

Supplemental “Transmit Simultaneously” Test Report

Report No.: RF200204C24-5

FCC ID: A4R-G4CVZ

Test Model: G4CVZ

Received Date: Feb. 04, 2020

Test Date: June 14 to 15, 2020

Issued Date: June 24, 2020

Applicant: GOOGLE LLC

Address: 1600 Amphitheatre Parkway Mountain View, CA 94043

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Hsin Chu Laboratory

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**FCC Registration /
Designation Number:** 723255 / TW2022



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Release Control Record

Issue No.	Description	Date Issued
RF200204C24-5	Original release.	June 24, 2020

1 Certificate of Conformity

Product: Thermostat

Test Model: G4CVZ

Sample Status: Engineering Sample

Applicant: GOOGLE LLC

Test Date: June 14 to 15, 2020

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
47 CFR FCC Part 15, Subpart C (Section 15.255)
47 CFR FCC Part 15, Subpart E (Section 15.407)
ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by :

Phoenix Huang
Phoenix Huang / Specialist

Date:

June 24, 2020

Approved by :

Wen Yu
Wen Yu / Supervisor

Date:

June 24, 2020

2 Summary of Test Results

FCC Part 15, Subpart C, E (SECTION 15.247, 15.255, 15.407)			
FCC Clause	Test Item	Result	Remarks
15.205 / 15.209 / 15.247(d) 15.255 (d)(2) 15.407(b) (1/2/3/4(i/ii)/6)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -10.3 dB at 17983.00 MHz.

Note:

Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) ($\pm$)
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	5.1 dB
	30MHz ~ 1GHz	5.1 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.3 dB
	18GHz ~ 40GHz	5.4 dB
	40GHz ~ 200GHz	5.4 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Thermostat
Test Model	G4CVZ
Status of EUT	Normal Operating Condition
Battery Nominal Voltage	3 Vdc
Battery Voltage Operation Range	2.55 – 3.45 Vdc
Modulation Type	WLAN: CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM BT-LE: GFSK 60GHz Radar: FMCW
Modulation Technology	WLAN: OFDM 60GHz Radar: Pulse BT-LE: DTS
Transfer Rate	WLAN: 802.11a: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps 802.11b: 11.0 / 5.5 / 2.0 / 1.0 Mbps 802.11g: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps 802.11n: up to 72.2 Mbps BT-LE: 1 Mbps
Operating Frequency	WLAN (2.4GHz): 2.412 ~ 2.462 GHz WLAN (5GHz): 5.18 ~ 5.24 GHz, 5.26 ~ 5.32 GHz, 5.5 ~ 5.7 GHz, 5.745 ~ 5.825 GHz BT-LE: 2.402 ~ 2.480 GHz 60GHz Radar: 61 ~ 61.5 GHz
Antenna Gain	WLAN (2.4GHz): PIFA antenna with 1.09 dBi gain WLAN (5GHz): PIFA antenna with 3.20 dBi gain (5.18 ~ 5.24 GHz) PIFA antenna with 1.96 dBi gain (5.26 ~ 5.32 GHz) PIFA antenna with 1.30 dBi gain (5.5 ~ 5.7 GHz) PIFA antenna with 1.95 dBi gain (5.745 ~ 5.825 GHz) BT-LE: PIFA antenna with 1.09 dBi gain 60GHz Radar: 5 dBi, ☒ Specified by manufacturer ☐ Measured
Antenna Connector	NA
Accessory Device	Refer to Notes as below
Data Cable Supplied	Refer to Notes as below

Note:

1. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.1.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO		DESCRIPTION
	RE $\geq$ 1G	RE<1G	
1	√	√	WLAN (2.4GHz) + 60GHz Radar
2	√	√	WLAN (5GHz) + 60GHz Radar
3	√	√	BT-LE + 60GHz Radar

Where **RE $\geq$ 1G**: Radiated Emission above 1GHz & Bandedge Measurement

RE<1G: Radiated Emission below 1GHz

Note: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-plane**.

Radiated Emission Test (Above 1GHz):

☒ Following channel(s) was (were) selected for the final test as listed below.

Available Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type
1	1 to 11	11	DSSS	DBPSK
	1	1	Pulse	FMCW
2	36 to 64 100 to 140 149 to 165	100	OFDM	BPSK
	1	1	Pulse	FMCW
3	0 to 39	0	DTS	GFSK
	1	1	Pulse	FMCW

Radiated Emission Test (Below 1GHz):

☒ Following channel(s) was (were) selected for the final test as listed below.

Available Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type
1	1 to 11	11	DSSS	DBPSK
	1	1	Pulse	FMCW
2	36 to 64 100 to 140 149 to 165	100	OFDM	BPSK
	1	1	Pulse	FMCW
3	0 to 39	0	DTS	GFSK
	1	1	Pulse	FMCW

Test Condition:

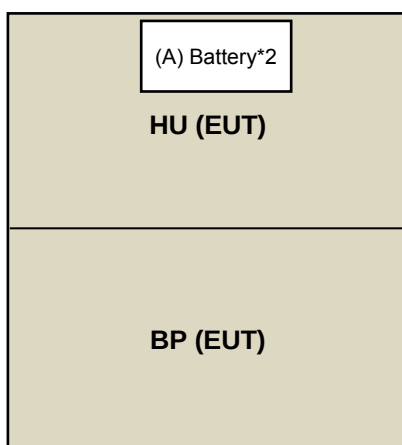
APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE $\geq$ 1G	19deg. C, 67%RH	3Vdc	Weiwei Lo
RE<1G	24deg. C, 64%RH, 25deg. C, 68%RH, 23deg. C, 62%RH	3Vdc	Weiwei Lo

3.2 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Battery	NA	AAA	NA	NA	Provided by Lab

3.2.1 Configuration of System under Test



4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

For 47 CFR FCC Part 15, Subpart C, E (15.247, 15.407):

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
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

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Limits of unwanted emission out of the restricted bands

Applicable To			Limit	
789033 D02 General UNII Test Procedure New Rules v02r01			Field Strength at 3m	
			PK:74 (dBμV/m)	AV:54 (dBμV/m)
Frequency Band	Applicable To		EIRP Limit	Equivalent Field Strength at 3m
5150~5250 MHz	15.407(b)(1)		PK:-27 (dBm/MHz)	PK:68.2(dBμV/m)
5250~5350 MHz	15.407(b)(2)			
5470~5725 MHz	15.407(b)(3)			
5725~5850 MHz	☒	15.407(b)(4)(i)	PK:-27 (dBm/MHz) ^{*1} PK:10 (dBm/MHz) ^{*2} PK:15.6 (dBm/MHz) ^{*3} PK:27 (dBm/MHz) ^{*4}	PK: 68.2(dBμV/m) ^{*1} PK:105.2 (dBμV/m) ^{*2} PK: 110.8(dBμV/m) ^{*3} PK:122.2 (dBμV/m) ^{*4}
	☐	15.407(b)(4)(ii)	Emission limits in section 15.247(d)	
^{*1} beyond 75 MHz or more above of the band edge.			^{*2} below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above.	
^{*3} below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above.			^{*4} from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.	

Note:

The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000 \sqrt{30P}}{3} \text{ } \mu\text{V/m, where P is the eirp (Watts).}$$

For 47 CFR FCC Part 15, Subpart C (15.255)

Spurious Emission	
Frequency Range	Limitation
Radiated emissions below 40GHz	Part 15.209
Between 40GHz and 200GHz	90pW/cm ² (at 3 meter)
Note: The levels of the spurious emissions shall not exceed the level of the fundamental emission	

4.1.2 Test Instruments

For Radiated Emission (Below 40GHz):

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESR7	102026	Apr. 22, 2020	Apr. 21, 2021
Spectrum Analyzer Keysight	N9030B	MY57141948	May 22, 2020	May 21, 2021
Pre-Amplifier EMCI	EMC001340	980142	May 25, 2020	May 24, 2021
Loop Antenna Electro-Metrics	EM-6879	264	Feb. 18, 2020	Feb. 17, 2021
RF Cable	NA	LOOPCAB-001	Jan. 08, 2020	Jan. 07, 2021
RF Cable	NA	LOOPCAB-002	Jan. 08, 2020	Jan. 07, 2021
Pre-Amplifier EMCI	EMC330N	980538	Apr. 28, 2020	Apr. 27, 2021
Trilog Broadband Antenna SCHWARZBECK	VULB9168	9168-0842	Nov. 08, 2019	Nov. 07, 2020
RF Cable	8D	966-5-1	Apr. 29, 2020	Apr. 28, 2021
RF Cable	8D	966-5-2	Apr. 29, 2020	Apr. 28, 2021
RF Cable	8D	966-5-3	Apr. 29, 2020	Apr. 28, 2021
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-ATT5-02	Jan. 14, 2020	Jan. 13, 2021
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-1819	Nov. 24, 2019	Nov. 23, 2020
Pre-Amplifier EMCI	EMC12630SE	980509	Apr. 29, 2020	Apr. 28, 2021
RF Cable EMCI	EMC104-SM-SM-1500	180503	Apr. 29, 2020	Apr. 28, 2021
RF Cable EMCI	EMC104-SM-SM-2000	180501	Apr. 29, 2020	Apr. 28, 2021
RF Cable EMCI	EMC104-SM-SM-6000	180506	Apr. 29, 2020	Apr. 28, 2021
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 15, 2020	Jan. 14, 2021
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 24, 2019	Nov. 23, 2020
RF Cable	EMC102-KM-KM-1200	160924	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC-KM-KM-4000	200214	Mar. 11, 2020	Mar. 10, 2021
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 966 Chamber No. 5.
3. Loop antenna was used for all emissions below 30 MHz.
- 4 Tested Date: June 14, 2020

For Other Test (Above 40 GHz):

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer Keysight	N9030A	MY55330160	Feb. 07, 2020	Feb. 06, 2021
*Horn Antenna (33~55GHz) OML	M22RH	110215-1	Oct. 17, 2017	Oct. 16, 2020
*Horn Antenna (50~75GHz) OML	M15HWD	110215-1	Oct. 17, 2017	Oct. 16, 2020
*Horn Antenna (75~110GHz) OML	M10RH	110215-1	Oct. 17, 2017	Oct. 16, 2020
*Horn Antenna(110~170GHz) OML	M06HWD	110215-1	Oct. 17, 2017	Oct. 16, 2020
*Horn Antenna (140~220GHz) OML	M05RH	110215-1	Oct. 17, 2017	Oct. 16, 2020
**Conical Horn Antenna (50~75GHz) Keysight	WR15CH-Conical	WR15CH_001	Jan. 20, 2020	Jan. 19, 2022
N9029AV15-DC9 - 50-75 GHz VDI Standard Downconverter with 9VDC supply Keysight	SA Extension WR15	SAX 381	CoC	CoC
N9029AV10-DC9 - 75-110 GHz VDI Standard Downconverter with 9VDC supply Keysight	SA Extension WR10	SAX 378	CoC	CoC
N9029AV06-DC9 - 110-170 GHz VDI Standard Downconverter with 9VDC supply Keysight	SA Extension WR6.5	SAX 377	CoC	CoC
**N9029AV05-DC9 - 140-220 GHz VDI Standard Downconverter with 9VDC supply Keysight	SA Extension WR5.1	SAX 375	Dec. 09, 2019	Dec. 08, 2021
*Millimeter-Wave Signal Generator Frequency Extension Module (50~75 GHz) Keysight	E8257DV15	SGX 050	CoC	CoC
PSG analog signal generator Keysight	E8257D	MY53401987	June 21, 2019	June 20, 2020
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA
DC Power Supply Topward	6603D	795558	NA	NA
Temperature & Humidity Chamber Giant Force	GTH-150-40-SP-AR	MAA0812-008	Jan. 16, 2020	Jan. 15, 2021
Voltage Meter FLUKE	179	89610322	Sep. 25, 2019	Sep. 24, 2020

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. *The calibration interval of the above test instruments is 36 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. **The calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
4. Certificate of Conformance (CoC) which is issued by manufacturer states that the product meets the specification.
5. The test was performed in 966 Chamber No. 6
6. Tested Date: June 15, 2020

4.1.3 Test Procedures

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz to 40GHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna 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.
- d. 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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) and Average detection (AV) at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

For Radiated emission above 40GHz

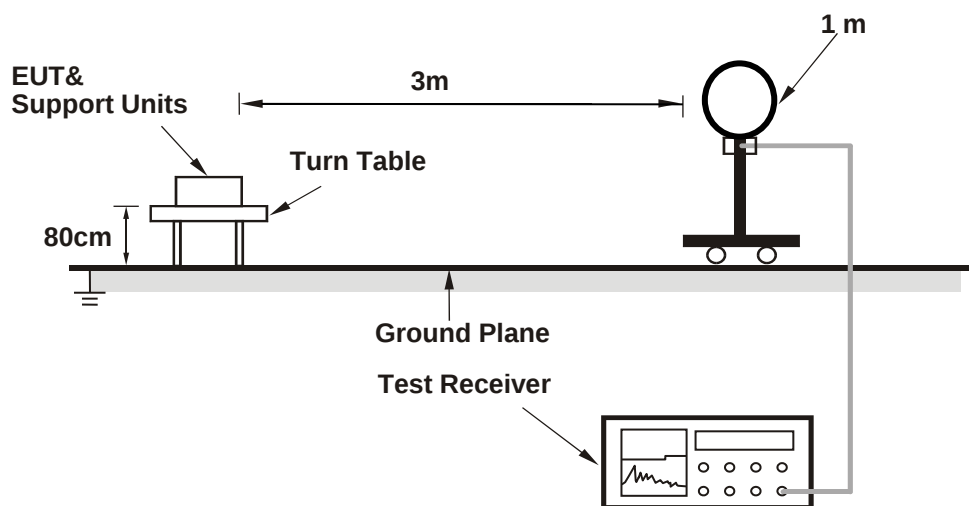
- a. Connect the test antenna covering the appropriate frequency range to a spectrum analyzer via an external mixer to the spectrum analyzer.
- b. Set spectrum analyzer RBW = 1 MHz, VBW = 3 MHz, average detector.
- c. Calculate the distance to the far field boundary and determine the maximum measurement distance.
- d. Perform an exploratory search for emissions and determine the approximate direction at which each observed emission emanates from the EUT.
- e. Exploratory measurements be made at a closer distance than the validated maximum measurement distance.
- f. Perform a final measurement; begin with the test antenna at the approximate position where the maximum level occurred during the exploratory scan.
- g. Slowly scan the test antenna around this position, slowly vary the test antenna polarization by rotating through at least 0° to 180°, and slowly vary the orientation of the test antenna to find the final position, polarization, and orientation at which the maximum level of the emission is observed.
- h. Record the measured reading with the test antenna fixed at this maximized position, polarization, and orientation. Record the measurement distance.
- i. Calculate the maximum field strength of the emission at the measurement distance and the adjusted/corrected power at the output of the test antenna.
- j. Calculate the EIRP from the measured field strength and then convert to the linear.
- k. Calculate the power density at the distance specified by the limit from the field strength at the distance specified by the limit.
- l. Repeat the preceding sequence for every emission observed in the frequency band under investigation.

4.1.4 Deviation from Test Standard

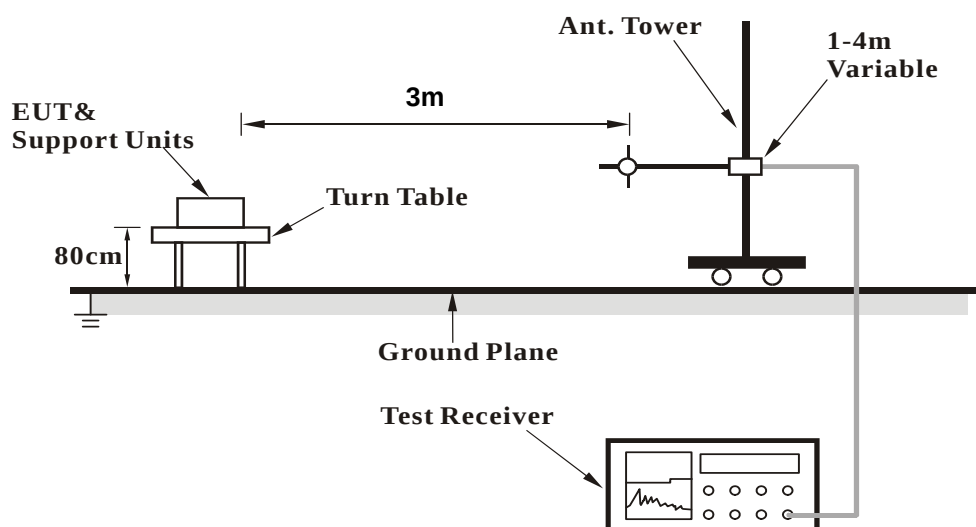
No deviation.

4.1.5 Test Setup

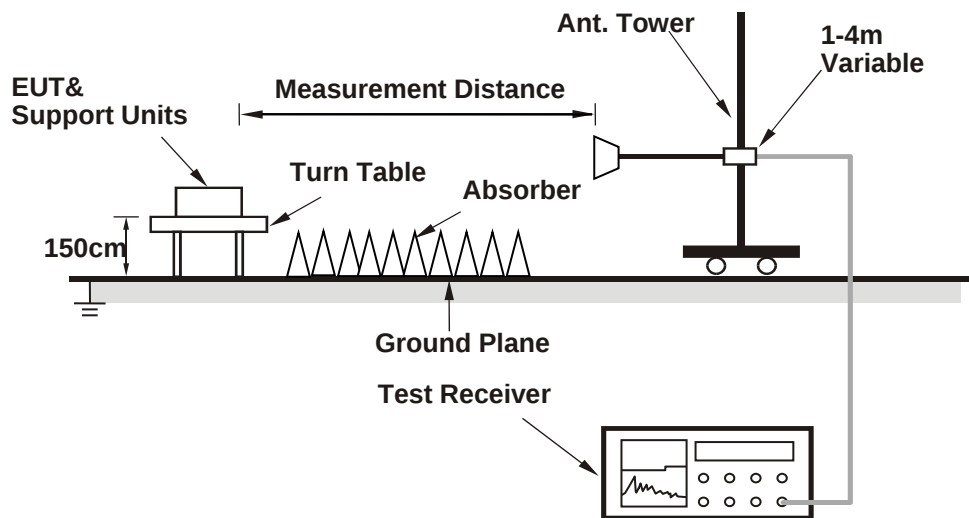
For Radiated emission below 30MHz



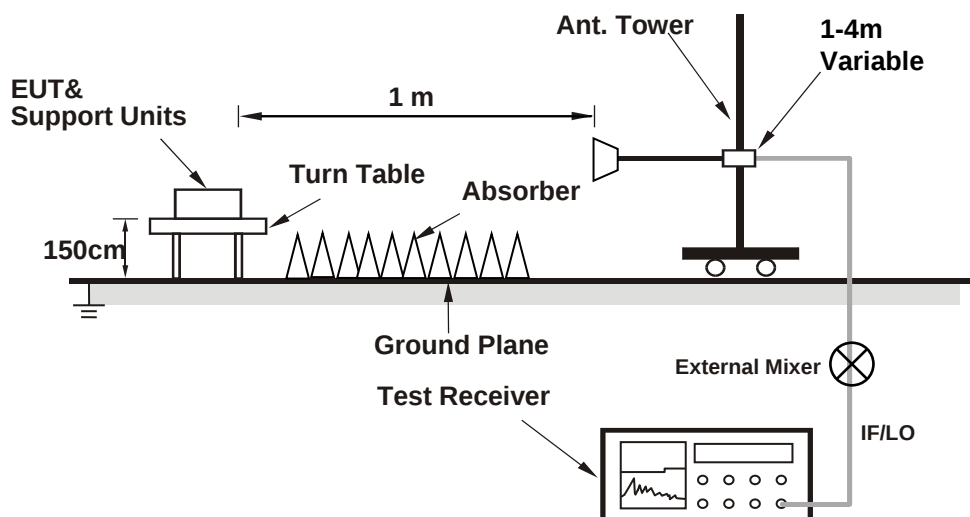
For Radiated emission 30MHz to 1GHz



For Radiated emission 1GHz to 40GHz



For Radiated emission above 40 GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

KDB 414788 OATS and Chamber Correlation Justification

- Based on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in regulations; however, an attempt should be made to avoid making measurements in the near field.
- Open-field site and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

4.1.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

4.1.7 Test Results (Mode 1)

Above 1GHz Data:

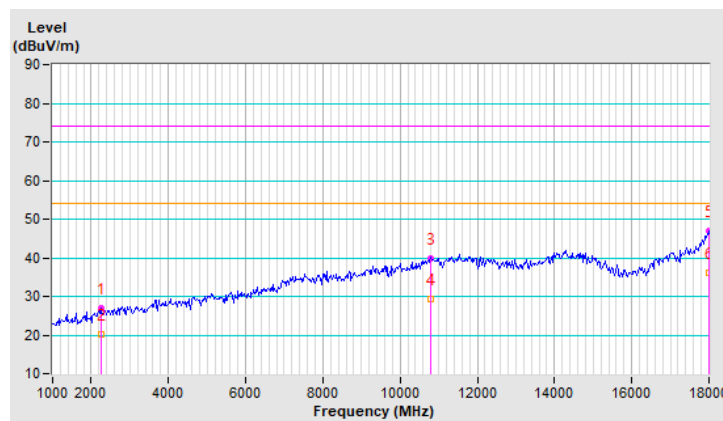
For 1~18GHz

Frequency Range	1GHz ~ 18GHz	Detector Function	Peak (PK) Average (AV)
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Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2241.00	26.9 PK	74.0	-47.1	1.58 H	117	29.5	-2.6
2	2241.00	20.1 AV	54.0	-33.9	1.58 H	117	22.7	-2.6
3	10792.00	40.0 PK	74.0	-34.0	2.97 H	118	27.7	12.3
4	10792.00	29.4 AV	54.0	-24.6	2.97 H	118	17.1	12.3
5	17983.00	47.0 PK	74.0	-27.0	1.47 H	116	22.1	24.9
6	17983.00	36.2 AV	54.0	-17.8	1.47 H	116	11.3	24.9

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

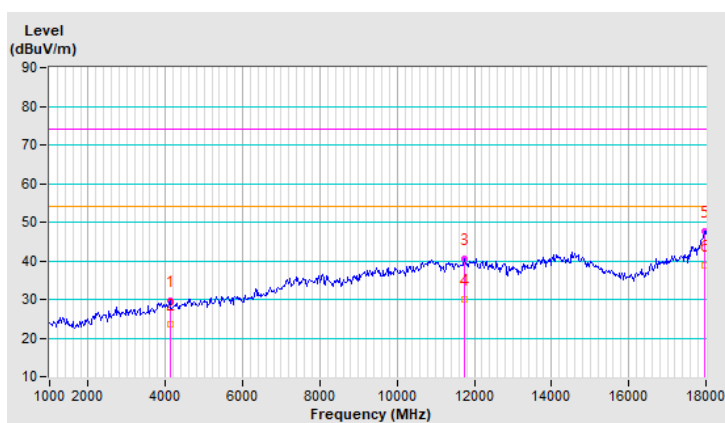


Frequency Range	1GHz ~ 18GHz	Detector Function	Peak (PK) Average (AV)
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Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	4111.00	29.6 PK	74.0	-44.4	1.60 V	120	29.9	-0.3
2	4111.00	23.5 AV	54.0	-30.5	1.60 V	120	23.8	-0.3
3	11744.00	40.6 PK	74.0	-33.4	2.98 V	119	28.2	12.4
4	11744.00	30.1 AV	54.0	-23.9	2.98 V	119	17.7	12.4
5	17949.00	47.7 PK	74.0	-26.3	1.47 V	124	23.5	24.2
6	17949.00	38.8 AV	54.0	-15.2	1.47 V	124	14.6	24.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.



For 18~40GHz

Frequency Range	18GHz ~ 40GHz	Detector Function	Peak (PK) Average (AV)
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Antenna Polarity: Horizontal								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	23016.00	34.5 PK	74.0	-39.5	1.51 H	261	47.1	-12.6
2	23016.00	31.8 AV	54.0	-22.2	1.51 H	261	44.4	-12.6
3	32806.00	38.3 PK	74.0	-35.7	1.54 H	141	49.1	-10.8
4	32806.00	33.7 AV	54.0	-20.3	1.54 H	141	44.5	-10.8
5	39120.00	43.0 PK	74.0	-31.0	1.53 H	357	47.1	-4.1
6	39120.00	38.7 AV	54.0	-15.3	1.53 H	357	42.8	-4.1

REMARKS:

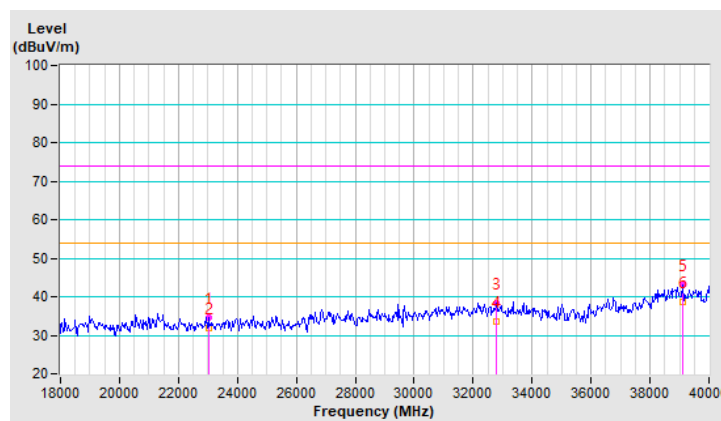
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. Shorter measurement distances was used to improve the measurement system's noise floor. As standard description is based on the measurement in distance of 3 meters, the data obtained at 1-meter distance was extrapolate results to the 3-m distance:

Test value at 3-meter distance (dBuV)

= Test value at 1 meter distance (dBuV) -20log(3/1)(dB)

= Test value at 1 meter distance (dBuV) -9.54(dB).

*Measurements made at 1 meter distance. Test value converted to account for 3-meter measurement distance.



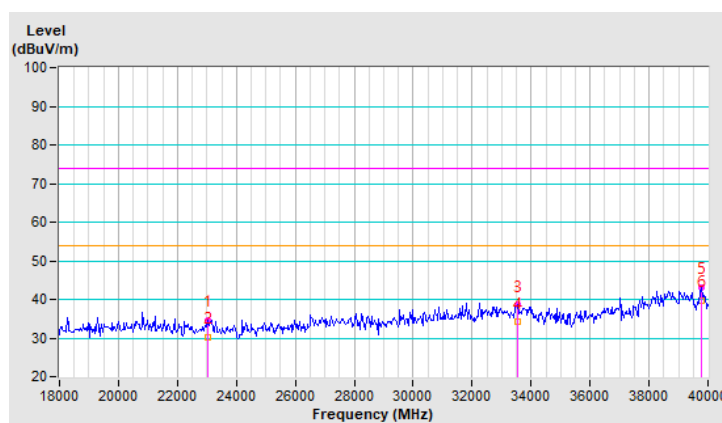
Frequency Range	18GHz ~ 40GHz	Detector Function	Peak (PK) Average (AV)
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Antenna Polarity: Vertical								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	23016.00	34.6 PK	74.0	-39.4	1.47 V	251	47.2	-12.6
2	23016.00	30.2 AV	54.0	-23.8	1.47 V	251	42.8	-12.6
3	33554.00	38.5 PK	74.0	-35.5	1.46 V	249	49.5	-11.0
4	33554.00	34.1 AV	54.0	-19.9	1.46 V	249	45.1	-11.0
5	39758.00	43.2 PK	74.0	-30.8	1.49 V	179	46.4	-3.2
6	39758.00	39.7 AV	54.0	-14.3	1.49 V	179	42.9	-3.2

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. Shorter measurement distances was used to improve the measurement system's noise floor. As standard description is based on the measurement in distance of 3 meters, the data obtained at 1-meter distance was extrapolate results to the 3-m distance:
Test value at 3-meter distance (dBuV)
= Test value at 1 meter distance (dBuV) -20log(3/1)(dB)
= Test value at 1 meter distance (dBuV) -9.54(dB).

*Measurements made at 1 meter distance. Test value converted to account for 3-meter measurement distance.



For above 40GHz

Frequency Range	40GHz ~ 200GHz	Detector Function	Average (AV)
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Antenna Polarity: Horizontal							
NO.	Frequency (GHz)	EIRP Level (dBm/MHz)	Raw Value (dBm/MHz)	Receiver Antenna Gain (dBi)	Power Density (pW/cm ²)	Power Density Limit (pW/cm ²)	Margin (pW/cm ²)
1	49.999	-77.528	24.0	-41.128	0.068	90	-89.932
2	51.248	-91.440	23.3	-54.125	0.003	90	-89.997
3	73.499	-92.094	23.3	-51.647	0.006	90	-89.994
4	77.103	-90.699	23.3	-49.836	0.009	90	-89.991
5	159.811	-92.050	23.3	-44.857	0.029	90	-89.971
6	170.000	-90.018	23.3	-42.288	0.052	90	-89.948
Antenna Polarity: Vertical							
NO.	Frequency (GHz)	EIRP Level (dBm/MHz)	Raw Value (dBm/MHz)	Receiver Antenna Gain (dBi)	Power Density (pW/cm ²)	Power Density Limit (pW/cm ²)	Margin (pW/cm ²)
1	50.000	-78.239	24.0	-41.838	0.058	90	-89.942
2	51.249	-91.444	23.3	-54.129	0.003	90	-89.997
3	73.491	-92.090	23.3	-51.644	0.006	90	-89.994
4	77.098	-90.696	23.3	-49.834	0.009	90	-89.991
5	159.827	-93.072	23.3	-45.878	0.023	90	-89.977
6	170.005	-90.084	23.3	-42.354	0.051	90	-89.949

Note:

1. The measured power level is converted to EIRP using the equation:

$$\text{EIRP} = \text{Raw Value} - \text{Receiver Antenna Gain} + 20 \cdot \log(4 \cdot 3.1416 \cdot D / \lambda)$$

where:

D is the measurement distance

λ is the wavelength

*Measurements made at 0.5 meter distance.

2. Power density formula as follows:

$$\text{Power density} = \text{EIRP} / (4 \cdot \pi \cdot r^2)$$

r is the standard distance at 3 meter

3. The far-field boundary is given in ANSI 63.10 as:

$$R \text{ far field} = (2 \cdot L^2) / \lambda$$

L is the Largest Antenna Dimension of measurement antenna, including the reflector

λ is the wavelength

Q-Band

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
40	0.03	0.0075	0.240
50	0.03	0.0060	0.300

V-Band

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
50	0.025	0.0075	0.208
75	0.025	0.0040	0.313

W-Band

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
75	0.018	0.0040	0.162
110	0.018	0.0027	0.238

D-Band

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
110	0.012	0.0027	0.106
170	0.012	0.0018	0.163

Y-Band

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
170	0.008	0.0018	0.073
260	0.008	0.0012	0.111

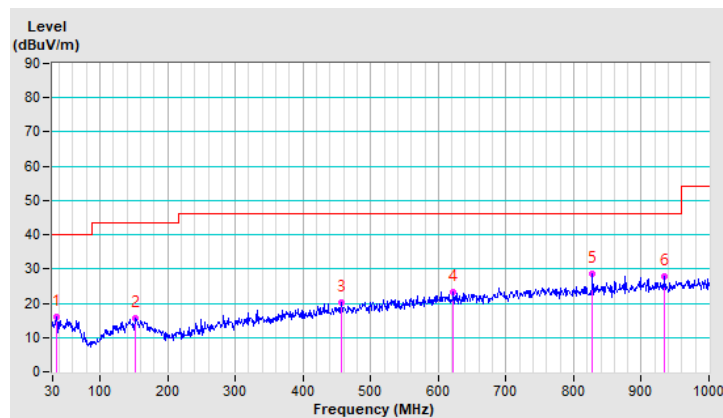
For below 1GHz

Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
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Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	34.85	16.0 QP	40.0	-24.0	1.02 H	300	29.3	-13.3
2	153.00	15.6 QP	43.5	-27.9	1.50 H	200	28.1	-12.5
3	457.55	20.3 QP	46.0	-25.7	1.04 H	100	28.3	-8.0
4	622.60	23.4 QP	46.0	-22.6	1.00 H	200	28.0	-4.6
5	828.06	28.6 QP	46.0	-17.4	1.04 H	222	30.4	-1.8
6	934.96	27.8 QP	46.0	-18.2	1.00 H	2	28.2	-0.4

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

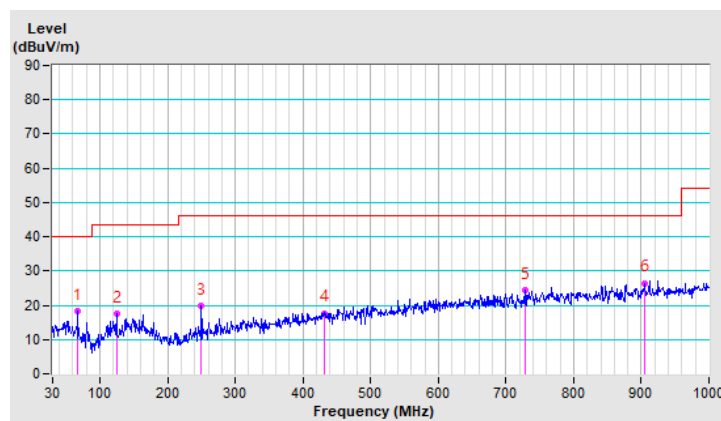


Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
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Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	66.38	18.4 QP	40.0	-21.6	1.45 V	122	32.4	-14.0
2	124.97	17.5 QP	43.5	-26.0	1.56 V	211	31.8	-14.3
3	250.01	19.7 QP	46.0	-26.3	1.00 V	360	33.5	-13.8
4	431.50	17.7 QP	46.0	-28.3	1.02 V	122	26.3	-8.6
5	727.85	24.5 QP	46.0	-21.5	1.00 V	360	27.8	-3.3
6	905.86	26.5 QP	46.0	-19.5	1.02 V	322	27.6	-1.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



4.1.8 Test Results (Mode 2)

Above 1GHz Data:

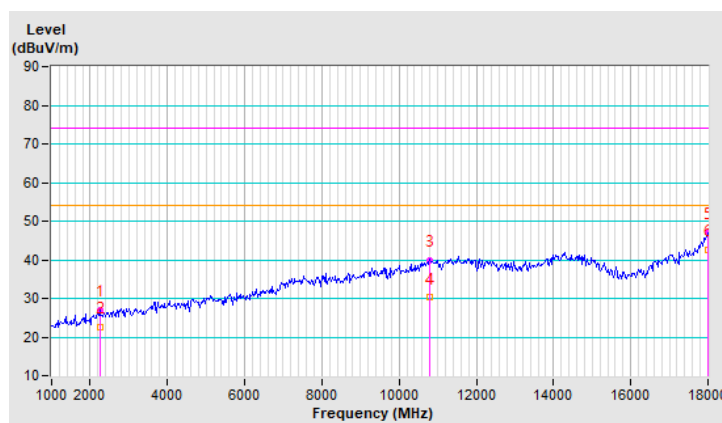
For 1~18GHz

Frequency Range	1GHz ~ 18GHz	Detector Function	Peak (PK) Average (AV)
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Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2241.00	26.9 PK	74.0	-47.1	1.41 H	11	29.5	-2.6
2	2241.00	22.6 AV	54.0	-31.4	1.41 H	11	25.2	-2.6
3	10792.00	40.0 PK	74.0	-34.0	1.20 H	212	27.7	12.3
4	10792.00	30.2 AV	54.0	-23.8	1.20 H	212	17.9	12.3
5	17983.00	47.0 PK	74.0	-27.0	1.57 H	217	22.1	24.9
6	17983.00	42.7 AV	54.0	-11.3	1.57 H	217	17.8	24.9

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

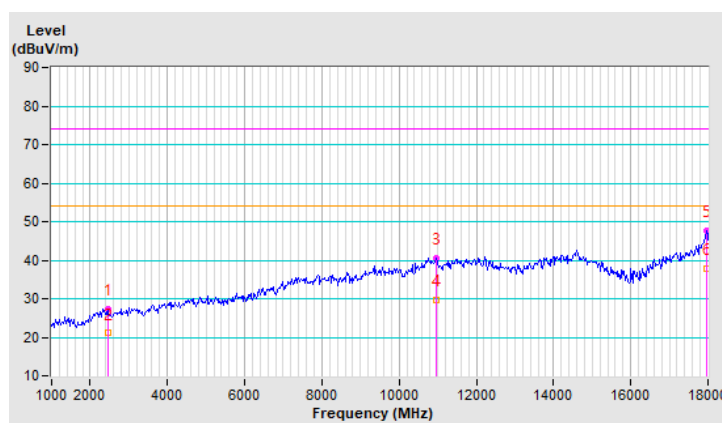


Frequency Range	1GHz ~ 18GHz	Detector Function	Peak (PK) Average (AV)
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Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#2445.00	27.4 PK	74.0	-46.6	1.58 V	117	30.6	-3.2
2	#2445.00	21.1 AV	54.0	-32.9	1.58 V	117	24.3	-3.2
3	10945.00	40.6 PK	74.0	-33.4	2.98 V	125	28.6	12.0
4	10945.00	29.8 AV	54.0	-24.2	2.98 V	125	17.8	12.0
5	17949.00	47.6 PK	74.0	-26.4	1.54 V	117	23.4	24.2
6	17949.00	37.9 AV	54.0	-16.1	1.54 V	117	13.7	24.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " # ": The radiated frequency is out of the restricted band.



For 18~40GHz

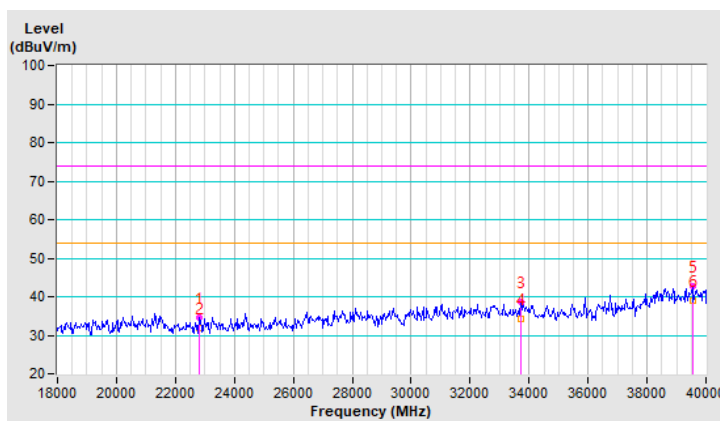
Frequency Range	18GHz ~ 40GHz	Detector Function	Peak (PK) Average (AV)
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Antenna Polarity: Horizontal								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	22796.00	34.6 PK	74.0	-39.4	1.47 H	258	47.5	-12.9
2	22796.00	31.9 AV	54.0	-22.1	1.47 H	258	44.8	-12.9
3	33708.00	38.8 PK	74.0	-35.2	1.49 H	147	49.6	-10.8
4	33708.00	34.3 AV	54.0	-19.7	1.49 H	147	45.1	-10.8
5	39538.00	42.8 PK	74.0	-31.2	1.52 H	357	46.6	-3.8
6	39538.00	38.9 AV	54.0	-15.1	1.52 H	357	42.7	-3.8

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. Shorter measurement distances was used to improve the measurement system's noise floor. As standard description is based on the measurement in distance of 3 meters, the data obtained at 1-meter distance was extrapolate results to the 3-m distance:
Test value at 3-meter distance (dBuV)
= Test value at 1 meter distance (dBuV) -20log(3/1)(dB)
= Test value at 1 meter distance (dBuV) -9.54(dB).

*Measurements made at 1 meter distance. Test value converted to account for 3-meter measurement distance.



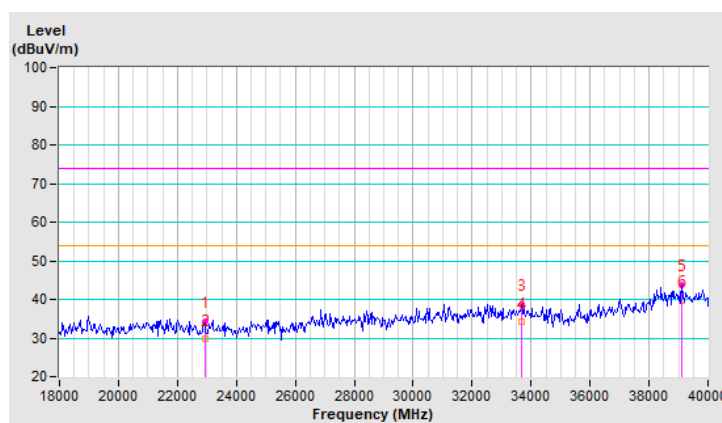
Frequency Range	18GHz ~ 40GHz	Detector Function	Peak (PK) Average (AV)
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Antenna Polarity: Vertical								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	22928.00	34.2 PK	74.0	-39.8	1.52 V	256	47.0	-12.8
2	22928.00	29.7 AV	54.0	-24.3	1.52 V	256	42.5	-12.8
3	33686.00	38.6 PK	74.0	-35.4	1.56 V	255	49.4	-10.8
4	33686.00	34.1 AV	54.0	-19.9	1.56 V	255	44.9	-10.8
5	39120.00	43.8 PK	74.0	-30.2	1.55 V	179	47.9	-4.1
6	39120.00	39.7 AV	54.0	-14.3	1.55 V	179	43.8	-4.1

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. Shorter measurement distances was used to improve the measurement system's noise floor. As standard description is based on the measurement in distance of 3 meters, the data obtained at 1-meter distance was extrapolate results to the 3-m distance:
Test value at 3-meter distance (dBuV)
= Test value at 1 meter distance (dBuV) -20log(3/1)(dB)
= Test value at 1 meter distance (dBuV) -9.54(dB).

*Measurements made at 1 meter distance. Test value converted to account for 3-meter measurement distance.



For above 40GHz

Frequency Range	40GHz ~ 200GHz	Detector Function	Average (AV)
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Antenna Polarity: Horizontal							
NO.	Frequency (GHz)	EIRP Level (dBm/MHz)	Raw Value (dBm/MHz)	Receiver Antenna Gain (dBi)	Power Density (pW/cm ²)	Power Density Limit (pW/cm ²)	Margin (pW/cm ²)
1	50.000	-41.128	-77.528	24.0	0.068	90	-89.932
2	51.249	-54.128	-91.440	23.3	0.003	90	-89.997
3	73.677	-50.713	-92.094	23.3	0.008	90	-89.992
4	77.099	-49.816	-90.699	23.3	0.009	90	-89.991
5	159.800	-45.870	-92.050	23.3	0.023	90	-89.977
6	170.396	-42.640	-90.018	23.3	0.048	90	-89.952
Antenna Polarity: Vertical							
NO.	Frequency (GHz)	EIRP Level (dBm/MHz)	Raw Value (dBm/MHz)	Receiver Antenna Gain (dBi)	Power Density (pW/cm ²)	Power Density Limit (pW/cm ²)	Margin (pW/cm ²)
1	49.968	-41.838	-78.239	24.0	0.058	90	-89.942
2	51.250	-54.122	-91.444	23.3	0.003	90	-89.997
3	73.502	-50.663	-92.090	23.3	0.008	90	-89.992
4	77.104	-49.816	-90.696	23.3	0.009	90	-89.991
5	159.795	-45.924	-93.072	23.3	0.023	90	-89.977
6	170.000	-42.337	-90.084	23.3	0.052	90	-89.948

Note:

1. The measured power level is converted to EIRP using the equation:

$$\text{EIRP} = \text{Raw Value} - \text{Receiver Antenna Gain} + 20 \cdot \log(4 \cdot 3.1416 \cdot D / \lambda)$$

where:

D is the measurement distance

λ is the wavelength

*Measurements made at 0.5 meter distance.

2. Power density formula as follows:

$$\text{Power density} = \text{EIRP} / (4 \cdot \pi \cdot r^2)$$

r is the standard distance at 3 meter

3. The far-field boundary is given in ANSI 63.10 as:

$$R \text{ far field} = (2 \cdot L^2) / \lambda$$

L is the Largest Antenna Dimension of measurement antenna, including the reflector

λ is the wavelength

Q-Band

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
40	0.03	0.0075	0.240
50	0.03	0.0060	0.300

V-Band

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
50	0.025	0.0075	0.208
75	0.025	0.0040	0.313

W-Band

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
75	0.018	0.0040	0.162
110	0.018	0.0027	0.238

D-Band

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
110	0.012	0.0027	0.106
170	0.012	0.0018	0.163

Y-Band

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
170	0.008	0.0018	0.073
260	0.008	0.0012	0.111

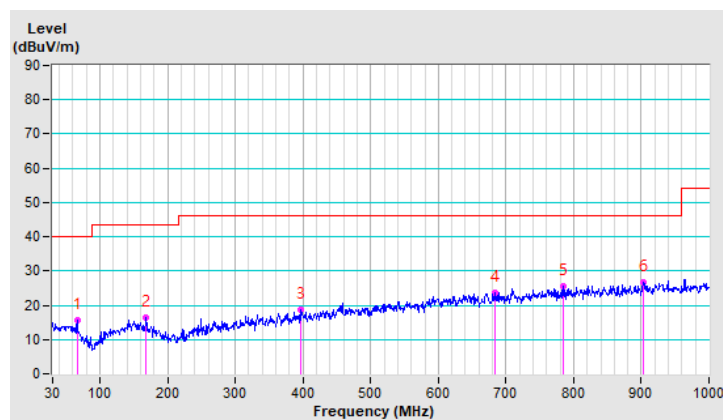
For below 1GHz

Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
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Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	66.38	15.5 QP	40.0	-24.5	1.06 H	200	29.5	-14.0
2	168.18	16.5 QP	43.5	-27.0	1.00 H	200	29.5	-13.0
3	397.60	18.7 QP	46.0	-27.3	1.05 H	200	28.4	-9.7
4	684.59	23.5 QP	46.0	-22.5	2.00 H	155	27.2	-3.7
5	784.36	25.5 QP	46.0	-20.5	1.03 H	200	27.8	-2.3
6	902.36	26.8 QP	46.0	-19.2	1.00 H	200	27.8	-1.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

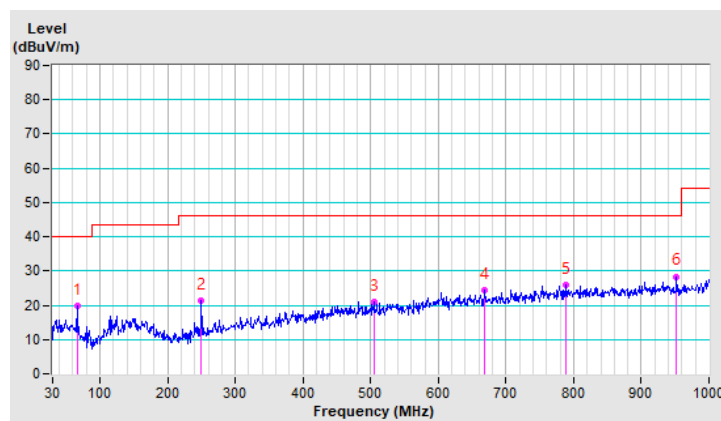


Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
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Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	66.62	19.7 QP	40.0	-20.3	1.00 V	200	33.6	-13.9
2	250.01	21.3 QP	46.0	-24.7	1.03 V	200	35.1	-13.8
3	504.35	20.9 QP	46.0	-25.1	1.50 V	200	28.2	-7.3
4	668.92	24.4 QP	46.0	-21.6	1.10 V	200	28.5	-4.1
5	788.34	25.8 QP	46.0	-20.2	1.50 V	200	28.1	-2.3
6	952.08	28.4 QP	46.0	-17.6	2.00 V	100	28.8	-0.4

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



4.1.9 Test Results (Mode 3)

Above 1GHz Data:

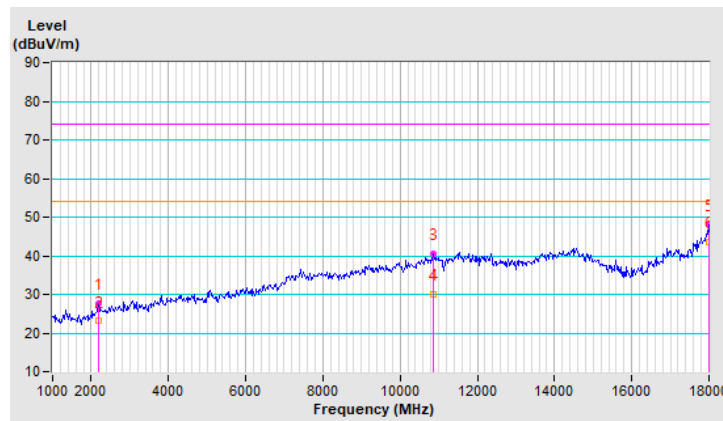
For 1~18GHz

Frequency Range	1GHz ~ 18GHz	Detector Function	Peak (PK) Average (AV)
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Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2173.00	27.6 PK	74.0	-46.4	1.47 H	11	30.6	-3.0
2	2173.00	23.1 AV	54.0	-30.9	1.47 H	11	26.1	-3.0
3	10860.00	40.5 PK	74.0	-33.5	1.26 H	214	28.2	12.3
4	10860.00	30.1 AV	54.0	-23.9	1.26 H	214	17.8	12.3
5	17983.00	48.0 PK	74.0	-26.0	1.54 H	208	23.1	24.9
6	17983.00	43.7 AV	54.0	-10.3	1.54 H	208	18.8	24.9

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

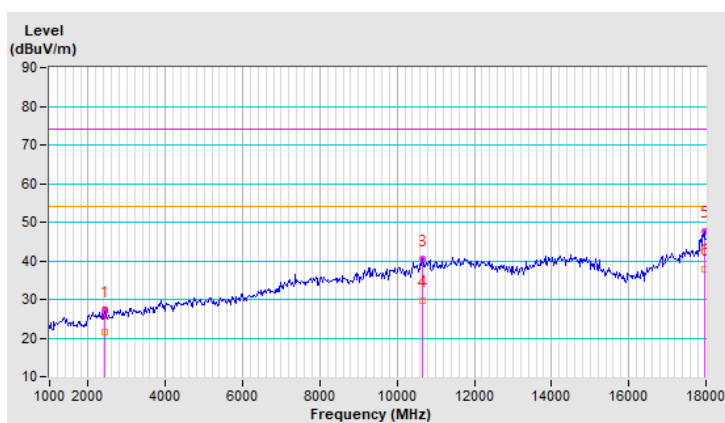


Frequency Range	1GHz ~ 18GHz	Detector Function	Peak (PK) Average (AV)
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Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2411.00	27.0 PK	74.0	-47.0	1.67 V	125	30.2	-3.2
2	2411.00	21.5 AV	54.0	-32.5	1.67 V	125	24.7	-3.2
3	10639.00	40.4 PK	74.0	-33.6	2.97 V	125	28.9	11.5
4	10639.00	29.7 AV	54.0	-24.3	2.97 V	125	18.2	11.5
5	17949.00	47.6 PK	74.0	-26.4	1.54 V	126	23.4	24.2
6	17949.00	37.8 AV	54.0	-16.2	1.54 V	126	13.6	24.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.



For 18~40GHz

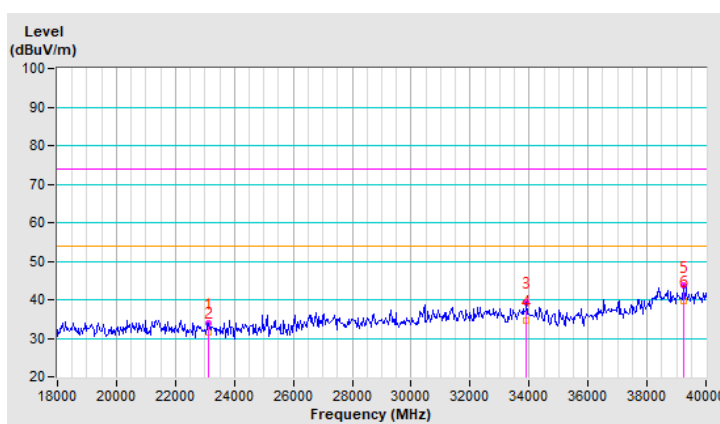
Frequency Range	18GHz ~ 40GHz	Detector Function	Peak (PK) Average (AV)
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Antenna Polarity: Horizontal								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	23104.00	33.9 PK	74.0	-40.1	1.45 H	261	46.5	-12.6
2	23104.00	31.5 AV	54.0	-22.5	1.45 H	261	44.1	-12.6
3	33906.00	39.4 PK	74.0	-34.6	1.51 H	150	50.0	-10.6
4	33906.00	34.7 AV	54.0	-19.3	1.51 H	150	45.3	-10.6
5	39252.00	43.6 PK	74.0	-30.4	1.49 H	355	47.5	-3.9
6	39252.00	39.6 AV	54.0	-14.4	1.49 H	355	43.5	-3.9

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. Shorter measurement distances was used to improve the measurement system's noise floor. As standard description is based on the measurement in distance of 3 meters, the data obtained at 1-meter distance was extrapolate results to the 3-m distance:
Test value at 3-meter distance (dBuV)
= Test value at 1 meter distance (dBuV) -20log(3/1)(dB)
= Test value at 1 meter distance (dBuV) -9.54(dB).

*Measurements made at 1 meter distance. Test value converted to account for 3-meter measurement distance.



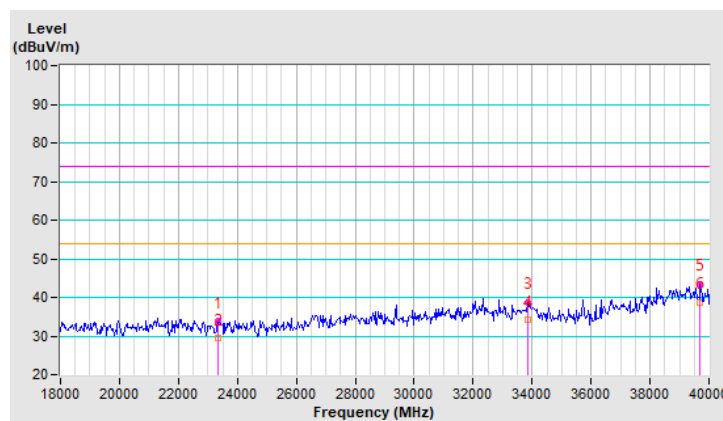
Frequency Range	18GHz ~ 40GHz	Detector Function	Peak (PK) Average (AV)
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Antenna Polarity: Vertical								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	23346.00	33.8 PK	74.0	-40.2	1.51 V	257	46.3	-12.5
2	23346.00	29.4 AV	54.0	-24.6	1.51 V	257	41.9	-12.5
3	33840.00	38.6 PK	74.0	-35.4	1.57 V	240	49.1	-10.5
4	33840.00	34.1 AV	54.0	-19.9	1.57 V	240	44.6	-10.5
5	39692.00	43.5 PK	74.0	-30.5	1.52 V	178	46.7	-3.2
6	39692.00	38.8 AV	54.0	-15.2	1.52 V	178	42.0	-3.2

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. Shorter measurement distances was used to improve the measurement system's noise floor. As standard description is based on the measurement in distance of 3 meters, the data obtained at 1-meter distance was extrapolate results to the 3-m distance:
 Test value at 3-meter distance (dBuV)
 = Test value at 1 meter distance (dBuV) -20log(3/1)(dB)
 = Test value at 1 meter distance (dBuV) -9.54(dB).

*Measurements made at 1 meter distance. Test value converted to account for 3-meter measurement distance.



For above 40GHz

Frequency Range	40GHz ~ 200GHz	Detector Function	Average (AV)
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Antenna Polarity: Horizontal							
NO.	Frequency (GHz)	EIRP Level (dBm/MHz)	Raw Value (dBm/MHz)	Receiver Antenna Gain (dBi)	Power Density (pW/cm ²)	Power Density Limit (pW/cm ²)	Margin (pW/cm ²)
1	49.999	-41.128	-77.529	24.0	0.068	90	-89.932
2	51.247	-54.127	-91.443	23.3	0.003	90	-89.997
3	73.502	-51.598	-91.181	23.3	0.006	90	-89.994
4	77.091	-49.827	-90.678	23.3	0.009	90	-89.991
5	159.816	-45.781	-93.063	23.3	0.023	90	-89.977
6	170.014	-42.532	-90.390	23.3	0.049	90	-89.951
Antenna Polarity: Vertical							
NO.	Frequency (GHz)	EIRP Level (dBm/MHz)	Raw Value (dBm/MHz)	Receiver Antenna Gain (dBi)	Power Density (pW/cm ²)	Power Density Limit (pW/cm ²)	Margin (pW/cm ²)
1	50.000	-41.838	-78.233	24.0	0.058	90	-89.942
2	51.250	-54.130	-91.437	23.3	0.003	90	-89.997
3	73.495	-51.640	-91.110	23.3	0.006	90	-89.994
4	77.106	-49.806	-90.679	23.3	0.009	90	-89.991
5	159.812	-45.868	-93.116	23.3	0.023	90	-89.977
6	170.008	-42.308	-90.067	23.3	0.052	90	-89.948

Note:

1. The measured power level is converted to EIRP using the equation:

$$\text{EIRP} = \text{Raw Value} - \text{Receiver Antenna Gain} + 20 \cdot \log(4 \cdot 3.1416 \cdot D / \lambda)$$

where:

D is the measurement distance

λ is the wavelength

*Measurements made at 0.5 meter distance.

2. Power density formula as follows:

$$\text{Power density} = \text{EIRP} / (4 \cdot \pi \cdot r^2)$$

r is the standard distance at 3 meter

3. The far-field boundary is given in ANSI 63.10 as:

$$R \text{ far field} = (2 \cdot L^2) / \lambda$$

L is the Largest Antenna Dimension of measurement antenna, including the reflector

λ is the wavelength

Q-Band

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
40	0.03	0.0075	0.240
50	0.03	0.0060	0.300

V-Band

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
50	0.025	0.0075	0.208
75	0.025	0.0040	0.313

W-Band

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
75	0.018	0.0040	0.162
110	0.018	0.0027	0.238

D-Band

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
110	0.012	0.0027	0.106
170	0.012	0.0018	0.163

Y-Band

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
170	0.008	0.0018	0.073
260	0.008	0.0012	0.111

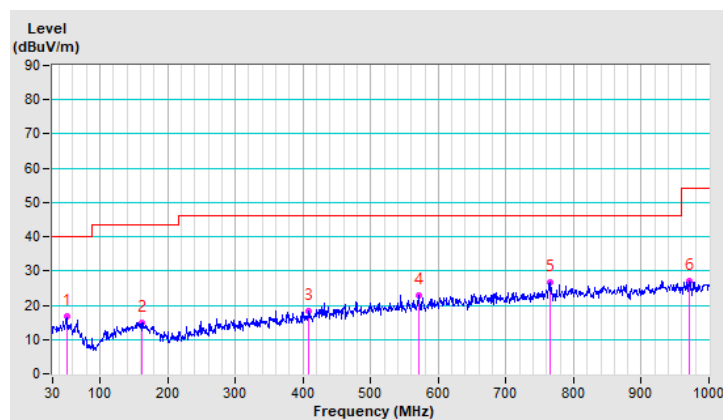
For below 1GHz

Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
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Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	50.76	16.6 QP	40.0	-23.4	1.00 H	200	29.1	-12.5
2	161.64	15.0 QP	43.5	-28.5	1.50 H	200	27.6	-12.6
3	408.66	18.4 QP	46.0	-27.6	1.00 H	11	27.9	-9.5
4	571.00	22.7 QP	46.0	-23.3	1.06 H	200	28.6	-5.9
5	765.35	26.8 QP	46.0	-19.2	1.05 H	20	29.1	-2.3
6	971.04	27.2 QP	54.0	-26.8	1.10 H	2	27.3	-0.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

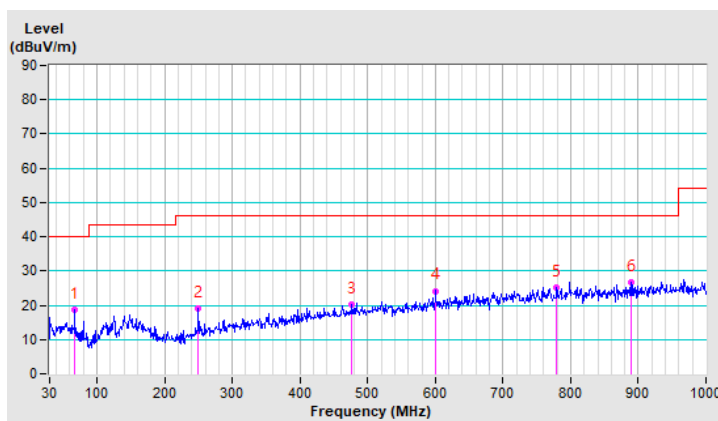


Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
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Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	66.62	18.7 QP	40.0	-21.3	1.10 V	200	32.6	-13.9
2	250.01	19.2 QP	46.0	-26.8	1.03 V	200	33.0	-13.8
3	476.32	20.1 QP	46.0	-25.9	2.00 V	102	27.8	-7.7
4	601.26	24.2 QP	46.0	-21.8	1.03 V	200	29.0	-4.8
5	778.93	25.3 QP	46.0	-20.7	1.00 V	102	27.5	-2.2
6	890.29	26.7 QP	46.0	-19.3	1.05 V	200	27.9	-1.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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