



Engineering Solutions & Electromagnetic Compatibility Services

FCC Certification Report

Electric Infrastructure Security Council
10 G Street, NE; Ste. 600
Washington, DC 20002 (USA)
Contact: Scott Blevins

Model: BNET-V
Base Station Radio
FCC ID: 2AVVL0BSXR1BNETV001

June 23, 2020

Standards Referenced for this Report	
Part 2: 2019	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 90: 2019	Private Land Mobile Radio Services
ANSI C63.26: 2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

FCC Rule Parts	Frequency Range (MHz)	Rated Conducted Output Power (W)	Frequency Tolerance (ppm)	Transmit Mode	Emission Designator
90	450-470	20	0.1	Analog FM	11K0F3E

Report Prepared By: Daniel Baltzell

Document Number: 2020019

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These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANAB. Refer to certificate and scope of accreditation AT-1445.

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1 Test Result Summary

Test	FCC Reference	Result
RF Power Output	2.1046(a), 90.205	Complies
Spurious Emissions at Antenna Terminals	2.1051, 90.210	Complies
Field strength of spurious radiation	2.1053(a), 90.210	Complies
Occupied Bandwidth/Emission Masks	2.1049(c)(1), 90.210	Complies
Frequency Stability vs. Temperature and Voltage	2.1055, 90.213	Complies
Modulation Characteristics	2.1047(a)(b)	Complies
Transient Frequency Response (421-512 MHz)	90.214	Complies

2 General Information

The following Certification Report is prepared on behalf of Electric Infrastructure Security Council (EIS Council) in accordance with the Federal Communications Commission rules and regulations. The Equipment Under Test (EUT) was the BNET-V Base Station radio; FCC ID: 2AVVL0BSXR1BNETV001.

The radio is subject to FCC SDoC. SDoC testing was performed and the data is contained in a separate SDoC report.

All measurements contained in this application were conducted in accordance with the applicable sections of FCC Rules and Regulations CFR 47 Parts 2, and 90. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier and cables.

2.1 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, Inc. 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report submitted to, and approved by, the Federal Communications Commission to perform AC line conducted and radiated emissions testing.

2.2 Related Submittal(s)/Grant(s)

This is a new certification application for FCC.

2.3 Grant Notes

Power is 20 W. The grant listed power is rated power and actual measured power is shown in the test report.

2.4 Tested System Details

The test sample was received on May 7, 2020. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable. The device was programmed for multiple modes of operation and modulation types.

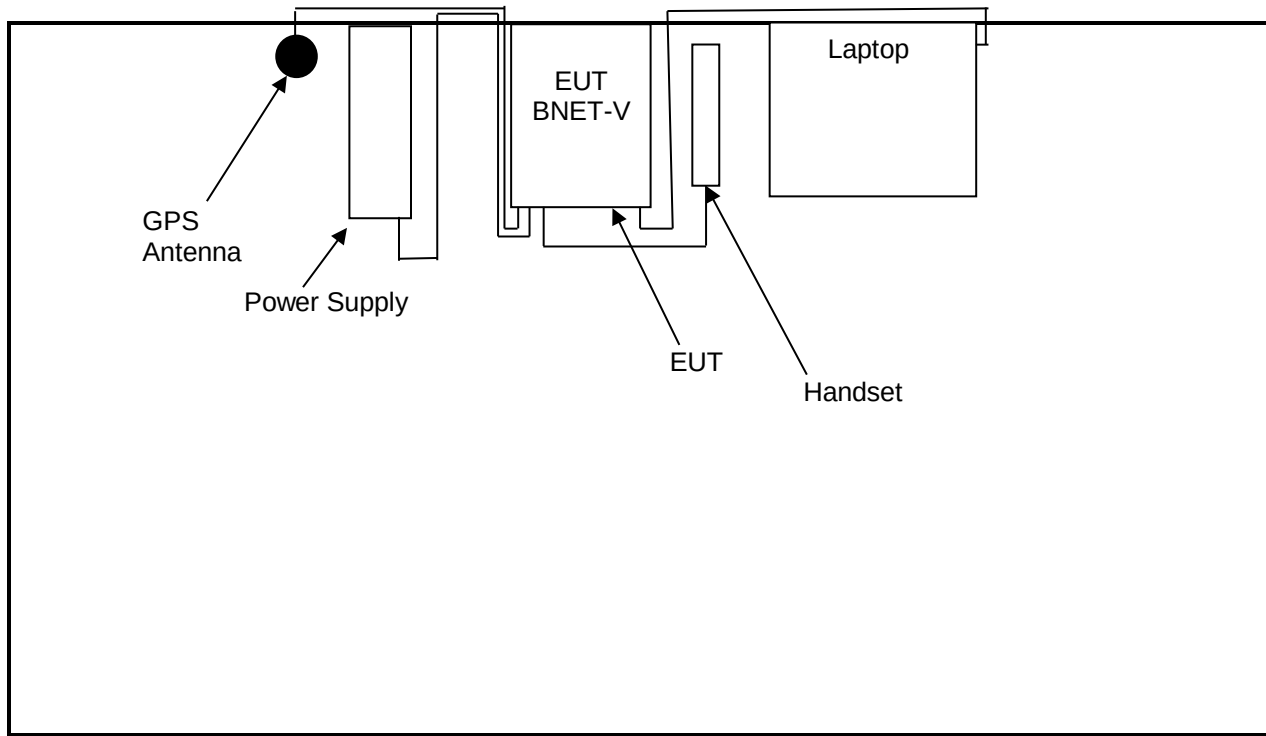
Table 2-1: Equipment Under Test (EUT)

Part	Manufacturer	Model	Serial Number	FCC ID	Cable	RTL Bar Code
Base Station	EIS Council	Black Sky BNET-V	B40-0046	2AVVL0BSXR1BNETV001	4m shielded antenna	23586
Handset	Sonetronics Inc.	H-189/6R	2	N/A	0.6m coiled	23587
GPS Antenna	Antcom Corp	4G15A-XT-4	579707	N/A	4m shielded	23584

Table 2-2: Auxiliary Equipment

Part	Manufacturer	Model	Serial Number	FCC ID	Cable	RTL Bar Code
Power Supply	TDK-Lambda	UP36-12	LOC-717A37 400C0	N/A	1.85m shielded AC/ 3.5m unshielded DC	23585
Laptop	Hewlett Packard	Elitebook 850	1032	N/A	2m Ethernet	23583
AC Adapter	Hewlett Packard	PPP009C	CT:WECJP0BG C90JB0B	N/A	1.8m unshielded AC/ 1.7m unshielded DC	23588

Figure 2-1: Configuration of Tested System



3 FCC Parts 2.1046(a), 90.205: Transmitter Power; Part 2.1033(C)(8) Voltages and Currents through the Final Amplifying Stage

24 VDC and 1.2 Amps

3.1 Test Procedure

ANSI C63.26 §5.2

The EUT was connected to a coaxial attenuator having a 50 Ω load impedance.

Manufacturer's Rated Power: 20.0 W

3.2 Test Data

Ambient Temperature: +24.2°C Relative Humidity: 33% Barometric Pressure: 99.7 kPa

Table 3-1: RF Conducted Output Power – Measured

Frequency (MHz)	High Power (dBm)	High Power (W)
450.0125	42.7	18.6
460.0000	43.3	21.4
469.9875	43.0	20.0

Results: The EUT is compliant.

Measurement uncertainties shown for these tests are expanded Gaussian uncertainties expressed at 95% confidence level using a coverage factor $k = 2$. Measurement uncertainty = ± 0.5 dB.

Table 3-2: Test Equipment Used for Testing RF Power Output - Conducted

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	04/26/2021
901724	API Weinschel, Inc.	48-40-34	40 dB 100W Attenuator	CJ8921	09/09/2020

Test Personnel:

Daniel Baltzell EMC Test Engineer	 Signature	May 8, 2020 Date of Test
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4 FCC Parts 2.1051, 90.210: Conducted Spurious Emissions

4.1 Test Procedure

ANSI C63.26 §5.7

The transmitter is terminated with a 50 Ω load and interfaced with a spectrum analyzer.

Device with digital modulation: Modulated to its maximum extent.

4.2 Test Data

Ambient Temperature: +24.1°C Relative Humidity: 31% Barometric Pressure: 101.3 kPa

Frequency range of measurement per Part 2.1057: 9 kHz to 10 x Fc

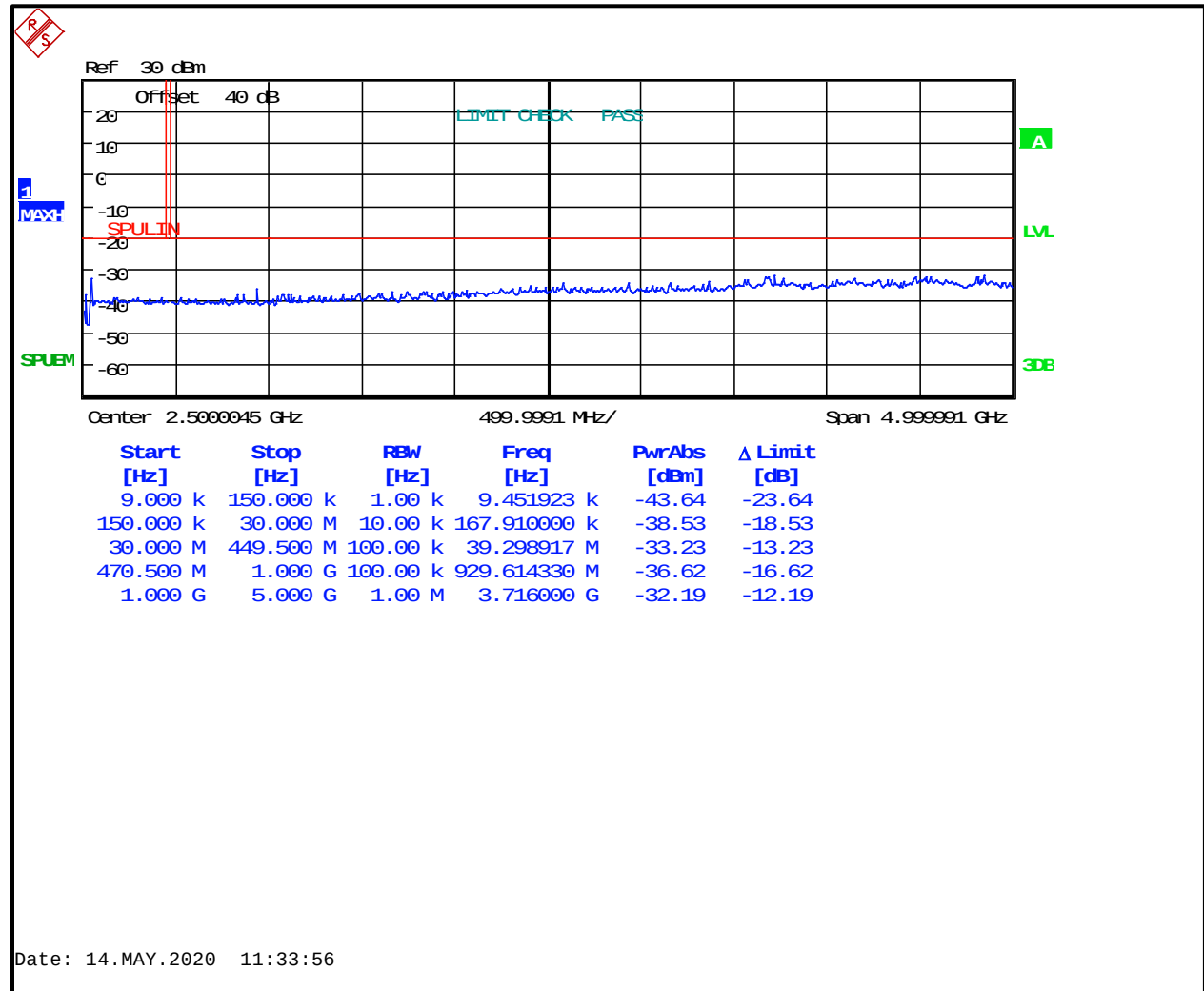
Limits: (50+10 LOG P(W)) for narrowband

The following channels (in MHz) were investigated:

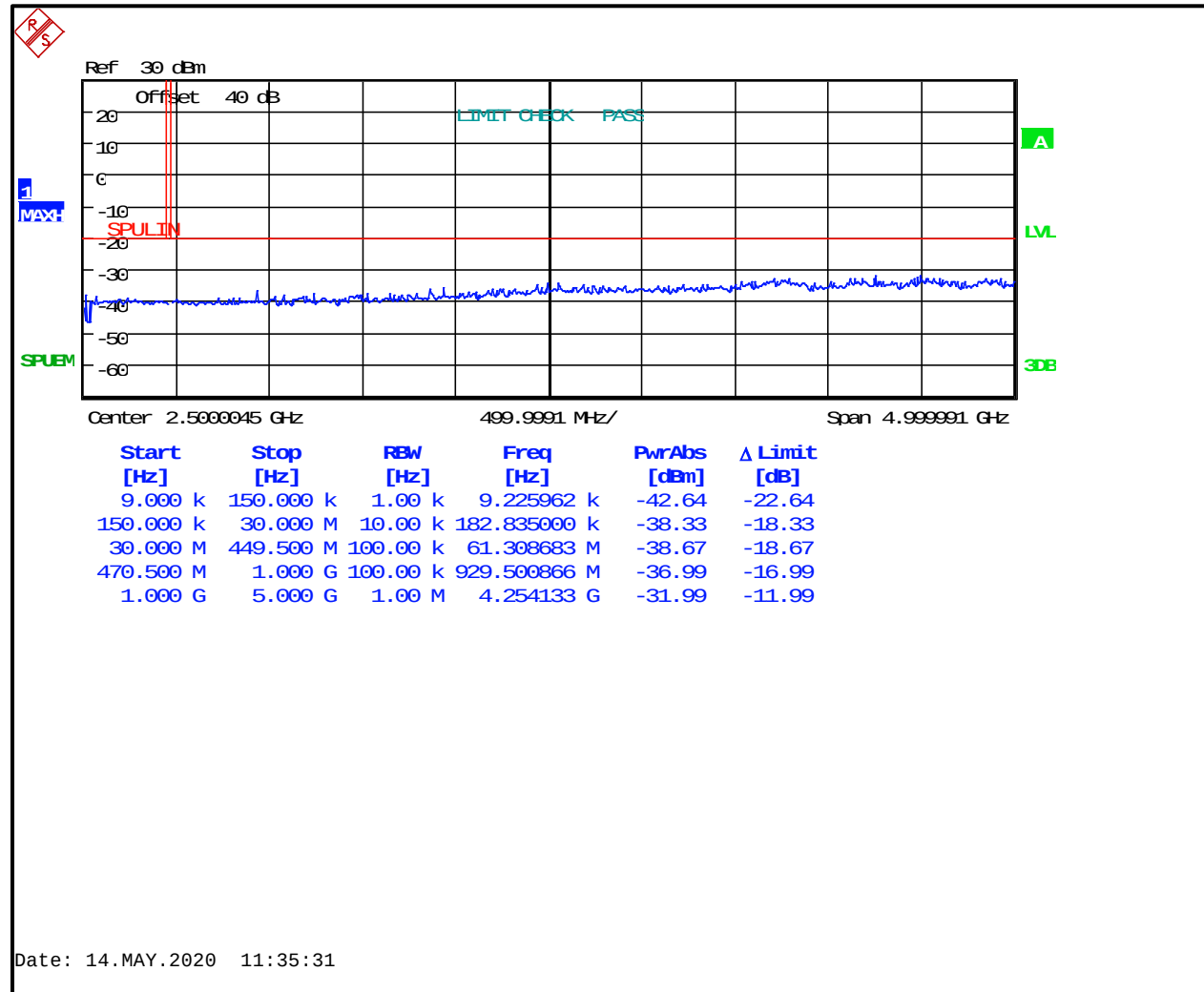
UHF Test Frequencies
450.0125
460.0000
469.9875

Both high and low power settings were checked; high power was found to be worst case, and is presented. All modes were investigated and analog mode is presented as representative data.

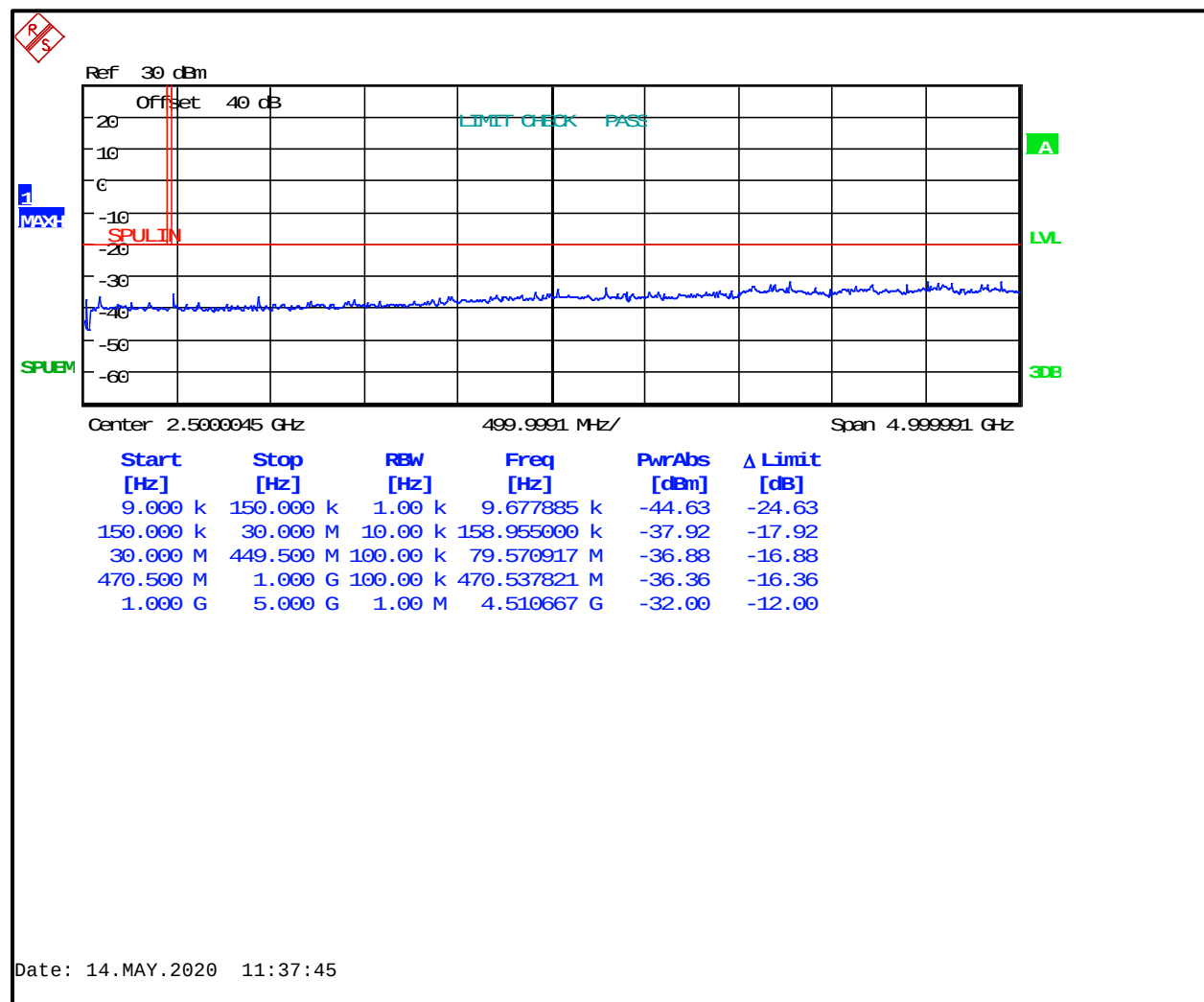
Plot 4-1: Spurious Emissions at Antenna Terminals – 450.0125 MHz



Plot 4-2: Spurious Emissions at Antenna Terminals – 460.0000 MHz



Plot 4-3: Spurious Emissions at Antenna Terminals – 469.9875 MHz



Results: The EUT is compliant.

Measurement uncertainties shown for these tests are expanded uncertainties expressed at the 95% confidence level using a coverage factor K=2. Measurement uncertainty: ±0.5 dB

Table 4-1: Test Equipment Used for Testing Spurious Emissions

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	04/26/2021
900819	Narda Microline	766-10	10 dB Attenuator; 20 W	06242	09/13/2020
901133	Par Electronics	400-512 (25W)	UHF Notch Filter	N/A	09/09/2020

Test Personnel:

Daniel Baltzell		May 14, 2020
EMC Test Engineer	Signature	Date of Test

5 FCC Parts 2.1053(a), 90.210: Radiated Emissions

5.1 Test Procedure

ANSI C63.26 §5.5

The spurious emissions levels were measured, and the device under test was replaced by a substitution antenna connected to a signal generator. This signal generator level was then corrected by subtracting the cable loss from the substitution antenna to the signal generator, and the gain of the antenna (dBi) was added to achieve the EIRP level, then converted from the corrected signal generator level (dBm) to dBc, and compared to the limit.

5.2 Test Data

Ambient Temperature: +17.8°C Relative Humidity: 27% Barometric Pressure: 101.6 kPa

Table 5-1: Field Strength of Spurious Radiation – 450.0125 MHz

Conducted Power 42.7 dBm; 18.6 W; Limit=50+10LogP=62.7 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
900.025	3.5	-70.8	0.3	20.4	93.5	-30.8
1350.038	7.6	-67.5	0.4	4.8	105.7	-43.0
1800.050	8.6	-65.7	0.4	7.3	101.5	-38.8
2250.063	8.7	-65.4	0.5	7.7	101.0	-38.3
2700.075	8.3	-65.6	0.6	7.6	101.4	-38.7
3150.088	8.4	-65.3	0.7	7.2	101.5	-38.8
3600.100	4.8	-68.8	0.8	7.5	104.7	-42.0
4050.113	2.9	-68.0	0.8	7.8	103.7	-41.0
4500.125	2.9	-68.4	0.9	9.1	102.9	-40.2

Table 5-2: Field Strength of Spurious Radiation – 460.0000 MHz

Conducted Power 43.3 dBm; 21.4 W; Limit=50+10LogP=63.3 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
920.000	2.3	-73.1	0.3	20.3	96.5	-33.2
1380.000	8.8	-65.3	0.4	4.7	104.3	-41.0
1840.000	7.4	-66.9	0.4	6.8	103.8	-40.5
2300.000	8.8	-65.3	0.5	7.7	101.5	-38.2
2760.000	8.0	-65.9	0.6	7.8	102.0	-38.7
3220.000	8.4	-65.3	0.7	7.2	102.1	-38.8
3680.000	2.3	-71.2	0.8	7.5	107.8	-44.5
4140.000	2.4	-68.6	0.8	8.1	104.6	-41.3
4600.000	3.1	-68.3	0.9	9.0	103.5	-40.2

Table 5-3: Field Strength of Spurious Radiation – 469.9875 MHz

Conducted Power 43 dBm; 20 W; Limit=50+10LogP=63 dBc

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss to Transmit Antenna (dB)	Substitution Antenna Gain (dBi)	Corrected Signal Generator Level (dBc)	Margin (dB)
939.975	5.0	-69.8	0.3	20.7	92.4	-29.4
1409.963	6.8	-67.8	0.4	4.7	106.5	-43.5
1879.950	7.7	-66.6	0.5	6.4	103.6	-40.6
2349.938	14.0	-60.1	0.5	7.5	96.1	-33.1
2819.925	8.0	-65.9	0.6	7.9	101.6	-38.6
3289.913	8.8	-64.9	0.7	7.3	101.3	-38.3
3759.900	2.5	-71.0	0.8	7.2	107.5	-44.5
4229.888	2.9	-68.5	0.9	8.5	103.8	-40.8
4699.875	2.8	-68.7	0.9	9.0	103.6	-40.6

Results: The EUT is compliant.

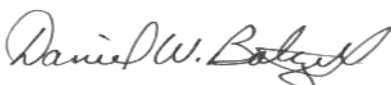
Measurement uncertainties shown for these tests are expanded uncertainties expressed at 95% confidence level using a coverage factor k = 2.

Radiated Emissions: ±4.6 dB

Table 5-4: Test Equipment Used for Testing Field Strength of Spurious Radiation

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	OATS1	N/A
901592	Insulated Wire Inc.	KPS-1503-3600-KPR	SMK RF Cables 20'	NA	01/29/2021
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	N/A
901669	ETS-Lindgren	3142E	Biconilog Antenna (30 MHz – 6000 MHz)	00166065	04/24/2022
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	04/26/2021
901582	Rohde & Schwarz	1167.0000.02	Signal Generator	101903	04/24/2021

Test Personnel:

Daniel Baltzell EMC Test Engineer	 Signature	May 13, 2020 Date of Test
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6 FCC Parts 2.1049(c)(1), 90.210: Bandwidths/Masks

Occupied Bandwidth - Compliance with the Emission Masks

6.1 Test Procedure

ANSI C63.26 §5.4

Notes: FCC 90.210 specifies mask D

Applicable Emission Masks		
Frequency Band (MHz)	Mask for Equipment With Audio Low Pass Filter	Mask for Equipment Without Audio Low Pass Filter
Below 25 ¹	A or B	A or C
25–50.....	B	C
72–76.....	B	C
150–174 ²	B, D, or E	C, D, or E
150 Paging-only	B	C
220–222	F	F
421–512 ²	B, D, or E	C, D, or E
450 Paging-only	B	G
806–809/851–854	B	H
809–824/854–869 ³	B	G
896–901/935–940	I	J
902–928	K	K
929–930	B	G
4940–4990 MHz	L or M	L or M
5850–5925 ⁴		
All other bands	B	C

¹ Equipment using single sideband J3E emission must meet the requirements of Emission Mask A. Equipment using other emissions must meet the requirements of Emission Mask B or C, as applicable.

² Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask B or C, as applicable. Equipment designed to operate with a 12.5 kHz channel bandwidth must meet the requirements of Emission Mask D, and equipment designed to operate with a 6.25 kHz channel bandwidth must meet the requirements of Emission Mask E.

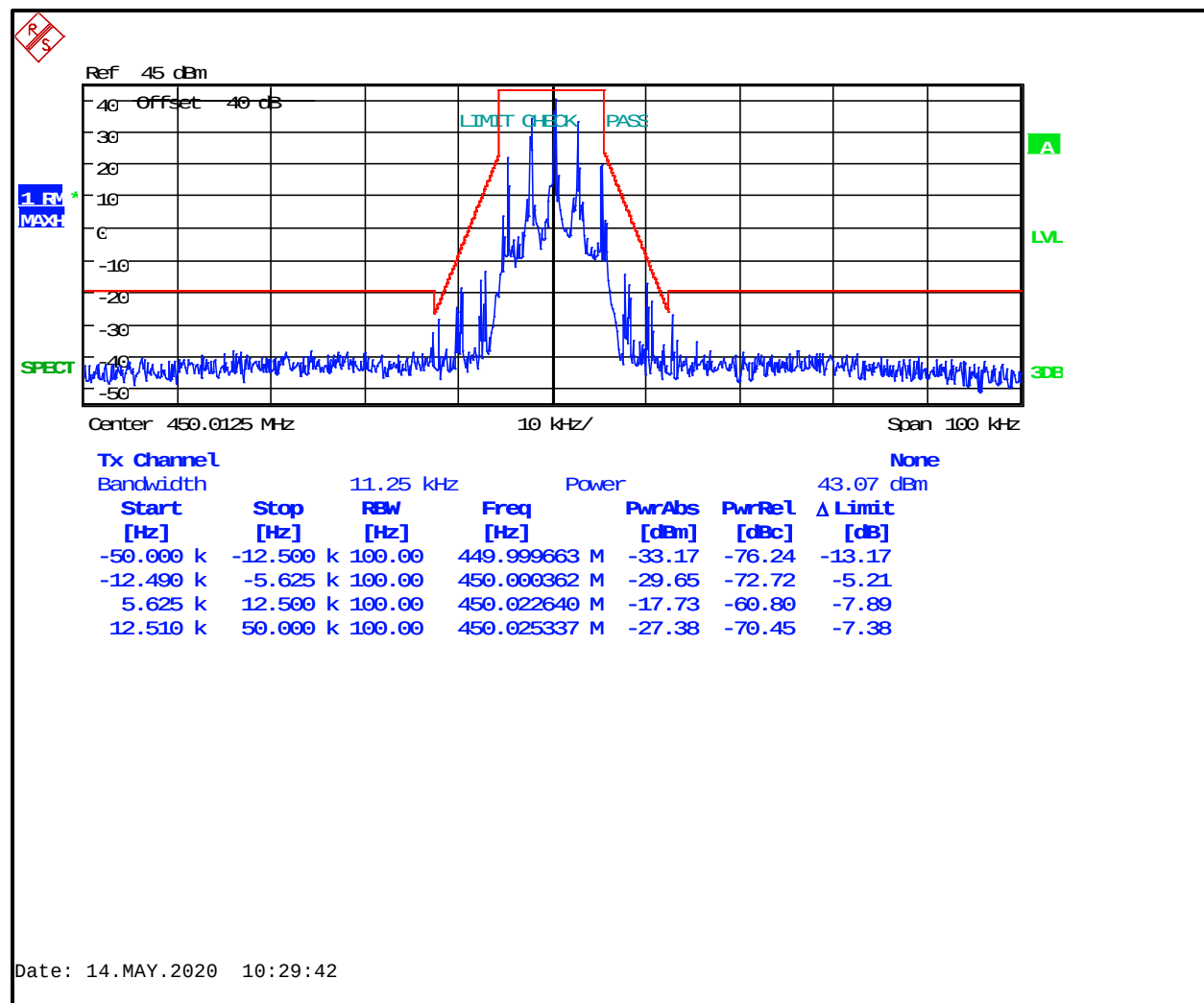
³ Equipment used in this licensed to EA or non-EA systems shall comply with the emission mask provisions of §90.691.

⁴ DSRCS Roadside Unit equipment in the 5850–5925 MHz band is governed under subpart M of this part.

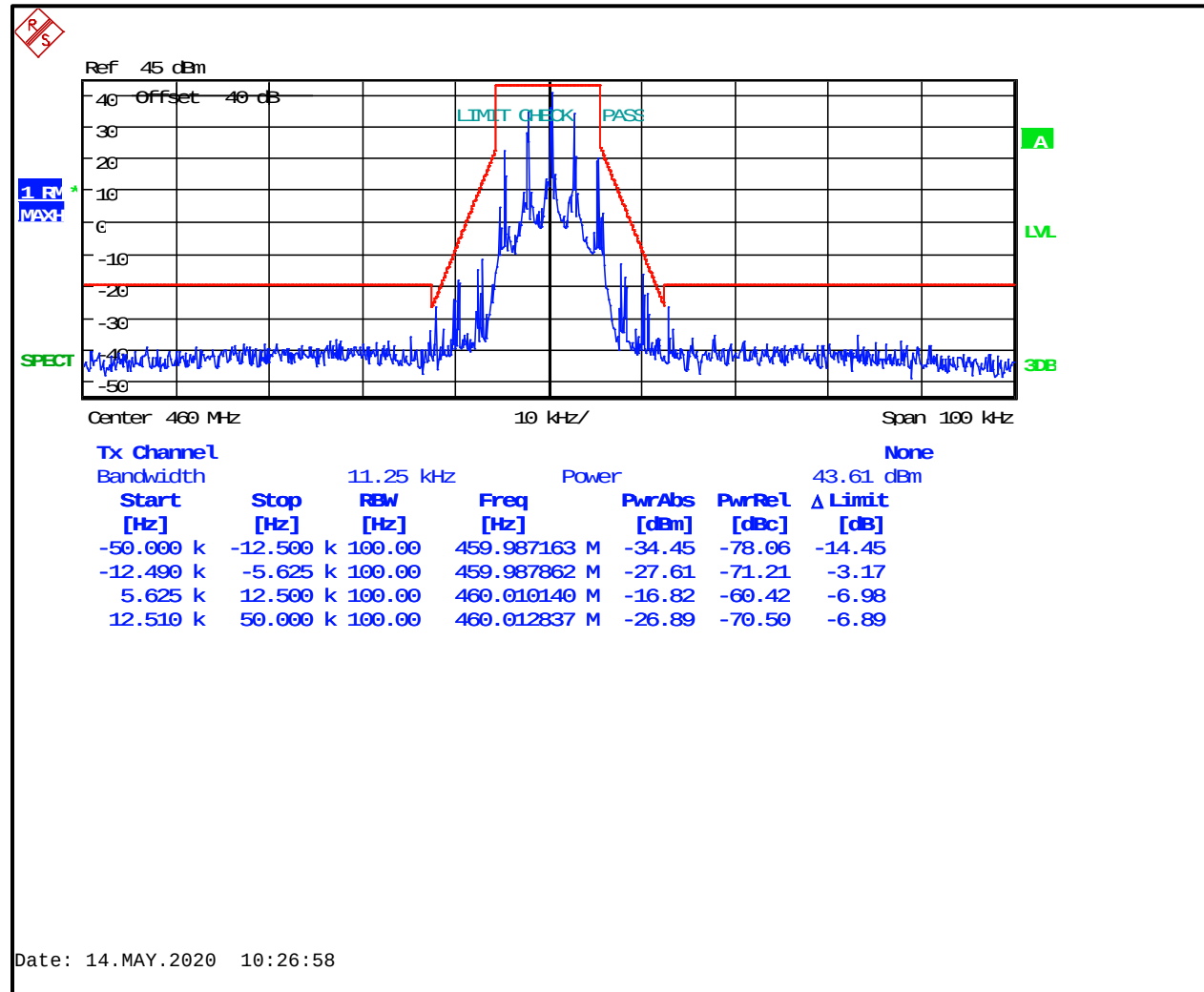
6.2 Test Data

Ambient Temperature: +24.1°C Relative Humidity: 31% Barometric Pressure: 101.3 kPa

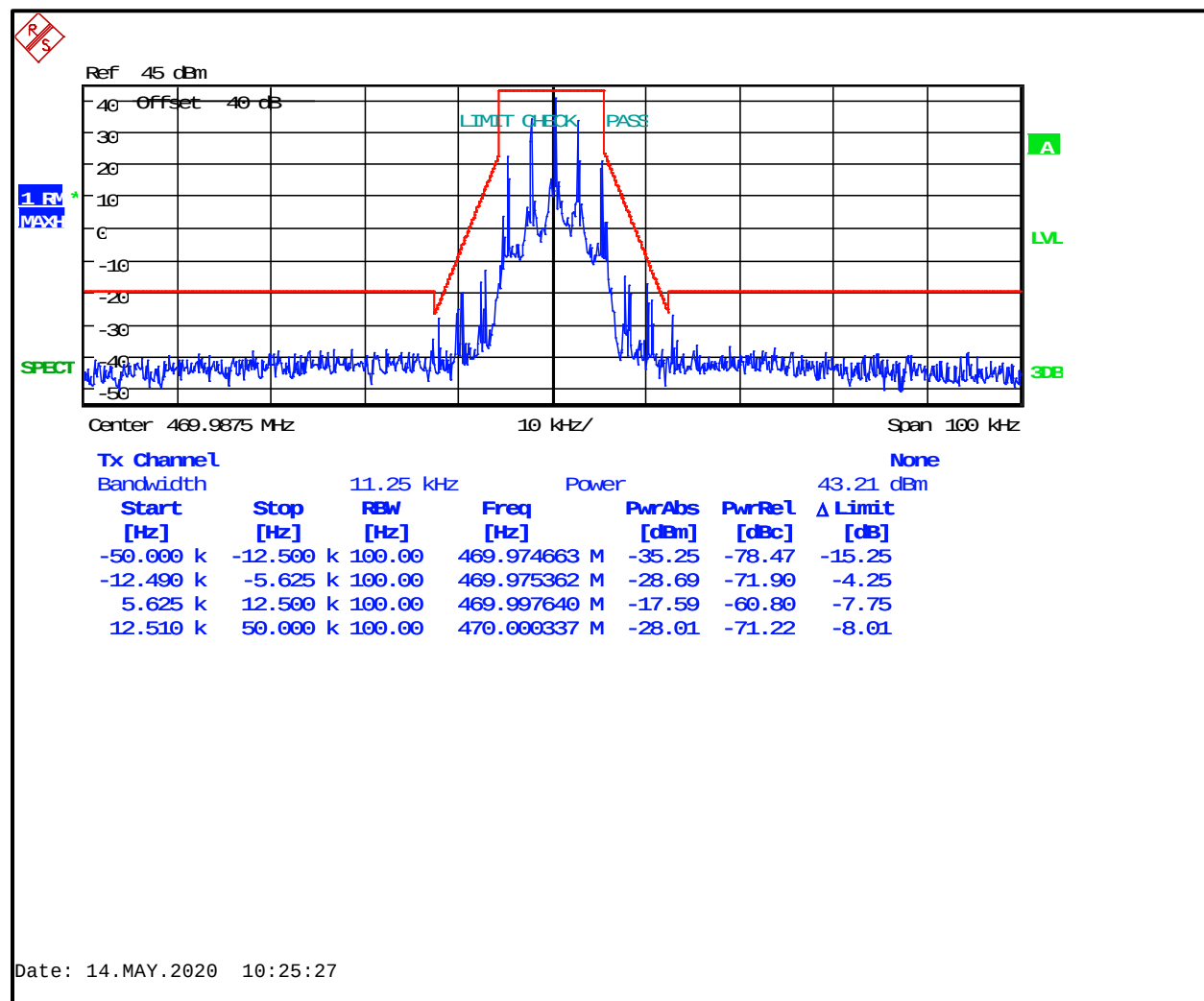
Plot 6-1: Occupied Bandwidth – 450.0125 MHz; Narrowband Analog; Mask D



Plot 6-2: Occupied Bandwidth – 460.0000 MHz; Narrowband Analog; Mask D



Plot 6-3: Occupied Bandwidth – 469.9875 MHz; Narrowband Analog; Mask D



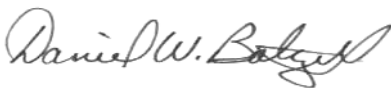
Results: The EUT is compliant.

Measurement uncertainty: Measurement uncertainties shown for these tests are expanded uncertainties expressed at 95% confidence level using a coverage factor $k = 2$. Measurement uncertainty = ± 2 dB.

Table 6-1: Test Equipment Used for Testing Occupied Bandwidth

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	04/26/2021
901724	API Weinschel, Inc.	48-40-34	40 dB 100W Attenuator	CJ8921	09/09/2020
901057	Hewlett Packard	3336B	Synthesizer/ Level Generator	2514A02585	01/31/2021

Test Personnel:

Daniel Baltzell EMC Test Engineer	 Signature	May 14, 2020 Date of Test
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7 FCC Parts 2.1055, 90.213: Frequency Stability

7.1 Test Procedure

ANSI C63.26 §5.6

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

The EUT was evaluated over the temperature range -30°C to +50°C.

The temperature was initially set to -30°C and a 1-hour period was observed for stabilization of the EUT. The frequency stability was measured within one minute after application of primary power to the transmitter. The temperature was raised at intervals of 10 degrees centigrade through the range. A ½-hour period was observed to stabilize the EUT at each measurement step and the frequency stability was measured within one minute after application of primary power to the transmitter. Additionally, the power supply voltage of the EUT was varied +/-15% nominal input voltage.

90.213: Base stations – 1.5 ppm.

7.2 Test Data

Ambient Temperature: +24.1°C Relative Humidity: 31% Barometric Pressure: 101.3 kPa

7.2.1 Temperature Frequency Stability

Table 7-1: Temperature Frequency Stability – 450.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	450.012500	0.00
-20	450.012500	0.00
-10	450.012500	0.00
0	450.012500	0.00
10	450.012500	0.00
20 (reference)	450.012500	0.00
30	450.012500	0.00
40	450.012500	0.00
50	450.012500	0.00

Table 7-2: Temperature Frequency Stability – 460.0000 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	459.999996	-0.01
-20	460.000000	0.00
-10	460.000000	0.00
0	460.000000	0.00
10	460.000000	0.00
20 (reference)	460.000000	0.00
30	460.000000	0.00
40	460.000000	0.00
50	460.000000	0.00

Table 7-3: Temperature Frequency Stability – 469.9875 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	469.987500	0.00
-20	469.987500	0.00
-10	469.987500	0.00
0	469.987500	0.00
10	469.987500	0.00
20 (reference)	469.987500	0.00
30	469.987500	0.00
40	469.987500	0.00
50	469.987500	0.00

7.2.2 Frequency Stability/Voltage Variation

Table 7-4: Frequency Stability/Voltage Variation – 450.0125 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
20.4	450.012500	0.00
24.(reference)	450.012500	0.00
27.6	450.012500	0.00

Table 7-5: Frequency Stability/Voltage Variation – 460.0000 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
20.4	459.999996	-0.01
24.(reference)	460.000000	0.00
27.6	459.999996	-0.01

Table 7-6: Frequency Stability/Voltage Variation – 469.9875 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
20.4	469.987500	0.00
24.(reference)	469.987500	0.00
27.6	469.987500	0.00

Results: The EUT is compliant.

Measurement uncertainties shown for these tests are expanded Gaussian uncertainties expressed at 95% confidence level using a coverage factor $k = 2$. Measurement uncertainty = ± 12 Hz.

Table 7-7: Test Equipment Used for Testing Frequency Stability

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900946	Tenney Engineering, Inc.	TH65	Temperature Chamber with Humidity	11380	04/07/2022
901672	Rohde & Schwarz	FSEM30	Spectrum Analyzer	FSEM30	04/25/2022
901724	API Weinschel, Inc.	48-40-34	40 dB 100W Attenuator	CJ8921	09/09/2020
901350	Meterman	33XR	Multimeter	040402802	09/20/2021

Test Personnel:

Daniel Baltzell
EMC Test Engineer



Signature

May 14, 2020
Date of Test

8 FCC Part 90.214: Transient Frequency Response

8.1 Test Procedure

ANSI C63.26 §6.5.2.2

§90.214 Transient frequency behavior: Transmitters designed to operate in the 150-174 MHz and 421-512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Time intervals ^{1 2}	Maximum frequency difference ³	All equipment	
		150 to 174 MHz	421 to 512 MHz

Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels

t ₁ ⁴	±25.0 kHz	5.0 ms	10.0ms
t ₂	±12.5 kHz	20.0 ms	25.0ms
t ₃ ⁴	±25.0 kHz	5.0 ms	10.0ms

Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels

t ₁ ⁴	±12.5 kHz	5.0 ms	10.0ms
t ₂	±6.25 kHz	20.0 ms	25.0ms
t ₃ ⁴	±12.5 kHz	5.0 ms	10.0ms

Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels

t ₁ ⁴	±6.25 kHz	5.0 ms	10.0ms
t ₂	±3.125 kHz	20.0 ms	25.0ms
t ₃ ⁴	±6.25 kHz	5.0 ms	10.0ms

t_{on} is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.

t₁ is the time period immediately following t_{on}.

t₂ is the time period immediately following t₁.

t₃ is the time period from the instant when the transmitter is turned off until t_{off}.

t_{off} is the instant when the 1 kHz test signal starts to rise.

² During the time from the end of t₂ to the beginning of t₃, the frequency difference must not exceed the limits specified in §90.213.

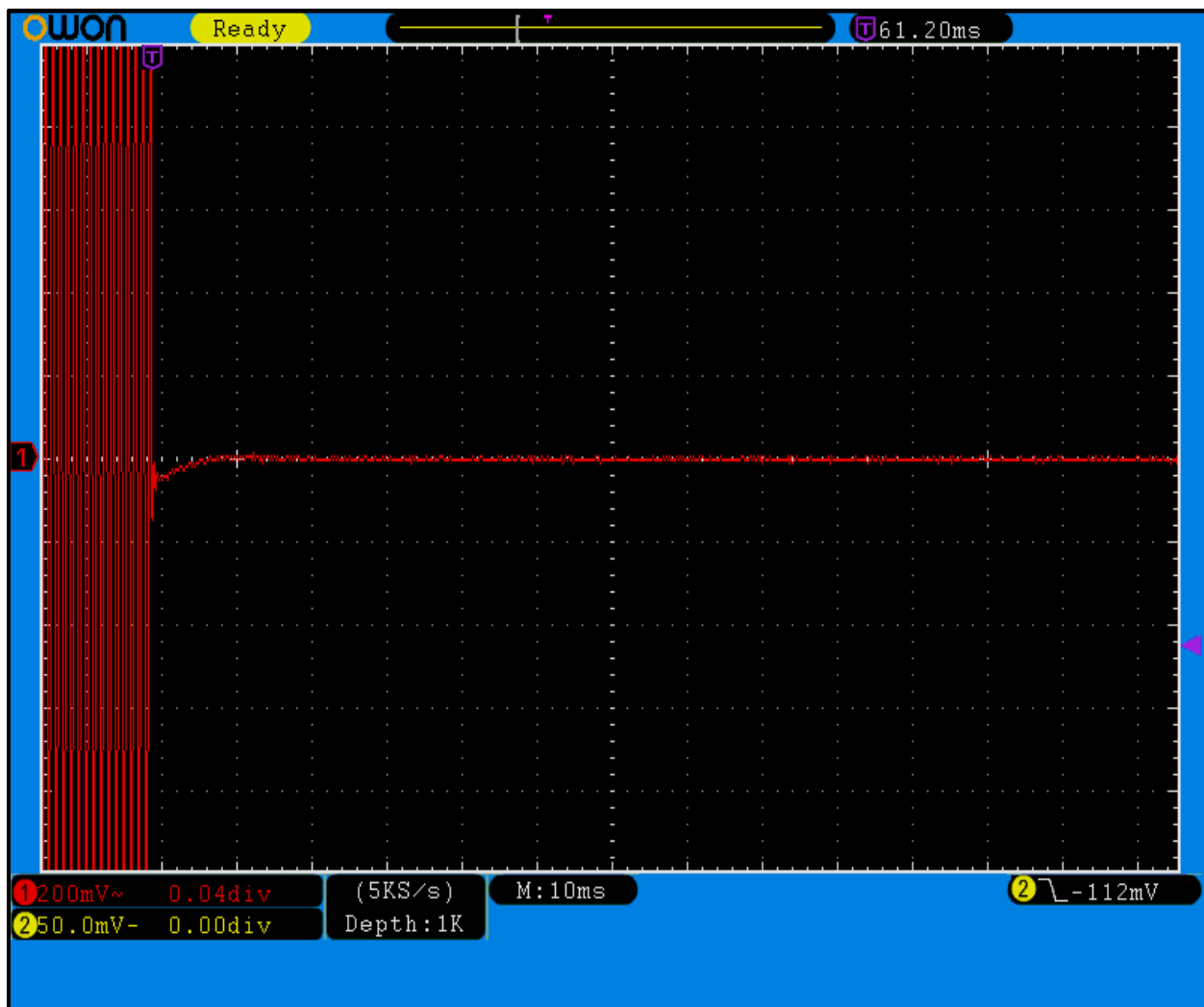
³ Difference between the actual transmitter frequency and the assigned transmitter frequency.

⁴ If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

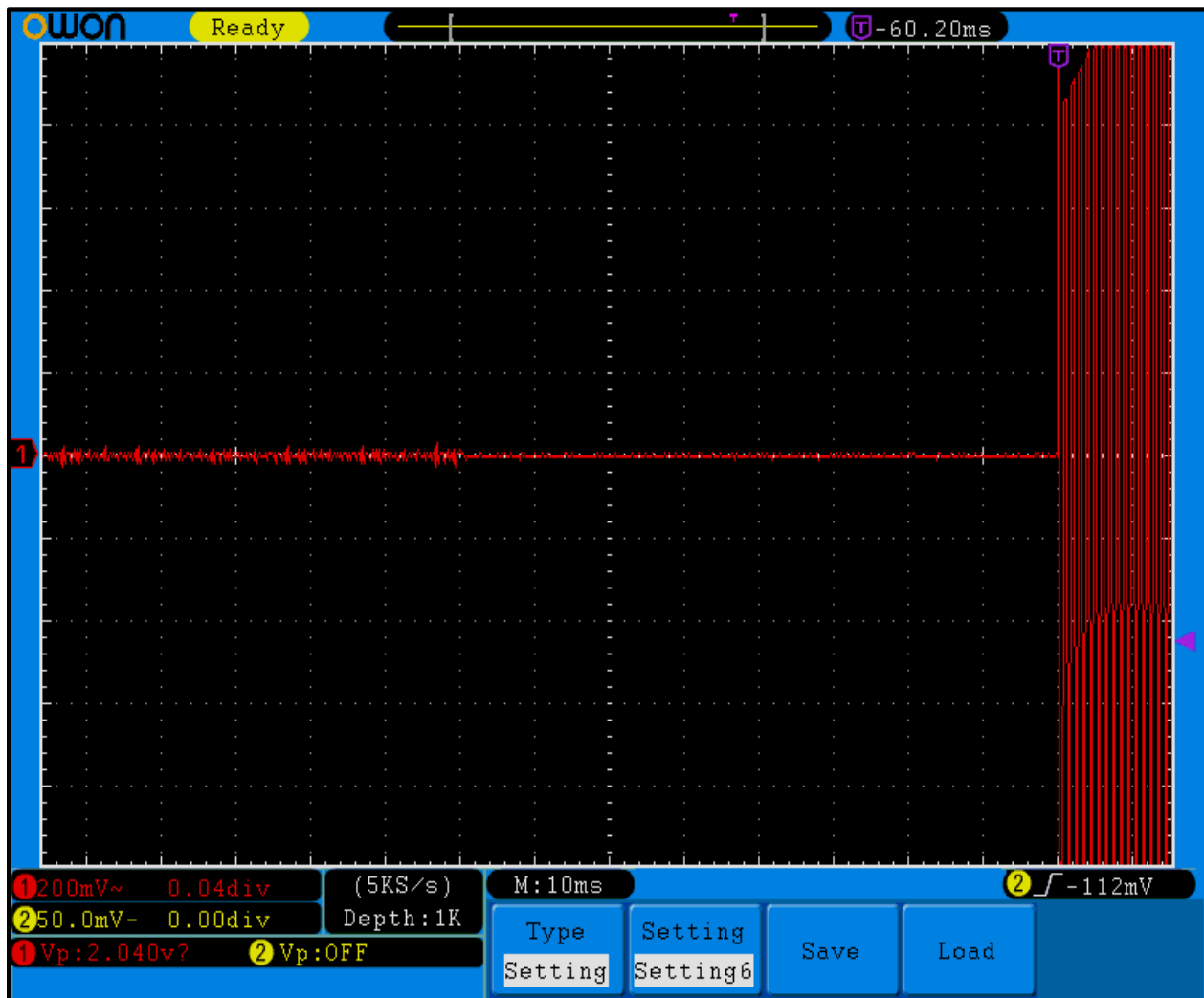
8.2 Test Data

Ambient Temperature: +24.1°C Relative Humidity: 32% Barometric Pressure: 100.6 kPa

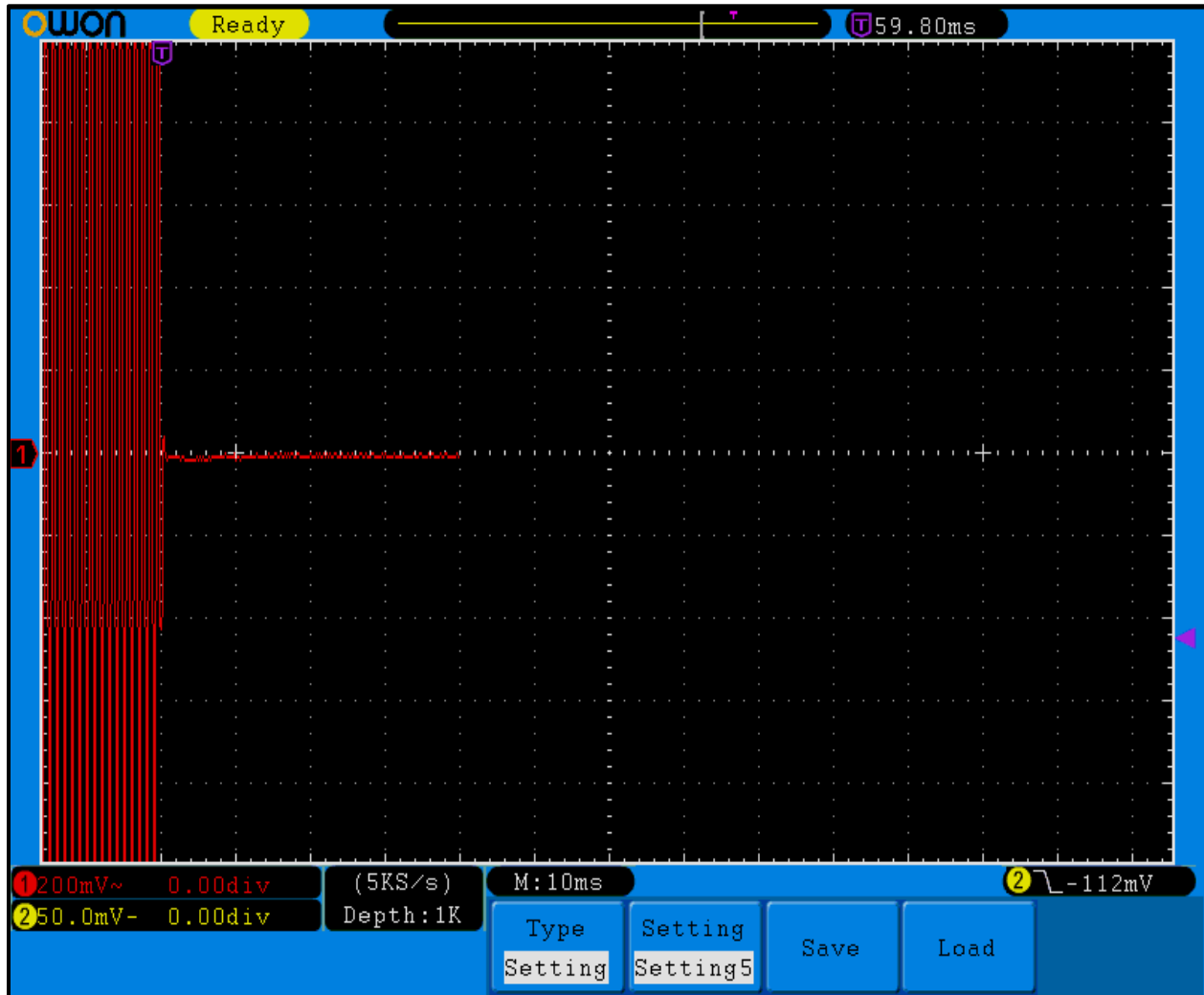
Plot 8-1: Transient Frequency Behavior – NB; Carrier On Time; 450.0125 MHz



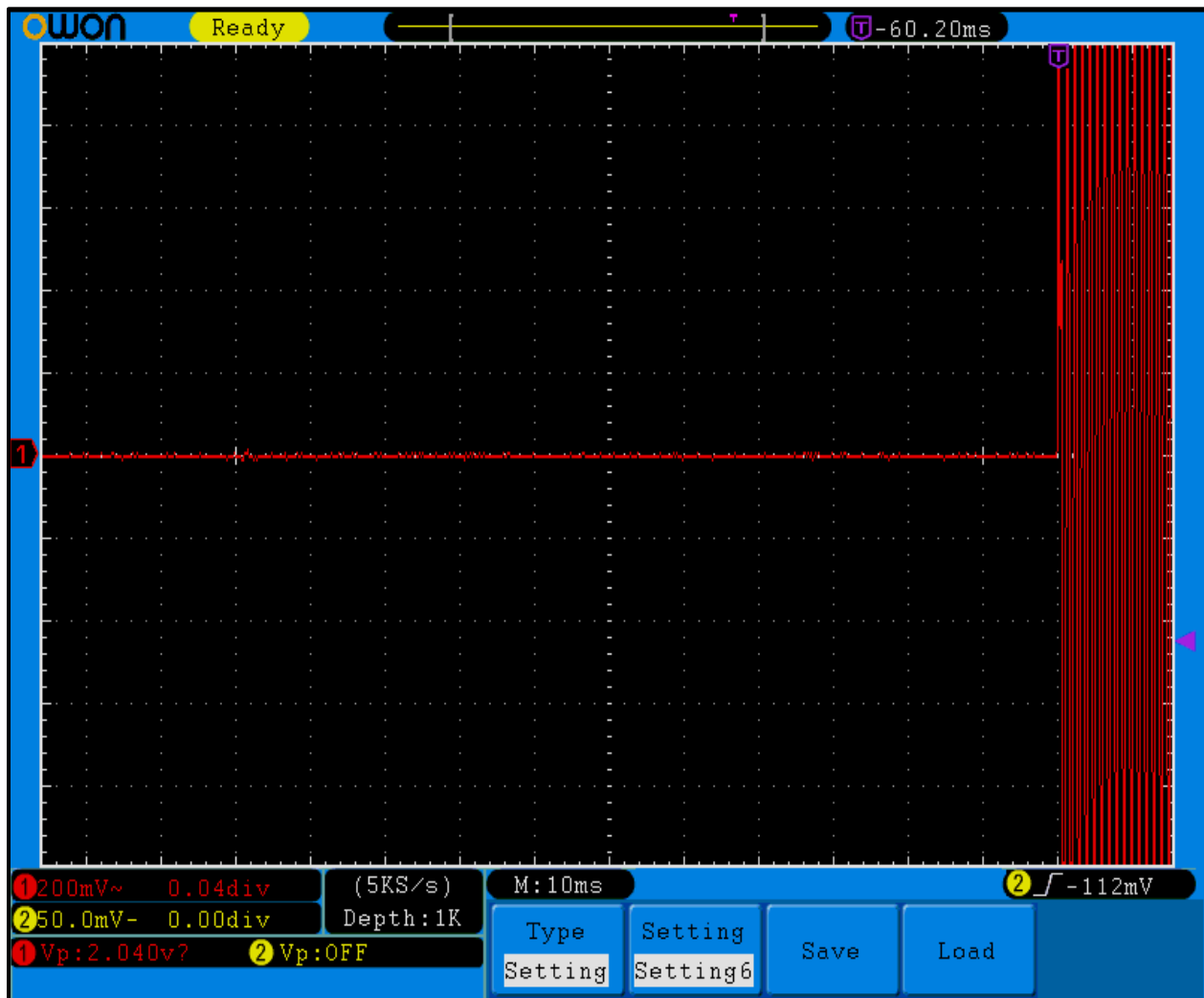
Plot 8-2: Transient Frequency Behavior – NB; Carrier Off Time; 450.0125 MHz



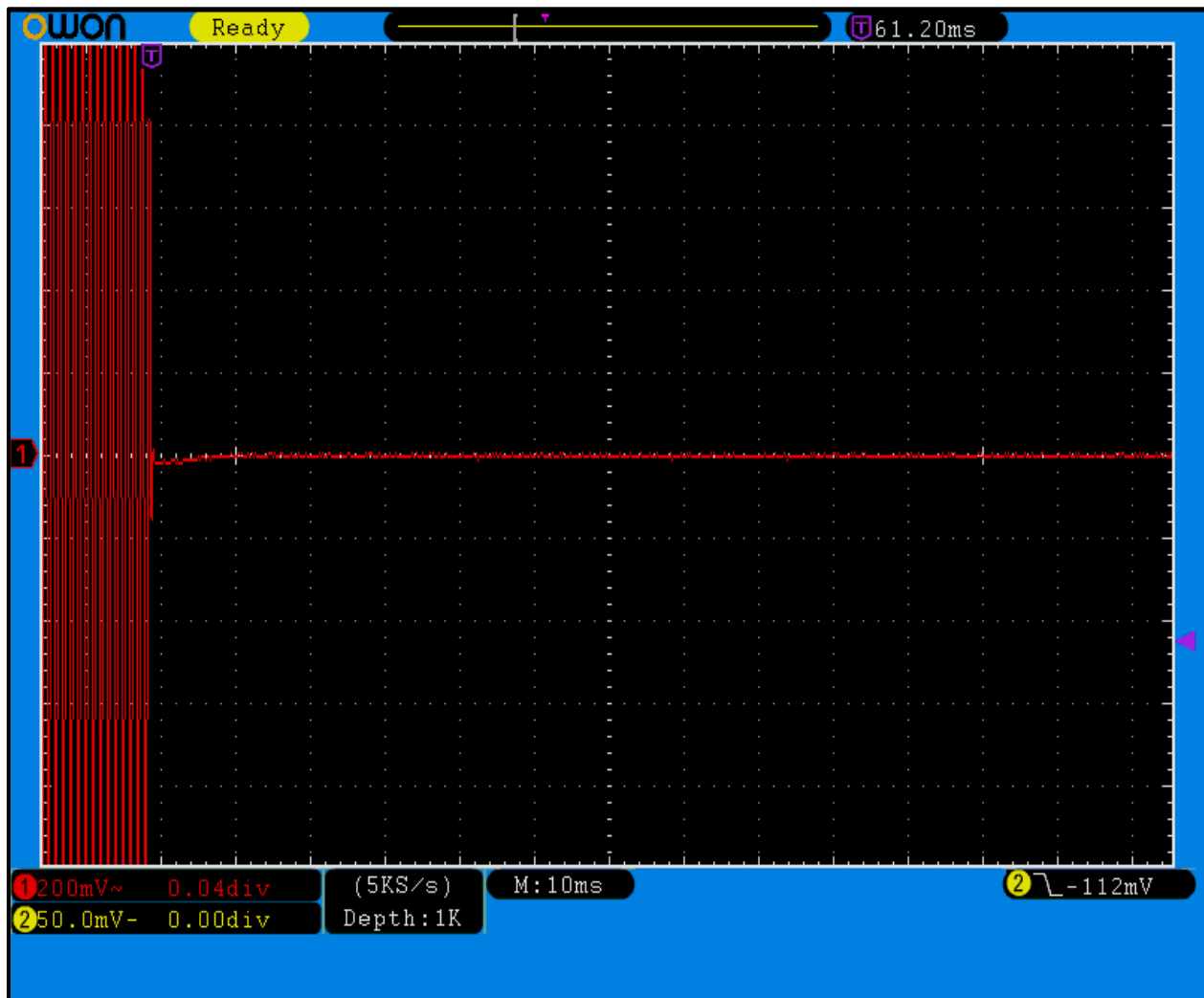
Plot 8-3: Transient Frequency Behavior – NB; Carrier On Time; 460.0000 MHz



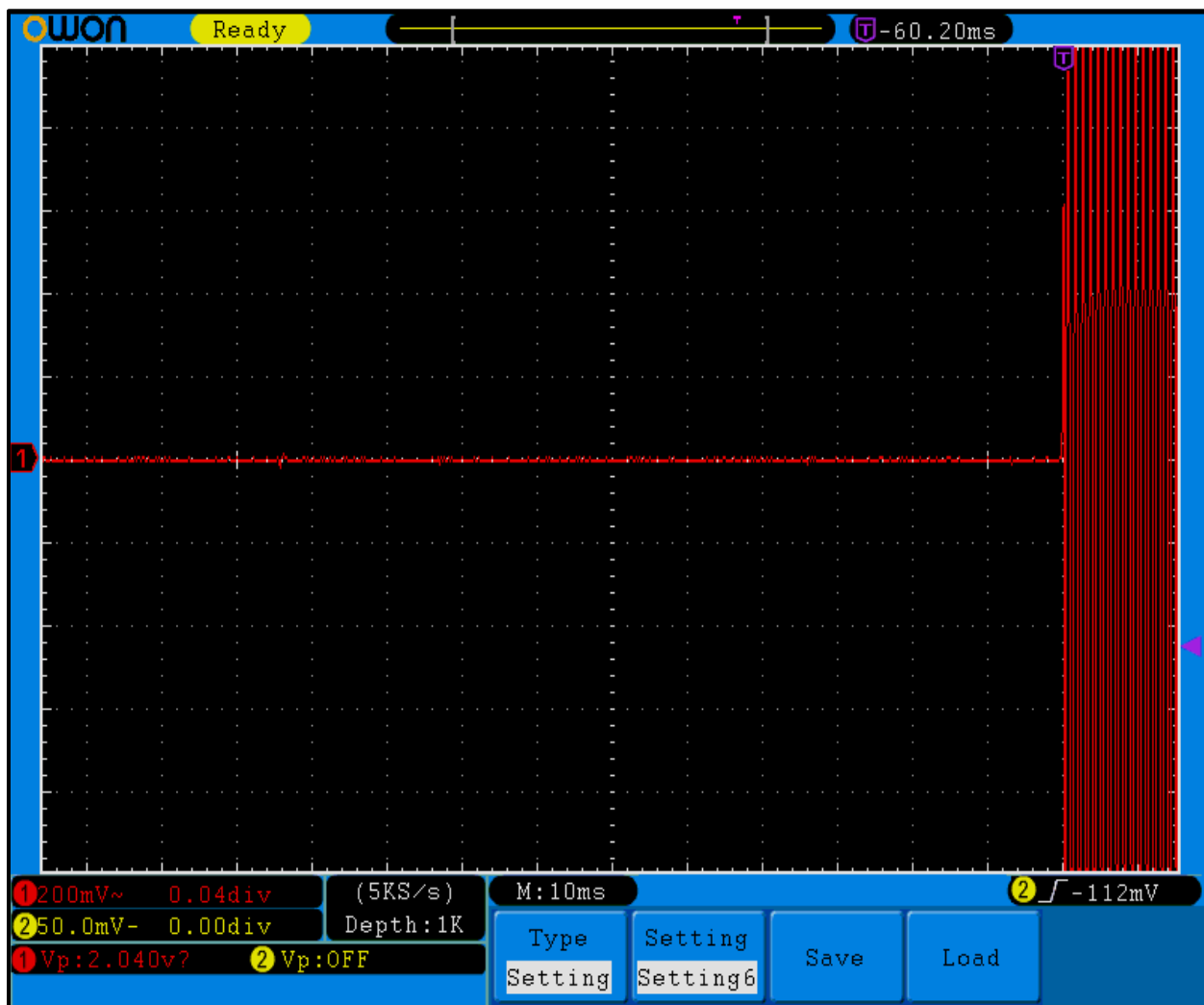
Plot 8-4: Transient Frequency Behavior – NB; Carrier Off Time; 460.0000 MHz



Plot 8-5: Transient Frequency Behavior – NB; Carrier On Time; 469.9875 MHz



Plot 8-6: Transient Frequency Behavior – NB; Carrier Off Time; 469.9875 MHz



Results: The EUT is compliant.

Measurement uncertainties shown for these tests are expanded uncertainties expressed at 95% confidence level using a coverage factor $k = 2$. Measurement uncertainty = ± 100 Hz

Table 8-1: Test Equipment Used for Testing Transient Frequency Behavior

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901610	OWON	SDS7102V	Oscilloscope	SDS71021312068	04/02/2021
900917	Hewlett Packard	8648C	Synthesized. Signal Generator (9 kHz - 3200 MHz)	3537A01741	02/01/2021
900948	Weinschel	47-10-43	Attenuator DC-18GHz, 10 dB, 50W	BH1487	09/13/2020
901346	Pasternack	1795	Power Divider (10 MHz - 1 GHz)	4067	N/A
900352	Werlatone	Directional Coupler	Coupler	C1795/4989	09/09/2020
901263	Agilent Technologies	.01-12 GHz	SMA Detector	2936A05505	N/A
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	02/01/2021
901724	Aeroflex	48-40-34	40 dB Attenuator	CJ8921	09/09/2020
901477	Micro-Coax	UFA210A-0- 0360-300300	RF cable 0.04 - 18 GHz	212349-002	01/29/2021
901235	IW Microwave Products	KPS-1503- 360-KPS	High Frequency RF Cables	36"	10/29/2020
901727	Insulated Wire Inc.	KPS-1503- 360-KPR	SMK RF Cables 36"	NA	08/20/2020

Test Personnel:

Daniel Baltzell		May 15, 2020
EMC Test Engineer	Signature	Date of Test

9 FCC Part 2.1047(a)(b): Modulation Characteristics

9.1 Test Procedures

9.1.1 Audio Frequency Response

ANSI C63-26 §5.3.3

The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic.

The input audio level at 1000 Hz was set to produce 20% of the rated system deviation. This point is shown as the 0 dB reference level, noted DEVref. The audio signal generator was varied from 100 Hz to 5 kHz with the input level held constant. The deviation in kHz was recorded using a modulation analyzer as DEVfreq. The response in dB relative to 1 kHz was calculated as follows:

Audio Frequency Response = $20 \text{ LOG } (\text{DEVfreq}/\text{DEVref})$

9.1.2 Audio Low Pass Filter Response

No Low Pass Filter present

The Audio Low Pass Filter Response is the frequency response of the post limiter low pass filter circuit above 3000 Hz.

9.1.3 Modulation Limiting

ANSI C63-26 §5.3.2

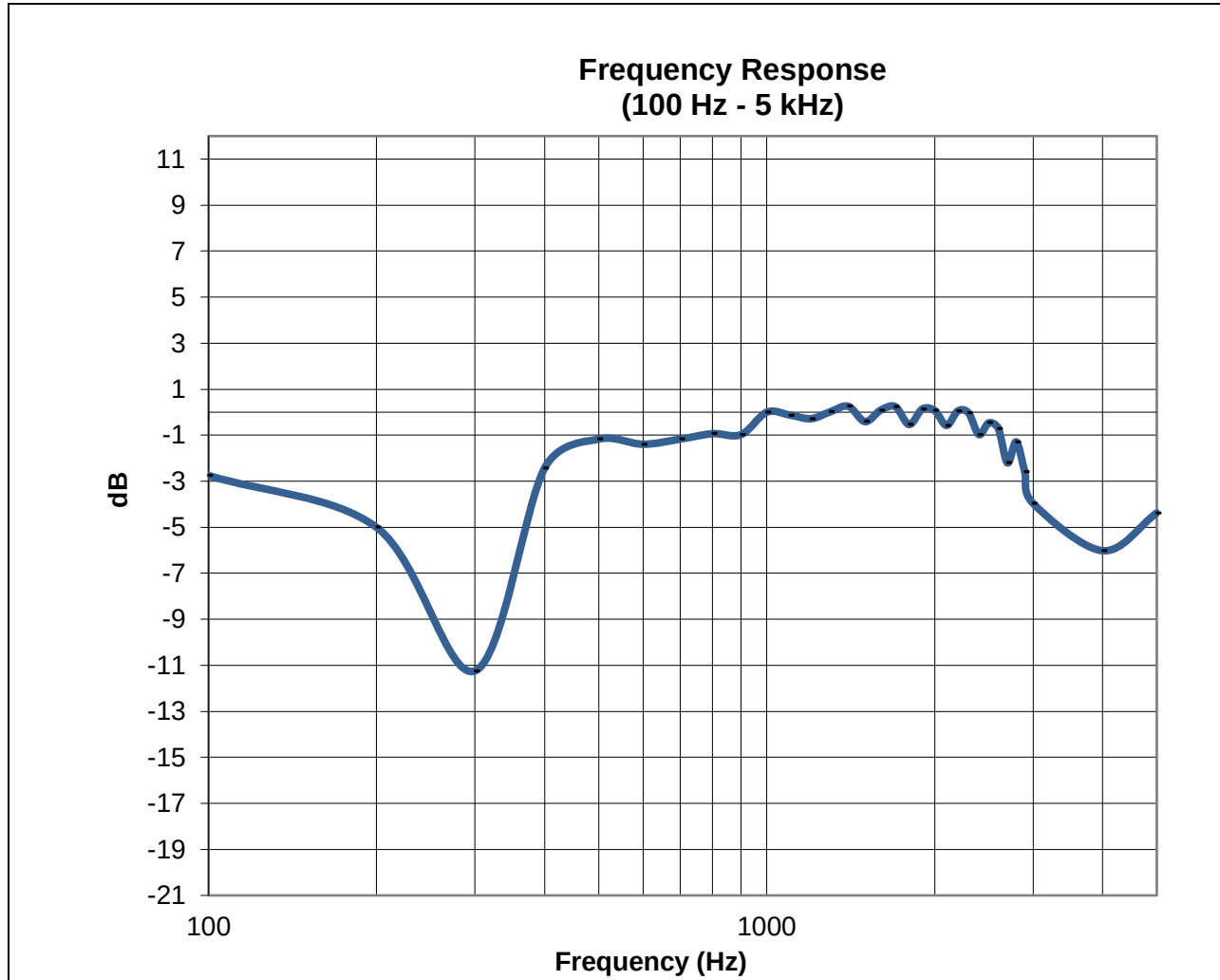
The transmitter was adjusted for full rated system deviation. The audio input level was adjusted for 60% of rated system deviation at 1000 Hz. Using this level (0 dB) as a reference, the audio input level was varied from the reference +/-20 dB for modulation frequencies of 300 Hz, 1,000 Hz, and 2,500 Hz. The system deviation obtained as a function of the input level was recorded. Both positive and negative peak deviations were recorded.

9.2 Test Data

Ambient Temperature: +24.2°C Relative Humidity: 23% Barometric Pressure: 101.6 kPa

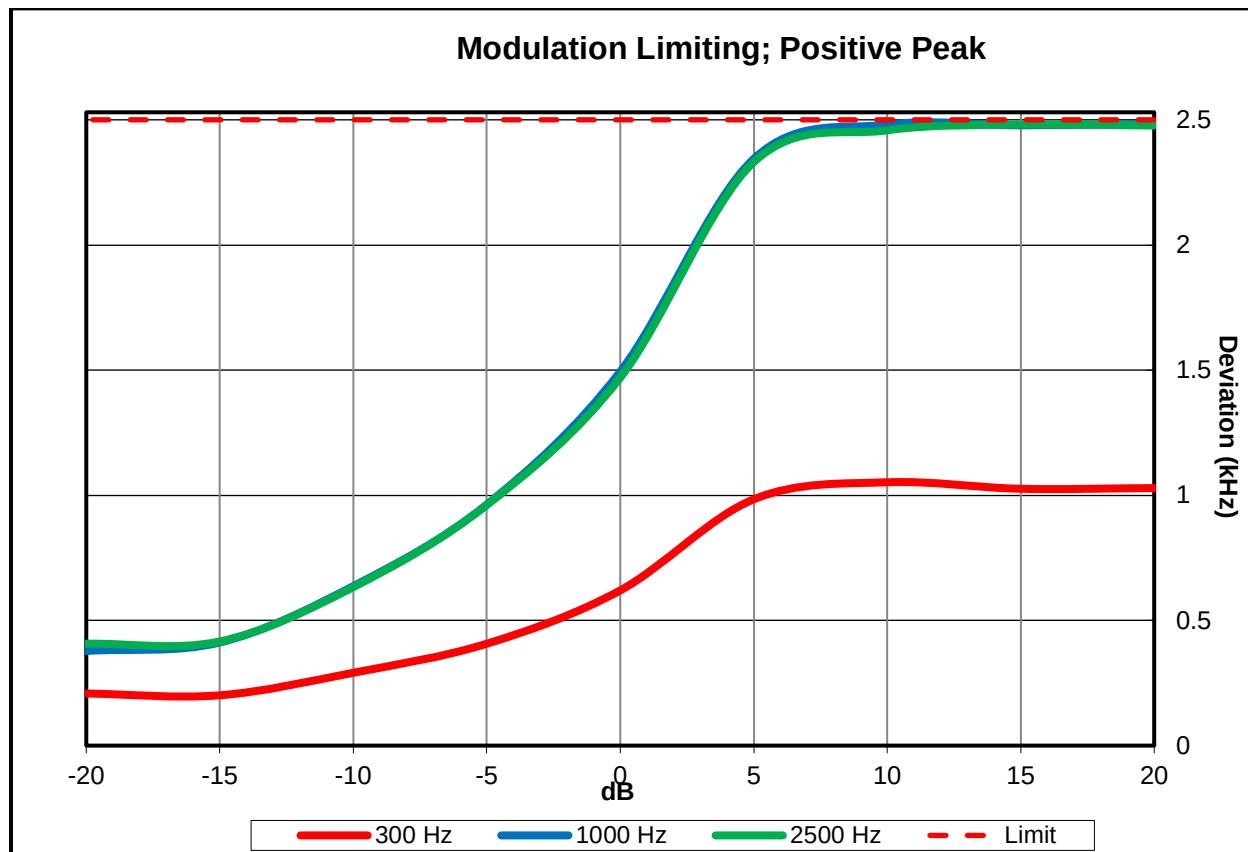
9.2.1 Frequency Response of Audio Modulating Circuit

Plot 9-1: Modulation Characteristics – Frequency Response – 460.0000 MHz



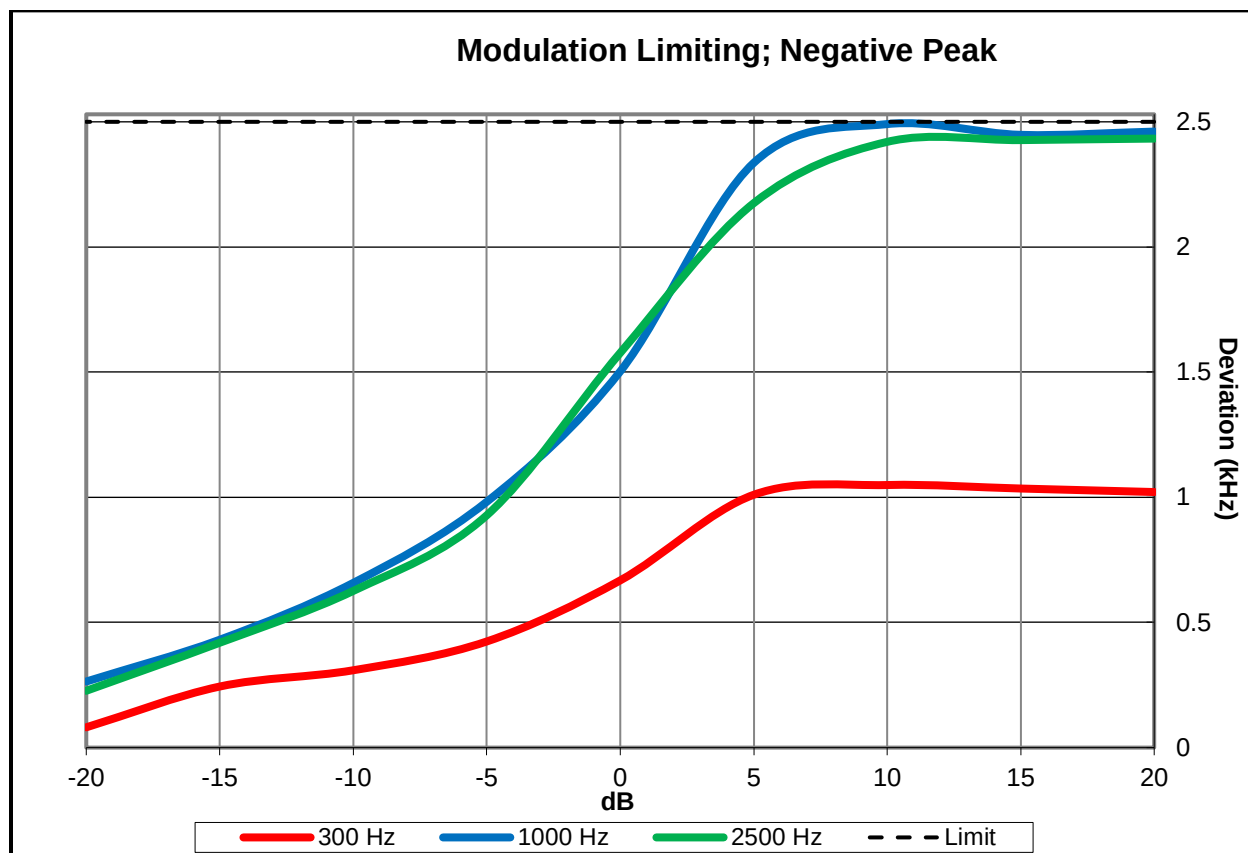
9.2.2 Modulation Limiting

Plot 9-2: Modulation Characteristics – Modulation Limiting – 460.0000 MHz; Positive Peak



Normalized Injection Amplitude (dB)	Injection Frequency (Hz) Positive Peak		
	300	1000	2500
20	1.029	2.484	2.477
15	1.026	2.478	2.481
10	1.052	2.481	2.458
5	0.984	2.344	2.331
0	0.62	1.494	1.47
-5	0.407	0.963	0.961
-10	0.291	0.637	0.633
-15	0.201	0.412	0.416
-20	0.208	0.378	0.407

Plot 9-3: Modulation Characteristics – Modulation Limiting – 460.0000 MHz; NB, Negative Peak



Normalized Injection Amplitude (dB)	Injection Frequency (Hz) Negative Peak		
	300	1000	2500
20	1.021	2.461	2.433
15	1.035	2.448	2.427
10	1.049	2.491	2.42
5	1.01	2.336	2.175
0	0.668	1.503	1.577
-5	0.424	0.982	0.928
-10	0.309	0.658	0.626
-15	0.244	0.431	0.419
-20	0.081	0.264	0.227

Results: The EUT is compliant.

Measurement uncertainty: $\pm 1.4\%$. This measurement uncertainty is an expanded uncertainty for 95% confidence level received with a coverage factor $k=2$.

Table 9-1: Test Equipment Used for Testing Modulation Requirements

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901057	Hewlett Packard	3336B	Synthesizer/ Level Generator	2514A02585	01/31/2021
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	02/01/2021
901537	Aeroflex	48-40-34	40 dB Attenuator	CB6628	09/09/2020

Test Personnel:

Daniel Baltzell		May 13, 2020
EMC Test Engineer	Signature	Date of Test

10 FCC Part 2.202: Necessary Bandwidth and Emission Bandwidth

Voice – 12.5 kHz channel separation FM

Calculation:

Max modulation (M) in kHz: 3.0

Max deviation (D) in kHz: 2.5

Constant factor (K): 1 (default)

$B_n = 2 \times M + 2 \times D \times K = 11.0 \text{ kHz}$

Emission designator: 11K0F3E

11 Conclusion

The data in this measurement report shows that the Electric Infrastructure Security Council Model BNET-V Base Station radio, FCC ID: 2AVVL0BSXR1BNETV001, complies with the applicable requirements of Parts 90 and 2 of the FCC Rules.