FCC CFR47 PART 15 CERTIFICATION

TEST REPORT

FOR

2.4 GHz 802.11b Radio Outdoor Package

MODEL: AVCW-109/209

FCC ID: MKZ0207WODU09

REPORT NUMBER: 02U1399-1

ISSUE DATE: JULY 24 2002

Prepared for
OTC WIRELESS, INC.
48507 MILMONT DRIVE
FREMONT, CA 94538
USA

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TABLE OF CONTENT

1. TEST RESULT CERTIFICATION

COMPANY NAME: OTC WIRELESS, INC.
48507 MILMONT DRIVE
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TELEPHONE NO: (510) 490-8288 extension 215

EUT DESCRIPTION: 2.4GHZ 802.11B RADIO OUTDOOR PACKAGE

MODEL NAME: AVCW-109/209

DATE TESTED: JULY 24 2002

TYPE OF EQUIPMENT	INTENTIONAL RADIATOR
EQUIPMENT TYPE	2.4GHz RADIO
MEASUREMENT PROCEDURE	ANSI 63.4 / 1992, TIA/EIA 603
PROCEDURE	CERTIFICATION
FCC RULE	CFR 47 PART 15 Subpart C

Compliance Certification Services, Inc. tested the above equipment for compliance with the requirement set forth in CFR 47, PART 15 Subpart C. The equipment in the configuration described in this report, shows the measured emission levels emanating from the equipment do not exceed the specified limit.

Note: This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document.

Approved & Released For CCS By:

STEVE CHENG
EMC ENGINEERING MANAGER
COMPLIANCE CERTIFICATION SERVICES

Tested By:

FRANK IBRAHIM
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. EUT DESCRIPTION

The Model AVCW-109/209, an outdoor unit, is a time-division-duplex wireless 802.11b Direct Sequence Spread Spectrum Transceiver that operates 2.4GHz-2.4835GHz for a computer data communication applications. The device functions both as a transmitter and a receiver. The transmitting and receiving operations are a time-domain duplexed. This unit provides a power output Of 15.8dBm (38mW) and a patch antenna with 9.0dBi gain.

3. EUT MODIFICATION

In order to comply with 15.209, there were modifications made to this Model AVCW-109/209. The modifications are listed below.

Mod.#1:	Add C103 (0.1uF), C104 (1000pf) on the digital board between Pin1 of U11 and Ground.
Mod.#2:	Add a ferrite bead on the location L10 (BLM21P300S) between Pin1 of U11 and Vccs.
Mod.#3:	Replace 0ohm resistor on location R24, R82 on the RF board with a ferrite bead (BLM21P300S).

4. TEST METHODOLOGY

Both conducted and radiated testing were performed according to the procedures documented on chapter 13 of ANSI C63.4 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and 2.1057.

5. TEST FACILITY

The open area test sites and conducted measurement facilities used to collect the radiated data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

6. ACCREDITATION AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code: 200065-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government. In addition, the test facilities are listed with Federal Communications Commission (reference no: 31040/SIT (1300B3) and 31040/SIT (1300F2))

6.1. Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
USA	NVLAP*	FCC Part 15, CISPR 22, AS/NZS 3548,IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11, CNS 13438	200065-0
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	1300
Japan	VCCI	CISPR 22 Two OATS and one conducted Site	R-1014, R-619, C-640
Norway	NEMKO	EN50081-1, EN50081-2, EN50082-1, EN50082-2, IEC61000-6-1, IEC61000-6-2, EN50083-2, EN50091-2, EN50130-4, EN55011, EN55013, EN55014-1, EN55104, EN55015, EN61547, EN55022, EN55024, EN61000-3-2, EN61000-3-3, EN60945, EN61326-1	ELA 117
Norway	NEMKO	EN60601-1-2 and IEC 60601-1-2, the Collateral Standards for Electro-Medical Products. MDD, 93/42/EEC, AIMD 90/385/EEC	ELA-171
Taiwan	BSMI	CNS 13438	SL2-IN-E-1012
Canada	Industry Canada	RSS210 Low Power Transmitter and Receiver	IC2324 A,B,C, and F

*No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government

7. CALIBRATION AND UNCERTAINTY

7.1. Measuring Instrument Calibration

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

7.2. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Radiated Emission	
30MHz – 200 MHz	+/- 3.3dB
200MHz – 1000MHz	+4.5/-2.9dB
1000MHz – 2000MHz	+4.6/-2.2dB
Power Line Conducted Emission	
150kHz – 30MHz	+/-2.9

Any results falling within the above values are deemed to be marginal.

7.3. Test and Measurement Equipment

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENTS LIST				
Name of Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Due Date**
Quasi-Peak Detector	***HP9K - 1GHz***	***85650A***	***2521A01038***	***4/15/03***
Spectrum Analyzer	***HP100Hz - 1.5GHz***	***8568A***	***101236***	***4/15/03***
Spectrum Analyzer	**HP100Hz - 1.5GHz**	**8568B**	**2841A04227**	**4/15/03**
Pre-Amplifier,25 dB	***HP0.1 - 1300MHz***	***8447D (P5)***	***2944A06550***	***8/10/02***
Antenna, Bicon	***Eaton30 - 200MHz***	***94455-1***	***1214***	***3/30/03***
Antenna, LP	***EMCO200 - 2000MHz***	***3146***	***2120***	***3/30/03***
Pre-Amplifier	***MITEQ1-26GHz***	***NSP2600-44***	***646456***	***4/26/03***
EMC Analyzer	***HP9K - 26.5GHz***	***HP8593EM***	***3710A00205***	***11/6/03***
Line Filter	***Lindgren 10k - 10GHz***	***LMF-3489***	***497***	***N.C.R.***
LISN	***Solar Elec. Co.***	***8012-50-R-24-BNC***	***837990***	***8/8/02***
LISN	***Fischer 9k - 100MHz***	***FCC-LISN-50/250-25-2***	***114***	***8/8/02***
EMI Test Receiver	***Rohde & Schwarz***	***ESHS 20***	***827129/006***	***4/17/03***
Spectrum Analyzer	**HP100Hz - 22GHz**	**8566B**	**2140A01296**	**5/16/03**
Quasi-Peak Detector	**HP9K - 1GHz**	**85650A**	**2811A01335**	**5/23/03**
Spectrum Display	**HP**	**85662A**	**3026A19146**	**5/23/03**
Horn Antenna	**EMCO**	**3115**	**6739**	**1/31/03**
Spectrum Analyzer	**HP**	**HP8593EM**	**3710A00205**	**6/11/03**
Spectrum Analyzer	**HP**	**HP8563E**	**Not Provided**	**3/18/03**

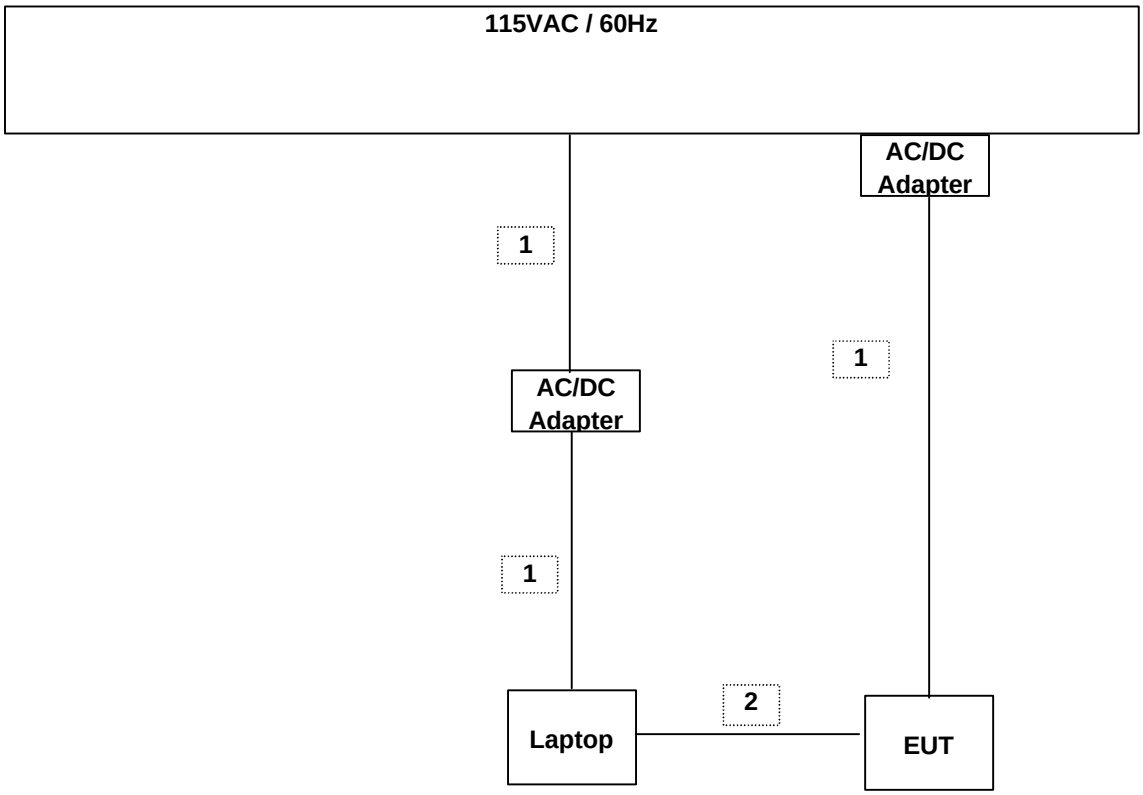
8. SUPPORT EQUIPMENT / EUT SETUP

The following peripheral support equipment was utilized to operate the equipment under test:

- Was use for ITE devices minimum configuration requirement:

TEST PERIPHERALS				
Device Type	**Manufacturer**	**Model Number**	**Serial Number**	**FCC ID**
Laptop	**Personal Computer**	**N340S8**	**PB344S811902382**	**DoC**
AC/DC Adapter	**LI SHIN CORP**	**LSE9802A2060**	**10810241**	**N/A**
AC/DC Adapter	**Not Provided**	**A10D1-05MP**	**A984606445**	**N/A**
DC Injector	***OTC Wireless***	***N/A***	***N/A***	***N/A***

The following setup was used to operate the equipment under test:



TEST I / O CABLES								
Cable No	I/O Port	# of I/O Port	Connector Type	Type of Cable	Cable Length	Data Traffic	Bundled	Remark
1	AC	3	US 115V	Un-shielded	1m	No	No	N/A
2	Networking	1	RJ45	Un-shielded	0.5m	Yes	No	N/A

9. APPLICABLE RULES AND BRIEF TEST RESULT

§15.247 (a) (2) - BANDWIDTH LIMITATION

(a) (2) For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

§15.247 (b) (1) - POWER OUTPUT

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

§15.247 (c) – SPURIOUS EMISSION

(c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

§15.247 (d) - PEAK POWER SPECTRAL DENSITY

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

§15.205- RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]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
6.215 - 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	([2])
13.36 - 13.41			

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.207- CONDUCTED LIMITS

(a) For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 450 kHz to 30 MHz shall not exceed 250 microvolts. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

FCC 15.207

FREQUENCY RANGE	FIELD STRENGTH (Microvolts)	FIELD STRENGTH (dBuV)/QP
450kHz-30MHz	250	48

§15.209- RADIATED EMISSION LIMITS; GENERAL REQUIREMENTS

(a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

(b) In the emission table above, the tighter limit applies at the band edges.

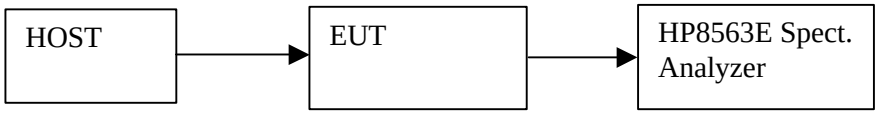
FCC PART 15.209

MEASURING DISTANCE OF 3 METER		
FREQUENCY RANGE (MHz)	FIELD STRENGTH (Microvolts/m)	FIELD STRENGTH (dBuV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

10. TEST SETUP, PROCEDURE AND RESULT

10.1. PEAK POWER OUTPUT

TEST SETUP



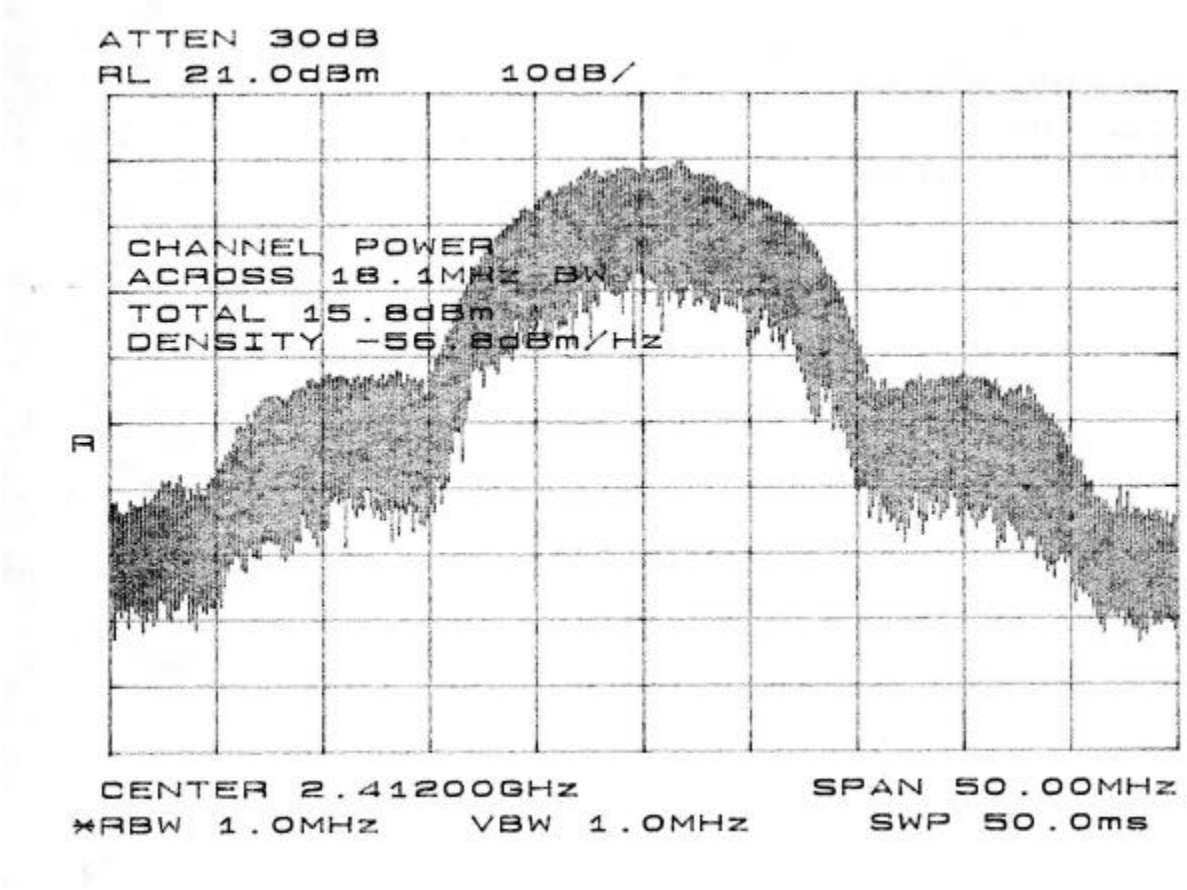
TEST PROCEDURE

The EUT is configured on a test bench as shown above in a continuously transmitting mode.
While the transmitter is on, the Spectrum Analyzer captures the emission displaying the value on screen.
Recorded the value on a template below.

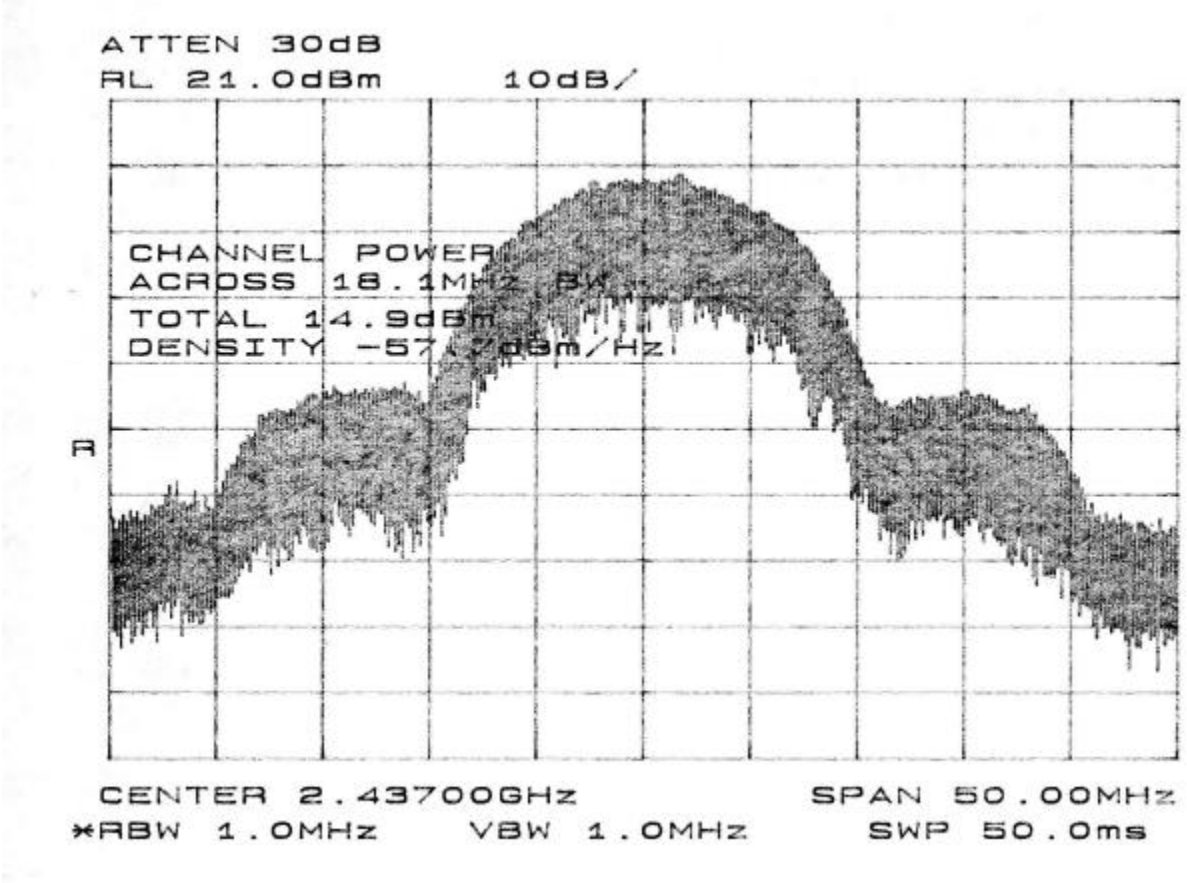
Channel	*Frequency (MHz)*	*Output Power (watts)*
LOW	*2412*	*0.038 (15.8 dBm)*
MID	*2437*	*0.031 (14.9 dBm)*
HIGH	*2462*	*0.029 (14.6 dBm)*

See Plots Below:

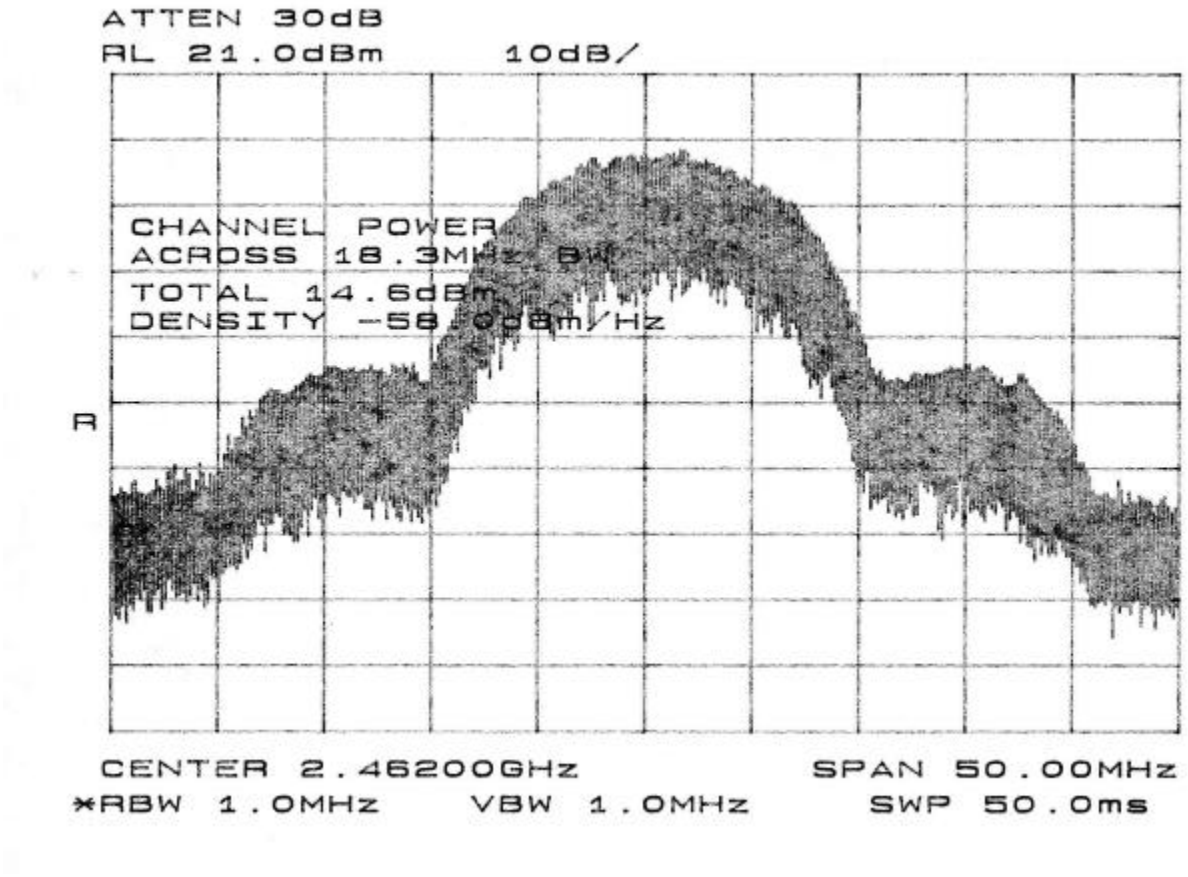
LOW CHANNEL
CONDUCTED PEAK OUTPUT POWER CH1



MIDDLE CHANNEL
CONDUCTED PEAK OUTPUT POWER CH6



HIGH CHANNEL
CONDUCTED PEAK OUTPUT POWER CH11



10.2. 6 dB BANDWIDTH MEASUREMENT

TEST SETUP

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
Above 1000	☒ Peak	☒ 300 kHz	☒ 300 kHz

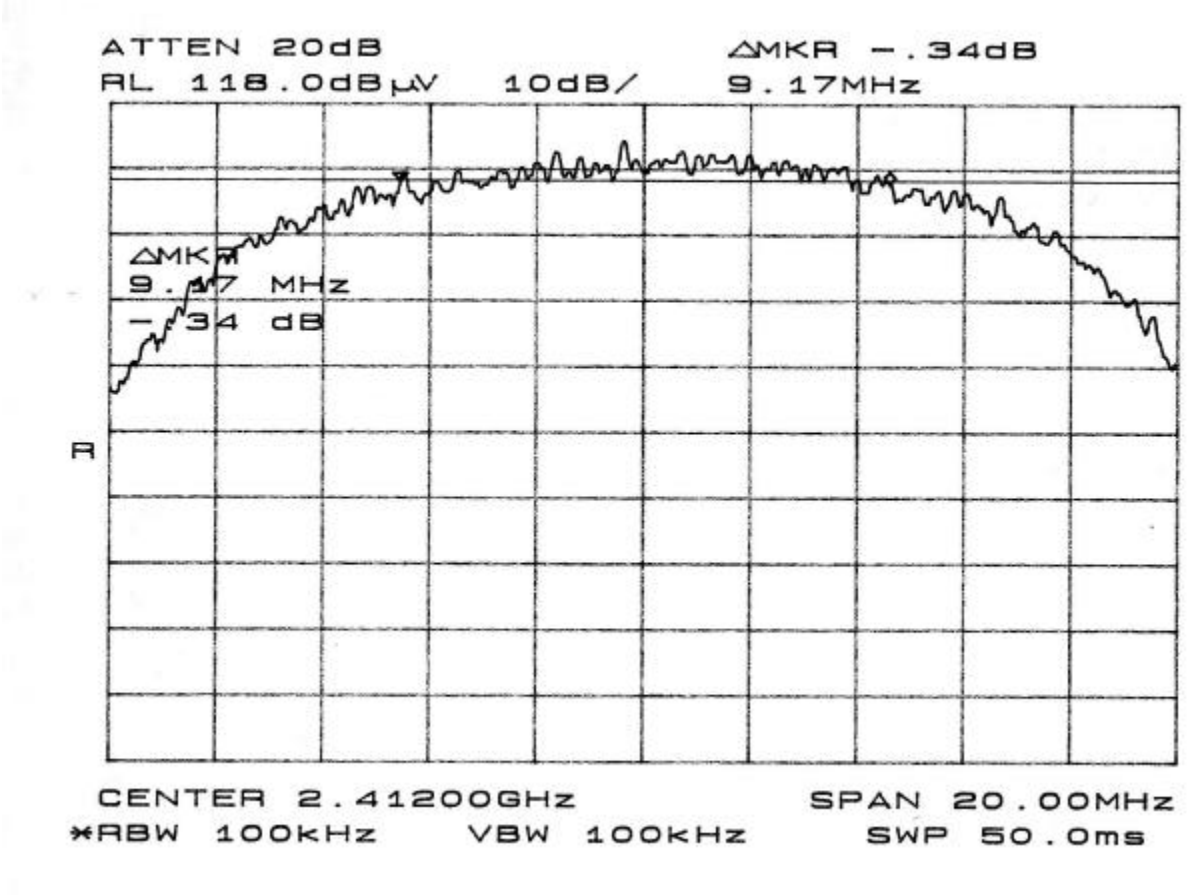
TEST PROCEDURE

The EUT transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 kHz RBW and 100 kHz VBW.

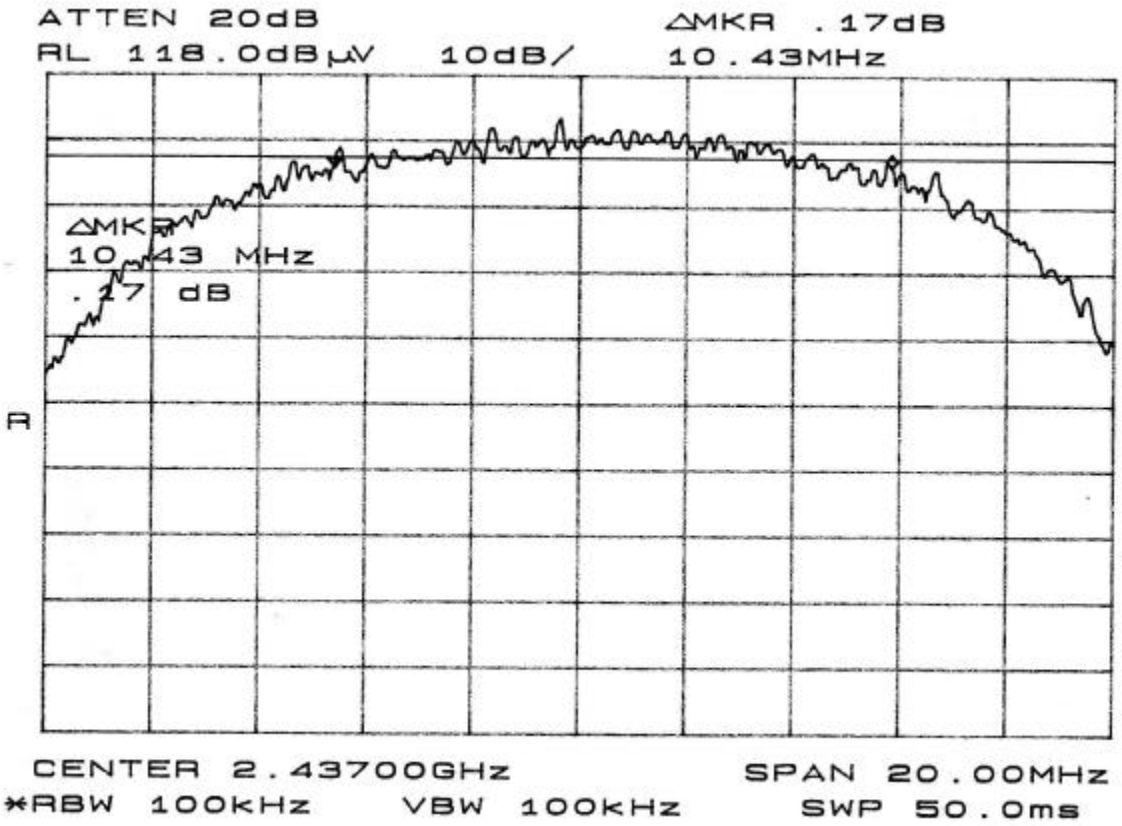
RESULT

No non-compliance noted. See plots below.

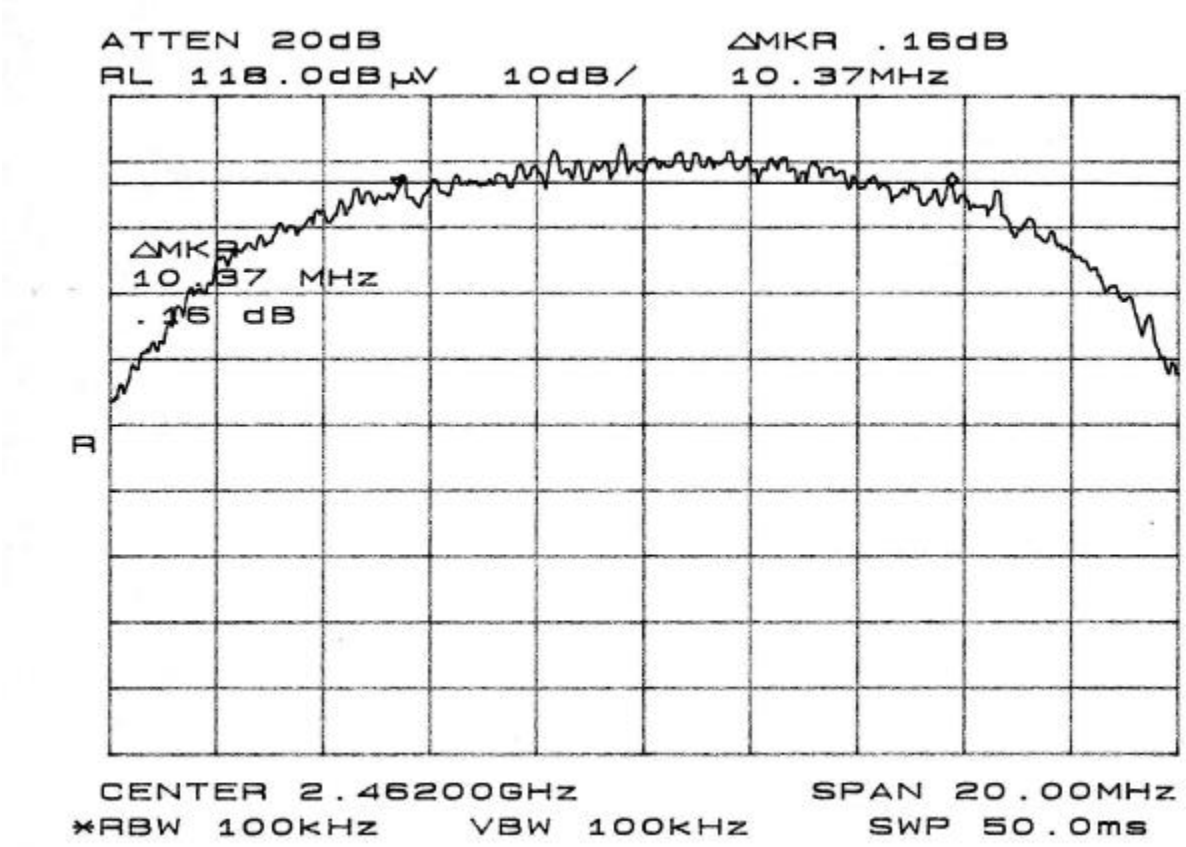
LOW CHANNEL
6dB BANDWIDTH CH1



MIDDLE CHANNEL
6dB BANDWIDTH CH6



HIGH CHANNEL
6dB BANDWIDTH CH11



10.3. CONDUCTED SPURIOUS EMISSION

TEST SETUP

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
30 - 25000	☒ Peak	☒ 100 kHz	☒ 100 kHz

TEST PROCEDURE

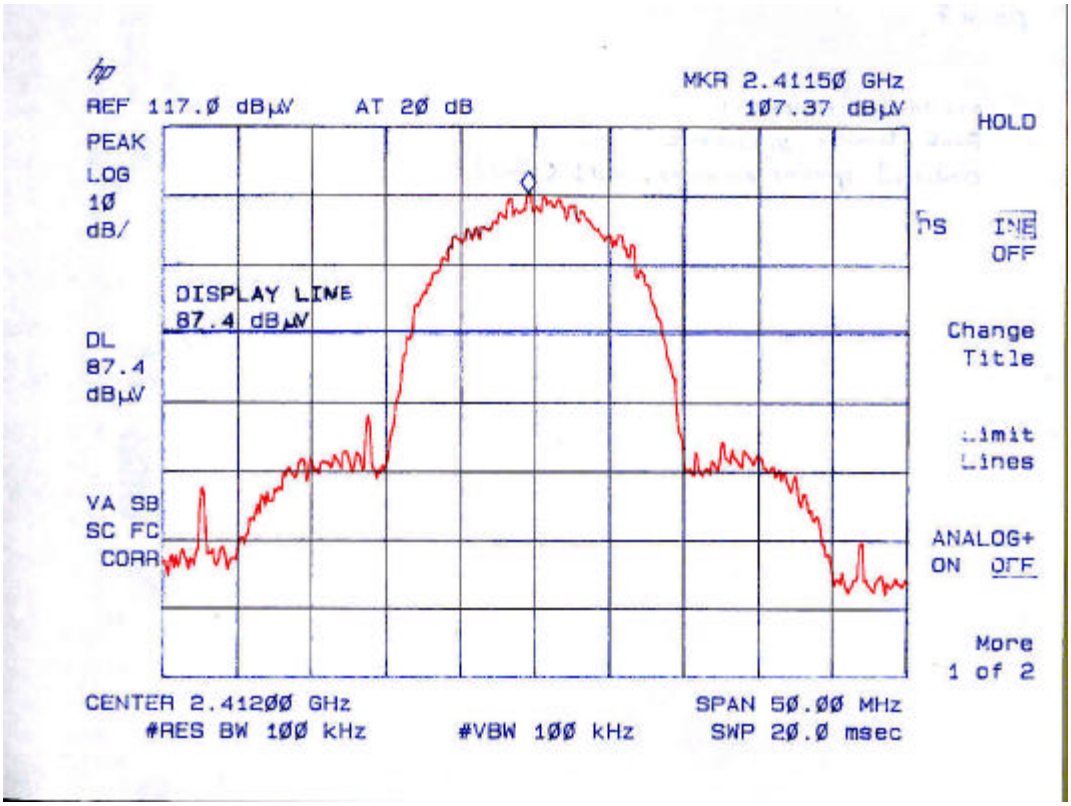
Connect the Eut's antenna port to the Spectrum Analyzer's input port.
Investigate the entire frequency of the carrier frequency, up to the tenth harmonic.

RESULT

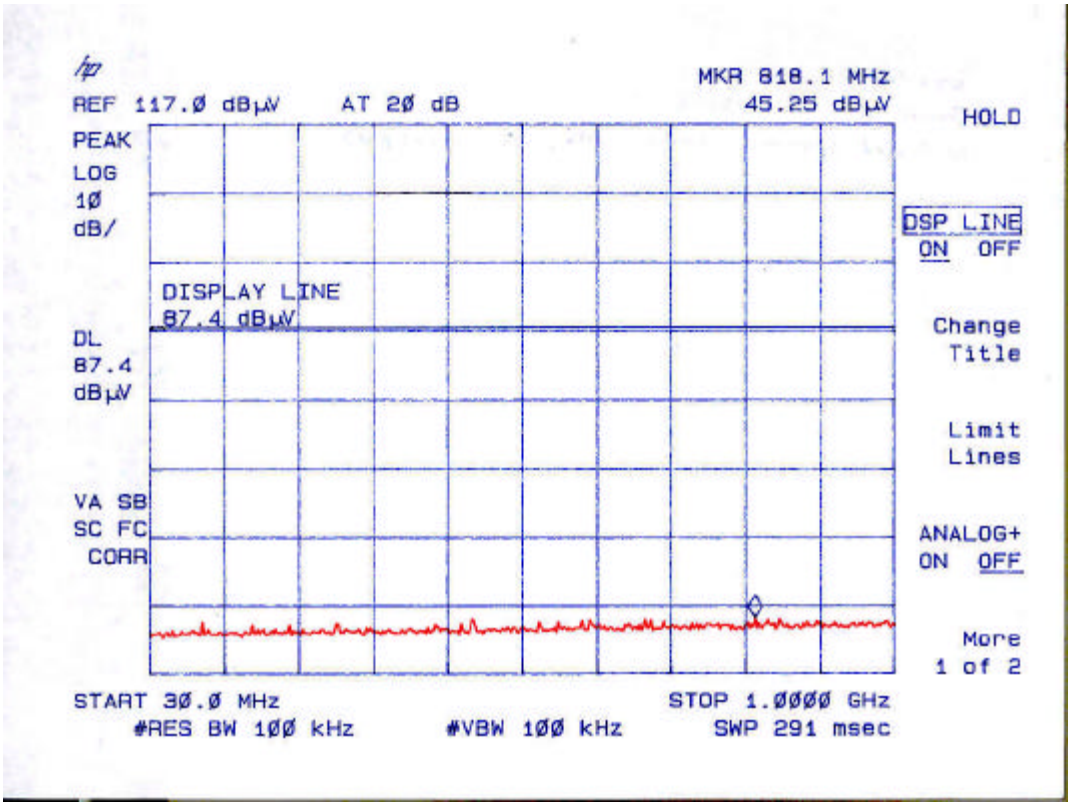
No non-compliance noted. See below plots for LOW, MID, HIGH channels.

Channel	Ferq (MHz)	Field Strength (dBuV/m)	Limit (dBuV/m) –20dBc	Margin (dB)
Low	818.1	45.25 (Noise Floor)	87.4	-42.15
Low	2457	71.05	87.4	-16.35
Low	22880	62.69(Noise Floor)	87.4	-24.71
Middle	718.7	45.7(Noise Floor)	87.5	-41.8
Middle	2373	69.39	87.5	-18.11
Middle	23.16	62.54(Noise Floor)	87.5	-24.96
High	840	44.19(Noise Floor)	86.7	-42.51
High	2407	72.73	86.7	-13.97
High	22710	62.47(Noise Floor)	86.7	-24.23

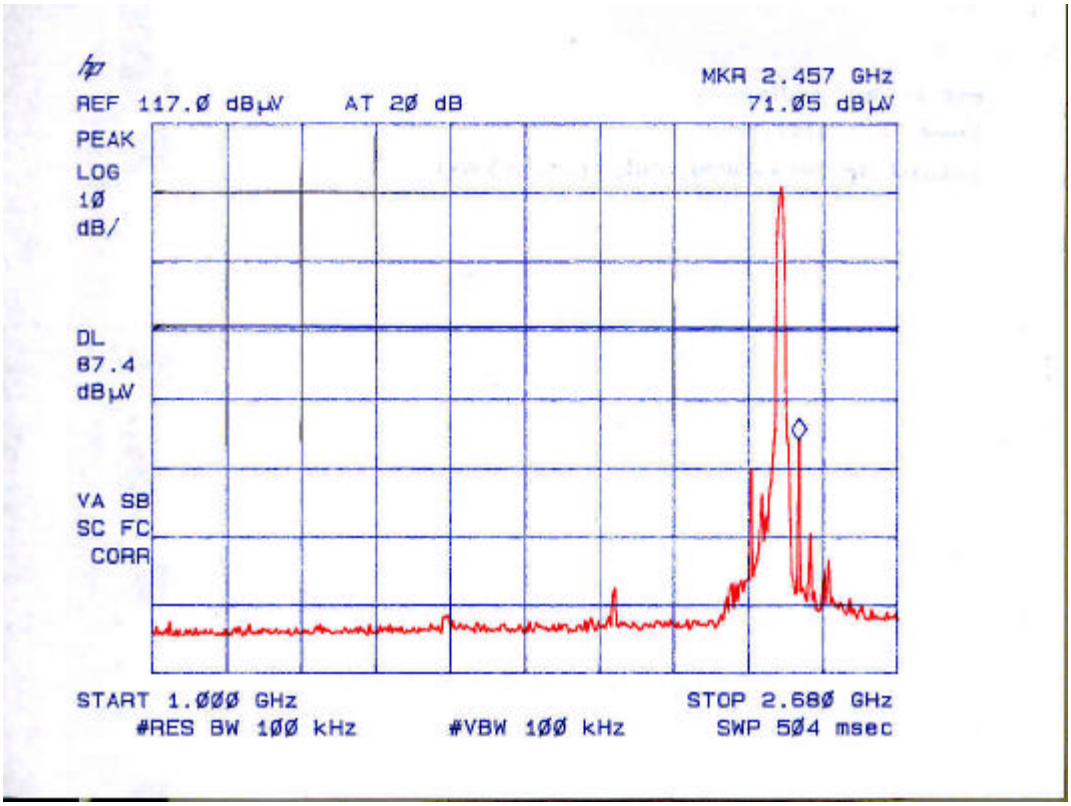
LOW CHANNEL
CONDUCTED SPURIOUS EMISSIONS CH1 (FUNDAMENTAL)



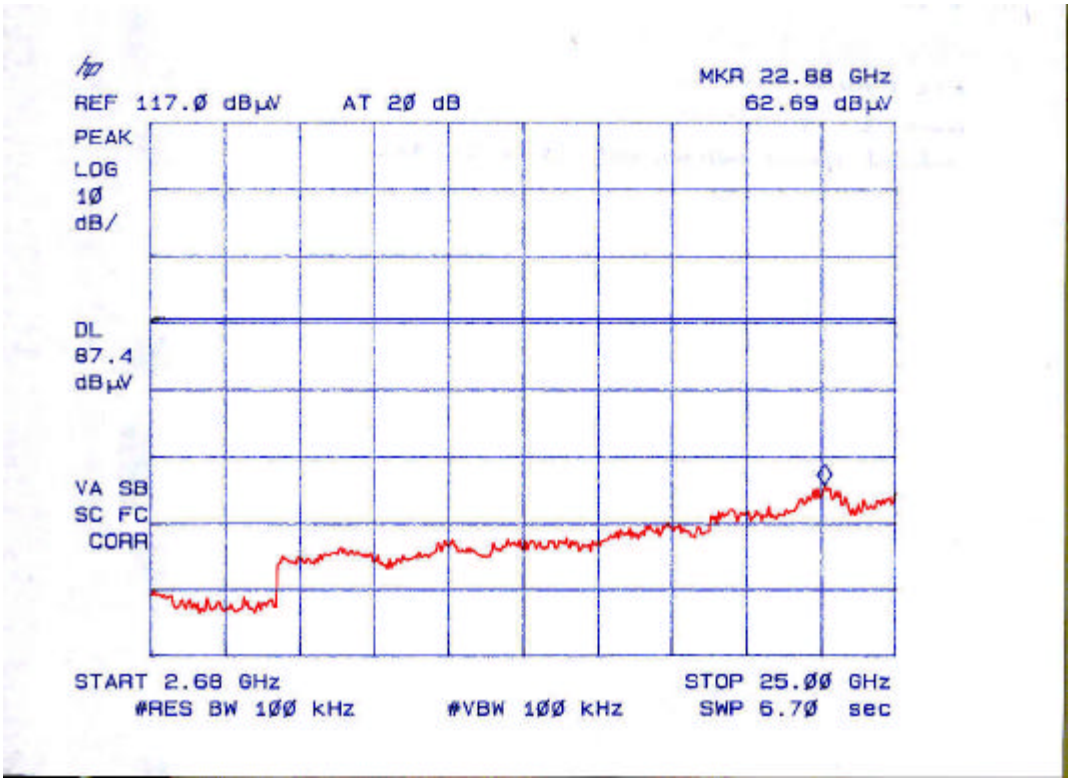
LOW CHANNEL
CONDUCTED SPURIOUS EMISSIONS CH1 (30-1000MHz)



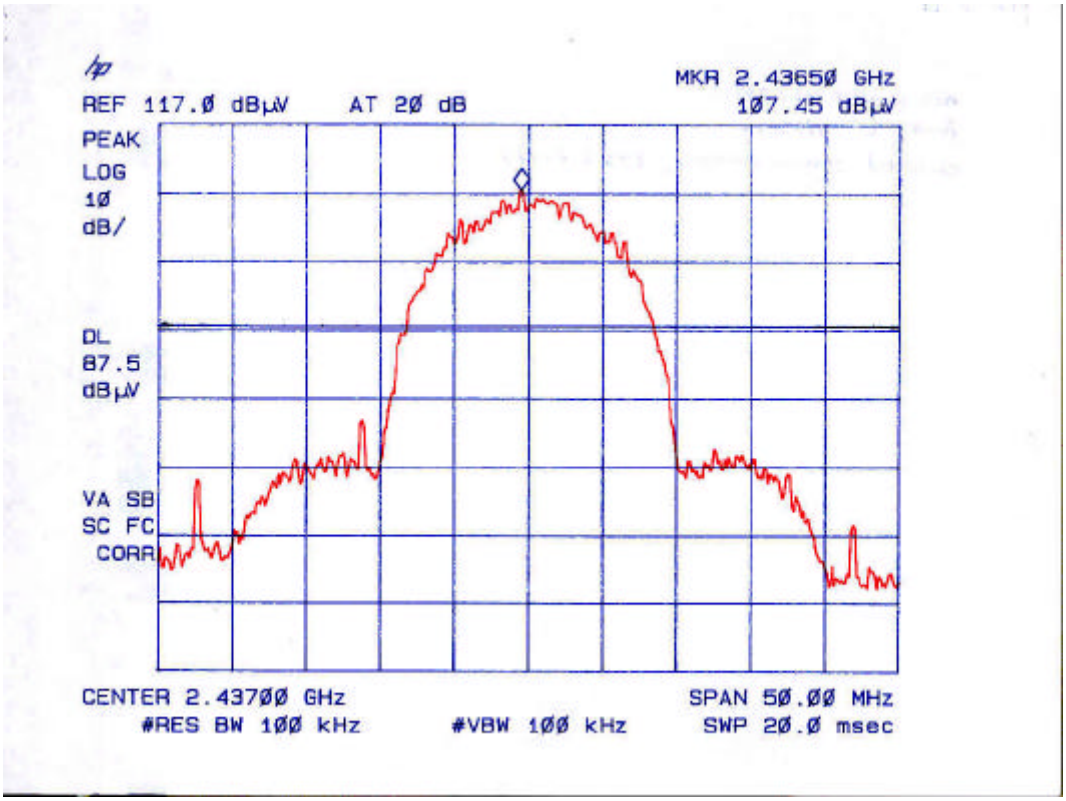
LOW CHANNEL
CONDUCTED SPURIOUS EMISSIONS CH1 (1-2.68GHz)



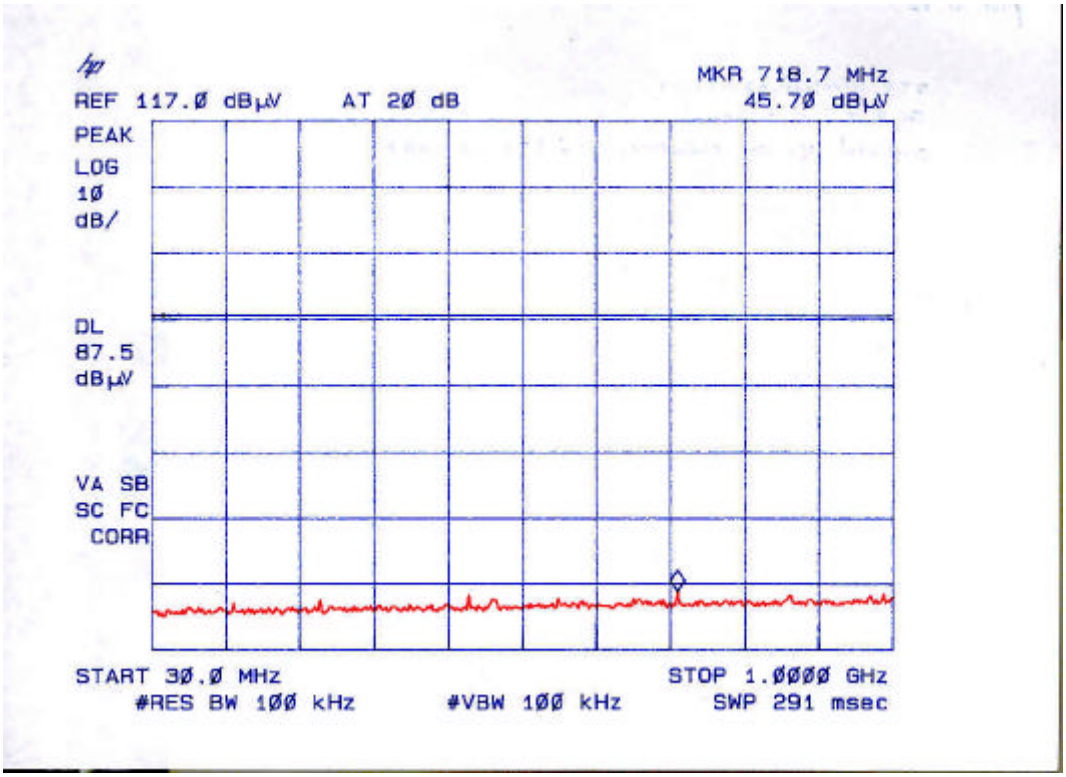
LOW CHANNEL
CONDUCTED SPURIOUS EMISSIONS CH1 (2.68-25GHz)



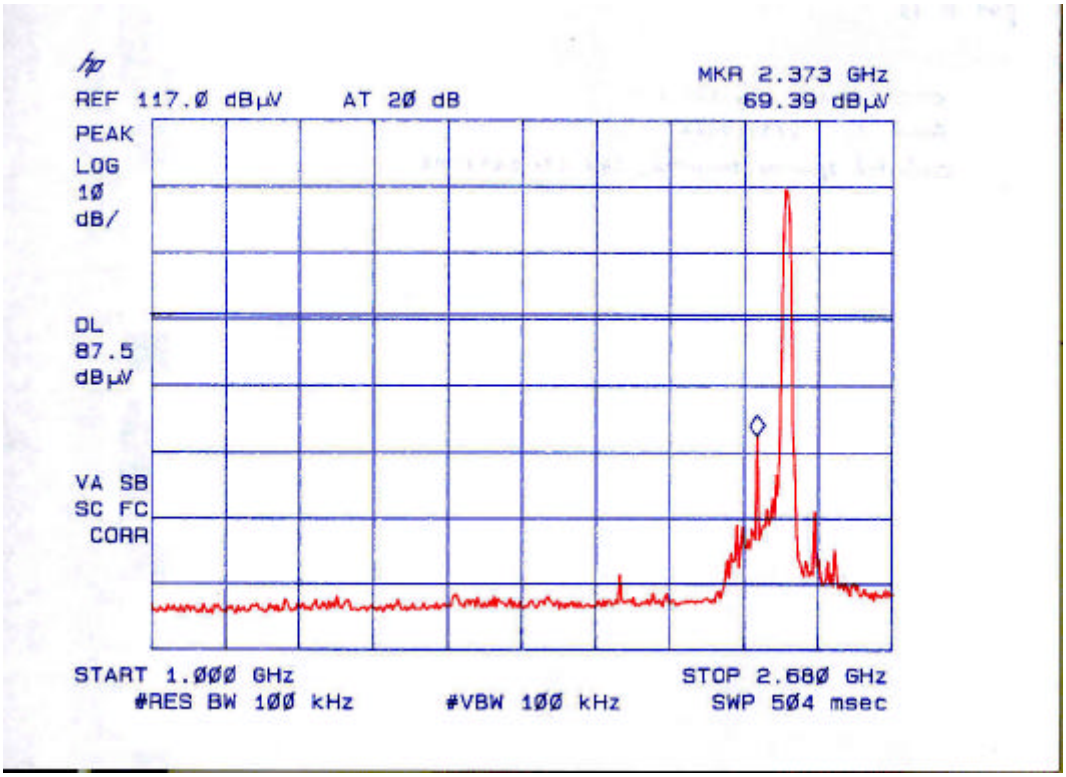
MIDDLE CHANNEL
CONDUCTED SPURIOUS EMISSIONS CH6 (FUNDAMENTAL)



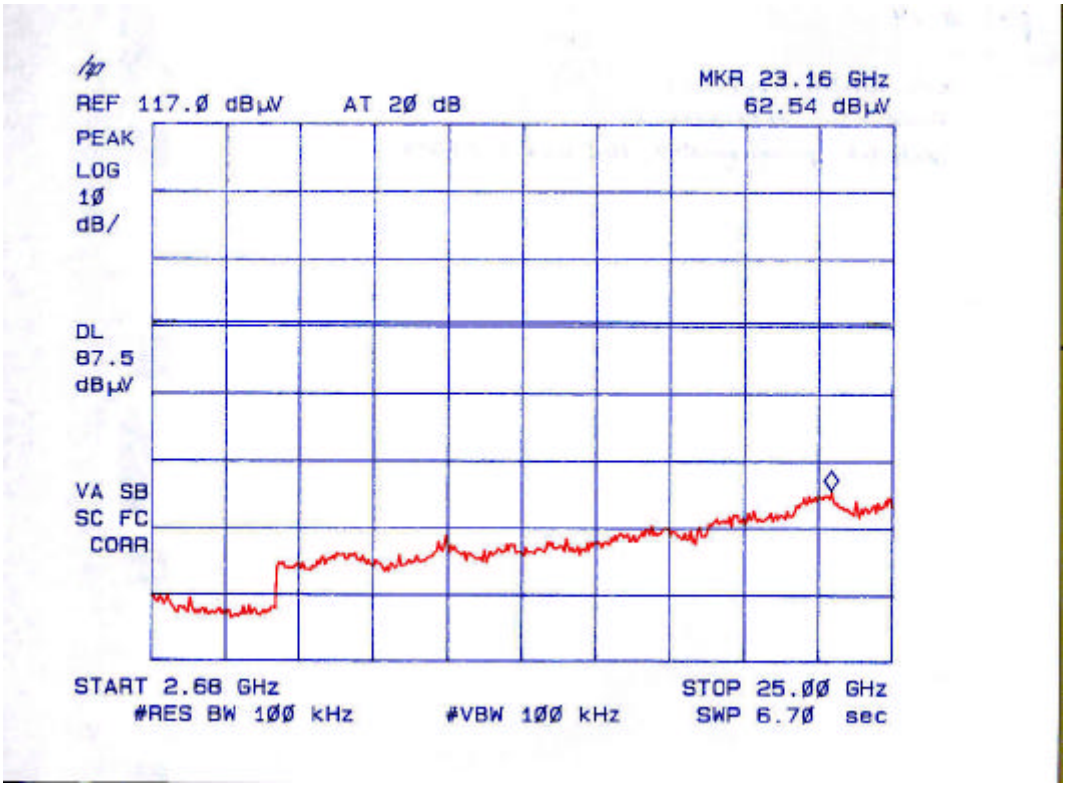
MIDDLE CHANNEL
CONDUCTED SPURIOUS EMISSIONS CH6 (30-1000MHz)



MIDDLE CHANNEL
CONDUCTED SPURIOUS EMISSIONS CH6 (1-2.68GHz)



MIDDLE CHANNEL
CONDUCTED SPURIOUS EMISSIONS CH6 (2.68-25GHz)



HIGH CHANNEL
CONDUCTED SPURIOUS EMISSIONS CH11 (FUNDAMENTAL)