FCC CFR47 PART 15 SUBPART C

Bluetooth Low Energy

CERTIFICATION TEST REPORT

FOR

Multi Path Blue Force Tracker

MODEL NUMBER : mBFT17(V)

FCC ID: 2AL3AHDJC-1801

REPORT NUMBER: 4788319772-E1V3

ISSUE DATE: MAR 05, 2018

Prepared for
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TEL: (031) 337-9902

ACCREDITED
Testing Laboratory

TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	01/30/18	Initial issue	Hyunsik Yun
V2	02/26/18	Revised KDB version Info and added duty factor	Hyunsik Yun
V2	03/05/18	Change the FCC ID.	Hyunsik Yun

TABLE OF CONTENTS

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Hyundai J-Comm. Co. Ltd

EUT DESCRIPTION: Multi Path Blue Force Tracker

MODEL NUMBER: mBFT17(V)

SERIAL NUMBER: 0008

DATE TESTED: JAN 11, 2018 – JAN 26, 2018

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass

UL Korea, Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Korea, Ltd. By:

SungGil Park
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:

Hyunsik Yun
Laboratory Engineer
UL Korea, Ltd.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with following methods.

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. KDB 558074 D01 DTS Meas Guidance v04.
4. ANSI C63.10-2013.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

218 Maeyeong-ro
☐ Chamber 1
☒ Chamber 2

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at http://www.iasonline.org/PDF/TL/TL-637.pdf.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	2.32 dB
Radiated Disturbance, Below 1GHz	4.14 dB
Radiated Disturbance, Above 1 GHz	5.97 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT supports the BLE/WCDMA/SAT mode.
This test report addresses the DTS (BLE) operational mode.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum total conducted output power as follows:

Frequency Range [MHz]	Mode	Power Mode	Output Power [dBm]	Output Power [mW]
2 402 - 2 480	BLE	Peak	2.251	1.68
		Average	1.854	1.53

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an chip antenna, with a maximum gain of 1.9 dBi

5.4. WORST-CASE CONFIGURATION AND MODE

Radiated emission below 1GHz and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Radiated emission above 1GHz was performed with the EUT set to transmit low/mid/high channels.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List					
No	Description	Manufacturer	Model	Serial Number	FCC ID
1	Adapter	Hyundai J.Comm Co.,Ltd.	Blue Force Tracker17/V	0024	N/A
2	External 3G modem	Hyundai J.Comm Co.,Ltd.	mBFT17(V)-WCDMA	N/A	2AL3AHDJC-1802

I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	2-PIN	Shielded	1 m	N/A
2	AC Power	2	AC	Shielded	1.1 m	N/A

TEST SETUP

The EUT is the unit with external 3G modem(Optional accessory) during the tests.
Test software exercised the EUT to enable BLE mode.

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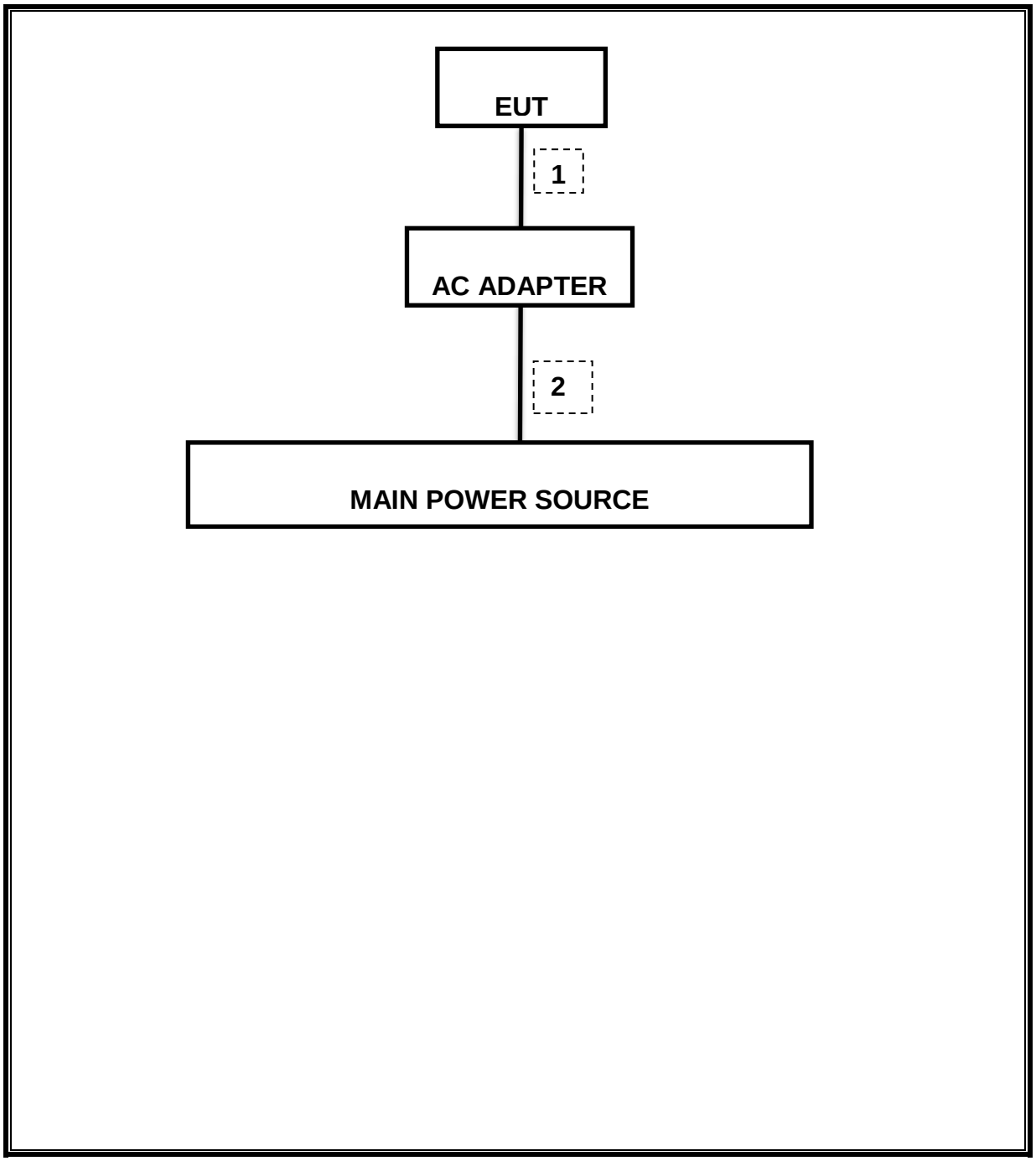
SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List				
Description	**Manufacturer**	**Model**	**S/N**	**Cal Due**
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	10-14-18
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-31-19
Antenna, Horn, 18 GHz	ETS	3115	00167211	10-14-18
Antenna, Horn, 18 GHz	ETS	3117	00168724	05-31-19
Antenna, Horn, 18 GHz	ETS	3117	00168717	05-31-19
Antenna, Horn, 40 GHz	ETS	3116C	00166155	12-04-19
Antenna, Horn, 40 GHz	ETS	3116C-PA	00168841	11-13-19
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-09-18
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-09-18
Preamplifier	ETS	3115-PA	00167475	08-09-18
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-07-18
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-08-18
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-08-18
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-26-19
Average Power Sensor	R&S	NRP-Z91	102681	08-08-18
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-08-18
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-08-18
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-08-18
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-07-18
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	08-08-18
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	08-08-18
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	08-08-18
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	08-08-18
High Pass Filter 6GHz	Micro-Tronics	HPM17542	009	08-08-18
High Pass Filter 6GHz	Micro-Tronics	HPM17542	016	08-08-18
LISN	R&S	ENV-216	101837	08-09-18

UL Software			
Description	**Manufacturer**	**Model**	**Version**
Radiated software	UL	UL EMC	Ver 9.5
AC Line Conducted software	UL	UL EMC	Ver 9.5

7. REFERENCE MEASUREMENT RESULTS

7.1. ON TIME AND DUTY CYCLE RESULTS

LIMITS

None: for reporting purposes only.

Mode	ON Time B [msec]	Period [msec]	Duty Cycle x [linear]	Duty Cycle [%]	Duty Cycle Correction Factor [dB]	1/T Minimum VBW [kHz]
2400MHz Bands						
BLE	0.389	0.625	0.623	62.3%	2.06	2.571

7.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to more than 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency [MHz]	99% Bandwidth [MHz]
Low	2402	1.027
Mid	2440	1.023
High	2480	1.023
Worst		1.027

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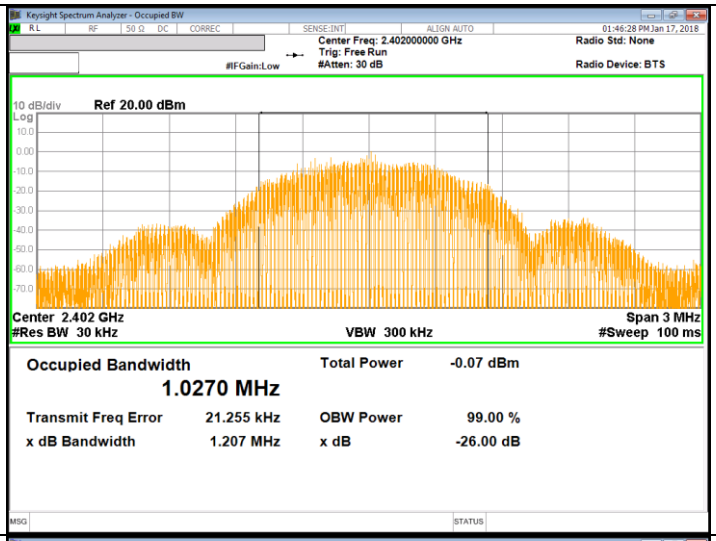
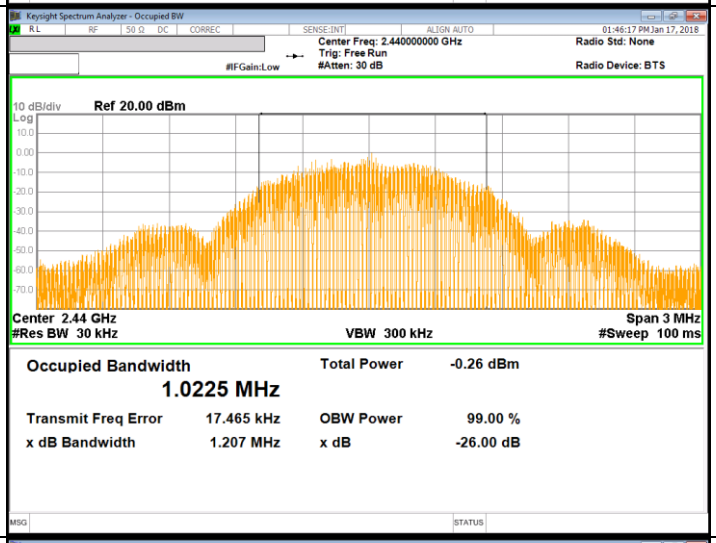
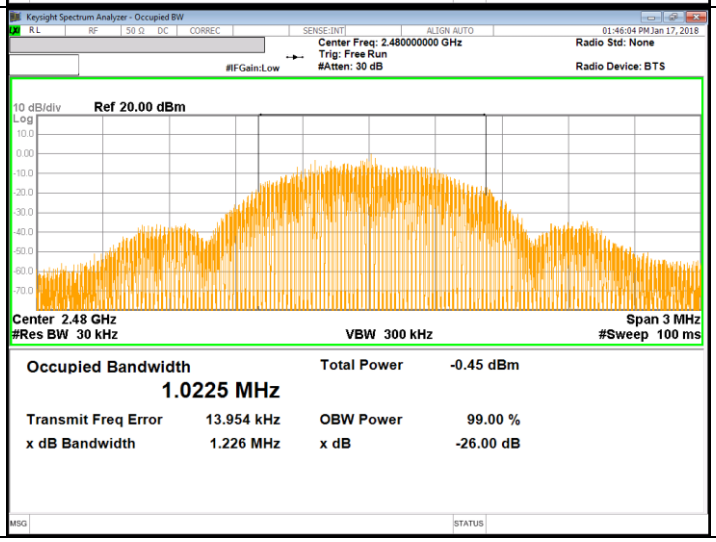
99% BANDWIDTH PLOTS

Low CH			
Middle CH			
High CH			

8. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result	Worst Case
15.247 (a)(2)	Occupied Band width (6dB)	>500KHz	Conducted	Pass	671.4 kHz
2.1051, 15.247 (d)	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-44.792 dBm
15.247	TX conducted output power	<30dBm		Pass	2.251 dBm (Peak)
15.247	PSD	<8dBm		Pass	-13.737 dBm (Peak)
15.207 (a)	AC Power Line conducted emissions	Section 10	Power Line conducted	Pass	36.13 dBuV (Av)
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m	Radiated	Pass	47.25 dBuV/m (Av)

9. ANTENNA PORT TEST RESULTS

9.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

The minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

Reference to KDB 558074 D01 DTS Meas Guidance v04: The transmitter output is connected to a spectrum analyzer with the RBW set to100KHz, the VBW >= 3 x RBW, peak detector and max hold.

RESULTS

Channel	Frequency [MHz]	6 dB Bandwidth [kHz]	Minimum Limit [kHz]
Low	2402	674.5	500.0
Mid	2440	671.4	500.0
High	2480	674.2	500.0
Worst		671.4	500.0

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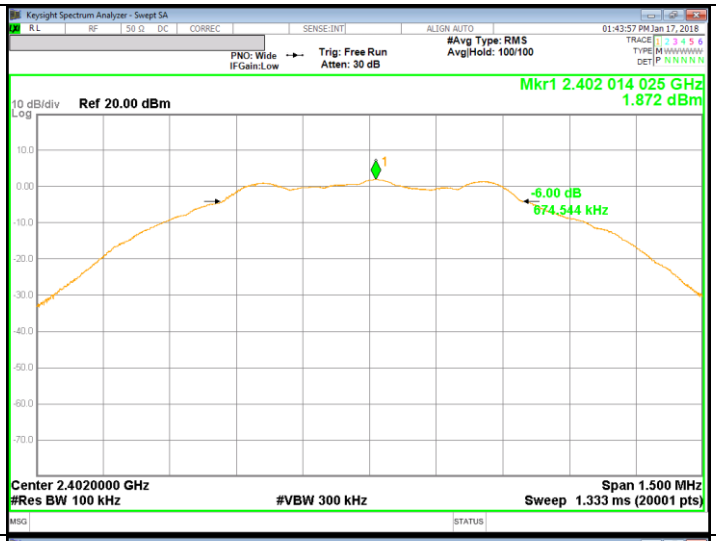
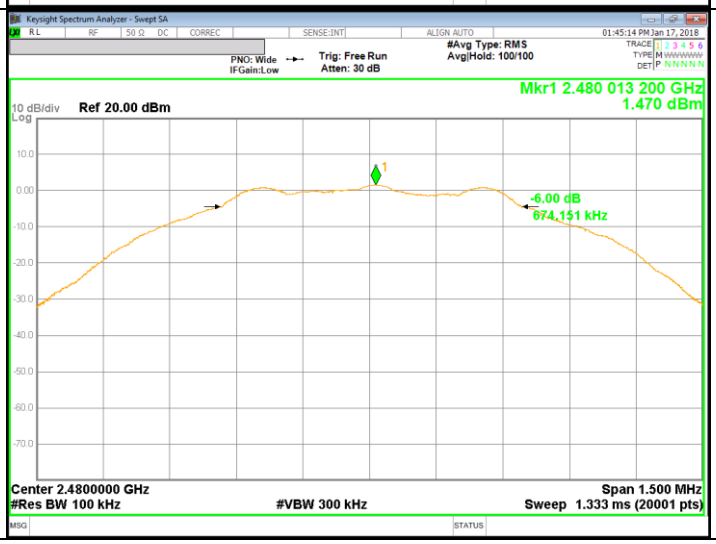
6 dB BANDWIDTH PLOTS

Low CH			
Middle CH			
High CH			

9.2. OUTPUT POWER

LIMITS

FCC §15.247 (b)

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

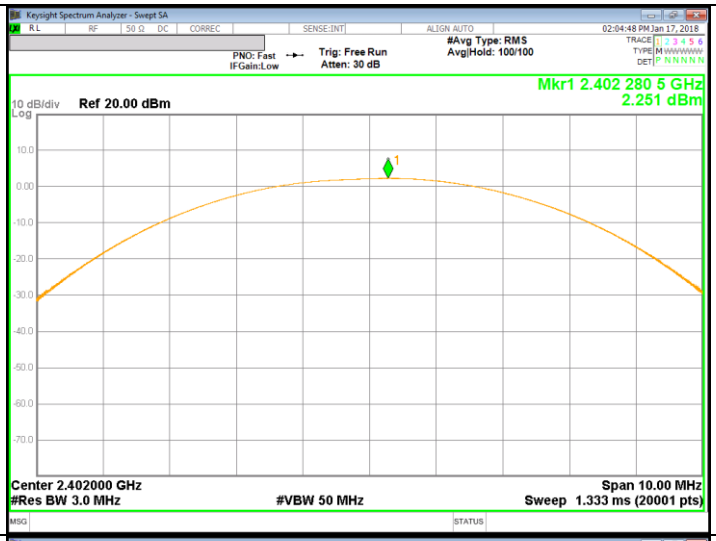
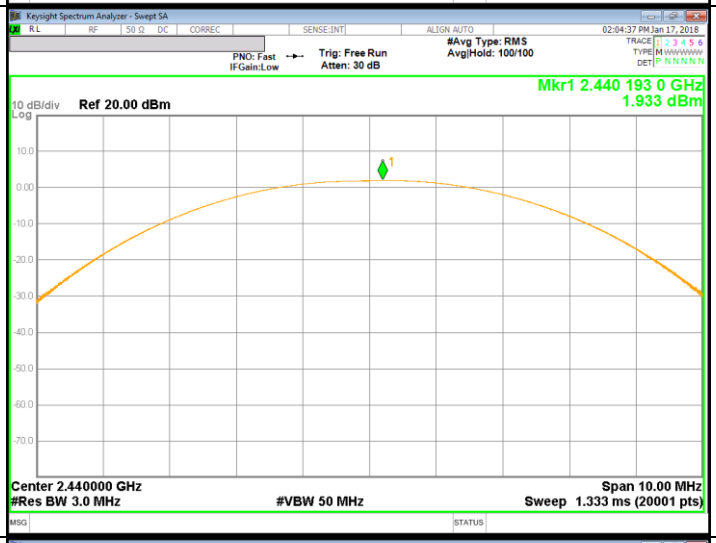
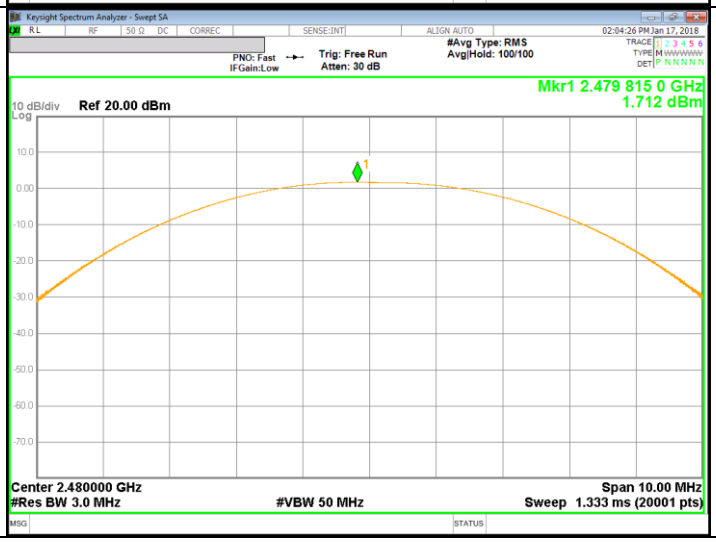
TEST PROCEDURE

Peak power is measured using KDB558074 D01 DTS Meas Guidance v04 under section 9.1.1 utilizing spectrum analyzer.

RESULTS

Channel	Frequency [MHz]	Peak Power Reading [dBm]	Limit [dBm]	Margin [dB]
Low	2402	2.251	30.000	-27.749
Mid	2440	1.933	30.000	-28.067
High	2480	1.712	30.000	-28.288
Worst		2.251	30.000	-27.749

OUTPUT POWER PLOTS

Low CH			
Middle CH			
High CH			

9.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2402	1.854	1.532
Middle	2440	1.671	1.469
High	2480	1.493	1.410

Note: AV power = Frame AV power reading value + Cable loss + Duty cycle factor;
Duty cycle factor (dB) = 10 log (1/x)

9.4. PSD

LIMITS

FCC §15.247

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

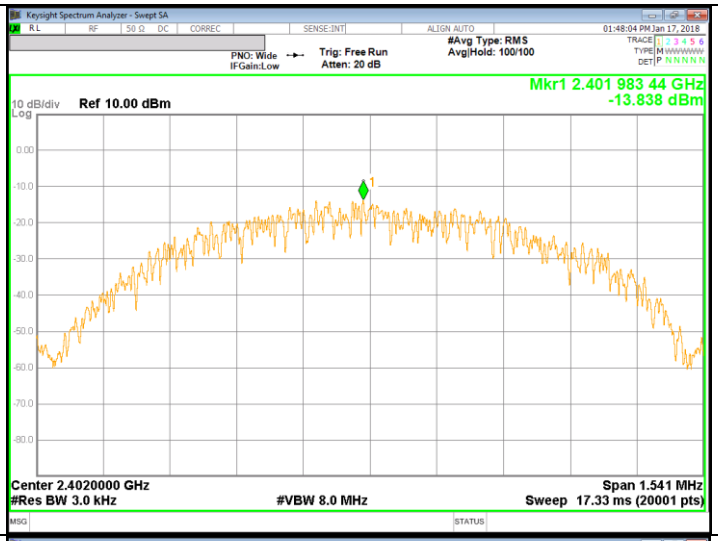
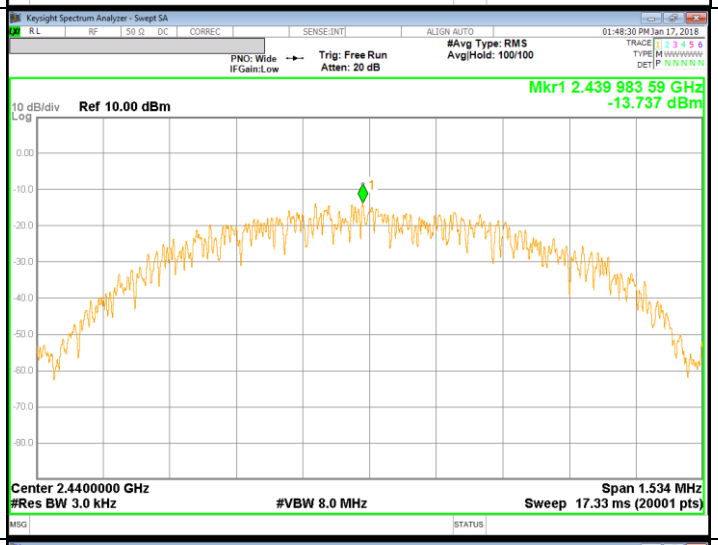
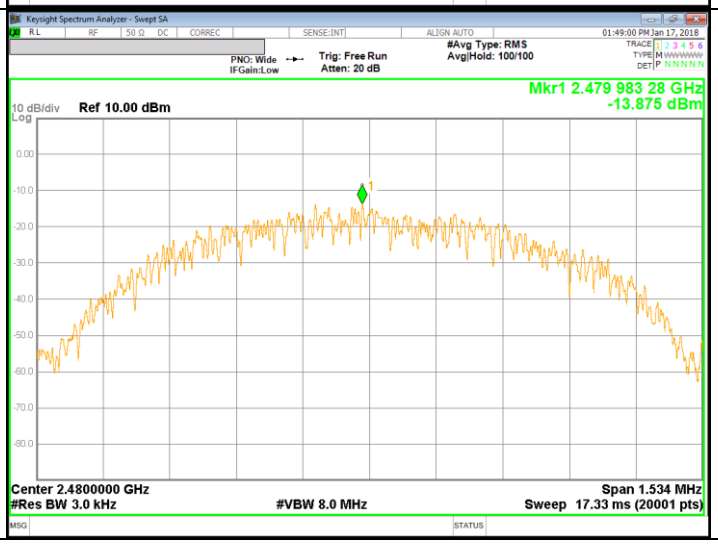
TEST PROCEDURE

Power Spectral Density was performed utilizing the "§10.2 Method PKPSD (Peak PSD)" under KDB558074 D01 DTS Meas Guidance v04

RESULTS

Channel	Frequency [MHz]	PSD [dBm]	Limit [dBm]	Margin [dB]
Low	2402	-13.84	8.00	-21.84
Mid	2440	-13.74	8.00	-21.74
High	2480	-13.88	8.00	-21.88

POWER SPECTRAL DENSITY PLOTS

Low CH		
Middle CH		
High CH		

9.5. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

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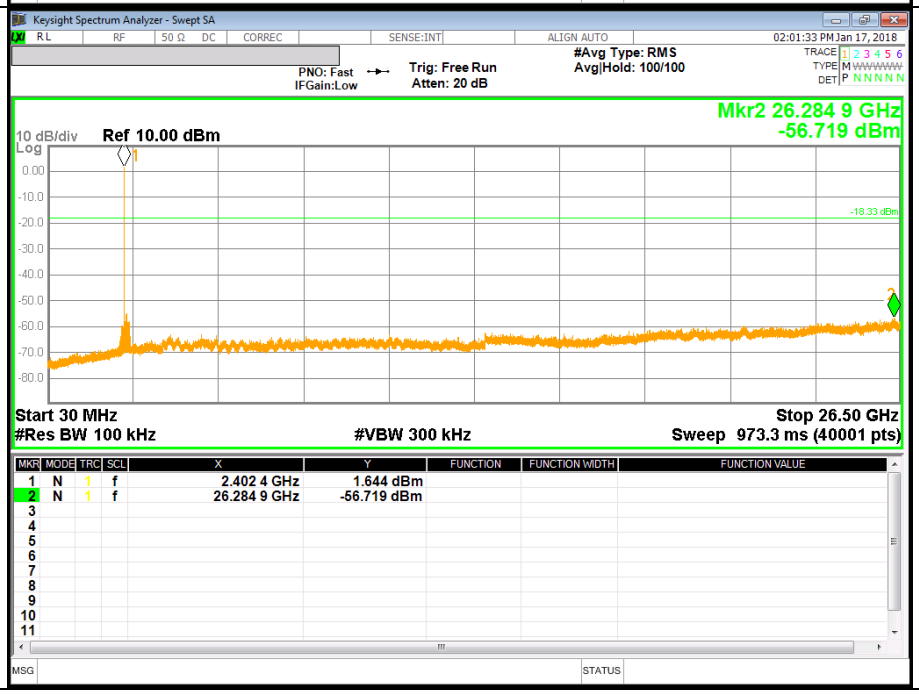
RESULTS

BANDEDGE & SPURIOUS EMISSIONS, LOW CHANNEL

Low CH BandEdge	
Low CH Spurious	

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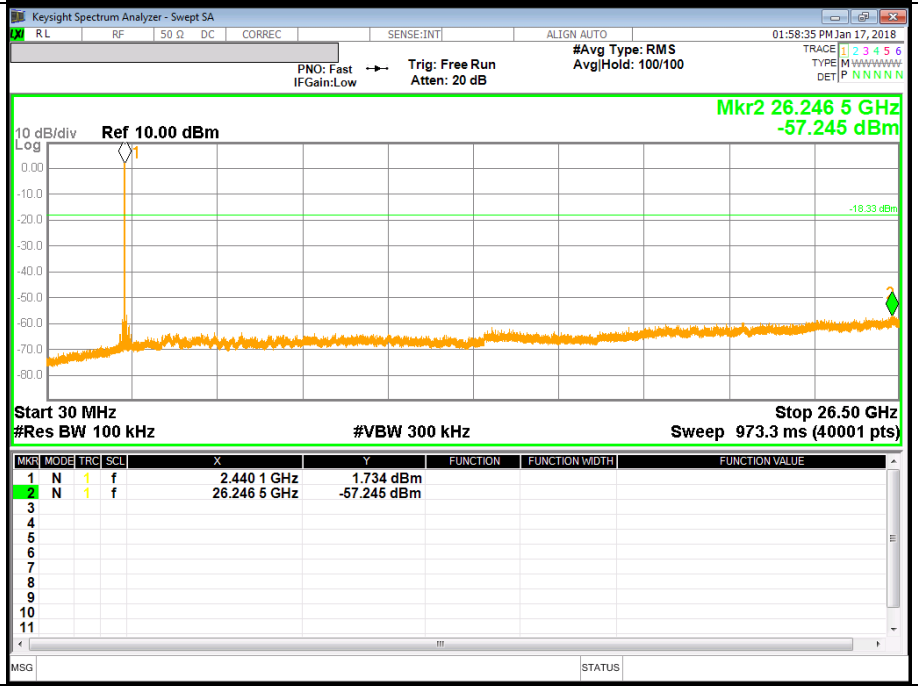
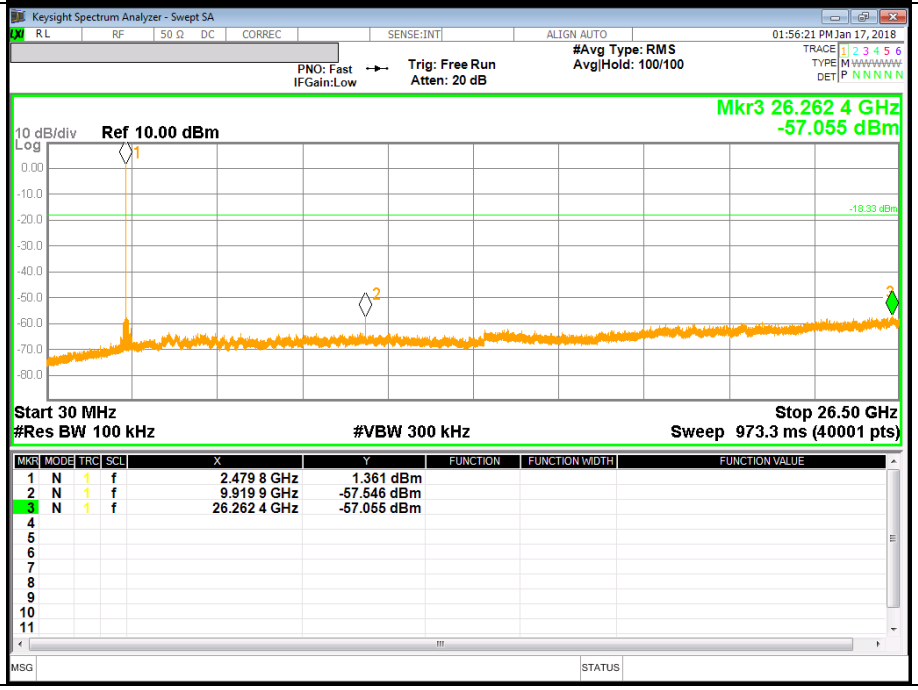
SPURIOUS EMISSIONS, MID CHANNEL

Middle CH BandEdge	
Middle CH Spurious	

SPURIOUS EMISSIONS, HIGH CHANNEL

High CH BandEdge	
High CH Spurious	

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10. RADIATED TEST RESULTS

10.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits (μV/m)	Measurement Distance (m)
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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz and 150 cm for above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and add duty cycle factor for average measurements. (Restriced bandedge, Final detection of spurious harmonic emissions)Duty cycle factor = 10 log (1/x). For this sample: DCF = 10log(1/0.623) = 2.06dB
(Spectrum Analyzer round it up to 2.06dB)

Pre-scans to detect harmonic and spurious emissions, the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

The spectrum from 1 GHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.
(From 30MHz to 1GHz, test was performed with the EUT set to transmit at the channel with highest output power)

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

Unwanted emissions within Restricted Bands are measured using traditional radiated procedures.

Band edge emissions within Restricted Bands are measured using RMS with duty cycle factor offset method.

Note : Emission was pre-scanned from 9KHz to 30MHz; No emissions were detected which was at least 20dB below the specification limit (consider distance correction factor).
Per FCC part 15.31(o), test results were not reported.

Formula for converting the filed strength from uV/m to dBuV/m is:
Limit (dBuV/m) = 20 log limit (uV/m)

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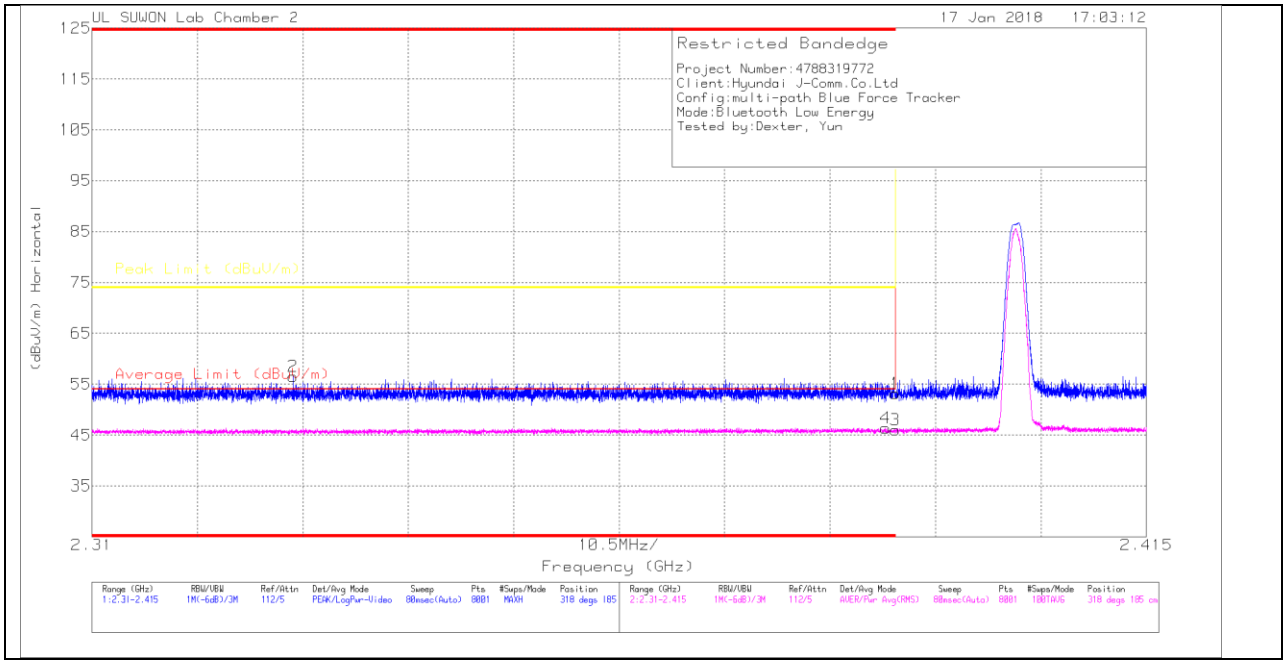
10.2. TRANSMITTER ABOVE 1 GHz
RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	170531_3117[0 0168724]	10dB[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	40.08	Pk	31.3	-18.2	0	53.18	-	-	74	-20.82	318	185	H
2	* 2.33	43.68	Pk	31.2	-18.4	0	56.48	-	-	74	-17.52	318	185	H
3	* 2.39	30.75	RMS	31.3	-18.2	2.06	45.91	54	-8.09	-	-	318	185	H
4	* 2.389	31.18	RMS	31.3	-18.2	2.06	46.34	54	-7.66	-	-	318	185	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector
RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT

VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	170531_3117[00168724]	10dB[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	39.6	Pk	31.3	-18.2	0	52.7	-	-	74	-21.3	351	289	V
2	* 2.387	44.57	Pk	31.3	-18.2	0	57.67	-	-	74	-16.33	351	289	V
3	* 2.39	30.5	RMS	31.3	-18.2	2.06	45.66	54	-8.34	-	-	351	289	V
4	* 2.34	31.36	RMS	31.2	-18.3	2.06	46.32	54	-7.68	-	-	351	289	V

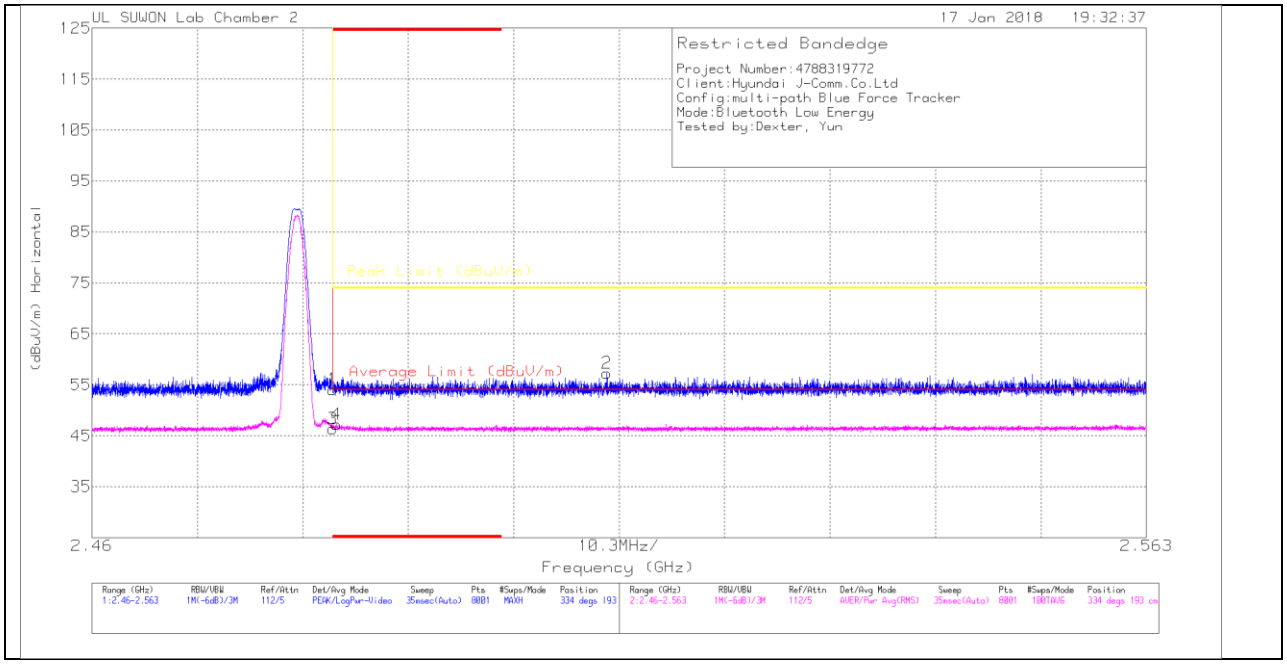
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

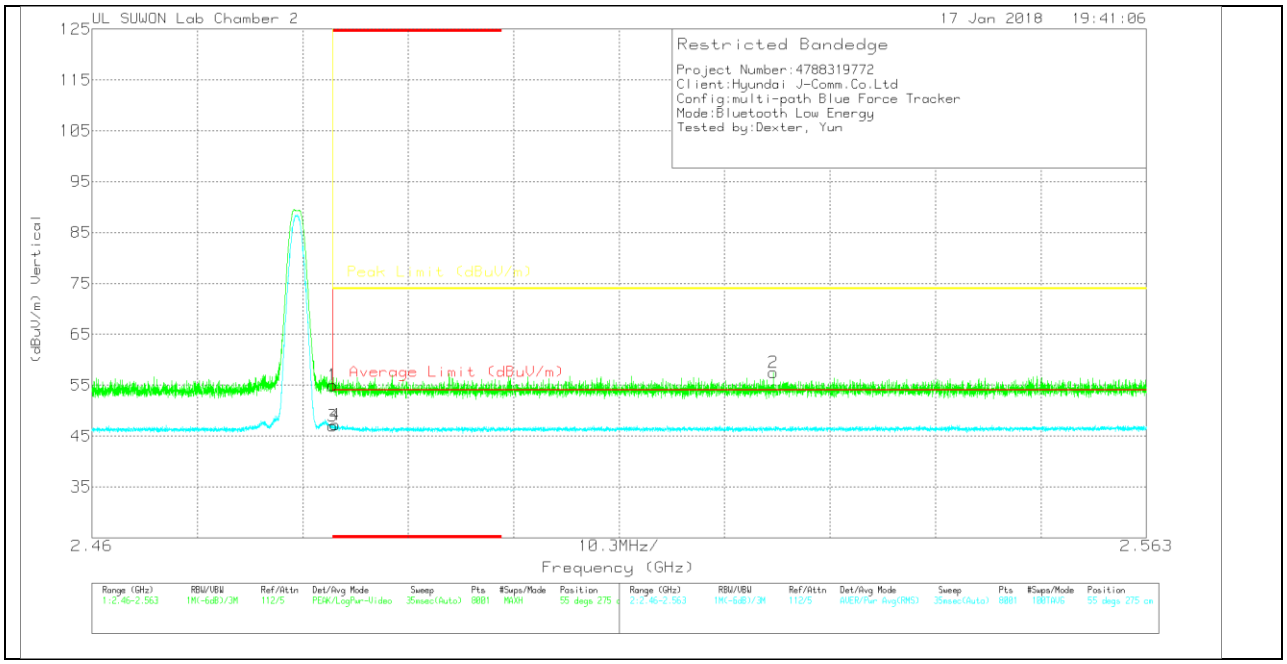
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	170531_3117[00168724]	10dB[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	40.5	Pk	31.6	-18	0	54.1	-	-	74	-19.9	334	193	H
2	2.51	43.71	Pk	31.6	-18	0	57.31	-	-	74	-16.69	334	193	H
3	* 2.484	30.71	RMS	31.6	-18	2.06	46.37	54	-7.63	-	-	334	193	H
4	* 2.484	31.52	RMS	31.6	-18	2.06	47.18	54	-6.82	-	-	334	193	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	170531_3117[00168724]	10dB[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	41.37	Pk	31.6	-18	0	54.97	-	-	74	-19.03	55	275	V
2	2.527	43.81	Pk	31.7	-18	0	57.51	-	-	74	-16.49	55	275	V
3	* 2.484	31.23	RMS	31.6	-18	2.06	46.89	54	-7.11	-	-	55	275	V
4	* 2.484	31.54	RMS	31.6	-18	2.06	47.2	54	-6.8	-	-	55	275	V

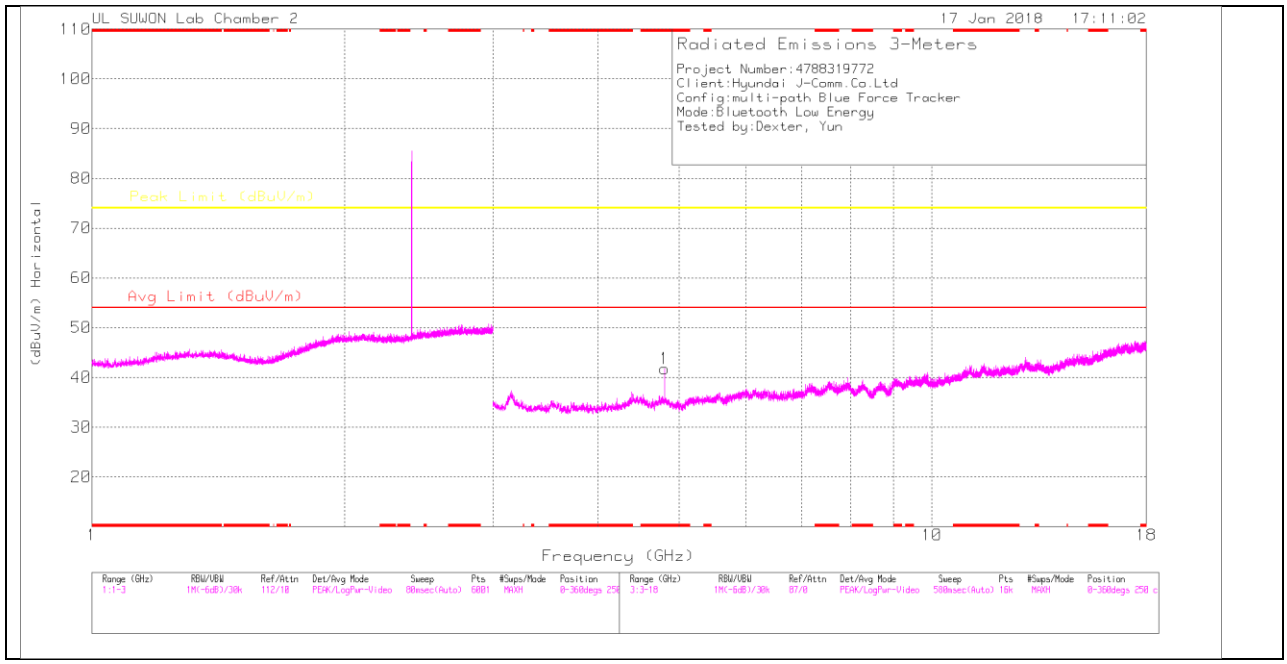
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

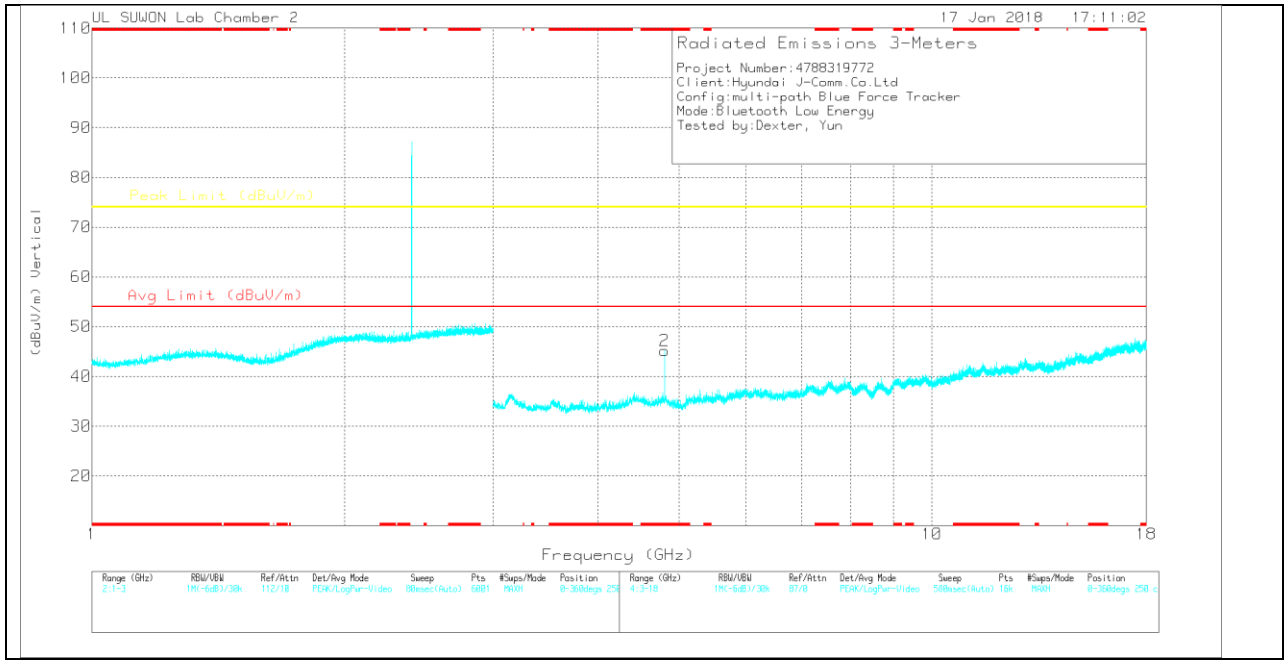
RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168724)_150619	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.805	32.23	Pk	33.8	-24.3	0	41.73	-	-	74	-32.27	0-360	250	H
2	* 4.804	35.71	Pk	33.8	-24.3	0	45.21	-	-	74	-28.79	0-360	250	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168724)_150619	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.804	38.52	PK2	33.8	-24.3	0	48.02	-	-	74	-25.98	45	178	H
* 4.804	28.37	MAv1	33.8	-24.3	2.06	39.93	54	-14.07	-	-	45	178	H
* 4.804	41.54	PK2	33.8	-24.3	0	51.04	-	-	74	-22.96	83	271	V
* 4.804	33.49	MAv1	33.8	-24.3	2.06	45.05	54	-8.95	-	-	83	271	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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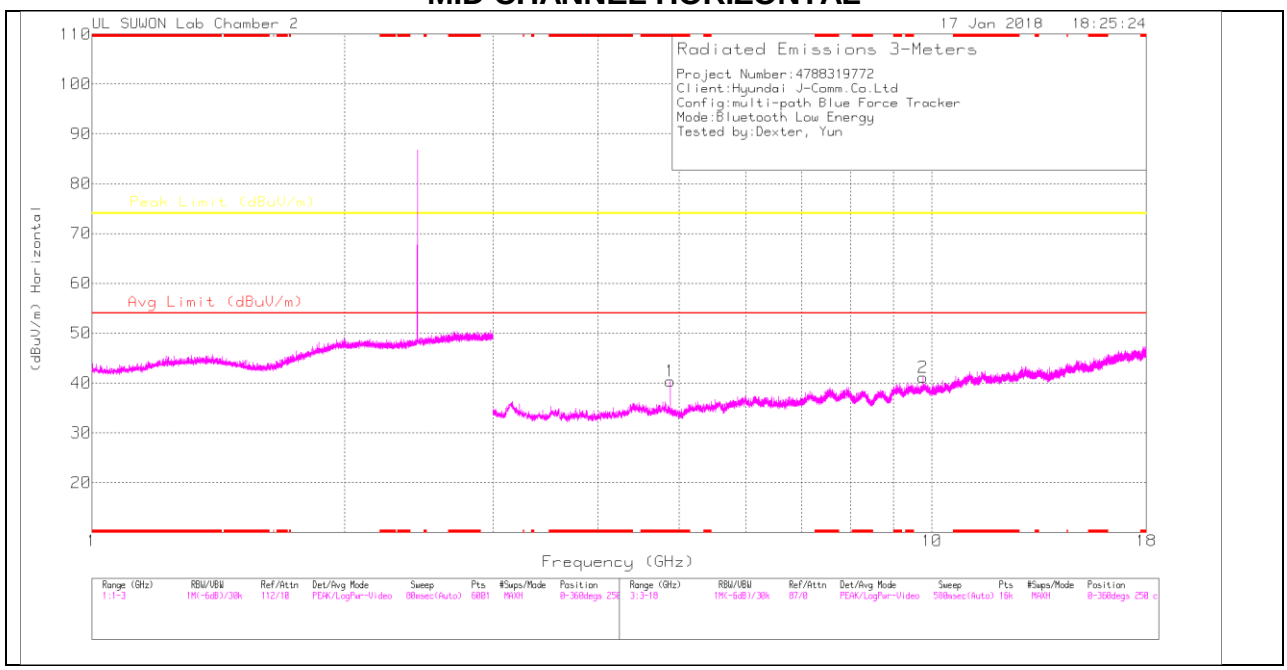
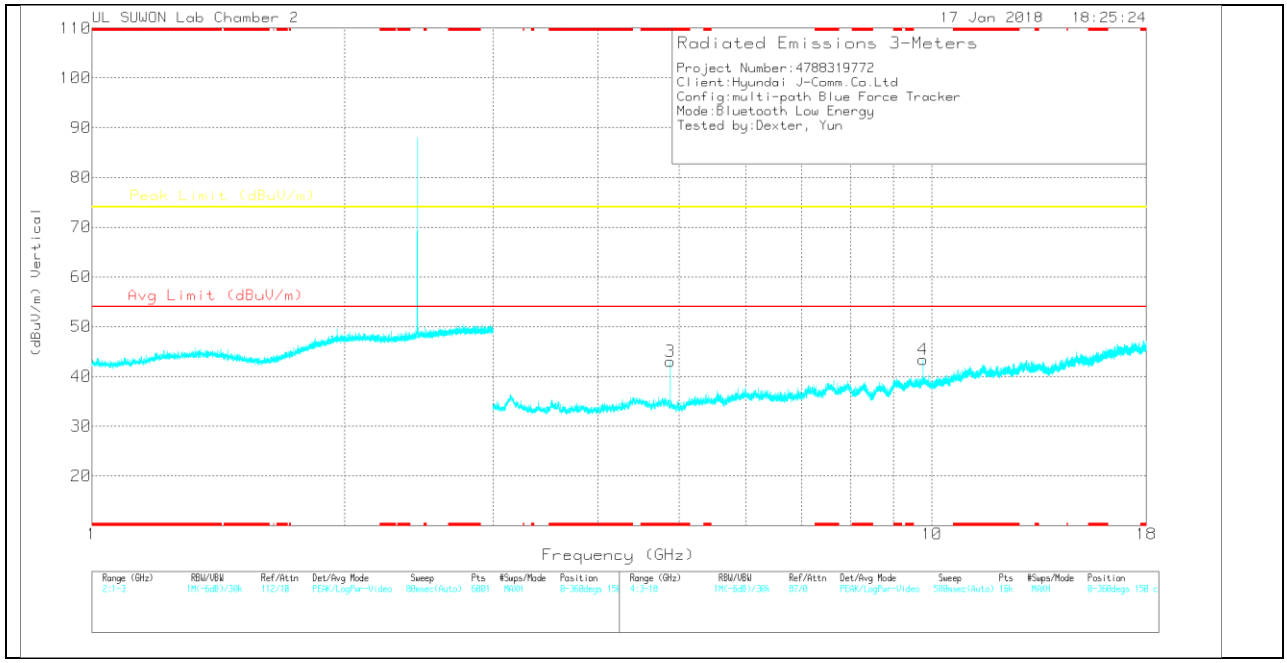
MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168724)_150619	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.88	31.12	Pk	33.8	-24.6	0	40.32	-	-	74	-33.68	0-360	250	H
2	9.761	22.26	Pk	36.9	-18	0	41.16	-	-	74	-32.84	0-360	250	H
3	* 4.88	33.83	Pk	33.8	-24.6	0	43.03	-	-	74	-30.97	0-360	250	V
4	9.761	24.45	Pk	36.9	-18	0	43.35	-	-	74	-30.65	0-360	250	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168724)_150619	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.88	37.98	PK2	33.8	-24.6	0	47.18	-	-	74	-26.82	44	147	H
* 4.88	27.95	MAv1	33.8	-24.6	2.06	39.21	54	-14.79	-	-	44	147	H
* 4.88	39.88	PK2	33.8	-24.6	0	49.08	-	-	74	-24.92	290	246	V
* 4.88	30.79	MAv1	33.8	-24.6	2.06	42.05	54	-11.95	-	-	290	246	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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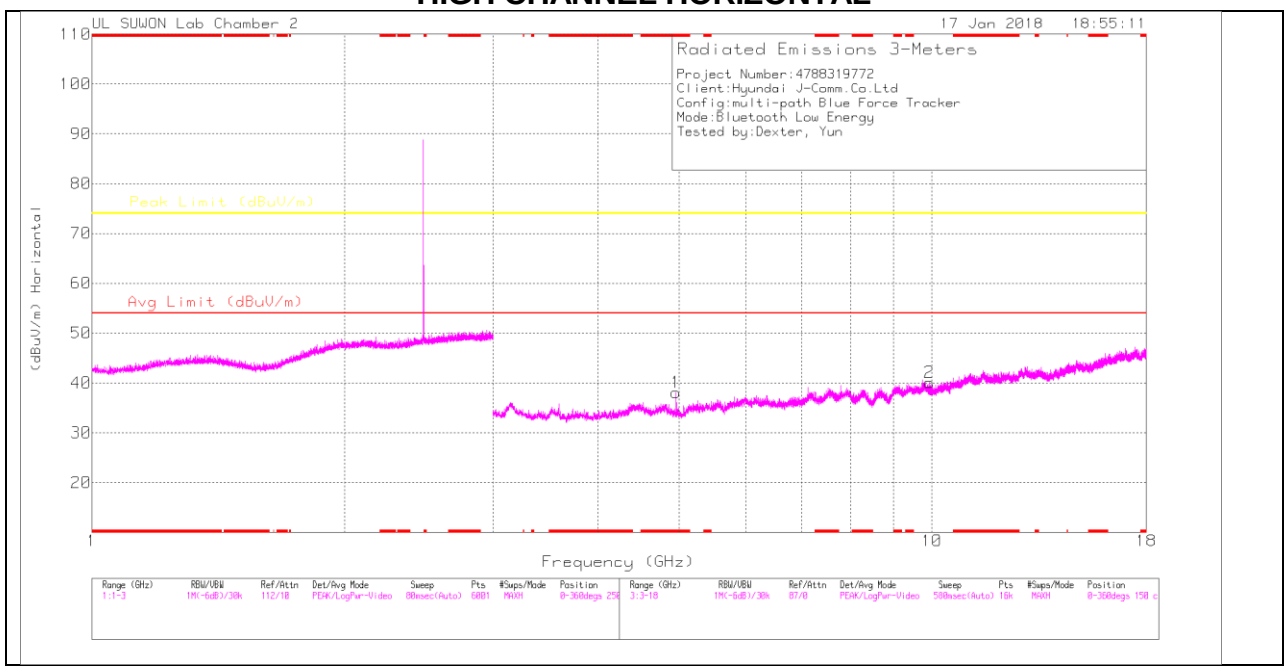
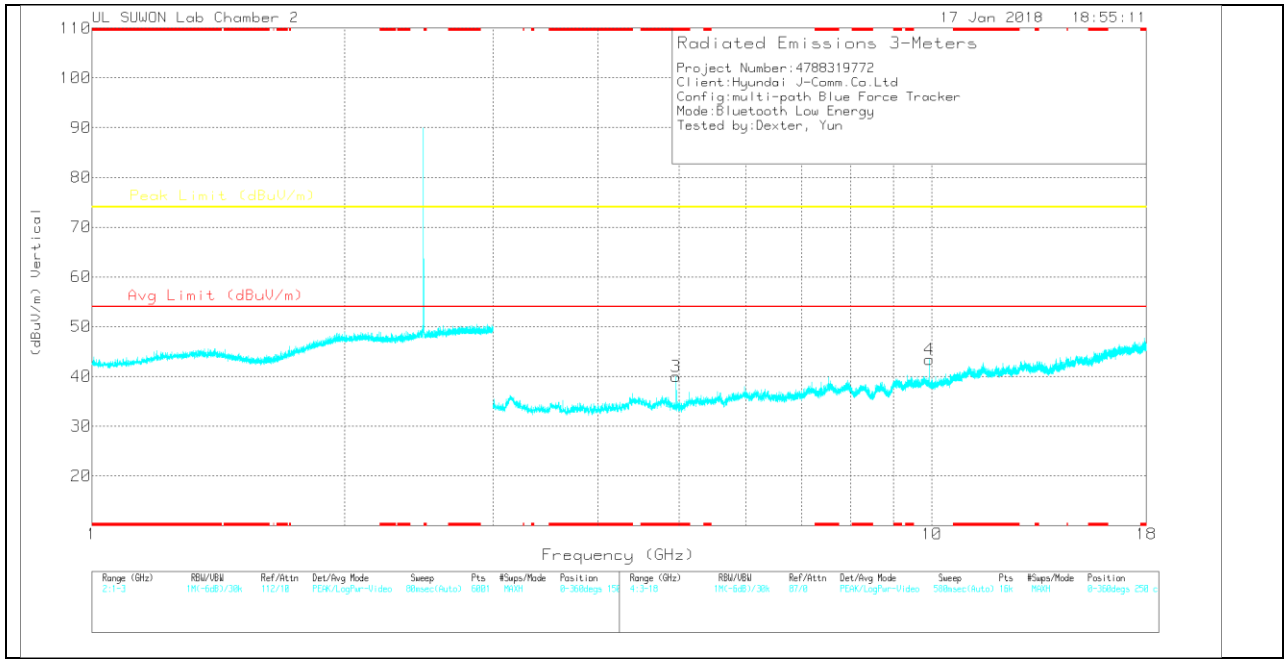
HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168724)_150619	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.96	29.01	Pk	33.8	-24.7	0	38.11	-	-	74	-35.89	0-360	250	H
2	9.919	21.04	Pk	37.1	-18	0	40.14	-	-	74	-33.86	0-360	250	H
3	* 4.959	30.83	Pk	33.8	-24.7	0	39.93	-	-	74	-34.07	0-360	150	V
4	9.919	24.27	Pk	37.1	-18	0	43.37	-	-	74	-30.63	0-360	250	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168724)_150619	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.959	36.45	PK2	33.8	-24.7	0	45.55	-	-	74	-28.45	43	125	H
* 4.96	26.02	MAv1	33.8	-24.7	2.06	37.18	54	-16.82	-	-	43	125	H
* 4.96	38.09	PK2	33.8	-24.7	0	47.19	-	-	74	-26.81	288	147	V
* 4.96	28.42	MAv1	33.8	-24.7	2.06	39.58	54	-14.42	-	-	288	147	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

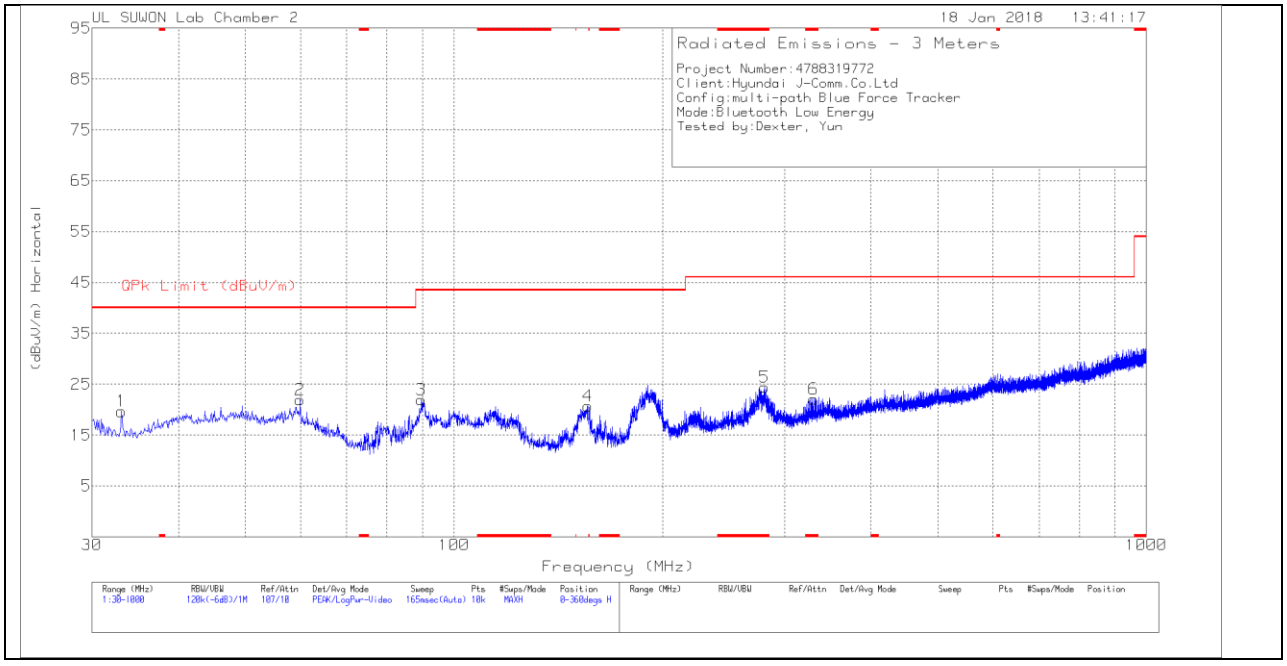
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

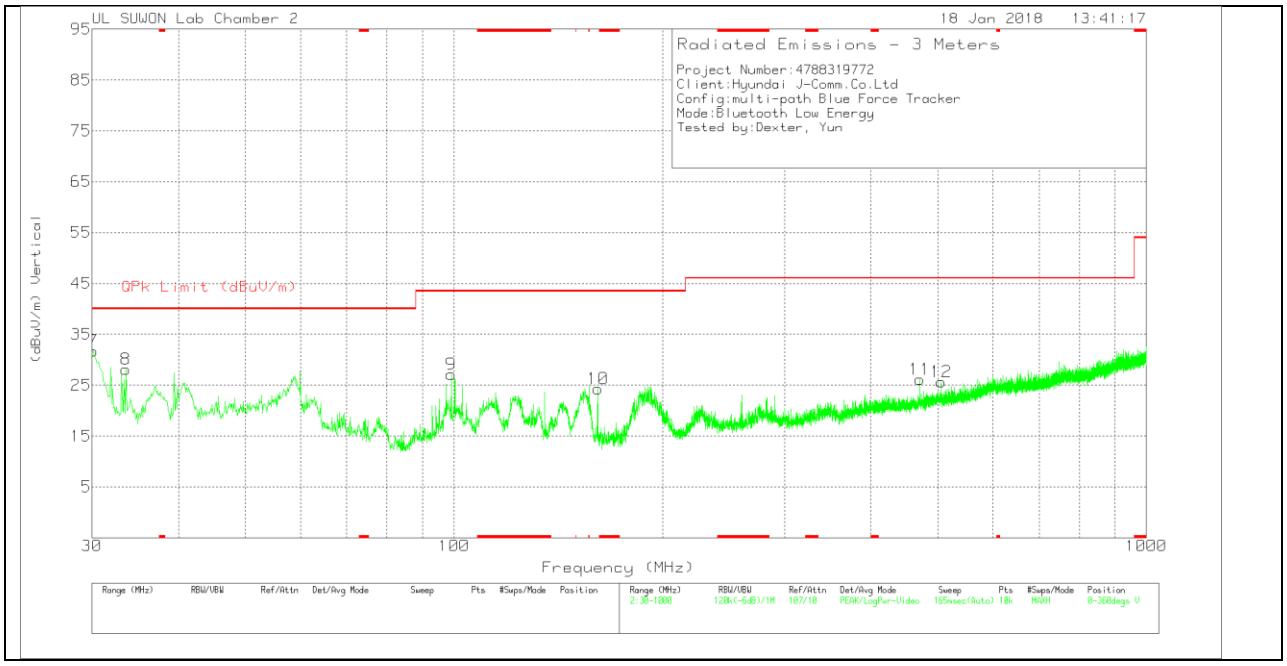
10.3. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)

HORIZONTAL PLOT



VERTICAL PLOT



BELOW 1 GHz TABLE

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163-845	30-1000MHz[dB]	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	33.104	34.55	Pk	16.7	-31.6	19.65	40	-20.35	0-360	200	H
2	59.973	34.93	Pk	18.3	-31.3	21.93	40	-18.07	0-360	400	H
3	89.752	37.58	Pk	15.5	-31.1	21.98	43.52	-21.54	0-360	200	H
4	156.1	37.42	Pk	14	-30.7	20.72	43.52	-22.8	0-360	200	H
5	* 281.036	35.87	Pk	18.6	-30.1	24.37	46.02	-21.65	0-360	100	H
6	* 330.409	32.08	Pk	19.9	-29.9	22.08	46.02	-23.94	0-360	100	H
7	30.097	47.24	Pk	16.1	-31.6	31.74	40	-8.26	0-360	100	V
8	33.589	42.97	Pk	16.8	-31.6	28.17	40	-11.83	0-360	200	V
9	99.064	40.92	Pk	17.3	-31.1	27.12	43.52	-16.4	0-360	100	V
10	161.338	40.7	Pk	14.3	-30.7	24.3	43.52	-19.22	0-360	100	V
11	470.477	33.42	Pk	22.3	-29.6	26.12	46.02	-19.9	0-360	100	V
12	505.688	32.18	Pk	23.1	-29.6	25.68	46.02	-20.34	0-360	100	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

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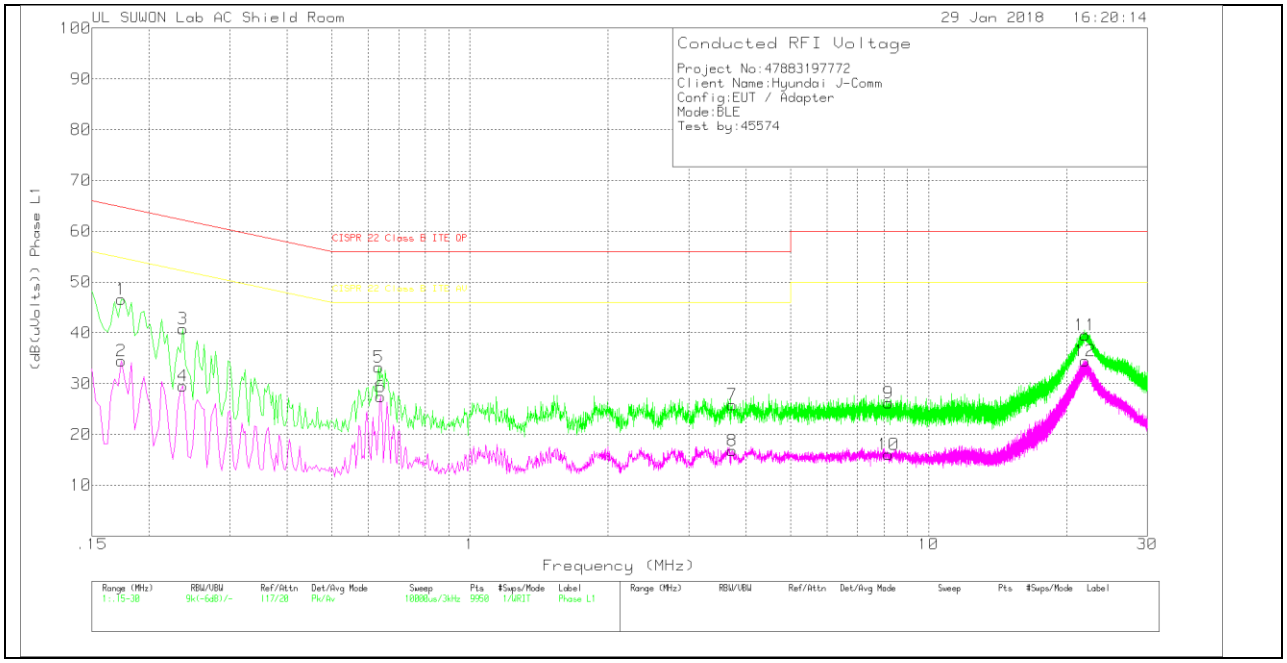
RESULTS

6 WORST EMISSIONS

LINE 1 PLOT



LINE 1 RESULTS

Trace Markers

Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101837_L1_without extension	CABLELOSS(dB)	Corrected Reading (dB(uVolts))	CISPR 22 Class B ITE QP	Margin (dB)	CISPR 22 Class B ITE AV	Margin (dB)
1	.174	36.53	Pk	9.9	.2	46.63	64.77	-18.14	-	-
2	.174	24.39	Av	9.9	.2	34.49	-	-	54.77	-20.28
3	.237	30.95	Pk	9.6	.2	40.75	62.2	-21.45	-	-
4	.237	19.71	Av	9.6	.2	29.51	-	-	52.2	-22.69
5	.633	23.25	Pk	9.8	.2	33.25	56	-22.75	-	-
6	.639	17.41	Av	9.8	.2	27.41	-	-	46	-18.59
7	3.738	15.92	Pk	9.6	.3	25.82	56	-30.18	-	-
8	3.735	6.91	Av	9.6	.3	16.81	-	-	46	-29.19
9	8.193	16.2	Pk	9.7	.3	26.2	60	-33.8	-	-
10	8.181	6.08	Av	9.7	.3	16.08	-	-	50	-33.92
11	21.936	29.33	Pk	9.8	.4	39.53	60	-20.47	-	-
12	21.936	24.29	Av	9.8	.4	34.49	-	-	50	-15.51

Pk - Peak detector

Av - Average detection

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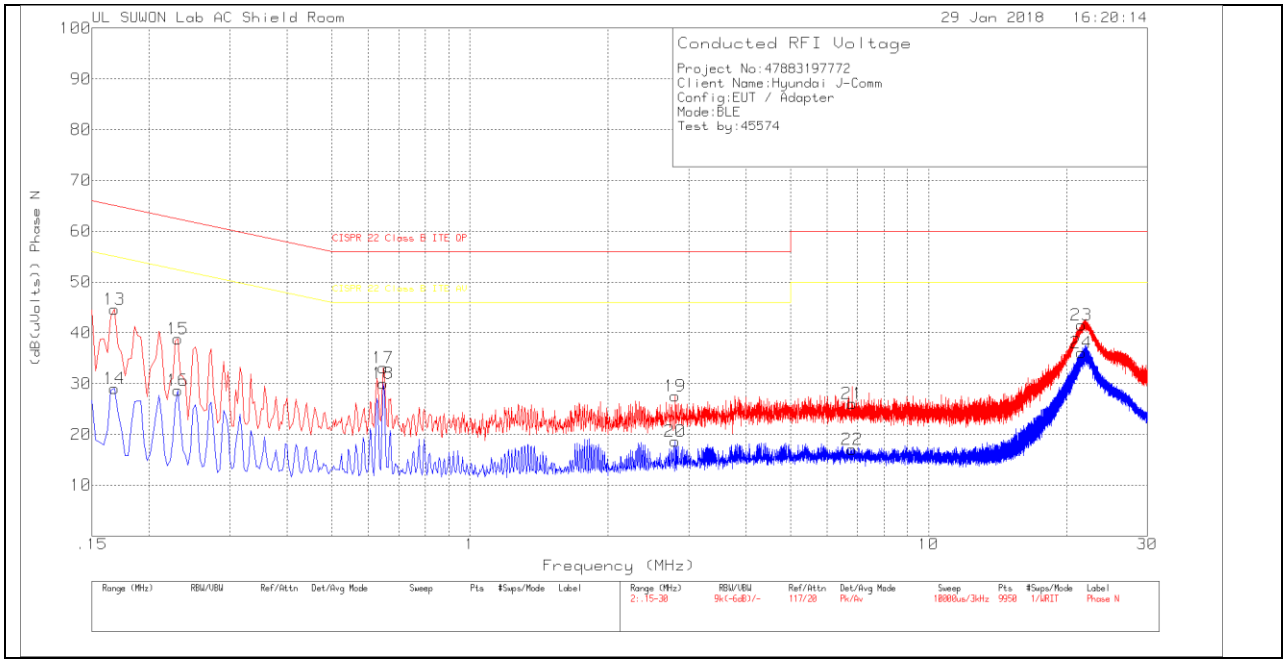
LINE 2 PLOT



LINE 2 RESULTS

Trace Markers

Range 2: Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101837_N_with out extension	CABLELOSS(dB)	Corrected Reading (dB(uVolts))	CISPR 22 Class B ITE QP	Margin (dB)	CISPR 22 Class B ITE AV	Margin (dB)
13	.168	34.61	Pk	9.9	.1	44.61	65.06	-20.45	-	-
14	.168	19.07	Av	9.9	.1	29.07	-	-	55.06	-25.99
15	.231	28.9	Pk	9.7	.2	38.8	62.41	-23.61	-	-
16	.231	18.72	Av	9.7	.2	28.62	-	-	52.41	-23.79
17	.648	23.07	Pk	9.8	.2	33.07	56	-22.93	-	-
18	.648	20.05	Av	9.8	.2	30.05	-	-	46	-15.95
19	2.805	17.61	Pk	9.6	.3	27.51	56	-28.49	-	-
20	2.805	8.7	Av	9.6	.3	18.6	-	-	46	-27.4
21	6.825	16.1	Pk	9.7	.3	26.1	60	-33.9	-	-
22	6.822	7.04	Av	9.7	.3	17.04	-	-	50	-32.96
23	21.525	31.31	Pk	9.8	.4	41.51	60	-18.49	-	-
24	21.54	25.93	Av	9.8	.4	36.13	-	-	50	-13.87

Pk - Peak detector

Av - Average detection

END OF REPORT

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