ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Product Name:	**2.4G wireless microphone**
Brand Name:	**dynamike**
Model No.:	**NT205**
Model Difference:	**N/A**
FCC ID:	**WOUNT205**
Report No.:	**E2/2017/90001**
Issue Date:	**Sep. 26, 2017**
FCC Rule Part:	**§15.249**
Prepared for:	**NEATRON CORPORATION 5F., No.515, Sec. 3, Ming Chih Rd., Taishan Dist., New Taipei City 243, Taiwan (R.O.C.)**
Prepared by:	**SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan Township, Taoyuan County, Taiwan 333**

Testing Laboratory
0513

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VERIFICATION OF COMPLIANCE

Applicant:	NEATRON CORPORATION 5F., No.515, Sec. 3, Ming Chih Rd., Taishan Dist., New Taipei City 243, Taiwan (R.O.C.)
Product Name:	2.4G wireless microphone
Brand Name:	dynamike
Model No.:	NT205
Model Difference:	N/A
FCC ID:	WOUNT205
File Number:	E2/2017/90001
Date of test:	Sep. 01, 2017 ~ Sep. 21, 2017
Date of EUT Received:	Sep. 01, 2017

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Test By:	Vito	***Date:***	Sep. 26, 2017
	Vito Pei / Sr. Engineer		
Prepared By:	Tiffany Kao	***Date:***	Sep. 26, 2017
	Tiffany Kao / Clerk		
Approved By:	Jim Chang	***Date:***	Sep. 26, 2017
	Jim Chang / Asst. Manager		

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Revision History

Report Number	Revision	Description	Issue Date
E2/2017/90001	Rev.00	Initial creation of document	Sep. 26, 2017

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1 GENERAL INFORMATION

1.1 Product Description

General:

Product Name:	2.4G wireless microphone	
Brand Name:	dynamike	
Model No.:	NT205	
Model Difference:	N/A	
USB Cable:	Model No.: N/A, Supplier: N/A	
Microphone:	Model No.: N/A, Supplier: N/A	
Hardware Version:	N/A	
Software Version:	N/A	
Operation Frequency:	2403MHz ~ 2479MHz	
Channel number:	32 channels	
Modulation Type:	FSK(GFSK)	
Power Supply:	3.7Vdc from Rechargeable Li-polymer Battery or 5V from USB cable	
	Battery:	Model No.: N/A, Supplier: N/A
Antenna Designation:	Internal Antenna, Peak Gain: 0dBi	

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1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.249

ANSI C63.10:2013

Note:

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

1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333 (TAF code 0513)

FCC Registration Numbers are: 735305

1.4 Special Accessories

There are no special accessories used while test was conducted.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz,. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table. For emissions testing at or below 1 GHz, the table height shall be 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

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2.5 Limitation

(1) Conducted Emission

Conducted Emission Limits is as following.

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 – 0.5	66 - 56	56 - 46
0.5 – 5	56	46
5 - 30	60	50

(2) Radiated Emission

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following.

Frequency (MHz)	Field strength of Fundamental	Field strength of Harmonics	Distance (m)
902 – 928	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
2400 – 2483.5	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
5725 – 5875	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
24.0 – 24.25 GHz	250 mV/m (107.95dBuV/m)	2500 uV/m (67.95dBuV/m)	3

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(3) Radiated Emission

Emission Radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits as below, whichever is the lesser attenuation.

Frequency (MHz)	Field strength μV/m	Distance (m)	Field strength at 3m dBμV/m
1.705-30	30	30	69.54
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

(4) Radiated Emission

For frequencies above 1000MHz, the above field strength limits are based on average limits. The peak filed strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20dB under any condition of modulation.

Remark:

1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of ξ 15.205 and RSS-Gen § 8.10
4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of ξ15.205 and RSS-Gen § 8.10, then the general radiated emission limits in ξ 15.209 and RSS-Gen § 8.9 apply.

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2.6 Configuration of Tested System

Fig. 2-1 Radiated Emission & Conducted (Antenna Port) Configuration

Fig. 2-3 AC Power Line Conducted Emission

Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Mod-el/Type No.	Series No.	Data Cable	Power Cord
1.	2.4GHz Wireless Test Software	N/A	N/A	N/A	N/A	N/A
2.	Notebook	Lenovo	L430	P0000081	Shielded	Unshielded

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3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	N/A
§15.249(a)(d)(e)	Radiated Emission	Compliant
§15.215(c)	20dB Bandwidth Measurement	Compliant

4 DESCRIPTION OF TEST MODES

4.1 Operated in 2400 ~ 2483.5MHz Band

32 channels are provided.

Channel	Frequency
0	2403, 2446
1	2405, 2450
2	2407, 2452
3	2409, 2454
4	2411, 2456
5	2413, 2458
6	2418, 2460
7	2420, 2462
8	2422, 2466
9	2424, 2468
10	2426, 2470
11	2428, 2474
12	2436, 2476
13	2438, 2479
14	2442, 2415
15	2432, 2472

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4.2 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED FREQUENCY	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
2.4G	0~31	2403, 2442, 2479	FSK(GFSK)	N/A	MAIN
RADIATED EMISSION TEST (ABOVE 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED FREQUENCY	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
2.4G	0~31	2403, 2442, 2479	FSK(GFSK)	N/A	MAIN

Note:
The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 2.4GHz Wireless Transmitter for channel Low, Mid and High, the worst case E2 position was reported.

ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST					
MODE	AVAILABLE CHANNEL	TESTED FREQUENCY	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
2.4G	0~31	2403, 2442, 2479	FSK(GFSK)	N/A	MAIN

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5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
20dB & 99% Bandwidth	+/- 51.33 Hz
100 kHz Bandwidth Of Frequency Band Edges	+/- 0.84 dB
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : **Vertical**)	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : **Horizontal**)	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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6 CONDUCTED EMISSION TEST

6.1 Standard Applicable:

Frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Note
1.The lower limit shall apply at the transition frequencies
2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

6.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
EMI Test Receiver	R&S	ESCI 7	100950	12/12/2016	12/11/2017
Coaxial Cables	N/A	N30N30-1042-1 50cm	N/A	08/30/2017	08/29/2018
LISN	Schwarzbeck	NSLK 8127	8127-648	06/18/2017	06/17/2018
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.

6.3 EUT Setup:

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

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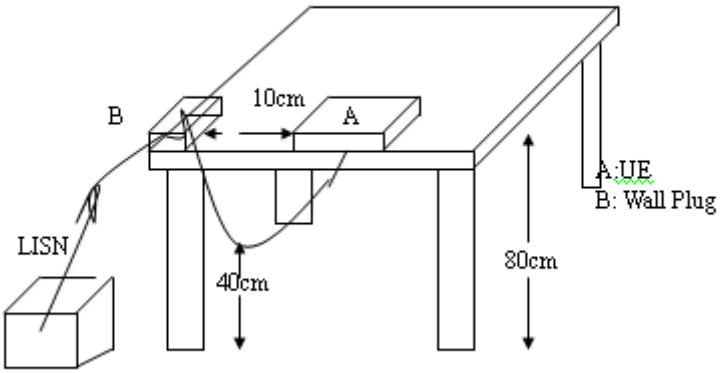
6.4 Test SET-UP (Block Diagram of Configuration)



6.5 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all phases of power being supplied by given UE are completed

6.6 Measurement Result:

Note: Refer to next page for measurement data and plots.

Note2: The * reveals the worst-case results that closet to the limit.

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AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode			Test Date:	Sep. 13, 2017
Temperature:	20 ℃	Humidity:	58 %	Test By:	Aken
				Phase:	L1

Site : Conduction Room
Limit: FCC Class B Conduction(QP)
Mode: NT201
Note:

Phase: L1
Power: AC 120V/60Hz

Temperature: 23 ℃
Humidity: 71 %

Conducted Emission

File :Condution Data :#771 Date: 2017/9/13 Time: 下午 05:29:16

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1740	29.21	19.65	48.86	64.77	-15.91	peak	
2		0.2140	25.06	19.66	44.72	63.05	-18.33	peak	
3		0.4820	21.22	20.10	41.32	56.30	-14.98	peak	
4		2.3940	16.62	20.49	37.11	56.00	-18.89	peak	
5	*	3.8340	21.16	20.27	41.43	56.00	-14.57	peak	
6		5.6620	15.96	20.09	36.05	60.00	-23.95	peak	

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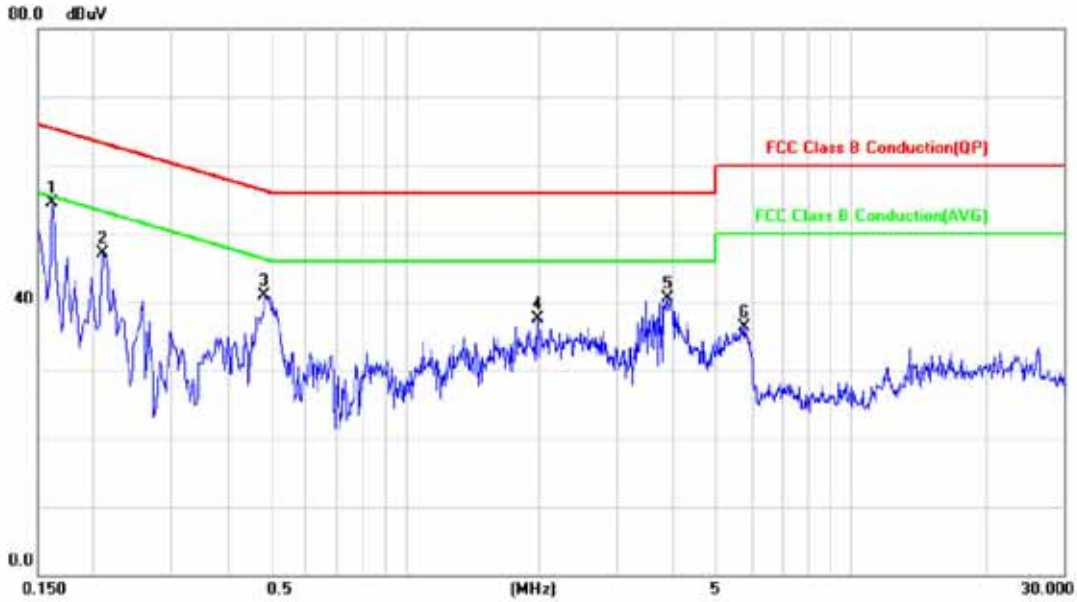
Site :	Conduction Room	Phase:	N	Temperature:	23 ℃
Limit:	FCC Class B Conduction(QP)	Power:	AC 120V/60Hz	Humidity:	71 %
Mode:	NT201				
Note:					

Conducted Emission

File :Condution Data :#772 Date: 2017/9/13 Time: 下午 05:30:40



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1620	34.96	19.50	54.46	65.36	-10.90	peak	
2		0.2100	27.55	19.51	47.06	63.21	-16.15	peak	
3		0.4860	20.89	19.97	40.86	56.24	-15.38	peak	
4		1.9860	17.03	20.41	37.44	56.00	-18.56	peak	
5		3.8820	20.33	20.12	40.45	56.00	-15.55	peak	
6		5.7900	16.39	19.95	36.34	60.00	-23.66	peak	

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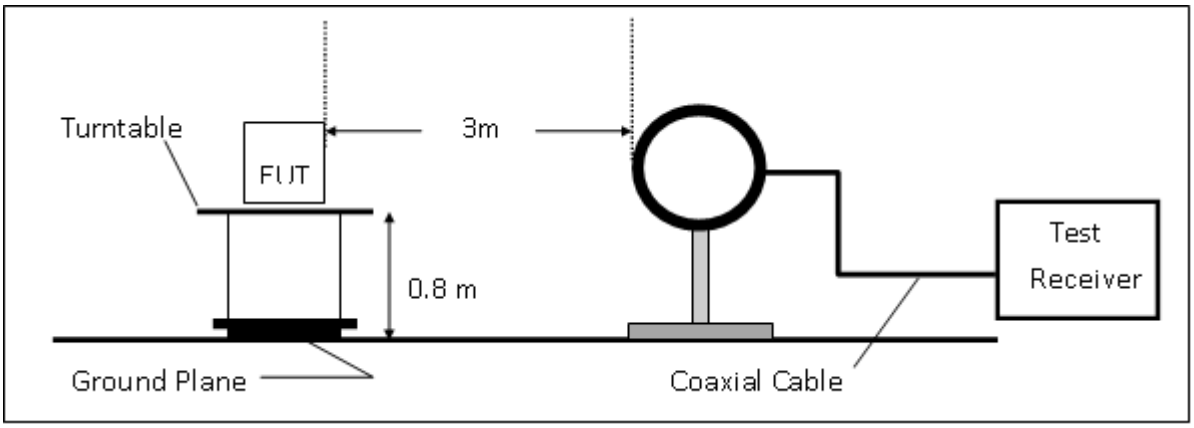
7 Radiated Emission Test

7.1. Measurement Procedure

1. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.

7.2. Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



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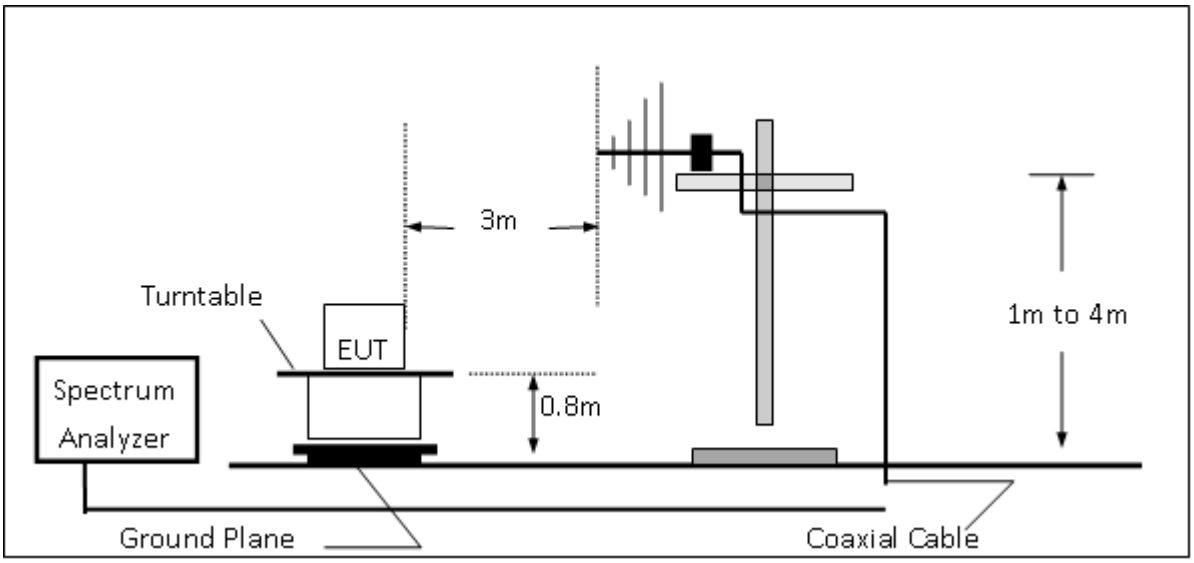
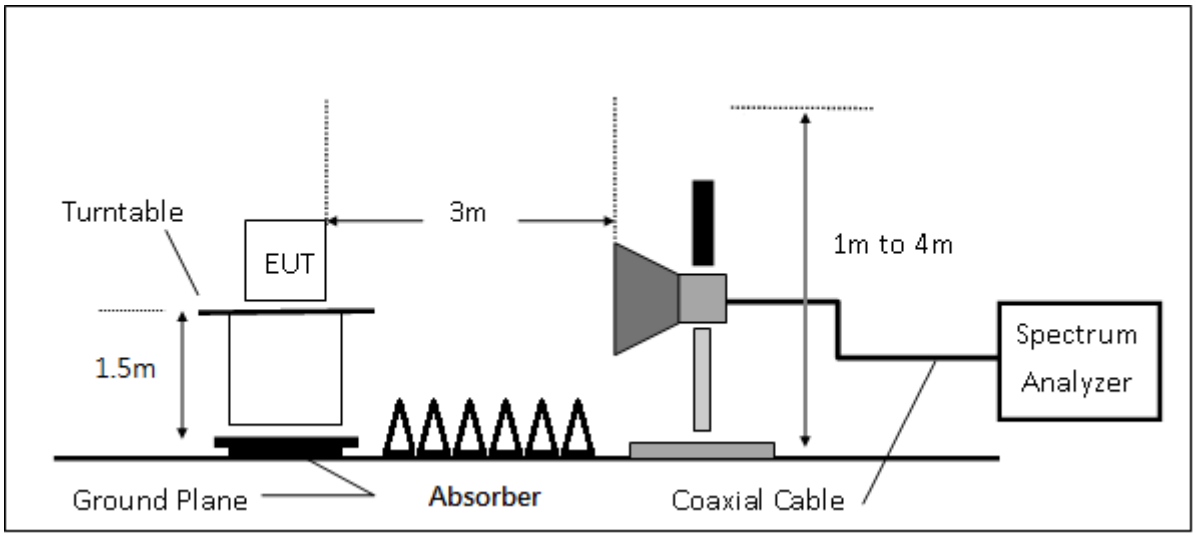
(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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7.3. Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESU 40	100363	04/18/2017	04/17/2018
Loop Antenna	ETS-Lindgren	6502	00143303	12/23/2016	12/22/2017
Broadband Antenna	TESEQ	CBL 6112D	35240	11/03/2016	11/02/2017
Horn Antenna	ETS-Lindgren	3117	00143272	12/15/2016	12/16/2017
Horn Antenna	Schwarzbeck	BBHA9170	185	08/01/2017	07/31/2018
Pre Amplifier	EMC Instruments	EMC330	980096	12/12/2016	12/11/2017
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/12/2016	12/11/2017
Pre Amplifier	R&S	SCU-18	10204	12/12/2016	12/11/2017
Pre Amplifier	R&S	SCU-26	100780	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/12/2016	12/11/2017
Attenuator	WOKEN	218FS-10	RF27	12/12/2016	12/11/2017
Site NSA	SGS	966 Chamber C	SAC-C	03/02/2017	03/01/2018
Site VSWR	SGS	966 Chamber C	SAC-C	03/02/2017	03/01/2018
DC Power Supply	HOLA	DP-3003	D7070035	05/04/2017	05/03/2018
Controller	MF	MF-7802	N/A	N.C.R.	N.C.R.
Antenna Master	MF	N/A	N/A	N.C.R.	N.C.R.
Turn Table	MF	N/A	N/A	N.C.R.	N.C.R.
Test Software	World-Pallas	Dr. E	V 3.0 Lite	N.C.R.	N.C.R.

Note: N.C.R refers to Not Calibrated Required

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7.4. Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)
Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)
Note : "**F**" : denotes Fundamental Frequency. ; "**H**" : denotes Harmonic Frequency.
"**E**" : denotes Band Edge Frequency. ; "**S**" : denotes Spurious Frequency.

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7.5. Measurement Result

Radiated Spurious Emission Measurement Result

Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2403 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Main CH Low	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2403.67	F	Peak	94.62	1.02	95.64	114	-18.36
2403.67	F	Average	50.23	1.02	51.25	94	-42.75

Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2403 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Main CH Low	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2403.58	F	Peak	105.83	1.02	106.86	114	-7.14
2403.58	F	Average	53.85	1.02	54.87	94	-39.13

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Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2442 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Main CH Mid	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2442.06	F	Peak	94.46	0.83	95.29	114	-18.71
2442.06	F	Average	50.26	0.83	51.09	94	-42.91

Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2442 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Main CH Mid	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2442.05	F	Peak	105.39	0.83	106.22	114	-7.78
2442.05	F	Average	56.39	0.83	57.22	94	-36.78

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Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2479 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Main CH High	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2479.07	F	Peak	94.45	1.17	95.62	114	-18.38
2479.07	F	Average	51.71	1.17	52.88	94	-41.12

Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2479 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Main CH High	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2479.06	F	Peak	105.43	1.17	106.60	114	-7.40
2479.06	F	Average	56.06	1.17	57.23	94	-36.77

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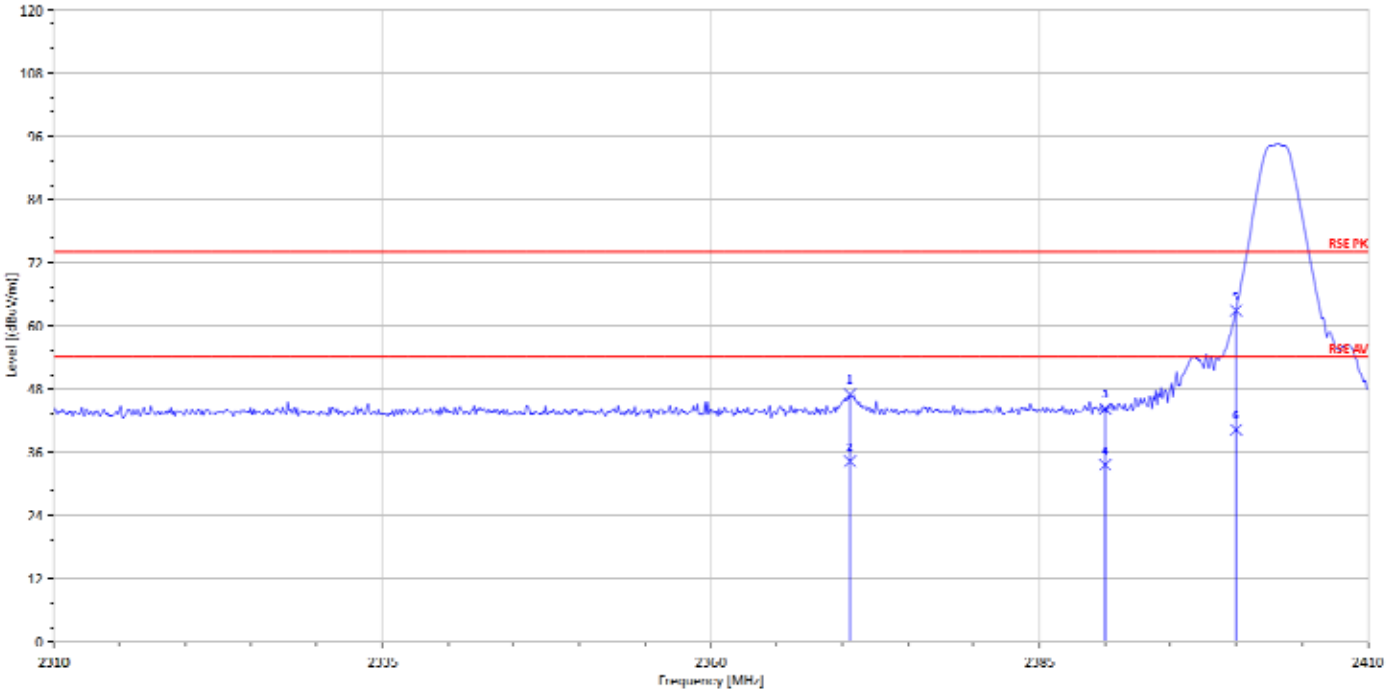
Radiated Spurious Emission Measurement Result

Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2403 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH Low	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2370.60	S	Peak	46.28	0.72	47.00	74	-27.00
2370.60	S	Average	33.44	0.72	34.16	54	-19.84
2390.00	E	Peak	43.34	0.92	44.27	74	-29.73
2390.00	E	Average	32.56	0.92	33.48	54	-20.52
2400.00	S	Peak	61.92	1.01	62.92	74	-11.08
2400.00	S	Average	39.23	1.01	40.24	54	-13.76

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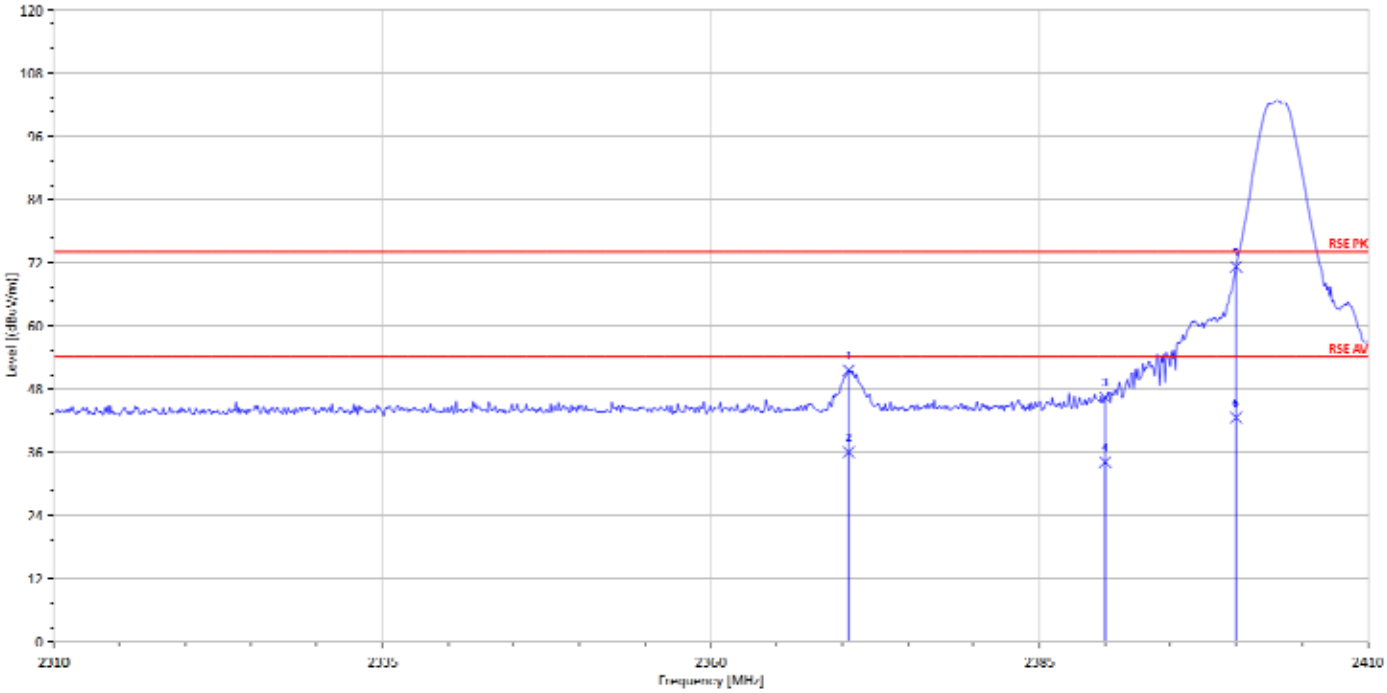
Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2403 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH Low	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2370.50	S	Peak	50.75	0.72	51.47	74	-22.53
2370.50	S	Average	35.21	0.72	35.93	54	-18.07
2390.00	E	Peak	45.51	0.92	46.43	74	-27.57
2390.00	E	Average	33.09	0.92	34.01	54	-19.99
2400.00	S	Peak	70.14	1.01	71.15	74	-2.85
2400.00	S	Average	41.55	1.01	42.56	54	-11.44

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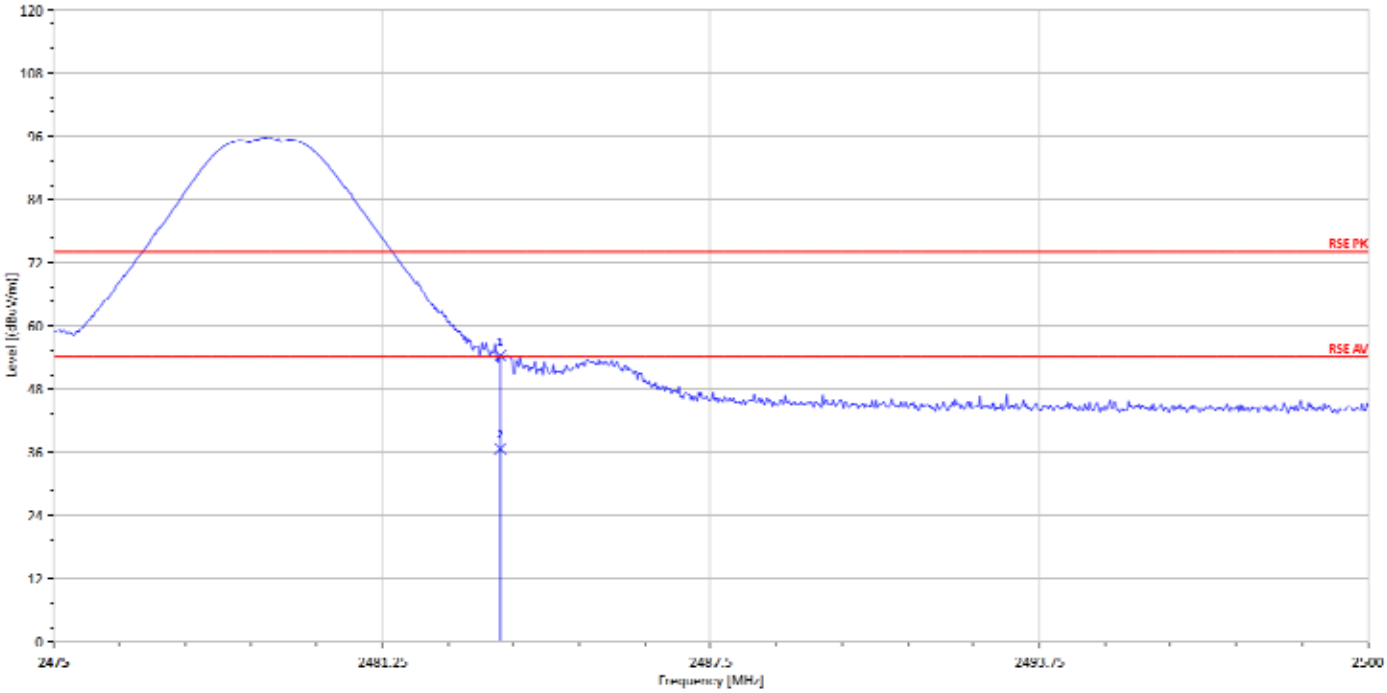
Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2479 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH High	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Peak	53.08	1.16	54.24	74	-19.76
2483.50	E	Average	35.43	1.16	36.59	54	-17.41

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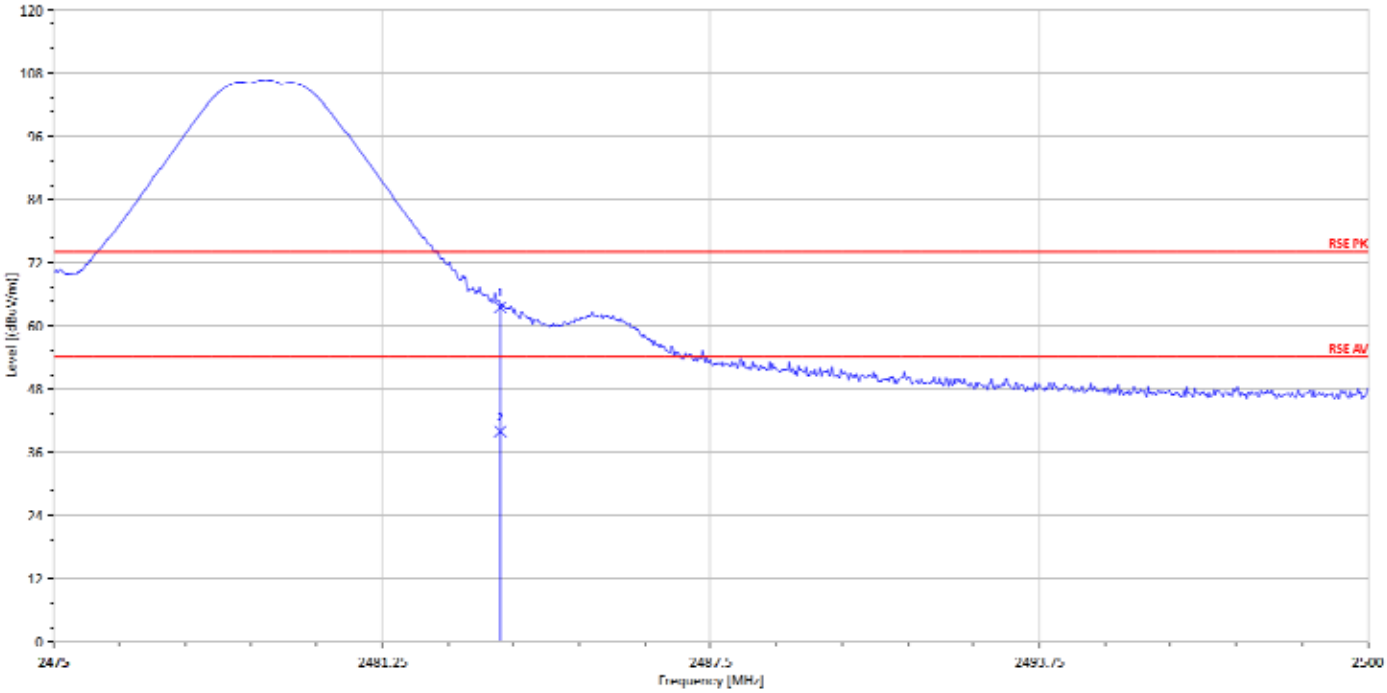
Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2479 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH High	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Peak	62.38	1.16	63.54	74	-10.46
2483.50	E	Average	38.74	1.16	39.90	54	-14.10

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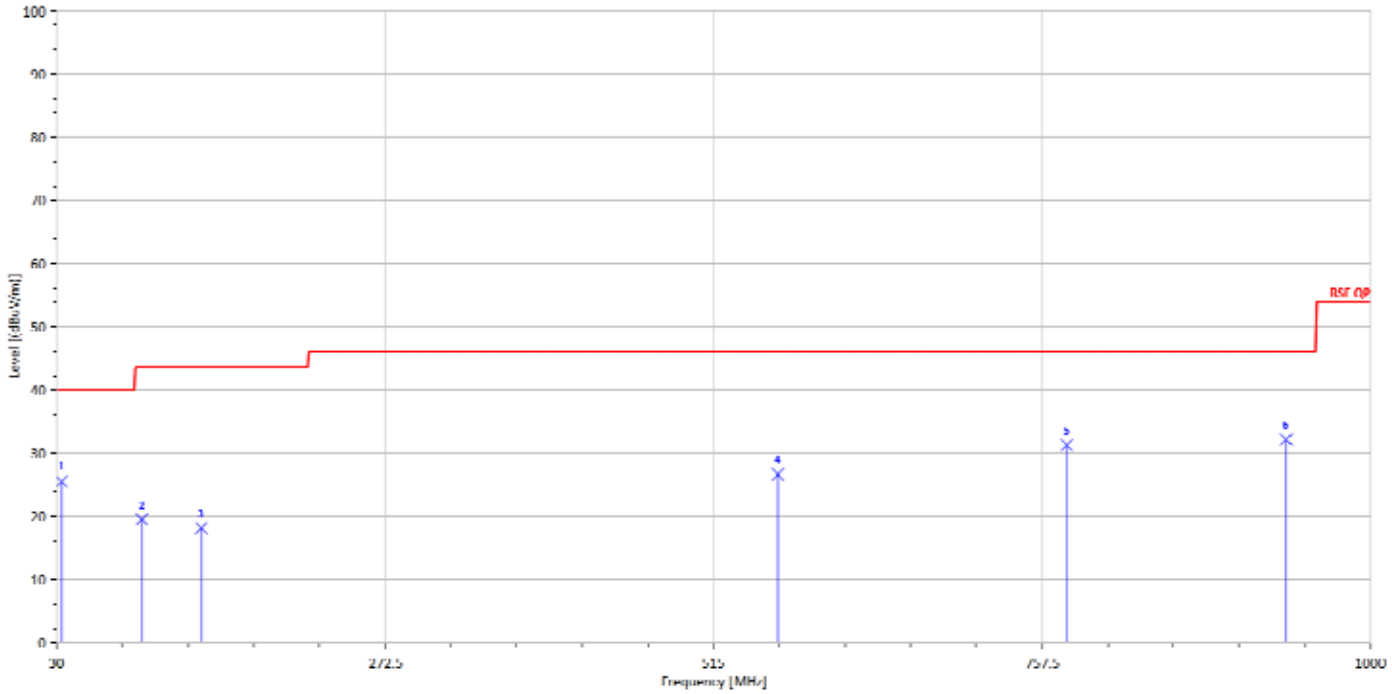
Radiated Spurious Emission Measurement Result (Below 1GHz)

Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2403 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
33.88	S	Peak	34.81	-9.27	25.54	40	-14.46
93.05	S	Peak	38.43	-18.95	19.48	43.5	-24.02
136.70	S	Peak	33.92	-15.82	18.10	43.5	-25.40
562.53	S	Peak	32.92	-6.30	26.62	46	-19.38
775.93	S	Peak	36.01	-4.80	31.21	46	-14.79
937.92	S	Peak	33.82	-1.71	32.11	46	-13.89

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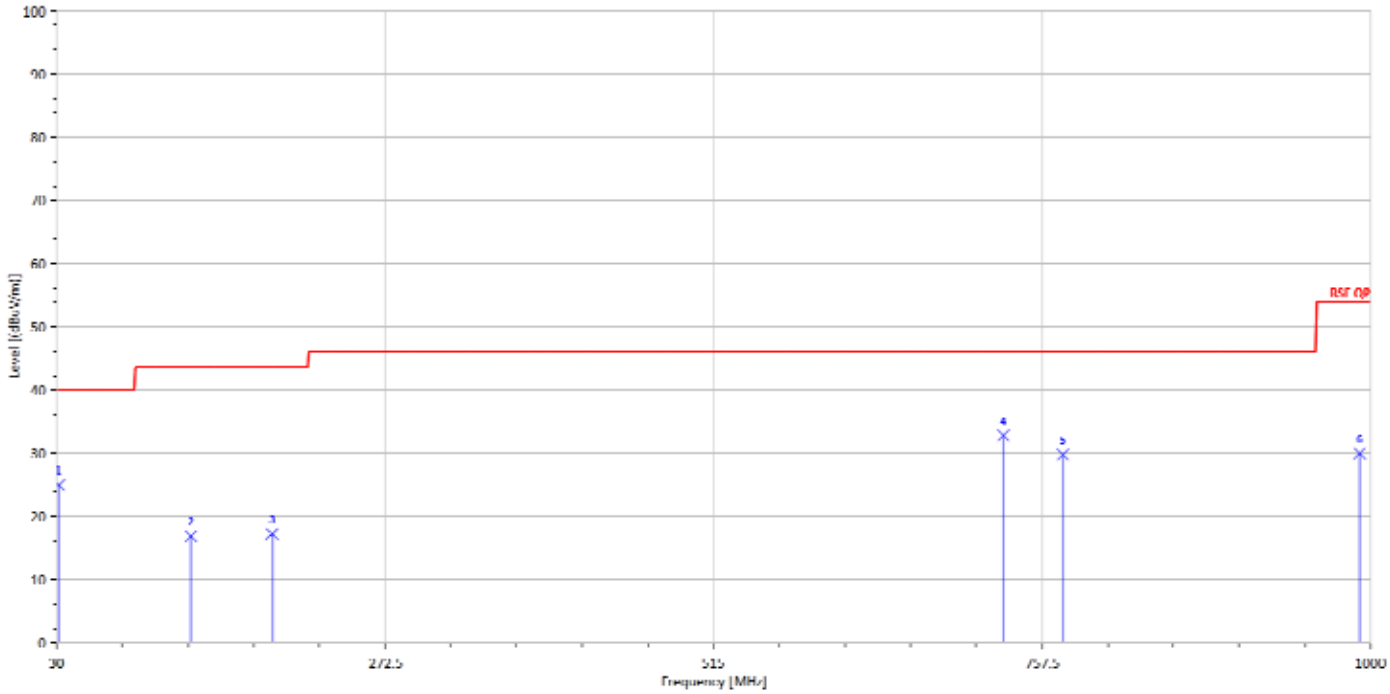
Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2403 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
31.94	S	Peak	33.19	-8.22	24.97	40	-15.03
128.94	S	Peak	32.42	-15.62	16.80	43.5	-26.70
189.08	S	Peak	35.55	-18.38	17.17	43.5	-26.33
729.37	S	Peak	37.40	-4.64	32.76	46	-13.24
773.02	S	Peak	34.28	-4.59	29.69	46	-16.31
992.24	S	Peak	30.64	-0.74	29.89	54	-24.11

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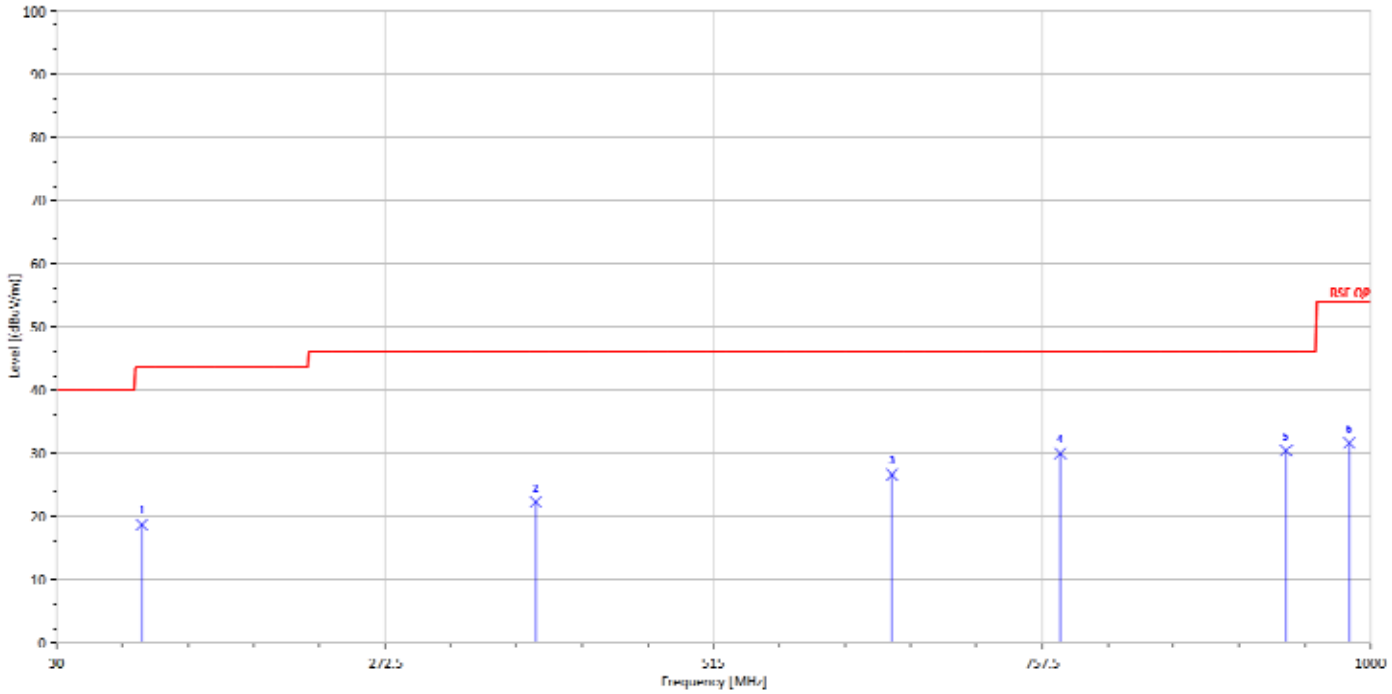
Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2442 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
93.05	S	Peak	37.58	-18.95	18.63	43.5	-24.87
384.05	S	Peak	32.55	-10.27	22.27	46	-23.73
646.92	S	Peak	31.48	-4.92	26.56	46	-19.44
771.08	S	Peak	34.24	-4.35	29.90	46	-16.10
937.92	S	Peak	32.06	-1.71	30.35	46	-15.65
984.48	S	Peak	32.35	-0.80	31.55	54	-22.45

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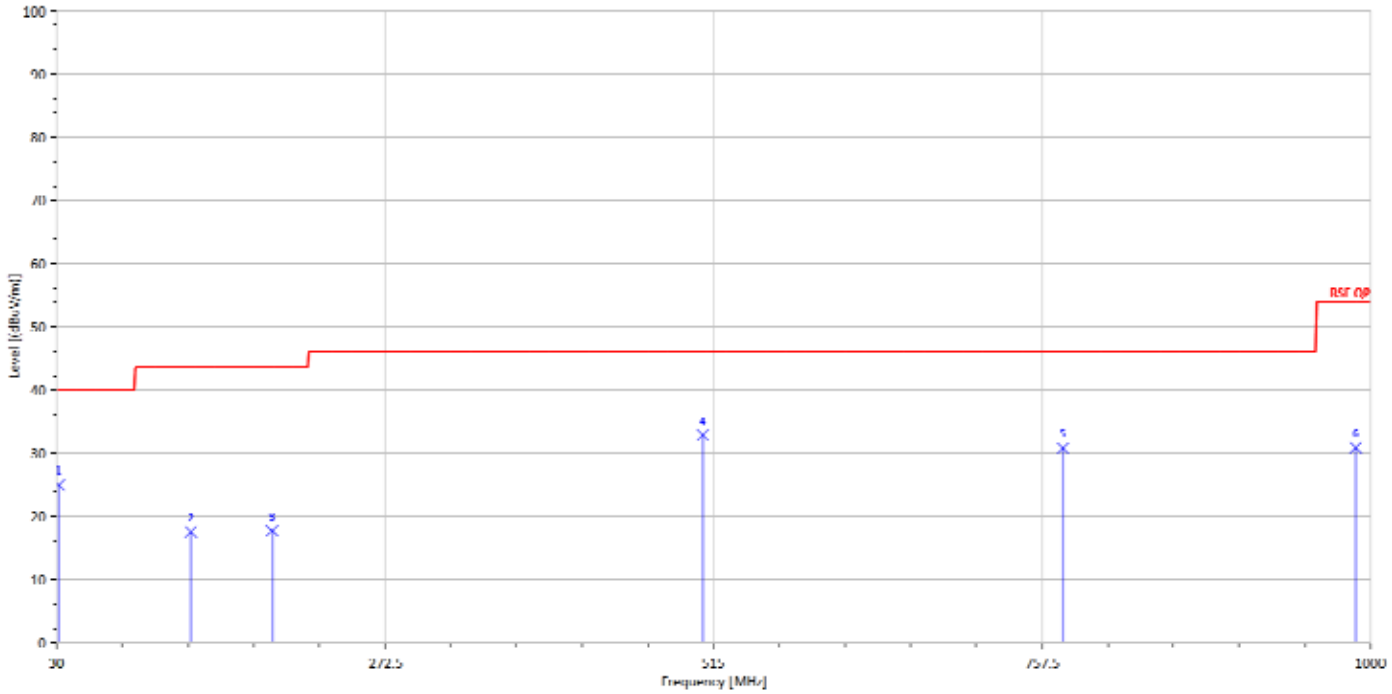
Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2442 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
31.94	S	Peak	33.19	-8.22	24.97	40	-15.03
128.94	S	Peak	33.11	-15.62	17.48	43.5	-26.02
189.08	S	Peak	36.04	-18.38	17.66	43.5	-25.84
507.24	S	Peak	40.76	-7.94	32.82	46	-13.18
773.02	S	Peak	35.31	-4.59	30.72	46	-15.28
989.33	S	Peak	31.46	-0.66	30.80	54	-23.20

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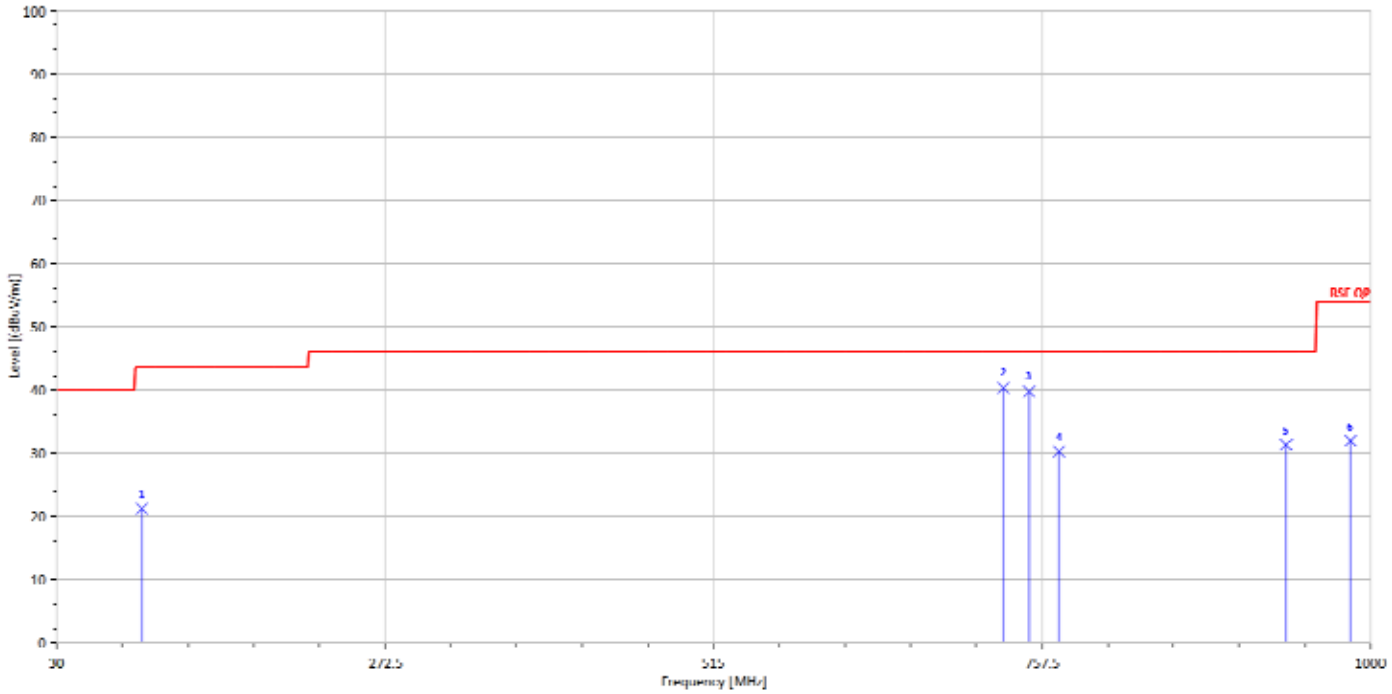
Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2479 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
93.05	S	Peak	40.17	-18.95	21.21	43.5	-22.29
729.37	S	Peak	45.01	-4.64	40.37	46	-5.63
747.80	S	Peak	43.95	-4.16	39.79	46	-6.21
770.11	S	Peak	34.53	-4.33	30.20	46	-15.80
937.92	S	Peak	32.99	-1.71	31.27	46	-14.73
985.45	S	Peak	32.62	-0.72	31.90	54	-22.10

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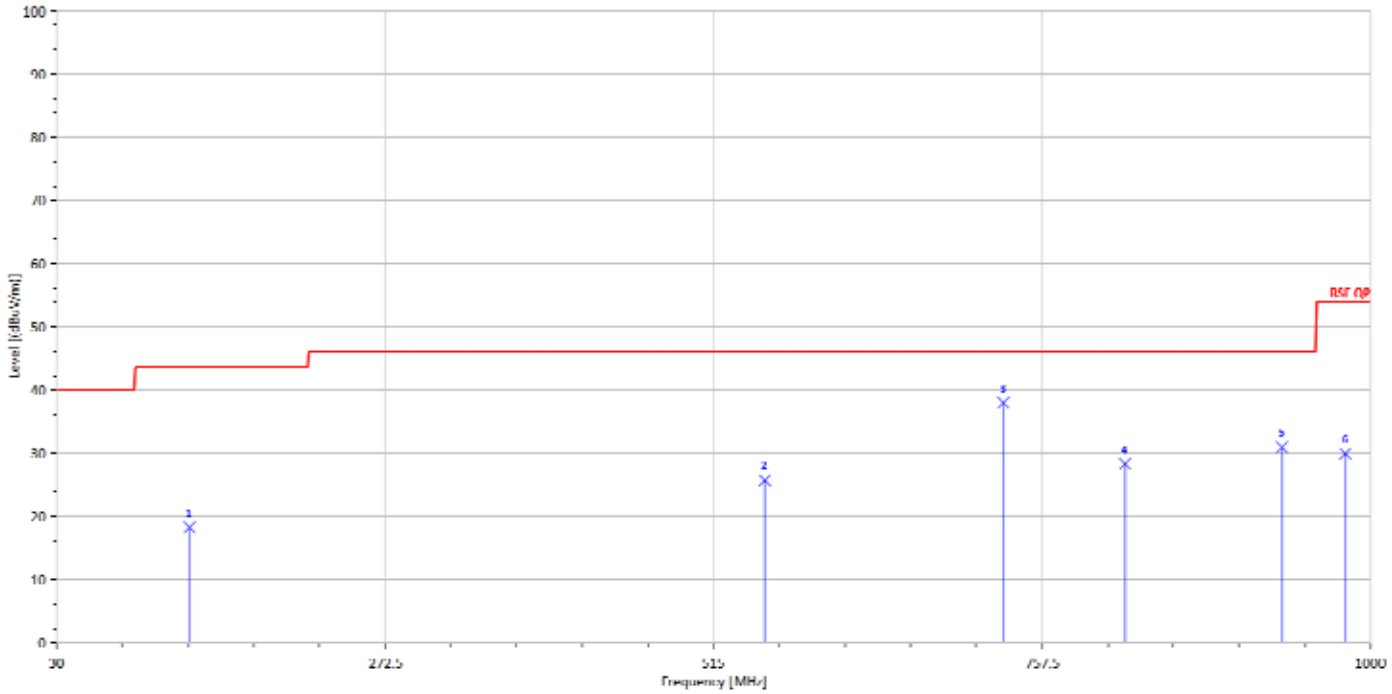
Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2479 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
127.97	S	Peak	33.82	-15.62	18.20	43.5	-25.30
552.83	S	Peak	32.52	-6.78	25.74	46	-20.26
729.37	S	Peak	42.63	-4.64	37.99	46	-8.01
818.61	S	Peak	31.24	-3.02	28.22	46	-17.78
935.01	S	Peak	32.47	-1.59	30.88	46	-15.12
981.57	S	Peak	30.78	-0.92	29.87	54	-24.13

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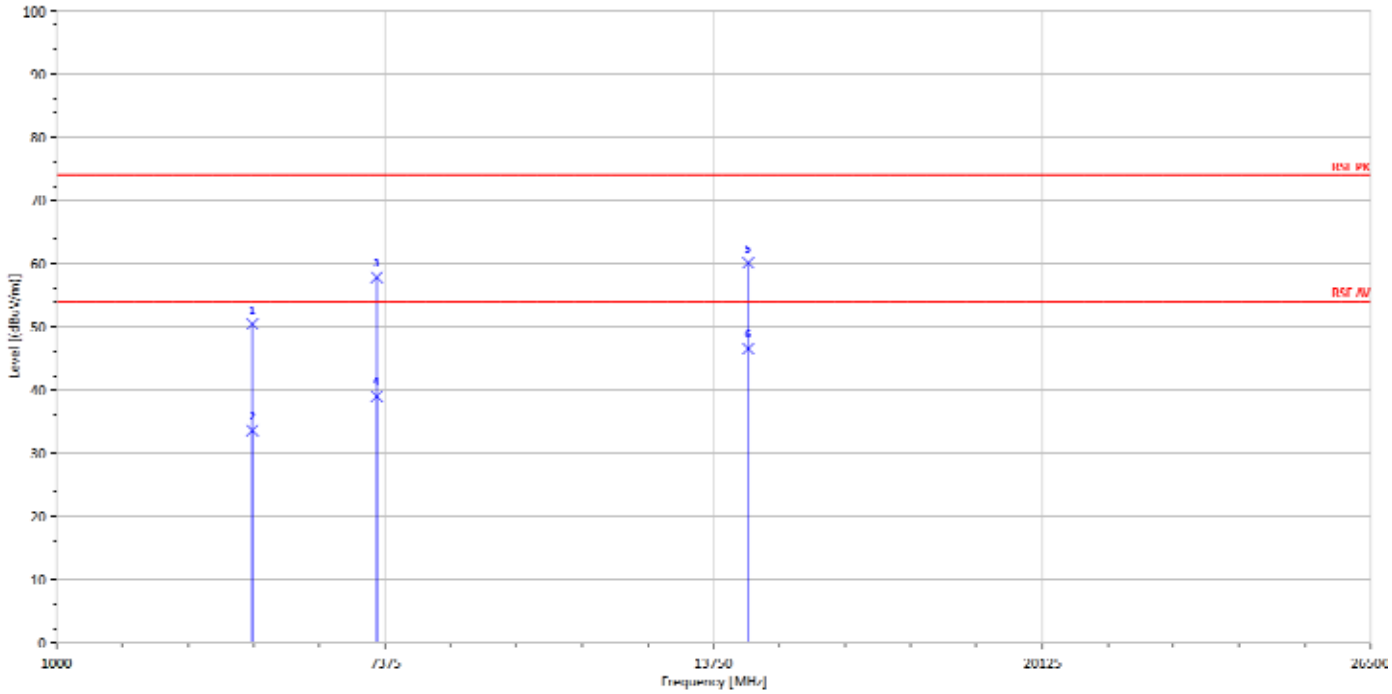
Radiated Spurious Emission Measurement Result (Above 1GHz)

Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2403 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4806.00	H	Peak	42.76	7.67	50.44	74	-23.56
4806.00	H	Average	25.89	7.67	33.56	54	-20.44
7209.00	H	Peak	42.90	14.85	57.75	74	-16.25
7209.00	H	Average	24.17	14.85	39.02	54	-14.98
14418.00	H	Peak	34.82	25.25	60.06	74	-13.94
14418.00	H	Average	21.25	25.24	46.49	54	-7.51

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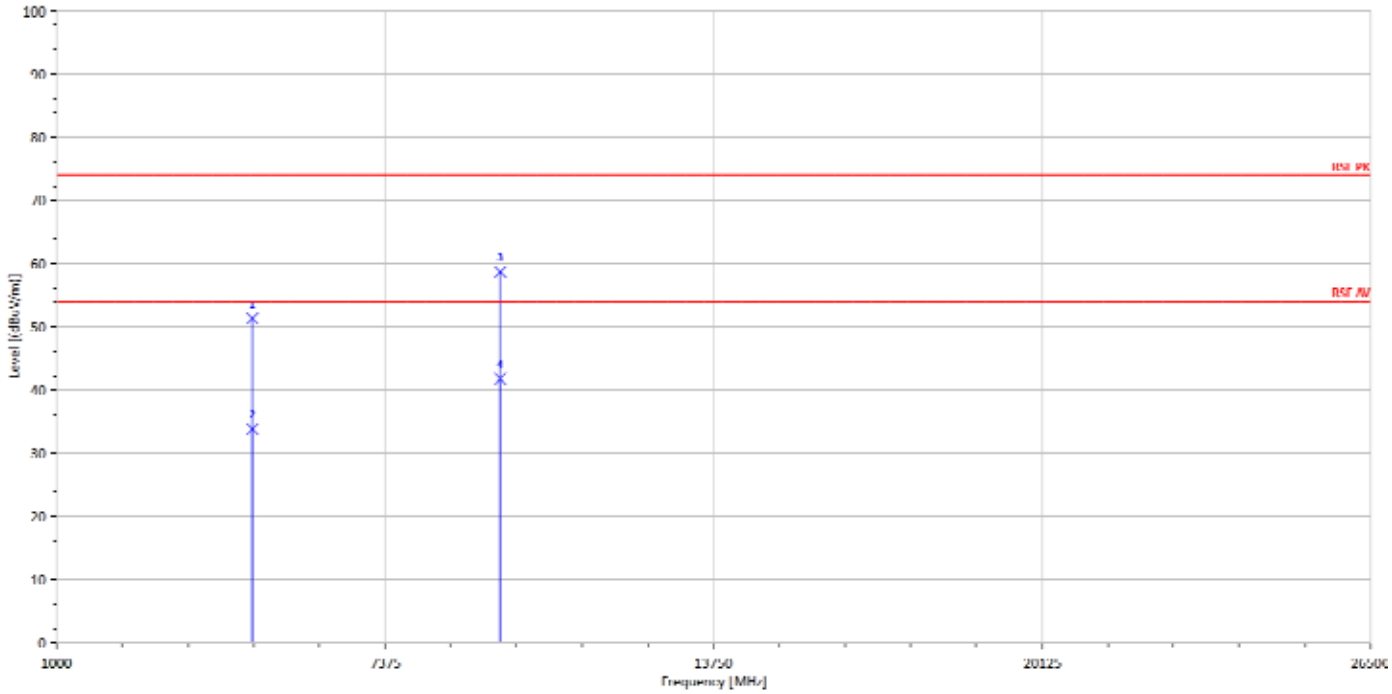
Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2403 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4806.00	H	Peak	43.66	7.67	51.34	74	-22.66
4806.00	H	Average	26.12	7.67	33.79	54	-20.21
9612.00	H	Peak	39.47	19.15	58.63	74	-15.37
9612.00	H	Average	22.54	19.19	41.73	54	-12.27

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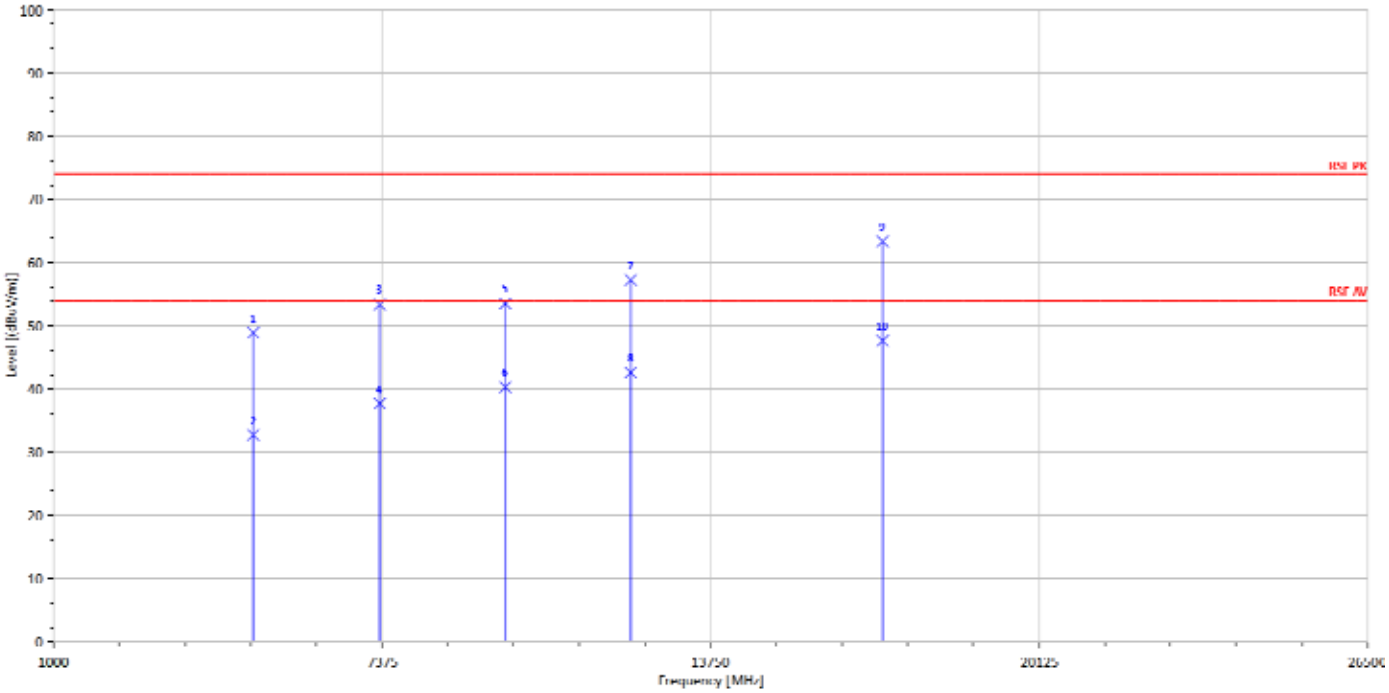
Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2442 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4884.00	H	Peak	41.31	7.58	48.88	74	-25.12
4884.00	H	Average	25.06	7.62	32.68	54	-21.32
7326.00	H	Peak	38.61	14.78	53.39	74	-20.61
7326.00	H	Average	22.92	14.80	37.72	54	-16.28
9768.00	H	Peak	34.67	18.86	53.53	74	-20.47
9768.00	H	Average	21.54	18.79	40.33	54	-13.67
12210.00	H	Peak	36.12	21.05	57.17	74	-16.83
12210.00	H	Average	21.46	21.05	42.51	54	-11.49
17094.00	H	Peak	37.41	25.93	63.34	74	-10.66
17094.00	H	Average	21.65	25.95	47.60	54	-6.40

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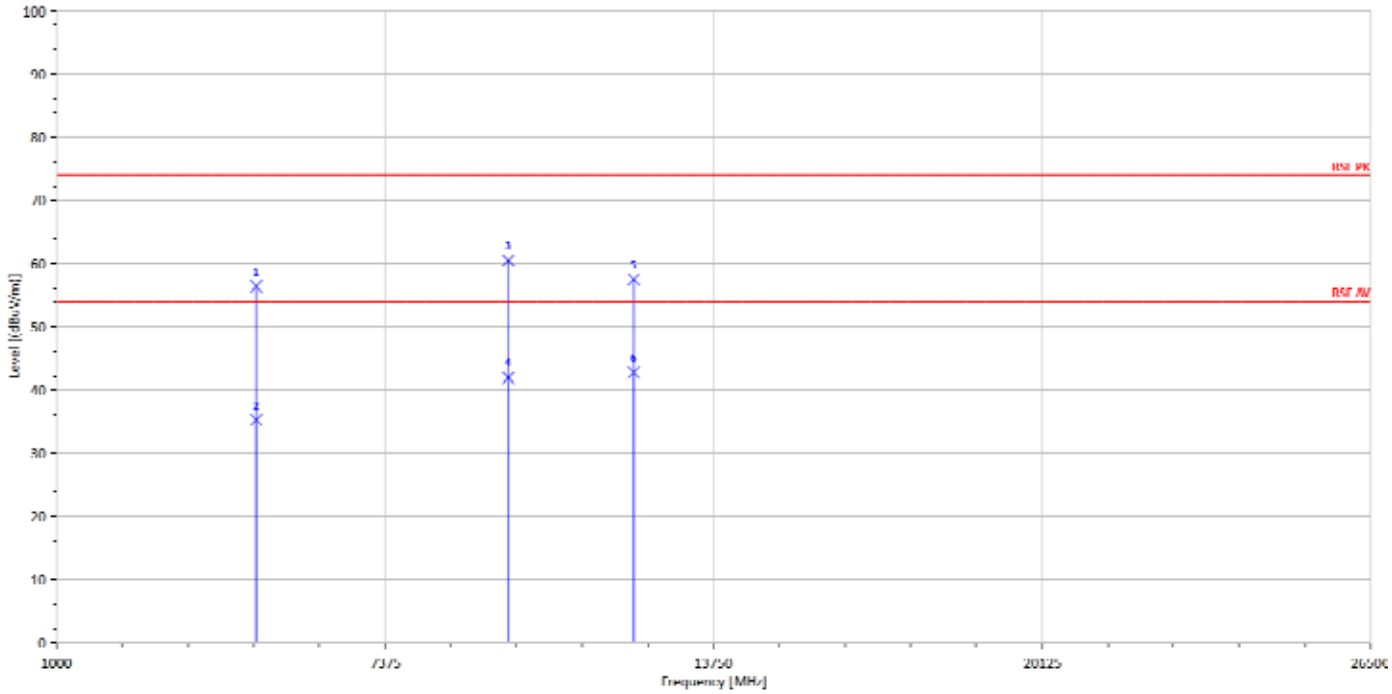
Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2442 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4884.00	H	Peak	48.79	7.58	56.37	74	-17.63
4884.00	H	Average	27.63	7.62	35.25	54	-18.75
9768.00	H	Peak	41.58	18.86	60.44	74	-13.56
9768.00	H	Average	23.11	18.79	41.90	54	-12.10
12210.00	H	Peak	36.38	21.05	57.43	74	-16.57
12210.00	H	Average	21.65	21.05	42.70	54	-11.30

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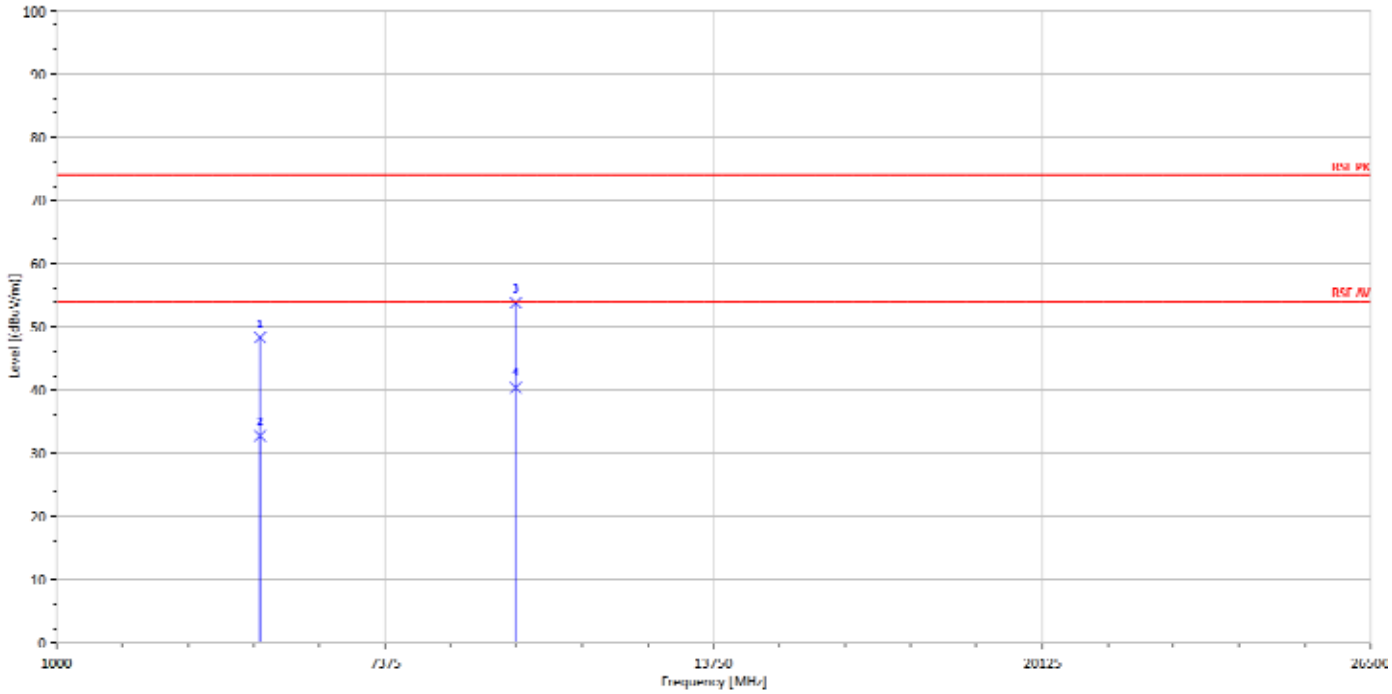
Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2479 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4958.00	H	Peak	40.54	7.73	48.28	74	-25.72
4958.00	H	Average	24.99	7.71	32.70	54	-21.30
9916.00	H	Peak	35.28	18.53	53.81	74	-20.19
9916.00	H	Average	21.74	18.66	40.40	54	-13.60

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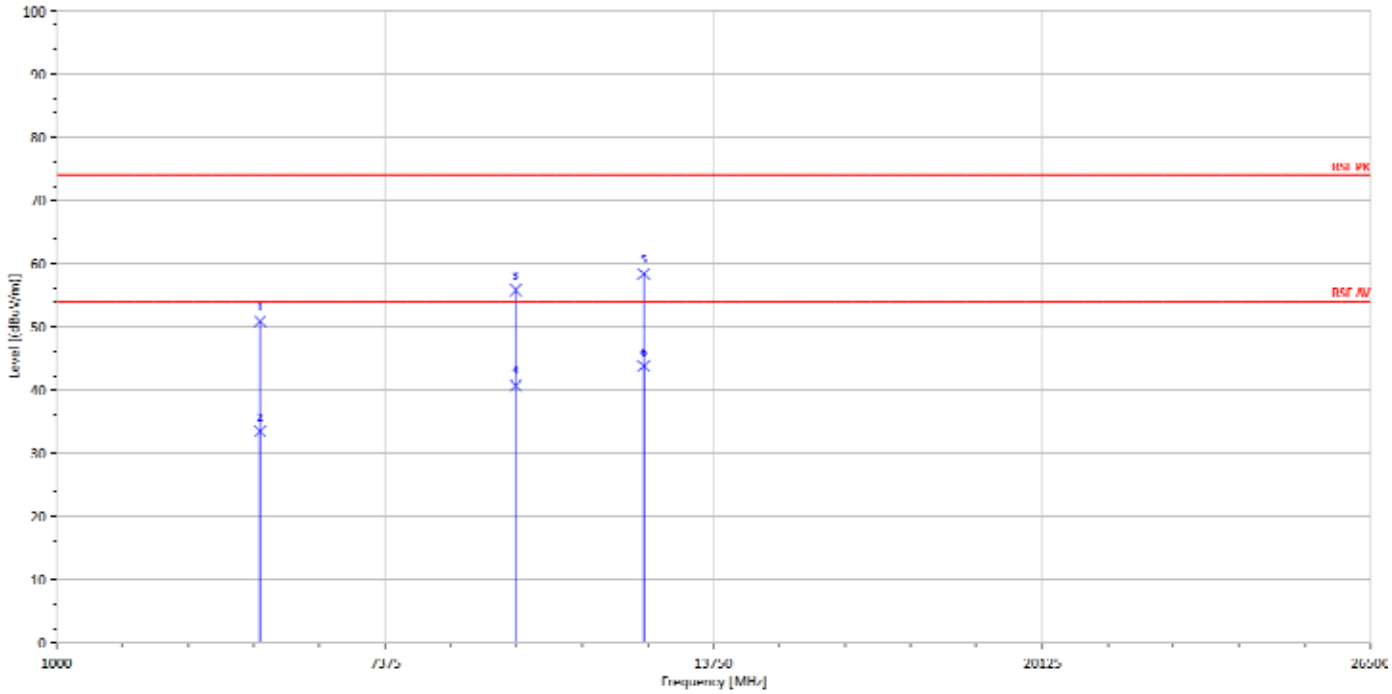
Operation Mode :	2.4G	Test Date :	2017/9/11
Fundamental Frequency :	2479 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4958.00	H	Peak	43.19	7.68	50.87	74	-23.13
4958.00	H	Average	25.72	7.71	33.43	54	-20.57
9916.00	H	Peak	37.27	18.53	55.81	74	-18.19
9916.00	H	Average	22.06	18.66	40.72	54	-13.28
12395.00	H	Peak	35.98	22.32	58.30	74	-15.70
12395.00	H	Average	21.46	22.24	43.70	54	-10.30

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8 20 dB Bandwidth Measurement

8.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set ETU normal operating mode.
3. Set SPA Center Frequency = fundamental frequency, RBW = 100kHz, VBW = 300kHz, Span = 5MHz.
4. Set SPA Max hold. Mark peak, -20dB.

8.2 Test SET-UP (Block Diagram of Configuration)

Refer to section 7.2 for the plot.

8.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	06/20/2017	06/19/2018
Power Meter	Anritsu	ML2496A	1326001	06/23/2017	06/22/2018
Power Sensor	Anritsu	MA2411B	1315048	06/23/2017	06/22/2018
Power Sensor	Anritsu	MA2411B	1315049	06/23/2017	06/22/2018
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2016	12/11/2017
DC Block	PASTERNACK	PE8210	RF29	12/12/2016	12/11/2017
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2016	12/11/2017
Attenuator	WOKEN	218FS-10	RF23	12/12/2016	12/11/2017
DC Power Supply	Agilent	E3640A	MY53140006	05/02/2017	05/01/2018

8.4 Measurement Results:

2.403GHz = 2.337MHz

2.442GHz = 2.357MHz

2.478GHz = 2.332MHz

Refer to attached data chart.

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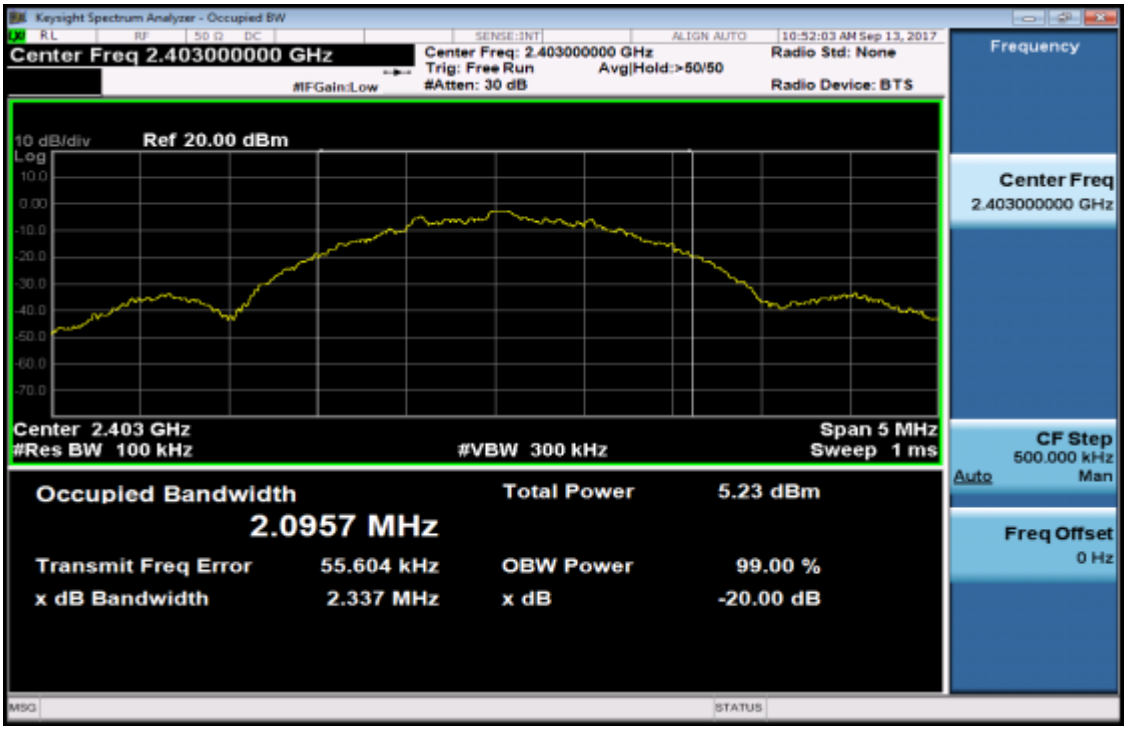
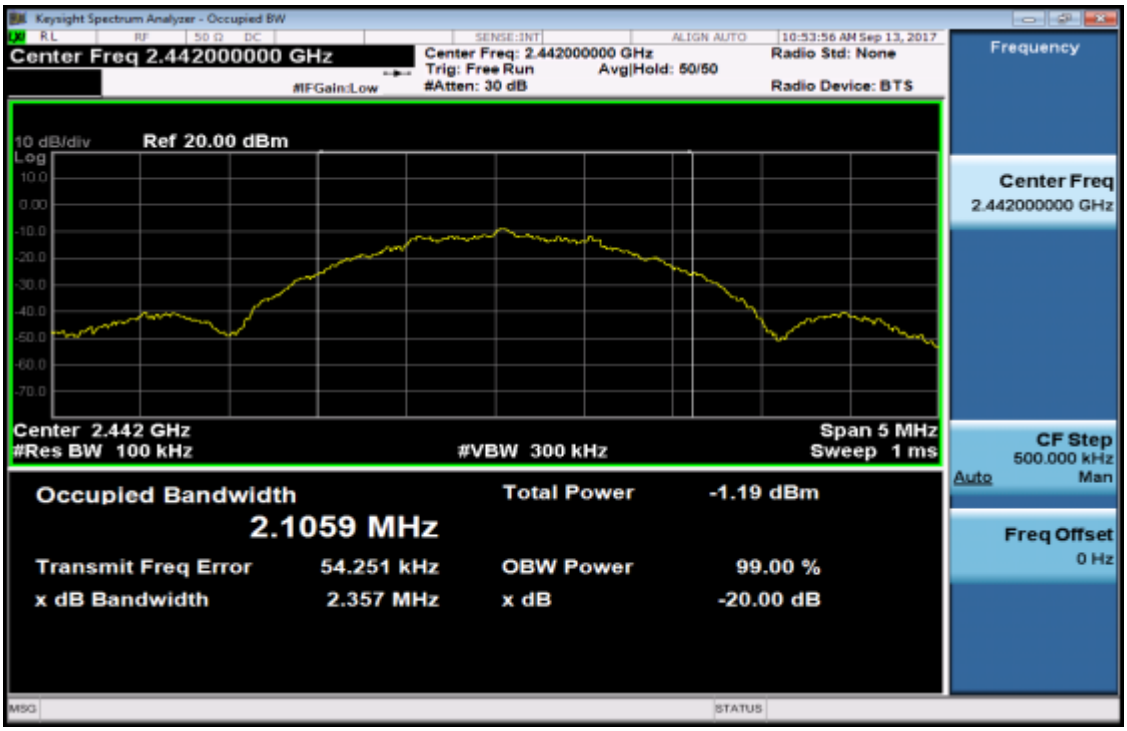
20dB Bandwidth Test Plot (2.403GHz)



20dB Bandwidth Test Plot (2.442GHz)



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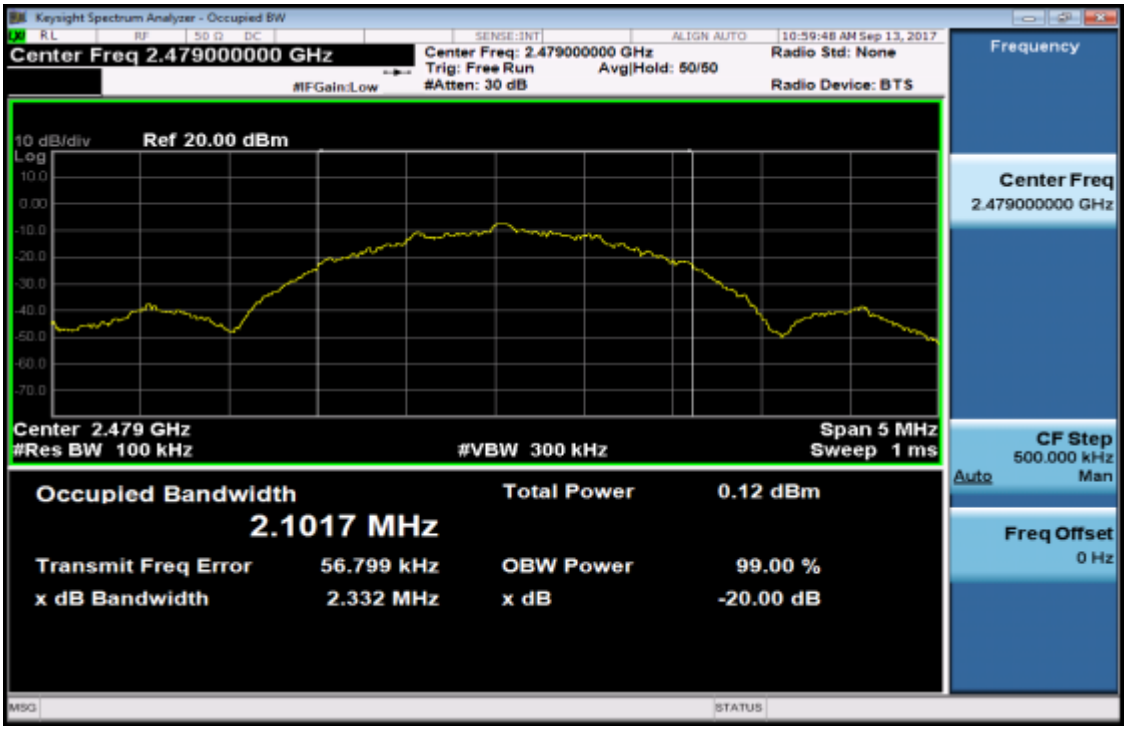
20dB Bandwidth Test Plot (2.479GHz)



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9 Antenna Requirement

9.1 Standard Applicable:

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

In case of point-to-point operation, the power shall be reduced by the one dB for every 3 dB that the directional gain of antenna exceeds 6dBi.

9.2 Antenna Connected Construction:

An embedded-in antenna design is used.

The antenna is designed as permanently attached and no consideration of replacement. Please see EUT photo and antenna spec. for details.

The antenna gain is less than 6dBi. Therefore, it is not necessary to reduce maximum output power limit.

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