



FCC TEST REPORT

according to

FCC Rules and Regulations Part 15 Subpart C

Applicant	:	Matrix Sound Limited
Address	:	95 High Street Hail Weston St Neots Cambridgeshire PE19 5JS
Equipment	:	Bluetooth Speaker
Model No.	:	X10
Trademark	:	BLUE AURA
FCC ID	:	OSY-X10

- The test result refers exclusively to the test presented test model / sample.,
- Without written approval of **Cerpass Technology (Suzhou) Co., Ltd.** the test report shall not be reproduced except in full.
- The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Rules and Regulations Part 15. The test report has been issued separately.
- The test report must not be used by the clients to claim product certification approval by **NVLAP** or any agency of the Government.



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History of this test report

☒ ORIGINAL.

☐ Additional attachment as following record:

Attachment No.	Issue Date	Description



CERTIFICATE OF COMPLIANCE

according to

FCC Rules and Regulations Part 15 Subpart C

Applicant	:	Matrix Sound Limited
Address	:	95 High Street Hail Weston St Neots Cambridgeshire PE19 5JS
Manufacturer	:	Dongguan Tristar Electronic Co., Ltd.
Address	:	No.24A DongXing Ave south, ZhenXingWei, TangXia Town, DongGuan City 523710, China
Equipment	:	Bluetooth Speaker
Model No.	:	X10
Trademark	:	
FCC ID	:	OSY-X10

I **HEREBY** CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **ANSI C63.4** The equipment was ***passed*** the test performed according to **FCC Rules and Regulations Part 15 Subpart C (2010)**.

The test was carried out on Aug 9~Sept. 12, 2013 at ***Cerpass Technology (Suzhou) Co.,Ltd***

Signature



Miro Chueh/ Technical director



1. Report of Measurements and Examinations

1.1 List of Measurements and Examinations

FCC Rule	. Description of Test	Result
§ 15.203	. Antenna Requirement	Pass
§ 15.207(a)	. Conducted Emission	Pass
§ 15.209(a)	. Radiated Emission	Pass
§ 15.247(a)(1)	. Channel Carrier Frequencies Separation	Pass
§ 15.247(a)(1)	. 20dB Bandwidth Measurement	Pass
§ 15.247(a)(1)	. Dwell Time	Pass
§ 15.247(b)	. Number of Hopping Channels	Pass
§ 15.247(b)	. Peak Output Power Measurement Data	Pass
§ 15.247(d)	. Band Edges Measurement Data	Pass



2. Test Configuration of Equipment under Test

2.1 Feature of Equipment under Test

Frequency	2.402GHz~2.480GHz
Number of Channel	79 channel
Modulation type	GFSK, $\pi/4$ PSK, 8DPSK
Power Supply	I/P: AC100-240V~ 50-60Hz 100WATTS. O/P:DC5.0V 500mA
Bluetooth Version	V1.0
Transmit Power	GFSK: 5.27dBm
	8DPSK: 4.91dBm
Antenna type	Internal PCB Antenna 0dBi
Operating Temperature	0℃~35℃

2.2 Carrier Frequency of Channels

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



2.3 Test Mode & Test Software

- a. During testing, the interface cables and equipment positions were varied according to ANSI C63.4
- b. The complete test system included EUT for RF test.
- c. The EUT was executed to keep transmitting and receiving data via Bluetooth.
- d. The following test mode was performed for conduction and radiation test:
GFSK: CH 00: 2402MHz, CH 39: 2441MHz, CH 78: 2480MHz.
8DPSK: CH 00: 2402MHz, CH 39: 2441MHz, CH 78: 2480MHz.

2.4 Description of Test System

Device	Manufacturer	Model No.	Description
Remote workstation			
NB	SONY	PCG-71811P	N/A



2.5 General Information of Test

Test Site:	CerpPASS Technology (Suzhou) Co.,Ltd
Test Site Location :	No.66,Tangzhuang Road, Suzhou Industrial Park, Jiangsu 215006, China
NVLAP LAB Code :	200814-0
FCC Registration Number :	916572, 331395
IC Registration Number :	7290A-1, 7290A-2
VCCI Registration Number :	T-1945 for Telecommunication Test C-2919 for Conducted emission test R-2670 for Radiated emission test below 1GHz G-227 for Radiated emission test above 1GHz
Frequency Range Investigated:	Conducted: from 150kHz to 30MHz Radiation: from 30MHz to 25000MHz
Test Distance:	The test distance of radiated emission from antenna to EUT is 3 M.



2.6 Measurement Uncertainty

Measurement Item	Measurement Uncertainty
Conducted Emission	± 2.71 dB
Radiation test (10m) below 1GHz	Vertical : ± 3.89 dB
	Horizontal: ± 4.11 dB
Radiation test (3m) below 1GHz	Vertical : ± 4.11 dB
	Horizontal: ± 4.10 dB
20 dB Bandwidth	7500 Hz
Maximum Peak Output Power	± 1.4 dB
100kHz Bandwidth of Frequency Band Edges	± 2.2 dB
Power Spectral Density	± 1.3870 dB



3. Antenna Requirements

3.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

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

3.2 Antenna Construction and Directional Gain

Antenna type: Internal PCB Antenna

Antenna Gain: 0 dBi



4. Test of Conducted Emission

4.1 Test Limit

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz on the 120 VAC power and return leads of the EUT according to the methods defined in ANSI C63.4-2009 Section 3.1. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 2.2. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

Frequency (MHz)	Quasi Peak (dB μ V)	Average (dB μ V)
0.15 – 0.5	66-56*	56-46*
0.5 – 5.0	56	46
5.0 – 30.0	60	50

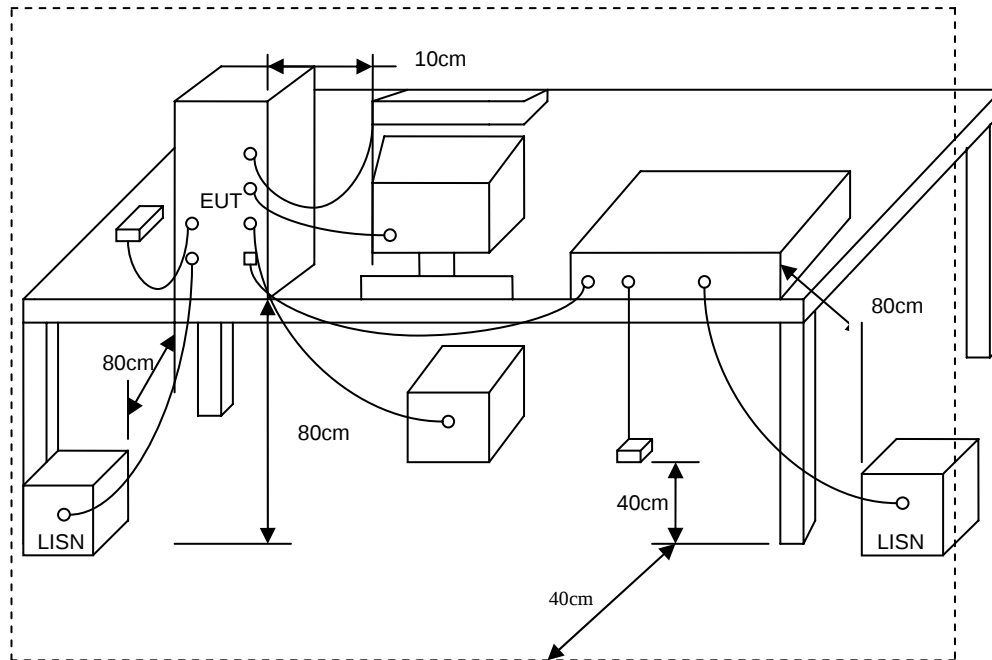
*Decreases with the logarithm of the frequency.

4.2 Test Procedures

- The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- Connect EUT to the power mains through a line impedance stabilization network (LISN).
- All the support units are connecting to the other LISN.
- The LISN provides 50 ohm coupling impedance for the measuring instrument.
- The FCC states that a 50 ohm, 50 micro-Henry LISN should be used.
- Both sides of AC line were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched.
- Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.



4.3 Typical Test Setup



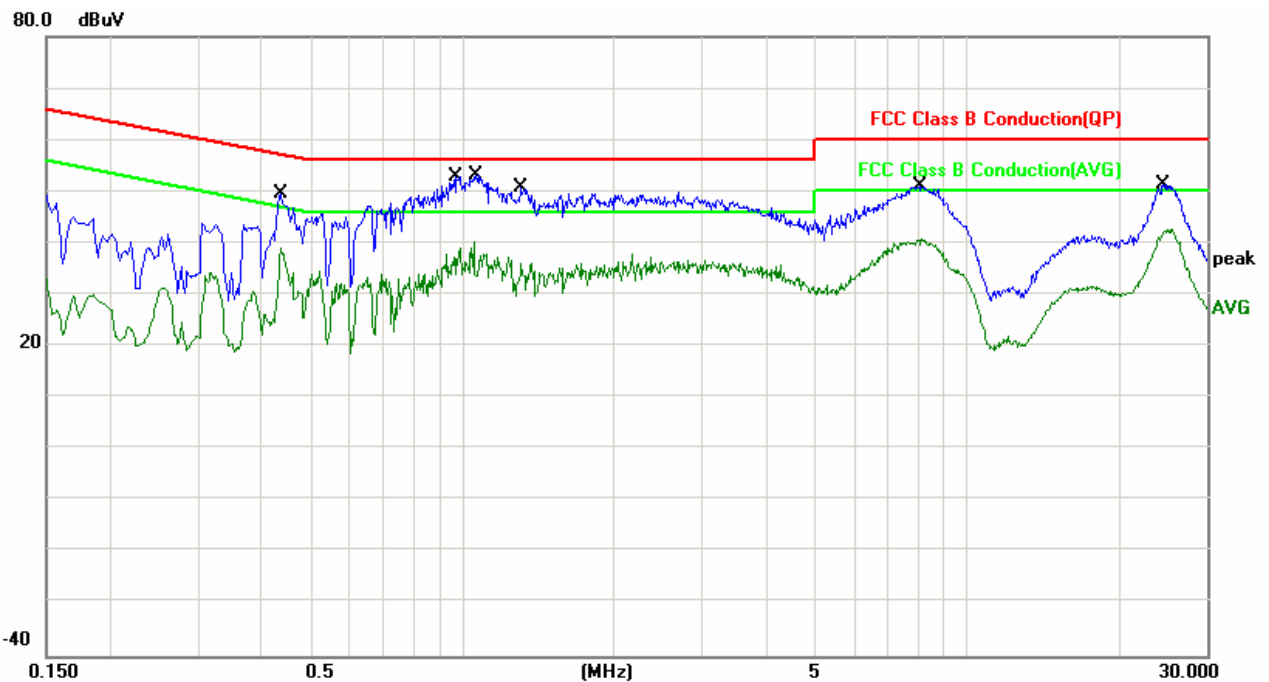
4.4 Measurement equipment

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date.
Test Receiver	R&S	ESCI	100565	2012.11.05	2013.11.04
AMN	R&S	ESH2-Z5	100182	2012.11.05	2013.11.04
Two-Line V-Network	R&S	ENV216	100325	2013.03.10	2014.03.09
ISN	FCC	FCC-TLISN-T2-02	20379	2012.12.08	2013.12.07
ISN	FCC	FCC-TLISN-T4-02	20380	2012.12.08	2013.12.07
ISN	FCC	FCC-TLISN-T8-02	20381	2012.12.08	2013.12.07
ISN	TESEQ	ISN ST08	30175	2012.09.13	2013.09.12
Current Probe	R&S	EZ-17	100303	2013.03.10	2014.03.09
Passive Voltage Probe	R&S	ESH2-Z3	100026	2013.03.10	2014.03.09
Attenuator	R&S	ESH3-Z2	100529	2013.03.10	2014.03.09
Temperature/Humidity Meter	Zhicheng	ZC1-11	CEP-TH-004	2013.03.10	2014.03.09



4.5 Test Result and Data

Test Mode :	Normal link		
AC Power :	AC 120V/60Hz	Phase :	LINE
Temperature :	22°C	Humidity :	50%
Pressure(mbar) :	1002	Date:	2013/08/19



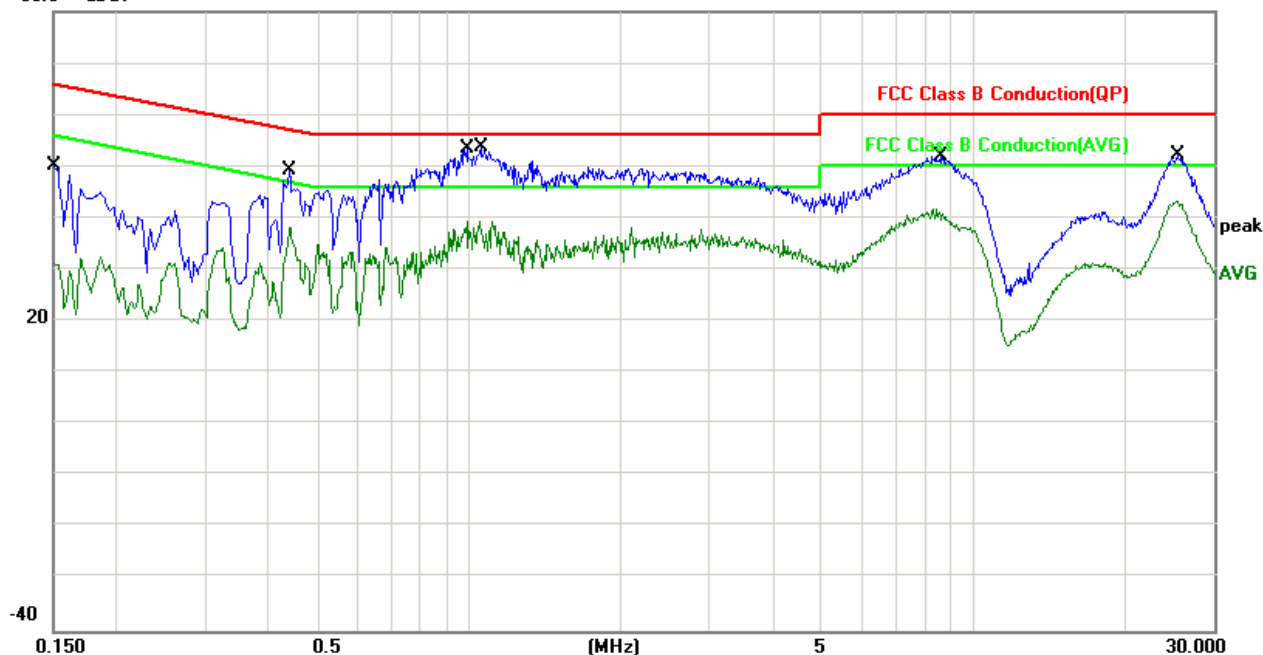
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.4380	0.06	45.24	45.30	57.10	-11.80	QP
2	0.4380	0.06	36.49	36.55	47.10	-10.55	AVG
3	0.9780	0.11	48.92	49.03	56.00	-6.97	QP
4	0.9780	0.11	36.30	36.41	46.00	-9.59	AVG
5	1.0660	0.11	49.27	49.38	56.00	-6.62	QP
6	1.0660	0.11	36.00	36.11	46.00	-9.89	AVG
7	1.3140	0.11	45.69	45.80	56.00	-10.20	QP
8	1.3140	0.11	33.60	33.71	46.00	-12.29	AVG
9	8.0980	0.27	46.89	47.16	60.00	-12.84	QP
10	8.0980	0.27	39.24	39.51	50.00	-10.49	AVG
11	24.6420	0.46	45.99	46.45	60.00	-13.55	QP
12	24.6420	0.46	40.60	41.06	50.00	-8.94	AVG

Note: Measurement Level = Reading Level + Correct Factor



Test Mode :	Normal link		
AC Power :	AC 120V/60Hz	Phase :	NEUTRAL
Temperature :	22°C	Humidity :	50%
Pressure(mbar) :	1002	Date:	2013/08/19

80.0 dBuV



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1500	0.09	46.62	46.71	65.99	-19.28	QP
2	0.1500	0.09	29.96	30.05	55.99	-25.94	AVG
3	0.4420	0.11	45.41	45.52	57.02	-11.50	QP
4	0.4420	0.11	37.08	37.19	47.02	-9.83	AVG
5	0.9820	0.15	49.14	49.29	56.00	-6.71	QP
6	0.9820	0.15	37.19	37.34	46.00	-8.66	AVG
7	1.0580	0.15	50.28	50.43	56.00	-5.57	QP
8	1.0580	0.15	37.91	38.06	46.00	-7.94	AVG
9	8.6780	0.31	47.23	47.54	60.00	-12.46	QP
10	8.6780	0.31	39.24	39.55	50.00	-10.45	AVG
11	25.3220	0.47	46.98	47.45	60.00	-12.55	QP
12	25.3220	0.47	41.97	42.44	50.00	-7.56	AVG

Note: Measurement Level = Reading Level + Correct Factor

Test engineer: Arnos



5. Test of Radiated Emission

5.1 Test Limit

Radiated emissions from 30 MHz to 25 GHz were measured according to the methods defines in ANSI C63.4-2009. The EUT was placed, 0.8 meter above the ground plane, as shown in section 5.6.3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions. For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

FREQUENCIES(MHz)	FIELD STRENGTH(microvolts/meter)	MEASUREMENT DISTANCE(meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

For unintentional device, according to CISPR PUB.22, for Class B digital devices, the general requirement of field strength of radiated emissions from intentional radiators at a distance of 10 meters shall not exceed the above table.

Frequency (MHz)	Distance Meters	Radiated (dB μ V/ M)
30-230	10	30
230-1000	10	37

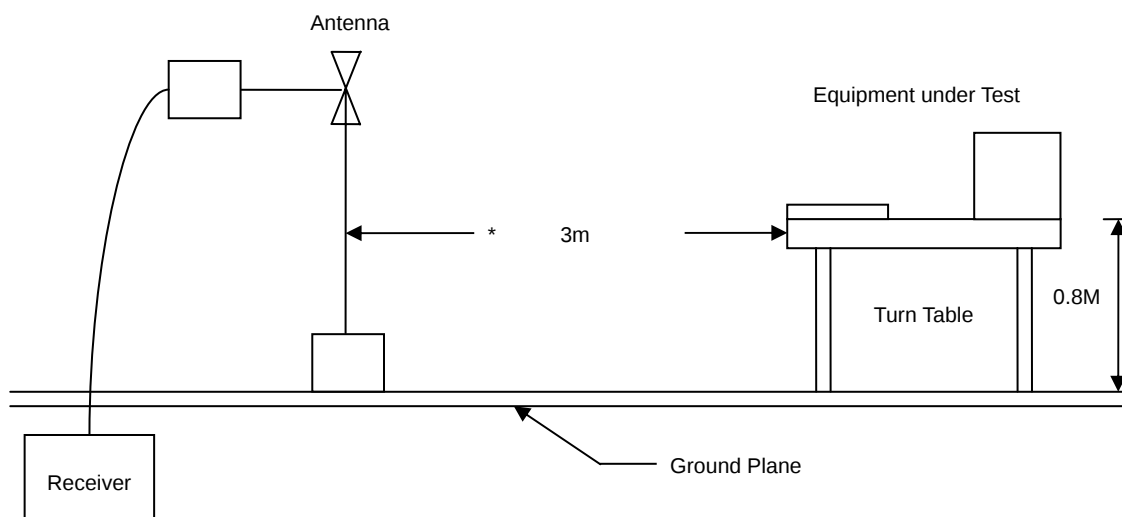


5.2 Test Procedures

- The EUT was placed on a rotatable table top 0.8 meter above ground.
- The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- The table was rotated 360 degrees to determine the position of the highest radiation.
- The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
- For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

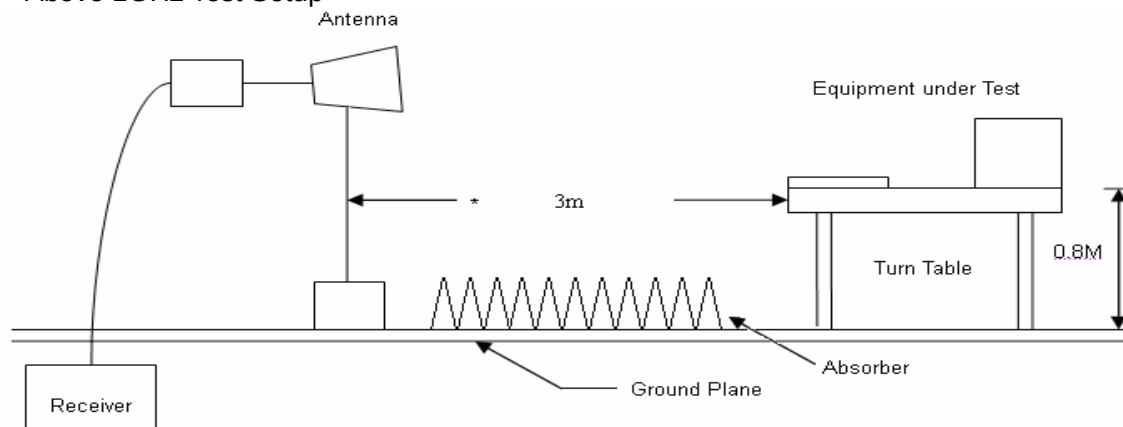
5.3 Typical Test Setup

Below 1GHz Test Setup





Above 1GHz Test Setup



5.4 Measurement equipment

Instrument	Model No.	Manufacturer	Serial No.	Calibration Date	Valid Date
EMI Test Receiver	R&S	ESCI	100563	2013.03.10	2014.03.09
H64 Preamplifier	HP	8447F	3113A05582	2013.03.10	2014.03.09
Preamplifier	Agilent	8449B	3008A02342	2013.03.10	2014.03.09
Ultra Broadband Antenna	R&S	HL562	100362	2013.05.03	2014.05.02
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-619	2013.05.03	2014.05.02
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	9170-347	2013.05.15	2014.05.15
Spectrum Analyzer	R&S	FSP40	100324	2013.03.10	2014.03.09
Temperature/ Humidity Meter	Zhicheng	ZC1-11	CEP-TH-002	2013.03.10	2014.03.09



5.5 Test Result and Data

The 9kHz-30MHz spurious emission is under limit 20dB more.

5.5.1 Test Result and Data of Transmitter

Below 1GHz

Site : EMC Lab AC 102	Time : 2013-08-19
Limit : FCC_CLASS_B_03M_QP	Margin : 6
Test mode: normal link	Probe : VERTICAL/ HORIZONTAL
Power : AC 120V/60Hz	

VERTICAL

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)
1	32.9100	-6.65	38.24	31.59	40.00	-8.41	QP	100	315
2	52.3100	-16.36	41.26	24.90	40.00	-15.10	QP	100	196
3	134.7600	-10.74	42.38	31.64	43.50	-11.86	QP	100	246
4	196.8400	-10.61	38.27	27.66	43.50	-15.84	QP	100	163
5	269.5900	-9.11	37.68	28.57	46.00	-17.43	QP	100	194
6	393.7500	-5.35	36.24	30.89	46.00	-15.11	QP	100	0

HORIZONTAL

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)
1	32.9099	-6.65	28.31	21.66	40.00	-18.34	QP	200	0
2	122.1500	-9.58	38.26	28.68	43.50	-14.82	QP	200	64
3	134.7600	-10.74	48.39	37.65	43.50	-5.85	QP	200	64
4	196.8400	-10.61	41.27	30.66	43.50	-12.84	QP	100	297
5	269.5899	-9.11	43.68	34.57	46.00	-11.43	QP	100	314
6	393.7500	-5.35	46.03	40.68	46.00	-5.32	QP	100	9

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor

**Above 1GHz**

Site : EMC Lab AC 102	Time : 2013-08-24
Limit : FCC_CLASS_B_03M_QP	Margin : 6
Test mode: Transmit by GFSK(1M) 2402MHz	Probe : VERTICAL/ HORIZONTAL
Power : AC 120V/60Hz	

VERTICAL

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	4805.690	9.033	29.717	38.750	-15.250	54.000	AVG
2	4810.000	9.039	44.119	53.158	-20.842	74.000	PEAK

HORIZONTAL

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	4804.690	9.640	31.340	40.980	-13.020	54.000	AVG
2	4810.000	9.650	45.865	55.515	-18.485	74.000	PEAK
3	7210.000	12.385	37.727	50.112	-23.888	74.000	PEAK
4	7213.360	12.462	24.864	37.326	-16.674	54.000	AVG

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor



Site : EMC Lab AC 102	Time : 2013-08-24
Limit : FCC_CLASS_B_03M_QP	Margin : 6
Test mode: Transmit by GFSK(1M) 2441MHz	Probe : VERTICAL/ HORIZONTAL
Power : AC 120V/60Hz	

VERTICAL

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	4870.000	9.024	39.695	48.719	-25.281	74.000	PEAK
2	4875.250	9.020	27.870	36.890	-17.110	54.000	AVG
3	7321.250	14.827	22.533	37.360	-16.640	54.000	AVG
4	7330.000	14.996	37.335	52.331	-21.669	74.000	PEAK

HORIZONTAL

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	4870.000	9.660	43.046	52.706	-21.294	74.000	PEAK
2	4875.360	9.660	28.220	37.880	-16.120	54.000	AVG
3	7330.000	15.138	41.973	57.111	-16.889	74.000	PEAK
4	7330.260	15.144	27.516	42.660	-11.340	54.000	AVG

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor



Site : EMC Lab AC 102	Time : 2013-08-24
Limit : FCC_CLASS_B_03M_QP	Margin : 6
Test mode: Transmit by GFSK(1M) 2480MHz	Probe : VERTICAL/ HORIZONTAL
Power : AC 120V/60Hz	

VERTICAL

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	4985.250	8.996	29.254	38.250	-15.750	54.000	AVG
2	4990.000	8.993	38.189	47.182	-26.818	74.000	PEAK

HORIZONTAL

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	4986.250	9.680	29.000	38.680	-15.320	54.000	AVG
2	4990.000	9.680	43.478	53.158	-20.842	74.000	PEAK
3	7450.000	16.473	40.208	56.681	-17.319	74.000	PEAK
4	7450.960	16.468	26.222	42.690	-11.310	54.000	AVG

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor



Site : EMC Lab AC 102	Time : 2013-08-24
Limit : FCC_CLASS_B_03M_QP	Margin : 6
Test mode: Transmit by 8DPSK(3M) 2402MHz	Probe : VERTICAL/ HORIZONTAL
Power : AC 120V/60Hz	

VERTICAL

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	4806.260	9.035	29.655	38.690	-15.310	54.000	AVG
2	4810.000	9.039	44.919	53.958	-20.042	74.000	PEAK
3	7206.660	12.612	26.648	39.260	-14.740	54.000	AVG
4	7210.000	12.677	40.427	53.104	-20.896	74.000	PEAK

HORIZONTAL

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	4805.690	9.643	32.717	42.360	-11.640	54.000	AVG
2	4810.000	9.650	44.461	54.111	-19.889	74.000	PEAK
3	7210.000	12.385	39.920	52.305	-21.695	74.000	PEAK
4	7213.660	12.469	27.751	40.220	-13.780	54.000	AVG

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor



Site : EMC Lab AC 102	Time : 2013-08-24
Limit : FCC_CLASS_B_03M_QP	Margin : 6
Test mode: Transmit by 8DPSK(3M) 2441MHz	Probe : VERTICAL/ HORIZONTAL
Power : AC 120V/60Hz	

VERTICAL

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	4870.000	9.024	42.886	51.910	-22.090	74.000	PEAK
2	4883.580	9.020	28.560	37.580	-16.420	54.000	AVG
3	7329.850	14.994	22.266	37.260	-16.740	54.000	AVG
4	7330.000	14.996	36.569	51.565	-22.435	74.000	PEAK

HORIZONTAL

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	4870.000	9.660	47.987	57.647	-16.353	74.000	PEAK
2	4880.360	9.660	35.700	45.360	-8.640	54.000	AVG
3	7325.670	15.038	27.322	42.360	-11.640	54.000	AVG
4	7330.000	15.138	42.761	57.899	-16.101	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor



Site : EMC Lab AC 102	Time : 2013-08-24
Limit : FCC_CLASS_B_03M_QP	Margin : 6
Test mode: Transmit by 8DPSK(3M) 2480MHz	Probe : VERTICAL/ HORIZONTAL
Power : AC 120V/60Hz	

VERTICAL

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	4985.650	8.995	30.545	19.540	-34.460	54.000	AVG
2	4990.000	8.993	43.077	52.070	-21.930	74.000	PEAK

HORIZONTAL

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	4986.660	9.680	28.570	38.250	-15.750	54.000	AVG
2	4990.000	9.680	42.812	52.492	-21.508	74.000	PEAK
3	7420.000	16.632	39.352	55.984	-18.016	74.000	PEAK
4	7436.260	16.546	23.814	40.360	-13.640	54.000	AVG

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor



6. 20dB Bandwidth Measurement Data

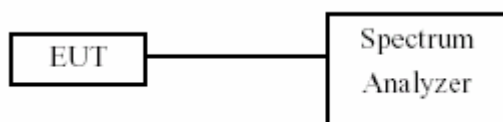
6.1 Test Limit

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 125 mW.

6.2 Test Procedures

- The transmitter output was connected to the spectrum analyzer.
- Set RBW of spectrum analyzer to 30 KHz and VBW to 100 KHz.
- The 20 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20 dB.

6.3 Test Setup Layout



6.4 Measurement equipment

Instrument/Ancillary	Model No.	Manufacturer	Serial No.	Calibration Date	Valid Date
Spectrum Analyzer	FSP40	R&S	100324	2013.03.10	2014.03.09

6.5 Test Result and Data

Test Date: Aug. 24, 2013

Temperature: 25°C

Atmospheric pressure: 1020 hPa

Humidity: 55%

1M

Channel	Frequency (MHz)	20dB Bandwidth (KHz)
00	2402	768.24
39	2441	794.01
78	2480	840.10

3M

Channel	Frequency (MHz)	20dB Bandwidth (KHz)
00	2402	1218.00
39	2441	1223.00
78	2480	1207.00

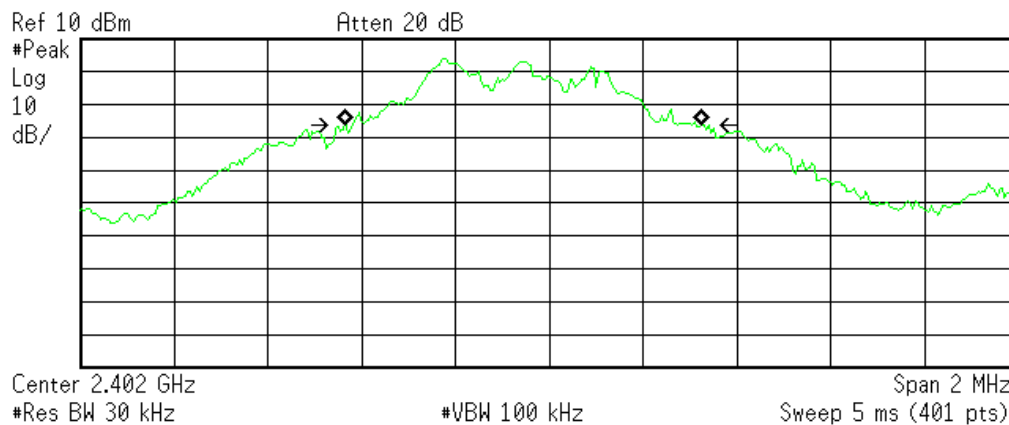


Modulation Standard: GFSK (1Mbps)

Channel: 00

Agilent 13:27:02 Aug 24, 2013

R T



Occupied Bandwidth
757.0418 kHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -54.603 kHz
x dB Bandwidth 768.238 kHz

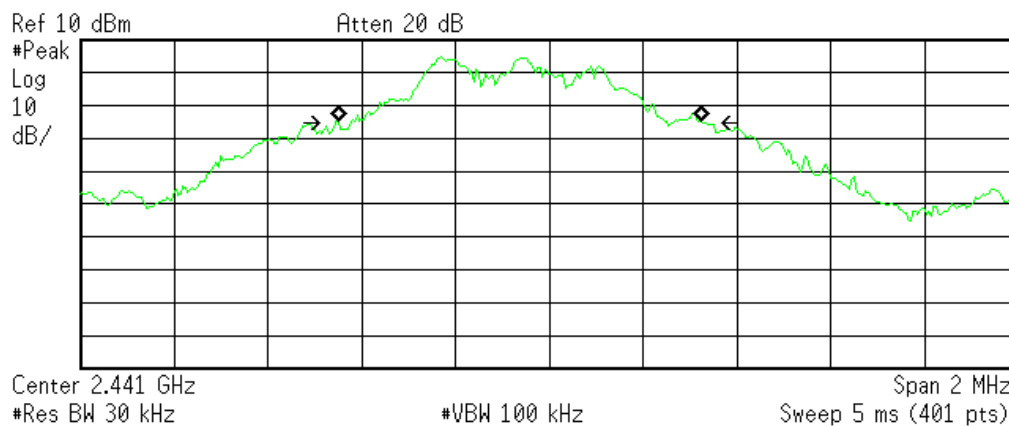
C:PICTURE.GIF file saved

Modulation Standard: GFSK (1Mbps)

Channel: 39

Agilent 13:25:03 Aug 24, 2013

R T



Occupied Bandwidth
772.5368 kHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -63.576 kHz
x dB Bandwidth 794.005 kHz

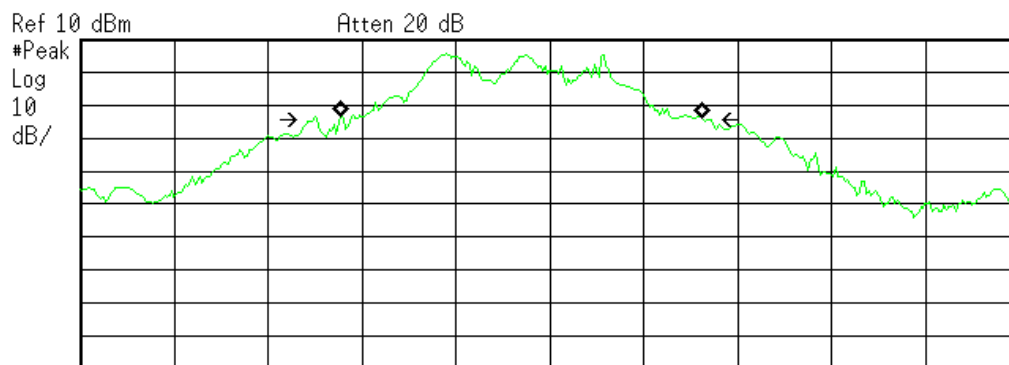


Modulation Standard: GFSK (1Mbps)

Channel: 78

Agilent 15:35:51 Aug 24, 2013

R T



Center 2.48 GHz

#Res BW 30 kHz

#VBW 100 kHz

Span 2 MHz

Sweep 8.04 ms (401 pts)

Occupied Bandwidth

768.6199 kHz

Occ BW % Pwr 99.00 %

x dB -20.00 dB

Transmit Freq Error -58.693 kHz

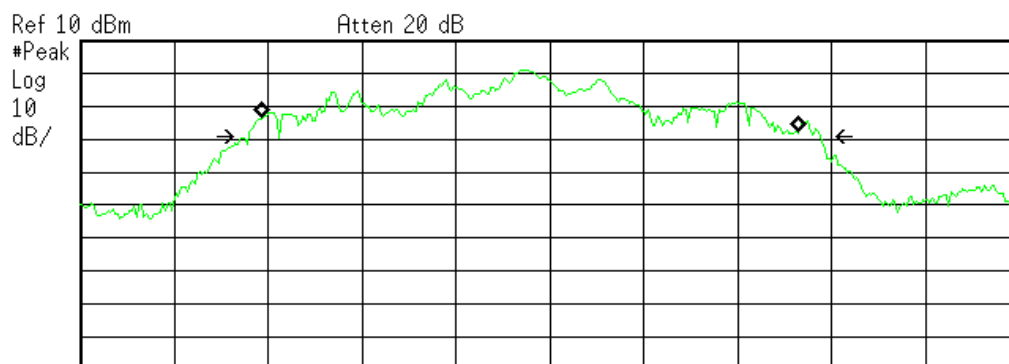
x dB Bandwidth 840.103 kHz

Modulation Standard: 8DPSK (3Mbps)

Channel: 00

Agilent 13:29:00 Aug 24, 2013

R T



Center 2.402 GHz

#Res BW 30 kHz

#VBW 100 kHz

Span 2 MHz

Sweep 5 ms (401 pts)

Occupied Bandwidth

1.1455 MHz

Occ BW % Pwr 99.00 %

x dB -20.00 dB

Transmit Freq Error -41.406 kHz

x dB Bandwidth 1.218 MHz

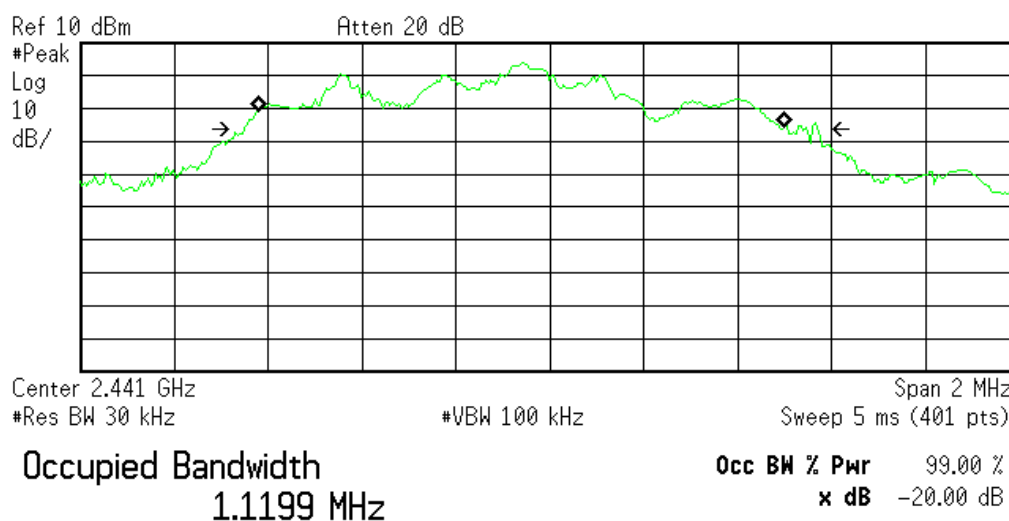


Modulation Standard: 8DPSK (3Mbps)

Channel: 39

* Agilent 13:30:14 Aug 24, 2013

R T



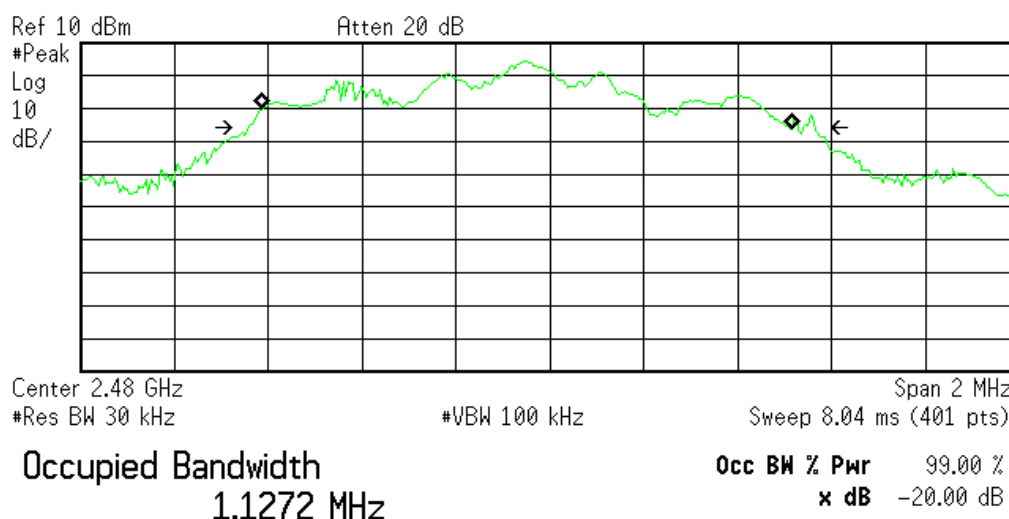
Transmit Freq Error -61.372 kHz
x dB Bandwidth 1.223 MHz

Modulation Standard: 8DPSK (3Mbps)

Channel: 78

* Agilent 15:37:19 Aug 24, 2013

R T



Transmit Freq Error -49.322 kHz
x dB Bandwidth 1.207 MHz



7. Frequencies Separation

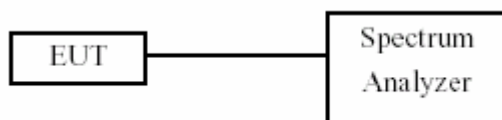
7.1 Test Limit

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.

7.2 Test Procedures

- The transmitter output was connected to the spectrum analyzer.
- Set RBW of spectrum analyzer to 30 KHz and VBW to 100 KHz.
- By using the MaxHold function record the separation of two adjacent channels.
- Measure the frequency difference of these two adjacent channels.

7.3 Test Setup Layout



7.4 Measurement equipment

Instrument/Ancillary	Model No.	Manufacturer	Serial No.	Calibration Date	Valid Date
Spectrum Analyzer	FSP40	R&S	100324	2013.03.10	2014.03.09

7.5 Test Result and Data

Test Date: Aug. 24, 2013

Temperature: 25°C

Atmospheric pressure: 1020 hPa

Humidity: 55%

1M

Channel Separation	Result
(MHz)	
1.000	Pass

3M

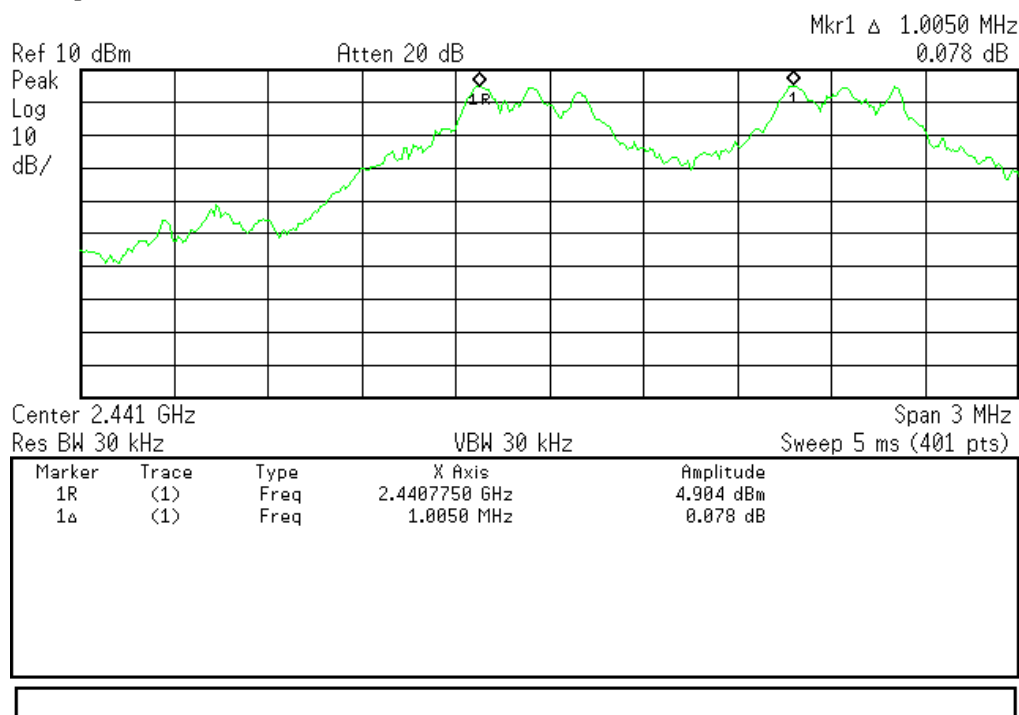
Channel Separation	Result
(MHz)	
1.000	Pass



Modulation Standard: GFSK (1Mbps)

* Agilent 13:37:55 Aug 24, 2013

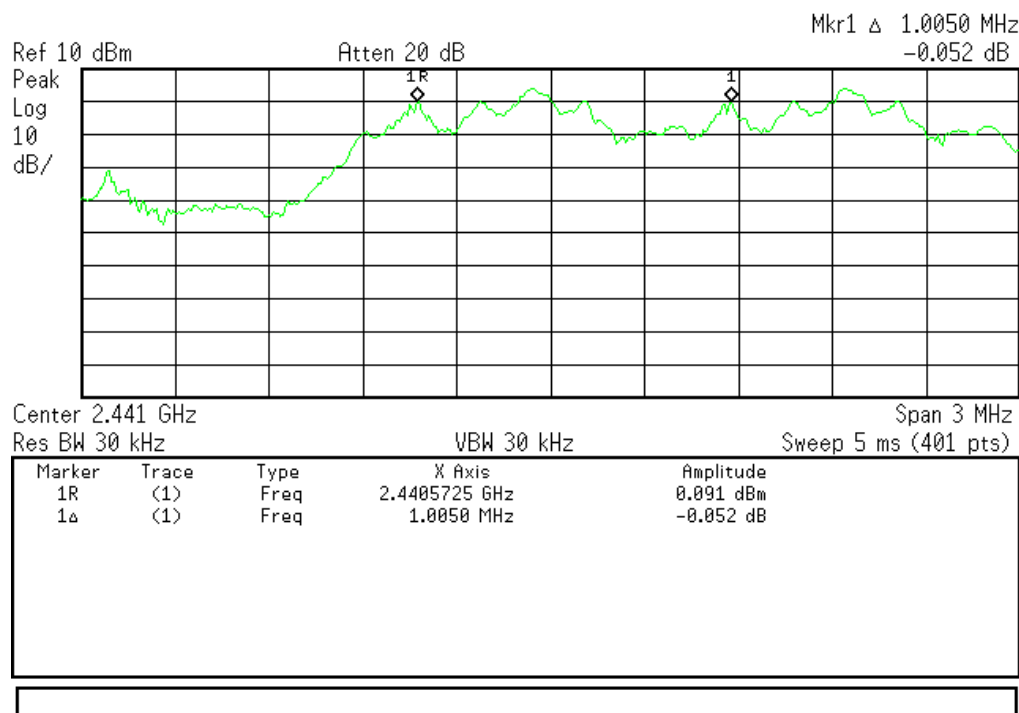
R T



Modulation Standard:8DPSK (3Mbps)

* Agilent 13:43:24 Aug 24, 2013

R T





8. Dwell Time on each channel

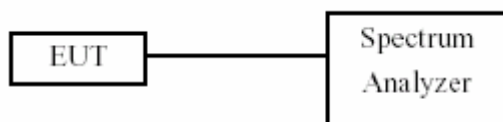
8.1 Test Limit

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.

8.2 Test Procedures

1. The transmitter output was connected to the spectrum analyzer.
2. Adjust the center frequency to measure frequency, then set zero span mode.
2. Set RBW of spectrum analyzer to 1 MHz and VBW to 1 MHz.
4. Measure the time duration of one transmission on the measured frequency.

8.3 Test Setup Layout



8.4 Measurement equipment

Instrument/Ancillary	Model No.	Manufacturer	Serial No.	Calibration Date	Valid Date
Spectrum Analyzer	FSP40	R&S	100324	2013.03.10	2014.03.09



8.5 Test Result and Data

Test Date: Aug. 24, 2013

Temperature: 25°C

Atmospheric pressure: 1020 hPa

Humidity: 55%

1M

DH 1

$0.40 * (1600/2)/79 * 31.6 = 128.00$ (ms)

Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
0.40	128.00	31.60	400	PASS

DH 3

$1.65 * (1600/4)/79 * 31.6 = 264.00$ (ms)

Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
1.65	264.00	31.60	400	PASS

DH 5

$2.90 * (1600/6)/79 * 31.6 = 309.33$ (ms)

Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
2.90	309.33	31.60	400	PASS



3M

DH 1

$$0.40 * (1600/2)/79 * 31.6 = 128.00 \text{ (ms)}$$

Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
0.40	128.00	31.60	400	PASS

DH 3

$$1.13 * (1600/4)/79 * 31.6 = 180.80 \text{ (ms)}$$

Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
1.13	180.80	31.60	400	PASS

DH 5

$$2.90 * (1600/6)/79 * 31.6 = 309.33 \text{ (ms)}$$

Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
2.90	309.33	31.60	400	PASS

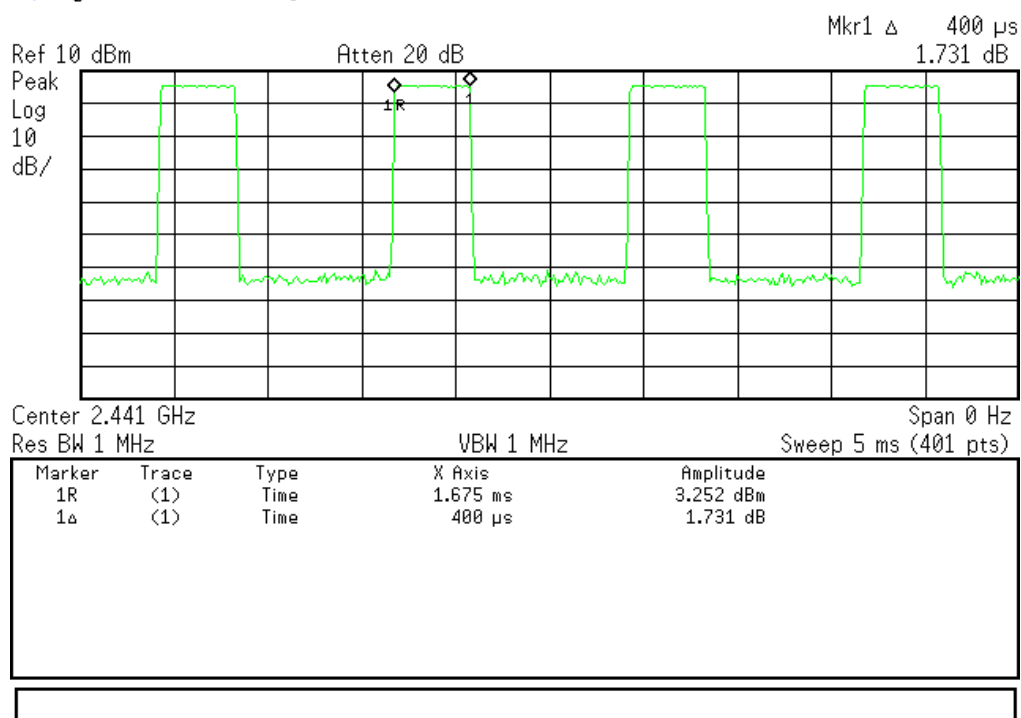


Modulation Standard: GFSK (1Mbps)

DH1

* Agilent 14:10:16 Aug 24, 2013

R T

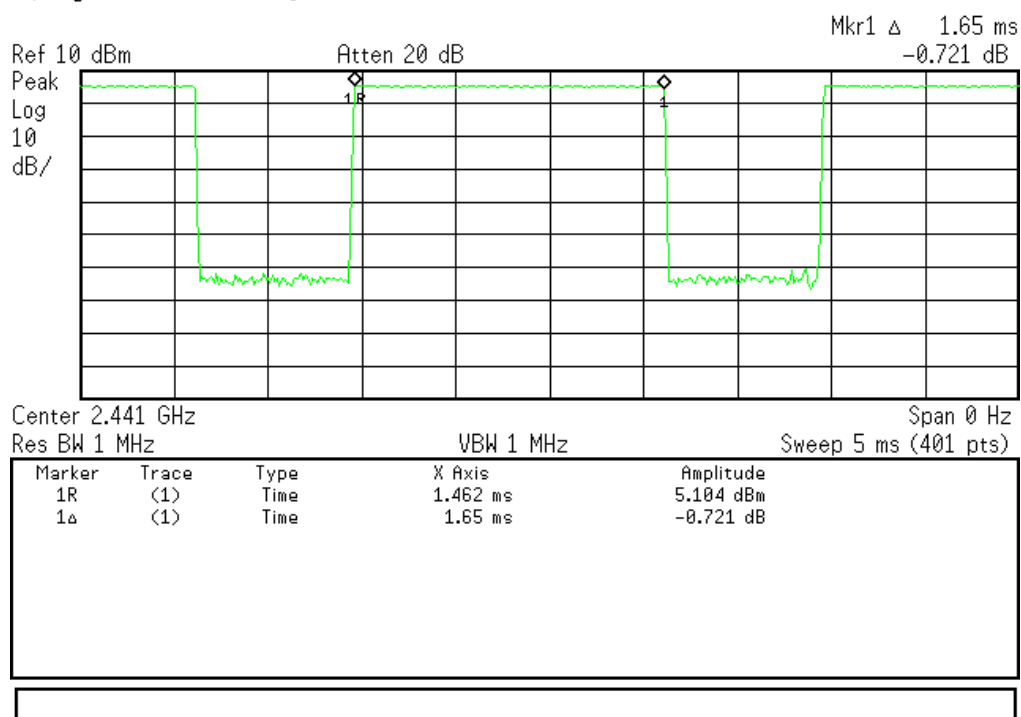


Modulation Standard: GFSK (1Mbps)

DH3

* Agilent 14:12:32 Aug 24, 2013

R T



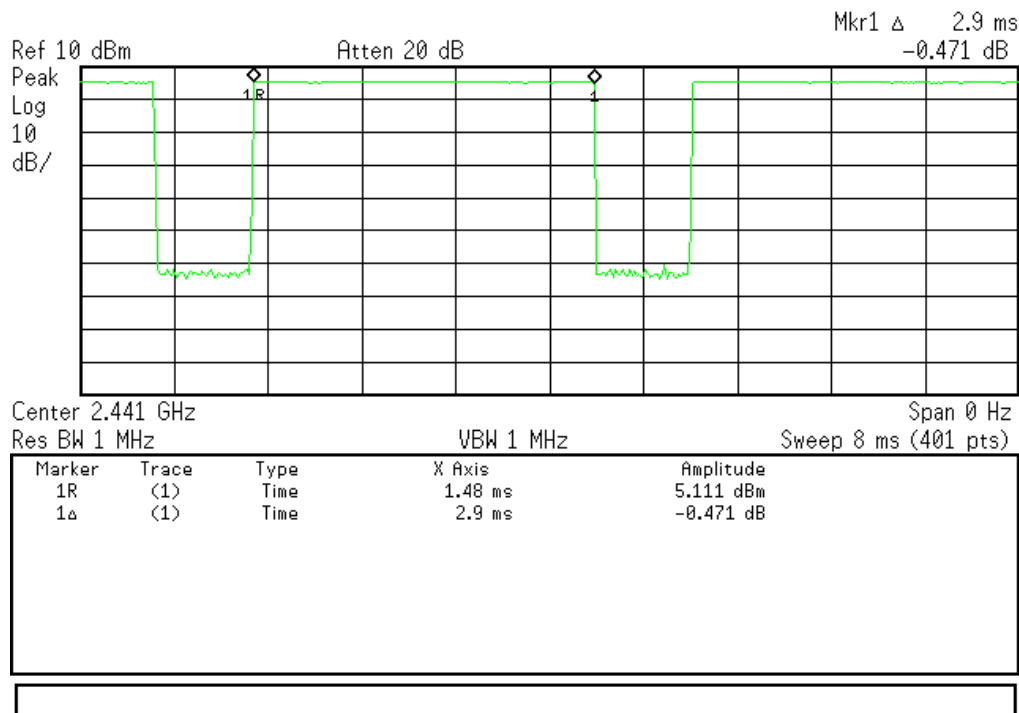


Modulation Standard: GFSK (1Mbps)

DH5

* Agilent 14:14:47 Aug 24, 2013

R T

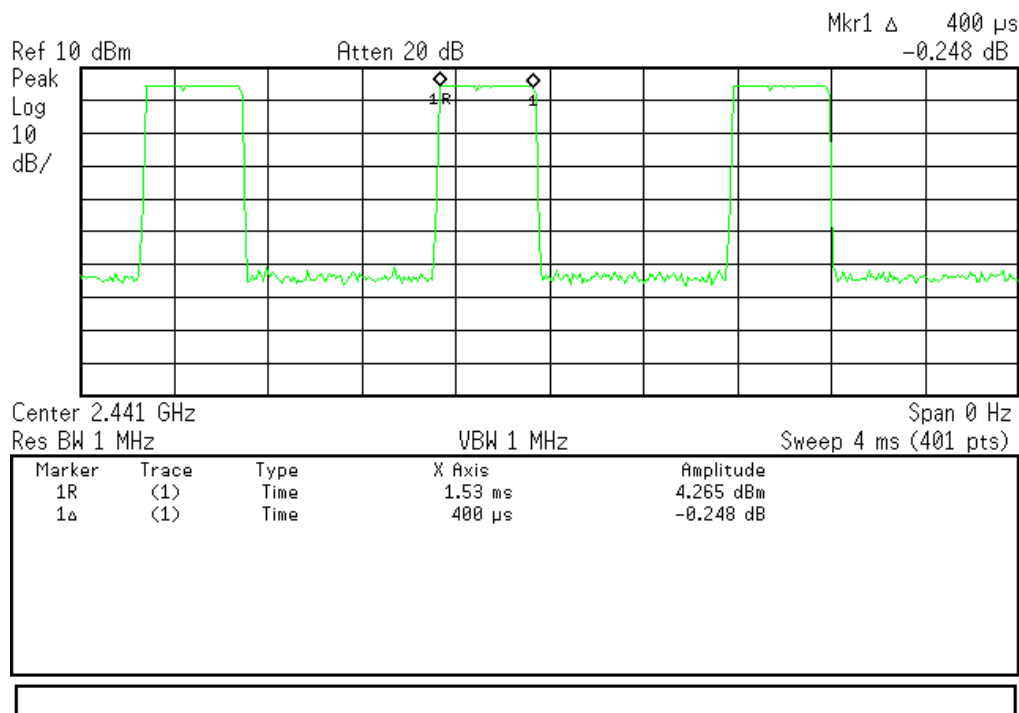


Modulation Standard: 8DPSK (3Mbps)

DH1

* Agilent 14:16:48 Aug 24, 2013

R T



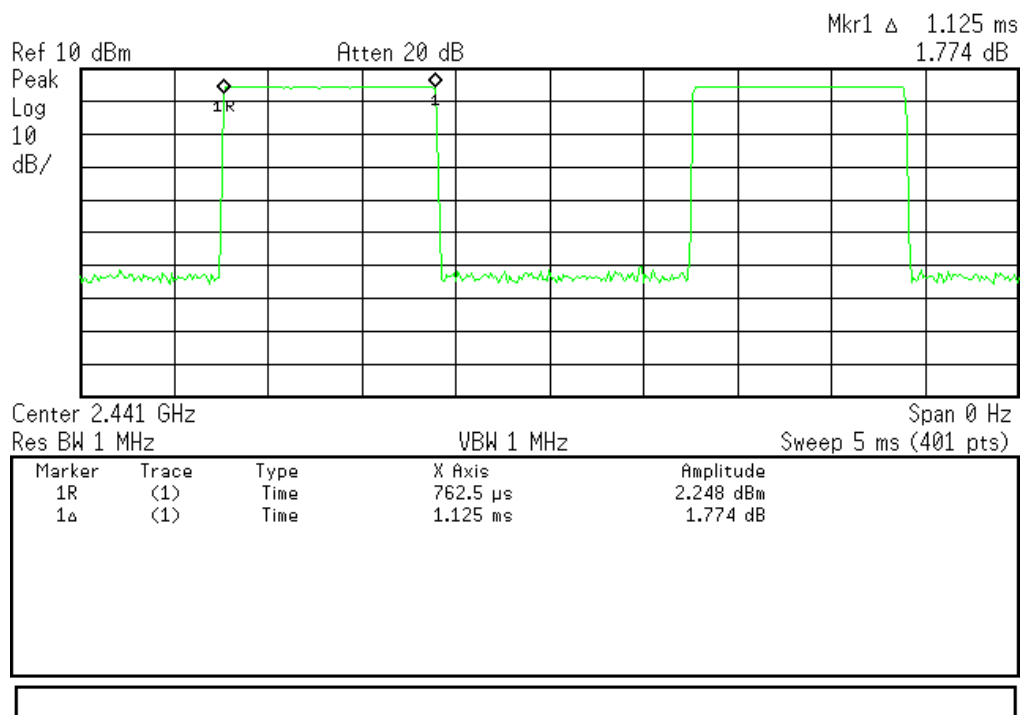


Modulation Standard: 8DPSK (3Mbps)

DH3

Agilent 14:18:48 Aug 24, 2013

R T

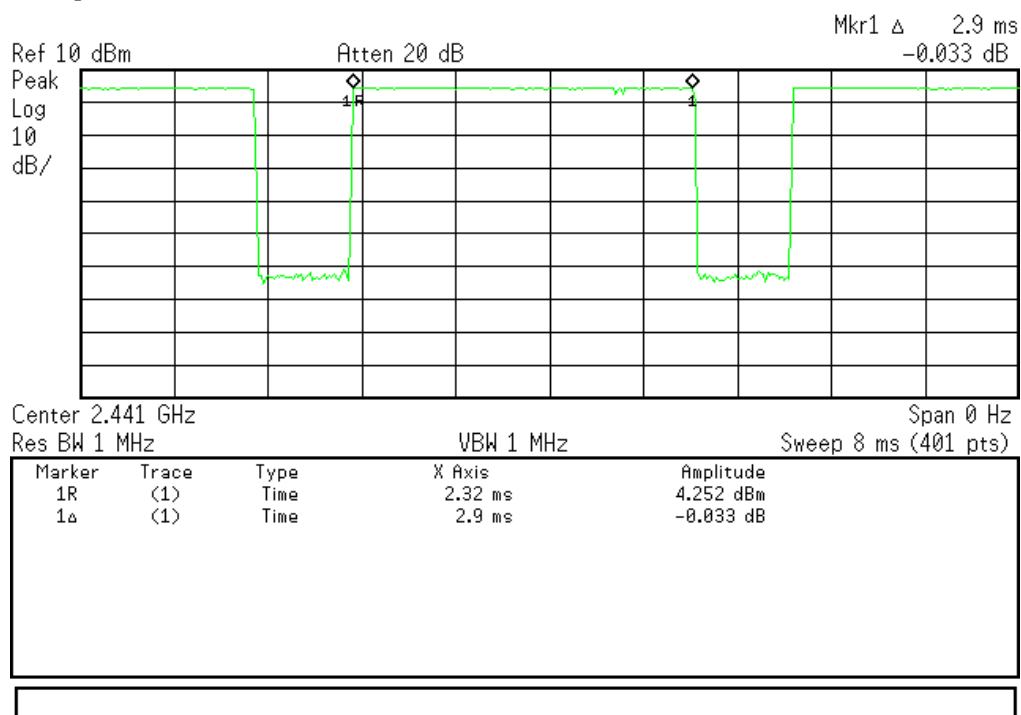


Modulation Standard: 8DPSK (3Mbps)

DH5

Agilent 14:20:27 Aug 24, 2013

R T





9. Number of Hopping Channels

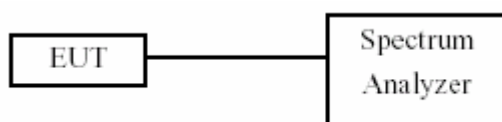
9.1 Test Limit

Frequency hopping systems in the 2400 ~ 2483.5 MHz band shall use at least 15 channels.

9.2 Test Procedures

- The transmitter output was connected to the spectrum analyzer.
- Set RBW of spectrum analyzer to 100 KHz and VBW to 300 KHz.
- Set the MaxHold function, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been record.

9.3 Test Setup Layout



9.4 Measurement equipment

Instrument/Ancillary	Model No.	Manufacturer	Serial No.	Calibration Date	Valid Date
Spectrum Analyzer	FSP40	R&S	100324	2013.03.10	2014.03.09

9.5 Test Result and Data

Test Date: Aug. 24, 2013

Temperature: 25°C

Atmospheric pressure: 1020 hPa

Humidity: 55%

Modulation Standard: GFSK (1Mbps)

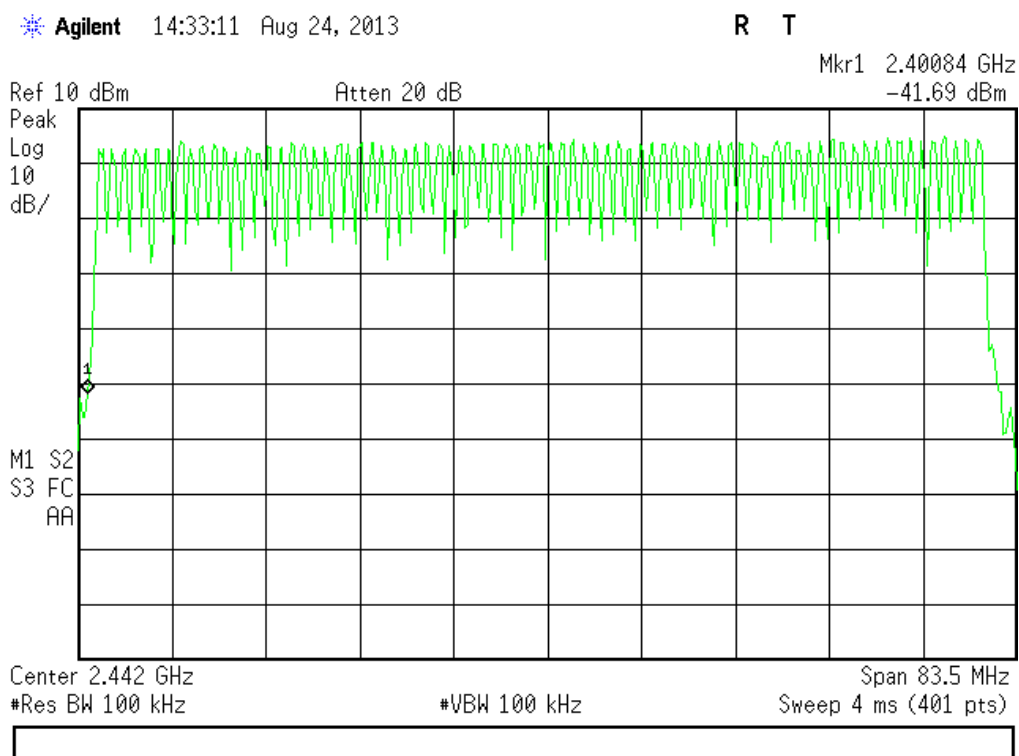
Number of hopping channels:	79	Channels
-----------------------------	----	----------

Modulation Standard: 8DPSK (3Mbps)

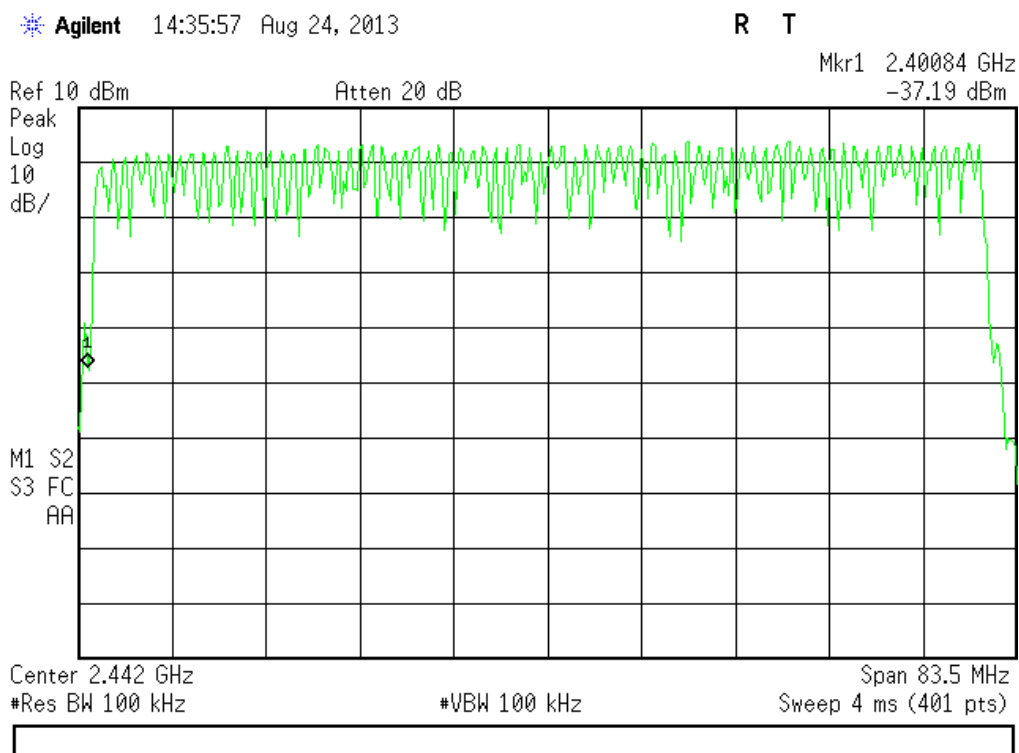
Number of hopping channels:	79	Channels
-----------------------------	----	----------



Modulation Standard: GFSK (1Mbps)



Modulation Standard: 8DPSK (3Mbps)





10. Maximum Peak Output Power

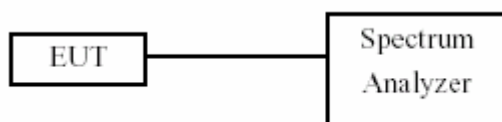
10.1 Test Limit

The Maximum Peak Output Power Measurement is 30dBm.

10.2 Test Procedures

The antenna port(RF output)of the EUT was connected to the input(RF input)of a power meter. Power was read directly from the meter and cable loss connection was added to the reading to obtain power at the EUT antenna terminal. The EUT Output Power was set to maximum to produce the worse case test result.

10.3 Test Setup Layout



10.4 Measurement equipment

Instrument/Ancillary	Model No.	Manufacturer	Serial No.	Calibration Date	Valid Date
Spectrum Analyzer	FSP40	R&S	100324	2013.03.10	2014.03.09

10.5 Test Result and Data

Test Date: Aug. 24, 2013

Temperature: 25°C

Atmospheric pressure: 1020 hPa

Humidity: 55%

1M

Channel	Frequency (MHz)	Peak Power Output (dBm)	Peak Power Output (mW)
00	2402	3.95	2.48
39	2441	5.27	3.37
78	2478	4.92	3.10

3M

Channel	Frequency (MHz)	Peak Power Output (dBm)	Peak Power Output (mW)
00	2402	2.50	1.78
39	2441	4.49	2.81
78	2478	4.91	3.10

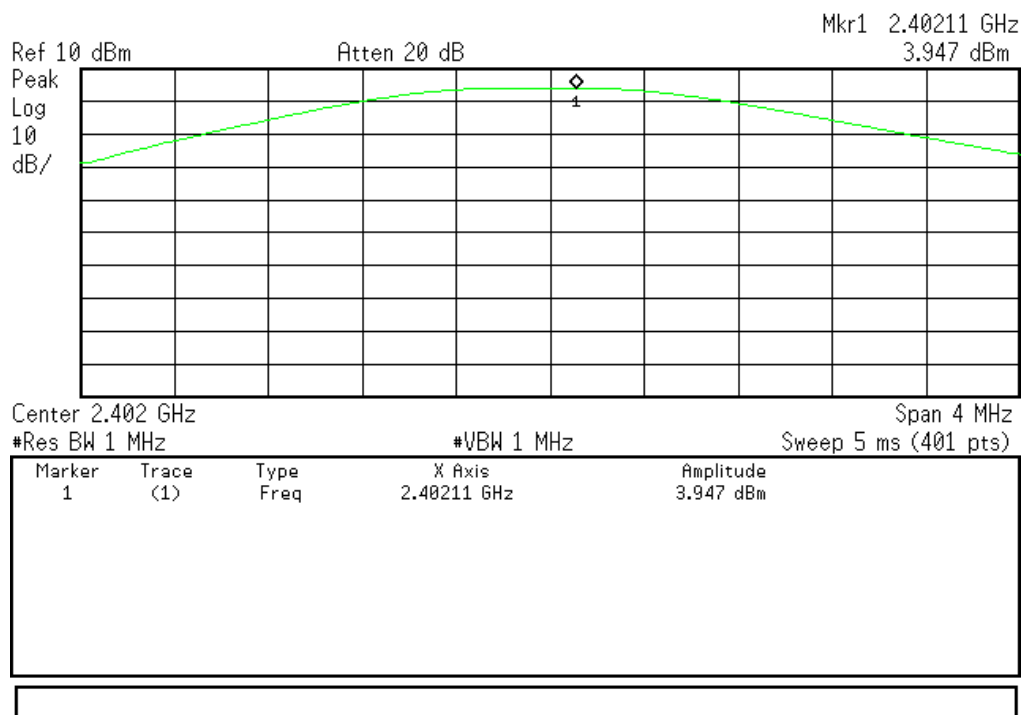


Modulation Standard: GFSK (1Mbps)

Channel: 00

* Agilent 14:46:27 Aug 24, 2013

R T

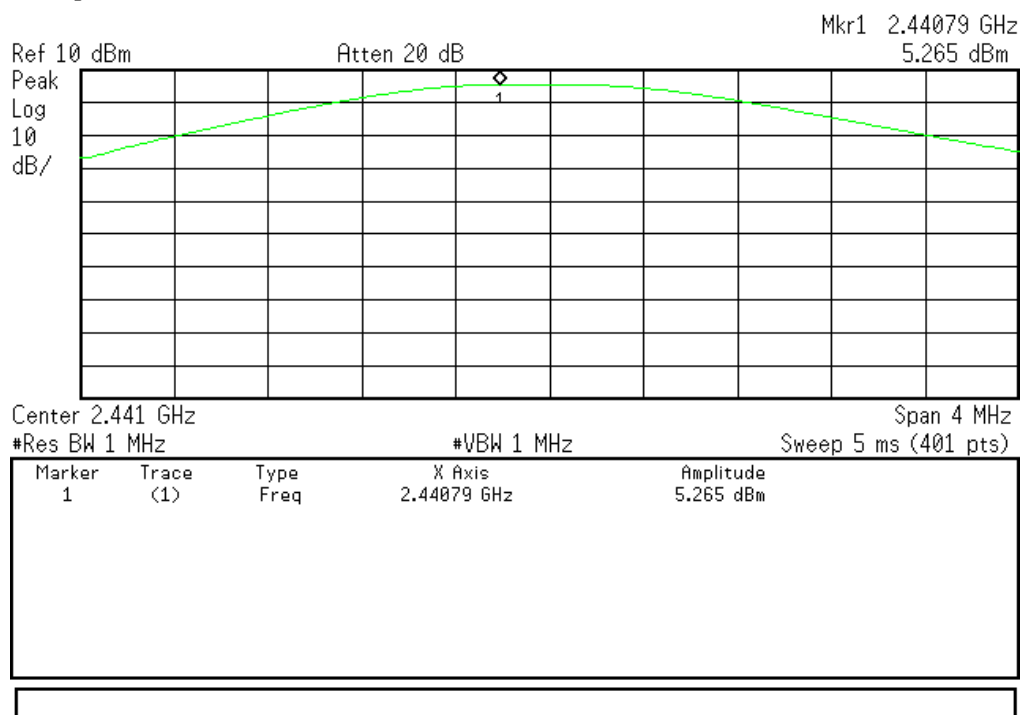


Modulation Standard: GFSK (1Mbps)

Channel: 39

* Agilent 14:45:25 Aug 24, 2013

R T





Modulation Standard: GFSK (1Mbps)

Channel: 78

* Agilent 15:40:50 Aug 24, 2013

R T



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.47978 GHz	4.916 dBm

Modulation Standard: 8DPSK (3Mbps)

Channel: 00

* Agilent 14:39:29 Aug 24, 2013

R T



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.40192 GHz	2.495 dBm

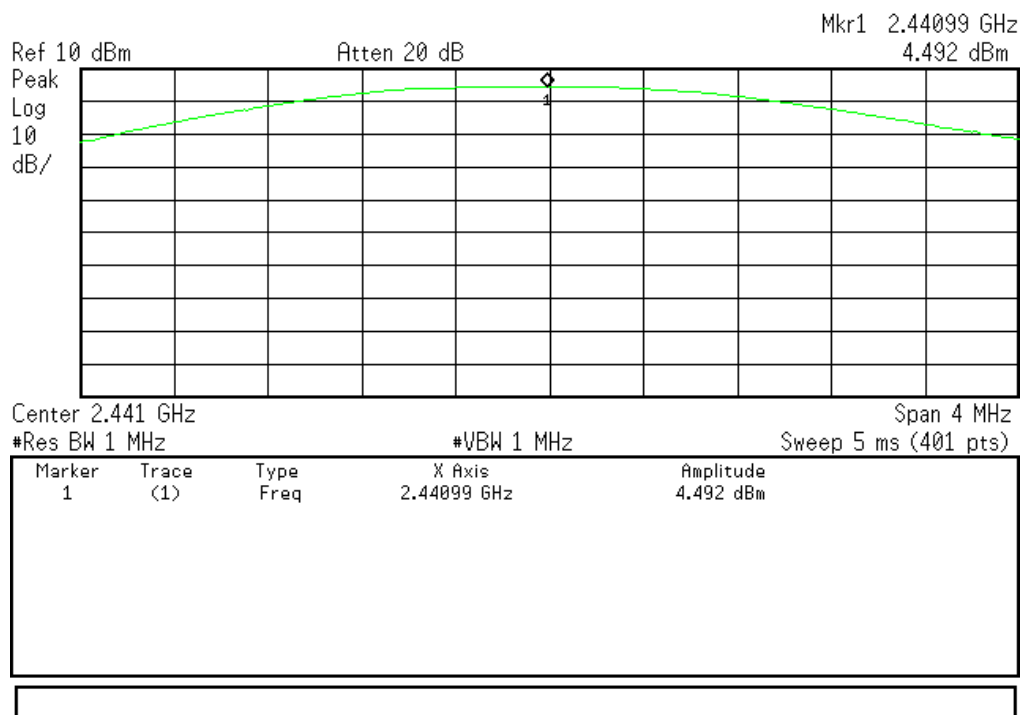


Modulation Standard: 8DPSK (3Mbps)

Channel: 39

* Agilent 14:40:54 Aug 24, 2013

R T

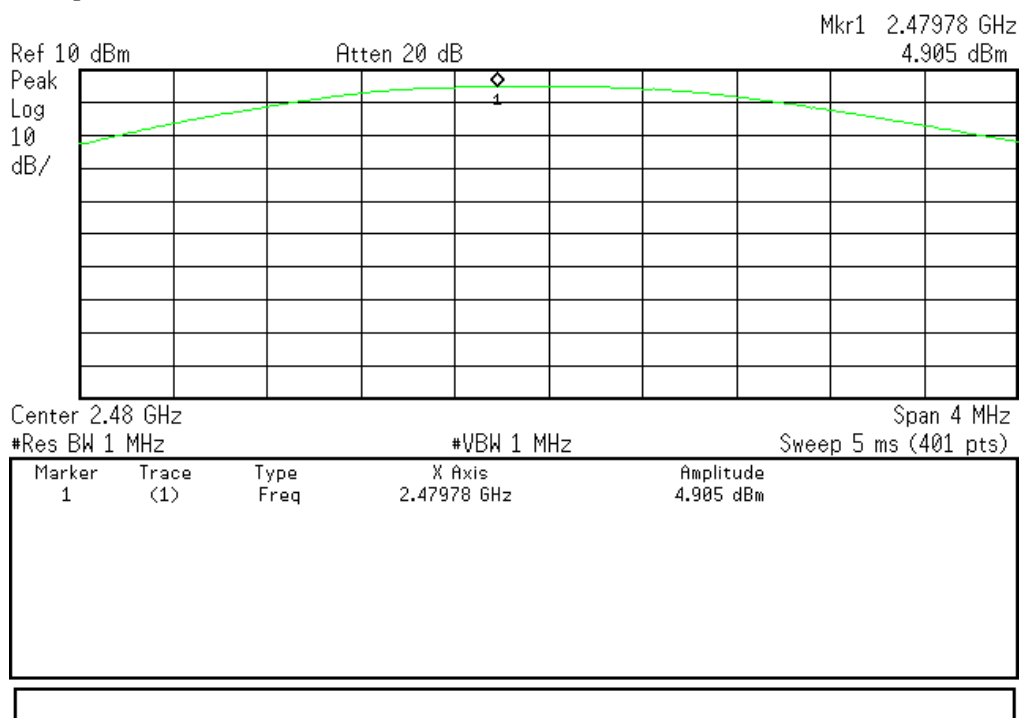


Modulation Standard: 8DPSK (3Mbps)

Channel: 78

* Agilent 15:39:49 Aug 24, 2013

R T





11. Band Edges Measurement

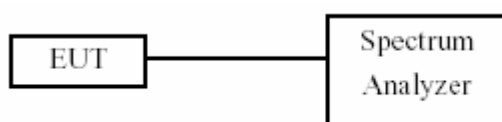
11.1 Test Limit

Below -20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

11.2 Test Procedure

- The transmitter output was connected to the spectrum analyzer via a low lose cable.
- Set both RBW and VBW of spectrum analyzer to 100 KHz with convenient frequency span including 100 KHz bandwidth from band edge.
- The band edges was measured and recorded.

11.3 Test Setup Layout



11.4 List of Measuring Equipment Used

Instrument/Ancillary	Model No.	Manufacturer	Serial No.	Calibration Date	Valid Date
Spectrum Analyzer	FSP40	R&S	100324	2013.03.10	2014.03.09

11.5 Test Result and Data

Test Date: Aug. 24, 2013

Temperature: 25°C

Atmospheric pressure: 1020 hPa

Humidity: 55%

1M

Channel	Frequency	maximum value in frequency (MHz)	maximum value is (dBm)
00	2402	2400.00	-42.87
78	2480	2483.50	-53.46

3M

Channel	Frequency	maximum value in frequency (MHz)	maximum value is (dBm)
00	2402	2400.00	-45.60
78	2480	2483.50	-50.26

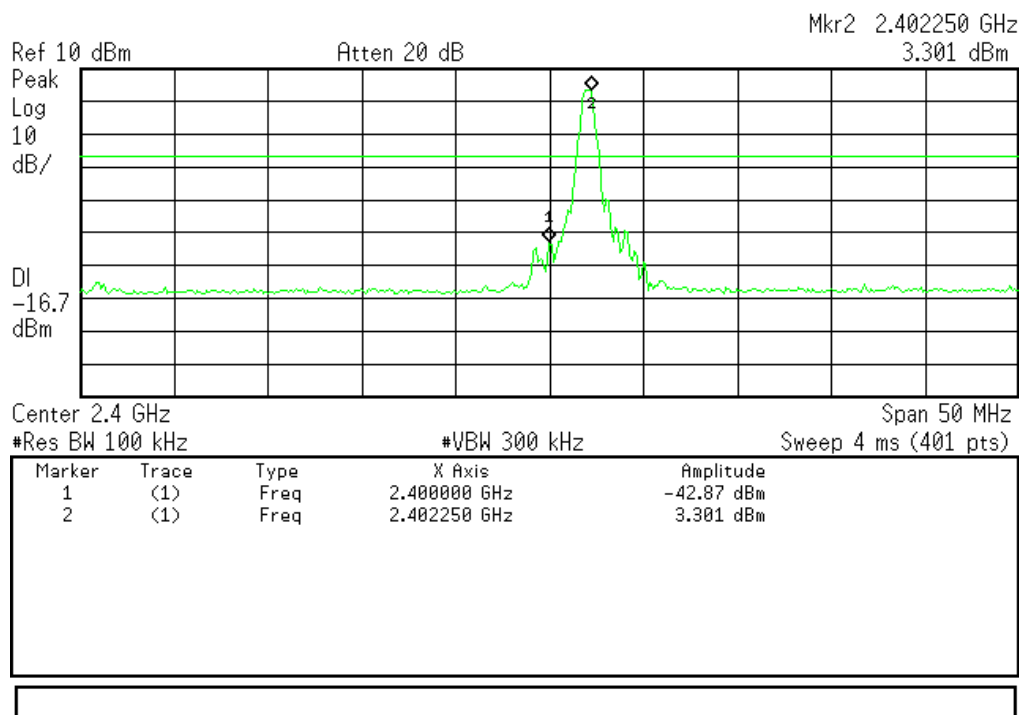


Modulation Standard: GFSK (1Mbps)

Channel: 00

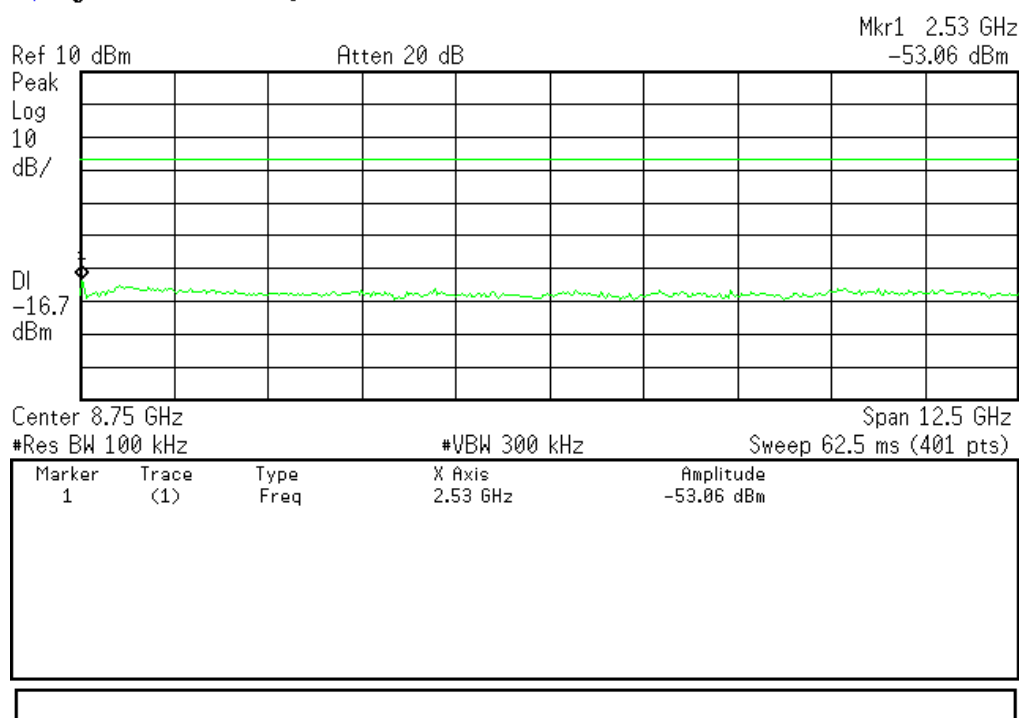
* Agilent 14:56:31 Aug 24, 2013

R T



* Agilent 15:17:26 Aug 24, 2013

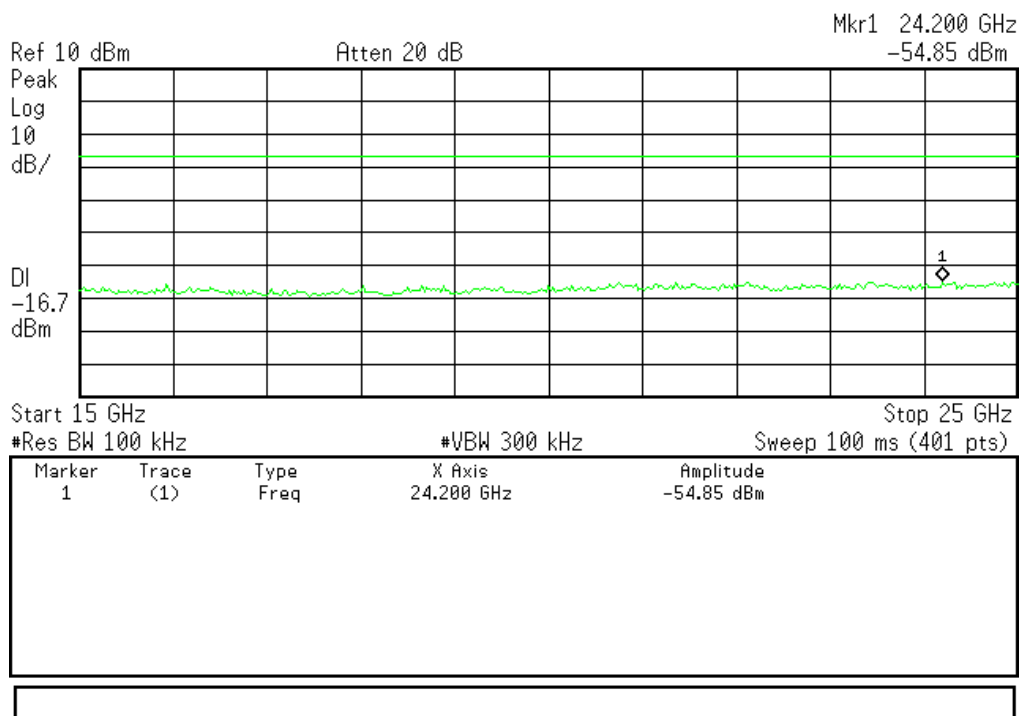
R T





* Agilent 15:15:51 Aug 24, 2013

R T

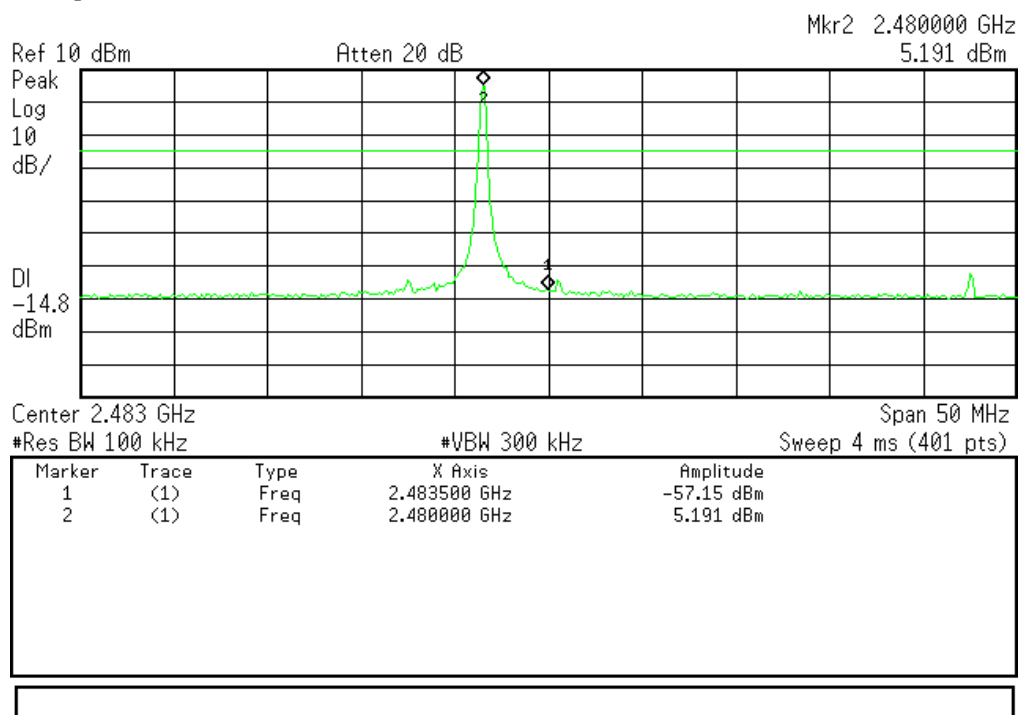


Modulation Standard: GFSK (1Mbps)

Channel: 78

* Agilent 15:10:25 Aug 24, 2013

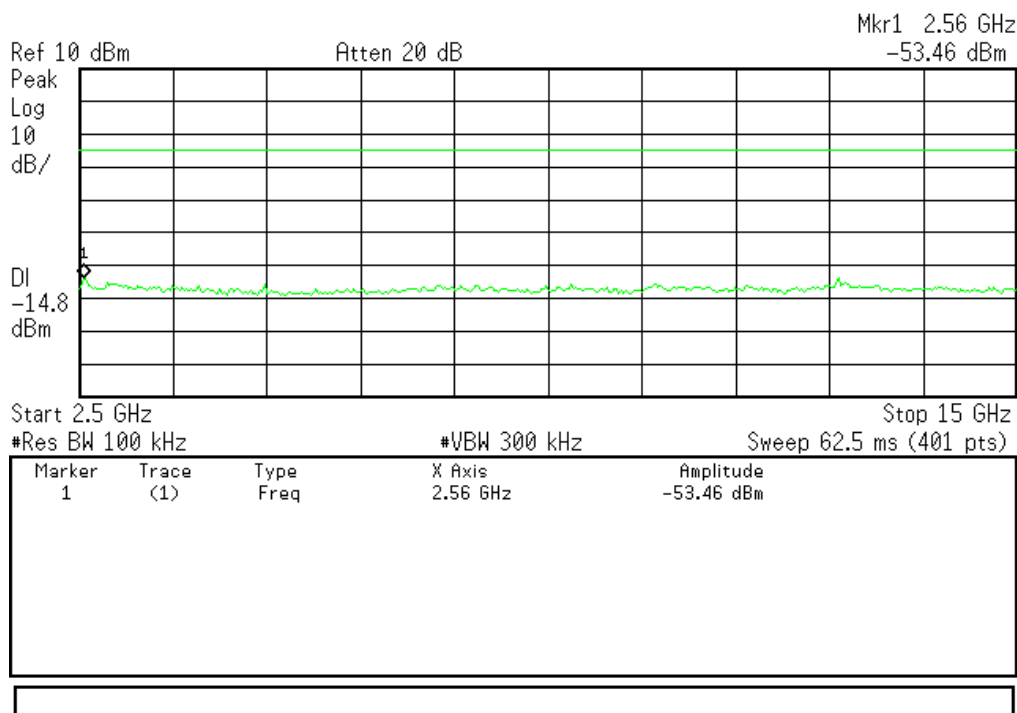
R T





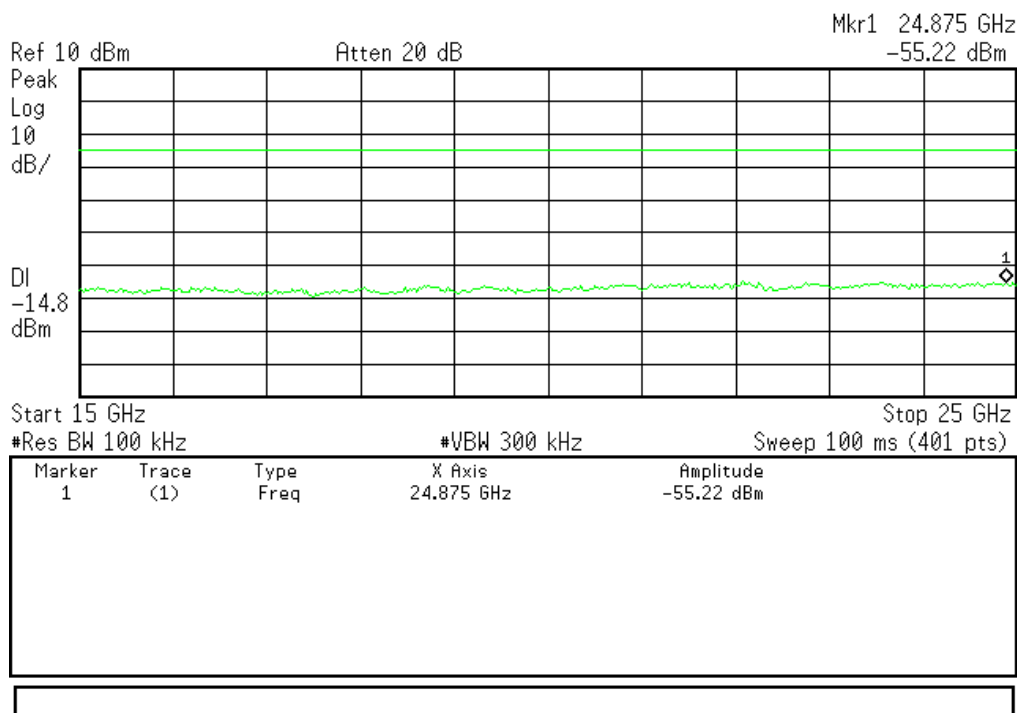
* Agilent 15:13:04 Aug 24, 2013

R T



* Agilent 15:14:26 Aug 24, 2013

R T



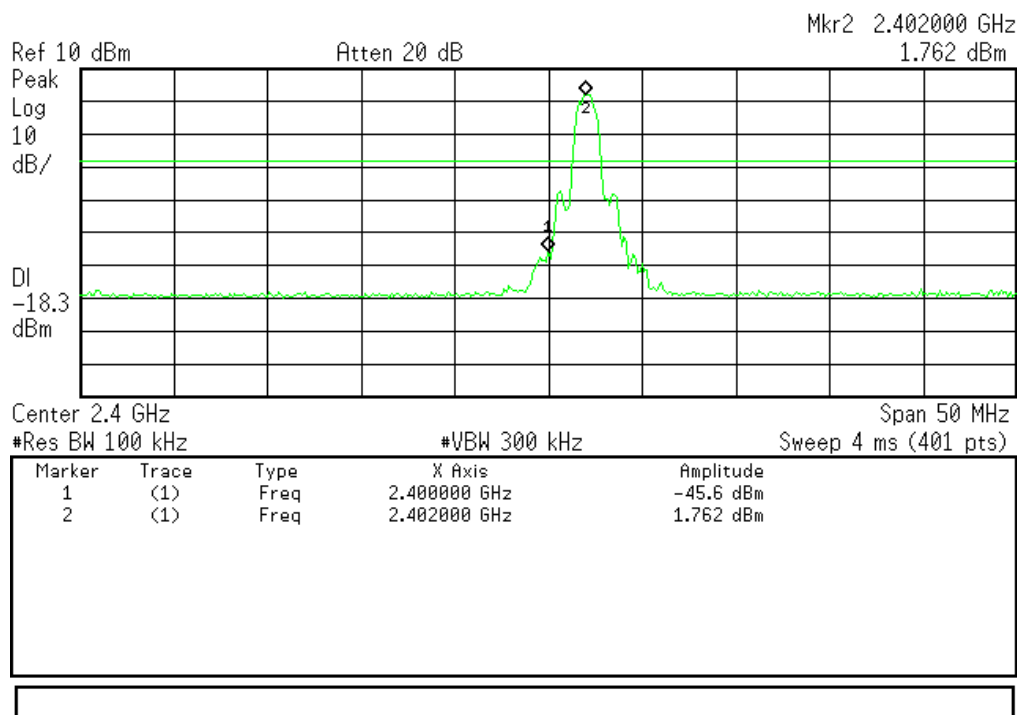


Modulation Standard: 8DPSK (3Mbps)

Channel: 00

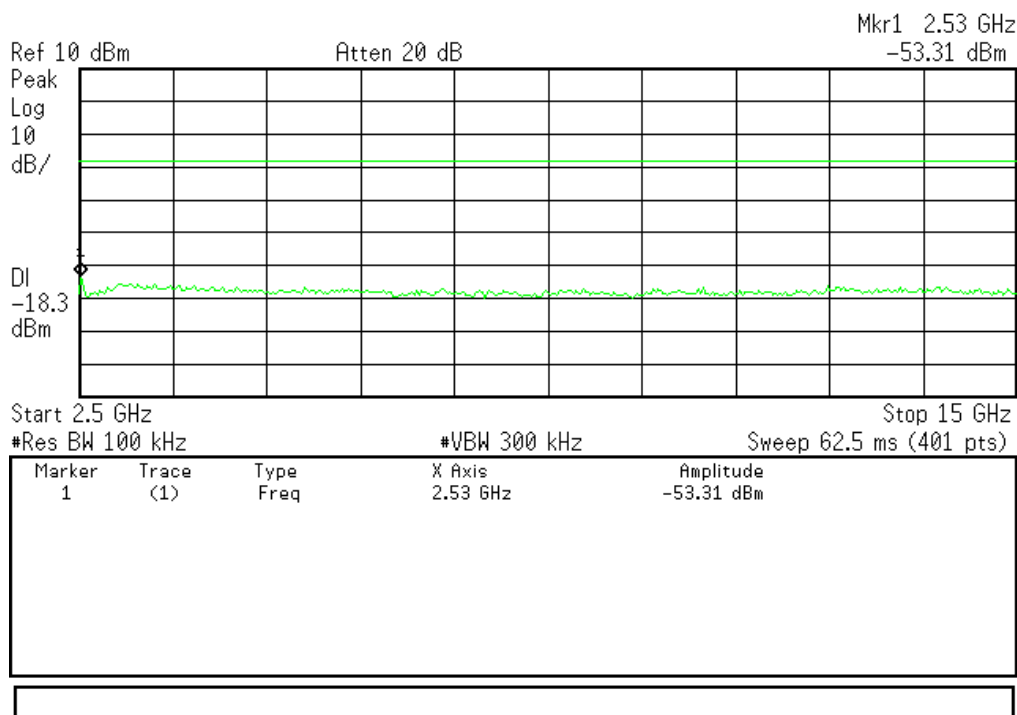
* Agilent 15:26:50 Aug 24, 2013

R T



* Agilent 15:27:56 Aug 24, 2013

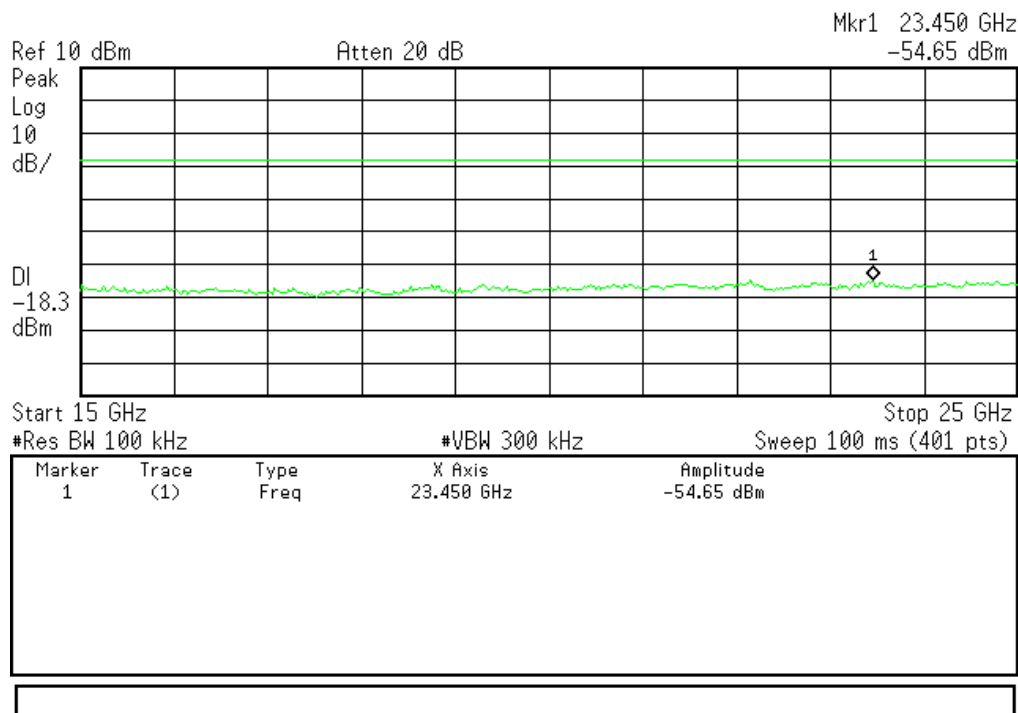
R T





* Agilent 15:29:08 Aug 24, 2013

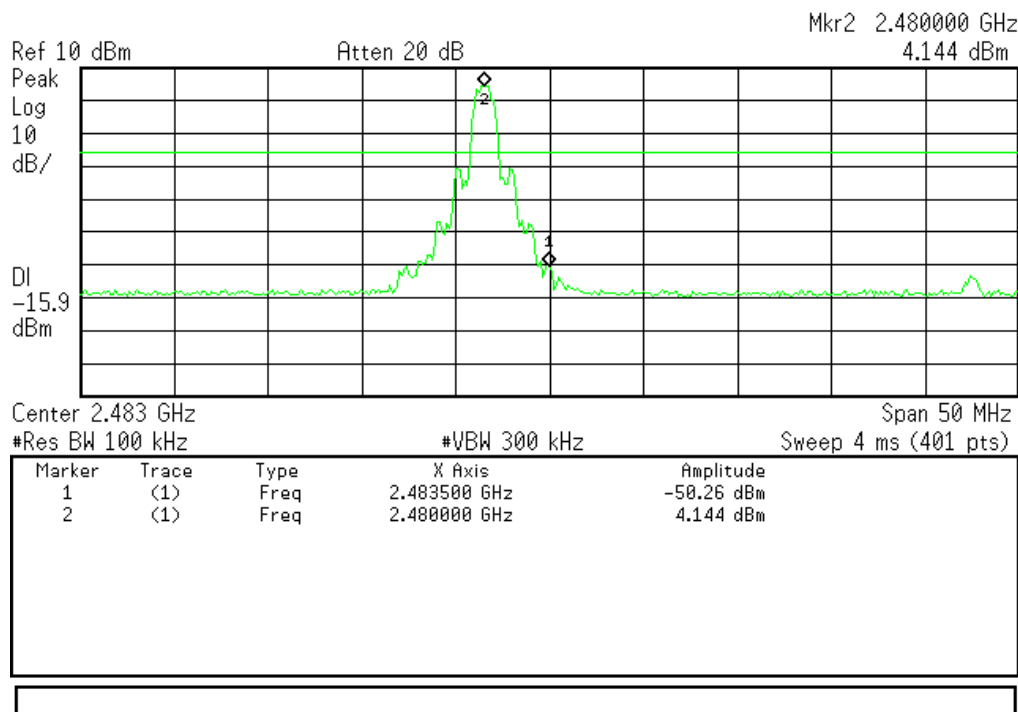
R T



Modulation Standard: 8DPSK (3Mbps)
Channel: 78

* Agilent 15:21:51 Aug 24, 2013

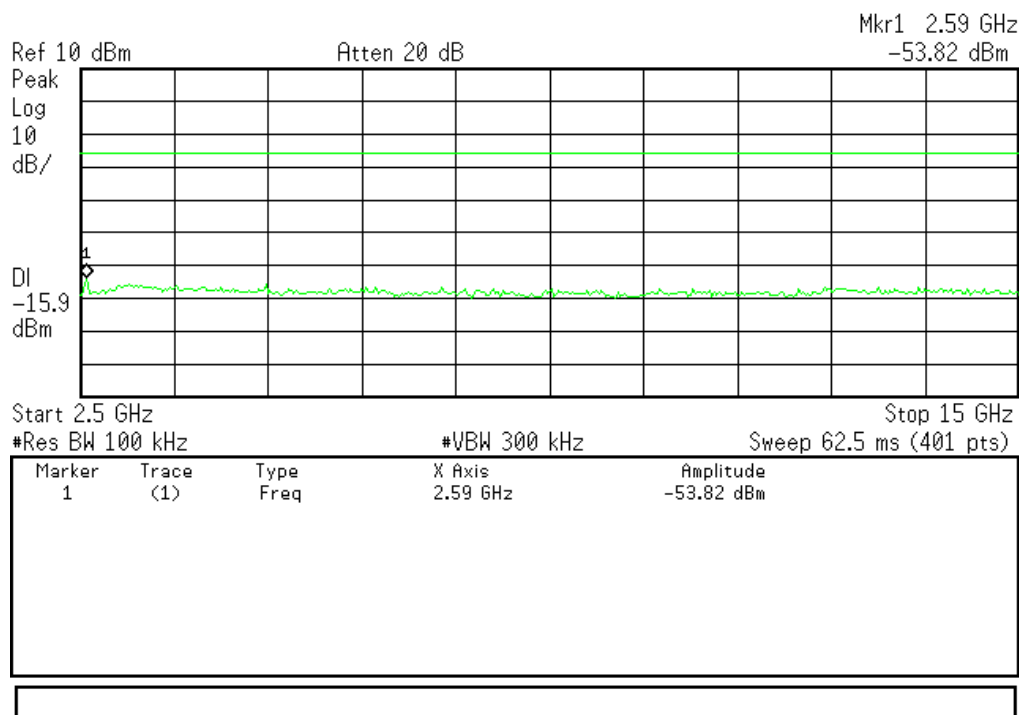
R T





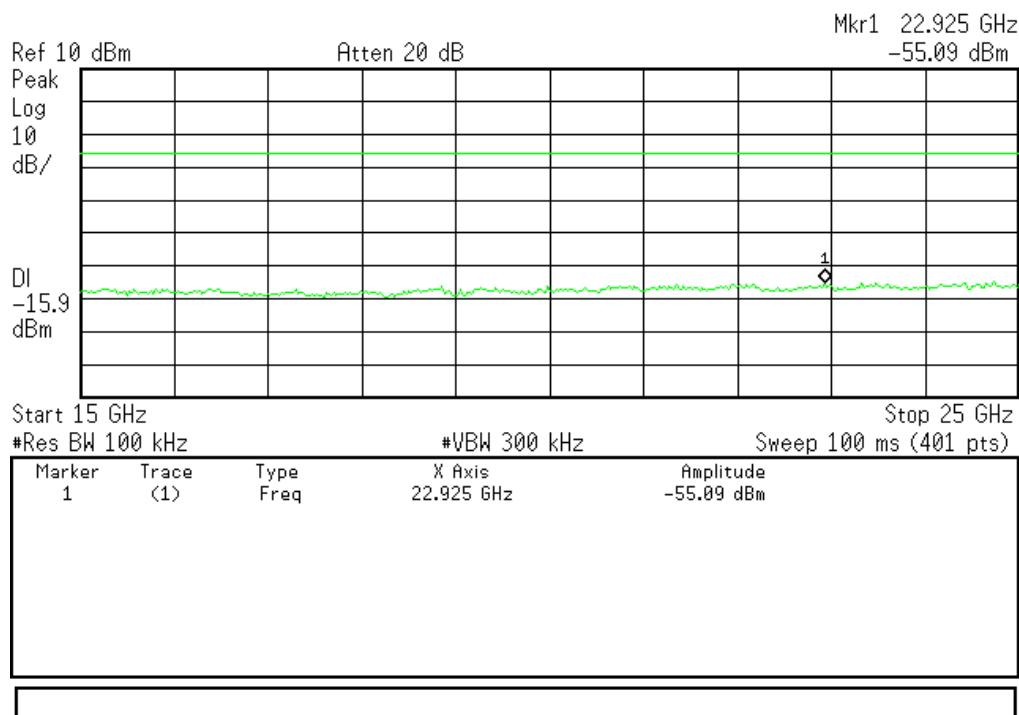
* Agilent 15:23:15 Aug 24, 2013

R T



* Agilent 15:24:08 Aug 24, 2013

R T



**11.6 Restrict band emission Measurement Data**

Test Date : Aug. 24, 2013
Temperature : 25°C
Humidity : 55%
Atmospheric Pressure : 1020 hPa

1M

Channel 0 Fundamental Frequency: 2402 MHz

VERTICAL

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2350.050	1.942	41.653	43.595	-30.405	74.000	PEAK
2	2350.580	1.943	28.627	30.570	-23.430	54.000	AVG
3	2390.000	2.005	35.249	37.254	-36.746	74.000	PEAK
4	2390.000	2.005	25.355	27.360	-26.640	54.000	AVG

HORIZONTAL

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2349.250	2.041	31.539	33.580	-20.420	54.000	AVG
2	2349.700	2.038	44.294	46.332	-27.668	74.000	PEAK
3	2390.000	1.839	34.568	36.407	-37.593	74.000	PEAK
4	2390.000	1.839	21.701	23.540	-30.460	54.000	AVG

Channel 78 Fundamental Frequency: 2480 MHz

VERTICAL

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2483.500	2.030	57.227	59.257	-14.743	74.000	PEAK
2	2483.500	2.030	42.930	44.960	-9.040	54.000	AVG
3	2500.000	2.046	55.113	57.159	-16.841	74.000	PEAK
4	2500.000	2.046	41.344	43.390	-10.610	54.000	AVG

HORIZONTAL

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2483.500	1.915	50.125	52.040	-1.960	54.000	AVG
2	2483.600	1.915	65.879	67.794	-6.206	74.000	PEAK
3	2500.000	1.944	57.911	59.855	-14.145	74.000	PEAK
4	2500.000	1.944	43.746	45.690	-8.310	54.000	AVG



3M

Channel 0 Fundamental Frequency: 2402 MHz

VERTICAL

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2350.050	1.942	39.676	41.618	-32.382	74.000	PEAK
2	2350.280	1.943	24.927	26.870	-27.130	54.000	AVG
3	2390.000	2.005	36.692	38.697	-35.303	74.000	PEAK
4	2390.410	2.006	24.574	26.580	-27.420	54.000	AVG

HORIZONTAL

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2349.700	2.038	44.532	46.570	-27.430	74.000	2349.700
2	2350.390	2.035	31.635	33.670	-20.330	54.000	2350.390
3	2390.000	1.839	34.848	36.687	-37.313	74.000	2390.000
4	2390.120	1.838	22.512	24.350	-29.650	54.000	2390.120

Channel 78 Fundamental Frequency: 2480 MHz

VERTICAL

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2483.500	2.030	59.681	61.711	-12.289	74.000	PEAK
2	2483.500	2.030	43.660	45.690	-8.310	54.000	AVG
3	2500.000	2.046	55.621	57.667	-16.333	74.000	PEAK
4	2500.000	2.046	41.644	43.690	-10.310	54.000	AVG

HORIZONTAL

No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2483.500	1.915	67.038	68.953	-5.047	74.000	PEAK
2	2483.500	1.915	50.255	52.170	-1.830	54.000	AVG
3	2500.000	1.944	58.300	60.244	-13.756	74.000	PEAK
4	2500.000	1.944	44.446	46.390	-7.610	54.000	AVG

Notes:

1. Result = Meter Reading + Factor
2. Factor = Antenna Factor + Cable Loss – Amplifier
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3 MHz for Peak detection at frequency above 1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average detection at frequency above 1GHz



12. Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.09000 – 0.11000	16.42000 – 16.42300	399.9 – 410.0	4.500 – 5.250
0.49500 – 0.505**	16.69475 – 16.69525	608.0 – 614.0	5.350 – 5.460
2.17350 – 2.19050	16.80425 – 16.80475	960.0 – 1240.0	7.250 – 7.750
4.12500 – 4.12800	25.50000 – 25.67000	1300.0 – 1427.0	8.025 – 8.500
4.17725 – 4.17775	37.50000 – 38.25000	1435.0 – 1626.5	9.000 – 9.200
4.20725 – 4.20775	73.00000 – 74.60000	1645.5 – 1646.5	9.300 – 9.500
6.21500 – 6.21800	74.80000 – 75.20000	1660.0 – 1710.0	10.600 – 12.700
6.26775 – 6.26825	108.00000 – 121.94000	1718.8 – 1722.2	13.250 – 13.400
6.31175 – 6.31225	123.00000 – 138.00000	2200.0 – 2300.0	14.470 – 14.500
8.29100 – 8.29400	149.90000 – 150.05000	2310.0 – 2390.0	15.350 – 16.200
8.36200 – 8.36600	156.52475 – 156.52525	2483.5 – 2500.0	17.700 – 21.400
8.37625 – 8.38675	156.70000 – 156.90000	2655.0 – 2900.0	22.010 – 23.120
8.41425 – 8.41475	162.01250 – 167.17000	3260.0 – 3267.0	23.600 – 24.000
12.29000 – 12.29300	167.72000 – 173.20000	3332.0 – 3339.0	31.200 – 31.800
12.51975 – 12.52025	240.00000 – 285.00000	3345.8 – 3358.0	36.430 – 36.500
12.57675 – 12.57725	322.00000 – 335.40000	3600.0 – 4400.0	Above 38.6
13.36000 – 13.41000			

** : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

12.1 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.