
FCC Test Report

Report No.: AGC00B110104F2

FCC ID : ZEATSN51B
PRODUCT DESIGNATION : Portable scanner
BRAND NAME : N/A
TEST MODEL : TSN51B
CLIENT : Sky Light Digital Limited
DATE OF ISSUE : Mar.23, 2011
STANDARD(S) : FCC Part 15 Rules

Attestation of Global Compliance Co., Ltd.

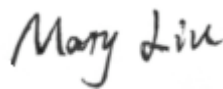
CAUTION: This report shall not be reproduced except in full without the written permission of the test laboratory and shall not be quoted out of context.

VERIFICATION OF COMPLIANCE

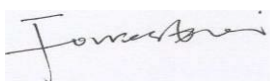
Applicant	Sky Light Digital Limited
	Rm.1009 Kwong Sang Hong Centre,151-153 Hoi Bun Road,Kwun Tong,Kowloon,Hong Kong
Manufacturer	Sky Light Electronic(ShenZhen)Limited
	No.6 Building,JinBi Industrial Area,HuangTian,BaoAn,Shenzhen,China.
Product Designation	Portable scanner
Brand Name	N/A
Model Name	TSN51B,TSN52B,TSN53B,TSN54B
Model difference	The above models all the same except for appearance color.
FCC ID	ZEATSN51B
Report Number	AGC00B110104F2
Date of Test	Mar.16, 2011 to Mar.23, 2011

WE HEREBY CERTIFY THAT:

The above equipment was tested by Attestation of Global Compliance Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2003) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 15.247.

Checked By: 

Mary Liu Mar.23, 2011

Authorized By 

Forrest Lei Mar.23, 2011

TABLE OF CONTENTS

1. GENERAL INFORMATION	4
1.1 PRODUCT DESCRIPTION	4
1.2 TABLE OF CARRIER FREQUENCIES	4
1.3 RECEIVER INPUT BANDWIDTH	4
1.4 EXAMPLE OF A HOPPING SEQUENCY IN DATA MODE	5
1.5 EQUALLY AVERAGE USE OF FREQUENCIES AND BEHAVIOUR	5
1.6 RELATED SUBMITTAL(S) / GRANT (S)	5
1.7 TEST METHODOLOGY	5
1.8 TEST FACILITY	6
1.9 SPECIAL ACCESSORIES	6
1.10 EQUIPMENT MODIFICATIONS	6
2. SYSTEM TEST CONFIGURATION	7
2.1 CONFIGURATION OF TESTED SYSTEM	7
2.2 EQUIPMENT USED IN TESTED SYSTEM	7
3. SUMMARY OF TEST RESULTS	8
4. DESCRIPTION OF TEST MODES	8
5 MAXIMUM OUTPUT POWER	9
5.1 MEASUREMENT PROCEDURE	9
5.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	9
5.3 MEASUREMENT EQUIPMENT USED	10
5.4 LIMITS AND MEASUREMENT RESULT	11
6 20 DB BANDWIDTH	12
6.1 MEASUREMENT PROCEDURE	12
6.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	12
6.3 MEASUREMENT EQUIPMENT USED	12
6.4 LIMITS AND MEASUREMENT RESULTS	12
7. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY (N/A)	18
7.1 MEASUREMENT PROCEDURE	18
7.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	18
7.3 MEASUREMENT EQUIPMENT USED	18
7.4 LIMITS AND MEASUREMENT RESULT	18
8. OUT OF BAND EMISSION	19
8.1 MEASUREMENT PROCEDURE	19
8.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	19
8.3 MEASUREMENT EQUIPMENT USED	19
8.4 LIMITS AND MEASUREMENT RESULT	19
9 BAND EDGE EMISSION	29
9.1 MEASUREMENT PROCEDURE	29
9.2 TEST SET-UP	29
9.3 TEST RESULT	29
10 NUMBER OF HOPPING FREQUENCY	34
10.1 MEASUREMENT PROCEDURE	34
10.2 TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)	34
10.3 MEASUREMENT EQUIPMENT USED	34
10.4 LIMITS AND MEASUREMENT RESULT	34

11	TIME OF OCCUPANCY (DWELL TIME)	
36		
11.1	MEASUREMENT PROCEDURE	36
11.2	TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)	36
11.3	MEASUREMENT EQUIPMENT USED	36
11.4	LIMITS AND MEASUREMENT RESULT	36
12	FREQUENCY SEPARATION	43
12.1	MEASUREMENT PROCEDURE	43
12.2	TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)	43
12.3	MEASUREMENT EQUIPMENT USED	43
12.4	LIMITS AND MEASUREMENT RESULT	43
13	FCC LINE CONDUCTED EMISSION TEST	46
13.1	LIMITS OF LINE CONDUCTED EMISSION TEST	46
13.2	BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST	46
13.3	PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST	47
13.4	FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST	47
13.5	TEST RESULT OF LINE CONDUCTED EMISSION TEST	48
14	FCC RADIATED EMISSION TEST	50
14.1	LIMITS OF RADIATED EMISSION TEST	50
14.2	BLOCK DIAGRAM OF RADIATED EMISSION TEST	50
14.3	PRELIMINARY PROCEDURE OF RADIATED EMISSION TEST	51
14.4	FINAL PROCEDURE OF RADIATED EMISSION TEST	51
14.5	TEST RESULT OF RADIATED EMISSION TEST	52
APPENDIX I		54
PHOTOGRAPHS OF THE EUT		54
APPENDIX II		60
PHOTOGRAPHS OF THE TEST SETUP		60

1. GENERAL INFORMATION

1.1 PRODUCT DESCRIPTION

The EUT is a **Portable scanner** designed as an “Communication Device”. It is designed by way of utilizing the FHSS technology to achieve the system operation.

A major technical description of EUT is described as following

Operation Frequency	2.402 GHz to 2.480GHz
Rated Output Power	Bluetooth (1Mbps) 1.89dBm Bluetooth EDR (2Mbps) 1.74dBm Bluetooth EDR(3Mbps) 1.79 dBm
Modulation	GFSK, $\pi/4$ -DQPSK, 8-DPSK
Number of channels	79
Antenna Designation	Integrated Antenna
Antenna Gain	0.83dBi
Power Supply	DC4.2V by battery or USB Operated

1.2 TABLE OF CARRIER FREQUENCIES

Frequency Band	Channel Number	Frequency
2400~2483.5MHZ	0	2402MHZ
	1	2403MHZ
	:	:
	38	2440 MHZ
	39	2441 MHZ
	40	2442 MHZ
	:	:
	77	2479 MHZ
	78	2480 MHZ

1.3 RECEIVER INPUT BANDWIDTH

The input bandwidth of the receiver is 1MHZ, In every connection one Bluetooth device is the master and the other one is slave. The master determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally the type of connection(e.g. single of multislots packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings. Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

1.4 EXAMPLE OF A HOPPING SEQUENCY IN DATA MODE

Example of a 79 hopping sequence in data mode:

40,21,44,23,42,53,46,55,48,33,52,35,50,65,54,67
56,37,60,39,58,69,62,71,64,25,68,27,66,57,70,59
72,29,76,31,74,61,78,63,01,41,05,43,03,73,07,75
09,45,13,47,11,77,15,00,64,49,66,53,68,02,70,06
01,51,03,55,05,04

1.5 EQUALLY AVERAGE USE OF FREQUENCIES AND BEHAVIOUR

The generation of the hopping sequence in connection mode depends essentially on two input values:

1 LAP/UAP of the master of the connection

2 Internal master clock

The LAP(lower address part) are the 24 LSB's of the 48 BD_ADDRESS. The BD_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP(upper address part) are the 24MSB's of the 48BD_ADDRESS

The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For synchronisation with other units only offset are used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5us. The clock has a cycle of about one day(23h30). In most cases it is implemented as 28 bit counter. For the deriving of the hopping sequence the entire.

LAP(24 bits), 4LSB's(4bits)(Input 1) and the 27MSB's of the clock(Input 2) are used. With this input values different mathematical procedures(permutations, additions, XOR-operations)are performed to generate the

Sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions the Bluetooth system has the following behaviour:

The first connection between the two devices is established, a hopping sequence was generated. For transmitting the wanted data the complete hopping sequence was not used. The connection ended.

The second connection will be established. A new hopping sequence is generated. Due to the fact the Bluetooth clock has a different value, because the period between the two transmission is longer(and it cannot be shorter)than the minimum resolution of the clock(312.5us). The hopping sequence will always differ from the first one.

1.6 RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID: ZEATSN51B** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

1.7 TEST METHODOLOGY

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2003). Radiated testing was performed at an antenna to EUT distance 3 meters.

1.8 TEST FACILITY

All measurement facilities used to collect the measurement data are located at
Attestation of Global Compliance Co., Ltd.

1F., No.2 Building, Huafeng No.1 Technical Industrial Park, Sanwei, Xixiang, Baoan District, Shenzhen

The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003.

FCC register No.: 259865

1.9 SPECIAL ACCESSORIES

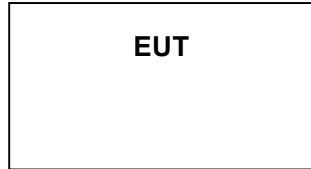
Not available for this EUT intended for grant.

1.10 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

2. SYSTEM TEST CONFIGURATION

2.1 CONFIGURATION OF TESTED SYSTEM



2.2 EQUIPMENT USED IN TESTED SYSTEM

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID
1	Portable scanner	N/A	TSN51B	ZEATSN51B

3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.207	Conduction Emission	Compliant
§15.209	Radiated Emission	Compliant
§15.247	Maximum Output Power	Compliant
§15.247	20 dB Bandwidth	Compliant
§15.247	Band Edges	Compliant
§15.247	Spurious Emission	Compliant
§15.247	Frequency Separation	Compliant
§15.247	Number of Hopping Frequency	Compliant
§15.247	Time of Occupancy	Compliant

4. DESCRIPTION OF TEST MODES

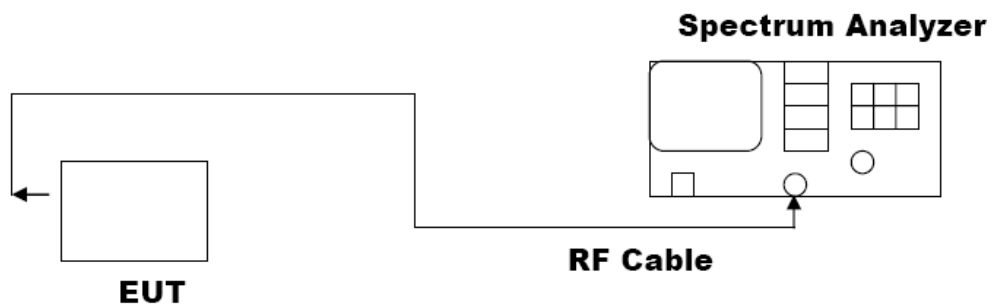
1. The EUT has been set to operate continuously on the lowest, middle and highest operation frequency individually.
2. The EUT stays in continuous transmitting mode on the operation frequency being set.

5 MAXIMUM OUTPUT POWER

5.1 MEASUREMENT PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
4. Set SPA Centre Frequency = Operation Frequency, RBW= 3 MHz, VBW= 3 MHz.
5. Set SPA Trace 1 Max hold, then View.

5.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



5.3 MEASUREMENT EQUIPMENT USED

Description	Manufacturer	Model	SERIAL NUMBER	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E4440A	N/A	06/29/2010	06/28/2011
Amplifier	EM	EM30180	0607030	06/29/2010	06/28/2011
Horn Antenna	EM	EM-AH-10180	N/A	06/29/2010	06/28/2011
EMI Test Receiver	Rohde & Schwarz	ESCI	N/A	06/29/2010	06/28/2011
Amplifier	EM	EM30180	N/A	06/29/2010	06/28/2011
Biological Antenna	A.H. Systems Inc.	SAS-521-4	N/A	06/29/2010	06/28/2011
Loop Antenna	Daze	ZN30900N	SEL0097	06/29/2010	06/28/2011
Isolation Transformer	LETEAC	LTBK	--	06/29/2010	06/28/2011

5.4 LIMITS AND MEASUREMENT RESULT

1MBPS LIMITS AND MEASUREMENT RESULT			
Frequency (GHz)	Result (dBm)	Applicable Limits (dBm)	Pass or Fail
2.402	1.89	30	Pass
2.441	1.57	30	Pass
2.480	1.68	30	Pass

2MBPS LIMITS AND MEASUREMENT RESULT			
Frequency (GHz)	Result (dBm)	Applicable Limits (dBm)	Pass or Fail
2.402	1.74	30	Pass
2.441	1.69	30	Pass
2.480	1.58	30	Pass

3MBPS LIMITS AND MEASUREMENT RESULT			
Frequency (GHz)	Result (dBm)	Applicable Limits (dBm)	Pass or Fail
2.402	1.55	30	Pass
2.441	1.49	30	Pass
2.480	1.79	30	Pass

6 20 DB BANDWIDTH

6.1 MEASUREMENT PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 KHz, VBW= 100 KHz.
4. Set SPA Trace 1 Max hold, then View.

6.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The Same as described in Section 5.2

6.3 MEASUREMENT EQUIPMENT USED

The same as described in Section 5.3

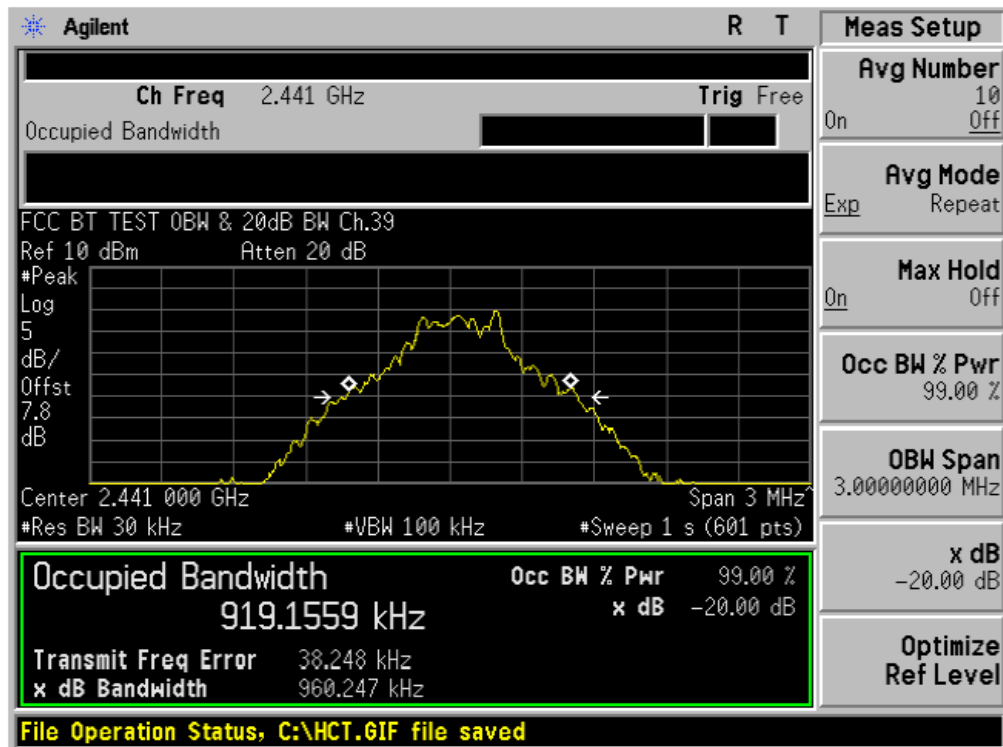
6.4 LIMITS AND MEASUREMENT RESULTS

BLUETOOTH 1MBPS LIMITS AND MEASUREMENT RESULT			
Applicable Limits	Measurement Result		
	Test Data (MHz)		Criteria
--	Low Channel	0.957	PASS
	Middle Channel	0.960	PASS
	High Channel	0.969	PASS

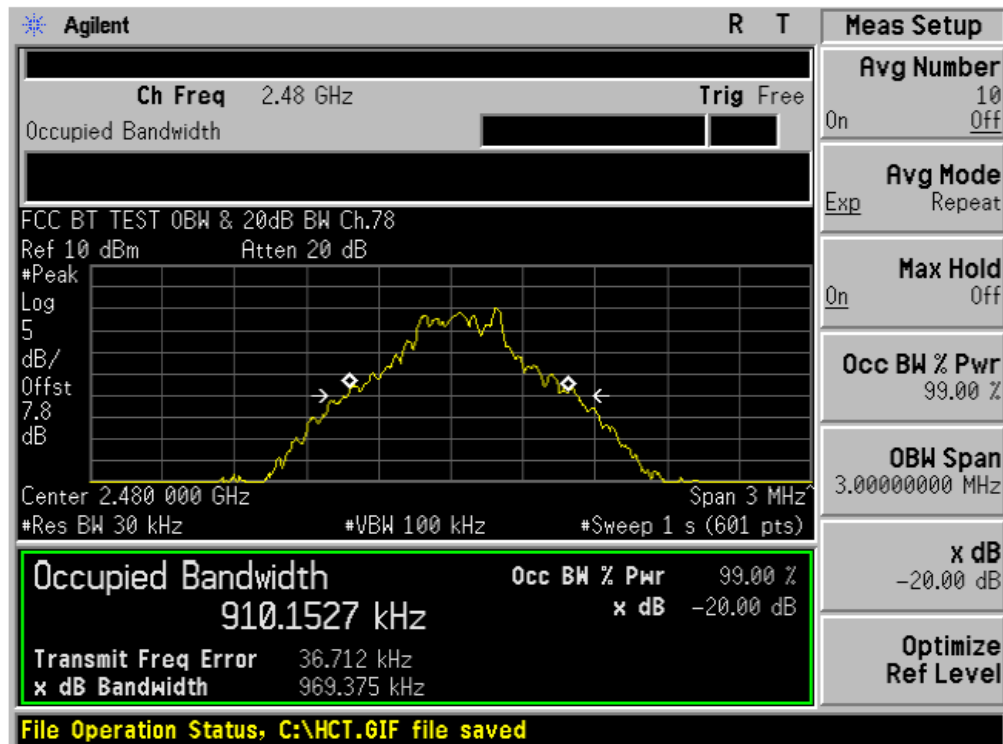
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL

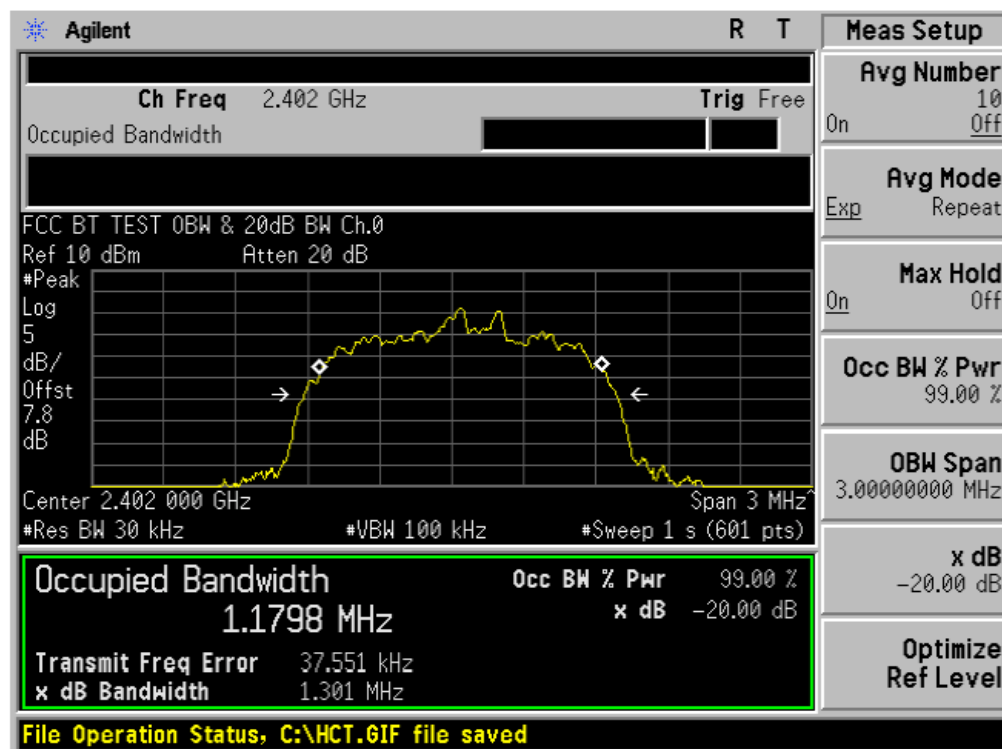


TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL

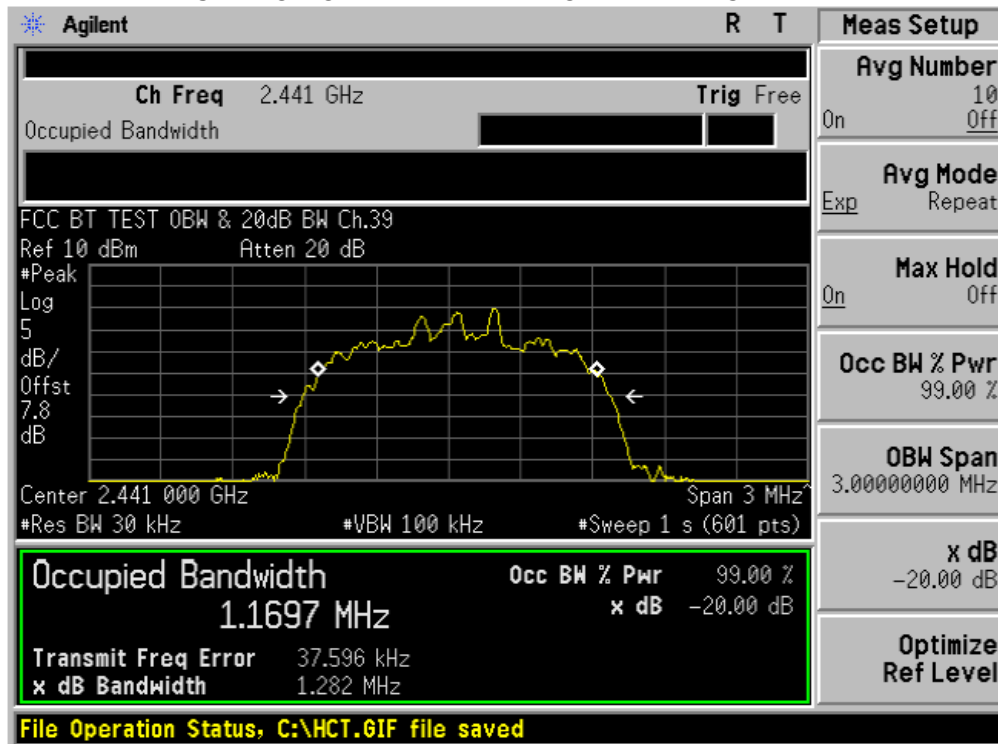


BLUETOOTH 2MBPS LIMITS AND MEASUREMENT RESULT			
Applicable Limits	Measurement Result		
	Test Data (MHz)		Criteria
--	Low Channel	1.301	PASS
	Middle Channel	1.282	PASS
	High Channel	1.300	PASS

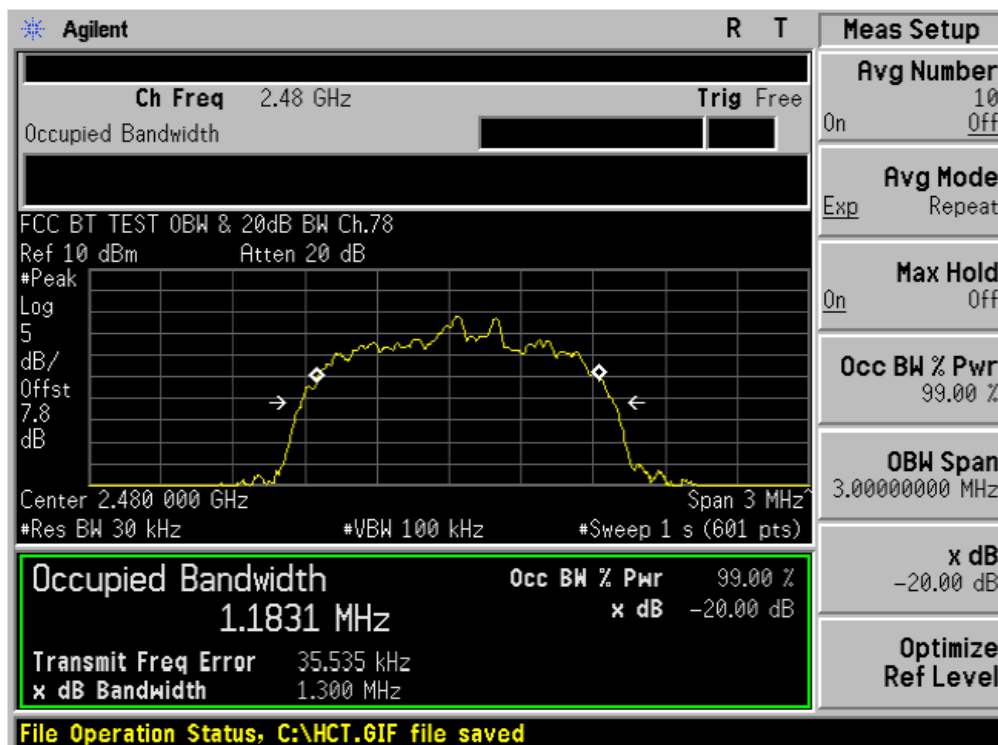
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL

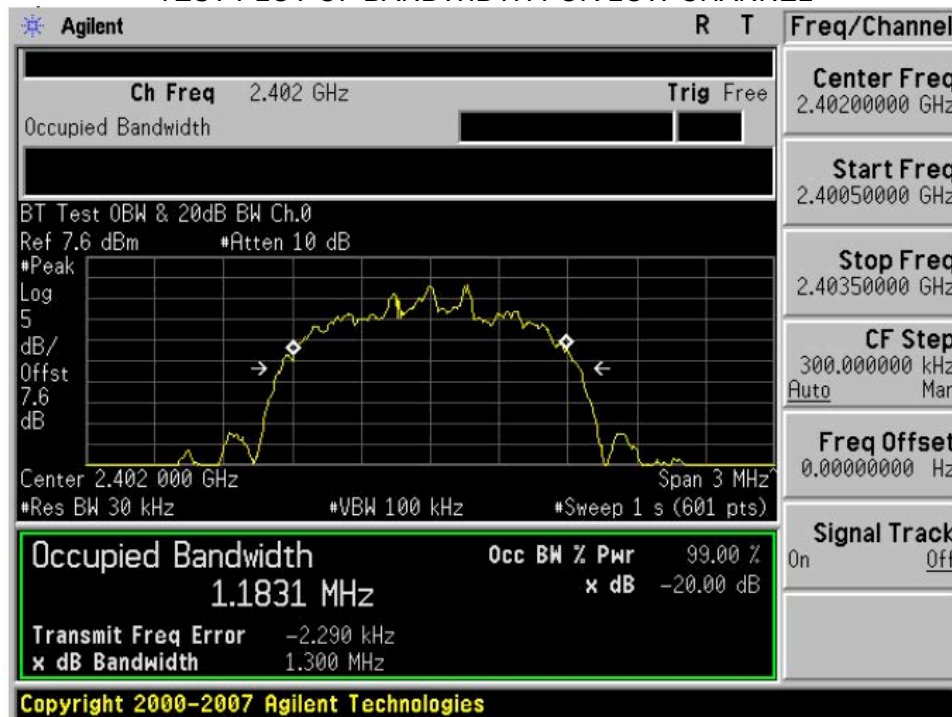


TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



BLUETOOTH 3MBPS LIMITS AND MEASUREMENT RESULT			
Applicable Limits	Measurement Result		
	Test Data (MHz)		Criteria
--	Low Channel	1.3	PASS
	Middle Channel	1.299	PASS
	High Channel	1.298	PASS

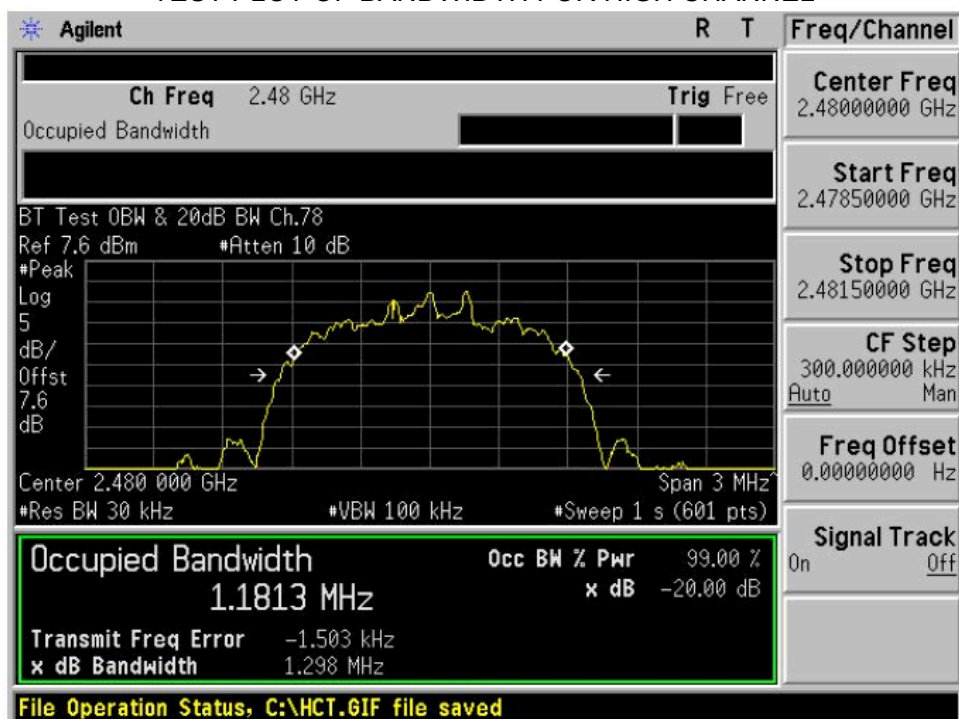
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL

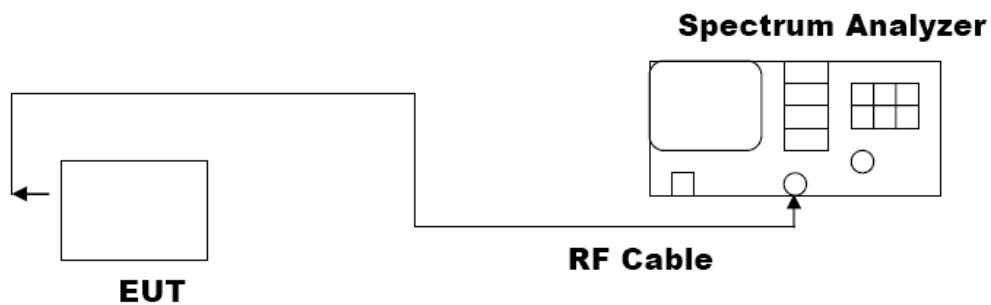


7. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY (N/A)

7.1 MEASUREMENT PROCEDURE

- (1). The EUT was placed on a turn table which is 0.8m above ground plane.
- (2). Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- (3). Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- (4). Set SPA Centre Frequency = Operation Frequency, RBW= 3 KHz,
VBW= 10 KHz., Sweep time= Auto
- (5). Set SPA Trace 1 Max hold, then View.

7.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



7.3 MEASUREMENT EQUIPMENT USED

SHIELDING ROOM					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4440A	N/A	06/29/2010	06/28/2011

7.4 LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT			
Applicable Limits	Measurement Result		
	Test Data (dBm/3KHz)		Criteria
8 dBm / 3KHz	Low Channel	--	--
	Middle Channel	--	--
	High Channel	--	--

8. OUT OF BAND EMISSION

8.1 MEASUREMENT PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 KHz, VBW= 100 KHz.
4. Set SPA Trace 1 Max hold, then View.

8.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The Same as described in section 5.2

1. Conducted test setup
2. Radiated Emission test Setup below 1GHz and Above 1GHz

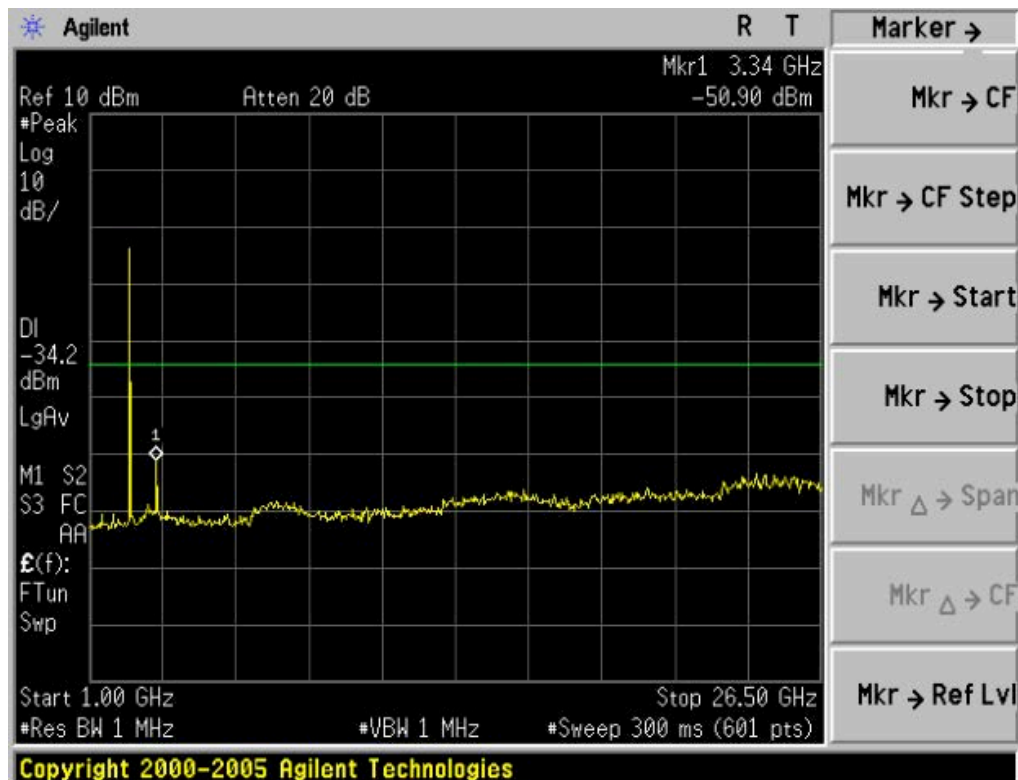
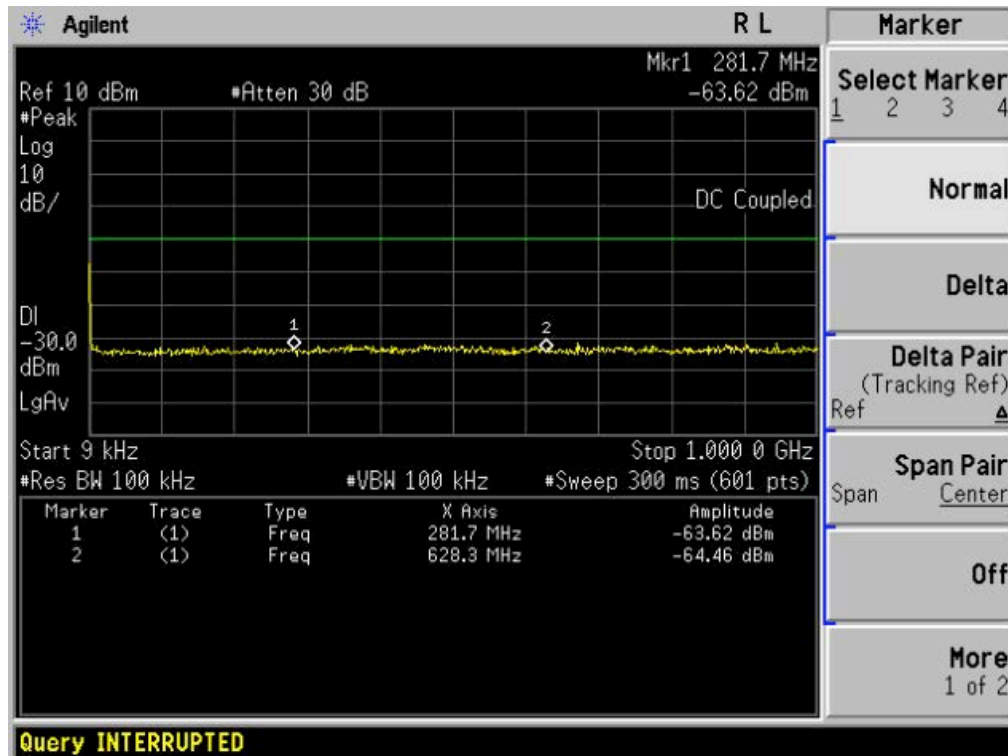
8.3 MEASUREMENT EQUIPMENT USED

The Same as described in section 5.3

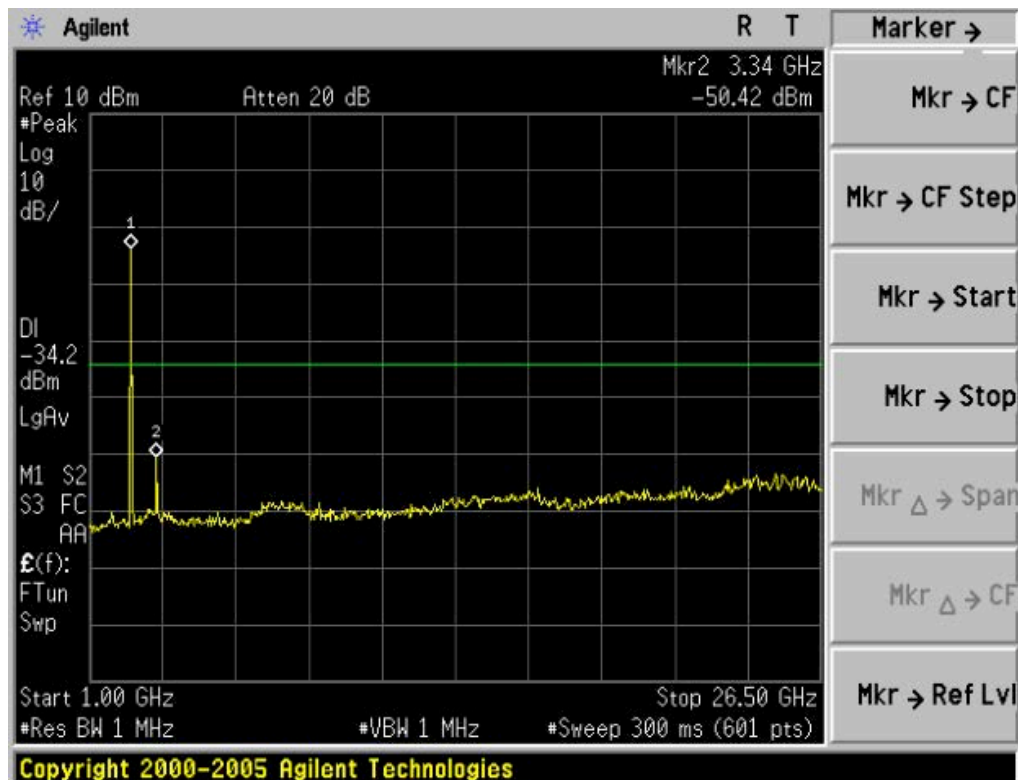
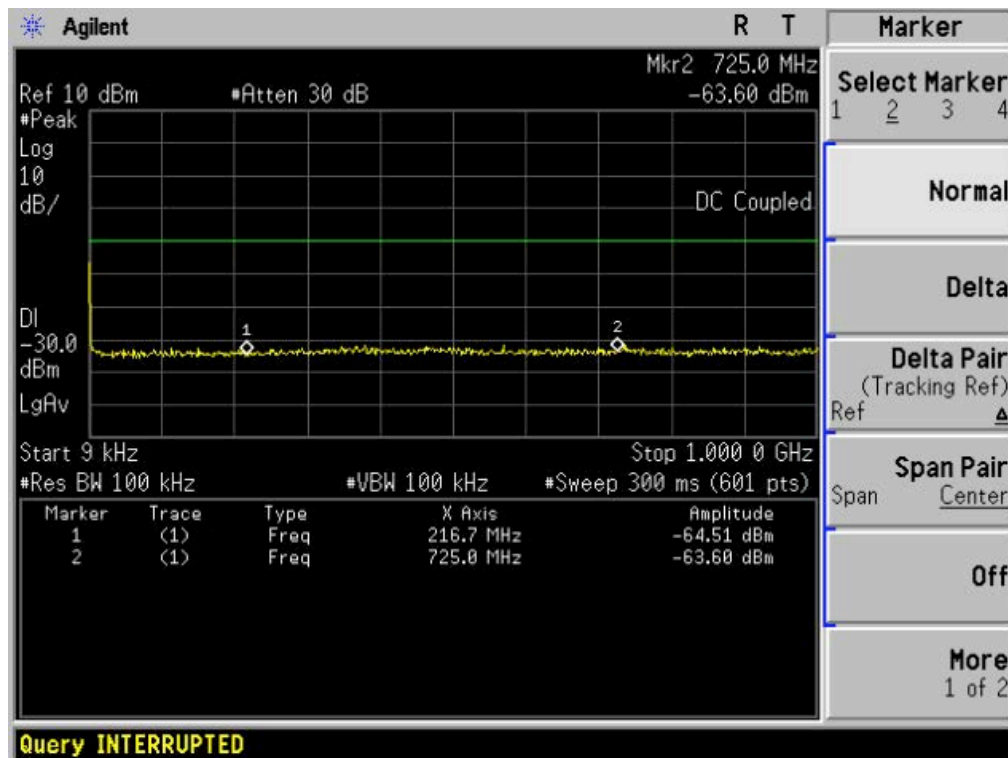
8.4 LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT		
Applicable Limits	Measurement Result	
	Test Data	Criteria
In any 100 KHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power.	At least -20dBc than the limit Specified on the BOTTOM Channel	PASS
In addition, radiation emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in§15.209(a))	At least -20dBc than the limit Specified on the TOP Channel	PASS

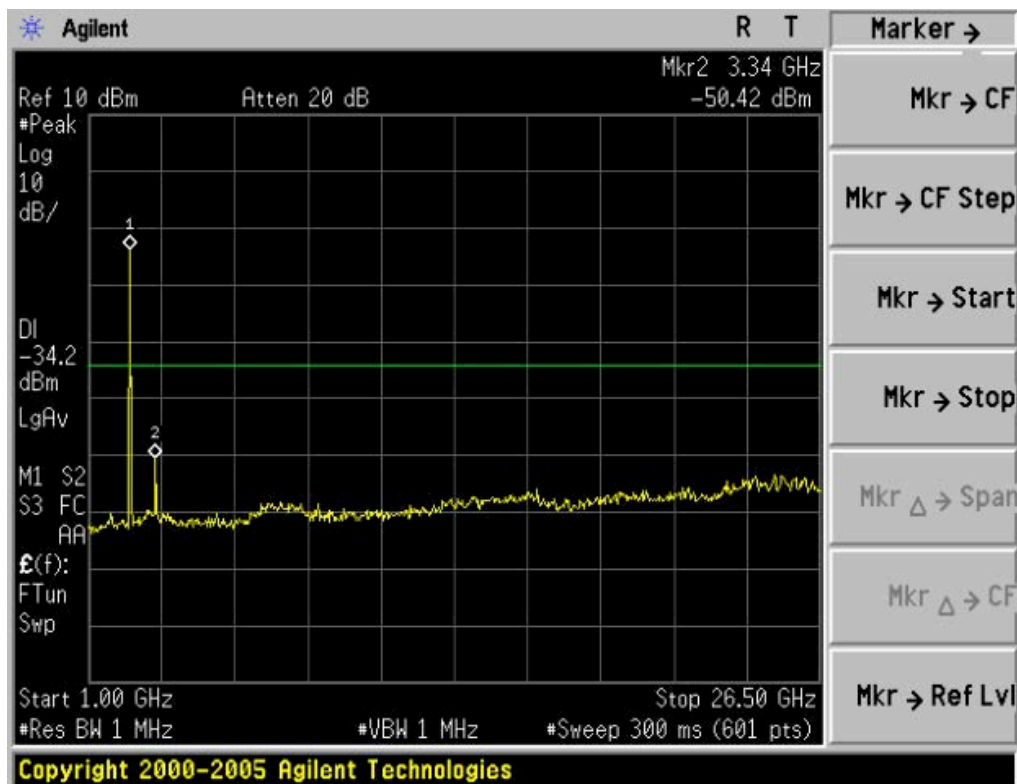
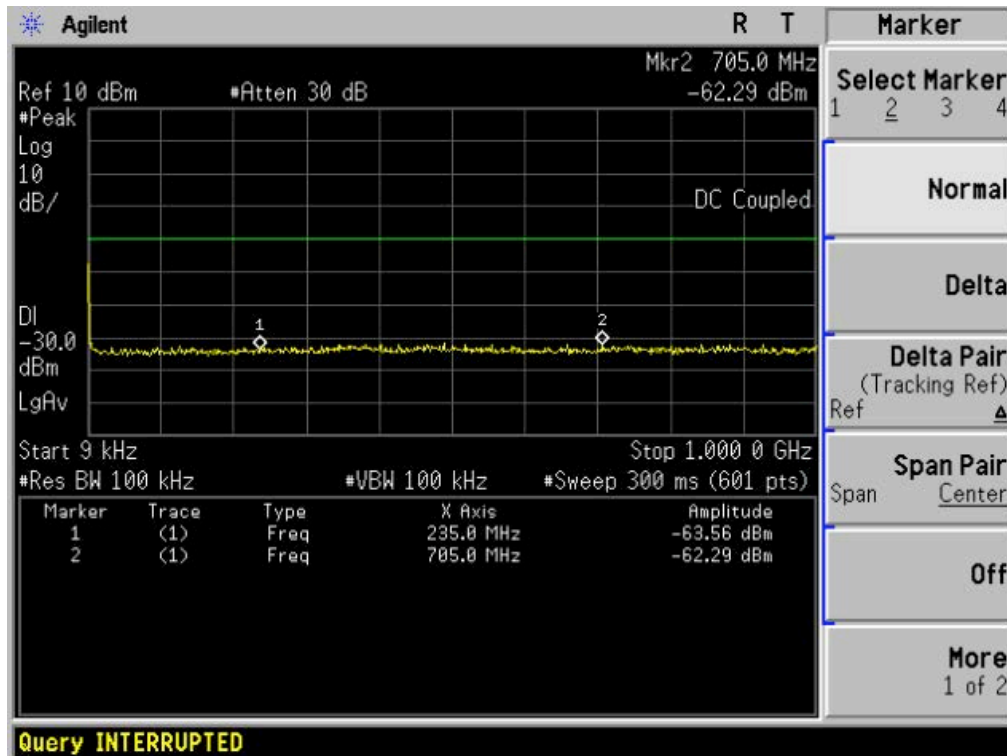
TEST PLOT OF OUT OF BAND EMISSIONS FOR LOW CHANNEL(1Mbps)



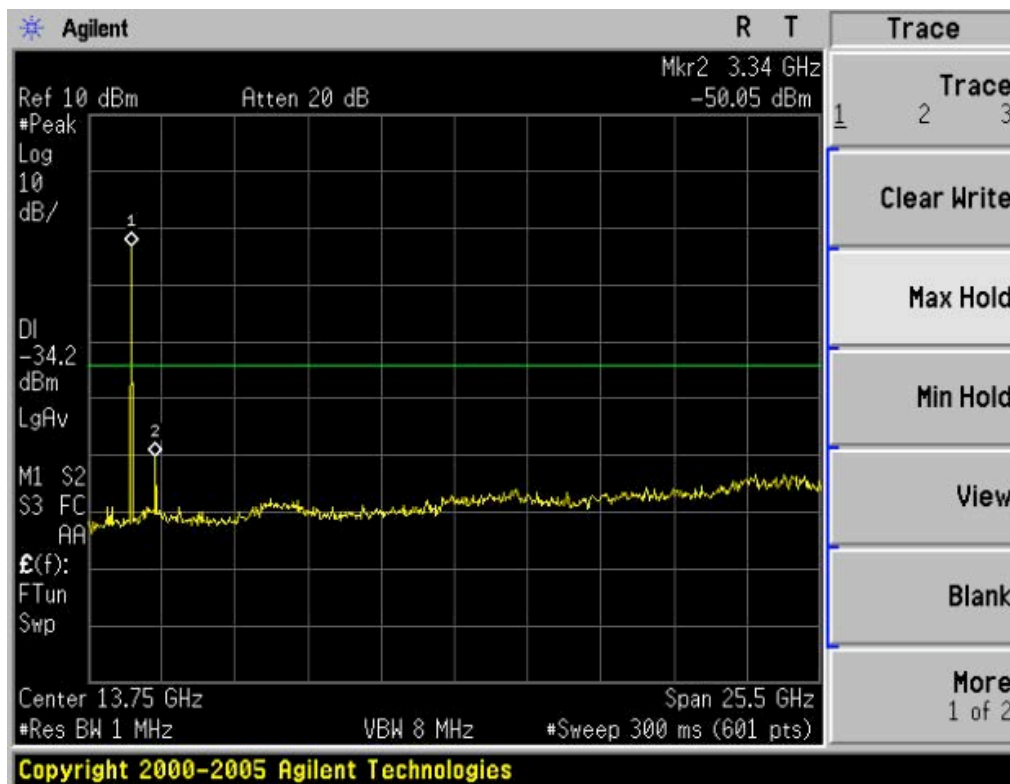
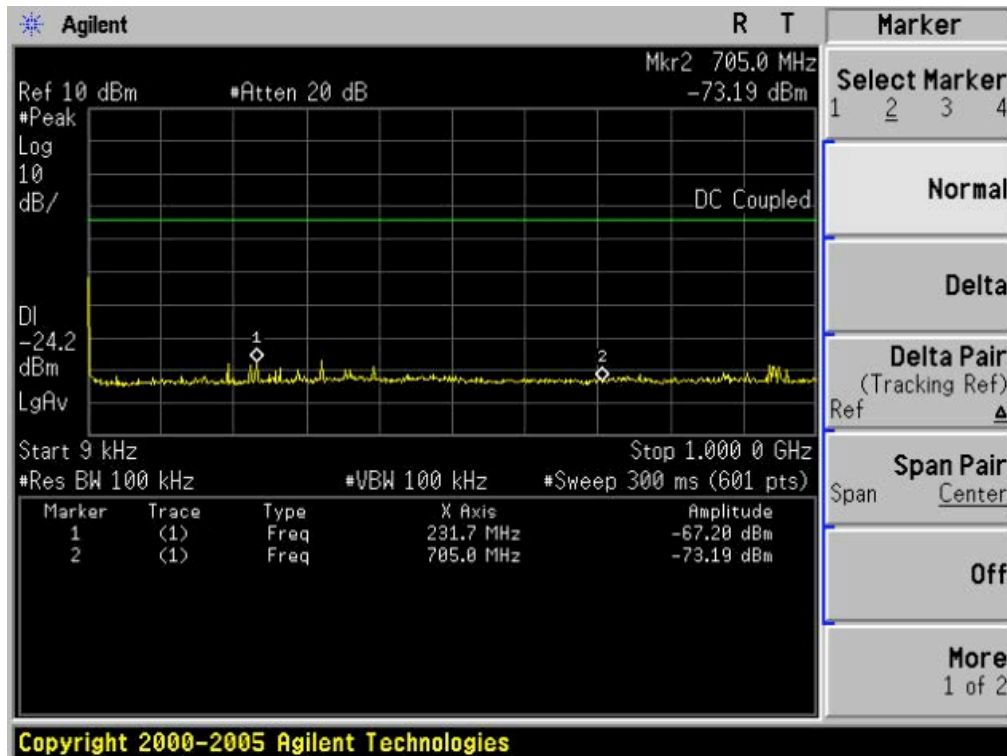
TEST PLOT OF OUT OF BAND EMISSIONS FOR MIDDLE CHANNEL (1Mbps)



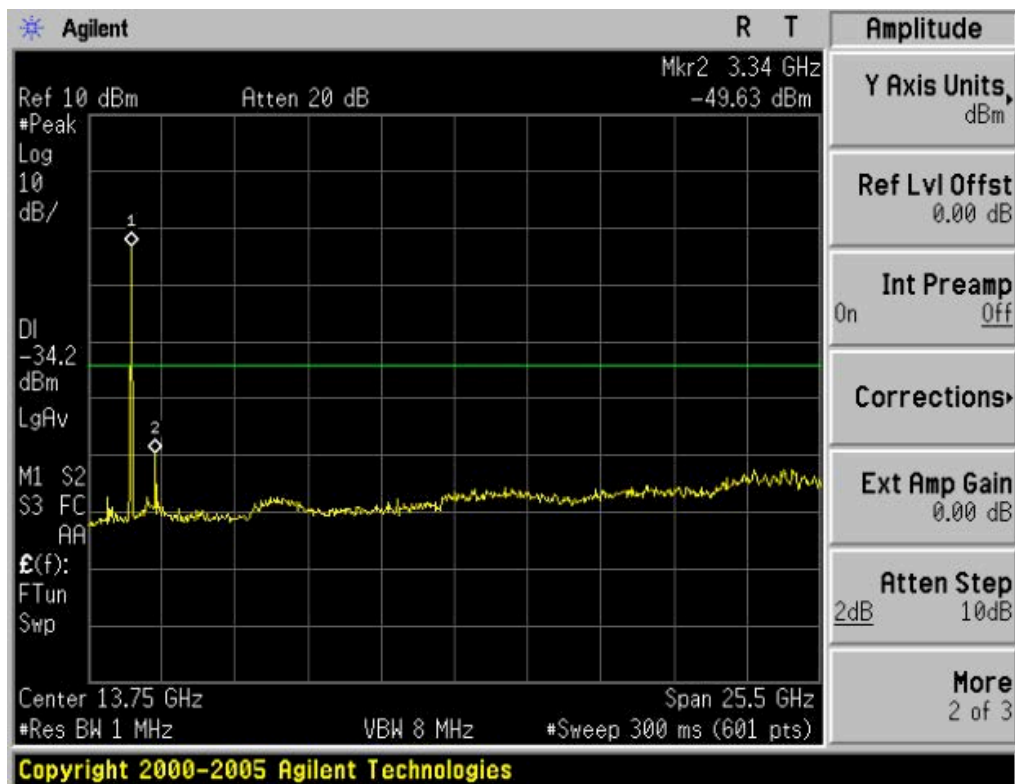
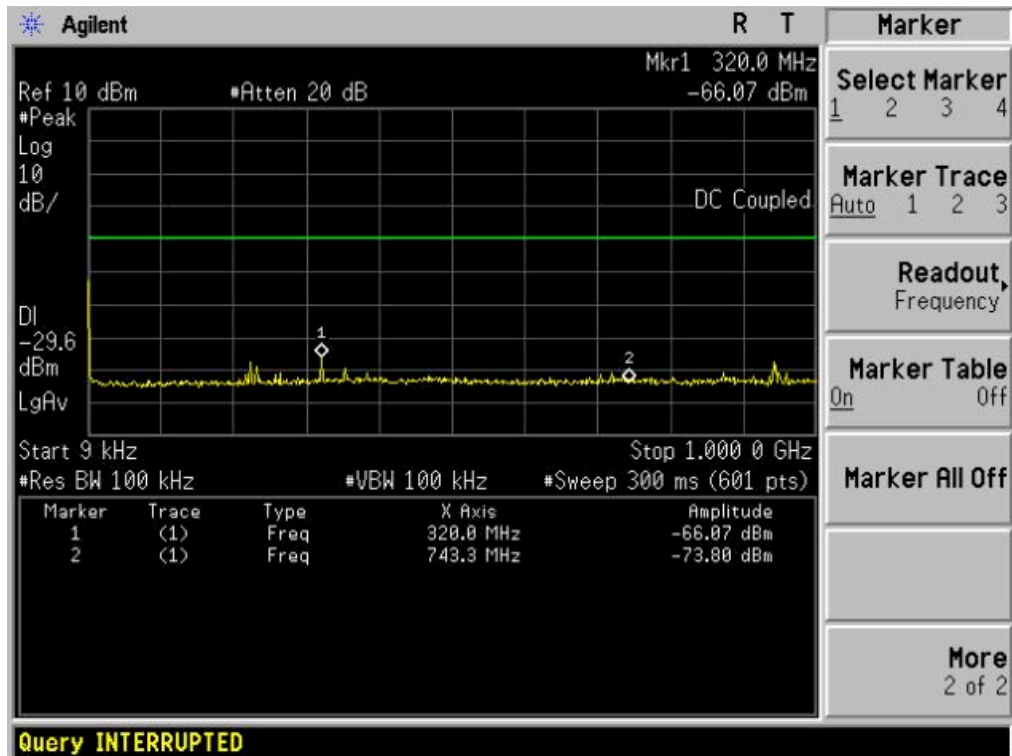
TEST PLOT OF OUT OF BAND EMISSIONS FOR HIGH CHANNEL(1Mbps)



TEST PLOT OF OUT OF BAND EMISSIONS FOR HIGH CHANNEL(2Mbps)



TEST PLOT OF OUT OF BAND EMISSIONS FOR HIGH CHANNEL(3Mbps)



RADIATED EMISSION BELOW 30MHZ

No emission found between lowest internal used/generated frequency to 30MHz.

RADIATED EMISSION BELOW 1GHZ

EUT	Portable scanner	Model Name	TSN51B
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	DC4.2V
Test Mode	BT2402MHZ	Modulation	GFSK

Freq. (MHZ)	Ant.Pol. H/V	Detector (PK/QP)	Reading (dBuV)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
42.77	H	Peak	15.02	15.33	30.35	40	-9.65
124.78	H	Peak	16.03	14.11	30.14	43.5	-13.36
175.02	H	Peak	10.97	15.66	26.63	43.5	-16.87
421.74	H	Peak	12.85	18.74	31.95	46	-14.05
640.89	H	Peak	9.36	26.02	35.38	46	-10.62
917.25	H	Peak	8.48	25.14	33.62	46	-12.38
56.25	V	Peak	15.45	10.25	25.70	40	-14.30
78.03	V	Peak	18.25	10.74	28.99	40	-11.01
132.78	V	Peak	19.62	13.88	33.50	43.5	-10.00
174.00	V	Peak	13.47	18.76	32.23	43.5	-11.27
725.12	V	Peak	6.87	25.33	32.20	46	-13.80
940.28	V	Peak	5.02	27.02	32.04	46	-13.96

EUT	Portable scanner	Model Name	TSN51B
	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	DC4.2V
Test Mode	BT2441MHZ	Modulation	GFSK

Freq. (MHZ)	Ant.Pol. H/V	Detector (PK/QP)	Reading (dBuV)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
--	H	Peak	--	--	--	--	--
--	H	Peak	--	--	--	--	--
--	V	Peak	--	--	--	--	--
--	V	Peak	--	--	--	--	--

EUT	Portable scanner	Model Name	TSN51B
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	DC4.2V
Test Mode	BT2480MHZ	Modulation	GFSK

Freq. (MHZ)	Ant.Pol. H/V	Detector (PK/QP)	Reading (dBuV)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
--	H	Peak	--	--	--	--	--
--	H	Peak	--	--	--	--	--
--	V	Peak	--	--	--	--	--
--	V	Peak	--	--	--	--	--

EUT	Portable scanner	Model Name	TSN51B
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	DC4.2V
Test Mode	BT2402/2441/2480MHZ	Modulation	π /4-DQPSK 8-DPSK

Freq. (MHZ)	Ant.Pol. H/V	Detector (PK/QP)	Reading (dBuV)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
--	H	Peak	--	--	--	--	--
--	H	Peak	--	--	--	--	--
--	V	Peak	--	--	--	--	--
--	V	Peak	--	--	--	--	--

Note: "--" means the mode at least have 20dB margin.

RADIATED EMISSION ABOVE 1GHZ

EUT	Portable scanner	Model Name	TSN51B
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	DC4.2V
Test Mode	BT2402/2441/2480MHZ	Modulation	GFSK

Freq. (MHZ)	Ant.Pol. H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Factor (dB)	Result		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin
					Peak (dBuV/m)	AV (dBuV/m)			
--	H	--	--	--	--	--	--	--	--
--	H	--	--	--	--	--	--	--	--
--	V	--	--	--	--	--	--	--	--
--	V	--	--	--	--	--	--	--	--

EUT	Portable scanner	Model Name	TSN51B
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	DC4.2V
Test Mode	BT2402/2441/2480MHZ	Modulation	π /4-DQPSK 8-DPSK

Freq. (MHZ)	Ant.Pol. H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Factor (dB)	Result		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin
					Peak (dBuV/m)	AV (dBuV/m)			
--	H	--	--	--	--	--	--	--	--
--	H	--	--	--	--	--	--	--	--
--	V	--	--	--	--	--	--	--	--
--	V	--	--	--	--	--	--	--	--

Note: This Handheld EUT was tested in 3 orthogonal positions and the worst-case data was presented.
Note: "--" means the mode at least have 20dB margin.

9 BAND EDGE EMISSION

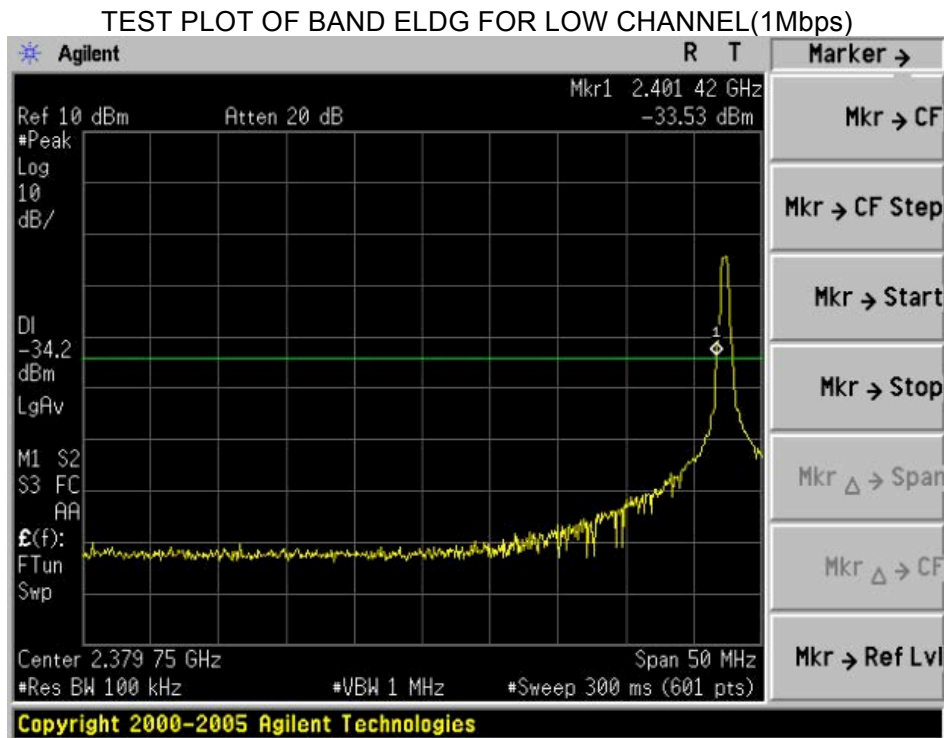
9.1 MEASUREMENT PROCEDURE

1. Set the EUT Work on the top, the bottom operation frequency individually.
2. Set SPA Start or Stop Frequency = Operation Frequency, RBW= 100kHz,
3. The band edges was measured and recorded.

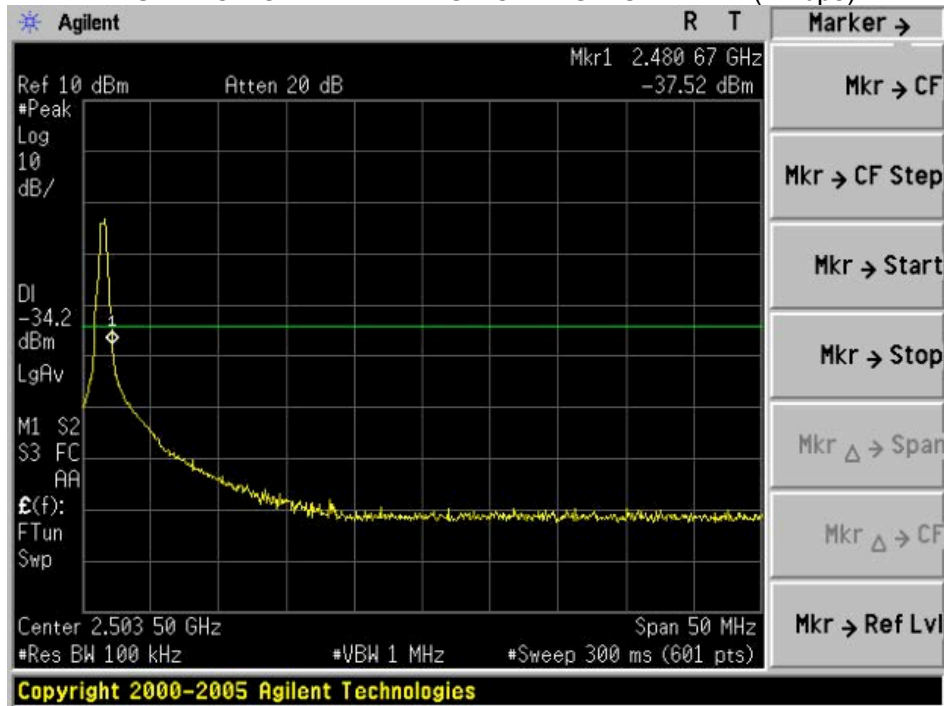
9.2 TEST SET-UP

The Same as described in section 5.2

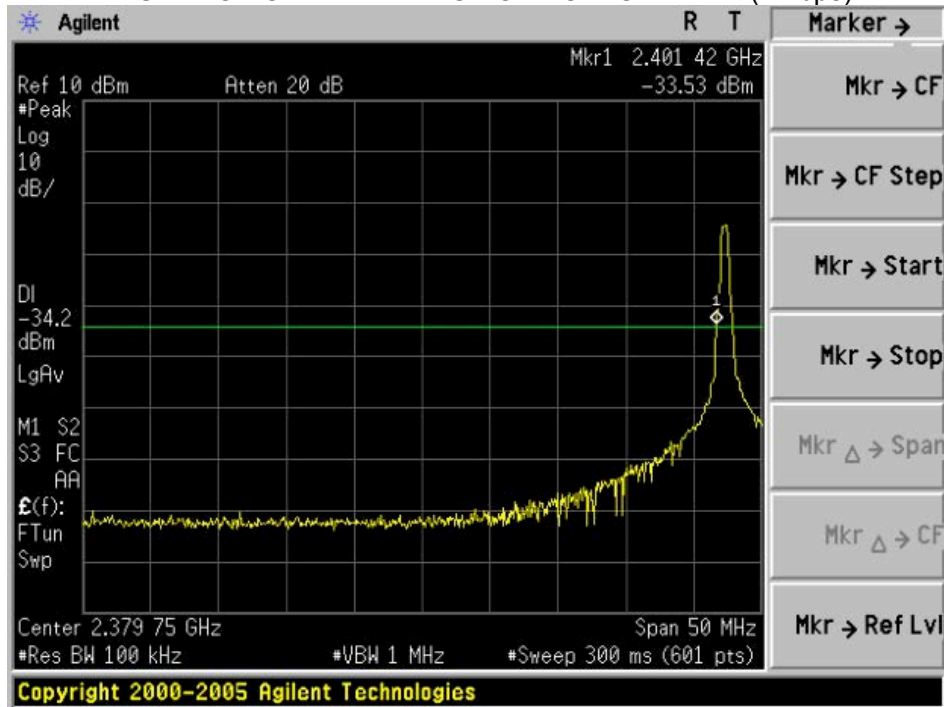
9.3 TEST RESULT



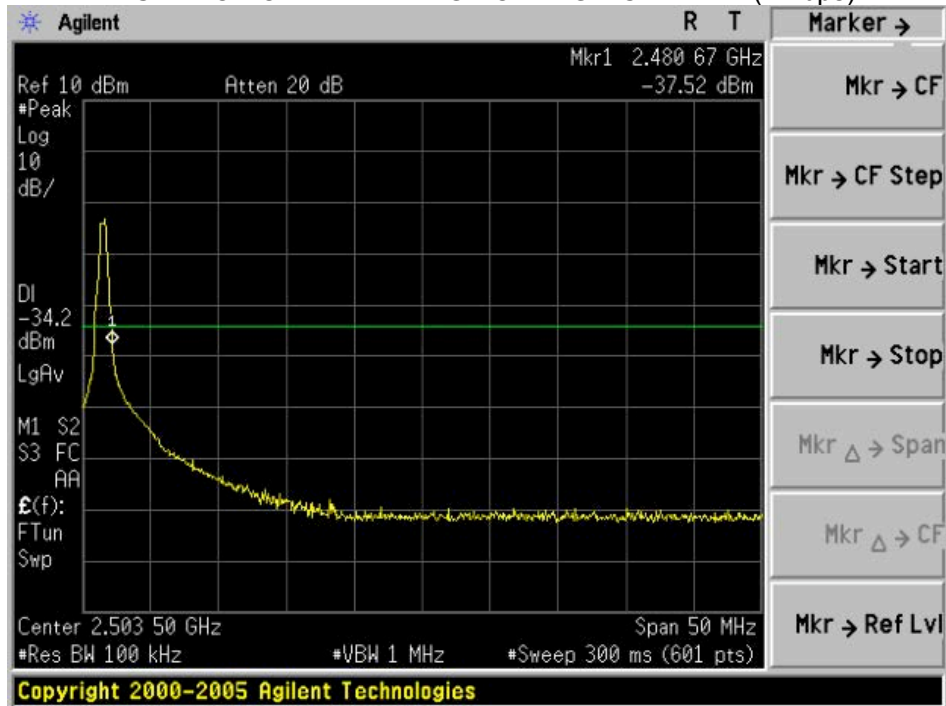
TEST PLOT OF BAND ELDG FOR HIGH CHANNEL(1Mbps)



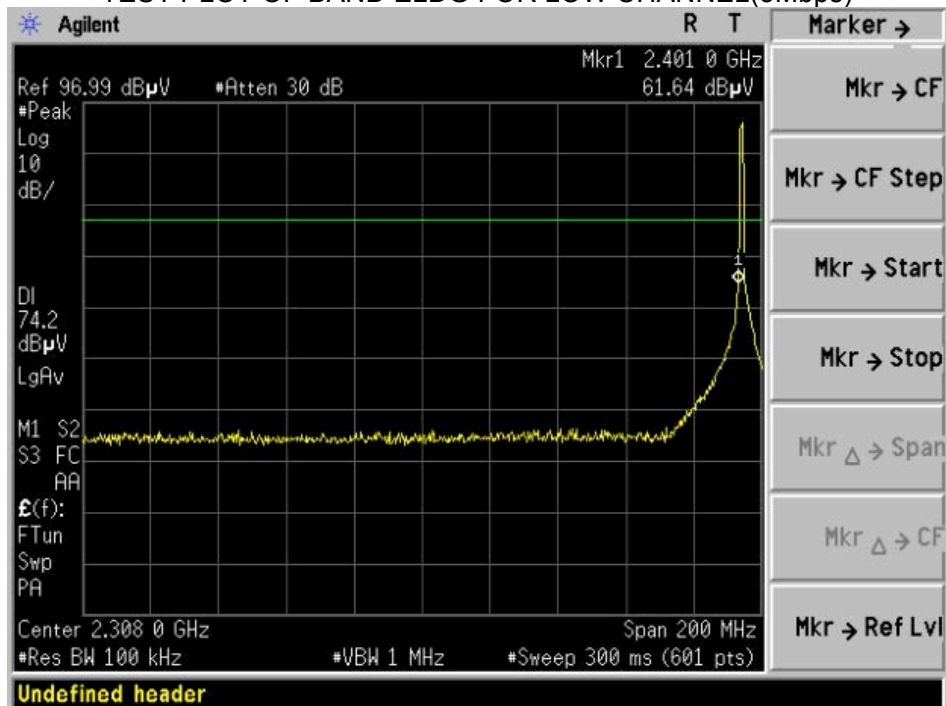
TEST PLOT OF BAND ELDG FOR LOW CHANNEL(2Mbps)



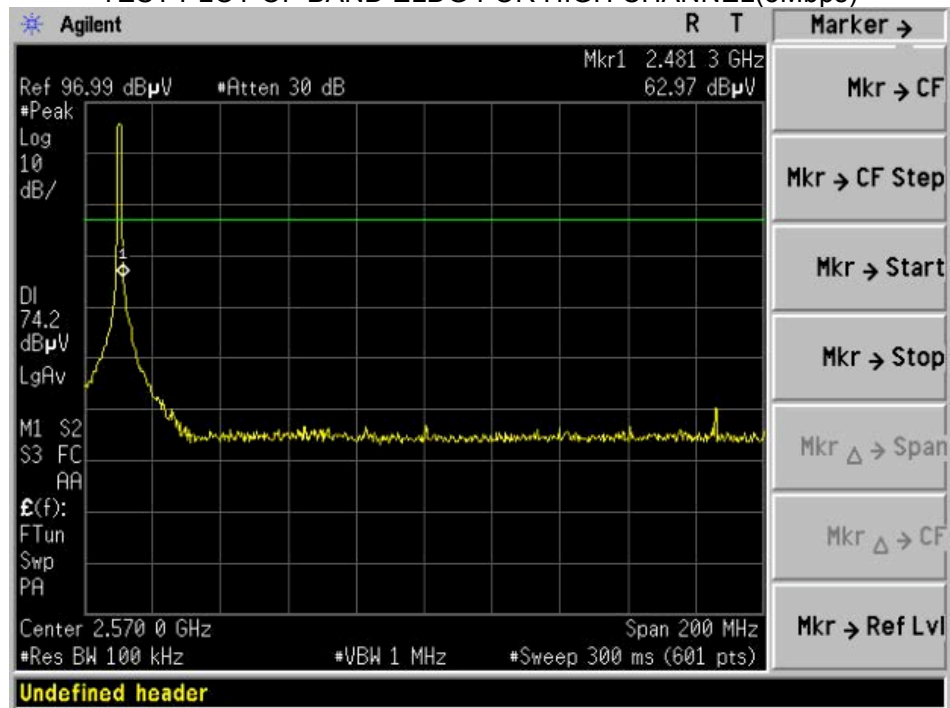
TEST PLOT OF BAND ELDG FOR HIGH CHANNEL(2Mbps)



TEST PLOT OF BAND ELDG FOR LOW CHANNEL(3Mbps)



TEST PLOT OF BAND ELDG FOR HIGH CHANNEL(3Mbps)



EUT	Portable scanner	Model Name	TSN51B
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	DC4.2V
Test Mode	BT2402MHZ	Modulation	GFSK

Freq. (MHZ)	Ant.Pol. H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Factor (dB)	Result		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin
					Peak (dBuV/m)	AV (dBuV/m)			
--	H	--	--	--	--	--	--	--	--
--	H	--	--	--	--	--	--	--	--
--	V	--	--	--	--	--	--	--	--
--	V	--	--	--	--	--	--	--	--

EUT	Portable scanner	Model Name	TSN51B
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	DC4.2V
Test Mode	BT2480MHZ	Modulation	GFSK

Freq. (MHZ)	Ant.Pol. H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Factor (dB)	Result		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin
					Peak (dBuV/m)	AV (dBuV/m)			
--	H	--	--	--	--	--	--	--	--
--	H	--	--	--	--	--	--	--	--
--	V	--	--	--	--	--	--	--	--
--	V	--	--	--	--	--	--	--	--

Note: "--" means other frequencies at least have 20dB margin.

The other modulation modes comply with standard requirement and at least have 20dB margin.

10 NUMBER OF HOPPING FREQUENCY

10.1 MEASUREMENT PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer Start = 2.4GHz Stop = 2.4835GHz
4. Set the Spectrum Analyzer as RBW = 100KHZ

10.2 TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 5.2

1. Conducted Method.

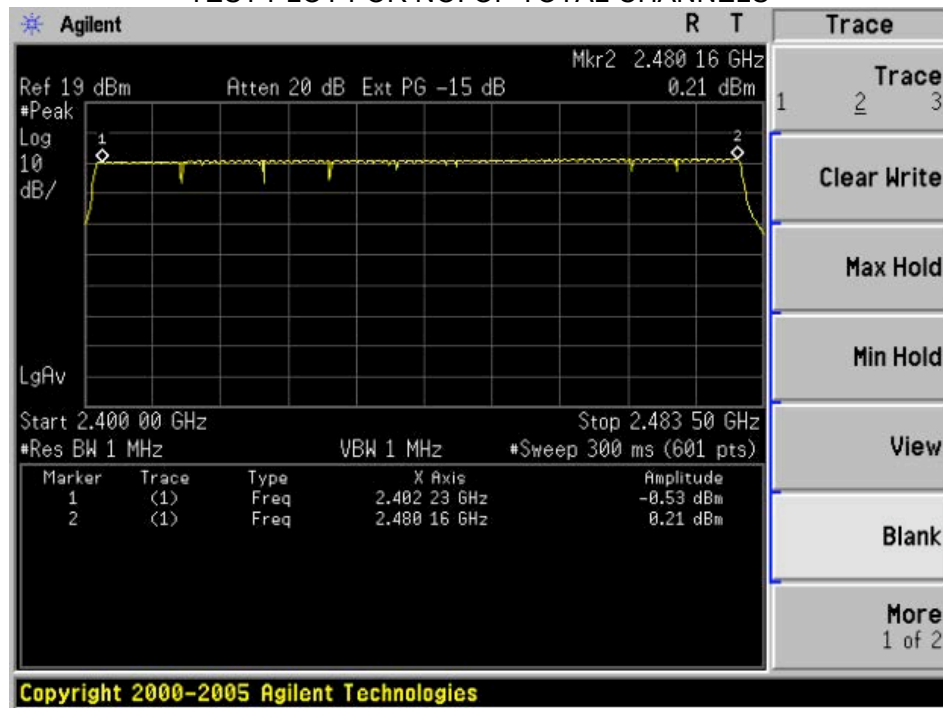
10.3 MEASUREMENT EQUIPMENT USED

The Same as described in section 5.3

10.4 LIMITS AND MEASUREMENT RESULT

TOTAL NO. OF HOPPING CHANNEL	LIMIT (NO. OF CH)	MEASUREMENT (NO. OF CH)	RESULT
	≥ 15	79	PASS

TEST PLOT FOR NO. OF TOTAL CHANNELS



11 TIME OF OCCUPANCY (DWELL TIME)

11.1 MEASUREMENT PROCEDURE

1. Place the EUT on the table and set it in transmitting mode
2. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer
3. Set center frequency of spectrum analyzer = Operating frequency
4. Set the spectrum analyzer as RBW, VBW=1MHz, Span = 0 Hz,

11.2 TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 5.2
Conducted Method

11.3 MEASUREMENT EQUIPMENT USED

The same as described in section 5.3

11.4 LIMITS AND MEASUREMENT RESULT

Bluetooth 1Mbps Test Result

Channel	Time of Pulse for DH5 (ms)	Period Time (s)	Sweep Time (ms)	Limit (ms)
Low	2.90	31.6	309.33	400
Middle	2.86	31.6	305.07	400
High	2.88	31.6	307.20	400

Low Channel Time

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

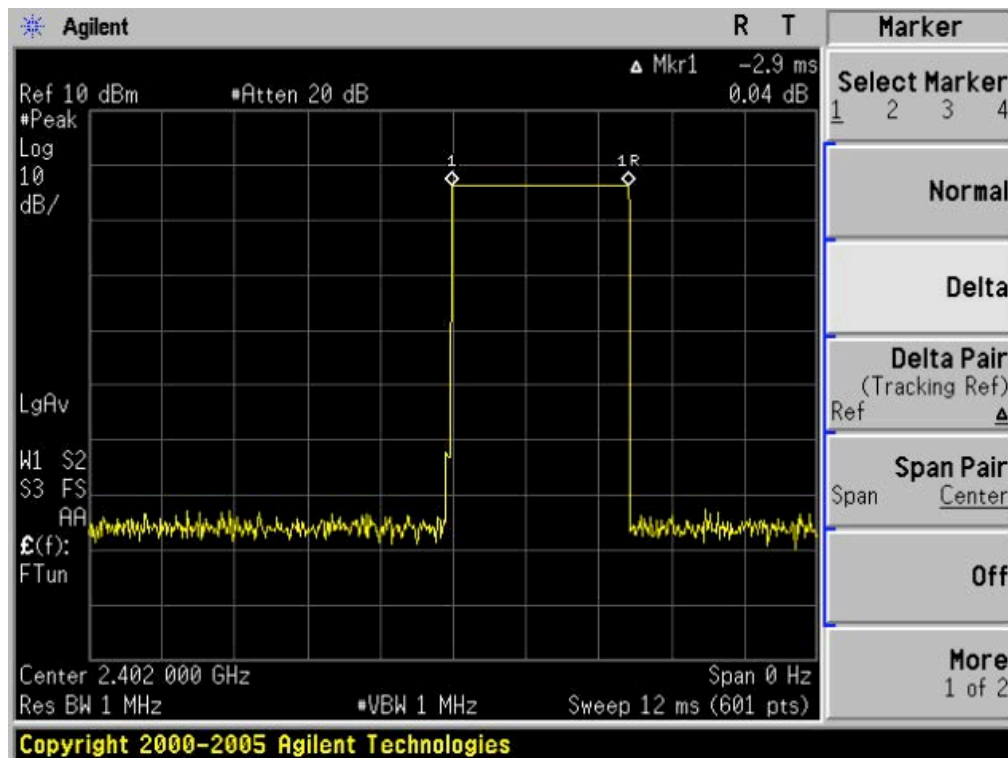
Middle Channel Time

$$2.86 \times (1600/6) / 79 \times 31.6 = 305.07 \text{ms}$$

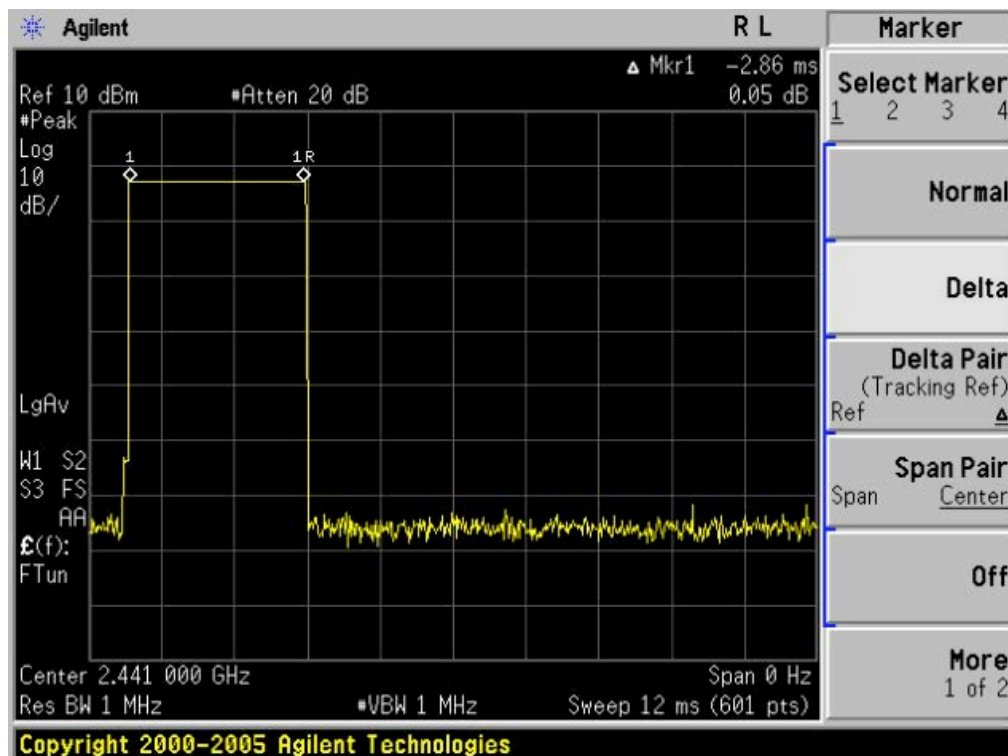
High Channel Time

$$2.88 \times (1600/6) / 79 \times 31.6 = 307.20 \text{ms}$$

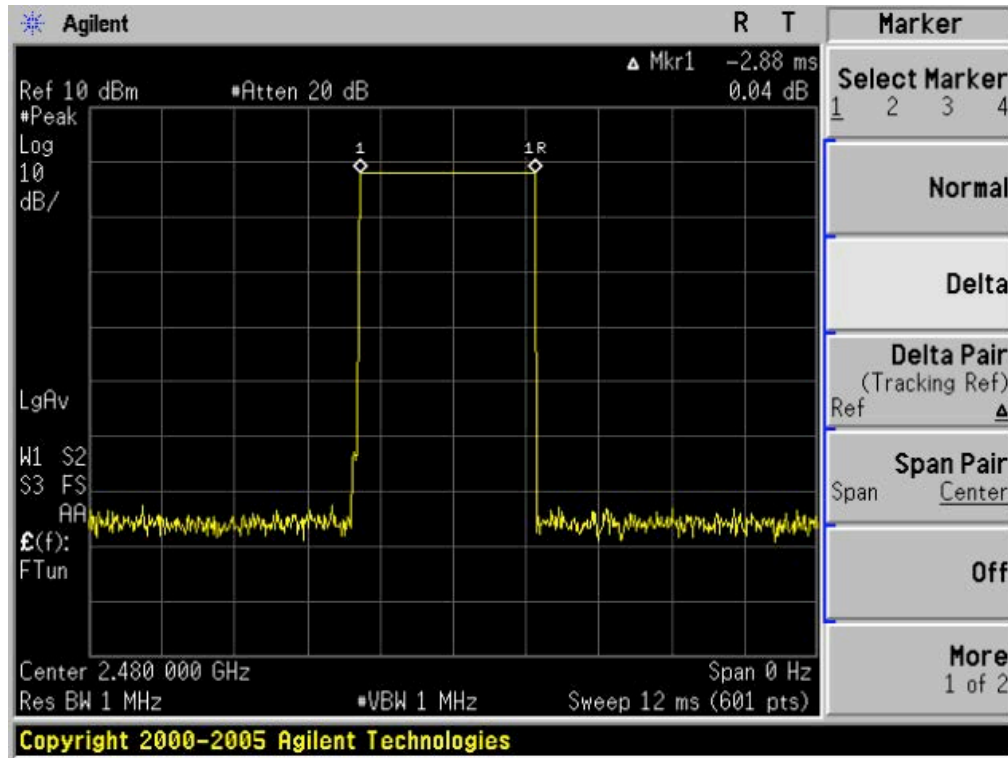
TEST PLOT OF LOW CHANNEL



TEST PLOT OF MIDDLE CHANNEL



TEST PLOT OF HIGH CHANNEL

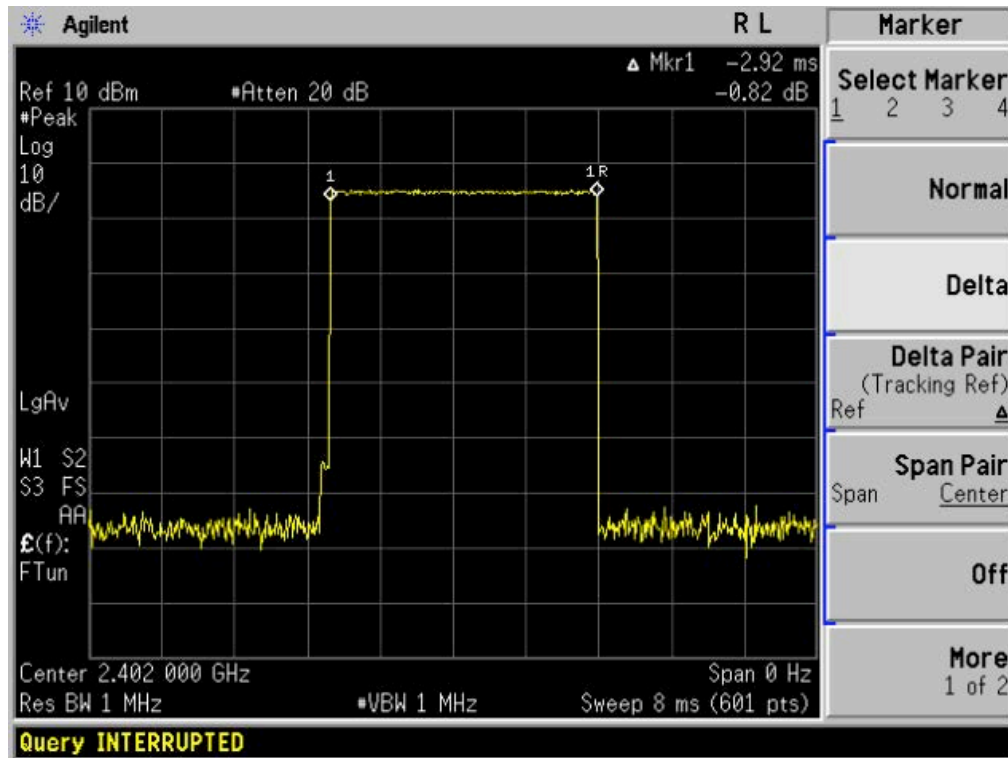


Bluetooth 2Mbps Test Result

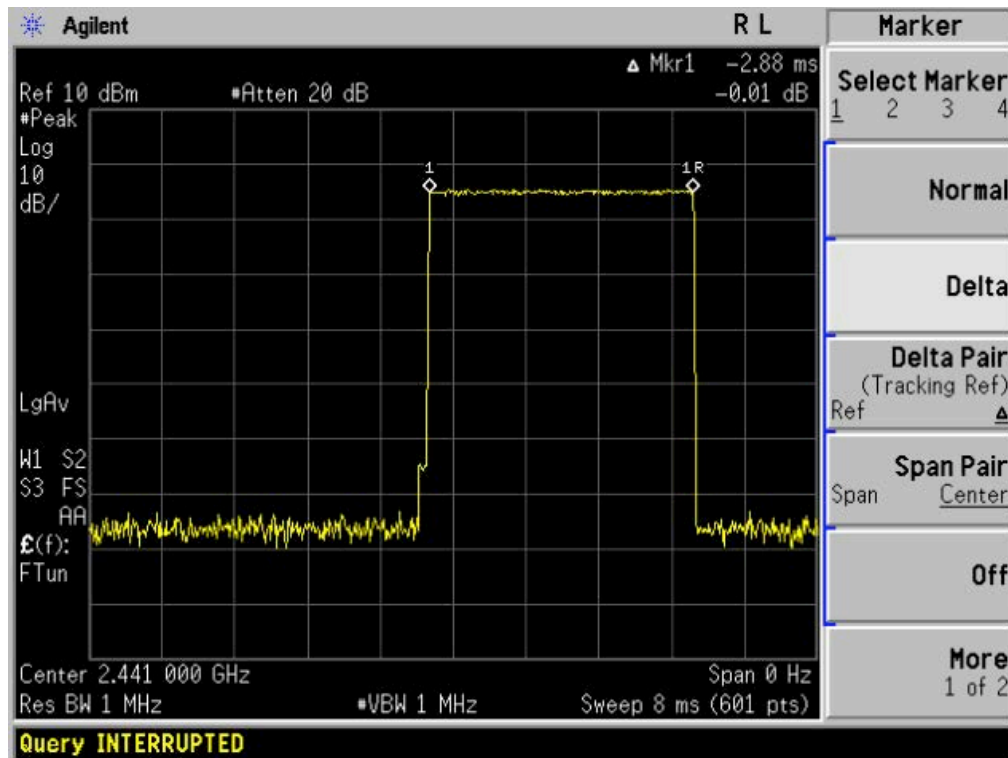
Channel	Time of Pulse for DH5 (ms)	Period Time (s)	Sweep Time (ms)	Limit (ms)
Low	2.92	31.6	311.47	400
Middle	2.88	31.6	307.20	400
High	2.893	31.6	308.59	400

Low Channel Time
 $2.92 \times (1600/6) / 79 \times 31.6 = 311.47 \text{ ms}$
 Middle Channel Time
 $2.88 \times (1600/6) / 79 \times 31.6 = 307.20 \text{ ms}$
 High Channel Time
 $2.893 \times (1600/6) / 79 \times 31.6 = 308.59 \text{ ms}$

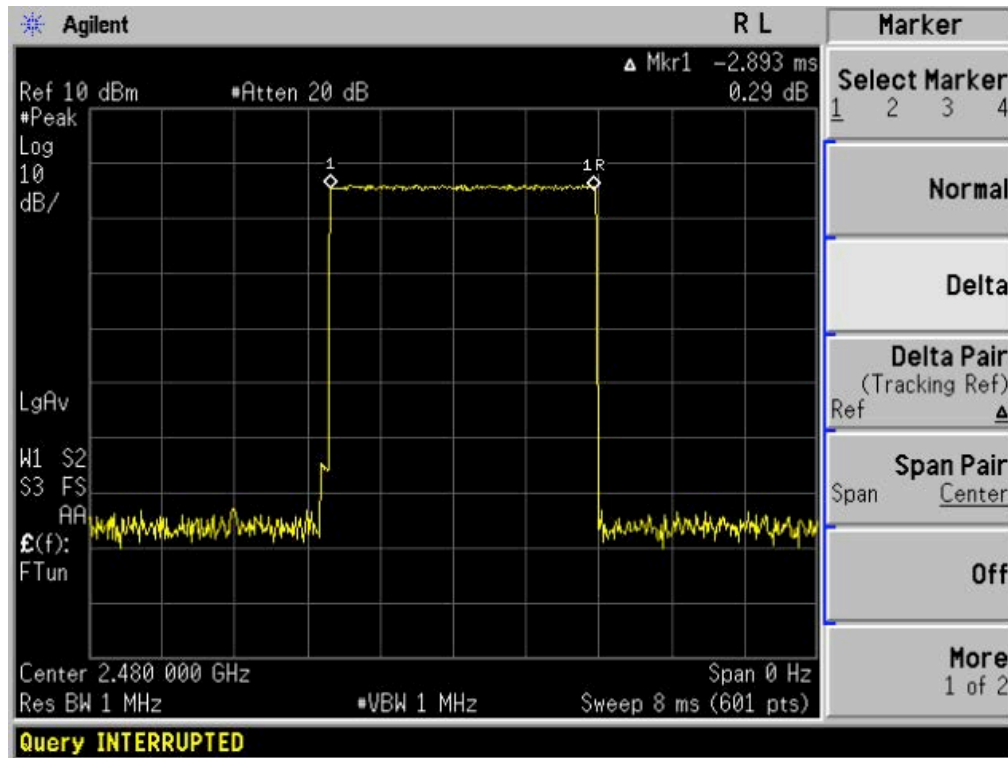
TEST PLOT OF LOW CHANNEL



TEST PLOT OF MIDDLE CHANNEL



TEST PLOT OF HIGH CHANNEL



Bluetooth 3Mbps Test Result

Channel	Time of Pulse for DH5 (ms)	Period Time (s)	Sweep Time (ms)	Limit (ms)
Low	2.905	31.6	309.87	400
Middle	2.905	31.6	309.87	400
High	2.917	31.6	311.15	400

Low Channel Time

$$2.905 \times (1600/6) / 79 \times 31.6 = 309.87 \text{ ms}$$

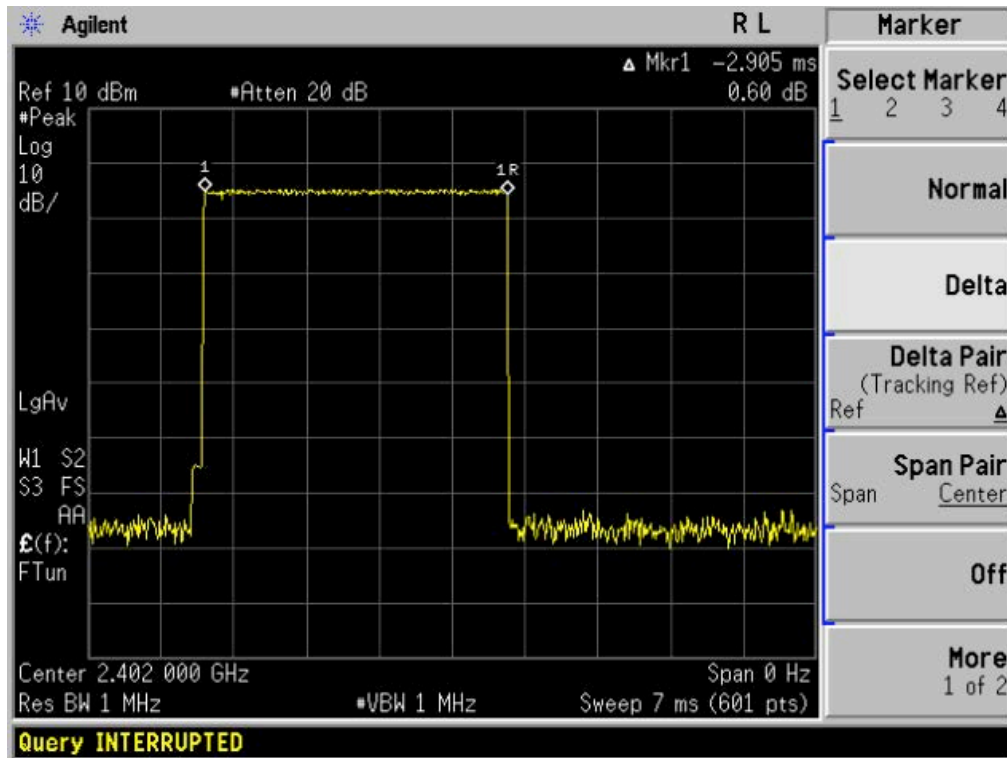
Middle Channel Time

$$2.905 \times (1600/6) / 79 \times 31.6 = 309.87 \text{ ms}$$

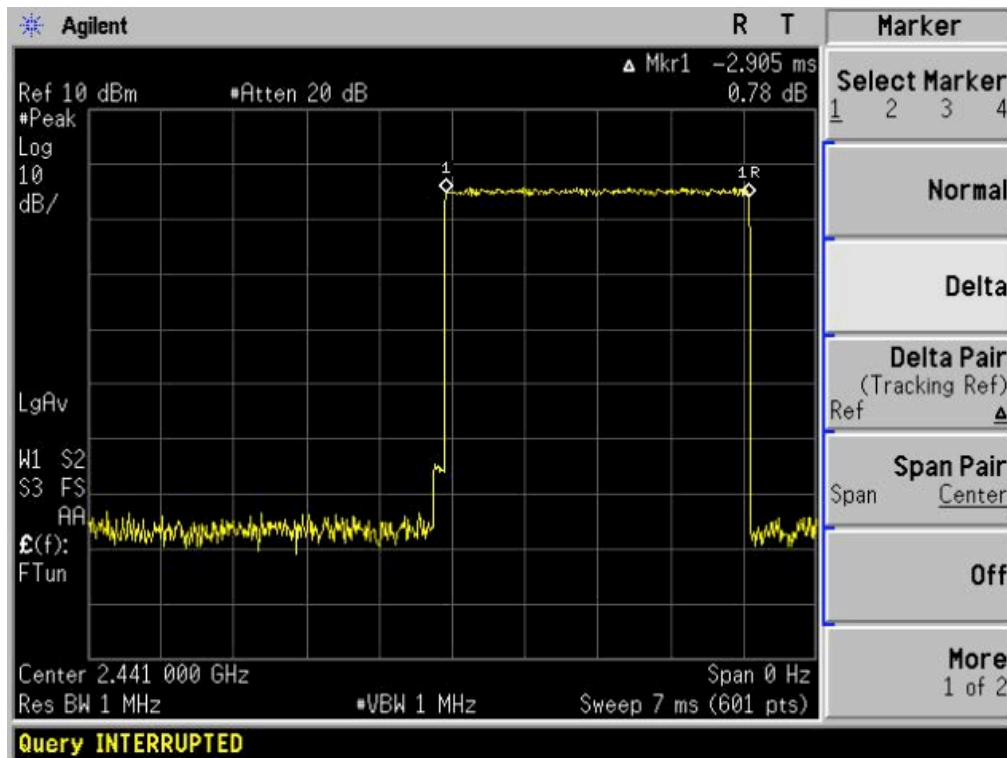
High Channel Time

$$2.917 \times (1600/6) / 79 \times 31.6 = 311.15 \text{ ms}$$

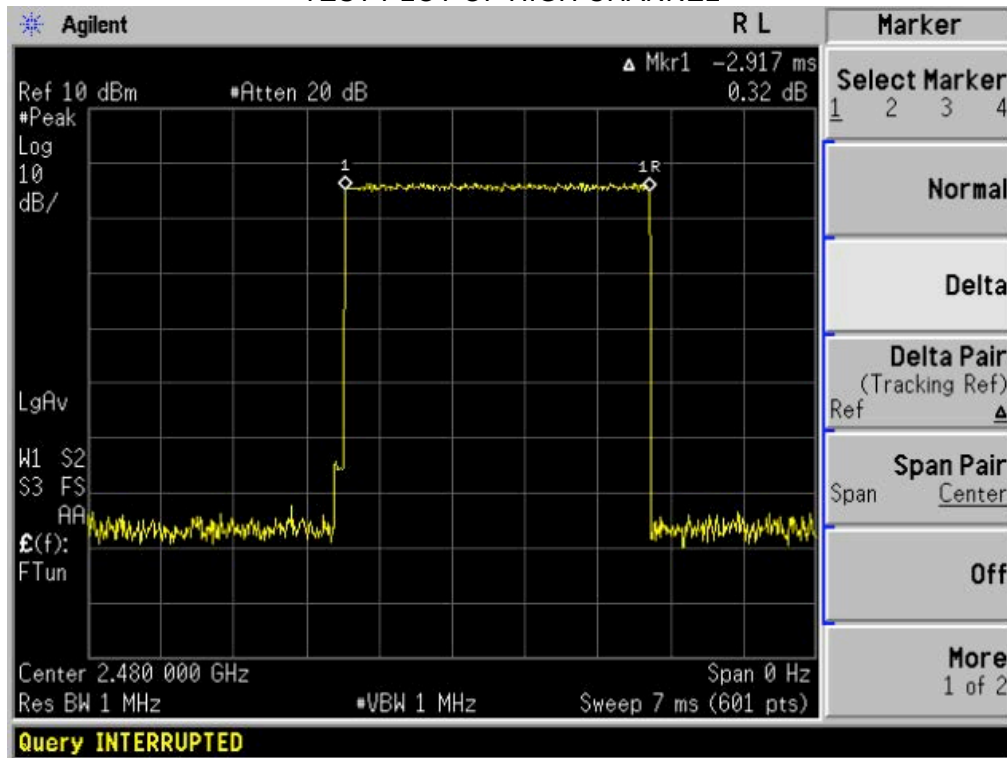
TEST PLOT OF LOW CHANNEL



TEST PLOT OF MIDDLE CHANNEL



TEST PLOT OF HIGH CHANNEL



12. FREQUENCY SEPARATION

12.1 MEASUREMENT PROCEDURE

1. Place the EUT on the table and set it in transmitting mode
2. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer
3. Set center frequency of spectrum analyzer = Middle of Operating frequency
4. Set the spectrum analyzer as RBW, VBW=100KHz, Span = 5 MHz,

12.2 TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 5.2

12.3 MEASUREMENT EQUIPMENT USED

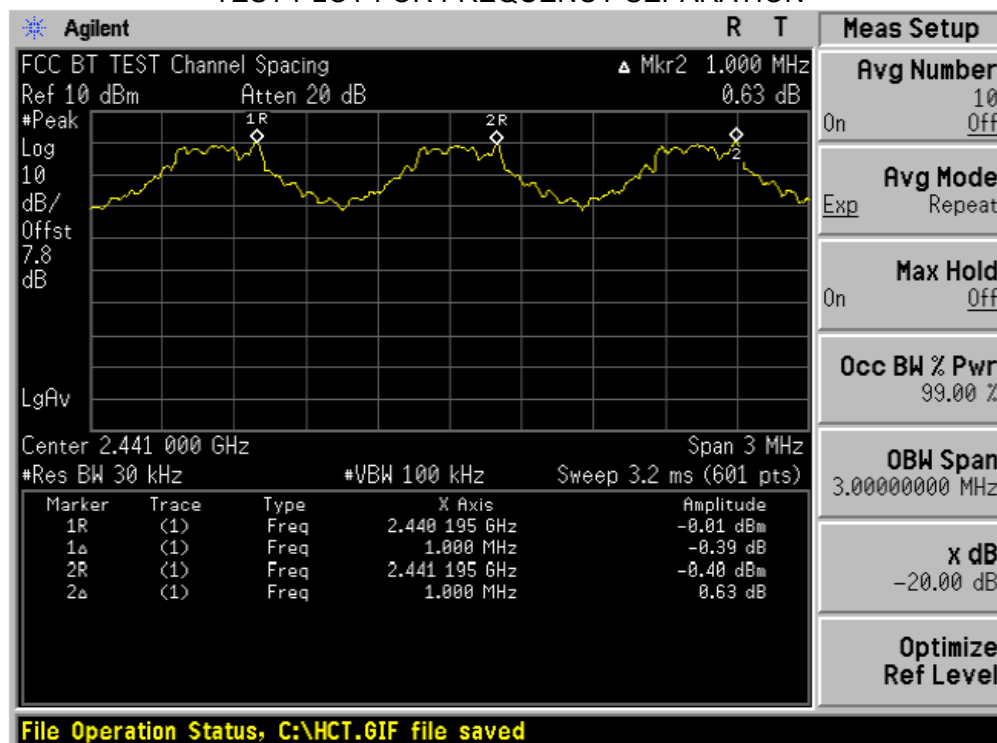
The same as described in section 5.3

12.4 LIMITS AND MEASUREMENT RESULT

BLUETOOTH 1MBPS TEST RESULT

CHANNEL	CHANNEL SEPARATION	LIMIT	RESULT
	KHz	KHz	
CH00-CH01	1000	≥ 25 KHz or 2/3 20 dB BW	Pass

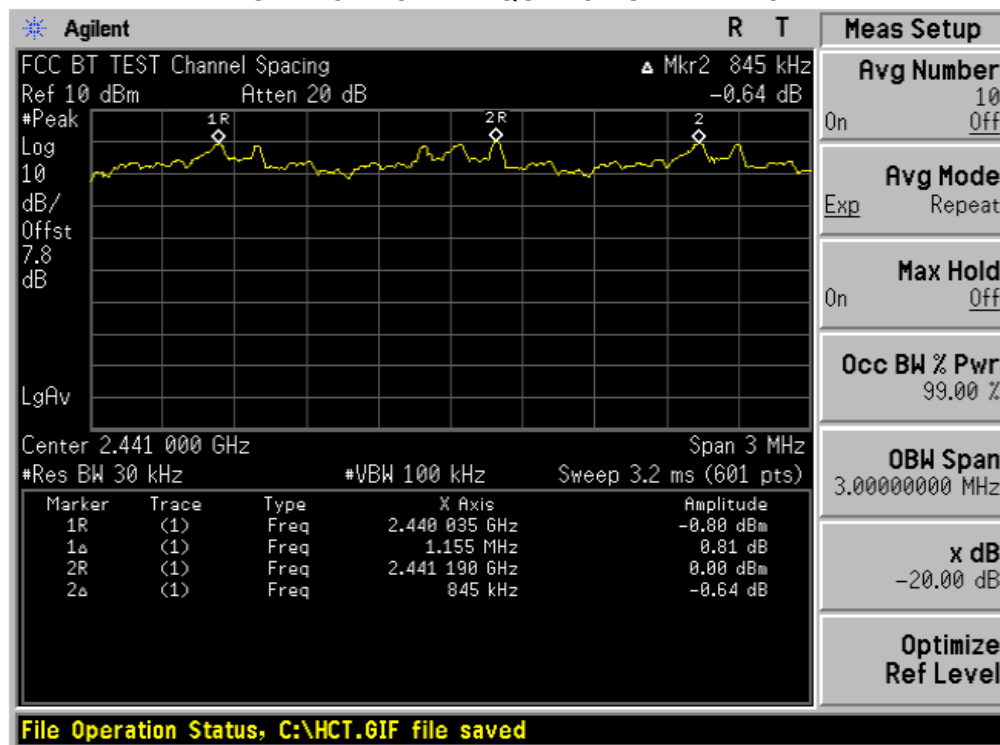
TEST PLOT FOR FREQUENCY SEPARATION



BLUETOOTH 2MBPS TEST RESULT

CHANNEL	CHANNEL SEPARATION	LIMIT	RESULT
	KHz	KHz	
CH00-CH01	1155	≥ 25 KHz or 2/3 20 dB BW	Pass

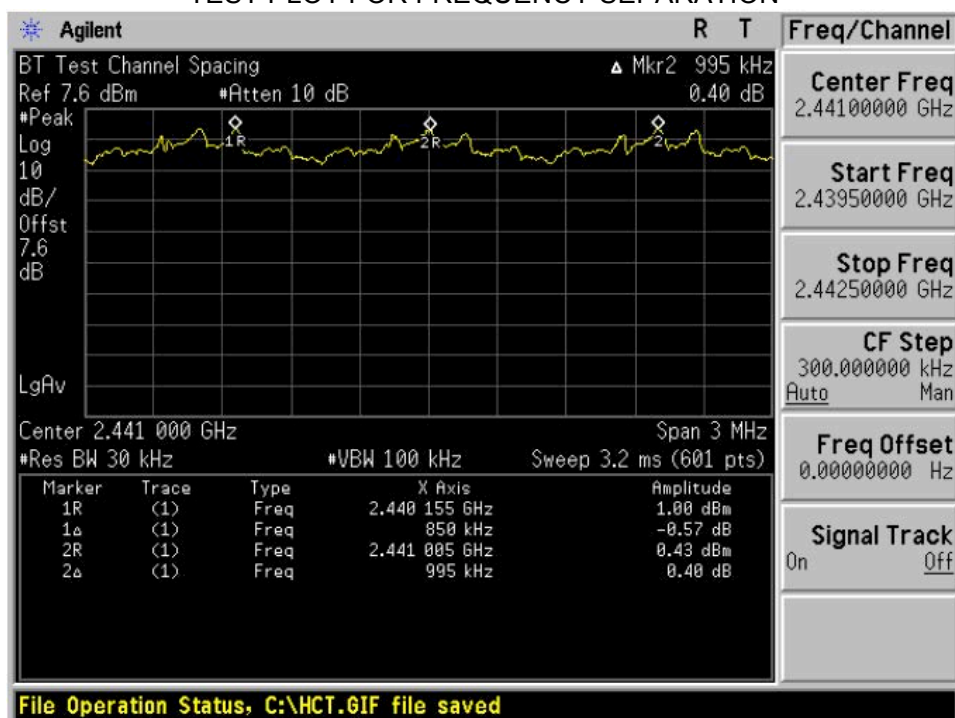
TEST PLOT FOR FREQUENCY SEPARATION



TEST PLOT FOR FREQUENCY SEPARATION

CHANNEL	CHANNEL SEPARATION	LIMIT	RESULT
	KHz	KHz	
CH00-CH01	995	≥ 25 KHz or 2/3 20 dB BW	Pass

TEST PLOT FOR FREQUENCY SEPARATION



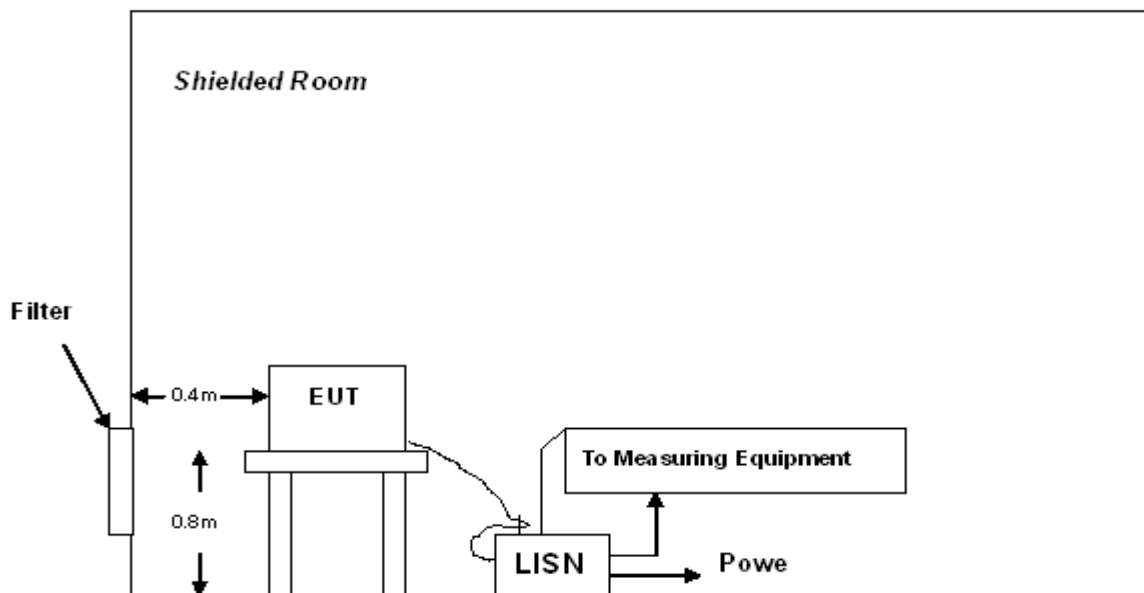
13 FCC LINE CONDUCTED EMISSION TEST

13.1 LIMITS OF LINE CONDUCTED EMISSION TEST

Frequency	Maximum RF Line Voltage	
	Q.P.(dBuV)	Average(dBuV)
150kHz~500kHz	66-56	56-46
500kHz~5MHz	56	46
5MHz~30MHz	60	50

**Note: 1. The lower limit shall apply at the transition frequency.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz

13.2 BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



A: Powered through filter

13.3 PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

- 1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- 2) Support equipment, if needed, was placed as per ANSI C63.4.
- 3) All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
- 4) All support equipments received AC120V power from a LISN, if any.
- 5) The EUT received DC4.5V by adapter and adapter received AC120V from LISN.
- 6) The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7) Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
- 8) During the above scans, the emissions were maximized by cable manipulation.
- 9) The following test mode(s) were scanned during the preliminary test:

Preliminary Line Conducted Emission Test				
Frequency Range Investigated		150 KHz TO 30 MHz		
Mode of operation	Date	Report No.	Data#	Worst Mode
Charging	03/21/2011	AGC00B110104F2	TSN51B-1(L,N)	<input checked="" type="checkbox"/>

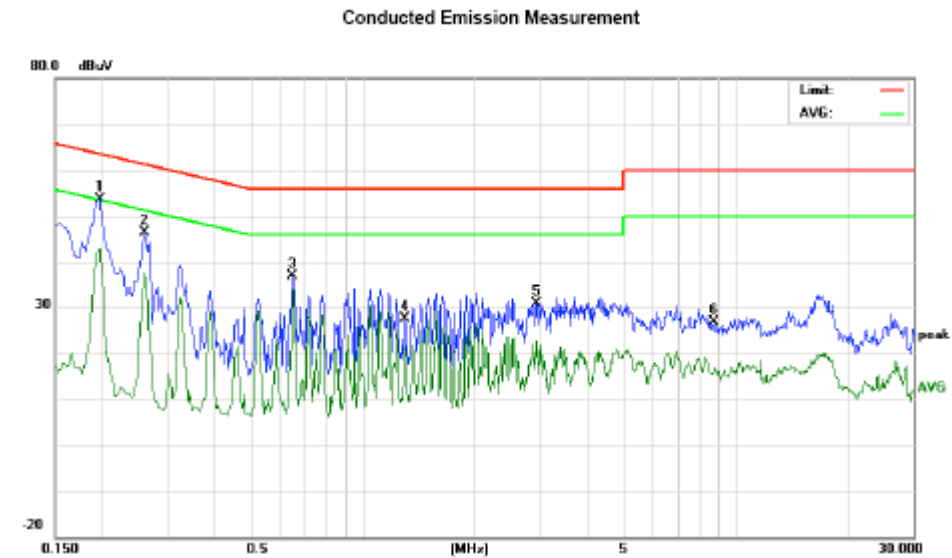
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

13.4 FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

- 1) EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
- 2) A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less -2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
- 3) The test data of the worst case condition(s) was reported on following Data page.

13.5 TEST RESULT OF LINE CONDUCTED EMISSION TEST

Line Conducted Emission Test Line 1-L



Site: Conduction

Phase: **L1**

Temperature: 28

Limit: FCC Class B Conduction(QP)

Power:

Humidity: 60 %

EUT: Portable scanner

M/N: TSN51B

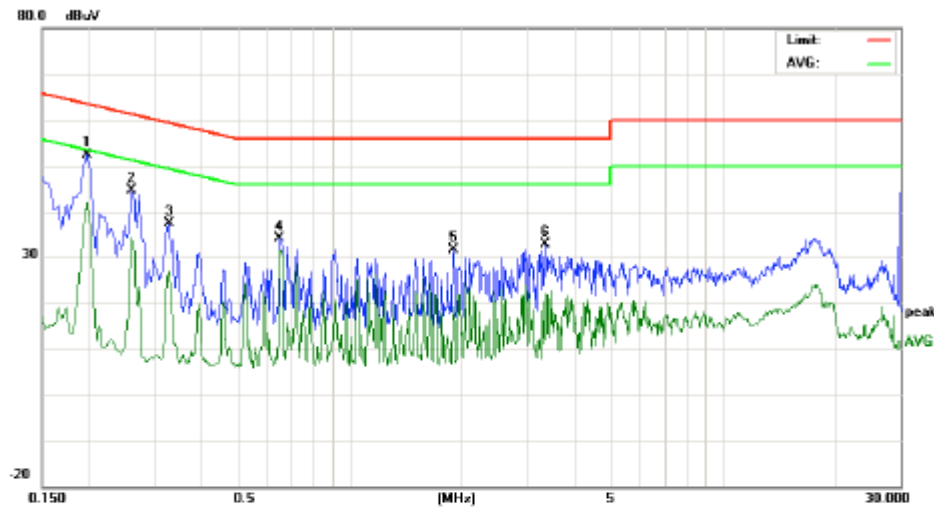
Mode: Charging

Note:

No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor dB	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG		Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.1980	43.50	42.01	32.04	10.21	53.71	52.22	42.25	63.69	53.69	-11.47	-11.44	P	
2	0.2620	36.04	34.58	26.36	10.27	46.31	44.85	36.63	61.36	51.36	-16.51	-14.73	P	
3	0.6540	37.53		7.25	10.33	47.86		17.58	56.00	46.00	-8.14	-28.42	P	
4	1.3020	17.18		10.17	10.38	27.56		20.55	56.00	46.00	-28.44	-25.45	P	
5	2.9340	20.46		12.23	10.53	30.99		22.76	56.00	46.00	-25.01	-23.24	P	
6	8.7420	16.63		5.93	10.28	26.91		16.21	60.00	50.00	-33.09	-33.79	P	

Line Conducted Emission Test Line 2-N

Conducted Emission Measurement



Site: Conduction Phase: **N** Temperature: 26
Limit: FCC Class B Conduction(QP) Power: Humidity: 60 %
EUT: Portale scanner
M/N: TSN51B
Mode: Charging
Note:

No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG		Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.1980	42.19		31.66	10.21	52.40		41.87	63.69	53.69	-11.29	-11.82	P	
2	0.2620	34.33		24.03	10.27	44.60		34.30	61.36	51.36	-16.76	-17.06	P	
3	0.3300	26.97		16.92	10.30	37.27		27.22	59.45	49.45	-22.18	-22.23	P	
4	0.6540	23.85		21.00	10.33	34.18		31.33	56.00	46.00	-21.82	-14.67	P	
5	1.9020	21.30		9.04	10.25	31.55		19.29	56.00	46.00	-24.45	-26.71	P	
6	3.3500	22.26		11.68	10.52	32.78		22.20	56.00	46.00	-23.22	-23.80	P	

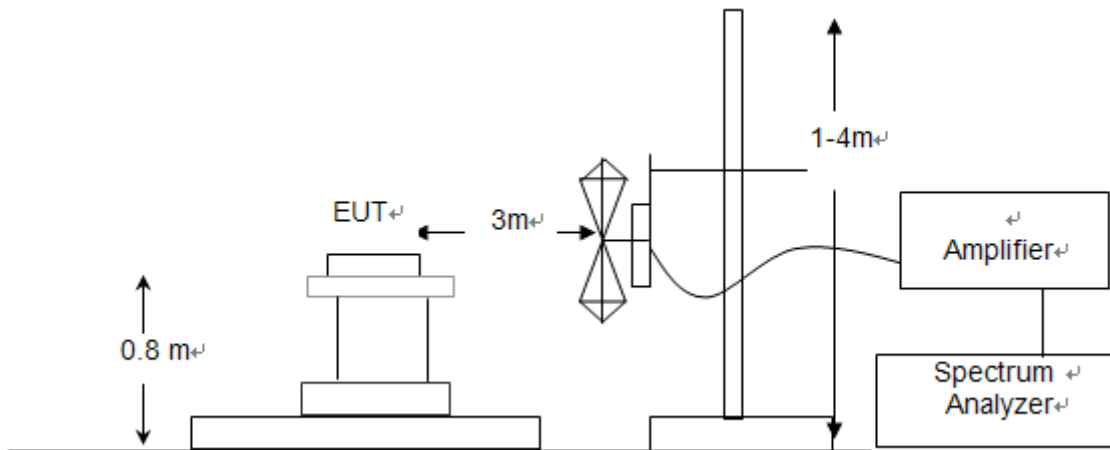
14 FCC RADIATED EMISSION TEST

14.1 LIMITS OF RADIATED EMISSION TEST

Frequency (MHz)	Distance (m)	Maximum Field Strength Limit (dBuV/m/ Q.P.)
30~88	3	40.0
88~216	3	43.5
216~960	3	46.0
Above 960	3	54.0

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

14.2 BLOCK DIAGRAM OF RADIATED EMISSION TEST



14.3 PRELIMINARY PROCEDURE OF RADIATED EMISSION TEST

- 1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground plane used).
- 2) All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
- 3) The EUT received DC4.2V by battery.
- 4) The antenna was placed at 3 meter away from the EUT as stated in FCC Part 15. The antenna connected to the Analyzer via a cable and at times a pre-amplifier would be used.
- 5) The Analyzer / Receiver quickly scanned from 30MHz to 1000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- 6) The test mode was scanned during the preliminary test.
Then, the EUT and cable(s) configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for final testing.

Preliminary Radiated Emission Test				
Frequency Range Investigated		30MHz TO 1GHZ		
Mode of operation	Date	Report No.	Data#	Worst Mode
Bluetooth	03/21/2011	AGC00B110104F2	TSN51B-0(H,V)	<input checked="" type="checkbox"/>

Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

14.4 FINAL PROCEDURE OF RADIATED EMISSION TEST

EUT and support equipment were set up on the turntable as per step 6 of the preliminary test.

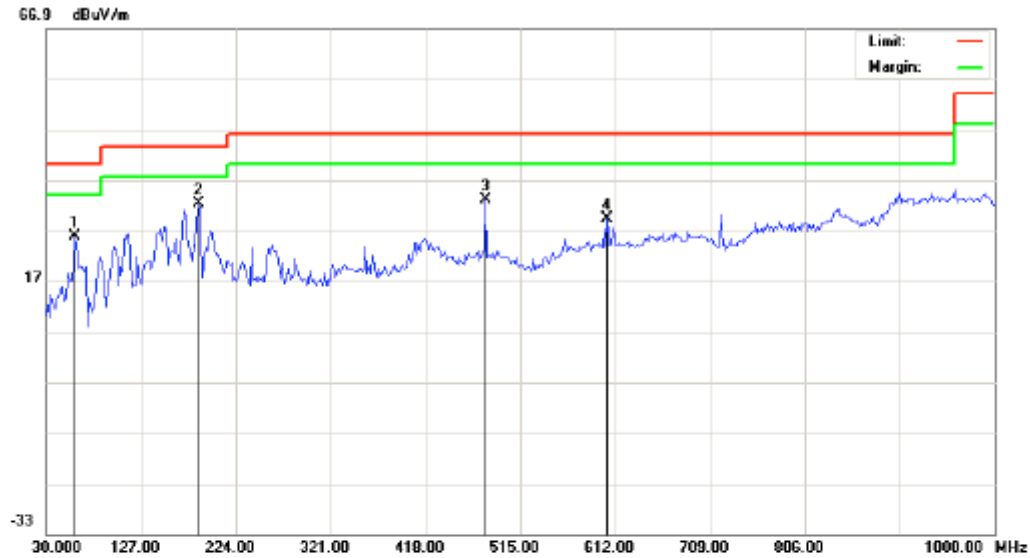
The Analyzer / Receiver scanned from 30MHz to 1000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and Q.P/Peak. reading is presented.

The test data of the worst case condition(s) was reported on the Summary Data page.

14.5 TEST RESULT OF RADIATED EMISSION TEST

Test Result of Radiated Emission Test-Horizontal-3m



Site: site #1

Limit: FCC Class B 3M Radiation

EUT: Portable scanner

M/N: TSN51B

Mode:Bluetooth

Note:

Polarization: *Horizontal*

Power: DC4.5V

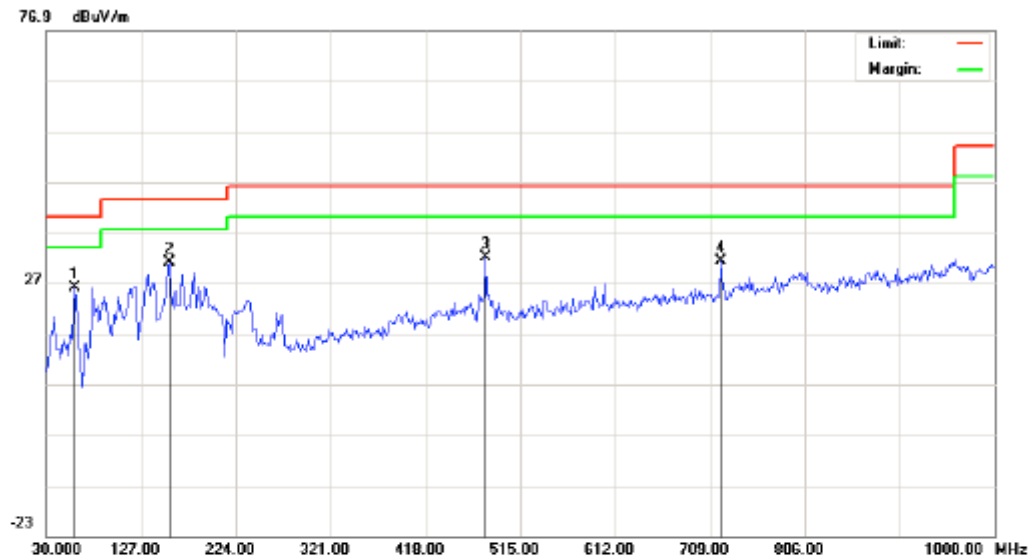
Distance: 3m

Temperature: 26

Humidity: 60 %

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		59.1000	6.84	18.84	25.68	40.00	-14.32	peak			
2	*	185.2000	16.43	15.96	32.39	43.50	-11.11	peak			
3		479.4333	11.39	21.67	33.06	46.00	-12.94	peak			
4		603.9167	4.44	24.95	29.39	46.00	-16.61	peak			

Test Result of Radiated Emission Test-Vertical-3m



Site: site #1

Polarization: **Vertical**

Temperature: 26

Limit: FCC Class B 3M Radiation

Power: DC4.5V

Humidity: 60 %

EUT: Portable scanner

Distance: 3m

M/N: TSN51B

Mode: Bluetooth

Note:

No.	Mk	Freq. MHz	Reading dBuV	Factor dB/m	Measurement dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1		59.1000	7.06	19.08	26.14	40.00	-13.86	peak			
2	*	156.1000	17.63	13.49	31.12	43.50	-12.38	peak			
3		479.4333	10.28	21.67	31.95	46.00	-14.05	peak			
4		720.3167	5.20	26.15	31.35	46.00	-14.65	peak			

APPENDIX I PHOTOGRAPHS OF THE EUT

WHOLE VIEW OF SAMPLE



TOP VIEW OF SAMPLE



BOTTOM VIEW OF SAMPLE



LEFT VIEW OF SAMPLE



RIGHT VIEW OF SAMPLE



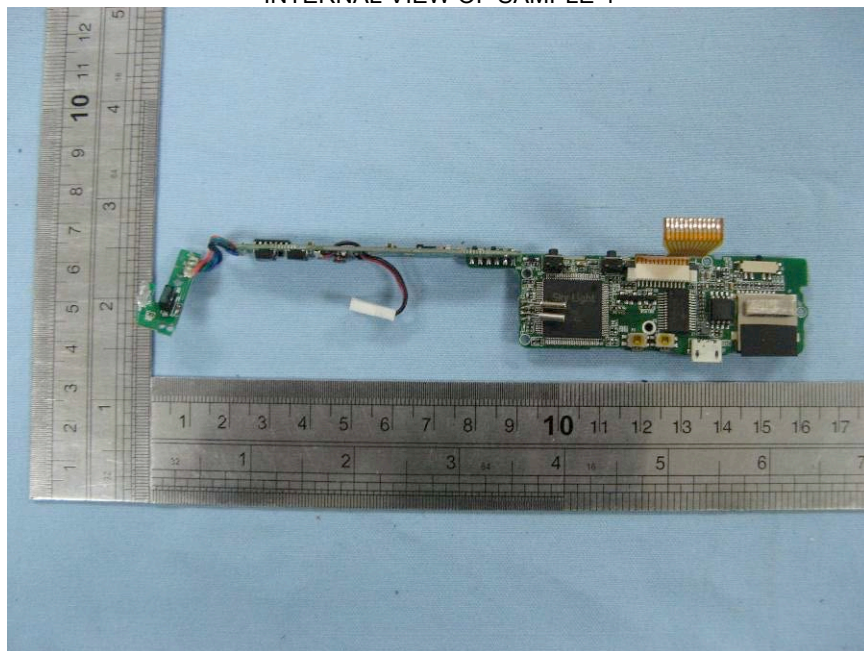
FRONT VIEW OF SAMPLE



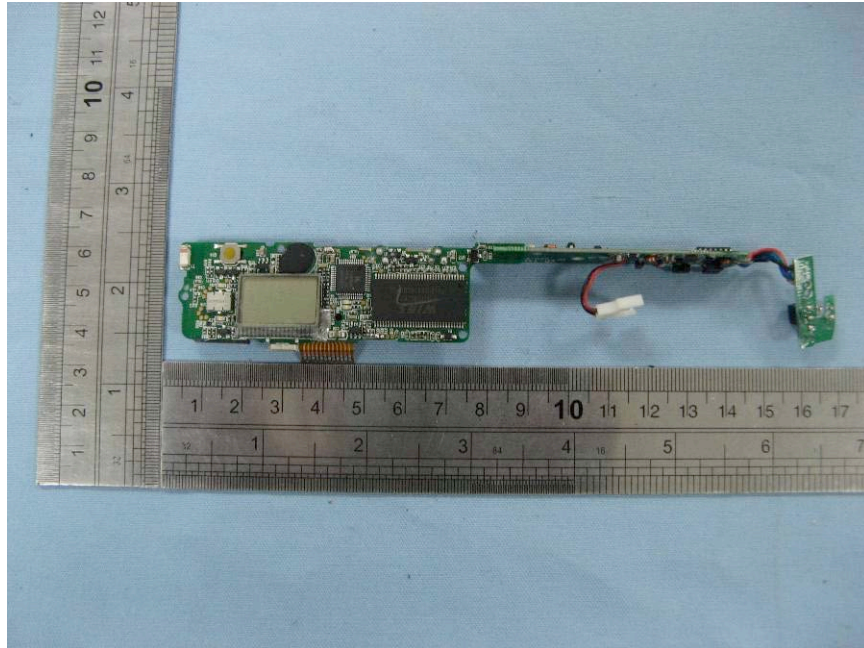
BACK VIEW OF SAMPLE



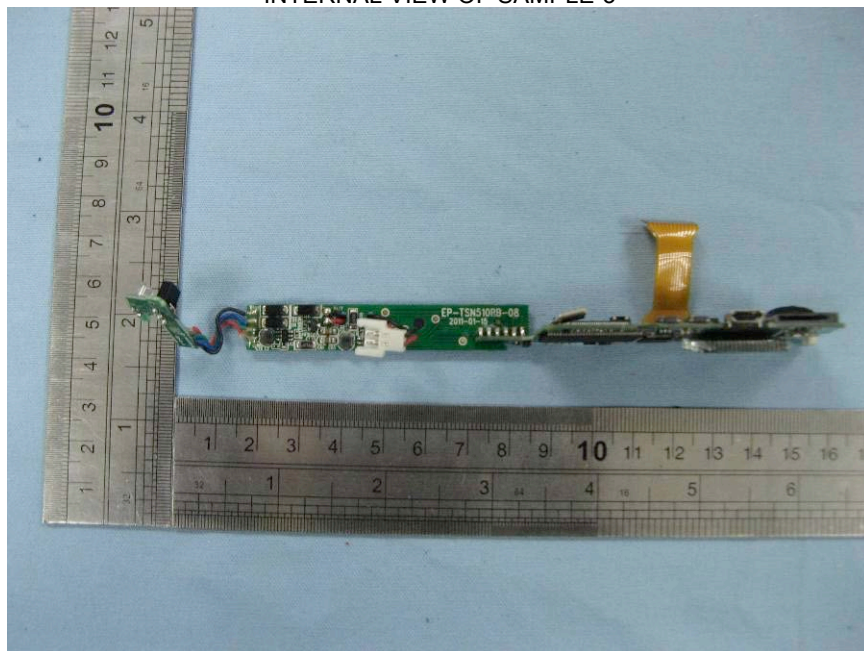
INTERNAL VIEW OF SAMPLE-1



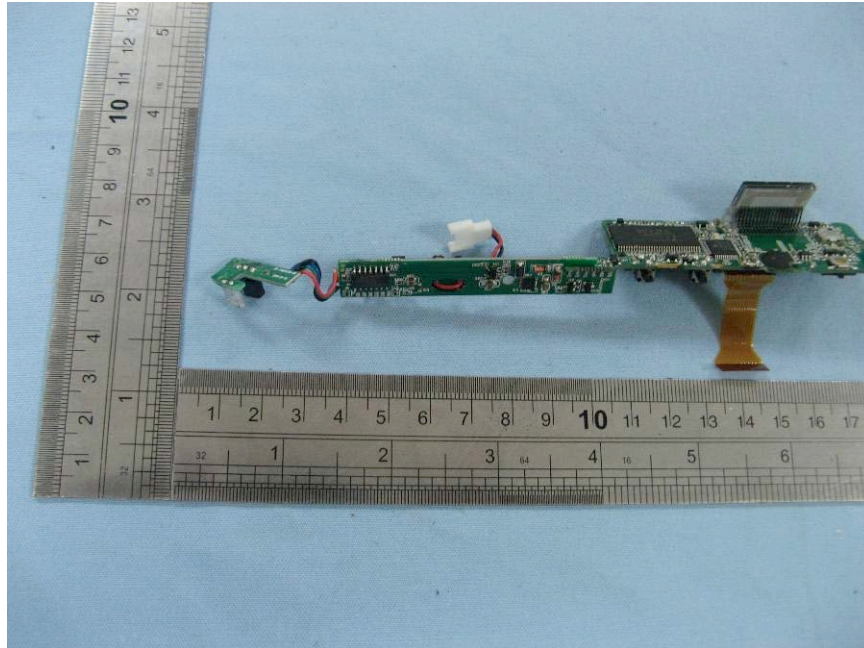
INTERNAL VIEW OF SAMPLE-2



INTERNAL VIEW OF SAMPLE-3



INTERNAL VIEW OF SAMPLE-4

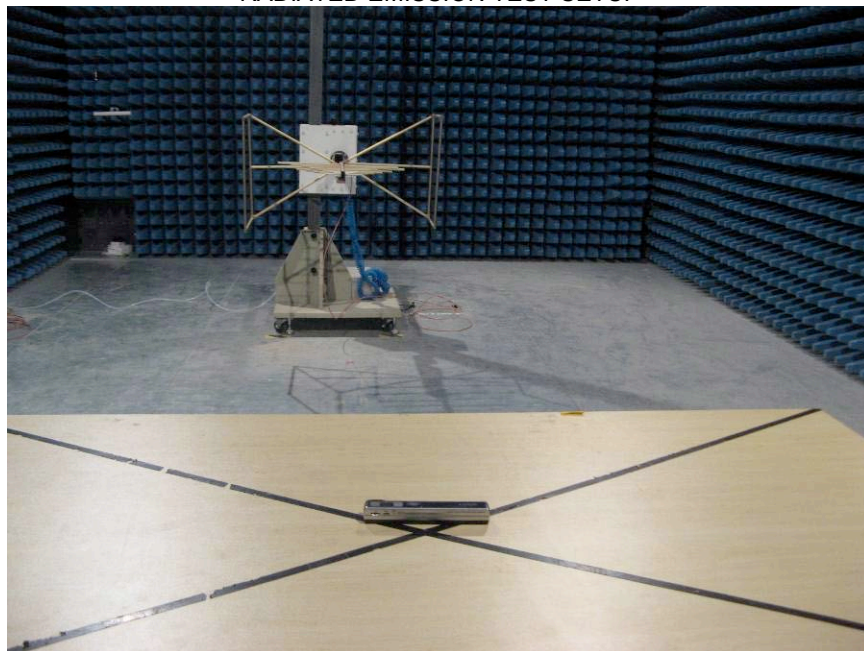


APPENDIX II PHOTOGRAPHS OF THE TEST SETUP

LINE CONDUCTED EMISSION TEST SETUP



RADIATED EMISSION TEST SETUP



----END OF REPORT----