



ESTECH Co., Ltd.

Rm 1015, World Venture Center 11,
426-5 Gasan-dong, Guncheon-gu,
Seoul, 158-803, Korea



**Electromagnetic
Interference
Test Report**

Test Report for FCC

FCC ID:SS4MT3XX

Report Number		ESTF151303-009		
Applicant	Company name	Bluebird Soft Inc.		
	Address	SEI Tower 13,14, 467-14, Dogok-dong Gangnam-gu, Seoul, South Korea.		
	Telephone	82-70-7730-8239		
Product	Product name	PDA		
	Model No.	MT3XX	Manufacturer	Bluebird Soft Inc.
	Serial No.	NONE	Country of origin	KOREA
Test date	2013-03-18 ~ 2013-03-26		Date of issue	27-Mar-13
Testing location	ESTECH. Co., Ltd. 97-1 Hoiuk-Ri Majang-Myon, Icheon-city, KyungKi-Do, Korea			
Standard	FCC PART 15 (2010) , ANSI C 63.4 (2003)			
Result		Complied		
Measurement facility registration number		915135		
Tested by	Engineer H.K.Lee		(Signature)	
Reviewed by	Engineering Manager J.M.Yang		(Signature)	
<p>* Note</p> <ul style="list-style-type: none"> - 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.

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)

Modulation Type : GFSK(FHSS) , DQPSK, 8DPSK
 Transfer Rate : 3 Mbps
 Number of Channel : 79 ch
 Channel Spacing : 1 MHz
 PEAK Output Power : GFSK : 0.0017 Watts, 8DPSK : 0.0017 Watts
 Rating : DC 7.4 V Battery
 : AC-DC Adaptor : Input : AC 100 V~240 V 50 Hz ~ 60 Hz, Output : 9 V, 3.0 A
 Receipt Date : 2013-03-14
 X-tal list(s) or : The highest operating frequency is 2480 MHz(Bluetooth)
 Frequencies generated

2.2 General descriptions of EUT

Products	WLAN/Bluetooth/NFC
Model Name	MT3XX
Power	Battery 7.4 V
Frequency Range	2 400 MHz ~ 2 483.5 MHz
Modulation Type	FHSS , GFSK
Antenna Specification	MAX. Peak gain:3.6 dBi

3. Test Standards

Test Standard : FCC PART 15 (2010)

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				remark
FCC Standard	Test Type	Result	Remark	Limit
15.207	AC Power Conducted Emission	Pass	Meet the requirement	
15.205 & 15.209	Intentional Radiated Emission	Pass	Meet the requirement	
15.247(a)(1)	Carrier Frequency Separation & 20 Bandwidth ,99% Bandwidth	Pass	Meet the requirement	>25 kHz
15.247(b)	Maximum Peak output power	Pass	Meet the requirement	30dBm(1W)
15.247(a)(1)(ii)	Number of Hopping Frequency	Pass	Meet the requirement	>75
15.247(c)	Transmitter Radiated Emission	Pass	Meet the requirement	
15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Pass	Meet the requirement	<400ms
15.247(d)	Band Edge Measurement	Pass	Meet the requirement	
15.107	Receiver conducted Emission	Pass	Meet the requirement	
15.109	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(2402 MHz), Middle(2441 MHz),High(2480 MHz)

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

d. Test rate :3 Mbps

4.2 EUT Operation.

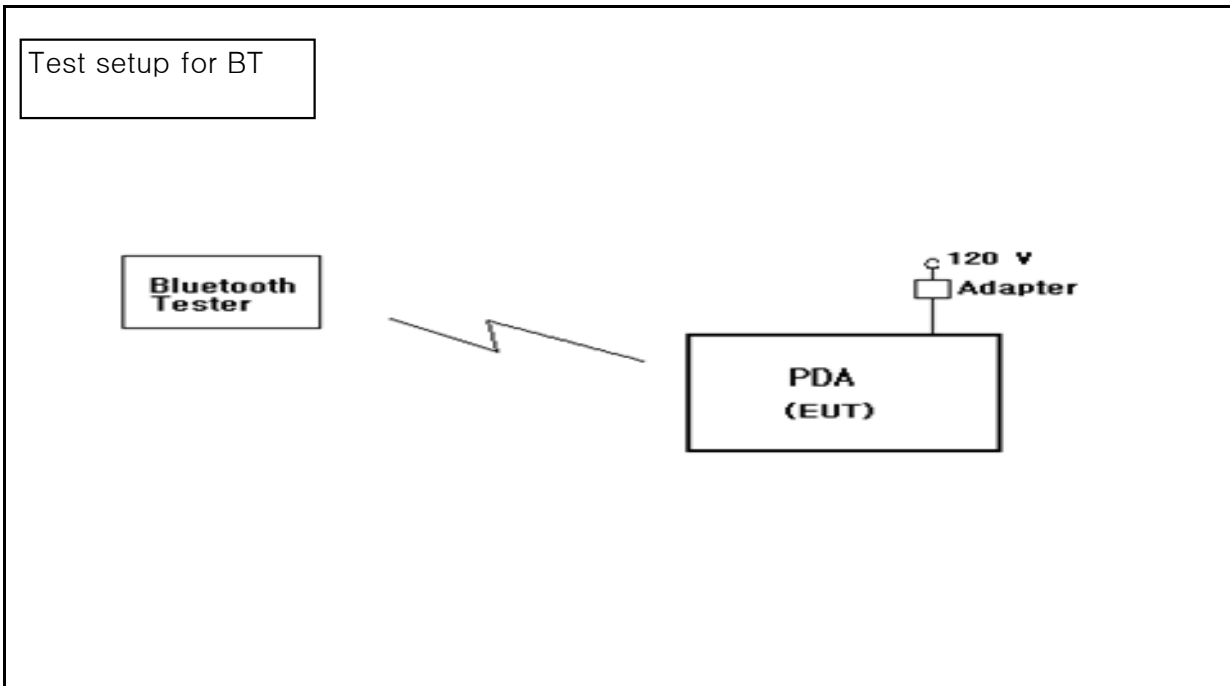
- * The EUT was in the following operation mode during all testing

- * 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.

- * Highest frequency of the EUT is above 1 GHz, the measurement shall be made up to 10 times the highest frequency or 40 GHz,

4.3 Configuration and Peripherals



4.4 EUT and Support equipment

Equipment Name	Model Name	S/N	Manufacturer	Remark (FCC ID)
PDA	MT3XX	NONE	Bluebird Soft Inc.	
Adapter	PSAC30U-090	NONE	Phihong Electronics Co., Ltd.	
Bluetooth Tester	TC-3000A	3000A5B0298	TESCOM	

4.5 Cable Connecting

Start Equipment		End Equipment		Cable Standard		Remark
Name	I/O port	Name	I/O port	Length	Shielded	
PDA	Wireless(BT)	Bluetooth Tester	Wireless(BT)	-	-	
PDA	Power	Adapter	-	1.5	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= 30 kHz
- . VBW= 300 kHz
- . Span= 3 MHz
- . Sweep= suitable duration based on the EUT specification.

20dB Bandwidth Test Instruments

Description	Model	Serial Number	Cal. Due Date
Spectrum Analyzer	E4440A	US41421291	2014-01-27
Bluetooth Tester	TC-3000A	3000A5B0298	2013-12-26
Dual Directional Coupler	772D	3736A22424	2014-01-27
-Spectrum Analyzer <=> EUT	Loss: 22.0 dB	-	

5.3 Measurement results

EUT	PDA	MODEL	MT3XX
MODE	FHSS	ENVIRONMENTAL CONDITION	26.4 °C, 43.8 % R.H .
INPUT POWER	7.4 Vd.c.		

CHANNEL	Channel Frequency (MHz)	Bandwidth at 99% (kHz)	Bandwidth at 20dB below(kHz)	Channel Separation (kHz)	Limit (kHz)	PASS/FAIL
0	2402	876	904	1000	603	PASS
39	2441	859	957	1000	638	PASS
78	2480	893	946	1000	631	PASS

(8DPSK)

CHANNEL	Channel Frequency (MHz)	Bandwidth at 99% (MHz)	Bandwidth at 20dB below(kHz)	Channel Separation (kHz)	Limit (kHz)	PASS/FAIL
0	2402	1.259	1296	1000	864	PASS
39	2441	1.295	1344	1000	896	PASS
78	2480	1.272	1361	1000	907	PASS



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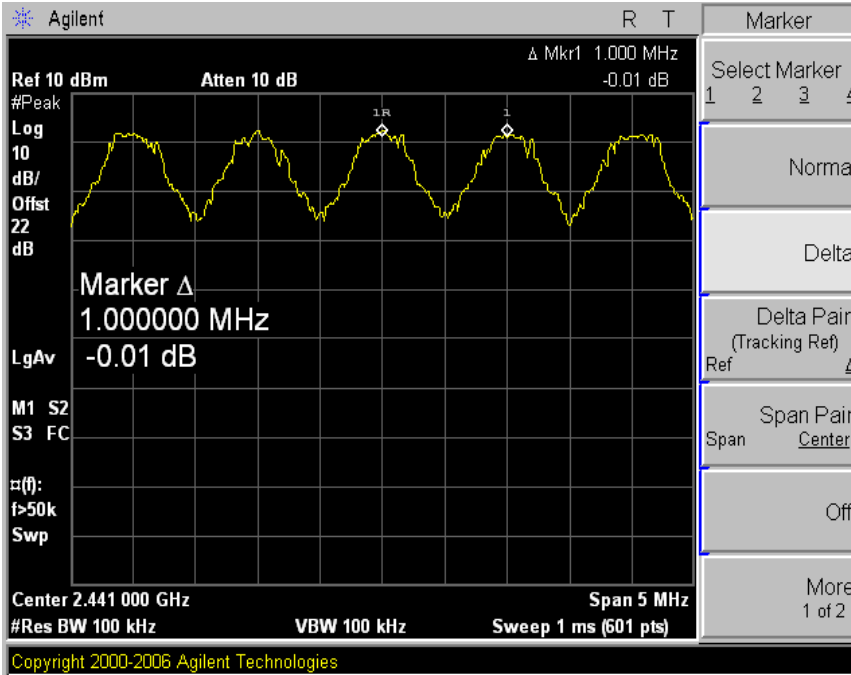
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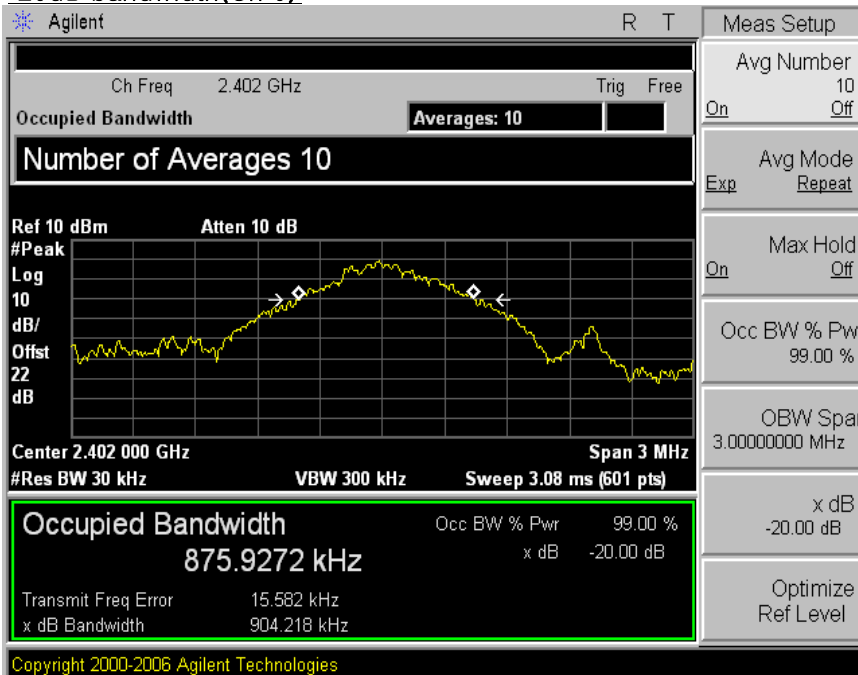
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5.4 Trace data (GFSK)

Channel Separation



20dB bandwidth(Ch 0)





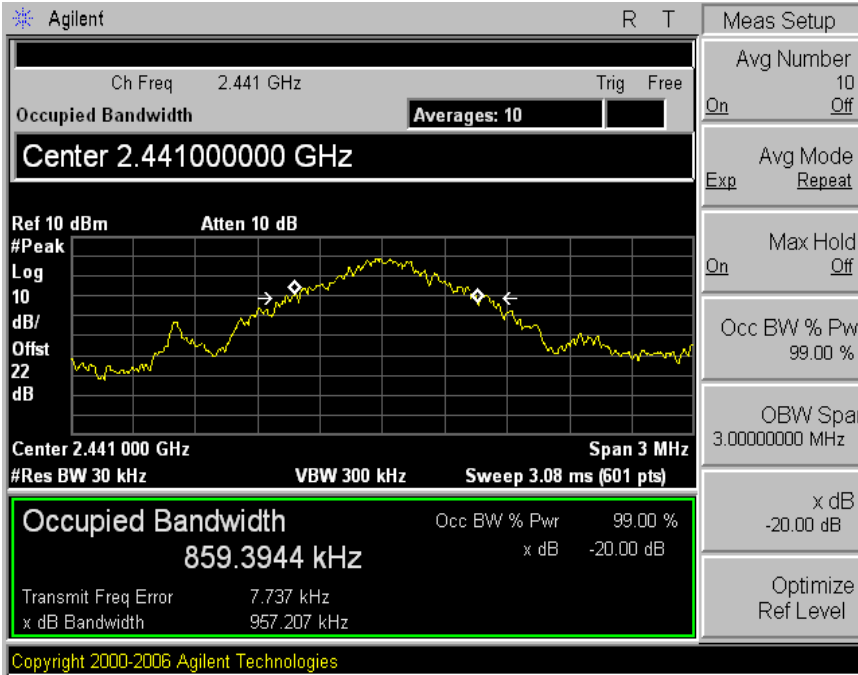
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20dB bandwidth(CH 39)



20dB bandwidth(CH 78)





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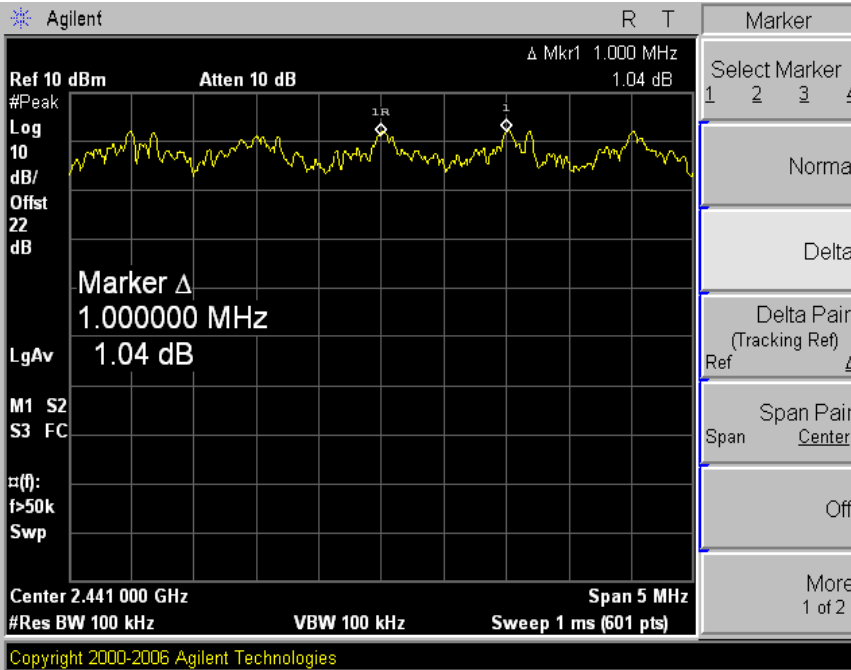
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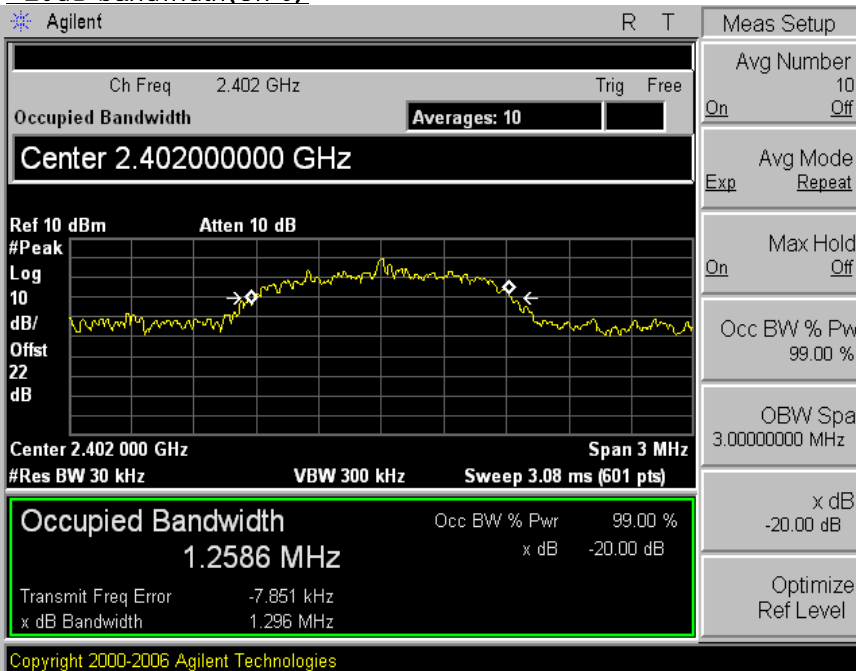
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(8DPSK)

Channel Separation



20dB bandwidth(Ch 0)





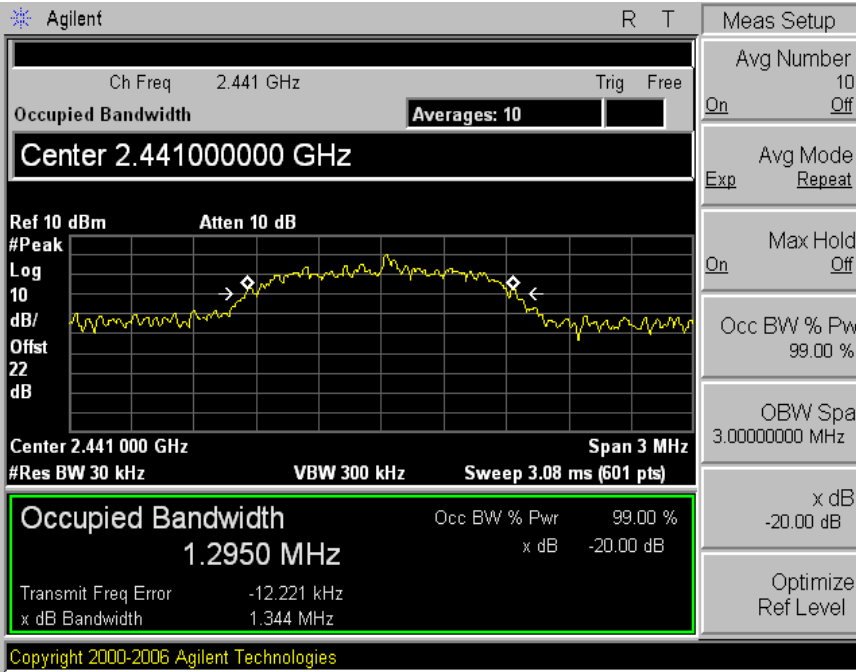
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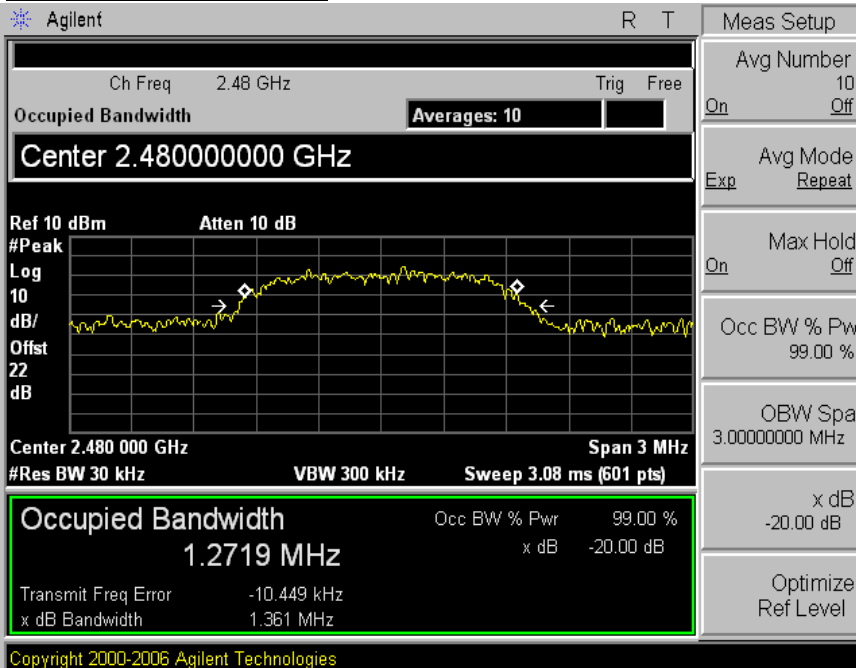


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20dB bandwidth(CH 39)



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	849622/045	2014-02-27
Power Sensor	NRV-251	325948/013	2014-02-27
Bluetooth Tester	TC-3000A	3000A5B0298	2013-12-26
Dual Directional Coupler	772D	3736A22424	2014-01-27
-Spectrum Analyzer <=> EUT	Loss: 22.0 dB	-	

6.2 Measurement results

EUT	PDA	MODEL	MT3XX
MODE	GFSK,8DPSK DH5	ENVIRONMENTAL CONDITION	24.6 °C, 43.4 % R.H.
INPUT POWER	7.4 Vd.c.		

GFSK

CHANNEL	Channel Frequency (MHz)	Peak Power Output(dBm)		Limit[mW]	PASS/ FAIL
		(dBm)	(mW)		
0	2402	1.86	1.5346	125	PASS
39	2441	2.36	1.7219	125	PASS
78	2480	1.43	1.3900	125	PASS

8DPSK

CHANNEL	Channel Frequency (MHz)	Peak Power Output(dBm)		Limit[mW]	PASS/ FAIL
		(dBm)	(mW)		
0	2402	1.78	1.5066	125	PASS
39	2441	2.34	1.7140	125	PASS
78	2480	1.32	1.3552	125	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)(iii), Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

7.2 Test instruments and measurement setup

The spectrum analyzer is set to as following.

- . RBW= 300 kHz
- . VBW= 300 kHz
- . 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	E4440A	US41421291	2014-01-27
Bluetooth Tester	TC-3000A	3000A5B0298	2013-12-26
Dual Directional Coupler	772D	3736A22424	2014-01-27
-Spectrum Analyzer <=> EUT	Loss: 22.0 dB		

7.3 Measurement results

EUT	PDA	MODEL	MT3XX
MODE	FHSS	ENVIRONMENTAL CONDITION	26.5 °C, 43.3 % R.H.
INPUT POWER	7.4 Vd.c.		
Number of CH	Limit (Number of CH)	PASS/FAIL	
79	>15	PASS	



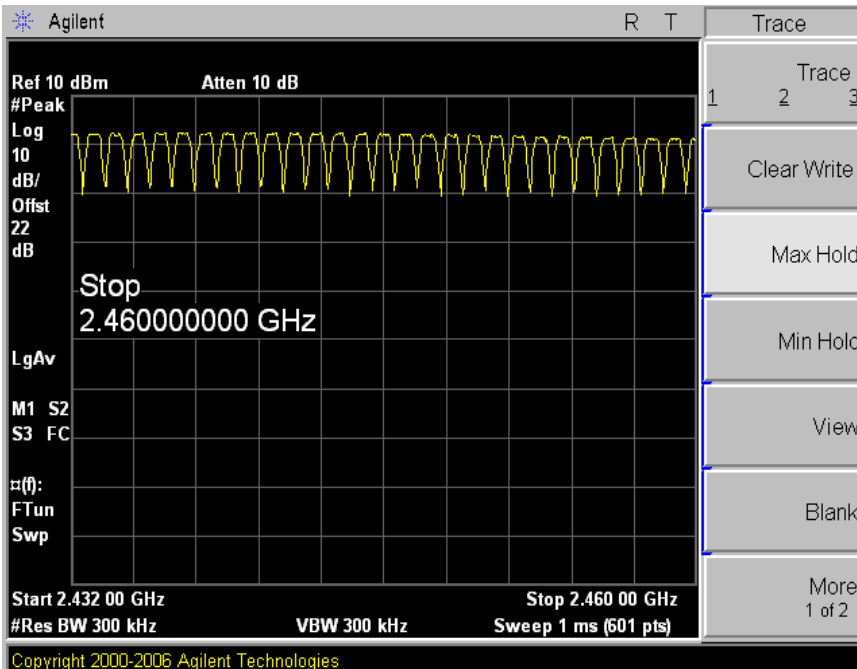
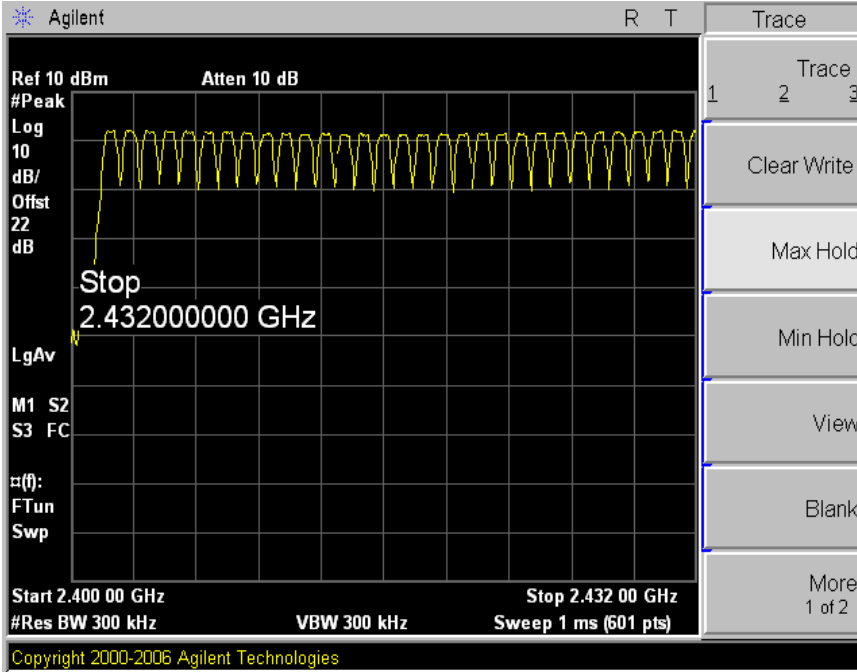
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7.4 Trace data(GFSK)



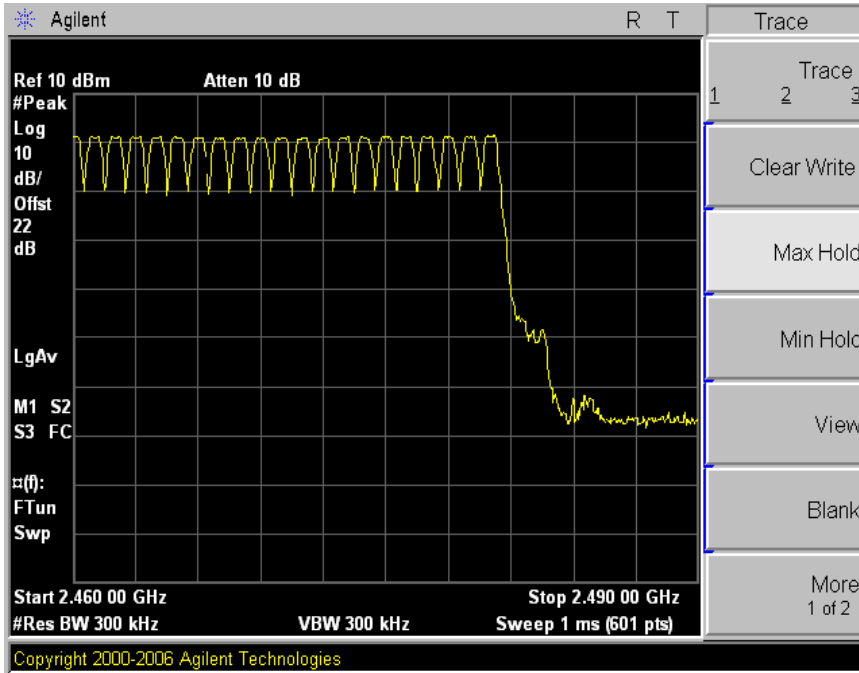


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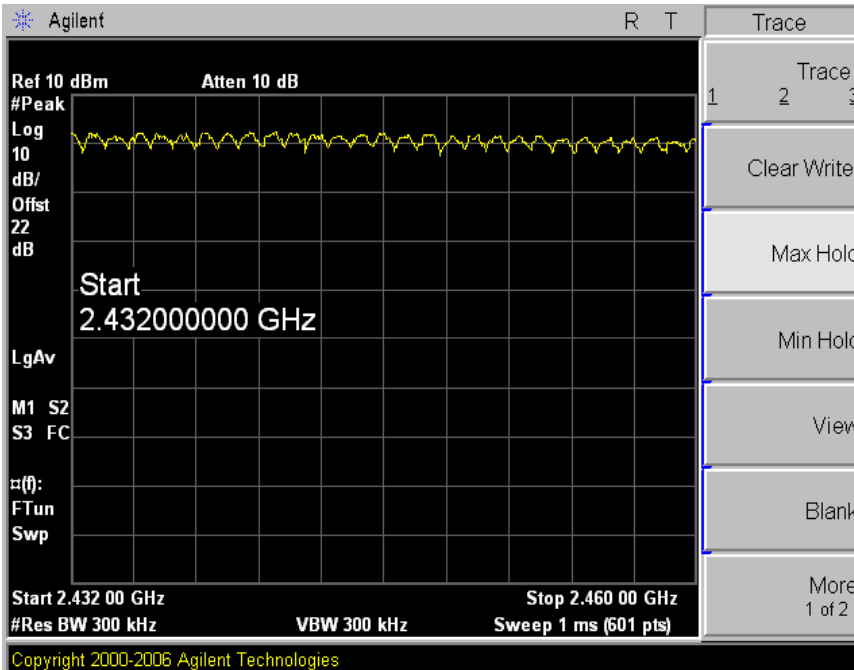
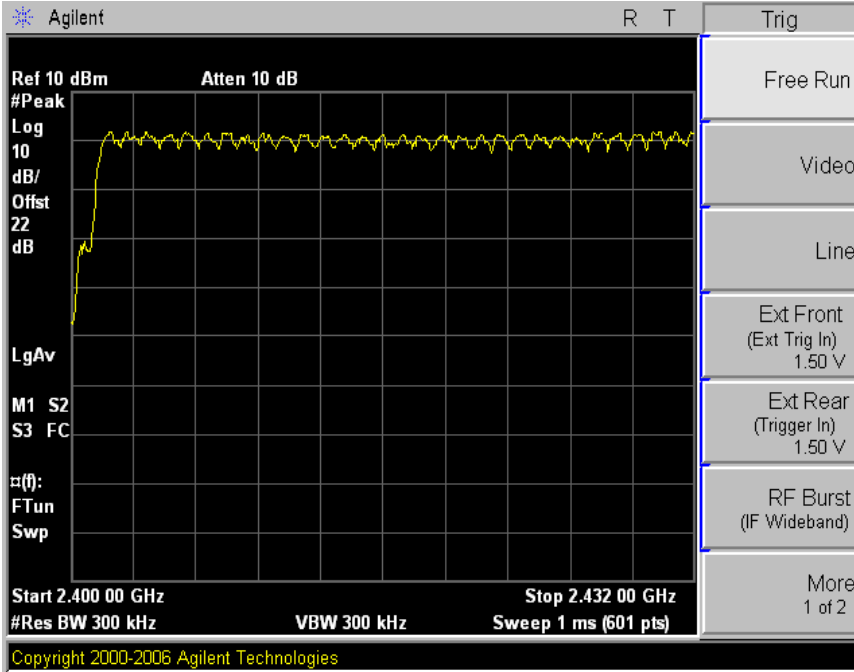
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7.4 Trace data(8DPSK)



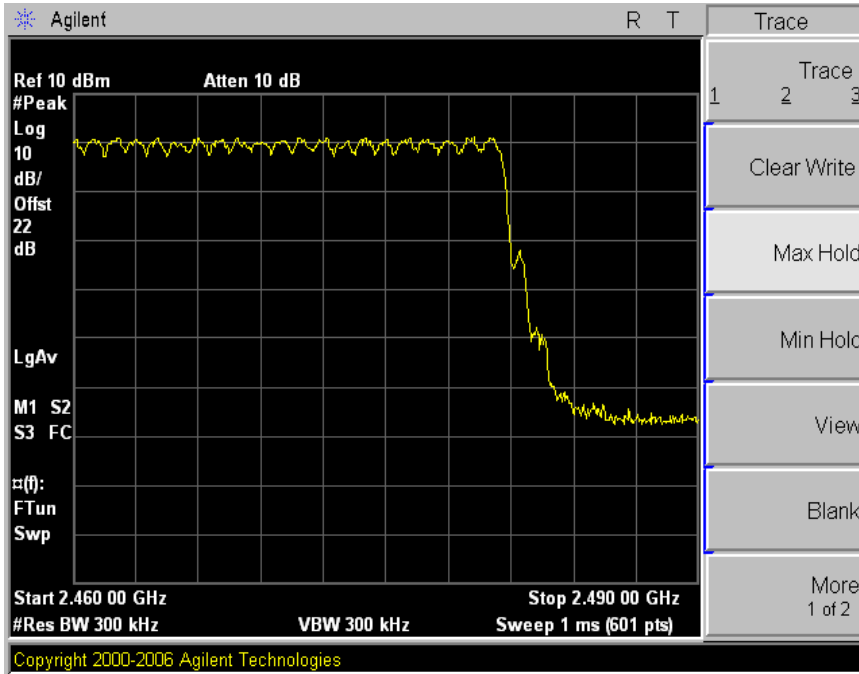


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8. Time of Occupancy (Dwell Time)

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= 1 MHz
- . 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	E4440A	US41421291	2014-01-27
Bluetooth Tester	TC-3000A	3000A5B0298	2013-12-26
Dual Directional Coupler	772D	3736A22424	2014-01-27
-Spectrum Analyzer <=> EUT	Loss:22.0 dB	-	

8.3 Measurement results

EUT	PDA	MODEL	MT3XX
MODE	FHSS	ENVIRONMENTAL CONDITION	26.3 °C, 43.6 % R.H.
INPUT POWER	7.4 Vd.c.		



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A. DH1 Mode

One period for each particular channel : $0.43 \text{ ms} \times 320.1 = 137.643 \text{ ms}$

Channel	Pulse Time(ms)	Limit(ms)	PASS/FAIL
39	137.64	400	PASS

Calculation: The Bluetooth system hops at a rate of 1600 times per second. This means there are 1600 timeslots in one second, the DH1 data rate operates on a one-slot transmission and one-slot receiving basis. Thus there are $1600/(1+1)=800$ transmissions per second. In one period for each particular channel there are $10.13 \times 31.6=320.1$ times of transmissions.

B. DH3 Mode

One period for each particular channel : $1.7 \text{ ms} \times 159.9 = 271.83 \text{ ms}$

Channel	Pulse Time(ms)	Limit(ms)	PASS/FAIL
39	271.83	400	PASS

Calculation: The Bluetooth system hops at a rate of 1600 times per second. This means there are 1600 timeslots in one second, the DH3 data rate operates on a three-slot transmission and one-slot receiving basis. Thus there are $1600/(3+1)=400$ transmissions per second. In one period for each particular channel there are $5.06 \times 31.6=159.9$ times of transmissions.

C. DH5 Mode

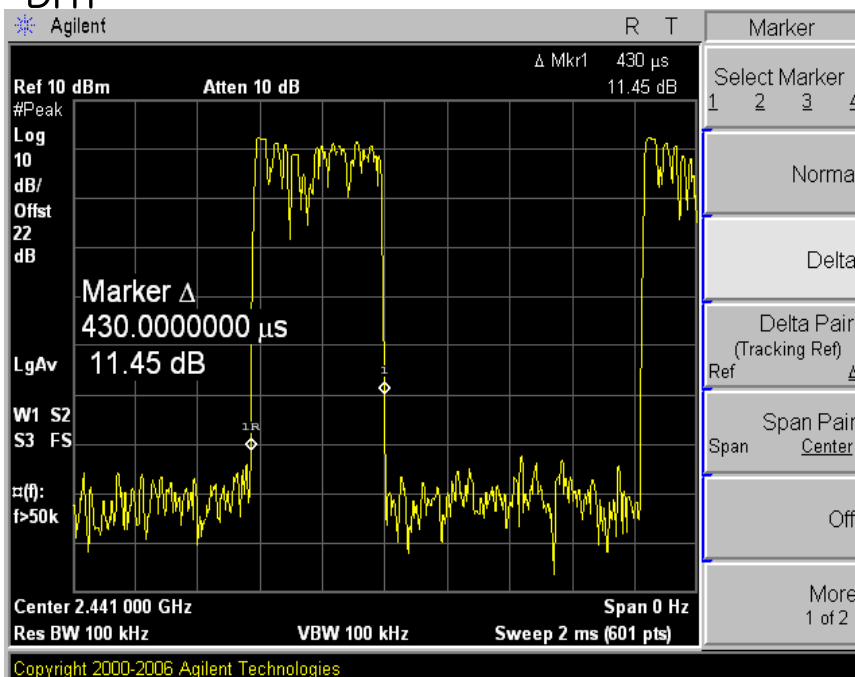
One period for each particular channel : $2.95 \text{ ms} \times 106.81 = 315.09 \text{ ms}$

Channel	Pulse Time(ms)	Limit(ms)	PASS/FAIL
39	315.09	400	PASS

Calculation: The Bluetooth system hops at a rate of 1600 times per second. This means there are 1600 timeslots in one second, the DH5 data rate operates on a five-slot transmission and one-slot receiving basis. Thus there are $1600/(5+1)=266.7$ transmissions per second. In one period for each particular channel there are $3.38 \times 31.6=106.81$ times of transmissions.

8.4 Trace data

DH1





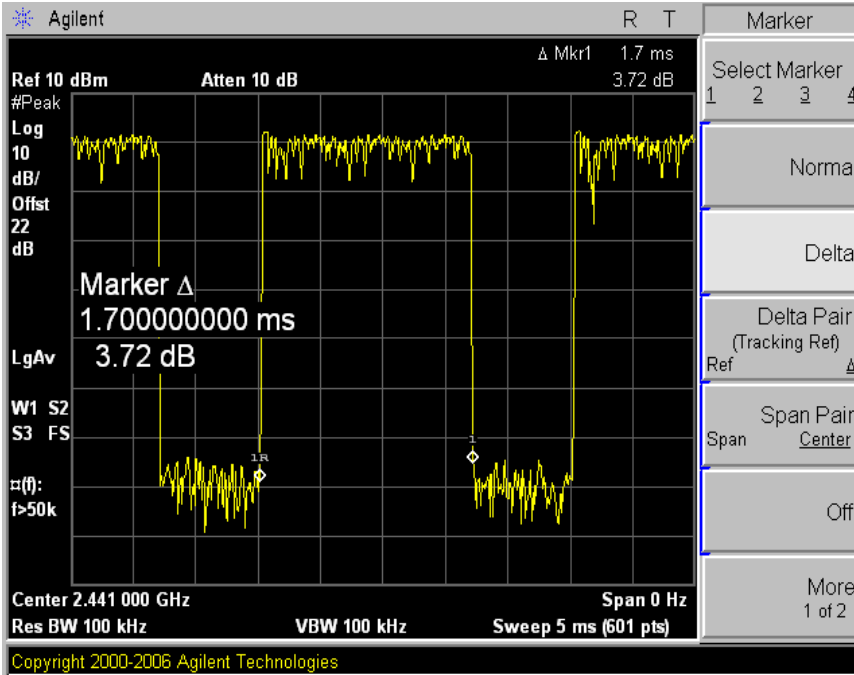
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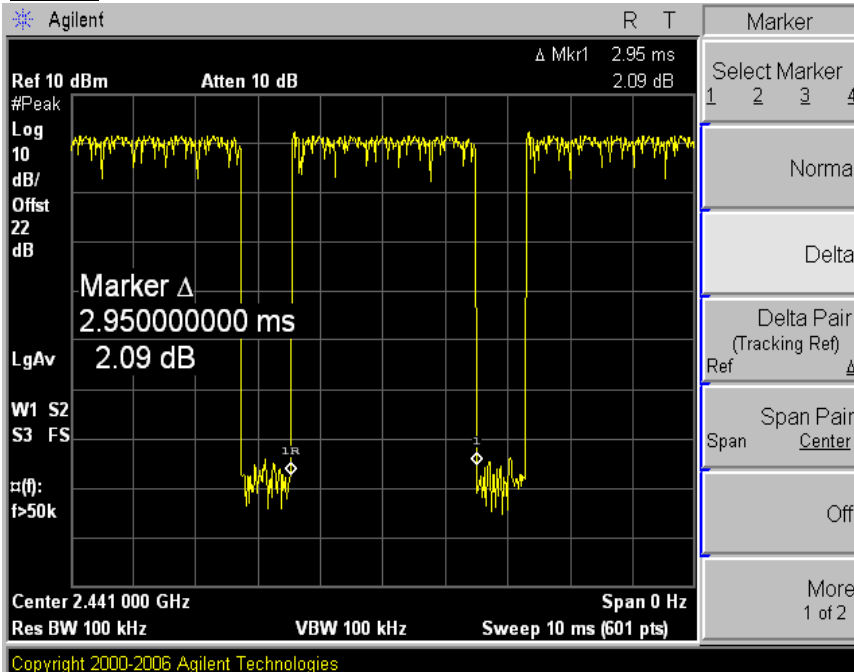


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DH3



DH5



8DPSK

A. DH1 Mode

One period for each particular channel : $0.45 \text{ ms} \times 320.1 = 144.045 \text{ ms}$

Channel	Pulse Time(ms)	Limit (ms)	PASS/FAIL
39	144.05	400	PASS

B. DH3 Mode

One period for each particular channel : $1.7 \text{ ms} \times 159.9 = 271.83 \text{ ms}$

Channel	Pulse Time(ms)	Limit (ms)	PASS/FAIL
39	271.83	400	PASS

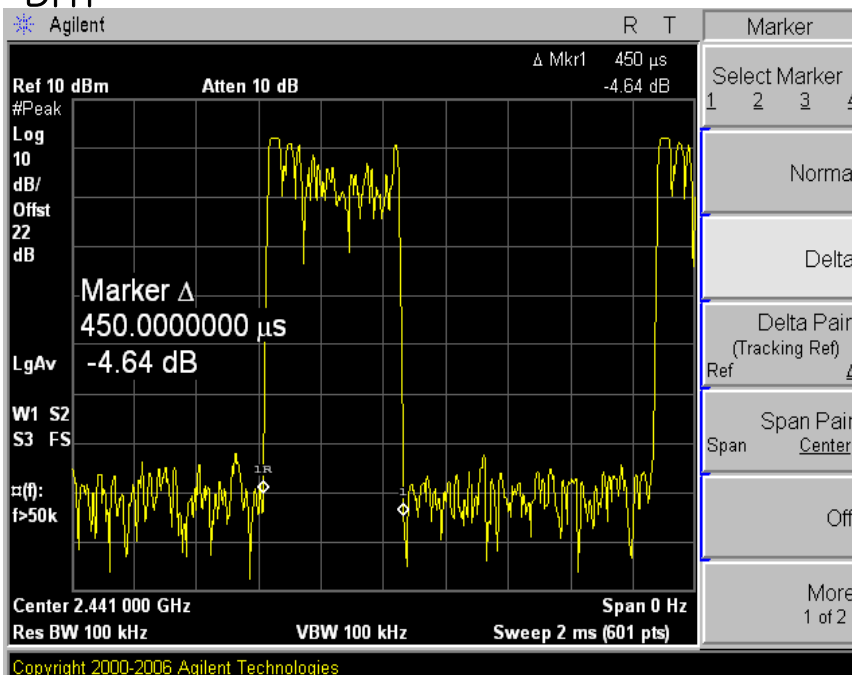
C. DH5 Mode

One period for each particular channel : $2.983 \text{ ms} \times 106.81 = 318.614 \text{ ms}$

Channel	Pulse Time(ms)	Limit (ms)	PASS/FAIL
39	318.61	400	PASS

8.5 Trace data

DH1





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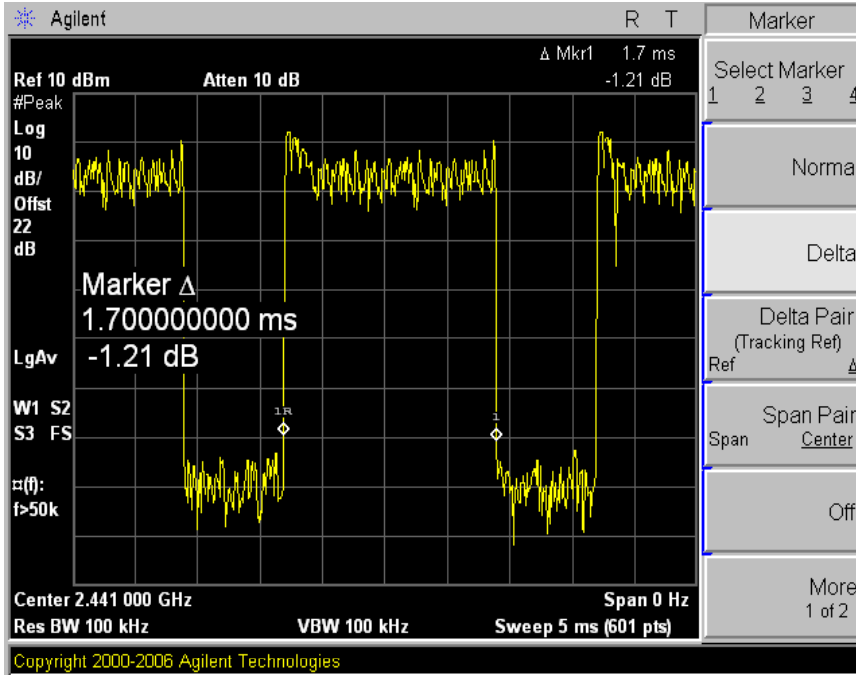
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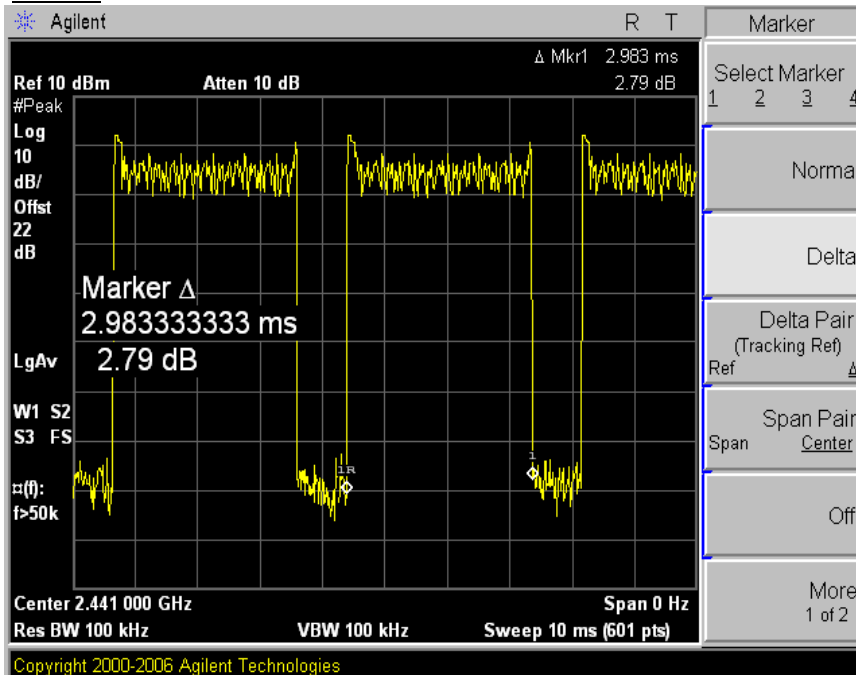
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8DPSK

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= 100 kHz
- . VBW= >300 kHz
- . 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	E4440A	US41421291	2014-01-27
Signal Analyzer	FSV	100939	2014-01-25
Bluetooth Tester	TC-3000A	3000A5B0298	2013-12-26
Dual Directional Coupler	772D	3736A22424	2014-01-27
-Spectrum Analyzer <=> EUT	Loss: 22.0 dB		

9.3 Measurement results of band-edge & out of emission

EUT	PDA	MODEL	MT3XX
MODE	GFSK	ENVIRONMENTAL CONDITION	24.6 °C, 43.8 % R.H.
INPUT POWER	7.4 Vd.c.		

* Refer to attach spectrum analyzer data chart.



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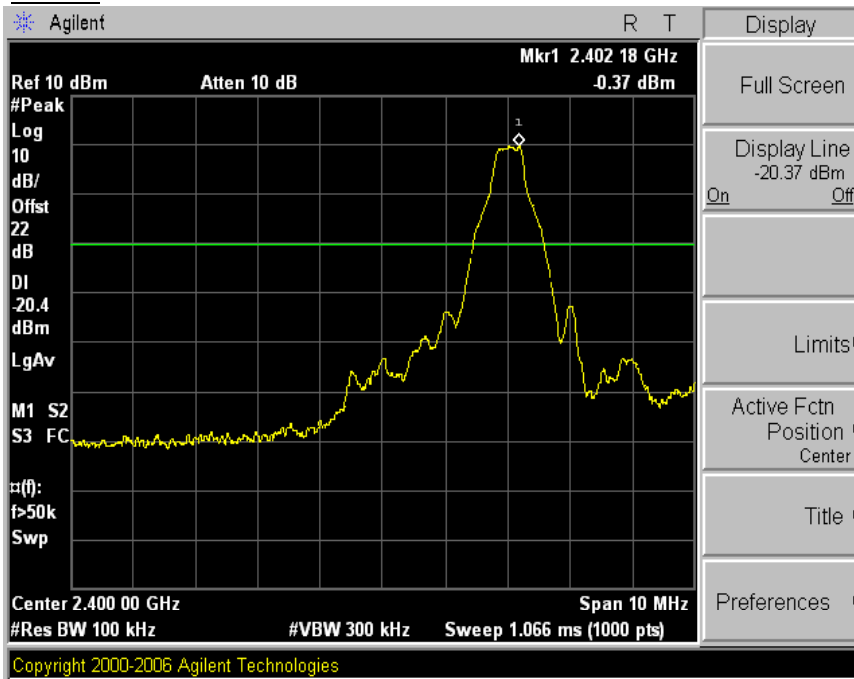
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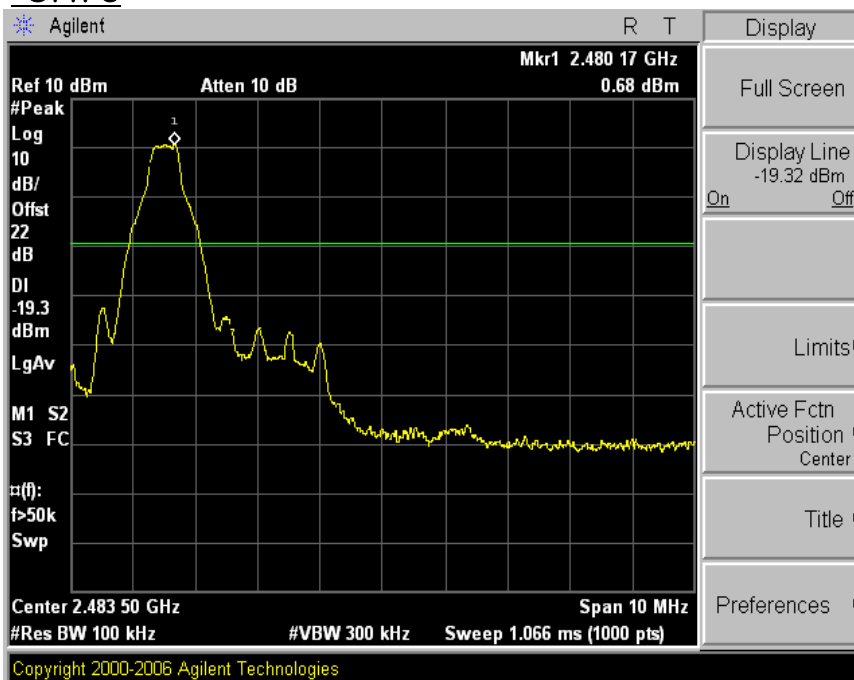
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9.4 Trace data of band-edge & Out of Emission

CH0



CH78





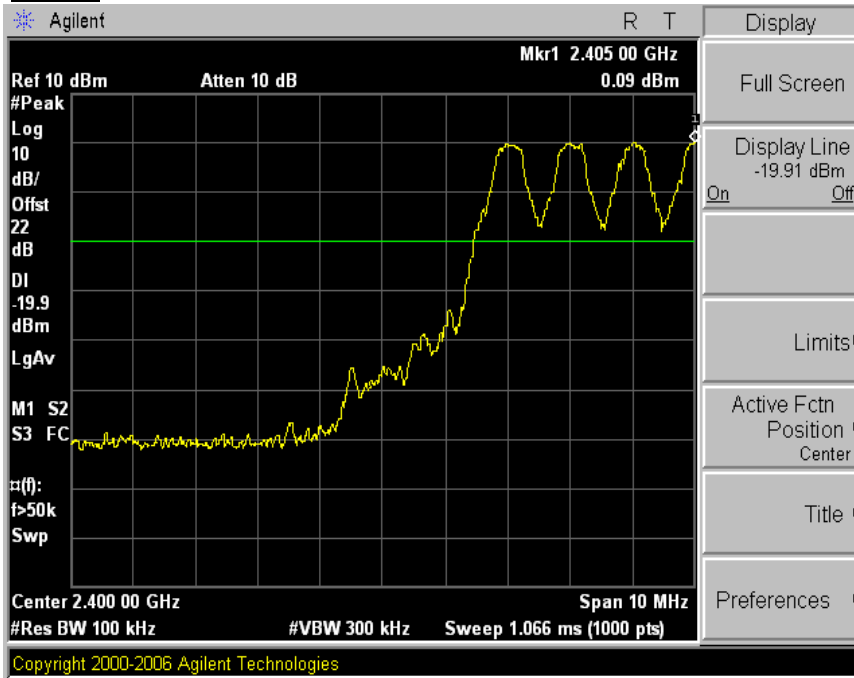
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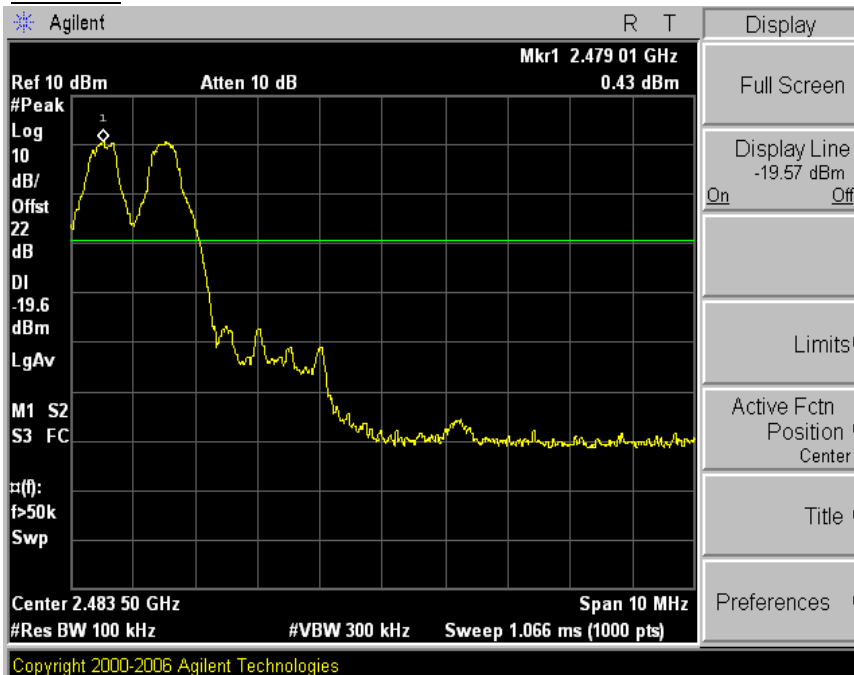


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Hopping on CH0



CH78





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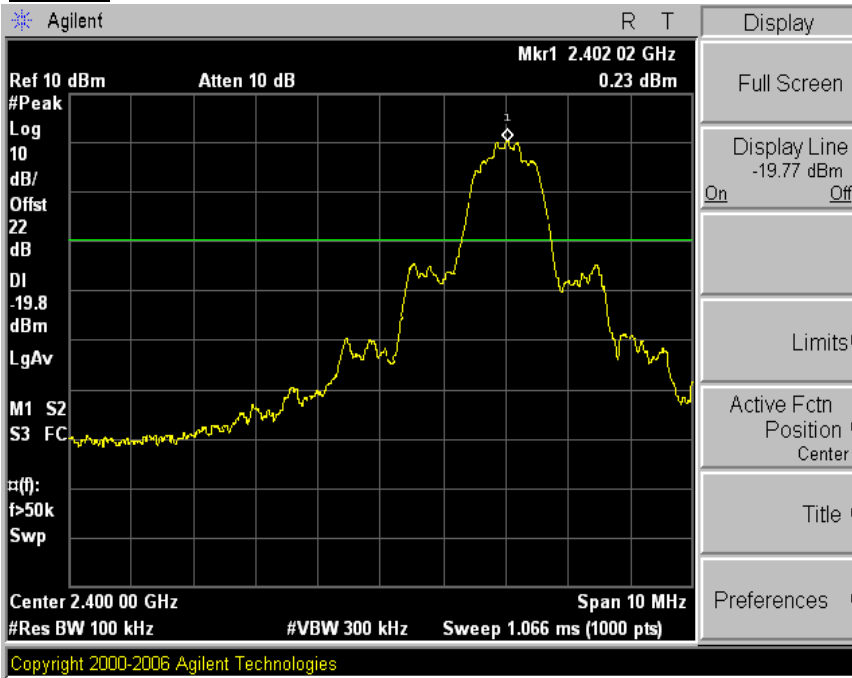
Rm 1015, World Venture Center II,
426-5 Gasan-dong, Guncheon-gu,
Seoul, 158-803, Korea



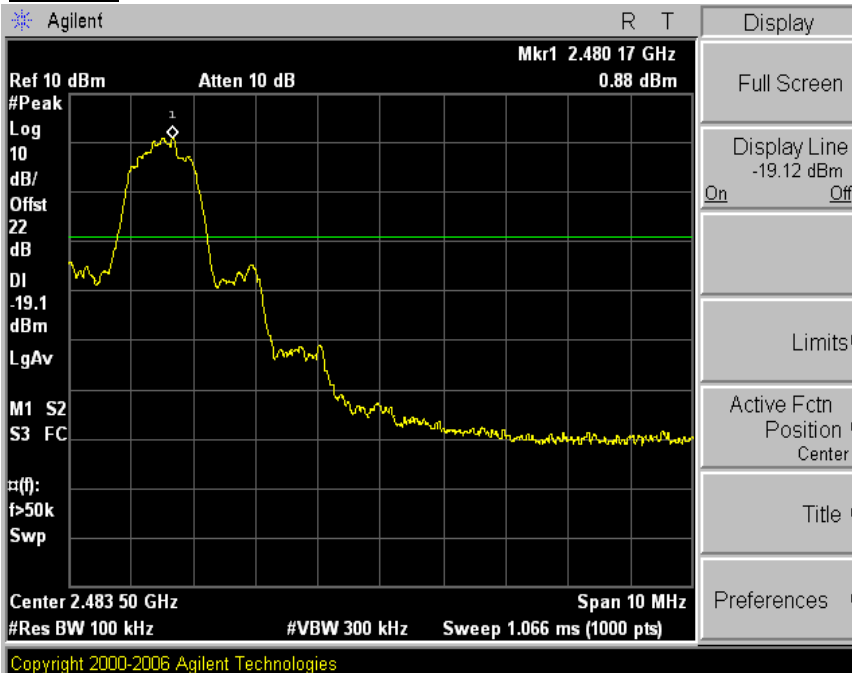
**Electromagnetic
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8DPSK

CH 0



CH78





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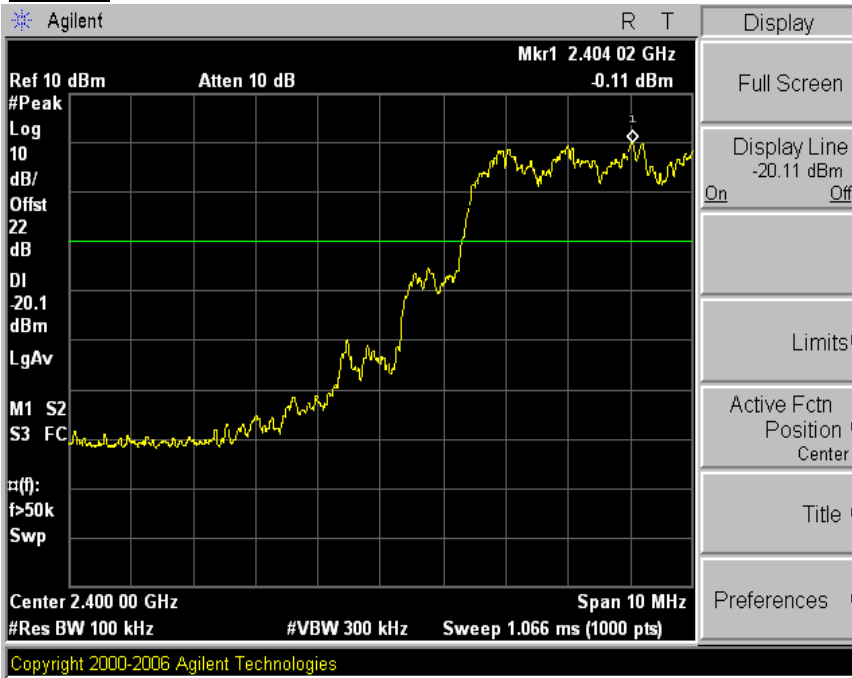
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Seoul, 158-803, Korea



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Hopping on

CH 0



CH78





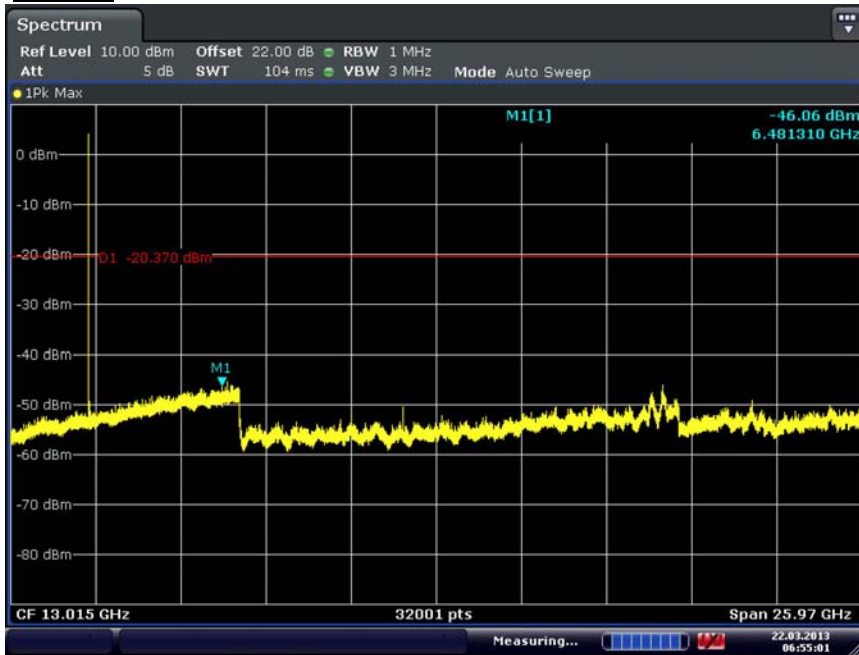
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GFSK
CH 0





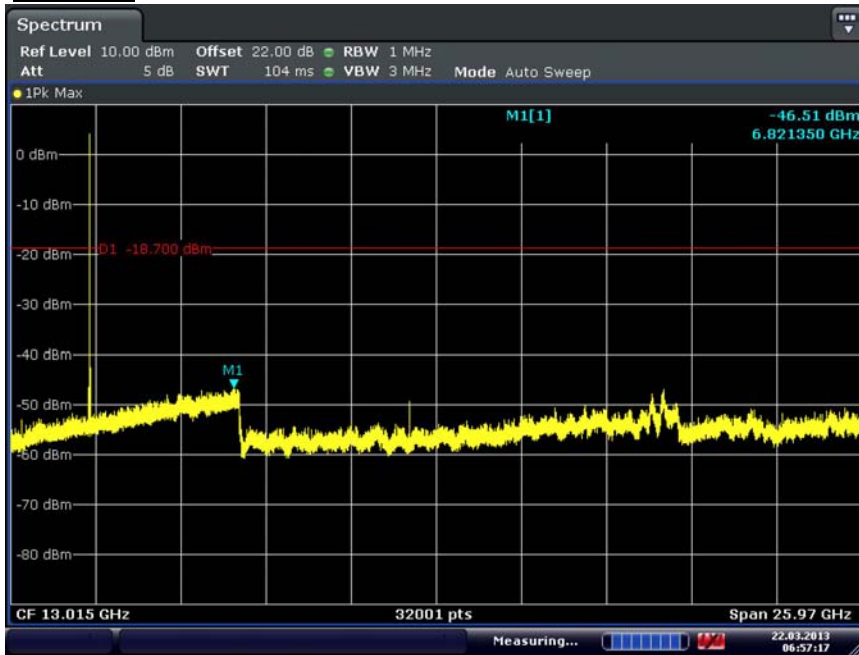
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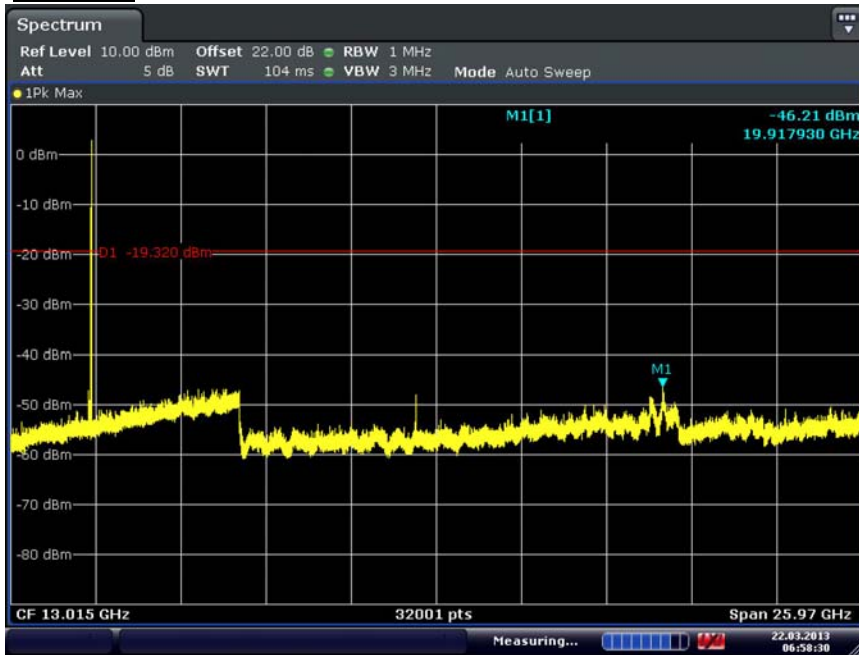
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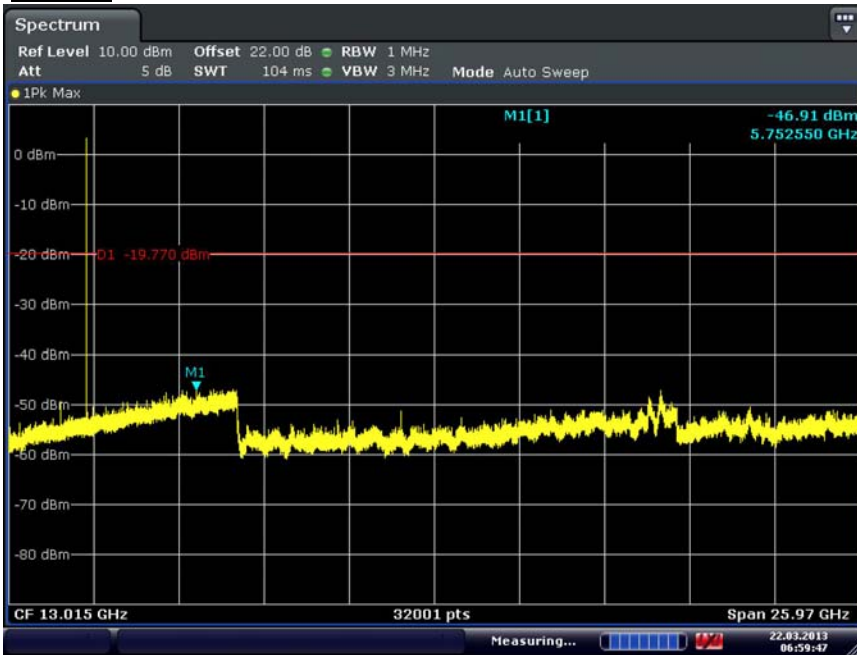
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CH 0





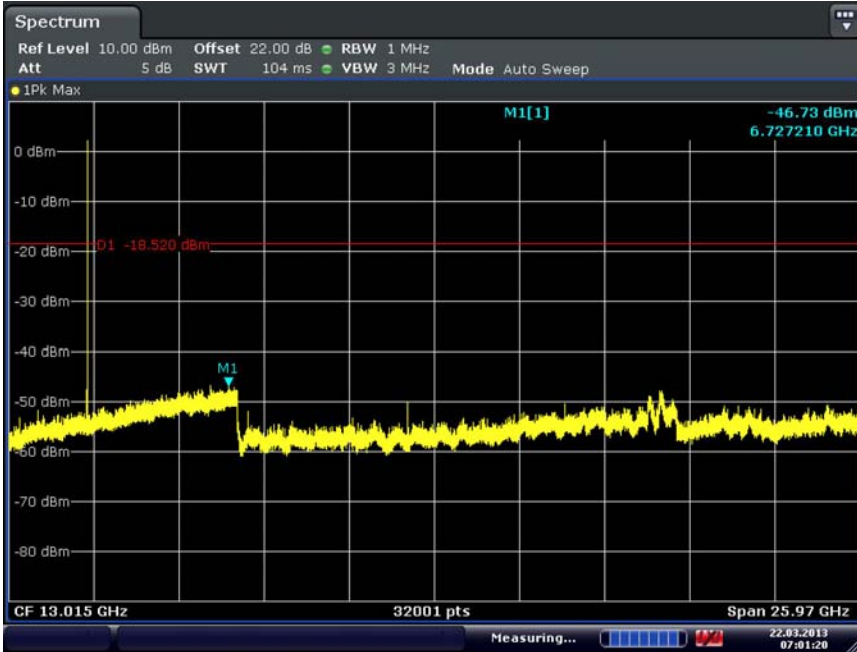
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Interference
Test Report**

CH 39





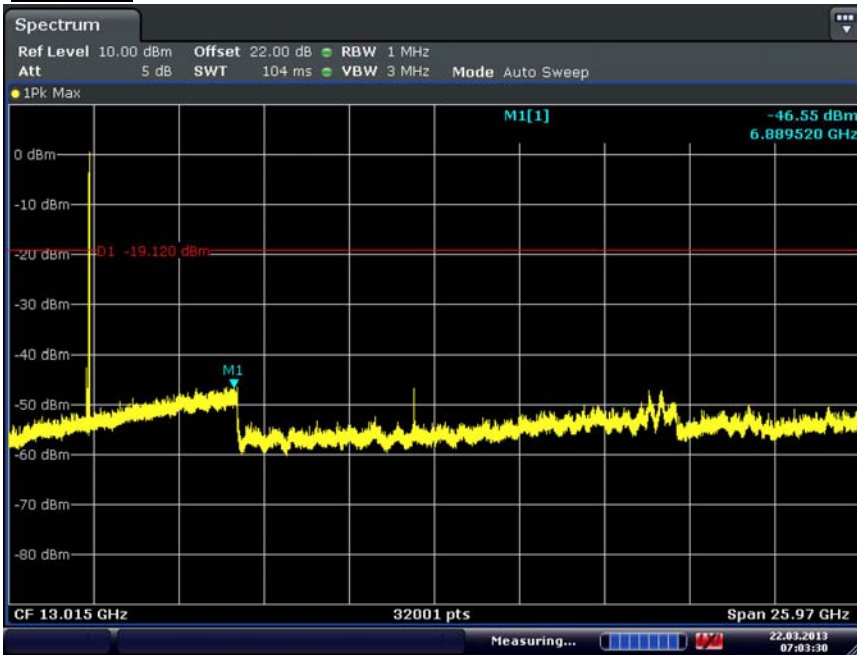
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**Electromagnetic
Interference
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10. Measurement of radiated disturbance

Above 30 MHz Electric Field strength was measured in accordance with FCC Part 15 (2010). The test setup was made according to ANSI C 63.4 (2003) on an open test site, which allows a 3 m distance measurement. The EUT was placed in the center of wooden turntable. The height of this table was 0.8 m. 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	ESCI7	ROHDE & SCHWARZ	1166.5950.07	27-Jan-14
Logbicon Antenna	VULB 9168	SCHWARZBECK	237	22-May-13
Turn Table	DT3000-2t	Innco System GmbH	N/A	-
Antenna Mast	MA4000-EP	Innco System GmbH	N/A	-
Antenna Master & Turn table controller	CO2000-P	Innco System GmbH	CO2000/641 /28051111/L	-
TEST Receiver	ESPI7	ROHDE & SCHWARZ	100185	26-Jan-14
PREAMPLIFIER	8449B	AGILENT	3008A00595	27-Jan-14
Horn Antenna	BBHA9120D	SCHWARZBECK	352	15-May-13
Spectrum Analyzer	R3273	ADVANTEST	110600592	25-Jan-14
Pyramidal Horn Antenna	3160-09-01	ETS-LINDGREN	102642	22-Oct-13
Turn Table	DT1500-S	Innco System GmbH	N/A	-
Antenna Mast	MA4000-EP	Innco System GmbH	N/A	-
Antenna Master & Turn table controller	CO2000-P	Innco System GmbH	CO2000/642 /28051111/L	-
Bluetooth Tester	TC-3000A	TESCOM	3000A5B0298	26-Dec-13

10.2 Environmental Condition

Below 1 GHz –Test Place : 10 m Semi-anechoic chamber

BT Basic Rate Mode (worst case)

Temperature (°C) : 25.4 °C

Humidity (% R.H.) : 45.8 % R.H.

Above 1 GHz–Test Place : 3 m Semi-anechoic chamber

BT Basic Rate Mode

Temperature (°C) : 23.4 °C

Humidity (% R.H.) : 46.5 % R.H.

BT EDR Mode

Temperature (°C) : 24.5 °C

Humidity (% R.H.) : 47.7 % R.H.

10.3-1 Test Data for Bluetooth(Basic Rate)

Test Date : 25-Mar-13

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction(dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW:1 MHz VBW:3 MHz)									
2378.2	28.10	H	1.2	26.66	5.0	0	74.0	59.76	-14.24
2378.2	34.66	V	1.1	26.66	5.0	0	74.0	66.32	-7.68
4804.03	52.43	V	1.4	31.36	-24.0	0	74.0	59.79	-14.21
4804.2	51.75	H	1.3	31.36	-24.0	0	74.0	59.11	-14.89
Average Value = Peak value + Duty Cycle Correction Factor									
2378.2	59.76	H	1.2			-30.60	54.0	29.16	-24.84
2378.2	66.32	V	1.1			-30.60	54.0	35.72	-18.28
4804.03	59.79	V	1.4			-30.60	54.0	29.19	-24.81
4804.2	59.11	H	1.3			-30.60	54.0	28.51	-25.49
Remark	<p>H : Horizontal, V : Vertical TEST MODE : Bluetooth Basic Rate-CH0(2402 MHz)</p> <p>*The TX signal isn't detected from 3th harmonics. *Checked in all 3 axis and the maximum measured data were reported.(worst case at Z axis) *Multiple of CL = Cable Loss-Amplifier Gain(In case of above1000 MHz) FYI : Duty Cycle Correction Factor (79 channel hopping) a. Time to cycle through all channels= $\Delta t = \tau$ [ms] x 79 channels = 233.05 ms, where τ = pulse width b. 100 ms/ Δt [ms] = H \rightarrow Round up to next highest integer, H' =1 c. Worst Case Dwell Time = τ [ms] x H' = 2.95 ms d. Duty Cycle Correction = 20log (Worst Case Dwell Time/ 100ms) dB = - 30.6 dB</p>								

10.3-2 Test Data for Bluetooth(Basic Rate)

Test Date : 25-Mar-13

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ W)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction(dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dB μ W/m)	Result (dB μ W/m)	Margin (dB)
PEAK(RBW:1 MHz VBW:3 MHz)									
4882.01	54.40	H	1.3	31.50	-24.0	0	74.0	61.94	-12.06
4882.01	53.27	V	1.2	31.50	-24.0	0	74.0	60.81	-13.19
Average Value = Peak value + Duty Cycle Correction Factor									
4882.01	61.94	H	1.3			-30.60	54.0	31.34	-22.66
4882.01	60.81	V	1.2			-30.60	54.0	30.21	-23.79
Remark	<p>H : Horizontal, V : Vertical TEST MODE : Bluetooth Basic Rate-CH39(2441 MHz)</p> <p>*The TX signal isn't detected from 3th harmonics.</p> <p>*Checked in all 3 axis and the maximum measured data were reported.(worst case at Z axis)</p> <p>*Multiple of CL = Cable Loss-Amplifier Gain(In case of above1000 MHz)</p> <p>FYI : Duty Cycle Correction Factor (79 channel hopping)</p> <p>a. Time to cycle through all channels= $\Delta t = \tau$ [ms] x 79 channels = 233.05 ms, where τ = pulse width</p> <p>b. $100 \text{ ms} / \Delta t$ [ms] = H \rightarrow Round up to next highest integer, H' =1</p> <p>c. Worst Case Dwell Time = τ [ms] x H' = 2.95 ms</p> <p>d. Duty Cycle Correction = $20 \log (\text{Worst Case Dwell Time} / 100\text{ms}) \text{ dB} = -30.6 \text{ dB}$</p>								

10.3-5 Test Data for Bluetooth(EDR)

Test Date : 25-Mar-13

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ /m)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction(dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dB μ /m)	Result (dB μ /m)	Margin (dB)
PEAK(RBW:1 MHz VBW:3 MHz)									
4881.94	46.99	H	1.3	31.50	-24.0	0	74.0	54.53	-19.47
4881.99	47.94	V	1.2	31.50	-24.0	0	74.0	55.48	-18.52
Average Value = Peak value + Duty Cycle Correction Factor									
4881.94	54.53	H	1.3			-30.51	54.0	24.02	-29.98
4881.99	55.48	V	1.2			-30.51	54.0	24.97	-29.03
Remark	<p>H : Horizontal, V : Vertical TEST MODE : Bluetooth EDR-CH39(2441 MHz)</p> <p>*The TX signal isn't detected from 3th harmonics. *Checked in all 3 axis and the maximum measured data were reported.(worst case at Z axis) *Multiple of CL = Cable Loss-Amplifier Gain(In case of above1000 MHz) FYI : Duty Cycle Correction Factor (79 channel hopping) a. Time to cycle through all channels= $\Delta t = \tau$ [ms] x 79 channels = 235.66 ms, where τ = pulse width b. $100 \text{ ms} / \Delta t$ [ms] = H \rightarrow Round up to next highest integer, H' =1 c. Worst Case Dwell Time = τ [ms] x H' = 2.983 ms d. Duty Cycle Correction = $20\log(\text{Worst Case Dwell Time} / 100\text{ms}) \text{ dB} = -30.51 \text{ dB}$</p>								

10.3-6 Test Data for Bluetooth(EDR)

Test Date : 25-Mar-13

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction (dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW:1 MHz VBW:3 MHz)									
2483.5	31.64	H	1.1	26.98	5.0	0	74.0	63.62	-10.38
2483.5	30.46	V	1.1	26.98	5.0	0	74.0	62.44	-11.56
4959.99	45.48	H	1.2	31.63	-23.9	0	74.0	53.23	-20.77
4959.99	49.45	V	1.3	31.63	-23.9	0	74.0	57.20	-16.80
Average Value = Peak value + Duty Cycle Correction Factor									
2483.5	63.62	H	1.1			-30.51	54.0	33.11	-20.89
2483.5	62.44	V	1.2			-30.51	54.0	31.93	-22.07
4959.99	53.23	H	1.1			-30.51	54.0	22.72	-31.28
4959.99	57.20	V	1.2			-30.51	54.0	26.69	-27.31
Remark	<p>H : Horizontal, V : Vertical TEST MODE : Bluetooth EDR-CH78(2480 MHz)</p> <p>*The TX signal isn't detected from 3th harmonics.</p> <p>*Checked in all 3 axis and the maximum measured data were reported.(worst case at Z axis)</p> <p>*Multiple of CL = Cable Loss-Amplifier Gain(In case of above1000 MHz)</p> <p>FYI : Duty Cycle Correction Factor (79 channel hopping)</p> <p>a. Time to cycle through all channels= $\Delta t = \tau$ [ms] x 79 channels = 235.66 ms, where τ = pulse width</p> <p>b. 100 ms/ Δt [ms] = H \rightarrow Round up to next highest integer, H' =1</p> <p>c. Worst Case Dwell Time = τ [ms] x H' = 2.983 ms</p> <p>d. Duty Cycle Correction = 20log (Worst Case Dwell Time/ 100ms) dB = - 30.51 dB</p>								

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 (2010). 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 0.8 m above the ground plan. A grounded vertical reference plane was positioned in a distance of 0.4 m from the EUT. The distance from the EUT to other metal surfaces was at least 0.8 m. 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 1.0 m.. The test receiver with Quasi Peak detector complies with CISPR 16.

11.1 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
TEST Receiver	ESHS 30	Rohde & Schwarz	828765/002	26-Jan-14
LISN	ESH3-Z5	Rohde & Schwarz	838979/010	27-Jan-14
Pulse Limiter	ESH3Z2	Rohde & Schwarz	NONE	26-Jan-14
Bluetooth Tester	TC-3000A	TESCOM	3000A5B0298	26-Dec-13

11.2 Environmental Condition

Test Place : Shielded Room

BT Basic Mode (worst case)

Temperature (°C) : 23.4 °C

Humidity (% R.H.) : 45.1 % R.H.



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11.3 Test Data for Bluetooth (Basic Rate)(worst case)

Test Date : 25-Mar-13

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)
0.16	0.13	0.17	H	65.67	47.89	48.20	55.67	29.76	30.07
0.17	0.13	0.17	H	65.01	46.06	46.36	55.01	28.90	29.20
0.19	0.13	0.17	N	64.17	42.95	43.25	54.17	29.17	29.47
0.20	0.13	0.16	H	63.61	41.63	41.92	53.61	28.02	28.31
0.22	0.13	0.16	N	62.82	40.74	41.03	52.82	30.83	31.12
0.48	0.12	0.18	N	56.41	40.96	41.26	46.41	31.18	31.48
Remark	H : Hot Line, N : Neutral Line TEST MODE : Bluetooth Basic Rate CH39(2441 MHz)								

Appendix 1. Special diagram for Bluetooth (Basic Rate)

Bluetooth – CH 39

*HOT

ES TECH
HOT LINE

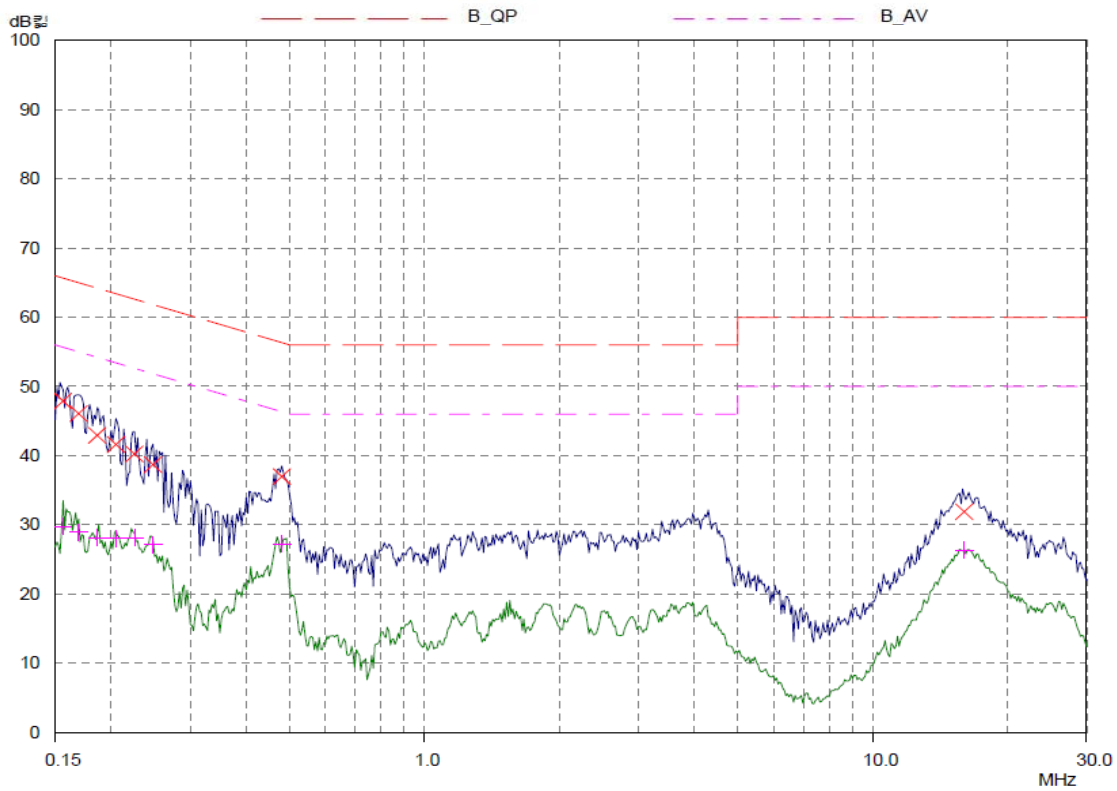
25 Mar 2013 10:30

EUT: MT3XX
 Manuf:
 Op Cond: 120 V
 Operator: Enginner H.K.Lee
 Test Spec: CLASS B
 Comment: BLUETOOTH-CH 39

Result File: 00371a_h.dat : Bluebird Soft Inc.

Scan Settings			Receiver Settings					
(1 Range)								
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	0.8%	10kHz	PK+AV	10msec	Auto	OFF	60dB

Final Measurement: Detectors: X QP / + AV
 Meas Time: 1sec
 Subranges: 25
 Acc Margin: 0 dB



Special diagram for Bluetooth (Basic Rate)

Bluetooth – CH 39

*NEUTRAL

ES TECH

25 Mar 2013 10:01

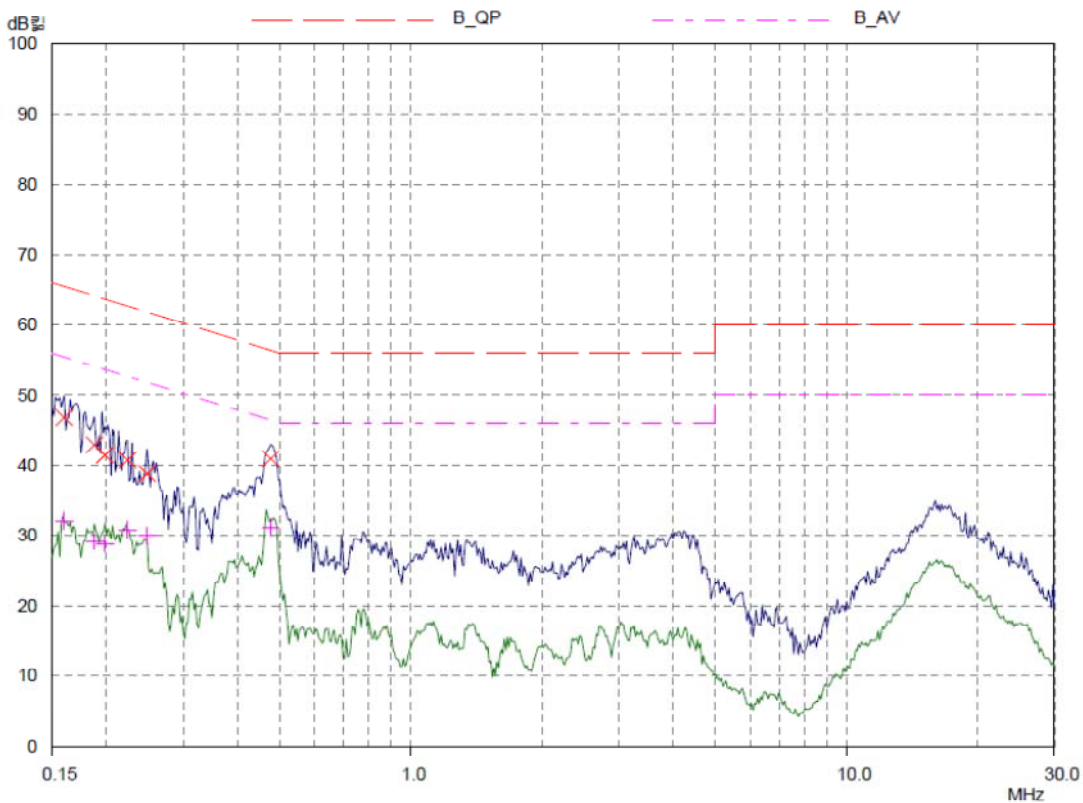
NEUTRAL LINE

EUT: MT3XX
Manuf:
Op Cond: 120 V
Operator: Enginner H.K.Lee
Test Spec: CLASS B
Comment: BLUETOOTH-CH6

Result File: 00371a_n.dat : Bluebird Soft Inc.

Scan Settings			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	0.8%	10kHz	PK+AV	10msec	Auto	OFF	60dB

Final Measurement: Detectors: X QP / + AV
Meas Time: 1sec
Subranges: 25
Acc Margin: 0 dB



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 3.6 dBi.