

Test Report

FCC Part15 Subpart C

Product Name : Barcode Scanner
Model No. : 1981i
FCC ID : HD5-1981A
IC : 1693B-1981A

Applicant : Honeywell International Inc
Address : 9680 old Bailes Rd Fort Mill SC29707 South
Carolina United States

Date of Receipt : Jan. 16, 2015
Test Date : Jan. 16, 2015~ Jan. 22, 2015
Issued Date : Jan. 30, 2015
Report No. : 14C0587R-RF-US-P06V01
Report Version : V 1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

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Test Report Certification

Issued Date : Jan. 30, 2015

Report No. : 14C0587R-RF-US-P06V01



Product Name : Barcode Scanner

Applicant : Honeywell International Inc

Address : 9680 old Bailes Rd Fort Mill SC29707 South Carolina United States

Manufacturer : 1. Honeywell International Inc
2. Metro(Suzhou)Technologies Co.,Ltd

Address : 1. 9680 old Bailes Rd Fort Mill SC29707 South Carolina United States
2. No.221 Xinghai street China-Singapore Suzhou Industrial Park

Model No. : 1981i

FCC ID : HD5-1981A

IC : 1693B-1981A

EUT Voltage : DC: 5.0 V

Trade Name : Honeywell

Applicable Standard : FCC CFR Title 47 Part 15 Subpart C: 2014
ANSI C63.10: 2013
ANSI C63.4:2014
RSS-Gen (Issue 4), November 2014
RSS-210 (Issue 8), December 2010

Test Result : Complied

Performed Location : Suzhou EMC Laboratory
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FCC Registration Number: 800392; IC Lab Code: 4075B

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Laboratory Information

We, **Quietek Corporation**, are an independent EMC and safety consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted(audited or listed) by the following related bodies in compliance with ISO 17025, EN 45001 and specified testing scope:

Taiwan R.O.C.	:	BSMI, NCC, TAF
Germany	:	TUV Rheinland
Norway	:	Nemko, DNV
USA	:	FCC
Japan	:	VCCI

The related certificate for our laboratories about the test site and management system can be downloaded from Quietek Corporation's Web Site :<http://www.quietek.com/tw/ctg/cts/accreditations.htm>
The address and introduction of Quietek Corporation's laboratories can be founded in our Web site :
<http://www.quietek.com/>

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
14C0587R-RF-US-P06V01	V1.0	Initial Issued Report	Jan. 30, 2015

1. General Information

1.1. EUT Description

Product	Barcode Scanner
Brand Name	Honeywell
Model No.	1981i
Working Voltage	DC 5.0V
Bluetooth	
Bluetooth Specification	Version 2.1 + EDR
Frequency Range	2402- 2480 MHz
Channel Number	79
Channel Separation	1MHz
Type of Modulation	FHSS
Data Rate	1Mbps(GFSK), 2Mbps(Pi/4 DQPSK), 3Mbps (8DPSK)
Antenna Type	Reference to Antenna List
Peak Antenna Gain	Reference to Antenna List

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

Bluetooth Antenna List

Antenna	Manufacturer	Peak Gain
Helical Antenna	Taiyo Yuden	2.4GHz: 1.8 dBi

1.2. Mode of Operation

QuieTek has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: Transmitter-1Mbps(GFSK_DH5)
Mode 2: Transmitter-2Mbps(Pi/4 DQPSK_DH5)
Mode 3: Transmitter-3Mbps(8DPSK_DH5)
Mode 4: Receiver-1Mbps(GFSK_DH5)
Mode 5: Receiver-2Mbps(Pi/4 DQPSK_DH5)
Mode 6: Receiver-3Mbps(8DPSK_DH5)

Note:

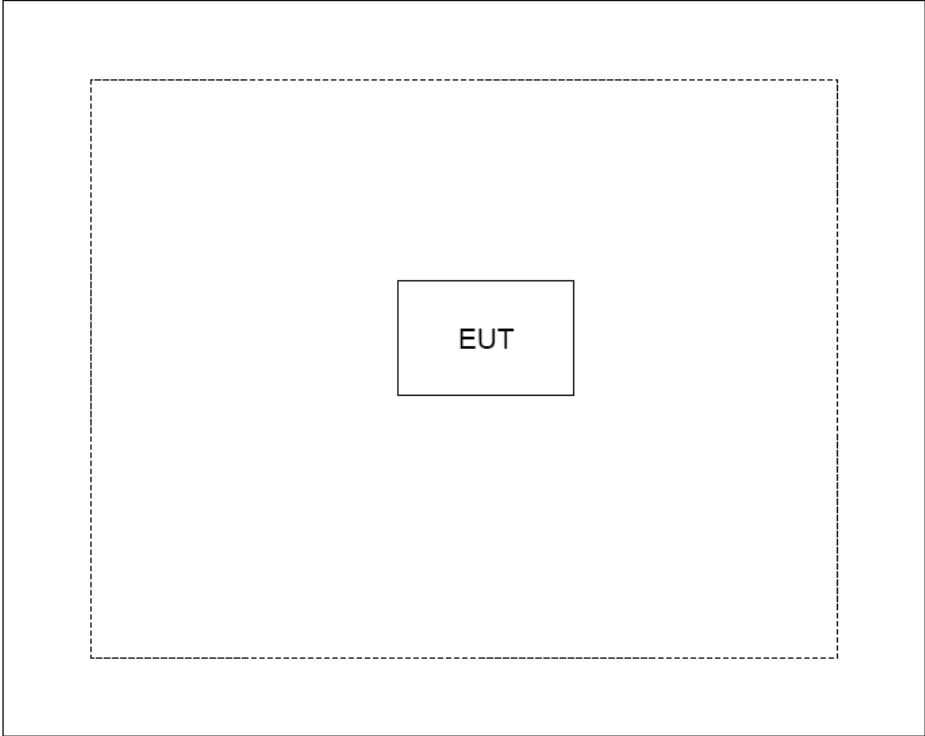
1. Regards to the frequency band operation: the lowest, middle and highest frequency of channel were selected to perform the test, then shown on this report.
2. For portable device, radiated spurious emission was verified over X, Y, Z Axis, and shown the worst case on this report.

1.3. Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook	Asus	N80V	8BN0AS226971468	N/A
2	iPod	Apple	A1199	7J71085BVQ5	Power by EUT
3	USB Mouse	DELL	MOC5UO	10D00JJL	N/A

1.4. Configuration of Tested System

Connection Diagram		
		
Signal Cable Type		Signal cable Description
A	N/A	N/A

1.5. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of equipment and scan barcode to enter the engineering mode.
3	Open the Bluetooth test set to control EUT, set the test mode and test channel, then start to test.

2. Technical Test

2.1. Summary of Test Result

☒ No deviations from the test standards

☐ Deviations from the test standards as below description:

Performed Test Item	Normative References	Test Performed	Deviation
Conducted Emission	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.207	Yes	No
Radiated Emission	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.209	Yes	No
20dB Bandwidth	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.247(a)(1)	Yes	No
99% Occupied Bandwidth	RSS-Gen Issue 4 2014 Section 6.6	Yes	No
Carrier Frequency Separation	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.247(a)(1)	Yes	No
Number of Hopping Frequencies	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.247(a)(1)(iii)	Yes	No
Time of Occupancy (Dwell Time)	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.247(a)(1)(iii)	Yes	No
Peak Output Power	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.247(b)(1)	Yes	No
Band-edge Compliance of RF Conducted Emissions	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.215(c), 15.247(d)	Yes	No
Spurious RF Conducted Emissions	FCC CFR Title 47 Part 15 Subpart C: 2014 15.247(d)	Yes	No
Radiated Emission Band Edge	FCC CFR Title 47 Part 15 Subpart C: 2014 15.247(d)	Yes	No

2.2. Test Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	21
Humidity (%RH)	25-75	50
Barometric pressure (mbar)	860-1060	950-1000

3. Conducted Emission

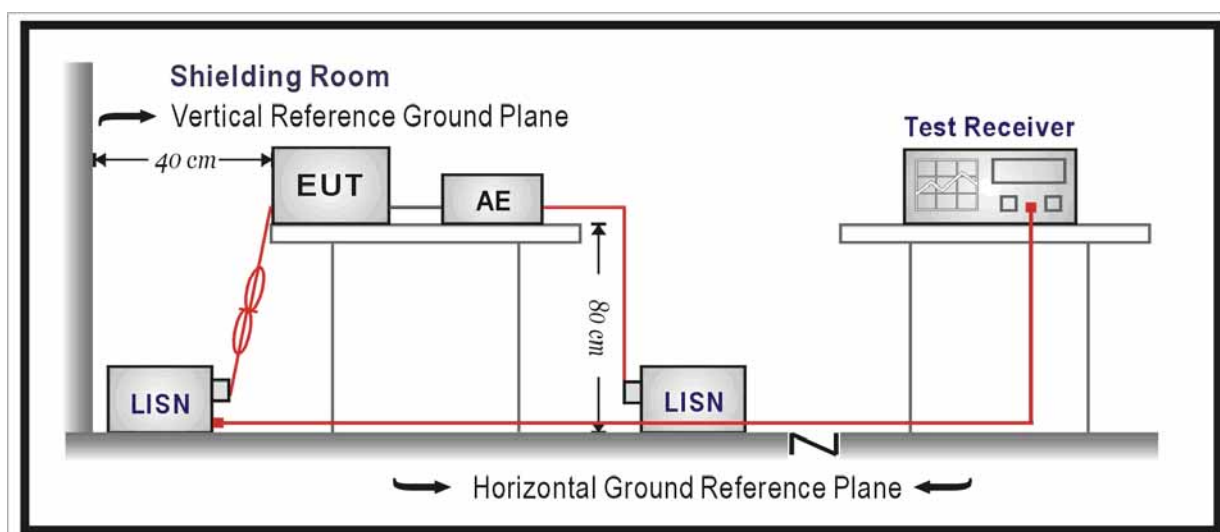
3.1. Test Equipment

Conducted Emission / TR-1

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100726	2015.03.28
Two-Line V-Network	R&S	ENV216	100043	2015.03.28
Two-Line V-Network	R&S	ENV216	100044	2015.09.16
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	2016.01.07
50ohm Termination	SHX	TF2	07081401	2015.09.16
Temperature/Humidity Meter	zhicheng	ZC1-2	TR1-TH	2016.01.07

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

3.2. Test Setup



3.3. Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

3.4. Test Procedure

According to FCC ANSI C63.4: 2009 & ANSI C63.10: 2009.

The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)

Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.

The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.

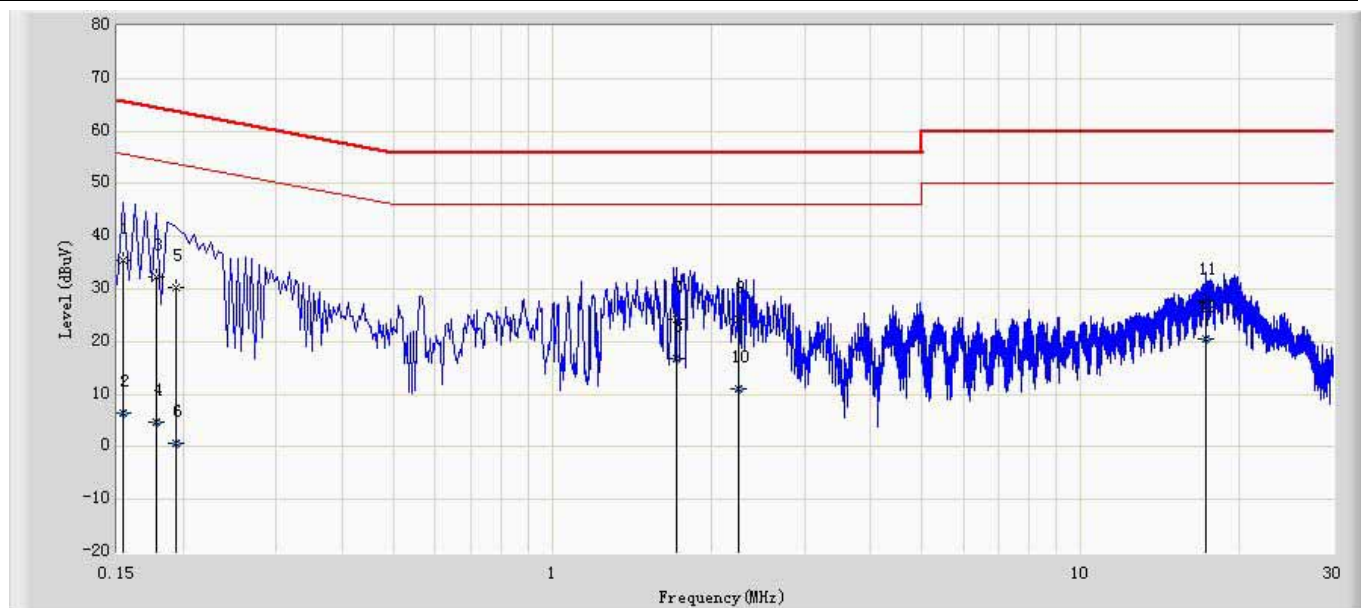
Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

3.5. Uncertainty

The measurement uncertainty is defined as ± 2.02 dB

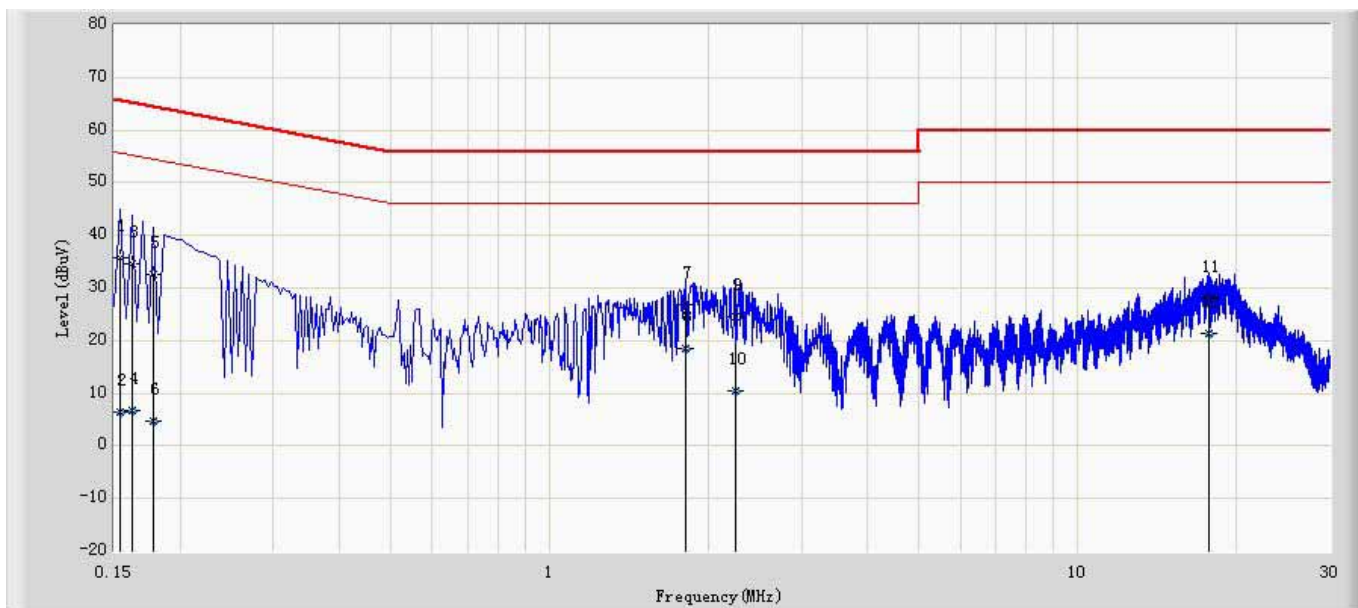
3.6. Test Result

Site: TR1	Time: 2015/01/21 - 15:23
Limit: FCC_Part15.107_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Line
EUT: Barcode Scanner	Power: AC 120V/60Hz
Note: Mode1 Transmit at channel 2402MHz by DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		0.154	35.513	25.664	-30.268	65.781	9.849	QP
2		0.154	6.383	-3.451	-49.398	55.781	9.834	AV
3		0.178	32.402	22.573	-32.176	64.578	9.829	QP
4		0.178	4.568	-5.254	-50.01	54.578	9.822	AV
5		0.194	30.254	20.435	-33.61	63.864	9.819	QP
6		0.194	0.582	-9.237	-53.282	53.864	9.819	AV
7		1.714	24.128	14.332	-31.872	56	9.796	QP
8	*	1.714	16.687	6.902	-29.313	46	9.785	AV
9		2.258	24.373	14.577	-31.627	56	9.796	QP
10		2.258	10.931	1.135	-35.069	46	9.796	AV
11		17.206	27.649	17.475	-32.351	60	10.174	QP
12		17.206	20.513	10.338	-29.487	50	10.175	AV

Site: TR1	Time: 2015/01/21 - 15:27
Limit: FCC_Part15.107_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Neutral
EUT: Barcode Scanner	Power: AC 120V/60Hz
Note: Mode1 Transmit at channel 2402MHz by DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		0.154	35.81	25.83	-29.971	65.781	9.98	QP
2		0.154	6.452	-3.521	-49.329	55.781	9.973	AV
3		0.162	34.459	24.493	-30.902	65.361	9.966	QP
4		0.162	6.645	-3.31	-48.716	55.361	9.955	AV
5		0.178	32.471	22.553	-32.107	64.578	9.918	QP
6		0.178	4.678	-5.241	-49.9	54.578	9.919	AV
7		1.814	26.784	16.79	-29.216	56	9.994	QP
8	*	1.814	18.452	8.467	-27.548	46	9.985	AV
9		2.254	24.621	14.678	-31.379	56	9.943	QP
10		2.254	10.593	0.65	-35.407	46	9.943	AV
11		17.666	28.117	17.974	-31.883	60	10.143	QP
12		17.666	21.297	11.158	-28.703	50	10.139	AV

Note: All the low ,middle and high channels of all different modes are investigated, and only report the worst case.

4. Radiated Emission

4.1. Test Equipment

Radiated Emission / AC-2

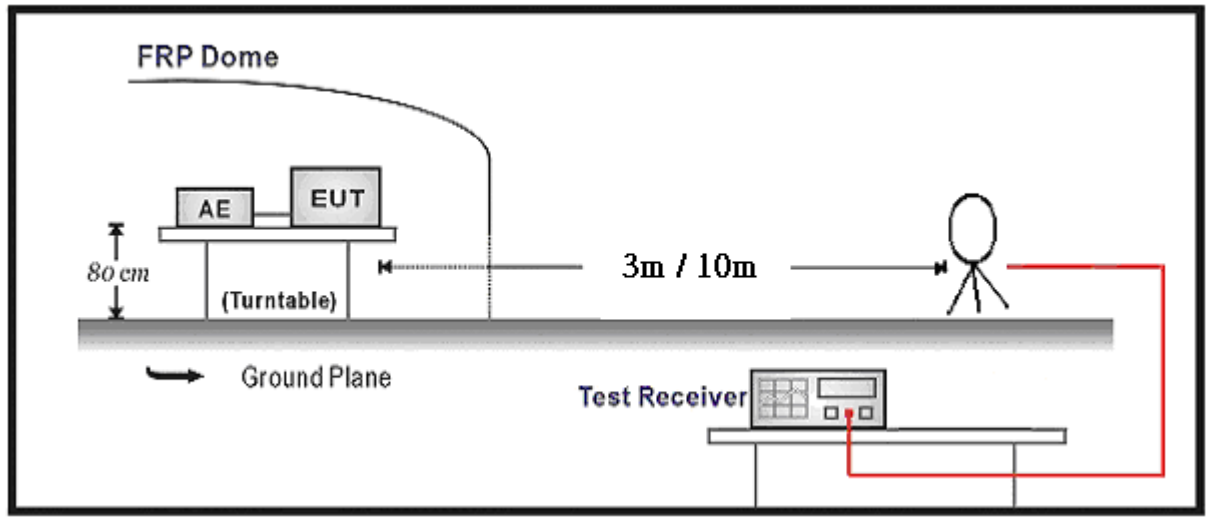
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100573	2015.03.28
Loop Antenna	R&S	HFH2-Z2	833799/003	2015.11.25
Bilog Antenna	Teseq GmbH	CBL6112D	27611	2015.10.10
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC2-C	2015.03.01
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC2-TH	2016.01.07

Radiated Emission / AC-5

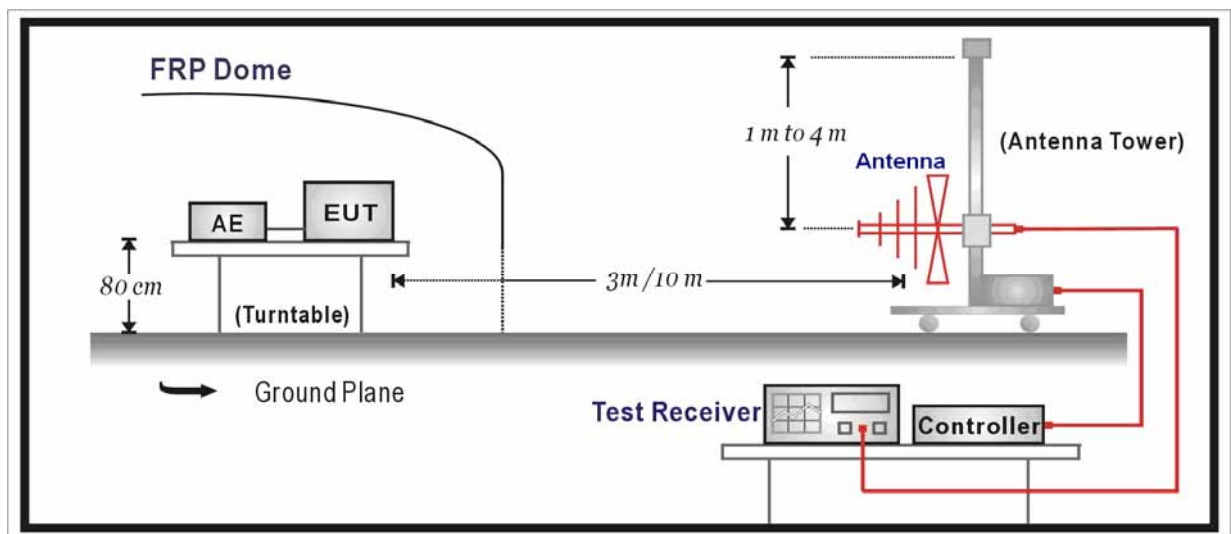
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2015.03.28
Preamplifier	Miteq	NSP1800-25	1364185	2015.05.12
Preamplifier	Quietek	AP-040G	CHM-0906001	2015.05.03
Bilog Antenna	Teseq GmbH	CBL6112D	27612	2015.05.03
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	499	2015.10.15
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	294	2016.01.07
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2016.04.10
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2015.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	AC5-C3	2015.03.01
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC5-TH	2015.06.09

4.2. Test Setup

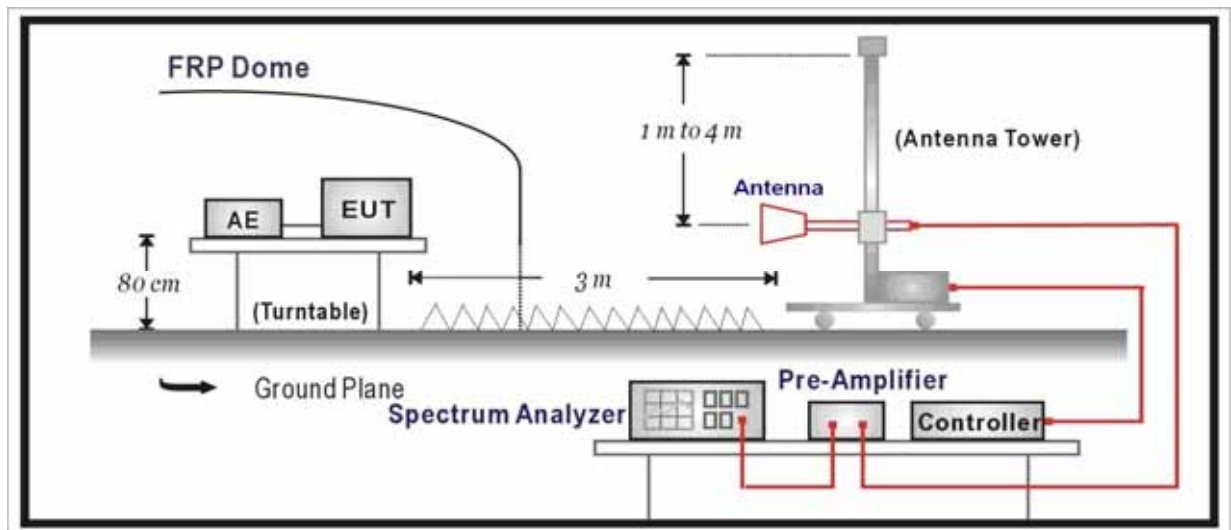
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



4.3. Limit

FCC Part 15 Subpart C Paragraph 15.209		
Frequency (MHz)	Distance (m)	Level (dBuV/m)
30 - 88	3	40
88 - 216	3	43.5
216 - 960	3	46
Above 960	3	54

Note 1: The lower limit shall apply at the transition frequency.

Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

Note 3: E field strength (dBuV/m) = 20 log E field strength (uV/m)

4.4. Test Procedure

According to ANSI C63.10: 2009.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the

maximum emission, all of the interface cables were manipulated according to ANSI C63.4: 2009 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

The frequency range from 30MHz to 10th harmonic is checked.

Note: When doing emission measurement above 1GHz, the horn antenna will be bended down a little (as horn antenna has the narrow beamwidth) in order to keeping the antenna in the “cone of radiation” of EUT. The 3dB beamwidth is 60~10 degrees for H-plane and 90~10 degrees for E-plane.

4.5. Uncertainty

The measurement uncertainty above 1GHz is defined as ± 3.9 dB
below 1GHz is defined as ± 3.8 dB

4.6. Test Result

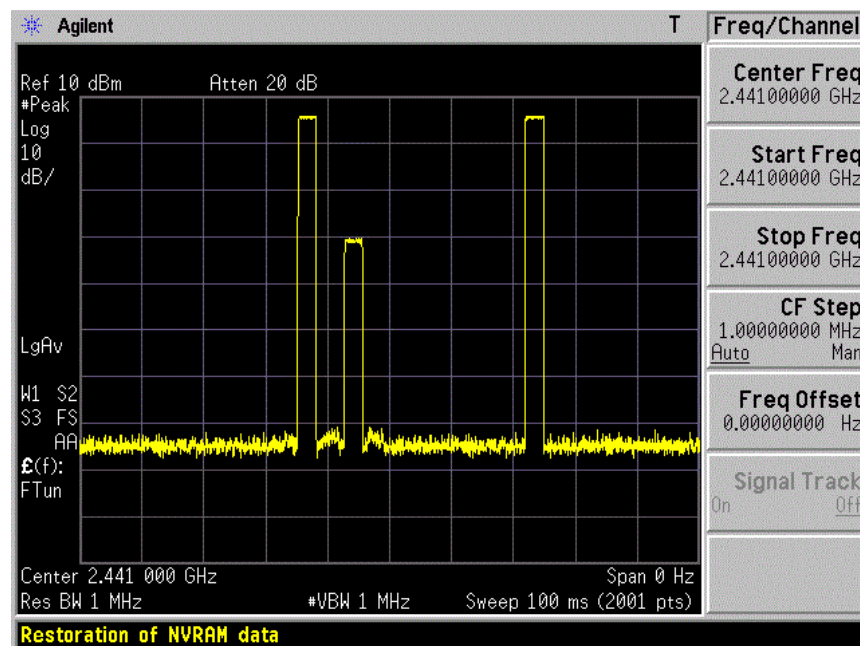
All of the test result shown indicates the worst case, and spectrum analyzer parameters setting as shown below:

Peak detector: RBW = 1MHz, VBW = 3MHz, sweep time = 200ms;

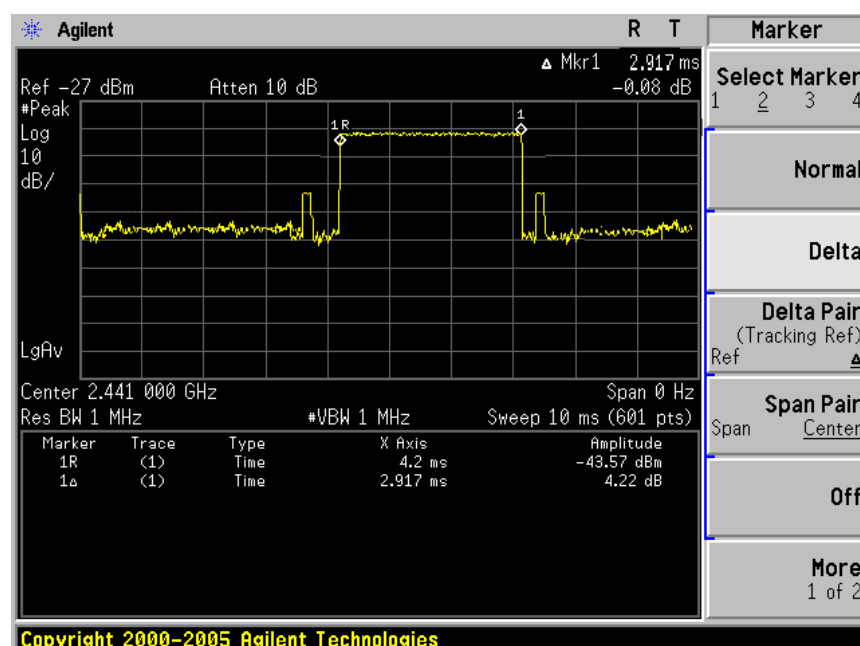
Average = Peak Measure Level+ Duty Factor

Duty Factor= $20 \cdot \text{LOG}(\text{Pulse Number} \cdot \text{On Time}/100) = -24.68\text{dB}$ in the worst condition of normal using.

Pulse Number



On Time



Measure Level = Reading Level + Cable Loss + Antenna Factor – Preamplifier Gain

Mode 1: Transmitter-1Mbps(GFSK_DH5)

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	H	4804	57.969	6.713	64.681	74	-9.319	PK
	H	4804			40.001	54	-13.999	AV
	V	4804	52.106	6.713	58.818	74	-15.182	PK
	V	4804			34.138	54(Note2)	-19.862	AV
	H	7206	38.961	8.942	47.903	54(Note2)	-6.097	PK
	V	7206	39.423	8.942	48.365	54(Note2)	-5.635	PK
	H	9608	38.273	10.437	48.71	54(Note2)	-5.29	PK
	V	9608	37.838	10.437	48.275	54(Note2)	-5.725	PK
39	H	7323	32.547	9.102	41.649	54(Note2)	-12.351	PK
	V	7323	32.254	9.102	41.356	54(Note2)	-12.644	PK
	H	4961	45.964	7.037	53.001	54(Note2)	-0.999	PK
	V	4944	38.833	7.021	45.854	54(Note2)	-8.146	PK
	H	7440	32.359	9.199	41.558	54(Note2)	-12.442	PK
	V	7440	33.352	9.199	42.551	54(Note2)	-11.449	PK
78	H	4804	33.238	6.713	39.951	54(Note2)	-14.049	PK
	V	4804	33.435	6.713	40.148	54(Note2)	-13.852	PK
	H	7216	32.056	8.952	41.008	54(Note2)	-12.992	PK
	V	7216	31.502	8.952	40.454	54(Note2)	-13.546	PK
	H	4884.5	44.919	6.881	51.8	54(Note2)	-2.2	PK
	V	4884.5	44.077	6.881	50.958	54(Note2)	-3.042	PK

Note 1: The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~25GHz), therefore no data appear in the report.

2: This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

Mode 2: Transmitter-2Mbps(Pi/4 DQPSK _DH5)

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	H	4804	53.154	6.713	59.866	74	-14.134	PK
	H	4804			35.186	54	-18.814	AV
	V	4804	46.661	6.713	53.373	54(Note2)	-0.627	PK
	H	7206	39.757	8.942	48.699	54(Note2)	-5.301	PK
	V	7206	39.322	8.942	48.264	54(Note2)	-5.736	PK
	H	9608	37.882	10.437	48.319	54(Note2)	-5.681	PK
	V	9608	37.211	10.437	47.648	54(Note2)	-6.352	PK
39	H	4884.5	54.712	6.825	61.537	74	-12.463	PK
	H	4884.5			36.857	54	-17.143	AV
	V	4884.5	57.263	6.825	64.088	74	-9.912	PK
	V	4884.5			39.408	54	-14.592	AV
	H	7324	40.846	9.015	49.861	54(Note2)	-4.139	PK
	V	7324	35.273	9.015	44.288	54(Note2)	-9.712	PK
	H	9764	55.219	10.531	65.750	74	-8.250	PK
	H	9764			41.070	54	-12.930	AV
	V	9764	50.408	10.531	60.939	74	-13.061	PK
	V	9764			36.259	54	-17.741	AV
78	H	4960	35.516	7.036	49.638	54(Note2)	-4.362	PK
	V	4960	40.874	7.036	47.910	54(Note2)	-6.090	PK
	H	7440	38.285	9.199	47.483	54(Note2)	-6.517	PK
	V	7440	37.557	9.199	46.755	54(Note2)	-7.245	PK
	H	9920	39.552	10.947	50.499	54(Note2)	-3.501	PK
	V	9920	38.884	10.947	49.831	54(Note2)	-4.169	PK

Note 1: The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~25GHz), therefore no data appear in the report.

2: This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

Mode 3: Transmitter-3Mbps(8DPSK_DH5)

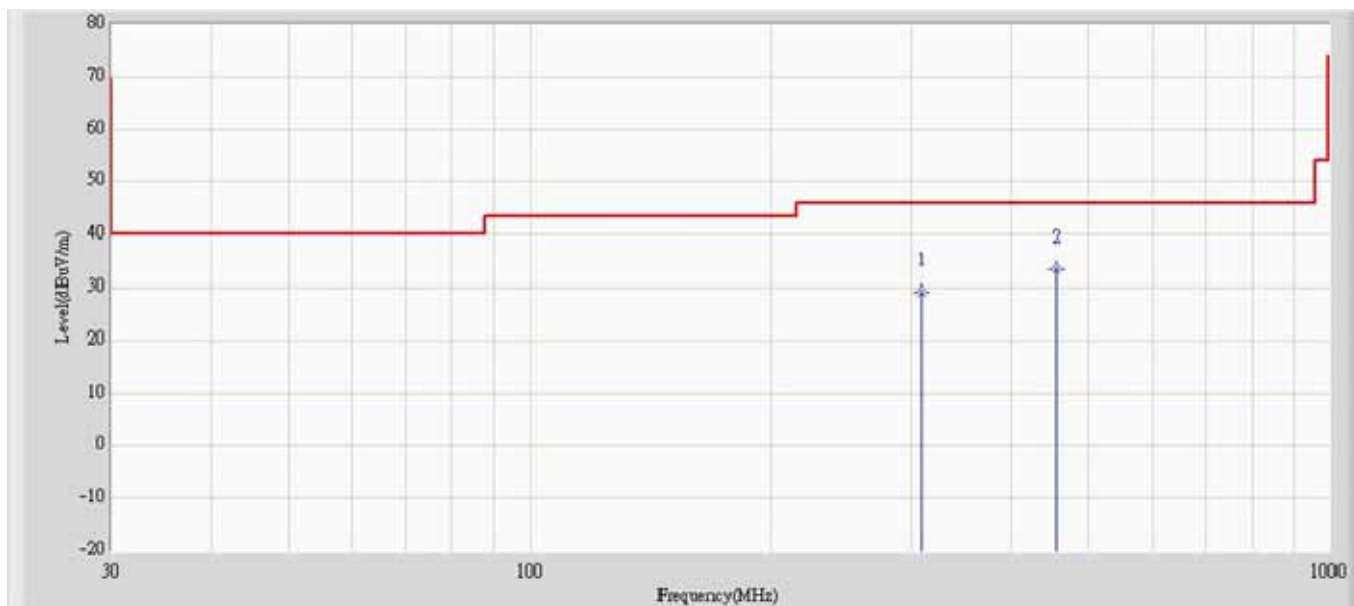
CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	H	4804	53.476	6.713	60.188	74	-13.812	PK
	H	4804			35.508	54	-18.492	AV
	V	4804	46.499	6.713	53.211	54(Note2)	-0.789	PK
	H	7206	38.849	8.942	47.791	54(Note2)	-6.209	PK
	V	7206	39.382	8.942	48.324	54(Note2)	-5.676	PK
	H	9608	37.267	10.437	47.704	54(Note2)	-6.296	PK
	V	9608	37.647	10.437	48.084	54(Note2)	-5.916	PK
39	H	4884.5	54.421	6.825	61.246	74	7.246	PK
	H	4884.5			36.566	54	-17.434	AV
	V	4884.5	41.162	6.825	47.987	54(Note2)	-6.013	PK
	H	7324	57.427	9.015	66.442	74	12.442	PK
	H	7324			41.762	54	-12.238	AV
	V	7324	35.615	9.015	44.630	54	-9.370	PK
	H	9764	54.703	10.531	65.234	74	11.234	PK
	H	9764			40.554	54	-13.446	AV
	V	9764	49.821	10.531	60.352	74	6.352	PK
	V	9764			35.672	54	-18.328	AV
78	H	4960	42.226	7.036	49.262	54(Note2)	-4.738	PK
	V	4960	41.393	7.036	48.429	54(Note2)	-5.571	PK
	H	7440	37.983	9.199	47.181	54(Note2)	-6.819	PK
	V	7440	37.905	9.199	47.103	54(Note2)	-6.897	PK
	H	9920	39.335	10.947	50.282	54(Note2)	-3.718	PK
	V	9920	38.591	10.947	49.538	54(Note2)	-4.462	PK

Note 1: The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~25GHz), therefore no data appear in the report.

2: This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

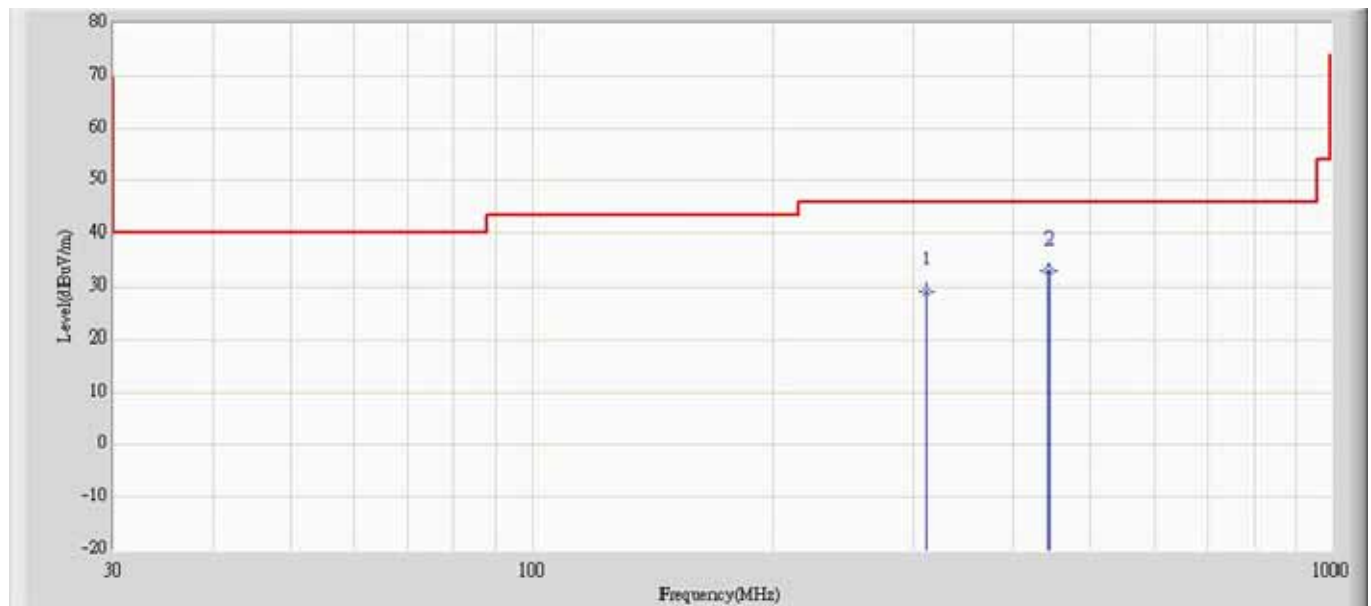
The worst case of Radiated Emission below 1GHz:

Site: AC2	Time: 2015/01/21 - 15:04
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: CBL6112D_27611(30-1000MHz)	Polarity: Horizontal
EUT: Barcode Scanner	Power: DC 5V
Note: Mode1: Transmit at channel 2402MHz by DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		378.715	31.586	8.686	-14.414	46.000	22.900	QP
2	*	634.431	33.380	5.948	-12.620	46.000	27.432	QP

Site: AC2	Time: 2015/01/21 - 15:08
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: CBL6112D_27611(30-1000MHz)	Polarity: Vertical
EUT: Barcode Scanner	Power: DC 5V
Note: Mode1: Transmit at channel 2402MHz by DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		499.965	35.107	9.667	-10.893	46.000	25.440	QP
2	*	624.974	39.142	11.744	-6.858	46.000	27.398	QP

5. 20dB Bandwidth & Occupied Bandwidth

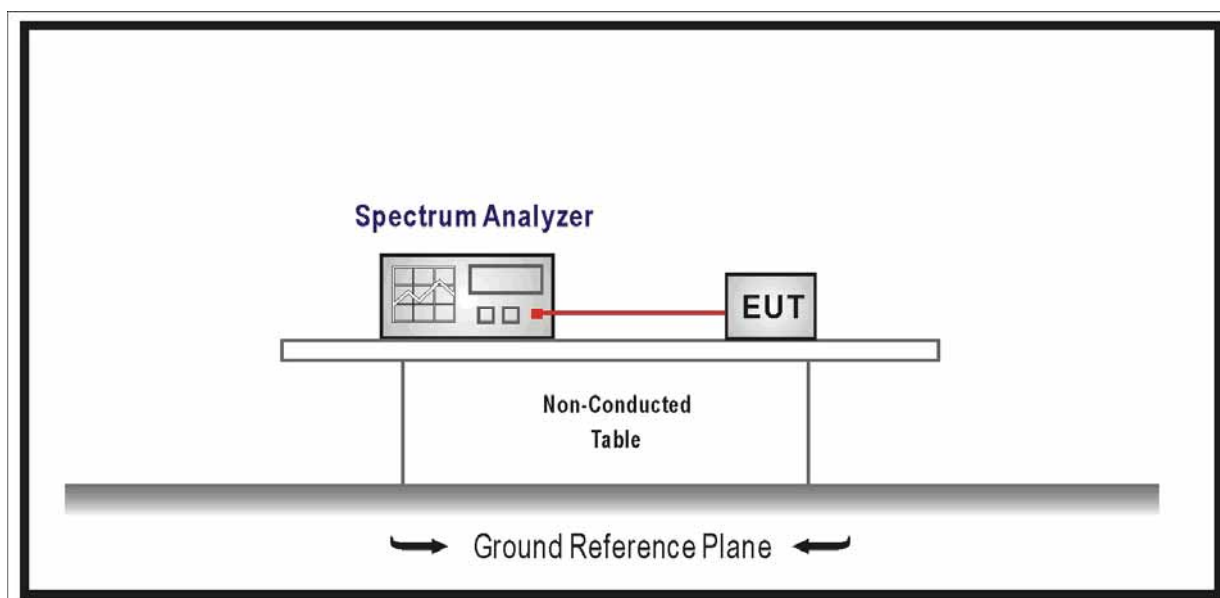
5.1 Test Equipment

20dB Bandwidth / TR8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2016.01.05
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2015.04.09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

5.2 Test Setup



5.3 Limit

- For frequency hopping systems operating in 2400-2483.5 MHz band, no limitation.
- For frequency hopping systems operating in 902-928 MHz band, the maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.
- For frequency hopping systems operating in 5725-5850 MHz band, the maximum 20 dB bandwidth of the hopping channel is 1 MHz.

5.4 Test Procedure

According to ANSI C63.10: 2013.

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel

RBW $\geq$ 1% of the 20dB bandwidth

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize.

Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation.

5.5 Uncertainty

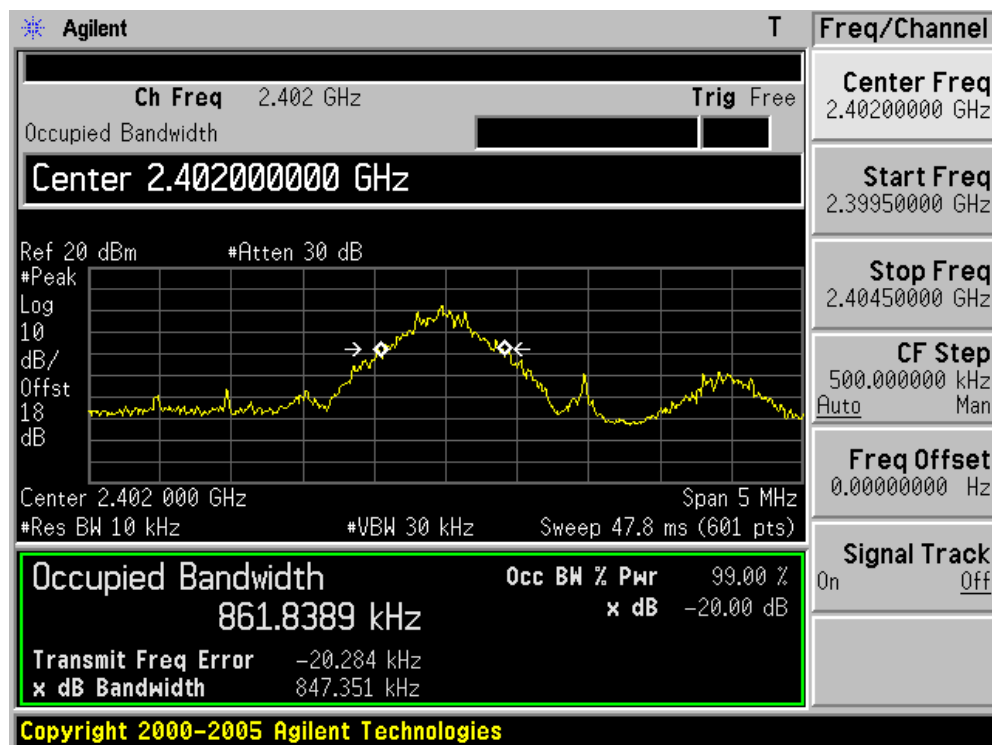
The measurement uncertainty is defined as ± 1 kHz

5.6 Test Result

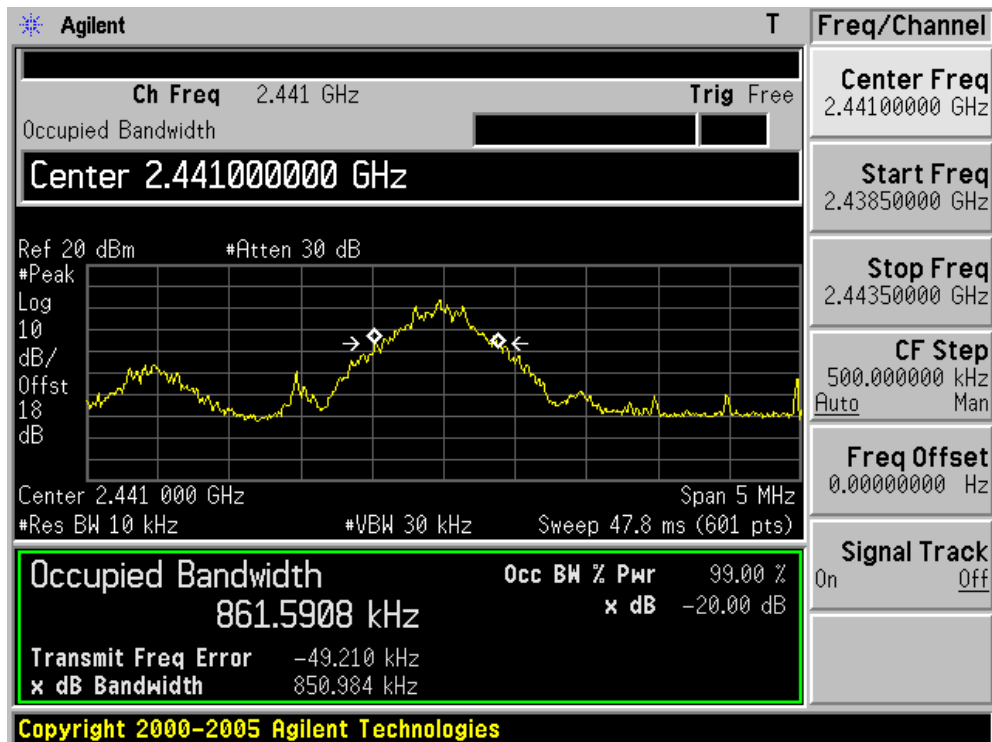
Product	:	Barcode Scanner
Test Item	:	Occupied Bandwidth
Test Site	:	TR-8
Test Mode		Mode 1: Transmitter-1Mbps(GFSK_DH5)

Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	2/3 of 20dB Bandwidth (kHz)	99% Occupied Bandwidth (kHz)
00	2402	847.351	564.901	861.8
39	2441	850.984	567.323	861.6
78	2480	849.836	566.557	1022.3

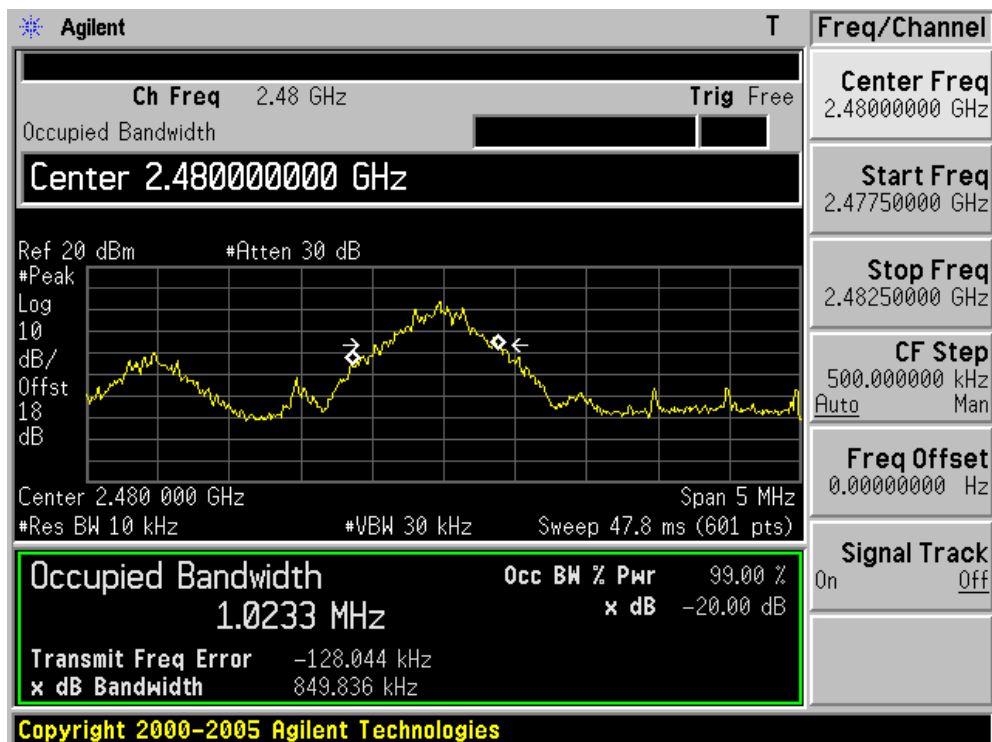
Channel 00 (2402MHz)



Channel 37 (2441MHz)



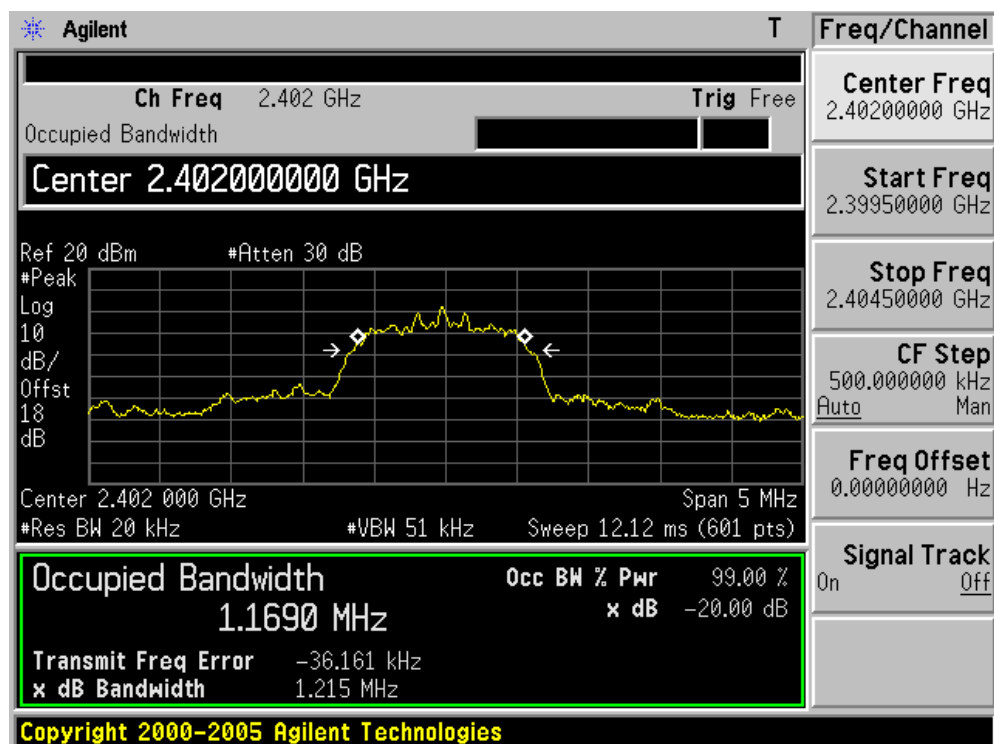
Channel 78 (2480MHz)



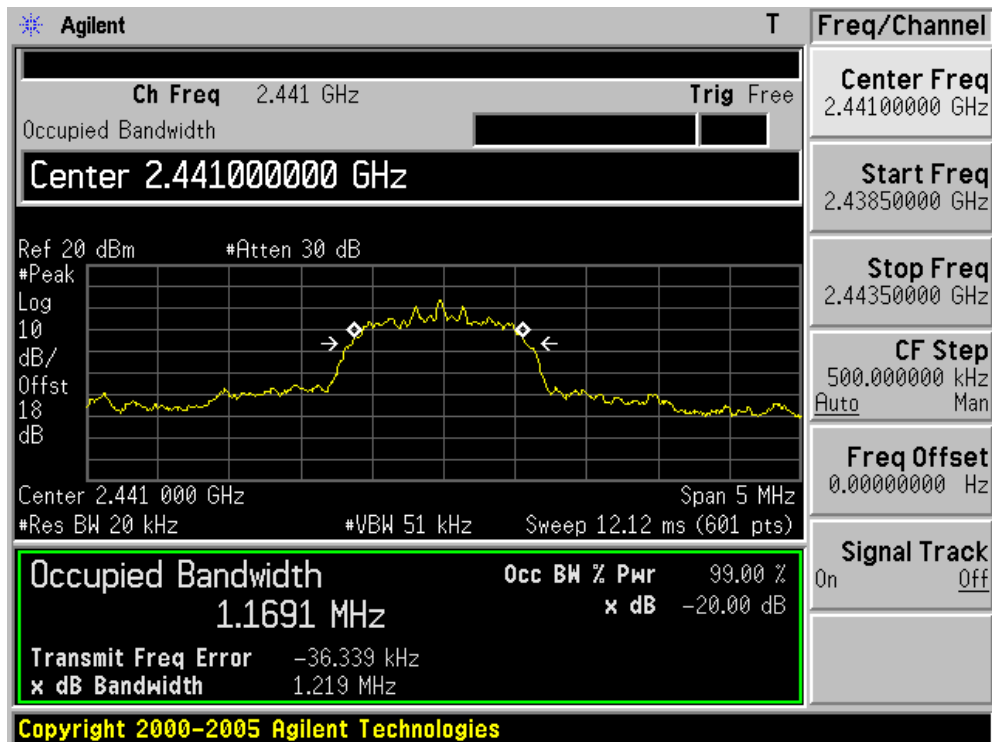
Product	:	Barcode Scanner
Test Item	:	Occupied Bandwidth
Test Site	:	TR-8
Test Mode		Mode 2: Transmitter-2Mbps(Pi/4 DQPSK_DH5)

Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	2/3 of 20dB Bandwidth (kHz)	99% Occupied Bandwidth (kHz)
00	2402	1215	810.000	1169.0
39	2441	1219	812.667	1169.1
78	2480	1213	808.667	1167.6

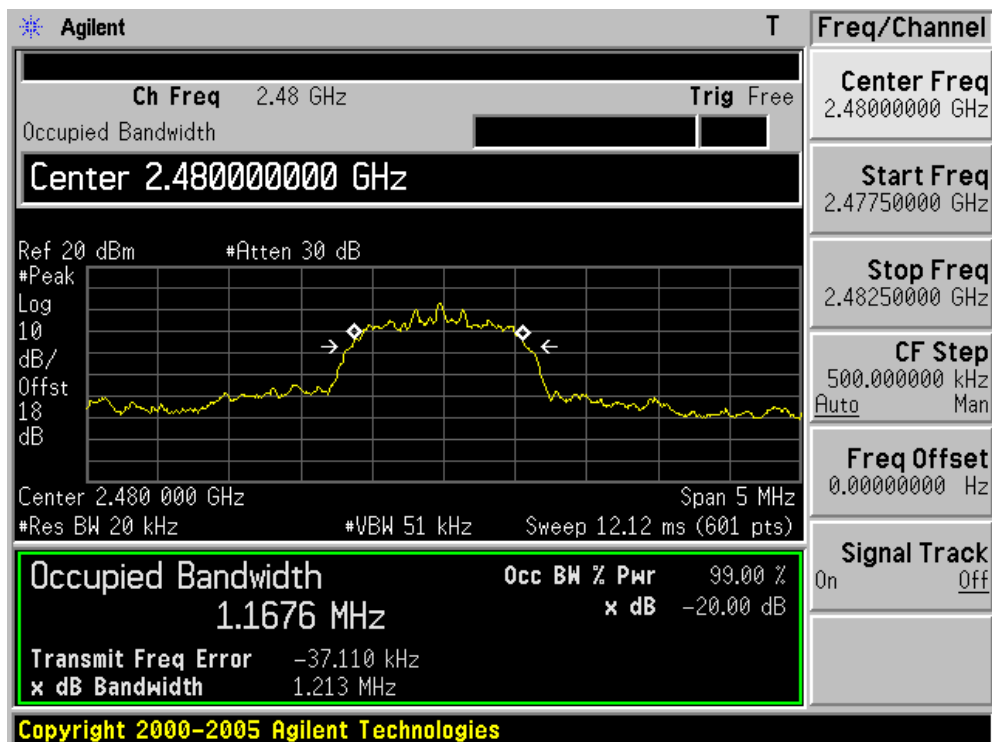
Channel 00 (2402MHz)



Channel 37 (2441MHz)



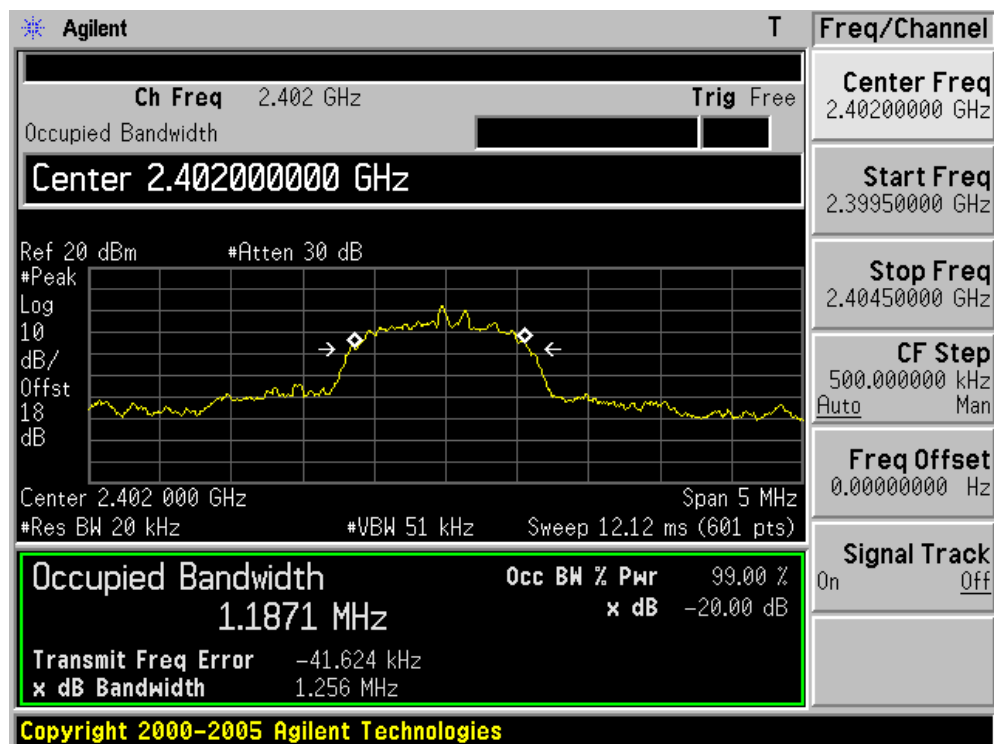
Channel 78 (2480MHz)



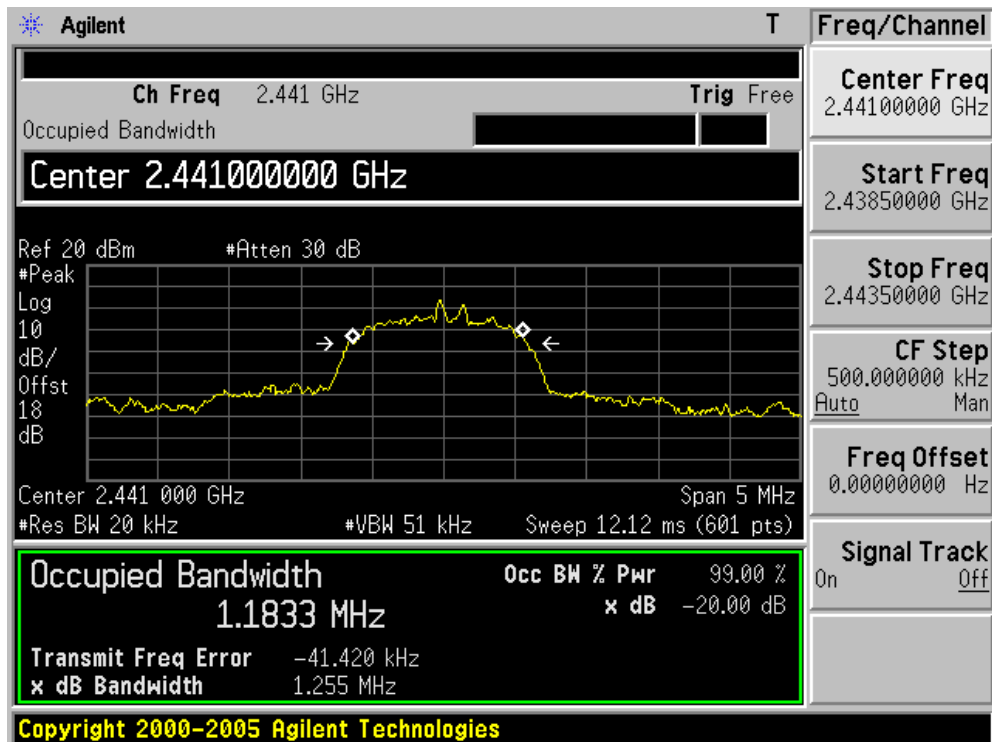
Product	:	Barcode Scanner
Test Item	:	Occupied Bandwidth
Test Site	:	TR-8
Test Mode		Mode 3: Transmitter-3Mbps(8DPSK_DH5)

Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	2/3 of 20dB Bandwidth (kHz)	99% Occupied Bandwidth (kHz)
00	2402	1256	837.333	1187.1
39	2441	1255	836.667	1183.3
78	2480	1255	836.667	1182.1

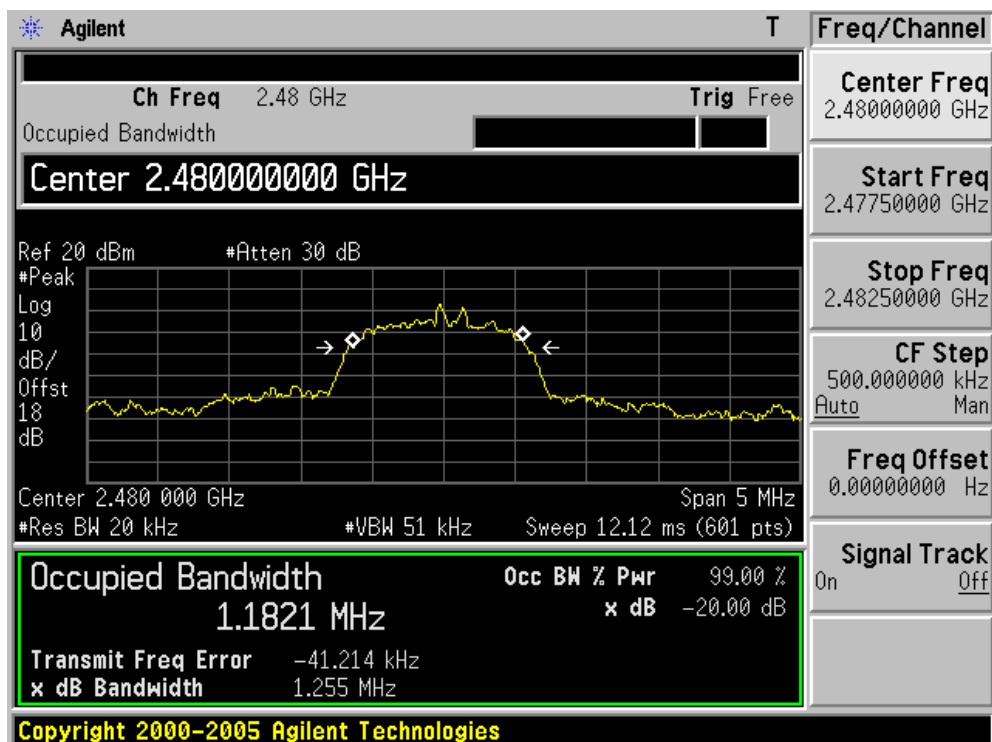
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)



6. Carrier Frequency Separation

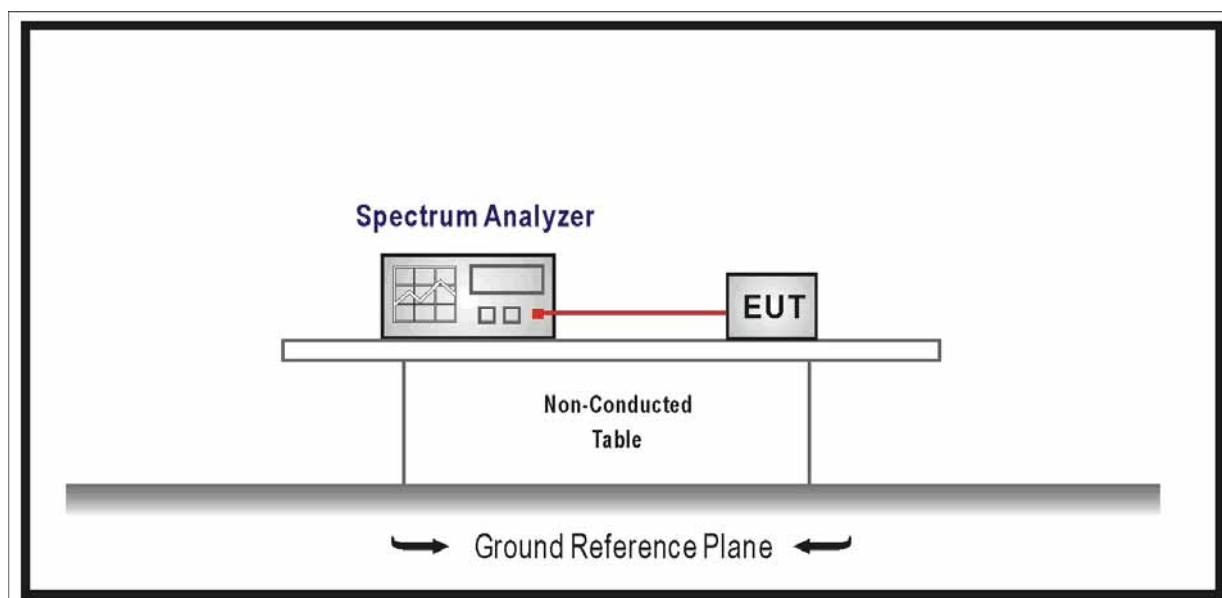
6.1. Test Equipment

Carrier Frequency Separation / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2016.01.05
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2015.04.09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

6.2. Test Setup



6.3. Limit

- Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, 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, provided the systems operate with an output power no greater than 125mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping

channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

- For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.
- Frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75 hopping frequencies. The maximum 20 dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

6.4. Test Procedure

According to ANSI C63.10: 2013.

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW) $\geq$ 1% of the span

Video (or Average) Bandwidth VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

6.5. Uncertainty

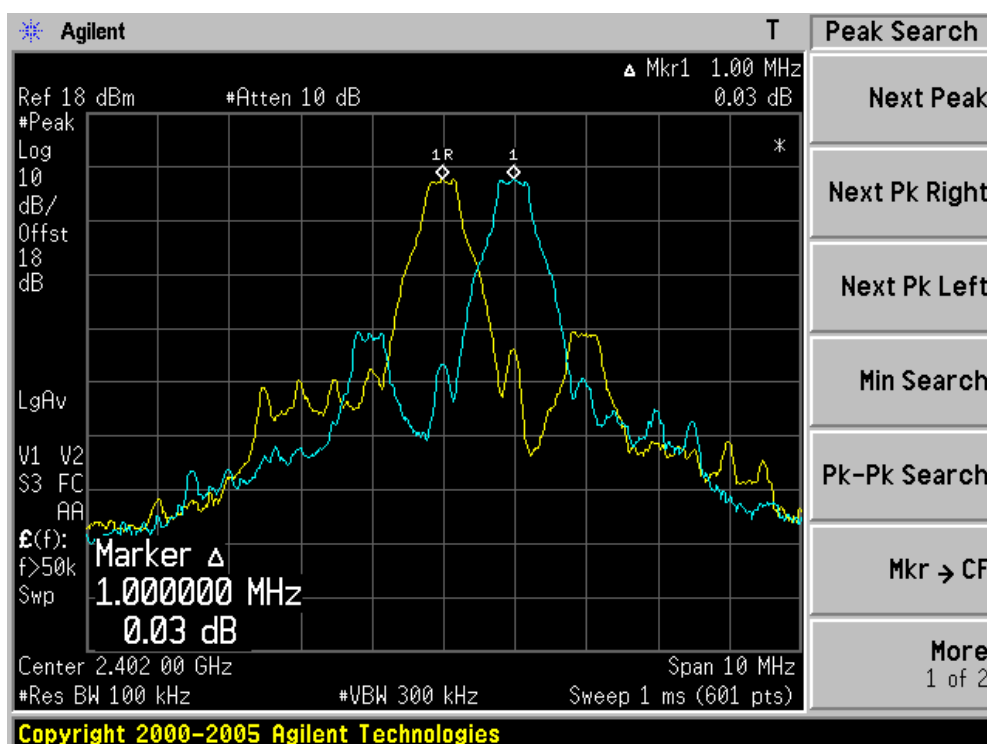
The measurement uncertainty is defined as ± 1 kHz

6.6. Test Result

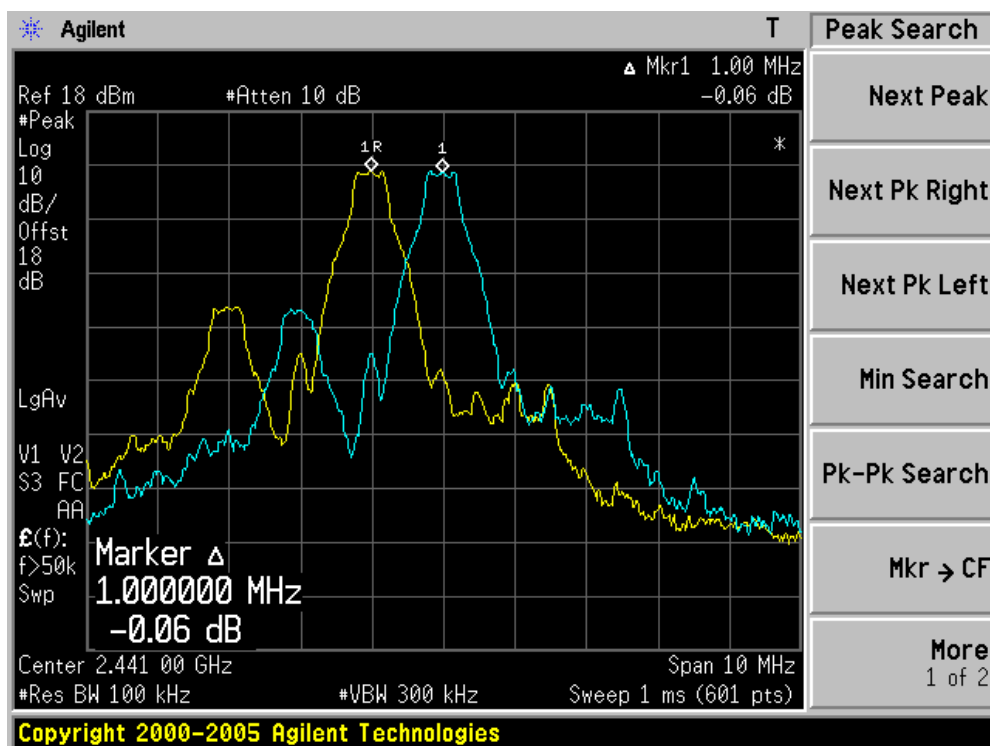
Product	:	Barcode Scanner
Test Item	:	Carrier Frequency Separation
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter-1Mbps (GFSK_DH5)

Channel No.	Frequency (MHz)	Carrier Frequency Separation (kHz)	Limit (kHz)	Result
00	2402	1000	>25 kHz or 2/3 of 20 dB BW	Pass
39	2441	1000	>25 kHz or 2/3 of 20 dB BW	Pass
78	2480	1000	>25 kHz or 2/3 of 20 dB BW	Pass

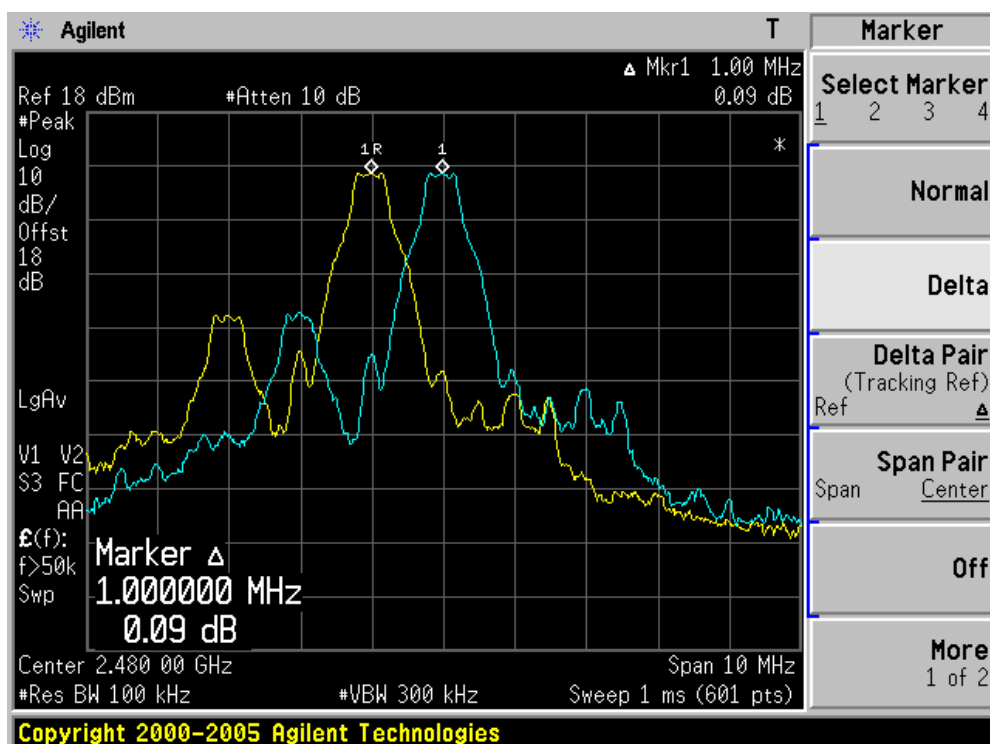
Channel 00 (2402MHz)



Channel 39 (2441MHz)



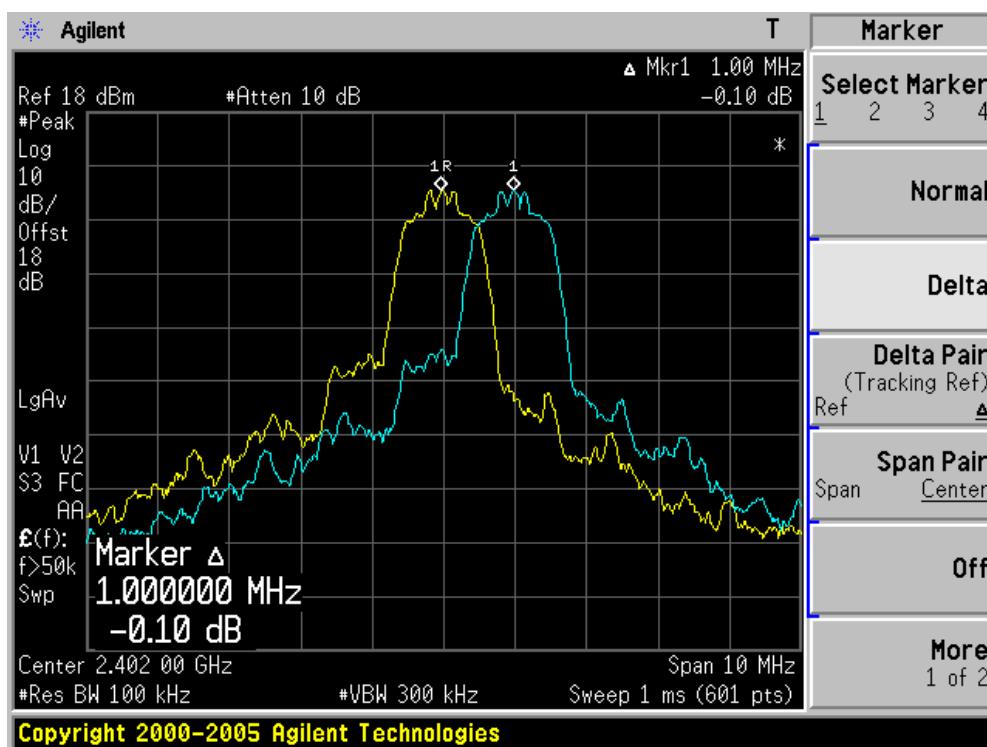
Channel 78 (2480MHz)



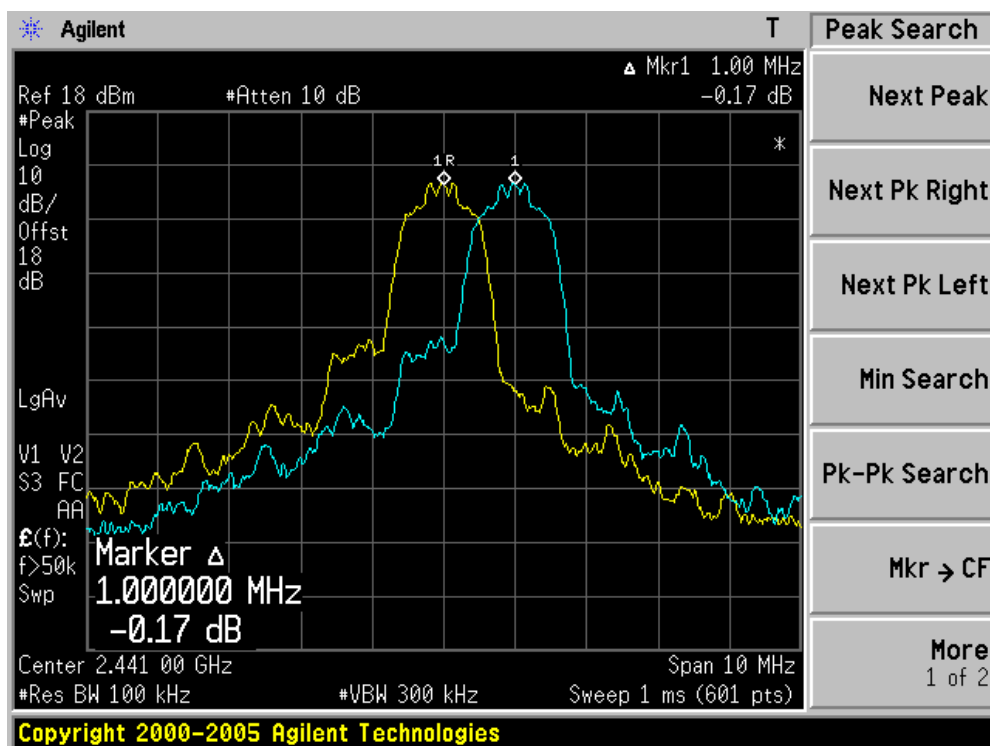
Product	:	Barcode Scanner
Test Item	:	Carrier Frequency Separation
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH5)

Channel No.	Frequency (MHz)	Carrier Frequency Separation (kHz)	Limit (kHz)	Result
00	2402	1000	>25 kHz or 2/3 of 20 dB BW	Pass
39	2441	1000	>25 kHz or 2/3 of 20 dB BW	Pass
78	2480	1000	>25 kHz or 2/3 of 20 dB BW	Pass

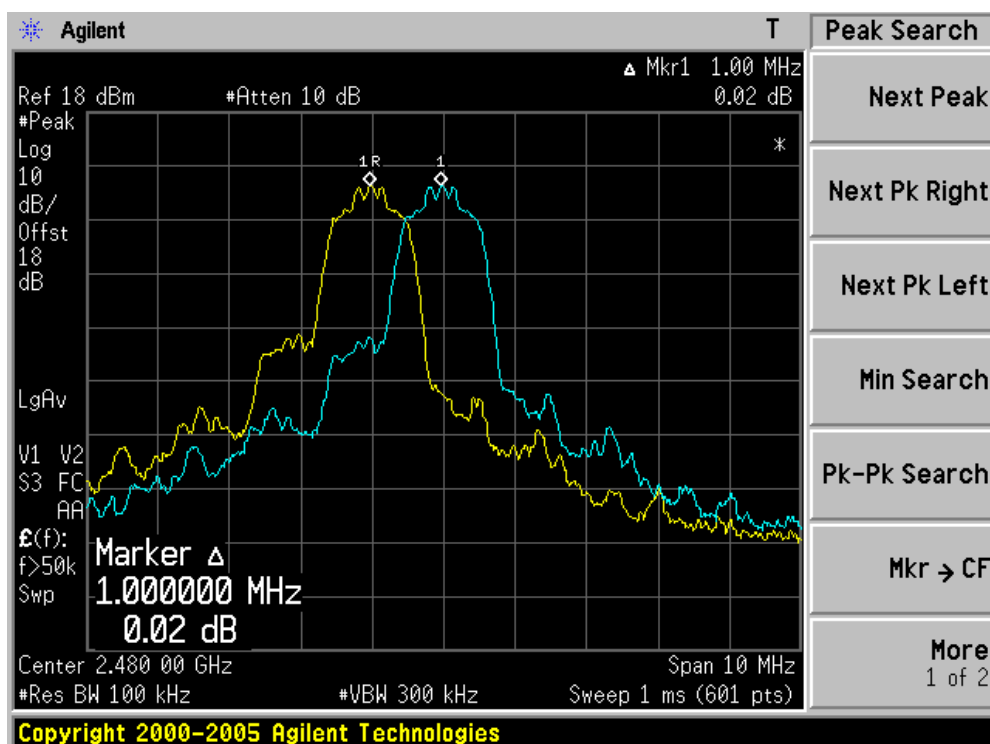
Channel 00 (2402MHz)



Channel 39 (2441MHz)



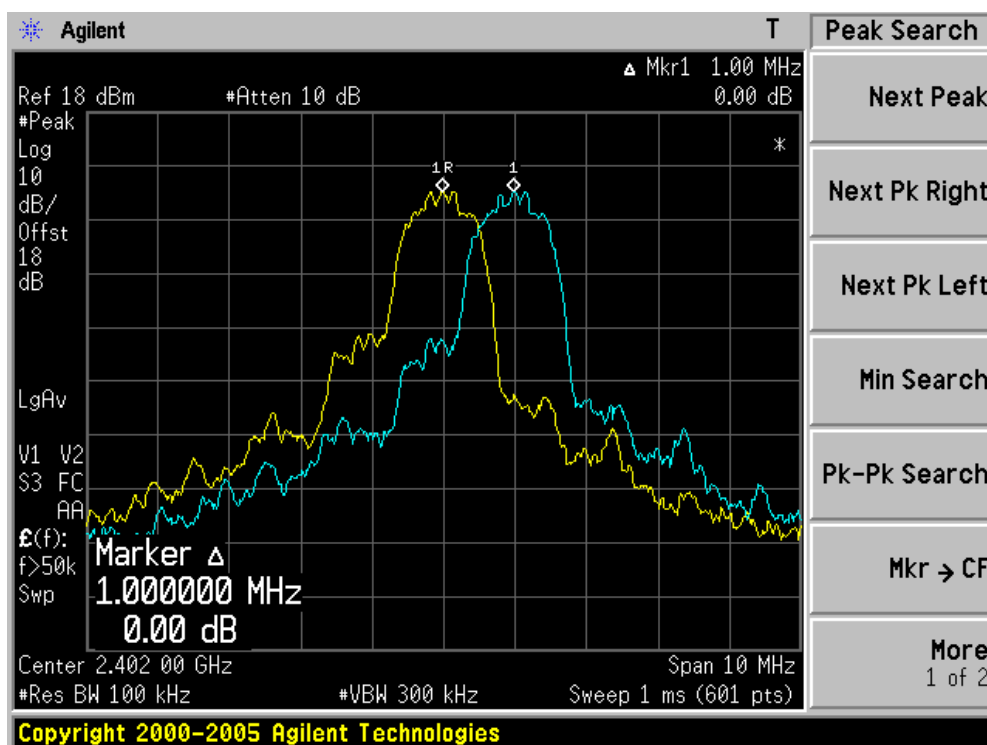
Channel 78 (2480MHz)



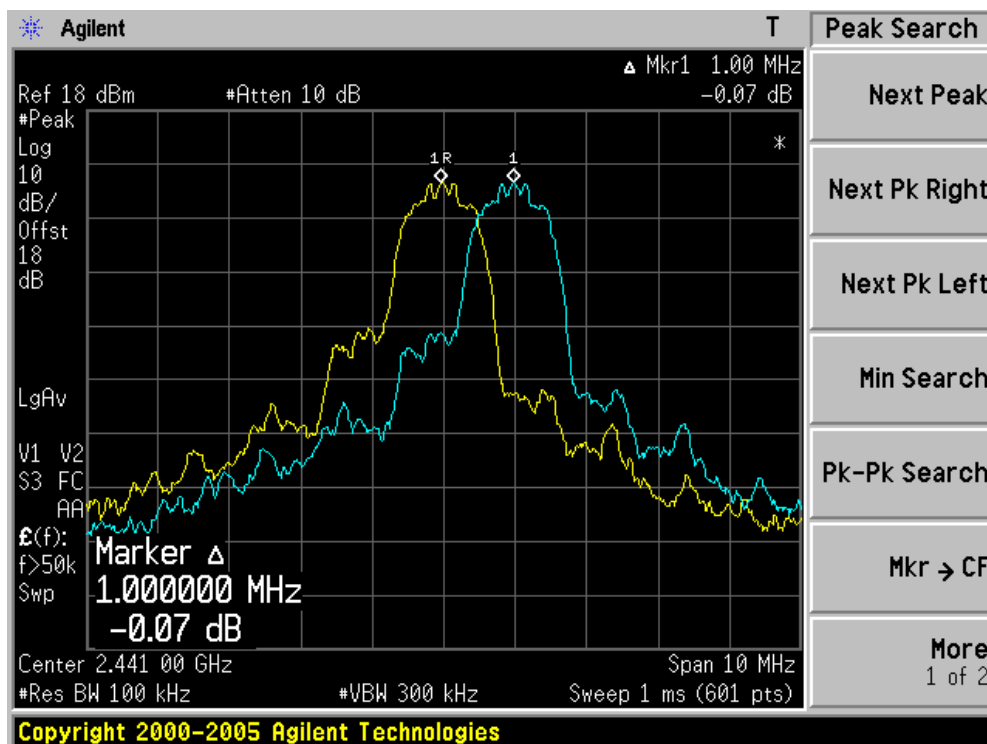
Product	:	Barcode Scanner
Test Item	:	Carrier Frequency Separation
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmitter-3Mbps (8DPSK_DH5)

Channel No.	Frequency (MHz)	Carrier Frequency Separation (kHz)	Limit (kHz)	Result
00	2402	1000	>25 kHz or 2/3 of 20 dB BW	Pass
39	2441	1000	>25 kHz or 2/3 of 20 dB BW	Pass
78	2480	1000	>25 kHz or 2/3 of 20 dB BW	Pass

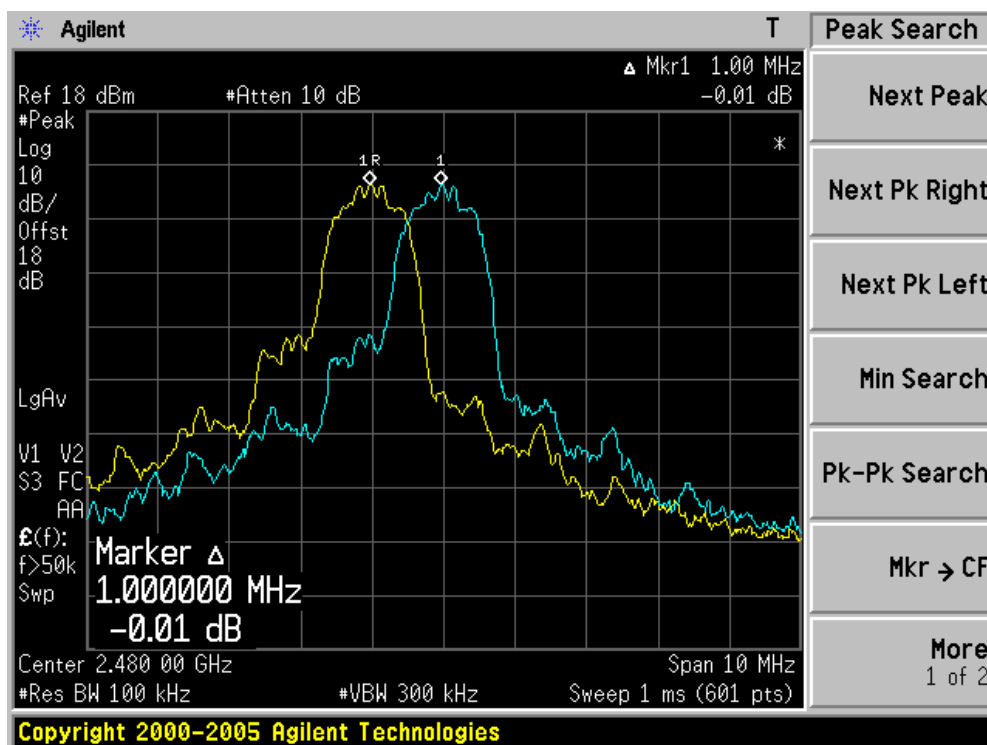
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)



7. Number of Hopping Frequencies

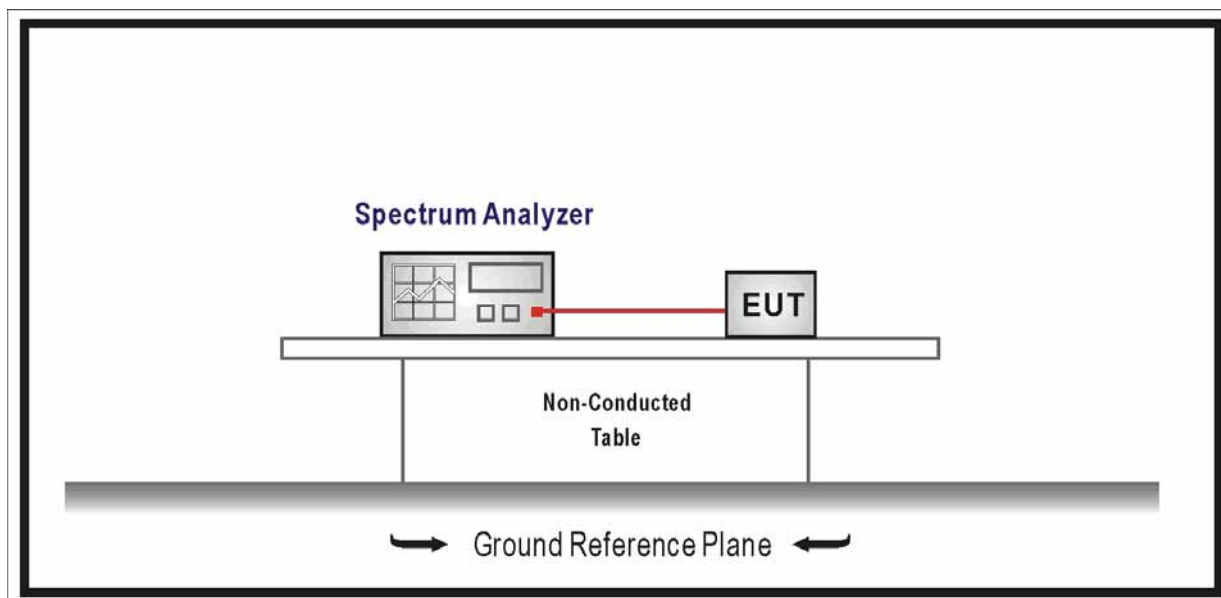
7.1. Test Equipment

Number of Hopping Frequencies / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2016.01.05
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2015.04.09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

7.2. Test Setup



7.3. Limit

- For frequency hopping systems operating in the 2400-2483.5 MHz band shall use at least 15 hopping frequencies.
- For frequency hopping systems operating in 902-928 MHz band shall use at least 50 hopping frequencies.
- For frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75 hopping frequencies.

7.4. Test Procedure

According to ANSI C63.10: 2013.

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW $\geq$ 1% of the span

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. It may prove necessary to bread the span up to sections, in order to clearly show all of the hopping frequencies.

7.5. Uncertainty

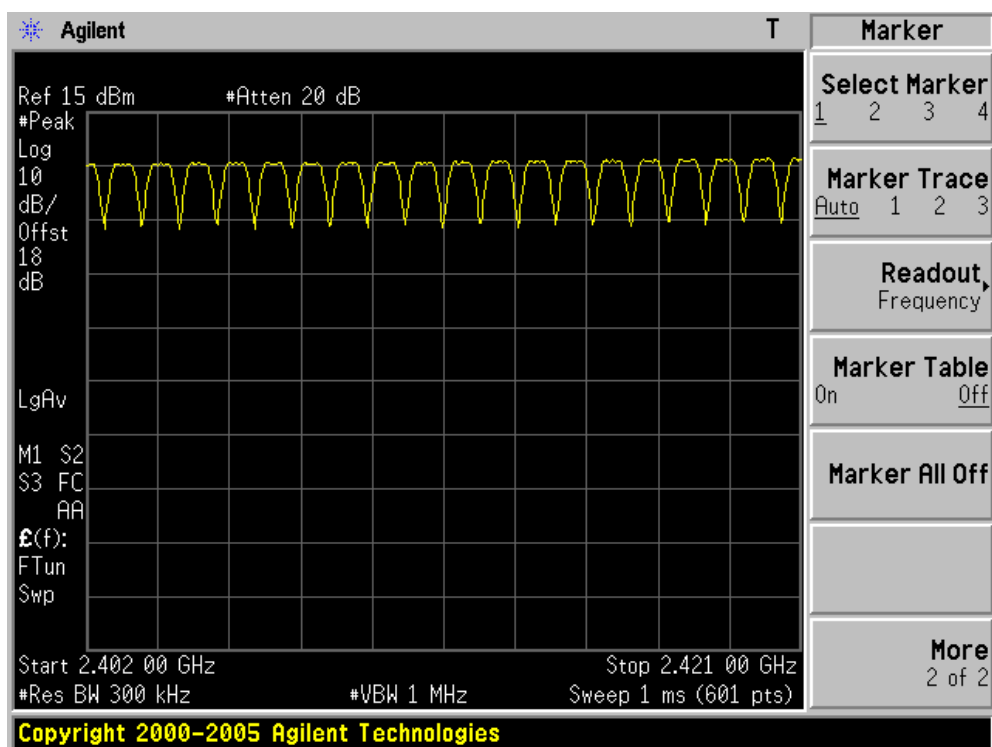
The measurement uncertainty is defined as ± 1 kHz

7.6. Test Result

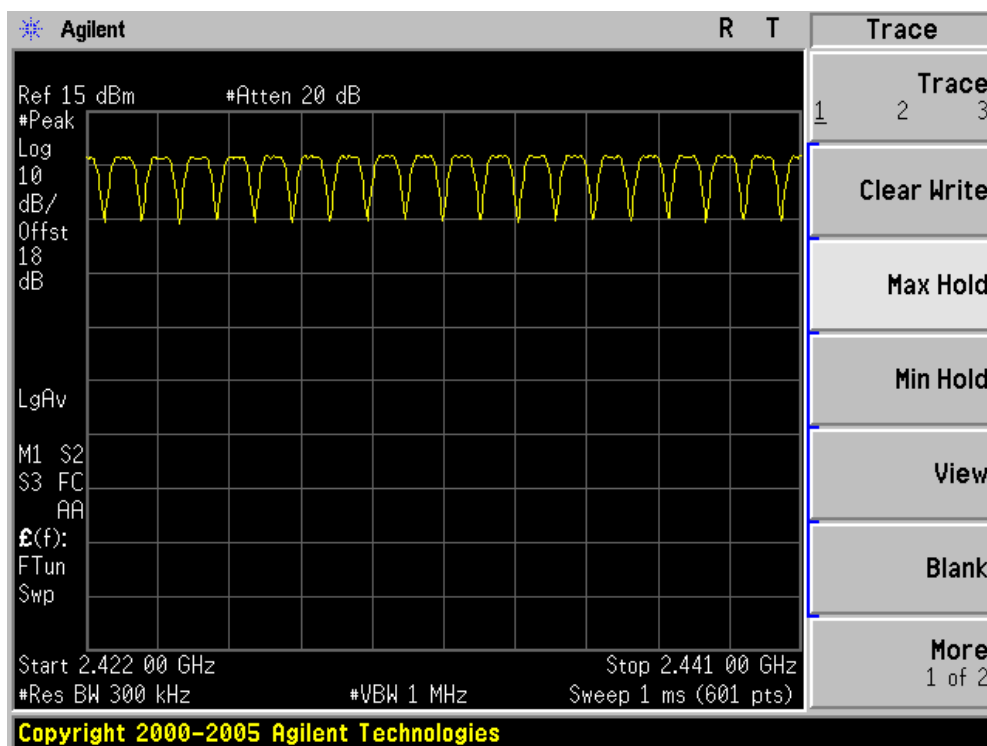
Product	:	Barcode Scanner
Test Item	:	Number of Hopping Frequencies
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter-1Mbps (GFSK_DH5)

Frequency Band (MHz)	Number of Hopping Frequencies	Limit	Result
2400 - 2483.5	79	>15	Pass

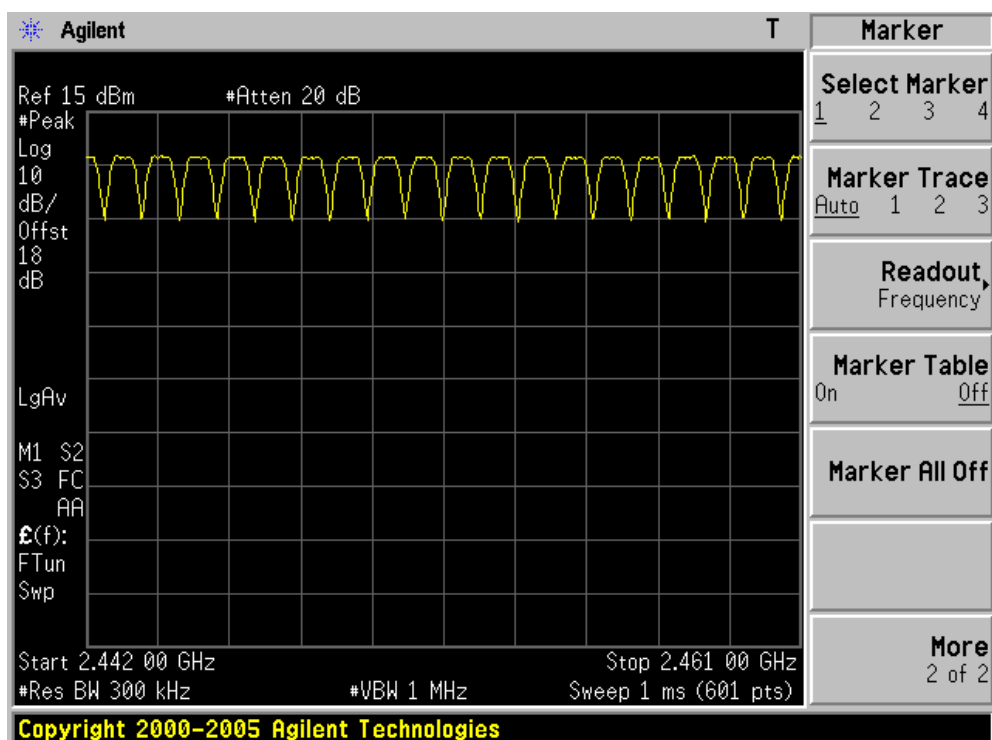
2402 - 2421 MHz



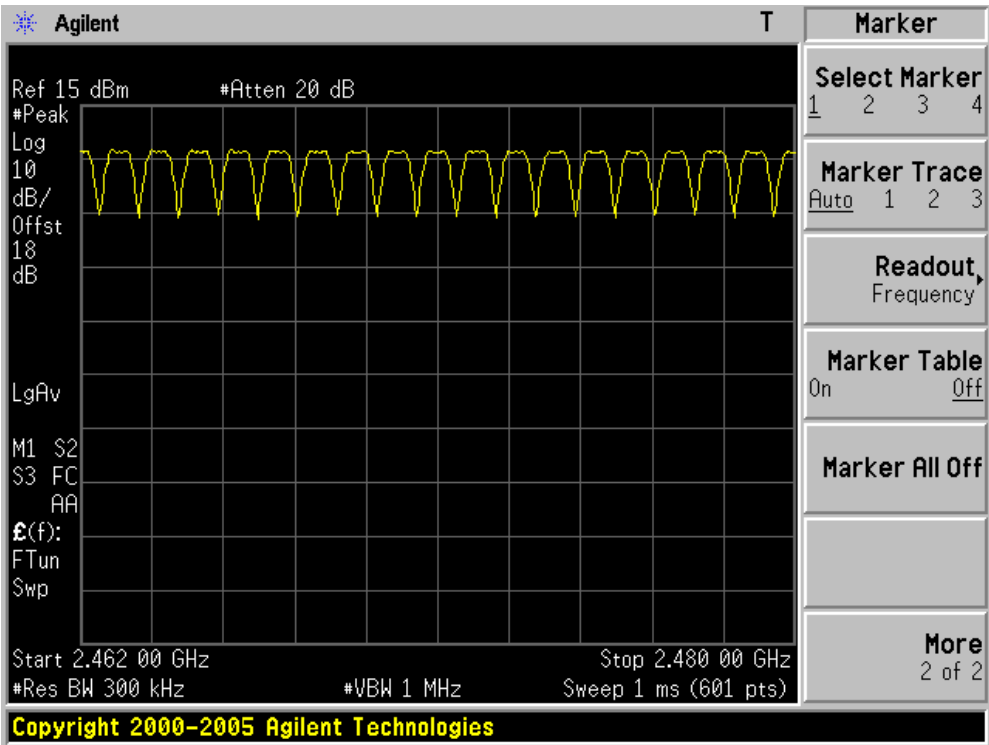
2422 - 2441 MHz



2442 - 2461 MHz



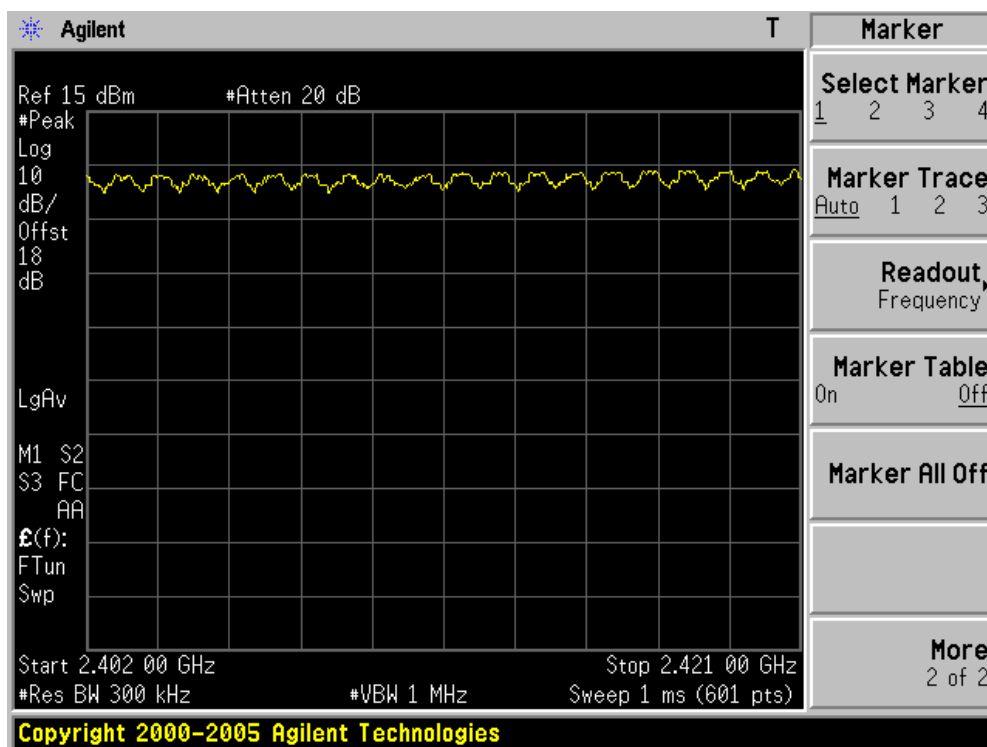
2462 - 2480 MHz



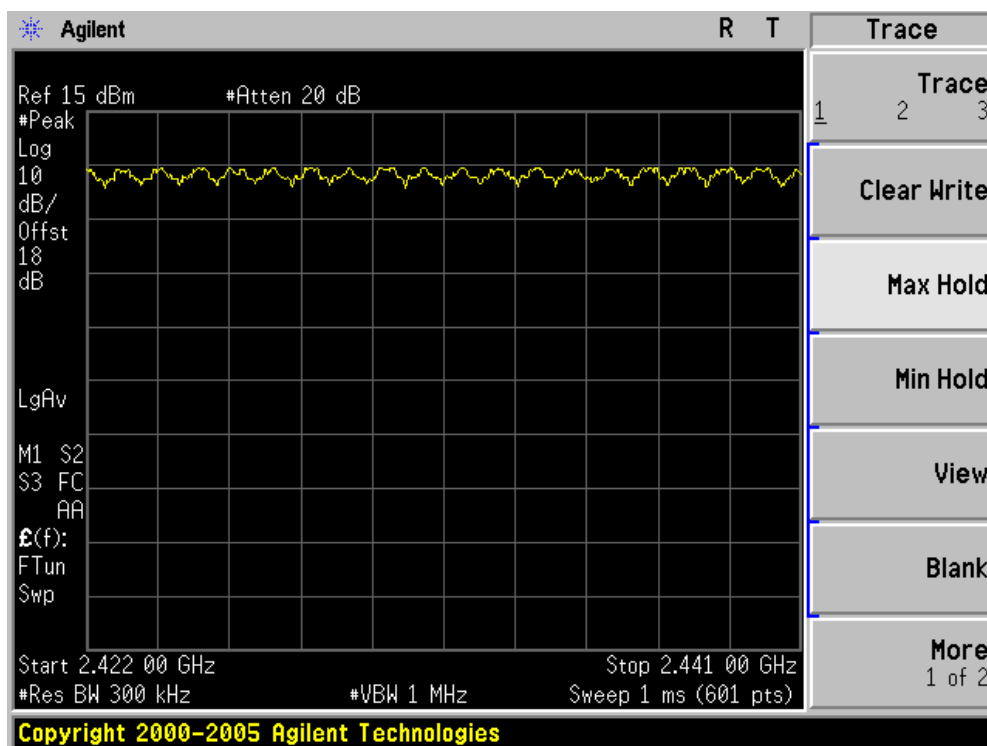
Product	:	Barcode Scanner
Test Item	:	Number of Hopping Frequencies
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH5)

Frequency Band (MHz)	Number of Hopping Frequencies	Limit	Result
2400 - 2483.5	79	>15	Pass

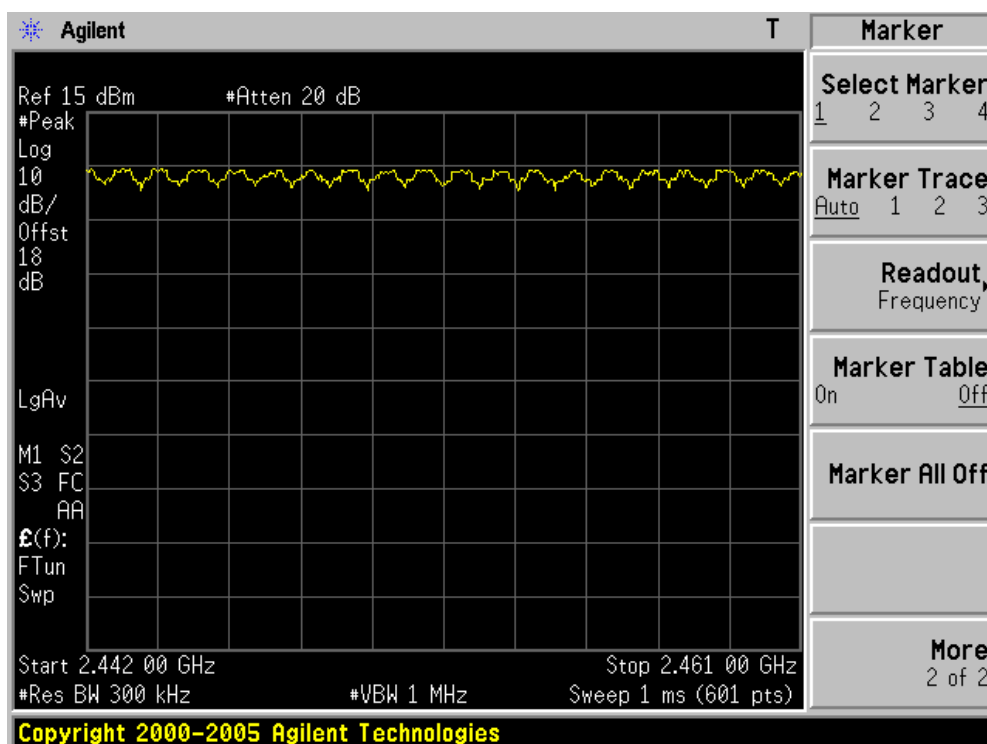
2402 - 2421 MHz



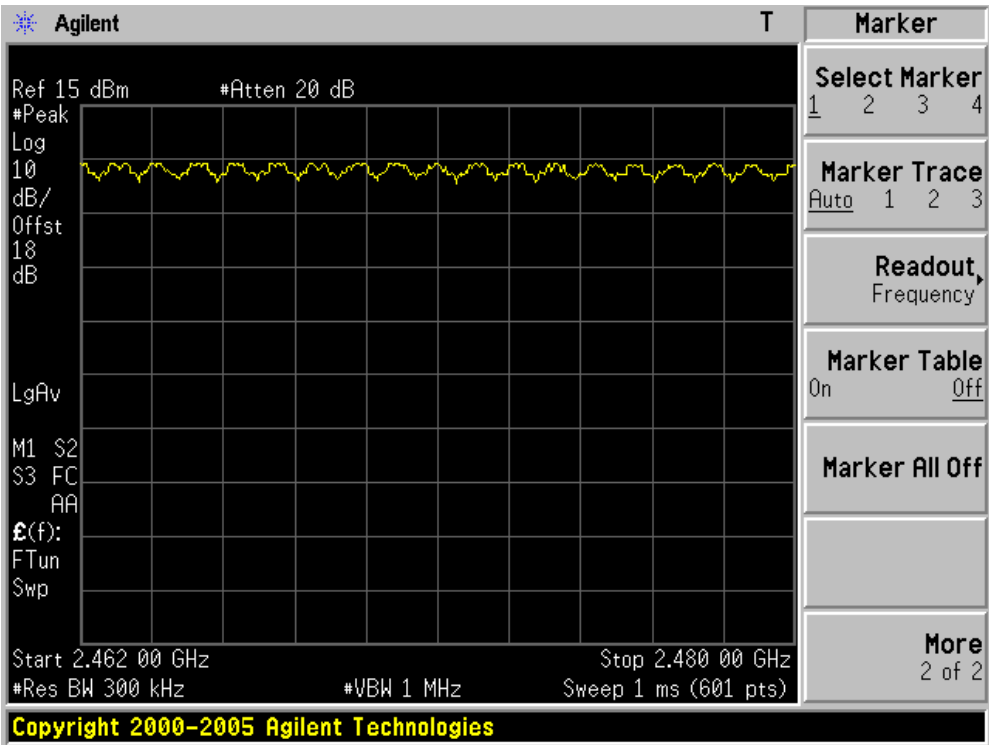
2422 - 2441 MHz



2442 - 2461 MHz



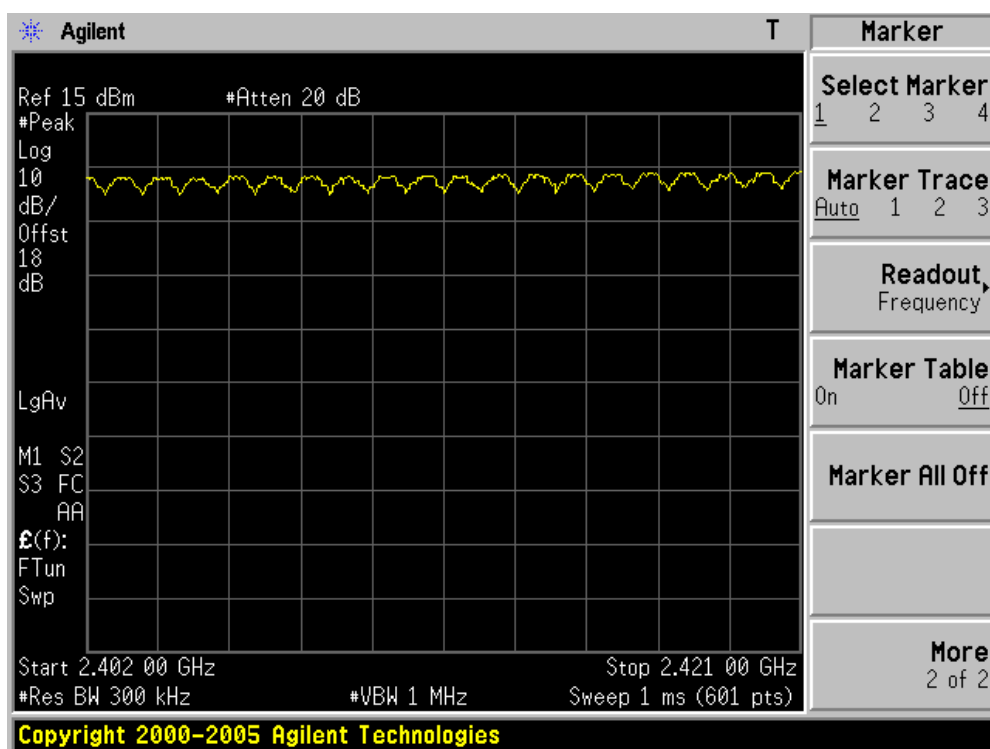
2462 - 2480 MHz



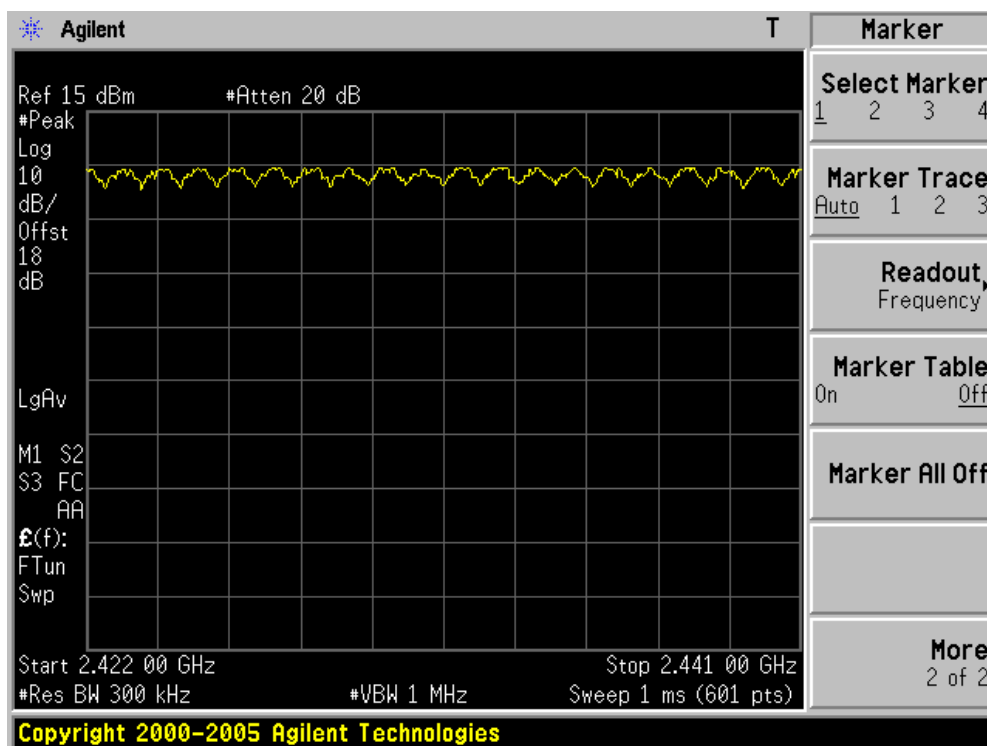
Product	:	Barcode Scanner
Test Item	:	Number of Hopping Frequencies
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmitter-3Mbps (8DPSK_DH5)

Frequency Band (MHz)	Number of Hopping Frequencies	Limit	Result
2400 - 2483.5	79	>15	Pass

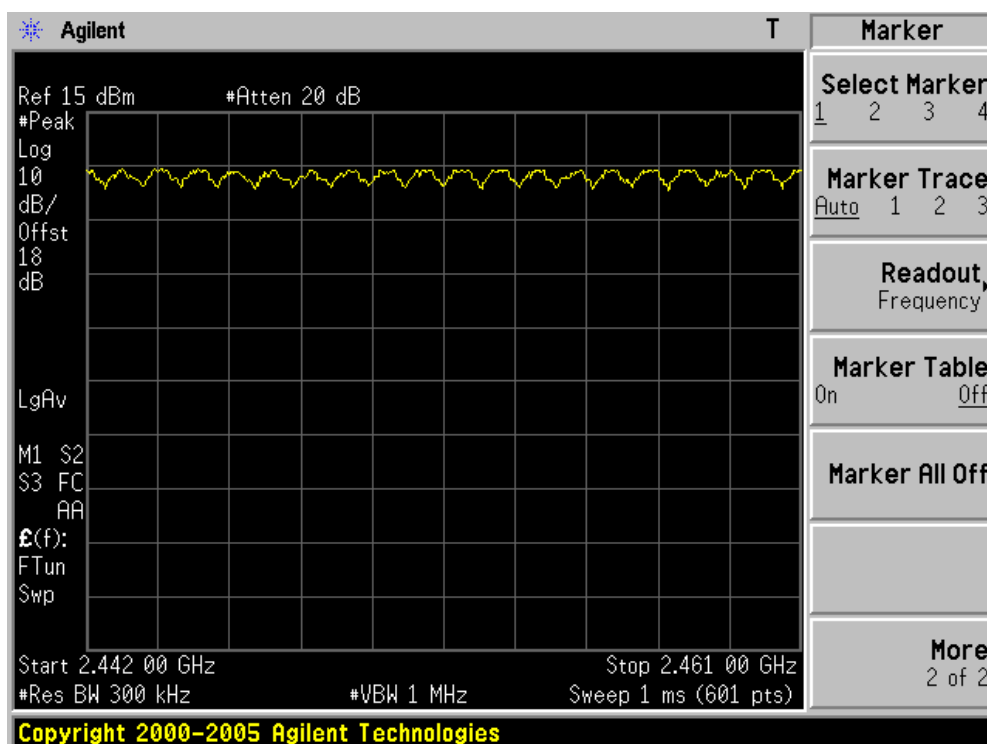
2402 - 2421 MHz



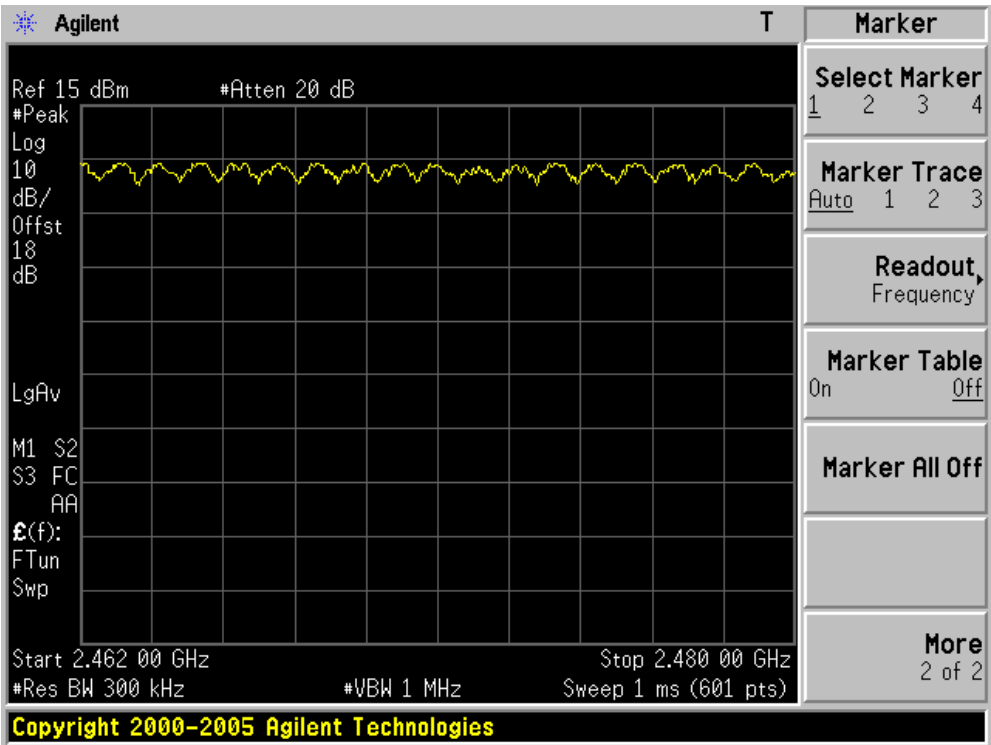
2422 - 2441 MHz



2442 - 2461 MHz



2462 - 2480 MHz



8. Time of Occupancy (Dwell Time)

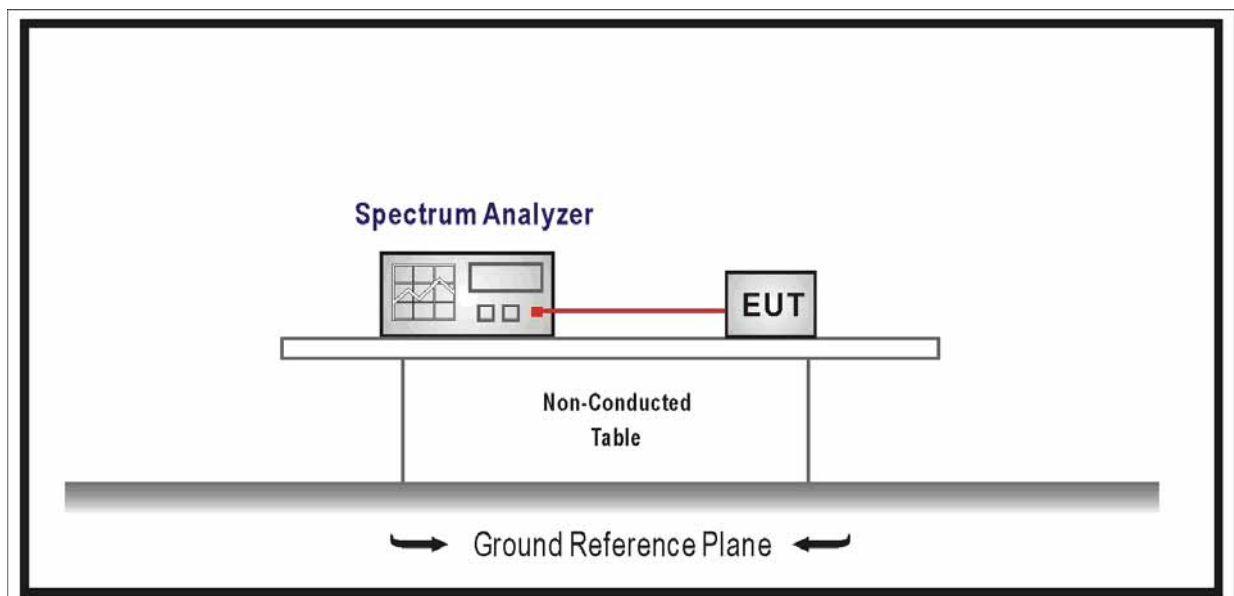
8.1. Test Equipment

Time of Occupancy (Dwell Time) / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2016.01.05
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2015.04.09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

8.2. Test Setup



8.3. Limit

- For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.
- Frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75

hopping frequencies. The maximum 20 dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

- Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

8.4. Test Procedure

According to ANSI C63.10: 2013.

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = zero span, centered on a hopping channel

RBW = 1MHz

VBW $\geq$ RBW

Sweep = as necessary to capture the entire dwell time per hopping channel

Detector function = peak

Trace = max hold

If possible, use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation.

8.5. Uncertainty

The measurement uncertainty is defined as ± 0.1 us

8.6. Test Result

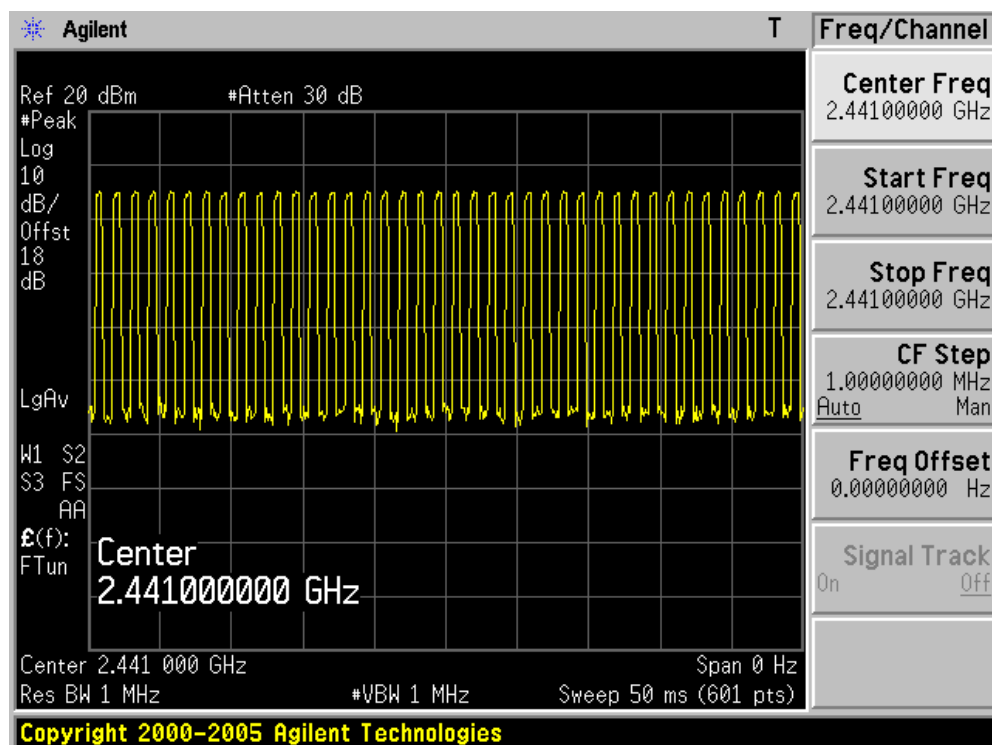
Product	:	Barcode Scanner
Test Item	:	Time of Occupancy (Dwell Time)
Test Site	:	TR-8
Test Mode	:	Transmitter-2Mbps (8DPSK_DH1)

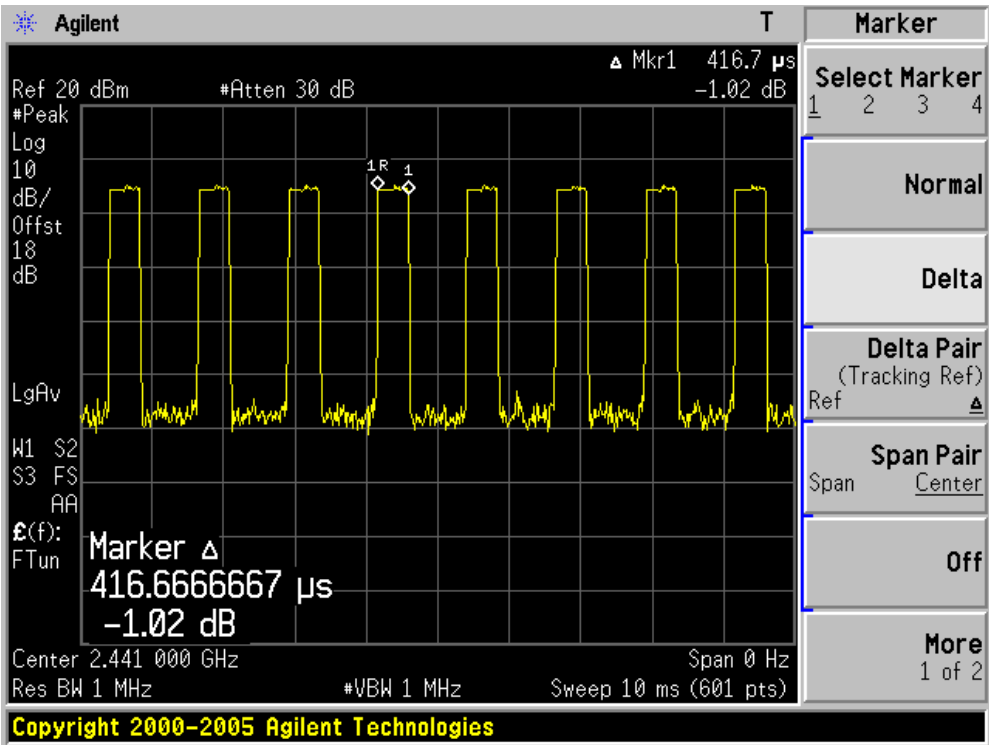
Channel No.	Frequency (MHz)	Time of Occupancy (ms)	Limit (ms)	Result
39	2441	133.3	< 400	Pass

Test Time Period: $0.4 \times 79 = 31.6\text{sec}$, Hopping Times Within 1sec: $40/50\text{msec} = 800$ hops/sec.

- 2441MHz, The Maximum Occupancy Time Within 31.6sec: $[(416.7\mu\text{s} \times 800)/79] \times 31.6 = 133.3\text{msec}$

Channel 39 (2441MHz)-(DH1)





Product	:	Barcode Scanner
Test Item	:	Time of Occupancy (Dwell Time)
Test Site	:	TR-8
Test Mode	:	Transmitter-2Mbps (8DPSK_DH3)

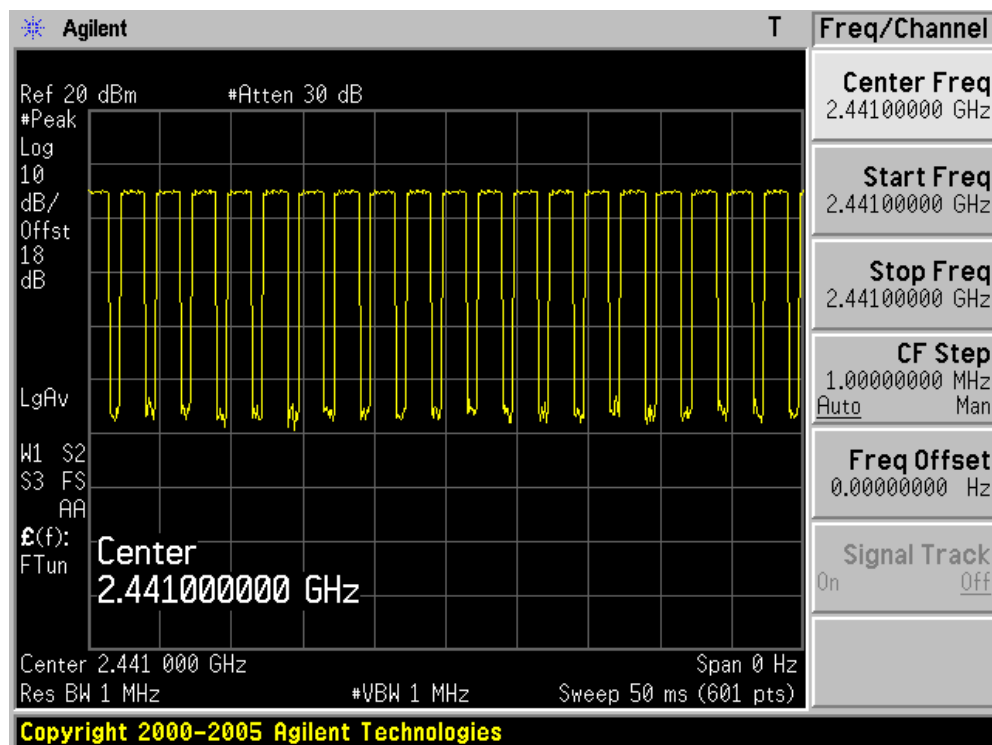
Channel No.	Frequency (MHz)	Time of Occupancy (ms)	Limit (ms)	Result
39	2441	264.0	< 400	Pass

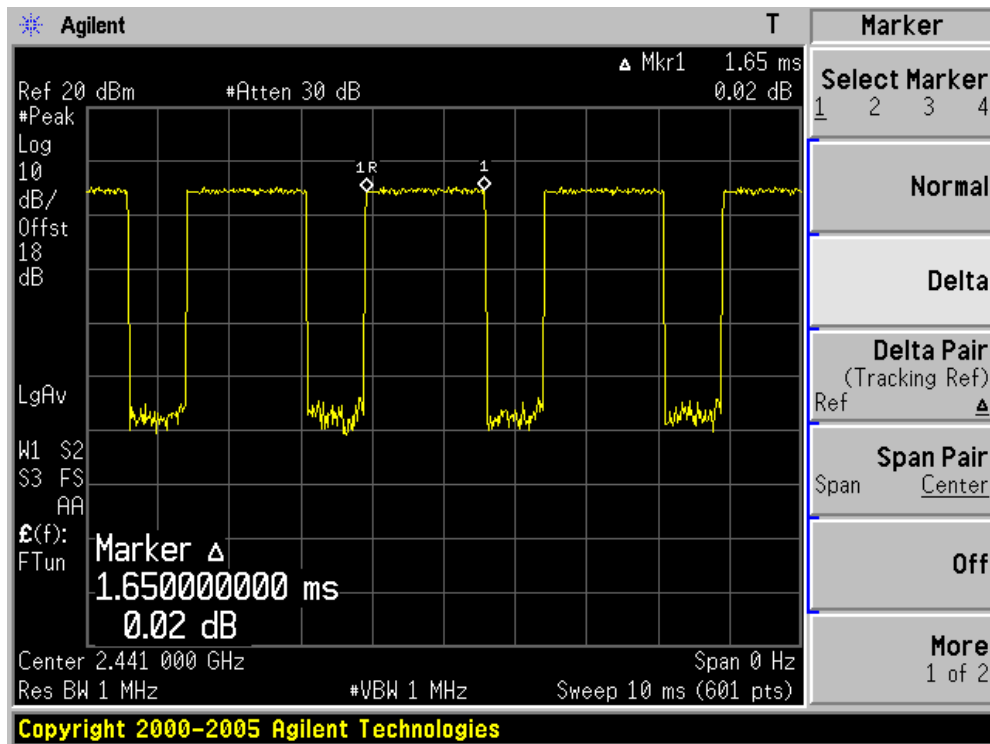
Test Time Period: $0.4 \times 79 = 31.6\text{sec}$, Hopping Times Within 1sec:

$20/50\text{msec} = 400\text{hops/sec}$.

- 2441MHz, The Maximum Occupancy Time Within 31.6sec: $[(1.65\text{ms} \times 400)/79] \times 31.6 = 264.0\text{msec}$

Channel 39 (2441MHz)-(DH3)





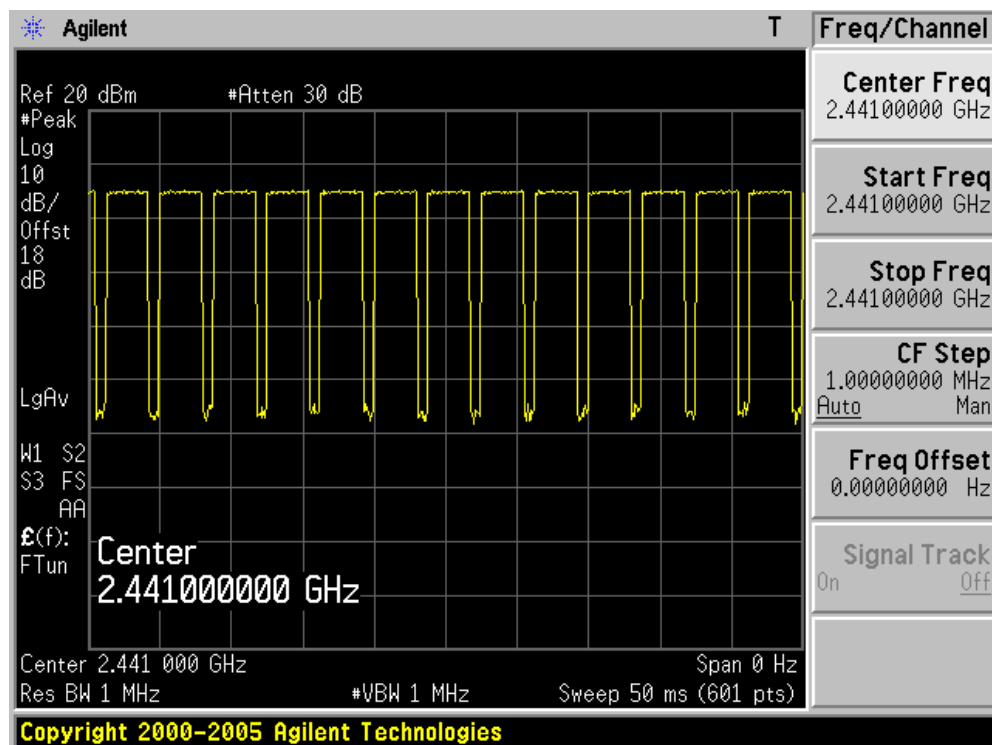
Product	:	Barcode Scanner
Test Item	:	Time of Occupancy (Dwell Time)
Test Site	:	TR-8
Test Mode	:	Transmitter-2Mbps (8DPSK_DH5)

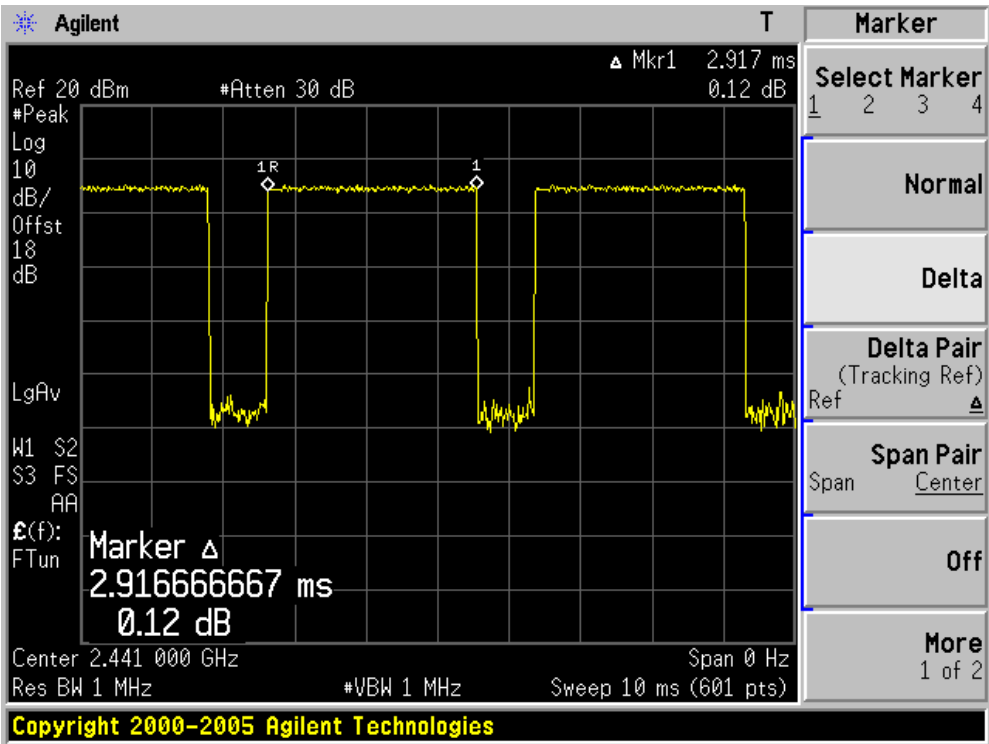
Channel No.	Frequency (MHz)	Time of Occupancy (ms)	Limit (ms)	Result
39	2441	302.03	< 400	Pass

Test Time Period: $0.4 \times 79 = 31.6\text{sec}$, Hopping Times Within 1sec: $13/50\text{msec} = 260$ hops/sec.

- 2441MHz, The Maximum Occupancy Time Within 31.6sec: $[(2.9 \text{ ms} \times 260) / 79] \times 31.6 = 302.03\text{msec}$

Channel 39 (2441MHz)-(DH5)





9. Peak Output Power

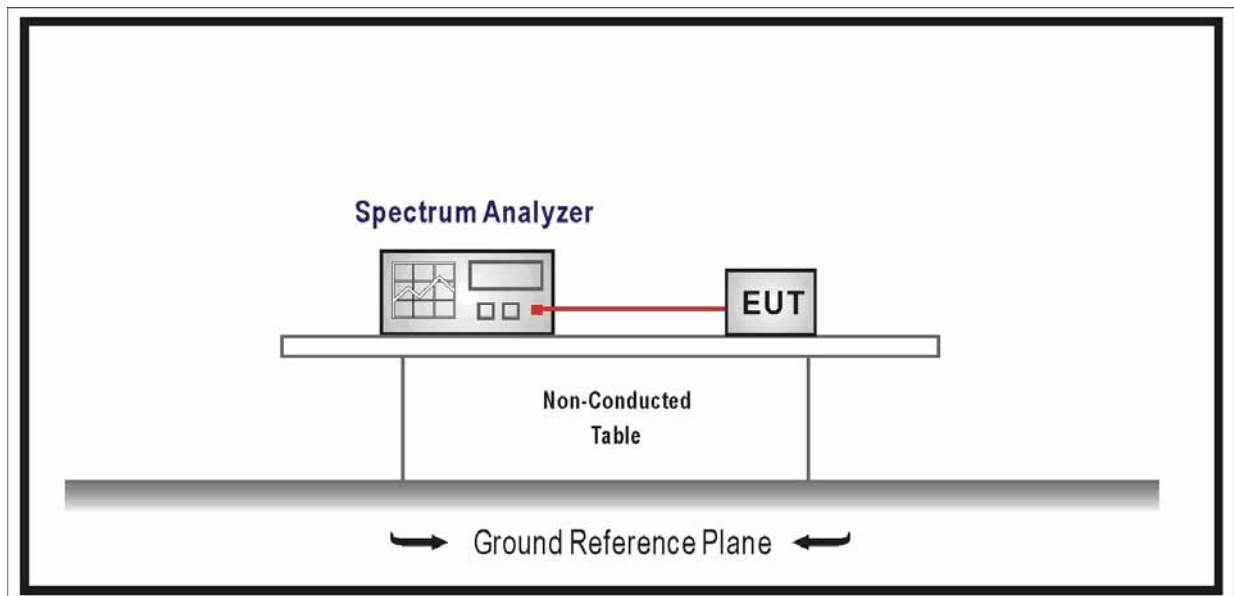
9.1. Test Equipment

Peak Output Power / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2016.01.05
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2015.04.09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

9.2. Test Setup



9.3. Limit

- For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
- For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels.

Note: the conducted output power limit specified above is based on the use the antennas with

directional gains that do not exceed 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values above, as appropriate, by the amount in dB that the directional gain of antenna exceeds 6 dBi.

9.4. Test Procedure

According to ANSI C63.10: 2013.

Use the following spectrum analyzer settings:

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

RBW > the 20 dB bandwidth of the emission being measured.

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power (don't forget added the external attenuation and cable loss).

9.5. Uncertainty

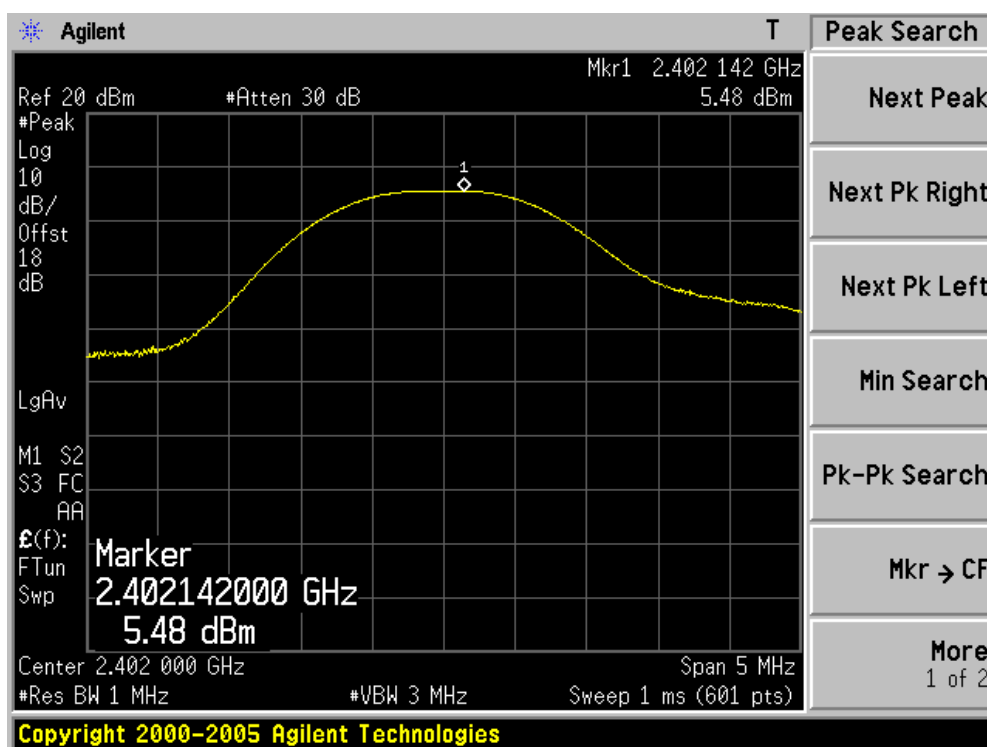
The measurement uncertainty is defined as ± 1.0 dB

9.6. Test Result

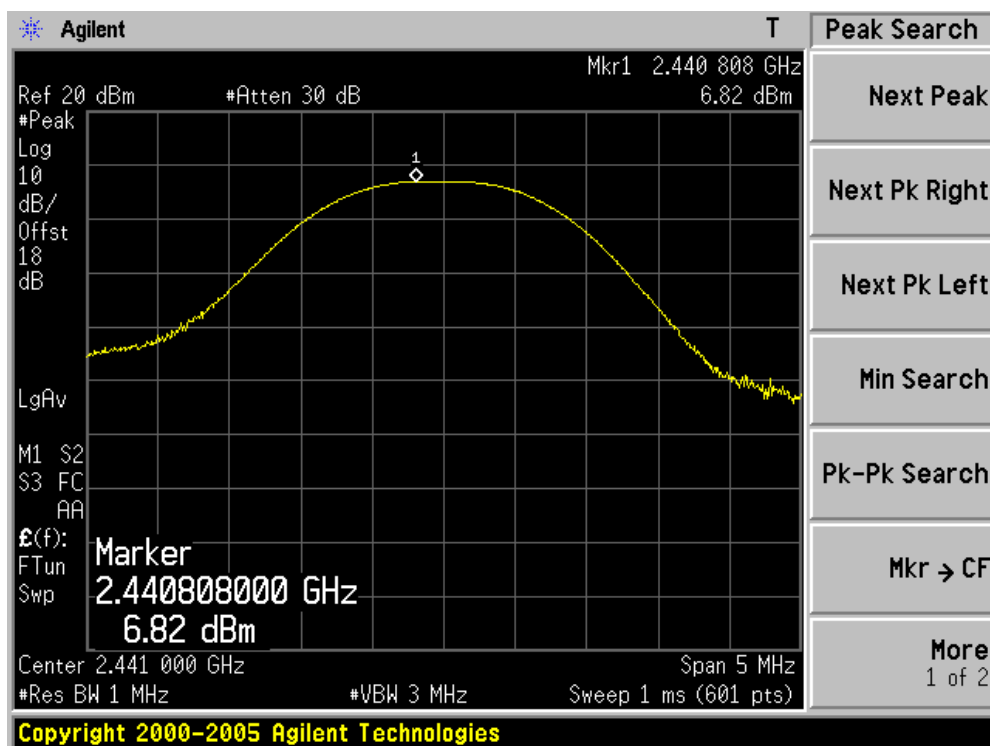
Product	:	Barcode Scanner
Test Item	:	Power Output
Test Mode	:	Mode 1: Transmitter-1Mbps (GFSK_DH5)

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Limit (dBm)	Result
0	2402	5.48	30.00	Pass
39	2441	6.82	30.00	Pass
78	2480	6.50	30.00	Pass

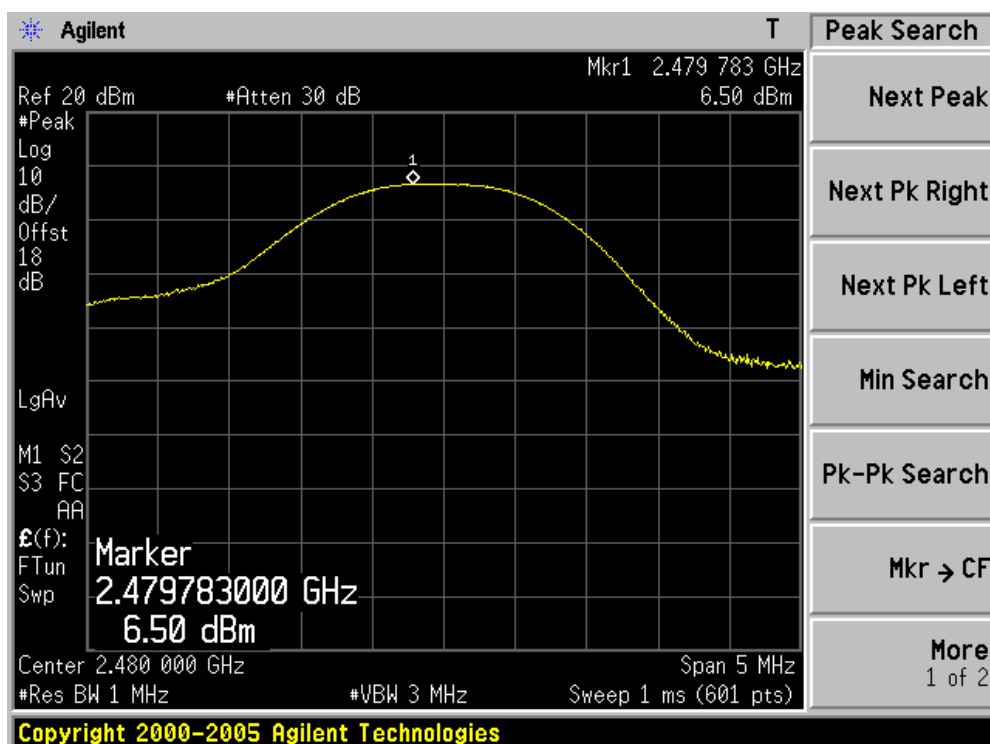
Channel 00 (2402MHz)



Channel 39 (2441MHz)



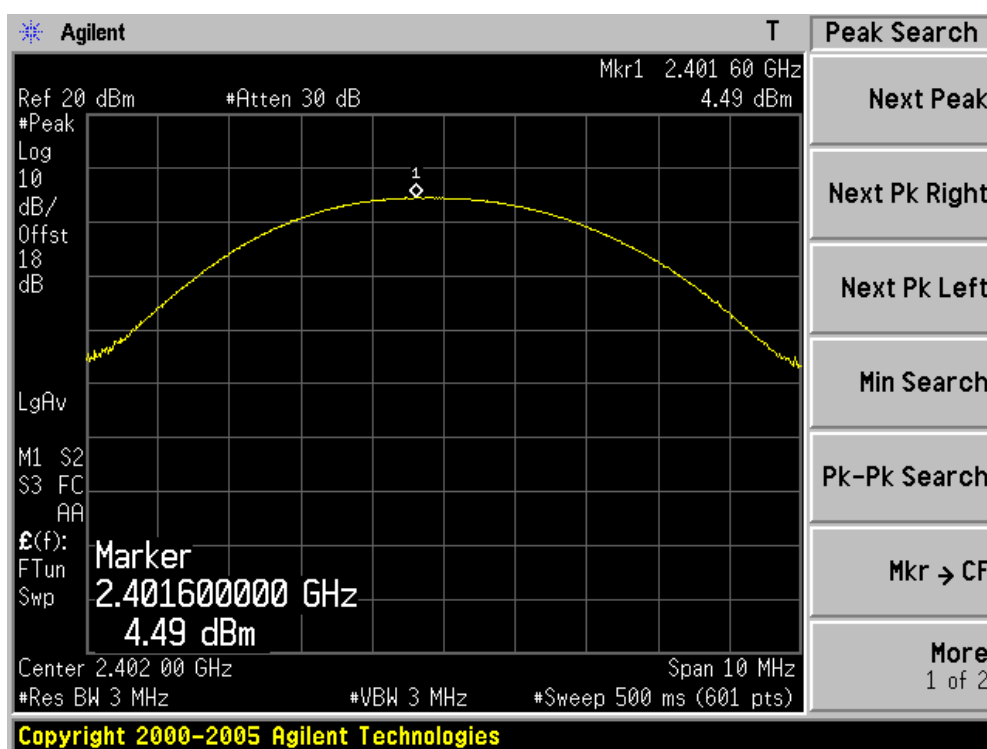
Channel 78 (2480MHz)



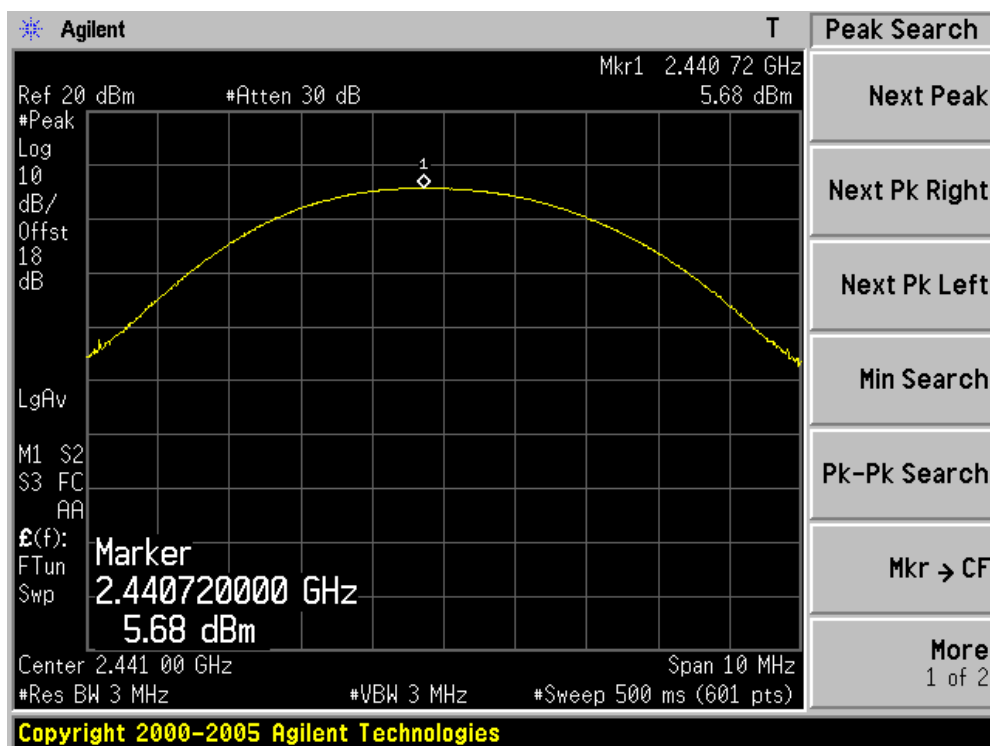
Product	:	Barcode Scanner
Test Item	:	Power Output
Test Mode	:	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH5)

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Limit (dBm)	Result
0	2402	4.49	30.00	Pass
39	2441	5.68	30.00	Pass
78	2480	5.41	30.00	Pass

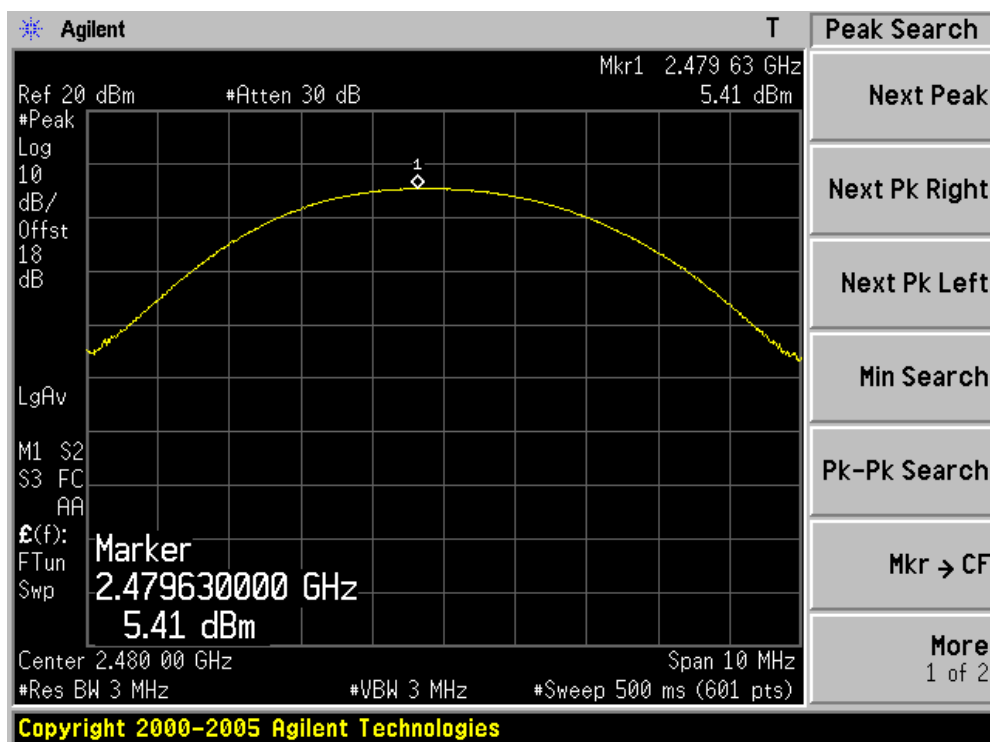
Channel 00 (2402MHz)



Channel 39 (2441MHz)



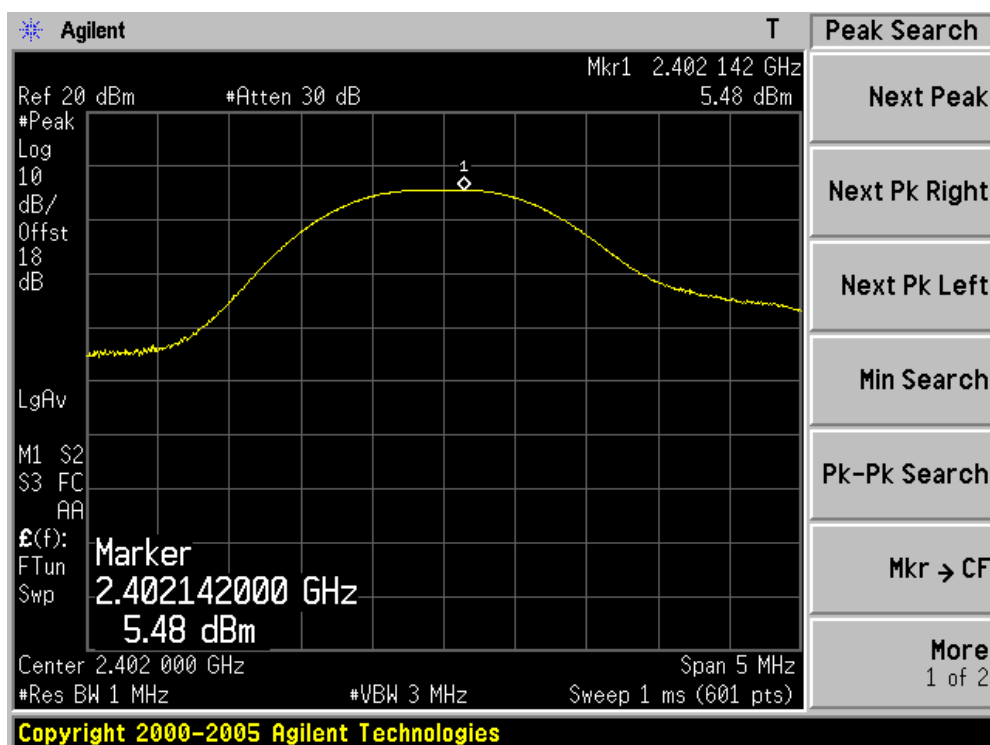
Channel 78 (2480MHz)



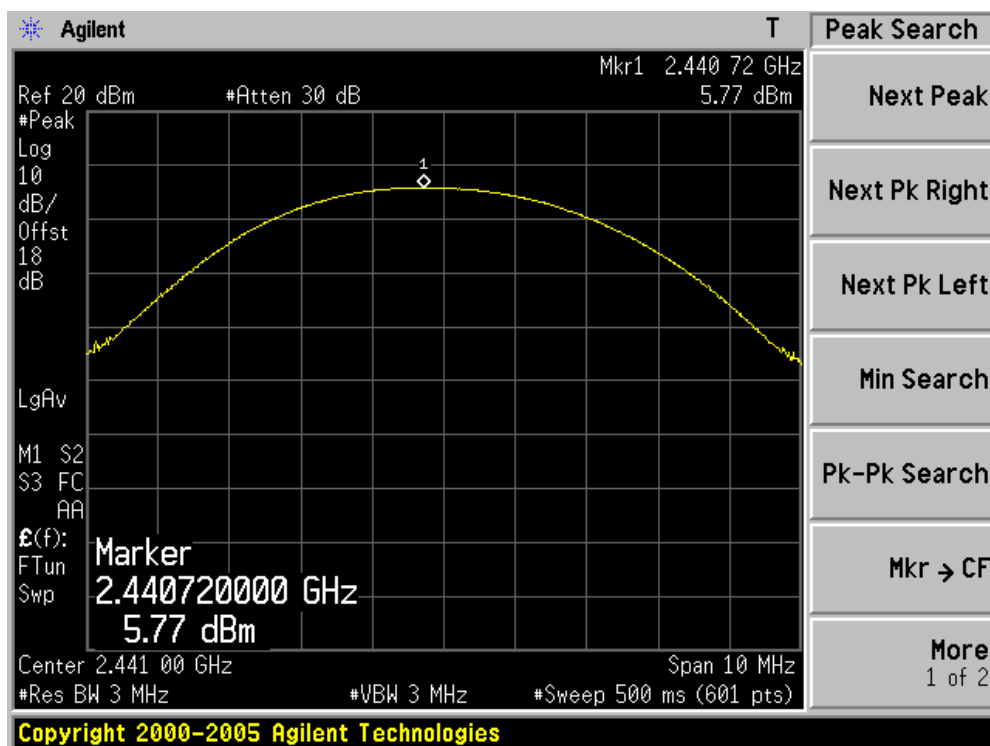
Product	:	Barcode Scanner
Test Item	:	Power Output
Test Mode	:	Mode 3: Transmitter-3Mbps (8DPSK_DH5)

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Limit (dBm)	Result
0	2402	5.48	30.00	Pass
39	2441	5.77	30.00	Pass
78	2480	5.45	30.00	Pass

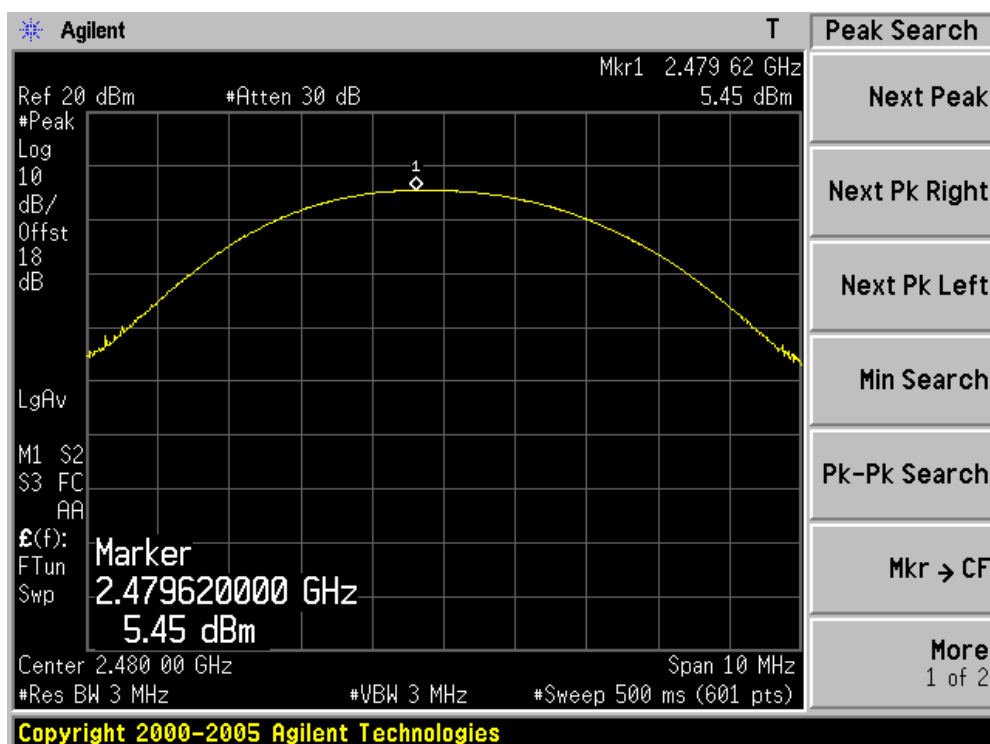
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)



10. Band-edge Compliance of RF Conducted Emissions

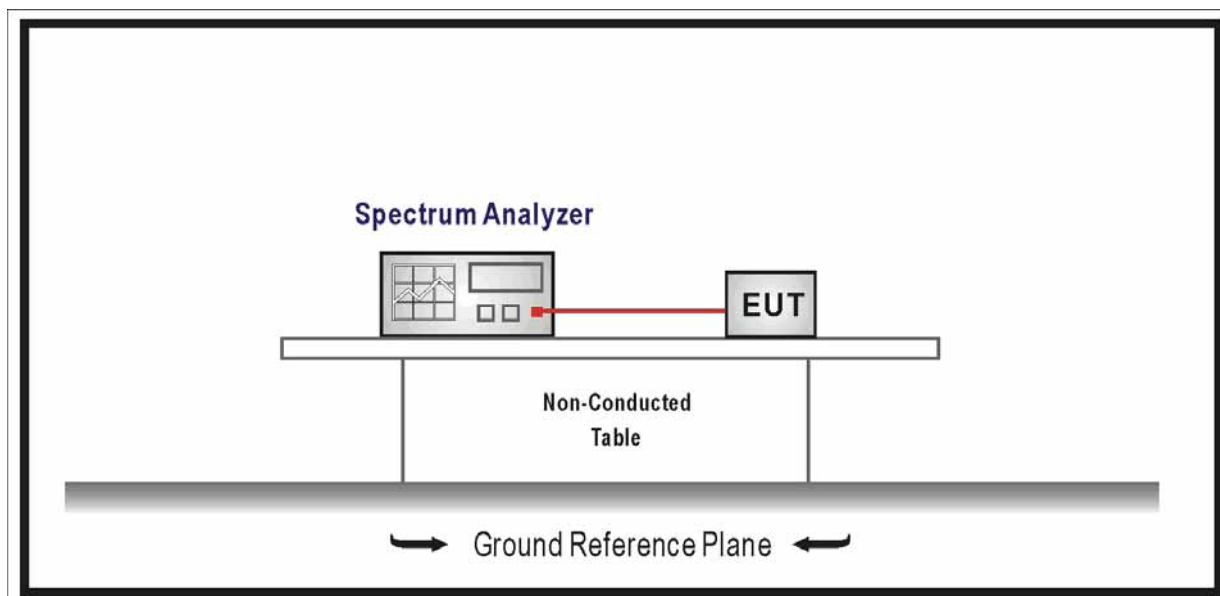
10.1. Test Equipment

Band-edge Compliance of RF Conducted Emissions / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2016.01.05
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2015.04.09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

10.2. Test Setup



10.3. Limit

- Intentional radiators operating under the alternative provisions to the general emission limits as contained in 15.217 through 15.257 and in Subpart E of FCC part 15, must be designed to ensure that 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.
- 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 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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) of FCC part 15 is not required.

10.4. Test Procedure

According to ANSI C63.10: 2013.

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation.

RBW $\geq$ 1% of the span

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge.

Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. The marker-delta value now displayed must comply with the limit specified in this Section.

Now, using the same instrument settings, enable the hopping function of the EUT. Allow the trace to stabilize. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit.

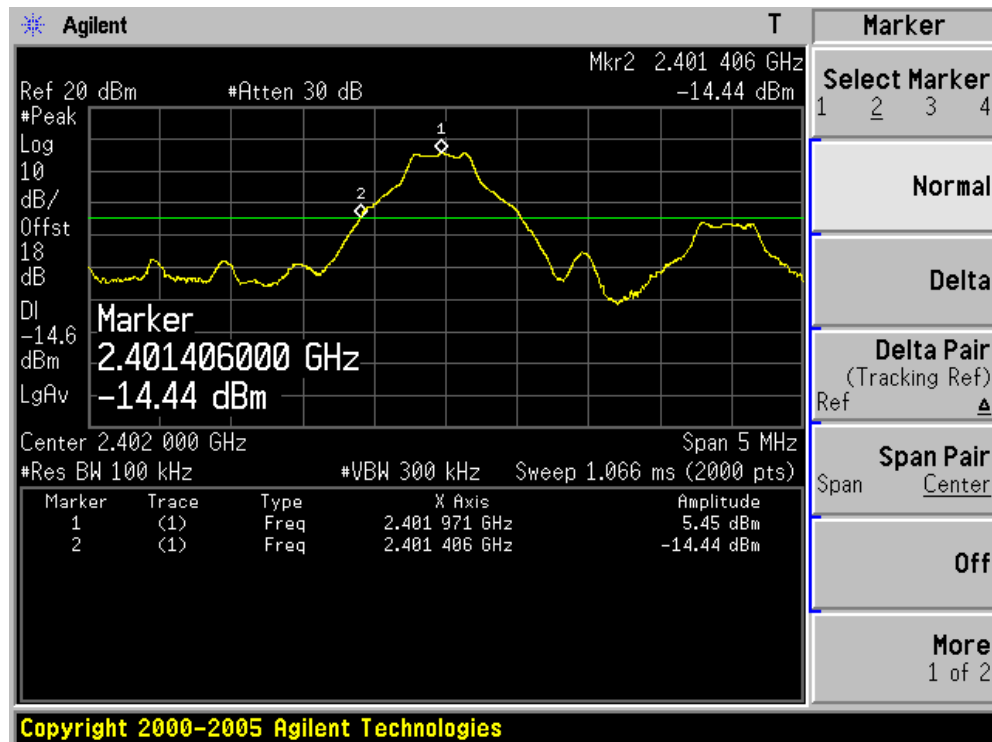
10.5. Uncertainty

The measurement uncertainty is defined as ± 1.0 dB

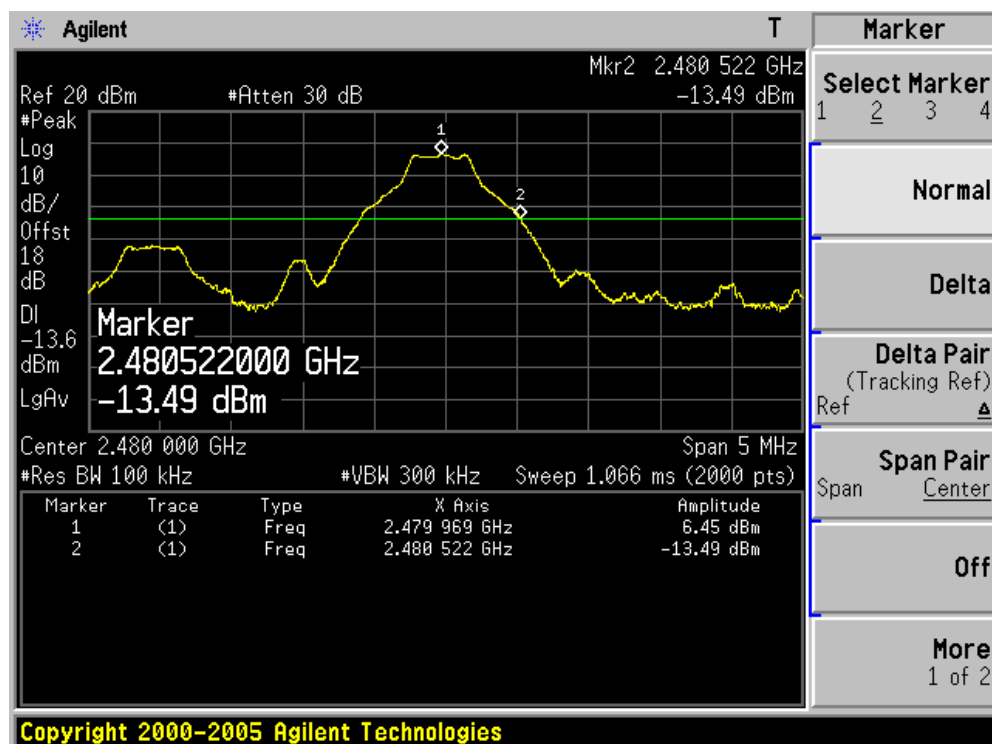
10.6. Test Result

Product	:	Barcode Scanner
Test Item	:	Band-edge Compliance of RF Conducted Emissions
Test Mode	:	Mode 1: Transmitter-1Mbps (GFSK_DH5)

Channel 00 (2402MHz)

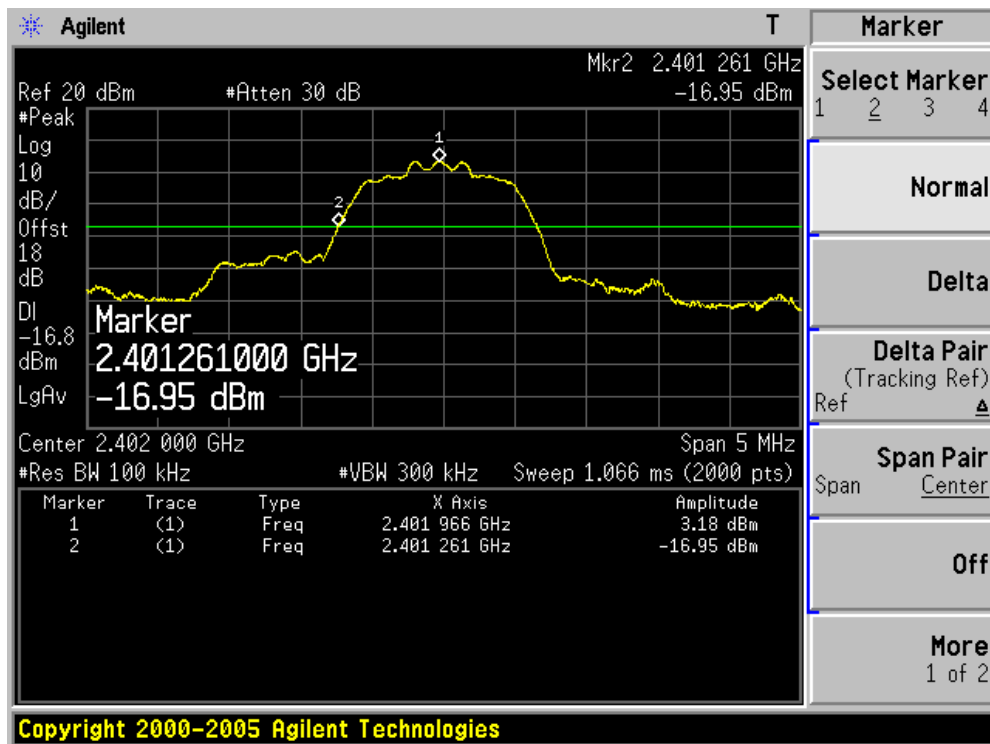


Channel 78 (2480MHz)

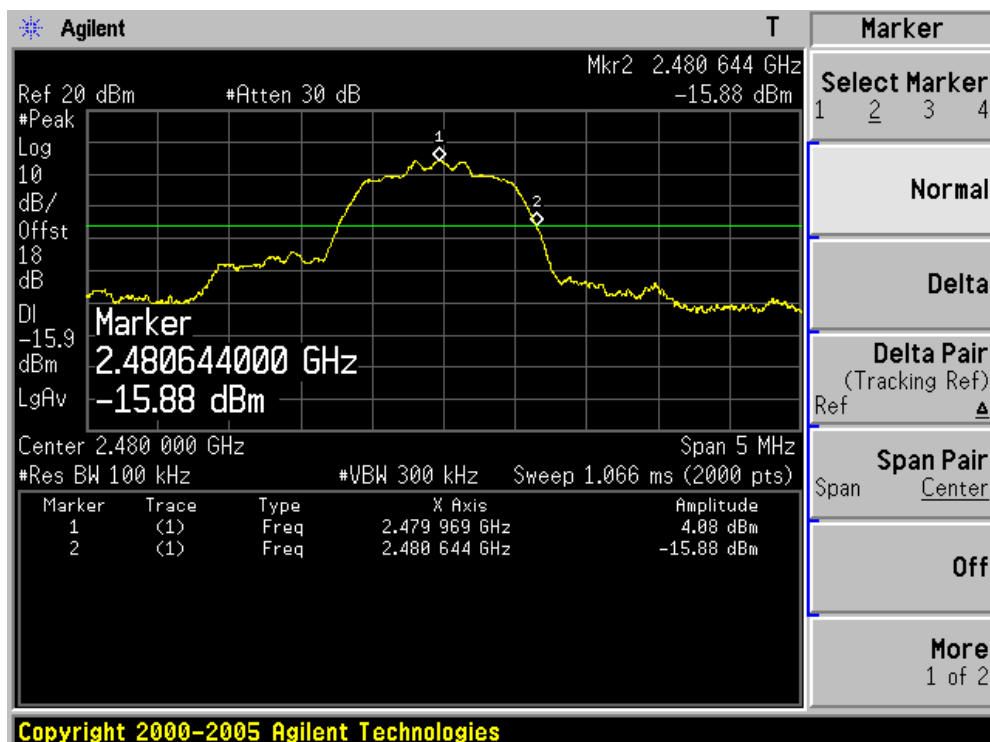


Product	:	Barcode Scanner
Test Item	:	Band-edge Compliance of RF Conducted Emissions
Test Mode	:	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH5)

Channel 00 (2402MHz)

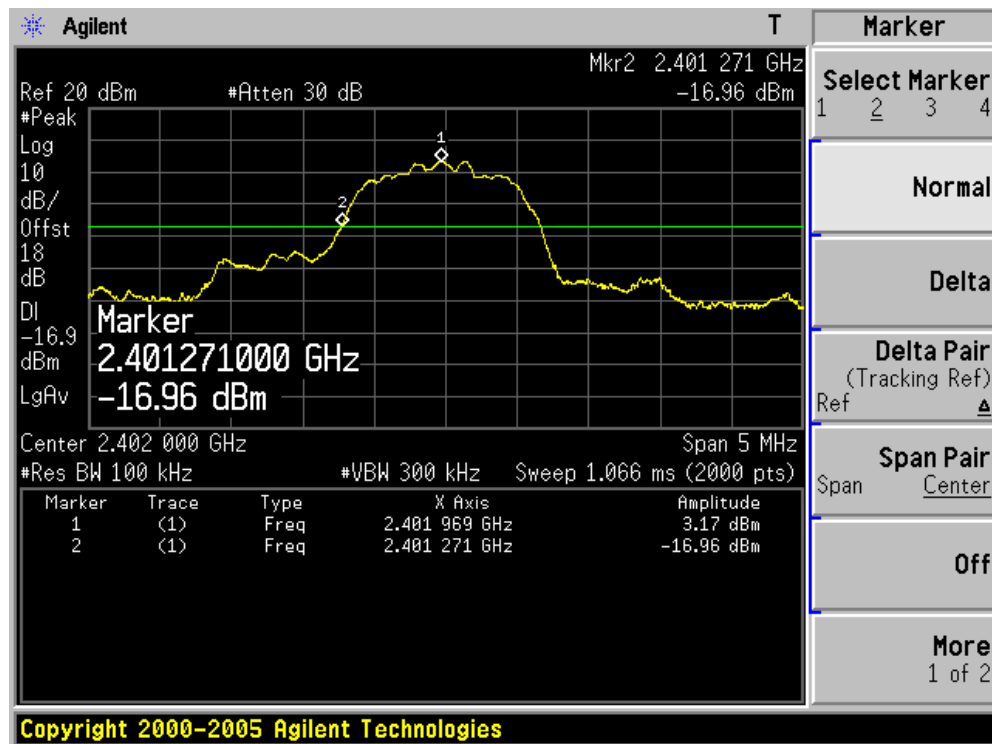


Channel 78 (2480MHz)

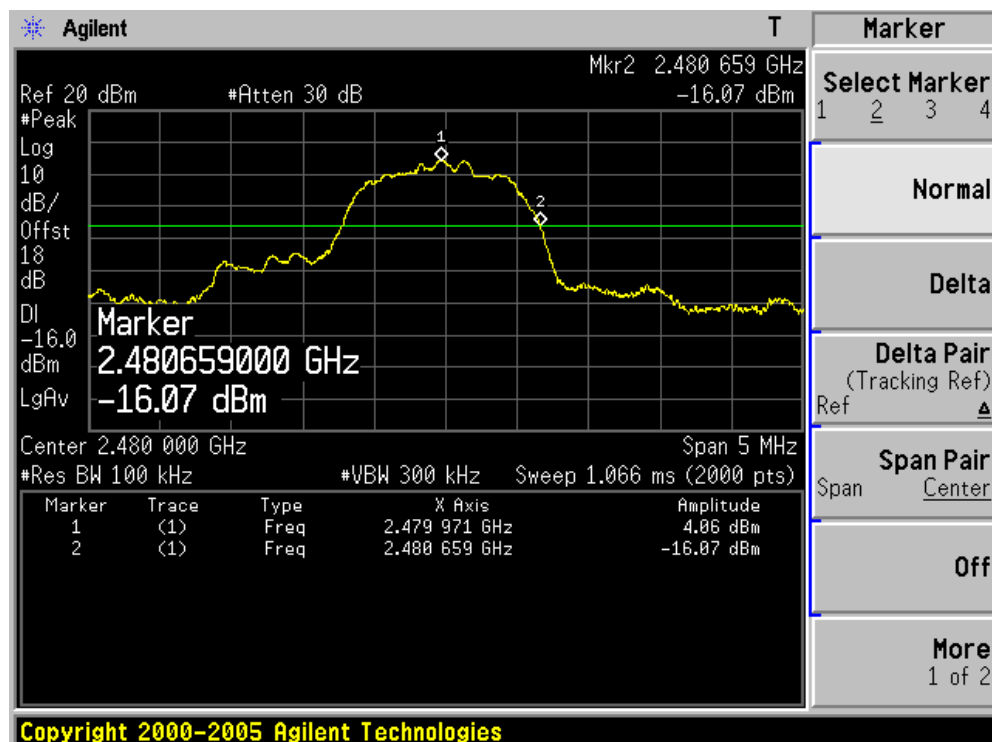


Product	:	Barcode Scanner
Test Item	:	Band-edge Compliance of RF Conducted Emissions
Test Mode	:	Mode 3: Transmitter-3Mbps (8DPSK_DH5)

Channel 00 (2402MHz)

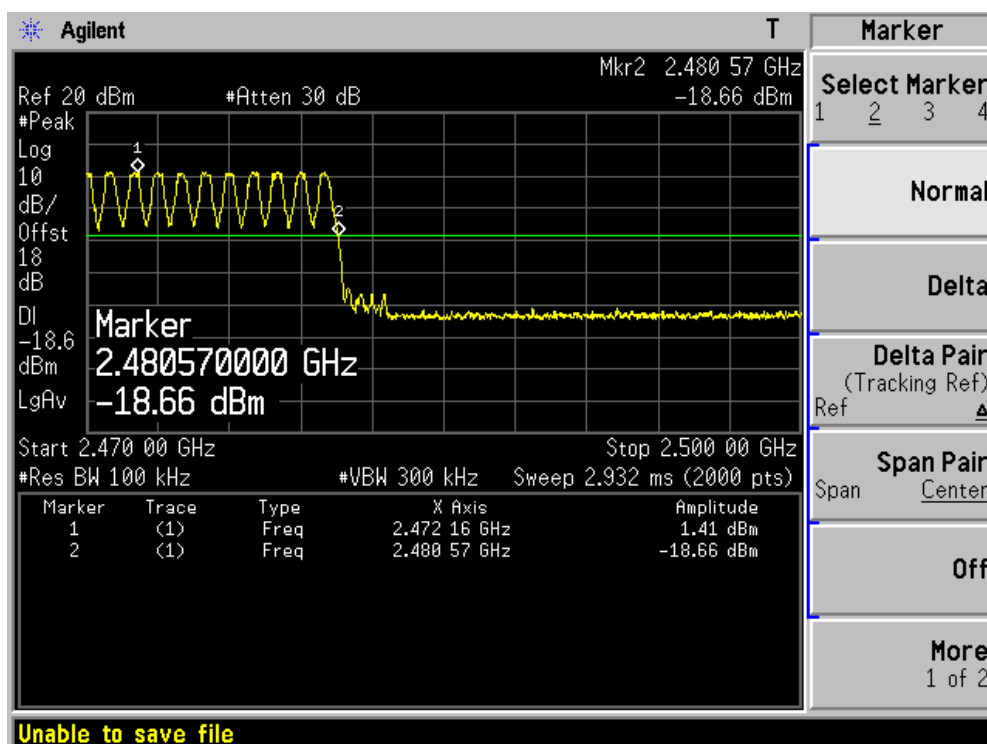
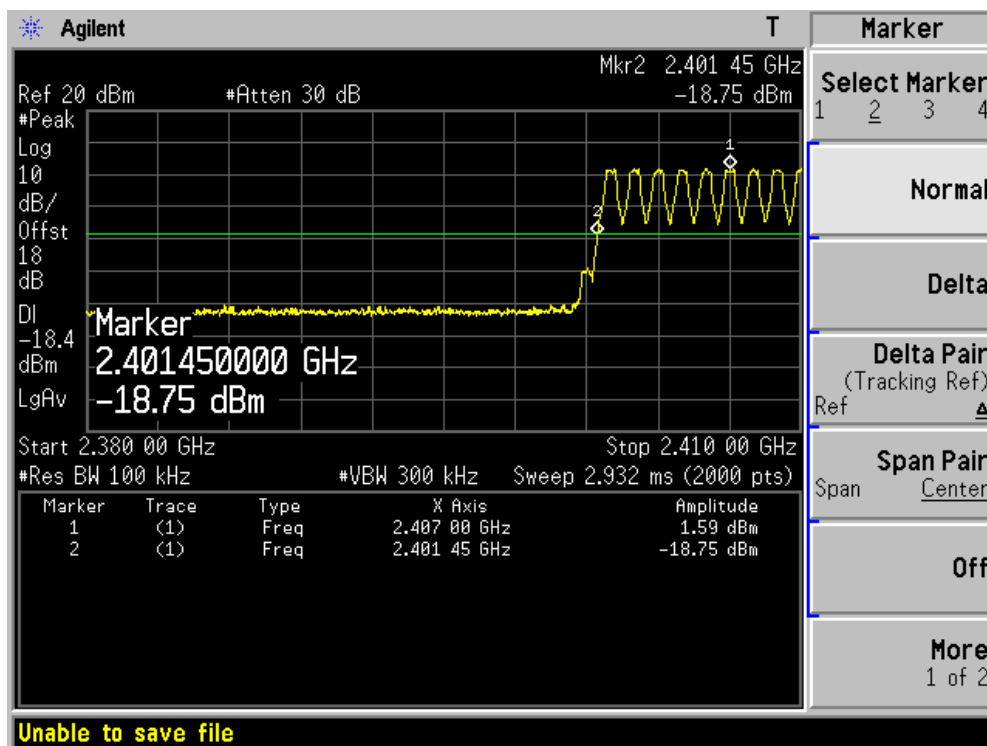


Channel 78 (2480MHz)



Product	:	Barcode Scanner
Test Item	:	Band-edge Compliance of RF Conducted Emissions
Test Mode	:	Mode 1: Hopping Mode

Hopping Mode



11. Spurious RF Conducted Emissions

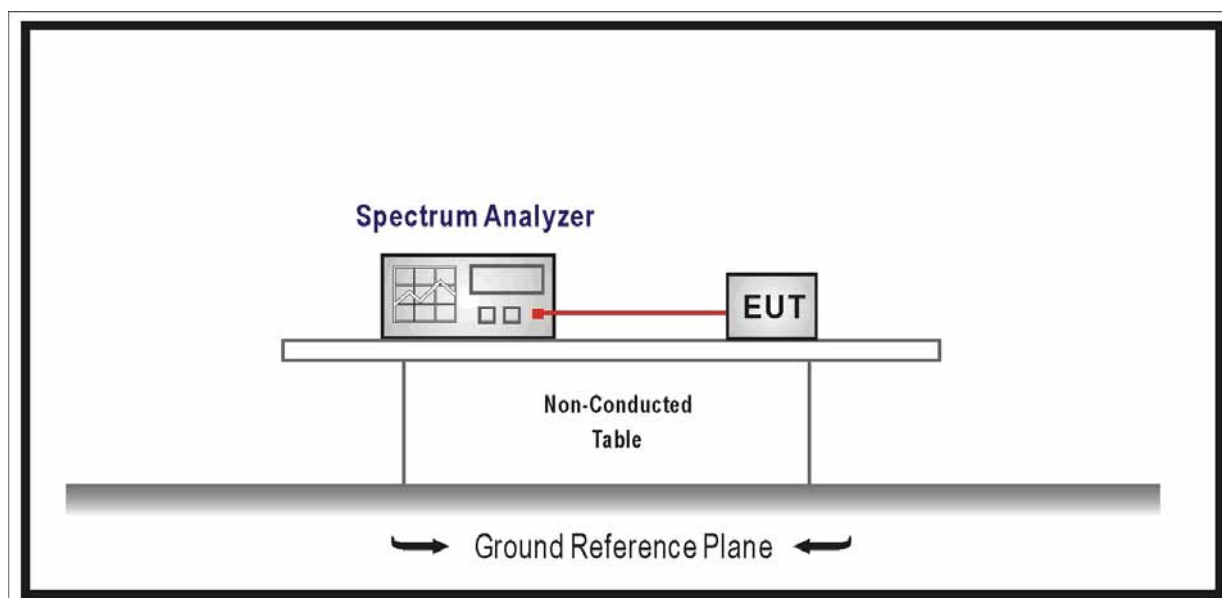
11.1. Test Equipment

Spurious RF Conducted Emissions / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2015.05.12
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2015.04.09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

11.2. Test Setup



11.3. Limit

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 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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in

Section 15.209(a) of FCC part 15 is not required.

11.4. Test Procedure

According to ANSI C63.10: 2013.

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100 kHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded. The level displayed must comply with the limit specified in this section.

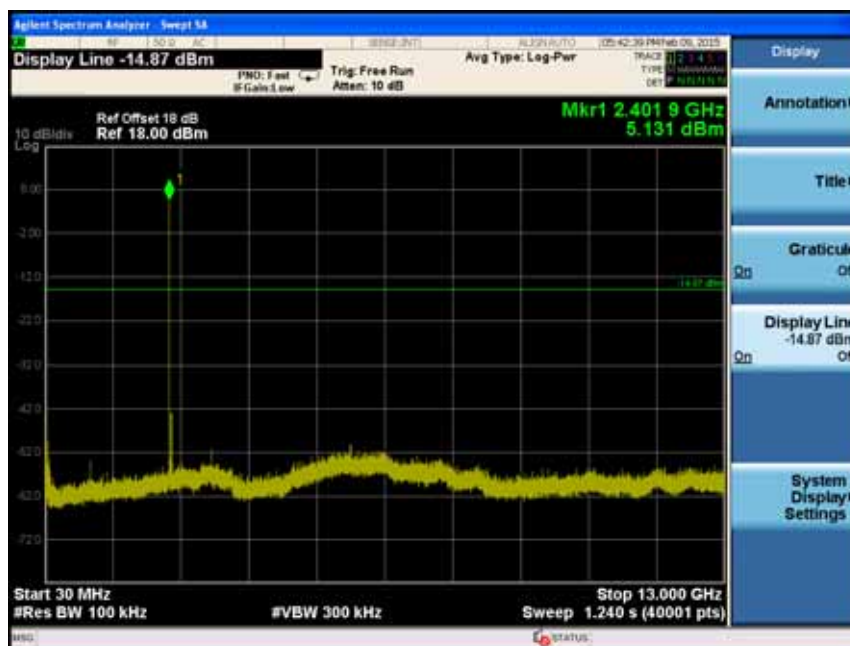
11.5. Uncertainty

The measurement uncertainty is defined as ± 1.0 dB

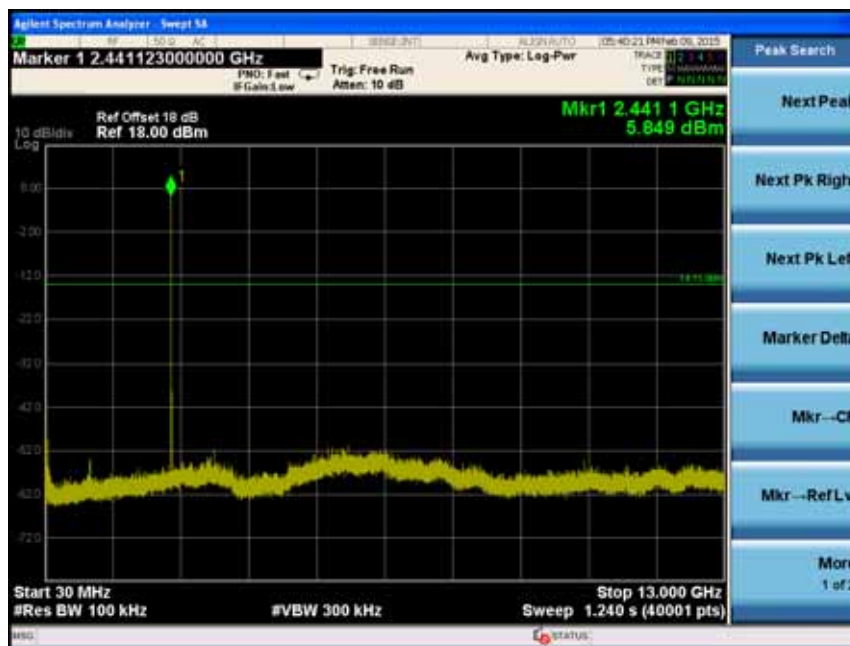
11.6. Test Result

Product	:	Barcode Scanner
Test Item	:	Spurious RF Conducted Emissions
Test Mode	:	Mode 1: Transmitter-1Mbps (GFSK_DH5)

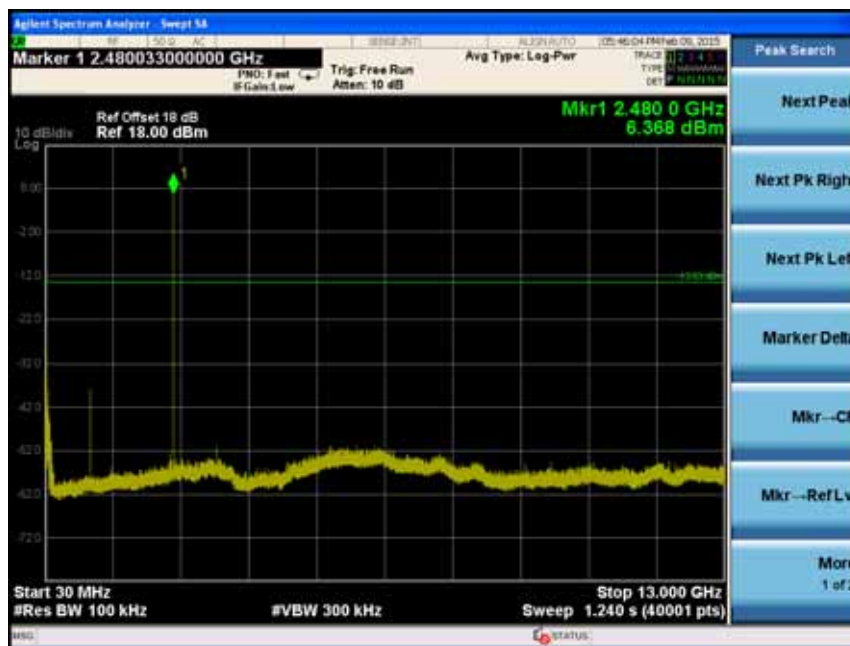
Channel 00 (2402MHz)



Channel 39 (2441MHz)

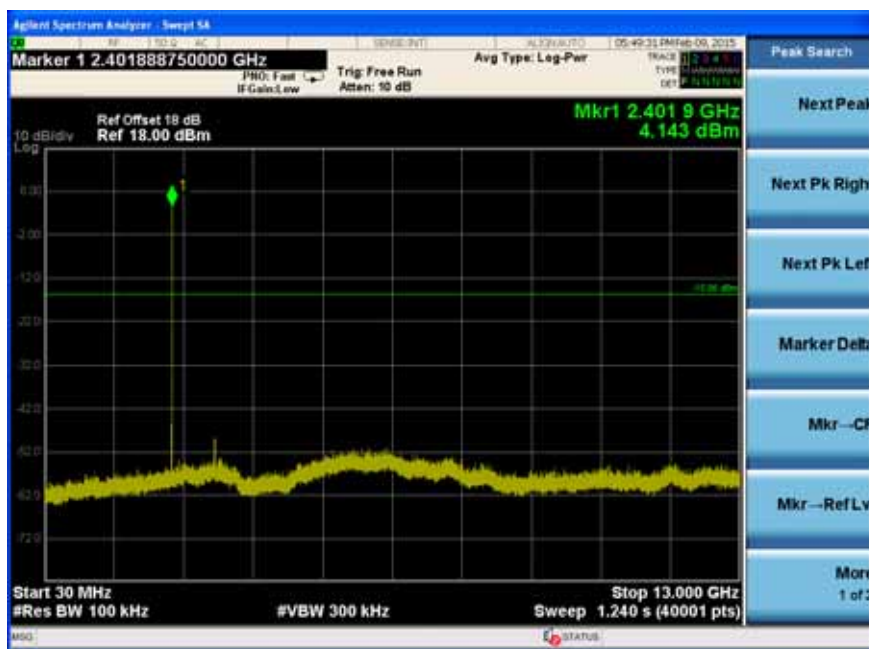


Channel 78 (2480MHz)

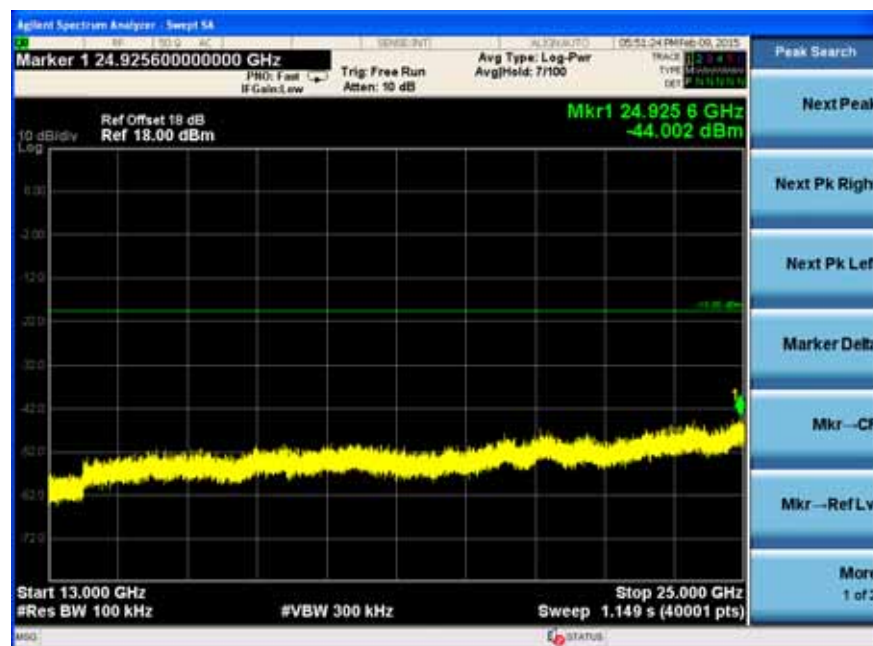
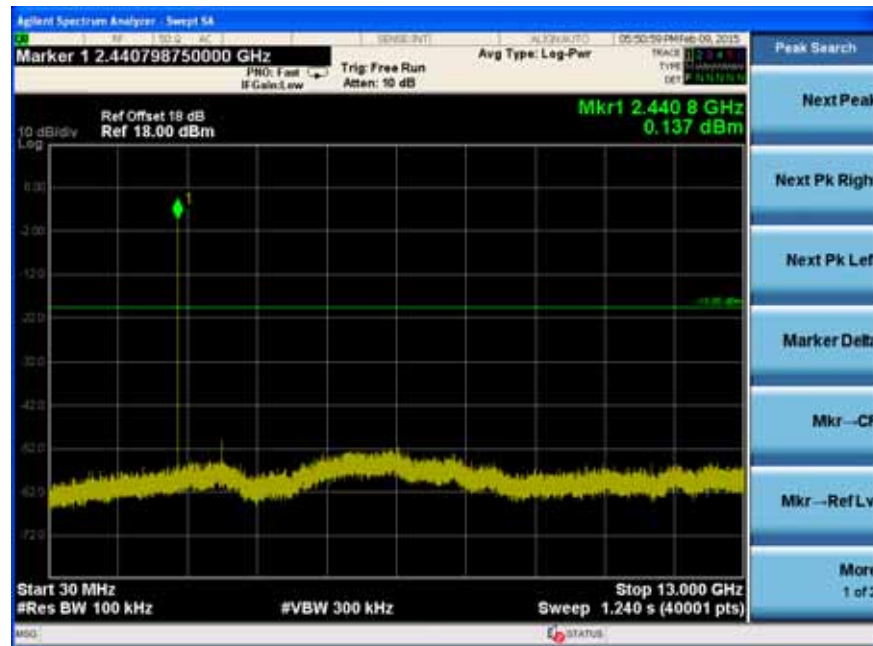


Product	:	Barcode Scanner
Test Item	:	Spurious RF Conducted Emissions
Test Mode	:	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH5)

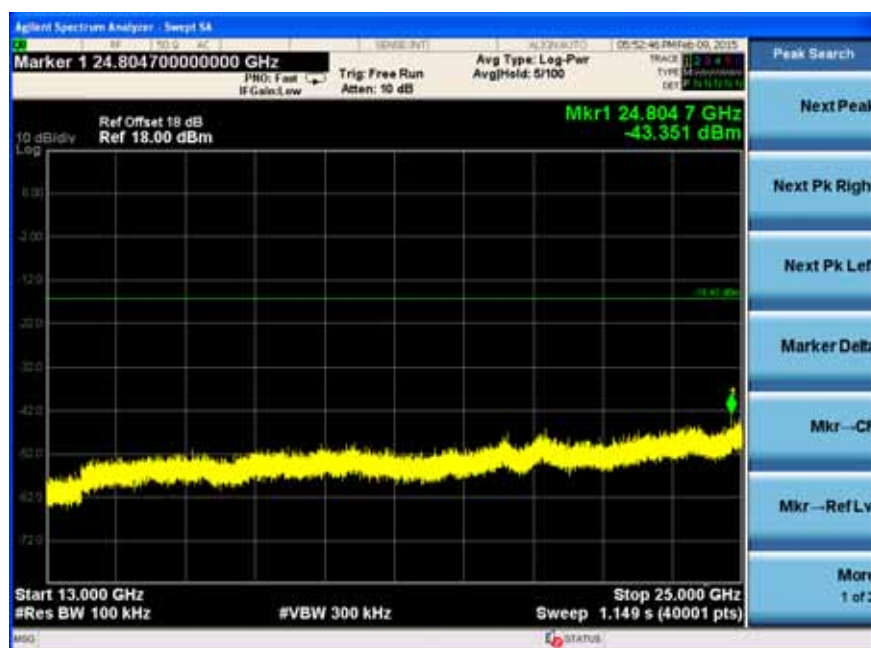
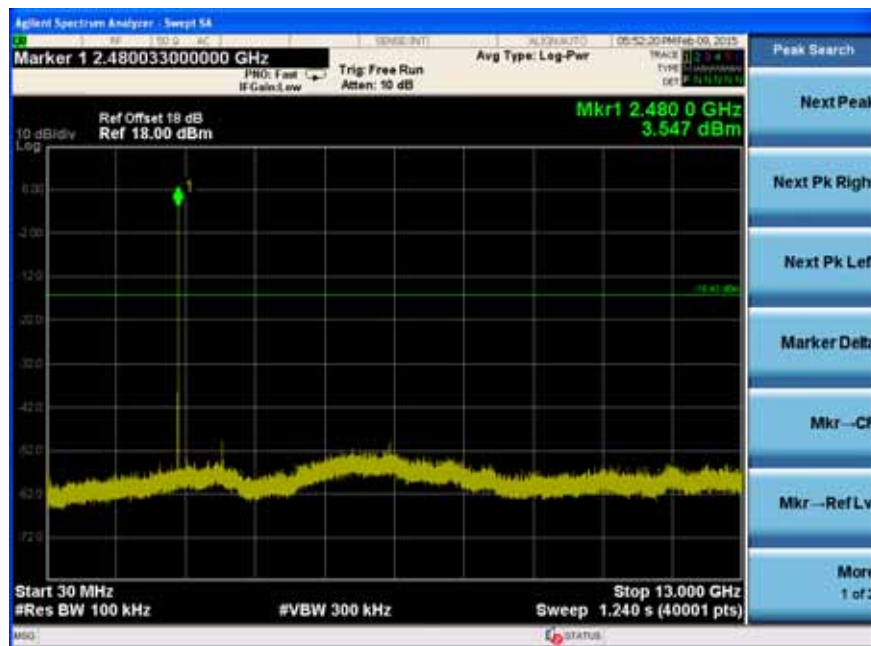
Channel 00 (2402MHz)



Channel 39 (2441MHz)

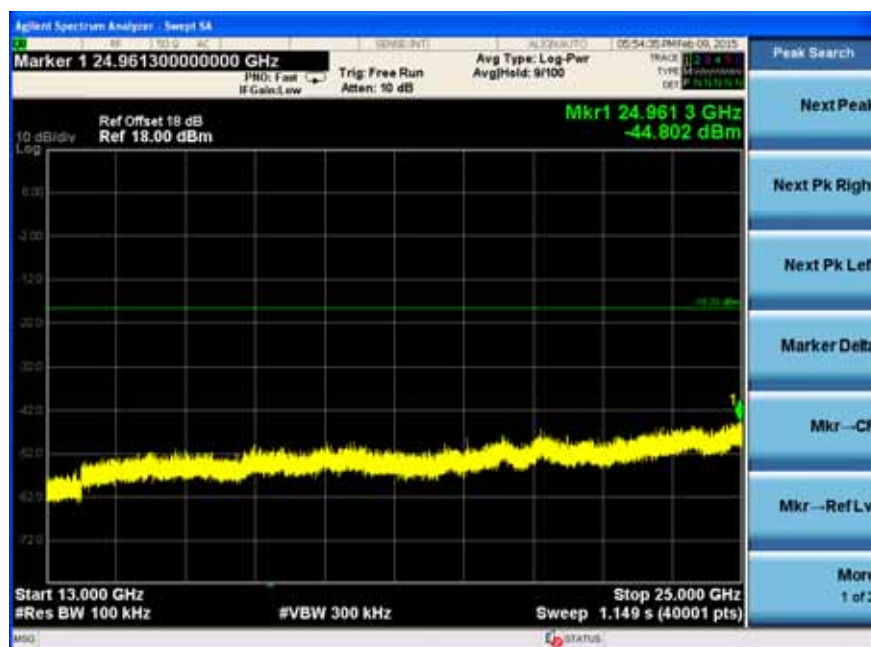
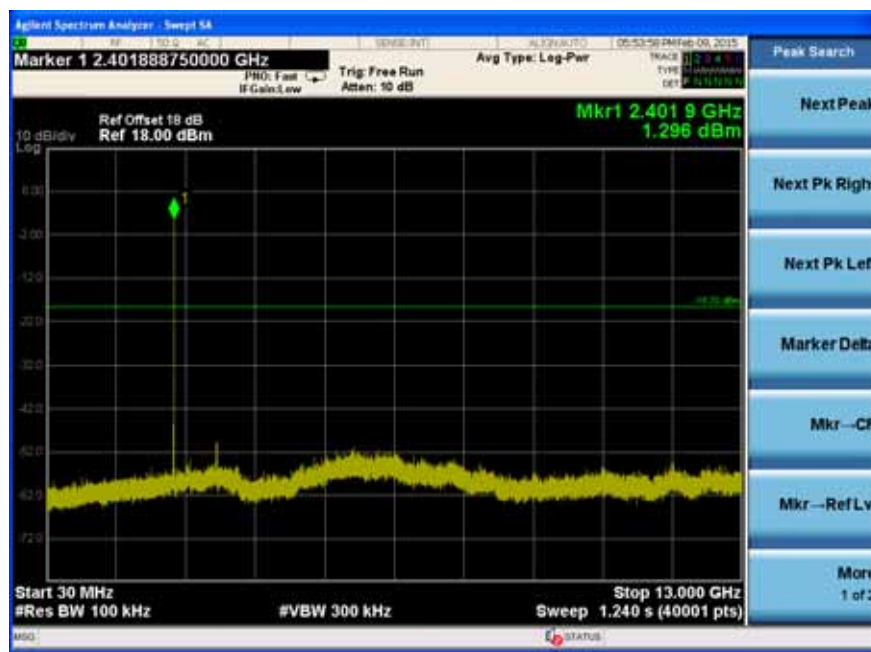


Channel 78 (2480MHz)

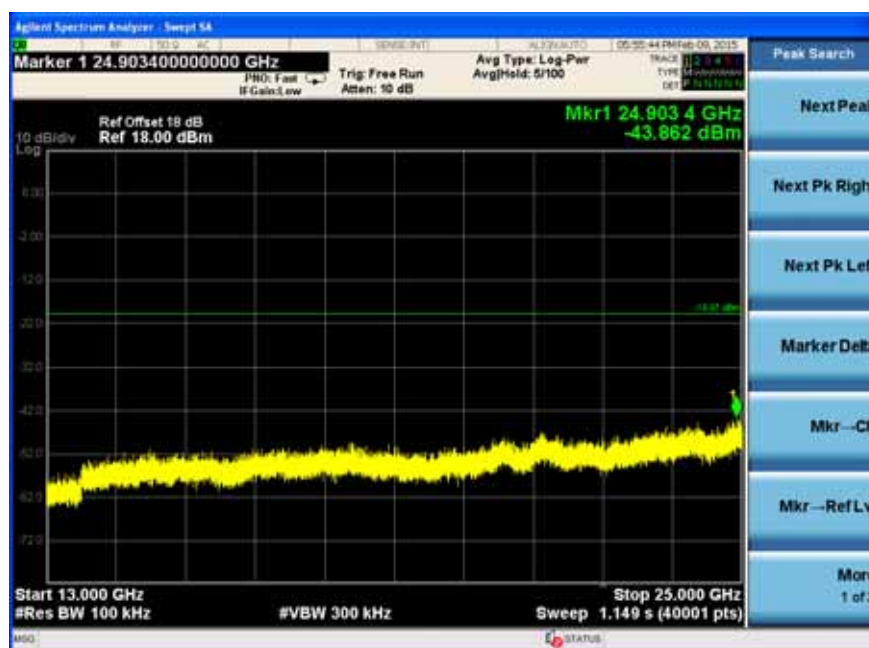
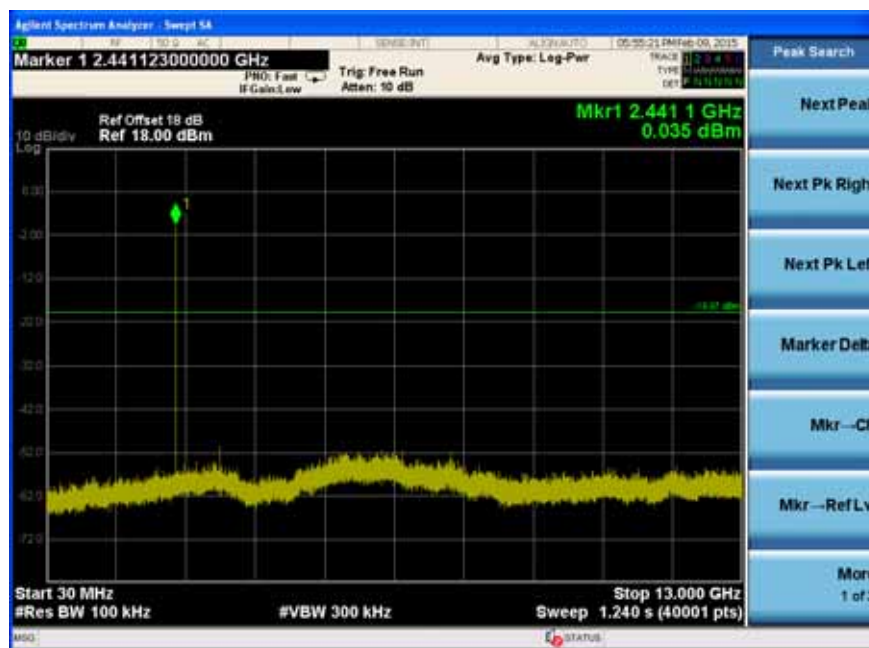


Product	:	Barcode Scanner
Test Item	:	Spurious RF Conducted Emissions
Test Mode	:	Mode 3: Transmitter-3Mbps (8DPSK_DH5)

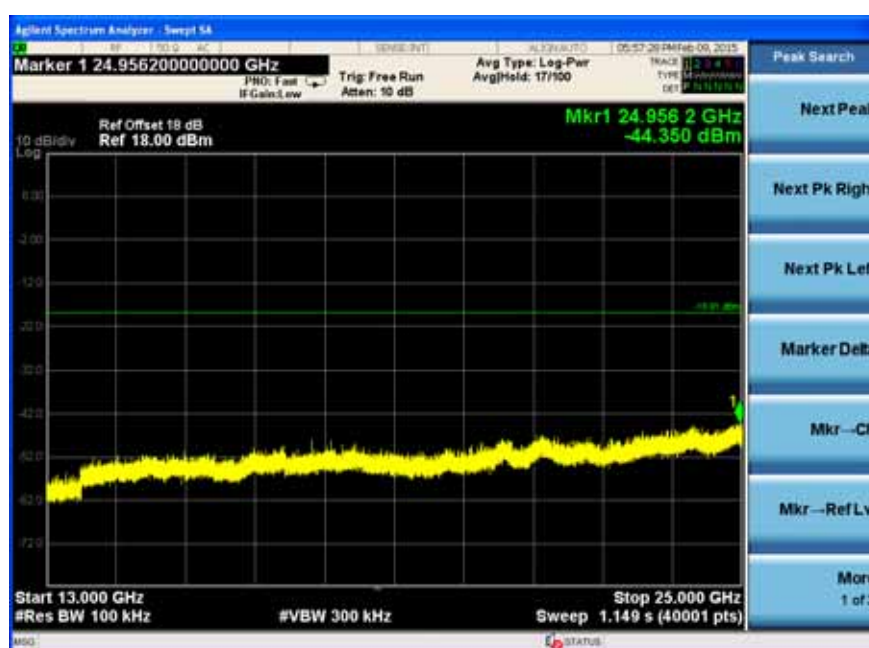
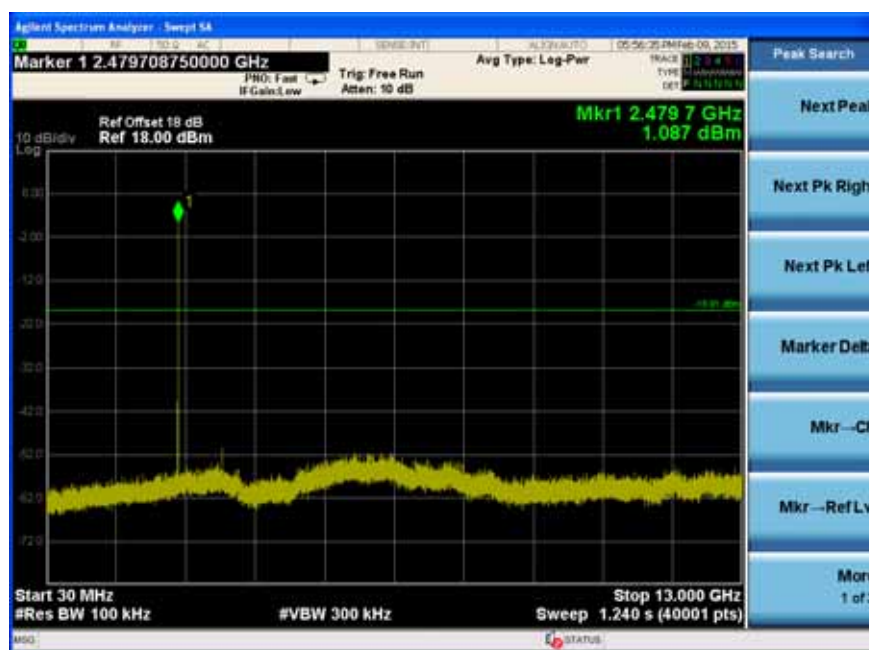
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)



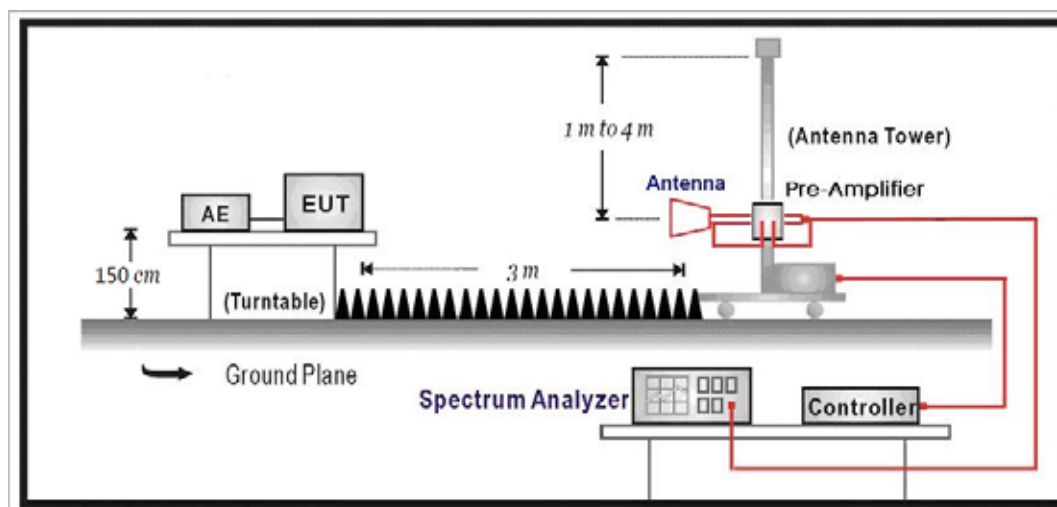
12. Radiated Emission Band Edge

12.1. Test Equipment

☒ Radiated Emission Band Edge / AC-5

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2015.05.12
EMI Test Receiver	R&S	ESCI	100573	2015.05.03
Preamplifier	Miteq	NSP1800-25	1364185	2015.05.03
Preamplifier	Quietek	AP-040G	CHM-0906001	2015.10.15
Bilog Antenna	Teseq GmbH	CBL6112D	27612	2015.01.07
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	499	2016.04.10
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	2015.05.12
Temperature/Humidity Meter	zhicheng	ZC1-2	AC5-TH	2016.01.07

12.2. Test Setup



12.3. Limit

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a) of FCC part 15.

12.4. Test Procedure

According to ANSI C63.10: 2013.

This test is required for any spurious emission or modulation product that falls in a Restricted Band, as defined in Section 15.205 of FCC part 15. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq 3 \times$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Follow the guidelines in ANSI C63.4 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization, etc. A pre-amp and a high pass filter are required for this test, in order to provide the measuring system with sufficient sensitivity. Allow the trace to stabilize. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, which must comply with the limit specified in Section 15.35(b) of FCC part 15.

Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209 of FCC Part 15. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from $20 \log(\text{dwell time}/100 \text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit of FCC part 15.

If the emission on which a radiated measurement must be made is located at the edge of the authorized band of operation, then the alternative “marker-delta” method may be employed.

12.5. Uncertainty

The measurement uncertainty above 1G is defined as ± 3.9 dB

below 1G is defined as ± 3.8 dB

12.6. Test Result

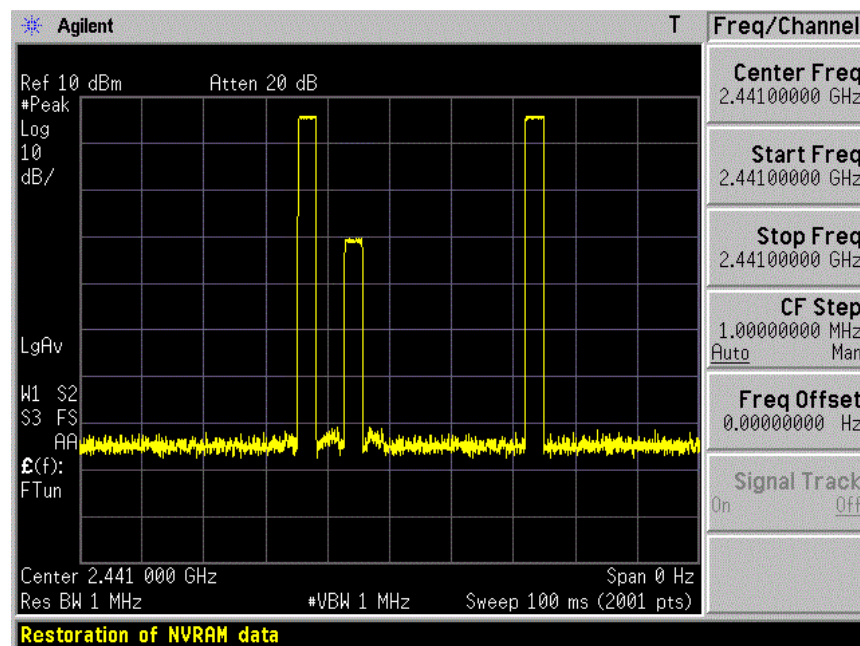
All of the test result shown indicates the worst case, and spectrum analyzer parameters setting as shown below:

Peak detector: RBW = 1MHz, VBW = 3MHz, sweep time = 200ms;

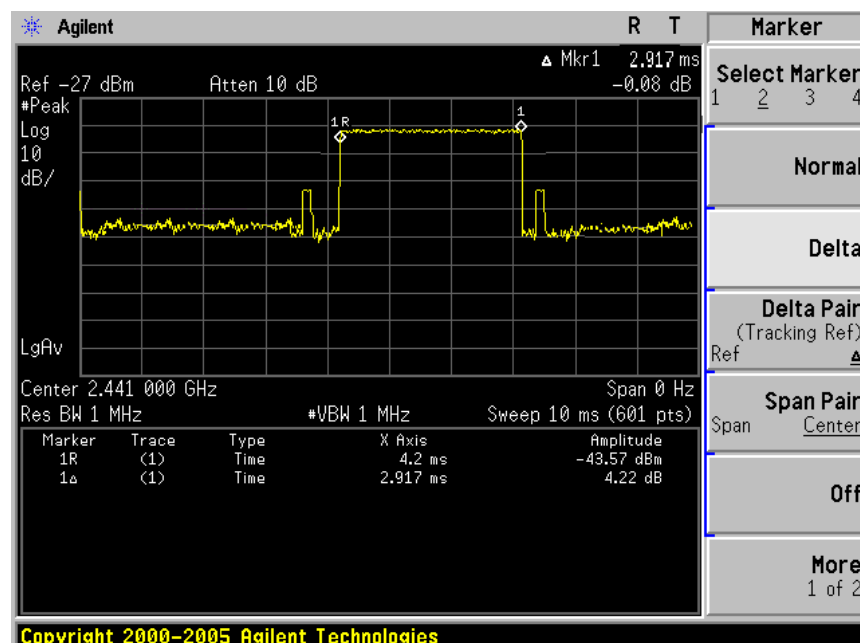
Average = Peak Measure Level+ Duty Factor

Duty Factor= $20 \times \text{LOG}(\text{Channel Number} \times \text{On Time}/100) = -24.68\text{dB}$ in the worst condition of normal using.

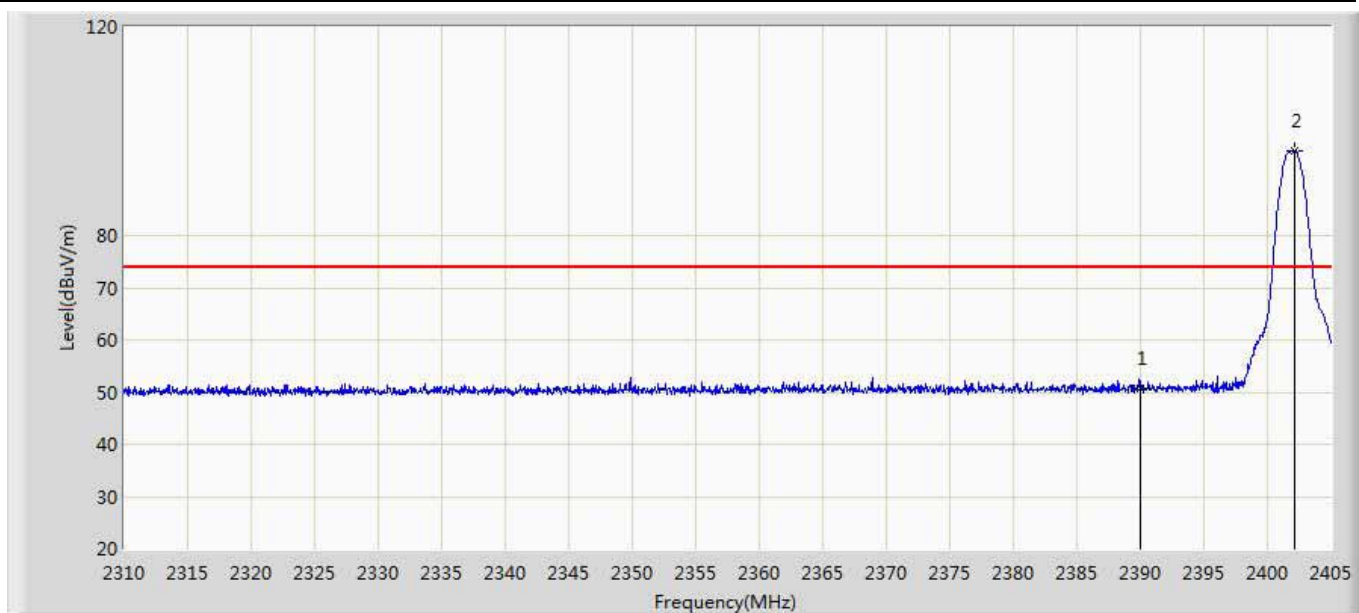
Pulse Number



On Time



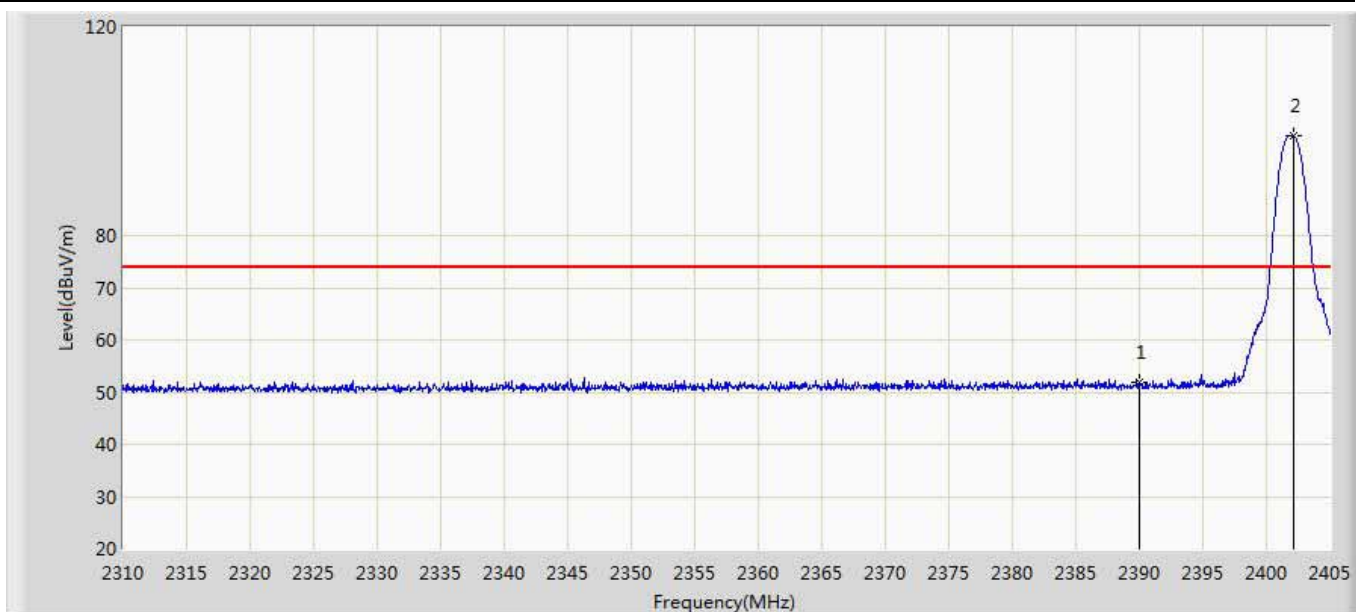
Site: AC5	Time: 2015/01/21 - 10:04
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: BARCODE SCANNER	Power: DC 5V
Note: Mode1 tx at 2402MHz by DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	50.720	14.684	-23.280	74.000	36.037	PK
2	*	2402.103	96.272	60.180	N/A	N/A	36.093	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1		2390.000	50.720	26.040	-27.96	54.000	-24.68	AV
2	*	2402.103	96.272	71.592	N/A	N/A	-24.68	AV

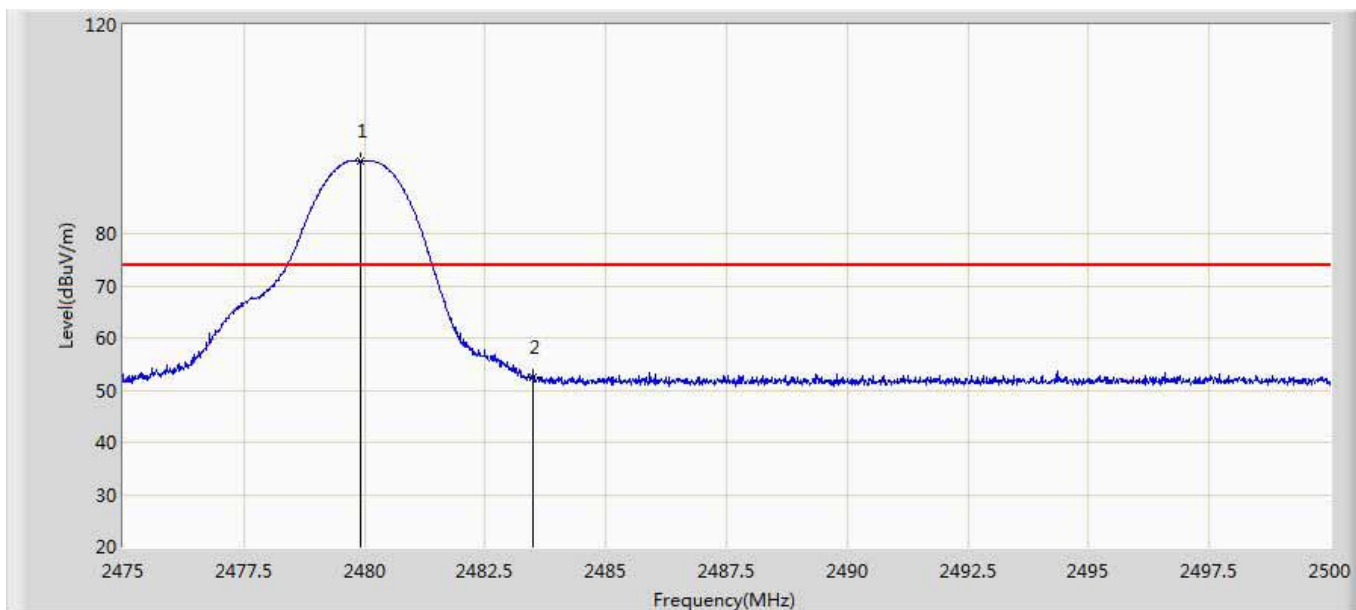
Site: AC5	Time: 2015/01/21 - 10:21
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: BARCODE SCANNER	Power: DC 5V
Note: Mode1 tx at 2402Mhz by DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	51.747	15.711	-22.253	74.000	36.037	PK
2	*	2402.103	99.059	62.967	N/A	N/A	36.093	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1		2390.000	51.747	27.067	-26.933	54.000	-24.68	AV
2	*	2402.103	99.059	74.379	N/A	N/A	-24.68	AV

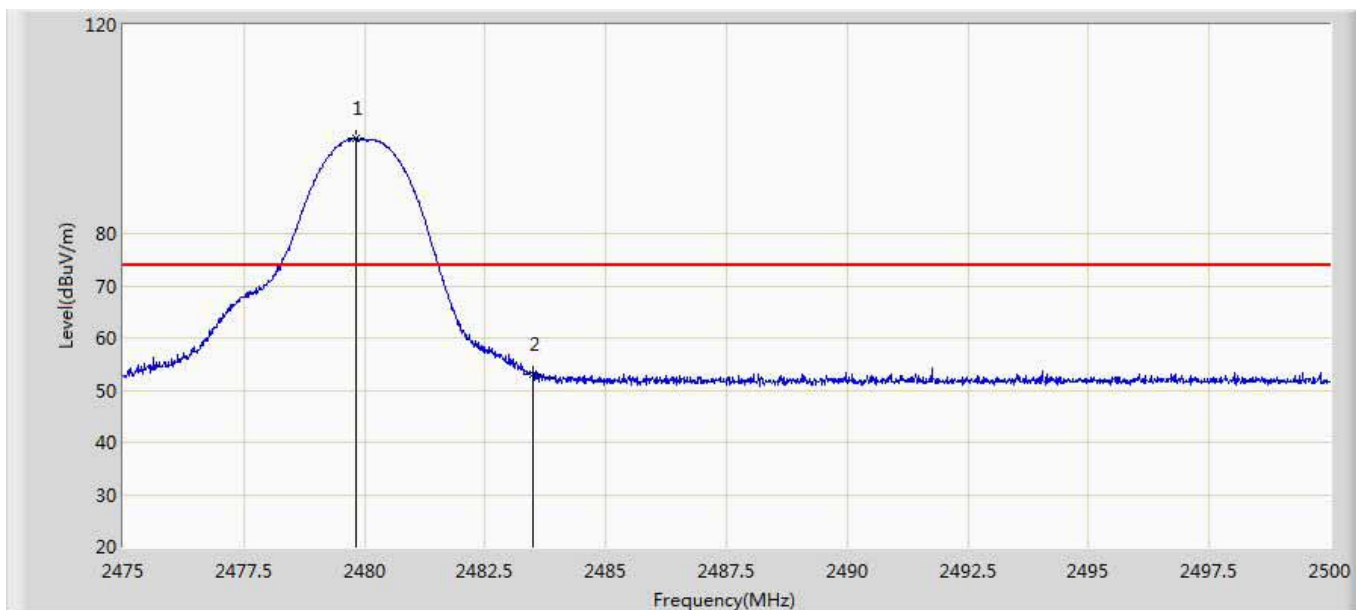
Site: AC5	Time: 2015/01/21 - 10:32
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: BARCODE SCANNER	Power: DC 5V
Note: Mode1 tx at 2480MHz by DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2479.913	93.972	57.523	N/A	N/A	36.448	PK
2		2483.500	52.563	16.098	-21.437	74.000	36.465	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1		2479.913	93.972	69.292	N/A	N/A	-24.68	AV
2	*	2483.500	52.563	27.883	-26.117	54.000	-24.68	AV

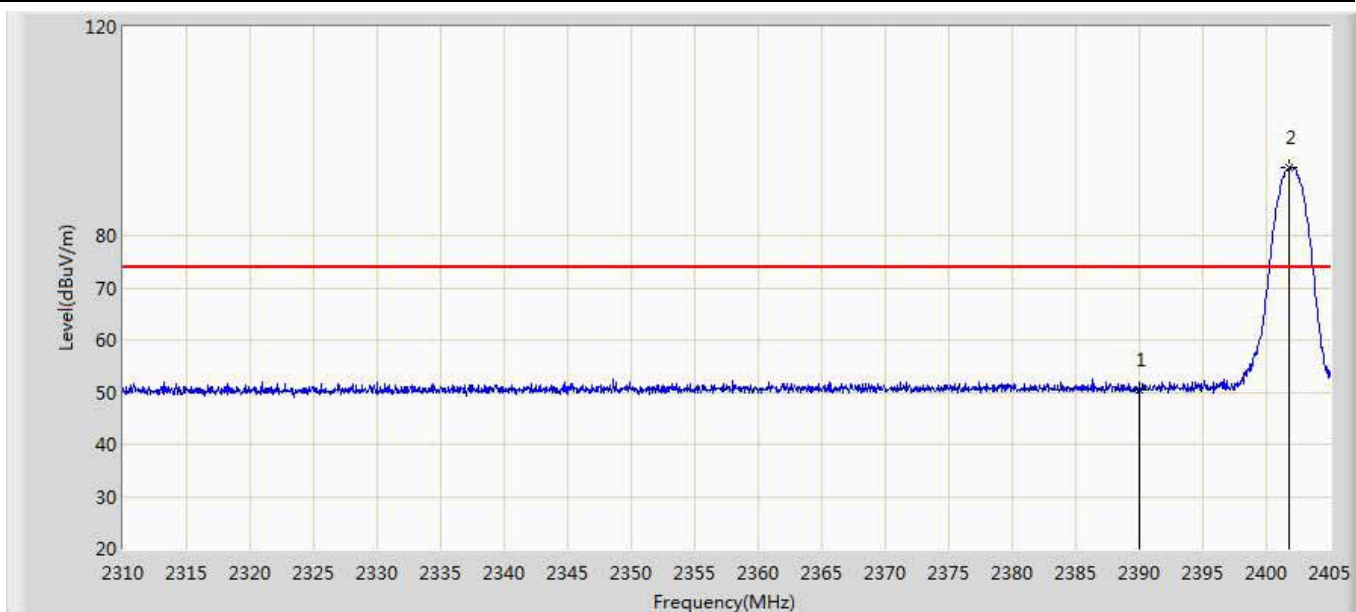
Site: AC5	Time: 2015/01/21 - 10:40
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: BARCODE SCANNER	Power: DC 5V
Note: Mode1 tx at 2480MHz by DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2479.837	98.123	61.675	N/A	N/A	36.448	PK
2		2483.500	53.172	16.707	-20.828	74.000	36.465	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1		2479.837	98.123	73.443	N/A	N/A	-24.68	AV
2	*	2483.500	53.172	28.492	-25.508	54.000	-24.68	AV

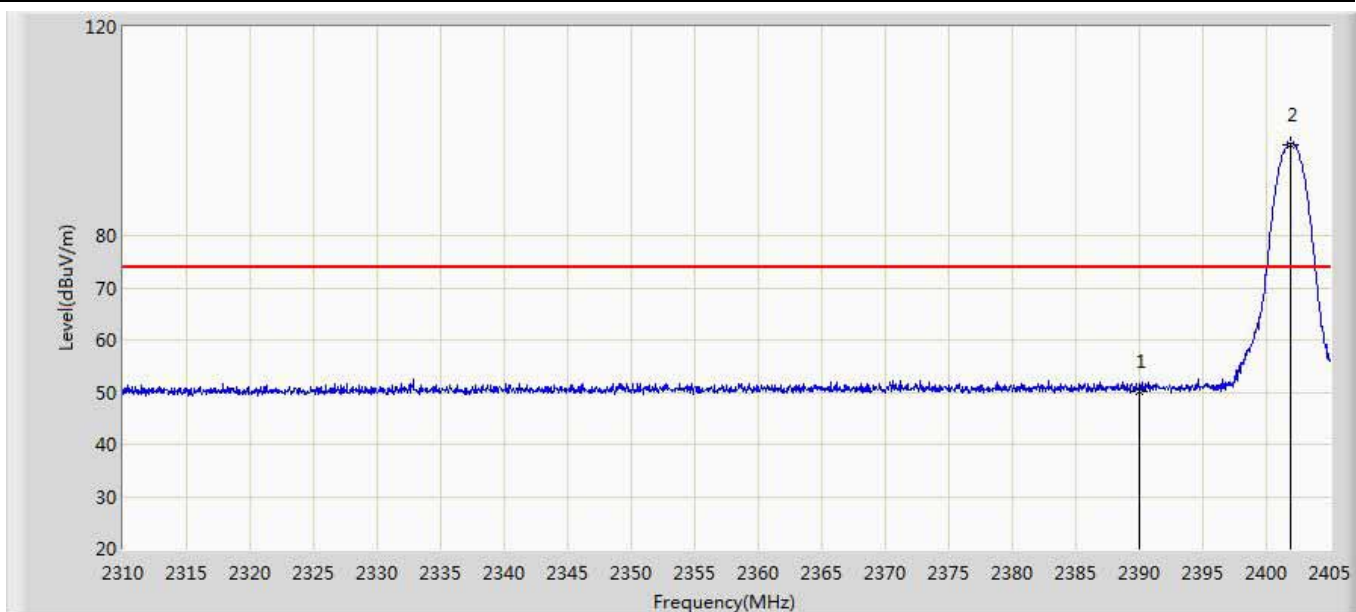
Site: AC5	Time: 2015/01/21 - 10:49
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: BARCODE SCANNER	Power: DC 5V
Note: Mode1 tx at 2402MHz by 2DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	50.396	14.360	-23.604	74.000	36.037	PK
2	*	2401.817	92.997	56.906	N/A	N/A	36.091	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1		2390.000	50.396	25.716	-28.284	54.000	-24.68	AV
2	*	2401.817	92.997	68.317	N/A	N/A	-24.68	AV

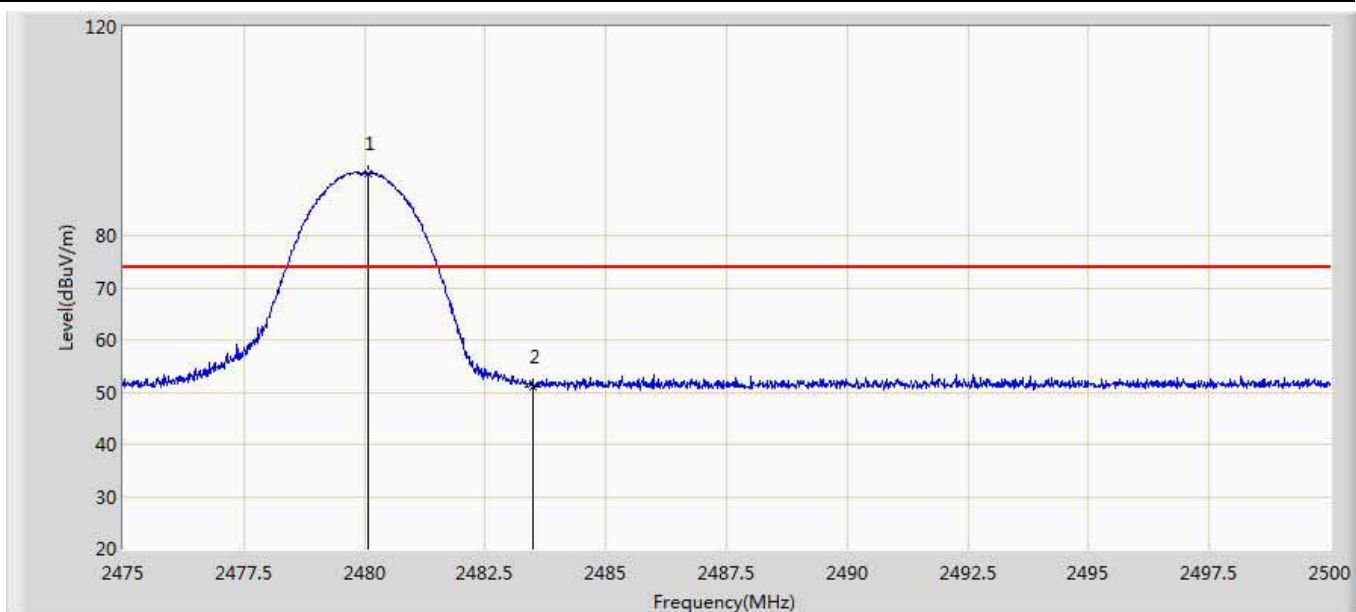
Site: AC5	Time: 2015/01/21 - 10:59
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: BARCODE SCANNER	Power: DC 5V
Note: Mode1 tx at 2402MHz by 2DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	50.245	14.209	-23.755	74.000	36.037	PK
2	*	2401.960	97.509	61.417	N/A	N/A	36.092	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1		2390.000	50.245	25.565	-28.435	54.000	-24.68	AV
2	*	2401.960	97.509	72.829	N/A	N/A	-24.68	AV

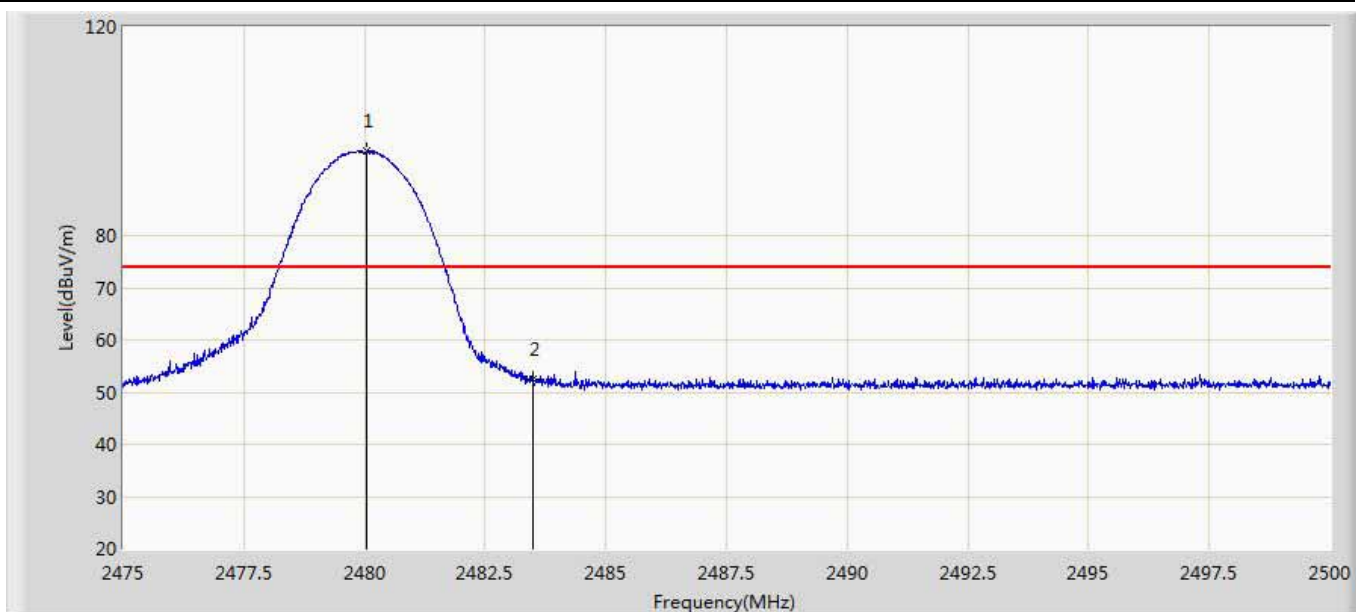
Site: AC5	Time: 2015/01/21 - 11:04
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: BARCODE SCANNER	Power: DC 5V
Note: Mode1 tx at 2480MHz by 2DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.075	91.980	55.531	N/A	N/A	36.450	PK
2		2483.500	51.134	14.669	-22.866	74.000	36.465	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1		2480.075	91.980	67.3	N/A	N/A	-24.68	AV
2	*	2483.500	51.134	26.454	-27.546	54.000	-24.68	AV

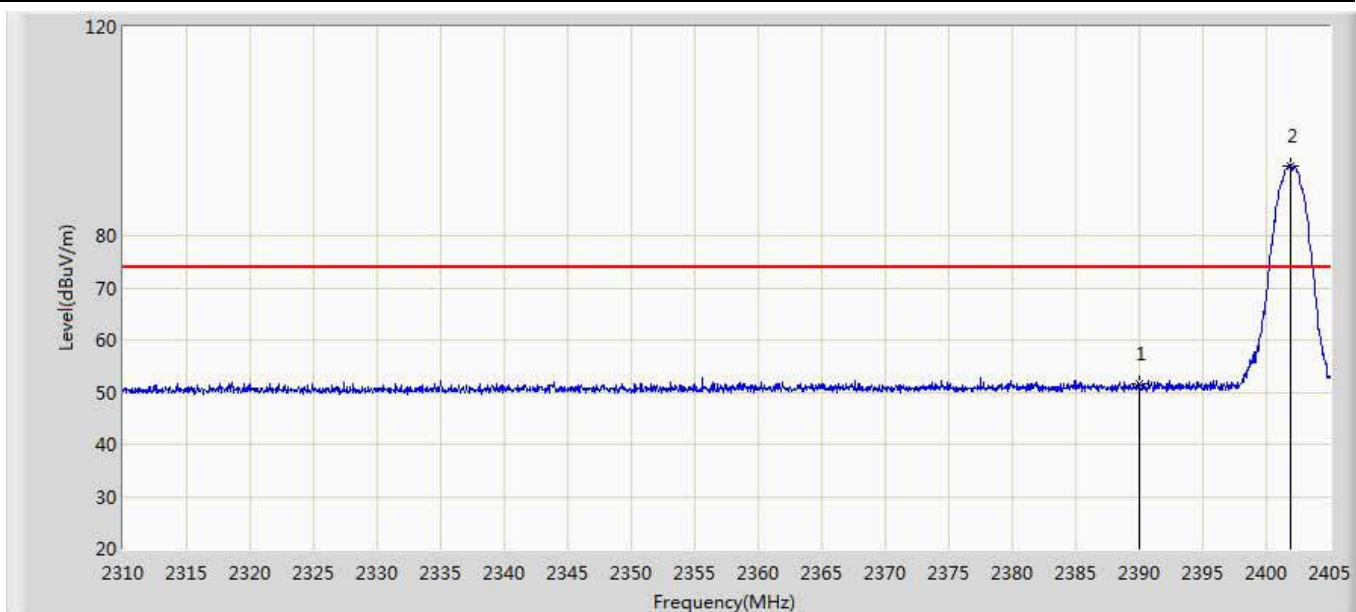
Site: AC5	Time: 2015/01/21 - 11:13
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: BARCODE SCANNER	Power: DC 5V
Note: Mode1 tx at 2480MHz by 2DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.038	96.149	59.700	N/A	N/A	36.450	PK
2		2483.500	52.363	15.898	-21.637	74.000	36.465	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1		2480.038	96.149	71.469	N/A	N/A	-24.68	AV
2	*	2483.500	52.363	27.683	-26.317	54.000	-24.68	AV

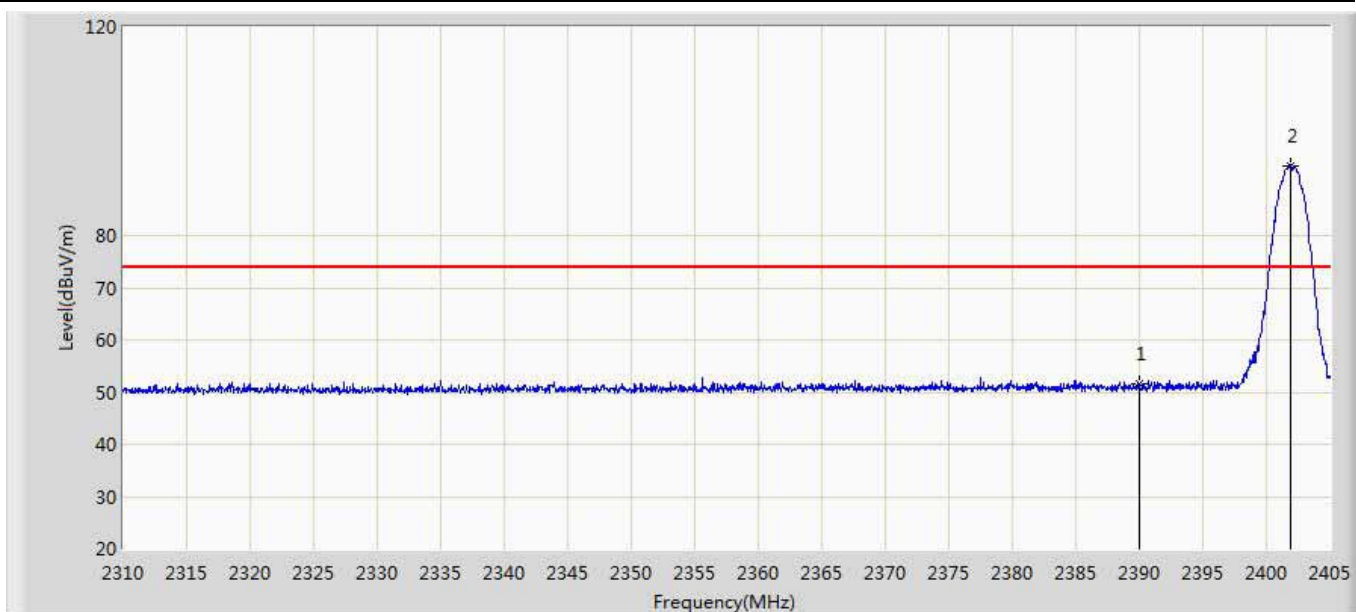
Site: AC5	Time: 2015/01/21 - 11:18
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: BARCODE SCANNER	Power: DC 5V
Note: Mode1 tx at 2402MHz by 3DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	51.509	15.473	-22.491	74.000	36.037	PK
2	*	2401.865	93.465	57.374	N/A	N/A	36.092	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1		2390.000	51.509	26.829	-27.171	54.000	-24.68	AV
2	*	2401.865	93.465	68.785	N/A	N/A	-24.68	AV

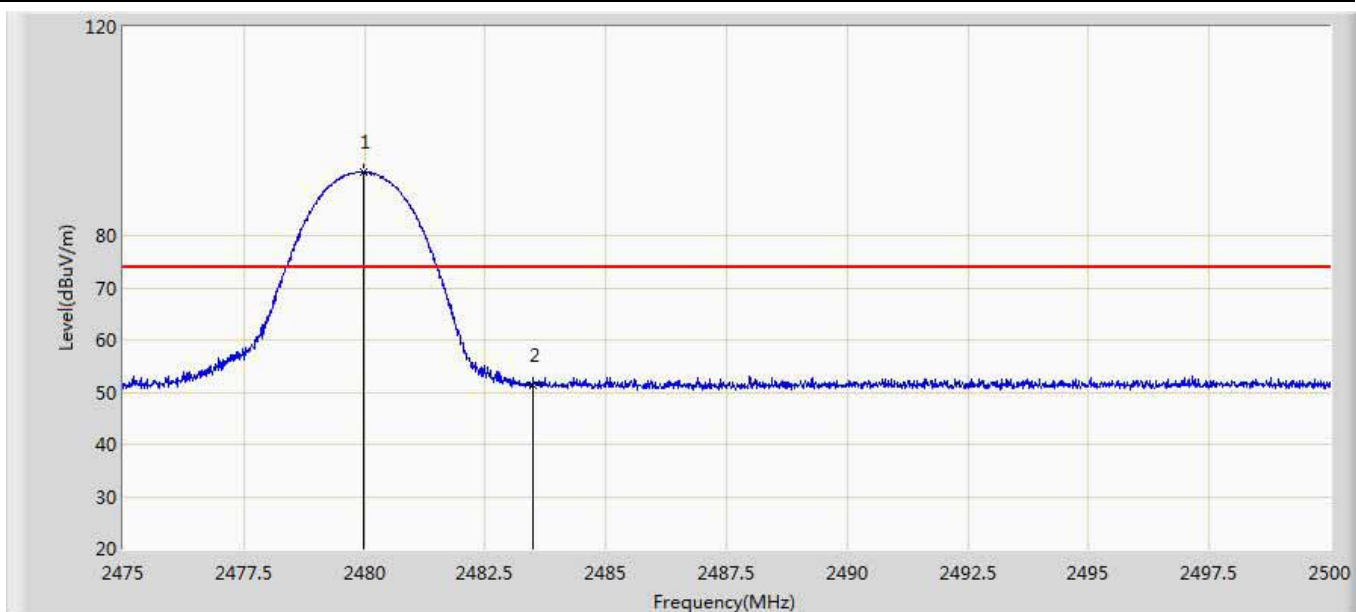
Site: AC5	Time: 2015/01/21 - 11:23
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: BARCODE SCANNER	Power: DC 5V
Note: Mode1 tx at 2402MHz by 3DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	51.521	15.453	-22.479	74.000	36.068	
2	*	2401.834	93.461	57.369	N/A	N/A	36.092	

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1		2390.000	51.521	26.841	-27.159	54.000	-24.68	AV
2	*	2401.834	93.461	68.781	N/A	N/A	-24.68	AV

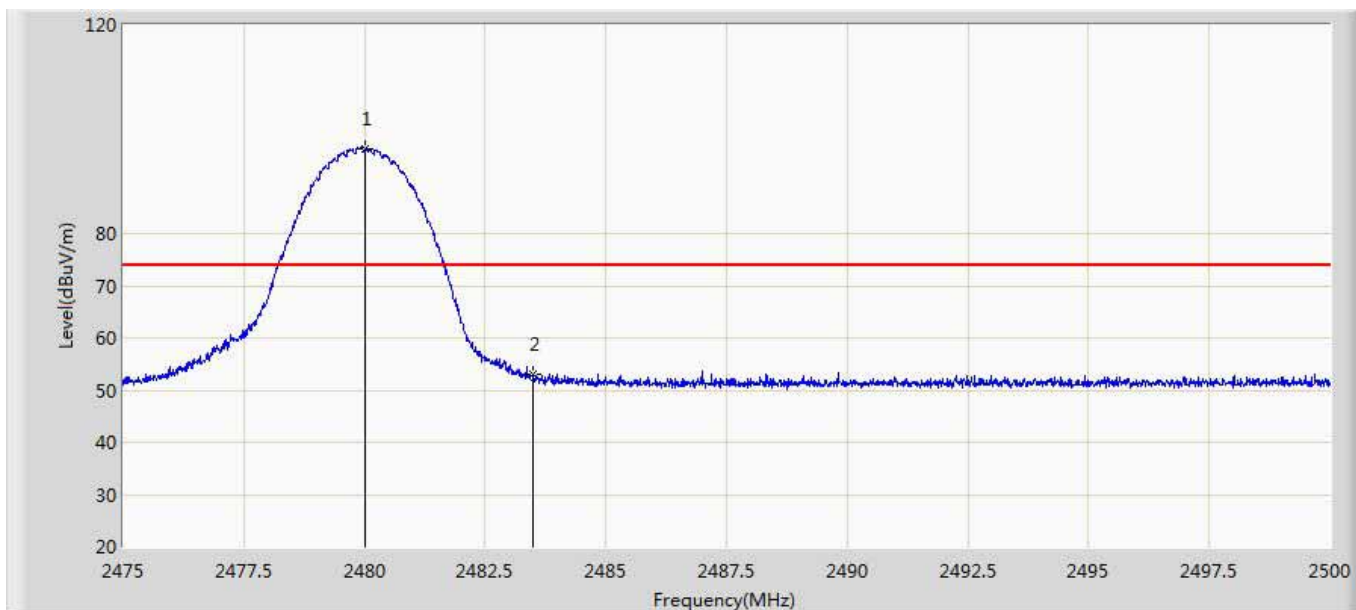
Site: AC5	Time: 2015/01/21 - 11:28
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: BARCODE SCANNER	Power: DC 5V
Note: Mode1 tx at 2480MHz by 3DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2479.975	92.294	55.845	N/A	N/A	36.449	PK
2		2483.500	51.316	14.851	-22.684	74.000	36.465	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1		2479.975	92.294	67.614	N/A	N/A	-24.68	AV
2	*	2483.500	51.316	26.636	-27.346	54.000	-24.68	AV

Site: AC5	Time: 2015/01/21 - 11:32
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: BARCODE SCANNER	Power: DC 5V
Note: Mode1 tx at 2480MHz by 3DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.025	96.310	59.861	N/A	N/A	36.450	PK
2		2483.500	52.943	16.478	-21.057	74.000	36.465	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1		2480.025	96.310	71.63	N/A	N/A	-24.68	AV
2	*	2483.500	52.943	28.263	-25.737	54.000	-24.68	AV

The End