

 ESTECH Co., Ltd. Rm 1015, World Venture Center 11, 426-5 Gasan-dong, Guncheon-gu, Seoul, 158-803, Korea	   	Electromagnetic Interference Test Report
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Test Report for IC & FCC

FCC ID:HD56500LP
IC:1693B-65E

Report Number		ESTF151001-004					
Applicant	Company name	Honeywell International Inc.					
	Address	700 Visions Drive, P.O.Box 208 Skaneateles Falls, NY, 13153-0208					
	Telephone	803-835-8190					
Product	Product name	Mobile Computer					
	Type name	Dolphin 6500	Brand name	Honeywell			
	Model No.	Dolphin 6500,6500LP	Manufacturer	BG Electronic Co.			
	Serial No.	NONE	Country of origin	CHINA			
Test date	2009-12-07 ~ 2010-01-25		Date of issue	25-Jan-10			
Testing location	ESTECH. Co., Ltd. 97-1 Hoiuk-Ri Majang-Myon, Icheon-city, KyungKi-Do, Korea						
Standard	FCC PART 15 2008 , ANSI C 63.4 2003 , RSS-210						
Measurement facility registration number		94696	IC Number	4475			
Tested by	Engineer J.H.Kim 						
Reviewed by	Engineering Manager J.M.Yang 						
Abbreviation	OK, Pass = Passed, Fail = Failed, N/A = not applicable						
* Note - BT + Wireless = HD56500LP - Model name of the FCC is Dolphin 6500 and model name of the IC is 6500LP - This test report is not permitted to copy partly without our permission - This test result is dependent on only equipment to be used - This test result based on a single evaluation of one sample of the above mentioned							

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1. Laboratory Information

1.1 General

This EUT (Equipment Under Test) has been shown to be capable of compliance with the applicable technical standards and is tested in accordance with the measurement procedures as indicated in this report.

ESTECH Lab attests to accuracy of test data. All measurement reported herein were performed by ESTECH Co., Ltd.

ESTECH Lab assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

1.2 Test Lab.

Corporation Name : ESTECH Co., Ltd.

Head Office : Rm 1015, World Venture Center II, 426-5, Gasan-dong, Geumcheon-gu, Seoul, Korea
(Safety & Telecom. Test Lab)

EMC Test Lab : 97-1, Hoeok-ri, Majang-myun, Ichion-city, Kyonggi-do, South Korea

1.3 Official Qualification(s)

KCC : Granted Accreditation from Ministry of Information & Communication for EMC, Safety and Telecommunication

KOLAS : Accredited Lab By Korea Laboratory Accreditation Schema base on CENELEC requirements

FCC : Filed Laboratory at Federal Communications Commission

VCCI : Granted Accreditation from Voluntary Control Council for Interference from ITE

2. Description of EUT

2.1 Summary of Equipment Under Test (Bluetooth)

Product Name	: Mobile Computer
Model Number	: Dolphin 6500,6500LP
Modulation Type	: GFSK(FHSS) , DQPSK, 8DPSK
Transfer Rate	: 3Mbps
Number of Channel	: 79 ch
Channel Spacing	: 1MHz
Output Power	: GFSK : 0.66 dBm 8DPSK : -0.59 dBm
Serial Number	: NONE
Manufacturer	: BG Electronic Co.
Country of origin	: CHINA
Rating	: Adapter :(100-240) V a.c. (50/60) Hz , 0.3A : DC input : 5 Vd.c. , 2.0 A
Receipt Date	: 2009-12-02
X-tal list(s)	: 13 MHz

2.2 General descriptions of EUT

The Bluetooth frequency hopping transceiver is designed to operate between 2400 and 2483.5MHz.

For the detailed features, please refer to the manufacturer's specifications or User's Manual.

– the system is designed to comply with all of the regulations in Section 15.247 when the transmitter is presented with a continuous data (or information) stream. It is also comply with FHSS requirements in Section 15.247(a)(1).

: Its hopping sequence is pseudo random, all channels used equally on average.

The receiver input bandwidth approximately equal the transmit band bandwidth, and its hop in sequence with the transmit signal.

– the system does not coordinate its channel selection/hopping sequence with other frequency hopping systems for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters.

3. Test Standards

Test Standard : FCC PART 15 (2008) & RSS-210

This Standard sets out the regulations under which an intentional, unintentional, or incidental radiator may be operated without an individual license. It also contains the technical specifications, administrative requirements and other conditions relating to the marketing of Part 15 devices.

Test Method : ANSI C 63.4 (2003)

This standard sets forth uniform methods of measurement of radio-frequency (RF) signals and noise emitted from both unintentional and intentional emitters of RF energy in the frequency range 9 kHz to 40 GHz. Methods for the measurement of radiated and AC power-line conducted radio noise are covered and may be applied to any such equipment unless otherwise specified by individual equipment requirements. These methods cover measurement of certain devices that deliberately radiate energy, such as intentional emitters, but does not cover licensed transmitters. This standard is not intended for certification/approval of avionic equipment or for industrial, scientific, and medical (ISM) equipment. These methods apply to the measurement of individual units or systems comprised of multiple units.

Summary of Test Results

Applied Standard : 47 CFR Part 15 Subpart C & RSS 210 Part I and II					
FCC Standard	IC Standard	Test Type	Result	Remark	Limit
15.207	RSS-Gen 7.2.2	AC Power Conducted Emission	Pass	Meet the requirement	
15.205 & 15.209	A8.5	Intentional Radiated Emission	Pass	Meet the requirement	
15.247(a)(1)	A8.1(a), A8.1(b)	Carrier Frequency Separation & 20 Bandwidth	Pass	Meet the requirement	>25kHz
15.247(b)	A8.4(2)	Maximum Peak output power	Pass	Meet the requirement	30dBm(1W)
15.247(a)(1)(ii)	A8.1(d)	Number of Hopping Frequency	Pass	Meet the requirement	>75
15.247(c)	A8.5	Transmitter Radiated Emission	Pass	Meet the requirement	
15.247(a)(1)(iii)	A8.1(d)	Time of Occupancy (Dwell Time)	Pass	Meet the requirement	<400ms
15.247(d)	A8.5	Band Edge Measurement	Pass	Meet the requirement	
15.107	RSS-Gen 7.2.2	Receiver conducted Emission	N/A		
15.109	RSS-Gen 7.2.3.2	Receiver radiated emission	Pass	Meet the requirement	

4. Measurement Condition

4.1 EUT Operation

a. Channel

Ch.	Frequency	Ch.	Frequency
0	2402 MHz	40	2442 MHz
1	2403 MHz	41	2443 MHz
2	2404 MHz	42	2444 MHz
3	2405 MHz	43	2445 MHz
4	2406 MHz	...	...
...	...	78	2480 MHz
39	2441 MHz		

b. Measurement Channel :Low(2402MHz), Middle(2441MHz),High(2480MHz)

c. Test Mode : DQPSK, 8DPSK, GFSK(worst case)

d. Test rate :3Mbps



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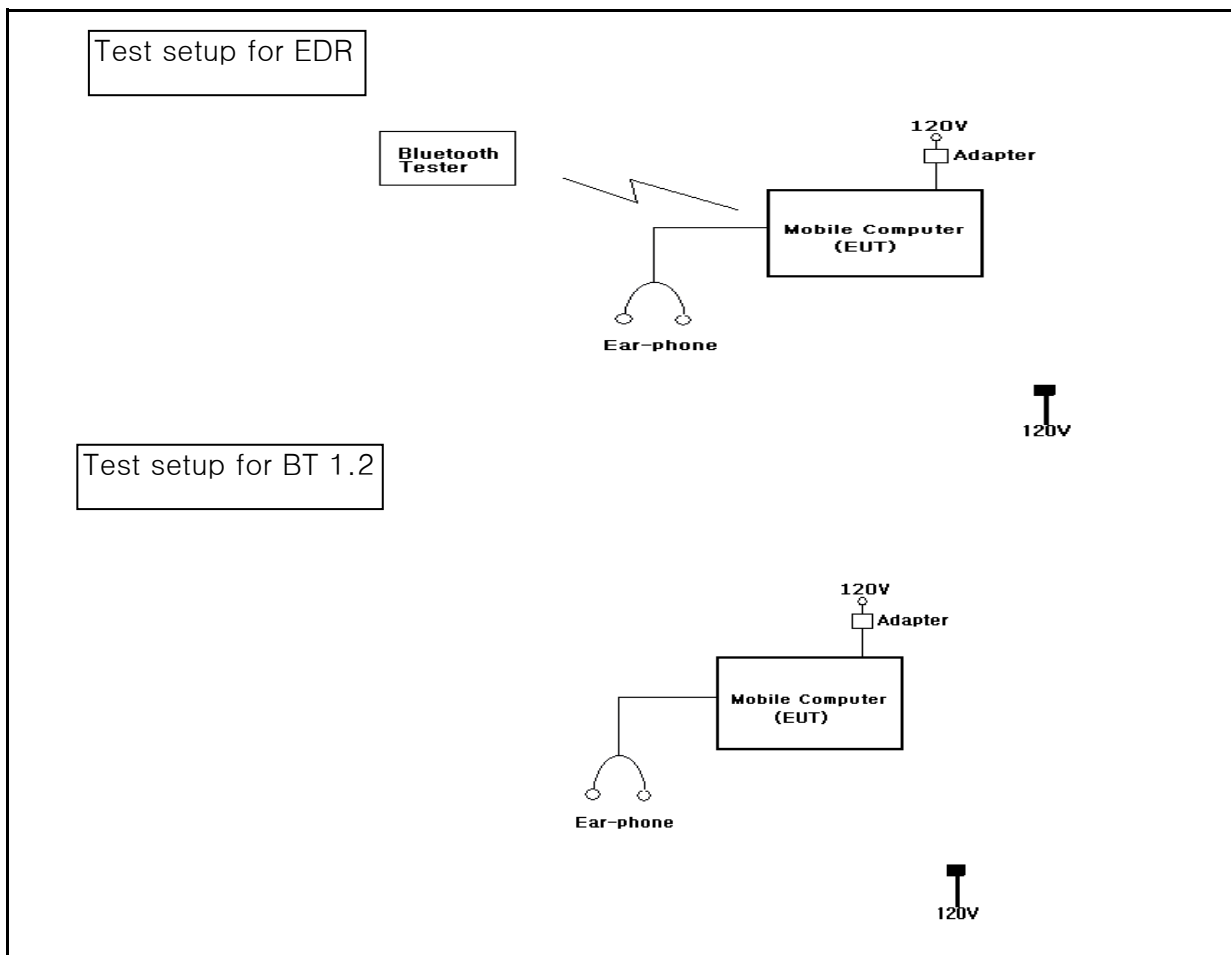


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4.2 EUT Operation.

- * The EUT was in the following operation mode during all testing
- * The operational conditions of the EUT was determined by the manufacturer according to the typical use of the EUT with respect to the expected highest level of emission
- * Execute a RF test program to enable EUT under transmission/receiving condition continuously at specific channel frequency.

4.3 Configuration and Peripherals



4.4 EUT and Support equipment

Equipment Name	Model Name	S/N	Manufacturer	Remark (FCC ID)
Mobile Computer	Dolphin 6500,6500LP	NONE	BG Electronic Co.	EUT
ADAPTER	PSC11R-050	P93801020A2	Phihong(Dongguan)Electronics Co.,Ltd	
Earphone	NONE	NONE	LG	

4.5 Cable Connecting

Start Equipment		End Equipment		Cable Standard		Remark
Name	I/O port	Name	I/O port	Length	Shielded	
Mobile Computer	Line	Earphone	Line	1.3	Unshielded	
Mobile Computer	Power	Adapter	—	2	Unshielded	

5. Carrier Frequency Separation

5.1 Test procedure

According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

5.2 Test instruments and measurement setup

The spectrum analyzer is set to as following.

- . RBW= 300KHz
- . VBW= 300KHz
- . Span= 3MHz
- . Sweep= suitable duration based on the EUT specification.

20dB Bandwidth Test Instruments

Description	Model	Serial Number	Cal. Due Date
Spectrum Analyzer	E4407B	US42041281	2010-09-10
Bluetooth Tester	TC-3000A	3000A570224	2010-12-18
Dual Directional Coupler	778D	16502	2010-02-26
-Spectrum Analyzer <=> EUT	Loss: 22.0dB	-	

5.3 Measurement results

EUT	Mobile Computer	MODEL	Dolphin 6500,6500LP
MODE	FHSS	ENVIRONMENTAL CONDITION	26℃, 43%RH
INPUT POWER	5Vdc		

CHANNEL	Channel Frequency (MHz)	Bandwidth at 20dB below(kHz)	Channel Separation (MHz)	Limit (kHz)	PASS/FAIL
0	2402	937	1.0	>25	PASS
39	2441	949	1.0	>25	PASS
78	2480	935	1.0	>25	PASS

(8DPSK)

CHANNEL	Channel Frequency (MHz)	Bandwidth at 20dB below(MHz)	Channel Separation (MHz)	Limit (MHz)	PASS/FAIL
0	2402	1.277	1.0	>0.85	PASS
39	2441	1.294	1.0	>0.86	PASS
78	2480	1.328	1.0	>0.89	PASS



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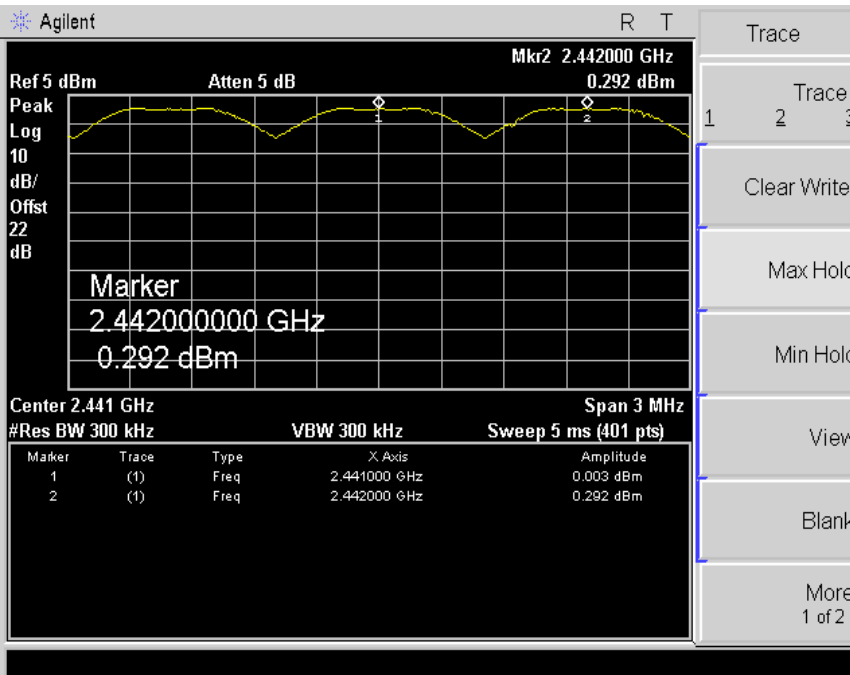
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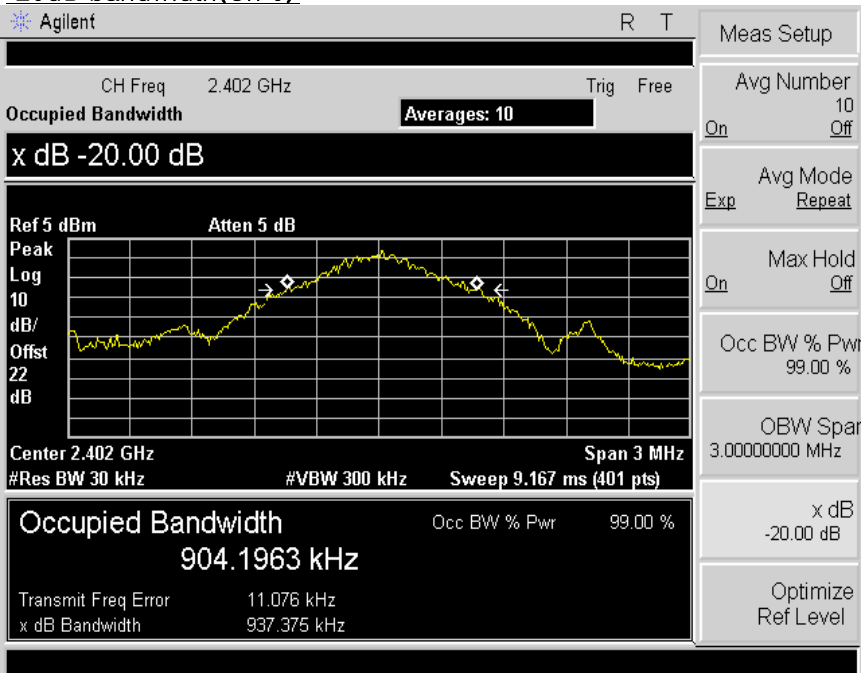
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5.4 Trace data (GFSK)

Channel Separation



20dB bandwidth(Ch 0)





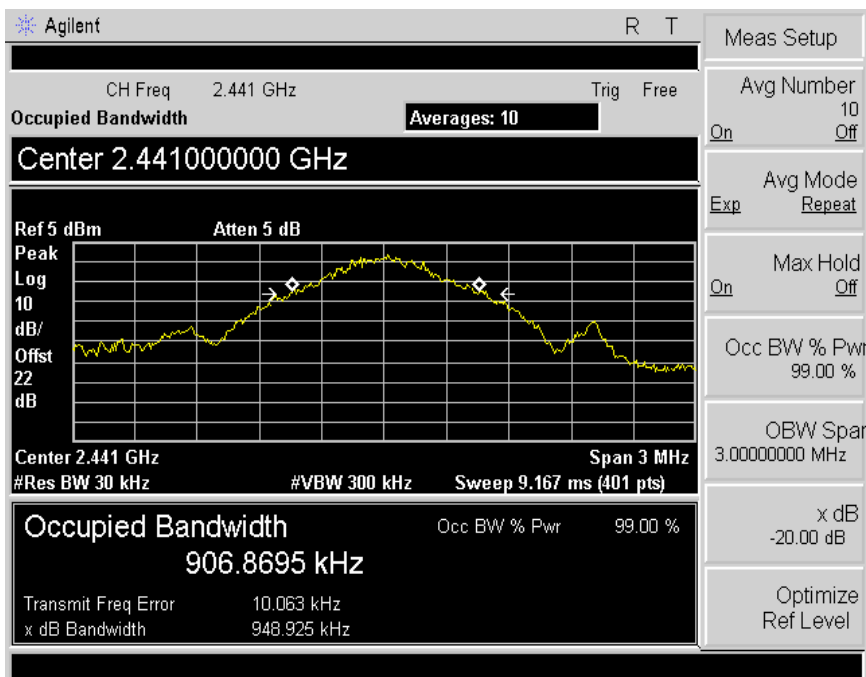
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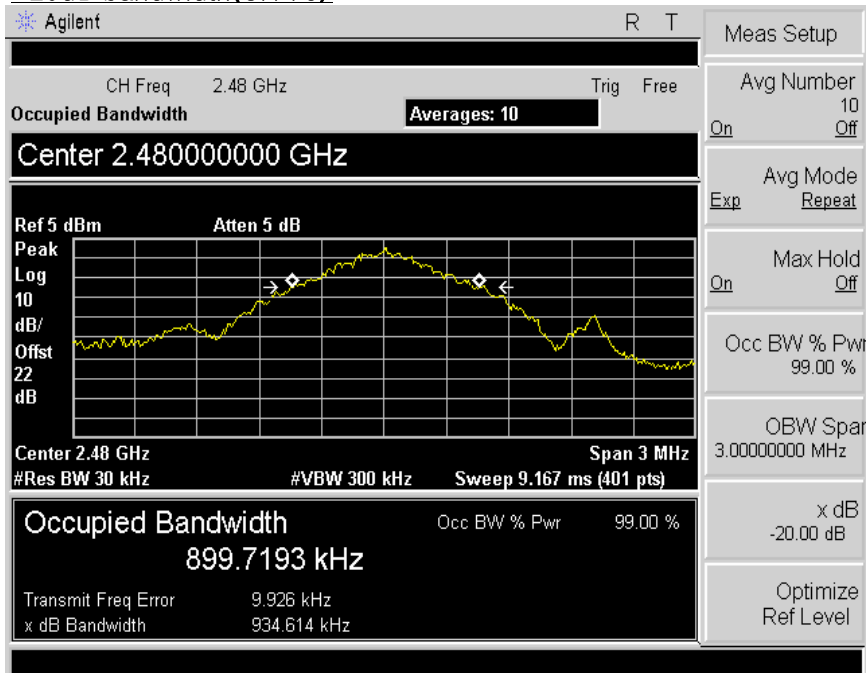


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20dB bandwidth(CH 39)



20dB bandwidth(CH 78)





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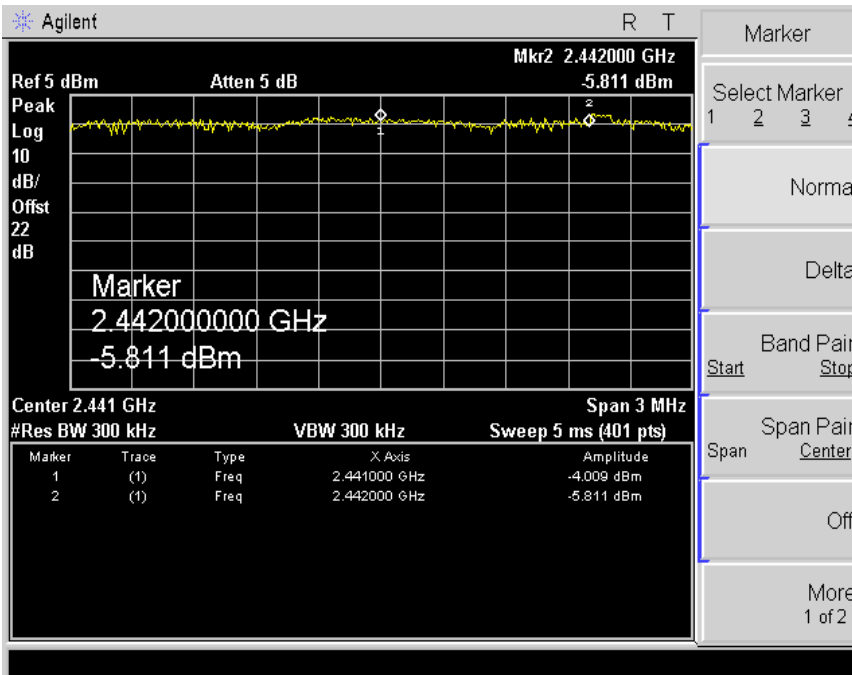
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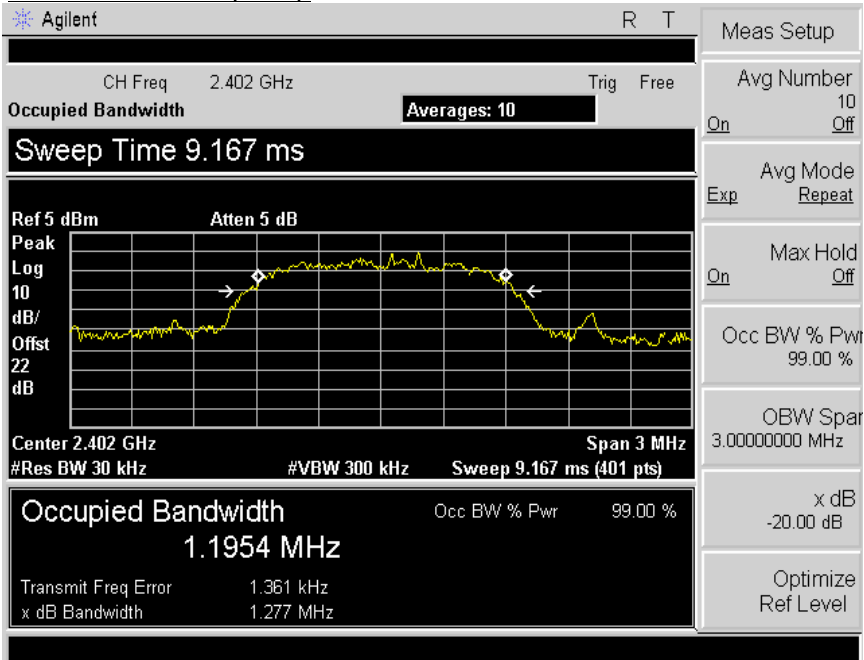
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(8DPSK)

Channel Separation



20dB bandwidth(Ch 0)





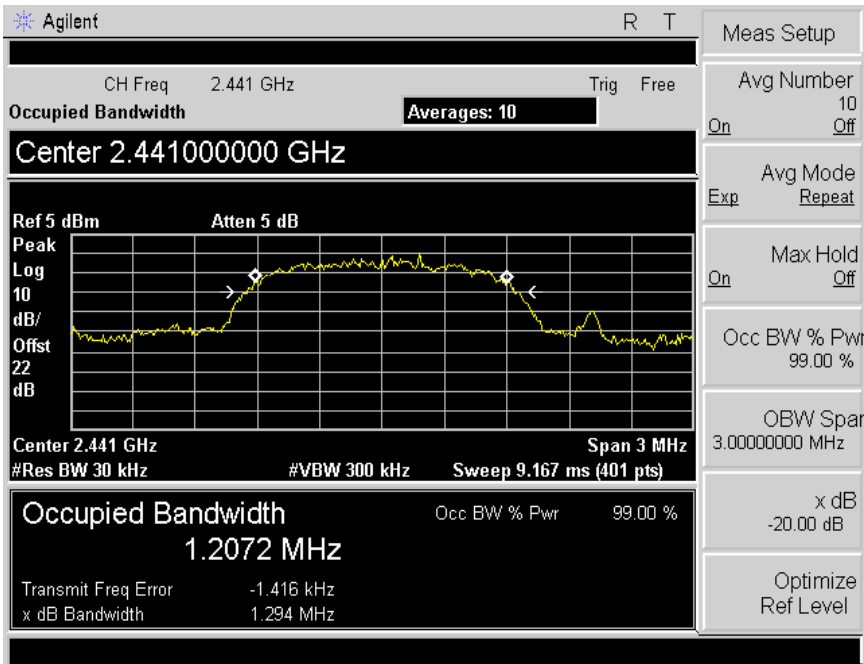
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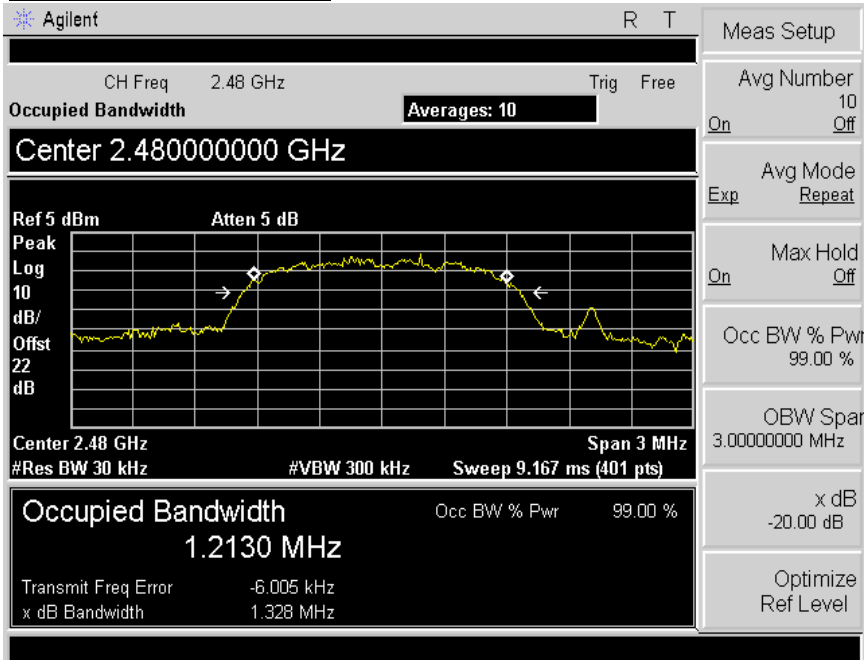


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20dB bandwidth(CH 39)



20dB bandwidth(CH 78)



6. MAXIMUM PEAK OUTPUT POWER

6.1 Test procedure

The transmitter antenna terminal is connected to the input of a Power Sensor. Measurement is made while EUT is operating in transmission mode at the appropriate center frequency. The maximum peak output power measurement is 30dBm.

Description	Model	Serial Number	Cal. Due Date
Power Meter	NRVS	849600/045	2010-02-11
Power Sensor	NRV-251	325948/013	2010-02-11
Bluetooth Tester	TC-3000A	3000A570224	2010-12-18
Dual Directional Coupler	778D	16502	2010-02-26
-Spectrum Analyzer <=> EUT	Loss: 22.0dB	-	

6.2 Measurement results

EUT	Mobile Computer	MODEL	Dolphin 6500,6500LP
MODE	GFSK,8DPSK DH5	ENVIRONMENTAL CONDITION	24℃, 43%RH
INPUT POWER	5Vdc		

GFSK

CHANNEL	Channel Frequency (MHz)	Peak Power Output(dBm)		Limit[1W] (dBm)	PASS/ FAIL
		(dBm)	(W)		
0	2402	-0.47	0.0009	30.0	PASS
39	2441	0.42	0.0011	30.0	PASS
78	2480	0.66	0.0012	30.0	PASS

8DPSK

CHANNEL	Channel Frequency (MHz)	Peak Power Output(dBm)		Limit[1W] (dBm)	PASS/ FAIL
		(dBm)	(W)		
0	2402	-0.59	0.0009	30.0	PASS
39	2441	-1.23	0.0008	30.0	PASS
78	2480	-1.41	0.0007	30.0	PASS

Note:GFSK mode is max power in three different modulations.

7. Number of Hopping Frequency

7.1 Test procedure

According to §15.247(a)(1)(ii), Frequency hopping systems operating in the 2400MHz–2483.5MHz bands shall use at least 75 hopping frequencies.

7.2 Test instruments and measurement setup

The spectrum analyzer is set to as following.

- . RBW= 100KHz
- . VBW= 100KHz
- . Span= the frequency band of operation
- . Sweep= suitable duration based on the EUT specification.

The Number of Hopping Frequency Test Instruments

Description	Model	Serial Number	Cal. Due Date
Spectrum Analyzer	E4407B	US42041281	2010-09-10
Bluetooth Tester	TC-3000A	3000A570224	2010-12-18
Dual Directional Coupler	778D	16502	2010-02-26
-Spectrum Analyzer <=> EUT	Loss: 22.0dB		

7.3 Measurement results

EUT	Mobile Computer	MODEL	Dolphin 6500,6500LP
MODE	FHSS	ENVIRONMENTAL CONDITION	26℃, 43%RH
INPUT POWER	5Vdc		
Number of CH	Limit (Number of CH)	PASS/FAIL	
79	>75	PASS	



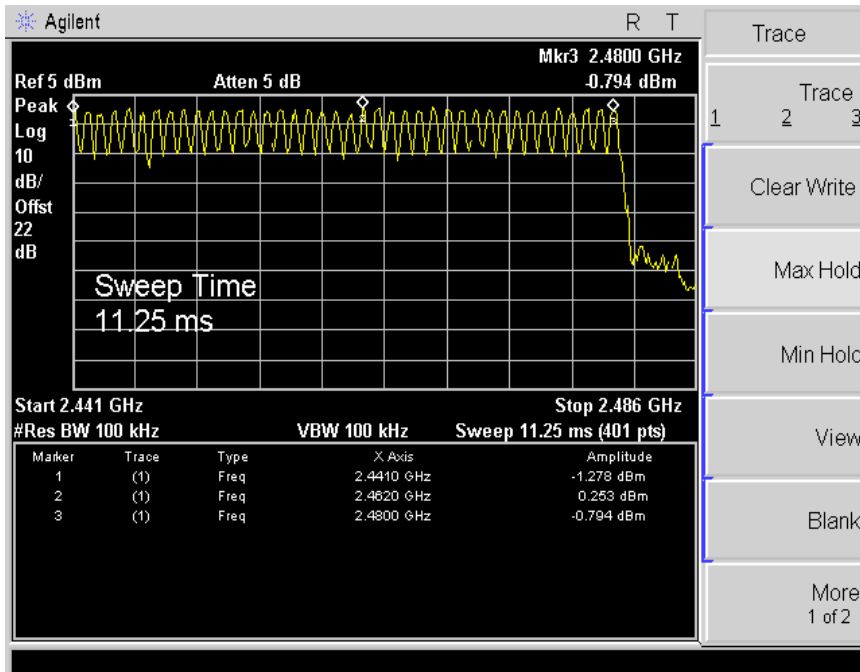
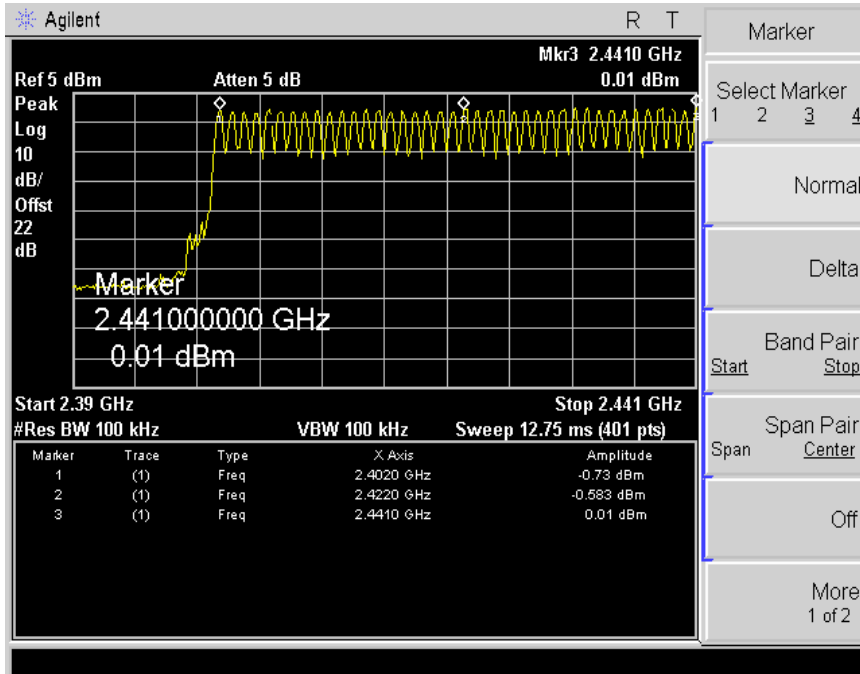
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7.4 Trace data





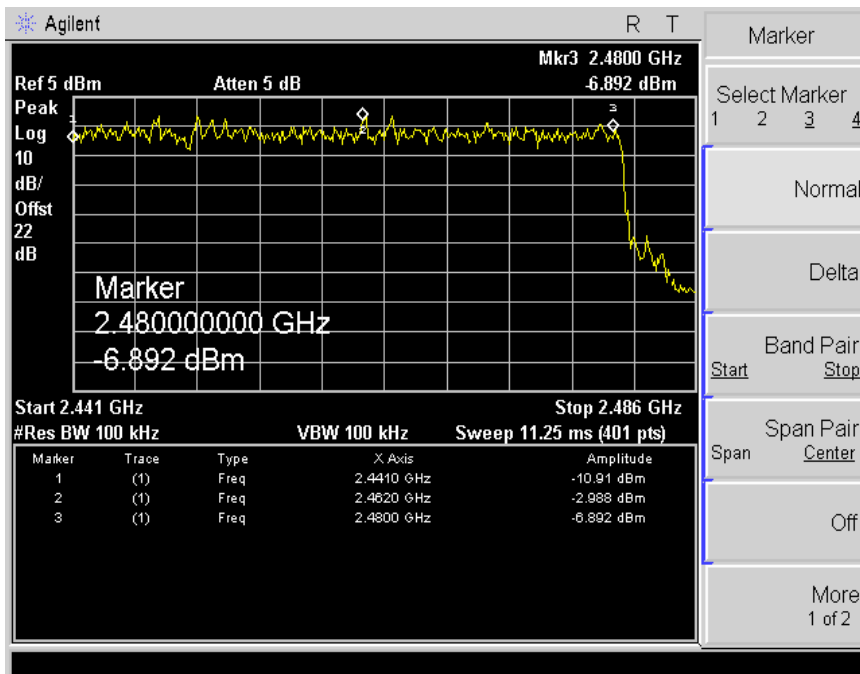
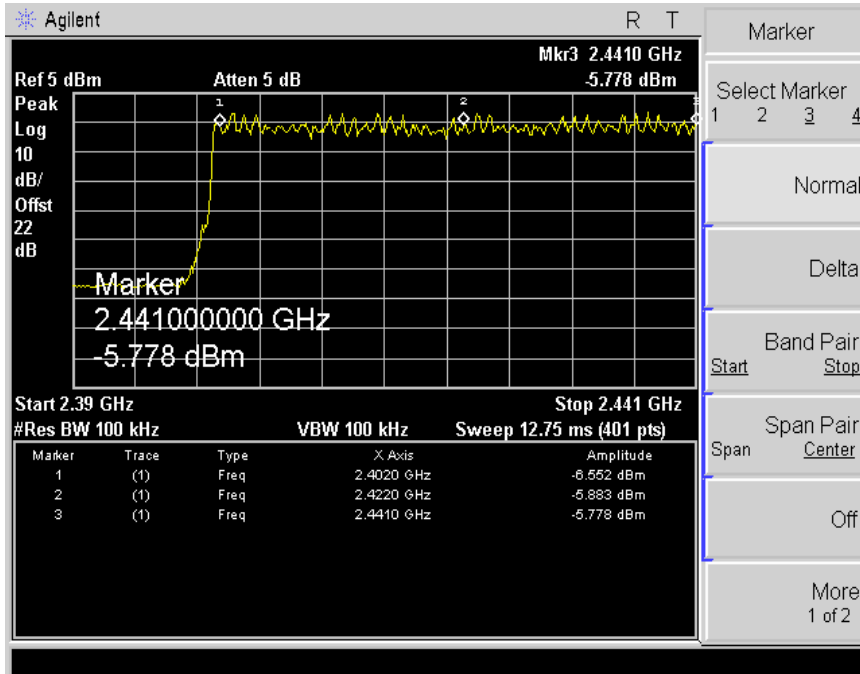
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7.4 Trace data



8. Time of Occupancy (Dwell Time)

8.1 Test procedure

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz–2483.5 MHz bands. The average time of occupancy on any channels shall not greater than 0.4 s within a period 0.4 s multiplied by the number of hopping channels employed.

8.2 Test instruments and measurement setup

The spectrum analyzer is set to as following.

- . RBW= 1MHz
- . VBW≥RBW
- . Span= zero span, centered on a hopping channel
- . Sweep = as necessary to capture the entire dwell time per hopping channel
- . Detector function = Peak
- . Trace = Max hold

The Time of Occupancy Test Instruments

Description	Model	Serial Number	Cal. Due Date
Spectrum Analyzer	E4407B	US42041281	2010-09-01
Bluetooth Tester	TC-3000A	3000A570224	2010-12-18
Dual Directional Coupler	778D	16502	2010-02-26
-Spectrum Analyzer <=> EUT	Loss:22.0dB	—	

8.3 Measurement results

EUT	Mobile Computer	MODEL	Dolphin 6500,6500LP
MODE	FHSS	ENVIRONMENTAL CONDITION	26℃, 43%RH
INPUT POWER	5Vdc		

A. DH1 Mode

One period for each particular channel : $0.402 \text{ ms} \times 320.1 = 128.68 \text{ ms}$

Channel	Pulse Time(ms)	Limit (ms)	PASS/FAIL
0	128.68	400	PASS

B. DH3 Mode

One period for each particular channel : $1.617 \text{ ms} \times 159.9 = 258.56 \text{ ms}$

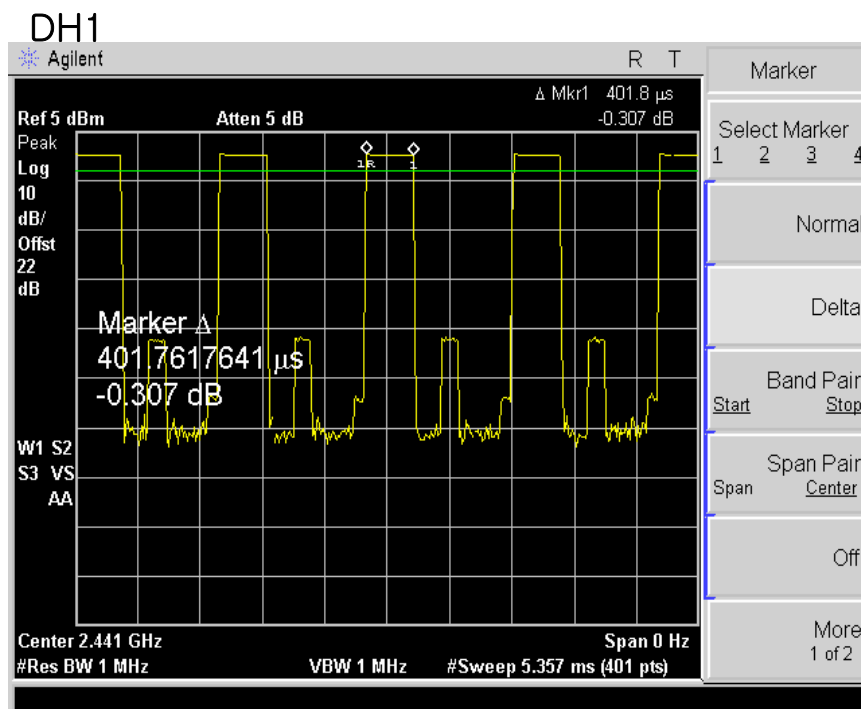
Channel	Pulse Time(ms)	Limit (ms)	PASS/FAIL
39	258.56	400	PASS

C. DH5 Mode

One period for each particular channel : $2.830 \text{ ms} \times 106.81 = 302.27 \text{ ms}$

Channel	Pulse Time(ms)	Limit (ms)	PASS/FAIL
78	302.3	400	PASS

8.4 Trace data





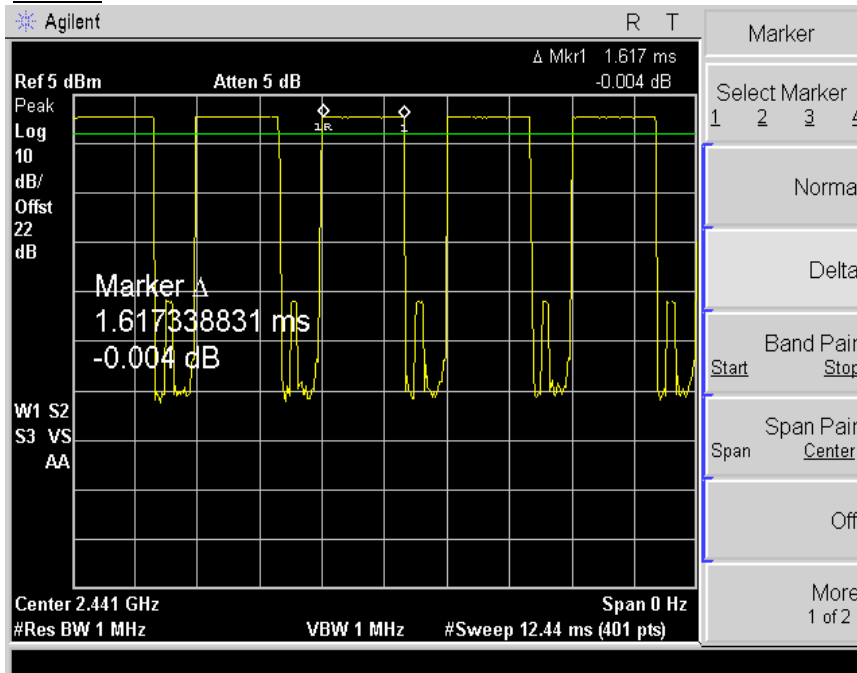
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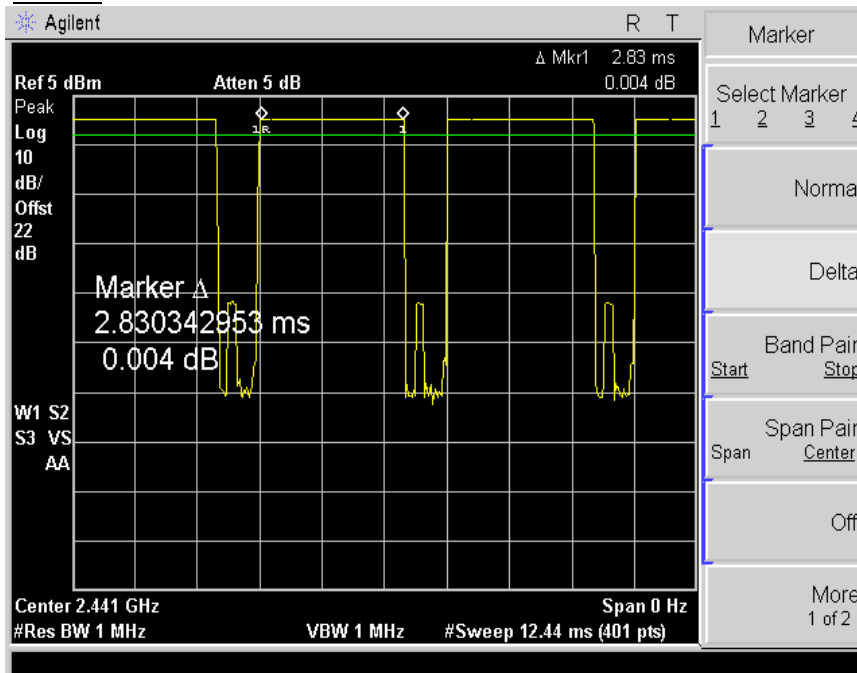


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DH3



DH5



8DPSK

A. DH1 Mode

One period for each particular channel : $0.411 \text{ ms} \times 320.1 = 131.56 \text{ ms}$

Channel	Pulse Time(ms)	Limit (ms)	PASS/FAIL
0	131.6	400	PASS

B. DH3 Mode

One period for each particular channel : $1.656 \text{ ms} \times 159.9 = 264.79 \text{ ms}$

Channel	Pulse Time(ms)	Limit (ms)	PASS/FAIL
39	264.8	400	PASS

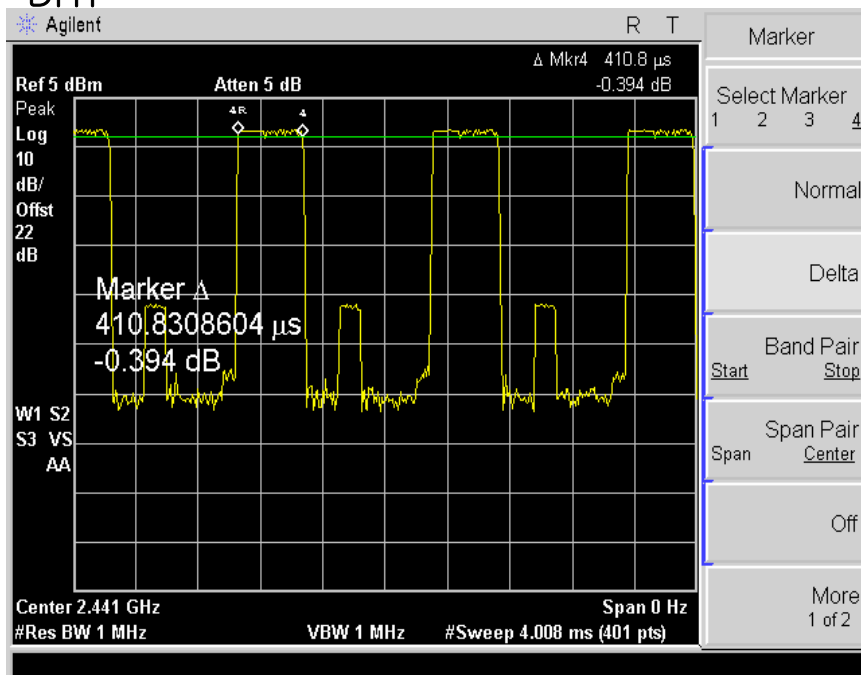
C. DH5 Mode

One period for each particular channel : $2.928 \text{ ms} \times 106.81 = 312.73 \text{ ms}$

Channel	Pulse Time(ms)	Limit (ms)	PASS/FAIL
78	312.7	400	PASS

8.5 Trace data

DH1





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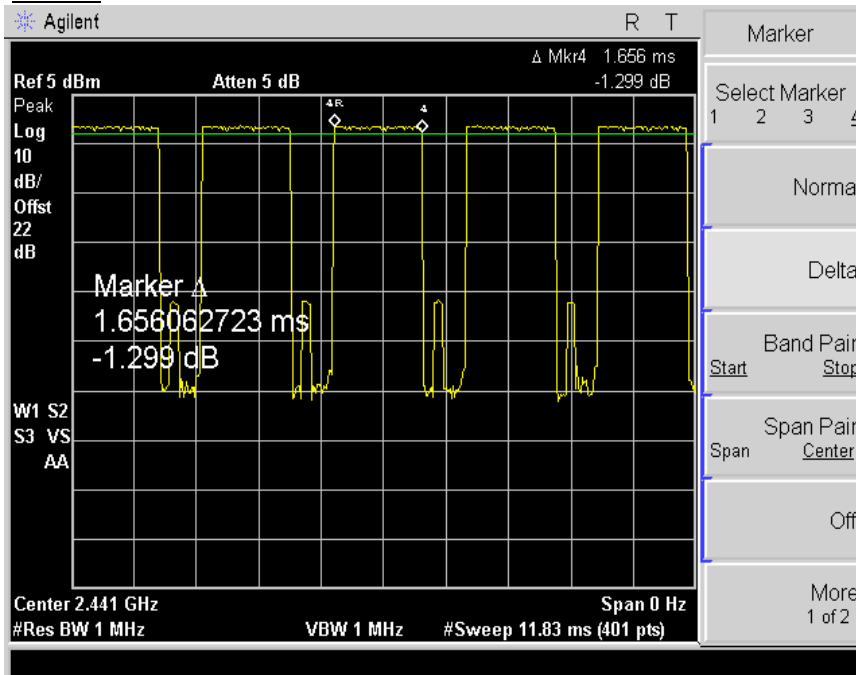
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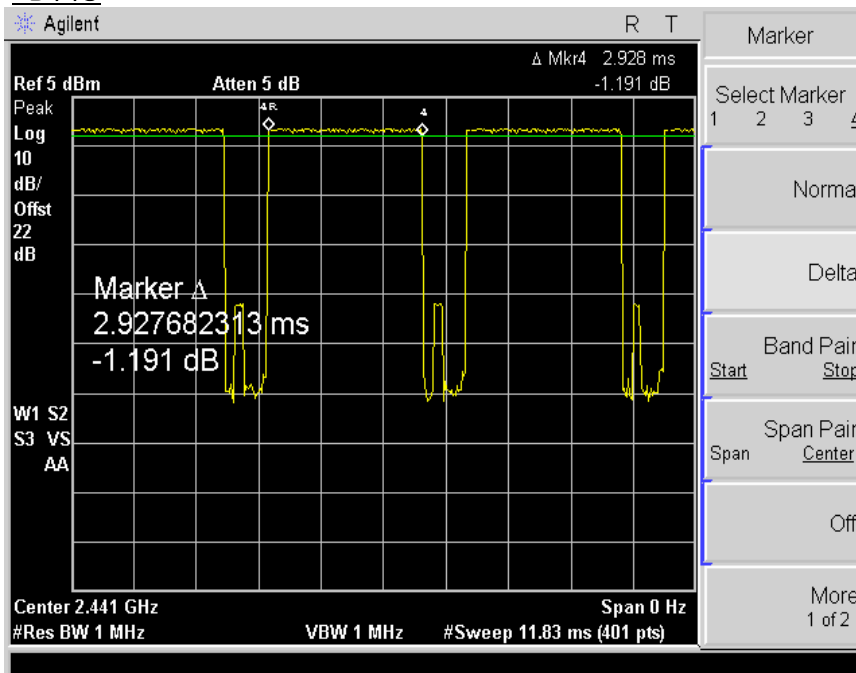
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8DPSK

DH3



DH5



9. band-edge and out of band emissions.

9.1 Test procedure

The radio frequency power at 20dB down from the highest inband power level is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency. The band edge&out of band emission shall be at least 20dB below of the highest inband power level.

9.2 Test instruments and measurement setup

The spectrum analyzer is set to as following.

- . RBW= 100KHz
- . VBW= 100KHz
- . Span= suitable frequency span
- . Sweep= suitable duration based on the EUT specification.

Band Edge&Out of Emission Test Instruments

Description	Model	Serial Number	Cal. Due Date
Spectrum Analyzer	E4407B	US42041281	2010-09-10
Bluetooth Tester	TC-3000A	3000A570224	2010-12-18
Dual Directional Coupler	778D	16502	2010-02-26
-Spectrum Analyzer <=> EUT	Loss: 22.0dB		

9.3 Measurement results of band-edge & out of emission

EUT	Mobile Computer	MODEL	Dolphin 6500,6500LP
MODE	GFSK	ENVIRONMENTAL CONDITION	24℃, 43%RH
INPUT POWER	5Vdc		

* Refer to attach spectrum analyzer data chart.



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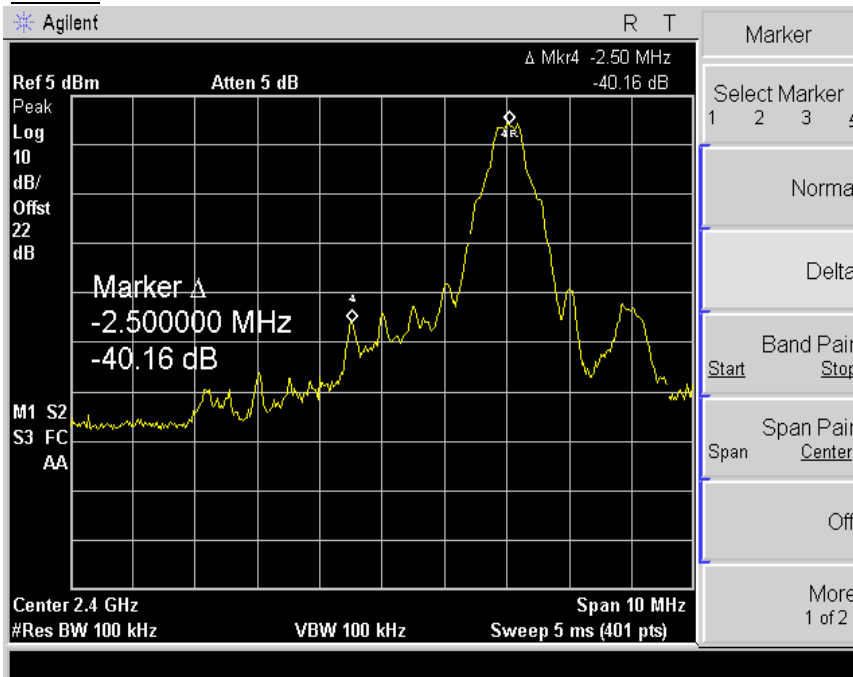
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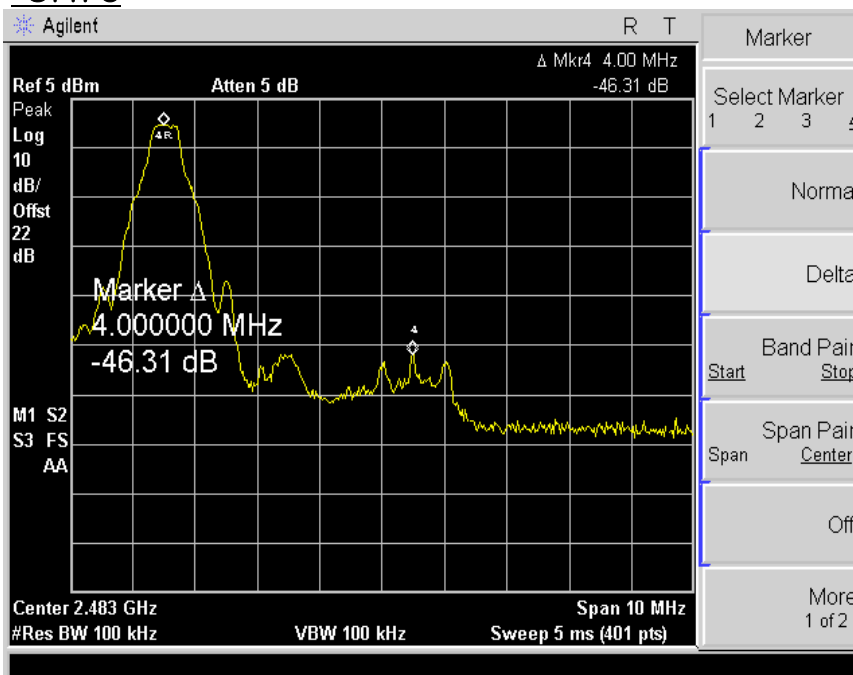
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9.4 Trace data of band-edge & Out of Emission

CH0



CH78





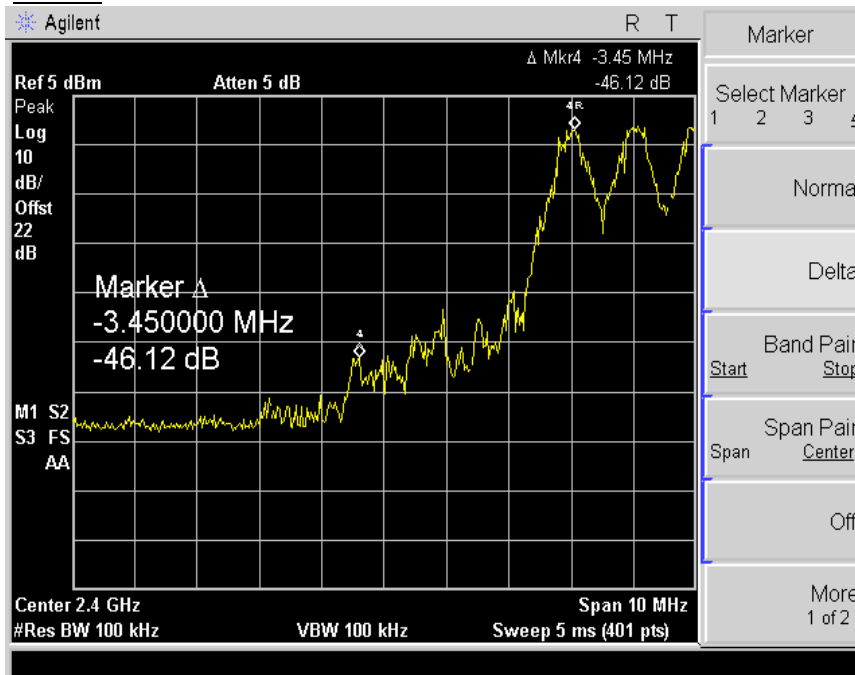
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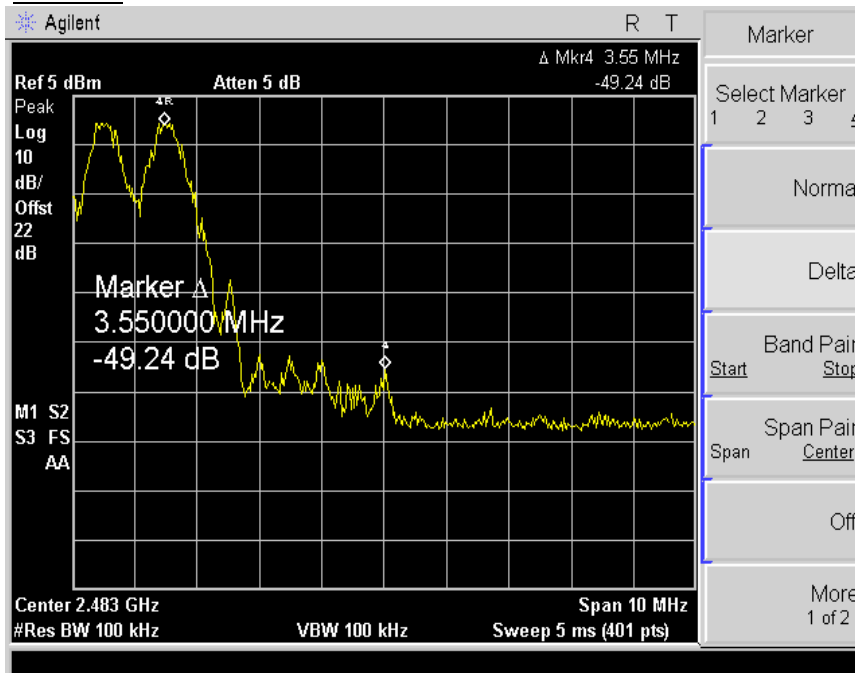


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Hopping on CH0



CH78





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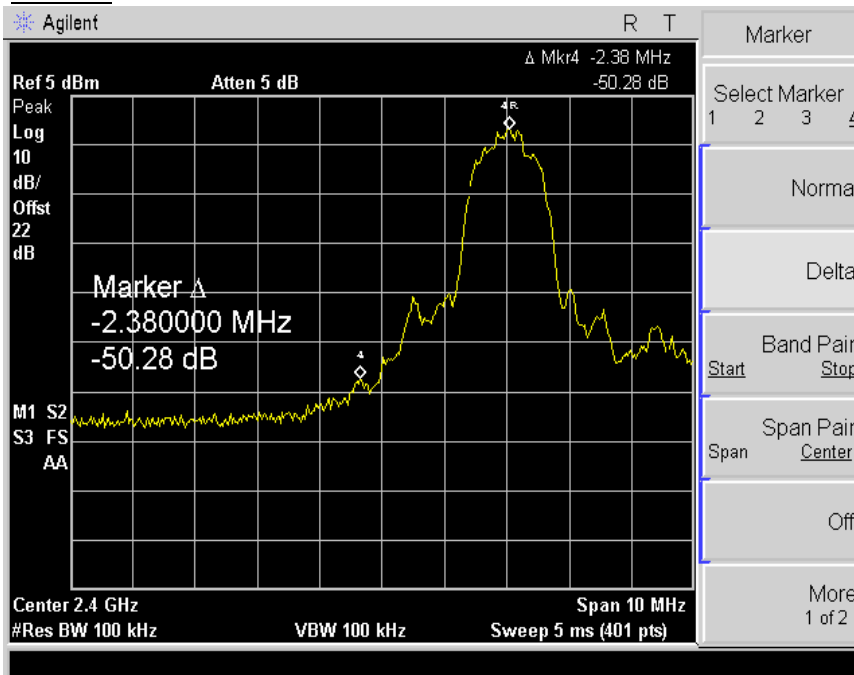
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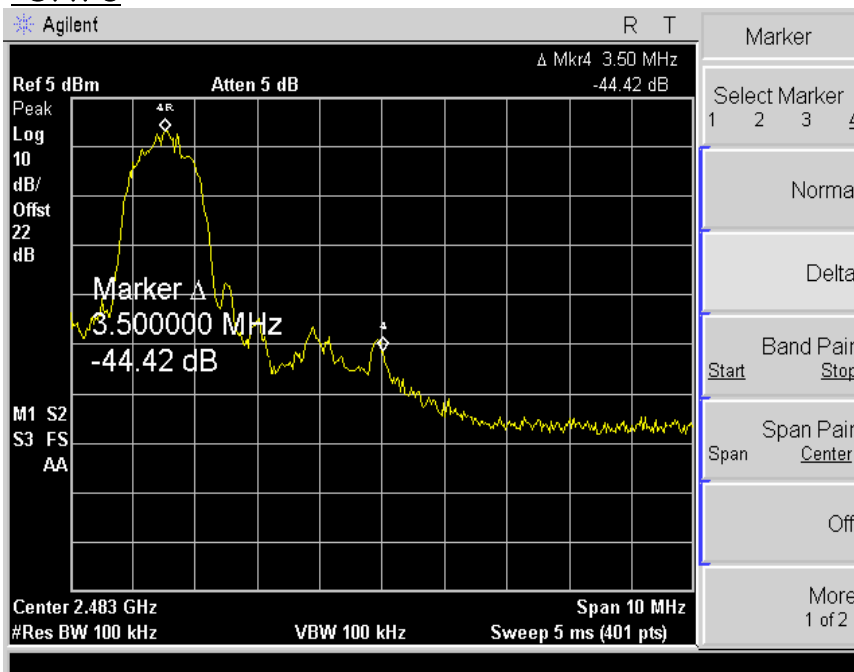
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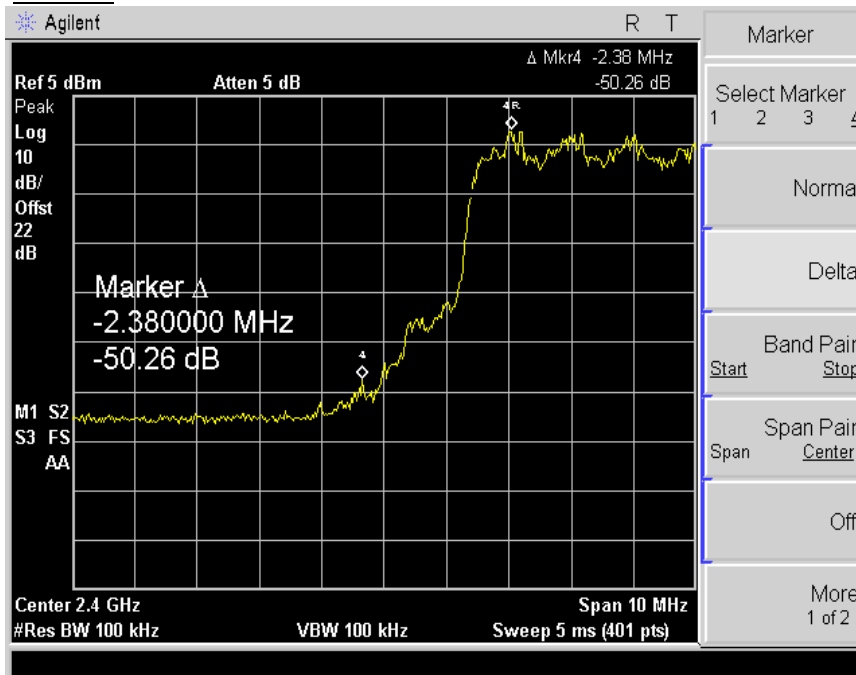
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Seoul, 158-803, Korea



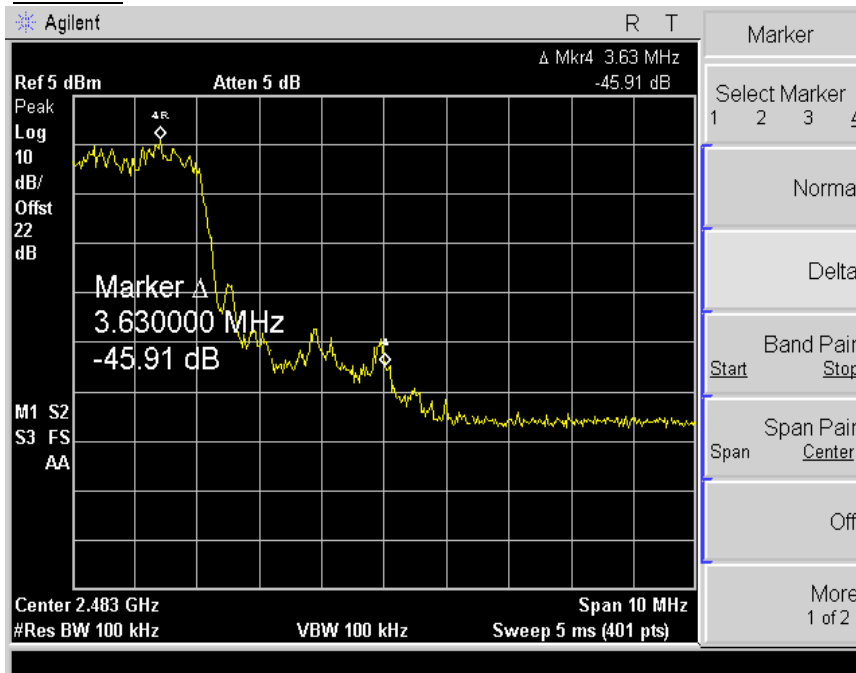
**Electromagnetic
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Test Report**

Hopping on

CH 0



CH78





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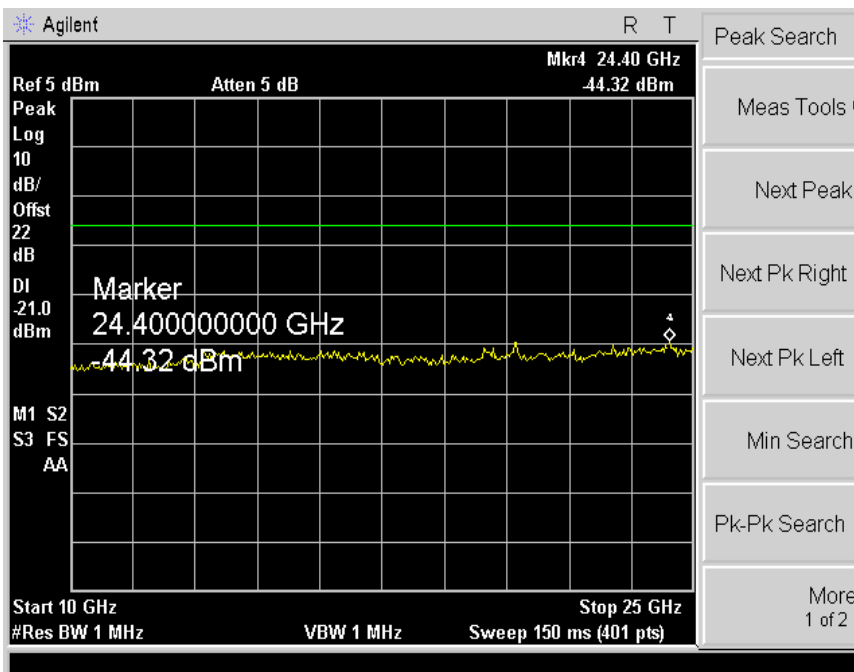
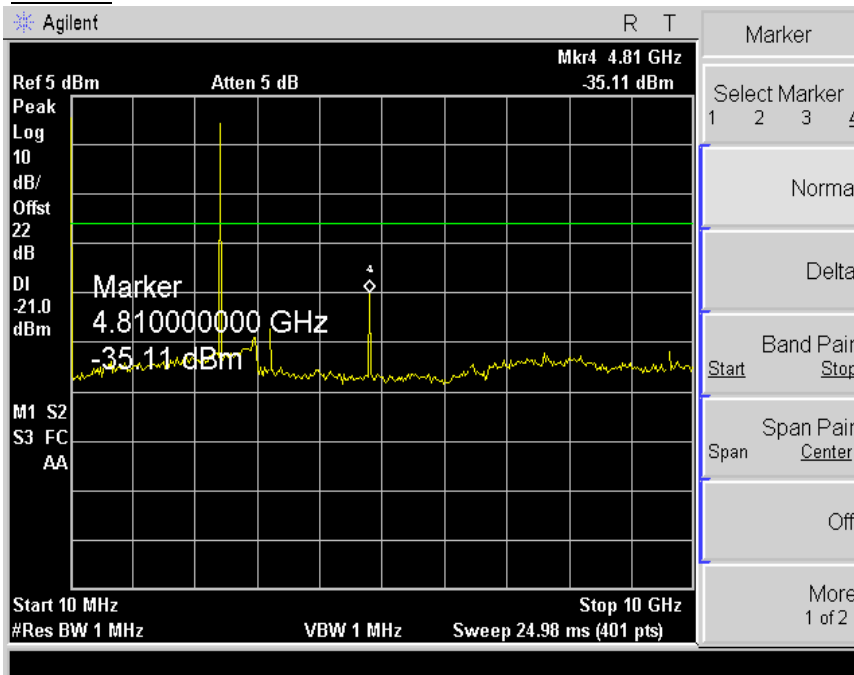
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426-5 Gasan-dong, Guncheon-gu,
Seoul, 158-803, Korea



Electromagnetic Interference Test Report

GFSK

CH 0





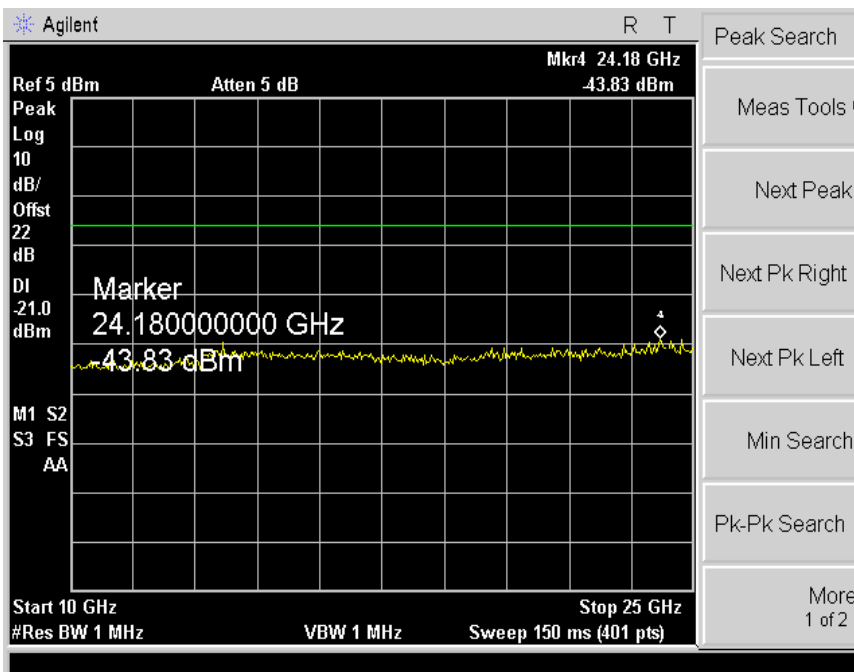
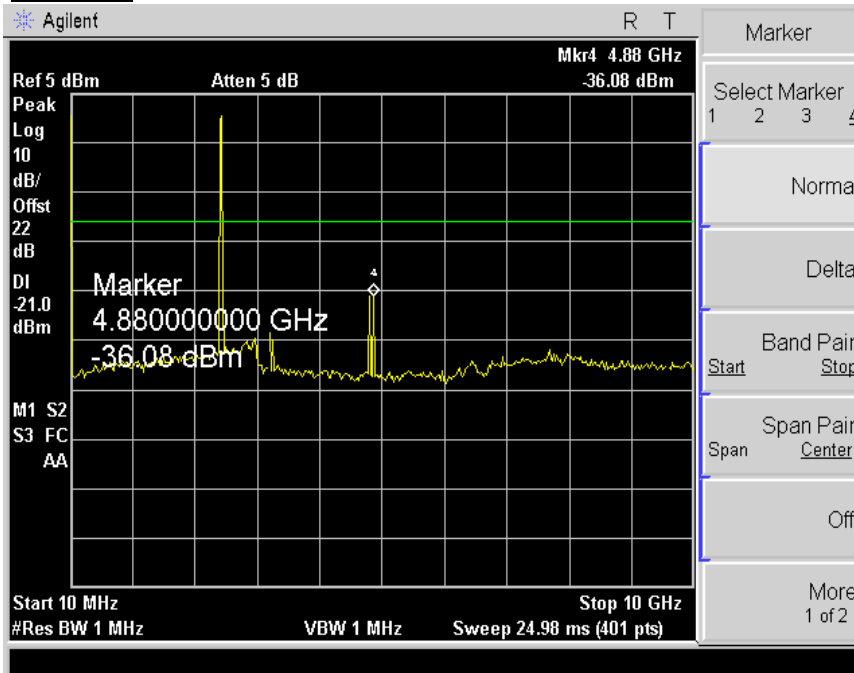
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Seoul, 158-803, Korea



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Interference
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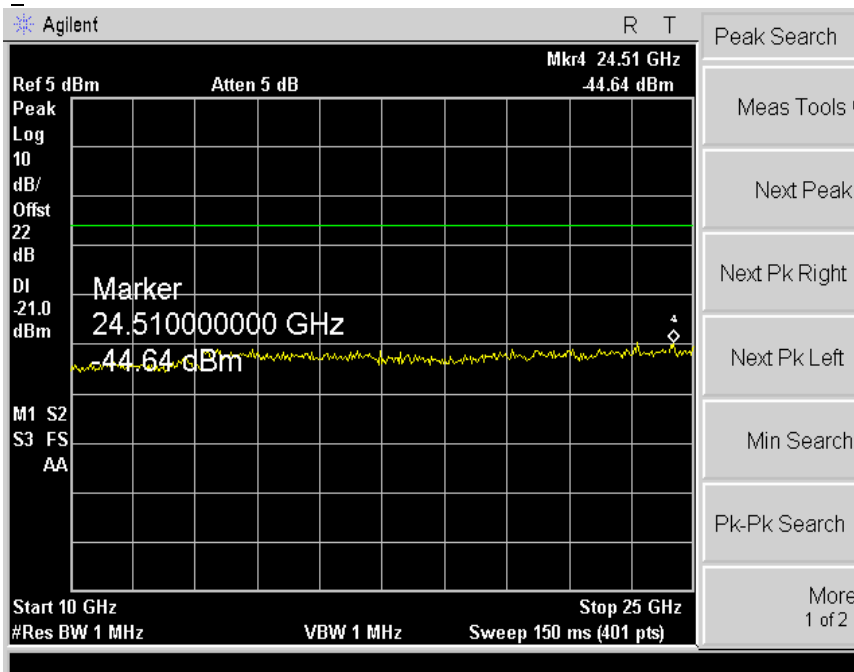
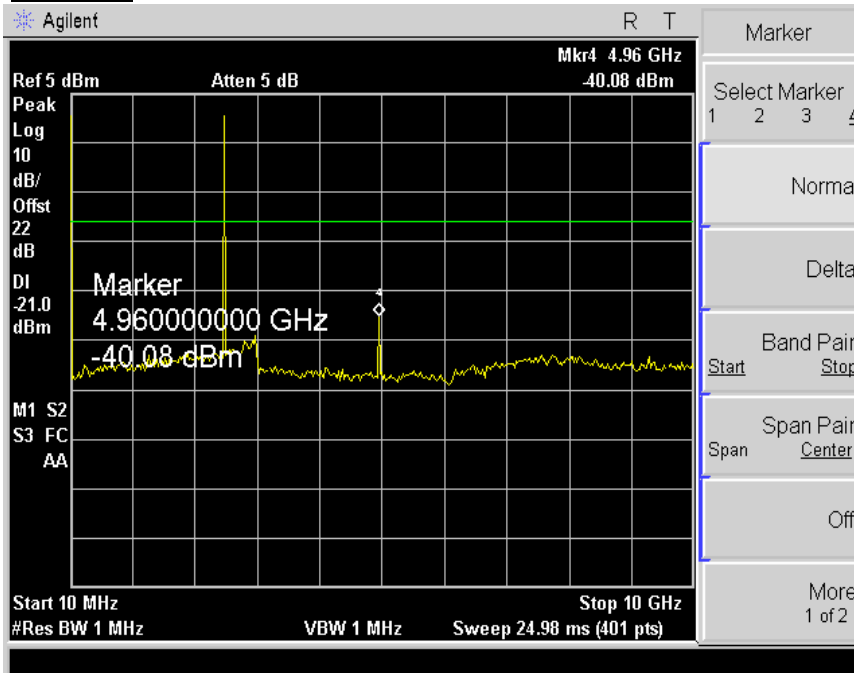
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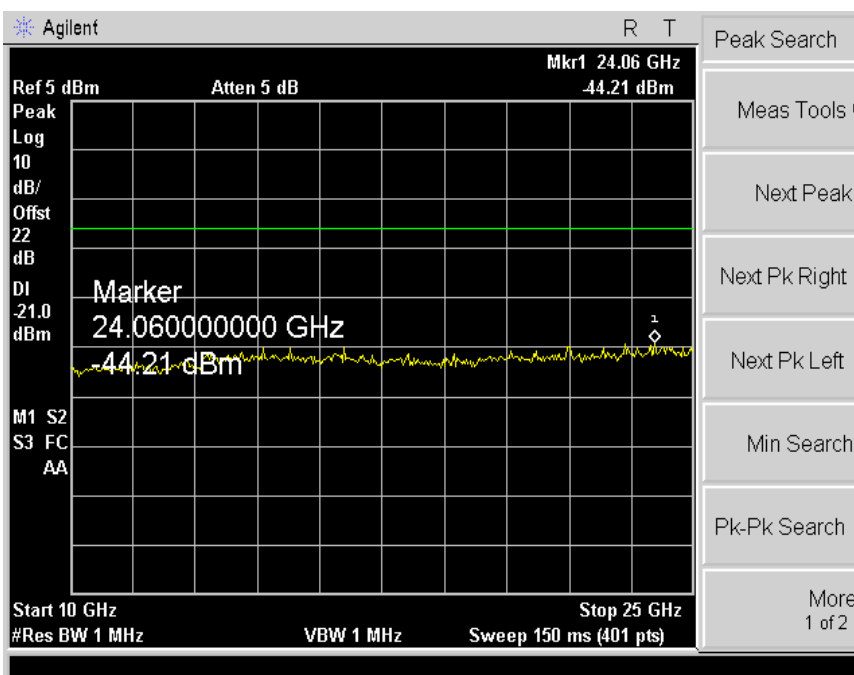
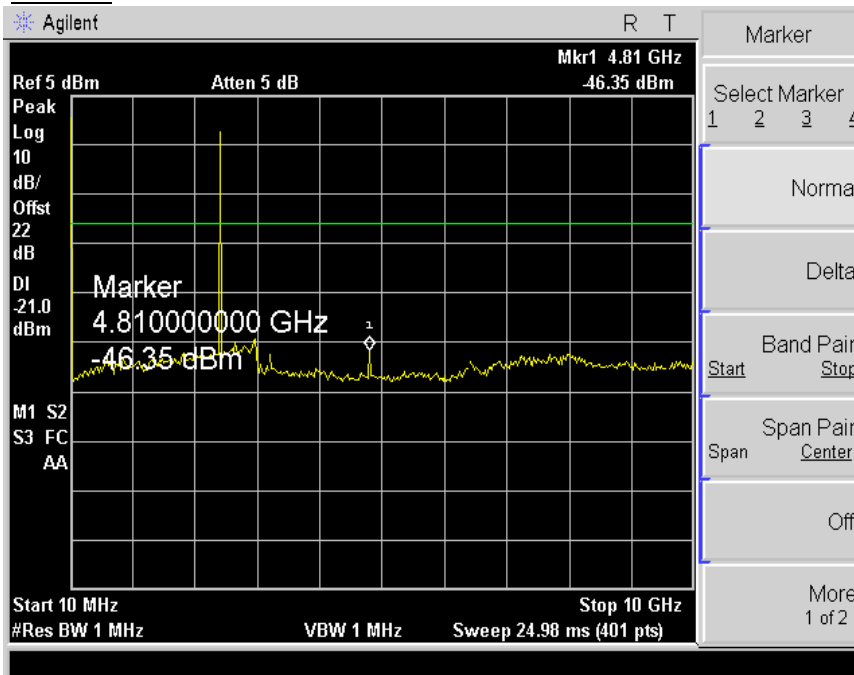
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Electromagnetic Interference Test Report

8DPSK

CH 0





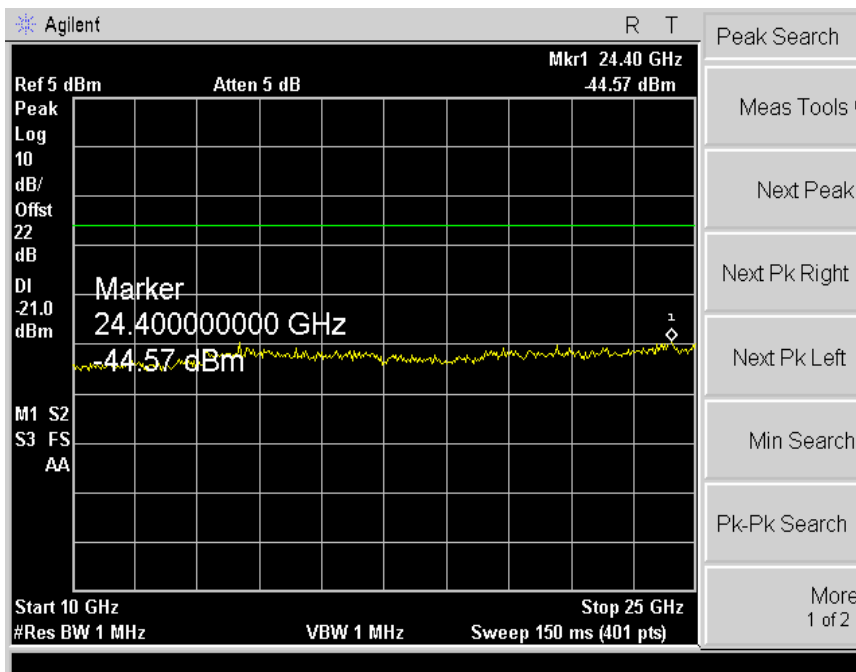
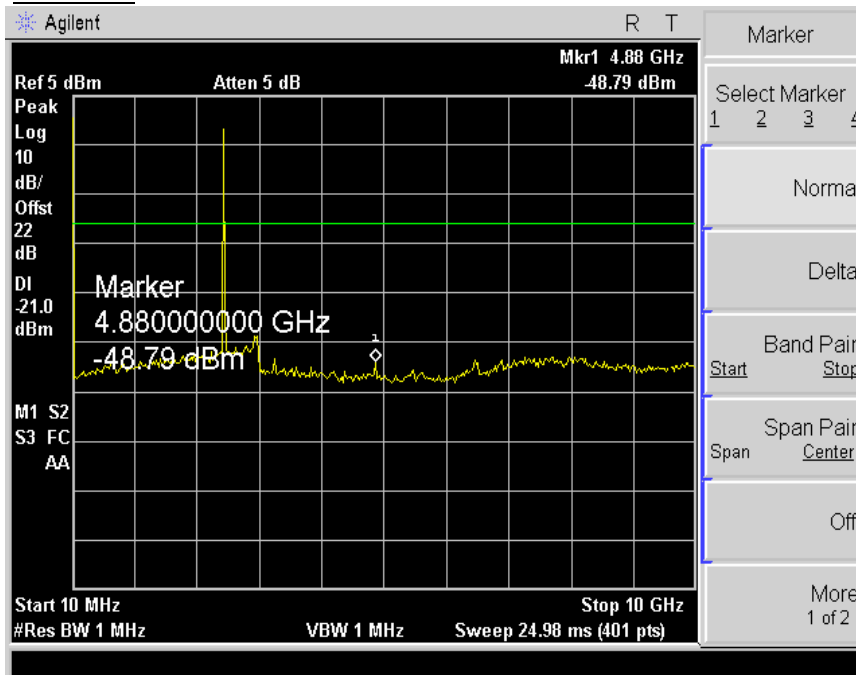
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CH 39





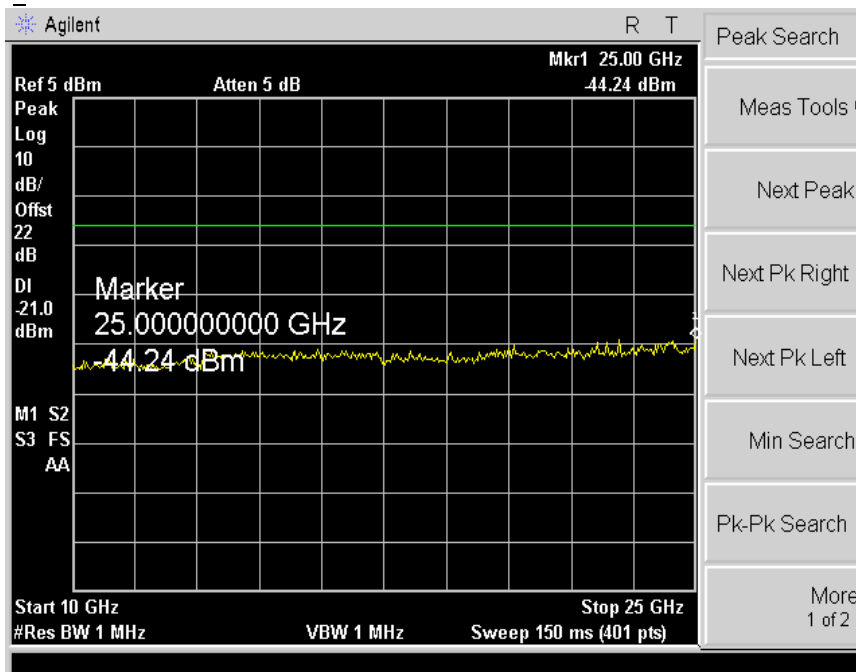
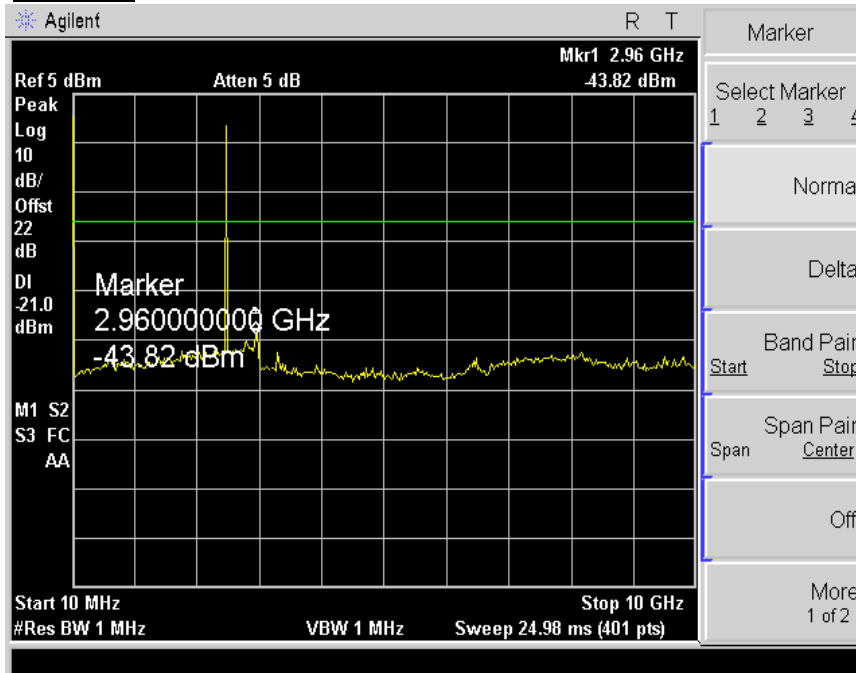
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10. Measurement of radiated disturbance

Above 30 MHz Electric Field strength was measured in accordance with FCC Part 15 (2008) & RSS-210. The test setup was made according to ANSI C 63.4 (2003) on an open test site, which allows a 3m distance measurement. The EUT was placed in the center of wooden turntable. The height of this table was 0.8m. The measurement was conducted with both horizontal and vertical antenna polarization. The turntable has fully rotated. For further description of the configuration refer to the picture of the test setup.

10.1 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
TEST Receiver	ESVS10	Rohde & Schwarz	838562/002	2010. 1. 29
Spectrum Analyzer	R3273	ADVANTEST	110600592	2010. 6. 04
LogBicon Antenna	VULB 9160	Schwarzbeck	3142	2010. 5. 13
Amplifier	8447F	HP	2805A02972	2010. 6. 24
PREAMPLIFIER	8449B	HP	3008A00581	2010. 3. 06
Horn Antenna	BBHA 9120 D	Schwarzbeck	352	2010. 6. 17
Turn Table	2087	EMCO	2129	–
Antenna Mast	2070-01	EMCO	9702-203	–
ANT Mast Controller	2090	EMCO	1535	–
Turn Table Controller	2090	EMCO	1535	–

10.2 Environmental Condition

Test Place : Open site(3m)
 Temperature(TX) : 5 °C
 Humidity(TX) : 63 %
 Temperature(RX) : 6 °C
 Humidity(RX) : 61 %

10.3 Test Data for Bluetooth

Test Date : 22-Jan-10

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Result Value		
				Ant Factor (dB)	Cable (dB)	Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
30.00	15.00	V	1.0	11.26	0.9	40.0	27.14	-12.86
70.54	13.50	V	1.0	9.68	1.3	40.0	24.48	-15.52
78.14	12.00	V	1.0	8.45	1.4	40.0	21.81	-18.19
120.43	9.00	V	1.0	11.21	1.8	43.5	21.98	-21.52
140.29	9.50	V	1.0	12.77	2.0	43.5	24.27	-19.23
177.76	9.10	V	1.0	11.27	2.2	43.5	22.56	-20.94
Remark	H : Horizontal, V : Vertical Bluetooth(39CH) *Checked in all 3 axis and the maximum measured data were reported. *CL = Cable Loss-Amplifier Gain(In case of above1000Mhz) *CL = Cable Loss(In case of below1000Mhz) *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120KHz for Quasi-peak detection at frequency below 1GHz. *The resolution bandwidth and video bandwidth of spectrum analyzer is 1MHz and 10Hz for average detection at frequency above 1GHz.							

10.3-1 Test Data for Bluetooth(1.2)

Test Date : 20-Jan-10

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Result Value		
				Ant Factor (dB)	Cable (dB)	Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW:1Mhz VBW:1MHz)								
2402.2	69.39	H	1.2	27.62	4.5	*OB	101.51	–
4804	48.96	H	1.2	31.27	–28.9	74.0	51.34	–22.66
2402.2	65.17	V	1.1	27.62	4.5	*OB	97.29	–
4804	49.13	V	1.1	31.27	–28.9	74.0	51.51	–22.49
AV(RBW:1Mhz VBW:10Hz)								
2402.2	56.13	H	1.2	27.62	4.5	*OB	88.25	–
4804	40.90	H	1.2	31.27	–28.9	54.0	43.28	–10.72
2402.2	53.00	V	1.1	27.62	4.5	*OB	85.12	–
4804	39.79	V	1.1	31.27	–28.9	54.0	42.17	–11.83
Remark	H : Horizontal, V : Vertical TEST MODE : Bluetooth-CH0(2402MHz) *The TX signal isn't detected from 3th harmonics. *OB = Operating band *Checked in all 3 axis and the maximum measured data were reported. *CL = Cable Loss–Amplifier Gain(In case of above1000Mhz) *CL = Cable Loss(In case of below1000Mhz) *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120KHz for Quasi-peak detection at frequency below 1GHz. *The resolution bandwidth and video bandwidth of spectrum analyzer is 1MHz and 10Hz for average detection at frequency above 1GHz.							

10.3-2 Test Data for Bluetooth(1.2)

Test Date : 20-Jan-10

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Result Value		
				Ant Factor (dB)	Cable (dB)	Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW:1Mhz VBW:1MHz)								
2441	68.91	H	1.2	27.60	4.5	*OB	101.01	-
4882	46.00	H	1.2	31.38	-28.7	74.0	48.71	-25.29
2441	66.16	V	1.1	27.60	4.5	*OB	98.26	-
4882	47.00	V	1.2	31.38	-28.7	74.0	49.71	-24.29
AV(RBW:1Mhz VBW:10Hz)								
2441	55.54	H	1.2	27.60	4.5	*OB	87.64	-
4882	38.82	H	1.2	31.38	-28.7	54.0	41.53	-12.47
2441	53.76	V	1.1	27.60	4.5	*OB	85.86	-
4882	47.00	V	1.2	31.38	-28.7	54.0	49.71	-4.29
Remark	H : Horizontal, V : Vertical TEST MODE : Bluetooth-CH39(2441MHz) *The TX signal isn't detected from 3th harmonics. *OB = Operating band *Checked in all 3 axis and the maximum measured data were reported. *CL = Cable Loss-Amplifier Gain(In case of above1000Mhz) *CL = Cable Loss(In case of below1000Mhz) *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120KHz for Quasi-peak detection at frequency below 1GHz. *The resolution bandwidth and video bandwidth of spectrum analyzer is 1MHz and 10Hz for average detection at frequency above 1GHz.							

10.3-3 Test Data for Bluetooth(1.2)

Test Date : 20-Jan-10

Measurement Distance : 3 m

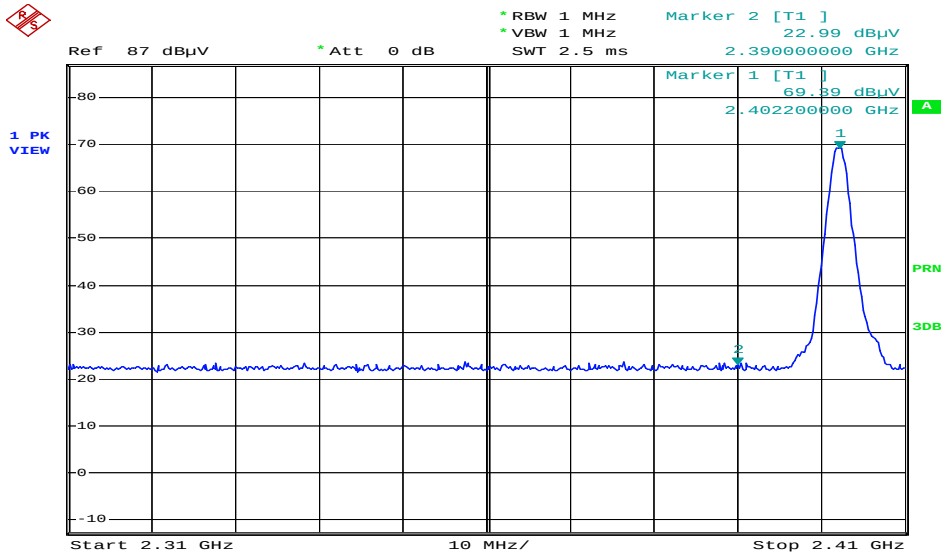
Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Result Value		
				Ant Factor (dB)	Cable (dB)	Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW:1Mhz VBW:1MHz)								
2479.8	62.60	H	1.3	27.59	4.5	*OB	94.69	–
4960	45.80	H	1.2	31.49	–28.5	74.0	48.76	–25.24
2479.8	61.40	V	1.1	27.59	4.5	*OB	93.49	–
4960	46.20	V	1.2	31.49	–28.5	74.0	49.16	–24.84
AV(RBW:1Mhz VBW:10Hz)								
2479.8	50.56	H	1.3	27.59	4.5	*OB	82.65	–
4960	38.50	H	1.2	31.49	–28.5	54.0	41.46	–12.54
2479.8	49.56	V	1.1	27.59	4.5	*OB	81.65	–
4960	39.00	V	1.2	31.49	–28.5	54.0	41.96	–12.04
Remark	H : Horizontal, V : Vertical TEST MODE : Bluetooth–CH78(2480MHz) *The TX signal isn't detected from 3th harmonics. *OB = Operating band *Checked in all 3 axis and the maximum measured data were reported. *CL = Cable Loss–Amplifier Gain(In case of above1000Mhz) *CL = Cable Loss(In case of below1000Mhz) *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120KHz for Quasi-peak detection at frequency below 1GHz. *The resolution bandwidth and video bandwidth of spectrum analyzer is 1MHz and 10Hz for average detection at frequency above 1GHz.							

10.4 Restricted Band Edges for BT(1.2)

Band Edges(CH Low)

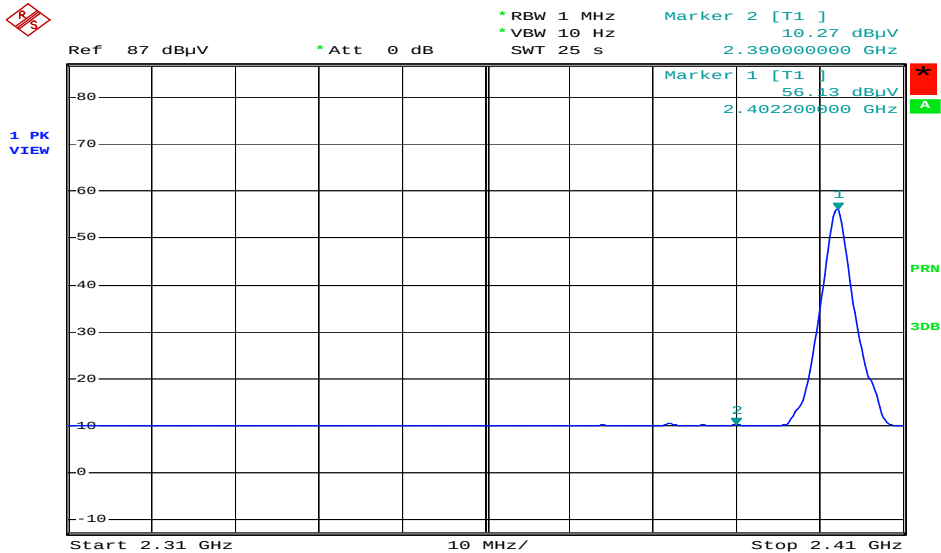
Detector mode:Peak

Polarity:Horizontal



Detector mode:Average

Polarity:Horizontal





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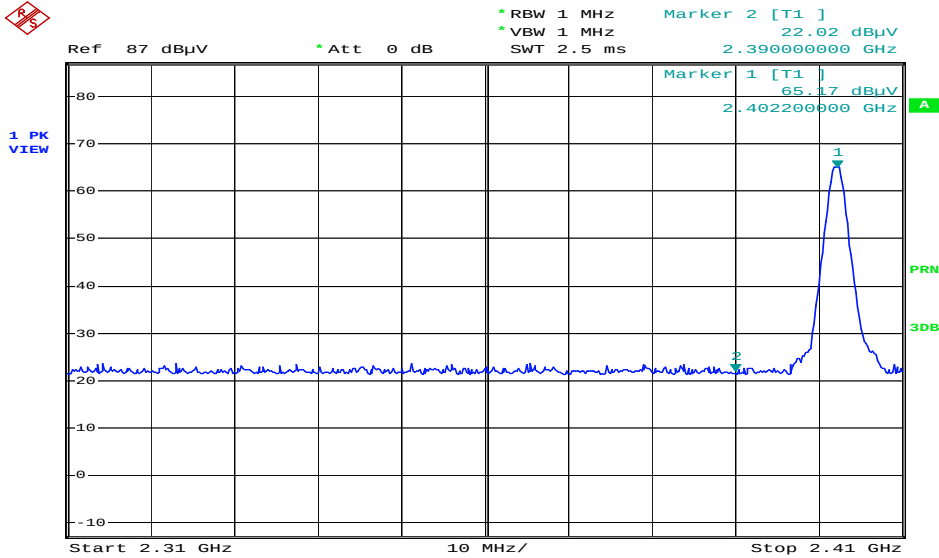


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Band Edges(CH Low)

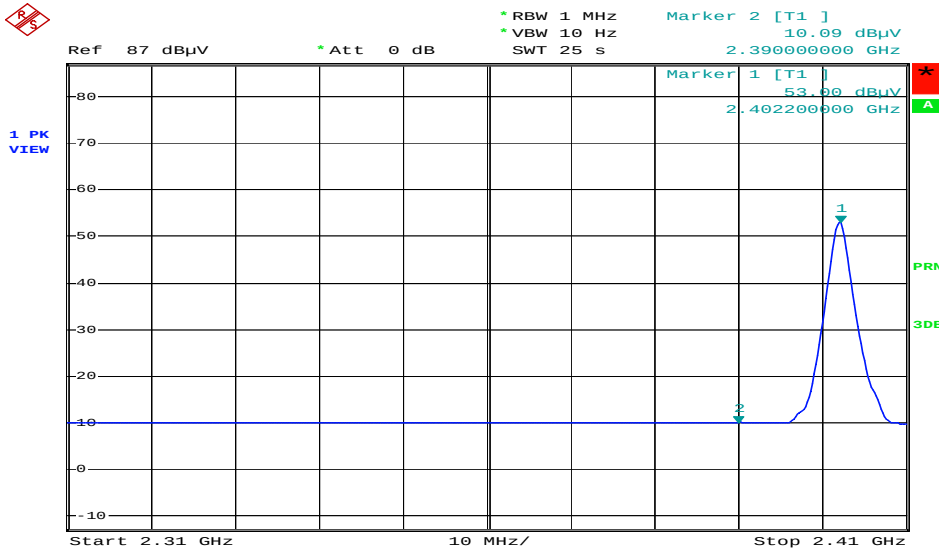
Detector mode:Peak

Polarity:Vertical



Detector mode:Average

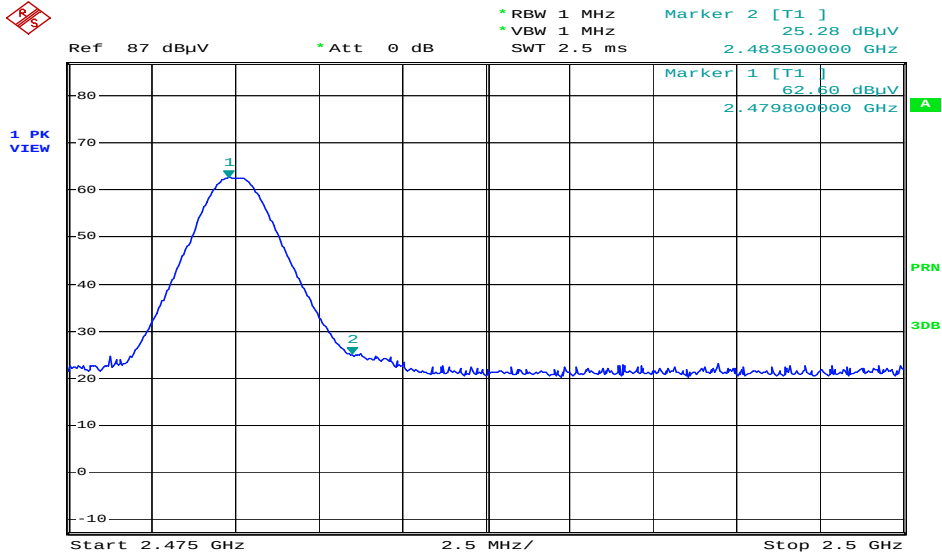
Polarity:Vertical



Band Edges(CH High)

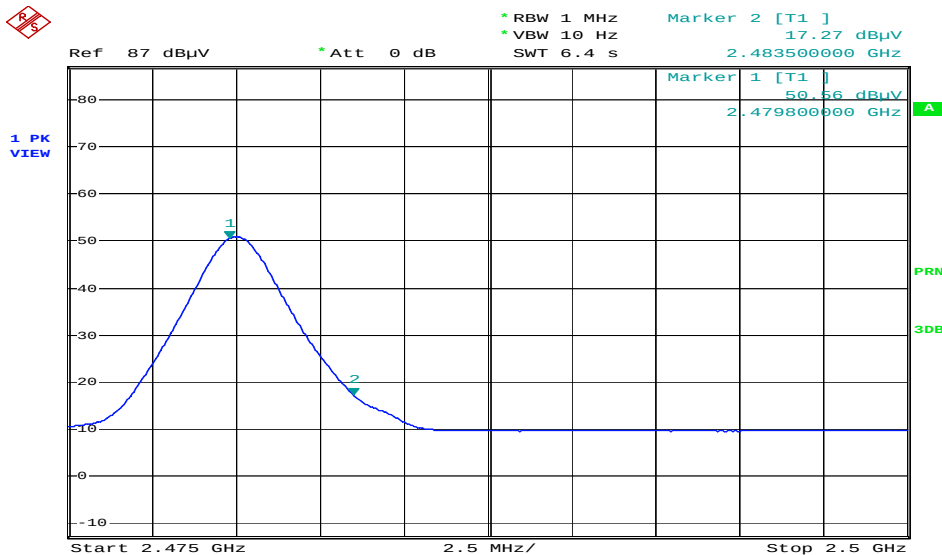
Detector mode:Peak

Polarity:Horizontal



Detector mode:Average

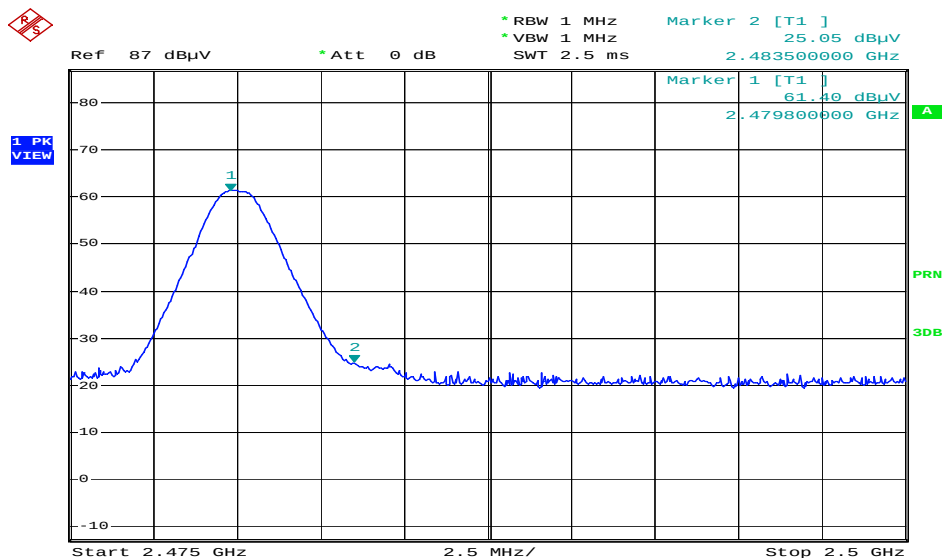
Polarity:Horizontal



Band Edges(CH High)

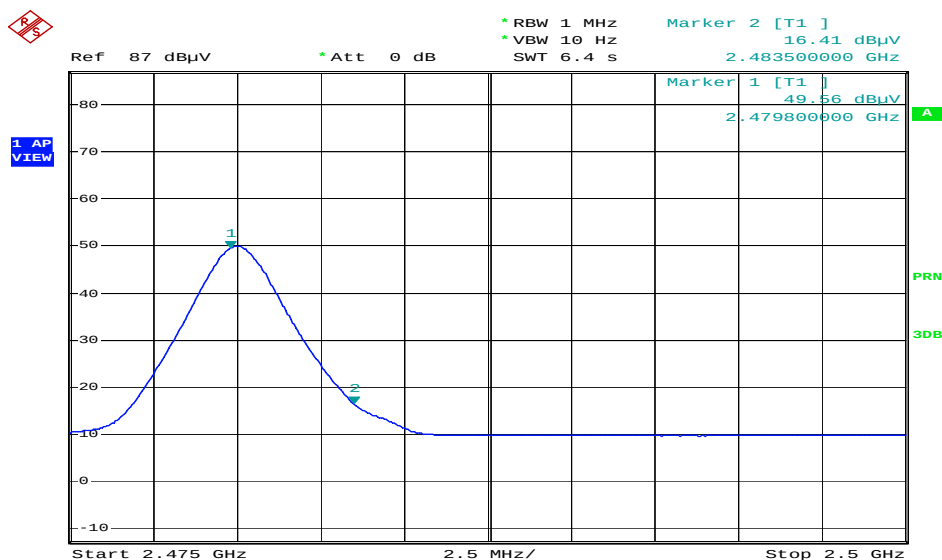
Detector mode:Peak

Polarity:Vertical



Detector mode:Average

Polarity:Vertical



10.5 Test Data for Bluetooth(2.0)

Test Date : 20-Jan-10

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Result Value		
				Ant Factor (dB)	Cable (dB)	Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW:1Mhz VBW:1MHz)								
2402	67.26	H	1.2	27.62	4.5	*OB	99.38	–
4804	44.00	H	1.3	31.27	–28.9	74.00	46.38	–27.62
2402	63.19	V	1.1	27.62	4.5	*OB	95.31	–
4804	43.80	V	1.1	31.27	–28.9	74.00	46.18	–27.82
AV(RBW:1Mhz VBW:10Hz)								
2402	54.12	H	1.2	27.62	4.5	*OB	86.24	–
4804	36.00	H	1.3	31.27	–28.9	54.0	38.38	–15.62
2402	50.83	V	1.1	27.62	4.5	*OB	82.95	–
4804	33.90	V	1.1	31.27	–28.9	54.0	36.28	–17.72
Remark	H : Horizontal, V : Vertical TEST MODE : Bluetooth-CH0(2402MHz) *The TX signal isn't detected from 3th harmonics. *OB = Operating band *Checked in all 3 axis and the maximum measured data were reported. *CL = Cable Loss-Amplifier Gain(In case of above1000Mhz) *CL = Cable Loss(In case of below1000Mhz) *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120KHz for Quasi-peak detection at frequency below 1GHz. *The resolution bandwidth and video bandwidth of spectrum analyzer is 1MHz and 10Hz for average detection at frequency above 1GHz.							

10.5-1 Test Data for Bluetooth(2.0)

Test Date : 20-Jan-10

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Result Value		
				Ant Factor (dB)	Cable (dB)	Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW:1Mhz VBW:1MHz)								
2440.8	66.69	H	1.2	27.60	4.5	*OB	98.79	–
4882	43.50	H	1.6	31.38	–28.7	74.0	46.21	–27.79
2440.8	61.28	V	1.9	27.60	4.5	*OB	93.38	–
4882	42.50	V	1.0	31.38	–28.7	74.0	45.21	–28.79
AV(RBW:1Mhz VBW:10Hz)								
2440.8	52.67	H	1.2	27.60	4.5	*OB	84.77	–
4882	33.80	H	1.6	31.38	–28.7	54.0	36.51	–17.49
2440.8	50.98	V	1.9	27.60	4.5	*OB	83.08	–
4882	33.10	V	1.0	31.38	–28.7	54.0	35.81	–18.19
Remark	H : Horizontal, V : Vertical TEST MODE : Bluetooth–CH39(2441MHz) *The TX signal isn't detected from 3th harmonics. *OB = Operating band *Checked in all 3 axis and the maximum measured data were reported. *CL = Cable Loss–Amplifier Gain(In case of above1000Mhz) *CL = Cable Loss(In case of below1000Mhz) *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120KHz for Quasi–peak detection at frequency below 1GHz. *The resolution bandwidth and video bandwidth of spectrum analyzer is 1MHz and 10Hz for average detection at frequency above 1GHz.							

10.5-2 Test Data for Bluetooth(2.0)

Test Date : 20-Jan-10

Measurement Distance : 3 m

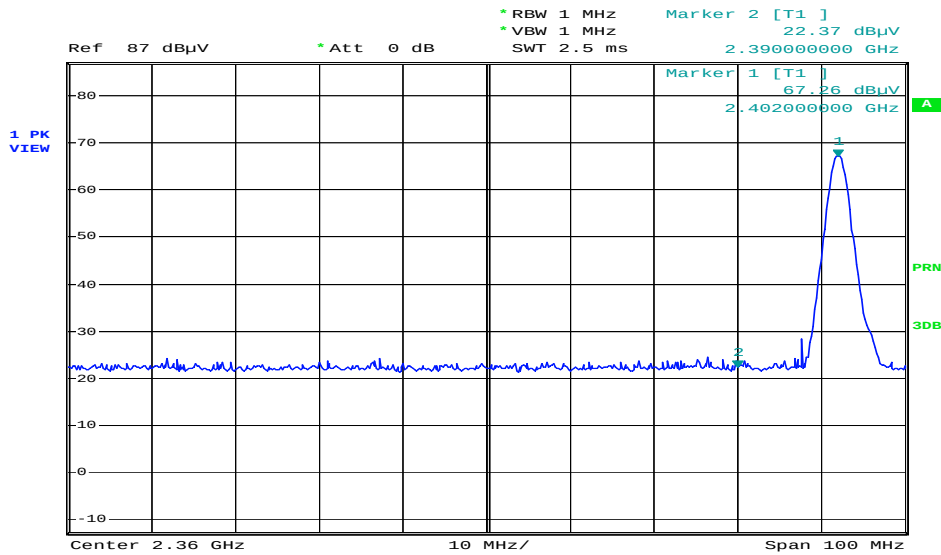
Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Result Value		
				Ant Factor (dB)	Cable (dB)	Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW:1Mhz VBW:1MHz)								
2480.15	62.52	H	1.2	27.59	4.5	*OB	94.61	–
4960	42.50	H	1.2	31.49	–28.5	74.0	45.46	–28.54
2480.15	57.27	V	1.8	27.59	4.5	*OB	89.36	–
4960	43.80	V	1.2	31.49	–28.5	74.0	46.76	–27.24
AV(RBW:1Mhz VBW:10Hz)								
2480.15	49.71	H	1.2	27.59	4.5	*OB	81.80	–
4960	34.60	H	1.2	31.49	–28.5	54.0	37.56	–16.44
2480.15	45.34	V	1.8	27.59	4.5	*OB	77.43	–
4960	34.60	V	1.2	31.49	–28.5	54.0	37.56	–16.44
Remark	H : Horizontal, V : Vertical TEST MODE : Bluetooth-CH78(2480MHz) *The TX signal isn't detected from 3th harmonics. *OB = Operating band *Checked in all 3 axis and the maximum measured data were reported. *CL = Cable Loss-Amplifier Gain(In case of above1000Mhz) *CL = Cable Loss(In case of below1000Mhz) *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120KHz for Quasi-peak detection at frequency below 1GHz. *The resolution bandwidth and video bandwidth of spectrum analyzer is 1MHz and 10Hz for average detection at frequency above 1GHz.							

10.6 Restricted Band Edges for BT(2.0)

Band Edges(CH Low)

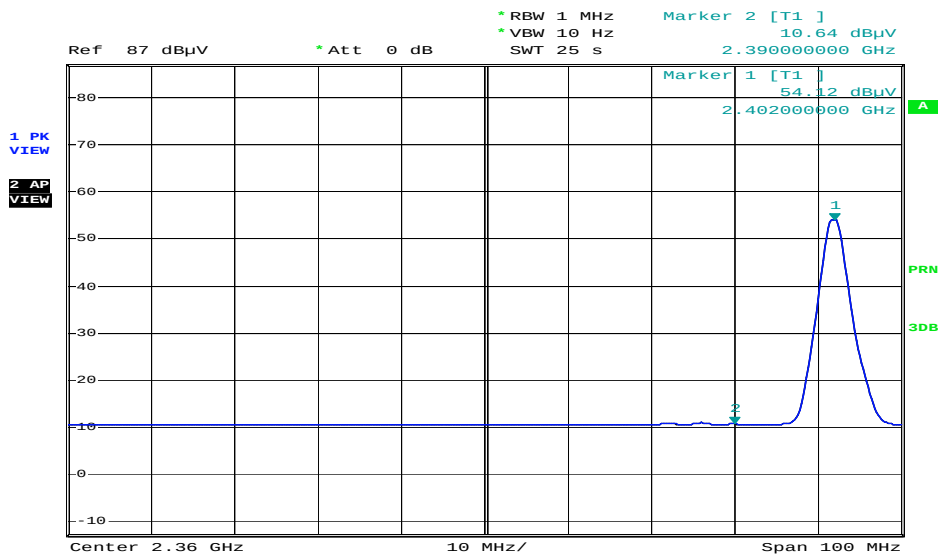
Detector mode:Peak

Polarity:Horizontal



Detector mode:Average

Polarity:Horizontal





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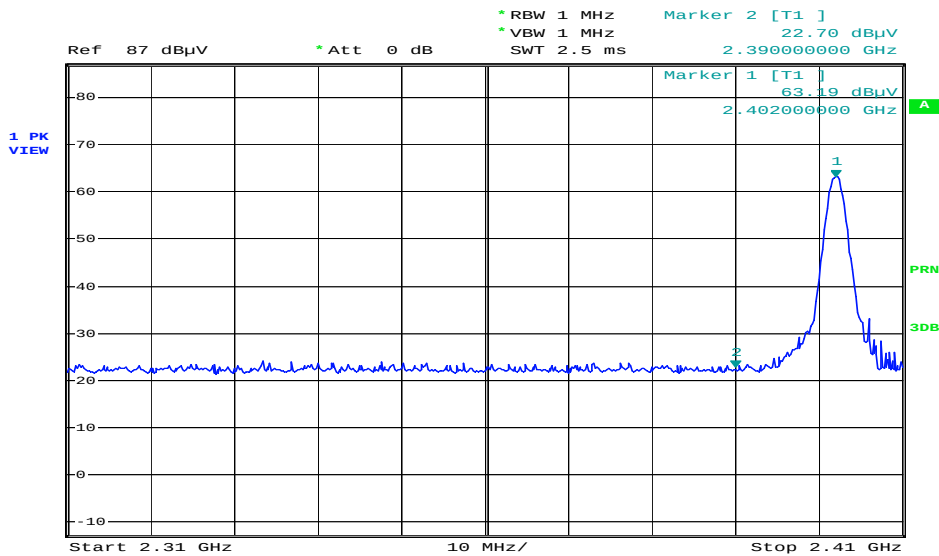


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Band Edges(CH Low)

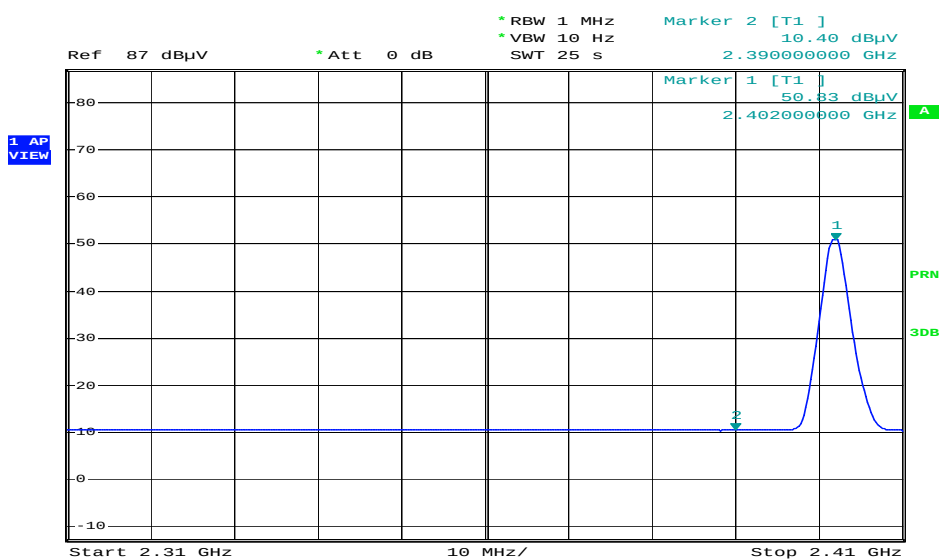
Detector mode:Peak

Polarity:Vertical



Detector mode:Average

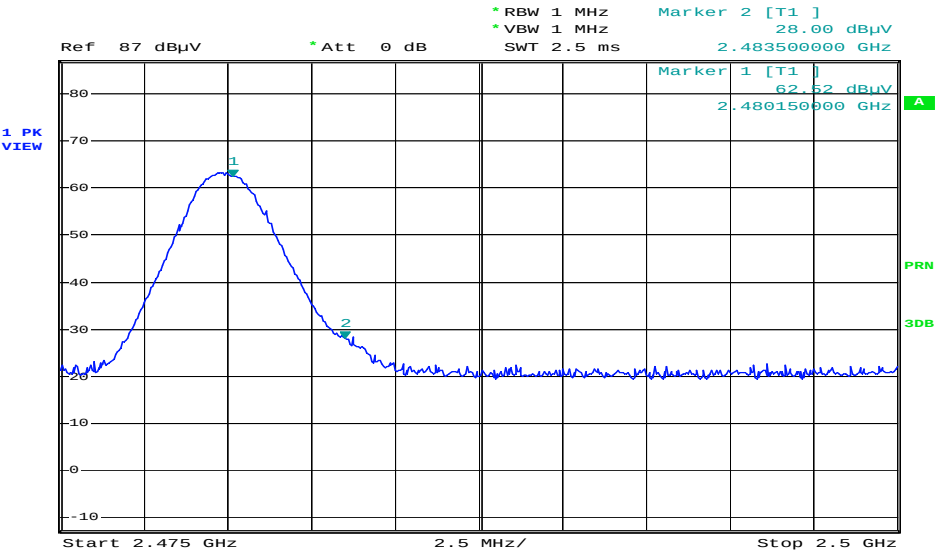
Polarity:Vertical



Band Edges(CH High)

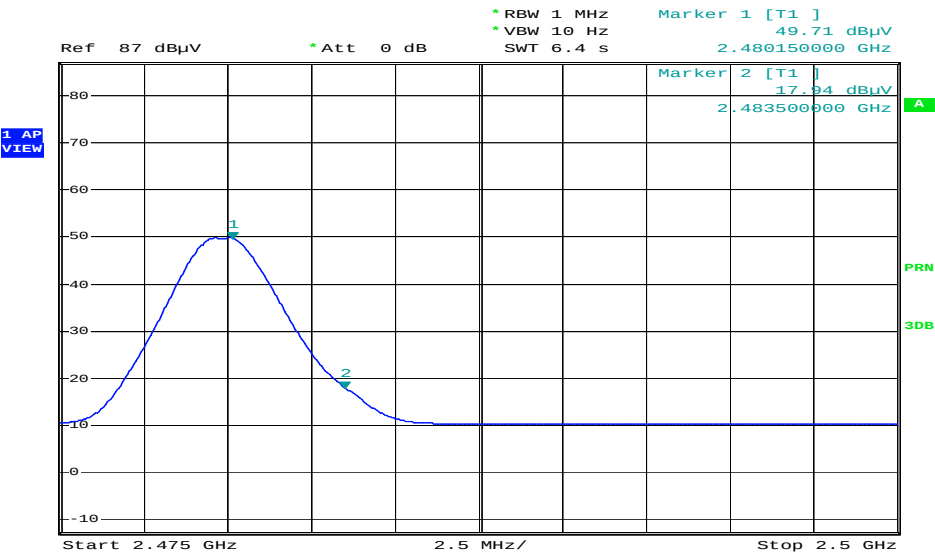
Detector mode:Peak

Polarity:Horizontal



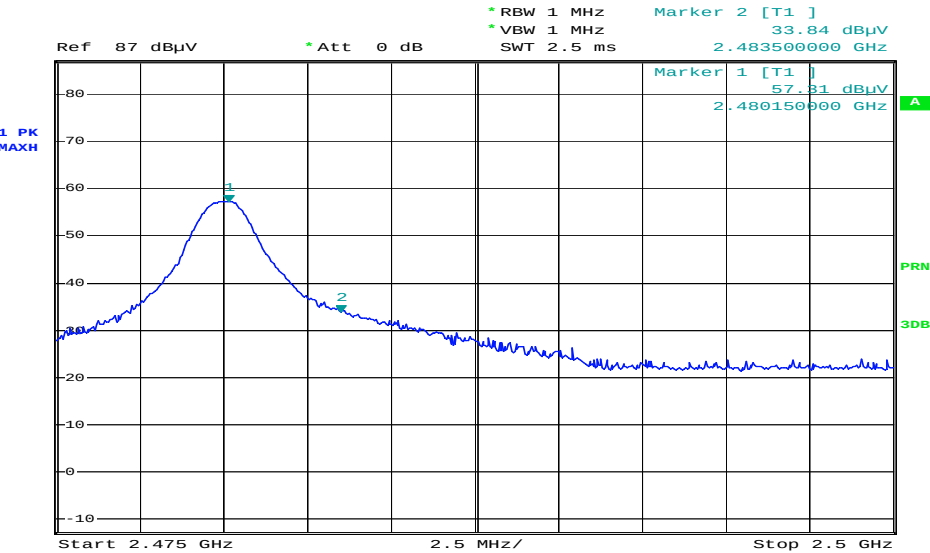
Detector mode:Average

Polarity:Horizontal

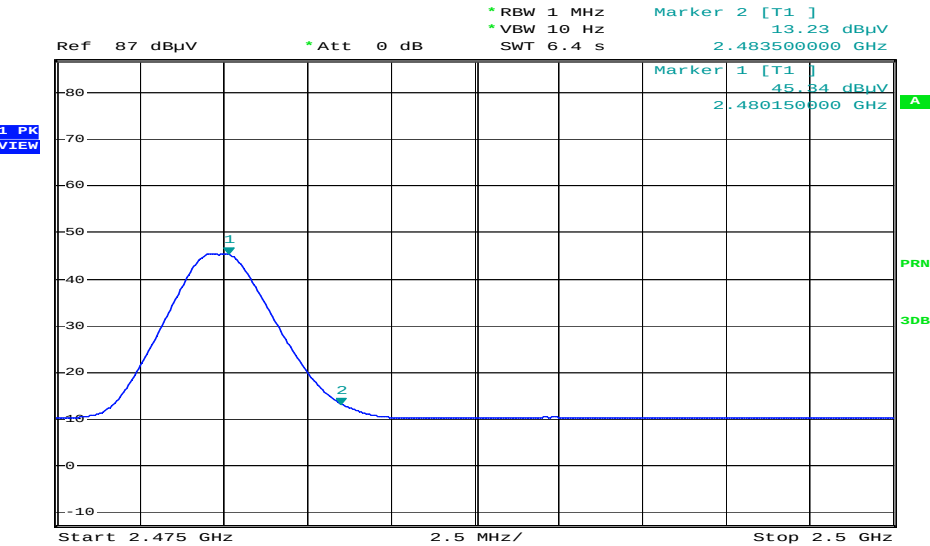


Band Edges(CH High)

Detector mode:Peak Polarity:Vertical



Detector mode:Average Polarity:Vertical



10.7 Test Data for Bluetooth(Receiver mode)

Test Date : 22-Jan-10

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Result Value		
				Ant Factor (dB)	Cable (dB)	Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
32.58	11.20	V	1.0	11.16	0.9	40.0	23.26	-16.74
39.98	11.30	V	1.2	11.68	1.0	40.0	23.94	-16.06
76.48	12.50	V	1.0	8.72	1.3	40.0	22.56	-17.44
81.12	12.50	V	1.0	8.12	1.4	40.0	22.00	-18.00
177.75	10.20	V	1.0	11.27	2.2	43.5	23.66	-19.84
257.28	8.20	V	1.0	11.63	2.8	46.0	22.65	-23.35
Remark	H : Horizontal, V : Vertical *Checked in all 3 axis and the maximum measured data were reported. *There is no detected the radiated emission above 1GHz. *CL = Cable Loss-Amplifier Gain(In case of above1000Mhz) *CL = Cable Loss(In case of below1000Mhz) *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120KHz for Quasi-peak detection at frequency below 1GHz. *The resolution bandwidth and video bandwidth of spectrum analyzer is 1MHz and 10Hz for average detection at frequency above 1GHz.							

11. Measurement of conducted disturbance

The continuous disturbance voltage of AC Mains in the frequency from 0.15 to 30 MHz was measured in accordance to FCC Part 15 (2008) & RSS-210. The test setup was made according to ANSI C 63.4 (2003) in a shielded. The EUT was placed on a non-conductive table at least 80 above the ground plan. A grounded vertical reference plane was positioned in a distance of 40cm from the EUT. The distance from the EUT to other metal surfaces was at least 0.8m. The EUT was only earthen by its power cord through the line impedance stabilizing network. The power cord has been bundled to a length of 1.0m.. The test receiver with Quasi Peak detector complies with CISPR 16.

11.1 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
LISN	ESH3-Z5	Schwarzbeck	838979/010	2010. 2. 21
LISN	NNLA8120A	Schwarzbeck	8120161	2010. 2. 21
TEST Receiver	ESPI7	Rohde & Schwarz	100185	2010. 8. 25
Pulse Limiter	ESH3Z2	Rohde & Schwarz	NONE	2010. 9. 9

11.2 Environmental Condition

Test Place : Shield Room

(BT1.2) Temperature: 24 °C

(BT1.2) Humidity : 45 %

11.3-1 Test Data for Bluetooth 1.2

Test Date : 18-Jan-10

Frequency (MHz)	Correction Factor		Line (H/N)	Quasi-peak Value			Average Value		
	Lisn (dB)	Cable (dB)		Limit (dB μ V)	Reading (dB μ V)	Result (dB μ V)	Limit (dB μ V)	Reading (dB μ V)	Result (dB)
0.17	0.09	0.2	H	64.77	37.54	37.86	54.77	24.70	25.02
0.20	0.09	0.2	N	63.82	33.48	33.80	53.82	24.10	24.42
0.31	0.09	0.2	N	60.00	33.04	33.37	50.00	24.53	24.86
0.40	0.09	0.3	H	57.94	34.05	34.44	47.94		
0.46	0.10	0.3	N	56.66	30.57	31.00	46.66	24.71	25.14
0.53	0.10	0.4	H	56.00	35.15	35.61	46.00		
6.90	0.31	0.8	N	60.00	24.47	25.53	50.00		
7.85	0.32	0.8	H	60.00	26.63	27.75	50.00	16.16	17.28
Remark	H : Hot Line, N : Neutral Line TEST MODE : Bluetooth-CH39(2441MHz)								



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**Electromagnetic
Interference
Test Report**

12. Photographs of test setup

12.1. Setup for Radiated Test : 30 ~ 1000 MHz

[Front]



[Rear]





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**Electromagnetic
Interference
Test Report**

12.2. Setup for Radiated Test :Above 1000 MHz

[Front]



12.3. Setup for Conducted Test : 0.15 ~ 30 MHz

[Front]



[Rear]



12.4. Photographs of EUT

[Front]



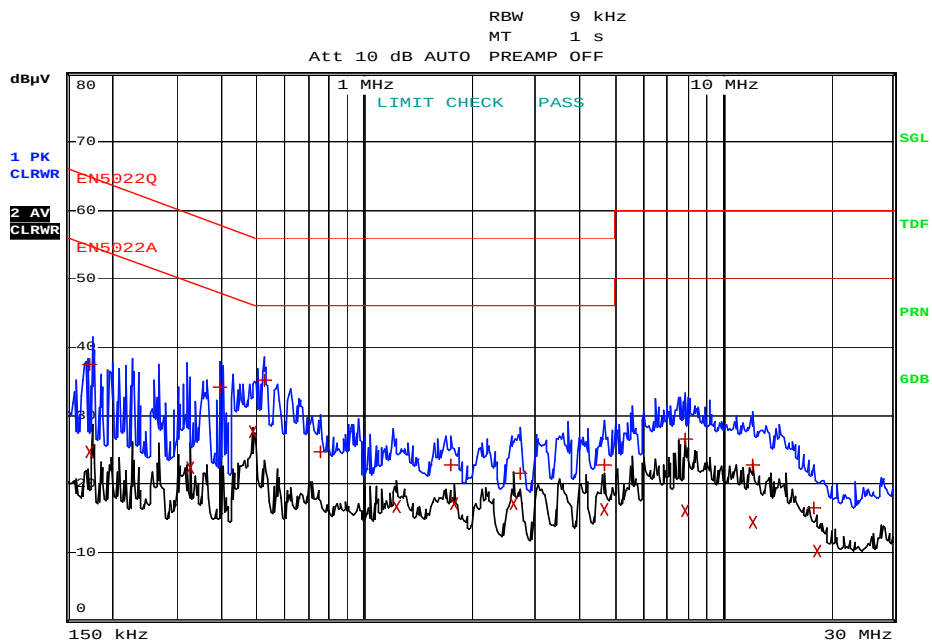
[Rear]



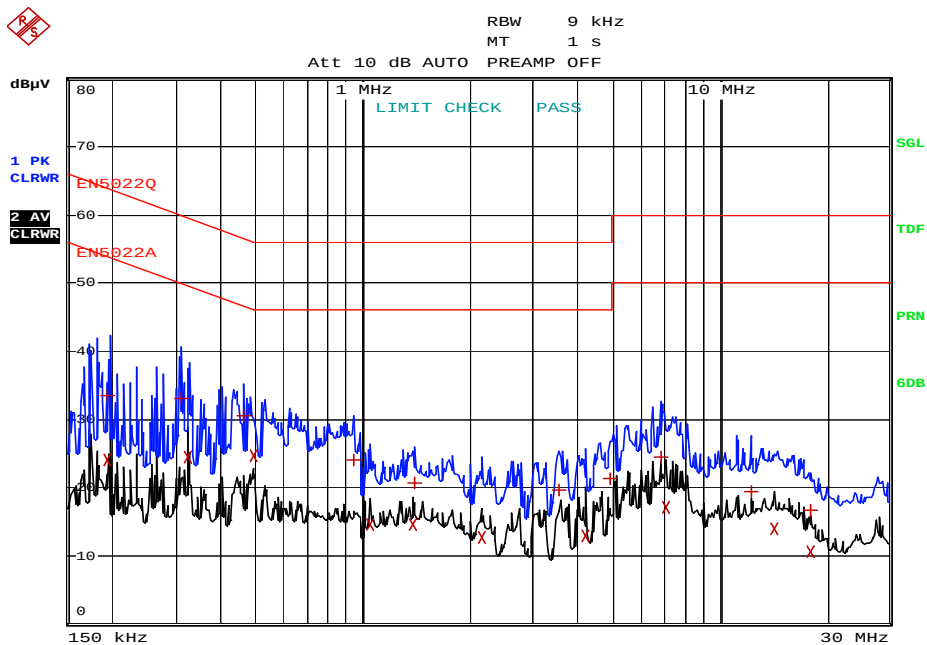
Appendix 1. Spectral diagram for Bluetooth 1.2

Bluetooth – CH 39

*HOT



*NEUTRAL



Appendix 2. Antenna Requirement

1. Antenna Requirement

1.1 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 15.24

1.2 Antenna Connected Construction

The antenna types used in this product are Intergrated Sandwich antenna . The maximum Gain of this antenna is 2.63 dBi.