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# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

# INTENTIONAL RADIATOR CERTIFICATION CLASS II PERMISSIVE CHANGE TEST REPORT

**Product Name: SDIO Wireless Module** 

**Brand Name: Silex** 

**SX-SDMAC** Model No.:

**Model Difference:** N/A

FCC ID: **N6C-SDMAC** 

ER/2018/10135 Report No.:

**Issue Date:** Feb. 12, 2018

§15.247, Cat: DTS **FCC Rule Part:** 

silex technology, Inc.

2-3-1Hikaridai, Seika-cho, Souraku-gun, Kyoto **Prepared for:** 

> 619-0237, Japan SGS Taiwan Ltd.

**Electronics & Communication Laboratory** 

Prepared by: No.134, Wu Kung Road, New Taipei Industrial

Park, Wuku District, New Taipei City, Taiwan

24803





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# VERIFICATION OF COMPLIANCE

silex technology, Inc. Applicant:

2-3-1Hikaridai, Seika-cho, Souraku-gun, Kyoto 619-0237, Japan

**Product Name:** SDIO Wireless Module

**Brand Name:** Silex

Model No.: SX-SDMAC

**Model Difference:** N/A

FCC ID: N6C-SDMAC

**Report Number:** ER/2018/10135

Date of test: Jan. 26, 2018 ~ Jan. 31, 2017

Date of EUT Received: Jan. 18, 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.

Test By:	Cooper Hou	Date:	Feb. 12, 2018	
Prepared By:	Cooper Hsu/Engineer Utoletta Tang	Date:	Feb. 12, 2018	
Approved By:	Violetta Tang / Clerk  Jim Chang / Manager	Date:	Feb. 12, 2018	

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# **Revision History**

Report Number	Revision	Description	Issue Date
ER/2018/10135	Rev.00	Initial creation of document	Feb. 12, 2018

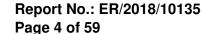
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## **GENERAL INFORMATION**

## 1.1 Product description

#### General:

Product Name:	SDIO Wireless Module
Brand Name:	Silex
Model No.:	SX-SDMAC
Model Difference:	N/A
Software version:	N/A
Hardware version:	N/A
Power Supply:	DC 3.3V

#### WLAN 2.4GHz:

Wi-Fi 802.11	Frequency Range	Channels	Modulation Technology	
b			DSSS	
g	2412-2462	11	OFDM	
n_HT20			OFDM	
n_HT40	2422-2452	7	OFDM	
Modulation type:		CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM		
Transition Rate:		802.11 n_20MHz	18/24/36/48/54 Mbps	

#### Class II Permissive Change

Scope:	The test report covers the radiated emissions requirements of the standards referenced in the report to allow new antennas to be included in this authorization.
CIIPC:	Adding new antennas to this certified module under FCC ID: N6C-SDMAC

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Antenna Type	Supplier	Antenna Part No.	Freq.	Peak Antenna Gain (dBi)	Worst Antenna Gain
ROD antenna	Sansei Denki	ANTDC-081A0	2.4GHz	2.00	V
		ANTDC-081B0		2.00	V
		ANTDP-027A0		1.50	
		ANTDP-039A0	1	1.50	

Note: Pre-scanned was done on the above 4 antennas, the ANTDC-081A0 results higher emission at 2.4GHz. Therefore, the completed set of measurement was done on the antenna to be presented on this test report.

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## 1.2 Test Methodology of Applied Standards

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 Number and Designation Number 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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## 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

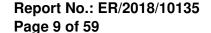
The EUT is a placed on as turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission 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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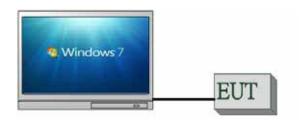
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## 2.4 Configuration of Tested System

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	Notebook	DELL	E5400	3704625136	Shielded	Unshielded
2	Bluetooth Test Software	N/A	N/A	N/A	N/A	N/A

## **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

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### **DESCRIPTION OF TEST MODES**

## 4.1 Operated in 2400 ~ 2483.5MHz Band

11 channels are provided for 802.11b, 802.11g and 802.11n HT20

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY		
1	2412 MHz	7	2442 MHz		
2	2417 MHz	8	2447 MHz		
3	2422 MHz	9	2452 MHz		
4	2427 MHz	10	2457 MHz		
5	2432 MHz	11	2462 MHz		
6	2437 MHz				

## 7 channels are provided for 802.11n HT40

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
3	2422 MHz	7	2442 MHz
4	2427 MHz	8	2447 MHz
5	2432 MHz	9	2452 MHz
6	2437 MHz		

#### 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:**

RADIATED EMISSION TEST (BELOW 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	
802.11g	1 to 11	6	OFDM	6	
RADIATED EMISSION TEST (ABOVE 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	
802.11b	1 to 11	1, 6, 11	DSSS	1	
802.11g	1 to 11	1, 6, 11	OFDM	6	
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	MCS 0	
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	MCS 0	

#### Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11b/g/n WLAN Transmitter for channel Low, Mid and High, the worst case E1 position was reported.

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## MEASUREMENT UNCERTAINTY

## Radiated Spurious Emission:

Measurement uncertainty (Polarization : <b>Vertical</b> )	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				
	9kHz – 30MHz: +/- 2.87 dB				

Measurement uncertainty (Polarization : <b>Horizontal</b> )	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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### 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  $(dB\mu V/m) = 20 \log Emission level (dB\mu V/m)$

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## 6.2 Measurement Equipment Used:

	966 Chamber								
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.				
TYPE		NUMBER	NUMBER	CAL.					
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+	TBD	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				

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

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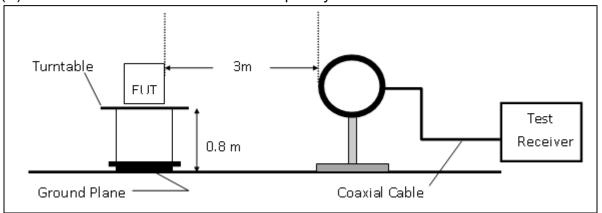
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台灣檢驗科技股份有限公司

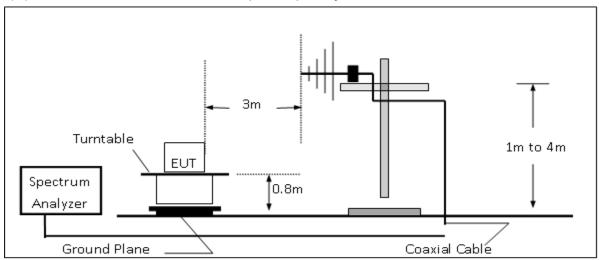


#### 6.3 Test SET-UP

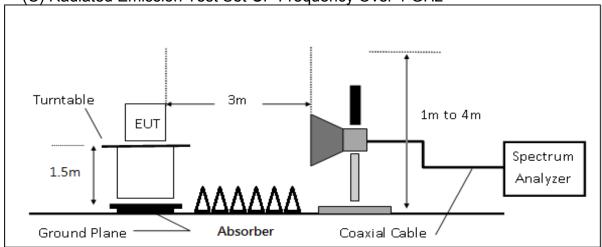
# (A) Radiated Emission Test Set-UP Frequency Below 30MHz.



## (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**

- 1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guid-
- 2. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 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=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
- 7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
- 8. 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.
- 9. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- 10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 11. 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.
- 12. Repeat above procedures until all default test channel 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	

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + 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.

## 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.

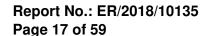
#### 6.7 Measurement Result

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

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## **Radiated Band Edge Measurement Result**

**Operation Band** :802.11b Fundamental Frequency :2412 MHz

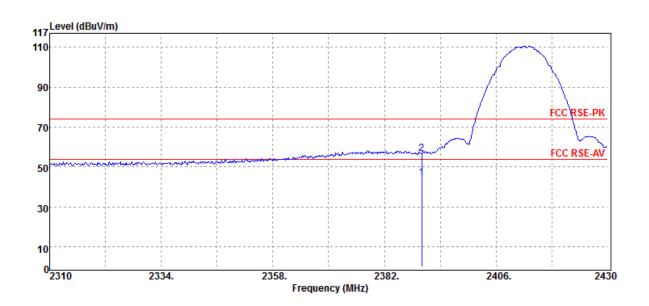
**Operation Mode** :Bandedge CH LOW

EUT Pol. :E2 Plane **Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

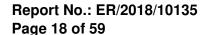
:VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m		
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB	
2390.00	Е	Average	44.15	0.40	44.55	54.00	-9.45	
2390.00	Е	Peak	56.37	0.40	56.77	74.00	-17.23	

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**Operation Band** Fundamental Frequency

:802.11b :2412 MHz :Bandedge CH LOW

**Operation Mode** 

EUT Pol.

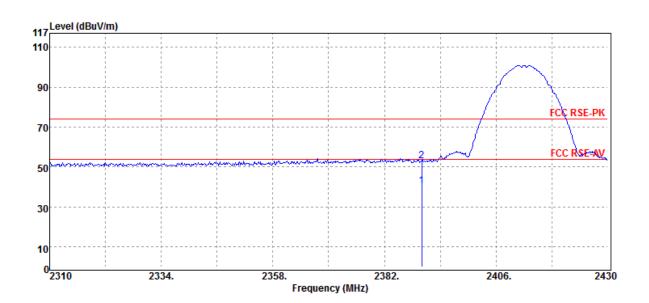
:E2 Plane

**Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:HORIZONTAL Measurement Antenna Pol.

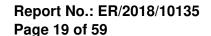


Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
2390.00	Е	Average	39.98	0.40	40.38	54.00	-13.62
2390.00	Е	Peak	52.65	0.40	53.05	74.00	-20.95

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:802.11b :2462 MHz

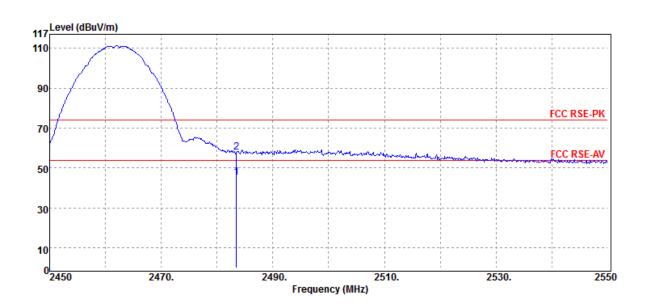
:Bandedge CH HIGH

EUT Pol. :E2 Plane **Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:VERTICAL Measurement Antenna Pol.

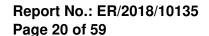


	Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin	
			Mode	Reading Level		FS	@3m		
_	MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB	
	2483.50	E	Average	44.51	0.73	45.24	54.00	-8.76	
	2483.50	Ε	Peak	57.35	0.73	58.08	74.00	-15.92	

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:802.11b :2462 MHz

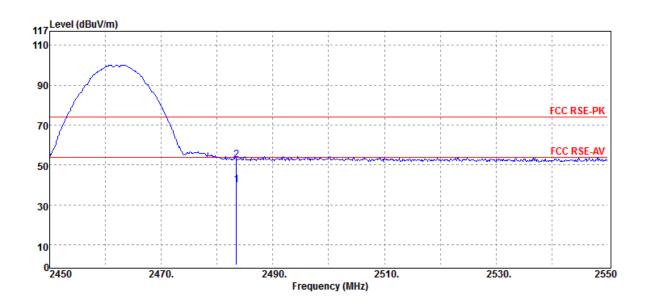
:Bandedge CH HIGH

EUT Pol. :E2 Plane **Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:HORIZONTAL Measurement Antenna Pol.

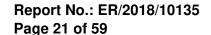


	Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin	
			Mode	Reading Level		FS	@3m		
_	MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB	
	2483.50	E	Average	39.20	0.73	39.93	54.00	-14.07	
	2483.50	Е	Peak	52.01	0.73	52.74	74.00	-21.26	

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**Operation Band** Fundamental Frequency

:802.11g :2412 MHz :Bandedge CH LOW

**Operation Mode** 

EUT Pol.

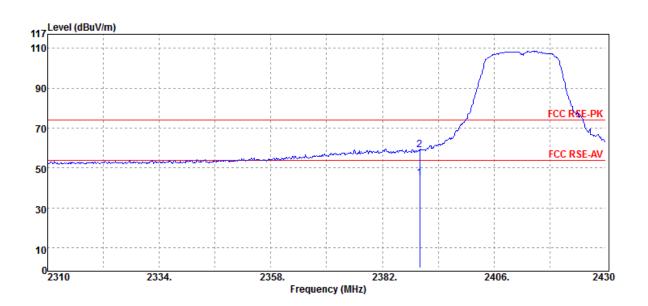
:E2 Plane

**Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

:Kane Engineer

:VERTICAL Measurement Antenna Pol.

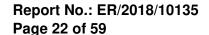


Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
2390.00	E	Average	44.67	0.40	45.07	54.00	-8.93
2390.00	Е	Peak	58.79	0.40	59.19	74.00	-14.81

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:802.11g :2412 MHz

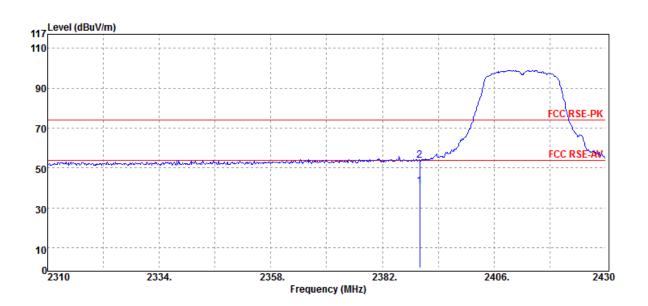
:Bandedge CH LOW

EUT Pol. :E2 Plane **Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:HORIZONTAL Measurement Antenna Pol.



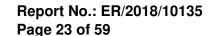
	Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin	
			Mode	Reading Level		FS	@3m		
_	MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB	
	2390.00	E	Average	40.43	0.40	40.83	54.00	-13.17	
	2390.00	Е	Peak	53.51	0.40	53.91	74.00	-20.09	

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:802.11g :2462 MHz

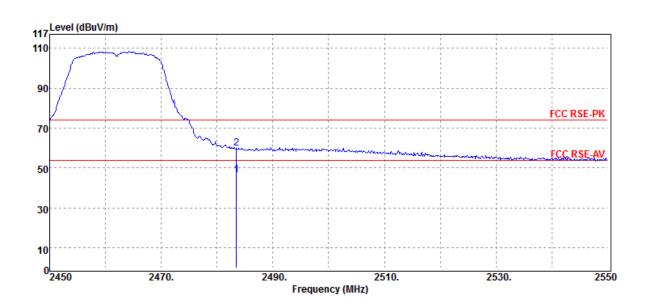
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EUT Pol. :E2 Plane **Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

:Kane Engineer

:VERTICAL Measurement Antenna Pol.

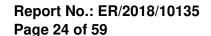


	Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin	
			Mode	Reading Level		FS	@3m		
_	MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB	
	2483.50	E	Average	45.67	0.73	46.40	54.00	-7.60	
	2483.50	Ε	Peak	59.03	0.73	59.76	74.00	-14.24	

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:802.11g :2462 MHz

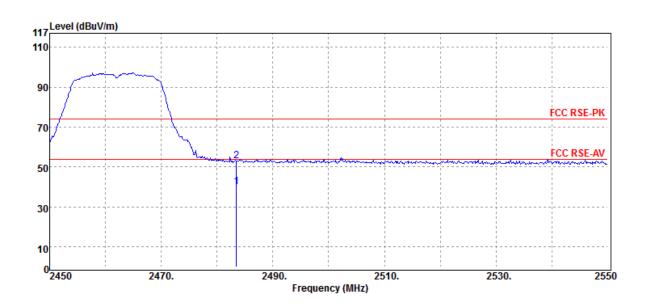
:Bandedge CH HIGH

EUT Pol. :E2 Plane **Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:HORIZONTAL Measurement Antenna Pol.

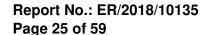


Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m		
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB	
2483.50	Е	Average	39.51	0.73	40.24	54.00	-13.76	
2483.50	Ε	Peak	52.34	0.73	53.07	74.00	-20.93	

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**Operation Band** Fundamental Frequency

:802.11n20 :2412 MHz :Bandedge CH LOW

**Operation Mode** EUT Pol.

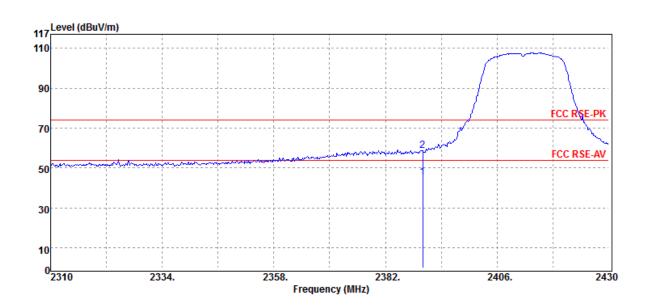
:E2 Plane

**Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

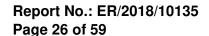
:VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
2390.00	Е	Average	44.86	0.40	45.26	54.00	-8.74
2390.00	Е	Peak	58.35	0.40	58.75	74.00	-15.25

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**Operation Band** Fundamental Frequency :802.11n20 :2412 MHz :Bandedge CH LOW

**Operation Mode** 

EUT Pol.

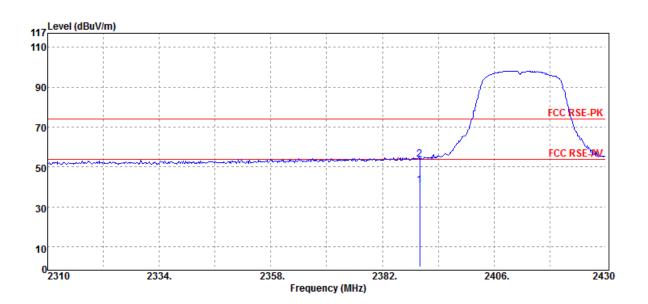
:E2 Plane

**Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

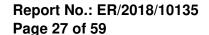
:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
2390.00	Е	Average	40.49	0.40	40.89	54.00	-13.11
2390.00	Е	Peak	53.64	0.40	54.04	74.00	-19.96

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:802.11n20 :2462 MHz

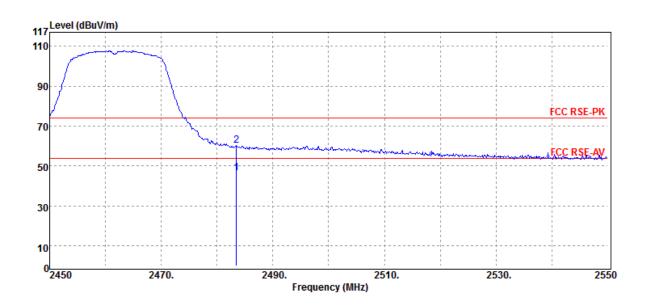
:Bandedge CH HIGH

EUT Pol. :E2 Plane **Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

:Kane Engineer

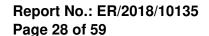
:VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
2483.50	Е	Average	45.66	0.73	46.39	54.00	-7.61
2483.50	Е	Peak	59.52	0.73	60.25	74.00	-13.75

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:802.11n20 :2462 MHz

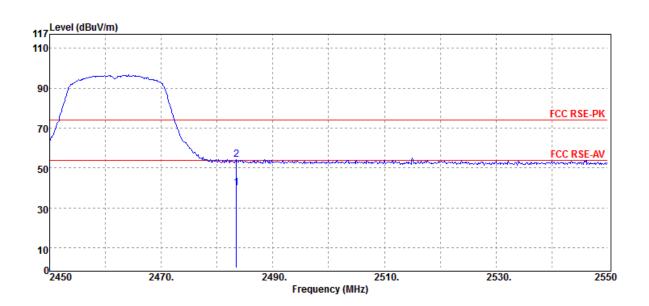
:Bandedge CH HIGH

EUT Pol. :E2 Plane **Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:HORIZONTAL Measurement Antenna Pol.

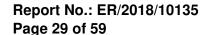


	Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
			Mode	Reading Level		FS	@3m	
_	MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
	2483.50	E	Average	39.44	0.73	40.17	54.00	-13.83
	2483.50	Ε	Peak	53.47	0.73	54.20	74.00	-19.80

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:802.11n40 :2422 MHz

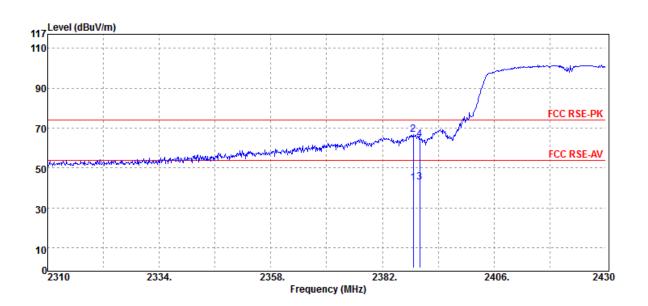
:Bandedge CH LOW

EUT Pol. :E2 Plane **Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

:Kane Engineer

:VERTICAL Measurement Antenna Pol.

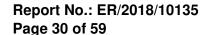


Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
2388.60	E	Average	42.28	0.39	42.67	54.00	-11.33
2388.60	Е	Peak	66.51	0.39	66.90	74.00	-7.10
2390.00	E	Average	42.55	0.40	42.95	54.00	-11.05
2390.00	Ε	Peak	64.03	0.40	64.43	74.00	-9.57

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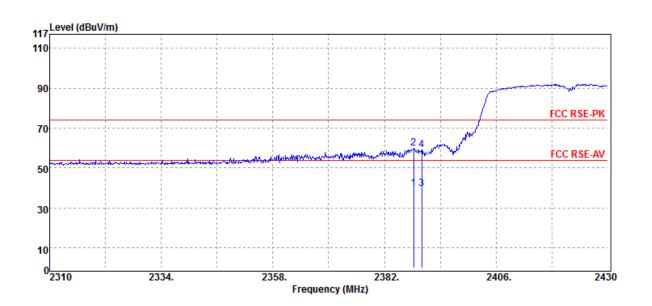
:802.11n40 :2422 MHz

:Bandedge CH LOW

EUT Pol. :E2 Plane **Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH Engineer :Kane

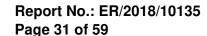
:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
2388.24	Е	Average	39.35	0.39	39.74	54.00	-14.26
2388.24	Е	Peak	59.51	0.39	59.90	74.00	-14.10
2390.00	Е	Average	39.45	0.40	39.85	54.00	-14.15
2390.00	Ε	Peak	58.63	0.40	59.03	74.00	-14.97

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:802.11n40 :2452 MHz

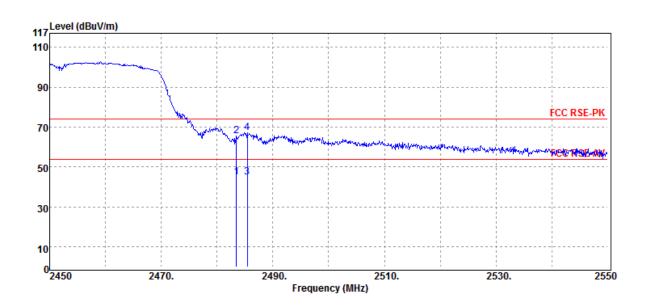
:Bandedge CH HIGH

EUT Pol. :E2 Plane **Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

:Kane Engineer

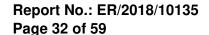
:VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
2483.50	E	Average	44.23	0.73	44.96	54.00	-9.04
2483.50	Е	Peak	64.89	0.73	65.62	74.00	-8.38
2485.40	E	Average	44.02	0.73	44.75	54.00	-9.25
2485.40	Ε	Peak	66.34	0.73	67.07	74.00	-6.93

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:802.11n40 :2452 MHz

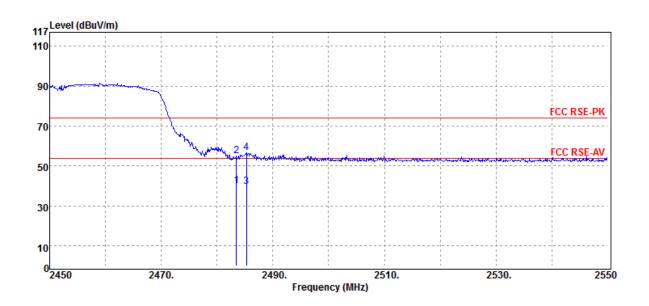
:Bandedge CH HIGH

EUT Pol. :E2 Plane **Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
2483.50	E	Average	39.18	0.73	39.91	54.00	-14.09
2483.50	Е	Peak	54.42	0.73	55.15	74.00	-18.85
2485.30	E	Average	39.04	0.73	39.77	54.00	-14.23
2485.30	Ε	Peak	55.82	0.73	56.55	74.00	-17.45

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# **Radiated Spurious Emission Measurement Result**

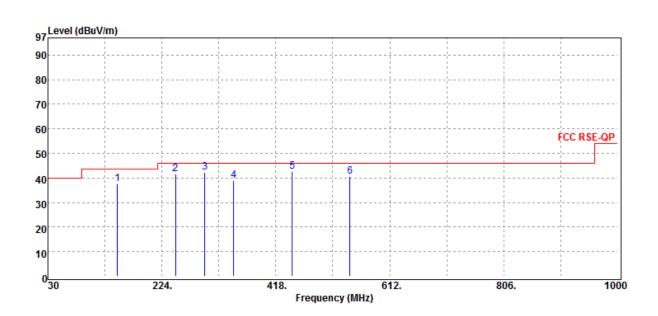
#### **Below 1GHz Worst-Case Data:**

**Operation Band** :802.11g Test Date :2018-01-31

:21 deg\_C / 62 RH **Fundamental Frequency** :2437 MHz Temp./Humi.

Operation Mode :Tx CH MID Engineer :Kane

EUT Pol. :E2 Plane :VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
148.34	S	Peak	44.77	-7.32	37.45	43.50	-6.05
247.28	S	Peak	49.34	-7.56	41.78	46.00	-4.22
296.75	S	Peak	48.28	-5.87	42.41	46.00	-3.59
346.22	S	Peak	43.60	-4.79	38.81	46.00	-7.19
446.13	S	Peak	45.81	-3.16	42.65	46.00	-3.35
544.10	S	Peak	42.50	-1.95	40.55	46.00	-5.45

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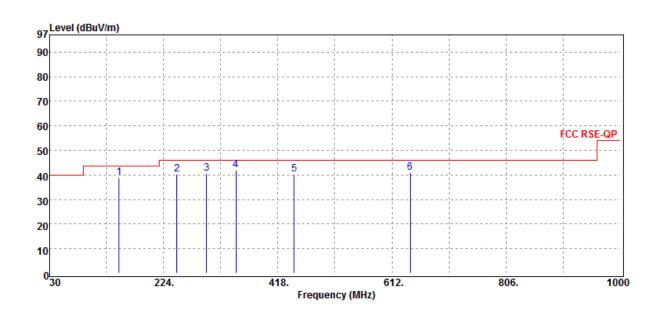
**Operation Band** :802.11g Fundamental Frequency :2437 MHz :Tx CH MID **Operation Mode** 

EUT Pol. :E2 Plane **Test Date** :2018-01-31

Temp./Humi. :21 deg\_C / 62 RH

Engineer

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
148.34	S	Peak	46.18	-7.32	38.86	43.50	-4.64
246.31	S	Peak	47.88	-7.57	40.31	46.00	-5.69
296.75	S	Peak	46.46	-5.87	40.59	46.00	-5.41
347.19	S	Peak	46.89	-4.81	42.08	46.00	-3.92
446.13	S	Peak	43.44	-3.16	40.28	46.00	-5.72
643.04	S	Peak	40.81	0.13	40.94	46.00	-5.06

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# **Radiated Spurious Emission Measurement Result**

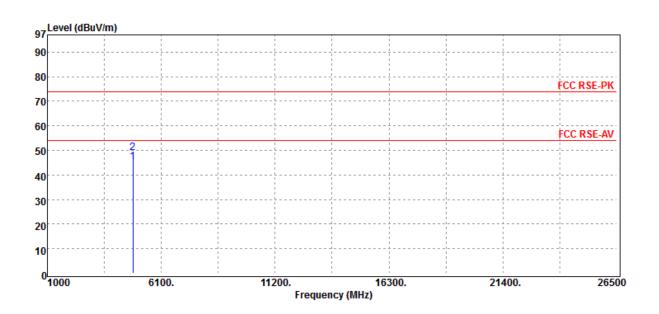
## **Above 1GHz Data:**

**Operation Band** :802.11b Test Date :2018-01-26

Temp./Humi. :21 deg C / 62 RH **Fundamental Frequency** :2412 MHz

**Operation Mode** :Tx CH LOW Engineer :Kane

EUT Pol. :E2 Plane :VERTICAL Measurement Antenna Pol.

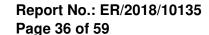


Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe	
		Mode	Reading Level		FS	@3m	Margin	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB	
4824.00	Н	Average	38.16	7.28	45.44	54.00	-8.56	
4824.00	Н	Peak	41.64	7.28	48.92	74.00	-25.08	

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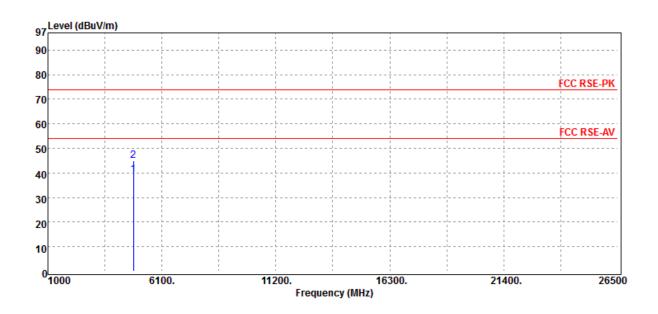
**Operation Band** :802.11b Fundamental Frequency :2412 MHz **Operation Mode** :Tx CH LOW

EUT Pol. :E2 Plane **Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4824.00	Н	Average	31.87	7.28	39.15	54.00	-14.85
4824.00	Н	Peak	37.61	7.28	44.89	74.00	-29.11

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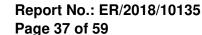
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EUT Pol.

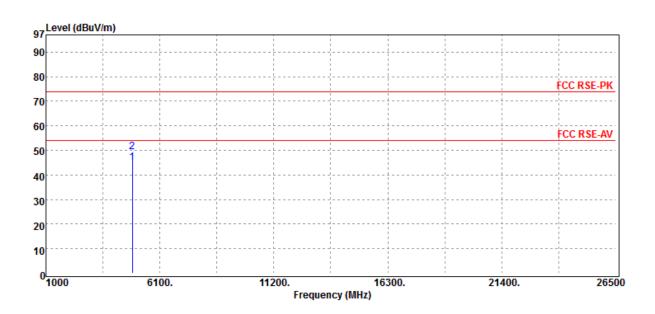
:802.11b :2437 MHz :Tx CH MID :E2 Plane

**Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4874.00	Н	Average	37.44	7.54	44.98	54.00	-9.02
4874.00	Н	Peak	41.92	7.54	49.46	74.00	-24.54

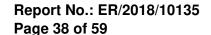
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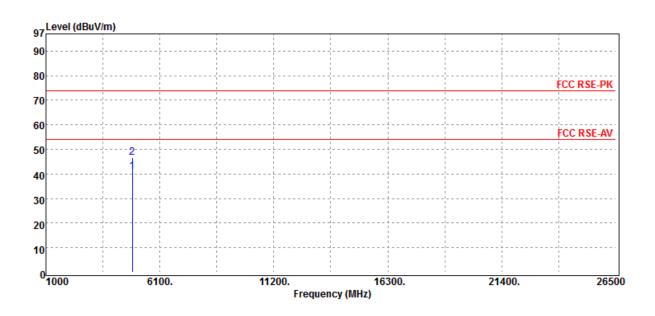
**Operation Band** :802.11b Fundamental Frequency :2437 MHz **Operation Mode** :Tx CH MID

EUT Pol. :E2 Plane **Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
4874.00	Н	Average	33.58	7.54	41.12	54.00	-12.88
4874.00	Н	Peak	39.19	7.54	46.73	74.00	-27.27

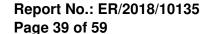
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EUT Pol.

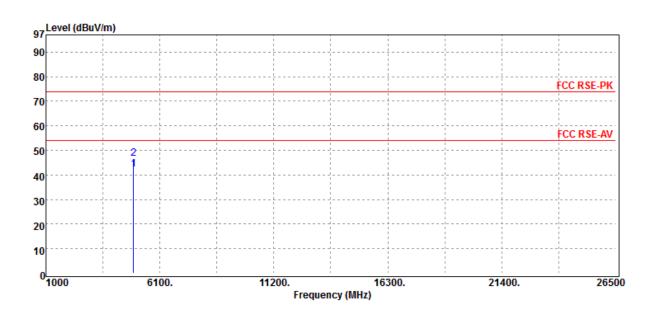
:802.11b :2462 MHz :Tx CH HIGH :E2 Plane

**Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4924.00	Н	Average	34.79	7.51	42.30	54.00	-11.70
4924.00	Н	Peak	39.17	7.51	46.68	74.00	-27.32

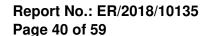
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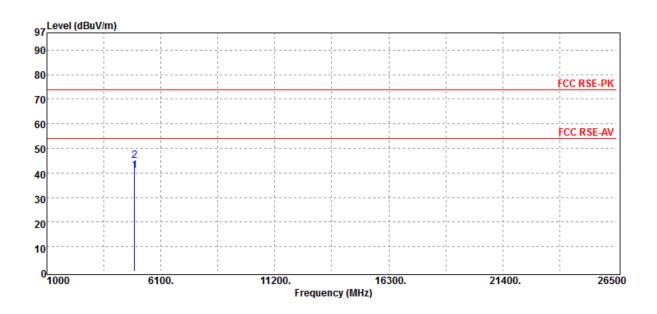
EUT Pol.

:802.11b :2462 MHz :Tx CH HIGH :E2 Plane

**Test Date** Temp./Humi. :2018-01-26 :21 deg\_C / 62 RH

Engineer :Kane

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
4924.00	Н	Average	33.51	7.51	41.02	54.00	-12.98
4924.00	Н	Peak	37.55	7.51	45.06	74.00	-28.94

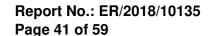
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EUT Pol.

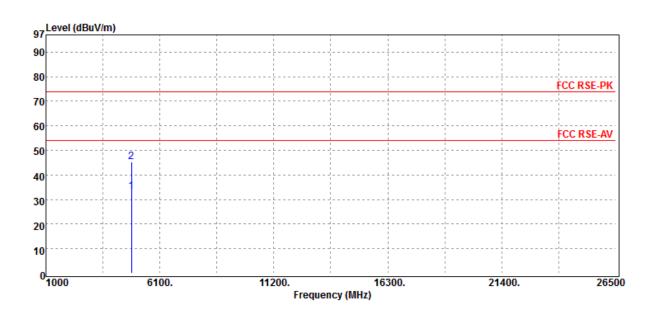
:802.11g :2412 MHz :Tx CH LOW :E2 Plane

**Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4824.00	Н	Average	25.86	7.28	33.14	54.00	-20.86
4824.00	Н	Peak	38.00	7.28	45.28	74.00	-28.72

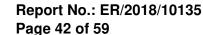
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EUT Pol.

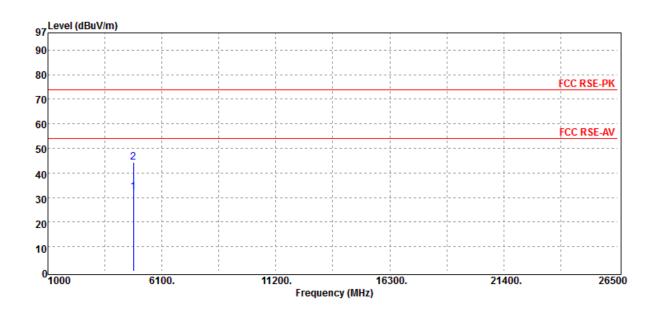
:802.11g :2412 MHz :Tx CH LOW :E2 Plane

**Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4824.00	Н	Average	24.99	7.28	32.27	54.00	-21.73
4824.00	Н	Peak	36.98	7.28	44.26	74.00	-29.74

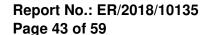
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**Operation Band** Fundamental Frequency

:2437 MHz **Operation Mode** :Tx CH MID EUT Pol. :E2 Plane

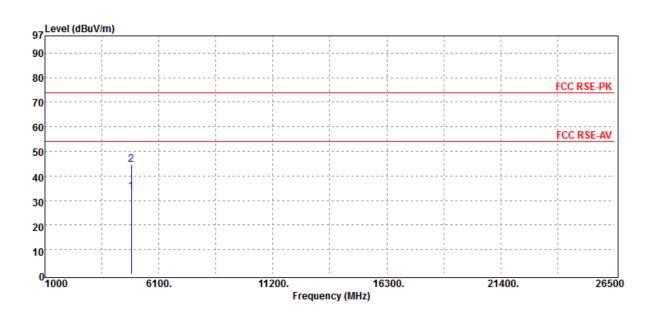
:802.11g

**Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4874.00	Н	Average	26.18	7.54	33.72	54.00	-20.28
4874.00	Н	Peak	37.12	7.54	44.66	74.00	-29.34

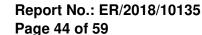
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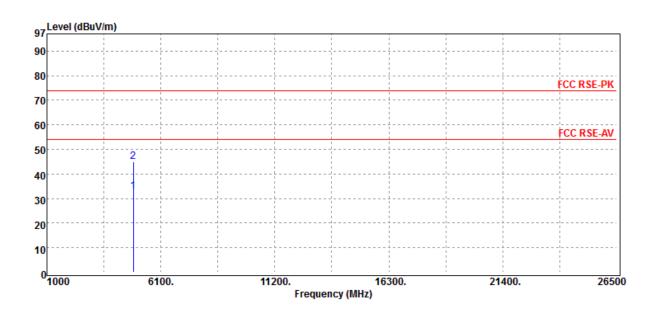
:802.11g :2437 MHz :Tx CH MID :E2 Plane

**Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4874.00	Н	Average	25.43	7.54	32.97	54.00	-21.03
4874.00	Н	Peak	37.48	7.54	45.02	74.00	-28.98

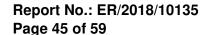
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**Operation Band** Fundamental Frequency

:2462 MHz **Operation Mode** :Tx CH HIGH EUT Pol. :E2 Plane

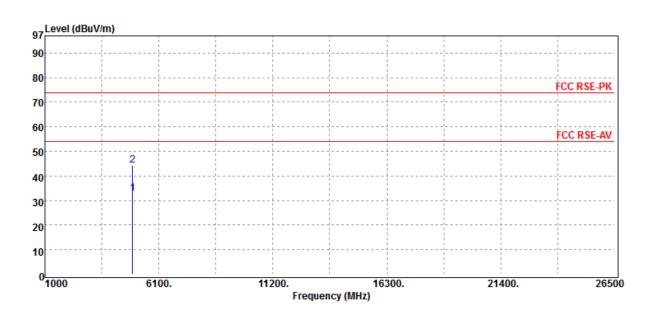
:802.11g

**Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Average	25.27	7.51	32.78	54.00	-21.22
4924.00	Н	Peak	36.65	7.51	44.16	74.00	-29.84

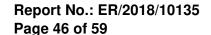
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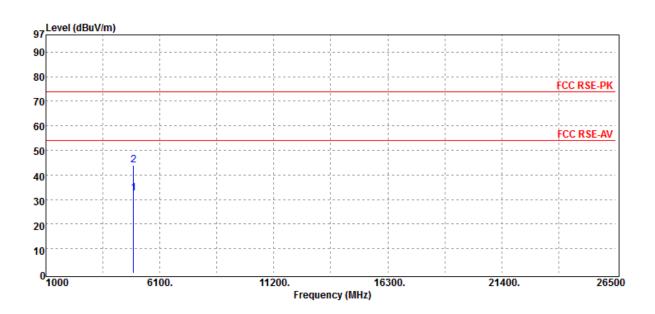
:802.11g :2462 MHz :Tx CH HIGH

EUT Pol. :E2 Plane **Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
4924.00	Н	Average	24.97	7.51	32.48	54.00	-21.52
4924.00	Н	Peak	36.34	7.51	43.85	74.00	-30.15

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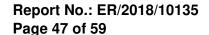
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EUT Pol.

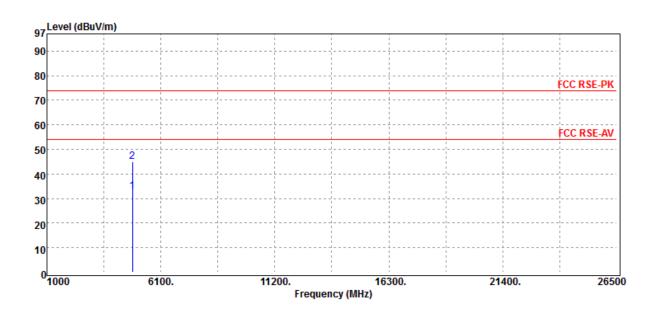
:802.11n20 :2412 MHz :Tx CH LOW :E2 Plane

**Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4824.00	Н	Average	25.75	7.28	33.03	54.00	-20.97
4824.00	Н	Peak	37.55	7.28	44.83	74.00	-29.17

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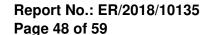
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台灣檢驗科技股份有限公司

SGS Taiwan Ltd.

t (886 12) 2299 13279





EUT Pol.

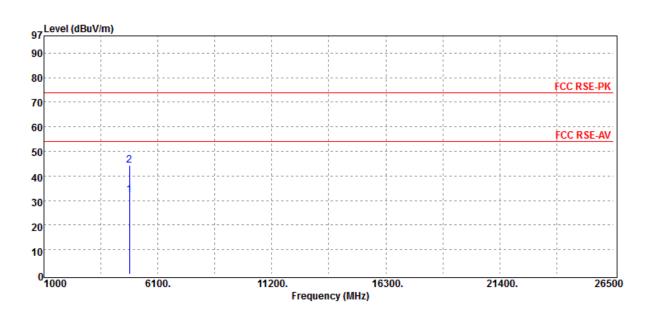
:802.11n20 :2412 MHz :Tx CH LOW :E2 Plane

**Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4824.00	Н	Average	25.03	7.28	32.31	54.00	-21.69
4824.00	Н	Peak	37.16	7.28	44.44	74.00	-29.56

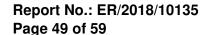
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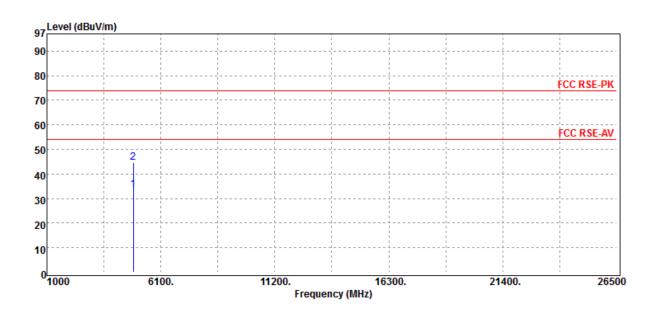
**Operation Band** :802.11n20 Fundamental Frequency :2437 MHz **Operation Mode** :Tx CH MID

EUT Pol. :E2 Plane **Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4874.00	Н	Average	25.99	7.54	33.53	54.00	-20.47
4874.00	Н	Peak	37.19	7.54	44.73	74.00	-29.27

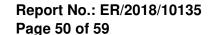
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**Operation Band** :802.11n20 Fundamental Frequency :2437 MHz

**Operation Mode** 

EUT Pol.

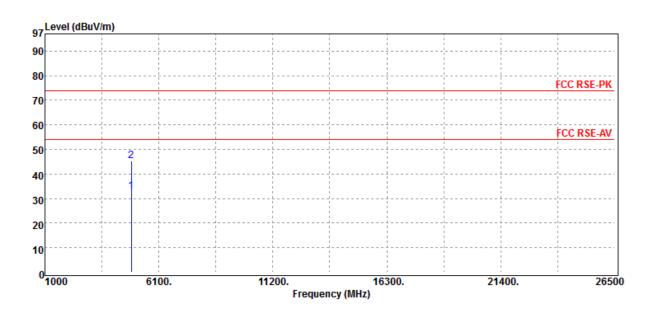
:Tx CH MID :E2 Plane

**Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4874.00	Н	Average	25.34	7.54	32.88	54.00	-21.12
4874.00	Н	Peak	37.72	7.54	45.26	74.00	-28.74

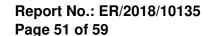
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EUT Pol.

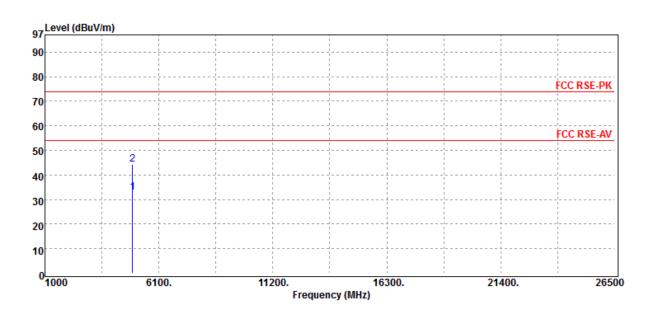
:802.11n20 :2462 MHz :Tx CH HIGH :E2 Plane

**Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4924.00	Н	Average	25.31	7.51	32.82	54.00	-21.18
4924.00	Н	Peak	36.71	7.51	44.22	74.00	-29.78

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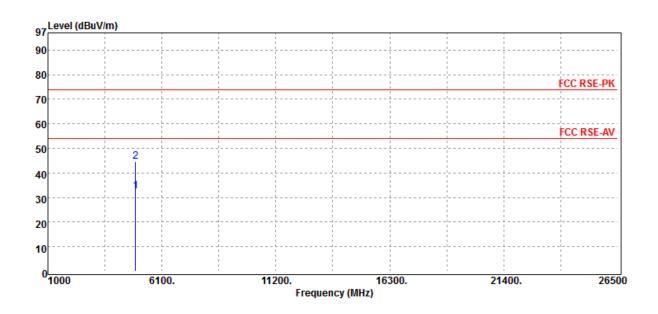
**Operation Band** Fundamental Frequency **Operation Mode** EUT Pol.

:802.11n20 :2462 MHz :Tx CH HIGH :E2 Plane

**Test Date** :2018-01-26 Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4924.00	Н	Average	24.94	7.51	32.45	54.00	-21.55
4924.00	Н	Peak	37.02	7.51	44.53	74.00	-29.47

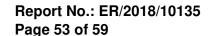
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**Operation Band** Fundamental Frequency

**Operation Mode** EUT Pol.

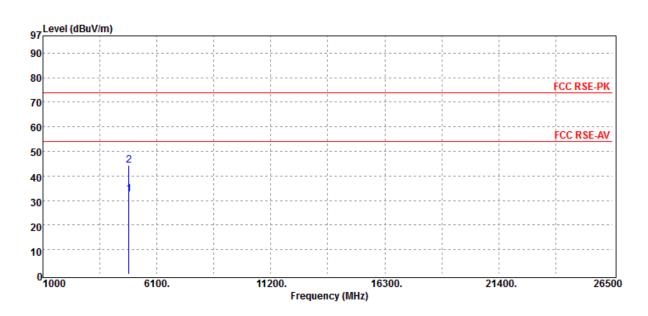
:802.11n40 :2422 MHz :Tx CH LOW :E2 Plane

**Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4844.00	Н	Average	25.41	7.29	32.70	54.00	-21.30
4844.00	Н	Peak	36.86	7.29	44.15	74.00	-29.85

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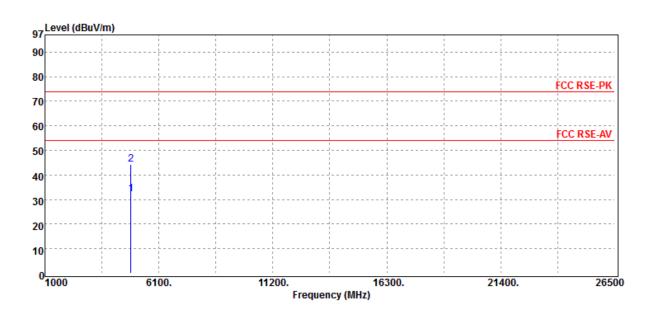
**Operation Band** Fundamental Frequency **Operation Mode** EUT Pol.

:802.11n40 :2422 MHz :Tx CH LOW :E2 Plane

**Test Date** :2018-01-26 Temp./Humi. :21 deg\_C / 62 RH

Engineer

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4844.00	Н	Average	24.89	7.29	32.18	54.00	-21.82
4844.00	Н	Peak	37.09	7.29	44.38	74.00	-29.62

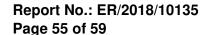
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**Operation Band** Fundamental Frequency

**Operation Mode** EUT Pol.

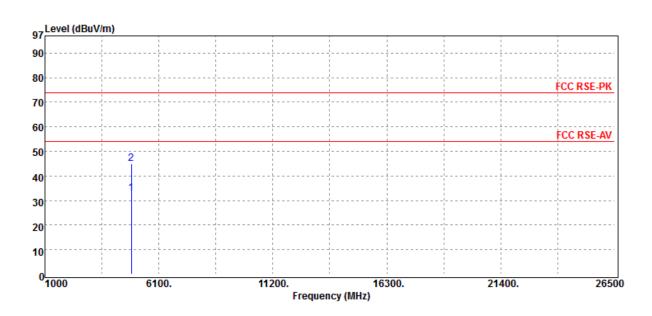
:802.11n40 :2437 MHz :Tx CH MID :E2 Plane

**Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4874.00	Н	Average	25.34	7.54	32.88	54.00	-21.12
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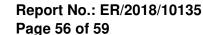
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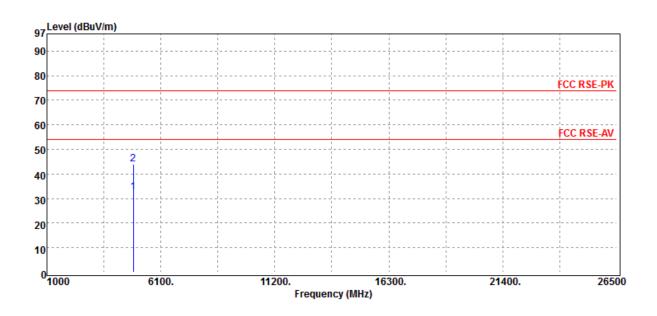
**Operation Band** :802.11n40 Fundamental Frequency :2437 MHz **Operation Mode** :Tx CH MID

EUT Pol. :E2 Plane **Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
4874.00	Н	Average	24.89	7.54	32.43	54.00	-21.57
4874.00	Н	Peak	36.54	7.54	44.08	74.00	-29.92

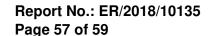
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EUT Pol.

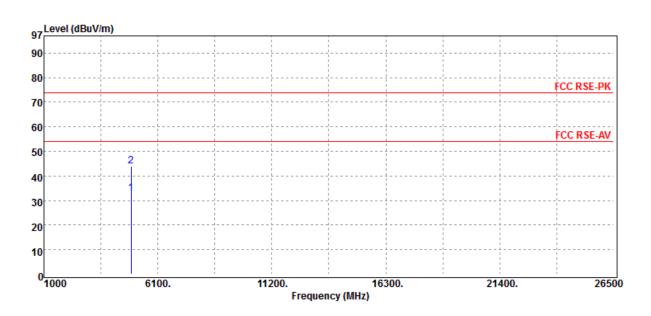
:802.11n40 :2452 MHz :Tx CH HIGH :E2 Plane

**Test Date** :2018-01-26

Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4904.00	Н	Average	25.38	7.54	32.92	54.00	-21.08
4904.00	Н	Peak	36.27	7.54	43.81	74.00	-30.19

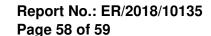
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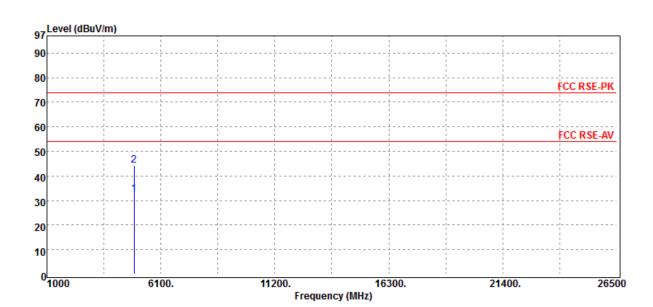
EUT Pol.

:802.11n40 :2452 MHz :Tx CH HIGH :E2 Plane

**Test Date** :2018-01-26 Temp./Humi. :21 deg\_C / 62 RH

Engineer :Kane

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
4904.00	Н	Average	24.95	7.54	32.49	54.00	-21.51
4904.00	Н	Peak	36.66	7.54	44.20	74.00	-29.80

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## 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

The antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

~ End of Report ~

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