

LABORATORY TEST REPORT

RADIO PERFORMANCE MEASUREMENTS

for the

TMBK5B MOBILE Transceiver

Tested in accordance with:

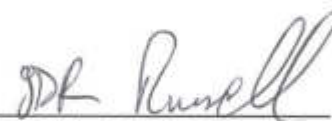
FCC 47 CFR Parts 27 and 90

RSS-119 Issue 12
RSS-Gen Issue 5

Report Revision: 1

Issue Date: 9 May 2022

PREPARED BY: I. D. Russell


Test Technician

CHECKED & APPROVED BY: M. C. James


Laboratory Technical Manager



FCC Registration: 838288
ISED Registration: 737A

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

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FCC ID: CASTMBK5B
IC : 737A-TMBK5B

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Report Revision: 1
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REVISION HISTORY

Date	Revision	Comments
9 May 2022	1	Initial test report

INTRODUCTION

Type approval testing of the TMBK5B, 30/35 Watt, MOBILE transceiver in order to demonstrate continued compliance with FCC 47 Parts 27 & 90, and RSS-119 Issue 12 & RSS-Gen Issue 5, after a change in RF power amplifier design.

This radio supports analogue, digital FFSK, Digital Mobile Radio (DMR), APCO P25 phase-1 and APCO P25 phase-2 modulations, however the change in RF design does not affect modulation.

PCB IPN (old) 220-01815-09
PCB IPN (new) 220-01815-10

REPORT PREPARED FOR

Tait International Ltd
245 Wooldridge Road
Harewood
Christchurch 8051
New Zealand

DESCRIPTION OF SAMPLE

Manufacturer	Tait International Limited
Equipment:	MOBILE Transceiver
Type:	TMBK5B
Product Code:	T02-00012-XFAA
Serial Number(s):	20917090
Frequency range	762 → 870 MHz
Transmit Power	30/35 W

HARDWARE & SOFTWARE

Quantity: 1

	Code and Version	Hardware
Hardware ID	TMBC52-0100_0008	Head
Boot Code	QCB5B_S00_3.05.12.0001	Head
Radio Application	QCB5F_S00_2.02.03.0009	Head
FPGA Image	QCB5G_S01_2.00.00.0001	Head
Hardware ID	TMBB24-K500_0002	Torso
Boot Code	QMB2B_S01_4.00.00.0001	Torso
DSP	QMB2A_E00_2.28.17.0139	Torso
Radio Application	QMB2F_E00_2.28.17.0139	Torso
FPGA Image	QMB2G_S02_1.81.00.0000	Torso

TEST CONDITIONS

All testing was performed between 28 March → 9 May 2022, and under the following conditions:

Ambient temperature:	15°C → 30°C
Relative Humidity:	20% → 90%
Standard Test Voltage	13.8 V _{DC}

TEST REQUIREMENTS AND RESULT SUMMARY

ISED Specification	FCC Specification	Test Name	Test Methods	Result
RSS-119 5.4	FCC 47 CFR 2.1046	Transmitter Output Power (Conducted)	RSS-Gen 6.12 ANSI C63.26 5.2.4.2	P
No specification	FCC 47 CFR 2.1047 (a)	Transmitter Audio Frequency Response – Pre-emphasis	ANSI C63.26 5.3.3.2	N1
No specification	FCC 47 CFR 2.1047 (b)	Transmitter Modulation Limiting	ANSI C63.26 5.3.2	N1
RSS-119 5.5	FCC 47 CFR 2.1049 (c)	Transmitter Occupied (99%) Bandwidth	RSS-Gen 6.7 ANSI C63.26 5.4.4	N1
RSS-119 5.5	FCC 47 CFR 90.210	Transmitter Spectrum Masks	RSS-119 4.2.2 TIA-603-E 2.2.11	N1
RSS-119 5.8.9	FCC 47 CFR 90.543	Adjacent Channel Power Ratio	RSS-119 4.3 ANSI C63.26 6.5.2.4	P
RSS-119 5.8	FCC 47 CFR 2.1051	Transmitter Spurious Emissions (Conducted)	RSS-Gen 6.13 ANSI C63.26 5.7	P
RSS-119 5.8	FCC 47 CFR 2.1053	Transmitter Spurious Emissions (Radiated)	RSS-Gen 6.13 ANSI C63.26 5.5	P
No specification	FCC CFR 90.543	Transmitter Radiated Emissions in the GNSS Band	ANSI C63.26 6.5.2.7.3	P
RSS-119 5.8.9.2 rad	No specification	Transmitter Conducted Emissions in the GNSS Band	RSS-119 5.8 ANSI C63.26 6.5.2.7.4	P
RSS-119 5.9	FCC 47 CFR 90.214	Transient Frequency Behaviour	RSS-119 5.9 ANSI C63.26 6.5.2.2	N/A 1
RSS-119 5.3	FCC 47 CFR 90.214	Transmitter Frequency Stability - Temperature	RSS-Gen 6.11 ANSI C63.26 5.6.4	P
RSS-119 5.3	FCC 47 CFR 2.1055 (d) (1)	Transmitter Frequency Stability - Voltage	RSS-Gen 6.11 ANSI C63.26 5.6.5	P
RSS-Gen 7.4	FCC 47 CFR 15.111	Receiver Spurious Emissions (Conducted)	RSS-Gen 7.4 TIA-603-E 2.1.2	P
No specification	FCC 47 CFR 27.53 c (4) & (6)	Transmitter Spurious Emissions (Conducted) Part 27	TIA-102.CAAA-C 2.2.7	P
No specification	FCC 47 CFR 27.53 c (4) & (6)	Transmitter Spurious Emissions (Radiated) Part 27	TIA-102.CAAA-C 2.2.7	N1

Test Case Result Definitions	
No test Performed	N
Test does not apply to the test object	N/A
Test object meets requirements	P (Pass)
Test object does not meet requirements	F (Fail)
Test object is not conclusive	I (Inconclusive)

Comments:

N/A 1: Only required where the EUT transmits in the 138-174 or 406.1-512 MHz band

N1: Not tested as this parameter is unlikely to be affected by the change in the Power Amplifier

STATEMENT OF COMPLIANCE

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

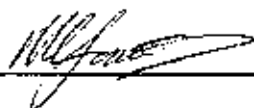
Equipment: MOBILE Transceiver
Type: TMBK5B
Product Code: T02-00012-XFAA
Serial Number(s): 20917090
Quantity: 1

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

FCC 47 CFR Parts 27 and 90

RSS-119 Issue 12 & RSS-Gen Issue 5

for the parameters tested in this report.

Signature: 

M. C. James
Laboratory Technical Manager

Date: 16 May 2022

The results obtained in this test report pertain only to the item(s) tested. Teltest does not make any claims of compliance for samples or variants that were not tested.

CHANNEL TABLE

Label	Channel Number	Receive Frequency	Transmit Frequency	Power	Bandwidth
762 Hi	1	762.025	762.025	30 W	12.5KHz
768 Hi	3	768.025	768.025	30 W	12.5KHz
769 Hi	5	769.075	769.075	30 W	12.5KHz
774 Hi	7	774.9	774.9	30 W	12.5KHz
775 Hi	9	775.975	775.975	30 W	12.5KHz
787 Hi	11	857.5	787.5	30 W	12.5KHz
798 Hi	13	768.025	798.025	30 W	12.5KHz
799 Hi	15	769.075	799.075	30 W	12.5KHz
804 Hi	17	774.9	804.9	30 W	12.5KHz
805 Hi	19	775.975	805.975	30 W	12.5KHz
806 Hi	21	856.025	806.025	35W	12.5KHz
815 Hi	23	865.025	815.025	35W	12.5KHz
823 Hi	25	869.975	823.975	35W	12.5KHz
851 Hi	27	851.025	851.025	35W	12.5KHz
860 Hi	29	860.025	860.025	35W	12.5KHz
762 Lo	2	762.025	762.025	2 W	12.5KHz
768 Lo	4	768.025	768.025	2 W	12.5KHz
769 Lo	6	769.075	769.075	2 W	12.5KHz
774 Lo	8	774.9	774.9	2 W	12.5KHz
775 Lo	10	775.975	775.975	2 W	12.5KHz
787 Lo	12	857.5	787.5	2 W	12.5KHz
798 Lo	14	768.025	798.025	2 W	12.5KHz
799 Lo	16	769.075	799.075	2 W	12.5KHz
804 Lo	18	774.9	804.9	2 W	12.5KHz
805 Lo	20	775.975	805.975	2 W	12.5KHz
806 Lo	22	856.025	806.025	2 W	12.5KHz
815 Lo	24	865.025	815.025	2 W	12.5KHz
823 Lo	26	869.975	823.975	2 W	12.5KHz
851 Lo	28	851.025	851.025	2 W	12.5KHz
860 Lo	30	860.025	860.025	2 W	12.5KHz

Programming Application Name
DMR and P25 Terminals Programming Application

Version
2.121.1.8 Alpha

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TEST RESULTS

TRANSMITTER OUTPUT POWER (CONDUCTED)

SPECIFICATION: FCC 47 CFR 2.1046
RSS-119 5.4

GUIDE: ANSI C63.26 5.2.4.2

MEASUREMENT PROCEDURE:

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

Example calculation

$$\begin{aligned} \text{Power in dBm} &= \text{Measured power (dBm)} + \text{attenuator and cable loss (dB)} \\ \text{Chan 1 power (dBm)} &= 12.44 \text{ dBm} + 31.86 \text{ dB} \\ &= 44.3 \text{ dBm} \\ \text{Power in Watts} &= (10^{(44.3 \text{ dBm})} / 10) / 1000 \\ &= 26.9 \text{ W} \end{aligned}$$

MEASUREMENT RESULTS:

Manufacturer's Rated Output Power:

Switchable: 30/35 W and 2 W

Frequency	Nominal (W)	Measured (W)	Variation (%)	Variation (dB)
762.025MHz	30	26.9	-10.3	-0.5
768.025MHz	30	28.0	-6.8	-0.3
769.075MHz	30	28.0	-6.7	-0.3
774.9MHz	30	27.5	-8.3	-0.4
775.975MHz	30	27.3	-9.2	-0.4
787.5MHz	30	25.6	-14.8	-0.7
798.025MHz	30	26.3	-12.2	-0.6
799.075MHz	30	26.9	-10.4	-0.5
804.9MHz	30	27.7	-7.6	-0.3
805.975MHz	30	27.9	-6.8	-0.3
806.025MHz	35	31.7	-9.4	-0.4
815.025MHz	35	31.1	-11.2	-0.5
823.975MHz	35	28.9	-17.3	-0.8
851.025MHz	35	33.0	-5.8	-0.3
860.025MHz	35	32.6	-6.7	-0.3
Measurement Uncertainty			± 0.6 dB	

Transmitter Output Power (Conducted) - continued

Nominal 2 W	Measured (W)	Variation (%)	Variation (dB)
762.025MHz	1.8	-7.9	-0.4
768.025MHz	1.9	-5.9	-0.3
769.075MHz	1.9	-5.2	-0.2
774.9MHz	1.8	-8.1	-0.4
775.975MHz	1.8	-8.3	-0.4
787.5MHz	1.8	-10.6	-0.5
798.025MHz	1.8	-8.7	-0.4
799.075MHz	1.8	-8.5	-0.4
804.9MHz	1.9	-6.9	-0.3
805.975MHz	1.9	-6.6	-0.3
806.025MHz	1.8	-10.0	-0.5
815.025MHz	1.8	-8.9	-0.4
823.975MHz	1.8	-11.0	-0.5
851.025MHz	1.8	-8.3	-0.4
860.025MHz	1.8	-8.0	-0.4
Measurement Uncertainty		± 0.6 dB	

LIMIT CLAUSES:

FCC 47 CFR 90.205 (s)

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

RSS-119 5.4

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

ADJACENT CHANNEL POWER RATIO

SPECIFICATION: FCC 47 CFR 90.543

RSS-119 5.8.9

MEASUREMENT PROCEDURE:

1. Refer Annex A for equipment set up.
2. The transmitter is modulated with the standard test pattern for digital modulation.
3. The test is performed in accordance with 47 CFR 90.543

LIMIT CLAUSE: FCC 47 CFR 90.543

RSS-119 5.8.9

MEASUREMENT UNCERTAINTY: ≤ 12.75 GHz ± 3.0 dB

MEASUREMENT RESULTS:

Analogue

Tx FREQUENCY: 769.075 MHz 30 W 12.5 kHz Channel Spacing

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP(dBc)
9.375 kHz	6.25 kHz	-47.31	-49.66	-40
15.625 kHz	6.25 kHz	-72.86	-72.9	-60
21.875 kHz	6.25 kHz	-74.61	-74.62	-60
37.5 kHz	25 kHz	-70.67	-70.52	-60
62.5 kHz	25 kHz	-74.25	-74.25	-65
87.5 kHz	25 kHz	-77.49	-77.57	-65
150 kHz	100 kHz	-75.7	-76.42	-65
250 kHz	100 kHz	-81.71	-81.89	-65
350 kHz	100 kHz	-85.09	-85.43	-65
>400 kHz to 12 MHz	30 kHz (swept)	-88		-75
12 MHz to paired receive band	30 kHz (swept)	-102.9		-75
In the paired receive band	30 kHz (swept)	-104.4		-100

Analogue

Tx FREQUENCY: 774.9 MHz 30 W 12.5 kHz Channel Spacing

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP (dBc)
9.375 kHz	6.25 kHz	-47.51	-48.89	-40
15.625 kHz	6.25 kHz	-72.95	-72.68	-60
21.875 kHz	6.25 kHz	-74.66	-74.25	-60
37.5 kHz	25 kHz	-70.71	-70.65	-60
62.5 kHz	25 kHz	-74.09	-74.38	-65
87.5 kHz	25 kHz	-77.5	-77.87	-65
150 kHz	100 kHz	-75.68	-76.47	-65
250 kHz	100 kHz	-81.83	-81.94	-65
350 kHz	100 kHz	-85.02	-85.23	-65
>400 kHz to 12 MHz	30 kHz (swept)	-88		-75
12 MHz to paired receive band	30 kHz (swept)	-102.5		-75
In the paired receive band	30 kHz (swept)	-105.7		-100

Analogue
Tx FREQUENCY: 799.075 MHz 30 W 12.5 kHz Channel Spacing

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP(dBc)
9.375 kHz	6.25 kHz	-48.11	-47.78	-40
15.625 kHz	6.25 kHz	-72.68	-72.45	-60
21.875 kHz	6.25 kHz	-74.25	-74.44	-60
37.5 kHz	25 kHz	-70.38	-70.79	-60
62.5 kHz	25 kHz	-74.03	-74.12	-65
87.5 kHz	25 kHz	-77.29	-77.67	-65
150 kHz	100 kHz	-76.14	-76.64	-65
250 kHz	100 kHz	-81.75	-81.8	-65
350 kHz	100 kHz	-85.21	-85.22	-65
>400 kHz to 12 MHz	30 kHz (swept)	-89.5		-75
12 MHz to paired receive band	30 kHz (swept)	-108.9		-75
In the paired receive band	30 kHz (swept)	-109.2		-100

Analogue
Tx FREQUENCY: 804.9 MHz 30 W 12.5 kHz Channel Spacing

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP (dBc)
9.375 kHz	6.25 kHz	-47.26	-47.64	-40
15.625 kHz	6.25 kHz	-72.29	-72.27	-60
21.875 kHz	6.25 kHz	-74.39	-74.2	-60
37.5 kHz	25 kHz	-70.39	-70.56	-60
62.5 kHz	25 kHz	-74.11	-74.05	-65
87.5 kHz	25 kHz	-77.28	-77.3	-65
150 kHz	100 kHz	-75.83	-76.52	-65
250 kHz	100 kHz	-81.69	-81.66	-65
350 kHz	100 kHz	-85.18	-85.33	-65
>400 kHz to 12 MHz	30 kHz (swept)	-88.6		-75
12 MHz to paired receive band	30 kHz (swept)	-108.7		-75
In the paired receive band	30 kHz (swept)	-109.2		-100

Analogue
Tx FREQUENCY: 769.075 MHz 30 W 25 kHz Channel Spacing

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP(dBc)
15.625 kHz	6.25 kHz	-68.77	-69.94	-40
21.875 kHz	6.25 kHz	-74.46	-74.4	-60
37.5 kHz	25 kHz	-76.25	-76.72	-60
62.5 kHz	25 kHz	-74.08	-73.99	-65
87.5 kHz	25 kHz	-77.34	-77.55	-65
150 kHz	100 kHz	-75.08	-75.94	-65
250 kHz	100 kHz	-81.39	-81.45	-65
350 kHz	100 kHz	-84.58	-84.62	-65
>400 kHz to 12 MHz	30 kHz (swept)	-89		-75
12 MHz to paired receive band	30 kHz (swept)	-103.1		-75
In the paired receive band	30 kHz (swept)	-107		-100

Analogue

Tx FREQUENCY: 774.9 MHz 30 W 25 kHz Channel Spacing

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP (dBc)
15.625 kHz	6.25 kHz	-70.25	-69.9	-40
21.875 kHz	6.25 kHz	-74.26	-74.26	-60
37.5 kHz	25 kHz	-76.76	-76.71	-60
62.5 kHz	25 kHz	-74.04	-74.13	-65
87.5 kHz	25 kHz	-77.43	-77.63	-65
150 kHz	100 kHz	-75.96	-76.61	-65
250 kHz	100 kHz	-81.65	-81.9	-65
350 kHz	100 kHz	-84.85	-85.18	-65
>400 kHz to 12 MHz	30 kHz (swept)	-88.2		-75
12 MHz to paired receive band	30 kHz (swept)	-102.7		-75
In the paired receive band	30 kHz (swept)	-105		-100

Analogue

Tx FREQUENCY: 799.075 MHz 30 W 25 kHz Channel Spacing

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP(dBc)
15.625 kHz	6.25 kHz	-69.99	-69.41	-40
21.875 kHz	6.25 kHz	-74.3	-74.36	-60
37.5 kHz	25 kHz	-76.67	-76.73	-60
62.5 kHz	25 kHz	-74.05	-74.14	-65
87.5 kHz	25 kHz	-77.48	-77.47	-65
150 kHz	100 kHz	-75.68	-75.74	-65
250 kHz	100 kHz	-81.37	-81.5	-65
350 kHz	100 kHz	-84.74	-84.98	-65
>400 kHz to 12 MHz	30 kHz (swept)	-89.4		-75
12 MHz to paired receive band	30 kHz (swept)	-109		-75
In the paired receive band	30 kHz (swept)	-108.8		-100

Analogue

Tx FREQUENCY: 804.9 MHz 30 W 25 kHz Channel Spacing

Frequency Offset	Measurement Bandwidth	ACP Measured Lower (dBc)	ACP Measured Upper (dBc)	Maximum ACP (dBc)
15.625 kHz	6.25 kHz	-69.01	-69.07	-40
21.875 kHz	6.25 kHz	-74.45	-73.88	-60
37.5 kHz	25 kHz	-76.5	-77.1	-60
62.5 kHz	25 kHz	-74.02	-73.85	-65
87.5 kHz	25 kHz	-77.25	-77.45	-65
150 kHz	100 kHz	-75.6	-76.05	-65
250 kHz	100 kHz	-81.66	-81.69	-65
350 kHz	100 kHz	-84.98	-85.18	-65
>400 kHz to 12 MHz	30 kHz (swept)	-88.4		-75
12 MHz to paired receive band	30 kHz (swept)	-108.5		-75
In the paired receive band	30 kHz (swept)	-109.4		-100

TRANSMITTER SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATIONS: FCC 47 CFR 2.1051

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GUIDE: TIA-603-E 2.2.13 (analogue)
TIA-102-CAAA-C 2.2.7 (digital)

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: 9 kHz to Fc-BW
Fc+ BW to 10Fc (9 GHz)
3. The EUT was set to transmit high or low power, modulated with analogue FM. 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. A filter was used for frequencies just below the second harmonic to 3 GHz.
4. For each frequency range the spectrum analyser was loaded with the appropriate calibration figures to compensate for the cables, attenuator and filter 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	32.46	
E5015 3m Blue 503429	1.11	
E5028 1m5 Blue 501868	0.5	
E3785 550_885MHz HPBRF	4.64	
Total Attenuation @ 1.575 GHz	38.71	Sum of component attenuation (a)
Amplitude offset	38.71	(b)
Correction @ 1.575 GHz	0	(a-b)

MEASUREMENT RESULTS:

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

LIMIT CLAUSES: FCC 47 CFR 90.210

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Photo: Conducted Emissions Test Setup



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

762.025 MHz @ 30 W

Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
3048.75	-39.20	-83.97
~	~	~

12.5 kHz Channel Spacing

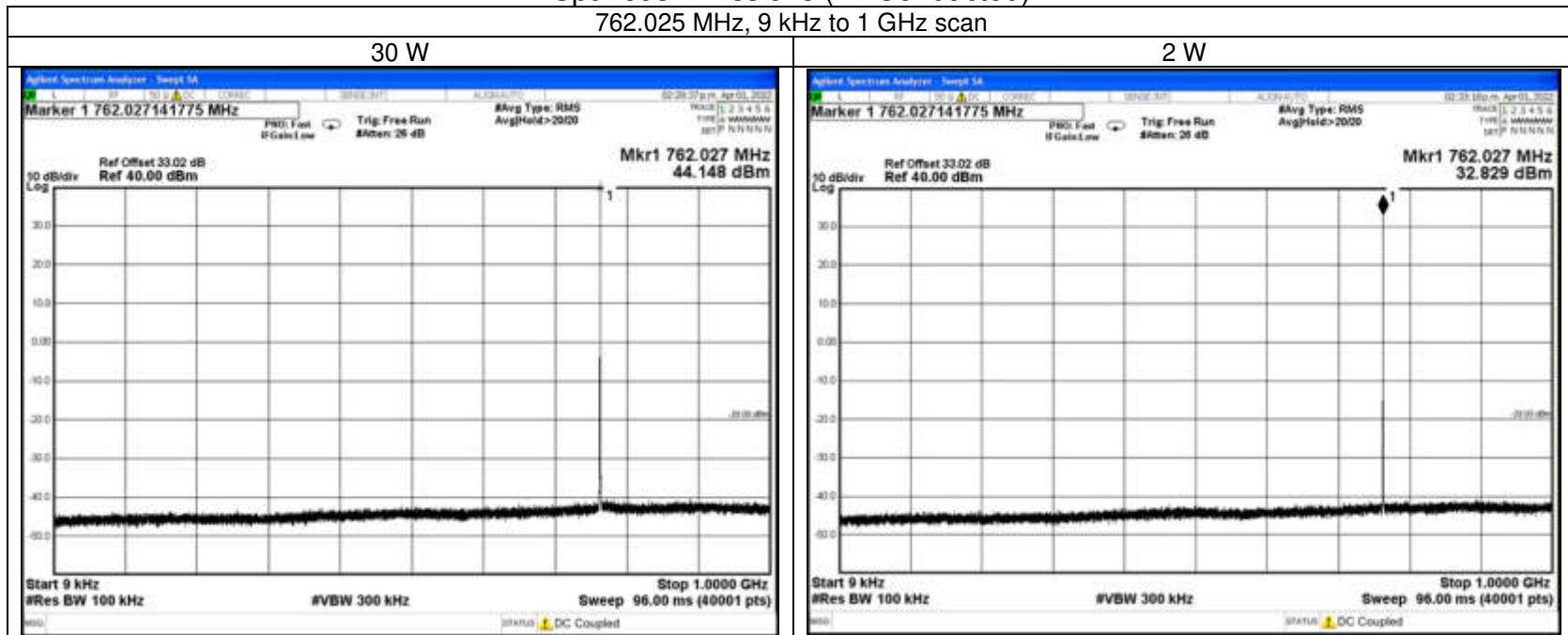
762.025 MHz @ 2 W

Emission Mask D

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

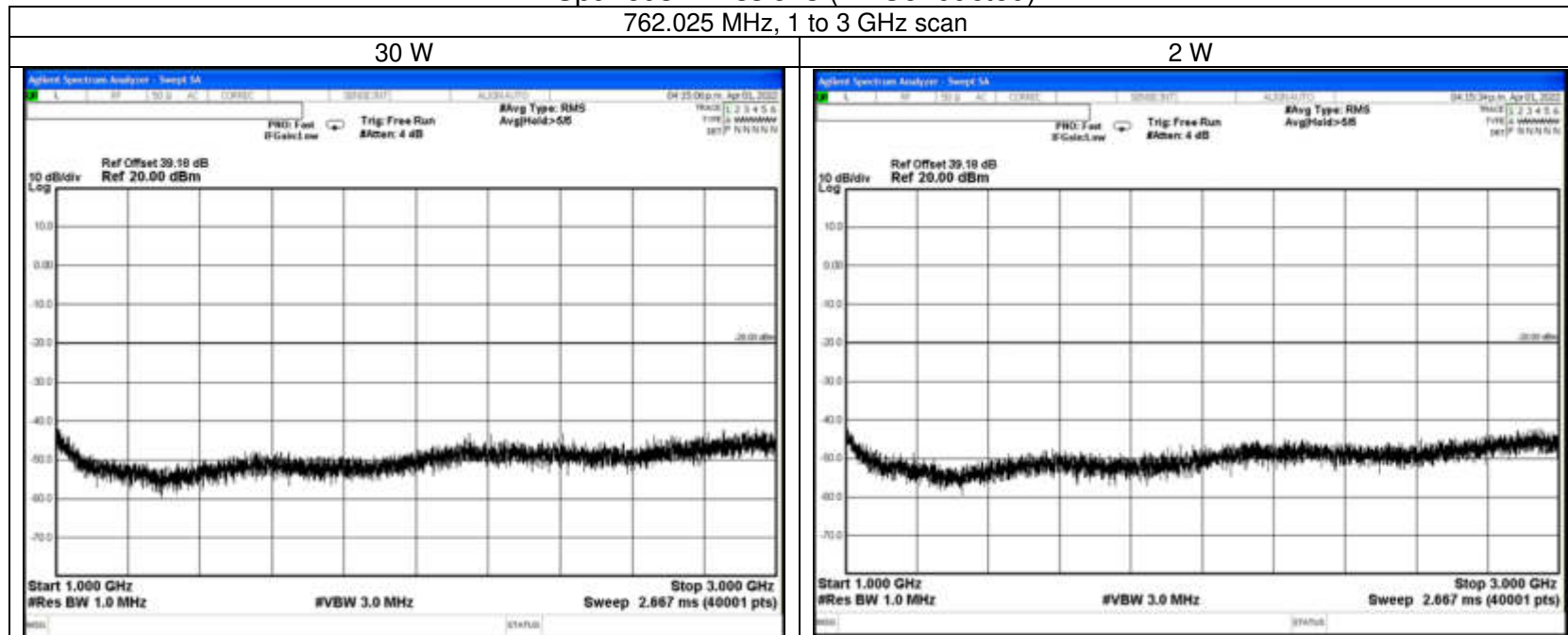
Spurious Emissions (Tx Conducted)

762.025 MHz, 9 kHz to 1 GHz scan



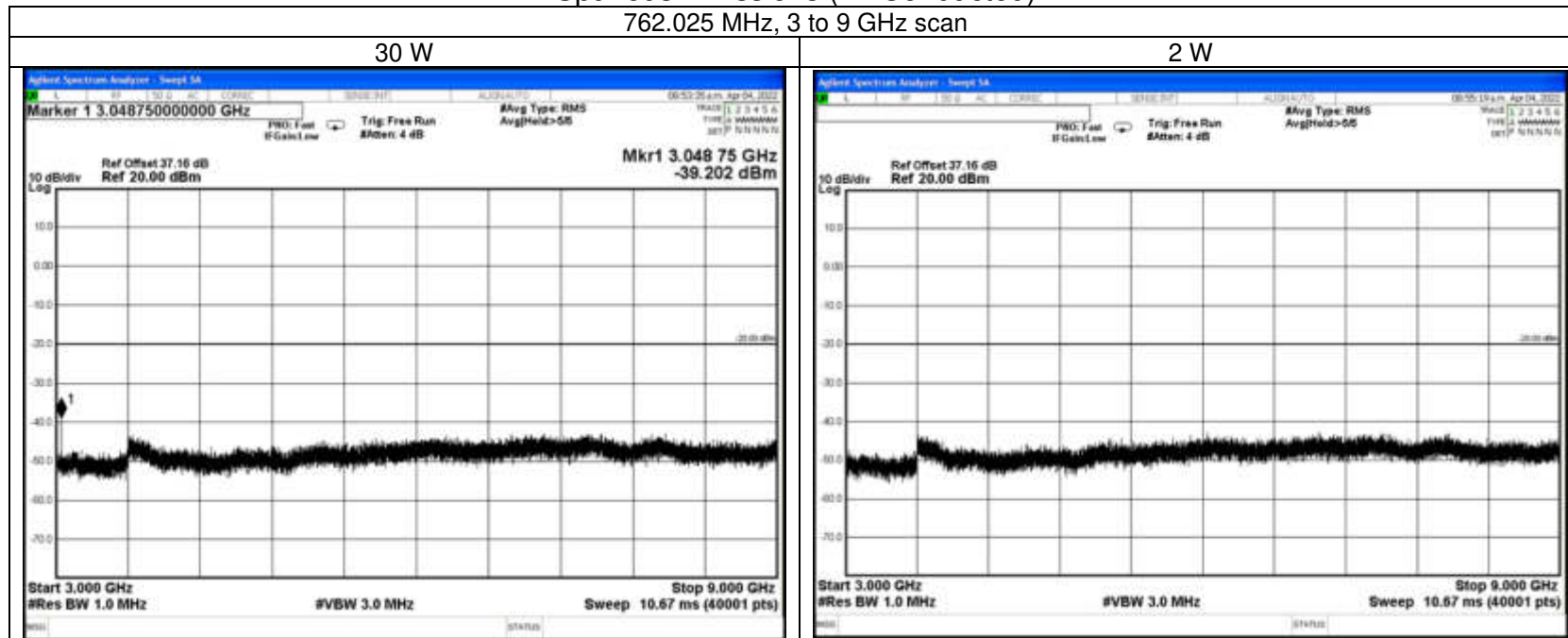
Spurious Emissions (Tx Conducted)

762.025 MHz, 1 to 3 GHz scan



Spurious Emissions (Tx Conducted)

762.025 MHz, 3 to 9 GHz scan



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

768.025 MHz @ 30 W

Emission Mask D

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

12.5 kHz Channel Spacing

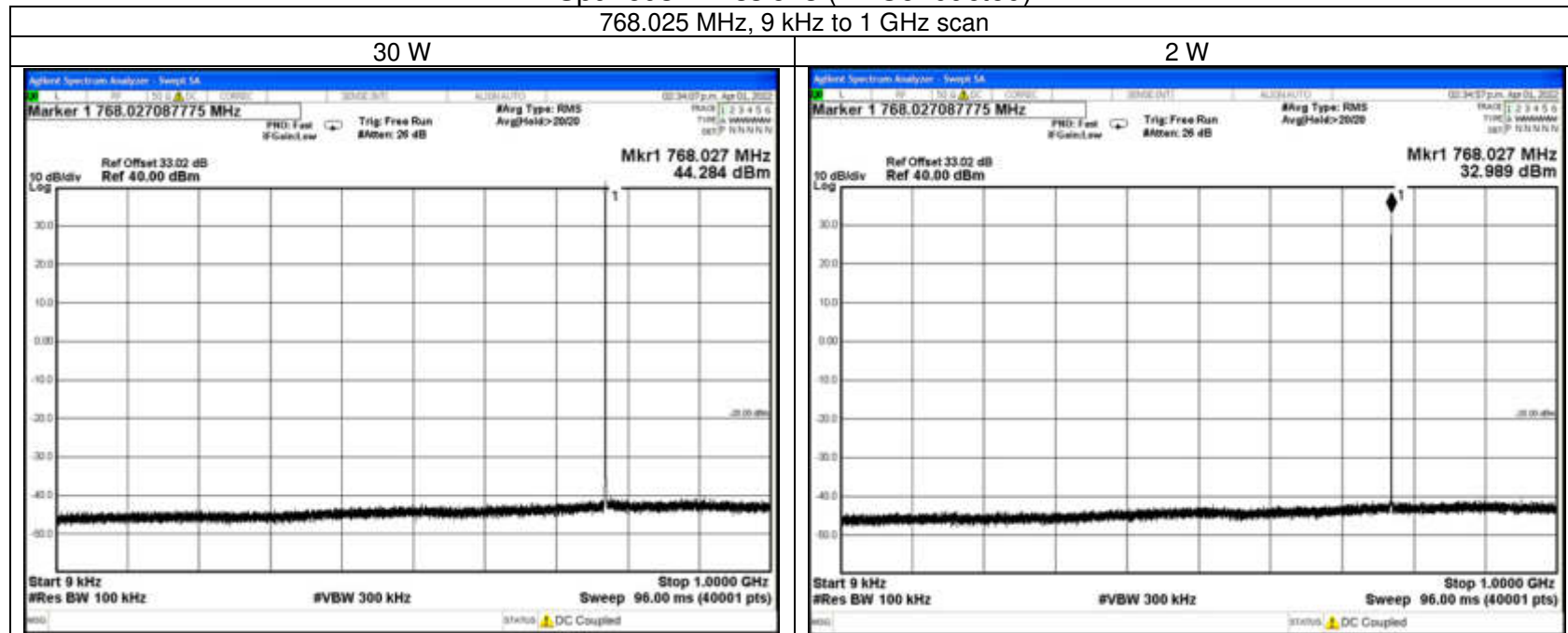
768.025 MHz @ 2 W

Emission Mask D

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

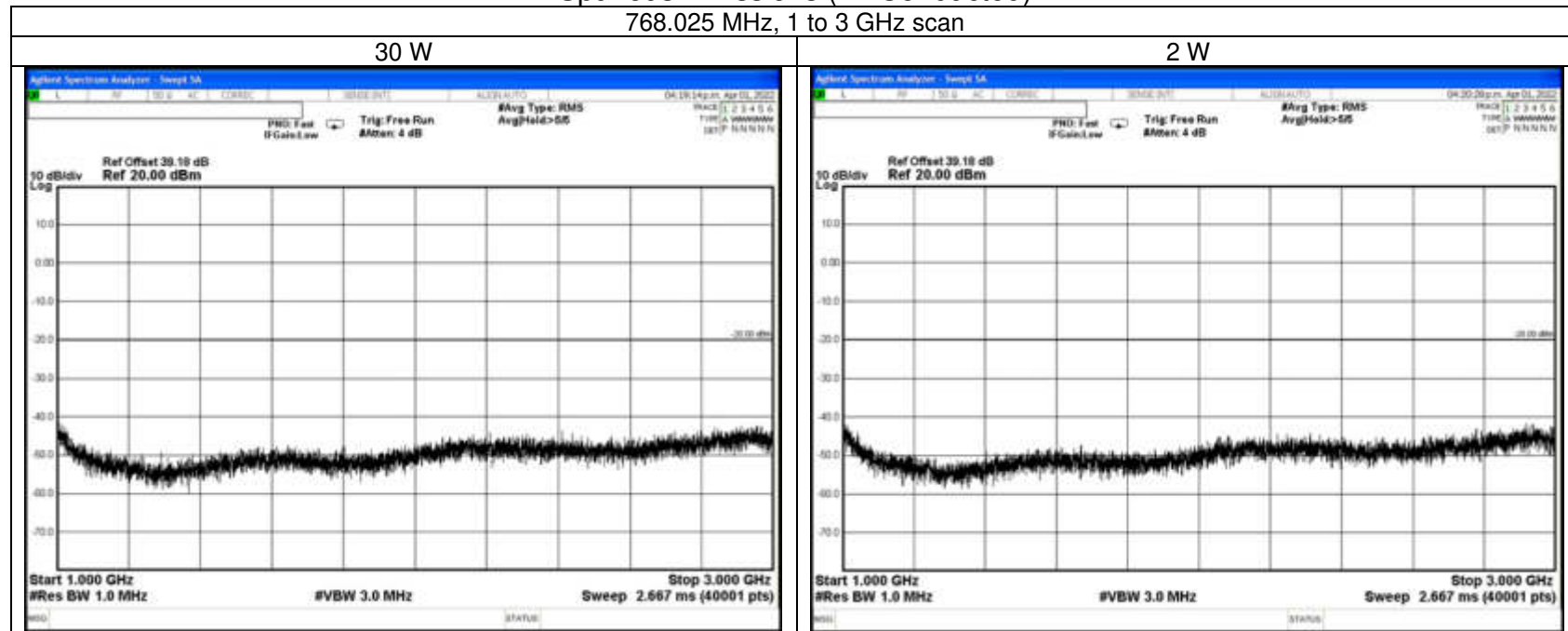
Spurious Emissions (Tx Conducted)

768.025 MHz, 9 kHz to 1 GHz scan



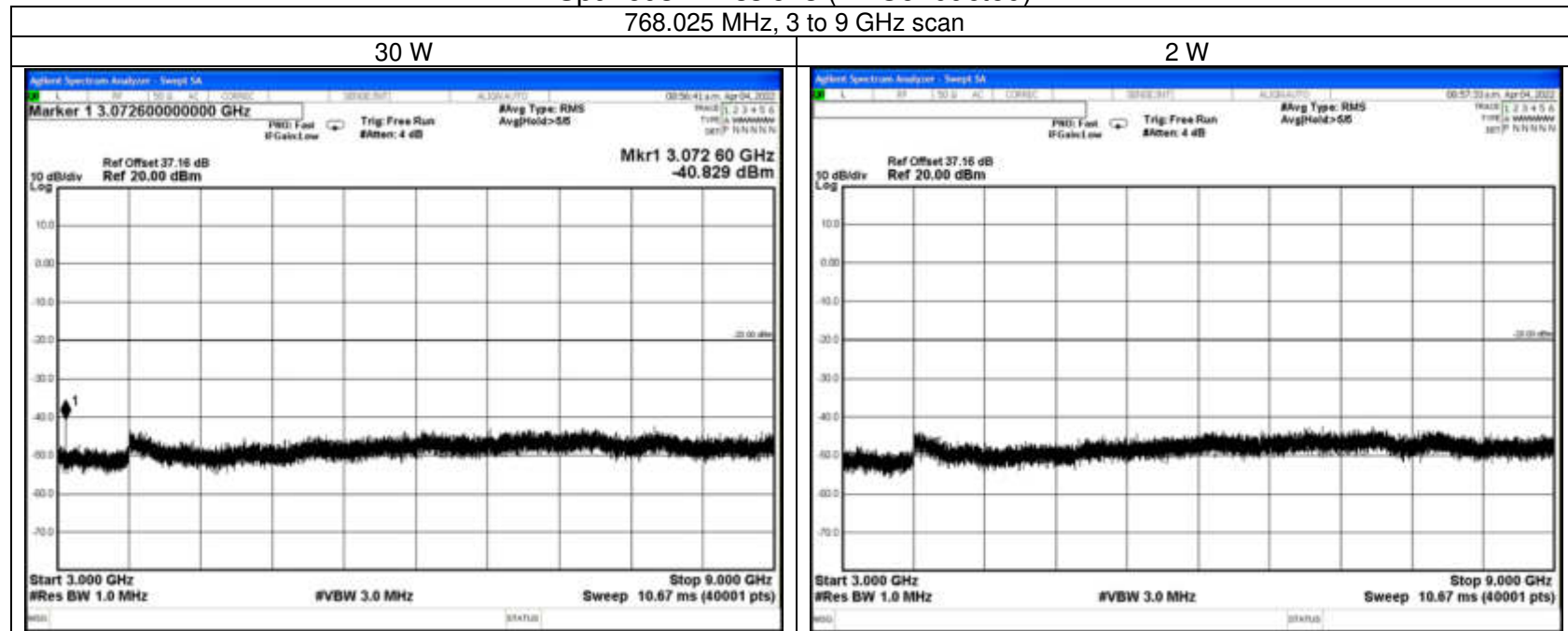
Spurious Emissions (Tx Conducted)

768.025 MHz, 1 to 3 GHz scan



Spurious Emissions (Tx Conducted)

768.025 MHz, 3 to 9 GHz scan



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

769.075 MHz @ 30 W

Emission Mask D

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

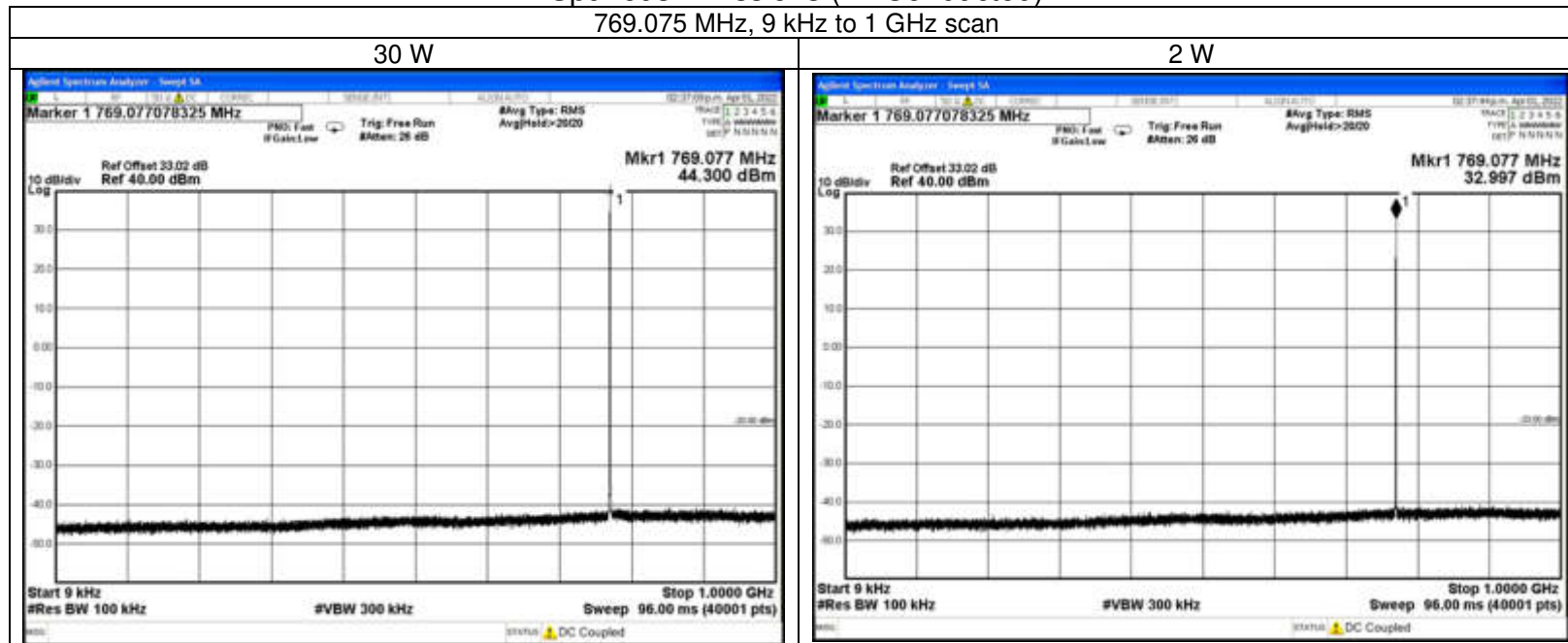
12.5 kHz Channel Spacing

769.075 MHz @ 2 W

Emission Mask D

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

Spurious Emissions (Tx Conducted)

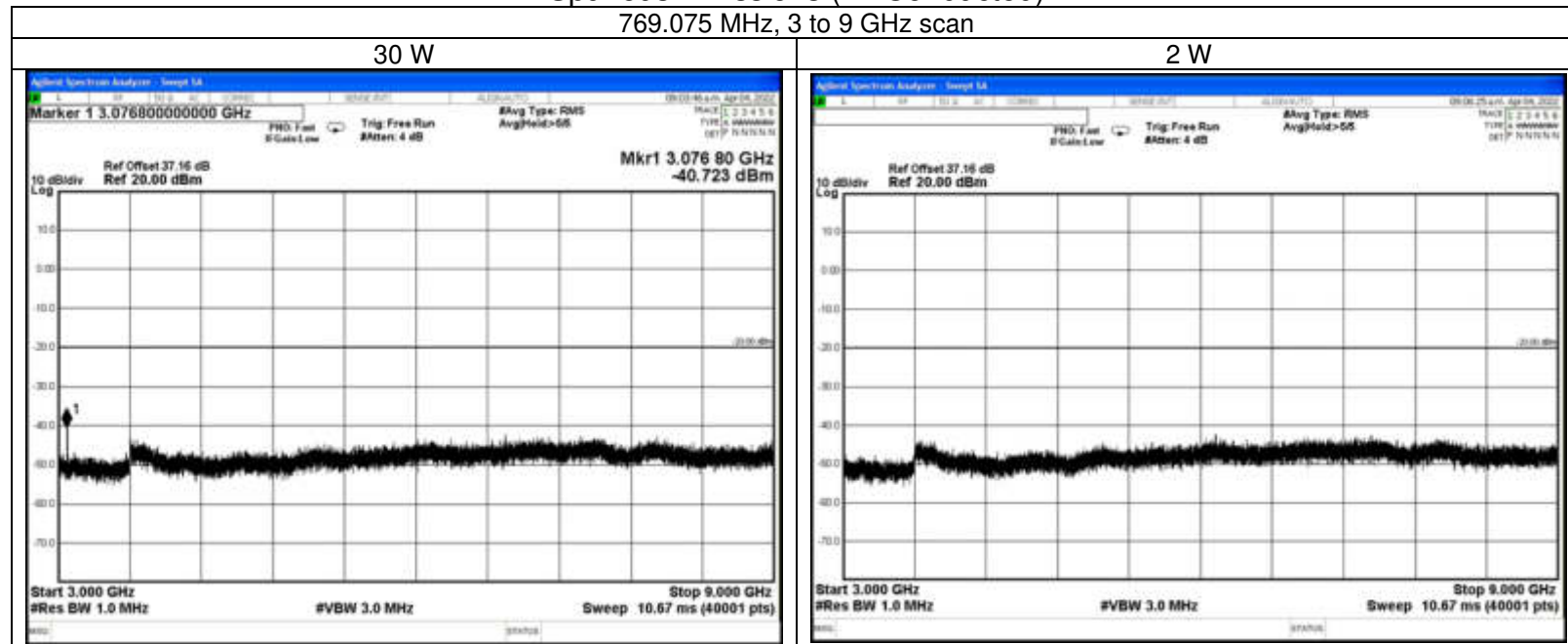


30 W



Spurious Emissions (Tx Conducted)

769.075 MHz, 3 to 9 GHz scan



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

774.9 MHz @ 30 W

Emission Mask D

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

12.5 kHz Channel Spacing

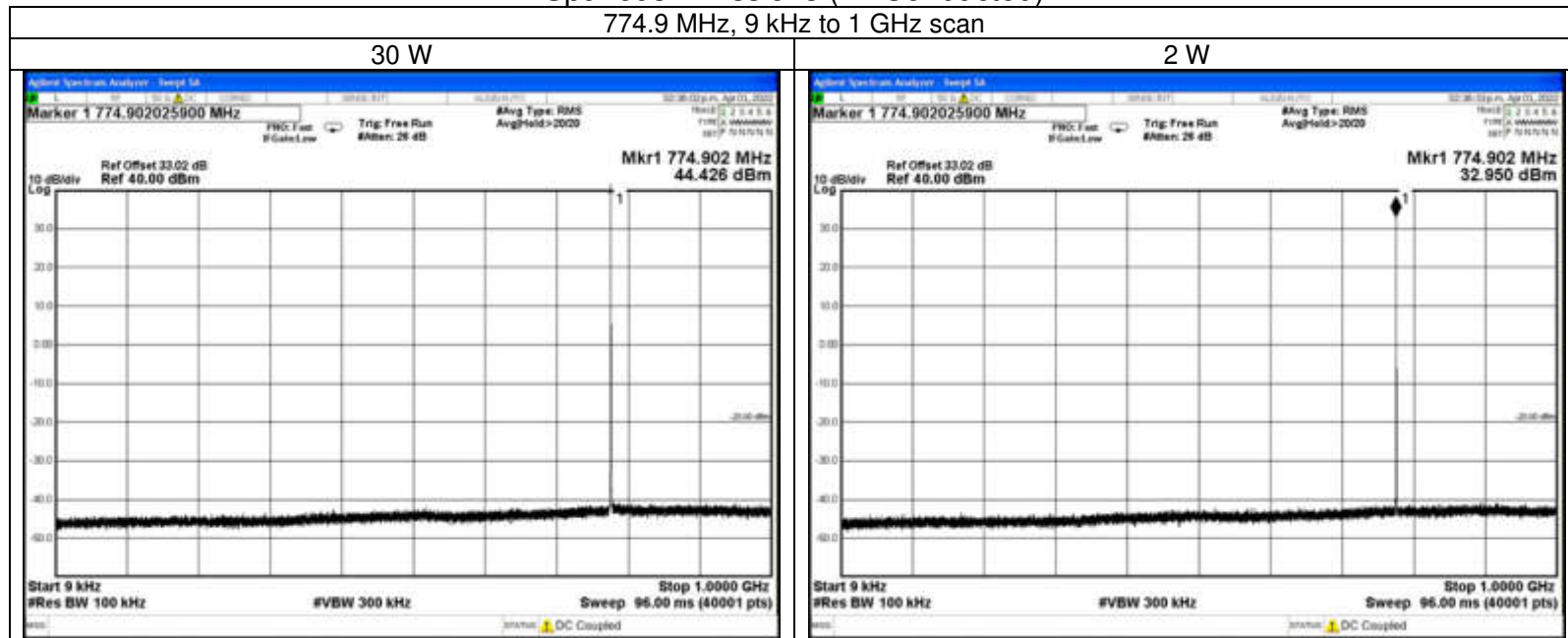
774.9 MHz @ 2 W

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.		

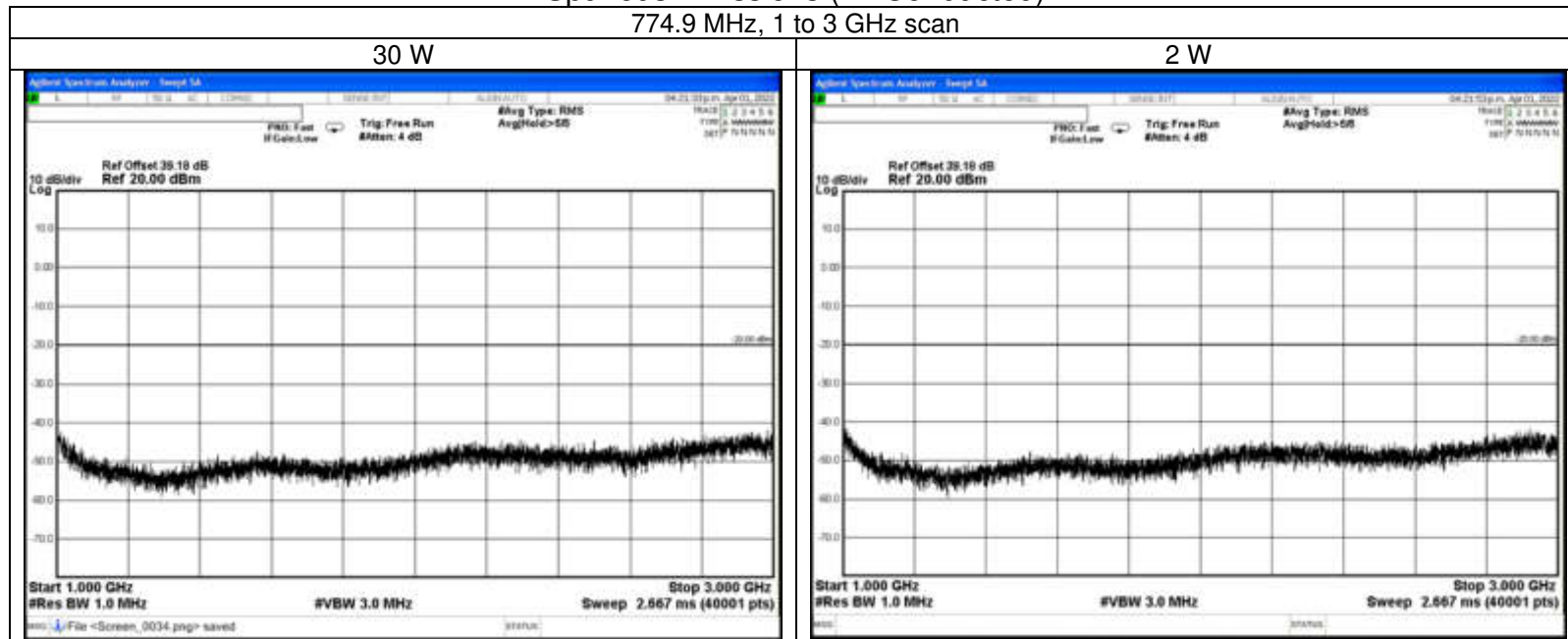
Spurious Emissions (Tx Conducted)

774.9 MHz, 9 kHz to 1 GHz scan



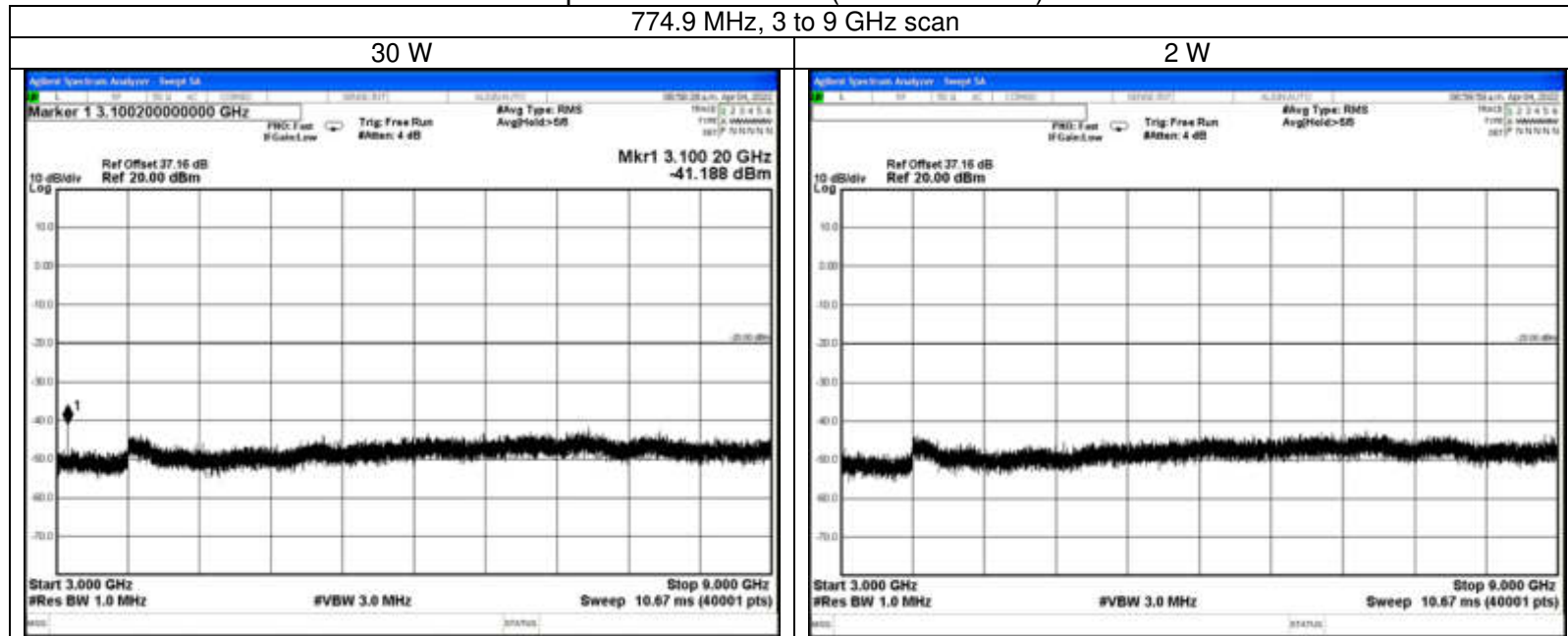
Spurious Emissions (Tx Conducted)

774.9 MHz, 1 to 3 GHz scan



Spurious Emissions (Tx Conducted)

774.9 MHz, 3 to 9 GHz scan



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

775.975 MHz @ 30 W

Emission Mask D

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

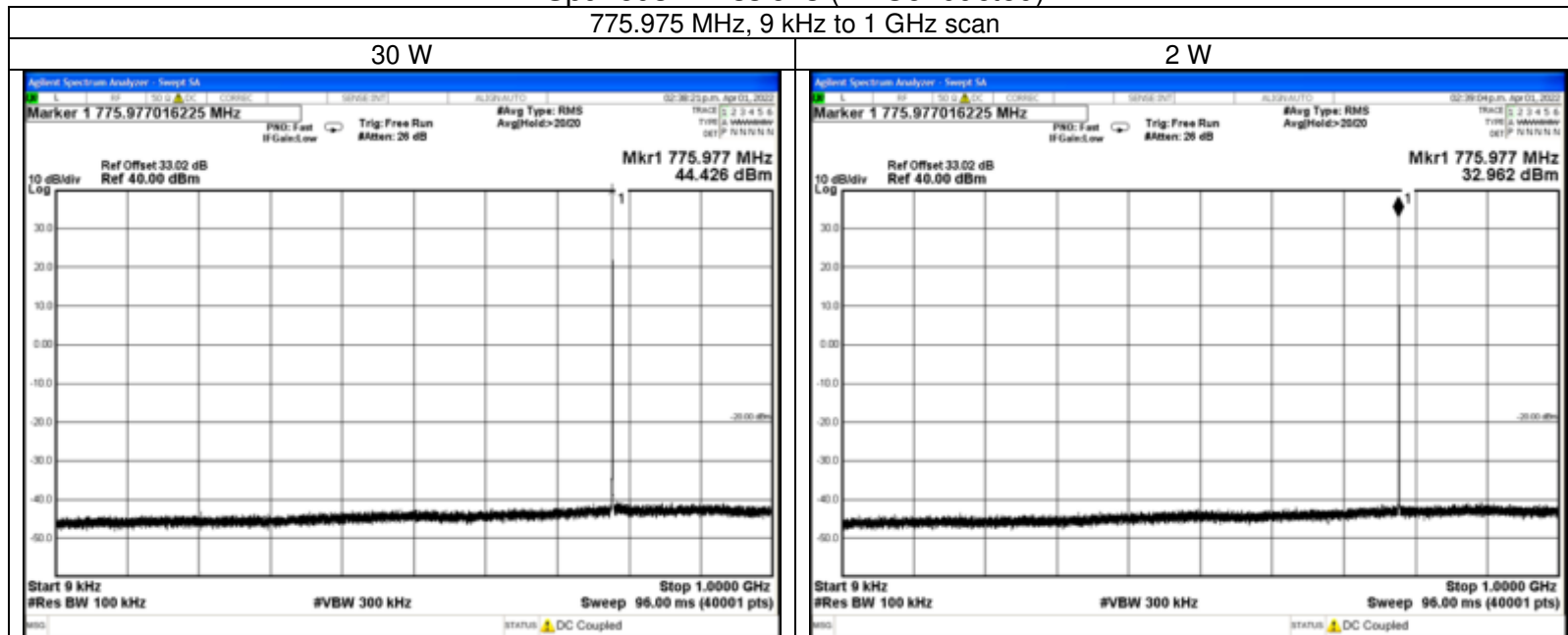
12.5 kHz Channel Spacing

775.975 MHz @ 2 W

Emission Mask D

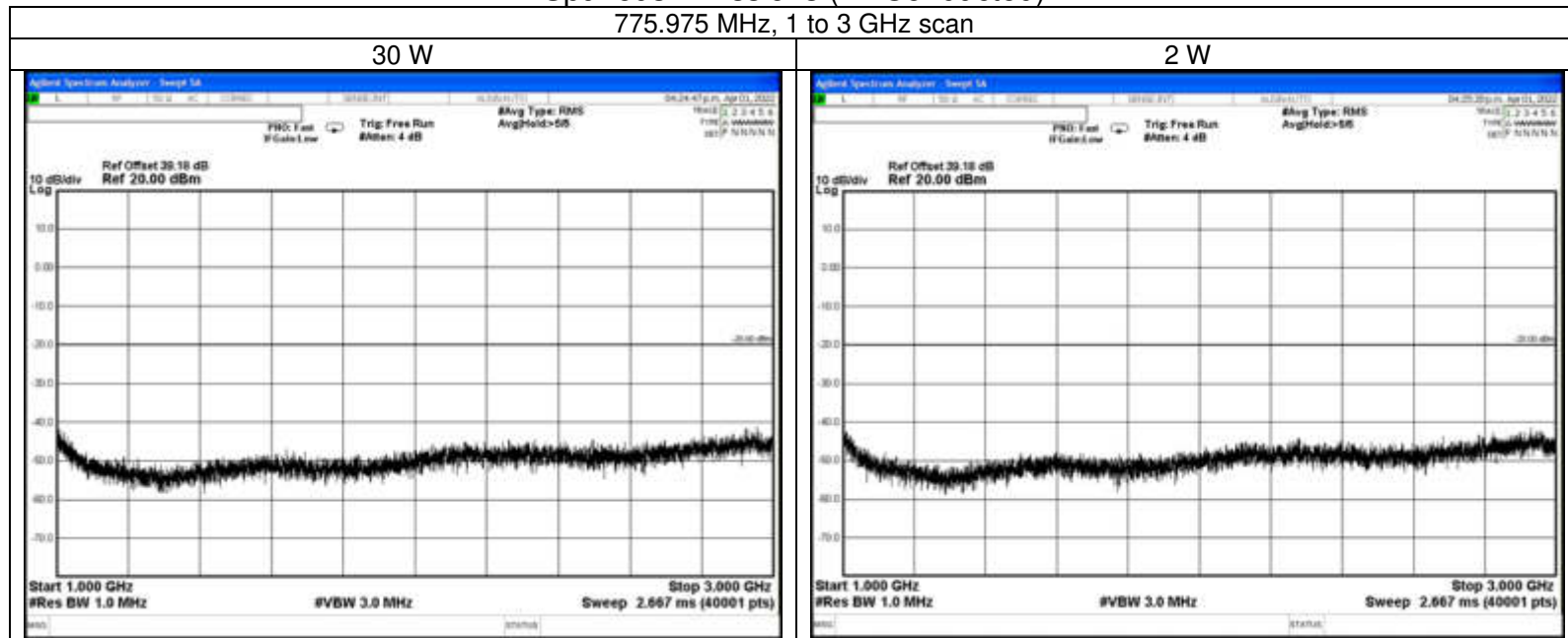
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty:	≤12.75 GHz ± 3.0 dB	
No emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Conducted)



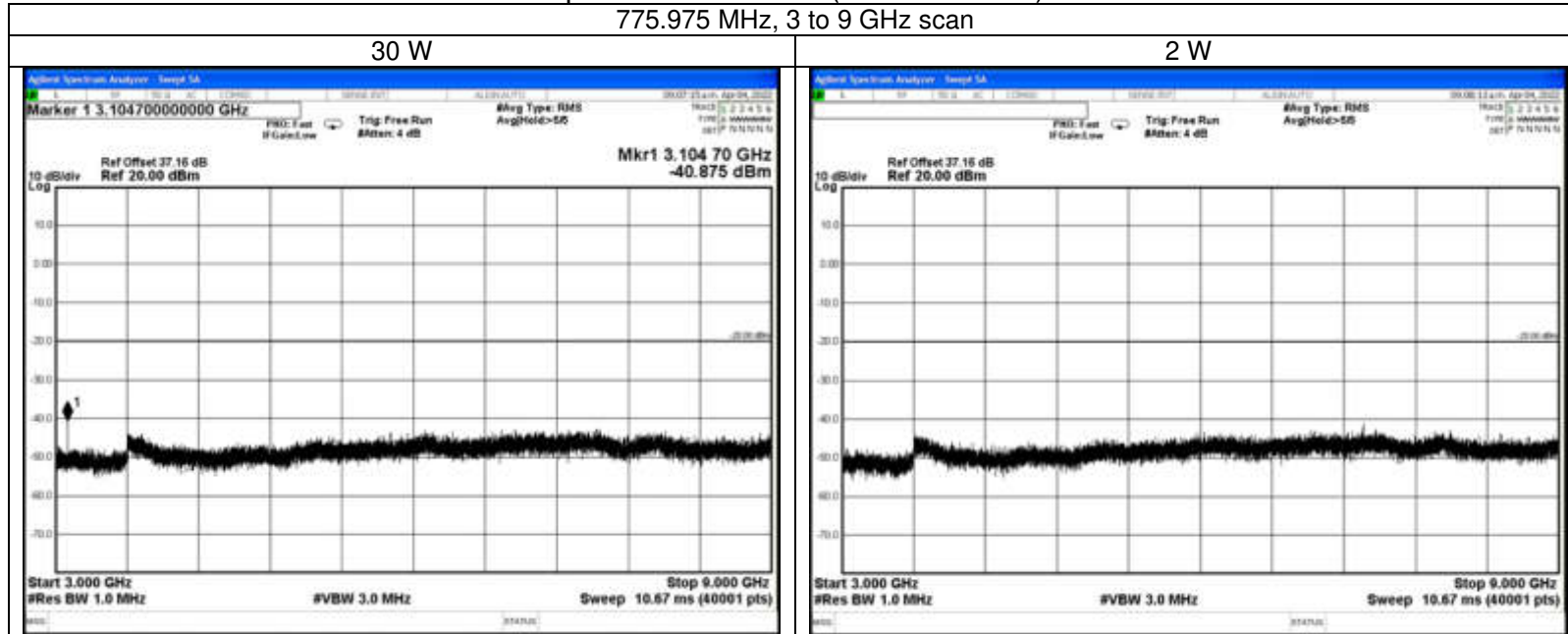
Spurious Emissions (Tx Conducted)

775.975 MHz, 1 to 3 GHz scan



Spurious Emissions (Tx Conducted)

775.975 MHz, 3 to 9 GHz scan



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

787.5 MHz @ 30 W

Emission Mask D

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

12.5 kHz Channel Spacing

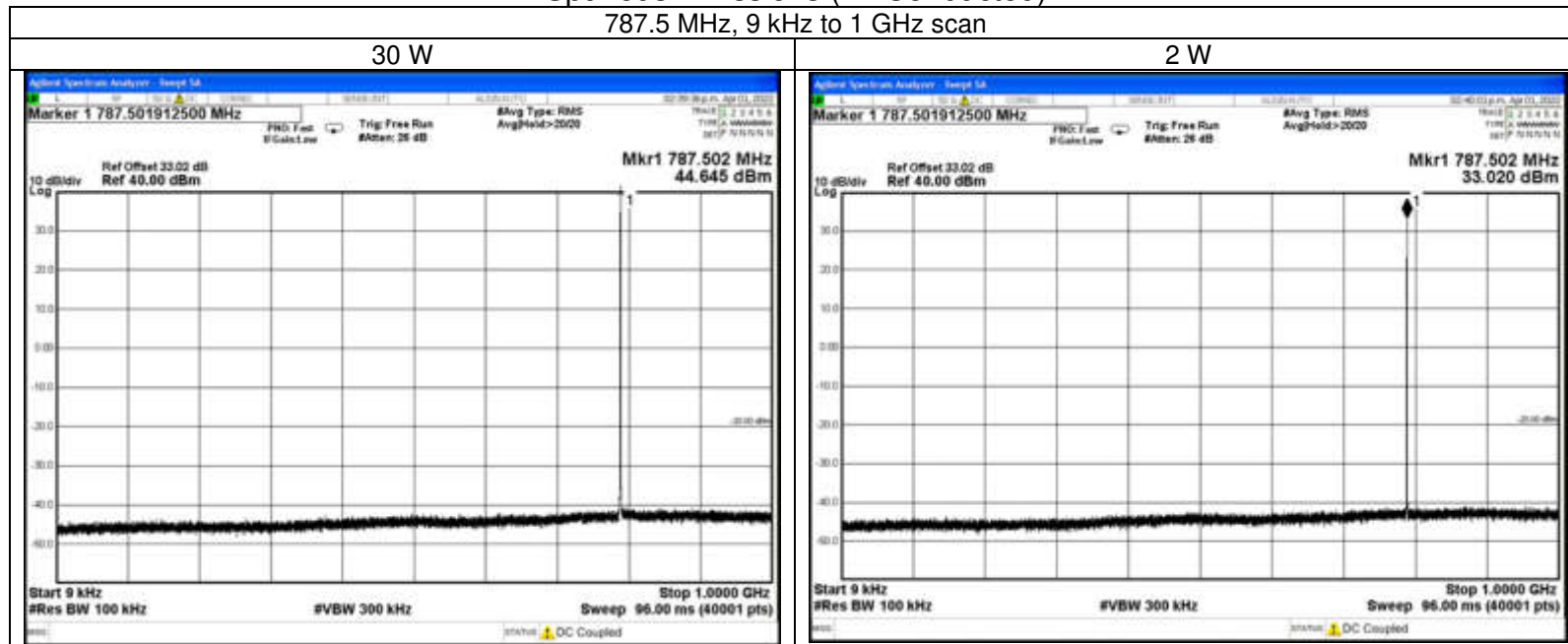
787.5 MHz @ 2 W

Emission Mask D

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

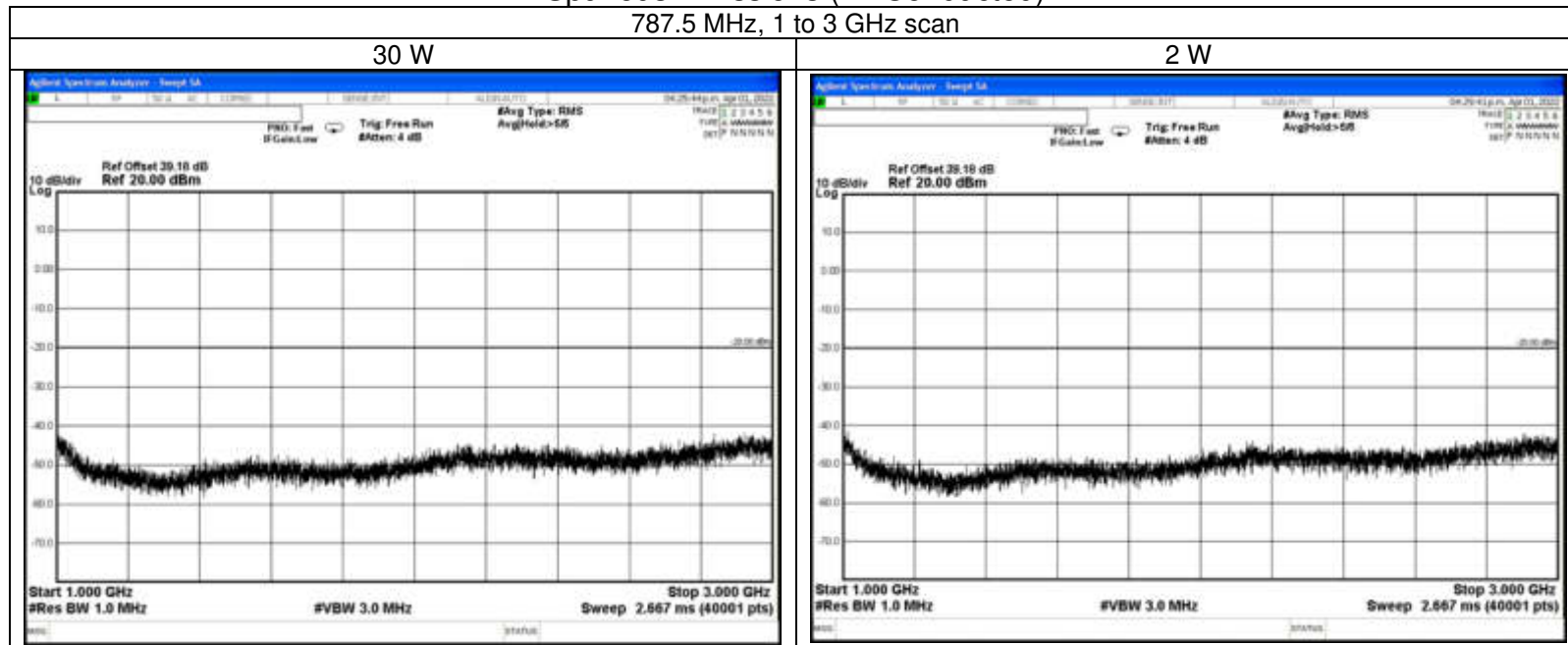
Spurious Emissions (Tx Conducted)

787.5 MHz, 9 kHz to 1 GHz scan



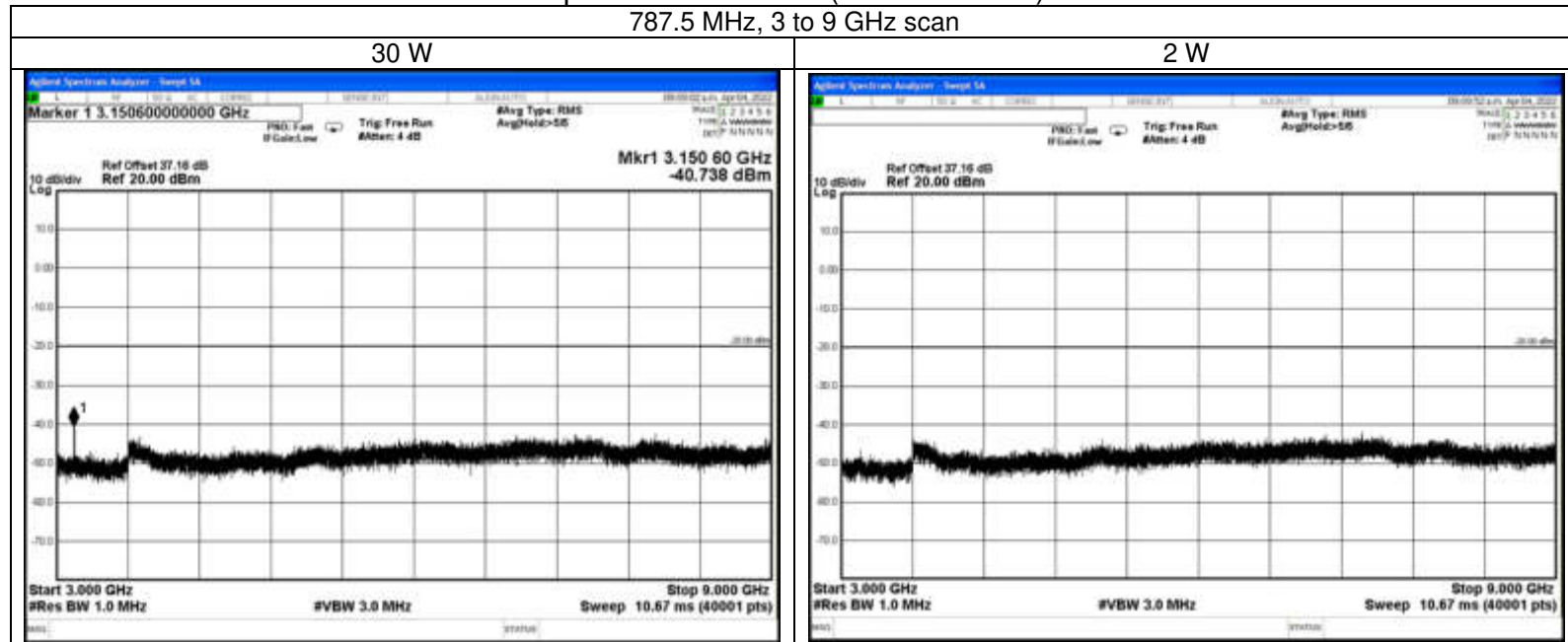
Spurious Emissions (Tx Conducted)

787.5 MHz, 1 to 3 GHz scan



Spurious Emissions (Tx Conducted)

787.5 MHz, 3 to 9 GHz scan



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

798.025 MHz @ 30 W

Emission Mask D

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

12.5 kHz Channel Spacing

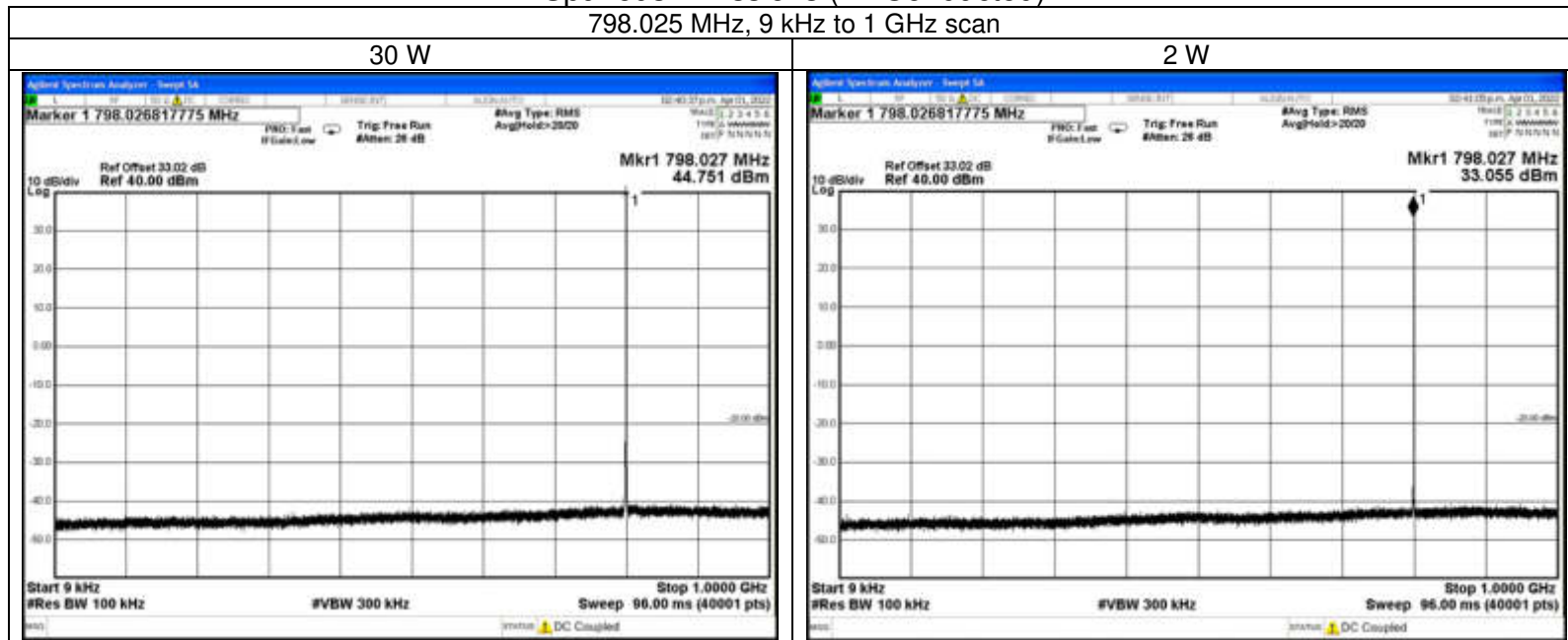
798.025 MHz @ 2 W

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.		

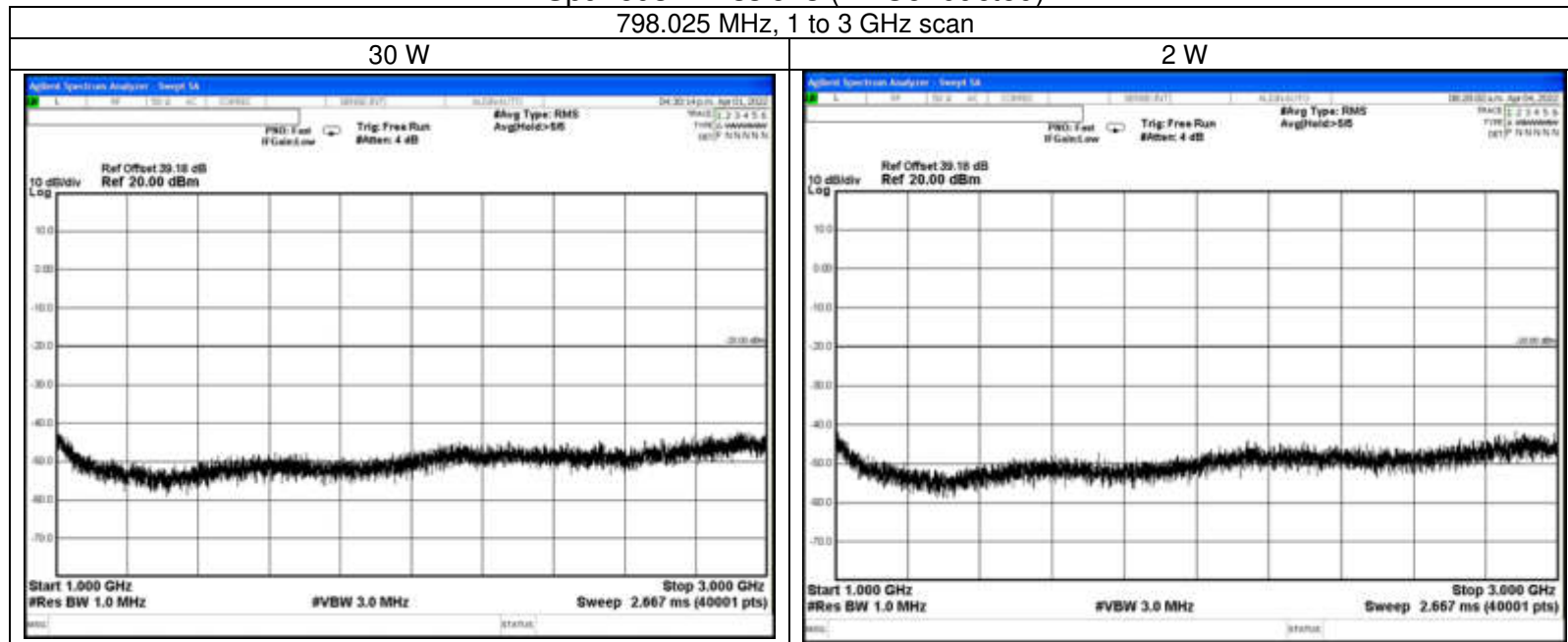
Spurious Emissions (Tx Conducted)

798.025 MHz, 9 kHz to 1 GHz scan



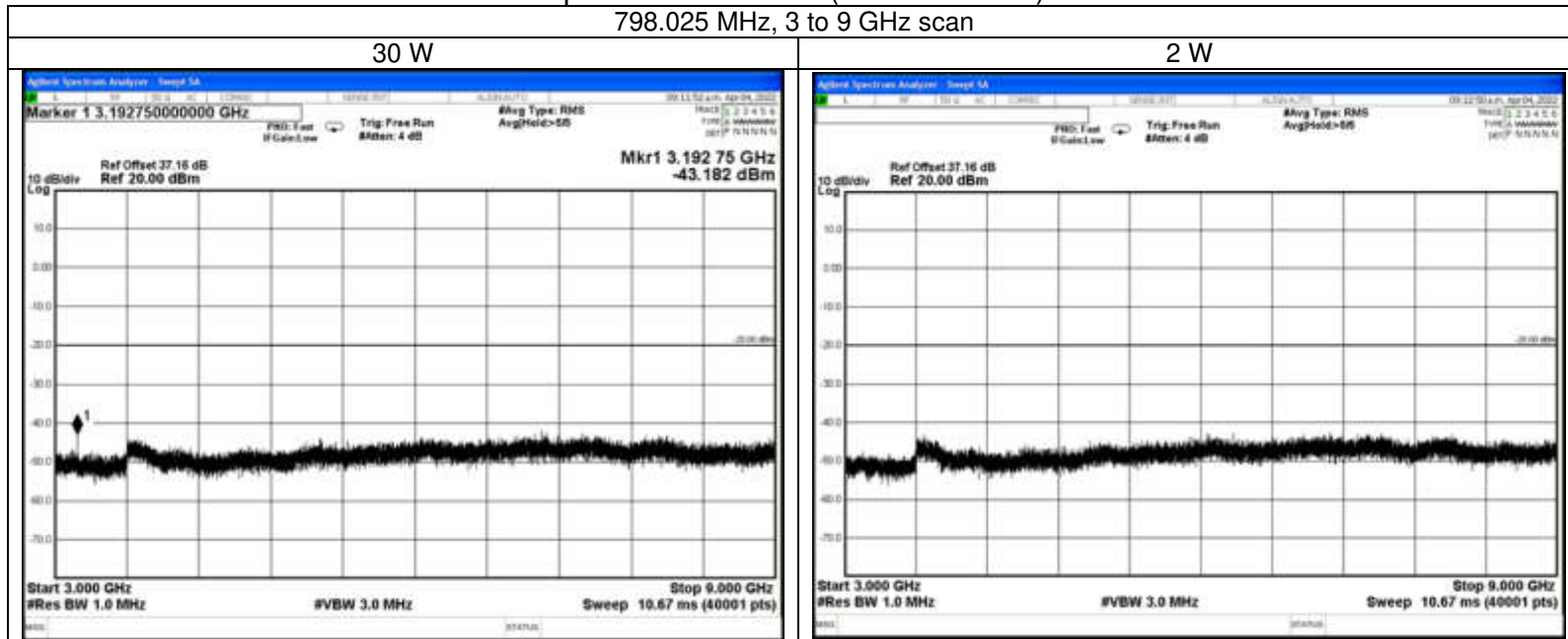
Spurious Emissions (Tx Conducted)

798.025 MHz, 1 to 3 GHz scan



Spurious Emissions (Tx Conducted)

798.025 MHz, 3 to 9 GHz scan



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

799.075 MHz @ 30 W

Emission Mask D

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

12.5 kHz Channel Spacing

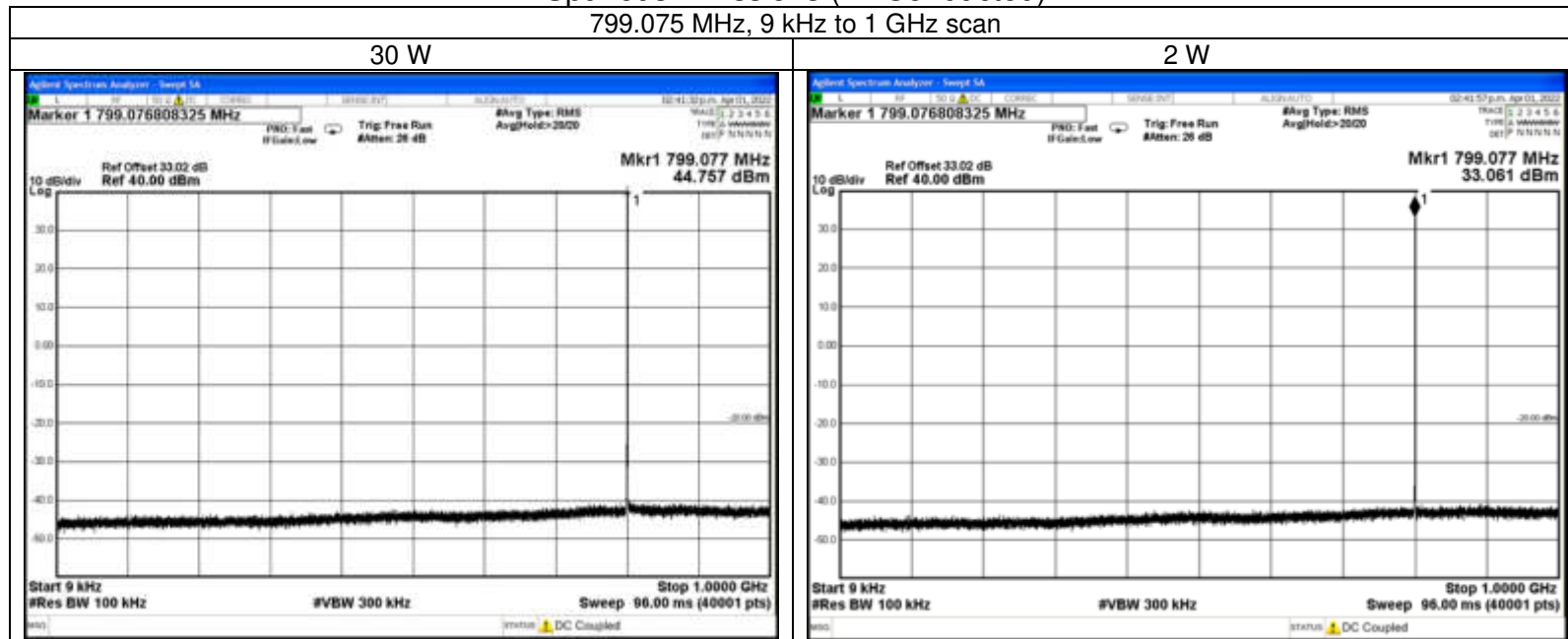
799.075 MHz @ 2 W

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.		

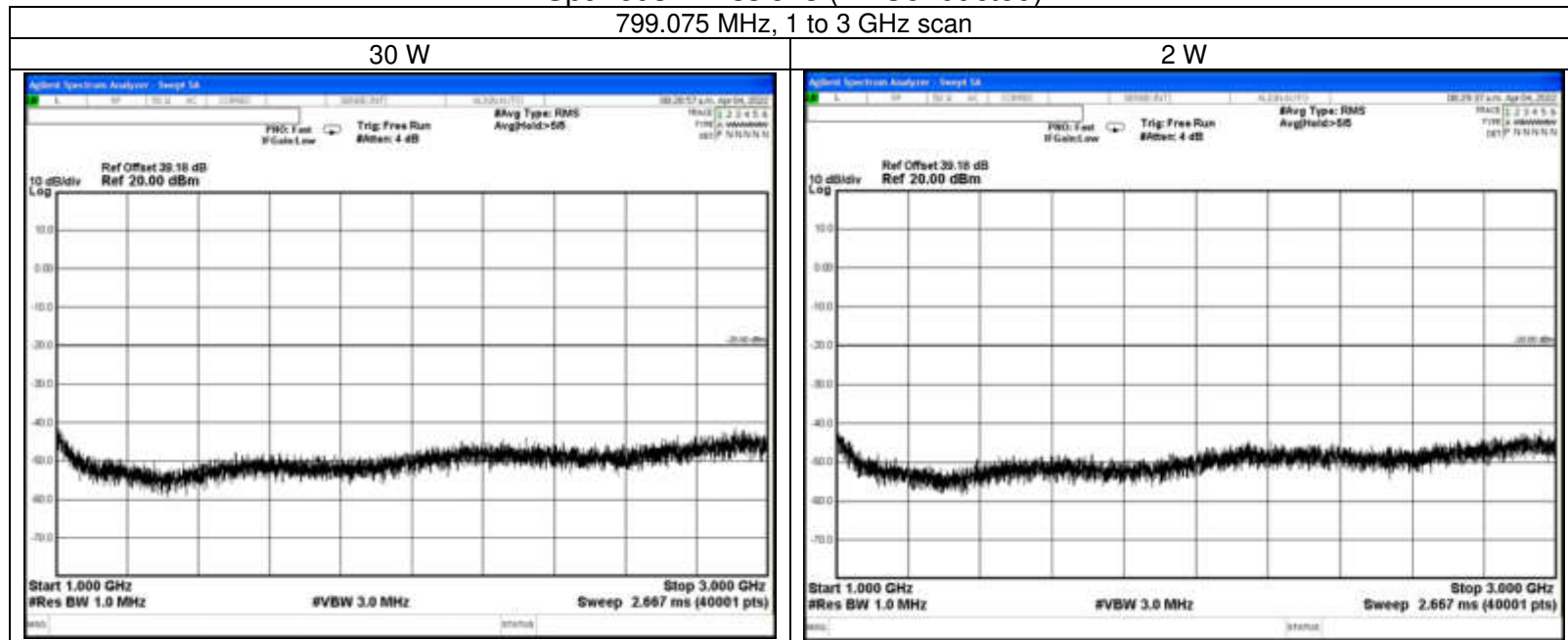
Spurious Emissions (Tx Conducted)

799.075 MHz, 9 kHz to 1 GHz scan

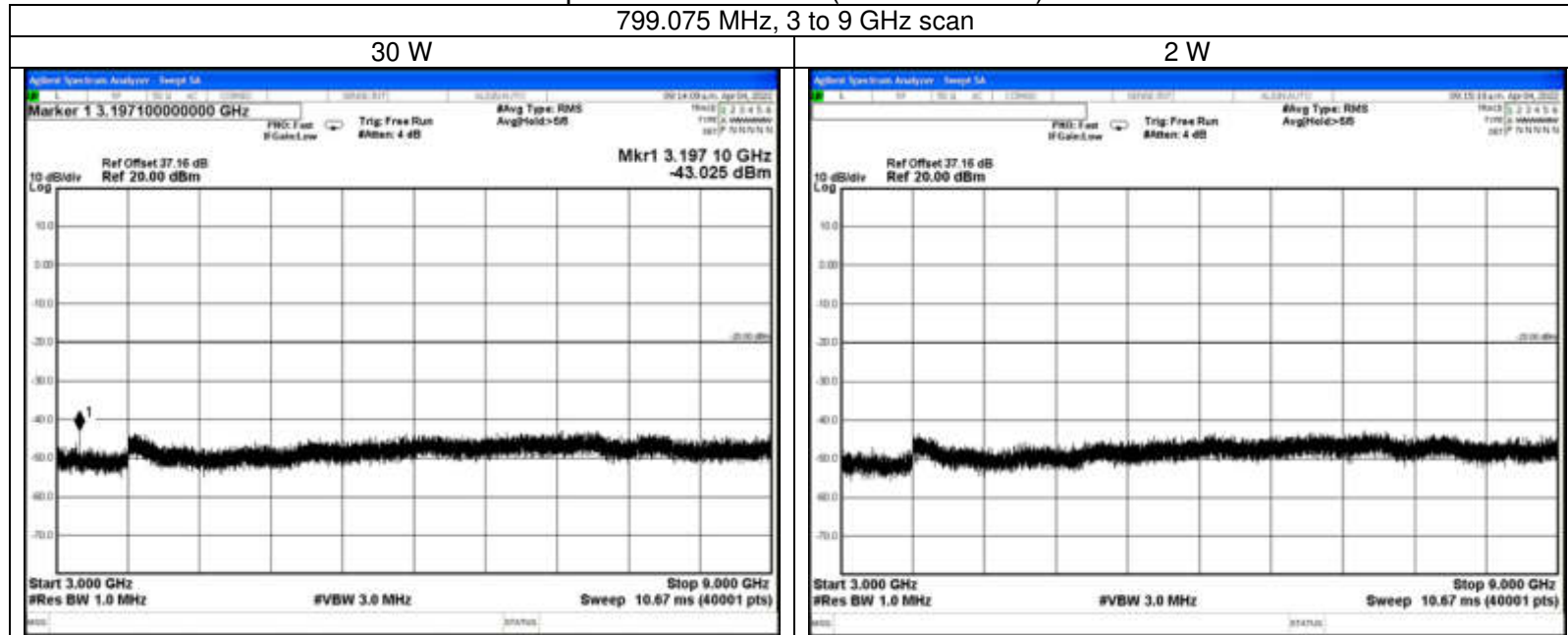


Spurious Emissions (Tx Conducted)

799.075 MHz, 1 to 3 GHz scan



Spurious Emissions (Tx Conducted)
799.075 MHz, 3 to 9 GHz scan



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

804.9 MHz @ 30 W

Emission Mask D

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

12.5 kHz Channel Spacing

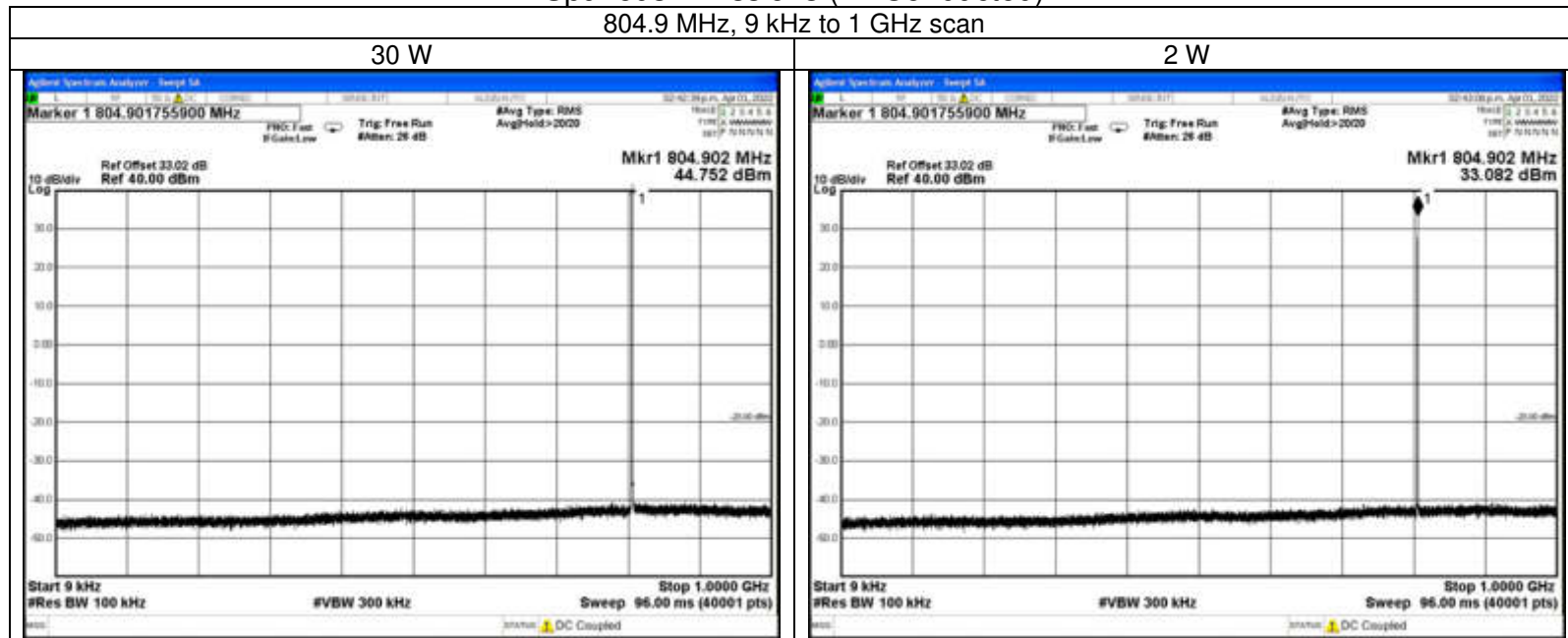
804.9 MHz @ 2 W

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.		

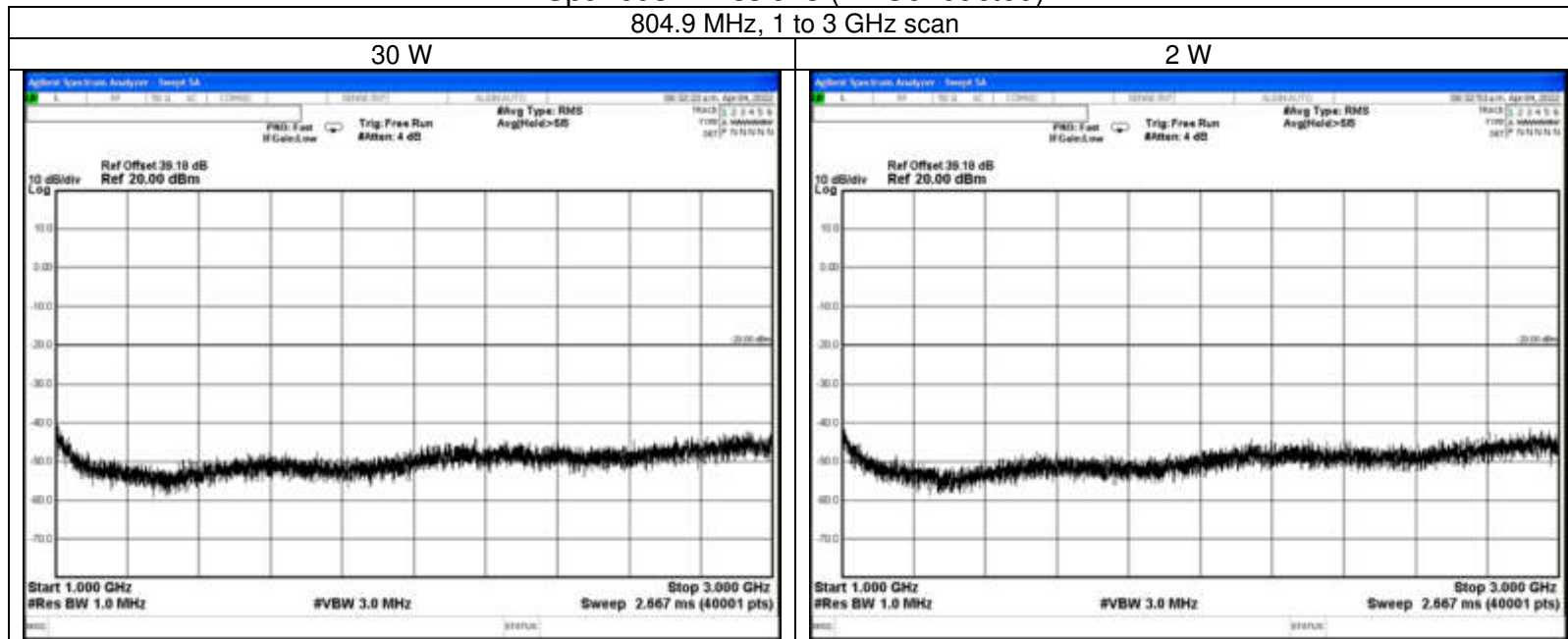
Spurious Emissions (Tx Conducted)

804.9 MHz, 9 kHz to 1 GHz scan



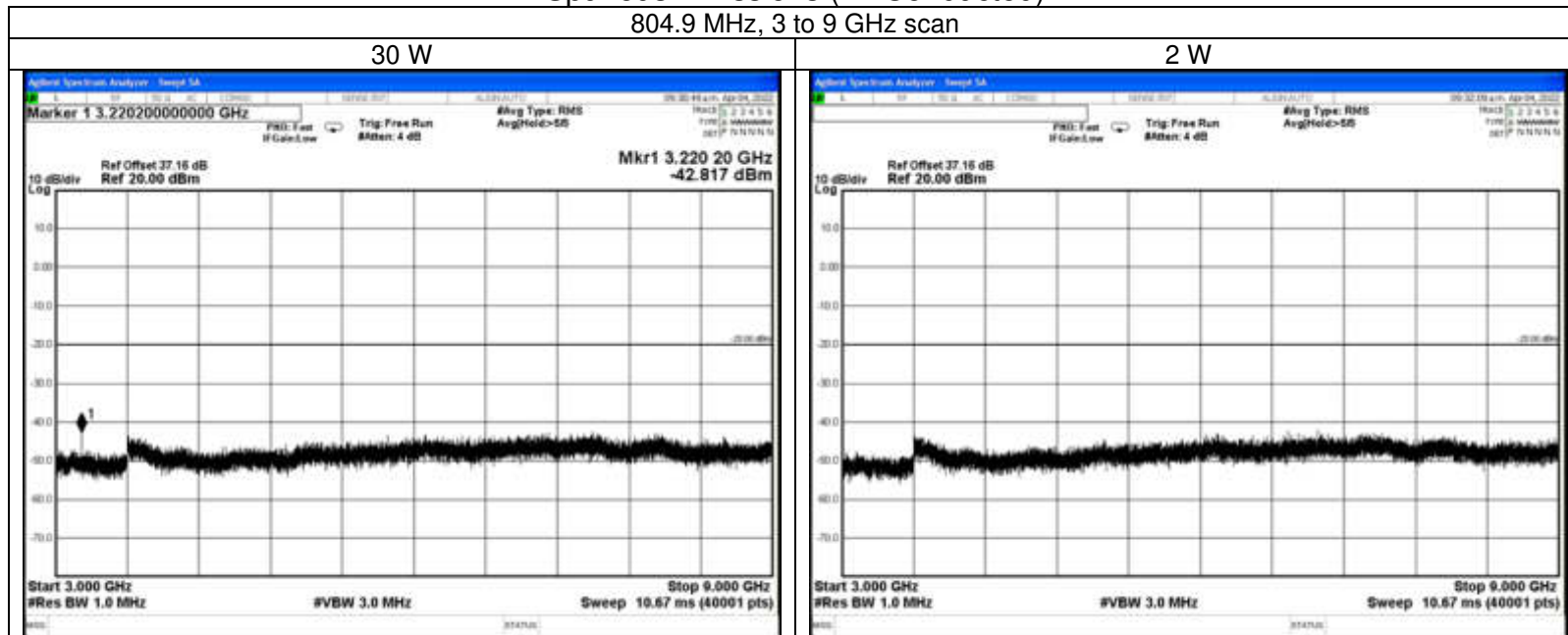
Spurious Emissions (Tx Conducted)

804.9 MHz, 1 to 3 GHz scan



Spurious Emissions (Tx Conducted)

804.9 MHz, 3 to 9 GHz scan



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

805.975 MHz @ 30 W

Emission Mask D

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

12.5 kHz Channel Spacing

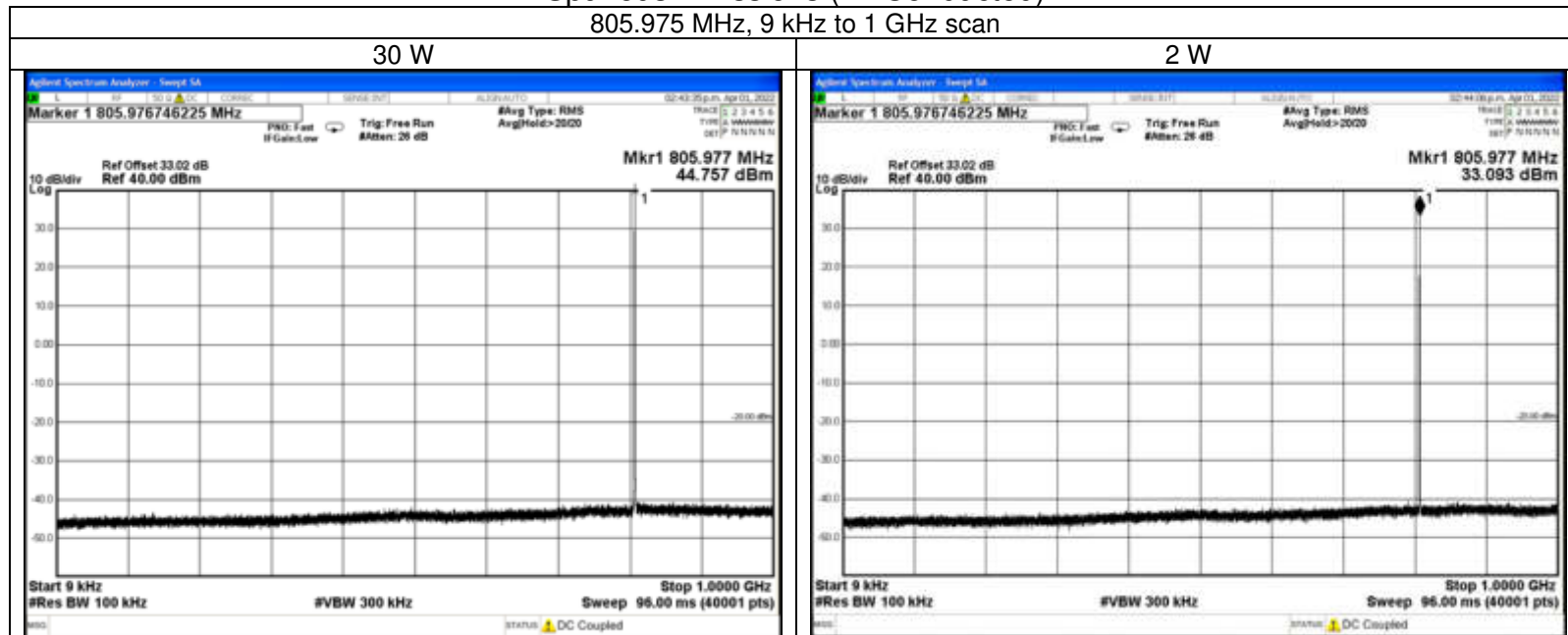
805.975 MHz @ 2 W

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.		

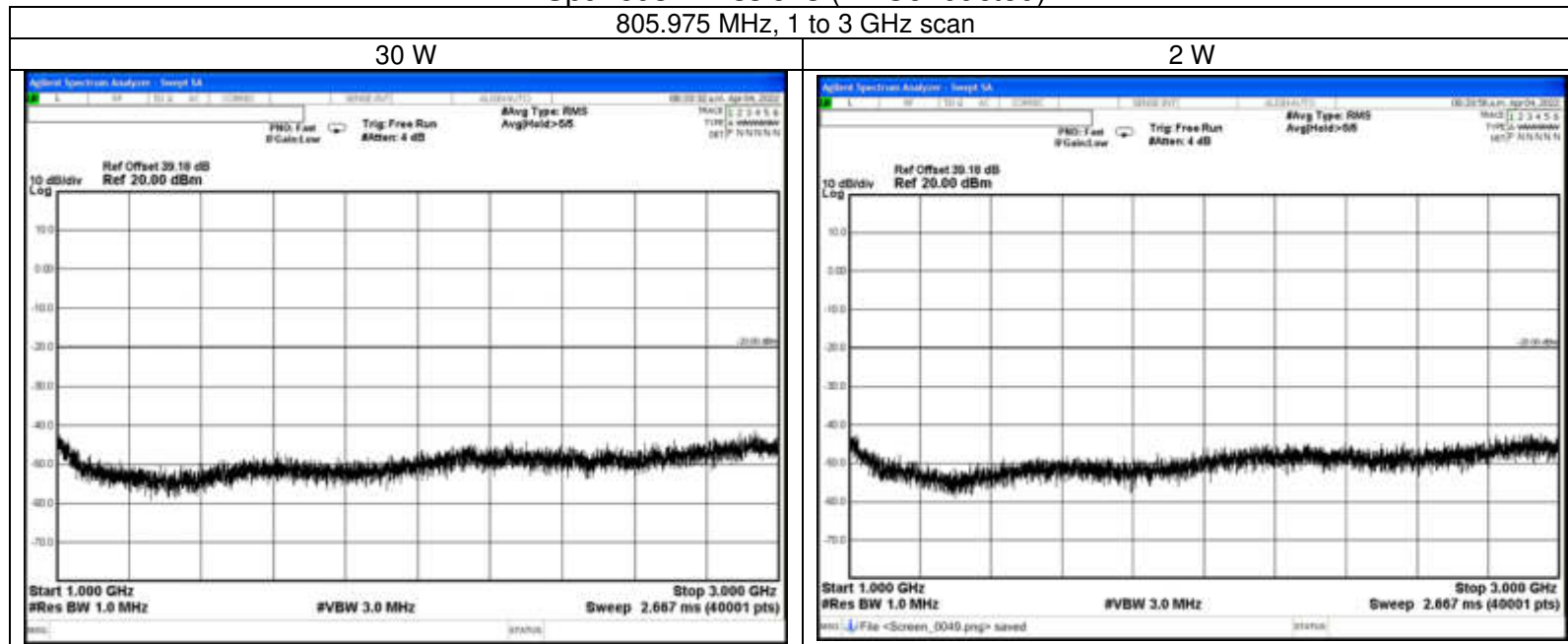
Spurious Emissions (Tx Conducted)

805.975 MHz, 9 kHz to 1 GHz scan



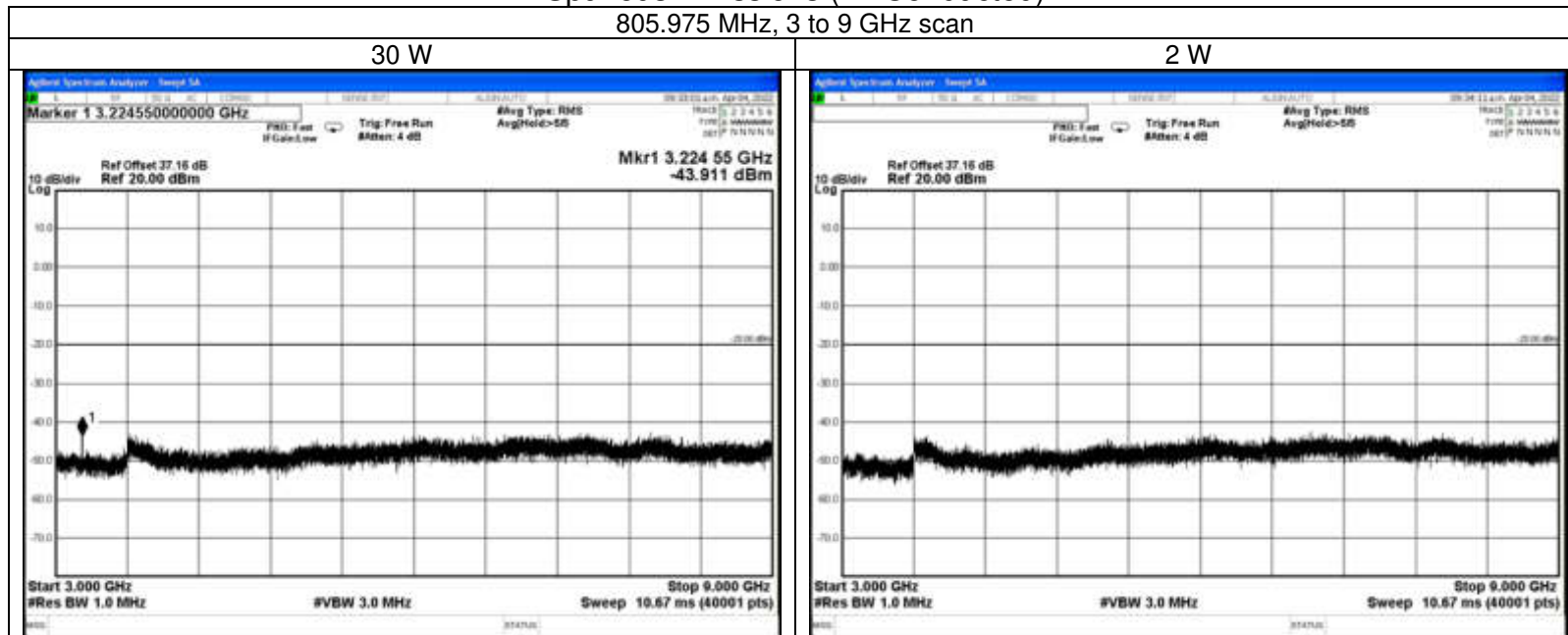
Spurious Emissions (Tx Conducted)

805.975 MHz, 1 to 3 GHz scan



Spurious Emissions (Tx Conducted)

805.975 MHz, 3 to 9 GHz scan



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

806.025 MHz @ 35 W

Emission Mask D

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

12.5 kHz Channel Spacing

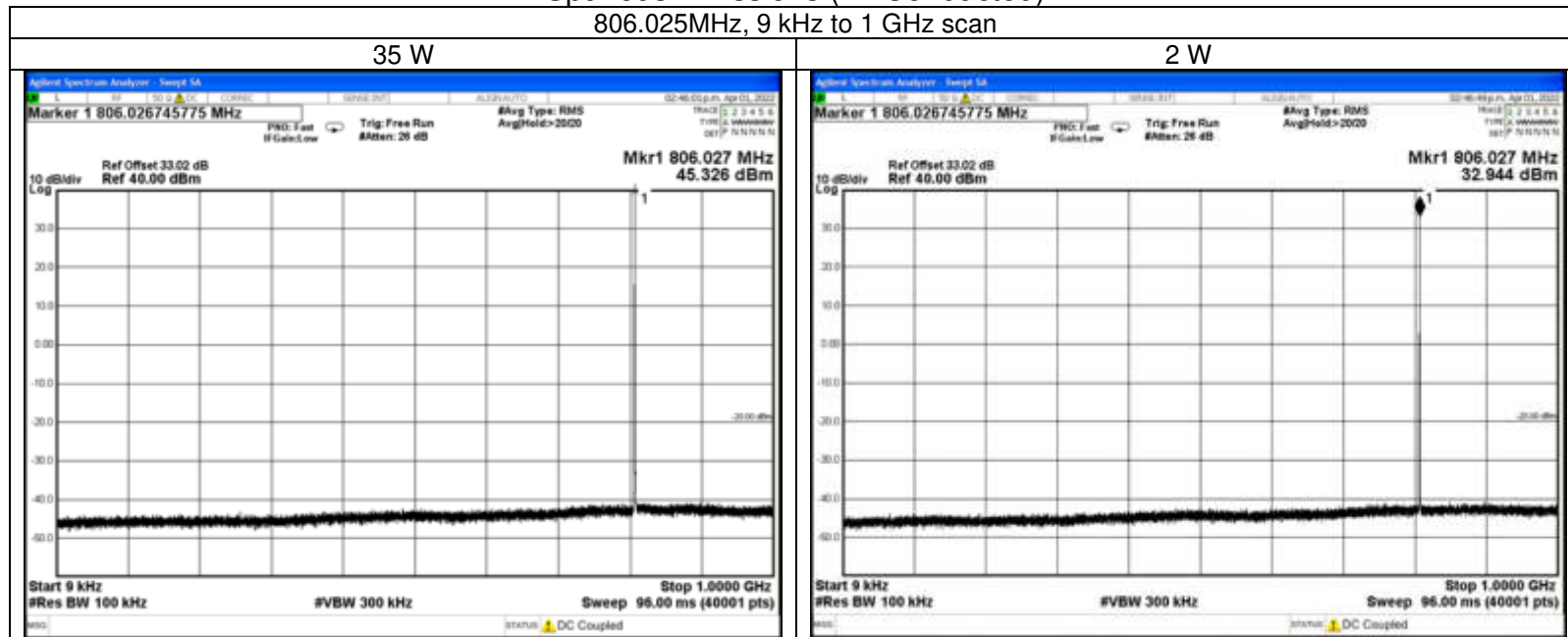
806.025MHz @ 2 W

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.		

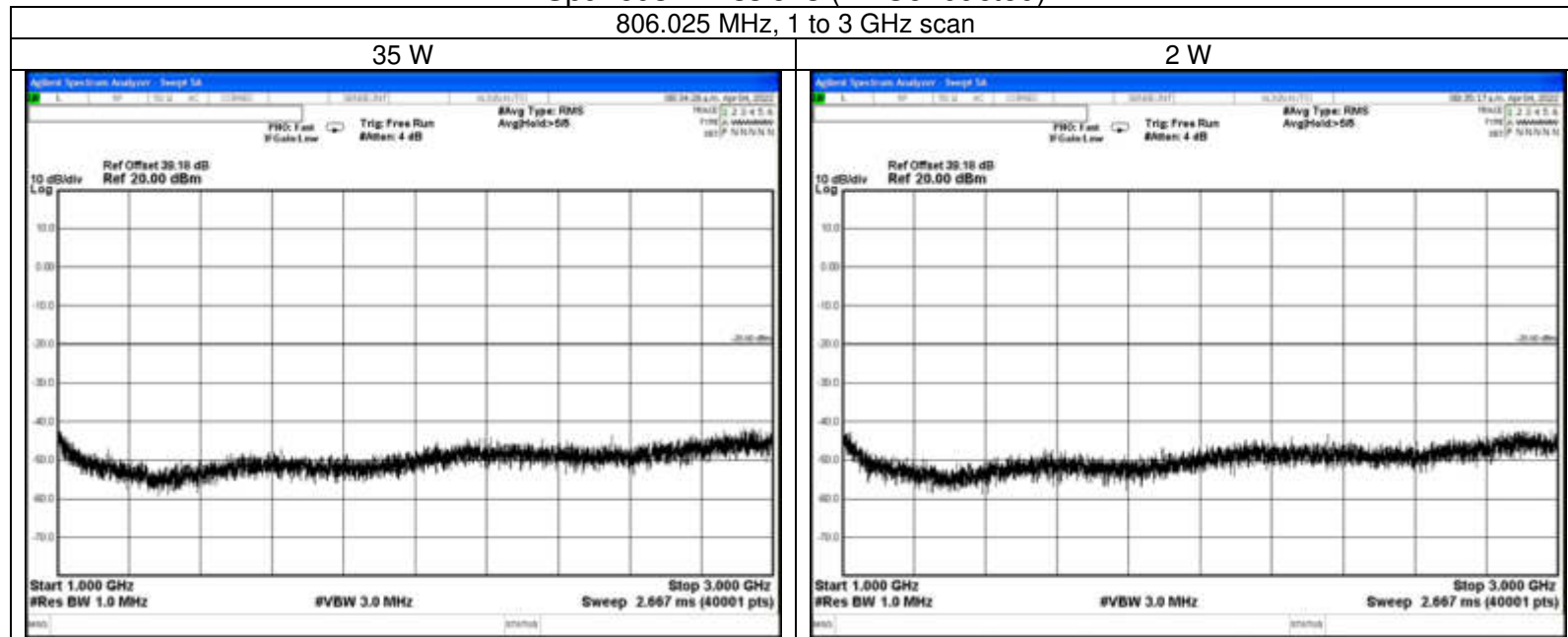
Spurious Emissions (Tx Conducted)

806.025MHz, 9 kHz to 1 GHz scan



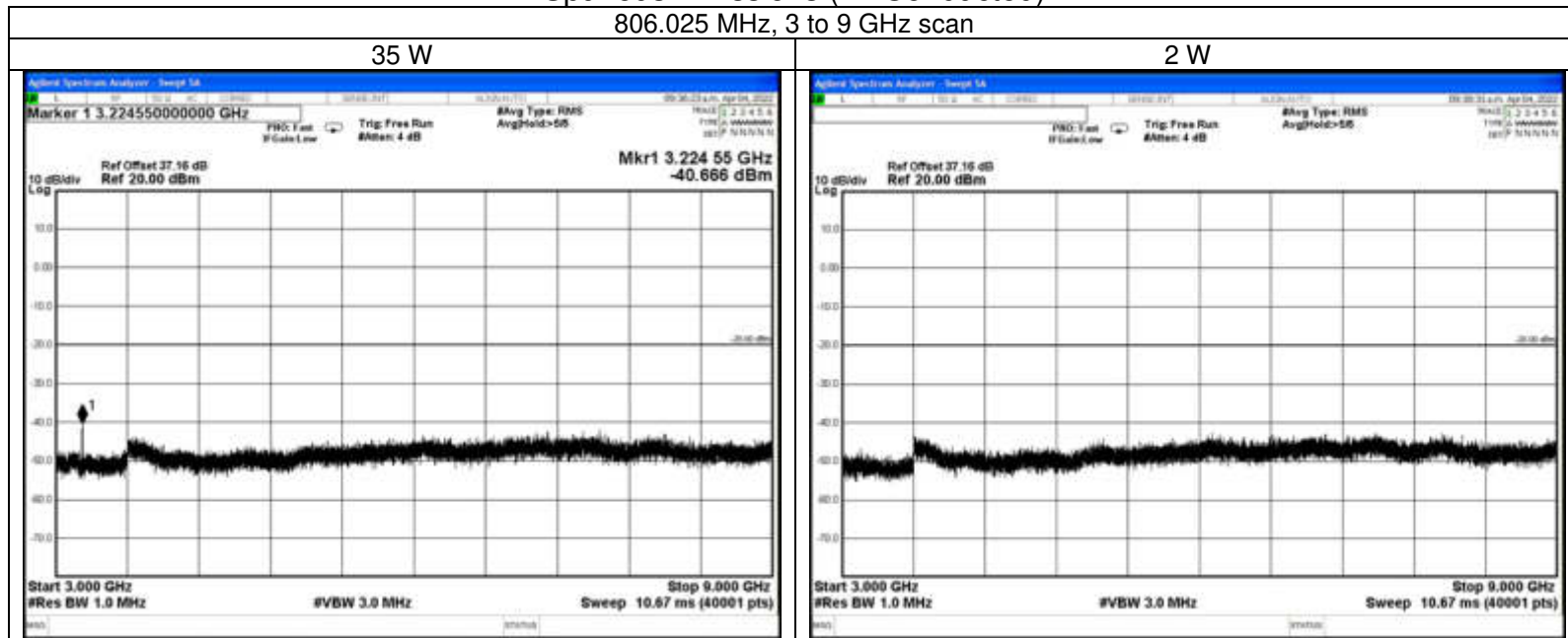
Spurious Emissions (Tx Conducted)

806.025 MHz, 1 to 3 GHz scan



Spurious Emissions (Tx Conducted)

806.025 MHz, 3 to 9 GHz scan



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

815.025 MHz @ 35 W

Emission Mask D

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

12.5 kHz Channel Spacing

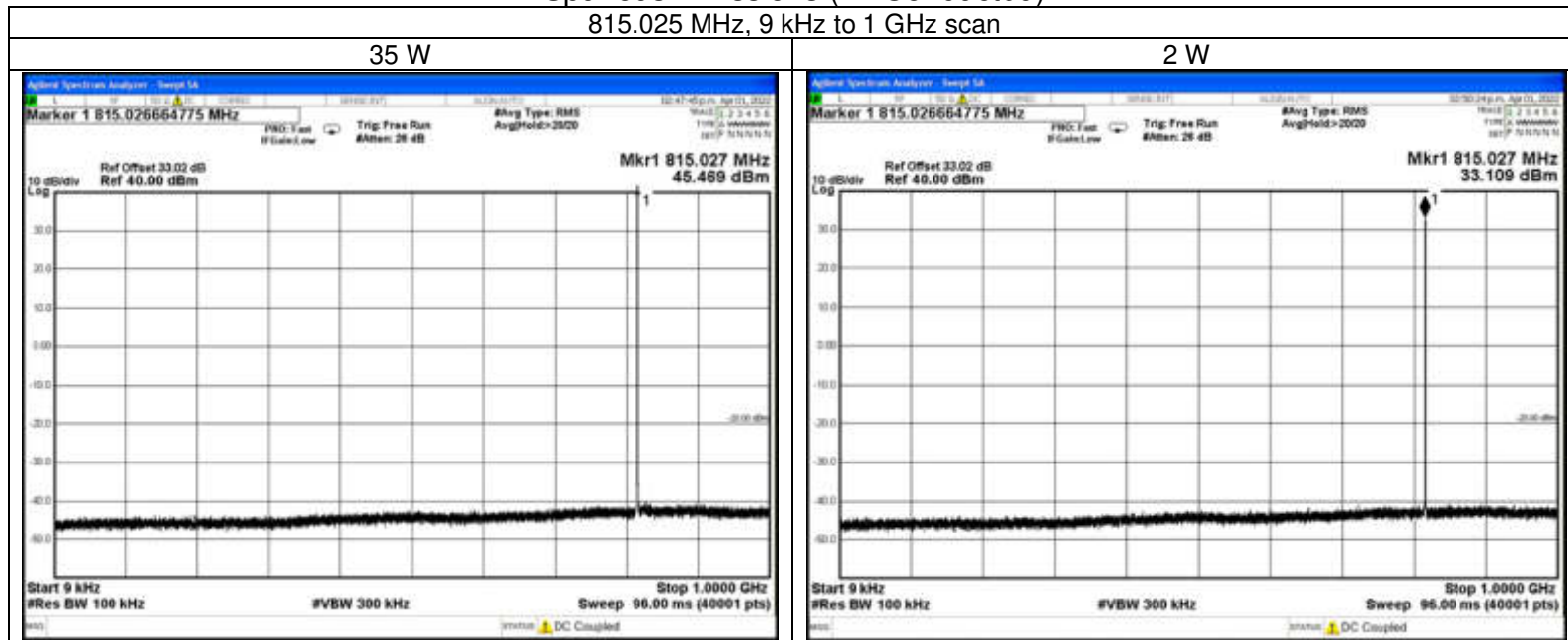
815.025 MHz @ 2 W

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.		

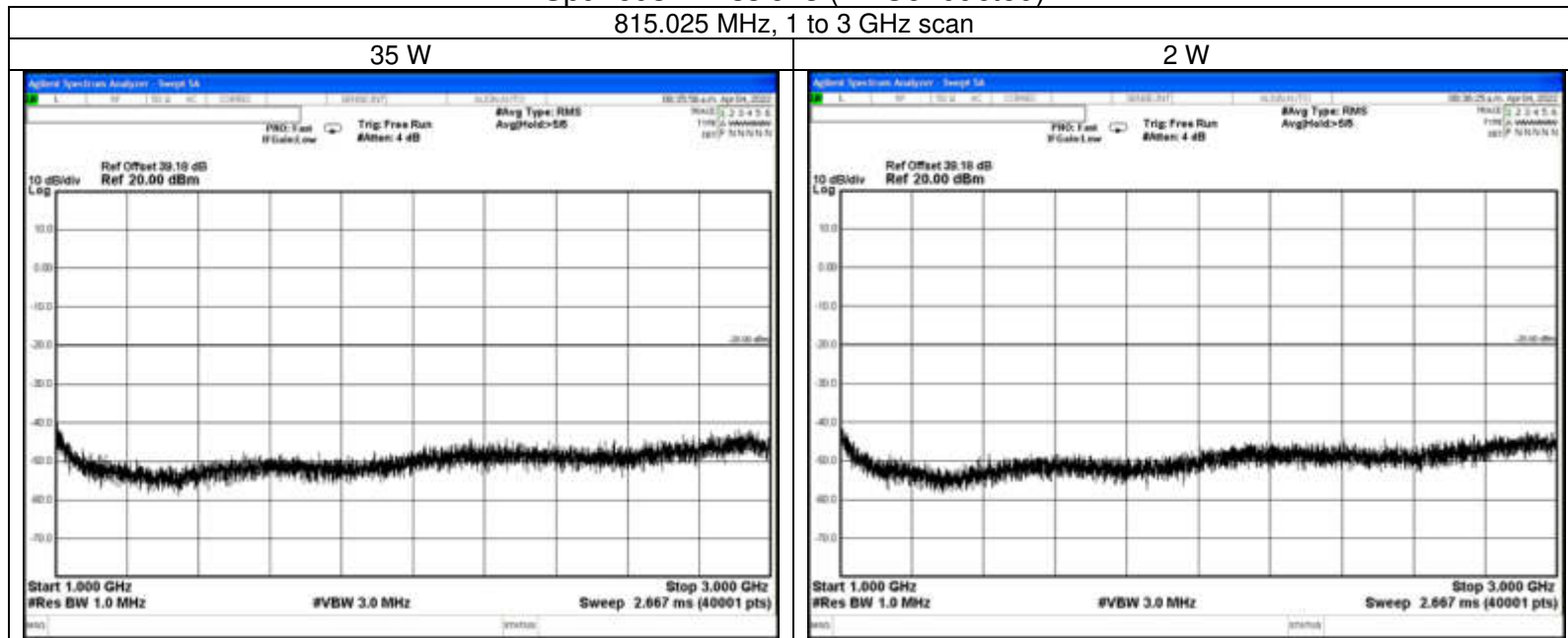
Spurious Emissions (Tx Conducted)

815.025 MHz, 9 kHz to 1 GHz scan



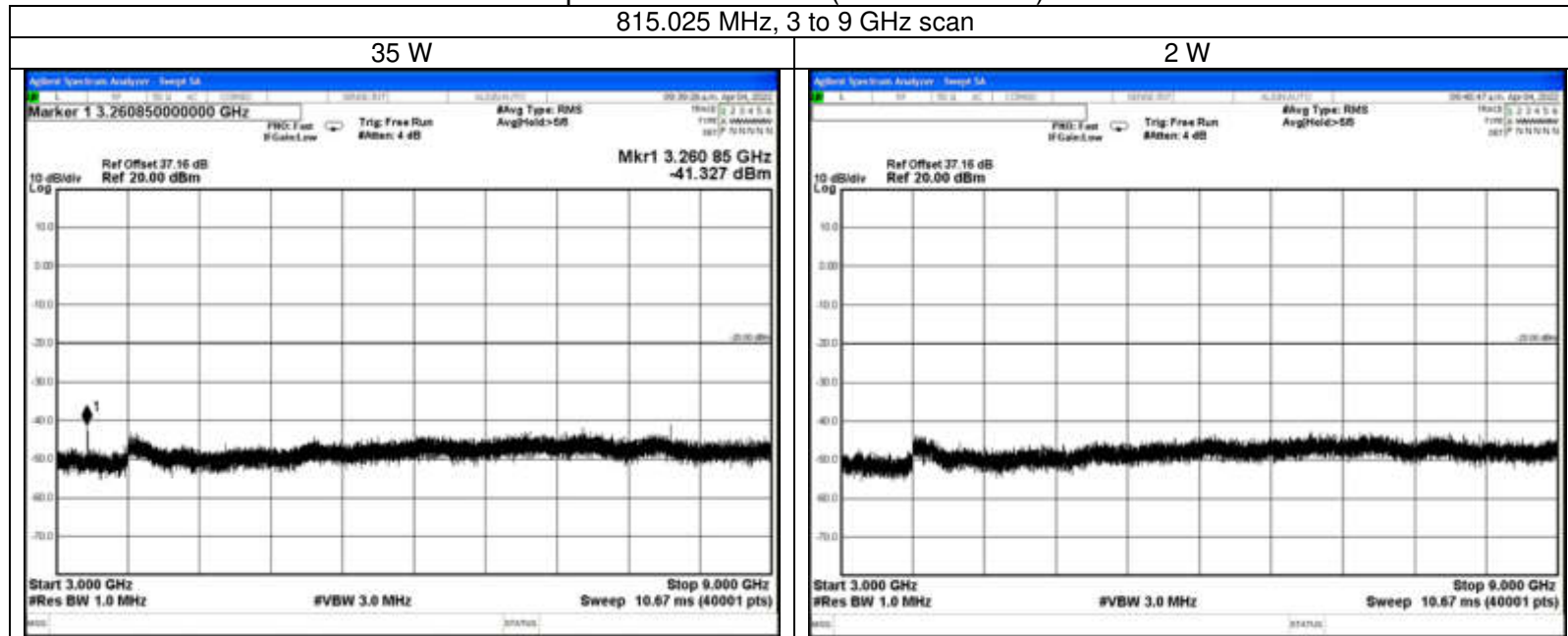
Spurious Emissions (Tx Conducted)

815.025 MHz, 1 to 3 GHz scan



Spurious Emissions (Tx Conducted)

815.025 MHz, 3 to 9 GHz scan



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 CFR 2.1051

RSS-119 5.8

12.5 kHz Channel Spacing

823.975 MHz @ 35 W

Emission Mask D

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

12.5 kHz Channel Spacing

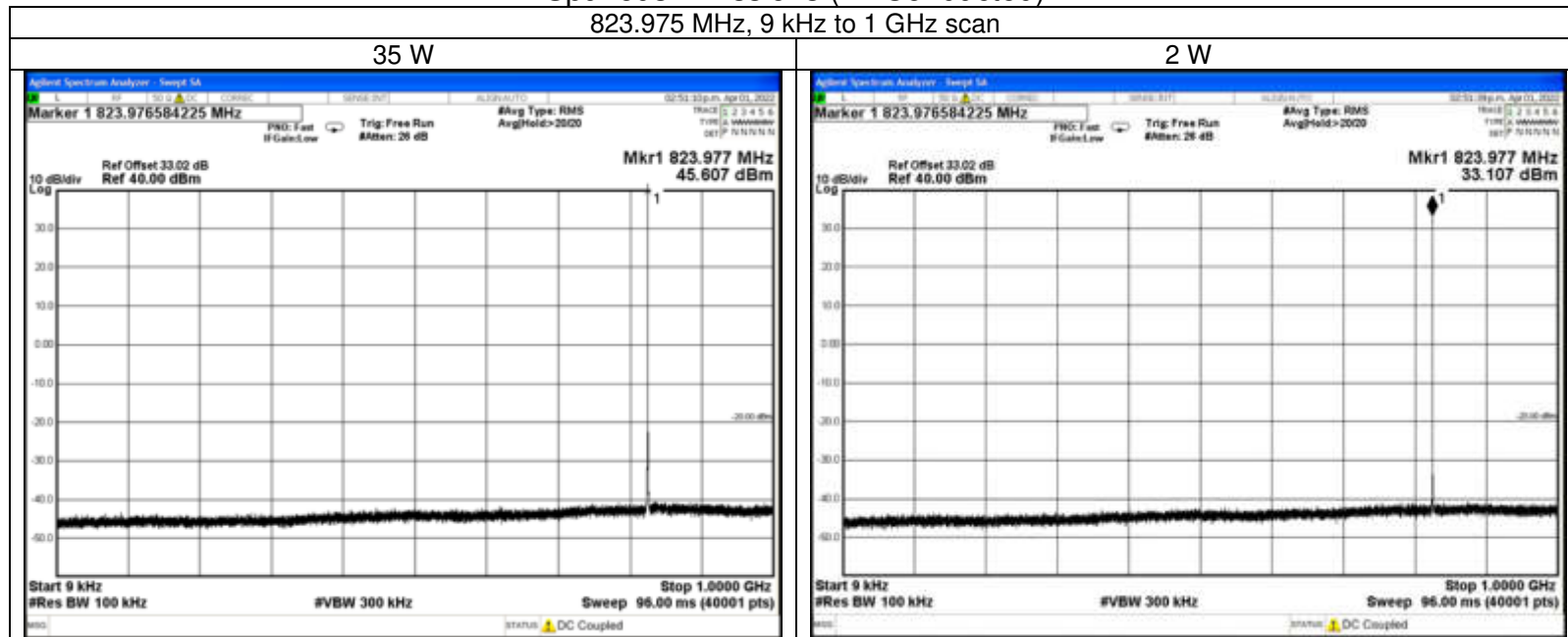
823.975 MHz @ 2 W

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.		

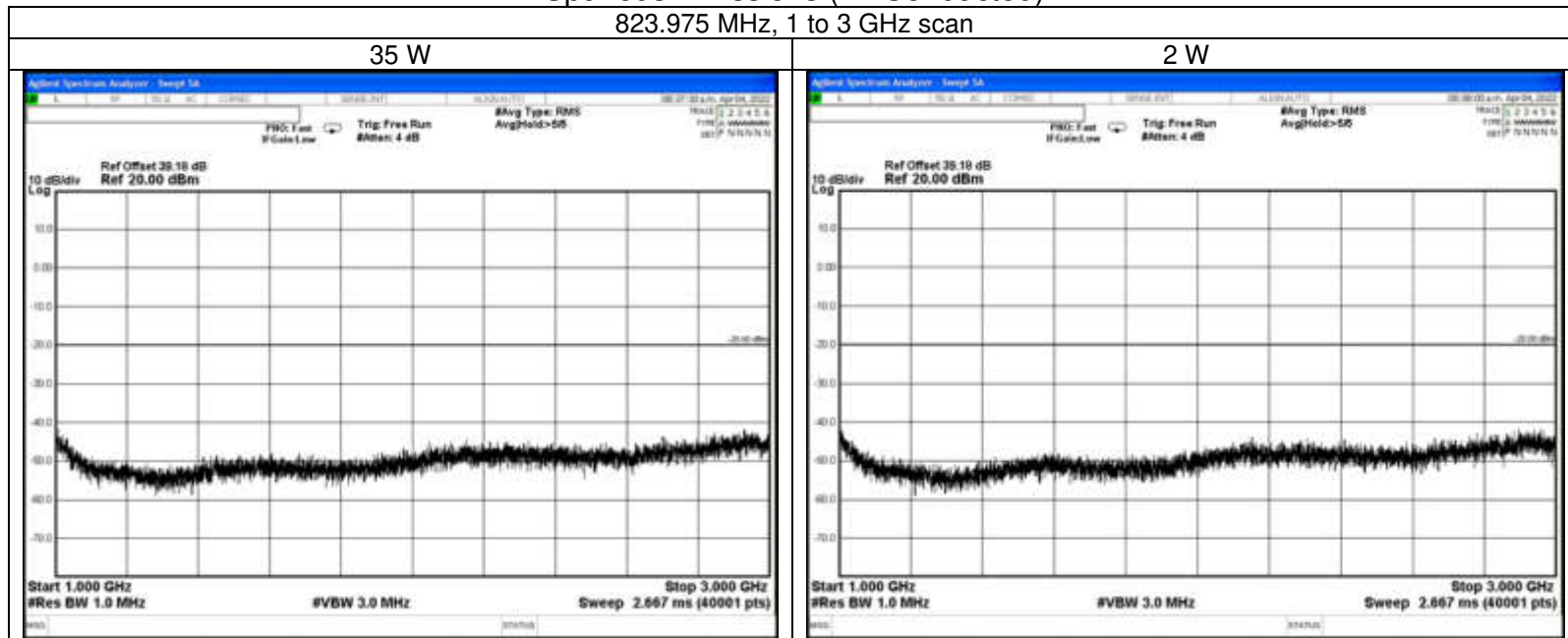
Spurious Emissions (Tx Conducted)

823.975 MHz, 9 kHz to 1 GHz scan



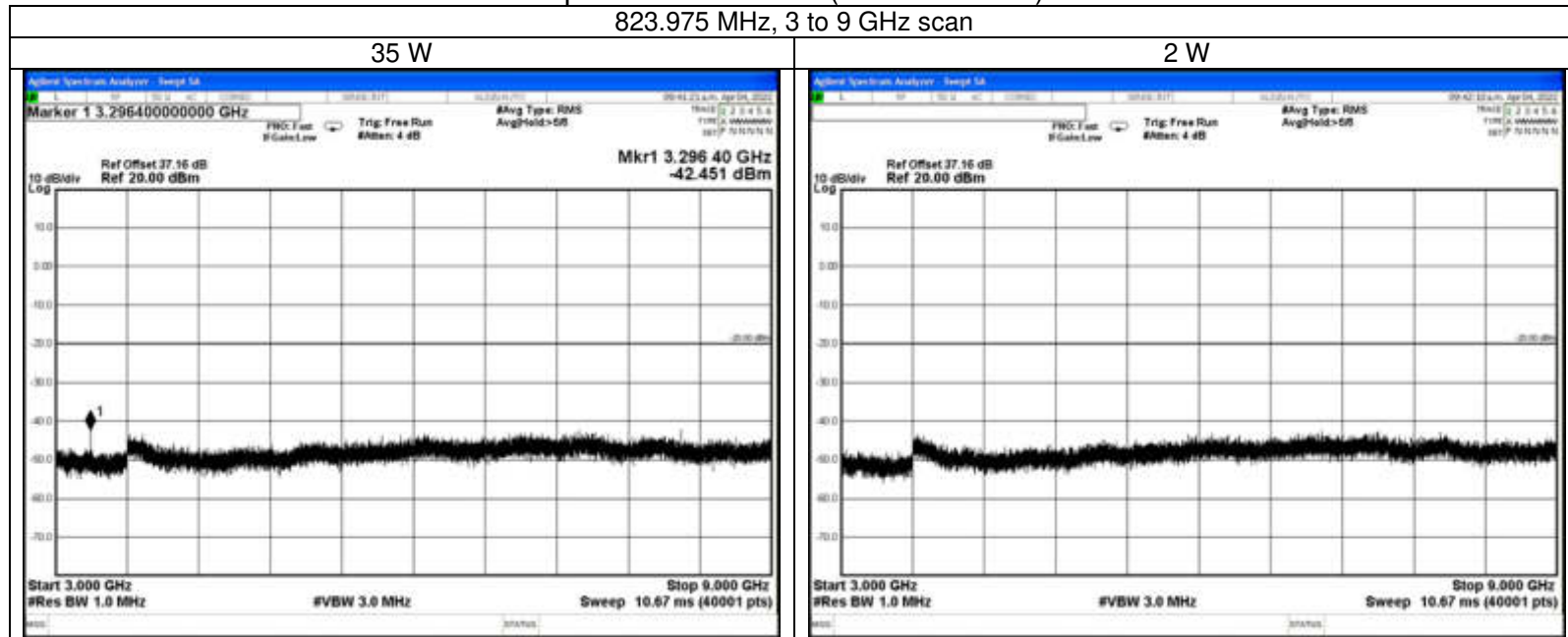
Spurious Emissions (Tx Conducted)

823.975 MHz, 1 to 3 GHz scan



Spurious Emissions (Tx Conducted)

823.975 MHz, 3 to 9 GHz scan



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 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

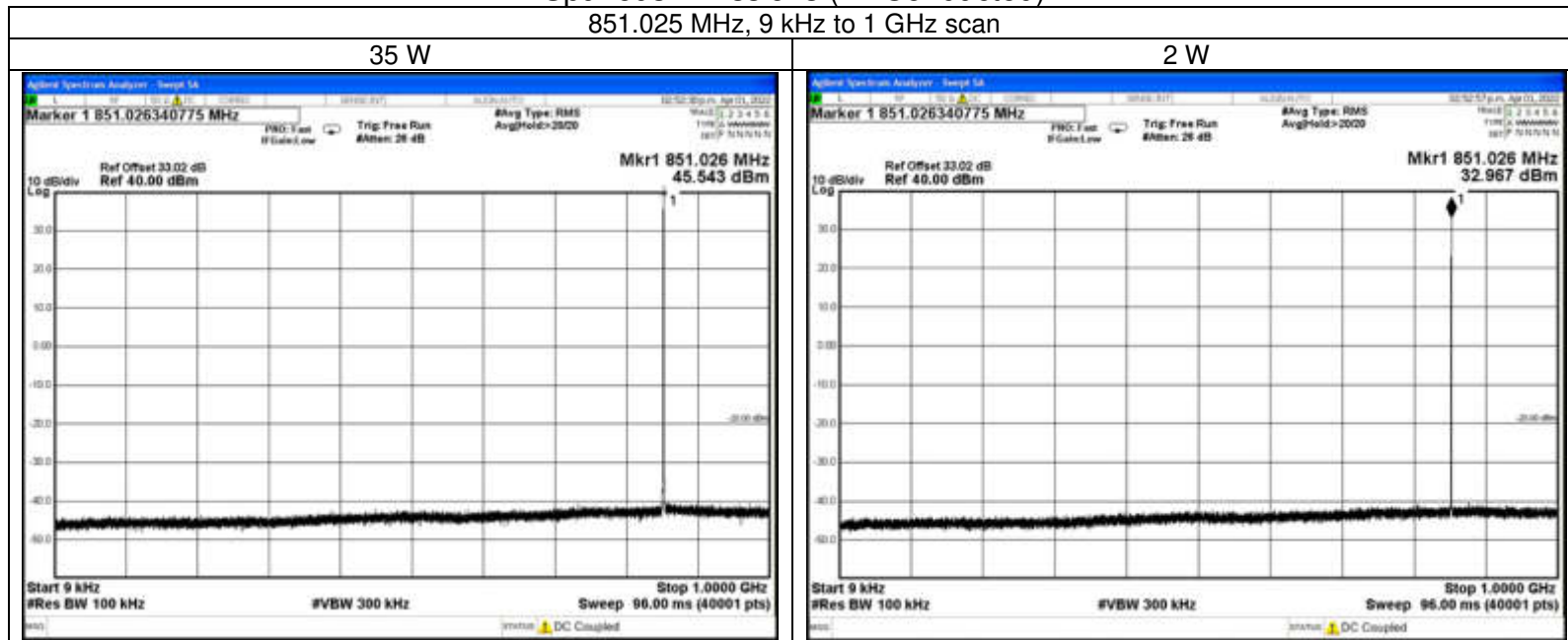
851.025 MHz @ 2 W

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.		

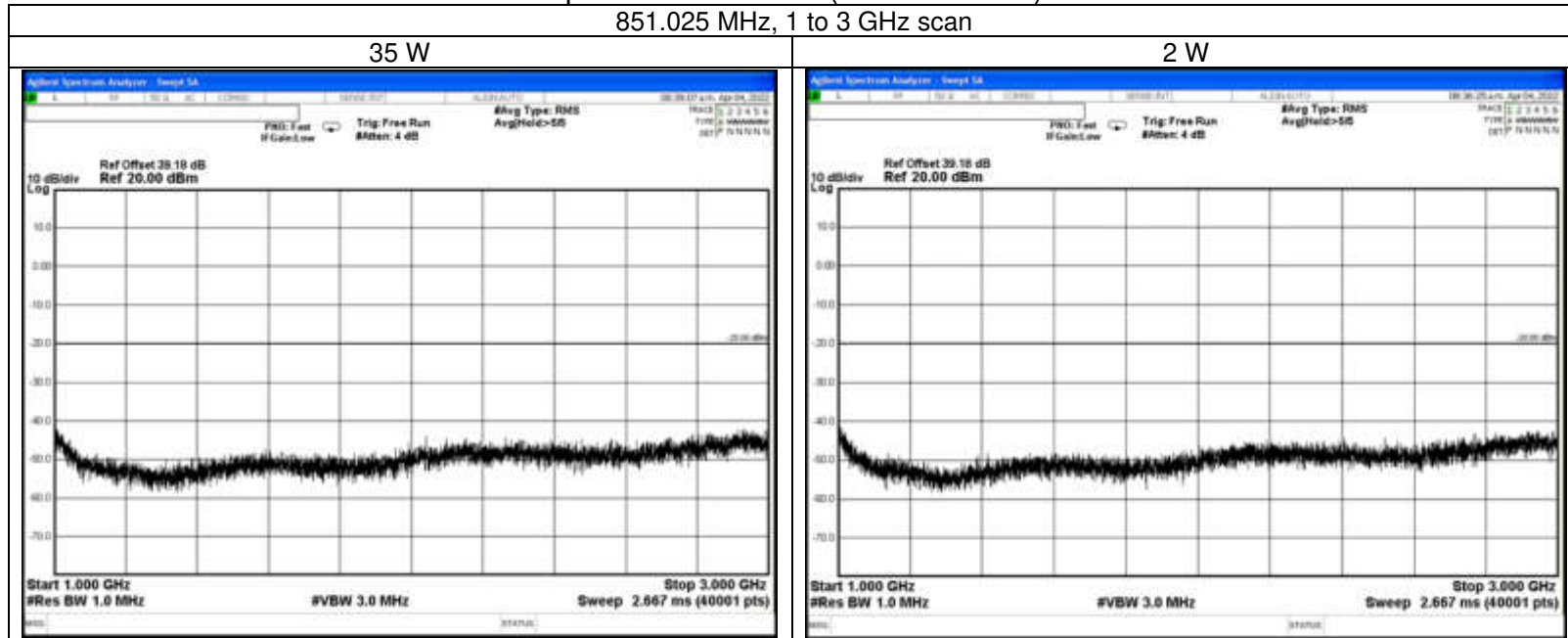
Spurious Emissions (Tx Conducted)

851.025 MHz, 9 kHz to 1 GHz scan



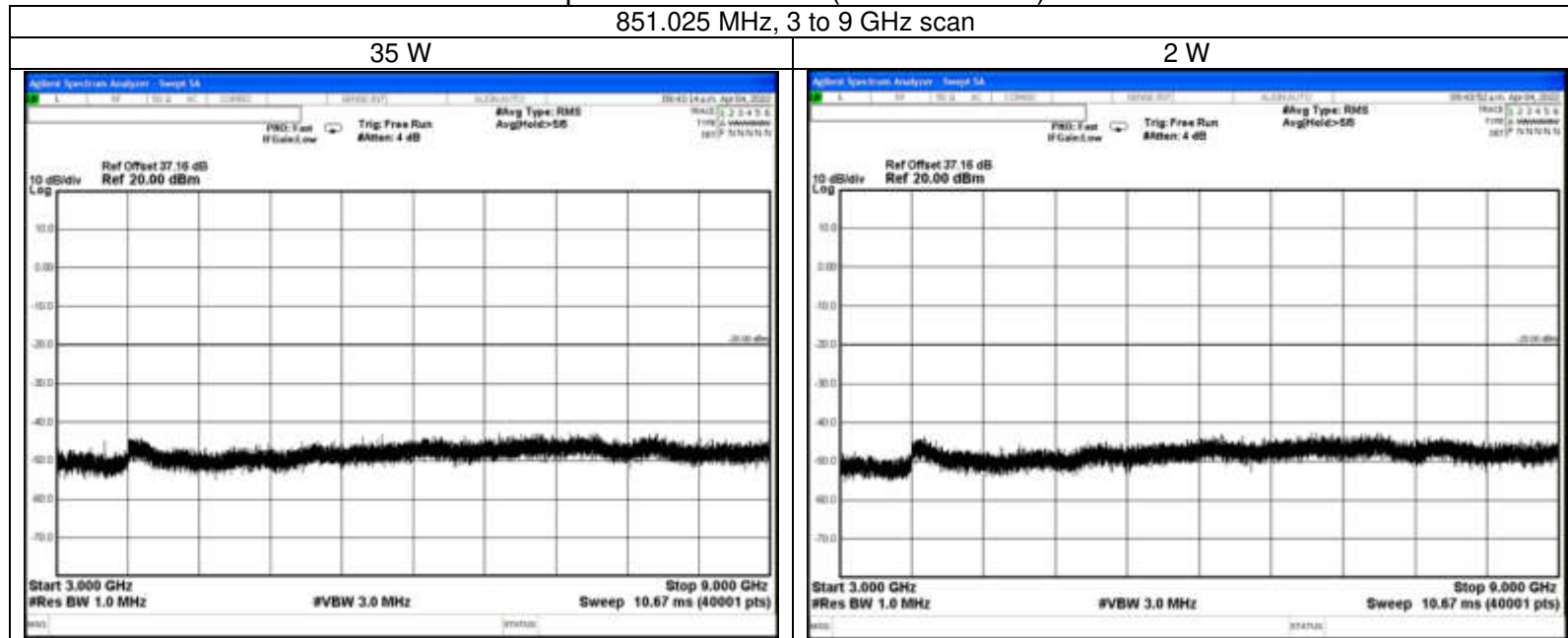
Spurious Emissions (Tx Conducted)

851.025 MHz, 1 to 3 GHz scan



Spurious Emissions (Tx Conducted)

851.025 MHz, 3 to 9 GHz scan



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC 47 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

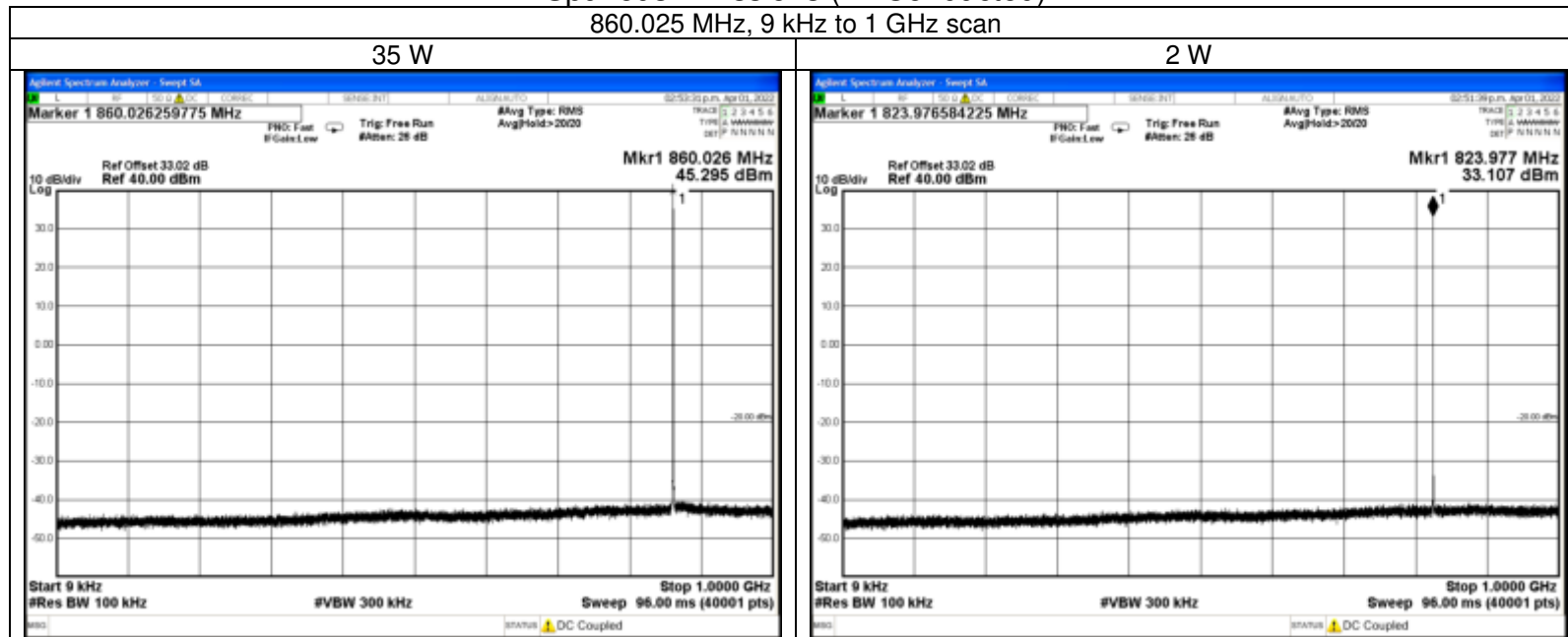
860.025 MHz @ 2 W

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.		

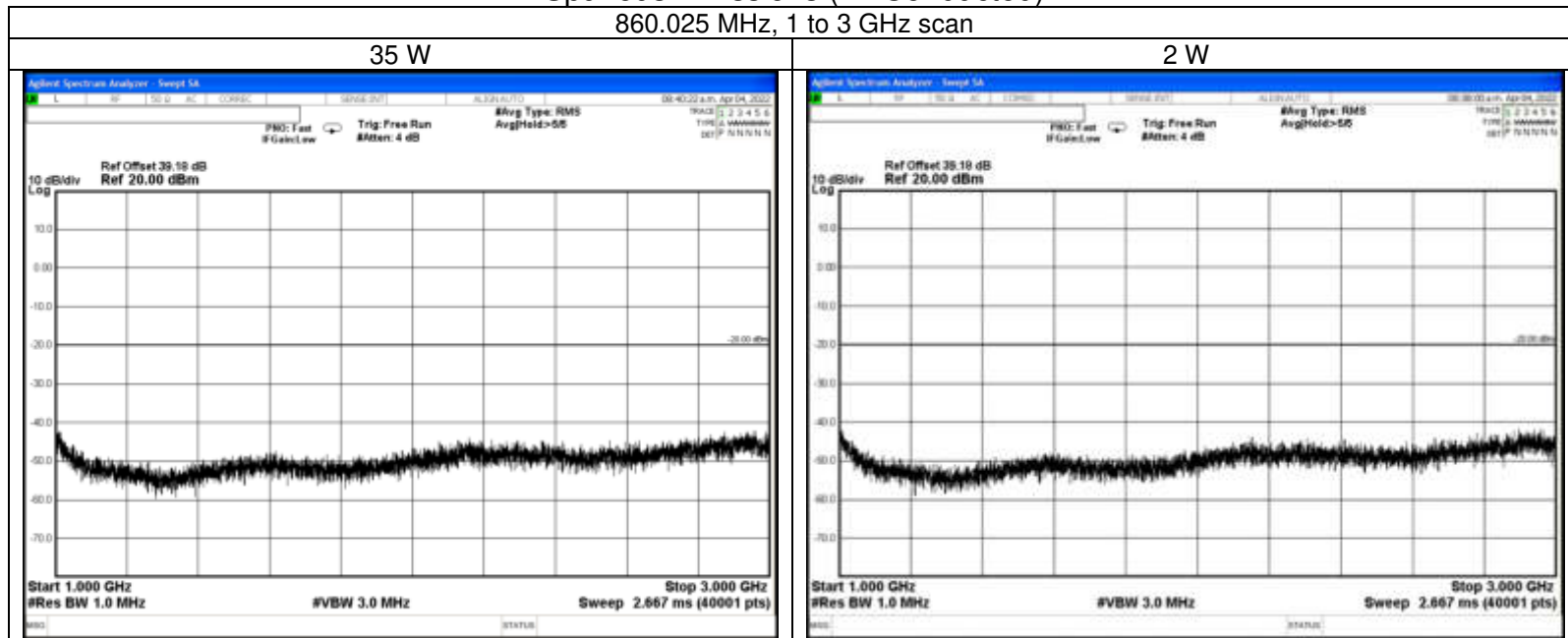
Spurious Emissions (Tx Conducted)

860.025 MHz, 9 kHz to 1 GHz scan



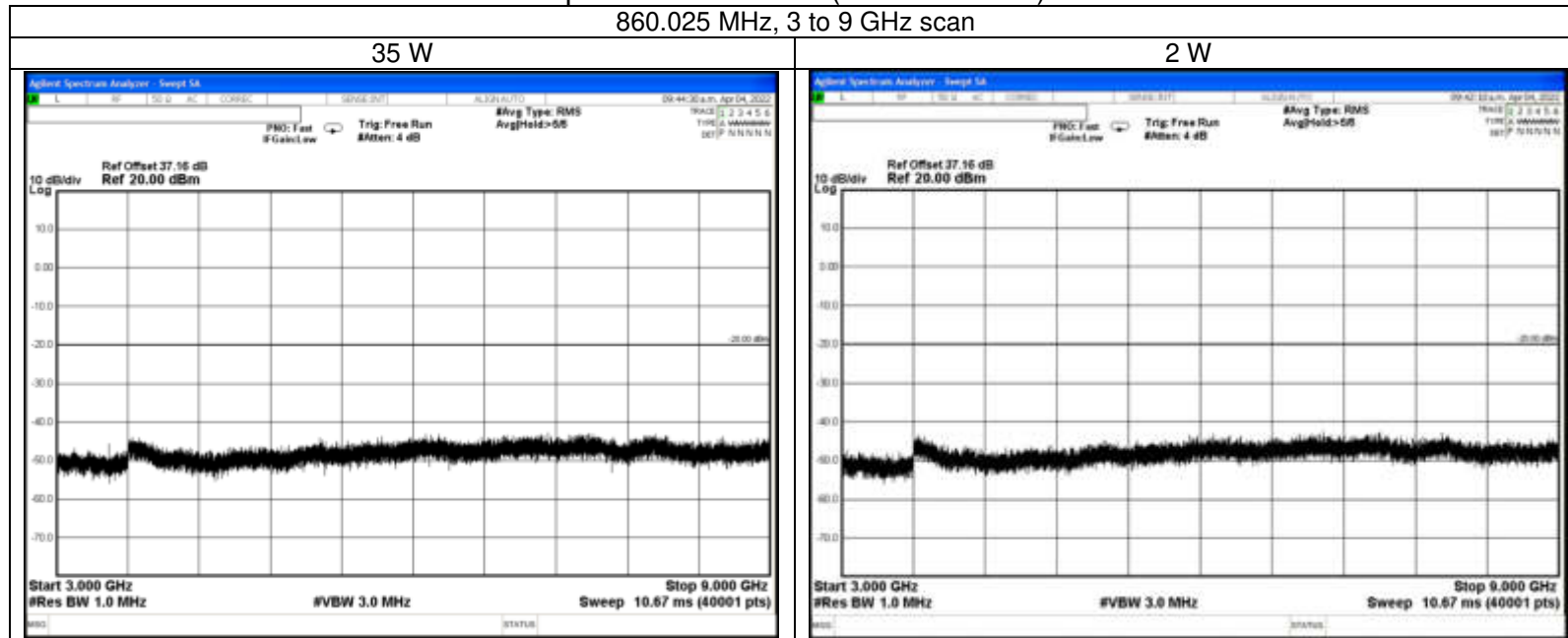
Spurious Emissions (Tx Conducted)

860.025 MHz, 1 to 3 GHz scan



Spurious Emissions (Tx Conducted)

860.025 MHz, 3 to 9 GHz scan



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	-64.8 dBc
30 W	-20 dBm	-64.8 dBc
35 W	-20 dBm	-65.4 dBc
2 W	-20 dBm	-53.0 dBc

TRANSMITTER SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC 47 CFR 2.1053

GUIDE: TIA/EIA-603E 2.2.12

MEASUREMENT PROCEDURE:

Initial Scan:

1. The EUT is placed in the S-Line TEM cell and emissions are measured from 30 MHz to 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) - Continued

SPECIFICATION: FCC 47 CFR 2.1053

12.5 kHz Channel Spacing 762.025 MHz @ 30 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
5334.1765	-39.16	-83.93
~	~	~

12.5 kHz Channel Spacing 762.025 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 768.025 MHz @ 30 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
5376.1767	-36.03	-80.80
~	~	~

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 other emissions were detected at a level greater than 20 dB below the limit.		

12.5 kHz Channel Spacing 769.075 MHz @ 30 W Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
4614.4515	-30.87	-75.64
5383.5264	-37.71	-82.48

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 other emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Radiated) - Continued

12.5 kHz Channel Spacing

774.9 MHz @ 30 W

Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
5424.3015	-32.8	-77.57
~	~	~

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.		

12.5 kHz Channel Spacing

775.975 MHz @ 30 W

Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
5431.8268	-35.54	-80.31
~	~	~

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 other emissions were detected at a level greater than 20 dB below the limit.		

12.5 kHz Channel Spacing

787.5 MHz @ 30 W

Emission Mask D

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

12.5 kHz Channel Spacing

787.5 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) - Continued

12.5 kHz Channel Spacing

798.025 MHz @ 30 W

Emission Mask D

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

12.5 kHz Channel Spacing

798.025 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

799.075 MHz @ 30 W

Emission Mask D

Emission Frequency (MHz)	Level (dBm)	Level (dBc)
1598.1520	-38.42	-83.39
~	~	~

12.5 kHz Channel Spacing

799.075 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

804.9 MHz @ 30 W

Emission Mask D

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

12.5 kHz Channel Spacing

804.9 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) - Continued

12.5 kHz Channel Spacing

805.975 MHz @ 30 W

Emission Mask D

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

12.5 kHz Channel Spacing

805.975 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

806.025 MHz @ 35 W

Emission Mask D

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

12.5 kHz Channel Spacing

806.025 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

815.025 MHz @ 35 W

Emission Mask D

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

12.5 kHz Channel Spacing

815.025 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) - Continued

12.5 kHz Channel Spacing

823.975 MHz @ 35 W

Emission Mask D

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

12.5 kHz Channel Spacing

823.975 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)
1702.0518	-39.91	-85.35
~	~	~

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)
5160.1516	-31.27	-76.71
~	~	~

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 other emissions were detected at a level greater than 20 dB below the limit.		

Spurious Emissions (Tx Radiated) - Continued

LIMITS: FCC 47 CFR 2.1053

Carrier Output Power	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \log_{10}(P_{\text{Watts}})$	
30 W	-20 dBm	-64.8 dBc
35 W	-20 dBm	-65.4 dBc
2 W	-20 dBm	-53.0 dBc

Open Area Test Site Results:

12.5 kHz Channel Spacing

799.075 MHz @ 30 W

Emission Mask D

Harmonics Emission Frequency (MHz)	Level (dBm)	Level (dBc)
1598.1500	-38.42	-83.19
2397.2250	-54.01	-98.78
3196.3000	-53.13	-97.90
3995.3750	-116.47	-161.24
4794.4500	-54.69	-99.39
5593.5250	-57.35	-102.12
Measurement Uncertainty	± 4.6 dB	

Sample Calculation

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
1598.15	-79.17	-25.16	-19.51	6.25	0.0	-38.42
		A	B	C	D	E

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

OATS Setup



TRANSMITTER RADIATED EMISSIONS IN THE GNSS BAND

SPECIFICATION: FCC 47 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. Emission measurements were made by the direct method.
7. The test was performed with a representative antennae connected to the EUT, at high output power settings on two channels operating in the required band.

774.9 MHz 30 W

Emission Frequency (1559-1610 MHz)	Antenna fitted	Antenna Polarity	Level dBW / MHz EIRP
Nil found	¼ wave	Vertical	None found
		Horizontal	None found

799.075 MHz 30 W

Emission Frequency (1559-1610 MHz)	Antenna fitted	Antenna Polarity	Level dBW / MHz EIRP
1598.19 MHz	¼ wave	Vertical	-91.82
		Horizontal	-103.15

LIMIT CLAUSE FCC 47 CFR 90.543 (f)	-70 dBW / MHz EIRP
---------------------------------------	--------------------

(f) For operations in the 763-775 MHz and 793-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

Setup



TRANSMITTER CONDUCTED EMISSIONS IN THE GNSS BAND

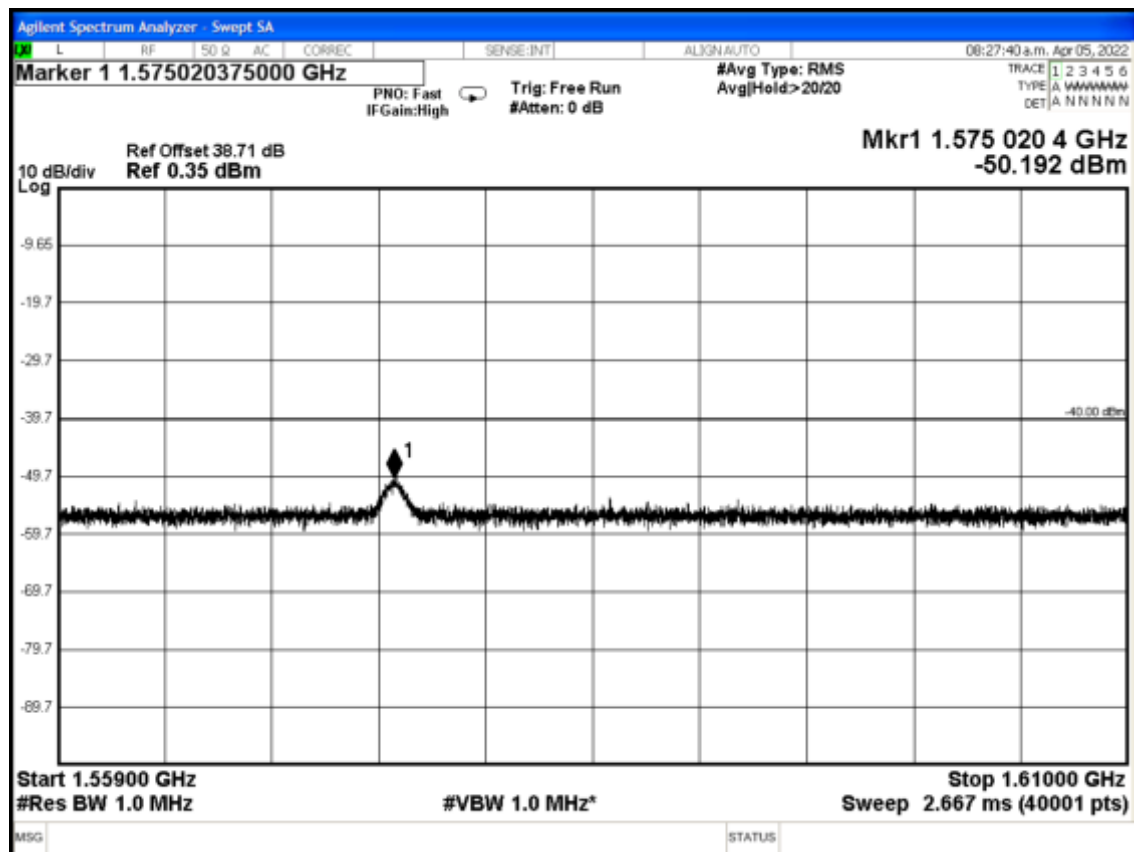
SPECIFICATION: RSS-119 5.8

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.
5. The emission at the frequency of the second harmonic was measured.

787.5 MHz 30 W

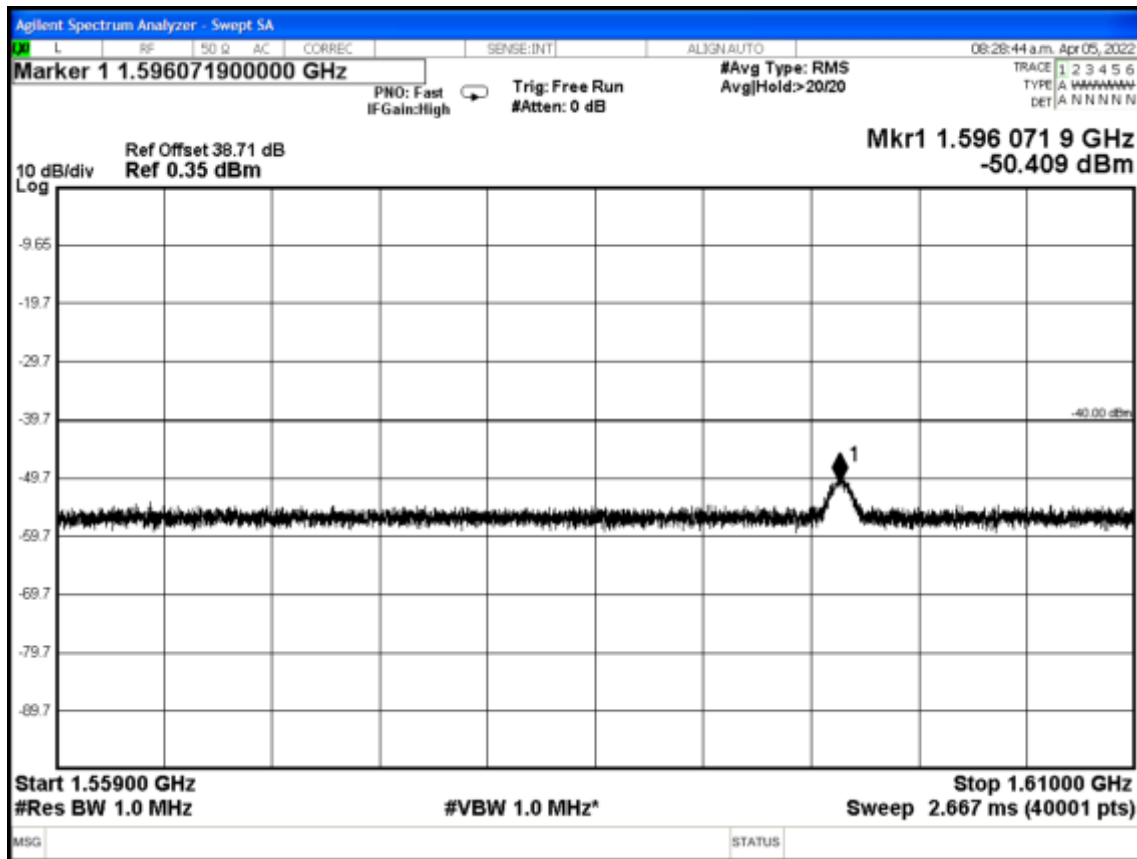
Frequency	Level dBm / MHz EIRP	Level dBW / MHz EIRP
1575.0204 MHz	-50.19	-80.19



Transmitter Conducted Emissions in the GNSS Band - Continued

798.025 MHz 30 W

Frequency	Level dBm / MHz EIRP	Level dBW / MHz EIRP
1596.0719 MHz	-50.41	-80.41

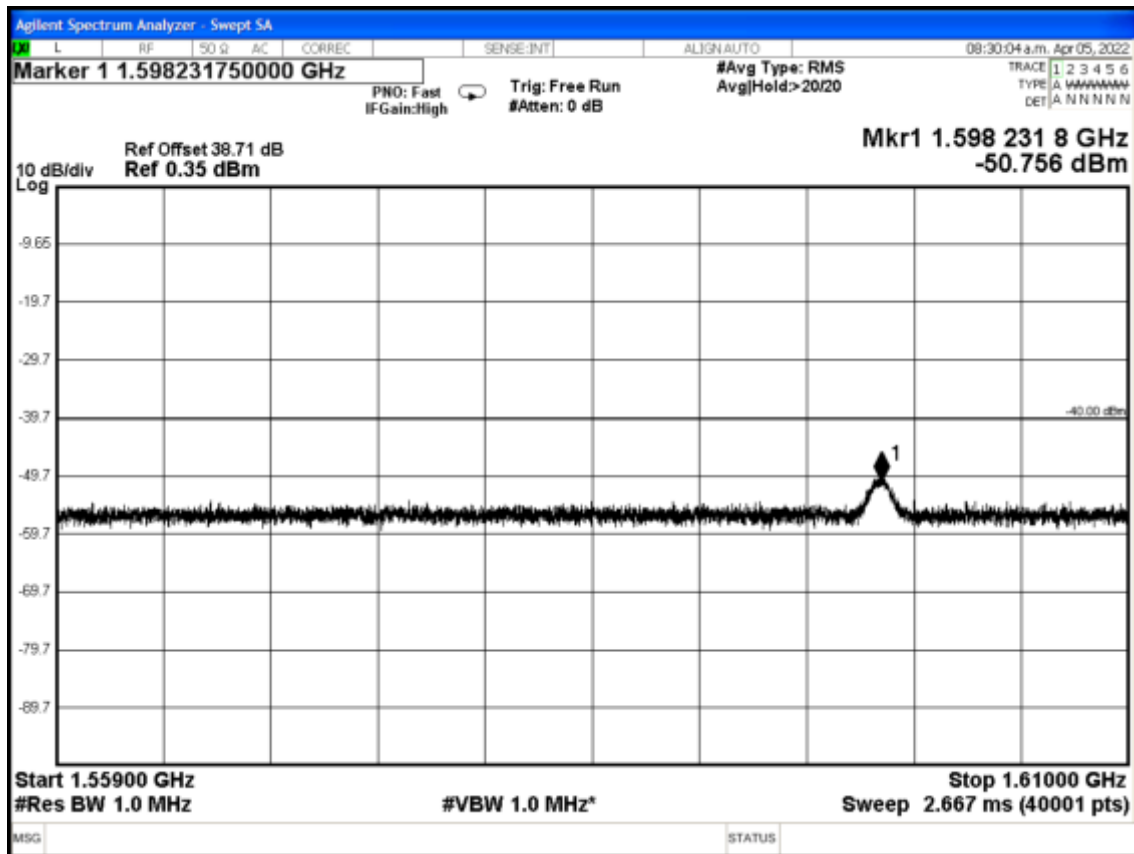


LIMIT CLAUSE RSS-119 5.8.9.2	-70 dBW / MHz EIRP
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Transmitter Conducted Emissions in the GNSS Band - Continued

799.075 MHz 30 W

Frequency	Level dBm / MHz EIRP	Level dBW / MHz EIRP
1598.2318 MHz	-50.75	-80.75

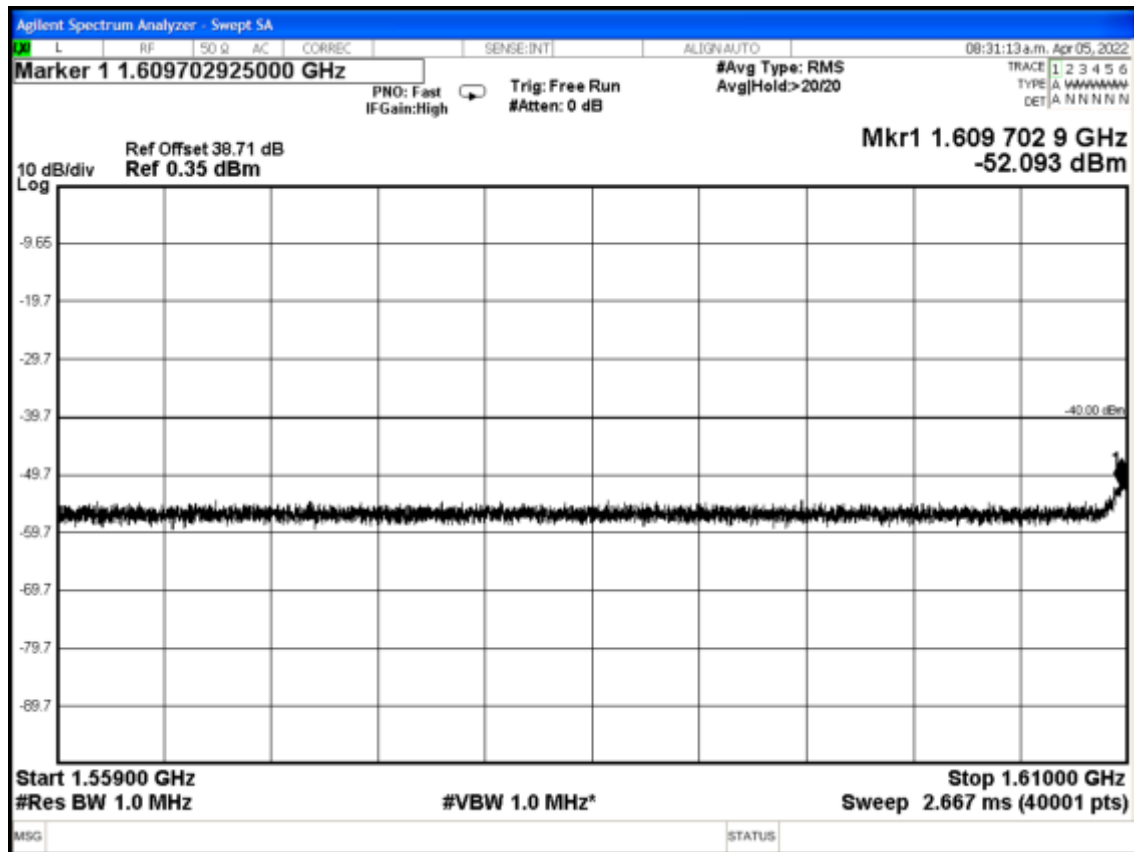


LIMIT CLAUSE RSS-119 5.8.9.2	-70 dBW / MHz EIRP
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Transmitter Conducted Emissions in the GNSS Band - Continued

804.9 MHz 30 W

Frequency	Level dBm / MHz EIRP	Level dBW / MHz EIRP
1609.7029 MHz	-52.09	-82.09



LIMIT CLAUSE RSS-119 5.8.9.2	-70 dBW / MHz EIRP
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TRANSMITTER SPURIOUS EMISSIONS (CONDUCTED) Part 27

SPECIFICATIONS: FCC 47 CFR 27.53 c (4) & (6)
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 763-775MHz and 793-805MHz.
3. A Scan is performed with a resolution and video bandwidth of 6.25 kHz

MEASUREMENT RESULTS:

See the tables and plots on the following pages.

Tx FREQUENCY: 787.5 MHz

12.5 kHz Channel Spacing 787.5 MHz @ 30 W

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 787.5 MHz @ 2 W

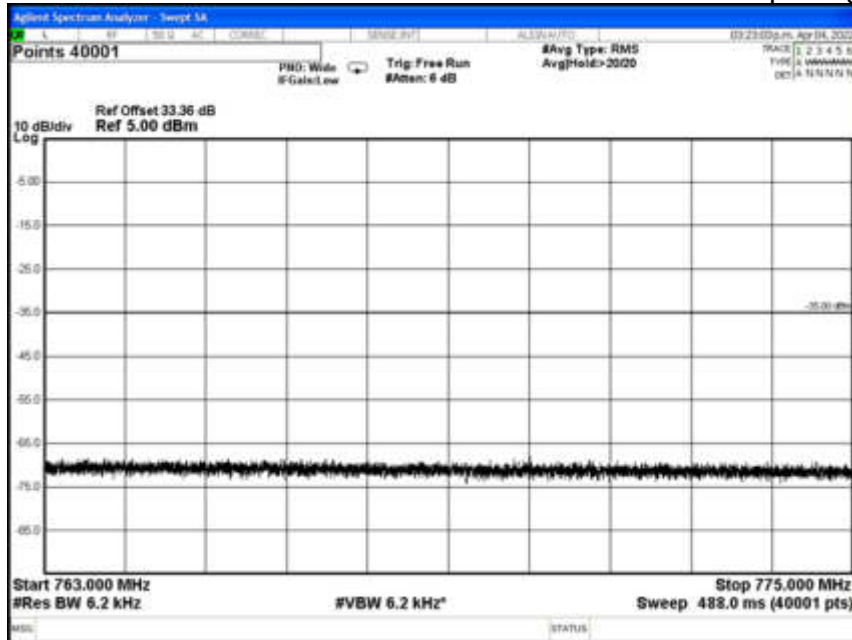
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 30 dB below the limit.		

LIMITS: FCC 47 CFR 27.53 c (4) & (6)

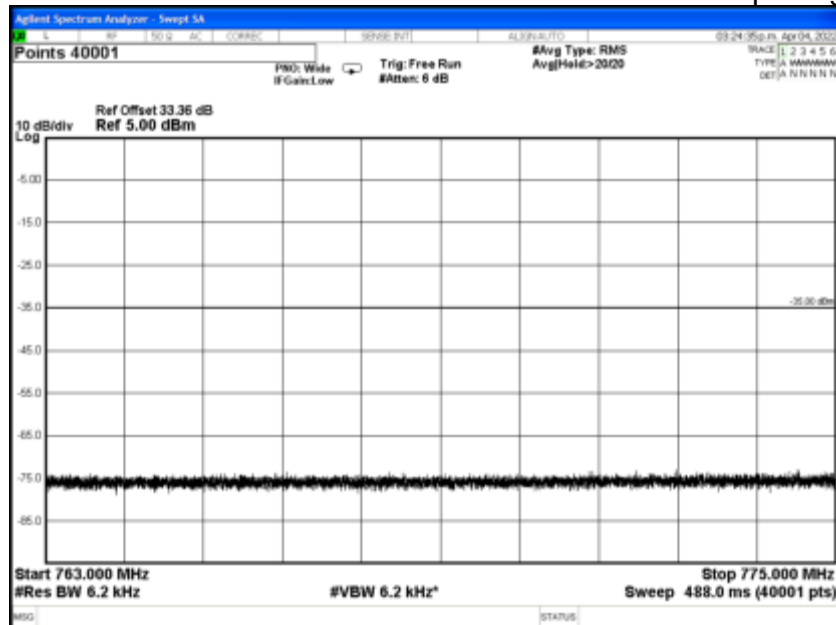
Carrier Output Power	$65 + 10 \log_{10} (P_{\text{Watts}})$ (mobiles)	
30 W	-35 dBm	-80 dBc
2 W	-35 dBm	-68 dBc

Spurious Emissions (Tx conducted) – Part27 Continued

30 Watts 763-775 MHz Scan 12.5kHz channel spacing

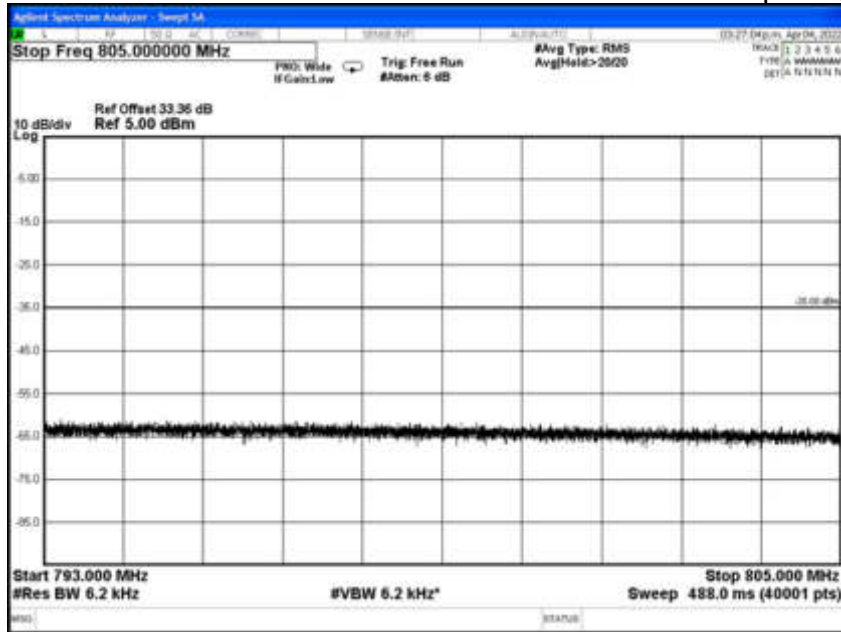


2 Watts 763-775 MHz Scan 12.5kHz channel spacing

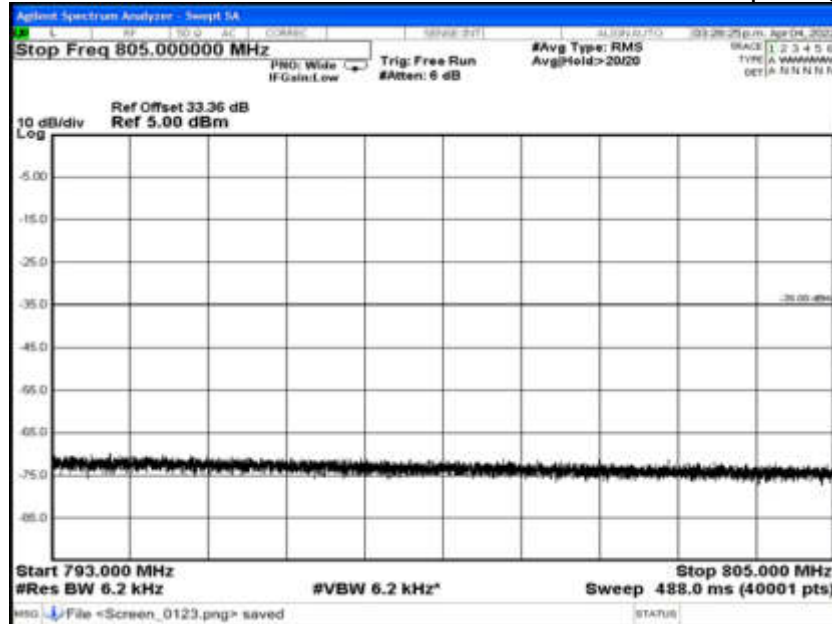


Spurious Emissions (Tx conducted) – Part27 Continued

30 Watts 793-805 MHz Scan 12.5kHz channel spacing



2 Watts 793-805 MHz Scan 12.5kHz 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 RESULTS:

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

Temperature ($^{\circ}\text{C}$)	Error (ppm)						
	762.025 MHz	768.025 MHz	769.07 5 MHz	774.9 MHz	775.975 MHz	787.5 MHz	798.025 MHz
-30	0.56	0.51	0.41	0.30	0.21	0.14	0.09
-20	0.20	0.18	0.12	0.04	-0.01	-0.06	-0.11
-10	-0.06	-0.06	-0.09	-0.10	-0.12	-0.14	-0.11
0	-0.16	-0.13	-0.11	-0.11	-0.07	-0.08	-0.05
10	-0.13	-0.11	-0.08	-0.06	-0.03	-0.03	-0.02
20	-0.03	0.00	0.01	0.02	0.05	0.03	0.05
30	0.02	0.03	0.02	0.03	0.01	-0.02	-0.03
40	-0.01	-0.01	-0.03	-0.04	-0.08	-0.13	-0.17
50	-0.17	-0.17	-0.22	-0.28	-0.32	-0.37	-0.40
Measurement Uncertainty				$\pm 5 \times 10^{-8}$			

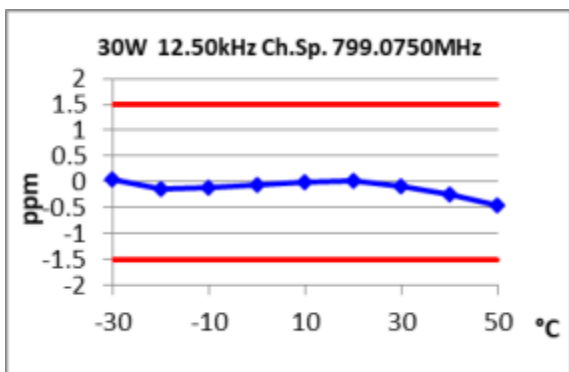
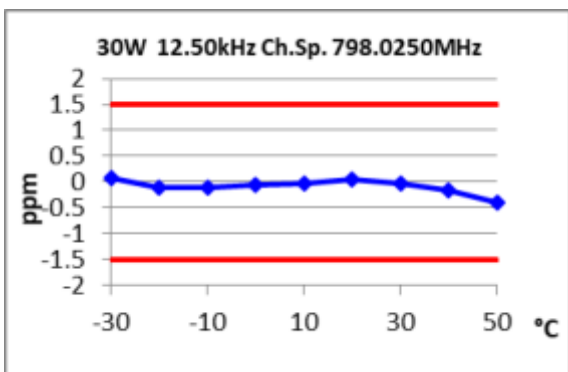
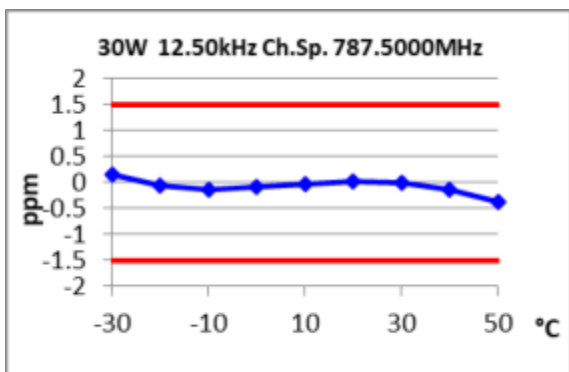
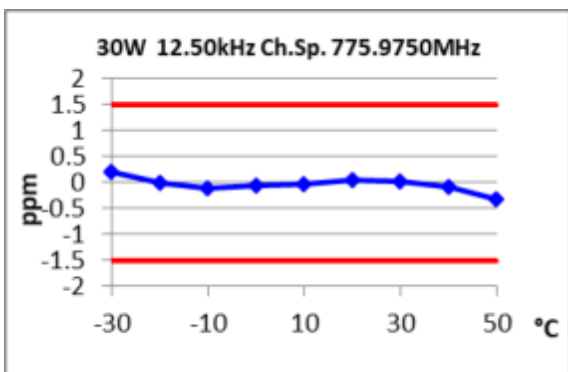
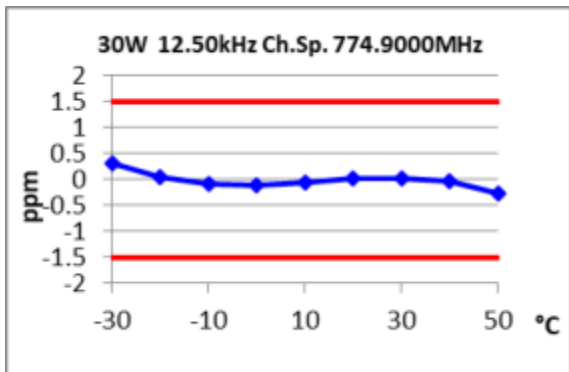
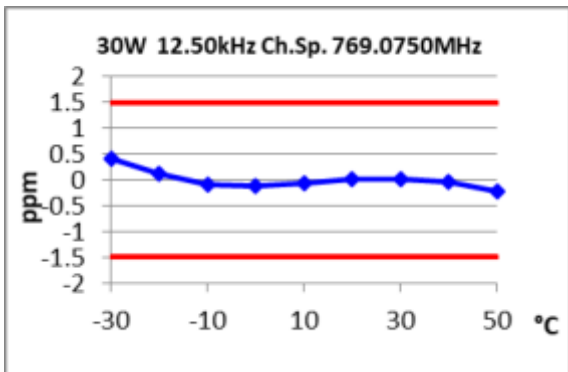
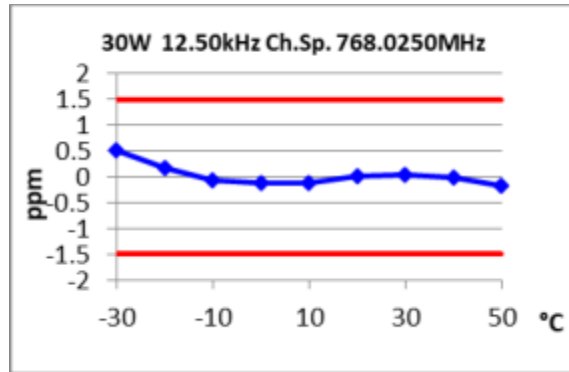
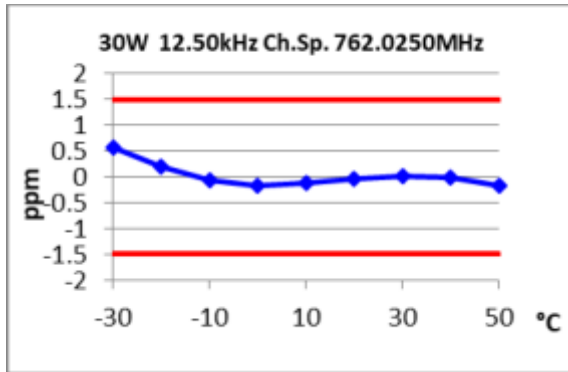
Temperature ($^{\circ}\text{C}$)	Error (ppm)							
	799.075 MHz	804.9 MHz	805.975 MHz	806.025 MHz	815.025 MHz	823.975 MHz	851.025 MHz	860.025 MHz
-30	0.04	0.00	0.51	0.58	0.50	0.44	0.31	0.26
-20	-0.13	-0.15	0.21	0.22	0.19	0.10	0.02	-0.03
-10	-0.11	-0.10	0.00	-0.07	-0.07	-0.1	-0.14	-0.14
0	-0.05	-0.04	-0.15	-0.16	-0.15	-0.13	-0.15	-0.13
10	-0.01	0.01	-0.12	-0.10	-0.08	-0.07	-0.09	-0.07
20	0.03	0.03	-0.04	-0.02	0.00	0.03	0.00	0.03
30	-0.07	-0.09	0.01	0.06	0.05	0.06	0.00	0.01
40	-0.23	-0.25	-0.01	0.03	0.01	0.00	-0.09	-0.09
50	-0.44	-0.47	-0.14	-0.14	-0.17	-0.21	-0.29	-0.33
Measurement Uncertainty					$\pm 5 \times 10^{-8}$			

LIMIT: FCC 47 CFR 90.213

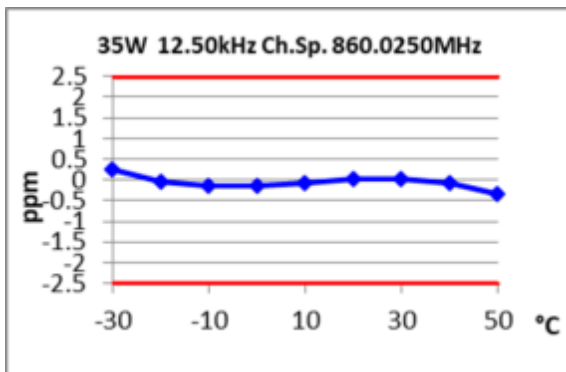
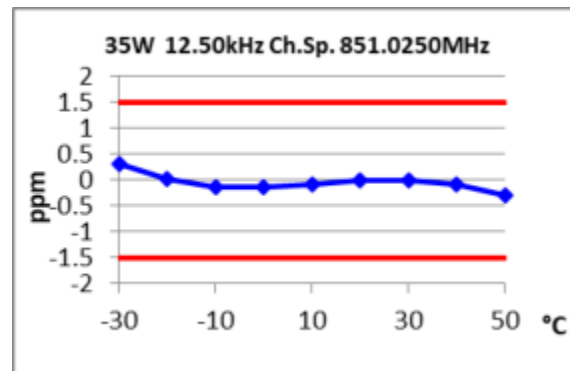
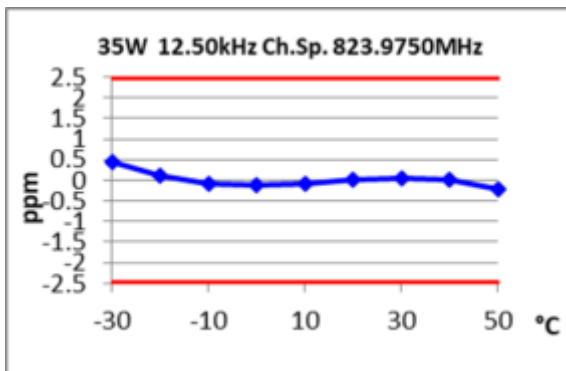
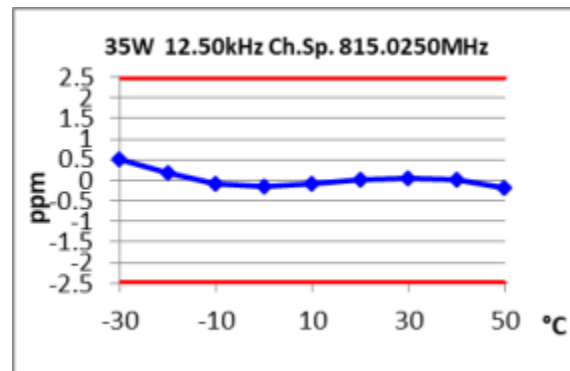
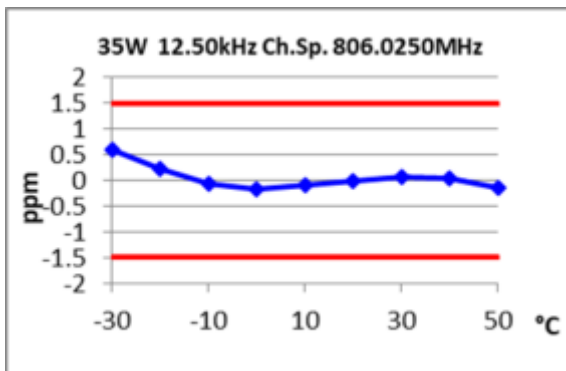
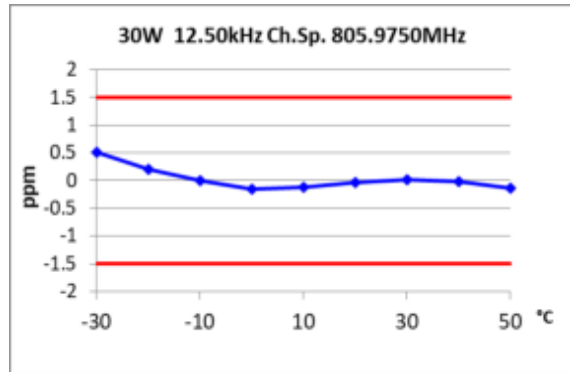
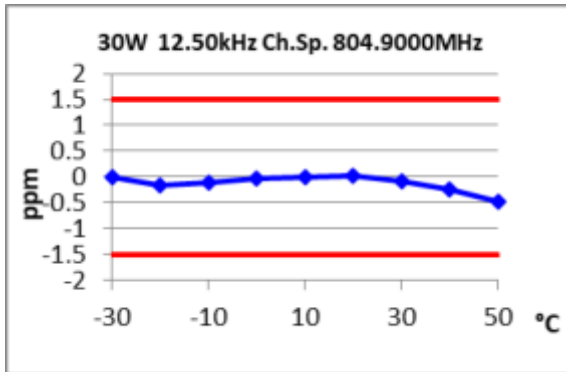
RSS-119 5.3

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

Transmitter Frequency Stability – Temperature



Transmitter Frequency Stability – 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 RESULTS:

	FREQUENCY ERROR (ppm) for 12.5 kHz		
	13.8 V _{DC}	11.73 V _{DC}	15.87 V _{DC}
762.025 MHz	-0.10	-0.09	-0.07
768.025 MHz	-0.04	-0.04	-0.04
769.075 MHz	-0.03	-0.03	-0.02
774.9 MHz	-0.05	-0.03	-0.03
775.975 MHz	-0.03	-0.03	-0.04
787.5 MHz	-0.09	-0.07	-0.05
798.025 MHz	-0.05	-0.06	-0.06
799.075 MHz	-0.08	-0.06	-0.06
804.9 MHz	-0.05	-0.07	-0.07
805.975 MHz	-0.08	-0.07	-0.07
806.025 MHz	-0.15	-0.13	-0.10
815.025 MHz	-0.11	-0.08	-0.07
823.975 MHz	-0.03	-0.04	-0.02
851.025 MHz	-0.08	-0.07	-0.06
860.025 MHz	-0.04	-0.03	-0.03
Measurement Uncertainty		$\pm 5 \times 10^{-8}$	

LIMIT CLAUSES: FCC 47 CFR 90.213 RSS-119 5.3

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

RECEIVER SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: RSS-Gen 7.4

GUIDE: TIA-603-E 2.1.2 (analogue)
TIA-102-CAAA-C 2.1.2 (digital)

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:

E5015 3m Blue 503429	0.9	
Total Attenuation @ 1000 MHz	0.9	Sum of component attenuation (a)
Amplitude offset	1.56	(b)
Correction @ 1000 MHz	-0.66	(a-b)

Measurement Uncertainty	≤12.75 GHz ± 2.8 dB
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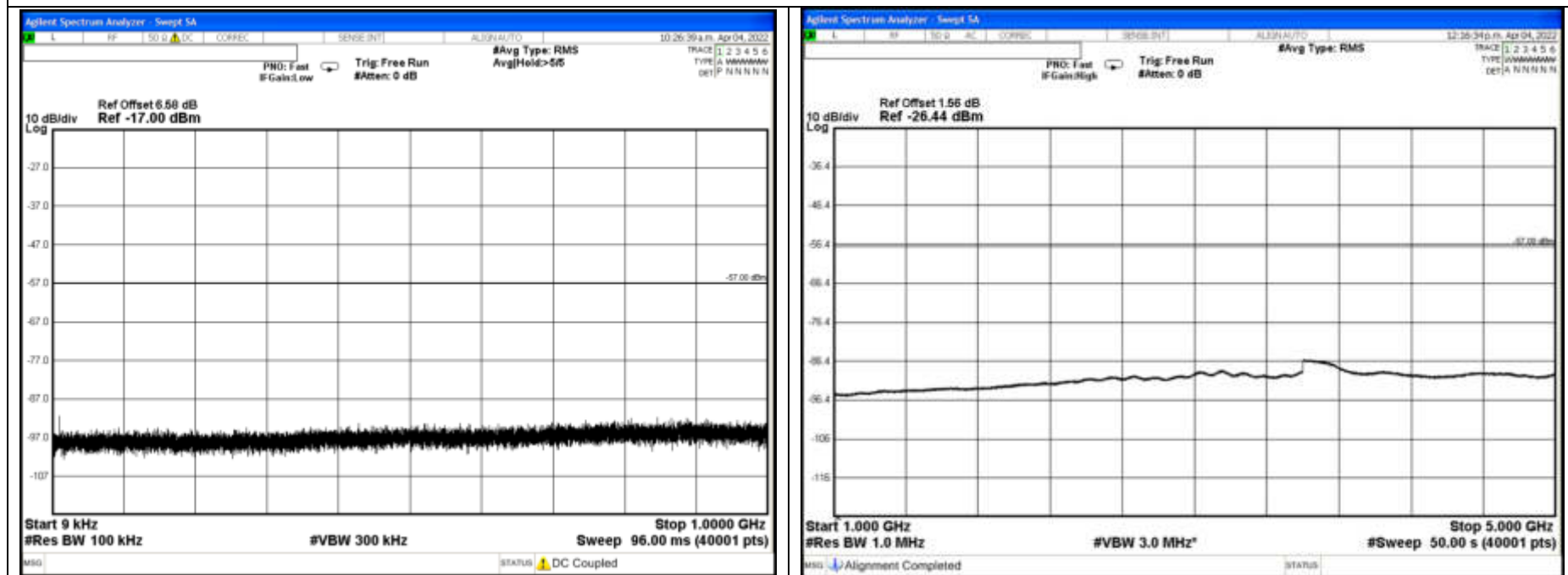
LIMIT CLAUSE: RSS-Gen 7.4

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

Receiver Spurious Emissions (Conducted) – Continued

762.025 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 2.8 dB	
No emissions were detected within 20 dB of Limit.		

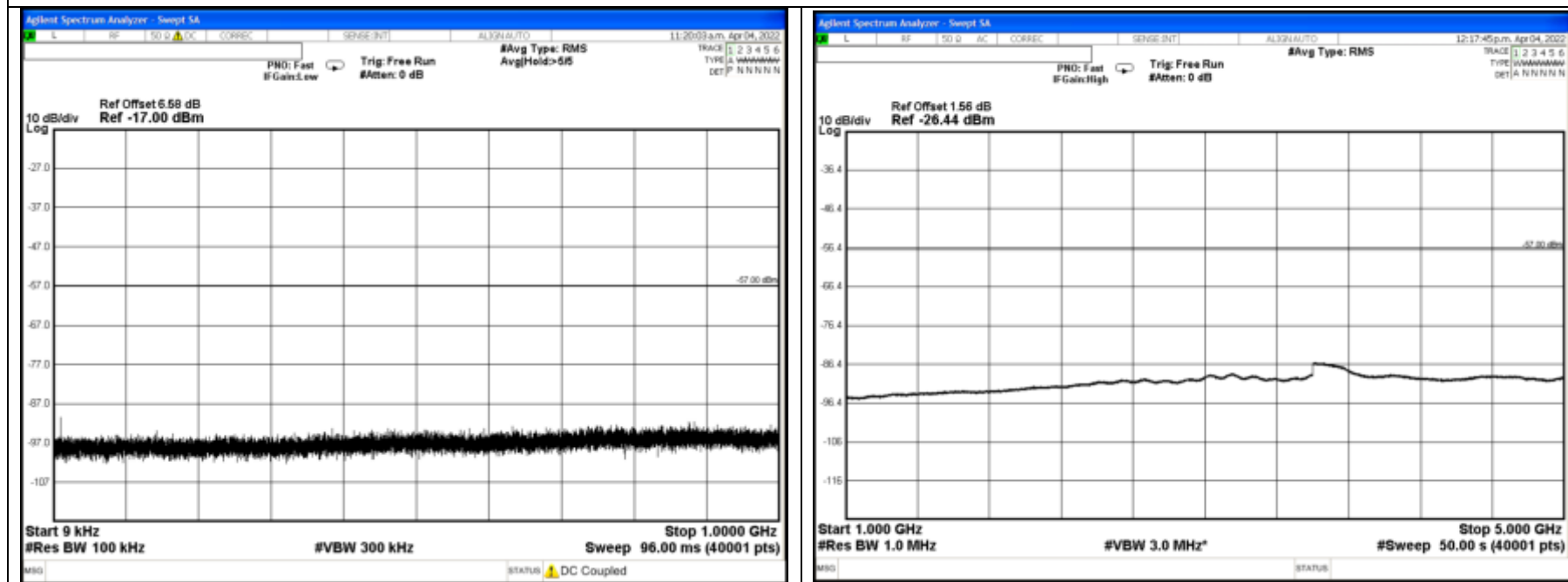
762.025 MHz



Receiver Spurious Emissions (Conducted) – Continued

768.025 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 2.8 dB	
No emissions were detected within 20 dB of Limit.		

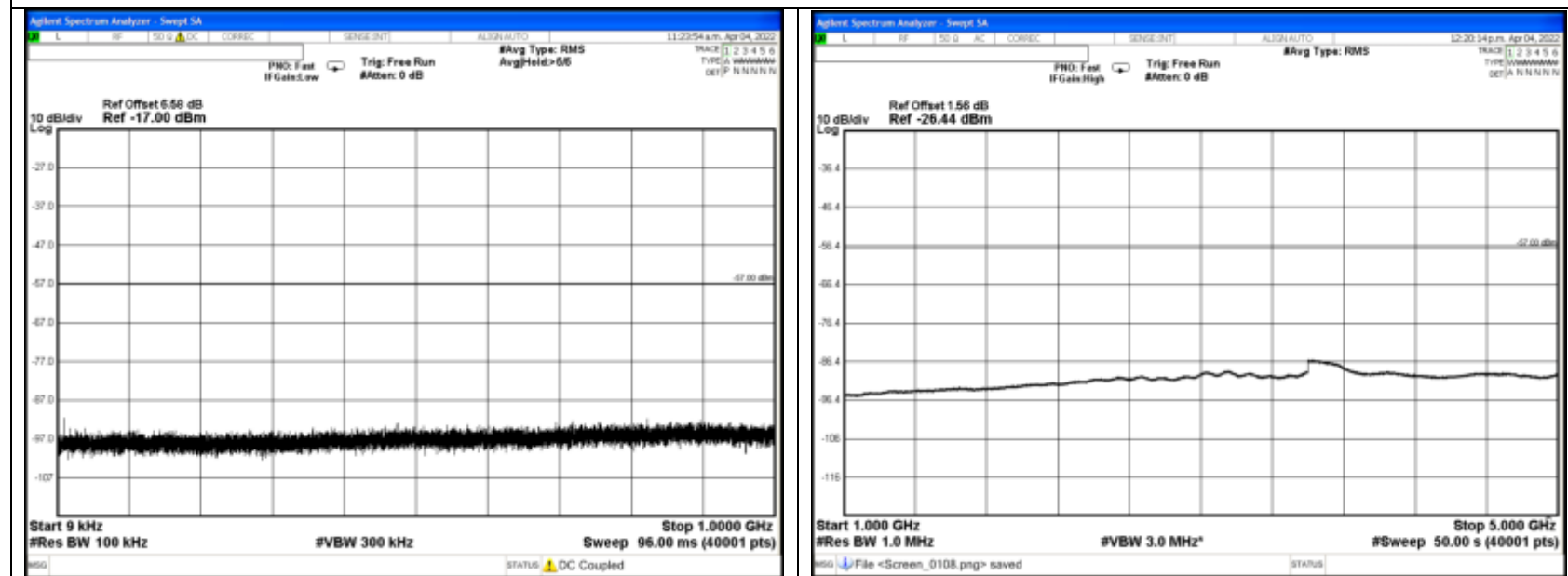
768.025 MHz



Receiver Spurious Emissions (Conducted) – Continued

769.075 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 2.8 dB	
No emissions were detected within 20 dB of Limit.		

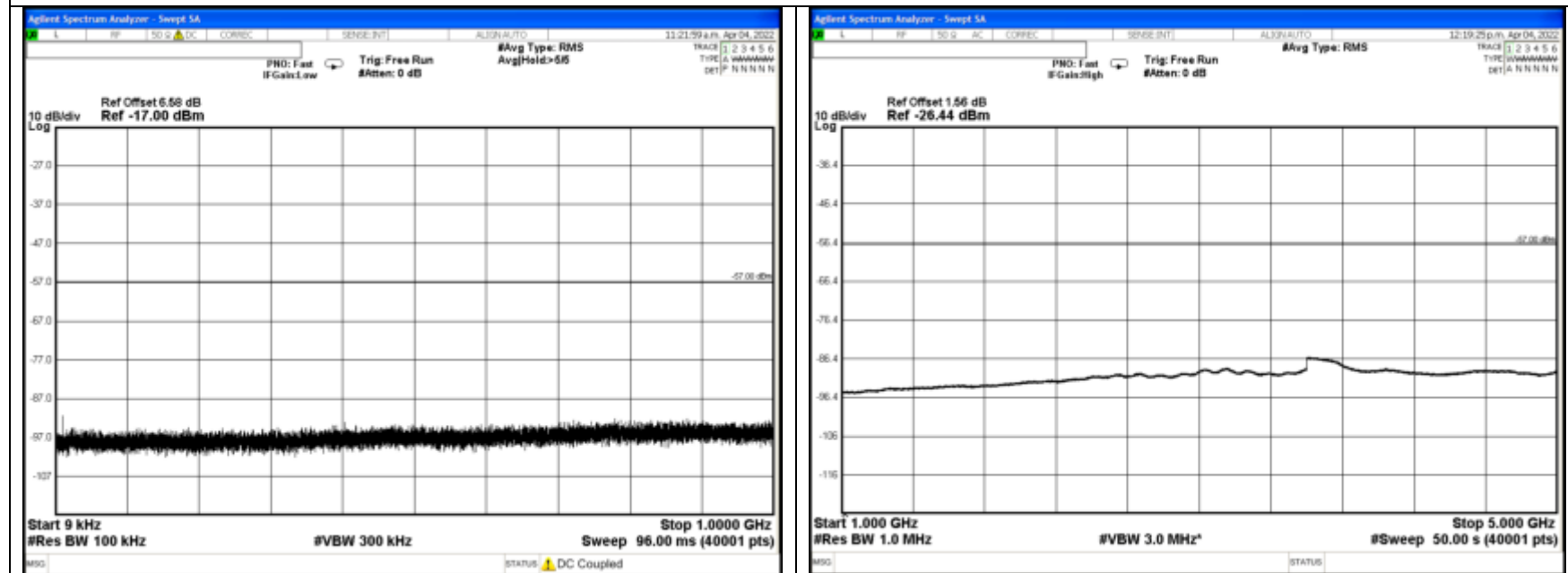
769.075 MHz



Receiver Spurious Emissions (Conducted) – Continued

774.9 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 2.8 dB	
No emissions were detected within 20 dB of Limit.		

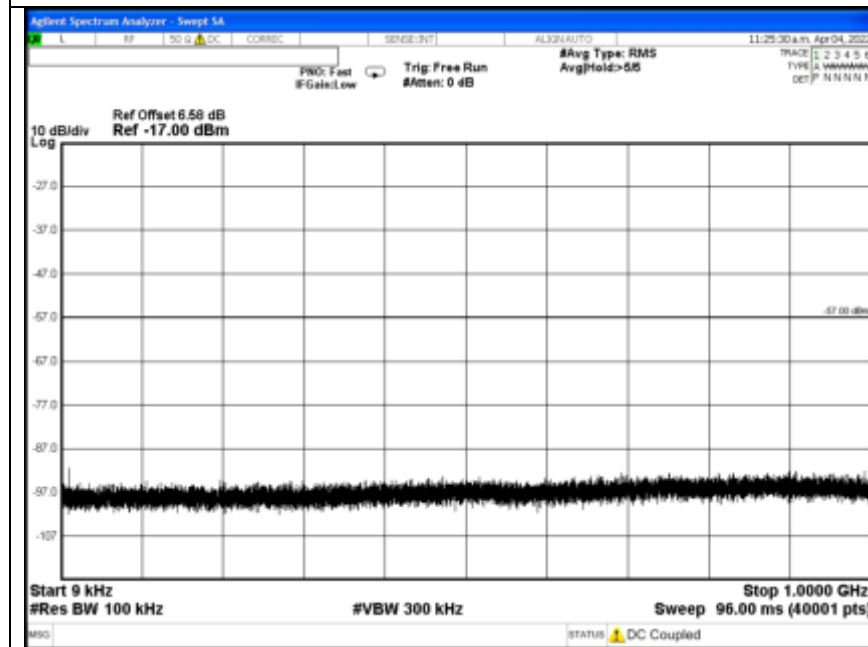
774.9 MHz



Receiver Spurious Emissions (Conducted) – Continued

775.975 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 2.8 dB	
No emissions were detected within 20 dB of Limit.		

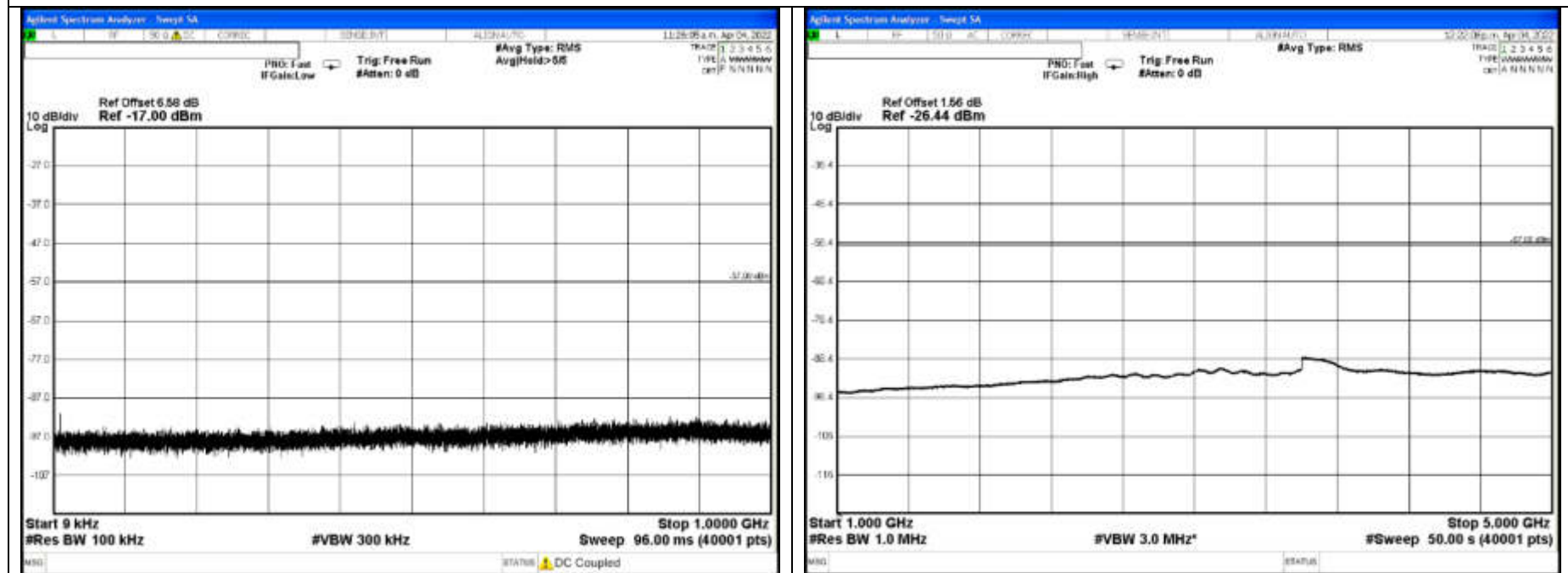
775.975 MHz



Receiver Spurious Emissions (Conducted) – Continued

857.5 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 2.8 dB	
No emissions were detected within 20 dB of Limit.		

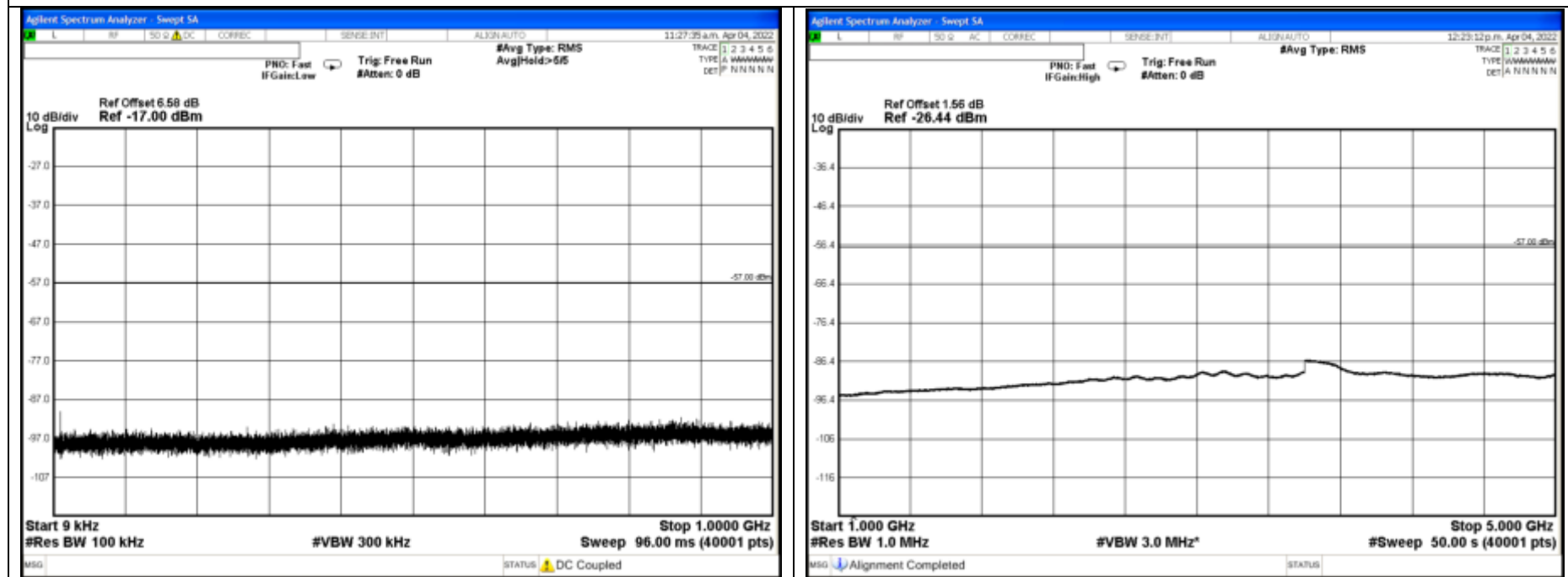
857.5 MHz



Receiver Spurious Emissions (Conducted) – Continued

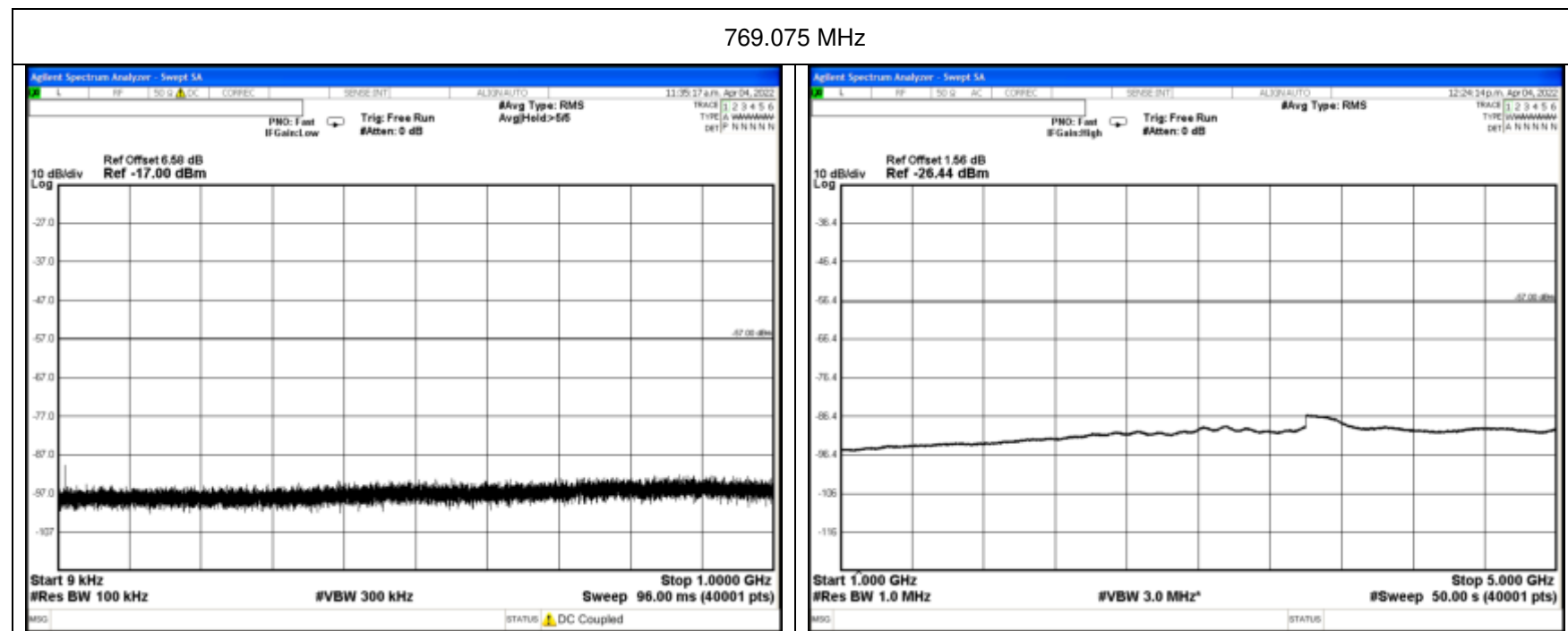
768.025 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 2.8 dB	
No emissions were detected within 20 dB of Limit.		

768.025 MHz



Receiver Spurious Emissions (Conducted) – Continued

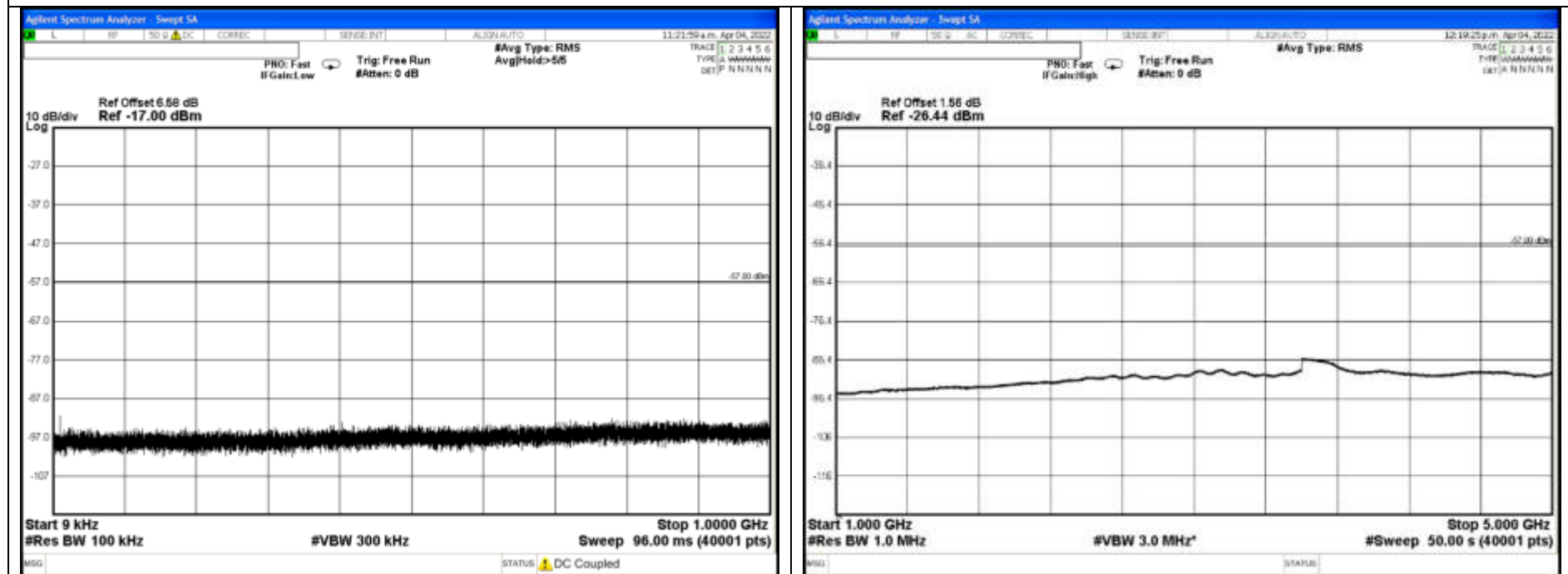
769.075 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 2.8 dB	
No emissions were detected within 20 dB of Limit.		



Receiver Spurious Emissions (Conducted) – Continued

774.9 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 2.8 dB	
No emissions were detected within 20 dB of Limit.		

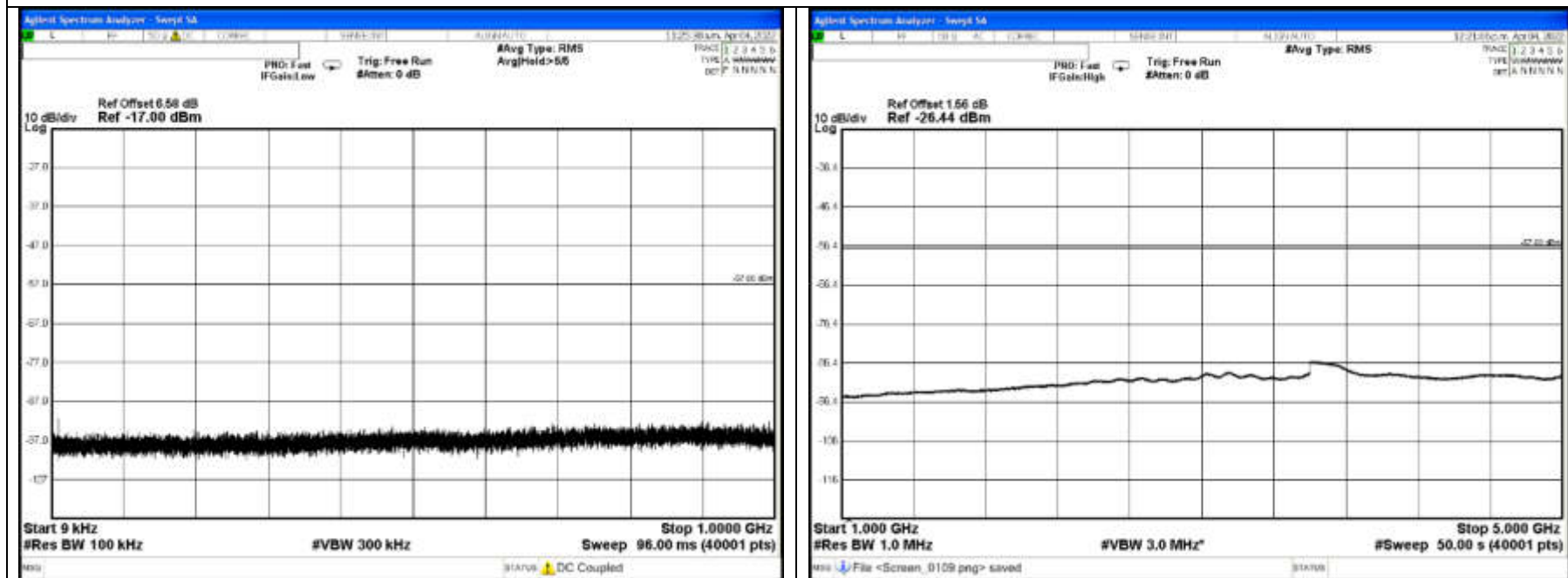
774.9 MHz



Receiver Spurious Emissions (Conducted) – Continued

775.975 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 2.8 dB	
No emissions were detected within 20 dB of Limit.		

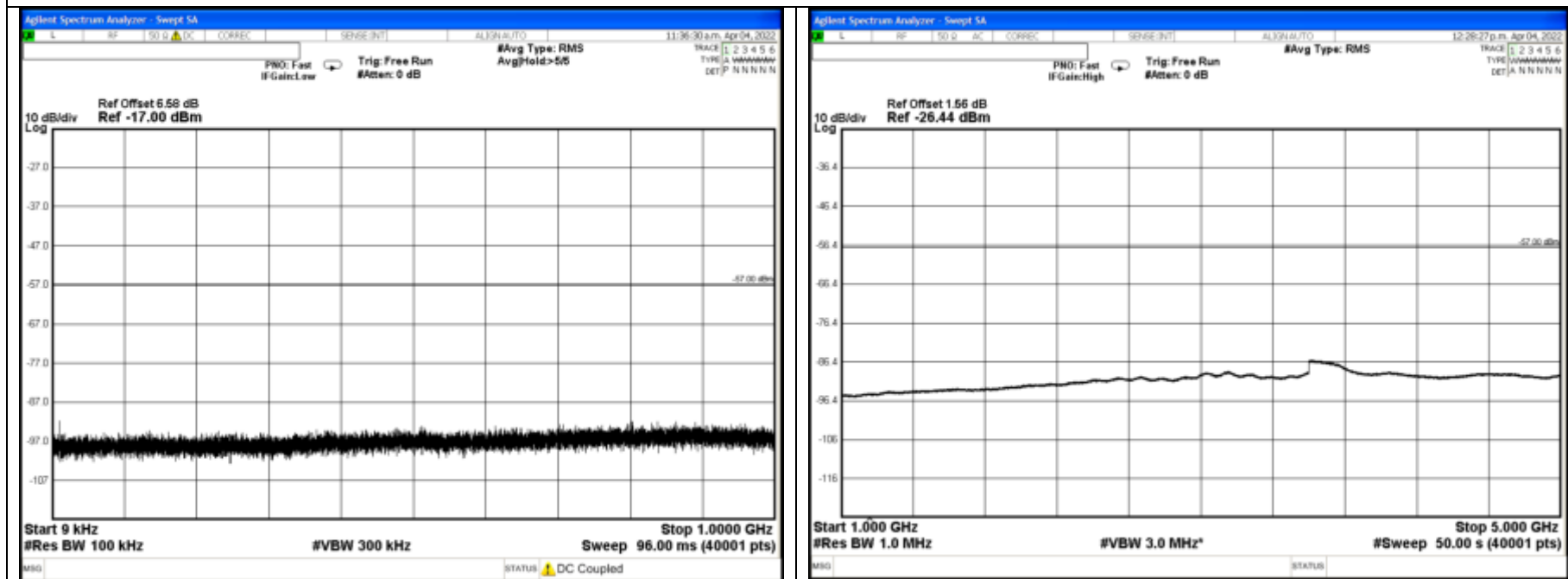
775.975 MHz



Receiver Spurious Emissions (Conducted) – Continued

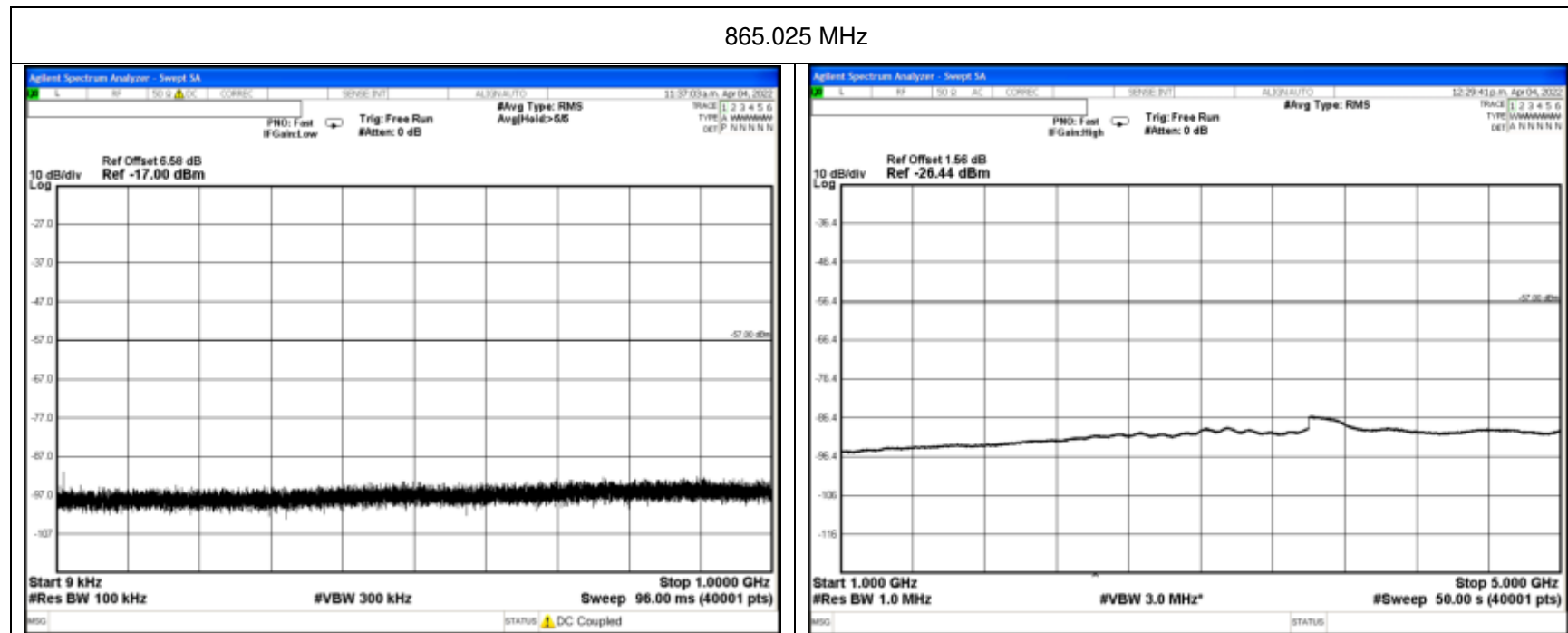
856.025 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 2.8 dB	
No emissions were detected within 20 dB of Limit.		

856.025 MHz



Receiver Spurious Emissions (Conducted) – Continued

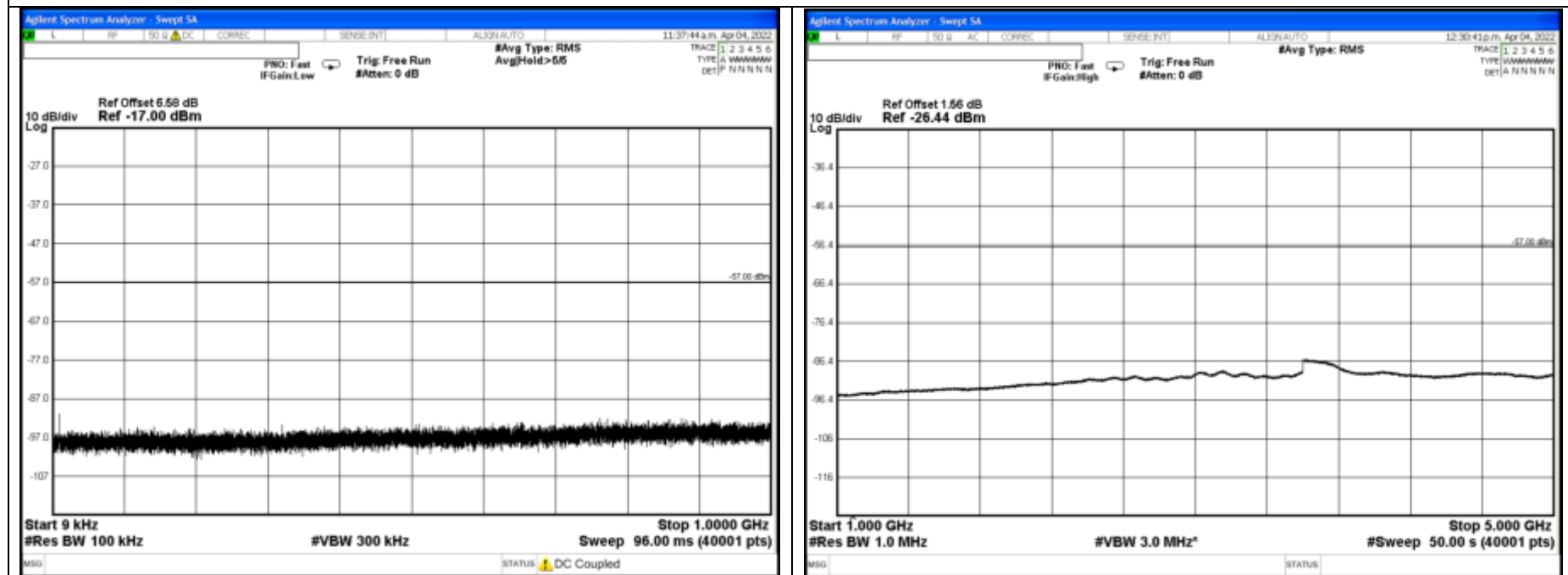
865.025 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 2.8 dB	
No emissions were detected within 20 dB of Limit.		



Receiver Spurious Emissions (Conducted) – Continued

869.975 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 2.8 dB	
No emissions were detected within 20 dB of Limit.		

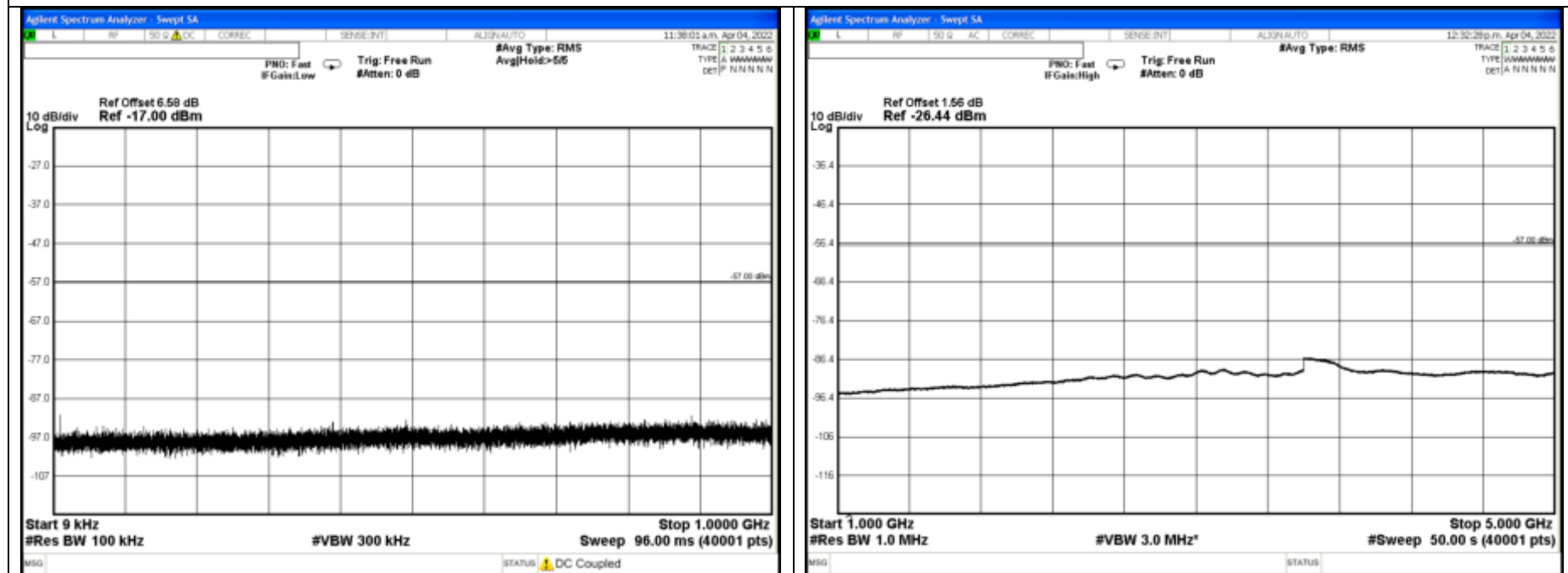
869.975 MHz



Receiver Spurious Emissions (Conducted) – Continued

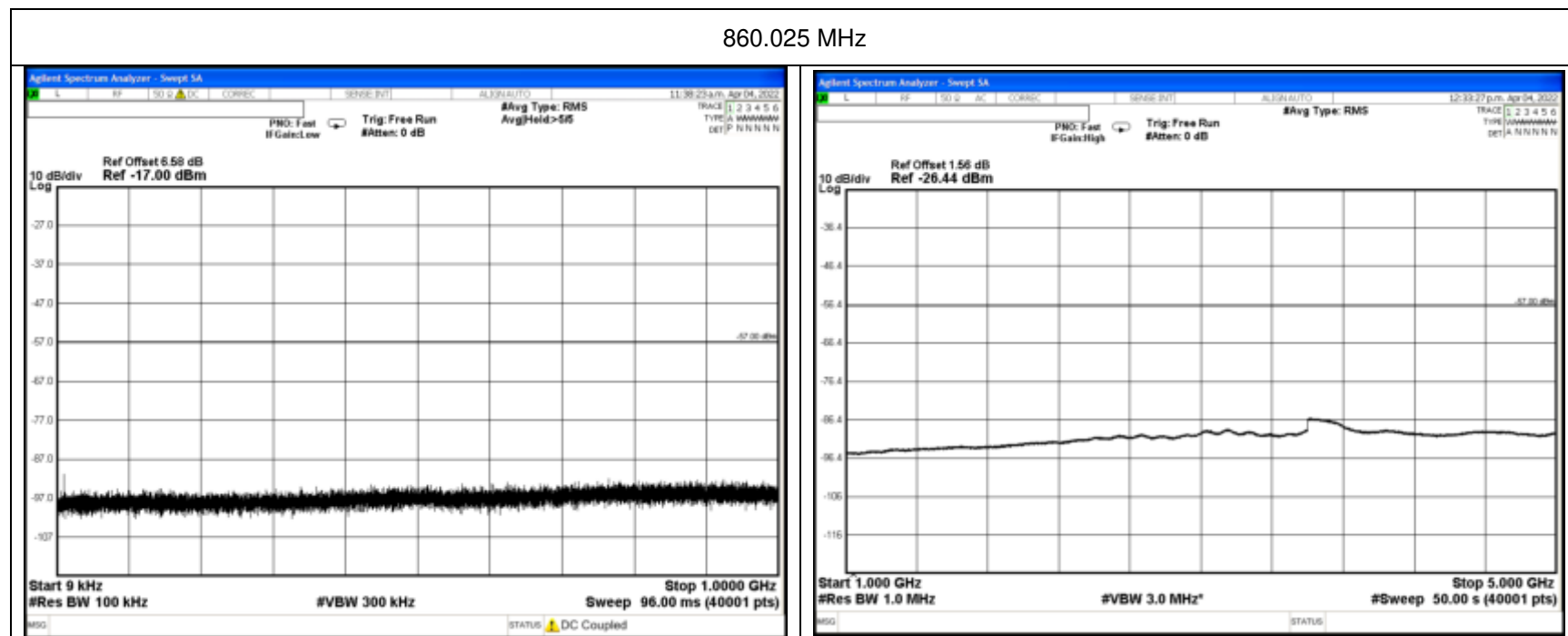
851.025 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 2.8 dB	
No emissions were detected within 20 dB of Limit.		

851.025 MHz



Receiver Spurious Emissions (Conducted) – Continued

860.025 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
Measurement Uncertainty	≤12.75 GHz ± 2.8 dB	
No emissions were detected within 20 dB of Limit.		



TEST EQUIPMENT LIST

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

Equipment Type	Information	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
Antenna	18GHz DRG	Emco	DRG3115	2084	E3076	12-Jul-24
Antenna	Log Periodic	Schwarzbeck	VUSLP	9111-219	E4617	
Antenna	Reverb - 1-18GHz DRG	Schwarzbeck	BBHA 9120 D	9120D-885	E4857	
Antenna	Reverb - 1-18GHz DRG	Schwarzbeck	BBHA 9120 D	9120D-884	E4858	
Coax Cable	OATS Turntable Cable 1	Intelcom	RG214	OATS1	E4621	11-Jan-23
Coax Cable	OATS Tower Cable	Intelcom	RG214	OATS2	E4622	11-Jan-23
Coax Cable	Reverb - 4.5m Multiflex 141	TeltestBlue6	MF 141	TeltestBlue6	E4843	11-Jan-23
Coax Cable	Reverb - 2m Multiflex 141	TeltestBlue5	MF 141	TeltestBlue5	E4844	11-Jan-23
Coax Cable	Reverb - 2m Multiflex 141	TeltestBlue4	MF 141	TeltestBlue4	E4845	11-Jan-23
Coax Cable	Reverb - 1m Multiflex 141	TeltestBlue3	MF 141	TeltestBlue3	E4846	11-Jan-23
Coax Cable	Reverb - 1m Multiflex 141	TeltestBlue2	MF 141	TeltestBlue2	E4847	10-Jan-23
Coax Cable	Reverb - 1m Multiflex 141	TeltestBlue1	MF 141	TeltestBlue1	E4848	11-Jan-23
Coax Cable	OATS Turntable Cable 2	Intelcom	RG215	OATS3	E4995	11-Jan-23
Coax Cable	2m Black	Suhner	RG214HF/Nm/Nm/2000	TeltestBlack7	E5004	11-Jan-23
Coax Cable	2m Black	Suhner	RG214HF/Nm/Nm/2000	TeltestBlack8	E5005	11-Jan-23
Coax Cable	1.5m Blue	Suhner	Sucoflex 126EA	502868/126EA	E5028	23-Dec-22
Environ. Chamber	Chest	Contherm	Chest	E3397	E3397	28-Nov-24
Environ. Chamber	Chest	Contherm	Chest	E3397	E3397	3-Nov-22
Filter High Pass/ Notch	550 to 885MHz	Tait		N/A	E3785	22-Jun-22
Power Supply		Rohde & Schwarz	NGS M32/10 192.0810.31	Fnr 434	E3556	17-May-22
Power Supply	40V/38A	Agilent	N5766A	US09E4663L	E4719	4-Oct-23
RF Amplifier	+21.7 dB 1GHz	Tait	ZFL-1000LN	E3660	E3360	2-Aug-22
RF Amplifier	Pre-amplifier	Agilent	87405C	MY47010688	E4941	19-Oct-22
RF Attenuator	30+3dB 350W	Weinschel	67-30-33 & BW-N3W5+	CK9178	E5023	12-Jan-23
RF Attenuator	10dB 50W	Weinschel	24-10-34	BC3293	E4364	22-Dec-22
RF Attenuator	3dB 0.5W	Weinschel	Model 1	CH6843	E5011	22-Dec-22
RF Attenuator	3dB 0.5W	Weinschel	Model 1	CH6857	E5012	22-Dec-22
RF Chamber	S-LINE TEM CELL	Rohde & Schwarz	1089.9296.02	338232/003	E3636	28-Oct-22
RF Chamber	Reverb - Stirrer controller for reverb chamber	Teseq	Stirrer Controller	29765.1	E4854	
RF Chamber	Reverb - 0.5 - 18GHz Reverberation Chamber	Teseq	RVC XS	29765	E4855	
RF Combiner	TREVA2	Minicircuits	ZFSC-4-1	-	E4084	

TELTEST Laboratories
Tait International Ltd
Report Number 4242

Equipment Type	Information	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
RF Load	50W	Weinschel	F1426	AE2490	E3624	22-Dec-22
Signal Generator	Analog 4GHz	Agilent	E4422B	GB40050320	E3788	16-Oct-22
Signal Generator	Digital 4GHz	Agilent	E4437B	US39260389	E4764	19-Oct-23
Spectrum Analyser	13.2GHz	Agilent	PSA E4445A	MY42510072	E4139	7-Oct-22
Spectrum Analyser	26.5GHz	Agilent	PXA N9030A	MY49432161	E4907	3-Oct-22
Temp & Humidity datalogger		Hobo	U21-011	10134275	E4980	25-Jul-22
TREVA 2		Teltest	-	2	-	
Testware	Conducted Emissions		March 2018	-	-	
Testware	Frequency Vs Temperature		April 2018	-	-	
Testware	Reverb Emissions		TTEL_REVEMIS 2.00.02	-	-	
Testware	S-Line Radiated Emissions		TTEL_SLINERADEM 2.00.01	-	-	
Testware	TREVA		TTEL_TREVA 2.00.00	-	-	
Testware	Spec An Correction Loader		June 2019	-	-	

