

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT CLASS II PC REPORT

OF

Applicant: Bitatek Co., Ltd.
6F., No. 115, Wugong 3rd Rd., Wugu Dist., New Taipei City 248,
Taiwan

Product Name: Frey

Brand Name: Bitatek

Model No.: Frey M1-0000, Frey M1-0010

Model Difference: Frey M1-0000 with GPS
Frey M1-0010 without GPS

FCC ID: SPYIM0002

Report Number: ER/2018/10090

FCC Rule Part: §15.247, Cat: DSS

Issue Date: Feb. 02, 2018

Date of Test: Jan. 19, 2018~Jan. 22, 2018

Date of EUT Received: Jan. 17, 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.

Prepared By:

Karen Huang

Karen Huang / Clerk

Jim Chang

Approved By:

Jim Chang / Asst. Manager



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Revision History

Report Number	Revision	Description	Issue Date
ER/2018/10090	Rev.00	Initial creation of document	Feb. 02, 2018

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Contents

1	GENERAL INFORMATION.....	4
2	SYSTEM TEST CONFIGURATION	6
3	SUMMARY OF TEST RESULTS	8
4	DESCRIPTION OF TEST MODES.....	8
5	ASUREMENT UNCERTAINTY	10
6	RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT	11
7	ANTENNA REQUIREMENT	40

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1 GENERAL INFORMATION

1.1 Product description

General:

Product Name of Host:	Mobile computers	
Brand Name:	Opticon	
Model No. of Host:	H-29	
Model Difference:	N/A	
Hardware Version:	ES2	
Software Version:	6.0.1.0.1.0.1	
Model No. of BT/WLAN Module:	Frey M1-0000, Frey M1-0010	
Scope:	The test report covers the radiated emissions requirements of the standards referenced in the report to allow system level approval of the module in this specific host.	
Class II Permissive change:	Frey INSTALLED IN Mobile computers	
USB Cable:	Model No.: A36-A026-V119, Supplier: Conntek information Co.,LTD.	
Power Supply:	3.7Vdc from Rechargeable Li-polymer Battery or 5V from AC/DC Adapter	
	Battery:	1. Model No.: BTBAT3, Supplier: Leung's Communication & Electric Products (Guangzhou) LTD. 2. Model No.: BTBAT4, Supplier: Leung's Communication & Electric Products (Guangzhou) LTD.
	Adapter:	Model No.: S018BDU0900200, Supplier: TENPAO INDUSTRIAL CO.,LTD.

Bluetooth_BR+EDR:

Bluetooth Version	V4.1 dual mode
Channel number:	79 channels
Modulation type:	GFSK + $\pi/4$ DQPSK + 8DPSK
Frequency Range:	2.402GHz – 2.480GHz
Antenna Designation:	PIFA Antenna, Gain: -0.15 dBi

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1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

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.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803 (TAF code 0513)

FCC Registration Number and Designation number are: 509634 / TW0001

1.4 Special Accessories

There is no special accessory 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 placed on a turn table which is 0.8 m above ground plan. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz. 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 placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plan. 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 Configuration of Tested System

Fig. 2-1 Radiated Emission Configuration



Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	BT Test Software	N/A	N/A	N/A	N/A	N/A
2.	Notebook	Lenovo	L430	R9-X11BG	Shielded	Unshielded

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3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.247(d)	Radiated Band Edge and Spurious Emission	Compliant
§15.203 §15.247(b)	Antenna Requirement	Compliant

4 DESCRIPTION OF TEST MODES

4.1 Operated in 2400 ~ 2483.5MHz Band

79 channels are provided for Bluetooth

CH	FREQUENCY	CH	FREQUENCY	CH	FREQUENCY	CH	FREQUENCY
0	2402 MHz	20	2422 MHz	40	2442 MHz	70	2462 MHz
1	2403 MHz	21	2423 MHz	41	2443 MHz	71	2463 MHz
2	2404 MHz	22	2424 MHz	42	2444 MHz	72	2464 MHz
3	2405 MHz	23	2425 MHz	43	2445 MHz	73	2465 MHz
4	2406 MHz	24	2426 MHz	44	2446 MHz	74	2466 MHz
5	2407 MHz	25	2427 MHz	45	2447 MHz	75	2467 MHz
6	2408 MHz	26	2428 MHz	46	2448 MHz	76	2468 MHz
7	2409 MHz	27	2429 MHz	47	2449 MHz	77	2469 MHz
8	2410 MHz	28	2430 MHz	48	2450 MHz	78	2470 MHz
9	2411 MHz	29	2431 MHz	49	2451 MHz	79	2471 MHz
10	2412 MHz	30	2432 MHz	50	2452 MHz	70	2472 MHz
11	2413 MHz	31	2433 MHz	51	2453 MHz	71	2473 MHz
12	2414 MHz	32	2434 MHz	52	2454 MHz	72	2474 MHz
13	2415 MHz	33	2435 MHz	53	2455 MHz	73	2475 MHz
14	2416 MHz	34	2436 MHz	54	2456 MHz	74	2476 MHz
15	2417 MHz	35	2437 MHz	55	2457 MHz	75	2477 MHz
16	2418 MHz	36	2438 MHz	56	2458 MHz	76	2478 MHz
17	2419 MHz	37	2439 MHz	57	2459 MHz	77	2479 MHz
18	2420 MHz	38	2440 MHz	58	2460 MHz	78	2480 MHz
19	2421 MHz	39	2441 MHz	59	2461 MHz		

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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.
- 3 Investigation has been done on all the possible configurations for searching the worst case.

RADIATED EMISSION TEST (Worst case)				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	PACKET TYPE
Bluetooth	0 to 78	0,39,78	8-DPSK	DH5
RADIATED BAND EDGE EMISSION TEST				
Bluetooth	0 to 78	0,78	GFSK, 8-DPSK	DH5

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

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5 ASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 0.84 dB
20dB Bandwidth	+/- 51.33 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 0.84 dB
Frequency Separation	+/- 51.33 Hz
Number of hopping frequency	+/- 51.33 Hz
Time of Occupancy	+/- 51.33 Hz
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: +/-2.87dB
	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: +/-2.87dB
	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 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

6.1 Standard Applicable

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. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 limit as below.

And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

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

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBμV/m) = 20 log Emission level (dBμV/m)

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6.2 Measurement Equipment Used

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Bi-log Antenna	SCHWAZBECK	VULB9168	378	2017/12/29	2018/12/28
Horn Antenna	Schwarzbeck	BBHA9120D	1441	2017/08/04	2018/08/03
Horn Antenna	Schwarzbeck	BBHA9170	184	2017/12/12	2018/12/11
Loop Antenna	ETS.LINDGREN	6502	148045	2017/09/26	2018/09/25
Spectrum Analyzer	Agilent	E4446A	MY51100003	2017/05/10	2018/05/09
EMI Test Receiver	R&S	ESCI7	100760	2017/06/06	2018/06/05
Pre-Amplifier	HP	8449B	3008A00578	2018/01/02	2019/01/01
Pre-Amplifier	HP	8447D	2944A07676	2018/01/02	2019/01/01
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	2018/01/02	2019/01/01
Attenuator	Mini-Circuit	BW-S10W2+		2018/01/02	2019/01/01
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M1	2018/01/02	2019/01/01
Low Loss Cable	Huber Suhner	966_RX	9	2018/01/02	2019/01/01
Notebook	Lenovo	L430	R9-X11BG	N/A	N/A

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

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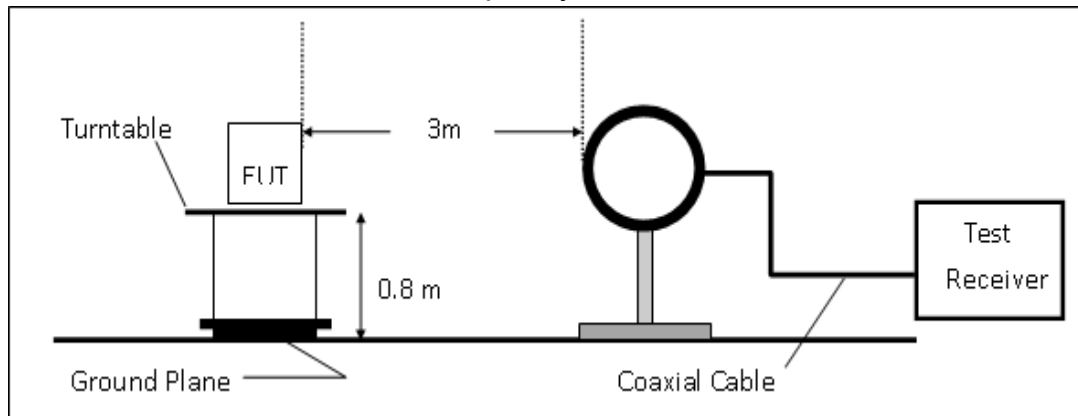
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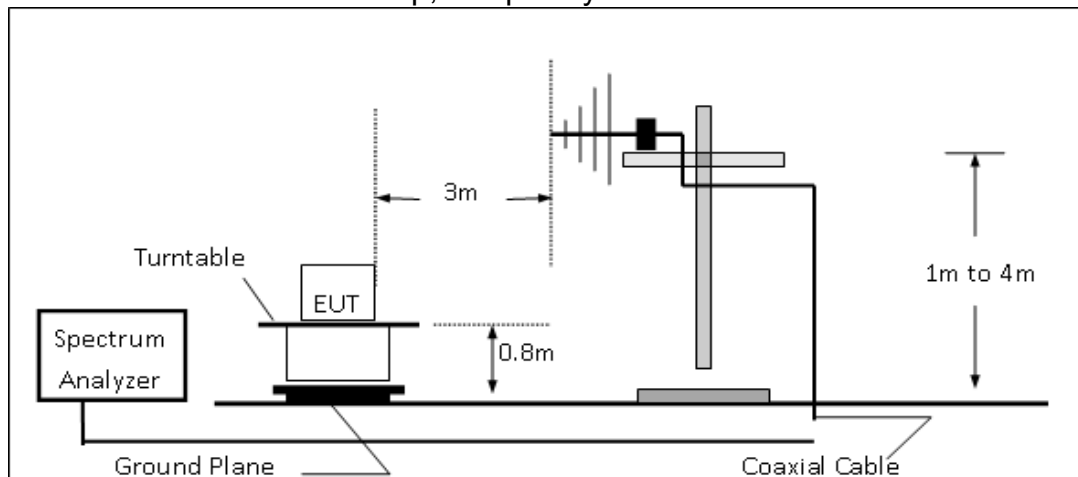
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6.3 Test SET-UP

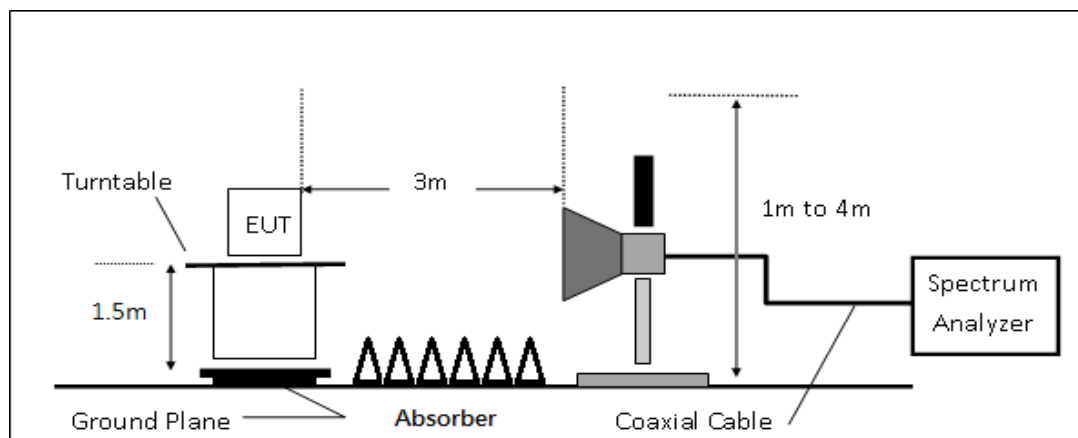
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(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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6.4 Measurement Procedure

Radiated Emission

1. The testing follows ANSI C63.10 Measurement Guidelines.
2. The EUT was placed on a turn table with 0.8m for frequency < 1GHz and 1.5m for frequency > 1GHz above ground plan.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
5. Use the follow spectrum analyzer setting:
 - (1) Span = wide enough to fully capture the emission being measured
 - (2) RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz, VBW $\geq$ RBW, Sweep = auto, Detector function = peak, Trace = max hold
 - (3) For average measurement: use duty cycle correction factor method per 15.35(c)
 Duty Cycle = On time/100 milliseconds

$$\text{On time} = N1 * L1 = N2 * L2 + \dots + N(n-1) * L(n-1) + N(n) * L(n)$$
 Where N1 is number of type 1 pulses, L1 is length of type 1 pulses, etc.
 Average Emission Level = Peak Emission Level + 20*log (duty Cycle)
6. When 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.
7. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
8. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
9. Repeat above procedures until all frequency of the interest measured were complete.

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6.5 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	

The limit of the emission level is expressed in dBuV/m, which converts $20 \cdot \log(\mu\text{V/m})$

Actual FS(dBuV/m) = SPA. Reading level(dBuV) + Factor(dB)

Factor(dB) = Antenna Factor(dBuV/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.

6.6 Test Results of Radiated Spurious Emissions form 9 KHz to 30 MHz

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

6.7 Measurement Result

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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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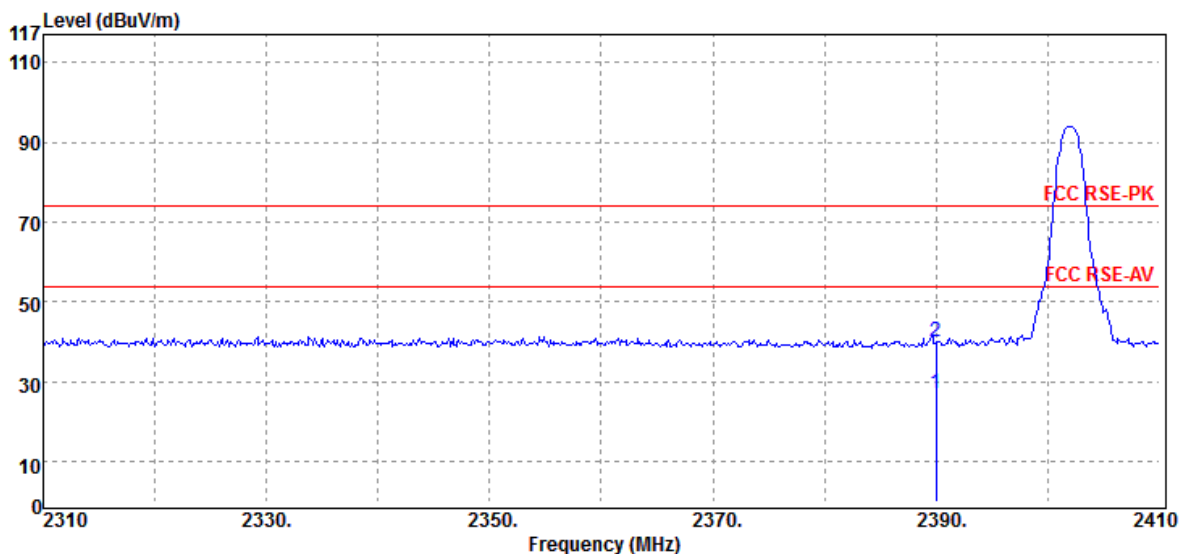
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Radiated Emission – Band Edge (Non-Hopping Mode):

Operation Band	:BR(1M)	Test Date	:2018-01-19
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:Bandedge CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
2390.00	E	Average	28.85	-1.74	27.11	54.00	-26.89
2390.00	E	Peak	41.68	-1.74	39.94	74.00	-34.06

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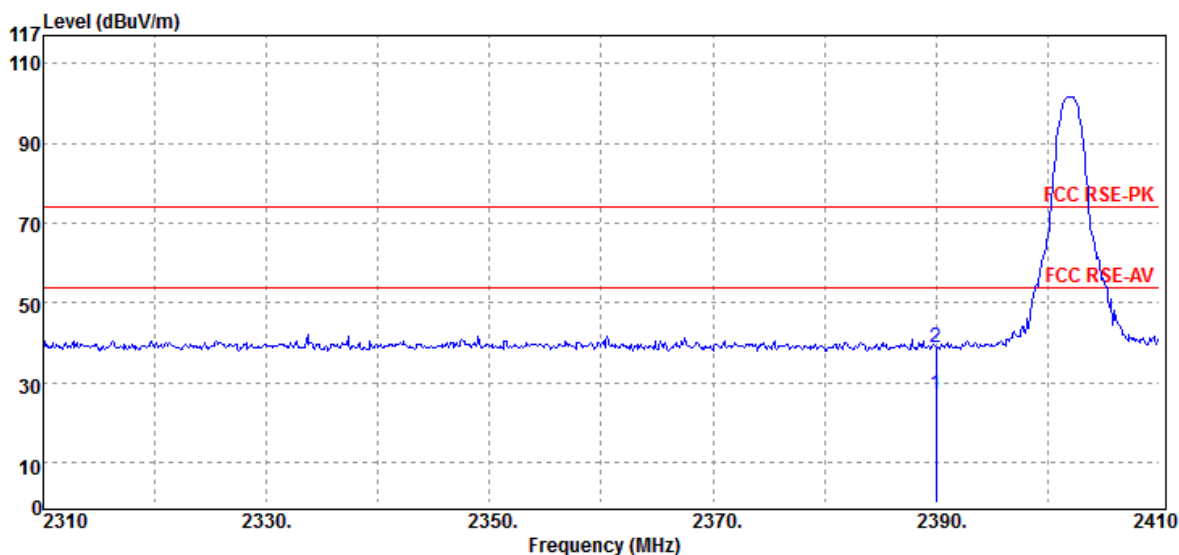
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Operation Band :BR(1M)
Fundamental Frequency :2402 MHz
Operation Mode :Bandedge CH LOW
EUT Pol. :H Plane

Test Date :2018-01-19
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode			Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Average	28.70	-1.74	26.96	54.00	-27.04
2390.00	E	Peak	40.69	-1.74	38.95	74.00	-35.05

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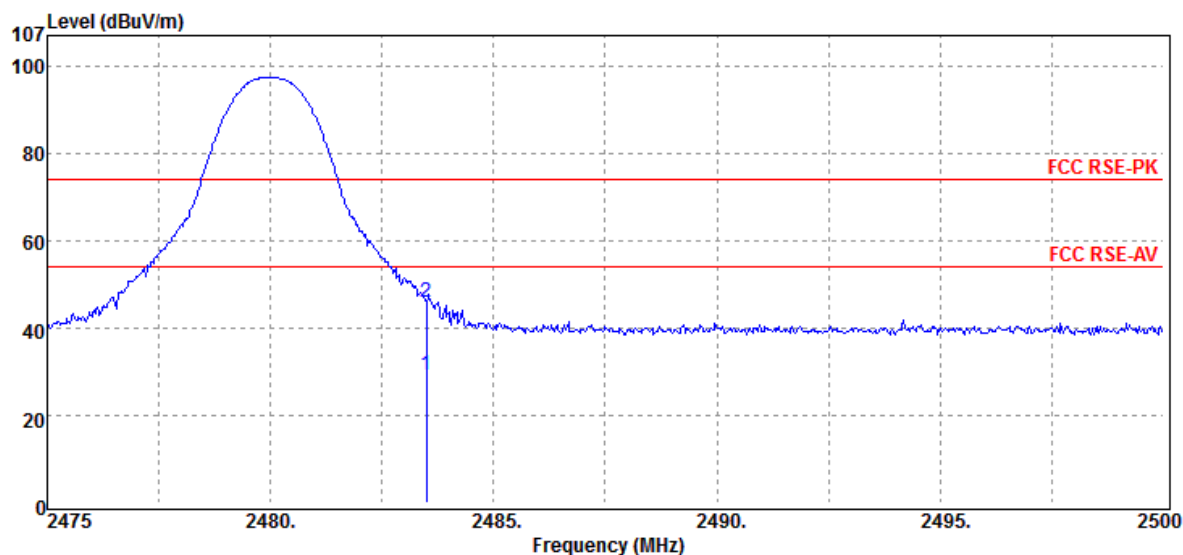
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Operation Band :BR(1M)
Fundamental Frequency :2480 MHz
Operation Mode :Bandedge CH HIGH
EUT Pol. :H Plane

Test Date :2018-01-19
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	30.77	-1.62	29.15	54.00	-24.85
2483.50	E	Peak	47.65	-1.62	46.03	74.00	-27.97

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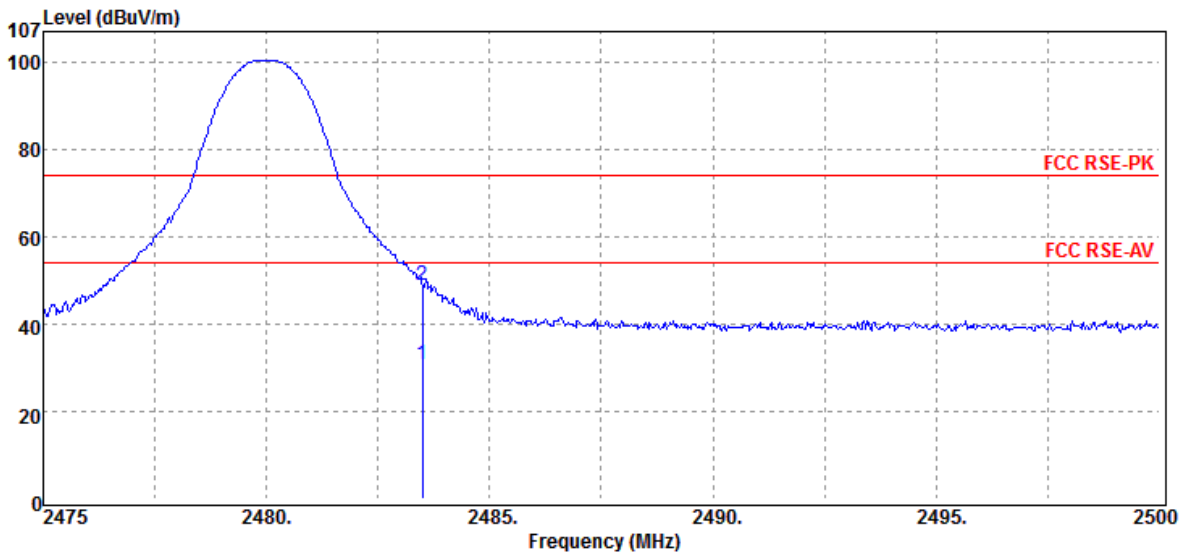
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Operation Band :BR(1M)
Fundamental Frequency :2480 MHz
Operation Mode :Bandedge CH HIGH
EUT Pol. :H Plane

Test Date :2018-01-19
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	32.26	-1.62	30.64	54.00	-23.36
2483.50	E	Peak	50.36	-1.62	48.74	74.00	-25.26

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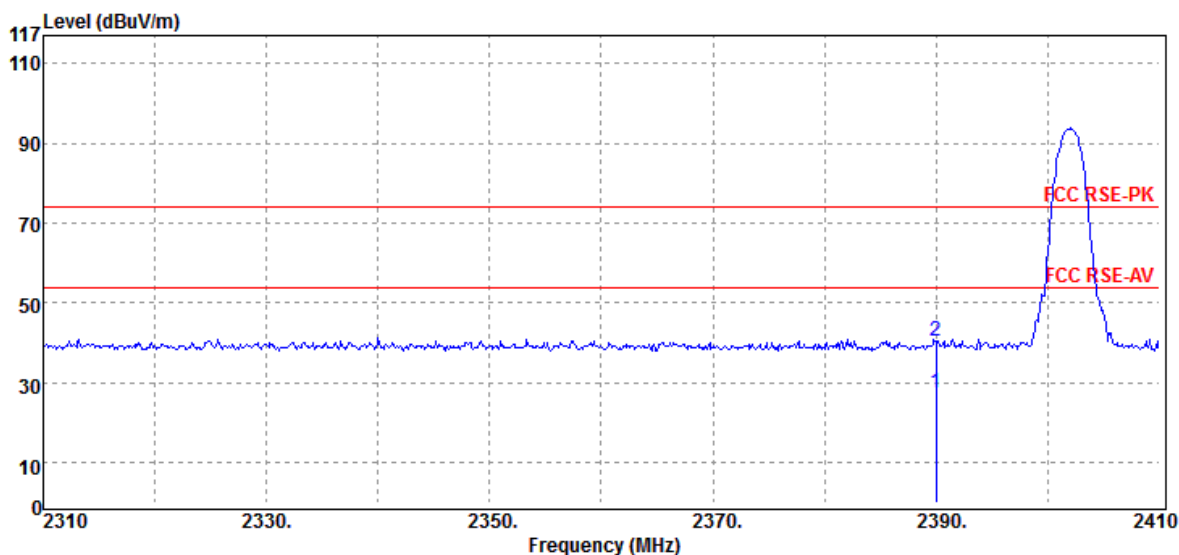
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Operation Band :EDR(3M)
Fundamental Frequency :2402 MHz
Operation Mode :Bandedge CH LOW
EUT Pol. :H Plane

Test Date :2018-01-19
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode			Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Average	29.23	-1.74	27.49	54.00	-26.51
2390.00	E	Peak	42.13	-1.74	40.39	74.00	-33.61

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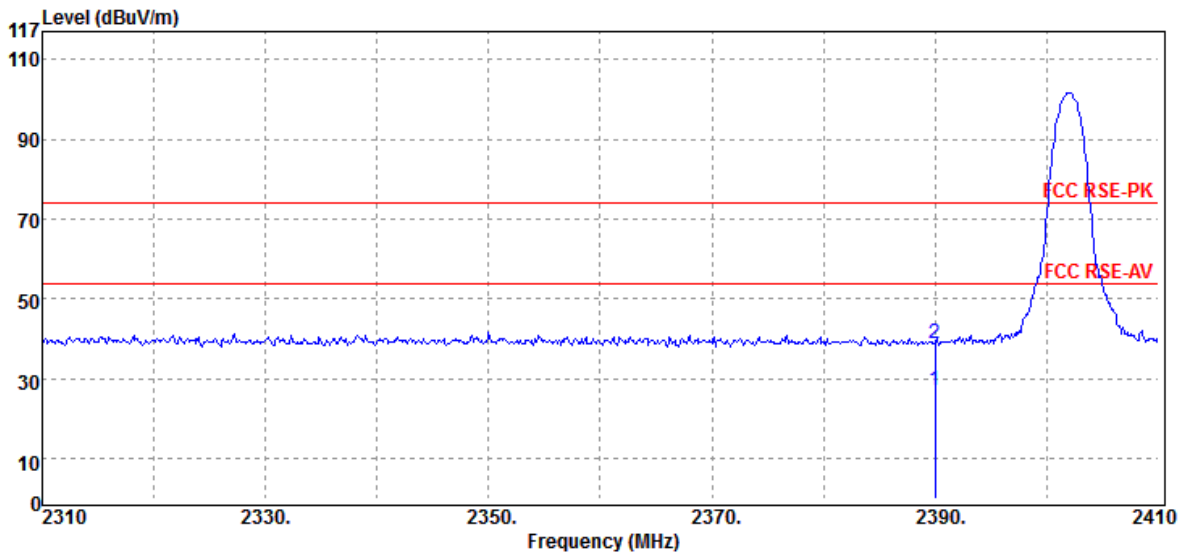
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Operation Band :EDR(3M)
Fundamental Frequency :2402 MHz
Operation Mode :Bandedge CH LOW
EUT Pol. :H Plane

Test Date :2018-01-19
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode			Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Average	28.85	-1.74	27.11	54.00	-26.89
2390.00	E	Peak	40.74	-1.74	39.00	74.00	-35.00

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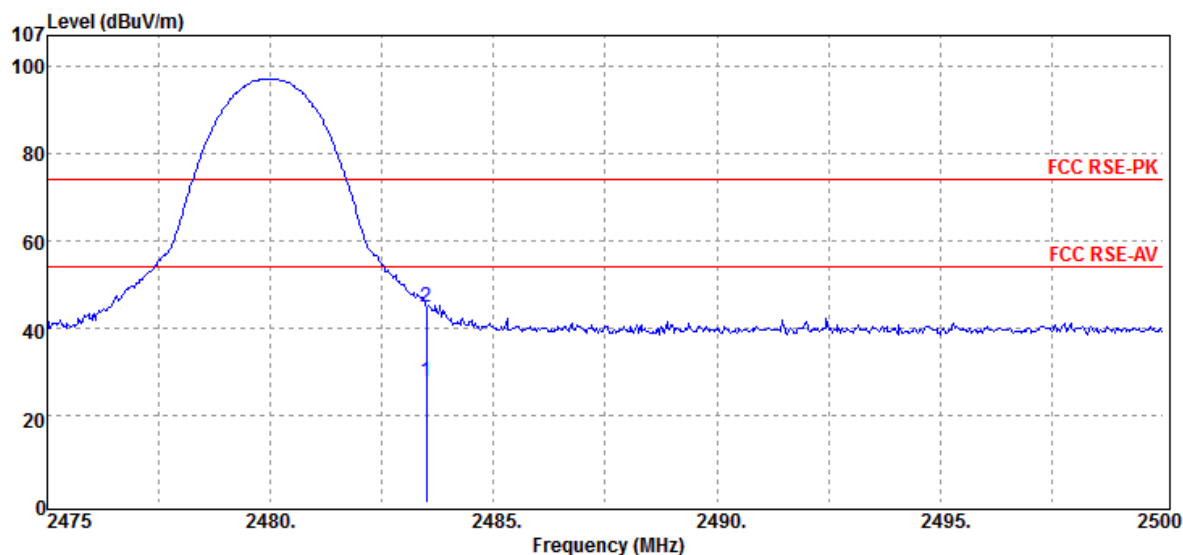
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Member of SGS Group

Operation Band :EDR(3M)
Fundamental Frequency :2480 MHz
Operation Mode :Bandedge CH HIGH
EUT Pol. :H Plane

Test Date :2018-01-19
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	29.54	-1.62	27.92	54.00	-26.08
2483.50	E	Peak	46.46	-1.62	44.84	74.00	-29.16

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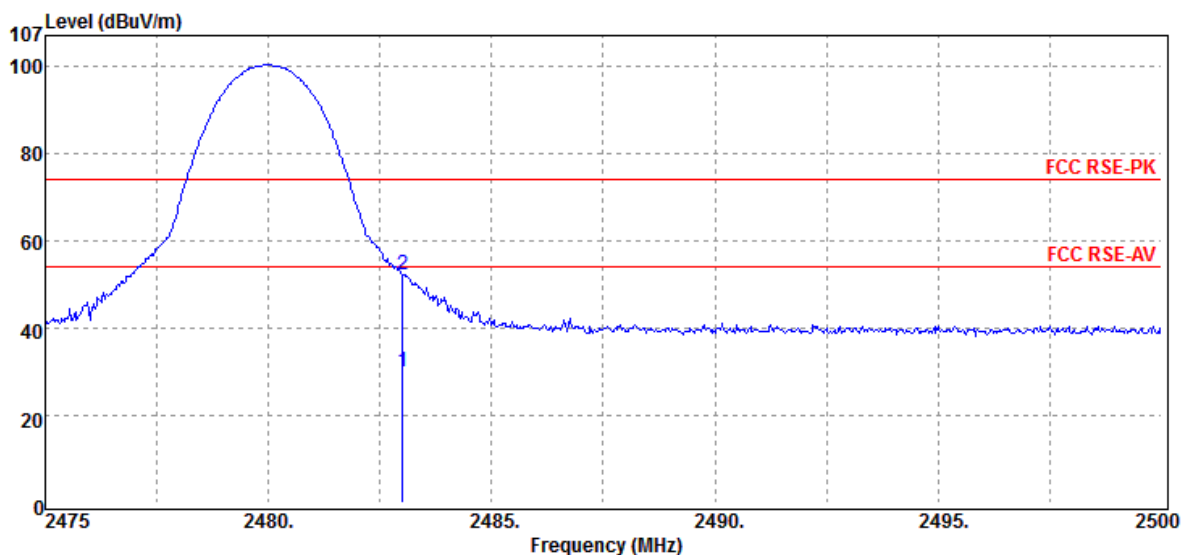
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Member of SGS Group

Operation Band :EDR(3M)
Fundamental Frequency :2480 MHz
Operation Mode :Bandedge CH HIGH
EUT Pol. :H Plane

Test Date :2018-01-19
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.00	E	Average	31.65	-1.61	30.04	54.00	-23.96
2483.00	E	Peak	53.99	-1.61	52.38	74.00	-21.62

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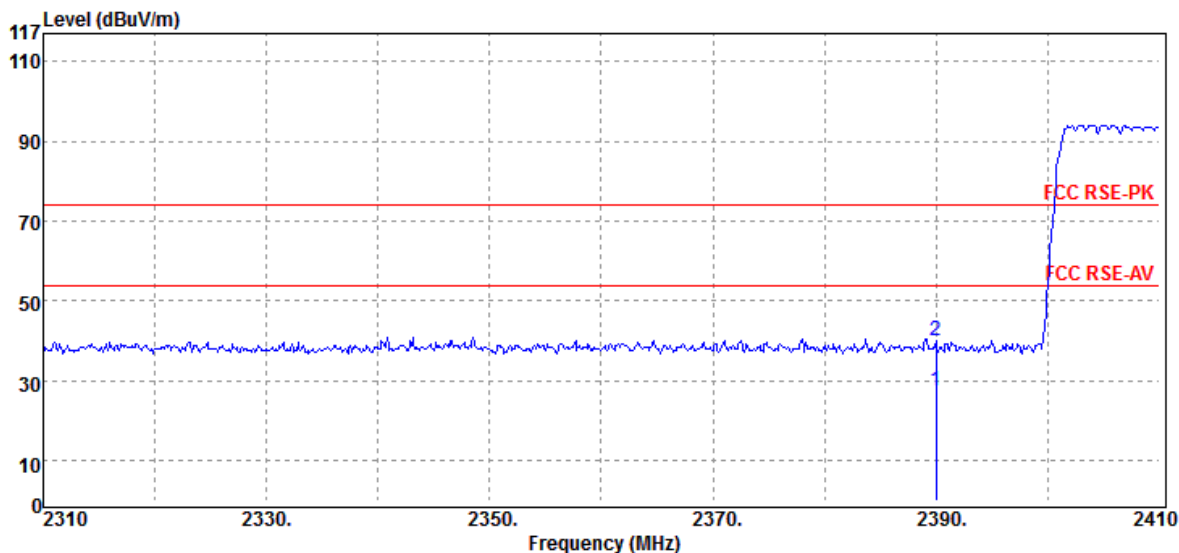
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Radiated Emission – Band Edge (Hopping Mode):

Operation Band :BR Hopping
Fundamental Frequency :2402 MHz
Operation Mode :Bandedge CH LOW
EUT Pol. :H Plane

Test Date :2018-01-19
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
2390.00	E	Average	29.18	-1.74	27.44	54.00	-26.56
2390.00	E	Peak	41.83	-1.74	40.09	74.00	-33.91

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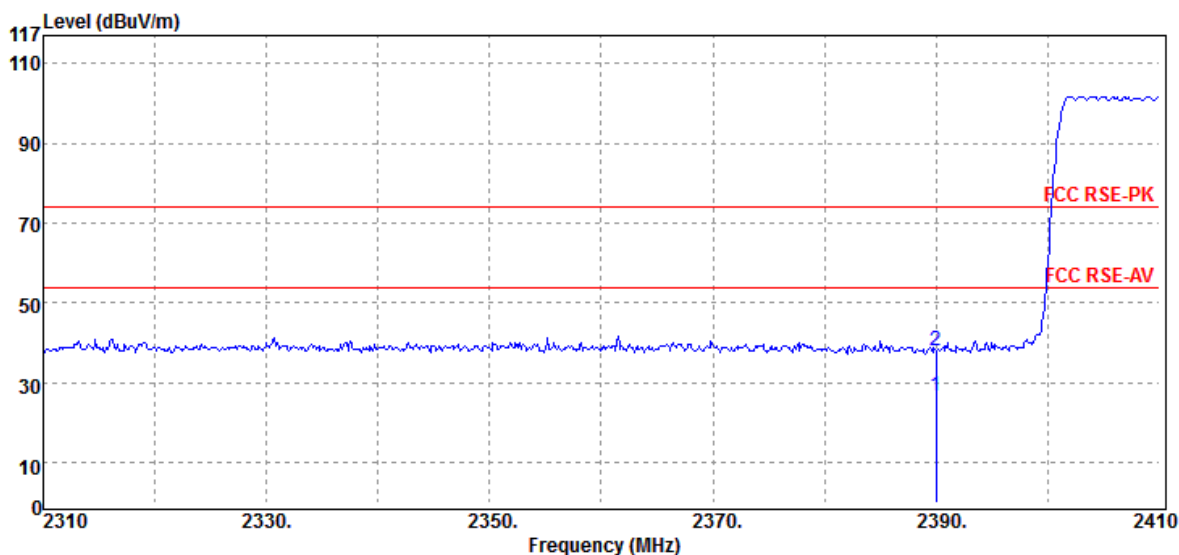
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Operation Band :BR Hopping
Fundamental Frequency :2402 MHz
Operation Mode :Bandedge CH LOW
EUT Pol. :H Plane

Test Date :2018-01-19
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Average	28.35	-1.74	26.61	54.00	-27.39
2390.00	E	Peak	39.90	-1.74	38.16	74.00	-35.84

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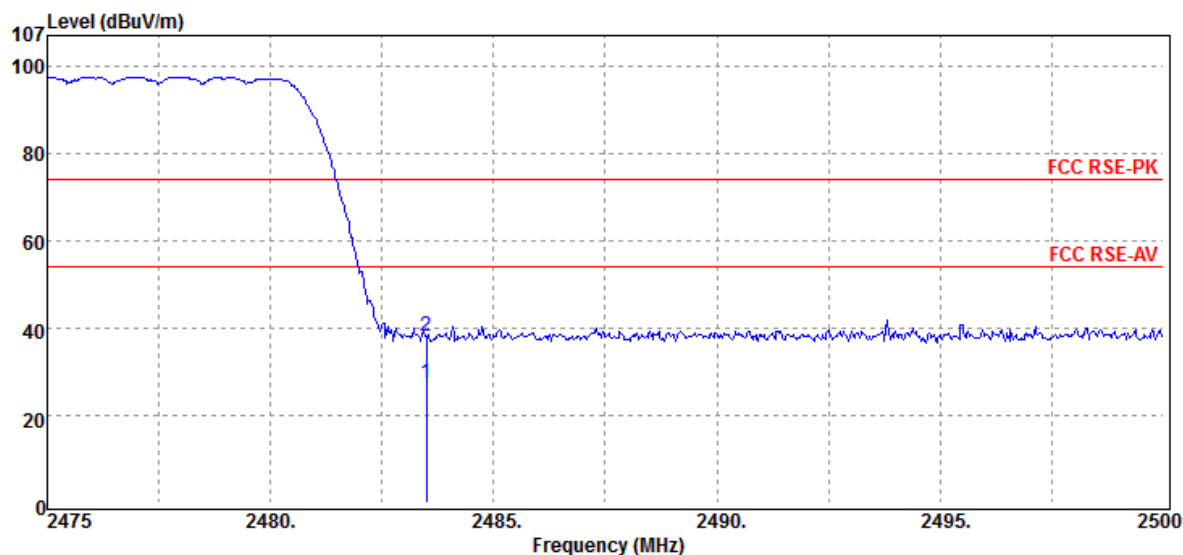
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Operation Band :BR Hopping
Fundamental Frequency :2480 MHz
Operation Mode :Bandedge CH HIGH
EUT Pol. :H Plane

Test Date :2018-01-19
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	29.10	-1.62	27.48	54.00	-26.52
2483.50	E	Peak	39.70	-1.62	38.08	74.00	-35.92

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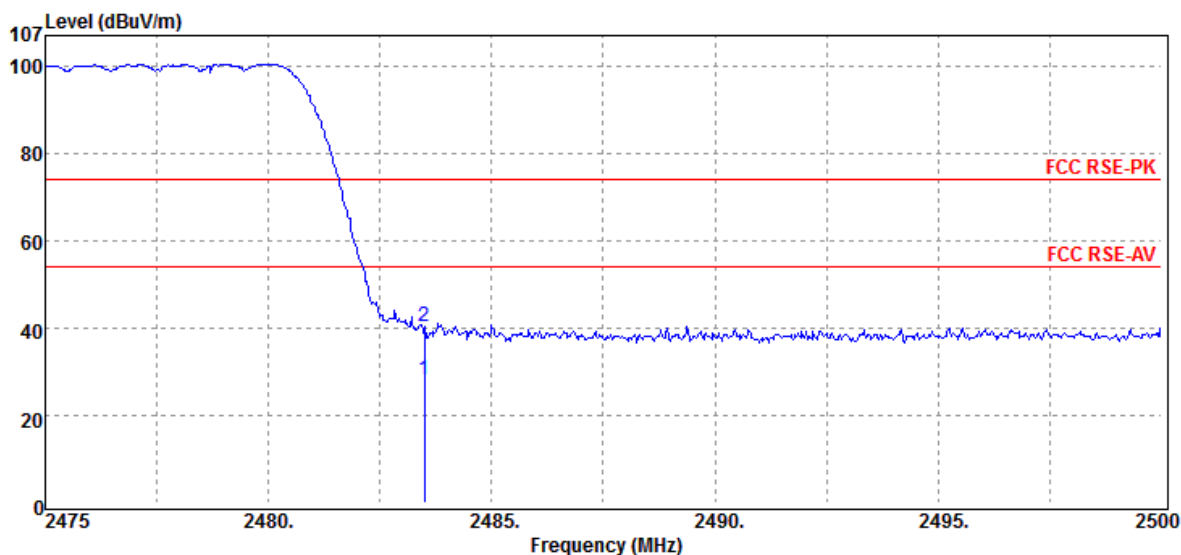
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Operation Band :BR Hopping
Fundamental Frequency :2480 MHz
Operation Mode :Bandedge CH HIGH
EUT Pol. :H Plane

Test Date :2018-01-19
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	29.61	-1.62	27.99	54.00	-26.01
2483.50	E	Peak	42.16	-1.62	40.54	74.00	-33.46

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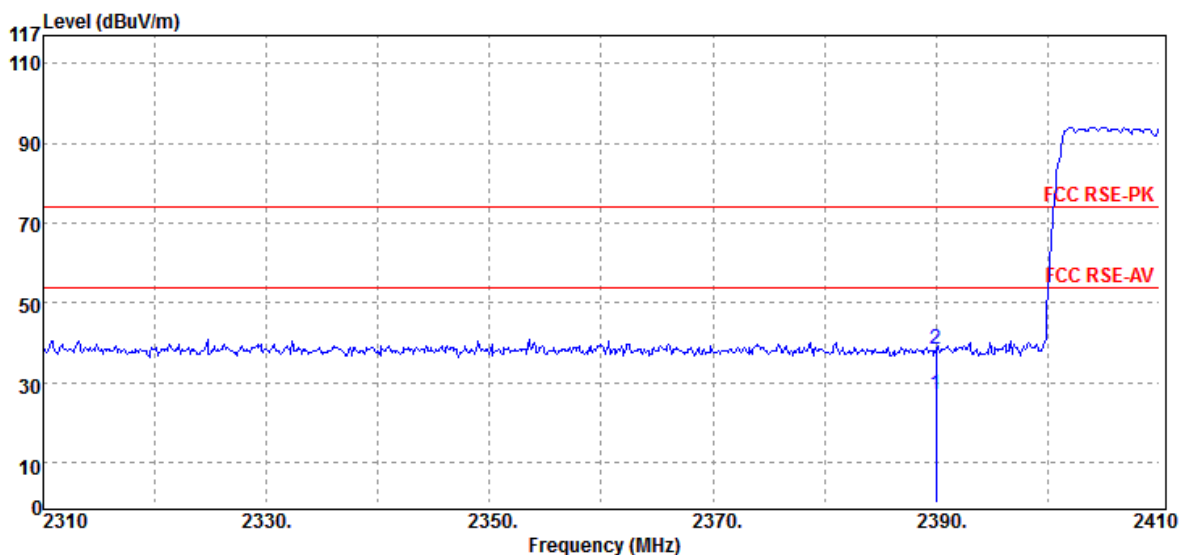
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Operation Band :EDR Hopping
Fundamental Frequency :2402 MHz
Operation Mode :Bandedge CH LOW
EUT Pol. :H Plane

Test Date :2018-01-19
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode			Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Average	28.77	-1.74	27.03	54.00	-26.97
2390.00	E	Peak	40.18	-1.74	38.44	74.00	-35.56

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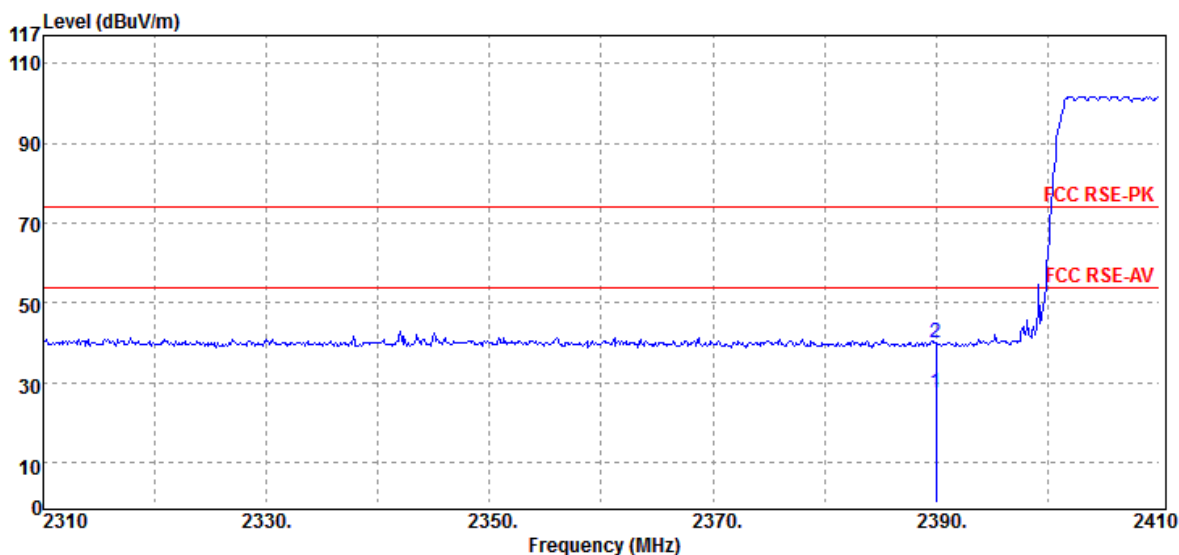
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Operation Band :EDR Hopping
Fundamental Frequency :2402 MHz
Operation Mode :Bandedge CH LOW
EUT Pol. :H Plane

Test Date :2018-01-19
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dB μ V	dB	dB μ V/m	dB μ V/m	dB
2390.00	E	Average	29.30	-1.74	27.56	54.00	-26.44
2390.00	E	Peak	41.76	-1.74	40.02	74.00	-33.98

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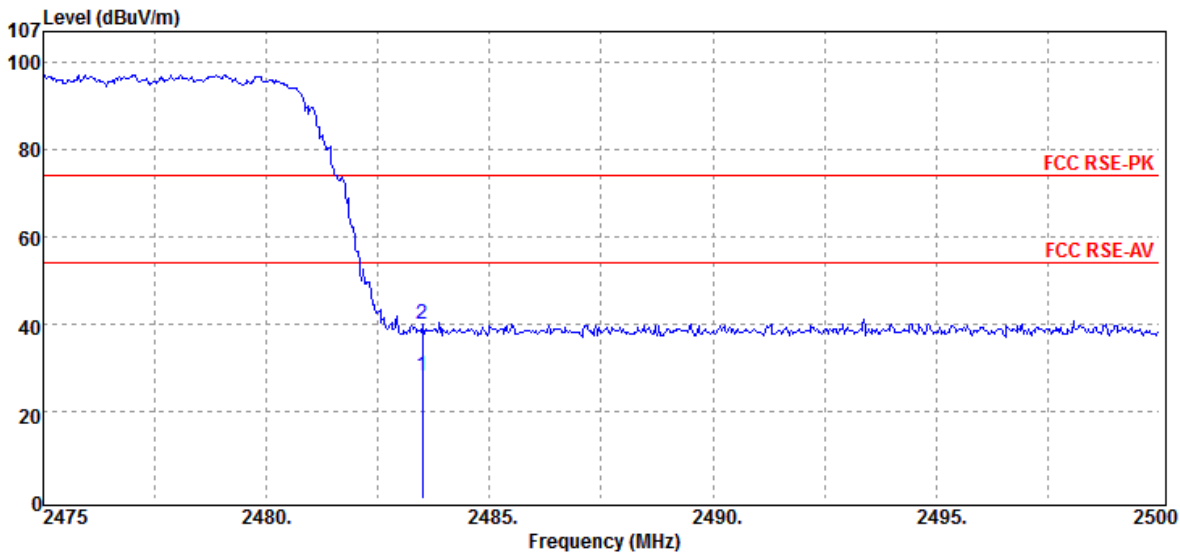
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Operation Band :EDR Hopping
Fundamental Frequency :2480 MHz
Operation Mode :Bandedge CH HIGH
EUT Pol. :H Plane

Test Date :2018-01-19
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	29.86	-1.62	28.24	54.00	-25.76
2483.50	E	Peak	41.56	-1.62	39.94	74.00	-34.06

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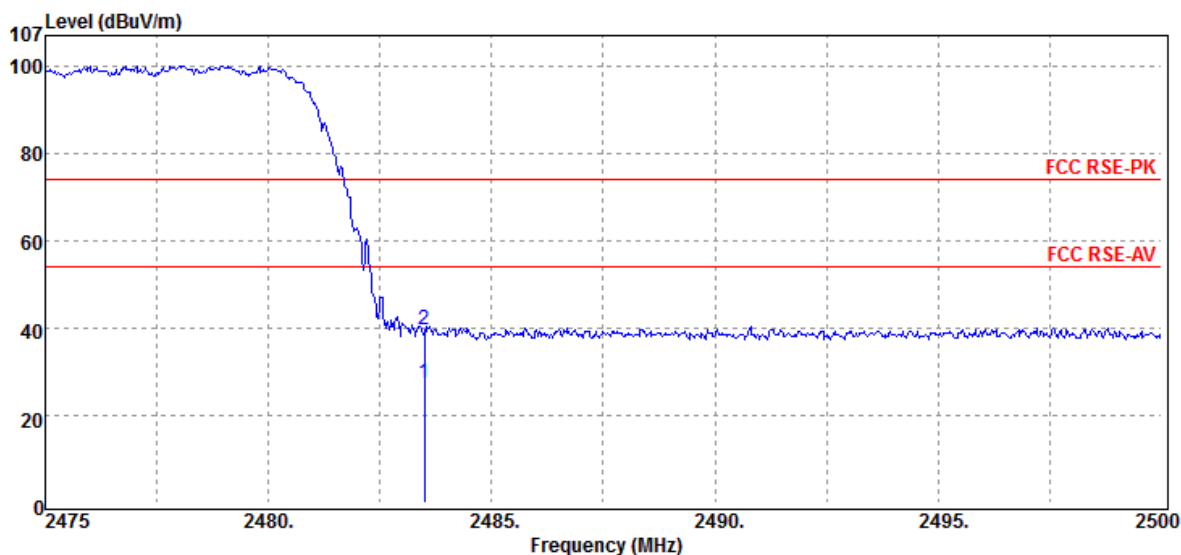
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Operation Band :EDR Hopping
Fundamental Frequency :2480 MHz
Operation Mode :Bandedge CH HIGH
EUT Pol. :H Plane

Test Date :2018-01-19
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	29.19	-1.62	27.57	54.00	-26.43
2483.50	E	Peak	41.20	-1.62	39.58	74.00	-34.42

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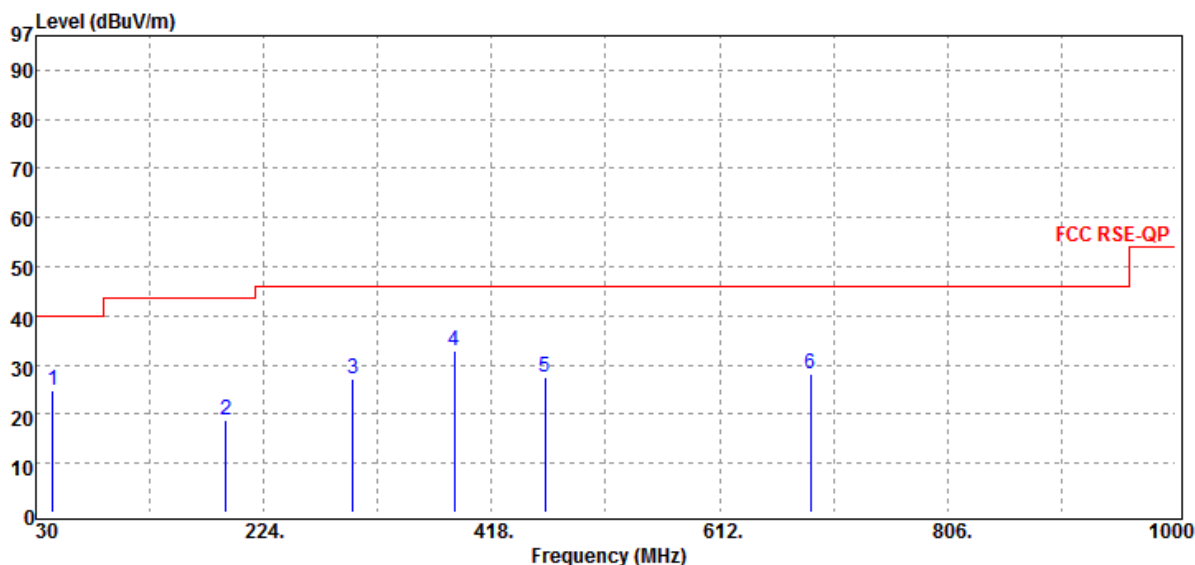
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Radiated Spurious Emission Measurement Result (Below 1GHz):

Operation Band	:EDR(3M)	Test Date	:2018-01-22
Fundamental Frequency	:2441 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	
44.55	S	Peak	32.89	-8.09	24.80	40.00	-15.20
191.99	S	Peak	28.31	-9.42	18.89	43.50	-24.61
299.66	S	Peak	33.16	-5.93	27.23	46.00	-18.77
385.99	S	Peak	37.23	-4.31	32.92	46.00	-13.08
463.59	S	Peak	29.99	-2.55	27.44	46.00	-18.56
689.60	S	Peak	26.96	1.27	28.23	46.00	-17.77

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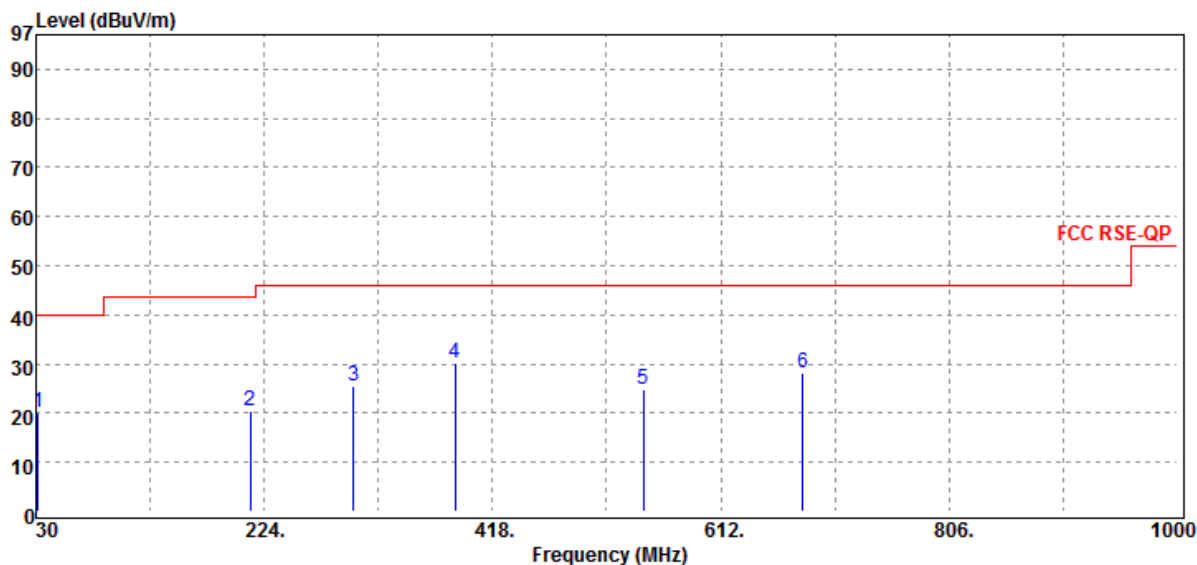
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Operation Band	:EDR(3M)	Test Date	:2018-01-22
Fundamental Frequency	:2441 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
		PK/QP/AV	dB μ V	dB	dB μ V/m	dB μ V/m	dB
31.94	S	Peak	29.23	-9.11	20.12	40.00	-19.88
212.36	S	Peak	30.26	-9.65	20.61	43.50	-22.89
299.66	S	Peak	31.28	-5.93	25.35	46.00	-20.65
385.99	S	Peak	34.58	-4.31	30.27	46.00	-15.73
546.04	S	Peak	26.30	-1.55	24.75	46.00	-21.25
681.84	S	Peak	27.23	0.92	28.15	46.00	-17.85

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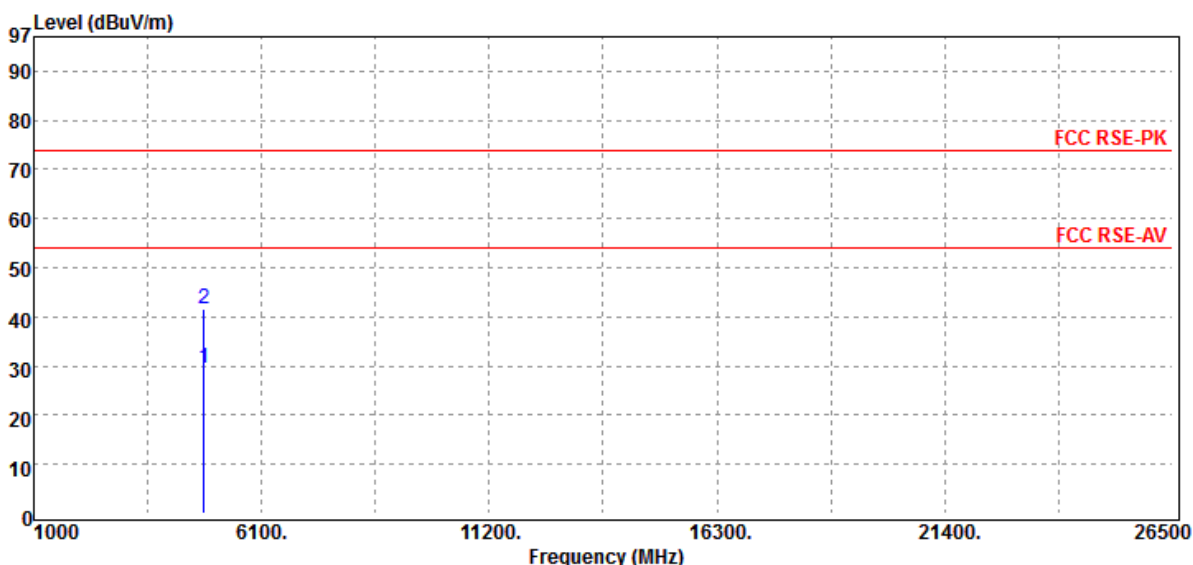
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Radiated Spurious Emission Measurement Result (Above 1GHz):

Operation Band	:EDR(3M)	Test Date	:2018-01-19
Fundamental Frequency	:2402 MHz	Temp./Humi.	:21 deg_C / 62 RH
Operation Mode	:Tx CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4804.00	H	Average	24.48	4.92	29.40	54.00	-24.60
4804.00	H	Peak	36.72	4.92	41.64	74.00	-32.36

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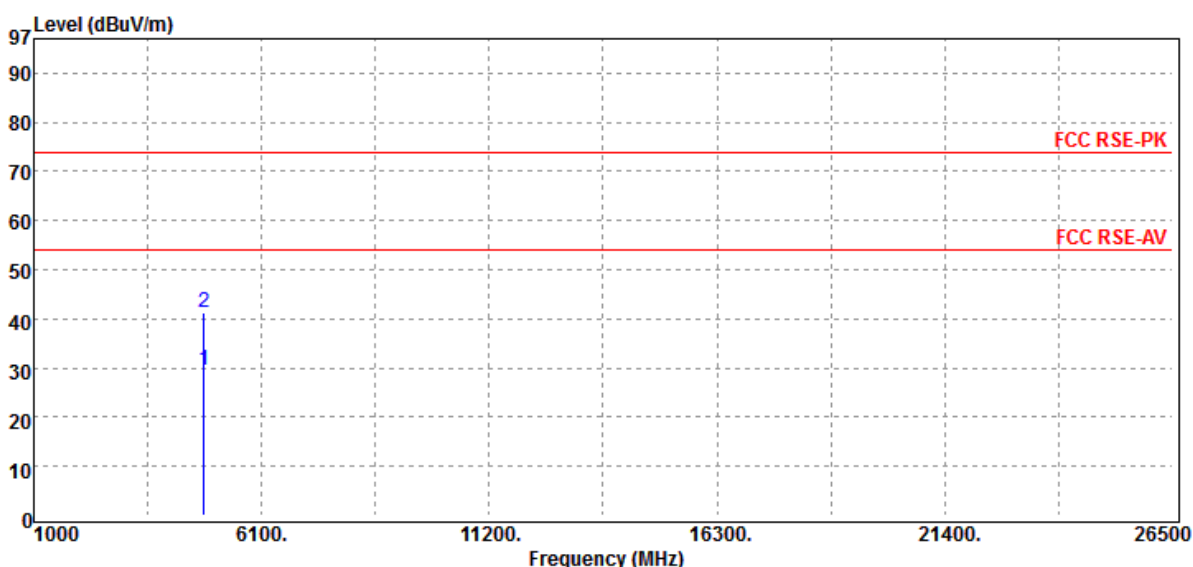
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Operation Band	:EDR(3M)	Test Date	:2018-01-19
Fundamental Frequency	:2402 MHz	Temp./Humi.	:21 deg_C / 62 RH
Operation Mode	:Tx CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4804.00	H	Average	24.51	4.92	29.43	54.00	-24.57
4804.00	H	Peak	36.28	4.92	41.20	74.00	-32.80

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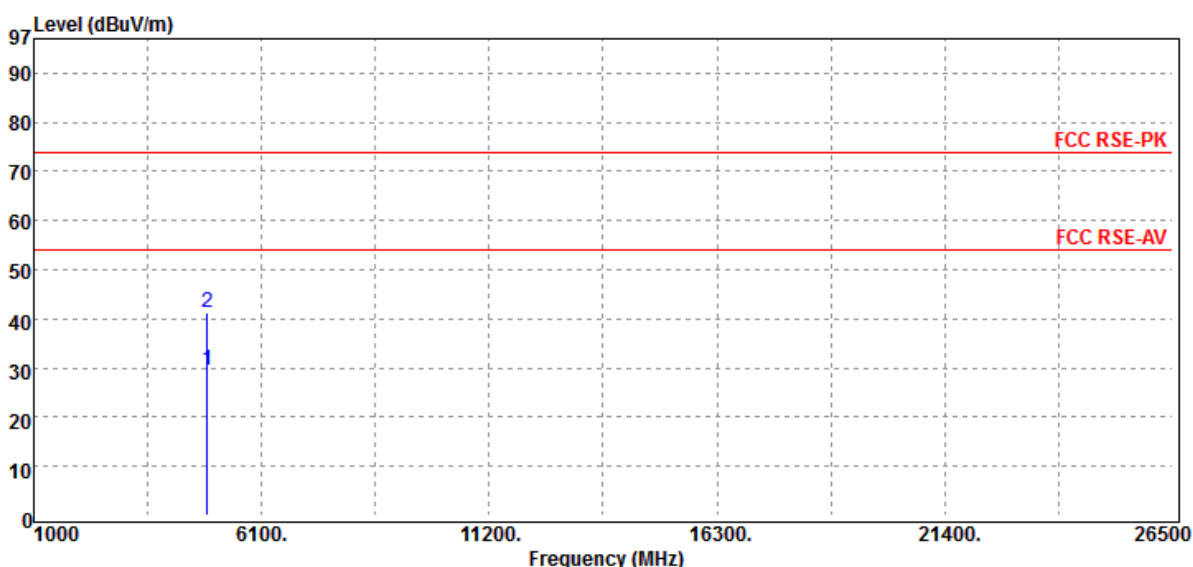
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Operation Band	:EDR(3M)	Test Date	:2018-01-19
Fundamental Frequency	:2441 MHz	Temp./Humi.	:21 deg_C / 62 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4882.00	H	Average	24.24	5.18	29.42	54.00	-24.58
4882.00	H	Peak	36.08	5.18	41.26	74.00	-32.74

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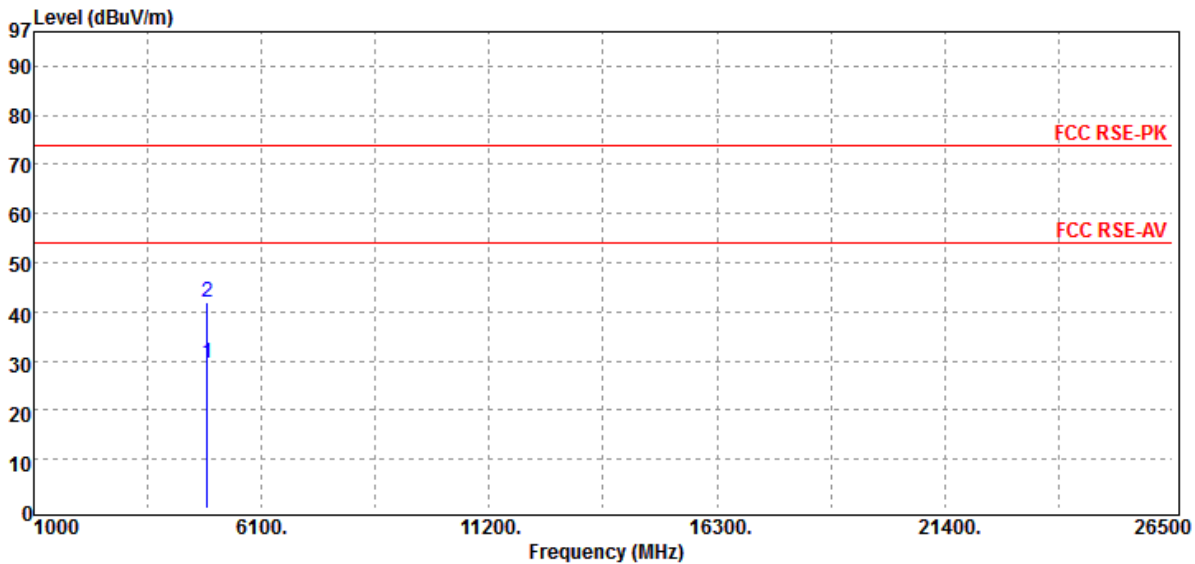
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Operation Band	:EDR(3M)	Test Date	:2018-01-19
Fundamental Frequency	:2441 MHz	Temp./Humi.	:21 deg_C / 62 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4882.00	H	Average	24.38	5.18	29.56	54.00	-24.44
4882.00	H	Peak	36.66	5.18	41.84	74.00	-32.16

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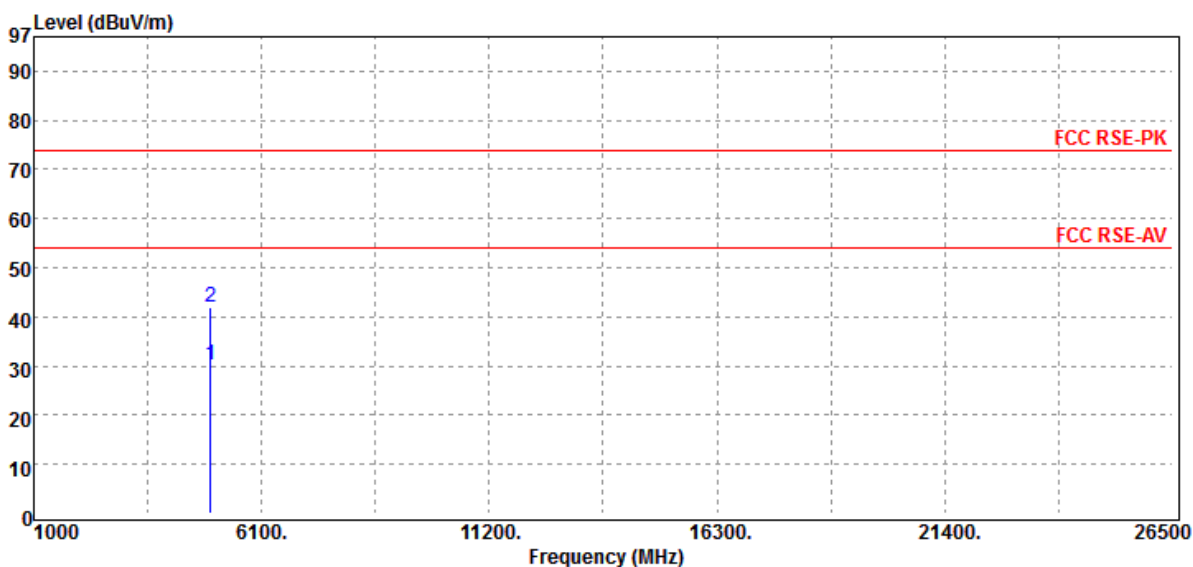
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Operation Band	:EDR(3M)	Test Date	:2018-01-19
Fundamental Frequency	:2480 MHz	Temp./Humi.	:21 deg_C / 62 RH
Operation Mode	:Tx CH HIGH	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4960.00	H	Average	25.01	5.29	30.30	54.00	-23.70
4960.00	H	Peak	36.55	5.29	41.84	74.00	-32.16

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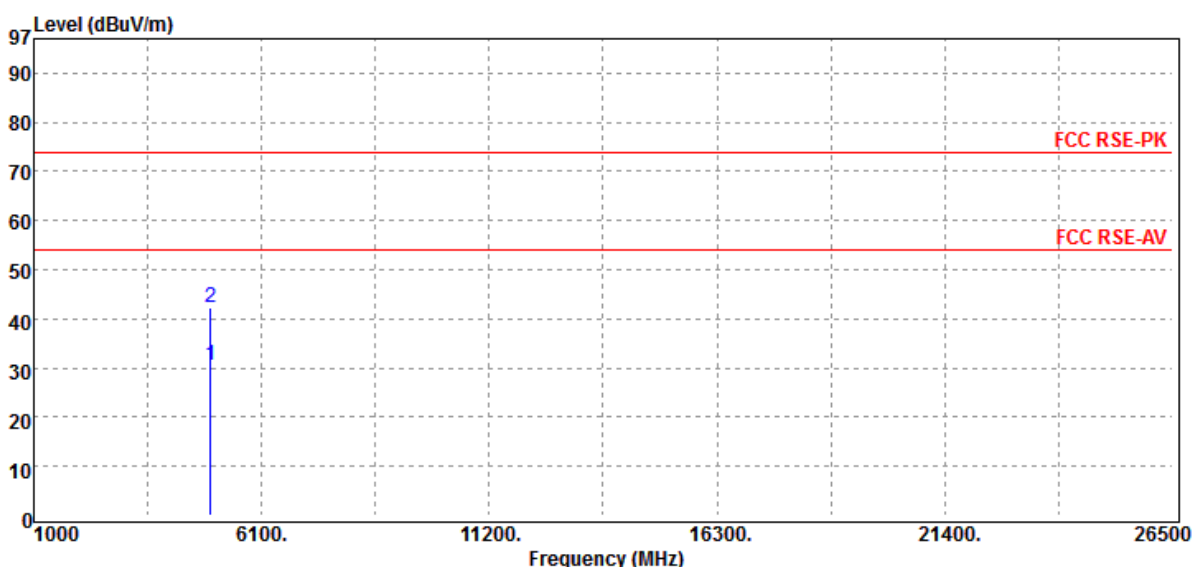
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Operation Band	:EDR(3M)	Test Date	:2018-01-19
Fundamental Frequency	:2480 MHz	Temp./Humi.	:21 deg_C / 62 RH
Operation Mode	:Tx CH HIGH	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4960.00	H	Average	25.28	5.29	30.57	54.00	-23.43
4960.00	H	Peak	36.92	5.29	42.21	74.00	-31.79

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7 ANTENNA REQUIREMENT

7.1 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.

7.2 Antenna Connected Construction

An embedded-in antenna design is used.

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.

~ End of Report ~

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