

KTL Test Report: 8R01143.1


Applicant: Bang & Olufsen Telecom A/S
Kjeldsmarkvej 1
DK-7600
Struer, Denmark

**Equipment Under Test:
(E.U.T.)** 2.4 GHz Cordless Telephone

FCC ID: OIPBEOCOM6000

In Accordance With: **FCC Part 15, Subpart C**
Frequency Hopping Transmitters
2400 - 2483.5 MHz

Tested By: KTL Ottawa Inc.
3325 River Road, R.R. 5
Ottawa, Ontario K1V 1H2

Authorized By: 
T. Tidwell, Laboratory Manager

Date: 13 APRIL, 1999

Total Number of Pages: 57

EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

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EQUIPMENT: 2.4 GHz Cordless Telephone
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EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

Section 1. Summary of Test Results

Manufacturer: Bang & Olufsen

Model No.: Beocom 6000

Serial No.: None

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C, Paragraph 15.247 for Frequency Hopping Spread Spectrum devices. Radiated tests were conducted in accordance with ANSI C63.4-1992. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

- | | | | | | | |
|---|----------------------------|-------------------------------------|---------------------|----------------|--------------------------|----------------|
| <input checked="" type="checkbox"/> | New Submission | <input checked="" type="checkbox"/> | Production Unit | | | |
| <input type="checkbox"/> | Class II Permissive Change | <input type="checkbox"/> | Pre-Production Unit | | | |
| <table border="1"><tr><td>D</td><td>S</td><td>S</td></tr></table> | D | S | S | Equipment Code | <input type="checkbox"/> | Family Listing |
| D | S | S | | | | |

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.

See " Summary of Test Data".



NVLAP LAB CODE: 100351-0

TESTED BY: Kevin Carr DATE: 13 APR 99
Kevin Carr, Technologist

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EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	MEAS.	RESULT
Powerline Conducted Emissions	15.207(a)	48 dB μ V	Chart	Complies
Channel Separation	15.247(a)(1)	Greater of 25 kHz or 20 dB Bandwidth	Customer Supplied Data	Complies
Pseudorandom Hopping Algorithm	15.247(a)(1)		Customer Supplied Data	Complies
Time of Occupancy	15.247(a)(1)(ii)	\leq 0.4 sec in 30 sec	Plots	Complies
20 dB Occupied Bandwidth	15.247(a)(1)	\leq 1 MHz	Plots	Complies
Peak Power Output	15.247(b)	1 Watt	Chart	Complies
Spurious Emissions (Antenna Conducted)	15.247(c)	-20 dBc	Plots	Complies
Spurious Emissions (Radiated)	15.247(c)	Table 15.209(a)	Chart	Complies

Footnotes For N/A's:

Test Conditions:

Indoor Temperature: 23 °C
 Humidity: 20 %

Outdoor Temperature: 10 °C
 Humidity: 20 %

EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

Section 2. Equipment Under Test (E.U.T.)

General Equipment Information

Frequency Range:	2400 – 2483.5 GHz
Tunable Bands:	1
Number of Channels:	79
Channel Spacing:	1.005382 MHz
Emissions Designator:	983KF1D
User Frequency Adjustment:	None, Software Controlled

KTL Ottawa

FCC PART 15, SUBPART C
FREQUENCY HOPPING TRANSMITTERS
PROJECT NO.: 8R01143.1

EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

Description of Modification for Modification Filing

NOT APPLICABLE

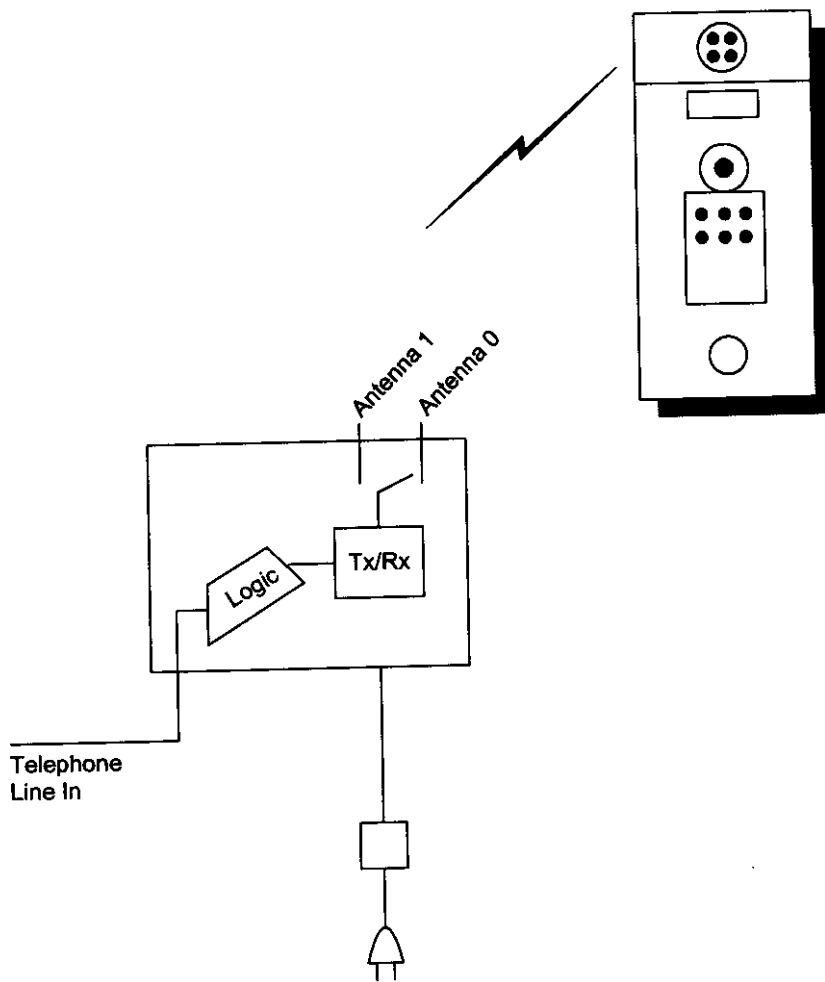
Family List Rational

EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

Theory of Operation

The E.U.T. is based upon DECT the ETSI Standards ETS-300-175-1 to ETS-300-9. The Mars system is improved by implementing extra features to combat interference at 2.4 GHz. The system is implemented with encryption based on DECT.

System Diagram



EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

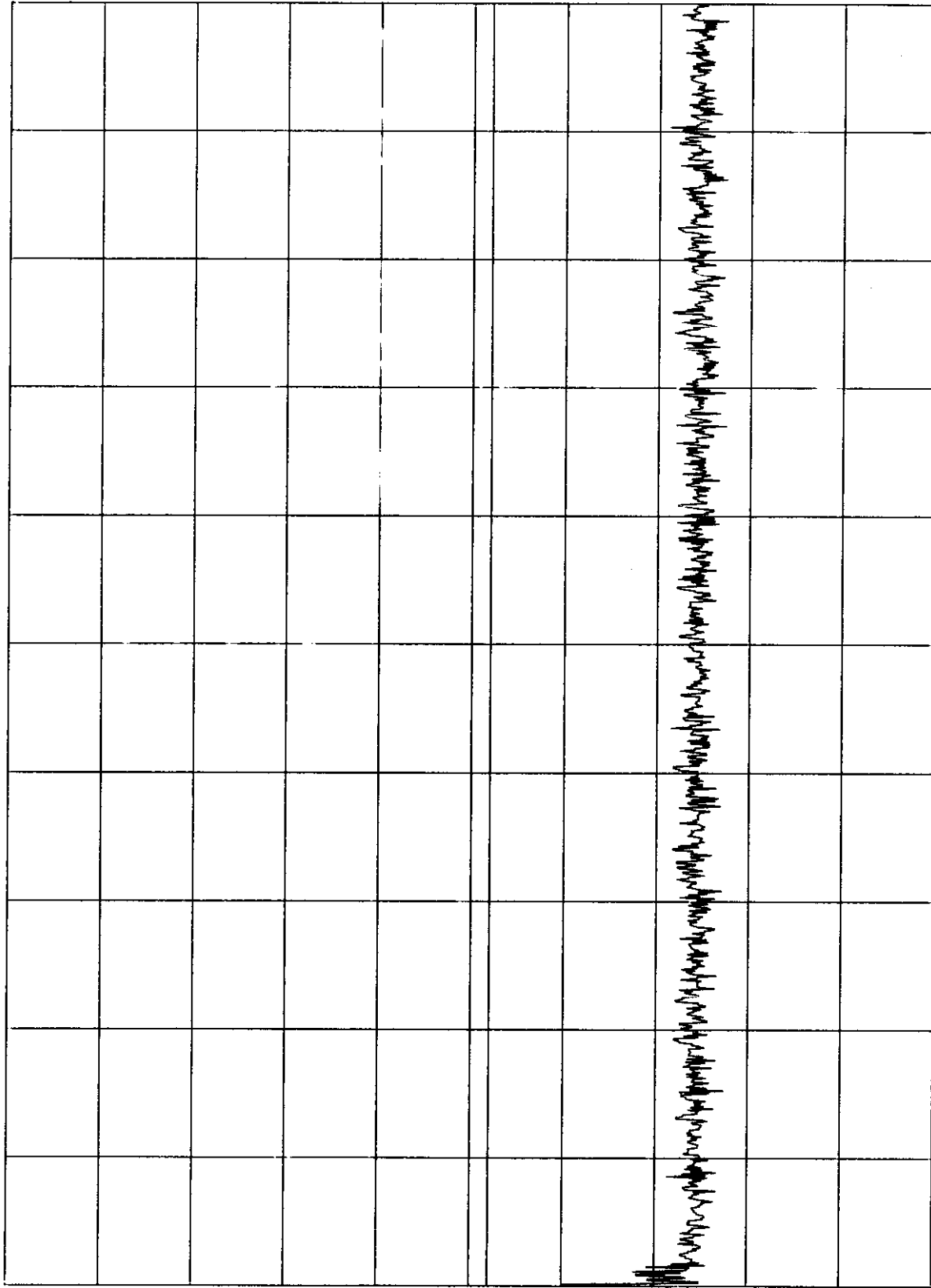
Section 3. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
TESTED BY: Kevin Carr	DATE: January 21, 1999

Test Results: Complies. See attached graph.

Measurement Data: See attached graph.

8R01143 10dB Limiter used January 21, 1999 Neutral
REF 90.0 dB V ATTEN 10 dB



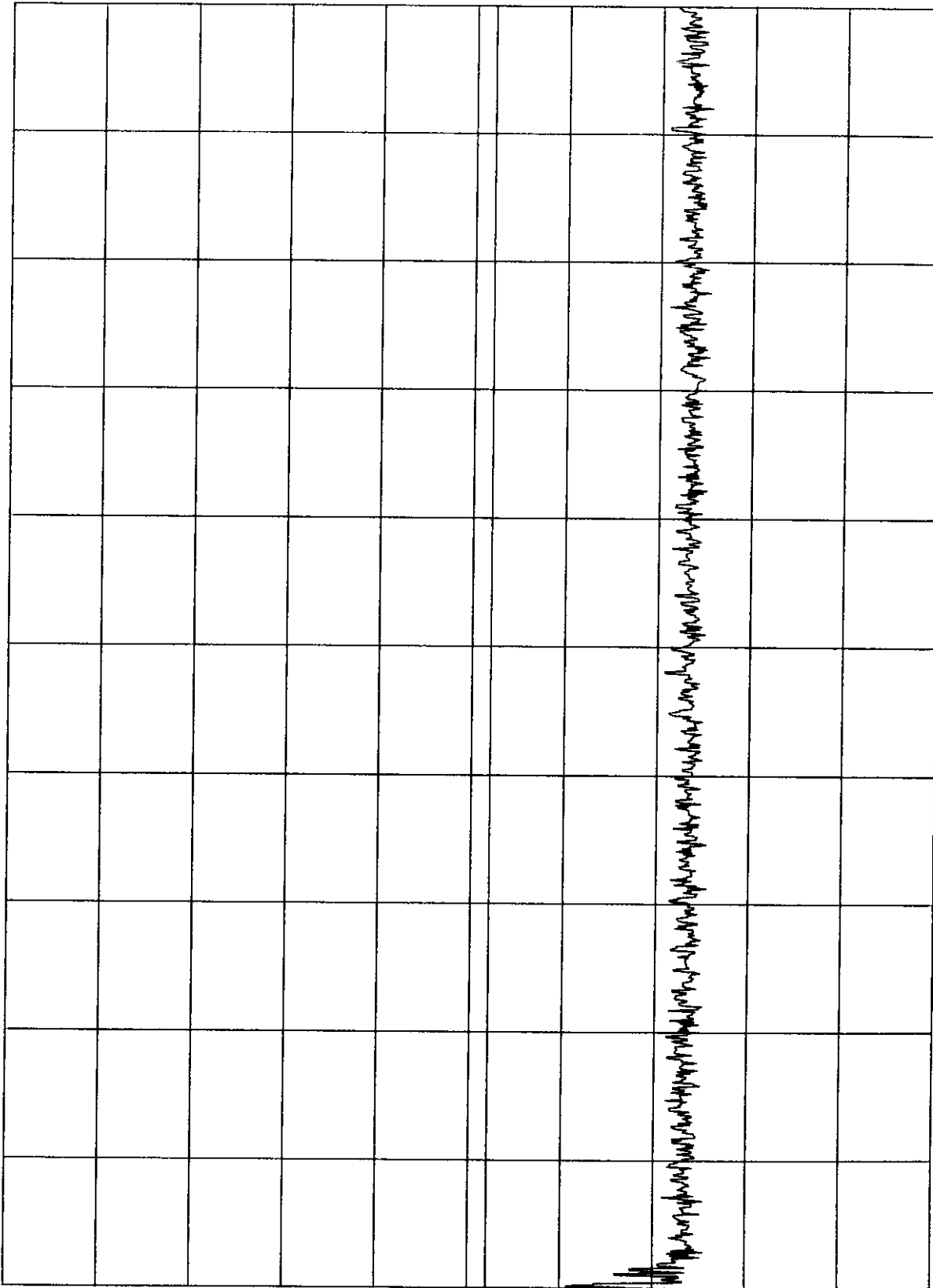
10 dB/

DL
38.0
dB V

Project No.: 8R01143.1
Conducted Emissions
120 VAC, 60 Hz
Page No.: 11 of 45

START 450 KHZ RES BW 10 KHZ VBW 30 KHZ STOP 30.0 MHZ
SWP 887 msec

8r01143 10dB Limiter used January 21, 1999 Phase
REF 90.0 dB V ATTEN 10 dB



10 dB/

DL
38.0
dB V

Project No.: 8R01143.1
Conducted Emissions
120 VAC, 60 Hz
Page No.: 12 of 45

START 450 KHZ RES BW 10 KHZ VBW 30 KHZ STOP 30.0 MHz
SWP 887 msec

EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

Section 4. Channel Separation

NAME OF TEST: Channel Separation	PARA. NO.: 15.247(a)(1)
TESTED BY: Customer Supplied Data	DATE: March 25, 1999

Test Results: Complies.

Measurement Data: Measured 20 dB bandwidth: 983 kHz
Channel Separation: 1.005382 MHz

EQUIPMENT: 2.4 GHz Cordless Telephone
 FCC ID: OIPBEOCOM6000

Section 5. Pseudorandom Hopping Algorithm

NAME OF TEST: Pseudorandom Hopping Algorithm	PARA. NO.: 15.247(a)(1)
TESTED BY: Customer Supplied Data	DATE: March 25, 1999

Test Results: Complies.

Measurement Data: Number of Hopping Frequencies: 79
 Number of Hopping Patterns:

Frequency: 2402.862 + CN 1.005382 MHz*

i	f(i)	i	f(i)	i	f(i)	i	f(i)	i	f(i)	i	f(i)	i	f(i)	i	f(i)
0	0	10	76	20	18	30	34	40	14	50	20	60	48	70	55
1	23	11	29	21	11	31	66	41	57	51	73	61	15	71	35
2	62	12	59	22	36	32	7	42	41	52	64	62	5	72	53
3	8	13	22	23	72	33	68	43	74	53	39	63	17	73	24
4	43	14	52	24	54	34	75	44	32	54	13	64	6	74	44
5	16	15	63	25	69	35	4	45	70	55	33	65	67	75	51
6	71	16	26	26	21	36	60	46	9	56	65	66	49	76	38
7	47	17	77	27	3	37	27	47	58	57	50	67	40	77	30
8	19	18	31	28	37	38	12	48	78	58	56	68	1	78	46
9	61	19	2	29	10	39	25	49	45	59	42	69	28		

EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

Section 6. Time of Occupancy

NAME OF TEST: Time of Occupancy	PARA. NO.: 15.247(a)(1)
TESTED BY: Kevin Carr	DATE: March 4, 1999

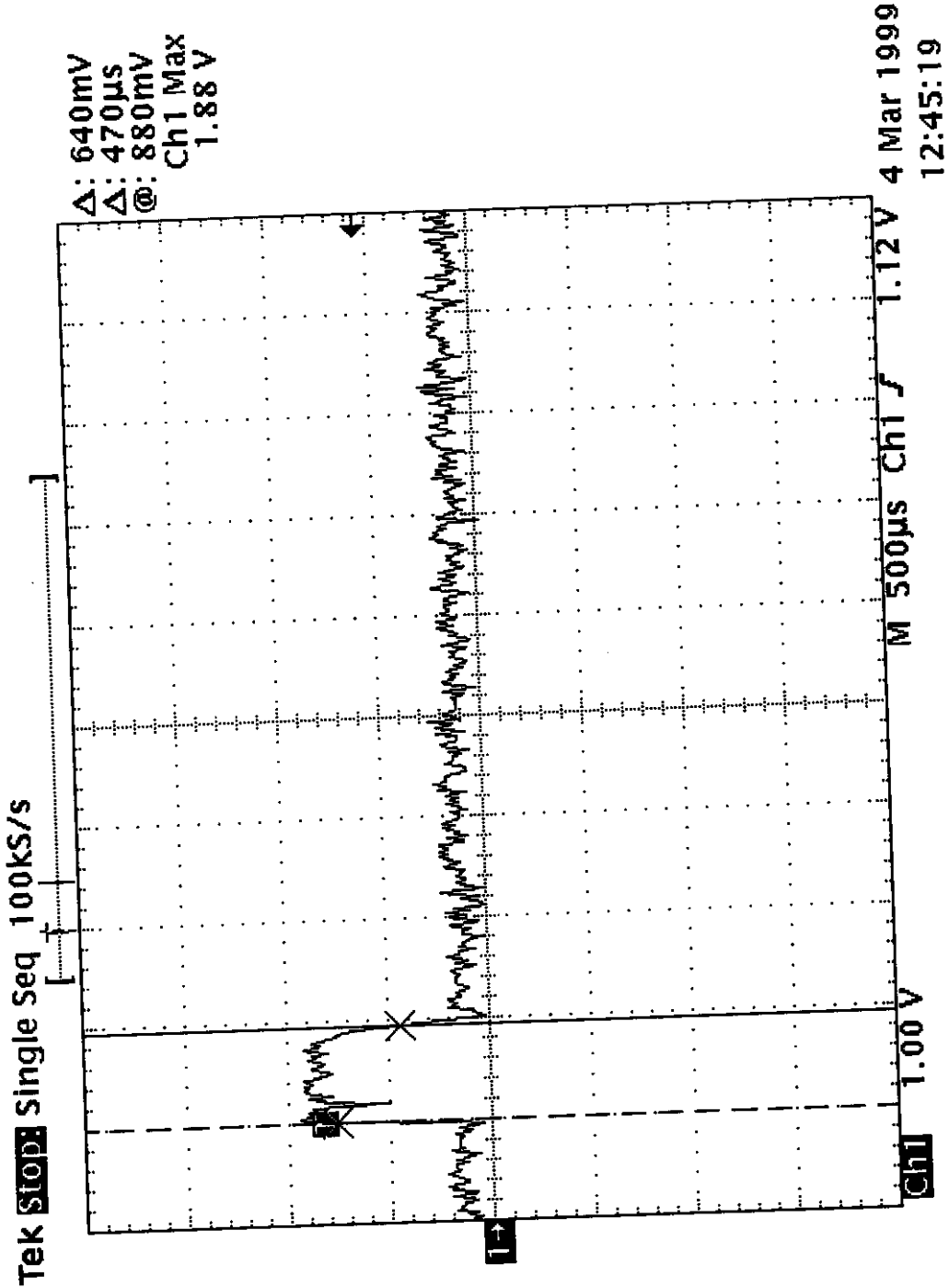
Test Results: Complies.

Measurement Data: Maximum dwell time using customer software hopping to same channel (unrealistic).

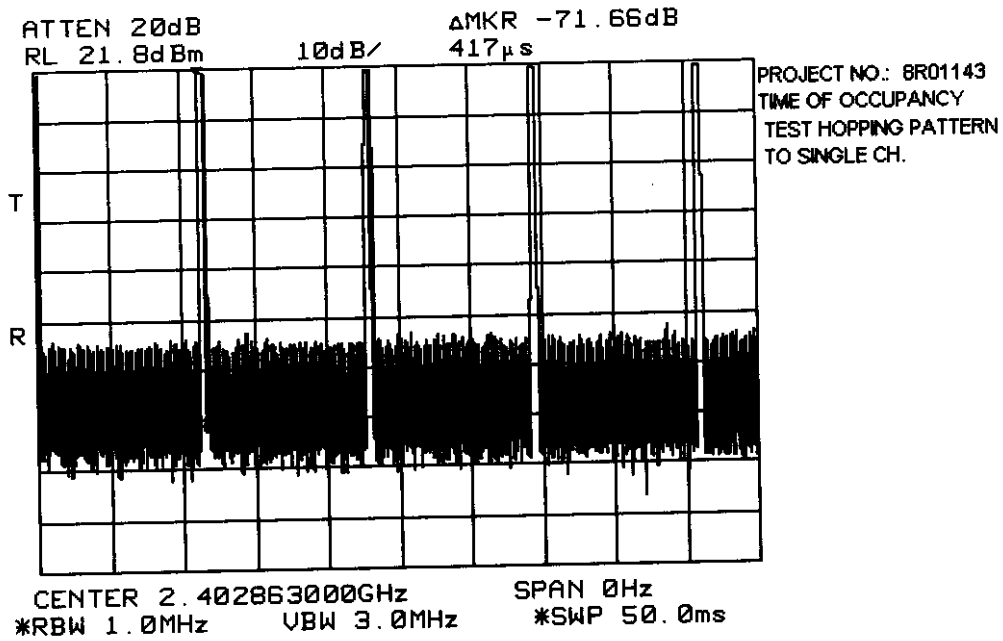
This is worst case:

$$20 \text{ Log } \frac{470\mu\text{s} \times 8}{100\text{ms}} = -28.5 \text{ dB}$$

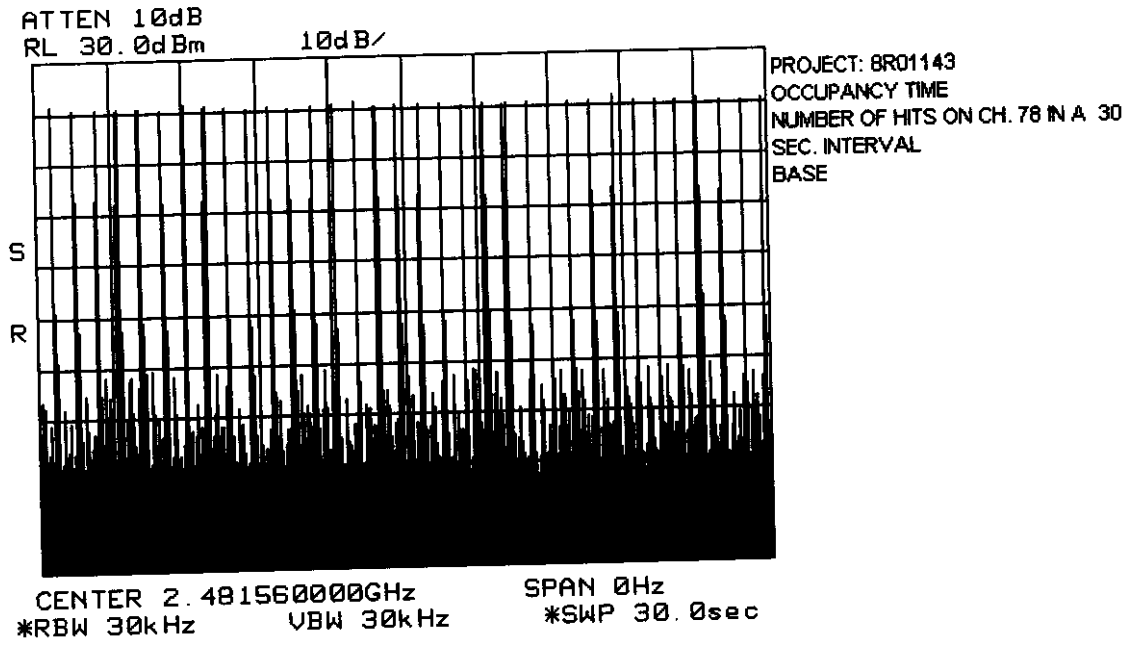
EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000



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EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

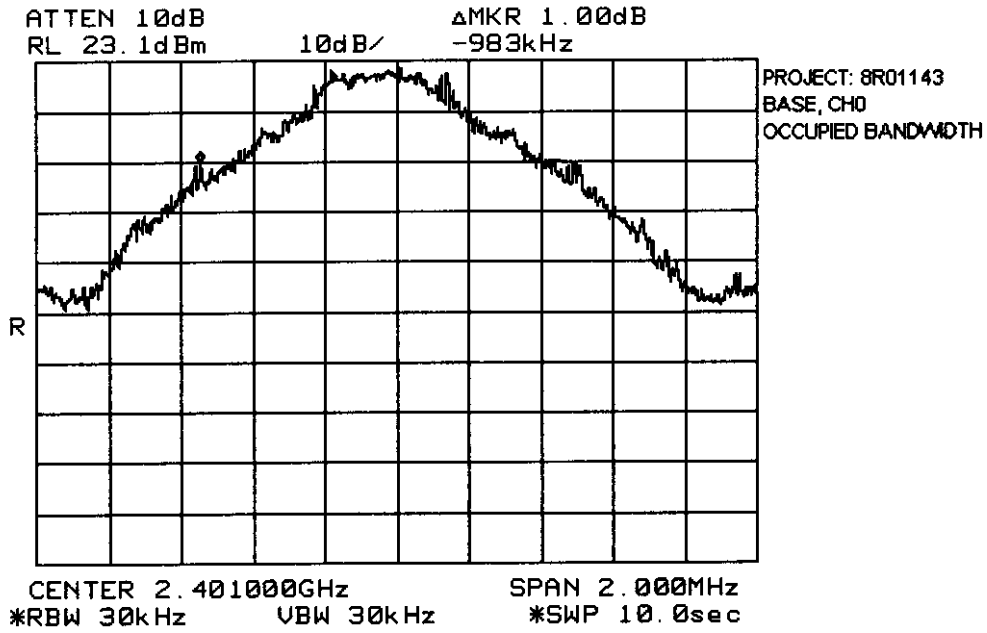
Section 7. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.247(a)(1)(i)
TESTED BY: Kevin Carr	DATE: March 3, 1999

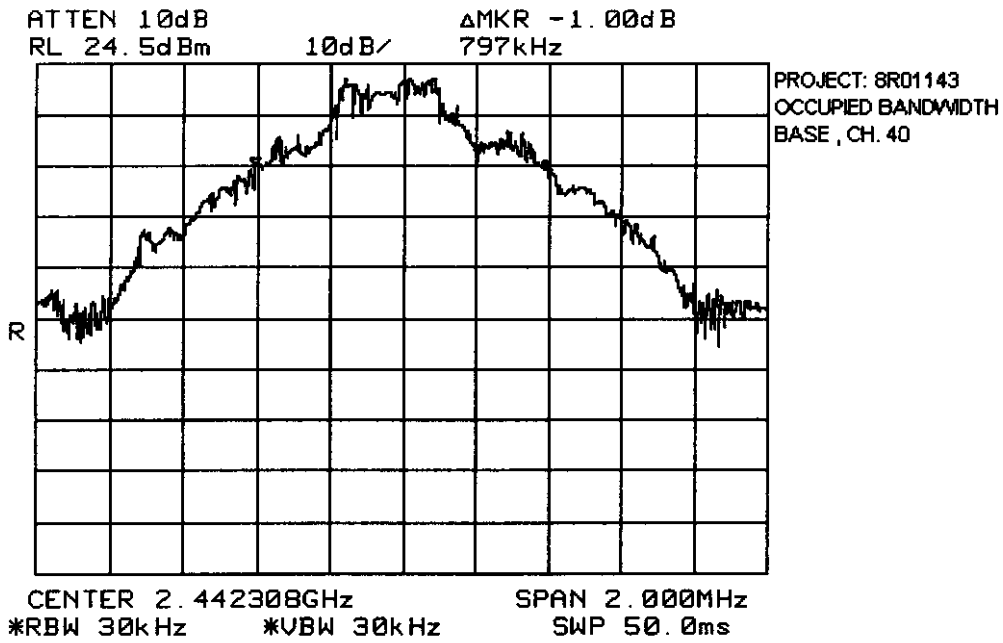
Test Results: Complies.

Measurement Data: 983 kHz

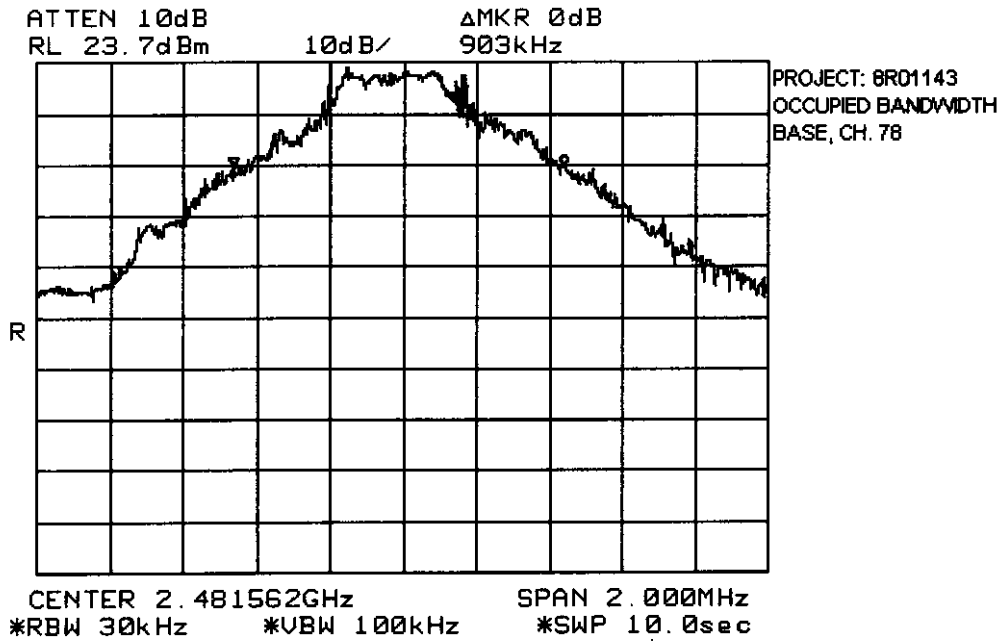
EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000



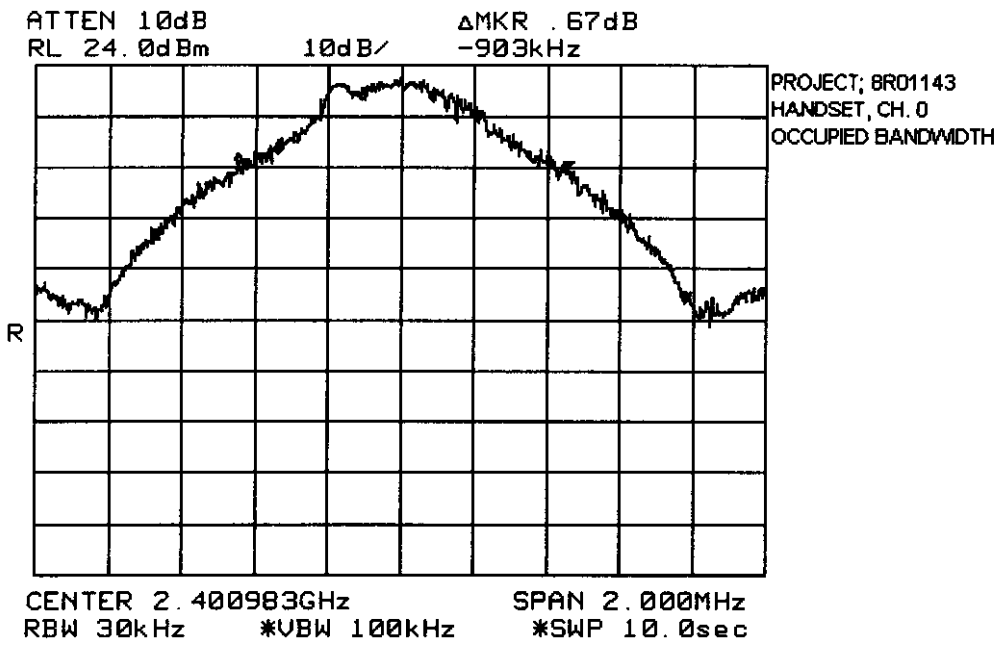
EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000



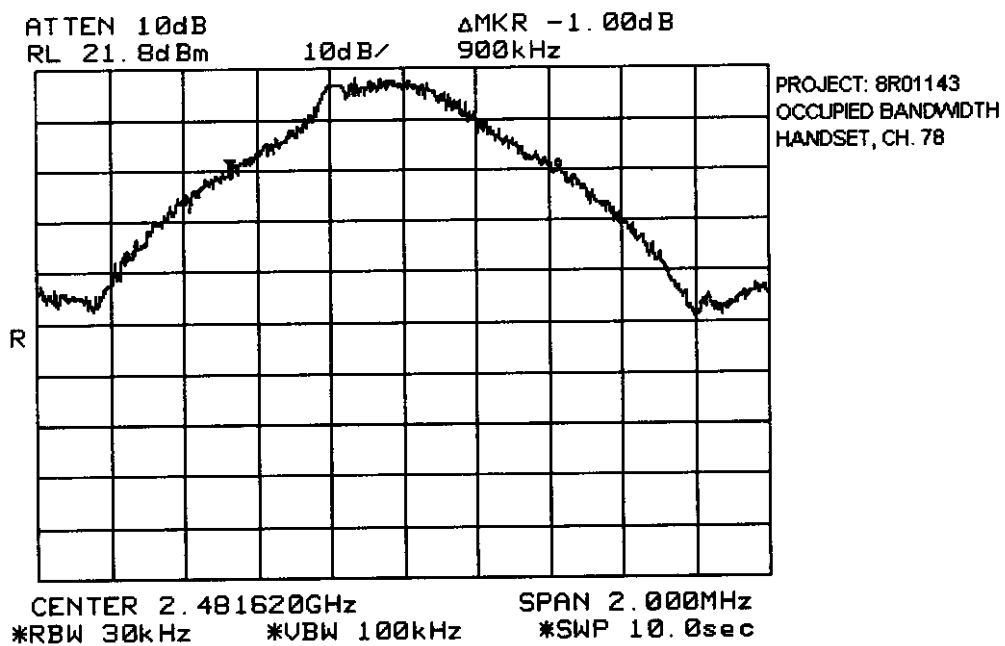
EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000



EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000



EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000



EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

Section 8. Peak Power Output

NAME OF TEST: Peak Power Output	PARA. NO.: 15.247 (b)
TESTED BY: Kevin Carr	DATE: March 24, 1999

Test Results: Complies. The maximum peak power output of the transmitter is 0.233 watts

Measurement Data: Detachable antenna? Yes No
If yes, state the type of non-standard connector used at the antenna port:

Directional Gain of Antenna: 0 dBi or 1 Numeric.
Peak Power Output: 0.233 watts.
Field Strength: 118.9 dBµV/m @ 3m or 0.881 V/m @ 3m.

Antennas:

Model	Type	Manufacturer	Gain	E.I.R.P.

EQUIPMENT: 2.4 GHz Cordless Telephone
 FCC ID: OIPBEOCOM6000

Test Data - Radiated Emissions (Peak Power Output)

Test Distance (meters) : 3		Range: A Tower		Receiver: HP8565E		RBW(kHz): 1 MHz		Detector: Peak			
Freq. (MHz)	Ant. *	Pol. (V/H)	Ant. HGT. (m)	Dist. Corr. dB	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Duty Cycle dB	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Handset: Channel 0											
2401.5	H2	V			83.5	31.2			114.7		
2401.3	H2	H			87.3	31.2			118.5		
Handset: Channel 40											
2442.8	H2	V			82.8	31.1			113.9		
2442.8	H2	H			87.8	31.1			118.9		
Handset: Channel 78											
2481.8	H2	V			81.2	31.2			112.4		
2482.0	H2	H			85.0	31.2			116.2		
Base (Antenna 0): Channel 0											
2401.1	H2	V			82.0	31.2			113.2		
2401.4	H2	H			82.0	31.2			113.2		
Base (Antenna 0): Channel 40											
2442.5	H2	V			82.8	31.1			113.9		
2442.6	H2	H			81.7	31.1			112.8		
Base (Antenna 0): Channel 78											
2481.7	H2	V			79.5	31.2			110.7		
2481.8	H2	H			81.5	31.2			112.7		
Base (Antenna 1): Channel 0											
2401.1	H2	V			79.3	31.2			110.5		
2401.2	H2	H			78.0	31.2			109.2		
Base (Antenna 1): Channel 40											
2442.6	H2	V			81.5	31.1			112.6		
2442.6	H2	H			81.0	31.1			112.1		
Base (Antenna 1): Channel 78											
2482.2	H2	V			80.7	31.2			111.9		
2481.8	H2	H			78.3	31.2			109.5		

Notes:
 B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole
 * Re-measured using dipole antenna.
 ** Includes cable loss when amplifier is not used.
 *** Includes cable loss.
 () Denotes failing emission level.

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FCC PART 15, SUBPART C
FREQUENCY HOPPING TRANSMITTERS
PROJECT NO.: 8R01143.1

EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

Section 9. Spurious Emissions (Antenna Conducted)

NAME OF TEST: Spurious Emissions (Antenna Conducted)	PARA. NO.: 15.247(c)
TESTED BY: Kevin Carr	DATE: March 4, 1999

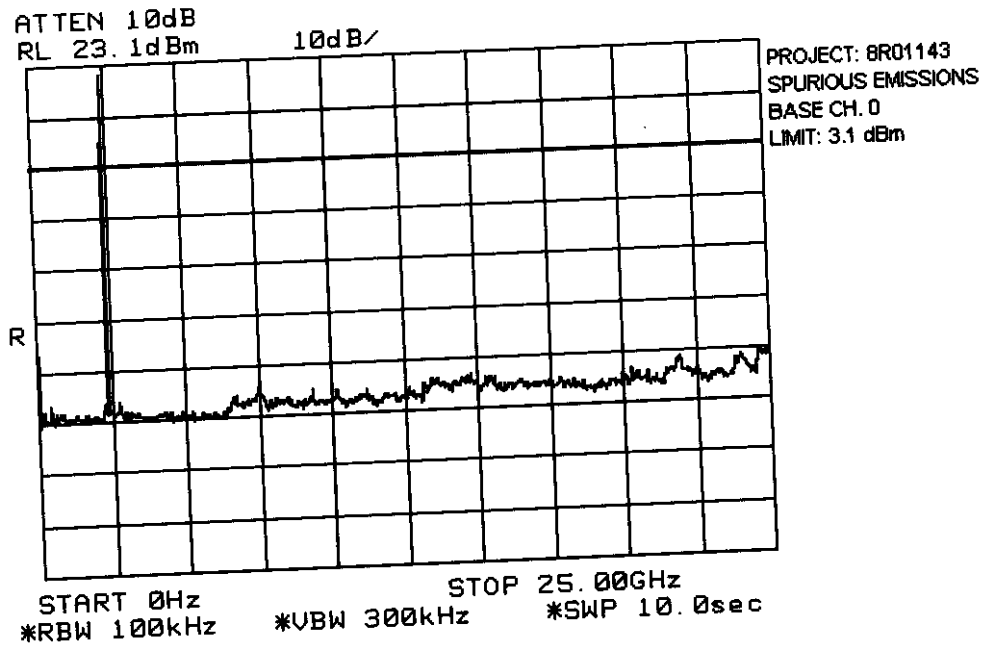
Test Results: Complies.

Measurement Data:

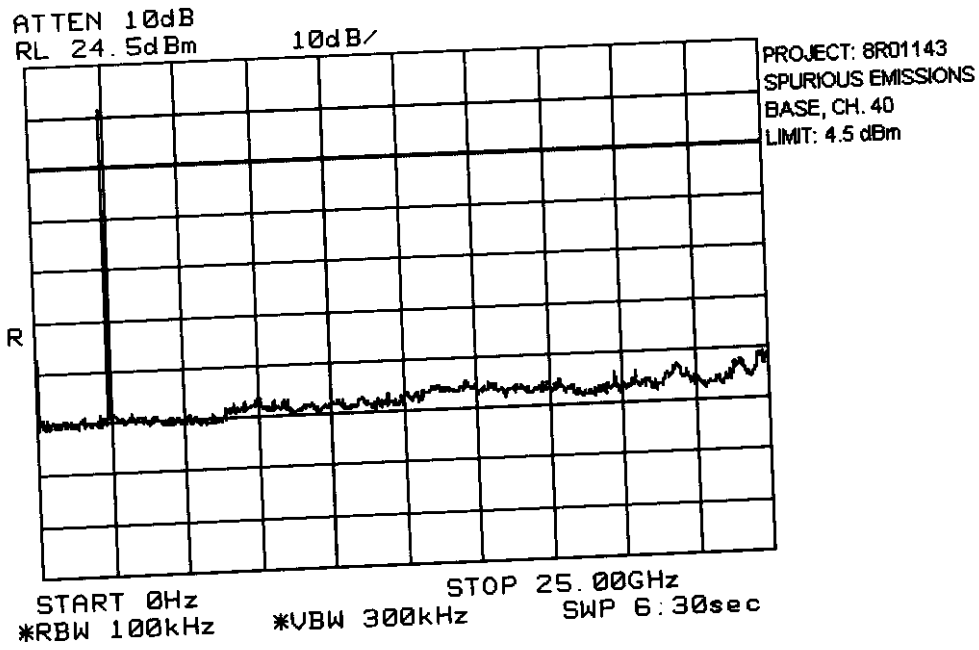
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FCC PART 15, SUBPART C
FREQUENCY HOPPING TRANSMITTERS
PROJECT NO.: 8R01143.1

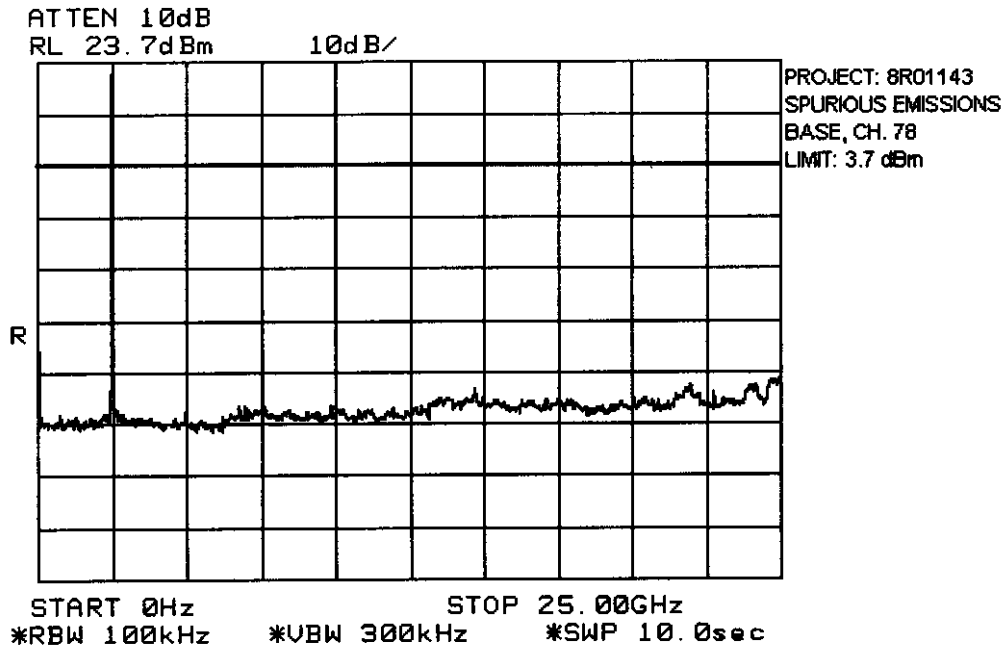
EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000



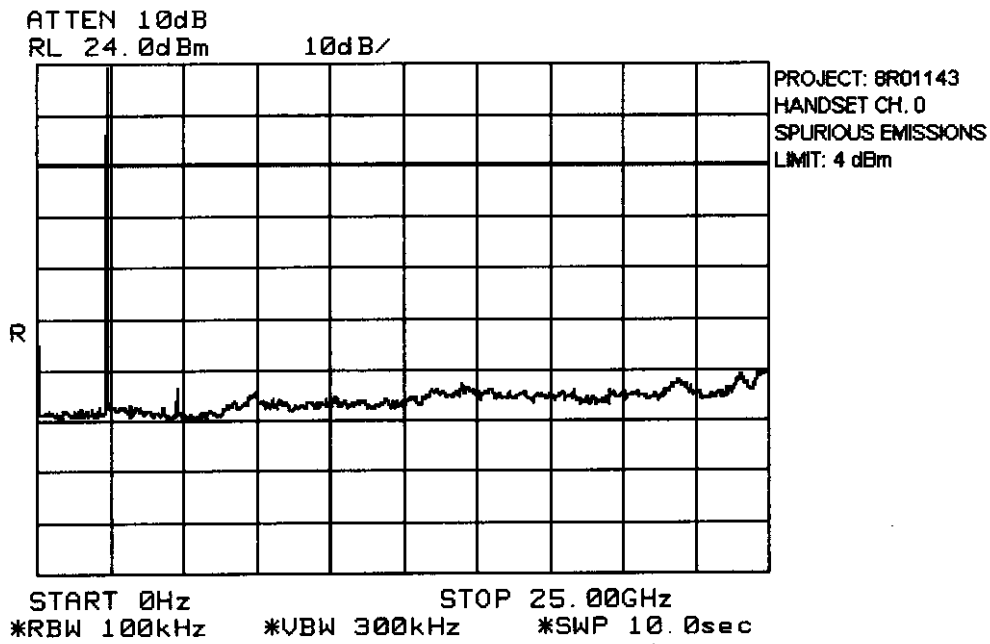
EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000



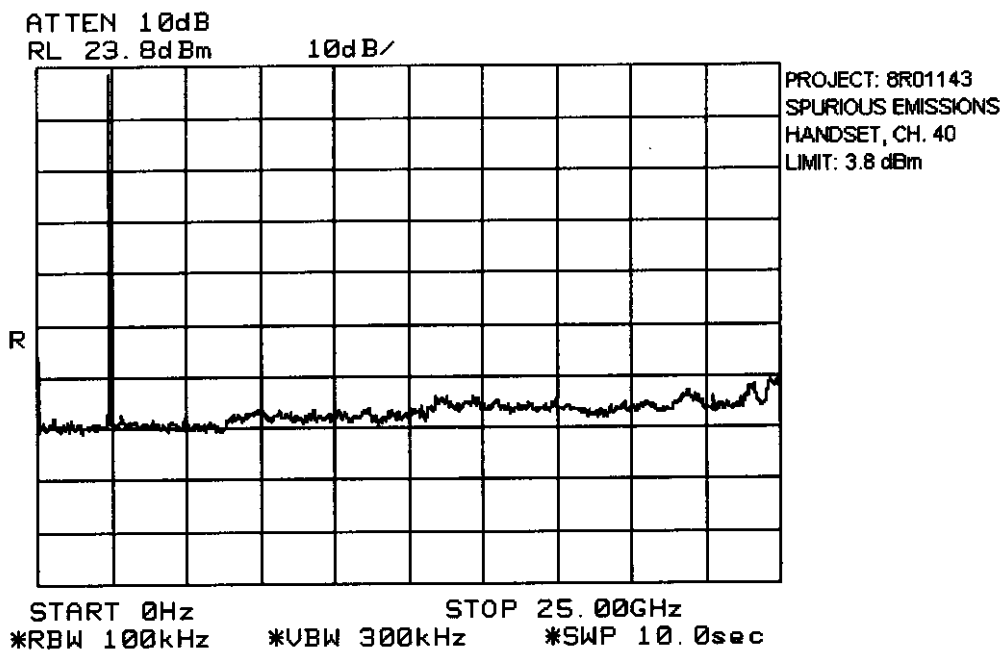
EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000



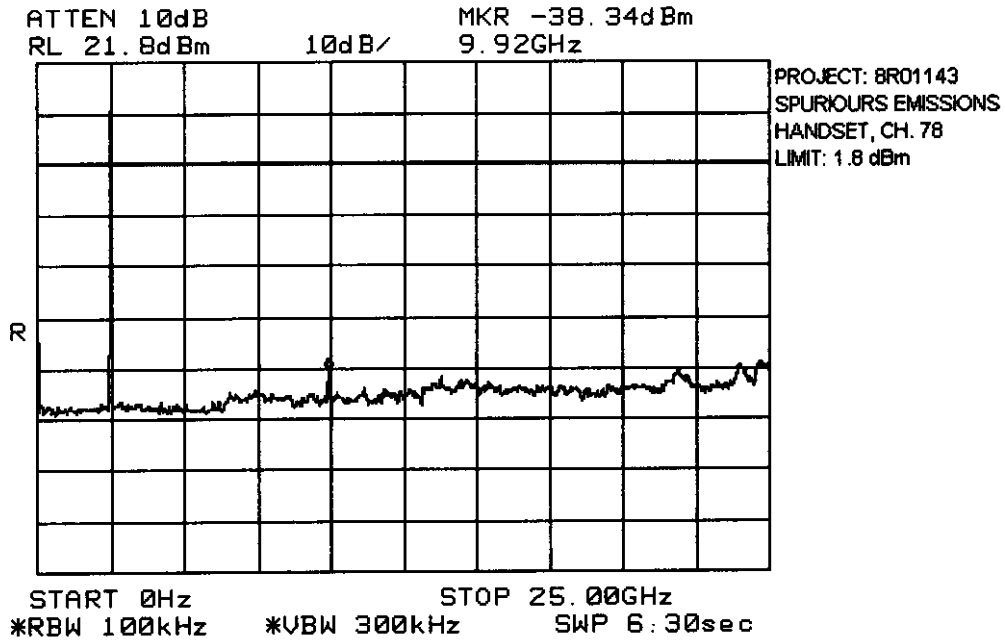
EQUIPMENT: 2.4 GHz Cordless Telephone
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EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

Section 10. Spurious Emissions (Radiated)

NAME OF TEST: Spurious Emissions (Radiated)	PARA. NO.: 15.247(c)
TESTED BY: Kevin Carr	DATE: March 24, 1999

Test Results: Complies. The worst case emission level is 72.1 dB μ V/m @ 3m at 7328 MHz. This is 1.9 dB below the specification limit.

Measurement Data: See attached table.

Duty Cycle Calculation:

EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

Test Data - Radiated Emissions Base (Peak)

Test Distance (meters) : 1/3		Range: A Tower		Receiver: HP8565E		RBW(kHz): 1 MHz		Detector: Peak			
Freq. (MHz)	Ant. *	Pol. (V/H)	Ant. HGT. (m)	Dist. Corr. dB	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Duty Cycle dB	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Base (Antenna 0): Channel 0											
4802.6	H2	V			75.0	38.4	-44.1		69.3	74.0	4.7
4802.2	H2	H			70.0	38.4	-44.1		64.3	74.0	9.7
12007.0	H2	V		-9.5	32.8	38.9			62.2	74.0	11.8
12007.0	H2	H		-9.5	33.5	38.9			62.9	74.0	11.1
19211.2	SH50-1	V		-9.5	34.3	40.4			65.2	74.0	8.8
19211.2	SH50-1	H		-9.5	32.8	40.4			63.7	74.0	10.3
Base (Antenna 0): Channel 40											
4885.0	H2	V			70.5	38.8	-44.3		65.0	74.0	9.0
4885.0	H2	H			71.5	38.8	-44.3		66.0	74.0	8.0
7327.3	H2	V			63.0	44.6	-42.2		65.4	74.0	8.6
7327.3	H2	H			63.5	44.6	-42.2		65.9	74.0	8.1
12215.0	H2	V		-9.5	33.7	38.9			63.1	74.0	10.9
12215.0	H2	H		-9.5	33.2	38.9			62.6	74.0	11.4
19544.0	SH50-1	V		-9.5	33.0	40.5			64.0	74.0	10.0
19544.0	SH50-1	H		-9.5	35.2	40.5			66.2	74.0	7.8
Base (Antenna 0): Channel 78											
4963.5	H2	V			66.7	39.1	-44.5		61.3	74.0	12.7
4964.1	H2	H			65.5	39.1	-44.5		60.1	74.0	13.9
7445.1	H2	V			57.5	44.8	-42.0		60.3	74.0	13.7
7445.2	H2	H			58.7	44.8	-42.0		61.5	74.0	12.5
12410.4	H2	V		-9.5	32.3	38.9			61.7	74.0	12.3
12410.4	H2	H		-9.5	32.8	38.9			62.2	74.0	11.8
19856.7	SH50-1	V		-9.5	31.8	40.5			62.8	74.0	11.2
19856.7	SH50-1	H		-9.5	33.2	40.5			64.2	74.0	9.8
22338.8	SH50-1	V		-9.5	36.0	40.6			67.1	74.0	6.9
22338.8	SH50-1	H		-9.5	35.8	40.6			66.9	74.0	7.1
Notes:											
B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole											
* Re-measured using dipole antenna.											
** Includes cable loss when amplifier is not used.											
*** Includes cable loss.											
() Denotes failing emission level.											
Frequency above 10 GHz where measured at 1 m.											

EQUIPMENT: 2.4 GHz Cordless Telephone

FCC ID: OIPBEOCOM6000

Test Data - Radiated Emissions Base (Peak)

Test Distance (meters) : 1/3		Range: A Tower		Receiver: HP8565E		RBW(kHz): 1 MHz		Detector: Peak			
Freq. (MHz)	Ant. *	Pol. (V/H)	Ant. HGT. (m)	Dist. Corr. dB	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Duty Cycle dB	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Base (Antenna 1): Channel 0											
4802.0	H2	V			71.7	38.4	-44.1		66.0	74.0	8.0
4802.3	H2	H			70.2	38.4	-44.1		64.5	74.0	9.5
12007.0	H2	V		-9.5	32.7	38.9			62.1	74.0	11.9
12007.0	H2	H		-9.5	32.5	38.9			61.9	74.0	12.1
19211.2	SH50-1	V		-9.5	33.7	40.4			64.6	74.0	9.4
19211.2	SH50-1	H		-9.5	35.3	40.4			66.2	74.0	7.8
Base (Antenna 1): Channel 40											
4884.8	H2	V			69.2	38.8	-44.3		63.7	74.0	10.3
4885.5	H2	H			68.2	38.8	-44.3		62.7	74.0	11.3
7327.1	H2	V			62.2	44.6	-42.2		64.6	74.0	9.4
7327.2	H2	H			62.0	44.6	-42.2		64.4	74.0	9.6
12213.4	H2	V		-9.5	33.0	38.9			62.4	74.0	11.6
12213.4	H2	H		-9.5	32.7	38.9			62.1	74.0	11.9
19541.5	SH50-1	V		-9.5	34.3	40.5			65.3	74.0	8.7
19544.0	SH50-1	H		-9.5	33.8	40.5			64.8	74.0	9.2
Base (Antenna 1): Channel 78											
4963.9	H2	V			58.8	39.1	-44.5		53.4	74.0	20.6
4964.1	H2	H			59.7	39.1	-44.5		54.3	74.0	19.7
7445.0	H2	V			58.8	44.8	-42.0		61.6	74.0	12.4
7446.4	H2	H			58.2	44.8	-42.0		61.0	74.0	13.0
12410.4	H2	V		-9.5	32.8	38.9			62.2	74.0	11.8
12410.4	H2	H		-9.5	33.5	38.9			62.9	74.0	11.1
19856.7	SH50-1	V		-9.5	34.2	40.5			65.2	74.0	8.8
19856.7	SH50-1	H		-9.5	33.5	40.5			64.5	74.0	9.5
22338.8	SH50-1	V		-9.5	34.5	40.6			65.6	74.0	8.4
22338.8	SH50-1	H		-9.5	35.8	40.6			66.9	74.0	7.1
Notes:											
B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole											
* Re-measured using dipole antenna.											
** Includes cable loss when amplifier is not used.											
*** Includes cable loss.											
() Denotes failing emission level.											
Frequency above 10 GHz where measured at 1 m.											

EQUIPMENT: 2.4 GHz Cordless Telephone
 FCC ID: OIPBEOCOM6000

Test Data - Radiated Emissions Handset (Peak)

Test Distance (meters) : 1/3		Range: A Tower		Receiver: HP8565E		RBW(kHz): 1 MHz		Detector: Peak			
Freq. (MHz)	Ant. *	Pol. (V/H)	Ant. HGT. (m)	Dist. Corr. dB	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Duty Cycle dB	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Handset: Channel 0											
4802.2	H2	V			58.0	38.4	-44.1		52.3	74.0	21.7
4802.0	H2	H			63.2	38.4	-44.1		57.5	74.0	16.5
12014.0	H2	V		-9.5	33.7	38.9			63.1	74.0	10.9
12014.0	H2	H		-9.5	32.0	38.9			61.4	74.0	12.6
19223.0	SH50-1	V		-9.5	32.5	40.4			63.4	74.0	10.6
19223.0	SH50-1	H		-9.5	33.3	40.4			64.2	74.0	9.8
Handset: Channel 40											
4884.8	H2	V			59.2	38.8	-44.3		53.7	74.0	20.3
4884.7	H2	H			63.5	38.8	-44.3		58.0	74.0	16.0
7327.2	H2	V			65.7	44.6	-42.2		68.1	74.0	5.9
7328.0	H2	H			69.7	44.6	-42.2		72.1	74.0	1.9
12215.0	H2	V		-9.5	33.5	38.9			62.9	74.0	11.1
12215.0	H2	H		-9.5	32.2	38.9			61.6	74.0	12.4
19545.0	SH50-1	V		-9.5	33.0	40.5			64.0	74.0	10.0
19545.0	SH50-1	H		-9.5	33.3	40.5			64.3	74.0	9.7
Handset: Channel 78											
4963.4	H2	V			63.0	39.1	-44.5		57.6	74.0	16.4
4963.4	H2	H			67.0	39.1	-44.5		61.6	74.0	12.4
7446.4	H2	V			63.3	44.8	-42.0		66.1	74.0	7.9
7445.2	H2	H			66.2	44.8	-42.0		69.0	74.0	5.0
12406.0	H2	V		-9.5	37.7	38.9			67.1	74.0	6.9
12406.0	H2	H		-9.5	38.2	38.9			67.6	74.0	6.4
19850.0	SH50-1	V		-9.5	38.0	40.5			69.0	74.0	5.0
19850.0	SH50-1	H		-9.5	39.0	40.5			70.0	74.0	4.0
22331.0	SH50-1	V		-9.5	39.5	40.6			70.6	74.0	3.4
22331.0	SH50-1	H		-9.5	37.8	40.6			68.9	74.0	5.1
Notes: B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole * Re-measured using dipole antenna. ** Includes cable loss when amplifier is not used. *** Includes cable loss. () Denotes failing emission level. Frequency above 10 GHz where measured at 1 m.											

EQUIPMENT: 2.4 GHz Cordless Telephone
 FCC ID: OIPBEOCOM6000

Test Data - Radiated Emissions Base (Average)

Test Distance (meters) : 1/3		Range: A Tower		Receiver: HP8565E		RBW(kHz): 1 MHz		Detector: Peak			
Freq. (MHz)	Ant. *	Pol. (V/H)	Ant. HGT. (m)	Dist. Corr. dB	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Duty Cycle dB	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Base (Antenna 0): Channel 0											
4802.6	H2	V			75.0	38.4	-44.1	-20	49.3	54.0	4.7
4802.2	H2	H			70.0	38.4	-44.1	-20	44.3	54.0	9.7
12007.0	H2	V		-9.5	32.8	38.9		-20	42.2	54.0	11.8
12007.0	H2	H		-9.5	33.5	38.9		-20	42.9	54.0	11.1
19211.2	SH50-1	V		-9.5	34.3	40.4		-20	45.2	54.0	8.8
19211.2	SH50-1	H		-9.5	32.8	40.4		-20	43.7	54.0	10.3
Base (Antenna 0): Channel 40											
4885.0	H2	V			70.5	38.8	-44.3	-20	45.0	54.0	9.0
4885.0	H2	H			71.5	38.8	-44.3	-20	46.0	54.0	8.0
7327.3	H2	V			63.0	44.6	-42.2	-20	45.4	54.0	8.6
7327.3	H2	H			63.5	44.6	-42.2	-20	45.9	54.0	8.1
12215.0	H2	V		-9.5	33.7	38.9		-20	43.1	54.0	10.9
12215.0	H2	H		-9.5	33.2	38.9		-20	42.6	54.0	11.4
19544.0	SH50-1	V		-9.5	33.0	40.5		-20	44.0	54.0	10.0
19544.0	SH50-1	H		-9.5	35.2	40.5		-20	46.2	54.0	7.8
Base (Antenna 0): Channel 78											
4963.5	H2	V			66.7	39.1	-44.5	-20	41.3	54.0	12.7
4964.1	H2	H			65.5	39.1	-44.5	-20	40.1	54.0	13.9
7445.1	H2	V			57.5	44.8	-42.0	-20	40.3	54.0	13.7
7445.2	H2	H			58.7	44.8	-42.0	-20	41.5	54.0	12.5
12410.4	H2	V		-9.5	32.3	38.9		-20	41.7	54.0	12.3
12410.4	H2	H		-9.5	32.8	38.9		-20	42.2	54.0	11.8
19856.7	SH50-1	V		-9.5	31.8	40.5		-20	42.8	54.0	11.2
19856.7	SH50-1	H		-9.5	33.2	40.5		-20	44.2	54.0	9.8
22338.8	SH50-1	V		-9.5	36.0	40.6		-20	47.1	54.0	6.9
22338.8	SH50-1	H		-9.5	35.8	40.6		-20	46.9	54.0	7.1
Notes:											
B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole											
* Re-measured using dipole antenna.											
** Includes cable loss when amplifier is not used.											
*** Includes cable loss.											
() Denotes failing emission level.											
Frequency above 10 GHz where measured at 1 m.											

EQUIPMENT: 2.4 GHz Cordless Telephone
 FCC ID: OIPBEOCOM6000

Test Data - Radiated Emissions Base (Average)

Test Distance (meters) : 1/3		Range: A Tower		Receiver: HP8565E		RBW(kHz): 1 MHz		Detector: Peak			
Freq. (MHz)	Ant. *	Pol. (V/H)	Ant. HGT. (m)	Dist. Corr. dB	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Duty Cycle dB	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Base (Antenna 1): Channel 0											
4802.0	H2	V			71.7	38.4	-44.1	-20	46.0	54.0	8.0
4802.3	H2	H			70.2	38.4	-44.1	-20	44.5	54.0	9.5
12007.0	H2	V		-9.5	32.7	38.9		-20	42.1	54.0	11.9
12007.0	H2	H		-9.5	32.5	38.9		-20	41.9	54.0	12.1
19211.2	SH50-1	V		-9.5	33.7	40.4		-20	44.6	54.0	9.4
19211.2	SH50-1	H		-9.5	35.3	40.4		-20	46.2	54.0	7.8
Base (Antenna 1): Channel 40											
4884.8	H2	V			69.2	38.8	-44.3	-20	43.7	54.0	10.3
4885.5	H2	H			68.2	38.8	-44.3	-20	42.7	54.0	11.3
7327.1	H2	V			62.2	44.6	-42.2	-20	44.6	54.0	9.4
7327.2	H2	H			62.0	44.6	-42.2	-20	44.4	54.0	9.6
12213.4	H2	V		-9.5	33.0	38.9		-20	42.4	54.0	11.6
12213.4	H2	H		-9.5	32.7	38.9		-20	42.1	54.0	11.9
19541.5	SH50-1	V		-9.5	34.3	40.5		-20	45.3	54.0	8.7
19544.0	SH50-1	H		-9.5	33.8	40.5		-20	44.8	54.0	9.2
Base (Antenna 1): Channel 78											
4963.9	H2	V			58.8	39.1	-44.5	-20	33.4	54.0	20.6
4964.1	H2	H			59.7	39.1	-44.5	-20	34.3	54.0	19.7
7445.0	H2	V			58.8	44.8	-42.0	-20	41.6	54.0	12.4
7446.4	H2	H			58.2	44.8	-42.0	-20	41.0	54.0	13.0
12410.4	H2	V		-9.5	32.8	38.9		-20	42.2	54.0	11.8
12410.4	H2	H		-9.5	33.5	38.9		-20	42.9	54.0	11.1
19856.7	SH50-1	V		-9.5	34.2	40.5		-20	45.2	54.0	8.8
19856.7	SH50-1	H		-9.5	33.5	40.5		-20	44.5	54.0	9.5
22338.8	SH50-1	V		-9.5	34.5	40.6		-20	45.6	54.0	8.4
22338.8	SH50-1	H		-9.5	35.8	40.6		-20	46.9	54.0	7.1
Notes: B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole * Re-measured using dipole antenna. ** Includes cable loss when amplifier is not used. *** Includes cable loss. () Denotes failing emission level. Frequency above 10 GHz where measured at 1 m.											

EQUIPMENT: 2.4 GHz Cordless Telephone
 FCC ID: OIPBEOCOM6000

Test Data - Radiated Emissions Handset (Average)

Test Distance (meters) : 1/3		Range: A Tower		Receiver: HP8565E		RBW(kHz): 1 MHz		Detector: Peak			
Freq. (MHz)	Ant. *	Pol. (V/H)	Ant. HGT. (m)	Dist. Corr. dB	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Duty Cycle dB	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Handset: Channel 0											
4802.2	H2	V			58.0	38.4	-44.1	-20	32.3	54.0	21.7
4802.0	H2	H			63.2	38.4	-44.1	-20	37.5	54.0	16.5
12014.0	H2	V		-9.5	33.7	38.9		-20	43.1	54.0	10.9
12014.0	H2	H		-9.5	32.0	38.9		-20	41.4	54.0	12.6
19223.0	SH50-1	V		-9.5	32.5	40.4		-20	43.4	54.0	10.6
19223.0	SH50-1	H		-9.5	33.3	40.4		-20	44.2	54.0	9.8
Handset: Channel 40											
4884.8	H2	V			59.2	38.8	-44.3	-20	33.7	54.0	20.3
4884.7	H2	H			63.5	38.8	-44.3	-20	38.0	54.0	16.0
7327.2	H2	V			65.7	44.6	-42.2	-20	48.1	54.0	5.9
7328.0	H2	H			69.7	44.6	-42.2	-20	52.1	54.0	1.9
12215.0	H2	V		-9.5	33.5	38.9		-20	42.9	54.0	11.1
12215.0	H2	H		-9.5	32.2	38.9		-20	41.6	54.0	12.4
19545.0	SH50-1	V		-9.5	33.0	40.5		-20	44.0	54.0	10.0
19545.0	SH50-1	H		-9.5	33.3	40.5		-20	44.3	54.0	9.7
Handset: Channel 78											
4963.4	H2	V			63.0	39.1	-44.5	-20	37.6	54.0	16.4
4963.4	H2	H			67.0	39.1	-44.5	-20	41.6	54.0	12.4
7446.4	H2	V			63.3	44.8	-42.0	-20	46.1	54.0	7.9
7445.2	H2	H			66.2	44.8	-42.0	-20	49.0	54.0	5.0
12406.0	H2	V		-9.5	37.7	38.9		-20	47.1	54.0	6.9
12406.0	H2	H		-9.5	38.2	38.9		-20	47.6	54.0	6.4
19850.0	SH50-1	V		-9.5	38.0	40.5		-20	49.0	54.0	5.0
19850.0	SH50-1	H		-9.5	39.0	40.5		-20	50.0	54.0	4.0
22331.0	SH50-1	V		-9.5	39.5	40.6		-20	50.6	54.0	3.4
22331.0	SH50-1	H		-9.5	37.8	40.6		-20	48.9	54.0	5.1

Notes:

B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole

- * Re-measured using dipole antenna.
 - ** Includes cable loss when amplifier is not used.
 - *** Includes cable loss.
 - () Denotes failing emission level.
- Frequency above 10 GHz where measured at 1 m.

KTL Ottawa

FCC PART 15, SUBPART C
FREQUENCY HOPPING TRANSMITTERS
PROJECT NO.: 8R01143.1

EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

Section 11. Test Equipment List

CAL CYCLE	EQUIPMENT	MANUFACTURER	MODEL	SERIAL	LAST CAL.	NEXT CAL.	
1 Year	Spectrum Analyzer	Hewlett Packard	8565E	FA000981	May 20/98	May 20/99	
1 Year	Spectrum Analyzer-1	Hewlett Packard	8566B	2311A02238	Oct. 22/98	Oct. 22/99	
1 Year	Spectrum Analyzer Display-1	Hewlett Packard	8566B	2314A04759	Oct. 22/98	Oct. 22/99	
1 Year	Quasi-peak adapter-1	Hewlett-Packard	85650A	2043A00302	Oct. 22/98	Oct. 22/99	
1 Year	Attenuator	Narda	768-20	9507	July 24/98	July 24/99	
1 Year	Attenuator	Narda	768-10	9704	July 24/98	July 24/99	
1 Year	Attenuator	Narda	768-10	9704	July 24/98	July 24/99	
1 Year	Attenuator	Narda	768-10	9704	July 24/98	July 24/99	
2 Year	Horn Antenna	EMCO #2	3115	4336	Oct. 30/97	Oct. 30/99	
1 Year	Digital Storage Oscilloscope	Tektronix	TDS544A	B012005	July 23/98	July 23/99	
1 Year	Low Noise Amplifier	Avantek	AWT-8035	1005	Aug. 4/98	Aug. 4/99	
1 Year	Low Noise Amplifier	DBS Microwave	DWT-13035	9623	Aug. 4/98	Aug. 4/99	
1 Year	Low Noise Amplifier	DBS Microwave	DWT-13035	9623	Aug. 4/98	Aug. 4/99	
1 Year	Low Noise Amplifier	DBS Microwave	DWT-13035	9623	Aug. 4/98	Aug. 4/99	
3 Year	Standard Gain Horn	Electro-Metrics	SH-50/60-1	FA000479	July 29/97	July 29/00	
1 Year	Plotter	Hewlett Packard	7550A	FA001129	NCR	NCR	
1 Year	High Pass Filter	Microwave Inc.	11SH10-400	FA001340	Feb. 26/99	Feb. 26/00	

NA: Not Applicable
NCR: No Cal Required

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FCC PART 15, SUBPART C
FREQUENCY HOPPING TRANSMITTERS
PROJECT NO.: 8R01143.1
ANNEX A

EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

ANNEX A
TEST METHODOLOGIES

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FCC PART 15, SUBPART C
FREQUENCY HOPPING TRANSMITTERS
PROJECT NO.: 8R01143.1
ANNEX A

EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
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Minimum Standard:

The R.F. that is conducted back onto the AC power line on any frequency within the band 0.45 to 30 MHz shall not exceed 250 μ V (48 dB μ V) across 50 ohms.

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FCC PART 15, SUBPART C
FREQUENCY HOPPING TRANSMITTERS
PROJECT NO.: 8R01143.1
ANNEX A

EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

NAME OF TEST: Channel Separation	PARA. NO.: 15.247(a)(1)
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Minimum Standard:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

NAME OF TEST: Pseudorandom Hopping Algorithm	PARA. NO.: 15.247(a)(1)
--	-------------------------

Minimum Standard:

The system shall hop to channel frequencies that are selected from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their transmitters and shall shift frequencies in synchronization with the transmitted signals.

Frequency hopping systems operating in the 2400-2483.5 MHz band shall use at least 75 hopping frequencies.

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FCC PART 15, SUBPART C
FREQUENCY HOPPING TRANSMITTERS
PROJECT NO.: 8R01143.1
ANNEX A

EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

NAME OF TEST: Time of Occupancy

PARA. NO.: 15.247(a)(1)(ii)

Minimum Standard:

The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.247(a)(2)
---	--------------------------------

Minimum Standard: The maximum allowed 20 dB bandwidth of the hopping channel is 1 MHz for 2400-2483.5 MHz transmitters.

Method Of Measurement:

The spectrum analyzer is set as follows:

- RBW: At least 1% of span/div.
- VBW: >RBW
- Span: Sufficient to display 20 dB bandwidth
- LOG dB/div.: 10 dB
- Sweep: Auto

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

EQUIPMENT: 2.4 GHz Cordless Telephone
 FCC ID: OIPBEOCOM6000

NAME OF TEST: Peak Power Output	PARA. NO.: 15.247(b)
---------------------------------	----------------------

Minimum Standard:

The maximum peak power output shall not exceed 1 watt. If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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

Direct Measurement Method For Detachable Antennas:

If the antenna is detachable, a peak power meter is used to measure the power output with the transmitter operating into a 50 ohm load.

Calculation Of EIRP For Integral Antenna:

If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation $GP/4\pi R^2 = E^2/120\pi$ and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts

E = the maximum measured field strength in V/m

R = the measurement range (3 meters)

G = the numeric gain of the transmit antenna in relation to an isotropic radiator

The RBW of the spectrum analyzer shall be set to a value greater than the measured 20 dB occupied bandwidth of the E.U.T.

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

NAME OF TEST: Spurious Emissions at Antenna Terminals PARA. NO.: 15.247(c)

Minimum Standard:

In any 100kHz bandwidth outside the 2400-2483.5 MHz bands emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits. Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength ($\mu\text{V/m @ 3m}$)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

THE SPECTRUM WAS SEARCHED TO THE 10th HARMONIC

Method Of Measurement:

30 MHz - 10th harmonic plot
 RBW: 100 kHz
 VBW: 300 kHz
 Sweep: Auto
 Display line: -20 dBc

Lower Band Edge

RBW: At least 1% of span/div.
 VBW: >RBW
 Span: As necessary to display any spurious at band edge.
 Sweep: Auto
 Center Frequency: 2400 MHz
 Marker: Peak of fundamental emission
 Marker Δ : Peak of highest spurious level below 2400 MHz

Upper Band Edge

RBW: At least 1% of span/div.
 VBW: >RBW
 Span: As necessary to display any spurious at band edge.
 Sweep: Auto
 Center Frequency: 2483.5 MHz
 Marker: Peak of fundamental emission
 Marker Δ : Peak of highest spurious level above 2483.5 MHz

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

NAME OF TEST: Radiated Spurious Emissions	PARA. NO.: 15.247(c)
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Minimum Standard: In any 100kHz bandwidth outside the 2400-2483.5 MHz bands emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits.
Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength (μ V/m @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

THE SPECTRUM WAS SEARCHED TO THE 10th HARMONIC

15.205 Restricted Bands

MHz	MHz	MHz	GHz
0.09-0.11	16.42-16.423	399.9-410	4.5-5.25
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.125-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41	1718		

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

KTL Ottawa

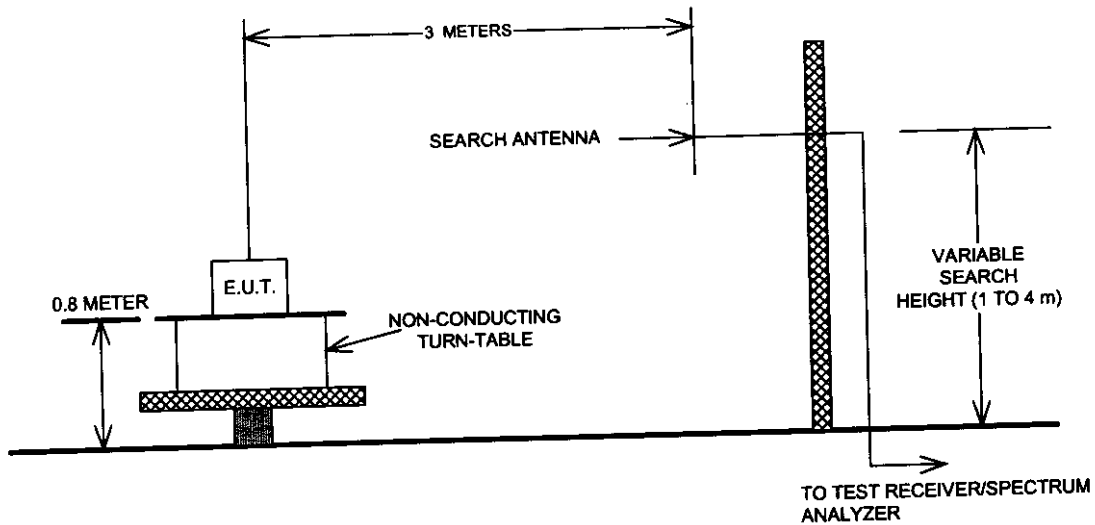
FCC PART 15, SUBPART C
FREQUENCY HOPPING TRANSMITTERS
PROJECT NO.: 8R01143.1
ANNEX B

EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

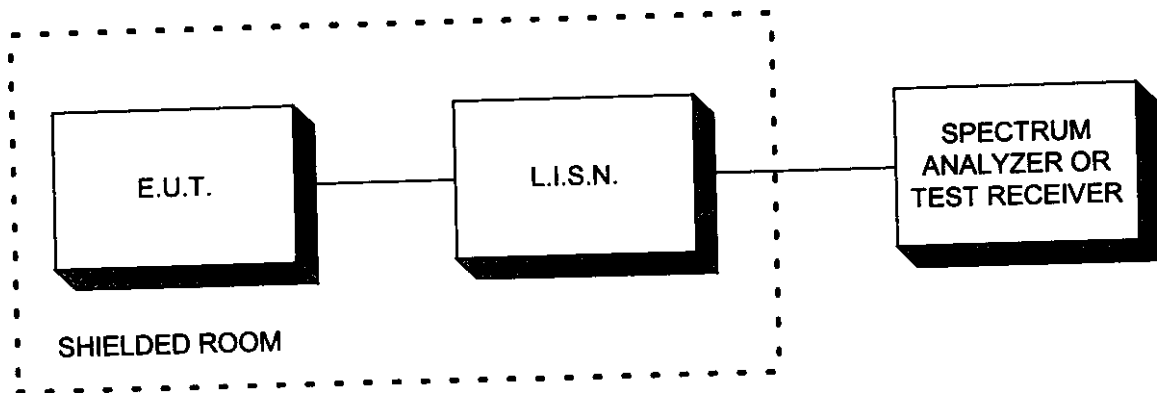
ANNEX B
BLOCK DIAGRAMS

EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

Test Site For Radiated Emissions



Conducted Emissions



EQUIPMENT: 2.4 GHz Cordless Telephone
FCC ID: OIPBEOCOM6000

Peak Power At Antenna Terminals

