FCC TEST REPORT No. 14/131	March 24, 2014
for 47 CFR Part 15 Subpart C	date of issue

Model name	VBar Control 2.4 GHz FHSS Remote Control System
Product description	2.4 GHz FHSS bidirectional setup and telemetry remote control system
FCC ID	2ABXHVBCTX10
Applicant	Mikado Model Helicopters GmbH, Friedrich-Klausing-Straße 2, 14469 Potsdam, Brandenburg, Germany
Manufacturer	Mikado Model Helicopters GmbH, Friedrich-Klausing-Straße 2, 14469 Potsdam, Brandenburg, Germany

The results in this report apply only to the samples tested.
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Approved by
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Chief TC of PE TC "OMEGA"

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1 EQUIPMENT UNDER TEST

1.1 Basic description

Equipment Category	Transceiver
Test item description	2.4 GHz FHSS Transceiver
Model name	VBar Control 2.4 GHz FHSS Remote Control System
Serial number	N/A

1.2 Technical characteristics declared by manufacturer

Frequency range	2.400 to 2.4835 GHz
Transmission	Adaptive and non-adaptive frequency hopping operation with "listen before talk" function
Channel Usage	80
Number of transceivers	1
Channel Spacing used	1 MHz
Maximum output power	+20 dBm (100 mW)
Modulation form	FHSS
Modulation type	MSK
MSK Deviation	2.182 kHz
Symbol Rate	150 kHz
Maximal Duty Cycle:	20 %
Antenna type	2 x patch antennas (angle of radiation > 180°)
Antenna gain	2 dBi
Temperature range	from 0 °C to + 40 °C, non-condensing
Supply voltage	from 3.0 V to 4.2 V

1.3 Photos

Figure 1.3.1

Figure 1.3.2

2 GENERAL INFORMATION ABOUT TESTS

2.1 Test program and results of the tests

Number of test	FCC rule	Description of test	Result (Pass, Fail, N/A)
1	FCC CFR 47:2008 § 15.247 (a)(1)	Hopping channel separation	Pass
2	FCC CFR 47:2008 § 15.247 (a)(1)(iii)	Number of hopping frequencies used	Pass
3	FCC CFR 47:2008 § 15.247 (a)(1)	Hopping channel bandwidth	Pass
4	FCC CFR 47:2008 § 15.247 (a)(1)(iii)	Dwell time of each frequency	Pass
5	FCC CFR 47:2008 § 15.247 (b)(1)	Output power	Pass
6	FCC CFR 47:2008 § 15.247 (d)	100 kHz Bandwidth of Frequency Band Edges measurement	Pass
7	FCC CFR 47:2008 § 15.209	Radiated Emission	Pass
8	FCC CFR 47:2008 § 15.203	Antenna Requirement	Pass
9	FCC CFR 47:2008 §15.109	Radiated Emission from Receiver Part	Pass
10	FCC CFR 47:2008 § 15.247 (h)(i)	RF exposure	Pass

Tested by:
Laboratory engineer  Boris Trifonov

Laboratory engineer  Vladimir Osaulko

Checked by:
Leading engineer  Fjodor Shubin

2.2 Test manner

The EUT consists one transceiver and two antennas. For organization of connection was used ancillary transceiver VBar Control 2.4 GHz FHSS Satellite Receiver.
The test distance of radiated emission from antenna to EUT is 3 m.
Methods of measurement are according to ANSI C63.4-2003.

2.3 Test conditions and test modes

Normal temperature and humidity:
- temperature: from 0 °C to +40 °C (non-condensing);
- relative humidity: from 20 % to 75 %

Normal power source:
U_{nom} = 3.0 to 4.2 Volt.

The frequencies for the testing

Channel, No.	Frequency, MHz
0	2401
40	2441
80	2481

2.4 Test equipment used

№	Name	Model	Inventory or serial No.
1.	Spectrum analyzer	FSV40	100821
2.	EMI test receiver	R&S ESU-26	100260
3.	Directional coupler	773D	100101
4.	Attenuator	Agilent 8494B	MY42141168
5.	Attenuator	PE7014-10	101692
6.	Antenna	Schwarzbeck VULB9163	9163244
7.	Antenna	HP11966 model 3115	9903-5701
8.	Antenna	ВВНА 9170	9170446
9.	Psychrometer	ВИТ-2	В931

All listed above test equipment is calibrated and certified in accordance with established procedure. The equipment has certificates currently in force.

Ancillary equipment

№	Name	Model	Serial Number
1.	Servo - mechanism	Savox	N/A
2.	Transceiver	VBar Control 2.4 GHz FHSS Satellite Receiver	N/A
3.	Controller	VBar Flybarless controller	N/A

2.5 Measurement uncertainty

Parameter	Maximum uncertainty
Output power	± 1.3 dB
Frequency range	± 1×10^{-5}
Spurious emissions	± 2.7 dB
Radiated emission	± 4.7 dB
Time	± 3 %
Temperature	± 1°C
Humidity	± 5 %
DC voltage	± 2 %

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of k=2.

Measurement uncertainty complies with the requirements of the normative documents and is guaranteed by the test procedures and test equipment.

2.6 Photo of test site

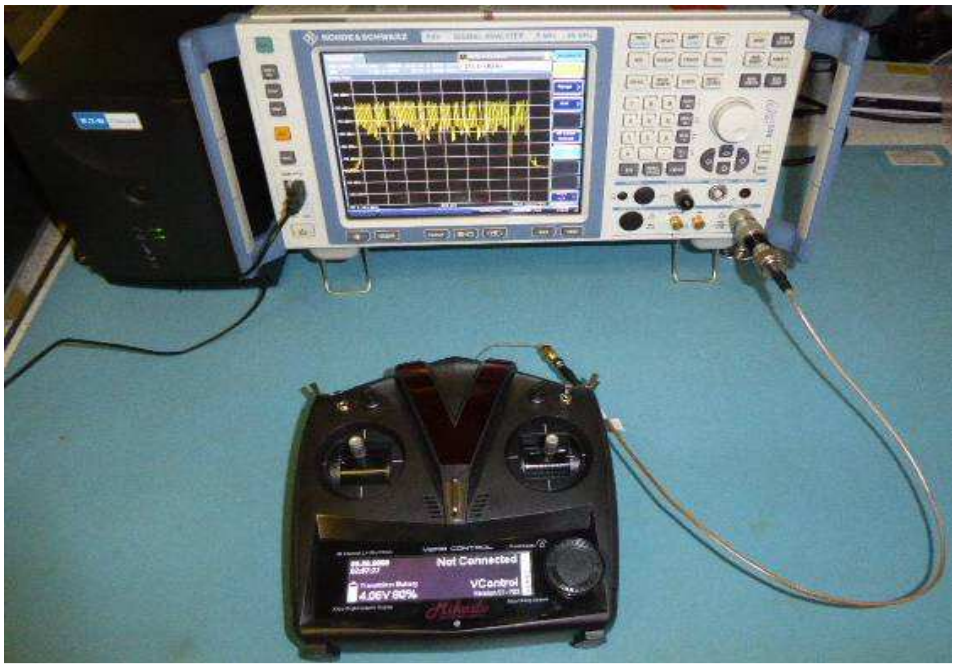


Figure 2.6.1 Conducted Test

Figure 2.6.2 - Radiated Emission Test (Frequency Range 30 MHz – 1000 MHz)

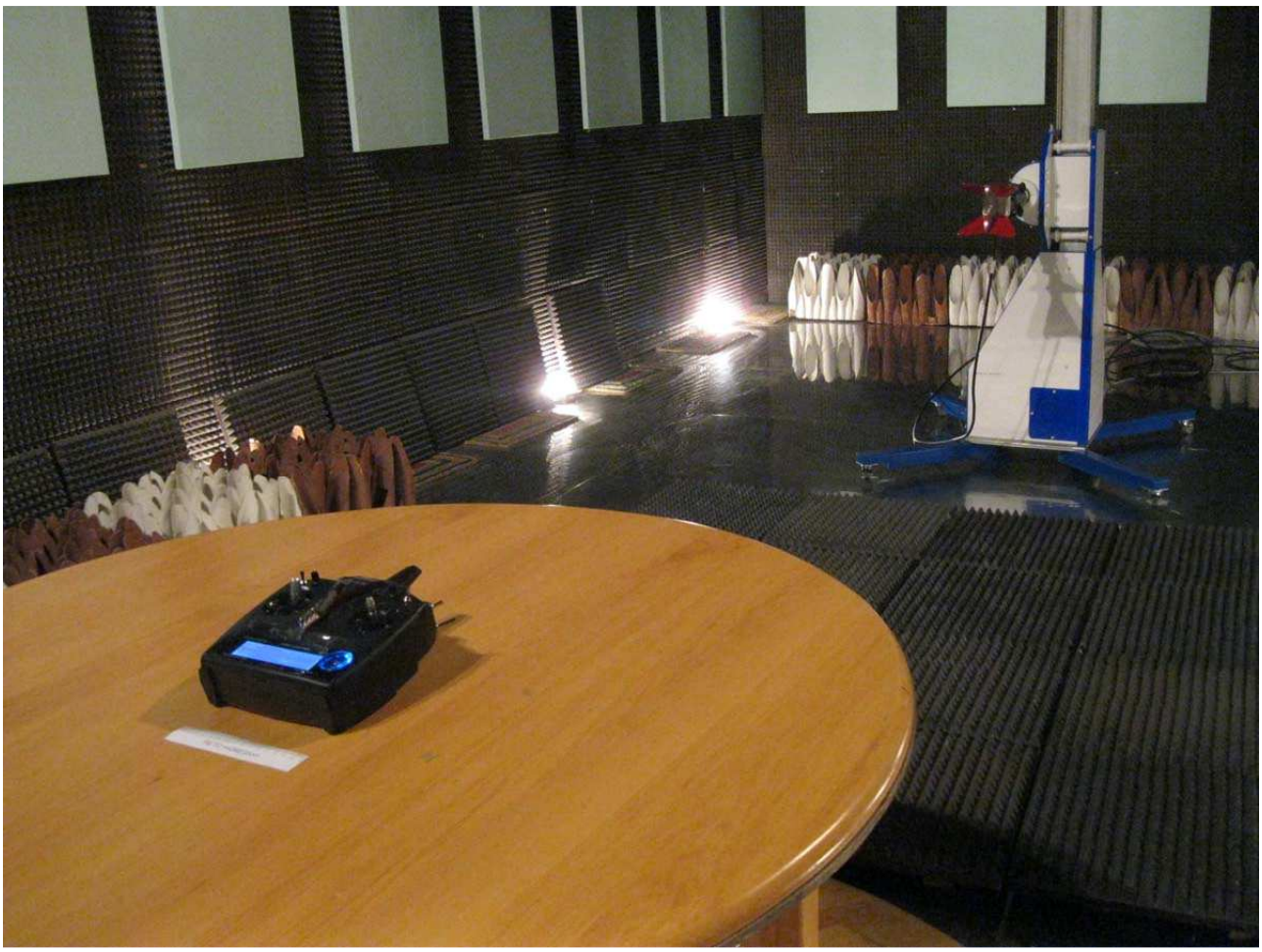


Figure 2.6.3 - Radiated Emission Test (Frequency Range 1 GHz – 18 GHz)

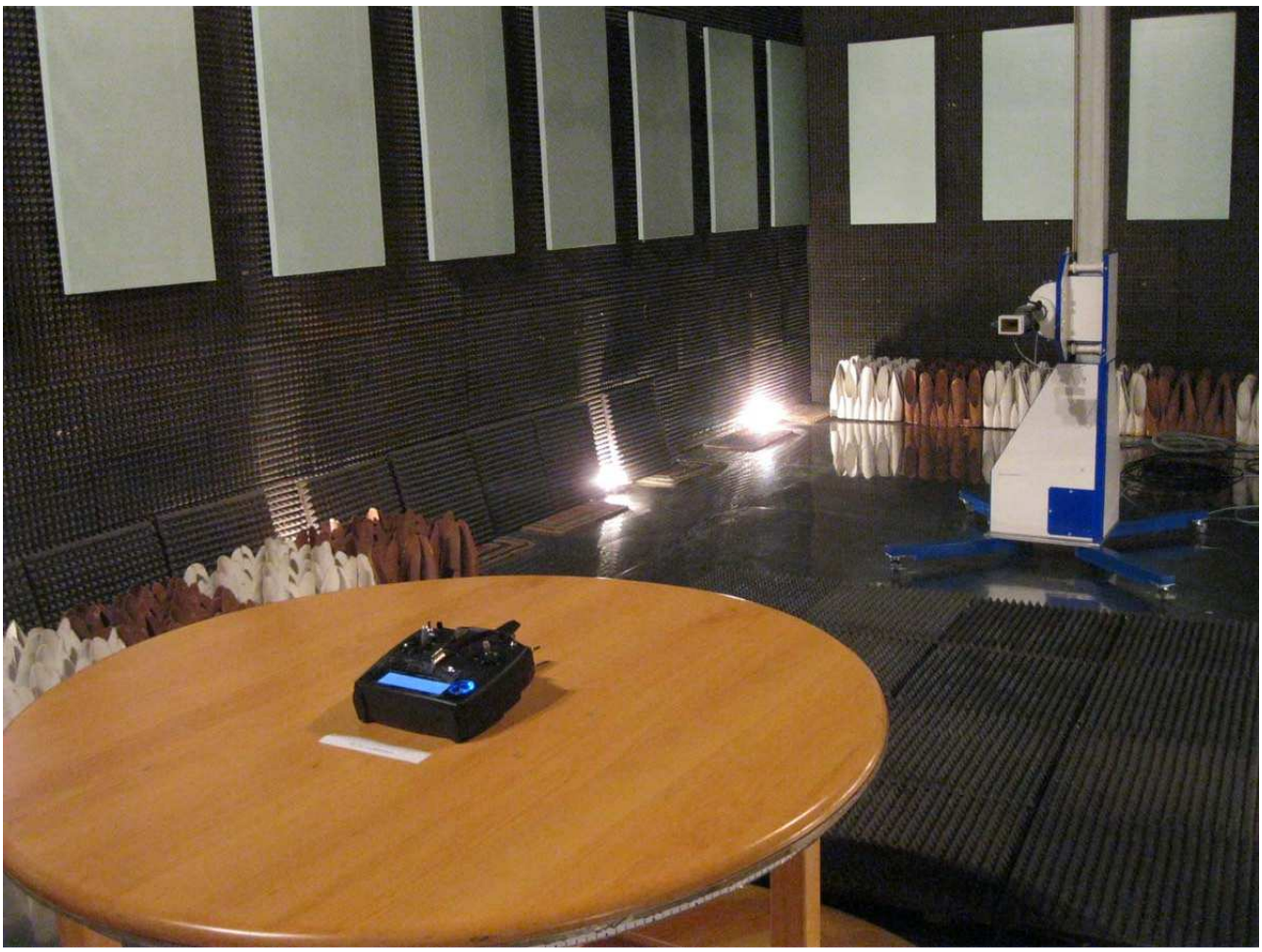


Figure 2.6.4 - Radiated Emission Test (Frequency Range 18 GHz – 25 GHz)

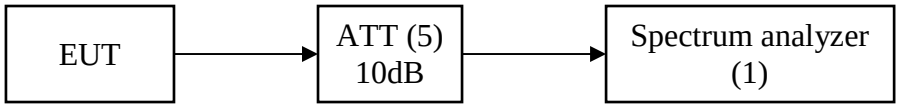
3 REPORT OF MEASUREMENTS AND EXAMINATIONS.

3.1 Hopping channel separation

3.1.1 Test procedure

1) The EUT output was connected to the spectrum analyzer according to test setup layout (3.1.2).
2) Set RBW of spectrum analyzer to 100 kHz and VBW to 100 kHz.
3) The Hopping channel separation is defined as the channel is separated with the next channel.

3.1.2 Test setup layout



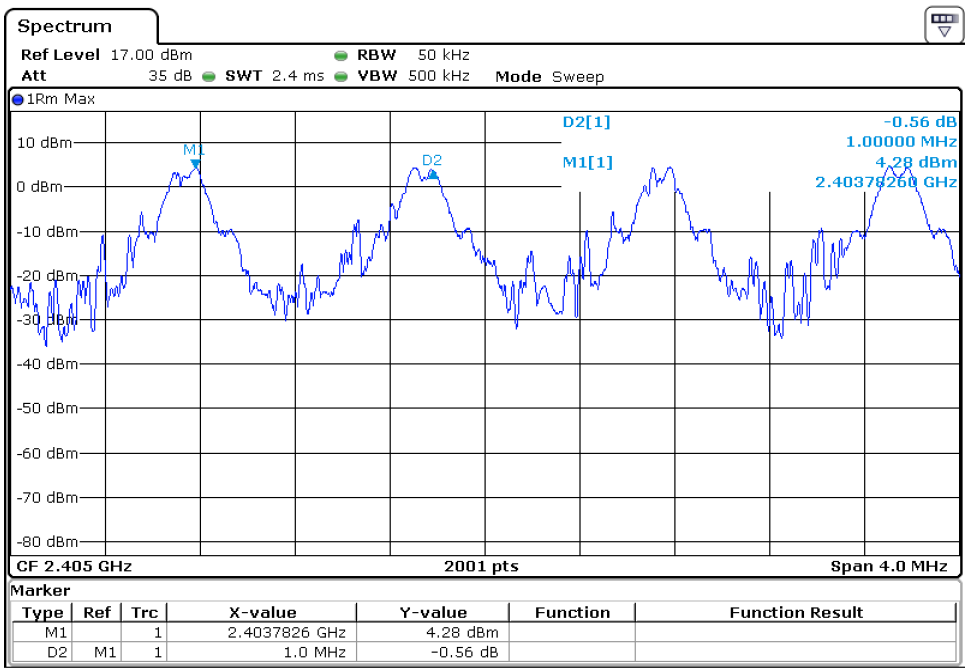
3.1.3 Test result

Relative humidity: 60 %

Hopping channel separation, MHz	Limit (2/3 of 20dB Bandwidth), kHz	Test Result (Pass, Fail, N/A)
1.0	330	Pass

Remark: frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or **two-thirds** of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

3.1.5 Plot Hopping channel separation

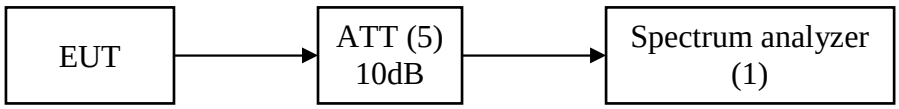


3.2 Number of hopping frequencies used

3.2.1 Test procedure

1) The EUT output was connected to the spectrum analyzer according to test setup layout (3.2.2).
2) Set RBW of spectrum analyzer to 300 kHz and VBW to 300 kHz.
3) The Number of hopping frequencies used is defined as the device has numbers of total channel.

3.2.2 Test setup layout



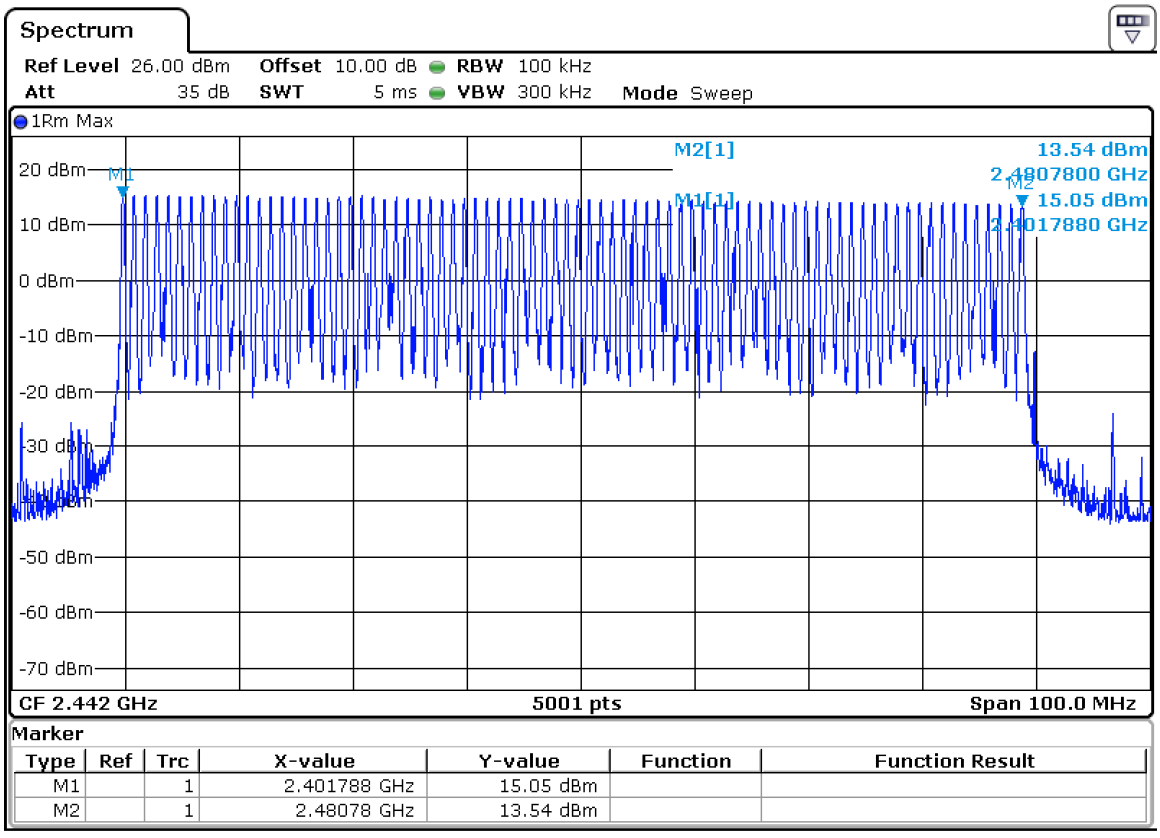
3.2.3 Test result

Temperature: +18 °C Relative humidity: 46 %

Number of hopping frequencies	Limit	Test Result (Pass, Fail, N/A)
80	15	Pass

Remark: The hopping sequence of a FHSS system is the sequence of the hopping channels used by the equipment. Non-adaptive Frequency Hopping systems shall make use of a hopping sequence(s) that contains at least 15 hopping channels. Adaptive Frequency Hopping systems shall make use of a hopping sequence(s) that is capable of operating over a minimum of 90 % of the band specified in table, from which at any given time a minimum of 20 hopping channels shall be used. Each hopping channel of the hopping sequence shall be occupied at least once during a period not exceeding four times the product of the dwell time per hop and the number of channels.

3.2.4 Plot

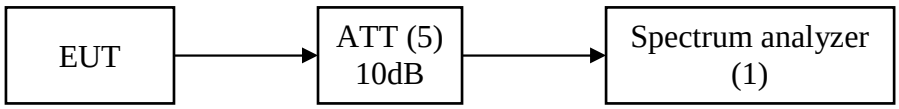


3.3 Hopping channel bandwidth

3.3.1 Test procedure

1) The ETU output was connected to the spectrum analyzer via attenuator.
2) Set RBW of spectrum analyzer to 100 kHz and VBW to 100 kHz.
3) The Hopping channel bandwidth is defined as the frequency range where the power is higher than peak power minus 20 dB.

3.3.2 Test setup layout



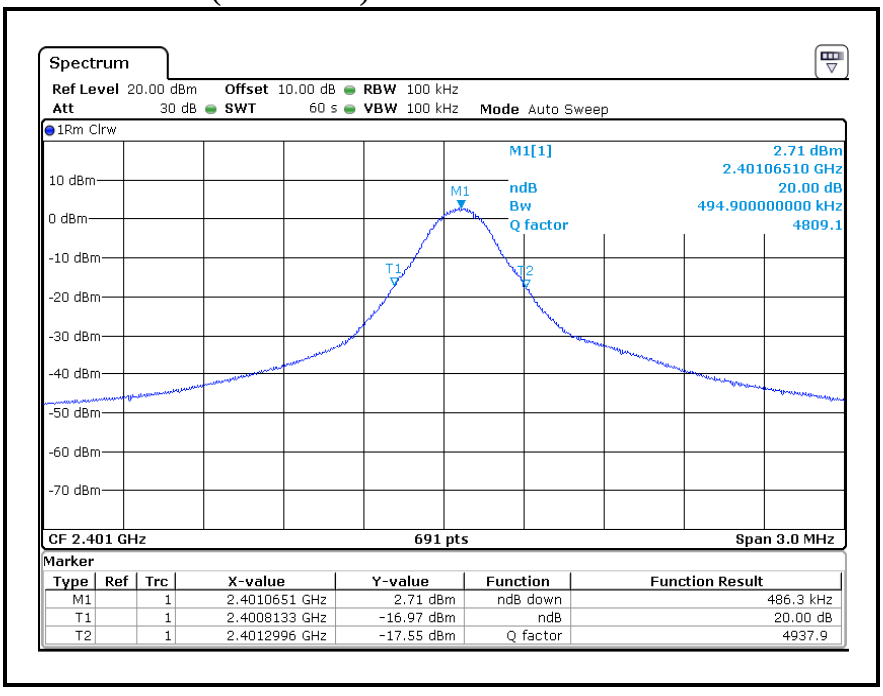
3.3.3 Test result

Temperature: +18 °C Relative humidity: 46 %

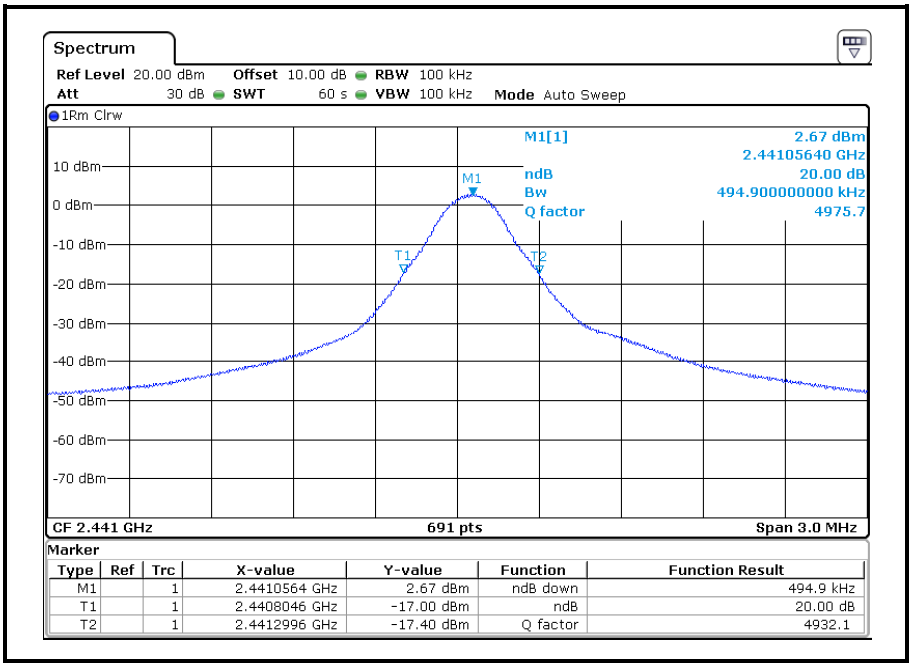
Channel	Frequency, MHz	Hopping channel bandwidth, kHz	Limit, MHz	Test Result (Pass, Fail, N/A)
0	2401	486.3	1.0	Pass
40	2441	494.4	1.0	Pass
80	2481	494.4	1.0	Pass

Remark: Non-adaptive Frequency Hopping systems shall make use of non-overlapping hopping channels separated by the channel bandwidth as measured at 20 dB below peak power.
The hopping channels defined within a hopping sequence shall be at least 1 MHz apart.

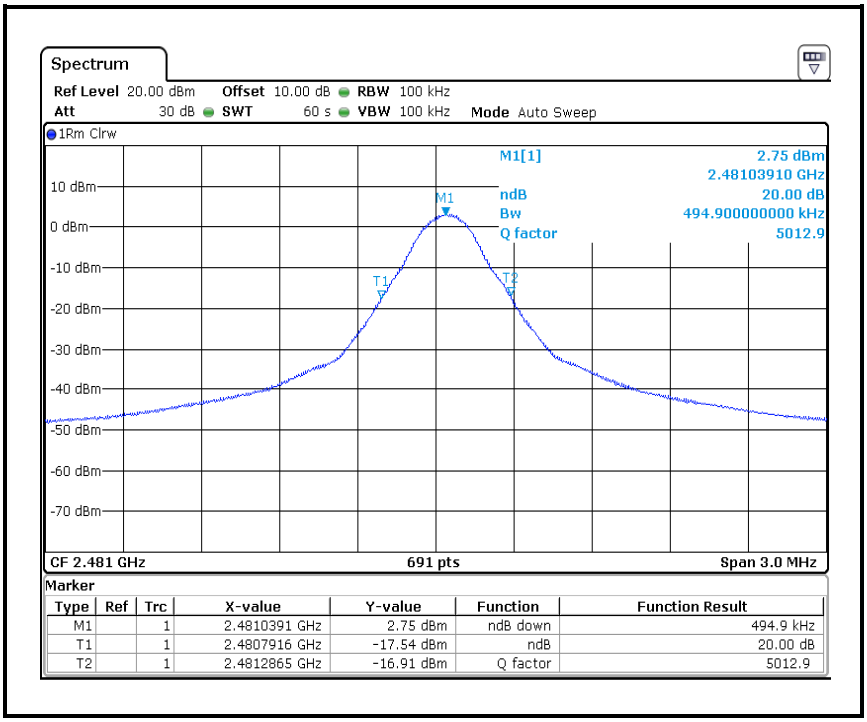
3.3.4 Plot Channel bandwidth (2401 MHz)



3.3.5 Plot Channel bandwidth (2441 MHz)



3.3.6 Plot Channel bandwidth (2481 MHz)

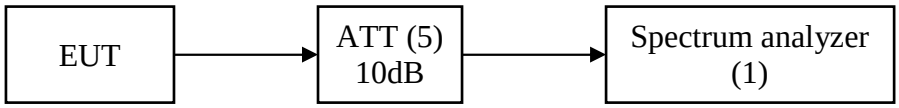


3.4 Dwell Time of Each Frequency

3.4.1 Test procedure

1) The EUT output was connected to the spectrum analyzer according to test setup layout (3.4.2).
2) Set RBW of spectrum analyzer to 1 MHz and VBW to 1 MHz.
3) Set the center frequency on any frequency would be measured and set the frequency span to zero span.

3.4.2 Test setup layout



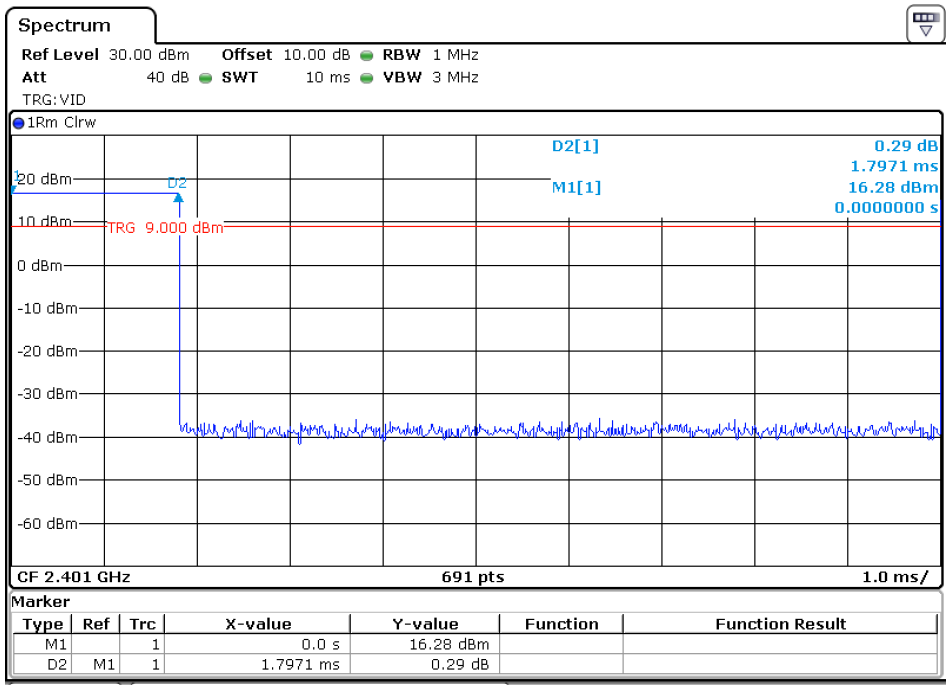
3.4.3 Test result

Temperature: +18 °C Relative humidity: 46 %

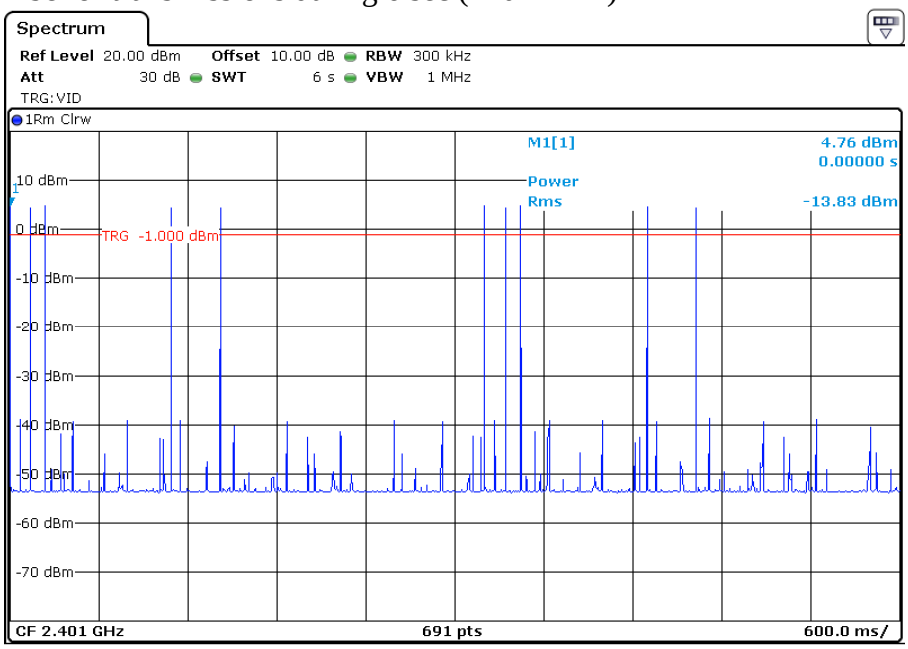
Channels	Pulse width (ms)	Number of 6 sec	Dwell Time, ms	Limit, s	Test Result (Pass, Fail, N/A)
0	1.797	10	17.97	0.4	Pass
80	1.797	14	25.16	0.4	Pass

Remark:
1. Dwell time = pulse width * Number of 6 sec.
2. 6 sec = 0.4 sec *15 times (Dwell Time * Minimum number of hopping frequencies)

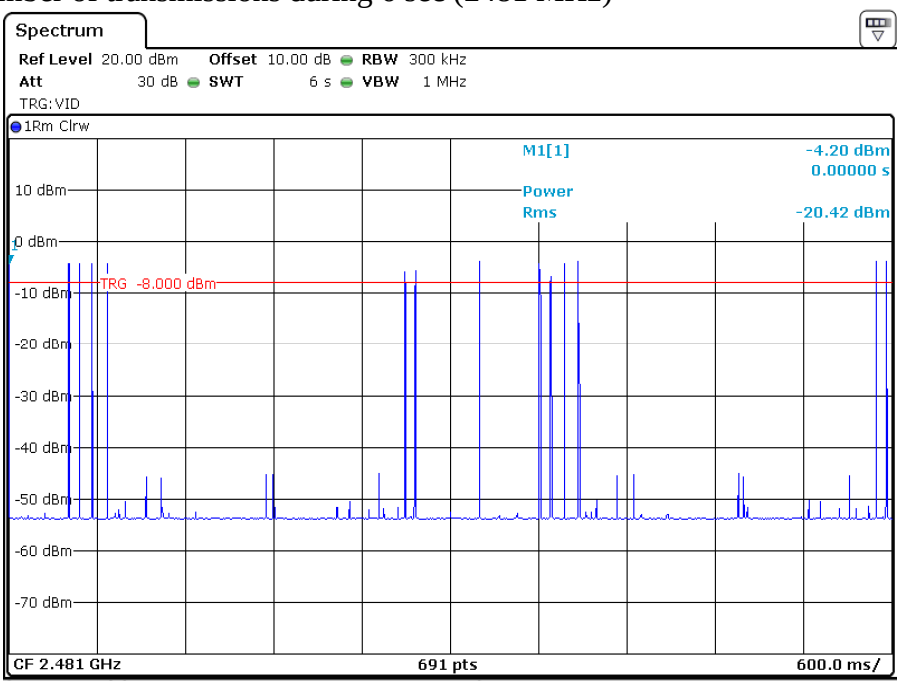
3.4.4 Plot "Pulse width"



3.4.5 Plot Number of transmissions during 6 sec (2401 MHz)



3.4.6 Plot Number of transmissions during 6 sec (2481 MHz)

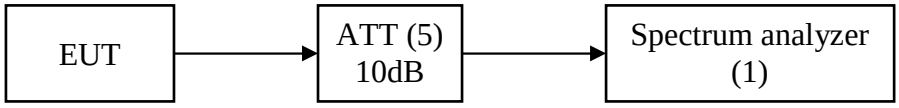


3.5 Output power

3.5.1 Test procedure

1) The EUT output was connected to the spectrum analyzer according to test setup layout (3.5.2).
2) The center frequency of the spectrum analyzer was set to the fundamental frequency and set RBW to 1 MHz and VBW to 1 MHz.

3.5.2 Test setup layout



3.5.3 Test result

Temperature: +18 °C Relative humidity: 46 %

Ant. 1

Channel	Frequency, MHz	Measured output power, W	Limit, W	Test Result (Pass, Fail, N/A)
0	2401	0.102	0.125	Pass
40	2441	0.098	0.125	Pass
80	2481	0.095	0.125	Pass

Ant. 2

Channel	Frequency, MHz	Measured output power, W	Limit, W	Test Result (Pass, Fail, N/A)
0	2401	0.098	0.125	Pass
40	2441	0.093	0.125	Pass
80	2481	0.097	0.125	Pass

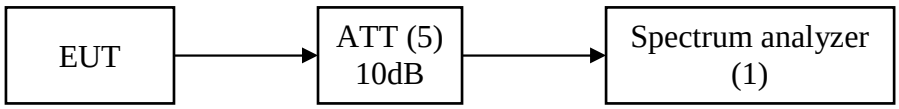
Remark: For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2401-2483.5 MHz band: 0.125 watts.

3.6 100 kHz Bandwidth of Frequency Band Edges Measurement

3.6.1 Test procedure

The transmitter output was connected to the spectrum analyzer via attenuator. Set both RBW and VBW of spectrum analyzer to 100 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded. The spectrum plots (Peak RBW=VBW=100 kHz) are attached on the following pages.

3.6.2 Test setup layout



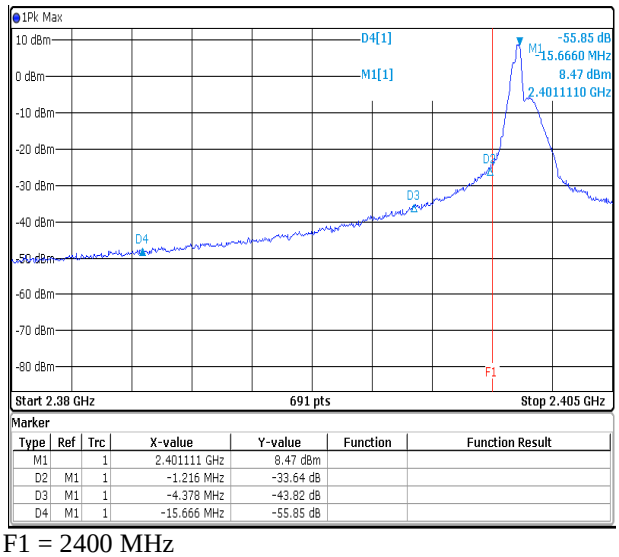
3.6.3 Test result

Temperature: +18 °C Relative humidity: 46

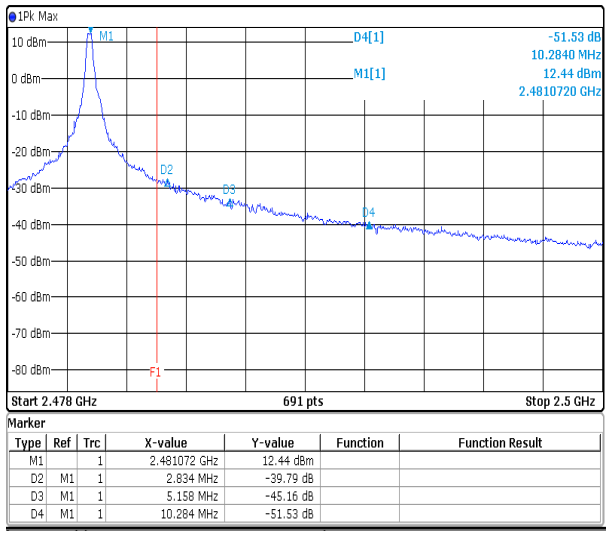
Frequency, MHz	Measured, dBc	Limit, dBc	Test Result (Pass, Fail, N/A)
2385.45	- 55.85	- 20	Pass
2396.73	- 43.82	- 20	Pass
2399.90	- 33.64	- 20	Pass
2483.91	- 39.79	- 20	Pass
2486.23	- 45.16	- 20	Pass
2491.36	- 51.53	- 20	Pass

Remark:
Below –20dB of the highest emission level of operating band (in 100 kHz Resolution Bandwidth)

3.6.4 Plots Frequency Band Edges



F1 = 2400 MHz



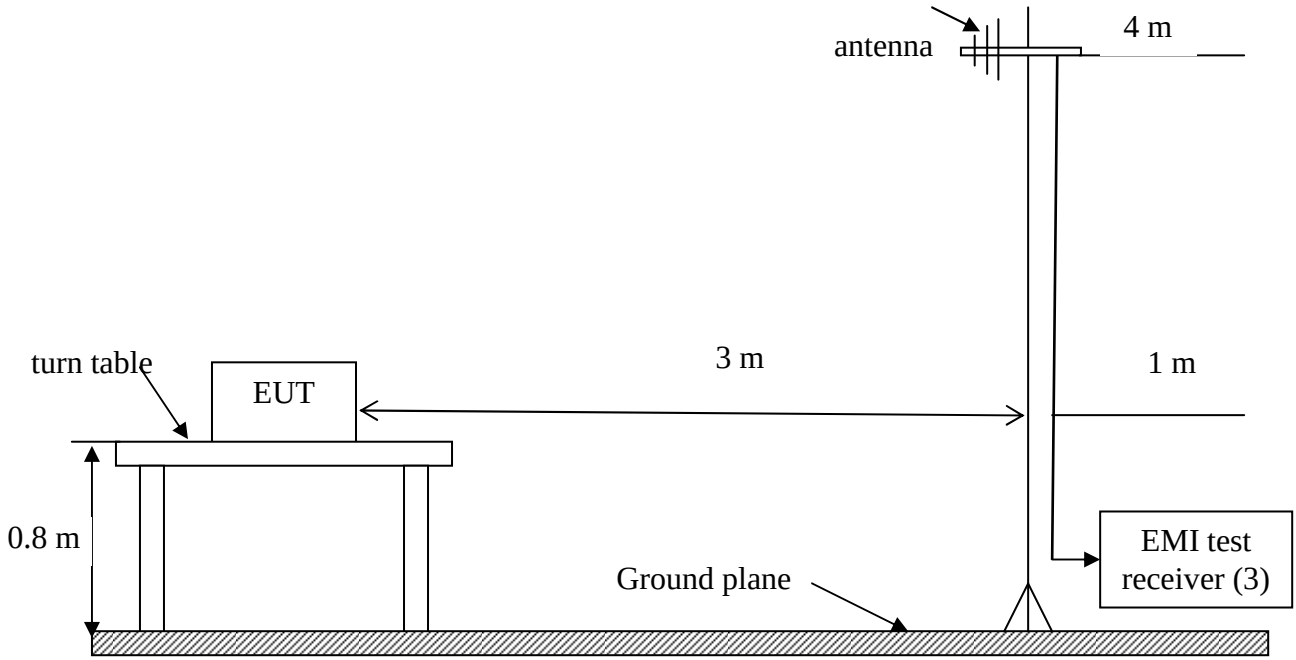
F1 = 2483.5 MHz

3.7 Radiated Emission from Receiver Part

3.7.1 Test procedure

1) The EUT was placed on a turn table top 0.8 m above the floor.
2) The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
3) The table was rotated 360 degrees to determine the position of the highest radiation.
4) The antenna is a broadband antenna and its height is varied between 1 meter and 4 meters above the floor to find the maximum value of the shield strength for both horizontal polarization and vertical polarization of the antenna.
5) For each suspected emission, the EUT was arranged to its worst case.
6) The test-receiver was set to Peal or Quasi-peak detect function with specified bandwidth with maximum hold mode.
7) For testing below 1 GHz, if the emission level of EUT in peak mode was 3 dB lower than the specified limit, the testing stopped and peak values of EUT were noted, otherwise, the emissions were repeating one by one using the quasi-peak method and noted.

3.7.2 Test setup layout



3.7.3 Limit

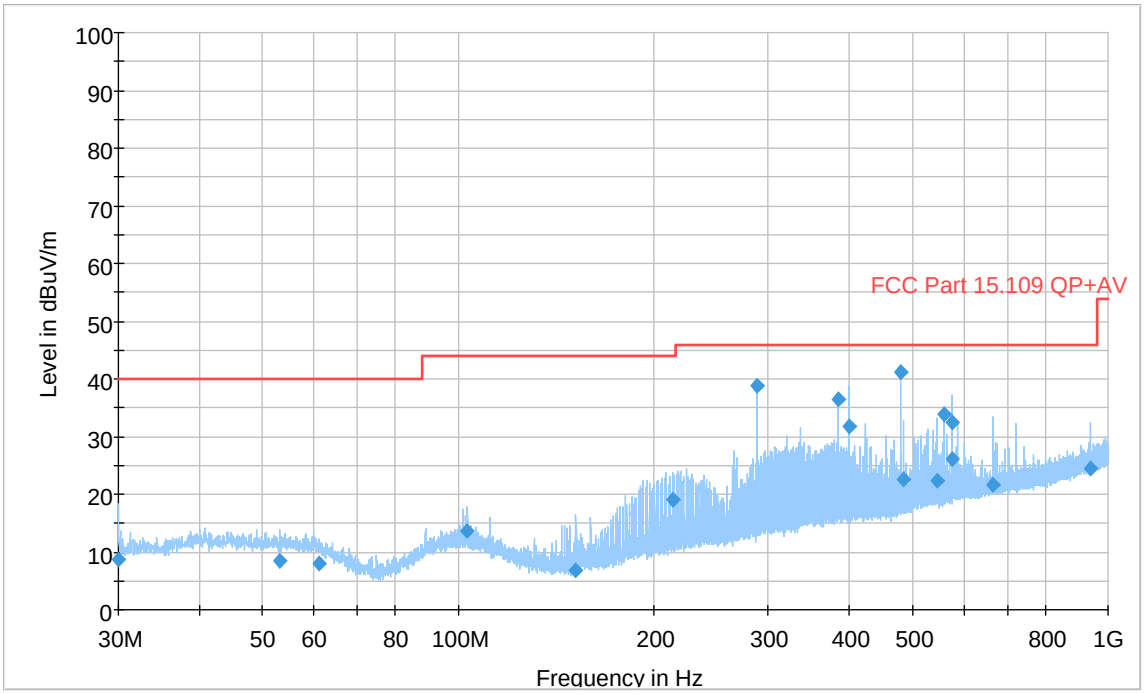
Limit FCC CFR 47:2008 §15.109

Frequency (MHz)	Field Strength (dBμV/m at 3-meter)	Field Strength (μV/m at 3-meter)
30-88	40	100
88-216	43.5	150
216-960	46	200
Above 960	54	500

3.7.4 Test result FCC CFR 47:2008 §15.109

Temperature: +20 °C - +22 °C Relative humidity: 67 % - 72 %

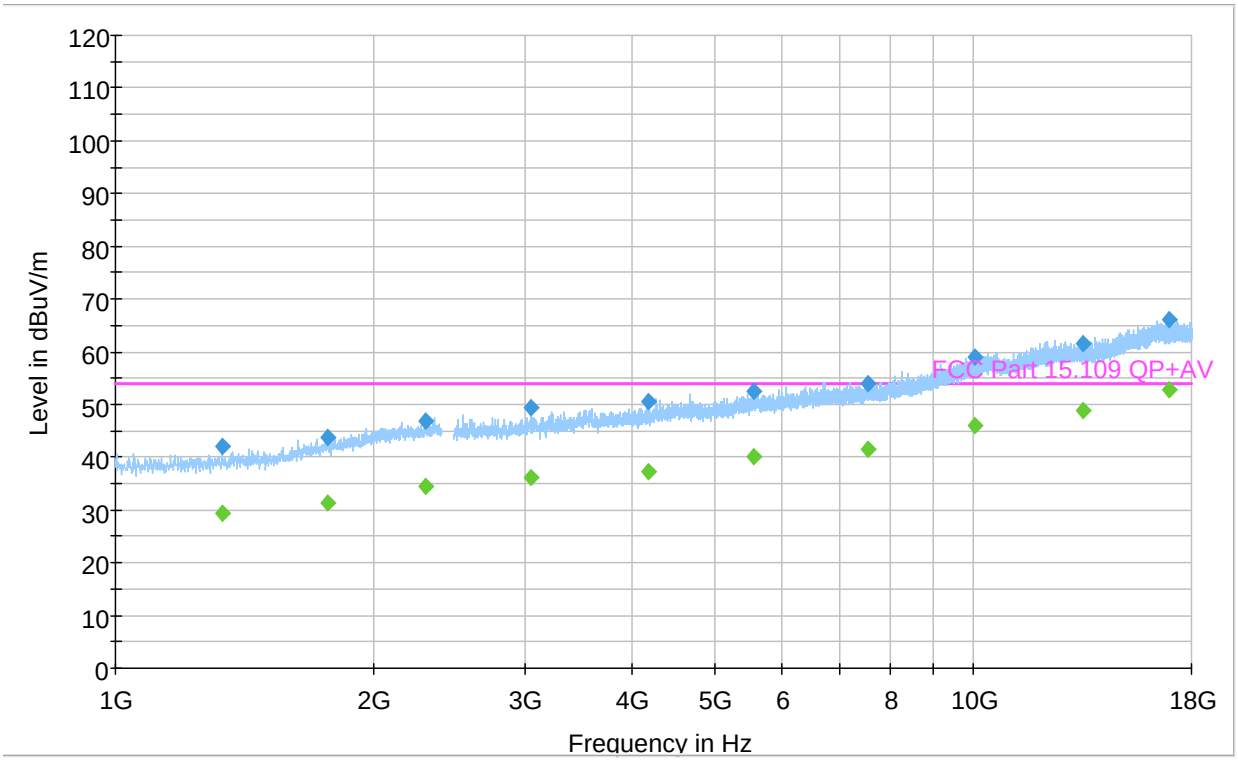
Below 1 GHz

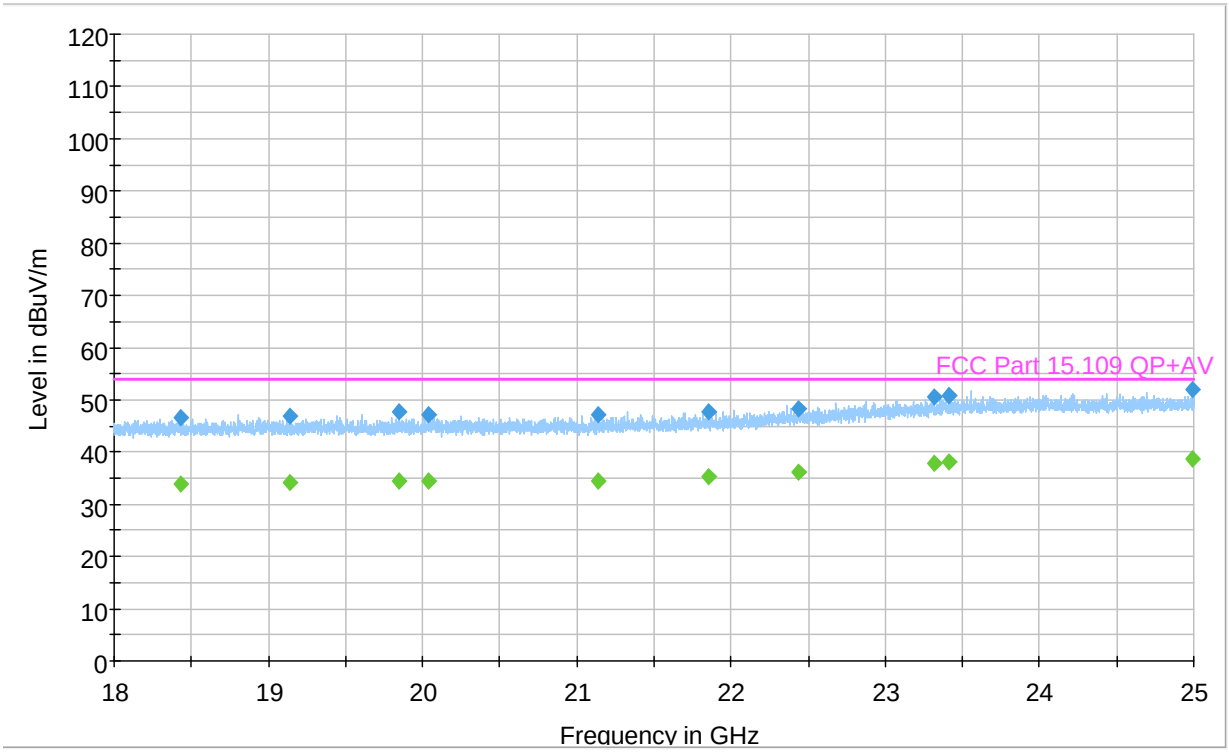


Final Result

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polari-zation	Azimuth (deg)	Margin (dB)	Limit (dBuV/m)
30.000000	8.6	1000.0	120.0	150.0	V	0.0	31.4	40.0
53.080000	8.6	1000.0	120.0	350.0	H	180.0	31.4	40.0
61.000000	7.9	1000.0	120.0	150.0	V	90.0	32.1	40.0
103.320000	13.8	1000.0	120.0	200.0	V	90.0	30.2	43.5
151.760000	6.9	1000.0	120.0	250.0	V	0.0	37.1	43.5
213.640000	19.1	1000.0	120.0	150.0	V	180.0	24.9	43.5
288.000000	38.9	1000.0	120.0	150.0	H	90.0	7.1	46.0
384.000000	36.6	1000.0	120.0	100.0	H	0.0	9.4	46.0
400.000000	31.9	1000.0	120.0	400.0	V	90.0	14.1	46.0
480.000000	41.1	1000.0	120.0	100.0	H	0.0	4.9	46.0
484.760000	22.6	1000.0	120.0	100.0	H	90.0	23.4	46.0
545.920000	22.3	1000.0	120.0	400.0	V	270.0	23.7	46.0
560.000000	33.9	1000.0	120.0	100.0	H	180.0	12.1	46.0
576.000000	32.5	1000.0	120.0	100.0	H	0.0	13.5	46.0
576.520000	26.2	1000.0	120.0	100.0	V	0.0	19.8	46.0
663.560000	21.5	1000.0	120.0	150.0	H	0.0	24.5	46.0
941.160000	24.4	1000.0	120.0	100.0	V	180.0	21.6	46.0

Above 1 GHz


120
110
100
90
80
70
60
50
40
30
20
10
0
Level in dBuV/m
FCC Part 15.109 QP+AV
1G
2G
3G
4G
5G
6
8
10G
18G
Frequency in Hz


120
110
100
90
80
70
60
50
40
30
20
10
0
Level in dBuV/m
FCC Part 15.109 QP+AV
18
19
20
21
22
23
24
25
Frequency in GHz

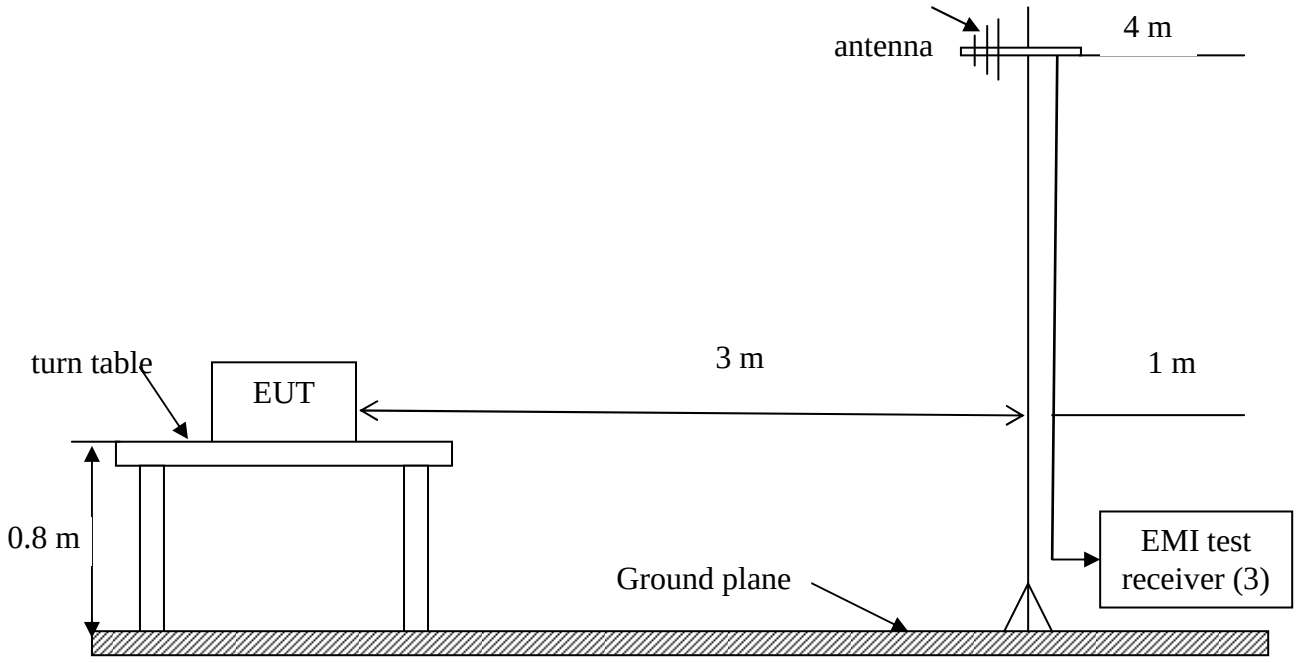
Frequency (MHz)	Average (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polari-zation	Azimuth (deg)	Margin (dB)	Limit (dBuV/m)
1332.000000	29.3	500.0	1000.000	100.0	H	90.0	24.7	54.0
1765.000000	31.3	500.0	1000.000	100.0	V	0.0	22.7	54.0
2305.000000	34.5	500.0	1000.000	100.0	V	0.0	19.5	54.0
3054.500000	36.2	500.0	1000.000	100.0	V	180.0	17.8	54.0
4189.500000	37.3	500.0	1000.000	100.0	H	0.0	16.7	54.0
5549.500000	40.0	500.0	1000.000	100.0	V	180.0	14.0	54.0
7534.500000	41.6	500.0	1000.000	100.0	H	270.0	12.4	54.0
10076.500000	46.2	500.0	1000.000	100.0	V	90.0	7.8	54.0
13472.500000	49.0	500.0	1000.000	100.0	H	0.0	5.0	54.0
16929.500000	52.9	500.0	1000.000	100.0	H	90.0	1.1	54.0
18431.000000	34.0	500.0	1000.0	100.0	V	180.0	20.0	54.0
19137.000000	34.1	500.0	1000.0	100.0	H	0.0	19.9	54.0
19845.000000	34.6	500.0	1000.0	100.0	H	0.0	19.4	54.0
20035.000000	34.4	500.0	1000.0	100.0	V	90.0	19.6	54.0
21132.000000	34.5	500.0	1000.0	100.0	H	90.0	19.5	54.0
21851.000000	35.3	500.0	1000.0	100.0	H	0.0	18.7	54.0
22437.000000	36.0	500.0	1000.0	100.0	V	180.0	18.0	54.0
23320.000000	37.9	500.0	1000.0	100.0	V	90.0	16.1	54.0
23411.000000	38.2	500.0	1000.0	100.0	V	0.0	15.8	54.0
24989.000000	38.6	500.0	1000.0	100.0	V	90.0	15.4	54.0

3.8 Radiated Emission from Transmitter Part

3.8.1 Test procedure

1) The EUT was placed on a turn table top 0.8 m above the floor.
2) The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
3) The table was rotated 360 degrees to determine the position of the highest radiation.
4) The antenna is a broadband antenna and its height is varied between 1 meter and 4 meters above the floor to find the maximum value of the shield strength for both horizontal polarization and vertical polarization of the antenna.
5) For each suspected emission, the EUT was arranged to its worst case.
6) The test-receiver was set to Peal or Quasi-peak detect function with specified bandwidth with maximum hold mode.
7) For testing below 1 GHz, if the emission level of EUT in peak mode was 3 dB lower than the specified limit, the testing stopped and peak values of EUT were noted, otherwise, the emissions were repeating one by one using the quasi-peak method and noted.

3.8.2 Test setup layout



3.8.3 Limit

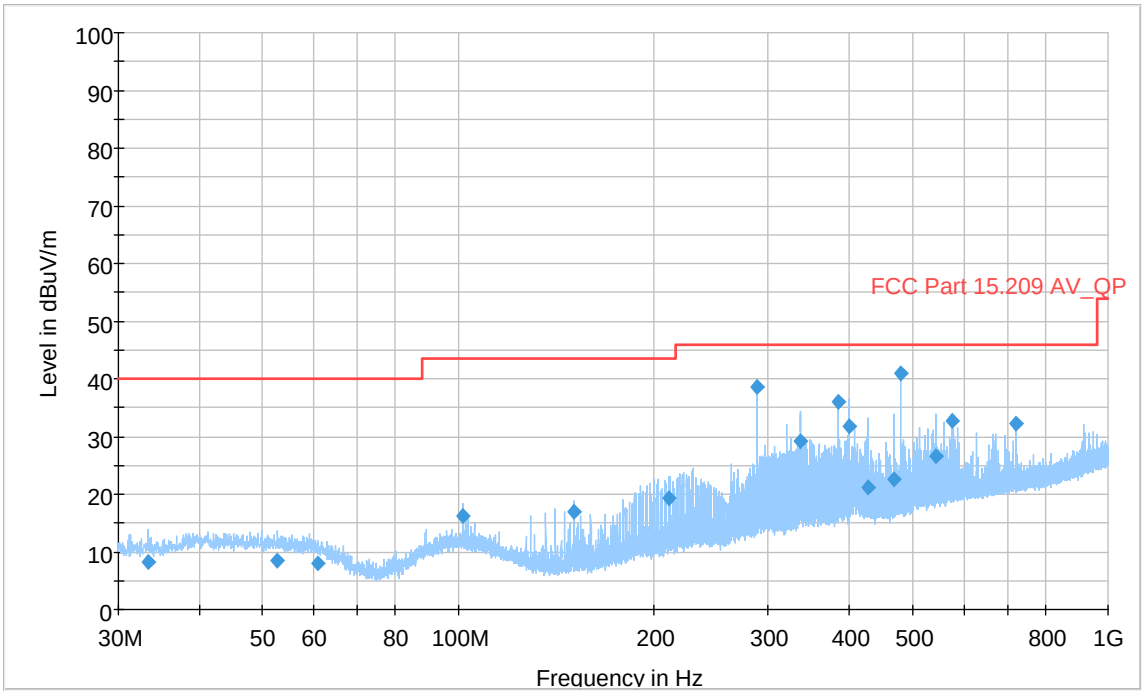
Limit FCC CFR 47:2008 §15.209

Frequency (MHz)	Field Strength (dBμV/m at 3-meter)	Field Strength (μV/m at 3-meter)
30-88	40	100
88-216	43.5	150
216-960	46	200
Above 960	54	500

3.8.4 Test result FCC CFR 47:2008 §15.209

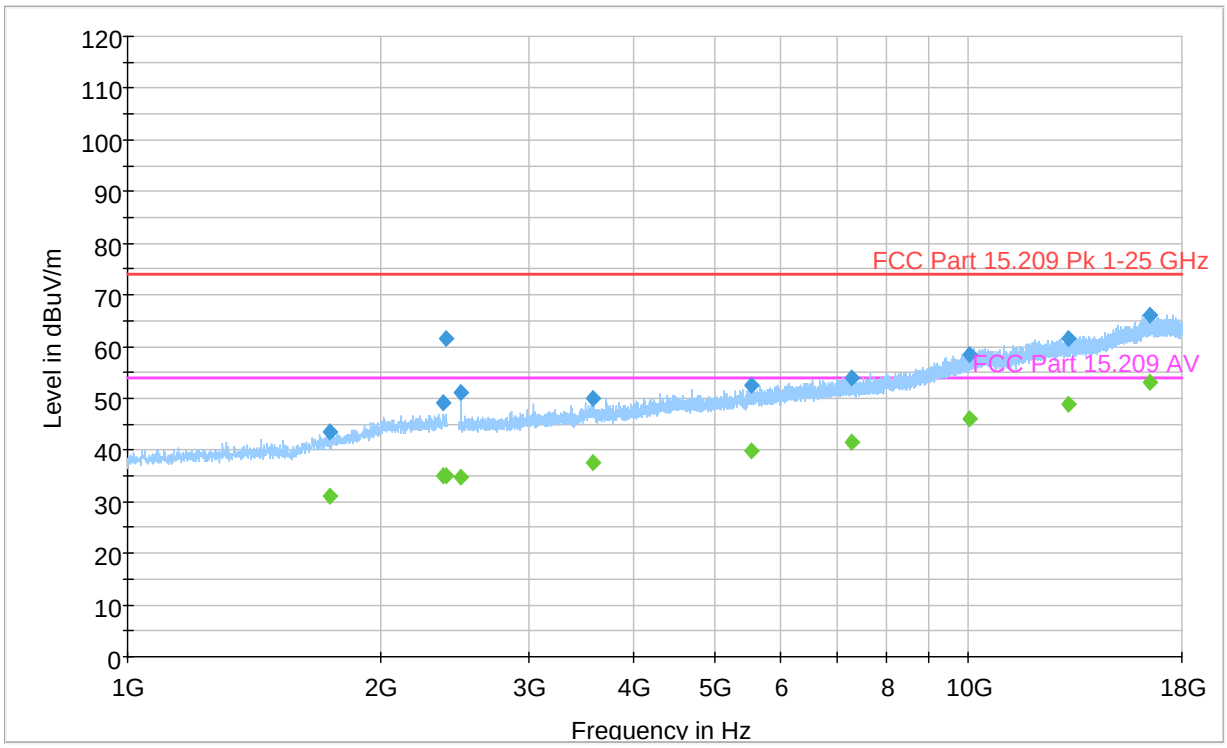
Temperature: +20 °C - +22 °C Relative humidity: 67 % - 72 %

Below 1 GHz

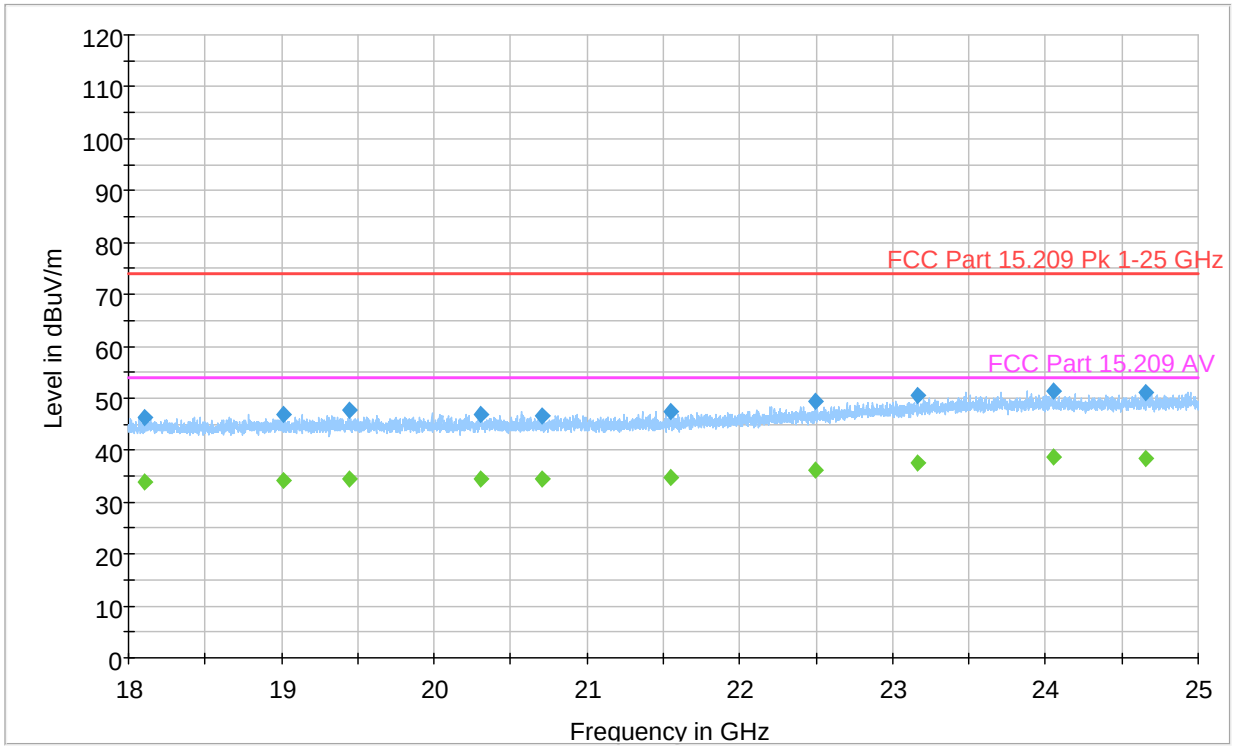


Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polari-zation	Azimuth (deg)	Margin (dB)	Limit (dBuV/m)
33.320000	8.2	1000.0	120.0	200.0	V	0.0	31.8	40.0
52.720000	8.5	1000.0	120.0	300.0	V	90.0	31.5	40.0
60.640000	7.9	1000.0	120.0	350.0	H	0.0	32.1	40.0
101.480000	16.2	1000.0	120.0	250.0	H	90.0	27.3	43.5
150.600000	17.0	1000.0	120.0	250.0	V	180.0	26.5	43.5
210.640000	19.3	1000.0	120.0	250.0	V	90.0	24.2	43.5
288.000000	38.6	1000.0	120.0	150.0	H	90.0	7.4	46.0
335.960000	29.2	1000.0	120.0	150.0	H	90.0	16.8	46.0
384.000000	36.1	1000.0	120.0	100.0	H	180.0	9.9	46.0
400.000000	31.8	1000.0	120.0	200.0	V	270.0	14.2	46.0
427.560000	21.2	1000.0	120.0	300.0	V	90.0	24.8	46.0
467.560000	22.5	1000.0	120.0	200.0	V	90.0	23.5	46.0
480.000000	40.9	1000.0	120.0	100.0	H	0.0	5.1	46.0
543.440000	26.7	1000.0	120.0	150.0	V	90.0	19.3	46.0
576.000000	32.6	1000.0	120.0	100.0	H	0.0	13.4	46.0
720.000000	32.2	1000.0	120.0	100.0	H	0.0	13.8	46.0

Above 1 GHz*



* - Operating frequency range is excluded from the spectrogram



Frequency (MHz)	Peak (PK) (dBuV/m)	Average (AV) (dBuV/m)	Meas. Time (ms)	Band-width (kHz)	Height (cm)	Polari-zation	Azimuth (deg)	Margin (PK) (dB)	Limit (PK) (dBuV/m)	Margin (AV) (dB)	Limit (AV) (dBuV/m)
1738.000000	43.5	31.1	500.0	1000.0	100.0	V	90.0	30.5	74.0	22.9	54.0
2372.000000	49.1	35.0	500.0	1000.0	100.0	H	0.0	24.9	74.0	19.0	54.0
2398.000000	61.5	35.0	500.0	1000.0	100.0	V	90.0	12.5	74.0	19.0	54.0
2495.500000	51.0	34.7	500.0	1000.0	100.0	V	180.0	23.0	74.0	19.3	54.0
3582.500000	50.0	37.5	500.0	1000.0	100.0	H	90.0	24.0	74.0	16.5	54.0
5524.500000	52.5	39.8	500.0	1000.0	100.0	H	90.0	21.5	74.0	14.2	54.0
7291.500000	53.9	41.5	500.0	1000.0	100.0	H	180.0	20.1	74.0	12.5	54.0
10053.500000	58.6	46.0	500.0	1000.0	100.0	V	90.0	15.4	74.0	8.0	54.0
13169.500000	61.7	48.9	500.0	1000.0	100.0	H	0.0	12.3	74.0	5.1	54.0
16499.500000	66.0	53.0	500.0	1000.0	100.0	V	0.0	8.0	74.0	1.0	54.0
18104.000000	46.3	33.9	500.0	1000.0	100.0	V	0.0	27.7	74.0	20.1	54.0
19014.000000	47.0	34.2	500.0	1000.0	100.0	H	90.0	27.0	74.0	19.8	54.0
19443.000000	47.6	34.6	500.0	1000.0	100.0	V	90.0	26.4	74.0	19.4	54.0
20308.000000	47.0	34.6	500.0	1000.0	100.0	V	90.0	27.0	74.0	19.4	54.0
20702.000000	46.7	34.4	500.0	1000.0	100.0	V	0.0	27.3	74.0	19.6	54.0
21551.000000	47.4	34.8	500.0	1000.0	100.0	V	0.0	26.6	74.0	19.2	54.0
22498.000000	49.5	36.1	500.0	1000.0	100.0	H	180.0	24.5	74.0	17.9	54.0
23164.000000	50.5	37.6	500.0	1000.0	100.0	V	0.0	23.5	74.0	16.4	54.0
24052.000000	51.3	38.7	500.0	1000.0	100.0	H	90.0	22.7	74.0	15.3	54.0
24652.000000	51.1	38.5	500.0	1000.0	100.0	H	90.0	22.9	74.0	15.5	54.0

3.9 Antenna Requirement

3.9.1 Test procedure

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

3.9.2 Test result

The antennas of the VBar Control 2.4 GHz FHSS Remote Control System permanently attached and there are no provisions for connection to an external antenna. It complies with the requirement of §15.203.

3.10 RF exposure

3.10.1 General

This test was performed to determine the minimum safe distance between the transmitter antenna and human to avoid public exposure in excess of limits for general population (uncontrolled exposure). Specification test limits are given in Table 3.10.1.

Table 3.10.1 — Limits For Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f2	6
30-300	61.4	0.163	1.0	6
300-1.500	-	-	f/300	6
1.500-100.000	-	-	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f^2	30
30-300	27.5	0.073	0.2	30
300-1.500	-	-	f/1500	30
1.500-100.000	-	-	1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

3.10.2 Test procedure: 47 CRF, §1.1307(b)(1).

3.10.3 Power density calculation for mobile transmitter

The power density at the specified distance was calculated from the following equation:

$$S = \frac{PG}{4\pi R^2},$$

where

S = power density (mW/cm^2)
P = average power input to the antenna over averaging time (mW)
G = power gain of the antenna in the direction of interest relative to an isotropic radiator (numeric)
R = distance to the center of radiation of the antenna (cm)

Power density calculation for duty cycle 20 %:

$$S = \frac{0.2 \times 102 \times 1.58}{4 \times \pi \times 20^2} = 0.0064\ [mW/cm^2]$$

Frequency range, MHz	Maximum output power, dBm	Antenna gain, dBi	EIRP		Power density, mW/m^2	Limit, mW/cm^2	Margin, mW/cm^2	Verdict
			dBm	mW				
2.400 - 2.4835	18.0	2	20	100	0.0064	1.0	0.9936	Pass

The equipment is intended for use at a distance of more than 20 cm from humans.