

FCC Part15.247 Test Report

Industry Canada RSS-Gen Issue 3/RSS-210 Issue 8

FCC Part15 Subpart C

Product Name : Kreyos Meteor
Model No. : KM0001
FCC ID : 2ABLC-KM0001
IC : 11634A-KM0001

Applicant : Kreyos, Inc.

Address : 955 Benecia Avenue, Sunnyvale, CA 94085, United
States

Date of Receipt : Dec. 16, 2013
Test Date : Dec. 16, 2013~May. 19, 2014
Issued Date : Jun. 04, 2014
Report No. : 13C0429R-RF-US-P06V01
Report Version : V 1.5



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 : Jun. 04, 2014

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Product Name : Kreyos Meteor
 Applicant : Kreyos, Inc.
 Address : 955 Benecia Avenue, Sunnyvale, CA 94085, United States
 Manufacturer : Kreyos, Inc.
 Address : 955 Benecia Avenue, Sunnyvale, CA 94085, United States
 Model No. : KM0001
 FCC ID : 2ABLC-KM0001
 IC : 11634A-KM0001
 EUT Voltage : DC: 3.7V
 Trade Name : Kreyos
 Applicable Standard : FCC CFR Title 47 Part 15 Subpart C: 2012
 ANSI C63.4: 2009; ANSI C63.10: 2009
 Industry Canada RSS-Gen Issue 3/RSS-210 Issue 8
 Test Result : Complied
 Performed Location : Suzhou EMC Laboratory
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 TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098
 FCC Registration Number: 800392; IC Lab Code: 4075B

Documented By : Alice Ni
 Reviewed By : Dream Cao
 Approved By : Jeff Chen

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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1. General Information

1.1. EUT Description

Product Name	Kreyos Meteor
Brand Name	Kreyos
Model No.	KM0001
Working Voltage	DC: 3.7V
Bluetooth Specification	4.0
Frequency Range	2402- 2480 MHz
Channel Number	V2.1+EDR: 79 V4.0: 40
Channel Separation	V2.1+EDR: 1MHz V4.0: 2MHz
Type of Modulation	V2.1+EDR: GFSK, Pi/4 DQPSK, 8DPSK V4.0: GFSK
Data Rate	V2.1+EDR: 1Mbps(GFSK), 2Mbps(Pi/4 DQPSK), 3Mbps (8DPSK) V4.0: 1Mbps(GFSK)
Antenna Type	Chip-Antenna
Peak Antenna Gain	2.1dBi

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

1.2. Mode of Operation

QuietTek 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_DH1)
Mode 2: Transmitter-2Mbps(Pi/4 DQPSK_DH1)
Mode 3: Transmitter-3Mbps(8DPSK_DH1)

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	N/A	N/A	N/A	N/A	N/A

1.4. Configuration of Tested System

Connection Diagram	
	
Signal Cable Type	Signal cable Description

1.5. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of equipment.
3	Select test mode and channel 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: 2012 Section 15.207	Yes	No
Radiated Emission	FCC CFR Title 47 Part 15 Subpart C: 2012 Section 15.209	Yes	No
20dB Bandwidth	FCC CFR Title 47 Part 15 Subpart C: 2012 Section 15.247(a)(1)	Yes	No
99% Occupied Bandwidth	RSS-Gen Issue 3 June 2010 Section 4.6.1	Yes	No
Carrier Frequency Separation	FCC CFR Title 47 Part 15 Subpart C: 2012 Section 15.247(a)(1)	Yes	No
Number of Hopping Frequencies	FCC CFR Title 47 Part 15 Subpart C: 2012 Section 15.247(a)(1)(iii)	Yes	No
Time of Occupancy (Dwell Time)	FCC CFR Title 47 Part 15 Subpart C: 2012 Section 15.247(a)(1)(iii)	Yes	No
Peak Output Power	FCC CFR Title 47 Part 15 Subpart C: 2012 Section 15.247(b)(1)	Yes	No
Band-edge Compliance of RF Conducted Emissions	FCC CFR Title 47 Part 15 Subpart C: 2012 Section 15.215(c), 15.247(d)	Yes	No
Spurious RF Conducted Emissions	FCC CFR Title 47 Part 15 Subpart C: 2012 15.247(d)	Yes	No
Radiated Emission Band Edge	FCC CFR Title 47 Part 15 Subpart C: 2012 15.247(d)	Yes	No

Performed Test Item	Normative References	Test Performed	Deviation
Conducted Emission	RSS-Gen Issue 3 December 2010 Section 7.2.2	Yes	No
Radiated Emission	RSS-210 Issue 8 December 2010 Section 2.7 Table 2 and Table 3	Yes	No
20dB Bandwidth	RSS-210 Issue 8 December 2010 Section A8.1	Yes	No
99% Occupied Bandwidth	RSS-Gen Issue 3 June 2010 Section 4.6.1	Yes	No
Carrier Frequency Separation	RSS-210 Issue 8 December 2010 Section A8.1	Yes	No
Number of Hopping Frequencies	RSS-210 Issue 8 December 2010 Section A8.1	Yes	No
Time of Occupancy (Dwell Time)	RSS-210 Issue 8 December 2010 Section A8.1	Yes	No
Peak Output Power	RSS-210 Issue 8 December 2010 Section A8.4	Yes	No
Spurious RF Conducted Emissions	RSS-210 Issue 8 December 2010 Section A8.5	Yes	No
Radiated Emission Band Edge	RSS-210 Issue 8 December 2010 Section A8.5	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

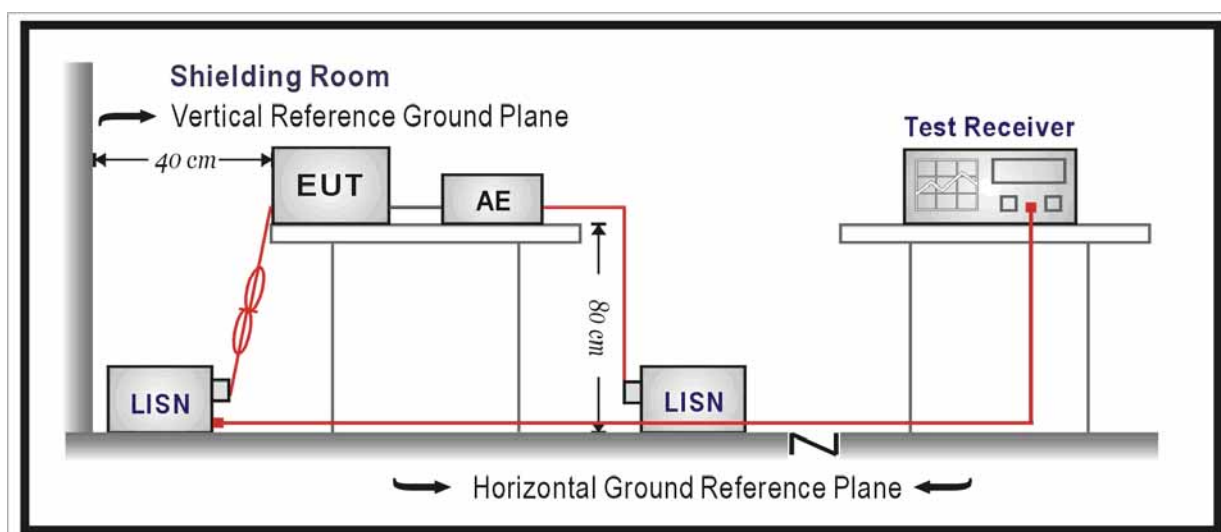
3.1. Test Equipment

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	2014.09.16
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	2015.03.01
50ohm Termination	SHX	TF2	07081401	2014.09.16
Temperature/Humidity Meter	zhicheng	ZC1-2	TR1-TH	2015.01.08

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.

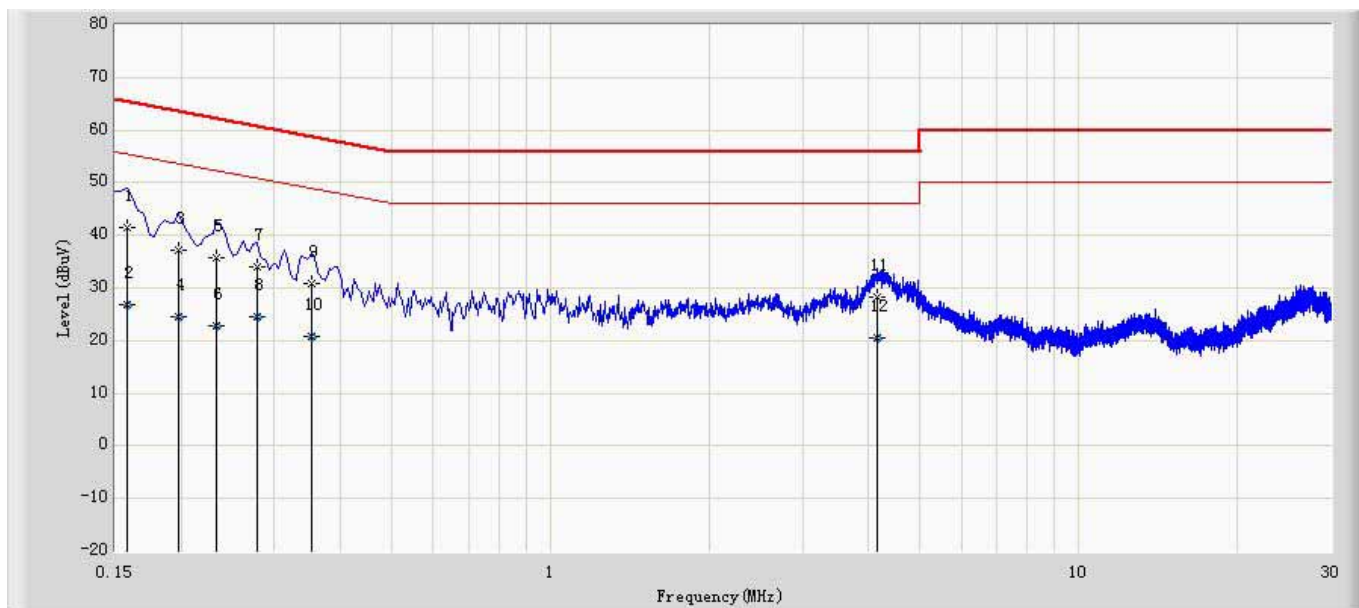
Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

3.5. Uncertainty

The measurement uncertainty is defined as ± 2.02 dB

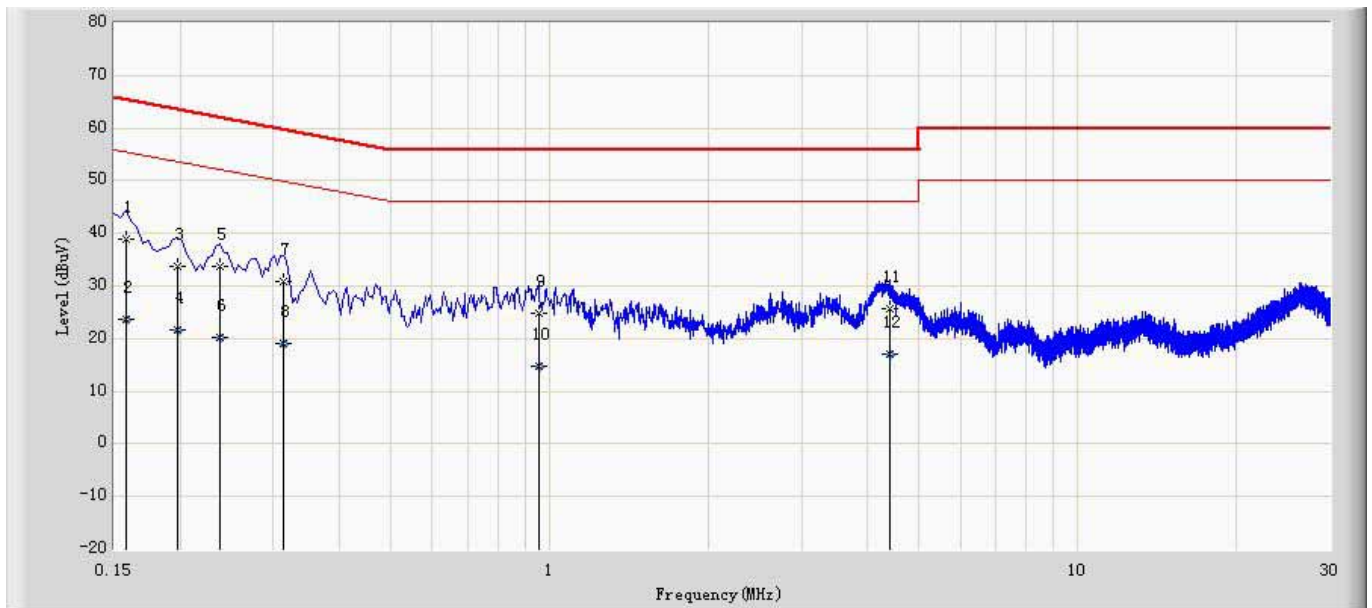
3.6. Test Result

Site: TR1	Time: 2014/05/10 - 09:12
Limit: FCC_Part15.207_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Line
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1	*	0.158	41.351	31.505	-24.218	65.568	9.846	QP
2		0.158	26.782	16.937	-28.786	55.568	9.846	AV
3		0.198	37.041	27.182	-26.653	63.694	9.860	QP
4		0.198	24.660	14.800	-29.034	53.694	9.860	AV
5		0.234	35.674	25.809	-26.632	62.307	9.865	QP
6		0.234	22.751	12.886	-29.556	52.307	9.865	AV
7		0.278	34.116	24.245	-26.760	60.875	9.871	QP
8		0.278	24.455	14.584	-26.421	50.875	9.871	AV
9		0.354	30.793	20.912	-28.076	58.868	9.881	QP
10		0.354	20.696	10.814	-28.173	48.868	9.881	AV
11		4.158	28.302	18.465	-27.698	56.000	9.837	QP
12		4.158	20.522	10.685	-25.478	46.000	9.837	AV

Site: TR1	Time: 2014/05/10 - 09:16
Limit: FCC_Part15.207_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Neutral
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1	*	0.158	38.884	28.893	-26.685	65.568	9.991	QP
2		0.158	23.791	13.801	-31.777	55.568	9.991	AV
3		0.198	33.875	23.953	-29.819	63.694	9.922	QP
4		0.198	21.789	11.867	-31.905	53.694	9.922	AV
5		0.238	33.817	23.898	-28.349	62.166	9.919	QP
6		0.238	20.294	10.375	-31.872	52.166	9.919	AV
7		0.314	30.941	20.985	-28.923	59.864	9.957	QP
8		0.314	19.076	9.119	-30.788	49.864	9.957	AV
9		0.954	24.770	14.754	-31.230	56.000	10.017	QP
10		0.954	14.874	4.857	-31.126	46.000	10.017	AV
11		4.394	25.813	15.741	-30.187	56.000	10.072	QP
12		4.394	17.037	6.965	-28.963	46.000	10.072	AV

4. Radiated Emission

4.1. Test Equipment

Radiated Emission / AC-2

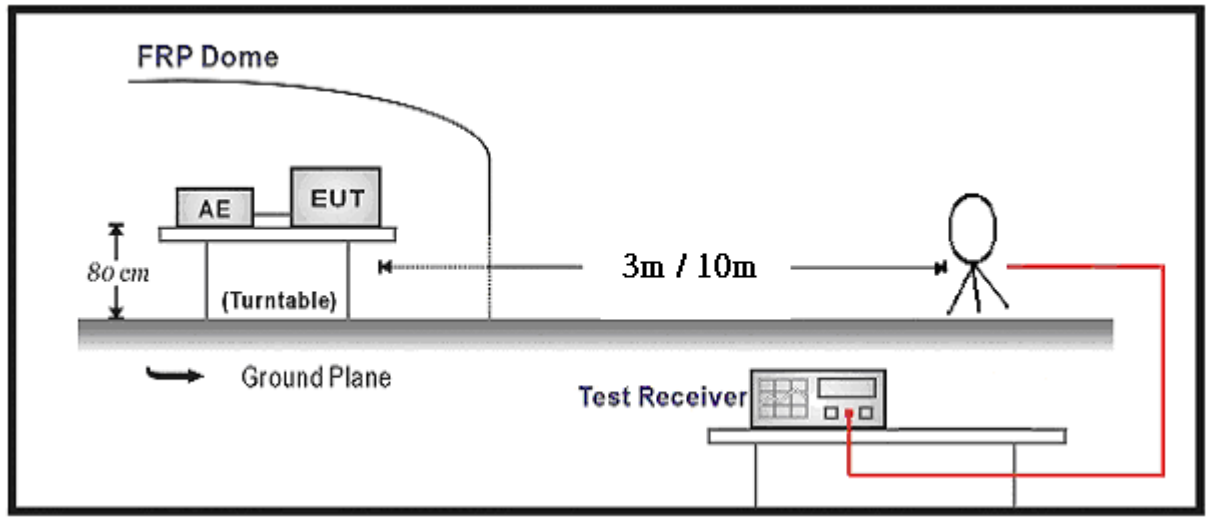
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100573	2015.03.28
Loop Antenna	R&S	HFH2-Z2	833799/003	2014.11.17
Bilog Antenna	Teseq GmbH	CBL6112D	27611	2014.10.15
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC2-C	2015.03.01
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC2-TH	2015.01.08

Radiated Emission / AC-5

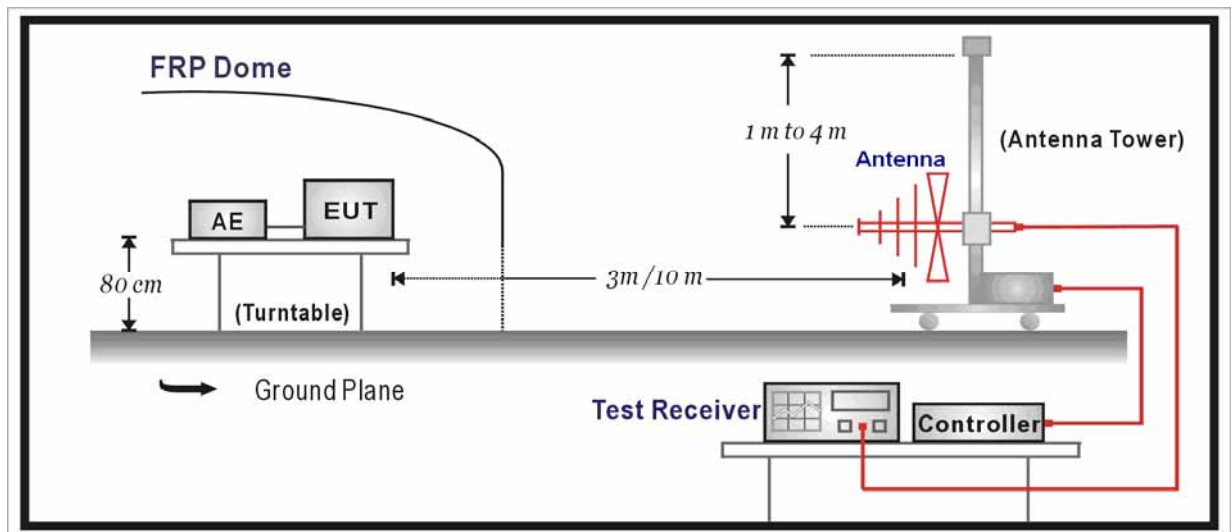
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2015.03.28
Preamplifier	Miteq	NSP1800-25	1364185	2015.05.03
Preamplifier	Quietek	AP-040G	CHM-0906001	2015.05.03
Bilog Antenna	Teseq GmbH	CBL6112D	27612	2014.10.15
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	737	2014.11.24
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	294	2014.11.24
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2015.03.01
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	2015.01.08

4.2. Test Setup

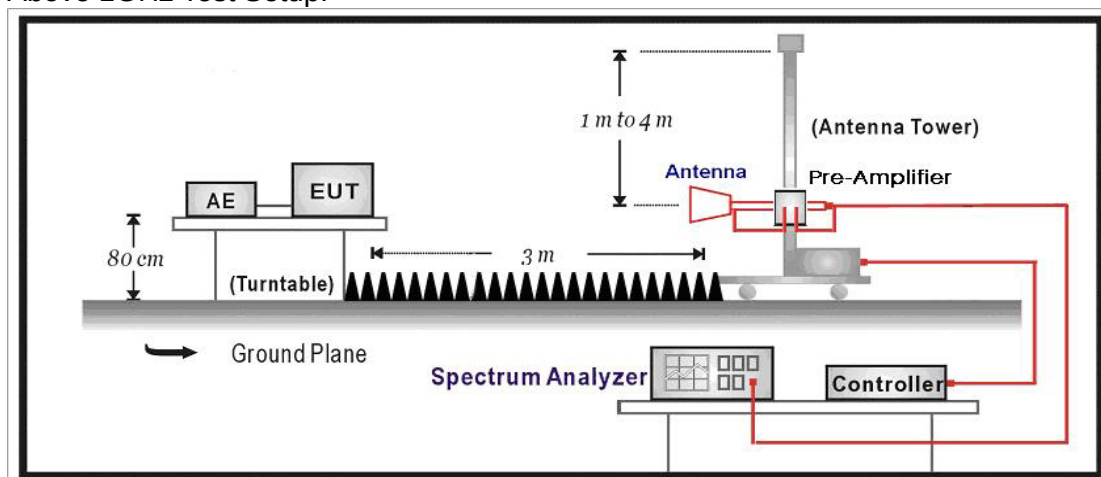
Below 30MHz Test Setup:



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 1G is defined as ± 3.9 dB
below 1G 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 detector: RBW = 1MHz, VBW = 10Hz, sweep time = auto.

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

Mode 1: Transmitter-1Mbps(GFSK_DH1)

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	H	4804.0	36.6	9.3	45.9	54(Note2)	-8.1	PK
	V	4804.0	33.0	9.1	42.1	54(Note2)	-11.9	PK
	H	7206.0	31.8	11.6	43.4	54(Note2)	-10.6	PK
	V	7206.0	32.3	11.5	43.8	54(Note2)	-10.2	PK
	H	9608.0	24.2	13.5	37.7	54(Note2)	-16.3	PK
	V	9608.0	23.8	13.5	37.3	54(Note2)	-16.7	PK
39	H	4882.0	25.9	9.9	35.8	54(Note2)	-18.2	PK
	V	4882.0	26.3	9.9	36.2	54(Note2)	-17.8	PK
	H	7323.0	23.5	11.7	35.2	54(Note2)	-18.8	PK
	V	7323.0	24.1	11.7	35.8	54(Note2)	-18.2	PK
	H	9764.0	23.1	13.6	36.7	54(Note2)	-17.3	PK
	V	9764.0	23.3	13.7	37.0	54(Note2)	-17.0	PK
78	H	4944.0	27.2	10	37.2	54(Note2)	-16.8	PK
	V	4944.0	27.0	10.1	37.1	54(Note2)	-16.9	PK
	H	7440.0	30.9	11.8	42.7	54(Note2)	-11.3	PK
	V	7440.0	29.1	11.9	41.0	54(Note2)	-13.0	PK
	H	9920.0	22.9	14	36.9	54(Note2)	-17.1	PK
	V	9920.0	23.2	14	37.2	54(Note2)	-16.8	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 _DH1)

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	H	4804.0	34.2	9.2	43.4	54(Mote2)	-10.6	PK
	V	4804.0	30.2	9.2	39.4	54(Mote2)	-14.6	PK
	H	7206.0	34.1	11.5	45.6	54(Mote2)	-8.4	PK
	V	7206.0	33.8	11.6	45.4	54(Mote2)	-8.6	PK
	H	9608.0	24.7	13.5	38.2	54(Mote2)	-15.8	PK
	V	9608.0	25.9	13.5	39.4	54(Mote2)	-14.6	PK
39	H	4882.0	29.3	9.9	39.2	54(Mote2)	-14.8	PK
	V	4882.0	31.2	10.2	41.4	54(Mote2)	-12.6	PK
	H	7323.0	30.3	11.7	42.0	54(Mote2)	-12.0	PK
	V	7323.0	30.1	11.7	41.8	54(Mote2)	-12.2	PK
	H	9764.0	23.9	13.5	37.4	54(Mote2)	-16.6	PK
	V	9764.0	25.1	13.7	38.8	54(Mote2)	-15.2	PK
78	H	4944.0	25.4	10.0	35.4	54(Mote2)	-18.6	PK
	V	4944.0	26.7	10.1	36.8	54(Mote2)	-17.2	PK
	H	7440.0	24.7	11.8	36.5	54(Mote2)	-17.5	PK
	V	7440.0	24.7	11.8	36.5	54(Mote2)	-17.5	PK
	H	9920.0	23.6	13.9	37.5	54(Mote2)	-16.5	PK
	V	9920.0	22.3	14.0	36.3	54(Mote2)	-17.7	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_DH1)

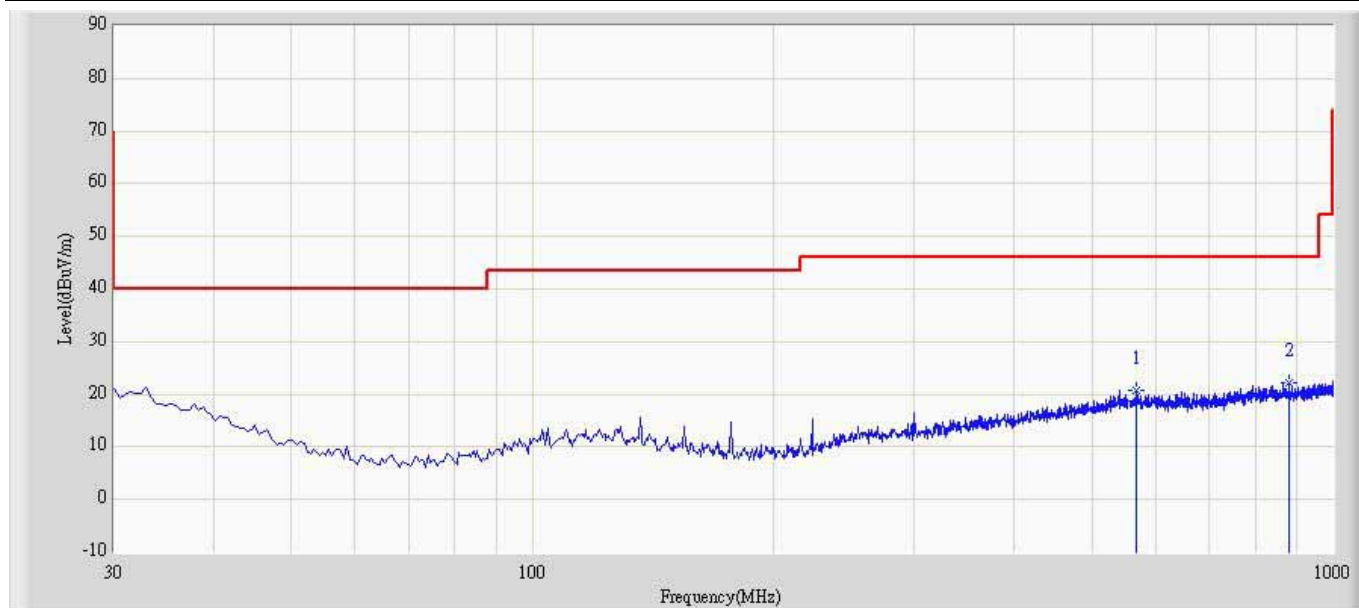
CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	H	4804.0	34.6	9.4	44.0	54(Mote2)	-10.0	PK
	V	4804.0	29.6	9.2	38.8	54(Mote2)	-15.2	PK
	H	7206.0	33.1	11.5	44.6	54(Mote2)	-9.4	PK
	V	7206.0	34.1	11.5	45.6	54(Mote2)	-8.4	PK
	H	9608.0	26.4	13.5	39.9	54(Mote2)	-14.1	PK
	V	9608.0	26.4	13.5	39.9	54(Mote2)	-14.1	PK
39	H	4882.0	27.3	9.8	37.1	54(Mote2)	-16.9	PK
	V	4867.5	27.1	9.8	36.9	54(Mote2)	-17.1	PK
	H	7323.0	28.6	11.8	40.4	54(Mote2)	-13.6	PK
	V	7323.0	30.1	11.7	41.8	54(Mote2)	-12.2	PK
	H	9764.0	23.2	13.6	36.8	54(Mote2)	-17.2	PK
	V	9764.0	25.2	13.7	38.9	54(Mote2)	-15.1	PK
78	H	4944.0	26.2	10.0	36.2	54(Mote2)	-17.8	PK
	V	4944.0	26.4	10.1	36.5	54(Mote2)	-17.5	PK
	H	7440.0	24.4	11.9	36.3	54(Mote2)	-17.7	PK
	V	7440.0	24.6	11.8	36.4	54(Mote2)	-17.6	PK
	H	9920.0	23.1	14.0	37.1	54(Mote2)	-16.9	PK
	V	9920.0	23.1	14.0	37.1	54(Mote2)	-16.9	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.

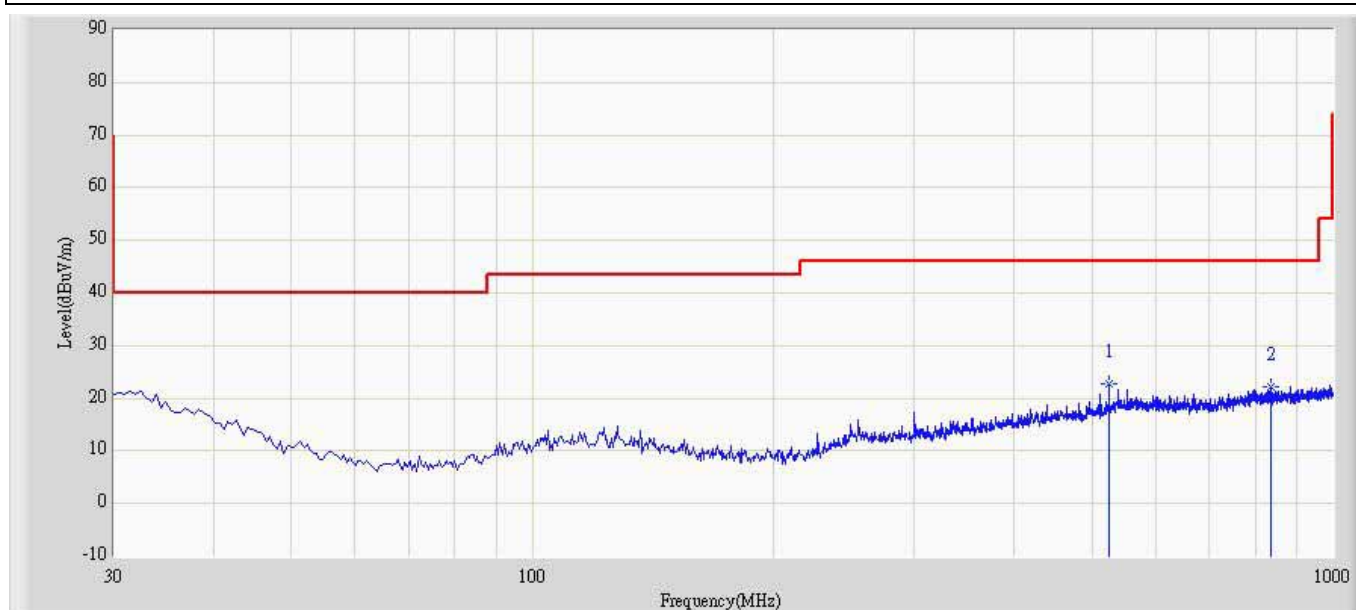
The worst case of Radiated Emission below 1GHz:

Site: AC2	Time: 2014/05/18 - 09:45
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: CBL6112D_27611(30-1000MHz)	Polarity: Horizontal
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 1: Transmit at channel 2441MHz by DH1	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		567.380	20.652	1.061	-25.348	46.000	19.591	QP
2	*	882.630	22.165	1.155	-23.835	46.000	21.010	QP

Site: AC2	Time: 2014/05/18 - 09:46
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: CBL6112D_27611(30-1000MHz)	Polarity: Vertical
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 1: Transmit at channel 2441MHz by DH1	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	524.700	22.683	3.912	-23.317	46.000	18.871	QP
2		835.100	22.172	1.322	-23.828	46.000	20.950	QP

5. 20dB Bandwidth

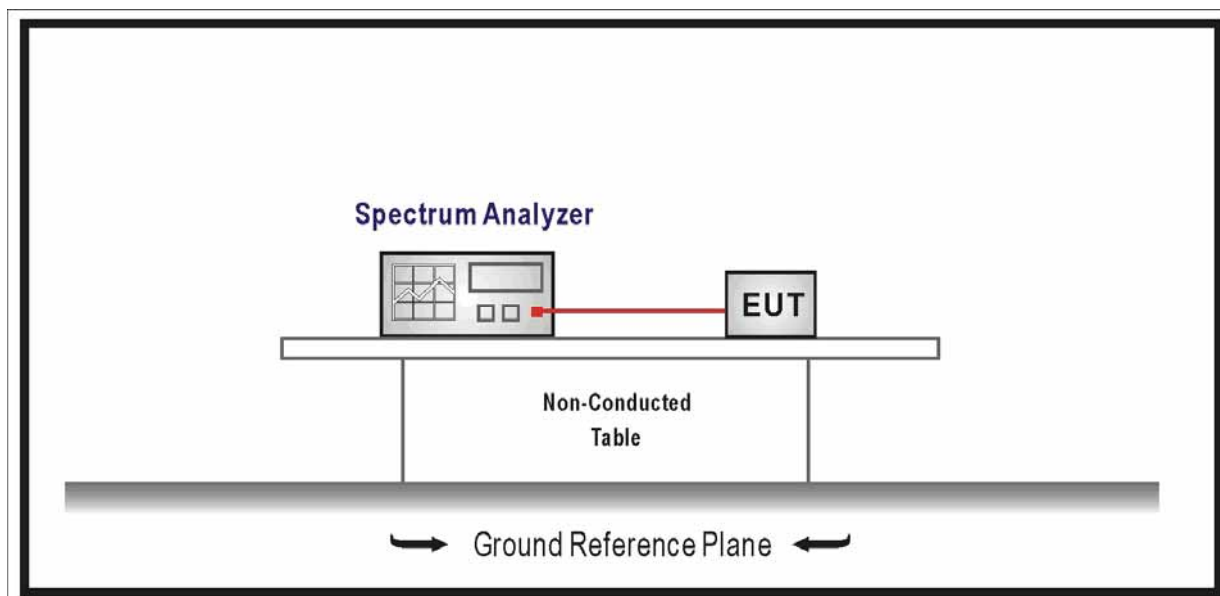
5.1 Test Equipment

20dB Bandwidth / TR8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2015.01.07
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: 2009.

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

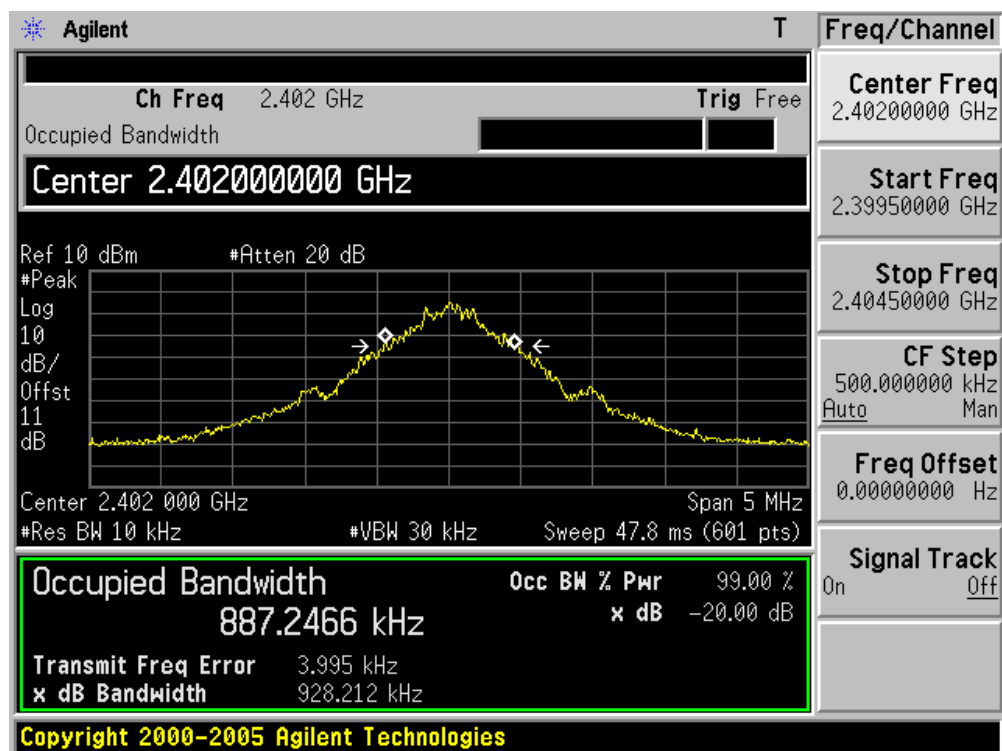
The measurement uncertainty is defined as ± 1 kHz

5.6 Test Result

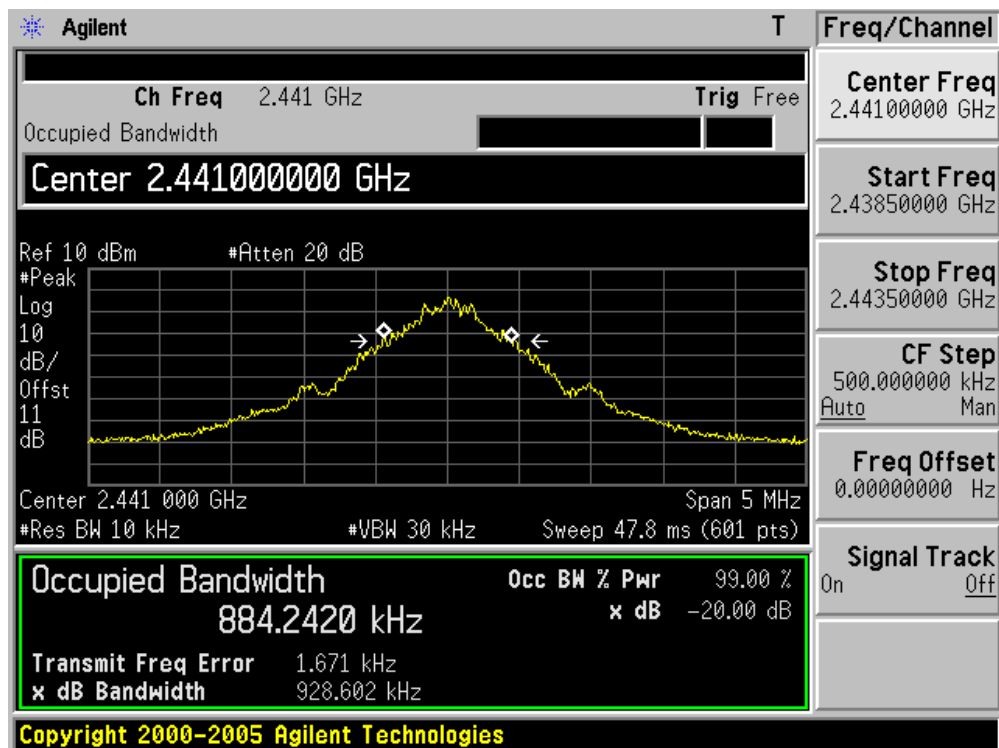
Product	:	Kreyos Meteor
Test Item	:	Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter-1Mbps (GFSK_DH1)

Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
00	2402	928.2	887.2
39	2441	928.6	884.2
78	2480	928.4	884.7

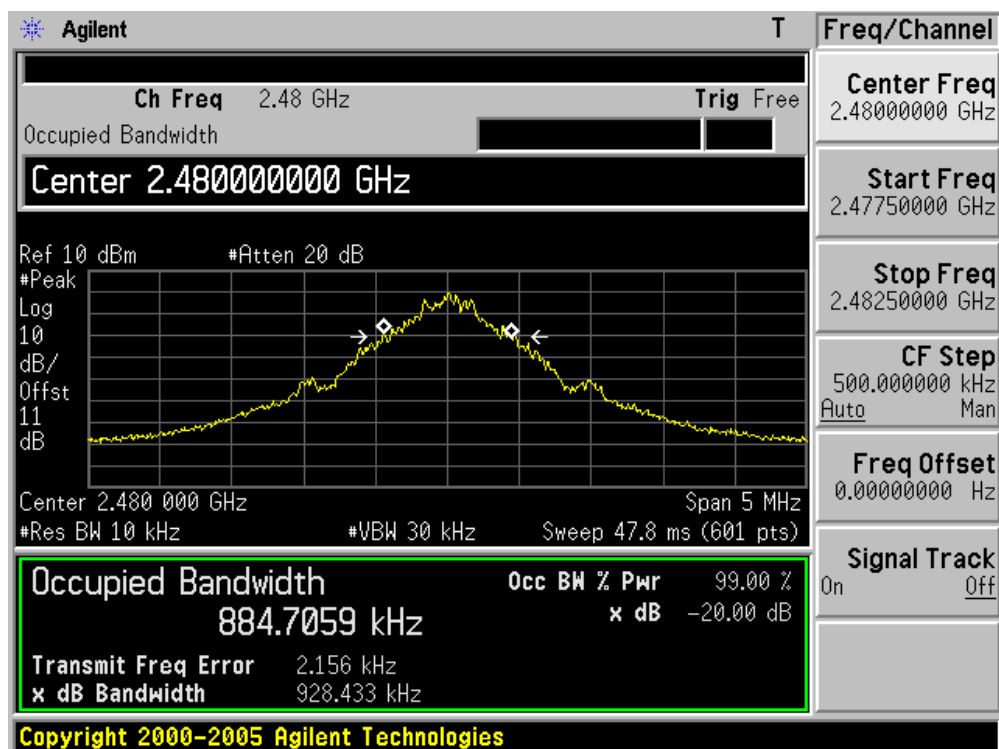
Channel 00 (2402MHz)



Channel 39 (2441MHz)



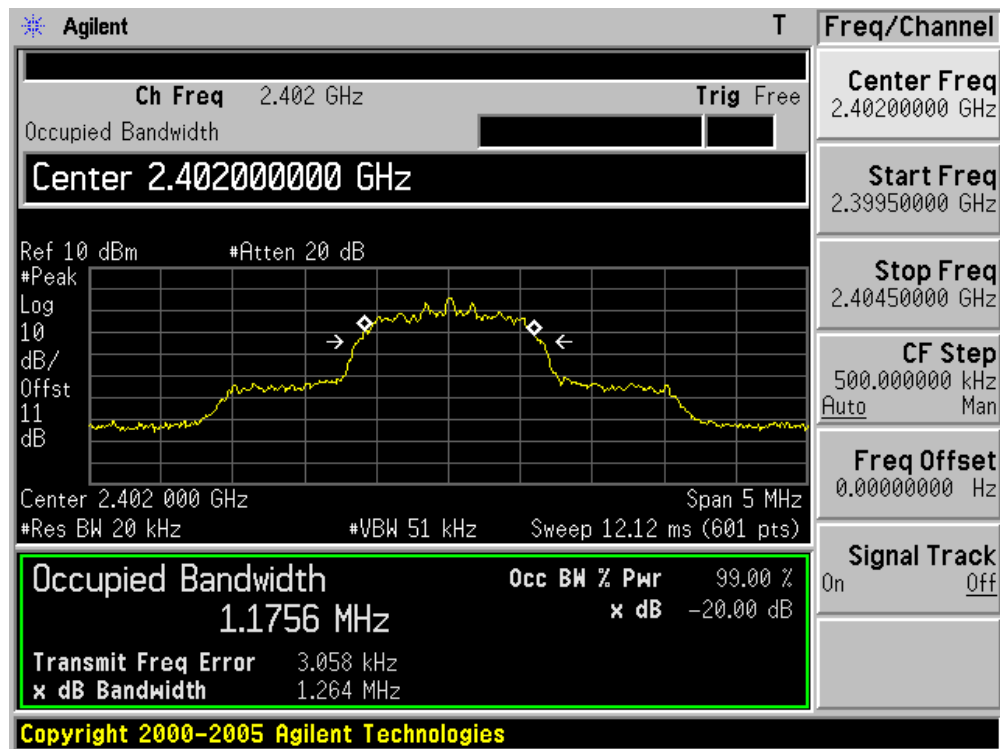
Channel 78 (2480MHz)



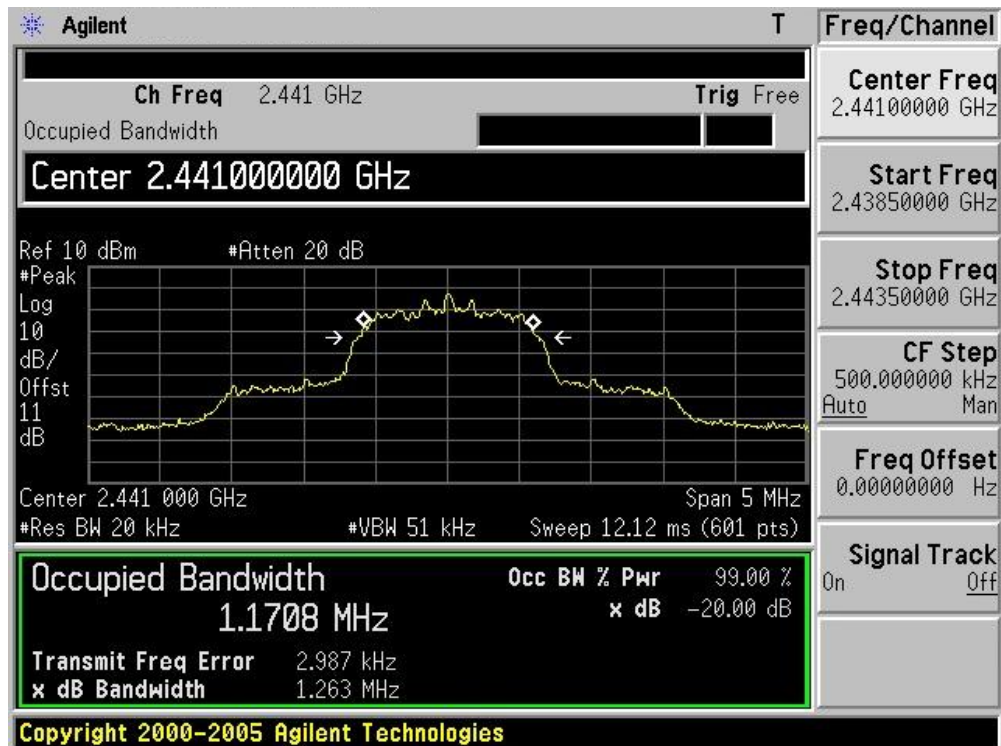
Product	:	Kreyos Meteor
Test Item	:	Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH1)

Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
00	2402	1264.0	1175.6
39	2441	1263.0	1170.8
78	2480	1263.0	1167.8

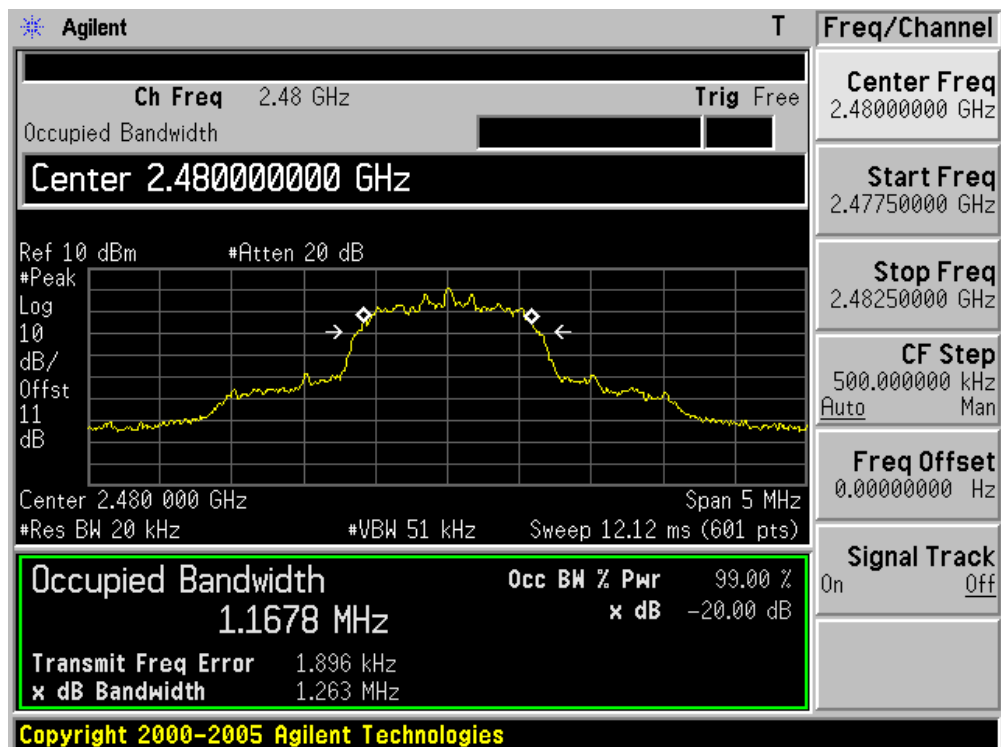
Channel 00 (2402MHz)



Channel 39 (2441MHz)



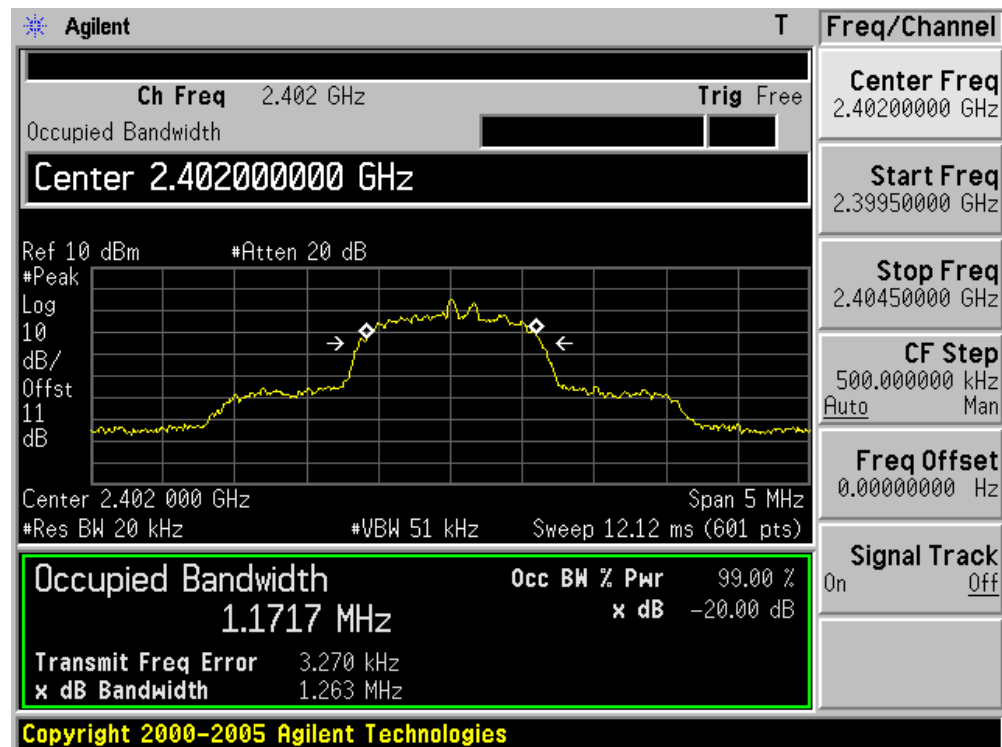
Channel 78 (2480MHz)



Product	:	Kreyos Meteor
Test Item	:	Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmitter-3Mbps (8DPSK_DH1)

Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
00	2402	1263.0	1171.7
39	2441	1263.0	1169.5
78	2480	1262.0	1168.7

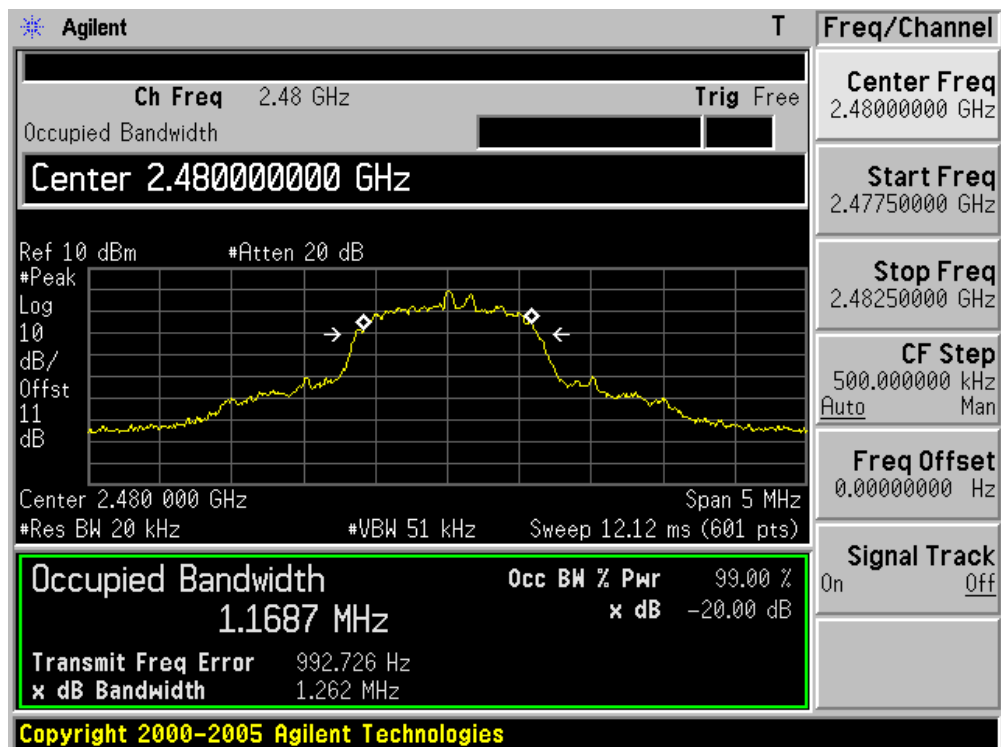
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)



6. Carrier Frequency Separation

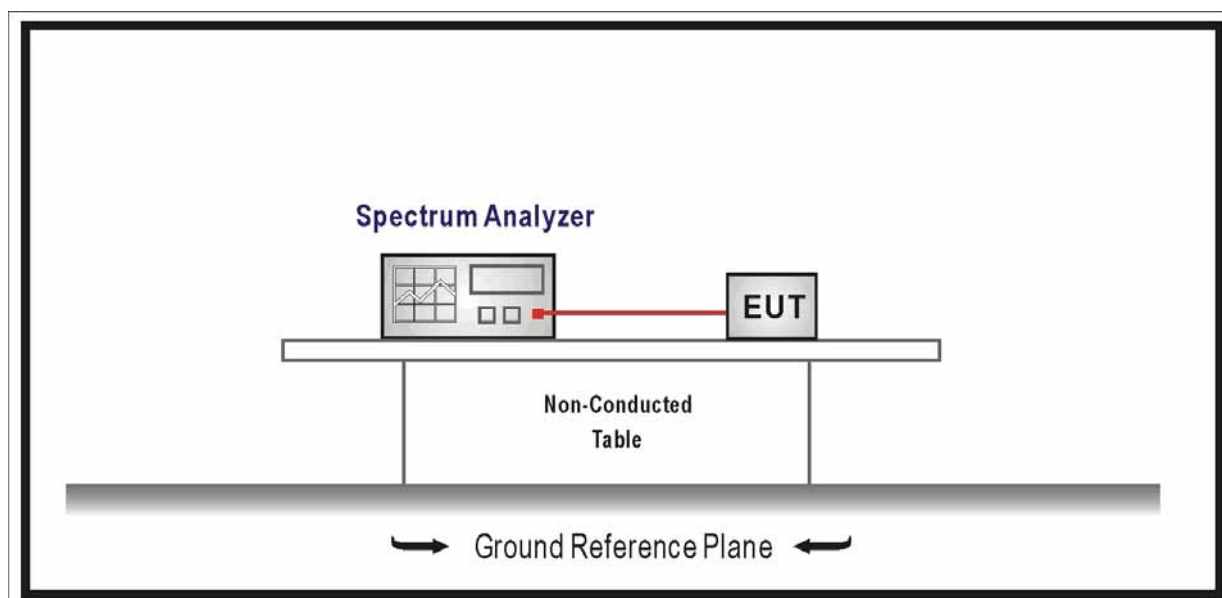
6.1. Test Equipment

Carrier Frequency Separation / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2015.01.07
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: 2009.

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

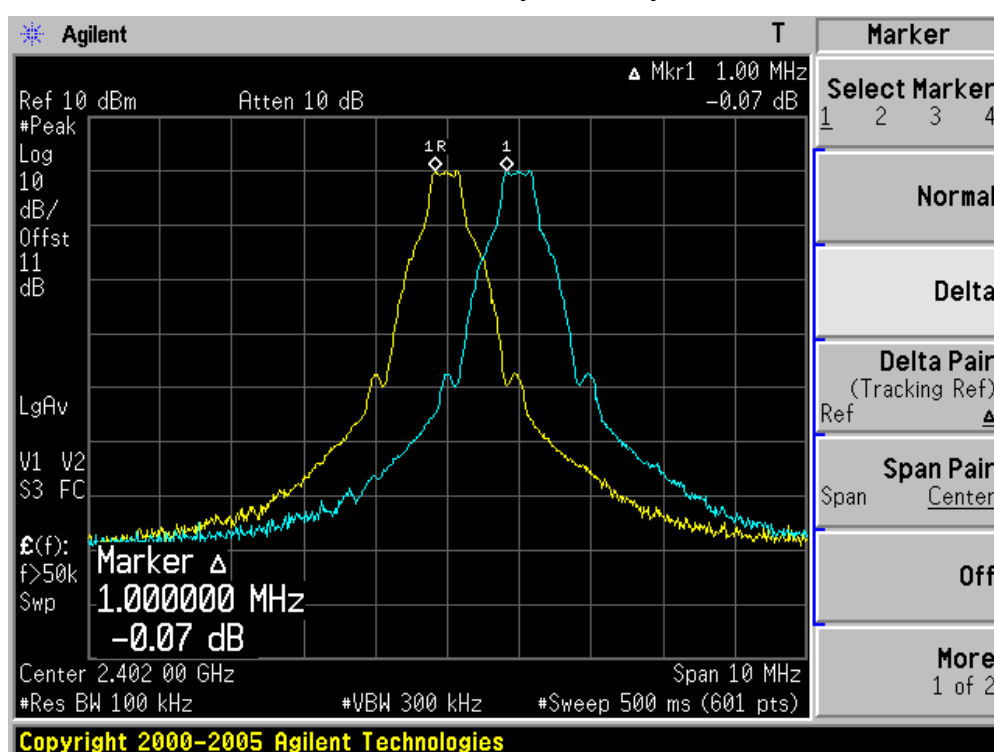
The measurement uncertainty is defined as ± 1 kHz

6.6. Test Result

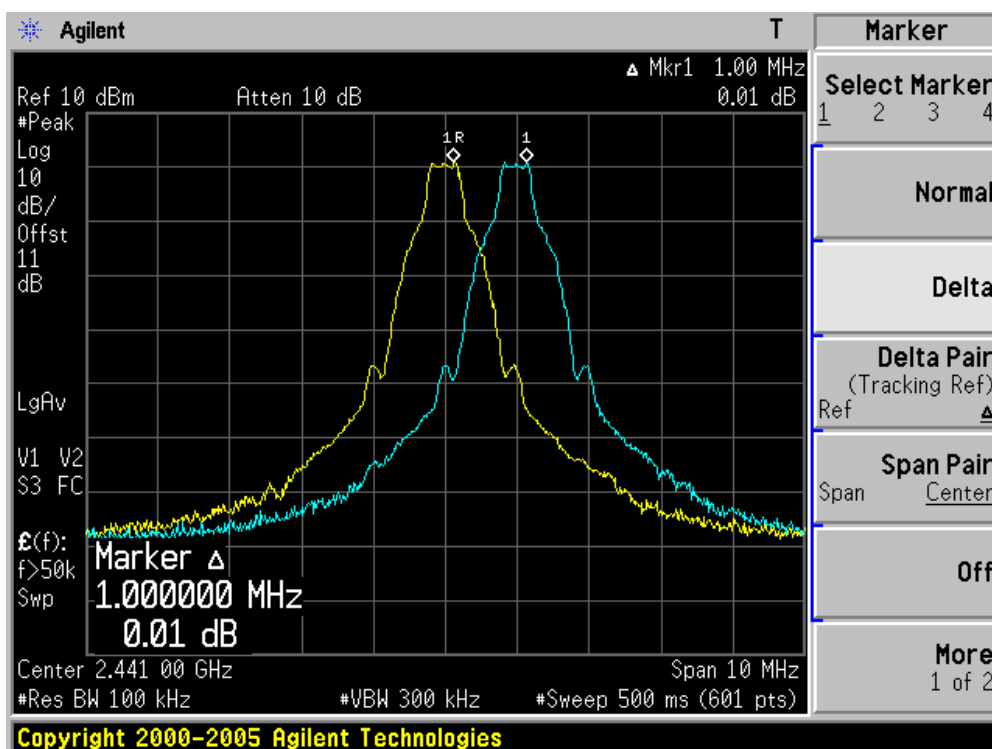
Product	:	Kreyos Meteor
Test Item	:	Carrier Frequency Separation
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter-1Mbps (GFSK_DH1)

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

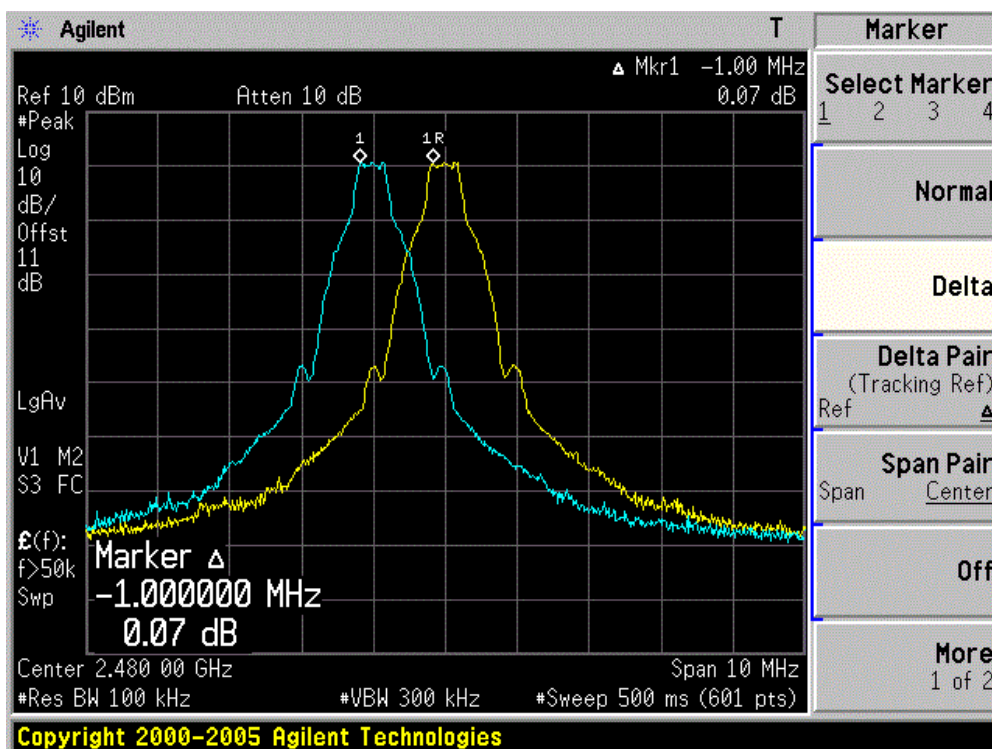
Channel 00 (2402MHz)



Channel 39 (2441MHz)



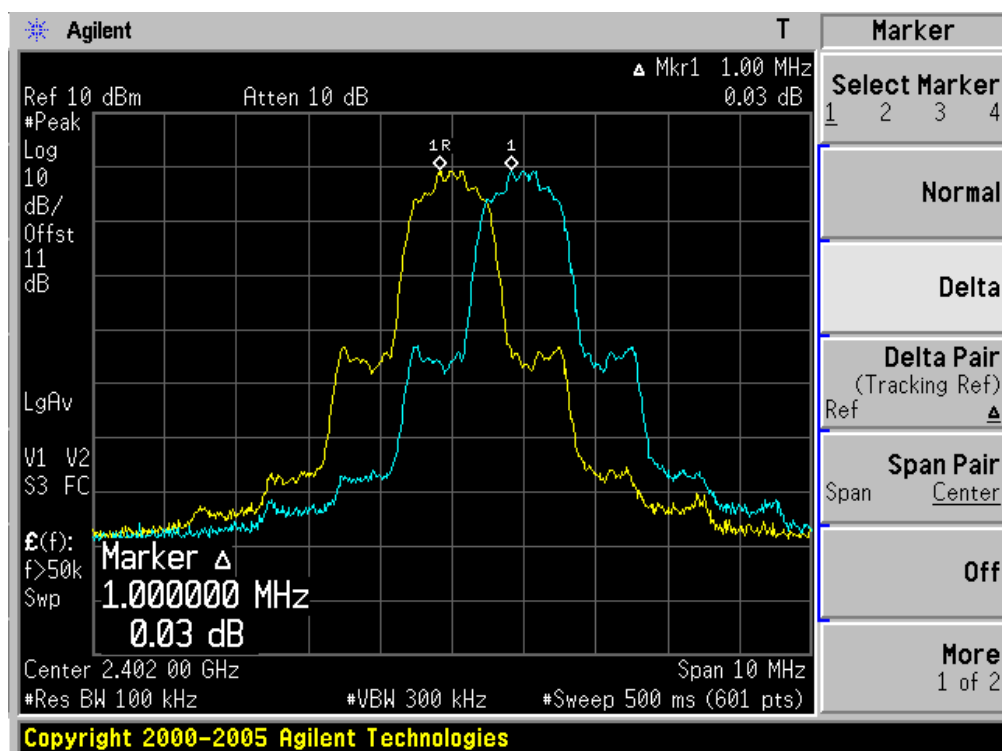
Channel 78 (2480MHz)



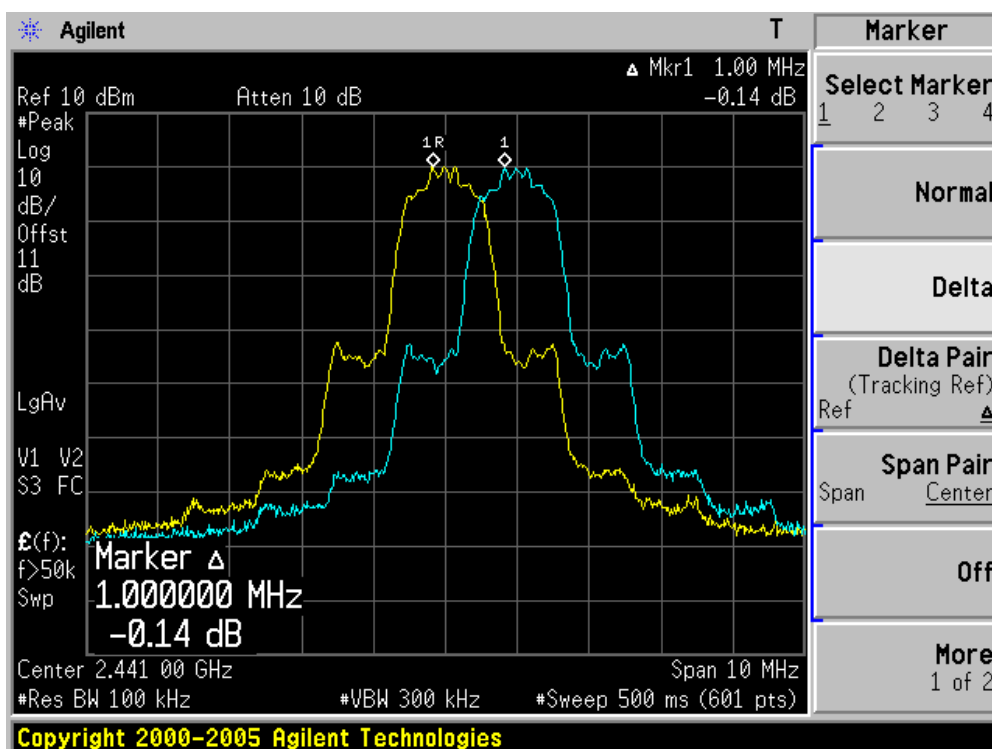
Product	:	Kreyos Meteor
Test Item	:	Carrier Frequency Separation
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH1)

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

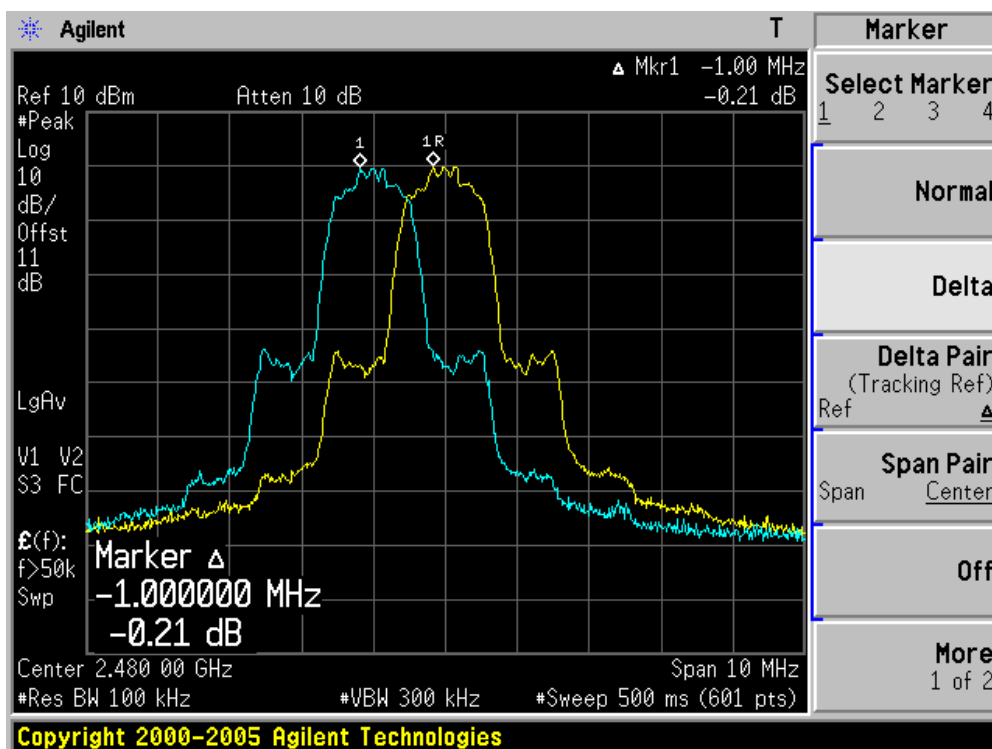
Channel 00 (2402MHz)



Channel 39 (2441MHz)



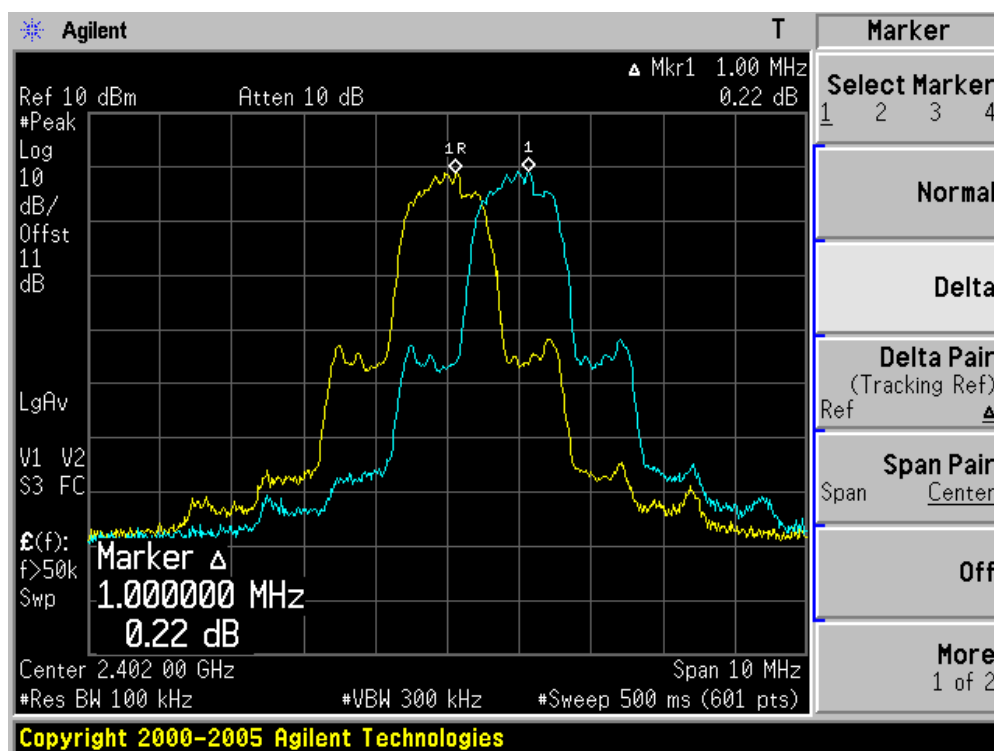
Channel 78 (2480MHz)



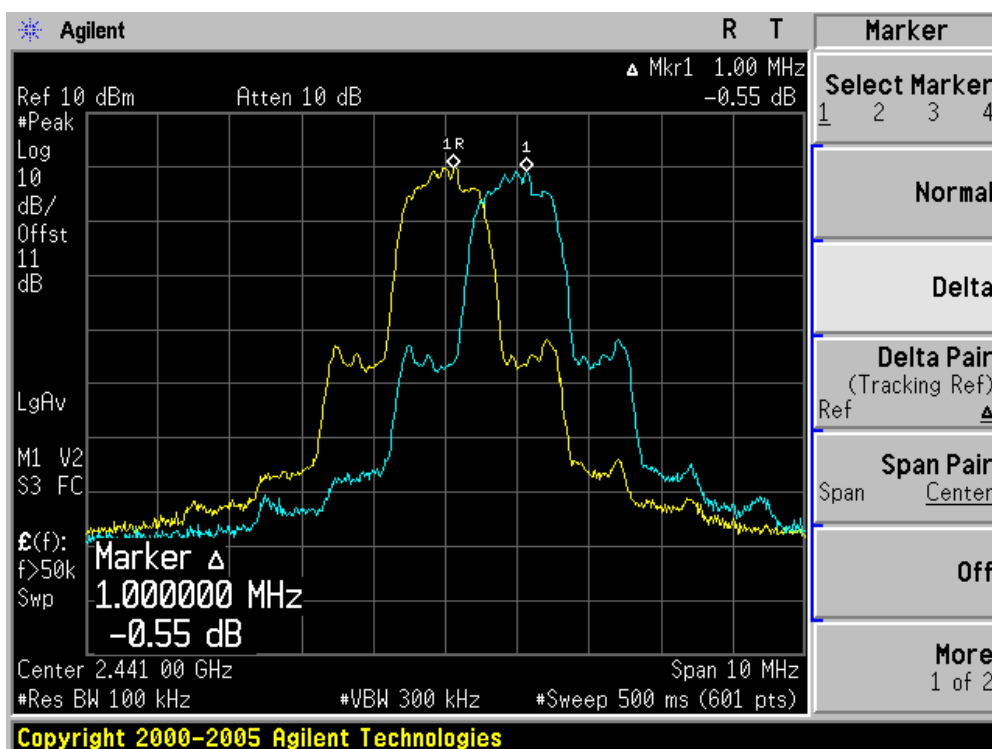
Product	:	Kreyos Meteor
Test Item	:	Carrier Frequency Separation
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmitter-3Mbps (8DPSK_DH1)

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

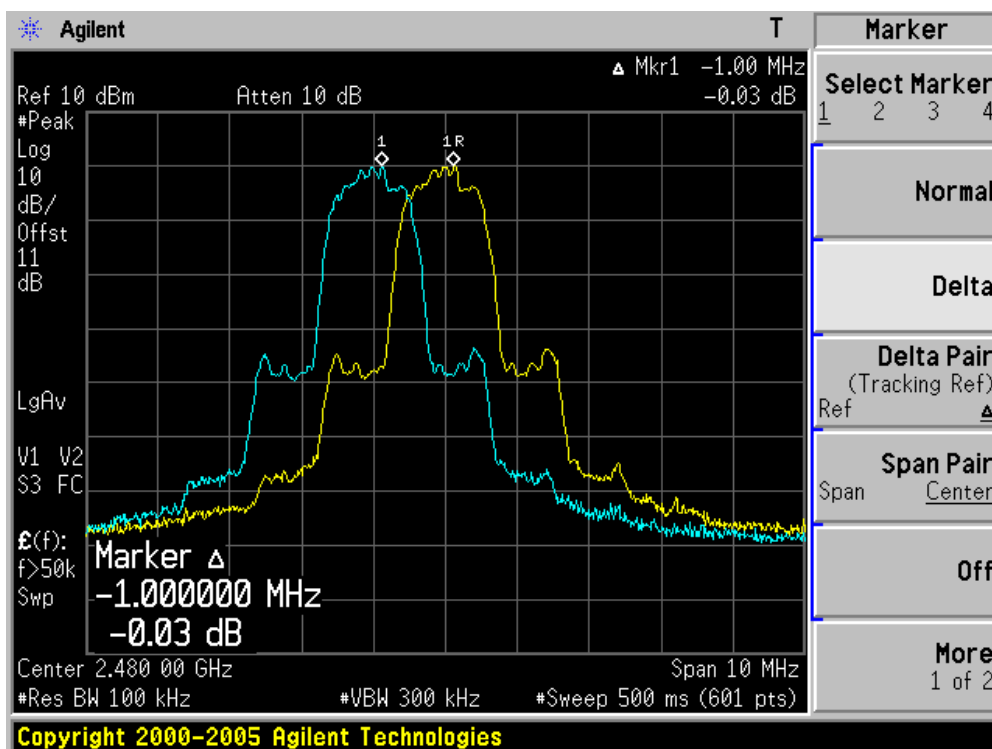
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)



7. Number of Hopping Frequencies

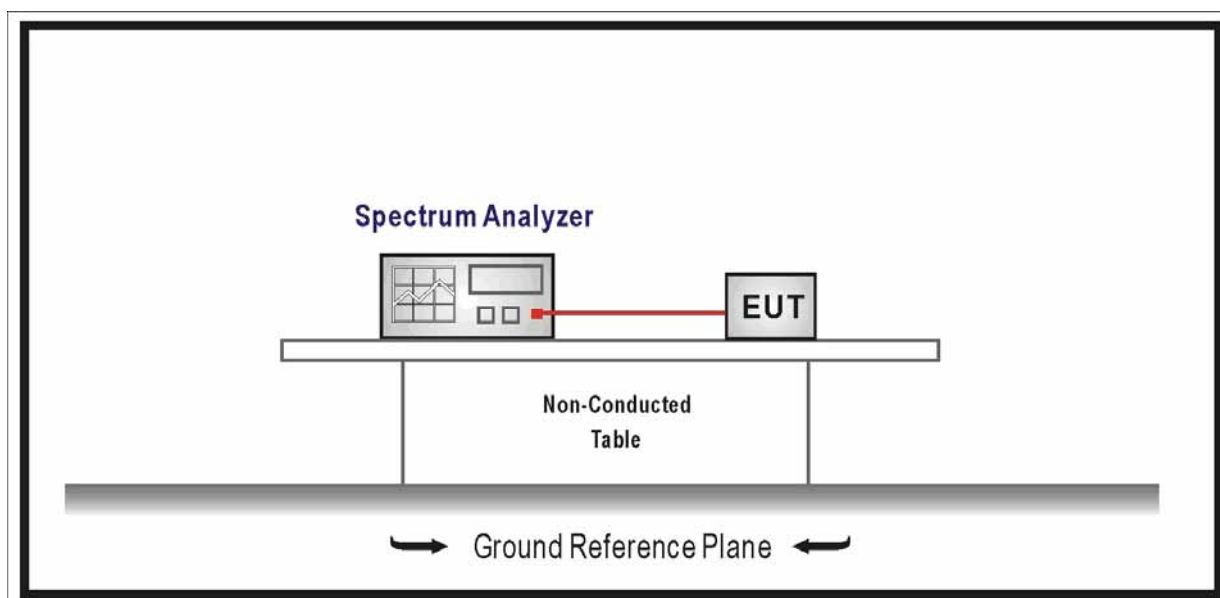
7.1. Test Equipment

Number of Hopping Frequencies / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2015.01.07
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: 2009.

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

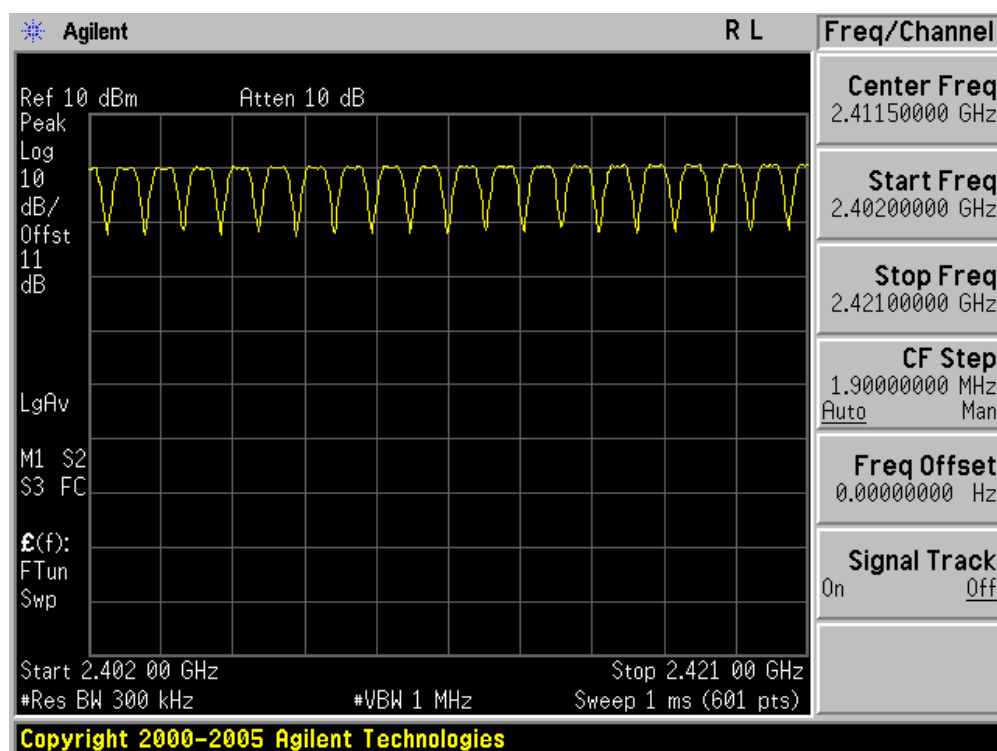
The measurement uncertainty is defined as ± 1 kHz

7.6. Test Result

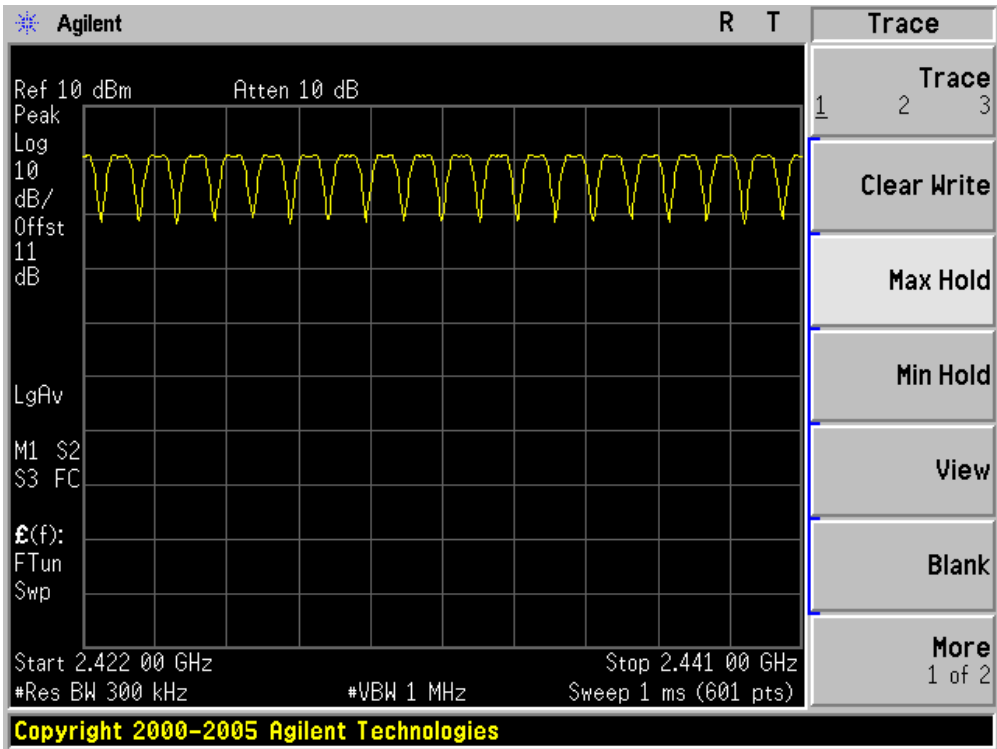
Product	:	Kreyos Meteor
Test Item	:	Number of Hopping Frequencies
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter-1Mbps(GFSK_DH1)

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

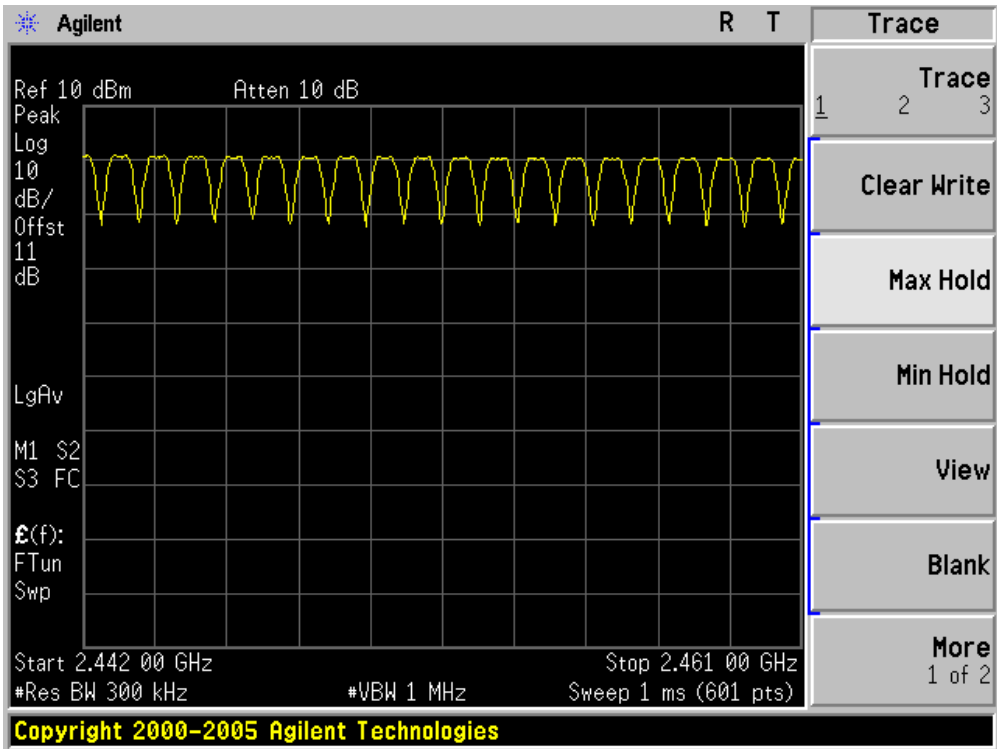
2402 - 2421 MHz



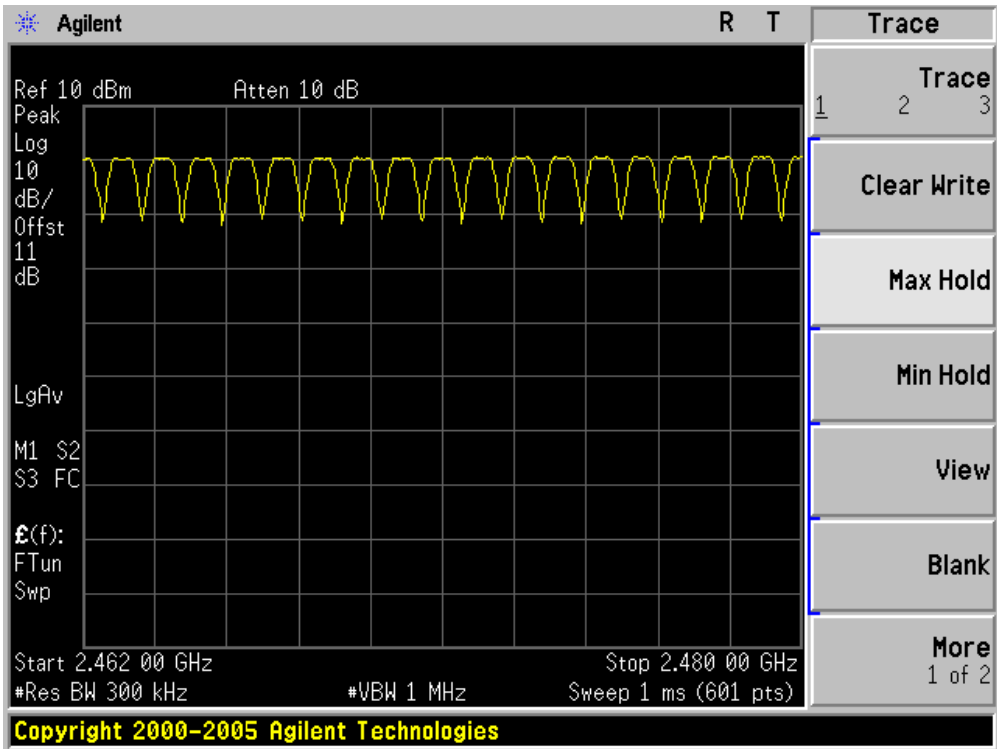
2422 - 2441 MHz



2442 - 2461 MHz



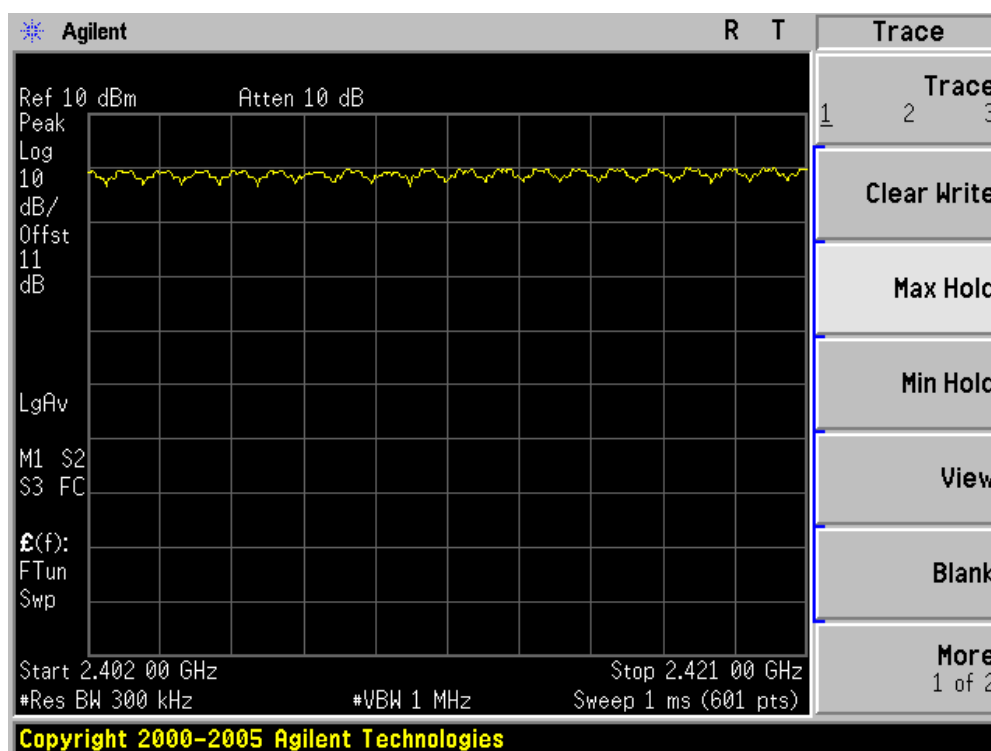
2462 - 2480 MHz



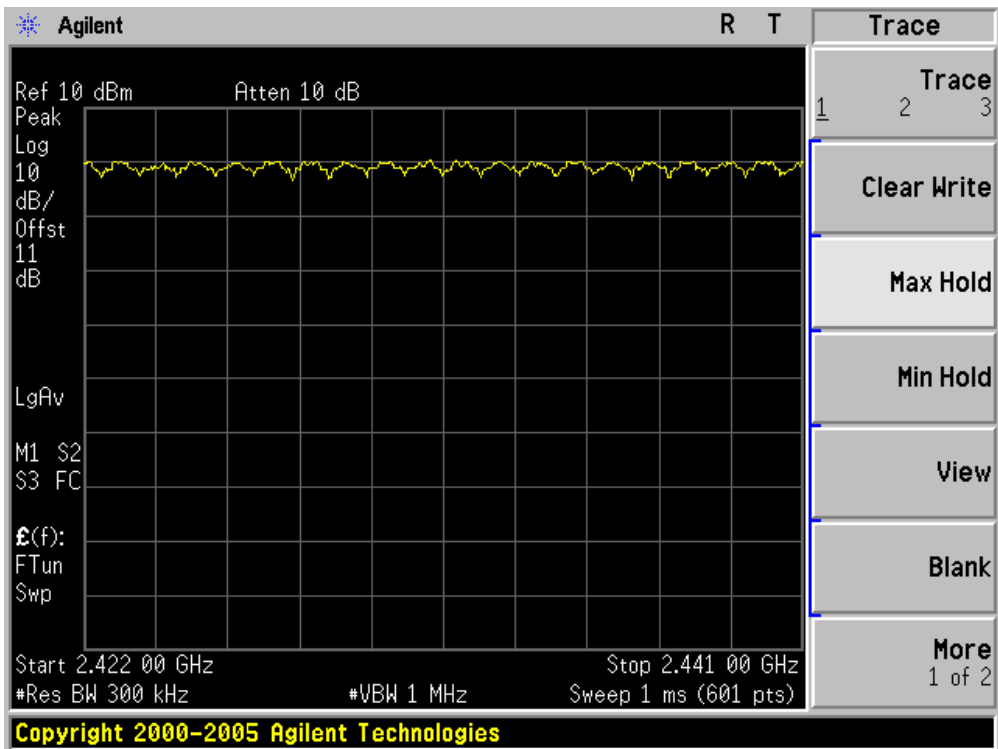
Product	:	Kreyos Meteor
Test Item	:	Number of Hopping Frequencies
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmitter-2Mbps(Pi/4 DQPSK_DH1)

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

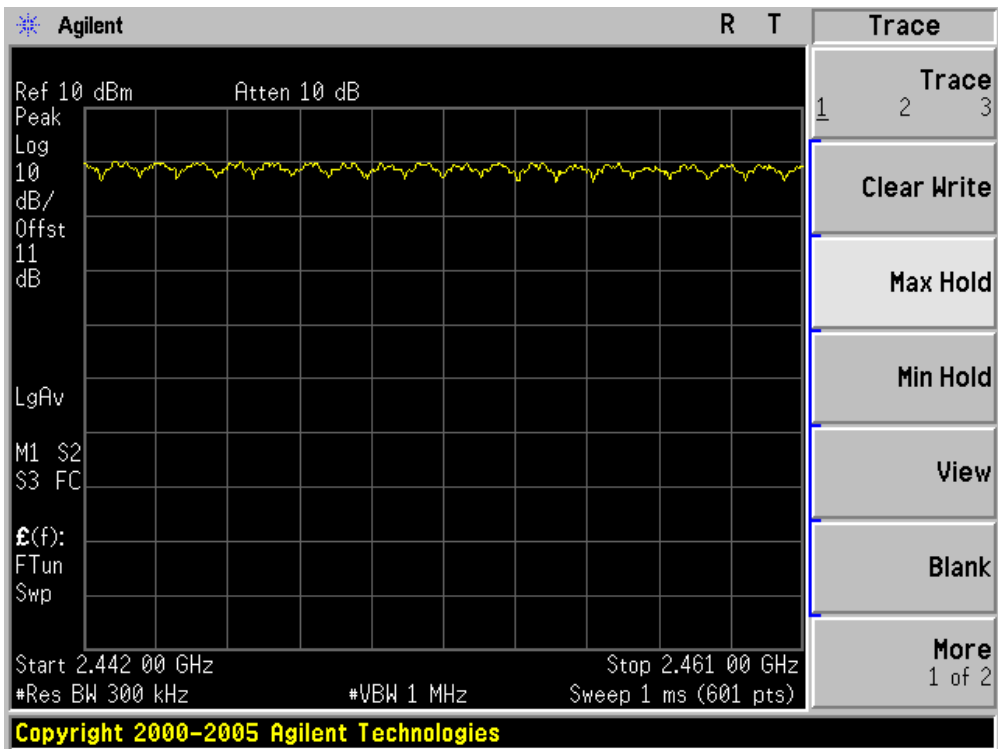
2402 - 2421 MHz



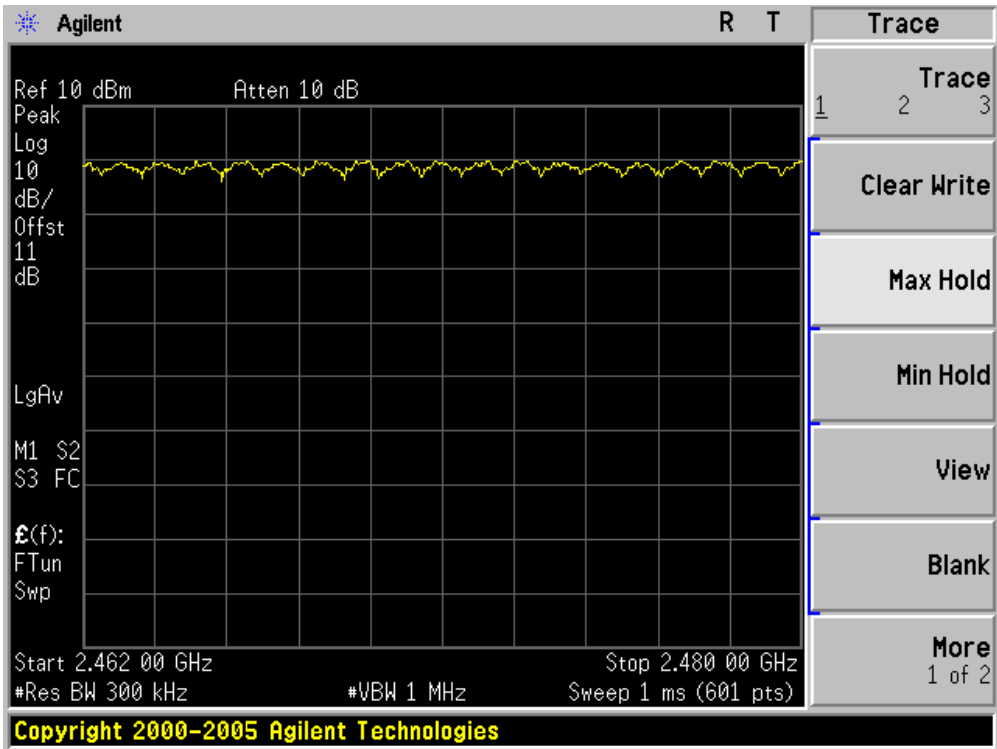
2422 - 2441 MHz



2442 - 2461 MHz



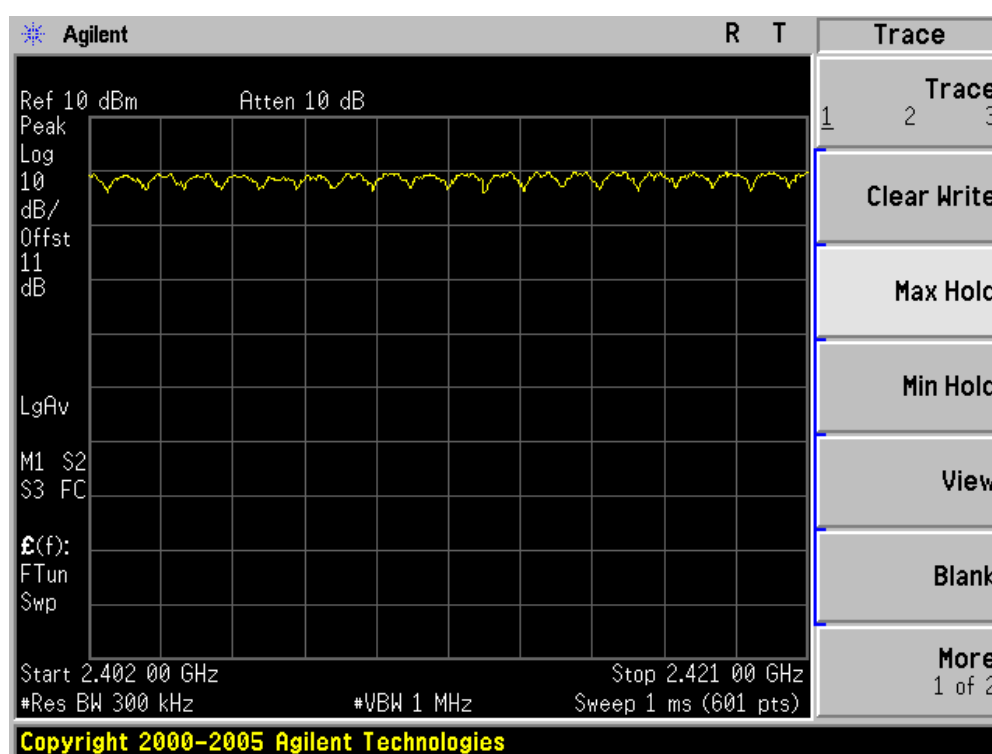
2462 - 2480 MHz



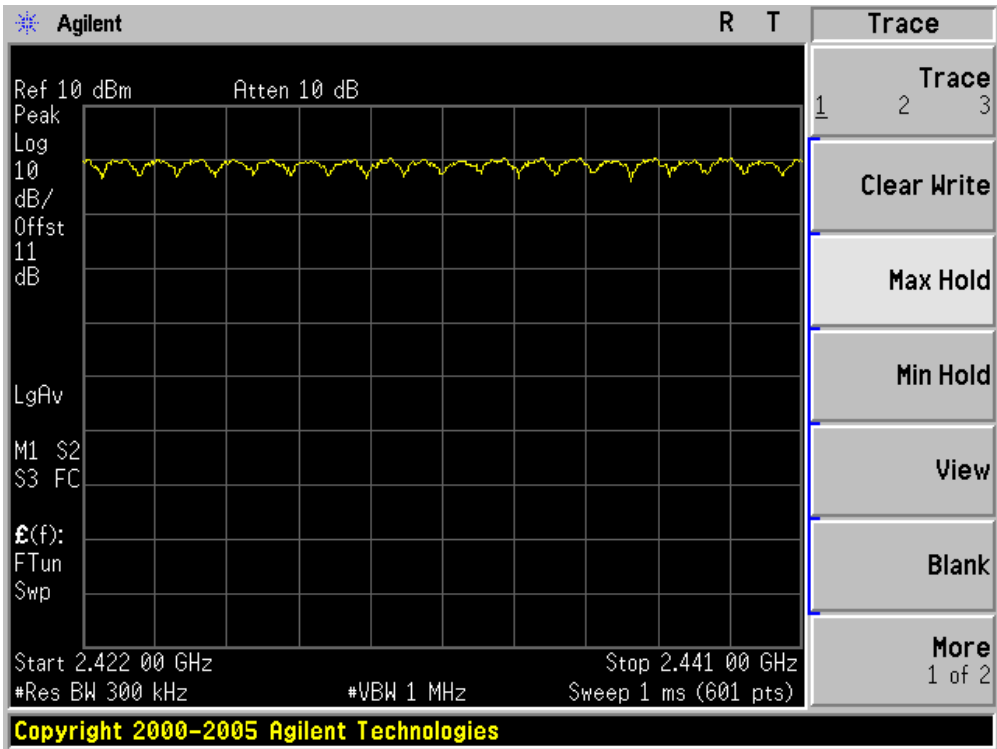
Product	:	Kreyos Meteor
Test Item	:	Number of Hopping Frequencies
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmitter-3Mbps(8DPSK_DH1)

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

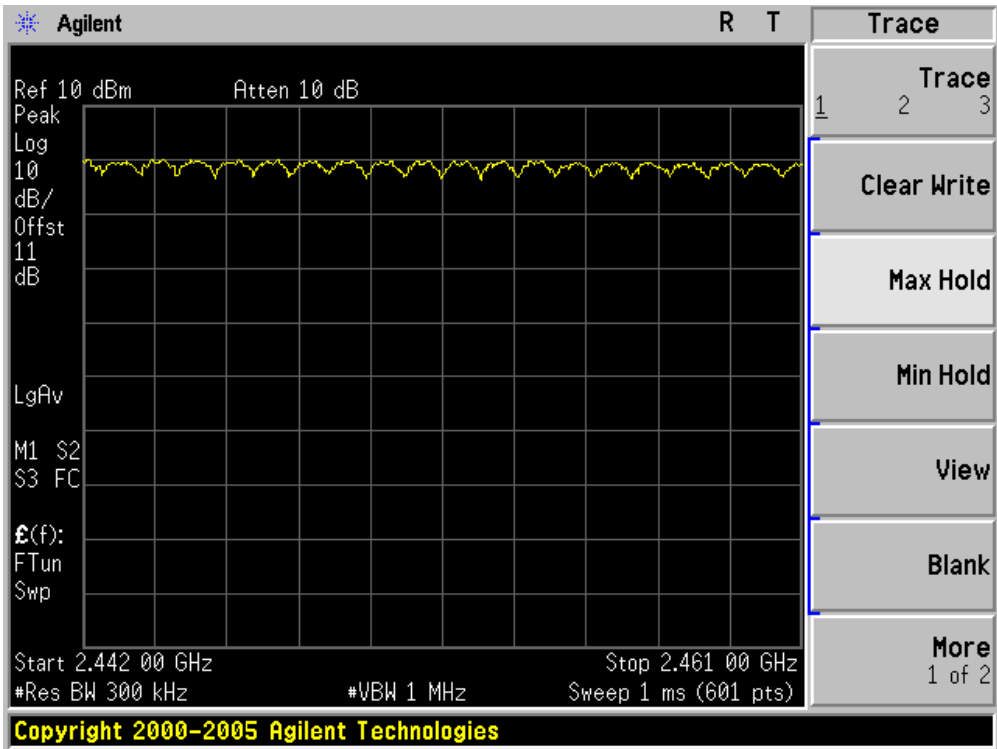
2402 - 2421 MHz



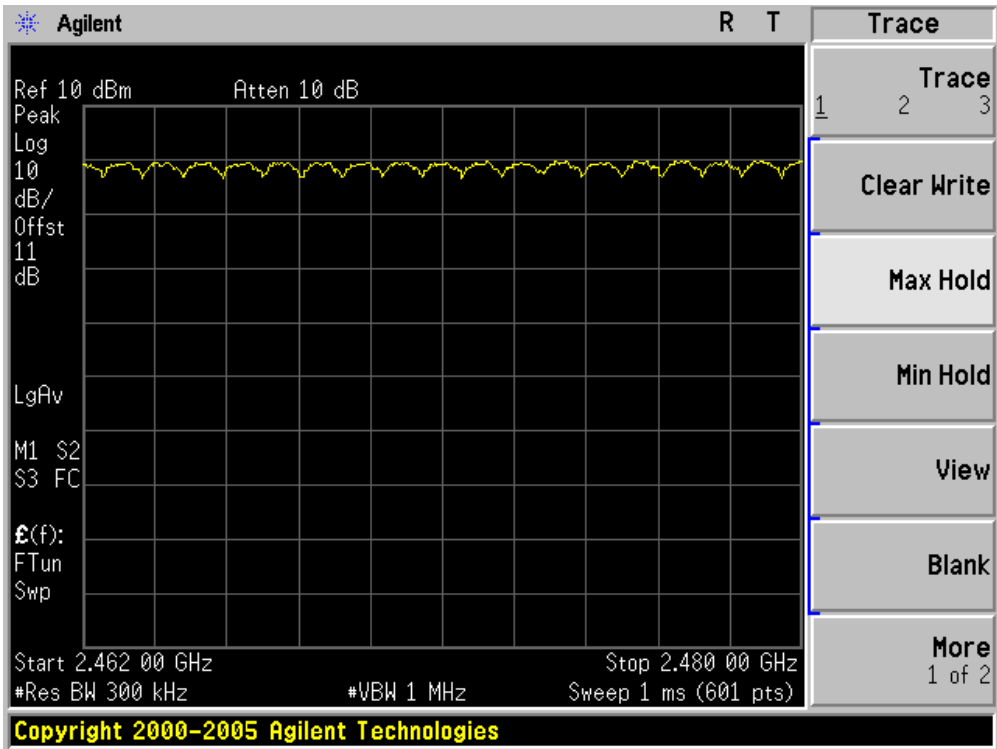
2422 - 2441 MHz



2442 - 2461 MHz



2462 - 2480 MHz



8. Time of Occupancy (Dwell Time)

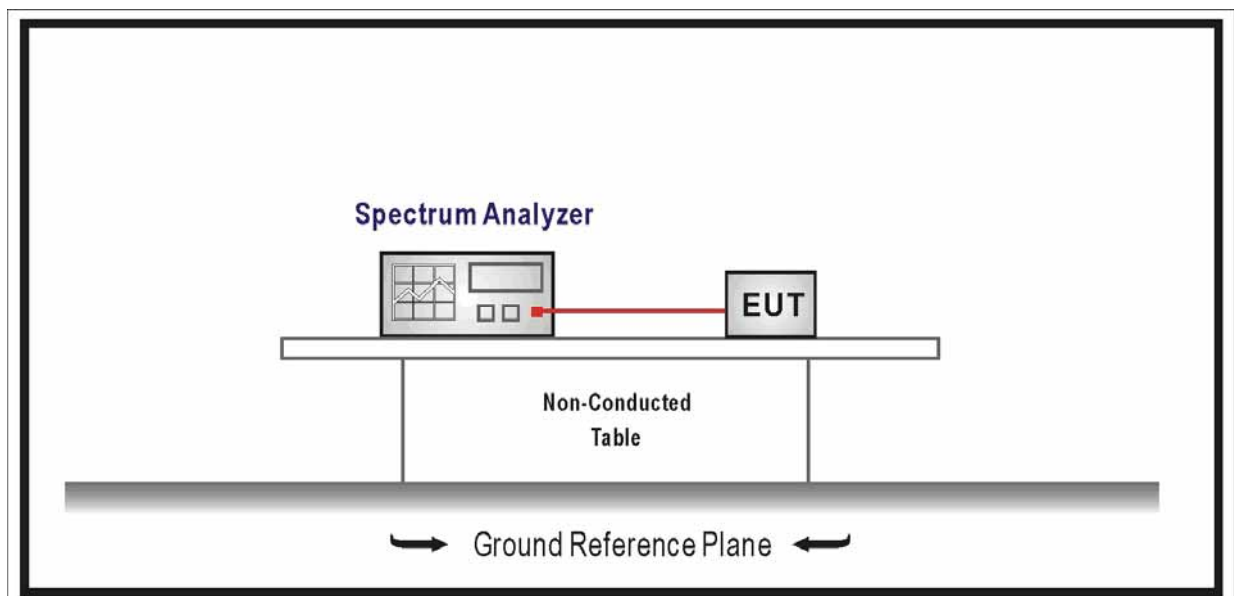
8.1. Test Equipment

Time of Occupancy (Dwell Time) / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2015.01.07
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: 2009.

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

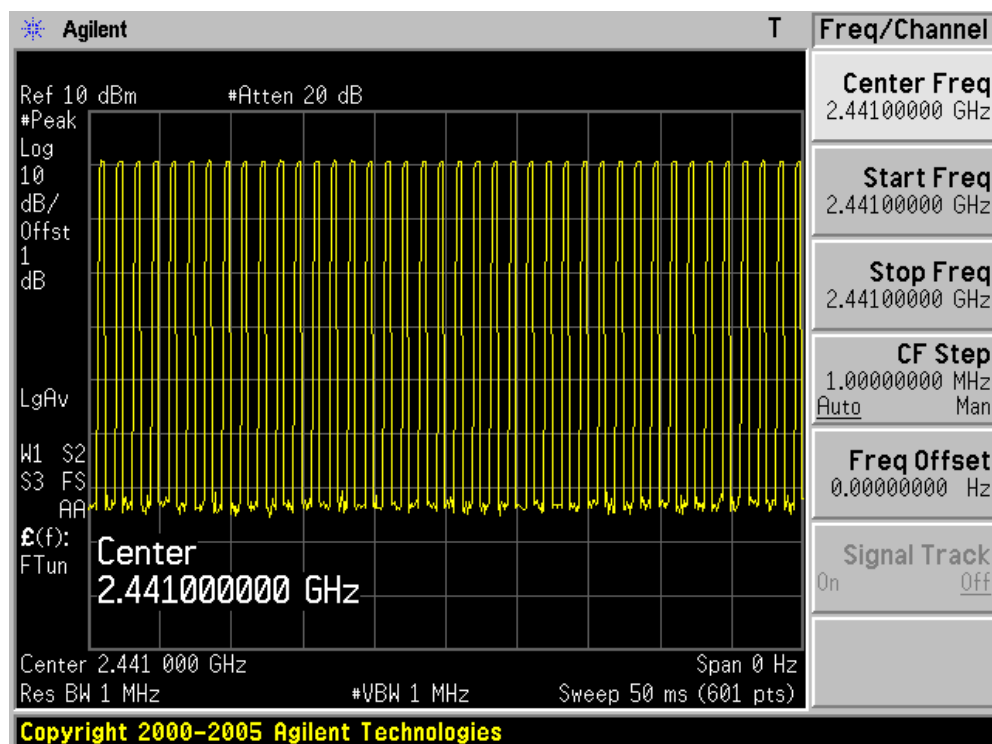
Product	:	Kreyos Meteor
Test Item	:	Time of Occupancy (Dwell Time)
Test Site	:	TR-8
Test Mode	:	Transmitter-3Mbps (8DPSK_DH1)

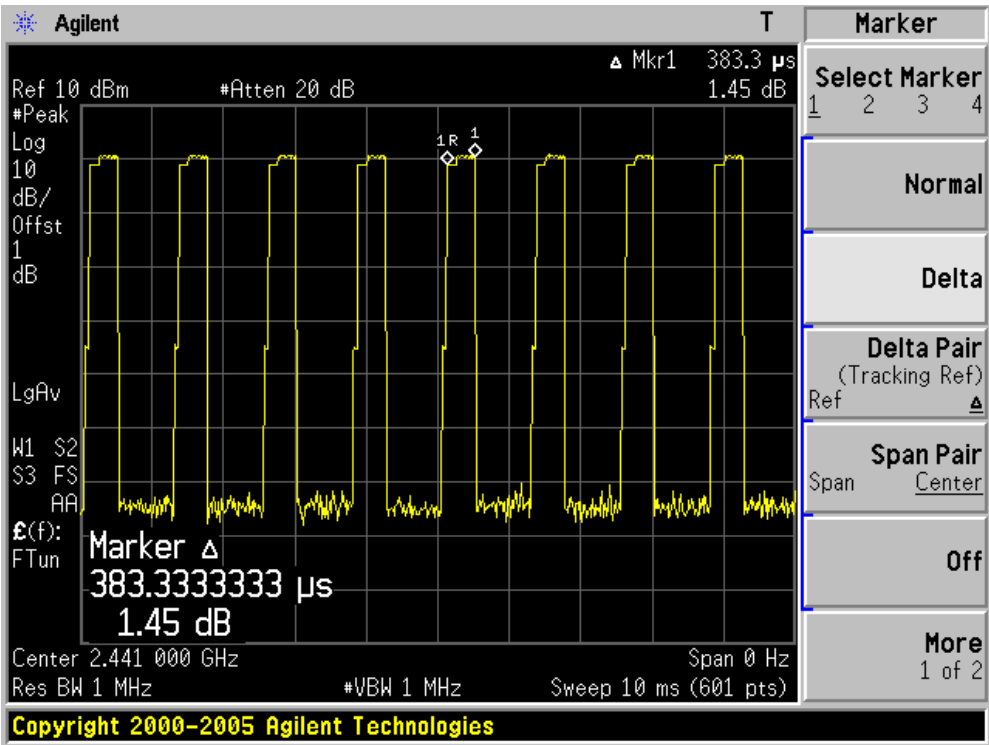
Channel No.	Frequency (MHz)	Time of Occupancy (ms)	Limit (ms)	Result
39	2441	122.6	< 400	Pass

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

- 2441MHz, The Maximum Occupancy Time Within 31.6sec: $[(0.383 \text{ms} \times 800) / 79] \times 31.6 = 122.6 \text{msec}$

Channel 39 (2441MHz)-(3DH1)





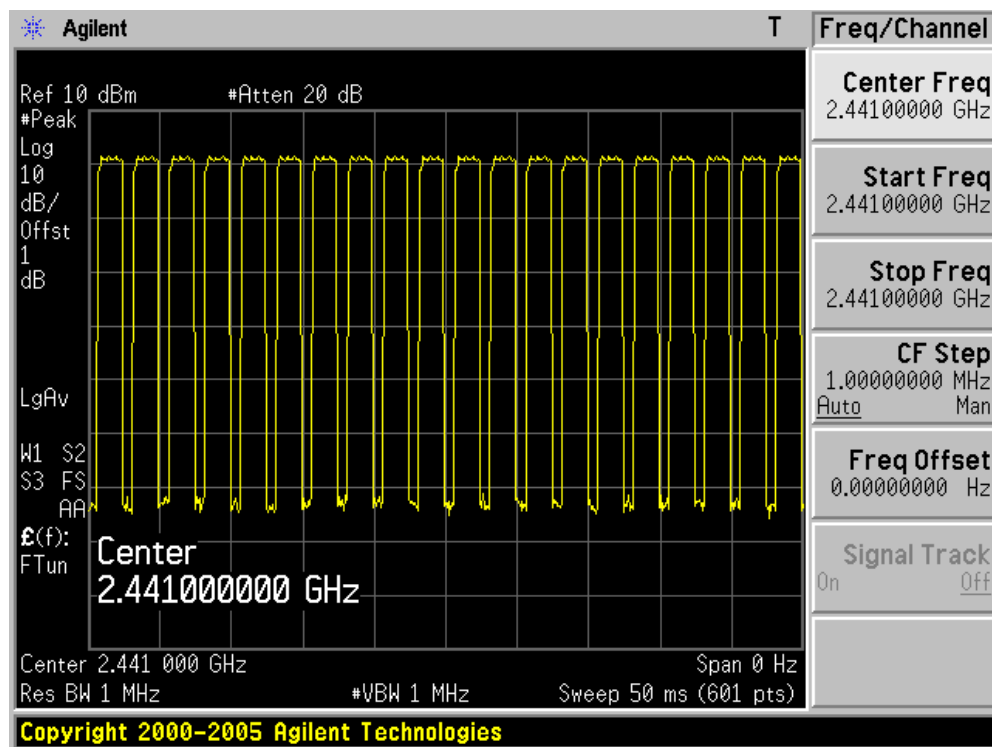
Product	:	Kreyos Meteor
Test Item	:	Time of Occupancy (Dwell Time)
Test Site	:	TR-8
Test Mode	:	Transmitter-3Mbps (8DPSK_DH3)

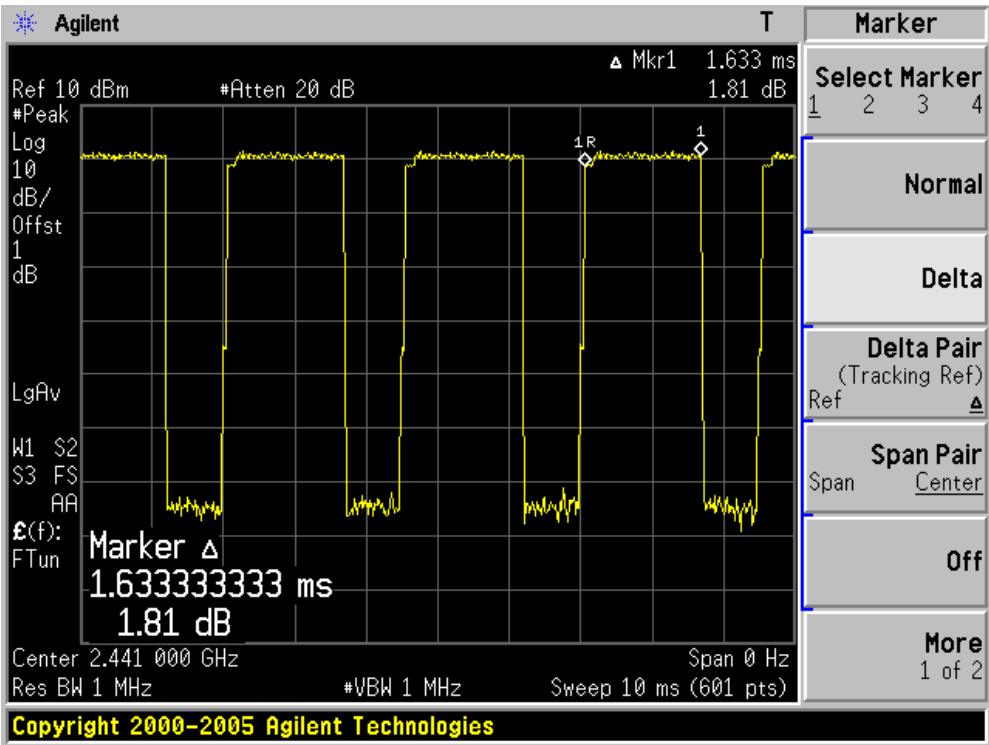
Channel No.	Frequency (MHz)	Time of Occupancy (ms)	Limit (ms)	Result
39	2441	260.8	< 400	Pass

Test Time Period: $0.4 \times 79 = 31.6\text{sec}$, Hopping Times Within 1sec: $20/50\text{msec} = 400\text{hops/sec}$.

2. 2441MHz, The Maximum Occupancy Time Within 31.6sec: $[(1.63\text{ms} \times 400)/79] \times 31.6 = 260.8\text{msec}$

Channel 39 (2441MHz) - (3DH3)





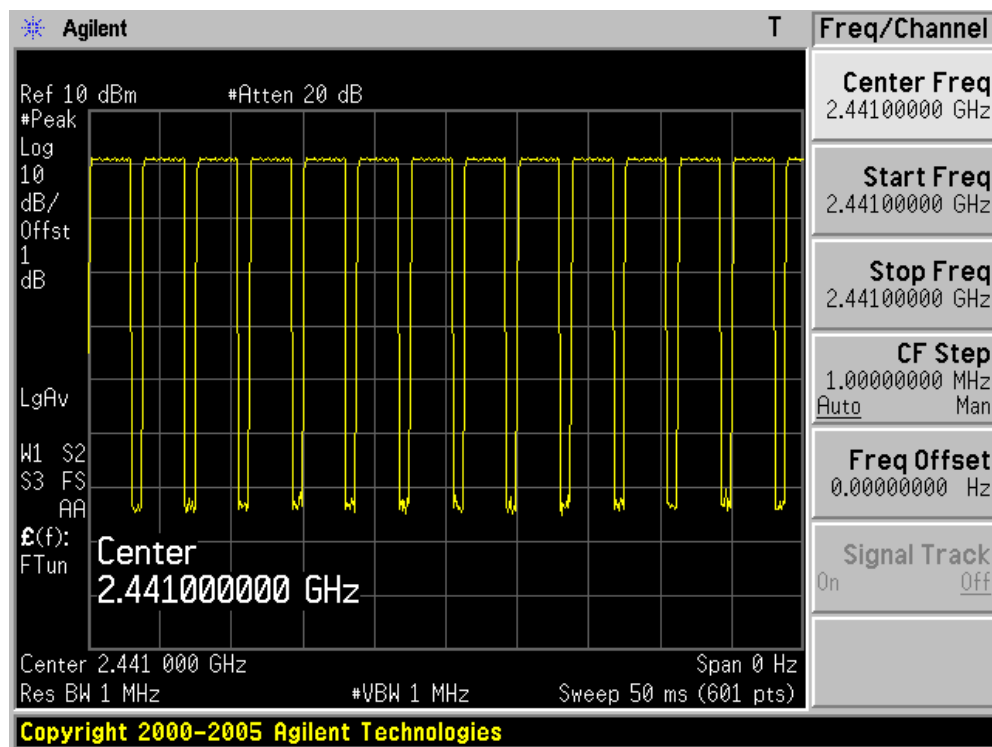
Product	:	Kreyos Meteor
Test Item	:	Time of Occupancy (Dwell Time)
Test Site	:	TR-8
Test Mode	:	Transmitter-3Mbps (8DPSK_DH5)

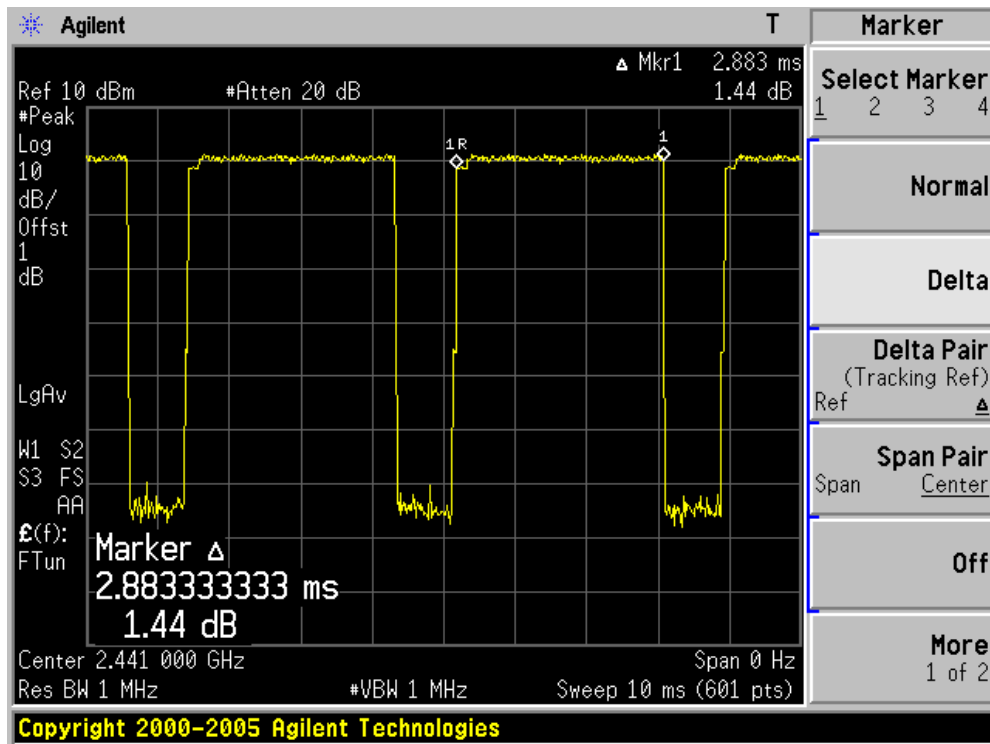
Channel No.	Frequency (MHz)	Time of Occupancy (ms)	Limit (ms)	Result
39	2441	322.9	< 400	Pass

Test Time Period: $0.4 \times 79 = 31.6\text{sec}$, Hopping Times Within 1sec: $14/50\text{msec} = 280\text{ hops/sec}$.

3. 2441MHz, The Maximum Occupancy Time Within 31.6sec: $[(2.883\text{ms} \times 280)/79] \times 31.6 = 322.9\text{msec}$

Channel 39 (2441MHz) - (3DH5)





9. Peak Output Power

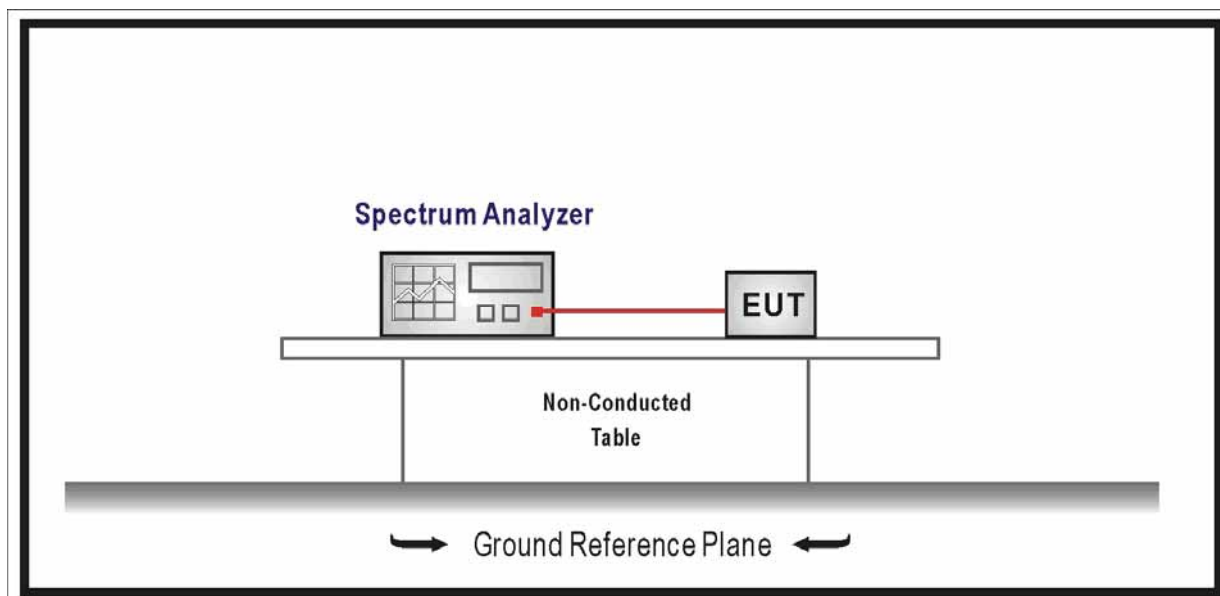
9.1. Test Equipment

Peak Output Power / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2015.01.07
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: 2009.

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

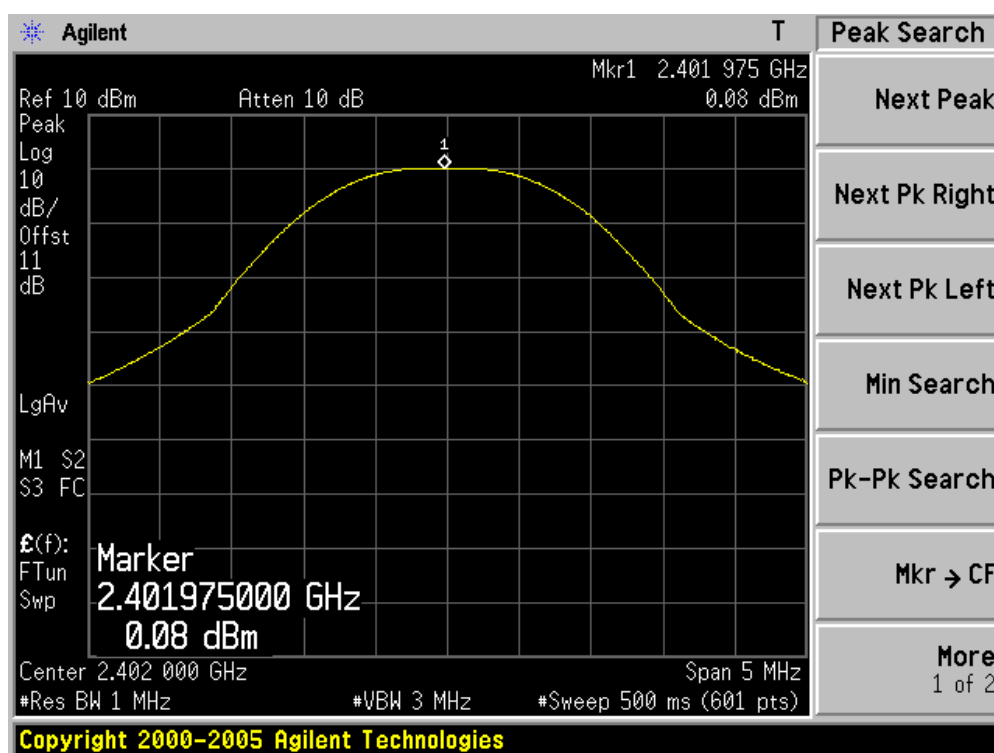
The measurement uncertainty is defined as ± 1.0 dB

9.6. Test Result

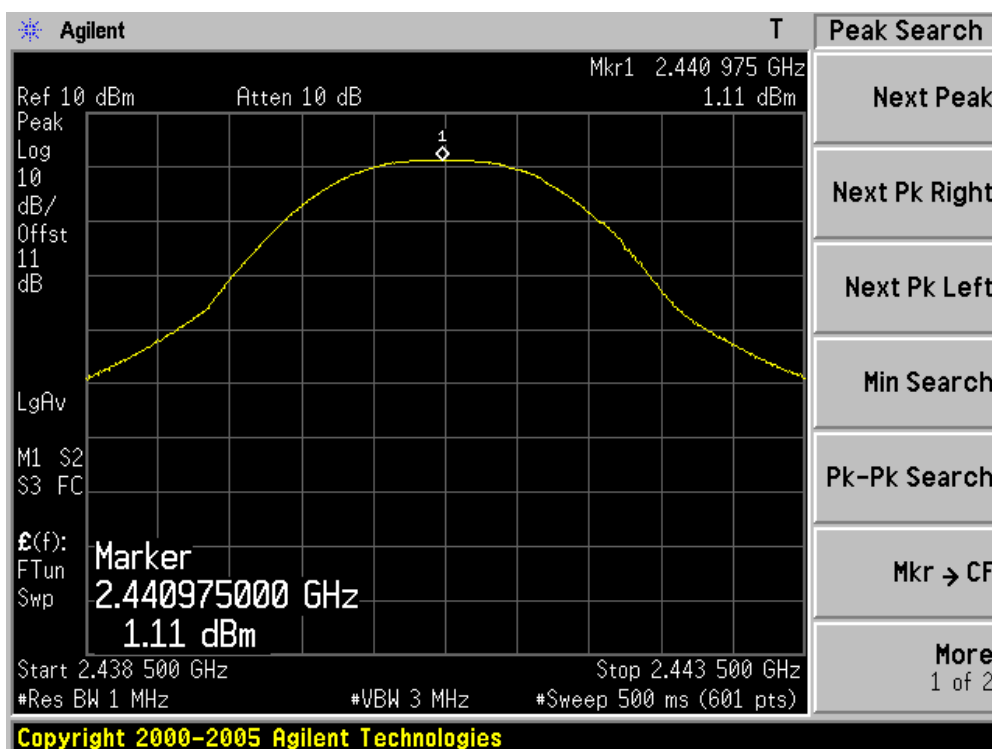
Product	:	Kreyos Meteor
Test Item	:	Power Output
Test Mode	:	Mode 1: Transmitter-1Mbps (GFSK_DH1)

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Limit (dBm)	Result
0	2402	0.08	30.00	Pass
39	2441	1.11	30.00	Pass
78	2480	0.87	30.00	Pass

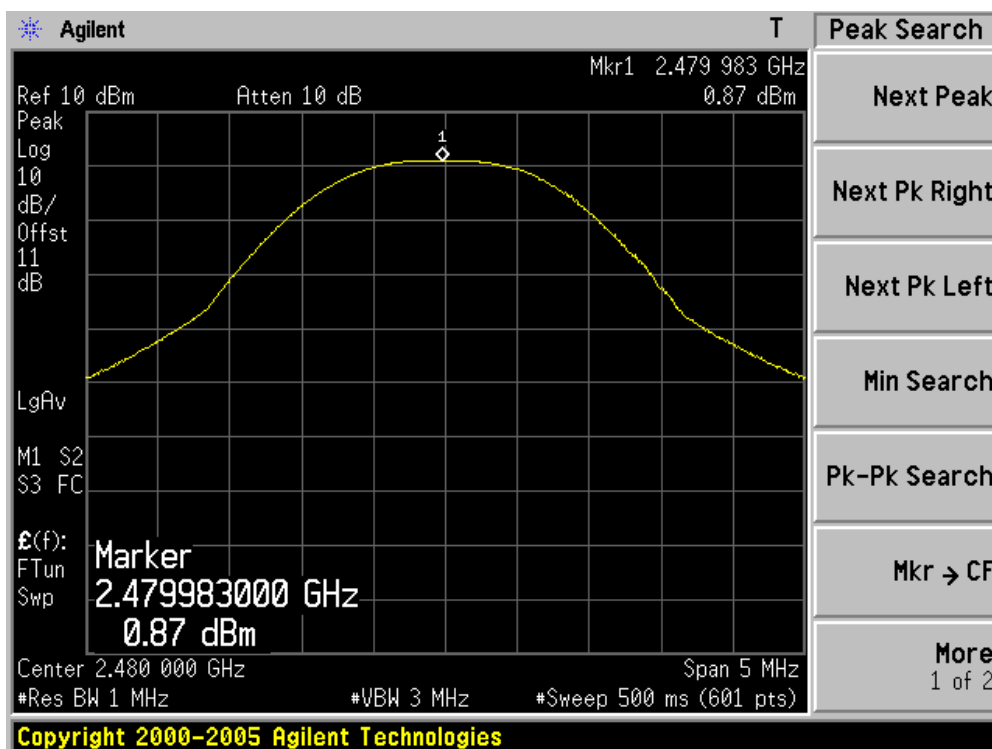
Channel 00 (2402MHz)



Channel 39 (2441MHz)



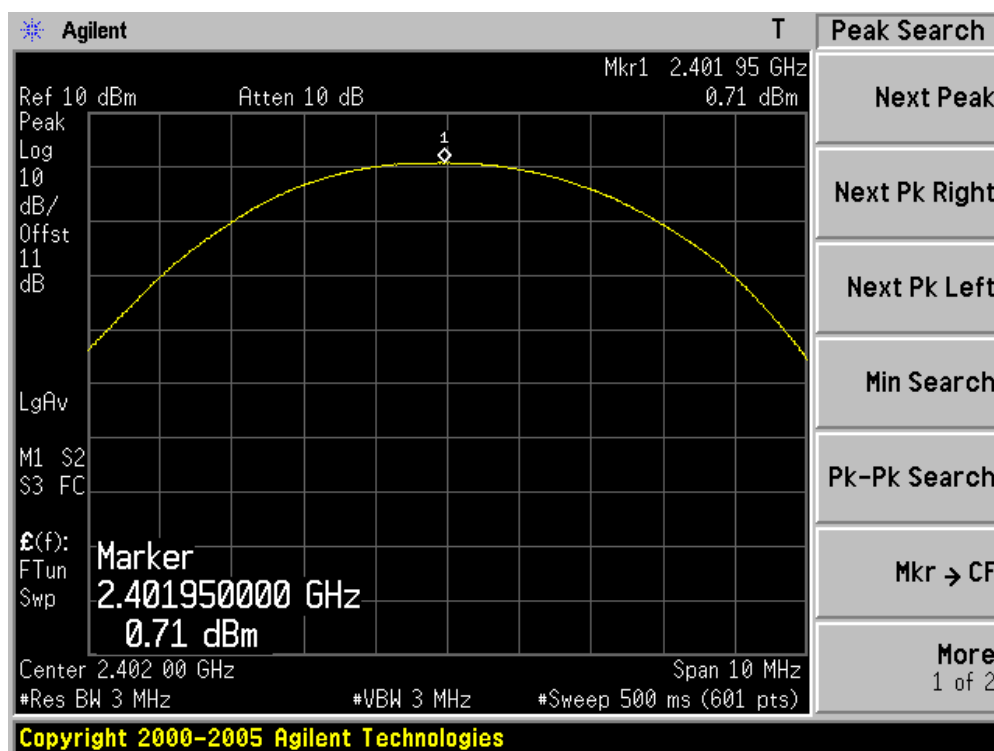
Channel 78 (2480MHz)



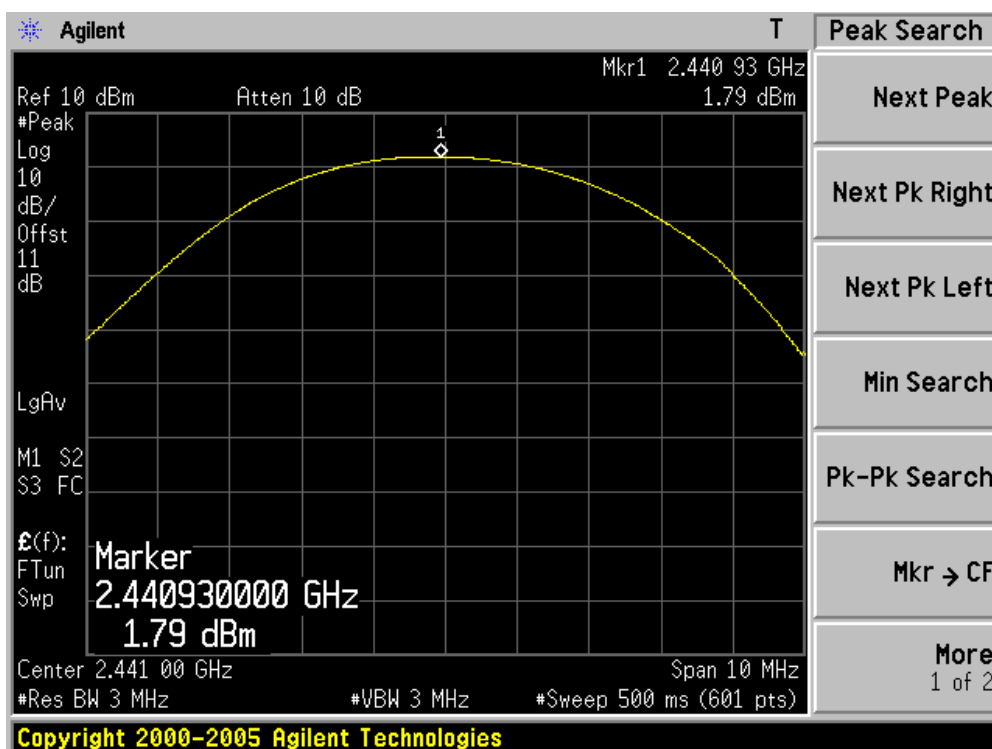
Product	:	Kreyos Meteor
Test Item	:	Power Output
Test Mode	:	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH1)

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Limit (dBm)	Result
0	2402	0.71	30.00	Pass
39	2441	1.79	30.00	Pass
78	2480	1.48	30.00	Pass

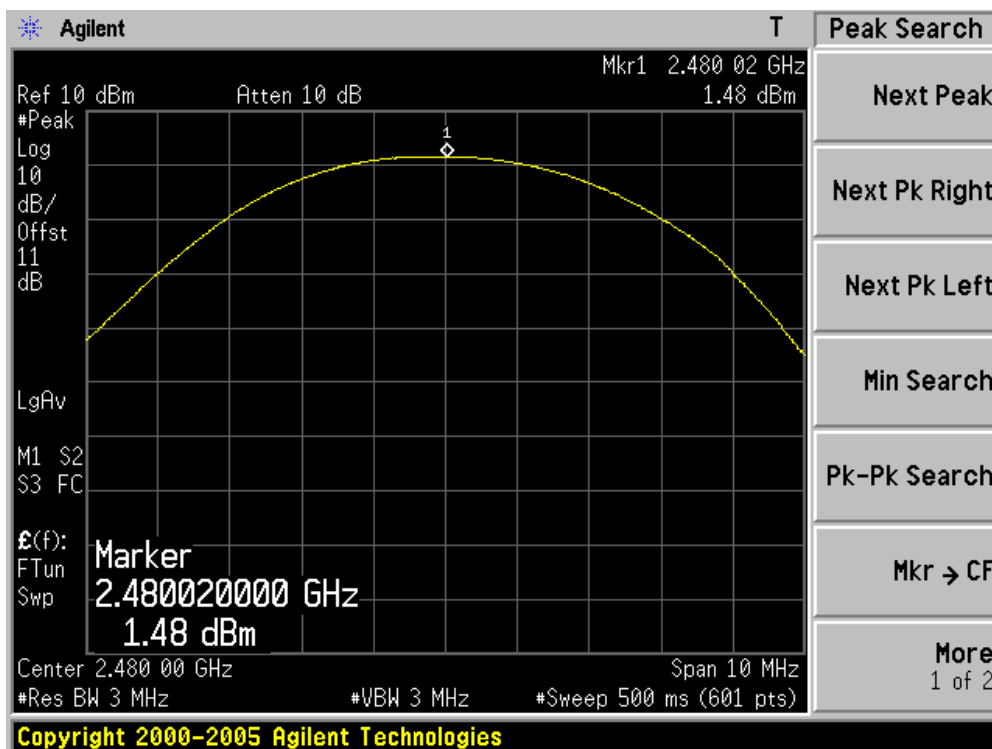
Channel 00 (2402MHz)



Channel 39 (2441MHz)



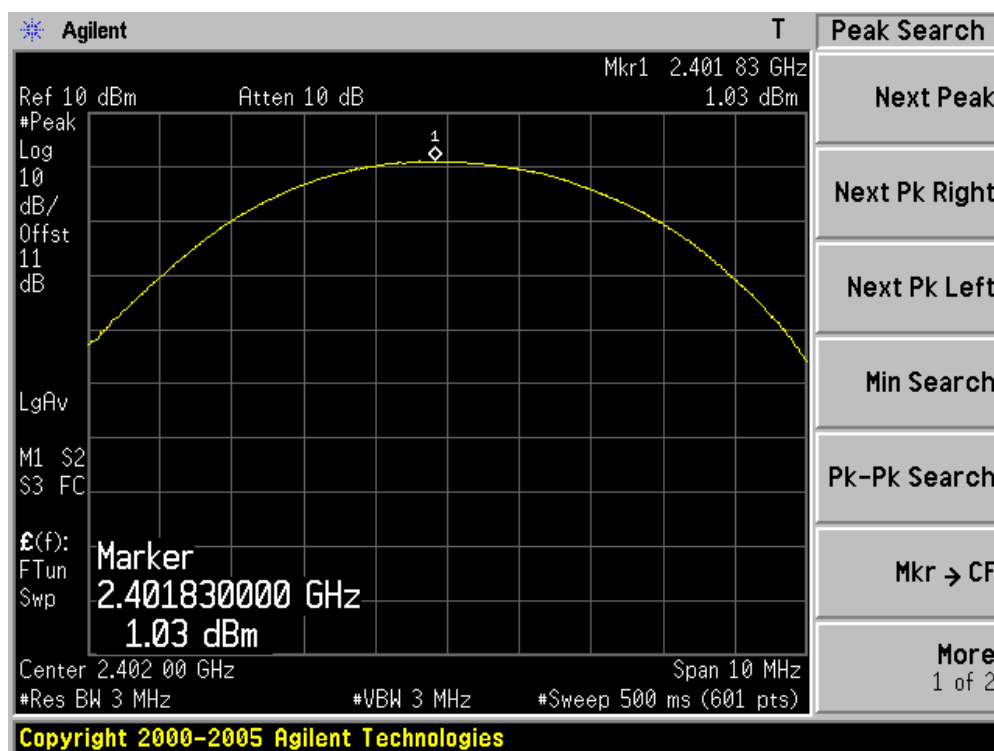
Channel 78 (2480MHz)



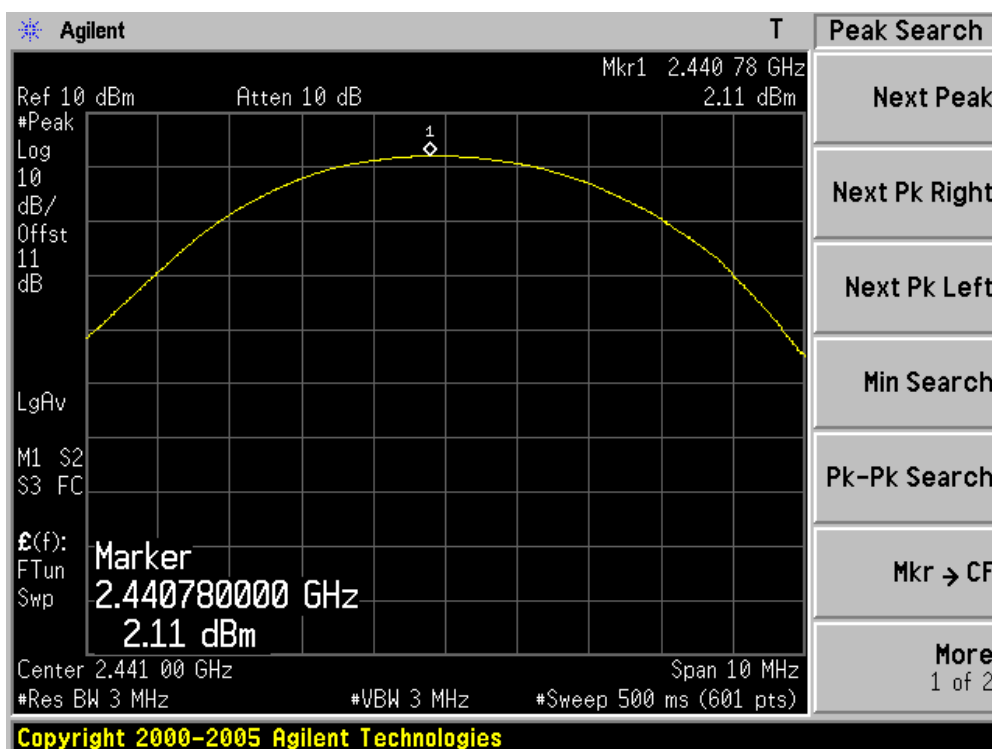
Product	:	Kreyos Meteor
Test Item	:	Power Output
Test Mode	:	Mode 3: Transmitter-3Mbps (8DPSK_DH1)

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Limit (dBm)	Result
0	2402	1.03	30.00	Pass
39	2441	2.11	30.00	Pass
78	2480	1.79	30.00	Pass

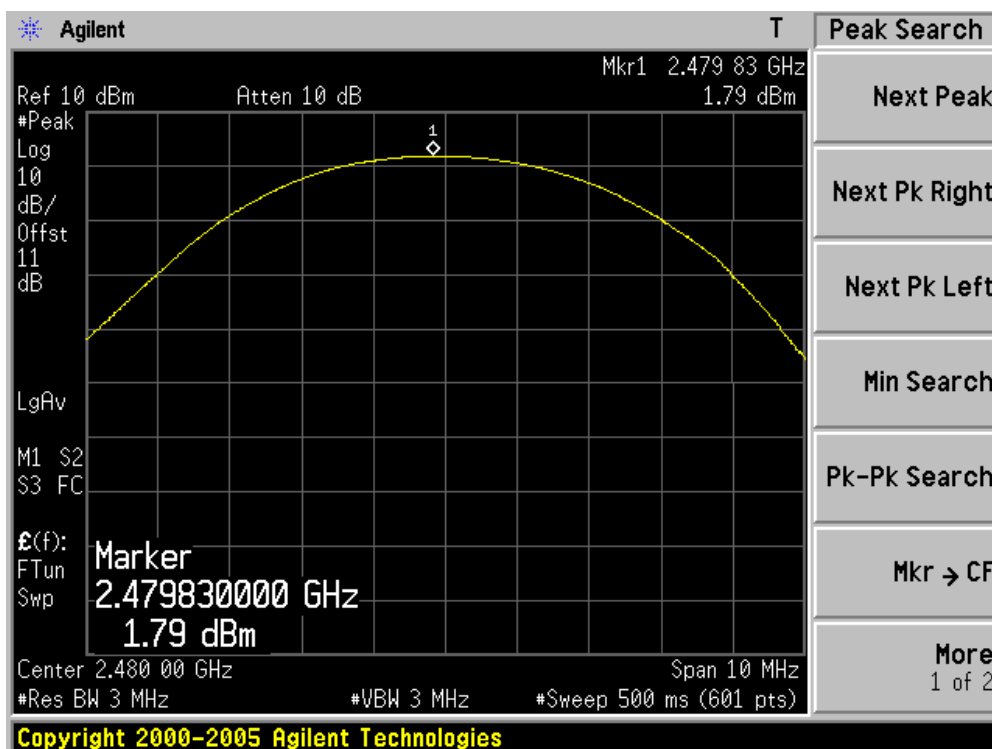
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)



10. Band-edge Compliance of RF Conducted Emissions

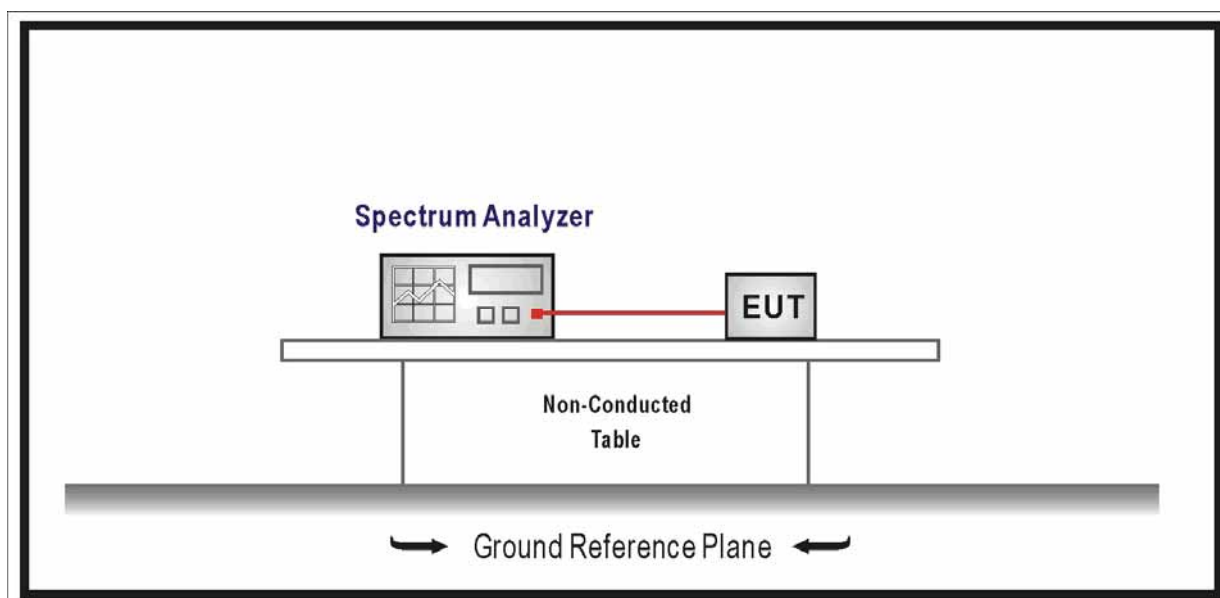
10.1. Test Equipment

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

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2015.01.07
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: 2009.

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.

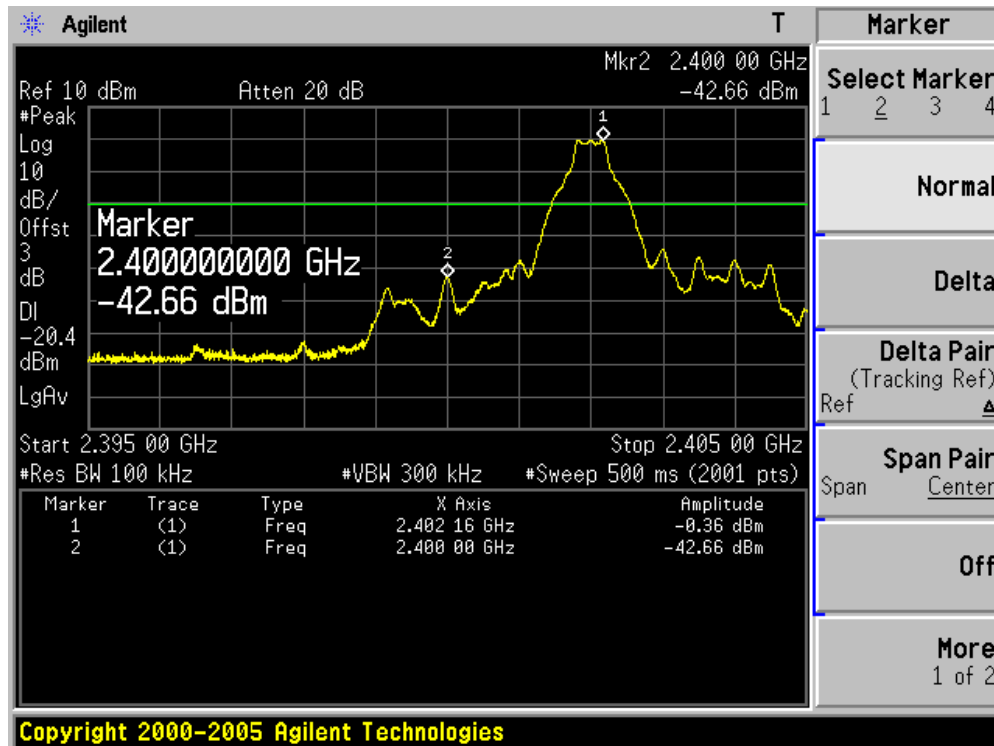
10.5. Uncertainty

The measurement uncertainty is defined as ± 1.0 dB

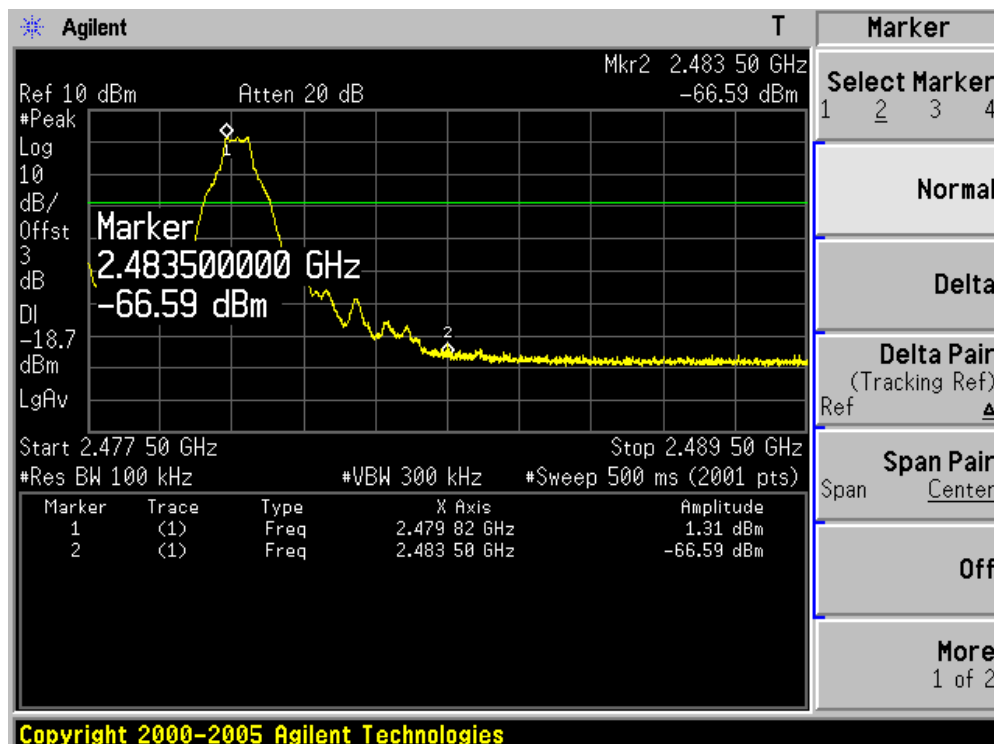
10.6. Test Result

Product	:	Kreyos Meteor
Test Item	:	Band-edge Compliance of RF Conducted Emissions
Test Mode	:	Mode 1: Transmitter-1Mbps (GFSK_DH1)

Channel 00 (2402MHz)

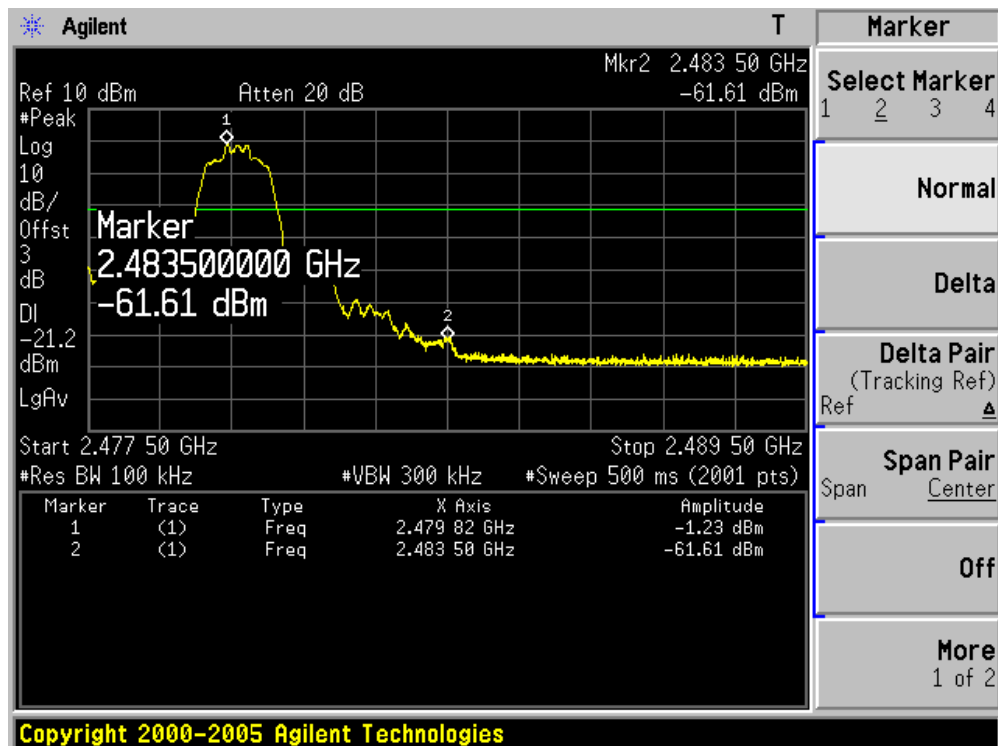


Channel 78 (2480MHz)

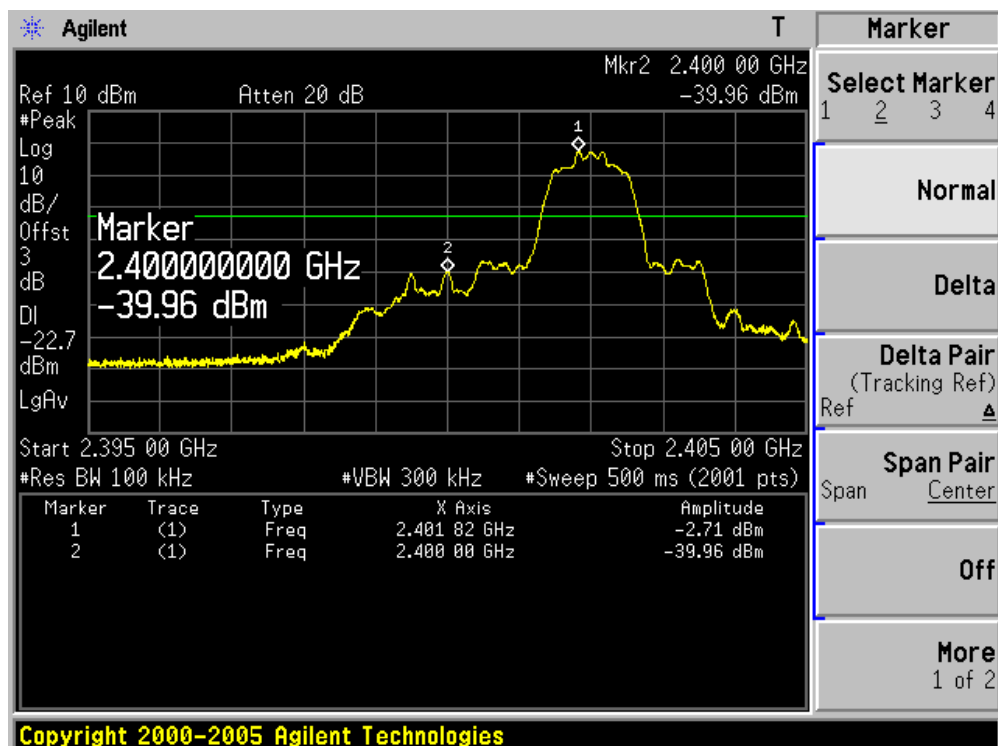


Product	:	Kreyos Meteor
Test Item	:	Band-edge Compliance of RF Conducted Emissions
Test Mode	:	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH1)

Channel 00 (2402MHz)

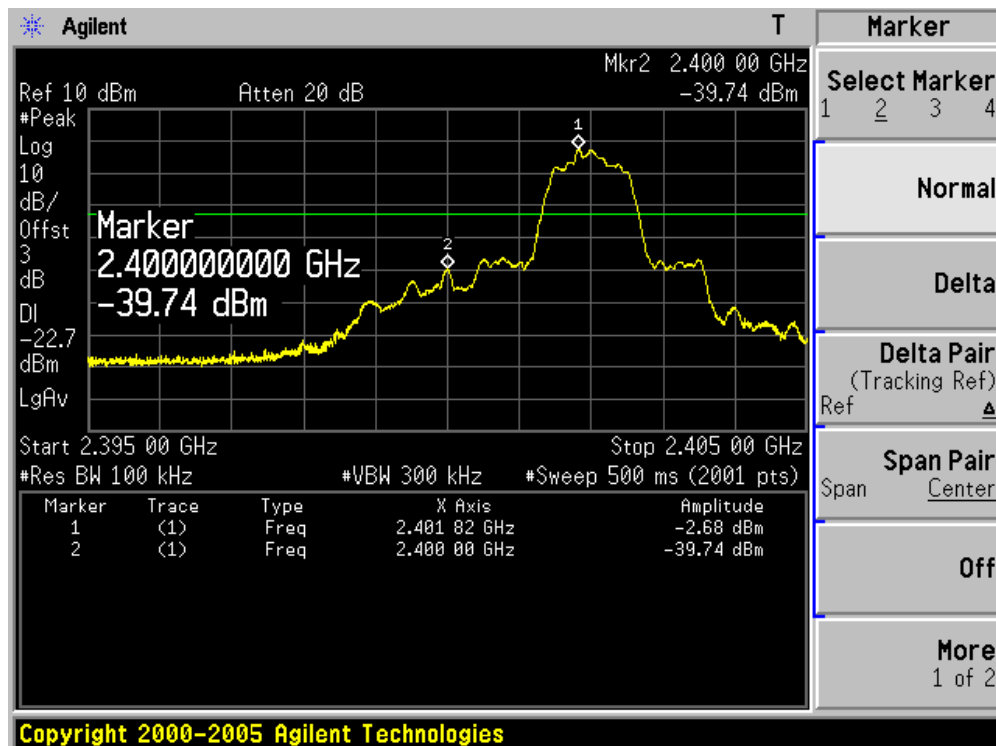


Channel 78 (2480MHz)

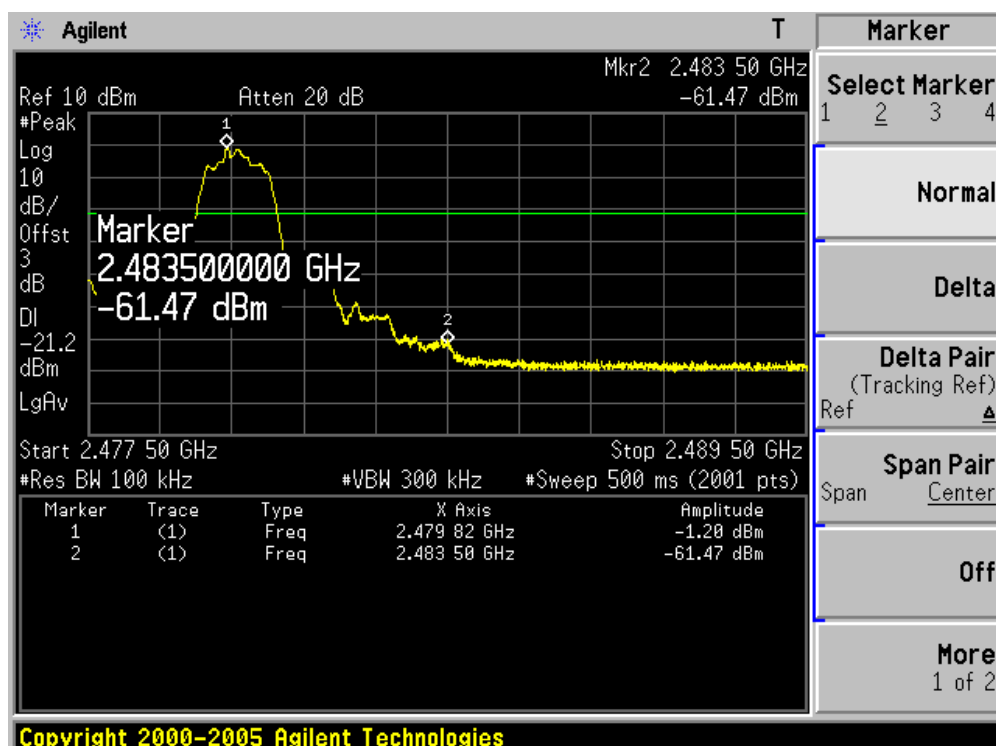


Product	:	Kreyos Meteor
Test Item	:	Band-edge Compliance of RF Conducted Emissions
Test Mode	:	Mode 3: Transmitter-3Mbps (8DPSK_DH1)

Channel 00 (2402MHz)

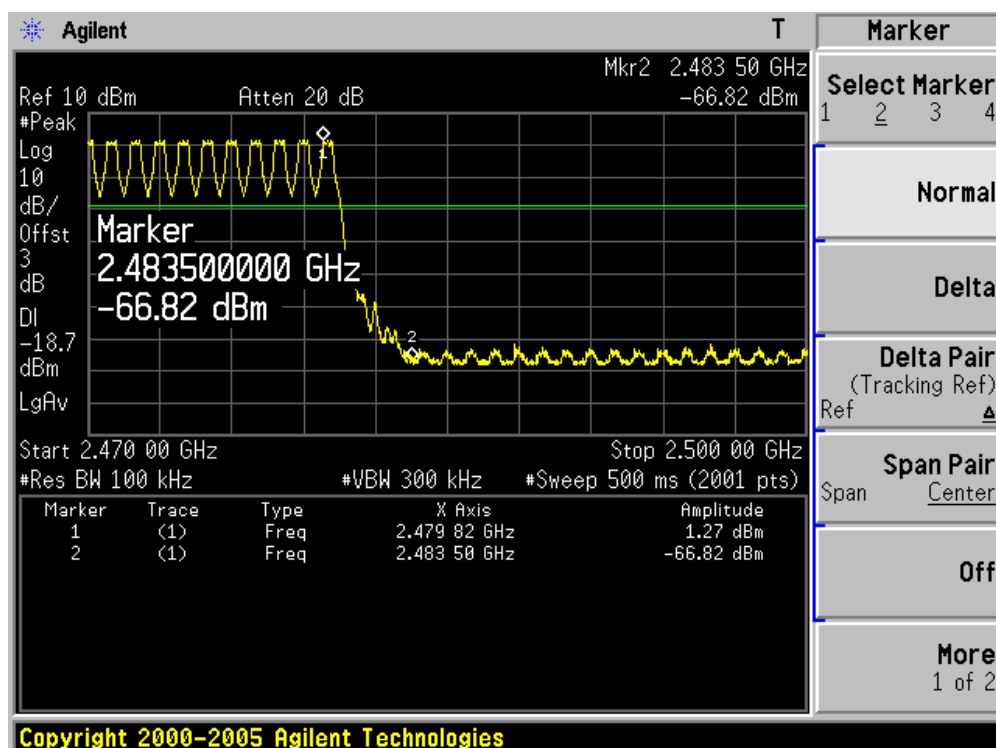
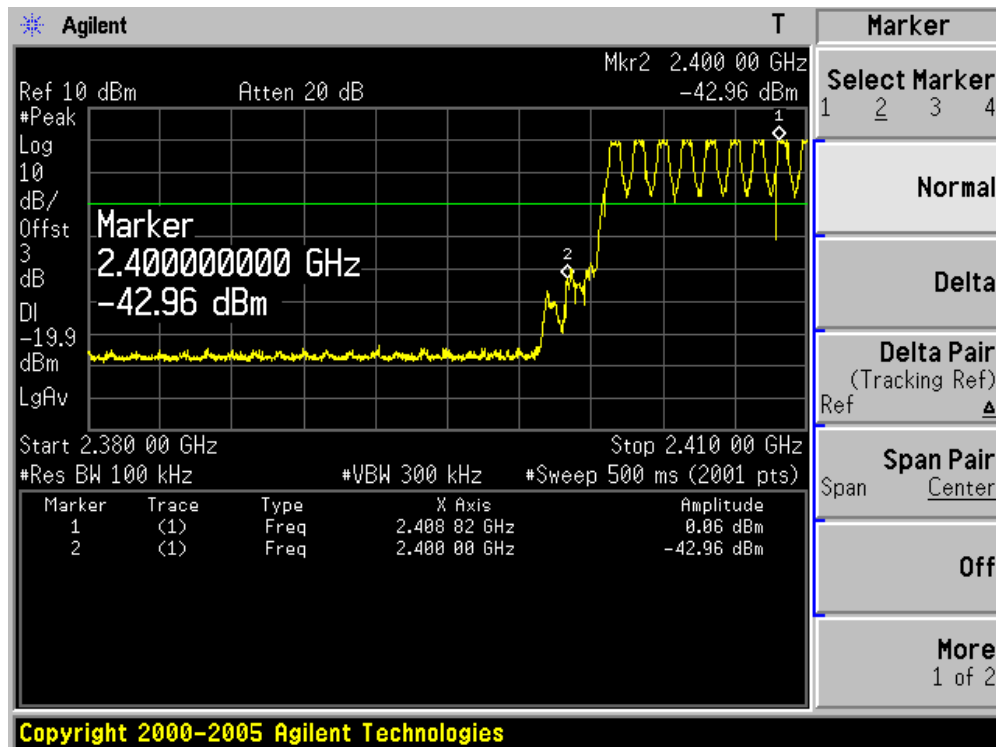


Channel 78 (2480MHz)



Product	:	Kreyos Meteor
Test Item	:	Band-edge Compliance of RF Conducted Emissions
Test Mode	:	Mode 1: Hopping Mode

Hopping Mode



11. Spurious RF Conducted Emissions

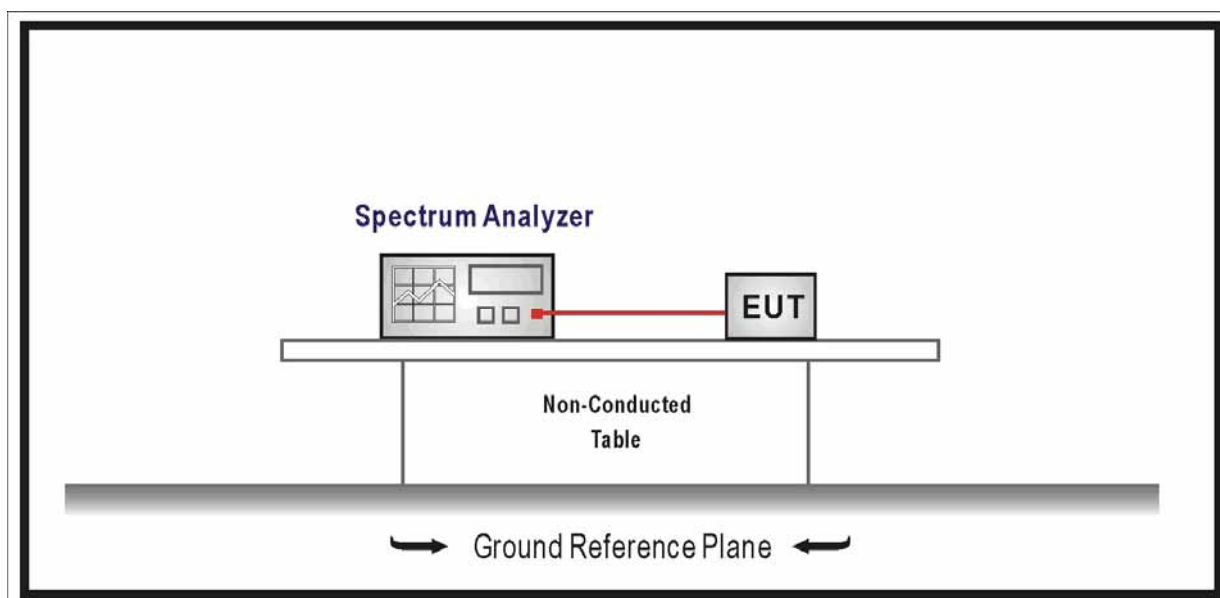
11.1. Test Equipment

Spurious RF Conducted Emissions / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2015.01.07
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: 2009.

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.

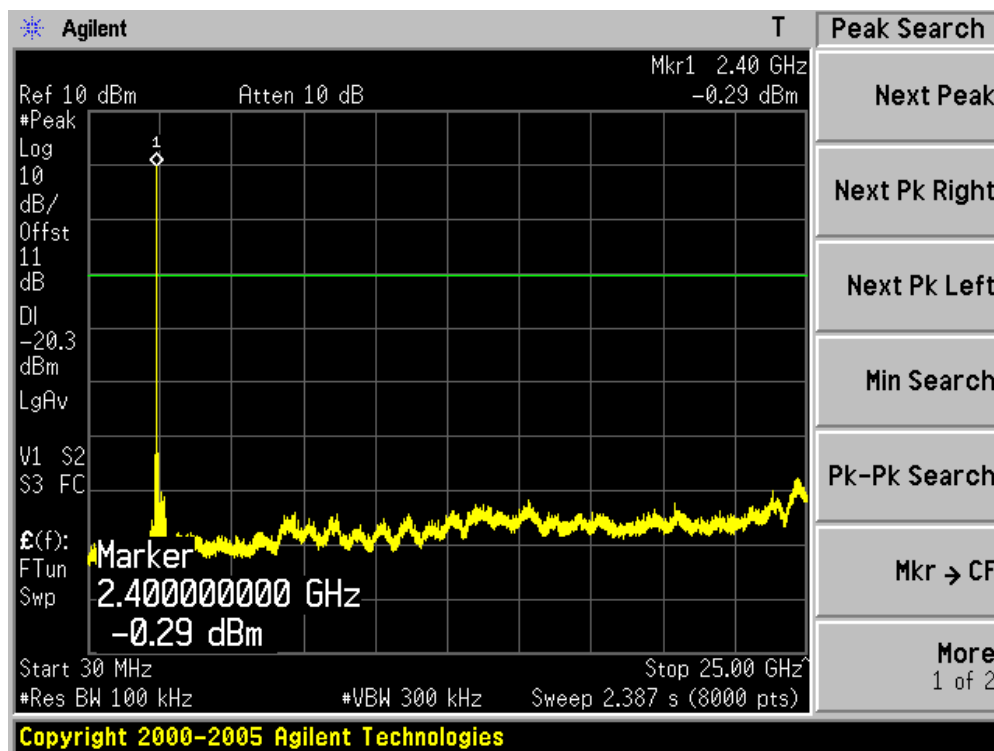
11.5. Uncertainty

The measurement uncertainty is defined as ± 1.0 dB

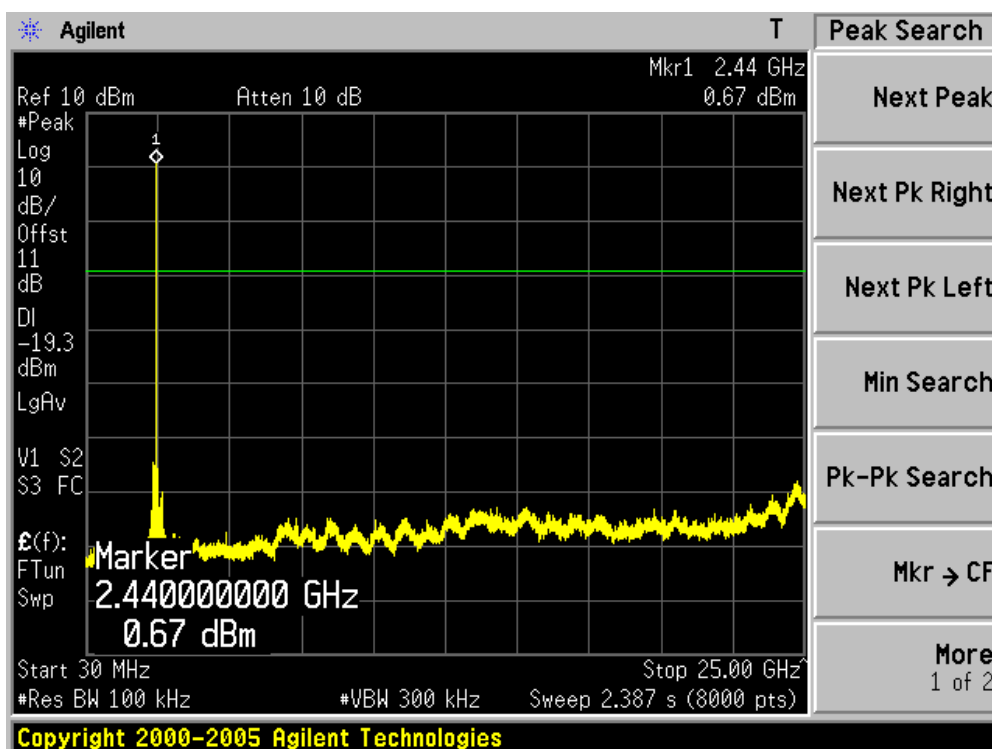
11.6. Test Result

Product	:	Kreyos Meteor
Test Item	:	Spurious RF Conducted Emissions
Test Mode	:	Mode 1: Transmitter-1Mbps (GFSK_DH1)

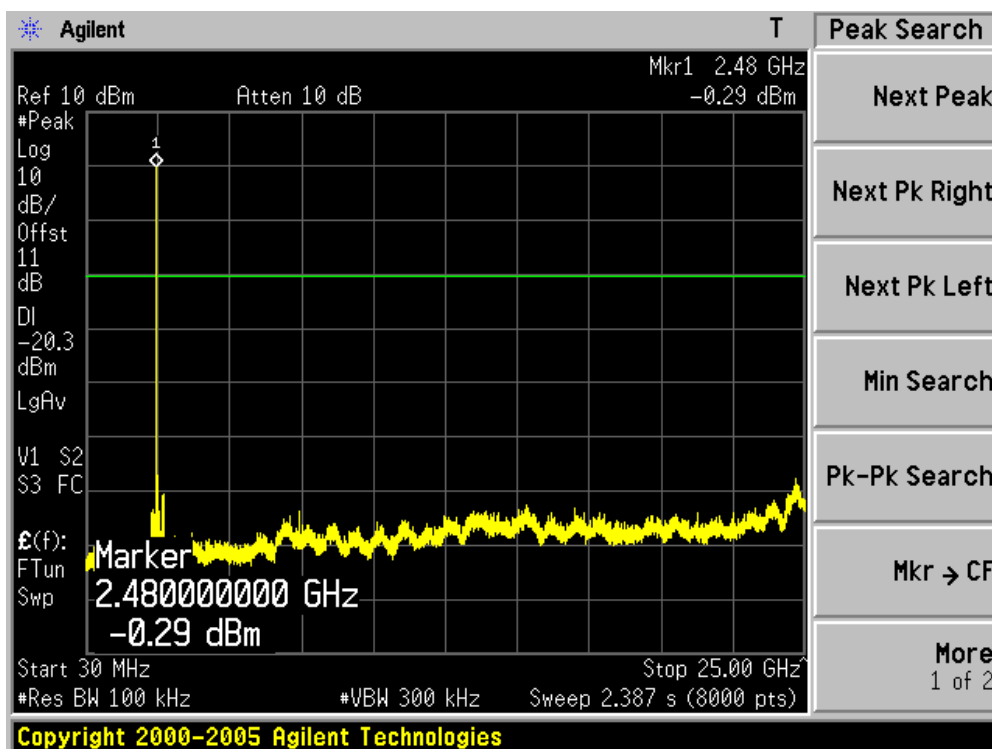
Channel 00 (2402MHz)



Channel 39 (2441MHz)

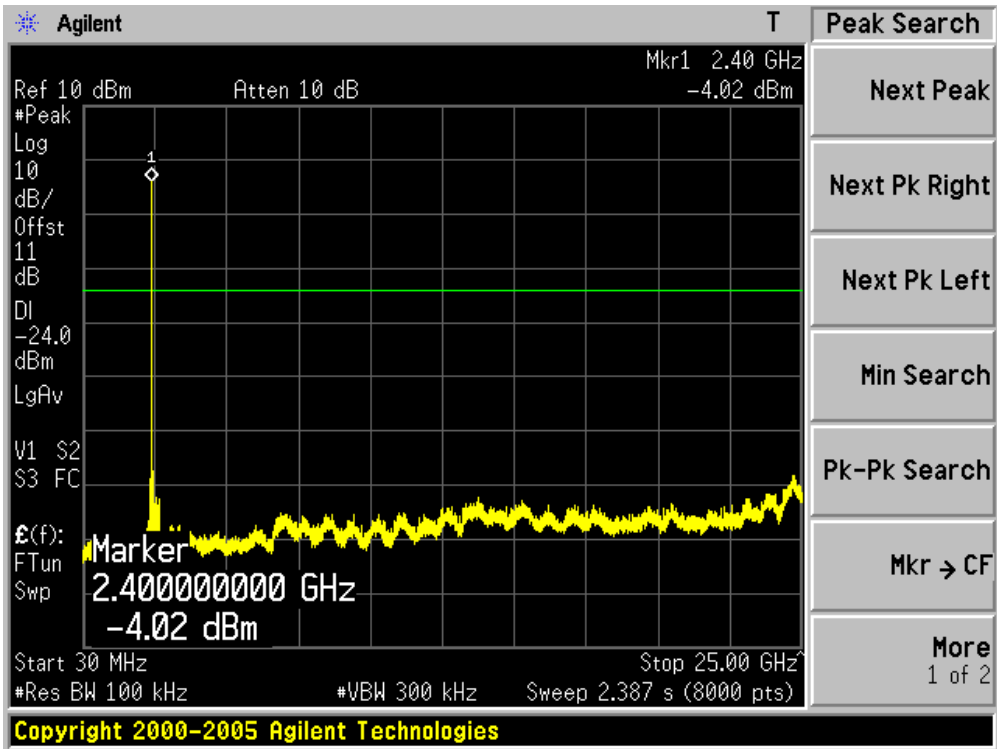


Channel 78 (2480MHz)

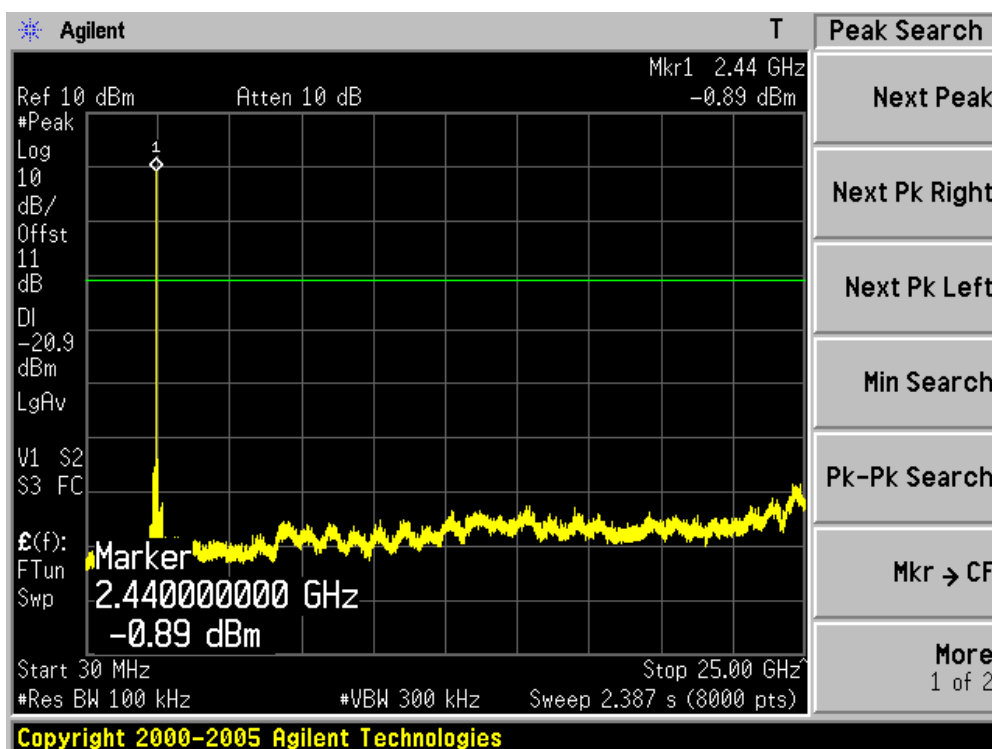


Product	:	Kreyos Meteor
Test Item	:	Spurious RF Conducted Emissions
Test Mode	:	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH1)

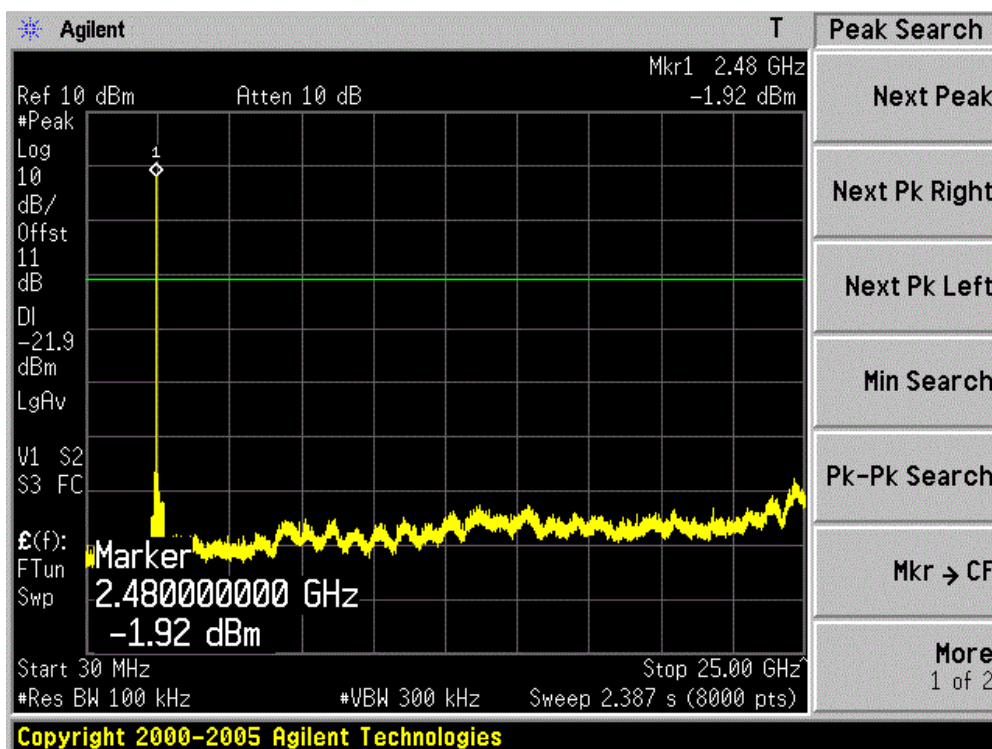
Channel 00 (2402MHz)



Channel 39 (2441MHz)

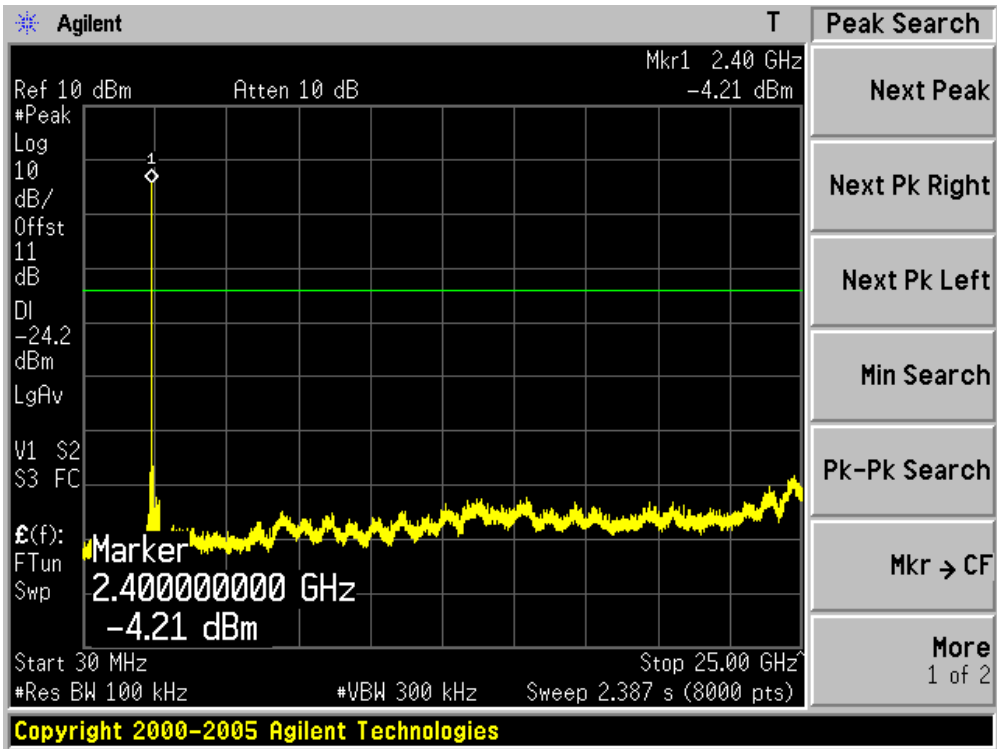


Channel 78 (2480MHz)

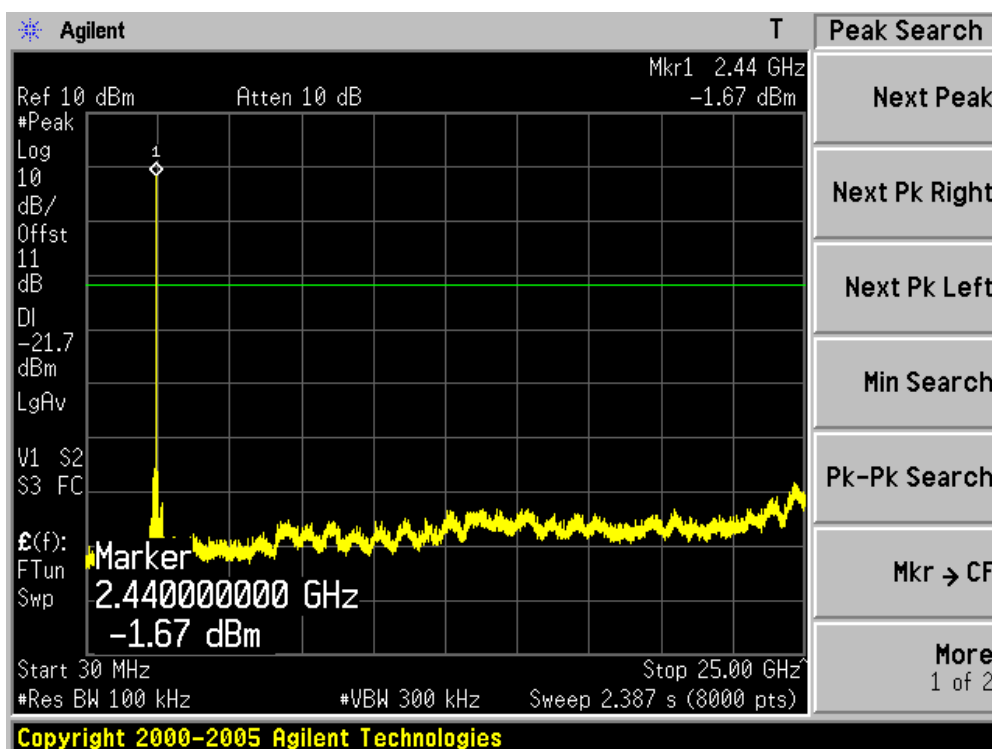


Product	:	Kreyos Meteor
Test Item	:	Spurious RF Conducted Emissions
Test Mode	:	Mode 3: Transmitter-3Mbps (8DPSK_DH1)

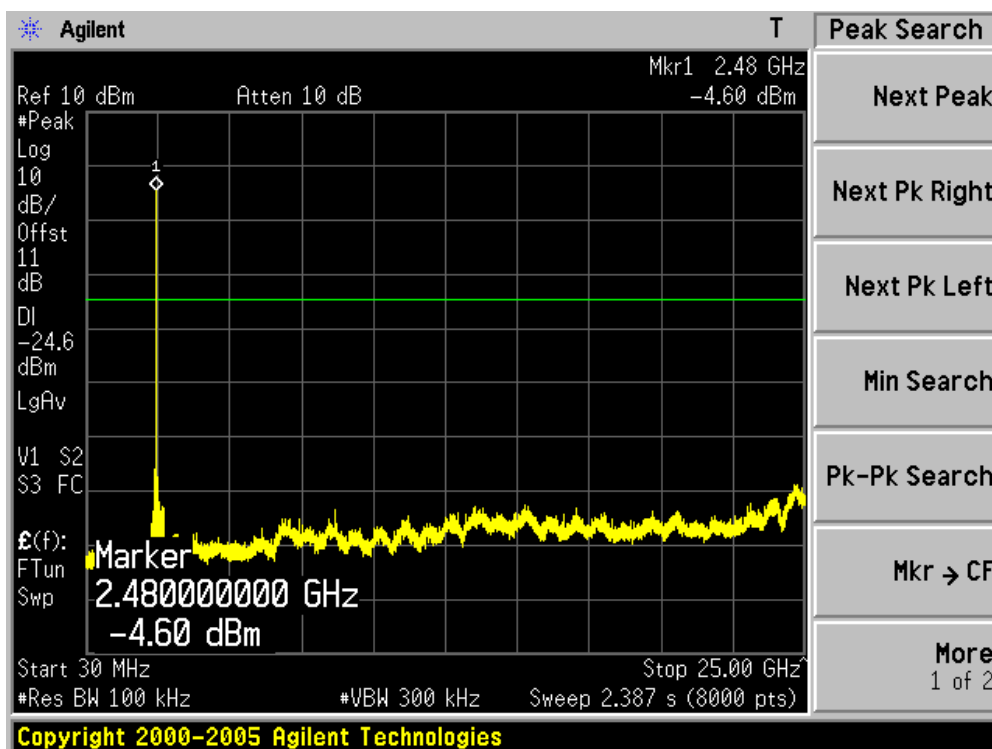
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)



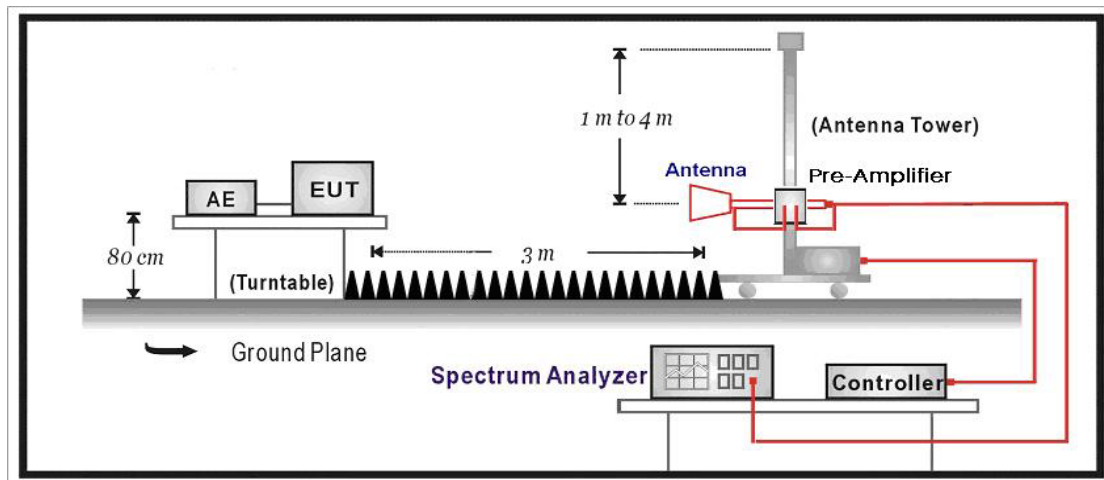
12. Radiated Emission Band Edge

12.1. Test Equipment

☒ Radiated Emission Band Edge / AC-5

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2015.03.28
EMI Test Receiver	R&S	ESCI	100573	2015.03.28
Preamplifier	Miteq	NSP1800-25	1364185	2015.05.03
Preamplifier	Quietek	AP-040G	CHM-0906001	2015.05.03
Bilog Antenna	Teseq GmbH	CBL6112D	27612	2014.10.15
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	737	2014.11.24
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	2015.03.01
Temperature/Humidity Meter	zhicheng	ZC1-2	AC5-TH	2015.01.08

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: 2009.

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 $\geq$ 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 $\pm 3.9 \text{ dB}$
below 1G is defined as $\pm 3.8 \text{ dB}$

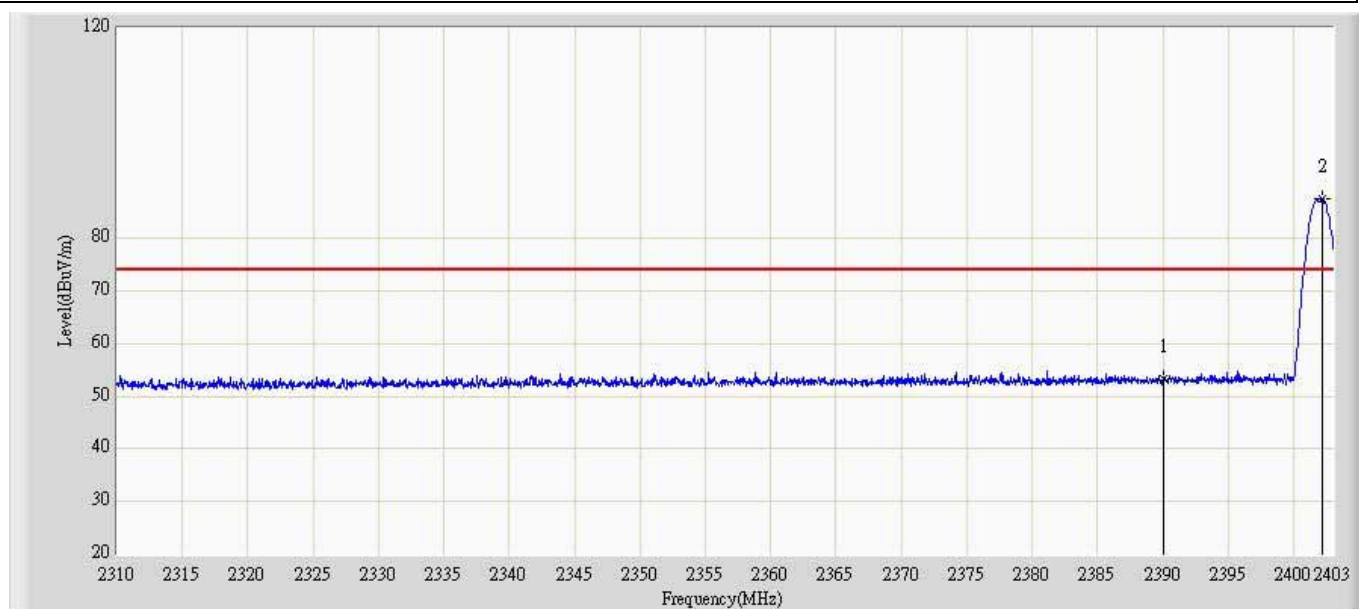
12.6. Test Result

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;

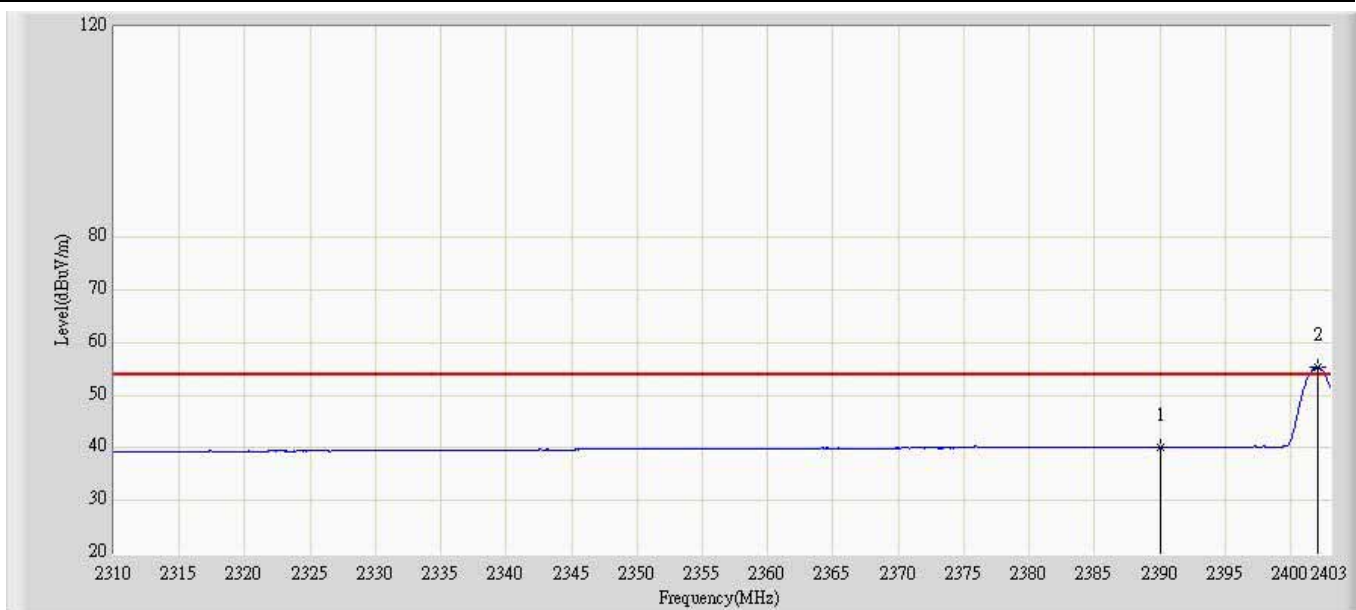
Average detector: RBW = 1MHz, VBW = 10Hz, sweep time = auto.

Site: AC5	Time: 2014/05/10 - 14:23
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 1: Transmit at channel 2402MHz by DH1	



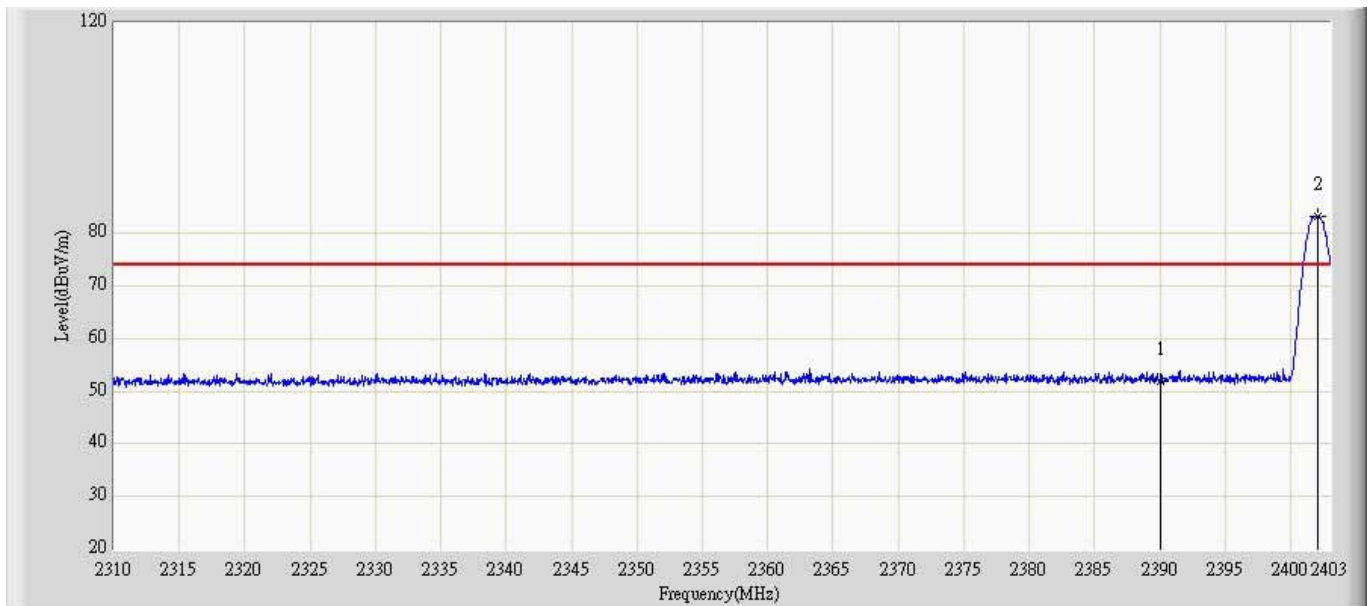
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	53.250	14.997	-20.750	74.000	38.253	PK
2		*	2402.163	87.625	49.263	N/A	N/A	38.361	PK

Site: AC5	Time: 2014/05/10 - 14:28
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 1: Transmit at channel 2402MHz by DH1	



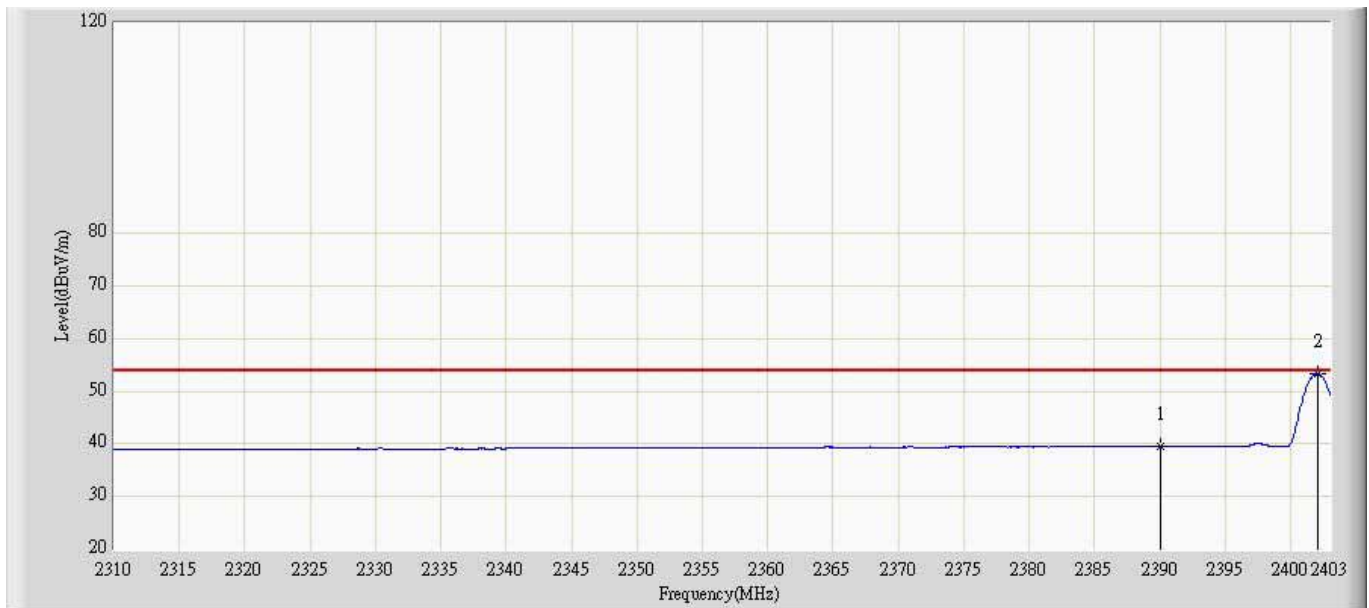
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	40.200	1.947	-13.800	54.000	38.253	AV
2		*	2402.070	55.277	16.916	N/A	N/A	38.361	AV

Site: AC5	Time: 2014/05/10 - 14:29
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 1: Transmit at channel 2402MHz by DH1	



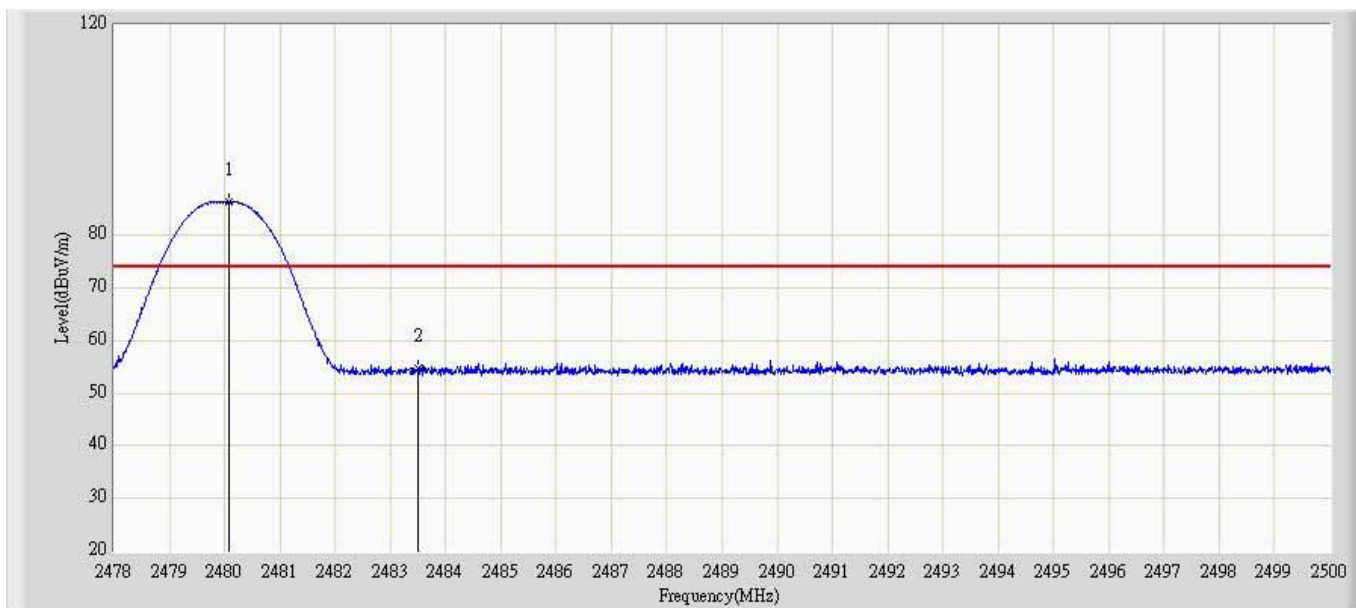
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	51.838	14.245	-22.162	74.000	37.593	PK
2		*	2402.116	83.229	45.576	N/A	N/A	37.653	PK

Site: AC5	Time: 2014/05/10 - 14:31
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 1: Transmit at channel 2402MHz by DH1	



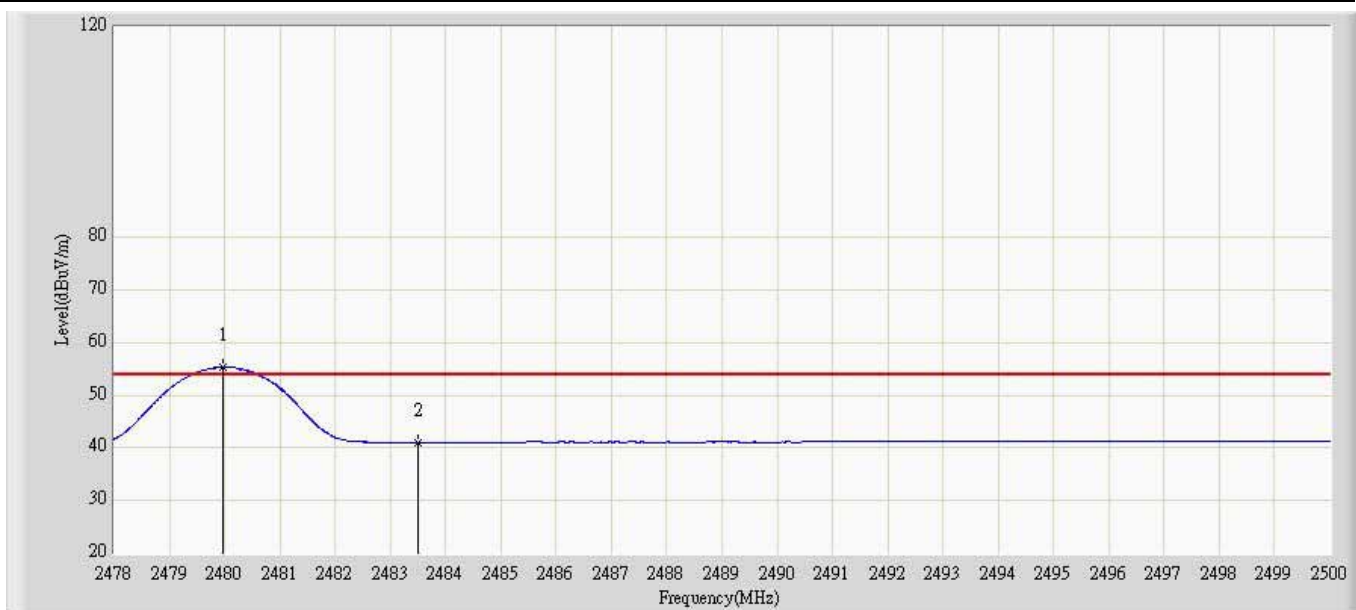
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	39.507	1.914	-14.493	54.000	37.593	AV
2		*	2402.070	53.275	15.623	N/A	N/A	37.652	AV

Site: AC5	Time: 2014/05/10 - 14:32
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 1: Transmit at channel 2480MHz by DH1	



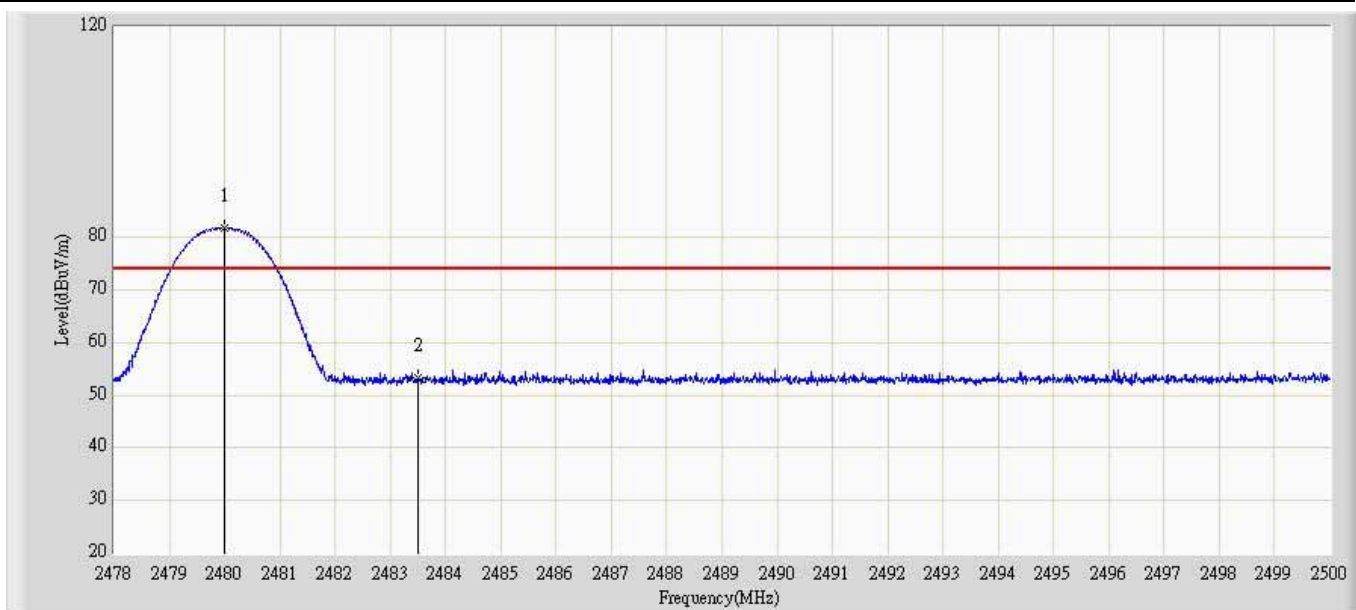
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.079	86.342	47.287	N/A	N/A	39.054	PK
2			2483.500	54.886	15.801	-19.114	74.000	39.084	PK

Site: AC5	Time: 2014/05/10 - 14:37
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 1: Transmit at channel 2480MHz by DH1	



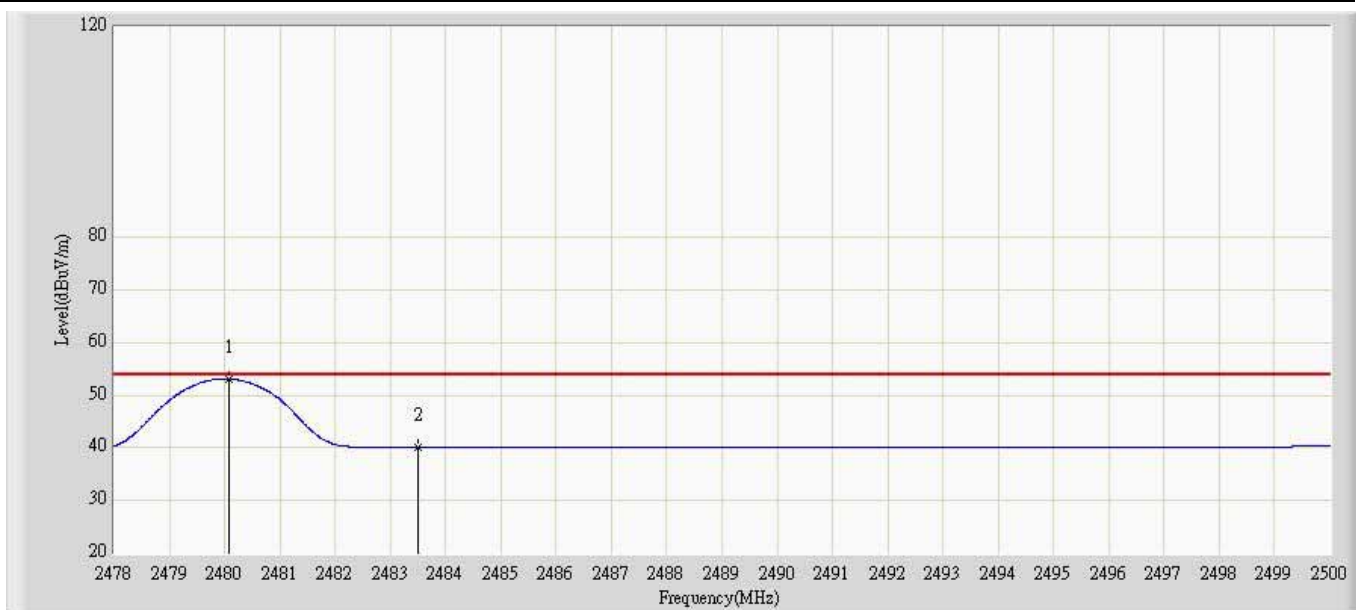
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2479.969	55.363	16.309	N/A	N/A	39.053	AV
2			2483.500	41.057	1.972	-12.943	54.000	39.084	AV

Site: AC5	Time: 2014/05/10 - 14:38
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 1: Transmit at channel 2480MHz by DH1	



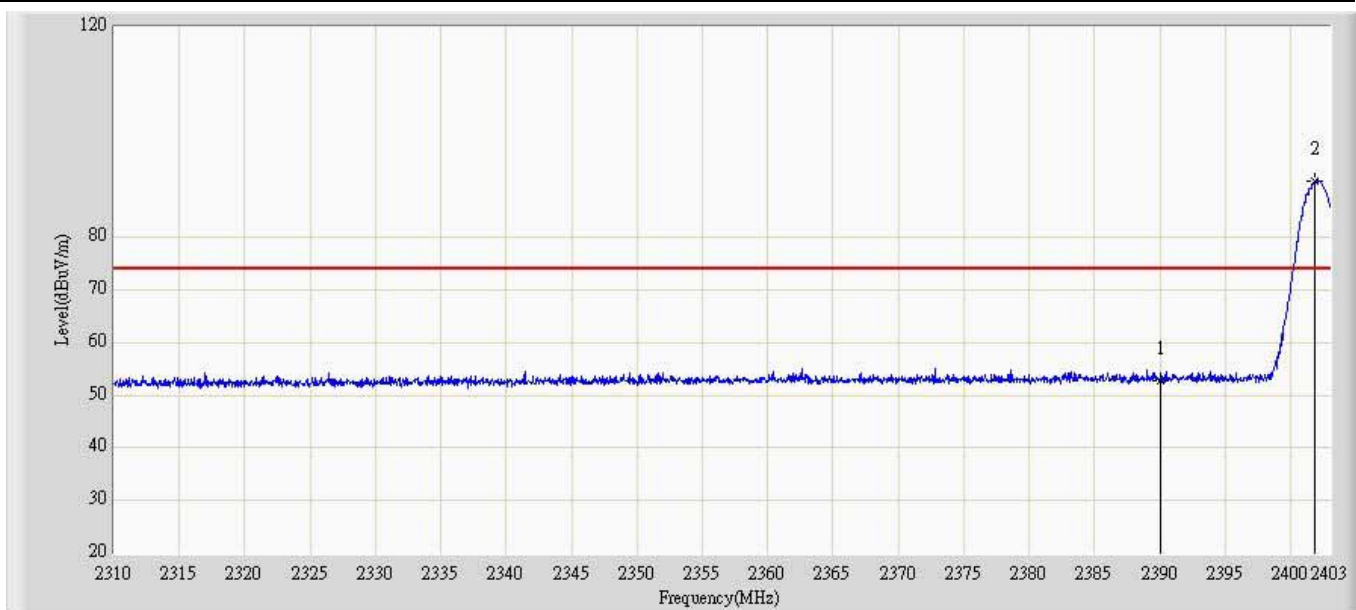
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2479.991	81.685	43.651	N/A	N/A	38.034	PK
2			2483.500	53.422	15.371	-20.578	74.000	38.050	PK

Site: AC5	Time: 2014/05/10 - 14:39
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 1: Transmit at channel 2480MHz by DH1	



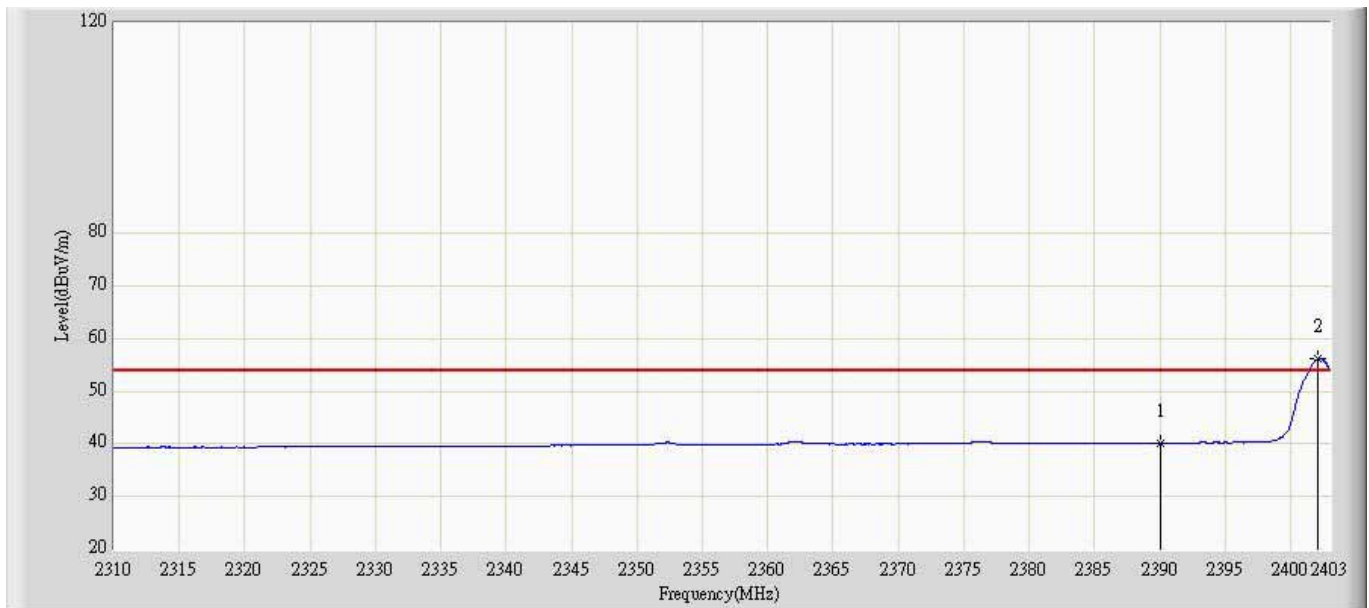
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.079	53.109	15.075	N/A	N/A	38.034	AV
2			2483.500	40.032	1.981	-13.968	54.000	38.050	AV

Site: AC5	Time: 2014/05/10 - 14:47
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 2: Transmit at channel 2402MHz by 2DH1	



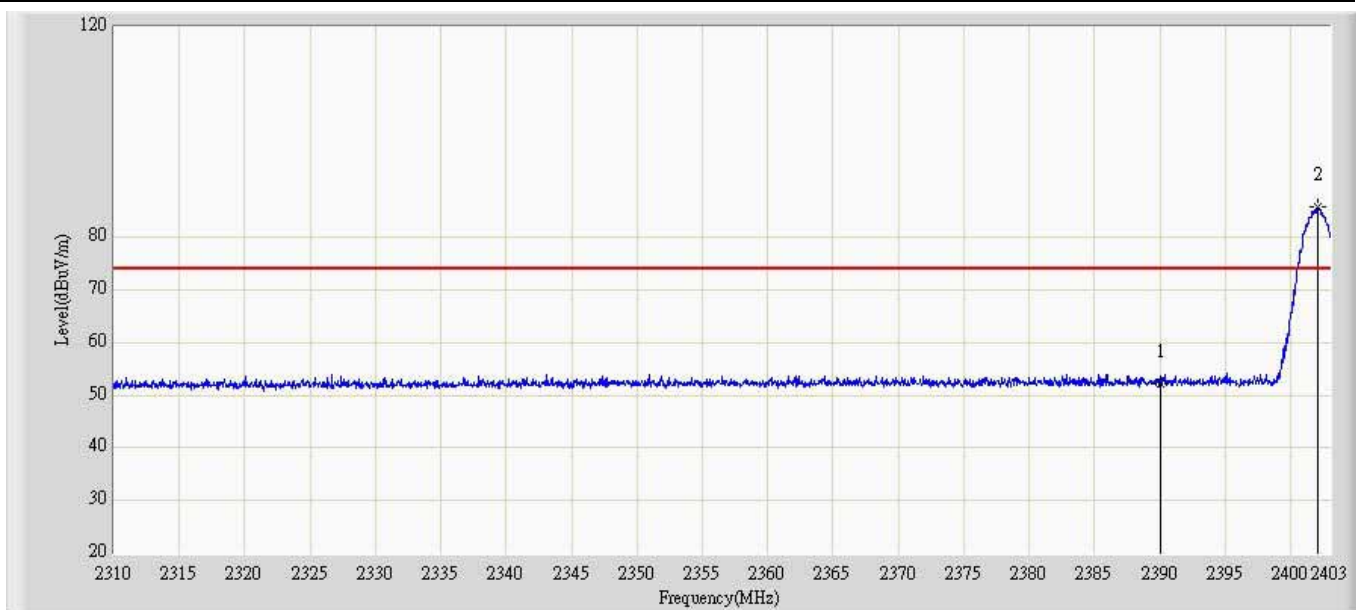
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	52.775	14.522	-21.225	74.000	38.253	PK
2		*	2401.884	90.713	52.354	N/A	N/A	38.359	PK

Site: AC5	Time: 2014/05/10 - 15:19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 2: Transmit at channel 2402MHz by 2DH1	



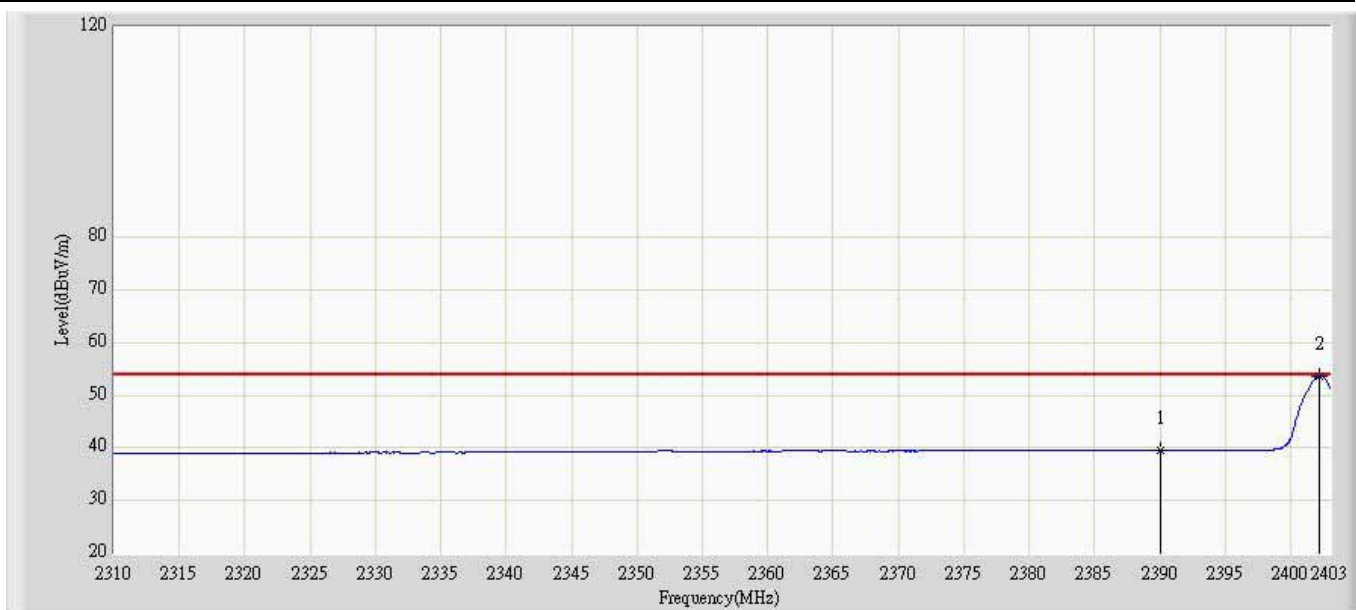
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	40.181	1.928	-13.819	54.000	38.253	AV
2		*	2402.116	56.213	17.852	N/A	N/A	38.361	AV

Site: AC5	Time: 2014/05/10 - 15:20
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 2: Transmit at channel 2402MHz by 2DH1	



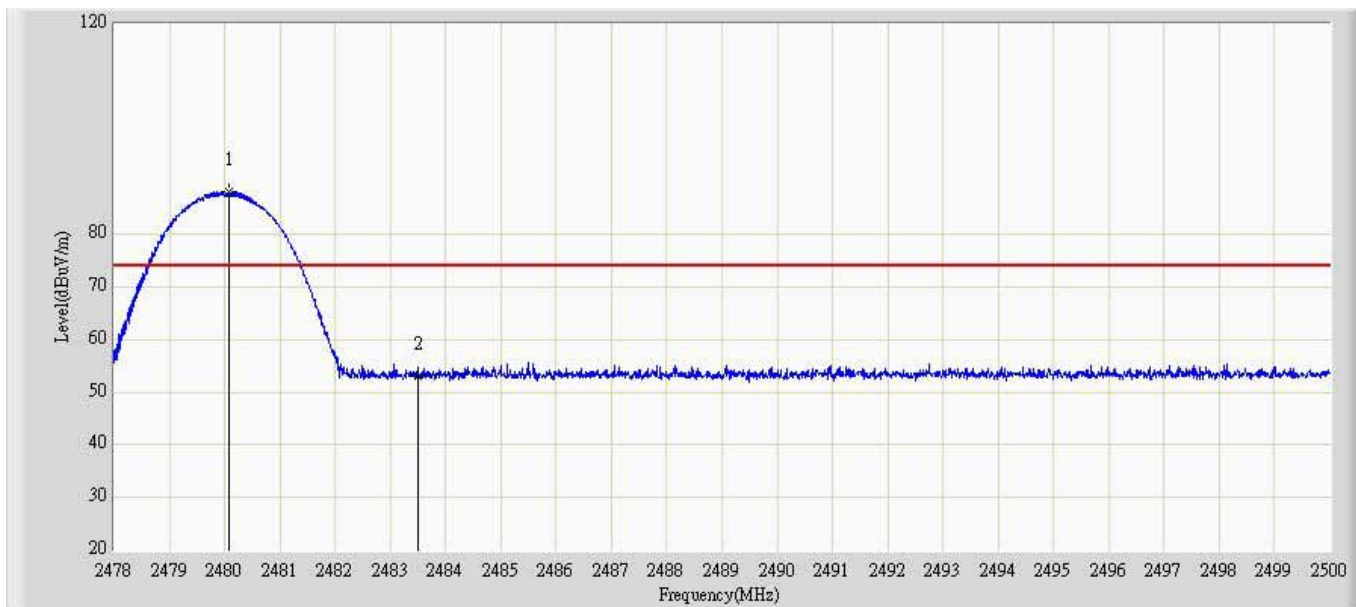
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	52.111	14.518	-21.889	74.000	37.593	PK
2		*	2402.116	85.708	48.055	N/A	N/A	37.653	PK

Site: AC5	Time: 2014/05/10 - 15:22
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 2: Transmit at channel 2402MHz by 2DH1	



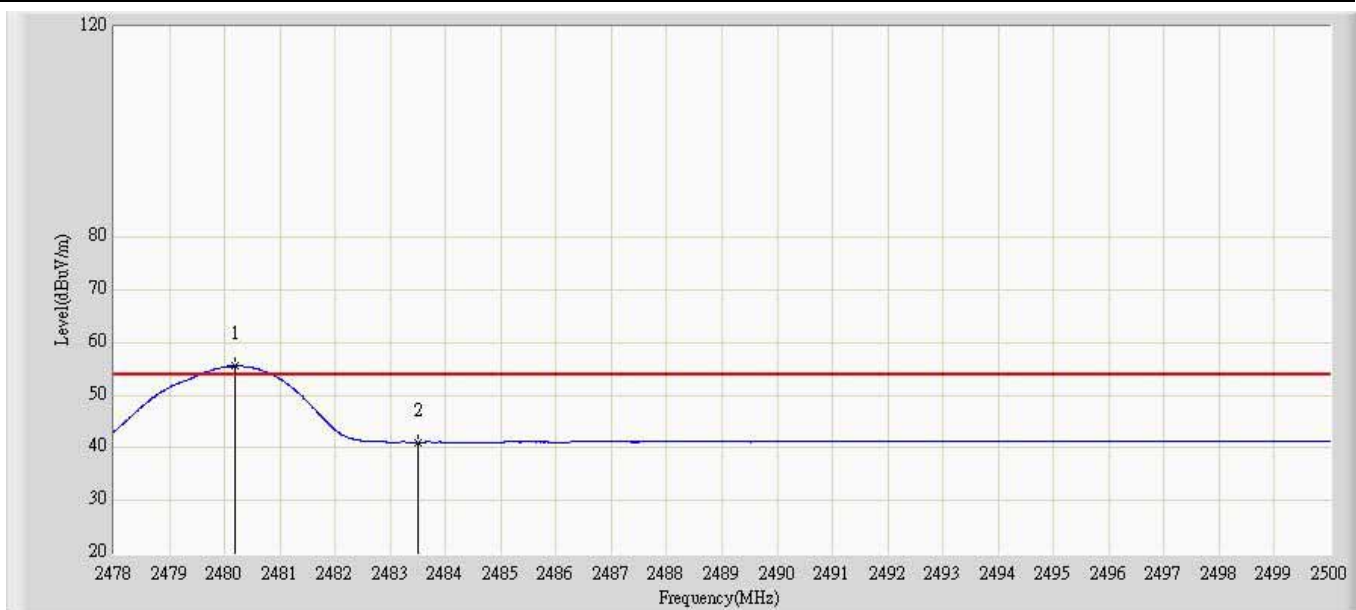
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	39.517	1.924	-14.483	54.000	37.593	AV
2		*	2402.163	53.706	16.053	N/A	N/A	37.653	AV

Site: AC5	Time: 2014/05/10 - 14:40
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 2: Transmit at channel 2480MHz by 2DH1	



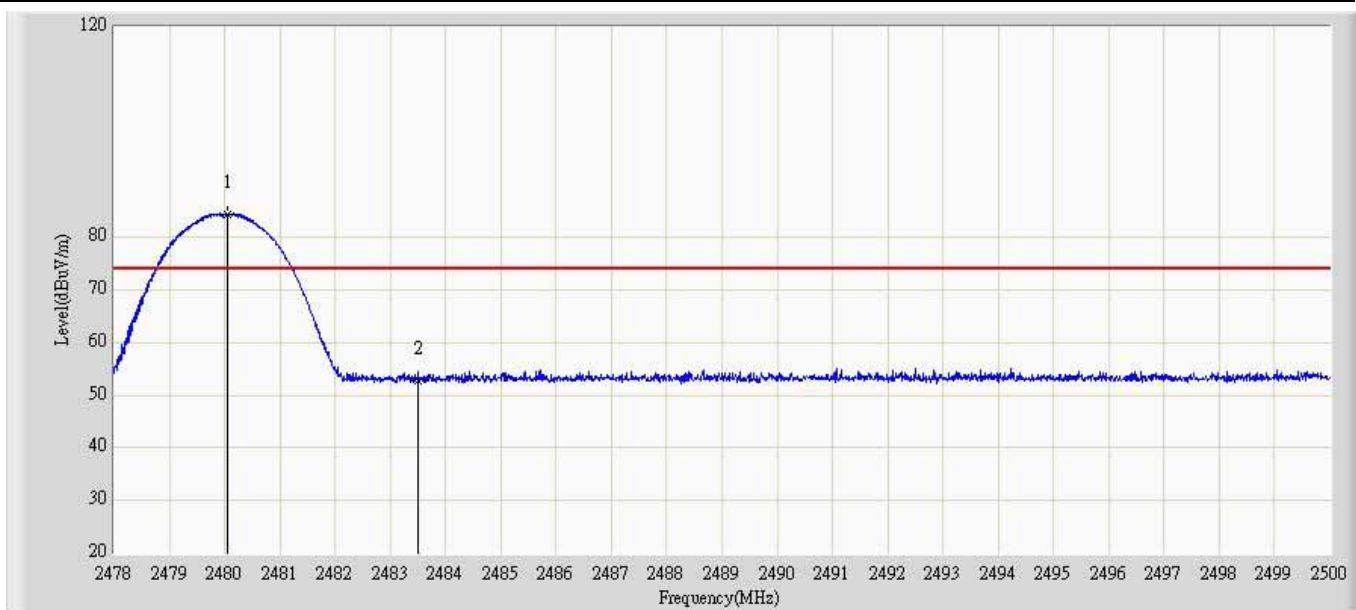
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.090	87.994	48.939	N/A	N/A	39.054	PK
2			2483.500	52.933	13.848	-21.067	74.000	39.084	PK

Site: AC5	Time: 2014/05/10 - 14:41
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 2: Transmit at channel 2480MHz by 2DH1	



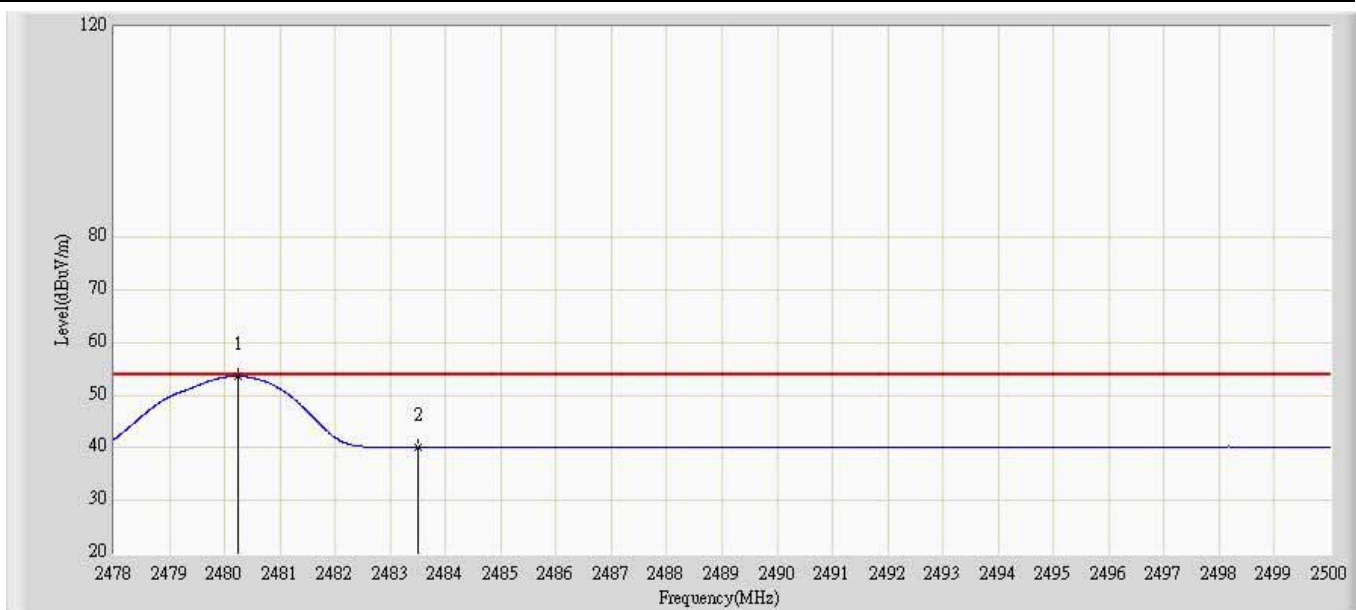
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.178	55.526	16.471	N/A	N/A	39.055	AV
2			2483.500	41.081	1.996	-12.919	54.000	39.084	AV

Site: AC5	Time: 2014/05/10 - 14:42
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 2: Transmit at channel 2480MHz by 2DH1	



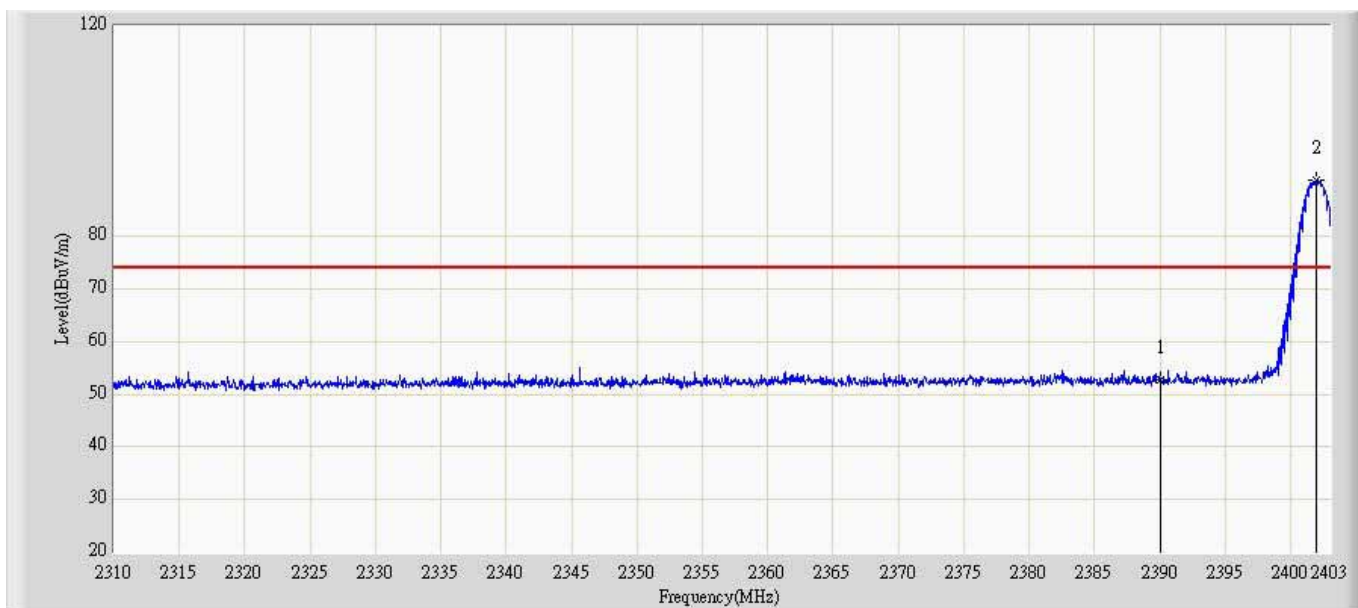
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.046	84.442	46.408	N/A	N/A	38.034	PK
2			2483.500	52.667	14.616	-21.333	74.000	38.050	PK

Site: AC5	Time: 2014/05/10 - 14:46
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 2: Transmit at channel 2480MHz by 2DH1	



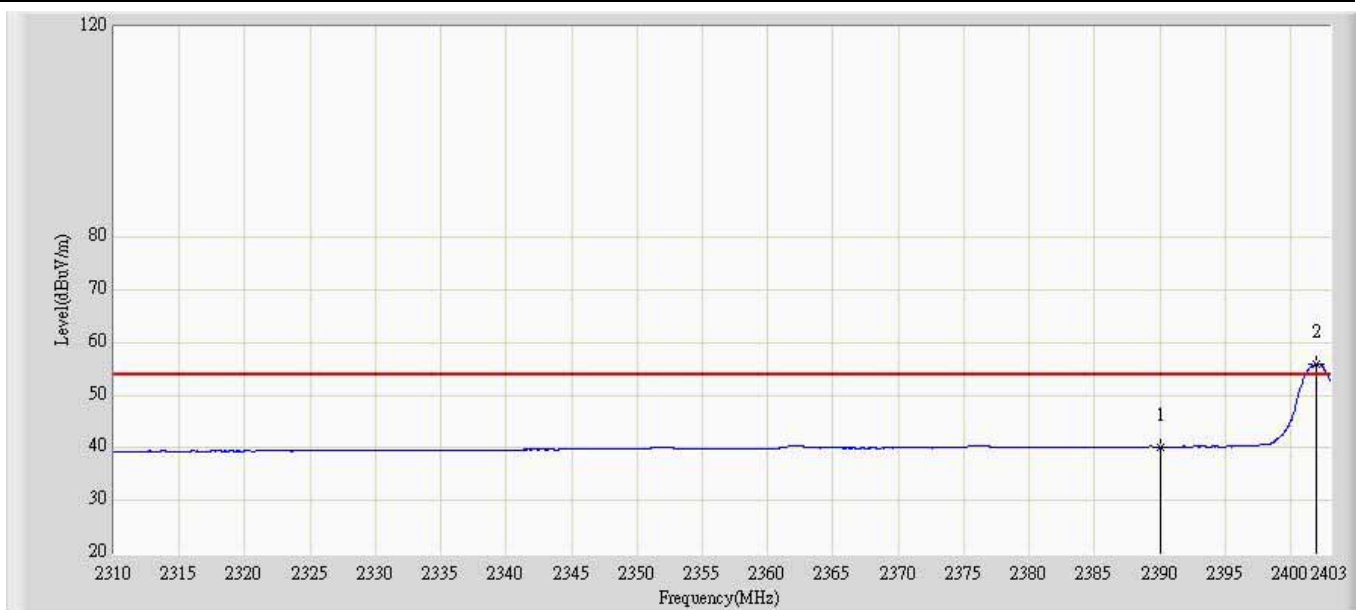
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.244	53.598	15.563	N/A	N/A	38.035	AV
2			2483.500	40.062	2.011	-13.938	54.000	38.050	AV

Engineer: Jack	
Site: AC5	Time: 2014/05/10 - 15:23
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 3: Transmit at channel 2402MHz by 3DH1	



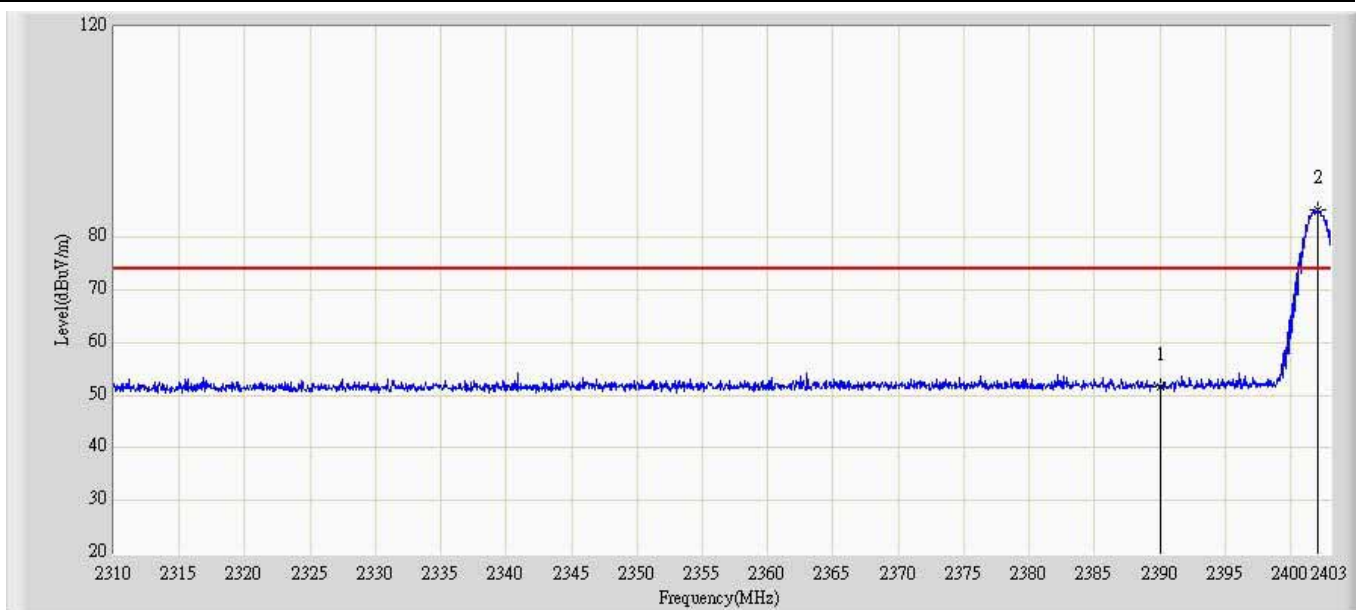
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	52.674	14.421	-21.326	74.000	38.253	PK
2		*	2401.930	90.702	52.343	N/A	N/A	38.360	PK

Site: AC5	Time: 2014/05/10 - 15:24
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 3: Transmit at channel 2402MHz by 3DH1	



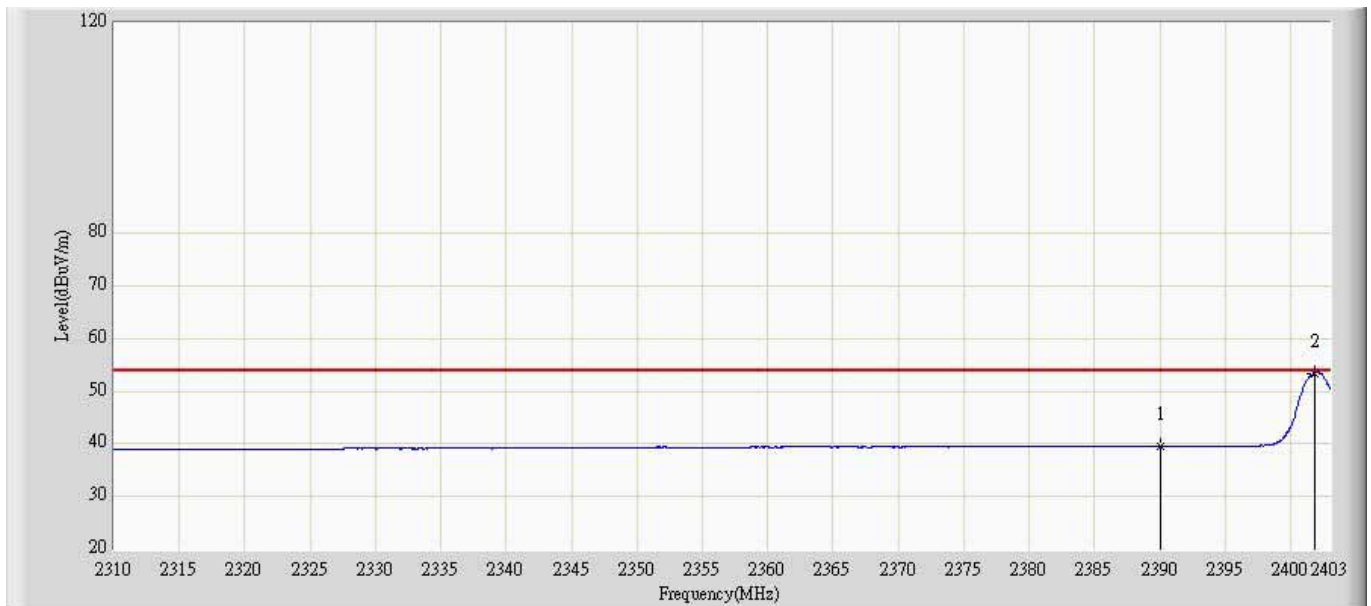
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	40.234	1.981	-13.766	54.000	38.253	AV
2		*	2401.930	55.947	17.588	N/A	N/A	38.360	AV

Site: AC5	Time: 2014/05/10 - 15:24
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 3: Transmit at channel 2402MHz by 3DH1	



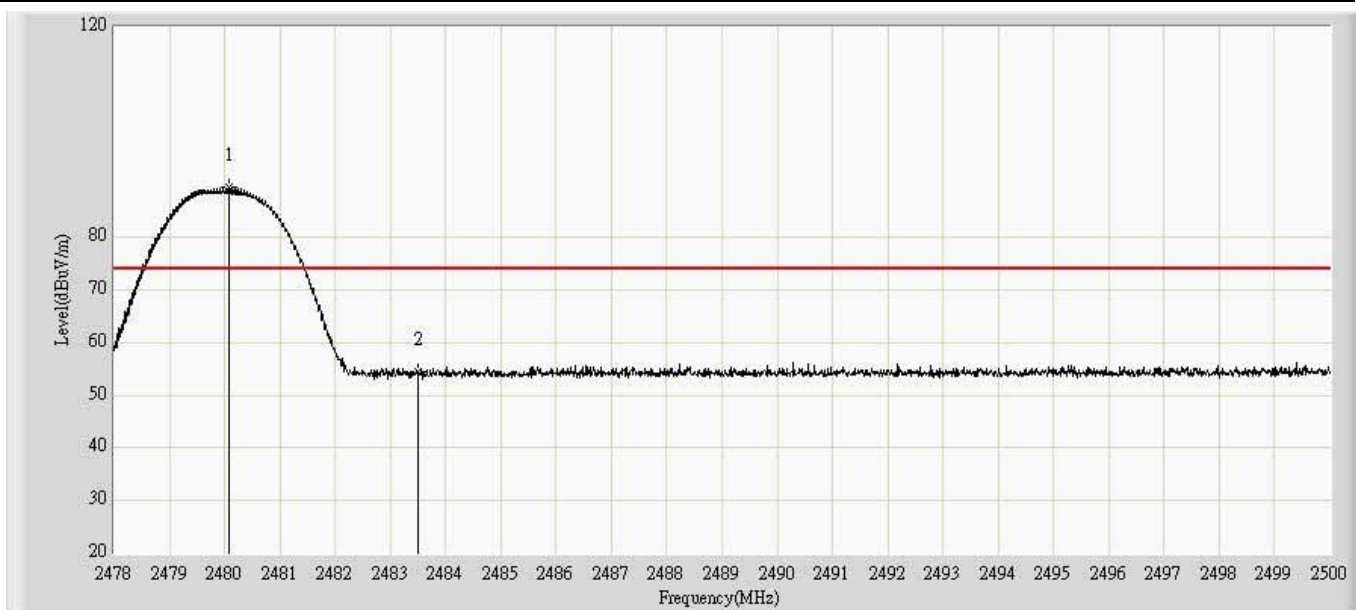
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	51.664	14.071	-22.336	74.000	37.593	PK
2		*	2402.023	85.373	47.721	N/A	N/A	37.652	PK

Site: AC5	Time: 2014/05/10 - 15:25
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 3: Transmit at channel 2402MHz by 3DH1	



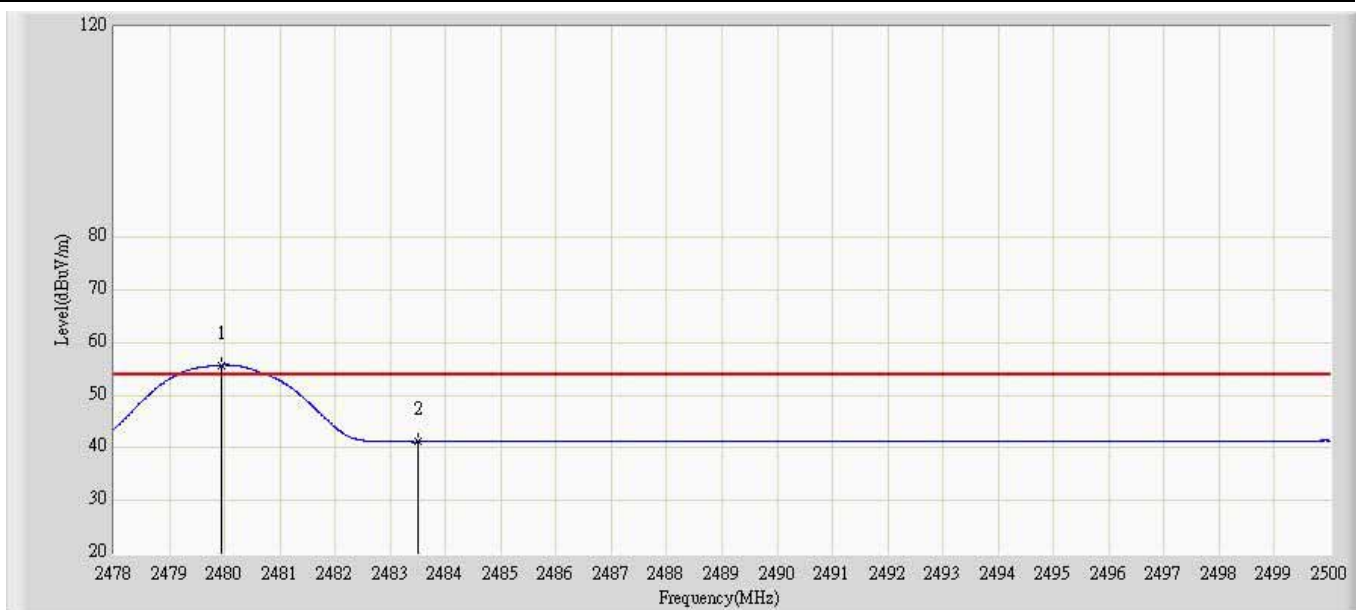
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	39.537	1.944	-14.463	54.000	37.593	AV
2		*	2401.791	53.446	15.795	N/A	N/A	37.651	AV

Site: AC5	Time: 2014/05/10 - 15:26
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 3: Transmit at channel 2480MHz by 3DH1	



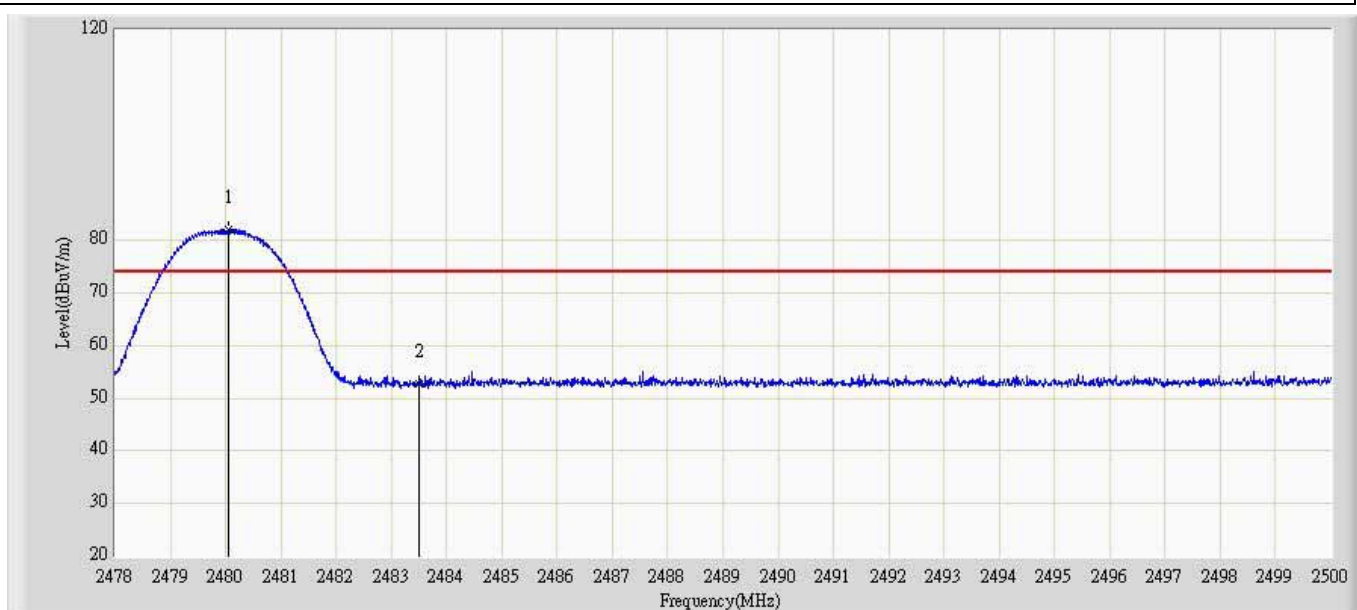
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.068	89.427	50.373	N/A	N/A	39.054	PK
2			2483.500	54.448	15.363	-19.552	74.000	39.084	PK

Site: AC5	Time: 2014/05/10 - 15:30
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 3: Transmit at channel 2480MHz by 3DH1	



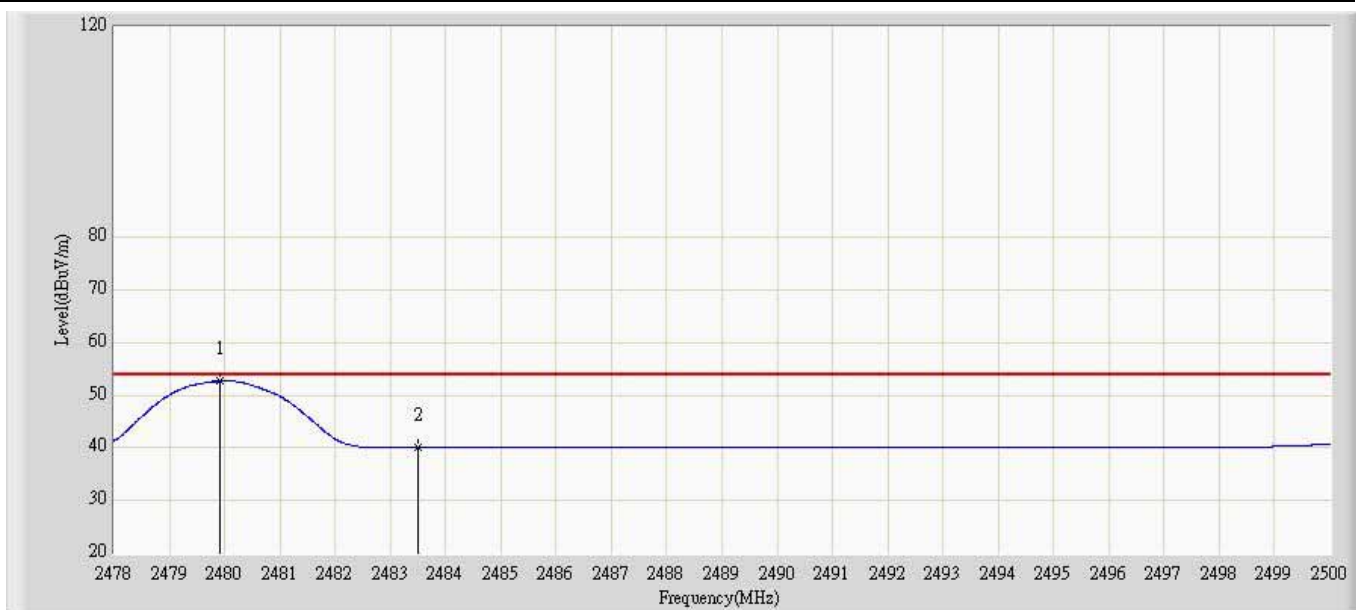
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2479.936	55.749	16.696	N/A	N/A	39.053	AV
2			2483.500	41.133	2.048	-12.867	54.000	39.084	AV

Site: AC5	Time: 2014/05/10 - 15:31
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 3: Transmit at channel 2480MHz by 3DH1	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.046	82.068	44.034	N/A	N/A	38.034	PK
2			2483.500	52.822	14.771	-21.178	74.000	38.050	PK

Site: AC5	Time: 2014/05/10 - 15:32
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Kreyos Meteor	Power: By Battery
Note: Mode 3: Transmit at channel 2480MHz by 3DH1	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2479.903	52.666	14.633	N/A	N/A	38.033	AV
2			2483.500	40.050	1.999	-13.950	54.000	38.050	AV

13. Receiver Spurious Emission for Industry Canada RSS-Gen Requirement

13.1 Test Equipment

Radiated Emission / AC-2

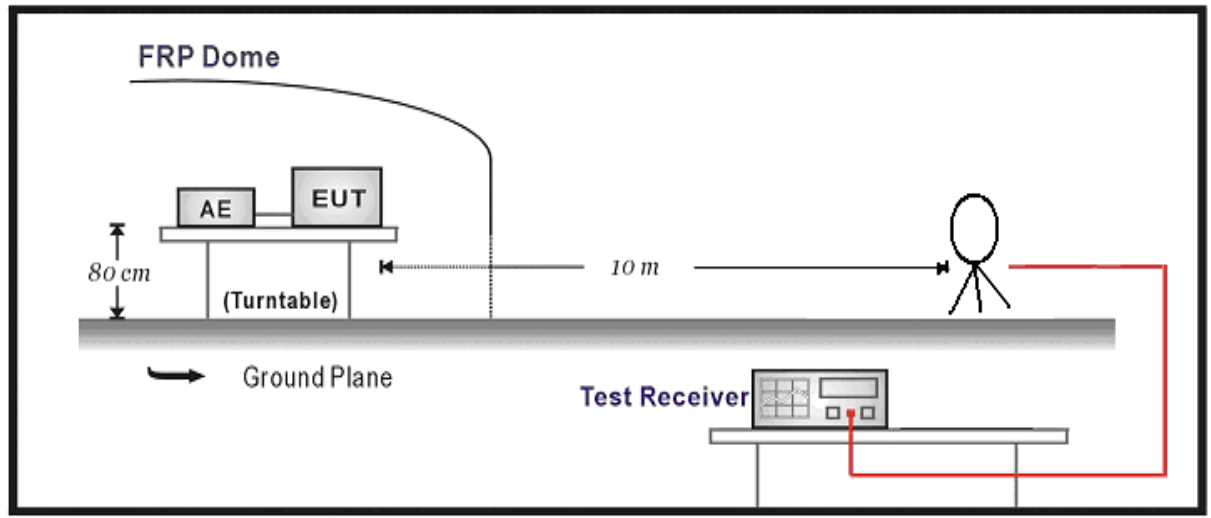
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100573	2015.03.28
Loop Antenna	R&S	HFH2-Z2	833799/003	2014.11.22
Bilog Antenna	Teseq GmbH	CBL6112D	27611	2014.10.15
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC2-C	2015.03.01
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC2-TH	2015.01.08

Radiated Emission / AC-5

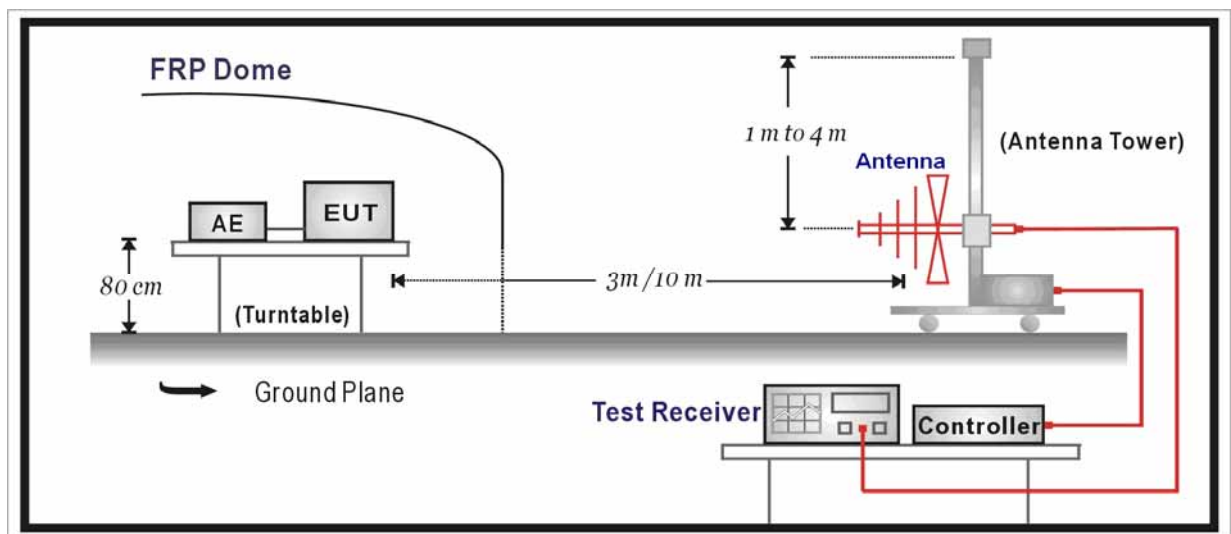
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2015.03.28
Preamplifier	Miteq	NSP1800-25	1364185	2015.05.03
Preamplifier	Quietek	AP-040G	CHM-0906001	2015.05.03
Bilog Antenna	Teseq GmbH	CBL6112D	27612	2014.10.15
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	499	2014.06.08
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	294	2014.11.24
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2015.03.01
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	2015.01.08

13.2 Test Setup

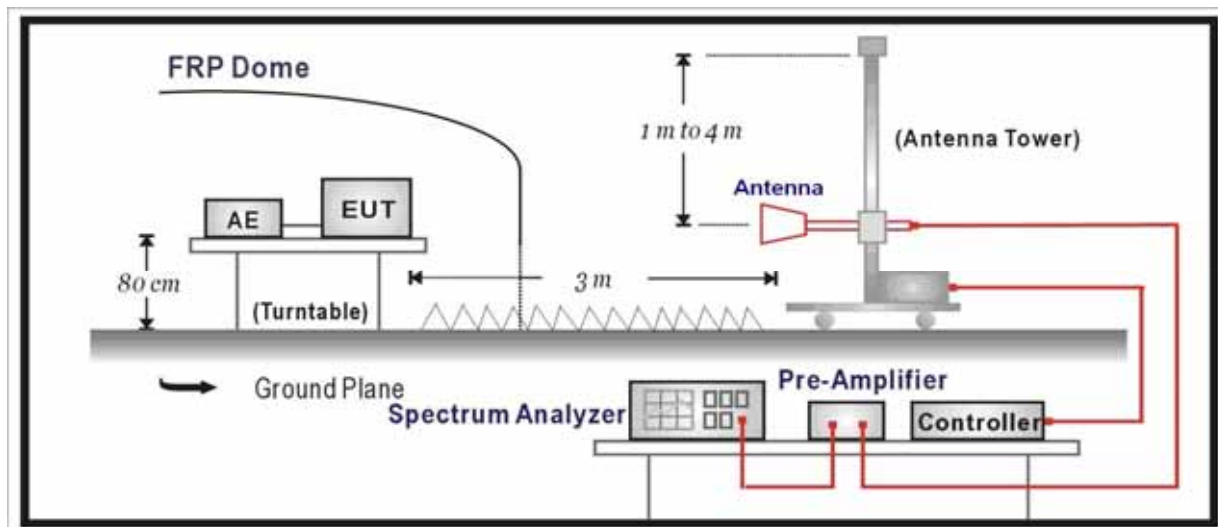
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



13.3 Limit

FCC Part 15 Subpart B Paragraph 15.109		
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)

13.4 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 9kHz 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.

13.5 Deviation from Test Standard

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

13.6 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 detector: RBW = 1MHz, VBW = 10Hz, sweep time = auto.

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

Mode 1: Receive-1Mbps (GFSK_DH1)

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
00	H	2203.3	46.8	-8.3	38.5	54(Note)	-15.5	PK
	H	3987.2	44.0	-3.6	40.4	54(Note)	-13.6	PK
	V	1563.7	46.9	-10.2	36.7	54(Note)	-17.3	PK
	V	2977.4	45.0	-5.2	39.8	54(Note)	-14.2	PK
39	H	1774.1	46.2	-9.8	36.4	54(Note)	-17.6	PK
	H	3288.8	46.0	-5.0	41.0	54(Note)	-13.0	PK
	V	1715.2	46.9	-9.8	37.1	54(Note)	-16.9	PK
	V	3330.9	45.5	-5.0	40.5	54(Note)	-13.5	PK
78	H	1521.6	46.7	-10.3	36.4	54(Note)	-17.6	PK
	H	2699.7	45.1	-6.2	38.9	54(Note)	-15.1	PK
	V	1361.8	47.1	-10.9	36.2	54(Note)	-17.8	PK
	V	2245.3	46.7	-8.1	38.6	54(Note)	-15.4	PK

Note: 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: Receive-2Mbps (Pi/4 DQPSK_DH1)

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
00	H	1425.4	46.1	-10.7	35.4	54(Note)	-18.6	PK
	H	2504.7	44.5	-6.9	37.6	54(Note)	-16.4	PK
	V	1586.8	46.5	-10.2	36.3	54(Note)	-17.7	PK
	V	3091.2	45.1	-5.1	40.0	54(Note)	-14.0	PK
39	H	1348.9	47.2	-11.0	36.2	54(Note)	-17.8	PK
	H	2725.7	44.7	-6.2	38.5	54(Note)	-15.5	PK
	V	1884.3	46.7	-9.6	37.1	54(Note)	-16.9	PK
	V	3278.2	44.5	-5.0	39.5	54(Note)	-14.5	PK
78	H	1442.4	46.1	-10.6	35.5	54(Note)	-18.5	PK
	H	2997.7	44.2	-5.2	39.0	54(Note)	-15.0	PK
	V	1510.3	45.8	-10.3	35.5	54(Note)	-18.5	PK
	V	2989.2	45.0	-5.2	39.8	54(Note)	-14.2	PK

Note: 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.

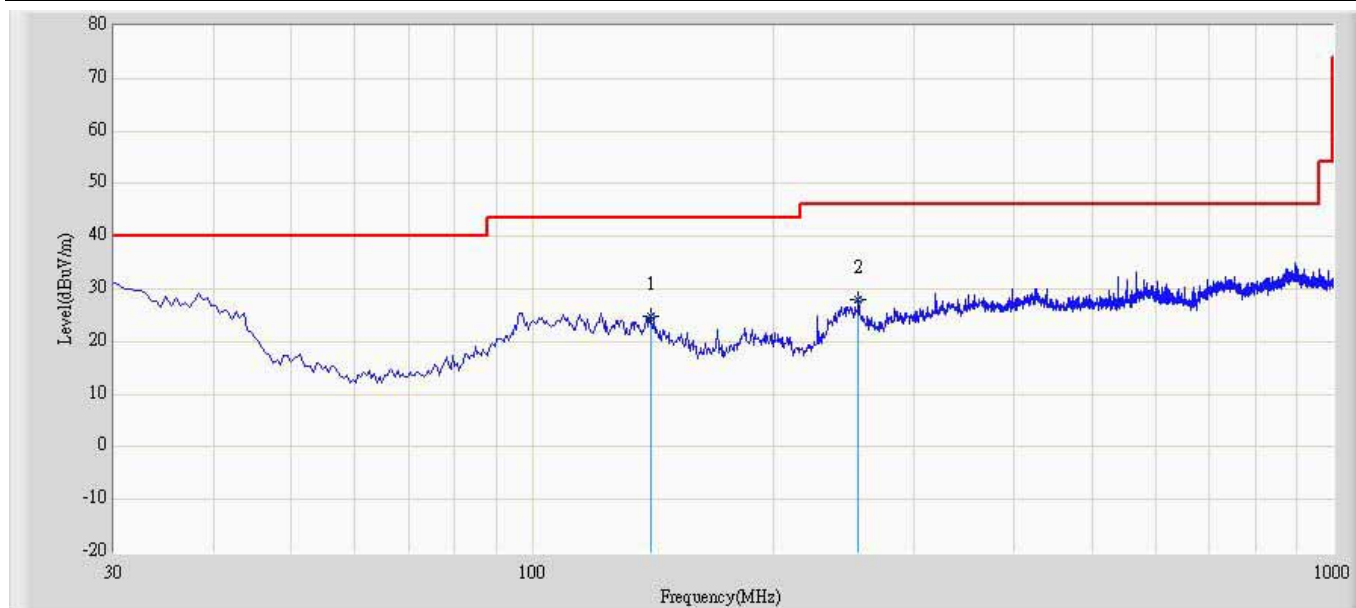
Mode 3: Receive-3Mbps (8DPSK_DH1)

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
00	H	1365.9	46.9	-10.9	36.0	54(Note)	-18.0	PK
	H	2462.3	46.7	-7.1	39.6	54(Note)	-14.4	PK
	V	1722.8	47.2	-9.9	37.3	54(Note)	-16.7	PK
	V	3269.7	45.5	-5.0	40.5	54(Note)	-13.5	PK
39	H	1535.8	46.5	-10.3	36.2	54(Note)	-17.8	PK
	H	2955.2	45.1	-5.3	39.8	54(Note)	-14.2	PK
	V	1450.9	46.2	-10.6	35.6	54(Note)	-18.4	PK
	V	2394.3	44.8	-7.5	37.3	54(Note)	-16.7	PK
78	H	1450.9	46.2	-10.6	35.6	54(Note)	-18.4	PK
	H	2394.3	44.8	-7.5	37.3	54(Note)	-16.7	PK
	V	1450.9	47.8	-10.6	37.2	54(Note)	-16.8	PK
	V	2589.7	45.0	-6.8	38.2	54(Note)	-15.8	PK

Note: 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.

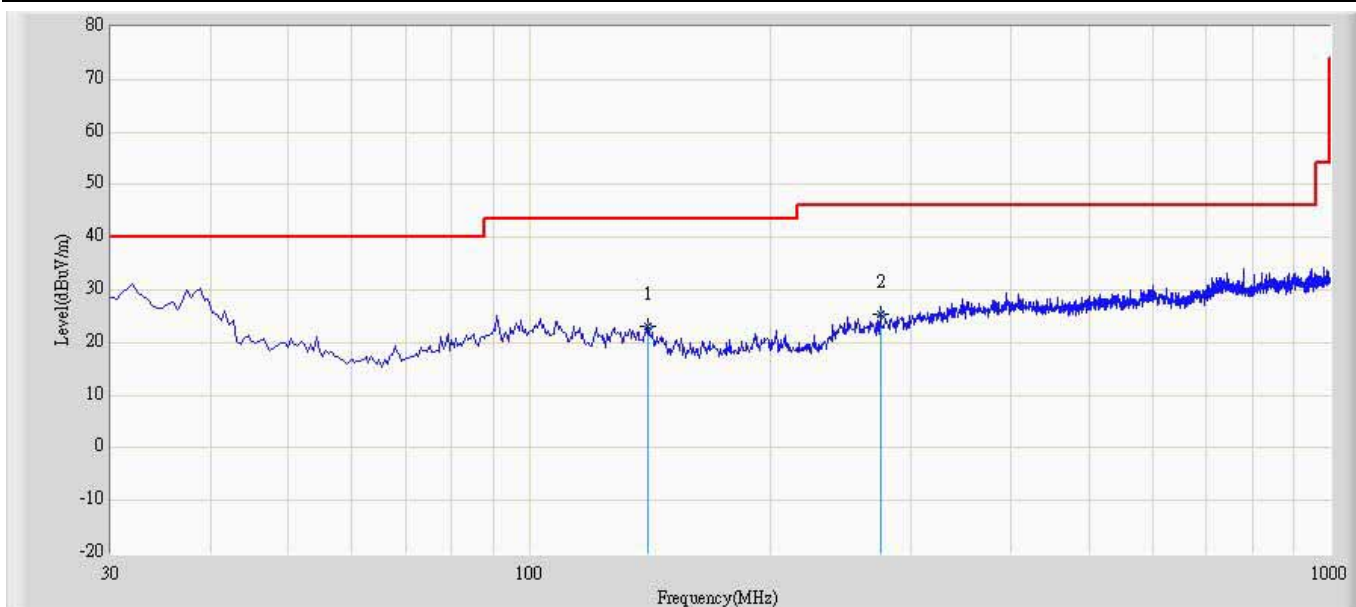
The worst case of Radiated Emission below 1GHz:

Site: AC2	Time: 2014/05/19 - 10:20
Limit: FCC_Part15.109_RE(3m)	Margin: 0
Probe: CBL6112D_27611(30-1000MHz)	Polarity: Horizontal
EUT: Kreyos Meteor	Power:DC
Note: Mode1: Receive at channel 2402MHz by DH1	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		140.580	25.907	2.356	-17.593	43.500	23.551	QP
2	*	255.525	28.887	2.246	-17.113	46.000	26.641	QP

Site: AC2	Time: 2014/05/19 - 10:38
Limit: FCC_Part15.109_RE(3m)	Margin: 0
Probe: CBL6112D_27611(30-1000MHz)	Polarity: Vertical
EUT: Kreyos Meteor	Power: DC
Note: Mode1: Receive at channel 2402MHz by DH1	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	140.580	24.122	1.945	-19.378	43.500	22.177	QP
2		274.440	26.356	1.816	-19.644	46.000	24.540	QP

The End