

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT **AND INDUSTRY CANADA RSS 210**

0F

Product Name:	PDA Phone	
Brand Name:	Sony	
Model No.:	C2004	
Type No.:	PM-0481-BV	
Model Difference:	N/A	
FCC ID:	PY7PM-0481	
IC:	4170B-PM0481	
Report No.:	EH/2013/70023	
Issue Date:	Jul. 26, 2013	
FCC Rule Part:	§15.247, Cat: DSS	
IC Rule Part:	RSS-210 issue 8 :2010, Annex 8	
Prepared for:	Sony Mobile Communications AB Nya Vattentornet 22188 Lund/SWEDEN	
Prepared by:	SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803	
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Report No.: EH/2013/70023 Issue Date: Jul. 26, 2013 Page: 2 of 106

VERIFICATION OF COMPLIANCE

Applicant:	Sony Mobile Communications AB
	Nya Vattentornet 22188 Lund/SWEDEN
Product Name:	PDA Phone
Brand Name:	Sony
Model No.:	C2004
Type No.:	PM-0481-BV
Model Difference:	N/A
FCC ID:	PY7PM-0481
IC:	4170B-PM0481
File Number:	EH/2013/70023
Date of test:	Apr. 01, 2013 ~ Jul. 23, 2013
Date of EUT Received:	Apr. 01, 2013
We handly contify the	.

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4:2009 & ANSI C63.10:2009 and RSS-Gen. issue 3 the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247 and IC RSS 210 issue 8: 2010 Annex 8. The test results of this report relate only to the tested sample identified in this report.

Test By:	Marcus Tseng	Date:	Jul. 26, 2013	
- Prepared By:	Marcus Tseng/Engineer Uroletta Tang	Date:	Jul. 26, 2013	
Approved By:	Violetta Tang / Clerk Jim Chang Jim Chang / Supervisor	Date:	Jul. 26, 2013	

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Revision History

Report Number	Revision	Description	Issue Date
EH/2013/70023	Rev.01	Initial creation of document	Jul. 26, 2013

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GENERAL INFORMATION 1.

1.1. Product description

General:

Product Name:	PDA Phone		
Brand Name:	Sony		
Model No.:	C2004		
Type No.:	PM-0481-1	BV	
Model Difference:	N/A		
Data Cable (USB):		: EC450, Supplier: K-one 242-6715.3, Length: 100 cm	
Simple Hands-Free (SHF-White):	Model No. Type No.:	: MH410c, Supplier: Foster Electric AG-1100	
Simple Hands-Free (SHF-Black):	Model No.: MH410c, Supplier: Foster Electric Type No.: CCA-0004017		
Car Charger:	Model No.: AN400, Supplier: Salcomp Type No.: CAA-0003013		
Hi-Fi Wireless Headset:	Model No.: MW600, Supplier: BALDA Type No.: DDA-0002029.B coupling with Simple Hands Free (Model No.: MH755, Supplier: BALDA Type No.: AG-0502)		
Hardware Version:	А		
Software Version:	15.2.A.0.17		
	3.7Vdc		
Power Supply:	Battery:	Model No.: BA900, Supplier: Sony Type No.: AB-0500	
	Adapter:	Model No.: EP800, Supplier: Salcomp Type No.: CAA-0002016-US	

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Bluetooth BR+EDR:

Bluetooth Version:	V3.0+HS
Channel number:	79 channels
Modulation type:	Frequency Hopping Spread Spectrum
Transmit Power:	10.11dBm
Frequency Range:	2.402GHz – 2.480GHz
Dwell Time:	<= 0.4s
Antenna Designation:	PIFA Antenna, Gain: 2.55dBi
Type of Emission:	915KF7D (GFSK) / 1M15G7D (π/4DQPSK) /1M20G7D (8DPSK)

Bluetooth Low Energy:

Frequency Range:	2402 – 2480MHz
Bluetooth Version:	V4.0 Dual mode
Channel number:	40 channels
Modulation type:	GFSK
Transmit Power:	1.24dBm (Peak)
Antenna Designation:	PIFA Antenna, Gain: 2.55dBi
Type of Emission:	1M05F7D

NFC:

Operating Frequency:	13.56MHz
Transmit Power:	< 123dBuV/m at 3m.
Number of Channels:	1
Antenna Type:	Loop Antenna
Modulation Type:	ASK, BPSK
Type of Emission:	15K0F1D

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WLAN 2.4GHz+5.7GHz:

Wi-Fi	Frequency Range	Channels	Rated Power	Modulation Technology	Type of Emission
11b/g	2412-2462	11	b: 17.27dBm g: 20.82dBm	DSSS, OFDM	b: 13M5G1D g: 16M6D1D
11n	HT20 2412-2462	11	HT20: 20.84dBm	OFDM	n: 17M8D1D
11a	5725-5850	5	a: 19.54dBm		a: 16M7D1D
11n (5GHz)	HT20 5725-5850	5	HT20: 19.62dBm	OFDM	n_20HT:17M8D1D
11n (5GHz)	HT40 5725-5850	2	HT40: 19.18dBm		n_40HT:36M0D1D
Antenna]	Antenna Designation:PIFA Antenna, 2.4GHz Gain: 2.55dBi 5GHz Gain: 1.66dBi (5725MHz-5850MHz)				
Modulati	on type:	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM			
Transition	n Rate:	802.11 a: 802.11 b: 802.11 g: 802.11 n_	6/9/12/18/24/36/48/5 1/2/5.5/11 Mbps 6/9/12/18/24/36/48/5 20MHz: 6.5 – 65.0N 40MHz: 13.5 – 135.0	54 Mbps 54 Mbps Ibps	

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WLAN 5GHz

Wi-Fi	Frequency Range	Channels	Rated Power (Avg)	Rated Power (EIRP)	Modulation Technology	Type of Emission
	5150~5250	4	12.77dBm	12.03dBm		16M7D1D
11a	5250~5350	4	12.78dBm	13.79dBm	OFDM	16M7D1D
	5470~5725	11	12.87dBm	15.57dBm		16M6D1D
	HT20 5150~5250	4	HT20: 12.85dBm	HT20: 12.11dBm		17M7D1D
11n	HT20 5250~5350	4	HT20: 12.84dBm	HT20: 13.85dBm	OFDM	17M8D1D
	HT20 5470~5725	8	HT20: 12.88dBm	HT20: 15.58dBm		17M7D1D
	HT40 5150~5250	2	HT40: 11.76dBm	HT40: 11.05dBm		36M1D1D
11n	HT40 5250~5350	2	HT40: 11.79dBm	HT40: 12.80dBm	OFDM	36M1D1D
	HT40 5470~5725	3	HT40: 11.87dBm	HT40: 14.57dBm		36M0D1D
Antenna Designation: PIFA Antenna, 5GHz Gain: -0.74dBi (5150MHz-5250MHz) 5GHz Gain: 1.01dBi (5250MHz-5350MHz) 5GHz Gain: 2.70dBi (5470MHz-5725MHz)						
Modulation type:CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM						
Transition Rate: $802.11 \text{ a: } 6/9/12/18/24/36/48/54 \text{ Mbps}$ $802.11 \text{ n}_20\text{MHz: } 6.5 - 65.0\text{Mbps}$ $802.11 \text{ n}_40\text{MHz: } 13.5 - 135.0\text{Mbps}$						

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GSM / WCDMA:

	Operating Frequency	Rated Power	
	GSM/GPRS 850, Class 12 824.2 MHz– 848.8 MHz		33dBm
	EDGE 850, Class 12	824.2 MHz- 848.8 MHz	27dBm
	GSM/GPRS 1900, Class 12	1850.2MHz - 1909.8MHz	30dBm
Cellular Phone Standards Frequency	EDGE 1900, Class 12	1850.2MHz - 1909.8MHz	26dBm
Range and Power.	WCDMA/HSUPA/HSDPA /HSPA+ Band II	1852.4MHz – 1907.6MHz	24dBm
	WCDMA/HSUPA/HSDPA /HSPA+ Band IV	1712.4MHz - 1752.6MHz	24dBm
	WCDMA/HSUPA/HSDPA /HSPA+ Band V	826.4MHz - 846.6MHz	24dBm
Type of Emission:	GSM 850: 248KGXW, GSM 1900: 247KGXW GPRS 850: 247KGXW, GPRS 1900: 247KGXW EDGE 850: 244KG7W, EDGE 1900: 242KG7W WCDMA Band II: 4M20F9W, WCDMA Band IV: 4M16F9W, WCDMA Band V: 4M26F9W HSDPA Band II: 4M22F9W, HSDPA Band IV: 4M23F9W, HSDPA Band V: 4M17F9W HSUPA Band II: 4M20F9W, HSUPA Band IV: 4M25F9W, HSUPA Band V: 4M27F9W		
IMEI:	004402146722479		

The report applied for Bluetooth BR+EDR.

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1.2. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID:** <u>**PY7PM-0481**</u> filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules and **IC:** <u>**4170B-PM0481**</u> filing to comply with Industry Canada RSS-210 issue 8: 2010 Annex 8. The composite system (digital device) is compliance with FCC part 15; Subpart B is authorized under the certification procedure.

1.3. Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4:2009 and ANSI C63.10:2009. Radiated testing was performed at an antenna to EUT distance 3 meters. Tested in accordance with FCC Public Notice DA 00-705 – Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

1.4. Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2009. & ANSI C63.10:2009. FCC Registration Number is: 990257. Canada Registration Number: 4620A-4.

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 29, Pau-Tou-Tsuo Valley Chia-Pau Tsuen, Linkou Hsiang, Taipei county, which is constructed and calibrated to meet the CISPR 22/EN 55022 requirements. SGS Site No. 1(3 &10 meters) and FCC Registration Number: 94644.

1.5. Special Accessories

There is no special accessory used while test was conducted.

1.6. Equipment Modifications

There was no modification incorporated into the EUT.

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2. SYSTEM TEST CONFIGURATION

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3. Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the general criterion in Section 7.1 of ANSI C63.4:2009 & 6.2 ANSI 63.10:2009.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz, and the measurement procedure 7.3 in ANSI 63.4:2009 & 6.2.2, and 6.2.3 in ANSI 63.10:2009 is followed to carry out the test. The CISPR Quasi-Peak and Average detector mode is employed according to §15.107

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna according to the requirements in Section 8 and 13 and of ANSI C63.4:2009, & Section 6.3, 6.4, 6.5, and 6.6 of ANSI 63.10:2009.ANSI C63.10:2009.and DA 00-705.

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2.4. Configuration of Tested System

Fig. 2-1 Radiated Emission

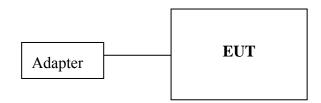


Fig. 2-2 Conducted (Antenna Port) Configuration

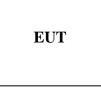


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	Bluetooth Test Software	QRCT	2.4.83.0	N/A	N/A	N/A
2.	Bluetooth Test Set	Anritsu	MT8852B	6k00006107	N/A	N/A

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台灣檢驗科技股份有限公司	t (886-2) 2299-3279	f (886-2) 2298-0488	www.tw.sgs.com	



Fig. 2-3 AC Power Line Conducted Emission

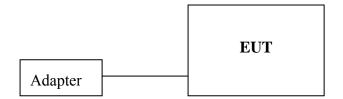


Table 2-2 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	Bluetooth Test Software	QRCT	2.4.83.0	N/A	N/A	N/A

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3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result	
§15.207(a)	AC Power Line Conducted	Compliant	
RSS-Gen §7.2.4	Emission	Compliant	
§15.247(b)(1)			
RSS-210 issue	Peak Output Power	Compliant	
8,§A8.4(2)			
§15.247(a)(1)	20dB Bandwidth		
RSS210 issue ,§A8.1(a)	200B Bandwidth &	Compliant	
RSS-Gen §4.6.3	99% Power Bandwidth	Compilant	
RSS-Gen §4.6.1	9978 FOwer Bandwidth		
§15.247(d)	100 kHz Bandwidth Of	Compliant	
RSS-210 issue 8,§A8.5	Frequency Band Edges	Compliant	
\$15.247(d)			
§15.209(a) (f)	Spurious Emission	Compliant	
RSS-Gen §7.2.5	Spurious Emission	Compilant	
RSS-210 issue 8,§A8.5			
§15.247(a)(1)			
RSS-210 issue	Frequency Separation	Compliant	
8,§A8.1(b)			
§15.247(a)(1)(iii)			
RSS-210 issue	Number of hopping frequency	Compliant	
8,§A8.1(d)			
§15.247(a)(1)(iii)			
RSS-210 issue	Time of Occupancy	Compliant	
8,§A8.1(d)			
§15.203,	Antenna Requirement	Compliant	
RSS- Gen issue §7.1.2	Antenna Requirement	Compitant	

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4. DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Channel Low, Mid and High with highest rated data rate were chosen as worst case for full testing. The field strength of spurious radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for Bluetooth Transmitter for channel Low, Mid and High the worst case E2 position was reported.

Channel Low: channel 1 at 2402MHz Channel Mid: channel 39 at 2441MHz Channel High: channel 78 at 2480MHz

In comparison with BR and EDR mode, emission carried out by EDR is chosen as the most representative measurement to perform measurement of radiated spurious emission pursuant to Part 15C.Modulation, EDR, is selected to be performed for 100 kHz Bandwidth Band Edge, Conducted Spurious Emission, Frequency Separation, Number of hopping frequency due to its characteristics of wider bandwidth.

Data type being used to conduct the measurement: DH1/DH3/DH5 (GFSK) with 1Mbps 2DH1/2DH3/2DH5 (/4 DQPSK) with 2Mbps 3DH1/3DH3/3DH5 (8DPSK) with 3Mbps

The given application is dual SIM build of certified product, PY7PM-0480, 4170B-PM-0480. It differs only in the mental shield covering the portion of slot space that is preserved in the built applicable PY7PM-0480, and 4170B-PM-0480. Except for the change as aforementioned above, all hardware, software relevant to RF Parameter of Physical layer, I/O signal remains unchanged, and the data as measured in the authorization of PY7M-0480, 4170B-PM-0480, and remains, and entails representative.

This test report only demonstrates the result of spot-check on Radiated Spurious Emission in order to reveal of the evidence of compliance record proving the implementation of dual SIM built causes no degradation as compared to build, PY7PM-0480/4170B-PM-0480.

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5. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 1.55 dB
20dB Bandwidth & 99% Power Bandwidth	+/- 123.36 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 1.55 dB
Frequency Separation	+/- 123.36 Hz
Number of hopping frequency	+/- 123.36 Hz
Time of Occupancy	+/- 123.36 Hz
Temperature	+/- 0.8 °C
Humidity	+/- 4.7 %
DC / AC Power Source	DC=+/-1%, AC=+/-0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : Vertical)	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

	30MHz - 167MHz: +/- 4.22dB
Measurement uncertainty	167MHz -500MHz: +/- 3.44dB
(Polarization : Horizontal)	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the

95% confidence level using a coverage factor of k=2.

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6. CONDUCTED EMISSION TEST

6.1. Standard Applicable

According to §15.207 and RSS-Gen §7.2.4, frequency within 150 kHz to 30MHz shall not exceed the limit table as below.

Frequency range	Limits dB(uV)			
MHz	Quasi-peak	Average		
0.15 to 0.50	66 to 56	56 to 46		
0.50 to 5	56	46		
5 to 30	60	50		
Note				
1. The lower limit shall apply at the transition frequencies				
2. The limit decreases linearly with the	ne logarithm of the frequency in the ra	ange 0.15 MHz to 0.50 MHz.		

6.2. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
ТҮРЕ		NUMBER	NUMBER	CAL.	
EMI Test Receiver	R&S	ESCI7	100759	05/20/2011	05/19/2013
EMI Receiver	R&S	ESCS 30	828985/004	09/23/2012	09/22/2013
LISN	Rolf-Heine	NNB-2/16Z	99012	03/23/2013	03/22/2014
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	03/23/2013	03/22/2014
Coaxial Cables	N/A	WK CE Cable	N/A	01/05/2013	01/04/2014

6.3. EUT Setup

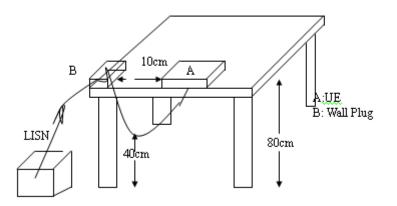
- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4:2009 & ANSI 63.10:2009.
- 2.The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

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6.4. Test SET-UP (Block Diagram of Configuration)



6.5. Measurement Procedure

- 1. The EUT was placed on a table which is 0.8m above ground plane.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all frequency measured were complete.

6.6. Measurement Result

Note: Refer to next page for measurement data and plots. Note2: The * reveals the worst-case results that closet to the limit

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AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode	: Operation	n mode					Test Date:	Apr. 24, 2013
Femperature:	26		Humid	lity:		60 %	Test By:	Marcus
	Class B Conductio Phone	n(QP)		Phas Pow Dista Mode	er: AC ince:	L1 120V/60Hz ation mode	Temperat Humidity:	
			Cond	lucted	Fmiss	ion		
File :El	H-2013-40003-13	Dat	a:#2	uotou		ate: 2013/4/24	Time:下午 06:0	17:44
80.0 dE	3uV							
10 0.0 0.150		₩₩ ₩ 1.5	phốt giớ	(MHz)	ji n		Class B Conduction	
No. Mk.	Reading Freq. Level	Correct Factor	Measure- ment	Limit	Over			
	MHz dBuV	dB	dBuV	dBuV	dB	Detector	Comment	
1 0	4681 37.79	0.07	37.86	56.55	-18.69			
	4681 27.37	0.07	27.44	46.55	-19.11	AVG		
	.5703 22.96	0.08	23.04	56.00	-32.96			
	.5703 18.65	0.08	18.73	46.00	-27.27	AVG		
	.1406 41.78	0.08	41.86	56.00	-14.14			
	.9336 31.45	0.10	31.55	56.00	-24.45			
	.9336 20.71	0.10	20.81	46.00	-25.19			
	.1406 33.27	0.12	33.39	56.00	-22.61	OP		
	.1406 21.85	0.12	21.97	46.00	-24.03			
	.6523 33.13	0.13	33.26	56.00	-22.74			
11 4	.6523 23.59	0.13	23.72	46.00	-22.28	AVG		

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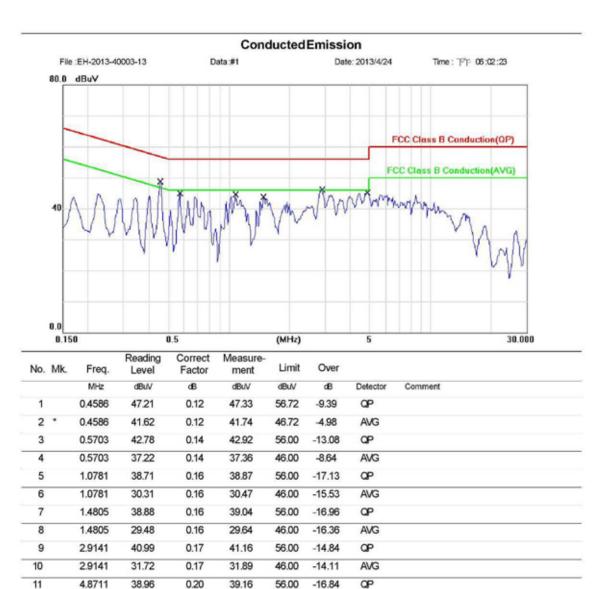
12

4.8711

29.23

FCC ID: PY7PM-0481 IC: 4170B-PM0481

Site ConductionRoom Limit: FCC Class B Conduction(QP) EUT: PDA Phone M/N: C2004 Note. Phase: N Power: AC 120V/60Hz Distance: Mode: Operation mode Temperature: 26 °C Humidity: 60%



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0.20

29.43

46.00

-16.57

AVG

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7. PEAK OUTPUT POWER MEASUREMENT

7.1. Standard Applicable

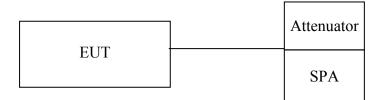
According to \$15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, The Limit: 1Watt. For all other frequency hopping systems in the 2400 - 2483.5 MHz band: The Limit: 0.125 Watts.

According to RSS-210 issue 8,§A8.4(2), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, the maximum conducted output power shall not exceed 1 W. For all other frequency hopping systems, the maximum peak conducted output power shall not exceed 0.125 W.

7.2. Measurement Equipment Used

	Conducted Emission Test Site				
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
ТҮРЕ		NUMBER	NUMBER	CAL.	
Power Sensor	Anritsu	ML2495A	1005007	02/08/2012	02/07/2014
Power Meter	Anritsu	MA2411B	917032	02/08/2012	02/07/2014
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2013	04/14/2014
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/15/2013	03/14/2014
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2013	02/27/2014
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2013	01/04/2014
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2013	02/27/2014
Splitter	Agilent	11636B	N/A	02/28/2013	02/27/2014

7.3. Test Set-up:



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7.4. Measurement Procedure:

- 1. Place the EUT on the table and set it in transmitting mode.
- Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (Max Hold, Detector = Peak, RBW >=20dB bandwidth)
- 3. Record the max. reading.
- 4. Repeat above procedures until all default test channel is completed.

NOTE: cable loss as 4.2dB that offsets in the spectrum

7.5. Measurement Result

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	7.93	7.93	0.00621	1
2441.00	8.04	8.04	0.00637	1
2480.00	7.78	7.78	0.00600	1

1M BR mode:

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	8.88	8.88	0.00773	0.125
2441.00	9.97	9.97	0.00993	0.125
2480.00	9.02	9.02	0.00798	0.125

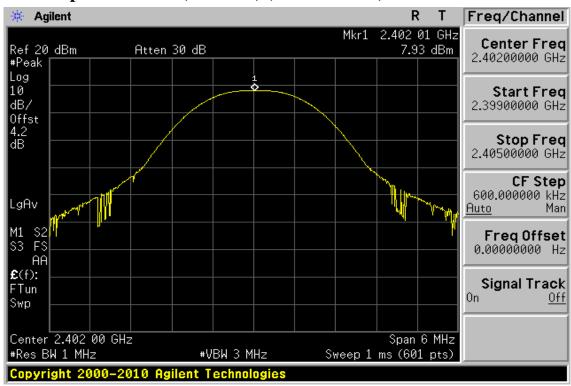
3M EDR mode:

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	8.97	8.97	0.00789	0.125
2441.00	10.11	10.11	0.01026	0.125
2480.00	9.10	9.10	0.00813	0.125

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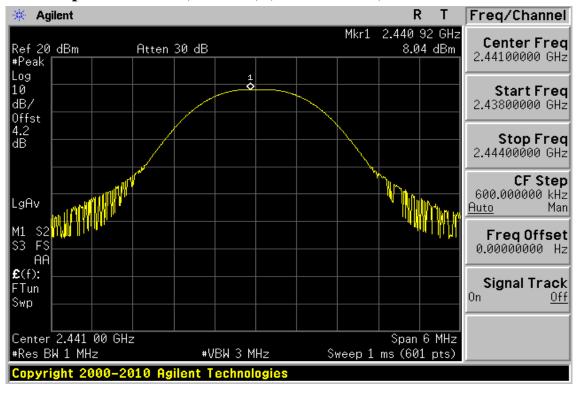
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Peak Power Output Data Plot (CH Low) (1M BR mode)

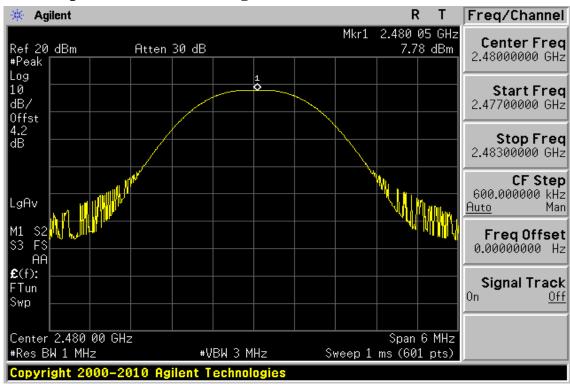
Peak Power Output Data Plot (CH Mid) (1M BR mode)



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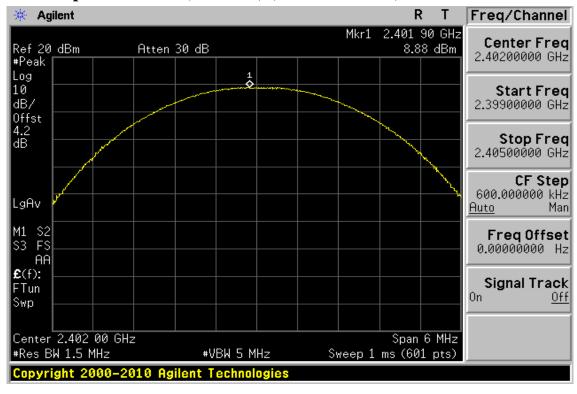
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Peak Power Output Data Plot (CH High) (1M BR mode)

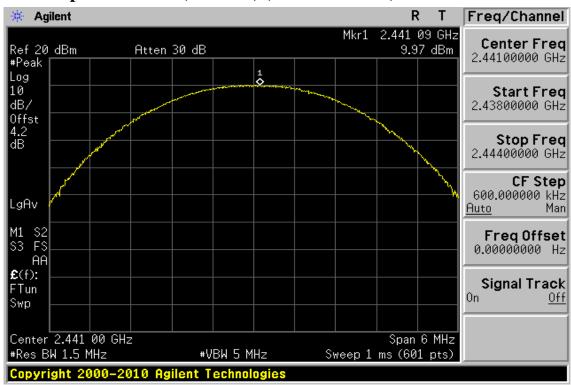
Peak Power Output Data Plot (CH Low) (2M EDR mode)



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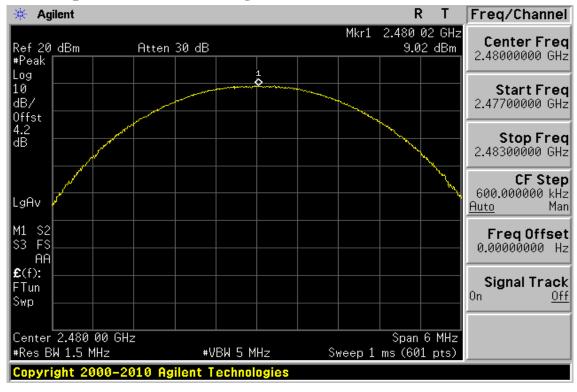
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Peak Power Output Data Plot (CH Mid) (2M EDR mode)

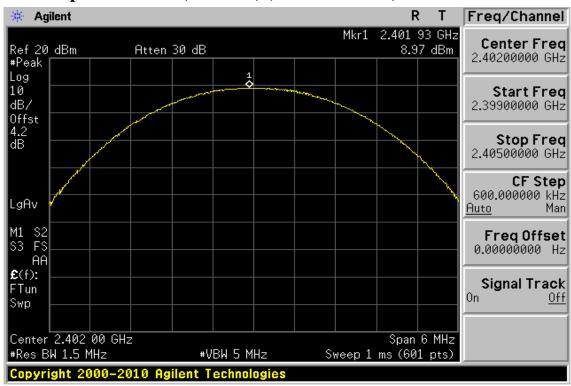
Peak Power Output Data Plot (CH High) (2M EDR mode)



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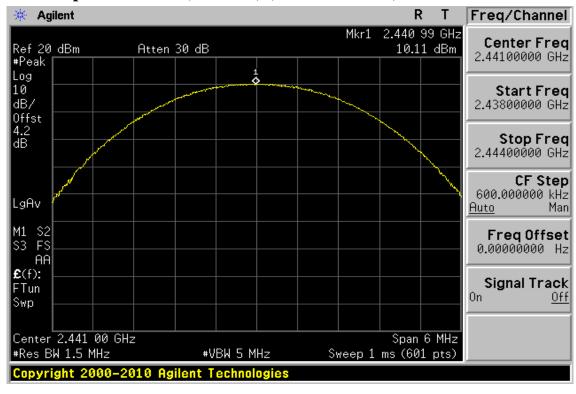
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Peak Power Output Data Plot (CH Low) (3M EDR mode)

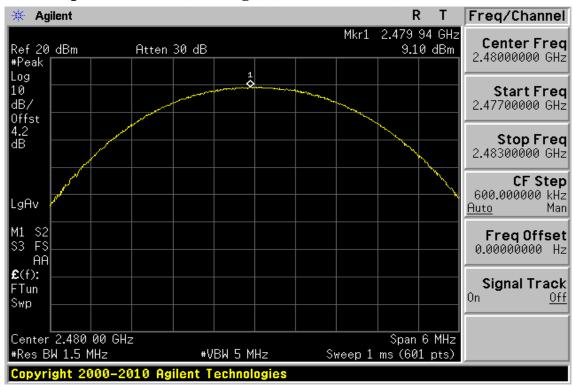
Peak Power Output Data Plot (CH Mid) (3M EDR mode)



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Peak Power Output Data Plot (CH High) (3M EDR mode)

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8. 20dB BANDWIDTH & 99% BANDWIDTH

8.1. Standard Applicable

For 20dB Bandwidth

According to §15.247(a)(1) and RSS210 A8.1(b), for frequency hopping systems operating in the 2400MHz-2483.5 MHz no limit for 20dB bandwidth.

For 99% Bandwidth

RSS-Gen §4.6.1, the transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.

The span between the two recorded frequencies is the occupied bandwidth.

	Conducted Emission Test Site				
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
TYPE		NUMBER	NUMBER	CAL.	
Power Sensor	Anritsu	ML2495A	1005007	02/08/2012	02/07/2014
Power Meter	Anritsu	MA2411B	917032	02/08/2012	02/07/2014
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2013	04/14/2014
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/15/2013	03/14/2014
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2013	02/27/2014
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2013	01/04/2014
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2013	02/27/2014
Splitter	Agilent	11636B	N/A	02/28/2013	02/27/2014

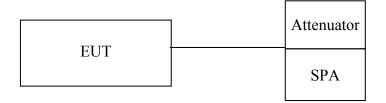
8.2. Measurement Equipment Used

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8.3. Test Set-up



8.4. 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 loss RF cable from the antenna port to the spectrum analyzer.
- 3. Set the spectrum analyzer as RBW=10 kHz (1 % of 20 dB Bandwidth.), VBW = 30 kHz, Span= 3MHz, Sweep=auto, Detector = Peak, and Max hold for 20dB Bandwidth test.
- 4. Mark the peak frequency and –20dB (upper and lower) frequency and Turn on the 99% bandwidth function, max reading.
- 5. Repeat above procedure for 99% Bandwidth, but set RBW to 1% of the span, and detector = peak.
- 6. Repeat above procedures until all test default channel is completed

NOTE: cable loss as 4.2dB that offsets in the spectrum

NOTE2: For the plot of bandwidth measurement, the marker of the 99% bandwidth is diamond-shape while the marker of the 20dB BW is arrow-mark

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8.5. Measurement Result:

20dB Bandwidth:

1M BR mode:

СН	Bandwidth
	(MHz)
Low	0.925496
Mid	0.925444
High	0.925587

2M EDR mode:

СН	Bandwidth	2/3 Bandwidth
	(MHz)	(MHz)
Low	1.289	0.859
Mid	1.288	0.859
High	1.290	0.860

3M EDR mode:

СН	Bandwidth	2/3 Bandwidth
	(MHz)	(MHz)
Lower	1.270	0.847
Mid	1.271	0.847
High	1.272	0.848

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99% Bandwidth:

СН	99% Bandwidth
	(MHz)
Low	0.8152242
Mid	0.9146571
High	0.9025707

2M EDR mode:

СН	99% Bandwidth
	(MHz)
Low	1.0715
Mid	1.1533
High	1.0699

3M EDR mode:

СН	99% Bandwidth
	(MHz)
Low	1.1985
Mid	1.1743
High	1.2004

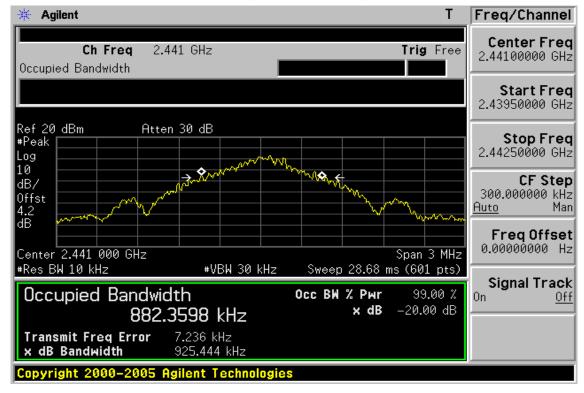
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20dB Band Width Test Data CH-Low (1M BR mode)



20dB Band Width Test Data CH-Mid (1M BR mode)



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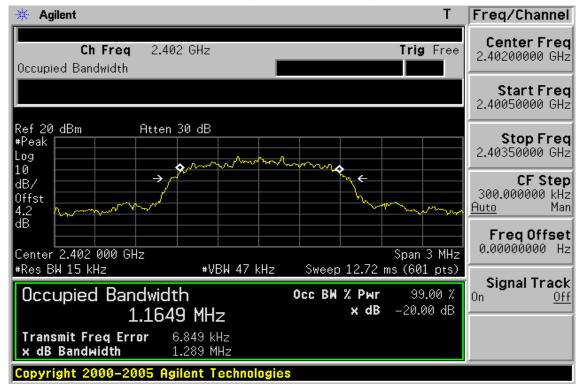
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20dB Width Test Data CH-High (1M BR mode)



20dB Band Width Test Data CH-Low (2M EDR mode)

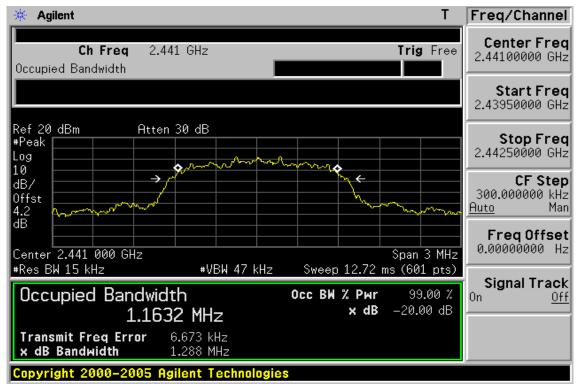


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20dB Band Width Test Data CH-Mid (2M EDR mode)



20dB Band Width Test Data CH-High (2M EDR mode)



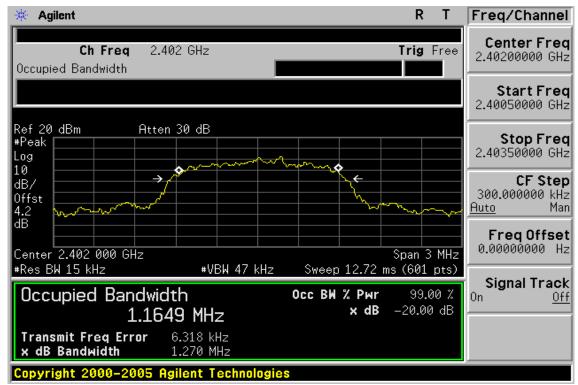
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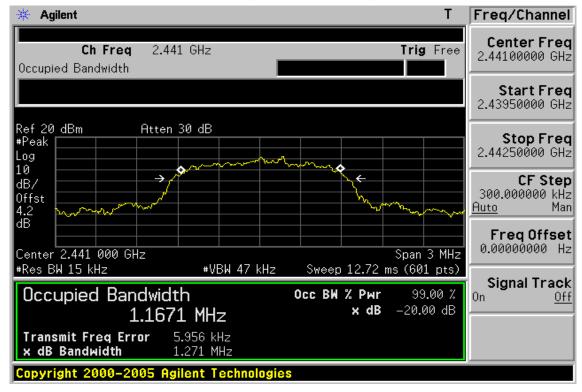
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20dB Band Width Test Data CH-Low (3M EDR mode)



20dB Band Width Test Data CH-Mid (3M EDR mode)



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20dB Width Test Data CH-High (3M EDR mode)



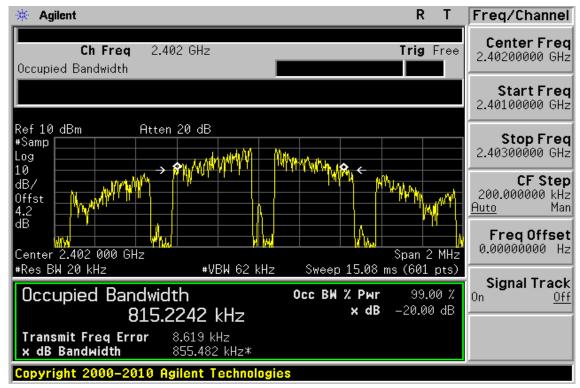
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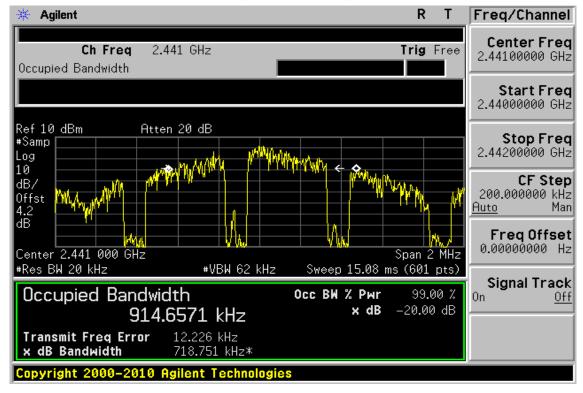
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99% Band Width Test Data CH-Low (1M BR mode)



99%Band Width Test Data CH-Mid (1M BR mode)

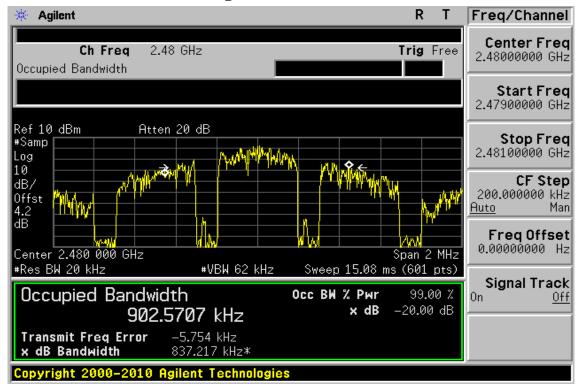


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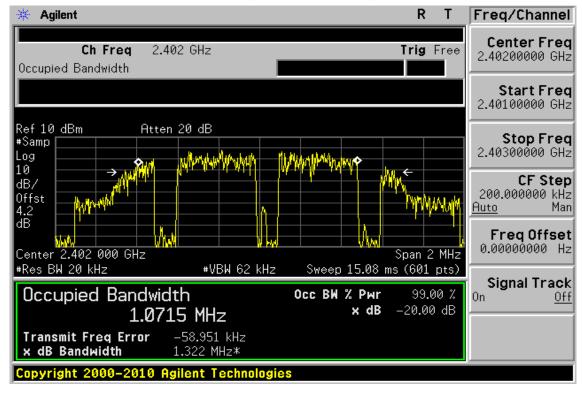
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99% Band Width Test Data CH-High (1M BR mode)



99% Band Width Test Data CH-Low (2M EDR mode)

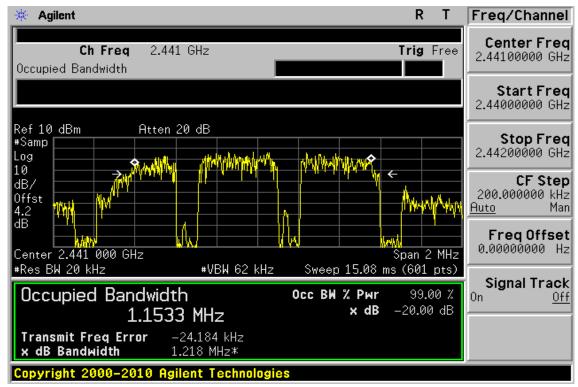


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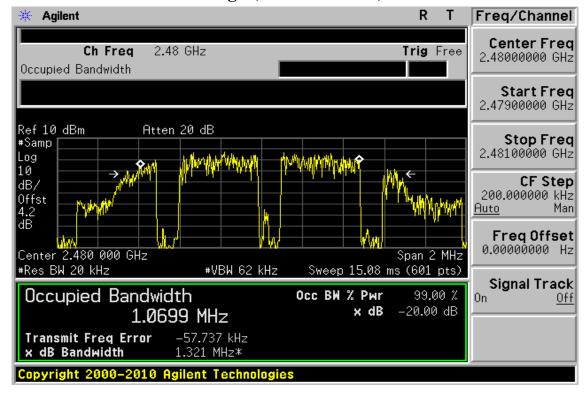
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99% Band Width Test Data CH-Mid (2M EDR mode)



99% Band Width Test Data CH-High (2M EDR mode)



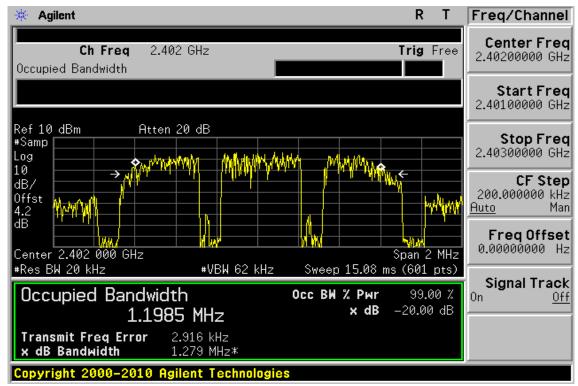
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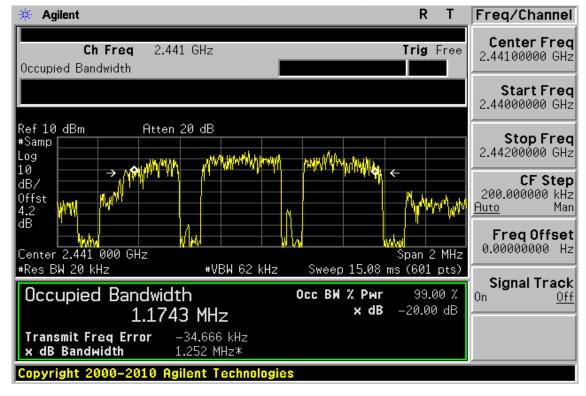
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99% Band Width Test Data CH-Low (3M EDR mode)



99%Band Width Test Data CH-Mid (3M EDR mode)

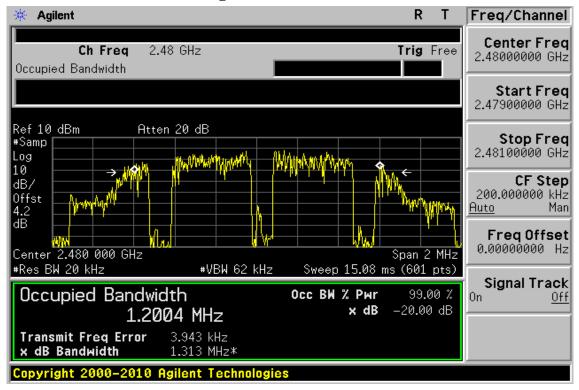


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99%Band Width Test Data CH-High (3M EDR mode)



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9. BAND EDGES EMISSION MEASUREMENT

9.1. Standard Applicable

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in15.209(a).

According to RSS-Gen §7.2.5 and RSS-210 issue 8,§A8.5, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 5 and 6 is not required. In addition, radiated emissions which fall in the restricted bands of Table 3 must also comply with the radiated emission limits specified in Tables 5 and 6.

9.2. Measurement Equipment Used

9.2.1. Conducted Emission at antenna port:

Conducted Emission Test Site								
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.			
ТҮРЕ		NUMBER	NUMBER	CAL.				
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2013	04/14/2014			
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/15/2013	03/14/2014			
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2013	02/27/2014			
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2013	01/04/2014			
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2013	02/27/2014			

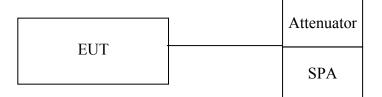
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9.3. Test SET-UP:

9.3.1. Conducted Emission at antenna port:



9.4. Measurement Procedure

100 kHz BANDWIDTH OF BAND EDGES:

- 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 loss 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=300 kHz, Sweep = auto
- 5. Mark Peak, 2.390GHz and 2.4835GHz and record the max. level.
- 6. Repeat above procedures until all frequency measured were complete.

Out-Of-Band EMISSION

- 1. To connect Antenna Port of EUT to Spectrum.
- 2. Set RBW = 100K & VBW = 300K on Spectrum.
- 3. Sweep the frequency to determine spurious emission as seen on spectrum from span of 30MHz to 3G, 3G to 8G, 8G to 13G, 13G to 18G and 18G to 26.5GHz
- 4. Via Software, combine 5 spans of frequency range into two plots containing the range of 30MHz to 3GHz, and 3GHz to 26.5GHz.

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9.5. Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

9.6. Measurement Result -1 Out-Of-Band EMISSION:

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

NOTE: cable loss as 4.2dB that offsets in the spectrum

NOTE: the occurrence of the spike on the conducted emission is the signal of the fundamental emission.

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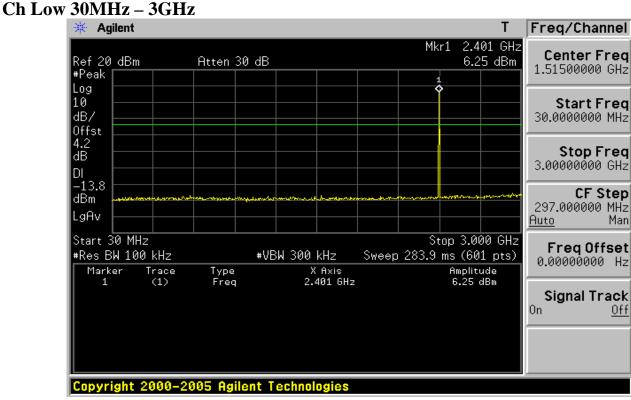
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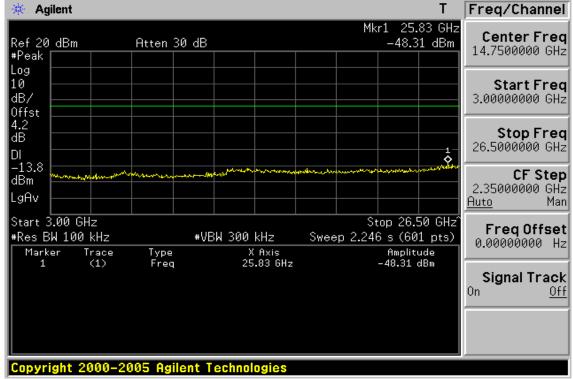
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9.7 Measurement Result -1 Conducted Spurious Emission Measurement Result (Worst: EDR mode)



Ch Low 3GHz – 26.5GHz

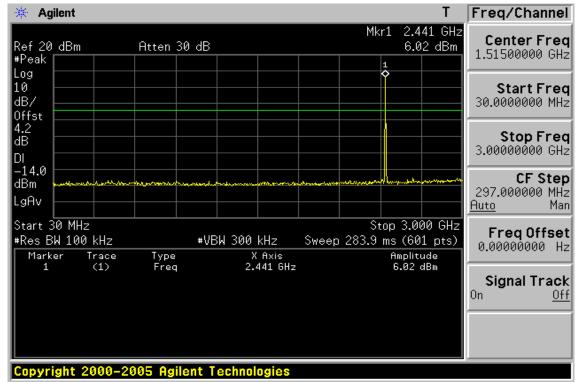


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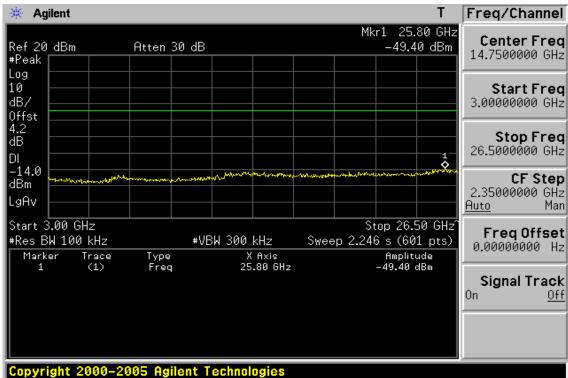
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Ch Mid 30MHz – 3GHz



Ch Mid 3GHz – 26.5GHz

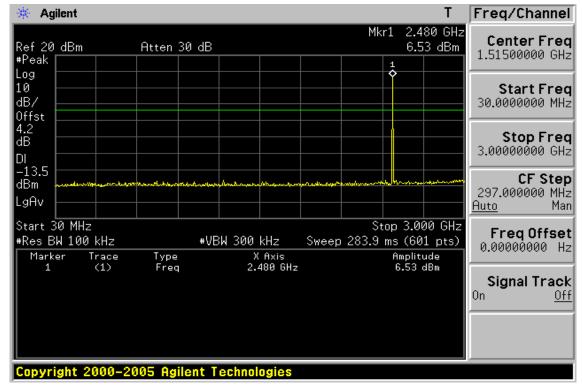


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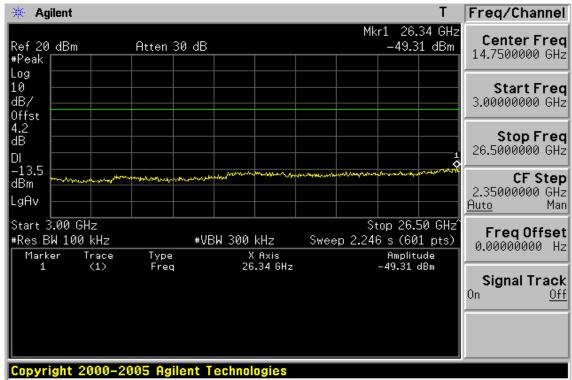
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Ch High 30MHz – 3GHz



Ch High 3GHz – 26.5GHz



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Tabular Results:

Out of Band emission at Fundamental Frequency Operation Mode		antenna terminals 2412 MHz :TX Low	5 – Bluetooth (EI Engine	:Nick	
	Freq. (MHz)	Note F/H/E/S	Reading dBm	Limit dBm	Safe Margin dB
	2401.00	Ref	6.25		
	<30	S		-13.80	
	30-1000	S		-13.80	
	4804.00	Н		-13.80	
	7206.00	Н		-13.80	
	9608.00	Н		-13.80	
	12010.00	Н		-13.80	
	14412.00	Н		-13.80	
	16814.00	Н		-13.80	
	19216.00	Н		-13.80	
	21618.00	Н		-13.80	
	24020.00	Н		-13.80	

-48.31

-13.80

"H": denotes Harmonic Frequency. "S": denotes Spurious Frequency. Note :

S

"---" : denotes Noise Floor. Ref: Reference Signal

25830.00

Note2: Limit = Ref (the highest emission of the fundamental) – 20dBm

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Fundamental Frequency Operation Mode		2441 MHz :TX Mid	Engine	Engineer		
	Freq. (MHz)	Note F/H/E/S	Reading dBm	Limit dBm	Safe Margin dB	
-	2441.00	Ref	6.02			
	<30	S		-14.00		
	30-1000	S		-14.00		
	4882.00	Н		-14.00		
	7323.00	Н		-14.00		
	9764.00	Н		-14.00		
	12205.00	Н		-14.00		
	14646.00	Н		-14.00		
	17087.00	Н		-14.00		
	21969.00	Н		-14.00		
	24410.00	Н		-14.00		
	24370.00	Н		-14.00		
	25800.00	S	-49.40	-14.00	35.40	

"H" : denotes Harmonic Frequency. "S" : denotes Spurious Frequency. Note : "---" : denotes Noise Floor.

Note2: Limit = Ref (the highest emission of the fundamental) – 20dBm

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Fundamental Frequency Operation Mode		2480 MHz :TX High	Engine	eer	:Nick
	Freq. (MHz)	Note F/H/E/S	Reading dBm	Limit dBm	Safe Margin dB
	2480.00	Ref	6.53		
	<30	S		-13.50	
	30-1000	S		-13.50	
	4960.00	Н		-13.50	
	7440.00	Н		-13.50	
	9920.00	Н		-13.50	
	12400.00	Н		-13.50	
	14880.00	Н		-13.50	
	17360.00	Н		-13.50	
	19840.00	Н		-13.50	
	22320.00	Н		-13.50	
	24800.00	Н		-13.50	
	26340.00	S	-49.31	-13.50	35.81

"H" : denotes Harmonic Frequency. "S" : denotes Spurious Frequency. Note : "---" : denotes Noise Floor.

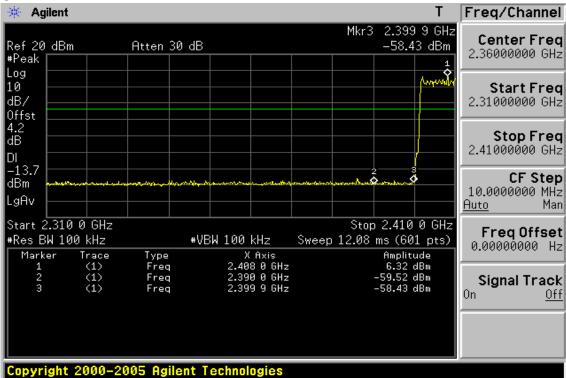
Note2: Limit = Ref (the highest emission of the fundamental) – 20dBm

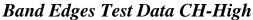
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

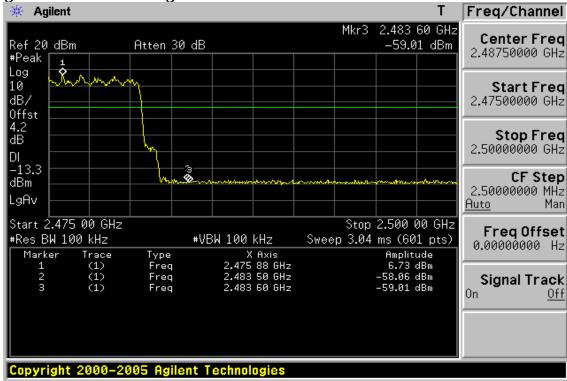
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9.7 Measurement Result -2 100 kHz BANDWIDTH OF BNAD EDGE: Band Edges Test Data CH-Low (Worst: EDR mode)







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Bluetooth EDR – The Worst

Frequency (GHz)	Results (dBm)	Ref (dBm)	Limit (dBm)	Verdict
2.3999	-58.43	6.32	-13.70	Pass
2.4836	-59.01	6.73	-13.30	Pass

Note: Limit = Ref (The highest level of emission) dBm - 20dBm

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10. SPURIOUS RADIATED EMISSION TEST

10.1. Standard Applicable

According to §15.247(d), Emission at antenna port:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Radiated Spurious Emission

Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated 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) (see § 15.205(c)).

And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

According to RSS-Gen §7.2.5 and RSS-210 issue 8,§A8.5, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 5 and 6 is not required. In addition, radiated emissions which fall in the restricted bands of Table 3 must also comply with the radiated emission limits specified in Tables 5 and 6 of RSS-GEN.

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10.2. Measurement Equipment Used:

10.2.1. Radiated emission:

966 Chamber								
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.			
ТҮРЕ		NUMBER	NUMBER	CAL.				
EMI Test Receiver	R&S	ESCI7	100759	05/20/2011	05/19/2013			
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2013	04/14/2014			
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	02/06/2013	02/07/2014			
Spectrum Analyzer	R&S	FSV-30	101398	10/18/2011	10/17/2013			
Bilog Antenna	SCHWAZBECK	VULB9168	378	01/10/2012	01/09/2014			
Horn antenna	ETS.LINDGREN	3117	123995	05/19/2011	05/18/2013			
Horn Antenna	Schwarzbeck	BBHA9170	185	07/11/2011	07/10/2013			
Pre-Amplifier	Agilent	8447D	2944A07676	01/04/2013	01/03/2014			
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/04/2013	01/03/2014			
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M2	02/28/2013	02/28/2014			
Attenuator	Mini-Circuit	BW-S10W2+	004	02/28/2013	02/27/2014			
Turn Table	HD	DT420	N/A	N.C.R	N.C.R			
Antenna Tower	HD	MA240-N	240/657	N.C.R	N.C.R			
Controller	HD	HD100	N/A	N.C.R	N.C.R			
Low Loss Cable	Huber Suhner	966_Rx	9	01/04/2013	01/03/2014			
3m Site NSA	SGS	966 chamber	N/A	07/15/2012	07/14/2013			

966 Chamber									
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.				
ТҮРЕ		NUMBER	NUMBER	CAL.					
EMI Test Receiver	R&S	ESCI7	100759	02/08/2013	02/07/2014				
Horn antenna	ETS.LINDGREN	3117	123995	05/31/2013	05/30/2014				
Horn Antenna	Schwarzbeck	BBHA9170	184	01/17/2012	01/16/2014				
3m Site NSA	SGS	966 chamber	N/A	07/15/2013	07/14/2014				

Note: The measurement was taken place with the long duration of the time, and additional equipment list as shown above indicate those equipment of which has been subject to undertake the calibration in intermediate period of time of the measurement.

NOTE: N.C.R refers to Not Calibrated Required.

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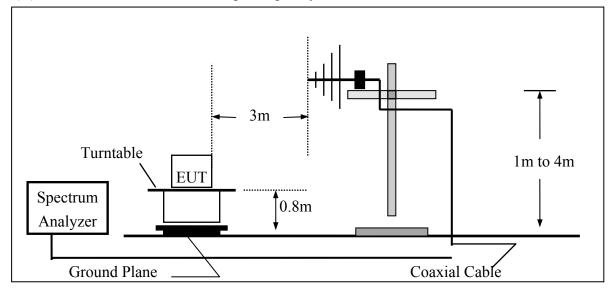
台灣檢驗科技股份有限公司	t (886-2) 2299-3279	f (886-2) 2298-0488	www.tw.sgs.com	
SGS Talwan Ltd.	No. 134, WUKUNGROAD, New Laipe	eiindustriaiPark, wukuDistrict, wew LaipeiCity	/,1alWan24803/新北市五股區新北產到	系園區五工路 134 號



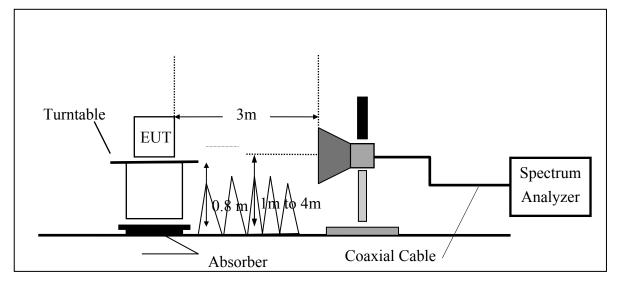
10.3. Test SET-UP:

10.3.1. Radiated emission:

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



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10.4. Measurement Procedure:

Radiated Emission:

- 1. The EUT was placed on a turn table which is 0.8m above ground plane.
- 2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
- 3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
- 4. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
- 5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 7. Repeat above procedures until all frequency of the interest measured were complete.

Auxiliary Procedure (Setting on Spectrum to capture the reading of emission level):

Span = wide enough to fully capture the emission being measured RBW = 1 MHz for $f \ge 1$ GHz, 100 kHz for f < 1 GHz VBW \ge RBW Sweep = auto Detector function = peak Trace = max hold

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10.5. Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

Remark:

- 1. The limit of the emission level is expressed in dBuV/m, which converts 20*log(uV/m)
- 2. Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) Pre_Amplifier Gain(dB)

10.6. Measurement Result:

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

Note: For measurement plot of radiation revealing the compliance of 15.209, please refer to Appendix I.

Note: For the tabular table as presents below, "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency. "---" : denotes Noise Floor

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10.6.1 Radiated Emission **Band Edge: (Worst: EDR mode)**

		n – Band Edg	e: (worst: I				
Operation Ba	and	:EDR		Test Date		:2013-04-24	
Fundamenta	l Frequency	:2402 MHz		Temp./Humi.		:23deg_C/52	RH
Operation M	ode	:Bandedge L	OW	Engineer		:Louis	
EUT Pol.		:E2 Plan		Measurement A	ntenna Pol.	:VERTICAL	,
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
-		Mode	Reading Lev	vel	FS	@3m	-
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV∕m	dBµV/m	dB
2390.00	Е	Average	30.38	2.12	32.50	54.00	-21.50
2390.00	Е	Peak	42.74	2.12	44.86	74.00	-29.14
Operation Ba	and	:EDR		Test Date		:2013-04-24	
Fundamental		:2402 MHz		Temp./Humi.		:2015 04 24	
	1 5		OW	1		<u> </u>	
Operation M	ode	:Bandedge L	,OW	Engineer	(D 1	:Louis	
EUT Pol.		:E2 Plan		Measurement A	ntenna Pol.	:HORIZON]	IAL
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin

rreq.	1,000	Detector	Speeduum	1 40101	rotuur	Emme	margin	
		Mode	Reading Level		FS	@3m		
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	_
2390.00	Е	Average	30.17	2.74	32.91	54.00	-21.09	
2390.00	Е	Peak	42.64	2.74	45.38	74.00	-28.62	

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Operation Ba Fundamental Operation M EUT Pol.	Frequency	:EDR :2480 MHz :Bandedge HIGH :E2 Plan		Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2013-04-24 :23deg_C/52 :Louis :VERTICAL	RH
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Lev	vel	FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Average	31.60	2.53	34.13	54.00	-19.87
2483.50	Е	Peak	46.41	2.53	48.94	74.00	-25.06
Operation Band:EDRFundamental Frequency:2480 MHzOperation Mode:Bandedge HIGHEUT Pol.:E2 Plan		Test Date Temp./Humi. Engineer Measurement A	Antenna Pol.	:2013-04-24 :23deg_C/52 :Louis :HORIZONT	RH		
Freq.	Note	Detector Mode	Spectrum Reading Lev		Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Average	34.17	3.56	37.73	54.00	-16.27
2483.50	Е	Peak	50.53	3.56	54.09	74.00	-19.91

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10.6.2 Radia	ted Spuriou	s Emission M	leasurement Re	sult (worst o	case EDR mo	de)	
Operation Ba		:EDR		st Date		:2103-07-15	
Fundamental	1 2	:2402 MHz		mp./Humi.		:23deg_C/52	RH
Operation Mo	ode	:TX LOW		gineer		:Allen	Ŧ
EUT Pol.		:E2 Plan	Me	asurement A	Antenna Pol.	:VEDRTICA	۸L
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
87.23	S	Peak	43.62	-17.69	25.93	40.00	-14.07
224.00	S	Peak	35.29	-14.92	20.37	46.00	-25.63
549.92	S	Peak	26.89	-8.58	18.31	46.00	-27.69
706.09	S	Peak	27.34	-5.65	21.69	46.00	-24.31
772.05	S	Peak	27.67	-4.57	23.10	46.00	-22.90
946.65	S	Peak	26.95	-2.12	24.83	46.00	-21.17
4804.00	Н	Average	29.13	6.99	36.12	54.00	-17.88
4804.00	Н	Peak	38.18	6.99	45.17	74.00	-28.83
7206.00	Н						
9608.00	Н						
12010.00	Н						
14412.00	Н						
16814.00	Н						
19216.00	Н						
21618.00	Н						
24020.00	Н						

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Operation Ba Fundamental Operation Me EUT Pol.	Frequency	:EDR :2402 MHz :TX LOW :E2 Plan	Т Е	Fest Date Femp./Humi. Engineer Measurement A	.ntenna Pol.	:2103-07-15 :23deg_C/52 :Allen :HORIZON	
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level	1	FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
89.17	S	Peak	33.62	-17.67	15.95	43.50	-27.55
319.06	S	Peak	25.68	-12.13	13.55	46.00	-32.45
512.09	S	Peak	27.03	-9.36	17.67	46.00	-28.33
667.29	S	Peak	26.88	-6.25	20.63	46.00	-25.37
834.13	S	Peak	26.96	-3.85	23.11	46.00	-22.89
867.11	S	Peak	28.27	-3.43	24.84	46.00	-21.16
4804.00	Н	Average	26.18	7.03	33.21	54.00	-20.79
4804.00	Н	Peak	38.37	7.03	45.40	74.00	-28.60
7206.00	Н						
9608.00	Н						
12010.00	Н						
14412.00	Н						
16814.00	Н						
19216.00	Н						
21618.00	Н						
24020.00	Н						

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Operation Ba Fundamental Operation Me EUT Pol.	Frequency	:EDR :2441 MHz :TX MID :E2 Plan] I	Fest Date Femp./Humi. Engineer Measurement A	ntenna Pol.	:2013-04-03 :23deg_C/52 :Louis :VERTICAL	
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Leve	1	FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
40.67	S	Peak	43.23	-13.48	29.75	40.00	-10.25
157.07	S	Peak	29.30	-12.29	17.01	43.50	-26.49
346.22	S	Peak	26.70	-11.73	14.97	46.00	-31.03
577.08	S	Peak	27.50	-8.05	19.45	46.00	-26.55
714.82	S	Peak	27.70	-5.51	22.19	46.00	-23.81
897.18	S	Peak	32.94	-2.87	30.07	46.00	-15.93
4882.00	Н	Average	25.95	7.16	33.11	54.00	-20.89
4882.00	Н	Peak	39.07	7.16	46.23	74.00	-27.77
7323.00	Н						
9764.00	Н						
12205.00	Н						
14646.00	Н						
17087.00	Н						
19528.00	Н						
21969.00	Н						
24410.00	Н						

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Operation Ba Fundamental Operation Me EUT Pol.	Frequency	:EDR :2441 MHz :TX MID :E2 Plan	Test Date Temp./Humi. Engineer Measurement Antenna Pol.		441 MHzTemp./Humi.:23deg_C/5X MIDEngineer:Louis		:2013-04-03 :23deg_C/52 :Louis :HORIZON	
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m		
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
39.70	S	Peak	31.31	-13.47	17.84	40.00	-22.16	
116.33	S	Peak	29.75	-14.98	14.77	43.50	-28.73	
345.25	S	Peak	28.09	-11.73	16.36	46.00	-29.64	
579.02	S	Peak	29.04	-8.01	21.03	46.00	-24.97	
770.11	S	Peak	27.46	-4.61	22.85	46.00	-23.15	
897.18	S	Peak	28.75	-2.87	25.88	46.00	-20.12	
4882.00	Н	Average	25.65	7.10	32.75	54.00	-21.25	
4882.00	Н	Peak	38.11	7.10	45.21	74.00	-28.79	
7323.00	Н							
9764.00	Н							
12205.00	Н							
14646.00	Н							
17087.00	Н							
19528.00	Н							
21969.00	Н							
24410.00	Н							

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Operation Ba Fundamental Operation Me EUT Pol.	Frequency	:EDR :2480 MHz :TX HIGH :E2 Plan	MHzTemp./Humi.HGHEngineer		:2013-04-03 :23deg_C/52 :Louis :VERTICAL		
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Leve	el	FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
39.70	S	Peak	42.06	-13.47	28.59	40.00	-11.41
114.39	S	Peak	31.91	-15.22	16.69	43.50	-26.81
343.31	S	Peak	27.54	-11.76	15.78	46.00	-30.22
563.50	S	Peak	28.57	-8.31	20.26	46.00	-25.74
776.90	S	Peak	27.64	-4.52	23.12	46.00	-22.88
897.18	S	Peak	33.44	-2.87	30.57	46.00	-15.43
4960.00	Н	Average	26.02	7.17	33.19	54.00	-20.81
4960.00	Н	Peak	37.24	7.17	44.41	74.00	-29.59
7440.00	Н						
9920.00	Н						
12400.00	Н						
14880.00	Н						
17360.00	Н						
19840.00	Н						
22320.00	Н						
24800.00	Н						

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Operation Ba Fundamental Operation Mo EUT Pol.	Frequency	:EDR :2480 MHz :TX HIGH :E2 Plan	1		:2480 MHz Temp./Humi. :23deg_C :TX HIGH Engineer :Louis		:2013-04-03 :23deg_C/52 :Louis :HORIZONT	
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m		
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
39.70	S	Peak	29.69	-13.47	16.22	40.00	-23.78	
160.95	S	Peak	26.94	-12.36	14.58	43.50	-28.92	
336.52	S	Peak	29.10	-11.83	17.27	46.00	-28.73	
435.46	S	Peak	29.90	-10.31	19.59	46.00	-26.41	
721.61	S	Peak	27.98	-5.40	22.58	46.00	-23.42	
897.18	S	Peak	29.33	-2.87	26.46	46.00	-19.54	
4960.00	Н	Average	25.95	7.02	32.97	54.00	-21.03	
4960.00	Н	Peak	37.12	7.02	44.14	74.00	-29.86	
7440.00	Н							
9920.00	Н							
12400.00	Н							
14880.00	Н							
17360.00	Н							
19840.00	Н							
22320.00	Н							
24800.00	Н							

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11. FREQUENCY SEPARATION

11.1. Standard Applicable

According to \$15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25 kHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

According to RSS 210 issue 8, A8.1(b), frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

11.2. Measurement Equipment Used:

Conducted Emission Test Site										
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.					
ТҮРЕ		NUMBER	NUMBER	CAL.						
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2013	04/14/2014					
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/15/2013	03/14/2014					
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2013	02/27/2014					
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2013	01/04/2014					
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2013	02/27/2014					

11.3. Test Set-up:

DUT	Attenuator
EUT	SPA

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11.4. 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 loss RF cable from the antenna port to the spectrum analyzer.
- 3. Set center frequency of spectrum analyzer = middle of hopping channel.
- 4. Set the spectrum analyzer as RBW, VBW=100 kHz, Adjust Span to 5MHz, Sweep = auto.
- 5. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

11.5. Measurement Result:

Channel separation (MHz)	Limit	Result
1	>=25 kHz or 2/3 times 20dB bandwidth	PASS

Note: Refer to next page for plots.

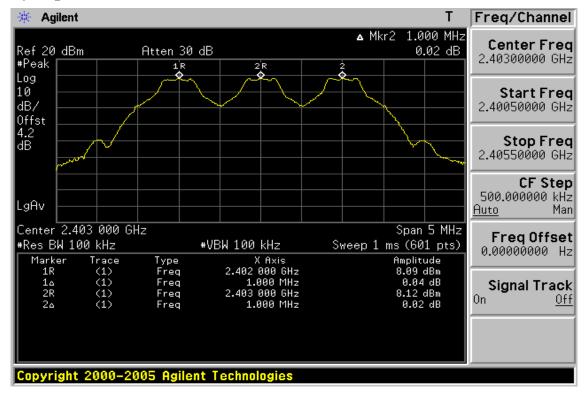
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Frequency Separation Test Data



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12. NUMBER OF HOPPING FREQUENCY

12.1. Standard Applicable

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands shall use at least 15 hopping frequencies.

According to RSS-210 issue 8,§A8.1(d), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 15 hopping channels, the maximum conducted output power shall not exceed 1 W. For all other frequency hopping systems, the maximum peak conducted output power shall not exceed 0.125 W.

12.2. Measurement Equipment Used:

Conducted Emission Test Site										
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.					
TYPE		NUMBER	NUMBER	CAL.						
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2013	04/14/2014					
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/15/2013	03/14/2014					
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2013	02/27/2014					
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2013	01/04/2014					
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2013	02/27/2014					

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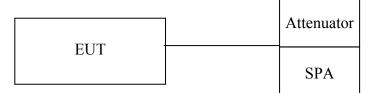
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12.3. Test Set-up:



12.4. 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 loss RF cable from the antenna port to the spectrum analyzer.
- 3. Set spectrum analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = auto.
- 4. Set the spectrum analyzer as RBW=430 kHz, VBW=1.5MHz., Detector = Peak
- 5. Max hold, view and count how many channel in the band.

12.5. Measurement Result:

Note: Refer to next page for plots.

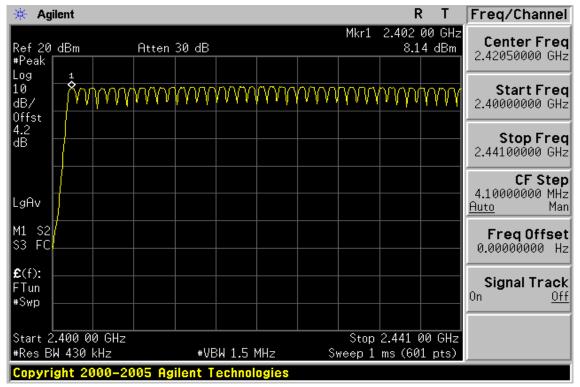
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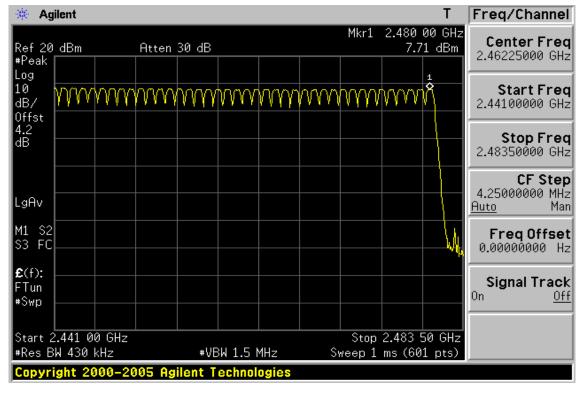


Channel Number

2.4 GHz – 2.441GHz



2.441 GHz – 2.4835GHz



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Tabular Data of Total Channel Number:

	Channel Number	Limit
2.4 GHz – 2.441GHz	40	
2.441 GHz – 2.4835GHz	39	15
2.4GHz ~2.4835GHz	(40+39) = 79	

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13. TIME OF OCCUPANCY (DWELL TIME)

13.1. Standard Applicable

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

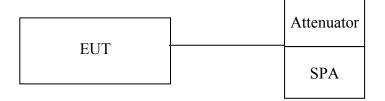
According to RSS-210 issue 8,§A8.1(d), Frequency hopping systems operating in the 2400-2483.5 MHz band shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Transmissions on particular hopping frequencies may be avoided or suppressed provided that a minimum of 15 hopping channels are used.

Limit: 0.4s = 400ms

13.2. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
ТҮРЕ		NUMBER	NUMBER	CAL.	
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2011	04/14/2014
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/17/2012	03/14/2014
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2012	02/27/2014
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2012	01/04/2014
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2012	02/27/2014

13.3. Test Set-up:



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13.4. 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 loss 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, 3MHz, Span = 0Hz, Detector = Peak, Adjust Sweep = 2~7ms.
- 5. Repeat above procedures until all frequency of the interest measured were complete.

Formula Deduced: time occupancy of one time slot X Hopping rate / total slot in one channel / total channel that hops X period of working channels.

Where, standard hopping rate is 1600 hops/s, slot in one channel for DH1, DH3, and DH5 is 2, 4, and 6, respectively.

DH1 consists of single time slot of the uplink, and one slot of the downlink Total Slot: 2

DH3 consists of three time slot of the uplink, and one slot of the downlink. Total Slot: 4

DH5 consists of five time slot of the uplink, and one slot of the downlink. Total Slot: 6

Note: the result of the complete test default channel at 1Mbps is recorded on the test report, 2Mbps, and 3Mbps only records the measurement result at middle channel that reveals no much deviation.

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13.5. Tabular Result of the Measurement:

1Mbps (GFSK):

Test Channel:	Mode:	Measurement Result (ms):	Limit (ms):
Low:	DH1	121.60	400ms
	DH3	262.72	400ms
	DH5	307.52	400ms
Middle:	DH1	121.60	400ms
	DH3	262.72	400ms
	DH5	307.52	400ms
High:	DH1	121.60	400ms
	DH3	262.72	400ms
	DH5	307.52	400ms

2Mbps (/4 DQPSK):

Test Channel:	Mode:	Measurement Result (ms):	Limit (ms):
Middle:	2DH1	123.84	400ms
	2DH3	262.72	400ms
	2DH5	307.52	400ms

3Mbps (8DPSK):

Test Channel:	Mode:	Measurement Result (ms):	Limit (ms):
Middle:	3DH1	123.84	400
	3DH3	262.72	400
	3DH5	307.52	400

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A period time = 0.4 (s) * 79 = 31.6 (s)

CH Low	DH1 time slot =	0.380 (ms) * (1600/2/79)	* 31.6 =	121.60 (ms)
	DH3 time slot =	1.642 (ms) * (1600/4/79)	* 31.6 =	262.72 (ms)
	DH5 time slot =	2.883 (ms) * (1600/6/79)	* 31.6 =	307.52 (ms)

CH Mid DH1 time slot =
$$0.380 \text{ (ms)} * (1600/2/79) * 31.6 = 121.60 \text{ (ms)}$$

DH3 time slot = $1.642 \text{ (ms)} * (1600/4/79) * 31.6 = 262.72 \text{ (ms)}$
DH5 time slot = $2.883 \text{ (ms)} * (1600/6/79) * 31.6 = 307.52 \text{ (ms)}$

CH High DH1 time slot =
$$0.380 \text{ (ms)} * (1600/2/79) * 31.6 = 121.60 \text{ (ms)}$$

DH3 time slot = $1.642 \text{ (ms)} * (1600/4/79) * 31.6 = 262.72 \text{ (ms)}$
DH5 time slot = $2.883 \text{ (ms)} * (1600/6/79) * 31.6 = 307.52 \text{ (ms)}$

2Mbps:

	CH Mid	2DH1 time slot =	0.387 (ms) * (1600/2/79)	* 31.6 =	123.84 (ms)
		2DH3 time slot =	1.642 (ms) * (1600/4/79)	* 31.6 =	262.72 (ms)
		2DH5 time slot =	2.883 (ms) * (1600/6/79)	* 31.6 =	307.52 (ms)
3Mbps:					
	CH Mid	3DH1 time slot =	0.387 (ms) * (1600/2/79)	* 31.6 =	123.84 (ms)
		3DH3 time slot =	1.642 (ms) * (1600/4/79)	* 31.6 =	262.72 (ms)
		3DH5 time slot =	2.883 (ms) * (1600/6/79)	* 31.6 =	307.52 (ms)

13.6. Measurement Result:

Note: Refer to next page for plots.

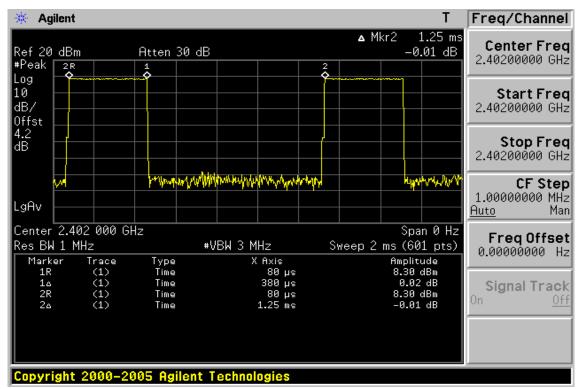
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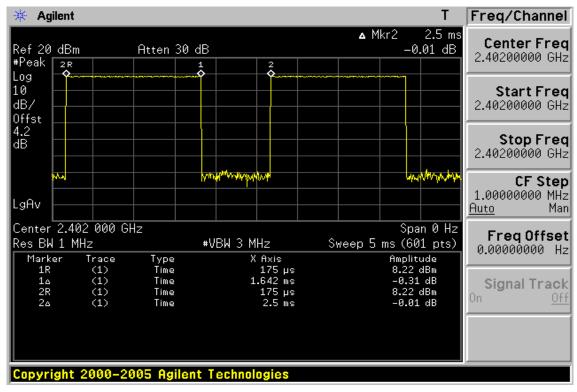


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CH-Low DH1



DH3



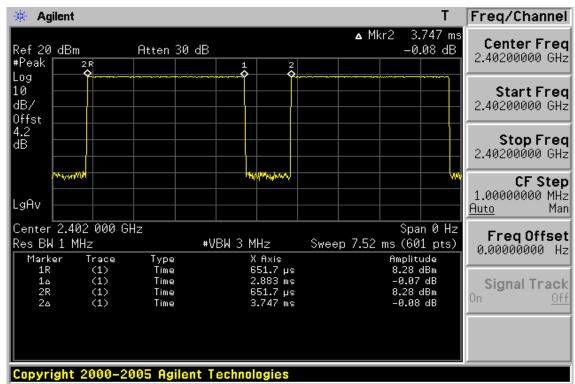
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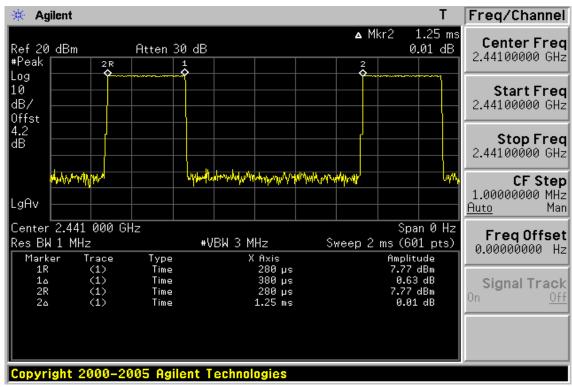


DH5



CH-Mid

DH1



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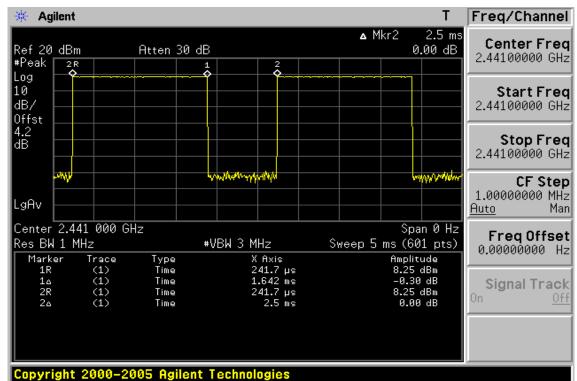
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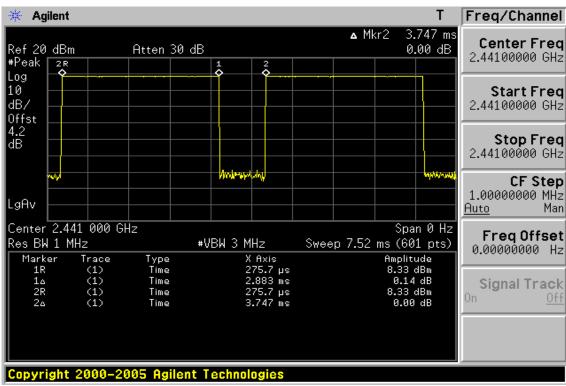
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DH3



DH5



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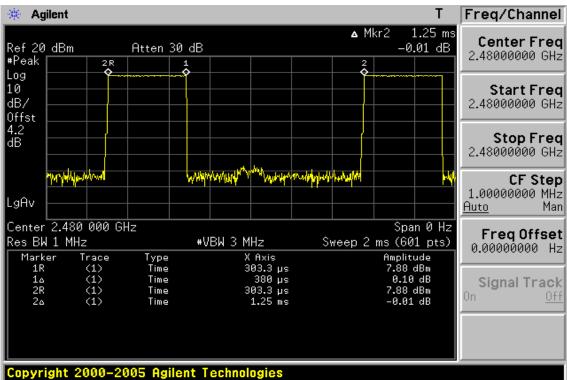
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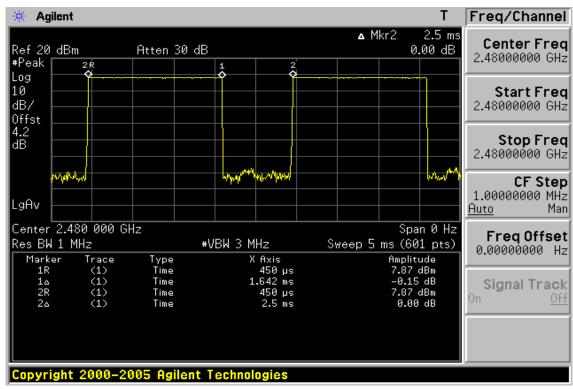


CH-High





DH3



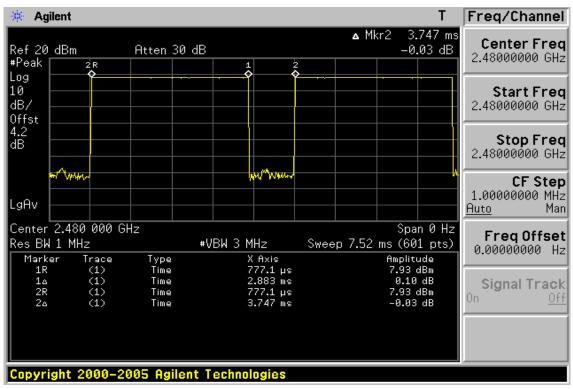
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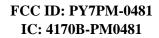


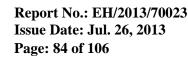
DH5



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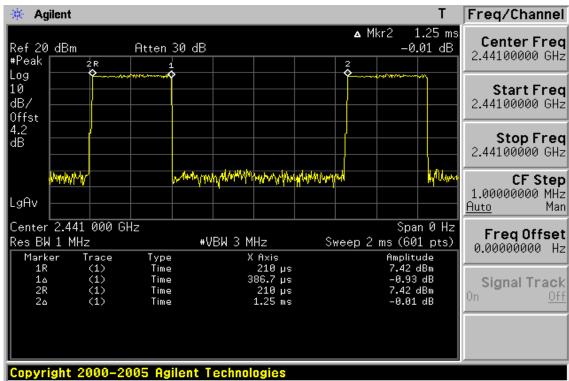
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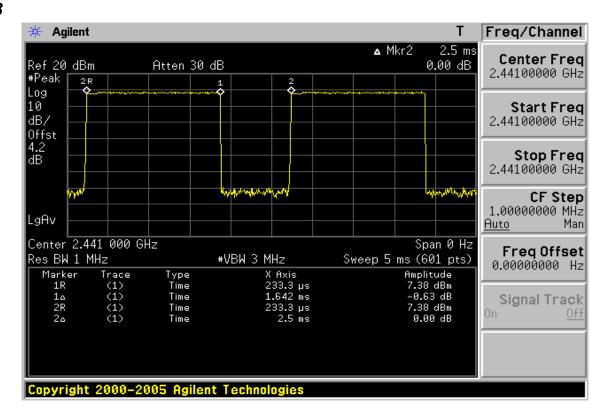




CH-Mid 2DH1



2DH3



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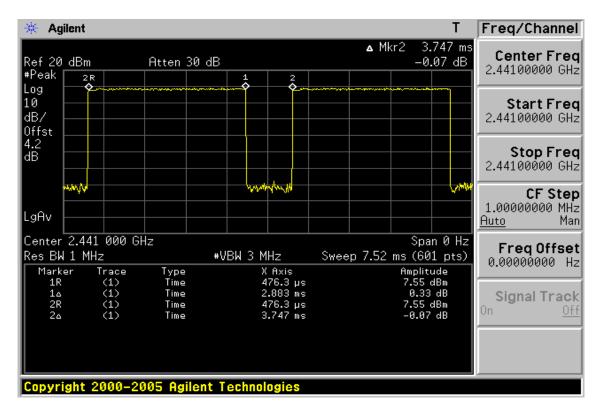
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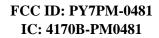


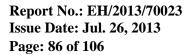
2DH5



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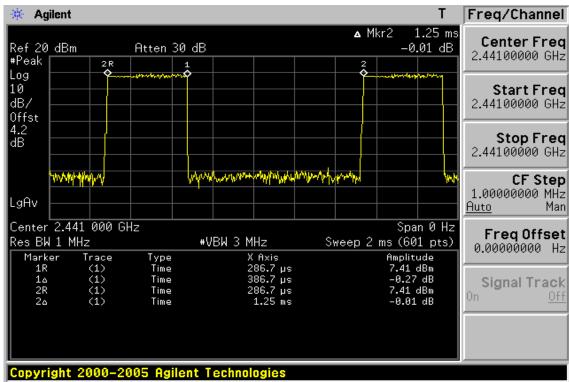
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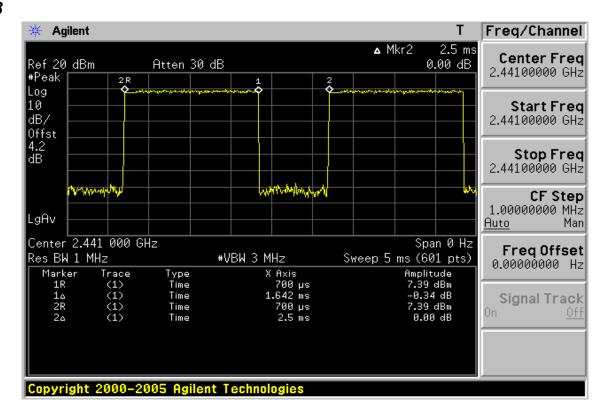




CH-Mid **3DH1**



3DH3



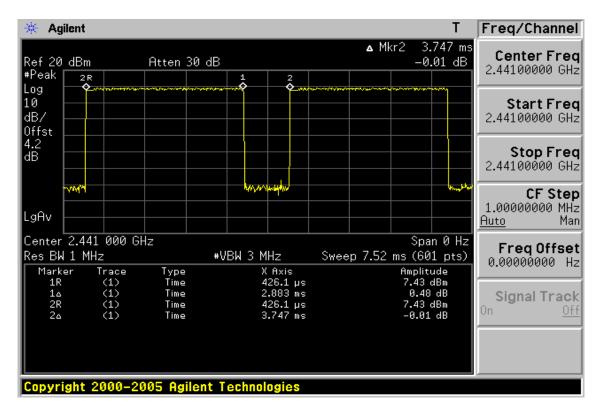
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3DH5



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14. ANTENNA REQUIREMENT

14.1. Standard Applicable

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

According to RSS-GEN 7.1.2, a transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. Any antenna gain in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power before using the power limits specified in RSS-210 or RSS-310 for devices of RF output powers of 10 milliwatts or less. For devices of output powers greater than 10 milliwatts, except devices subject to RSS-210 Annex 8 (Frequency Hopping and Digital Modulation Systems Operating in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz Bands) or RSS-210 Annex 9 (Local Area Network Devices), the total antenna gain shall be added to the measured RF output power before using the specified power limits. For devices subject to RSS-210 Annex 8 or Annex 9, the antenna gain shall not be added.

14.2. Antenna Connected Construction

The directional gains of antenna used for transmitting is 2.55dBi, and the antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

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APPENDIX 1

MEASUREMENT PLOT OF RADIATED SPURIOUS EMISSION

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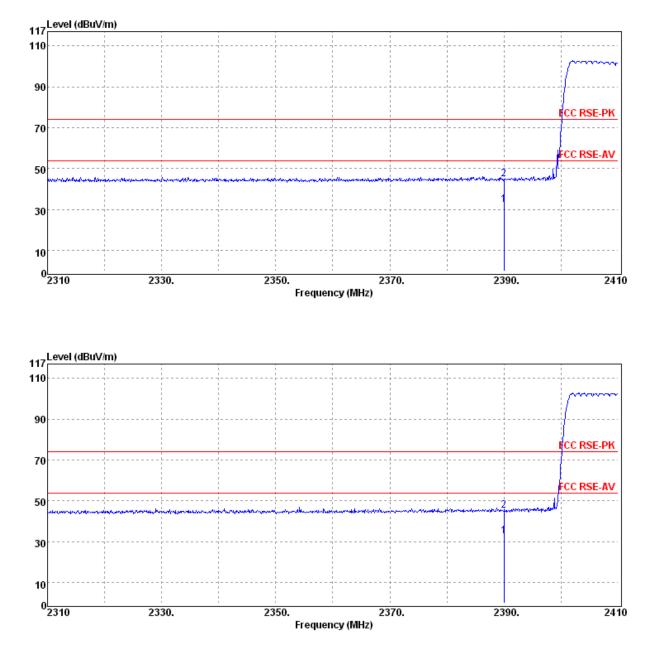
Band Edges Radiated Emission:

Note: The emission that surpasses the limit of peak represents the fundamental emission of the operation that does not account to be conformed to the limit of the interest.

Note: The trace on RE (radiation emission) plot is as colored blue, and the detection manner we've

employed is peak detector.

employed is pean detected			
Operation Band	:EDR	Test Date	:2013-04-24
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23deg_C/52RH
Operation Mode	:Bandedge LOW	Engineer	:Louis
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:Ver. / Hor.



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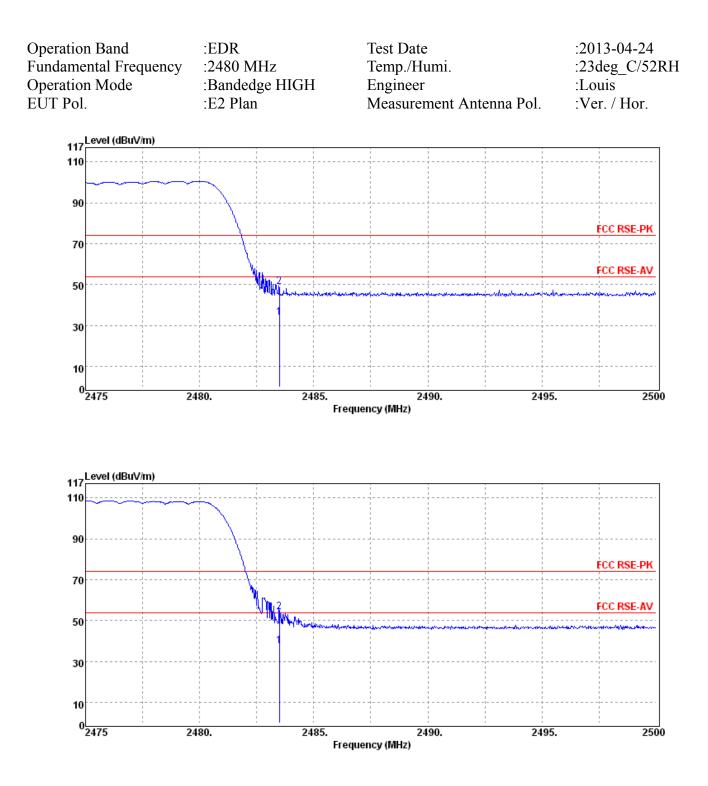
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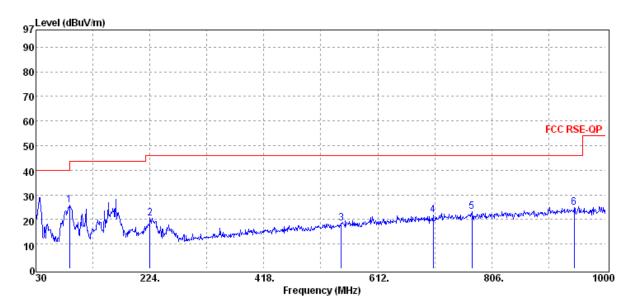
Radiated Spurious Emission Measurement photos Result (below 1GHz)

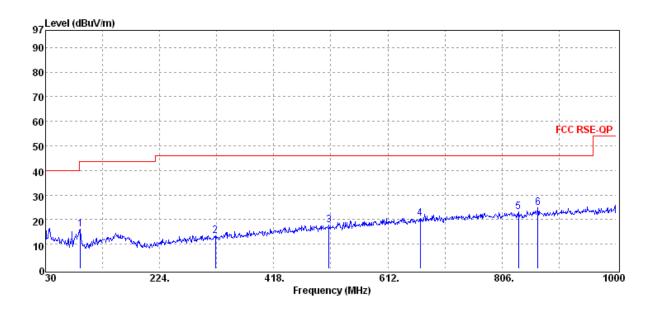
Note: The trace on RE (radiation emission) plot is as colored blue, and the detection manner we've

employed is peak detector.

Operation Band	:EDR
Fundamental Frequency	:2402 MHz
Operation Mode	:TX LOW
EUT Pol.	: E2 Plan

Test Date:2013-07-15Temp./Humi.:23deg_C/52RHEngineer:AllenMeasurement Antenna Pol.<td:Ver. / Hor.</td>





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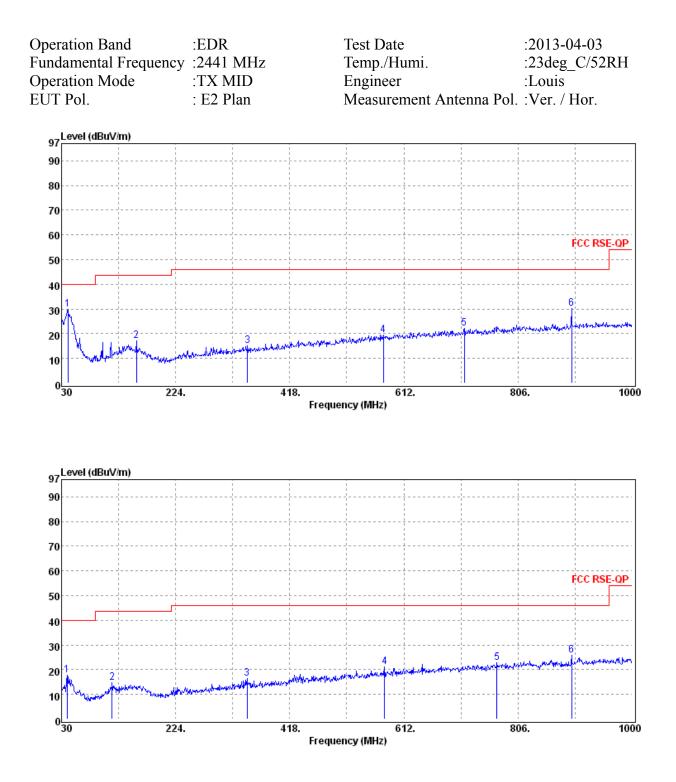
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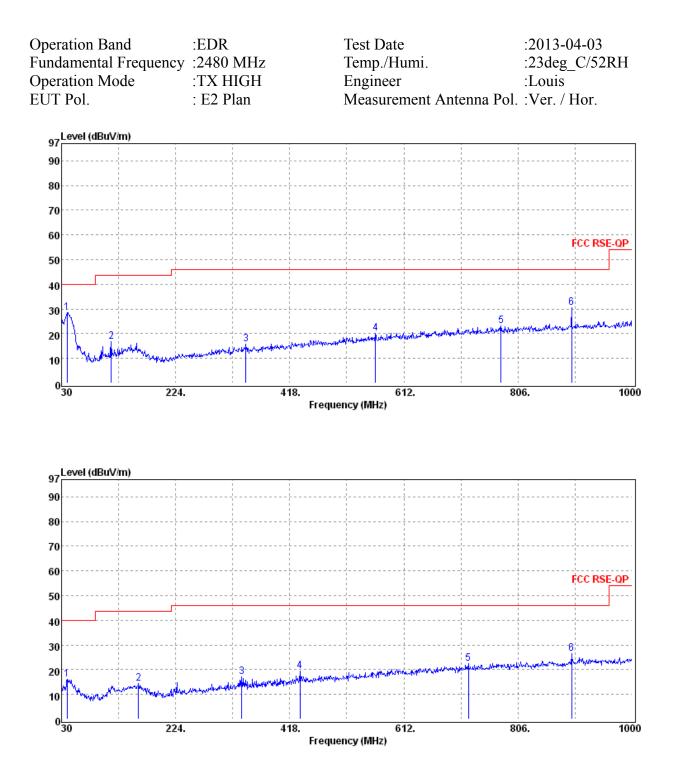
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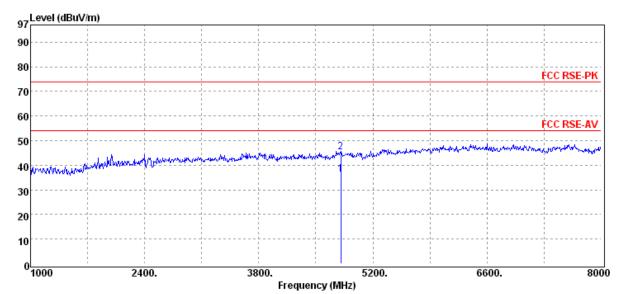
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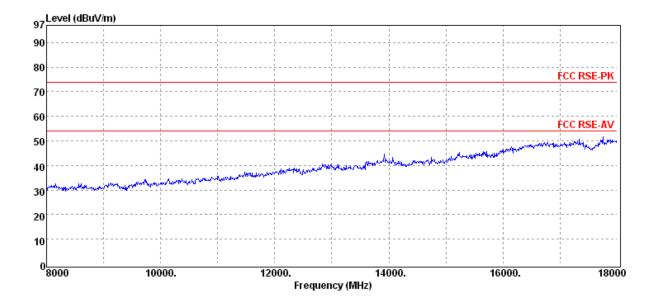
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Radiated Spurious Emission Measurement photos Result (above 1GHz)

-			
Operation Band	:EDR	Test Date	:2013-07-15
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23deg_C/52RH
Operation Mode	:TX LOW	Engineer	: Allen
EUT Pol.	: E2 Plan	Measurement Antenna Pol.	:VERTICAL





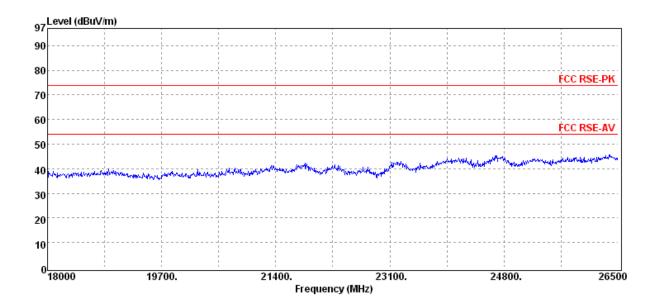
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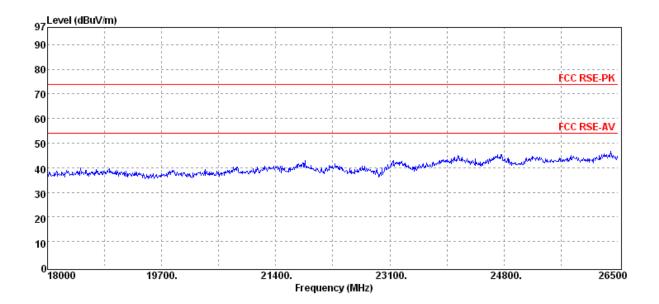
eration Band Indamental Findamental Findamenta	requency	:TX LOW		Test Date Temp./H Engineer	umi.		: Allen	_C/52RH
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0					200.	66	500.	80
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0 1000 97 Level (dBuV/m 90					200.	66	500.	
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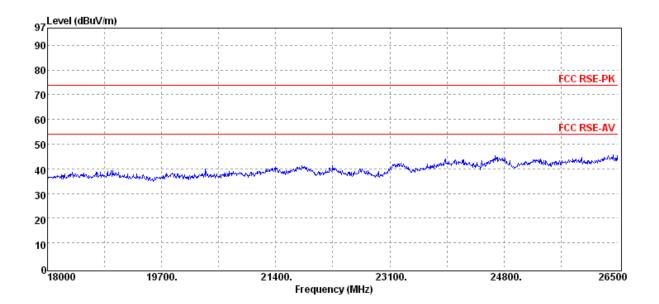
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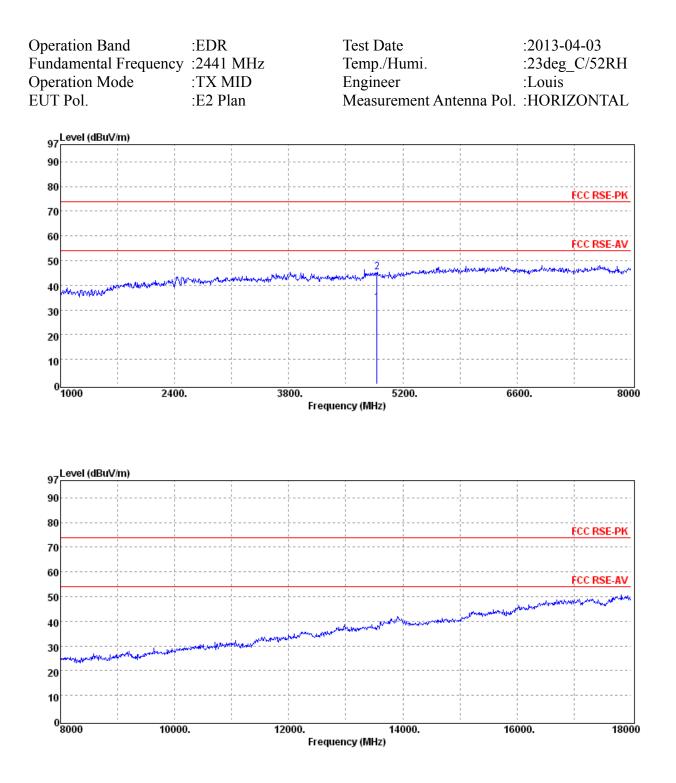


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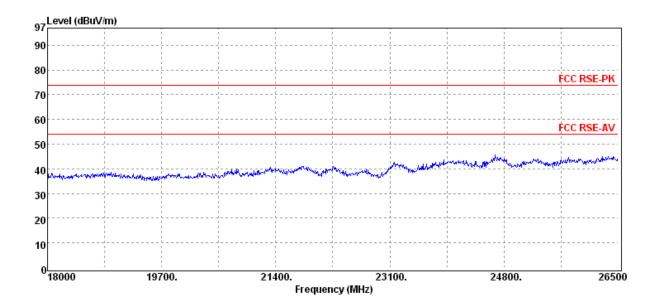


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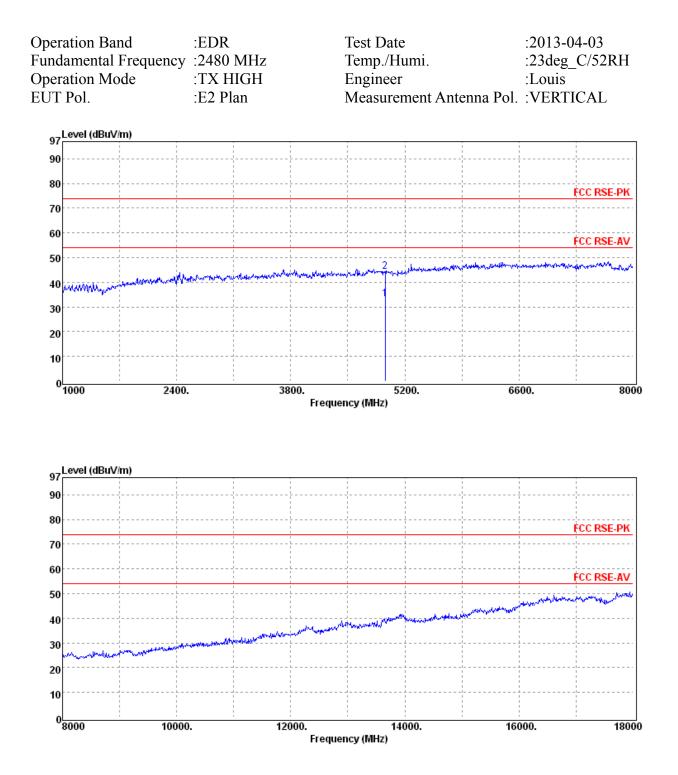




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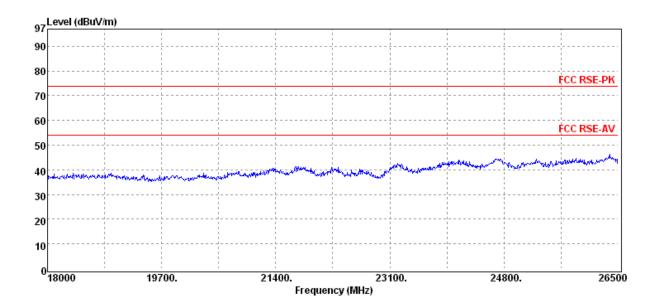
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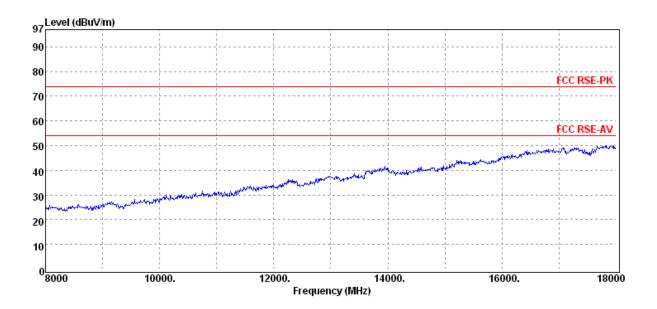
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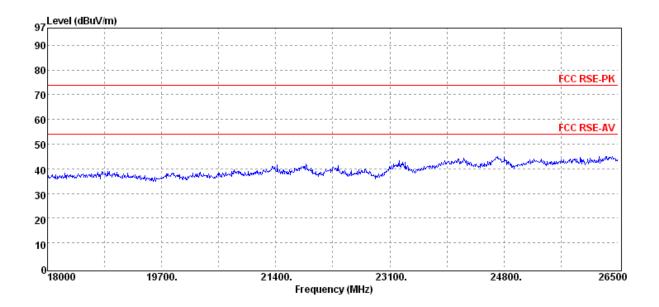


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