


RADIO TEST REPORT

FCC ID : 2AYRA-03678
Equipment : AC1200 Dual Band Wi-Fi Range Extender
Brand Name : LINKSYS
Model Name : RE6400 V2
Applicant : Linksys USA, Inc.
12045 East Waterfront Drive Playa Vista, CA.
90094, USA
Standard : 47 CFR FCC Part 15.247

The product was received on Oct. 28, 2021, and testing was started from Oct. 30, 2021 and completed on Oct. 30, 2021. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.



Approved by: Sam Chen

Sporton International Inc. Hsinchu Laboratory
No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)



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Appendix B. Test Photos

Photographs of EUT v01



History of this test report

Report No.	Version	Description	Issued Date
FR0D0335-01AA	01	Initial issue of report	Nov. 24, 2021



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	-
3.1	15.247(d)	Emissions in Restricted Frequency Bands	PASS	-

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: **Sam Chen**
Report Producer: **Viola Huang**



1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	IEEE Std. 802.11	Ch. Frequency (MHz)	Channel Number
2400-2483.5	b, g, n (HT20)	2412-2462	1-11 [11]
2400-2483.5	n (HT40)	2422-2452	3-9 [7]

Band	Mode	BWch (MHz)	Nant
2.4-2.4835GHz	802.11b	20	2TX
2.4-2.4835GHz	802.11g	20	2TX
2.4-2.4835GHz	802.11n HT20	20	2TX
2.4-2.4835GHz	802.11n HT40	40	2TX

Note:

- ◆ 11b mode uses a combination of DSSS-DBPSK, DQPSK, CCK modulation.
- ◆ 11g, HT20 and HT40 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.
- ◆ BWch is the nominal channel bandwidth.

1.1.2 Antenna Information

Ant.	Port	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	
						2.4GHz	5GHz
1	1	N/A	N/A	Dipole Antenna	I-PEX	3.8	3.8
2	2	N/A	N/A	Dipole Antenna	I-PEX	3.3	3.7

Note: The above information was declared by manufacturer.

For 2.4GHz Function:**For IEEE 802.11b/g/n (2TX/2RX):**

Port 1 and Port 2 can be used as transmitting/receiving antenna.

Port 1 and Port 2 could transmit/receive simultaneously.

For 5GHz Function:**For IEEE 802.11a/n/ac (2TX/2RX):**

Port 1 and Port 2 can be used as transmitting/receiving antenna.

Port 1 and Port 2 could transmit/receive simultaneously.



1.1.3 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
802.11b	0.994	0.03	n/a (DC>=0.98)	n/a (DC>=0.98)
802.11g	0.945	0.25	1.4m	1k
802.11n HT20	0.927	0.33	1.313m	1k
802.11n HT40	0.868	0.61	652.5u	3k

Note:

- ◆ DC is Duty Cycle.
- ◆ DCF is Duty Cycle Factor.

1.1.4 EUT Operational Condition

EUT Power Type	Internal power supply			
Beamforming Function	<input checked="" type="checkbox"/>	With beamforming	<input type="checkbox"/>	Without beamforming
	The product has beamforming function for n/ac in 5GHz.			
Function	<input checked="" type="checkbox"/>	Point-to-multipoint	<input type="checkbox"/>	Point-to-point
Test Software Version	MT7663 QA 0.0.2.8			

Note: The above information was declared by manufacturer.

1.1.5 Table for EUT support function

Function
AP Mode
Extender Mode



1.1.6 Table for Permissive Change

This product is an extension of original one reported under Sporton project number: FR0D0335AA

Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
1. Adjusting the parameter of Flash to improve the throughput via software change.	After evaluating, the worst case is found at 802.11b CH6 (2437Hz) non bf mode and retest this channel only and for above 1GHz will be based on original output power to retest
2. Equipping new equipment name: AC1200 Dual Band Wi-Fi Range Extender and model name: RE6400 V2 for this change.	It doesn't affect the test result of this test report.



1.2 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ◆ 47 CFR FCC Part 15.247
- ◆ ANSI C63.10-2013

The following reference test guidance is not within the scope of accreditation of TAF.

- ◆ FCC KDB 558074 D01 v05r02

1.3 Testing Location Information

Testing Location Information	
Test Lab. : Sporton International Inc. Hsinchu Laboratory	
Hsinchu (TAF: 3787)	ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.) TEL: 886-3-656-9065 FAX: 886-3-656-9085 Test site Designation No. TW3787 with FCC. Conformity Assessment Body Identifier (CABID) TW3787 with ISED.

Test Condition	Test Site No.	Test Engineer	Test Environment (°C / %)	Test Date
Radiated	03CH03-CB	Caster Chang	24.6~25.7 / 56~59	Oct. 30, 2021

1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

Test Items	Uncertainty	Remark
Radiated Emission (1GHz ~ 18GHz)	4.7 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	4.2 dB	Confidence levels of 95%



2 Test Configuration of EUT

2.1 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests	
Tests Item	Emissions in Restricted Frequency Bands
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.
Operating Mode > 1GHz	CTX
	The EUT was performed at X axis, Y axis and Z axis position for Radiated measurement, and the worst case was found at Y axis. So the measurement will follow this same test configuration.
1	EUT in Y axis

2.2 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

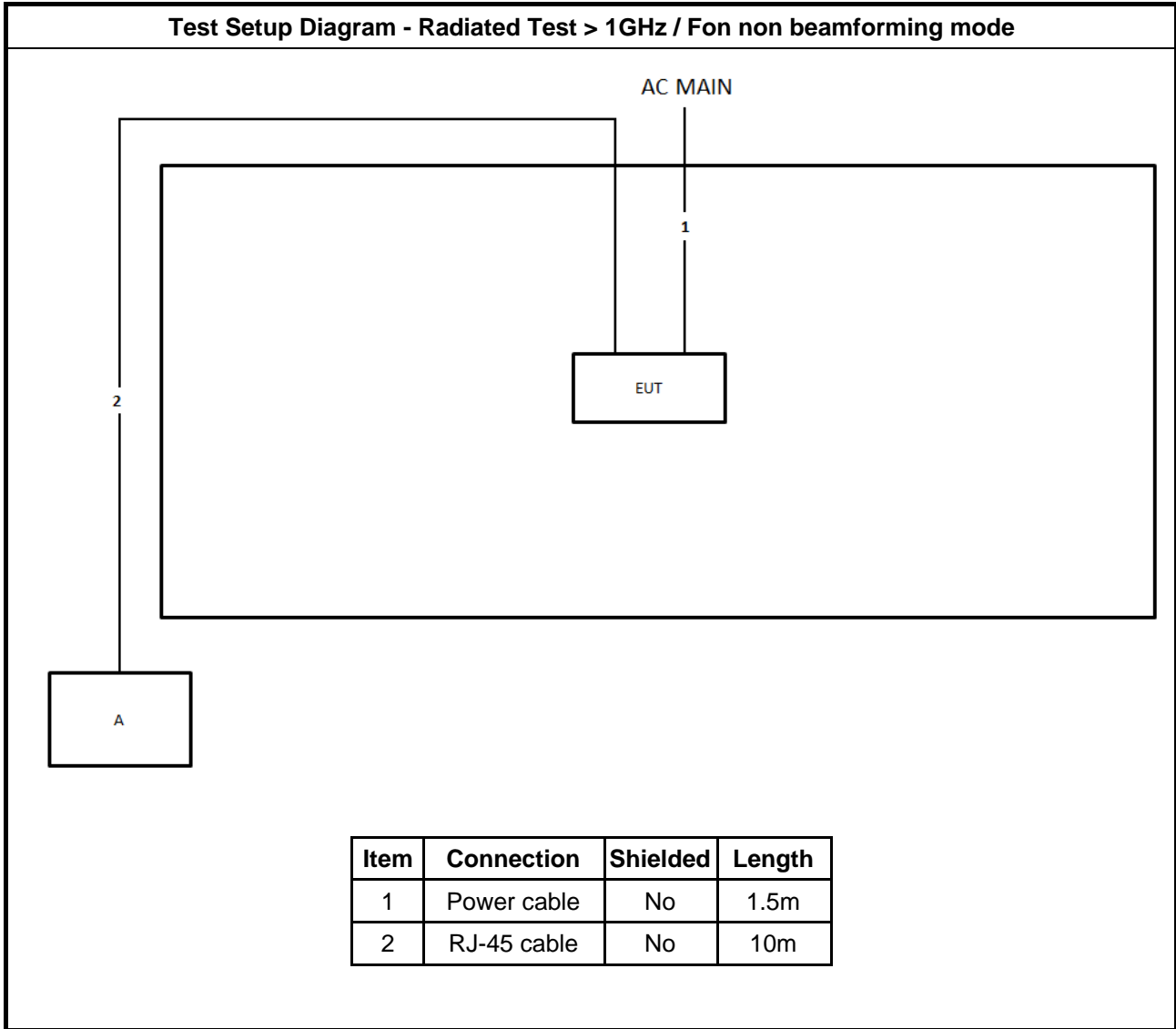
2.3 Accessories

N/A

2.4 Support Equipment

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
A	Notebook	DELL	E4300	N/A

2.5 Test Setup Diagram





3 Transmitter Test Result

3.1 Emissions in Restricted Frequency Bands

3.1.1 Emissions in Restricted Frequency Bands Limit

Restricted Band Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Note 3: Using the distance of 1m during the test for above 18 GHz, and the test value to correct for the distance factor at 3m.

3.1.2 Measuring Instruments

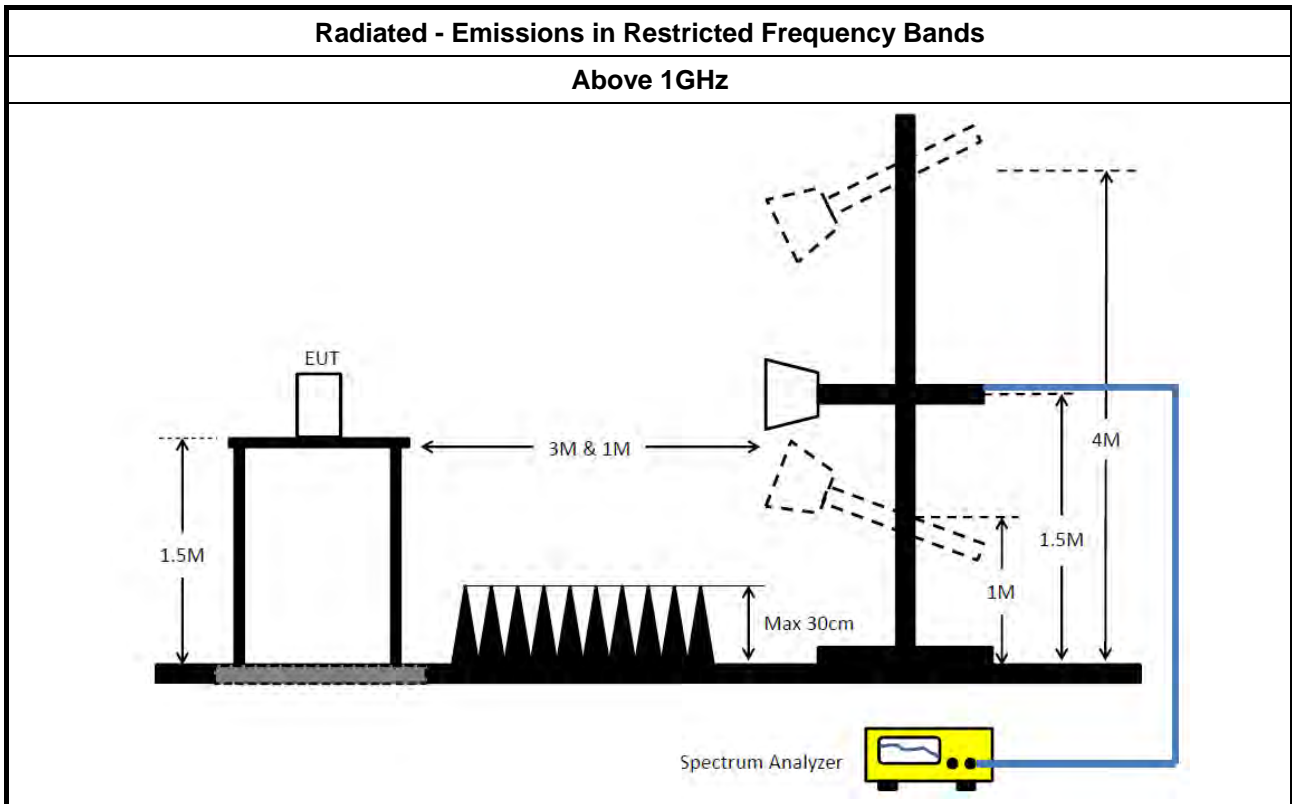
Refer a test equipment and calibration data table in this test report.



3.1.3 Test Procedures

Test Method	
<ul style="list-style-type: none"> ▪ The average emission levels shall be measured in [duty cycle \geq 98 or duty factor]. 	
<ul style="list-style-type: none"> ▪ Refer as ANSI C63.10, clause 6.10.3 band-edge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band. 	
<ul style="list-style-type: none"> ▪ For the transmitter unwanted emissions shall be measured using following options below: 	
	<ul style="list-style-type: none"> ▪ Refer as FCC KDB 558074, clause 8.6 for unwanted emissions into restricted bands.
	<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.1(trace averaging for duty cycle \geq 98%).
	<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.2(trace averaging + duty factor).
	<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.3(Reduced VBW \geq 1/T).
	<input type="checkbox"/> Refer as ANSI C63.10, clause 11.12.2.5.3 (Reduced VBW). VBW \geq 1/T, where T is pulse time.
	<input type="checkbox"/> Refer as ANSI C63.10, clause 7.5 average value of pulsed emissions.
	<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.4 measurement procedure peak limit.
<ul style="list-style-type: none"> ▪ For the transmitter band-edge emissions shall be measured using following options below: 	
	<ul style="list-style-type: none"> ▪ Refer as FCC KDB 558074 clause 8.7 & C63.10 clause 11.13.1, When the performing peak or average radiated measurements, emissions within 2 MHz of the authorized band edge may be measured using the marker-delta method described below.
	<ul style="list-style-type: none"> ▪ Refer as FCC KDB 558074, clause 8.7 (ANSI C63.10, clause 6.10.6) for marker-delta method for band-edge measurements.
	<ul style="list-style-type: none"> ▪ Refer as FCC KDB 558074, clause 8.7 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).
	<ul style="list-style-type: none"> ▪ For conducted unwanted emissions into restricted bands (absolute emission limits). Devices with multiple transmit chains using options given below: (1) Measure and sum the spectra across the outputs or (2) Measure and add 10 log(N) dB
	<ul style="list-style-type: none"> ▪ For FCC KDB 662911 The methodology described here may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance may be demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred.

3.1.4 Test Setup



3.1.5 Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA)(if applicable) = Level.

3.1.6 Emissions in Restricted Frequency Bands (Below 30MHz)

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to KDB414788 Radiated Test Site, and the result came out very similar.

All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10th harmonic or 40 GHz, whichever is appropriate.

3.1.7 Test Result of Emissions in Restricted Frequency Bands

Refer as Appendix A



4 Test Equipment and Calibration Data

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
3m Semi Anechoic Chamber VSWR	TDK	SAC-3M	03CH03-CB	1GHz ~18GHz 3m	May 06, 2021	May 05, 2022	Radiation (03CH03-CB)
Horn Antenna	ETS · Lindgren	3115	6821	750MHz~18GHz	Jan. 26, 2021	Jan. 25, 2022	Radiation (03CH03-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Aug. 05, 2021	Aug. 04, 2022	Radiation (03CH03-CB)
Pre-Amplifier	Agilent	8449B	3008A02097	1GHz ~ 26.5GHz	Jul. 02, 2021	Jul. 01, 2022	Radiation (03CH03-CB)
Pre-Amplifier	MITEQ	TTA1840-35-H G	1864479	18GHz ~ 40GHz	Jul. 13, 2021	Jul. 12, 2022	Radiation (03CH03-CB)
Spectrum Analyzer	R&S	FSP40	100019	9kHz ~ 40GHz	Jun. 04, 2021	Jun. 03, 2022	Radiation (03CH03-CB)
RF Cable-high	Woken	RG402	High Cable-20+29	1GHz ~ 18GHz	Oct. 04, 2021	Oct. 03, 2022	Radiation (03CH03-CB)
RF Cable-high	Woken	RG402	High Cable-29	1GHz ~ 18GHz	Oct. 04, 2021	Oct. 03, 2022	Radiation (03CH03-CB)
RF Cable-high	Woken	RG402	High Cable-40G#1	18GHz ~ 40 GHz	Jul. 15, 2021	Jul. 14, 2022	Radiation (03CH03-CB)
RF Cable-high	Woken	RG402	High Cable-40G#2	18GHz ~ 40 GHz	Jul. 15, 2021	Jul. 14, 2022	Radiation (03CH03-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH03-CB)

Note: Calibration Interval of instruments listed above is one year.

N.C.R. means Non-Calibration required.

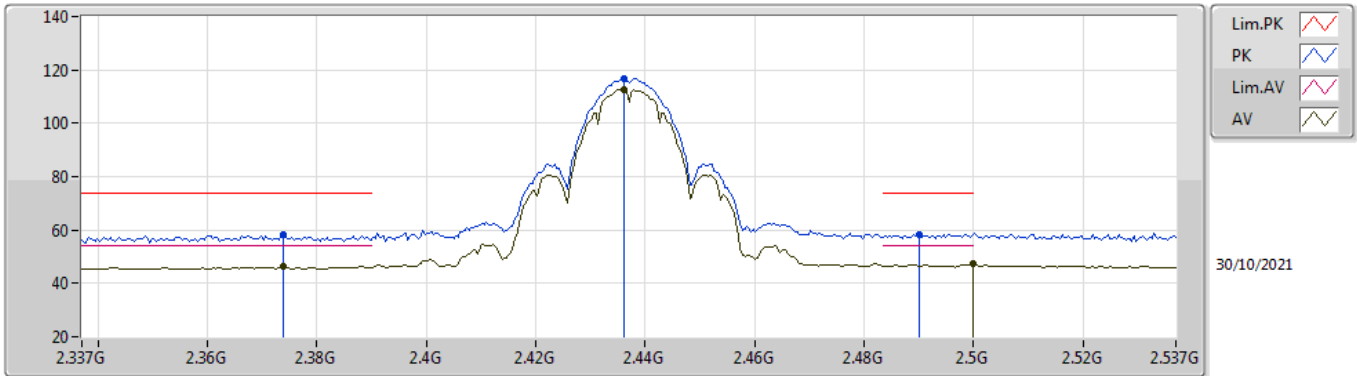


Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-
802.11b_Nss1,(1Mbps)_2TX	Pass	AV	2.4998G	47.35	54.00	-6.65	3	Vertical	190	1.86	-

802.11b_Nss1,(1Mbps)_2TX

2437MHz_TX

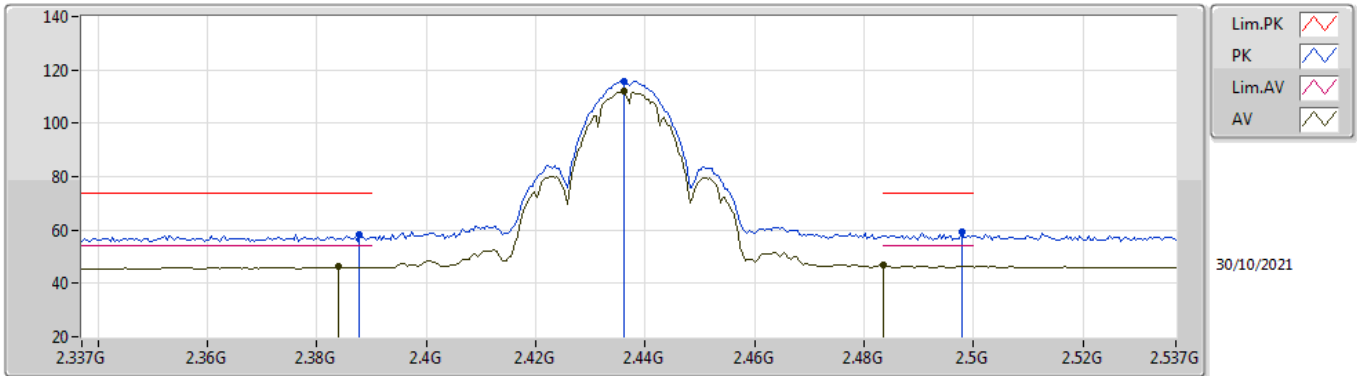


EUT_V_2TX
Setting 27
03-E-C-5

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	2.3738G	58.37	74.00	-15.63	25.65	3	Vertical	190	1.86	-	28.35	4.37	-
AV	2.3738G	46.23	54.00	-7.77	13.51	3	Vertical	190	1.86	-	28.35	4.37	-
PK	2.4362G	116.66	Inf	-Inf	83.87	3	Vertical	190	1.86	-	28.37	4.42	-
AV	2.4362G	112.71	Inf	-Inf	79.92	3	Vertical	190	1.86	-	28.37	4.42	-
PK	2.4902G	58.20	74.00	-15.80	25.11	3	Vertical	190	1.86	-	28.64	4.45	-
AV	2.4998G	47.35	54.00	-6.65	14.20	3	Vertical	190	1.86	-	28.70	4.45	-

802.11b_Nss1,(1Mbps)_2TX

2437MHz_TX

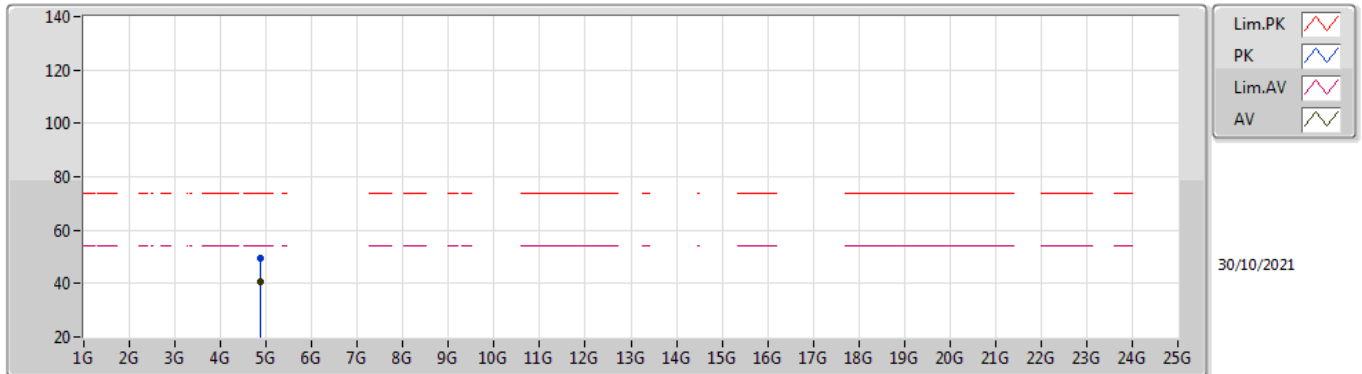


EUT_V_2TX
Setting 27
03-E-C-5

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	2.3878G	58.49	74.00	-15.51	25.78	3	Horizontal	168	1.17	-	28.32	4.39	-
AV	2.3838G	46.19	54.00	-7.81	13.48	3	Horizontal	168	1.17	-	28.33	4.38	-
PK	2.4362G	115.83	Inf	-Inf	83.04	3	Horizontal	168	1.17	-	28.37	4.42	-
AV	2.4362G	111.89	Inf	-Inf	79.10	3	Horizontal	168	1.17	-	28.37	4.42	-
PK	2.4978G	59.39	74.00	-14.61	26.25	3	Horizontal	168	1.17	-	28.69	4.45	-
AV	2.4835G	46.74	54.00	-7.26	13.70	3	Horizontal	168	1.17	-	28.60	4.44	-

802.11b_Nss1,(1Mbps)_2TX

2437MHz_TX

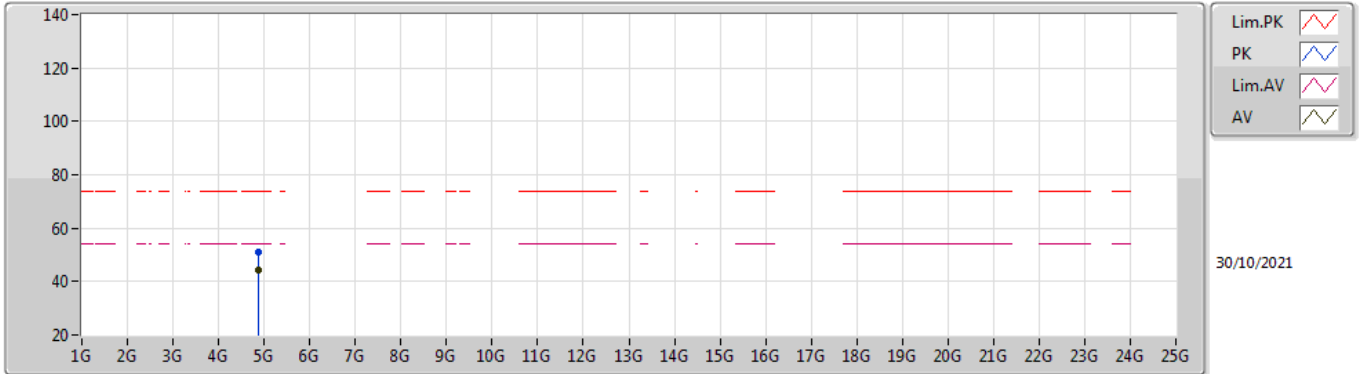


EUT Y_2TX
Setting 27
03-E-C-5

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	4.874G	49.52	74.00	-24.48	44.36	3	Vertical	28	2.11	-	33.50	7.06	35.40
AV	4.87402G	40.75	54.00	-13.25	35.59	3	Vertical	28	2.11	-	33.50	7.06	35.40

802.11b_Nss1,(1Mbps)_2TX

2437MHz_TX



EUT Y_2TX
Setting 27
03-E-C-5

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	4.87409G	51.20	74.00	-22.80	46.04	3	Horizontal	315	1.92	-	33.50	7.06	35.40
AV	4.87405G	44.28	54.00	-9.72	39.12	3	Horizontal	315	1.92	-	33.50	7.06	35.40