

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION REFERENCING TEST DATA ACROSS SEPARATE EQUIPMENT VERIFICATION

OF

Applicant: Sharp Corporation, Mobile Communication B.U.
2-13-1, Hachihonmatsu-lida, Higashi-hiroshima-shi,
Hiroshima 739-0192, Japan

Manufacturer: Sharp Corporation
1 Takumi-cho, Sakai-ku, Sakai-Shi, Osaka 590-8522, Japan

Product Name: Cellular Phone

Report Number: ER/2018/C0151

FCC ID: APYHRO00271

FCC Rule Part: §15.225
§15.247, Cat: DSS & DTS

Issue Date: Dec. 28, 2018

Date of Test: Oct. 25, 2018 ~ Nov. 29, 2018

Date of EUT Received: Oct. 25, 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:

Marcus Tseng

Marcus Tseng / Sr. Engineer

Approved By:

Jazz Huang

Jazz Huang / Asst. Supervisor



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Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
ER/2018/C0151	Rev.00	Initial creation of document	All	Dec. 28, 2018	Stefanie Yu

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1 GENERAL INFORMATION

1.1 Product description

General:

Product Name:	Cellular Phone
Hardware Version:	DVT
Software Version:	N/A
Power Supply:	3.8V from Rechargeable Li-ion Battery

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1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.225

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 DTS Meas. Guidance

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 Numbers are: 509634 / TW0001

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 Radiated Emissions for DXX

The EUT is placed on a turn table which is 0.8 m above ground plan. 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 one orthogonal axis 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.

2.3.2 Radiated Emissions for DSS & DTS

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 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 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.

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2.4 Configuration of Tested System

Fig. 2-1 Radiated Emission Configuration (NFC& BT & BLE & WLAN)



Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	NFC Test Software	N/A	N/A	N/A	N/A	N/A
2.	Bluetooth Test Software	N/A	N/A	N/A	N/A	N/A
3.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A

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3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.225 (a)-(d)	Radiated Emission	Compliant
§15.247(d)	Radiated Spurious Emission	Compliant

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4 DESCRIPTION OF TEST MODES

4.1 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 base on the worst case of original FCC ID: APYHRO00268 for DXX, DSS and DTS.

RADIATED EMISSION TEST:

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	Worst Case Position H / E1 / E2
NFC	1	1	ASK	-	H
Bluetooth	0 to 78	0,39,78	8-DPSK	3DH5	E2
Bluetooth LE	0 to 39	0,19,39	GFSK	1	E2
802.11b	1 to 11	1, 6, 11	DSSS	1	E2
802.11g	1 to 11	1, 6, 11	OFDM	6	E2
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	MCS 0	E2

Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for NFC, BT, BLE, WLAN Transmitter for channel Low, Mid and High, the worst case position was reported.

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5 MEASUREMENT UNCERTAINTY

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 RADIATED SPURIOUS EMISSION MEASUREMENT

6.1 Measurement Equipment Used:

SGS SAC-III					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Bi-log Antenna	SCHWAZBECK	VULB9168	378	12/29/2017	12/28/2018
Horn Antenna	Schwarzbeck	BBHA9120D	1441	08/16/2018	08/15/2019
Horn Antenna	Schwarzbeck	BBHA9170	184	12/12/2017	12/11/2018
Loop Antenna	ETS.LINDGREN	6502	148045	10/08/2018	10/07/2019
3m Site NSA	SGS	966 chamber	N/A	01/02/2018	01/01/2019
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/15/2018	05/14/2019
Network Analyzer	Anritsu	MS4644A	1216312	06/19/2018	06/18/2019
Pre-Amplifier	HP	8449B	3008A00578	01/02/2018	01/01/2019
Pre-Amplifier	HP	8447D	2944A07676	01/02/2018	01/01/2019
Pre-Amplifier	EMC Instruments	EMC184045B	980135	10/02/2018	10/01/2019
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2018	01/01/2019
1GHz High Pass Filter	Micro-Tronics	HPM50108	32	01/02/2018	01/01/2019
2GHz High Pass Filter	Micro-Tronics	HPM50110	36	01/02/2018	01/01/2019
Low Loss Cable	Huber Suhner	966 RX	9	01/02/2018	01/01/2019
Notebook	Lenovo	L430	R9-X11BG	N/A	N/A

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

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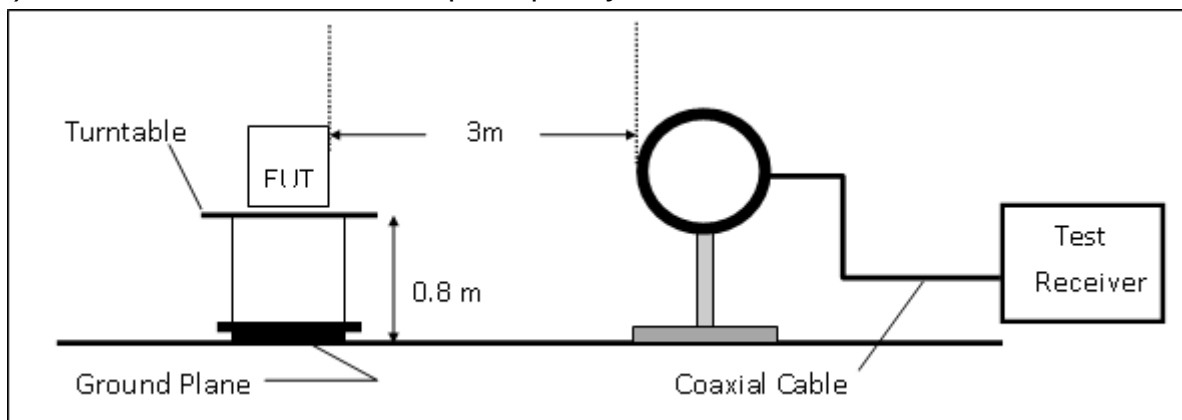
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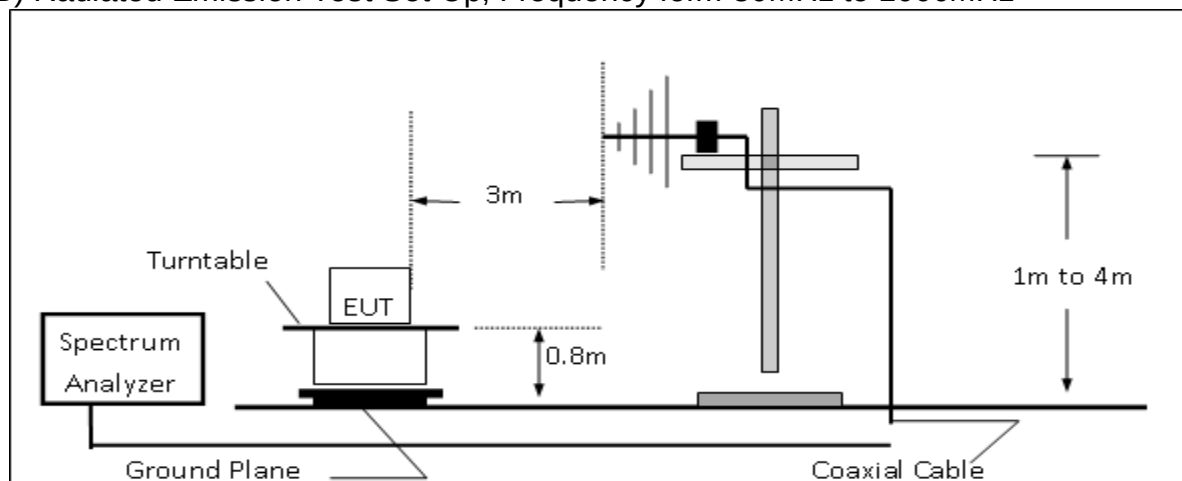
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6.2 Test SET-UP

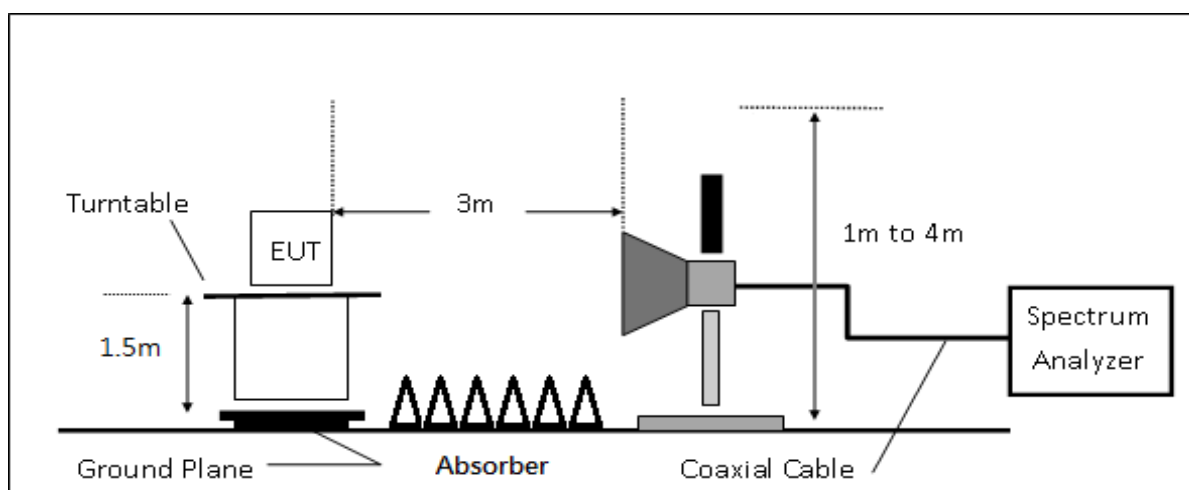
(A) Radiated Emission Test Set-Up Frequency Below 30MHz.



(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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6.3 Measurement Procedure

1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
2. The EUT was placed on a turn table with 1.5m for frequency> 1GHz above ground plane.
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. 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.
6. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
8. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
9. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
10. Repeat above procedures until all default test channel measured were complete.

6.4 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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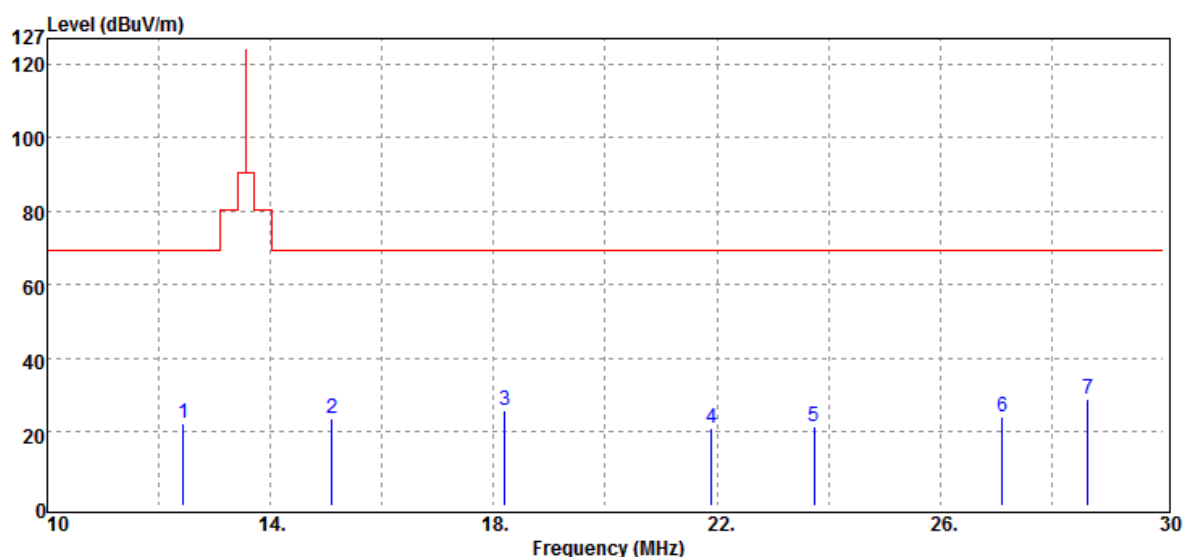
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6.5 Measurement Result

Operation Band	:NFC	Test Date	:2018-11-29
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:24.1 deg_C / 65 RH
Operation Mode	:Tx	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
12.44	Peak	10.96	11.50	22.46	69.54	-47.08
15.10	Peak	12.36	11.56	23.92	69.54	-45.62
18.20	Peak	14.25	11.63	25.88	69.54	-43.66
21.90	Peak	10.08	11.14	21.22	69.54	-48.32
23.74	Peak	10.69	10.69	21.38	69.54	-48.16
27.12	Peak	10.09	9.94	20.03	69.54	-49.51
28.64	Peak	17.24	9.62	26.86	69.54	-42.68

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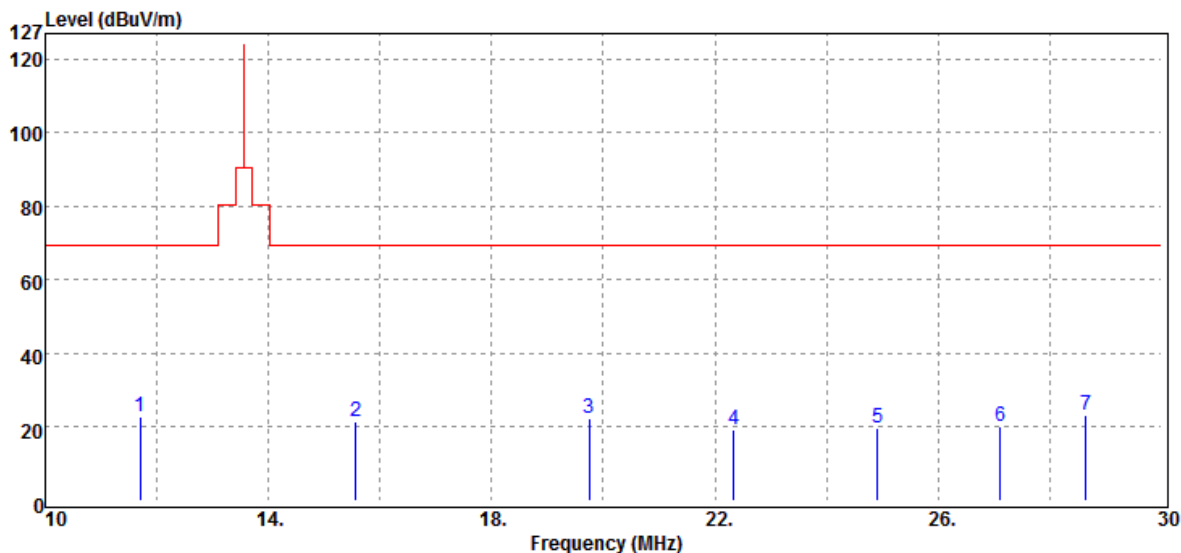
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Operation Band :NFC
Fundamental Frequency :13.56 MHz
Operation Mode :Tx
EUT Pol. :H Plane

Test Date :2018-11-29
Temp./Humi. :24.1 deg_C / 65 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
11.70	Peak	11.48	11.47	22.95	69.54	-46.59
15.56	Peak	10.09	11.56	21.65	69.54	-47.89
19.74	Peak	10.79	11.66	22.45	69.54	-47.09
22.34	Peak	8.09	11.03	19.12	69.54	-50.42
24.92	Peak	9.38	10.41	19.79	69.54	-49.75
27.12	Peak	10.29	9.94	20.23	69.54	-49.31
28.64	Peak	13.81	9.62	23.43	69.54	-46.11

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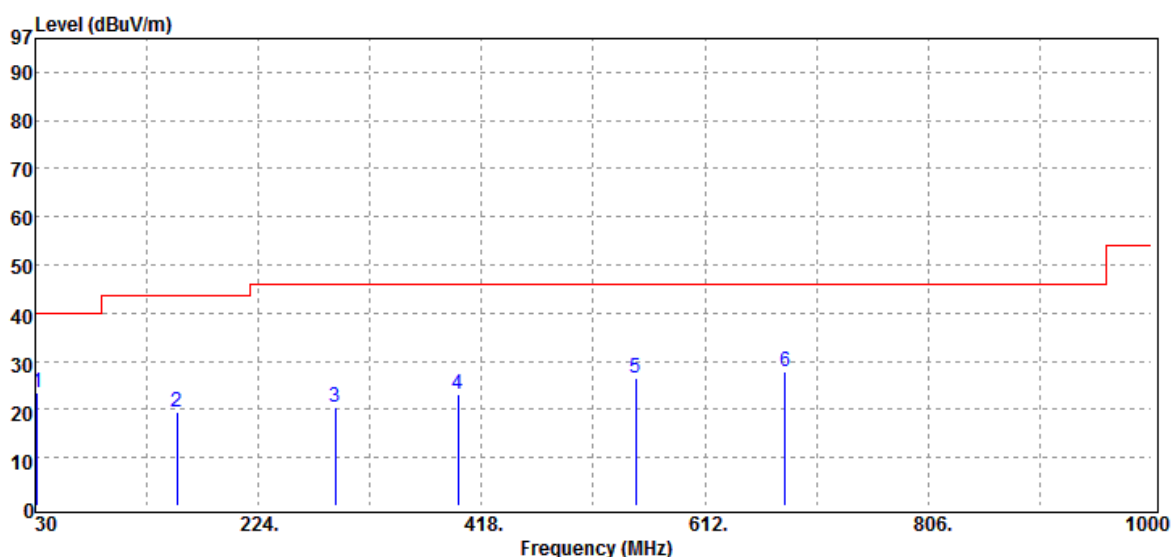
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Operation Band :NFC
Fundamental Frequency :13.56 MHz
Operation Mode :Tx
EUT Pol. :H Plane

Test Date :2018-11-29
Temp./Humi. :24.1 deg_C / 65 RH
Engineer :Tin
Measurement Antenna Pol. :VERTICAL



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
31.94	Peak	32.30	-8.88	23.42	40.00	-16.58
153.19	Peak	26.61	-7.31	19.30	43.50	-24.20
290.93	Peak	26.31	-5.79	20.52	46.00	-25.48
397.63	Peak	26.57	-3.38	23.19	46.00	-22.81
551.86	Peak	27.74	-1.37	26.37	46.00	-19.63
681.84	Peak	26.44	1.50	27.94	46.00	-18.06

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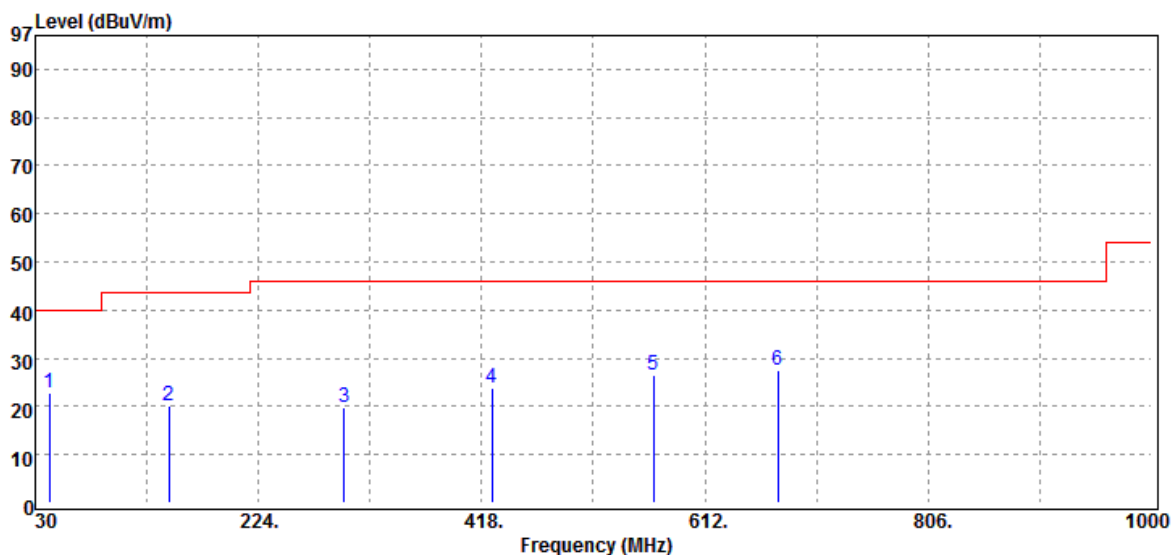
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Operation Band :NFC
Fundamental Frequency :13.56 MHz
Operation Mode :Tx
EUT Pol. :H Plane

Test Date :2018-11-29
Temp./Humi. :24.1 deg_C / 65 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
42.61	Peak	30.80	-8.05	22.75	40.00	-17.25
146.40	Peak	27.58	-7.59	19.99	43.50	-23.51
298.69	Peak	25.49	-5.55	19.94	46.00	-26.06
426.73	Peak	26.79	-2.97	23.82	46.00	-22.18
567.38	Peak	27.05	-0.53	26.52	46.00	-19.48
675.05	Peak	26.27	1.37	27.64	46.00	-18.36

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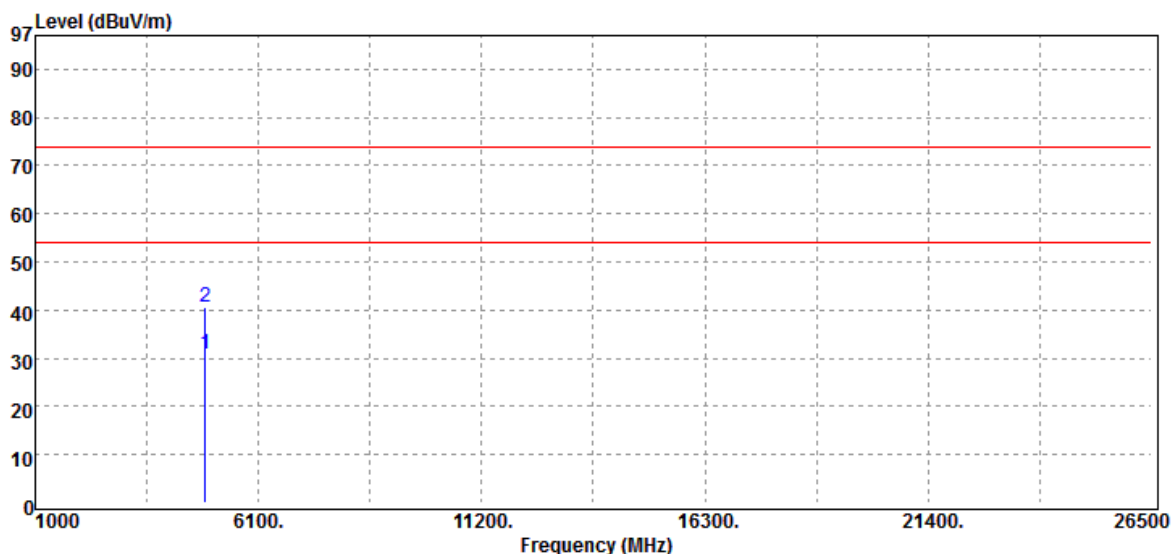
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Operation Band :EDR(3M)
Fundamental Frequency :2441 MHz
Operation Mode :Tx CH MID
EUT Pol. :E2 Plane

Test Date :2018-11-29
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :VERTICAL



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4882.00	Average	25.09	5.90	30.99	54.00	-23.01
4882.00	Peak	34.80	5.90	40.70	74.00	-33.30

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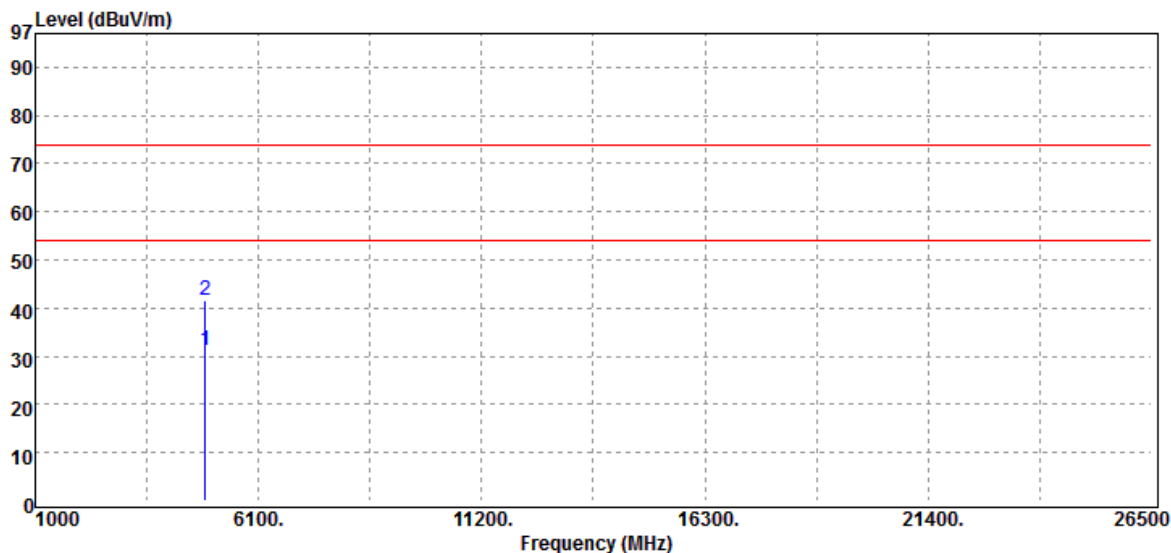
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Operation Band :EDR(3M)
Fundamental Frequency :2441 MHz
Operation Mode :Tx CH MID
EUT Pol. :E2 Plane

Test Date :2018-11-29
Temp./Humi. :23 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode	Reading Level			FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4882.00	Average	25.22	5.90	31.12	54.00	-22.88
4882.00	Peak	35.82	5.90	41.72	74.00	-32.28

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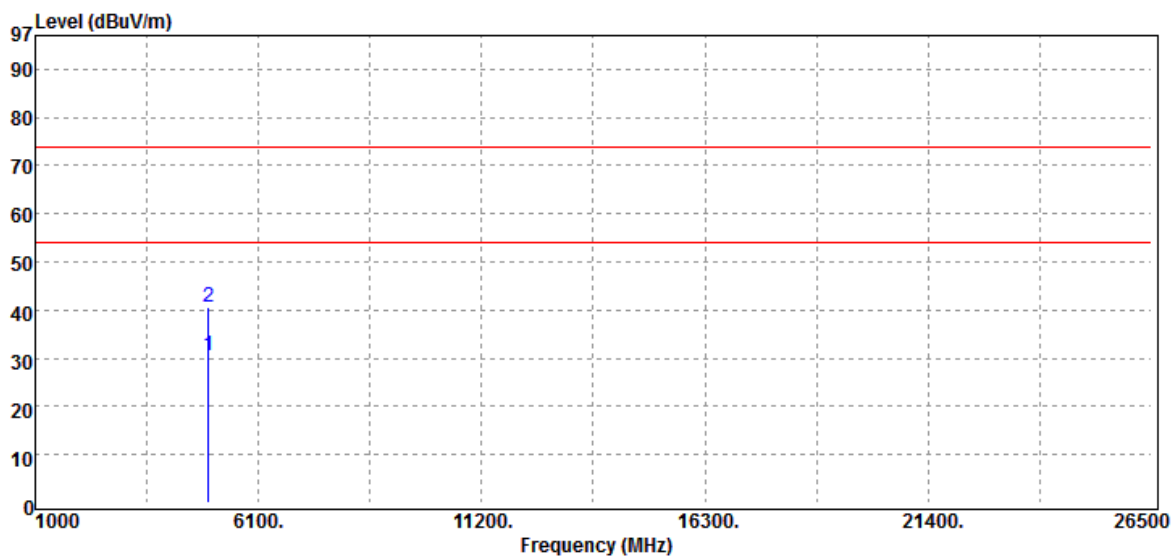
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Operation Band	:BLE	Test Date	:2018-11-29
Fundamental Frequency	:2480 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:Tx CH HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4960.00	Average	24.51	6.05	30.56	54.00	-23.44
4960.00	Peak	34.58	6.05	40.63	74.00	-33.37

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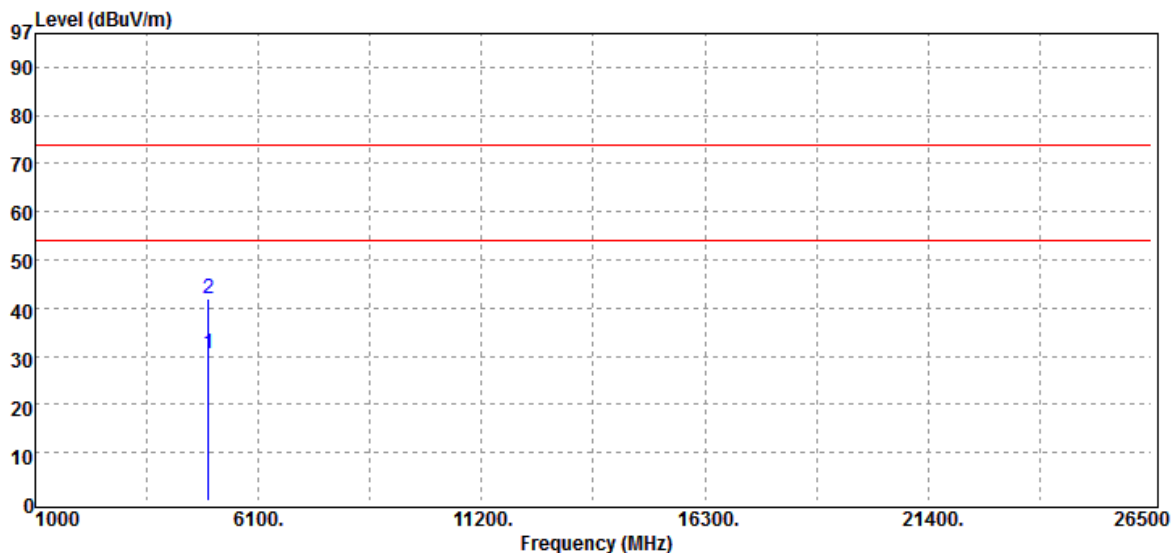
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Operation Band :BLE
Fundamental Frequency :2480 MHz
Operation Mode :Tx CH HIGH
EUT Pol. :E2 Plane

Test Date :2018-11-29
Temp./Humi. :21 deg_C / 61 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4960.00	Average	24.62	6.05	30.67	54.00	-23.33
4960.00	Peak	35.82	6.05	41.87	74.00	-32.13

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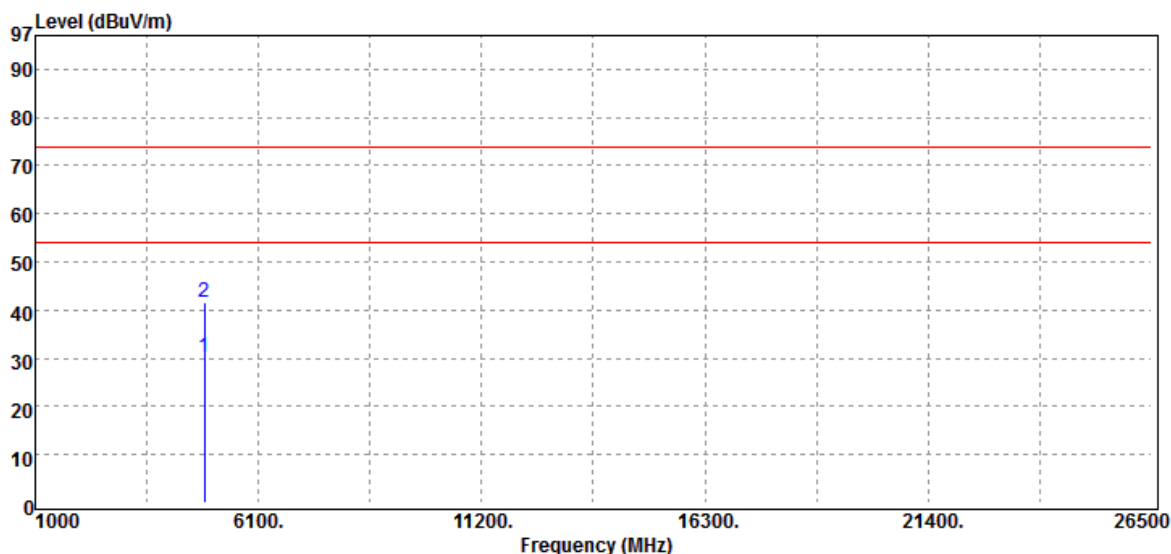
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Operation Band :802.11b
Fundamental Frequency :2437 MHz
Operation Mode :Tx CH MID
EUT Pol. :E2 Plane

Test Date :2018-11-29
Temp./Humi. :21 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :VERTICAL



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dB μ V	dB	dB μ V/m	dB μ V/m	dB
4874.00	Average	24.44	5.85	30.29	54.00	-23.71
4874.00	Peak	35.73	5.85	41.58	74.00	-32.42

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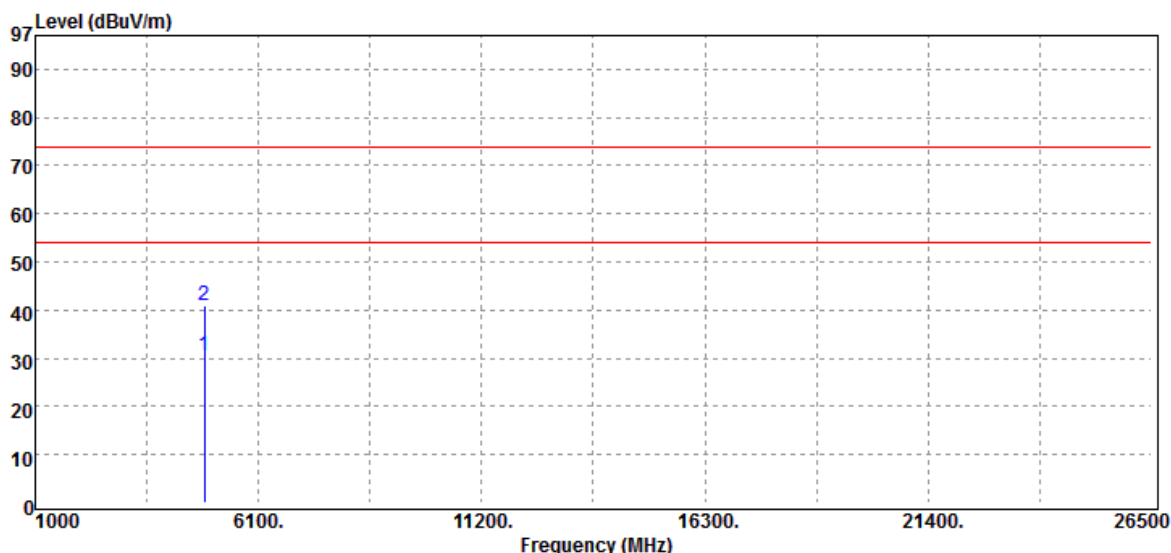
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Operation Band	:802.11b	Test Date	:2018-11-29
Fundamental Frequency	:2437 MHz	Temp./Humi.	:21 deg_C / 62 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4874.00	Average	24.67	5.85	30.52	54.00	-23.48
4874.00	Peak	34.94	5.85	40.79	74.00	-33.21

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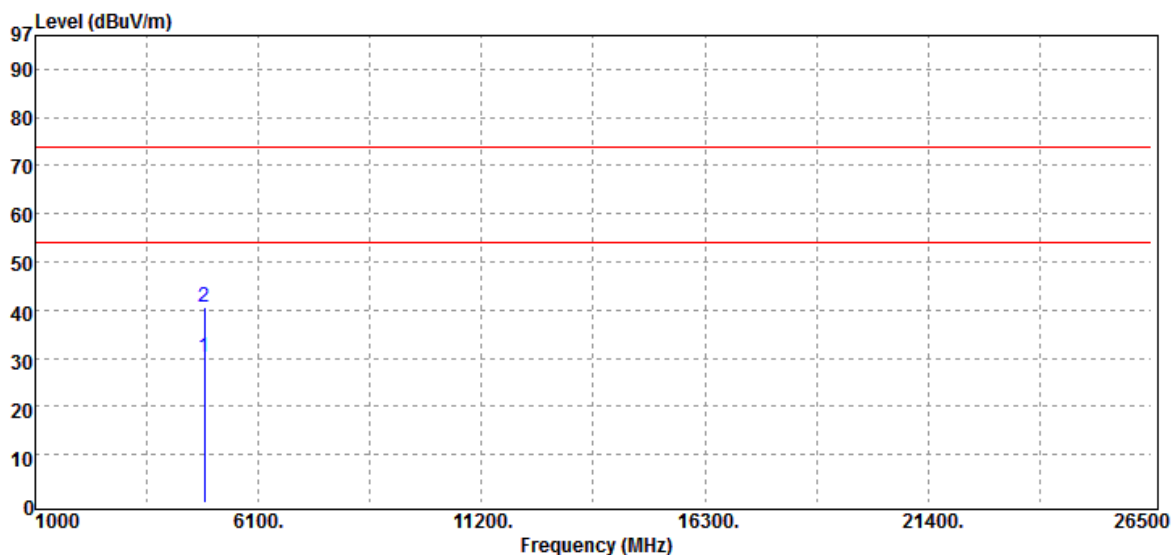
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Operation Band :802.11g
Fundamental Frequency :2437 MHz
Operation Mode :Tx CH MID
EUT Pol. :E2 Plane

Test Date :2018-11-29
Temp./Humi. :21 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :VERTICAL



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode	Reading Level			FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4874.00	Average	24.33	5.85	30.18	54.00	-23.82
4874.00	Peak	34.74	5.85	40.59	74.00	-33.41

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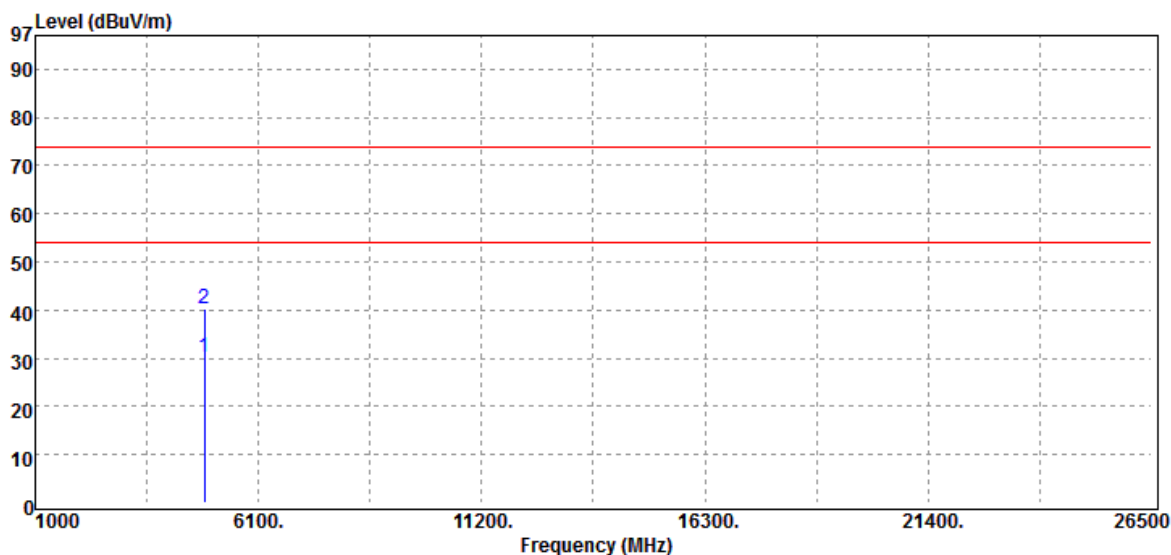
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Operation Band :802.11g
Fundamental Frequency :2437 MHz
Operation Mode :Tx CH MID
EUT Pol. :E2 Plane

Test Date :2018-11-29
Temp./Humi. :21 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode	Reading Level			FS	@3m	
MHz	PK/QP/AV	dB μ V	dB	dB μ V/m	dB μ V/m	dB
4874.00	Average	24.49	5.85	30.34	54.00	-23.66
4874.00	Peak	34.44	5.85	40.29	74.00	-33.71

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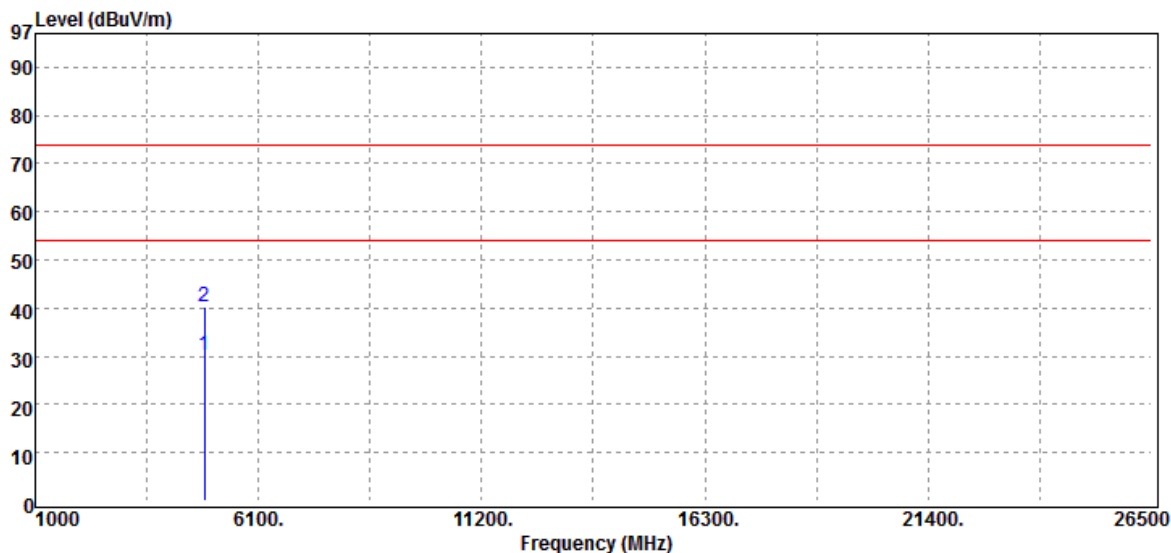
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Operation Band :802.11n20
Fundamental Frequency :2437 MHz
Operation Mode :Tx CH MID
EUT Pol. :E2 Plane

Test Date :2018-11-29
Temp./Humi. :21 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :VERTICAL



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode	Reading Level			FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4874.00	Average	24.38	5.85	30.23	54.00	-23.77
4874.00	Peak	34.34	5.85	40.19	74.00	-33.81

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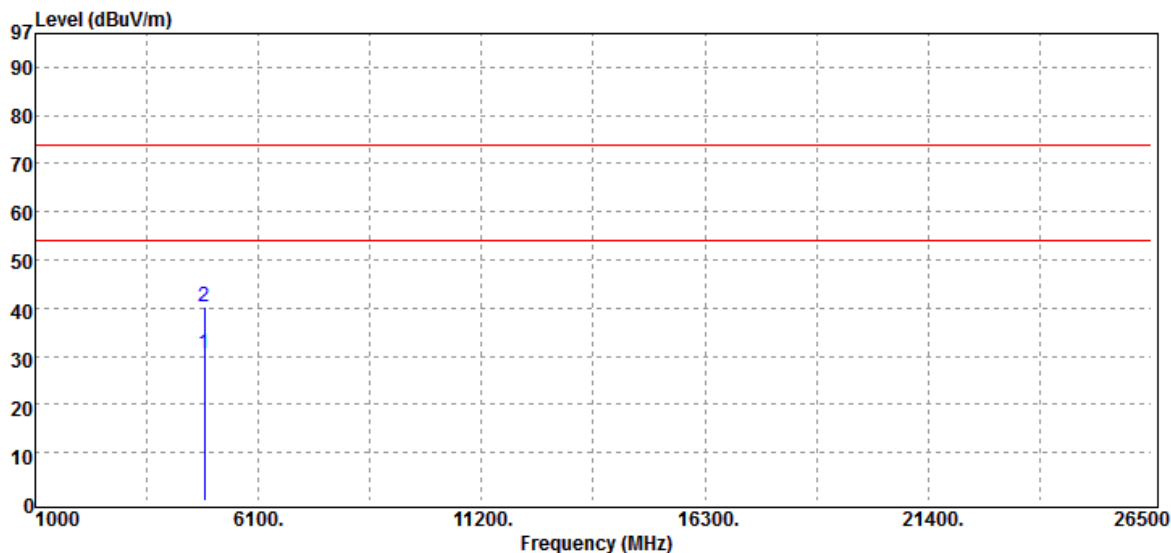
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Operation Band :802.11n20
Fundamental Frequency :2437 MHz
Operation Mode :Tx CH MID
EUT Pol. :E2 Plane

Test Date :2018-11-29
Temp./Humi. :21 deg_C / 62 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode	Reading Level			FS	@3m	
MHz	PK/QP/AV	dB μ V	dB	dB μ V/m	dB μ V/m	dB
4874.00	Average	24.70	5.85	30.55	54.00	-23.45
4874.00	Peak	34.39	5.85	40.24	74.00	-33.76

~ End of Report ~

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