

FCC Certification Test Report

Report No.: FC191023C07

Test Model: TN0002A

FCC ID: BABTN0002A

Received Date: Oct. 23, 2019

Test Date: Dec. 12 ~ Dec. 20, 2019

Issued Date: May. 28, 2020

Applicant: DENSO TEN LIMITED

Address: 2-28, GOSHO-DORI 1-CHOME, HYOGO-KU, KOBE 652-8510 JAPAN

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lin Kou Laboratories

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Test Location (1): No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City
33383, TAIWAN

FCC Registration / 328930 / TW1050

Designation Number:

Test Location (2): No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

FCC Registration / 418586 / TW1078
Designation Number:



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the U.S. Government. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

Table of Contents

Release Control Record	3
1 Certificate of Conformity	4
2 Summary of Test Results.....	5
2.1 Measurement Uncertainty	5
2.2 Modification Record	5
3 General Information	6
3.1 Description of EUT	6
3.2 Features of EUT	6
3.3 Operating Modes of EUT and Determination of Worst Case Operating Mode	7
3.4 Test Program Used and Operation Descriptions.....	7
3.5 Primary Clock Frequencies of Internal Source	7
4 Configuration and Connections with EUT	8
4.1 Connection Diagram of EUT and Peripheral Devices	8
4.2 Configuration of Peripheral Devices and Cable Connections	9
5 Radiated Emissions up to 1 GHz	10
5.1 Limits	10
5.2 Test Instruments	11
5.3 Test Arrangement	12
5.4 Test Results.....	13
6 Radiated Emissions above 1 GHz.....	15
6.1 Limits	15
6.2 Test Instruments	16
6.3 Test Arrangement	17
6.4 Test Results.....	18
7 Antenna-conducted Power Measurement	22
7.1 Limits	22
7.2 Test Instruments	22
7.3 Test Arrangement	23
7.4 Test Results.....	24
8 Pictures of Test Arrangements	27
Appendix – Information of the Testing Laboratories	28

Release Control Record

Issue No.	Description	Date Issued
FC191023C07	Original release.	May. 28, 2020

1 Certificate of Conformity

Product: Car Audio

Brand: ISUZU

FCC ID: BABTN0002A

Test Model: TN0002A

Sample Status: Engineering sample

Applicant: DENSO TEN LIMITED

Test Date: Dec. 12 ~ Dec. 20, 2019

Standards: 47 CFR FCC Part 15, Subpart B, Class B
ANSI C63.4:2014

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 : Christin Lee , **Date:** May. 28, 2020
Christin Lee / Specialist

Approved by : Mitch Jen , **Date:** May. 28, 2020
Mitch Jen / Assistant Manager

2 Summary of Test Results

FCC Clause	Test Item	Result/Remarks	Verdict
15.107	AC Power Line Conducted Emissions	Without AC power port of the EUT	N/A
15.109	Radiated Emissions up to 1 GHz	Minimum passing Class B margin is -2.87 dB at 389.936 MHz	Pass
	Radiated Emissions above 1 GHz	Minimum passing Class B margin is -12.06 dB at 21132.51 MHz	Pass
15.111	Antenna-Conducted Power Test (30MHz ~ 960MHz)	Minimum passing Class B margin is -23.94 dB at 916.600 MHz	Pass

N/A: Not Applicable

Note:

1. There is no deviation to the applied test methods and requirements covered by the scope of this report.
2. 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:

Measurement	Frequency	Expanded Uncertainty (k=2) ($\pm$)
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	3.57 dB
Radiated Emissions above 1 GHz	Above 1GHz	5.04 dB
Antenna-conducted Power Measurement	30MHz ~ 960MHz	5.74 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 Description of EUT

Product	Car Audio
Brand	ISUZU
FCC ID	BABTN0002A
Test Model	TN0002A
Sample Status	Engineering sample
Operating Software	N/A
Power Supply Rating	12Vdc
Accessory Device	N/A
Data Cable Supplied	N/A

3.2 Features of EUT

The tests reported herein were performed according to the method specified by DENSO TEN LIMITED, for detailed feature description, please refer to the manufacturer's specifications or user's manual.

3.3 Operating Modes of EUT and Determination of Worst Case Operating Mode

The EUT is designed with DC power of rating 12Vdc.

For radiated emission test, the EUT has been pre-tested under following modes and mode 5 was the worst case for final test.

Mode	Test Condition
1	5G WIFI Play + GPS RX, 12Vdc
2	BT Play + GPS RX, 12Vdc
3	CD Play + GPS RX, 12Vdc
4	VTR (AUX IN) Play + GPS RX, 12Vdc
5	USB Play + GPS RX, 12Vdc
6	FM 88MHz + GPS RX, 12Vdc
7	FM 98MHz + GPS RX, 12Vdc
8	FM 108MHz + GPS RX, 12Vdc
9	Camera + GPS RX, 12Vdc
10	2.4G WIFI Play + GPS RX, 12Vdc

Test modes are presented in the report as below.

Mode	Test Condition
Radiated emission up to 1GHz test	
-	USB Play + GPS RX, 12Vdc
Radiated emission above 1GHz test	
-	USB Play + GPS RX, 12Vdc
Antenna-conducted power measurement test	
-	FM 88MHz, 12Vdc
	FM 98MHz, 12Vdc
	FM 108MHz, 12Vdc

3.4 Test Program Used and Operation Descriptions

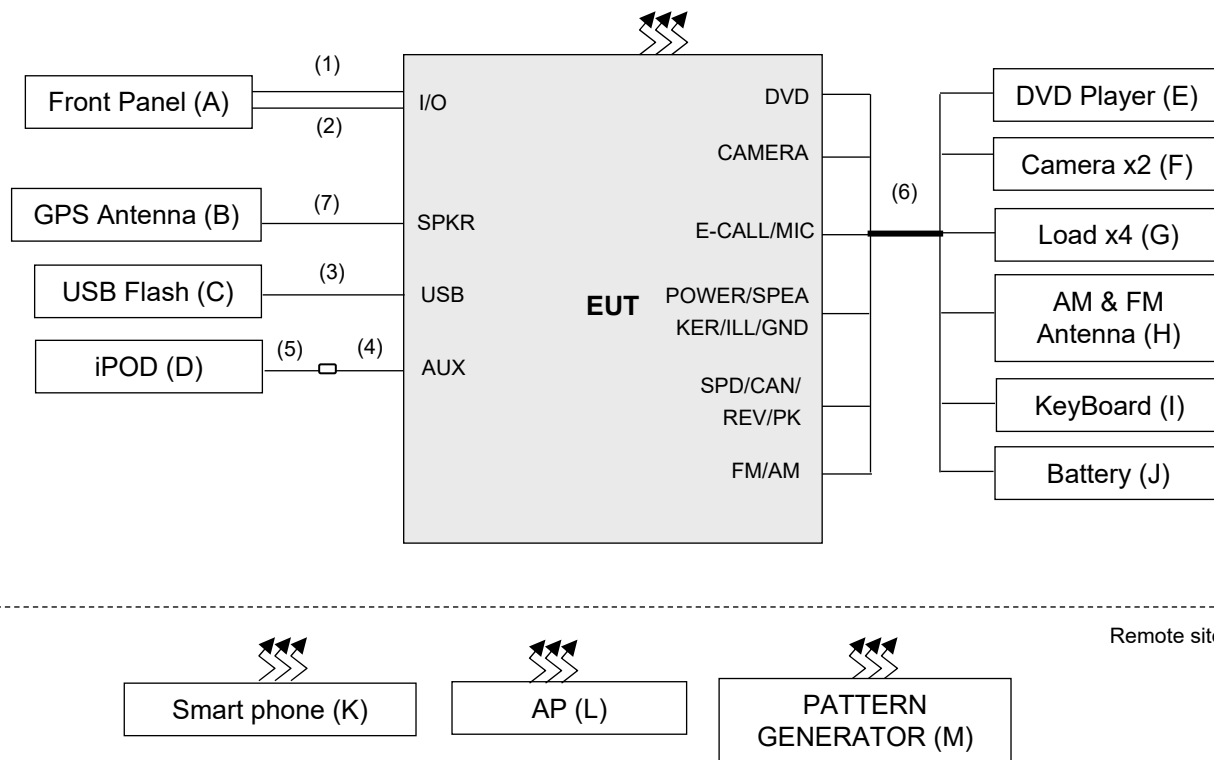
- The EUT powered by battery and placed on the test table.
- The EUT connected with USB flash and sent 1kHz audio/video signal.
- Set GPS of EUT under RX condition.

3.5 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 5GHz, provided by DENSO TEN LIMITED, for detailed internal source, please refer to the manufacturer's specifications.

4 Configuration and Connections with EUT

4.1 Connection Diagram of EUT and Peripheral Devices



4.2 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Front Panel	Denso ten	134000-962	BR300014	NA	Provided by client
B.	GPS Antenna	Ask	8983963550	NA	NA	Provided by client
C.	USB Flash	HP	v250W	05	NA	-
D.	iPod	apple	A1204	4H814G21YX6	NA	-
E.	DVD Player	Denso ten	113000-629	BR200044	NA	Provided by client
F.	Camera	NA	CC-8100I-Z	0000081	NA	Provided by client
G.	Load x4	NA	NA	NA	NA	Provided by client
H.	AM & FM Antenna	NA	NA	NA	NA	Provided by client
I.	KeyBoard	NA	NA	NA	NA	Provided by client
J.	Battery	YUASA	75D23R-CMF II	NA	NA	-
K.	Smart phone	LG	LG-H791	511KPQJ544996	NA	-
L.	AP	D-LINK	DIR826L	QBQ91C9000416	NA	-
M.	PATTERN GENERATOR	FLUKE	54200	856031	NA	-

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Items K-M acted as communication partners to transfer data.

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Disp24p (Power • Control) cable	1	0.18	N	0	Provided by client
2.	Disp4p (LVDS) cable	1	0.16	Y	0	Provided by client
3.	USB cable	1	0.41	Y	0	Provided by client
4.	AUX in cable	1	0.38	N	0	Provided by client
5.	Audio cable	1	1.5	Y	0	-
6.	Load cable	1	0.55	N	0	Provided by client
	Camera cable	1	1.65	N	0	
	DVD cable	1	1.2	N	0	
	FM/AM cable	1	1.6	Y	0	
	Keyboard cable	1	0.95	N	0	
7.	RF cable	1	0.5	Y	0	Provided by client

5 Radiated Emissions up to 1 GHz

5.1 Limits

Emissions radiated outside of the specified bands, shall be according to the general radiated limits as following:

Continuing:

Radiated Emissions Limits at 10 meters (dBμV/m)				
Frequencies (MHz)	FCC 15B Class A	FCC 15B Class B	CISPR 22, Class A	CISPR 22, Class B
30-88	39	29.5	40	30
88-216	43.5	33.1		
216-230	46.4	35.6		
230-960				
960-1000	49.5	43.5	47	37

Radiated Emissions Limits at 3 meters (dBµV/m)				
Frequencies (MHz)	FCC 15B Class A	FCC 15B Class B	CISPR 22, Class A	CISPR 22, Class B
30-88	49.5	40	50.5	40.5
88-216	54	43.5		
216-230	56.9	46		
230-960				
960-1000	60	54	57.5	47.5

- Notes:
1. The lower limit shall apply at the transition frequencies.
 2. Emission level (dB μ V/m) = 20 log Emission level (μ V/m).
 3. QP detector shall be applied if not specified.

5.2 Test Instruments

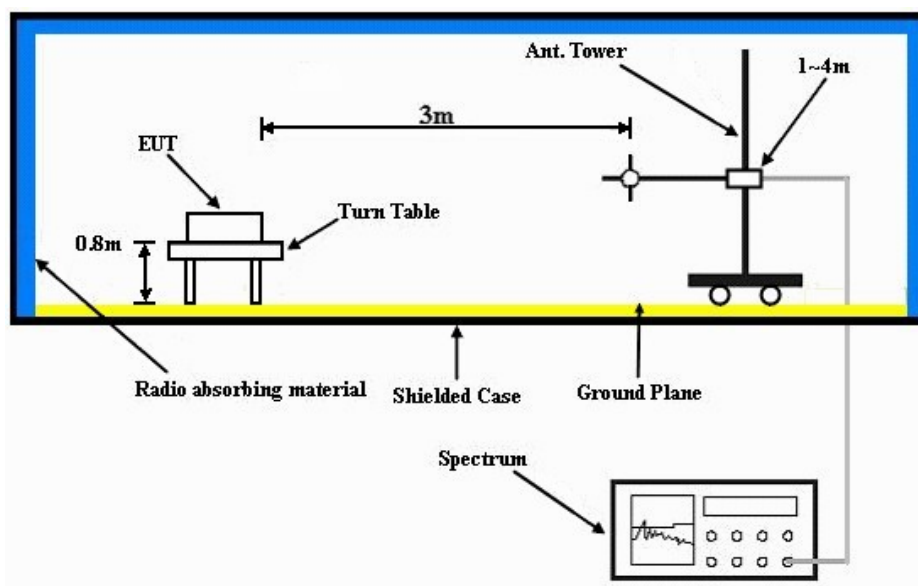
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ (Below 1GHz)	ESCI	100424	Jan. 03, 2019	Jan. 02, 2020
Spectrum Analyzer Agilent	E4446A	MY51100039	Sep. 05, 2019	Sep. 04, 2020
BILOG Antenna SCHWARZBECK	VULB9168	9168-149	Nov. 07, 2019	Nov. 06, 2020
RF signal cable (with 5dB PAD) Times	LMR-400 (18M)	CABLE-CH2-01	Mar. 25, 2019	Mar. 24, 2020
Preamplifier Agilent (Below 1GHz)	8447D	2944A10629	Sep. 05, 2019	Sep. 04, 2020
Software BV ADT	BV ADT_Radiated_ V8.7.08	NA	NA	NA
Antenna Tower BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Controller BV ADT	SC100	SC93021702	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 HwaYa Chamber 2.
 3. The VCCI Site Registration No. is R-20018.

5.3 Test Arrangement

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited test facility. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- 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.

Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for quasi-peak detection (QP) at frequency below 1GHz.



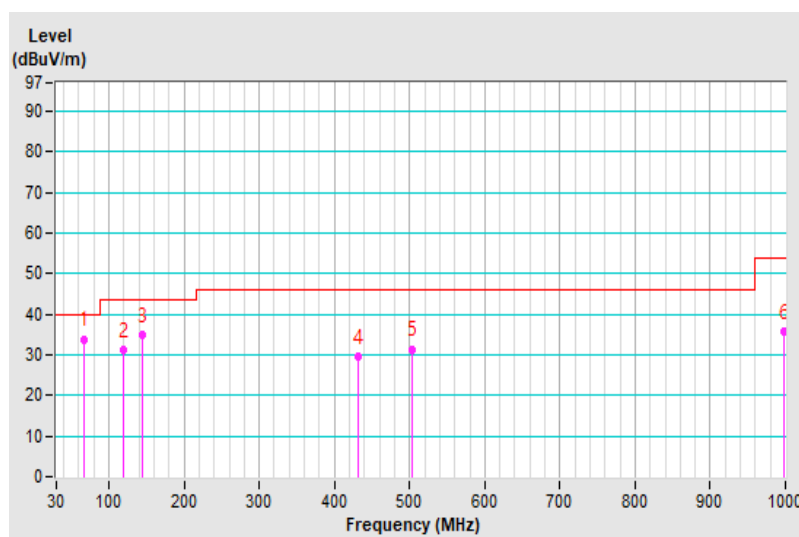
5.4 Test Results

Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	12Vdc	Environmental Conditions	25°C, 66%RH
Tested by	Mick Chou	Test Date	2019/12/12

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	66.377	33.86 QP	40.00	-6.14	1.00 H	47	44.38	-10.52
2	119.972	31.16 QP	43.50	-12.34	1.50 H	104	42.80	-11.64
3	143.981	34.81 QP	43.50	-8.69	2.00 H	96	43.97	-9.16
4	431.988	29.62 QP	46.00	-16.38	1.00 H	351	35.01	-5.39
5	504.014	31.44 QP	46.00	-14.56	1.00 H	69	35.76	-4.32
6	998.205	35.58 QP	54.00	-18.42	1.00 H	132	31.01	4.57

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

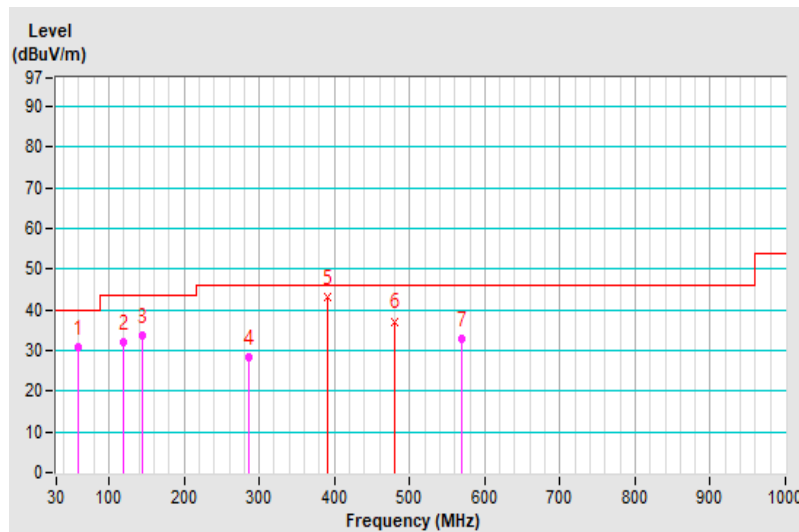


Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	12Vdc	Environmental Conditions	25°C, 66%RH
Tested by	Mick Chou	Test Date	2019/12/12

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	59.974	30.83 QP	40.00	-9.17	1.00 V	149	40.71	-9.88
2	119.972	31.95 QP	43.50	-11.55	1.00 V	73	43.59	-11.64
3	143.981	33.70 QP	43.50	-9.80	1.00 V	55	42.86	-9.16
4	286.384	28.35 QP	46.00	-17.65	1.50 V	7	36.79	-8.44
5	389.936	43.13 QP	46.00	-2.87	2.48 V	177	49.57	-6.44
6	480.006	37.16 QP	46.00	-8.84	3.00 V	253	42.08	-4.92
7	569.832	33.01 QP	46.00	-12.99	3.00 V	360	36.22	-3.21

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



6 Radiated Emissions above 1 GHz

6.1 Limits

Emissions radiated outside of the specified bands, shall be according to the general radiated limits as following:

Radiated Emissions Limits at 10 meters (dBμV/m)				
Frequencies (MHz)	FCC 15B Class A	FCC 15B Class B	CISPR 22, Class A	CISPR 22, Class B
1000-3000	Avg: 49.5	Avg: 43.5	Not defined	Not defined
Above 3000	Peak: 69.5	Peak: 63.5	Not defined	Not defined

Radiated Emissions Limits at 3 meters (dBμV/m)				
Frequencies (MHz)	FCC 15B Class A	FCC 15B Class B	CISPR 22, Class A	CISPR 22, Class B
1000-3000	Avg: 60	Avg: 54	Avg: 56 Peak: 76	Avg: 50 Peak: 70
Above 3000	Peak: 80	Peak: 74	Avg: 60 Peak: 80	Avg: 54 Peak: 74

- Notes:
1. The lower limit shall apply at the transition frequencies.
 2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
 3. As shown in 15.35(b), 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.

Radiated Emissions Limits at 1.5 meter (dBμV/m)		
Frequencies (MHz)	FCC 15B Class A	FCC 15B Class B
18000-40000	Avg: 66 Peak: 86	Avg: 60 Peak: 80

Note: Limit@1.5m = Limit@3m + 20log(3/1.5)

Frequency Range (For unintentional radiators)

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705-108	1000
108-500	2000
500-1000	5000
Above 1000	5th harmonic of the highest frequency or 40GHz, whichever is lower

6.2 Test Instruments

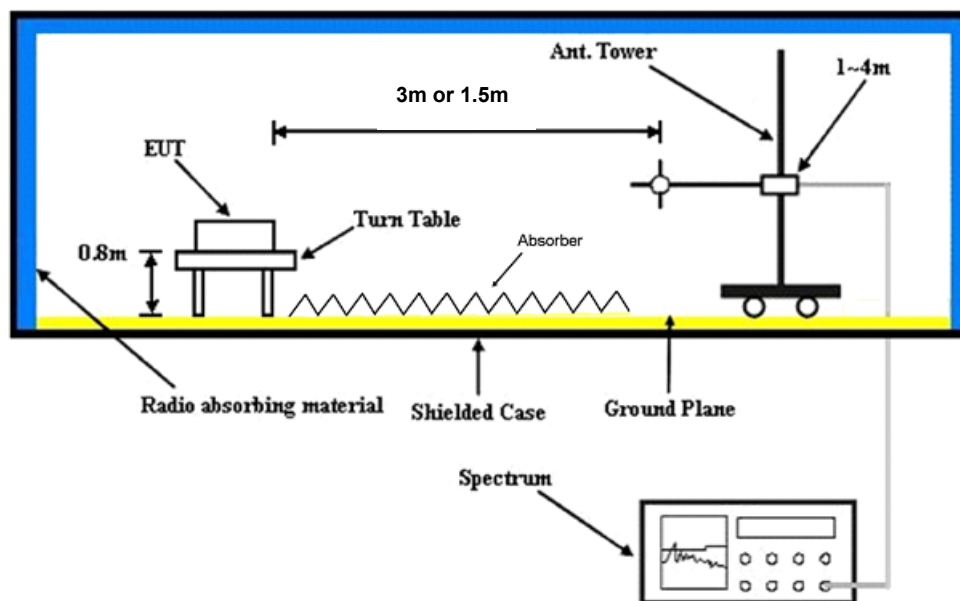
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ (Above 1GHz)	ESR7	101471	Mar. 07, 2019	Mar. 06, 2020
Spectrum Analyzer Agilent	E4446A	MY51100039	Sep. 05, 2019	Sep. 04, 2020
BILOG Antenna SCHWARZBECK	VULB9168	9168-149	Nov. 07, 2019	Nov. 06, 2020
RF signal cable (with 5dB PAD) Times	LMR-400 (18M)	CABLE-CH2-01	Mar. 25, 2019	Mar. 24, 2020
HORN Antenna (with 4dB PAD) SCHWARZBECK	BBHA 9120 D	9120D-405	Nov. 24, 2019	Nov. 23, 2020
Pre-Amplifier Agilent (Above 1GHz)	8449B	3008A01961	Sep. 05, 2019	Sep. 04, 2020
Software BV ADT	BV ADT_Radiated_ V8.7.08	NA	NA	NA
Antenna Tower BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Controller BV ADT	SC100	SC93021702	NA	NA
BandPass Filter (2.4G) MICRO-TRONICS	BRM17690-01	003	Sep. 05, 2019	Sep. 04, 2020
BandPass Filter (5G) MICRO-TRONICS	BRM50716-01	G011	Sep. 05, 2019	Sep. 04, 2020
RF Coaxial Cable EMCI	EMC102-KM-KM-1000	170819	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable Rosnol	K1K50-UP0279-K1K50 -3000	181129-1	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable JUNFLON+EMC	JUNFLON+EMC104-S M-SM-6000	Cable-CH2-02(M WX3221308G003 +130710)	Jun. 11, 2019	Jun. 10, 2020
Fix tool for Boresight antenna	BAF-01	2	NA	NA
Pre-amplifier (18GHz-40GHz) EMC	EMC184045B	980175	Sep. 05, 2019	Sep. 04, 2020
HORN Antenna (with 3dB PAD) SCHWARZBECK	BBHA 9170	148	Nov. 24, 2019	Nov. 23, 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 test was performed in HwaYa Chamber 2.
3. The VCCI Site Registration No. is G-10018.

6.3 Test Arrangement

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- For frequency range 1GHz ~ 18GHz, the EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- For frequency range 18GHz ~ 40GHz, the EUT was set 1.5 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The height of antenna can be varied from one meter to four meters, the height of adjustment depends on the EUT height and the antenna 3dB beamwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The spectrum analyzer system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

Note: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection (PK) at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.



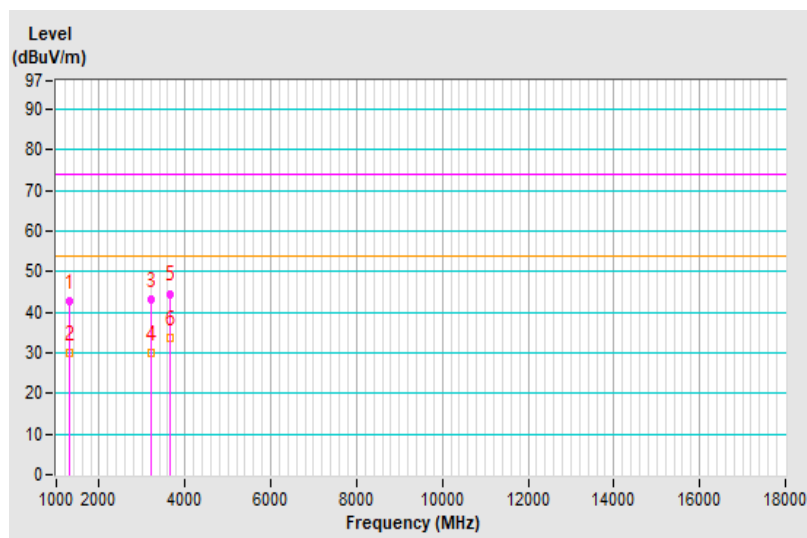
6.4 Test Results

Frequency Range	1GHz ~ 18GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	12Vdc	Environmental Conditions	25°C, 66%RH
Tested by	Mick Chou	Test Date	2019/12/12

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	1300.02	42.57 PK	74.00	-31.43	1.32 H	275	45.49	-2.92
2	1300.02	30.11 AV	54.00	-23.89	1.32 H	275	33.03	-2.92
3	3202.15	43.05 PK	74.00	-30.95	1.68 H	155	41.53	1.52
4	3202.15	29.83 AV	54.00	-24.17	1.68 H	155	28.31	1.52
5	3660.78	44.57 PK	74.00	-29.43	1.00 H	169	42.33	2.24
6	3660.78	33.84 AV	54.00	-20.16	1.00 H	169	31.60	2.24

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

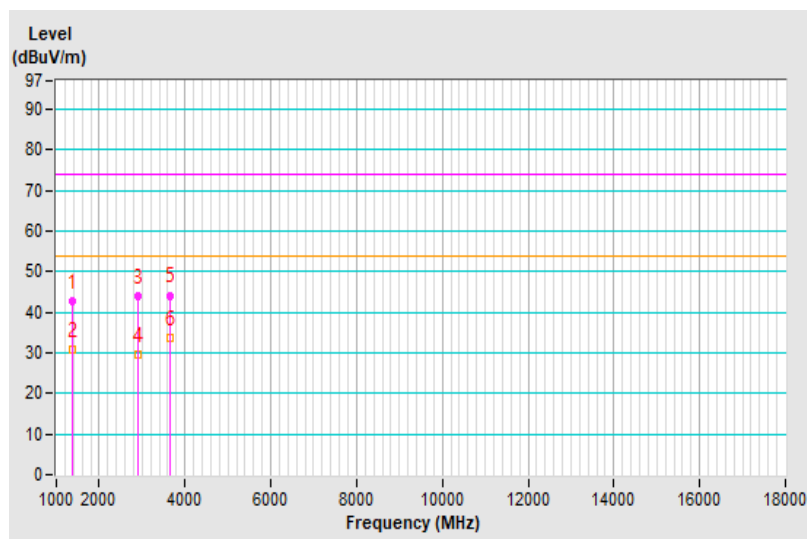


Frequency Range	1GHz ~ 18GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	12Vdc	Environmental Conditions	25°C, 66%RH
Tested by	Mick Chou	Test Date	2019/12/12

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	1382.63	42.57 PK	74.00	-31.43	1.55 V	22	45.05	-2.48
2	1382.63	30.66 AV	54.00	-23.34	1.55 V	22	33.14	-2.48
3	2920.38	44.05 PK	74.00	-29.95	1.85 V	42	42.97	1.08
4	2920.38	29.73 AV	54.00	-24.27	1.85 V	42	28.65	1.08
5	3661.95	44.15 PK	74.00	-29.85	1.00 V	354	41.91	2.24
6	3661.95	33.67 AV	54.00	-20.33	1.00 V	354	31.43	2.24

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

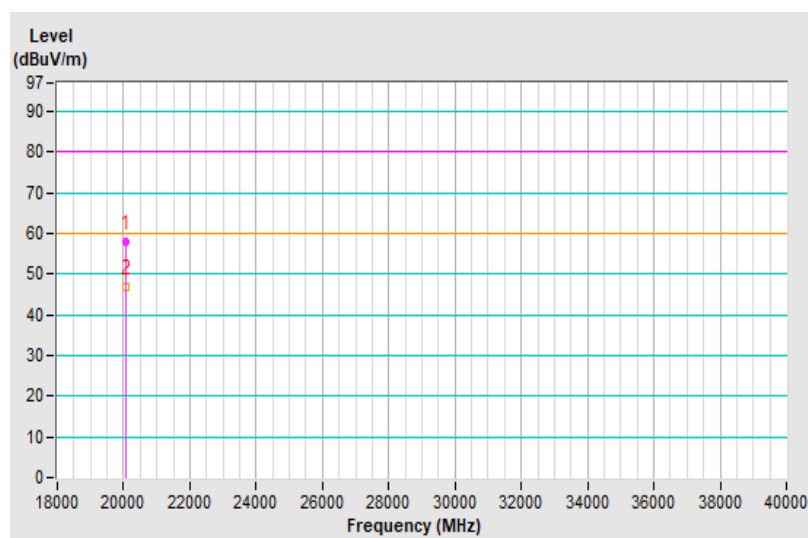


Frequency Range	18GHz ~ 40GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	12Vdc	Environmental Conditions	25°C, 66%RH
Tested by	Mick Chou	Test Date	2019/12/12

Antenna Polarity & Test Distance : Horizontal at 1.5 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	20054.37	57.91 PK	80.00	-22.09	1.56 H	245	67.63	-9.72
2	20054.37	46.82 AV	60.00	-13.18	1.56 H	245	56.54	-9.72

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

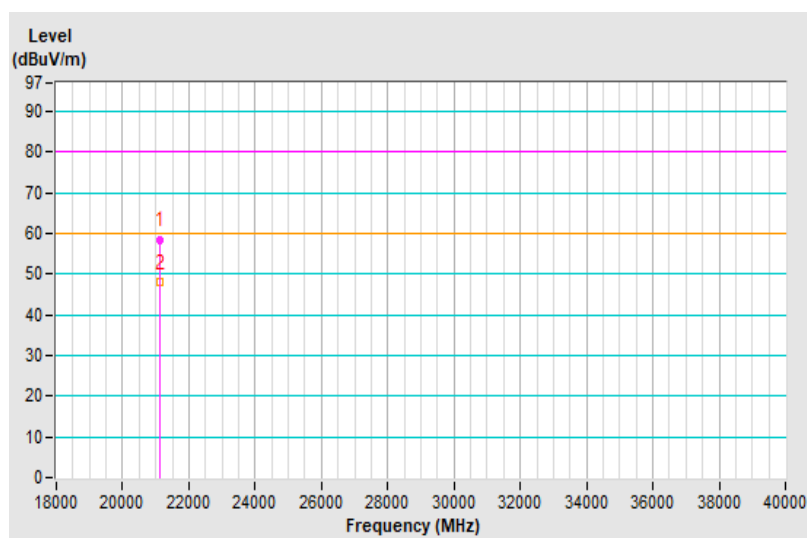


Frequency Range	18GHz ~ 40GHz	Detector Function & Resolution Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	12Vdc	Environmental Conditions	25°C, 66%RH
Tested by	Mick Chou	Test Date	2019/12/12

Antenna Polarity & Test Distance : Vertical at 1.5 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	21132.51	58.55 PK	80.00	-21.45	1.84 V	255	67.57	-9.02
2	21132.51	47.94 AV	60.00	-12.06	1.84 V	255	56.96	-9.02

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



7 Antenna-conducted Power Measurement

7.1 Limits

Frequency (MHz)	Limits	
	(nW→dBuV)	
30 – 960	2 nW	51.81 dBuV

7.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Agilent Preamplifier	8447D	2944A10386	Feb. 19, 2019	Feb. 18, 2020
R&S TEST RECEIVER	ESR3	102414	Jan. 17, 2019	Jan. 16, 2020
Schwarzbeck Antenna	VULB9168	9168-434	Nov. 08, 2019	Nov. 07, 2020
Max Full. Turn Table & Tower	MF7802	MF780208103	NA	NA
Software	Radiated_V8.7.08	NA	NA	NA
WOKEN RF cable With 5dB PAD	8D	CABLE-CH7-01	Jan. 21, 2019	Jan. 20, 2020

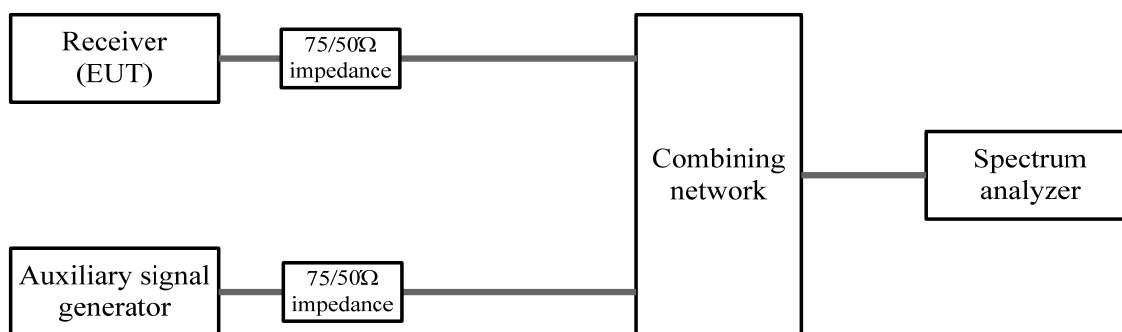
Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in Lin Kou Chamber No. 7.
 3. The VCCI Site Registration No. R-20008.

7.3 Test Arrangement

- The antenna terminals of the EUT and the auxiliary signal generator(NTSC/ATSC) are connected to the measuring receiver by means of coaxial cables.
- RF switch box shall be switched to auxiliary signal generator side.
- The output level of the auxiliary signal generator would be set to give 70dB (μV) at the antenna input of the EUT on 75 Ω impedance. (For Analog signal in)
- The output level of the auxiliary signal generator would be set to give VHF 50 dB (μV) and UHF 54 dB (μV) at the antenna input of the EUT on 75 Ω impedance. (For Digital signal in)
- RF switch box shall be switched to spectrum analyzer side.
- The measuring receiver is tuned to the test frequency and the disturbance level is measured, taking into account the attenuation between the receiver antenna terminal and the measuring receiver input.
- The test shall then be repeated with EUT switched off, to check that the measured disturbance voltage is not due to the auxiliary generator.
- In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed on antenna input terminal emission measurement.
- Conducted emissions were investigated over the frequency range from 30MHz to 960MHz using a receiver bandwidth of 120kHz.

Note:

- Emission level = Reading + Correction Factor
- Correction factor = Insertion loss + Cable loss – amplifier gain.
- Margin value = Emission level – Limit value.



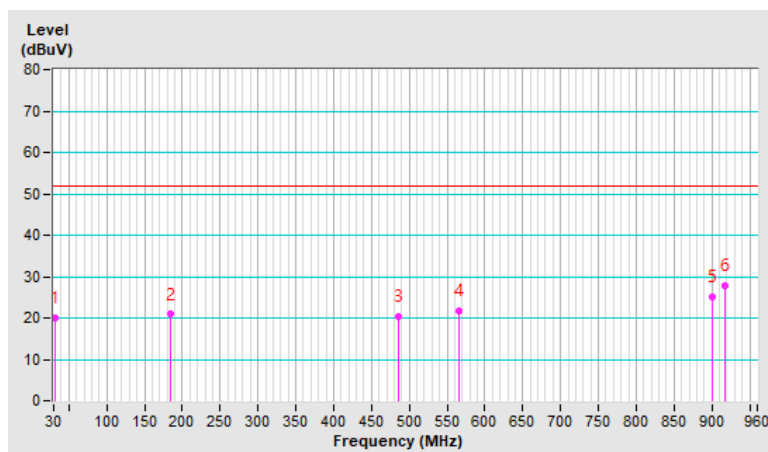
7.4 Test Results

Frequency Range	30MHz ~ 960MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	12Vdc	Environmental Conditions	23°C, 70%RH
Tested by	Chin-Wen Wang	Test Date	2019/12/20
Test Mode	FM 88MHz		

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Correction Factor (dB/m)
1	31.550	20.01 QP	51.81	-31.80	41.90	-21.89
2	183.450	20.89 QP	51.81	-30.92	40.72	-19.83
3	485.700	20.44 QP	51.81	-31.37	38.27	-17.83
4	566.300	21.74 QP	51.81	-30.07	39.07	-17.33
5	901.100	25.13 QP	51.81	-26.68	38.78	-13.65
6	916.600	27.87 QP	51.81	-23.94	41.32	-13.45

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

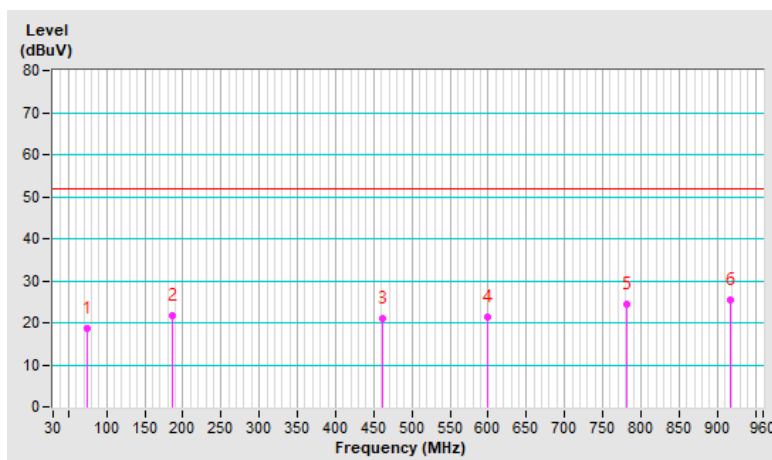


Frequency Range	30MHz ~ 960MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	12Vdc	Environmental Conditions	23°C, 70%RH
Tested by	Chin-Wen Wang	Test Date	2019/12/20
Test Mode	FM 98MHz		

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Correction Factor (dB/m)
1	74.950	18.62 QP	51.81	-33.19	39.97	-21.35
2	186.550	21.67 QP	51.81	-30.14	41.45	-19.78
3	460.900	21.08 QP	51.81	-30.73	39.09	-18.01
4	598.850	21.51 QP	51.81	-30.30	38.64	-17.13
5	781.750	24.47 QP	51.81	-27.34	39.61	-15.14
6	916.600	25.42 QP	51.81	-26.39	38.87	-13.45

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

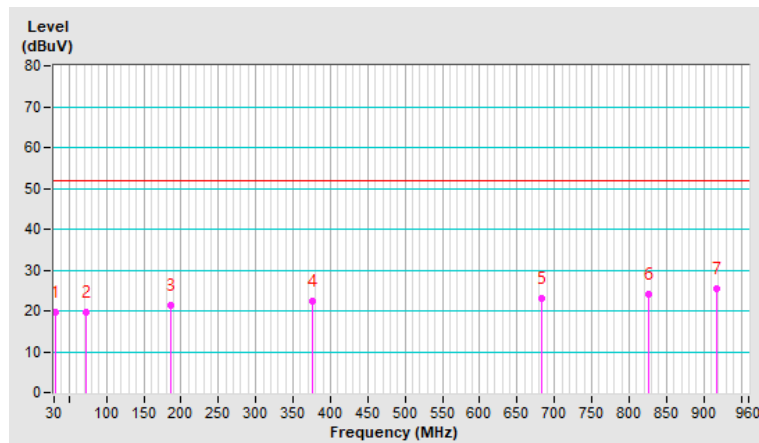


Frequency Range	30MHz ~ 960MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Input Power	12Vdc	Environmental Conditions	23°C, 70%RH
Tested by	Chin-Wen Wang	Test Date	2019/12/20
Test Mode	FM 108MHz		

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Correction Factor (dB/m)
1	31.550	19.66 QP	51.81	-32.15	41.55	-21.89
2	71.850	19.69 QP	51.81	-32.12	41.06	-21.37
3	186.550	21.33 QP	51.81	-30.48	41.11	-19.78
4	375.650	22.48 QP	51.81	-29.33	40.61	-18.13
5	682.550	23.13 QP	51.81	-28.68	39.48	-16.35
6	825.150	24.07 QP	51.81	-27.74	38.59	-14.52
7	916.600	25.57 QP	51.81	-26.24	39.02	-13.45

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



8 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 and approved according to ISO/IEC 17025.

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

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

--- END ---