EMC
TEST REPORT

: 140800075TWN-001
Model No. : LNL9ZA1CB
Issued Date : Aug. 25, 2014
Test Site : 93910

Applicant: **Leeo, Inc.**
989 Commercial Street, Palo Alto, CA 94303 USA

Test Method/ Standard: **47 CFR FCC Part 15.249 & ANSI C63.4 2003**

Test By: **Intertek Testing Services Taiwan Ltd.**
No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,
Shiang-Shan District, Hsinchu City, Taiwan

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The test report was reviewed by:

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Title Senior Engineer

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Summary of Tests

Test	Reference	Results
Radiated Emission test	15.249(c), 15.209	Pass
Emission on the Band Edge	15.249(d)	Pass
Conducted Emission of AC Power	15.207	Pass
20dB Bandwidth	15.215(c)	Pass

1. General information

1.1 Identification of the EUT

Product:	Nightlight
Model No.:	LNL9ZA1CB
FCC ID:	2ACWP-LNL9ZA1C
Frequency Range:	2402MHz ~ 2480MHz
Channel Number:	79 Channels
Frequency of Each Channel:	2402MHz+1k, k=0~78
Type of Modulation:	GFSK, π/4-DQPSK, 8DPSK
Rated Power:	100 - 240Vac, 50- 60Hz, 0.2 A max
Power Cord:	N/A
Sample Received:	Jul. 31, 2014
Test Date(s):	Aug. 13, 2014 ~ Aug. 20, 2014
Note 1:	This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.
Note 2:	When determining the test conclusion, the Measurement Uncertainty of test has been considered.

1.2 Antenna description

The antenna is affixed to the EUT using a unique connector, which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector.

Antenna Gain : -0.59 dBi max
Antenna Type : PIFA antenna
Connector Type : IPEX

1.3 Peripherals equipment

Peripherals	Brand	Model No.	Serial No.	Data cable
Notebook PC	HP	HSTNN-I04C	N/A	USB to RS232 × 1 meter

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Paragraph 15.249 for non-spread spectrum devices.

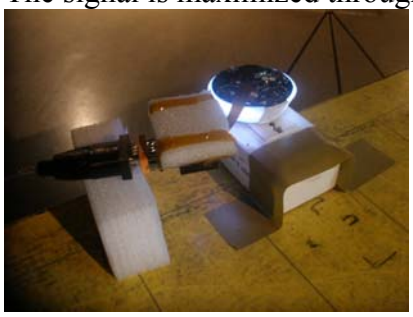
The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

2.2 Operation mode

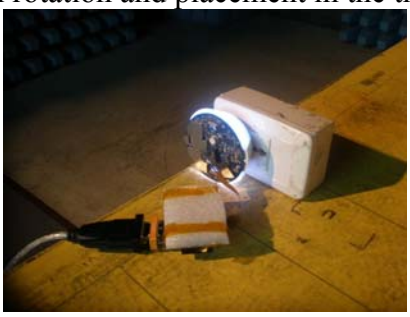
The EUT is supplied with 120Vac, 60Hz.

TX mode based on “Putty Tool” to execute and select different frequency and modulation.

The signal is maximized through rotation and placement in the three orthogonal axes.



X axis



Y axis

Z axis

After verifying three axes, we found the maximum electromagnetic field was occurred at Y axis. The final test data was executed under this configuration.

2.3 Test equipment

Equipment	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Test Receiver	Rohde & Schwarz	ESCI	100018	2013/12/03	2014/12/02
Spectrum Analyzer	Rohde & Schwarz	FSP30	100137	2014/06/16	2015/06/15
Spectrum Analyzer	Rohde & Schwarz	FSEK30	100186	2014/01/20	2015/01/19
Horn Antenna (1-18G)	Schwarzbeck	BBHA 9120 D	9120D-456	2012/09/03	2014/09/03
Horn Antenna (14-42G)	SHWARZBECK	BBHA 9170	BBHA9170159	2012/09/05	2014/09/05
Broadband Antenna	Schwarzbeck	VULB 9168	9168-172	2013/08/08	2015/08/07
Pre-Amplifier	MITEQ	AFS44-00102650--42-10P-44	1495287	2013/10/27	2015/10/26
Pre-Amplifier	MITEQ	JS4-26004000--27-8A	828825	2012/09/18	2014/09/17
Power Meter	Anritsu	ML2495A	0844001	2013/10/10	2014/10/09
Power Senor	Anritsu	MA2411B	0738452	2013/10/10	2014/10/09
Temperature&Humidity Test Chamber	TERCHY	MHU-225LRU (SA)	950838	2014/06/12	2015/06/11
Two-Line V-Network	Rohde & Schwarz	ESH3-Z5	838979/014	2013/10/12	2014/10/11
Singal Analyzer	Agilent	N9030A	MY51380492	2013/09/19	2014/09/18
Loop Antenna	RolfHeine	LA-285	02/10033	2014/03/18	2016/03/16

Note: The above equipments are within the valid calibration period.

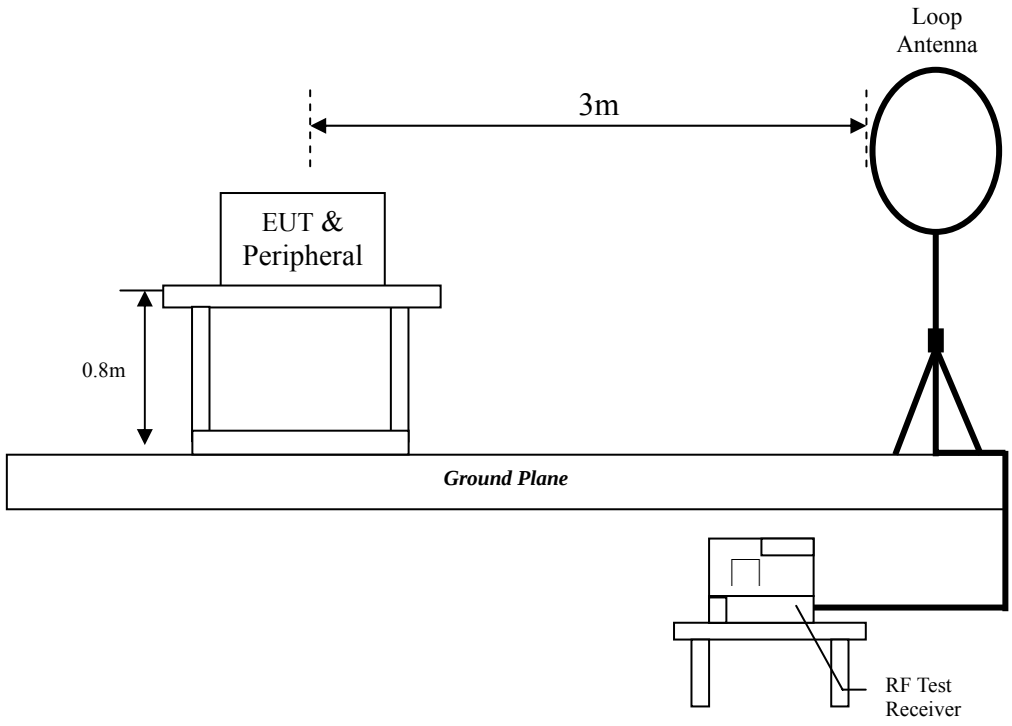
3. Radiated emission test FCC 15.249 (C)

3.1 Operating environment

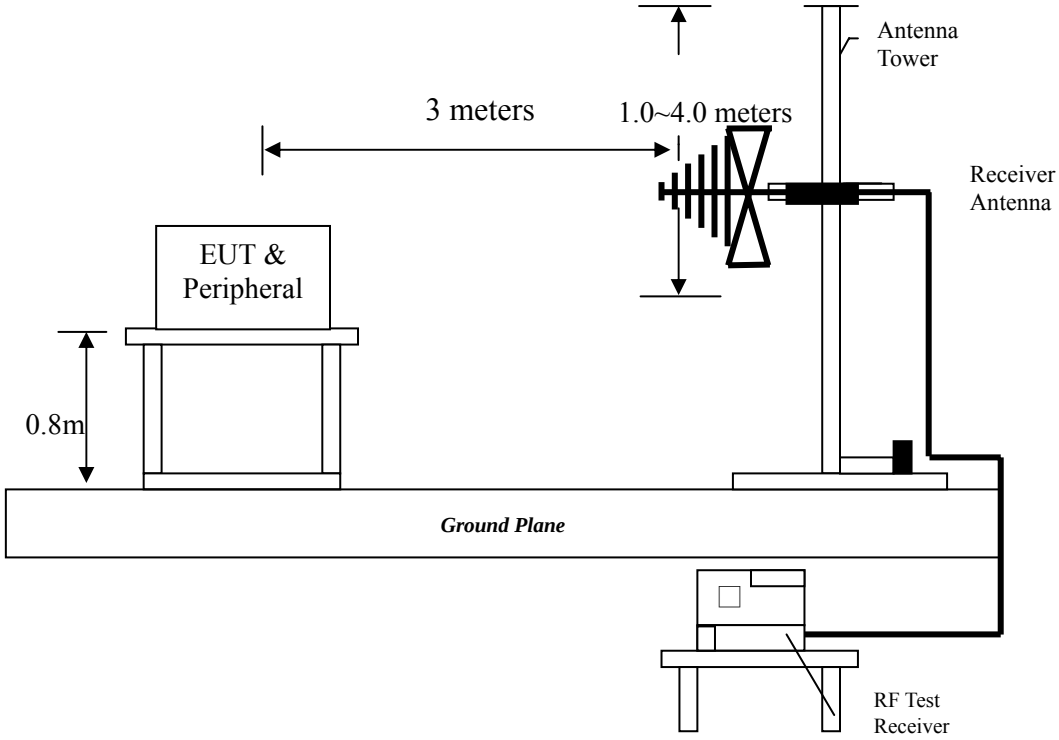
Temperature:	25	℃
Relative Humidity:	50	%
Atmospheric Pressure	1008	hPa

3.2 Test setup & procedure

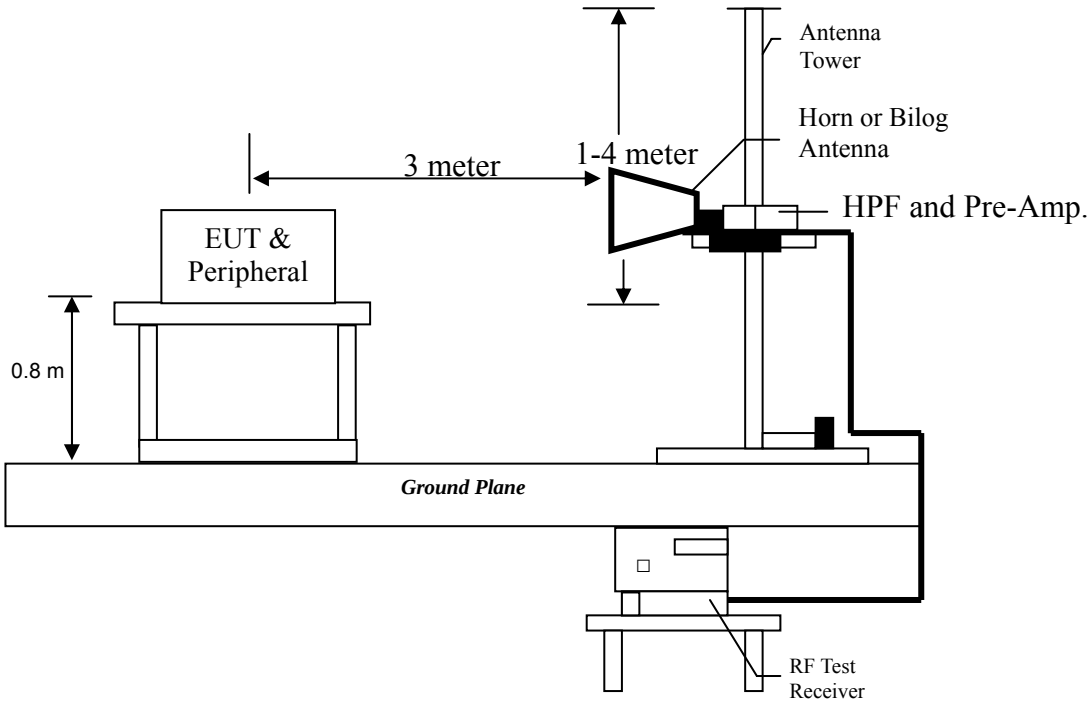
Radiated emission from 9 kHz to 30 MHz uses Loop Antenna:



Radiated emission from 30 MHz to 1 GHz uses Bilog Antenna:



Radiated emission above 1 GHz uses Horn Antenna:



Radiated emissions were invested cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1 MHz RBW/ 3 MHz VBW) recorded also on the report.
The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

The EUT configuration please refer to the “Spurious set-up photo.pdf”.

3.3 Emission limit

3.3.1 Fundamental and harmonics emission limits

Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	(mV/m@3m)	(dBuV/m@3m)	(uV/m@3m)	(dBuV/m@3m)
2400-2483.5	50	93.9794	500	73.9794

3.3.2 General radiated emission limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

Frequency MHz	15.209 Limits (dBμV/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:
1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Measurement uncertainty was calculated in accordance with TR 100 028-1.

Parameter	Uncertainty		
Radiated Spurious Emission	Below 1 GHz	Vertical	±2.46 dB
		Horizontal	±2.35 dB
	Above 1 GHz	Vertical	±4.19 dB
		Horizontal	±4.30 dB
Conducted Spurious Emission	±0.84 dB		
Conducted disturbance, mains port Emission	2.5 dB		

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of k=2.

3.4 Radiated spurious emission test data

3.4.1 Measurement results: frequencies equal to or less than 1 GHz

The test was performed on EUT under GFSK, π/4-DQPSK, 8DPSK continuously transmitting mode. Channel 0, 39, 78 were verified. The worst case occurred at GFSK TX Channel 39

EUT : LNL9ZA1CB
Test Condition : Tx at GFSK Channel 39

Antenna Polariz. (V/H)	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
Vertical	311.30	QP	17.71	22.59	40.30	46.00	-5.70
Vertical	336.52	QP	18.38	23.00	39.03	46.00	-6.97
Vertical	359.80	QP	18.97	23.00	41.96	46.00	-4.04
Vertical	449.04	QP	21.18	23.00	42.02	46.00	-3.98
Vertical	480.08	QP	21.70	23.00	39.24	46.00	-6.76
Vertical	513.06	QP	22.29	23.00	42.36	46.00	-3.64
Horizontal	264.74	QP	17.29	23.00	39.53	46.00	-6.47
Horizontal	311.30	QP	18.11	23.00	39.29	46.00	-6.71
Horizontal	321.00	QP	18.28	23.00	42.13	46.00	-3.87
Horizontal	359.80	QP	18.96	23.00	41.82	46.00	-4.18
Horizontal	383.08	QP	19.37	23.00	41.14	46.00	-4.86
Horizontal	449.04	QP	20.52	21.00	43.63	46.00	-2.37

Remark: Corr. Factor = Antenna Factor + Cable Loss

3.4.2 Measurement results: frequency above 1GHz

Mode	Freq. (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
GFSK ch0	12000	PK	V	38.83	13.18	46.25	59.43	74.00	-14.57
	12000	AV	V	38.83	13.18	28.79	41.97	54.00	-12.03
	12000	PK	H	38.83	13.18	50.28	63.46	74.00	-10.54
	12000	AV	H	38.83	13.18	24.19	37.37	54.00	-16.63
GFSK ch39	9764	PK	V	38.35	11.23	40.47	51.70	74.00	-22.30
	12205	PK	V	38.66	13.18	39.69	52.87	74.00	-21.13
	9764	PK	H	38.35	11.23	41.06	52.29	74.00	-21.71
	12205	PK	H	38.66	13.18	40.05	53.23	74.00	-20.77
GFSK ch78	9920	PK	V	38.57	11.07	41.27	52.34	74.00	-21.66
	9920	PK	H	38.57	11.07	41.12	52.19	74.00	-21.81

Remark:

1. Correction Factor = Antenna Factor + Cable Loss + Power Amplifier
2. Corrected Level = Reading + Correction Factor
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

Mode	Freq. (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
π/4-DQPSK ch0	4804	PK	V	40.13	-0.10	40.68	40.58	74.00	-33.42
	4804	PK	H	40.13	-0.10	40.52	40.42	74.00	-33.58
π/4-DQPSK ch39	4860	PK	V	40.03	0.08	42.93	43.01	74.00	-30.99
	9764	PK	V	38.35	11.23	43.05	54.28	74.00	-19.72
	9764	AV	V	38.35	11.23	38.78	50.01	54.00	-3.99
	4882	PK	H	39.99	0.16	39.39	39.55	74.00	-34.45
π/4-DQPSK ch78	4960	PK	V	39.84	0.41	39.60	40.01	74.00	-33.99
	4960	PK	H	39.84	0.41	40.01	40.42	74.00	-33.58

Remark:

1. Correction Factor = Antenna Factor + Cable Loss + Power Amplifier
2. Corrected Level = Reading + Correction Factor
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

Mode	Freq. (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
8DPSK ch0	12000	PK	V	38.83	13.18	44.14	57.32	74.00	-16.68
	12000	AV	V	38.83	13.18	27.51	40.69	54.00	-13.31
	12000	PK	H	38.83	13.18	49.96	63.14	74.00	-10.86
	12000	AV	H	38.83	13.18	29.31	42.49	54.00	-11.51
8DPSK ch39	4860	PK	V	40.03	0.08	42.40	42.48	74.00	-31.52
	9750	PK	H	38.33	11.24	38.37	49.61	74.00	-24.39
	12210	PK	H	38.65	13.18	38.55	51.73	74.00	-22.27
8DPSK ch78	4950	PK	V	39.86	0.38	43.71	44.09	74.00	-29.91
	4950	PK	H	39.86	0.38	43.60	43.98	74.00	-30.02
	12390	PK	H	38.50	13.18	41.71	54.89	74.00	-19.11
	12390	AV	H	38.50	13.18	23.54	36.72	54.00	-17.28

Remark:

1. Correction Factor = Antenna Factor + Cable Loss + Power Amplifier
2. Corrected Level = Reading + Correction Factor
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

3.4.3 Measurement results: Fundamental and harmonics emission

Mode	Channel	Frequency (MHz)	Spectrum Analyzer	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
GFSK	Ch0	2402	PK	V	32.59	64.70	97.29	114	-16.71
	Ch0	2402	AV	V	32.59	29.79	62.38	94	-31.62
	Ch0	2402	PK	H	32.59	62.31	94.90	114	-19.10
	Ch0	2402	AV	H	32.59	29.17	61.76	94	-32.24
	Ch39	2441	PK	V	32.63	60.62	93.25	114	-20.75
	Ch39	2441	AV	V	32.63	28.72	61.35	94	-32.65
	Ch39	2441	PK	H	32.63	58.68	91.31	114	-22.69
	Ch39	2441	AV	H	32.63	28.09	60.72	94	-33.28
	Ch78	2480	PK	V	32.64	55.61	88.25	114	-25.75
	Ch78	2480	AV	V	32.64	28.18	60.82	94	-33.18
	Ch78	2480	PK	H	32.64	55.93	88.57	114	-25.43
	Ch78	2480	AV	H	32.64	26.93	59.57	94	-34.43

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

Mode	Channel	Frequency (MHz)	Spectrum Analyzer	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
π/4-DQPSK	Ch0	2402	PK	V	32.59	66.43	99.02	114	-14.98
	Ch0	2402	AV	V	32.59	33.62	66.21	94	-27.79
	Ch0	2402	PK	H	32.59	66.88	99.47	114	-14.53
	Ch0	2402	AV	H	32.59	33.73	66.32	94	-27.68
	Ch39	2441	PK	V	32.63	62.02	94.65	114	-19.35
	Ch39	2441	AV	V	32.63	24.96	57.59	94	-36.41
	Ch39	2441	PK	H	32.63	64.03	96.66	114	-17.34
	Ch39	2441	AV	H	32.63	25.52	58.15	94	-35.85
	Ch78	2480	PK	V	32.64	58.92	91.56	114	-22.44
	Ch78	2480	AV	V	32.64	24.40	57.04	94	-36.96
	Ch78	2480	PK	H	32.64	62.98	95.62	114	-18.38
	Ch78	2480	AV	H	32.64	25.23	57.87	94	-36.13

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

Mode	Channel	Frequency (MHz)	Spectrum Analyzer	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
8DPSK	Ch0	2402	PK	V	32.59	63.80	96.39	114	-17.61
	Ch0	2402	AV	V	32.59	27.95	60.54	94	-33.46
	Ch0	2402	PK	H	32.59	62.37	94.96	114	-19.04
	Ch0	2402	AV	H	32.59	28.52	61.11	94	-32.89
	Ch39	2441	PK	V	32.63	52.86	85.49	114	-28.51
	Ch39	2441	AV	V	32.63	25.61	58.24	94	-35.76
	Ch39	2441	PK	H	32.63	55.58	88.21	114	-25.79
	Ch39	2441	AV	H	32.63	33.79	66.42	94	-27.58
	Ch78	2480	PK	V	32.64	50.82	83.46	114	-30.54
	Ch78	2480	AV	V	32.64	25.07	57.71	94	-36.29
	Ch78	2480	PK	H	32.64	53.86	86.50	114	-27.50
	Ch78	2480	AV	H	32.64	26.05	58.69	94	-35.31

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

4. Radiated emission on the band edge FCC 15.249(d)

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 (2414~2470MHz) or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

EUT : LNL9ZA1CB
Test Condition : Y-axis
Mode : GFSK

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)	Restricted band (MHz)
2345.36	PK	V	32.35	28.79	61.14	74	-12.86	2310~2390
2390.00	AV	V	32.51	14.58	47.09	54	-6.91	
2402.07	PK	V	32.55	67.51	100.06	-	100.06	-
2402.07	AV	V	32.55	30.85	63.40	-	63.40	
2479.92	PK	V	32.83	67.94	100.77	-	100.77	-
2479.92	AV	V	32.83	31.19	64.02	-	64.02	
2483.50	PK	V	32.84	29.37	62.21	74	-11.79	2483.5~2500
2483.50	AV	V	32.84	18.21	51.05	54	-2.95	

EUT : LNL9ZA1CB
Test Condition : Y-axis
Mode : π/4-DQPSK

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)	Restricted band (MHz)
2336.00	PK	V	32.32	28.74	61.06	74	-12.94	2310~2390
2390.00	AV	V	32.51	14.69	47.20	54	-6.80	
2402.07	PK	V	32.55	65.39	97.94	-	97.94	-
2402.07	AV	V	32.55	25.76	58.31	-	58.31	
2480.00	PK	V	32.83	58.24	91.07	-	91.07	-
2480.00	AV	V	32.83	24.03	56.86	-	56.86	
2487.60	PK	V	32.86	27.69	60.55	74	-13.45	2483.5~2500
2483.50	AV	V	32.84	15.32	48.16	54	-5.84	

EUT : LNL9ZA1CB
Test Condition : Y-axis
Mode : 8DPSK

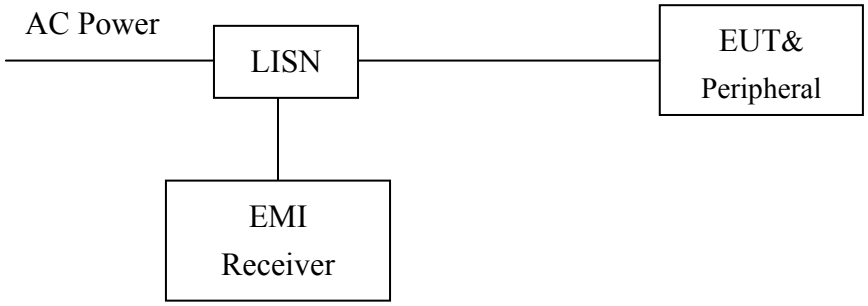
Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)	Restricted band (MHz)
2390.00	PK	V	32.51	26.55	59.06	74	-14.94	2310~2390
2390.00	AV	V	32.51	14.59	47.10	54	-6.90	
2402.15	PK	V	32.55	66.83	99.38	-	99.38	-
2402.15	AV	V	32.55	22.40	54.95	-	54.95	
2479.92	PK	V	32.83	68.38	101.21	-	101.21	-
2480.05	AV	V	32.83	30.67	63.50	-	63.50	
2486.64	PK	V	32.85	25.93	58.78	74	-15.22	2483.5~2500
2483.50	AV	V	32.84	17.94	50.78	54	-3.22	

5. Conducted emission test FCC 15.207

5.1 Operating environment

Temperature:	25	℃
Relative Humidity:	50	%
Atmospheric Pressure	1008	hPa

5.2 Test setup & procedure



The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination.
Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/2003 on conducted measurement.
The bandwidth of the field strength meter (R & S Test Receiver ESCI 30) is set at 9kHz.

The EUT configuration please refers to the “Conducted set-up photo.pdf”.

5.3 Emission limit

Freq. (MHz)	Conducted Limit (dBuV)	
	Q.P.	Ave.
0.15~0.50	66 – 56*	56 – 46*
0.50~5.00	56	46
5.00~30.0	60	50

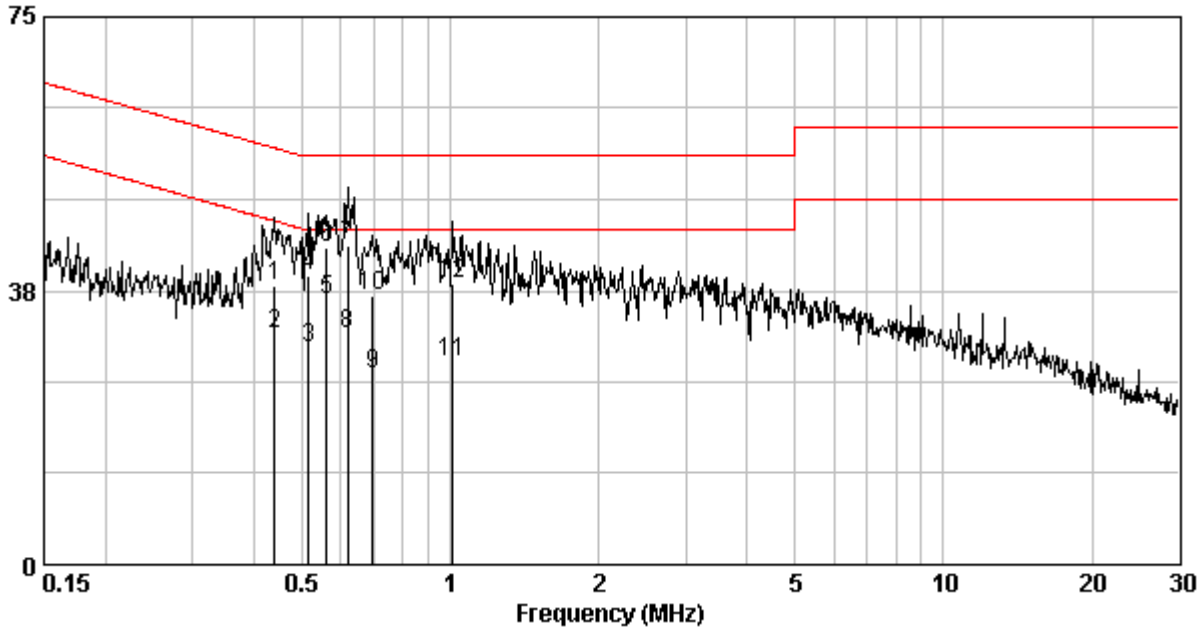
*Decreases with the logarithm of the frequency.

5.4 Conducted emission data FCC 15.207

Phase : Live Line
EUT : LNL9ZA1CB
Test Condition : TX mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Over Limit (dB) Qp	Av
0.440	9.73	38.29	57.07	31.66	47.07	-18.78	-15.41
0.516	9.74	39.62	56.00	29.60	46.00	-16.38	-16.40
0.561	9.75	43.51	56.00	36.13	46.00	-12.49	-9.87
0.621	9.77	43.77	56.00	31.61	46.00	-12.23	-14.39
0.697	9.78	36.86	56.00	26.09	46.00	-19.14	-19.91
1.010	9.84	38.40	56.00	27.86	46.00	-17.60	-18.14

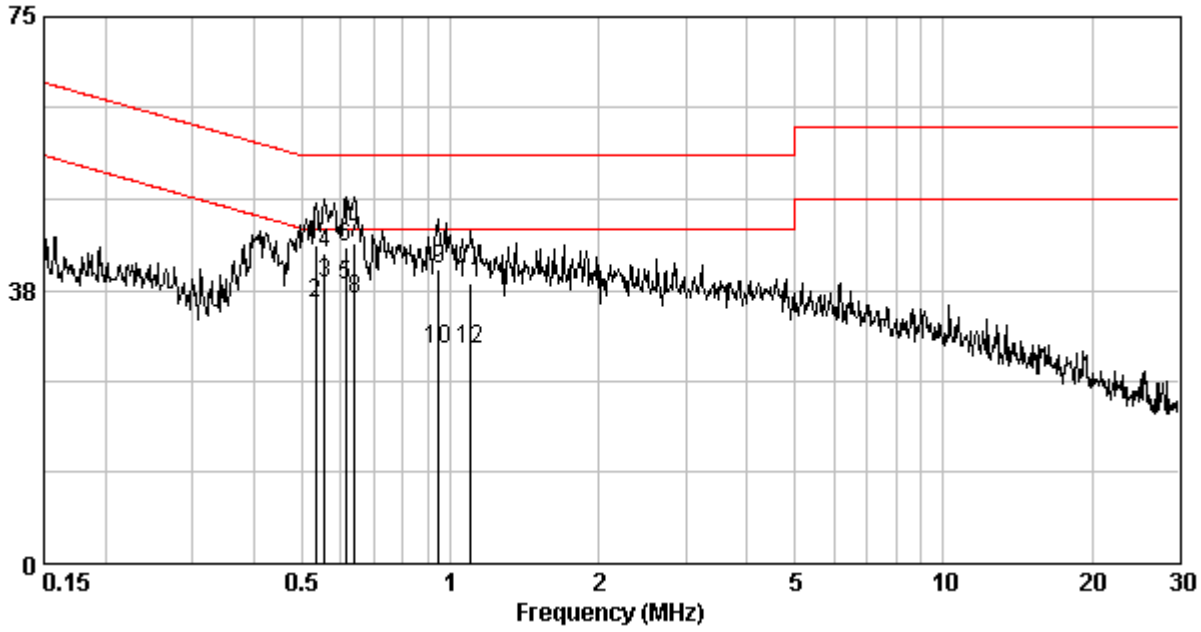
Remark:
1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Over Limit (dB) = Level (dBuV) – Limit (dBuV)



Phase : Neutral Line
EUT : LNL9ZA1CB
Test Condition : TX mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Over Limit (dB) Qp	Av
0.532	9.74	43.60	56.00	35.62	46.00	-12.40	-10.38
0.555	9.75	42.61	56.00	38.35	46.00	-13.39	-7.65
0.614	9.76	43.30	56.00	38.11	46.00	-12.70	-7.89
0.641	9.77	43.85	56.00	36.31	46.00	-12.15	-9.69
0.948	9.83	40.43	56.00	29.28	46.00	-15.57	-16.72
1.100	9.84	38.58	56.00	29.29	46.00	-17.42	-16.71

Remark:
1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Over Limit (dB) = Level (dBuV) – Limit (dBuV)



6. 20dB Bandwidth test

6.1 Operating environment

Temperature: 25 ℃
Relative Humidity: 50 %
Atmospheric Pressure: 1008 hPa

6.2 Test setup & procedure

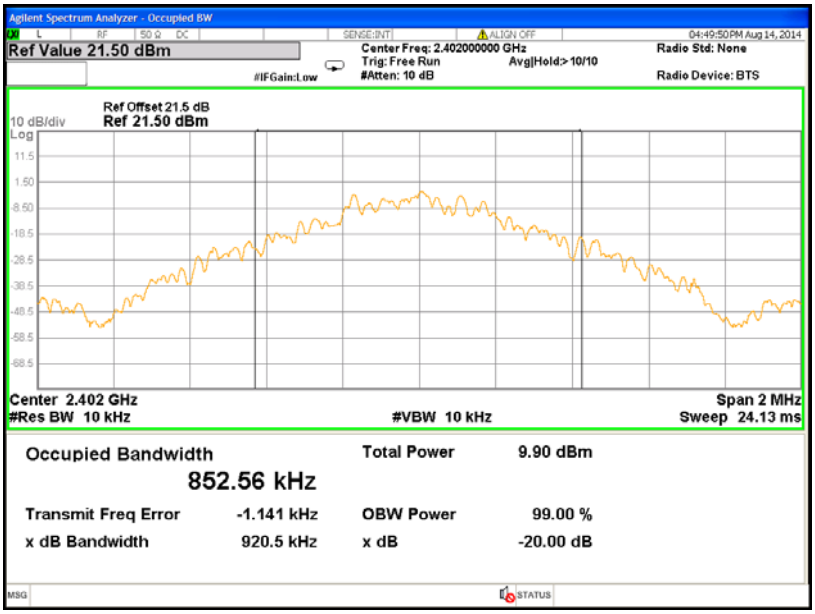
Step 1: The 20dB bandwidth was measured using a 50 ohm spectrum analyzer
Step 2: The span range for the SA display shall be between two times and five times the OBW.
Step 3: The nominal IF filter bandwidth (3 dB RBW) should be approximately 1 % to 5 % of the OBW, unless otherwise specified, depending on the applicable requirement.
Step 4: The test was performed at 3 channels (lowest, middle and highest channel). The maximum 20dB modulation bandwidth is in the following Table.

6.3 Measured data of modulated bandwidth test results

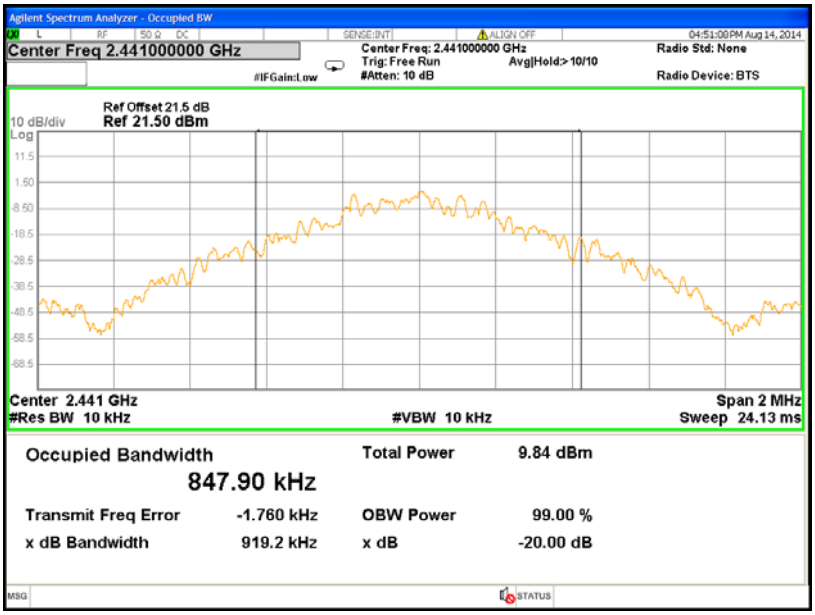
Mode	Channel	Frequency (MHz)	20dB Bandwidth(MHz)
GFSK	0	2402	0.921
	39	2441	0.919
	78	2480	0.920
π/4-DQPSK	0	2402	1.280
	39	2441	1.285
	78	2480	1.314
8DPSK	0	2402	1.209
	39	2441	1.208
	78	2480	1.216

Please see the plot below.

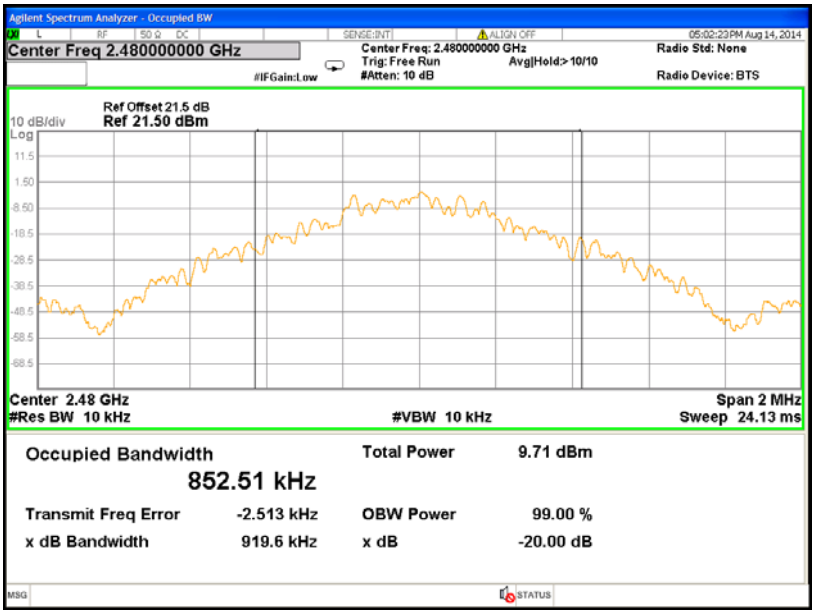
20dB Occupied Bandwidth @ GFSK mode Channel 0 2402MHz



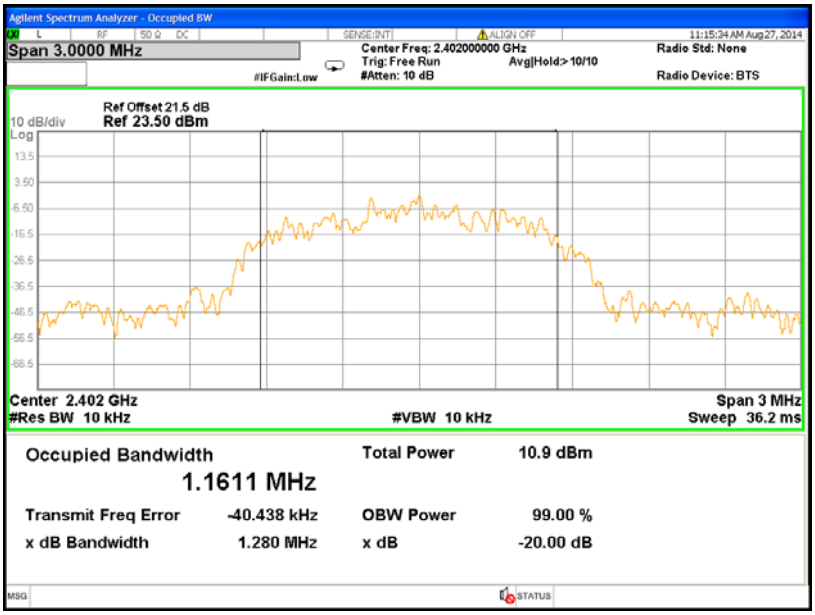
20dB Occupied Bandwidth @ GFSK mode Channel 39 2441MHz



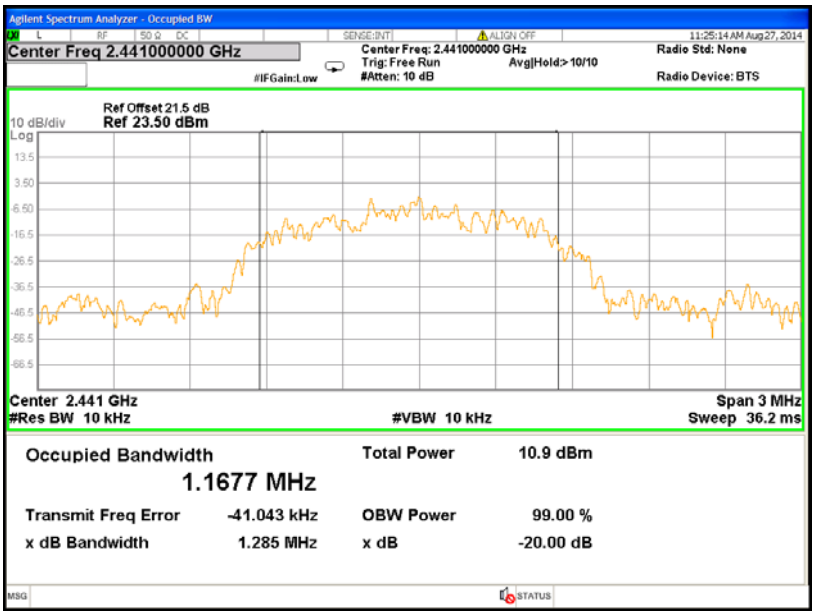
20dB Occupied Bandwidth @ GFSK mode Channel 78 2480MHz



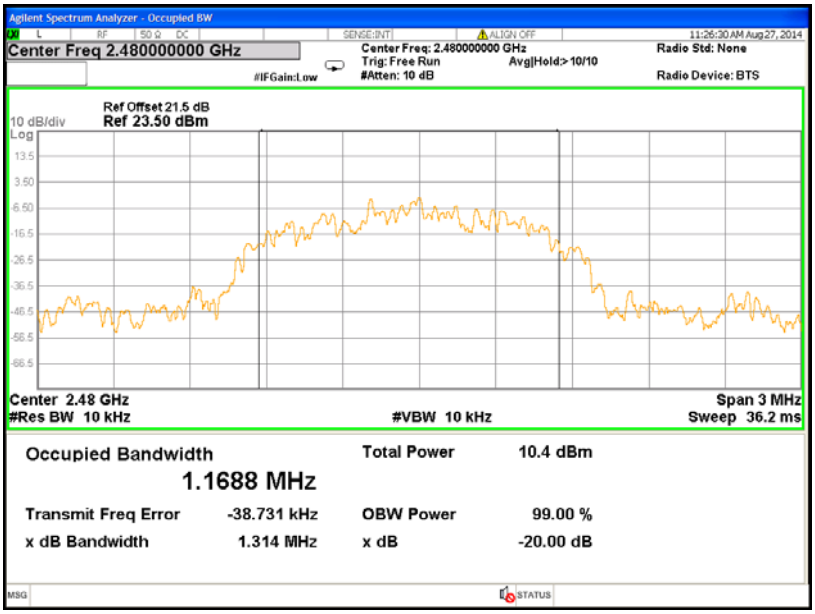
20dB Occupied Bandwidth @ π/4-DQPSK mode Channel 0 2402MHz



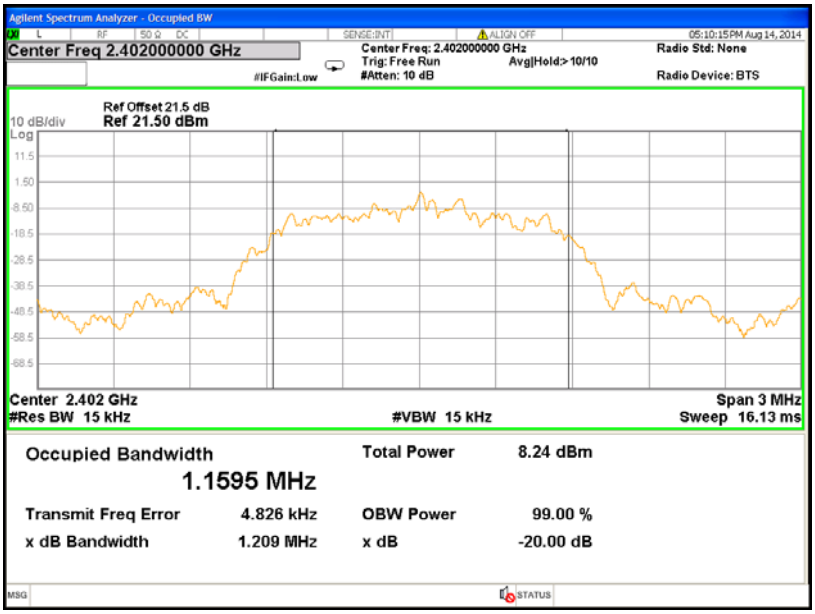
20dB Occupied Bandwidth @π/4-DQPSK mode Channel 39 2441MHz



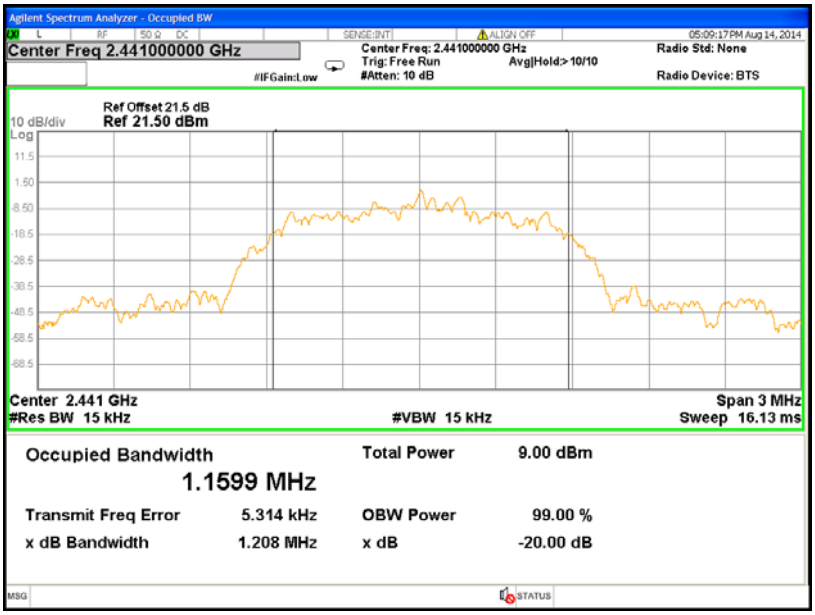
20dB Occupied Bandwidth @π/4-DQPSK mode Channel 78 2480MHz



20dB Occupied Bandwidth @ 8DPSK mode Channel 0 2402MHz



20dB Occupied Bandwidth @ 8DPSK mode Channel 39 2441MHz



20dB Occupied Bandwidth @ 8DPSK mode Channel 78 2480MHz