

Report No.: EH/2012/B0006 Issue Date: Apr. 29, 2013

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ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

OF

Product Name: Mobile Phone

Brand Name: Sony

Marketing Name: C2104

Model No.: PM-0300-BV

Model Difference: N/A

FCC ID: **PY7PM-0300**

IC: 4170B-PM0300

Report No.: EH/2012/B0006

Issue Date: Apr. 29, 2013

FCC Rule Part: §15.247, Cat: DSS

IC Rule Part: RSS-210 issue 8 :2010, Annex 8

Prepared for: Sony Mobile Communications AB

Nva Vattentornet 22188 Lund/SWEDEN

SGS Taiwan Ltd.

Electronics & Communication Laboratory

Prepared by: No.134, Wu Kung Road, New Taipei Industrial

Park, Wuku District, New Taipei City, Taiwan

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VERIFICATION OF COMPLIANCE

Applicant: Sony Mobile Communications AB

Nya Vattentornet 22188 Lund/SWEDEN

Product Name: Mobile Phone

Brand Name: Sony

Marketing Name: C2104

Model No.: PM-0300-BV

Model Difference: N/A

FCC ID: PY7PM-0300

IC: 4170B-PM0300

File Number: EH/2012/B0006

Date of test: Nov. 06, 2012 ~ Nov. 30, 2012

Date of EUT Received: Nov. 06, 2012

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 / Engineer

Prepared By:

Cherry Chen / Clerk

Approved By:

Date: Apr. 29, 2013

Apr. 29, 2013

Jim Chang / Supervisor

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Version

Version No.	Date	Description
00	Dec. 01, 2012	Initial creation of document
01	Mar. 08, 2013	Rephrase the description of measurement procedure. Re-organize the order of the measurement plot
02	Mar. 11, 2013	Incorporate the product features in the section of the general product.
		Revise the description of test procedure, reformat
03	Mar. 19, 2013	the test item to more readable, and viewable.
03		Remove description not relevant to the respective
		regulatory provision.
		Revise the incorrect naming of product specifica-
		tion. Revise the misusage of reference to regula-
0.4	Man 26 2012	tory provision. Update the uncertainty table re-
04	Mar. 26, 2013	flecting the uncertainty is the maximum tolerance
		above and below the measurement point. Adjust-
		ing the gain of the antenna to 3 decimal places.
05	A 20, 2012	Revise the section of summary with the appropri-
05	Apr. 29, 2013	ate ruling part

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MEASUREMENT PLOT OF RADIATED SPURIOUS EMISSION85

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1. GENERAL INFORMATION

1.1. Product description

General:

Product Name:	Mobile Pho	one	
Brand Name:	Sony		
Marketing Name:	C2104		
Model No.:	PM-0300-E	3V	
Model Difference:	N/A		
Data Cable (USB):	Model No.:	EC450, Supplier: K-one AI-0700	
Simple Hands-Free (SHF):	Model No.: MH410c, Supplier: Foster Electric Type No.: AG-1100		
Car Charger:	Model No.: AN400, Supplier: Salcomp Type No.: CAA-0003013		
Hardware Version:	A		
Software Version:	15.0.A.1.1		
	3.7Vdc from Li-Polymer battery		
Power Supply:	Battery: Model No.: BA900, Supplier: Sony Type No.: AB-0500		
	Adapter: Model No.: EP800, Supplier: Sa Type No.: CAA-0002016-US		

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Bluetooth_BR+EDR:

Bluetooth Version:	$V2.1 + EDR (GFSK + \pi/4DQPSK + 8DPSK)$
Channel number:	79 channels
Modulation type:	Frequency Hopping Spread Spectrum
Transmit Power:	9.75dBm
Frequency Range:	2.402GHz – 2.480GHz
Dwell Time:	<= 0.4s
Antenna Designation:	PIFA Antenna, Gain: 0.02dBi
Type of Emission:	891KF7D (GFSK) / 1M18G7D (π/4DQPSK) /1M18G7D (8DPSK)

Bluetooth Low Energy:

Frequency Range:	2402 – 2480MHz
Bluetooth Version:	V4.0 Dual mode
Channel number:	40 channels
Modulation type:	GFSK
Transmit Power:	1.45 dBm (Peak)
Antenna Designation:	PIFA Antenna, Gain: 0.02dBi
Type of Emission:	1M09F7D

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:	23K0F1D

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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: 20.36dBm g: 19.19dBm	DSSS, OFDM	b: 15M3G1D g: 17M2D1D	
11n	HT20 2412-2462	11	HT20: 19.13dBm	OFDM	n: 18M0D1D	
11a	5725-5850	5	a: 19.38 dBm		a: 17M9D1D	
11n (5GHz)	HT20 5725-5850	5	HT20: 19.26 dBm	OFDM	n_20HT:18M4D1D	
11n (5GHz)	HT40 5725-5850	2	HT40: 19.50 dBm		n_40HT:36M8D1D	
Antenna l	Designation:	PIFA Antenna, 2.4GHz Gain: 0.02dBi 5GHz Gain: 3.11 dBi (5725MHz-5850MHz)				
Modulation type:		CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM				
Transition Rate:		802.11 a: 6/9/12/18/24/36/48/54 Mbps 802.11 b: 1/2/5.5/11 Mbps 802.11 g: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 72.2Mbps 802.11 n_40MHz: 13.5 – 150Mbps				

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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	15.95dBm	16.21dBm		17M7D1D
11a	5250~5350	4	15.87dBm	16.90dBm	OFDM	17M6D1D
	5470~5725	11	15.97dBm	19.37dBm		17M9D1D
	HT20 5150~5250	4	HT20: 15.97dBm	HT20: 16.23dBm		18M5D1D
11n	HT20 5250~5350	4	HT20: 15.92dBm	HT20: 16.95dBm	OFDM	18M5D1D
	HT20 5470~5725	11	HT20: 15.98dBm	HT20: 19.38dBm		18M5D1D
	HT40 5150~5250	2	HT40: 15.77dBm	HT40: 16.03dBm		36M2D1D
11n	HT40 5250~5350	2	HT40: 15.78dBm	HT40: 16.81dBm	OFDM	36M3D1D
	HT40 5470~5725	5	HT40: 15.93dBm	HT40: 19.33dBm		36M4D1D
Antenna D	Designation	PIFA Antenna, 5GHz Gain: 0.26 dBi (5150MHz-5250MHz) 5GHz Gain: 1.03 dBi (5250MHz-5350MHz) 5GHz Gain: 3.40 dBi (5470MHz-5725MHz)				
Modulatio	n type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM				
Transition	Rate:	802.11 a: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 72.2Mbps 802.11 n_40MHz: 13.5 – 150Mbps				

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GSM / WCDMA:

	Operating Frequency	Rated Power		
	GSM/GPRS 850, Class 12	824.2 MHz– 848.8 MHz	33 dBm	
	EDGE 850, Class 12	824.2 MHz– 848.8 MHz	27 dBm	
	GSM/GPRS 1900, Class 12	1850.2MHz – 1909.8MHz	30 dBm	
Cellular Phone Standards Frequency	EDGE 1900, Class 12	1850.2MHz – 1909.8MHz	26 dBm	
Range and Power.	WCDMA/HSUPA/HSDPA /HSPA+ Band II	1852.4MHz – 1907.6MHz	24 dBm	
	WCDMA/HSUPA/HSDPA /HSPA+ Band IV	1712.4MHz - 1752.6MHz	24 dBm	
	WCDMA/HSUPA/HSDPA /HSPA+ Band V 826.4MHz - 846.6MHz		24 dBm	
Type of Emission:	GSM 850: 249KGXW, GSM 1900: 253KGXW GPRS 850: 250KGXW, GPRS 1900: 247KGXW EDGE 850: 243KG7W, EDGE 1900: 251KG7W WCDMA Band II: 4M19F9W, WCDMA Band IV: 4M19F9W, WCDMA Band V: 4M20F9W HSDPA Band II: 4M24F9W, HSDPA Band IV: 4M24F9W, HSDPA Band II: 4M24F9W HSUPA Band IV: 4M25F9W HSUPA Band V: 4M25F9W			
IMEI:	004402146156595			

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: PY7PM-0300 filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules and IC: 4170B-PM0300 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 were 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 are: 990257 and 236194, Canada Registration Number: 4620A-04.

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

Not available for this EUT intended for grant.

1.6. Equipment Modifications

Not available for this EUT intended for grant.

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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

The EUT (Transmitter) was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

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 requirements in Section 7.3.1 of ANSI C63.4:2009 & ANSI C63.10:2009. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and Average detector mode.

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 Subclause 8.3.1.2 of ANSI C63.4:2009, ANSI C63.10:2009.and DA 00-705.

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2.4. Configuration of Tested System

Fig. 2-1 Radiated Emission & Conducted (Antenna Port) Configuration

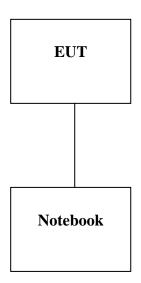


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	Notebook	IBM	T60	L3DK794	Un-shielded	Un-shielded
2.	Bluetooth Test Software	QRCT	2.4.83.0	N/A	N/A	N/A

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Fig. 2-2 AC Power line Conducted Emission

EUT

Table 2-2 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
2.	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(b)	20dB Balldwidth &	Compliant
RSS-Gen §4.6.3	99% Power Bandwidth	Compliant
RSS-Gen §4.6.1	99% 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)	Courious Emission	Compliant
RSS-Gen §7.2.5	Spurious Emission	Compliant
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,	Antanna Paguirament	Compliant
RSS- Gen issue §7.1.2	Antenna Requirement	Compliant

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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 E1 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, and Time of Occupancy due to its characteristics of wider bandwidth.

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

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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:

-	30MHz - 180MHz: +/- 3.37dB
Massacra ant un containte	180MHz -417MHz: +/- 3.19dB
Measurement uncertainty (Polarization: Vertical)	0.417GHz-1GHz: +/- 3.19dB
(I olulization : Vertical)	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 logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

6.2. 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 C63.10:2009.
- 2. The EUT was plug-in the AC/DC Power adapter. The host system was placed on the center of the back edge on the test table. The peripherals was placed on the side of the host PC system. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
- 3. The spacing between the peripherals was 10 centimeters.
- 4. External I/O cables were draped along the edge of the test table and bundle when necessary.
- 5. The host system was connected with 120Vac/60Hz power source.

6.3. 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.

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6.4. Measurement Equipment Used:

Conducted Emission Test Site							
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.		
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	03/23/2012	03/22/2013		
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	03/23/2012	03/22/2013		
Coaxial Cables	N/A	WK CE Cable	N/A	01/05/2012	01/04/2013		

6.5. Measurement Result

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Note: Refer to next page for measurement data and plots.

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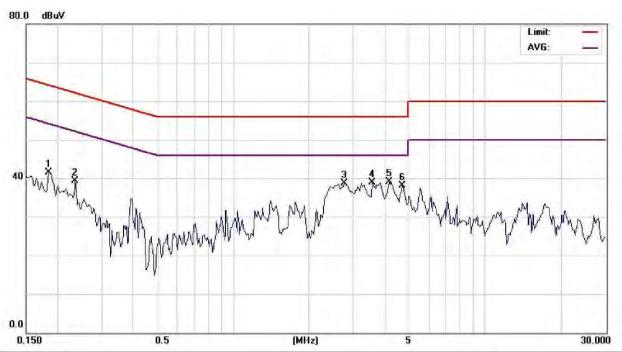


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AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode			Test Date:	Nov. 19, 2012
Temperature:	26 ℃	Humidity:	60 %	Test By:	Marcus



Site ConductionRoom

Limit: FCC Class B Conduction(QP)

EUT: MobilePhone M/N: PM-0300-BV

Mode: Operationmode

Note:

Phase:	LT	remperature	e. 20	0
Power:	AC 120V/60Hz	Humidity:	60%	

Distance:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
		MHz	dBuV	dВ	dBuV	dBuV	dВ	Detector	Comment
1		0.1852	41.36	0.22	41.58	64.25	-22.67	peak	
2		0.2360	39.14	0.21	39.35	62.24	-22.89	peak	
3		2.7678	38.41	0.27	38.68	56.00	-17.32	peak	
4		3.5811	38.70	0.29	38.99	56.00	-17.01	peak	
5	*	4.1793	38.79	0.30	39.09	56.00	-16.91	peak	
6		4.7032	37.82	0.32	38.14	56.00	-17.86	peak	

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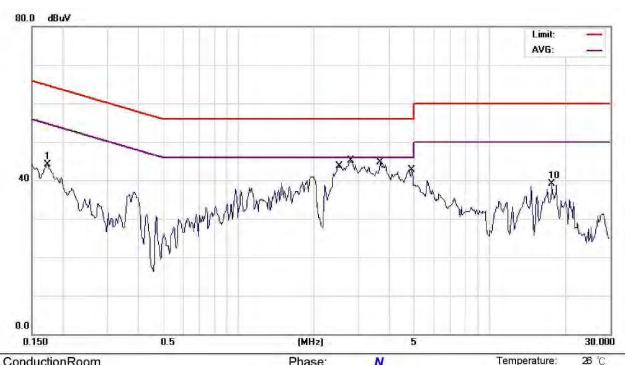
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Site ConductionRoom

Limit: FCC Class B Conduction(QP)

EUT: MobilePhone M/N: PM-0300-BV Mode: Operationmode

Note:

Phase: N AC 120V/60Hz Power: Humidity: 60%

Distance:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
		MHz	dBuV	dВ	dBuV	dBuV	dB	Detector	Comment
1		0.1735	43.84	0.33	44.17	64.79	-20.62	peak	
2		2.5271	37.60	0.34	37.94	56.00	-18.06	QP	
3	*	2.5271	28.29	0.34	28.63	46.00	-17.37	AVG	
4		2.7958	37.50	0.34	37.84	56.00	-18.16	QP	
5		2.7958	27.72	0.34	28.06	46.00	-17.94	AVG	
6		3.6607	35.22	0.35	35.57	56.00	-20.43	QP	
7		3.6607	26.66	0.35	27.01	46.00	-18.99	AVG	
8		4.9004	32.96	0.37	33.33	56.00	-22.67	QP	
9		4.9004	23.54	0.37	23.91	46.00	-22.09	AVG	
10		17.7896	38.33	0.69	39.02	60.00	-20.98	peak	

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7. PEAK OUTPUT POWER MEASUREMENT

7.1. Standard Applicable

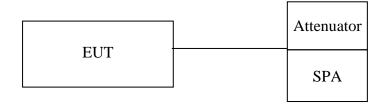
According to \$15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850MHz band: 1Watt. For all other frequency hopping systems in the 2400 – 2483.5MHz band: 0.125 Watts.

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.

Measurement Equipment Used

Weasurement Equipment Oscu									
Conducted Emission Test Site									
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.				
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	04/15/2011	04/14/2013				
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/17/2012	03/16/2014				
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2012	02/27/2013				
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2012	01/04/2013				
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2012	02/27/2013				
Splitter	Agilent	11636B	N/A	02/28/2012	02/27/2013				

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.
- 2. 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 peak function, >20dB bandwidth, >=RBW)
- 3. Record the max. reading.
- 4. Repeat above procedures until all frequency measured were complete.

NOTE: cable loss as 0.9dB that offsets in the spectrum

7.5. Measurement Result

1M BR mode:

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	8.67	8.67	0.00736	1
2441.00	8.42	8.42	0.00695	1
2480.00	8.28	8.28	0.00673	1

2M EDR mode:

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	9.30	9.30	0.00851	0.125
2441.00	9.03	9.03	0.00800	0.125
2480.00	8.89	8.89	0.00774	0.125

3M EDR mode:

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	9.75	9.75	0.00944	0.125
2441.00	9.44	9.44	0.00879	0.125
2480.00	9.23	9.23	0.00838	0.125

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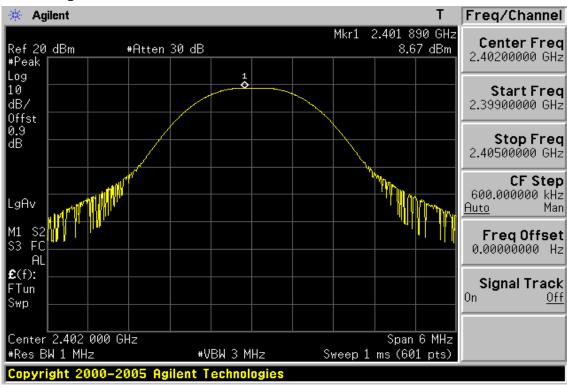
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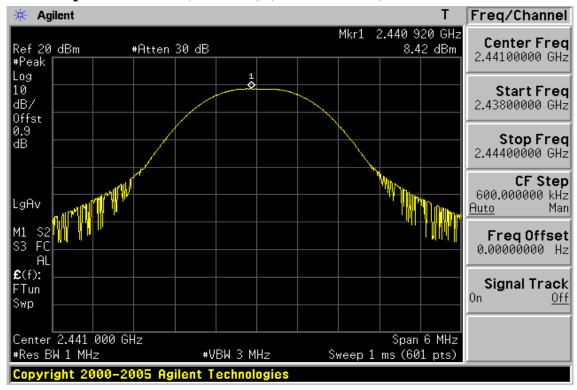
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Peak Power Output Data Plot (CH Low) (1M BR mode)



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



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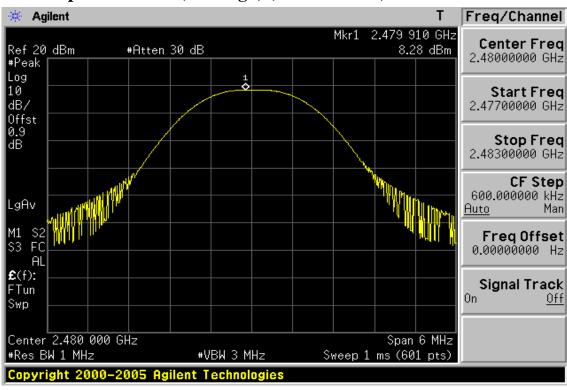
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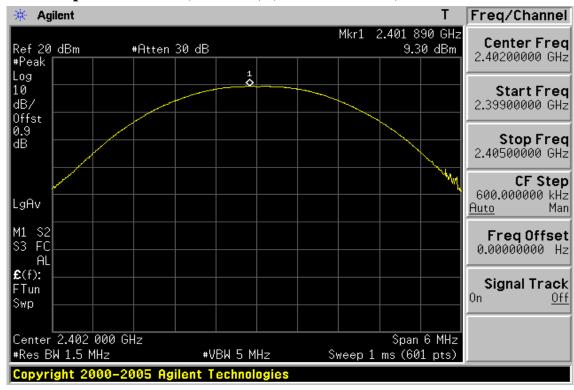
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Peak Power Output Data Plot (CH High) (1M BR mode)



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



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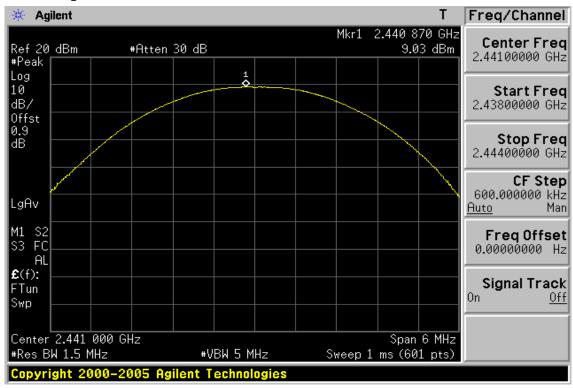
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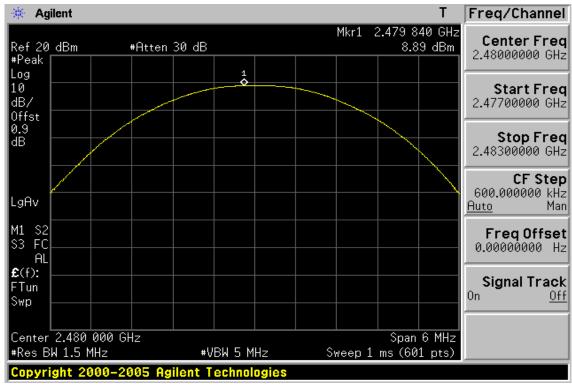
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Peak Power Output Data Plot (CH Mid) (2M EDR mode)



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



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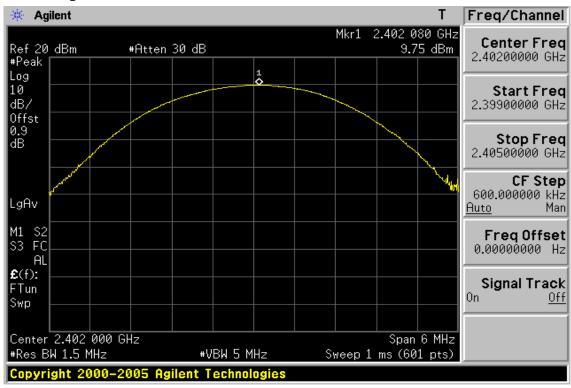
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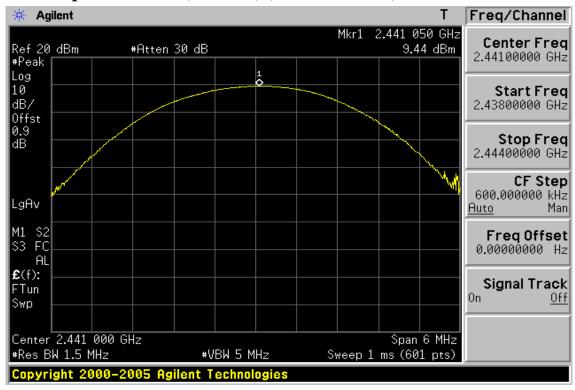
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Peak Power Output Data Plot (CH Low) (3M EDR mode)



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



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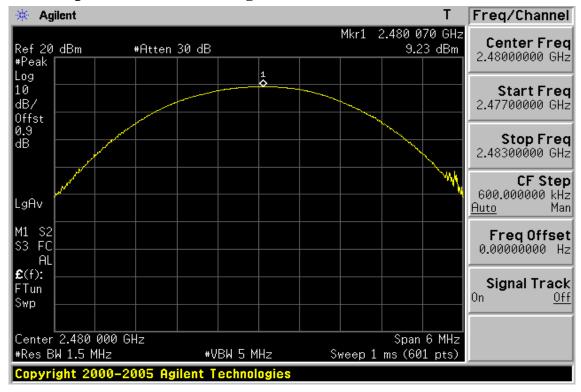
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Peak Power Output Data Plot (CH High) (3M EDR mode)



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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.

8.2. Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
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	04/15/2011	04/14/2013
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/17/2012	03/16/2014
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2012	02/27/2013
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2012	01/04/2013
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2012	02/27/2013
Splitter	Agilent	11636B	N/A	02/28/2012	02/27/2013

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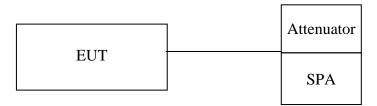
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8.3. Test Set-up



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 Bandwidth.), Span= 3MHz, Sweep=auto 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 procedures until all frequency measured were complete.

NOTE: cable loss as 0.9dB 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	0.884050	
Mid	0.925380	
High	0.789916	

2M EDR mode:

СН	Bandwidth	2/3 Bandwidth
	(MHz)	(MHz)
Low	1.230	0.820
Mid	1.230	0.820
High	1.216	0.811

3M EDR mode:

СН	Bandwidth	2/3 Bandwidth	
	(MHz)	(MHz)	
Lower	1.250	0.833	
Mid	1.250	0.833	
High	1.253	0.835	

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99% Bandwidth:

1M BR mode:

СН	99% Bandwidth	
	(MHz)	
Low	0.8871973	
Mid	0.8697296	
High	0.8914784	

2M EDR mode:

СН	99% Bandwidth	
	(MHz)	
Low	1.1766	
Mid	1.1664	
High	1.1608	

3M EDR mode:

СН	99% Bandwidth	
	(MHz)	
Low	1.1766	
Mid	1.1768	
High	1.1797	

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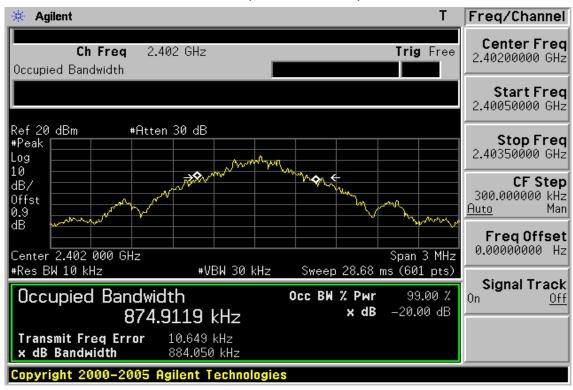
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20dB Band Width Test Data CH-Low (1M BR mode)



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



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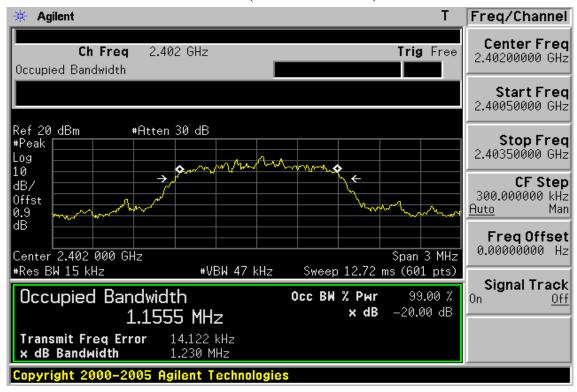
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20dB Width Test Data CH-High (1M BR mode)



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



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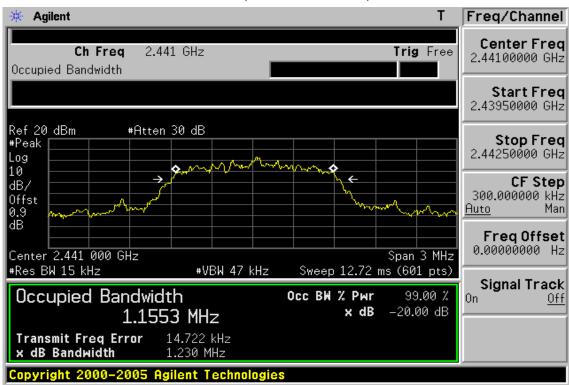
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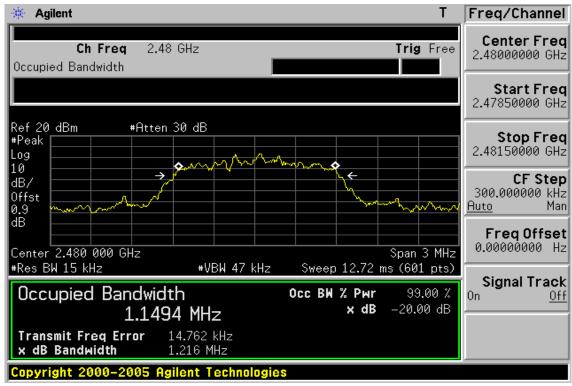
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20dB Band Width Test Data CH-Mid (2M EDR mode)



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



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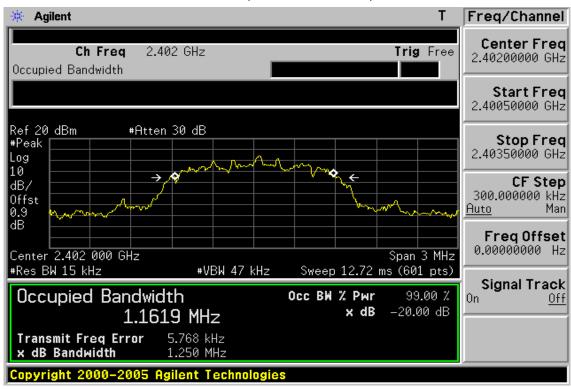
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20dB Band Width Test Data CH-Low (3M EDR mode)



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



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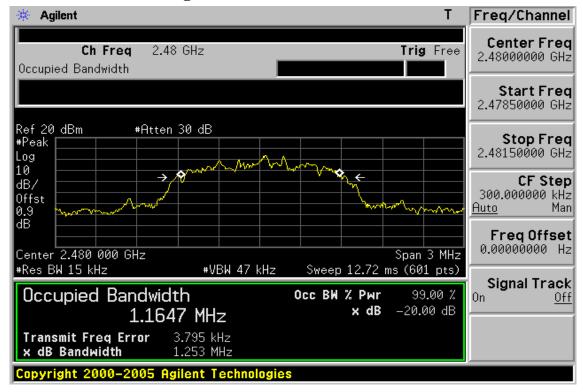
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20dB Width Test Data CH-High (3M EDR mode)



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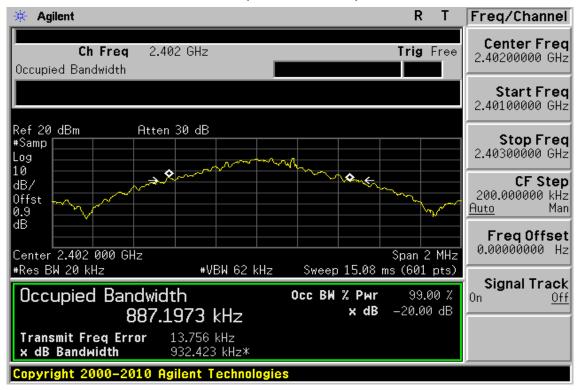
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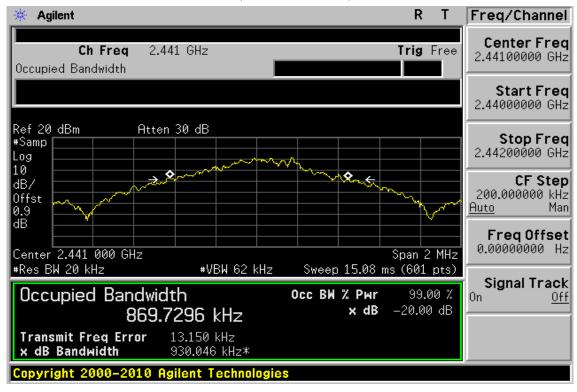
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99% Band Width Test Data CH-Low (1M BR mode)



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



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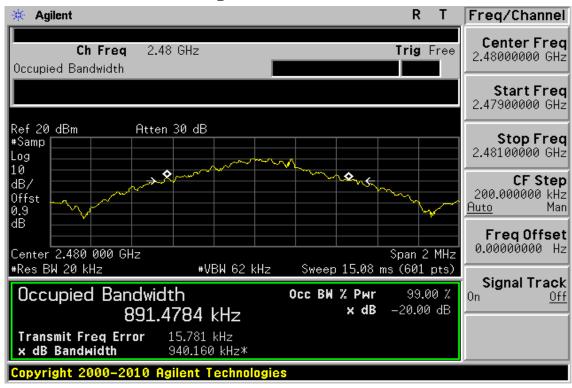
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99%Band Width Test Data CH-High (1M BR mode)



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



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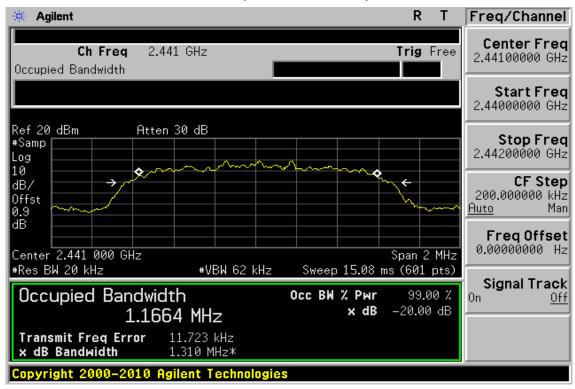
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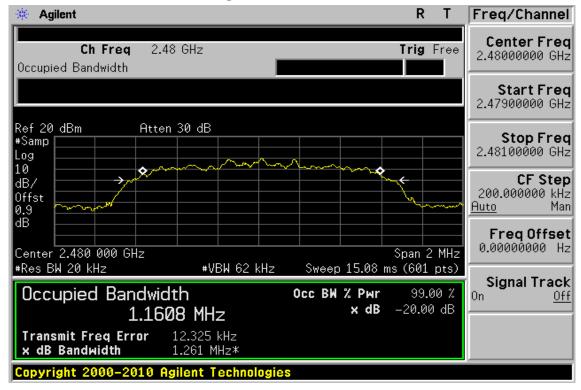
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99% Band Width Test Data CH-Mid (2M EDR mode)



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



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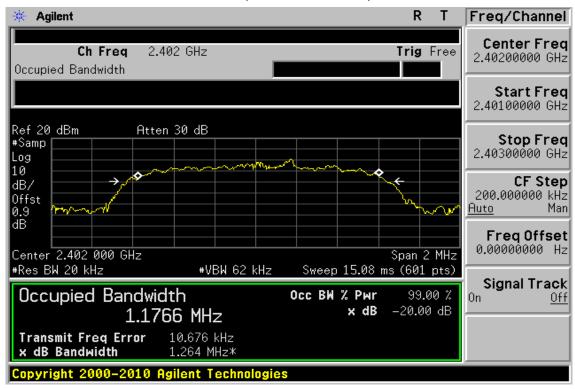
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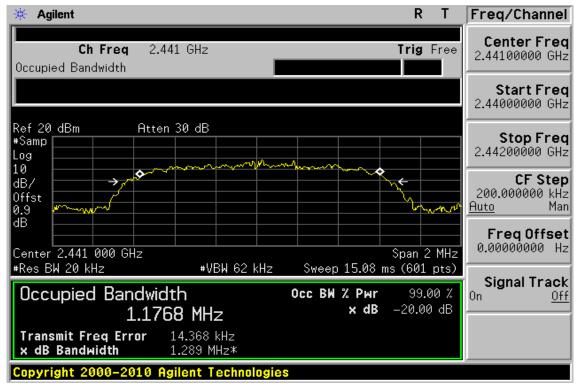
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99% Band Width Test Data CH-Low (3M EDR mode)



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



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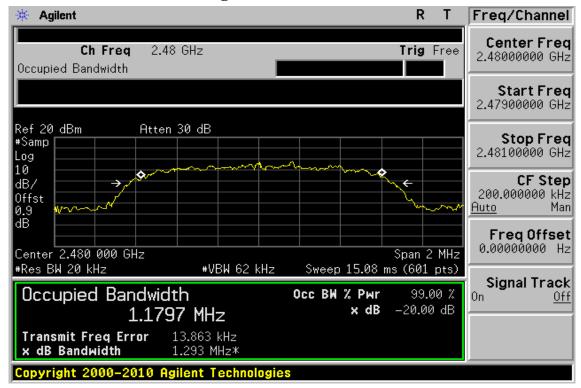
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99%Band Width Test Data CH-High (3M EDR mode)



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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.				
TYPE		NUMBER	NUMBER	CAL.					
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2011	04/14/2013				
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/17/2012	03/16/2014				
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2012	02/27/2013				
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2012	01/04/2013				
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2012	02/27/2013				

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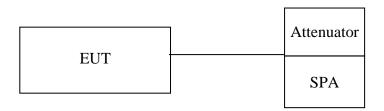


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9.3. Test SET-UP:

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=100 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 0.9dB 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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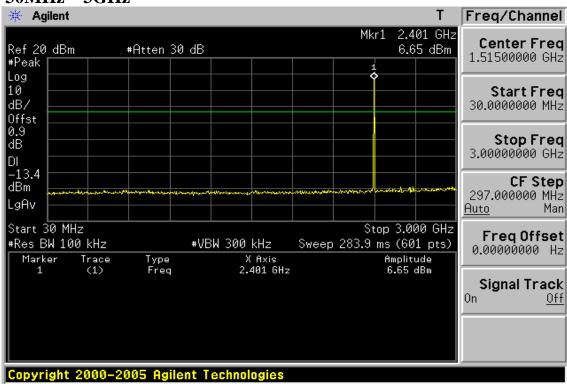
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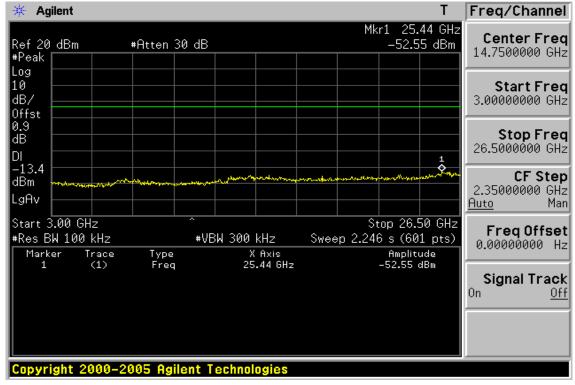
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Conducted Spurious Emission Measurement Result (Worst: EDR mode) Ch Low 30MHz – 3GHz



Ch Low 3GHz - 26.5GHz



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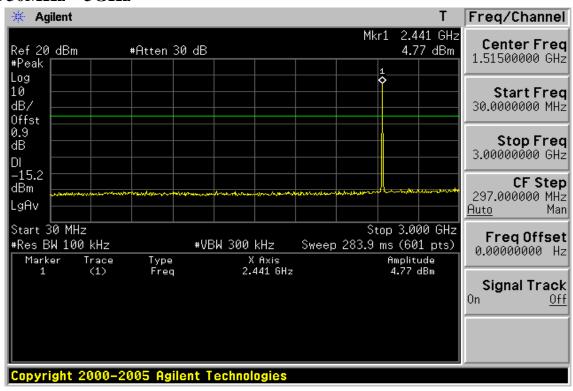
303 Talwan Eta



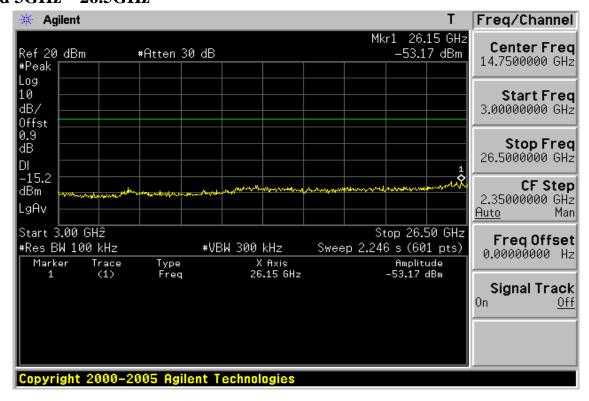
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Ch Mid 30MHz - 3GHz



Ch Mid 3GHz – 26.5GHz



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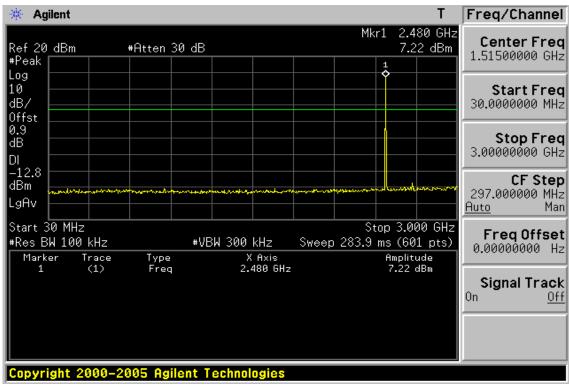
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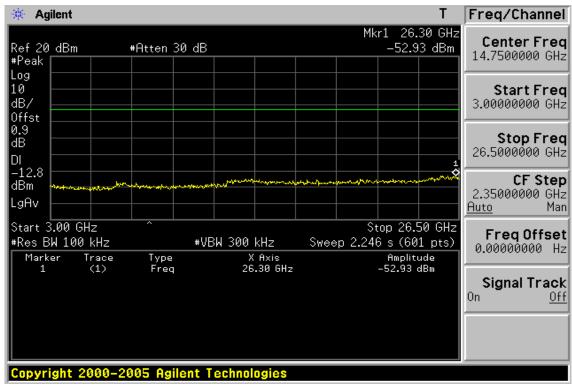
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Ch High 30MHz - 3GHz



Ch High 3GHz - 26.5GHz



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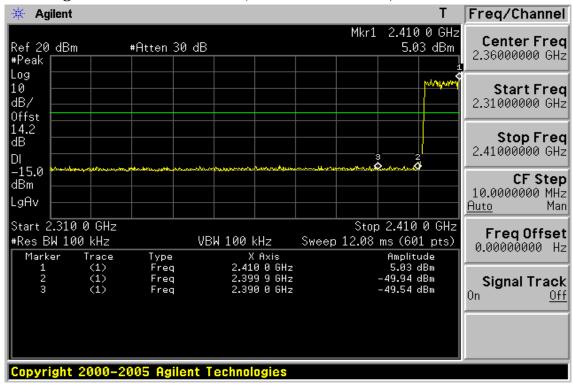
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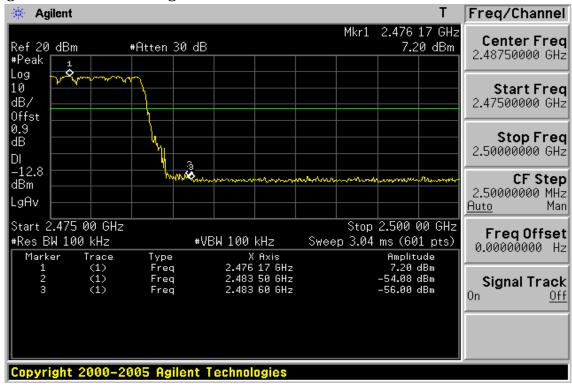
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9.7 Measurement Result -2 100 kHz BANDWIDTH OF BNAD EDGE: Band Edges Test Data CH-Low (Worst: EDR mode)



Band Edges Test Data CH-High



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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 TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.					
EMI Test Receiver	R&S	ESCI7	100759	05/20/2011	05/19/2013					
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2011	04/14/2013					
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	02/15/2011	02/14/2013					
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	01/04/2012	01/03/2013					
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/04/2012	01/03/2013					
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M2	02/28/2012	02/27/2013					
Attenuator	Mini-Circuit	BW-S10W2+	004	02/28/2012	02/27/2013					
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	01/04/2012	01/03/2013					
3m Site NSA	SGS	966 chamber	N/A	07/15/2012	07/14/2013					

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

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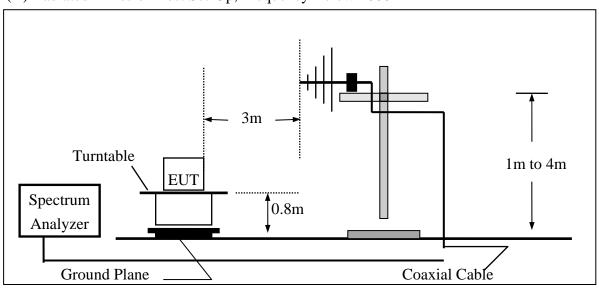
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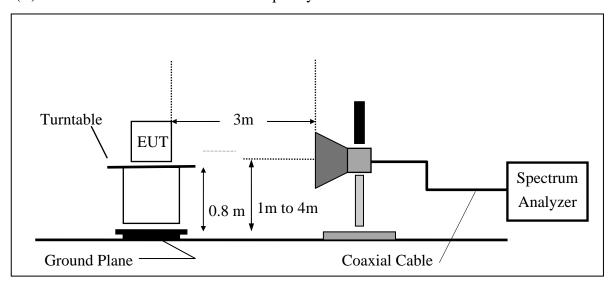
10.3. Test SET-UP:

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)

Operation Band :3DH5 (3M) Test Date :2012-11-10 Fundamental Frequency :2402 MHz Temp./Humi. :22.7deg_C/57RH

Operation Mode :BANDEDGE LOW Engineer :Marcus EUT Pol. :E1 Plan Measurement Antenna Pol. :VERTICAL

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Leve	el	FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Average	30.97	2.12	33.09	54.00	-20.91
2390.00	E	Peak	41.78	2.12	43.90	74.00	-30.10
Operation Band Fundamental Frequency		:3DH5 (3M) :2402 MHz	* *			:2012-11-10 :22.7deg_C/57RH	
1		:BANDEDG		Engineer		:Marcus	
EUT Pol.		:E1 Plan		Measurement An	tenna Pol.	:HORIZONT	AL

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Average	31.45	2.74	34.19	54.00	-19.81
2390.00	E	Peak	41.26	2.74	44.00	74.00	-30.00

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Operation Band Fundamental Frequency Operation Mode

EUT Pol.

:3DH5 (3M) :2480 MHz :BANDEDGE HIGH

:E1 Plan

Test Date Temp./Humi. Engineer :2012-11-10 :22.7deg_C/57RH

Engineer :Marcus
Measurement Antenna Pol. :VERTICAL

Freq.	Note	Detector Mode	Spectrum Reading Leve	Factor el	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	32.28	2.53	34.81	54.00	-19.19
2483.50	E	Peak	43.70	2.53	46.23	74.00	-27.77
Operation Ban Fundamental F Operation Mod EUT Pol.	Frequency	:3DH5 (3M) :2480 MHz :BANDEDG: :E1 Plan	E HIGH	Test Date Temp./Humi. Engineer Measurement An	tenna Pol.	:2012-11-10 :22.7deg_C/5 :Marcus :HORIZONT	
Freq.	Note	Detector Mode	Spectrum Reading Leve	Factor el	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	31.36	3.56	34.92	54.00	-19.08
2483.50	E	Peak	41.79	3.56	45.35	74.00	-28.65

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10.6.2 Radiated Spurious Emission Measurement Result (worst case EDR mode)

Fundamental Frequency Operation Mode:		:3DH5 (3M) :2402 MHz :TX LOW :E1Plan	Test Date Temp./Humi. Engineer Measurement Antenna Pol.			:2012-11-06 :22.7deg_C/57RH :Marcus :VERTICAL	
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
30.97	S	Peak	32.05	-14.33	17.72	40.00	-22.28
114.39	S	Peak	32.19	-15.22	16.97	43.50	-26.53
341.37	S	Peak	26.95	-11.79	15.16	46.00	-30.84
556.71	S	Peak	29.60	-8.45	21.15	46.00	-24.85
690.57	S	Peak	28.62	-5.88	22.74	46.00	-23.26
928.22	S	Peak	27.31	-2.30	25.01	46.00	-20.99
4804.00	Н	Average	35.20	6.99	42.19	54.00	-11.81
4804.00	Н	Peak	42.63	6.99	49.62	74.00	-24.38
7206.00	Н						
9608.00	Н						
12010.00	Н						
14412.00	Н						
16814.00	Н						
19216.00	Н						
21618.00	Н						

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Operation Band Fundamental Frequency Operation Mode EUT Pol.		:3DH5 (3M) :2402 MHz :TX LOW :E1 Plan	Test Date :2012-11-06 Temp./Humi. :22.7deg_C/57R Engineer :Marcus Measurement Antenna Pol. :HORIZONTAL				
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
41.64	S	Peak	27.28	-13.56	13.72	40.00	-26.28
160.95	S	Peak	27.08	-12.36	14.72	43.50	-28.78
288.02	S	Peak	27.10	-12.86	14.24	46.00	-31.76
432.55	S	Peak	28.08	-10.37	17.71	46.00	-28.29
618.79	S	Peak	28.23	-7.15	21.08	46.00	-24.92
845.77	S	Peak	27.99	-3.73	24.26	46.00	-21.74
4804.00	Н	Average	33.32	7.03	40.35	54.00	-13.65
4804.00	Н	Peak	40.45	7.03	47.48	74.00	-26.52
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 Ban Fundamental F Operation Mod EUT Pol.	damental Frequency :2441 MHz Temp./Humi. eration Mode :TX MID Engineer		ntenna Pol.	:2012-11-06 :22.7deg_C/57RH :Marcus :VERTICAL			
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
30.97	S	Peak	31.65	-14.33	17.32	40.00	-22.68
114.39	S	Peak	33.13	-15.22	17.91	43.50	-25.59
286.08	S	Peak	27.81	-12.89	14.92	46.00	-31.08
510.15	S	Peak	28.48	-9.39	19.09	46.00	-26.91
680.87	S	Peak	27.80	-6.02	21.78	46.00	-24.22
885.54	S	Peak	27.84	-3.09	24.75	46.00	-21.25
4882.00	Н	Average	34.57	7.16	41.73	54.00	-12.27
4882.00	Н	Peak	40.47	7.16	47.63	74.00	-26.37
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 Band Fundamental Frequency Operation Mode EUT Pol.		:3DH5 (3M) :2441 MHz :TX MID :E1 Plan	Test Date :2012-11-06 Temp./Humi. :22.7deg_C/5 Engineer :Marcus Measurement Antenna Pol. :HORIZONT.				
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
60.07	S	Peak	28.20	-14.59	13.61	40.00	-26.39
148.34	S	Peak	27.26	-12.45	14.81	43.50	-28.69
257.95	S	Peak	27.73	-13.79	13.94	46.00	-32.06
482.02	S	Peak	28.06	-9.79	18.27	46.00	-27.73
639.16	S	Peak	28.22	-6.78	21.44	46.00	-24.56
791.45	S	Peak	28.15	-4.31	23.84	46.00	-22.16
4882.00	Н	Average	33.71	7.10	40.81	54.00	-13.19
4882.00	Н	Peak	39.51	7.10	46.61	74.00	-27.39
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 Ban Fundamental F Operation Mod EUT Pol.	Frequency	:3DH5 (3M) :2480 MHz :TX HIGH :E1 Plan	MHz Temp./Humi. IIGH Engineer			:2012-11-06 :22.7deg_C/57RH :Marcus :VERTICAL		
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m		
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB	
30.97	S	Peak	32.48	-14.33	18.15	40.00	-21.85	
114.39	S	Peak	32.30	-15.22	17.08	43.50	-26.42	
329.73	S	Peak	28.19	-11.92	16.27	46.00	-29.73	
501.42	S	Peak	28.50	-9.55	18.95	46.00	-27.05	
676.02	S	Peak	27.93	-6.10	21.83	46.00	-24.17	
877.78	S	Peak	29.34	-3.25	26.09	46.00	-19.91	
4960.00	Н	Average	33.01	7.17	40.18	54.00	-13.82	
4960.00	Н	Peak	40.38	7.17	47.55	74.00	-26.45	
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 Band :3DH5 (3M) Fundamental Frequency :2480 MHz Operation Mode :TX HIGH EUT Pol. :E1 Plan		Test Date Temp./Humi. Engineer Measurement Antenna Pol.			:2012-11-06 :22.7deg_C/57RH :Marcus :HORIZONTAL		
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
41.64	S	Peak	27.31	-13.56	13.75	40.00	-26.25
163.86	S	Peak	27.52	-12.61	14.91	43.50	-28.59
315.18	S	Peak	26.84	-12.20	14.64	46.00	-31.36
464.56	S	Peak	27.51	-9.92	17.59	46.00	-28.41
676.02	S	Peak	28.13	-6.10	22.03	46.00	-23.97
891.36	S	Peak	27.32	-2.98	24.34	46.00	-21.66
4960.00	Н	Average	27.16	7.02	34.18	54.00	-19.82
4960.00	Н	Peak	38.35	7.02	45.37	74.00	-28.63
7440.00	Н						
9920.00	Н						
12400.00	Н						
14880.00	Н						
17360.00	Н						
19840.00	Н						
22320.00	Н						

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11. FREQUENCY SEPARATION

11.1. Standard Applicable

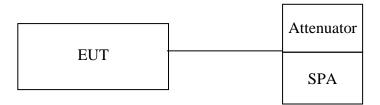
According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25 kHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

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.
TYPE		NUMBER	NUMBER	CAL.	
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2011	04/14/2013
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/17/2012	03/16/2014
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2012	02/27/2013
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2012	01/04/2013
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2012	02/27/2013

11.3. Test Set-up:



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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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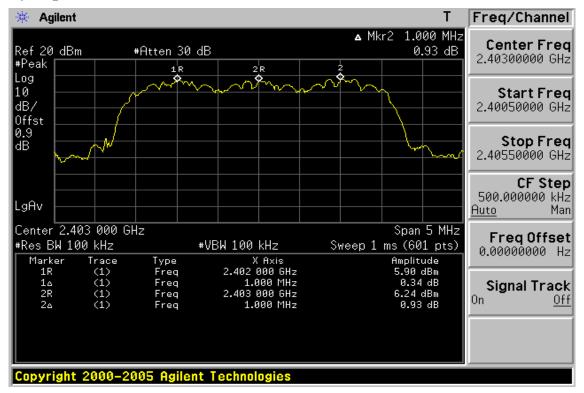
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Frequency Separation Test Data



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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:

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Conducted Emission Test Site						
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.	
TYPE		NUMBER	NUMBER	CAL.		
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2011	04/14/2013	
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/17/2012	03/16/2014	
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2012	02/27/2013	
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2012	01/04/2013	
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2012	02/27/2013	

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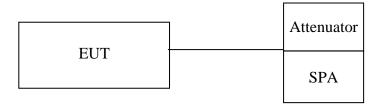
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12.3. Test Set-up:



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.
- 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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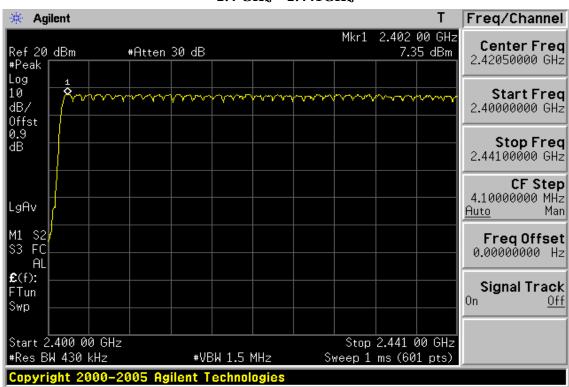


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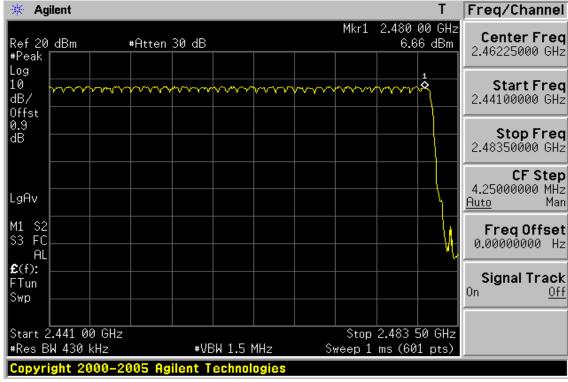
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Channel Number

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.

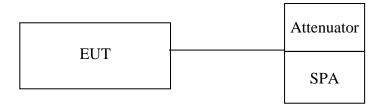
According to RSS-210 issue 8,§A8.1(d), Frequency hopping systems operating in the 2400-2483.5 MHz band shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels 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.
TYPE		NUMBER	NUMBER	CAL.	
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2011	04/14/2013
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/17/2012	03/16/2014
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2012	02/27/2013
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2012	01/04/2013
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2012	02/27/2013

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, Adjust $Sweep = 2\sim7ms$.
- 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	122.56	400ms
	DH3	261.28	400ms
	DH5	307.52	400ms
Middle:	DH1	122.56	400ms
	DH3	261.28	400ms
	DH5	307.52	400ms
High:	DH1	122.56	400ms
	DH3	261.28	400ms
	DH5	307.52	400ms

2Mbps ($\Pi/4$ DQPSK):

Test Channel:	Mode:	Measurement Result (ms):	Limit (ms):
Middle:	2DH1	122.56	400ms
	2DH3	262.72	400ms
	2DH5	307.52	400ms

3Mbps (8DPSK):

Test Channel:	Mode:	Measurement Result (ms):	Limit (ms):
Middle:	3DH1	122.56	400
	3DH3	261.28	400
	3DH5	307.52	400

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

1Mbps:

CH Low DH1 time slot =
$$0.383 \text{ (ms)} * (1600/2/79) * 31.6 = 122.56 \text{ (ms)}$$

DH3 time slot =
$$1.633 \text{ (ms)} * (1600/4/79) * 31.6 = 261.28 \text{ (ms)}$$

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

CH Mid DH1 time slot =
$$0.383 \text{ (ms)} * (1600/2/79) * 31.6 = 122.56 \text{ (ms)}$$

DH3 time slot =
$$1.633 \text{ (ms)} * (1600/4/79) * 31.6 = 261.28 \text{ (ms)}$$

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

CH High DH1 time slot =
$$0.383 \text{ (ms)} * (1600/2/79) * 31.6 = 122.56 \text{ (ms)}$$

DH3 time slot =
$$1.633 \text{ (ms)} * (1600/4/79) * 31.6 = 261.28 \text{ (ms)}$$

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

2Mbps:

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

2DH3 time slot =
$$1.642 \text{ (ms)} * (1600/4/79) * 31.6 = 262.72 \text{ (ms)}$$

2DH5 time slot =
$$2.883 \text{ (ms)} * (1600/6/79) * 31.6 = 307.52 \text{ (ms)}$$

3Mbps:

CH Mid 3DH1 time slot =
$$0.383 \text{ (ms)} * (1600/2/79) * 31.6 = 122.56 \text{ (ms)}$$

3DH3 time slot =
$$1.633$$
 (ms) * $(1600/4/79)$ * $31.6 = 261.28$ (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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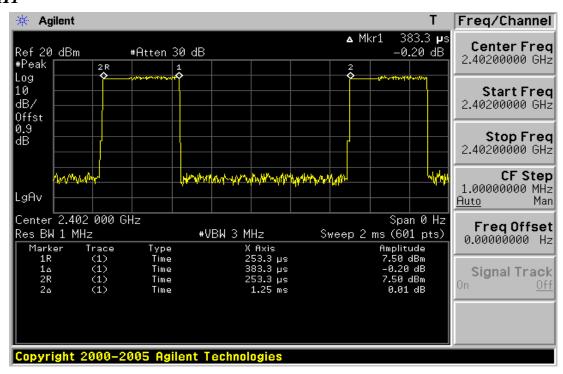
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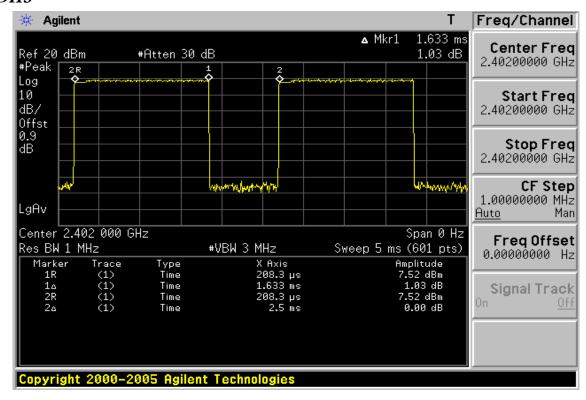
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CH-Low DH1



DH3



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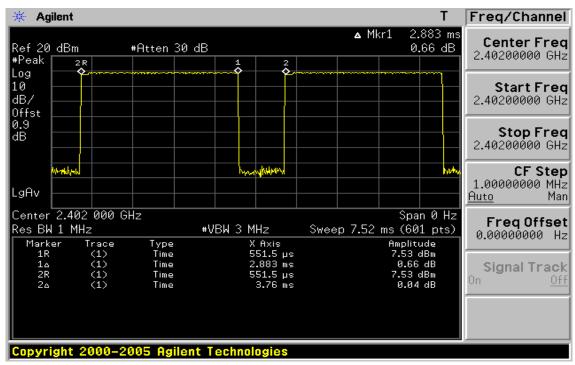
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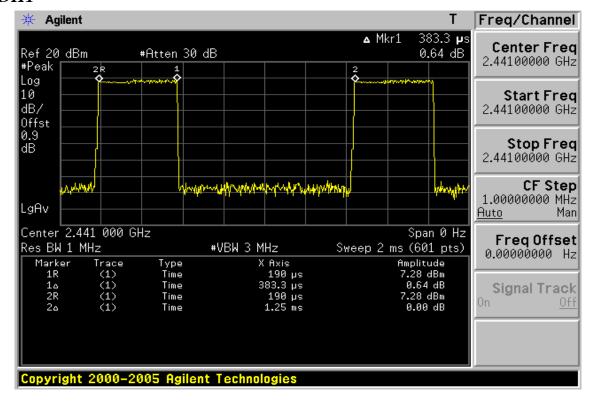
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DH5



CH-Mid

DH1



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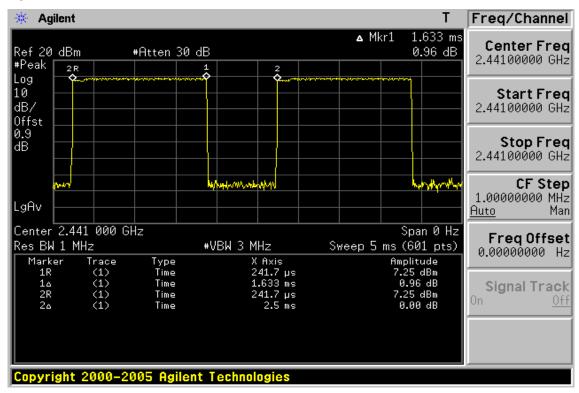
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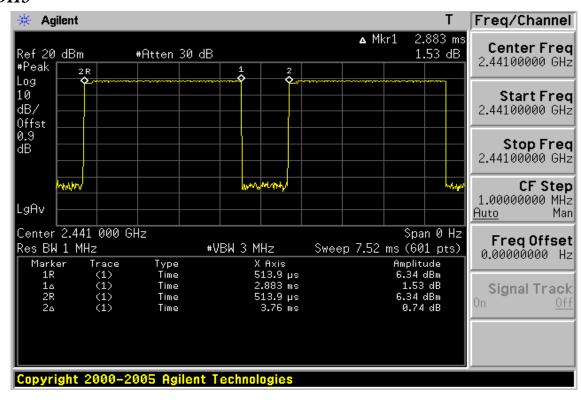
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DH3



DH₅



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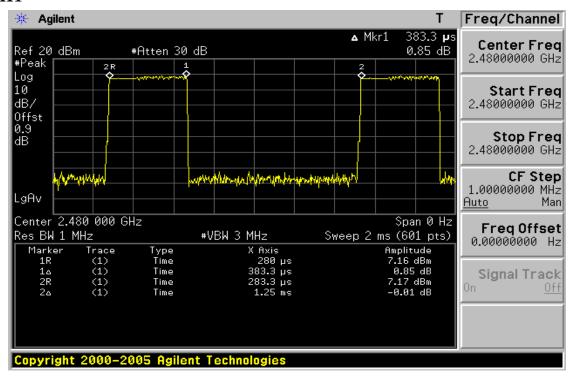
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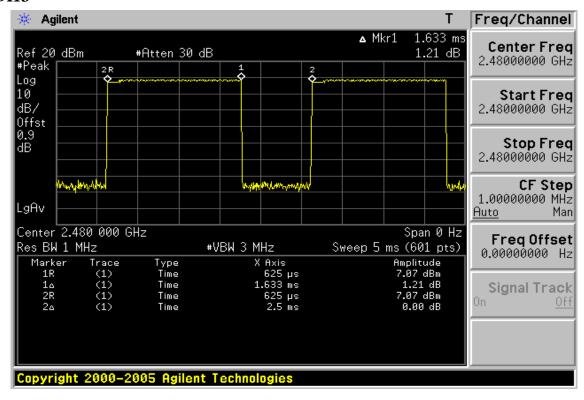
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CH-High DH1



DH3



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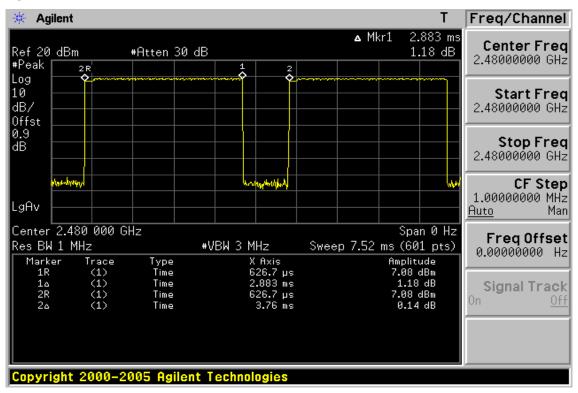
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DH5



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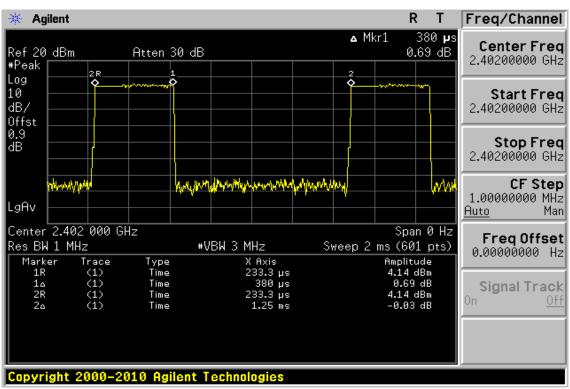
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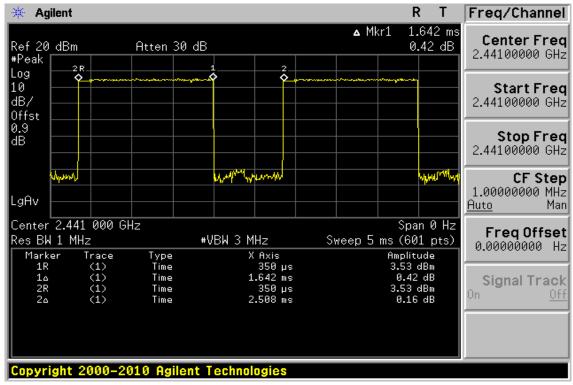
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CH-Mid 2DH1



2DH3



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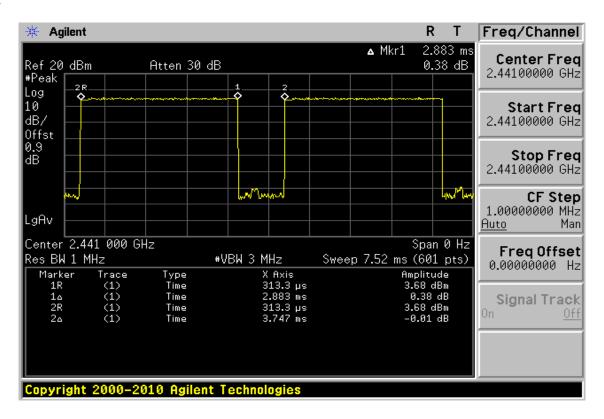
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2DH5



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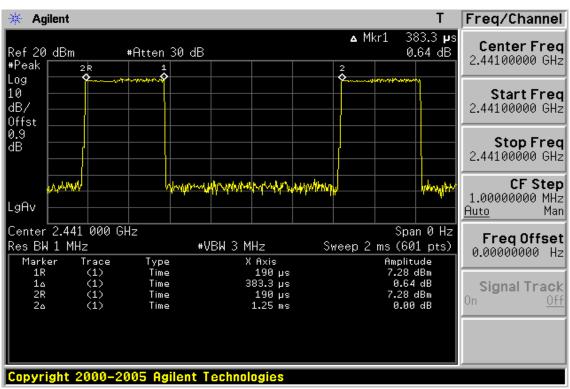
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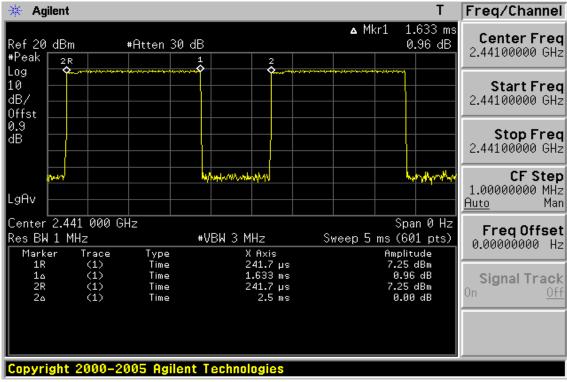
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CH-Mid 3DH1



3DH3



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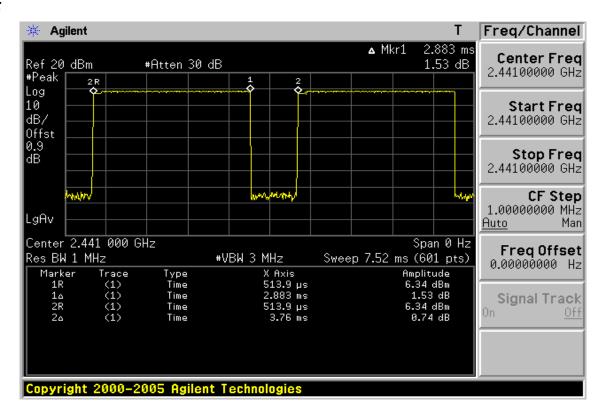
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3DH5



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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 0.02dBi, 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:

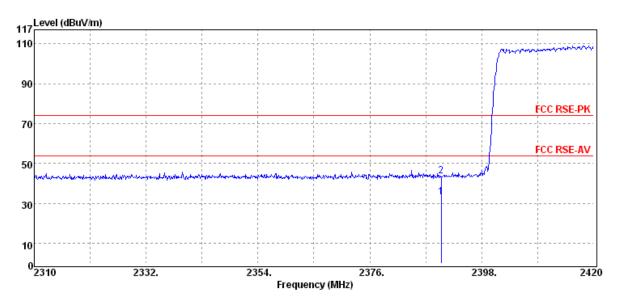
Note: The emission that surpasses the limit of peak represents the fundamental emission of the operation that does not account to be conformed to the limit of the interest.

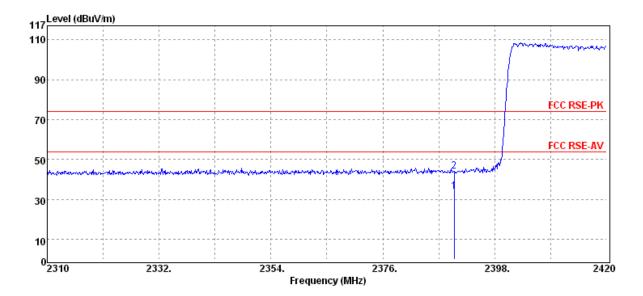
Note: The trace on RE (radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Operation Band :3DH5 (3M) :2012-11-10 Test Date

Fundamental Frequency :22.7deg_C/57RH :2402 MHz Temp./Humi.

Operation Mode :BANDEDGE LOW Engineer :Marcus EUT Pol. :E1 Plan Measurement Antenna Pol. :Ver. / Hor.





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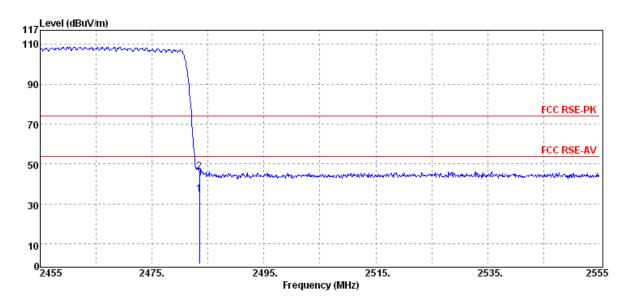
Operation Band **Fundamental Frequency** Operation Mode EUT Pol.

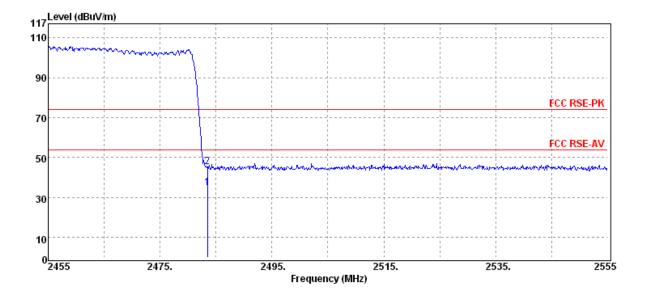
:3DH5 (3M) :2480 MHz :BANDEDGE HIGH

:E1 Plan

Test Date Temp./Humi. :2012-11-10 :22.7deg_C/57RH

Engineer :Marcus Measurement Antenna Pol. :Ver. / Hor.





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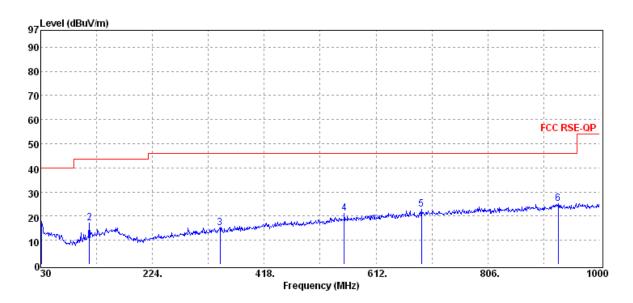
Radiated Spurious Emission Measurement photos Result (below 1GHz)

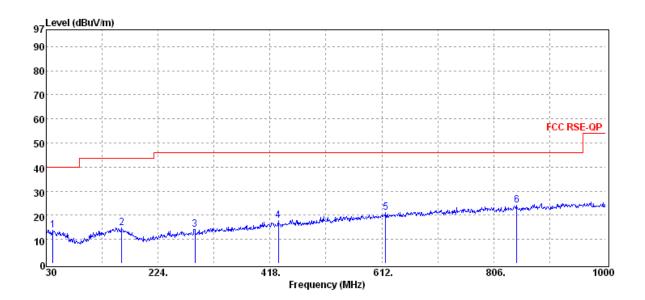
Note: The trace on RE (radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Operation Band :3DH5 (3M) Test Date :2012-11-06

Fundamental Frequency :2402 MHz Temp./Humi. :22.7deg_C/57RH

Operation Mode :TX LOW Engineer :Marcus EUT Pol. :H Plan Measurement Antenna Pol. :Ver. / Hor.





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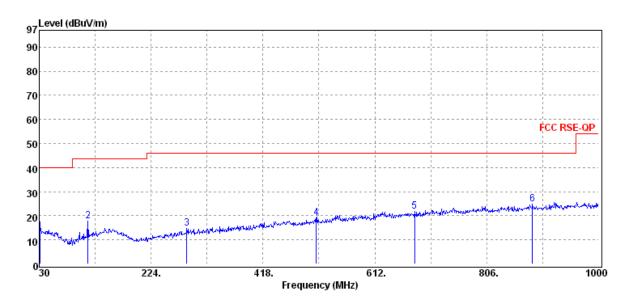
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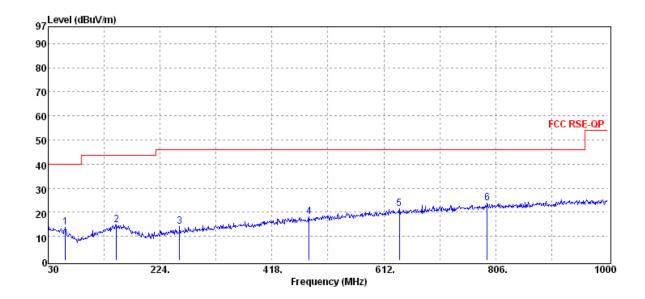
Operation Band :3DH5 (3M) Test Date :2012-11-06

Fundamental Frequency: 2441 MHz

Temp./Humi.: 22.7deg_C/57RH

Operation Mode :TX MID Engineer :Marcus EUT Pol. :H Plan Measurement Antenna Pol. :Ver. / Hor.





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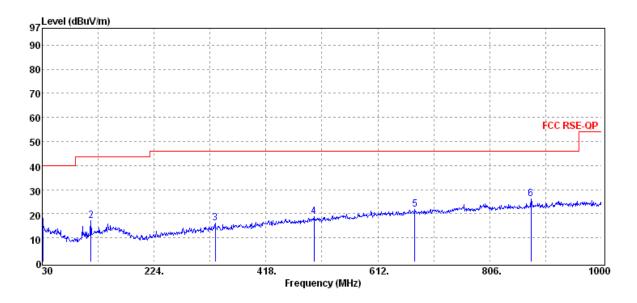
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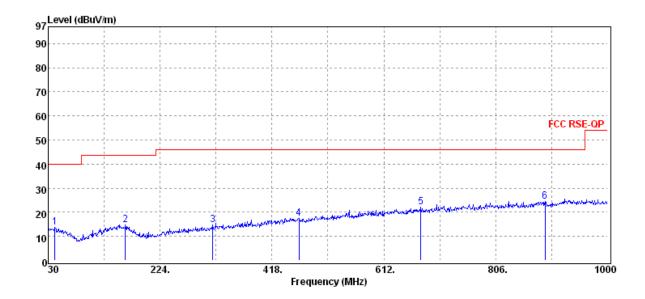
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Operation Band :3DH5 (3M) Test Date :2012-11-06

Fundamental Frequency: 2480 MHz
Temp./Humi.: 22.7deg_C/57RH

Operation Mode :TX HIGH Engineer :Marcus EUT Pol. :H Plan Measurement Antenna Pol. :Ver. / Hor.





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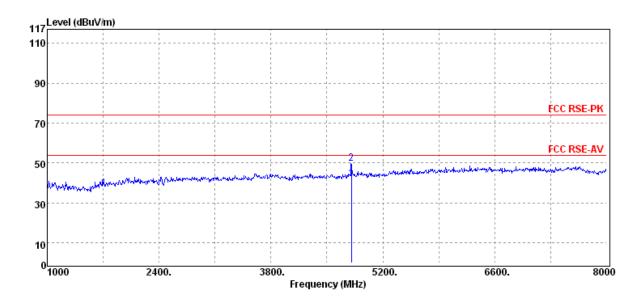
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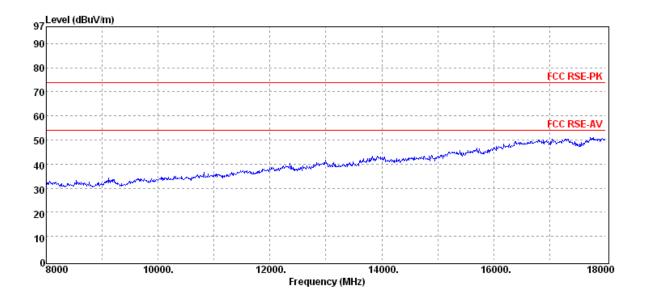
Radiated Spurious Emission Measurement photos Result (above 1GHz)

Operation Band :3DH5 (3M) Test Date :2012-11-06

Fundamental Frequency :2402 MHz Temp./Humi. :22.7deg_C/57RH

Operation Mode :TX LOW Engineer :Marcus EUT Pol. :E1 Plan Measurement Antenna Pol. : VERTICAL





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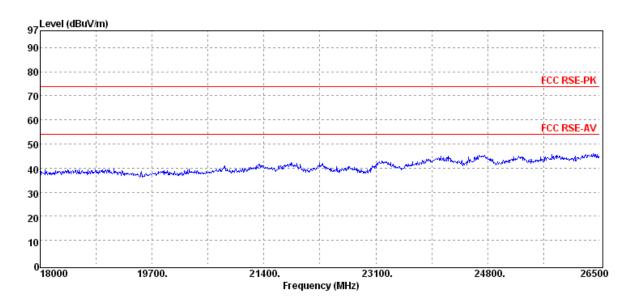
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Operation Band :3DH5 (3M) Test Date :2012-11-06 Fundamental Frequency :2402 MHz Temp./Humi. :22.7deg_C/57RH

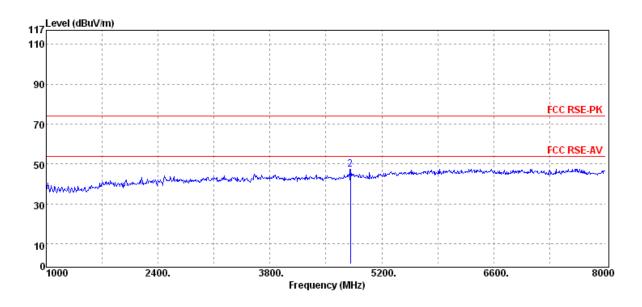
Fundamental Frequency: 2402 MHz

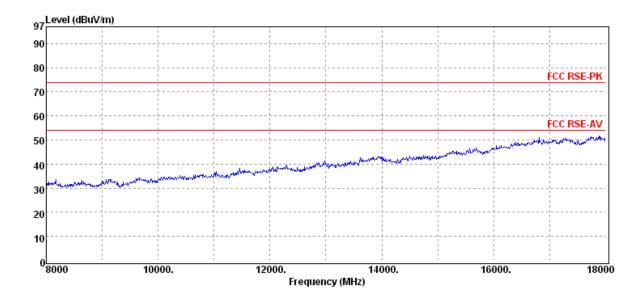
Operation Mode: TX LOW

Temp./Humi.: 22.7deg_C

Engineer: :Marcus

EUT Pol. :E1 Plan Measurement Antenna Pol. :HORIZONTAL





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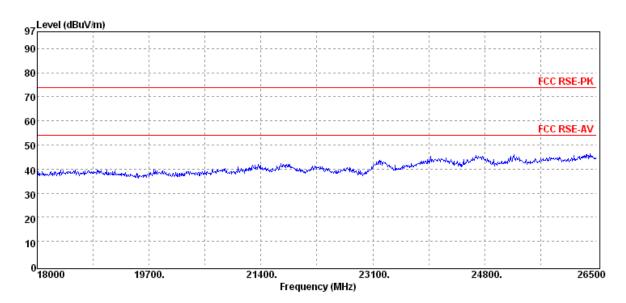
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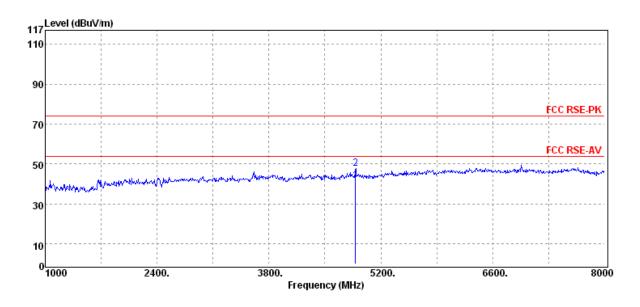
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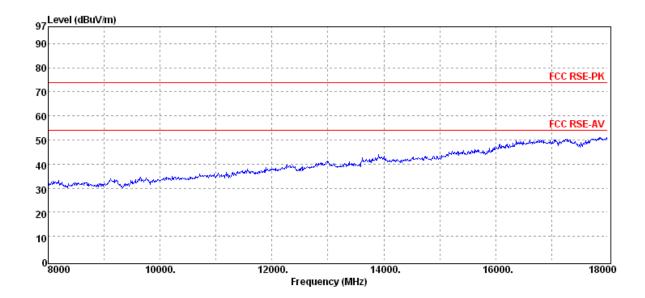
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Operation Band :3DH5 (3M) Test Date :2012-11-06

Fundamental Frequency: 2441 MHz Temp./Humi. :22.7deg_C/57RH

Operation Mode :TX MID Engineer :Marcus
EUT Pol. :E1 Plan Measurement Antenna Pol. :VERTICAL





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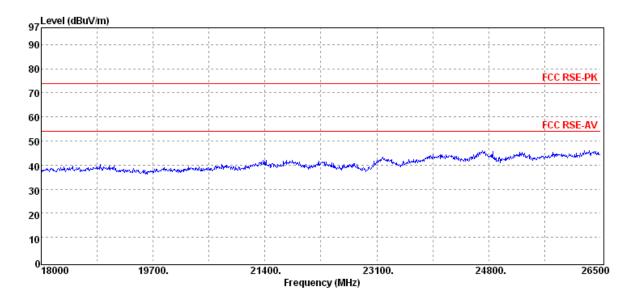
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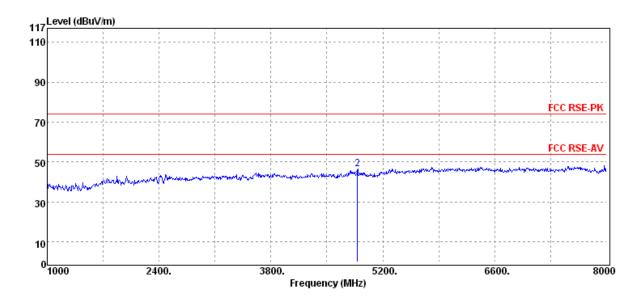
Report No.: EH/2012/B0006 Issue Date: Apr. 29, 2013

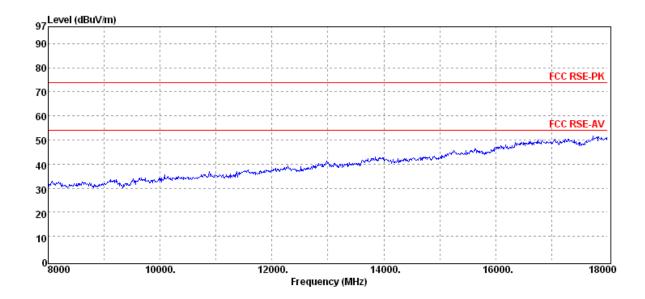
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Operation Band :3DH5 (3M) Test Date :2012-11-06 Fundamental Frequency :2441 MHz Temp./Humi. :22.7deg_C/57RH

Operation Mode :TX MID Engineer :Marcus

EUT Pol. :E1 Plan Measurement Antenna Pol. :HORIZONTAL





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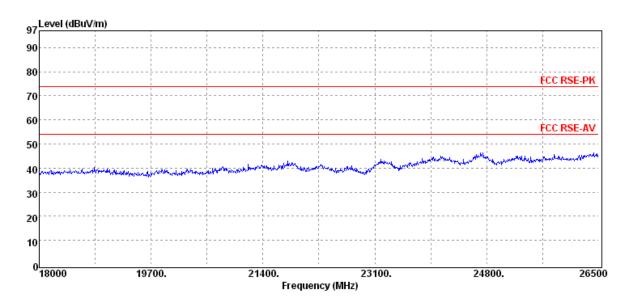
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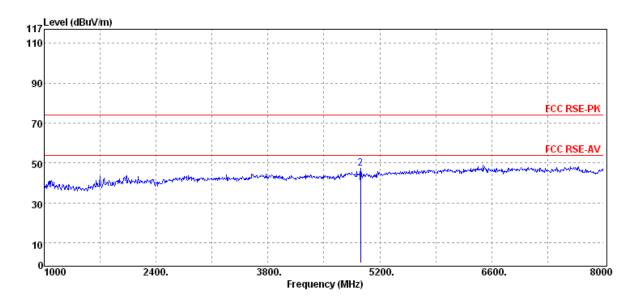
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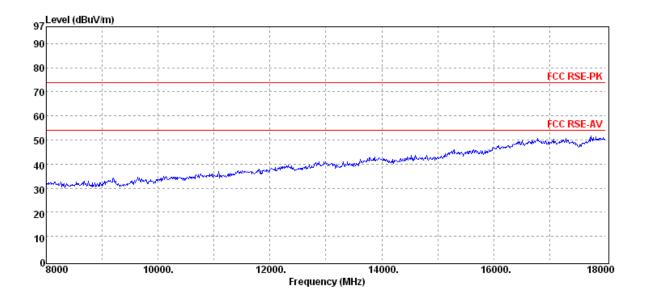
Operation Band :3DH5 (3M) Test Date :2012-11-06

Fundamental Frequency: 2480 MHz

Temp./Humi.: 22.7deg_C/57RH

Operation Mode :TX HIGH Engineer :Marcus
EUT Pol. :E1 Plan Measurement Antenna Pol. :VERTICAL





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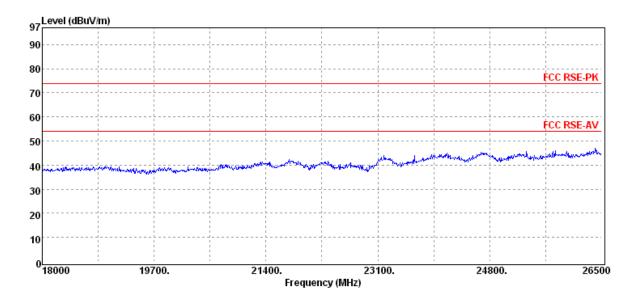
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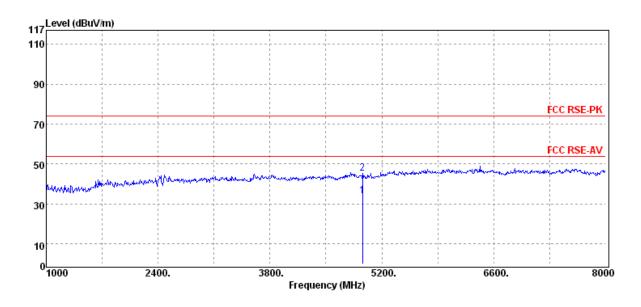
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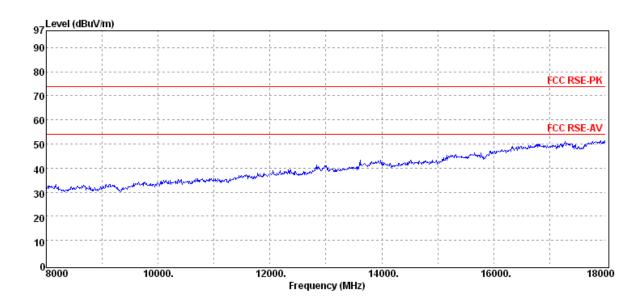
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Operation Band :3DH5 (3M) Test Date :2012-11-06 Fundamental Frequency :2480 MHz Temp./Humi. :22.7deg_C/57RH

Operation Mode :TX HIGH Engineer :Marcus

EUT Pol. :E1 Plan Measurement Antenna Pol. :HORIZONTAL





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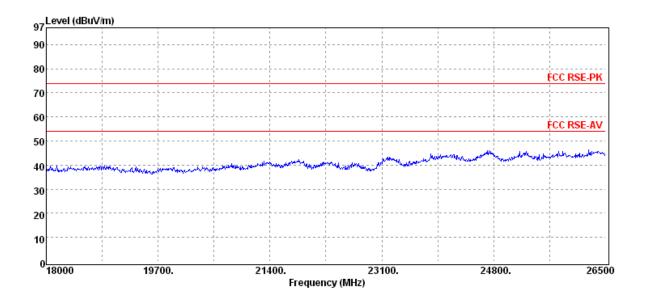
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