Test Report:	1W03875
Applicant:	VTECH Engineering Canada 200-7671 Alderbridge Way Richmond, BC V6X 1Z9
Equipment Under Test: **(EUT)**	AT&T 2230 2.4GHz FHSS Cordless Telephone
In Accordance With:	**FCC Part 15, Subpart C** Frequency Hopping Transmitters 2400 - 2483.5 MHz
Tested By:	Nemko Canada Inc. (Formerly KTL Ottawa Inc.) 3325 River Road, R.R. 5 Ottawa, Ontario K1V 1H2
Authorized By:	
	R. Grant, Wireless Group Manager
Date:	
Total Number of Pages:	70

Table of Contents

Section 1. Summary of Test Results

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 is 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.

☒	New Submission	☒	Production Unit
☐	Class II Permissive Change	☐	Pre-Production Unit
D S S	Equipment Code	☐	Family Listing

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: _____ DATE: _____
Glen Westwell, Wireless Technologist

Summary Of Test Data

Name Of Test	Para. No.	Result
Powerline Conducted Emissions	15.207(a)	Complies
Channel Separation	15.247(a)(1)	Complies
Pseudorandom Hopping Algorithm	15.247(a)(1)	Complies
Time of Occupancy	15.247(a)(1)(ii)	Complies
20 dB Occupied Bandwidth	15.247(a)(1)	Complies
Peak Power Output	15.247(b)	Complies
Spurious Emissions (Radiated)	15.247(c)	Complies

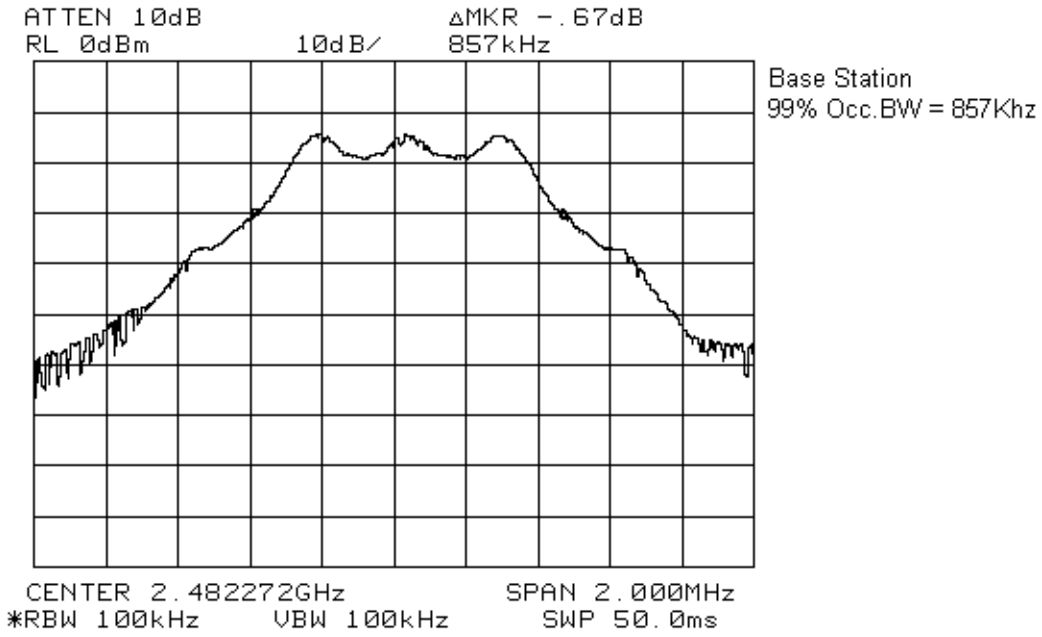
Footnotes For N/A's:

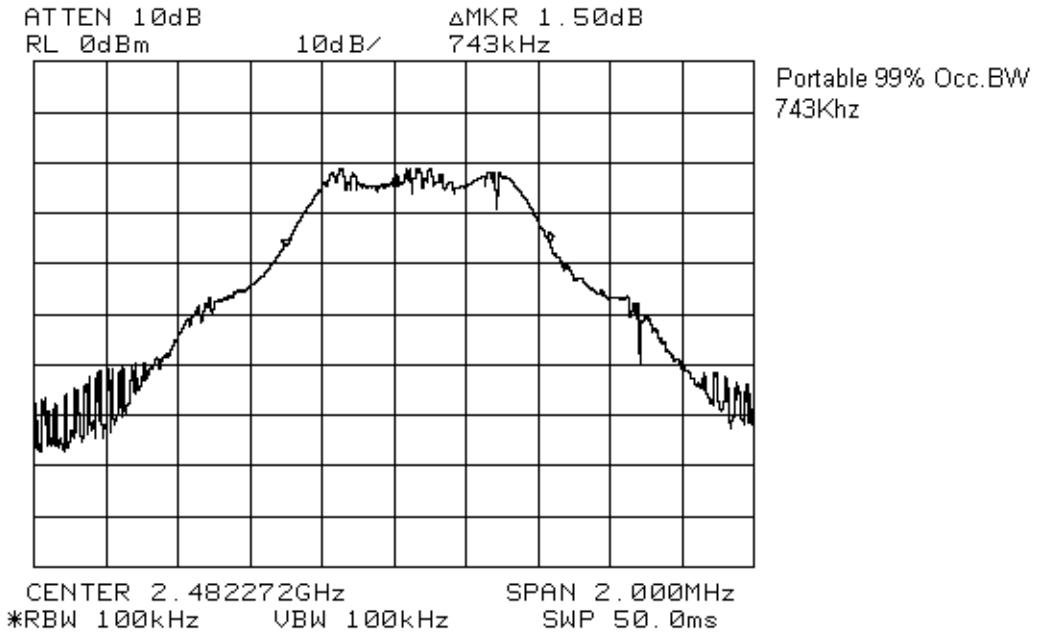
Test Conditions:

Indoor	Temperature:	22 °C
	Humidity:	31 %
Outdoor	Temperature:	18 °C
	Humidity:	39 %

Section 2. General Equipment Specification

Manufacturer:	VTECH Engineering Canada (AT&T)
Model No.:	AT&T 2230
Serial No.:	Non (Portable & Base Station)
Date Received In Laboratory:	May 9, 2001
Nemko Identification No.:	Item #1&2
Frequency Range:	2401.056MHz to 2482.272MHz
Modulation:	GFSK
Number of Channels:	95
Channel Spacing:	864kHz
Emissions Designator:	857KF1D


ATTEN 10dB
RL 0dBm
10dB/
ΔMKR -.67dB
857kHz
Base Station
99% Occ.BW = 857Khz
CENTER 2.482272GHz
SPAN 2.000MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms


ATTEN 10dB
RL 0dBm
10dB/
ΔMKR 1.50dB
743kHz
Portable 99% Occ.BW
743Khz
CENTER 2.482272GHz
SPAN 2.000MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms

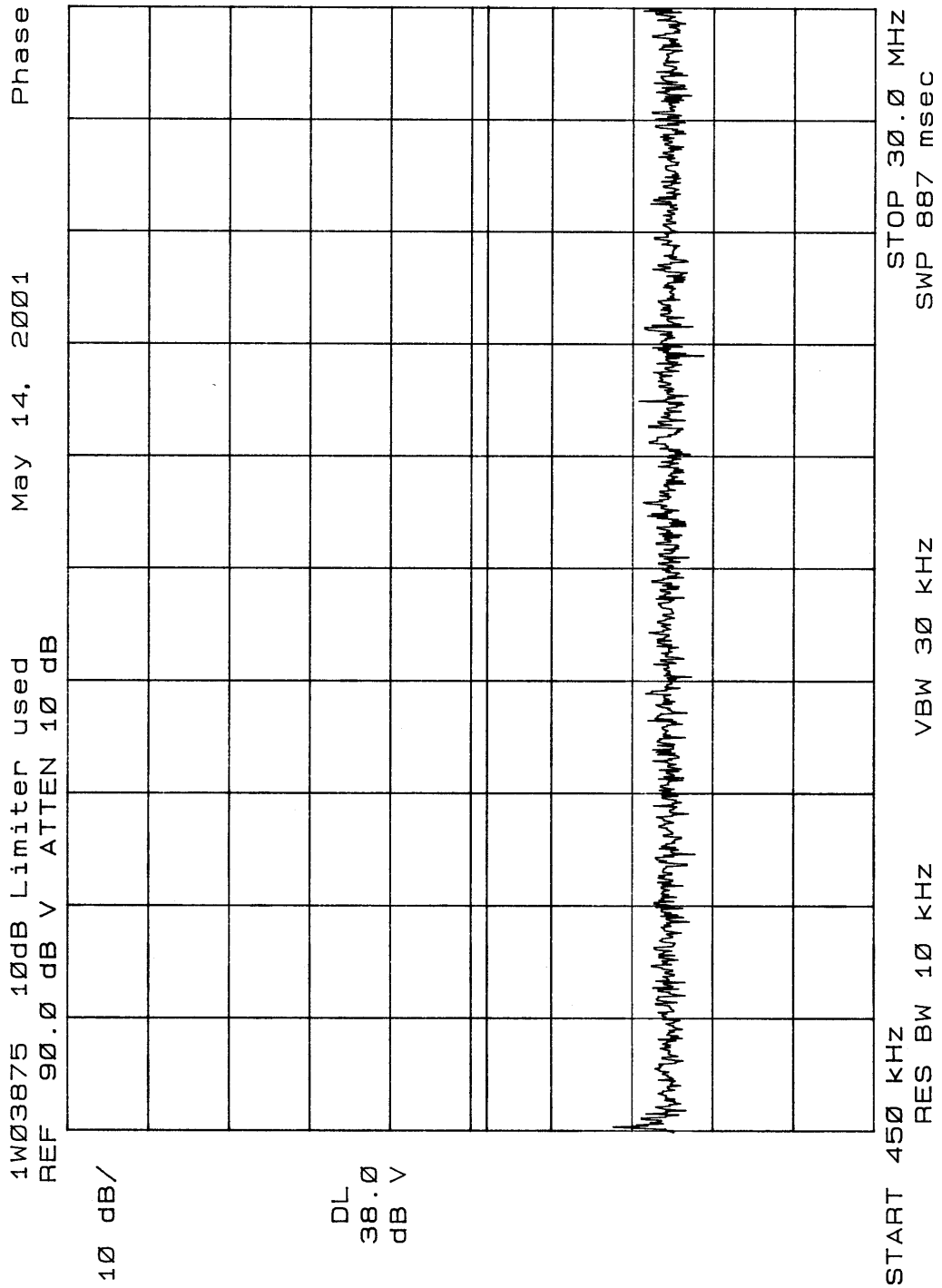
Section 3. Powerline Conducted Emissions

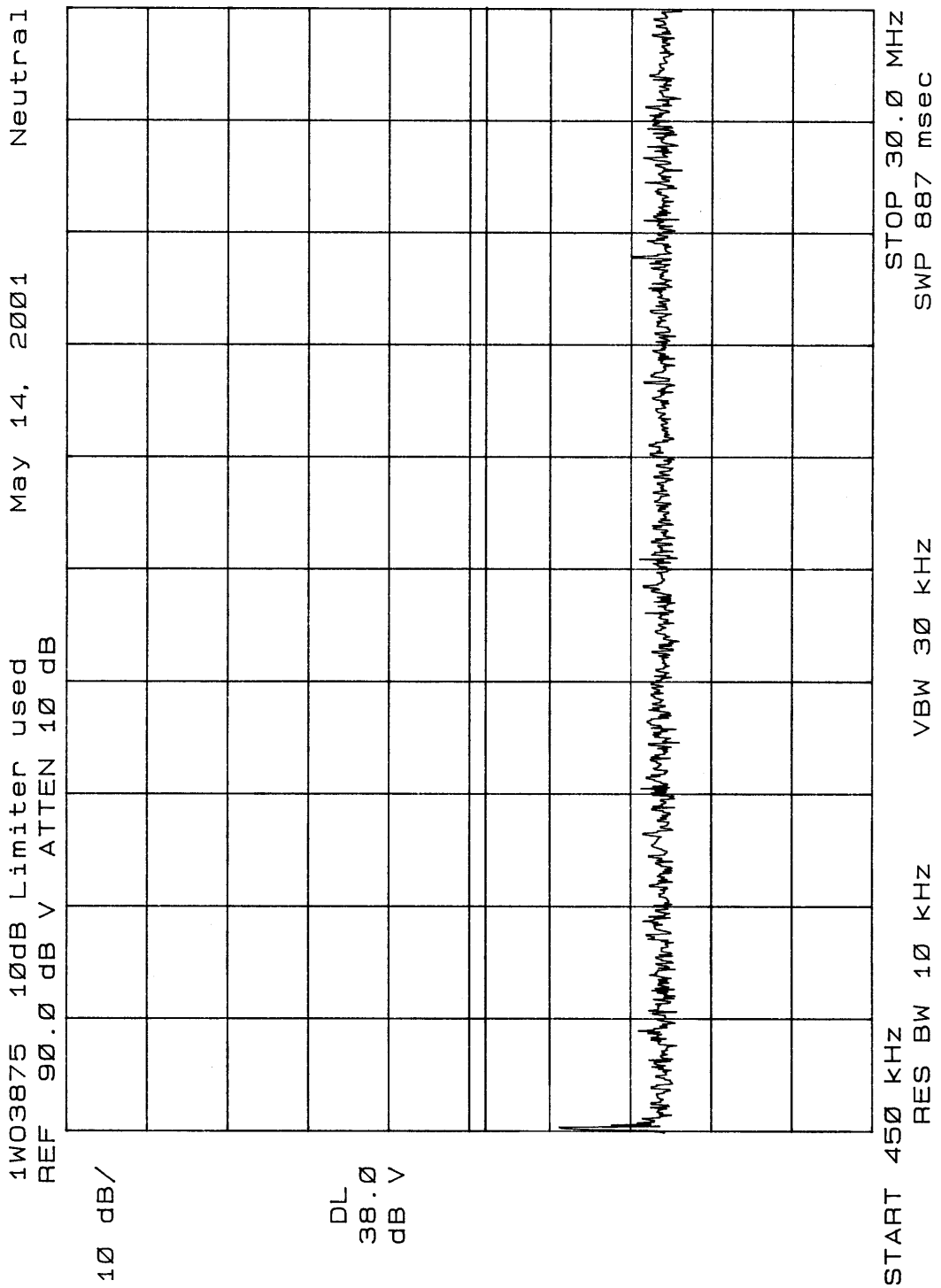
Para. No.: 15.207 (a)

Test Performed By: Glen Westwell	**Date of Test:** May 11, 2001

Test Results: Complies. See attached graph.

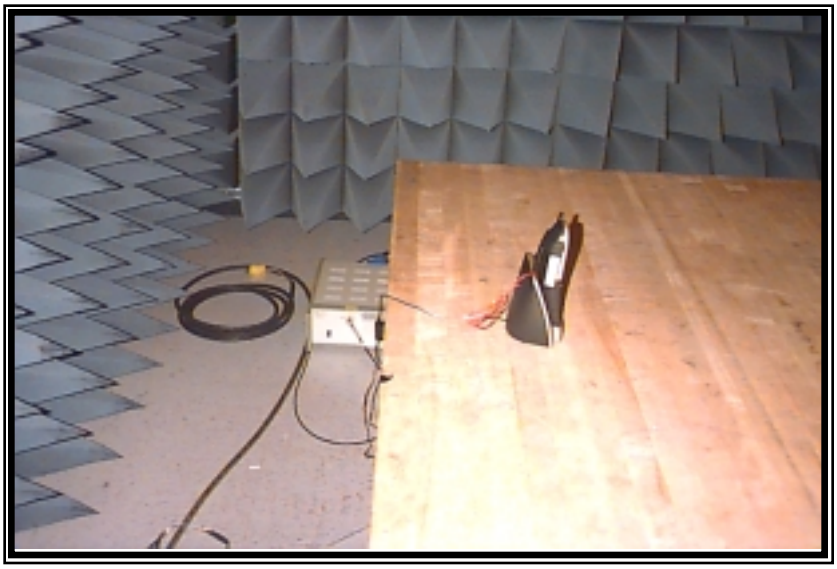
Measurement Data: See attached graph.


1W03875 10dB Limiter used
REF 90.0 dB V ATTEN 10 dB
May 14, 2001
Phase
10 dB/
DL
38.0
dB V
START 450 kHz
RES BW 10 kHz
VBW 30 kHz
STOP 30.0 MHz
SWP 887 msec

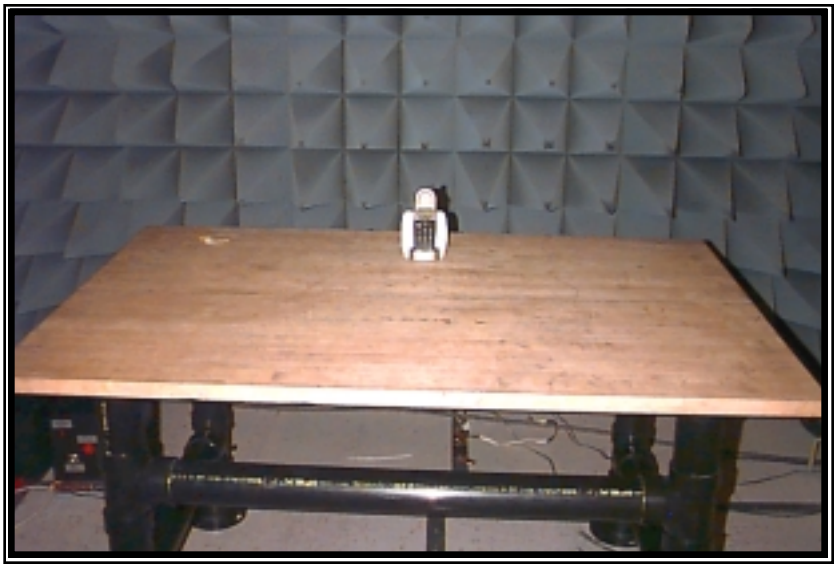

1W03875 10dB Limiter used May 14, 2001 Neutral
REF 90.0 dB V ATTEN 10 dB
10 dB/
DL
38.0
dB V
START 450 kHz
RES BW 10 kHz
VBW 30 kHz
STOP 30.0 MHz
SWP 887 msec

Conducted Photographs (Worst Case Configuration)

Side View



Front View



Section 4. Channel Separation

Para. No.: 15.247 (a)(1)

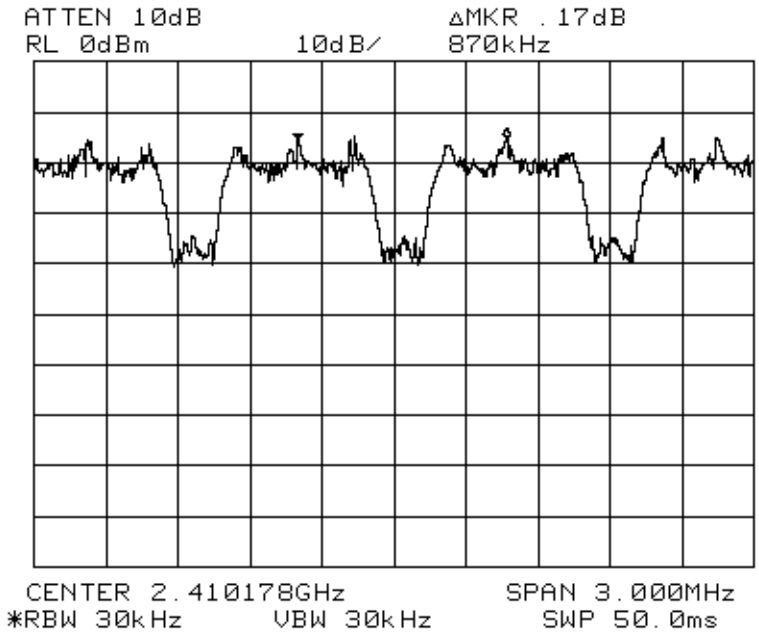
Test Performed By: Glen Westwell	**Date of Test:** May 21, 2001

Test Results: Complies.

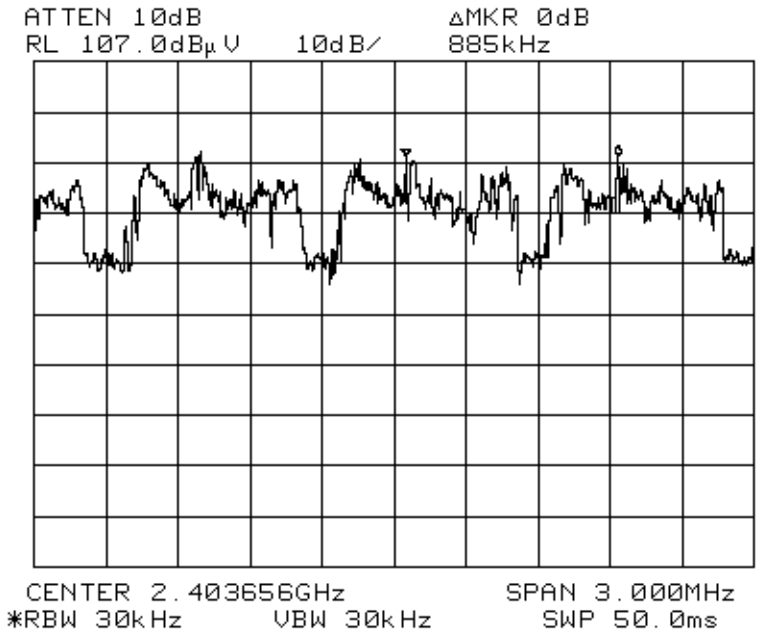
Measurement Data:

Channel Separation:	870kHz
Maximum 20dB Bandwidth:	707kHz

See attached graphs.



CH. Separation =870Khz
Portable
Hopping "On"



CH. Separation =885Khz
Base Station
Hopping "On"

Section 5. Pseudorandom Hopping Algorithm

Para. No.: 15.247 (a)(1)

Test Performed By: Glen Westwell	**Date of Test:** May 22, 2001

Test Results: Complies.

Measurement Data: Number of Hopping Frequencies: 95

See attached Manufacturers Data

See attached graphs.

3. Adaptation to 2.4GHz ISM band

3.1 Frame format:

Down-link (FP to PP) Up-link (PP to FP)

0	1	2	3	4	5	6	7

length 10 ms

3.1.1 Crystal frequency 10.368000 MHz

Symbol rate: 576 kbit/sec.
Frame length: 8 timeslots, same as 10 ms.
Frame frequency: 100 Hz
Number of symbols for frame: 5760
Number of symbols per slot: 720 (440 in burst and 280 in guard space)

3.1.2 Frequency hopping

Slots are used in pairs for duplex bearers (0,4), (1,5), etc. The FP transmit on a frequency in a slot-pair, and the PP responds on the same carrier in the up-link direction. Handset uses preamble antenna diversity to detect the best antenna for reception/transmission.

Frame
N
N+1
N+2

Frequency versus slot

0	1	2	3	4	5	6	7
x		y		x		y	
z		w		z		w	
v		t		v		t	

3.2 Burst format:

Sync field	A field	B field	XZ	Guard space

3.2.1 Sync-field

Length: 48 symbols consisting of

Prolonged preamble:	16 bit data (1010b sequence)
Preamble for bit-synchronization:	16 bit data (1010b sequence)
Frame synchronization word:	FP: E98Ah (1110 1001 1000 1010b sequence)
	PP: 1675h (0001 0110 0111 0101b sequence)

3.2.2 A-field

Total length 64 symbols
Header: 8 bit
Tail: 40 bit
CRC: 16 bit

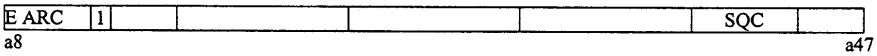
3.2.2.1 T-MUX:

NT: RFPI is normally broadcast 7 out of every 8 frames.
QT: Static system information
PT: Broadcast, paging
MT: MAC layer control
CT: Connection oriented higher layer signaling

3.2.2.2 Derive hopping SeQuenceCode (SQC) from RFPI

In order to distribute usage of different hopping sequences, the actual used sequence is derived from the FP identity, RFPI. The RFPI is normally broadcast 7 out of every 8 frames which then allows immediate recognition of hopping sequence by the PP during the initial synchronization.

The RFPI consists of 40 bits (5 bytes):



a8 a47

The SQC is located from bit a40 to a44.

3.2.2.3 Excluding fixed carriers.

List of excluded RF carriers or parts hereof is broadcast using paging (reserved code 3).
The method is defined:

PT_3 (1): *ExcpPattern0*[32]	(32 bits used)
PT_3 (2): *ExcpPattern1*[32]	(32 bits used)
PT_3 (3): *ExcpPattern2*[15]	(31 bits used)

ExcpPatternx describes a complete pattern of excluded RF carriers (If a bit is set the carrier is excluded).

3.2.3 B-field

Format and usage of B-field is similar to DECT. 320 bits of ADPCM data.

3.2.4 XZ-field

Format and usage of XZ-field is similar to DECT. X-field is a 4-bit CRC on the B-field content. Z-field is a copy of the X field and is used to detect sliding collision.

3.3 Frequency hopping algorithm

The number of used frequencies (NUF) in the hopping algorithm is 95.
In FP and PP exists a PrimaryHoppingIndexNumber (PHIN). This number is incremented modulo NUF in the end of the normal downlink half-frame. It is broadcast in Q0 message instead of PSCN.

To a simplex or an established duplex bearer is assigned a HoppingIndexOffset (HIO), which is analogue to the used RF carrier in a FDMA system. This value is broadcast in place of CN in Q0 message. In the FP in all unused slots in up-link direction the receiver is scanning with HIO=0. The receiver scanning doesn't exclude RF-carriers.

Different FPs use different hopping sequences. The different sequences are derived from the hopping table by adding an offset, SeQuenceCode (SQC). See section 3.2.2.2.

A hopping table maps an index I to a carrier number: CN = f (I)

The physical RF carrier is calculated by the formula:

CN = (f ((PHIN+HIO) mod NUF) + SQC) mod NUF

3.3.1 Excluded carriers

Excluded carriers (exceptions) are fixed carriers that constantly are interfered by CW RF-carrier. The decision for excluding a RF carrier, are based on:

- RSSI monitor during scanning in the FP.
- Bearer quality in FP correlated to specific RF-carriers.
- Bearer quality detected in PP and reported using Q1 in MAC-header.

When exception carriers are included the complete algorithm is:

```
I = (PHIN+HIO) mod NUF
CN = ( f (I) + SQC ) mod NUF
While CN in ExclusionList
{
 I = (I + FreqHopIndexExcpShift) mod NUF
 CN = ( f (I) + SQC ) mod NUF
}
```

where FreqHopIndexExcpShift = (NUF-1).

3.3.2 Hopping tables

Three different hopping tables are defined.

3.3.2.1 Hopping sequence for North America and most of Europe

For 10.368000 MHz crystal the frequencies are derived as:
Frequency: 2401.056 MHz + CN * 0.864000 MHz

i	f(I)	I	f(i)	i	f(i)	i	f(i)	i	f(i)
0	0	20	2	40	27	60	13	80	40
1	23	21	18	41	12	61	33	81	1
2	62	22	81	42	89	62	65	82	28
3	8	23	11	43	25	63	50	83	55
4	43	24	36	44	87	64	79	84	35
5	16	25	72	45	14	65	56	85	53
6	71	26	54	46	57	66	91	86	24
7	47	27	69	47	41	67	42	87	44
8	19	28	21	48	74	68	80	88	82
9	61	29	3	49	32	69	48	89	51
10	76	30	37	50	70	70	15	90	90
11	29	31	10	51	9	71	85	91	38
12	59	32	34	52	58	72	5	92	83
13	22	33	66	53	78	73	88	93	30
14	52	34	7	54	45	74	17	94	46
15	86	35	68	55	20	75	84		
16	63	36	94	56	73	76	6		
17	26	37	75	57	93	77	67		
18	77	38	4	58	64	78	49		
19	31	39	60	59	39	79	92		

3.4 PP synchronization procedure

PP selects a random RF carrier and tries to receive a frame within 0.9 sec. If nothing is received then a new RF carrier is selected.
When a burst with correct A-CRC is received and it is a Nt (RFPI) the hopping sequence (SQC) is known and the PP must receive in the following frames using the hopping sequence. If the received A-field is different from a Nt, the PP selects a new RF carrier randomly and waits for Nt. In this state the PP do not have information of excluded RF carriers, but just follows the known hopping sequence without excluding any RF carriers. Only individual frames are missed on the excluded carriers. When PT3 is received, the PP is able to receive on exception carriers.

3.5 Dual slot diversity

Dual slot diversity is activated in case interference is detected. That is, two bearers are active, carrying the same B-field content. The receiver decides which of the received speech frames to use, depending on A-CRC and/or X-CRC. The setup and release of the 2nd bearer are performed dynamically by the FP-MAC and PP-MAC to adapt to current interference level. The two bearers are managed independently in the MAC, like a stalled intra-cell bearer hand-over with two established bearers. HoppingIndexOffset (HIO) for the two bearers are selected independently.

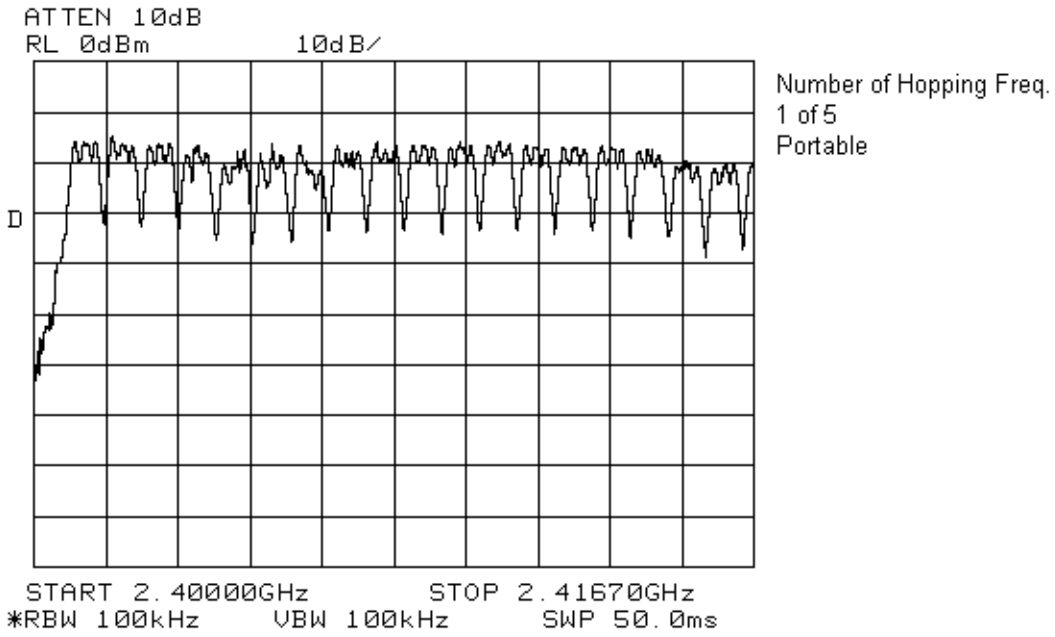
3.6 Power amplifier activation

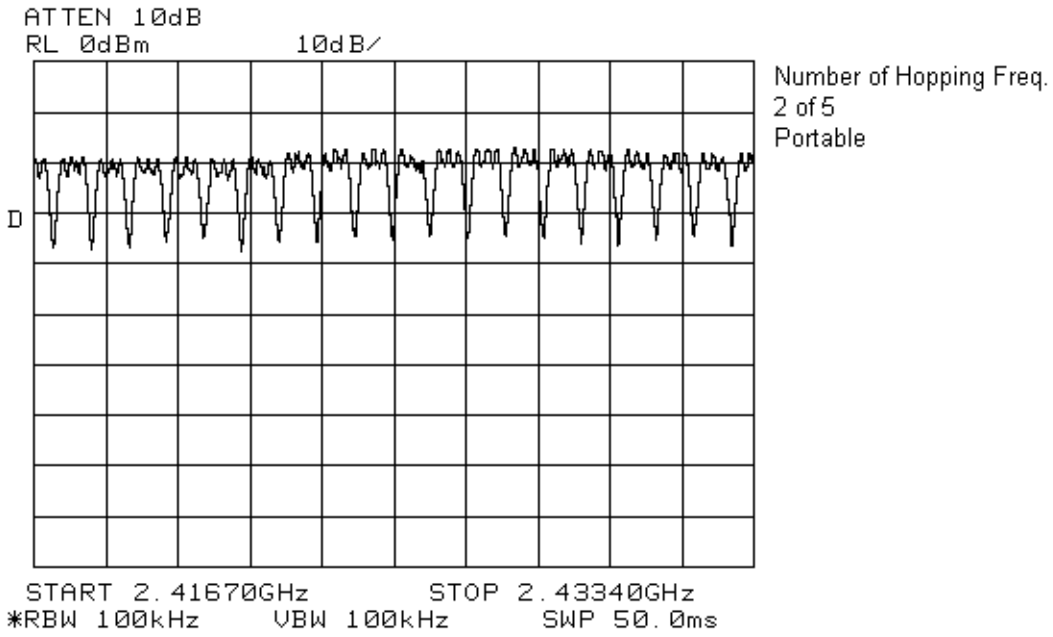
3.6.1 External connection

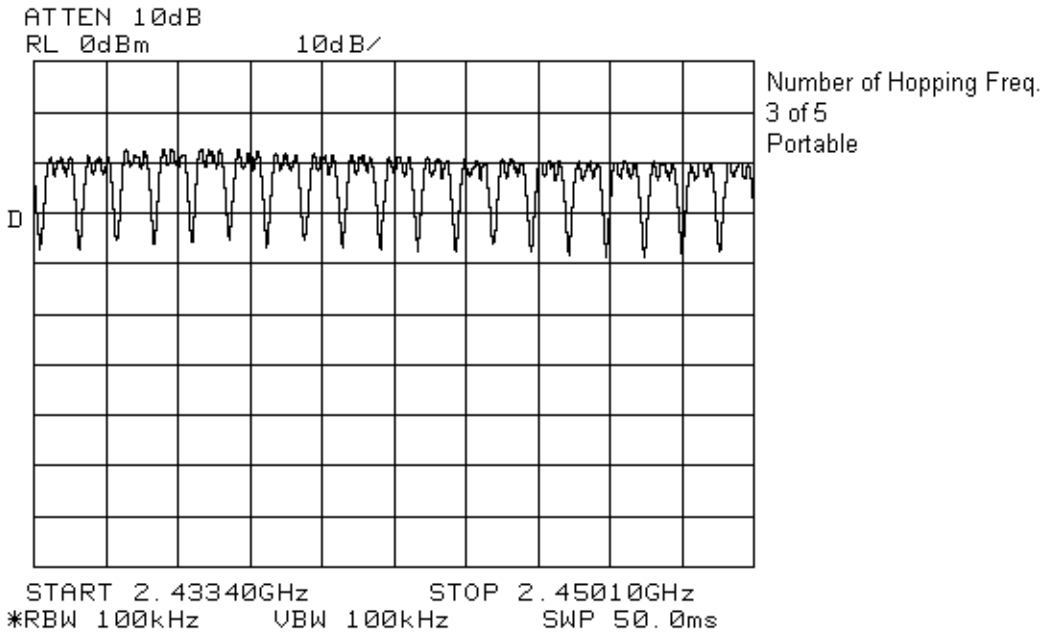
The FP has one connection active at all times to make synchronization of the PP possible. In case a speech connection is active one slot will be active in down-link direction and one slot will be active from in up-link direction. The power amplifier will be active from start of sync field to the end of XZ field, which is slightly less than 1/12 of the total frame. In case dual slot diversity is active, two slots will be active equal to 2/12 of a frame.

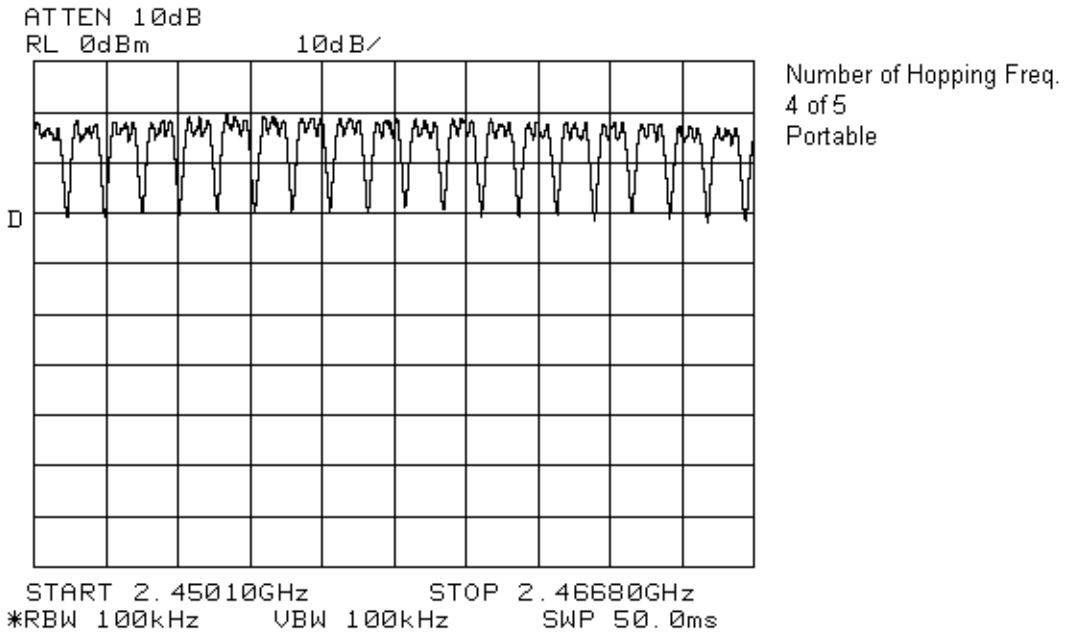
3.6.2 Internal connection

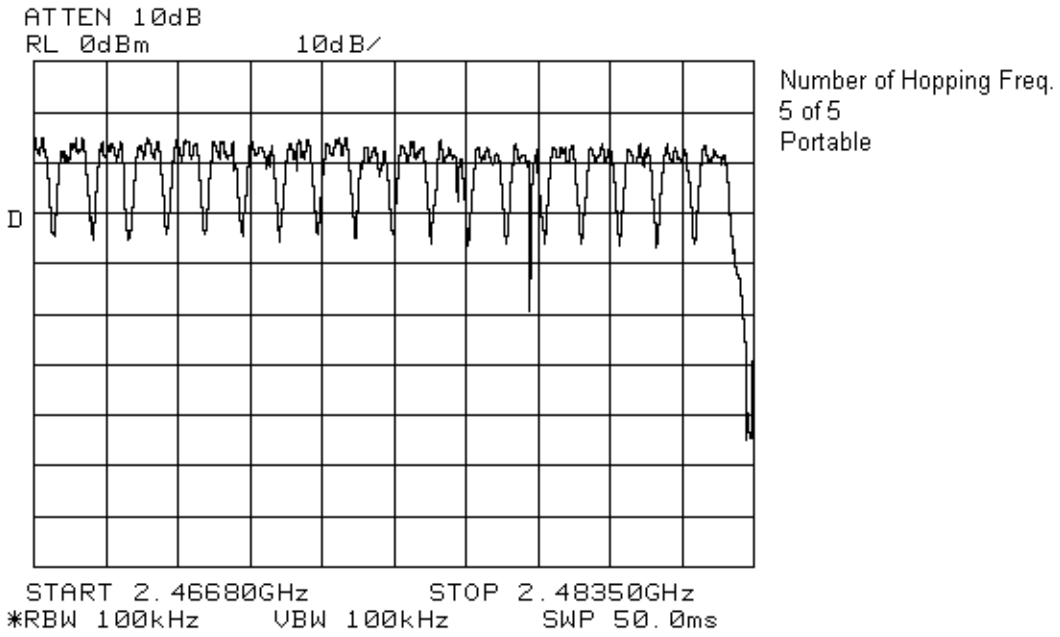
Two handsets are able to make an internal connection. In this case two bearers will be active in the down-link direction from FP, and one bearer will be active from each handset. The two bearers in down-link direction are not correlated and uses different HoppingIndeOfffset. Dual slot diversity is activated independently towards each handset, i.e. up to four bearers may be activated in down-link direction, and two bearer may be active in up-link direction.

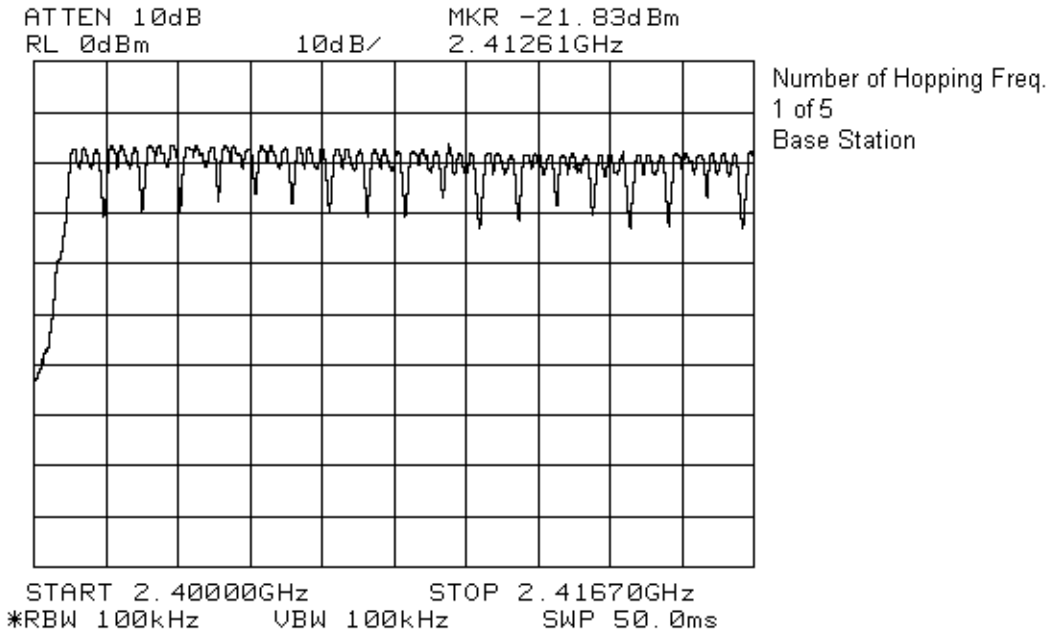

ATTEN 10dB
RL 0dBm
10dB/
D
Number of Hopping Freq.
1 of 5
Portable
START 2.40000GHz
STOP 2.41670GHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms

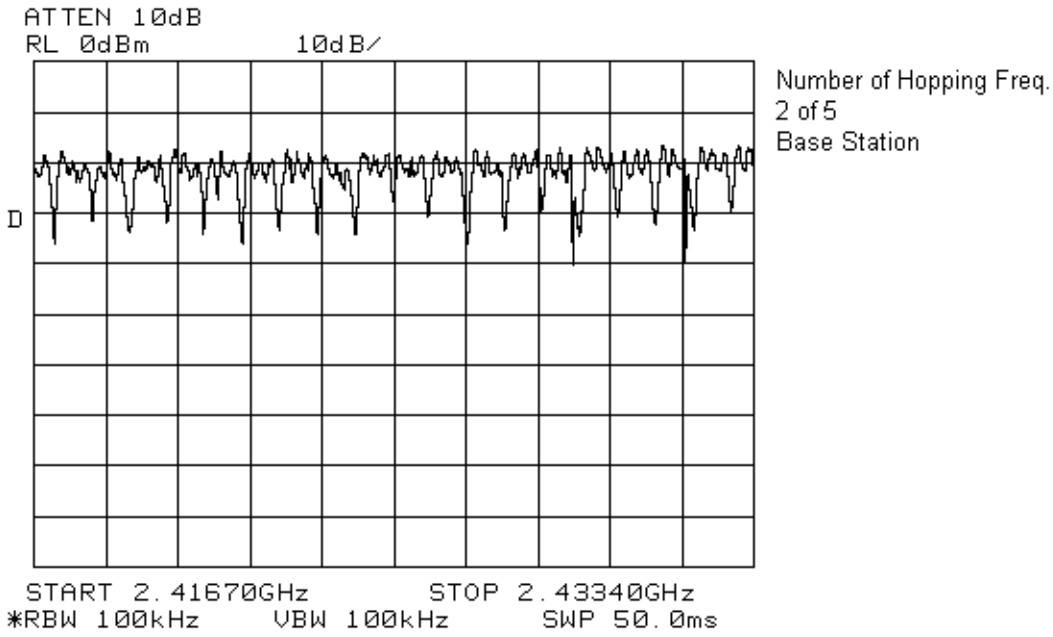

ATTEN 10dB
RL 0dBm
10dB/
D
Number of Hopping Freq.
2 of 5
Portable
START 2.41670GHz
STOP 2.43340GHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms

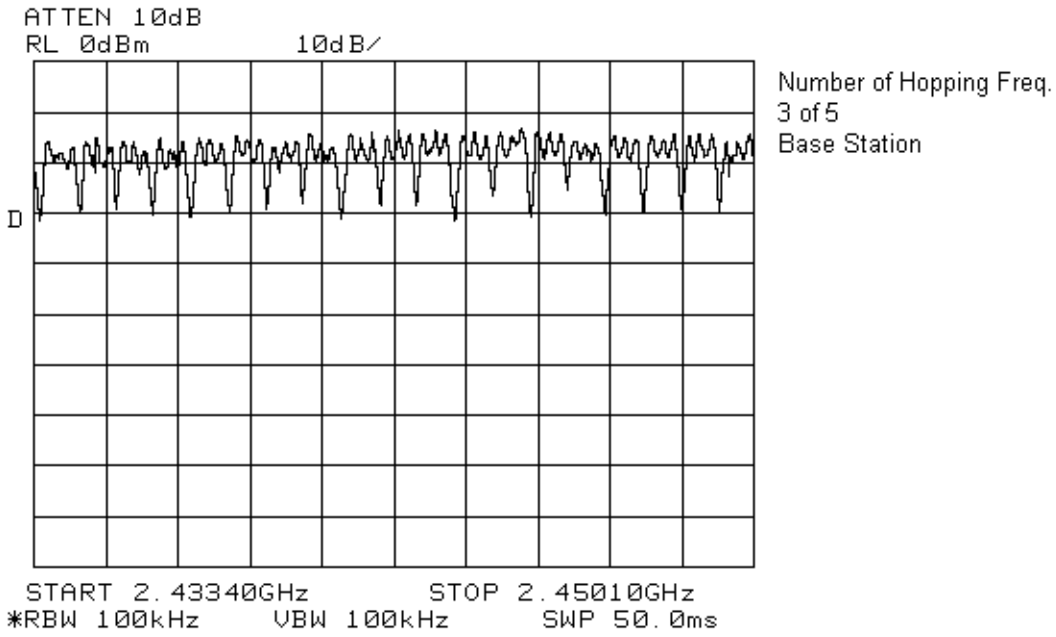

ATTEN 10dB
RL 0dBm
10dB/
D
Number of Hopping Freq.
3 of 5
Portable
START 2.43340GHz
STOP 2.45010GHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms

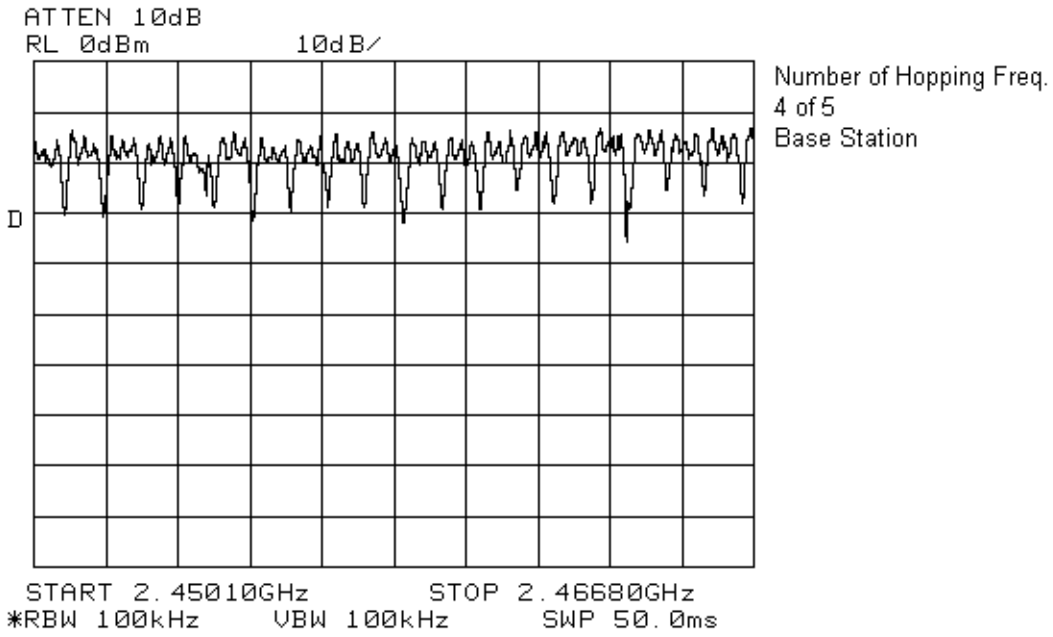

ATTEN 10dB
RL 0dBm
10dB/
D
START 2.45010GHz
STOP 2.46680GHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms
Number of Hopping Freq.
4 of 5
Portable

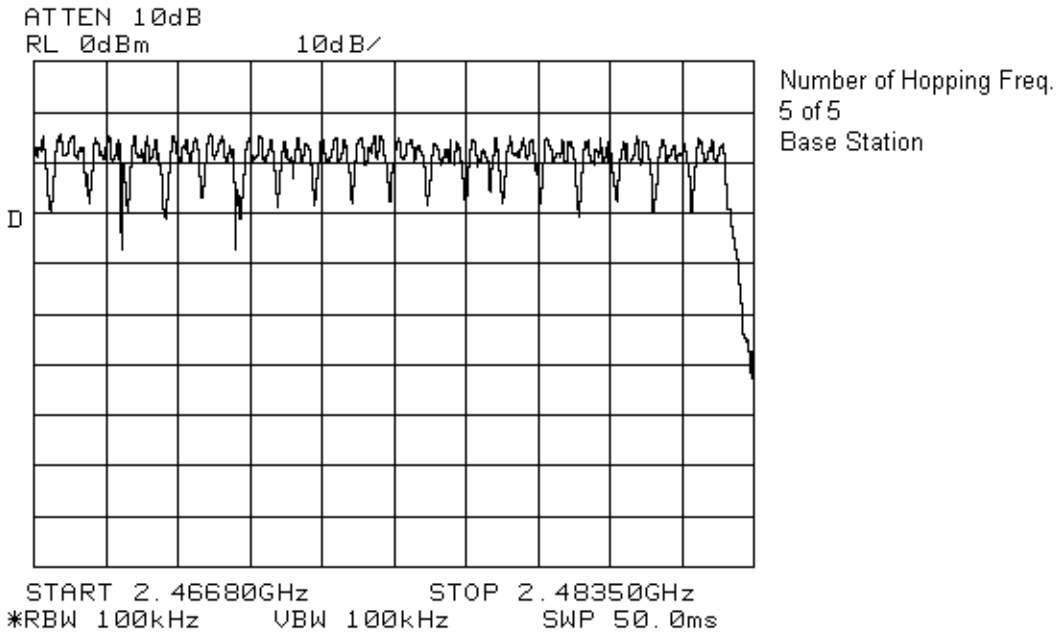

ATTEN 10dB
RL 0dBm
10dB/
D
Number of Hopping Freq.
5 of 5
Portable
START 2.46680GHz
STOP 2.48350GHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms


ATTEN 10dB
RL 0dBm
10dB/
MKR -21.83dBm
2.41261GHz
Number of Hopping Freq.
1 of 5
Base Station
START 2.40000GHz
STOP 2.41670GHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms


ATTEN 10dB
RL 0dBm
10dB/
D
Number of Hopping Freq.
2 of 5
Base Station
START 2.41670GHz
STOP 2.43340GHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms


ATTEN 10dB
RL 0dBm
10dB/
D
Number of Hopping Freq.
3 of 5
Base Station
START 2.43340GHz
STOP 2.45010GHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms


ATTEN 10dB
RL 0dBm
10dB/
D
Number of Hopping Freq.
4 of 5
Base Station
START 2.45010GHz
STOP 2.46680GHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms


ATTEN 10dB
RL 0dBm
10dB/
D
Number of Hopping Freq.
5 of 5
Base Station
START 2.46680GHz
STOP 2.48350GHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms

Section 6. Time of Occupancy

Para. No.: 15.247 (a)(1)(ii)

Test Performed By: Glen Westwell	**Date of Test:** May 22, 2001

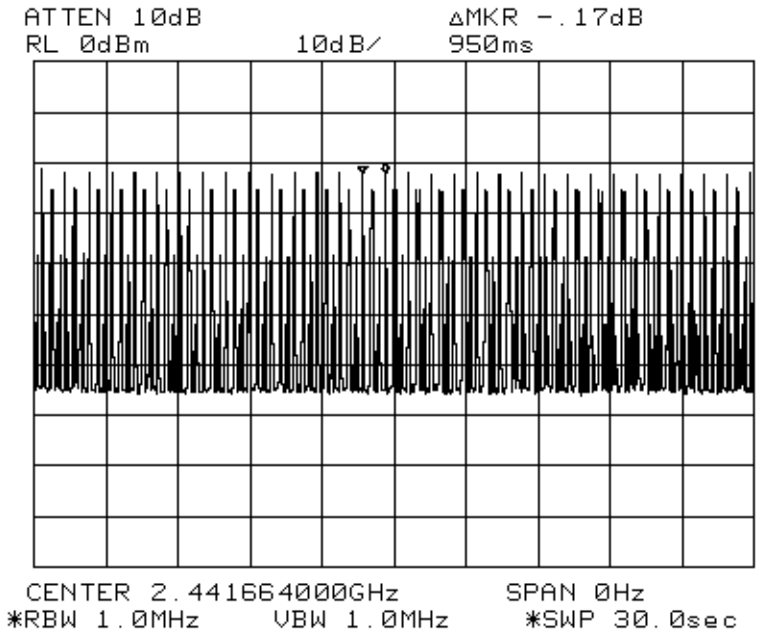
Test Results: Complies.

Measurement Data: Maximum Dwell Time On Any Channel:

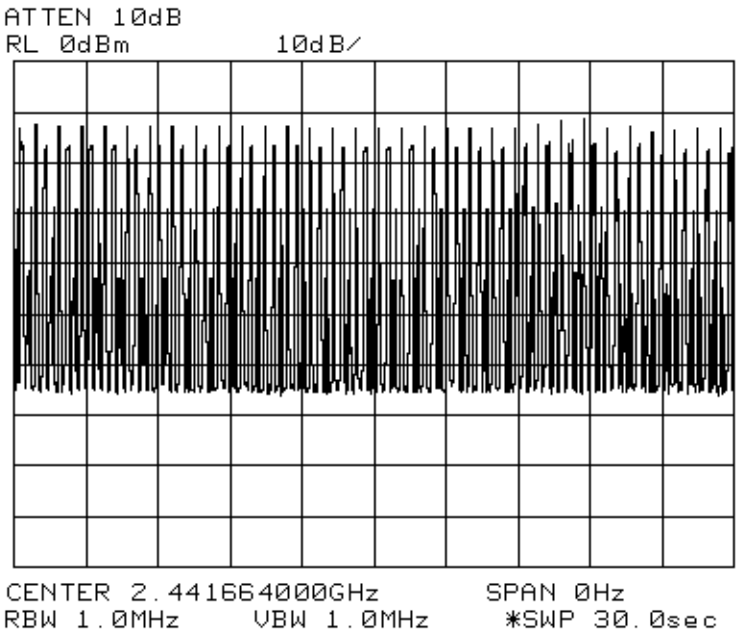
32 Time Occupied on Channel 47 in a 30 second period.

Base Station: 32 x 835.2µSec = 26.73mSec
Portable: 32 x 165.6µSec = 5.3mSec

See attached graphs.

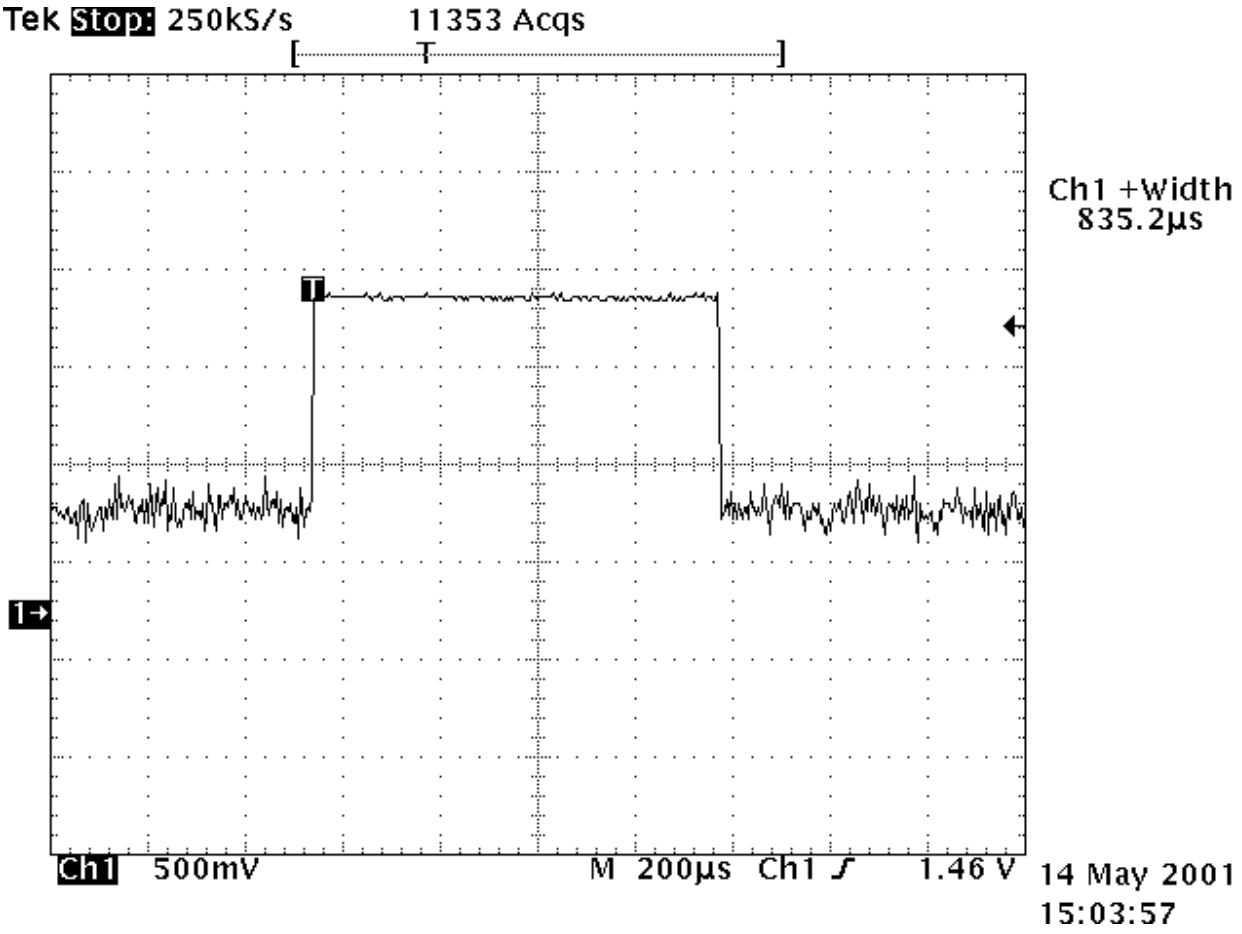


Base Station
Time of Occupancy
Hopping "on"
32 Peaks in a 30Sec Period.

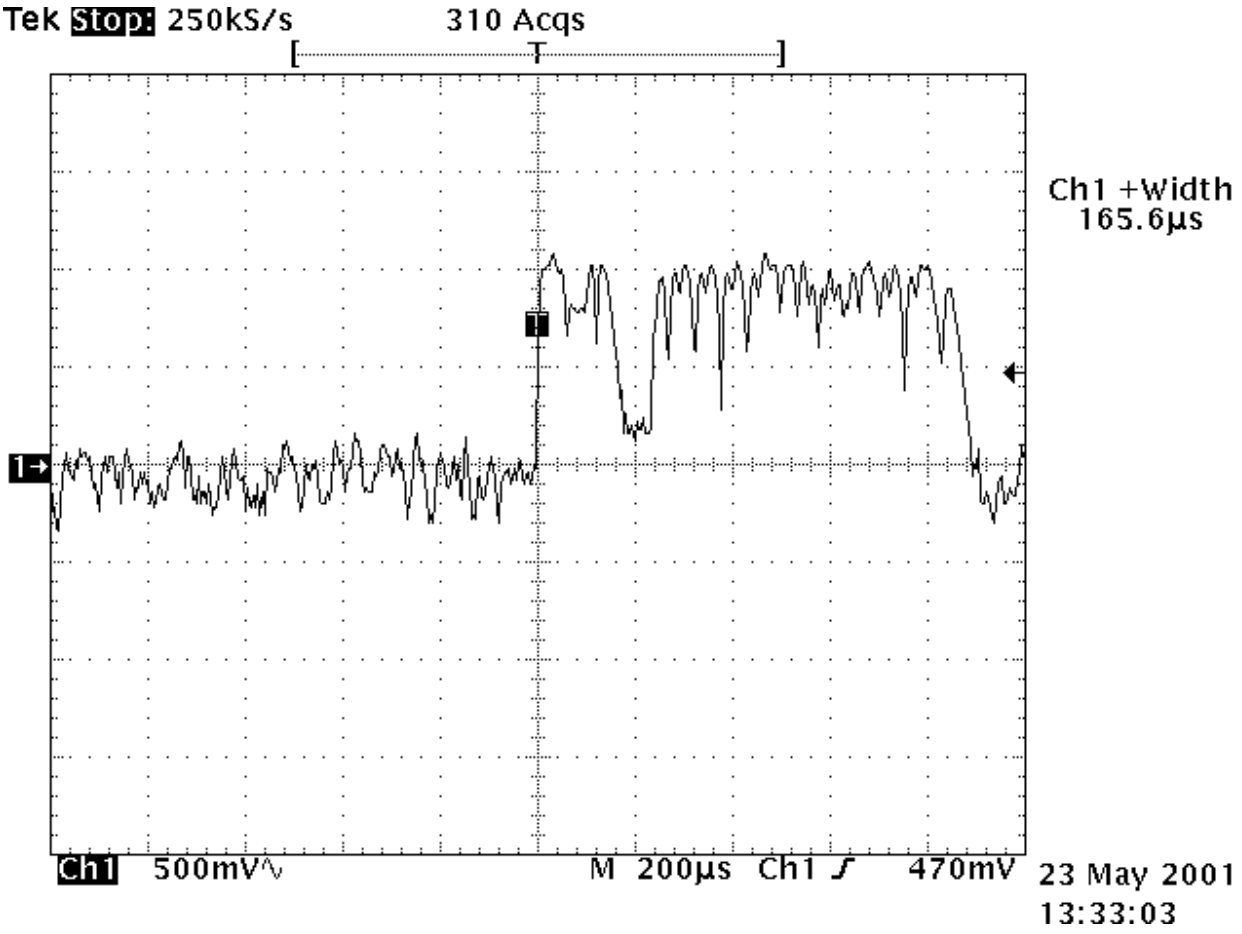


Portable
Time of Occupancy
Hopping "On"
32 Peaks in a 30Sec Period.

Base Station



Portable


Tek Stop: 250kS/s
310 Acqs
Ch1 +Width
165.6µs
Ch1 500mV
M 200µs Ch1 ƒ 470mV
23 May 2001
13:33:03

Section 7. Occupied Bandwidth

Para. No.: 15.247 (a)(1)(ii)

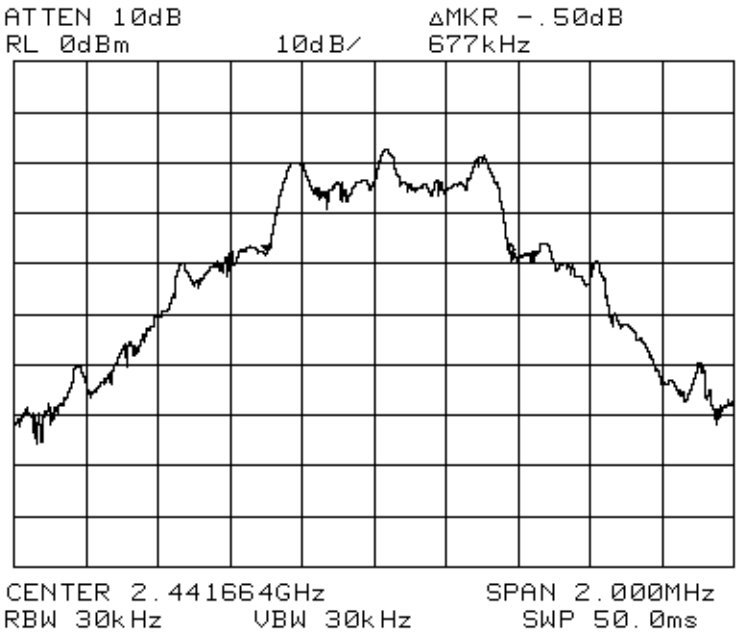
Test Performed By: Glen Westwell	**Date of Test:** May 23, 2001

Test Results: Complies.

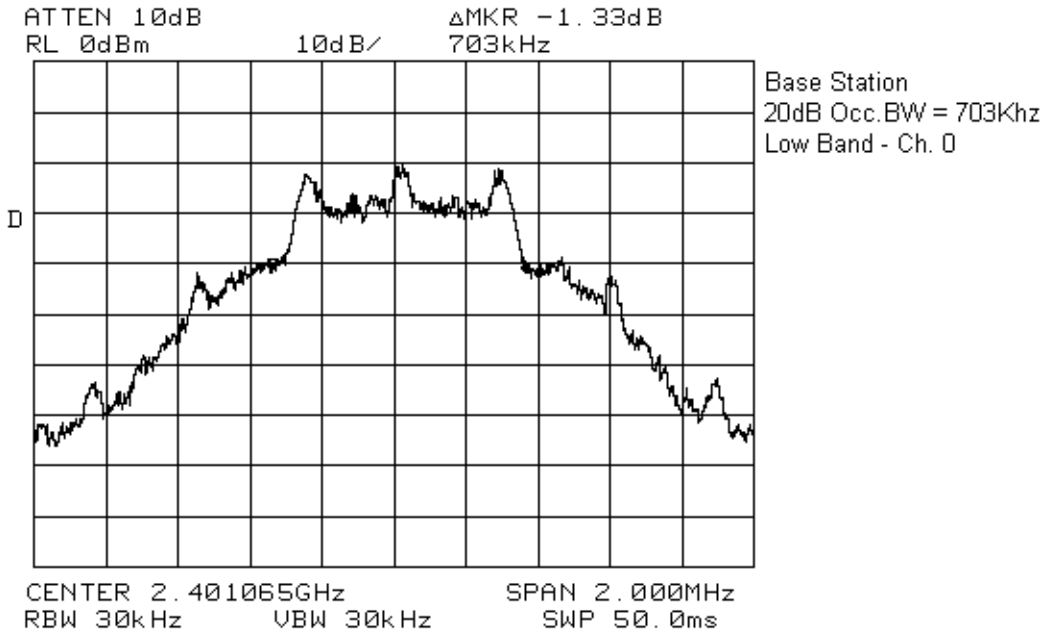
Measurement Data: Maximum Occupied Bandwidth = 707kHz

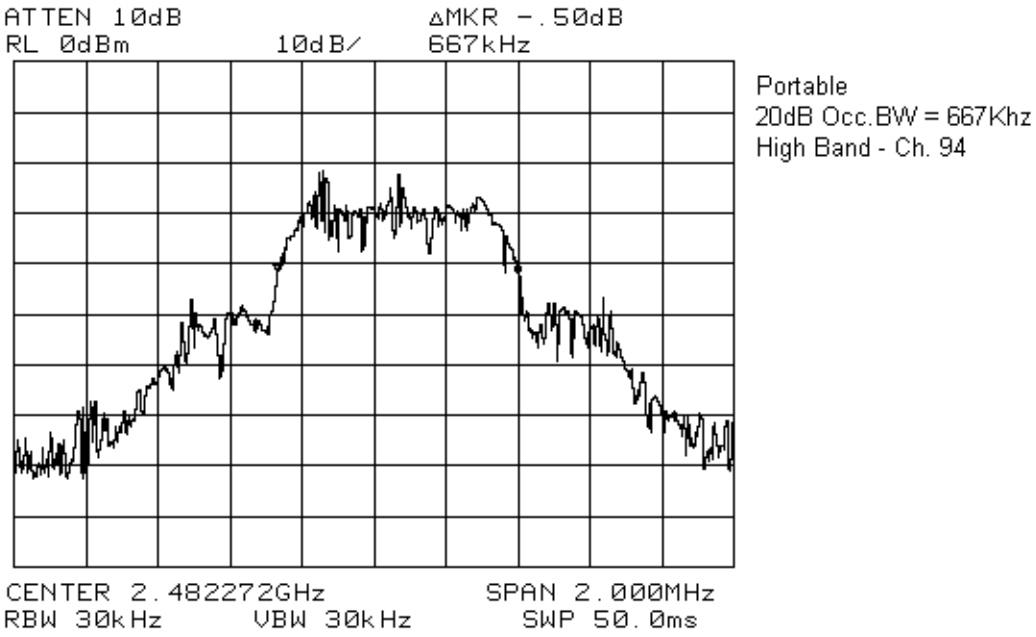
See attached graphs.

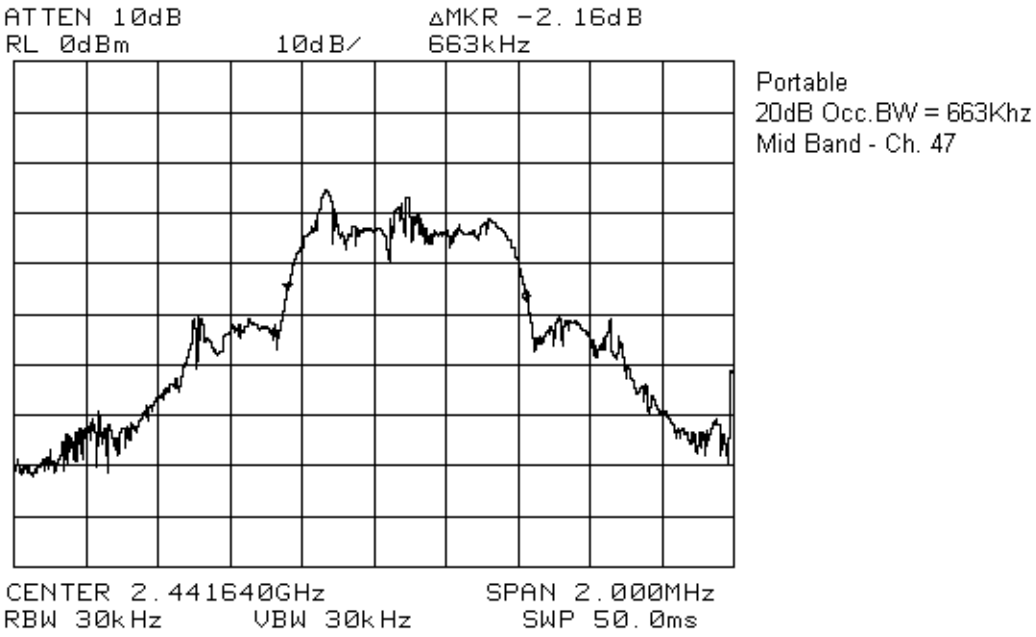

ATTEN 10dB
RL 0dBm
10dB/
ΔMKR -.33dB
707kHz
Base Station
20dB Occ.BW = 707Khz
High Band - CH. 94
CENTER 2.482272GHz
SPAN 2.000MHz
RBW 30kHz
VBW 30kHz
SWP 50.0ms

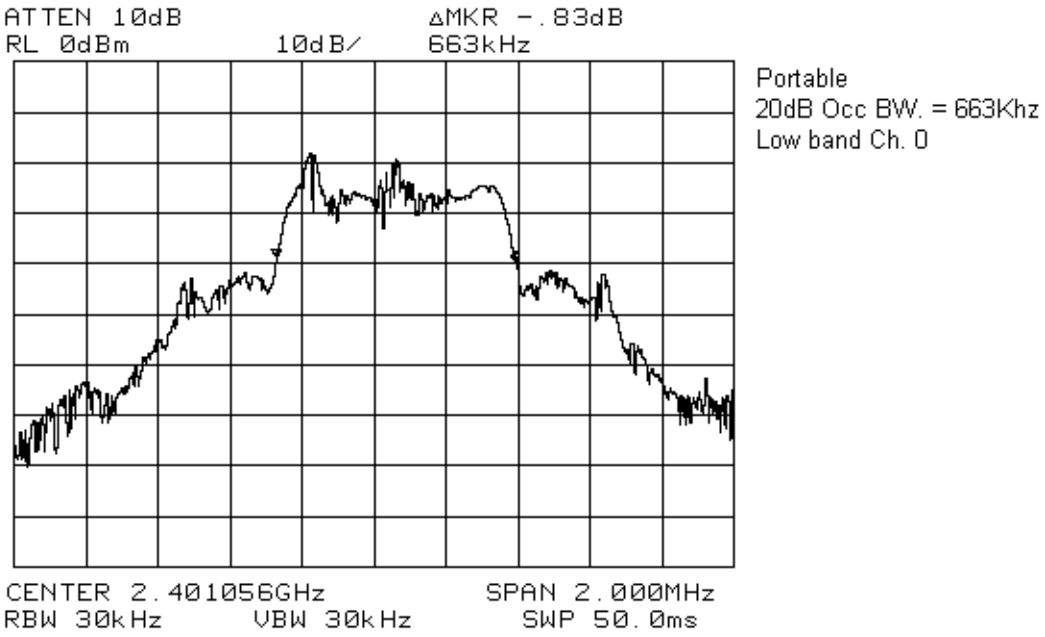


Base Station
20dB Occ.BW = 677Khz
Mid Band - Ch. 47


ATTEN 10dB
RL 0dBm
10dB/
ΔMKR -1.33dB
703kHz
Base Station
20dB Occ.BW = 703Khz
Low Band - Ch. 0
D
CENTER 2.401065GHz
SPAN 2.000MHz
RBW 30kHz
VBW 30kHz
SWP 50.0ms


ATTEN 10dB
RL 0dBm
10dB/
ΔMKR -.50dB
667kHz
Portable
20dB Occ.BW = 667Khz
High Band - Ch. 94
CENTER 2.482272GHz
SPAN 2.000MHz
RBW 30kHz
VBW 30kHz
SWP 50.0ms


ATTEN 10dB
RL 0dBm
10dB/
ΔMKR -2.16dB
663kHz
Portable
20dB Occ.BW = 663Khz
Mid Band - Ch. 47
CENTER 2.441640GHz
SPAN 2.000MHz
RBW 30kHz
VBW 30kHz
SWP 50.0ms


ATTEN 10dB
RL 0dBm
10dB/
ΔMKR -.83dB
663kHz
Portable
20dB Occ BW. = 663Khz
Low band Ch. 0
CENTER 2.401056GHz
SPAN 2.000MHz
RBW 30kHz
VBW 30kHz
SWP 50.0ms

Section 8. Peak Power Output

Para. No.: 15.247 (b)

Test Performed By: Glen Westwell	**Date of Test:** May 23, 2001

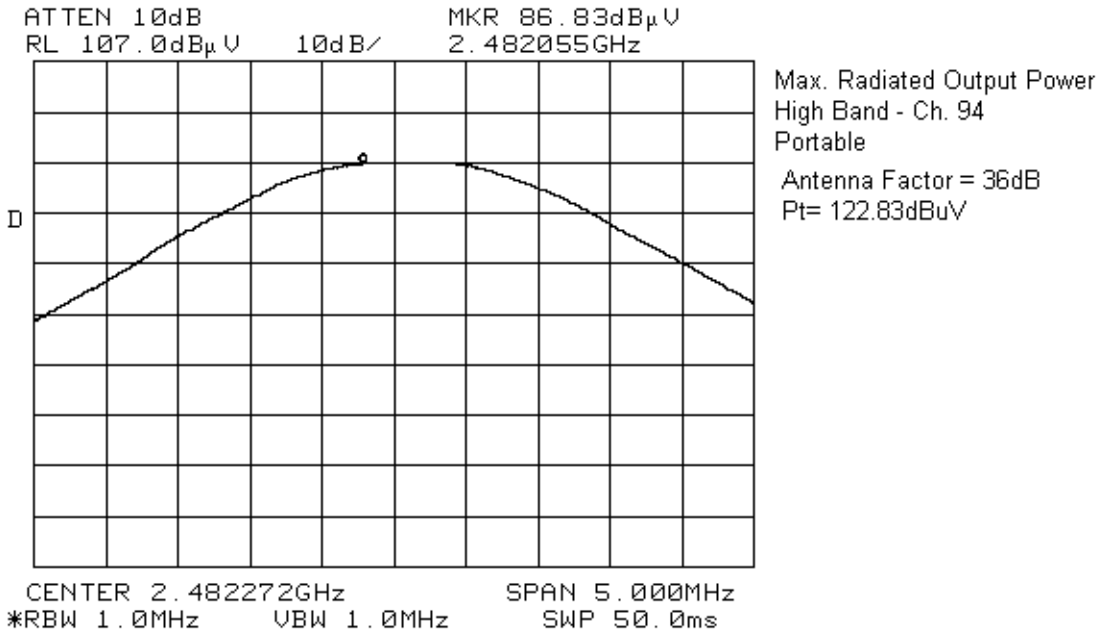
Test Results: Complies. The maximum peak power output of the transmitter is 0.575 W.

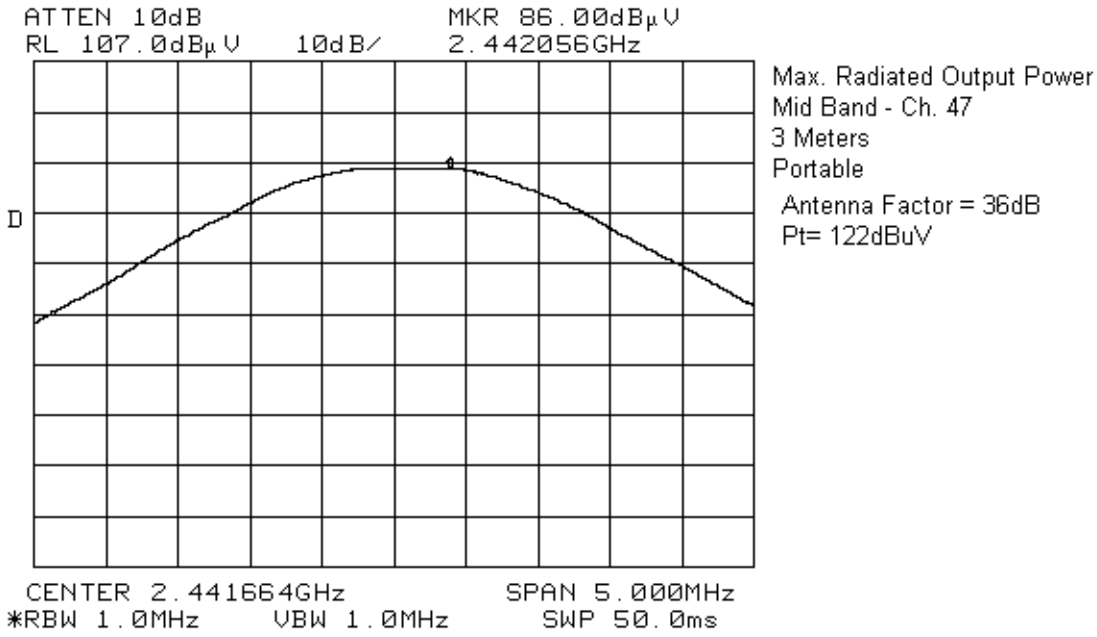
Measurement Data: Detachable antenna? ☐ Yes ☒ No

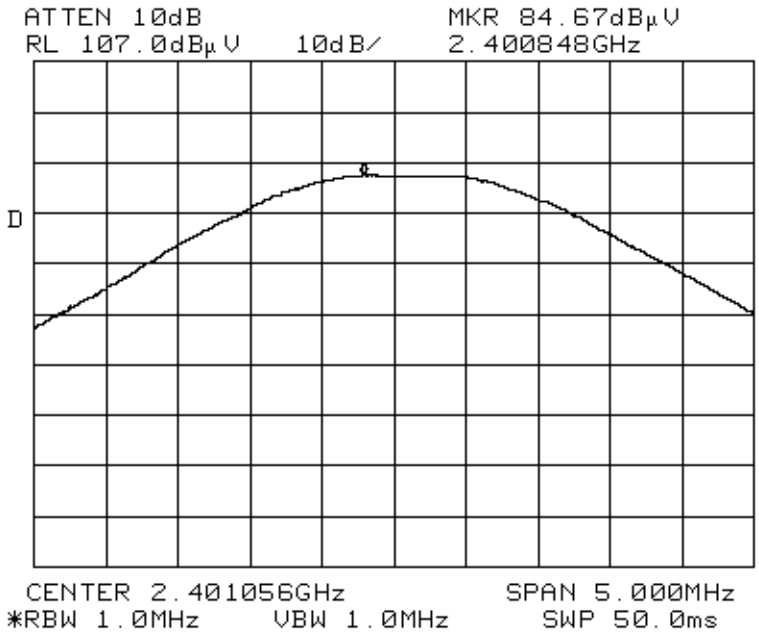
If yes, state the type of non-standard connector used at the antenna port:

Directional Gain of Antenna: 0 dBi or 1 Numeric.
Field Strength: 122.83dBµV/m @ 3m or 1.385 V/m @ 3m.

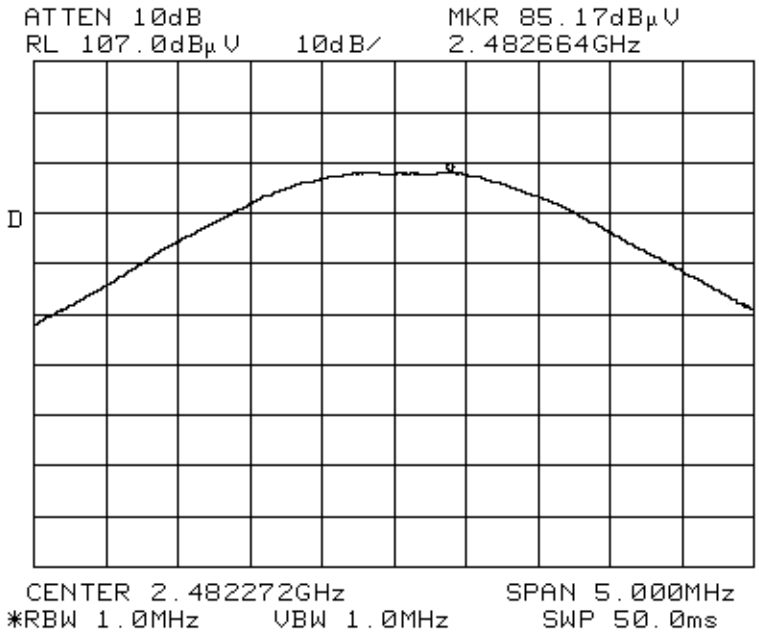
See attached plots.


ATTEN 10dB
RL 107.0dBµV
10dB/
MKR 86.83dBµV
2.482055GHz
D
CENTER 2.482272GHz
SPAN 5.000MHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms
Max. Radiated Output Power
High Band - Ch. 94
Portable
Antenna Factor = 36dB
Pt= 122.83dBuV


ATTEN 10dB
RL 107.0dBµV
10dB/
MKR 86.00dBµV
2.442056GHz
D
CENTER 2.441664GHz
SPAN 5.000MHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms
Max. Radiated Output Power
Mid Band - Ch. 47
3 Meters
Portable
Antenna Factor = 36dB
Pt= 122dBuV

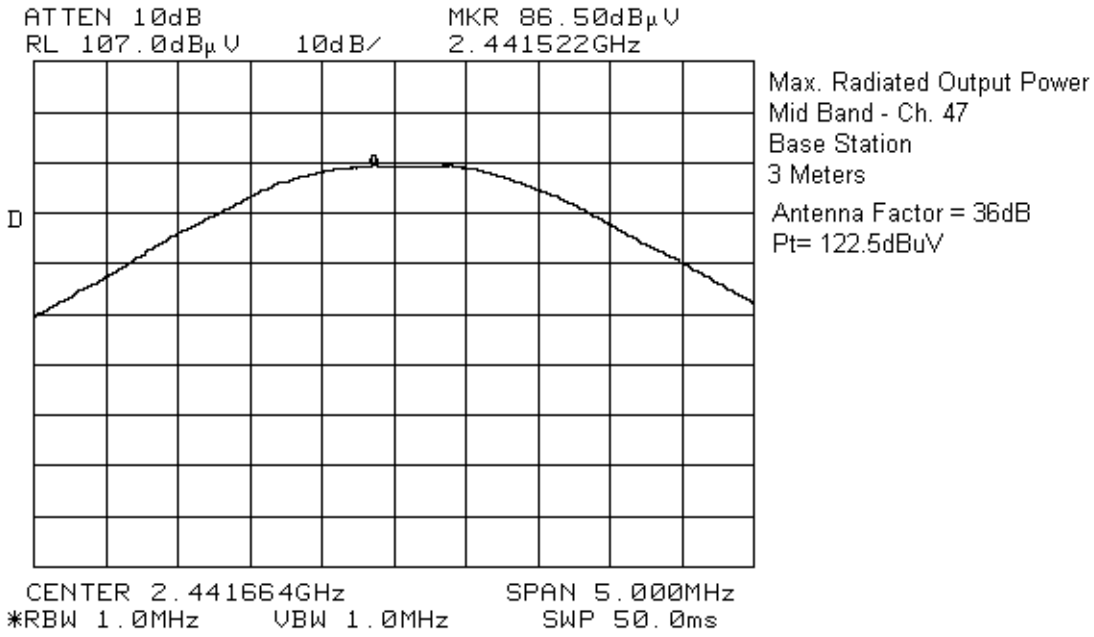


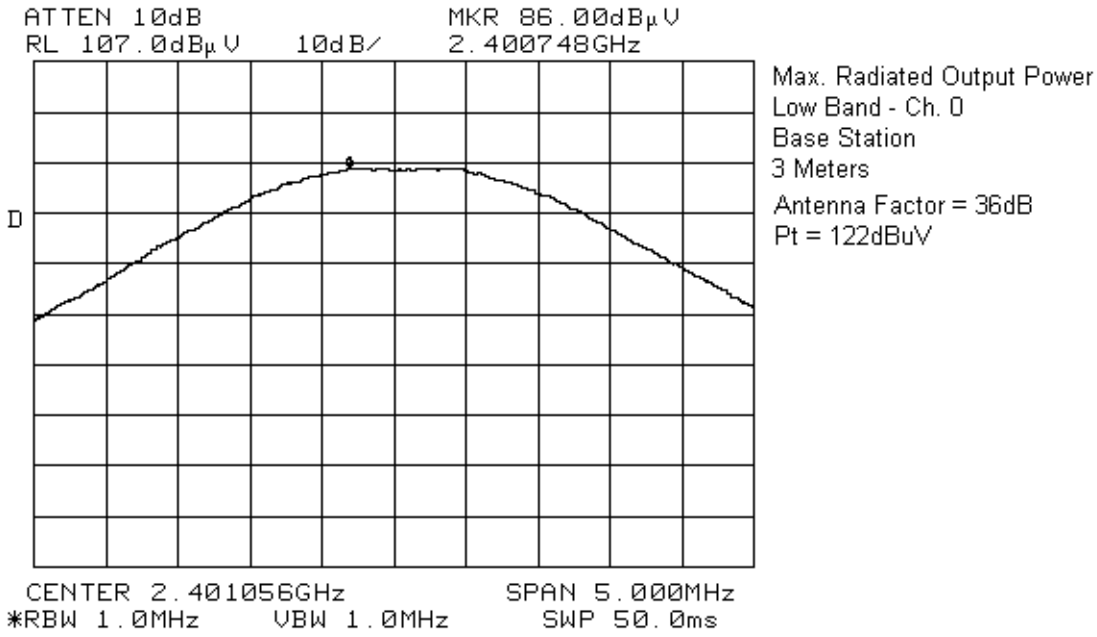
Max. Radiated Output Power
Low Band - Ch. 0
3 meters
Portable
Antenna Factor = 36dB
Pt= 120.7dBuV



Max. Radiated Output Power
High Band - Ch. 94
Base Station
3 Meters

Antenna Factor = 36dB
Pt = 121.2dBuV


ATTEN 10dB
RL 107.0dBµV
10dB/
MKR 86.50dBµV
2.441522GHz
D
Max. Radiated Output Power
Mid Band - Ch. 47
Base Station
3 Meters
Antenna Factor = 36dB
Pt= 122.5dBuV
CENTER 2.441664GHz
SPAN 5.000MHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms


ATTEN 10dB
RL 107.0dBµV
10dB/
MKR 86.00dBµV
2.400748GHz
D
CENTER 2.401056GHz
SPAN 5.000MHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms
Max. Radiated Output Power
Low Band - Ch. 0
Base Station
3 Meters
Antenna Factor = 36dB
Pt = 122dBuV

Section 9. Spurious Emissions (Radiated)

Para. No.: 15.247 (c)

Test Performed By: Glen Westwell	**Date of Test:** May 24, 2001

Test Results: Complies. The worst case emission level is 50.0dBµV/m @ 3m at 4883MHz. This is 4.0 dB below the specification limit.

Measurement Data: See attached table.

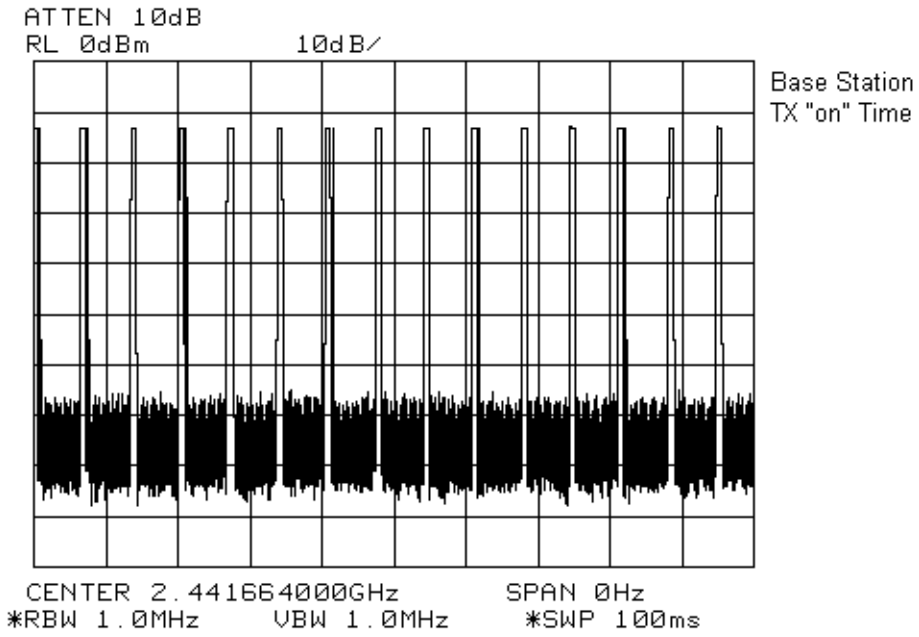
Duty Cycle Calculation: Base Station: 15 x 835.2µSec = 12.53mSec

$$20\text{Log}\ \frac{12.53ms}{100ms} = -18\text{dB}$$

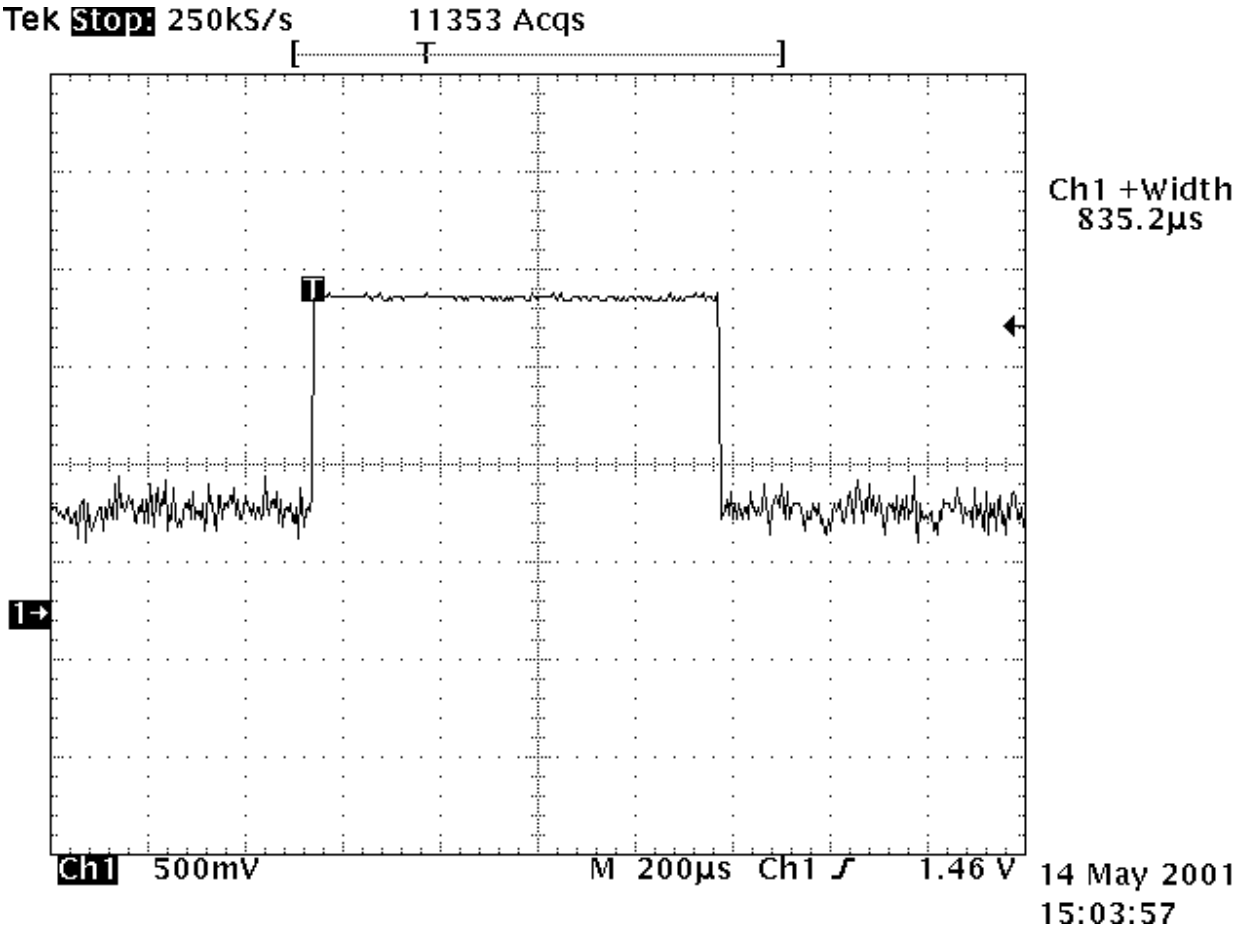
Portable: 10 x 165.6µSec = 1.66mSec

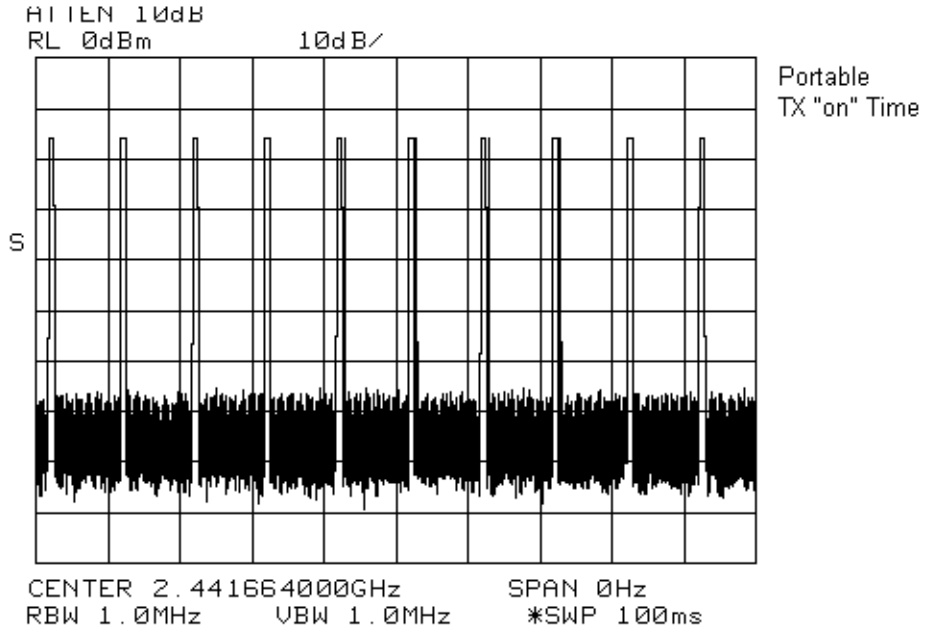
$$20\text{Log}\ \frac{1.66ms}{100ms} = -35.6\text{dB},\ \therefore\ -20\text{dB}$$

- Handheld portable and base station equipment is tested on three orthogonal axis.
- The worst case emission levels are reported.

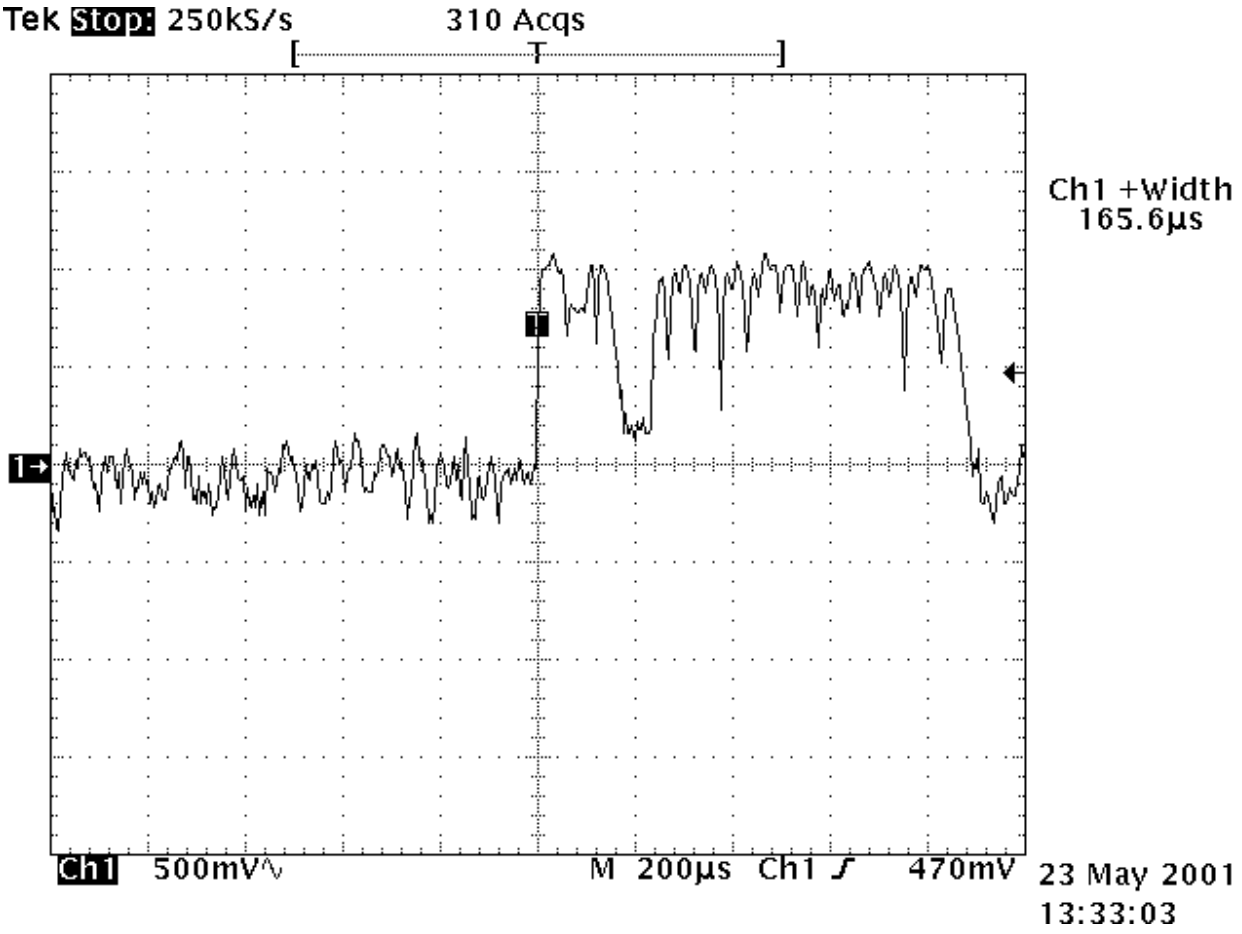

ATTEN 10dB
RL 0dBm
10dB/
Base Station
TX "on" Time
CENTER 2.441664000GHz
SPAN 0Hz
*RBW 1.0MHz
VBW 1.0MHz
*SWP 100ms

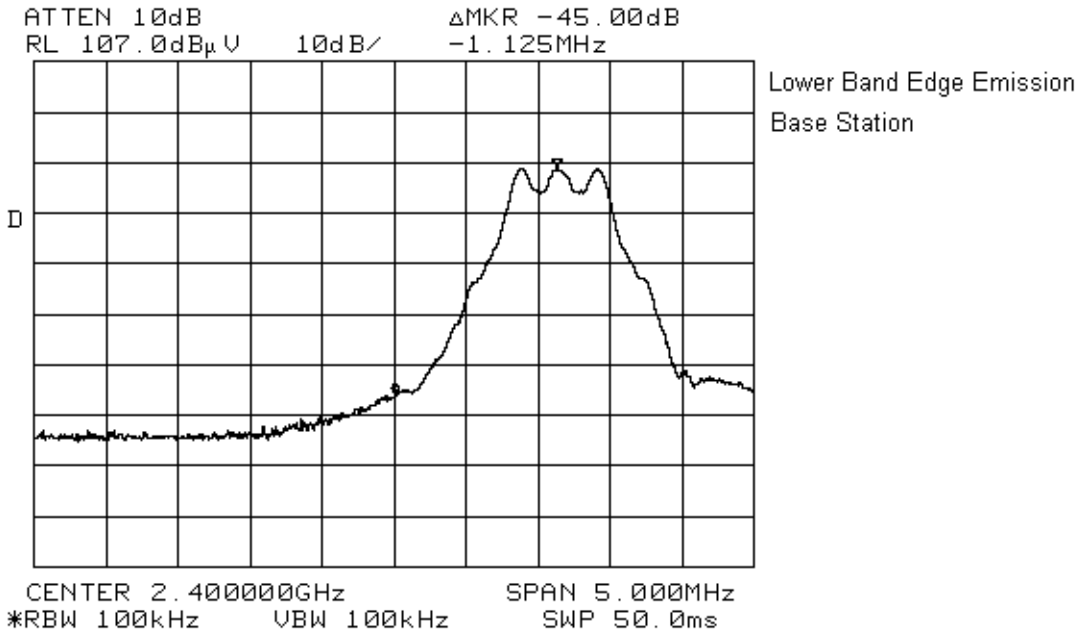
Base Station



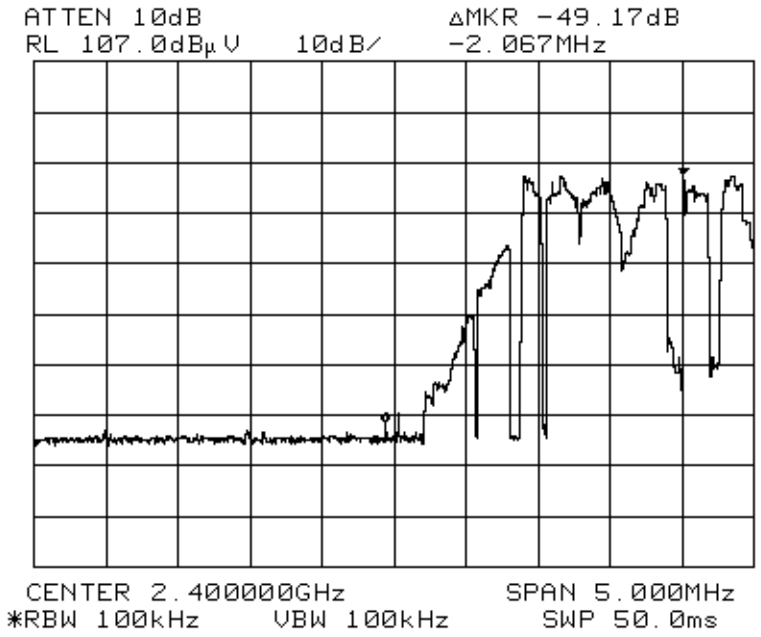

ATTEN 10dB
RL 0dBm
10dB/
S
Portable
TX "on" Time
CENTER 2.441664000GHz
SPAN 0Hz
RBW 1.0MHz
VBW 1.0MHz
*SWP 100ms

Portable

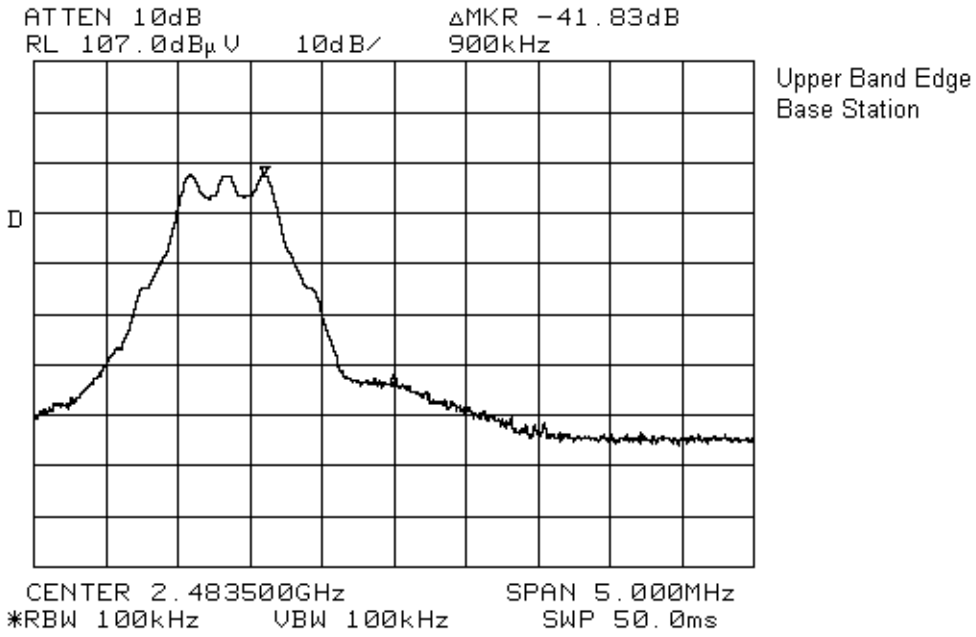

Tek Stop: 250kS/s
310 Acqs
Ch1 +Width
165.6µs
Ch1 500mV
M 200µs Ch1 ƒ 470mV
23 May 2001
13:33:03

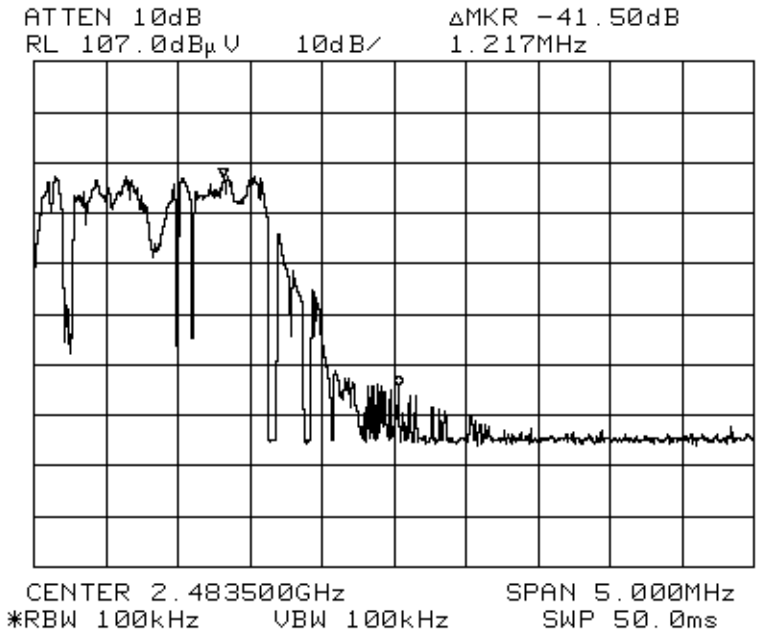


Lower Band Edge Emission
Base Station

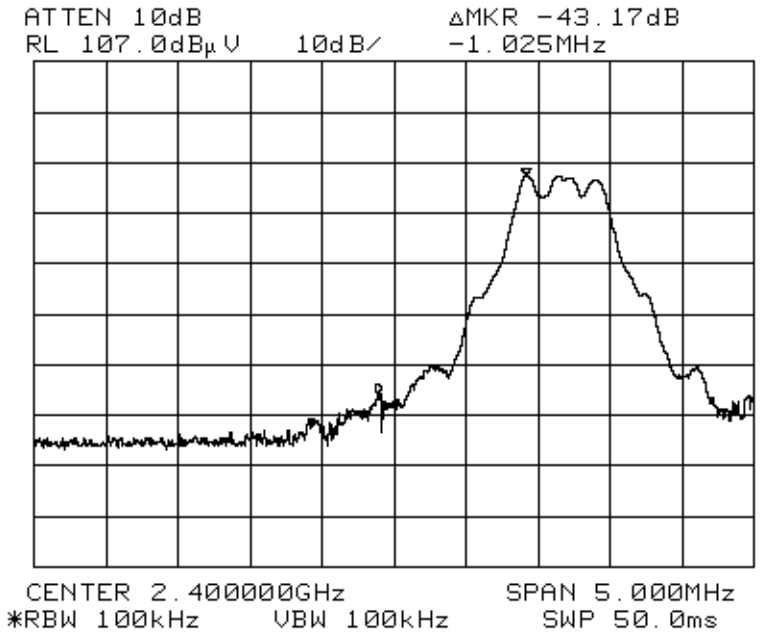


Lower Band Edge Emission
Base Station
Hopping "On"

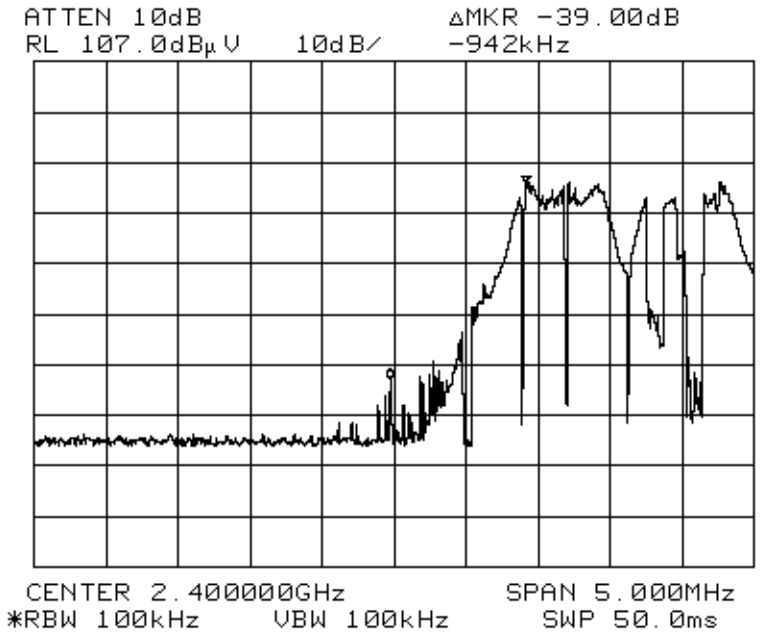

ATTEN 10dB
RL 107.0dBµV
10dB/
ΔMKR -41.83dB
900kHz
Upper Band Edge
Base Station
D
CENTER 2.483500GHz
SPAN 5.000MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms



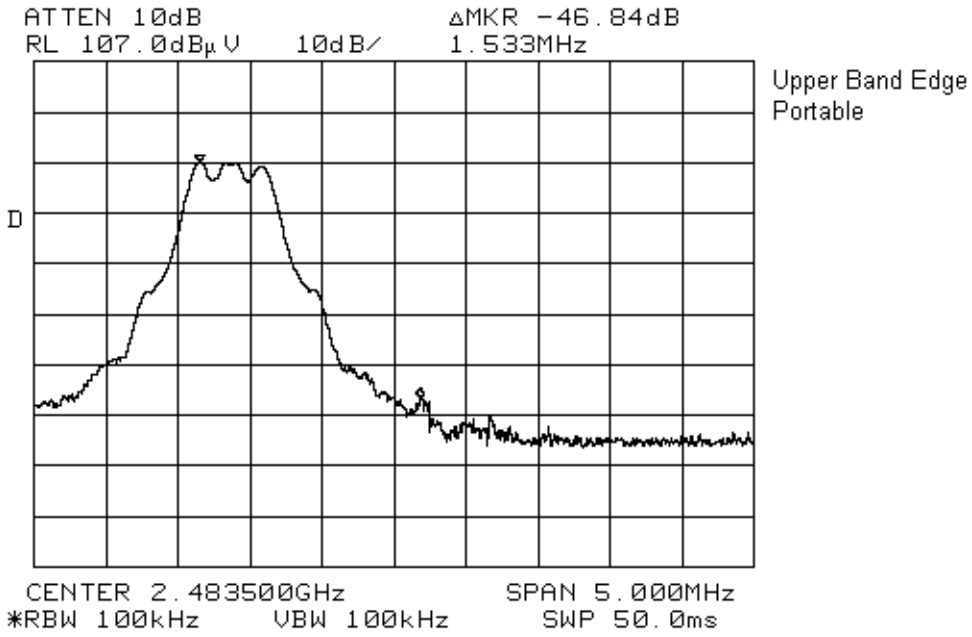
Upper Band Edge
Base Station
Hopping "On"

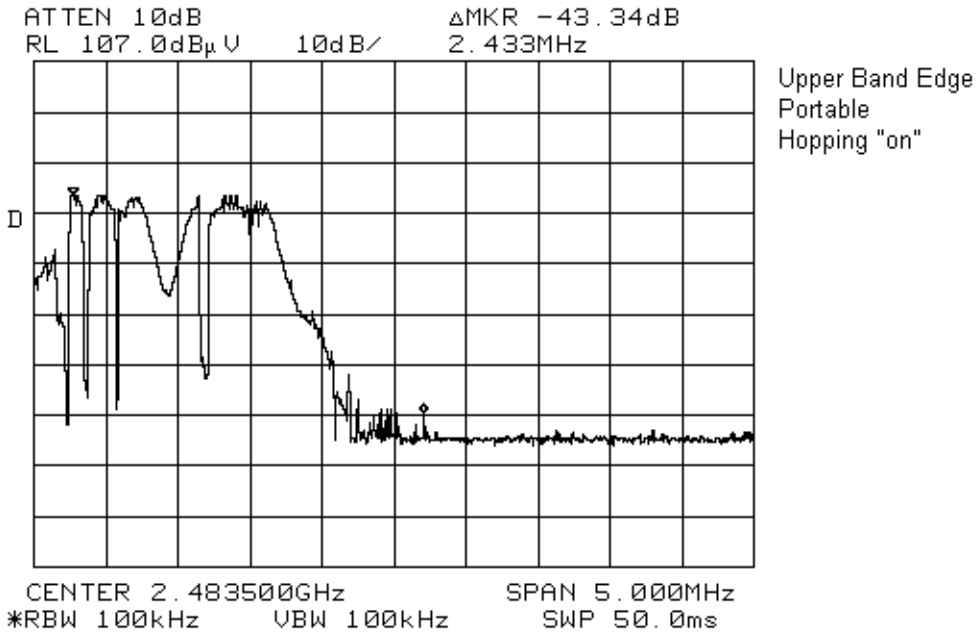


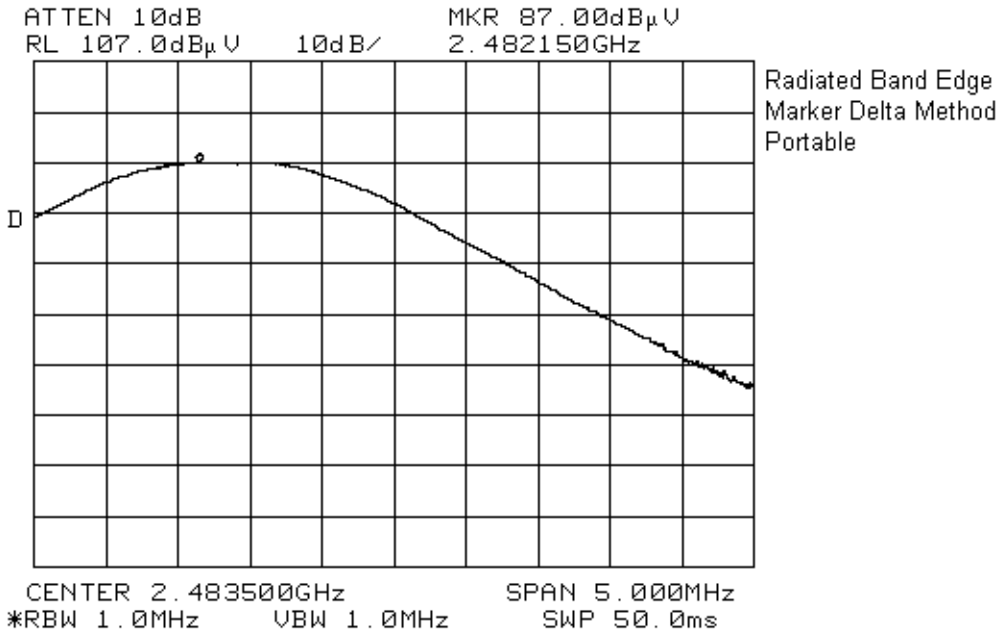
Lower band Edge Emission
Portable



Lower Band Edge
Portable
Hopping "on"

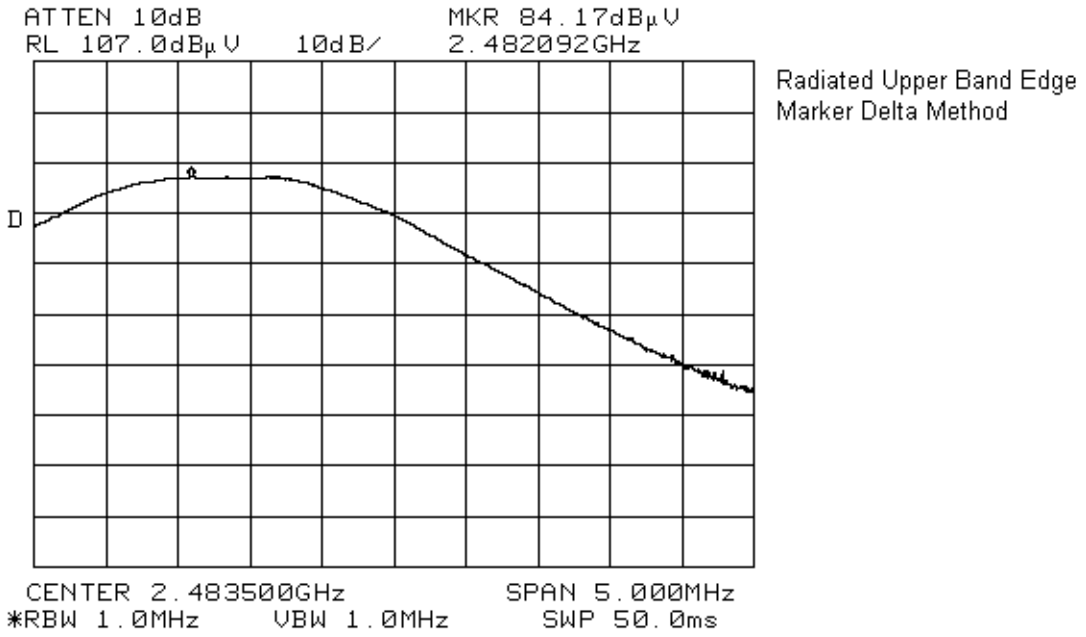

ATTEN 10dB
RL 107.0dBµV
10dB/
ΔMKR -46.84dB
1.533MHz
Upper Band Edge
Portable
D
CENTER 2.483500GHz
SPAN 5.000MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms


ATTEN 10dB
RL 107.0dBµV
10dB/
ΔMKR -43.34dB
2.433MHz
D
Upper Band Edge
Portable
Hopping "on"
CENTER 2.483500GHz
SPAN 5.000MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms



Band Edge Level:	= 87.0 –8 = 79.0dBµV
Antenna Factor:	= 36dB
Band Edge Peak:	= 115dBµV

Band Edge Level:	115dBµV
Marker Delta:	-46.8dB
Duty Cycle Correction:	-20.0dB
	48.2dBµV @ 3 meters



Band Edge Level:	= 84.2 –8 = 76.2dBµV
Antenna Factor:	= 36dB
Band Edge Peak:	= 112.2dBµV

Band Edge Level:	112.2dBµV
Marker Delta:	-41.8dB
Duty Cycle Correction:	-18.0dB
	52.4dBµV @ 3 meters

Test Data - Radiated Emissions (Peak) Portable

Test Distance (meters) : 3		Range: A Tower		Receiver: HP 8465E		RBW: 1 MHz		Detector: Peak	
Freq. (MHz)	Ant. *	Pol. (V/H)	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Dist. Corr. (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Channel 1									
4802.11		H	77.2	43.6	-55.6		65.2	74.0	8.8
4802.11		V	77.1	43.6	-55.6		65.1	74.0	8.9
7203.17		H	64.3	50.7	-55.8		59.2	74.0	14.8
7203.17		V	66.2	50.7	-55.8		61.1	74.0	12.9
Channel 47									
4883.33		H	74.3	43.9	-55.4		62.8	74.0	11.2
4883.33		V	73.3	43.9	-55.4		61.8	74.0	12.2
7324.99		H	65.7	50.9	-55.7		60.9	74.0	13.1
7324.99		V	65.4	50.9	-55.7		60.6	74.0	13.4
Channel 94									
4964.54		H	71.5	44.2	-55.1		60.6	74.0	13.4
4964.54		V	22.0	44.2	-55.1		61.1	74.0	12.9
7446.82		H	64.2	51.3	-55.7		59.8	74.0	14.2
7446.82		V	64.9	51.3	-55.7		60.5	74.0	13.5

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.
N.D. = Not Detected

Test Data - Radiated Emissions (Average) Portable

Test Distance (meters) : 3		Range: A Tower		Receiver: HP 8465E		RBW: 1 MHz		Detector: Peak	
Freq. (MHz)	Ant. *	Pol. (V/H)	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Duty Cycle Corr. (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Channel 1									
4802.11		H	77.2	43.6	-55.6	-20	45.2	54.0	8.8
4802.11		V	77.1	43.6	-55.6	-20	45.1	54.0	8.914.8
7203.17		H	64.3	50.7	-55.8	-20	39.2	54.0	18.9
7203.17		V	66.2	50.7	-55.8	-20	41.1	54.0	
Channel 47									
4883.33		H	74.3	43.9	-55.4	-20	42.8	54.0	11.2
4883.33		V	73.3	43.9	-55.4	-20	41.8	54.0	12.2
7324.99		H	65.7	50.9	-55.7	-20	40.9	54.0	13.1
7324.99		V	65.4	50.9	-55.7	-20	40.6	54.0	13.4
Channel 94									
4964.54		H	71.5	44.2	-55.1	-20	40.6	54.0	13.4
4964.54		V	22.0	44.2	-55.1	-20	41.1	54.0	12.9
7446.82		H	64.2	51.3	-55.7	-20	39.8	54.0	14.2
7446.82		V	64.9	51.3	-55.7	-20	40.5	54.0	13.5

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.
N.D. = Not Detected

Test Data - Radiated Emissions (Peak) Base Station

Test Distance (meters) : 3		Range: A Tower		Receiver: HP 8465E		RBW: 1 MHz		Detector: Peak	
Freq. (MHz)	Ant. *	Pol. (V/H)	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Dist. Corr. (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Channel 1									
4802.11		V	72.5	43.6	-55.6		60.5	74.0	13.5
4802.11		H	76.7	43.6	-55.6		64.7	74.0	9.3
7203.17		V	67.2	50.7	-55.8		62.1	74.0	11.9
7203.17		H	72.8	50.7	-55.8		67.7	74.0	6.3
Channel 4									
4883.33		H	79.5	43.9	-55.4		68.0	74.0	6.0
4883.33		V	73.8	43.9	-55.4		62.3	74.0	11.7
7324.99		H	71.0	50.9	-55.7		66.2	74.0	7.8
7324.99		V	72.3	50.9	-55.7		67.5	74.0	6.5
Channel 94									
4964.54		V	77.0	44.2	-55.1		66.1	74.0	7.9
4964.54		H	78.0	44.2	-55.1		67.1	74.0	6.9
7446.82		V	66.7	51.3	-55.7		62.3	74.0	11.7
7446.82		H	67.0	51.3	-55.7		62.6	74.0	11.4

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.
N.D. = Not Detected

Test Data - Radiated Emissions (Average) Base Station

Test Distance (meters) : 3		Range: A Tower		Receiver: HP 8465E		RBW: 1 MHz		Detector: Peak	
Freq. (MHz)	Ant. *	Pol. (V/H)	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Dist. Corr. (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Channel 1									
4802.11		V	72.5	43.6	-55.6	-18.0	42.5	54.0	11.5
4802.11		H	76.7	43.6	-55.6	-18.0	46.7	54.0	7.3
7203.17		V	67.2	50.7	-55.8	-18.0	44.1	54.0	9.9
7203.17		H	72.8	50.7	-55.8	-18.0	49.7	54.0	4.3
Channel 4									
4883.33		H	79.5	43.9	-55.4	-18.0	50.0	54.0	4.0
4883.33		V	73.8	43.9	-55.4	-18.0	44.3	54.0	9.7
7324.99		H	71.0	50.9	-55.7	-18.0	48.2	54.0	5.8
7324.99		V	72.3	50.9	-55.7	-18.0	49.5	54.0	4.5
Channel 94									
4964.54		V	77.0	44.2	-55.1	-18.0	48.1	54.0	5.9
4964.54		H	78.0	44.2	-55.1	-18.0	49.1	54.0	4.9
7446.82		V	66.7	51.3	-55.7	-18.0	44.3	54.0	9.7
7446.82		H	67.0	51.3	-55.7	-18.0	44.6	54.0	9.4

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.
N.D. = Not Detected

Radiated Photographs (Worst Case Configuration)

Front View

Rear View

Section 10. Test Equipment List

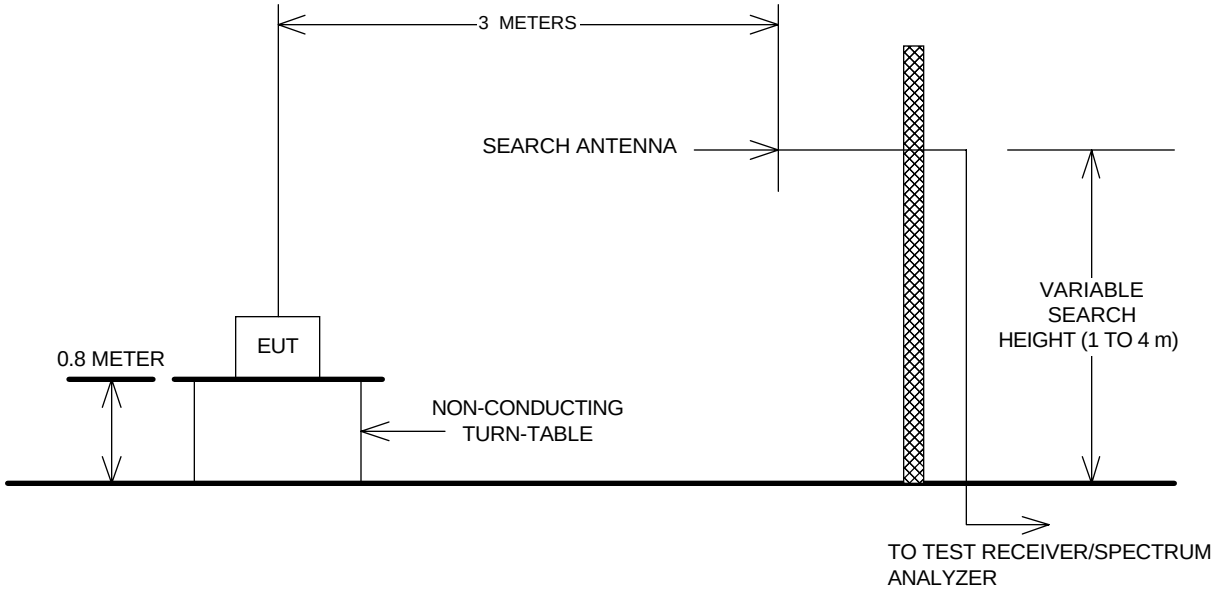
CAL CYCLE	EQUIPMENT	MANUFACTURER	MODEL	SERIAL	LAST CAL.	NEXT CAL.
1 Year	Spectrum Analyzer	Hewlett Packard	8565E	FA000981	June 16/00	June 16/01
1 Year	Spectrum Analyzer-**1**	Hewlett Packard	8566B	2311A02238	Dec. 10/00	Dec. 10/01
1 Year	Spectrum Analyzer Display-**1**	Hewlett Packard	8566B	2314A04759	Dec. 10/00	Dec. 10/01
1 Year	Quasi-peak adapter-**1**	Hewlett-Packard	85650A	2043A00302	Dec. 14/00	Dec. 14/01
1 Year	LISN	EMCO	4825/2	0002-1/47	Feb. 14/00	Aug. 14/01
1 Year	Horn Antenna	EMCO #2	3115	4336	Dec. 1/00	Dec. 1/01
1 Year	Plotter	Hewlett Packard	7550A	FA001129	NCR	NCR
	High Pass Filter	K&L	11SH10-4000	FA001340	COU	COU
1 Year	RF AMP	JCA	48-600	FA001497	Aug. 31/00	Aug. 31/01

NA: Not Applicable
NCR: No Cal Required
COU: CAL On Use

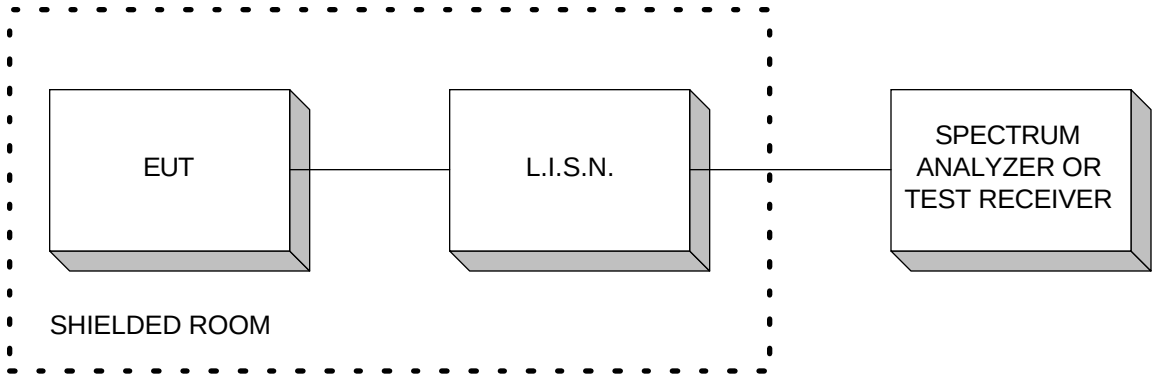
Annex A

Block Diagrams

Test Site For Radiated Emissions



Conducted Emissions



Peak Power At Antenna Terminals