TEST REPORT

FCC ID:V2V-DLBPROP2, IC:7607A-DLBPROP2

Applicant : **LigoWave LLC**

Address : **138 Mountain Brook Dr Canton, GA 30115 United States**

Equipment under Test (EUT):

Name : Broadband Digital Transmission System
Model : LigoDLB Propeller 2

Standards : FCC PART 15, SUBPART C : 2014 (Section 15.407)
RSS-247 ISSUE 1 MAY 2015
ANSI C63.4:2014 ; ANSI C63.10:2013

Report No. : T1850694 05

Date of Test : June 19- July 08, 2015

Date of Issue : July 09, 2015

Test Result :	**PASS ***

* In the configuration tested, the EUT complied with the standards specified above

Authorized Signature

(Mark Zhu)
General Manager

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Description **Page**

1 General Information

1.1 Description of Device (EUT)

Trade Name	:	N/A
EUT	:	Broadband Digital Transmission System
Model No.		LigoDLB Propeller 2
DIFF.	:	N/A
Antenna Type	:	Printed Antenna [printed antenna, directional gain is 11dBi (8dBi per antenna)
Operation Frequency	:	IEEE 802.11b/g: 2412MHz-2462MHz IEEE 802.11n HT20: 2412MHz-2462MHz IEEE 802.11n HT40: 2422MHz-2452MHz
Channel number	:	EEE 802.11b/g:11Channels IEEE 802.11n HT20: 11 Channels IEEE 802.11n HT40: 7Channels
Modulation type	:	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n :OFDM(64QAM, 16QAM, QPSK, BPSK)
Power Supply	:	DC 24V Supply by POE adaptor with 120V/60Hz input
Adapter		Model No.: GRT-240050, AY012E-ZF243
Applicant	:	LigoWave LLC
Address	:	138 Mountain Brook Dr Canton, GA 30115 United States
Manufacturer	:	LigoWave LLC
Address	:	138 Mountain Brook Dr Canton, GA 30115 United States

Tested by (name + signature).....:	Eric Huang Test Engineer	
Approved by (name + signature).....:	Simple Guan Project Manager	

1.2 Description of Test Facility

Shenzhen Alpha Product Testing Co., Ltd
Building B, East Area of Nanchang Second, Industrial Zone, Gushu 2nd Road,
Bao'an, Shenzhen, China

August 11, 2014 File on Federal Communication Commission
Registration Number: 203110

July 18, 2014 Certificated by IC
Registration Number: 12135A

2 EMC Equipment List

Equipment	Manufacture	Model No.	Serial No.	Last cal.	Cal Interval
3m Semi-Anechoic	ETS-LINDGREN	N/A	SEL0017	2015.01.19	1Year
Spectrum analyzer	Agilent	E4407B	MY46185649	2015.01.19	1Year
Receiver	R&S	ESCI	1166.5950K03-1011	2015.01.19	1Year
Receiver	R&S	ESCI	101202	2015.01.19	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	VULB9168-438	2015.01.21	1Year
Horn Antenna	EMCO	3115	640201028-06	2015.01.21	1Year
Active Loop Antenna	Beijing Daze	ZN30900A	SEL0097	2015.01.21	1Year
Cable	Resenberger	N/A	No.1	2015.01.19	1Year
Cable	SCHWARZBECK	N/A	No.2	2015.01.19	1Year
Cable	SCHWARZBECK	N/A	No.3	2015.01.19	1Year
Pre-amplifier	Schwarzbeck	BBV9743	9743-019	2015.01.19	1Year
Pre-amplifier	R&S	AFS33-18002650-30-8P-44	SEL0080	2015.01.19	1Year
Base station	Agilent	E5515C	GB44300243	2015.01.19	1 Year
Temperature controller	Terchy	MHQ	120	2015.01.19	1Year

Power divider	Anritsu	K240C	020346	2015.01.19	1 Year
Signal Generator	HP	83732B	VS3449051	2015.01.19	1 Year
Power Meter	Anritsu	ML2487A	6K00001491	2015.01.19	1Year
Power sensor	Anritsu	ML2491A	32516	2015.01.19	1Year

3 Test Procedure

POWER LINE CONDUCTED INTERFERENCE: The test procedure used was ANSI Standard ANSI C63.4:2014 using a 50 u H LISN. Both Lines were observed. The bandwidth of the receiver was 10kHz with an appropriate sweep speed. The ambient temperature of the EUT was 25℃ with a humidity of 58%.

RADIATION INTERFERENCE: The test procedure used was ANSI Standard ANSI C63.4:2014 using a ANRITSU spectrum analyzer with a pre-selector. The analyzer was calibrated in dB above a micro volt at the output of the antenna. The resolution bandwidth was 100kHz and the video bandwidth was 300 kHz up to 1 GHz and 1 MHz with a video BW of 3MHz above 1 GHz. The ambient temperature of the EUT was 25℃ with a humidity of 58%.

FORMULA OF CONVERSION FACTORS: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer and cable loss. The antenna correction factors and cable loss are stated in terms of dB. The gain of the Pre-selector was accounted for in the Spectrum Analyzer Meter Reading.
Example:
Freq (MHz) METER READING + ACF + CABLE = FS
33.20 dBuV + 10.36 dB + 0.9 dB= 44.46 dBuV/m @ 3m
ANSI STANDARD ANSI C63.4:2014 10.1.7 MEASUREMENT PROCEDURES: The EUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The EUT was placed in the center of the table (1.5m side). The table used for radiated measurements is capable of continuous rotation. When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes. The situation was similar for the conducted measurement except that the table did not rotate. The EUT was setup as described in ANSI Standard ANSI C63.4:2014 10.1.7 with the EUT 40 cm from the vertical ground wall.

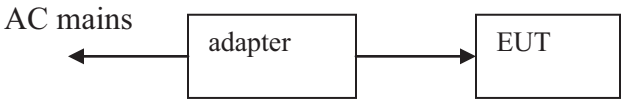
4 Summary of Measurement

4.1 Summary of test result

Test Item	Test Requirement	Standards Paragraph	Result
Spurious Emission	FCC PART 15 : 2014 & IC RSS-247	Section 15.247&15.209 & RSS-247 Section 5.5	Compliance
Conduction Emission	FCC PART 15 : 2014 & IC RSS Gen	Section 15.207&7.2.4	Compliance
Bandwidth Test	FCC PART 15 : 2014 & IC RSS-247	Section 15.247& RSS-247 5.1(2)	Compliance
Peak Power	FCC PART 15 : 2014 & IC RSS-247	Section 15.247 & RSS-247 5.4(2)	Compliance
Power Density	FCC PART 15 : 2014 & IC RSS-247	Section 15.247 & Section 5.2(2)	Compliance
Band Edge	FCC PART 15 : 2014 & IC RSS-247	Section 15.247 & Section 5.5	Compliance
Antenna Requirement	FCC PART 15 : 2014 & IC RSS Gen	Section 15.203&7.1.4	Compliance

Note: The EUT has been tested as an independent unit. And Continual Transmitting in maximum power (The adapter be used during Test)

4.2 Test connection



4.3 Assistant equipment used for test

Description	:	Adapter
Manufacturer	:	N/A
Model No.	:	GRT-240050A, AY012E-ZF243

4.4 Test mode

Dutycycle :100% Keeping MIMO TX			
Mode	data rate (Mpbs)(see Note)	Channel	Frequency (MHz)
IEEE 802.11b	1	Low :CH1	2412
	1	Middle: CH6	2437
	1	High: CH11	2462
IEEE 802.11g	6	Low :CH1	2412
	6	Middle: CH6	2437
	6	High: CH11	2462
IEEE 802.11 n/HT20 with 2.4G	6.5	Low :CH1	2412
	6.5	Middle: CH6	2437
	6.5	High: CH11	2462
IEEE 802.11 n/HT40 with 2.4G	13.5	Low :CH3	2422
	13.5	Middle:CH6	2437
	13.5	High:CH9	2452
Note: According exploratory test, EUT will have maximum output power in those data rate. so those data rate were used for all test.			

4.5 Channel list

For IEEE 802.11b/g and IEEE 802.11n/HT20 with 2.4G					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
CH1	2412	CH5	2432	CH9	2452
CH2	2417	CH6	2437	CH10	2457
CH3	2422	CH7	2442	CH11	2462
CH4	2427	CH8	2447		

For IEEE 802.11n/HT40 with 2.4G					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
CH1	/	CH5	2432	CH9	2452
CH2	/	CH6	2437	/	/
CH3	2422	CH7	2442	/	/
CH4	2427	CH8	2447	/	/

4.6 Test Conditions

Temperature range	21-25℃
Humidity range	40-75%
Pressure range	86-106kPa

4.7 Measurement Uncertainty (95% confidence levels, k=2)

Item	MU	Remark
Uncertainty for Power point Conducted Emissions Test	2.42dB	
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	2.13 dB	Polarize: V
	2.57dB	Polarize: H
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.54dB	Polarize: V
	4.1dB	Polarize: H
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	2.08dB	Polarize: H
	2.56dB	Polarize: V
Uncertainty for radio frequency	1×10-9	
Uncertainty for conducted RF Power	0.65dB	
Uncertainty for temperature	0.2℃	
Uncertainty for humidity	1%	
Uncertainty for DC and low frequency voltages	0.06%	

5 Spurious Emission

5.1 Radiation Emission

5.1.1 Radiation Emission Limits(15.209)

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

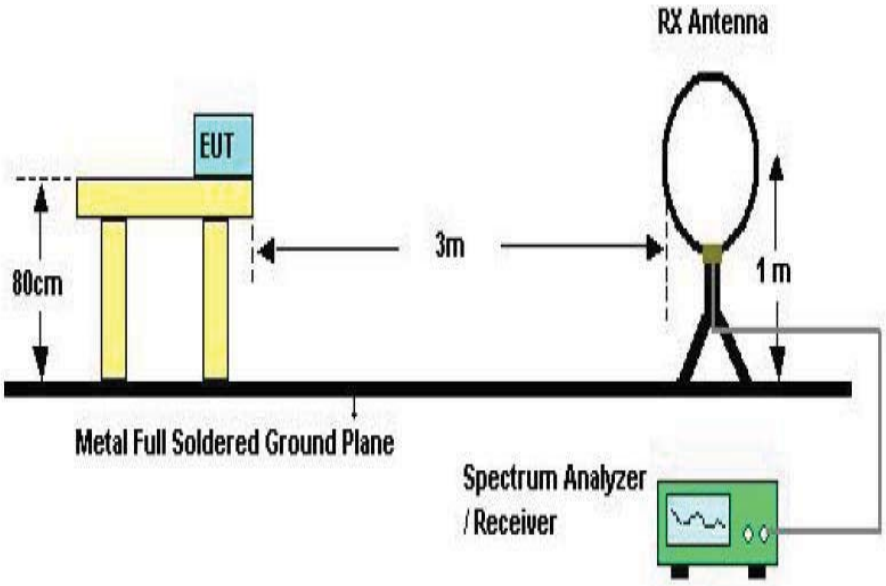
Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

NOTE:

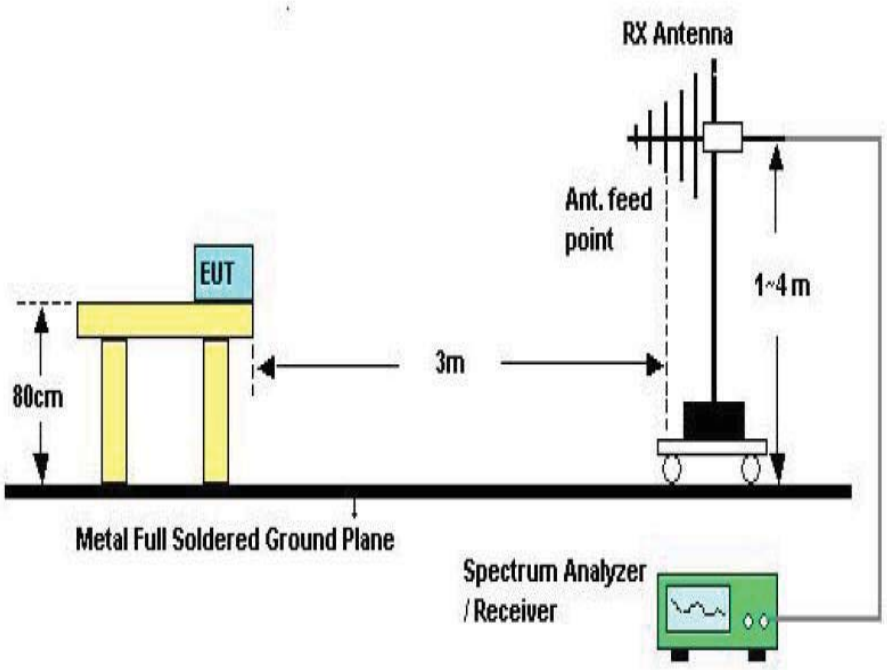
a) The tighter limit applies at the band edges.
b) Emission Level(dB uV/m)=20log Emission Level(Uv/m)

5.1.2 Test Setup

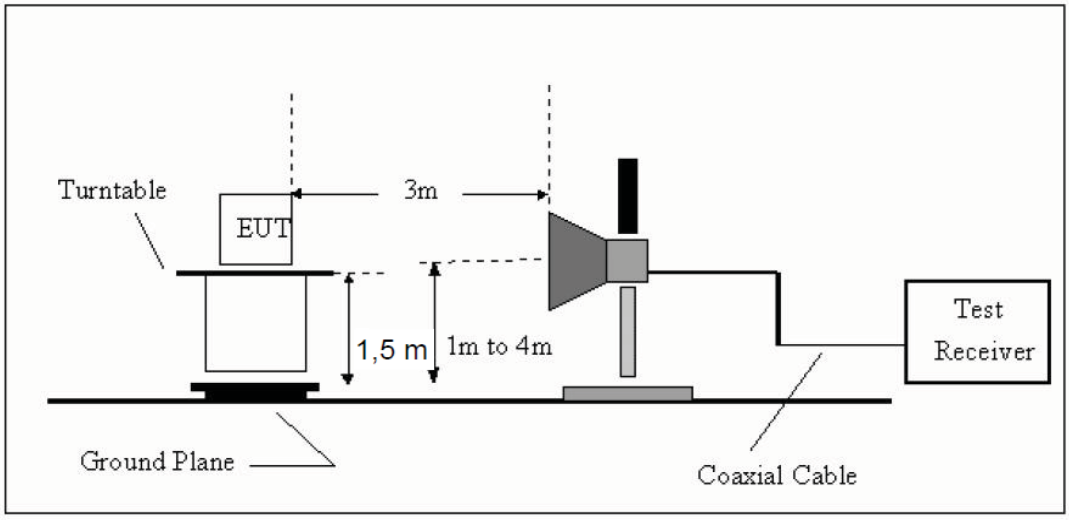
See the next page



Below 30MHz Test Setup



Above 30MHz Test Setup



Above 1GHz Test Setup

5.1.3 Test Procedure

a) The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1GHz, The EUT was placed on a rotating 0.8 m high above ground, The table was rotated 360 degrees to determine the position of the highest radiation
b) The Test antenna shall vary between 1m and 4m,Both Horizontal and Vertical antenna are set of make measurement.
c) The initial step in collecting conducted emission data is a spectrum analyzer Peak detector mode pre-scanning the measurement frequency range. Significant Peaks are then marked. and then Qusia Peak Detector mode premeasured
d) If Peak value comply with QP limit Below 1GHz.The EUT deemed to comply with QP limit. But the Peak value and average value both need to comply with applicable limit above 1GHz.
e) For the actual test configuration, please see the test setup photo.

5.1.4 Test Equipment Setting For emission test Result

9KHz~150KHz	RBW 200Hz	VBW1KHz
150KHz~30MHz	RBW 9KHz	VBW 30KHz
30MHZ~1GHz	RBW 120KHz	VBW 300KHz
Above 1GHz	RBW 1MHz	VBW 3MHz

5.1.5 Test Condition

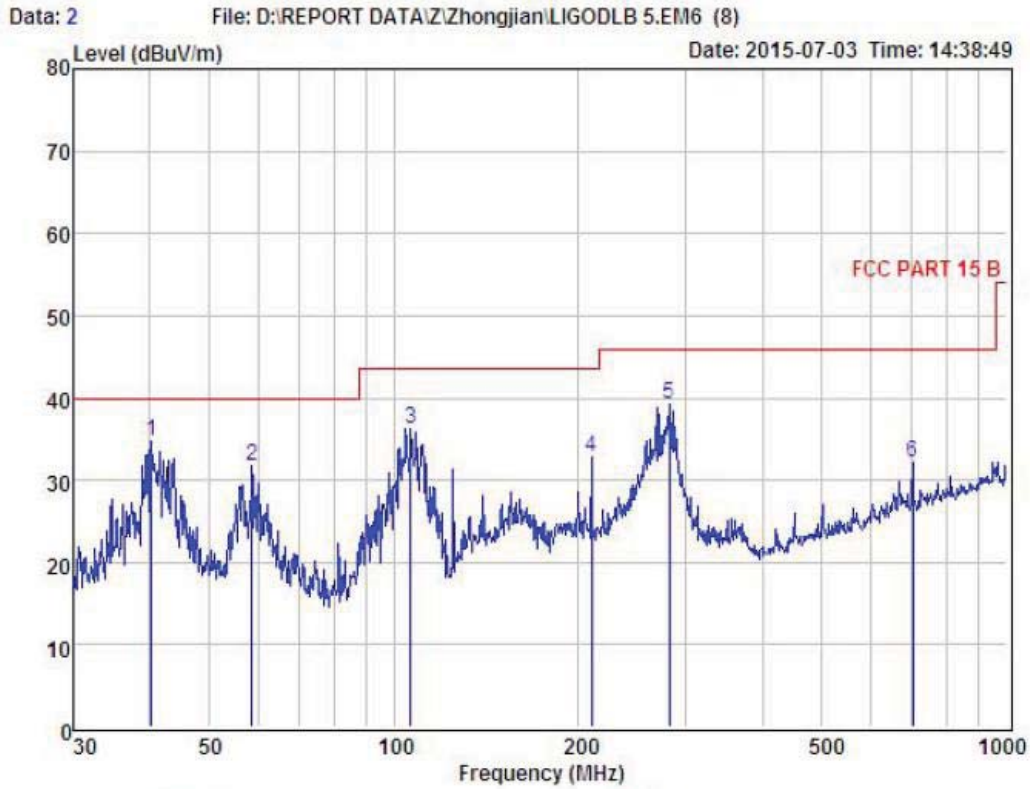
MIMO Continual Transmitting in maximum power.

5.1.6 Test Result

We have scanned the 9KHz from 25GHz to the EUT.
Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: PASS

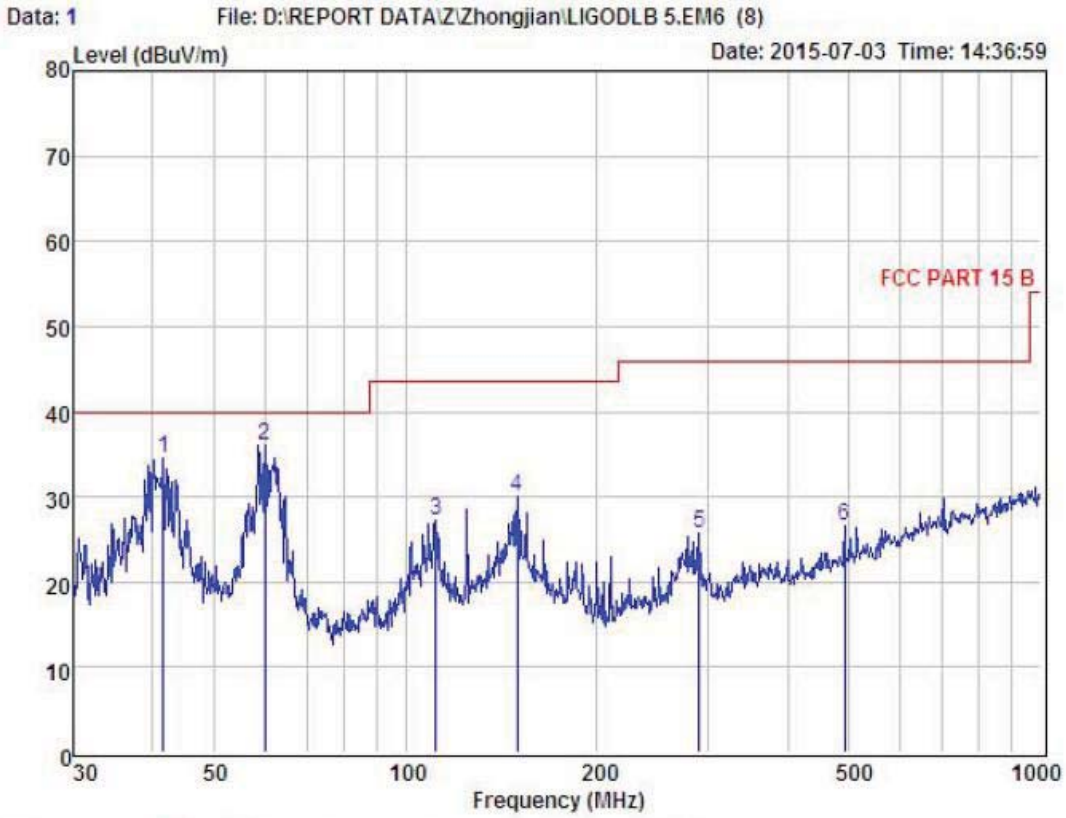
Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.



Condition : FCC PART 15 B 3m POL: HORIZONTAL
EUT : 5GHz Wireless Device
Model No : LigoDLB Propeller 2
Test Mode :
Power : DC 24V From Adapter
Test Engineer :
Remark :
Temp : 24.2℃
Hum : 54%

Item	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit	Margin	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dBuV	
1	40.28	52.49	14.07	31.89	0.18	34.85	40.00	-5.15	Peak
2	58.61	50.47	12.75	31.75	0.23	31.70	40.00	-8.30	Peak
3	106.76	56.33	10.93	31.35	0.42	36.33	43.50	-7.17	Peak
4	210.05	53.13	10.07	30.91	0.62	32.91	43.50	-10.59	Peak
5	281.01	57.02	12.41	30.62	0.53	39.34	46.00	-6.66	Peak
6	701.76	41.08	19.67	29.28	0.80	32.27	46.00	-13.73	Peak

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss



Condition : FCC PART 15 B 3m POL: VERTICAL
EUT : 5GHz Wireless Device
Model No : LigoDLB Propeller 2
Test Mode :
Power : DC 24V From Adapter
Test Engineer :
Remark :
Temp : 24.2℃
Hum : 54%

Item	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit	Margin	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dBuV	
1	41.57	52.34	13.93	31.87	0.19	34.59	40.00	-5.41	Peak
2	60.07	54.89	12.75	31.75	0.24	36.13	40.00	-3.87	Peak
3	111.74	46.71	11.32	31.34	0.44	27.13	43.50	-16.37	Peak
4	150.01	46.63	14.16	31.19	0.39	29.99	43.50	-13.51	Peak
5	290.02	43.12	12.58	30.59	0.54	25.65	46.00	-20.35	Peak
6	490.74	38.79	16.41	29.63	1.08	26.65	46.00	-19.35	Peak

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss

From 1G-25GHz

EUT	Broadband Digital Transmission System	**Model Name**	LigoDLB Propeller 2
Temperature	26°C	**Relative Humidity**	56%
Pressure	960hPa	**Test voltage**	DC 24V From adapter
Test Mode	MIMO TX Low		

IEEE 802.11b

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1103	V	43.09	---	-11.24	31.85	---	74	54	42.15	Peak
4824	V	35.71	---	0.64	36.35	---	74	54	37.65	Peak
N/A										

EUT	Broadband Digital Transmission System	**Model Name**	LigoDLB Propeller 2
Temperature	26°C	**Relative Humidity**	56%
Pressure	960hPa	**Test voltage**	DC 24V From adapter
Test Mode	MIMO TX Low		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1103	H	42.63	---	-11.24	31.39	---	74	54	42.61	Peak
4824	H	35.36	---	0.64	36	---	74	54	38	Peak
N/A										

Notes: AV Means AV detector test data, Peak Means Peak detector test data.
Emissions attenuated more than 20 dB below the permissible value are not reported.

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX Mid		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1103	V	42.98	---	-11.24	31.74	---	74	54	42.26	Peak
4874	V	38.4	---	0.76	39.16	---	74	54	34.84	Peak

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX Mid		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1103	H	42.79	---	-11.24	31.55	---	74	54	42.45	Peak
4874	H	39.51	---	0.76	40.27	---	74	54	33.73	Peak

Notes: AV Means AV detector test data, Peak Means Peak detector test data.
Emissions attenuated more than 20 dB below the permissible value are not reported.

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX High		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1103	V	42.64	---	-11.24	31.4	---	74	54	42.6	Peak
4924	V	35.76	---	0.87	36.63	---	74	54	37.37	Peak

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX High		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1103	H	43.06	---	-11.24	31.82	---	74	54	42.18	Peak
4924	H	32.95	---	0.87	33.82	---	74	54	40.18	Peak

Notes: AV Means AV detector test data, Peak Means Peak detector test data.
Emissions attenuated more than 20 dB below the permissible value are not reported.

IEEE 802.11 g:

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX Low		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1145	V	43.06	---	-11.24	31.82	---	74	54	42.18	Peak
2586	V	45.66	---	-7.13	38.53	---	74	54	35.47	Peak
3062	V	43.71	---	-5.74	37.97	---	74	54	36.03	Peak
4824	V	42.76	---	0.64	43.4	---	74	54	30.6	Peak
N/A										

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX Low		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1294	H	43.74	---	-10.96	32.78	---	74	54	41.22	Peak
2038	H	42.87	---	-8.58	34.29	---	74	54	39.71	Peak
3483	H	41.72	---	-4.95	36.77	---	74	54	37.23	Peak
4824	H	40.39	---	0.64	41.03	---	74	54	32.97	Peak
N/A										

Notes: AV Means AV detector test data,Peak Means Peak detector test data.
Emissions attenuated more than 20 dB below the permissible value are not reported.

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX Mid		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1374	V	42.7	---	-10.43	32.27	---	74	54	41.73	Peak
2589	V	42.95	---	-7.13	35.82	---	74	54	38.18	Peak
3365	V	42.49	---	-5.18	37.31	---	74	54	36.69	Peak
4874	V	41.67	---	0.76	42.43	---	74	54	31.57	Peak

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX Mid		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1321	H	42.47	---	-10.84	31.63	---	74	54	42.37	Peak
2314	H	43.1	---	-7.46	35.64	---	74	54	38.36	Peak
3577	H	41.34	---	-4.76	36.58	---	74	54	37.42	Peak
4874	H	39.24	---	0.76	40	---	74	54	34	Peak

Notes: AV Means AV detector test data, Peak Means Peak detector test data.
Emissions attenuated more than 20 dB below the permissible value are not reported.

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX High		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1302	V	42.93	---	-10.84	32.09	---	74	54	41.91	Peak
2982	V	43.41	---	-5.86	37.55	---	74	54	36.45	Peak
3831	V	42.46	---	-3.96	38.5	---	74	54	35.5	Peak
4924	V	40.56	---	0.87	41.43	---	74	54	32.57	Peak

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX High		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1446	H	42.11	---	-10.29	31.82	---	74	54	42.18	Peak
2198	H	42.2	---	-8.24	33.96	---	74	54	40.04	Peak
3905	H	42.33	---	-3.68	38.65	---	74	54	35.35	Peak
4924	H	39.74	---	0.87	40.61	---	74	54	33.39	Peak

Notes: AV Means AV detector test data, Peak Means Peak detector test data.
Emissions attenuated more than 20 dB below the permissible value are not reported.

IEEE 802.11n/HT20 with 2.4G

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX Low		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1492	V	43.97	---	-10.27	33.7	---	74	54	40.3	Peak
2671	V	43.33	---	-6.94	36.39	---	74	54	37.61	Peak
3948	V	43.81	---	-3.68	40.13	---	74	54	33.87	Peak
4824	V	42.79	---	0.64	43.43	---	74	54	30.57	Peak
N/A										

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX Low		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1451	H	41.87	---	-10.27	31.6	---	74	54	42.4	Peak
2839	H	42.14	---	-6.17	35.97	---	74	54	38.03	Peak
3607	H	41.71	---	-4.52	37.19	---	74	54	36.81	Peak
4824	H	40.63	---	0.64	41.27	---	74	54	32.73	Peak
N/A										

Notes: AV Means AV detector test data, Peak Means Peak detector test data.
Emissions attenuated more than 20 dB below the permissible value are not reported.

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX Mid		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1262	V	42.74	---	-10.96	31.78	---	74	54	42.22	Peak
2013	V	43.18	---	-8.58	34.6	---	74	54	39.4	Peak
3798	V	42.42	---	-4.07	38.35	---	74	54	35.65	Peak
4874	V	41.54	---	0.76	42.3	---	74	54	31.7	Peak

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX Mid		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1511	H	43.41	---	-10.14	33.27	---	74	54	40.73	Peak
2353	H	43.57	---	-7.59	35.98	---	74	54	38.02	Peak
3266	H	43.84	---	-5.39	38.45	---	74	54	35.55	Peak
4874	H	42.58	---	0.76	43.34	---	74	54	30.66	Peak

Notes: AV Means AV detector test data,Peak Means Peak detector test data.
Emissions attenuated more than 20 dB below the permissible value are not reported.

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX High		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1477	V	43.53	---	-10.27	33.26	---	74	54	40.74	Peak
2703	V	42.41	---	-6.43	35.98	---	74	54	38.02	Peak
3561	V	42.3	---	-4.76	37.54	---	74	54	36.46	Peak
4924	V	41.13	---	0.87	42	---	74	54	32	Peak

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX High		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1503	H	41.97	---	-10.14	31.83	---	74	54	42.17	Peak
3588	H	42.27	---	-4.96	37.31	---	74	54	36.69	Peak
4153	H	42.08	---	-2.48	39.6	---	74	54	34.4	Peak
4924	H	40.13	---	0.87	41	---	74	54	33	Peak

Notes: AV Means AV detector test data,Peak Means Peak detector test data.
Emissions attenuated more than 20 dB below the permissible value are not reported.

IEEE 802.11n/HT40 with 2.4G

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX Low		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1551	V	42.99	---	-10.07	32.92	---	74	54	41.08	Peak
2695	V	42.86	---	-6.94	35.92	---	74	54	38.08	Peak
3463	V	42.15	---	-4.95	37.2	---	74	54	36.8	Peak
4844	V	40.74	---	0.64	41.38	---	74	54	32.62	Peak
N/A										

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX Low		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1542	H	42.3	---	-10.14	32.16	---	74	54	41.84	Peak
2358	H	42.16	---	-7.59	34.57	---	74	54	39.43	Peak
3096	H	42.57	---	-5.74	36.83	---	74	54	37.17	Peak
4844	H	40.97	---	0.64	41.61	---	74	54	32.39	Peak
N/A										

Notes: AV Means AV detector test data,Peak Means Peak detector test data.
Emissions attenuated more than 20 dB below the permissible value are not reported.

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX Mid		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1628	V	42.79	---	-9.84	32.95	---	74	54	41.05	Peak
2593	V	42.21	---	-7.13	35.08	---	74	54	38.92	Peak
3301	V	42.35	---	-5.31	37.04	---	74	54	36.96	Peak
4874	V	41.2	---	0.76	41.96	---	74	54	32.04	Peak

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX Mid		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1564	H	43.05	---	-10.07	32.98	---	74	54	41.02	Peak
2248	H	43.39	---	-8.13	35.26	---	74	54	38.74	Peak
3159	H	42.35	---	-5.52	36.83	---	74	54	37.17	Peak
4874	H	41.6	---	0.76	42.36	---	74	54	31.64	Peak

Notes: AV Means AV detector test data,Peak Means Peak detector test data.
Emissions attenuated more than 20 dB below the permissible value are not reported.

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX High		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1645	V	43.56	---	-9.84	33.72	---	74	54	40.28	Peak
2590	V	43.09	---	-7.13	35.96	---	74	54	38.04	Peak
3851	V	42.51	---	-3.84	38.67	---	74	54	35.33	Peak
4904	V	40.86	---	0.87	41.73	---	74	54	32.27	Peak

EUT	Broadband Digital Transmission System	Model Name	LigoDLB Propeller 2
Temperature	26°C	Relative Humidity	56%
Pressure	960hPa	Test voltage	DC 24V From adapter
Test Mode	MIMO TX High		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1792	H	43.16	---	-9.27	33.89	---	74	54	40.11	Peak
2804	H	43.34	---	-6.17	37.17	---	74	54	36.83	Peak
3743	H	43.7	---	-4.24	39.46	---	74	54	34.54	Peak
4904	H	42.13	---	0.87	43	---	74	54	31	Peak

Notes: AV Means AV detector test data, Peak Means Peak detector test data.
Emissions attenuated more than 20 dB below the permissible value are not reported.

6 POWER LINE CONDUCTED EMISSION

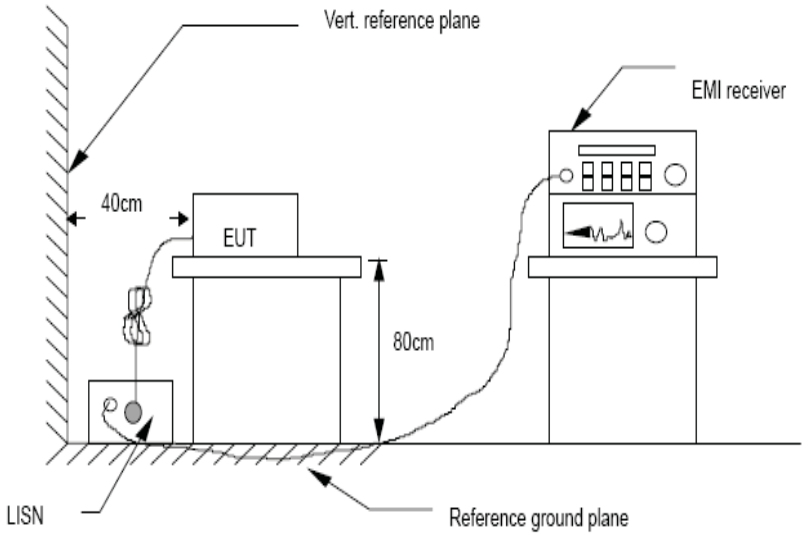
6.1 Conducted Emission Limits(15.207)

Frequency MHz	Limits dB(μV)	
	Quasi-peak Level	Average Level
0.15 -0.50	66 -56*	56 - 46*
0.50 -5.00	56	46
5.00 -30.00	60	50

Notes: 1. *Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

3.The limit decreases in line with the logarithm of the frequency in the rang of 0.15 to 0.50 MHz.

6.2 Test Setup



6.3 Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI ANSI C63.4:2014 on Conducted Emission Measurement.
The bandwidth of test receiver is set at 9 kHz.

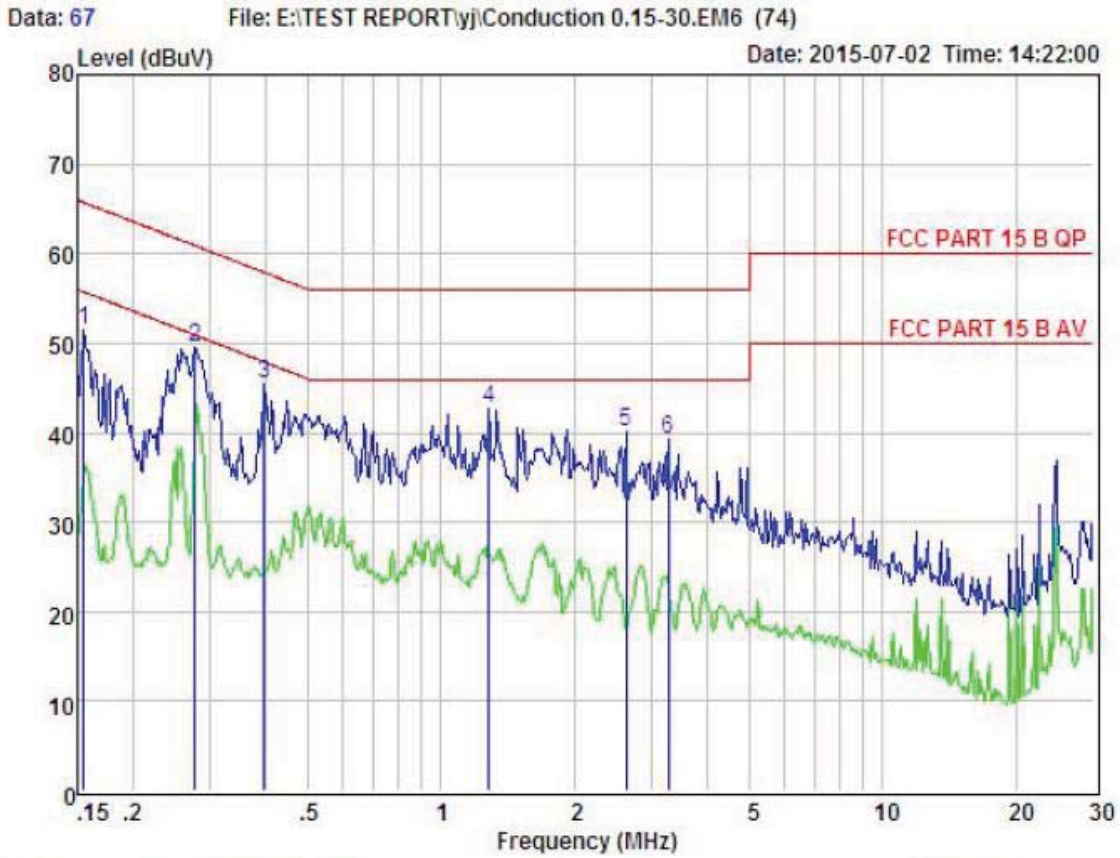
6.4 Test Results

MIMO TX MODE
Worse case is reported only

PASS

Detailed information please see the following page.

L:

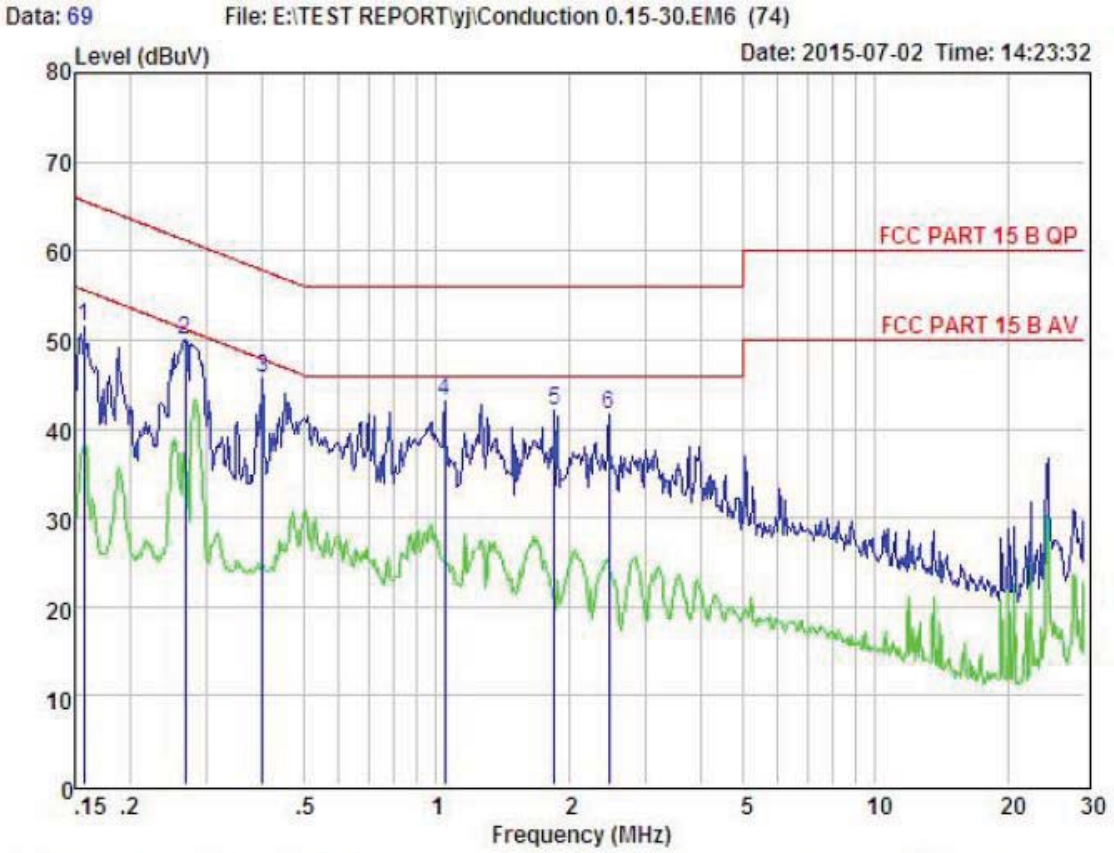


Condition : FCC PART 15 B QP POL: LINE Temp:24 ℃ Hum:56 %
EUT :
Model No : LigoDLB2
Test Mode :
Power : AC 120V/60Hz
Test Engineer:
Remark :

Item	Freq	Read	LISN Factor	Preamp Factor	Cable Lose	Level	Limit	Margin	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dBuV	
1	0.155	41.52	0.03	-9.72	0.10	51.37	65.74	-14.37	Peak
2	0.277	39.62	0.03	-9.72	0.10	49.47	60.90	-11.43	Peak
3	0.398	35.62	0.03	-9.72	0.10	45.47	57.90	-12.43	Peak
4	1.282	32.85	0.05	-9.71	0.10	42.71	56.00	-13.29	Peak
5	2.622	30.23	0.06	-9.70	0.11	40.10	56.00	-15.90	Peak
6	3.276	29.47	0.07	-9.69	0.12	39.35	56.00	-16.65	Peak

Remarks: Level = Read + LISN Factor - Preamp Factor + Cable loss

N:



Condition : FCC PART 15 B QP POL: NEUTRAL Temp:24 ℃ Hum:56 %
EUT :
Model No : LigoDLB2
Test Mode :
Power : AC 120V/60Hz
Test Engineer:
Remark :

Item	Freq	Read	LISN Factor	Preamp Factor	Cable Lose	Level	Limit	Margin	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dBuV	
1	0.157	41.57	0.03	-9.72	0.10	51.42	65.60	-14.18	Peak
2	0.267	40.16	0.03	-9.72	0.10	50.01	61.20	-11.19	Peak
3	0.402	35.93	0.03	-9.72	0.10	45.78	57.81	-12.03	Peak
4	1.043	33.29	0.04	-9.71	0.10	43.14	56.00	-12.86	Peak
5	1.858	32.10	0.05	-9.70	0.10	41.95	56.00	-14.05	Peak
6	2.474	31.73	0.06	-9.70	0.11	41.60	56.00	-14.40	Peak

Remarks: Level = Read + LISN Factor - Preamp Factor + Cable loss

7 Conducted Maximum Output Power

7.1 Test limit

Please refer section15.247.

Regulation 15.247(b) The limit of Maximum Peak Output Power Measurement is 1W(30dBm)

7.2 Test Procedure

Details see the KDB558074 Meas Guidance V03

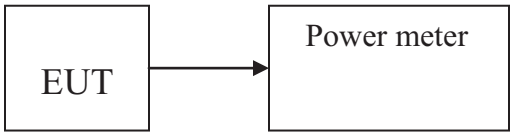
7.2.1 Place the EUT on the table and set it in transmitting mode.

7.2.2 Connected the EUT's antenna port to peak power meter by 20dB attenuator.

7.2.3 Measure out each mode and each bands peak output power of EUT.

Note: The cable loss and attenuator loss were offset into measure device as amplitude offset.
Details see the KDB558074 DTS Meas Guidance V03

7.3 Test Setup



7.4 Test Results

PASS

Detailed information please see the following page.

EUT: Broadband Digital Transmission System			M/N: LigoDLB Propeller 2			
Test date: 2015-06-29	Test site: RF site		Tested by: Simple Guan			
Mode	Frequency (MHz)	Ant Port	PK Output power(dBm)		Limit (dBm)	Margin (dB)
IEEE 802.11 b	CH1: 2412	0	22.55	25.32	28.3	2.98
		1	22.06			
	CH6: 2437	0	22.23	25.12	28.3	3.18
		1	21.98			
	CH11: 2462	0	21.50	23.81	28.3	4.49
		1	19.97			
IEEE 802.11 g	CH1: 2412	0	24.22	26.49	28.3	1.81
		1	22.58			
	CH6: 2437	0	22.37	25.13	28.3	3.17
		1	21.85			
	CH11: 2462	0	21.56	24.08	28.3	4.22
		1	20.52			
IEEE 802.11 n/HT20 with 2.4G	CH1: 2412	0	23.58	26.06	28.3	2.24
		1	22.45			
	CH6: 2437	0	22.15	24.13	28.3	4.17
		1	19.76			
	CH11: 2462	0	21.46	23.71	28.3	4.59
		1	19.78			
IEEE 802.11 n/HT40 with 2.4G	CH1: 2422	0	22.38	24.54	28.3	3.76
		1	20.48			
	CH4: 2437	0	21.78	24.28	28.3	4.02
		1	20.69			
	CH7: 2452	0	20.89	23.38	28.3	4.92
		1	19.77			
Conclusion: PASS						

8 PEAK POWER SPECTRAL DENSITY

8.1 Test limit

8.1.1 Please refer section15.247.

8.1.2 For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

8.1.3 The direct sequence operating of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

8.2 Method of measurement

Details see the KDB558074 DTS Meas Guidance V03

8.2.1 Place the EUT on the table and set it in transmitting mode.

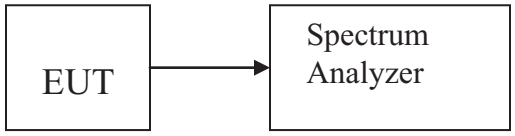
8.2.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

8.2.3 Set the spectrum analyzer as RBW = 3kHz, VBW = 10kHz, span=5-30%EBW, detail see the test plot.

8.2.4 Record the max reading.

8.2.5 Repeat the above procedure until the measurements for all frequencies are completed.

8.3 Test Setup



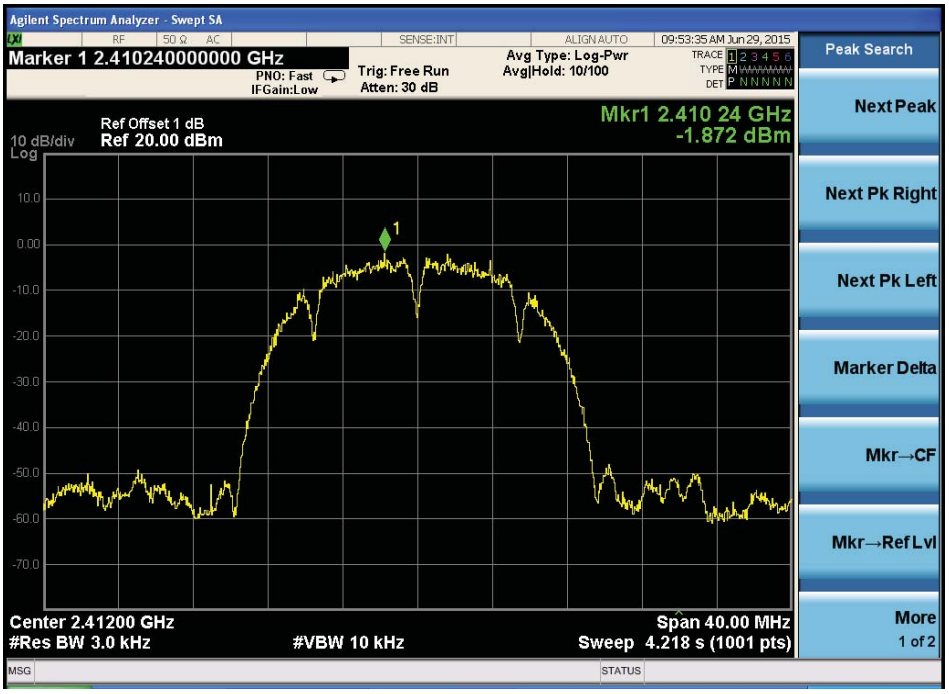
8.4 Test Results

PASS.

Detailed information please see the following page.

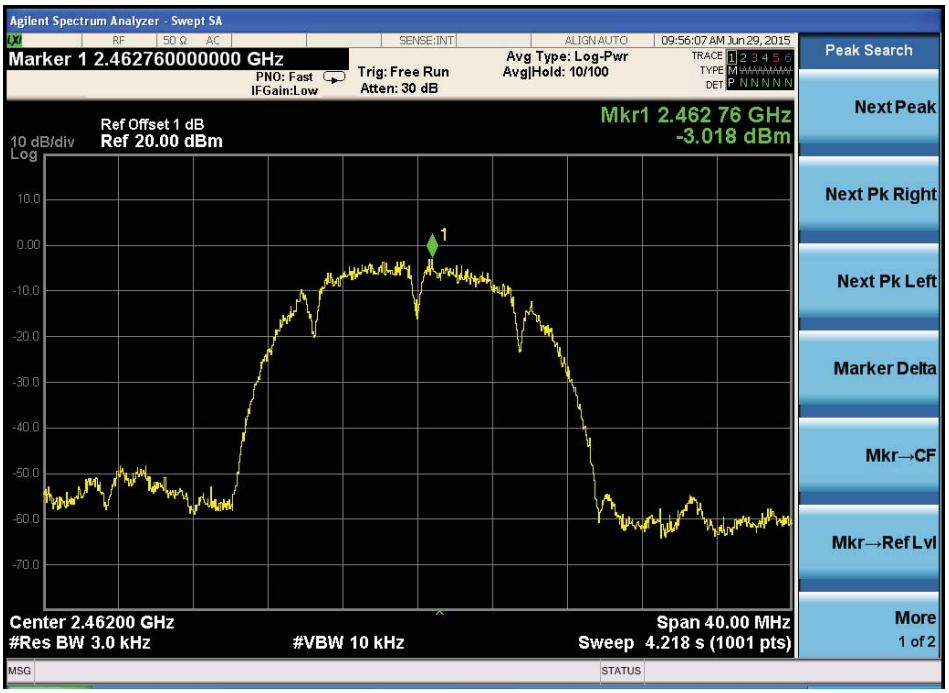
EUT: Broadband Digital Transmission System			M/N: LigoDLB Propeller 2			
Test date: 2015-06-29	Test site: RF site		Tested by: Simple Guan			
Mode	Frequency (MHz)	Ant Port	PK Output power(dBm)		Limit (dBm)	Result
IEEE 802.11 b	CH1: 2412	0	-1.872	-0.10	8	PASS
		1	-4.858			
	CH6: 2437	0	-2.232	0.52	8	PASS
		1	-2.773			
	CH11: 2462	0	-3.018	-0.45	8	PASS
		1	-3.943			
IEEE 802.11 g	CH1: 2412	0	-3.641	-1.57	8	PASS
		1	-5.793			
	CH6: 2437	0	-3.891	-0.02	8	PASS
		1	-2.31			
	CH11: 2462	0	-4.158	-1.01	8	PASS
		1	-3.887			
IEEE 802.11 n/HT20 with 2.4G	CH1: 2412	0	-4.311	-1.85	8	PASS
		1	-5.493			
	CH6: 2437	0	-4.532	-1.87	8	PASS
		1	-5.251			
	CH11: 2462	0	-4.336	-1.64	8	PASS
		1	-4.992			
IEEE 802.11 n/HT40 with 2.4G	CH1: 2422	0	-5.332	-1.99	8	PASS
		1	-4.686			
	CH4: 2437	0	-6.331	-3.13	8	PASS
		1	-6.351			
	CH7: 2452	0	-5.966	-3.34	8	PASS
		1	-6.768			
Conclusion: PASS						

Port 0 antenna
IEEE 802.11b :
CH Low :

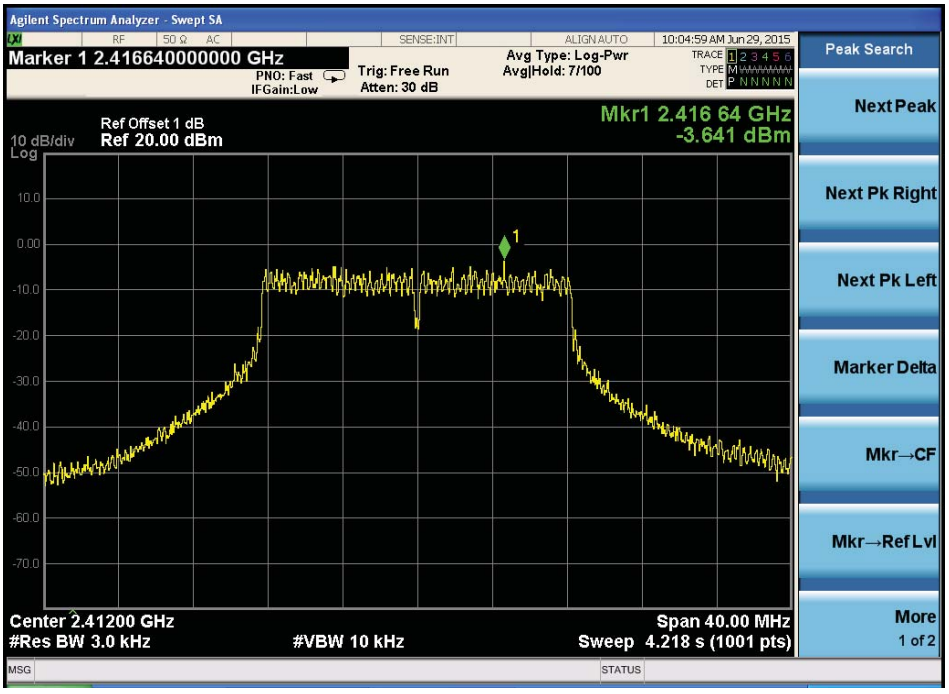


CH Mid:

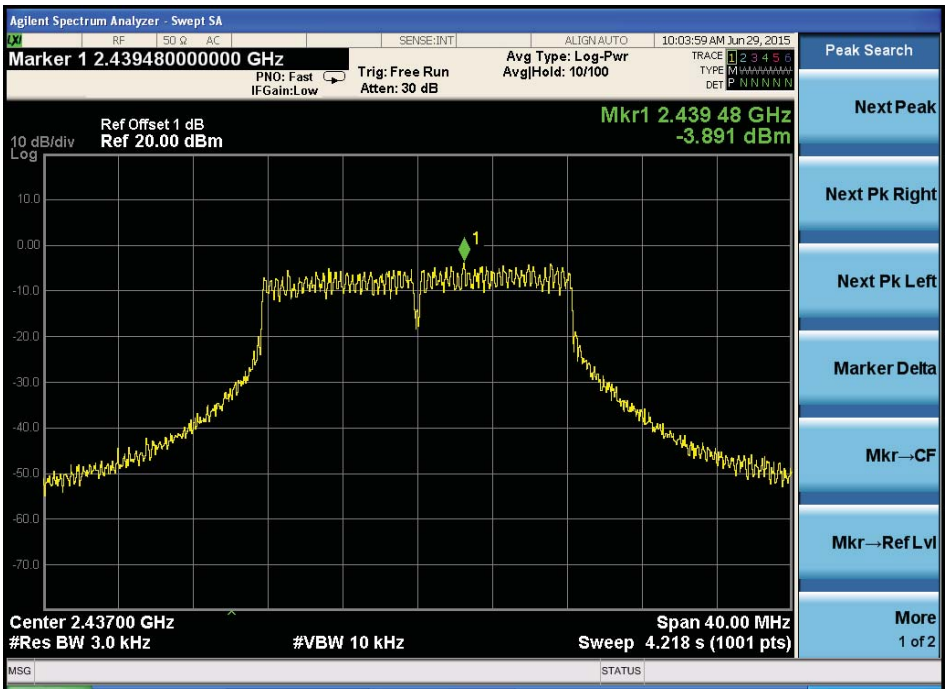
CH Hig:



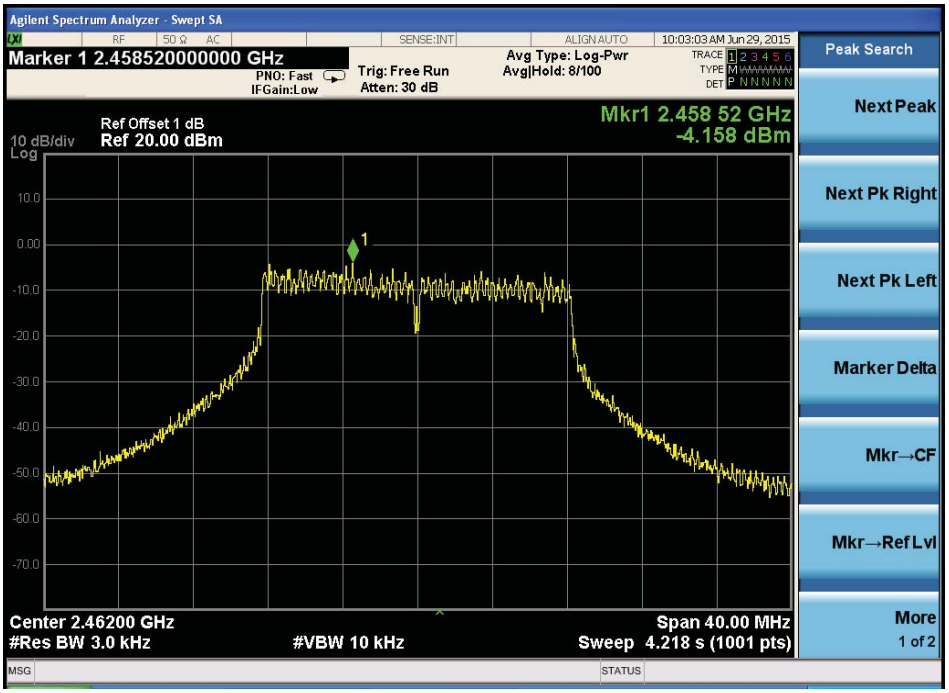
IEEE 802.11g :
CH Low



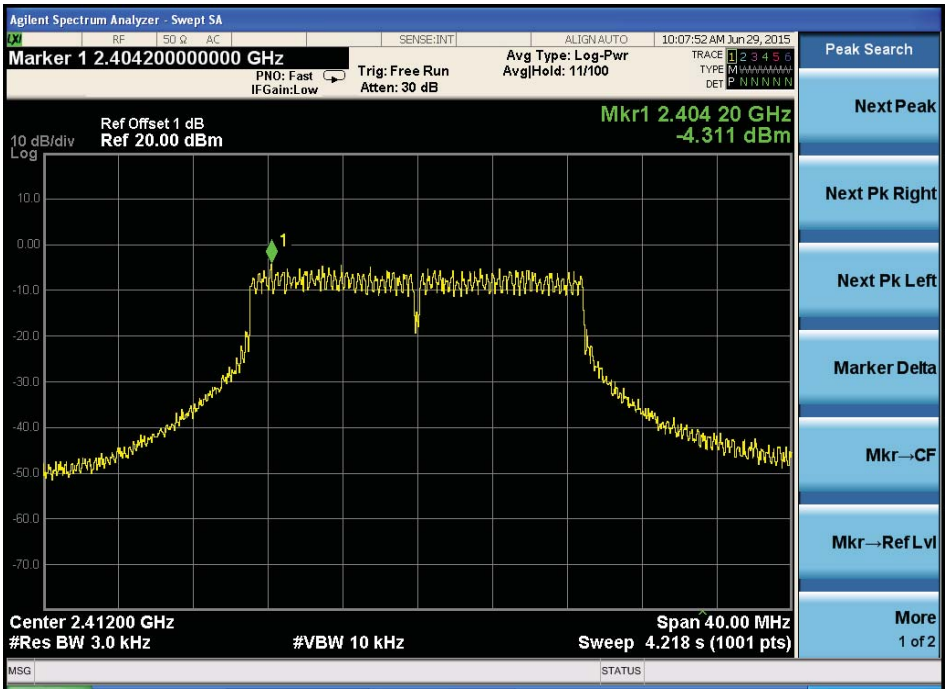
CH Mid:


Agilent Spectrum Analyzer - Swept SA
RF 50 Ω AC
SENSE:INT
ALIGN AUTO
10:03:59 AM Jun 29, 2015
Marker 1 2.439480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 10/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 1 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 2.439 48 GHz
-3.891 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.43700 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 40.00 MHz
Sweep 4.218 s (1001 pts)
MSG
STATUS
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

CH Hig:


Agilent Spectrum Analyzer - Swept SA
RF 50 Ω AC
SENSE:INT
ALIGN AUTO
10:03:03 AM Jun 29, 2015
Marker 1 2.458520000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 8/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 1 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 2.458 52 GHz
-4.158 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.46200 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 40.00 MHz
Sweep 4.218 s (1001 pts)
MSG
STATUS
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

IEEE 802.11n HT20 :
CH Low :



CH Mid: