Nemko Test Report:	4L0205RUS1
Applicant:	Sparks Unlimited
Equipment Under Test: (E.U.T.)	Meter reader
FCC ID:	RZD-JTS1
In Accordance With:	**FCC Part 15, Subpart C, 15.247** Frequency Hopping Transmitters
Tested By:	Nemko USA Inc. 802 N. Kealy Lewisville, Texas 75057-3136
Authorized By:	 Tom Tidwell, Frontline Manager
Date:	4/28/04
Total Number of Pages:	49

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Section 1. Summary of Test Results

Manufacturer: Sparks Unlimited

Model No.: GroundCover Rev B

Serial No.: 1000000001

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
☐	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: 100426-0

Summary Of Test Data

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

Footnotes:
This device is battery powered.

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

General Equipment Information

Frequency Band:	☒ 902 – 928 MHz ☐ 2400 – 2483.5 MHz
Frequency of Operation:	902.3 – 907.158 MHz
Number of Channels:	50
Channel Spacing:	100kHz
User Frequency Adjustment:	Software controlled

Description of Modification for Modification Filing

No modification made during testing.

Family List Rational

Section 3. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
TESTED BY:	DATE:

Test Results: NA

Measurement Data:

Equipment Used:

Measurement Uncertainty: +/- 0.7 dB

Temperature: ?C

Relative Humidity: %

Section 4. Channel Separation

NAME OF TEST: Channel Separation	PARA. NO.: 15.247(a)(1)
TESTED BY: Dustin Oaks	DATE: 04/14/2004

Test Results: Complies.

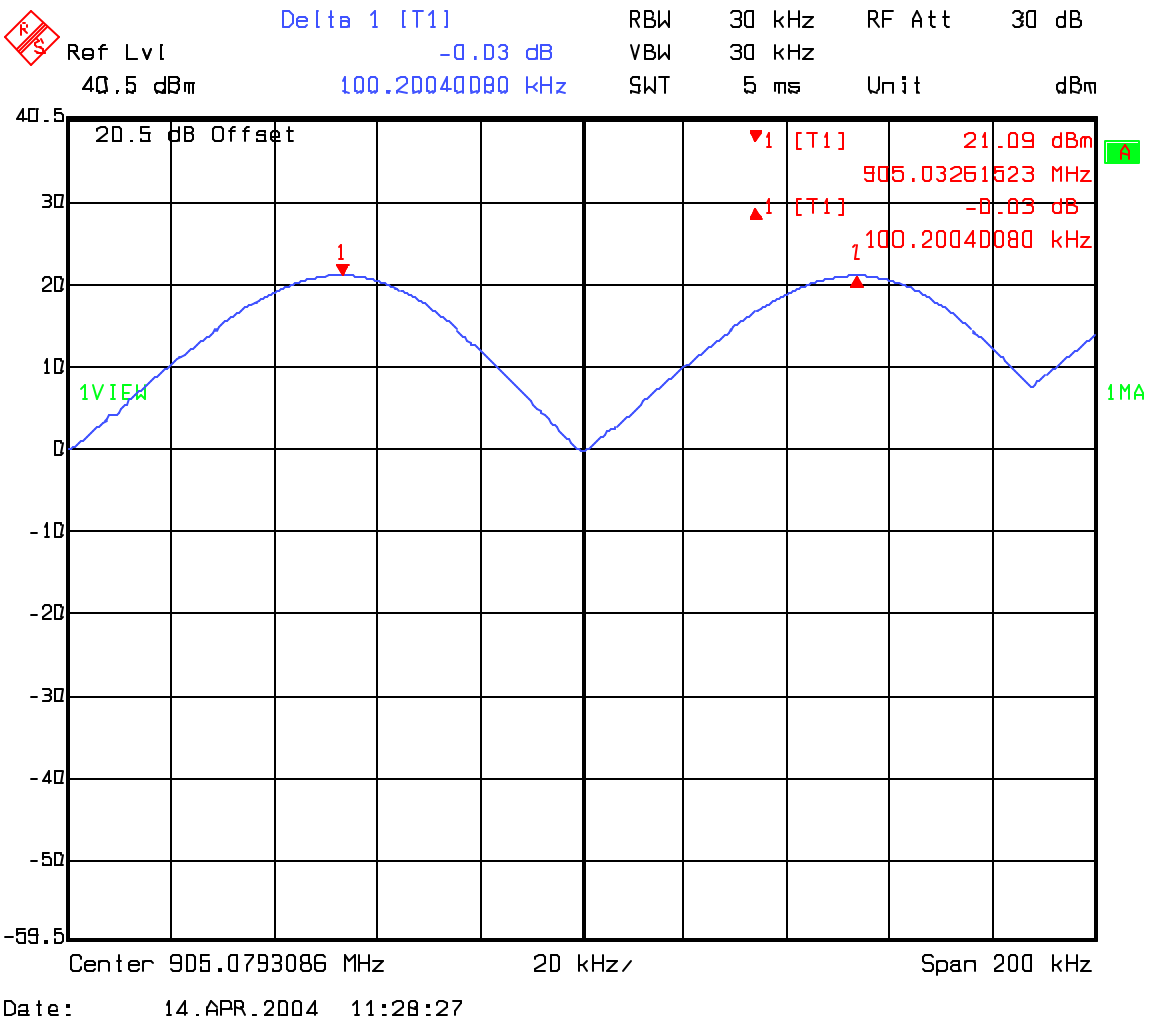
Measurement Data: See 20 dB BW plot
Measured 20 dB bandwidth: 96.19 kHz
Channel Separation: 100.2 kHz

Equipment Used: 1036, 1044

Measurement Uncertainty: +/- 0.7 dB

Temperature: 21?C

Relative Humidity: 48%


Delta 1 [T1]
-0.03 dB
100.200400800 kHz
RBW 30 kHz
VBW 30 kHz
SWT 5 ms
RF Att 30 dB
Unit dBm
Ref Lvl
40.5 dBm
20.5 dB Offset
1 [T1] 21.09 dBm
905.032615523 MHz
1 [T1] -0.03 dB
100.200400800 kHz
1VIEW
1MA
A
40.5
30
20
10
0
-10
-20
-30
-40
-50
-59.5
Center 905.0793086 MHz
20 kHz/
Span 200 kHz
Date: 14.APR.2004 11:28:27

Section 5. Hopping Requirements

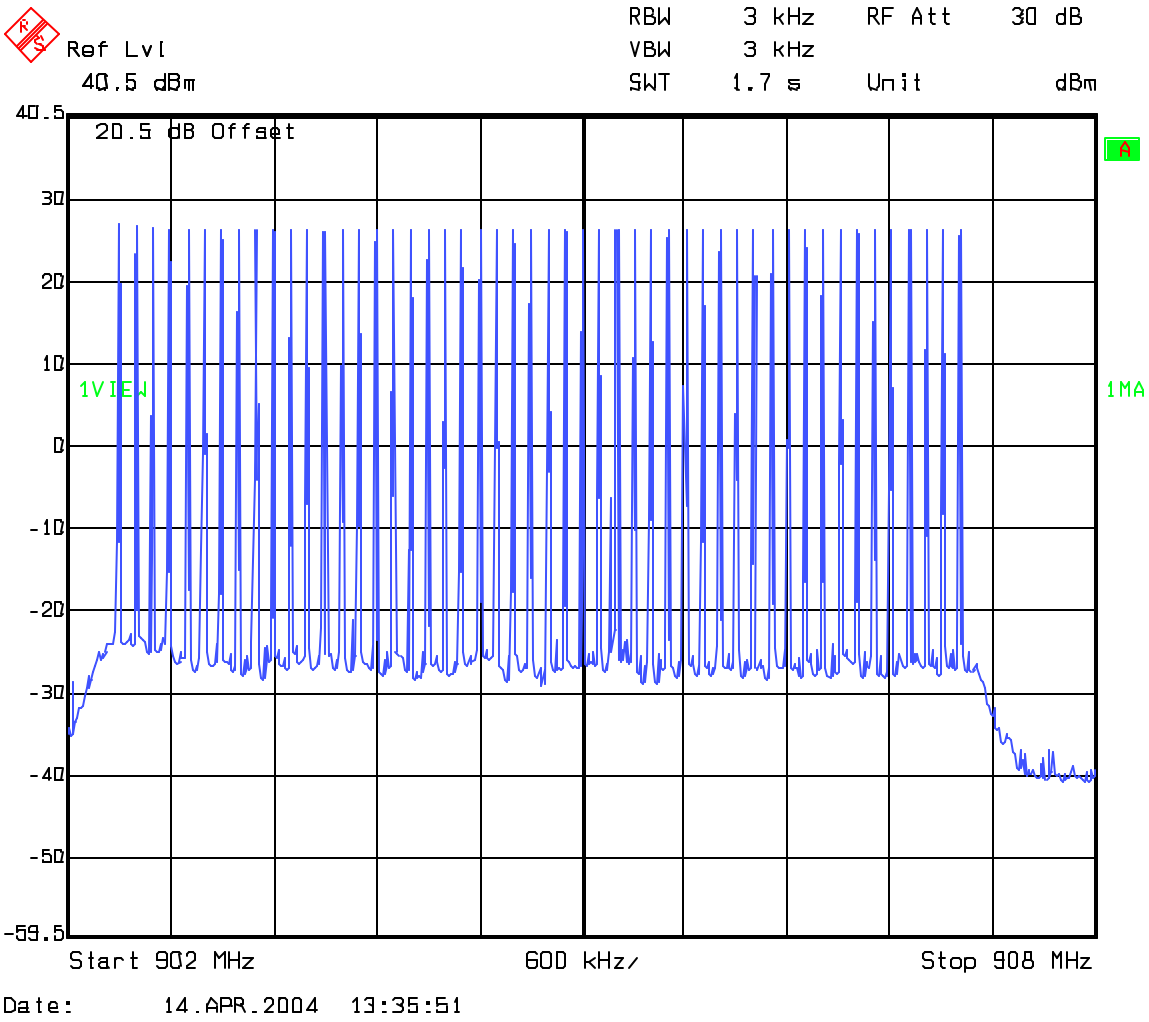
NAME OF TEST: Hopping Requirements	PARA. NO.: 15.247(a)/(h)
TESTED BY: Dustin Oaks	DATE: 04/14/2004

Test Results: Complies.

Measurement Data:

	Number of Hopping Frequencies:	50(Tested by Nemko USA, Inc.)
	Pseudorandom Hopping Sequence	Received from Manufacturer
	Equal Hopping Frequency Use	Received from Manufacturer
	System Receiver Hopping Capability	Received from Manufacturer
	Section 15.247(h)	Received from Manufacturer
	Receiver Bandwidth	Received from Manufacturer

Number of Hopping Channels



Pseudorandom Frequency Hopping Sequence

After system initialization, before the master transceiver or any slave units begin transmitting, the master transceiver selects from five available frequency tables. The tables are selected based on a receiver scan of all fifty possible frequencies made during the initialization process and channels are rated by interference criteria. The order of frequencies is then determined by this starting randomization in conjunction with a selection algorithm that uses a seed number from the micro controller clock to determine the starting channel in the selected table and order of channels for the immediate transmission sequence. See attached tables.

For instance, if table 3 has the least total reception activity and the clock value picks 43, then table 3 is employed starting at channel 43. The frequency sequence would be:

Example Table:

905	902.6	906.2	905.4	903.2
906.9	905.6	904.2	904.3	902.4
904	903.6	902.8	906.4	906.6
905.2	907.1	905.7	904.8	904.4
903	906.1	903.1	902.7	903.7
905.1	904.9	907	905.3	904.1
905.9	902.3	906.3	903.5	906.8
905.8	905.5	903.4	906.7	902.9
906.5	903.3	904.7	903.8	906
904.5	907.2	902.5	904.6	903.9

Equal Hopping Frequency Use

The master transceiver determines the hopping sequence during system initialization and before each communication session with any slave unit within communication range. After transmitting a synchronization signal, all slave units within communication range of the master transceiver are given the current hopping sequence and synchronize their microcontroller clock with that of the master transceiver based on data and timing information contained in the synchronization signal. If there is no immediate communications after synchronization, then every second after synchronization the master and all synchronized slave units index to the next channel dictated by the channel hopping algorithm. If the master transceiver transmits a command that requires a response from a slave unit, and either transmission requires transmitting longer than the maximum allowed transmission time per channel, the transmissions cease and the master and slave units index to the next channel in dictated by the channel hopping algorithm and a new preamble is transmitted from the master transceiver that allows all slave units to re-synchronize their timing on the new channel. The master transceiver keeps track of frequencies used and transmission times in the system, and makes sure that all channels are utilized equally during normal operation.

System Receiver Hopping Capability

Slave units use their receivers to scan all fifty possible frequencies at regular intervals looking for a preamble sequence from the master transceiver. The preamble sequence contains a data packet that gives the slave units the channel hopping sequence algorithm that has been selected by the master transited. After the master transceiver transmits a synchronization signal, all slave units within communication range of the master transceiver receive the current hopping sequence and synchronize their microcontroller clock with that of the master transceiver based on data and timing information contained in the synchronization signal. The master transceiver initiates all communication sequences in the system, therefore no slave unit needs the capacity to determine the hopping sequence independent of the master transceiver.

Section 15.247(h):

After system initialization, before the master transceiver or any slave units begin transmitting, the master transceiver selects one of five available frequency tables. The table is selected based on a receiver scan of all fifty possible frequencies made during the initialization process and channels are rated by interference criteria. The order of frequencies is then determined by this starting randomization in conjunction with a selection algorithm that uses a seed number from the micro clock to determine the starting channel in the selected table and order of channels for the immediate transmission sequence. The receiver scan of all fifty possible frequencies and the reordering of transmission frequencies is always initiated just before the master transceiver broadcasts a synchronization signal to the rest of the system. This complies with the FCC rules (15.247), allowing the intelligent selection of frequencies based on reception indications, since the system does not coordinate its frequency use with that of any other systems by any means.

Receiver Bandwidth

The receiver bandwidth is set at 100 kHz by bandpass filter network components external to the Xemics XE1203 and software scaling of the Xemics XE1203.

Section 6. Time of Occupancy

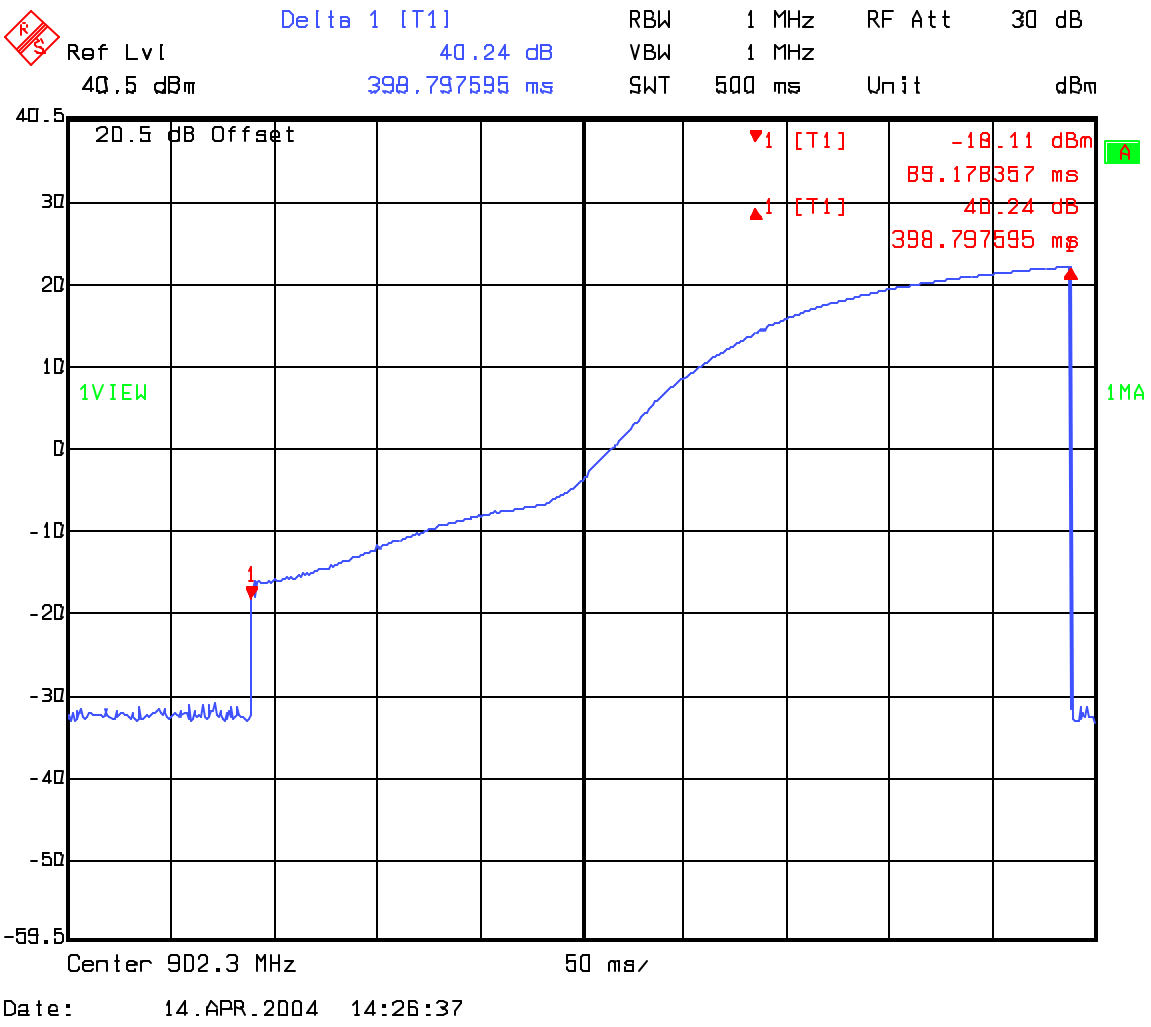
NAME OF TEST: Time of Occupancy	PARA. NO.: 15.247(a)(1)
TESTED BY: Dustin Oaks	DATE: 04/14/2004

Test Results: Complies.

Measurement Data:

Maximum Dwell Time On Any Channel: 399 msec. in a 20 sec. period

The device operates on 50 hopping channels. Average 'ON' time per channel is 398.8mS with on 'OFF' time of 2mS per channel. For channel one to be repeated, the unit must cycle through all 50 channels, yielding a cycle time of (398.8m + 2m) * 50 = 20.04 Seconds resulting in no channel being repeated within the 20 second time frame.


Delta 1 [T1]
40.24 dB
398.797595 ms
RBW 1 MHz
VBW 1 MHz
SWT 500 ms
RF Att 30 dB
Unit dBm
Ref Lvl
40.5 dBm
20.5 dB Offset
1 [T1] -18.11 dBm
89.178357 ms
1 [T1] 40.24 dB
398.797595 ms
1VIEW
1MA
A
40.5
30
20
10
0
-10
-20
-30
-40
-50
-59.5
Center 902.3 MHz
50 ms/
Date: 14.APR.2004 14:26:37

Section 7. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.247(a)(1)(i)
TESTED BY: Dustin Oaks	DATE: 04/14/2004

Test Results: Complies.

Measurement Data: See attached plots.

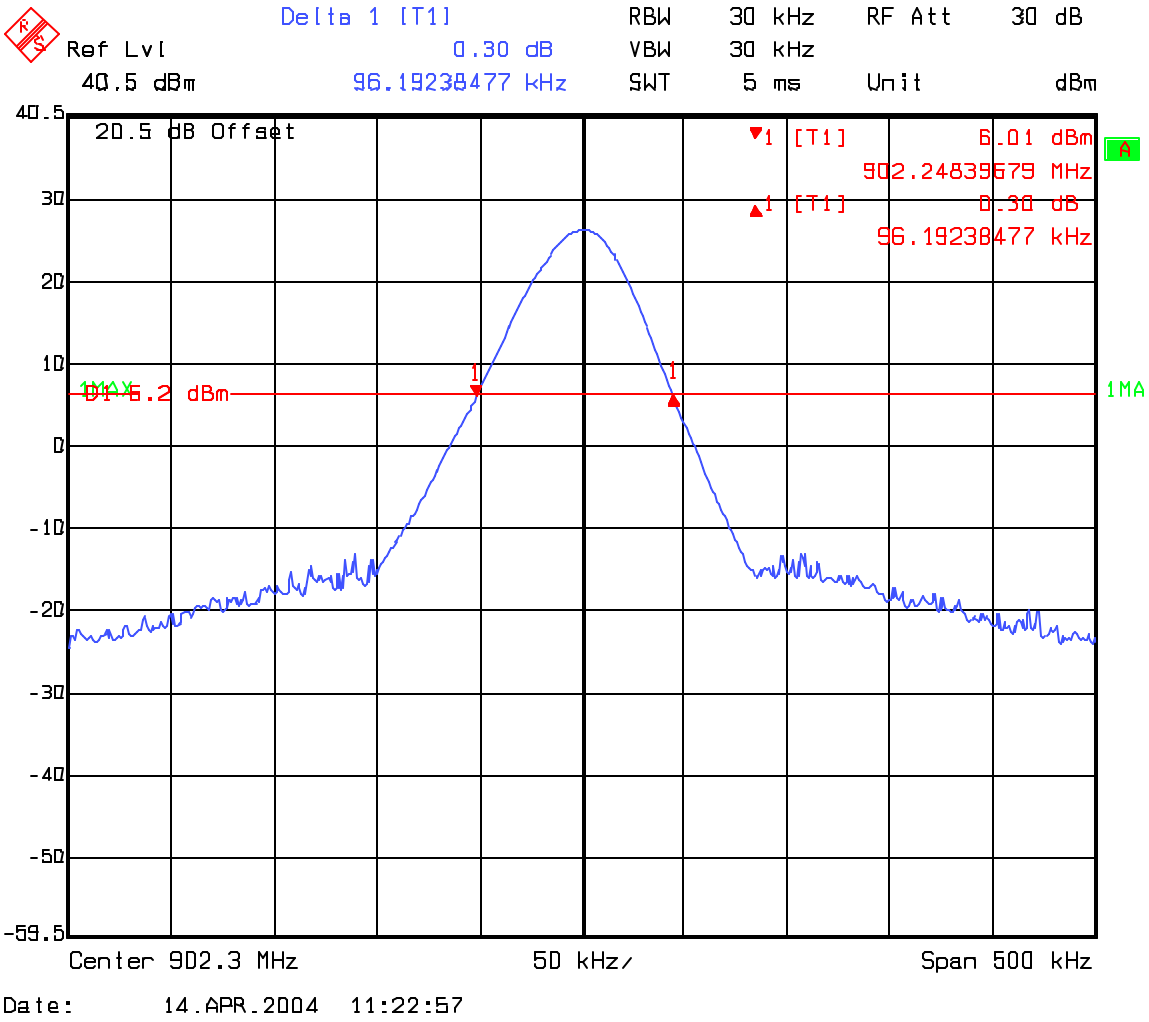
Equipment Used: 1036, 1044

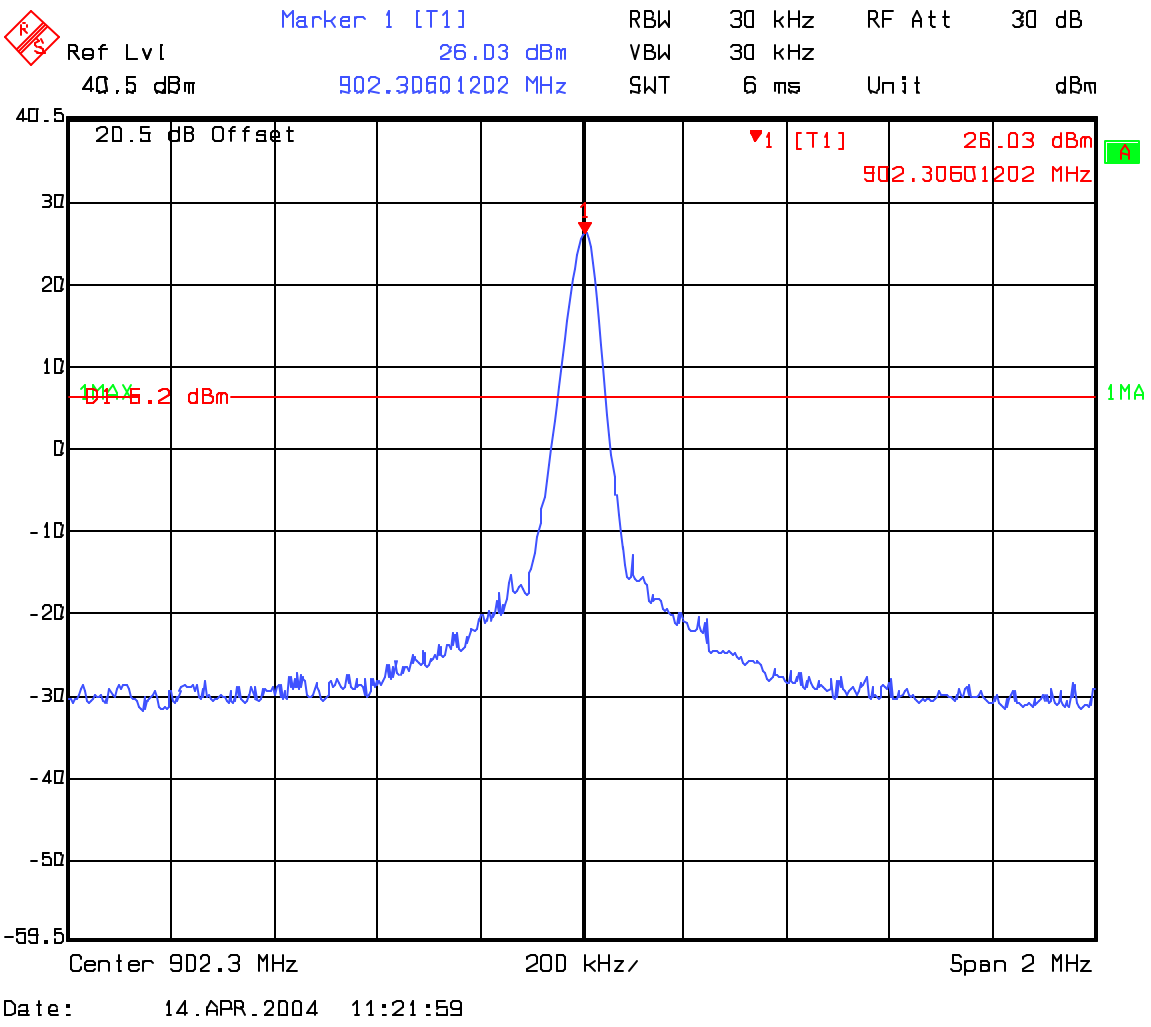
Measurement Uncertainty: +/- 0.7 dB

Temperature: 21?C

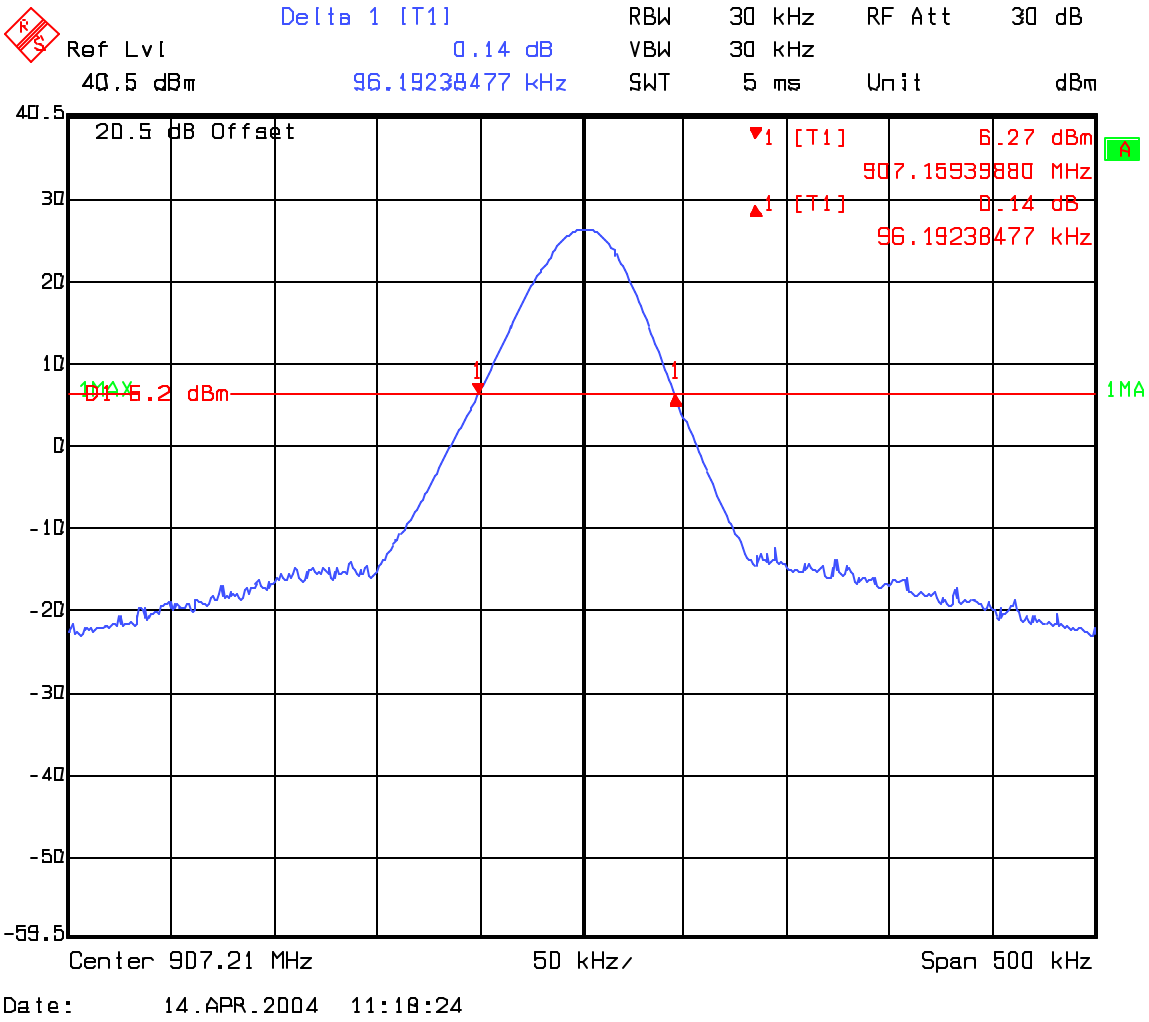
Relative Humidity: 48%

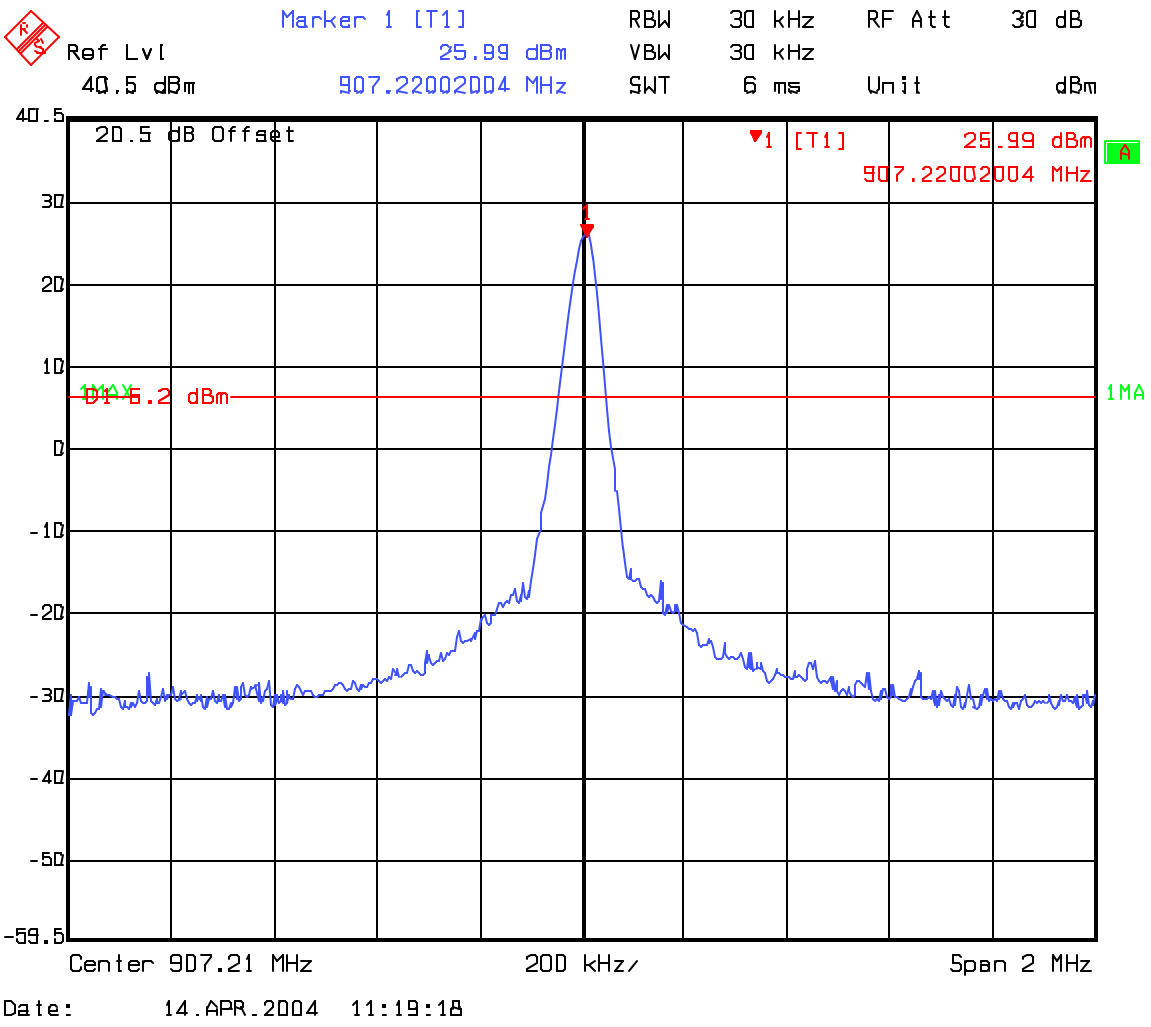
Lower Channel Band Width Measurements




Marker 1 [T1]
RBW 30 kHz
RF Att 30 dB
Ref Lvl
26.03 dBm
VBW 30 kHz
40.5 dBm
902.30601202 MHz
SWT 6 ms
Unit dBm
20.5 dB Offset
1 [T1]
26.03 dBm
902.30601202 MHz
A
1MAX
D1 -6.2 dBm
1MA
40.5
30
20
10
0
-10
-20
-30
-40
-50
-59.5
Center 902.3 MHz
200 kHz/
Span 2 MHz
Date: 14.APR.2004 11:21:59

Upper Channel Band Width Measurements




Marker 1 [T1]
RBW 30 kHz
RF Att 30 dB
Ref Lvl
25.99 dBm
VBW 30 kHz
40.5 dBm
907.22002004 MHz
SWT 6 ms
Unit dBm
20.5 dB Offset
1 [T1]
25.99 dBm
907.22002004 MHz
A
1MAX
-6.2 dBm
1MA
40.5
30
20
10
0
-10
-20
-30
-40
-50
-59.5
Center 907.21 MHz
200 kHz/
Span 2 MHz
Date: 14.APR.2004 11:19:18

Section 8. Peak Power Output

NAME OF TEST: Peak Power Output	PARA. NO.: 15.247 (b)
TESTED BY: Dustin Oaks	DATE: 04/14/2004

Test Results: Complies.

Measurement Data: See attached plots.
Detachable Antenna? ☒ Yes ☐ No
If yes, state the type of non-standard connector used: SMA

Note: This unit is professionally installed.

Antenna Terminal Measurements

Antenna	EIRP (dBm)	EIRP (W)
Low Channel	21.59	0.1442
High Channel	21.97	0.1574

EIRP Power

Antenna	EIRP (dBm)	EIRP (W)
Board Mount Antenna	25.61	0.3639
Vehicle Mount Antenna	27.41	0.5508
Rubber Ducky	28.61	0.7261

Note: Substitution Method used to obtain EIRP values. Highest value for each antenna shown.

Equipment Used: 1036, 1044

Measurement Uncertainty: +/- 0.7 dB

Temperature: 21?C

Relative Humidity: 48%

Section 9. Spurious Emissions (Antenna Conducted)

NAME OF TEST: Spurious Emissions (Antenna Conducted)	PARA. NO.: 15.247(c)
TESTED BY: Dustin Oaks	DATE: 04/14/2004

Test Results: Complies.

Measurement Data: See attached plots.

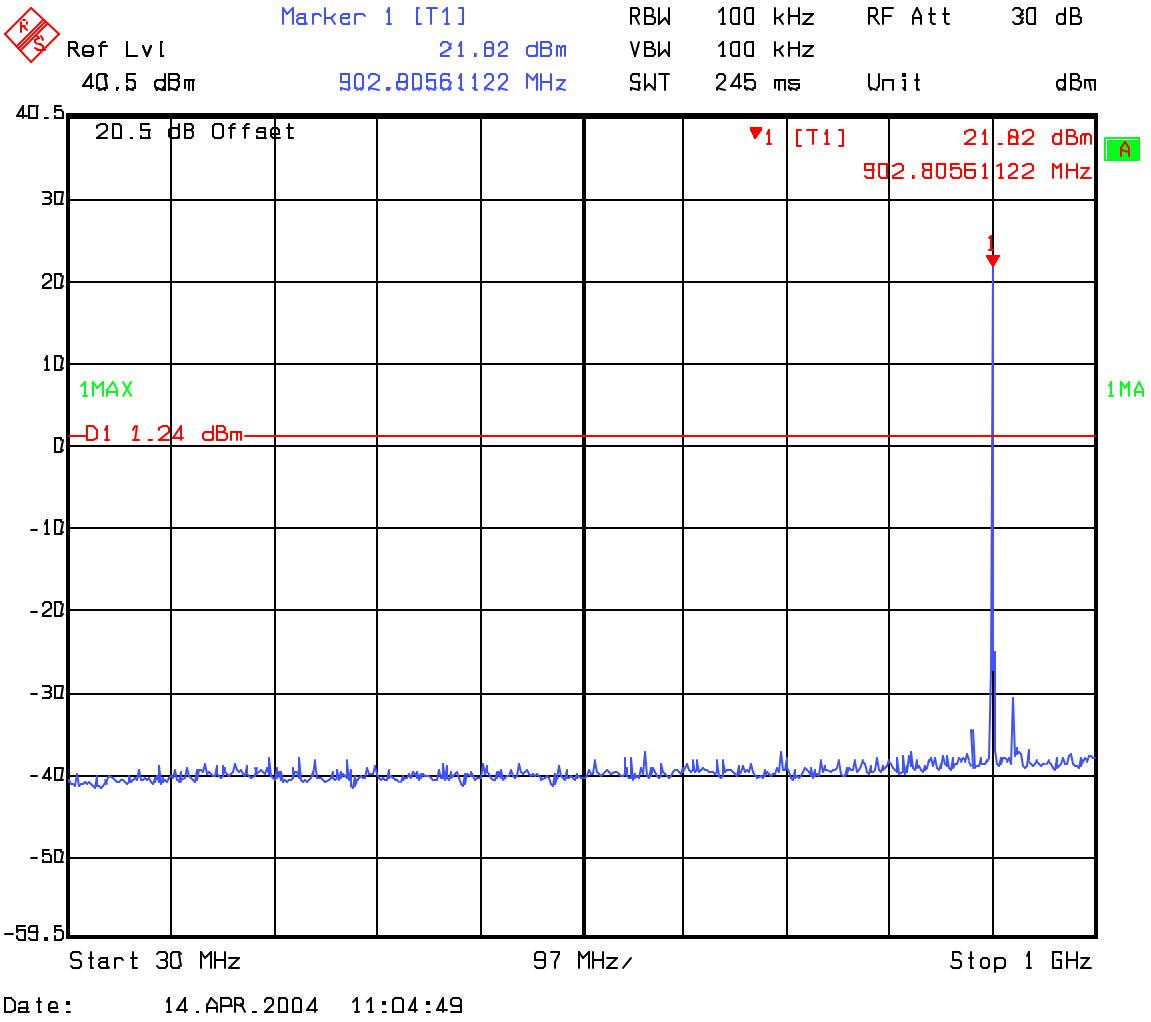
Equipment Used: 1036, 1044

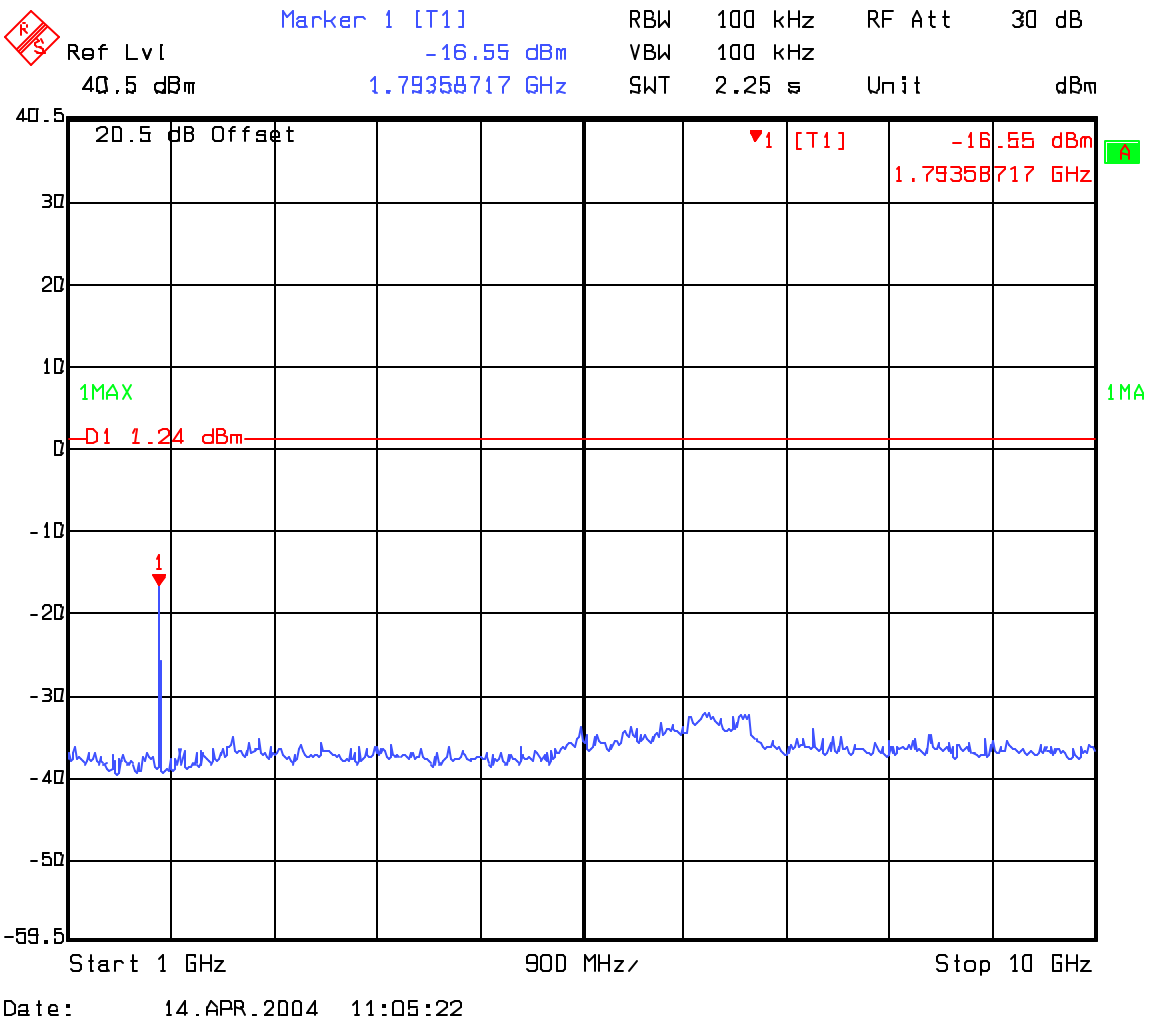
Measurement Uncertainty: +/- 0.7 dB

Temperature: 21?C

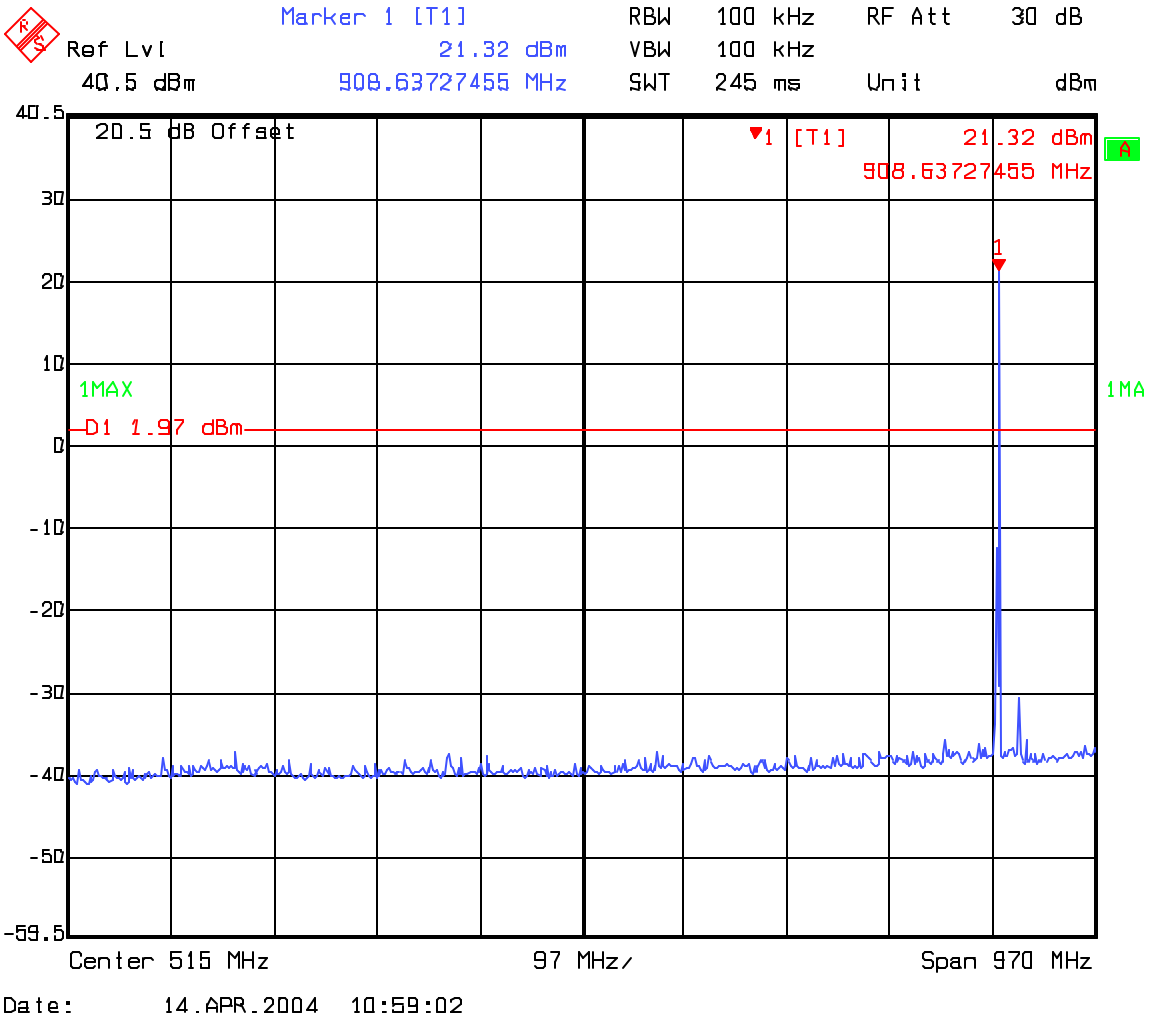
Relative Humidity: 48%

Low Channel: Antenna conducted measurements

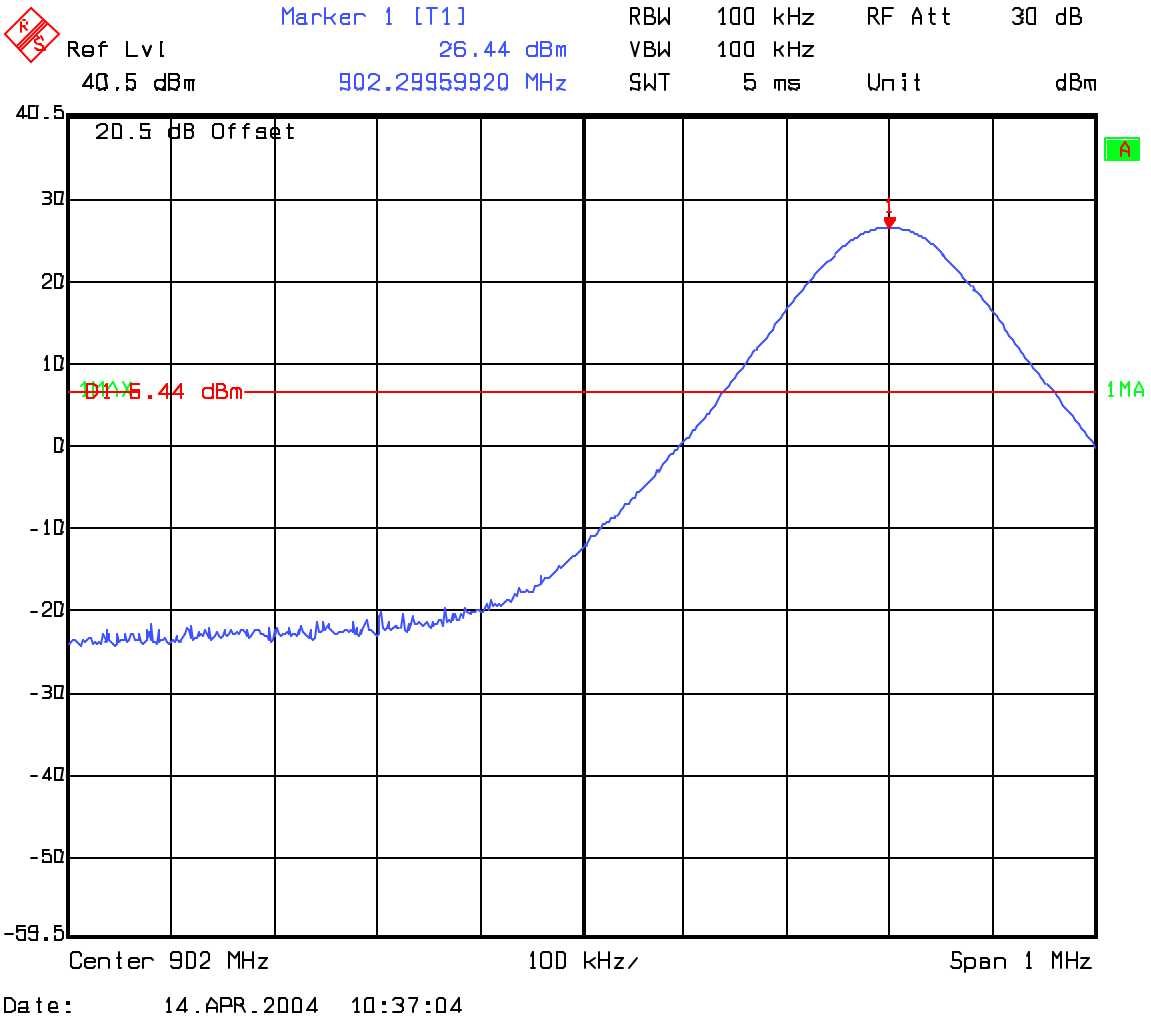



Marker 1 [T1]
RBW 100 kHz
RF Att 30 dB
Ref Lvl
-16.55 dBm
VBW 100 kHz
40.5 dBm
1.79358717 GHz
SWT 2.25 s
Unit dBm
20.5 dB Offset
1 [T1]
-16.55 dBm
1.79358717 GHz
A
1MAX
D1 1.24 dBm
1MA
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 14.APR.2004 11:05:22

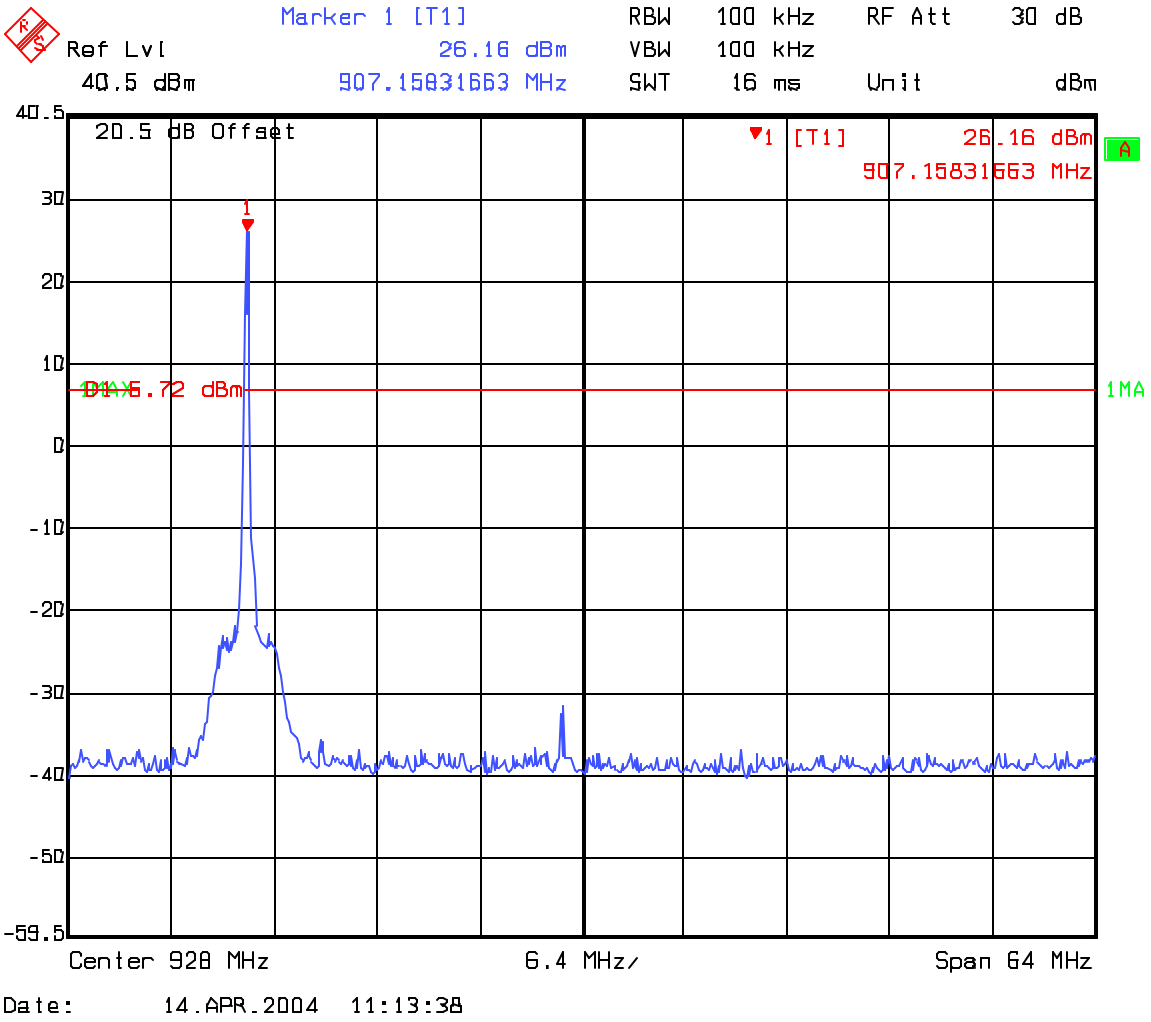
High Channel: Antenna conducted measurements



Band Edge Compliance - Lower Channel



Band Edge Compliance - Upper Channel



Section 10. Spurious Emissions (Radiated)

NAME OF TEST: Spurious Emissions (Radiated)	PARA. NO.: 15.247(c)
TESTED BY: Dustin Oaks	DATE: 04/14/2004

Test Results: Complies.

Measurement Data: See attached table.

Duty Cycle Calculation:

Duty Cycle correction factor(dB) = 20 log (rf_{ON} in ms/100ms)
= 20 log (52/100)
= -5.68dB

Equipment Used: 1484, 1485, 991, 1480, 1036, 1033, 1016, 1481

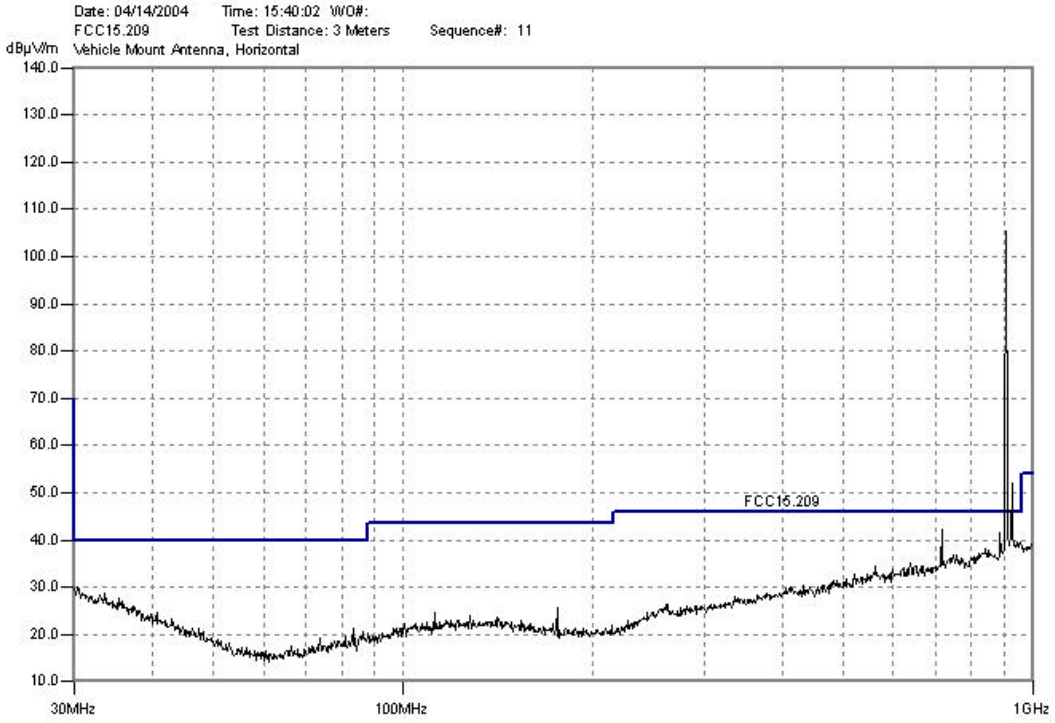
Measurement Uncertainty: +/- 0.7 dB

Temperature: 21?C

Relative Humidity: 48%

Test Data - Radiated Emissions (9kHz-1000MHz)

The following plot represents worse case emissions from all antennas. No detectable emissions below 30MHz.



Note: Largest spur around 700MHz is outside a restricted band and only required to be -20dBc.

Test Data - Radiated Emissions (1GHz to 10GHz)

Note: Measurements were performed at 1 meter, limit was corrected accordingly.

Radiated Emissions

Page 1 of

Job No.: 4L0205 Date: 4/14/2004
Specification: FCC 15.247 Temperature(°C): 21
Tested By: Dustin Oaks Relative Humidity(%) 48
E.U.T.:
Configuration: Power 1:1, Unit continuously Tansmitting.
Sample Number:
Location: Lab 3 RBW: 100kHz: 30MHz to 1000MHz and 1MHz > 1GHz
Detector Type: Peak VBW: 100kHz: 30MHz to 1000MHz and 1MHz > 1GHz

Test Equipment Used

Antenna: 1480 Directional Coupler: #N/A
Pre-Amp: 1016 Cable #1: 1484
Filter: #N/A Cable #2: 1485
Receiver: 1464 Cable #3: #N/A
Attenuator #1 #N/A Cable #4: #N/A
Attenuator #2: #N/A Mixer: #N/A

Additional equipment used: 1484, 1485, 991, 1480, 1036, 1033, 1484, 1485, 1016, 1481
Measurement Uncertainty: +/- .7 dB

Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Ave Factor	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Comment
Vehicle Mount Antenna									
8118	54.6	37.5	5.7	33	5.7	59.1	63.5	-4.4	Low Channel
8162	53	37.4	5.7	33.1	5.7	57.3	63.5	-6.2	High Channel
8118	52.7	37.5	5.7	33	5.7	57.2	63.5	-6.3	Low Channel
8162	50.7	37.4	5.7	33.1	5.7	55.0	63.5	-8.5	High Channel
5442	49.6	34.3	4.7	28.6	5.7	54.3	63.5	-9.2	High Channel
Rubber Ducky Antenna									
8118	56.7	37.5	5.7	33	5.7	61.2	63.5	-2.3	Low Channel
8118	54.3	37.5	5.7	33	5.7	58.8	63.5	-4.7	Low Channel
2706	63.7	28.8	3.6	32.5	5.7	57.9	63.5	-5.6	Low Channel
8162	53.4	37.4	5.7	33.1	5.7	57.7	63.5	-5.8	High Channel
2721	63.1	28.8	3.6	32.5	5.7	57.3	63.5	-6.2	High Channel
2721	62.5	28.8	3.6	32.5	5.7	56.7	63.5	-6.8	High Channel
2706	61.7	28.8	3.6	32.5	5.7	55.9	63.5	-7.6	Low Channel
8162	51.4	37.4	5.7	33.1	5.7	55.7	63.5	-7.8	High Channel
5442	49.2	34.3	4.7	28.6	5.7	53.9	63.5	-9.6	High Channel
5412	49.1	34.2	4.7	28.6	5.7	53.7	63.5	-9.8	Low Channel

Notes:

Radiated Spurious Emissions

Page 1 of **Continuation Page**

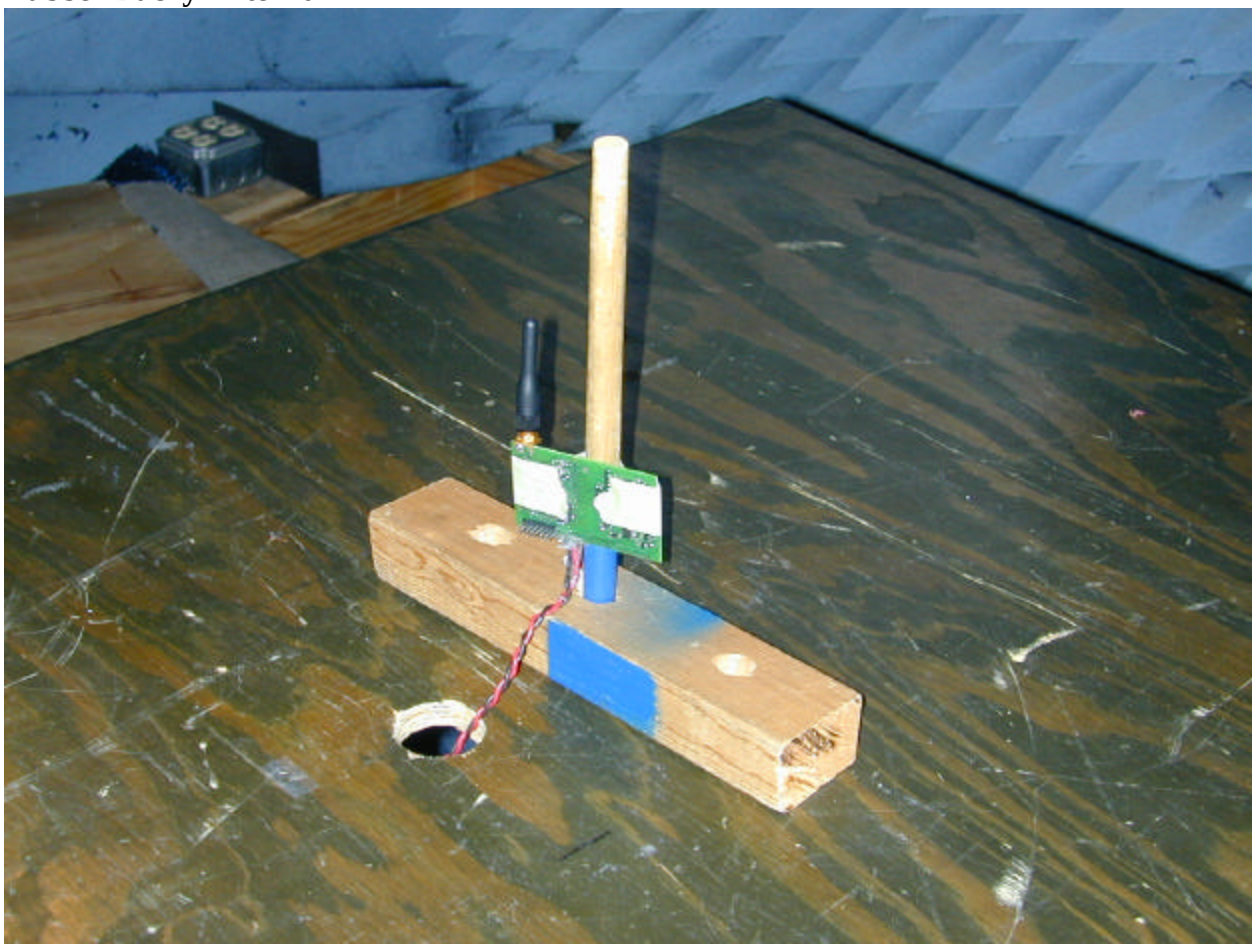
Job No.: 4L0205 Date: 4/16/2004
Specification: CFR 47, Part 15 Temperature(°C): 21
Tested By: #N/A Relative Humidity(%) 48
E.U.T.: 0
Configuration: Power 1:1, Unit continuously Tansmitting.

Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Ave Factotr	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Comment
Board mount Antenna									
2706	69.2	28.8	3.6	32.5	5.7	63.4	63.5	-0.1	Low Channel
2721	68.8	28.8	3.6	32.5	5.7	63.0	63.5	-0.5	High Channel
3608	62.7	31.5	3.6	31.8	5.7	60.3	63.5	-3.2	Low Channel
2706	65.4	28.8	3.6	32.5	5.7	59.6	63.5	-3.9	Low Channel
3628	61.2	31.5	3.6	31.8	5.7	58.8	63.5	-4.7	High Channel
8118	54.2	37.5	5.7	33	5.7	58.7	63.5	-4.8	Low Channel
8163	54.1	37.4	5.7	33.1	5.7	58.4	63.5	-5.1	High Channel
2721	64.1	28.8	3.6	32.5	5.7	58.3	63.5	-5.2	High Channel
6314	53.6	34.4	5.2	31.6	5.7	55.9	63.5	-7.6	Low Channel
3628	57.4	31.5	3.6	31.8	5.7	55.0	63.5	-8.5	High Channel
8163	50.5	37.4	5.7	33.1	5.7	54.8	63.5	-8.7	High Channel
8118	50.2	37.5	5.7	33	5.7	54.7	63.5	-8.8	Low Channel
4535	54.9	32	4.1	31	5.7	54.3	63.5	-9.2	High Channel
5442	49.3	34.3	4.7	28.6	5.7	54.0	63.5	-9.5	High Channel
6349	51.5	34.5	5.2	31.7	5.7	53.8	63.5	-9.7	High Channel
3608	56.1	31.5	3.6	31.8	5.7	53.7	63.5	-9.8	Low Channel

Notes:

Radiated Photographs (Worst Case Configuration)

Rubber Ducky Antenna



Vehicle Mount Antenna

Board Mount Antenna

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	03/29/04	03/29/05
1044	Blue flex cable .6m	0 0	0	09/02/03	09/01/04
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	07/24/03	07/23/04
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	07/24/03	07/23/04
991	Horn antenna	EMCO 3160-10	9704-1049	CNR	N/A
1480	Bilog Antenna	Schaffner-Chase CBL6111C	2572	CalNotReq	N/A
1033	Horn antenna	EMCO 3115	8812-3035	09/22/03	09/22/05
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	10/27/03	10/26/04
1481	Microwave Highpass Filter	K & L 3DH1-2000/T8000-0/0	4	Cal B4 Use	N/A

Section 11. Test Equipment List

ANNEX A - TEST DETAILS

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

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?V (48 dB?V) across 50 ohms.

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

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.

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.

NAME OF TEST: Time of Occupancy	PARA. NO.: 15.247(a)(1)(ii)

Minimum Standard:

Frequency Band (MHz)	20 dB Bandwidth	No. of Hopping Channels	Average Time of Occupancy
902 - 928	<250 kHz	50	=<0.4 sec. in 20 sec.
902 – 928	=>250 kHz	25	=<0.4 sec. in 10 sec.
2400 – 2483.5	-----	75	=<0.4 sec. in 30 sec.
5725 – 5850	-----	75	=<0.4 sec. in 30 sec.

Method Of Measurement:

The spectrum analyzer is set as follows:

RBW: 1 MHz
VBW: = RBW
Span: 0 Hz
LOG dB/div.: 10 dB
Sweep: Sufficient to see one hop time sequence.
Trigger: Video

The occupancy time of one hop is measured as above. The average time of occupancy is calculated over the appropriate period of time from above table (10, 20, or 30 seconds).

Avg. time of occupancy = (period from table/duration of one hop)/no. of channels multiplied by the duration of one hop.

For instance:

If a 2.4 GHz system has a measured hop duration time of 1 msec. and uses 75 channels, then the average time of occupancy would be:

(30 sec./.001 sec.)/75 chan. = 400 x 1 msec. = 400 msec. or 0.4 sec. in 30 sec.

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

Minimum Standard:

Frequency Band (MHz)	Maximum 20 dB Bandwidth
902 - 928	500 kHz
2400 – 2483.5	1 MHz
5725 – 5850	1 MHz

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

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

Minimum Standard:

Frequency Band (MHz)	No. of Hopping Channels	Maximum Peak Power Output at Antenna Port
902 - 928	at least 50	1 watt
902 – 928	25 - 49	0.25 watts
2400 – 2483.5	75	1 watt
5725 – 5850	75	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.

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

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. The dBi gain of the antenna(s) employed shall be reported.

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? $R^2 = E^2/120$? 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

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

Minimum Standard: In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, 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 (? 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: 902 MHz, 2400 MHz, or 5725 MHz
Marker: Peak of fundamental emission
Marker ?: Peak of highest spurious level below center frequency.

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: 928 MHz, 2483.5 MHz, or 5850 MHz
Marker: Peak of fundamental emission
Marker ?: Peak of highest spurious level above center frequency.

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

NAME OF TEST: Radiated Spurious Emissions PARA. NO.: 15.247(c)

Minimum Standard: In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, 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 (? 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

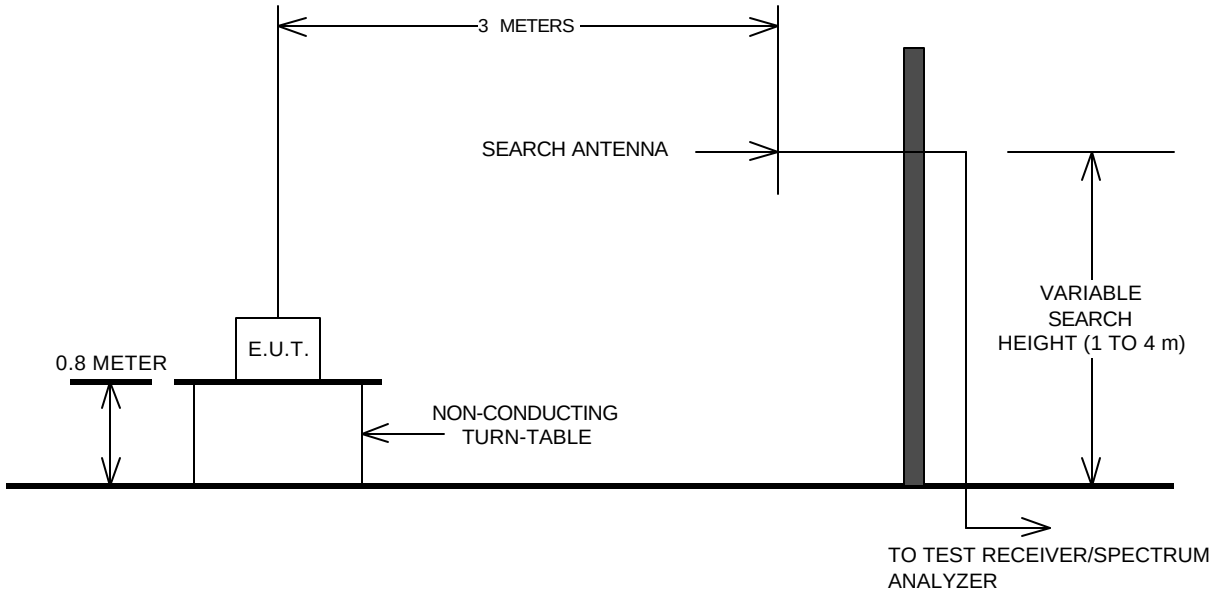
MHz	MHz	MHz	GHz
0.09-0.11	16.42-16.423	399.9-410	4.5-5.25
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.125-6.218	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:

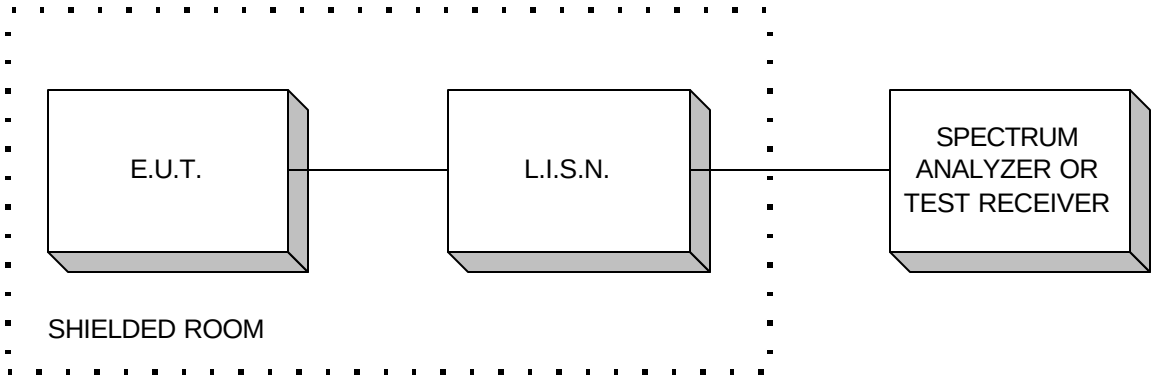
Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

ANNEX B - TEST DIAGRAMS

Test Site For Radiated Emissions



Conducted Emissions



Peak Power At Antenna Terminals