Variant EMC Test Report

Report No.: RM150902C16A

Test Model: LinkIt Smart 7688 Duo

Received Date: Jun. 26, 2018

Test Date: Jul. 11, 2018 ~ Jul. 16, 2018

Issued Date: Jul. 24, 2018

Applicant: Seeed Technology Limited

Address: F2, Building 8, Shiling Industrial Park, Xili Town, Nanshan District, Shenzhen, Guangdong, PRC

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

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

Test Location: No. 19, Hwa Ya 2nd Rd, Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan (R.O.C.)

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Release Control Record

Issue No.	Description	Date Issued
RM150902C16A	Original release	Jul. 24, 2018

1 Certificate of Conformity

Product:	802.11b/g/n IoT Module
Brand:	Seeed
Test Model:	LinkIt Smart 7688 Duo
Sample Status:	Identical Prototype
Applicant:	Seeed Technology Limited
Test Date:	Jul. 11, 2018 ~ Jul. 16, 2018
Standards:	**EN 301 489-1 V2.1.1 (2017-02)** **EN 301 489-17 V3.1.1 (2017-02)** EN 55032:2015, Class B EN 61000-3-2:2014, Class A (Not Applicable) EN 61000-3-3:2013 (Not Applicable) EN 61000-4-2:2009 (Not Applicable) EN 61000-4-3:2006 +A1:2008 +A2:2010 EN 61000-4-4:2012 (Not Applicable) EN 61000-4-5:2014 (Not Applicable) EN 61000-4-6:2014 +AC:2015 (Not Applicable) EN 61000-4-11:2004 (Not Applicable)

This report is issued as a supplementary report to BV CPS report no.: RM150902C16. This report shall be used by combining with its original report.

Prepared by : Evonne Liu , **Date:** Jul. 24, 2018

Evonne Liu / Specialist

Approved by : Carl Chen , **Date:** Jul. 24, 2018

Carl Chen / Project Engineer

2 Summary of Test Results

EN 301 489-1 V2.1.1 (2017-02) / EN 301 489-17 V3.1.1 (2017-02), Emission					
Clause	Basic Standard	Phenomenon	Application	Result/Remarks	Verdict
8.2	EN 55032:2015	Radiated emission 30-1000 MHz	Enclosure of ancillary equipment measured on a standalone basis	Minimum passing Class B margin is -4.13 dB at 124.97 MHz	Pass
		Radiated emission 1-6 GHz		Minimum passing Class B margin is -17.27 dB at 2689.39 MHz	Pass
8.3	EN 55032:2015	Conducted emission 150 kHz - 30 MHz	DC power input/output ports (fixed)	Test not applicable because port does not exists.	N/A
		Conducted emission 150 kHz - 30 MHz	DC power input ports (vehicular)	Test not applicable because the port does not exist.	N/A
8.4	EN 55032:2015	Conducted emission 150 kHz - 30 MHz	AC mains input/output ports	Without AC power port of the EUT	N/A
8.5	EN 61000-3-2:2014	Harmonic current emissions	AC mains input port	Class A Test not applicable because the port does not exists	N/A
8.6	EN 61000-3-3:2013	Voltage fluctuations and flicker	AC mains input ports	Test not applicable because the port does not exists	N/A
8.7	EN 55032:2015	Conducted disturbance 150 kHz - 30 MHz	Telecommunication ports	Without telecom port of the EUT	N/A

EN 301 489-1 V2.1.1 (2017-02) / EN 301 489-17 V3.1.1 (2017-02), Immunity					
Clause	Basic Standard	Phenomenon	Application	Result/Remarks	Verdict
9.2	EN 61000-4-3:2006 +A1:2008 +A2:2010	RF Electromagnetic Field (80 MHz to 6000 MHz) (RS)	Enclosure	Performance Criterion A	Pass
9.3	EN 61000-4-2:2009	Electrostatic Discharges (ESD)	Enclosure	Refer to Note	N/A
9.4	EN 61000-4-4:2012	Fast Transients Common Mode (EFT)	Signal, telecommunication and control ports, DC and AC power ports	EUT's cable length is not greater than 3m and EUT consumes DC power.	N/A
9.5	EN 61000-4-6:2014/AC: 2015	RF Common Mode 150 kHz to 80 MHz (CS)	Signal, telecommunication and control ports, DC and AC power ports	EUT's cable length is not greater than 3m and EUT consumes DC power	N/A
9.6	ISO 7637-2:2004	Transients and Surges	DC power input ports (Vehicular)	Test not applicable because not intend for vehicular use.	N/A

EN 301 489-1 V2.1.1 (2017-02) / EN 301 489-17 V3.1.1 (2017-02), Immunity					
Clause	Basic Standard	Phenomenon	Application	Result/Remarks	Verdict
9.7	EN 61000-4-11:2004	Voltage Dips and Interruptions	AC mains power input ports	Test not applicable because port does not exist.	N/A
9.8	EN 61000-4-5:2014	Surges	AC mains power input ports, Signal and Wired network ports	Test not applicable because port does not exist.	N/A

Note:

1. N/A: Not Applicable
2. There is no deviation to the applied test methods and requirements covered by the scope of this report.
3. Only Radiated emission and RS tests were performed for this addendum. Refer to original report for other test data.

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:
The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Expanded Uncertainty (k=2) (±)	Maximum allowable uncertainty (±)
Radiated disturbance, 30 MHz ~ 1 GHz	4.70 dB	6.3 dB (U_{cispr})
Radiated disturbance, 1 GHz ~ 6 GHz	2.26 dB	5.2 dB (U_{cispr})

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 Features of EUT

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

3.2 General Description of EUT

Product	802.11b/g/n IoT Module	
Brand Name	Seeed	
Model No.	LinkIt Smart 7688 Duo	
Status of EUT	Identical Prototype	
Operating Software	N/A	
Power Supply rating	5.0 Vdc (host equipment)	
Modulation Type	WLAN	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Operating Frequency	WLAN	2412 ~ 2472 MHz
Antenna Type	WLAN	Chip antenna
Accessory Device	N/A	
Data Cable Supplied	N/A	

Note:

1. This report is issued as a supplementary report to BV CPS report no.: RM150902C16. The difference compared with original report is updating standards to the latest version. Therefore, only Radiated Emission and RS tests were retested and recorded in this report.
2. The EUT provides 1 completed transmitter and 1 receiver.

Modulation Mode	TX Function
802.11b	1TX
802.11g	1TX
802.11n (HT20)	1TX
802.11n (HT40)	1TX

3. The above EUT information is declared by the manufacturer and for more detailed features 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

Mode	Test Condition
Radiated emission test	
-	WLAN Link + USB with Notebook (Charge)
RS test	
-	WLAN Link + USB with Notebook (Charge)

3.4 Test Program Used and Operation Descriptions

<Emission Tests>

a. The EUT was connected with Converting Board.
b. The Converting Board linked with Notebook via USB Cable.
c. The Notebook set H-patterns to Printer, and the Printer printed.
d. The WLAN function was turned on.
e. The EUT communicated data with the remote sited Notebook which acted as communication partner.

<Immunity Tests>

a. The EUT was connected with Converting Board.
b. The Converting Board linked with Notebook via USB Cable.
c. The WLAN function was turned on.

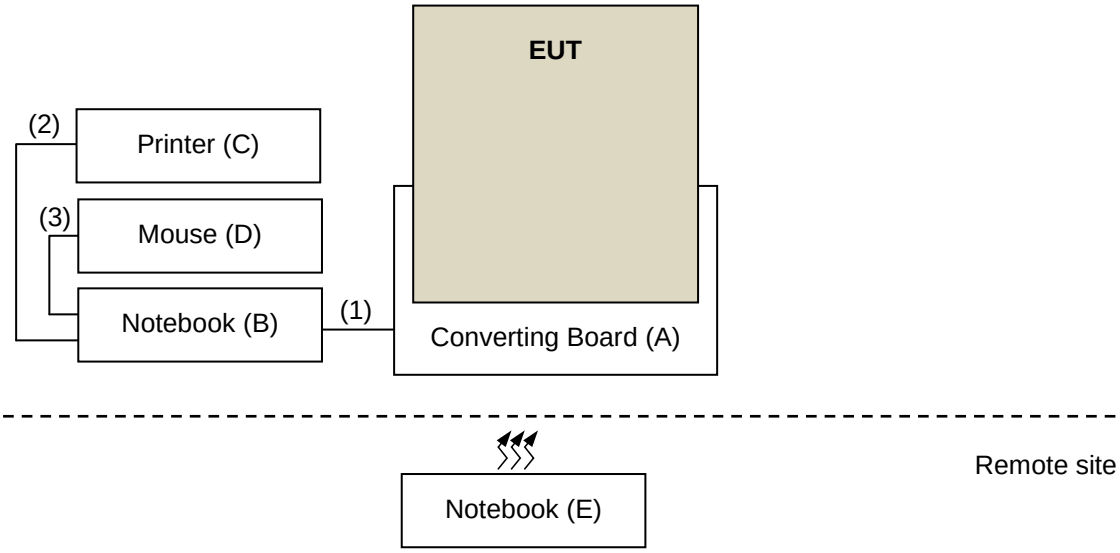
3.5 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 2400 MHz, provided by Seeed Technology Limited, for detailed internal source, please refer to the manufacturer's specifications.

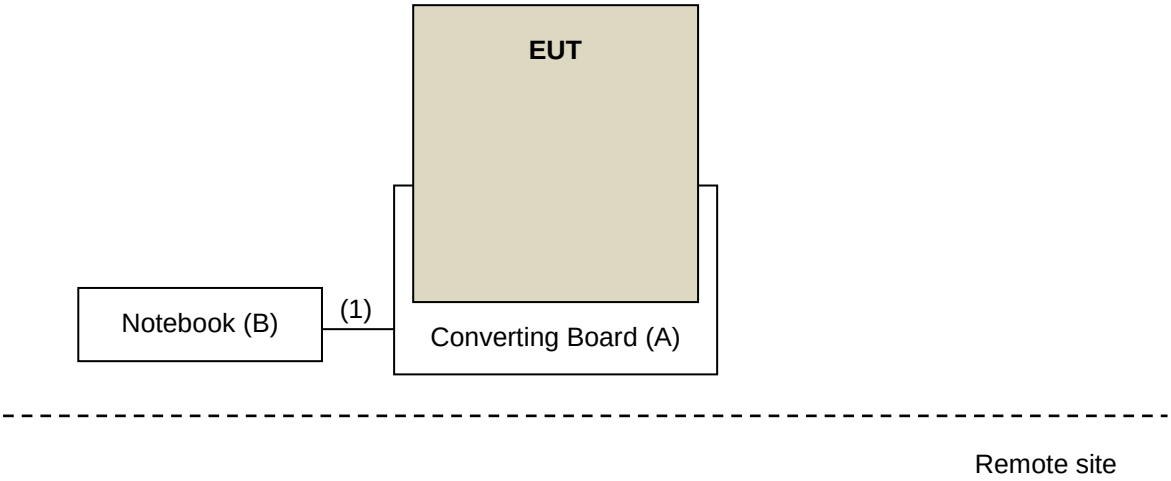
4 Configuration and Connections with EUT

4.1 Connection Diagram of EUT and Peripheral Devices

Emission tests:



Immunity tests:



4.2 Configuration of Peripheral Devices and Cable Connections

Emission tests:

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Converting Board	N/A	N/A	N/A	N/A	Provided by client
B.	Notebook	DELL	E6440	6QLNM32	N/A	--
C.	Printer	EPSON	T22	MEEZ070388	N/A	--
D.	Mouse	DELL	MS111-P	CN-011D3V-71581-1C J-093C	N/A	--
E.	Notebook	DELL	E6440	FMLNM32	N/A	--

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB Cable	1	1.2	Y	0	--
2.	USB Cable	1	1.8	Y	0	--
3.	USB Cable	1	1.8	Y	0	--

Immunity tests:

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Converting Board	N/A	N/A	N/A	N/A	Provided by client
B.	Notebook	DELL	N4050	G8S3RR1	PPD-AR5B195	--

Note:

1. 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.	USB Cable	1	0.9	Y	0	--

5 Radiated Disturbance up to 1 GHz

5.1 Limits

Frequency (MHz)	Class A (at 10 m)	Class B (at 10 m)
	dBuV/m	dBuV/m
30 - 230	40	30
230 - 1000	47	37

Notes:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

5.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ (V)	ESR	101240	Oct. 24, 2017	Oct. 23, 2018
Test Receiver ROHDE & SCHWARZ (H)	ESR	101264	Dec. 25, 2017	Dec. 24, 2018
BILOG Antenna SCHWARZBECK (V)	VULB9168	9168-160	Nov. 29, 2017	Nov. 28, 2018
BILOG Antenna SCHWARZBECK (H)	VULB9168	9168-156	Nov. 29, 2017	Nov. 28, 2018
Preamplifier Sonoma (V)	310N	352924	Jul. 12, 2018	Jul. 11, 2019
Preamplifier Sonoma (H)	310N	352923	Jul. 12, 2018	Jul. 11, 2019
RF signal cable (with 5dB PAD) Times (V)	LMR-600 (18M) +LMR-400 (7M)	CABLE-CH1 (VER) -01	Oct. 24, 2017	Oct. 23, 2018
RF signal cable (with 5dB PAD) Times (H)	LMR-600 (11.8M) +LMR-400 (7M)	CABLE-CH1 (HOR) -01	Oct. 24, 2017	Oct. 23, 2018
Software BV ADT	BV ADT_Radiated_ V8.7.08	NA	NA	NA
Antenna Tower (V)	MFA-440	9707	NA	NA
Antenna Tower (H)	MFA-440	970705	NA	NA
Turn Table	DS430	50303	NA	NA
Controller (V)	MF7802	074	NA	NA
Controller (H)	MF7802	08093	NA	NA

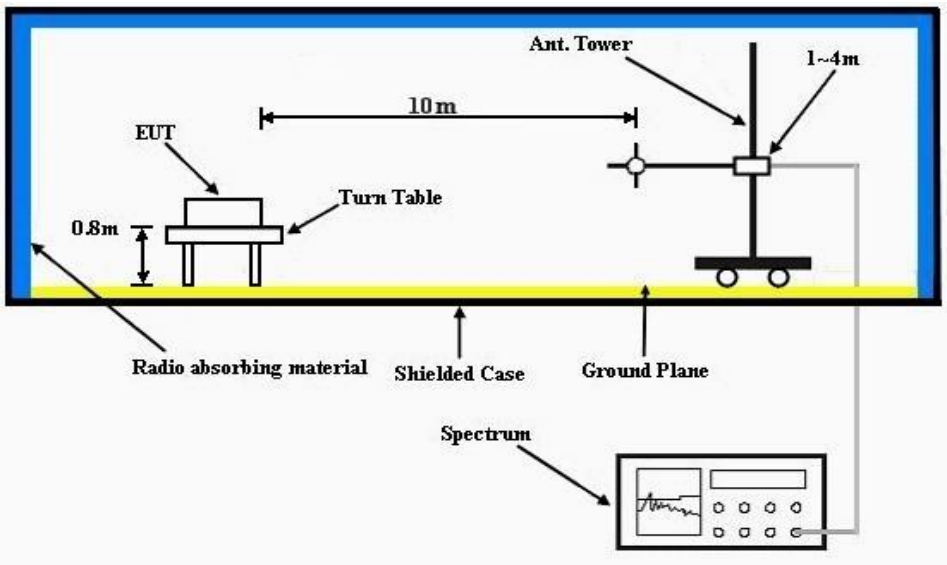
Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Chamber 1.
3. The IC Site Registration No. is IC 7450F-1.
4. The VCCI Site Registration No. is R-1893.

5.3 Test Arrangement

a. 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.
b. The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. 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.
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.

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



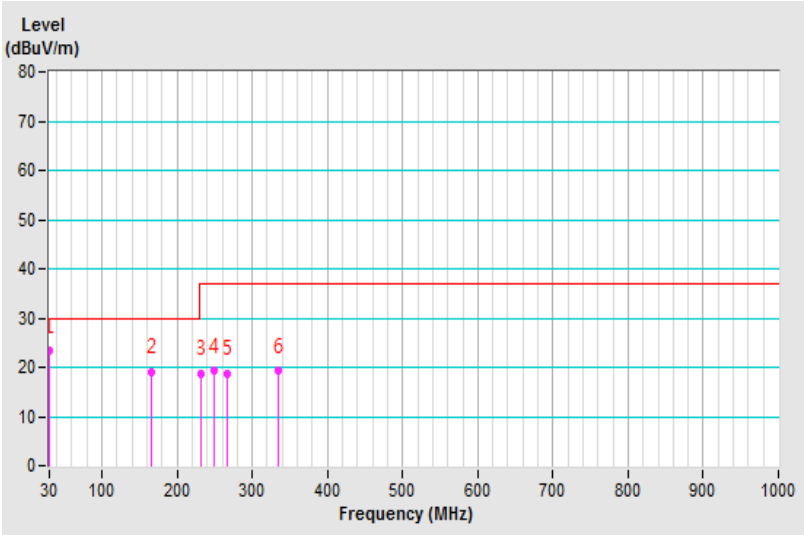
5.4 Test Results

Frequency Range	30MHz ~ 1GHz	Detector Function & Bandwidth	Quasi-Peak (QP), 120kHz
Tested by	Scott Yang	Environmental Conditions	25℃, 63%RH
Test Date	2018/7/12		

Antenna Polarity & Test Distance : Horizontal at 10 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	30.58	23.29 QP	30.00	-6.71	2.50 H	34	38.37	-15.08
2	166.10	18.92 QP	30.00	-11.08	4.00 H	238	32.26	-13.34
3	232.40	18.63 QP	37.00	-18.37	4.00 H	148	34.20	-15.57
4	249.96	19.22 QP	37.00	-17.78	3.50 H	52	33.27	-14.05
5	266.55	18.59 QP	37.00	-18.41	4.00 H	175	32.00	-13.41
6	334.45	19.23 QP	37.00	-17.77	4.00 H	284	30.60	-11.37

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

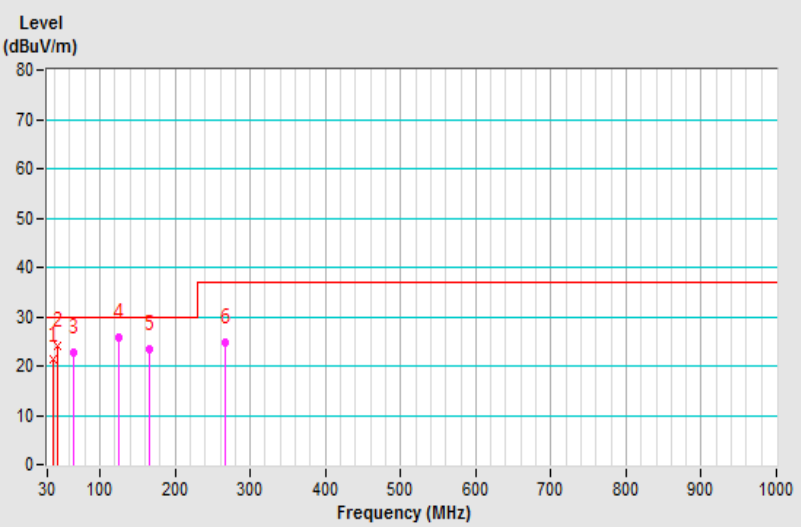


Frequency Range	30MHz ~ 1GHz	Detector Function & Bandwidth	Quasi-Peak (QP), 120kHz
Tested by	Scott Yang	Environmental Conditions	25℃, 63%RH
Test Date	2018/7/12		

Antenna Polarity & Test Distance : Vertical at 10 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	37.03	21.20 QP	30.00	-8.80	1.50 V	283	35.51	-14.31
2	43.83	24.19 QP	30.00	-5.81	2.00 V	328	37.70	-13.51
3	65.55	22.86 QP	30.00	-7.14	2.00 V	154	37.47	-14.61
4	**124.97**	**25.87 QP**	**30.00**	**-4.13**	**1.00 V**	**302**	**41.10**	**-15.23**
5	166.53	23.35 QP	30.00	-6.65	1.00 V	141	36.82	-13.47
6	266.93	24.89 QP	37.00	-12.11	1.00 V	312	38.14	-13.25

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 Disturbance above 1 GHz

6.1 Limits

Frequency (GHz)	Class A (dBuV/m) (at 3 m)		Class B (dBuV/m) (at 3 m)	
	Average	Peak	Average	Peak
1 to 3	56	76	50	70
3 to 6	60	80	54	74

Notes:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

Frequency Range of Radiated Measurement (For unintentional radiators)

Highest frequency generated or used in the EUT or on which the EUT operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 108	1000
108-500	2000
500-1000	5000
Above 1000	Up to 5 times of the highest frequency or 6 GHz, whichever is less

6.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ (Above 1GHz)	ESR7	101471	Mar. 01, 2018	Feb. 28, 2019
Spectrum Analyzer Agilent	E4446A	MY51100039	Sep. 05, 2017	Sep. 04, 2018
RF signal cable (with 5dB PAD) Times	LMR-400 (18M)	CABLE-CH2-01	Apr. 27, 2018	Apr. 26, 2019
HORN Antenna (with 4dB PAD) SCHWARZBECK	BBHA 9120 D	9120D-405	Dec. 01, 2017	Nov. 30, 2018
Preamplifier Agilent (Above 1GHz)	8449B	3008A01922	Sep. 15, 2017	Sep. 14, 2018
RF Coaxial Cable JUNFLON+EMC	JUNFLON+EMC104-SM-SM-6000	Cable-CH2-02(MWX322 1308G003+130710)	Jun. 11, 2018	Jun. 10, 2019
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
RF Coaxial Cable EMCI	EMC102-KM-KM-1000	170820	Aug. 29, 2017	Aug. 28, 2018
RF Coaxial Cable EMCI	EMC102-KM-KM-3000	170818	Aug. 29, 2017	Aug. 28, 2018
Fix tool for Boresight antenna	BAF-01	2	NA	NA

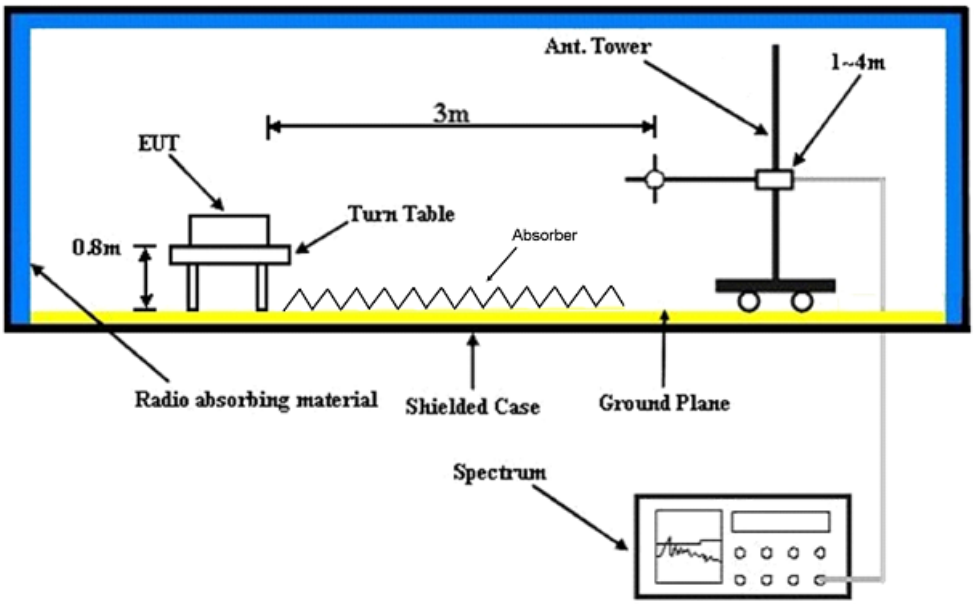
Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The 3 dB beamwidth of the horn antenna is minimum 30 degree (or w = 1.6 m at 3 m distance) for 1~6 GHz.
3. The test was performed in HwaYa Chamber 2.
4. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
5. The IC Site Registration No. is IC 7450F-2.
6. The VCCI Site Registration No. is G-10018.

6.3 Test Arrangement

a. 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.
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 can be varied from one meter to four meters, the height of adjustment depends on the EUT height and the antenna 3 dB 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.
d. 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.
e. 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:

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



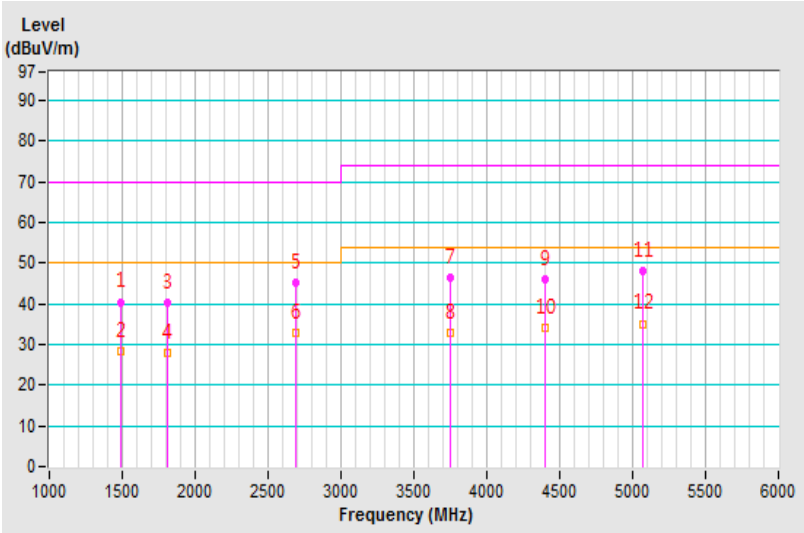
6.4 Test Results

Frequency Range	1GHz ~ 6GHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 1MHz
Tested by	Pon Tsai	Environmental Conditions	20℃, 60%RH
Test Date	2018/7/12		

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	1489.12	40.48 PK	70.00	-29.52	1.24 H	0	42.58	-2.10
2	1489.12	28.21 AV	50.00	-21.79	1.24 H	0	30.31	-2.10
3	1808.76	40.25 PK	70.00	-29.75	1.24 H	183	41.30	-1.05
4	1808.76	28.06 AV	50.00	-21.94	1.24 H	183	29.11	-1.05
5	2689.39	45.34 PK	70.00	-24.66	1.50 H	360	42.43	2.91
6	**2689.39**	**32.73 AV**	**50.00**	**-17.27**	**1.50 H**	**360**	**29.82**	**2.91**
7	3746.53	46.34 PK	74.00	-27.66	1.50 H	84	41.01	5.33
8	3746.53	32.72 AV	54.00	-21.28	1.50 H	84	27.39	5.33
9	4400.76	46.15 PK	74.00	-27.85	1.50 H	360	39.14	7.01
10	4400.76	34.06 AV	54.00	-19.94	1.50 H	360	27.05	7.01
11	5072.01	48.08 PK	74.00	-25.92	1.74 H	283	38.90	9.18
12	5072.01	35.13 AV	54.00	-18.87	1.74 H	283	25.95	9.18

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

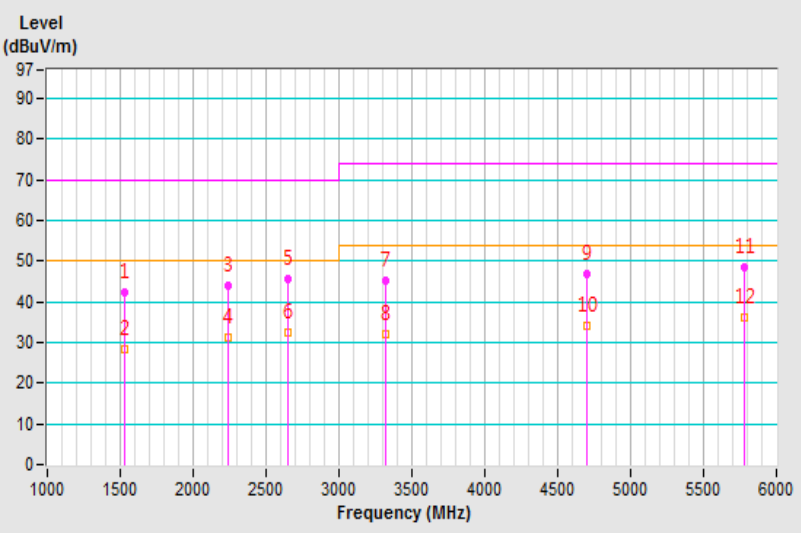


Frequency Range	1GHz ~ 6GHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 1MHz
Tested by	Pon Tsai	Environmental Conditions	20℃, 60%RH
Test Date	2018/7/12		

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	1527.22	42.24 PK	70.00	-27.76	1.74 V	10	44.26	-2.02
2	1527.22	28.19 AV	50.00	-21.81	1.74 V	10	30.21	-2.02
3	2237.00	43.93 PK	70.00	-26.07	1.00 V	356	41.76	2.17
4	2237.00	31.12 AV	50.00	-18.88	1.00 V	356	28.95	2.17
5	2647.54	45.46 PK	70.00	-24.54	1.74 V	286	42.92	2.54
6	2647.54	32.50 AV	50.00	-17.50	1.74 V	286	29.96	2.54
7	3315.88	45.05 PK	74.00	-28.95	1.00 V	344	41.45	3.60
8	3315.88	31.88 AV	54.00	-22.12	1.00 V	344	28.28	3.60
9	4703.26	46.96 PK	74.00	-27.04	1.24 V	360	39.04	7.92
10	4703.26	34.24 AV	54.00	-19.76	1.24 V	360	26.32	7.92
11	5778.57	48.33 PK	74.00	-25.67	1.00 V	265	37.70	10.63
12	5778.57	36.13 AV	54.00	-17.87	1.00 V	265	25.50	10.63

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 General Immunity requirements

EN 301 489-1 V2.1.1 (2017-02) / EN 301 489-17 V3.1.1 (2017-02), Immunity requirements			
Clause	Reference standard	Test specification	Performance Criterion
9.2	EN 61000-4-3 RS	Enclosure port: 80-6000 MHz, 3 V/m , 80 % AM (1 kHz) Spot frequencies 80, 104, 136, 165, 200, 260, 330, 430, 560, 715±1 MHz, 3V/m , 80 % AM (1 kHz) 920±1 MHz, 3 V/m, 100 % PM (200 Hz)	CT/CR

7.1 Performance Criteria

General Performance Criteria

- Performance criteria for continuous phenomena applied to transmitters and receivers (CT/CR)
  During and after the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer when the apparatus is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.
  During the test the EUT shall not unintentionally transmit or change its actual operating state and stored data.
  If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.
- Performance criteria for transient phenomena applied to transmitters and receivers (TT/TR)
  After the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer, when the apparatus is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.
  During the EMC exposure to an electromagnetic phenomenon, a degradation of performance is, however, allowed. No change of the actual mode of operation (e.g. unintended transmission) or stored data is allowed.
  If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.
- Performance criteria for equipment which does not provide a continuous communication link
  For radio equipment which does not provide a continuous communication link, the performance criteria described in CT/CR and TT/TR are not appropriate, then the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation of performance during and/or after the immunity tests.
  The performance criteria specified by the manufacturer shall give the same degree of immunity protection as called for in CT/CR and TT/TR.
- Performance criteria for ancillary equipment tested on a stand alone basis
  If ancillary equipment is intended to be tested on a stand alone basis, the performance criteria described in CT/CR and TT/TR are not appropriate, then the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation of performance during and/or after the immunity tests.
  The performance criteria specified by the manufacturer shall give the same degree of immunity protection as called for in CT/CR and TT/TR.

Product Specific Performance Criteria

The particular performance criteria which are specified in the relevant part of EN 301 489 series dealing with the particular type of radio equipment, take precedence over the corresponding parts of the general performance criteria.

Where particular performance criteria for specific functions are not given, then the general performance criteria shall apply.

EN 301 489-17, Broadband Data Transmission Systems

Special conditions for EN 301489-17 V3.1.1 (2017-02)		
Criteria	During test	After test
A	Shall operate as intended. May show degradation of performance (see note 1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 2). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
B	May show loss of function (one or more). May show degradation of performance (see note 1). No unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 2). Shall be no loss of stored data or user programmable functions.
C	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (see note 2).

Note 1: Degradation of performance during the test is understood as degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance.

If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

Note 2: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed.

If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

Note:

1. The WLAN linking mode is activated and monitoring communication status via notebook by ping command during and after tests.

8 Radiated, Radio-frequency, Electromagnetic Field Immunity Test (RS)

8.1 Test Specification

Basic Standard:	EN 61000-4-3
Frequency Range:	(1) 80 MHz ~ 6000 MHz, Spot Frequency (2) 920±1 MHz
Field Strength:	3 V/m
Modulation:	(1) 1 kHz Sine Wave, 80 %, AM Modulation (2) 200 kHz 100 % Pulse Modulation
Frequency Step:	1 % of preceding frequency value
Polarity of Antenna:	Horizontal and Vertical
Antenna Height:	1.55 m
Dwell Time:	3 seconds

8.2 Test Instruments

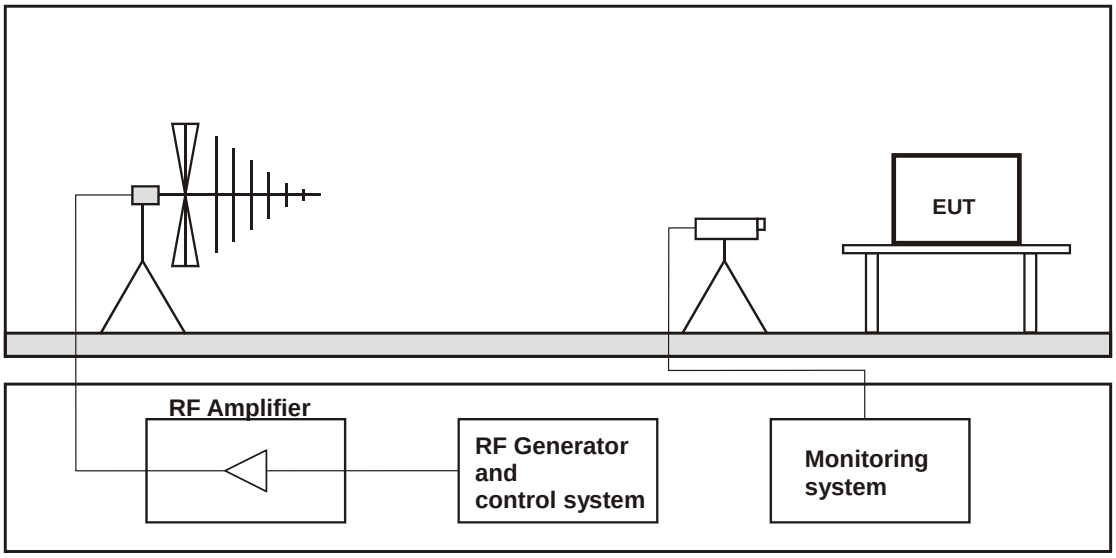
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
BONN Power Amp	BLMA 1060-100/50D	118694	NA	NA
BBA Power Amp	B250C125	101011	NA	NA
Power Sensor	NRP-Z91	101572	Feb. 07, 2018	Feb. 06, 2019
Power Sensor	NRP-Z91	101573	Jan. 25, 2018	Jan. 24, 2019
Signal Generator	SMB100A	105801	Jan. 22, 2018	Jan. 21, 2019
R&S Software	EMC32 Version 8.52.0	NA	NA	NA
Stacked Log-Per Antenna	STLP9149	9149-141	NA	NA
High GAIN LOG-Periodic Antenna	HL046E	100114	NA	NA

Notes: 1. The test was performed in Hwa Ya RS Room 2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The transmit antenna was located at a distance of 3 meters from the EUT.

8.3 Test Arrangement

The test procedure was in accordance with EN 61000-4-3

a. The testing was performed in a modified semi-anechoic chamber.
b. The frequency range is swept from 80 MHz to 6000 MHz, with the signal 80 % amplitude modulated with a 1 kHz sine wave.
c. The field strength level was 3 V/m.
d. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the two sides (The cellular phone is like a lamina. When the EUT was placed on the table, the all sides of cellular phone have almost the same separation distance away from field generation antenna. The right (90°) and left (270°) sides are under the same field strength while the EUT was tested at front (0°) and back (180°) side. Therefore, we have pre-tested all test modes at front (0°) side. According to the pretest result, only the worst mode was tested at front and back sides of cellular phone for RS testing).



8.4 Test Results

Input Power	230 Vac, 50 Hz	Tested by	Regan Wang
Environmental Conditions	23 °C, 59 % RH	Test Date	2018/07/16

Frequency (MHz)	Polarity	Azimuth(°)	Applied Field Strength		Observation	Remarks	Performance Criterion
			(V/m)	Modulation			
80 - 6000	V&H	0, 180	3	80 % AM (1 kHz)	Note 1	-	A

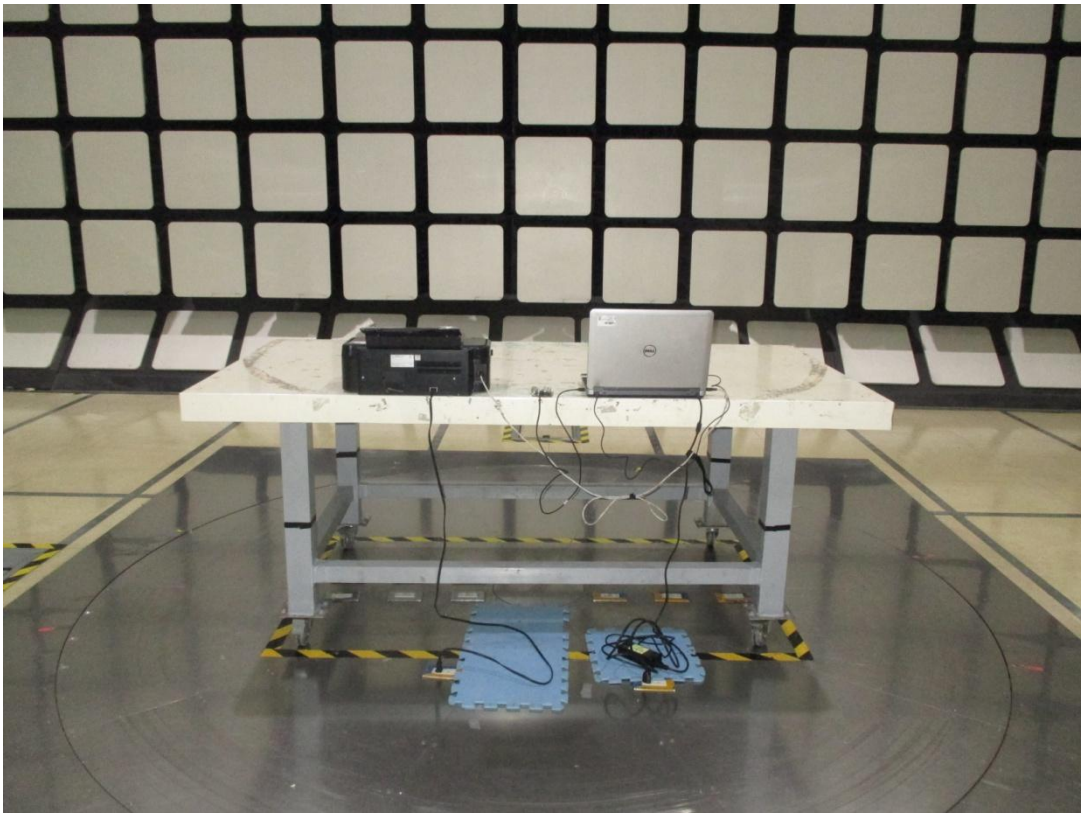
Note: 1. The EUT function was correct during the test.

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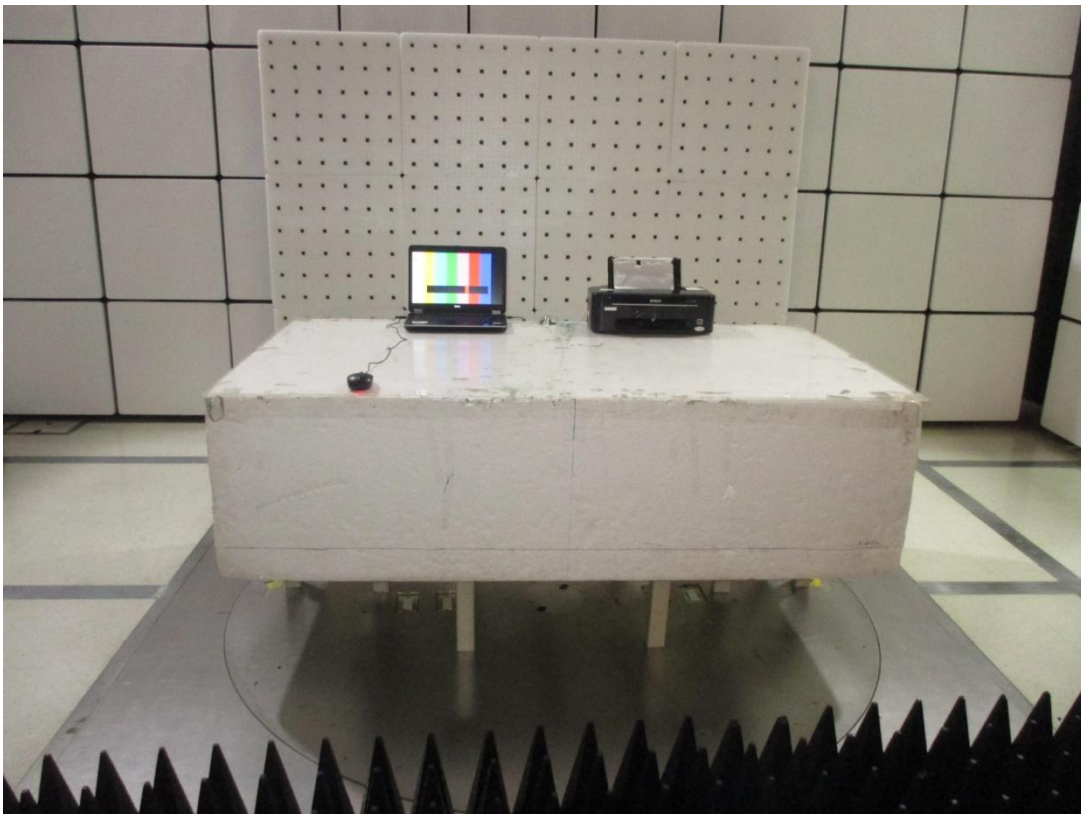
9 Pictures of Test Arrangements

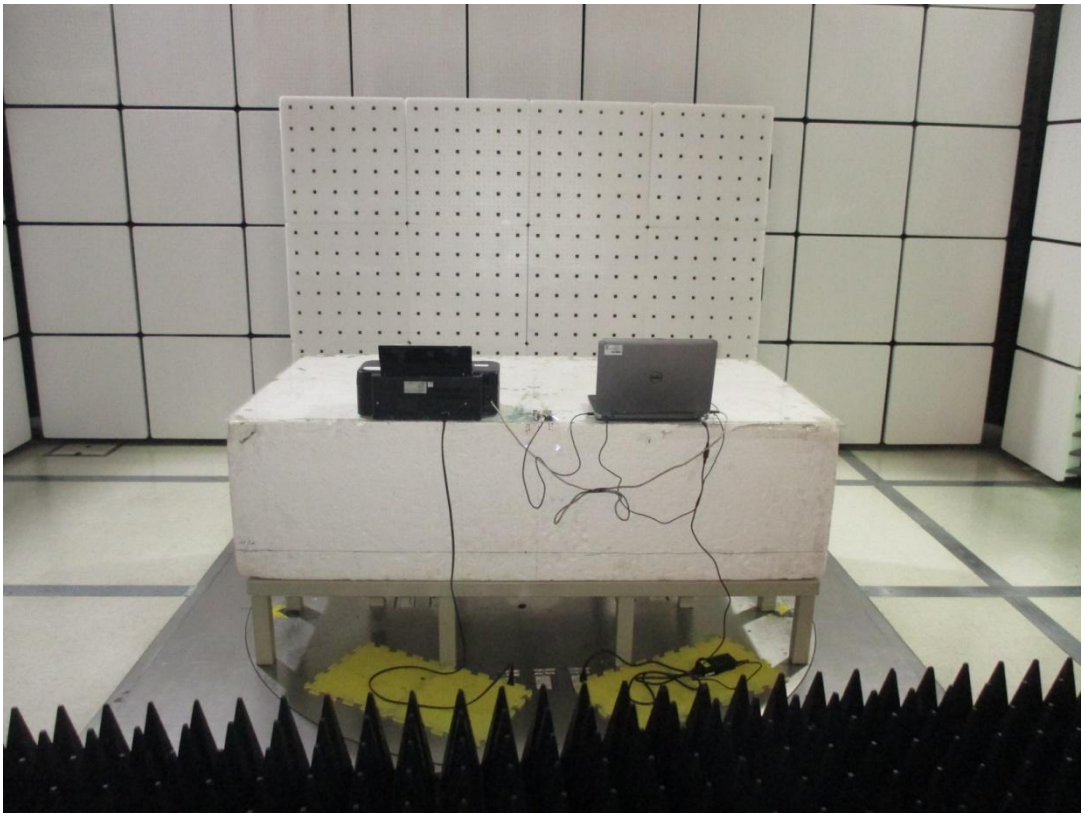
9.1 Radiated Disturbance up to 1 GHz





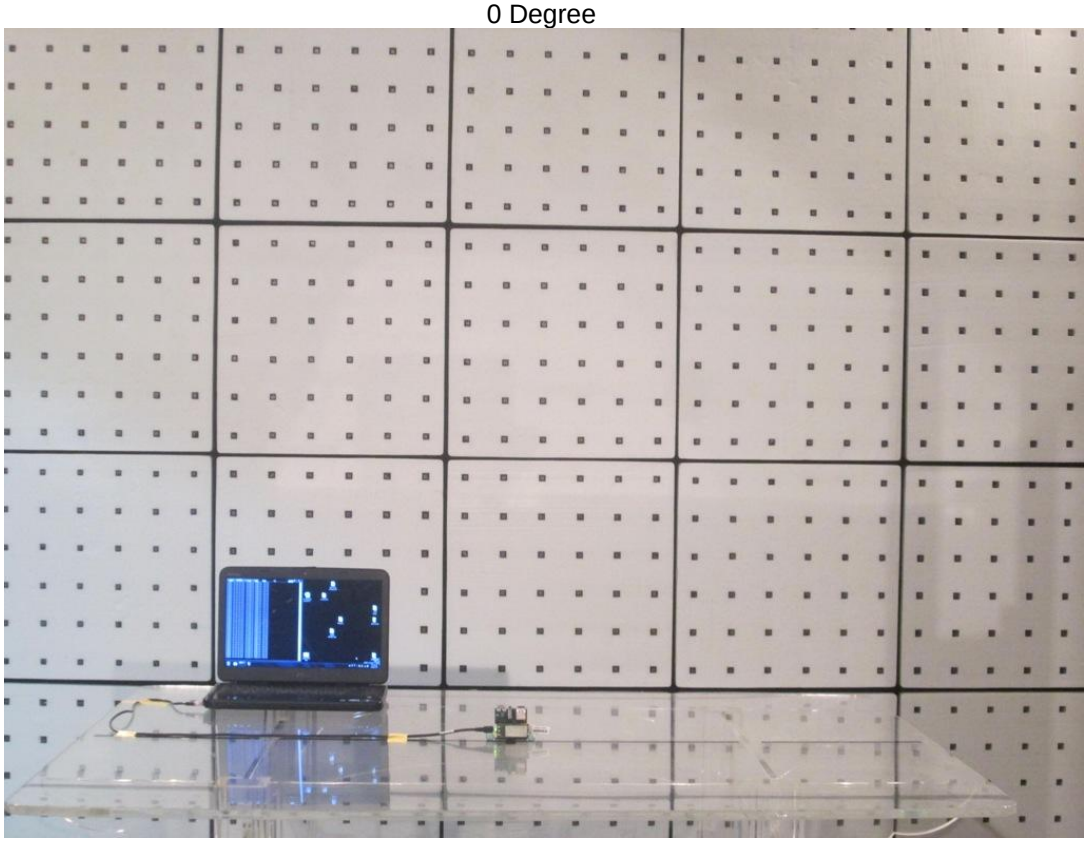
9.2 Radiated Disturbance above 1 GHz



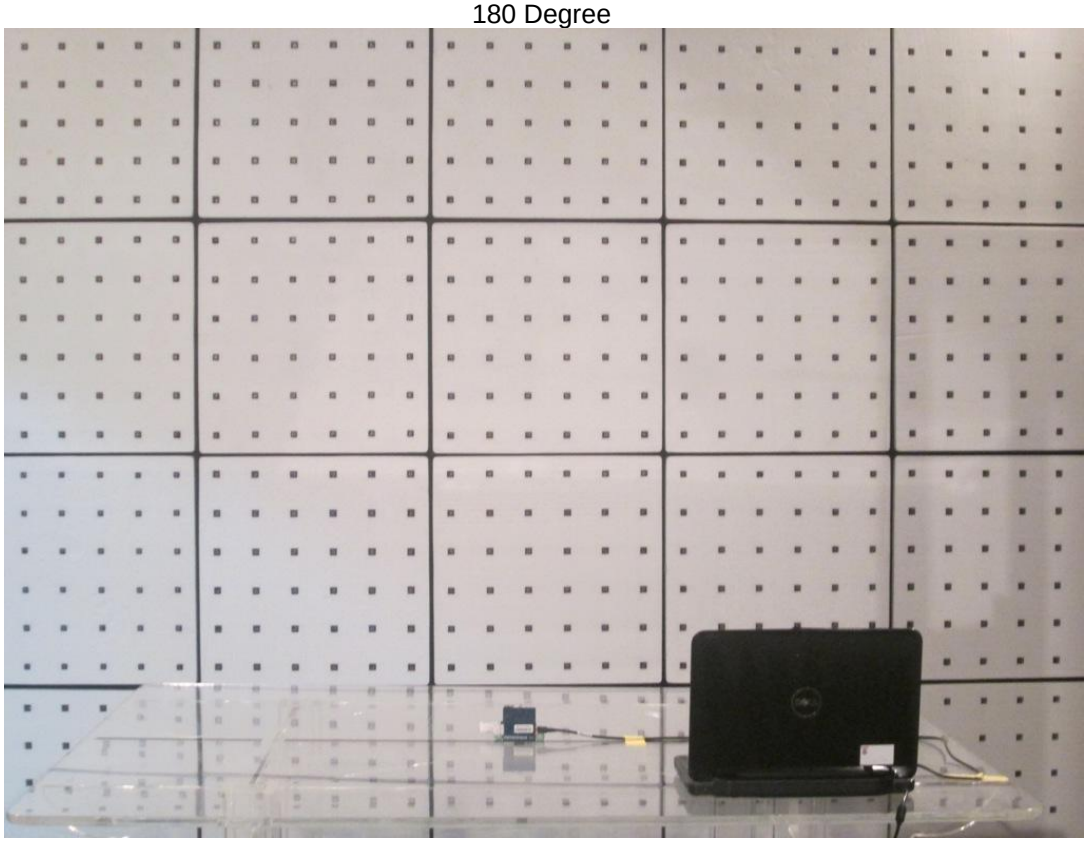


9.3 Radio-frequency, Electromagnetic Field Immunity Test (RS)

0 Degree



180 Degree



Appendix – Information on 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 accredited and approved according to ISO/IEC 17025.

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

Linko 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.

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