Prüfbericht-Nr.: *Test Report No.:*	**50087609 003**	**Auftrags-Nr.:** *Order No.:*	164093954	**Seite 1 von 51** *Page 1 of 51*
Kunden-Referenz-Nr.: *Client Reference No.:*	N/A	**Auftragsdatum:** *Order date:*	24.05.2017	
Auftraggeber: *Client:*	**Paralenz Group ApS.** Refshalevej 163a ST.MF, Copenhagen K, 1432 Denmark			
Prüfgegenstand: *Test item:*	DIVE CAMERA			
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	PDC-1			
Auftrags-Inhalt: *Order content:*	Test Report			
Prüfgrundlage: *Test specification:*	CFR47 FCC Part15: Subpart C Section 15.247 CFR47 FCC Part15: Subpart C Section 15.207 CFR47 FCC Part15: Subpart C Section 15.209		RSS-247 Issue 2 February 2017 RSS-GEN Issue 4 November 2014	

Wareneingangsdatum: *Date of receipt:*	24.05.2017	Refer to Photo Document
Prüfmuster-Nr.: *Test sample No.:*	A000552029-0001 A000552029-0002	
Prüfzeitraum: *Testing period:*	24.05.2017 - 10.07.2017	
Ort der Prüfung: *Place of testing:*	EMTEK (Shenzhen) Co., Ltd.	
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shenzhen) Co., Ltd.	
Prüfergebnis*: *Test result*:*	PASS	

geprüft von / *tested by:*			**kontrolliert von** / *reviewed by:*		
11.07.2017	Hardy Suo / Assistant Project Manager		11.07.2017	Sam Lin / Technical Certifier	
Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

Sonstiges / *Other:*

FCC ID: 2AL8V-PDC1A

IC: 22808-PDC1A

HVIN: PDC-1

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.
This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.

TEST SUMMARY

5.1.1 ANTENNA REQUIREMENT
RESULT: Pass

5.1.2 PEAK OUTPUT POWER
RESULT: Pass

5.1.3 20DB BANDWIDTH AND 99% BANDWIDTH FOR BT CLASSIC
RESULT: Pass

5.1.4 6DB BANDWIDTH AND 99% BANDWIDTH FOR BLE
RESULT: Pass

5.1.5 CONDUCTED SPURIOUS EMISSIONS MEASURED IN 100KHZ BANDWIDTH
RESULT: Pass

5.1.6 POWER SPECTRAL DENSITY
RESULT: Pass

5.1.7 SPURIOUS EMISSION
RESULT: Pass

5.1.8 FREQUENCY SEPARATION
RESULT: Pass

5.1.9 NUMBER OF HOPPING FREQUENCY
RESULT: Pass

5.1.10 TIME OF OCCUPANCY
RESULT: Pass

5.1.11 CONDUCTED EMISSIONS
RESULT: Pass

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1. General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendixes:
Appendix A: Test data.

2. Test Sites

2.1 Test Facilities

EMTEK (Shenzhen) Co., Ltd.

(FCC Registration No.: 709623)
(Test site Industry Canada No.: 4480A-2)

Bldg 69, Majialong Industry Zone, Nanshan District,
Shenzhen, Guangdong, P.R. China

The tests at the test site have been conducted under the supervision of a TÜV engineer.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Kind of Equipment	Manufacturer	Type	S/N	Calibrated until
Transmitter spurious emissions				
EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	2018-05-20
Loop Antenna	Schwarzbeck	FMZB 1519	1519-012	2018-05-20
Cable	H+B	3M SF104-26.5	295838/4	2018-05-21
Cable	H+B	6M SF104-26.5	295840/4	2018-05-21
Pre-Amplifier	HP	8447F	2944A07999	2018-05-20
Bilog Antenna	Schwarzbeck	VULB9163	142	2018-05-21
Cable	Schwarzbeck	AK9513	ACRX1	2018-05-20
Cable	Rosenberger	N/A	FP2RX2	2018-05-20
Cable	Schwarzbeck	AK9513	CRPX1	2018-05-21
Cable	Schwarzbeck	AK9513	CRRX2	2018-05-21
Pre-Amplifier	A.H.	PAM-0126	1415261	2018-05-20
Horn Antenna	Schwarzbeck	BBHA 9120	707	2018-05-21
Pre-Amplifier	A.H.	PAM-0126	1415261	2018-05-20
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	2018-05-20
EMI Test Receiver	Rohde & Schwarz	FSV40	132.1-3008K39-100967-AP	2018-05-20
Pre-Amplifier	Lunar EM	LNA26G40-40	J1013131028001	2018-05-20
Horn Antenna	AHS/USA	SAS-573	184	2018-05-20
Cable	H+B	0.5M SF104-26.5	289147/4	2018-05-20
Cable	H+B	3M SF104-26.5	295838/4	2018-05-20
Cable	H+B	6M SF104-26.5	295840/4	2018-05-20
Radio Spectrum Test				
EMI Test Receiver	Rohde & Schwarz	ESCI	101045	2018-05-21
Vector Signal Generater	Agilent	N5182B	My53050553	2018-05-20
Analog Signal Generator	Agilent	N5171B	My53050878	2018-05-20
Signal Analyzer	Agilent	N9010A	My53470879	2018-05-21
Power Meter	Agilent	PS-X10-100	N/A	2018-05-21
Temp. / Humidity Chamber	Kingson	THS-M1	242	2018-05-20
Conducted Emission				
Test Receiver	Rohde & Schwarz	ESCI	26115-010-0027	2018-05-20
L.I.S.N.	Rohde & Schwarz	ENV216	101161	2018-05-20
50Ω Coaxial Switch	Anritsu	MP59B	6100175589	2018-05-21
Voltage Probe	Rohde & Schwarz	ESH2-Z3	100122	2018-05-21

2.3 Traceability

All measurement equipment calibrations are traceable to NIST or where calibration is performed outside the United States, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basics using in house standards or comparisons.

2.5 Measurement Uncertainty

Table 2: Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	±1x10^-5
Maximum Peak Output Power Test	±1.0dB
Conducted Emissions Test	±2.0dB
Radiated Emission Test	±2.0dB
Power Density	±2.0dB
Occupied Bandwidth Test	±1.0dB
Band Edge Test	±3dB
All emission, radiated	±3dB
Antenna Port Emission	±3dB
Temperature	±0.5℃
Humidity	±3%

2.6 Location of Original Data

The original copies of all test data taken during actual testing were retained in the TÜV Rheinland (Shenzhen) file for certification follow-up purposes.

2.7 Status of Facility Used for Testing

EMTEK (Shenzhen) Co., Ltd. test facility located at Bldg 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, P.R. China is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a DIVE CAMERA which that supports Bluetooth classic, Bluetooth BLE and IEEE 802.11 b/g/n protocols.

Note: This report is for Bluetooth classic and Bluetooth BLE only.

For details refer to user manual and circuit diagram.

3.2 Ratings and System Details

Table 3: Technical Specification

Technical Specification	Value
Product Name	DIVE CAMERA
Model	PDC-1
Frequency Bandwidth	2400-2483.5MHz
Operating Frequency/Channels/Protocol	2412-2462MHz/11CH/802.11b/g/n-HT20 2402-2480MHz
Channel Spacing	1 MHz, 2MHz, 5MHz
Extreme Temperature Range	-20 ~ +55 ℃
Modulation	DSSS (DBPSK, DQPSK, CCK) OFDM (BPSK, QPSK, 16QAM, 64QAM) GFSK, pi/4-DQPSK, 8-DPSK
Antenna Number	1
Antenna Type	Integral antenna
Antenna Gain	2.4GHz band: 2.0dBi max
Operation Voltage	Powered by USB Type-C port 5.0Vdc or rechargeable battery (DC 3.8V, 1600mAh)

Table 4: RF channel and frequency of Bluetooth (BDR & EDR mode)

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
0	2402.00	21	2423.00	42	2444.00	63	2465.00
1	2403.00	22	2424.00	43	2445.00	64	2466.00
2	2404.00	23	2425.00	44	2446.00	65	2467.00
3	2405.00	24	2426.00	45	2447.00	66	2468.00
4	2406.00	25	2427.00	46	2448.00	67	2469.00
5	2407.00	26	2428.00	47	2449.00	68	2470.00
6	2408.00	27	2429.00	48	2450.00	69	2471.00

7	2409.00	28	2430.00	49	2451.00	70	2472.00
8	2410.00	29	2431.00	50	2452.00	71	2473.00
9	2411.00	30	2432.00	51	2453.00	72	2474.00
10	2412.00	31	2433.00	52	2454.00	73	2475.00
11	2413.00	32	2434.00	53	2455.00	74	2476.00
12	2414.00	33	2435.00	54	2456.00	75	2477.00
13	2415.00	34	2436.00	55	2457.00	76	2478.00
14	2416.00	35	2437.00	56	2458.00	77	2479.00
15	2417.00	36	2438.00	57	2459.00	78	2480.00
16	2418.00	37	2439.00	58	2460.00		
17	2419.00	38	2440.00	59	2461.00		
18	2420.00	39	2441.00	60	2462.00		
19	2421.00	40	2442.00	61	2463.00		
20	2422.00	41	2443.00	62	2464.00		

Table 5: RF channel and frequency of Bluetooth (Low Energy mode)

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
0	2402.00	11	2424.00	22	2446.00	33	2468.00
1	2404.00	12	2426.00	23	2448.00	34	2470.00
2	2406.00	13	2428.00	24	2450.00	35	2472.00
3	2408.00	14	2430.00	25	2452.00	36	2474.00
4	2410.00	15	2432.00	26	2454.00	37	2476.00
5	2412.00	16	2434.00	27	2456.00	38	2478.00
6	2414.00	17	2436.00	28	2458.00	39	2480.00
7	2416.00	18	2438.00	29	2460.00		
8	2418.00	19	2440.00	30	2462.00		
9	2420.00	20	2442.00	31	2464.00		
10	2422.00	21	2444.00	32	2466.00		

3.3 Independent Operation Modes

The basic operation modes are:

A. Tx
   1. Bluetooth mode (BDR & EDR mode)
      a. Tansmitting
         i. Low Channel
         ii. Middle Channel
         iii. High Channel
   2. Bluetooth mode (Low Energy mode)
      a. Tansmitting
         i. Low Channel
         ii. Middle Channel
         iii. High Channel
B. Normal operation
C. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5 Submitted Documents

- Bill of Material
- PCB Layout
- Photo Document
- Circuit Diagram
- Instruction Manual
- Rating Label

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum power level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All testing were performed according to the procedures in ANSI C63.10: 2013.

4.3 Special Accessories and Auxiliary Equipment

The EUT was tested together with the following accessories:

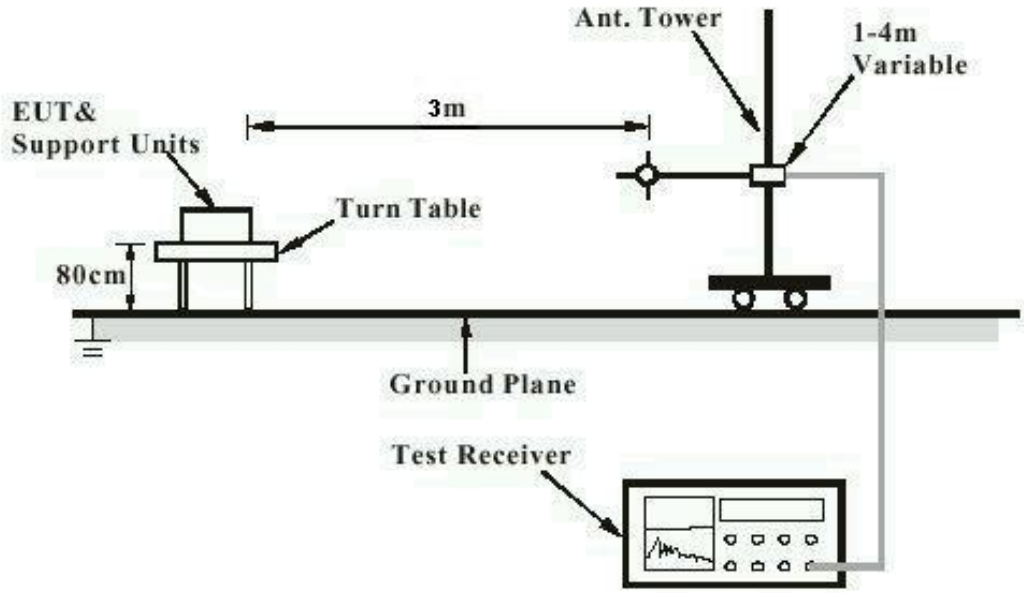
Description	Manufacturer	Model	S/N	Note
PC	LENOVO	WB0205140E	WB06355728	--
AC/DC adapter	ME	G051B-050200B-1	--	Input: 100-240V, 50/60Hz, 0.25A; Output: 5V, 2a

4.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



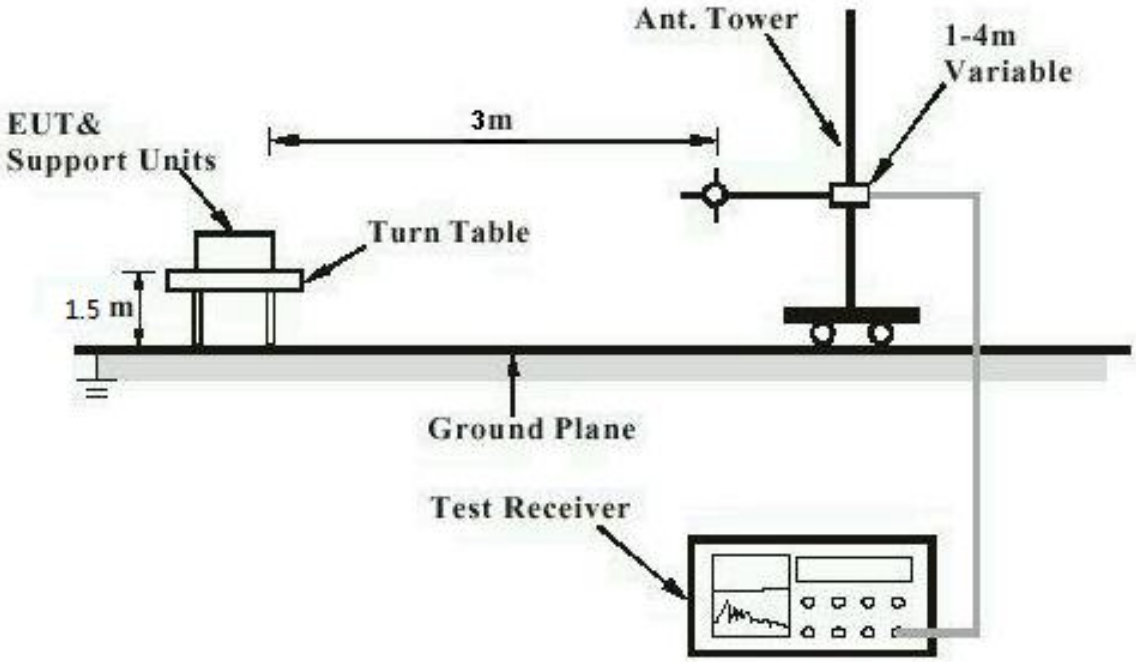


Diagram of Measurement Equipment Configuration for Conduction Measurement

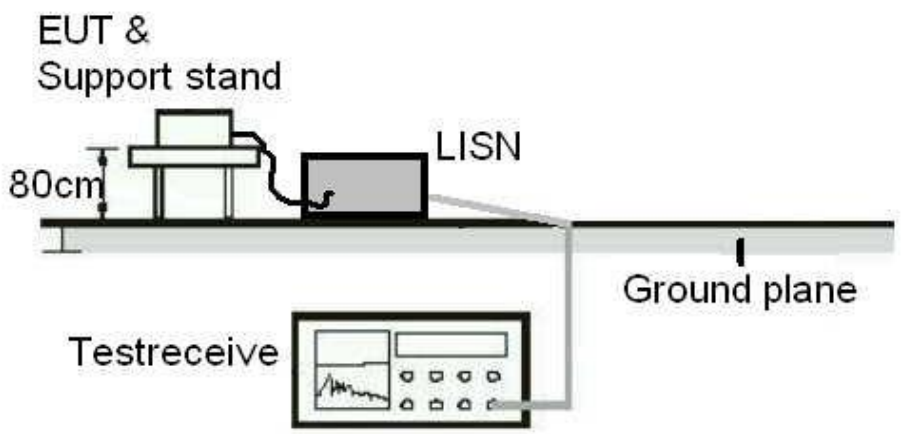
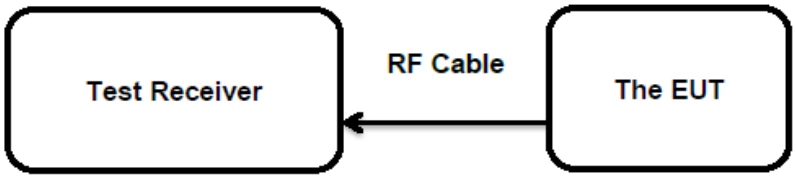


Diagram of Measurement Equipment Configuration for Transmitter Measurement



5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.203 RSS-GEN Clause8.3

The EUT has an integral antenna which in accordance to section 15.203 is considered sufficient to comply with the provisions of this section. Bluetooth and 2.4GHz Wi-Fi use the same antenna and cannot transmit simultaneously.

Refer to EUT Photo for further details.

5.1.2 Peak Output Power

RESULT: **Pass**

Test date	:	2017-06-14
Test standard	:	FCC Part 15.247(b)(1) FCC Part 15.247(b)(3) RSS-247 clause 5.4(2) RSS-247 clause 5.4(4)
Basic standard	:	ANSI C63.10: 2013 Clause 9.1 of KDB 558074 v04
Limit	:	For FCC: FHSS<125mW, DTSS<1000mW For IC: < 1000mW (Maximum peak conducted output power) < 4000mW (e.i.r.p.)
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A.1.a, A.2.a
Ambient temperature	:	25℃
Relative humidity	:	50%
Atmospheric pressure	:	101kPa

Table 6: Test result of Peak Output Power of Buletooth (BDR mode)

Channel	Channel Frequency (MHz)	Peak Output Power		Limit for FCC	Limit for IC
		(dBm)	(mW)	(mW)	(mW)
Low Channel	2402	11.733	14.904	125	1000
Middle Channel	2441	11.220	13.243	125	1000
High Channel	2480	**12.486**	**17.726**	125	1000

Table 7: Test result of Peak Output Power of Bluetooth (EDR mode)

Channel	Channel Frequency (MHz)	Peak Output Power		Limit for FCC	Limit for IC
		(dBm)	(mW)	(mW)	(mW)
Low Channel	2402	10.926	12.377	125	1000
Middle Channel	2441	10.155	10.363	125	1000
High Channel	2480	11.684	14.737	125	1000

Table 8: Test result of Peak Output Power of Bluetooth (Low Energy mode)

Channel	Channel Frequency (MHz)	Peak Output Power		Limit
		(dBm)	(mW)	(mW)
Low Channel	2402	10.894	12.286	1000
Middle Channel	2440	11.289	13.456	1000
High Channel	2480	12.147	16.395	1000

Note: the ANT gain is 2 dBi max, hence the max e.i.r.p=12.486 dBi+2 dBi=14.486 dBi=28.093 mW which is less than 4000 mW.

5.1.3 20dB Bandwidth and 99% Bandwidth for BT classic

RESULT: **Pass**

Date of testing	:	2017-06-14
Test standard	:	FCC Part 15.247(a)(1) RSS-247 clause 5.1(2) RSS-Gen clause 6.6
Basic standard	:	ANSI C63.10: 2013 Clause 8 of KDB 558074 v04
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A.1.a
Ambient temperature	:	25℃
Relative humidity	:	50%
Atmospheric pressure	:	101kPa

Table 9: Test result of 20dB and 99% Bandwidth of BDR mode

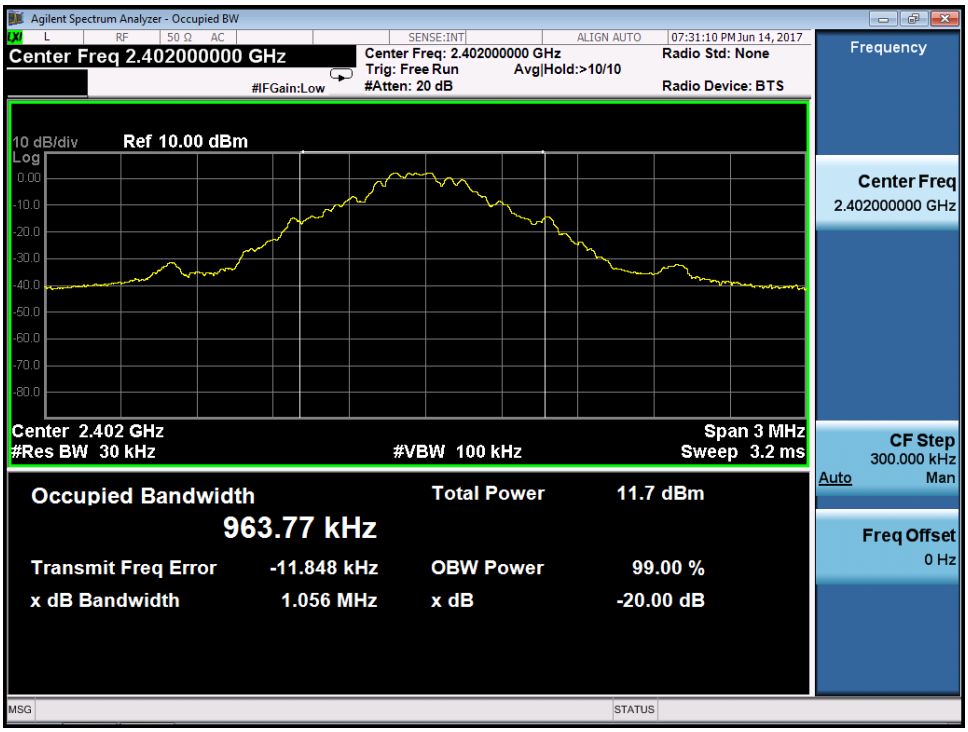
Channel	Channel Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low Channel	2402	1.056	0.964
Mid Channel	2441	1.058	0.962
High Channel	2480	1.052	0.966

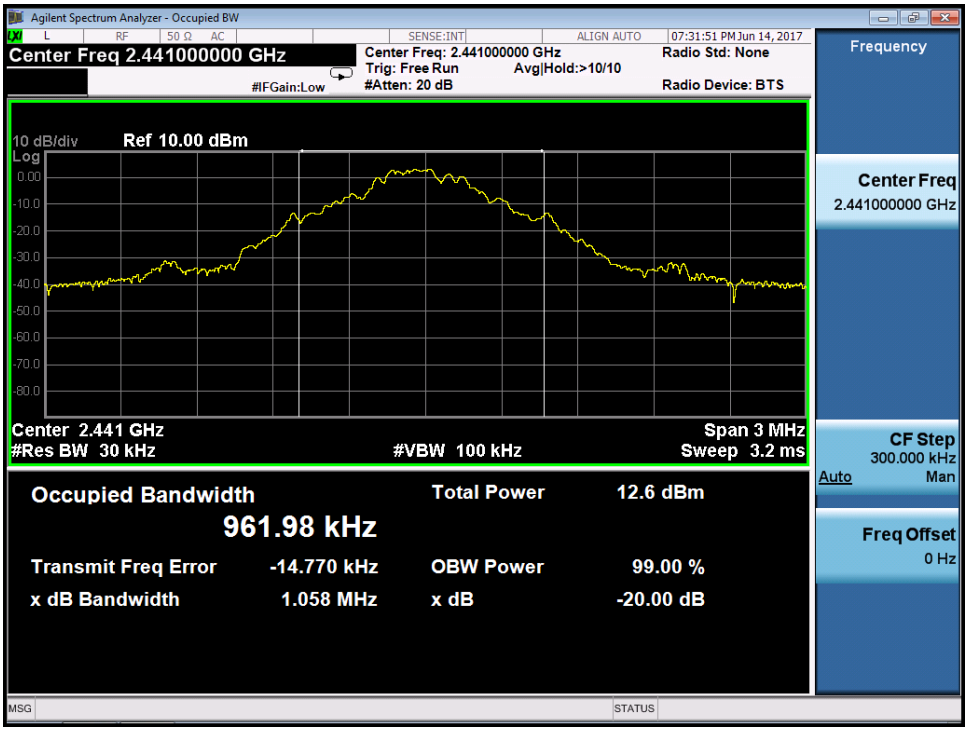
Table 10: Test result of 20dB and 99% Bandwidth of EDR mode

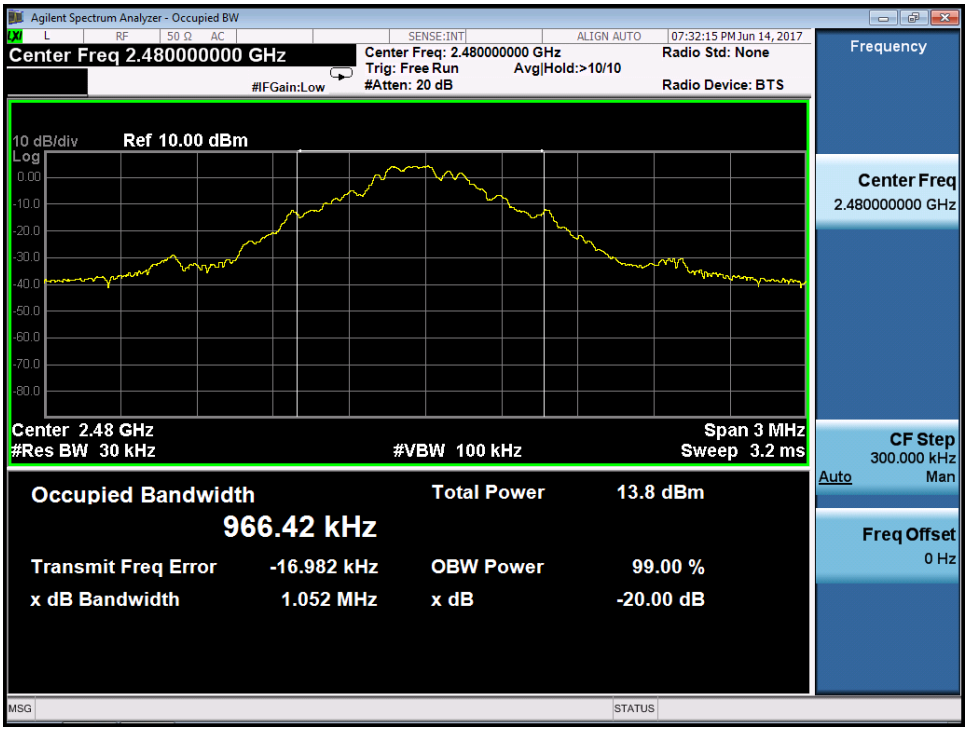
Channel	Channel Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low Channel	2402	1.343	1.1859
Mid Channel	2441	1.333	1.1874
High Channel	2480	1.332	1.1890

For details refer to following test plot.

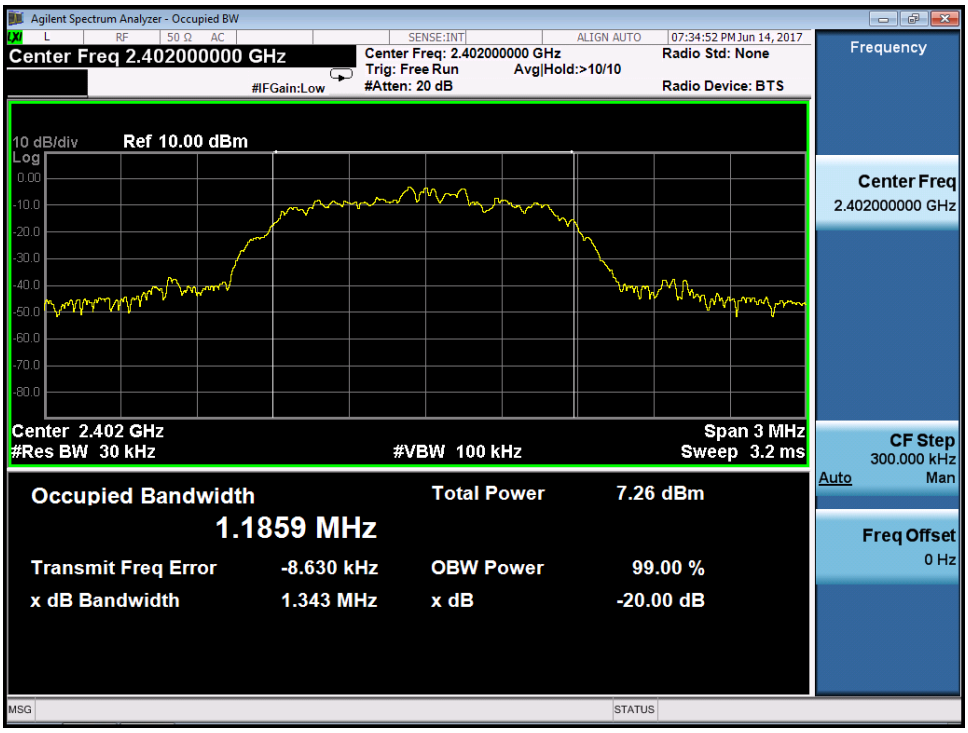
Test plot of 20dB and 99% Bandwidth of BDR mode

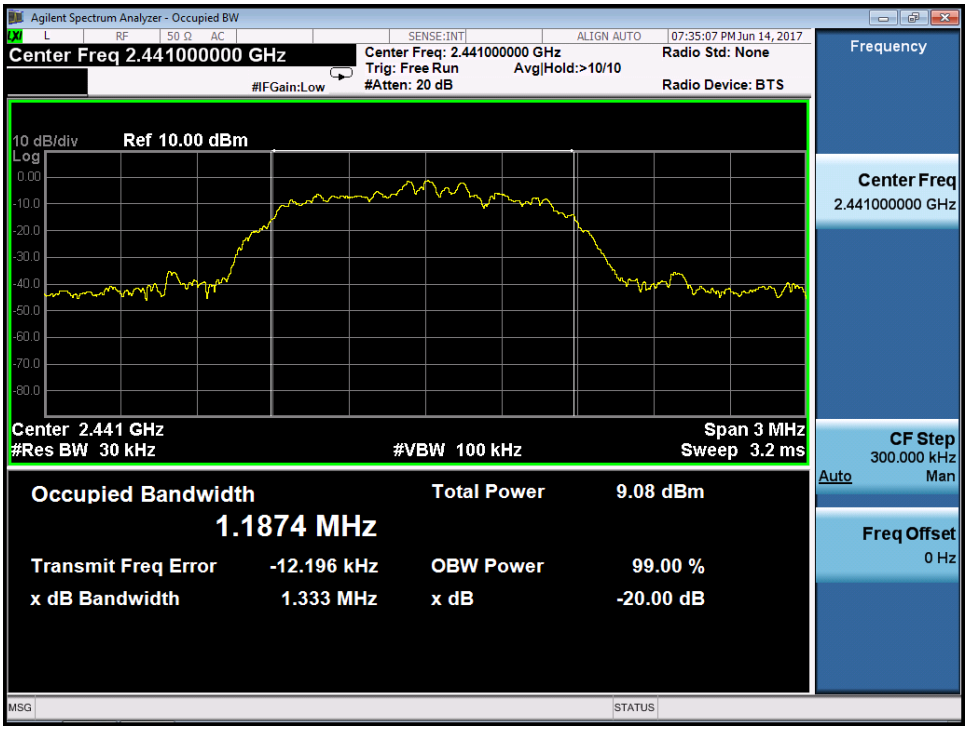


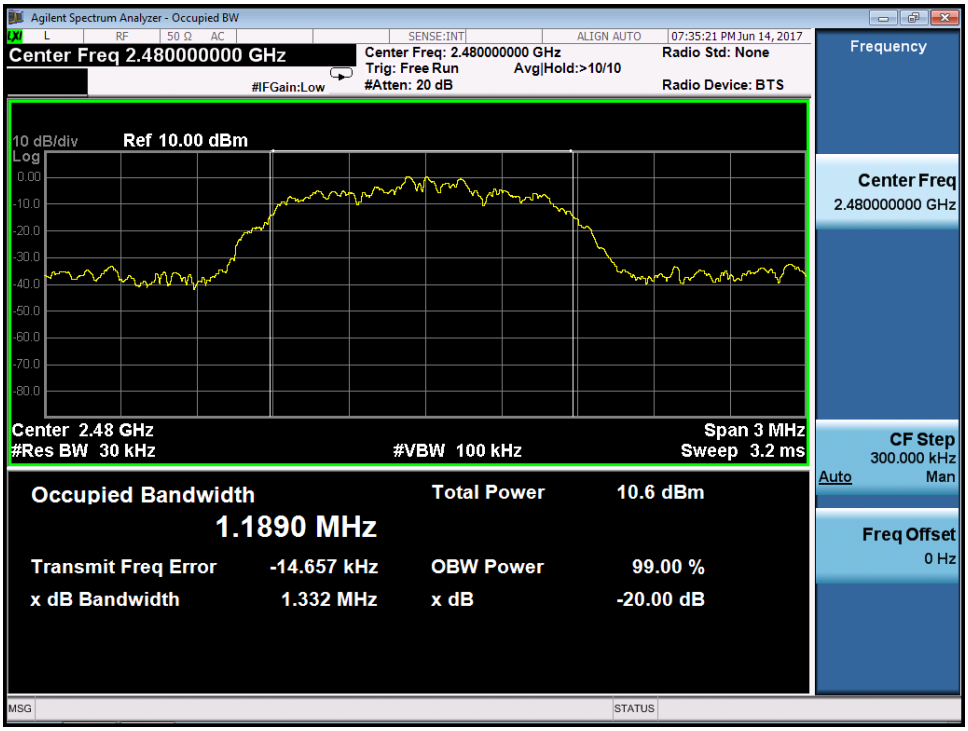




Test plot of 20dB and 99% Bandwidth of EDR mode




Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.441000000 GHz
Center Freq: 2.441000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
#IFGain:Low
07:35:07 PM Jun 14, 2017
Frequency
10 dB/div
Ref 10.00 dBm
Center 2.441 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 3.2 ms
Occupied Bandwidth
1.1874 MHz
Total Power 9.08 dBm
Transmit Freq Error -12.196 kHz
OBW Power 99.00 %
x dB Bandwidth 1.333 MHz
x dB -20.00 dB
Center Freq
2.441000000 GHz
CF Step
300.000 kHz
Auto Man
Freq Offset
0 Hz
MSG
STATUS


Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
#IFGain:Low
07:35:21 PM Jun 14, 2017
Frequency
10 dB/div
Ref 10.00 dBm
Center 2.48 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 3.2 ms
Occupied Bandwidth
1.1890 MHz
Total Power 10.6 dBm
Transmit Freq Error -14.657 kHz
OBW Power 99.00 %
x dB Bandwidth 1.332 MHz
x dB -20.00 dB
Center Freq
2.480000000 GHz
CF Step
300.000 kHz
Auto Man
Freq Offset
0 Hz
MSG
STATUS

5.1.4 6dB Bandwidth and 99% Bandwidth for BLE

RESULT: **Pass**

Date of testing	:	2017-06-14
Test standard	:	FCC Part 15.247(a)(2) RSS-247 clause 5.2(1) RSS-Gen clause 6.6
Basic standard	:	ANSI C63.10: 2013 Clause 8 of KDB 558074 v04
Kind of test site	:	Shielded room

Test setup

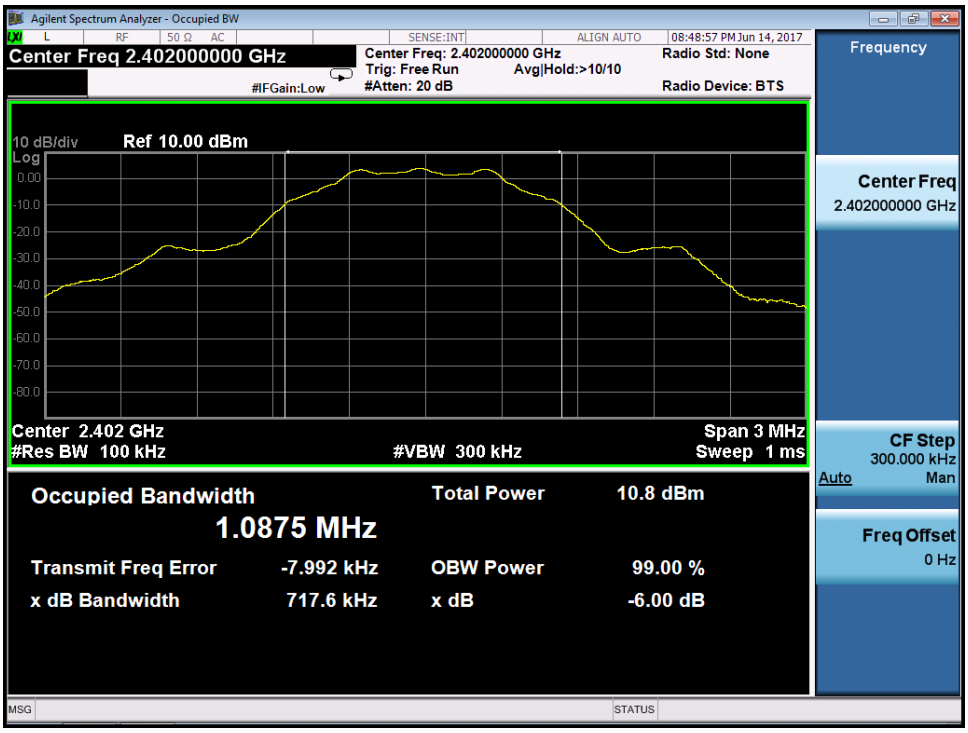
Test Channel	:	Low/ Middle/ High
Operation Mode	:	A.2.a
Ambient temperature	:	25℃
Relative humidity	:	50%
Atmospheric pressure	:	101kPa

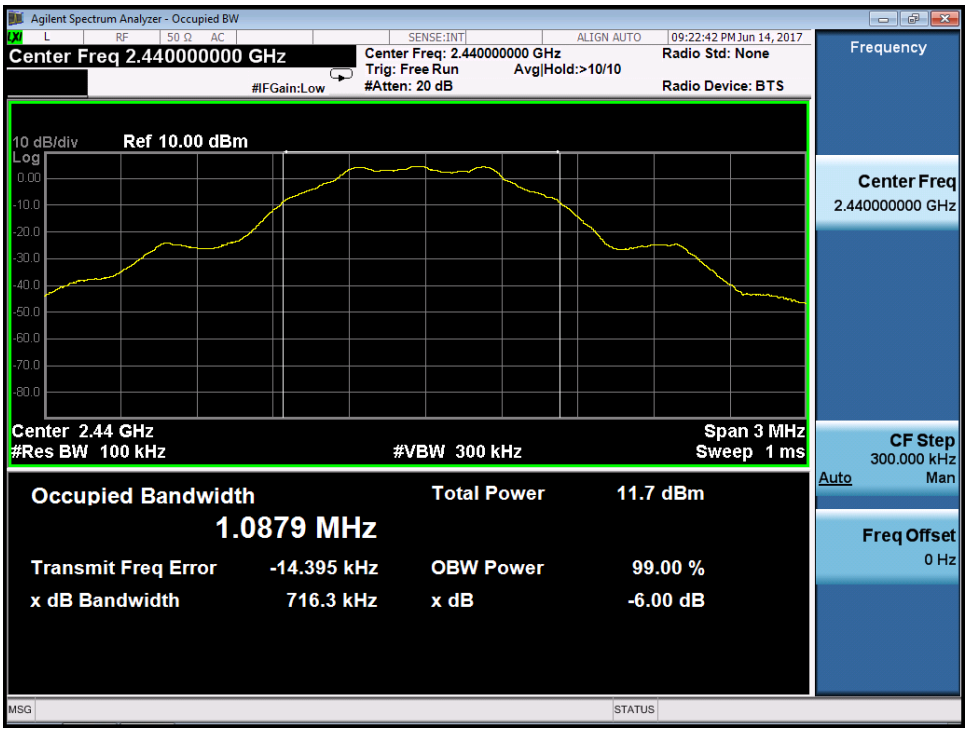
Table 11: Test result of 6dB Bandwidth and 99% Bandwidth of Bluetooth, Low Energy mode

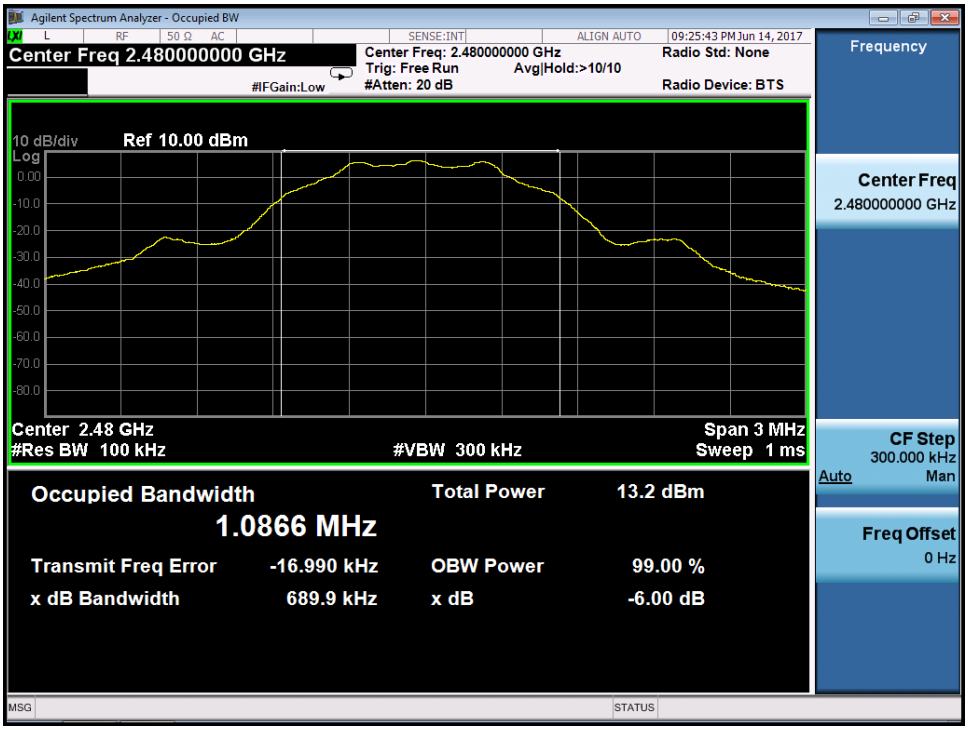
Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Limit of 6dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low Channel	2402	0.7176	≥0.5	1.0875
Mid Channel	2440	0.7163	≥0.5	1.0879
High Channel	2480	0.6899	≥0.5	1.0866

For details refer to following test plot.

Test plot of 6dB and 99% Bandwidth for BLE






Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
#IFGain:Low
10 dB/div
Ref 10.00 dBm
Log
Center 2.48 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3 MHz
Sweep 1 ms
Occupied Bandwidth
1.0866 MHz
Total Power 13.2 dBm
Transmit Freq Error -16.990 kHz
OBW Power 99.00 %
x dB Bandwidth 689.9 kHz
x dB -6.00 dB
Frequency
Center Freq
2.480000000 GHz
CF Step
300.000 kHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

5.1.5 Conducted Spurious Emissions measured in 100kHz Bandwidth

RESULT: **Pass**

Date of testing	:	2017-06-14
Test standard	:	FCC part 15.247(d) RSS-247 clause 5.5
Basic standard	:	ANSI C63.10: 2013
Limit	:	20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power)
Kind of test site	:	Shield room

Test setup

Test Channel	:	Low/ Middle/ High
Operation mode	:	A.1.a, A.2.a
Ambient temperature	:	25℃
Relative humidity	:	50%
Atmospheric pressure	:	101kPa

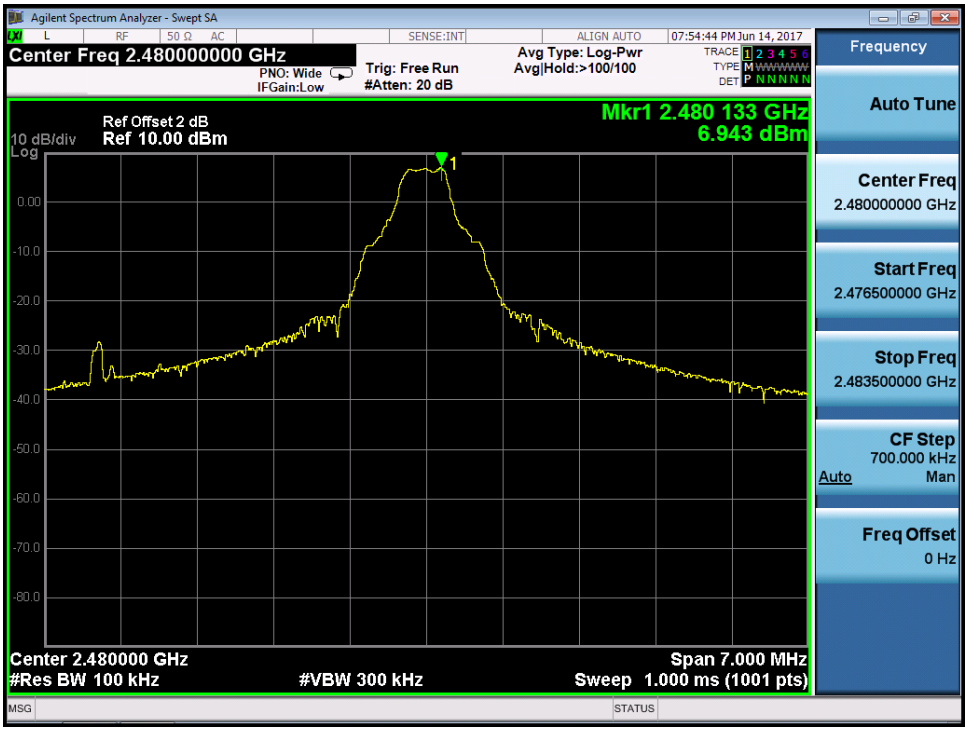
For details refer to following test plot.

Test Plot of Conducted spurious emissions measured in 100kHz Bandwidth of BDR mode

Low Channel

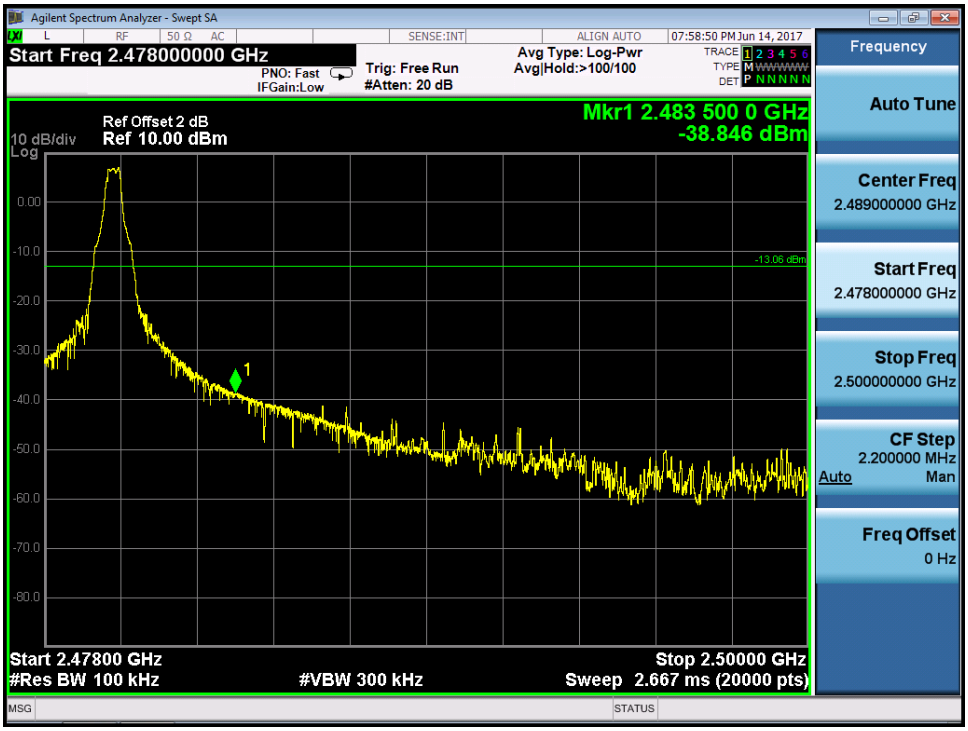
Middle Channel

High Channel



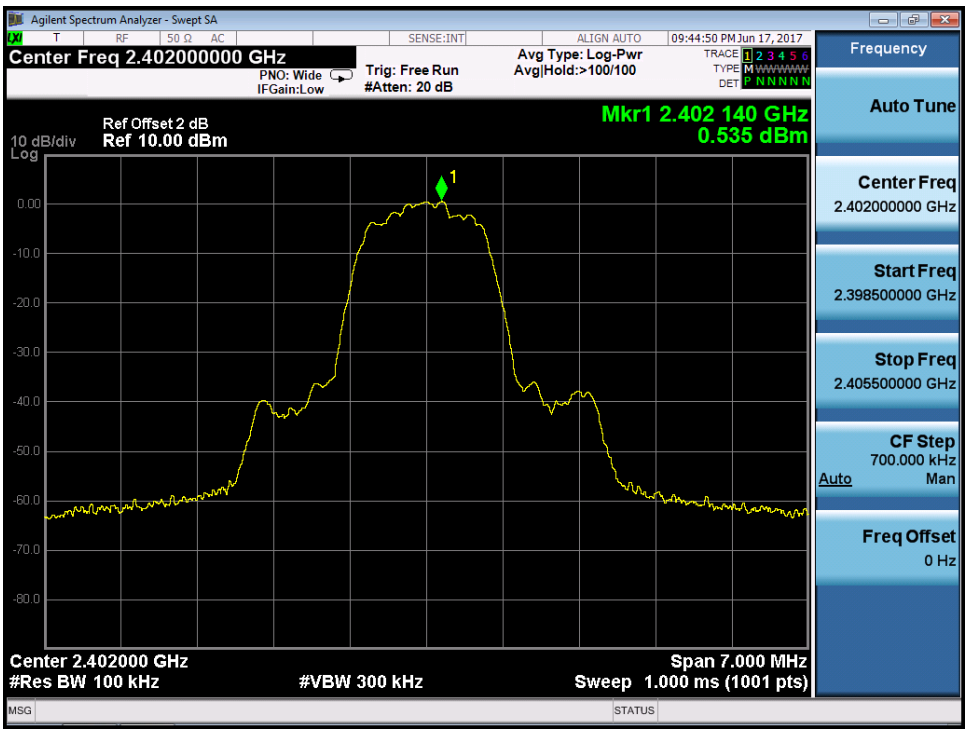
Band Edge

Agilent Spectrum Analyzer - Swept SA
Start Freq 2.390000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
07:59:57 PM Jun 14, 2017
Ref Offset 2 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.400 000 0 GHz
-35.566 dBm
Start 2.390000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.403000 GHz
Sweep 1.333 ms (20000 pts)
Frequency
Auto Tune
Center Freq
2.396500000 GHz
Start Freq
2.390000000 GHz
Stop Freq
2.403000000 GHz
CF Step
1.300000 MHz
Auto
Man
Freq Offset
0 Hz

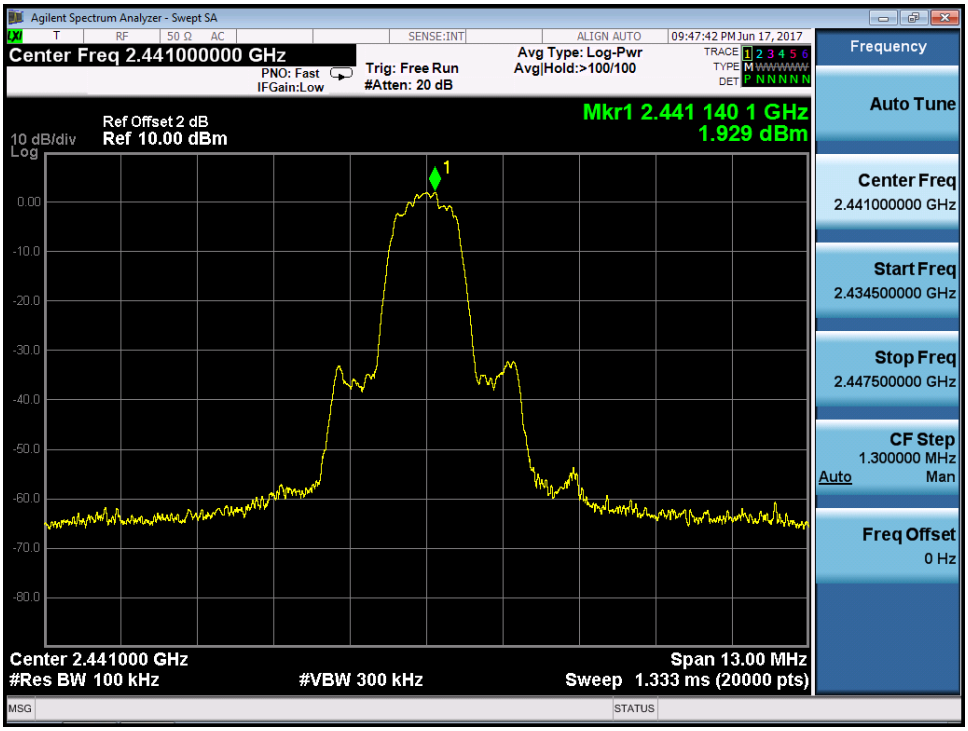

Agilent Spectrum Analyzer - Swept SA
Start Freq 2.478000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
07:58:50 PM Jun 14, 2017
Ref Offset 2 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.483 500 0 GHz
-38.846 dBm
Start 2.47800 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 2.667 ms (20000 pts)
Frequency
Auto Tune
Center Freq
2.489000000 GHz
Start Freq
2.478000000 GHz
Stop Freq
2.500000000 GHz
CF Step
2.200000 MHz
Auto
Man
Freq Offset
0 Hz

Test Plot of Conducted spurious emissions measured in 100kHz Bandwidth of EDR mode

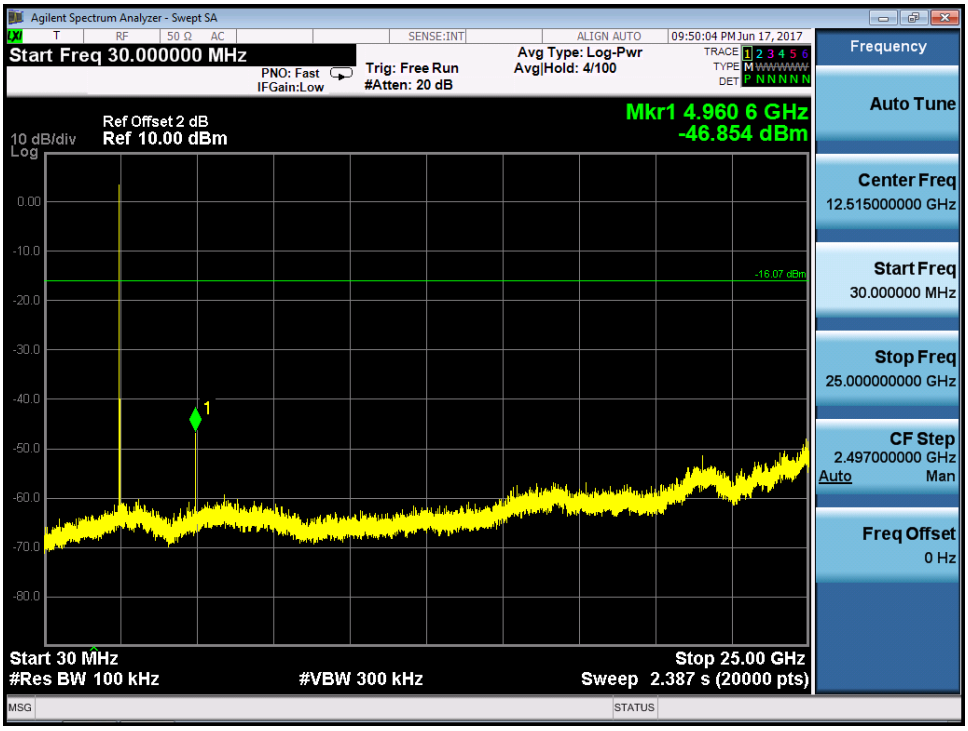
Low Channel



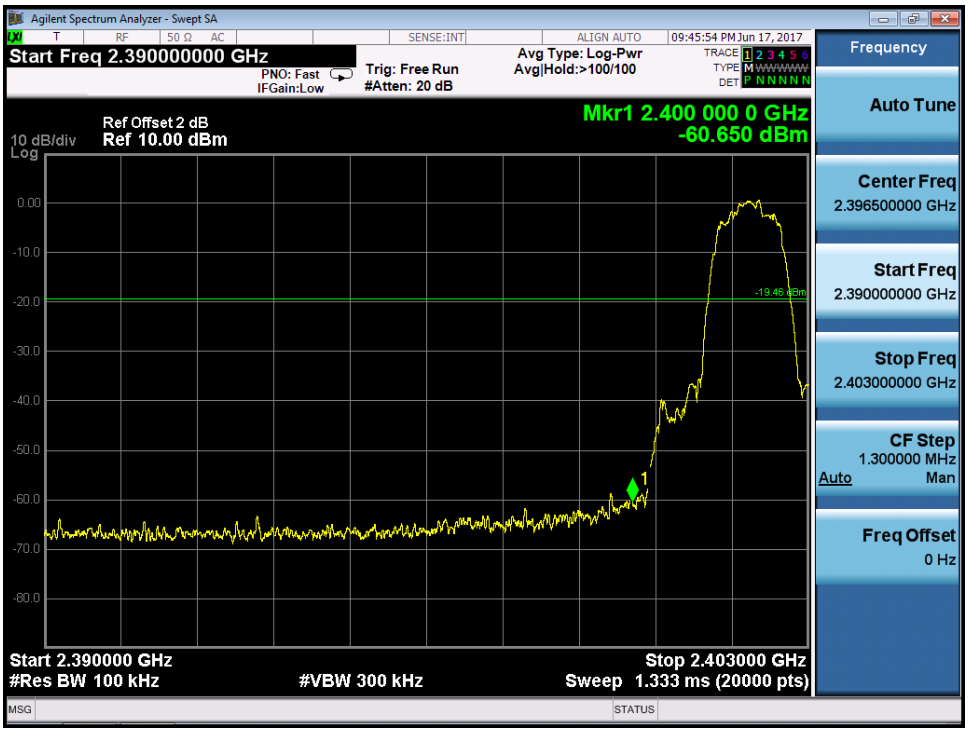
Middle Channel

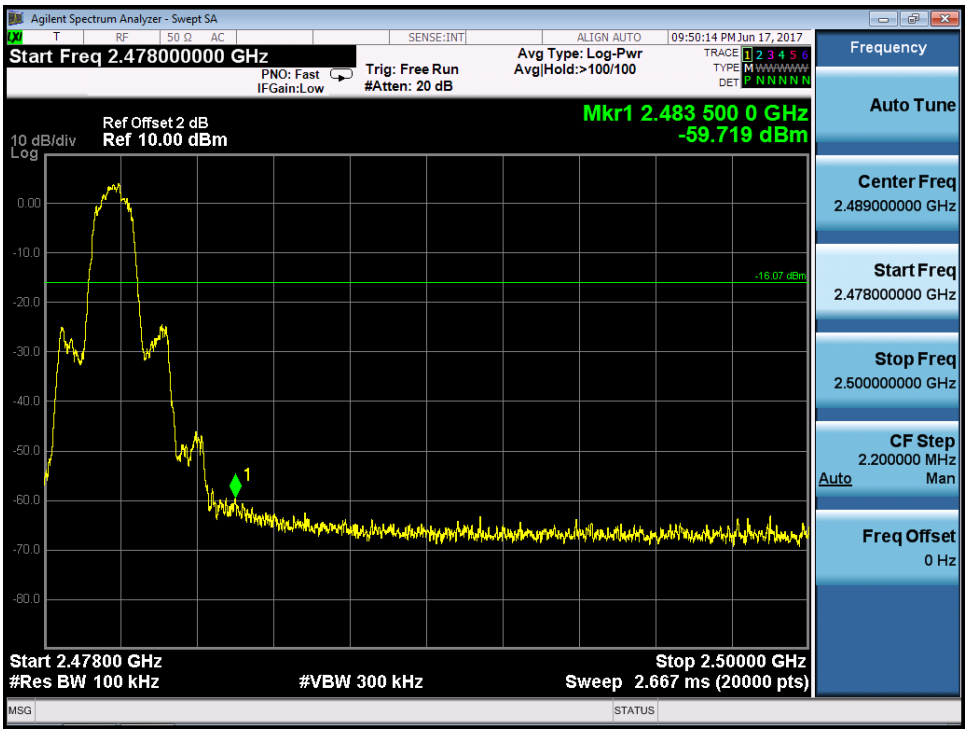


High Channel



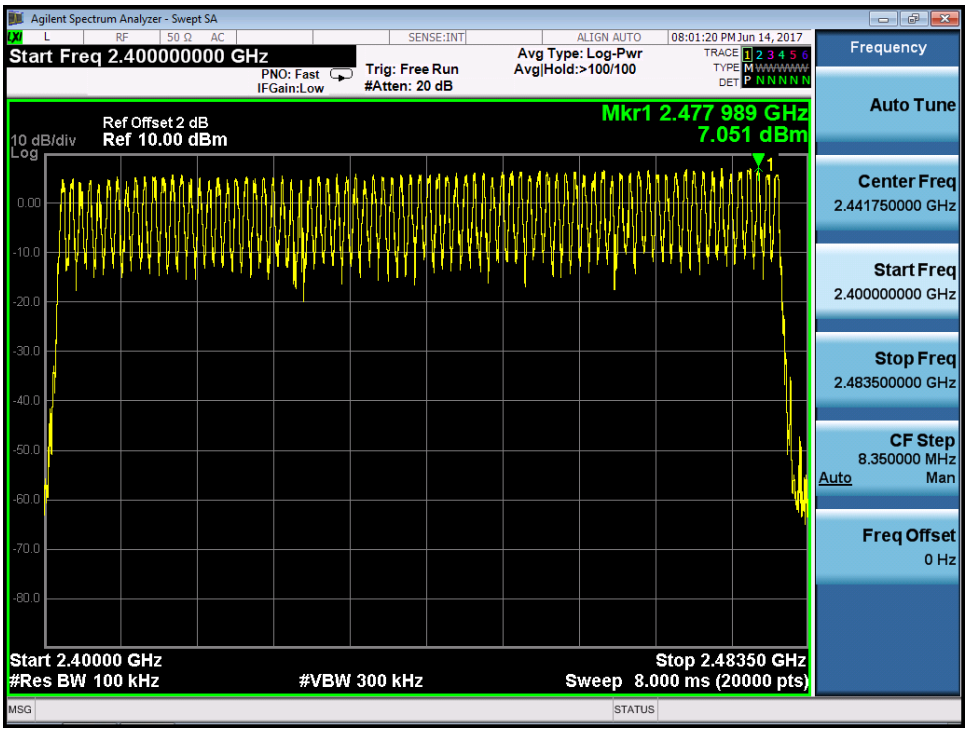
Band Edge

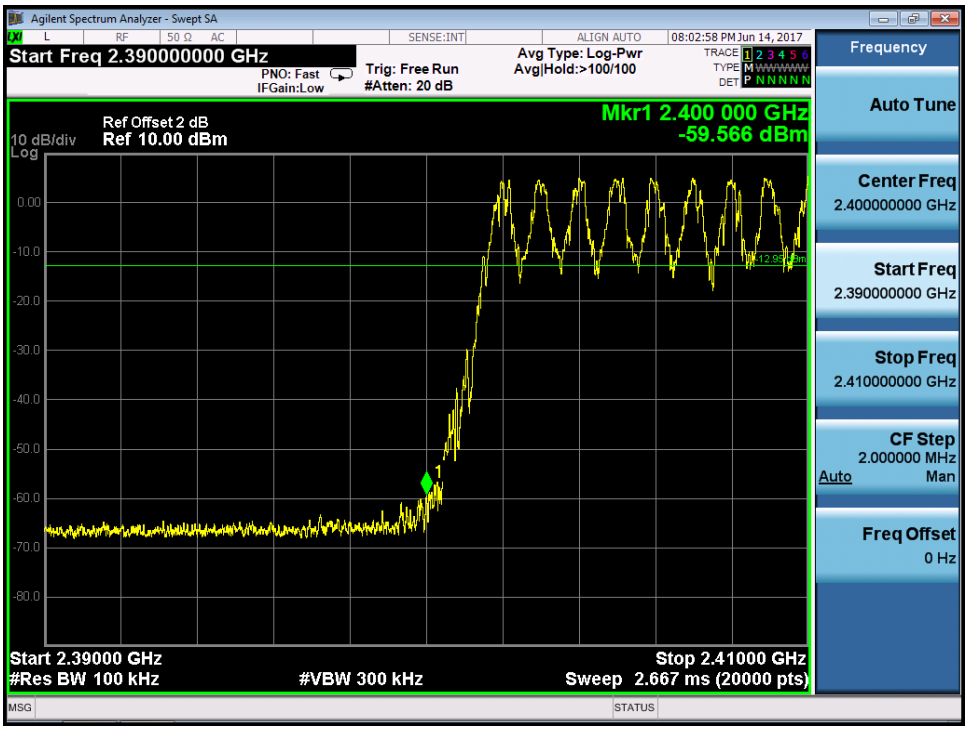

Agilent Spectrum Analyzer - Swept SA
Start Freq 2.390000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
09:45:54 PM Jun 17, 2017
Ref Offset 2 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.400 000 0 GHz
-60.650 dBm
-19.46 dBm
Start 2.390000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.403000 GHz
Sweep 1.333 ms (20000 pts)
Frequency
Auto Tune
Center Freq
2.396500000 GHz
Start Freq
2.390000000 GHz
Stop Freq
2.403000000 GHz
CF Step
1.300000 MHz
Auto
Man
Freq Offset
0 Hz

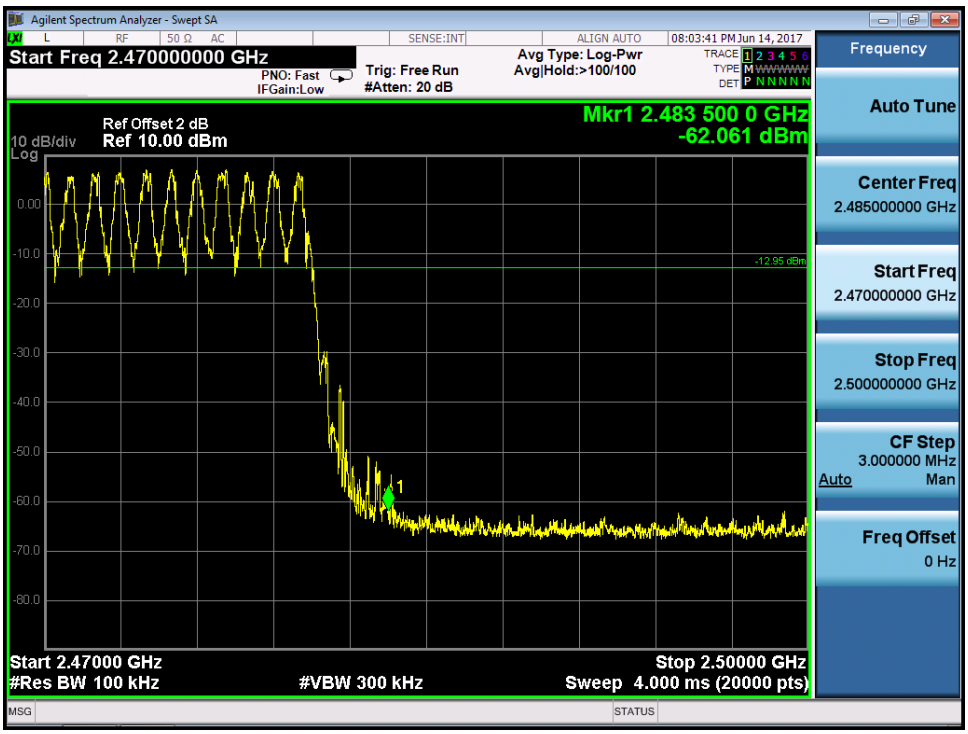

Agilent Spectrum Analyzer - Swept SA
Start Freq 2.478000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
09:50:14 PM Jun 17, 2017
Ref Offset 2 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.483 500 0 GHz
-59.719 dBm
-16.07 dBm
Start 2.47800 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 2.667 ms (20000 pts)
Frequency
Auto Tune
Center Freq
2.489000000 GHz
Start Freq
2.478000000 GHz
Stop Freq
2.500000000 GHz
CF Step
2.200000 MHz
Auto
Man
Freq Offset
0 Hz

Test Plot of Conducted spurious emissions measured in 100kHz Bandwidth of hopping mode

Note: Worst case for BDR and EDR was only reported.

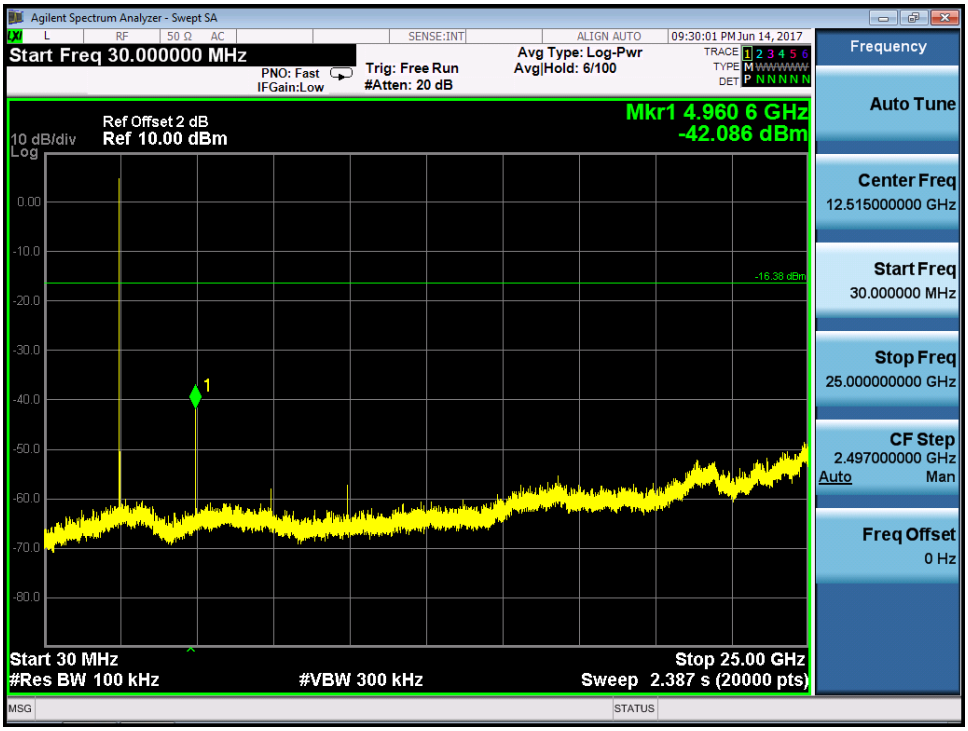



Agilent Spectrum Analyzer - Swept SA
Start Freq 2.390000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
08:02:58 PM Jun 14, 2017
Ref Offset 2 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.400 000 GHz
-59.566 dBm
-12.95 dBm
Start 2.39000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.41000 GHz
Sweep 2.667 ms (20000 pts)
Frequency
Auto Tune
Center Freq
2.400000000 GHz
Start Freq
2.390000000 GHz
Stop Freq
2.410000000 GHz
CF Step
2.000000 MHz
Auto
Man
Freq Offset
0 Hz


Agilent Spectrum Analyzer - Swept SA
Start Freq 2.470000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
08:03:41 PM Jun 14, 2017
Ref Offset 2 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.483 500 0 GHz
-62.061 dBm
-12.95 dBm
Start 2.47000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 4.000 ms (20000 pts)
Frequency
Auto Tune
Center Freq
2.485000000 GHz
Start Freq
2.470000000 GHz
Stop Freq
2.500000000 GHz
CF Step
3.000000 MHz
Auto
Man
Freq Offset
0 Hz

Test Plot of Conducted spurious emissions measured in 100kHz Bandwidth of Low Energy mode

Low Channel

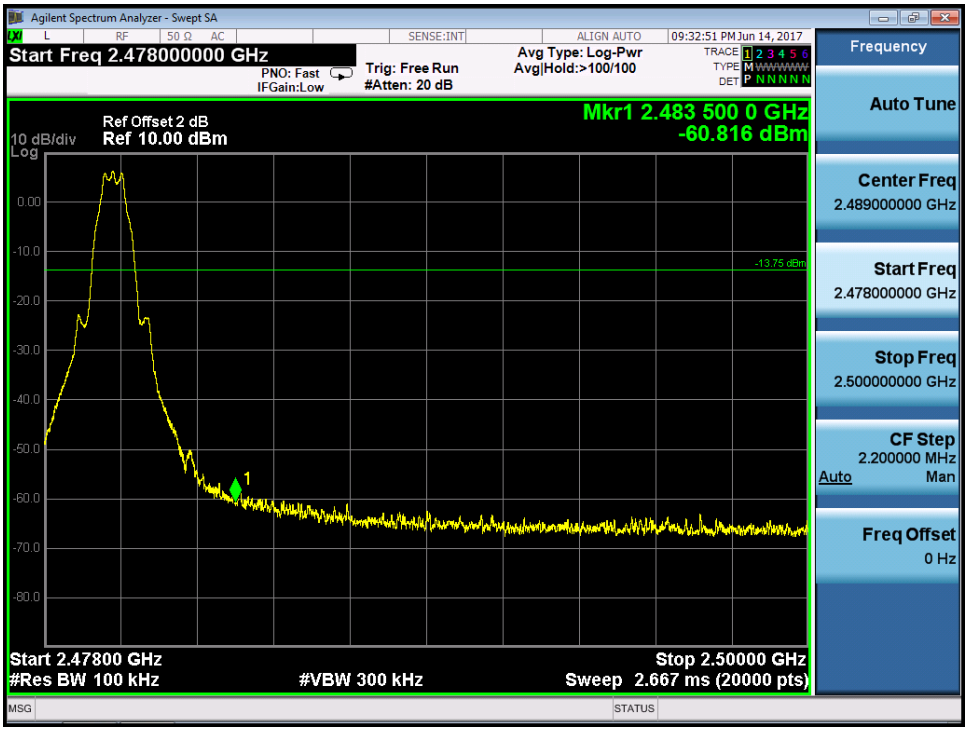


Middle Channel

High Channel

Band Edge

Agilent Spectrum Analyzer - Swept SA
Start Freq 2.390000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
09:18:33 PM Jun 14, 2017
Ref Offset 2 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.400 000 GHz
-46.923 dBm
-16.38 dBm
Start 2.390000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.403000 GHz
Sweep 1.267 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.396500000 GHz
Start Freq
2.390000000 GHz
Stop Freq
2.403000000 GHz
CF Step
1.300000 MHz
Auto
Man
Freq Offset
0 Hz


Agilent Spectrum Analyzer - Swept SA
Start Freq 2.478000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
09:32:51 PM Jun 14, 2017
Ref Offset 2 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.483 500 0 GHz
-60.816 dBm
-13.75 dBm
Start 2.47800 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 2.667 ms (20000 pts)
Frequency
Auto Tune
Center Freq
2.489000000 GHz
Start Freq
2.478000000 GHz
Stop Freq
2.500000000 GHz
CF Step
2.200000 MHz
Auto
Man
Freq Offset
0 Hz

5.1.6 Power spectral density

RESULT: **Pass**

Date of testing	:	2017-06-14
Test standard	:	FCC part 15.247(e) RSS-247 clause 5.2(2)
Basic standard	:	ANSI C63.10: 2013 Clause 10 of KDB 558074 v04
Limit	:	8dBm/3kHz
Kind of test site	:	Shield room

Test setup

Test Channel	:	Low/ Middle/ High
Operation mode	:	A.2.a
Ambient temperature	:	25℃
Relative humidity	:	50%
Atmospheric pressure	:	101kPa

Table 12: Test result of power spectral density

Mode	Channel (MHz)	Result (dBm/3kHz)	Limit (dBm/3kHz)	Conclusion
Bluetooth LE mode	2402	-9.677	8	Pass
	2440	-8.743	8	Pass
	2480	-7.223	8	Pass

For details refer to following test plot.

Test plot of power spectral density

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 27/100
09:26:04 PM Jun 14, 2017
Ref Offset 2 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.479 958 0 GHz
-7.223 dBm
Center 2.4800000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 1.500 MHz
Sweep 158.2 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.479250000 GHz
Stop Freq
2.480750000 GHz
CF Step
150.000 kHz
Auto
Man
Freq Offset
0 Hz

5.1.7 Spurious Emission

RESULT: **Pass**

Date of testing	:	2017-07-06
Test standard	:	FCC part 15.247(d) RSS-Gen
Basic standard	:	ANSI C63.10: 2013 Clause 11 of KDB 558074 v04
Limits	:	FCC part 15.209(a)
Kind of test site	:	3m Semi-Anechoic Chamber & Anechoic Chamber

Test setup

Test Channel	:	Low/ Middle/ High
Operation mode	:	A.1.a, A.2.a
Ambient temperature	:	22℃
Relative humidity	:	55%
Atmospheric pressure	:	101kPa

For details refer to appendix A.

5.1.8 Frequency Separation

RESULT: **Pass**

Date of testing	:	2017-06-14
Test standard	:	FCC part 15.247(a)(1) RSS-247 clause 5.1(2)
Basic standard	:	ANSI C63.10: 2013
Limit	:	≥ 25kHz or two-thirds of 20dB bandwidth, whichever is greater
Kind of test site	:	Shield room

Test setup

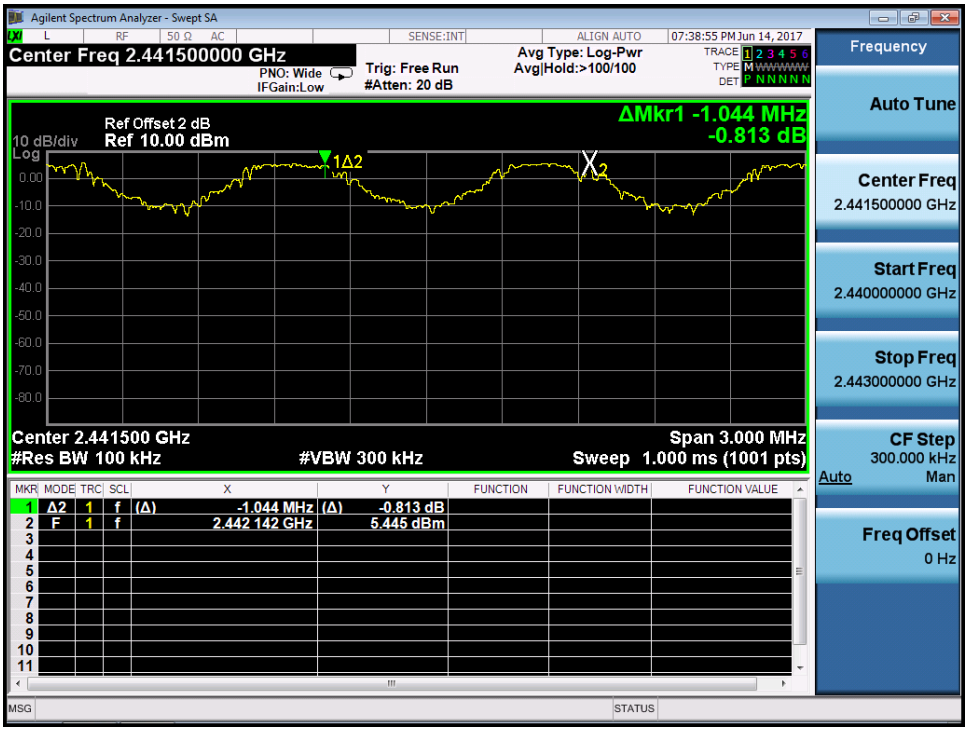
Test Channel	:	Low/ Middle/ High
Operation Mode	:	A.1.a
Ambient temperature	:	25℃
Relative humidity	:	50%
Atmospheric pressure	:	101kPa

Table 13: Test result of Frequency Separation

Channel	Channel Frequency (MHz)	Measured Channel Separation (MHz)	Limit (kHz)	Result
Low Channel	2402	1.005	≥ 25kHz or two-thirds of 20dB bandwidth	Pass
Adjacency Channel	2403			
Mid Channel	2441	1.004	≥ 25kHz or two-thirds of 20dB bandwidth	Pass
Adjacency Channel	2442			
High Channel	2479	0.969	≥ 25kHz or two-thirds of 20dB bandwidth	Pass
Adjacency Channel	2480			

For details refer to following test plot.

Test plot of Frequency Separation



Agilent Spectrum Analyzer - Swept SA
Center Freq 2.479500000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
07:39:30 PM Jun 14, 2017
Ref Offset 2 dB
10 dB/div
Log
Ref 10.00 dBm
ΔMkr1 -969 kHz
-0.249 dB
Center 2.479500 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3.000 MHz
Sweep 1.000 ms (1001 pts)
1 Δ2 1 f (Δ) -969 kHz (Δ) -0.249 dB
2 F 1 f 2.479 932 GHz 6.141 dBm
Frequency
Auto Tune
Center Freq
2.479500000 GHz
Start Freq
2.478000000 GHz
Stop Freq
2.481000000 GHz
CF Step
300.000 kHz
Auto
Man
Freq Offset
0 Hz

5.1.9 Number of hopping frequency

RESULT: **Pass**

Date of testing	:	2017-06-21
Test standard	:	FCC part 15.247(a)(1)(iii) RSS-247 clause 5.1(4)
Basic standard	:	ANSI C63.10: 2013
Limits	:	≥ 15 non-overlapping channels
Kind of test site	:	Shield room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A.1.a
Ambient temperature	:	25℃
Relative humidity	:	50%
Atmospheric pressure	:	101kPa

Table 14: Test result of Number of hopping frequency

Frequency Range	Measured Quantity of Hopping Channel	Limit	Result
2402 to 2480MHz	79	≥15	Pass

5.1.10 Time of Occupancy

RESULT: **Pass**

Date of testing	:	2017-06-28
Test standard	:	FCC part 15.247(a)(1)(iii) RSS-247 clause 5.1(4)
Basic standard	:	ANSI C63.10: 2013
Limits	:	0.4s
Kind of test site	:	Shield room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A.1.a
Ambient temperature	:	25℃
Relative humidity	:	50%
Atmospheric pressure	:	101kPa

Table 15: Test result of Time of Occupancy

Mode	Packet Type	Channel Frequency (MHz)	Packet Duration [ms]	Number of Hops per Channel	Dwell Time (ms)	Limit [ms]
BDR	DH1	2402	0.372	320	119.04	400
		2441	0.372	320	119.04	400
		2480	0.372	320	119.04	400
	DH3	2402	1.624	165	267.96	400
		2441	1.631	165	269.12	400
		2480	1.631	165	269.12	400
	DH5	2402	2.870	112	321.44	400
		2441	2.880	112	322.56	400
		2480	2.870	112	321.44	400
EDR	DH1	2402	0.380	320	121.60	400
		2441	0.372	320	119.04	400
		2480	0.384	320	122.88	400
	DH3	2402	1.638	165	270.27	400
		2441	1.631	165	269.12	400
		2480	1.624	165	267.96	400
	DH5	2402	2.880	112	322.56	400
		2441	2.880	112	322.56	400
		2480	2.850	112	322.56	400

5.1.11 Conducted emissions

RESULT: **Pass**

Date of testing	:	2017-06-21
Test standard	:	FCC Part 15.207 RSS-Gen Clause 8.8
Basic standard	:	ANSI C63.10: 2013
Frequency range	:	0.15 – 30MHz
Limits	:	FCC Part 15.207 Table 3 of RSS-Gen
Kind of test site	:	Shield room

Test setup

Input Voltage	:	AC 120V, 60Hz
Operation Mode	:	A
Earthing	:	Not Connected
Ambient temperature	:	21℃
Relative humidity	:	53%
Atmospheric pressure	:	101kPa

For details refer to appendix A.

6. Photographs of the Test Set-Up

Photograph 1: Set-up for Radiated Spurious Emission up to 1GHz

Please refer to the attached setup photos.

Photograph 2: Set-up for Radiated Spurious Emission above 1GHz

Please refer to the attached setup photos.

Photograph 3: Set-up for Conducted Emission on AC Mains

Please refer to the attached setup photos.

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