

FCC Test Report

(Spot Check: Part 22 – SA Mode: n5 Band)

Report No.: RF200514C16B

FCC ID: T8GSAN9001

Original FCC ID: T8GSAN9000

Test Model: SA-N9001 CUS D1

Received Date: May 14, 2020

Test Date: Nov. 29 ~ Dec. 24, 2020

Issued Date: Dec. 30, 2020

Applicant: Harman Connected Car Division

Address: Parking 3, 85748 Garching Germany

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

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FCC Registration / 788550 / TW0003

Designation Number:



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Release Control Record

Issue No.	Description	Date Issued
RF200514C16B	Original release	Dec. 30, 2020

1 Certificate of Conformity

Product: Module

Brand: Harman

Test Model: SA-N9001 CUS D1

Sample Status: Standard Sample

Applicant: Harman Connected Car Division

Test Date: Nov. 29 ~ Dec. 24, 2020

Standards: FCC Part 22, Subpart H

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 RF characteristics under the conditions specified in this report.

Prepared by : Celine Chou , **Date:** Dec. 30, 2020
Celine Chou / Senior Specialist

Approved by : Bruce Chen , **Date:** Dec. 30, 2020
Bruce Chen / Senior Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 22 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 22.913 (a)	Effective radiated power	Pass	Meet the requirement of limit.
2.1053 22.917	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -22.30dB at 1673.00MHz.

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	3.04 dB
	30MHz ~ 200MHz	3.59 dB
	200MHz ~ 1000MHz	3.60 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 16, 2020	Apr. 15, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 12, 2020	Jun. 11, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Nov. 06, 2020	Nov. 05, 2021
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 22, 2020	Nov. 21, 2021
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 22, 2020	Nov. 21, 2021
Loop Antenna TESEQ	HLA 6121	45745	Jul. 06, 2020	Jul. 05, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jun. 08, 2020	Jun. 07, 2021
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 18, 2020	Feb. 17, 2021
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8 000	CABLE-CH9-02 (248780+171006)	Jan. 18, 2020	Jan. 17, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Jan. 18, 2020	Jan. 17, 2021
RF signal cable Woken	8D-FB	Cable-CH9-01	Jun. 08, 2020	Jun. 07, 2021
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Pre-amplifier (18GHz-40GHz) EMC	EMC184045B	980175	Sep. 04, 2020	Sep. 03, 2021
UXM 5G Wireless Test Platform Keysight	E7515B	MY58300759	Apr. 18, 2020	Apr. 17, 2021
Standard Temperature And Humidity Chamber TERCHY	MHU-225AU	920842	May 27, 2020	May 31, 2021
JFW 20dB attenuation	50HF-020-SMA	NA	NA	NA
True RMS Clamp Meter Fluke	325	31130711WS	Jun. 06, 2020	Jun. 05, 2021
DC power supply	U8002A	MY56330015	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 9.

3 General Information

3.1 General Description of EUT

Product	Module					
Brand	Harman					
Test Model	SA-N9001 CUS D1					
Sample Status	Standard Sample					
Power Supply rating	4.2Vdc					
Modulation Type	$\pi/2$ BPSK, QPSK, 16QAM, 64QAM, 256QAM					
Waveform Type	CP-OFDM, DFT-s-OFDM					
Operating Frequency	n5 (Channel Bandwidth: 5MHz)	826.5 ~ 846.5MHz				
	n5 (Channel Bandwidth: 10MHz)	829.0 ~ 844.0MHz				
	n5 (Channel Bandwidth: 15MHz)	831.5 ~ 841.5MHz				
	n5 (Channel Bandwidth: 20MHz)	834.0 ~ 839.0MHz				
Max. ERP Power		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
	n5 (Channel Bandwidth: 5MHz)	201.372mW (23.04dBm)	102.565mW (20.11dBm)	99.312mW (19.97dBm)	89.950mW (19.54dBm)	44.566mW (16.49dBm)
	n5 (Channel Bandwidth: 10MHz)	201.837mW (23.05dBm)	103.514mW (20.15dBm)	100.925mW (20.04dBm)	90.365mW (19.56dBm)	43.853mW (16.42dBm)
	n5 (Channel Bandwidth: 15MHz)	199.067mW (22.99dBm)	102.802mW (20.12dBm)	100.693mW (20.03dBm)	88.920mW (19.49dBm)	44.875mW (16.52dBm)
	n5 (Channel Bandwidth: 20MHz)	198.153mW (22.97dBm)	101.625mW (20.07dBm)	99.541mW (19.98dBm)	89.950mW (19.54dBm)	44.771mW (16.51dBm)
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
Emission Designator	n5 (Channel Bandwidth: 5MHz)	4M46G7D	4M46G7D	4M47D7W	4M46D7W	4M46D7W
	n5 (Channel Bandwidth: 10MHz)	9M38G7D	9M38G7D	9M37D7W	9M38D7W	9M38D7W
	n5 (Channel Bandwidth: 15MHz)	14M1G7D	14M1G7D	14M1D7W	14M1D7W	14M1D7W
	n5 (Channel Bandwidth: 20MHz)	18M9G7D	18M9G7D	18M9D7W	18M9D7W	18M9D7W
		$\pi/2$ BPSK	QPSK	16QAM	64QAM	256QAM
Antenna Type	Refer to note					
Antenna Connector	Refer to note					
Accessory Device	NA					
Cable Supplied	NA					

Note:

1. This report is a supplementary report to the original BV CPS report no.: RF200514C16A. Exhibit prepared for FCC Spot Check Verification report, the format, test items and amount of spot-check test data are decided by applicant's engineering judgment, for more details please refer to declaration letter exhibit. Radiated emission and output power verification worst test refer to original report.

2. The antenna information is listed as below.

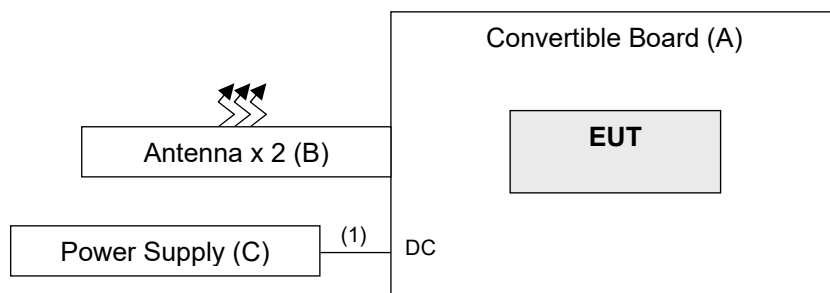
Operating frequency band	Antenna	Gain (dBi)	Connector Type
Band 2	5G/4G Terminal Mount Monopole Antenna	2.92	SMA
Band 5		1.01	
Band 7		2.20	
Band 12		-1.17	
Band 25		2.97	
Band 38		2.18	
Band 41		2.20	
Band 66		3.44	
Band 71		1.72	
Band 77		2.61	

* The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

3. The EUT supports the following ENDC configuration.

5GNR	FCC 5G FR1			ENDC
	Band	SCS	Bandwidth (MHz)	
	n5	15kHz	5/10/15/20	Band 2/66
	n41	30kHz	10/15/20/40/50/60/80/90/100	Band 26
	n66	15kHz	5/10/15/20/40	Band 5/12
	n71	15kHz	5/10/15/20	Band 2/66

3.2 Configuration of System under Test



3.2.1 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.	Convertible Board	NA	NA	NA	NA	Provided by client
B.	Antenna x 2	TAOGLAS	TG.55.8113	NA	NA	Provided by client
C.	DC Power supply	TECPEL	GPS-3030DD	GEO855739	NA	-

Note: All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC cable	1	1	N	0	-

3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports. The worst case was found when positioned on X-plane. Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	ERP	165300 to 169300	165300 (826.5MHz), 167300 (836.5MHz), 169300 (846.5MHz)	5MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 RB / 0 RB Offset 1 RB / 12 RB Offset 1 RB / 24 RB Offset 12 RB / 0 RB Offset 12 RB / 6 RB Offset 12 RB / 13 RB Offset 25 RB / 0 RB Offset
		165800 to 168800	165800 (829.0MHz), 167300 (836.5MHz), 168800 (844.0MHz)	10MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 RB / 0 RB Offset 1 RB / 26 RB Offset 1 RB / 51 RB Offset 26 RB / 0 RB Offset 26 RB / 13 RB Offset 26 RB / 26 RB Offset 52 RB / 0 RB Offset
		166300 to 168300	166300 (831.5MHz), 167300 (836.5MHz), 168300 (841.5MHz)	15MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 RB / 0 RB Offset 1 RB / 39 RB Offset 1 RB / 78 RB Offset 39 RB / 0 RB Offset 39 RB / 19 RB Offset 39 RB / 40 RB Offset 79 RB / 0 RB Offset
		166800 to 167800	166800 (834.0MHz), 167300 (836.5MHz), 167800 (839.0MHz)	20MHz	$\pi/2$ BPSK / QPSK / 16QAM / 64QAM / 256QAM	1 RB / 0 RB Offset 1 RB / 53 RB Offset 1 RB / 105 RB Offset 53 RB / 0 RB Offset 53 RB / 27 RB Offset 53 RB / 53 RB Offset 106 RB / 0 RB Offset
-	Radiated Emission Below 1GHz	166800 to 167800	167300 (836.5MHz)	20MHz	$\pi/2$ BPSK	1 RB / 0 RB Offset
-	Radiated Emission Above 1GHz	166800 to 167800	167300 (836.5MHz)	20MHz	$\pi/2$ BPSK	1 RB / 0 RB Offset

Test Condition:

Test Item	Environmental Conditions	Input Power (System)	Tested By
ERP	25deg. C, 70%RH	4.2Vdc	James Yang
Radiated Emission	22deg. C, 66%RH	120Vac, 60Hz	Han Wu

3.4 EUT Operating Conditions

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency

3.5 General Description of Applied Standards and References

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and References:

Test Standard:

FCC 47 CFR Part 2

FCC 47 CFR Part 22

ANSI/TIA/EIA-603-E 2016

ANSI 63.26-2015

All test items have been performed and recorded as per the above standards.

References Test Guidance:

KDB 971168 D01 Power Meas License Digital Systems v03r01

All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Mobile / Portable station are limited to 7 watts e.r.p.

4.1.2 Test Procedures

Conducted Power Measurement:

1. Connect the DUT transmitter output to the spectrum analyzer via coaxial cable while ensuring proper impedance matching.
2. Set span to at least 1.5 times the OBW.
3. Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
4. Set VBW $\geq 3 \times$ RBW.
5. Set number of points in sweep $\geq 2 \times$ span / RBW.
6. Sweep time = auto-couple.
7. Detector = RMS (power averaging).
8. If the EUT can be configured to transmit continuously (i.e., burst duty cycle $\geq 98\%$), then set the trigger to free run.
9. If the EUT cannot be configured to transmit continuously (i.e., burst duty cycle $< 98\%$), then use a sweep trigger with the level set to enable triggering only on full power bursts and configure the EUT to transmit at full power for the entire duration of each sweep. Ensure that the sweep time is less than or equal to the transmission burst duration.
10. Trace average at least 100 traces in power averaging (i.e., RMS) mode.
11. Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with the band limits set equal to the OBW band edges. If the instrument does not have a band power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

Maximum EIRP / ERP

The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation as follows:

$$\text{EIRP} = P_{\text{Meas}} + G_T$$

$$\text{ERP} = P_{\text{Meas}} + G_T - 2.15$$

where

ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively
(expressed in the same units as P_{Meas} , e.g., dBm or dBW)

P_{Meas} measured transmitter output power or PSD, in dBm or dBW

G_T gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

4.1.3 Test Setup

Conducted Power Measurement:



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

4.1.4 Test Results

Conducted Output Power (dBm)

NR Band 5 (SCS 15kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		166800	167300	167800
		Frequency (MHz)		834	836.5	839
20M	pi/2 BPSK	1	0	24.07	24.10	24.11
		1	53	24.07	23.96	23.91
		1	105	24.02	24.03	24.05
		53	0	23.83	23.88	23.98
		53	27	23.89	23.89	23.98
		53	53	23.92	23.83	24.00
		106	0	23.88	23.99	23.82
	QPSK	1	0	21.14	21.21	21.15
		1	53	21.07	21.02	21.00
		1	105	21.00	21.12	21.10
		53	0	21.00	21.05	21.04
		53	27	21.03	21.07	20.94
		53	53	21.00	21.06	21.06
		106	0	21.05	21.09	21.06
	16QAM	1	0	21.05	21.12	21.03
		1	53	20.95	21.09	21.10
		1	105	20.92	21.03	20.90
		53	0	20.83	20.99	20.94
		53	27	20.86	20.98	20.89
		53	53	20.82	20.86	20.92
		106	0	20.97	20.99	21.00
	64QAM	1	0	20.63	20.62	20.68
		1	53	20.40	20.59	20.53
		1	105	20.41	20.49	20.54
		53	0	20.49	20.34	20.34
		53	27	20.30	20.50	20.36
		53	53	20.41	20.47	20.44
		106	0	20.45	20.50	20.32
	256QAM	1	0	17.65	17.65	17.62
		1	53	17.55	17.57	17.47
		1	105	17.53	17.44	17.60
		53	0	17.39	17.33	17.47
		53	27	17.36	17.37	17.39
		53	53	17.32	17.39	17.30
		106	0	17.32	17.45	17.42

NR Band 5 (SCS 15kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		166300	167300	168300
		Frequency (MHz)		831.5	836.5	841.5
15M	pi/2 BPSK	1	0	24.13	24.02	24.02
		1	39	24.07	23.91	23.93
		1	78	24.07	23.96	23.95
		39	0	23.95	23.86	23.94
		39	19	23.80	23.99	23.91
		39	40	23.82	23.85	23.82
		79	0	23.99	23.86	23.87
	QPSK	1	0	21.26	21.12	21.21
		1	39	21.04	21.13	21.08
		1	78	21.16	21.07	21.05
		39	0	20.93	20.93	21.10
		39	19	20.92	20.97	21.07
		39	40	21.01	21.08	21.02
		79	0	21.00	21.04	21.02
	16QAM	1	0	21.00	21.17	21.06
		1	39	20.98	20.90	20.99
		1	78	20.99	20.95	21.09
		39	0	21.00	20.80	20.98
		39	19	20.90	20.83	20.91
		39	40	20.94	20.80	20.92
		79	0	20.91	20.81	20.86
	64QAM	1	0	20.62	20.63	20.53
		1	39	20.44	20.53	20.53
		1	78	20.50	20.60	20.46
		39	0	20.31	20.46	20.30
		39	19	20.47	20.39	20.41
		39	40	20.50	20.44	20.34
		79	0	20.44	20.36	20.49
	256QAM	1	0	17.66	17.60	17.55
		1	39	17.46	17.58	17.51
		1	78	17.58	17.53	17.42
		39	0	17.37	17.37	17.36
		39	19	17.40	17.33	17.42
		39	40	17.42	17.36	17.39
		79	0	17.44	17.40	17.31

NR Band 5 (SCS 15kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		165800	167300	168800
		Frequency (MHz)		829	836.5	844
10M	pi/2 BPSK	1	0	24.06	24.19	24.16
		1	26	24.09	24.01	24.07
		1	51	24.00	23.93	23.93
		26	0	23.98	23.86	23.94
		26	13	23.92	23.89	23.84
		26	26	23.86	23.89	23.91
		52	0	23.95	23.99	23.91
	QPSK	1	0	21.23	21.29	21.10
		1	26	21.02	21.10	21.06
		1	51	21.19	21.20	21.08
		26	0	21.02	20.97	21.07
		26	13	21.07	20.94	20.95
		26	26	20.99	21.03	20.93
		52	0	20.92	21.07	21.05
	16QAM	1	0	21.03	21.18	21.06
		1	26	21.05	21.03	20.93
		1	51	20.98	20.98	21.04
		26	0	20.92	20.92	20.97
		26	13	20.87	20.91	20.93
		26	26	20.94	20.89	20.92
		52	0	20.95	20.83	20.88
	64QAM	1	0	20.70	20.52	20.61
		1	26	20.47	20.45	20.51
		1	51	20.48	20.41	20.60
		26	0	20.50	20.36	20.43
		26	13	20.46	20.39	20.34
		26	26	20.50	20.45	20.47
		52	0	20.34	20.30	20.31
	256QAM	1	0	17.50	17.56	17.50
		1	26	17.54	17.47	17.50
		1	51	17.46	17.55	17.44
		26	0	17.43	17.44	17.43
		26	13	17.50	17.45	17.39
		26	26	17.47	17.35	17.30
		52	0	17.43	17.33	17.39

NR Band 5 (SCS 15kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		165300	167300	169300
		Frequency (MHz)		826.5	836.5	846.5
5M	pi/2 BPSK	1	0	24.06	24.18	24.09
		1	12	24.03	23.95	24.10
		1	24	23.97	24.09	23.90
		12	0	23.84	24.00	23.94
		12	6	23.92	24.00	23.81
		12	13	23.87	24.00	23.99
		25	0	23.95	23.91	23.89
	QPSK	1	0	21.22	21.25	21.20
		1	12	21.00	21.06	21.07
		1	24	21.05	21.14	21.14
		12	0	21.07	21.01	21.03
		12	6	20.95	20.95	21.07
		12	13	21.00	20.93	21.01
		25	0	21.05	20.94	21.10
	16QAM	1	0	21.11	21.08	21.11
		1	12	21.06	20.96	21.04
		1	24	21.10	21.10	20.99
		12	0	20.98	20.98	20.83
		12	6	20.82	20.83	20.84
		12	13	20.88	20.81	20.91
		25	0	20.82	20.85	20.92
	64QAM	1	0	20.64	20.66	20.68
		1	12	20.55	20.42	20.59
		1	24	20.48	20.52	20.41
		12	0	20.32	20.34	20.48
		12	6	20.45	20.46	20.38
		12	13	20.47	20.32	20.31
		25	0	20.37	20.39	20.38
	256QAM	1	0	17.54	17.62	17.63
		1	12	17.59	17.43	17.43
		1	24	17.49	17.43	17.48
		12	0	17.49	17.44	17.30
		12	6	17.49	17.33	17.44
		12	13	17.43	17.35	17.34
		25	0	17.43	17.34	17.42

ERP Power (dBm)

NR Band 5 (SCS 15kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		166800	167300	167800
		Frequency (MHz)		834	836.5	839
20M	pi/2 BPSK	1	0	22.93	22.96	22.97
		1	53	22.93	22.82	22.77
		1	105	22.88	22.89	22.91
		53	0	22.69	22.74	22.84
		53	27	22.75	22.75	22.84
		53	53	22.78	22.69	22.86
		106	0	22.74	22.85	22.68
	QPSK	1	0	20.00	20.07	20.01
		1	53	19.93	19.88	19.86
		1	105	19.86	19.98	19.96
		53	0	19.86	19.91	19.90
		53	27	19.89	19.93	19.80
		53	53	19.86	19.92	19.92
		106	0	19.91	19.95	19.92
	16QAM	1	0	19.91	19.98	19.89
		1	53	19.81	19.95	19.96
		1	105	19.78	19.89	19.76
		53	0	19.69	19.85	19.80
		53	27	19.72	19.84	19.75
		53	53	19.68	19.72	19.78
		106	0	19.83	19.85	19.86
	64QAM	1	0	19.49	19.48	19.54
		1	53	19.26	19.45	19.39
		1	105	19.27	19.35	19.40
		53	0	19.35	19.20	19.20
		53	27	19.16	19.36	19.22
		53	53	19.27	19.33	19.30
		106	0	19.31	19.36	19.18
	256QAM	1	0	16.51	16.51	16.48
		1	53	16.41	16.43	16.33
		1	105	16.39	16.30	16.46
		53	0	16.25	16.19	16.33
		53	27	16.22	16.23	16.25
		53	53	16.18	16.25	16.16
		106	0	16.18	16.31	16.28

*ERP = Conducted + antenna gain - 2.15

NR Band 5 (SCS 15kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		166300	167300	168300
		Frequency (MHz)		831.5	836.5	841.5
15M	pi/2 BPSK	1	0	22.99	22.88	22.88
		1	39	22.93	22.77	22.79
		1	78	22.93	22.82	22.81
		39	0	22.81	22.72	22.80
		39	19	22.66	22.85	22.77
		39	40	22.68	22.71	22.68
		79	0	22.85	22.72	22.73
	QPSK	1	0	20.12	19.98	20.07
		1	39	19.90	19.99	19.94
		1	78	20.02	19.93	19.91
		39	0	19.79	19.79	19.96
		39	19	19.78	19.83	19.93
		39	40	19.87	19.94	19.88
		79	0	19.86	19.90	19.88
	16QAM	1	0	19.86	20.03	19.92
		1	39	19.84	19.76	19.85
		1	78	19.85	19.81	19.95
		39	0	19.86	19.66	19.84
		39	19	19.76	19.69	19.77
		39	40	19.80	19.66	19.78
		79	0	19.77	19.67	19.72
	64QAM	1	0	19.48	19.49	19.39
		1	39	19.30	19.39	19.39
		1	78	19.36	19.46	19.32
		39	0	19.17	19.32	19.16
		39	19	19.33	19.25	19.27
		39	40	19.36	19.30	19.20
		79	0	19.30	19.22	19.35
	256QAM	1	0	16.52	16.46	16.41
		1	39	16.32	16.44	16.37
		1	78	16.44	16.39	16.28
		39	0	16.23	16.23	16.22
		39	19	16.26	16.19	16.28
		39	40	16.28	16.22	16.25
		79	0	16.30	16.26	16.17

*ERP = Conducted + antenna gain - 2.15

NR Band 5 (SCS 15kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		165800	167300	168800
		Frequency (MHz)		829	836.5	844
10M	pi/2 BPSK	1	0	22.92	23.05	23.02
		1	26	22.95	22.87	22.93
		1	51	22.86	22.79	22.79
		26	0	22.84	22.72	22.80
		26	13	22.78	22.75	22.70
		26	26	22.72	22.75	22.77
		52	0	22.81	22.85	22.77
	QPSK	1	0	20.09	20.15	19.96
		1	26	19.88	19.96	19.92
		1	51	20.05	20.06	19.94
		26	0	19.88	19.83	19.93
		26	13	19.93	19.80	19.81
		26	26	19.85	19.89	19.79
		52	0	19.78	19.93	19.91
	16QAM	1	0	19.89	20.04	19.92
		1	26	19.91	19.89	19.79
		1	51	19.84	19.84	19.90
		26	0	19.78	19.78	19.83
		26	13	19.73	19.77	19.79
		26	26	19.80	19.75	19.78
		52	0	19.81	19.69	19.74
	64QAM	1	0	19.56	19.38	19.47
		1	26	19.33	19.31	19.37
		1	51	19.34	19.27	19.46
		26	0	19.36	19.22	19.29
		26	13	19.32	19.25	19.20
		26	26	19.36	19.31	19.33
		52	0	19.20	19.16	19.17
	256QAM	1	0	16.36	16.42	16.36
		1	26	16.40	16.33	16.36
		1	51	16.32	16.41	16.30
		26	0	16.29	16.30	16.29
		26	13	16.36	16.31	16.25
		26	26	16.33	16.21	16.16
		52	0	16.29	16.19	16.25

*ERP = Conducted + antenna gain - 2.15

NR Band 5 (SCS 15kHz)						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		165300	167300	169300
		Frequency (MHz)		826.5	836.5	846.5
5M	pi/2 BPSK	1	0	22.92	23.04	22.95
		1	12	22.89	22.81	22.96
		1	24	22.83	22.95	22.76
		12	0	22.70	22.86	22.80
		12	6	22.78	22.86	22.67
		12	13	22.73	22.86	22.85
		25	0	22.81	22.77	22.75
	QPSK	1	0	20.08	20.11	20.06
		1	12	19.86	19.92	19.93
		1	24	19.91	20.00	20.00
		12	0	19.93	19.87	19.89
		12	6	19.81	19.81	19.93
		12	13	19.86	19.79	19.87
		25	0	19.91	19.80	19.96
	16QAM	1	0	19.97	19.94	19.97
		1	12	19.92	19.82	19.90
		1	24	19.96	19.96	19.85
		12	0	19.84	19.84	19.69
		12	6	19.68	19.69	19.70
		12	13	19.74	19.67	19.77
		25	0	19.68	19.71	19.78
	64QAM	1	0	19.50	19.52	19.54
		1	12	19.41	19.28	19.45
		1	24	19.34	19.38	19.27
		12	0	19.18	19.20	19.34
		12	6	19.31	19.32	19.24
		12	13	19.33	19.18	19.17
		25	0	19.23	19.25	19.24
	256QAM	1	0	16.40	16.48	16.49
		1	12	16.45	16.29	16.29
		1	24	16.35	16.29	16.34
		12	0	16.35	16.30	16.16
		12	6	16.35	16.19	16.30
		12	13	16.29	16.21	16.20
		25	0	16.29	16.20	16.28

*ERP = Conducted + antenna gain - 2.15

4.2 Radiated Emission Measurement

4.2.1 Limits of Radiated Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The emission limit equal to -13dBm .

4.2.2 Test Procedure

- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- b. $\text{EIRP} = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$. Correction Factor (includes EIRP and ERP unit conversion factor) = Antenna gain of substitution horn. – Tx cable loss. Measurement method refers to ANSI C63.26 section 5.5.3.2.
- c. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, $\text{E.R.P power} = \text{E.I.R.P power} - 2.15\text{dBi}$.

Note:

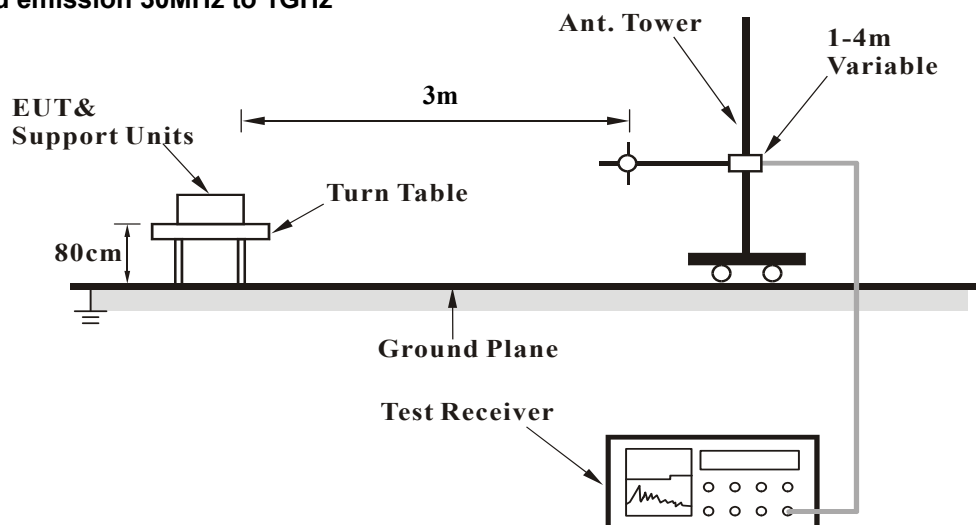
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.
2. The emission levels were against the limit of frequency range 9 kHz ~ 30 MHz: The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report

4.2.3 Deviation from Test Standard

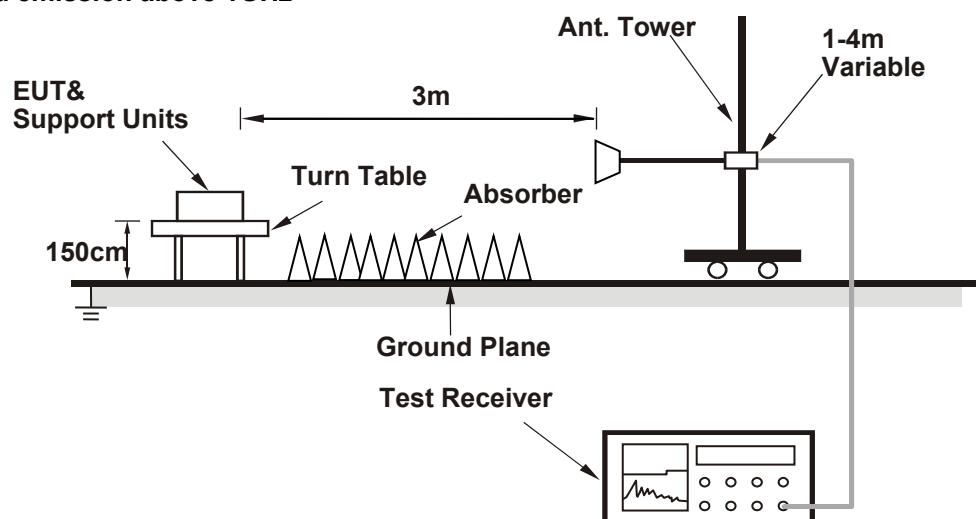
No deviation.

4.2.4 Test Setup

For radiated emission 30MHz to 1GHz



For radiated emission above 1GHz



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

4.2.5 Test Results

Below 1GHz

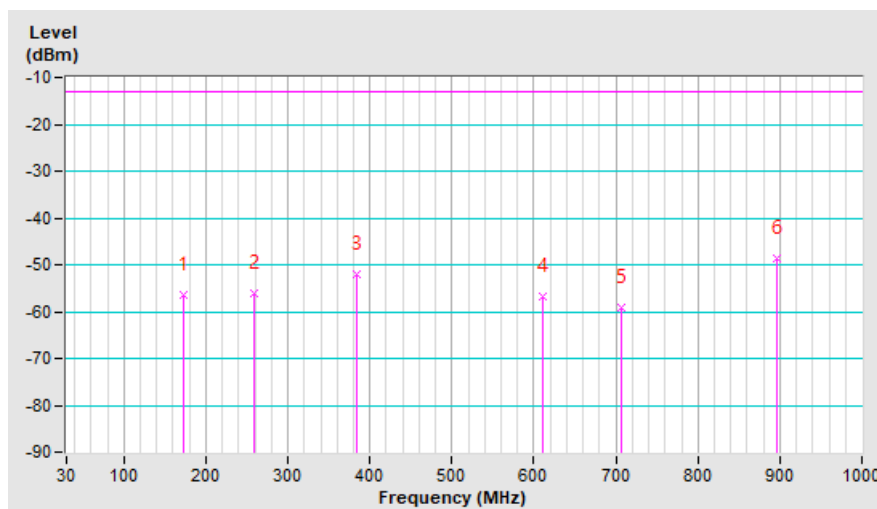
n5, Channel Bandwidth: 20MHz

Mode	TX channel 167300 (836.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	173.56	-46.80	-53.50	-2.80	-56.30	-13.00	-43.30
2	258.92	-48.90	-54.50	-1.50	-56.00	-13.00	-43.00
3	383.08	-48.60	-55.40	3.50	-51.90	-13.00	-38.90
4	610.06	-56.40	-60.50	3.70	-56.80	-13.00	-43.80
5	707.06	-60.20	-62.70	3.50	-59.20	-13.00	-46.20
6	897.18	-54.10	-52.30	3.50	-48.80	-13.00	-35.80

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB) + 2.15dB.

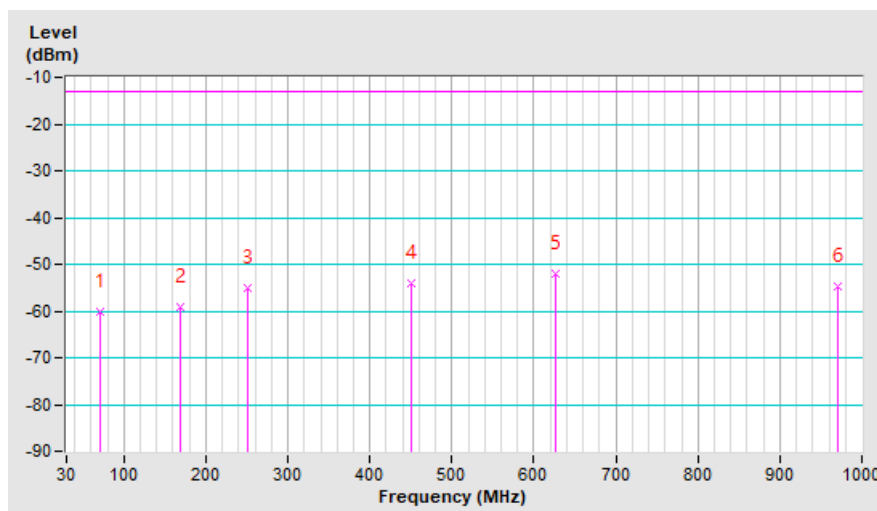


Mode	TX channel 167300 (836.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	70.74	-51.90	-59.90	-0.40	-60.30	-13.00	-47.30
2	169.68	-53.80	-56.30	-2.80	-59.10	-13.00	-46.10
3	251.16	-52.90	-53.60	-1.40	-55.00	-13.00	-42.00
4	450.98	-51.60	-57.50	3.40	-54.10	-13.00	-41.10
5	625.58	-54.80	-55.70	3.70	-52.00	-13.00	-39.00
6	970.90	-61.70	-58.40	3.70	-54.70	-13.00	-41.70

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB) + 2.15dB.



Above 1GHz
n5, Channel Bandwidth: 20MHz

Mode	TX channel 167300 (836.5MHz)	Frequency Range	1GHz ~ 10GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1673.00	-48.80	-41.10	0.80	-40.30	-13.00	-27.30
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1673.00	-43.40	-36.10	0.80	-35.30	-13.00	-22.30

Remarks:

1. ERP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB) + 2.15dB.

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 and approved according to ISO/IEC 17025.

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

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