FCC RF TEST REPORT

47 CFR FCC Part 15 Subpart C § 15.249

Equipment	**: Smart Phone**
BRAND NAME	**: NOKIA**
MODEL NAME	**: TA-1053**
FCC ID	**: 2AJOTTA-1053**

We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.
The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager

Testing Laboratory
1190

SPORTON INTERNATIONAL INC.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR712016-02D	Rev. 01	Initial issue of report	Apr. 06, 2017

1. SUMMARY OF THE TEST RESULT

Applied Standard:				
Part	**FCC Rule**	**Description of Test**	**Result**	**Under Limit**
3.1	15.207	AC Power Line Conducted Emissions	Complies	Under limit 13.80 dB at 13.558 MHz
3.2	15.249(a)(d)	Radiated Spurious Emissions	Complies	10.34 dB at 2400.000MHz
3.3	15.203	Antenna Requirements	Complies	-

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.7**

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.6**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.9**

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 25000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.2**

2. GENERAL INFORMATION

2.1 Applicant

HMD Global Oy

Karaportti 2, 02610 Espoo, Finland

2.2 Manufacturer

HMD Global Oy

Karaportti 2, 02610 Espoo, Finland

2.3 Product Feature of Equipment Under Test

GSM/WCDMA/LTE, Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n, Wi-Fi 5GHz 802.11a/n, ANT+, FM Receiver, NFC, and GPS.

Product Specification subjective to this standard	
Antenna Type	WWAN: PIFA Antenna WLAN: PIFA Antenna Bluetooth: PIFA Antenna ANT+: PIFA Antenna GPS/Glonass/Beidou : Monopole Antenna NFC : Loop Antenna

2.4 Re-use of Measured Data

2.4.1 Introduction Section

The original model (FCC ID: 2AJOTTA-1044) and the variant model (FCC ID: 2AJOTTA-1053) has identical PCB layout, antenna, SW implementation for Bluetooth/Wi-Fi/GPS. Based on their similarity, the FCC Part 15C & 15E(equipment class: DTS, DSS,DXX, NII) test data issued for original model also apply for the variant model.

The applicant takes full responsibility that the test data as referenced in section 4 below represent compliance for this FCC ID (FCC ID: 2AJOTTA-1053).

2.4.2 Difference Section

The original model (FCC ID: 2AJOTTA-1044) and the variant model (FCC ID: 2AJOTTA-1053) has identical PCB layout, antenna, SW implementation for Bluetooth/Wi-Fi/GPS. The details of similarity and difference can be found in the Operating Description.

The product specification is outlined in the following table:

FCC ID			2AJOTTA-1044	2AJOTTA-1053
Wireless Tech	**Mode**		**Frequency (MHz)**	
GSM	GSM Voice GPRS (GMSK) EDGE (8PSK)	Multi-Slot Class 11 DTM: Yes	850/1900	850/1900
UMTS	AMR/RCM12.2Kbps HSDPA/HSUPA/DC-HSDPA		B2/B4/B5	B2/B5
LTE	QPSK/16QAM VoLTE		B2/B4/B7/B12/B17/B38	B5/B7/B38
Wi-Fi	11b/11g/11n(HT20)		2412-2462 MHz/	
	11a/11n(HT20)/11n(HT40)		5180-5240 MHz 5260-5320 MHz 5500-5700 MHz 5745-5825 MHz	
Bluetooth	BR/EDR/LE		2402-2480 MHz	
ANT+	ANT+		2402-2480 MHz	

2.4.3 Spot Check Verification Data Section

Summary of the spot check:

Test Item	Mode	2AJOTTA-1044 Worst Result	2AJOTTA-1053 Worst Result	Difference (dB)
Average Conducted Power (dBm)	802.11b	13.99	13.89	0.10
	802.11g	11.64	11.65	0.01
	11n HT20	10.90	10.92	-0.02
	20MHz BW 5150-5250MHz	14.42	14.48	-0.06
	20MHz BW 5250-5350MHz	14.41	14.47	-0.06
	20MHz BW 5470-5725MHz	14.37	14.34	0.03
	20MHz BW 5725-5850MHz	14.43	14.40	0.03
	40MHz BW 5150-5250MHz	14.23	14.19	0.04
	40MHz BW 5250-5350MHz	14.21	14.26	-0.05
	40MHz BW 5470-5725MHz	14.17	14.04	0.13
	40MHz BW 5725-5850MHz	14.34	14.40	-0.06
	BT (1Mbps)	7.53	7.62	-0.09
	BT (2Mbps)	5.23	5.17	0.06
	BT (3Mbps)	5.20	5.13	0.07
	BT-LE	0.63	0.72	-0.09
	ANT+	0.47	0.48	-0.01
	Test date	2017/02/11 – 2017/02/24	2017/03/14 – 2017/03/14	
Peak Radiated Spurious Emission (Band Edge) (dBuV/m)	802.11b	54.48	54.95	-0.47
	11n HT20	56.36	57.04	-0.68
	BT (1Mbps)	44.35	43.75	0.60
	BT-LE	55.17	54.61	0.56
	ANT+	65.94	63.66	2.28
	Test date	2017/02/11 – 2017/02/24	2017/03/03 – 2017/03/11	
Average Radiated Spurious Emission (Band Edge) (dBuV/m)	802.11b	45.51	44.25	1.26
	11n HT20	45.77	46.96	-1.19
	BT (1Mbps)	19.59	18.99	0.60
	BT-LE	45.28	45.24	0.04
	ANT+	38.85	38.59	0.26
	Test date	2017/02/11 – 2017/02/24	2017/03/03 – 2017/03/11	
Peak Radiated Spurious Emission (Harmonic) (dBuV/m)	802.11b	45.27	46.25	-0.98
	11n HT20	41.37	43.54	-2.17
	BT (1Mbps)	40.93	41.49	-0.56
	BT-LE	40.63	42.23	-1.60
	ANT+	37.66	39.64	-1.98
	Test date	2017/02/11 – 2017/02/24	2017/03/03 – 2017/03/11	

Conclusion:

WLAN Radiated spurious emission test against the variant model for non-cellular part based on the worst-case condition from the original model was performed in this filing to demonstrate the test data from original model remains representative for the variant model.

Based on the spot check test result (power levels measured are within 0.5dB, and the worst case of RSE spot check verification based on the worst condition from the original model is within 3dB, and are compliance with the limits), the test data from the original model is representative for the variant model.

The unwanted, harmonics, radiated spurious emission is reported peak measurement only due to spurious lower than 20dB than the limit.

2.4.4 Reference detail Section

Equipment Class	Reference FCC ID	Type Grant/Permissive Change	Reference Application	Folder Test/RF Exposure	Report Title
DTS	2AJOTTA-1044	Original Grant	FR712016B	Part 15C	All sections applicable
			FR712016C	Part 15C	All sections applicable
			FA712016	RF Exposure	All sections applicable
DSS	2AJOTTA-1044	Original Grant	FR712016A	Part 15C	All sections applicable
			FA712016	RF Exposure	All sections applicable
DXX	2AJOTTA-1044	Original Grant	FR712016D	Part 15C	All sections applicable
			FA712016	RF Exposure	All sections applicable
NII	2AJOTTA-1044	Original Grant	FR712016F FR712016G FZ712016	Part 15E	Conducted sections applicable
			FA712016	RF Exposure	All sections applicable

2.5 Modification of EUT

No modifications are made to the EUT during all test items.

2.6 Table for Test Modes

Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode
AC Power Line Conducted Emissions	CTX
Bandwidth	CTX
Radiated Emissions	CTX

Note:

1. CTX=continuously transmitting.
2. The programmed RF utility, “QRCT Tool” installed in the notebook to make the EUT get into the engineering modes to continuously transmit.

2.7 Table for Testing Locations

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	**Sporton Site No.**	
	TH05-HY	CO05-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

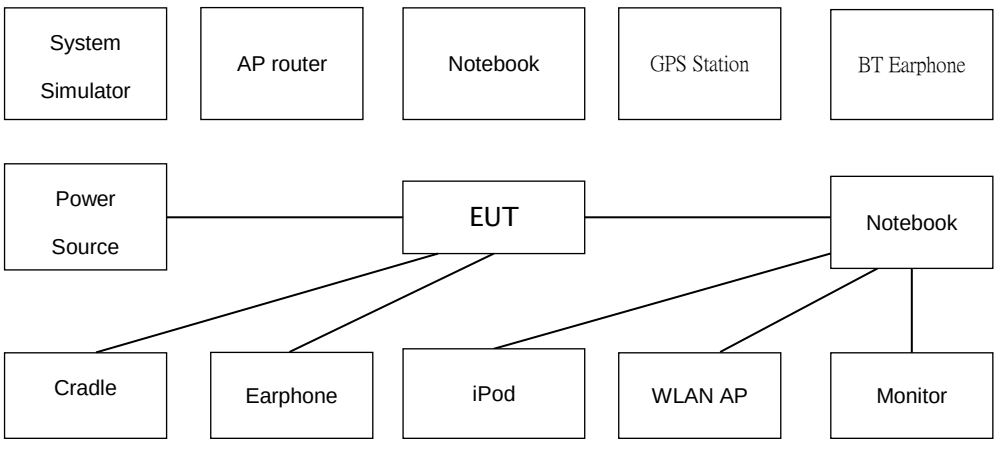
Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd. Guishan Dist, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	03CH10-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

2.8 Table for Supporting Units

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded,1.8m
3.	Notebook	DELL	Latitude E6320	FCC DoC/ Contains FCC ID: QDS-BRCM1054	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
5.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

2.9 Connection Diagram of Test System



This example is connection diagram of EUT test configurations.

. For detail, please refer to test mode configuration and setup photographs for each test item.

3. TEST RESULT

3.1 AC Power Line Conducted Emissions Measurement

3.1.1 Limit

For a Low-power Radio-frequency device which is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Frequency (MHz)	QP Limit (dBμV)	AV Limit (dBμV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

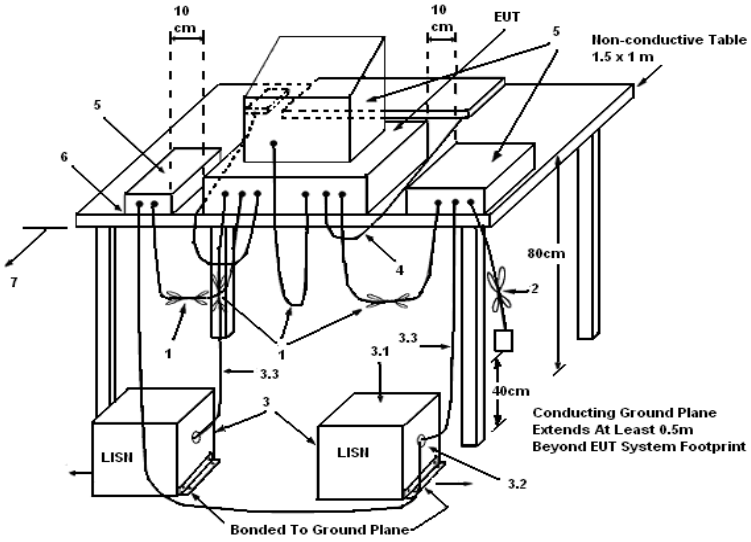
3.1.2 Measuring Instruments

Please refer to section 4 of equipment list in this report.

3.1.3 Test Procedures

1. Configure the EUT according to ANSI C63.4. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 kHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth (IF bandwidth = 9kHz) with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

3.1.4 Test Setup Layout



LEGEND:

(1) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

(2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

(3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω. LISN can be placed on top of, or immediately beneath, reference ground plane.

(3.1) All other equipment powered from additional LISN(s).

(3.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.

(3.3) LISN at least 80 cm from nearest part of EUT chassis.

(4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.

(5) Non-EUT components of EUT system being tested.

(6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.

(7) Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

3.1.5 Test Deviation

There is no deviation with the original standard.

3.1.6 EUT Operation during Test

The EUT was placed on the test table and programmed in transmitting function.

3.1.7 Results of AC Power Line Conducted Emissions Measurement

Please refer to Appendix A

3.2 Radiated Spurious Emissions

3.2.1 Limit

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general field strength limits listed in 15.209 as below, whichever is less stringent.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.2.2 Measuring Instruments

Please refer to section 4 of equipment list in this report.

3.2.3 Test Procedures

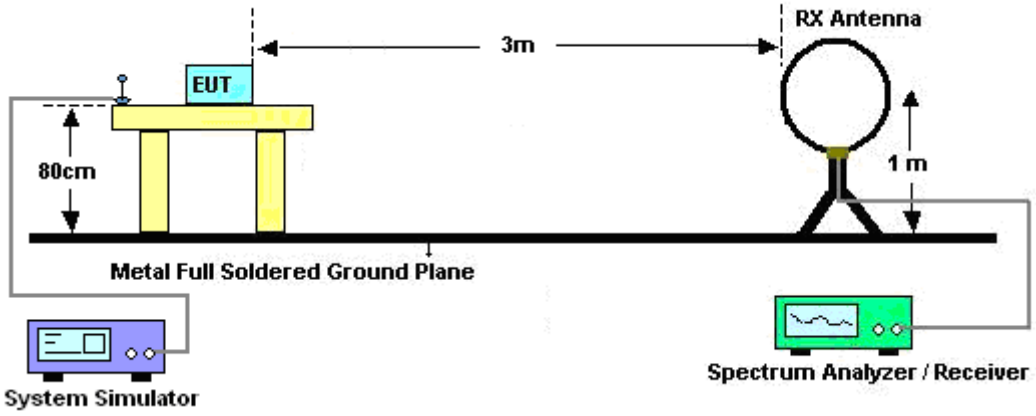
1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
4. Set to the maximum power setting and enable the EUT transmit continuously.

Remark:

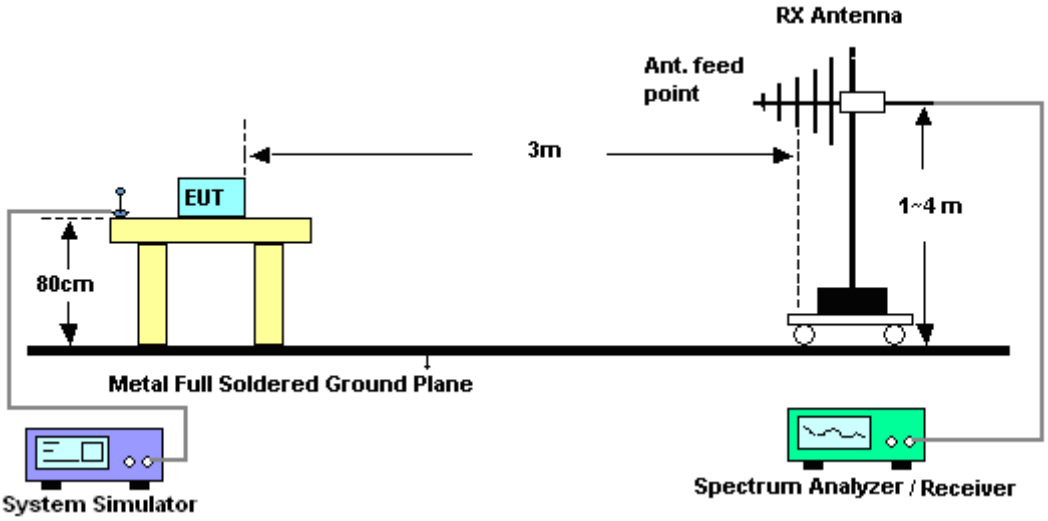
1. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
2. For average measurement: use duty cycle correction factor method per 15.35(c).
   Duty cycle = On time/100 milliseconds
   On time = N1*L1+N2*L2+...+Nn-1*LNn-1+Nn*Ln
   Where N1 is number of type 1 pulses, L1 is length of type 1 pulses, etc.
   Average Emission Level = Peak Emission Level + 20*log(Duty cycle)

3.2.4 Test Setup Layout

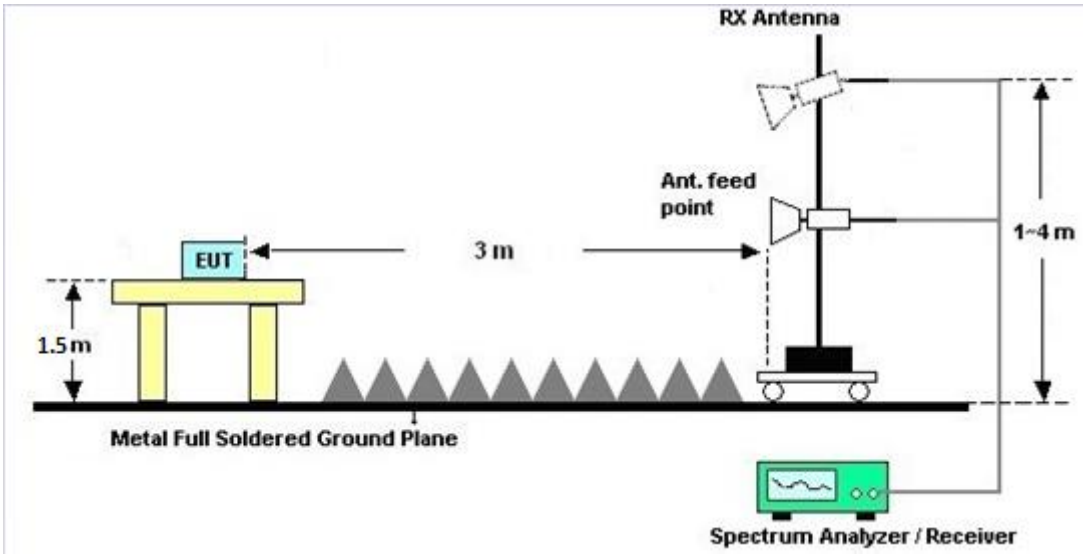
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.2.5 Test Deviation

There is no deviation with the original standard.

3.2.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.2.7 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

3.2.8 Duty cycle correction factor for average measurement

Please refer to Appendix D.

3.2.9 Test Result of Spurious Emissions

Please refer to Appendix B and C

3.3 Antenna Requirements

3.3.1 Limit

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. 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 the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited.

3.3.2 Antenna Connector Construction

Enbedded in Antenna.

4. LIST OF MEASURING EQUIPMENT

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Power Meter	Agilent	E4416A	GB41292344	300MHz~40GHz	Dec. 26, 2016	Feb. 09, 2017 ~ Feb. 17, 2017	Dec. 25, 2017	Conducted (TH05-HY)
Power Sensor	Agilent	E9327A	US40441548	300MHz~40GHz	Dec. 26, 2016	Feb. 09, 2017 ~ Feb. 17, 2017	Dec. 25, 2017	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz-40GHz	Jul. 17, 2016	Feb. 09, 2017 ~ Feb. 17, 2017	Jul. 16, 2017	Conducted (TH05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Feb. 11, 2017	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz~7GHz	Aug. 30, 2016	Feb. 11, 2017	Aug. 29, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 29, 2016	Feb. 11, 2017	Nov. 28, 2017	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 05, 2017	Feb. 11, 2017	Jan. 04, 2018	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 05, 2017	Feb. 11, 2017	Jan. 04, 2018	Conduction (CO05-HY)
Amplifier	SONOMA	310N	187311	9kHz~1GHz	Oct. 26, 2016	Mar. 03, 2017 ~ Mar. 04, 2017	Oct. 25, 2017	Radiation (03CH10-HY)
Bilog Antenna	TESEQ	CBL 6111D&00800 N1D01N-06	35413&02	30MHz~1GHz	Jan. 07, 2017	Mar. 03, 2017 ~ Mar. 04, 2017	Jan. 06, 2018	Radiation (03CH10-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1325	1GHz ~ 18GHz	Sep. 30, 2016	Mar. 03, 2017 ~ Mar. 04, 2017	Sep. 29, 2017	Radiation (03CH10-HY)
Preamplifier	Keysight	83017A	MY53270078	1GHz~26.5GHz	Oct. 26, 2016	Mar. 03, 2017 ~ Mar. 04, 2017	Oct. 25, 2017	Radiation (03CH10-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200485	10Hz ~ 44GHz	Oct. 17, 2016	Mar. 03, 2017 ~ Mar. 04, 2017	Oct. 16, 2017	Radiation (03CH10-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Mar. 03, 2017 ~ Mar. 04, 2017	N/A	Radiation (03CH10-HY)
Turn Table	EMEC	TT 2200	N/A	0~360 Degree	N/A	Mar. 03, 2017 ~ Mar. 04, 2017	N/A	Radiation (03CH10-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Oct. 20, 2016	Mar. 03, 2017 ~ Mar. 04, 2017	Oct. 19, 2018	Radiation (03CH10-HY)
Preamplifier	Jet-Power	JPA00101800-30-10P	1601180002	1GHz~18GHz	Jul. 27, 2016	Mar. 03, 2017 ~ Mar. 04, 2017	Jul. 26, 2017	Radiation (03CH10-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170576	18GHz ~ 40GHz	Apr. 15, 2016	Mar. 03, 2017 ~ Mar. 04, 2017	Apr. 14, 2017	Radiation (03CH10-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY55420170	N/A	Mar. 10, 2016	Mar. 03, 2017 ~ Mar. 04, 2017	Mar. 09, 2017	Radiation (03CH10-HY)
Preamplifier	MITEQ	JS44-18004000-33-8P	1840917	18GHz ~ 40GHz	Jun. 14, 2016	Mar. 03, 2017 ~ Mar. 04, 2017	Jun. 13, 2017	Radiation (03CH10-HY)

Note: Test equipment calibration is traceable to the procedure of ISO17025.

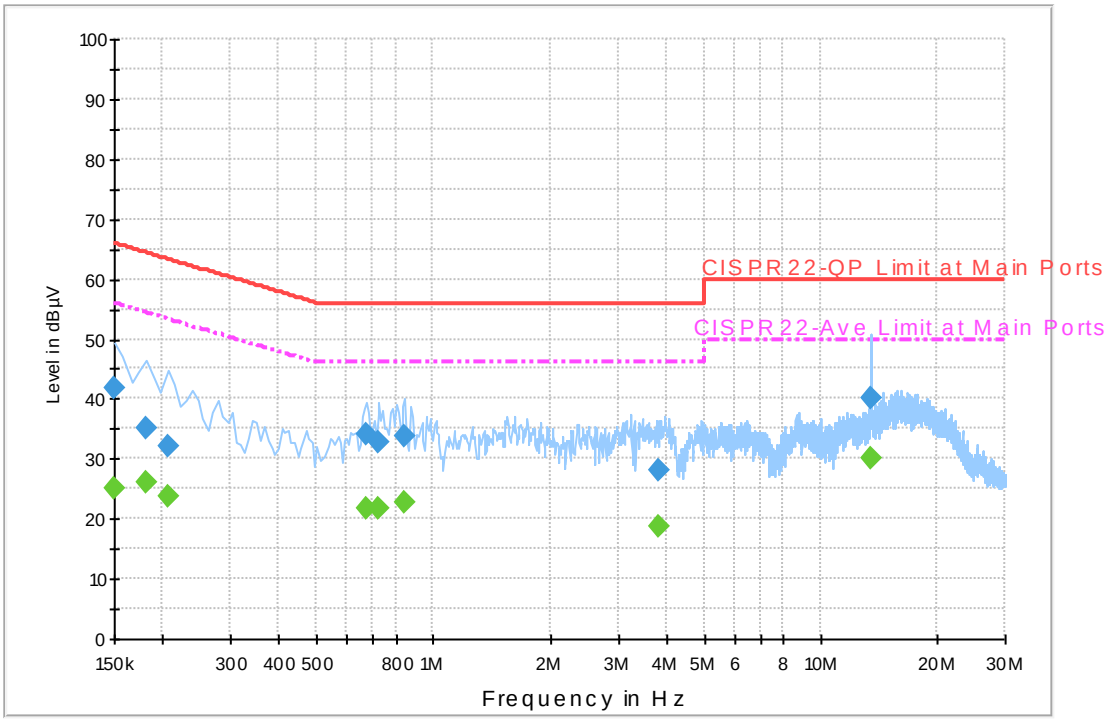
Appendix A. AC Conducted Emission Test Results

Test Engineer :	Arthur Hsieh	**Temperature :**	21~22℃
		Relative Humidity :	58~60%

EUT Information

Report NO :	712016-02
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Line

ENV216 Auto Test FCC Power Bar - L



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	41.8	Off	L1	19.6	24.2	66.0
0.182000	35.2	Off	L1	19.6	29.2	64.4
0.206000	32.1	Off	L1	19.6	31.3	63.4
0.670000	34.3	Off	L1	19.6	21.7	56.0
0.726000	32.6	Off	L1	19.6	23.4	56.0
0.846000	33.9	Off	L1	19.6	22.1	56.0
3.846000	28.1	Off	L1	19.7	27.9	56.0
13.558000	40.2	Off	L1	20.2	19.8	60.0

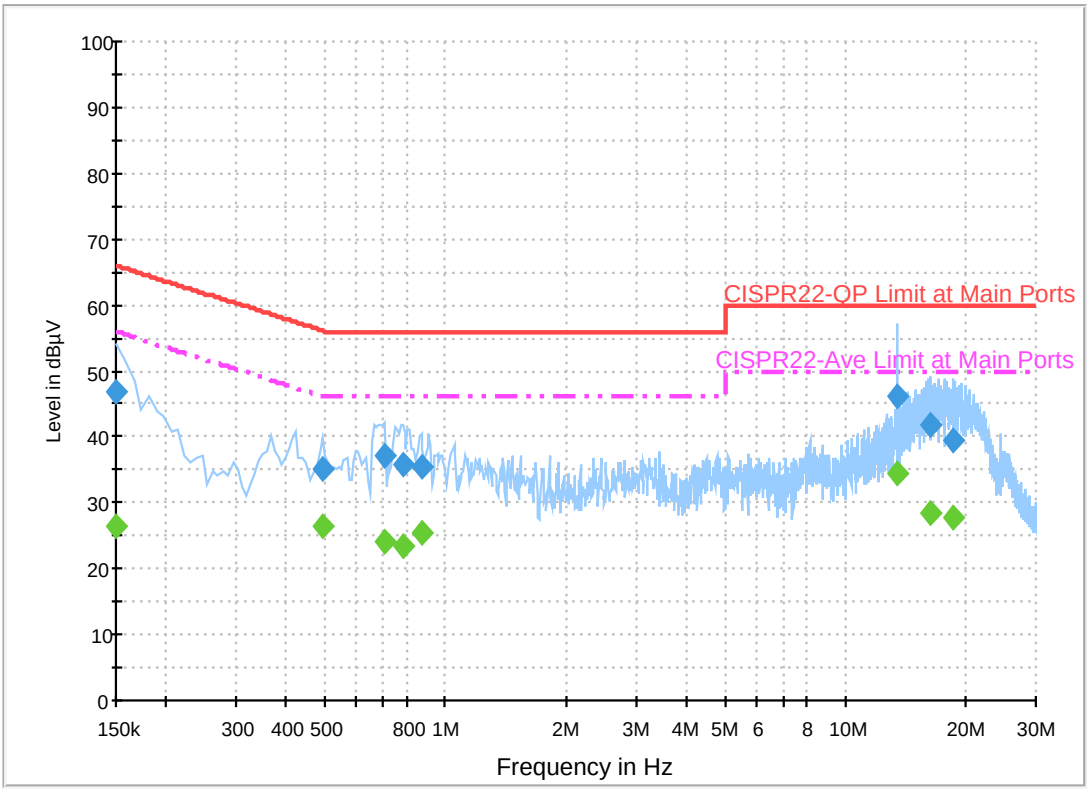
Final Result 2

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	25.2	Off	L1	19.6	30.8	56.0
0.182000	25.9	Off	L1	19.6	28.5	54.4
0.206000	23.8	Off	L1	19.6	29.6	53.4
0.670000	21.6	Off	L1	19.6	24.4	46.0
0.726000	21.7	Off	L1	19.6	24.3	46.0
0.846000	22.8	Off	L1	19.6	23.2	46.0
3.846000	18.6	Off	L1	19.7	27.4	46.0
13.558000	30.2	Off	L1	20.2	19.8	50.0

EUT Information

Report NO :	712016-02
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Neutral

ENV216 Auto Test FCC Power Bar - N



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	46.8	Off	N	19.5	19.2	66.0
0.494000	35.0	Off	N	19.5	21.1	56.1
0.702000	37.2	Off	N	19.5	18.8	56.0
0.782000	35.9	Off	N	19.5	20.1	56.0
0.870000	35.4	Off	N	19.6	20.6	56.0
13.558000	46.2	Off	N	20.3	13.8	60.0
16.374000	41.8	Off	N	20.5	18.2	60.0
18.566000	39.3	Off	N	20.6	20.7	60.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	26.5	Off	N	19.5	29.5	56.0
0.494000	26.4	Off	N	19.5	19.7	46.1
0.702000	24.1	Off	N	19.5	21.9	46.0
0.782000	23.3	Off	N	19.5	22.7	46.0
0.870000	25.4	Off	N	19.6	20.6	46.0
13.558000	34.5	Off	N	20.3	15.5	50.0
16.374000	28.4	Off	N	20.5	21.6	50.0
18.566000	27.9	Off	N	20.6	22.1	50.0

Appendix B. Radiated Spurious Emission

Test Engineer :	Stan Hsieh	Temperature :	22~24°C
		Relative Humidity :	45~47%

2.4GHz 2400~2483.5MHz

ANT+ (Band Edge @ 3m)

ANT+	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
ANT+ CH 00 2402MHz		2400	53.9	-20.1	74	54.49	27.23	5.39	33.21	312	31	P	H
		2402	89.9	-24.1	114	90.49	27.23	5.39	33.21	312	31	P	H
		2489.68	43.4	-30.6	74	43.61	27.5	5.46	33.17	312	31	P	H
		2400	38.59	-15.41	54	39.18	27.23	5.39	33.21	312	31	A	H
		2402	75.33	-18.67	94	75.92	27.23	5.39	33.21	312	31	A	H
		2493.28	32.12	-21.88	54	32.32	27.5	5.46	33.16	312	31	A	H
		2400	63.66	-10.34	74	64.25	27.23	5.39	33.21	240	60	P	V
		2402	90.53	-23.47	114	91.12	27.23	5.39	33.21	240	60	P	V
		2485.84	43.77	-30.23	74	44.02	27.46	5.46	33.17	240	60	P	V
		2400	36.51	-17.49	54	37.1	27.23	5.39	33.21	240	60	A	V
		2402	75.19	-18.81	94	75.78	27.23	5.39	33.21	240	60	A	V
		2495.32	32.19	-21.81	54	32.39	27.5	5.46	33.16	240	60	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

ANT+ (Harmonic @ 3m)

ANT+	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
ANT+ CH 00 2402MHz		4804	35.22	-38.78	74	58.12	31.42	7.58	61.9	100	0	P	H
		7206	39.64	-34.36	74	56.28	35.96	9.44	62.04	100	0	P	H
													H
													H
		4804	34.94	-39.06	74	57.84	31.42	7.58	61.9	100	0	P	V
		7206	39.5	-34.5	74	56.14	35.96	9.44	62.04	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

2.4GHz ANT+ (LF)

ANT+	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz ANT+ LF		30.81	22.71	-17.29	40	29.27	25.54	0.65	32.75	-	-	P	H
		54.84	21.52	-18.48	40	39.73	13.6	0.93	32.74	-	-	P	H
		98.31	21.14	-22.36	43.5	36.63	16.14	1.14	32.77	-	-	P	H
		591.9	26.21	-19.79	46	31.3	25.33	2.57	32.99	-	-	P	H
		730.5	30.28	-15.72	46	33.3	27.03	2.91	32.96	-	-	P	H
		948.9	31.4	-14.6	46	29.9	29.97	3.29	31.76	100	0	P	H
													H
													H
													H
													H
													H
													H
		30	24.73	-15.27	40	30.74	26.1	0.65	32.76	-	-	P	V
		46.2	23	-17	40	37.94	16.87	0.93	32.74	-	-	P	V
		67.8	22.47	-17.53	40	41.81	12.48	0.93	32.75	-	-	P	V
		474.3	24.13	-21.87	46	31	23.68	2.3	32.85	-	-	P	V
		729.8	33.96	-12.04	46	37	27.01	2.91	32.96	100	0	P	V
		943.3	31.5	-14.5	46	30.19	29.85	3.29	31.83	-	-	P	V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **over limit** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBµV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBµV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBµV/m) – Limit Line(dBµV/m)

For Peak Limit @ 2390MHz:

1. Level(dBµV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBµV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBµV) – 35.86 (dB)

= 55.45 (dBµV/m)

2. Over Limit(dB)

= Level(dBµV/m) – Limit Line(dBµV/m)

= 55.45(dBµV/m) – 74(dBµV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBµV/m)

= Antenna Factor(dB/m) + CaANT+ Loss(dB) + Read Level(dBµV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBµV) – 35.86 (dB)

= 43.54 (dBµV/m)

2. Over Limit(dB)

= Level(dBµV/m) – Limit Line(dBµV/m)

= 43.54(dBµV/m) – 54(dBµV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is "PASS".

Appendix C. Radiated Spurious Emission Plots

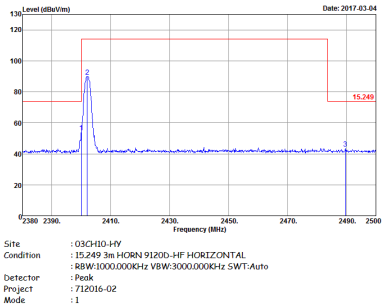
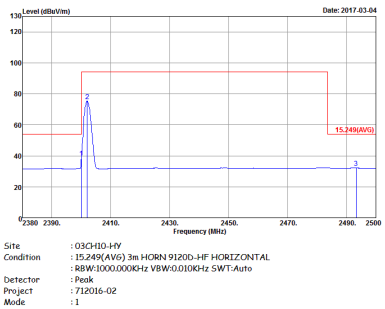
Test Engineer :	Stan Hsieh	**Temperature :**	22~24°C
		Relative Humidity :	45~47%

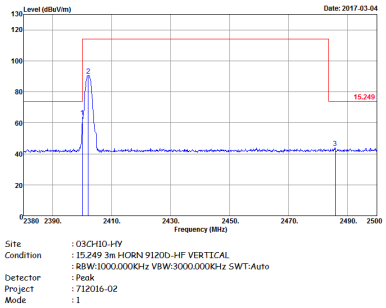
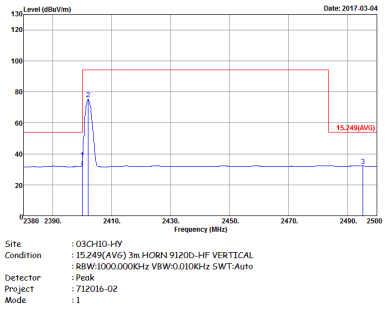
Note symbol

-L	**Low channel location**
-R	**High channel location**

2.4GHz 2400~2483.5MHz

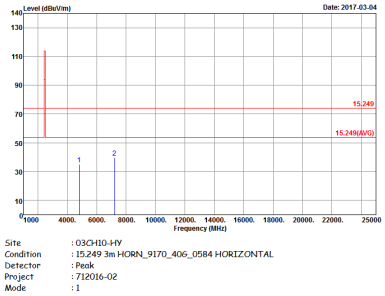
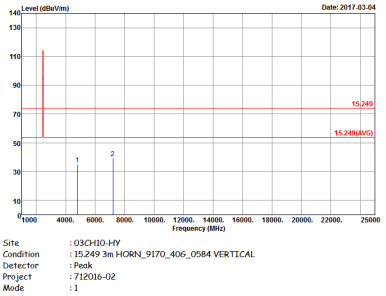
ANT+ (Band Edge @ 3m)

ANT+	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	ANT+ CH00 2402MHz	
1	Horizontal	Fundamental
Peak		
Avg.		

ANT+	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	ANT+ CH00 2402MHz	
1	Vertical	Fundamental
Peak		
Avg		

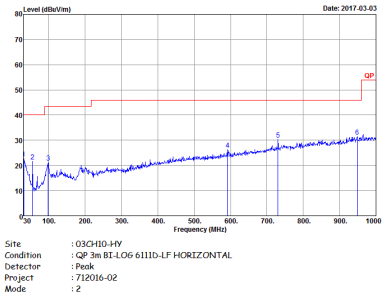
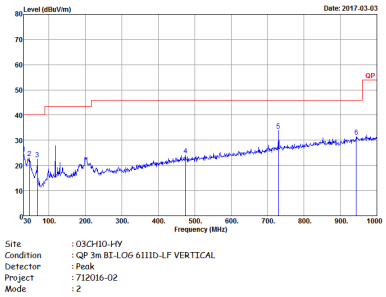
2.4GHz 2400~2483.5MHz

ANT+ (Harmonic @ 3m)

ANT+	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	ANT+ CH00 2402MHz	
1	Horizontal	Vertical
Peak Avg.		

Emission below 1GHz

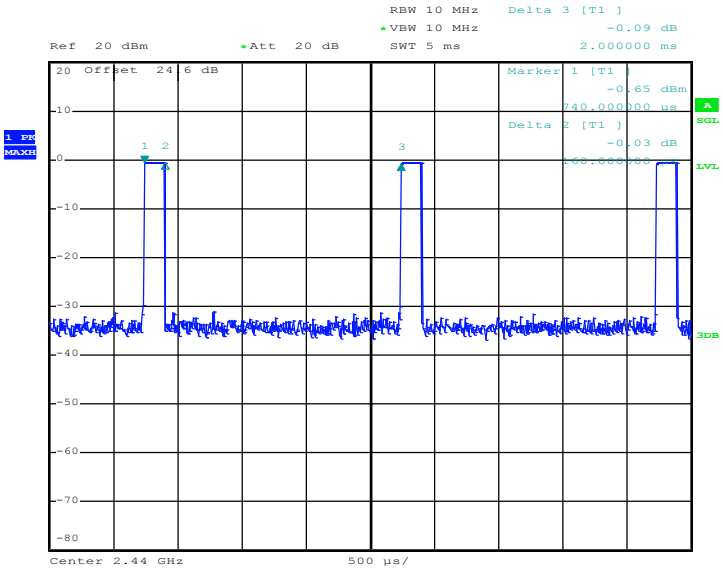
2.4GHz ANT+ (LF)

ANT+	2.4GHz 2400~2483.5MHz	
ANT	ANT+ LF	
1	Horizontal	Vertical
QP / Peak		

Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
ANT+	8	160	6.25	10kHz

ANT+



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