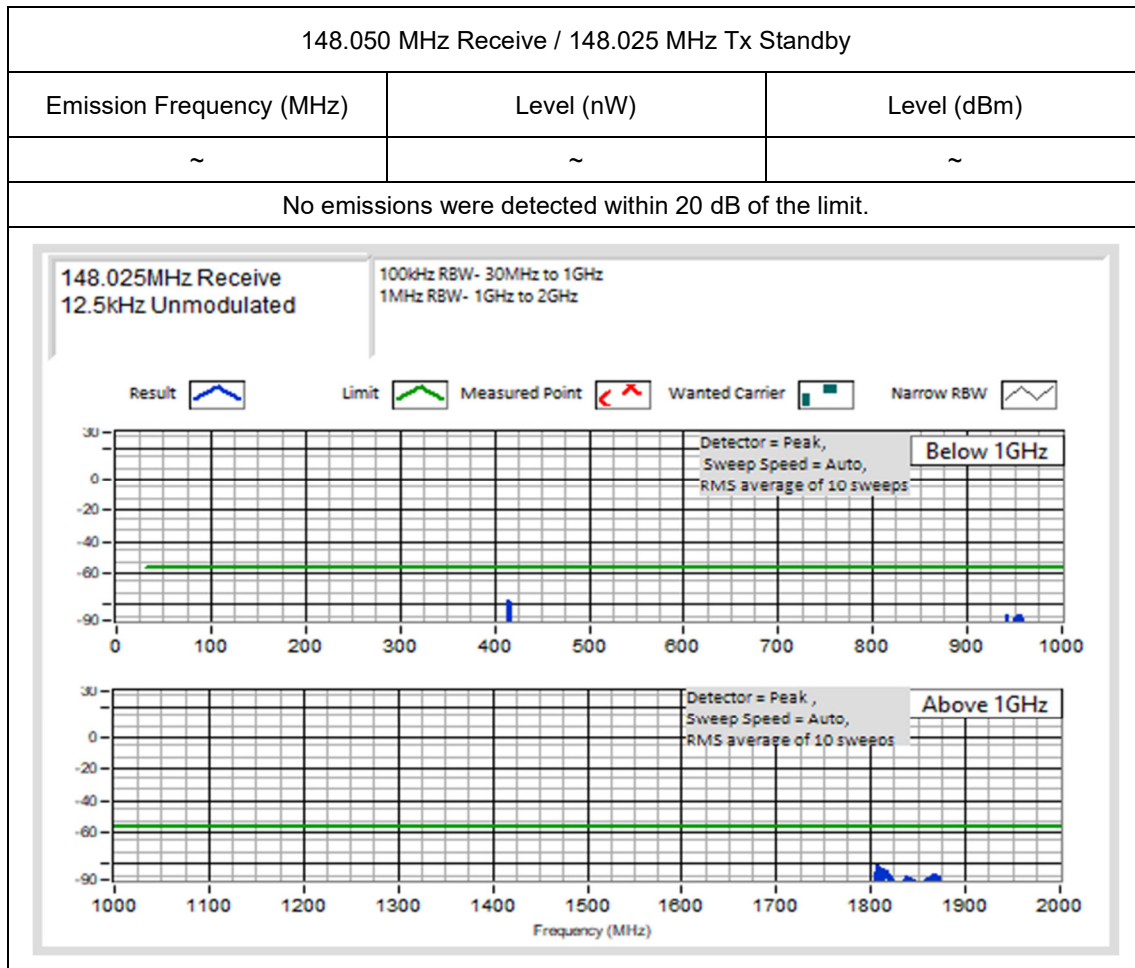
Receiver Spurious Emissions (Conducted) – Continued



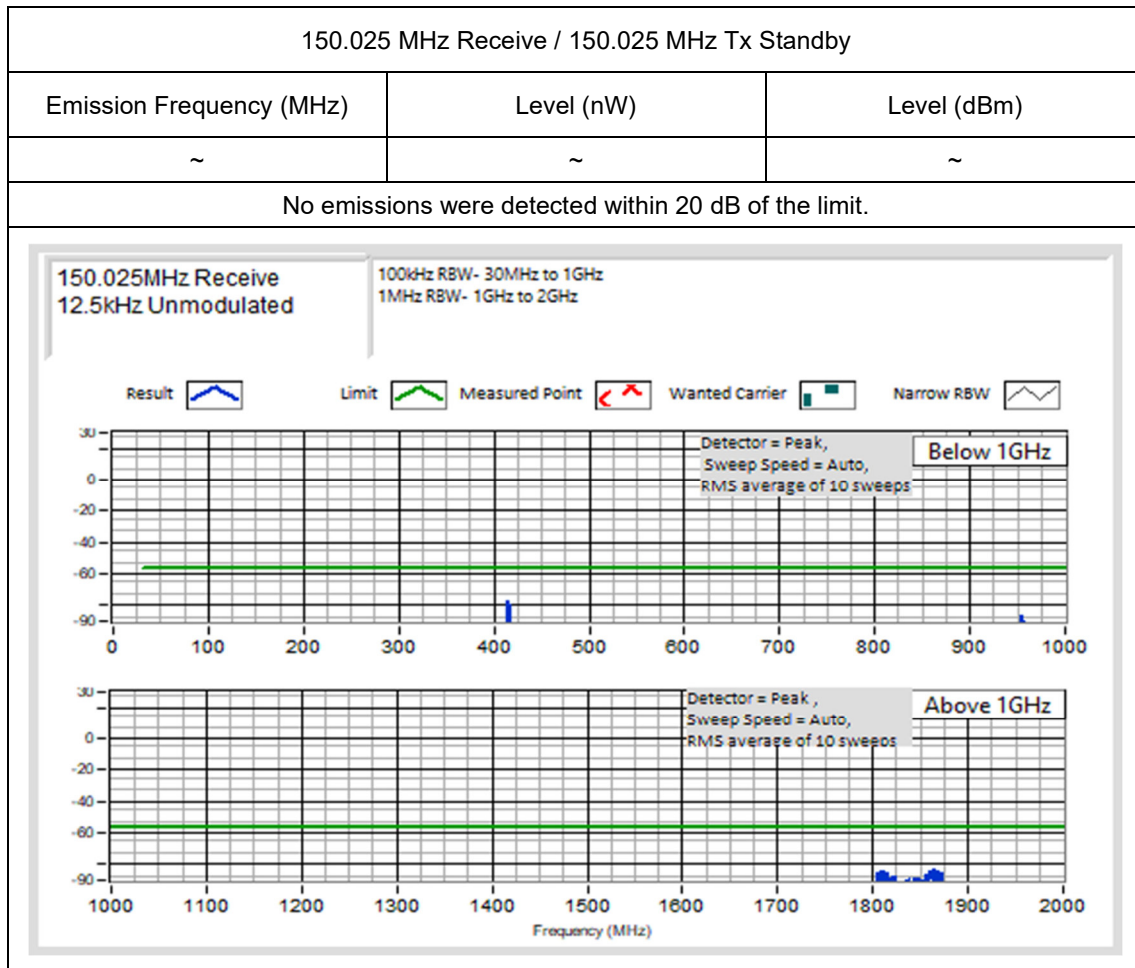
Receiver Spurious Emissions (Conducted) – Continued



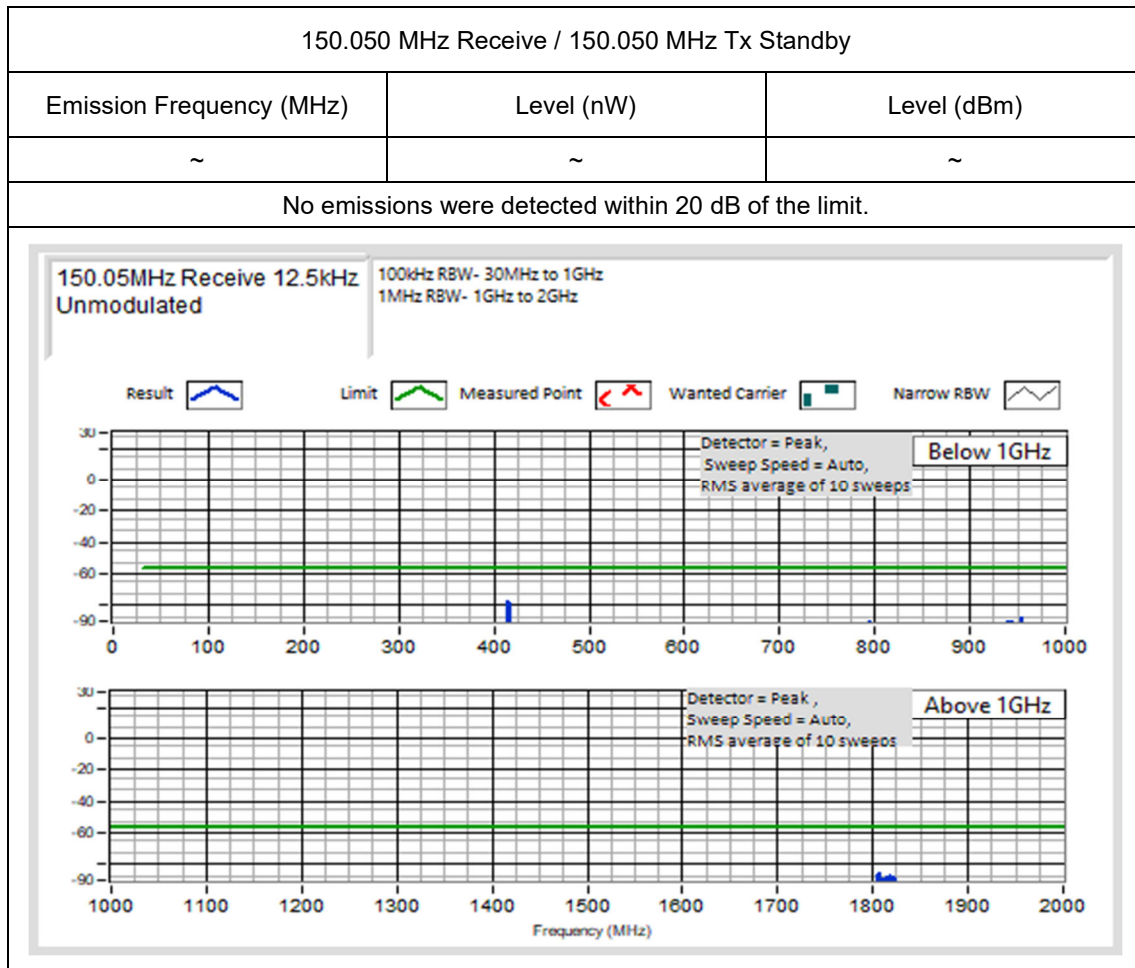
Receiver Spurious Emissions (Conducted) – Continued



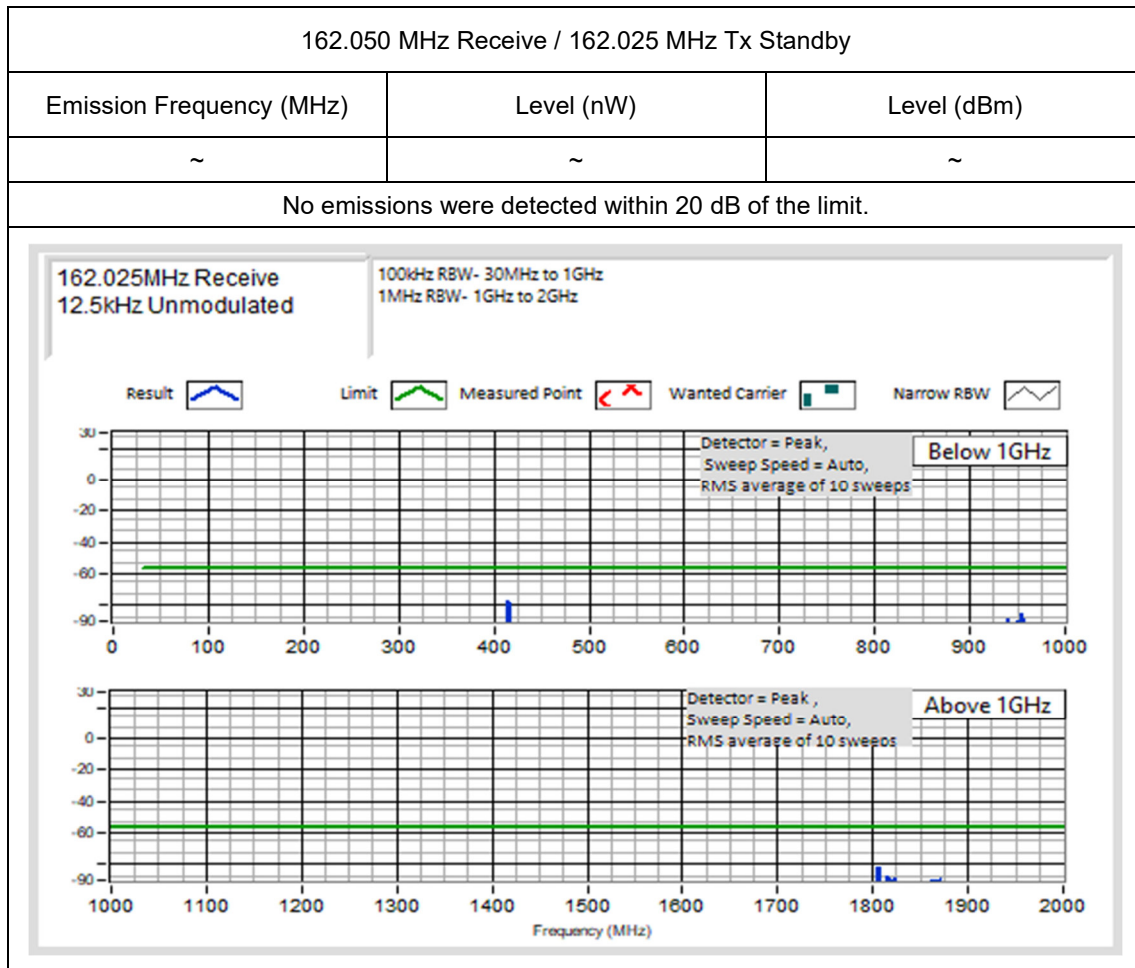
Receiver Spurious Emissions (Conducted) – Continued



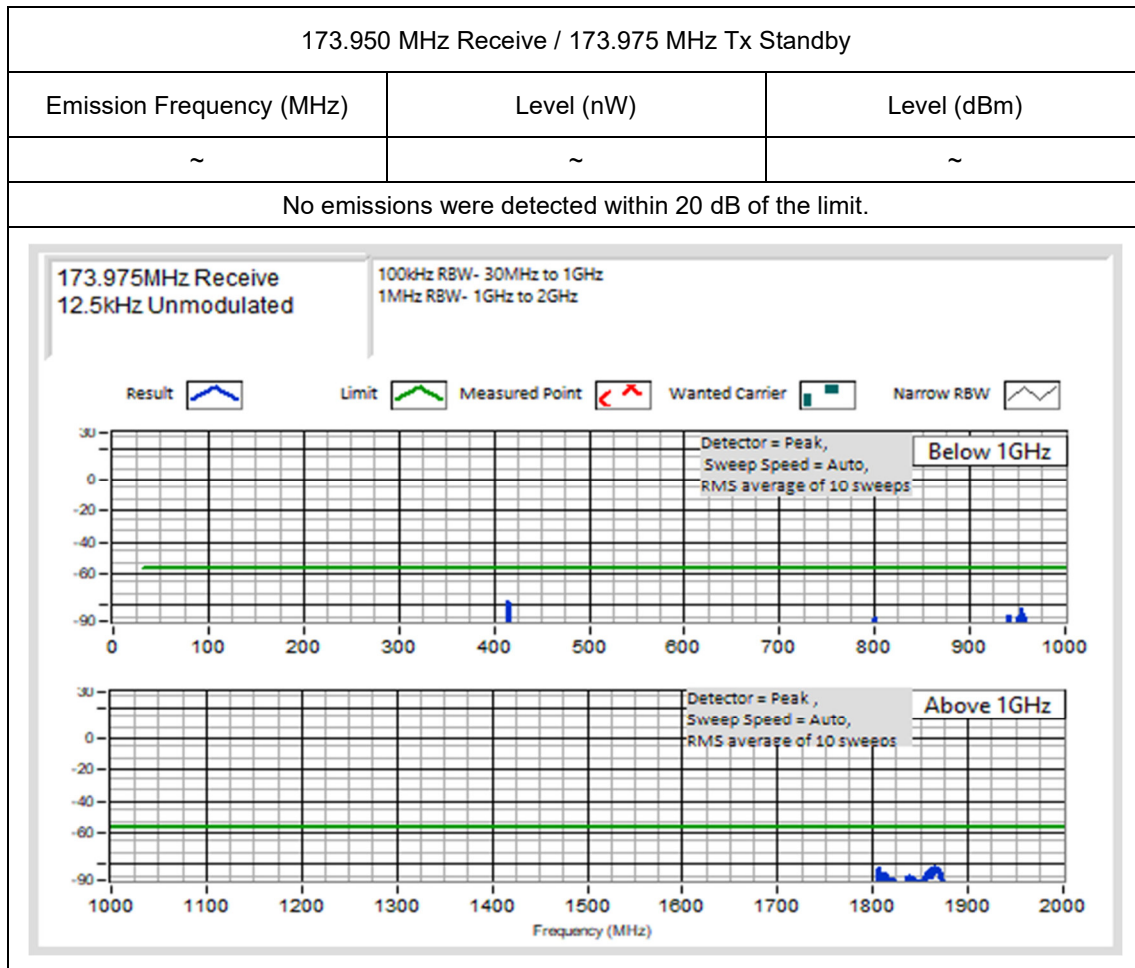
Receiver Spurious Emissions (Conducted) – Continued



Receiver Spurious Emissions (Conducted) – Continued



Receiver Spurious Emissions (Conducted) – Continued



TEST EQUIPMENT LIST

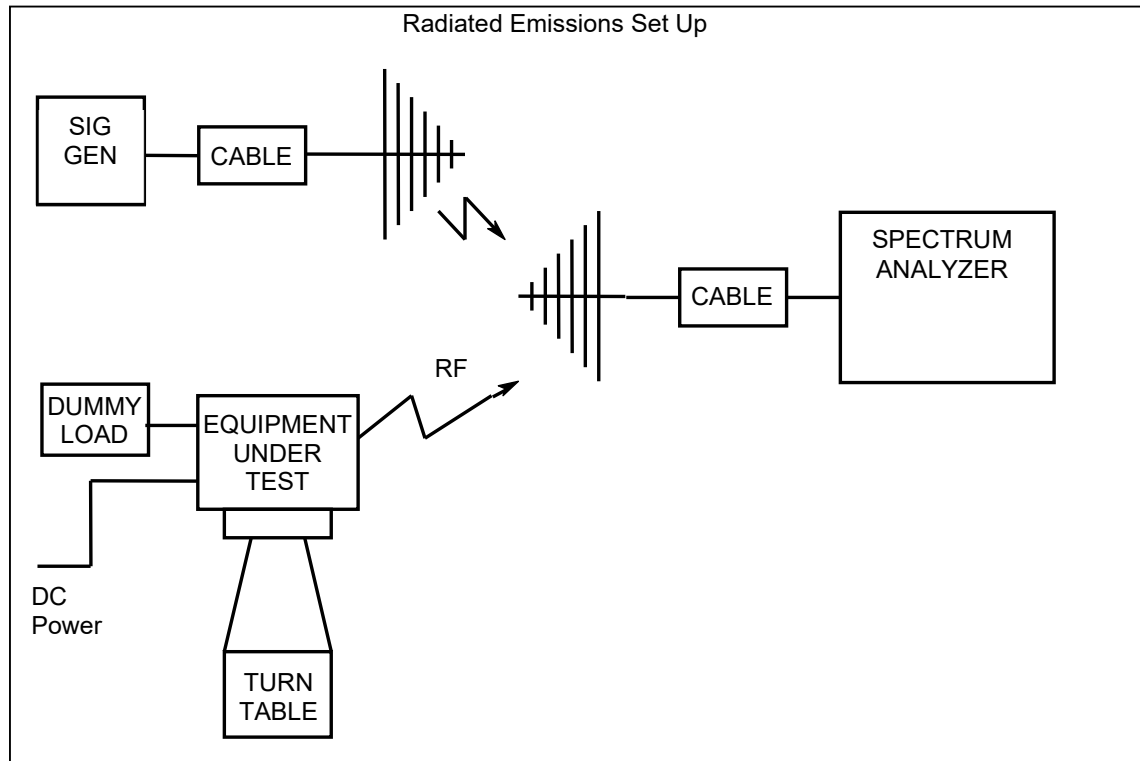
Equipment Type	Information	Manufacturer	Model No	Serial No.	Tait ID	Cal Due
Audio Analyser	TREVA2	Hewlett Packard	HP8903B	2818A04275	E3710	07/10/2026
Audio Analyser	TREVA1	Hewlett Packard	HP8903A	2437A04625	E4986	16/12/2026
Coax Cable	3m Blue	Suhner	Sucoflex 126EA	503429/126EA	E5015	01/10/2026
Coax Cable	1.5m Blue	Suhner	Sucoflex 126EA	502868/126EA	E5028	07/10/2026
Environ. Chamber	Upright	Contherm	5400 RHLT.M	1416	E4051	05/01/2029
Filter High Pass/ Notch	135 to 175MHz	Tait		N/A	E3382	25/05/2027
Modulation Analyser	TREVA2	Hewlett Packard	HP8901B (Opt 002)	2441A00393	E3073	09/10/2026
Modulation Analyser	TREVA1	Hewlett Packard	HP8901B (Opt 002)	3704A05837	E3786	10/10/2026
Multimeter		Fluke	77	35069359	E3237	03/10/2026
Oscilloscope	400MHz	Tektronics	TDS380	B017095	E3782	09/10/2027
Power Meter	TREVA2 Power Head for HP8901	Hewlett Packard	HP11722A	2716A02037	E1575	08/10/2026
Power Meter	TREVA1 Power Head for HP8901	Hewlett Packard	HP11722A	3111A05573	R7054	10/10/2026
Power Supply	TREVA 1 60V/25A	Agilent	N5767A	US23D6941R	E11372	03/10/2026
Power Supply	TREVA 2 60V/25A	Agilent	N5767A	US09F4901H	E4656	02/10/2027
Power Supply	60V/25A	Agilent	N5767A	3111A05573	E4979	09/10/2026
RF Attenuator	6dB 150W	Weinschel	40-06-34	KV457	E3561	01/10/2026
RF Attenuator	TREVA2 20dB 150W	Weinschel	40-20-33	CJ405	E3733	01/10/2026
RF Attenuator	30+3dB 350W	Weinschel	67-30-33 & BW-N3W5+	CK9178	E5023	01/10/2026
RF Attenuator	TREVA2 3dB	Weinschel	Model 1	BL9950	E4080	01/10/2026
RF Attenuator	TREVA1 3dB	Weinschel	Model 1	BL9958	E4081	01/10/2026
RF Attenuator	TREVA1 20dB 150W	Weinschel	40-20-23	MF817	E4082	01/10/2026
RF Combiner	TREVA1	Minicircuits	ZFSC-4-1	-	E4083	
RF Combiner	TREVA2	Minicircuits	ZFSC-4-1	-	E4084	
RF Load	50W	Weinschel	F1426	BF0487	E3675	01/10/2026
Spectrum Analyser	26.5GHz	Agilent	PXA N9030A	MY49432161	E4907	26/02/2027
Temp & Humidity datalogger		TP-Link TAPO	T315	22383M6000671	E11377	09/02/2027
TREVA 1		Teltest	-	1	-	04/09/2026
Laser Level		Bosch	GL 3-80	432006098	E11381	02/02/2027
Laser Measure		Bosche	GLM 40-12	432215102	E11382	02/02/2027
Antenna	Ultralog 30 MHz to 6000 MHz	Rohde & Schwarz	HL562E	102307	E11397	27/08/2028
EMI Receiver	44GHz model	Rohde & Schwarz	ESW44	103552	E11398	15/09/2026
Bias Unit	Power supply for 2 active receiving antennas	Rohde & Schwarz	IN-600	101845	E11404	08/09/2026
Pre-amplifier	0.1 to 8GHz	Rohde & Schwarz	ESCU08	101154	E11403	29/08/2026
Switch Unit		Rohde & Schwarz	OSP220	103447	E11406	
Semi Anechoic Chamber	3m test distance, 40GHz	Frankonia	SAC-3 Plus S	1540	E11410	20/02/2027
Control Room	Control Room	Frankonia		1541	E11411	
Boresight Antenna Mast		Frankonia	FBM1-4		E11413	
Turntable	1.2m diameter 500kg load limit.	Frankonia	FTM 1,2-0,5		E11414	
Camera	Chamber Zoomable Camera	Messtechnik	PT-03	25-041488	E11417	

TEST EQUIPMENT LIST

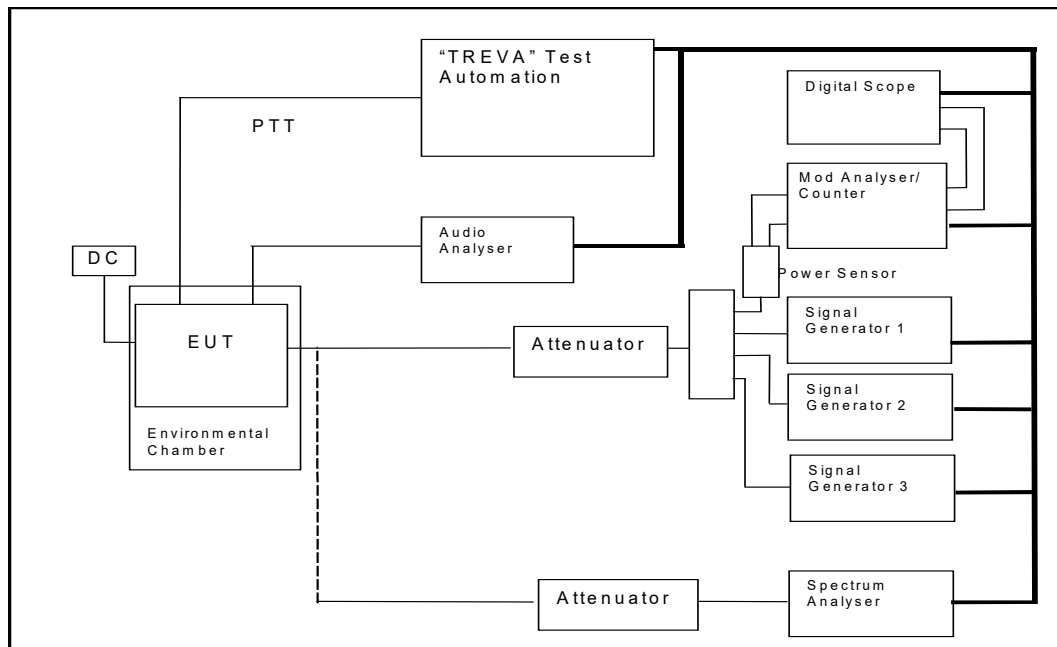
Equipment Type	Information	Manufacturer	Model No	Serial No.	Tait ID	Cal Due
Testware	TREVA		TTEL_TREVA_2.03.00	-	-	
Testware	Radio Conducted Emissions		TTEL_RADIOCOND_1.0 2.01	-	-	
Testware	Occupied Bandwidth		TTEL_OCCBW_2.01.00	-	-	
Testware	Sideband Spectrum		TTEL_SBSPEC_1.01.00	-	-	
Testware	Spec An Correction Loader		TTEL_SPECANCORR_1. 01.00	-	-	
Testware	ELEKTRA	Rohde & Schwarz	5.22.3	-	-	

* 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 **E**VAuation system (TREVA), which is configured as shown below. The Spectrum Analyser is connected to the EUT via the attenuator network for Conducted Emissions, Occupied Bandwidth, and Spectrum Masks measurement.



END OF REPORT