TEST REPORT

Dt&C

DT&C Co., Ltd.

42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17042
Tel : 031-321-2664, Fax : 031-321-1664

1. Report No : DRTFCC2209-0142
2. Customer
   - Name : Miliwave Co., Ltd.
   - Address : 504, 106-40 Gwahakdanji-ro, Gangneung-si, Gangwon-do, 25440 South Korea
3. Use of Report : FCC Original Grant
4. Product Name / Model Name : 60GHz Bridge / MWC-740m
   FCC ID : 2AVCWMWC-740M
5. Test Method Used : ANSI C63.10-2013
   Test Specification : Part 15.255
6. Date of Test : 2022.08.18 ~ 2022.09.01
7. Testing Environment : Refer to appended test report.
8. Test Result : Refer to the attached test result.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
This test report is not related to KOLAS accreditation.

Affirmation	Tested by Name : JaeHyeok Bang (Signature)	Technical Manager Name : JaeJin Lee (Signature)

2022 . 09 . 01 .

DT&C Co., Ltd.

If this report is required to confirmation of authenticity, please contact to report@dtnc.net

Test Report Version

Test Report No.	Date	Description	Revised By	Reviewed By
DRTFCC2209-0142	Sep. 01, 2022	Initial issue	JaeHyeok Bang	JaeJin Lee

Table of Contents

1 EUT DESCRIPTION

FCC Equipment Class	DXX - Part 15 Low Power Communication Device Transmitter
Product	60GHz Bridge
Model Name	MWC-740m
Add Model Name	-
Power Supply	DC 5 V
Frequency Range	802.11ad: 58.32 ~ 69.12 GHz
Max. RF Output Power (EIRP)	802.11ad : 37.46 dBm
Modulation Type	Single carrier modulation
Data Rate	MCS 0 ~ 12(Max data rate: 4 620 Mbps)
Antenna Specification	**Antenna type**: PCB array antenna **Antenna gain(Max)**: 15 dBi

2 INFORMATION ABOUT TESTING

2.1 Transmitting configuration of EUT

Test Mode	Worst case data rate	Test Frequency(GHz)
802.11ad	MCS 1 (385 Mbps)	58.32 GHz (Ch.1)
		62.64 GHz (Ch.3)
		69.12 GHz (Ch.6)

Note 1: The worst case data rate is determined as above test mode according to the power measurements.

Operation test setup for EUT

- Software: Tera term

2.2 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-
-	-	-	-	-

2.3 Tested environment

Temperature	:	21 ºC ~ 23 ºC
Relative humidity content	:	42 % ~ 45 %

2.4 EMI suppression Device(s) / Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

2.5 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with requirements of ANSI C 63.4-2014 and ANSI C 63.10-2013. All measurement uncertainty values are shown with a coverage factor of *k* = 2 to indicate a 95 % level of confidence.

Test items	Measurement uncertainty
AC power-line conducted emission	3.4 dB (The confidence level is about 95 %, k = 2)
Radiated emission (1 GHz Below)	4.9 dB (The confidence level is about 95 %, k = 2)
Radiated emission (1 GHz ~ 18 GHz)	5.0 dB (The confidence level is about 95 %, k = 2)
Radiated emission (18 GHz Above)	5.3 dB (The confidence level is about 95 %, k = 2)

3 SUMMARY OF TEST RESULTS

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Status Note 1
15.215(c)	20dB Bandwidth	NA	Radiated	C Note2
15.255(e)(1)	6 dB Bandwidth	NA		C
15.255(c)	Equivalent Isotropic Radiated Power	Peak < 43 dBm Average < 40 dBm		C Note3
15.255(e)	Peak Conducted Output Power	< 500 mW		C
15.255(d) 15.209	Unwanted Emissions	Below 40GHz < Part 15.209 limits 40 ~ 200GHz < 90 pW/cm^2 (Refer to section 8.3)		C Note3
15.255(f)	Frequency Stability	Within the 57 ~71GHz band		C
15.207	AC Power-Line Conducted Emissions	< Part 15.207 limits (Refer to section 8.5)	AC Line Conducted	C
15.203	Antenna Requirements	Part 15.203 (Refer to section 7)	-	C

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable
Note 2: This test item was performed to demonstrate that the 20dB bandwidth is also contained within the frequency band. This is a worst case rather than the 6dB bandwidth.
Note 3: This test item was performed in three orthogonal EUT positions and the worst case data was reported.

4 TEST METHODOLOGY

The measurement procedures described in the ANSI C63.10-2013 was used in measurement of the EUT.

4.1 EUT configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

4.2 EUT exercise

The EUT was operated in the test mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.255 under the FCC Rules Part 15 Subpart C.

4.3 General test procedures

Conducted Emissions

The EUT is placed on the wooden table, which is 0.8 m above ground plane and the conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-peak and Average detector

Radiated Emissions

The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the highest emission, the relative positions of the EUT were rotated through three orthogonal axes.

4.4 Description of test modes

The EUT has been tested with all modes of operating conditions to determine the worst case emission characteristics. A test program is used to control the EUT for staying in continuous transmitting mode.

5 INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

6 FACILITIES AND ACCREDITATIONS

6.1 Facilities

DT&C Co., Ltd.		
The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042. The test site complies with the requirements of § 2.948 according to ANSI C63.4-2014. **- FCC & ISED MRA Designation No.: KR0034** **- ISED#: 5740A**		
www.dtnc.net		
Telephone	:	+ 82-31-321-2664
FAX	:	+ 82-31-321-1664

6.2 Equipment

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, loop, horn. Spectrum analyzers with pre-selectors and peak, quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

7 ANTENNA REQUIREMENTS

7.1 According to Part 15.203

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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.

The antenna is permanently attached on the main PCB.

Therefore this E.U.T Complies with the requirement of §15.203

8 TEST RESULTS

8.1 Emission Bandwidth

▣ Test Requirements and limit

Part 15.215(c)

The 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

Part 15.255(e)(1)

Transmitters with an emission bandwidth of less than 100 MHz must limit their peak transmitter conducted output power to the product of 500 mW times their emission bandwidth divided by 100 MHz. For the purposes of this paragraph, emission bandwidth is defined as the instantaneous frequency range occupied by a steady state radiated signal with modulation, outside which the radiated power spectral density never exceeds 6 dB below the maximum radiated power spectral density in the band, **as measured with a 100 kHz resolution bandwidth spectrum analyzer.** The center frequency must be stationary during the measurement interval, even if not stationary during normal operation (e.g., for frequency hopping devices).

▣ Test Configuration

Refer to the APPENDIX I.

▣ Test Procedure

ANSI C63.10-2013 – Section 9.3

The following procedure was used for measurement of the bandwidth for millimeter-wave devices;

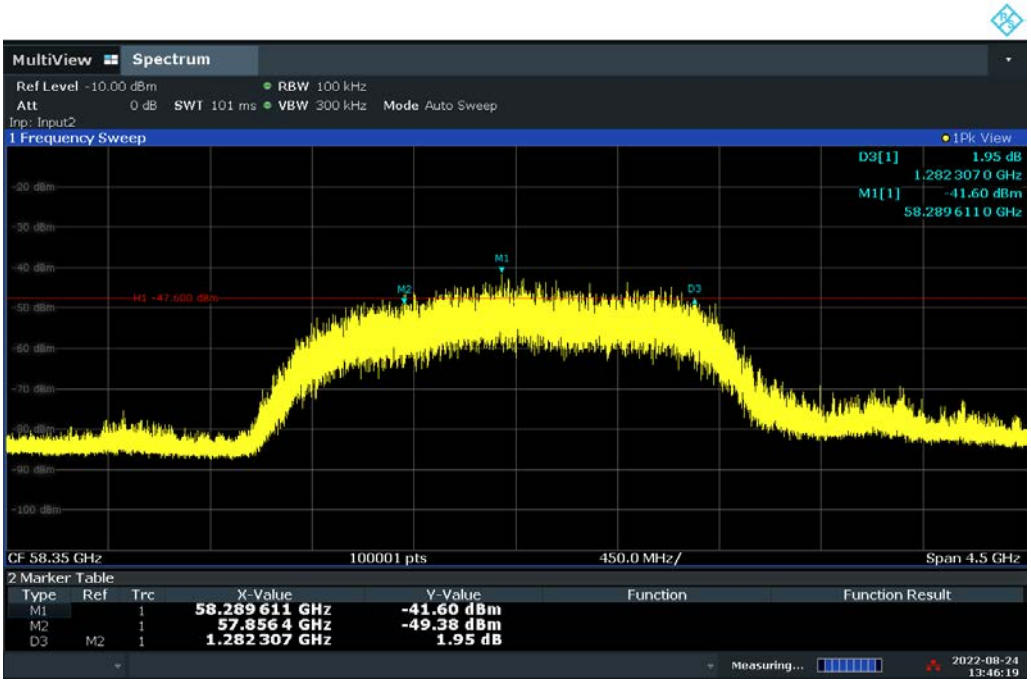
- Spectrum analyzer settings:
  1) Span equal to approximately two times to three times the EBW, centered on the carrier frequency.
  2) RBW, as specified in the requirement.
  3) VBW, as specified in the requirement, or VBW ≥ RBW if not specified.
  4) Sweep = auto.
  5) Detector function = peak.
  6) Trace = max hold. Allow the trace to stabilize.
  7) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

▣ Test Results: Comply

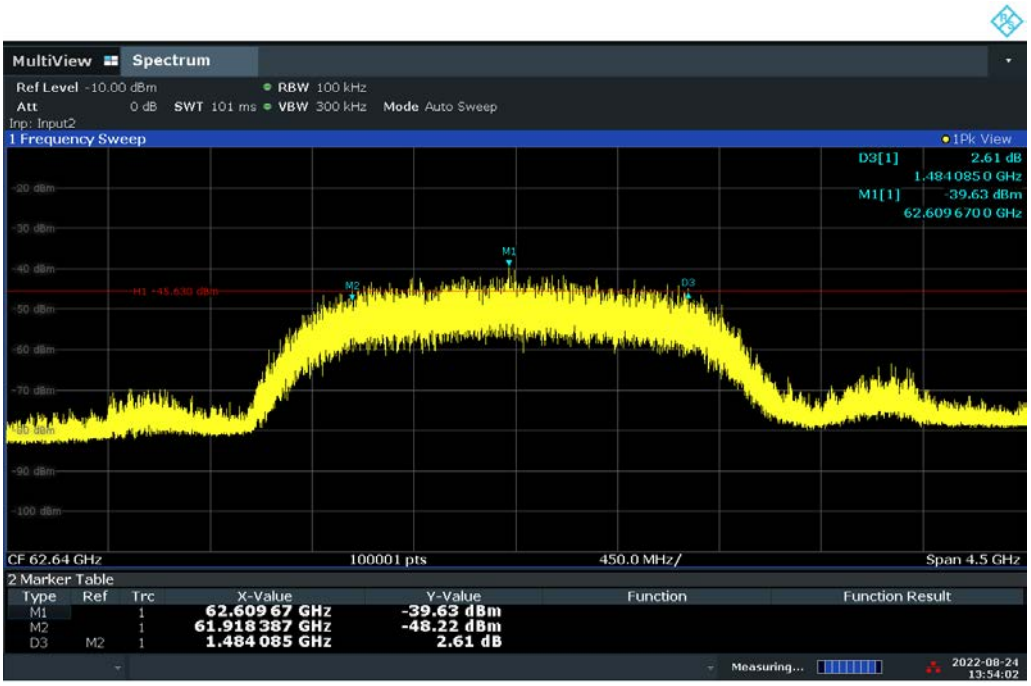
Test Mode	Data Rate	Frequency[GHz]	6 dB Bandwidth [MHz]	20 dB Bandwidth [MHz]
802.11ad	MCS1	58.32	1 282.307	2 096.79
		62.64	1 484.085	2 141.79
		69.12	1 398.361	2 107.14

▣ Result plots

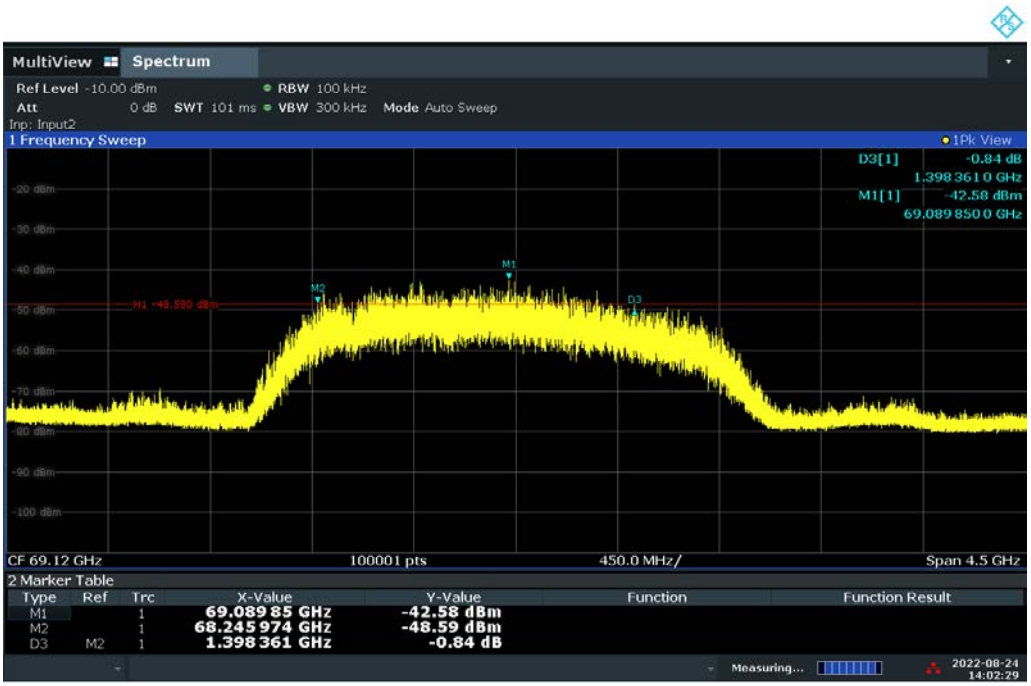
6 dB Bandwidth MCS 1 & 58.32 GHz



6 dB Bandwidth MCS 1 & 62.64 GHz



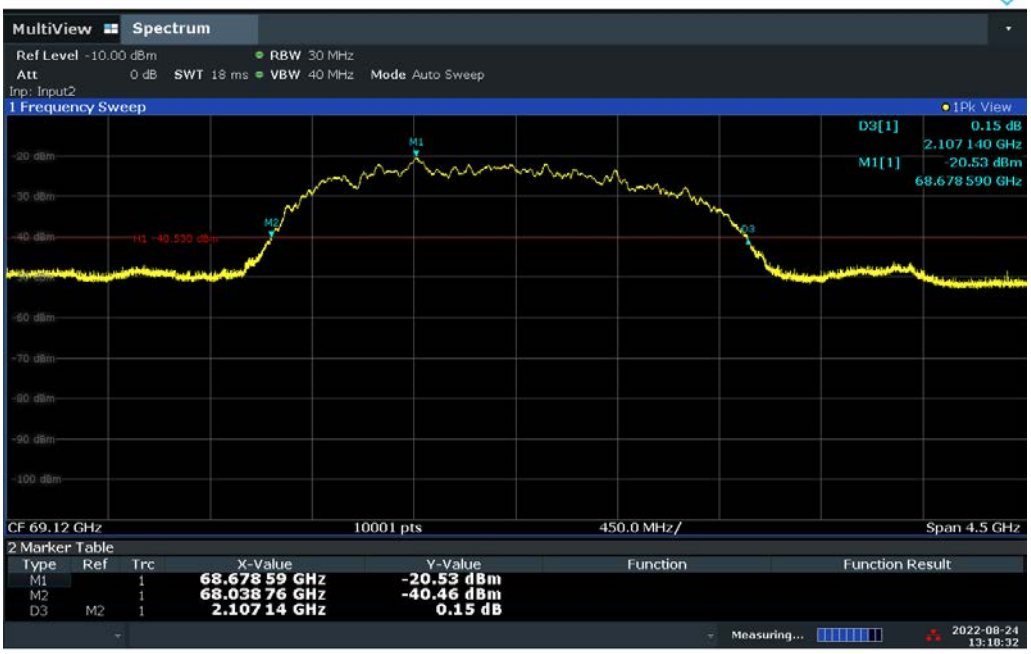
6 dB Bandwidth MCS 1 & 69.12 GHz



20 dB Bandwidth MCS 1 & 58.32 GHz

20 dB Bandwidth MCS 1 & 62.64 GHz

20 dB Bandwidth MCS 1 & 69.12 GHz



8.2 Equivalent Isotropic Radiated Power & Peak Conducted Output Power

▣ Test Requirements and limit

Part 15.255(c): Within the 57-71 GHz band, emission levels shall not exceed the following equivalent isotropically radiated power (EIRP):

(1) Products other than fixed field disturbance sensors and short-range devices for interactive motion sensing shall comply with one of the following emission limits, as measured during the transmit interval:

(i) The average power of any emission shall not exceed 40 dBm and the peak power of any emission shall not exceed 43 dBm; or

(ii) For fixed point-to-point transmitters located outdoors, the average power of any emission shall not exceed 82 dBm, and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi. The peak power of any emission shall not exceed 85 dBm, and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi.

▣ Test Configuration

Refer to the APPENDIX I.

▣ Test Procedure

ANSI C63.10-2013 – Section 9.11

The following procedure was used for measurement of the output power for millimeter-wave devices;

1) The measurements were performed at 3m test site.
2) The EUT is placed on a non-conductive table is 1.5 meter above test site ground plane.
3) The measurement procedure described in ANSI C63.10-2013 Section 9.9 was followed, to find maximum signal.
4) The average and peak voltages was recorded from the DSO.
5) Replace the EUT with mm-wave source to the RF input port of the instrumentation system.
6) The mm-wave source is unmodulated.
7) Adjust the amplitude of the mm-wave source such that the DSO indicates a voltage equal to the peak voltage recorded in step 4).
8) Without changing any settings, replace the DSO with the mm-wave power meter.
9) Measure and note the power.

Far field distance (R_m)

$R_m = 2D^2 / \lambda$,

Where, D=the largest dimension of the antenna / λ=the wavelength of the emissions

Frequency Range(GHz)	λ (cm)	D (cm)	Rm (m)	Measurement Distance(m)
58.32 ~ 69.12	0.43	5.68	1.49	1.60

Note: The dimension of the antenna of the EUT antenna or measurement antenna, whichever is largest, was used.

▣ Test Results: Comply

Peak Power(e.i.r.p)

Measurement distance(D)	Frequency (GHz)	ANT Pol	DSO Reading [mV]	Power Meter Level[dBm]	Antenna Gain [dBi]	E (dBuV/m)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1.6m	58.32	H	13.30	-12.15	24.76	135.66	35.04	43.00	7.96
1.6m	62.64	H	20.30	-10.01	25.10	138.08	37.46	43.00	5.54
1.6m	69.12	H	12.50	-12.35	25.21	136.49	35.87	43.00	7.13

Average Power(e.i.r.p)

Measurement distance(D)	Frequency (GHz)	ANT Pol	DSO Reading [mV]	Power Meter Level[dBm]	Antenna Gain [dBi]	E (dBuV/m)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1.6m	58.32	H	11.3	-12.38	24.76	135.43	34.81	40.00	5.19
1.6m	62.64	H	18.2	-10.15	25.10	137.94	37.32	40.00	2.68
1.6m	69.12	H	10.5	-12.61	25.21	136.23	35.61	40.00	4.39

Note.

1. The EIRP was investigated under all data rate and the worst case data was reported.(MCS 1)

2. Sample calculation.

$E = 126.8 – 20\log(\lambda) + P – G.$

where

E is the field strength of the emission at the measurement distance, in dBμV/m

P is the power measured at the output of the test antenna, in dBm

λ is the wavelength of the emission under investigation [300/fMHz], in m

G is the gain of the test antenna, in dBi

$EIRP = E_{Meas} + 20\log(d_{Meas}) - 104.7$

where

EIRP is the equivalent isotropically radiated power, in dBm

E_{Meas} is the field strength of the emission at the measurement distance, in dBμV/m

d_{Meas} is the measurement distance, in m

Peak Conducted Output Power:

Frequency (GHz)	EIRP(dBm)	EUT Antenna Gain(dBi)	Conducted Output Power(dBm)	Limit (dBm)	Margin (dB)
58.32	35.04	15.00	20.04	26.99	6.95
62.64	37.46	15.00	22.46	26.99	4.53
69.12	35.87	15.00	20.87	26.99	6.12

Note. Calculate the conducted output power (in watts) from the EIRP using Equation:

$P_{cond} = EIRP_{Linear} / G_{EUT}$

Where

P_{cond} is the conducted output power, in W

$EIRP_{Linear}$ is the equivalent isotropically radiated power, in W

G_{EUT} is numeric gain of the EUT radiating element (antenna)

8.3 Unwanted emissions

▣ Test Requirements and limit

FCC Part 15.255(d): Limits on spurious emissions

(1) The power density of any emissions outside the 57-71 GHz band shall consist solely of spurious emissions.

(2) Radiated emissions below 40 GHz shall not exceed the general limits in §15.209.

(3) Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm^2 at a distance of 3 meters.

(4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.

FCC Part 15.209(a): the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
0.009 – 0.490	2400/F (kHz)	300
0.490 – 1.705	24000/F (kHz)	30
1.705 – 30.0	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

▣ Test Configuration

Refer to the APPENDIX I.

▣ Test Procedure

ANSI C63.10-2013 – Section 9.12 & 9.13

The following procedure was used for measurement of the radiated spurious emissions.

1) The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements at above 1 GHz, the table height is 1.5 m

2) The table was rotated 360 degrees to determine the position of the highest radiation.

3) During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 0.5 ~ 3 meter away from the interference-receiving antenna.

4) For measurements above 1GHz absorbers are placed on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1 GHz, the absorbers are removed.

5) The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

6) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.

7) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

- Spectrum analyzer settings:

1. Frequency Range: Below 1GHz
RBW = 100 or 120 kHz, VBW = 3 x RBW, Detector = Peak or Quasi Peak

2. Frequency Range: ≤ 40GHz
Peak Measurement
RBW = 1 MHz, VBW = 3 MHz, Detector = Peak, Sweep time = Auto, Trace mode = Max Hold until the trace stabilizes
Average Measurement
RBW = 1 MHz, VBW ≥ 1/T, Detector = Peak, Sweep Time = Auto, Trace Mode = Max Hold until the trace stabilizes

3. Frequency Range: Above 40GHz
RBW = 1 MHz, VBW = 1 or 3 MHz, Detector = Peak or average, Sweep time = Auto, Trace mode = Max Hold until the trace stabilizes

Far field distance (R_m)

$R_m = 2D^2 / \lambda$,

Where, D=the largest dimension of the measurement antenna / λ=the wavelength of the emissions

Frequency Range(GHz)	λ (cm)	D(cm)	Rm (m)	Measurement Distance(m)
40 ~ 60	0.50	6.24	1.56	1.60
60 ~ 90	0.33	4.82	1.39	1.60
90 ~ 140	0.21	2.74	0.70	0.70
140 ~ 200	0.15	1.89	0.48	0.70

▣ Test Results: Comply

Frequency Range: 9 kHz ~ 1 GHz
Test Frequency: 62.64 GHz

Frequency (MHz)	ANT Pol	Detector Mode	Measured Level(dBuV)	TF (dB/m)	DCF(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
928.21	H	PK	25.10	7.90	NA	33.00	46.00	13.00
945.67	H	PK	25.20	8.20	NA	33.40	46.00	12.60
954.40	H	PK	25.10	8.50	NA	33.60	46.00	12.40
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-

Note.

1. The worst case data was reported. No other spurious and harmonic emissions were found above listed frequencies.
2. Information of DCF(Distance Correction Factor)
   For finding emissions, measurements may be performed at a distance closer than that specified in the regulations.
   In this case, the distance factor is applied to the result.
   - Calculation of distance correction factor
   At frequencies below 30 MHz = 40 log(tested distance / specified distance)
   At frequencies at or above 30 MHz = 20 log(tested distance / specified distance)
   When distance factor is “NA”, the measurements were performed at the specified distance and distance factor is not applied.
3. Sample Calculation.
   Margin = Limit – Result / Result = Measured Level + TF + Distance factor / TF = AF + CL – AG
   Where, TF = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain
4. ***** Noise floor.

Frequency Range: 1 ~ 40 GHz
Tested Frequency: 58.32 GHz

Frequency (MHz)	ANT Pol	Detector Mode	Measured Level(dBuV)	TF (dB/m)	DCF(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*3 362.98	H	PK	41.45	5.71	NA	47.16	74.00	26.84
*3 363.92	H	AV	30.44	5.70	NA	36.14	54.00	17.86
10 560.43	H	PK	41.76	15.87	-5.46	52.17	74.00	21.83
10 560.18	H	AV	34.40	15.87	-5.46	44.81	54.00	9.19
14 080.23	V	PK	37.10	20.63	-5.46	52.27	74.00	21.73
14 080.38	V	AV	26.95	20.63	-5.46	42.12	54.00	11.88
21 120.13	H	PK	41.69	8.94	-5.46	45.17	74.00	28.83
21 120.19	H	AV	30.93	8.94	-5.46	34.41	54.00	19.59
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-

Tested Frequency: 62.64 GHz

Frequency (MHz)	ANT Pol	Detector Mode	Measured Level(dBuV)	TF (dB/m)	DCF(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*3 425.02	H	PK	42.47	5.56	NA	48.03	74.00	25.97
*3 423.14	H	AV	30.68	5.54	NA	36.22	54.00	17.78
10 559.98	H	PK	41.27	15.87	-5.46	51.68	74.00	22.32
10 560.14	H	AV	34.42	15.87	-5.46	44.83	54.00	9.17
14 080.46	V	PK	38.13	20.63	-5.46	53.30	74.00	20.70
14 080.25	V	AV	28.98	20.63	-5.46	44.15	54.00	9.85
21 120.30	H	PK	41.35	8.94	-5.46	44.83	74.00	29.17
21 120.19	H	AV	31.07	8.94	-5.46	34.55	54.00	19.45
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-

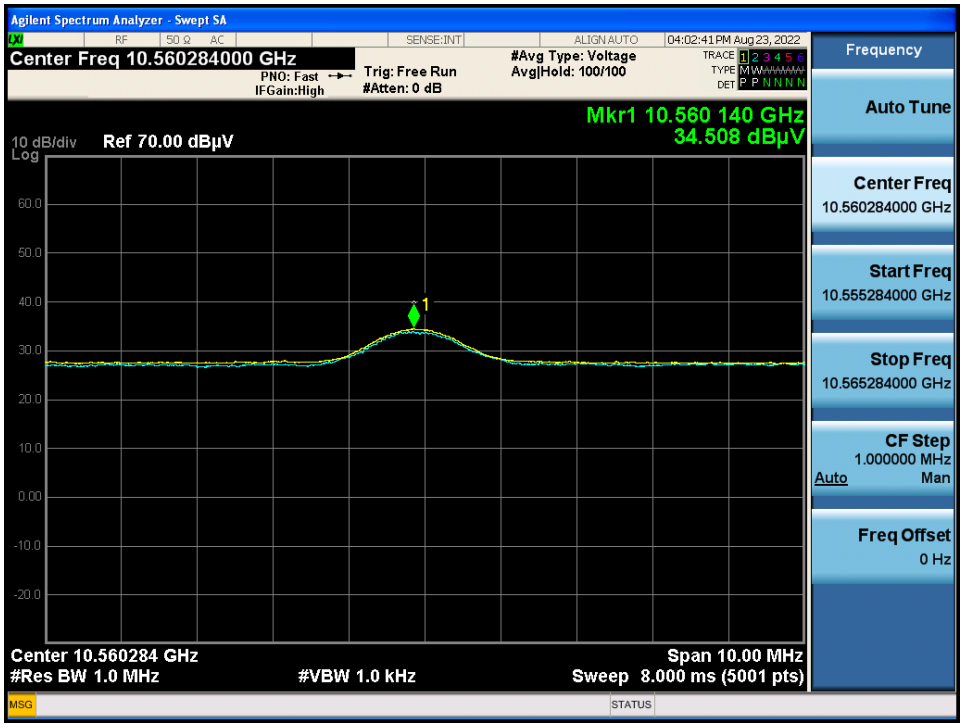
Tested Frequency: 69.12 GHz

Frequency (MHz)	ANT Pol	Detector Mode	Measured Level(dBuV)	TF (dB/m)	DCF(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*3 373.79	H	PK	41.88	5.60	NA	47.48	74.00	26.52
*3 373.79	H	AV	30.01	5.60	NA	35.61	54.00	18.39
10 560.08	H	PK	41.91	15.87	-5.46	52.32	74.00	21.68
10 560.14	H	AV	34.51	15.87	-5.46	44.92	54.00	9.08
14 080.98	V	PK	37.44	20.63	-5.46	52.61	74.00	21.39
14 080.26	V	AV	27.48	20.63	-5.46	42.65	54.00	11.35
21 120.08	H	PK	41.93	8.94	-5.46	45.41	74.00	28.59
21 120.04	H	AV	30.78	8.94	-5.46	34.26	54.00	19.74
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-

Note.

1. No other spurious and harmonic emissions were found above listed frequencies.
2. Information of DCF(Distance Factor)
   For finding emissions, the test distance might be reduced. In this case, the distance factor is applied to the result.
   - Calculation of distance factor = 20 log(applied distance / required distance)
   When distance factor is “N/A”, the distance is 3 m and distance factor is not applied.
3. Sample Calculation.
   Margin = Limit – Result / Result = Measured Level + TF + Distance factor / TF = AF + CL – AG
   Where, TF = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain
4. ***** Noise floor.

Worst data plot (Measured Level) Y axis & Hor



Frequency Range: 40 ~ 200 GHz
Tested Frequency: 58.32 GHz

Measurement distance(m)	Frequency (MHz)	ANT Pol	Measured Level(dBm)	AFCLAG (dB/m)	E (dBuV/m)	EIRP (dBm)	Power Density (pW/cm²)	Limit (pW/cm²)
1.6	56 670.25	H	-63.50	31.23	74.73	-25.89	2.28	90.00
0.7	*90 483.24	H	-67.29	47.41	87.12	-20.68	7.56	90.00
0.7	*128 098.05	H	-62.54	48.26	92.72	-15.08	27.45	90.00
0.7	*151 105.06	H	-68.96	51.42	89.46	-18.34	12.96	90.00

Tested Frequency: 62.64 GHz

Measurement distance(m)	Frequency (MHz)	ANT Pol	Measured Level(dBm)	AFCLAG (dB/m)	E (dBuV/m)	EIRP (dBm)	Power Density (pW/cm²)	Limit (pW/cm²)
0.7	*90 330.74	H	-66.82	47.43	87.61	-20.19	8.46	90.00
0.7	*127 999.05	H	-62.17	48.26	93.09	-14.71	29.89	90.00
0.7	*150 448.08	H	-69.05	51.38	89.33	-18.47	12.58	90.00
0.7	*172 068.22	H	-72.39	51.76	86.37	-21.43	6.36	90.00

Tested Frequency: 69.12 GHz

Measurement distance(m)	Frequency (MHz)	ANT Pol	Measured Level(dBm)	AFCLAG (dB/m)	E (dBuV/m)	EIRP (dBm)	Power Density (pW/cm²)	Limit (pW/cm²)
1.6	*73 138.98	H	-64.99	30.35	72.36	-28.26	1.32	90.00
0.7	*90 096.25	H	-67.32	47.45	87.13	-20.67	7.58	90.00
0.7	*128 061.55	H	-62.25	48.26	93.01	-14.79	29.35	90.00
0.7	*151 209.56	H	-68.31	51.42	90.11	-17.69	15.05	90.00

Note.

1. The radiated emissions were investigated up to 200GHz. And no other spurious and harmonic emissions were found above listed frequencies.
2. Sample Calculation.

   E(dBuV/m) = Measured level (dBuV) + 107 + AFCLAG(dB/m)

   where, E=field strength / AFCLAG = Antenna Factor(dB/m) + Cable Loss(dB/m) – Amplifier Gain(dB)

   EIRP(dBm) = E(dBuV/m) + 20log(D) - 104.7; where, D is measurement distance (in the far field region) in m.

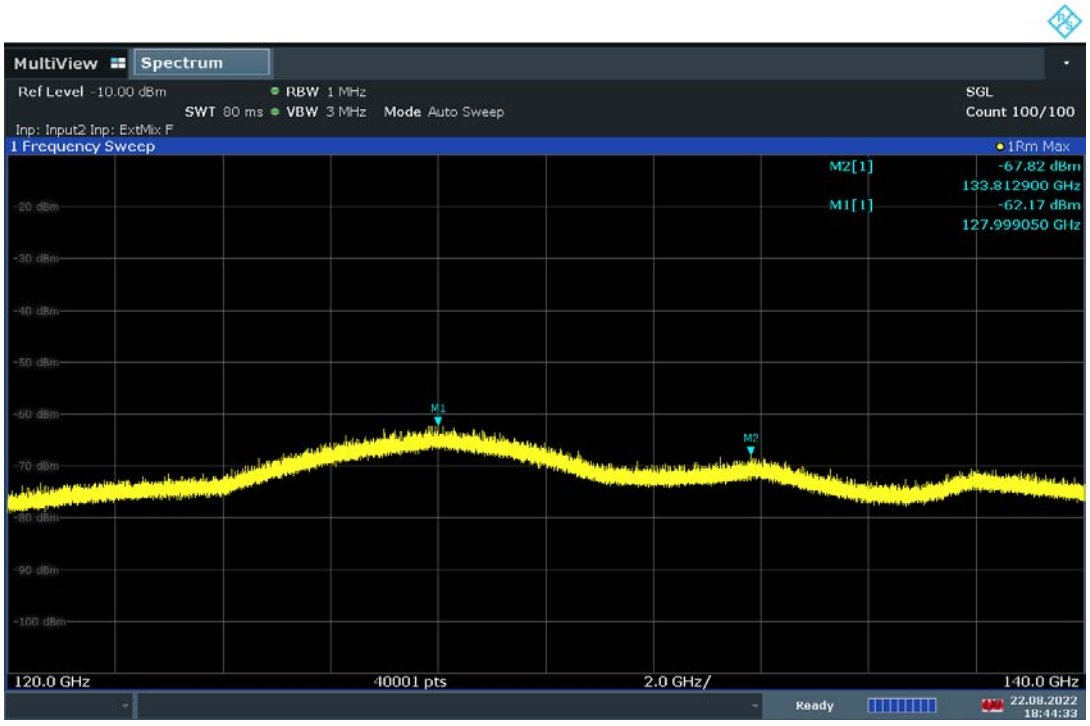
   $PD = EIRP_{Linear} / 4\pi d^2$

   Where, PD = the power density at the distance specified by the limit, in W/m^2

   $EIRP_{Linear}$ = EIRP, in watts

   D = is the distance at which the power density limit is specified, in m
3. The mixer loss was applied to the measured level by SA correction factor.
4. ***** Noise floor

Worst data plot (Measured Level) Y axis & Hor



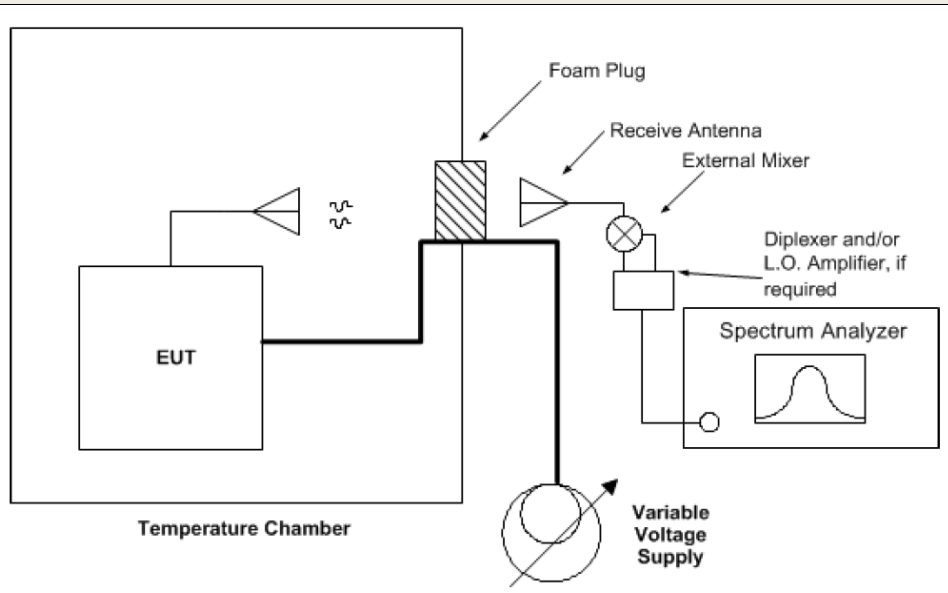
8.4 Frequency stability

▣ Test Requirements and limit

FCC Part 15.255(f): Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range −20 to + 50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

▣ Test Configuration

Frequency stability



▣ Test Procedure

ANSI C63.10-2013 – Section 9.14

1) With the EUT at ambient temperature (approximately 25 °C) and voltage source set to the EUT nominal operating voltage (100%), record the spectrum mask of the EUT emission on the spectrum analyzer.

2) Vary EUT power supply between 85% and 115% of nominal, and record the frequency excursion of the EUT emission mask.

3) Set the power supply to 100% nominal setting, and raise EUT operating temperature to 50 °C. Record the frequency excursion of the EUT emission mask.

4) Repeat step 3) at each 10 °C increment down to −20 °C.

▣ Test Results: Comply

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	Tested Frequency: 58.32 GHz	Tested Frequency: 69.12 GHz
			Measured low frequency(F_L)(MHz), 20dBC	Measured high frequency(F_L)(MHz), 20dBC
100%	5.00	+25(Ref)	57 340.30	70 140.05
100%		-20	57 343.45	70 140.95
100%		-10	57 362.35	70 138.70
100%		0	57 361.45	70 139.15
100%		+10	57 338.50	70 143.20
100%		+20	57 340.30	70 147.70
100%		+30	57 341.65	70 145.00
100%		+40	57 341.65	70 144.10
100%		+50	57 342.55	70 147.25
115%	5.75	+25	57 342.55	70 142.75
85%	4.25	+25	57 338.50	70 144.10

Note: Fundamental emissions were contained within the frequency bands.

8.5 AC line conducted emissions

▣ Test Requirements and limit, Part 15.207

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 uH/50 ohm line impedance stabilization network(LISN).

Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

▣ Test Configuration:

See test photographs for the actual connections between EUT and support equipment.

▣ Test Procedure:

ANSI C63.10-2013 – Section 6.2

1) The EUT is placed on a wooden table 80 cm above the reference ground plane.
2) The EUT is connected via LISN to the test power supply.
3) The measurement results are obtained as described below:
4) Detectors – Quasi Peak and Average Detector.

▣ **Test Results: Comply**

AC Line Conducted Emissions (Graph) MCS 1 & 62.64 GHz

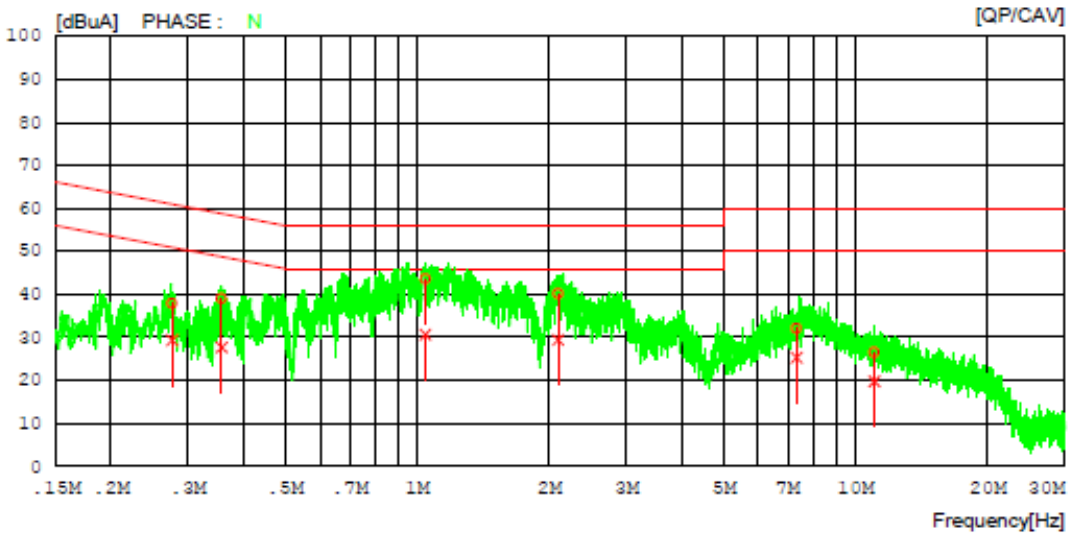
Results of Conducted Emission

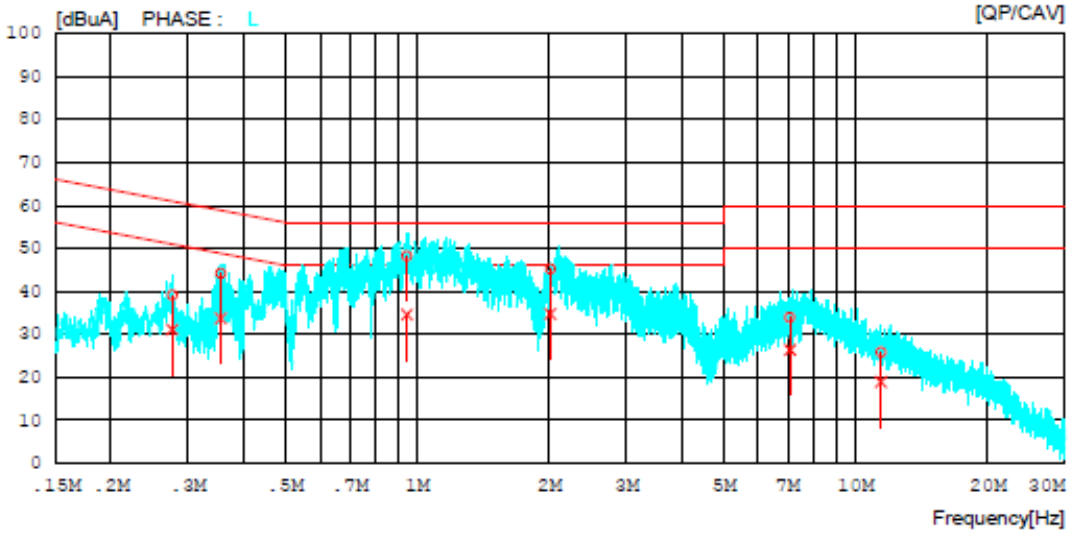
DTNC Date 2022-08-26

Order No.	DTNC2208-06146	Referrence No.	
Model No.	MWC-740m	Power Supply	
Serial No.		Temp/Humi.	23 'C / 43 %
Test Condition	Ch3	Operator	J.H.Bang

Memo

LIMIT : FCC P15.207 AV
FCC P15.207 QP





AC Line Conducted Emissions (List) MCS 1 & 62.64 GHz

Results of Conducted Emission

DTNC Date 2022-08-26

Order No.	DTNC2208-06146	Referrence No.	
Model No.	MWC-740m	Power Supply	
Serial No.		Temp/Humi.	23 'C / 43 %
Test Condition	Ch3	Operator	J.H.Bang

Memo

LIMIT : FCC P15.207 AV
FCC P15.207 QP

NO	FREQ	READING QP	READING CAV	C.FACTOR	RESULT QP	RESULT CAV	LIMIT QP	LIMIT CAV	MARGIN QP	MARGIN CAV	PHASE
	[MHz]	[dBuA]	[dBuA]	[dB]	[dBuA]	[dBuA]	[dBuA]	[dBuA]	[dBuA]	[dBuA]	
1	0.27583	27.85	19.36	10.00	37.85	29.36	60.94	50.94	23.09	21.58	N
2	0.35763	29.07	17.64	10.01	39.08	27.65	58.78	48.78	19.70	21.13	N
3	1.04304	33.52	20.45	10.12	43.64	30.57	56.00	46.00	12.36	15.43	N
4	2.09367	29.97	19.27	10.16	40.13	29.43	56.00	46.00	15.87	16.57	N
5	7.32124	21.77	15.05	10.28	32.05	25.33	60.00	50.00	27.95	24.67	N
6	11.01185	16.07	9.31	10.45	26.52	19.76	60.00	50.00	33.48	30.24	N
7	0.27619	29.13	21.13	10.00	39.13	31.13	60.93	50.93	21.80	19.80	L
8	0.35598	34.15	23.70	10.01	44.16	33.71	58.82	48.82	14.66	15.11	L
9	0.94644	38.13	24.57	10.07	48.20	34.64	56.00	46.00	7.80	11.36	L
10	2.01056	35.01	24.55	10.16	45.17	34.71	56.00	46.00	10.83	11.29	L
11	7.07437	23.61	16.17	10.26	33.87	26.43	60.00	50.00	26.13	23.57	L
12	11.41271	15.50	8.60	10.39	25.89	18.99	60.00	50.00	34.11	31.01	L

9 LIST OF TEST EQUIPMENT

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Rohde Schwarz	FSW85	21/12/16	22/12/16	101530
Spectrum Analyzer	Rohde Schwarz	FSW85	22/08/04	23/08/04	101778
Spectrum Analyzer	Agilent Technologies	N9020A	22/06/24	23/06/24	US47360812
Spectrum Analyzer	KEYSIGHT	N9030B	21/12/16	22/12/16	MY55480168
DC Power supply	SM techno	SDP30-5D	22/06/24	23/06/24	305DMG305
DC Power supply	SM techno	SDP30-5D	22/06/24	23/06/24	305DMG304
Signal Generator	KEYSIGHT	N5182B	21/12/16	22/12/16	MY53050182
Signal Generator	ANRITSU	MG3695C	21/12/16	22/12/16	173501
Multimeter	FLUKE	17B+	21/12/16	22/12/16	36390701WS
Thermohygrometer	BODYCOM	BJ5478	21/12/16	22/12/16	120612-2
Thermohygrometer	XIAOMI	MHO-C201	21/12/16	22/12/16	00089675
Loop Antenna	ETS-Lindgren	6502	21/01/28	23/01/28	00226186
Bilog Antenna	Schwarzbeck	VULB 9160	21/12/16	22/12/16	3362
HORN ANT	ETS	3117	21/12/16	22/12/16	00140394
HORN ANT	A.H.Systems Inc.	SAS-574	22/06/24	23/06/24	154
Horn Antenna	MI Wave	RX ANT-5 261U+410U	22/06/24	23/06/24	108
Horn Antenna	MI Wave	RX ANT-6 261V+410V	22/06/24	23/06/24	110
Horn Antenna	MI Wave	RX ANT-7 261E	22/06/24	23/06/24	112
Horn Antenna	MI Wave	261W-25/387	22/06/24	23/06/24	743
Horn Antenna	MI Wave	RX ANT-8 261F	22/06/24	23/06/24	114
Horn Antenna	MI Wave	RX ANT-9 261G	22/06/24	23/06/24	116
Harminoc mixer	Rohde Schwarz	FS-Z90	22/08/04	23/08/04	101714
Harminoc mixer	Rohde Schwarz	FS-Z140	22/08/04	23/08/04	101009
Harminoc mixer	Rohde Schwarz	FS-Z220	21/10/07	23/10/07	101012
Harminoc mixer	KEYSIGHT	M1971W	21/12/16	22/12/16	MY56390126
PreAmplifier	H.P	8447D	21/12/16	22/12/16	2944A07774
PreAmplifier	Agilent	8449B	22/06/24	23/06/24	3008A02108
PreAmplifier	tsj	MLA-1840-J02-45	22/06/24	23/06/24	16966-10728
*PreAmplifier	Norden Millimeter Inc.	NA4060G50N8P12	21/02/18	23/02/18	1003
*PreAmplifier	Norden Millimeter Inc.	NN6090G40N5P-2	21/02/18	23/02/18	1001
High-pass filter	Wainwright	WHKX12-935-1000-15000-40SS	22/06/24	23/06/24	7
High-pass filter	Wainwright	WHKX10-2838-3300-18000-60SS	22/06/24	23/06/24	2
High-pass filter	Wainwright	WHKX6-6320-8000-26500-40CC	22/06/24	23/06/24	2
Level Setting Attenuator	SAGE Millimeter	STA-30-15-M1	22/04/11	23/04/11	10390-01
Digital oscilloscope	Tektronix	DPO2024B	21/12/16	22/12/16	C012114
RF Detector	SAGE Milimeter	SFD-503753-15SF-P1	22/04/27	23/04/27	17841-01
Power meter & Power sensor	Rohde Schwarz	NRP2, NRP110T	21/12/16	22/12/16	106060, 101002
mmW Multiplier	OML, Inc.	S15MS	22/08/04	23/08/04	170821-1
Temp & Humi Test Chamber	SJ Science	SJ-TH-S50	21/12/14	22/12/14	SJ-TH-S50-131011
EMI Test Receiver	ROHDE&SCHWARZ	ESU	21/11/12	22/11/12	100469
PULSE LIMITER	Rohde Schwarz	ESH3-Z2	22/08/23	23/08/23	101333
LISN	SCHWARZBECK	NSLK 8128 RC	21/10/22	22/10/22	8128 RC-387
HYGROMETER	TESTO	608-H1	22/01/14	23/01/14	34862883
Cable	HUBER+SUHNER	SUCOFLEX100	22/01/04	23/01/04	M-1
Cable	HUBER+SUHNER	SUCOFLEX100	22/01/04	23/01/04	M-2
Cable	JUNFLON	MWX241/B	22/01/04	23/01/04	M-3
Cable	JUNFLON	MWX221	22/01/04	23/01/04	M-4
Cable	JUNFLON	MWX221	22/01/04	23/01/04	M-5
Cable	JUNFLON	J12J101757-00	22/01/04	23/01/04	M-7
Cable	HUBER+SUHNER	SUCOFLEX104	22/01/04	23/01/04	M-8
Cable	HUBER+SUHNER	SUCOFLEX106	22/01/04	23/01/04	M-9

Cable	JUNFLON	MWX315	22/06/08	23/06/08	M-10
Cable	Junkosha	MWX241	22/01/04	23/01/04	mmW-1
Cable	Junkosha	MWX241	22/01/04	23/01/04	mmW-4
Cable	Junkosha	MWX261	22/01/04	23/01/04	mmW-6
Cable	HUBER+SUHNER	SUCOFLEX 104	22/01/04	23/01/04	mmW-8
Cable	HUBER+SUHNER	SUCOFLEX 104	22/01/04	23/01/04	mmW-9
Cable	SAGE MILLIMETER Inc	SCW-1M1M024-F1	22/01/04	23/01/04	mmW-10
Cable	DTNC	Cable	22/01/04	23/01/04	RFC-69
Test Software	tsj	Radiated Emission Measurement	NA	NA	Version 2.00.0177
Test Software	tsj	Noise Terminal Measurement	NA	NA	Version 2.00.0170

Note1: The measurement antennas were calibrated in accordance to the requirements of ANSI C63.5-2017.
Note2: The cable is not a regular calibration item, so it has been calibrated by DT & C itself.
Note3: * The mm-wave instruments were calibrated by the manufacturer.

APPENDIX I

Test set up diagrams

Below 1GHz	Above 1GHz