

FCC CFR47 PART 22H AND 24E INDUSTRY CANADA RSS-132 ISSUE 2 INDUSTRY CANADA RSS-133 ISSUE 5

CERTIFICATION TEST REPORT FOR

iPad with 802.11a/b/g/n and GSM 2G / 3G

MODEL NUMBER: A1396 FCC ID: BCGA1396 IC: 579C-A1396

REPORT NUMBER: 10U13548-18 ISSUE DATE: JANUARY 31, 2011

Prepared for

APPLE 1 INFINITE LOOP CUPERTINO, CA 95014, U.S.A.

Prepared by

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Revision History

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	APPLE 1 INFINITE LOOP CUPERTINO, CA 95014, U.S.	A			
EUT DESCRIPTION:	iPad with 802.11a/b/g/n and GS	M 2G / 3G			
MODEL:	A1396				
SERIAL NUMBER:	DLXDX003DKYR (Conducted Unit), DLXF100GDK5F (Radiated Unit)				
DATE TESTED:	JANUARY 11-26, 2011				
	APPLICABLE STANDARDS				
ST/	TEST RESULTS				
FCC PART 22 SUBPA	Pass				
INDUSTRY CANADA RSS-132 Issue 2 and RSS-133 Issue 5 Pass					

Compliance Certification Services (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For CCS By:

Tested By:

THU CHAN ENGINEERING MANAGER UL CCS Chin Pany

CHIN PANG EMC ENGINEER UL CCS

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with TIA-603-C, FCC CFR 47 Part 2, FCC CFR 47 Part 22, FCC CFR Part 24, RSS-132 Issue 2, and RSS-133 Issue 5.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <u>http://www.ccsemc.com</u>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The Apple iPad, Model A1396 is a tablet device with iPod functions (music application support, and video), 802.11a/b/g/n radio, Bluetooth radio functions, and cellular using the GSM 2G/3G data radio functions. This device measures 241.36mm (9.5 inches) tall x 185.85 mm (7.31 inches) wide in the landscape orientation, 8.80 mm (0.373 inches) thick and weighs 612.3 grams (1.35 Lbs) The rechargeable battery is not user accessible.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted and ERP / EIRP output powers as follows:

Frequency range (MHz)	Modulation	Cond	ucted	ERP	
Trequency range (MHZ)	Wouldton	dBm	mW	dBm	mW
824.2 - 848.80	GPRS	32.13	1633.1	30.30	1071.5
824.2 - 848.80	EGPRS	29.69	931.1	28.00	631.0
826.4 - 846.6	UMTS, REL99	27.63	579.4	25.50	354.8
826.4 - 846.6	UMTS, HSDPA	28.00	631.0	25.30	338.8

Part 22 Cellular Band

Part 24 PCS Band

Frequency range (MHz)	Modulation	Cond	ucted	EIRP	
Trequency range (IMTZ)	wouldton	dBm	mW	dBm	mW
1850.20 – 1909.8	GPRS	30.16	1037.5	32.50	1778.3
1850.20 – 1909.8	EGPRS	28.61	726.1	30.70	1174.9
1852.4 – 1907.6	UMTS, REL99	26.05	402.7	31.50	1412.5
1852.4 – 1907.6	UMTS, HSDPA	26.81	479.7	31.30	1349.0

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an IFA antenna for the 850MHz and 1900MHz bands with a maximum peak gain of -1.68dBi for cell band and 2.31dBi for PCS band.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 04.08.00

The EUT software installed during testing was 8F5148C

The EUT is linked with Agilent 8960 Communication Test Set

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5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power.

Based on the investigation results, the highest peak power and enhanced data rate is the worstcase scenario for all measurements.

Worst-case modes:

- Cellular & PCS bands for GSM
 - o GPRS (GSMK)
 - EGPRS (8PSK)
- Band V & Band II for UMTS (WCDMA)
 - o Rel 99
 - Rel 6 HSDPA Subtest 2

For the fundamental investigation, since the EUT is a portable device that has three orientations; therefore X, Y and Z orientations have been investigated, also with AC/DC adapter, and the worst case was found to be at Y orientation for Cell band and for PCS band with AC/DC adapter.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST								
Description Manufacturer Model Serial Number FCC ID								
AC Adapter	Foxlink Technology Ltd.	A1357	6072804	DoC				
DC Power Supply	HP	E3610A	KR24104150	NA				

I/O CABLES (CONDUCTED TEST)

	I/O CABLE LIST							
Cable	Port	# of	Connector	Cable	Cable	Remarks		
No.		Identical	Туре	Туре	Length			
		Ports						
1	AC	2	US 115V	Un-shielded	2m	NA		
2	DC	1	DC	Un-shielded	1m	NA		
3	Antenna Port	1	EUT	Un-shielded	0.2m	NA		
4	RFIn/Out	1	Spectrum Analyzer	Un-shielded	None	NA		
5	RFIn/Out	1	Communications Test Set	Un-shielded	1m	NA		

I/O CABLES (RADIATED TEST)

I/O CABLE LIST								
Cable	Port	# of	Connector	Cable	Cable	Remarks		
No.		Identical	Туре	Туре	Length			
		Ports			-			
1	AC	1	US 115V	Un-shielded	2m	NA		
2	DC	1	DC	Un-shielded	1m	NA		
3	RF In/Out	1	Horn	Un-shielded	1.5m	NA		

TEST SETUP

The EUT is a stand-alone device. A link is established between the EUT and the Agilent communications test set.

SETUP DIAGRAM FOR CONDUCTED TESTS



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SETUP DIAGRAM FOR RADIATED TESTS



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6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST							
Description	Manufacturer	Model	Asset	Cal Due			
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	07/14/11			
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	07/14/11			
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01159	05/08/11			
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00778	01/27/12			
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	C00930	04/07/11			
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	01/07/12			
Peak Power Meter	Agilent / HP	E4416A	C00963	12/04/11			
EMI Test Receiver, 30 MHz	R&S	ESHS 20	N02396	05/06/11			
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11/10/11			
Highpass Filter, 1.5 GHz	Micro-Tronics	HPM13193	N02688	CNR			
Signal Generator, 20 GHz	Agilent / HP	83732B	C00774	07/14/12			
Antenna, Tuned Dipole 400~1000 MHz	ETS	3121C DB4	C00993	06/28/11			
Highpass Filter, 2.7 GHz	Micro-Tronics	HPM13194	N02686	CNR			
Communication Test Set	Agilent / HP	E5515C	C01086	06/17/11			
Directional Coupler, 4.2 GHz, 40 dB	A-R	DC7144A	C00983	CNR			

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7. RF POWER OUTPUT VERIFICATION

PROCEDURE USED TO ESTABLISH TEST SIGNAL

GPRS/EGPRS

Function: Menu select > GSM Mobile Station > GSM 850/900/1800/1900 Press Connection control to choose the different menus Press RESET > choose all to reset all settings Connection Press Signal Off to turn off the signal and change settings Network Support > GSM+GPRS or GSM+EGPRS Main Service > Packet Data Service selection > Test Mode A – Auto Slot Config. off Press Slot Config bottom on the right twice to select and change the number of MS Signal time slots and power setting > Slot configuration > Uplink/Gamma > 33 dBm for GPRS 850/900 > 27 dBm for EGPRS 850/900 > 30 dBm for GPRS1800/1900 > 26 dBm for EGPRS1800/1900 BS Signal Enter the same channel number for TCH channel (test channel) and BCCH channel Frequency Offset > + 0 Hz Mode > BCCH and TCH BCCH Level > -85 dBm (May need to adjust if link is not stable) BCCH Channel > choose desire test channel [Enter the same channel number for TCH channel (test channel) and BCCH channel] Channel Type > Off P0> 4 dB Slot Config > Unchanged (if already set under MS Signal) TCH > choose desired test channel Off Hopping > Main Timeslot > 3 (Default) Coding Scheme > CS4 (GPRS) and MCS9 (EGPRS) Network 2E9-1PSR Bit Pattern Bit Stream > AF/RF Enter appropriate offsets for Ext. Att. Output and Ext. Att. Input Connection Press Signal On to turn on the signal and change settings

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WCDMA + HSDPA Procedure

The following settings were used to configure the Radio Communication Tester,

- Connection
- Dedicated Chan (CS): RMC
- Band Select:
 - Band VI for US Cell Band
 - Band II for US PCS Band
 - Band I for 2100MHz band
- Network
- Requested UE Data
 - Authentication: Off
 - Security: Off
 - IMEI: ON
 - RLC Reestablish: Off
- BS Signal
- Node B Setting
 - RF Channel Downlink
 - Band VI: 4357 / 4407 / 4458
 - Band II: 9662 / 9800 / 9938
 - Band I: 10562 / 10700 / 10838
- Circuit Switched
 - RMC Setting
 - Reference Channel Type: 12.2Kbps
 - Test Mode: Loop Mode 1 RLC TM
 - Channel Data Source DTCH: All One
 - Signaling RAB Setting
 - SRB Cell DCH: 13.6 Kbps
- HSDPA HS-DSCH
 - Fixed Reference Channel
 - H-Set Selection: H-Set 1 QPSK
- UE Signal
- Analyzer Setting
 - RF Channel Uplink:
 - o Band VI: 4132 / 4182 / 4233
 - o Band II: 9262 / 9400 / 9538
 - o Band I; 9612 / 9750 / 9888
 - UE power Control
 - Max Allowed UE Power: 25

RULE PART(S)

FCC: §2.1046 IC: RSS-132, 4.4; RSS-133, 6.4

LIMITS

For reporting purposes only

TEST PROCEDURE

The transmitter output was connected to a Communications Test Set and configured to operate at maximum power in a call. The peak power was measured using the spectrum analyzer at three equally spaced operating frequencies for each band. The RBW was set to 300 KHz for the GSM and EDGE measurements and 5 MHz for the UMTS (WCDMA) measurements.

MODES TESTED

- GSM GSM/GPRS (GSMK) & EGPRS (8PSK) modes.
- UMTS (W-CDMA) Rel 99, Rel 6 HSDPA

RESULTS

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RF POWER OUTPUT FOR GSM MODE 7.1.

		Frequency	Conducted output power (dBm)			
Band	Ch		Average		Peak	
			1 slot	2 slot	1 slot	2 slot
GSM850	128	824.2			32.06	30.98
	190	836.6			32.13	31.20
	251	848.8			32.06	31.04
GSM1900	512	1850.2			30.16	28.66
	661	1880.0			30.10	28.61
	810	1909.8			30.03	28.49

GPRS (GMSK) - Coding scheme: CS4

EGPRS (8PSK) - Coding scheme: MCS9

		Frequency	Conducted output power (dBm)			
Band	Ch		Average		Peak	
			1 slot	2 slot	1 slot	2 slot
GSM850	128	824.2			29.51	29.48
	190	836.6			<mark>29.69</mark>	29.62
	251	848.8			29.53	29.38
GSM1900	512	1850.2			28.52	28.46
	661	1880			<mark>28.61</mark>	28.57
	810	1909.8			28.31	28.23

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7.2. RF POWER OUTPUT FOR UMTS REL99

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 V7.5.0 specification. The EUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7) 12.2kps RMC is used for this testing. Power control set to All bits up. A summary of these settings are illustrated below:

	Mode	Rel99
	Subtest	-
	Loopback Mode	Test Mode 1
	Rel99 RMC	12.2kbps RMC
	HSDPA FRC	Not Applicable
	HSUPA Test	Not Applicable
WCDMA Conorol	Power Control Algorithm	Algorithm2
Sottings	βc	Not Applicable
Setungs	βd	Not Applicable
	βec	Not Applicable
	βc/βd	8/15
	βhs	Not Applicable
	βed	Not Applicable

REL 99

Band			F	Conducted output power (dBm)	
	UL Ch	DL Ch	Frequency	Average	Peak
LIMITSSED	4132	4357	826.4		27.50
(Rand V)	4180	4405	836.0		27.49
(Ballu V)	4230	4455	846.0		<mark>27.63</mark>
	9262	9662	1852.4		25.99
(Rand II)	9400	9800	1880		<mark>26.05</mark>
(Ballu II)	9538	9938	1907.6		25.70

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7.3. RF POWER OUTPUT FOR UMTS Rel 6 HSDPA

The following Sub-Tests were completed according to the test requirements outlined in section 5.2A of the 3GPP TS34.121-1 V7.5.0 specification. All TX RMS and Peak power requirements for Power Class 3 were met according to table 5.2AA.5 and achieved through the outlined test procedure in section 5.2AA.4.2. A summary of these settings are illustrated below:

	Mode	Rel6 HSDPA	Rel6 HSDPA	Rel6 HSDPA	Rel6 HSDPA
	Subtest	1	2	3	4
	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	HSUPA Test	Not Applicable			
WCDMA	Power Control Algorithm	Algorithm 2			
General	βc	2/15	12/15	15/15	15/15
Settings	βd	15/15	15/15	8/15	4/15
	βec	-	-	-	-
	βc/βd	2/15	12/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	βed	Not Applicable			
	DACK	8			
	DNAK	8			
HSDPA	DCQI	8			
Specific	Ack-Nack repetition factor	3			
Settings	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	Ahs = βhs/βc	30/15			

<u>Result</u>

REL 6 HSDPA

Pand	Subtest			Frequency	Conducted outp	ut power (dBm)
Danu	Sublesi	OL CII	DL CII	Frequency	Average	Peak
		4132	4357	826.4		27.86
	1	4180	4405	836.0		27.84
		4230	4455	846.0		27.72
		4132	4357	826.4		27.94
	2*	4180	4405	836.0		<mark>28.00</mark>
UMTS850		4230	4455	846.0		27.75
(Band V)		4132	4357	826.4		27.92
	3	4180	4405	836.0		27.80
		4230	4455	846.0		27.72
		4132	4357	826.4		27.89
	4	4180	4405	836.0		27.91
		4230	4455	846.0		27.72
		9262	9662	1852.4		26.75
	1	9400	9800	1880.0		26.67
		9538	9938	1907.6		26.37
		9262	9662	1852.4		<mark>26.81</mark>
	2*	9400	9800	1880.0		26.65
UMTS1900		9538	9938	1907.6		26.38
(Band II)		9262	9662	1852.4		26.75
	3	9400	9800	1880.0		26.62
		9538	9938	1907.6		26.33
		9262	9662	1852.4		26.72
	4	9400	9800	1880.0		26.67
		9538	9938	1907.6		26.38

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8. CONDUCTED TEST RESULTS

8.1. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049 IC: RSS-Gen, 4.6

LIMITS

For reporting purposes only

TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the low, middle and high channel in each band. The -26dB bandwidth was also measured and recorded.

MODES TESTED

- GSM GSM (GSMK) & EGPRS (8PSK),
- UMTS (W-CDMA) Rel 99, Rel 6 HSDPA Subtest 2

Band	Mode	Channel	f (MHz)	99% BW (kHz)	-26dB BW (kHz)
		128	824.2	242.5151	299.342
	GPRS	190	836.6	251.5239	316.461
Collular		251	848.8	245.7307	302.135
Celiulai		128	824.2	239.0078	292.488
EGF	EGPRS	190	836.6	241.6168	302.647
		251	848.8	250.1539	291.262
		512	1850.2	238.0926	296.226
	GPRS	661	1880.0	242.1909	307.932
PCS		810	1909.8	245.7307	302.135
FC3		512	1850.2	238.5221	318.537
	EGPRS	661	1880.0	251.7286	302.227
		810	1909.8	239.8155	294.425

RESULTS

Band	Mode	Channel	f (MHz)	99% BW (MHz)	-26dB BW (MHz)
		4132	826.4	4.0295	4.474
R	Rel 99	4180	836.6	4.0261	4.581
UMTS		4230	846.6	4.0698	4.497
Band V	HSDPA	4132	826.4	4.0467	4.546
	Rel 6	4180	836.6	4.0497	4.492
	Subtest 2	4230	846.6	4.0774	4.505
		9262	1852.4	4.0613	4.501
	Rel 99	9400	1880.0	4.0896	4.442
UMTS		9538	1907.6	4.0500	4.514
Band II	HSDPA	9262	1852.4	4.0807	4.558
	Rel 6	9400	1880.0	4.0688	4.496
	Subtest 2	9538	1907.6	4.0522	4.503

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GPRS850 BAND

99% and 26dB Bandwidth





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HIGH CH	R T	Sweep
Ch Freq 848.8 MHz Occupied Bandwidth	Trig Free	Sweep Time 333.4 ms <u>Auto Man</u>
Ref 30 dBm Atten 10 dB		Sweep <u>Single Cont</u> Auto Sweep
# samp Log 10 →		Time <u>Norm Accy</u> Gate On <u>Off</u>
dB Center 848.800 0 MHz #Res BW 3 kHz #VBW 10 kHz	Span 1 MHz Sweep 333.4 ms (601 pts)	Gate Setup ▸
Occupied Bandwidth 245.7307 kHz	Occ BW % Pwr 99.00 % x dB -26.00 dB	Points 601
Transmit Freq Error -141.978 Hz x dB Bandwidth 302.135 kHz* Copyright 2000-2009 Agilent Technologies		

EGPRS850 BAND



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MID CH	, 2011		RT	Freq/Channel
Ch Freq 83 Occupied Bandwidth	5.6 MHz		Trig Free	Center Freq 836.60000 MHz
	E			Start Freq 836.100000 MHz
Ref 30 dBm Atter #Samp Log 10 dB/ Offst 40.7 dB Center 836.600 0 MHz	10 dB		Span 1 MHz	Stop Freq 837.100000 MHz CF Step 100.000000 kHz <u>Auto Man</u> Freq Offset 0.00000000 Hz
Res BW 3 kHz Occupied Bandw	#VBW 10 kHz	Sweep 333.4	ms (601 pts) 99.00 %	Signal Track On <u>Off</u>
241.	6168 kHz	x dB	-26.00 dB	
x dB Bandwidth	1.085 kHz 302.647 kHz*			
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UMTS REL99 Cellular Band





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HIGH CH		RТ	Freq/Channel
Ch Freq 846 MHz Occupied Bandwidth		Trig Free	Center Freq 846.00000 MHz
			Start Freq 841.000000 MHz
Ref 30 dBm Atten 10 dB #Samp Log			Stop Freq 851.000000 MHz
dB/ Offst 40.7 dP/ dB/ dB/ dB/ dB/ dB/ dB/ dB/ dB		<	CF Step 1.00000000 MHz <u>Auto Man</u>
Center 846.000 MHz #Res BW 100 kHz #VBW 30	0 kHz Sweei	Span 10 MHz 20 ms (601 pts)	Freq Offset 0.00000000 Hz
Occupied Bandwidth 4.0698 MHz	Occ BW % F	⊃wr 99.00 % dB -26.00 dB	Signal Track On <u>Off</u>
Transmit Freq Error -10.348 kHz x dB Bandwidth 4.497 MHz*			
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UMTS HSDPA Cellular Band



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MID CH					
🔆 Agilent 02:16:38 Jan 12, 2	2011		R T	Swe	зер
Ch Freq 836 Occupied Bandwidth	MHz		Trig Free	Swe <u>Auto</u>	əp Time 20.00 ms <u>Man</u>
				<u>Single</u>	Sweep <u>Cont</u>
Ref 30 dBm Atten 1 #Samp				Auto Norm	Sweep Time <u>Accy</u>
dB/ Offst 40.7 dB				On	Gate <u>Off</u>
Center 836.000 MHz #Res BW 100 kHz	#VBW 300 kHz	Sweep 20 n	Span 10 MHz ns (601 pts)	Gate	Setup 🕨
Occupied Bandwic 4.049	ith o 7 MHz	Dod BW % Pwr x dB	99.00 % -26.00 dB		Points 601
Transmit Freq Error	30.153 kHz I.492 MHz*				
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GPRS1900 PCS Band





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HIGH CH	011		RТ	S₩	eep
Ch Freq 848.8 Occupied Bandwidth	MHz		Trig Free	Swe <u>Auto</u>	ep Time 333.4 ms <u>Man</u>
Ref 30 dBm Atten 10 #Samp) dB	Mater .		<u>Single</u> Auto Norm	<u>Cont</u> Sweep Time <u>Accy</u>
dB/ Offst 40.7 dB	→ MM(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)			On Gate	Gate <u>Off</u> Setup
Center 848.800 0 MHz #Res BW 3 kHz	#VBW 10 kHz	Sweep 333.4 i	Span 1 MHz ms (601 pts)		Doints
Occupied Bandwid 245.73	th 307 kHz	Occ BW % Pwr x dB	99.00 % -26.00 dB		601
Transmit Freq Error -1 x dB Bandwidth 30 Copyright 2000-2009 Agilent Tec	41.978 Hz 02.135 kHz* hnologies				
-					

EGPRS1900 PCS Band



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MID CH	12, 2011		RТ	Swe	ep
Ch Freq 1 Occupied Bandwidth	.88 GHz		Trig Free	Swee 3 <u>Auto</u>	p Time 33.4 ms <u>Man</u>
Ref 30 dBm Att	en 10 dB			<u>Single</u> Auto S	Sweep <u>Cont</u> Sweep
#Samp Log 10 dB/ Offst 41				Norm On	Time <u>Accy</u> Gate <u>Off</u>
dB Center 1.880 000 0 GHz #Res BW 3 kHz	#VBW 10 kHz	Sweep 333.4 r	Span 1 MHz ns (601 pts)	Gate	Setup 🕨
Occupied Band 25	width I.7286 kHz	Occ BW % Pwr x dB	99.00 % -26.00 dB		Points 601
Transmit Freq Error x dB Bandwidth Convright 2000-2009 Agiler	-2.570 kHz 302.227 kHz*				
Copyright 2000-2009 Agrief	r reentologies				I



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UMTS REL99 PCS Band





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HIGH CH					
* Agilent 01:41:48 Jan 12, 2011 R T			В	W/Avg	
Ch Freq 1.907 Occupied Bandwidth	6 GHz		Trig Free	Auto	Res BW 100.0 kHz <u>Man</u>
				Auto	Video BW 300.0 kHz <u>Man</u>
Ref 30 dBm Atten 10 #Samp Log 10	0 dB			Auto	VBW/RBW 10.00000 <u>Man</u>
dB/ Offst 41				On	Average 10 <u>Off</u>
Center 1.907 600 GHz			Span 10 MHz	Avg/V Log-Pi <u>Auto</u>	′BW Type wr (Video) ► <u>Man</u>
#Res BW 100 kHz	#VBW 300 kHz	Sweep 20 r	ms (601 pts)		
Occupied Bandwidth 4.0500 MHz		Occ BW % Pwr x dB	99.00 % -26.00 dB		Snan/RRW
Transmit Freq Error -7.562 kHz x dB Bandwidth 4.514 MHz*				Auto	106 <u>Man</u>
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UMTS HSDPA PCS Band



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8.2. BAND EDGE

RULE PART(S)

FCC: §22.359, 24.238 IC: RSS-132, 4.5; RSS-133, 6.5

<u>LIMITS</u>

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

TEST PROCEDURE

The transmitter output was connected to a Agilent 8960 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

For each band edge measurement:

- Set the spectrum analyzer span to include the block edge frequency (824, 848, 1850, 1910MHz)
- Set a marker to point the corresponding band edge frequency in each test case.
- Set display line at -13 dBm
- Set resolution bandwidth to at least 1% of emission bandwidth.

MODES TESTED

- GSM GSM (GSMK) & EGPRS (8PSK),
- UMTS (W-CDMA) Rel 99, Rel 6 HSDPA Subtest 2

RESULTS

See the following pages.

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GPRS850

Low Channel Band Edge



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REPORT NO: 10U13548-18 FCC ID: BCGA1396

High Channel Band Edge



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EGPRS850

Low Channel Band Edge



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High Channel Band Edge



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UMTS, REL99 Low Channel Band Edge



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High Channel Band Edge



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UMTS, HSDPA CELL

Low Channel Band Edge



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GPRS1900

Low Channel Band Edge



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High Channel Band Edge



EGPRS1900

Low Channel Band Edge



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High Channel Band Edge



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UMTS, REL99 PCS BAND

Low Channel Band Edge



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High Channel Band Edge



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UMTS HSDPA PCS BAND

Low Channel Band Edge



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High Channel Band Edge



8.3. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §22.901, §22.917, §24.238 IC: RSS-132, 4.5; RSS-133, 6.5

LIMITS

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P) dB$.

TEST PROCEDURE

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

For each out of band emissions measurement:

- Set display line at -13 dBm
- Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz.

MODES TESTED

- GSM GSM (GSMK) & EGPRS (8PSK),
- UMTS (W-CDMA) Rel 99, Rel 6 HSDPA Subtest 2

RESULTS

See the following pages.

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GPRS Mode (Cellular Band)







EGPRS Mode (Cellular Band)



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UMTS REL99 CELL BAND

LOW CH 🔆 Agilent 01:35:27 Jan 12, 2011 Т R Marker Mkr1 3.619 GHz Select Marker Ref 30 dBm Atten 10 dB -29.44 dBm 2 3 4 #Peak Log 10 Normal dB/ Offst 40.7 dB Delta DI -13.0 Delta Pair dBm (Tracking Ref) #PA∨g Ref ≙ ٥ M1 S2 Span Pair \$3 FC Span <u>Center</u> AA ¤(f): FTun Off Swp More Start 30 MHz Stop 10.000 GHz 1 of 2 Sweep 99.72 ms (601 pts) #Res BW 1 MHz #VBW 1 MHz Copyright 2000-2009 Agilent Technologies

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🔆 Agilent 01:36	6:05 Jan 12, 2011			RT	Marker
Ref 30 dBm	Atten 10 dB		M	cr1 3.453 GHz -29.19 dBm	Select Marker
#Peak Log 10 dB/ Offst					Norma
dB DI					Delta
13.0 dBm #PAvg	1				Delta Pair (Tracking Ref)
M1 S2	Hand Marken	Selected and a second	and the second sec	1,41 yaran 9, ya 1,52 yi da da a	Span Pair Span <u>Center</u>
¤(f): FTun Swp					Off
Start 30 MHz #Res BW 1 MHz	#	VBW 1 MHz	Sto Sweep 99.72	p 10.000 GHz ms (601 pts)	More 1 of 2
Copyright 2000-20	009 Agilent Technolog	jies			

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UMTS HSDPA Mode (Cellular Band)



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MID CH						
🔆 Agilent 02:12	:26 Jan 12, 2011			R	T	Marker
Ref 30 dBm #Peak	Atten 10 dB		M	cr1 6.843 -27.86	3 GHz dBm	Select Marker 1 2 3 4
Log 10 dB/						Normal
40.7 dB						Delta
-13.0 dBm #PAvg			1			Delta Pair (Tracking Ref) Ref <u>∆</u>
M1 S2	un and the state of the state o	whendress and when the her		Search of Angles	nates and a	Span Pair _{Span <u>Center</u>}
¤(f): FTun Swp						Off
Start 30 MHz #Res BW 1 MHz	#VE	SW 1 MHz	Sto Sweep 99.72	p 10.000 ms (601) GHz pts)	More 1 of 2
Copyright 2000-200	09 Agilent Technologie	S				



GPRS Mode (PCS Band)



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EGPRS Mode (PCS Band)







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MID CH					
🔆 Agilent 01	:49:17 Jan 12, 2011		R	Т	Marker
Ref 30 dBm #Peak	Atten 10 dB		Mkr1 13.98 -24.85 d	GHz Bm	Select Marker 1 <u>2 3</u> 4
Log 10 dB/					Normal
dB DI					Delta
-13.0 dBm #PA∨g			¢		Delta Pair (Tracking Ref) Ref ∆
M1 S2	with the second with the	depthent may be and a family of the second			Span Pair Span <u>Center</u>
¤(f): FTun Swp					Off
Start 30 MHz #Res BW 1 MH	GHz ts)	More 1 of 2			
Copyright 2000	2009 Agilent Technologie:	3			

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UMTS HSDPA Mode (PCS Band)



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🔆 Agilent 02:0	04:16 Jan 12, 2011			F		Marker
Ref 30 dBm	Atten 10 dB			Mkr1 13.7 -25.50	1 GHz dBm	Select Marker
Peak .og						÷ = = -
0 IB/						Norma
nst 1 IB						Delta
13.0 IBm PAvg			1 1	man an		Delta Pair (Tracking Ref) Ref 4
11 S2	and the harmon and the second					Span Pail Span <u>Center</u>
i(f): Tun Swp						Off
Start 30 MHz Res BW 1 MHz	, ,	VBW 1 MHz	Sween 199	Stop 20.0 7 ms (601	0 GHz	More 1 of 2
Convright 2000-2	2009 Agilent Technolo	aies	5 H 6 6 1 1 0 1		1.01	L



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8.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235 IC: RSS-132, 4.3; RSS-133, 6.3

LIMITS

22.355 & RSS-132 4.3 - The carrier frequency shall not depart from the reference frequency in excess of ± 2.5 ppm for mobile stations.

RSS-133 6.3 - The carrier frequency shall not depart from the reference frequency in excess of ± 2.5 ppm for mobile stations.

§24.235 - The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

TEST PROCEDURE

Frequency Stability vs Temperature:

The EUT is place inside a temperature chamber. The temperature is set to 20°C and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until +50°C is reached. Reference power supply voltage for these tests is 3.8 Vdc.

Frequency Stability vs Voltage:

The peak frequency error is recorded (worst-case). The test voltages are 3.8 to 4.26Vdc.

MODES TESTED

- GSM GSM (GSMK) & EGPRS (8PSK),
- UMTS (W-CDMA) Rel 99

RESULTS

See the following pages.

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GPRS Mode (Cellular Band)

Reference Frequency: Cellular Mid Channel 836.599982Hz @ 20°C							
	Limit:	to stay +- 2.5 ppm =	2091.500	Hz			
DC Power Supply	Environment Frequency Deviation Measureed with Time Elapse						
(Vdc)	Temperature (°C)	(MHz)	Delta (ppm)	Limit (ppm)			
3.80	50	836.599990	-0.010	2.5			
3.80	40	836.599957	0.030	2.5			
3.80	30	836.599962	0.024	2.5			
3.80	20	836.599982	836.599982 0				
3.80	10	836.599989	2.5				
3.80	0	836.599995	2.5				
3.80	-10	836.599950	0.038	2.5			
3.80	-20	836.599997	836.599997 -0.018				
3.80	-30	836.599975	0.008	2.5			
Ref	erence Frequency: (Cellular Mid Channel	836.599982MHz @ 20	°C			
	Limit:	to stay +- 2.5 ppm =	2091.500	Hz			
DC Power Supply	Environment	Frequency Dev	viation Measureed wi	th Time Elapse			
(Vdc)	Temperature (°C)	(MHz)	Delta (ppm)	Limit (ppm)			
3.80	20	836.599982	0.000	2.5			
3.40	20	836.599997	-0.018	2.5			
4.26	20	836.599990	-0.010	2.5			
3.3 (end point voltage)	20	836.599959	0.027	2.5			

EGPRS Mode (Cellular Band)

Reference Frequency: Cellular Mid Channel 836.599975MHz @ 20°C						
	Limit:	to stay +- 2.5 ppm =	2091.500	Hz		
DC Dewer Sumply	Environment	Ereau anov Dov	vistion Messured wit	th Time Flance		
DC Power Supply	Environment	Frequency Dev	Viation Weasureed wi	th time Elapse		
(Vdc)	Temperature (°C)	(MHZ)	Delta (ppm)	Limit (ppm)		
3.80	50	836.599927	0.057	2.5		
3.80	40	836.599939	0.043	2.5		
3.80	30	836.599990	-0.018	2.5		
3.80	20	836.599975	0	2.5		
3.80	10	836.599934	2.5			
3.80	0	836.600035	836.600035 -0.072			
3.80	-10	836.600041	-0.079			
3.80	-20	836.600053	-0.093	2.5		
3.80	-30	836.599971	0.005	2.5		
Ref	erence Frequency:	Cellular Mid Channel	836.599975MHz @ 20	°C		
	Limit:	to stay +- 2.5 ppm =	2091.500	Hz		
DC Power Supply	Environment	Frequency Dev	viation Measureed wit	th Time Elapse		
(Vdc)	Temperature (°C)	(MHz)	Delta (ppm)	Limit (ppm)		
3.80	20	836.599975	0.000	2.5		
3.40	20	836.599973	0.002	2.5		
4.26	20	836.599978	-0.004	2.5		
3.3 (end point voltage)	20	836.599968	0.008	2.5		

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UMTS Rel 99 Mode (Cellular Band)

Reference Frequency: Cellular Mid Channel 836.000010MHz @ 20°C					
	Limit: to	stay +- 2.5 ppm =	2090.000	Hz	
DC Power Supply	Environment	Frequency Dev	viation Measureed wi	th Time Elapse	
(Vdc)	Temperature (°C)	(MHz)	Delta (ppm)	Limit (ppm)	
3.80	50	836.000013	-0.004	2.5	
3.80	40	836.000014	-0.005	2.5	
3.80	30	836.000017	-0.008	2.5	
3.80	20	836.000010	0	2.5	
3.80	10	836.000023	-0.016	2.5	
3.80	0	835.999962	0.057	2.5	
3.80	-10	835.999966	0.053	2.5	
3.80	-20	835.999958	0.062	2.5	
3.80	-30	835.999952	0.069	2.5	
Refe	rence Frequency: Ce	ellular Mid Channe	el 836.000010MHz @ 2	20°C	
	Limit: to	stay +- 2.5 ppm =	2090.000	Hz	
DC Power Supply	Environment	Frequency Dev	viation Measureed wi	th Time Elapse	
(Vdc)	Temperature (°C)	(MHz)	Delta (ppm)	Limit (ppm)	
3.80	20	836.000010	0.000	2.5	
3.40	20	836.000015	-0.006	2.5	
4.26	20	835.999978	0.038	2.5	
3.3 (end point voltage)	20	835.999966	0.053	2.5	

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GPRS Mode (PCS Band)

Reference Frequency: PCS Mid Channel 1879.99955MHz @ 20°C						
Limit: within	Limit: within the authorized block or +- 2.5 ppm = 4700.000 Hz					
Power Supply	Environment	Frequency Dev	viation Measureed wi	th Time Elapse		
(Vdc)	Temperature (°C)	(MHz)	Delta (ppm)	Limit (ppm)		
3.80	50	1879.999923	0.017	2.5		
3.80	40	1879.999930	0.013	2.5		
3.80	30	1879.999935	0.011	2.5		
3.80	20	1879.999955	0	2.5		
3.80	10	1879.999990	1879.999990 -0.019			
3.80	0	1879.999980	1879.999980 -0.013			
3.80	-10	1879.999984	-0.015	2.5		
3.80	-20	1879.999981	-0.014	2.5		
3.80	-30	1879.999987	-0.017	2.5		
Refe	erence Frequency: F	PCS Mid Channel 1	879.999955MHz @ 2	0°C		
Limit: within	the authorized bloc	ck or +- 2.5 ppm =	4700.000	Hz		
Power Supply	Environment	Frequency Dev	viation Measureed wi	th Time Elapse		
(Vdc)	Temperature (°C)	(MHz)	Delta (ppm)	Limit (ppm)		
3.80	20	1879.999955	0.000	2.5		
3.40	20	1879.999968	-0.007	2.5		
4.26	20	1879.999958	-0.002	2.5		
3.3 (end point voltage)	20	1879.999942	0.007	2.5		

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EGPRS Mode (PCS Band)

Reference Frequency: PCS Mid Channel 1879.99963MHz @ 20°C						
Limit: within	the authorized bloc	ck or +- 2.5 ppm =	4700.000	Hz		
Power Supply	Environment	Frequency Dev	viation Measureed wi	ith Time Elapse		
(Vdc)	Temperature (°C)	(MHz)	Delta (ppm)	Limit (ppm)		
3.80	50	1879.999895	0.036	2.5		
3.80	40	1879.999900	0.034	2.5		
3.80	30	1879.999889	0.039	2.5		
3.80	20	1879.999963	0	2.5		
3.80	10	1879.999920	1879.999920 0.023			
3.80	0	1879.999911	0.028	2.5		
3.80	-10	1879.999975	-0.006	2.5		
3.80	-20	1879.999978	-0.008	2.5		
3.80	-30	1879.999973	-0.005	2.5		
Refe	erence Frequency: F	PCS Mid Channel 1	879.999963MHz @ 2	0°C		
Limit: within	the authorized bloc	ck or +- 2.5 ppm =	4700.000	Hz		
Power Supply	Environment	Frequency Dev	viation Measureed wi	ith Time Elapse		
(Vdc)	Temperature (°C)	(MHz)	Delta (ppm)	Limit (ppm)		
3.80	20	1879.999963	0.000	2.5		
3.40	20	1879.999932	0.016	2.5		
4.26	20	1879.999955	0.004	2.5		
3.30 (end point voltage)	20	1879.999915	0.026	2.5		

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UMTS Rel 99 Mode (PCS Band)

Reference Frequency: PCS Mid Channel 1879.999964MHz @ 20°C							
Limit: to stay +- 2.5 ppm = 4700.000 Hz							
DC Power Supply	Environment	Frequency Dev	viation Measureed wi	th Time Elapse			
(Vdc)	Temperature (°C)	(MHz)	(MHz) Delta (ppm)				
3.80	50	1879.999951	0.007	2.5			
3.80	40	1879.999949	0.008	2.5			
3.80	30	1879.999955	0.005	2.5			
3.80	20	1879.999964	0	2.5			
3.80	10	1879.999952	2.5				
3.80	0	1879.999954	2.5				
3.80	-10	1880.000038	1880.000038 -0.039				
3.80	-20	1880.000051	-0.046	2.5			
3.80	-30	1880.000050	-0.046	2.5			
Ref	erence Frequency: F	PCS Mid Channel 1	879.999964MHz @ 2	0°C			
	Limit: to	stay +- 2.5 ppm =	4700.000	Hz			
DC Power Supply	Environment	Frequency Dev	viation Measureed wi	th Time Elapse			
(Vdc)	Temperature (°C)	(MHz)	Delta (ppm)	Limit (ppm)			
3.80	20	1879.999968	0	2.5			
3.40	20	1879.999959	0.005	2.5			
4.26	20	1879.999951	0.009	2.5			
3.3(end point voltage)	20	1879.999945	0.012	2.5			

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9. RADIATED TEST RESULTS

9.1. RADIATED POWER (ERP & EIRP)

RULE PART(S)

FCC: §2.1046, §22.913, §24.232

IC: RSS-132; 4.4, RSS-133, 6.4

<u>LIMITS</u>

22.913(a) - The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

24.232(c) & RSS-133 § 6.4 - Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

RSS-132 4.4, SRSP503 5.1.3 - The maximum ERP shall be 11.5 Watts for mobile stations.

TEST PROCEDURE

ANSI / TIA / EIA 603C , RSS-132; RSS-133

MODES TESTED

- GSM GSM (GSMK) & EGPRS (8PSK),
- UMTS (W-CDMA) Rel 99, Rel 6 HSDPA Subtest 2

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RESULTS for Cellular Band (ERP)

			ERP		
Mode	Channel	f (MHz)	dBm mW		
	128	824.20	29.90	977.24	
GPRS	190	836.60	30.30	1071.52	
	251	848.80	30.10	1023.29	
	128	824.20	27.10	512.86	
EGPRS	190	836.60	27.30	537.03	
	251	848.80	28.00	630.96	

			ERP		
Mode	Channel	f (MHz)	dBm mW		
	4132	826.40	24.80	302.00	
Rel 99	4180 836.00		25.20	331.13	
	4230 846.60		25.50	354.81	
	4132	826.40	826.40 25.30		
HSDPA	4180	836.60	25.30	338.84	
(Sublest Z)	4230	846.60	25.20	331.13	

RESULTS for PCS Band (EIRP)

			EIRP		
Mode	Channel	f (MHz)	dBm mW		
	512	1850.20	32.50	1778.28	
GPRS	661	1880.00	32.00	1584.89	
	810	1909.80	32.00	1584.89	
	512	1850.20	29.70	933.25	
EGPRS	661	1880.00	30.70	1174.90	
	810	1909.80	30.70	1174.90	

			EIRP		
Mode	Channel	f (MHz)	dBm	mW	
	9262	1852.40	31.00	1258.93	
Rel 99	9400	1880.00	31.50	1412.54	
	9538	1907.60	31.50	1412.54	
церра	9262	1852.40	30.60	1148.15	
(Subtect 2)	9400	1880.00	30.80	1202.26	
(Sublest Z)	9538	1907.60	31.30	1348.96	

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ERP for GPRS Mode (Cellular Band)

	High Frequency Substitution Measurement Compliance Certification Services Chamber B			
Company:	APPLE			
Project #:	10U13548			
Date:	1/12/2011			
Test Engineer:	Chin Pang			
Configuration:	EUT with AC Adapter			
Mode:	TX, GPRS 850			
	Worst Case: Y Position			

<u>Test Equipment:</u> Receiving: Sunol T130, and 3m Chamber N-type Cable (Setup this one for testing EUT) Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.

f	SG reading	Ant. Pol.	Cable Loss	Antenna Gain	ERP	Limit	Margin	Notes
MHz	(dBm)	(H/∨)	(dB)	(dBd)	(dBm)	(dBm)	(dB)	
Low Ch		1		[]	1			
824.20	30.4	V	0.5	0.0	29.9	38.5	-8.5	
824.20	29.8	Н	0.5	0.0	29.3	38.5	-9.2	
	ļ	i		Ĩ	1			
Mid Ch	ļ	1			i			
836.60	30.8	V	0.5	0.0	30.3	38.5	-8.1	
836.60	28.9	Н	0.5	0.0	28.4	38.5	-10.0	
		(ļ	1			
High Ch	Ĩ	1			1			
848.80	29.7	V	0.5	0.0	29.2	38.5	-9.2	
848.80	30.6	H	0.5	0.0	30.1	38.5	-8.4	
Rev. 1.24.7							•	

ERP for EGPRS Mode (Cellular Band)

High Frequency Substitution Measurement Compliance Certification Services Chamber B					
Company:	APPLE				
Project #:	10U13548				
Date:	1/12/2011				
Test Engineer:	Chin Pang				
Configuration:	EUT with AC Adapter				
Mode:	TX, EGPRS 850				
	Worst Case: Y Position				

<u>Test Equipment:</u>

Receiving: Sunol T130, and 3m Chamber N-type Cable (Setup this one for testing EUT) Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.

f	SG reading	Ant. Pol.	Cable Loss	Antenna Gain	ERP	Limit	Margin	Notes
MHz	(dBm)	(H/∨)	(dB)	(dBd)	(dBm)	(dBm)	(dB)	
Low Ch								
824.20	26.9	v	0.5	0.0	26.4	38.5	-12.0	
824.20	27.6	Н	0.5	0.0	27.1	38.5	-11.4	
Mid Ch								
836.60	27.5	v	0.5	0.0	27.0	38.5	-11.4	
836.60	27.8	Н	0.5	0.0	27.3	38.5	-11.1	
High Ch								
848.80	26.7	V	0.5	0.0	26.2	38.5	-12.2	
848.80	28.5	Н	0.5	0.0	28.0	38.5	-10.5	
Rev. 1.24.7	,							

ERP for UMTS Rel 99 Mode (Cellular Band)

High Frequency Substitution Measurement Compliance Certification Services Chamber B

Company:	
Project #:	
Date:	
Test Engineer:	
Configuration:	
Mode:	

APPLE 10U13548 1/13/2011 Chin Pang EUT with AC Adapter TX, UMTS 850, Rel 99 Worst Case: Y Position

Test Equipment:

Receiving: Sunol T130, and 3m Chamber N-type Cable (Setup this one for testing EUT) Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.

f	SG reading	Ant. Pol.	Cable Loss	Antenna Gain	ERP	Limit	Margin	Notes
MHz	(dBm)	(H/∨)	(dB)	(dBd)	(dBm)	(dBm)	(dB)	
Low Ch								
826.40	24.7	V	0.5	0.0	24.2	38.5	-14.2	
826.40	25.3	Н	0.5	0.0	24.8	38.5	-13.7	
Mid Ch					l			
836.00	25.7	V	0.5	0.0	25.2	38.5	-13.2	
836.00	25.4	Н	0.5	0.0	24.9	38.5	-13.5	
				Ĩ	1			8
High Ch	Ţ							
846.00	24.1	V	0.5	0.0	23.6	38.5	-14.8	
846.00	26.0	Н	0.5	0.0	25.5	38.5	-13.0	
Rev. 1.24.7								

ERP for UMTS Rel 6 HSDPA Mode (Cellular Band)

High Frequency Substitution Measurement Compliance Certification Services Chamber B

Company:	APPLE
Project#:	10U13548
Date:	1/13/2011
Test Engineer:	Chin Pang
Configuration:	EUT and AC Adapter
Mode:	TX, UMTS 1900, HSDPA
	Worst Case: Y Position

<u>Test Equipment:</u> Receiving: Sunol T130, and 3m Chamber N-type Cable (Setup this one for testing EUT) Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.

						:	:	:
f	SG reading	Ant. Pol.	Cable Loss	Antenna Gain	ERP	Limit	Margin	Notes
MHz	(dBm)	(H/∨)	(dB)	(dBd)	(dBm)	(dBm)	(dB)	
Low Ch								
826.40	25.0	v	0.5	0.0	24.5	38.5	-13.9	
826.40	25.8	Н	0.5	0.0	25.3	38.5	-13.2	
Mid Ch								
836.00	25.3	v	0.5	0.0	24.8	38.5	-13.6	
836.00	25.8	Н	0.5	0.0	25.3	38.5	-13.1	
High Ch								
846.00	23.7	v	0.5	0.0	23.2	38.5	-15.2	
846.00	25.7	Н	0.5	0.0	25.2	38.5	-13.3	
Rev. 1.24.7	,							

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EIRP for GPRS Mode (PCS Band)

High Frequency Fundamental Measurement	
Compliance Certification Services Chamber B	

Company:	APPLE	
Project #:	10U13548	
Date:	1/24/2011	
Test Engineer:	Chin Pang	
Configuration:	EUT and AC Adapter	
Mode:	TX, GPRS 1900	
	Worst Case: Y Position	

Test Equipment:

Receiving: Horn T59, and Camber B SMA Cables Substitution: Horn T60 Substitution, 6ft SMA Cable (208947003) Warehouse

f	SG reading	Ant. Pol.	Cable Loss	Antenna Gain	EIRP	Limit	Delta	Notes
GHz	(dBm)	(H/∨)	(dB)	(dBi)	(dBm)	(dBm)	(dB)	
Low Ch	,					1		
1.850	20.8	٧	0.85	8.01	28.0	33.0	-5.0	
1.850	25.3	H	0.85	8.01	32.5	33.0	-0.5	
Mid Ch								
1.880	20.3	V	0.85	8.07	27.5	33.0	-5.5	
1.880	24.8	H	0.85	8.07	32.0	33.0	-1.0	
High Ch								
1.910	20.1	V	0.85	8.13	27.4	33.0	-5.6	
1.910	24.8	H	0.85	8.13	32.0	33.0	-1.0	
Rev. 1.24.7								

EIRP for EGPRS Mode (PCS Band)

	High Frequency Fundamental Measurement Compliance Certification Services Chamber B
Company:	APPLE
Project #:	10U13548
Date:	1/24/2011
Test Engineer:	Chin Pang
Configuration:	EUT and AC Adapter
Mode:	TX, EGPRS 1900
	Worst Case: Y Position

Test Equipment:

Receiving: Horn T59, and Camber B SMA Cables Substitution: Horn T60 Substitution, 6ft SMA Cable (208947003) Warehouse

f	SG reading	Ant. Pol.	Cable Loss	Antenna Gain	EIRP	Limit	Delta	Notes
GHz	(dBm)	(H/∨)	(dB)	(dBi)	(dBm)	(dBm)	(dB)	
Low Ch								
1.850	21.3	V	0.85	8.01	28.4	33.0	4.6	
1.850	22.5	Н	0.85	8.01	29.7	33.0	-3.4	
Mid Ch								
1.880	21.1	v	0.85	8.07	28.3	33.0	4.7	
1.880	23.5	Н	0.85	8.07	30.7	33.0	-2.3	
High Ch								
1.910	20.4	V	0.85	8.13	27.7	33.0	-5.4	
1.910	23.4	Н	0.85	8.13	30.7	33.0	-2.3	
Rev. 1.24.7								

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EIRP for UMTS Rel 99 Mode (PCS Band)

High Frequency Fundamental Measurement Compliance Certification Services Chamber B

Company:	APPLE
Project #:	10U13548
Date:	1/13/2011
Test Engineer:	Chin Pang
Configuration:	EUT and AC Adapter
Mode:	TX, UMTS 1900, Rel 99
	Worst Case: Y Position

Test Equipment:

Receiving: Horn T59, and Camber B SMA Cables Substitution: Horn T60 Substitution, 6ft SMA Cable (208947003) Warehouse

f	SG reading	Ant. Pol.	Cable Loss	Antenna Gain	EIRP	Limit	Delta	Notes
GHz	(dBm)	(H/∨)	(dB)	(dBi)	(dBm)	(dBm)	(dB)	
1.852	23.9	V	0.85	8.01	31.0	33.0	-2.0	
1.852	18.3	Н	0.85	8.01	25.5	33.0	-7.6	
1.880	24.3	V	0.85	8.07	31.5	33.0	-1.5	
1.880	18.0	Н	0.85	8.07	25.2	33.0	-7.8	
1.908	24.2	V	0.85	8.13	31.5	33.0	-1.5	
1.908	18.6	Н	0.85	8.13	25.9	33.0	-7.1	
Rev. 1.24.7								

EIRP for UMTS Rel 6 HSDPA Mode (PCS Band)

	High Frequency Fundamental Measurement Compliance Certification Services Chamber B
Company:	APPLE
Project #:	10U13548
Date:	1/13/2011
Test Engineer:	Chin Pang
Configuration:	EUT and AC Adapter
Mode:	TX, UMTS 1900, HSDPA
	Worst Case: Y Position

Test Equipment:

Receiving: Horn T59, and Camber B SMA Cables Substitution: Horn T60 Substitution, 6ft SMA Cable (208947003) Warehouse

f	SG reading	Ant. Pol.	Cable Loss	Antenna Gain	EIRP	Limit	Delta	Notes
GHz	(dBm)	(H/∨)	(dB)	(dBi)	(dBm)	(dBm)	(dB)	
1.852	23.5	V	0.85	8.01	30.6	33.0	-2.4	
1.852	17.5	Н	0.85	8.01	24.7	33.0	-8.4	
1.880	23.6	V	0.85	8.07	30.8	33.0	-2.2	
1.880	17.8	Н	0.85	8.07	25.0	33.0	-8.0	
1.908	24.0	V	0.85	8.13	31.3	33.0	-1.7	
1.908	18.4	Н	0.85	8.13	25.7	33.0	-7.3	
Rev. 1.24.7								

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9.2. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

FCC: §2.1053, §22.917, §24.238 IC: RSS-132, 4.5; RSS-233, 6.5

LIMIT

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

TEST PROCEDURE

For Cellular equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

For PCS equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

MODES TESTED

- GSM GSM (GSMK) & EGPRS (8PSK),
- UMTS (W-CDMA) Rel 99, Rel 6 HSDPA Subtest 2

RESULTS

See the following pages.

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GPRS Mode (Cellular Band)

Company	r:	Apple							
Project#	:	10U13548							
Date:		1/21/2011							
Test Eng	ineer:	Chin Pang							
Configur	ation:	EUT and AC A	dapter						
Mode:		TX. GPRS 850	נ						
	Chambe	r -	Pre-an	nplifer		Filter		Lin	nit
Chamber			T145 8449B		Filter 4			Daut 00	
5	n Chamber B	1145 6449		""	teri	-	Part 22	-	
f	SG reading	Ant. Pol.	Distance	Preamp	Filter	ERP	Limit	Delta	Notes
GHz	(dBm)	(H/V)	(m)	(dB)	(dB)	(dBm)	(dBm)	(dB)	
Low Ch, 8	24.2MHz								
1.65	-11.1	V	3.0	35.5	1.0	45.7	-13.0	-32.7	
2.47	-9.8	V	3.0	35.4	1.0	44.2	-13.0	-31.2	
1.65	-8.1	Н	3.0	35.5	1.0	-42.6	-13.0	-29.6	
2.47	-8.2	H	3.0	35.4	1.0	42.6	-13.0	-29.6	
Mid Ch 8	36 6MH7								
1 67	.14 0	v	3.0	35.5	10	48.5	-13.0	-35.5	
1.07	-6.8	v	3.0	35.4	1.0	41.2	-13.0	-28.2	
2.51	-11.3	H	3.0	35.5	1.0	45.9	-13.0	-32.9	
2.51	3.4	Н	3.0	35.4	1.0	-37.9	-13.0	-24.9	
2.51 1.67 2.51	-J.+	í	1						
2.51 1.67 2.51	-3.4	Į	1	L			1		
2.51 1.67 2.51 High Ch, 8									
2.51 1.67 2.51 High Ch, 8 1.70	10.8	v	3.0	35.5	1.0	45.3	-13.0	-32.3	
2.51 1.67 2.51 High Ch, 8 1.70 2.55	-10.8 -3.1	V V	3.0 3.0	35.5 35.4	1.0 1.0	45.3 -37.6	-13.0 -13.0	-32.3 -24.6	
2.51 1.67 2.51 High Ch, 8 1.70 2.55 1.70		V V H	3.0 3.0 3.0	35.5 35.4 35.5	1.0 1.0 1.0	45.3 -37.6 -49.0	-13.0 -13.0 -13.0	-32.3 -24.6 -36.0	

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EGPRS Mode (Cellular Band)

Company: Apple Project #: 10U13548 Poate: 1/21/2011 Sest Engineer: Chin Pang Configuration: EUT and AC Ac Mode: TX, EGPRS 85		.dapter 50							
	Chambe	r	Pre-an	nplifer		Filter		Lir	nit
5m Chamber B		T145 8449	3 -	Filt	ter 1	-	Part 22	-	
f	SG reading	Apt Pol	Distance	Preamn	Filter	ERP	limit	Delta	Notes
GHz	(dBm)	(H/V)	(m)	(dB)	(dB)	(dBm)	(dBm)	(dB)	Notes
ow CH. 82	4.2MHzz	(<u></u>	11		<u>,</u>		
1.65	-16.1	V	3.0	35.5	1.0	-50.7	-13.0	-37.7	
2.47	-7.6	V	3.0	35.4	1.0	-42.0	-13.0	-29.0	
1.65	-15.7	Н	3.0	35.5	1.0	-50.2	-13.0	-37.2	
2 47	-9.5	Н	3.0	35.4	1.0	_43.9	-13.0	-30.9	
Lid Ch. 830	5.6MHz					- day			
1id Ch, 830 1.67	.6MHz -18.4	v	3.0	35.5	1.0	-52.9	-13.0	-39.9	
1id Ch, 830 1.67 2.51	-18.4 -3.7	V V	3.0 3.0	35.5 35.4	1.0 1.0	-52.9 -38.1	-13.0 -13.0	-39.9 -25.1	
lid Ch, 830 1.67 2.51 1.67	-18.4 -18.4 -3.7 -16.5	V V H	3.0 3.0 3.0	35.5 35.4 35.5	1.0 1.0 1.0	-52.9 -38.1 -51.1	-13.0 -13.0 -13.0	-39.9 -25.1 -38.1	
lid Ch, 83 1.67 2.51 1.67 2.51	6.6MHz -18.4 -3.7 -16.5 -0.6	V V H H	3.0 3.0 3.0 3.0 3.0	35.5 35.4 35.5 35.4	1.0 1.0 1.0 1.0	-52.9 -38.1 -51.1 -35.0	-13.0 -13.0 -13.0 -13.0	-39.9 -25.1 -38.1 -22.0	
lid Ch, 83(1.67 2.51 1.67 2.51	3.6MHz -18.4 -3.7 -16.5 -0.6 8.8MHz	V V H H	3.0 3.0 3.0 3.0 3.0	35.5 35.4 35.5 35.4	1.0 1.0 1.0 1.0	-52.9 -38.1 -51.1 -35.0	-13.0 -13.0 -13.0 -13.0	-39.9 -25.1 -38.1 -22.0	
lid Ch, 83 1.67 2.51 1.67 2.51 igh Ch, 84	.6MHz -18.4 -3.7 -16.5 -0.6 8.8MHz -18.6	V V H H	3.0 3.0 3.0 3.0 3.0	35.5 35.4 35.5 35.4 35.5	1.0 1.0 1.0 1.0	-52.9 -38.1 -51.1 -35.0	-13.0 -13.0 -13.0 -13.0 -13.0	-39.9 -25.1 -38.1 -22.0	
lid Ch, 83 1.67 2.51 1.67 2.51 igh Ch, 84 1.70 2.55	.6MHz -18.4 -3.7 -16.5 -0.6 8.8MHz -18.6 -5.5	V V H H V V	3.0 3.0 3.0 3.0 3.0 3.0 3.0	35.5 35.4 35.5 35.4 35.5 35.4	1.0 1.0 1.0 1.0 1.0	-52.9 -38.1 -51.1 -35.0 -53.1 -40.0	-13.0 -13.0 -13.0 -13.0 -13.0 -13.0 -13.0	-39.9 -25.1 -38.1 -22.0 -40.1 -27.0	
id Ch, 83 1.67 2.51 1.67 2.51 igh Ch, 8 ² 1.70 2.55 1.70	.6MHz 18.4 3.7 16.5 0.6 8.8MHz 18.6 5.5 18.8	V V H H V V	3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	35.5 35.4 35.5 35.4 35.5 35.4 35.5 35.4 35.5	1.0 1.0 1.0 1.0 1.0 1.0 1.0	-52.9 -38.1 -51.1 -35.0 -53.1 -40.0 -53.3	-13.0 -13.0 -13.0 -13.0 -13.0 -13.0 -13.0	39.9 25.1 38.1 22.0 40.1 27.0 40.3	

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UMTS REL 99 Mode (Cellular Band)

Company Project# Date: Fest Eng Configur Mode:	Company: Apple Project #: 10U13548 Date: 1/24/2011 Test Engineer: Chin Pang Configuration: EUT (K94) and Mode: TX, UMT 850, I		d AC Adapter Rel 99						
	Chamber			Pre-amplifer		Filter			mit
5m Chamber B		T145 8449	в –	Fil	ter 1	-	Part 22	-	
f	SG reading	Ant. Pol.	Distance	Preamp	Filter	ERP	Limit	Delta	Notes
GHz	(dBm)	(H/V)	(m)	(dB)	(dB)	(dBm)	(dBm)	(dB)	
ow CH, 8	26.4MHzz								
1.65	-13.9	V	3.0	35.5	1.0	48.4	-13.0	-35.4	
2.48	-23.6	V	3.0	35.4	1.0	-58.0	-13.0	-45.0	
1.65	-11.9	Н	3.0	35.5	1.0	46.5	-13.0	-33.5	
2.48	-25.2	Н	3.0	35.4	1.0	-59.6	-13.0	46.6	
Mid Ch. 83	6MHz								
1.67	-16.0	V	3.0	35.5	1.0	-50.5	-13.0	-37.5	
2.51	-21.0	V	3.0	35.4	1.0	-55.4	-13.0	-42.4	
1.67	-15.5	Н	3.0	35.5	1.0	-50.1	-13.0	-37.1	
2.51	-20.2	Н	3.0	35.4	1.0	-54.6	-13.0	-41.6	
ulah Ch. 9	46 MH-							,	
1 60	40MITZ 12.0	v	2.0	25.5	10	49.4	12.0	25.4	
1.03	-13.9	V	3.0	35.0	1.0	-40.4	-13.0	-55.4	
25/	-20.0	N H	3.0	35.4	1.0	-55.0	-13.0	27.9	
2.54	-0.4	11 U	3.0	35.5	1.0	-40.5	-13.0	-21.5	
2.54	23.1				1.11				

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UMTS HSDPA (Cellular Band)

Company: Apple Project #: 10U13548 Pate: 1/24/2011 Sest Engineer: Chin Pang Configuration: EUT (K94) and Mode: TX, UMT 850,								
Chambe	r l	Pre-ar	nplifer		Filter			imit
5m Chamber B		T145 8449B -		Filter 1		•	Part 22	-
SG reading	Apt Pol	Distance	Preamn	Filter	ERP	Limit	Delta	Notes
(dBm)	(H/V)	(m)	(dB)	(dB)	(dBm)	(dBm)	(dB)	Notes
6.4MHzz	((<i>1</i>	(7		(
-14.2	V	3.0	35.5	1.0	-48.7	-13.0	-35.7	
-19.6	v	3.0	35.4	1.0	-54.0	-13.0	41.0	
-9.0	Н	3.0	35.5	1.0	43.6	-13.0	-30.6	
-20.7	Н	3.0	35.4	1.0	-55.1	-13.0	42.1	
MHz								
-17.5	v	3.0	35.5	10	-52.0	-13.0	-39.0	
-11.3	v	3.0	35.4	1.0	45.7	-13.0	-32.7	
-13.0	<u>.</u> H	3.0	35.5	1.0	47.6	-13.0	-34.6	
-14.1	H	3.0	35.4	1.0	-48.5	-13.0	-35.5	
°MU-							·	
	v	20	25.5	10	51.1	12.0	20.4	
-10.0	v v	3.0	33.3 25.4	1.0	-51.1	-13.0	-30.1	
-20.0	V	3.0	30.4 25.5	1.0	-55.0	-13.0	-42.0	
-3.1	п	3.0	35.5 35.4	1.0	-44.2	-13.0	-31.2	
	neer: tion: Chamber Chamber B SG reading (dBm) 6.4MHzz -19.6 -9.0 -20.7 MHz -17.5 -11.3 -13.0 -14.1 6MHz -16.6	Apple 10U13548 1/24/2011 1eer: Chin Pang tion: EUT (K94) an TX, UMT 850, Chamber B ▼ SG reading Ant. Pol. (dBm) (H/V) 6.4MHzz -11.2 V -19.6 V -9.0 H -20.7 H MHz -17.5 V -11.3 V -13.0 H -14.1 H 6MHz -16.6 V	Apple 10U13548 1/24/2011 1eer: Chin Pang tion: EUT (K94) and AC Adapter TX, UMT 850, HSDPA Chamber B Chamber B C	Apple 10U13548 1/24/2011 neer: Chin Pang tion: EUT (K94) and AC Adapter TX, UMT 850, HSDPA Chamber Pre-amplifer T145 8449B - SG reading Ant. Pol. Distance Preamp (dBm) (H/V) (m) (dB) 6.4MHzz - - - -14.2 V 3.0 35.5 -19.6 V 3.0 35.4 -9.0 H 3.0 35.5 -20.7 H 3.0 35.4 -11.3 V 3.0 35.5 -11.3 V 3.0 35.5 -14.1 H 3.0 35.4 6MHz - - - -16.6 V 3.0 35.5	Apple 10U13548 1/24/2011 1eeer: Chin Pang tion: EUT (K94) and AC Adapter TX, UMT 850, HSDPA Chamber B Chamber B	Apple 10U13548 1/24/2011 1/24/2011 neer: Chin Pang ion: EUT (K94) and AC Adapter TX, UMT 850, HSDPA Filter Chamber Pre-amplifer Filter Chamber B T145 8449B Filter Filter 1 SG reading (H/V) Ant. Pol. (m) Distance Preamp Filter (dBm) ERP (dBm) 6.4MHzz - - - - - - 14.2 V 3.0 35.5 1.0 48.7 -14.2 V 3.0 35.4 1.0 -54.0 9.0 H 3.0 35.5 1.0 43.6 -20.7 H 3.0 35.4 1.0 -55.1 MHz - - - - - -11.3 V 3.0 35.5 1.0 43.6 -20.7 H 3.0 35.5 1.0 45.7 -13.0 H 3.0 35.5 1.0 45.7 -13.0 H 3.0 35.4 <td>Apple 10U13548 1/24/2011 Neer: Chin Pang ion: EUT (K94) and AC Adapter TX, UMT 850, HSDPA Filter Filter Chamber B Filter I SG reading Ant. Pol. Distance Preamp Filter ERP Limit (dBm) (H/V) Implifer T145 8449B SG reading Ant. Pol. Distance Preamp Filter ERP Limit (dB) Limit (dB) Implifer T145 8449B SG reading Ant. Pol. Distance Preamp Filter ERP Limit (dB) Limit (dB) Implifer T13.0 SG reading Ant. Pol. Distance Preamp Filter ERP Limit (dB) Implifer 13.0 -141.2 V 3.0 35.5 1.0 48.7 -13.0 -141.2 V 3.0 35.4 1.0 -51.1 -13.0 -141.2 V 3.0 35.5 1.0 43.6 -13.0 -14.1 V 3.0 35.5 1.0 45.7 -13.0 -17.5 V 3.0 35.5 1.0 47.6 -13.0 -11.3 V 3.0 35.5 1.0 47.6 -13.0 <t< td=""><td>Apple 10U13548 1/24/2011 teer: Chin Pang tion: EUT (K94) and AC Adapter TX, UMT 850, HSDPA Filter TX, UMT 850, HSDPA Filter 1 • Limit Delta (dBm) Distance (H/V) Pre-amplifer T145 8449B • Filter 1 • Limit OB(B) Delta (dBm) Delta (dB) Delt</td></t<></td>	Apple 10U13548 1/24/2011 Neer: Chin Pang ion: EUT (K94) and AC Adapter TX, UMT 850, HSDPA Filter Filter Chamber B Filter I SG reading Ant. Pol. Distance Preamp Filter ERP Limit (dBm) (H/V) Implifer T145 8449B SG reading Ant. Pol. Distance Preamp Filter ERP Limit (dB) Limit (dB) Implifer T145 8449B SG reading Ant. Pol. Distance Preamp Filter ERP Limit (dB) Limit (dB) Implifer T13.0 SG reading Ant. Pol. Distance Preamp Filter ERP Limit (dB) Implifer 13.0 -141.2 V 3.0 35.5 1.0 48.7 -13.0 -141.2 V 3.0 35.4 1.0 -51.1 -13.0 -141.2 V 3.0 35.5 1.0 43.6 -13.0 -14.1 V 3.0 35.5 1.0 45.7 -13.0 -17.5 V 3.0 35.5 1.0 47.6 -13.0 -11.3 V 3.0 35.5 1.0 47.6 -13.0 <t< td=""><td>Apple 10U13548 1/24/2011 teer: Chin Pang tion: EUT (K94) and AC Adapter TX, UMT 850, HSDPA Filter TX, UMT 850, HSDPA Filter 1 • Limit Delta (dBm) Distance (H/V) Pre-amplifer T145 8449B • Filter 1 • Limit OB(B) Delta (dBm) Delta (dB) Delt</td></t<>	Apple 10U13548 1/24/2011 teer: Chin Pang tion: EUT (K94) and AC Adapter TX, UMT 850, HSDPA Filter TX, UMT 850, HSDPA Filter 1 • Limit Delta (dBm) Distance (H/V) Pre-amplifer T145 8449B • Filter 1 • Limit OB(B) Delta (dBm) Delta (dB) Delt

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GPRS Mode (PCS Band)

Company Project # Date: Test Eng Configur: Mode:	:ompany: Apple 'roject #: 10U13548 Jate: 1/20/2011 'est Engineer: Chin Pang Configuration: EUT and AC Ac Mode: TX, GPRS 190								
	Chambe	r	Pre-an	nplifer	Filter			Limit	
5r	5m Chamber B			B	Filt	ter 1	-	Part 24	-
	CC reading	Ant Dal	Distance	Draaman			linald	Dalta	Nata
T CH-	(dBm)	ANT. POI. /UN/	Distance (m)	Preamp (dB)	Hitter (dB)		(dBm)	Delta	Notes
		((in)	(UD)	(ub)	(авті)	(автт)	(UD)	
2 70	12 0	v	2.0	25.4	1.0	16.3	12.0	22.2	
5.55	-12.0	V V	3.0	35.4	1.0	40.5	-13.0	-33.3	
3 70	-10.0		3.0	35.4	1.0	-43.2	-13.0	-32.2	
5.55	-9.0	H	3.0	35.4	1.0	43.4	-13.0	-30.4	
				•			•		
Mid Ch, 18	80MHz								
3.76	-12.7	V	3.0	35.3	1.0	47.1	-13.0	-34.1	
	-10.7	V	3.0	35.4	1.0	45.1	-13.0	-32.1	
5.64		н	7 30	35.3	1.0	45.2	-13.0	-32.2	
5.64 3.76	-10.9		J.U					244	
5.64 3.76 5.64	-10.9 -9.6	H	3.0	35.4	1.0	44.1	-13.0	-31.1	
5.64 3.76 5.64	-10.9 -9.6	H	3.0	35.4	1.0	44.1	-13.0	-31.1	
5.64 3.76 5.64 High Ch, 1	-10.9 -9.6 909.8MHz	H	3.0	35.4	1.0	44.1	-13.0	-31.1	
5.64 3.76 5.64 High Ch, 1 3.82 5.73	-10.9 -9.6 909.8MHz -13.2 -11.1	H V V	3.0 3.0 3.0	35.4 35.3 35.4	1.0 1.0 1.0	44.1 47.5 45.6	-13.0 -13.0 -13.0	-31.1	
5.64 3.76 5.64 High Ch, 1 3.82 5.73 3.82	-10.9 -9.6 909.8MHz -13.2 -11.1 -14.3	H V V	3.0 3.0 3.0 3.0 3.0	35.4 35.3 35.4 35.3	1.0 1.0 1.0 1.0	44.1 47.5 45.6 48.6	-13.0 -13.0 -13.0 -13.0	-31.1 -34.5 -32.6 -35.6	

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EGPRS Mode (PCS Band)

			Above IGH	IZ Filgh Fiel	uency st	DSulution	nineasui	ement	
Company	:	Apple							
Project #	:	10U13548							
Date:		1/20/2011							
Test Eng	ineer	Chin Bang							
Configure	nieer.	EIIT and AC A	dantar						
Mada	ation.	EUT and AC A	ooo						
	Chambe	r	Pre-ar	nplifer		Filter		Lir	nit
	Champer							Liniit	
5r	n Chamber B	-	T145 8449	в 🚽	Fil	ter 1	-	Part 24	-
,								,	
f	SG reading	Ant. Pol.	Distance	Preamp	Filter	EIRP	Limit	Delta	Notes
GHz	(dBm)	(H/V)	(m)	(dB)	(dB)	(dBm)	(dBm)	(dB)	
Low CH. 1	850.2MHzz	(<u>, , , , , , , , , , , , , , , , , , , </u>	11	(<u></u>	<u>, , , , , , , , , , , , , , , , , , , </u>	
3.70	-13.9	v	3.0	35.4	1.0	-48.2	-13.0	-35.2	
	-11.3	V	3.0	35.4	1.0	45.7	-13.0	-32.7	
5.55	· · · ·	Н	3.0	35.4	1.0	47.4	-13.0	-34.4	
5.55	-13.1		2	7 of 4	10	44.4	-13.0	314	
5.55 3.70 5.55	-13.1 -10.0	Н	3.0	35.4	1.0		÷		
5.55 3.70 5.55 Mid.Cb. 19	-13.1 -10.0	H	3.0	33.4	1.0			-51.4	
5.55 3.70 5.55 Mid Ch, 18 3.76	-13.1 -10.0 80MHz	H	3.0	30.4 35.3	1.0	48.7	13.0	35.7	
5.55 3.70 5.55 Mid Ch, 18 3.76 5.64	-13.1 -10.0 80MHz -14.3 -11.2	H V V	3.0 3.0 3.0	35.4 35.3 35.4	1.0	48.7 45.6	-13.0 -13.0	-35.7	
5.55 3.70 5.55 Mid Ch, 18 3.76 5.64 3.76	-13.1 -10.0 80MHz -14.3 -11.2 -14.3	H V V H	3.0 3.0 3.0 3.0 3.0	35.3 35.3 35.4 35.3	1.0 1.0 1.0 1.0	48.7 45.6 48.6	-13.0 -13.0 -13.0	-35.7 -32.6 -35.6	
5.55 3.70 5.55 Mid Ch, 18 3.76 5.64 3.76 5.64	-13.1 -10.0 80MHz -14.3 -11.2 -14.3 -10.3	H V V H H	3.0 3.0 3.0 3.0 3.0 3.0	35.4 35.3 35.4 35.3 35.4	1.0 1.0 1.0 1.0 1.0	48.7 45.6 48.6 44.8	-13.0 -13.0 -13.0 -13.0	-35.7 -32.6 -35.6 -31.8	
5.55 3.70 5.55 Mid Ch, 18 3.76 5.64 3.76 5.64	-13.1 -10.0 80MHz -14.3 -11.2 -14.3 -10.3	H V V H H	3.0 3.0 3.0 3.0 3.0	35.4 35.3 35.4 35.3 35.4	1.0 1.0 1.0 1.0 1.0	48.7 45.6 48.6 44.8	-13.0 -13.0 -13.0 -13.0	-35.7 -32.6 -35.6 -31.8	
5.55 3.70 5.55 Mid Ch, 18 3.76 5.64 3.76 5.64 High Ch, 1	-13.1 -10.0 80MHz -14.3 -11.2 -14.3 -10.3 909.8MHz	H V V H H	3.0 3.0 3.0 3.0 3.0	35.4 35.3 35.4 35.3 35.4	1.0 1.0 1.0 1.0	48.7 45.6 48.6 44.8	-13.0 -13.0 -13.0 -13.0	35.7 32.6 35.6 31.8	
5.55 3.70 5.55 Mid Ch, 18 3.76 5.64 3.76 5.64 5.64 High Ch, 1 3.82	-13.1 -10.0 80MHz -14.3 -11.2 -14.3 -10.3 909.8MHz -14.1	H V H H	3.0 3.0 3.0 3.0 3.0 3.0 3.0	35.4 35.3 35.4 35.3 35.4 35.3	1.0 1.0 1.0 1.0 1.0 1.0	48.7 45.6 48.6 44.8 48.4	-13.0 -13.0 -13.0 -13.0 -13.0	35.7 32.6 35.6 31.8 35.4	
5.55 3.70 5.55 Mid Ch, 18 3.76 5.64 3.76 5.64 4 5.64 High Ch, 1 3.82 5.73	-13.1 -10.0 80MHz -14.3 -11.2 -14.3 -10.3 909.8MHz -14.1 -10.4	H V H H V V	3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	35.4 35.3 35.4 35.3 35.4 35.3 35.4 35.3 35.4	1.0 1.0 1.0 1.0 1.0 1.0	48.7 45.6 48.6 44.8 44.8 48.4 44.9	-13.0 -13.0 -13.0 -13.0 -13.0 -13.0 -13.0	35.7 32.6 35.6 31.8 35.4 31.9	
5.55 3.70 5.55 Mid Ch, 18 3.76 5.64 3.76 5.64 High Ch, 1 3.82 5.73 3.82	-13.1 -10.0 80MHz -14.3 -11.2 -14.3 -10.3 909.8MHz -14.1 -10.4 -14.6 -14.6	H V H H V V V H	3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	35.4 35.3 35.4 35.3 35.4 35.3 35.4 35.3 35.4 35.3	1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	48.7 45.6 48.6 44.8 48.4 48.9 48.9	-13.0 -13.0 -13.0 -13.0 -13.0 -13.0 -13.0 -13.0	35.7 32.6 35.6 31.8 35.4 31.9 35.9	

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UMTS REL 99 Mode (PCS Band)

Company Project # Date: Test Eng Configur	Company: Apple Project #: 10U13548 Pate: 1/20/2011 Sest Engineer: Chin Pang Configuration: EUT and AC Ac Mode: TX, UMTS1900								
Mode:		TX, UMTS1900	I, REL99						
	Chambe	r	Pre-an	nplifer		Filter		Lir	nit
5m Chamber B 🚽			T145 8449	в –	Filt	ter 1	-	Part 24	-
		,		,			1		
f	SG reading	Ant. Pol.	Distance	Preamp	Filter	EIRP	Limit	Delta	Notes
GHz	(dBm)	(H/∨)	(m)	(dB)	(dB)	(dBm)	(dBm)	(dB)	
Low Ch. 1	352.4MHz								
3.70	-19.7	V	3.0	35.4	1.0	-54.0	-13.0	41.0	
5.56	-17.8	V	3.0	35.4	1.0	-52.2	-13.0	-39.2	
3.70	-19.2	Н	3.0	35.4	1.0	-53.5	-13.0	-40.5	
5.56	-17.0	Н	3.0	35.4	1.0	-51.4	-13.0	-38.4	
M:J.C. 40	90MU-								
2 7C		v	2.0	25.2	10	52.4	12.0	40.1	
5.70	-10./	V V	2.0	33.3 25.4	1.0	-33.1	-13.0	-40.1	
	20.0		3.0	35.4 35.3	1.0	-30.1	-13.0	-57.1	
3.04	-20.0	H	3.0	35.3	1.0	-54.5	-13.0	-37.5	
3.76		••							
3.76 5.64	-1010					:		· · · · · · · · · · · · · · · · · · ·	
3.76 5.64 High Ch, 1	907.6MHz								
3.76 3.76 5.64 High Ch, 1 3.82	907.6MHz -20.1	V	3.0	35.3	1.0	-54.4	-13.0	-41.4	
3.76 5.64 High Ch, 1 3.82 5.72	907.6MHz _20.1 _16.9	V V	3.0 3.0	35.3 35.4	1.0 1.0	-54.4 -51.4	-13.0 -13.0	_41.4 _38.4	
3.76 5.64 High Ch, 1 3.82 5.72 3.82	907.6MHz -20.1 -16.9 -20.1	V V H	3.0 3.0 3.0	35.3 35.4 35.3	1.0 1.0 1.0	-54.4 -51.4 -54.4	-13.0 -13.0 -13.0	41.4 -38.4 -41.4	

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UMTS HSDPA (PCS Band)

Company		Angle							
Project #		10113548							
Data:	•	1/0/10040							
Date. Tost End	incor	Chin Dong							
Configur	neer.	Chin Pang	-1+						
Conngur	ation.	EUT and AC A	dapter						
vioae:		TX, UMEST900	J, HSUPA						
	Chambe	r	Pre-an	nplifer		Filter		Lir	nit
Chamber			T145 8440	B	Filter d			Dant 04	
5m Chamber B 🗸		1 145 6449	· ·		teri	-	Part 24	-	
f	SG reading	Ant. Pol.	Distance	Preamp	Filter	EIRP	Limit	Delta	Notes
GHz	(dBm)	(H/V)	(m)	(dB)	(dB)	(dBm)	(dBm)	(dB)	
Low Ch, 1	852.4MHz								
3.70	-20.2	V	3.0	35.4	1.0	-54.5	-13.0	-41.5	
5.56	-17.8	V	3.0	35.4	1.0	-52.2	-13.0	-39.2	
3.70	-19.9	H	3.0	35.4	1.0	-54.2	-13.0	-41.2	
5.56	-16.3	H	3.0	35.4	1.0	-50.7	-13.0	-37.7	
Mid Ch 18	80MHz								
	-19.3	v	3.0	35.3	1.0	-53.7	-13.0	-40.7	
3.76	-16.9	V	3.0	35.4	1.0	-51.3	-13.0	-38.3	
3.76 5.64		Н	3.0	35.3	1.0	-55.2	-13.0	-42.2	
3.76 5.64 3.76	-20.9		7 20	7 25 4	10	-50.1	-13.0	-37.1	
3.76 5.64 3.76 5.64	-20.9 -15.6	H	j.0	55.4	1.0		¢		
3.76 5.64 3.76 5.64	-20.9 -15.6	H	3.0	33.4	1.0		•		
3.76 5.64 3.76 5.64 High Ch, 1	-20.9 -15.6 907.6MHz	H	3.0	35.4	- 10	- 54 O	42.0		
3.76 5.64 3.76 5.64 High Ch, 1 3.82	-20.9 -15.6 907.6MHz -20.6	H V	3.0	35.3	1.0	-54.9	-13.0	41.9	
3.76 5.64 3.76 5.64 High Ch, 1 3.82 5.72	-20.9 -15.6 907.6MHz -20.6 -17.1		3.0 3.0 3.0	35.4 35.3 35.4 25.2	1.0 1.0	-54.9 -51.6	-13.0 -13.0 13.0	41.9 -38.6	
3.76 5.64 3.76 5.64 High Ch, 1 3.82 5.72 3.82 5.72	-20.9 -15.6 907.6MHz -20.6 -17.1 -20.3	H V V H	3.0 3.0 3.0 3.0	35.3 35.3 35.4 35.3	1.0 1.0 1.0 1.0	-54.9 -51.6 -54.6	-13.0 -13.0 -13.0 13.0	41.9 -38.6 -41.6 -25.9	

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9.3. RECEIVER SPURIOUS EMISSIONS

<u>LIMIT</u>

RSS-Gen 7.2.2

Spurious Emission Limits for Receivers:

Spurious Frequency (MHz)	Field Strength (microvolts/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960	500

TEST PROCEDURE

The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (local oscillator frequency, intermediate frequency or carrier frequency),

or 30 MHz, whichever is the higher, to at least 3 times the highest tunable and local oscillator frequencies.

<u>RESULTS</u>

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SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



COMPLIANCE CERTIFICATION SERVICES (UL CCS) FORM NO: CCSUP4701D 47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888 This report shall not be reproduced except in full, without the written approval of UL CCS

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SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)



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DATA

30-1000MHz Frequency Measurement Compliance Certification Services, Fremont 5m Chamber													
Test Engr: Date: Project #: Company: Test Target: Mode Oper:		Chin Pan 01/24/11 10U13548 Apple FCC 15B Normal	NE 1										
	f Dist Read AF CL	Measurem Distance to Analyzer H Antenna F Cable Loss	ent Frequ o Antenn Reading 'actor	ency a	Amp D Corr Filter Corr. Limit	Preamp Gain Margin Margin vs. Limit Distance Correct to 3 meters Filter Insert Loss Calculated Field Strength Field Strength Limit						Limit	
f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Pad dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/OP	Notes
42.361 66.602 96.603 177.846 295.211 71.162 142.565 159.845 295.211 6666.626	3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	43.3 46.9 45.7 41.0 38.4 41.7 36.1 39.3 46.4 38.7	12.6 8.1 9.2 10.5 13.1 8.2 13.1 10.8 13.1 18.9	0.6 0.7 0.9 1.2 1.6 0.7 1.1 1.1 1.1 1.6 2.5	29.6 29.5 29.1 28.8 29.6 29.3 29.3 29.3 28.8 29.6	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	26.9 26.1 26.2 23.6 24.3 21.0 20.8 22.0 32.4 30.5	40.0 40.0 43.5 43.5 46.0 40.0 43.5 43.5 43.5 46.0 46.0	-13.1 -13.9 -17.3 -19.9 -21.7 -19.0 -22.7 -21.5 -13.6 -15.5	V V V V H H H H	P P P P P P P P P P P P P P	
Rev. 1.27.09 Note: No other emissions were detected above the system noise floor.													

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SPURIOUS EMISSIONS ABOVE 1000 MHz (WORST-CASE CONFIGURATION)

Note: No emissions were detected above the system noise floor.

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9.4. POWER LINE CONDUCTED EMISSION

<u>LIMIT</u>

RSS-Gen 7.2.2

Except when the requirements applicable to a given device state otherwise, for any licenceexempt radio communication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in Table 2. The tighter limit applies at the frequency range boundaries.

Table 2 – AC Power Lines Conducted Emission Limits

Frequency of Emission (MHz)	Conducted Limit (dBuV)				
	Quasi-peak	Average			
0.15-0.5	66 to 56 *	56 to 46 *			
0.5-5	56	46			
5-30	60	50			

Decreases with the logarithm of the frequency.

RESULTS

6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)										
Freq.		Reading		Closs	Limit	EN_B	Mar	Remark		
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2	
0.17	63.04		39.75	0.00	64.77	54.77	-1.73	-15.02	L1	
0.25	55.37		29.81	0.00	61.66	51.66	-6.29	-21.85	L1	
24.01	43.71		35.12	0.00	60.00	50.00	-16.29	-14.88	L1	
0.17	60.55		39.15	0.00	64.77	54.77	-4.22	-15.62	L2	
0.27	53.21		29.60	0.00	61.24	51.24	-8.03	-21.64	L2	
24.01	41.66		33.24	0.00	60.00	50.00	-18.34	-16.76	L2	
6 Worst I	Data									

LINE 1 RESULTS



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LINE 2 RESULTS



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