



Nemko Test Report: 6L0296RUS1

Applicant: Sirit Inc.
1321 Valwood Parkway
Carrollton, TX 75006

Equipment Under Test: IDentity MaX Reader-012

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:

A handwritten signature in black ink, appearing to read 'Abe Cox', is written over a thin red vertical line.

Abe Cox, Key Accounts Manager

Date: 29 June 2006

Table of Contents

Section 1.	Summary of Test Results	3
Section 2.	Equipment Under Test (E.U.T.)	5
Section 3.	Channel Separation.....	7
Section 4.	Time of Occupancy	10
Section 5.	Peak Power Output	17
Section 6.	Spurious Emissions (Antenna Conducted).....	21
Section 7.	Powerline Conducted Emissions	31
Section 8.	Test Equipment List	36
ANNEX A - TEST DETAILS		37
ANNEX B - TEST DIAGRAMS		45

Section 1. Summary of Test Results

Manufacturer: Sirit Inc.

Model No.: IDentity MaX Reader-012

Serial No.: ENG-MAX-008

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 C63.4-2003. 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

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

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Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
Powerline Conducted Emissions	15.207(a)	48 dB μ V	COMPLIES
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 20 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:

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

General Equipment Information

Frequency Band:

- ☒ 902 – 928 MHz
☐ 2400 – 2483.5 MHz

Channel Frequencies:

902.75 to 927.25 MHz

Number of Channels:

50

Channel Spacing:

500kHz

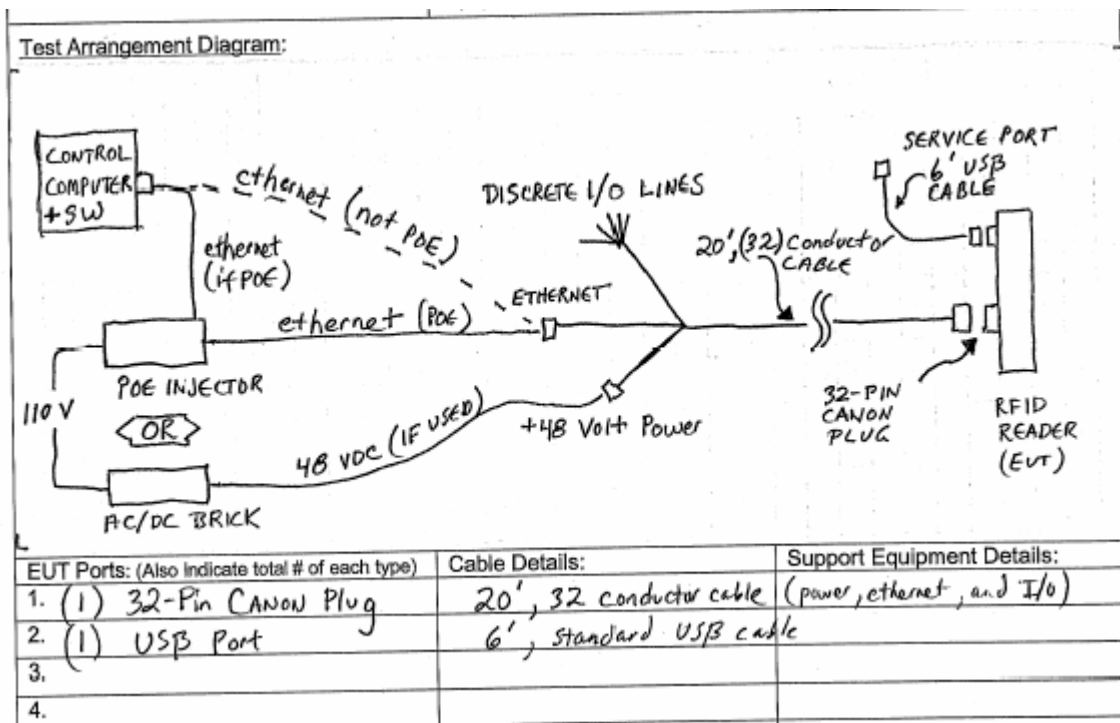
User Frequency Adjustment:

Software controlled

Description of DUT

The IDentity MaX reader is an RFID device capable of reading EPC Class 0, Class 1 and Class 1 Gen 2 RFID tags, and processing the data for a gated access type application. Generally, the reader is configured, upon installation, to work with specific inputs and outputs to interface with customer systems including access panels, gates and visual indicators. All system configurations are accomplished using either a PC based application or a web based user interface.

System Diagram



48 VDC Power Supply
AULT Model PW118

PoE Power Supply
PHIHONG Model PSA16U-480(POE)

The 48 VDC Power supply was used during testing.

Section 3. Channel Separation

NAME OF TEST: Channel Separation	PARA. NO.: 15.247(a)(1)
TESTED BY: Kevin Rose	DATE: June 16, 2006

Test Results: Complies.

Measurement Data: See 20 dB BW plot
Measured 20 dB bandwidth: 352 kHz
Channel Separation: 500 kHz

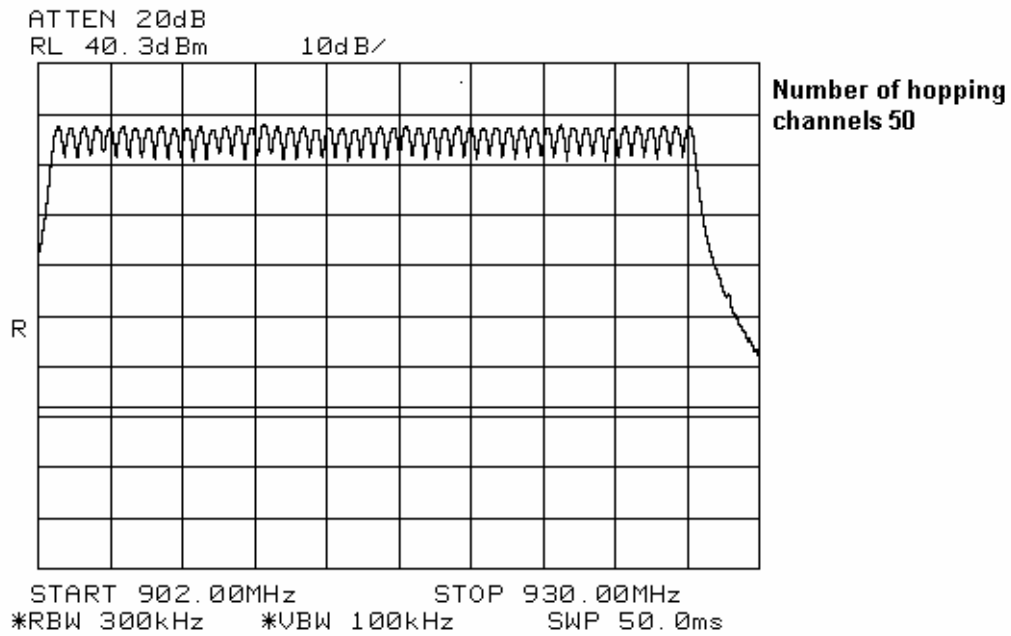
Equipment Used: 1045,1083,1464,1659,1064,1065.

Measurement Uncertainty: +/- 1.7 dB

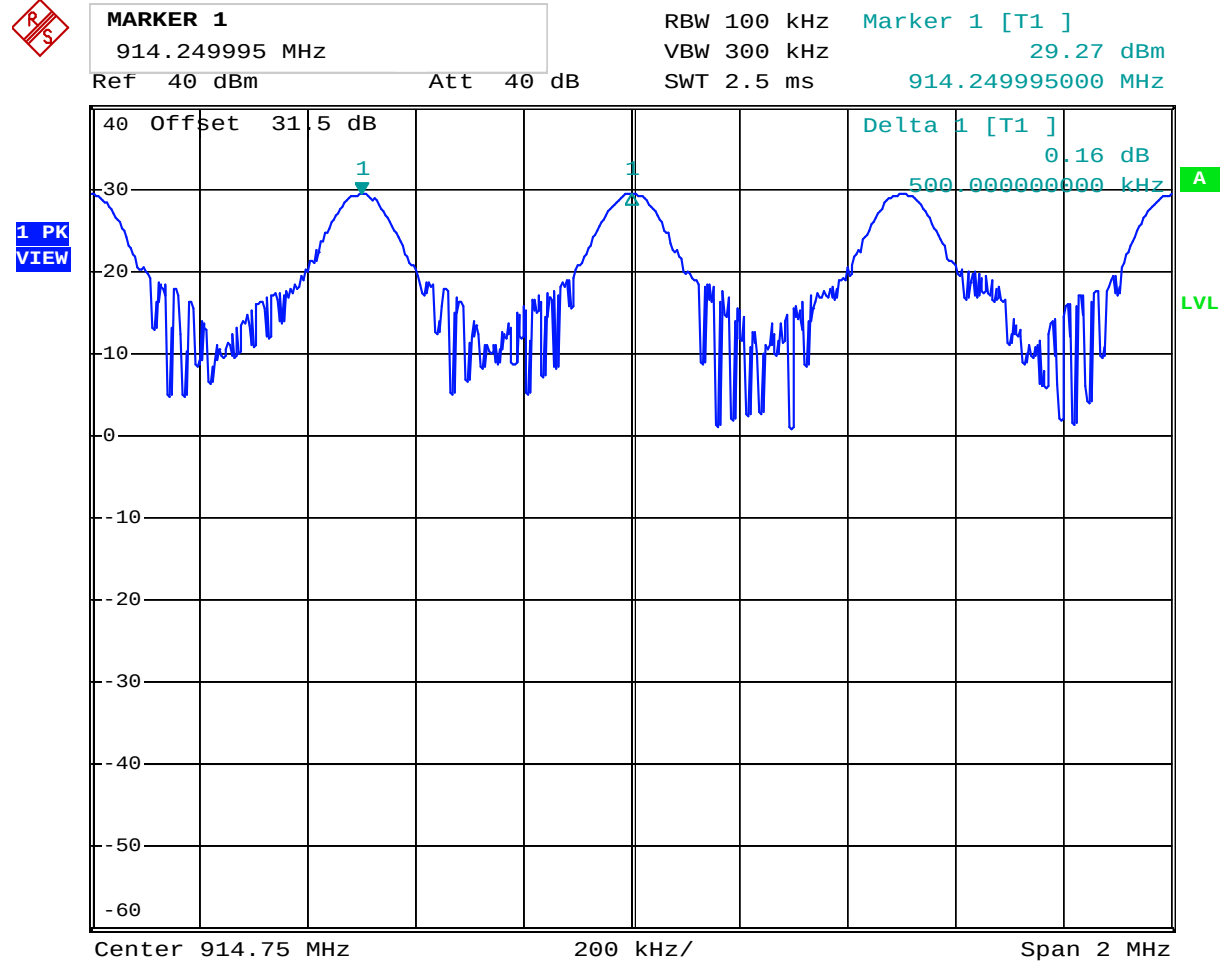
Temperature: 20°C

Relative Humidity: 46%

Number of hopping channels = 50



Channel separation



Date: 16.JUN.2006 13:14:52

Section 4. Time of Occupancy

NAME OF TEST: Time of Occupancy	PARA. NO.: 15.247(a)(1)
TESTED BY: Kevin Rose	DATE: June 16, 2006

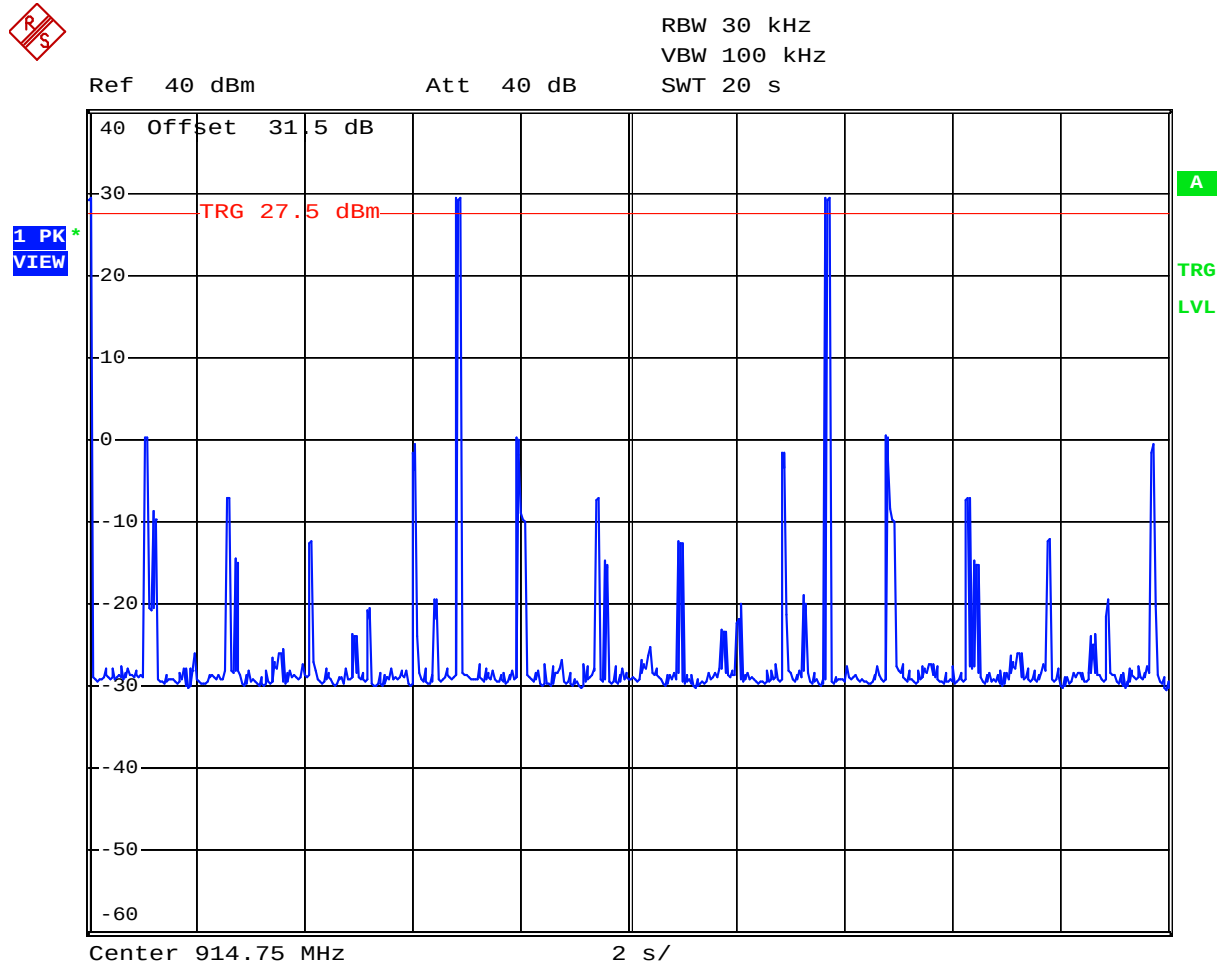
Test Results: Complies.

Measurement Data:

Maximum Dwell Time On Any Channel: 364.8 mS in 20 seconds

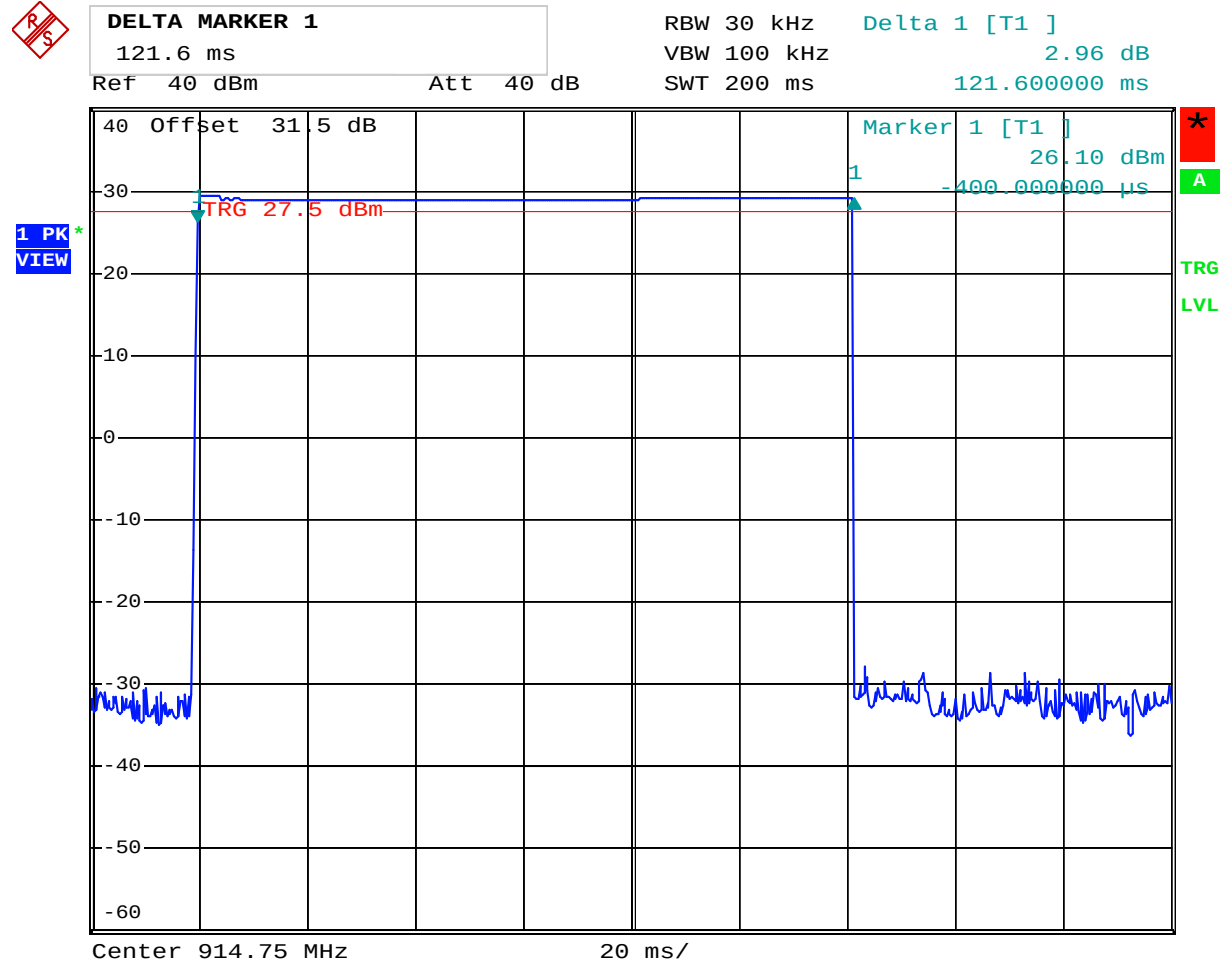
Equipment Used: 1045,1083,1464,1659,1064,1065.

20 second graph 364.8ms in a 20 second period



Date: 16.JUN.2006 13:10:57

Pulse width



Date: 16.JUN.2006 13:13:13

Section 5. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.247(a)(1)(i)
TESTED BY: Kevin Rose	DATE: June 16 2006

Test Results: Complies.

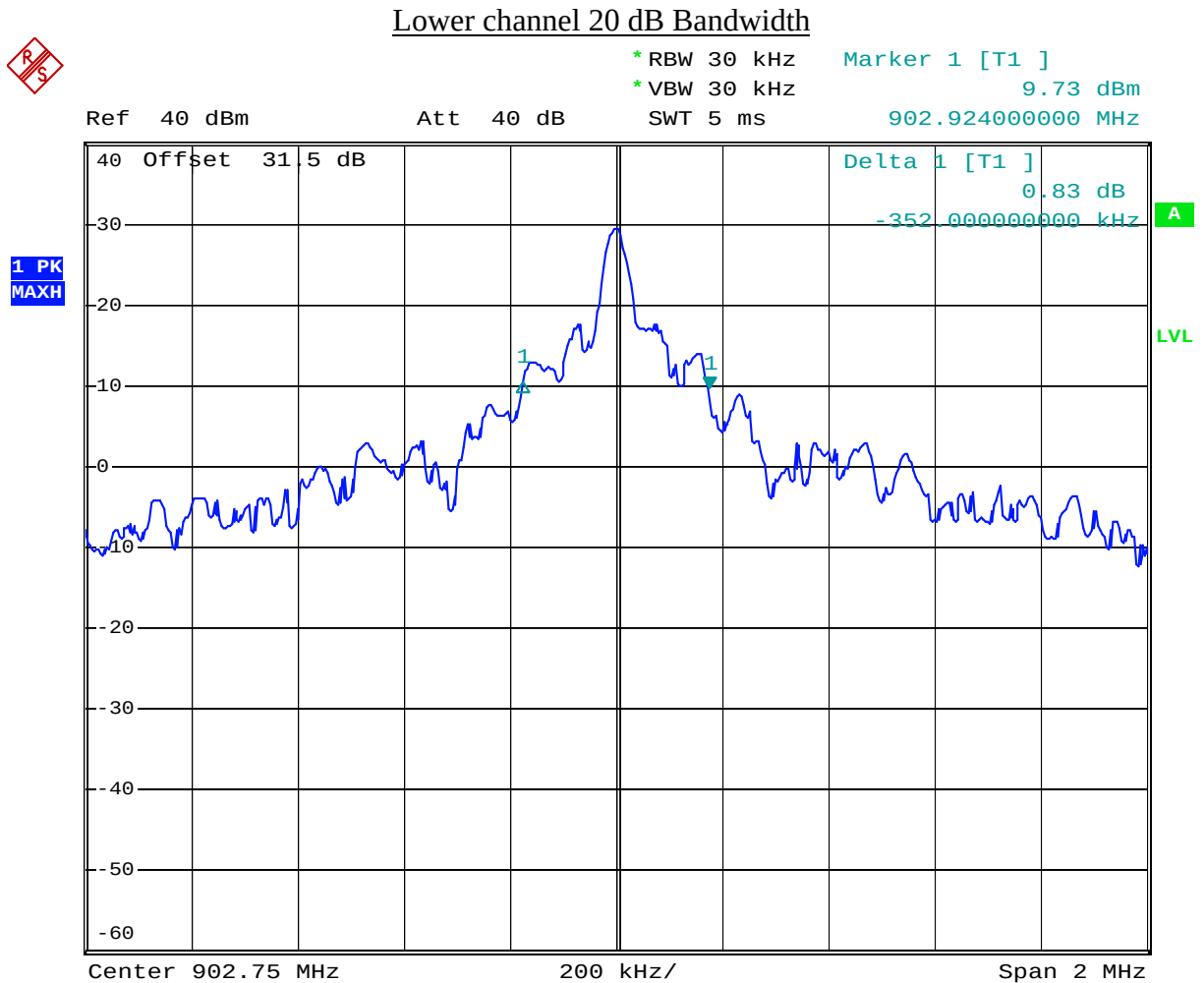
Measurement Data: See attached plots.

Equipment Used: 1045,1083,1464,1659,1064,1065.

Measurement Uncertainty: +/- 1.7 dB

Temperature: 19°C

Relative Humidity: 38%

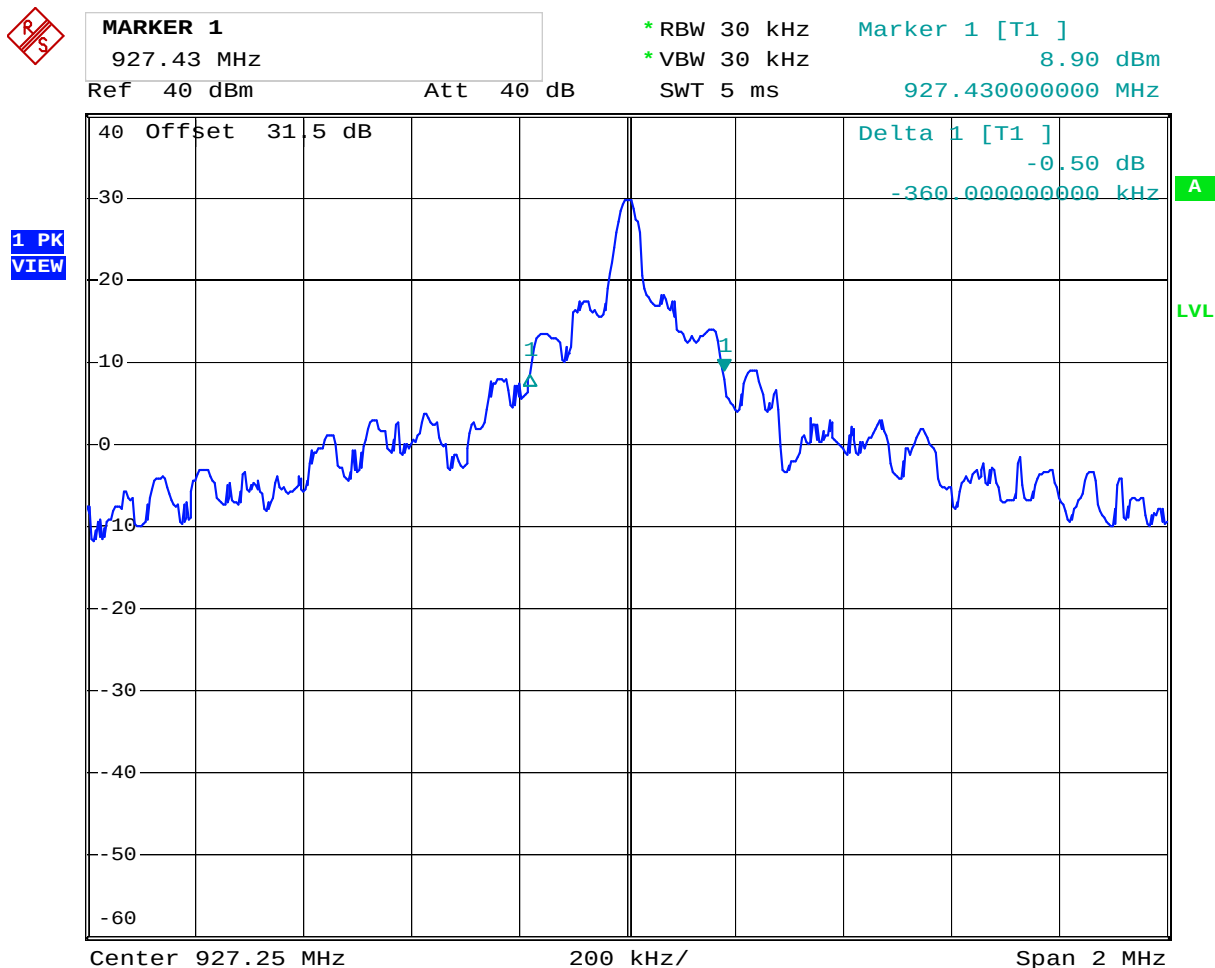


Date: 16.JUN.2006 13:20:54

Mid channel 20 dB Bandwidth

Date: 16.JUN.2006 13:42:32

High channel 20 dB Bandwidth



Date: 16.JUN.2006 13:38:28

Section 5. Peak Power Output

NAME OF TEST: Peak Power Output	PARA. NO.: 15.247 (b)
TESTED BY: Kevin Rose	DATE: June 16, 2006

Test Results: Complies.

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

Antennas:

Model	Type	Manufacturer	Gain (dBi)	E.I.R.P. (dBm)
ID Max Integrated Antenna	Panel	Sirit Inc.	5.47	35.23

Peak power output at antenna port(dBm): 29.76

Equipment Used: 1045,1083,1464,1659,1064,1065.

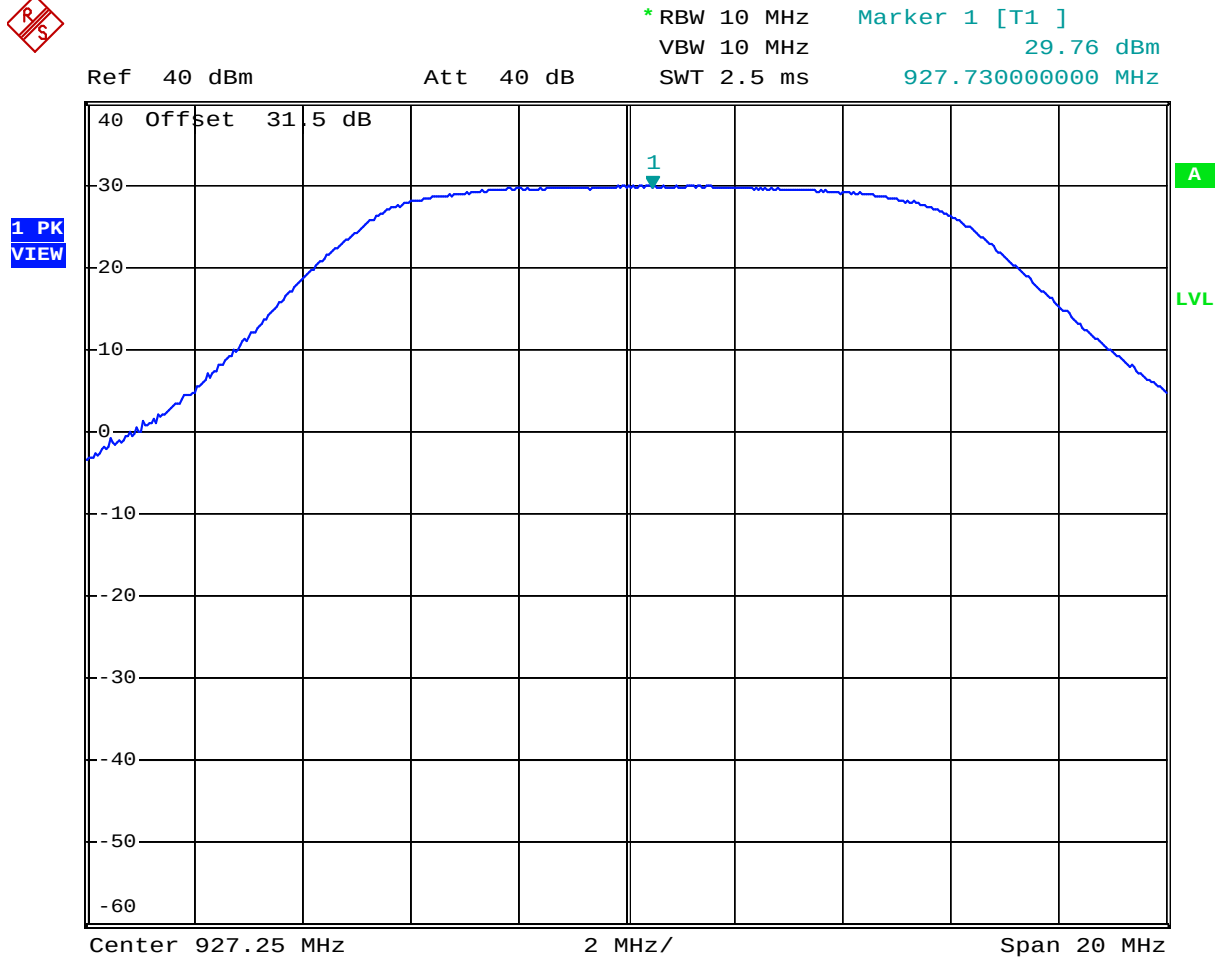
Measurement Uncertainty: +/- 1.7 dB

Temperature: 19°C

Relative Humidity: 38%

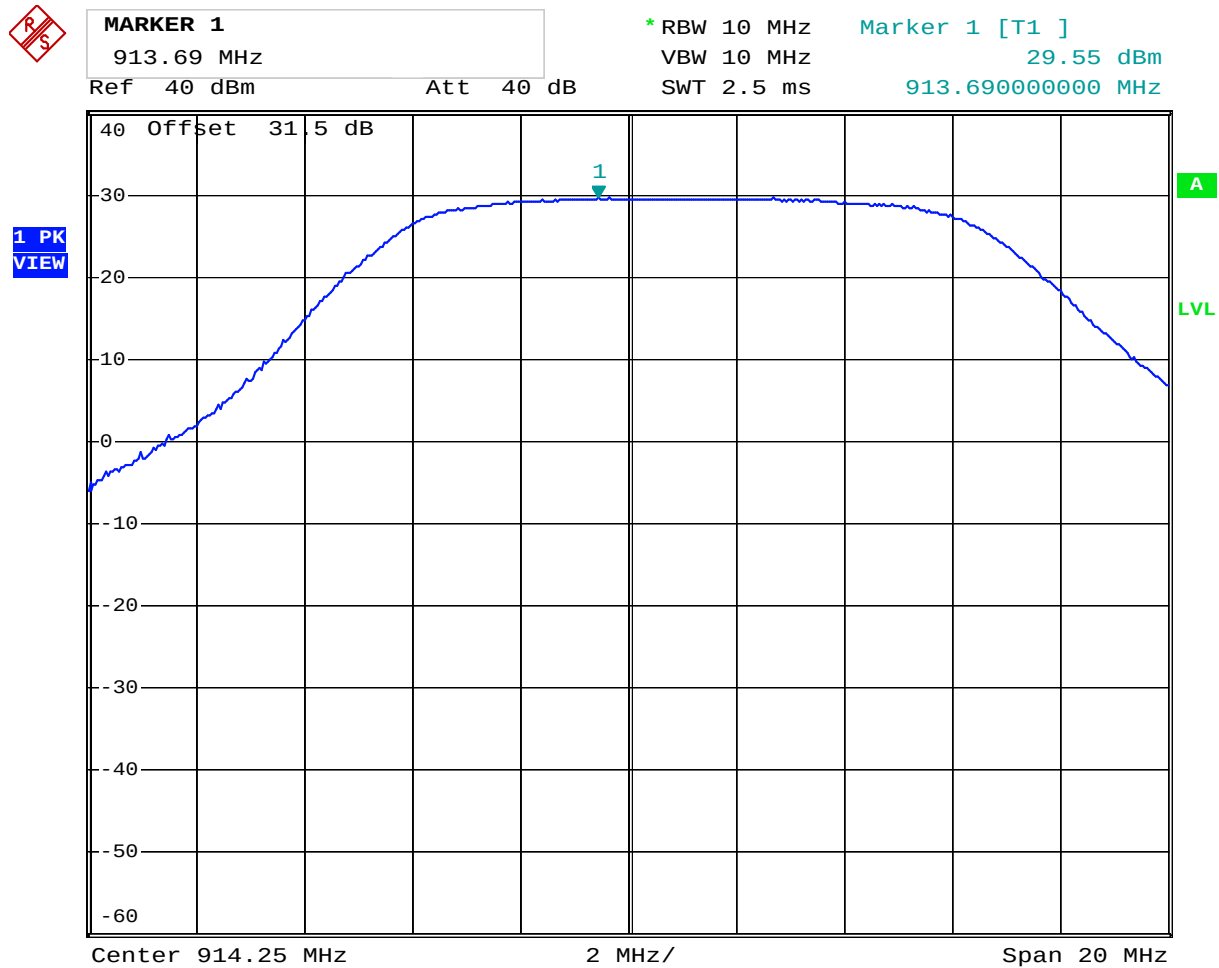
15.31(e): The DUT was tested at +/- 15% input voltage on both power supplies. This had no effect on output power.

High channel conducted power



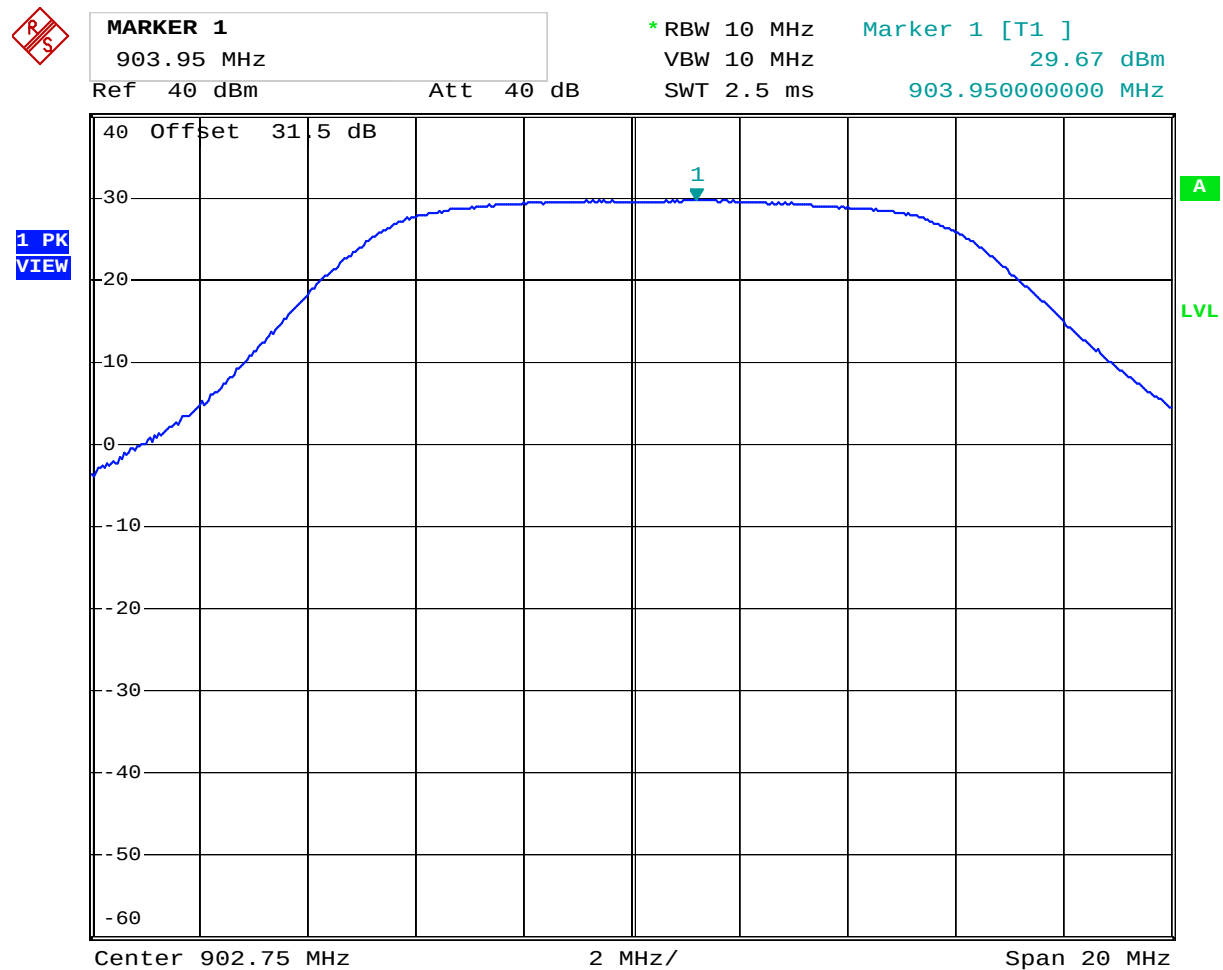
Date: 16.JUN.2006 13:46:57

Mid channel conducted power output



Date: 16.JUN.2006 13:47:34

Low channel conducted power output



Date: 16.JUN.2006 13:48:42

Section 6. Spurious Emissions (Antenna Conducted)

NAME OF TEST: Spurious Emissions (Antenna Conducted)	PARA. NO.: 15.247(c)
TESTED BY: Kevin Rose	DATE: June 16, 2006

Test Results: Complies

Measurement Data:

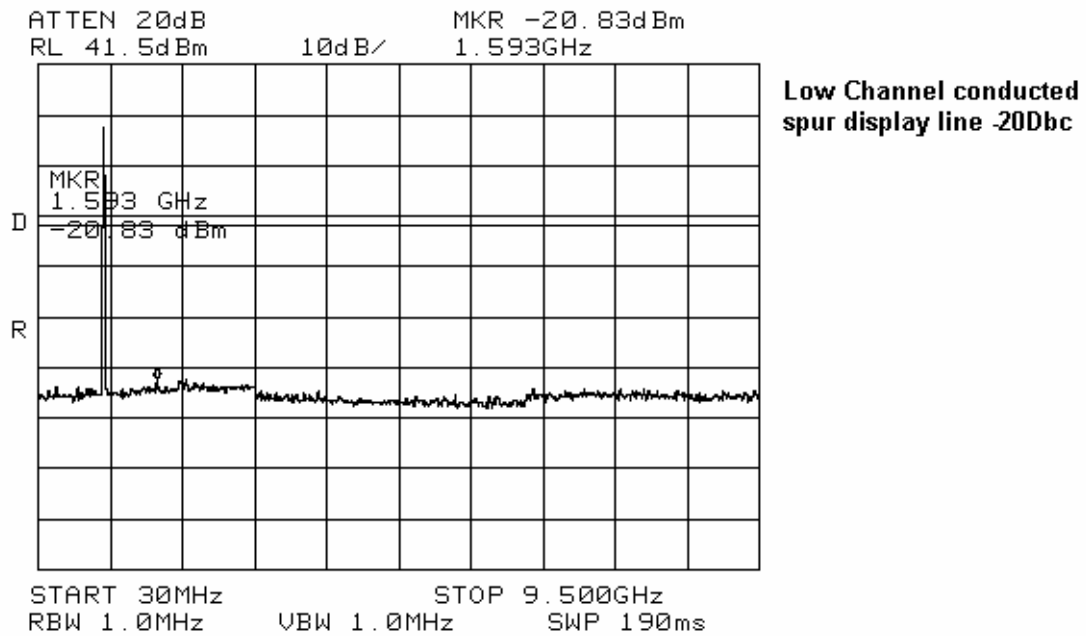
Equipment Used: 1045,1083,1464,1659,1064,1065.

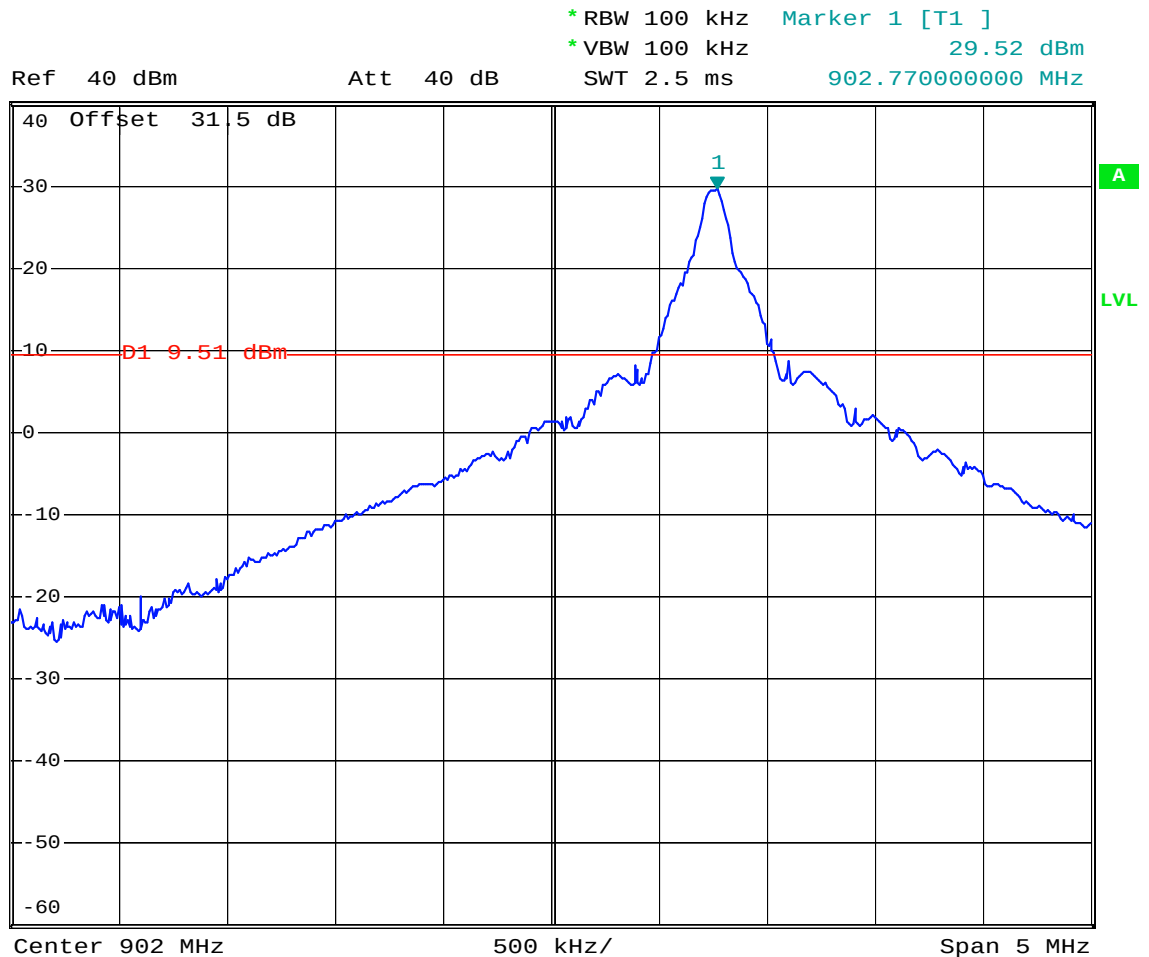
Measurement Uncertainty: +/- 1.7 dB

Temperature: 21°C

Relative Humidity: 46%

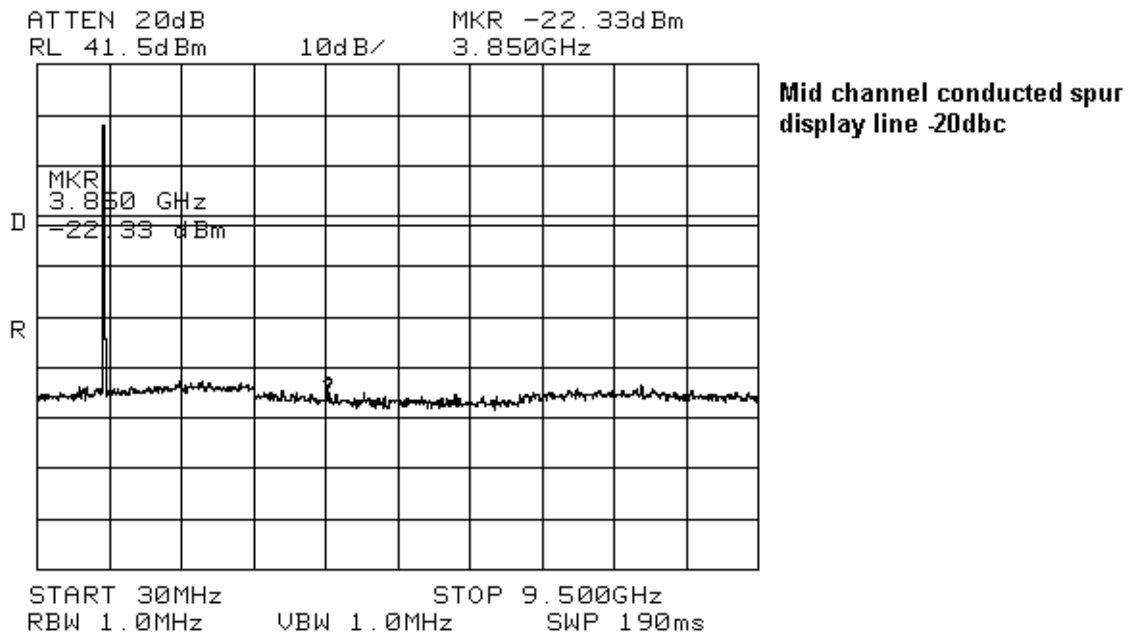
LOW CHANNEL Spurious Emissions



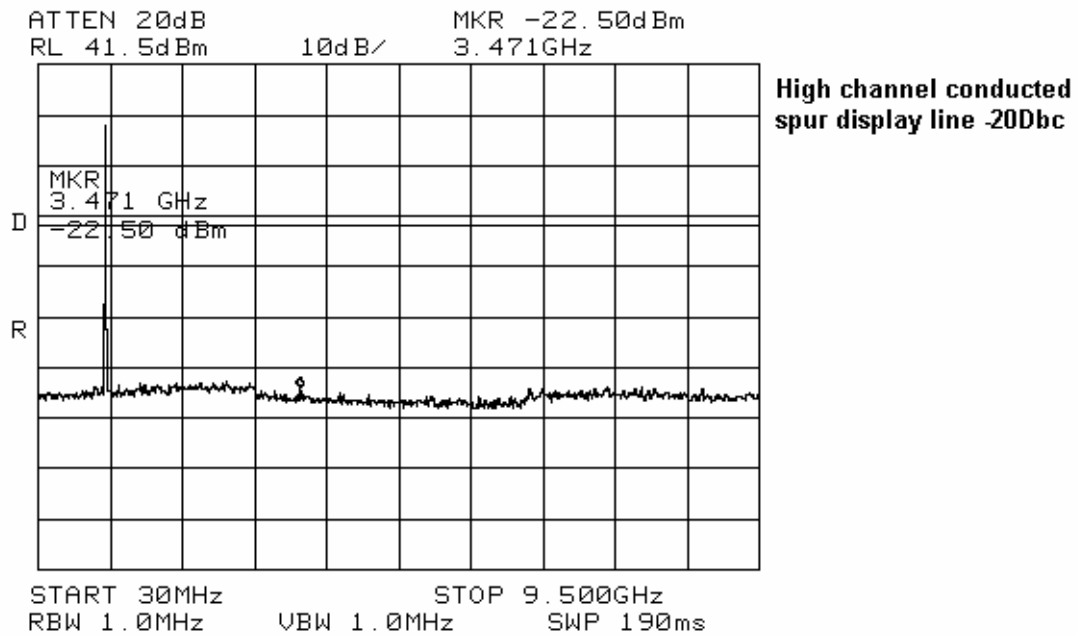
Lower bandedge 20dBc1 PK
VIEW

Date: 16.JUN.2006 13:30:22

MID CHANNEL Spurious Emissions



HIGH CHANNEL Spurious Emissions



Upper Bandedge



DISPLAY LINE 1

9.66 dBm

Ref 40 dBm

Att 40 dB

* RBW 100 kHz

* VBW 100 kHz

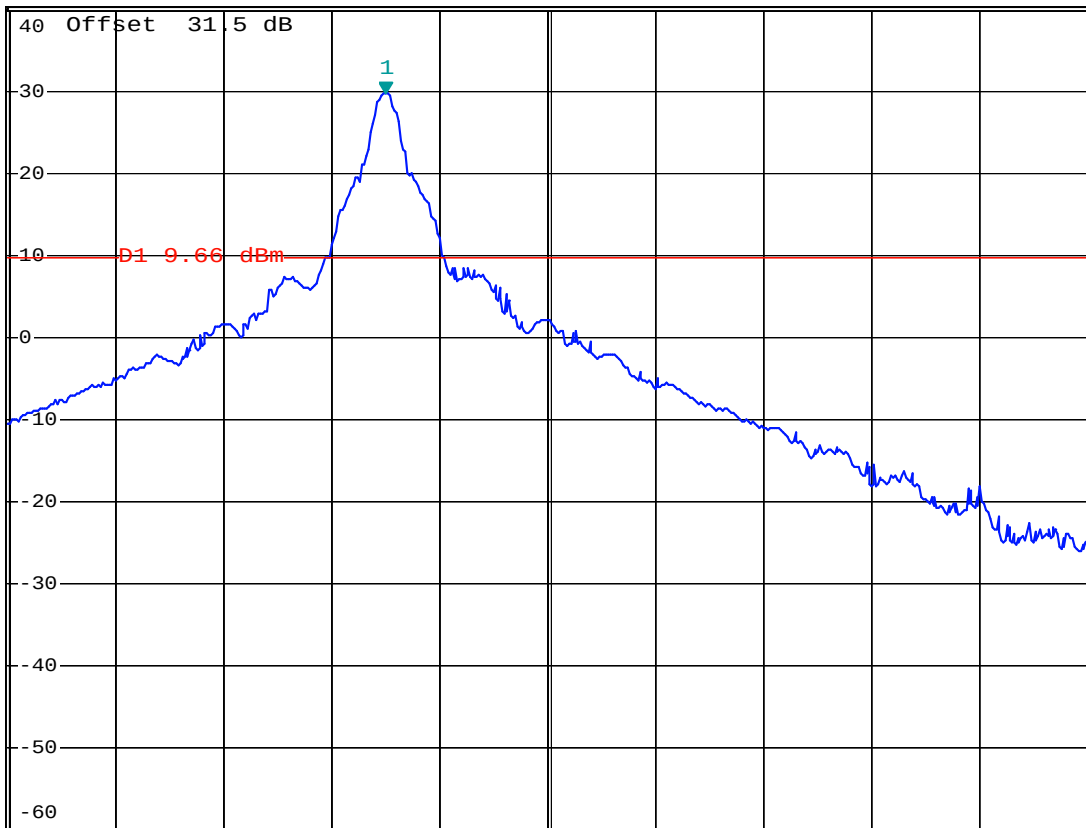
SWT 2.5 ms

Marker 1 [T1]

29.66 dBm

927.250000000 MHz

1 PK
VIEW



Center 928 MHz

500 kHz/

Span 5 MHz

Date: 16.JUN.2006 13:28:07

Section 7. Spurious Emissions (Radiated)

NAME OF TEST: Spurious Emissions (Radiated)	PARA. NO.: 15.247(c)
TESTED BY: Kevin Rose	DATE: June 16, 2006

Test Results: Complies.

Measurement Data: See attached table.

Duty Cycle Calculation: No Duty Cycle

Duty Cycle correction factor (dB) = $20 \log (rf_{ON} \text{ in ms}/100\text{ms})$

Equipment Used: 791,760,759,1016,993,1484,1485,1464.

Measurement Uncertainty: +/- 1.7 dB

Temperature: 19°C

Relative Humidity: 38%

All measurement were made with 1MHz RBW and 1MHz VBW for peak and 1MHz RBW and 10Hz VBW for average measurements.

During the test the EUT was transmitting continuous and hopping function was disabled.

Note: All readings are Peak 1MHz RBW and 1MHz VBW

Test Data - Radiated Emissions**LOW CHANNEL****Measurement Data:** Reading listed by order taken.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	Cable Horn dB	Cable dB	Pre-A dB	dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
Low Channel											
1	1805.493M	21.3	+0.7 +27.3	+2.0	+27.7		+0.0	23.6	54.0	-30.4	Vert
2	7221.984M	24.5	+1.2 +36.0	+3.9	+24.8		+0.0	40.8	54.0	-13.2	Vert
3	5416.485M	22.8	+1.2 +34.3	+3.5	+27.6		+0.0	34.2	54.0	-19.8	Vert
4	6319.250M	22.8	+1.3 +34.6	+3.9	+26.1		+0.0	36.5	54.0	-17.5	Vert
5	1805.496M	25.2	+0.7 +27.3	+2.0	+27.7		+0.0	27.5	54.0	-26.5	Horiz
6	4513.742M	27.0	+1.0 +32.0	+3.1	+27.6		+0.0	35.5	54.0	-18.5	Horiz
7	5416.486M	27.0	+1.2 +34.3	+3.5	+27.6		+0.0	38.4	54.0	-15.6	Horiz
8	7221.986M	23.5	+1.2 +36.0	+3.9	+24.8		+0.0	39.8	54.0	-14.2	Horiz
Mid Channel											
9	1829.502M	22.8	+0.7 +27.4	+2.1	+27.8		+0.0	25.2	54.0	-28.8	Horiz
10	4573.737M	23.2	+1.0 +32.2	+3.1	+27.6		+0.0	31.9	54.0	-22.1	Horiz
11	5488.487M	23.7	+1.2 +34.4	+3.5	+27.6		+0.0	35.2	54.0	-18.8	Horiz
12	6403.237M	26.8	+1.3 +34.6	+3.9	+25.6		+0.0	41.0	54.0	-13.0	Horiz
13	7317.987M	22.5	+1.2 +36.1	+4.0	+25.0		+0.0	38.8	54.0	-15.2	Horiz
14	6403.235M	24.5	+1.3 +34.6	+3.9	+25.6		+0.0	38.7	54.0	-15.3	Vert

High Channel										
15	1854.496M	23.5	+0.7 +27.6	+2.1	+27.8	+0.0	26.1	54.0	-27.9	Vert
16	6490.740M	25.8	+1.3 +34.7	+4.0	+25.2	+0.0	40.6	54.0	-13.4	Vert
17	7417.988M	22.8	+1.2 +36.3	+4.1	+25.3	+0.0	39.1	54.0	-14.9	Vert
18	8345.236M	23.0	+1.2 +36.9	+4.4	+23.4	+0.0	42.1	54.0	-11.9	Vert
19	7417.988M	24.3	+1.2 +36.3	+4.1	+25.3	+0.0	40.6	54.0	-13.4	Horiz
20	6490.738M	25.3	+1.3 +34.7	+4.0	+25.2	+0.0	40.1	54.0	-13.9	Horiz
21	1854.488M	22.3	+0.7 +27.6	+2.1	+27.8	+0.0	24.9	54.0	-29.1	Horiz

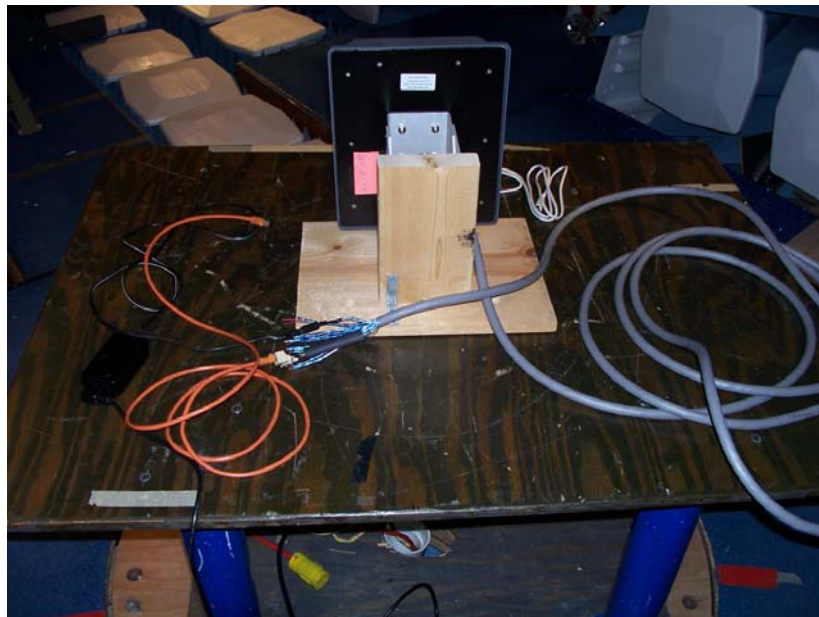
Note: All readings are Peak 1MHz RBW and 1MHz VBW

Radiated Photographs

FRONT VIEW



REAR VIEW



Section 7. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
TESTED BY: Kevin Rose	DATE: June 16 2006

Test Results: Complies.

Measurement Data: See attached plots.

Equipment Used: 1659,1258,1081,1555

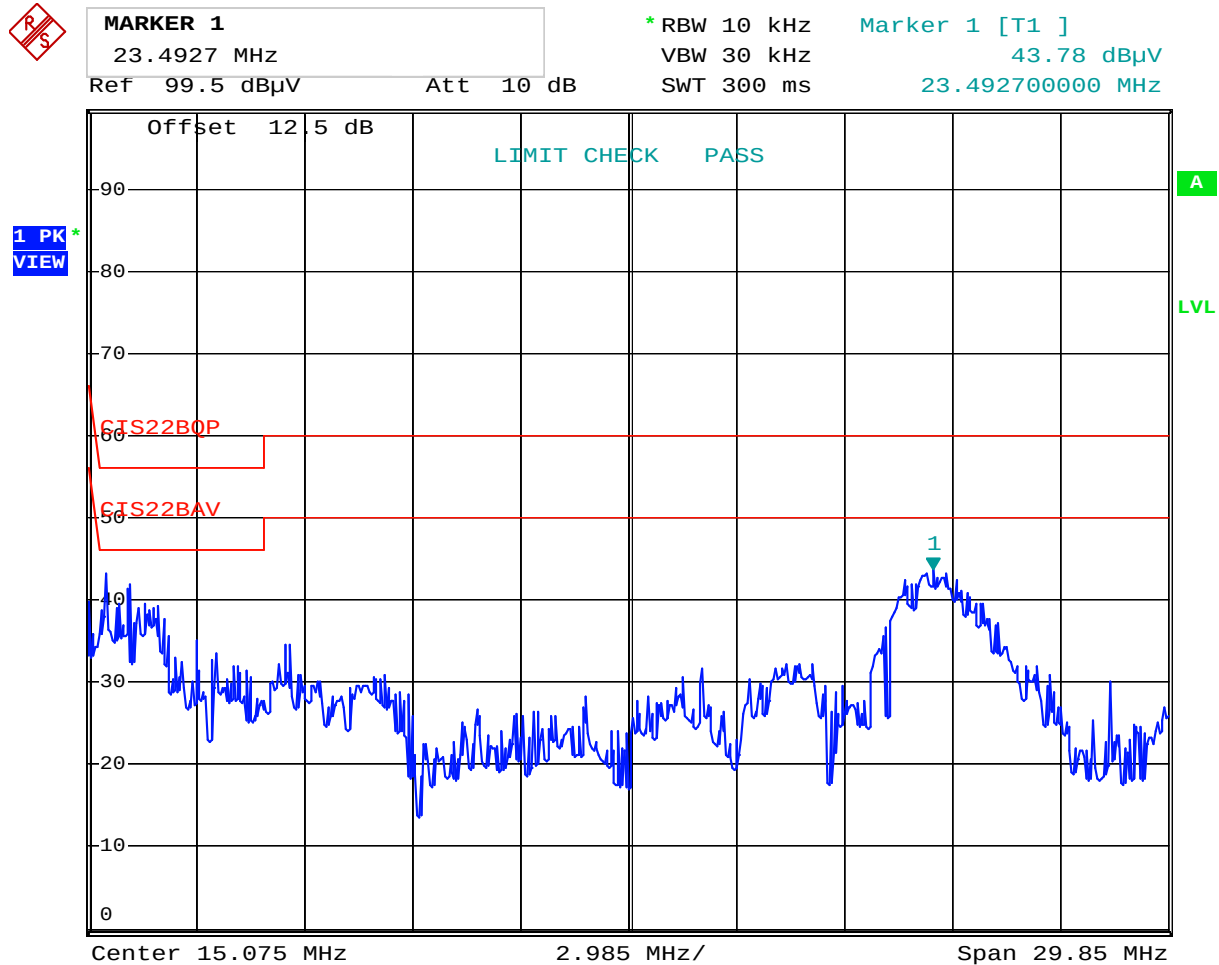
Measurement Uncertainty: +/- 1.7 dB

Temperature: 22°C

Relative Humidity: 43%

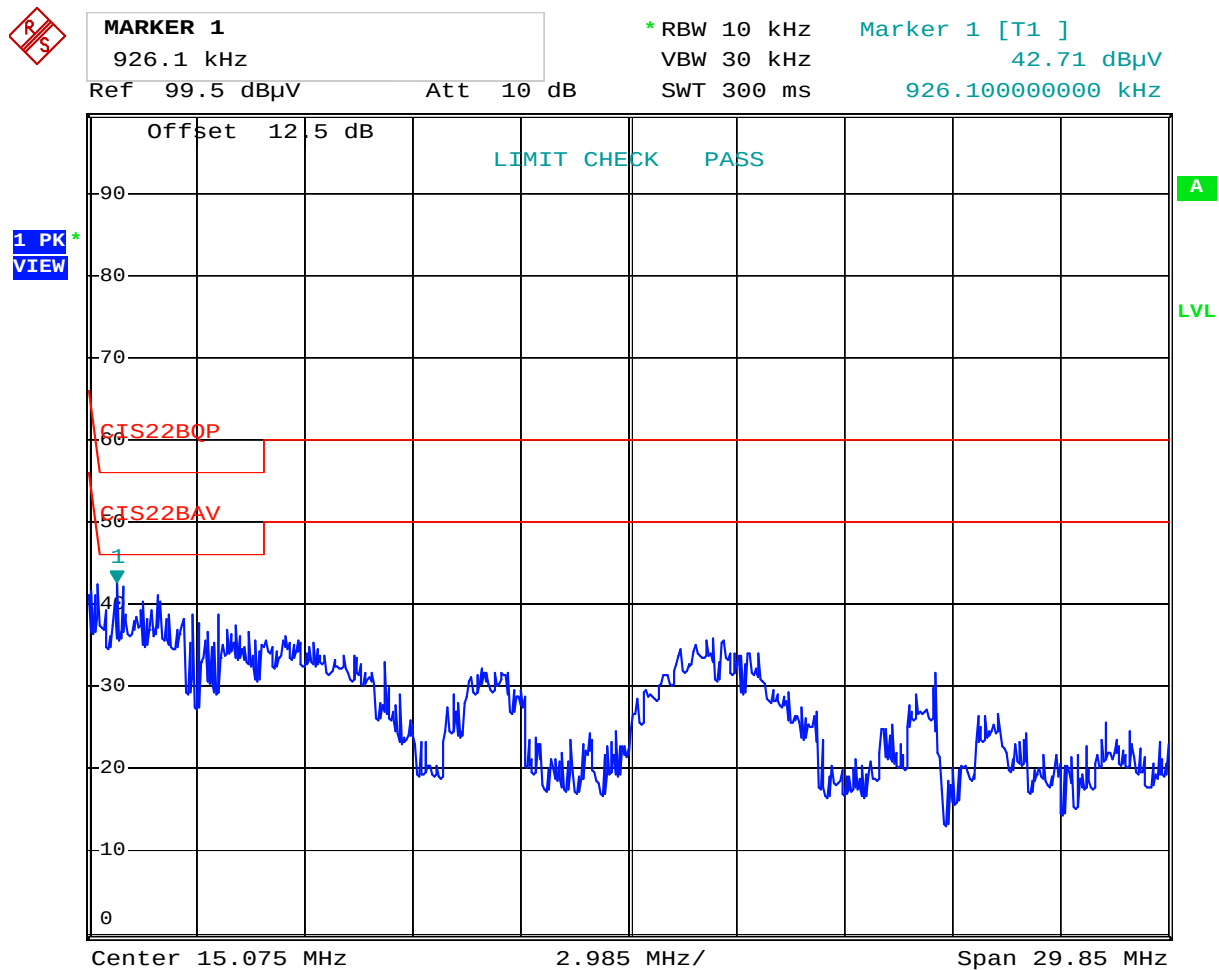
Ault power supply
PhiHong

Ault power supply hot



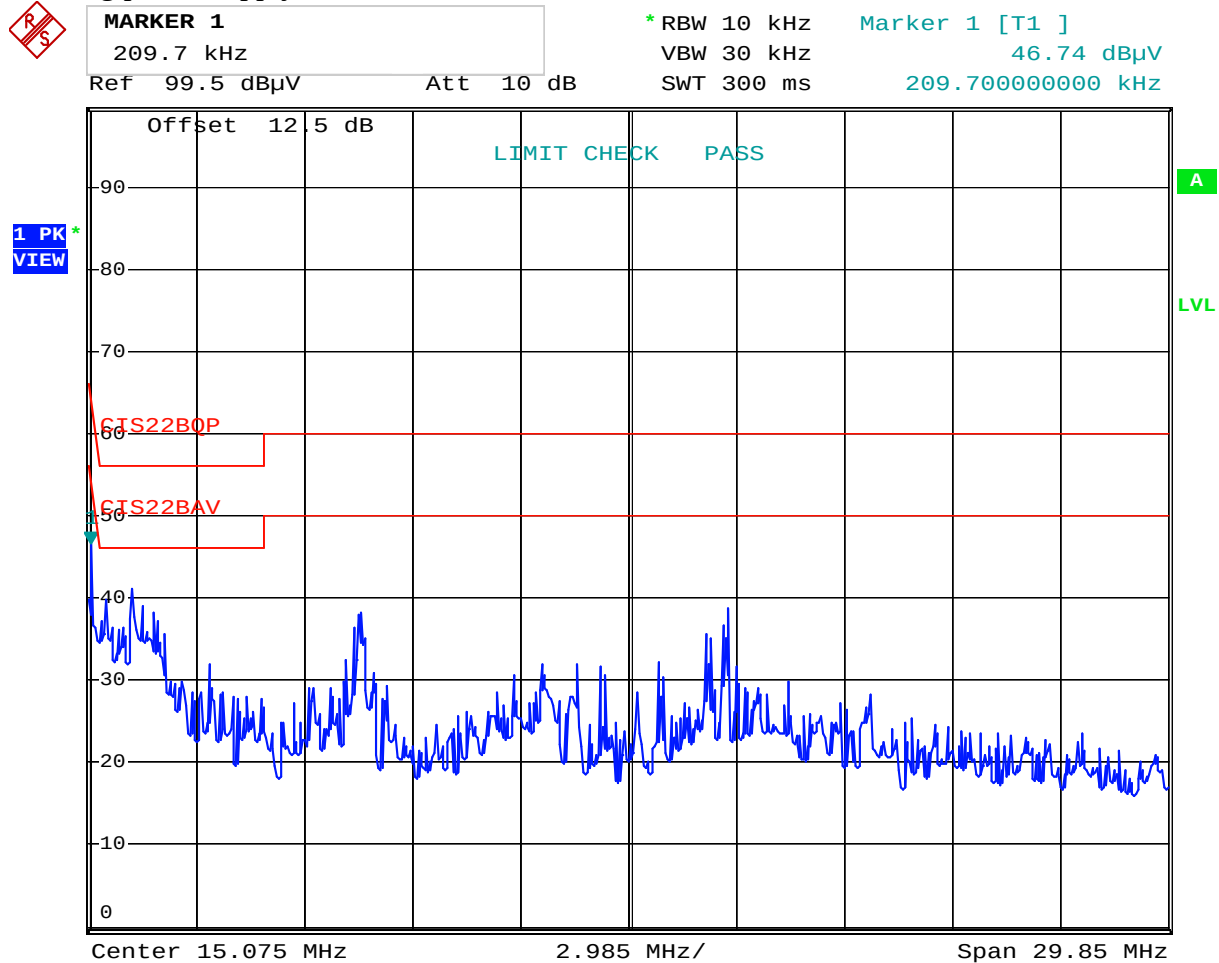
Date: 16.JUN.2006 14:52:26

Ault power supply Neutral



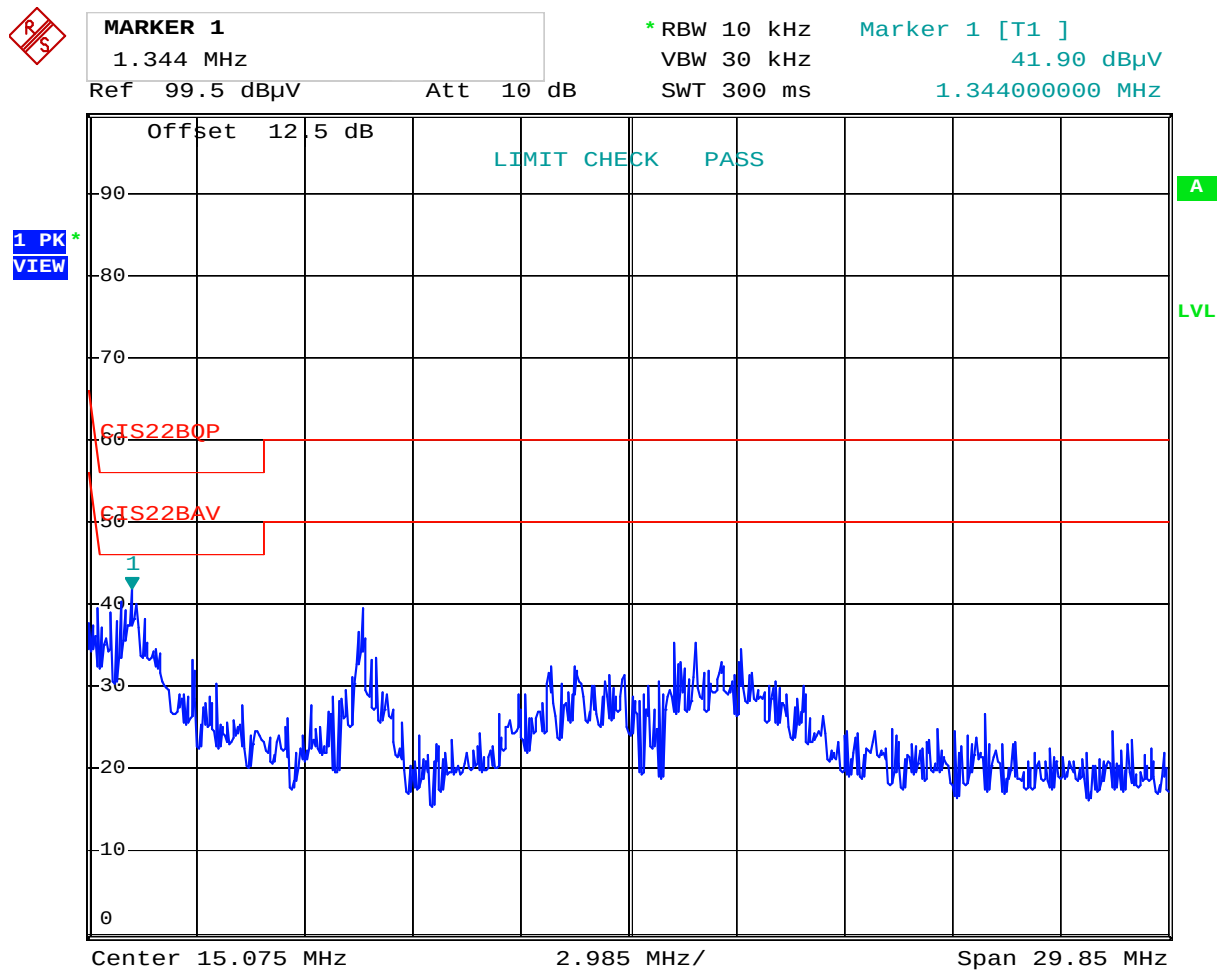
Date: 16.JUN.2006 14:50:31

Phihong power supply hot



Date: 16.JUN.2006 14:56:22

Phihong power supply neutral



Date: 16.JUN.2006 14:58:48

Section 8. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1045	CABLE 2m	Astrolab Inc. 32027-2-29094-72TC	N/A	CBU	N/A
1083	Cable 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/14/05	01/15/07
1659	Spectrum Analyzer	Rhode & Schwarz FSP	973353	01/10/06	01/10/07
1064	ATTENUATOR	NARDA 776B-20	NONE	CBU	N/A
1065	ATTENUATOR	NARDA 776B-10	NONE	CBU	N/A
791	PREAMP, 25dB	Nemko USA, Inc. LNA25	398	04/20/06	04/20/07
760	Antenna biconical	Electro Metrics MFC-25	477	08/04/05	08/04/06
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	02/13/06	02/13/07
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	04/20/06	04/20/07
993	Horn antenna	A.H. Systems SAS-200/571	XXX	08/01/05	08/02/07
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	08/26/05	08/26/06
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	08/26/05	08/26/06
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/14/05	01/15/07
1659	Spectrum Analyzer	Rhode & Schwarz FSP	973353	01/10/06	01/10/07
1258	LISN .15mhz-30mhz	EMCO 0	1305	04/19/06	04/19/07
1081	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	06/15/06	06/15/07
1555	Filter high pass 5KHz	Solar Electronics 7930-5.0	933125	04/20/06	04/20/07

Nemko USA, Inc.

FCC PART 15, SUBPART C

FREQUENCY HOPPING SPREAD SPECTRUM TRANSMITTER

EQUIPMENT: IDentity MaX Reader-012

PROJECT NO.: 6L0296RUS1

ANNEX A - TEST DETAILS

Nemko USA, Inc.

FCC PART 15, SUBPART C

FREQUENCY HOPPING SPREAD SPECTRUM TRANSMITTER

EQUIPMENT: IDentity MaX Reader-012

PROJECT NO.: 6L0296RUS1

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: 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:

$(30 \text{ sec.} / .001 \text{ sec.}) / 75 \text{ chan.} = 400 \times 1 \text{ msec.} = 400 \text{ msec. or } 0.4 \text{ sec. in } 30 \text{ sec.}$

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 $GP/4\pi R^2 = E^2/120\pi$ 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

NAME OF TEST: Spurious Emissions at Antenna Terminals	PARA. NO.: 15.247(c)
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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 ($\mu\text{V/m}$ @ 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: 902 MHz, 2400 MHz, or 5725 MHz

Marker: Peak of fundamental emission

Marker Δ : 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 Δ : 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 ($\mu\text{V/m}$ @ 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

15.205 Restricted Bands

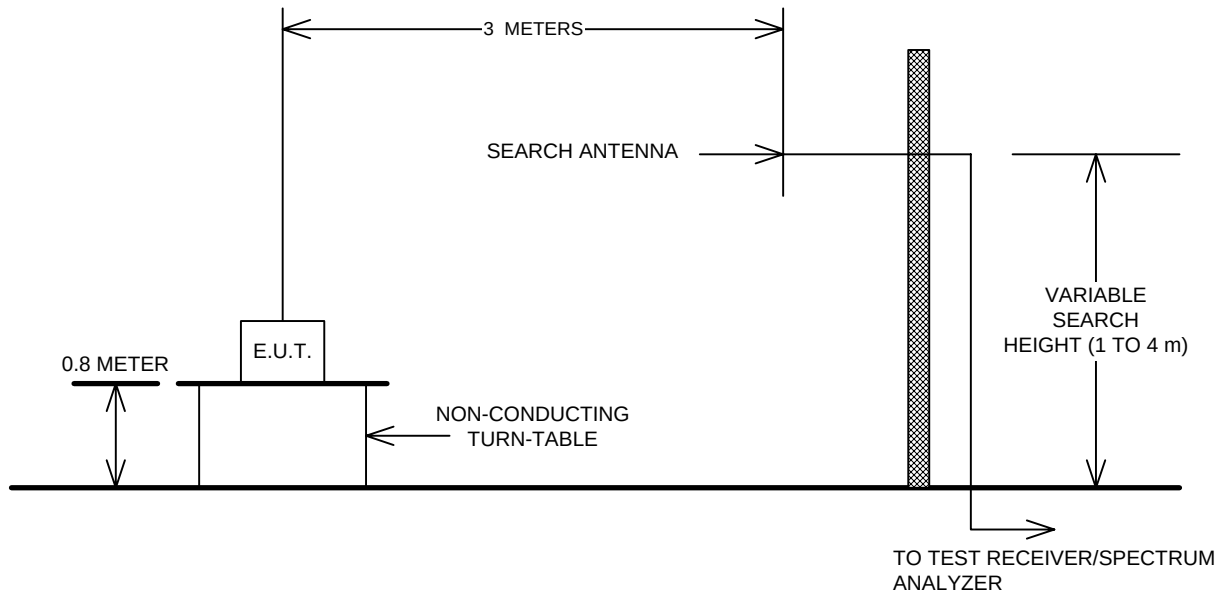
MHz	MHz	MHz	GHz
0.09-0.11	16.42-16.423	399.9-410	4.5-5.25
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.125-6.218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

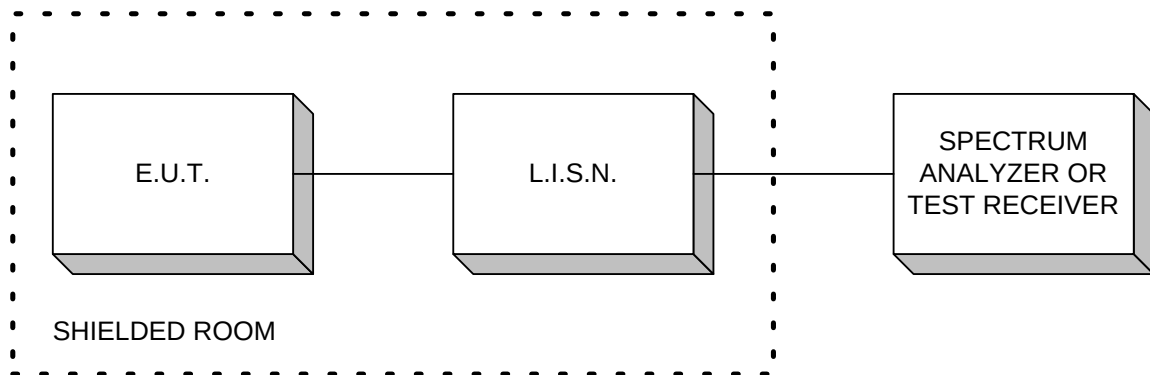
Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

ANNEX B - TEST DIAGRAMS

Test Site For Radiated Emissions



Conducted Emissions



Peak Power At Antenna Terminals

