FCC Test Report

FCC EVALUATION REPORT FOR CERTIFICATE	
Project Reference No.	270658
Product	Remote Training System
Brand Name	motorola
Model	TRAVELFENCE50TU
Alternate Model	/
Tested according to	FCC Rules and Regulations Part 15 Subpart C 2013, 15.247 ANSI C63.4-2009

Tested in period	2014-10-26 to 2014-10-30
Issued date	2014-10-31
Name and address of the Test House	Nemko Nemko Shanghai Ltd. Shenzhen Branch Unit CD, Floor 10, Tower 2, Financial base, Kefa Road 8#, Hi-Technology Park, Nanshan District, Shenzhen, China Phone : +86 755 8221 0420 Fax : +86 755 8221 3363
Tested by	Zone Peng 2014-10-31 ***Zone Peng*** ***date***
Verified by	Daria Liu 2014-11-05 ***Daria Liu*** ***date***

Contents of This Report

1. Client Information

1.1 Applicant

Company Name:	BINATONE ELECTRONICS INTERNATIONAL LTD.
Company Address:	Flat 23A, 9 Des Voeux Road West, Hong Kong

1.2 Manufacturer

Company Name:	Foshan Shunde Alford Electronics Co., Ltd.
Company Address:	Xinjiao Industrial Park, DaLiang, ShunDe, Foshan City, Guangdong Province, China

1.3 Scope

●Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission under FCC part 15.247.

2. Equipment under Test (EUT)

2.1 Identification of EUT

Category:	N/A
Name:	Remote Training System
Model Name:	TRAVELFENCE50TU
Alternate model:	/
Brand name:	motorola
Remark:	/

2.2 Detail spec:

Operation Frequency：2441MHz
Type of Modulation : CSS

Antenna Type：Integral Antenna
Antenna Number : 1
Antenna gain: 0dBi
Channel number: 1

Max PK Output power: 19.57dBm

2.3 Additional Information Related to Testing

CH 2441 MHz

Remark: Only the worse case found by prescan is listed

3. General Test Conditions

3.1 Location

Global United Technology Services Co., Ltd. -- Nemko ELA 632

2nd Floor, Block No.2, Laodong Industrial Zone, Xixiang Road Baoan District, Shenzhen, China

FCC Registration No.:600491

IC Registration No.9079A-1

Note: all test are witnessed by NEMKO engineer

3.2 Operating Environment

All tests and measurements were performed in a shielded enclosure or a controlled environment suitable for the tests conducted. The climatic conditions in the test area are automatically controlled and recorded continuously.

Parameters	Recording during test	Accepted deviation
Ambient temperature	24-25°C	15 – 35 ºC
Relative humidity	50-55%RH	30 - 60%RH
Atmospheric pressure	101.2 kPa -101.3kPa	86-106kPa

3.3 Operating During Test

Test mode

TM1 : 120VAC 60Hz TX Mode continuous transmiting

Remark : Input voltage have been adjusted from 85% to 115% ,no influence of Fundamental emission found .

3.4 Test Equipment

The test equipments used in testing are calibrated on a regular basis. For most of the testing equipments accredited calibration is conducted once a year. For certain equipment the calibration interval is longer. Between the calibrations all test equipment are controlled and verified on a regular basis. The test equipments used are defined in each test section of this report.

4. Measurement Uncertainty

The Measurement Uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 with the confidence level of 95 %.

Conducted Emission : 0.15~30MHz 3.45dB

Radiated Emission: 30MHz~1000MHz 4.50dB

1GHz-18GHz 4.70dB

5. Radiated Electromagnetic Disturbances

5.1 Test Procedure

The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. An antenna was located 3m from the EUT on an adjustable mast.

The EUT were rotated 0 to 360 degree and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. The test result are reported as below.

For below 1GHz

RBW=120 kHz; VBW=300KHz.QP detector,The frequency range from 30MHz to 1000MHz is checked.

For above 1GHz. The frequency range from 1GHz to 25GHz(10^{th} harmonics) is checked.

RBW=1MHz ; VBW=1MHz,PK detector for peak emissions measurement above 1GHz

RBW=1MHz ; VBW=3MHz, RMS detector for average emissions measure above 1GHz

5.2 Measurement Equipment

	Equipment	Calibration due	Type	Serial No.	Manufacturer
☒	EMI Test Receiver	Jul. 04 2015	ESU26	GTS203	R&S
☒	BiConiLog Antenna	Feb. 26 2015	VULB9163	GTS214	SCHWARZBECK
☒	Horn Antenna	Feb. 26 2015	BBHA9120D	GTS215	SCHWARZBECK
☒	Horn Antenna	Feb. 26 2015	BBHA9170	GTS216	SCHWARZBECK
☒	Coaxial Cable	Apr. 01 2015	N/A	GTS213	GTS
☒	Coaxial Cable	Apr. 01 2015	N/A	GTS211	GTS
☒	Coaxial cable	Apr. 01 2015	N/A	GTS210	GTS
☒	Coaxial Cable	Apr. 01 2015	N/A	GTS212	GTS
☒	Amplifier	Jul. 04 2015	8347A	GTS204	HP

5.3 Test Result

Remark: If PK value is lower than AV limit , only show PK diagram as below.

From 18GHz to 25GHz, Spurious Emission can not be found .

For restriction band test :Only list the restriction band test which there found emission.

For other restriction band: no emission found.

For Radiated emission test : The EUT have been tested at X,Y,Z axial direction, Only list the worse mode.

Mode	Freq range	Test ANT polarity	Diagram	Test Result
TX MODE	30MHz-1GHz:	H	5-1	Pass
	30MHz-1GHz:	V	5-2	Pass
	1GHz-18GHz:	H	5-3	Pass
	1GHz-18GHz:	V	5-4	Pass

NOTES:

1.All modes were measured and only the worst case emission was reported.

2. H =Horizontal V=Vertical

3. Emission = Reading +Antenna Factor + Cable Loss –Amp Factor

4. Emission level dB μ V = 20 log Emission level μ V/m

5. The lower limit shall apply at the transition frequencies

6. All the emissions appearing within 15.205 Restricted bands shall not exceed the limits shown in (15.209 limit)#.

7. Unwanted emissions not falling within restricted frequency bands shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits;

Remark :

The limit of " # "of 3 meter distance is

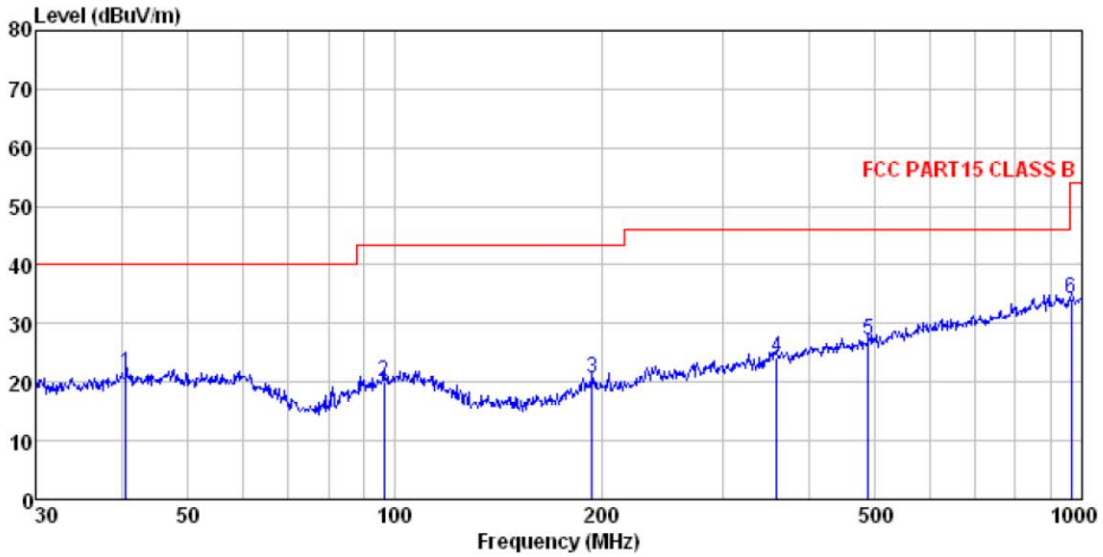
Frequency MHz	Distance m	Field strength		Distance m	Field strength
		μV/m	dBμV/m(QP)		dBμV/m(QP)
30-88	3	100	40.0	10	30.0
88-216	3	150	43.5	10	33.5
216-960	3	200	46.0	10	36.0
960-1000	3	500	54.0	10	44.0
Above 1000	3	74.0 dBμV/m (PK) 54.0 dBμV/m (AV)		/	/

15.205 Restricted bands:

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
[1]0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	[2]
13.36–13.41.			

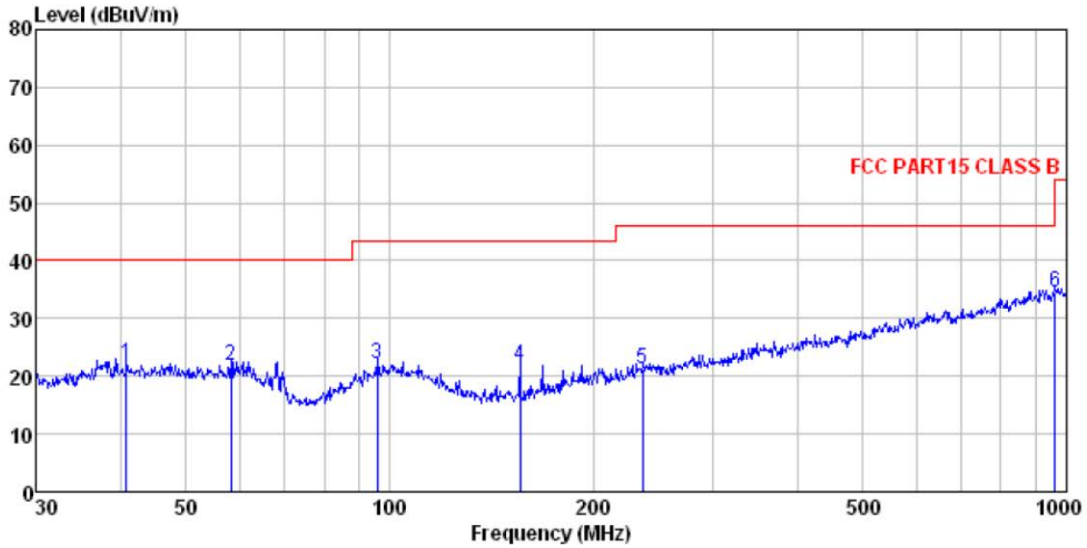
[1]Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.
[2]Above 38.6

5.3.1 Diagram 5-1



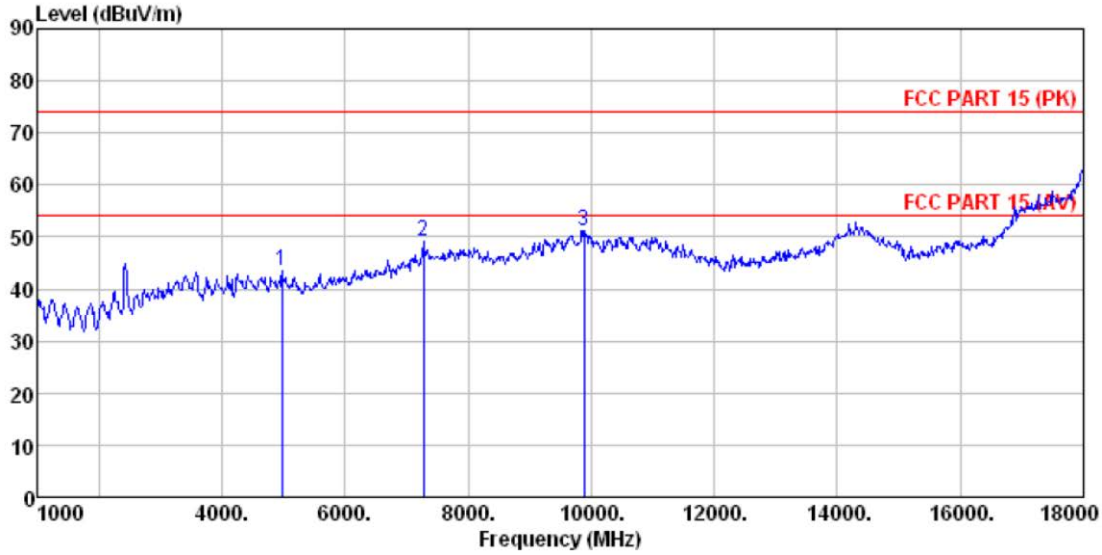
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	40.559	37.49	15.58	0.67	32.05	21.69	40.00	-18.31	QP
2	96.436	35.70	14.94	1.16	31.75	20.05	43.50	-23.45	QP
3	193.773	38.44	12.56	1.81	32.12	20.69	43.50	-22.81	QP
4	359.186	37.18	16.40	2.67	32.00	24.25	46.00	-21.75	QP
5	489.027	37.02	18.33	3.26	31.59	27.02	46.00	-18.98	QP
6	965.542	36.74	23.52	5.09	31.22	34.13	54.00	-19.87	QP

5.3.2 Diagram 5-2

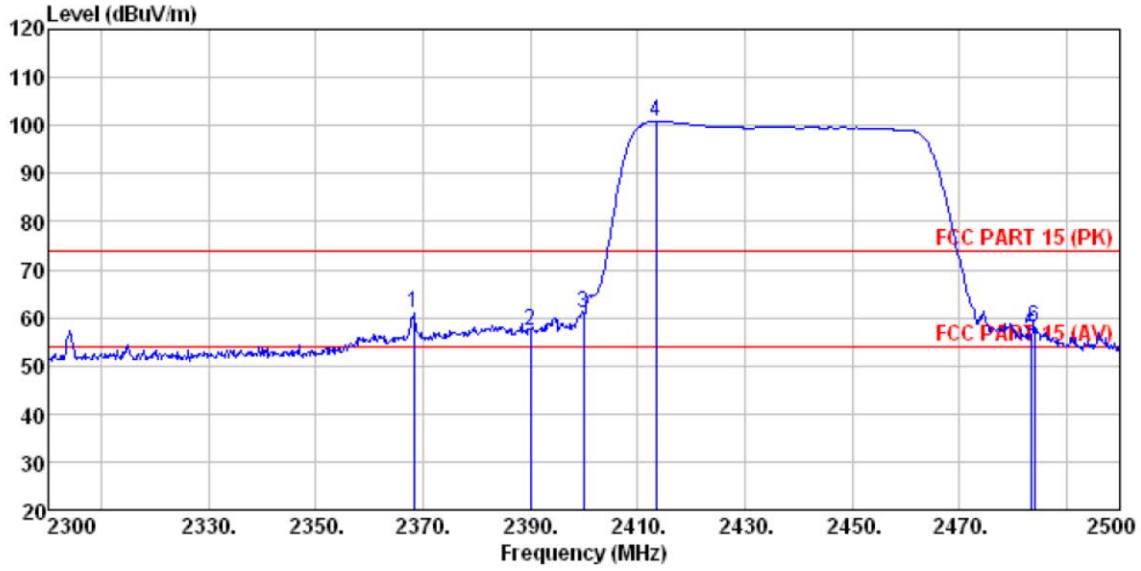


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	40.845	37.85	15.57	0.67	32.05	22.04	40.00	-17.96	QP
2	58.203	38.28	14.80	0.84	31.94	21.98	40.00	-18.02	QP
3	95.762	37.74	14.90	1.16	31.74	22.06	43.50	-21.44	QP
4	155.910	41.82	10.51	1.60	32.00	21.93	43.50	-21.57	QP
5	236.645	37.36	13.93	2.05	32.16	21.18	46.00	-24.82	QP
6	962.162	37.25	23.49	5.09	31.22	34.61	54.00	-19.39	QP

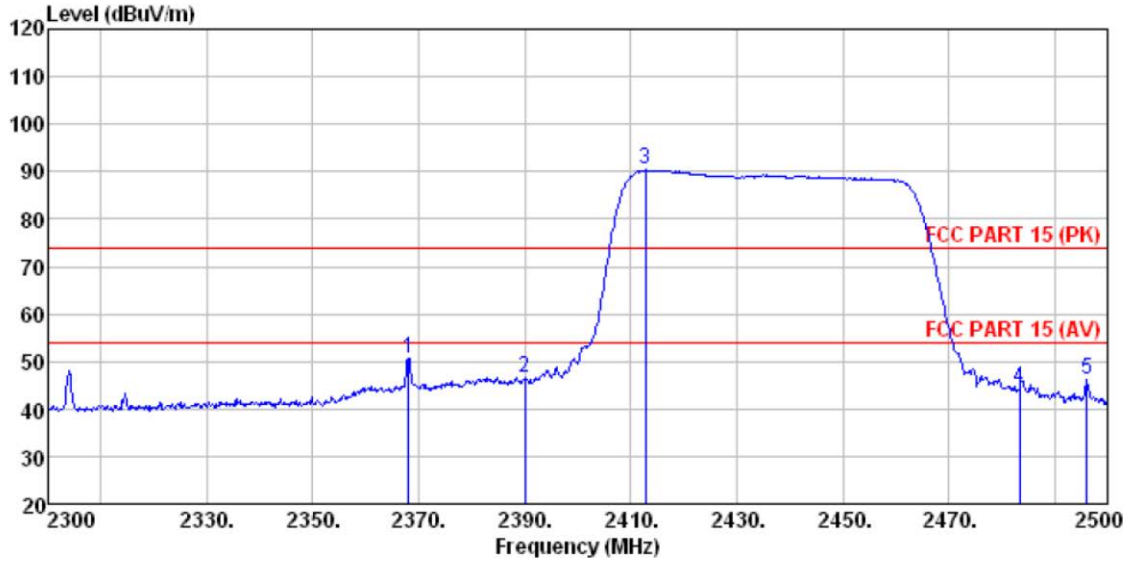
5.3.3 Diagram 5-3



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	4978.000	35.15	31.94	8.74	32.17	43.66	74.00	-30.34	Peak
2	7273.000	33.12	36.28	11.69	31.94	49.15	74.00	-24.85	Peak
3	9891.000	30.02	38.72	14.35	31.82	51.27	74.00	-22.73	Peak

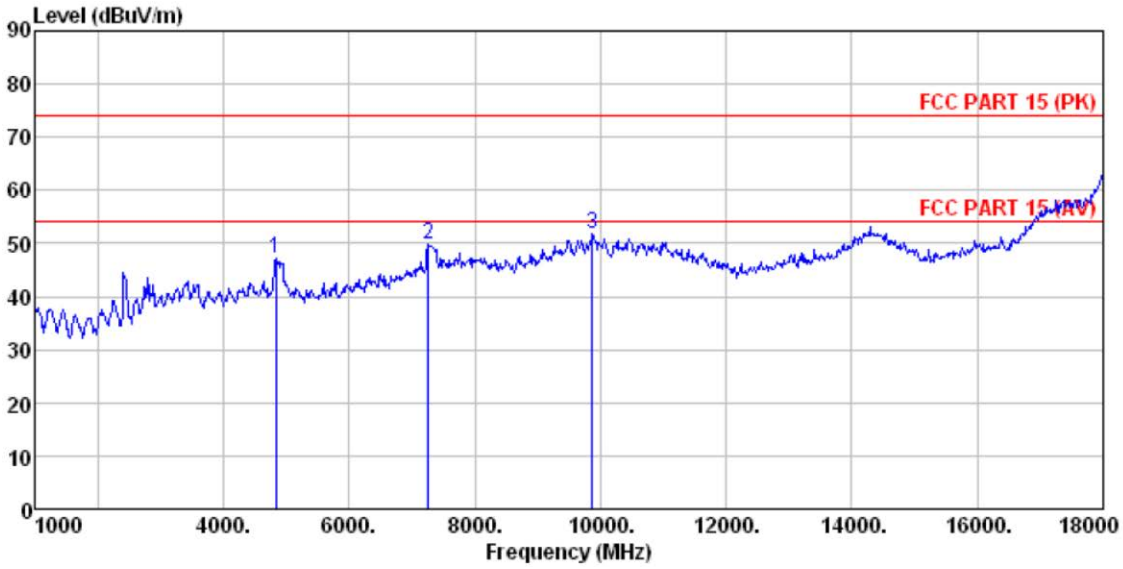


		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1		2368.200	58.05	27.67	5.36	30.25	60.83	74.00	-13.17	Peak
2		2390.000	54.61	27.59	5.38	30.18	57.40	74.00	-16.60	Peak
3		2400.000	58.28	27.58	5.39	30.18	61.07	74.00	-12.93	Peak
4	*	2413.400	97.98	27.55	5.41	30.12	100.82			Peak
5		2483.400	53.16	27.53	5.47	29.93	56.23	74.00	-17.77	Peak
6		2484.000	55.00	27.53	5.47	29.93	58.07	74.00	-15.93	Peak

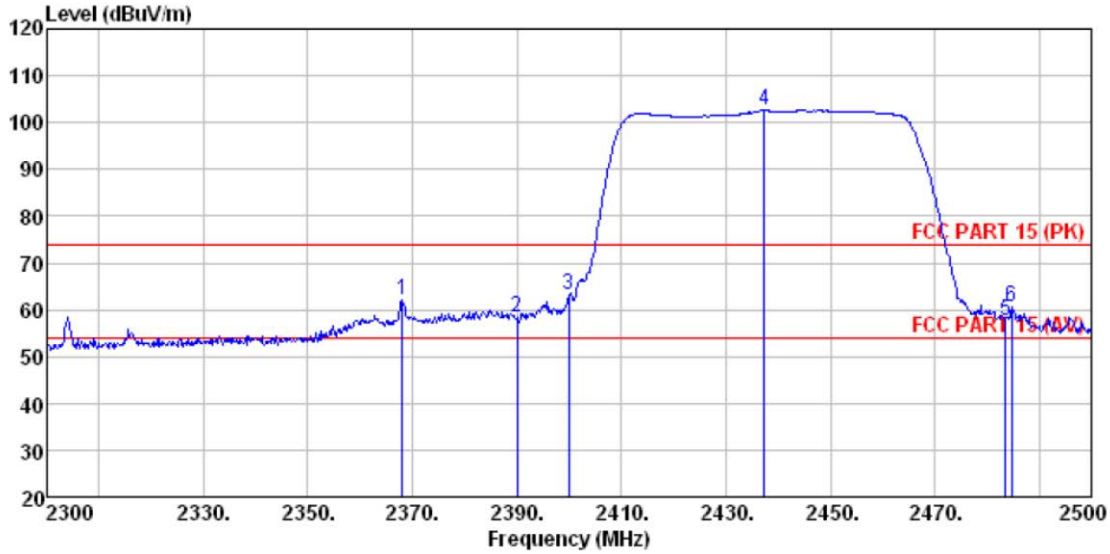


		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1		2368.000	47.69	27.67	5.36	30.25	50.47	54.00	-3.53	Average
2		2390.000	43.78	27.59	5.38	30.18	46.57	54.00	-7.43	Average
3	*	2412.800	87.46	27.55	5.41	30.12	90.30			Average
4		2483.400	41.27	27.53	5.47	29.93	44.34	54.00	-9.66	Average
5		2496.200	42.96	27.55	5.48	29.93	46.06	54.00	-7.94	Average

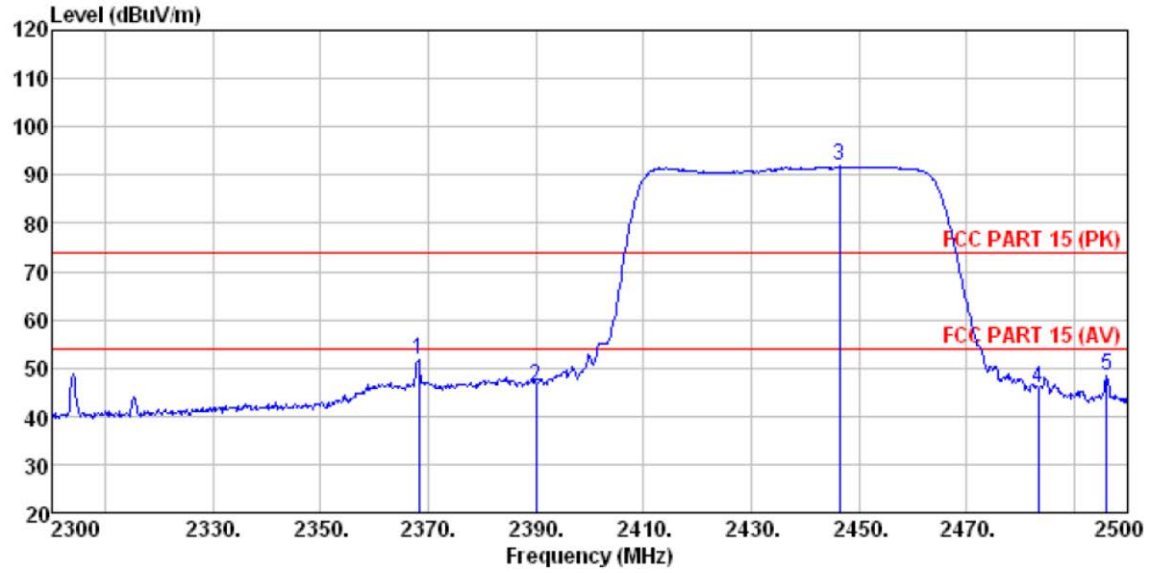
5.3.4 Diagram 5-4



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	4842.000	38.85	31.82	8.63	32.11	47.19	74.00	-26.81	Peak
2	7256.000	33.87	36.24	11.69	31.96	49.84	74.00	-24.16	Peak
3	9874.000	30.60	38.72	14.33	31.80	51.85	74.00	-22.15	Peak



		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1		2368.000	59.39	27.67	5.36	30.25	62.17	74.00	-11.83	Peak
2		2390.000	55.45	27.59	5.38	30.18	58.24	74.00	-15.76	Peak
3		2400.000	60.26	27.58	5.39	30.18	63.05	74.00	-10.95	Peak
4	*	2437.400	99.76	27.50	5.43	30.06	102.63			Peak
5		2483.500	54.48	27.53	5.47	29.93	57.55	74.00	-16.45	Peak
6		2484.800	57.53	27.53	5.47	29.93	60.60	74.00	-13.40	Peak



		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1		2368.200	49.14	27.67	5.36	30.25	51.92	54.00	-2.08	Average
2		2390.000	43.50	27.59	5.38	30.18	46.29	54.00	-7.71	Average
3	*	2446.400	88.96	27.46	5.44	30.06	91.80			Average
4		2483.400	42.76	27.53	5.47	29.93	45.83	54.00	-8.17	Average
5		2496.200	45.49	27.55	5.48	29.93	48.59	54.00	-5.41	Average

6. 6dB Bandwidth test

6.1 Test Procedure

6dB Bandwidth:

Systems using digital modulation techniques may operate in the 902 - 928 MHz,2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

The transmitter output was connected to a spectrum analyzer. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 KHz RBW and 300 KHz VBW. The 6dB bandwidth is defined as the total spectrum with the power of which is lower than peak power for 6dB.

1. Set resolution bandwidth (RBW) = 100 kHz.
2. Set the video bandwidth (VBW) _ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

6.2 Measurement Equipment

	Equipment	Calibration due	Type	Serial No.	Manufacturer
☒	Spectrum	Jul. 04 2015	FSP30	GTS208	RS

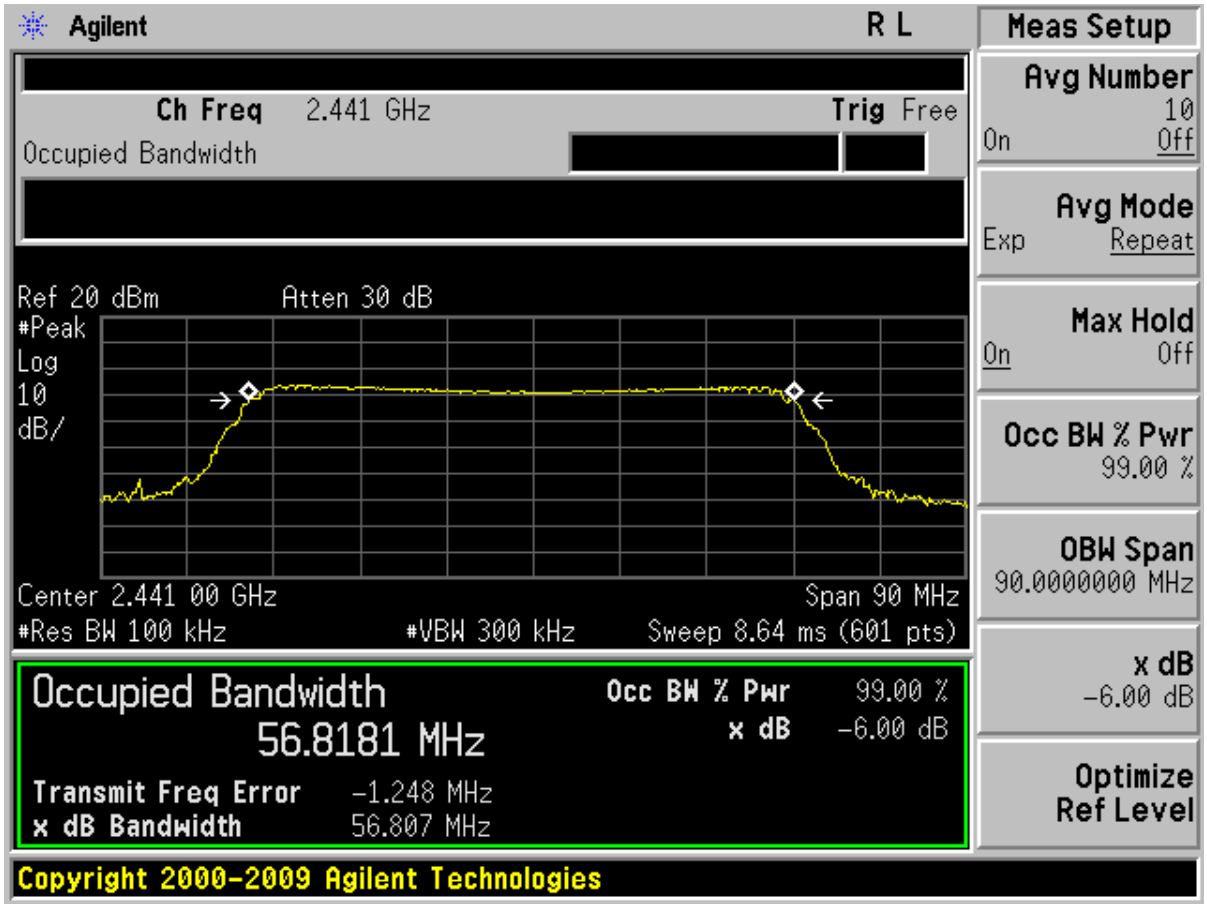
6.3 Test Result

Remark : Conducted measurement.

6dB Bandwidth:

Diagram	6dB bandwidth (MHz)	99% bandwidth (MHz)	>Limit kHz	Result
6-1	56.807	56.8181	500	PASS

6.3.1 Diagram 6-1



7. Band Edge Compliance Test

7.1 Test Procedure

In any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

7.2 Measurement Equipment

	Equipment	Calibration due	Type	Serial No.	Manufacturer
☒	Spectrum	Jul. 04 2015	FSP30	GTS208	RS

7.3 Test Result

Conducted measurement

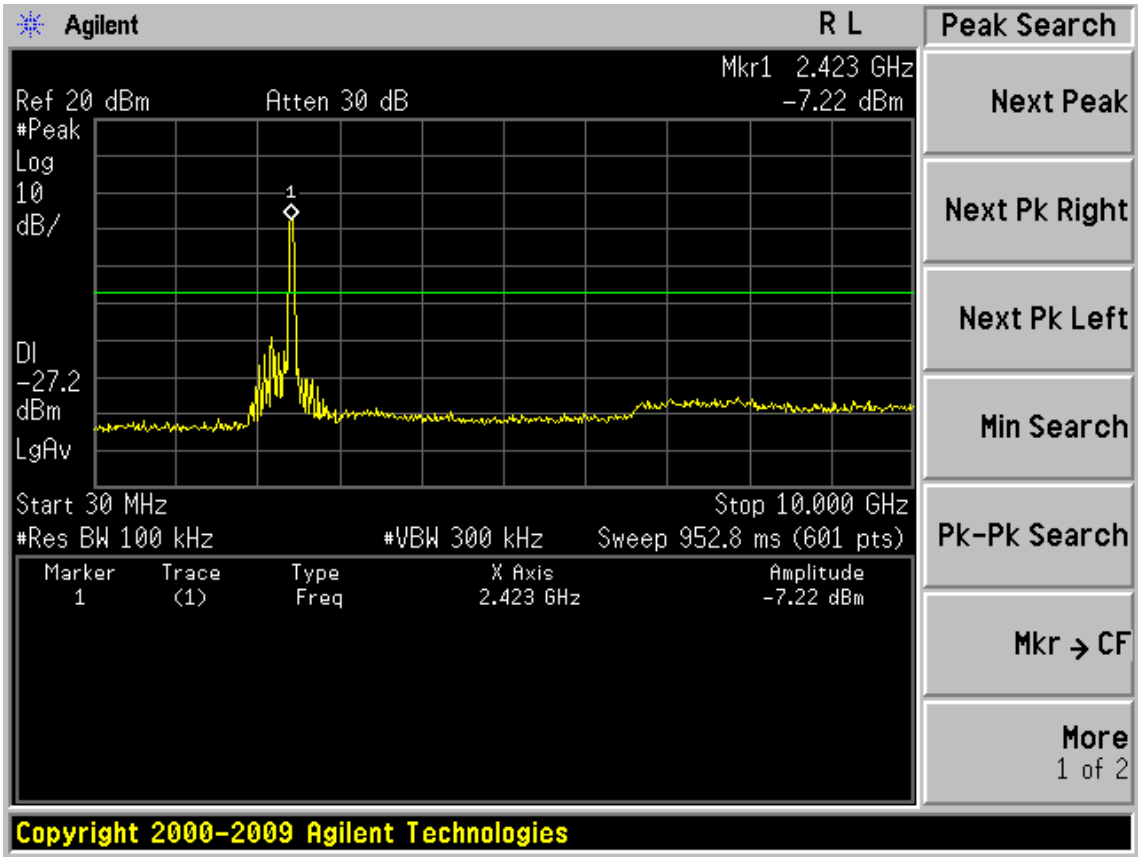
PK detector

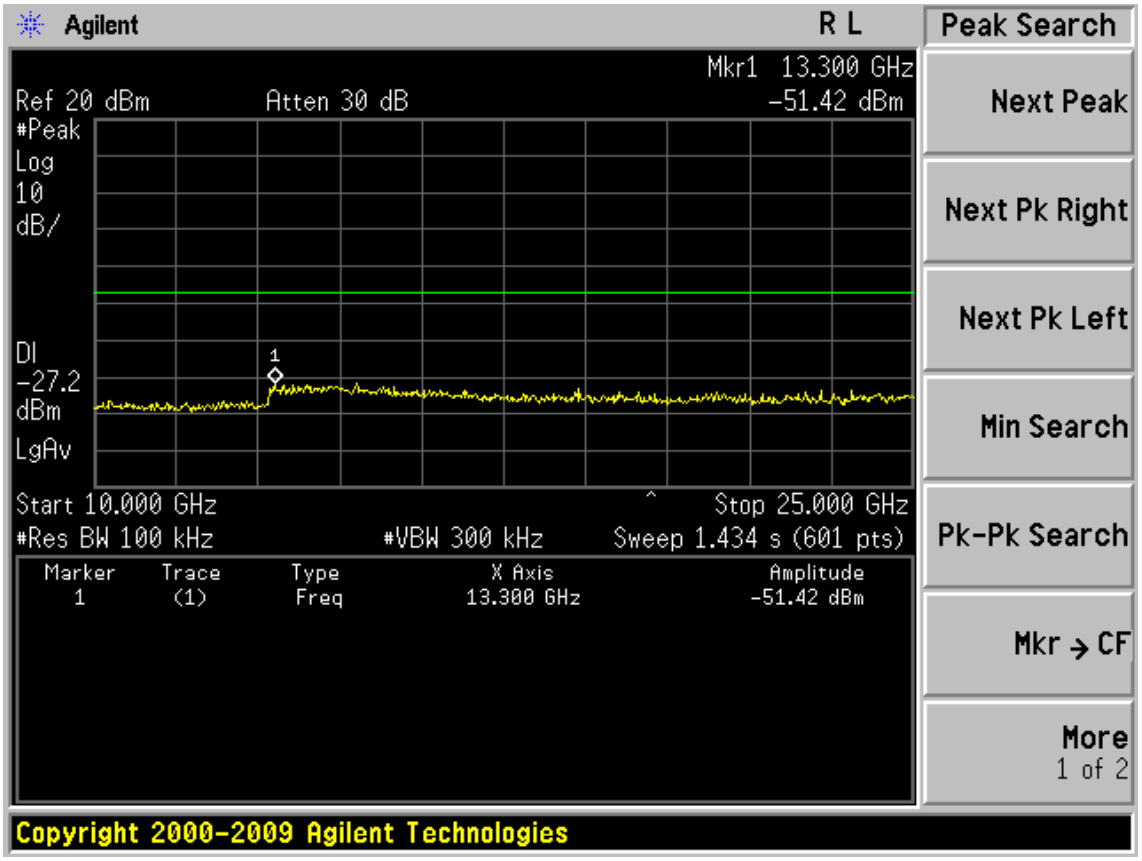
Max hold

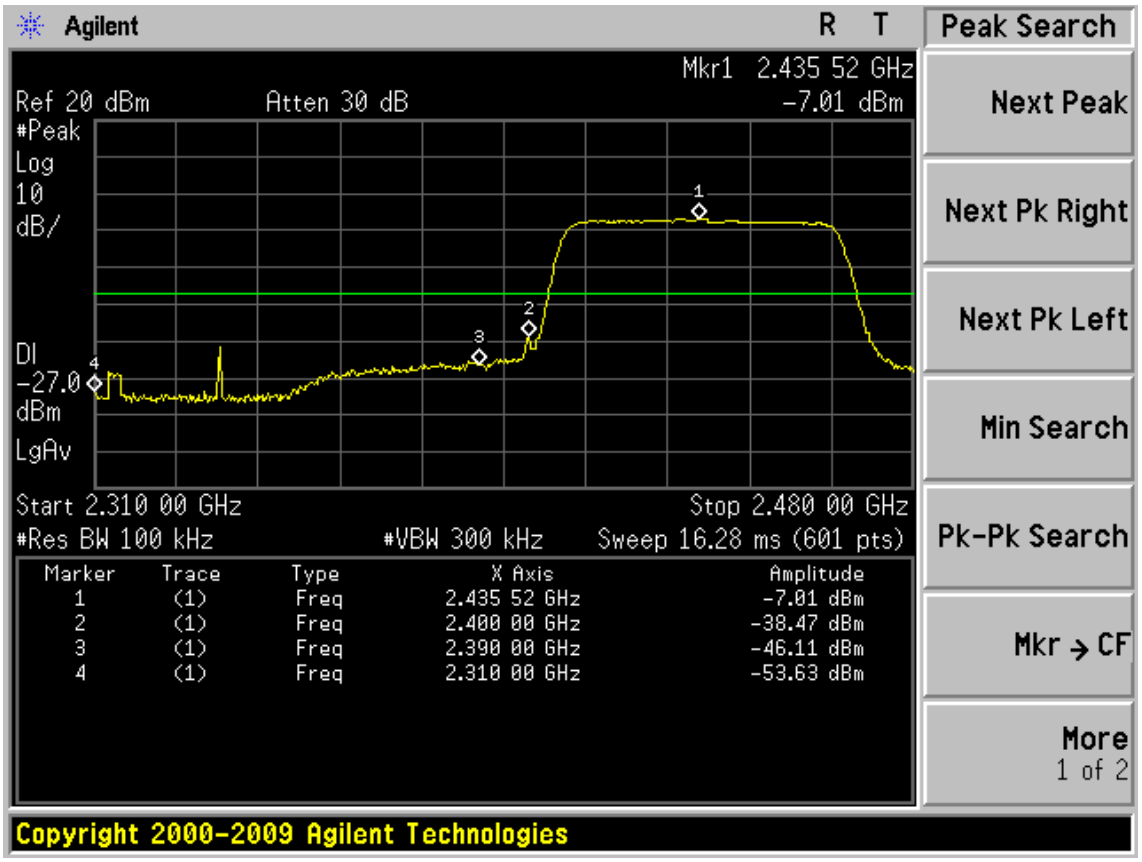
RMB100kHz VBW 300kHz

Channel	Test Data	Test Result
2441MHz	Diagram 7-1	Pass

7.3.1 Diagram 7-1




Agilent
R L
Peak Search
Mkr1 13.300 GHz
Ref 20 dBm
Atten 30 dB
-51.42 dBm
#Peak
Log
10
dB/
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Dl
-27.2
dBm
LgAv
Start 10.000 GHz
Stop 25.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.434 s (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 13.300 GHz -51.42 dBm
Copyright 2000-2009 Agilent Technologies


Agilent
R T
Peak Search
Mkr1 2.435 52 GHz
Ref 20 dBm
Atten 30 dB
-7.01 dBm
#Peak
Log
10
dB/
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Dl
-27.0
dBm
LgAv
Start 2.310 00 GHz
Stop 2.480 00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 16.28 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.435 52 GHz -7.01 dBm
2 (1) Freq 2.400 00 GHz -38.47 dBm
3 (1) Freq 2.390 00 GHz -46.11 dBm
4 (1) Freq 2.310 00 GHz -53.63 dBm
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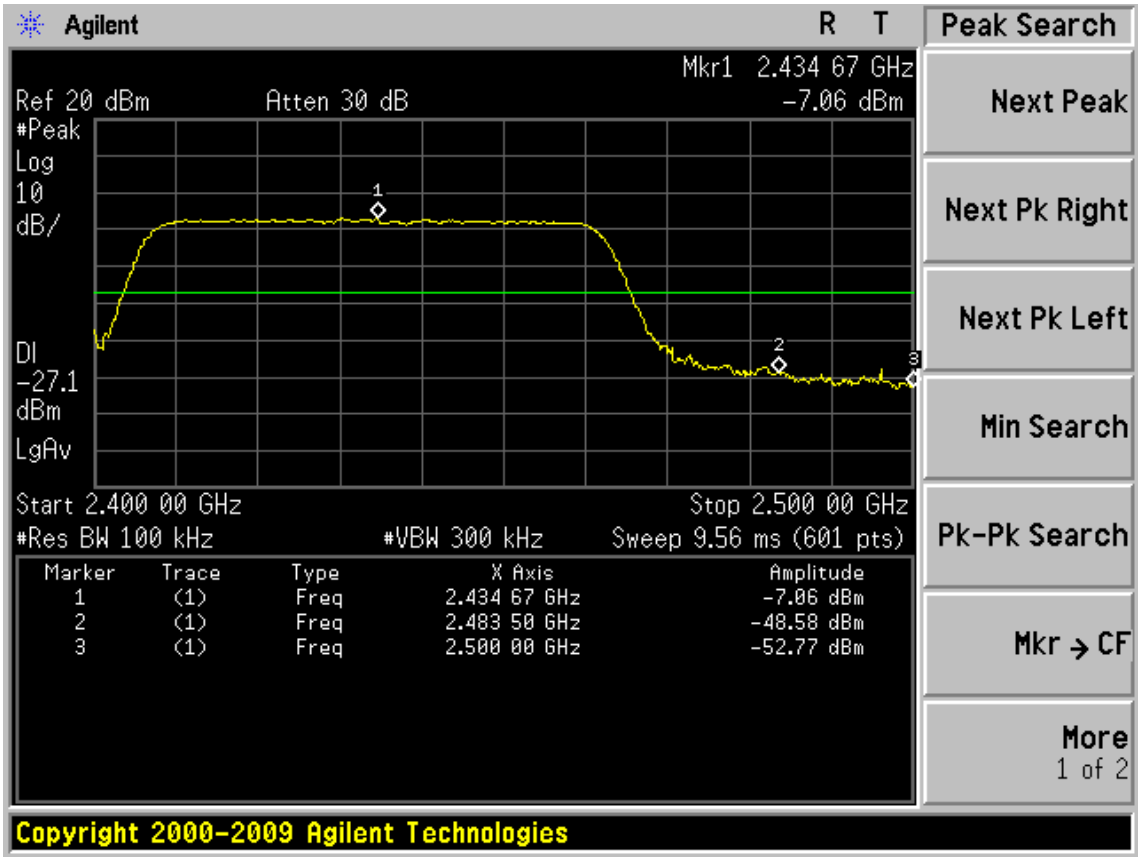

Agilent
R T
Peak Search
Mkr1 2.434 67 GHz
Ref 20 dBm
Atten 30 dB
-7.06 dBm
Next Peak
#Peak
Log
10
dB/
Next Pk Right
Next Pk Left
Dl
-27.1
dBm
LgAv
Min Search
Start 2.400 00 GHz
Stop 2.500 00 GHz
Pk-Pk Search
#Res BW 100 kHz
#VBW 300 kHz
Sweep 9.56 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.434 67 GHz -7.06 dBm
2 (1) Freq 2.483 50 GHz -48.58 dBm
3 (1) Freq 2.500 00 GHz -52.77 dBm
Mkr → CF
More
1 of 2
Copyright 2000-2009 Agilent Technologies

8. Power Spectral Density Test

8.1 Test Procedure

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

The transmitter output was connected to a spectrum analyzer. The maximum power density level was measured by spectrum analyzer with RBW >3kHz and Detector: PK

Cable loss and attenuator loss have been added in Spectrum setting offset .

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the RBW >=3 kHz.
4. Set the VBW>= 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

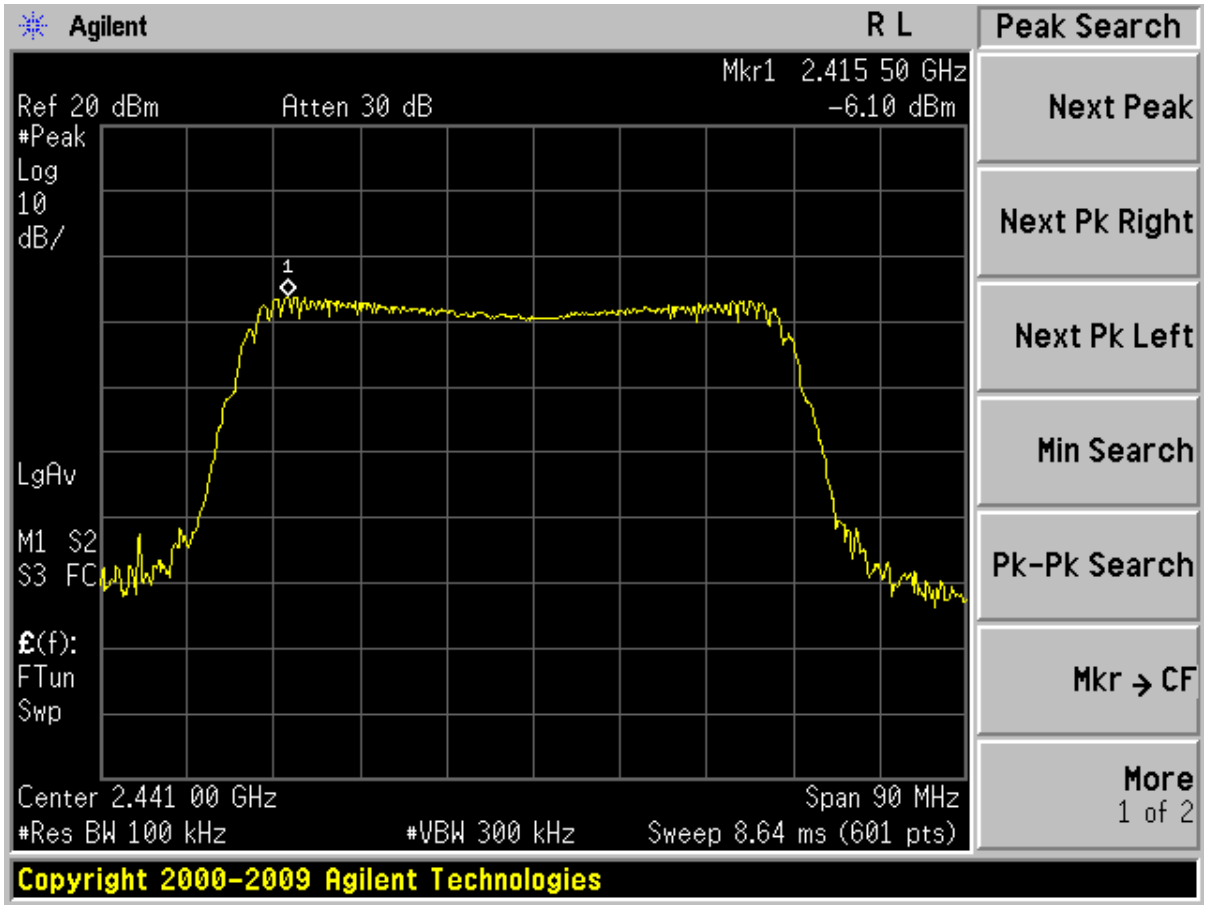
8.2 Measurement Equipment

	Equipment	Calibration due	Type	Serial No.	Manufacturer
☒	Spectrum	Jul. 04 2015	FSP30	GTS208	RS

8.3 Test Result

Channel	Diagram	Result (dBm)	<Limit (dBm)	Result
2441MHz	8-1	-6.10	8	Pass

8.3.1 Diagram 8-1



9. Peak Output Power Test

9.1 Test Procedure

For systems using digital modulation in the 2400—2483.5MHz, The Peak out put power shall not exceed 1W(30dBm)

The transmitter output was connected to a PK power meter ,Cable loss have been added in power meter setting offset .

9.2 Measurement Equipment

	Equipment	Calibration due	Type	Serial No.	Manufacturer
☒	Power Meter	July 01 2015	ML2495A	GTS540	Anritsu
☒	Power Sensor	July 01 2015	MA2411B	GTS541	Anritsu

9.3 Test Result

PEAK Output power : PASS

CH	Peak output Power （dBm）	AV output Power (dBm)	Limit (dBm)
2441MHz	19.57	12.11	30

10. Antenna requirement

10.1 Requirement

For intentional device, according to FCC 47 CFR Section 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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

10.2 Result

The antenna used for this product is Internal Patch antenna that no antenna other than that furnished by the responsible party shall be used with the device, The maximum peak gain of this antenna is 0dBi.

END OF REPORT