ACME TESTING INC., 2002 VALLEY HWY, P.O. BOX 3, ACME, WASHINGTON 98220-0003 888-226-3837.

REPORT OF MEASUREMENTS
PART 15C (15.247) - INTENTIONAL RADIATOR

DEVICE:	905 - 925 MHz 41 CHANNEL DIRECT SEQUENCE SPREAD SPECTRUM TRANSCEIVER
MODEL:	CCU3200
MANUFACTURER:	WAVERIDER COMMUNICATIONS (CANADA) INC.
ADDRESS:	6120 – 1A STREET S.W. CALGARY ALBERTA CANADA T2H 0G3

THE DATA CONTAINED IN THIS REPORT WAS
COLLECTED ON 1, 11, & 24 AUGUST 2000 AND COMPILED BY:

PAUL G. SLAVENS
CHIEF EMC ENGINEER

WORK ORDER: 23500HR

(Table of Contents Continued)

1. General

1.1 Purpose

The purpose of this report is to show compliance to the FCC regulations for spread spectrum unlicensed devices operating under section 15.247 of the Code of Federal Regulations title 47.

1.2 Manufacturer

Company Name:	WaveRider Communications (Canada) Inc.
Contact:	Ivan Rodrigues
Street Address:	6120 – 1A Street S.W.
City/Province:	Calgary Alberta
Country/Postal Code:	Canada T2H 0G3
Telephone:	403 319-2350
Fax:	403 319-2359

1.3 Test location

Company:	Acme Testing Inc.
Street Address:	2002 Valley Highway
Mailing Address:	PO Box 3
City/State/Zip:	Acme WA 98220-0003
Laboratory:	Test Site 2
Telephone:	888 226-3837
Fax:	360 595-2722
E-mail:	acmetest@acmetesting.com
Web:	www.acmetesting.com
Receipt of EUT:	1 August 2000

1.4 Test Personnel

Paul G. Slavens, Chief EMC Engineer

2. Test Results Summary

Summary of Test Results

Requirement	CFR Section	Test Result
Radiated Spurs < 15.209	15.205(b)	PASS
AC Emissions < 48 dBuV	15.207	PASS
6 dB BW > 500 kHz	15.247(a)	PASS
Max Output Power < 1 W	15.247(a)	PASS
Antenna Gain Requirements	15.247(b)	PASS
Radio Frequency Exposure	15.247(b)	PASS
Conducted Spurious >-20 dBc	15.247(c)	PASS
Power Density < 8dBm in 3 kHz	15.247(d)	PASS
Process Gain > 10 dB	15.247(e)	PASS

The signed original of this report, supplied to the client, represents the only "official" copy. Retention of any additional copies (electronic or non-electronic media) is at Acme Testing's discretion to meet internal requirements only. The client has made the determination that EUT Condition, Characterization, and Mode of Operation are representative of production units, and meet the requirements of the specifications referenced herein.

Consistent with Industry practice, measurement and test equipment not directly involved in obtaining measurement results but having an impact on measurements (such as cable loss, antenna factors, etc.) is factored into the "Correction Factor" documented in certain test results. Instrumentation employed for testing meets tolerances consistent with known Industry Standards and Regulations.

The measurements contained in this report were made in accordance with the referenced standards and all applicable Public Notices received prior to the date of testing. Acme Testing assumes responsibility only for the accuracy and completeness of this data as it pertains to the sample tested.

_____ _____

Paul G. Slavens — Date of Issuance

Chief EMC Engineer

3. Description of Equipment and Peripherals

3.1 Equipment Under Test (EUT)

Device:	905 - 925 MHz 41 Channel Direct Sequence Spread Spectrum Transceiver
Model Number:	CCU3200
FCC ID:	OOX-WRM3200
Power:	120 V/60 Hz
Grounding:	3-Wire AC Plug
Antennas:	Yagi, Omni-directional, Circular, and Patch
Number of Channels:	41
Lowest Frequency:	905 MHz
Highest Frequency:	925 MHz

3.2 EUT Peripherals

The EUT was tested as a stand-alone device.

3.3 Description of Interface Cables for Emissions

CPU and Transmitter Unit/Antenna

Shielded	Unshielded	Flat	Round	Length	Ferrite
Yes	No	No	Yes	12 m (coiled)	No

RS-232

Shielded	Unshielded	Flat	Round	Length	Ferrite
Yes	No	No	Yes	1 m	No

Ethernet (Unterminated)

Shielded	Unshielded	Flat	Round	Length	Ferrite
No	Yes	Yes	No	1 m	No

ARRANGEMENT OF INTERFACE CABLES: All interface cables were positioned for worst case maximum emissions within the manner assumed to be a typical operation condition (please reference photographs).

3.4 Mode of Operation During Tests

The EUT was exercised by transmitting a modulated signal on channels 1, 21 & 41. During radiated spurious emissions testing the EUT was tested with four (Yagi, Omni-directional, Circular, and Patch) antennas.

3.5 Modifications Required for Compliance

1. None.

4. Antenna requirement

4.1 Regulation

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

4.2 Result

The intentional radiator uses a standard connector, however the intentional radiator is only installed by professionals.

5. Conducted Emissions Tests

Test Requirement: FCC CFR47, Part 15C

Test Procedure: ANSI C63.4:1992

5.1 Test Equipment

⇒ Spectrum Analyzer: Hewlett-Packard 8566B, Serial Number 2403A06519, Calibrated: 7 January 2000, Calibration due Date: 7 January 2001

⇒ RF Preselector: Hewlett-Packard 85685A, Serial Number 2926A00971, Calibrated: 17 March 2000, Calibration due Date: 17 March 2001

⇒ Quasi Peak Adapter: Hewlett-Packard 85650A, Serial Number 2521A-00689, Calibrated: 19 November 1999, Calibration due Date: 19 November 2000

⇒ Line Impedance Stabilization Network: Rhode & Schwarz ESH2-Z5, Serial Number ACMERS1, Calibrated: 1 September 1999, Calibration due Date: 01 September 2000

5.2 Purpose

The purpose of this test is to evaluate the level of conducted noise the EUT imposes on the AC mains.

5.3 Test Procedures

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that is placed above the groundplane. Floor standing equipment is placed directly on the groundplane. Any supplemental grounding mechanisms are connected, if appropriate. The EUT is connected to its associated peripherals, with any excess I/O cabling bundled to approximately 1 meter. The EUT is connected to a dedicated LISN and all peripherals are connected to a second separate LISN circuit. The LISNs are bonded to the groundplane.

Preview tests are performed to determine the "worst case" mode of operation. With the EUT operating in "worst case" mode, final conducted measurements are taken. Conducted measurements are made on each current carrying conductor with respect to ground.

Conducted Emissions Test Characteristics	
Frequency range	0.45 MHz - 30.0 MHz
Test instrumentation resolution bandwidth	9 kHz
Lines Tested	Line 1/Line 2

5.4 Test Results

LINE 1
PEAK EMISSIONS

PEAK #	FREQ. (MHz)	AMPL (dBuV)
1	19.31	47.1
2	0.5435	45.9
3	0.4615	45.7
4	0.5019	45.2
5	0.6268	45.1
6	0.6676	45.1
7	0.7079	45.1

LINE 2
PEAK EMISSIONS

PEAK #	FREQ. (MHz)	AMPL (dBuV)
1	4.211	45.7
2	0.5458	45.6
3	0.5861	45.6
4	0.504	45.4
5	0.4595	45.3
6	0.7109	45.2
7	0.8768	45.2
8	1.246	45.2

A summary of the highest amplitude emissions is listed above. For detailed plots of all emissions from 0.45 MHz – 30 MHz, please refer to the accompanying data in the list of attachments.

6. 6 dB Bandwidth

6.1 Regulation

15.247(a2) For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

6.2 Test Equipment

⇒ Spectrum Analyzer: Hewlett-Packard 8566B, Serial Number 2403A06519, Calibrated: 7 January 2000, Calibration due Date: 7 January 2001

⇒ RF Preselector: Hewlett-Packard 85685A, Serial Number 2926A00971, Calibrated: 17 March 2000, Calibration due Date: 17 March 2001

6.3 Test Procedures

The RF output of the EUT is connected to the RF input port of the RF preselector through a 10 dB pad. The following measurements were made with a RBW = 100 kHz and VBW = 300 KHz.

6.4 Test Results

⇒ The measured 6 dB bandwidth at channel 1 is 2.6 MHz.
⇒ The measured 6 dB bandwidth at channel 21 is 2.48 MHz.
⇒ The measured 6 dB bandwidth at channel 41 is 2.48 MHz.

Please see plots in the list of attachments.

7. Power Output

7.1 Regulation

15.247(b1) The maximum peak output power of the intentional radiator shall not exceed the following: For frequency hopping systems operating in the 2400-2483.5 MHz or 5725-5850 MHz band and for all direct sequence systems: 1 watt.

7.2 Test Equipment

⇒ Spectrum Analyzer: Hewlett-Packard 8566B, Serial Number 2403A06519, Calibrated: 7 January 2000, Calibration due Date: 7 January 2001

⇒ RF Preselector: Hewlett-Packard 85685A, Serial Number 2926A00971, Calibrated: 17 March 2000, Calibration due Date: 17 March 2001

7.3 Test Procedures

The modulated RF output of the EUT is connected to the RF input port of the RF preselector with a 20 dB pad. The following measurements were made with a RBW = 3 MHz and VBW = 3 MHz.

7.4 Test Results

⇒ Measured maximum Peak Envelope Power for channel 1 was 26.0 dBm.
⇒ Measured maximum Peak Envelope Power for channel 21 was 24.8 dBm.
⇒ Measured maximum Peak Envelope Power for channel 41 was 26.0 dBm.

8. Antenna gain requirements

8.1 Regulation

15.247(b3) Except as shown below, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the above stated values by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

1 Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

(ii) Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

(iii) Fixed, point-to-point operation, as used in paragraphs (b)(3)(i) and (b)(3)(ii) of this section, excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

8.2 Result

Maximum measured power is 26.0 dBm. The maximum gain antenna is the Yagi's gain on 9.2 dBi.

9. Radio Frequency exposure

9.1 Regulation

15.247(b4) Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See §1.1307(b)(1) of this Chapter.

9.2 Result

According to par 1.1307b(1), the EUT does not require an environmental evaluation.

1. This equipment classification is not present within table 1 of part 1.1307 and is not listed in section 1.1307b(2).
2. The EUT categorically exempt from routine environmental evaluation per section 2.1093.

Included are calculations that determine that minimum distance I from the transmitter antenna that will ensure an exposure limit at or below the guidelines given in table 1 of part 1.1310 for the general population. The formula for these calculations are taken from OET Bulletin 65, edition 97-01, August 1997; "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields".

9.3 CALCULATIONS

Per Table 1 of Section 1.1310 the limit for general population exposure at 902 - 928 MHz is 1.0 mW/cm^2

Per OET Bulletin 65, edition 97-01 the formula for calculating power density is:
$S = P*G/4\pi R^2$
with
Power = 26.0 dBm = 400 mW
Gain of Antenna = 9.2 dBi or a numeric gain of 8.3
therefore
Solving for R gives a minimum safe distance of 20 cm

9.4 CONCLUSION

The EUT user's manual instructs the installer to maintain the at least minimum safe distance.

10. Conducted Spurious Emissions

10.1 Regulation

15.247 I In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

10.2 Test Equipment

⇒ Spectrum Analyzer: Hewlett-Packard 8566B, Serial Number 2403A06519, Calibrated: 7 January 2000, Calibration due Date: 7 January 2001

⇒ RF Preselector: Hewlett-Packard 85685A, Serial Number 2926A00971, Calibrated: 17 March 2000, Calibration due Date: 17 March 2001

⇒ Quasi Peak Adapter: Hewlett-Packard 85650A, Serial Number 2521A-00689, Calibrated: 19 November 1999, Calibration due Date: 19 November 2000

10.3 Test Procedures

The RF output of the EUT is connected to the RF input port of the RF preselector through a 10 dB pad. The following measurements were made with a RBW = 100 kHz and VBW = 300 kHz.

10.4 Test Results

No out of band conducted emissions were detected within 50 dB of the carrier power. Please see plots in the list of attachments.

11. Radiated Spurious Emissions

11.1 Regulation

15.247 I In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

11.2 Test Equipment

⇒ Spectrum Analyzer: Hewlett-Packard 8566B, Serial Number 2403A06519, Calibrated: 7 January 2000, Calibration due Date: 7 January 2001

⇒ RF Preselector: Hewlett-Packard 85685A, Serial Number 2926A00971, Calibrated: 17 March 2000, Calibration due Date: 17 March 2001

⇒ Quasi Peak Adapter: Hewlett-Packard 85650A, Serial Number 2521A-00689, Calibrated: 19 November 1999, Calibration due Date: 19 November 2000

⇒ Line Impedance Stabilization Network: Rhode & Schwarz ESH2-Z5, Serial Number ACMERS1, Calibrated: 1 September 1999, Calibration due Date: 01 September 2000

⇒ Broadband Biconical Antenna (20 MHz to 200 MHz): EMCO 3110, Serial Number 1115, Calibrated: 28 December 1999, Calibration due Date: 28 December 2000

⇒ Broadband Log Periodic Antenna (200 MHz to 1000 MHz): EMCO 3146, Serial Number 2853, Calibrated: 28 December 1999, Calibration due Date: 28 December 2000

⇒ EUT Turntable Position Controller: EMCO 1061-3M, Serial Number 9003-1441, No Calibration Required

⇒ Antenna Mast with Controller: EMCO 1051, Serial Number 9002-1457, No Calibration Required

⇒ Pyramidal Horn Antenna: EMCO 3160-10, Serial Number 9708-1055, Calibration Not Required

⇒ 2 GHz to 10 GHz Low Noise Preamplifier: Milliwave 593-2898, Serial Number 2494, No Calibration Required

⇒ Double Ridge Guide Horn Antenna: EMCO 3115, Serial Number 9807-5534, Calibrated: 30 December 1999, Calibration due Date: 30 December 2000

⇒ 8 – 22GHz Preamplifier: MITEQ AFS4-35LN, Serial Number 484280, Calibrated: 3 January 2000, Calibration Due Date: 3 January 2001

11.3 Test Procedures

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that sits on a flush mounted metal turntable. Floor standing equipment is placed directly on the flush mounted metal turntable. The EUT is connected to its associated peripherals with any excess I/O cabling bundled to approximately 1 meter.

Preview tests are performed to determine the "worst case" mode of operation. With the EUT operating in "worst case" mode, emissions from the unit are maximized by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions.

Radiated Emissions Test Characteristics	
Frequency range	30 MHz – 22000 MHz **15.205 RESTRICTED BANDS ONLY**
Test distance	3 m
Test instrumentation resolution bandwidth	120 kHz (30 MHz – 10,000 MHz) 1 MHz (10,000 MHz – 22,000 MHz)
Receive antenna scan height	1 m – 4 m
Receive antenna polarization	Vertical/Horizontal

11.4 Test Results

WITH THE YAGI ANTENNA
Channel 1

Emission Number	Frequency (MHz)	EUT Emission (dBuV/m)	Spec limit (dBuV/m)	Delta to the limit dB	Detector Function (Peak, Quasi-Peak)	Polarity (Vertical/ Horizontal)	Antenna Height (cm)	Table Azimuth (deg.)
1	2714.40	52.6	74	-21.4	PK	H	100	142
2	2714.40	50.2	74	-23.8	PK	V	100	1
3	2715.59	38.6	54	-15.4	AVG	H	100	142
4	2715.59	35.7	54	-18.3	AVG	V	100	1
5	3619.27	32.5	54	-21.5	AVG	H	100	15
6	3619.27	31.4	54	-22.6	AVG	V	100	163
7	3619.60	41.8	74	-32.2	PK	H	100	15
8	3619.60	41.7	74	-32.3	PK	V	100	163
9	4524.21	46.2	74	-27.8	PK	H	130	124
10	4524.05	45.0	74	-29.0	PK	V	100	180
11	4524.89	35.0	54	-19	AVG	H	130	124
12	4524.89	33.2	54	-20.8	AVG	V	100	180

Channel 21

Emission Number	Frequency (MHz)	EUT Emission (dBuV/m)	Spec limit (dBuV/m)	Delta to the limit dB	Detector Function (Peak, Quasi-Peak)	Polarity (Vertical/ Horizontal)	Antenna Height (cm)	Table Azimuth (deg.)
1	2744.70	54.2	74	-19.8	PK	H	130	149
2	2744.82	55.1	74	-18.9	PK	V	100	246
3	2745.63	37.6	54	-16.4	AVG	H	130	149
4	2745.63	38.3	54	-15.7	AVG	V	100	246
5	3659.61	39.3	54	-14.7	AVG	H	130	136
6	3659.47	36.4	54	-17.6	AVG	V	100	1
7	3659.70	46.4	74	-27.6	PK	H	130	136
8	3659.70	45.4	74	-28.6	PK	V	100	1
9	4574.80	40.4	74	-33.6	PK	H	100	129
10	4574.80	45.0	74	-29.0	PK	V	100	249
11	4575.36	31.2	54	-22.8	AVG	H	100	129
12	4575.03	33.3	54	-20.7	AVG	V	100	249

Channel 41

Emission Number	Frequency (MHz)	EUT Emission (dBuV/m)	Spec limit (dBuV/m)	Delta to the limit dB	Detector Function (Peak, Quasi-Peak)	Polarity (Vertical/ Horizontal)	Antenna Height (cm)	Table Azimuth (deg.)
1	2774.80	58.8	74	-15.2	PK	H	100	165
2	2774.80	60.3	74	-13.7	PK	V	100	289
3	2775.89	41.3	54	-12.7	AVG	H	100	165
4	2775.89	43.4	54	-10.6	AVG	V	100	289
5	3699.78	38.5	54	-15.5	AVG	H	100	118
6	3699.71	43.9	74	-30.1	PK	V	100	353
7	3699.87	46.5	74	-27.5	PK	H	100	118
8	3699.78	33.7	54	-20.3	AVG	V	100	353
9	4624.72	40.3	74	-33.7	PK	H	100	236
10	4624.60	31.5	54	-22.5	AVG	V	100	353
11	4624.80	30.1	54	-23.9	AVG	H	100	236
12	4624.72	43.2	74	-30.8	PK	V	100	353

WITH THE OMNI-DIRECTIONAL ANTENNA

Channel 1

Emission Number	Frequency (MHz)	EUT Emission (dBuV/m)	Spec limit (dBuV/m)	Delta to the limit dB	Detector Function (Peak, Quasi-Peak)	Polarity (Vertical/ Horizontal)	Antenna Height (cm)	Table Azimuth (deg.)
1	2714.44	50.5	74	-23.5	PK	H	100	195
2	2714.52	50.9	74	-23.1	PK	V	130	330
3	2715.30	31.6	54	-22.4	AVG	H	100	195
4	2715.31	33.5	54	-20.5	AVG	V	130	330
5	3619.12	32.5	54	-21.5	AVG	V	130	330
6	3619.45	44.1	74	-29.9	PK	V	130	330
7	4524.37	45.7	74	-28.3	PK	H	150	190
8	4524.34	47.3	74	-26.7	PK	V	160	170
9	4524.63	33.2	54	-20.8	AVG	H	150	190
10	4524.88	34.8	54	-19.2	AVG	V	160	170

Channel 21

Emission Number	Frequency (MHz)	EUT Emission (dBuV/m)	Spec limit (dBuV/m)	Delta to the limit dB	Detector Function (Peak, Quasi-Peak)	Polarity (Vertical/ Horizontal)	Antenna Height (cm)	Table Azimuth (deg.)
1	2744.66	51.8	74	-22.2	PK	H	200	95
2	2744.66	57.7	74	-16.3	PK	V	160	180
3	2745.52	33.9	54	-20.1	AVG	H	200	95
4	2745.52	37.1	54	-16.9	AVG	V	160	180
5	4574.71	43.6	74	-30.4	PK	H	150	150
6	4574.58	47.0	74	-27	PK	V	150	330
7	4575.16	31.9	54	-22.1	AVG	H	150	150
8	4574.80	31.1	54	-22.9	AVG	V	150	330

Channel 41

Emission Number	Frequency (MHz)	EUT Emission (dBuV/m)	Spec limit (dBuV/m)	Delta to the limit dB	Detector Function (Peak, Quasi-Peak)	Polarity (Vertical/ Horizontal)	Antenna Height (cm)	Table Azimuth (deg.)
1	2774.78	55.2	74	-18.8	PK	H	115	200
2	2774.80	60.2	74	-13.8	PK	V	130	180
3	2775.69	34.1	54	-19.9	AVG	H	115	200
4	2775.78	38.4	54	-15.6	AVG	V	130	180
5	3699.66	33.1	54	-20.9	AVG	H	205	190
6	3699.59	35.3	54	-18.7	AVG	V	200	330
7	3699.80	49.8	74	-24.2	PK	H	205	190
8	3699.86	50.8	74	-23.2	PK	V	200	330
9	4624.63	45.7	74	-28.3	PK	H	205	205
10	4624.70	50.5	74	-23.5	PK	V	160	160
11	4625.26	34.5	54	-19.5	AVG	H	205	205
12	4625.26	38.0	54	-16.0	AVG	V	160	160

WITH THE CIRCULAR ANTENNA

Channel 1

Emission Number	Frequency (MHz)	EUT Emission (dBuV/m)	Spec limit (dBuV/m)	Delta to the limit dB	Detector Function (Peak, Quasi-Peak)	Polarity (Vertical/ Horizontal)	Antenna Height (cm)	Table Azimuth (deg.)
1	2714.45	46.4	74	-27.6	PK	H	140	0
2	2714.44	49.0	74	-25.0	PK	V	115	15
3	2715.17	30.7	54	-23.3	AVG	H	140	0
4	2715.40	32.1	54	-21.9	AVG	V	115	15

Channel 21

Emission Number	Frequency (MHz)	EUT Emission (dBuV/m)	Spec limit (dBuV/m)	Delta to the limit dB	Detector Function (Peak, Quasi-Peak)	Polarity (Vertical/ Horizontal)	Antenna Height (cm)	Table Azimuth (deg.)
1	2744.76	45.2	74	-28.8	PK	H	190	50
2	2744.61	49.0	74	-25.0	PK	V	130	10
3	2745.47	30.4	54	-23.6	AVG	H	190	50
4	2745.52	33.1	54	-20.9	AVG	V	130	10

Channel 41

Emission Number	Frequency (MHz)	EUT Emission (dBuV/m)	Spec limit (dBuV/m)	Delta to the limit dB	Detector Function (Peak, Quasi-Peak)	Polarity (Vertical/ Horizontal)	Antenna Height (cm)	Table Azimuth (deg.)
1	2774.73	48.5	74	-25.5	PK	V	130	350
2	2774.73	43.4	74	-30.6	PK	H	140	10
3	2775.81	33.7	54	-20.3	AVG	V	130	350
4	2775.45	29.4	54	-24.6	AVG	H	140	10

WITH THE PATCH ANTENNA

Channel 1

Emission Number	Frequency (MHz)	EUT Emission (dBuV/m)	Spec limit (dBuV/m)	Delta to the limit dB	Detector Function (Peak, Quasi-Peak)	Polarity (Vertical/ Horizontal)	Antenna Height (cm)	Table Azimuth (deg.)
1	2714.60	54.7	74	-19.3	PK	H	260	10
2	2714.47	60.2	74	-13.8	PK	V	100	352
3	2715.59	40.9	54	-13.1	AVG	H	260	10
4	2715.59	46.4	54	-7.6	AVG	V	100	352
5	3619.27	35.7	54	-18.3	AVG	H	170	330
6	3619.28	37.6	54	-16.4	AVG	V	100	314
7	3619.54	45.2	74	-28.8	PK	H	170	330
8	3619.60	45.3	74	-28.7	PK	V	100	314

Channel 21

Emission Number	Frequency (MHz)	EUT Emission (dBuV/m)	Spec limit (dBuV/m)	Delta to the limit dB	Detector Function (Peak, Quasi-Peak)	Polarity (Vertical/ Horizontal)	Antenna Height (cm)	Table Azimuth (deg.)
1	2744.62	52.9	74	-21.1	PK	H	160	355
2	2744.67	57.0	74	-17.0	PK	V	100	330
3	2745.55	35.0	54	-19.0	AVG	H	160	355
4	2745.59	37.6	54	-16.4	AVG	V	100	330
5	3659.48	33.1	54	-20.9	AVG	H	160	325
6	3659.56	38.3	54	-15.7	AVG	V	110	310
7	3659.66	43.7	74	-30.3	PK	H	160	325
8	3659.68	46.9	74	-27.1	PK	V	110	310

Channel 41

Emission Number	Frequency (MHz)	EUT Emission (dBuV/m)	Spec limit (dBuV/m)	Delta to the limit dB	Detector Function (Peak, Quasi-Peak)	Polarity (Vertical/ Horizontal)	Antenna Height (cm)	Table Azimuth (deg.)
1	2774.79	57.2	74	-16.8	PK	H	110	100
2	2774.82	61.2	74	-12.8	PK	V	110	288
3	2775.89	43.4	54	-10.6	AVG	H	110	100
4	2775.89	47.2	54	-6.8	AVG	V	110	288
5	3699.77	35.1	54	-18.9	AVG	H	110	34
6	3699.77	38.9	54	-15.1	AVG	V	110	7
7	3699.88	42.8	74	-31.2	PK	H	110	34
8	3699.88	45.1	74	-28.9	PK	V	110	7

12. Peak Power Spectral Density

12.1 Regulation

For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

12.2 Test Equipment

⇒ Spectrum Analyzer: Hewlett-Packard 8566B, Serial Number 2403A06519, Calibrated: 7 January 2000, Calibration due Date: 7 January 2001

⇒ RF Preselector: Hewlett-Packard 85685A, Serial Number 2926A00971, Calibrated: 17 March 2000, Calibration due Date: 17 March 2001

12.3 Test Procedures

The RF output of the EUT is connected to the RF input port of the RF preselector through a 10 dB pad. The following measurements were made with a RBW = 3 kHz, VBW = 10 kHz and Sweep Time = 666 seconds.

12.4 Test Results

Maximum peak power spectral density of channel 1 is 7.2 dBm.
Maximum peak power spectral density of channel 21 is 4.2 dBm.
Maximum peak power spectral density of channel 41 is 6.0 dBm.

Please see plots in the list of attachments.

13. Process gain requirements

13.1 Regulation

The processing gain of a direct sequence system shall be at least 10 dB. The processing gain represents the improvement to the received signal-to-noise ratio, after filtering to the information bandwidth, from the spreading/despreading function. The processing gain may be determined using one of the following methods:

(1) As measured at the demodulated output of the receiver: the ratio in dB of the signal-to-noise ratio with the system spreading code turned off to the signal-to-noise ratio with the system spreading code turned on.

(2) As measured using the CW jamming margin method: a signal generator is stepped in 50 kHz increments across the passband of the system, recording at each point the generator level required to produce the recommended Bit Error Rate (BER). This level is the jammer level. The output power of the intentional radiator is measured at the same point. The jammer to signal ratio (J/S) is then calculated, discarding the worst 20% of the J/S data points. The lowest remaining J/S ratio is used to calculate the processing gain as follows: Gp = (S/N)o + Mj + Lsys, where Gp = processing gain of the system, (S/N)o = signal-to-noise ratio required for the chosen BER, Mj = J/S ratio, and Lsys = system losses. Note that total losses in a system, including intentional radiator and receiver, should be assumed to be no more than 2 dB.

13.2 Result

Please see the process gain measurements in the attachments. The process gain of the product exceeds 10 dB.

14. Miscellaneous Comments and Notes

1. None.

15. List of Attachments

1 Conducted Emissions Plots. (2)
2 6 dB Bandwidth Plots. (3)
3 Power Output Plots. (3)
4 Conducted Spurious Emissions Plots. (6)
5 Spectral Density Plots. (3)
6 Process Gain Testing. (28)
7 Photos of test set-up. (2)