



FCC PART 15.247

TEST REPORT

For

Advanced Card Systems Limited

Units 4108 - 4110, 41st Floor, Manhattan Place, 23 Wang Tai Road, Kowloon Bay, Hong Kong

FCC ID: V5MACR1255

Report Type: Class II Permissive Change	Product Type: NFC Bluetooth Smart Card Reader
Report Number: <u>RSZ180605001-22B</u>	
Report Date: <u>2018-06-26</u>	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Advanced Card Systems Limited's* product, model number: *ACR1255 (FCC ID: V5MACR1255)* or the "EUT" in this report was a *NFC Bluetooth Smart Card Reader*, which was measured approximately: 8.5 cm (L) x 5.4 cm (W) x 1.1cm (H), rated with input voltage: DC 3.7 V battery.

**All measurement and test data in this report was gathered from production sample serial number: 180605001. (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2018-06-05.*

Objective

This report is prepared on behalf of *Advanced Card Systems Limited* in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

This is a CIIPC application of the device; the differences between the original device and the current one are as follows:

1. Change the NFC antenna.
2. Change the power unit.
3. Change the produce type.
4. Change the appearance silkscreen.
5. Change the company address to "Units 4108 - 4110, 41st Floor, Manhattan Place, 23 Wang Tai Road, Kowloon Bay, Hong Kong".
6. Remove the USB cable

For the change made to the device, the test item "AC Line Conducted Emissions" and "Spurious Emissions" were performed.

Related Submittal(s)/Grant(s)

FCC Part 15.225 DXX submissions with FCC ID: V5MACR1255.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

And KDB 558074 D01 DTS Meas Guidance v04 .

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF Output Power with Power meter		±0.5dB
RF conducted test with spectrum		±1.5dB
AC Power Lines Conducted Emissions		±1.95dB
Emissions, Radiated	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB
Temperature		±3°C
Humidity		±6%
Supply voltages		±0.4%

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

For BLE mode, 40 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	21	2444
2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2412	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

EUT was tested with Channel 0, 19 and 39.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

BLE test in the engineer mode.

The device was tested with the worst case was performed as below:

Mode	Data rate	Power level		
		Low channel	Middle channel	High channel
BLE	/	Default	Default	Default

Local Support Equipment

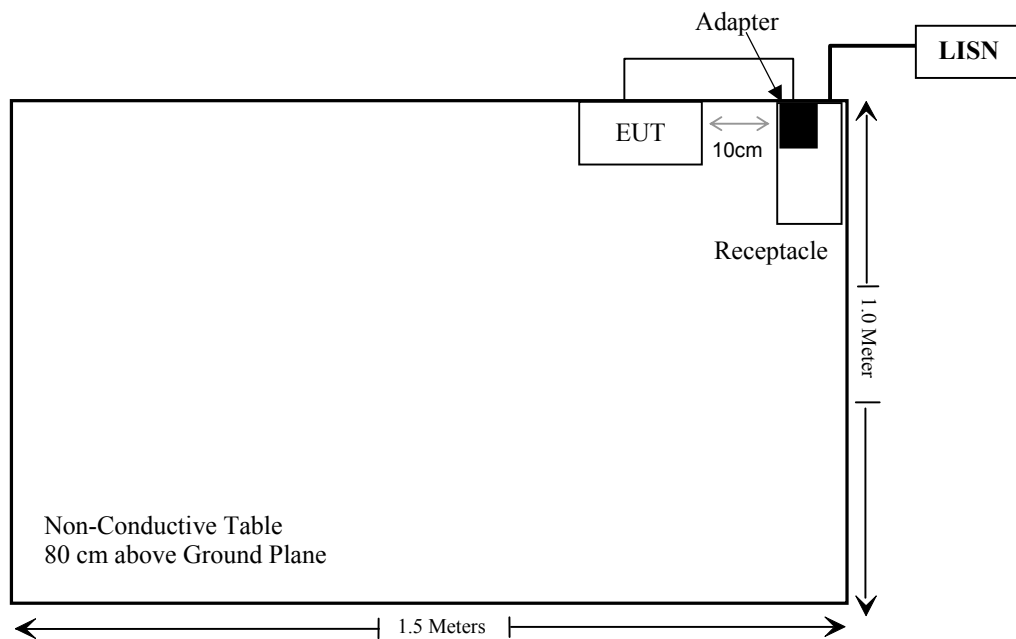
Manufacturer	Description	Model	Serial Number
Longway	Adapter	TYP60-1207000Z	LW516654

External I/O Cable

Cable Description	Length (m)	From/Port	To
Shielding Un-detachable USB cable	1.0	EUT	Adapter

Block Diagram of Test Setup

For conducted emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b) (1)& §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliance*
§15.247(b)(3)	Maximum Conducted Output Power	Compliance*
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance*
§15.247(e)	Power Spectral Density	Compliance*

Compliance*: Please referred to FCC ID: V5MACR1255 granted on 2015-06-29. Report No.: RSZ150511001-00A, which was tested by Mike Hu , Bay Area Compliance Laboratories Corp. (Shenzhen).

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2017-08-04	2018-08-04
Rohde & Schwarz	LISN	ENV216	3560.6650.12-101613-Yb	2017-12-21	2018-12-21
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2018-05-21	2018-11-19
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
N/A	Conducted Emission Cable	N/A	UF A210B-1-0720-504504	2018-05-12	2018-11-12
Radiated Emission Test					
A.H.System	Horn Antenna	SAS-200/571	135	2015-08-18	2018-08-17
Rohde & Schwarz	Signal Analyzer	FSEM	845987/005	2018-04-24	2019-04-24
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2018-05-21	2019-05-21
HP	Amplifier	HP8447E	1937A01046	2018-05-21	2018-11-19
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017-12-22	2020-12-21
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2018-01-11	2019-01-11
Ducommun technologies	RF Cable	UFA210A-1-4724-30050U	MFR64369223410-001	2018-05-21	2018-11-19
Ducommun technologies	RF Cable	104PEA	218124002	2018-05-21	2018-11-19
Ducommun technologies	RF Cable	RG-214	1	2018-05-21	2018-11-19
Ducommun technologies	RF Cable	RG-214	2	2018-05-22	2018-11-22
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-04	2017-12-29	2020-12-28
Ducommun Technologies	Pre-amplifier	ALN-22093530-01	991373-01	2017-08-03	2018-08-03
Sinoscite	Notch Filter	BSF2402-2480MN-0898-001	N/A	2018-05-21	2019-05-21
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC§15.247 (i), §1.1307 (b) (1) & §2.1093 – RF EXPOSURE**Applicable Standard**

According to FCC §2.1093 and §1.1307(b) (1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 General RF Exposure Guidance

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

1. $f(\text{GHz})$ is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

The Max Peak Output Power: $-0.26\text{dBm}=0.94\text{mW}$
 $(0.94/5) \cdot \sqrt{2.402}=0.29 < 3.0$

Result: No SAR test is required

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
 - b. Antenna must use a unique type of connector to attach to the EUT.
- Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has a PCB antenna arrangement for BT, which was permanently attached and the gain was 0.5 dBi, fulfill the requirement of this section. Please refer to the internal photos.

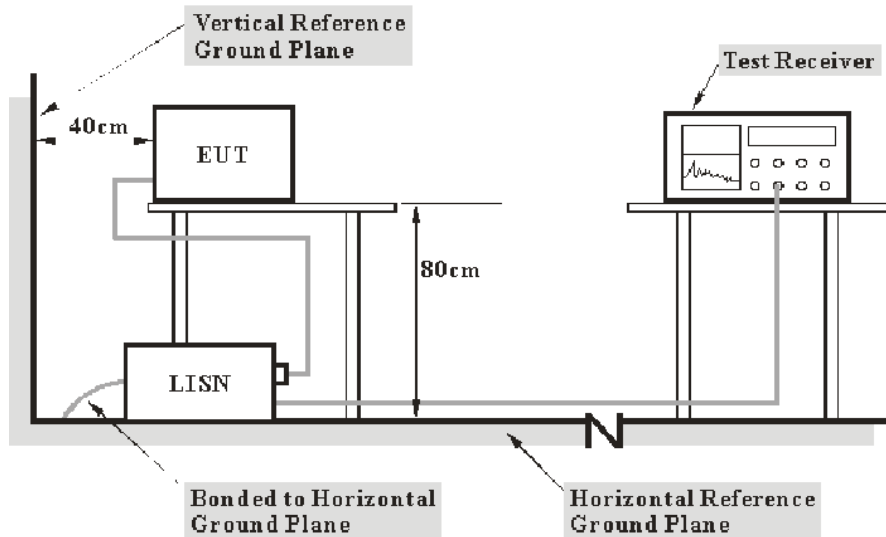
Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

EUT Setup



- Note: 1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Transient Limiter Attenuation}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207,

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(L_m)} \leq L_{\text{lim}} + U_{\text{cispr}}$$

In BACL, $U_{(L_m)}$ is less than U_{cispr} , if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

Test Data

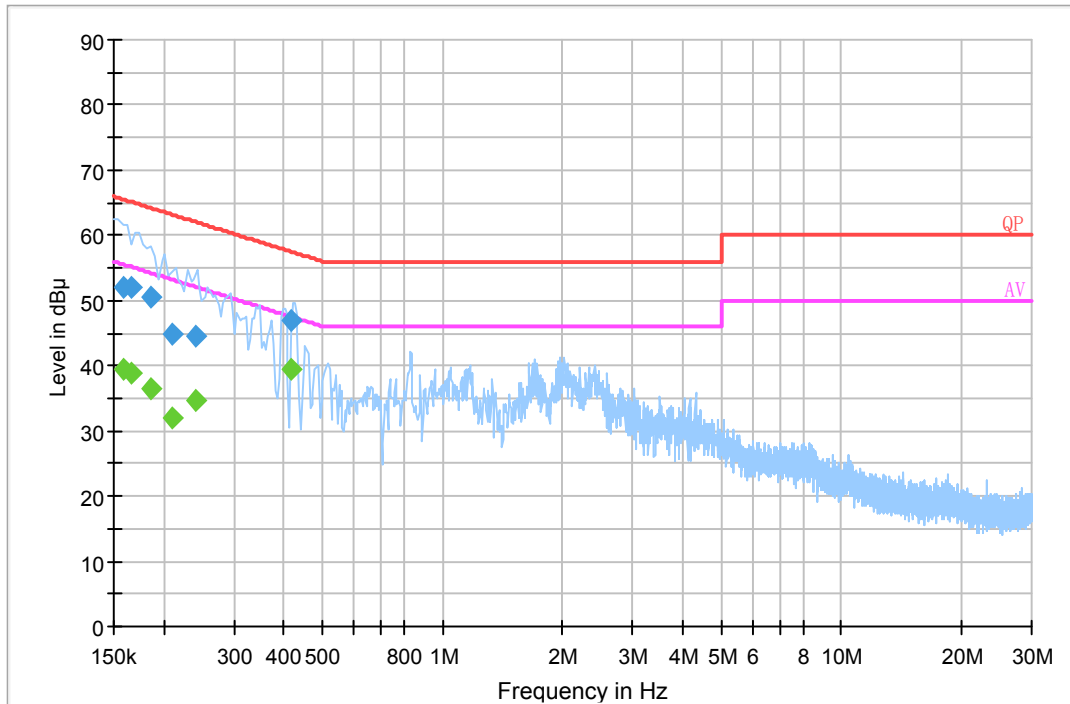
Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Bibo Zhang on 2018-06-22.

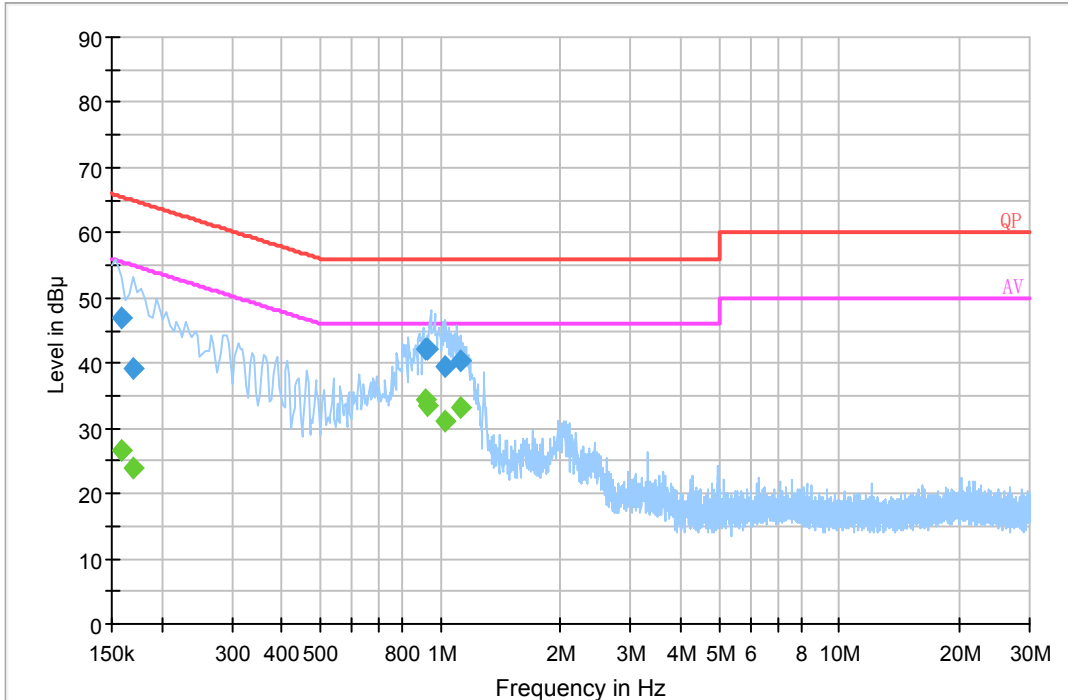
EUT operation mode: Transmitting

AC 120V/60 Hz, Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.158500	52.0	20.1	65.5	13.5	QP
0.165500	52.0	20.1	65.2	13.2	QP
0.185500	50.6	20.1	64.2	13.6	QP
0.209500	44.8	20.1	63.2	18.4	QP
0.241500	44.4	20.1	62.0	17.6	QP
0.419610	46.9	20.1	57.5	10.6	QP
0.158500	39.4	20.1	55.5	16.1	Ave.
0.165500	39.0	20.1	55.2	16.2	Ave.
0.185500	36.4	20.1	54.2	17.8	Ave.
0.209500	32.1	20.1	53.2	21.1	Ave.
0.241500	34.6	20.1	52.0	17.4	Ave.
0.419610	39.6	20.1	47.5	7.9	Ave.

AC 120V/60 Hz, Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.158000	47.0	20.1	65.6	18.6	QP
0.169500	39.2	20.1	65.0	25.8	QP
0.919590	42.2	20.0	56.0	13.8	QP
0.931810	42.1	20.0	56.0	13.9	QP
1.030550	39.5	20.0	56.0	16.5	QP
1.125110	40.4	20.0	56.0	15.6	QP
0.158000	26.6	20.1	55.6	29.0	Ave.
0.169500	24.0	20.1	55.0	30.9	Ave.
0.919590	34.4	20.0	46.0	11.6	Ave.
0.931810	33.5	20.0	46.0	12.5	Ave.
1.030550	31.1	20.0	46.0	14.9	Ave.
1.125110	33.2	20.0	46.0	12.8	Ave.

Note:

- 1) Correction Factor = LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit - Corrected Amplitude

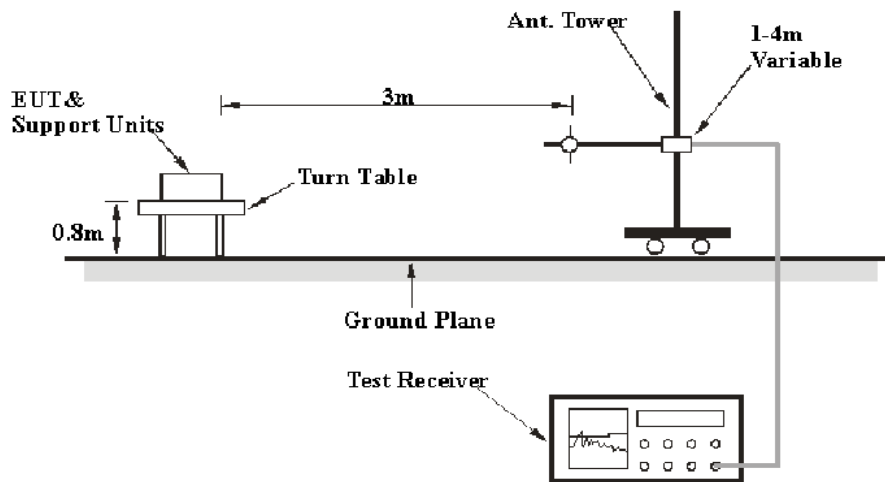
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

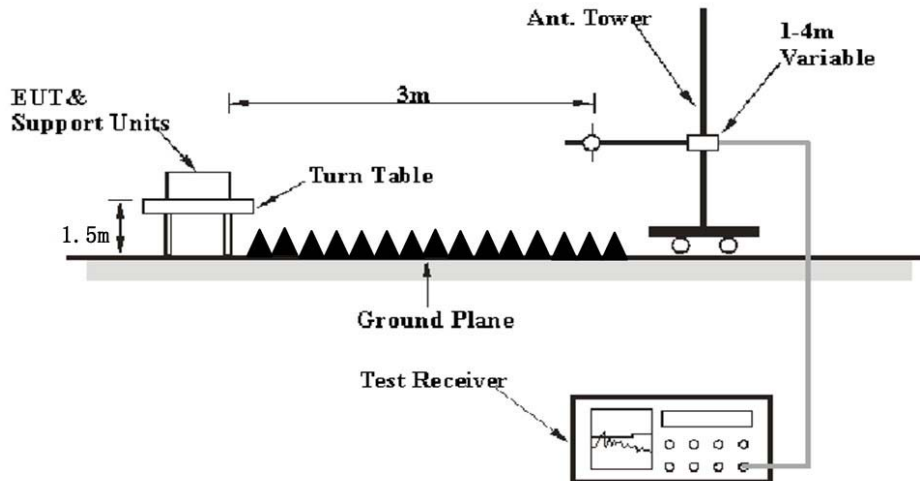
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz ^{Note 1}	/	Average
	1MHz	> 1/T ^{Note 2}	/	Average

Note 1: when duty cycle is no less than 98%

Note 2: when duty cycle is less than 98%

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247.

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(L_m)} \leq L_{\text{lim}} + U_{\text{cispr}}$$

In BACL, $U_{(L_m)}$ is less than U_{cispr} , if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

Test Data

Environmental Conditions

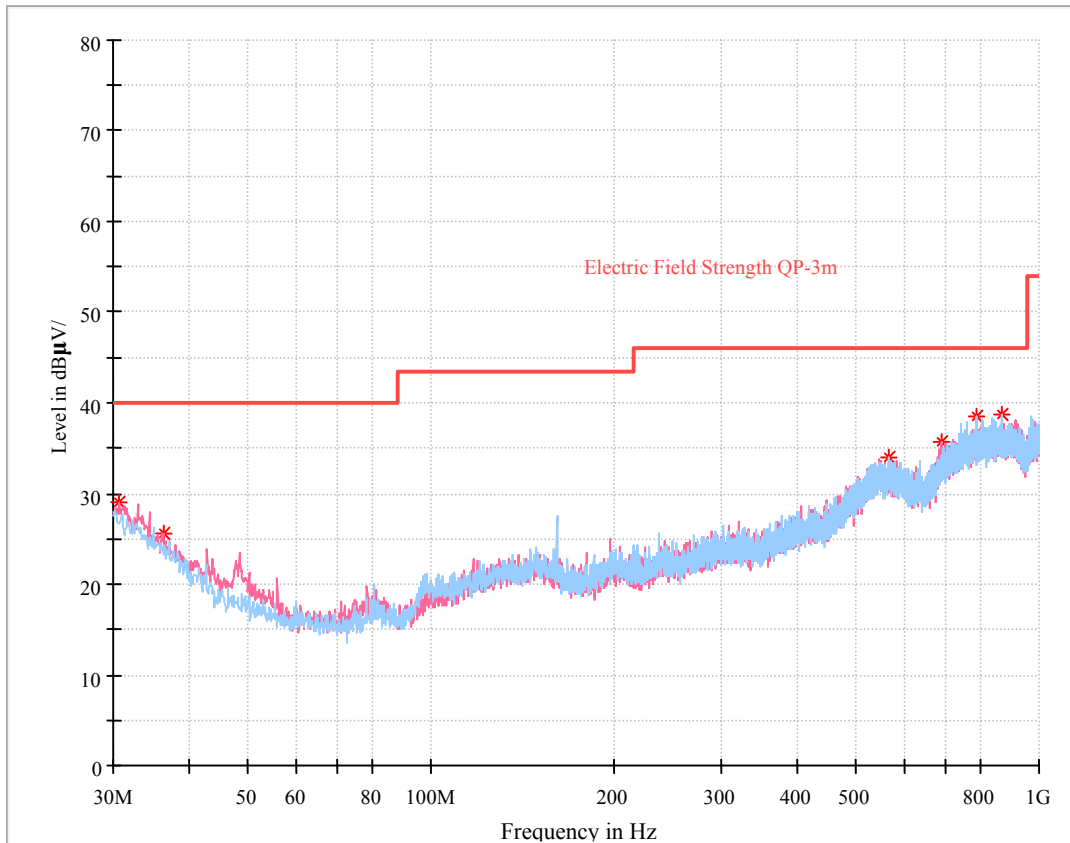
Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Bibo Zhang on 2018-06-19.

EUT operation mode: Transmitting

BLE Mode:

30 MHz~1 GHz:



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
30.727500	28.96	202.0	V	0.0	0.2	40.00	11.04
36.305000	25.59	202.0	V	90.0	-3.4	40.00	14.41
568.350000	33.97	102.0	H	174.0	5.1	46.00	12.03
692.510000	35.72	102.0	V	0.0	6.5	46.00	10.28
788.176250	38.44	202.0	H	204.0	9.0	46.00	7.56
867.958750	38.70	102.0	H	228.0	9.8	46.00	7.30

1 GHz-25 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	PK/QP/Ave.		Height (m)	Polar (H/V)				
Low Channel (2402 MHz)									
2402.00	61.39	PK	308	1.4	H	33.92	95.31	/	/
2402.00	60.33	Ave.	308	1.4	H	33.92	94.25	/	/
2402.00	61.86	PK	319	1.7	V	33.92	95.78	/	/
2402.00	60.87	Ave.	319	1.7	V	33.92	94.79	/	/
2373.60	27.90	PK	140	1.2	V	33.92	61.82	74	12.18
2373.60	13.28	Ave.	140	1.2	V	33.92	47.20	54	6.80
2489.60	27.51	PK	231	1.8	V	34.08	61.59	74	12.41
2489.60	13.36	Ave.	231	1.8	V	34.08	47.44	54	6.56
4804.00	43.79	PK	224	1.5	V	5.84	49.63	74	24.37
4804.00	31.44	Ave.	224	1.5	V	5.84	37.28	54	16.72
Middle Channel (2440 MHz)									
2440.00	61.28	PK	219	1.6	H	33.92	95.20	/	/
2440.00	60.17	Ave.	219	1.6	H	33.92	94.09	/	/
2440.00	61.69	PK	114	2.1	V	33.92	95.61	/	/
2440.00	60.61	Ave.	114	2.1	V	33.92	94.53	/	/
4880.00	43.42	PK	16	2.4	v	6.21	49.63	74	24.37
4880.00	31.38	Ave.	16	2.4	v	6.21	37.59	54	16.41
High Channel (2480 MHz)									
2480.00	58.69	PK	358	2.0	H	34.08	92.77	/	/
2480.00	57.56	Ave.	358	2.0	H	34.08	91.64	/	/
2480.00	60.19	PK	296	2.0	V	34.08	94.27	/	/
2480.00	59.04	Ave.	296	2.0	V	34.08	93.12	/	/
2341.10	26.48	PK	185	1.9	v	33.83	60.31	74	13.69
2341.10	13.21	Ave.	185	1.9	V	33.83	47.04	54	6.96
2483.50	27.97	PK	238	1.9	V	34.08	62.05	74	11.95
2483.50	15.08	Ave.	238	1.9	V	34.08	49.16	54	4.84
4960.00	44.34	PK	250	2.2	V	7.82	52.16	74	21.84
4960.00	35.98	Ave.	99	1.3	V	7.82	43.80	54	10.20

Note:

Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

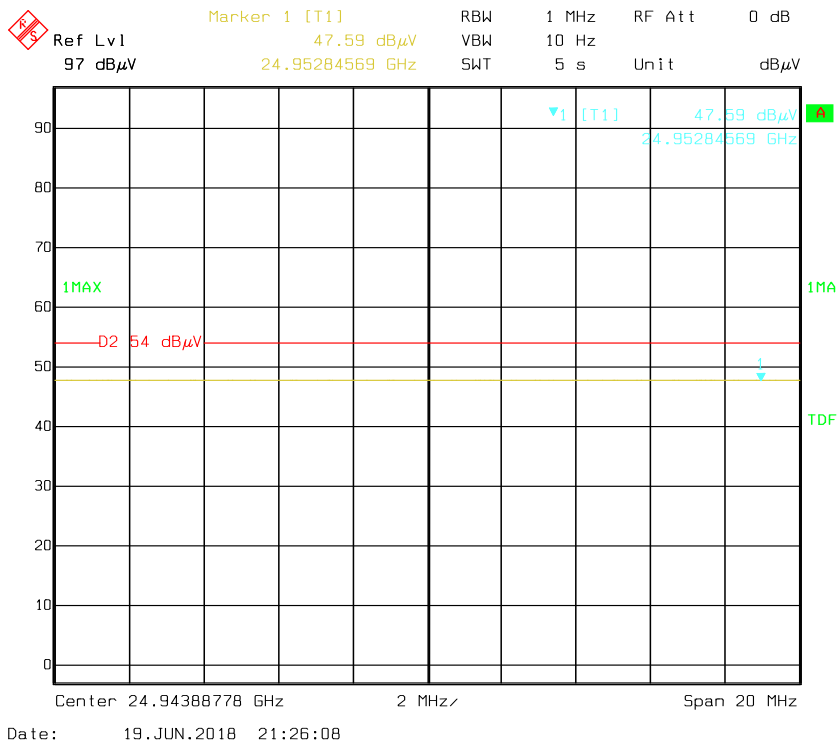
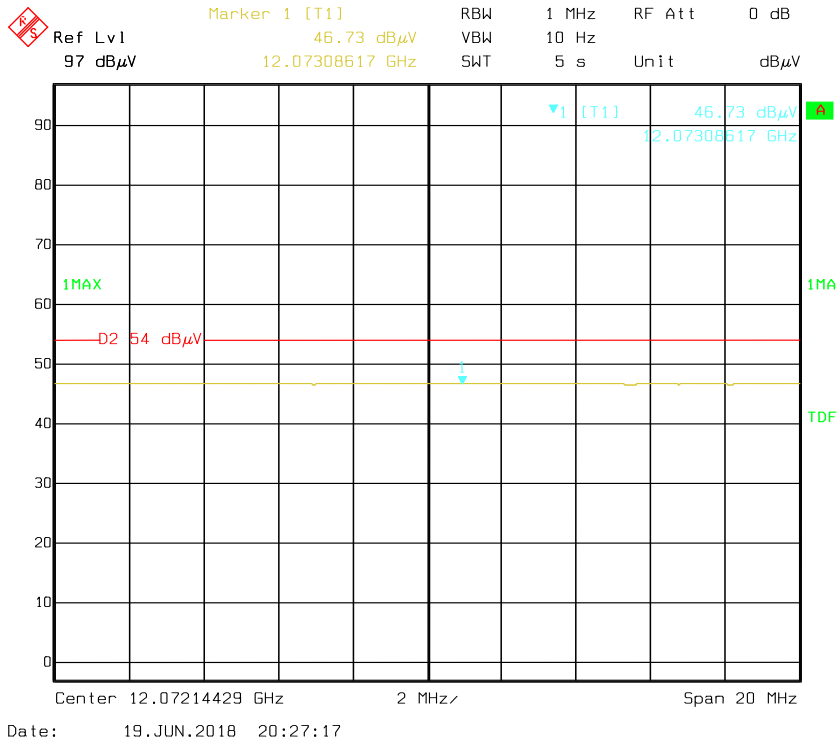
Corrected Amplitude = Corrected Factor + Reading

Margin = Limit - Corrected. Amplitude

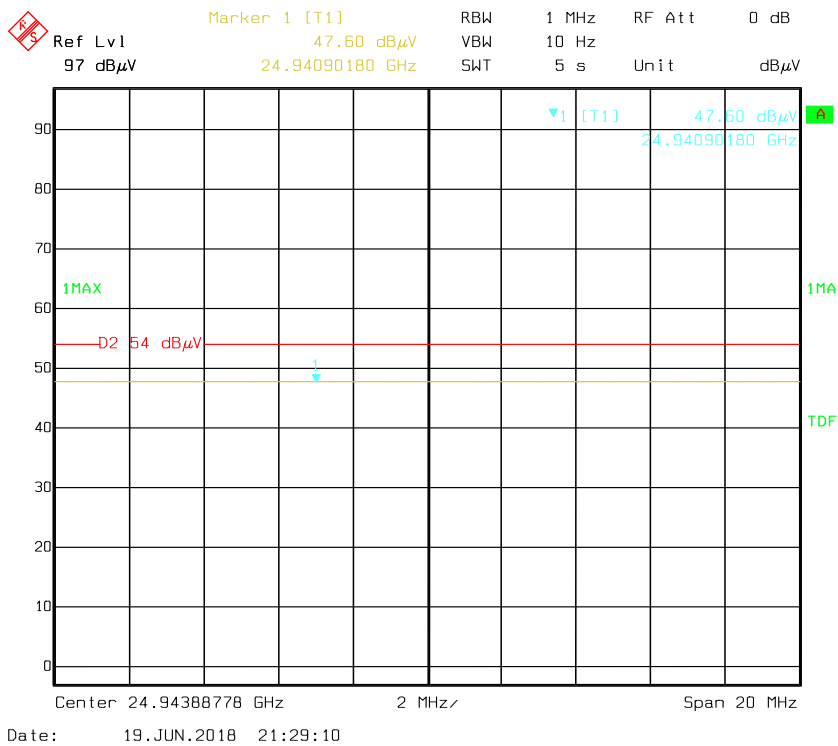
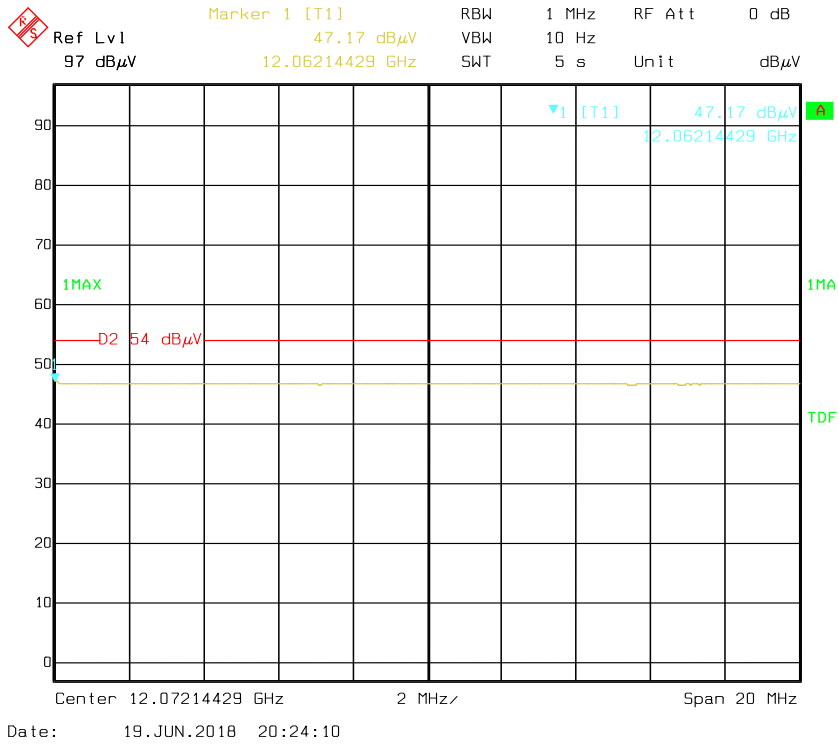
The other spurious emission which is 20dB to the limit was not recorded.

And for the pre-scan is performed with the 2400-2483.5MHz band filter.

Pre-scan for Average Horizontal



Vertical



******* END OF REPORT *******