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Ericsson Confidential TEST REPORT

ERICSSON 🍃		TEST REPORT			1 (34)
Prepared (also subject responsible if other)		No.			
EWU/PR/HD Keith A. Goshia					
Approved	Checked	Date	Rev	Reference	
EWU/PR/H Thomas J. Funk		2006-10-26	С	TA8AKRC161134-4	

FCC Part 27 Report

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Sub-part 2.1033 (c): CFR-27 Subpart L

Equipment Identification

FCC ID: TA8AKRC161134-4

Date of Report

Thursday, 26 October 2006

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<u>Rule</u>

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EWU/PR/H Thomas J. Funk		2006-10-26	С	TA8AKRC161134-4	

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List of General Information Required for Type Acceptance

In Accordance with FCC Rules and Regulations, Volume II, Part 2 and to Part 27 sub-part L

Sub-part

2.1033 (c)(1) Name and Address of Applicant: **Ericsson Wireless Communications** 6210 Spine Rd. Boulder, CO 80301 Vendor: Applicant 2.1033(c)(2): FCC ID: TA8AKRC161134-4 2.924 Model No RRU22 21_{IV}40 Technical Description: 2.1033(c)(4): Type of Emission: 4M17F9W 2.1033(c)(5) Frequency Range, MHz: 2112.4-2152.6MHz 2.1033(c)(6) Power Rating, Watts: 40 Switchable Adjustable x N/A 40 2.1033(c)(7)Maximum Power Rating, Watts:

2.1033(c)(8) Voltages & Currents in all Elements in Final R.F. Stage, <u>Including Final Transistor or Solid State Device:</u> Collector Voltage, VDC: -48 = per manual

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Open Exhibits

2.1033	<u>Cover Letter:</u> Please see Attached Exhibit 1
2.1033	<u>Cover Letter Confidentiality:</u> Please see Attached Exhibit 2
2.1033	<u>Cover Letter Temperature Range:</u> Please see Attached Exhibit 3
2.1033	<u>External Photo's:</u> Please see Attached Exhibits 5
2.1033	<u>Photo FCC ID:</u> Please see Attached Exhibit 6
2.1033	<u>Tune-Up Procedure:</u> Please see Attached Exhibit 7
2.1033	FCC Form 731: Including Fee Processing Form
2.1033	<u>Test Report:</u> Please see Attached Exhibit 9

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Confidential Exhibits

2.1033	Internal Photo's: Please see Attached Exhibit 10
2.1033	<u>System Block Diagram:</u> Please see Attached Exhibit 11
2.1033	<u>Schematics:</u> Please see Attached Exhibit 12
2.1033	Technical Description: Please see Attached Exhibit 13
2.1033	Installation Instruction: Please see Attached Exhibit 14
2.1033	<u>Parts List:</u> Please see Attached Exhibit 15
2.1033	<u>Technical Circuit Description</u> : Please see Attached Exhibit 16

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2.1033(c)(14) & 27 Sub part L Test Report:

Test Report Follows

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Sub-part 2.1033 (c) :

Test and Measurement Data

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2, Sub-part J, Sections 2.1046, 2.1049, 2.1051, 2.1053, 2.1055 and the following individual Parts:

Domestic Public Radio Services	
Personal Communications Services	
Miscellaneous Wireless Communication Services	<u>X</u>
Broadband PCS	
Special Provisions for Alternative Cellular Technologies and and Auxiliary Services	<u>X</u>
International Fixed Public Radio Communications Service	
Experimental, Auxiliary & Special Broadcast and Other Program Distribution Services	
Low Power Auxiliary Stations	
Stations in the Maritime Service	
Transmitter Frequency Tolerances, 156–162 MHz, Coast Stations	
Private Coast Stations & Marine Utility Stations	
Compulsory R/T Installations for Small Passenger Boats	
Radio Telegraph Installation Required for Vessels on the Great Lakes	
Radio Telegraph Installation Required by the Bridge-to-Bridge Act	
Aviation Services	
Private Land Mobile Radio Services	
	Personal Communications Services Miscellaneous Wireless Communication Services Broadband PCS Special Provisions for Alternative Cellular Technologies and and Auxiliary Services International Fixed Public Radio Communications Service Experimental, Auxiliary & Special Broadcast and Other Program Distribution Services Low Power Auxiliary Stations Stations in the Maritime Service Transmitter Frequency Tolerances, 156–162 MHz, Coast Stations Private Coast Stations & Marine Utility Stations Compulsory R/T Installations for Small Passenger Boats Radio Telegraph Installation Required for Vessels on the Great Lakes Radio Telegraph Installation Required by the Bridge–to–Bridge Act Aviation Services

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- Private Operational–Fixed microwave Services <u>94</u>
- <u>95</u> General Mobile Radio Service

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General Information

- 1. Spurious radiation was measured at three (3) meters.
- 2. The normal modes of modulation are:
 - (a) Voice (b) Wideband Data (c) SAT (d) ST (e) SAT + Voice SAT + DTMF (f) 16QAM or QPSK WCDMA (g) X (h) Pi/4 DQPSK (i) NAMPS Voice (j) NAMPS DSAT NAMPS ST (k)

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Standard Test Conditions and Engineering Practices

Except as noted herein, the following conditions and procedures were observed during the testing:

Room Temperature	$= 25 \pm 5^{\circ} C$
Room Humidity	= 20–50%
Supply Voltage	- 48VDC

Prior to testing, the E.U.T. was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.

Measurement results, unless otherwise noted, are worst-case measurements.

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Name of Test:	R.F. Power Output & Occupied Bandwidth
Paragraph:	47 CFR 27.50(d), 2.1046 & 2.1049
<u>Guide:</u>	EIA Standard RS 152B, Paragraph 3.3
Test Methodologies:	TIA 603
Test Condition:	Standard Temperature & Humidity
Test Equipment:	As per Attached Appendix J

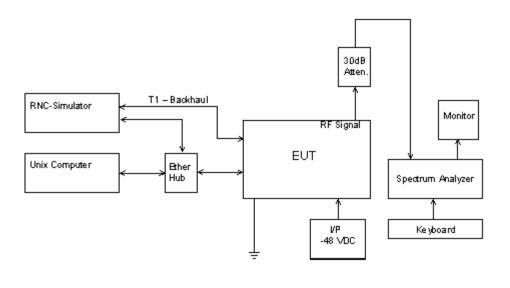
Measurement Procedures

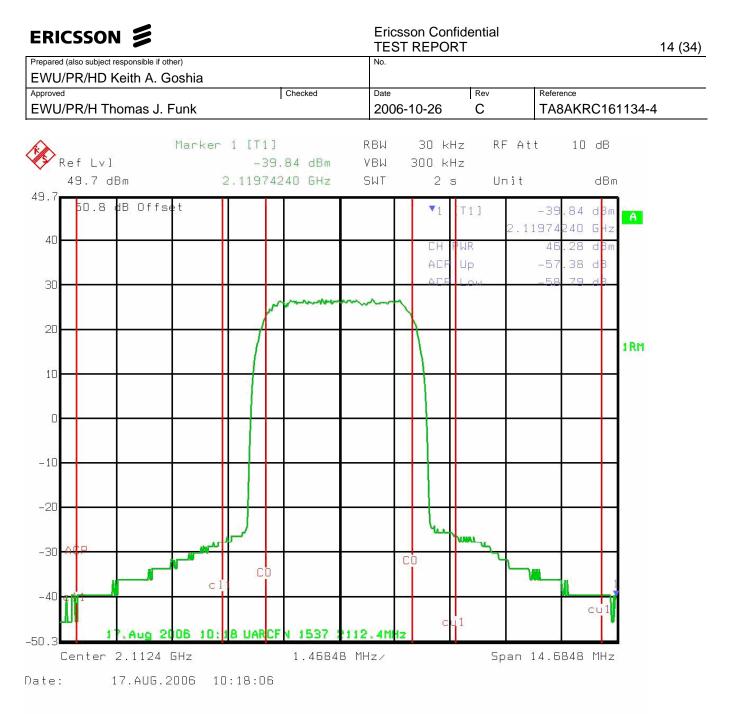
- 1. The E.U.T. was connected to a directional coupler and a resistive coaxial attenuator of normal load impedance, and the modulated output power was measured by means of an R.F. power meter for reference. The actual RF data was recorded by the means of a Spectrum Analyzer. Spectrum analyzer bandwidth was set to the 3GPP standard test mode that was developed by Rhode & Schwarz and is the default settings which measure the total RF power using a 30kHz bandwidth.
- 2. Measurement accuracy is ±3%.

Measurement Results

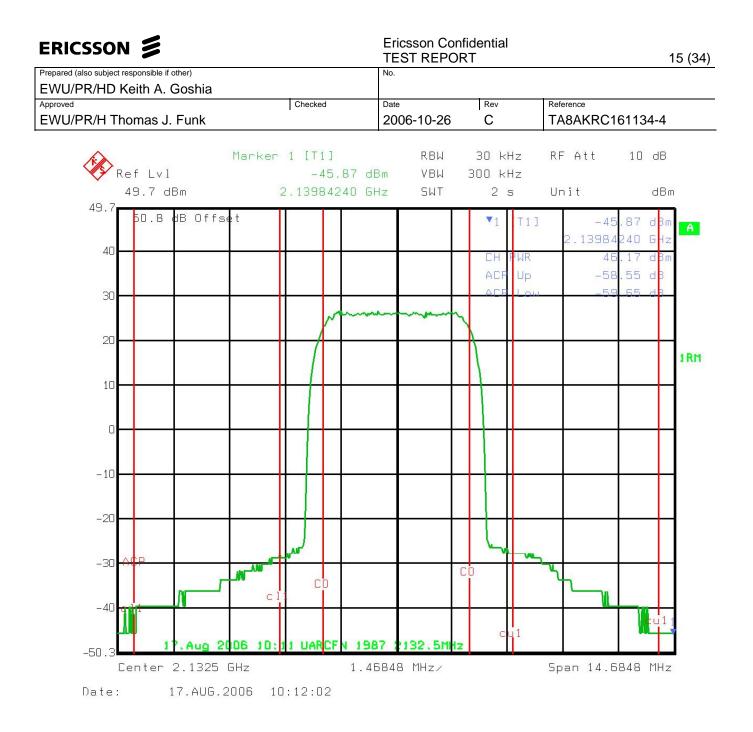
Nominal, MHz	Channel Num.	Band	R.F. Power Output, dBm	
			High Power QPSK	High Power 16 QAM
2112.4Mhz	1537	Class 4	46.28	45.98
2132.5Mhz	1987	Class 4	46.17	45.96
2152.6Mhz	1738	Class 4	46.41	45.92

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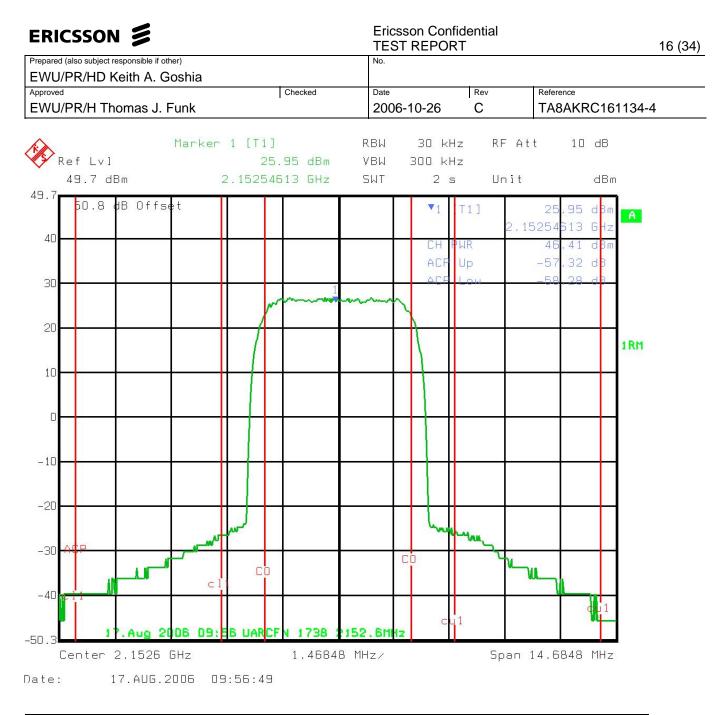




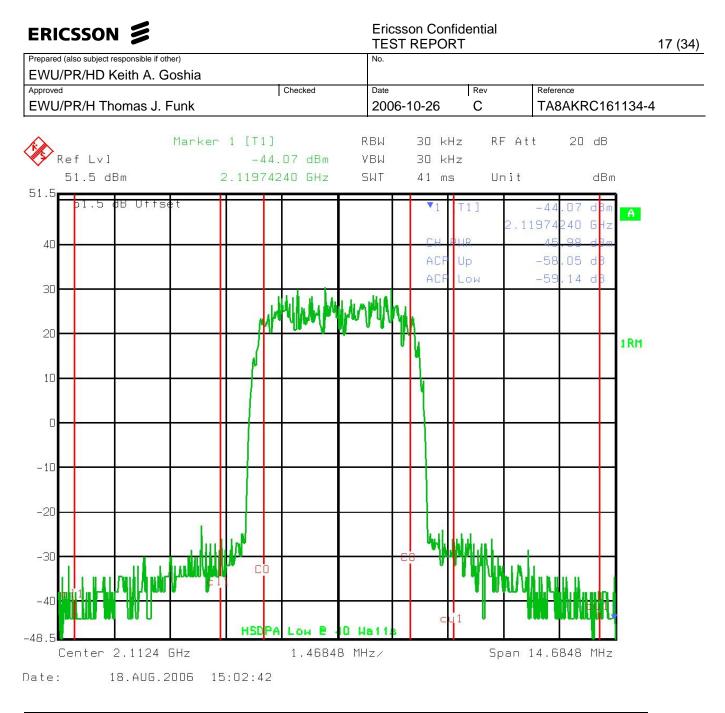




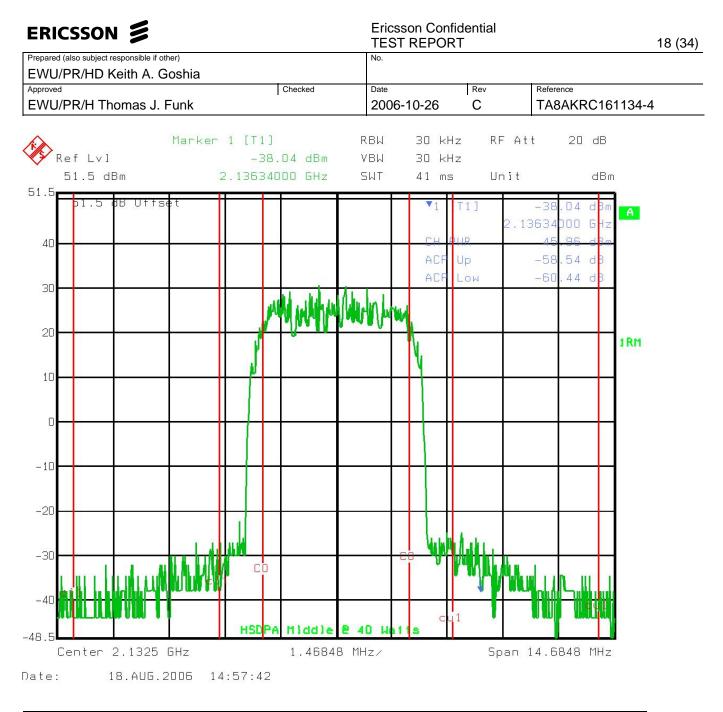
Test Result for QPSK on 2132.5MHz



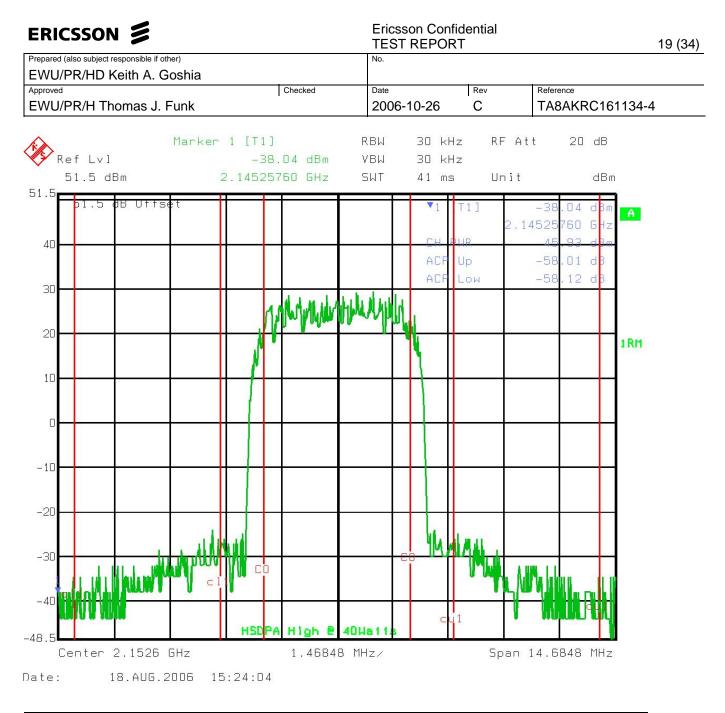
Test Result for QPSK on 2152.6MHz



Test Result for 16 QAM on 2112.4MHz



Test Result for 16 QAM on 2132.5MHz



Test Result for 16 QAM on 2152.6MHz

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EWU/PR/H Thomas J. Funk		2006-10-26	С	TA8AKRC161134-4

Name of Test:Spurious Emissions at Antenna TerminalsParagraph:47 CFR 27.53(g)Guide:EIA Standard RS 152B, Paragraph 17Test Methodologies:TIA 603Test Condition:Standard Temperature & HumidityTest Equipment:As per Attached Appendix J

Measurement Procedures

- 1. The E.U.T. was connected, through a directional coupler, a 50 dB coaxial attenuator then to a Rohde & Schwarz Spectrum Analyzer.
- 2. Measurements were made over the range from 1GHz to 20 GHz for the worst case modulation at the highest R.F. power settings.
- 3. All other emissions were 20 dB or more below the limit.
- 4. Spectrum analyzer bandwidth was set to the 3GPP standard test mode that was developed by Rhode & Schwarz and is the default settings.
- 5. Measurement Results: All emissions are 30dB below and more and no plots where provided. All measurement where recorded and found to be in the noise floor. The 30 data plots are available upon request. The file size is 8MB.

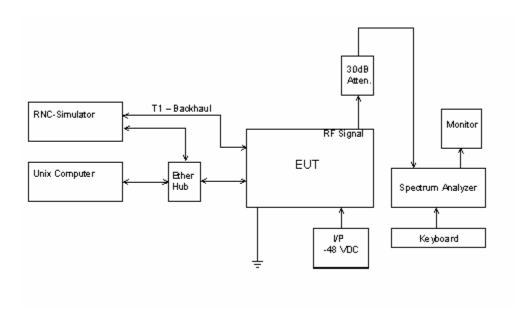
Frequency	2112.4MHz	2132.5MHz	2152.6MHz
1 st Harmonic	Noise floor -35dB	Noise floor -37dB	Noise floor -33dB
2 nd Harmonic	Noise floor -33dB	Noise floor -32dB	Noise floor -34dB
3 rd Harmonic	Noise floor -35dB	Noise floor -35dB	Noise floor -34dB

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Spurious Emissions at Antenna Terminals

Test 1: Spurious Emissions at Antenna Terminals



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Approved	Checked	Date	Rev	Reference	
EWU/PR/H Thomas J. Funk		2006-10-26	С	TA8AKRC161134-4	

Name of Test:	Field Strength of Spurious Radiation
Paragraph:	47 CFR 27.53(g)
<u>Guide:</u>	See Measurement Procedure Below
Test Methodologies:	TIA 603
Test Condition:	Standard Temperature & Humidity
Test Equipment:	As per Attached Appendix J
	Measurement Procedures

- 1. A description of the measurement facilities was filed with the F.C.C. and was found to be in compliance with the requirements of Section 15.38, by letter from the F.C.C. The test facility used was Elliott Laboratories in Sunnyvale CA
- 2. In the field, the test sample was placed on a turntable at three meters away from the search antenna. The test sample was connected to an R.F. wattmeter and a 50 ohm dummy load, and adjusted to its maximum rated output.

In order to obtain the maximum response at each spurious frequency, the turntable was rotated. Also, the Search Antennas were raised and lowered vertically, and all cables were oriented. Excess power lead was coiled above the system.

3. Measurement Results:

Spurious emission bandwidth settings per 27.53 (g).

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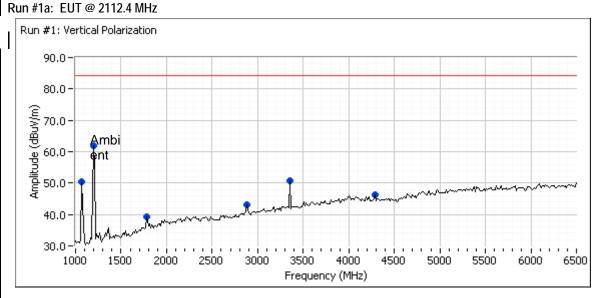
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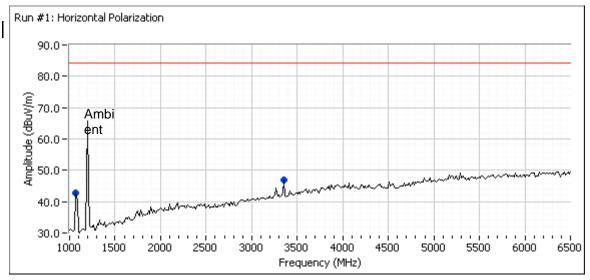
Client:	Ericsson	Wireless			ob Number:	J65655	
Oliciti.	Encoson				og Number:	T65875	
Model:	RRU22 2 ⁻	1IV40			nt Manager:	-	
Contact:	Keith Gos	hia					
Standard:	FCC part	27			Class:	N/A	
Test Spec	rific Detai		ourious Emiss	ions, F	Part 27		
-	Objective:	The objective of this test sess specification listed above.	sion is to perform final qua	alification te	sting of the E	UT with respec	ct to the
	te of Test:	10/25/2006 8:26	Config. Used:	1 None			
Test General T The EUT and equipment w	d all local su vas located a	guration upport equipment were located approximately 30 meters from		-48Vdc ted spuriou			
Test General T The EUT and equipment w overhead in	t Location: est Confi d all local su vas located s the GR-108 ement anter	SVOATS #2 guration upport equipment were located approximately 30 meters from 9 test configuration. nna was located 3 meters from	EUT Voltage: on the turntable for radia the EUT with all I/O conn	-48Vdc ted spuriou			
Test General T The EUT and equipment w overhead in The measure	t Location: est Confi d all local su vas located s the GR-108 ement anter	SVOATS #2 guration upport equipment were located approximately 30 meters from 9 test configuration. nna was located 3 meters from	EUT Voltage: on the turntable for radia the EUT with all I/O conno the EUT.	-48Vdc ted spuriou			
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Run #1: Radiated Spurious Emissions, Transmit Mode, 1000 - 22000 MHz Measurements made at 3m





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30.0 20.0 18 Run #1a: El Frequency	UT @ 2112	.4 MHz Pol	19000 Part 2) 195(27 Note 1	DO 2000 Frequency Detector	0 2050 (MHz) Azimuth	Height			νν 22000
30.0 20.0 18 20.0 18 20.0 18 20.0 18 20.0 18 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.	UT @ 2112 Level dBmV/ m	.4 MHz Pol v/h	19000	27 Note 1 Margin	Detector Pk/QP/Av g	0 2050 (MHz) Azimuth degrees	DO 21 Height meters	Comment s	1500 2	νφ ν 22000
30.0 20.0 18 20.0 20.0 18 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.	UT @ 2112 Level dBmV/ m 91.0	.4 MHz Pol v/h	19000 Part 2 Limit	27 Note 1 Margin	Detector Pk/QP/Av g PK	0 2050 (MHz) Azimuth degrees 268	Height neters	Comment	1500 2	νφ ν 22000
30.0 20.0 18 20.0 20.0 18 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.	UT @ 2112 Level dBmV/ m 91.0 69.5	.4 MHz Pol v/h V	19000 Part 2 Limit - 84.4	27 Note 1 Margin N/A -14.9	Detector Pk/QP/Av 9 PK PK PK	Azimuth degrees 268 263	Height 1.0 1.2	Comment s	1500 2	/// :2000
30.0 20.0 18 20.0 18 20.0 18 20.0 18 20.0 18 20.0 18 20.0 10 20.0 20.	UT @ 2112 Jupper de la construction BOOO UT @ 2112 Level dBmV/ m 91.0 69.5 63.4	.4 MHz Pol v/h V V V	19000 Part 2 Limit - 84.4 84.4	27 Note 1 27 Note 1 Margin N/A -14.9 -21.0	Detector Pk/QP/Av g PK PK PK PK	0 2050 (MHz) Azimuth degrees 268 263 243	Height Height 1.0 1.2 1.5	Comment s	1500 2	νν 22000
30.0 20.0 18 20.0 18 20.0 18 20.0 10 10 10 10 20.0 10 10 20.0 10 10 20.0 10 10 20.0 10 10 20.0 10 10 20.0 10 10 20.0 10 10 10 20.0 10 10 10 10 10 10 10 10 10 10 10 10 10	UT @ 2112 Level dBmV/ m 91.0 69.5 63.4 63.1	.4 MHz Pol v/h V V V V H	Part 2 Limit - 84.4 84.4 84.4	27 Note 1 Margin N/A -14.9 -21.0 -21.3	Detector Pk/QP/Av g PK PK PK PK PK	0 2050 (MHz) Azimuth degrees 268 263 243 284	Height Meters 1.0 1.2 1.5 1.3	Comment s	1500 2	/// 12000
30.0 20.0 18 20.0 20.0 18 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.	UT @ 2112 Level dBmV/ m 91.0 69.5 63.4 63.1 59.9 The field s propagati and, for e	.4 MHz Pol v/h V V V H H strength on equat rp limits,	Part 2 Limit - 84.4 84.4 84.4 84.4 limit in the tion: $E=\sqrt{3}$ the dipole	27 Note 1 27 Note 1 Margin N/A -14.9 -21.0 -21.3 -24.5 tables abov 30PG)/d. The gain (2.2df	Detector Pk/QP/Av g PK PK PK PK PK PK ve was calcula is limit is cons	Azimuth degrees 268 263 243 284 264 ated from the servative - it en included.	Height Meters 1.0 1.2 1.5 1.3 1.8 e eirp limit of does not c The erp o	Comment s For referent detailed in th onsider the p r eirp for all s	nce only e standard u presence of t	www 22000 sing the free space he ground plane ess than 10dB of
30.0 20.0 18 20.0 18 20.0 18 20.0 10 20.0 20.	UT @ 2112 Level dBmV/ m 91.0 69.5 63.4 63.1 59.9 The field s propagati and, for e margin re	.4 MHz Pol v/h V V V H H strength on equal rp limits, lative to	Part 2 Limit - 84.4 84.4 84.4 84.4 limit in the tion: $E=\sqrt{3}$ the dipole	27 Note 1 27 Note 1 Margin N/A -14.9 -21.0 -21.3 -24.5 tables abov 30PG)/d. The gain (2.2df	Detector Pk/QP/Av g PK PK PK PK PK PK PK Si limit is cons Bi) has not bea	Azimuth degrees 268 263 243 284 264 ated from the servative - it en included.	Height Meters 1.0 1.2 1.5 1.3 1.8 e eirp limit of does not c The erp o	Comment s For referent detailed in th onsider the p r eirp for all s	nce only e standard u presence of t	sing the free space
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30.0 20.0 18 20.0 18 20.0 18 20.0 10 20.0 20.	UT @ 2112 Level dBmV/ m 91.0 69.5 63.4 63.1 59.9 The field s propagati and, for e margin re	.4 MHz Pol V/h V V H H H strength on equal rp limits, lative to	Part 2 Limit - 84.4 84.4 84.4 84.4 limit in the tion: $E=\sqrt{(3)}$ the dipole this field st	27 Note 1 27 Note 1 Margin N/A -14.9 -21.0 -21.3 -24.5 tables abor 30PG)/d. Th gain (2.2df trength limit	Detector Pk/QP/Av g PK PK PK PK PK PK PK PK is limit is cons 3i) has not bea is determined	Azimuth degrees 268 263 243 284 264 ated from the servative - it en included. d using subs	Height Height 1.0 1.2 1.5 1.3 1.8 e eirp limit of does not c The erp of titution means Height	Comment s For referent detailed in th onsider the p r eirp for all s asurements.	nce only e standard u presence of t	sing the free space
30.0 20.0 18 20.0 18 20.0 18 20.0 10 20.0 20.	UT @ 2112 Level dBmV/ m 91.0 69.5 63.4 63.1 59.9 The field s propagati and, for e margin re UT @ 2132 Level dBmV/	.4 MHz Pol v/h V V V V H H strength on equal rp limits, lative to	Part 2 Limit - 84.4 84.4 84.4 84.4 limit in the tion: $E=\sqrt{(3)}$ the dipole this field st	27 Note 1 27 Note 1 N/A -14.9 -21.0 -21.3 -24.5 tables abov 30PG)/d. Th gain (2.2df trength limit	Detector PK/QP/Av g PK PK PK PK PK PK PK PK PK is limit is cons Bi) has not bea is determined	Azimuth degrees 268 263 243 284 264 ated from the servative - it en included. d using subsitive Azimuth	Height Height 1.0 1.2 1.5 1.3 1.8 e eirp limit of does not c The erp o titution means Height	Comment s For referent detailed in th onsider the p r eirp for all s asurements.	e standard u presence of t signals with l	sing the free space

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EWU/PR/H	- Thomas	s J. Fur	ık			2006-10)-26	С	TA8AKRC16	51134-4
1088.642	63.3	V	84.4	-21.1	PK	242	1.2	1		
4265.080	61.5	Н	84.4	-22.9	PK	284	1.2			
1088.655	58.6	H	84.4	-25.8	PK	264	1.0			
1000.000	00.0		04.4	-20.0		204	1.0			
Note 1:	propagati and, for e	on equa rp limits,	tion: E=√(3 , the dipole	0PG)/d. Th gain (2.2dł	is limit is cons	servative - it en included.	does not c The erp c	onsider the p r eirp for all s	e standard using presence of the g signals with less t	round plane
Run #1c: E	IIT @ 2153	4 MHz								
Frequency	Level	Pol	Part 2	7 Note 1	Detector	Azimuth	Height	Comment s		
MHz	dBmV/ m	v/h	Limit	Margin	Pk/QP/Av g	degrees	meters			
2153.000	84.1	V	-	N/A	PK	61	1.0	For referen	nce only	
4306.000	64.8	V	84.4	-19.6	PK	284	1.0			
4306.000	61.3	Н	84.4	-23.1	PK	279	1.8			
1088.653	60.3	Н	84.4	-24.1	PK	280	1.7			
1088.666	58.8	V	84.4	-25.6	PK	53	1.0			
3329.650	48.9	V	84.4	-35.5	PK	0	1.0			
3331.460	47.8	Н	84.4	-36.6	PK	350	1.0			
1785.590	44.4	V	84.4	-40.0	PK	110	1.0			
Note 1: Run #2: Ra Vertical	propagati The eirp f measurer	on equa for all sig ments.	tion: E=√(3 jnals with le	0PG)/d. Th ss than 20	is limit is cons	servative - it relative to th	does not c is field stre	onsider the p ngth limit is c	e standard using presence of the g determined using	round plane.
Frequency	Substituti	on moas	urements	Site	FUT	measureme	nte	eirp Limit	erp Limit	Margin
MHz	Pin ¹	Gain 2	FS ³	Factor ⁴	FS⁵	eirp (dBm)	erp (dBm)	dBm	dBm	dB
	-30.0	10.1	80.2	100.1	69.5	-30.6		-13.0		-17.6
4224.770	-29.2	10.1	81.0	100.1	66.4	-33.7		-13.0		-20.7
4224.770 4265.080	20.2	10.2	80.8	99.4	64.8	-34.6		-13.0		-21.6
	-28.8	10.2	·	•	•			•		
4265.080		10.2								
4265.080 4306.000	-28.8		wer (dBm)	to the subs	stitution anten	na				
4265.080 4306.000 Note 1:	-28.8 Pin is the	input po	()				gain of 2.2	dBi. <u>Horn an</u> t	tenna (Asset 487) used.
4265.080 4306.000 Note 1: Note 2:	-28.8 Pin is the Gain is th	input po e gain (o	dBi) for the	substitutior		lipole has a	-	dBi. Horn ant	tenna (Asset 487) used.
4265.080	-28.8 Pin is the Gain is th FS is the	input po e gain (o field stre	dBi) for the sength (dBuV	substitutior //m) measu	n antenna. A c	lipole has a substitution a	antenna.		,) used.

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<u>Name of Test:</u> Frequency Stability – Temperature and Voltage Variation

Paragraph: 47 CFR 27.54, 2.1055

<u>Guide:</u>

Test Condition:

Standard

TEMPERATURE	FREQUENCY @ 2112.4MHz	Δ Hz 12.47	FREQUENCY @ 2132.5MHz	Δ Hz 18.35	FREQUENCY @ 2152.6MHz	Δ Hz 12.84
-33ºC	2112399997.10	-2.9	2132500003.32	3.32	2152599995.56	-4.44
-30°C	2112400006.14	6.14	2132499991.87	-8.13	2152600002.69	2.69
-20°C	2112399993.67	-6.33	2132500008.98	8.98	2152600002.93	2.93
-10ºC	2112399996.88	-3.12	2132500007.52	7.52	2152600005.17	5.17
O°C	2112400003.09	3.09	2132500010.22	10.22	2152599992.33	-7.67
10ºC	2112399995.36	-4.64	2132500003.09	3.09	2152600004.03	4.03
20°C	2112399997.43	-2.57	2132499997.37	-2.63	2152600001.57	1.57
30°C	2112400005.36	5.36	2132500004.36	4.36	2152599994.62	-5.38
40°C	2112400005.86	5.86	2132500009.00	9	2152600001.64	1.64
50°C	2112400004.19	4.19	2132500001.87	1.87	2152599995.84	-4.16

EIA Standard RS 152B, Paragraph 10

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Name of Test: Necessary Bandwidth and Emission Bandwidth

<u>Paragraph:</u> 47 CFR 2.202 (g)

Modulation = WCDMA (F9W)

Emission Bandwidth Calculation: Necessary Bandwidth, kHz = 4,170.00

Justification for WCDMA bandwidth of 4.17 MHz.

Reference: 3GPP TS 25.141.

Chip rate is 3.840MHz per the 3GPP standard. At the 3dB down point, the bandwidth is 4.2MHz. Channel spacing is normally set to 5.0MHz from centre frequency to centre frequency.

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Testimonial	
and	
Statement of Certification	

This is to certify:

- 1. That the application was prepared either by, or under the direct supervision of, the undersigned.
- 2. That the technical data supplies with the application were taken under my direction and supervision.
- 3. That the data was obtained on representative units, randomly selected.
- 4. That, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.

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Certifying Engineer:

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Radio Frequency Radiation Exposure Limits

The device is installed in a permanent location. It is not operator accessible, and is contained in a secured environment that is accessible by field service engineers or installation engineers only. The ERP of the device is less than 1000 Watts. The Antenna's used on this device are a typical 18dB gain antenna, with this configuration and the maximum RF output of the device set to 40 Watts the exposure limit is less than 1000 Watts.

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Appendix J

Test Instrumentation List

All equipment calibrated within last 180 days

Power Meter

HP 8901A HP 437B

Power Sensor

HP 8481B

Spectrum Analyzer Rhode & Schwarz FSEM