ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Applicant:	Traxxas, L.P. 6250 Traxxas Way, McKinney, TX 75070, USA
Product Name:	TQ Receiver
Brand Name:	TRAXXAS, LaTrax
Model No.:	6519B, 3046B
Model Difference:	6519B shares the same antenna with the 3046B, the only difference are the length of the antenna cable and brand name
FCC ID:	XVE-TRX1026
Report Number:	E2/2018/30052
FCC Rule Part:	§15.249
Issue Date:	May 11, 2018
Date of Test:	Mar. 20, 2018 ~ Apr. 25, 2018
Date of EUT Received:	Mar. 20, 2018

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.

Tested By: Aken Huang

Aken Huang / Engineer

Approved By: Jim Chang

Jim Chang / Manager

Testing Laboratory
0513

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Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
E2/2018/30052	Rev.00	Initial creation of document	All	May 11, 2018	Yuri Tsai

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1 GENERAL INFORMATION

1.1 Product Description

General:

Product Name:	TQ Receiver
Brand Name:	TRAXXAS, LaTrax
Model No.:	6519B, 3046B
Model Difference:	6519B shares the same antenna with the 3046B, the only difference are the length of the antenna cable and brand name
Hardware Version:	N/A
Software Version:	N/A
Operation Frequency:	2406 ~ 2453MHz
Channel number:	3 Channels
Modulation Type:	DSSS
Power Supply:	6Vdc
Host:	Refer to next page for detail
Antenna Designation:	1. Internal Antenna, Peak Gain: 0.98 dBi 2. Internal Antenna, Peak Gain: -0.74 dBi

This test report applies for 2.4GHz function.

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Host:

Brand	Model Number	Product Name
LaTrax	75054-1 &-5	LaTrax Rally
LaTrax	76054-5	Teton
LaTrax	76064-5	Desert PreRunner
Traxxas	24054-1 & -4	1/10 Bandit w/ TQ 2.4
Traxxas	36034-1	Bigfoot Classic Stampede
Traxxas	36054-1 & -4	1/10 Stampede w/ TQ 2.4
Traxxas	36064-1	1/10 Skully w/ TQ 2.4
Traxxas	36084-1	Bigfoot Stampede
Traxxas	36094-1	1/10 Craniac w/ TQ 2.4
Traxxas	37054-1 & -4	1/10 Rustler w/ TQ 2.4
Traxxas	38104-5	Blast w/ TQ 2.4
Traxxas	45104-1	Nitro Sport w/ TQ 2.4
Traxxas	49104-1	1/10 T-Maxx Classic w/ TQ 2.4
Traxxas	58024	1/10 Slash w/o Battery w/ TQ 2.4
Traxxas	58034-1	1/10 Slash w/ TQ 2.4
Traxxas	58034-2	1/10 Slash w/ OBA
Traxxas	58094-1	1/10 2017 Ford Raptor w/ TQ 2.4
Traxxas	67054-1	1/10 Stampede 4x4 Brushed
Traxxas	70054-1	1/16 Slash w/ TQ 2.4
Traxxas	71054-1	1/16 E-Revo Brushed w/ TQ 2.4
Traxxas	72054-5	1/16 Summit XL-5 w/ TQ 2.4
Traxxas	74054-4 & -6	Fiesta ST Rally
Traxxas	83024-4	4-Tec 2.0 XL-5 No Body
Traxxas	83044-4	4-Tec 2.0 Mustang

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1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.249

ANSI C63.10:2013

Note: 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 / TW0002

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 Configuration of Tested System

Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	2.4GHz Test Software	N/A	N/A	N/A	N/A	N/A

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

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4 DESCRIPTION OF TEST MODES

4.1 Operated in 2400 ~ 2483.5MHz Band

3 channels are provided.

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	TESTED FREQUENCY	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
2.4G	2406, 2429, 2453	GFSK	N/A	MAIN
RADIATED EMISSION TEST (ABOVE 1 GHz)				
MODE	TESTED FREQUENCY	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
2.4G	2406, 2429, 2453	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	TESTED FREQUENCY	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
2.4G	2406, 2429, 2453	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	12/24/2017	12/23/2018
Coaxial Cables	N/A	N30N30-1042-150cm	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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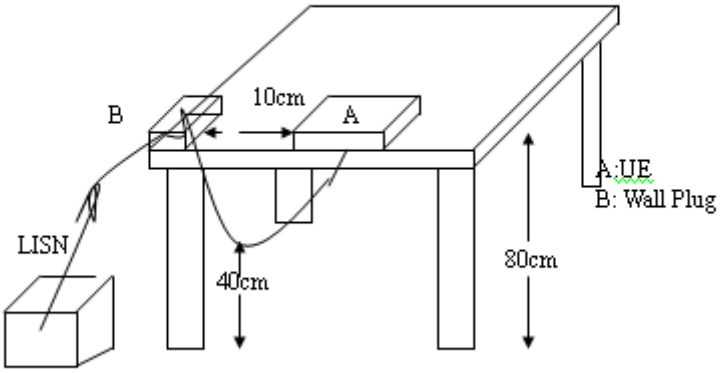
6.4 Test SET-UP (Block Diagram of Configuration)



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:

N/A, EUT powered from DC.

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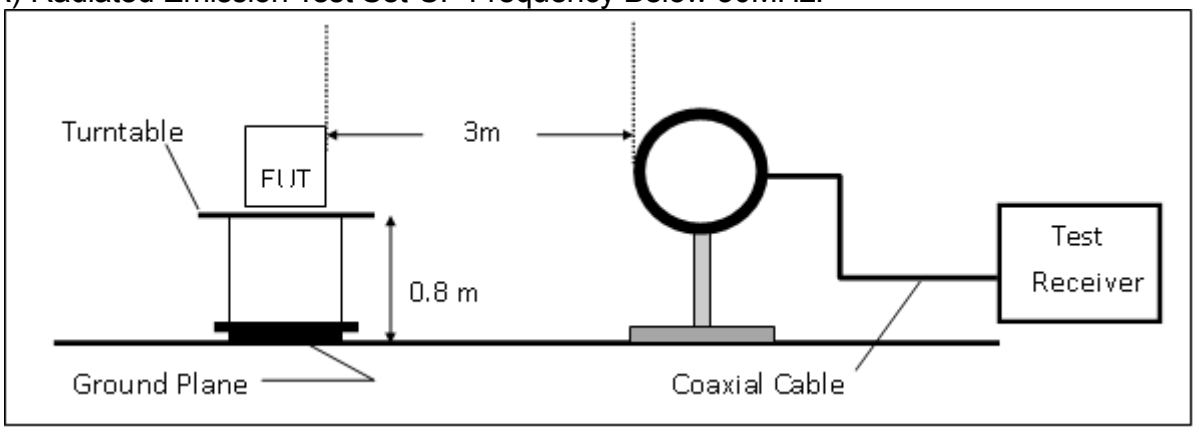
7 RADIATED EMISSION TEST

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.



Note: There is a comparison data of both open-field test site and semi-Anechoic, and test result came out very similar.

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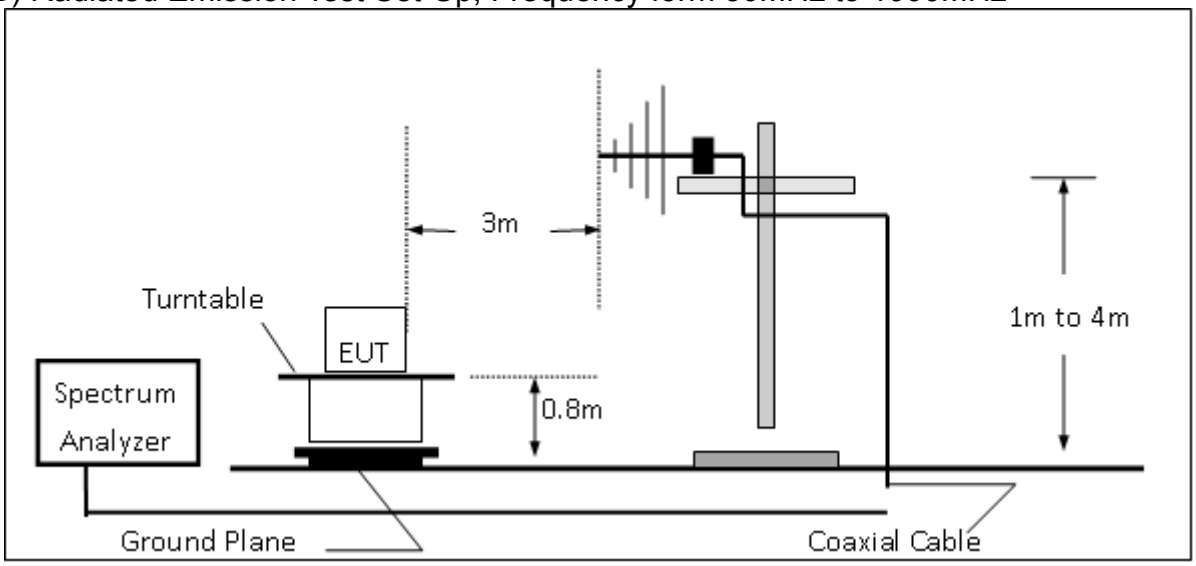
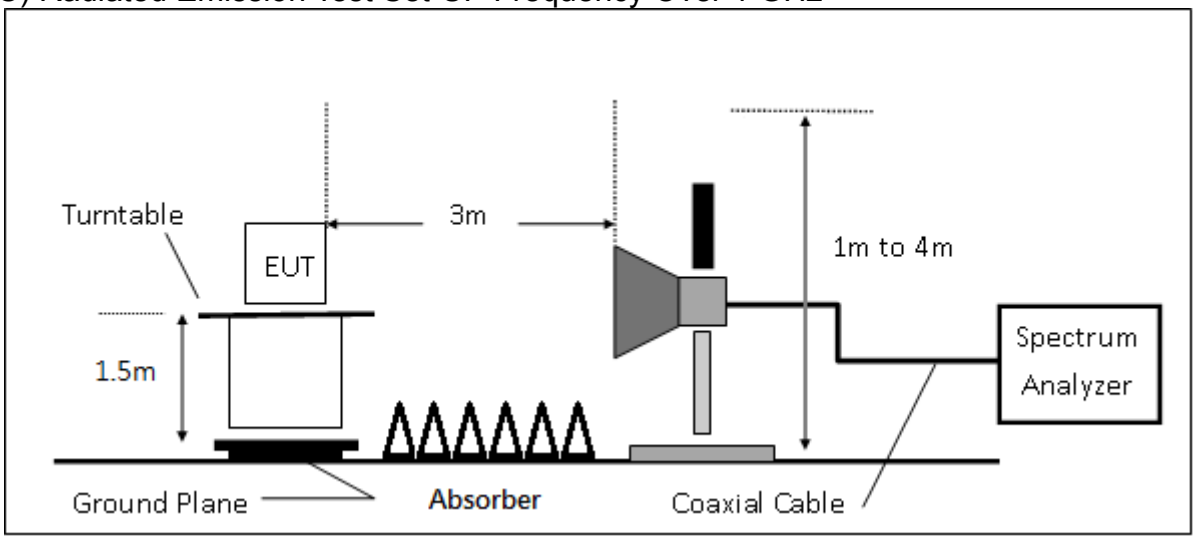
(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



(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	04/11/2018	04/10/2019
Loop Antenna	ETS-Lindgren	6502	00143303	12/23/2017	12/22/2018
Broadband Antenna	TESEQ	CBL 6112D	35240	11/03/2017	11/02/2018
Horn Antenna	ETS-Lindgren	3117	00143272	12/15/2017	12/16/2018
Horn Antenna	Schwarzbeck	BBHA9170	185	08/01/2017	07/31/2018
Pre Amplifier	EMC Instruments	EMC330	980096	12/24/2017	12/23/2018
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/24/2017	12/23/2018
Pre Amplifier	R&S	SCU-18	10204	12/24/2017	12/23/2018
Pre Amplifier	R&S	SCU-26	100780	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/24/2017	12/23/2018
Attenuator	WOKEN	218FS-10	RF27	12/24/2017	12/23/2018
Site NSA	SGS	966 Chamber C	SAC-C	03/02/2018	03/01/2019
Site VSWR	SGS	966 Chamber C	SAC-C	03/02/2018	03/01/2019
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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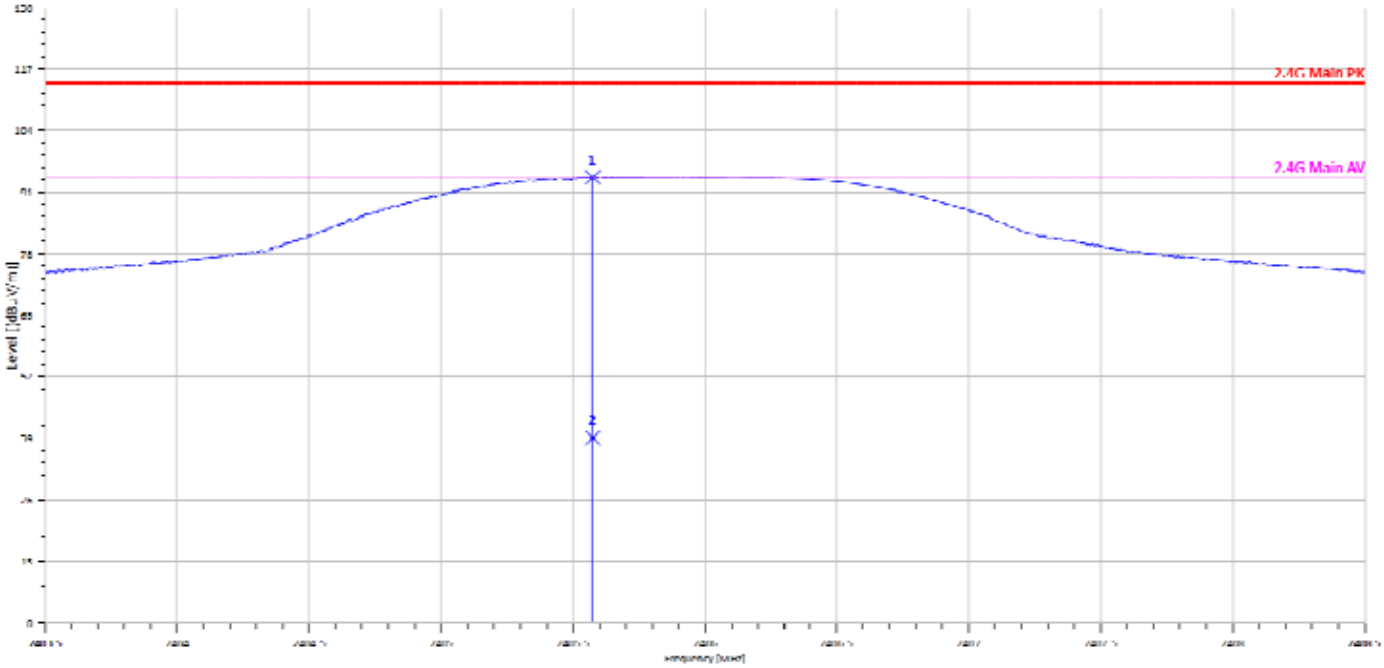
7.5. Measurement Result

Radiated Spurious Emission Measurement Result

Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2406 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Main CH Low	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2405.58	F	Peak	100.91	-6.78	94.12	114	-19.88
2405.58	F	Average	45.83	-6.78	39.04	94	-54.96

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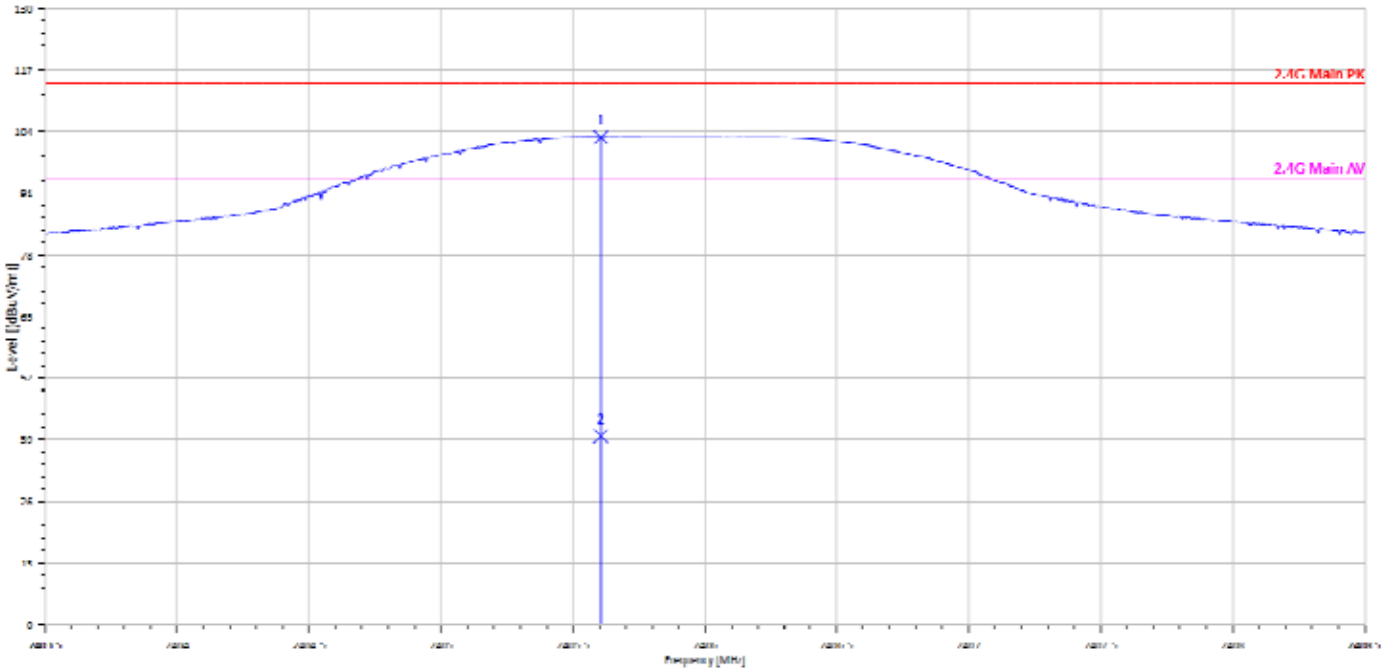
Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2406 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Main CH Low	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2405.61	F	Peak	109.48	-6.78	102.70	114	-11.30
2405.61	F	Average	46.49	-6.78	39.71	94	-54.29

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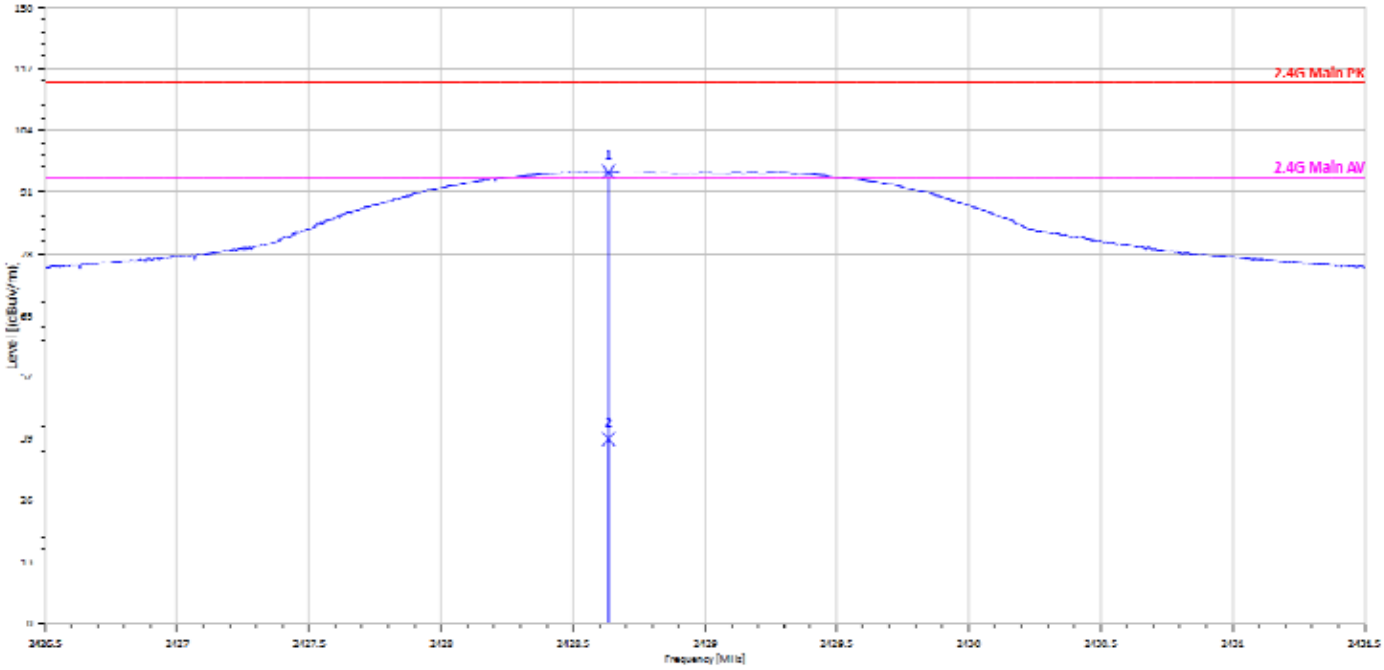
Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2429 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Main CH Mid	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2428.64	E	Peak	101.82	-6.66	95.15	114	-18.85
2428.64	E	Average	45.43	-6.66	38.76	94	-55.24

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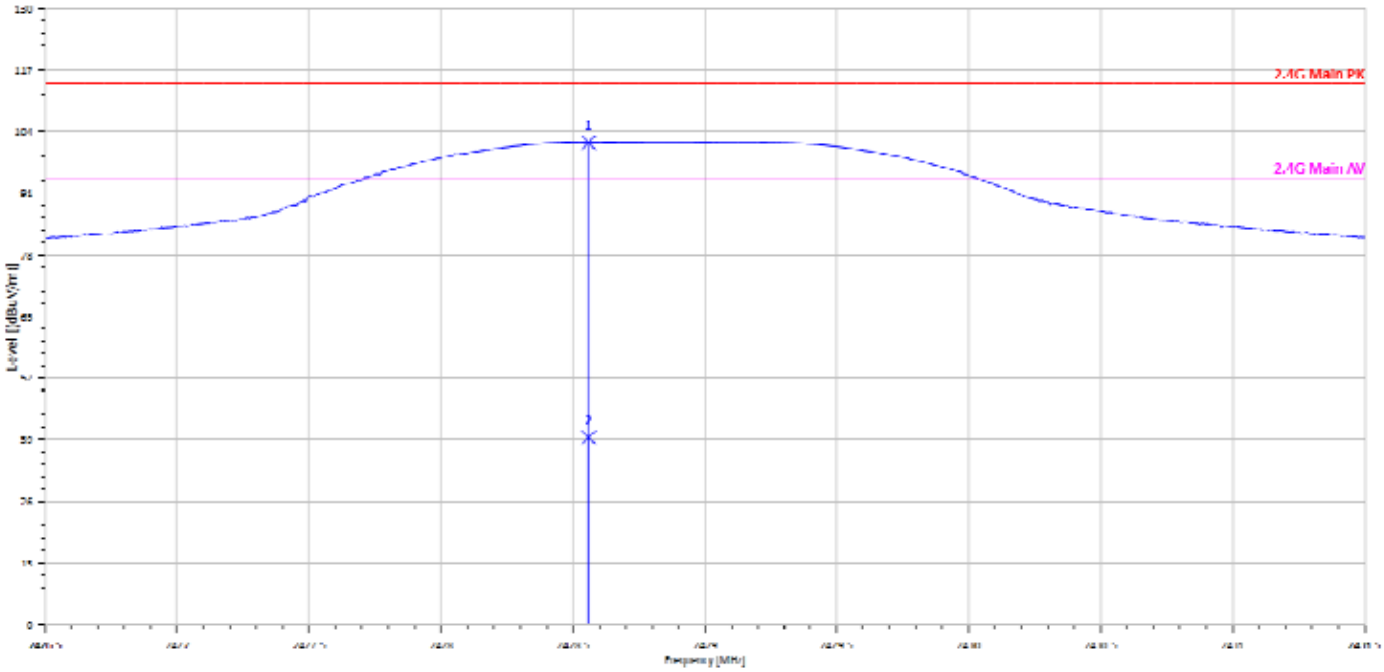
Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2429 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Main CH Mid	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2428.56	F	Peak	108.29	-6.66	101.62	114	-12.38
2428.56	F	Average	46.04	-6.66	39.37	94	-54.63

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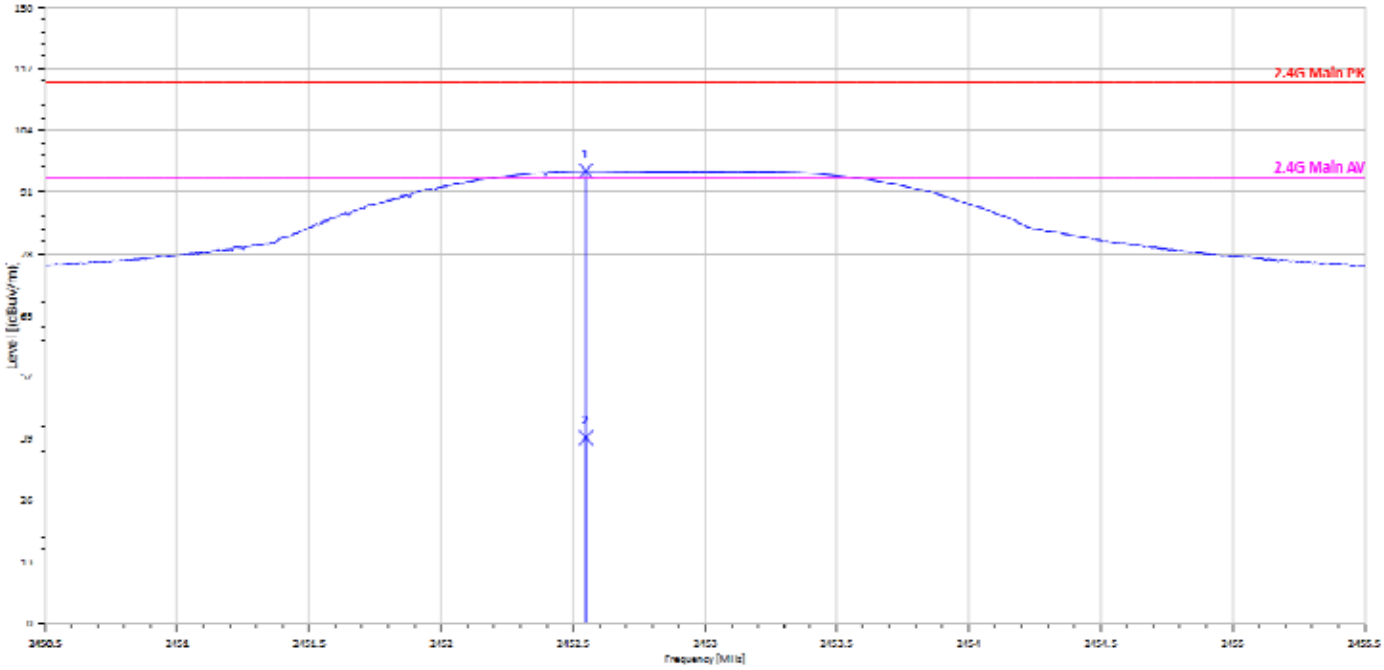
Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2453 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Main CH High	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
2452.55	F	Peak	101.91	-6.54	95.37	114	-18.63
2452.55	F	Average	45.61	-6.54	39.06	94	-54.94

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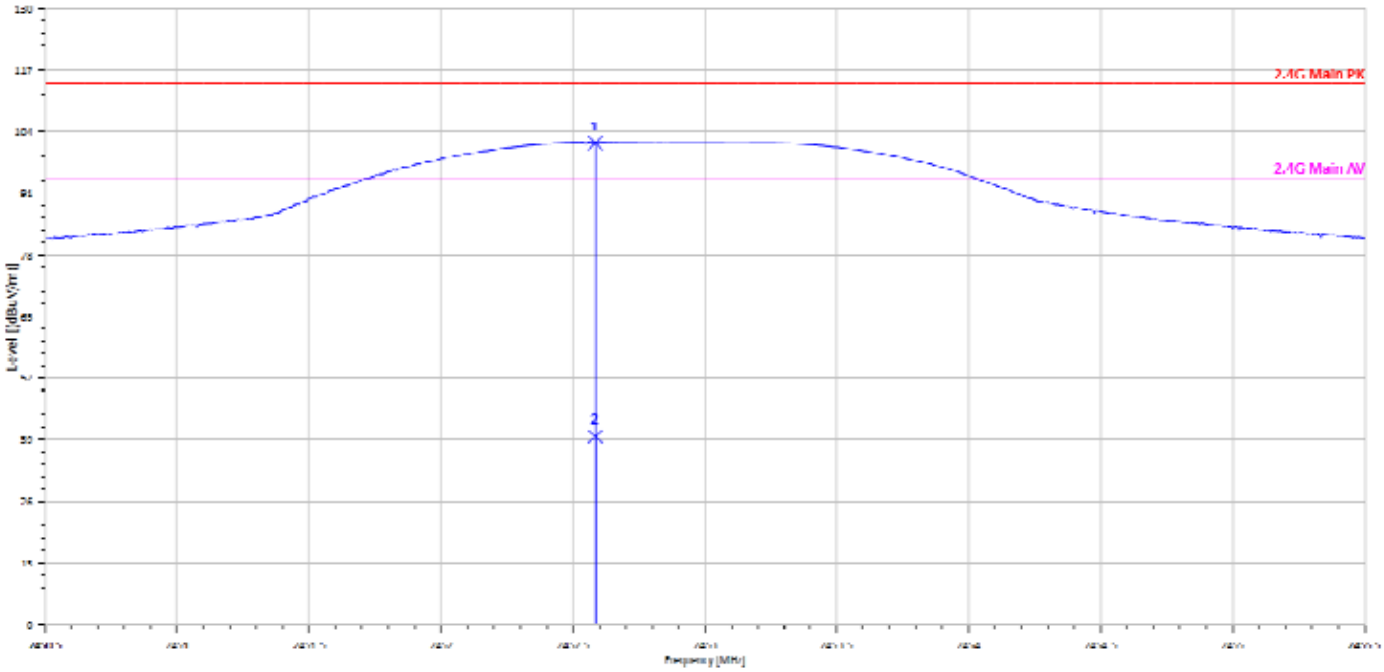
Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2453 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Main CH High	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2452.59	E	Peak	108.08	-6.54	101.54	114	-12.46
2452.59	E	Average	46.14	-6.54	39.59	94	-54.41

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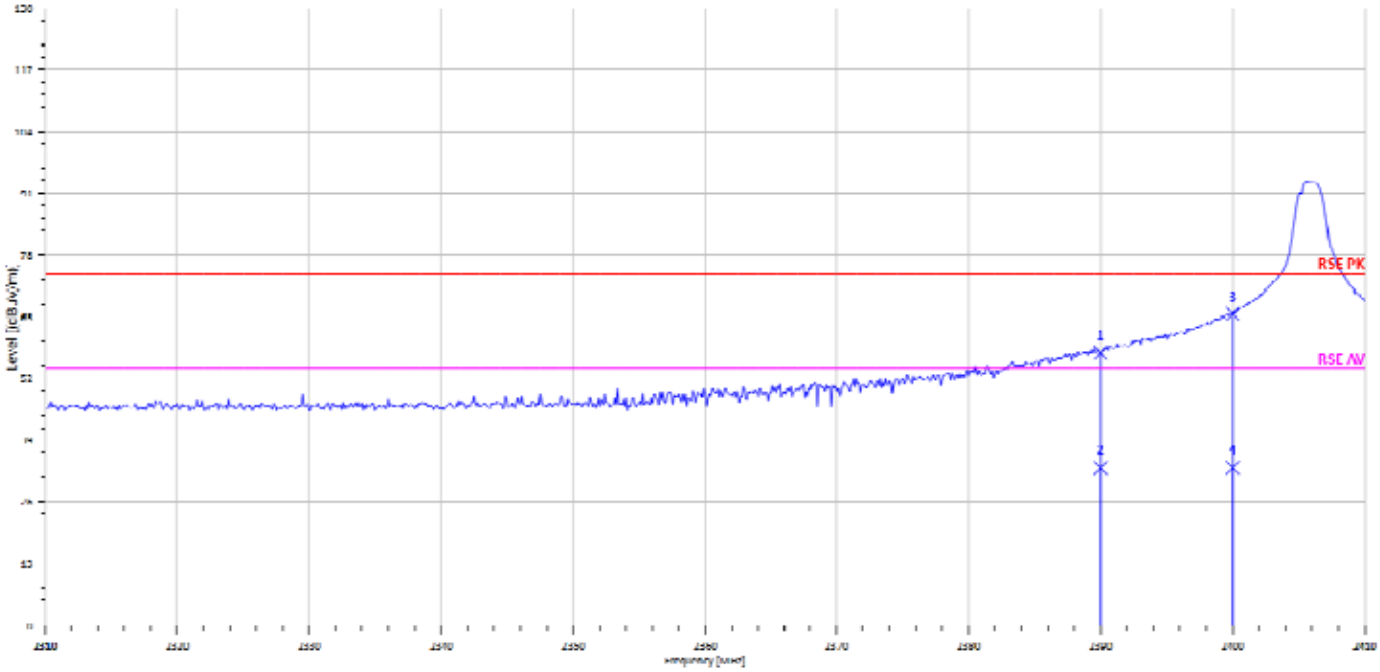
Radiated Spurious Emission Measurement Result

Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2406 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH Low	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2390.00	E	Peak	64.23	-6.84	57.38	74	-16.62
2390.00	E	Average	39.96	-6.84	33.12	54	-20.88
2400.00	S	Peak	72.38	-6.81	65.57	74	-8.43
2400.00	S	Average	39.98	-6.81	33.17	54	-20.83

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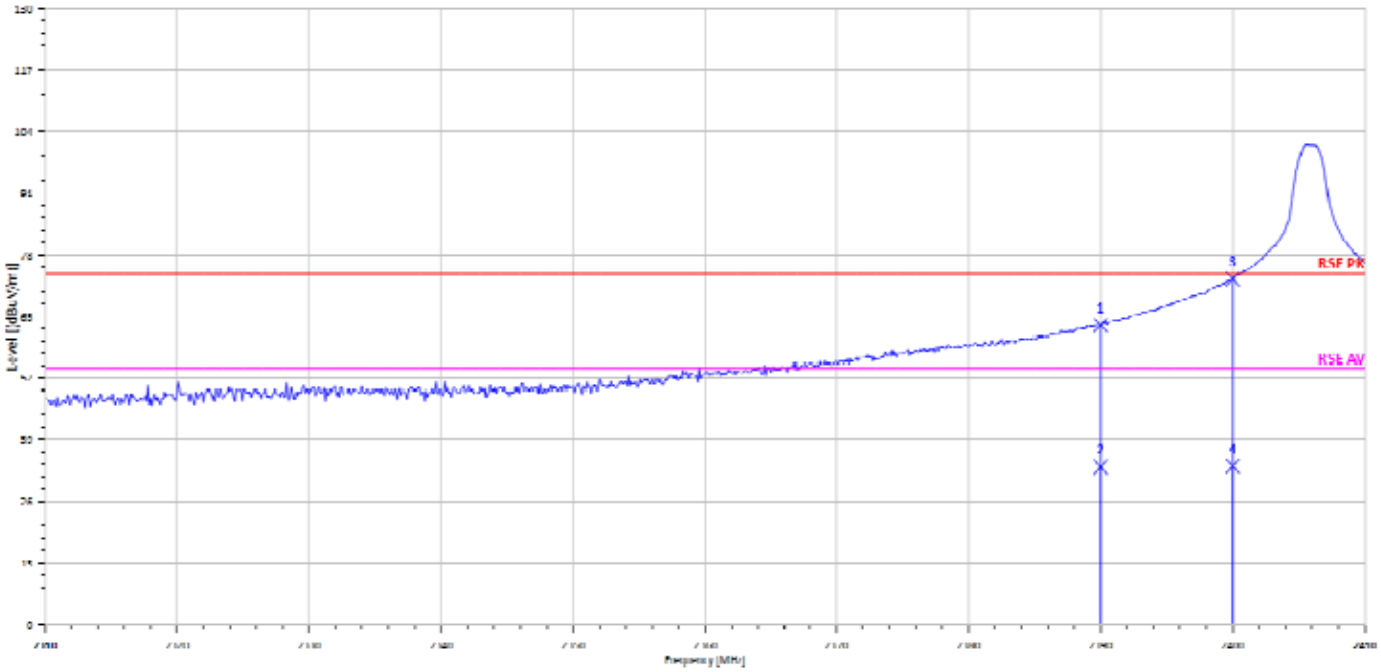
Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2406 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH Low	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2390.00	E	Peak	69.97	-6.84	63.12	74	-10.88
2390.00	E	Average	40.00	-6.84	33.16	54	-20.84
2400.00	S	Peak	79.73	-6.81	72.92	74	-1.08
2400.00	S	Average	40.15	-6.81	33.34	54	-20.66

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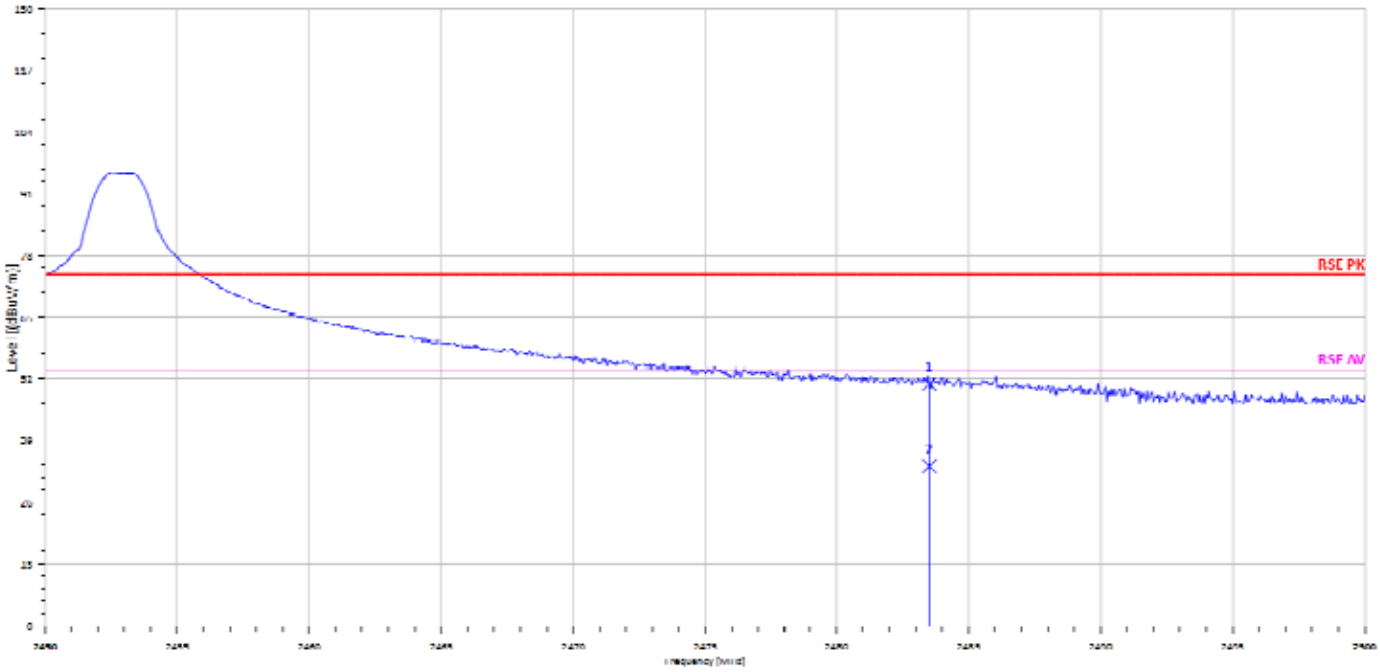
Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2453 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH High	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



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	57.33	-6.38	50.95	74	-23.05
2483.50	E	Average	39.92	-6.38	33.54	54	-20.46

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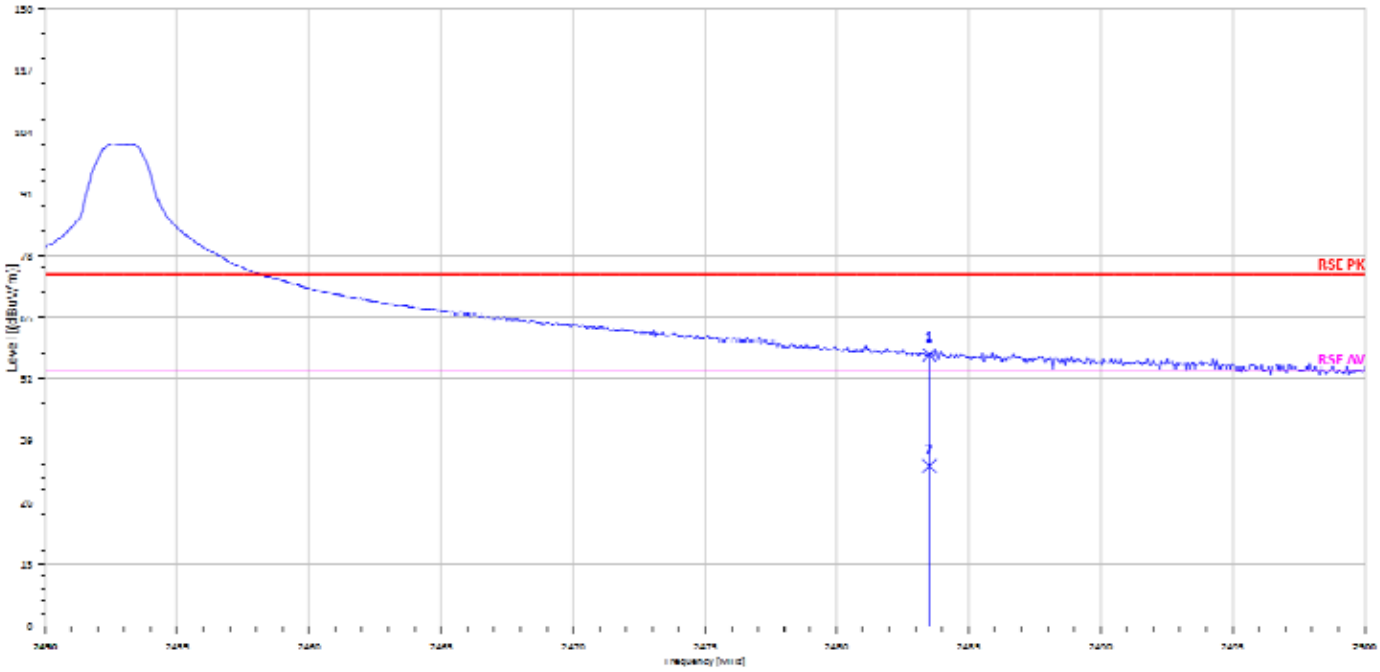
Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2453 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH High	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



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	63.42	-6.38	57.04	74	-16.96
2483.50	E	Average	39.96	-6.38	33.57	54	-20.43

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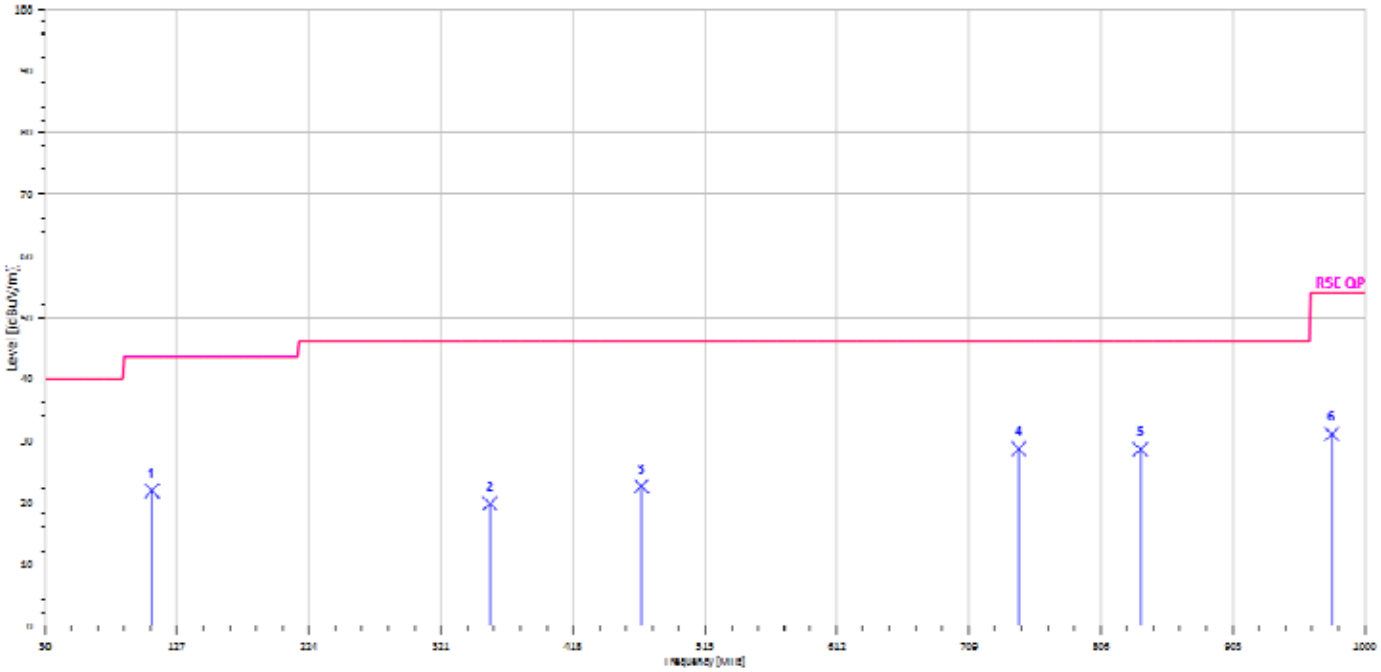
Radiated Spurious Emission Measurement Result (Below 1GHz)

Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2406 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
108.57	S	Peak	41.49	-19.69	21.79	43.5	-21.71
356.89	S	Peak	33.88	-14.10	19.78	46	-26.22
468.44	S	Peak	33.68	-11.13	22.55	46	-23.45
745.86	S	Peak	35.77	-7.11	28.66	46	-17.34
835.10	S	Peak	34.43	-5.86	28.57	46	-17.43
975.75	S	Peak	35.03	-4.06	30.97	54	-23.03

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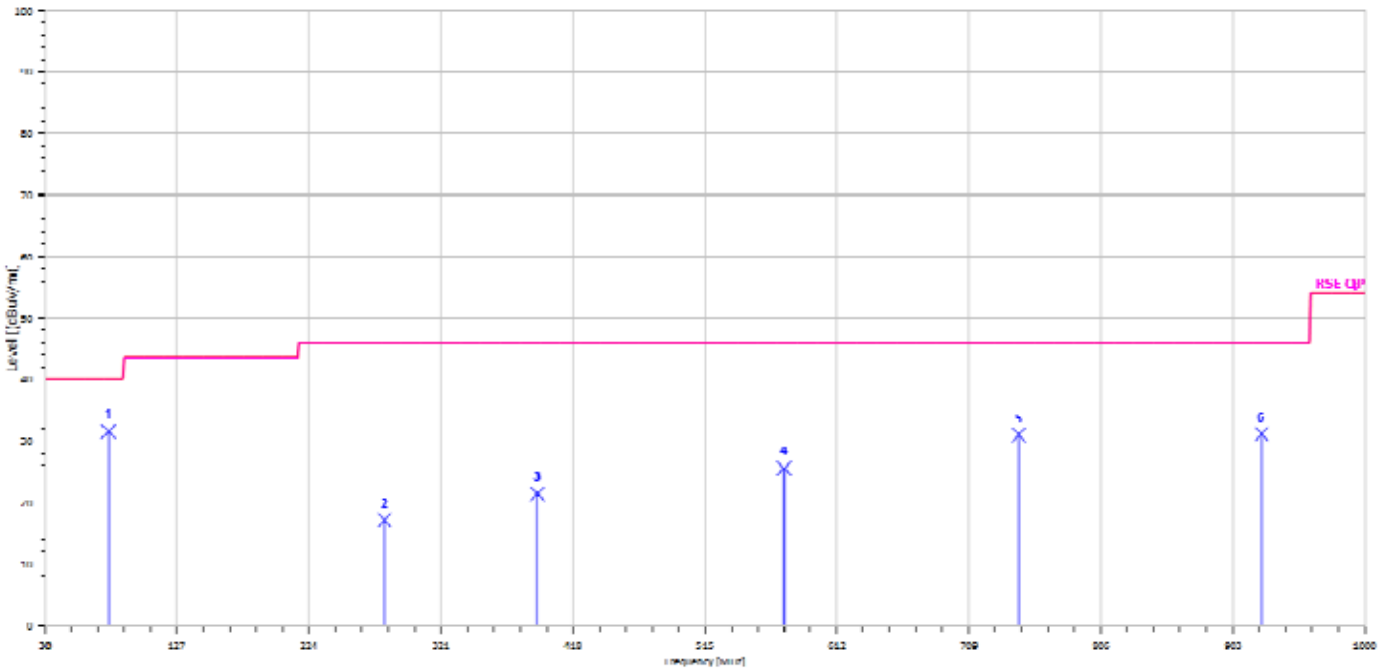
Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2406 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
76.56	S	Peak	51.96	-20.47	31.48	40	-8.52
279.29	S	Peak	32.83	-15.73	17.10	46	-28.90
391.81	S	Peak	34.35	-13.00	21.35	46	-24.65
573.20	S	Peak	34.94	-9.40	25.55	46	-20.45
745.86	S	Peak	38.06	-7.11	30.96	46	-15.04
924.34	S	Peak	36.01	-4.91	31.09	46	-14.91

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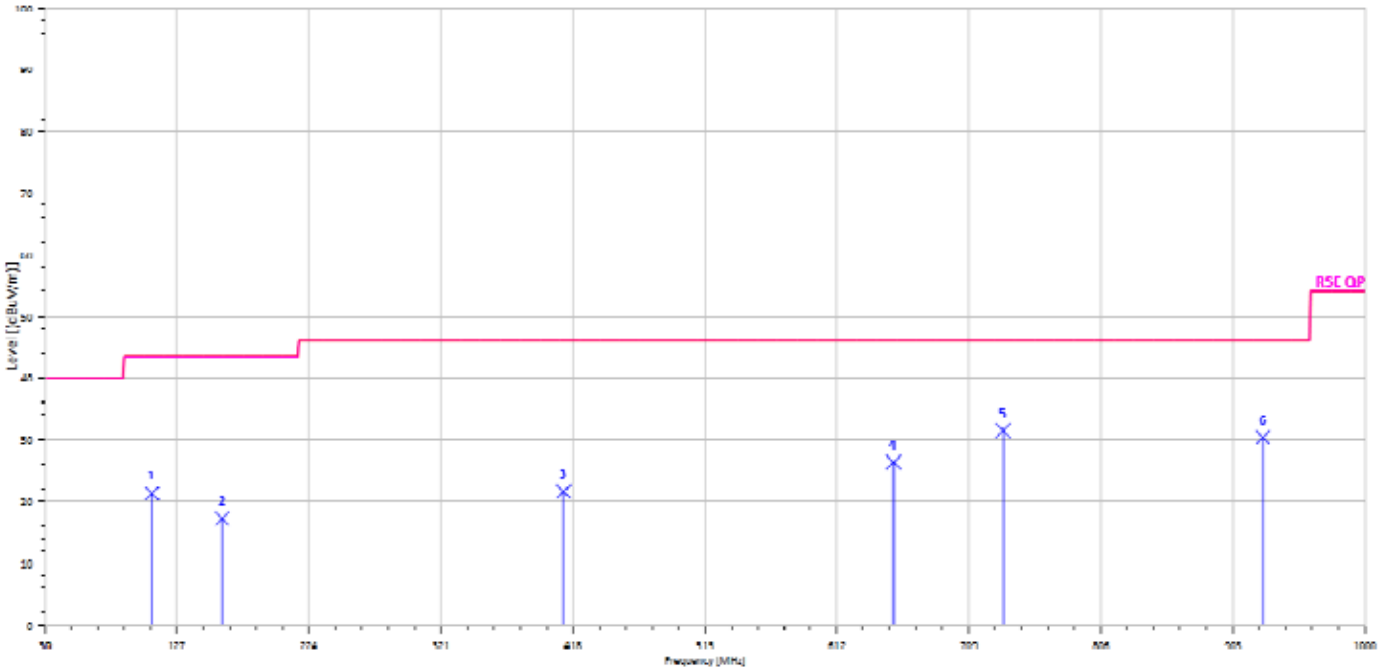
Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2429 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
108.57	S	Peak	41.02	-19.69	21.33	43.5	-22.17
159.98	S	Peak	32.77	-15.54	17.23	43.5	-26.27
411.21	S	Peak	33.59	-11.96	21.63	46	-24.37
653.71	S	Peak	34.30	-7.97	26.33	46	-19.67
734.22	S	Peak	39.10	-7.64	31.46	46	-14.54
925.31	S	Peak	35.26	-4.88	30.39	46	-15.61

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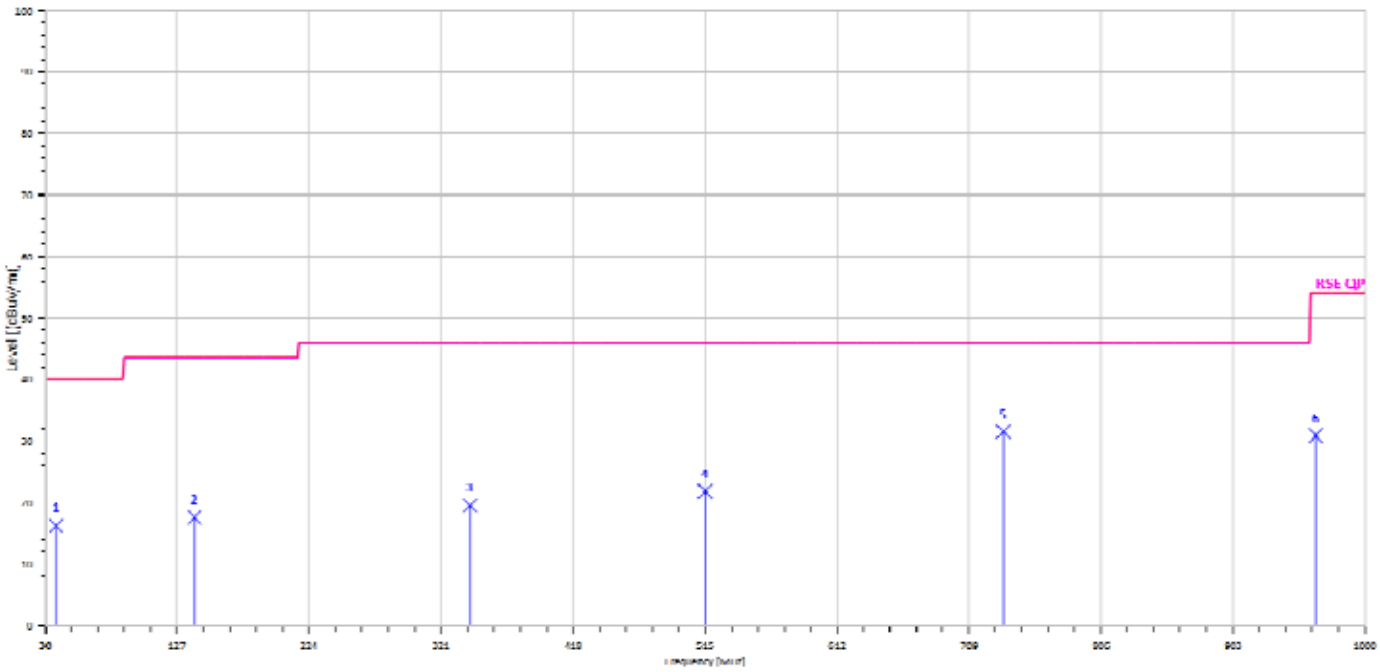
Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2429 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
37.76	S	Peak	33.76	-17.57	16.19	40	-23.81
139.61	S	Peak	34.05	-16.50	17.55	43.5	-25.95
342.34	S	Peak	33.79	-14.31	19.48	46	-26.52
515.00	S	Peak	32.48	-10.70	21.78	46	-24.22
734.22	S	Peak	39.09	-7.64	31.46	46	-14.54
964.11	S	Peak	35.13	-4.30	30.82	54	-23.18

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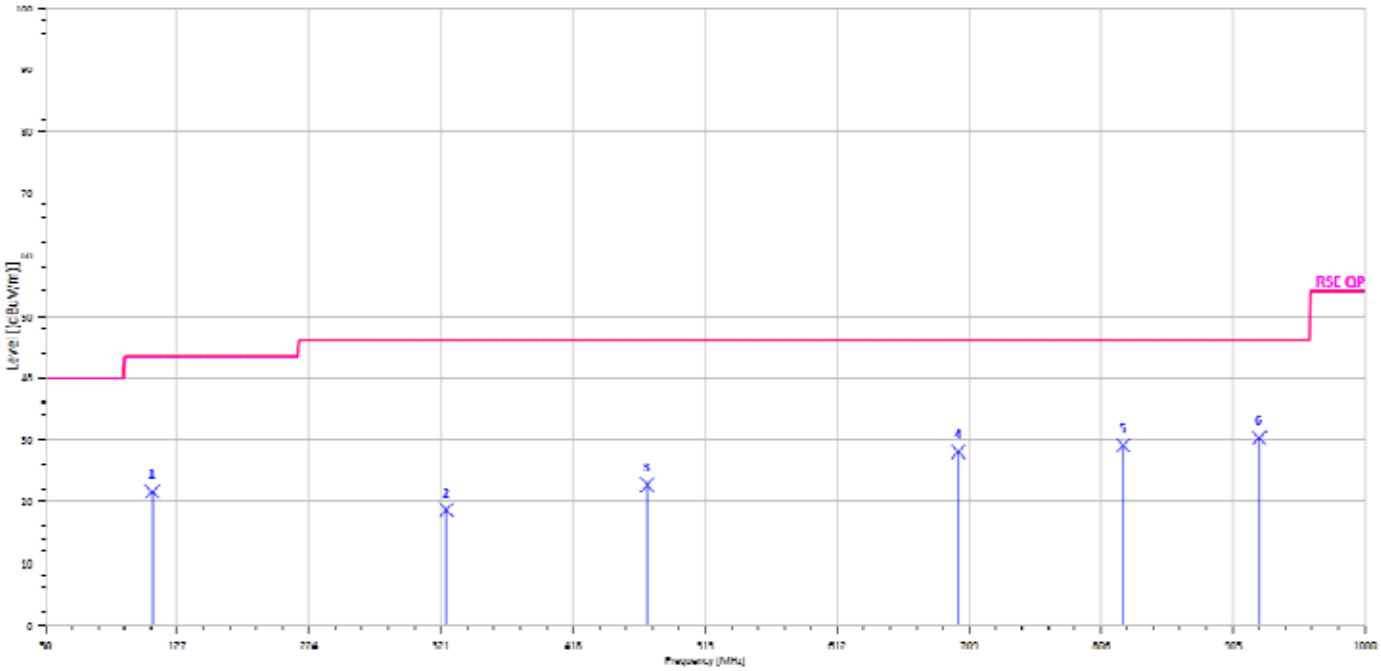
Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2453 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
108.57	S	Peak	41.30	-19.69	21.61	43.5	-21.89
324.88	S	Peak	33.22	-14.60	18.62	46	-27.38
472.32	S	Peak	33.75	-11.10	22.65	46	-23.35
701.24	S	Peak	35.41	-7.41	28.00	46	-18.00
822.49	S	Peak	35.16	-6.08	29.07	46	-16.93
922.40	S	Peak	35.28	-4.99	30.29	46	-15.71

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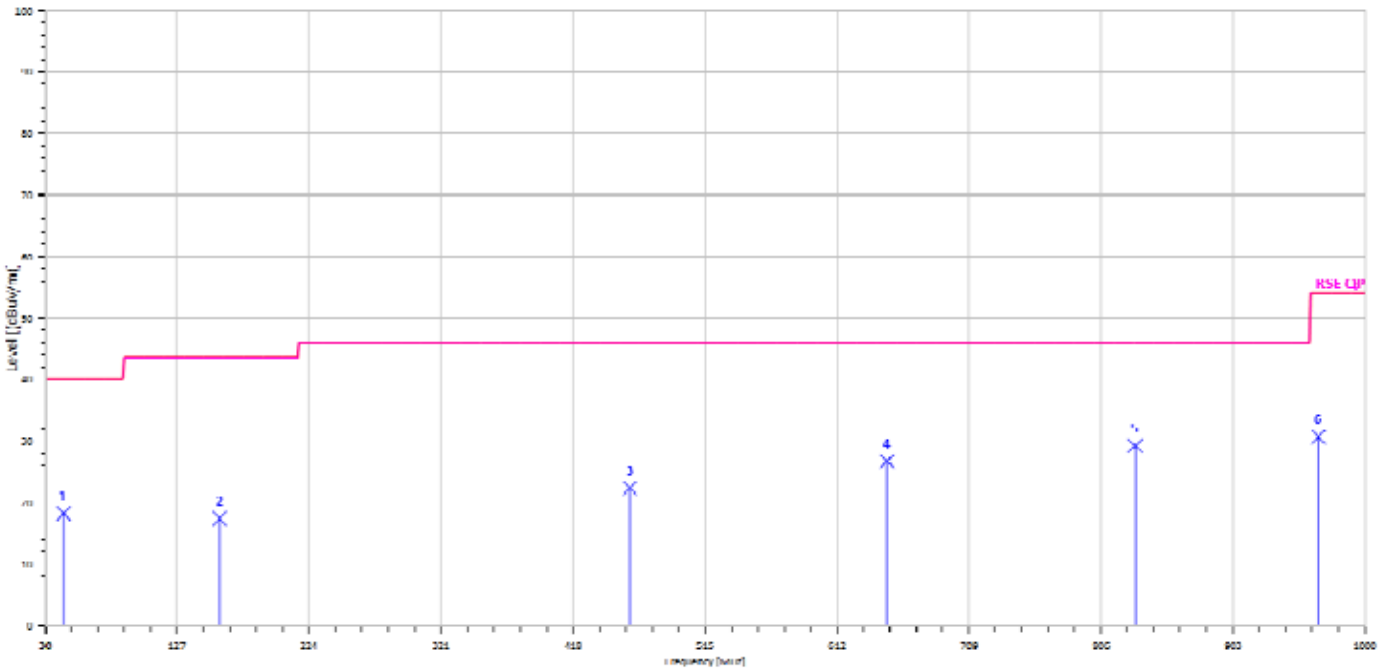
Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2453 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
43.58	S	Peak	35.30	-17.14	18.16	40	-21.84
158.04	S	Peak	32.96	-15.59	17.36	43.5	-26.14
459.71	S	Peak	33.61	-11.31	22.29	46	-23.71
648.86	S	Peak	34.61	-7.92	26.69	46	-19.31
831.22	S	Peak	35.08	-5.87	29.21	46	-16.79
966.05	S	Peak	34.87	-4.23	30.64	54	-23.36

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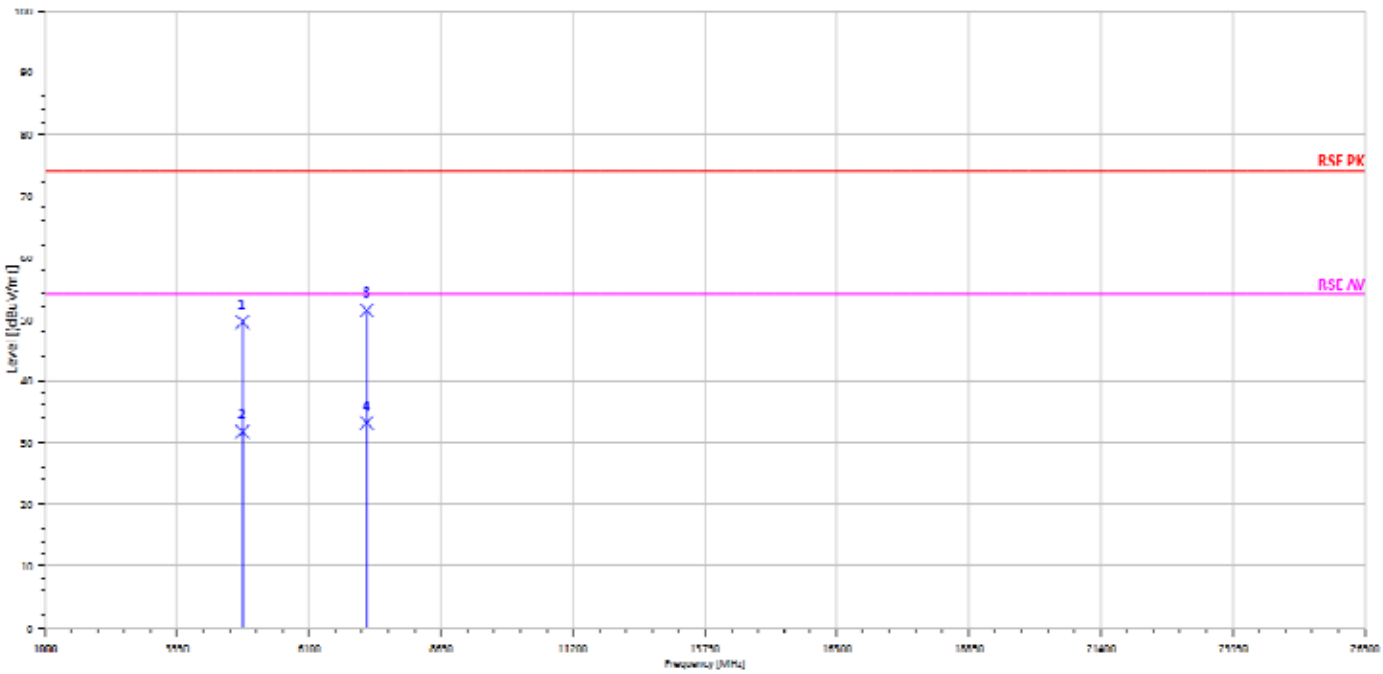
Radiated Spurious Emission Measurement Result (Above 1GHz)

Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2406 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4812.00	H	Peak	50.69	-1.11	49.58	74	-24.42
4812.00	H	Average	32.87	-1.11	31.76	54	-22.24
7218.00	H	Peak	45.95	5.50	51.45	74	-22.55
7218.00	H	Average	27.67	5.50	33.17	54	-20.83

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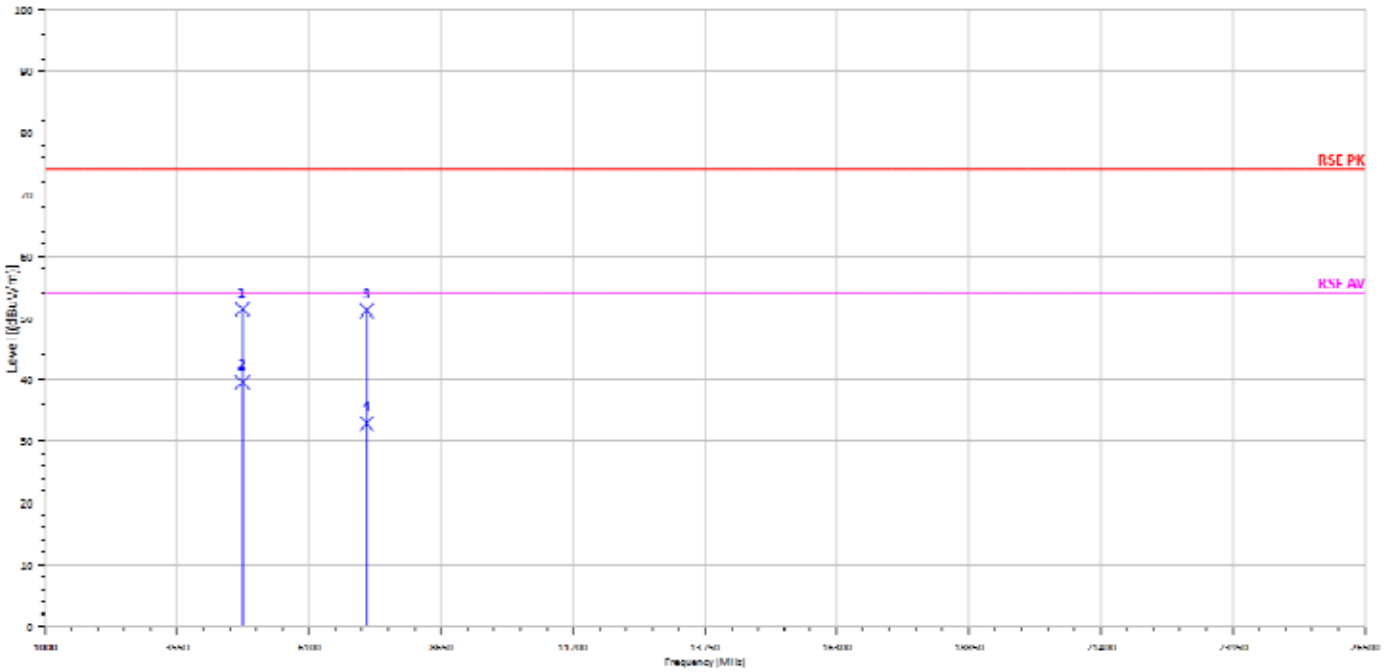
Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2406 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4812.00	H	Peak	52.53	-1.11	51.42	74	-22.58
4812.00	H	Average	40.67	-1.11	39.56	54	-14.44
7218.00	H	Peak	45.70	5.50	51.20	74	-22.80
7218.00	H	Average	27.40	5.50	32.90	54	-21.10

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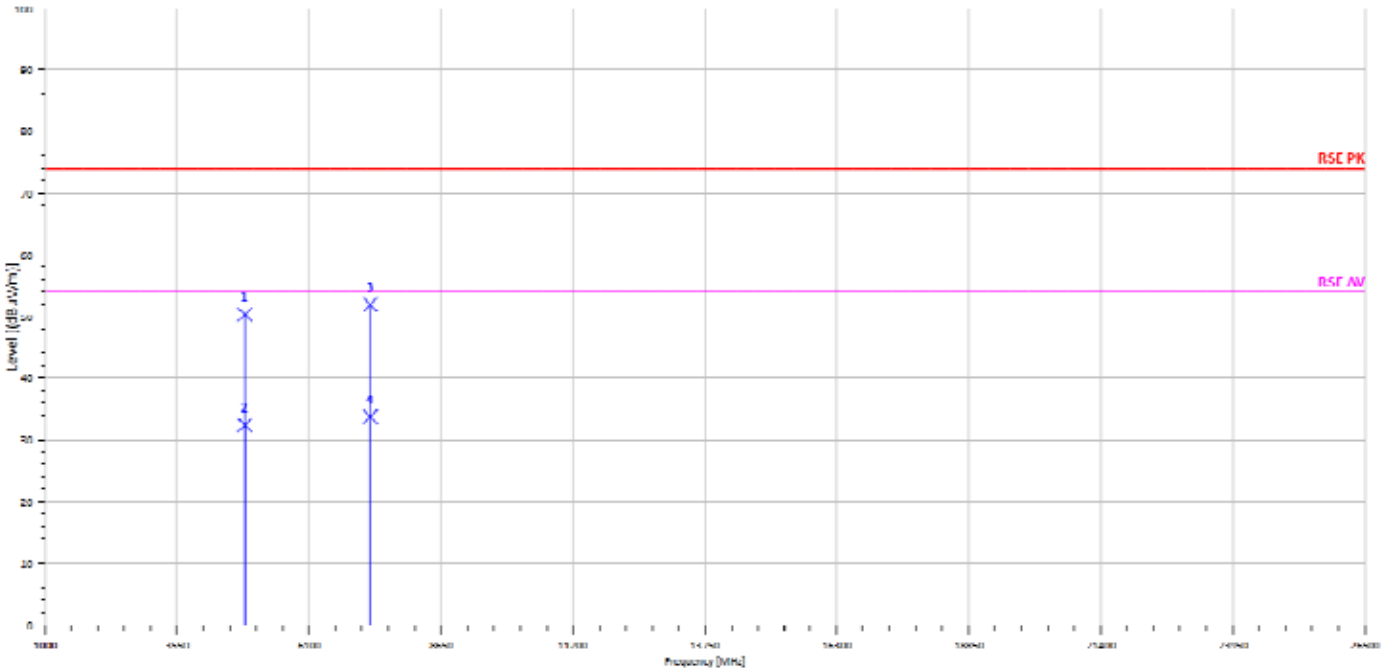
Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2429 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
4858.00	H	Peak	51.18	-0.84	50.34	74	-23.66
4858.00	H	Average	33.24	-0.84	32.40	54	-21.60
7287.00	H	Peak	45.97	6.00	51.96	74	-22.04
7287.00	H	Average	27.77	6.00	33.77	54	-20.23

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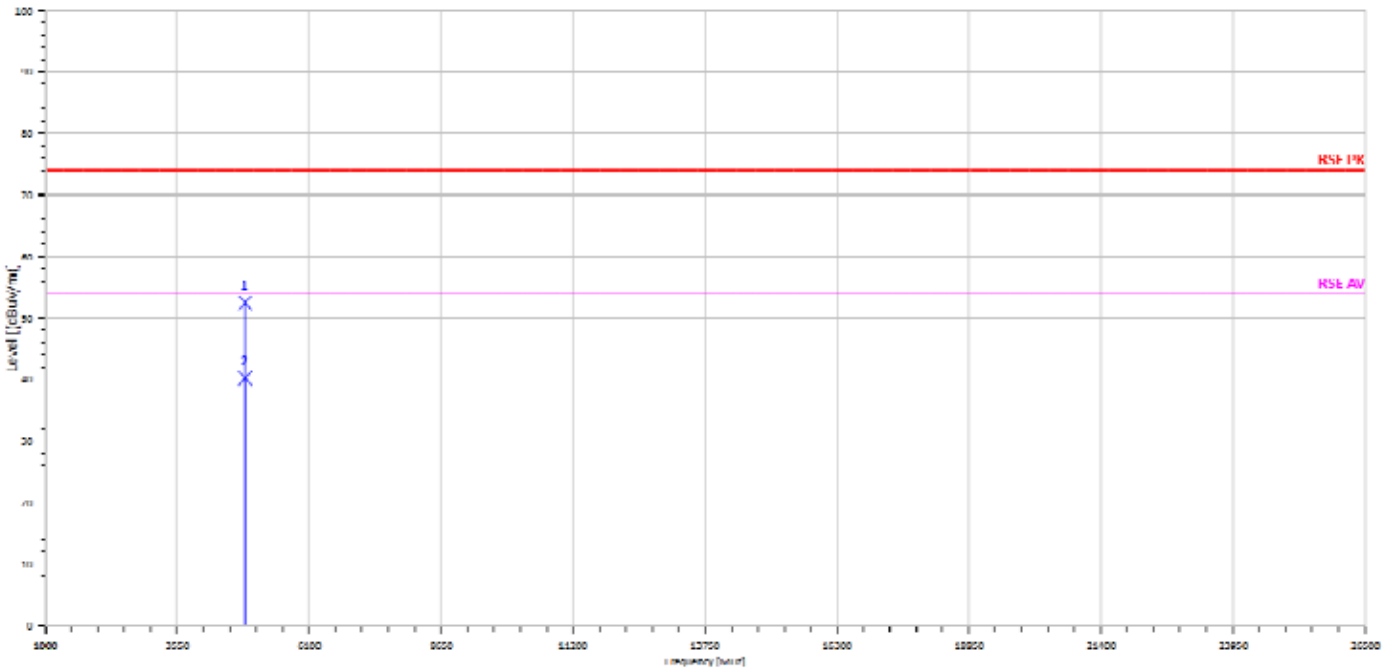
Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2429 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4858.00	H	Peak	53.26	-0.84	52.42	74	-21.58
4858.00	H	Average	40.99	-0.84	40.15	54	-13.85

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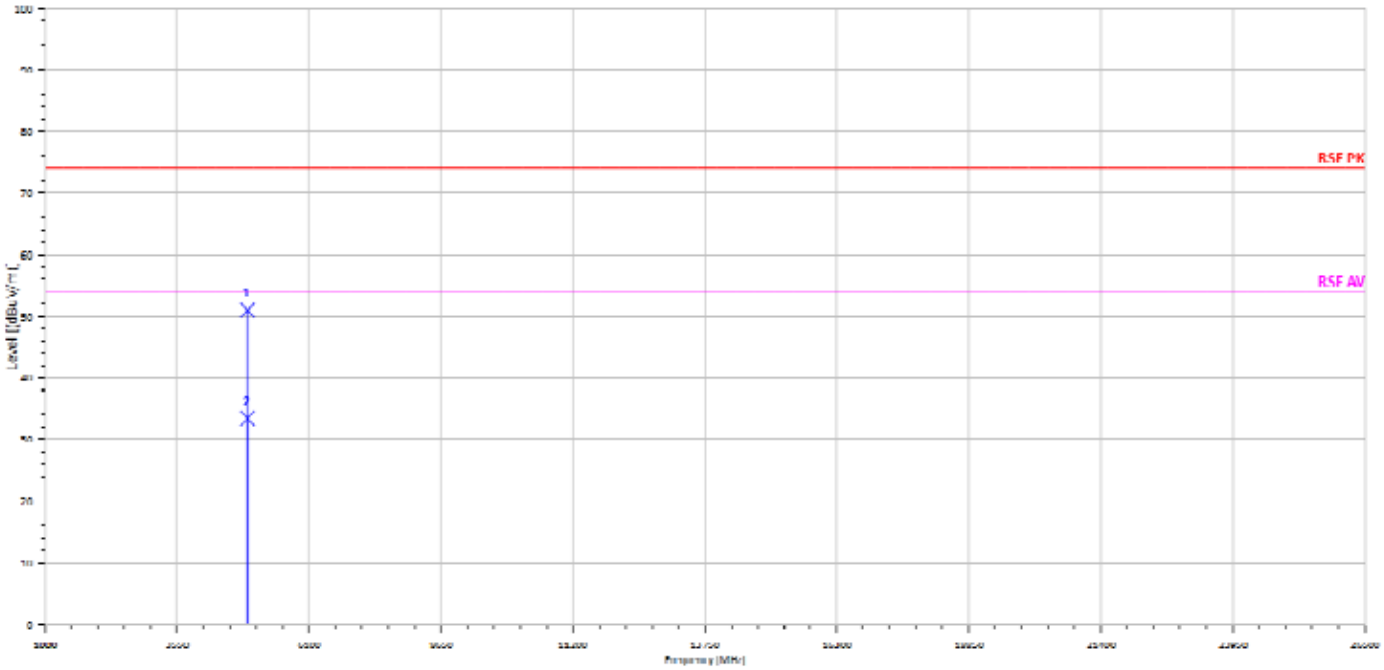
Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2453 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4906.00	H	Peak	51.57	-0.60	50.97	74	-23.03
4906.00	H	Average	33.97	-0.60	33.37	54	-20.63

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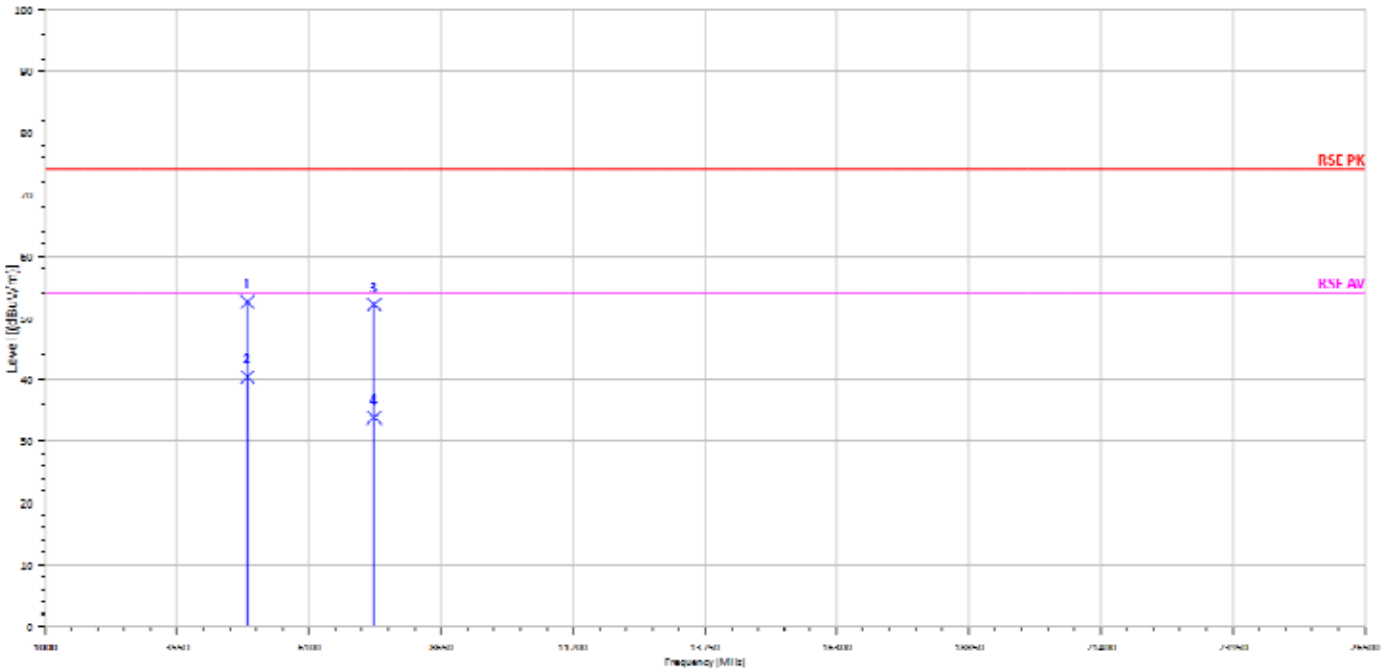
Operation Mode :	2.4G	Test Date :	2018/4/20
Fundamental Frequency :	2453 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Jerry
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4906.00	H	Peak	53.19	-0.60	52.59	74	-21.41
4906.00	H	Average	41.08	-0.60	40.47	54	-13.53
7359.00	H	Peak	45.99	6.15	52.14	74	-21.86
7359.00	H	Average	27.69	6.15	33.84	54	-20.16

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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	12/24/2017	12/23/2018
DC Block	PASTERNACK	PE8210	RF29	12/24/2017	12/23/2018
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/24/2017	12/23/2018
Attenuator	WOKEN	218FS-10	RF23	12/24/2017	12/23/2018
DC Power Supply	Agilent	E3640A	MY53140006	05/02/2017	05/01/2018

8.4 Measurement Results:

2.406GHz = 1.197MHz
2.429GHz = 1.249MHz
2.453GHz = 1.370MHz

Refer to attached data chart.

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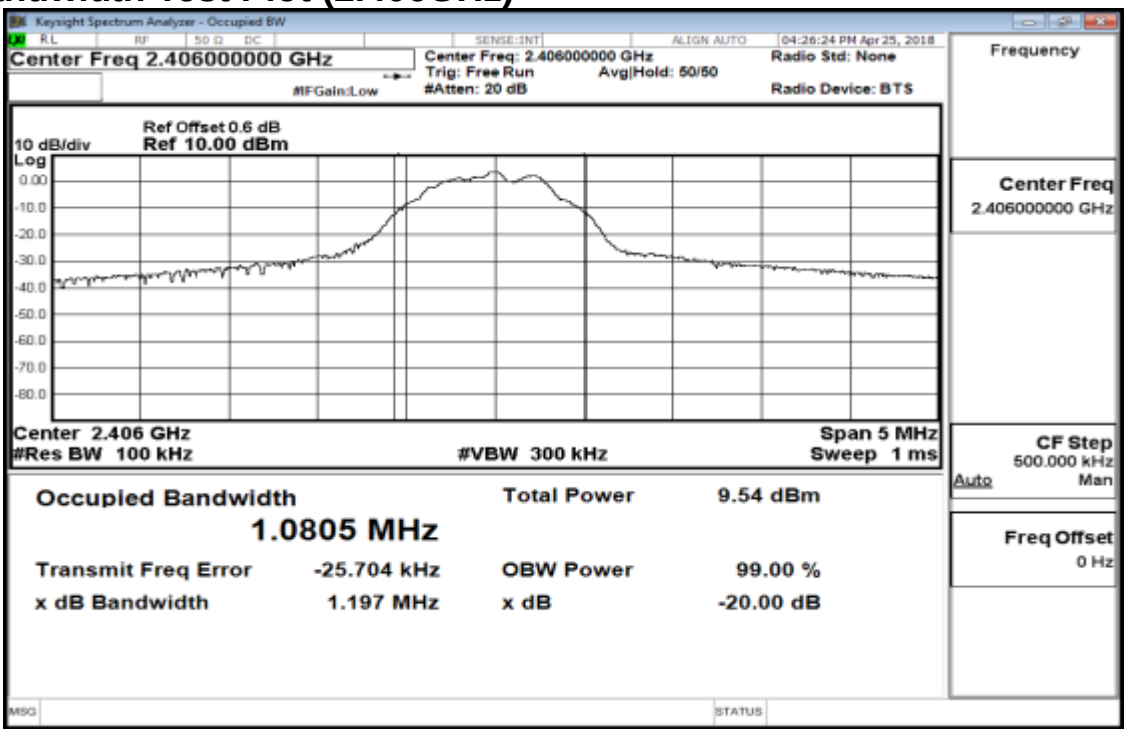
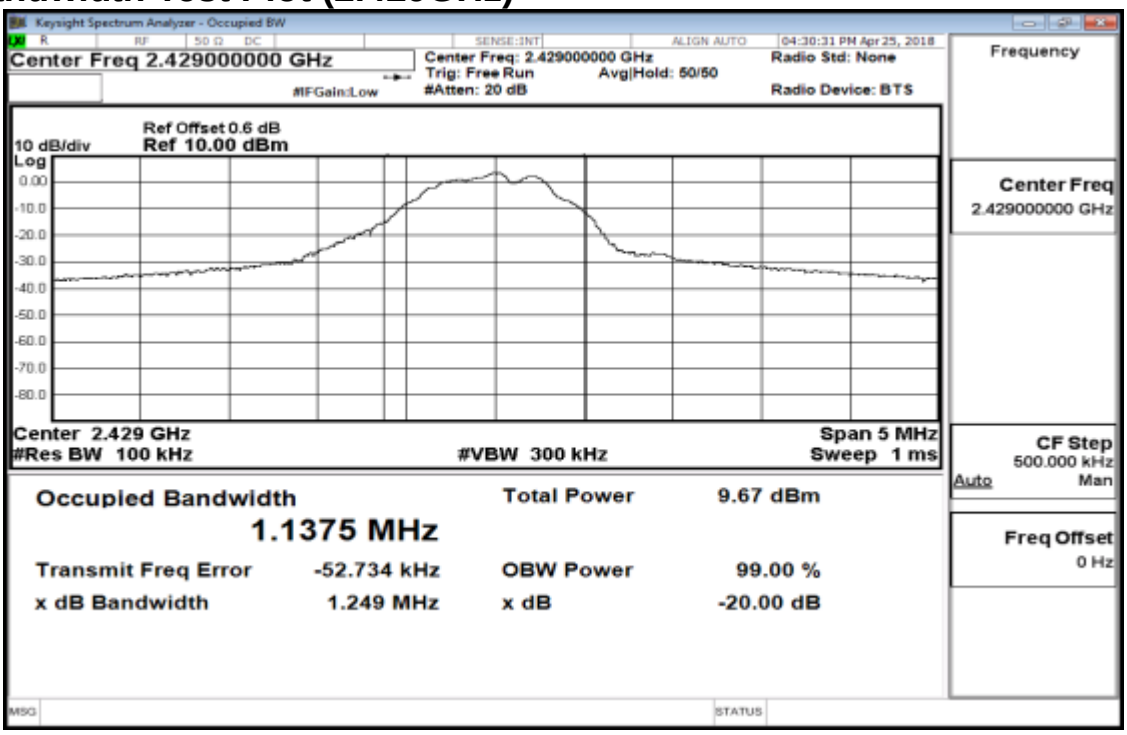
20dB Bandwidth Test Plot (2.406GHz)



20dB Bandwidth Test Plot (2.429GHz)



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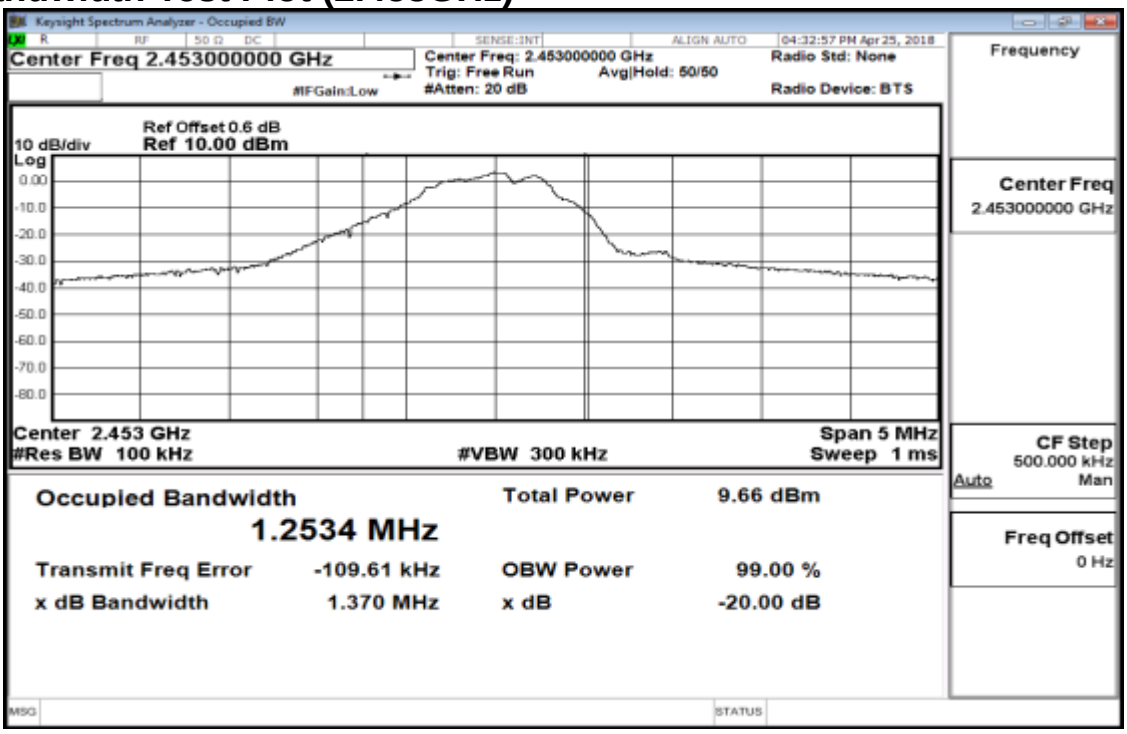
20dB Bandwidth Test Plot (2.453GHz)



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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 internal 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.

~ End of Report ~

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