FCC RADIO TEST REPORT
FCC ID:2ACNECL1839

Product：	ASTRO
Trade Name：	TAG Mobile
Model Number：	CL1839
Serial Model：	N/A
Report No.：	NTEK-2015NT03091280R1

Prepared for

TAG Mobile, LLC

1330 Capital Parkway Carrollton, TX 75006, USA

Prepared by

Shenzhen NTEK Testing Technology Co., Ltd.

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Website:www.ntek.org.cn

TEST RESULT CERTIFICATION

Applicant's name	:	TAG Mobile, LLC
Address	:	1330 Capital Parkway Carrollton, TX 75006, USA
Manufacture's Name	:	CETRIX Technologies Limited.
Address	:	13A/F South Tower, World Finance Center Harbour City, 17 Canton Road, TST KLN, Hong Kong

Product description

Product name	:	ASTRO
Model and/or type reference	:	CL1839
Serial Model：		N/A
Standards	:	FCC Part15.247: 01 Oct. 2014
Test procedure		ANSI C63.4-2003

This device described above has been tested by Shenzhen NTEK, and the test results show that the equipment under test (EUT) is in compliance with Part 15 of FCC Rules. And it is applicable only to the tested sample identified in the report.
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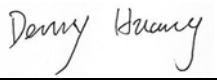
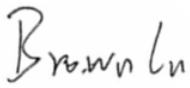
Date of Test	:	
Date (s) of performance of tests	:	09 Mar. 2015 ~18 Mar. 2015
Date of Issue	:	18 Mar. 2015
Test Result	:	**Pass**

Testing Engineer : 
(Denny Huang)

Technical Manager : 
(Brown Lu)

Authorized Signatory : 
(Bill Yao)

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1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.247) , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.247(a)(1)	Hopping Channel Separation	PASS	
15.247(b)(1)	Peak Output Power	PASS	
15.247(c)	Radiated Spurious Emission	PASS	
15.247(a)(iii)	Number of Hopping Frequency	PASS	
15.247(a)(iii)	Dwell Time	PASS	
15.247(a)(1)	Bandwidth	PASS	
15.205	Band Edge Emission	PASS	
15.203	Antenna Requirement	PASS	

1.1 TEST FACILITY

NTEK Testing Technology Co., Ltd.
Add. : 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen P.R. China
FCC Registered No.: 238937 IC Registered No.:9270A-1
CNAS Registration No.:L5516

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ± **U**，where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**，providing a level of confidence of approximately **95** %。

No.	Item	Uncertainty
1	Conducted Emission Test	±1.38dB
2	RF power,conducted	±0.16dB
3	Spurious emissions,conducted	±0.21dB
4	All emissions,radiated(<1G)	±4.68dB
5	All emissions,radiated(>1G)	±4.89dB
6	Temperature	±0.5°C
7	Humidity	±2%

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

<table>
<tr><td>Equipment</td><td>ASTRO</td></tr>
<tr><td>Trade Name</td><td>TAG Mobile</td></tr>
<tr><td>Model Name</td><td>CL1839</td></tr>
<tr><td>Serial Model</td><td>N/A</td></tr>
<tr><td>Model Difference</td><td>N/A</td></tr>
<tr><td>Product Description</td><td>The EUT is a ASTRO
<table>
<tr><td>Operation Frequency:</td><td>2402~2480 MHz</td></tr>
<tr><td>Modulation Type:</td><td>BT(1Mbps): GFSK
BT EDR(2Mbps): π/4-DQPSK
BT EDR(3Mbps): 8-DPSK</td></tr>
<tr><td>Bit Rate of Transmitter</td><td>1Mbps/2Mbps/3Mbps</td></tr>
<tr><td>Number Of Channel</td><td>79 CH</td></tr>
<tr><td>Antenna Designation:</td><td>Please see Note 3.</td></tr>
</table></td></tr>
<tr><td>Channel List</td><td>Please refer to the Note 2.</td></tr>
<tr><td>Battery</td><td>DC3.7V, 800mAh</td></tr>
<tr><td>Adapter</td><td>Mode: ASTRO CL1839
Input: 100-240V~, 50/60Hz, 0.12A
Output: 5V⎓, 350mA</td></tr>
<tr><td>Connecting I/O Port(s)</td><td>Please refer to the User's Manual</td></tr>
</table>

Note:

1. For a more detailed features description, please refer to the manufacturer’s specifications or the User's Manual.

2.

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

3.

Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	N/A	N/A	FPCB Antenna	N/A	1.0	BT Antenna

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	CH00
Mode 2	CH39
Mode 3	CH78
Mode 4	normal link

For Conducted Emission	
Final Test Mode	Description
Mode 4	normal link

For Radiated Emission	
Final Test Mode	Description
Mode 1	CH00
Mode 2	CH39
Mode 3	CH78

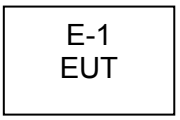
Note:

(1) The measurements are performed at the highest, middle, lowest available channels.

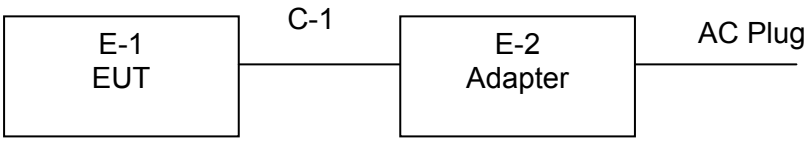
(2) The EUT use new battery.

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test



Conducted Emission Test



2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	ASTRO	TAG Mobile	CL1839	N/A	EUT
E-2	Adapter	N/A	ASTRO CL1839	N/A	

Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	120cm	

Note:

(1) The support equipment was authorized by Declaration of Confirmation.
(2) For detachable type I/O cable should be specified the length in cm in『Length』column.
(3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4407B	MY45108040	2014.07.06	2015.07.05	1 year
2	Test Receiver	R&S	ESPI	101318	2014.07.06	2015.07.05	1 year
3	Bilog Antenna	TESEQ	CBL6111D	31216	2014.07.06	2015.07.05	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2014.07.06	2015.07.05	1 year
5	Spectrum Analyzer	ADVANTEST	R3132	150900201	2014.07.06	2015.07.05	1 year
6	Horn Antenna	EM	EM-AH-10180	2011071402	2014.07.06	2015.07.05	1 year
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2014.07.06	2015.07.05	1 year
8	Amplifier	EM	EM-30180	060538	2014.07.06	2015.07.05	1 year
9	Loop Antenna	ARA	PLA-1030/B	1029	2014.07.06	2015.07.05	1 year
10	Power Meter	R&S	NRVS	100696	2014.07.06	2015.07.05	1 year
11	Power Sensor	R&S	URV5-Z4	0395.1619.05	2014.07.06	2015.07.05	1 year

Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Test Receiver	R&S	ESCI	101160	2014.07.06	2015.07.05	1 year
2	LISN	R&S	ENV216	101313	2014.07.06	2015.07.05	1 year
3	LISN	EMCO	3816/2	00042990	2014.07.06	2015.07.05	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2014.07.06	2015.07.05	1 year
5	Passive Voltage Probe	R&S	ESH2-Z3	100196	2014.07.06	2015.07.05	1 year
6	Absorbing clamp	R&S	MOS-21	100423	2014.07.06	2015.07.05	1 year

1	Attenuation	MCE	24-10-34	BN9258	2014.07.06	2015.07.05	1 year

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)		Standard
	Quasi-peak	Average	Quasi-peak	Average	
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	CISPR
0.50 -5.0	73.00	60.00	56.00	46.00	CISPR
5.0 -30.0	73.00	60.00	60.00	50.00	CISPR

0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	73.00	60.00	56.00	46.00	FCC
5.0 -30.0	73.00	60.00	60.00	50.00	FCC

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

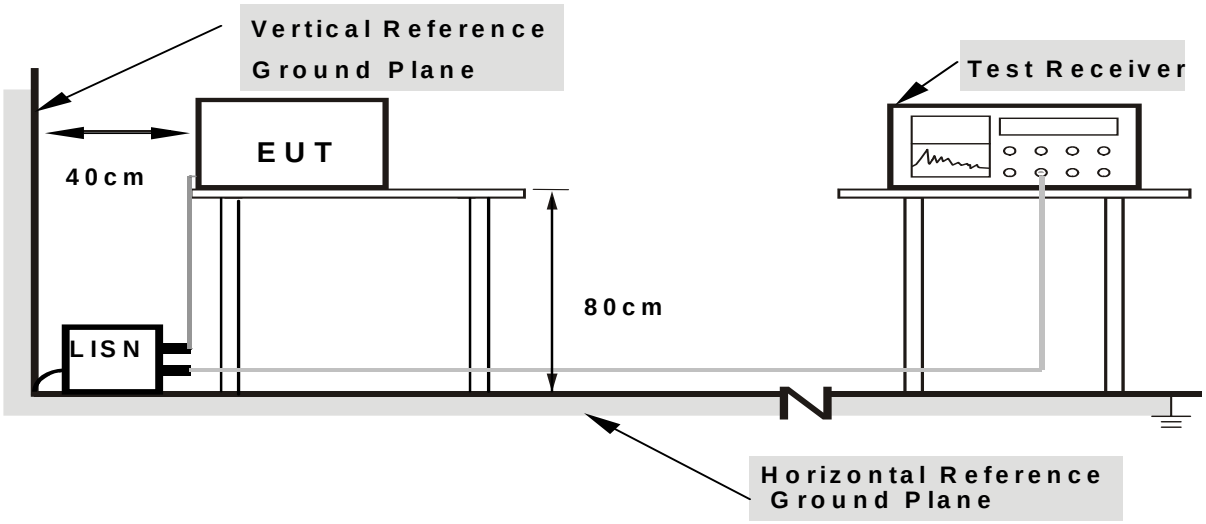
3.1.2 TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 DEVIATION FROM TEST STANDARD

No deviation

3.1.4 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

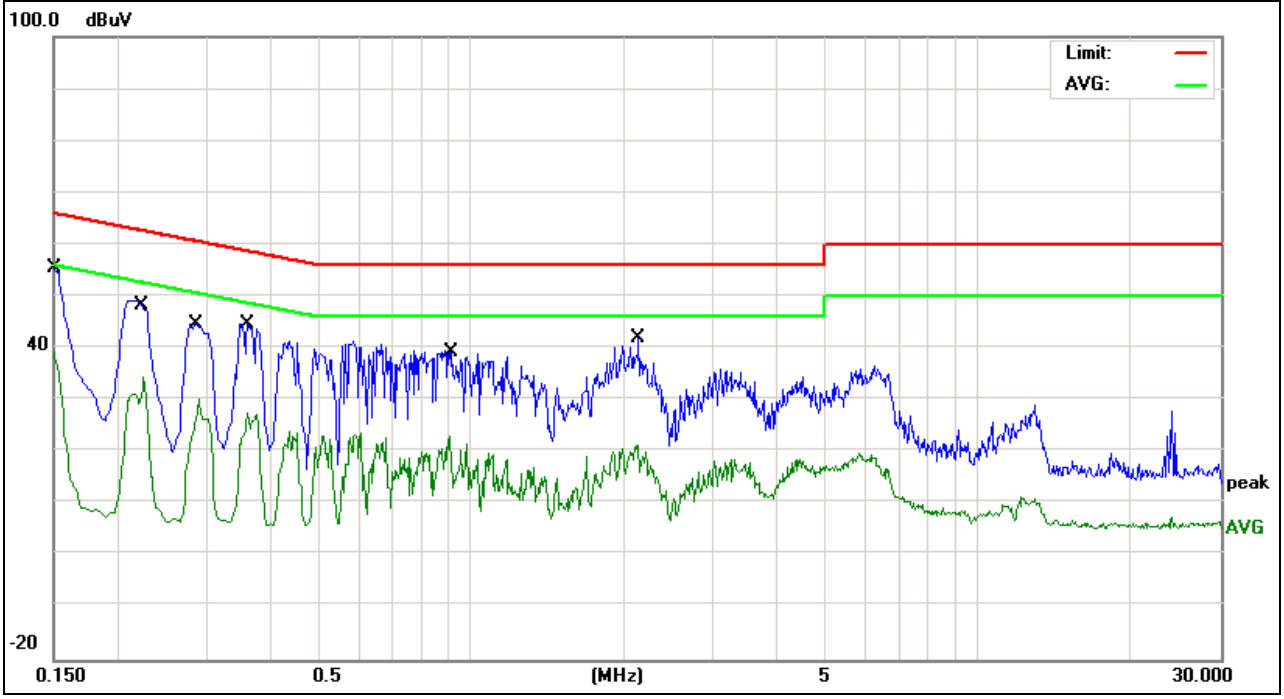
3.1.6 TEST RESULTS

EUT：	ASTRO	Model Name ：	CL1839
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010hPa	Phase：	L
Test Voltage ：	DC 5.0V from adapter AC 120V/60Hz	Test Mode：	Mode 4

Frequency (MHz)	Reading Level (dBμV)	Correct Factor (dB)	Measure-ment (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.1500	45.75	9.63	55.38	65.99	-10.61	QP
0.1500	29.60	9.63	39.23	55.99	-16.76	AVG
0.2260	39.63	9.64	49.27	62.59	-13.32	QP
0.2260	24.79	9.64	34.43	52.59	-18.16	AVG
0.2900	35.05	9.73	44.78	60.52	-15.74	QP
0.2900	20.41	9.73	30.14	50.52	-20.38	AVG
0.3620	35.19	9.51	44.70	58.68	-13.98	QP
0.3620	17.93	9.51	27.44	48.68	-21.24	AVG
0.9060	29.82	9.74	39.56	56.00	-16.44	QP
0.9060	13.21	9.74	22.95	46.00	-23.05	AVG
2.1180	30.76	9.65	40.41	56.00	-15.59	QP
2.1180	11.66	9.65	21.31	46.00	-24.69	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

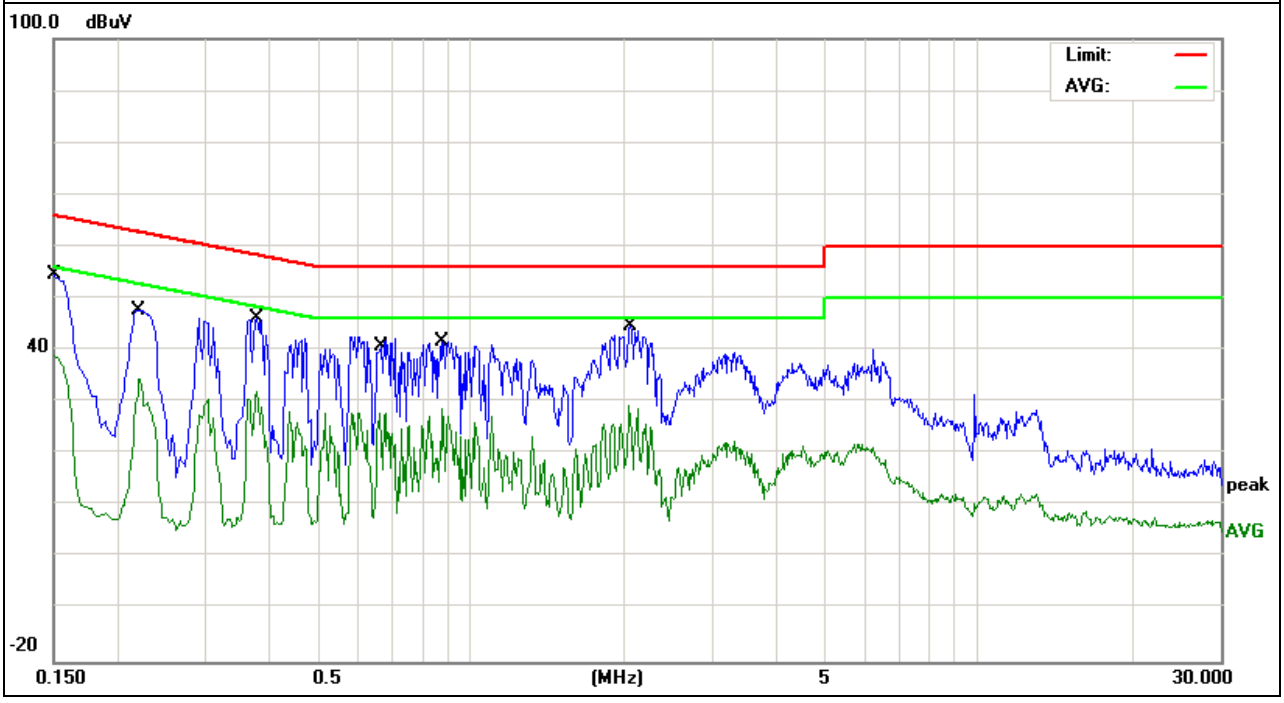


EUT：	ASTRO	Model Name ：	CL1839
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010hPa	Phase：	N
Test Voltage ：	DC 5.0V from adapter AC 120V/60Hz	Test Mode：	Mode 4

Frequency	Reading Level	Correct Factor	Measure-ment	Limits	Margin	Remark
(MHz)	(dBμV)	(dB)	(dBμV)	(dBμV)	(dB)	
0.1500	44.91	9.60	54.51	65.99	-11.48	QP
0.1500	29.41	9.60	39.01	55.99	-16.98	AVG
0.2220	37.92	9.62	47.54	62.74	-15.20	QP
0.2220	24.74	9.62	34.36	52.74	-18.38	AVG
0.3780	36.25	9.63	45.88	58.32	-12.44	QP
0.3780	22.33	9.63	31.96	48.32	-16.36	AVG
0.6580	30.69	9.65	40.34	56.00	-15.66	QP
0.6580	18.33	9.65	27.98	46.00	-18.02	AVG
0.8780	31.71	9.63	41.34	56.00	-14.66	QP
0.8780	19.20	9.63	28.83	46.00	-17.17	AVG
2.0460	33.09	9.54	42.63	56.00	-13.37	QP
2.0460	19.78	9.54	29.32	46.00	-16.68	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

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

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	(dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. 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 Quasi Peak detector mode re-measured.
e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

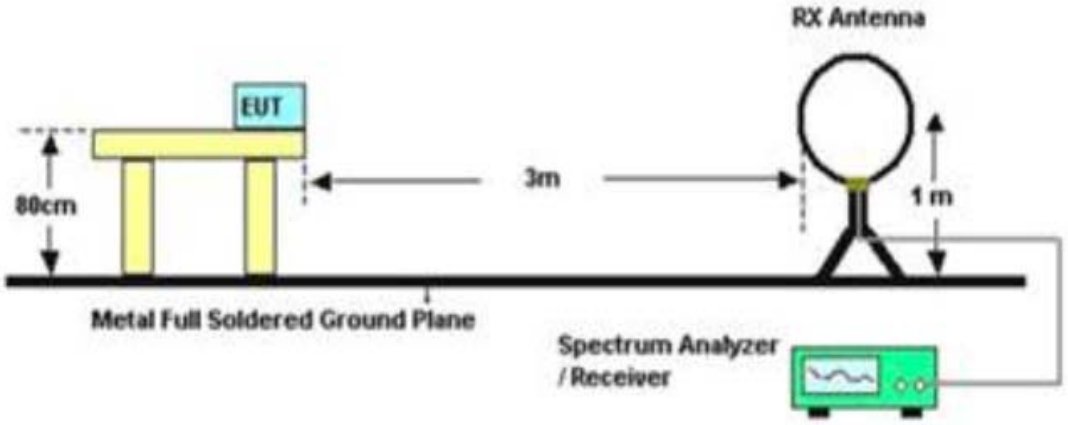
Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	QP	120 kHz	300 kHz
Above 1000	Peak	1 MHz	1 MHz
	Peak	1 MHz	10 Hz

3.2.3 DEVIATION FROM TEST STANDARD

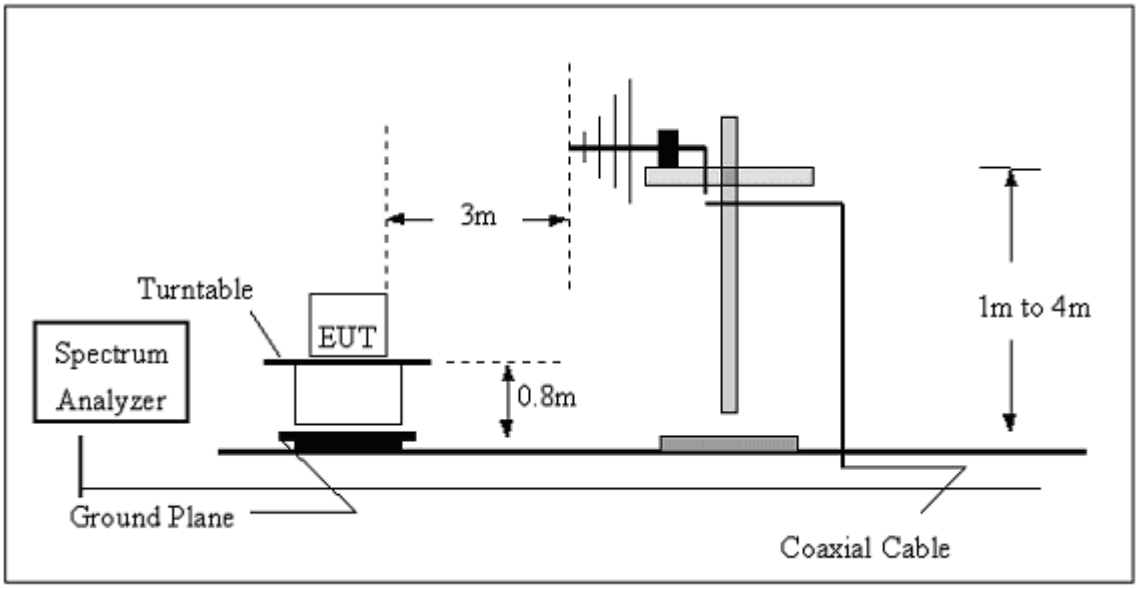
No deviation

3.2.4 TEST SETUP

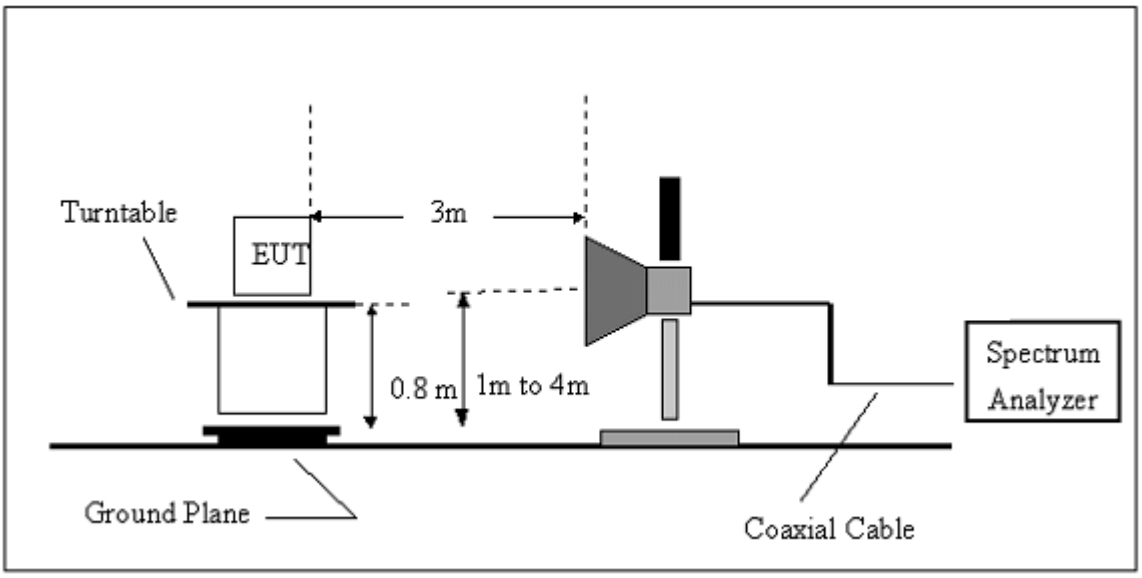
（A）Radiated Emission Test-Up Frequency Below 30MHz



（B）Radiated Emission Test-Up Frequency 30MHz~1GHz



（C）Radiated Emission Test-Up Frequency Above 1GHz



3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.6 TEST RESULTS (BELOW 30 MHZ)

EUT：	ASTRO	Model Name ：	CL1839
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 3.7V
Test Mode ：	TX	Polarization :	---

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	P
--	--	--	--	P

NOTE:
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =20 log (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

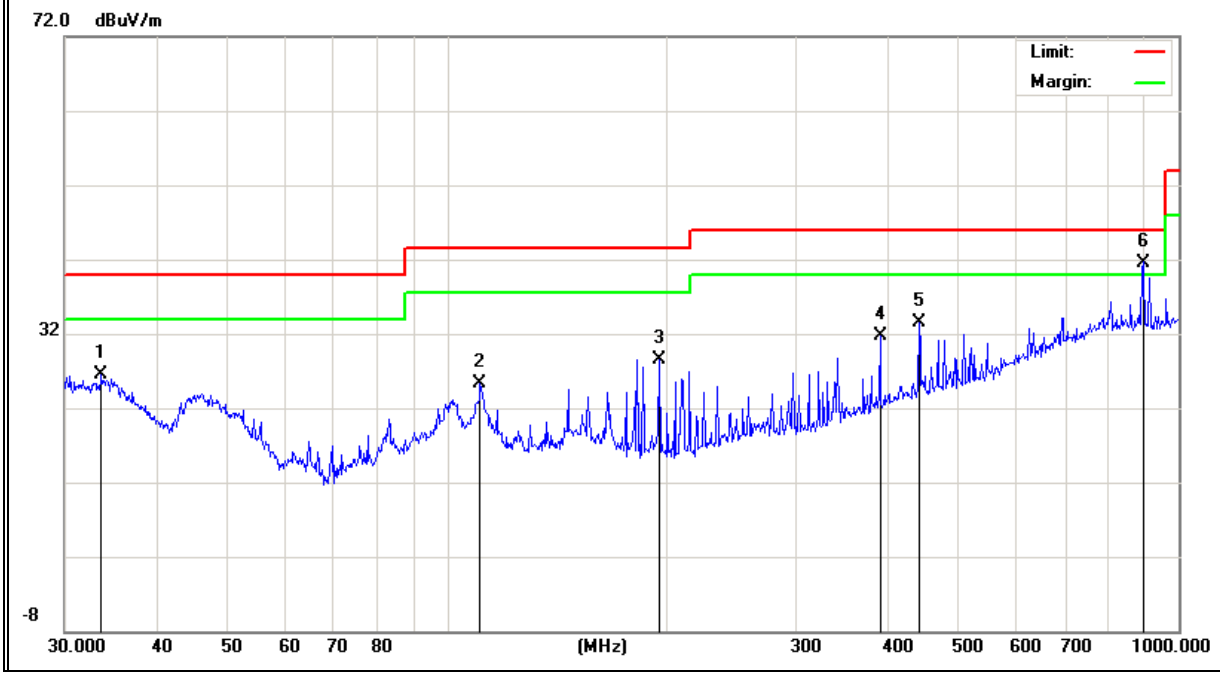
3.2.7 TEST RESULTS (BETWEEN 30M – 1000 MHZ)

EUT：	ASTRO	Model Name ：	CL1839
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010hPa	Test Mode：	TX
Test Voltage ：	DC 3.7V		

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
V	33.6802	9.01	17.41	26.42	40.00	-13.58	QP
V	110.957	15.08	10.16	25.24	43.50	-18.26	QP
V	195.1365	17.77	10.74	28.51	43.50	-14.99	QP
V	390.7225	13.79	17.93	31.72	46.00	-14.28	QP
V	441.7425	14.31	19.14	33.45	46.00	-12.55	QP
V	893.8567	14.57	27.03	41.60	46.00	-4.40	QP

Remark:

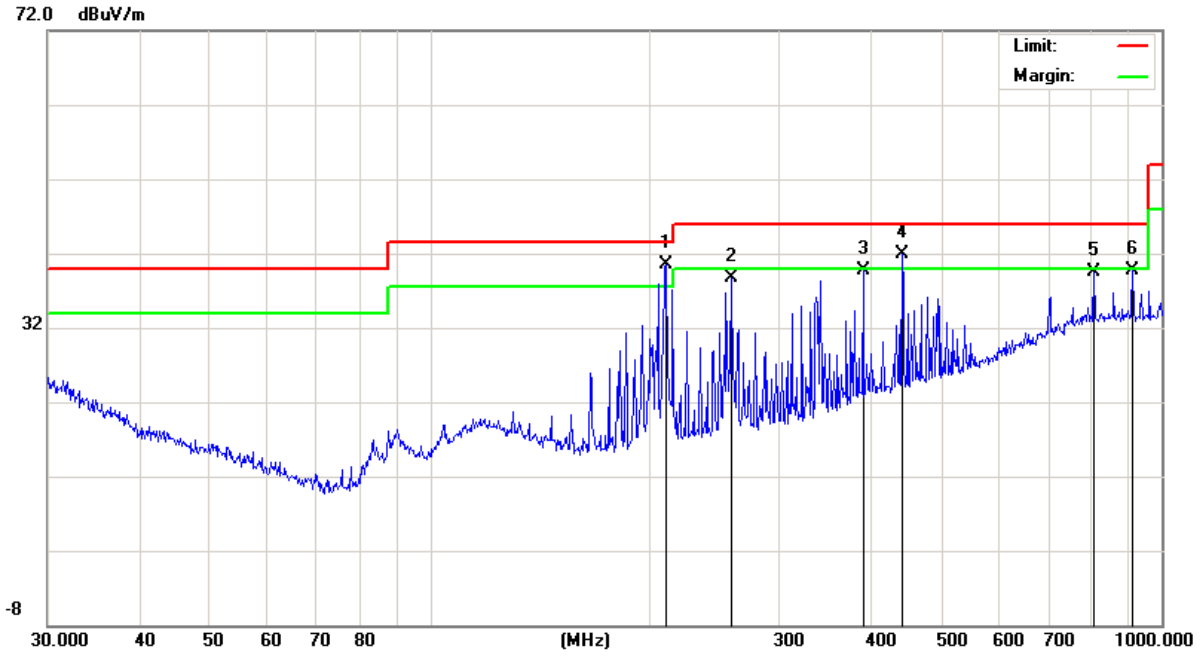
Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit



Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
H	210.0482	29.00	11.46	40.46	43.50	-3.04	QP
H	258.3263	24.95	13.68	38.63	46.00	-7.37	QP
H	390.7226	21.84	17.93	39.77	46.00	-6.23	QP
H	441.7426	22.81	19.14	41.95	46.00	-4.05	QP
H	807.4291	12.07	27.38	39.45	46.00	-6.55	QP
H	912.8620	12.57	27.09	39.66	46.00	-6.34	QP

Remark:

Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit



3.2.8 **TEST RESULTS (ABOVE 1000 MHZ)**

EUT：	ASTRO	Model Name ：	CL1839
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010hPa	Test Mode：	TX
Test Mode ：	DC 3.7V		

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark	Comment
Low Channel (2402 MHz)-Above 1G							
4804.244	59.59	-3.64	55.95	74.00	-18.05	Pk	Vertical
4804.244	42.13	-3.64	38.49	54.00	-15.51	AV	Vertical
7206.158	53.01	-0.95	52.06	74.00	-21.94	Pk	Vertical
7206.158	38.07	-0.95	37.12	54.00	-16.88	AV	Vertical
4804.362	60.24	-3.64	56.60	74.00	-17.40	Pk	Horizontal
4804.362	42.07	-3.64	38.43	54.00	-15.57	AV	Horizontal
7206.211	54.31	-0.95	53.36	74.00	-20.64	Pk	Horizontal
7206.211	38.63	-0.95	37.68	54.00	-16.32	AV	Horizontal
Mid Channel (2441 MHz)-Above 1G							
4882.052	59.03	-3.68	55.35	74.00	-18.65	Pk	Vertical
4882.052	39.46	-3.68	35.78	54.00	-18.22	AV	Vertical
7323.148	55.52	-0.82	54.70	74.00	-19.30	Pk	Vertical
7323.148	40.31	-0.82	39.49	54.00	-14.51	AV	Vertical
4882.263	58.03	-3.68	54.35	74.00	-19.65	Pk	Horizontal
4882.263	39.17	-3.68	35.49	54.00	-18.51	AV	Horizontal
7323.305	55.45	-0.82	54.63	74.00	-19.37	Pk	Horizontal
7323.305	39.58	-0.82	38.76	54.00	-15.24	AV	Horizontal
High Channel (2480 MHz)- Above 1G							
4960.215	58.39	-3.59	54.80	74.00	-19.20	Pk	Vertical
4960.215	41.23	-3.59	37.64	54.00	-16.36	AV	Vertical
7440.237	52.86	-0.68	52.18	74.00	-21.82	Pk	Vertical
7440.237	37.41	-0.68	36.73	54.00	-17.27	AV	Vertical
4960.085	57.22	-3.59	53.63	74.00	-20.37	Pk	Horizontal
4960.085	39.39	-3.59	35.80	54.00	-18.20	AV	Horizontal
7440.144	52.73	-0.68	52.05	74.00	-21.95	Pk	Horizontal
7440.144	36.59	-0.68	35.91	54.00	-18.09	AV	Horizontal

Note: Mode 3Mbps is the worst mode.

4. NUMBER OF HOPPING CHANNEL

4.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)(iii)	Number of Hopping Channel	≥15	2400-2483.5	PASS

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	= the frequency band of operation
RB	RBW=100kHz
VB	VBW ≥ RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

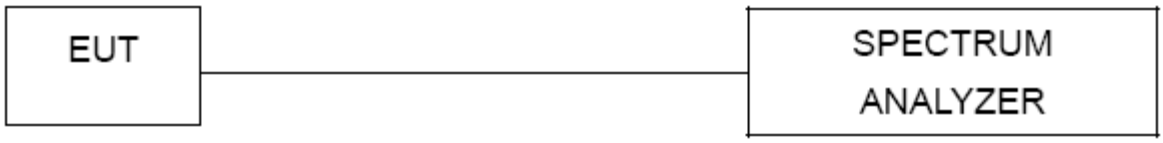
4.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting : RBW= 100kHz, VBW=100kHz, Sweep time = Auto.

4.1.2 DEVIATION FROM STANDARD

No deviation.

4.1.3 TEST SETUP



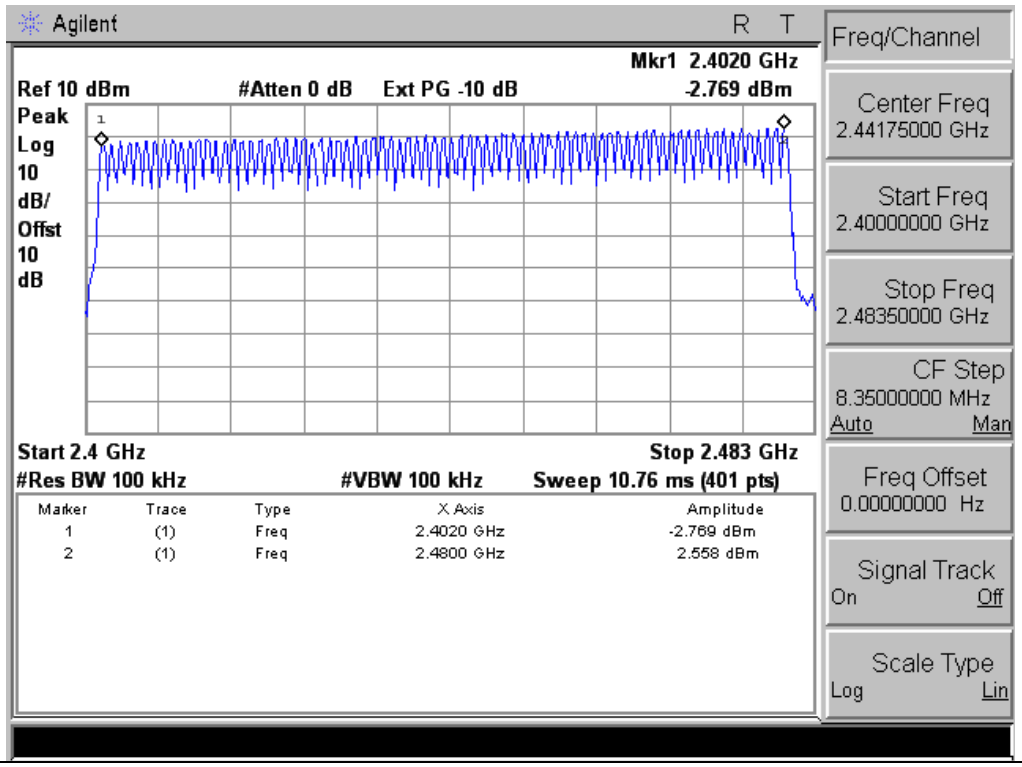
4.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

4.1.5 TEST RESULTS

EUT：	ASTRO	Model Name ：	CL1839
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1015 hPa	Test Voltage ：	DC 3.7V
Test Mode ：	Hopping Mode		

Number of Hopping Channel	79



5. AVERAGE TIME OF OCCUPANCY

5.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)(iii)	Average Time of Occupancy	0.4sec	2400-2483.5	PASS

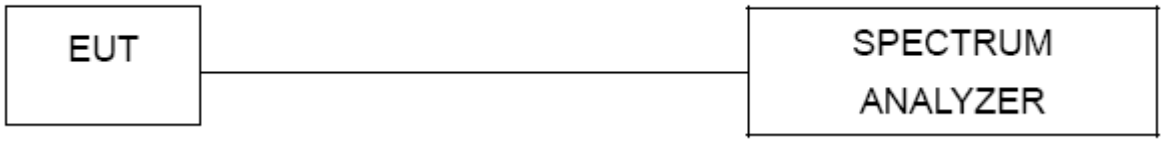
5.1.1 TEST PROCEDURE

a. The transmitter output (antenna port) was connected to the spectrum analyzer
b. Set RBW of spectrum analyzer to 1MHz and VBW to 3MHz.
c. Use a video trigger with the trigger level set to enable triggering only on full pulses.
d. Sweep Time is more than once pulse time.
e. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
f. Measure the maximum time duration of one single pulse.
g. Set the EUT for DH5, DH3 and DH1 packet transmitting.
h. Measure the maximum time duration of one single pulse.
i. A Period Time = (channel number)*0.4
DH1 Time Slot: Reading * (1600/2)*31.6/(channel number)
DH3 Time Slot: Reading * (1600/4)*31.6/(channel number)
DH5 Time Slot: Reading * (1600/6)*31.6/(channel number)

5.1.2 DEVIATION FROM STANDARD

No deviation.

5.1.3 TEST SETUP



5.1.4 EUT OPERATION CONDITIONS

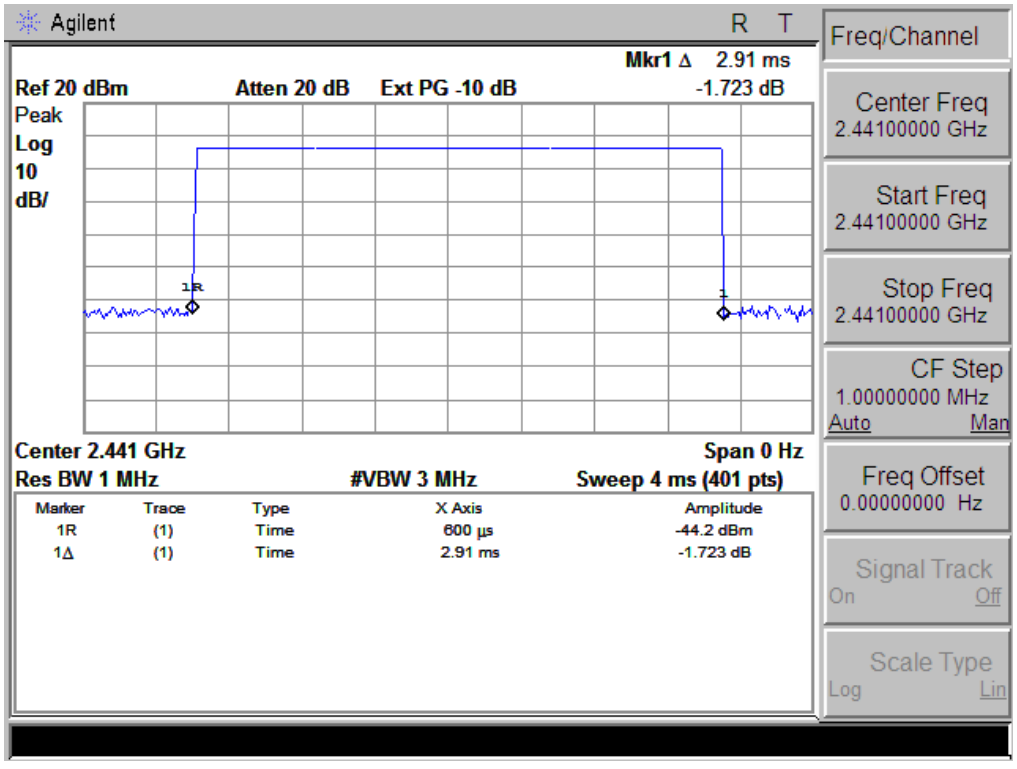
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

5.1.5 TEST RESULTS

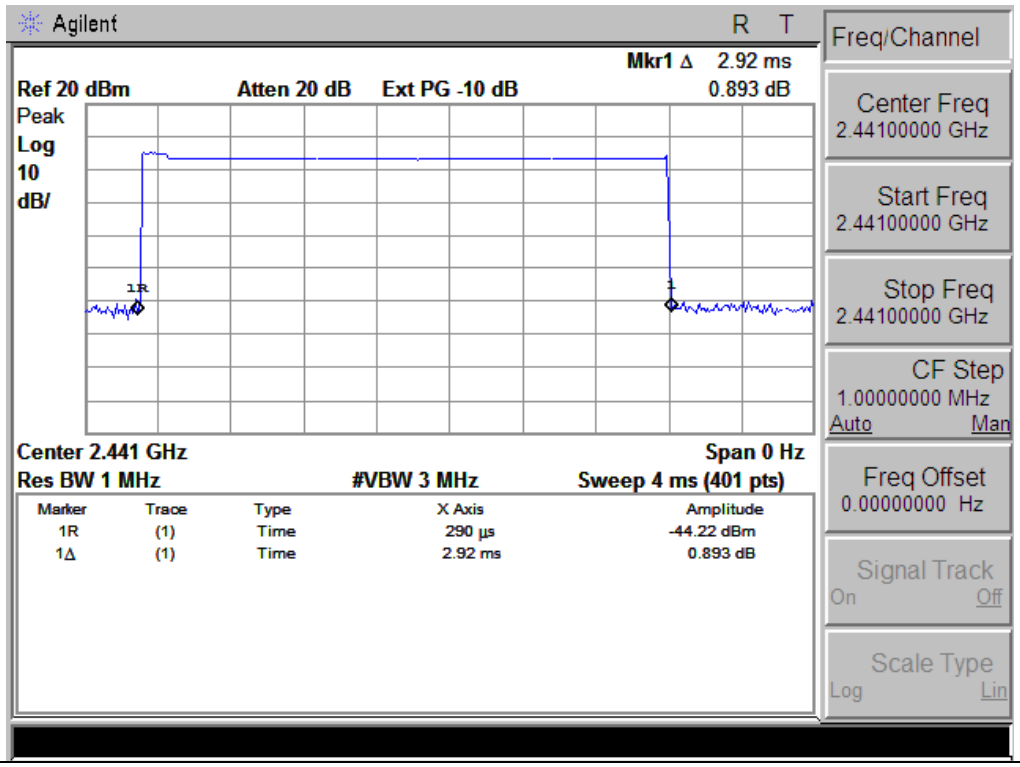
EUT：	ASTRO	Model Name ：	CL1839
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 3.7V
Test Mode ：	CH39-DH5 ,2DH5,3DH5		

Data Packet	Frequency	Pulse Duration	Dwell Time	Limits
		(ms)	(s)	(s)
DH5	2441 MHz	2.91	0.31	0.4
2DH5	2441 MHz	2.92	0.31	0.4
3DH5	2441 MHz	2.93	0.31	0.4

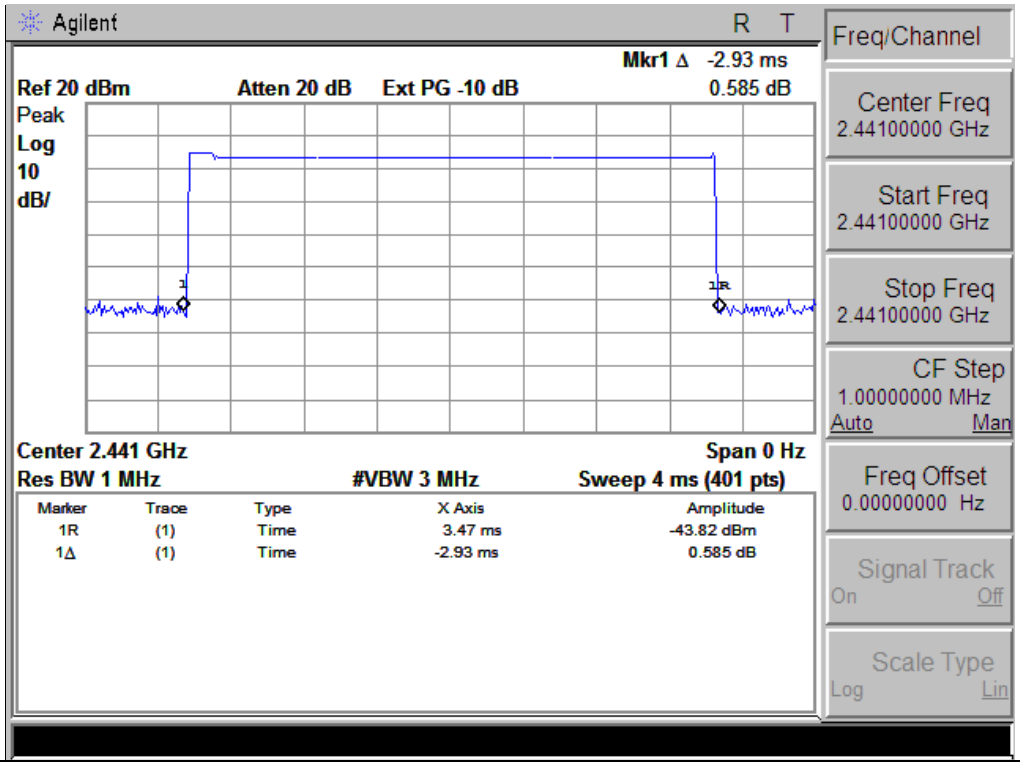
CH39-DH5



CH39-2DH5



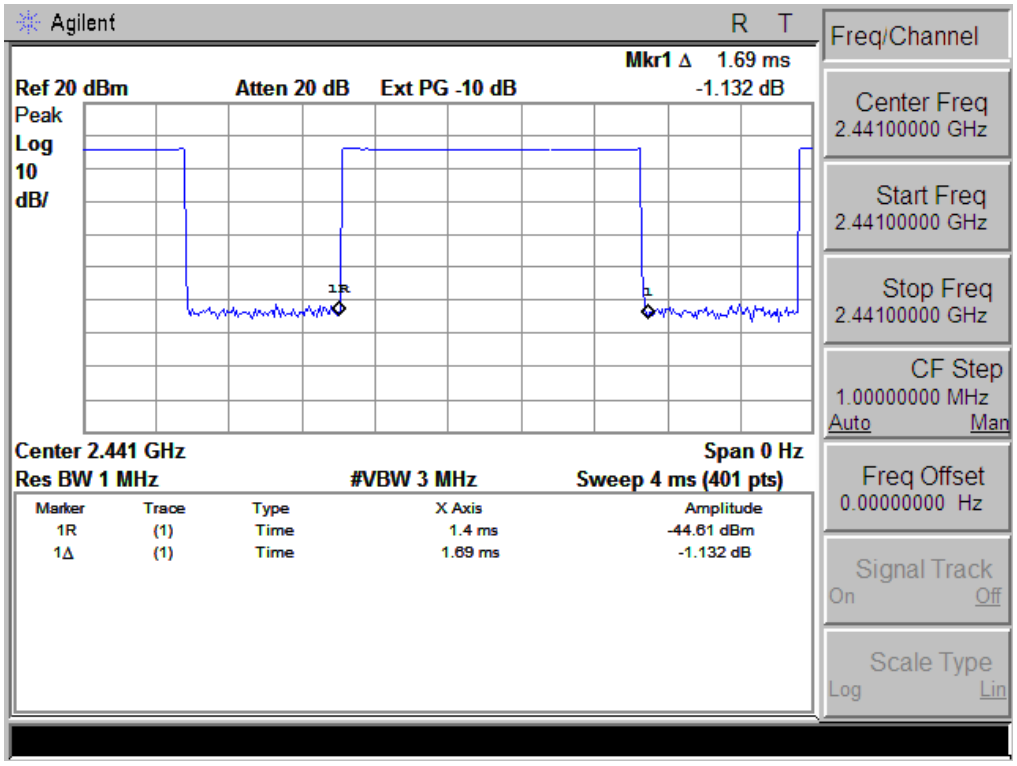
CH39-3DH5



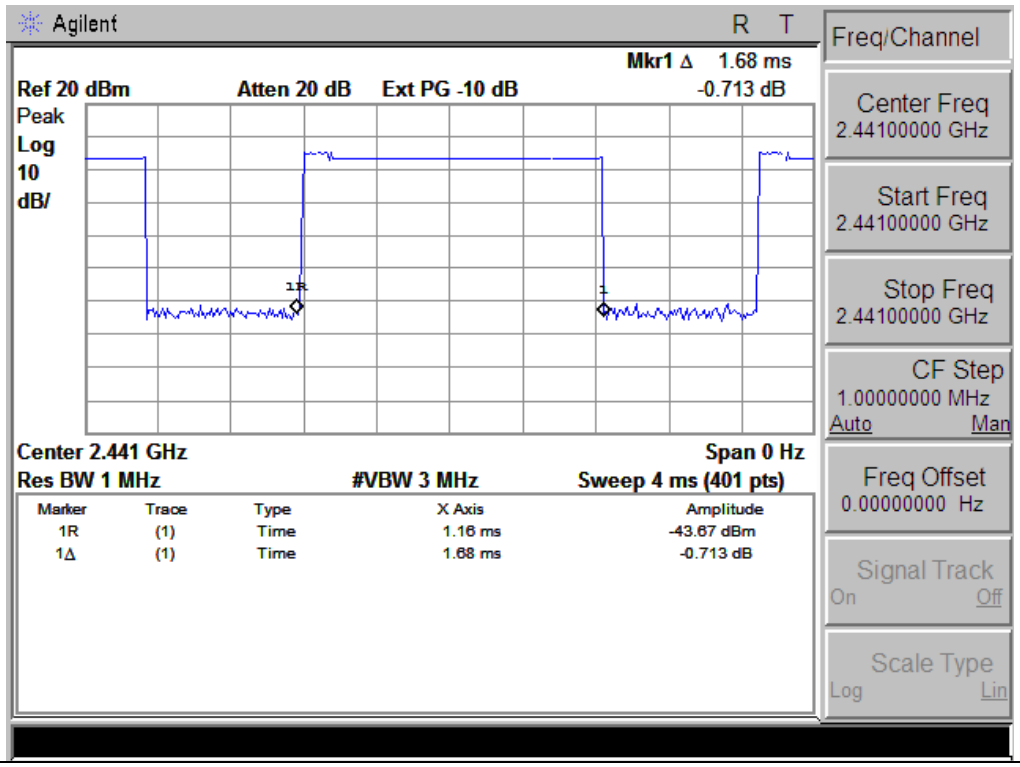
EUT：	ASTRO	Model Name ：	CL1839
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 3.7V
Test Mode ：	CH39-DH3,2DH3,3DH3		

Data Packet	Frequency	Pulse Duration	Dwell Time	Limits
		(ms)	(s)	(s)
DH3	2441 MHz	1.69	0.27	0.4
2DH3	2441 MHz	1.68	0.27	0.4
3DH3	2441 MHz	1.68	0.27	0.4

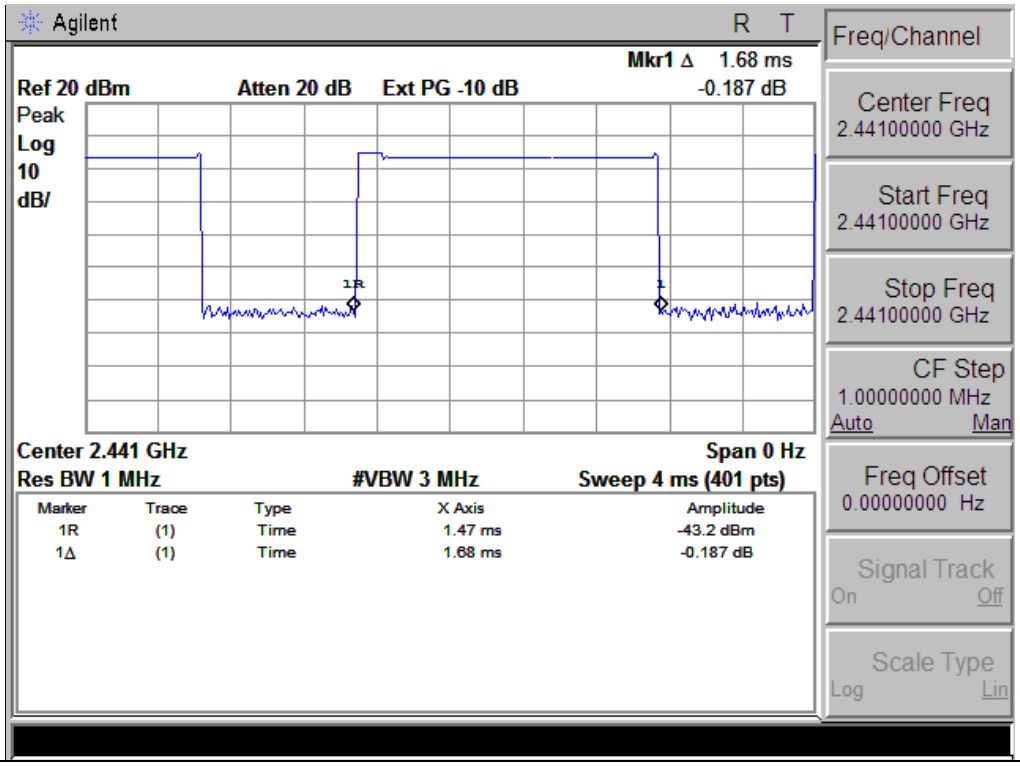
CH39-DH3



CH39-2DH3



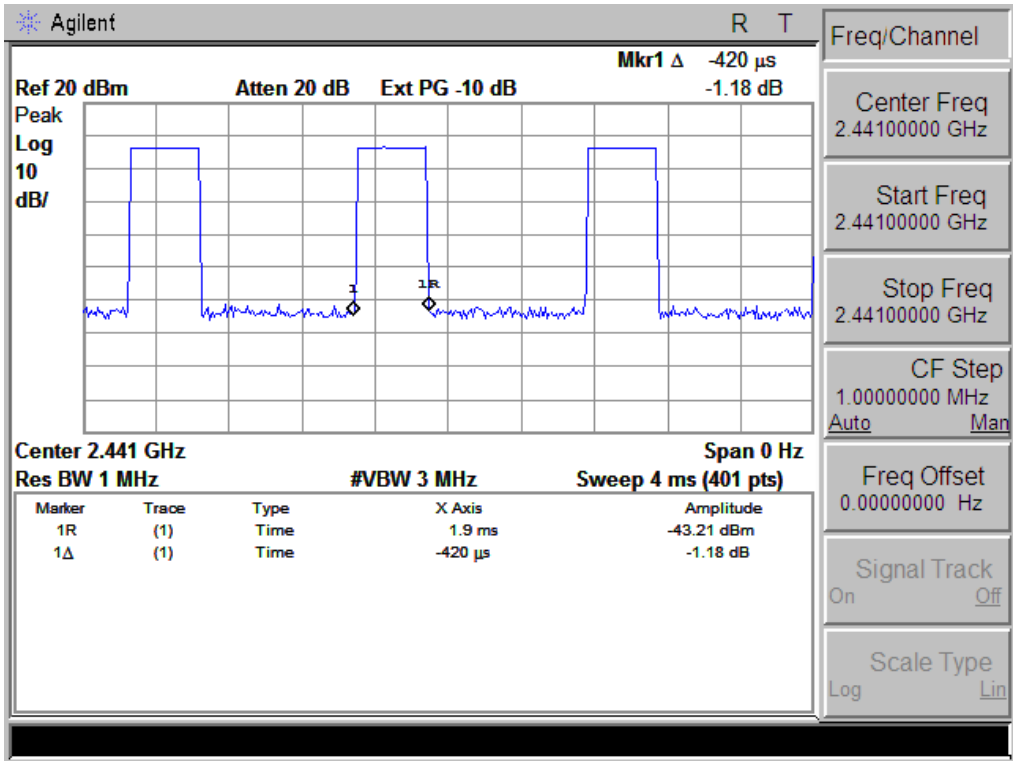
CH39-3DH3



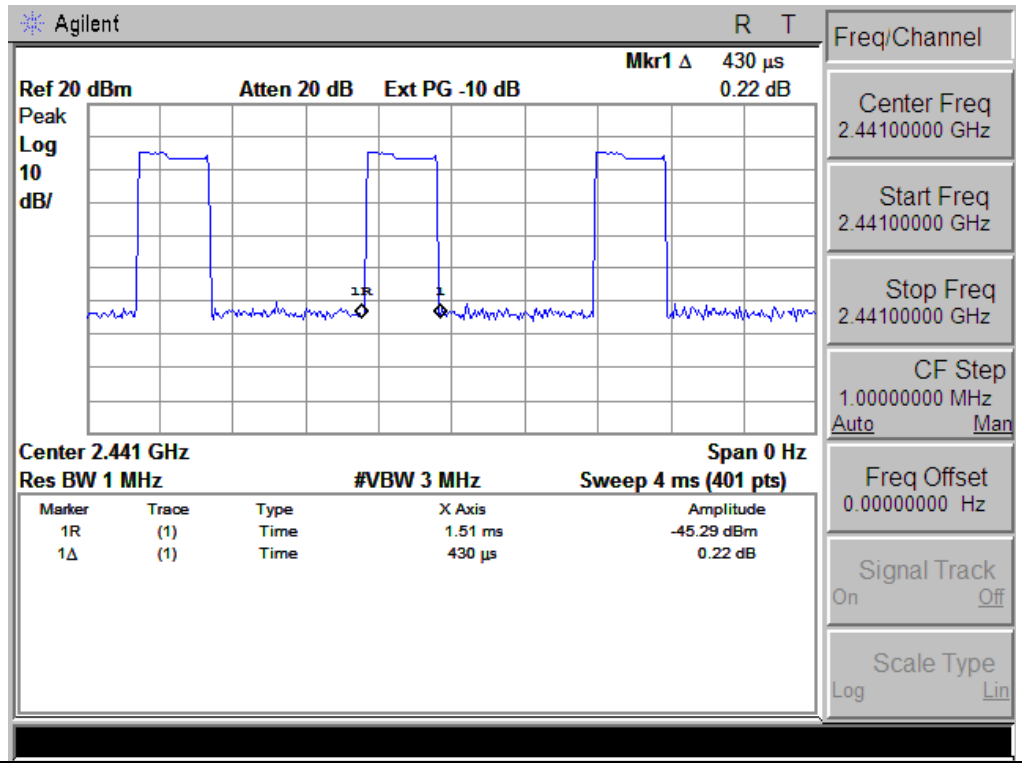
EUT：	ASTRO	Model Name ：	CL1839
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 3.7V
Test Mode ：	CH39-DH1,2DH1,3DH1		

Data Packet	Frequency	Pulse Duration	Dwell Time	Limits
		(ms)	(s)	(s)
DH1	2441 MHz	0.42	0.13	0.4
2DH1	2441 MHz	0.43	0.14	0.4
3DH1	2441 MHz	0.42	0.13	0.4

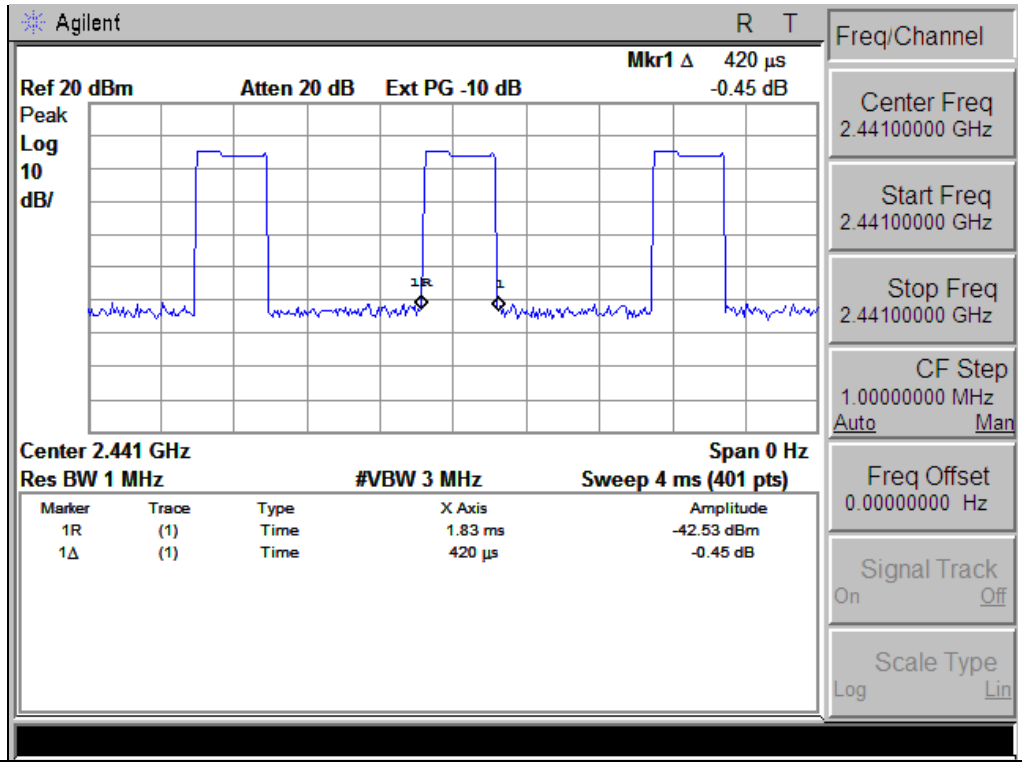
CH39-DH1



CH39-2DH1



CH39-3DH1



6. HOPPING CHANNEL SEPARATION MEASUREMENT

6.1 APPLIED PROCEDURES / LIMIT

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	30 kHz (Channel Separation)
VB	100 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

6.1.1 TEST PROCEDURE

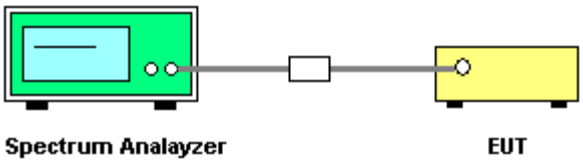
a. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.

b. The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for channel separation measurement.

6.1.2 DEVIATION FROM STANDARD

No deviation.

6.1.3 TEST SETUP



6.1.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

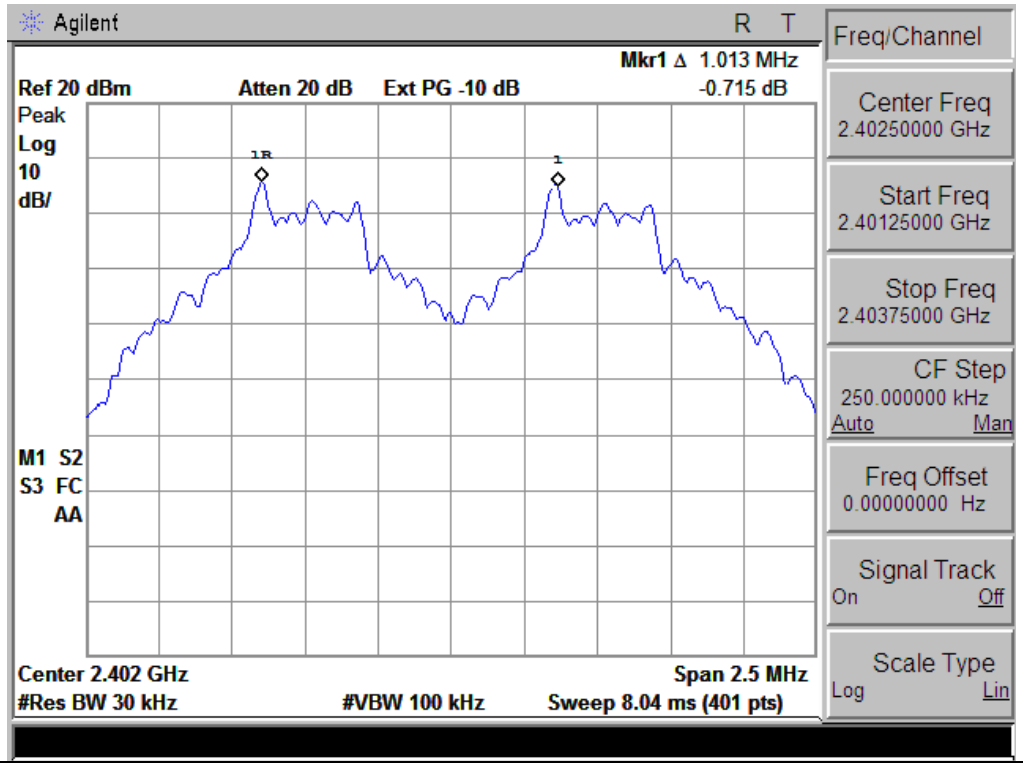
6.1.5 TEST RESULTS

EUT：	ASTRO	Model Name ：	CL1839
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 3.7V
Test Mode ：	CH00 / CH39 /CH78 (1Mbps Mode)		

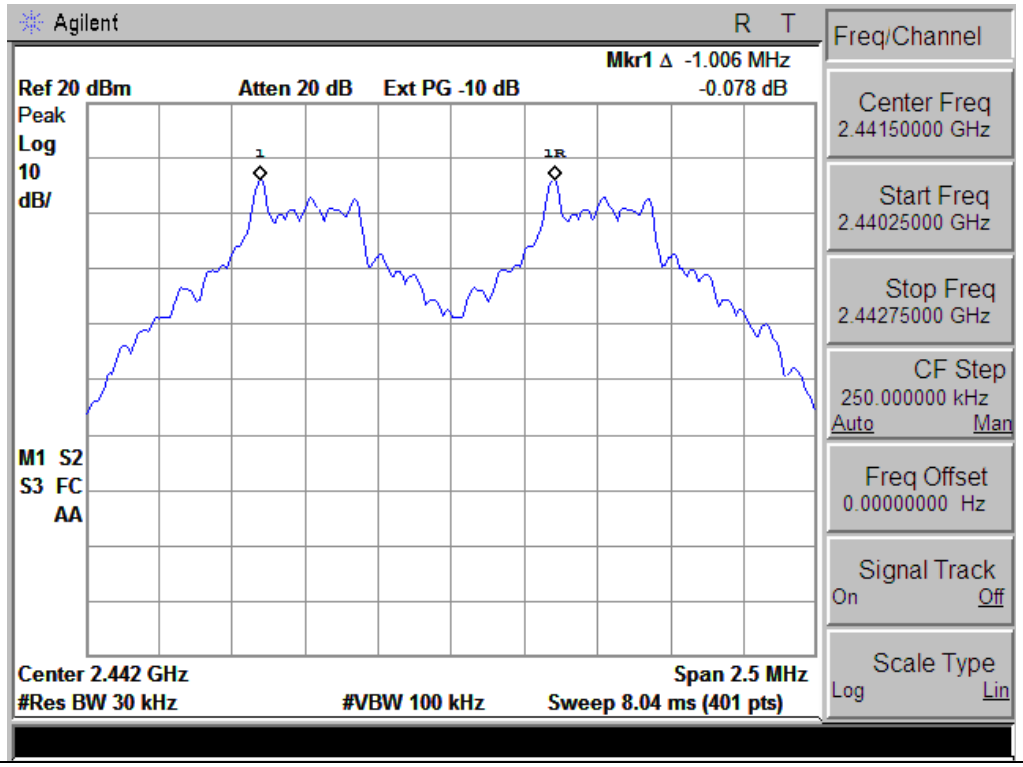
Frequency	Ch. Separation (MHz)	Result
2402 MHz	1.013	**Complies**
2441 MHz	1.006	**Complies**
2480 MHz	1.006	**Complies**

Ch. Separation Limits: > 20dB bandwidth

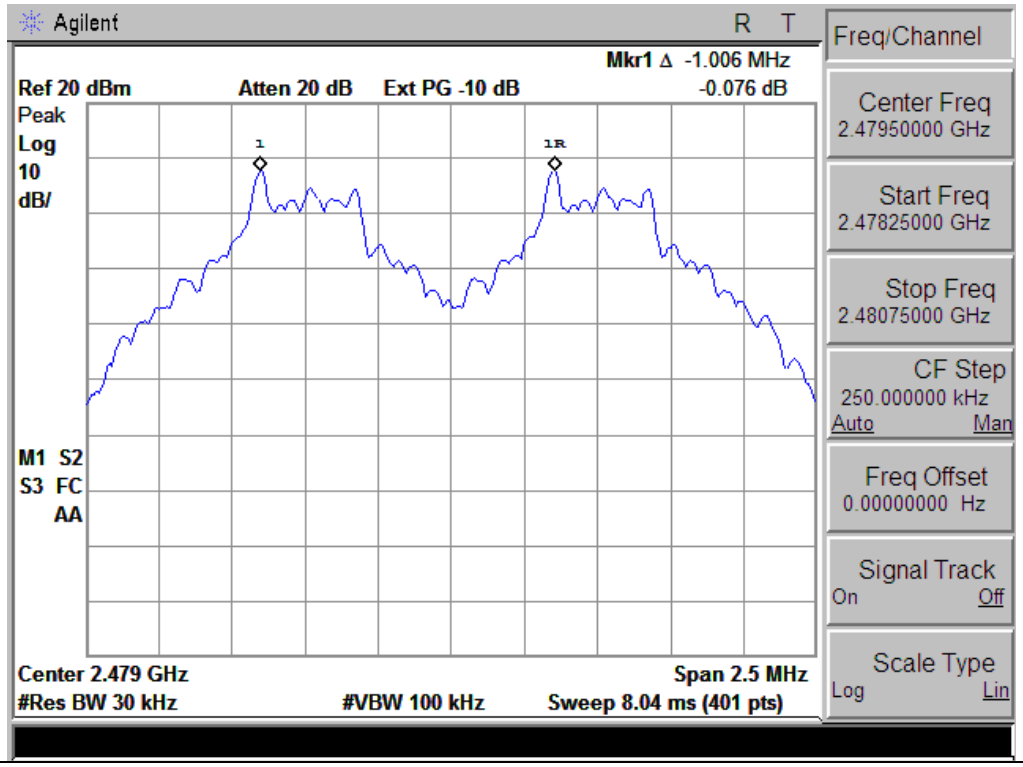
CH00 -1Mbps



CH39 -1Mbps



CH78 -1Mbps

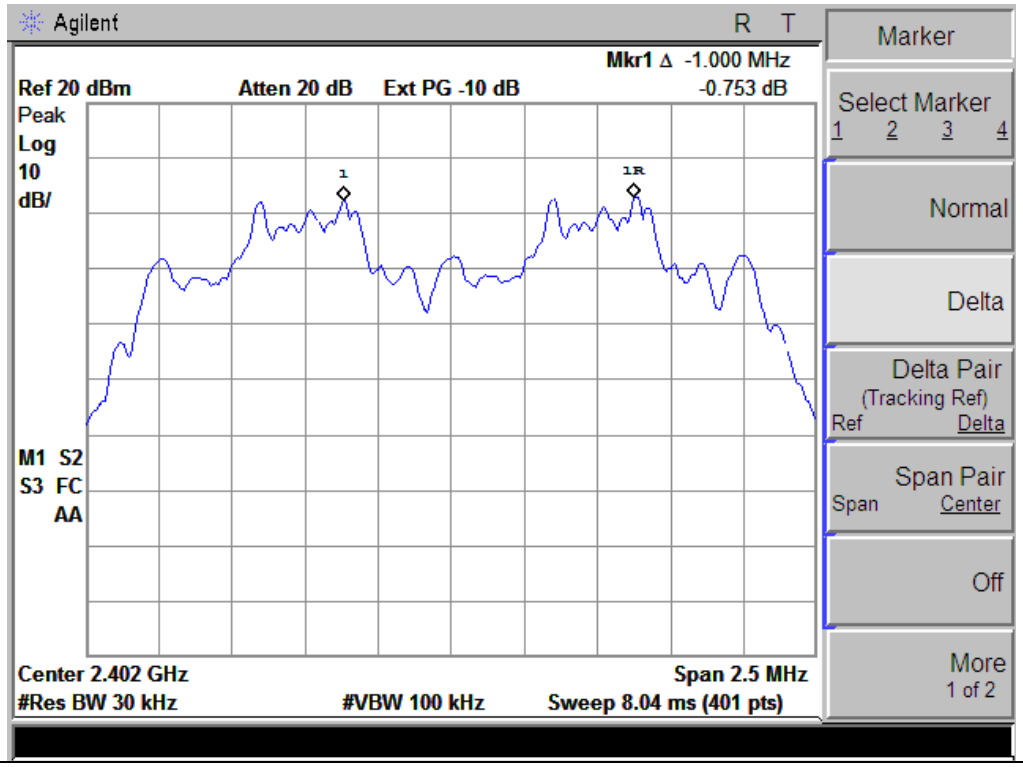


EUT：	ASTRO	Model Name ：	CL1839
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 3.7V
Test Mode ：	CH00 / CH39 /CH78 (2Mbps Mode)		

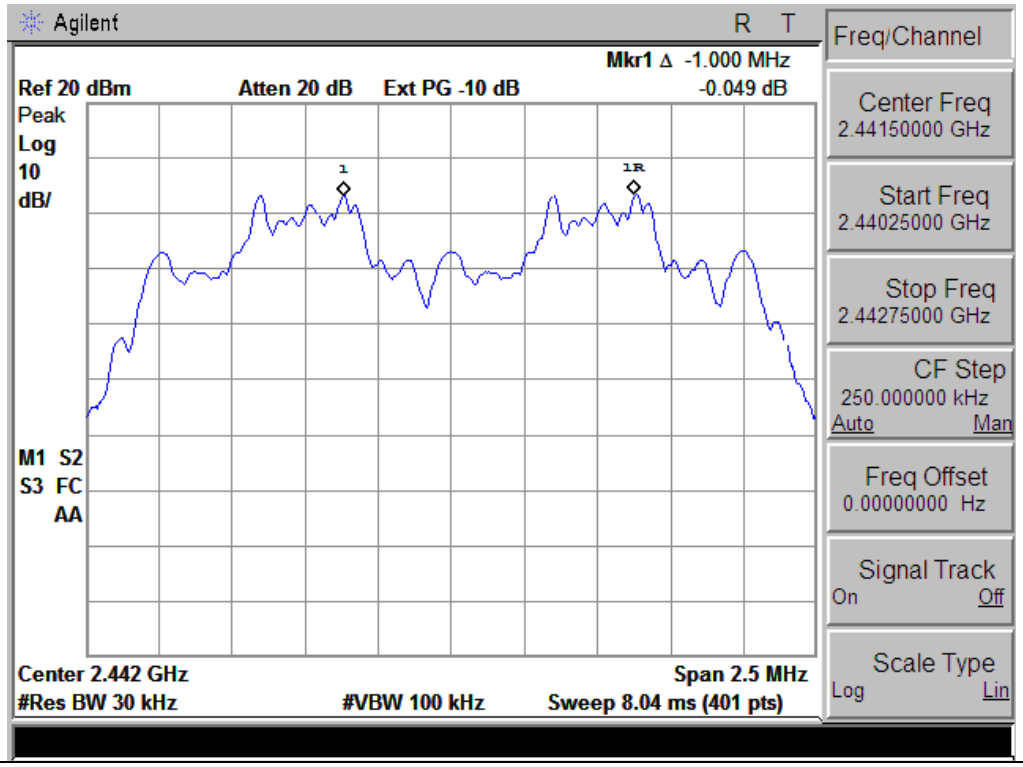
Frequency	Ch. Separation (MHz)	Result
2402 MHz	1.000	**Complies**
2441 MHz	1.000	**Complies**
2480 MHz	1.000	**Complies**

Ch. Separation Limits: >2/3 of 20dB bandwidth

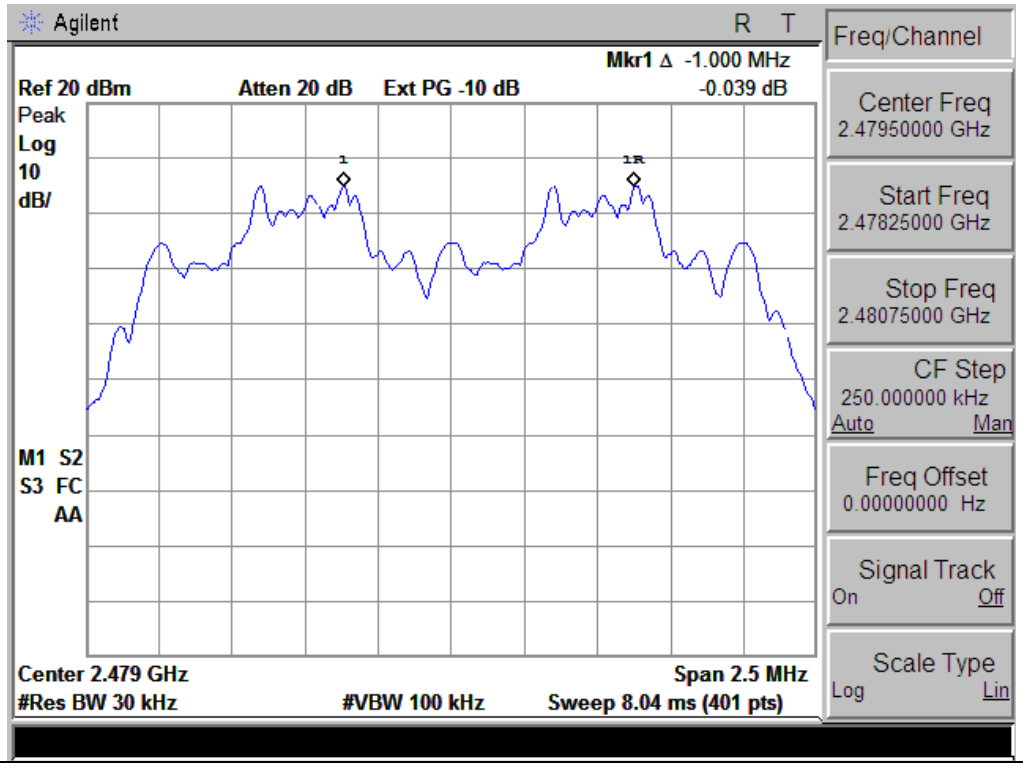
CH00 -2Mbps



CH39 -2Mbps



CH78 -2Mbps

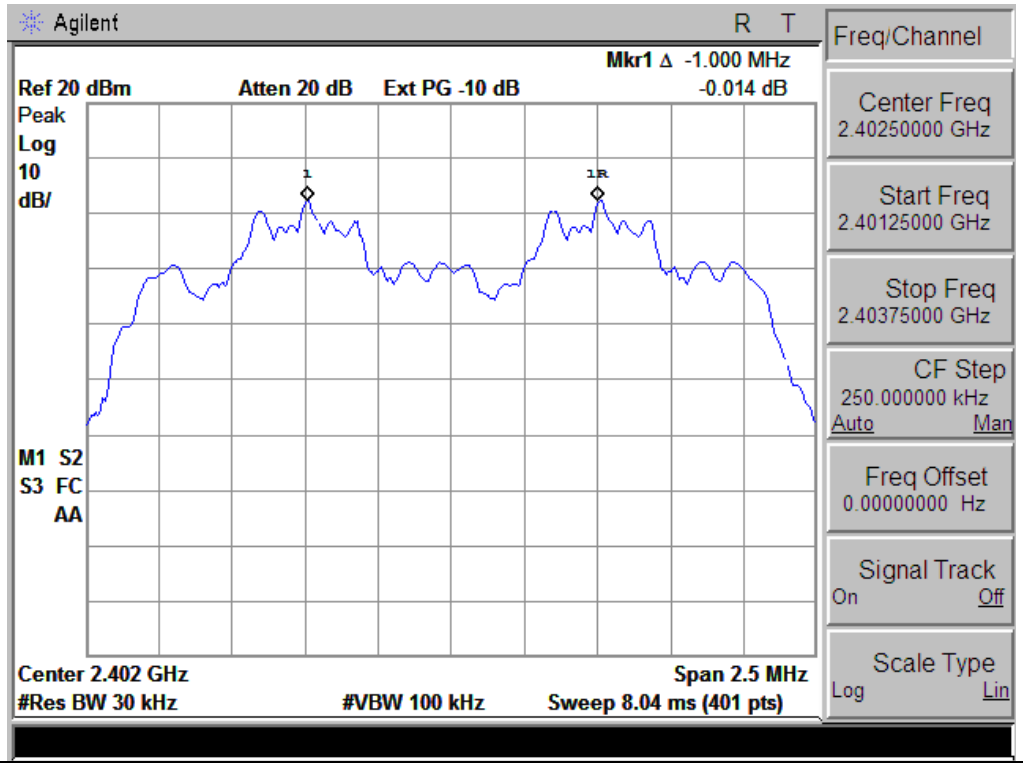


EUT：	ASTRO	Model Name ：	CL1839
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 3.7V
Test Mode ：	CH00 / CH39 /CH78 (3Mbps Mode)		

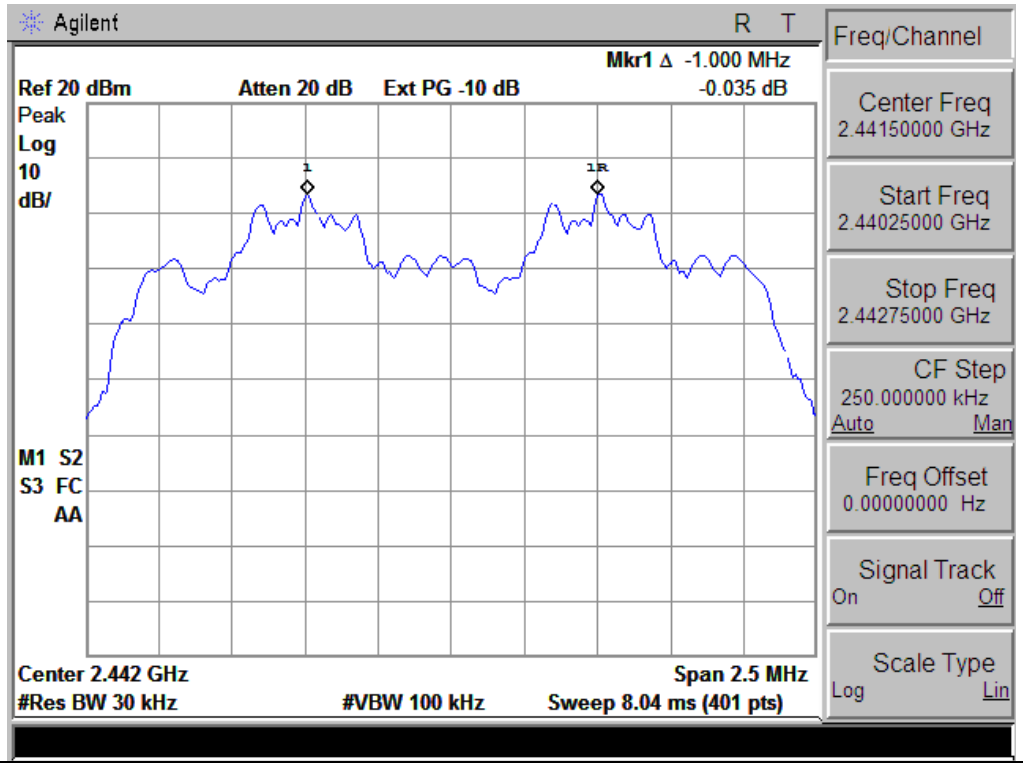
Frequency	Ch. Separation (MHz)	Result
2402 MHz	1.000	**Complies**
2441 MHz	1.000	**Complies**
2480 MHz	1.000	**Complies**

Ch. Separation Limits: >2/3 of 20dB bandwidth

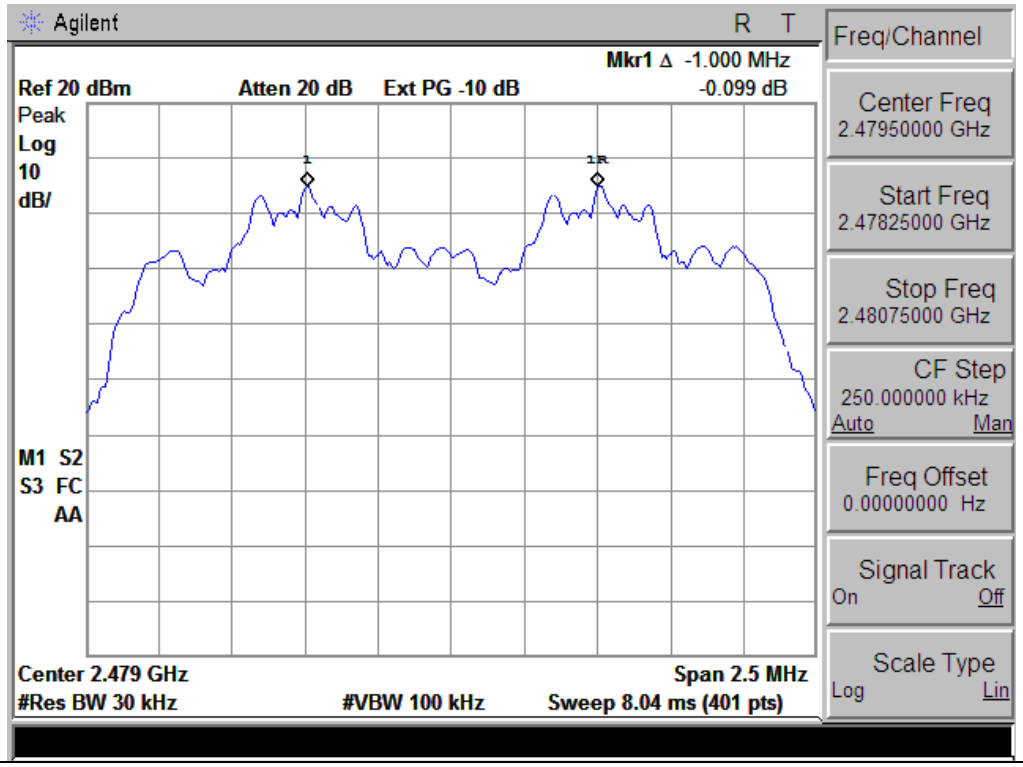
CH00 -3Mbps



CH39 -3Mbps



CH78 -3Mbps



7. BANDWIDTH TEST

7.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)	Bandwidth	(20dB bandwidth)	2400-2483.5	PASS

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	30 kHz
VB	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

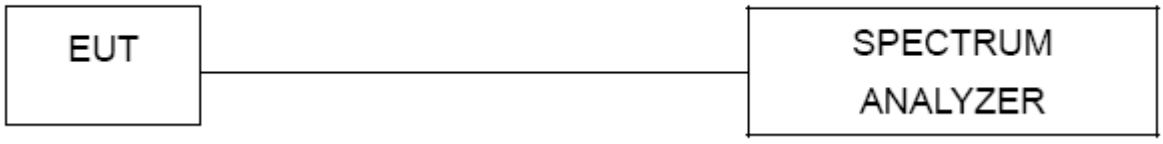
7.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting : RBW= 30KHz, VBW=100KHz, Sweep time = Auto.

7.1.2 DEVIATION FROM STANDARD

No deviation.

7.1.3 TEST SETUP



7.1.4 EUT OPERATION CONDITIONS

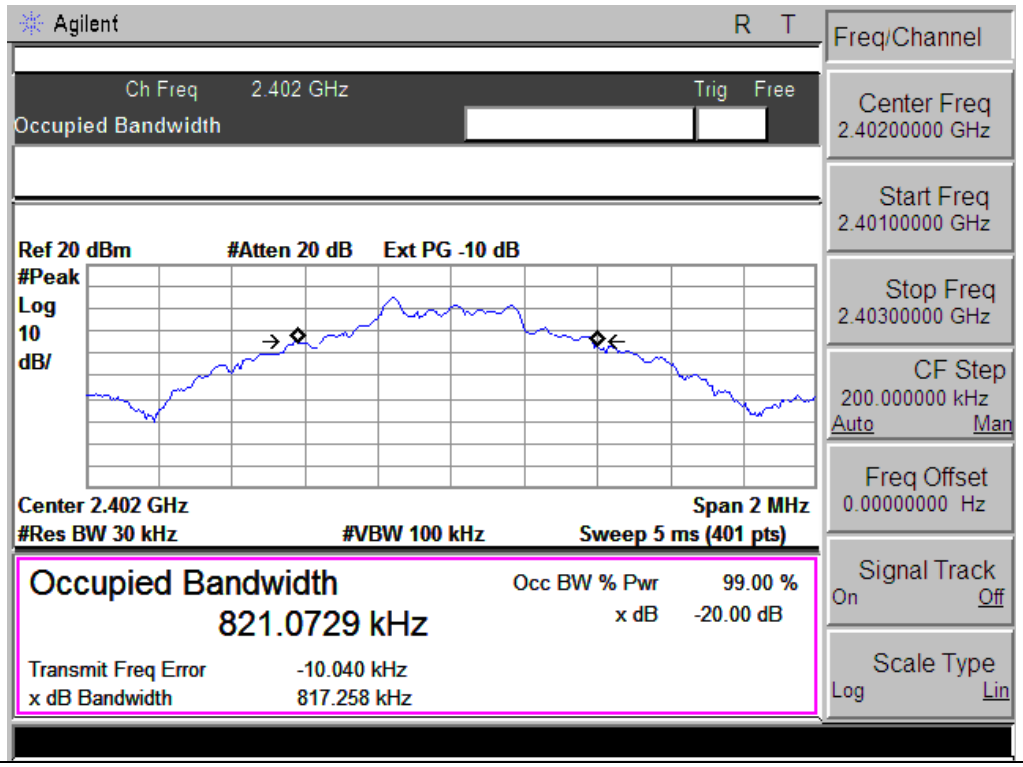
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

7.1.5 TEST RESULTS

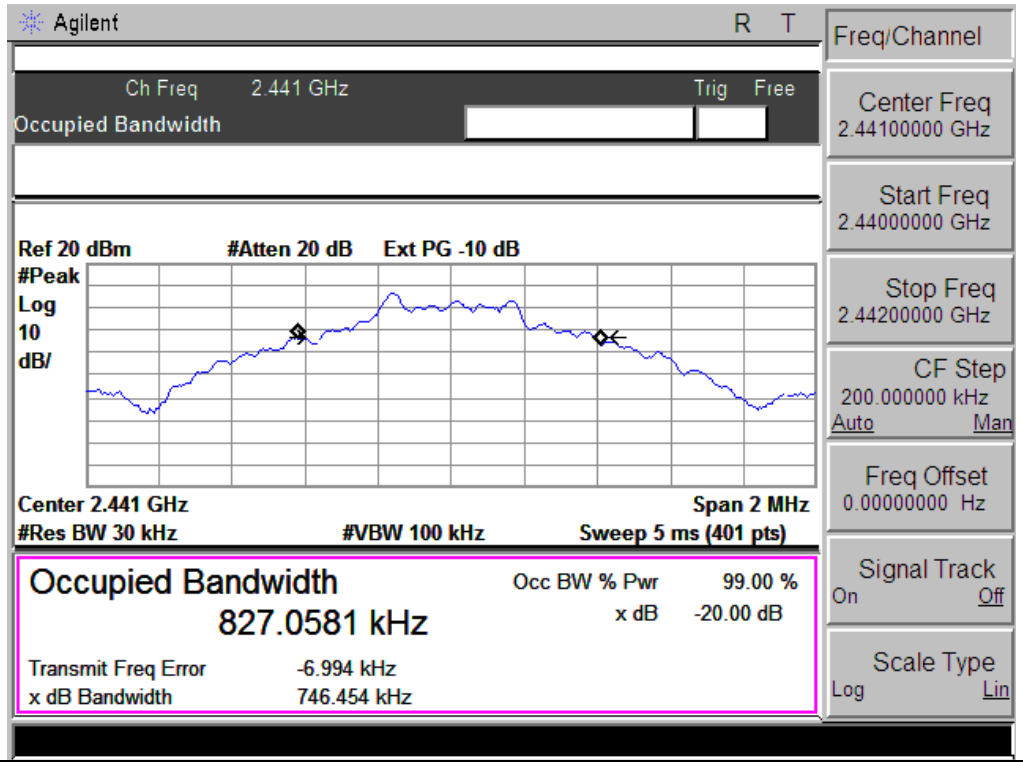
EUT：	ASTRO	Model Name ：	CL1839
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 3.7V
Test Mode ：	CH00 / CH39 /C78**(1Mbps)**		

Frequency	20dB Bandwidth (kHz)	Result
2402 MHz	817.258	**PASS**
2441 MHz	746.454	**PASS**
2480 MHz	822.069	**PASS**

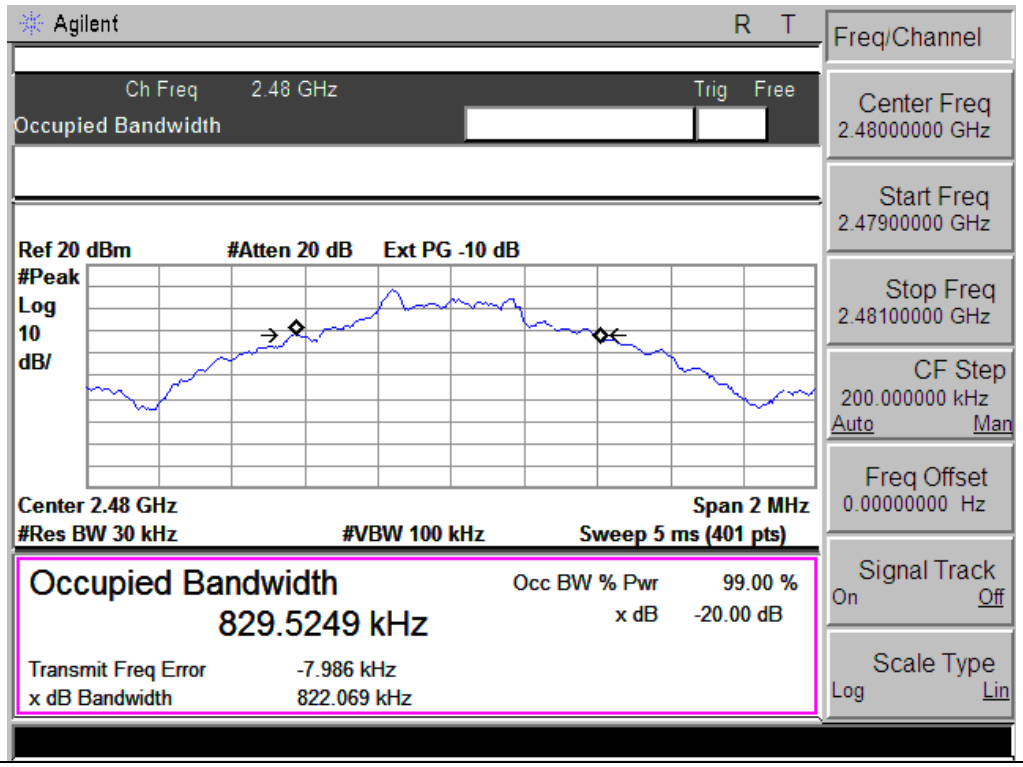
CH00-1Mbps



CH39 -1Mbps



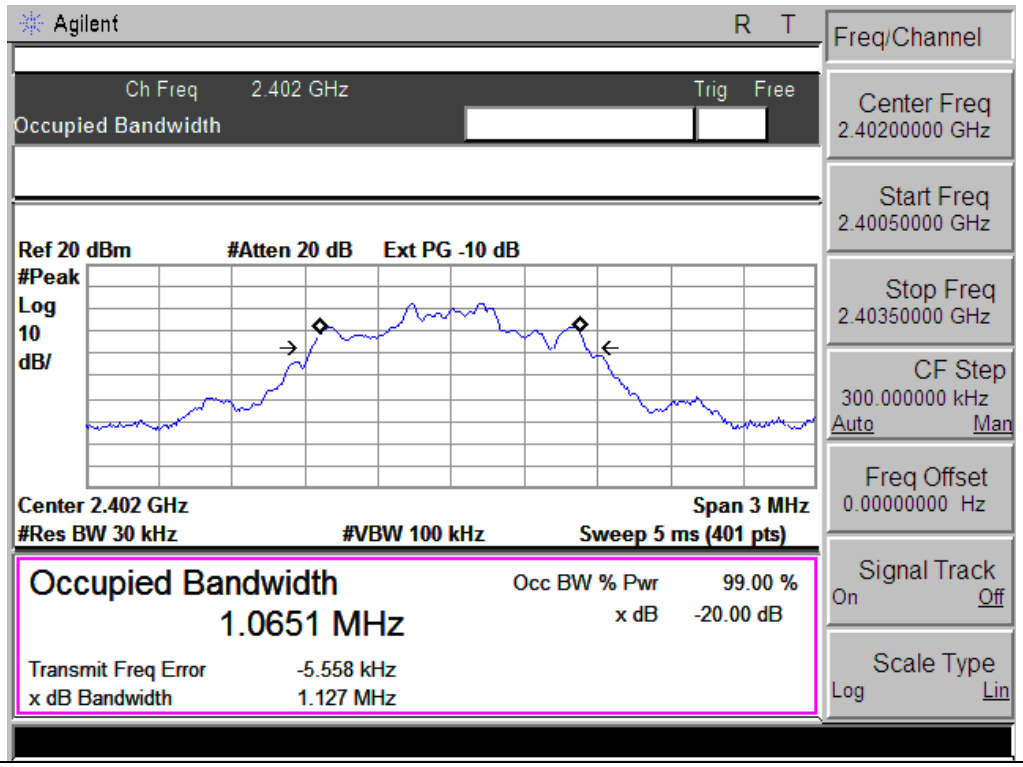
CH78 -1Mbps



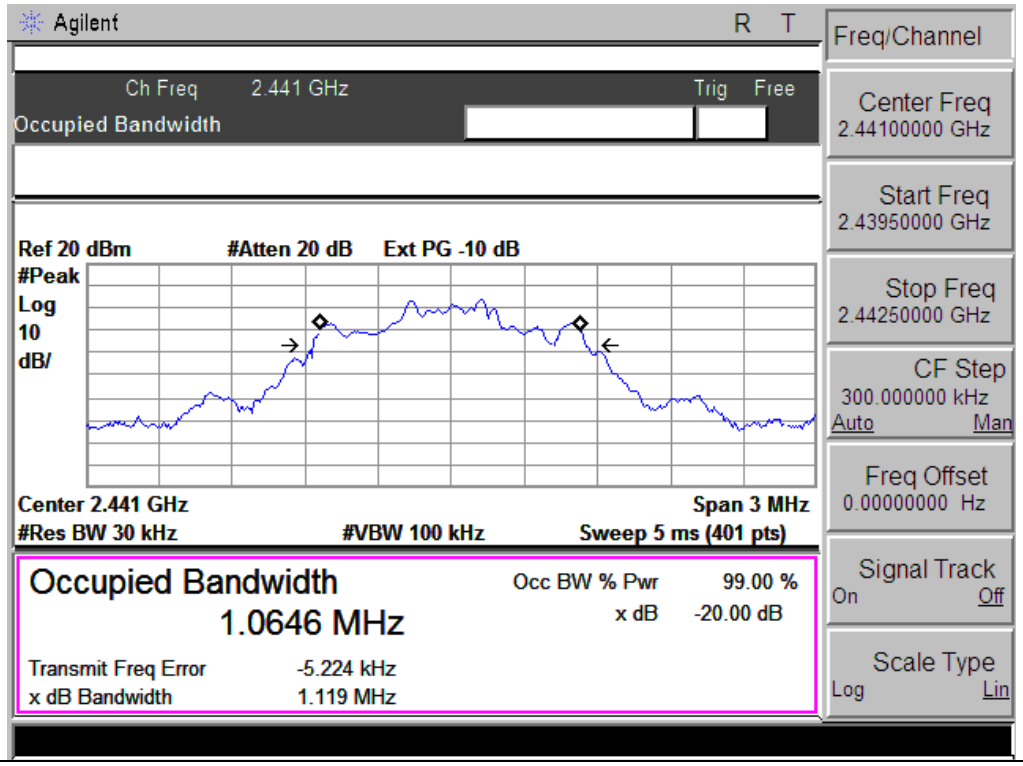
EUT：	ASTRO	Model Name ：	CL1839
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 3.7V
Test Mode ：	CH00 / CH39 /C78**(2Mbps)**		

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.127	**PASS**
2441 MHz	1.119	**PASS**
2480 MHz	1.130	**PASS**

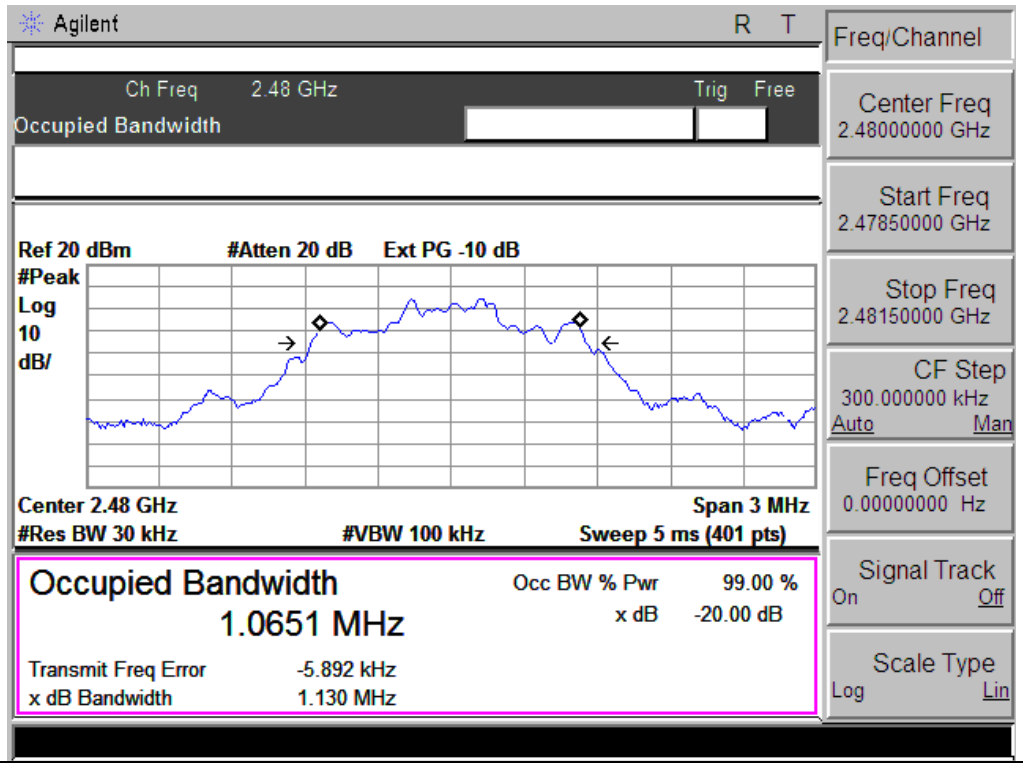
CH00 -2Mbps



CH39 -2Mbps



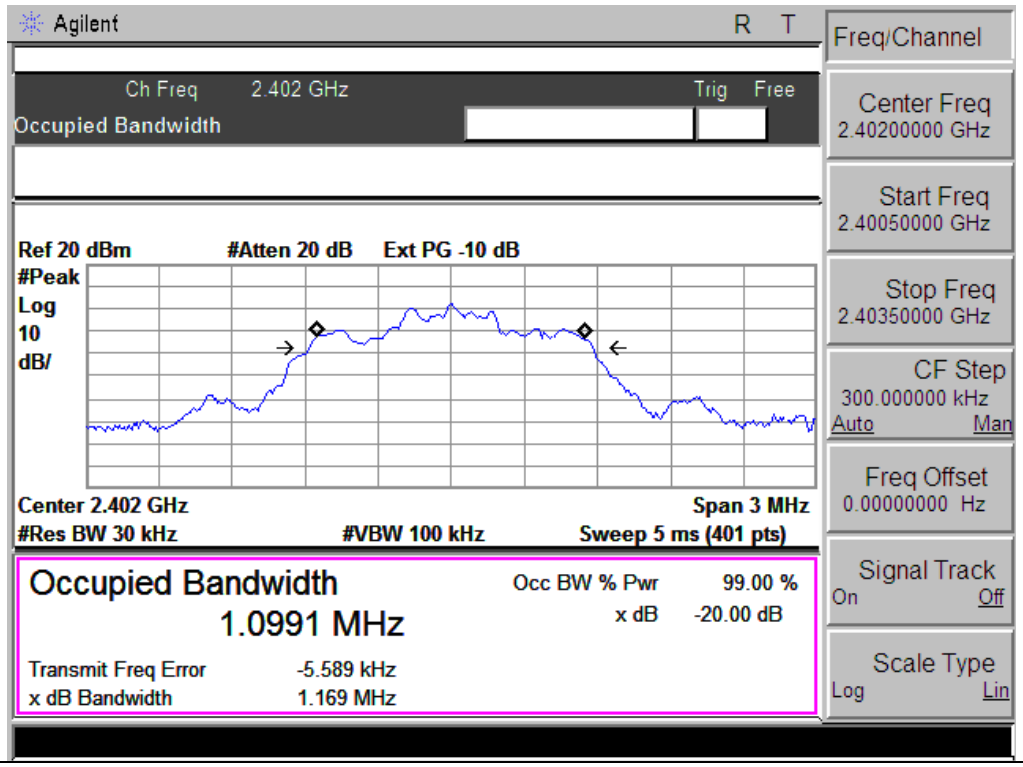
CH78 -2Mbps



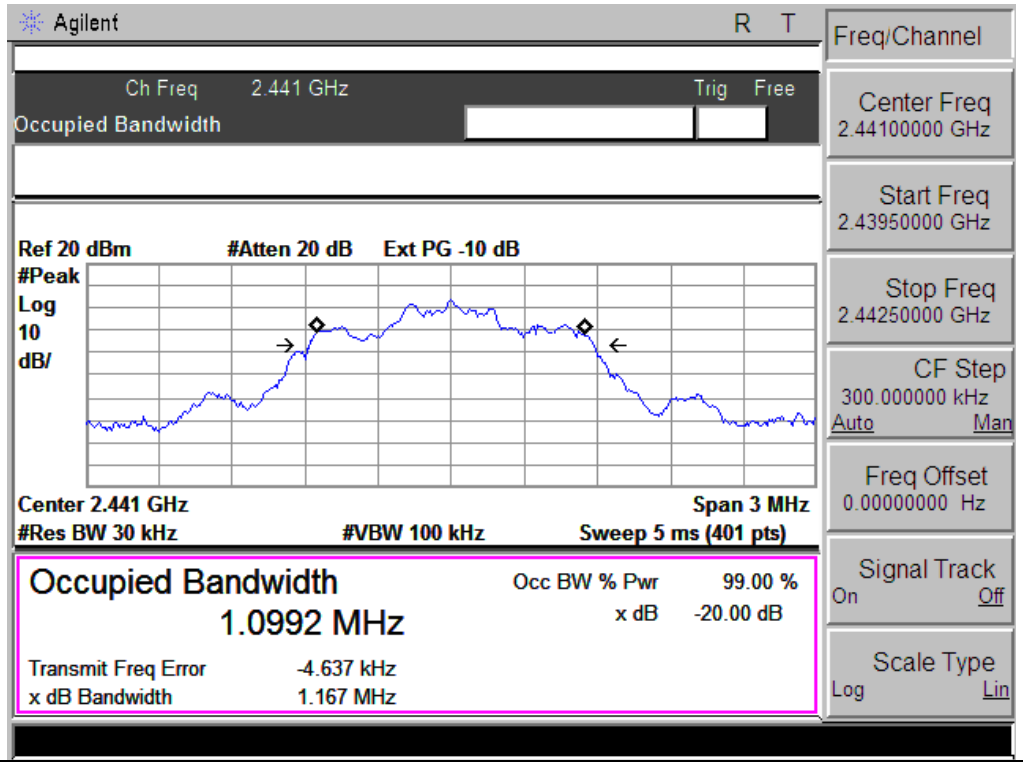
EUT：	ASTRO	Model Name ：	CL1839
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 3.7V
Test Mode ：	CH00 / CH39 /C78**(3Mbps)**		

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.169	**PASS**
2441 MHz	1.167	**PASS**
2480 MHz	1.169	**PASS**

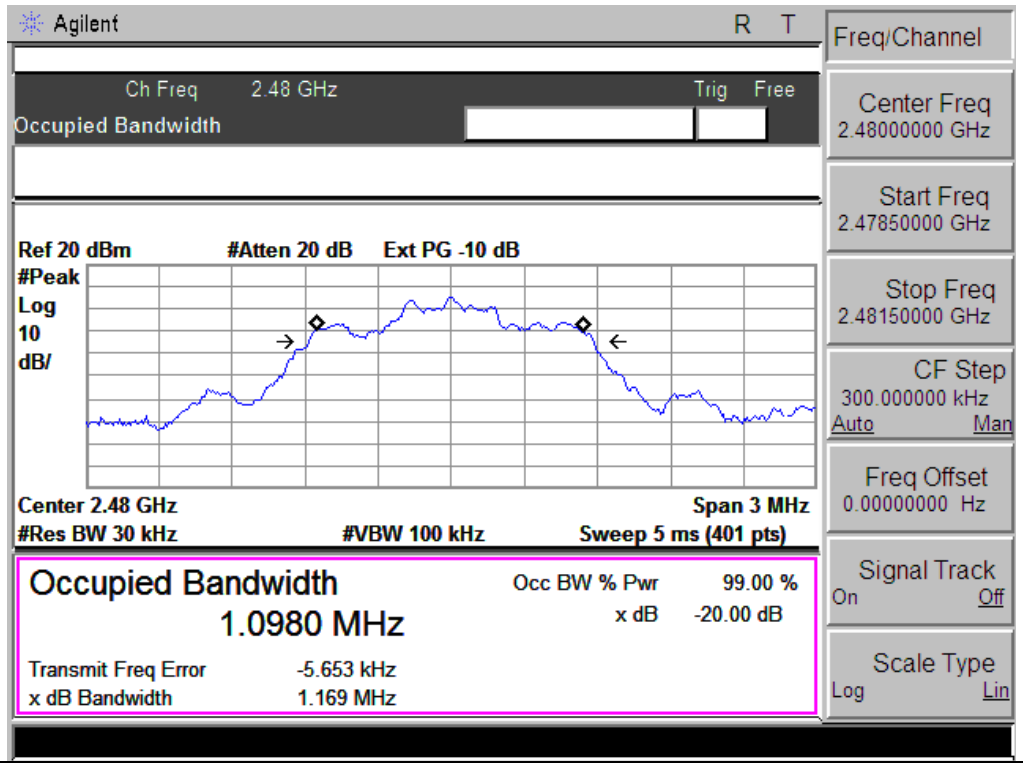
CH00 -3Mbps



CH39 -3Mbps



CH78 -3Mbps



8. PEAK OUTPUT POWER TEST

8.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (b)(i)	Peak Output Power	0.125 w or 20.96dBm	2400-2483.5	PASS

8.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

b. Spectrum Setting : RBW > the 20 dB bandwidth of the emission being measured

Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

VBW ≥ RBW

Sweep = auto

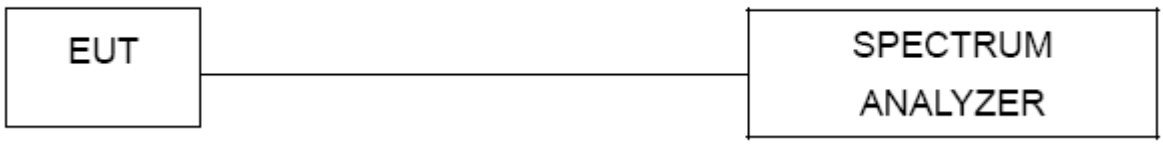
Detector function = peak

Trace = max hold

8.1.2 DEVIATION FROM STANDARD

No deviation.

8.1.3 TEST SETUP



8.1.4 EUT OPERATION CONDITIONS

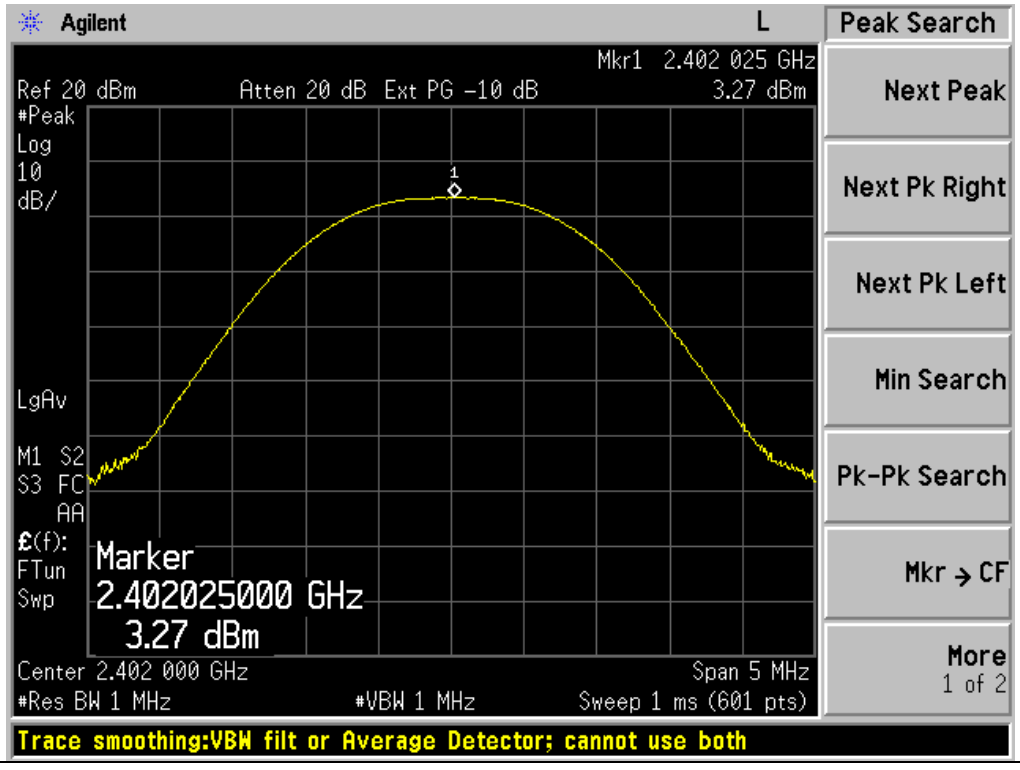
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

8.1.5 TEST RESULTS

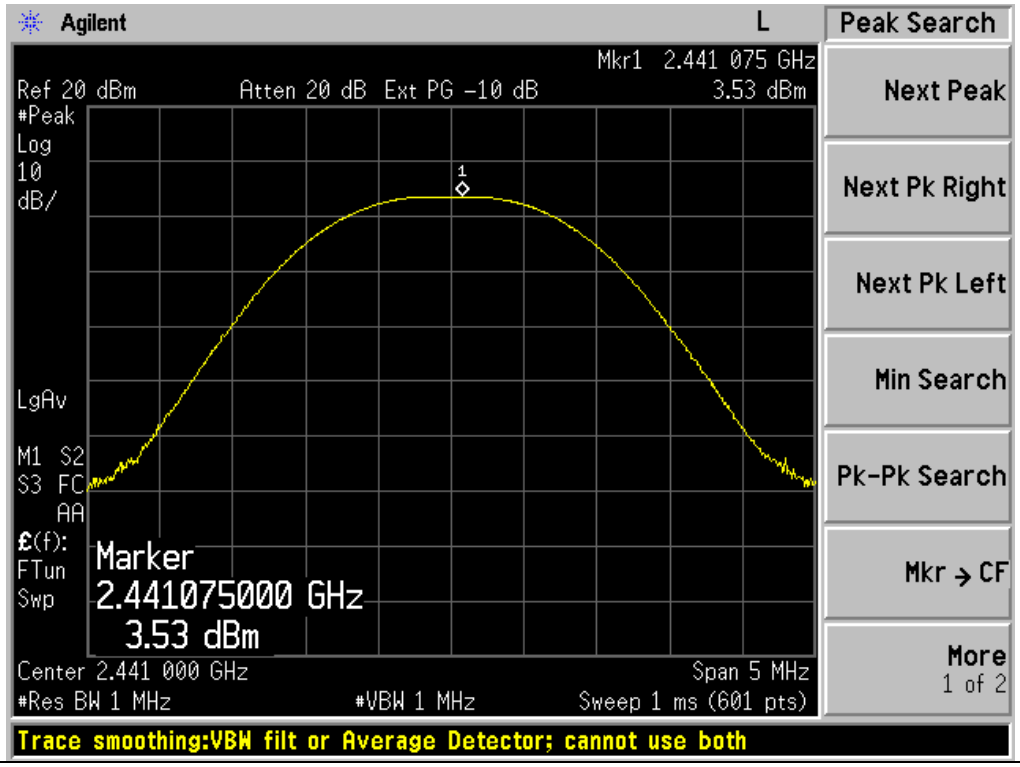
EUT：	ASTRO	Model Name ：	CL1839
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 3.7V
Test Mode ：	CH00/ CH39 /CH78 (1M/2M/3Mbps Mode)		

1Mbps			
Test Channel	Frequency (MHz)	Peak Output Power (dBm)	LIMIT (dBm)
CH00	2402	3.27	30
CH39	2441	3.53	30
CH78	2480	3.41	30
2Mbps			
CH00	2402	2.58	20.96
CH39	2441	2.93	20.96
CH78	2480	2.60	20.96
3Mbps			
CH00	2402	2.51	20.96
CH39	2441	2.67	20.96
CH78	2480	2.59	20.96

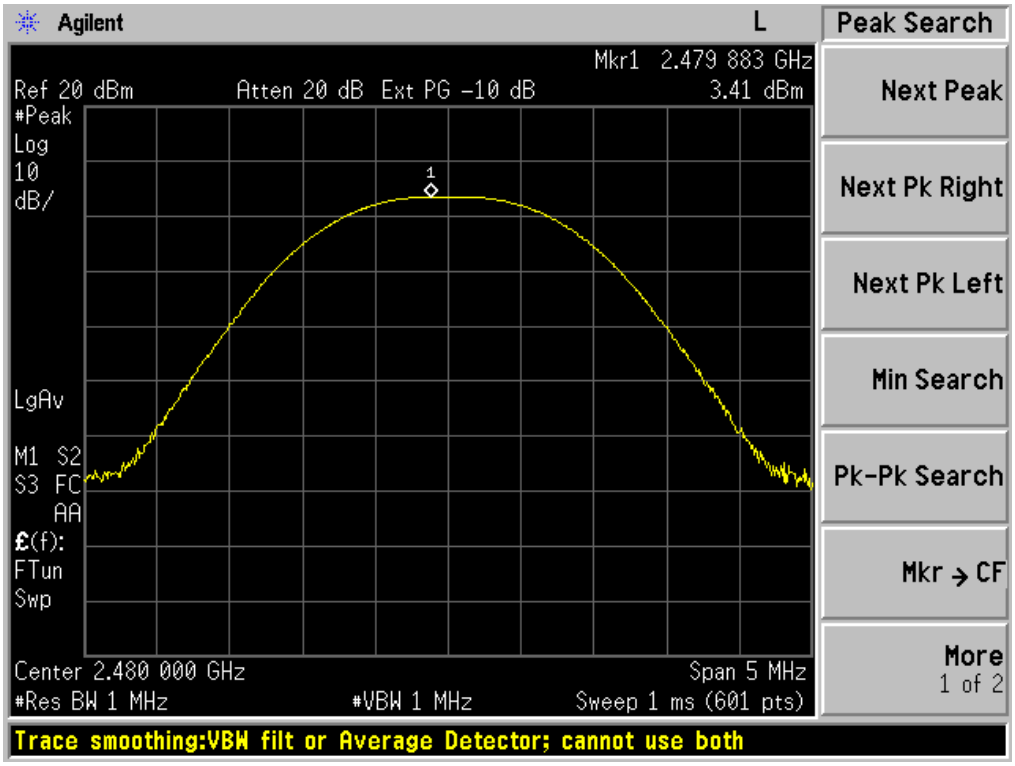
CH00 -1Mbps



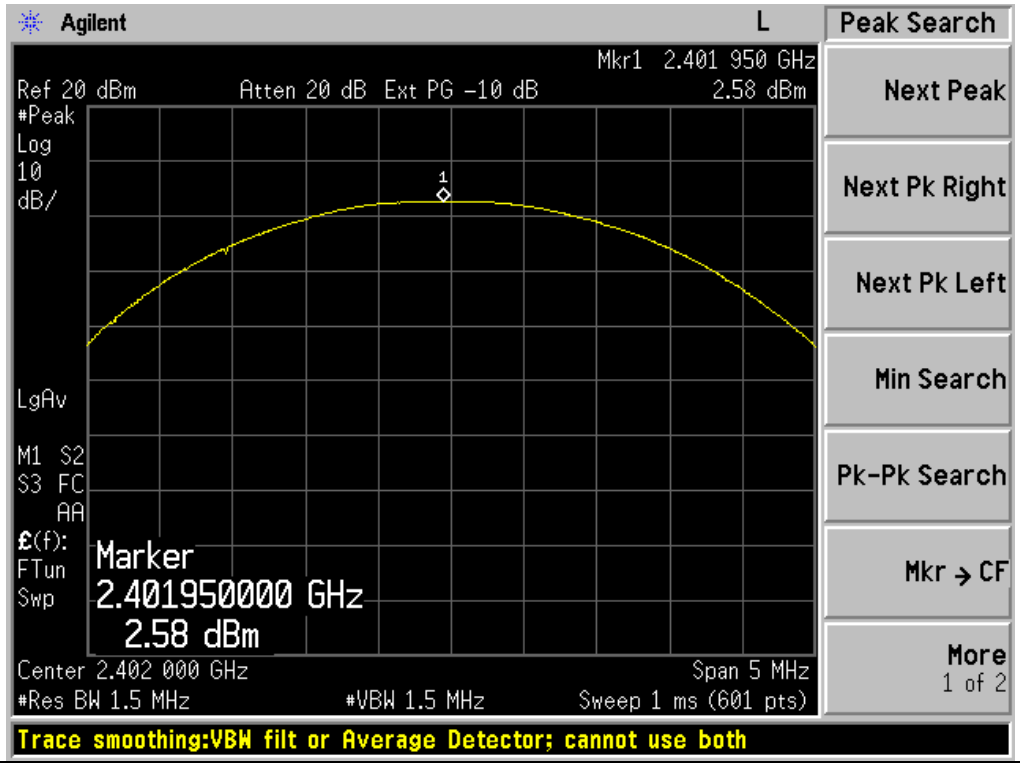
CH39 -1Mbps



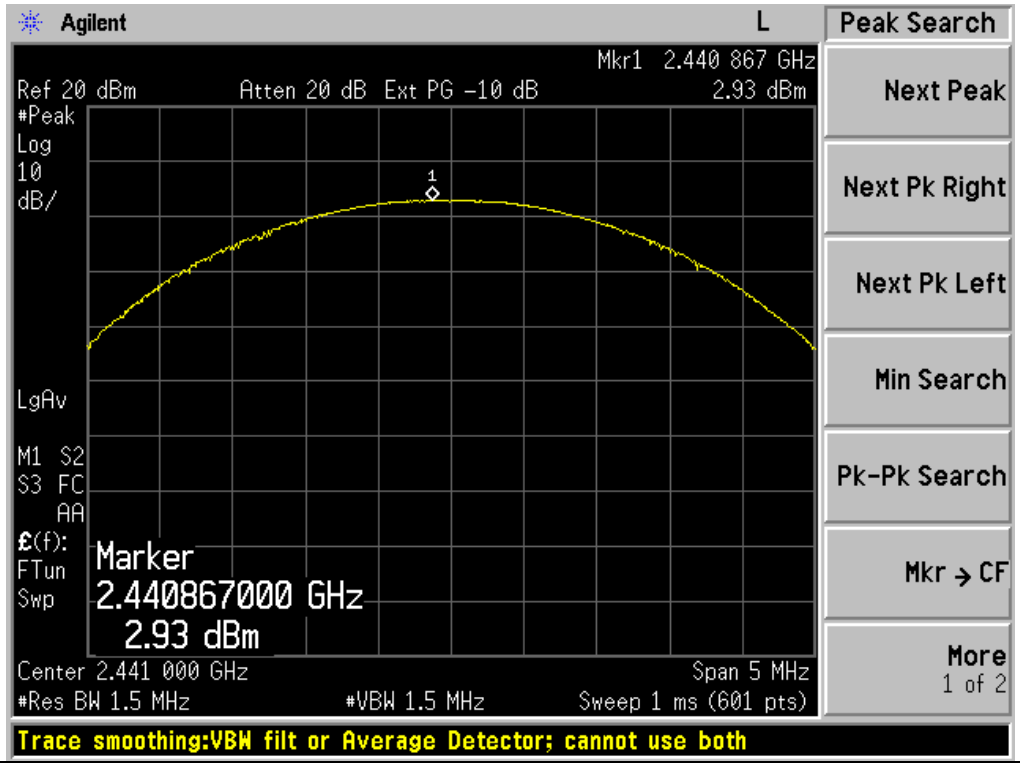
CH78 -1Mbps



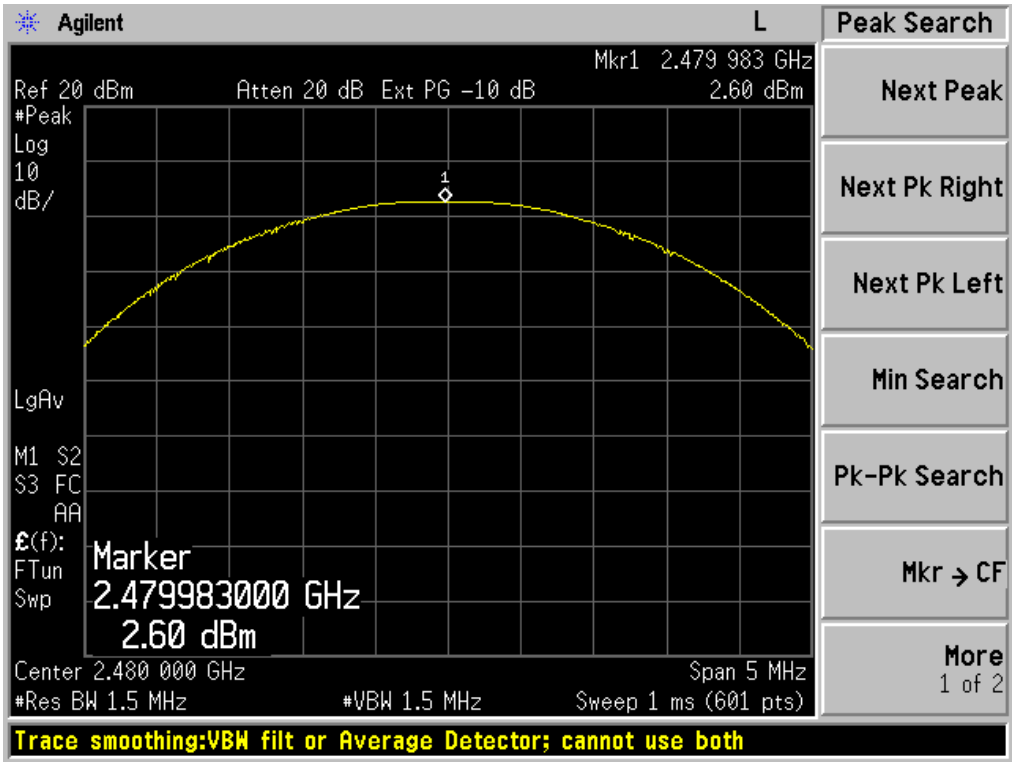
CH00 -2Mbps


Agilent
L
Peak Search
Mkr1 2.401 950 GHz
Ref 20 dBm
Atten 20 dB Ext PG -10 dB
2.58 dBm
#Peak
Log
10
dB/
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Marker
2.401950000 GHz
2.58 dBm
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Center 2.402 000 GHz
Span 5 MHz
#Res BW 1.5 MHz
#VBW 1.5 MHz
Sweep 1 ms (601 pts)
Trace smoothing:VBW filt or Average Detector; cannot use both

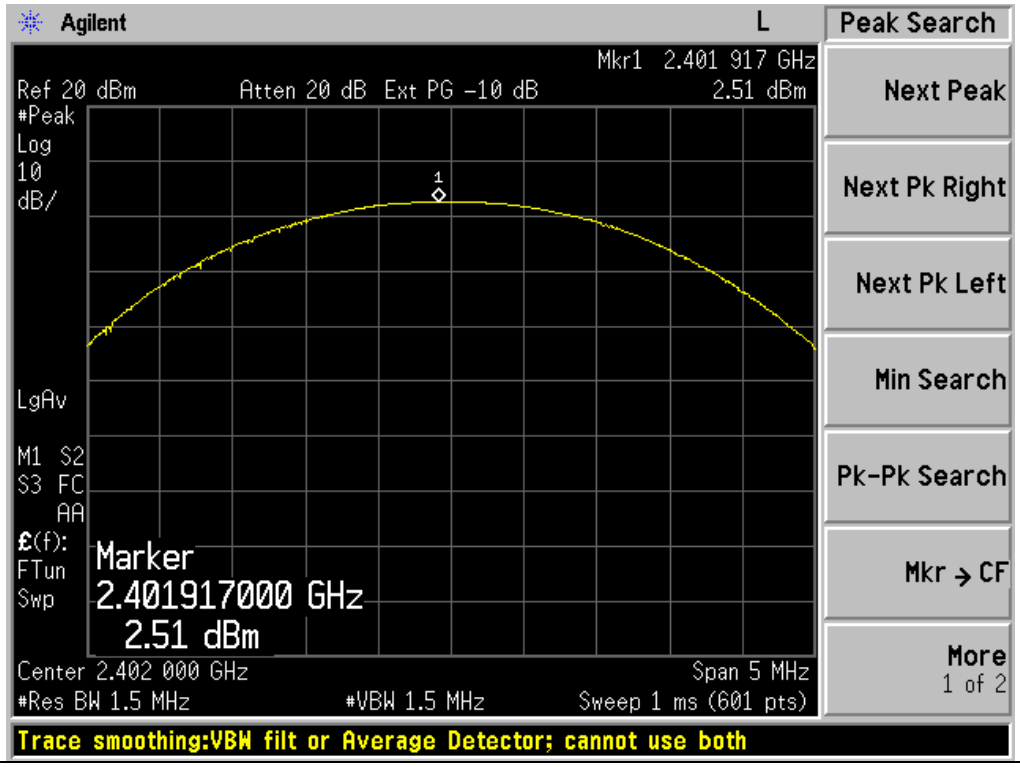
CH39 -2Mbps



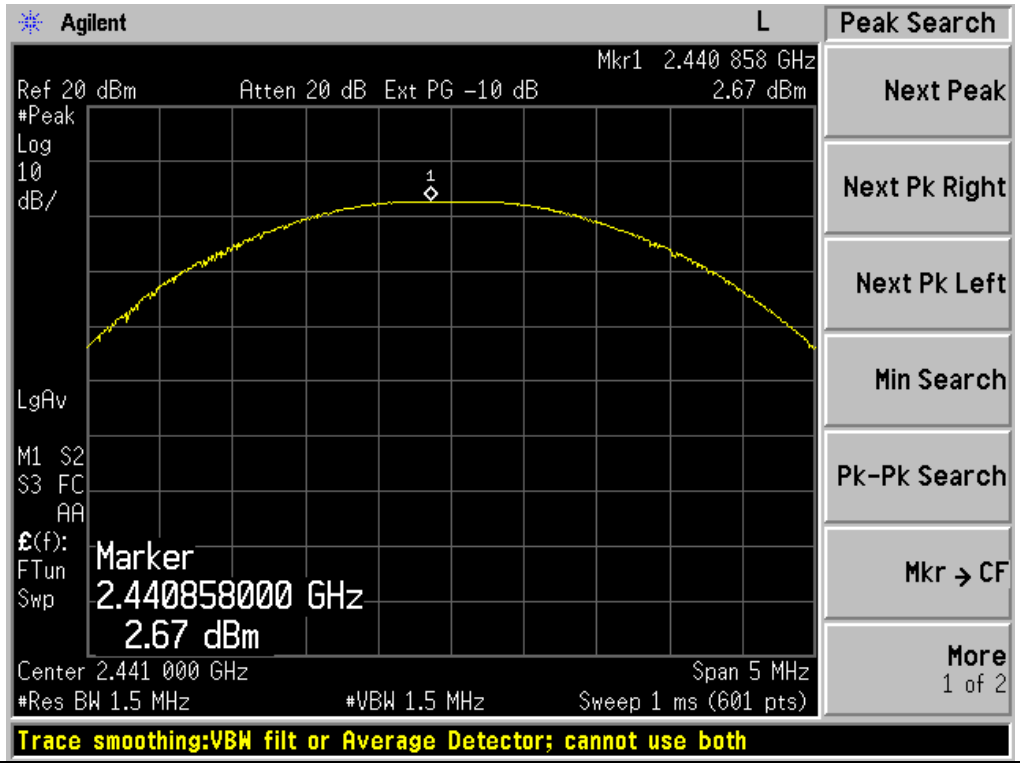
CH78 -2Mbps



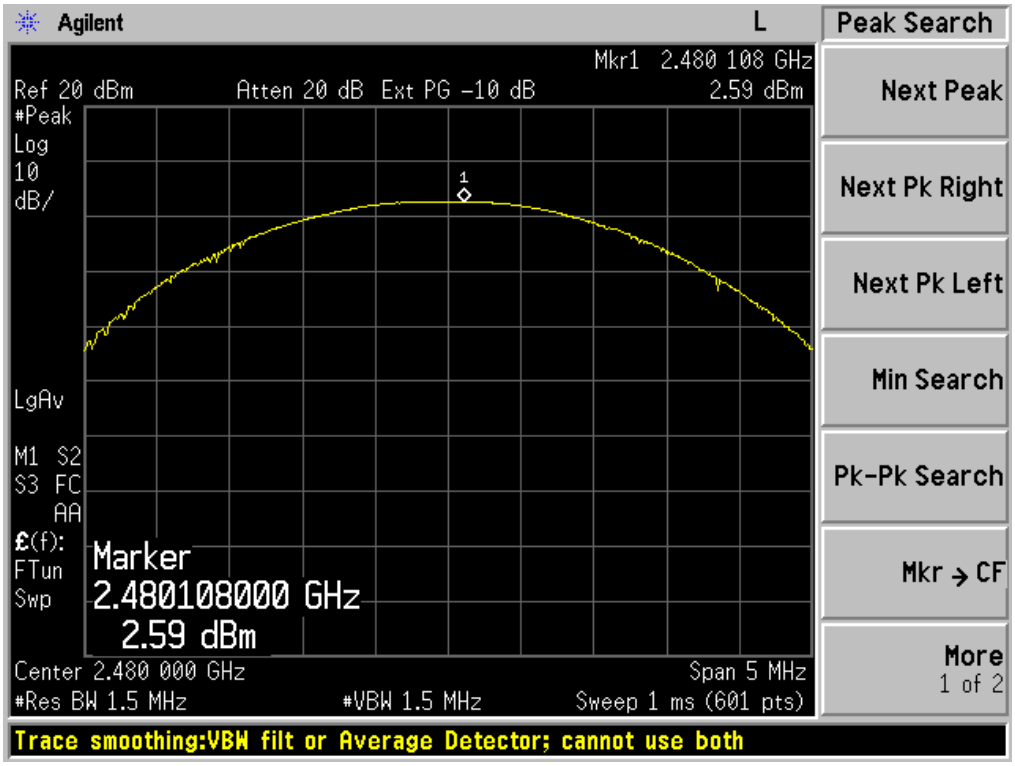
CH00 -3Mbps


Agilent
L
Peak Search
Mkr1 2.401 917 GHz
Ref 20 dBm
Atten 20 dB Ext PG -10 dB
2.51 dBm
#Peak
Log
10
dB/
Next Peak
Next Pk Right
Next Pk Left
Min Search
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Pk-Pk Search
Mkr → CF
Marker
2.401917000 GHz
2.51 dBm
More
1 of 2
Center 2.402 000 GHz
Span 5 MHz
#Res BW 1.5 MHz
#VBW 1.5 MHz
Sweep 1 ms (601 pts)
Trace smoothing:VBW filt or Average Detector; cannot use both

CH39 -3Mbps



CH78 -3Mbps



9. 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE

APPLICABLE STANDARD

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

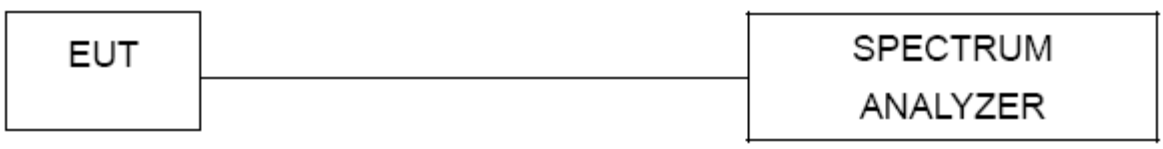
TEST PROCEDURE

a) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
b) Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
c) Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
d) Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
e) Repeat above procedures until all measured frequencies were complete.

9.1 DEVIATION FROM STANDARD

No deviation.

9.2 TEST SETUP



9.3 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

9.4 TEST RESULTS

EUT：	ASTRO	Model Name ：	CL1839
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 3.7V
Test Mode ：	CH00/ CH78 (1M/2M/3Mbps Mode)		

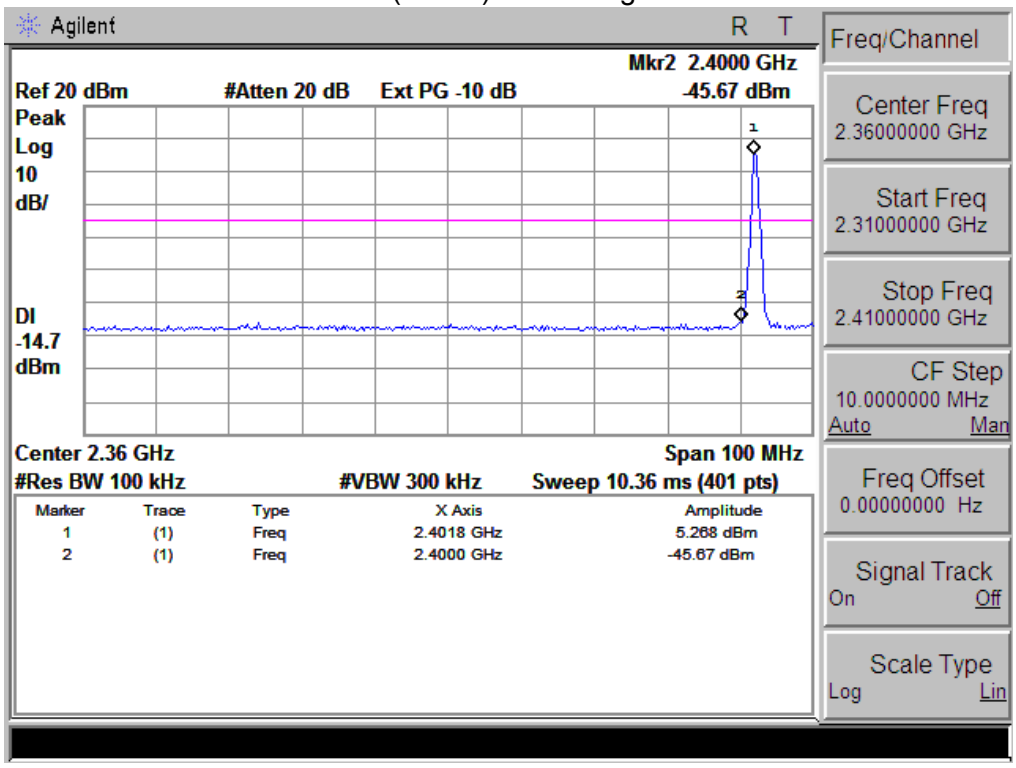
Frequency Band	Delta Peak to band emission (dBc)	＞Limit (dBc)	Result
1Mbps Non-hopping			
2400	50.94	20	Pass
2483.5	56.52	20	Pass
2Mbps Non-hopping			
2400	52.17	20	Pass
2483.5	55.37	20	Pass
3Mbps Non-hopping			
2400	49.67	20	Pass
2483.5	54.97	20	Pass
1Mbps hopping			
2400	52.01	20	Pass
2483.5	56.25	20	Pass
2Mbps hopping			
2400	51.18	20	Pass
2483.5	54.28	20	Pass
3Mbps hopping			
2400	51.74	20	Pass
2483.5	54.53	20	Pass

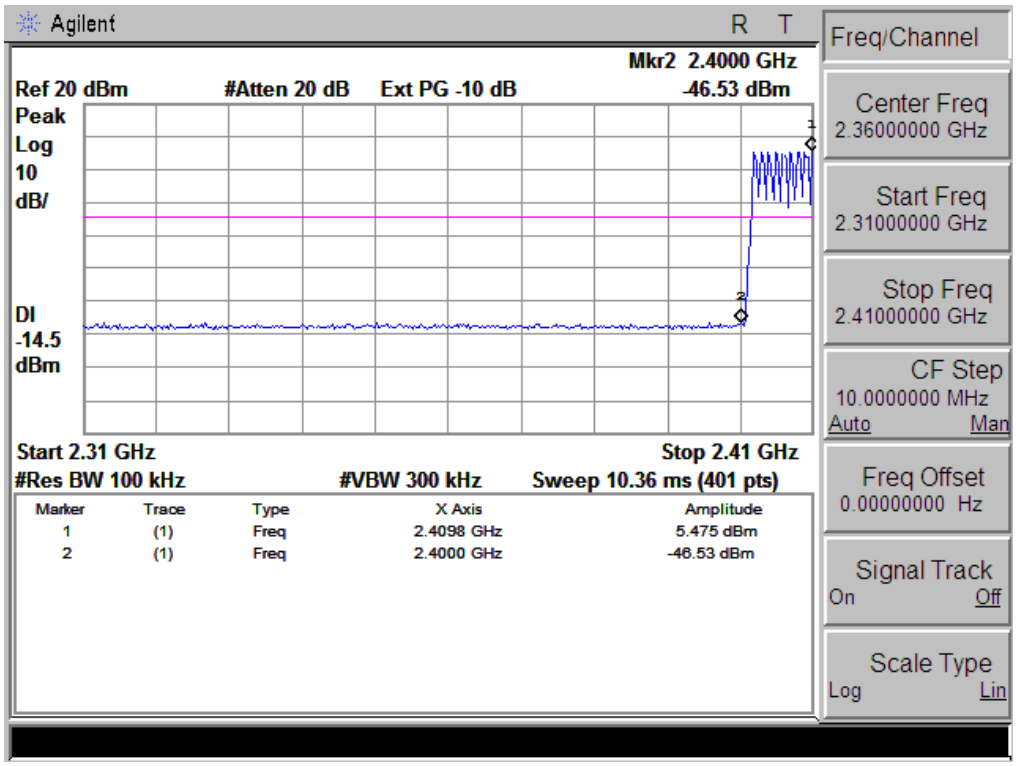
Radiated band edge:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
1Mbps Non-hopping							
2390	56.56	-13.06	43.50	74.00	-30.50	peak	Vertical
2390	57.69	-13.06	44.63	74.00	-29.37	peak	Horizontal
2483.5	56.67	-12.78	43.89	74.00	-30.11	peak	Vertical
2483.5	58.75	-12.78	45.97	74.00	-28.03	peak	Horizontal
1Mbps hopping							
2390	57.72	-13.06	44.66	74.00	-29.34	peak	Vertical
2390	58.87	-13.06	45.81	74.00	-28.19	peak	Horizontal
2483.5	56.64	-12.78	43.86	74.00	-30.14	peak	Vertical
2483.5	58.91	-12.78	46.13	74.00	-27.87	peak	Horizontal
2Mbps Non-hopping							
2390	57.69	-13.06	44.63	74.00	-29.37	peak	Vertical
2390	56.02	-13.06	42.96	74.00	-31.04	peak	Horizontal
2483.5	58.55	-12.78	45.77	74.00	-28.23	peak	Vertical
2483.5	57.86	-12.78	45.08	74.00	-28.92	peak	Horizontal
2Mbps hopping							
2390	56.53	-13.06	43.47	74.00	-30.53	peak	Vertical
2390	57.81	-13.06	44.75	74.00	-29.25	peak	Horizontal
2483.5	58.34	-12.78	45.56	74.00	-28.44	peak	Vertical
2483.5	56.66	-12.78	43.88	74.00	-30.12	peak	Horizontal
3Mbps Non-hopping							
2390	57.92	-13.06	44.86	74.00	-29.14	peak	Vertical
2390	57.07	-13.06	44.01	74.00	-29.99	peak	Horizontal
2483.5	56.89	-12.78	44.11	74.00	-29.89	peak	Vertical
2483.5	57.74	-12.78	44.96	74.00	-29.04	peak	Horizontal
3Mbps hopping							
2390	55.83	-13.06	42.77	74.00	-31.23	peak	Vertical
2390	55.99	-13.06	42.93	74.00	-31.07	peak	Horizontal
2483.5	54.76	-12.78	41.98	74.00	-32.02	peak	Vertical
2483.5	57.66	-12.78	44.88	74.00	-29.12	peak	Horizontal

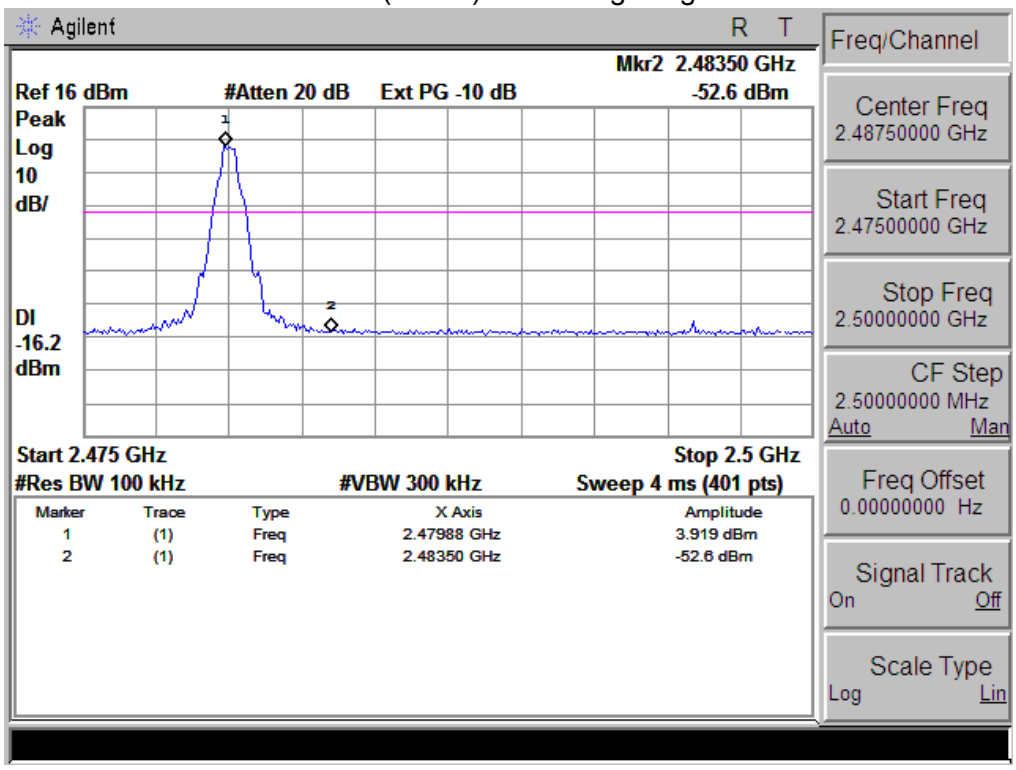
Note: Refer to chapter 3.2 test method, When PK value is lower than the Average value limit, average didn't record.

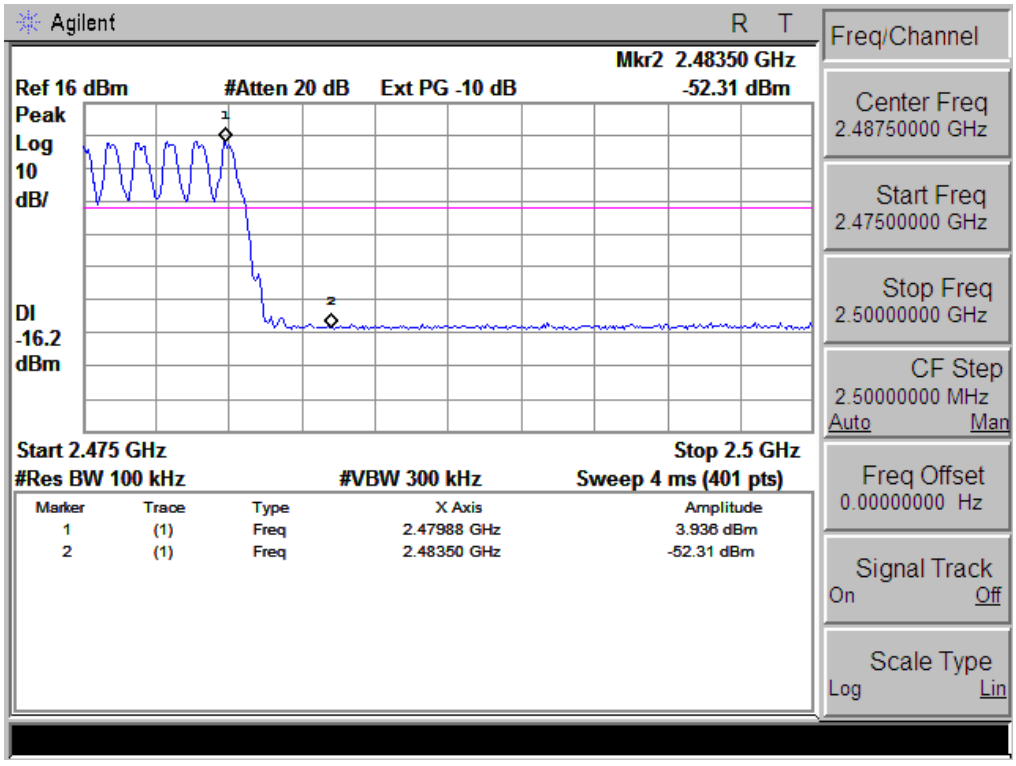
BDR mode (GFSK): Band Edge-Left Side



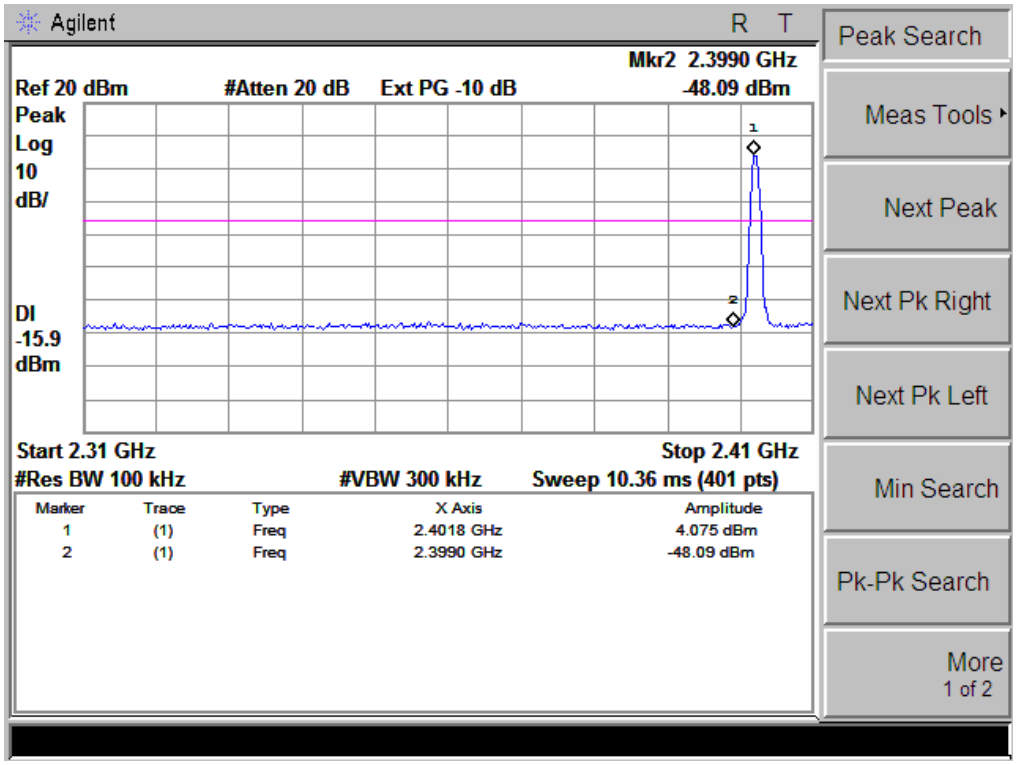


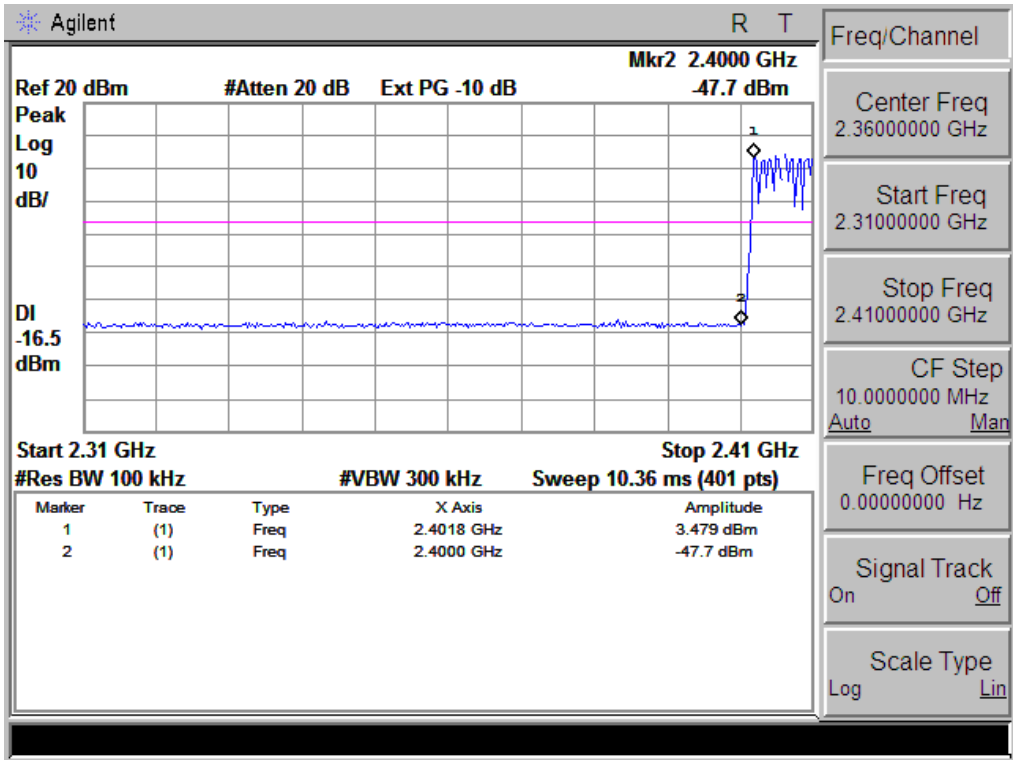
BDR mode (GFSK): Band Edge-Right Side



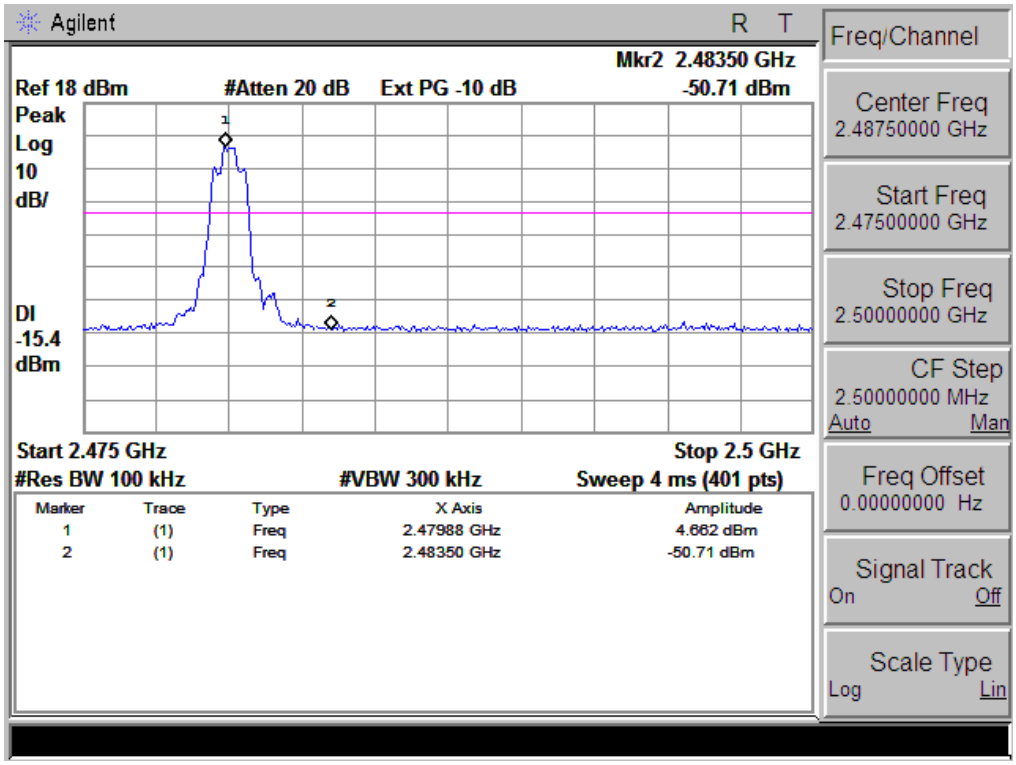


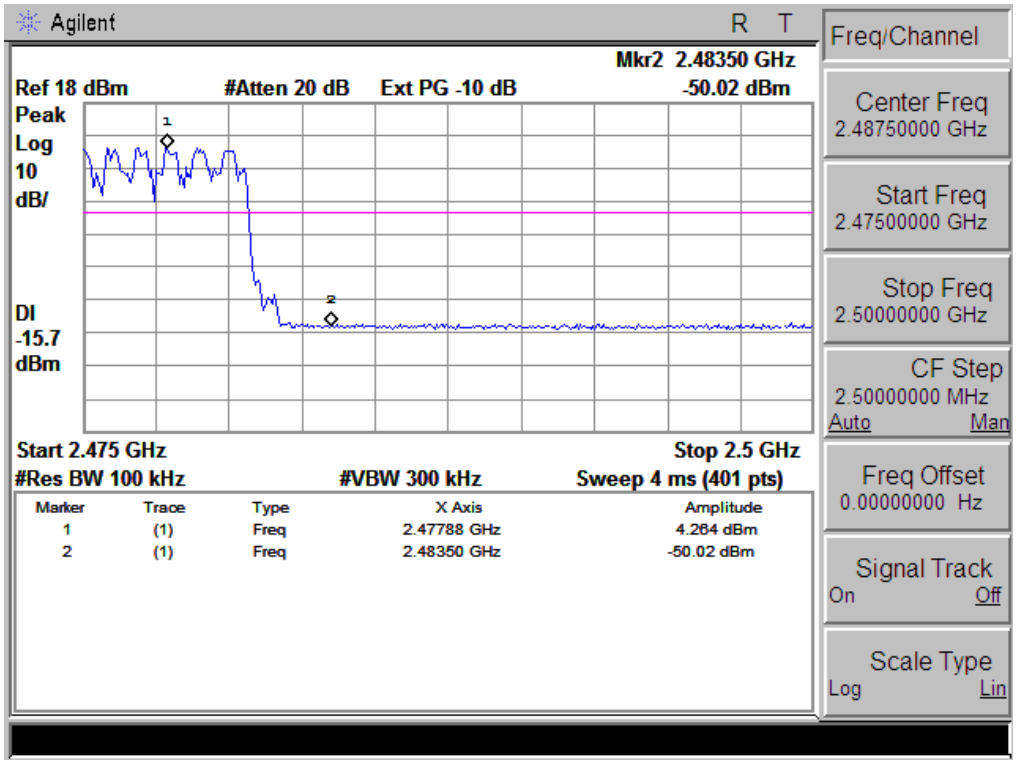
EDR mode (π /4-DQPSK): Band Edge-Left Side



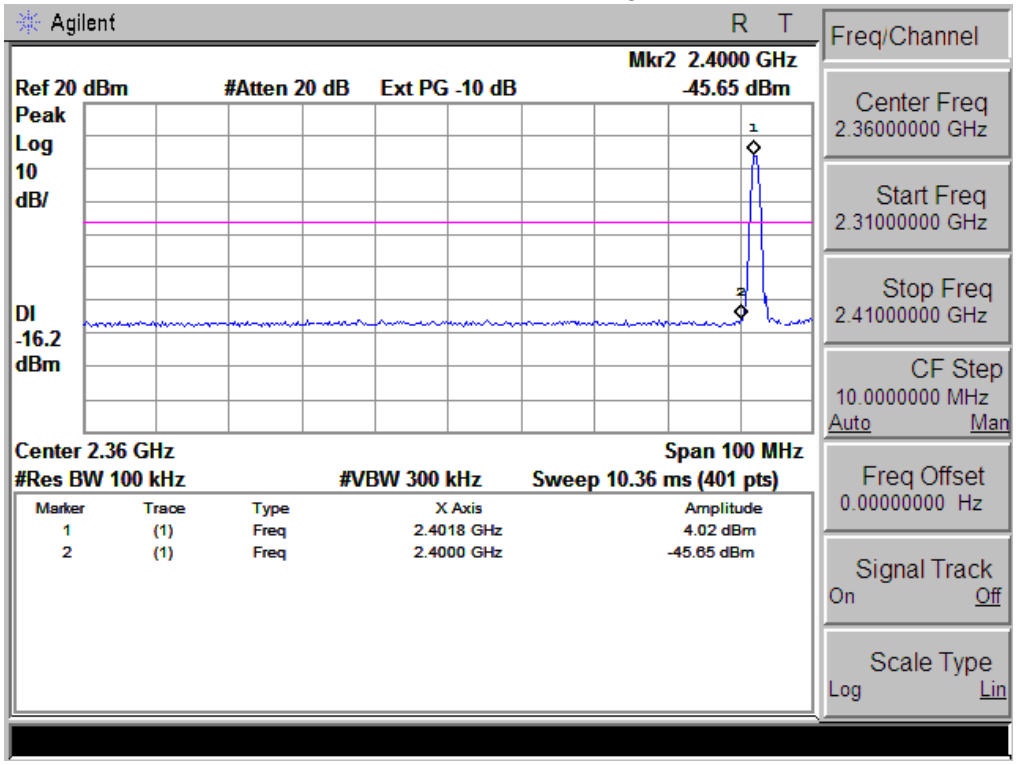


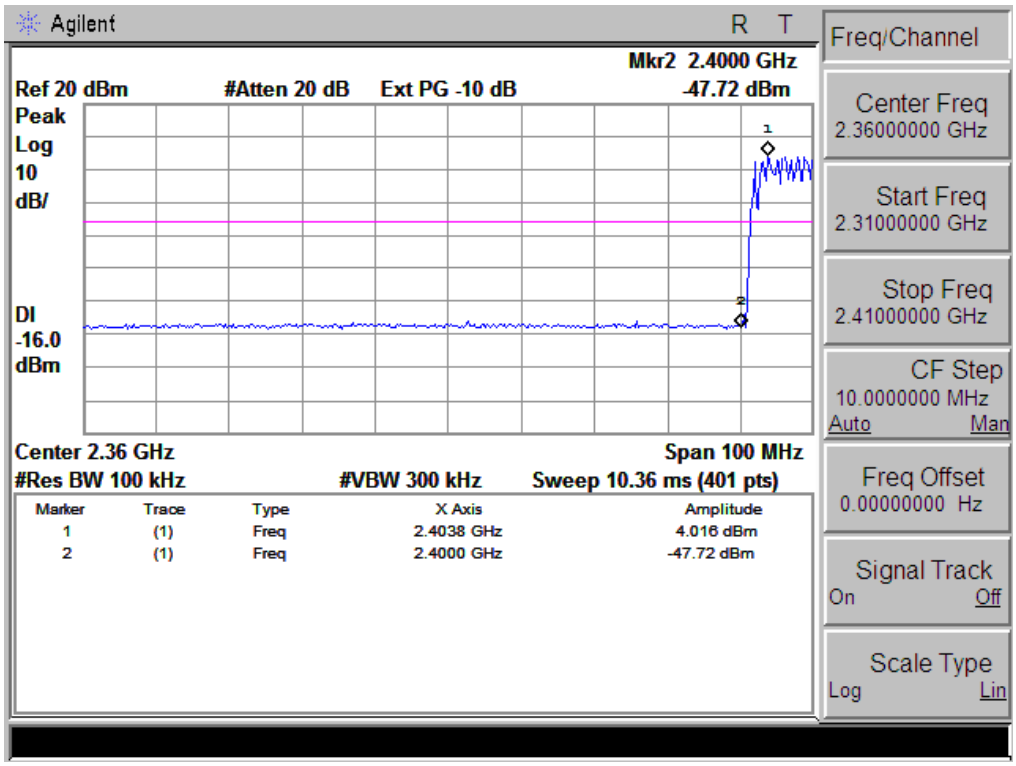
EDR mode (π /4-DQPSK): Band Edge- Right Side



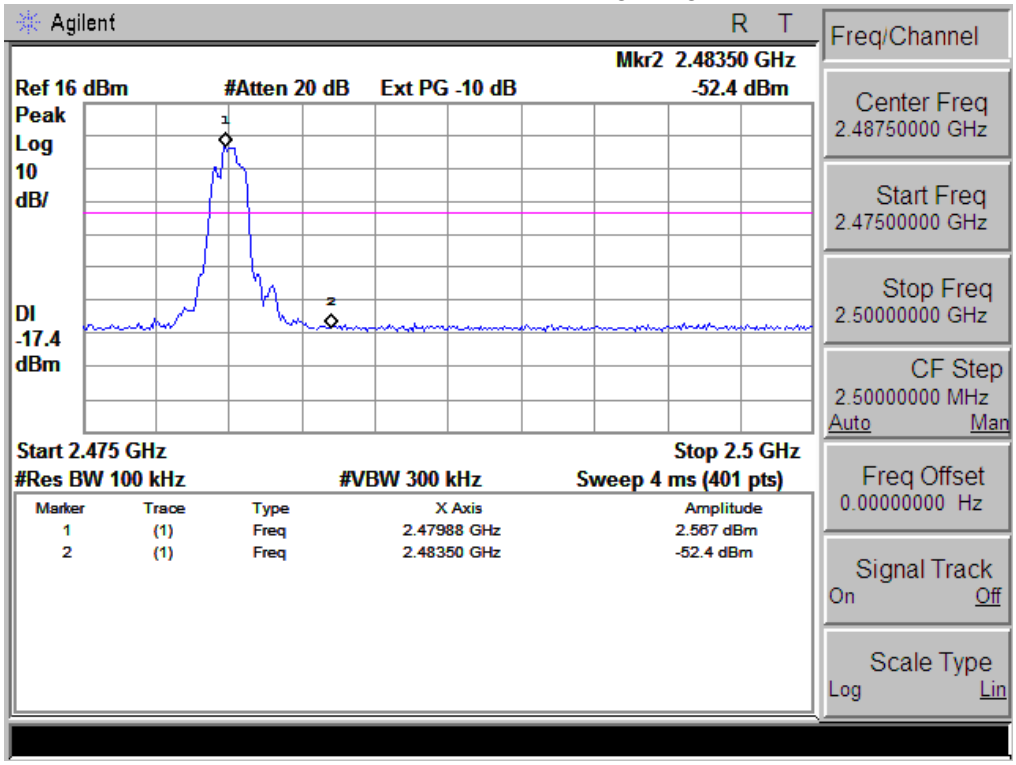


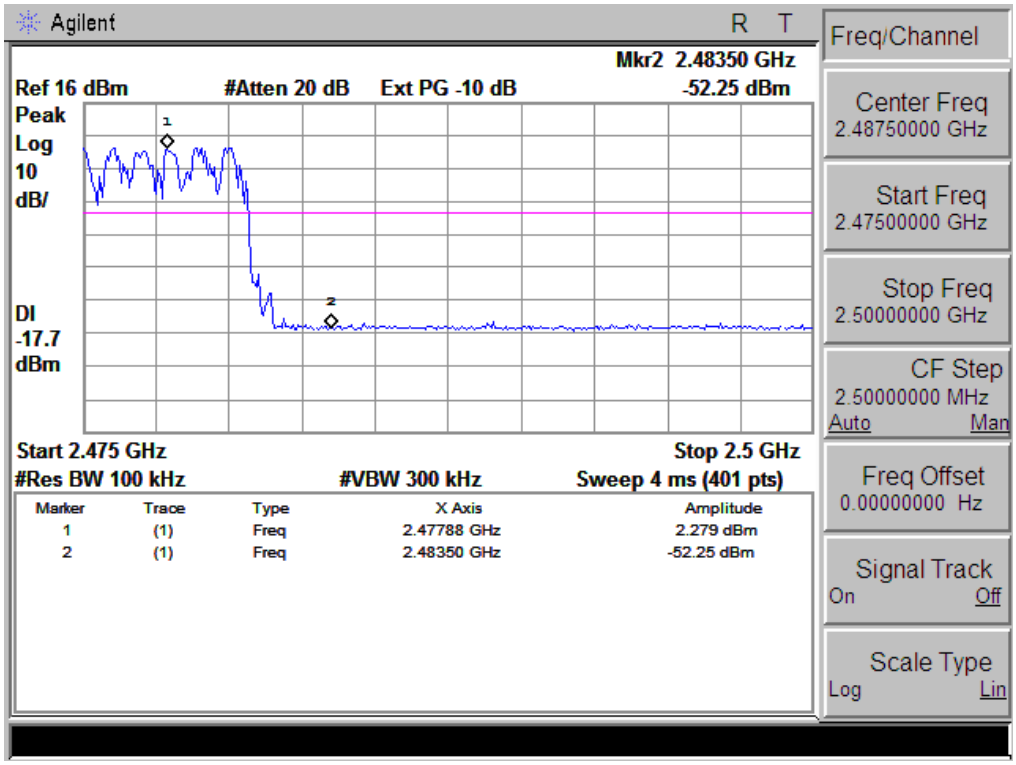
EDR mode(8DPSK): Band Edge-Left Side





EDR mode(8DPSK): Band Edge-Right Side





NOTE: Hopping enabled and disabled have evaluated,and the wortest data was reported

10. ANTENNA REQUIREMENT

10.1 STANDARD REQUIREMENT

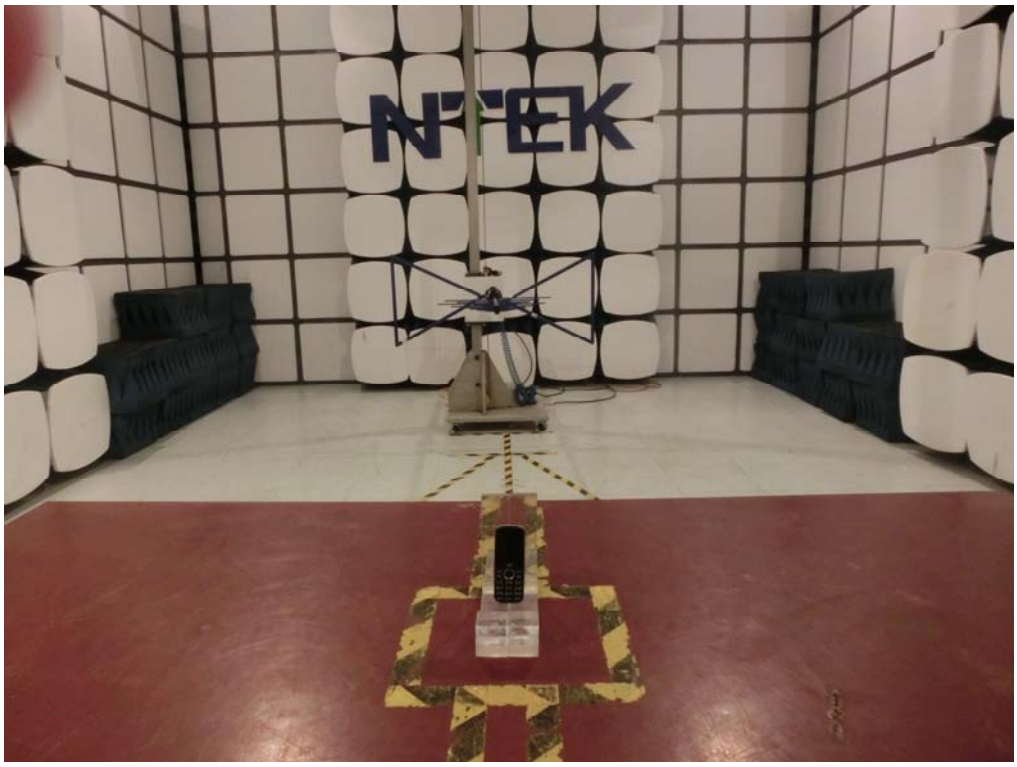
15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

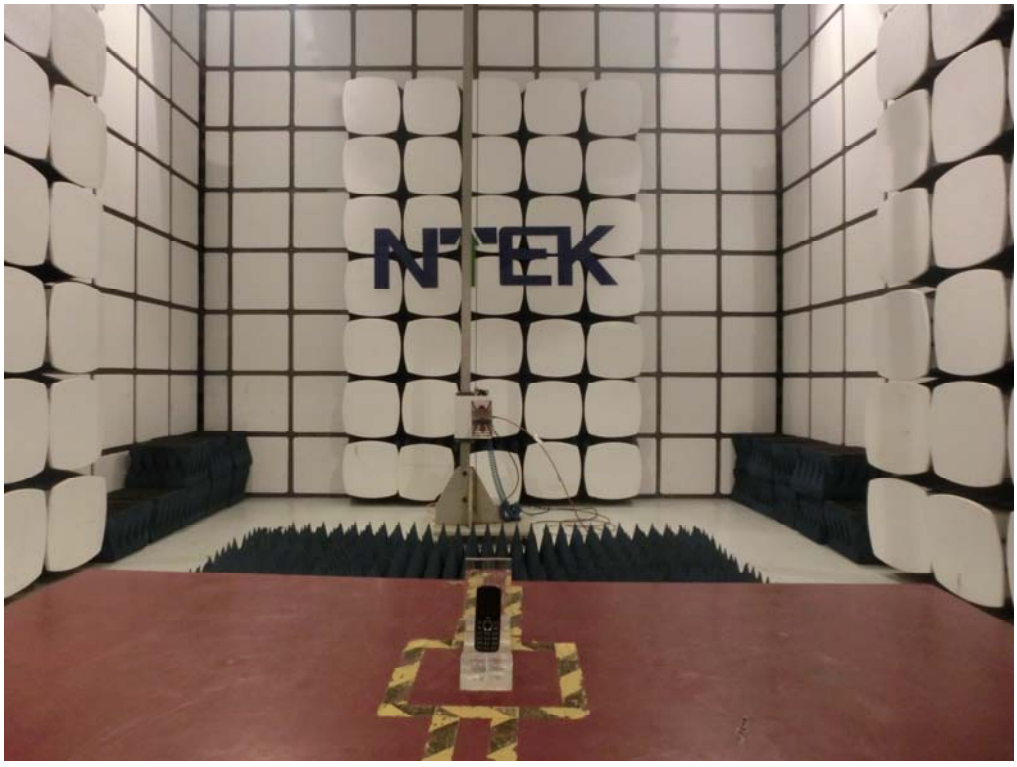
10.2 EUT ANTENNA

The EUT antenna is permanent attached antenna. It comply with the standard requirement.

11. EUT TEST PHOTO

Radiated Measurement Photos





CONDUCTED EMISSION Photos