

Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

851.025 MHz @ 35 W

Emission Mask D

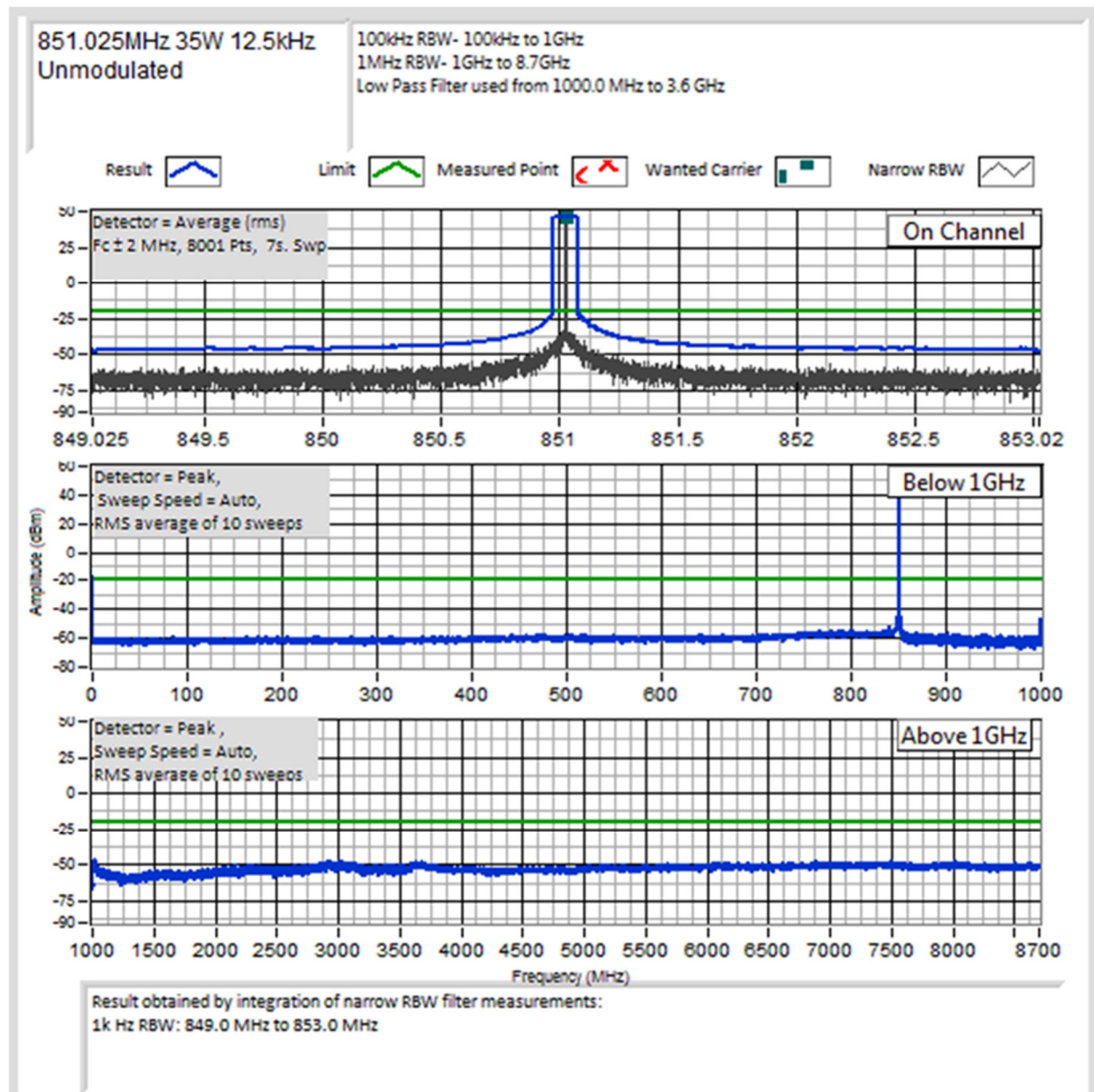
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing

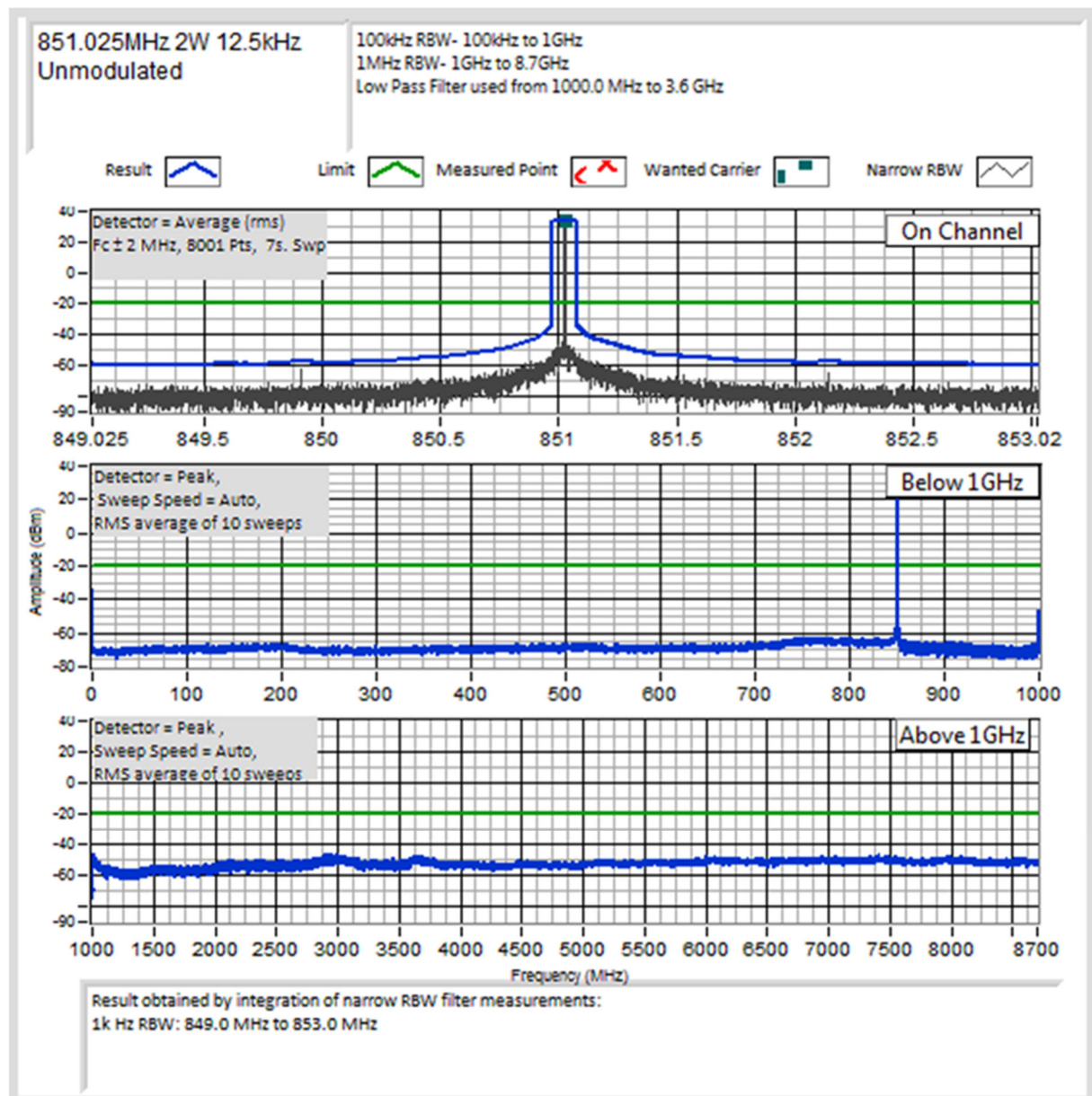
851.025 MHz @ 2 W

Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty:	≤12.75 GHz ± 3.0 dB	
No emissions were detected at a level greater than 20 dB below the limit.		



Spurious Emissions (Tx Conducted)



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

860.025 MHz @ 35 W

Emission Mask D

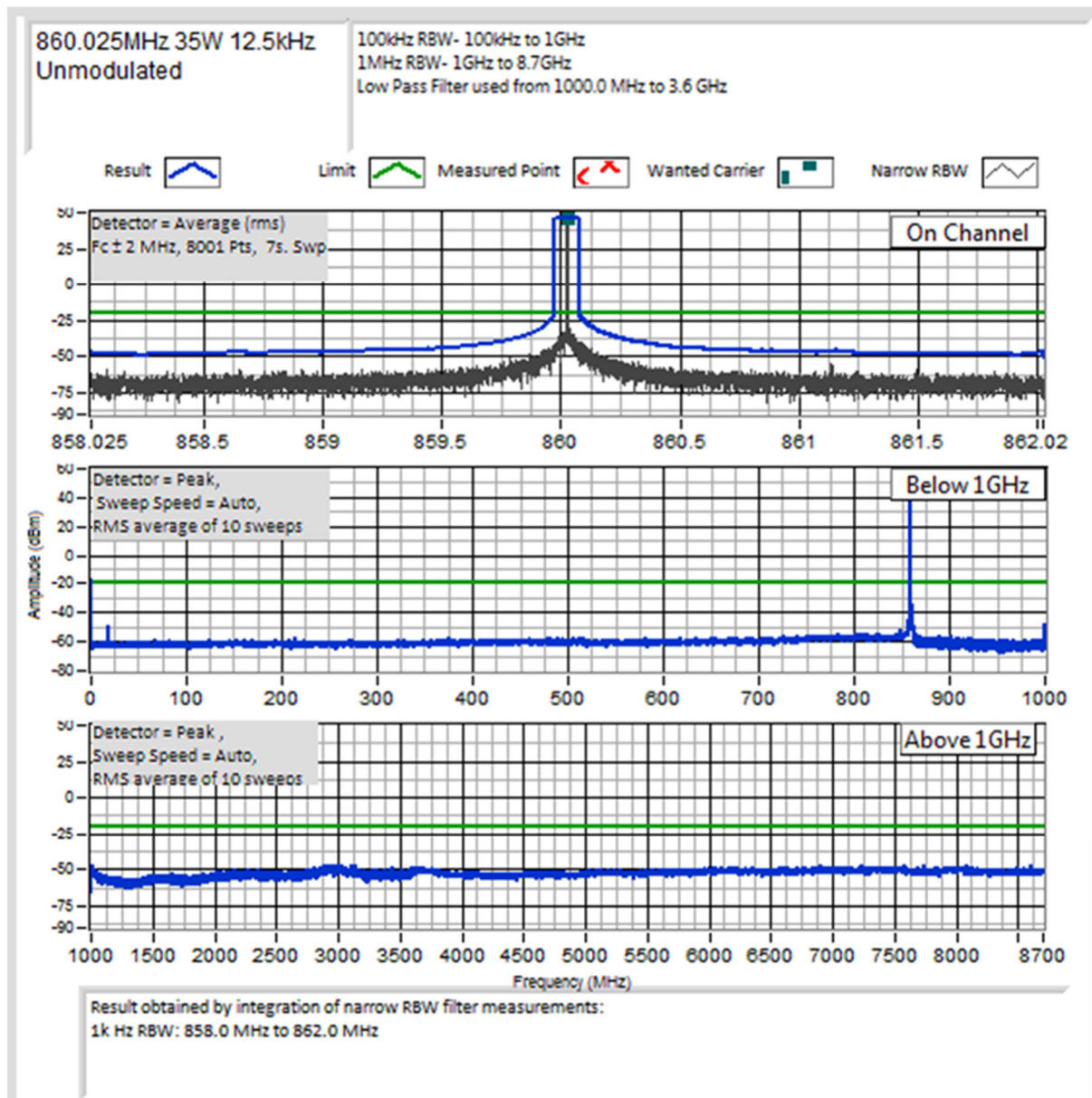
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing

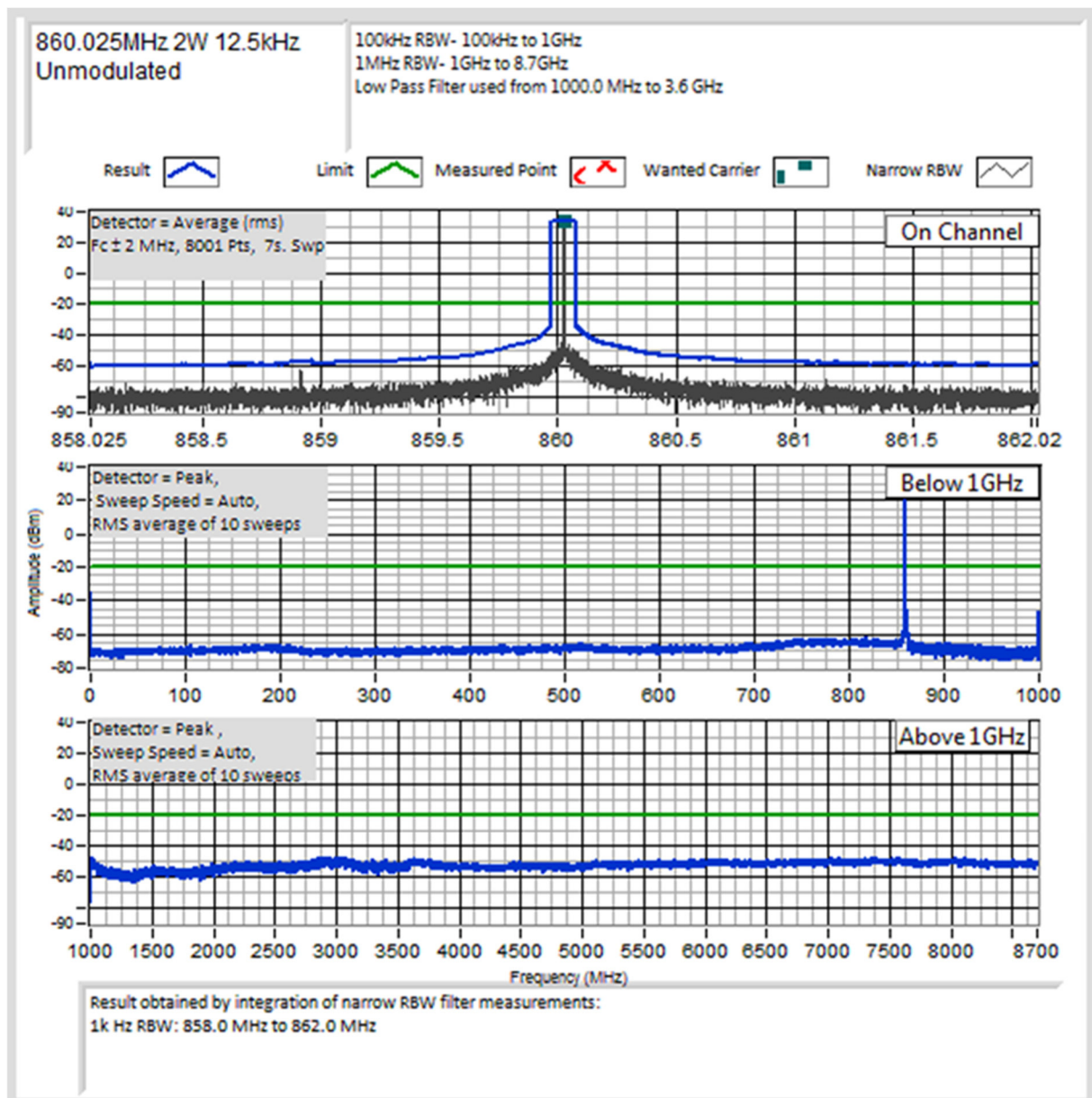
860.025 MHz @ 2 W

Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty:	≤12.75 GHz ± 3.0 dB	
No emissions were detected at a level greater than 20 dB below the limit.		



Spurious Emissions (Tx Conducted)



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

868.975 MHz @ 35 W

Emission Mask D

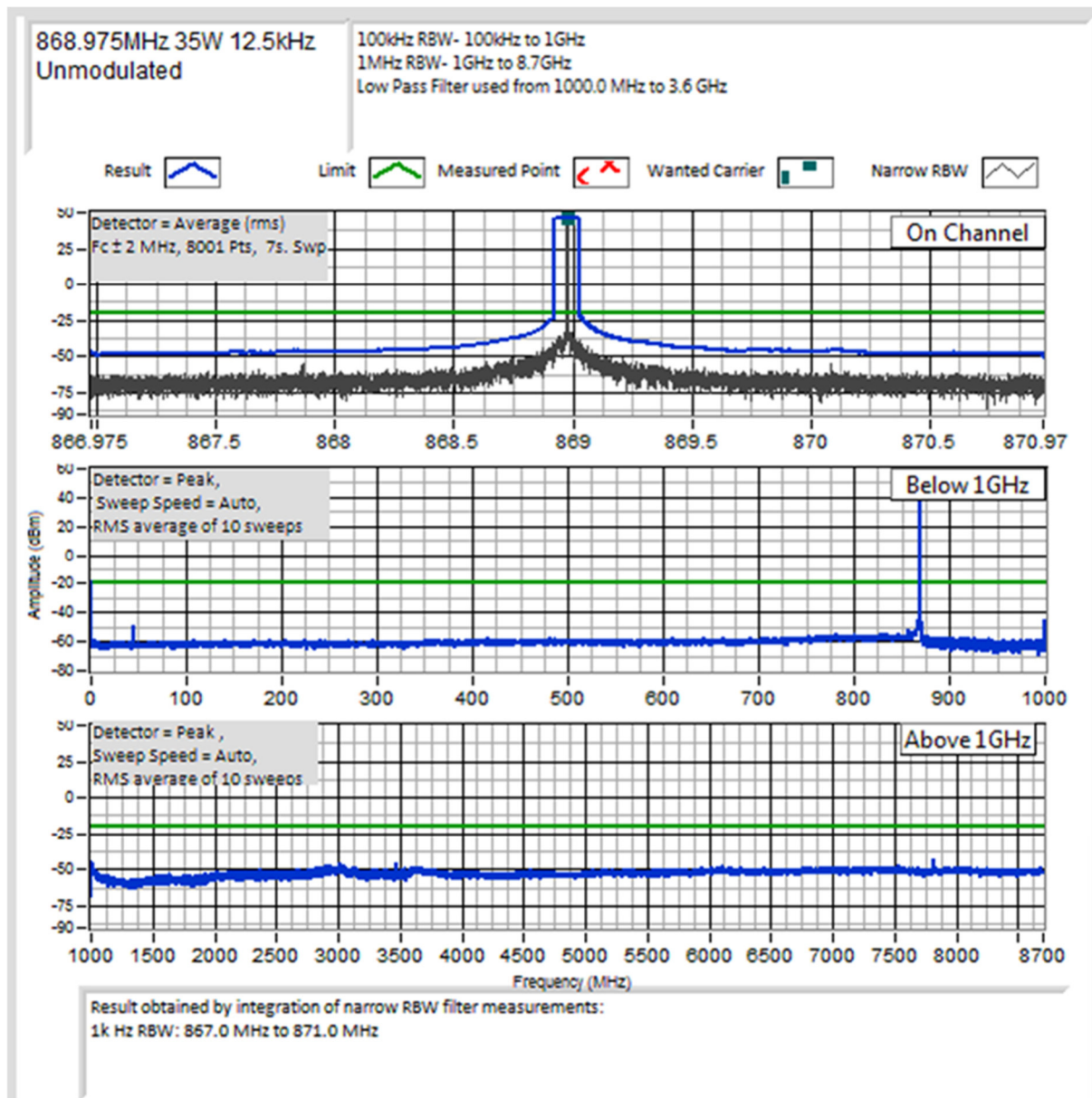
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~

12.5 kHz Channel Spacing

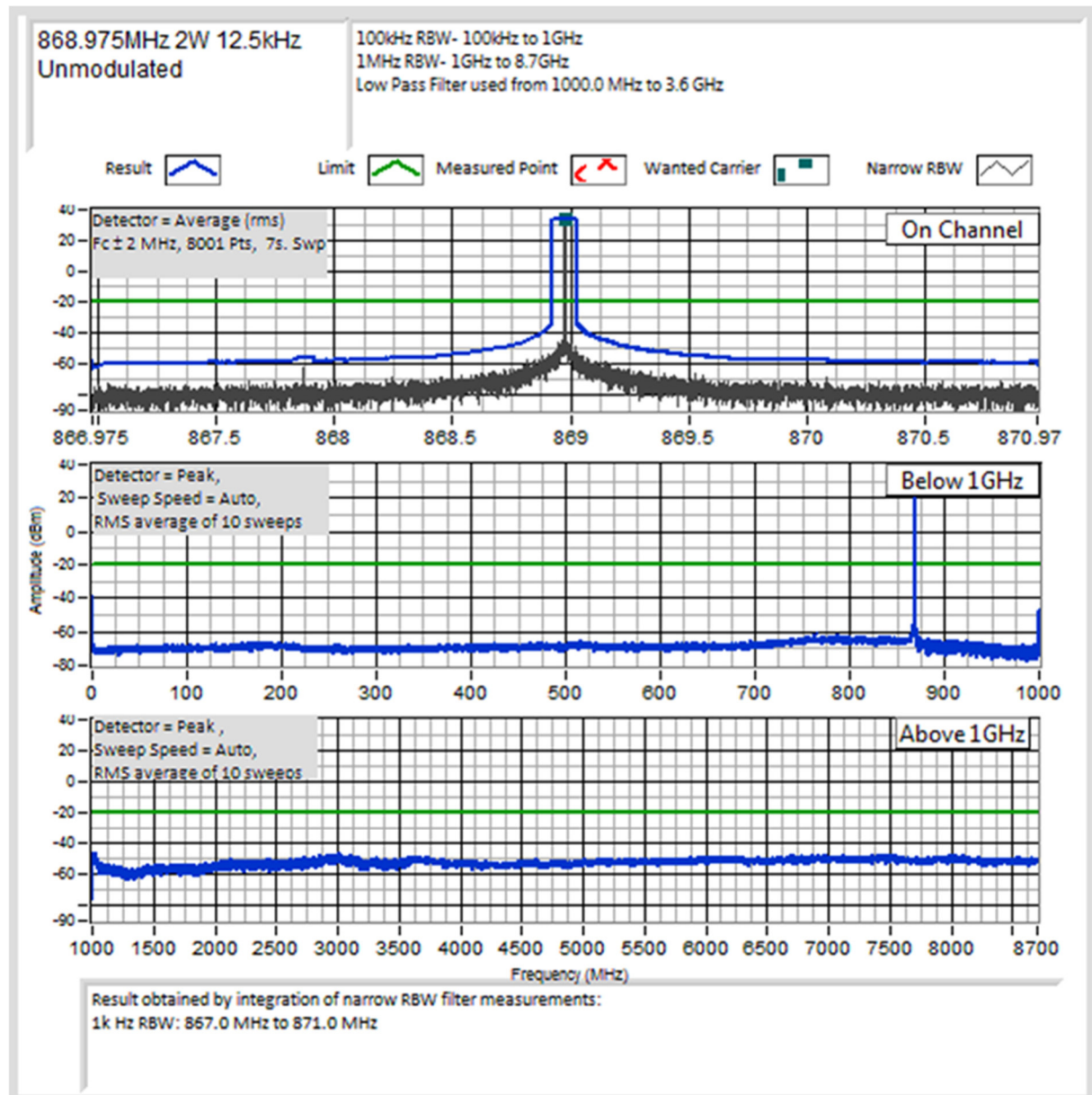
868.975 MHz @ 2 W

Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty:	≤12.75 GHz ± 3.0 dB	
No emissions were detected at a level greater than 20 dB below the limit.		



Spurious Emissions (Tx Conducted)



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	-65.4 dBc
35 W	-20 dBm	-65.4 dBc
2 W	-20 dBm	-53 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 ($10 \times F_c$). 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 768.025 MHz @ 35 W Emission Mask D

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

12.5 kHz Channel Spacing 768.025 MHz @ 2 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty	± 4.6 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

12.5 kHz Channel Spacing 769.075 MHz @ 35 W Emission Mask D

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

12.5 kHz Channel Spacing 769.075 MHz @ 2 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty	± 4.6 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

12.5 kHz Channel Spacing 774.9 MHz @ 35 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
5424.3	-39.51	-84.95
~	~	~

12.5 kHz Channel Spacing 774.9 MHz @ 2 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty	± 4.6 dB	
No other 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 775.975 MHz @ 35 W Emission Mask D

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

12.5 kHz Channel Spacing 775.975 MHz @ 2 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty	± 4.6 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

12.5 kHz Channel Spacing 851.025 MHz @ 35 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
5106.15	-31.45	-76.89
~	~	~

12.5 kHz Channel Spacing 851.025 MHz @ 2 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty	± 4.6 dB	
No other emissions were detected at a level greater than 20 dB below the limit.		

12.5 kHz Channel Spacing 860.025 MHz @ 35 W Emission Mask D

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

12.5 kHz Channel Spacing 860.025 MHz @ 2 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty	± 4.6 dB	
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 868.975 MHz @ 35 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
6951.8	-25.60	-71.04
~	~	~

12.5 kHz Channel Spacing 868.975 MHz @ 2 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty	± 4.6 dB	
No other 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 $50 + 10 \log_{10} (P_{\text{Watts}})$	
35 W	-20 dBm	-65.4 dBc
2 W	-20 dBm	-53 dBc

Tx Radiated Emissions - Continued

Open Area Test Site Results:

12.5 kHz Channel Spacing

851.025 MHz @ 35 W

Emission Mask D

Harmonics Emission Frequency (MHz)	Level (dBm)	Level (dBc)
1702.050	-54.82	-100.26
2553.075	-49.45	-94.89
3404.100	-61.56	-107.00
4255.125	-50.63	-96.07
5106.150	-31.45	-76.89
5957.175	-51.44	-96.88
Measurement Uncertainty	± 4.6 dB	

Sample Calculation	Measurement					Result	
	Reference	Substitution					
Emission Frequency (MHz)	Reference Level (dBm)	Sig-gen Level	Cable and Attenuator Gain	Antenna Gain (dBd)	Path and Boresight corrections	dBm	nW
1702.050	-93.78	-39.84	-20.31	6.05	-0.72	-54.82	3.3
		A	B	C	D	E	

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

Photo: OATS Setup



TRANSMITTER RADIATED EMISSIONS IN THE GNSS BAND

SPECIFICATION: FCC CFR 90.543

GUIDE: TIA/EIA-603E 2.2.12

MEASUREMENT PROCEDURE:

1. Refer Annex A for equipment set up.
2. Spurious emissions were measured in the GNSS band. (1559 – 1610 MHz)
3. The EUT was placed on a wooden turntable at a distance of three metres from the test antenna.
4. The test antenna was raised from 1m to 4m to obtain a maximum reading; the turntable was then rotated through 360° to obtain the maximum response of each spurious emission.
5. Valid emissions were determined by switching the EUT on and off.
6. The EUT was replaced by a signal generator and substitution antenna to make measurements by the substitution method.
7. The antenna is normally installed remotely from the base station. For this test the antenna port of the EUT is terminated in 50 ohms. For conducted emissions from the EUT antenna port see results in the following test Transmitter Conducted Emissions in the GNSS Band.

MEASUREMENT RESULTS:

769.075 MHz		35 W	12.5 kHz Channel Spacing
	Emission Frequency	Antenna Polarity	Level dBW / MHz EIRP
Wideband Signals RBW 1 MHz	1578.99 MHz	Horizontal	-84.125
		Vertical	-84.125
Discrete Emissions RBW 1 kHz	1562.16 MHz	Horizontal	-109.14
		Vertical	-109.14

LIMIT CLAUSE FCC 47 CFR 90.543 (f)	-70 dBW / MHz EIRP for wideband signals -80 dBW EIRP for discrete emissions of less than 700 Hz BW
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Photo: GNSS Radiated Setup



TRANSMITTER CONDUCTED EMISSIONS IN THE GNSS BAND

SPECIFICATION: RSS-119 5.8

MEASUREMENT PROCEDURE:

1. Refer Annex A for equipment set up.
2. Spurious emissions were measured in the GNSS band. (1559 – 1610 MHz)
3. The EUT was connected via an attenuator to a spectrum analyser.
4. Allowance was made for a theoretical dipole with a gain of 2.15dBm isotropic.

MEASUREMENT RESULTS:

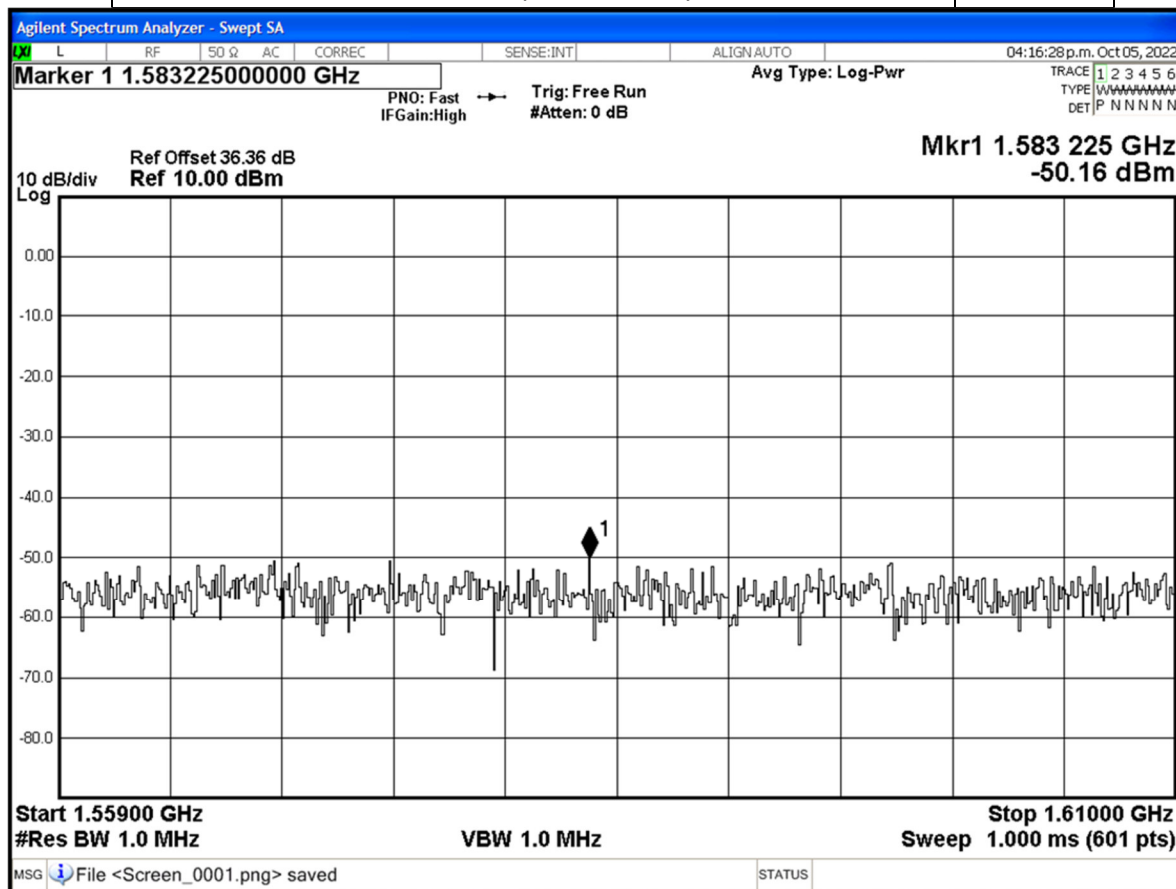
775.975 MHz 35 W

Frequency	Level dBm / MHz EIRP	Level dBW / MHz EIRP
1583.225 MHz	-50.16	-80.16

LIMIT CLAUSE RSS-119 5.8.9.2	-70 dBW / MHz EIRP
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Attenuation correction: (dB)

E5023 30dB 350W CK9178	32.46	Gain – Theoretical Dipole	2.15
E5028 1m5 Blue 501868	0.5		
E5015 3m Blue 503429	1.12		
E3785 Filter	4.43		
Total Attenuation @ 1583 MHz	38.51	Offset = Loss - gain	38.51-2.15
Spectrum Analyser Reference Offset			36.36



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).
4. A 10 MHz reference was fitted to the EUT for this test.

MEASUREMENT RESULTS:

See the plots on the following pages.

Temperature ($^{\circ}\text{C}$)	Error (ppm)						
	768.025 MHz	769.075 MHz	774.9 MHz	775.975 MHz	851.025 MHz	860.025 MHz	868.975 MHz
-30	-0.04	-0.01	0	-0.01	-0.01	0	0
-20	0.02	0.01	-0.01	0	-0.02	0	-0.01
-10	-0.02	-0.02	-0.02	-0.01	-0.02	-0.01	-0.03
0	0.02	0.01	0	0.02	0.01	0.02	0.02
10	-0.01	-0.02	-0.03	-0.01	-0.03	-0.02	-0.02
20	-0.01	-0.02	-0.03	-0.03	-0.03	-0.02	-0.02
30	0.02	0.01	0	0.04	-0.01	0.03	0.01
40	0.01	0	-0.02	0	-0.02	0	-0.01
50	-0.02	-0.02	-0.02	-0.02	-0.04	-0.02	-0.03
Measurement Uncertainty				$\pm 5 \times 10^{-8}$			

