TEST NUMBER - 285-02

TESTING TO

FEDERAL COMMUNICATIONS COMMISSION CFR47 PART15.239

Low Power License-Exempt Radiocommunication Devices
Intentional Radiators 88-108 MHz

for

Harman Becker Automotive Systems
1201 South Ohio Street
Martinsville, IN 46151

of

FM Automotive TX

Production Prototype

FCC ID: QNG-02001

on

8/30/02

Tested by

Andrew Mertinooke

Reviewed by

Clifton P Brick

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Compliance Worldwide, Inc. – 357 Main Street – Sandown, NH 03873
(603) 887 3903 Fax 887 6445
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TEST DESCRIPTION

1. TEST OBJECTIVE

To test the FM Automotive TX Production Prototype to RSS 210 / Part 15 Subpart C Rules and write a report.

2. E.U.T. DESCRIPTION

GENERAL

The FM Automotive TX is a FM band low power transmitter designed to be installed in an automobile by the auto dealer or at the factory. The purpose of the unit is to relay the audio from a DVD player to the automobile's sound system.

SERIAL NUMBERS:

Production Prototype

TEST RESULTS AND CONCLUSIONS

PRODUCT TESTED - FM Automotive TX

MODEL NUMBER - Production Prototype

RADIATED TEST RESULTS

The test results show that the emissions radiated from this equipment are in compliance with FCC Rules Part 15 Subpart C.

OCCUPIED BANDWIDTH & OUTPUT POWER

The test results show that the occupied bandwidth and output power of this equipment are in compliance with FCC Rules Part 15 Subpart C .

CONDUCTED TEST RESULTS

The EUT has no AC Mains connection, therefore conducted emissions were not measured.

ANALYSIS AND CONCLUSIONS

Based upon the radiated measurements we find that this equipment is within the limits of the FCC Rules Part 15 Subpart C. All results are based on a test of one sample, and represent other production units, only in as much as a sample represents other production units. If any significant changes are made to the unit, the changes shall be evaluated and a retest may be required.

NOTES (Special conditions unique to this test)

None

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TEST PROCEDURES

1. TEST EQUIPMENT

A. HP 8546A (9 kHz - 6.5 GHz) EMI Receiver w/ RF Filter Section, S/N 3704A00323 / 3650A00360. Calibration Date 10-18-2001, calibrated annually.

B. Com-Power Biconilog Antenna, Model AC220, S/N 25509. Calibration Date 12-14-2001, calibrated annually.

C. EMCO LISN, Model EM 3825/2, S/N 9109-1860. Calibration Date: 3-11-2002, calibrated annually.

2. FREQUENCY RANGE TO BE SCANNED.

A. Radiated Test from 30 MHz to 40 GHz (or the 10^{th} harmonic of the highest frequency whichever is lower).

B. Conducted Test from 450 kHz to 30 MHz.

3. TEST PROCEDURES.

Radiated test procedure:

The EUT, associated cables and peripheral devices are placed on the supporting table and any support equipment is placed off the site. The EUT is turned on and any necessary operating or test software installed and allowed to warm up. The EUT is pre-scanned in our ferrite tile lined chamber where it is rotated 360 degrees and examined in both horizontal and vertical polarization, all emission frequencies are identified and recorded. The EUT is then moved to the OATS and the frequency band from 30 MHz to 40 GHz is scanned, all frequencies identified in the chamber are investigated, as well as harmonic frequencies of the EUT. When an emission is found the emission is maximized by varying the bundle position of the connecting cables, the antenna height, the antenna polarization (vertical and horizontal) and the table orientation (360 degrees). The maximum reading is recorded and the next signal is searched for.

Conducted test procedure:

The power line of the EUT is connected to the LISN (Line Impedance Stabilization Network). A measurement of the emissions are made from the power line for both phase and neutral on the analyzer in the frequency range from 450 kHz to 30 MHz. The maximum readings are recorded for each phase.

All measurements are made according to the procedures defined in: "ANSI C63.4-1992 Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz, American National Standard for (ISBN 1-55937-215-5).

FCC TEST LIMITS

1. FCC Part 15.209, 15.235, 15.249 Radiation Limits (Quasi-Peak):

Frequency MHz	Distance meters	Limit dBµV/m	Limit µV/m
1.705 - 30	30	29.5*	30*
30 - 88	3	40.0	100
49.82 - 49.90	3	80.0*	10,000*
88-108	3	48.0*	250*
88 - 216	3	43.5	150
216 - 960	3	46.0	200
902 - 928	3	94.0*	50,000*
960 - 1000	3	54.0	500
1000 - 40000	3	54.0*	500*

*NOTE: Average Limits

2. FCC Part 15.207 Conduction Limits (Quasi-Peak)

Frequency MHz	Limit dBµV/m	Limit µV/m
0.450 - 30.0	48.0	250

TEST FACILITY DESCRIPTION

Compliance Worldwide is located on 357 Main Street in Sandown, New Hampshire. The conducted and radiated test sites, located at C.W. are used for Federal Communications Commission (FCC) testing and Industry Canada Testing. A site description is on file with the FCC in Columbia, MD USA. Site information is also on file with Industry Canada, anyone wishing to review this Test Facility Description is referred to file number **IC 3023**. This is currently on file at Industry Canada, 1241 Clyde Avenue, Ottawa, ON K2C 1Y3.

The radiated site is a 3/10 meter indoor site with an enclosure for the product and a basement for the personnel, support equipment and test equipment.

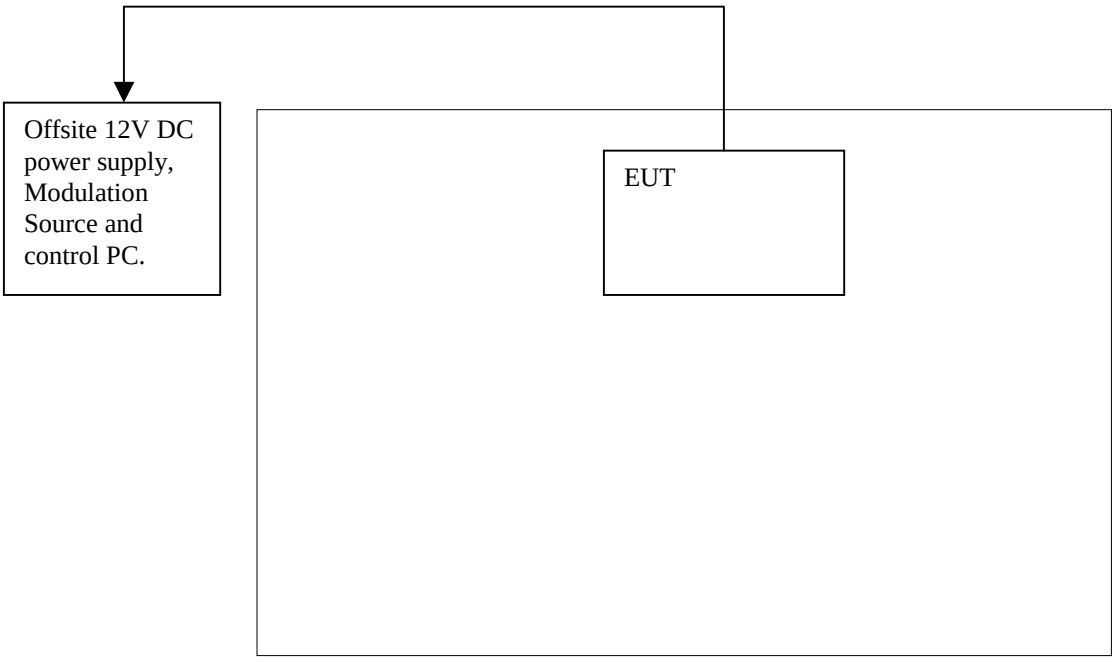
The conducted site is part of a 16' x 20' x 12' ferrite tile chamber and uses one of the walls for the vertical metal wall required by EN 55022.

Both sites are designed to test products or systems 1.5 meter x 1.0 meter, floor standing or table top.

DATE ON FILE FCC: August 10, 2000

DATE ON FILE IC: August 11, 2000

TEST SET UP
AND
PERIPHERAL CONNECTION INFORMATION



The EUT was connected to a Mastech model 3003 DC power Supply for power.

The EUT was connected to a Dell Inspiron model 3800 PC for control via a USB to RS232 adapter.

The EUT was connected to a HP Signal Generator for modulation input via two RCA connectors.

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PLEASE NOTE - EUT (equipment under test) is QNG-02001.

The cables directly connected to this equipment are listed below.

Connection Descriptions

1. ___Wiring Harness 6 conductor with connector_____
(description)

_____EUT_____
(from device)

_____Extension Cable_____
(to device)

CABLE LENGTH _1.5 ft (S) SHIELDED or (U) UNSHIELDED _S__

2. ____Category 5 cable using 5 conductors_____
(description)

______End of Wiring Harness Cable to EUT_____
(from device)

_Off Site support Equipment Power Supply, PC and Sig Gen.
(to device)

CABLE LENGTH __15 ft (S) SHIELDED or (U) UNSHIELDED _U _

RADIATED TEST RESULTS

Frequency Range:	30 - 1000 MHz.
Measurement Distance:	3.0 Meters.
Bandwidth:	120 kHz, Per ANSI C63.4-1992.*
Detector Functions:	Peak, Quasi Peak, Average
Video Filter:	300 kHz
Table Height:	0.8 meters
Antenna Height Variation:	1 - 4 Meters.

Horizontal and Vertical Polarization Measurements Taken.

*Measurement Bandwidth is 1 MHz above 1 GHz

PLEASE SEE NEXT PAGE FOR RADIATED TEST DATA

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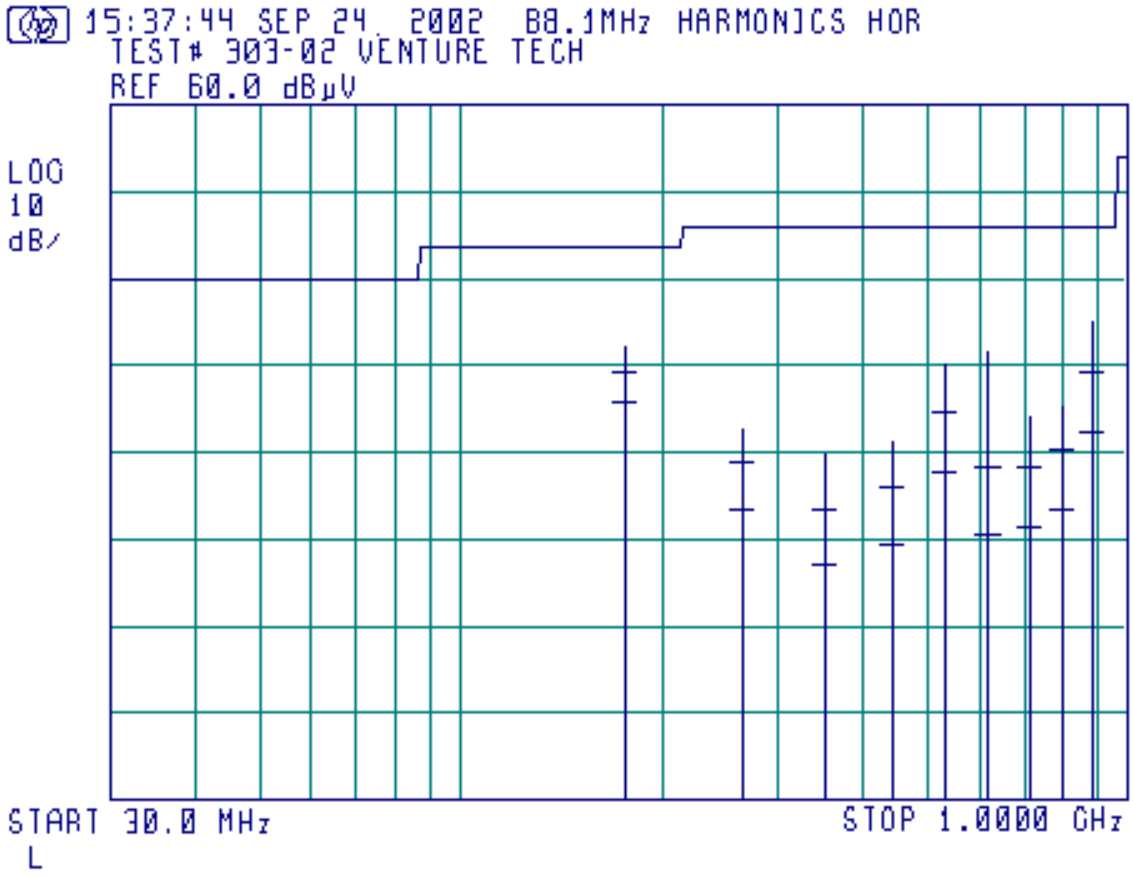
Radiated Horizontal Data Log Plot CH A



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Radiated Horizontal Tabular Data CH A

Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP Limit (dBuV)	QP Margin (dB)
176.164600	32.56	29.25	43.50	-14.25
264.268200	22.59	19.26	46.00	-26.74
352.486550	19.95	13.85	46.00	-32.15
440.460575	21.63	16.09	46.00	-29.91
528.560000	30.53	24.78	46.00	-21.22
616.767025	31.79	18.45	46.00	-27.55
704.851500	24.38	18.60	46.00	-27.40
792.893475	25.40	20.34	46.00	-25.66
880.996950	35.25	29.25	46.00	-16.75

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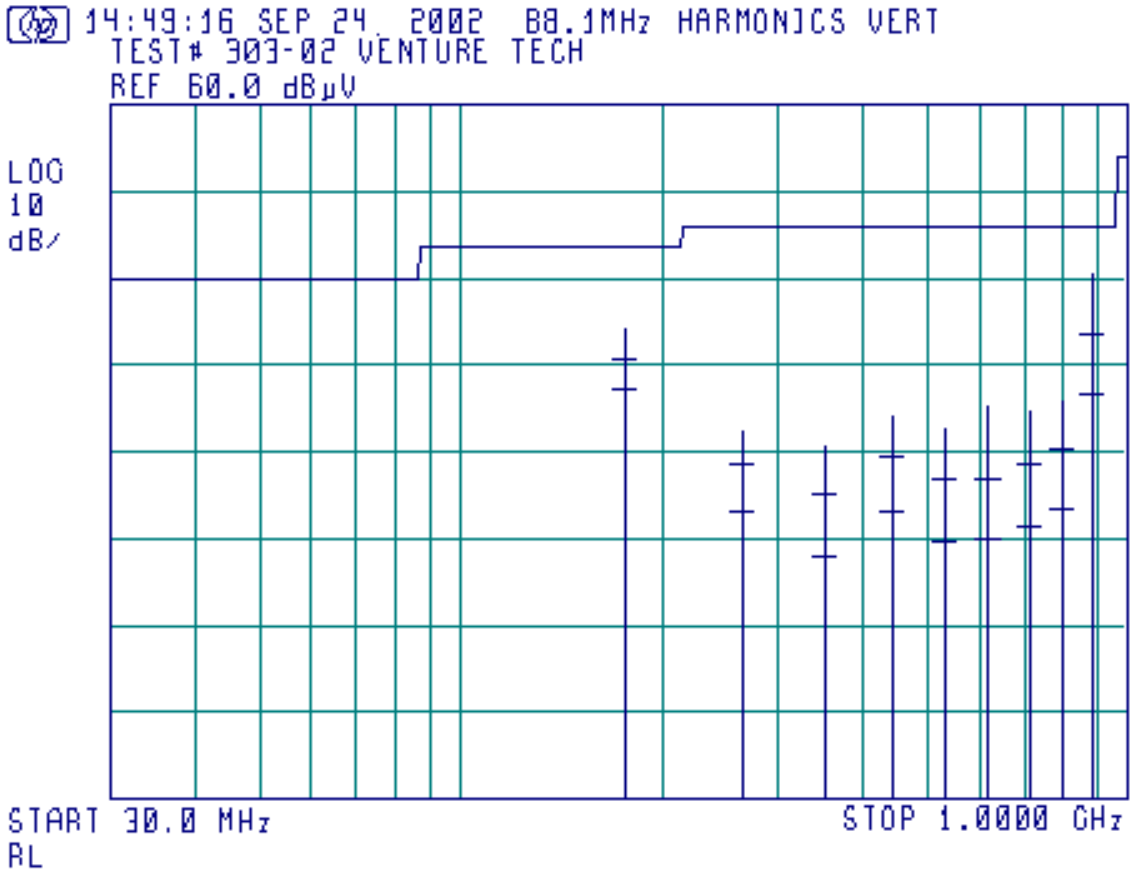
Radiated Vertical Data Log Plot CH A



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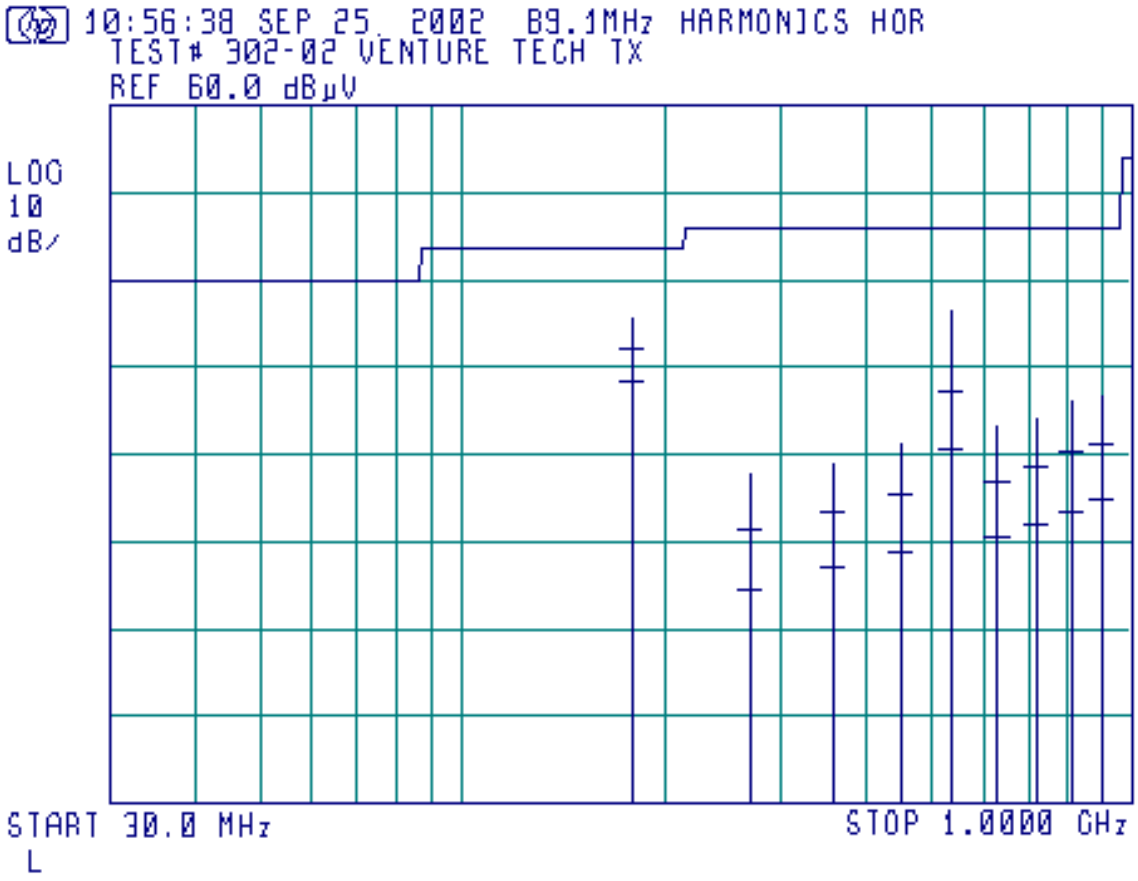
Radiated Vertical Tabular Data CH A

Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP Limit (dBuV)	QP Margin (dB)
176.164600	34.55	30.81	43.50	-12.69
264.268200	22.18	18.88	46.00	-27.12
352.486550	20.93	15.30	46.00	-30.70
440.460575	24.40	19.63	46.00	-26.37
528.560000	22.61	16.75	46.00	-29.25
616.767025	25.39	17.19	46.00	-28.81
704.851500	24.67	18.66	46.00	-27.34
792.893475	25.97	20.23	46.00	-25.77
880.996950	40.49	33.85	46.00	-12.15

Radiated Horizontal Data Log Plot CH B



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Radiated Horizontal Tabular Data CH B

Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP Limit (dBuV)	QP Margin (dB)
178.979025	35.48	32.36	43.50	-11.14
268.580850	17.92	11.49	46.00	-34.51
357.977550	19.19	13.83	46.00	-32.17
447.594000	21.72	15.85	46.00	-30.15
537.086400	36.72	27.25	46.00	-18.75
626.589200	23.69	17.42	46.00	-28.58
716.023500	24.30	18.66	46.00	-27.34
805.622875	26.05	20.50	46.00	-25.50
895.029050	27.19	21.64	46.00	-24.36

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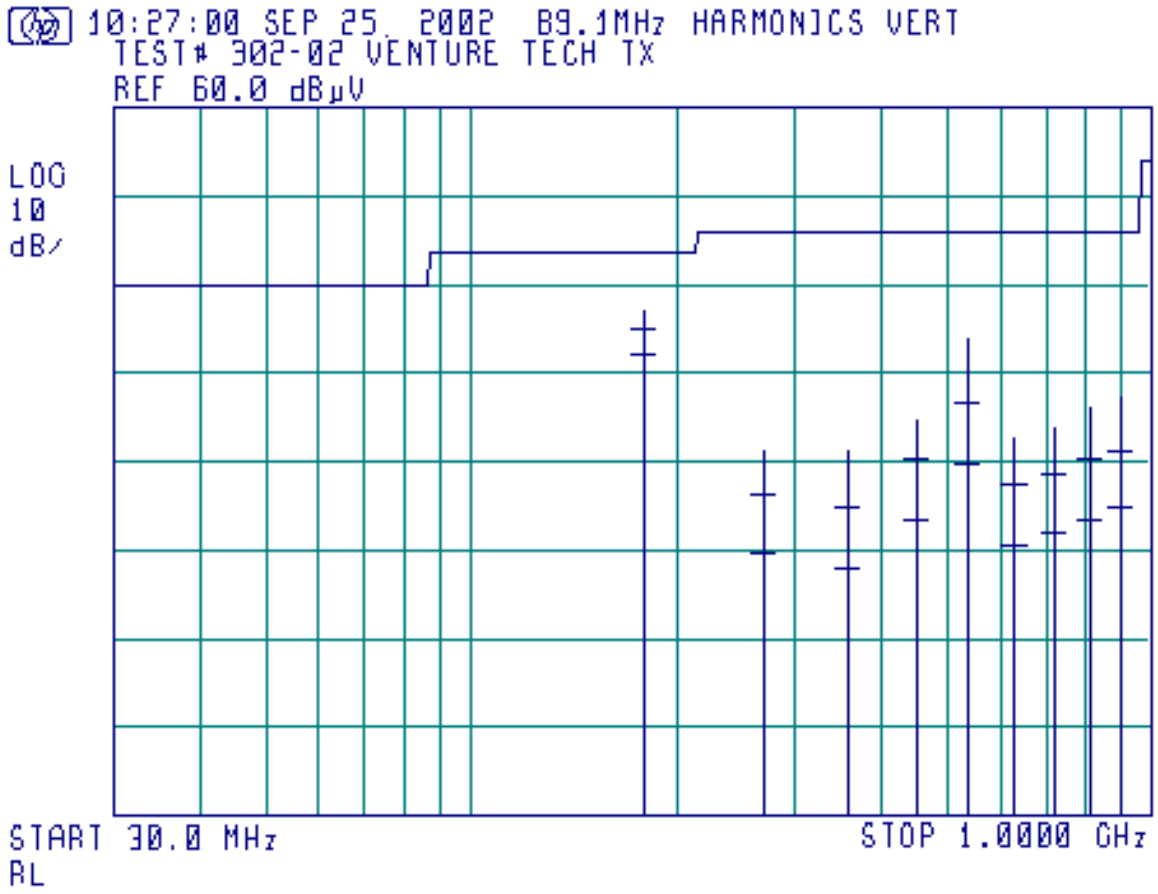
Radiated Vertical Data Log Plot CH B



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Radiated Vertical Tabular Data CH B

Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP Limit (dBuV)	QP Margin (dB)
178.979025	37.30	35.28	43.50	-8.22
268.580850	21.37	16.47	46.00	-29.53
357.977550	21.57	14.87	46.00	-31.13
447.594000	24.82	20.35	46.00	-25.65
537.086400	33.96	27.02	46.00	-18.98
626.589200	22.78	17.50	46.00	-28.50
716.023500	23.90	18.69	46.00	-27.31
805.622875	26.10	20.54	46.00	-25.46
895.029050	27.23	21.64	46.00	-24.36

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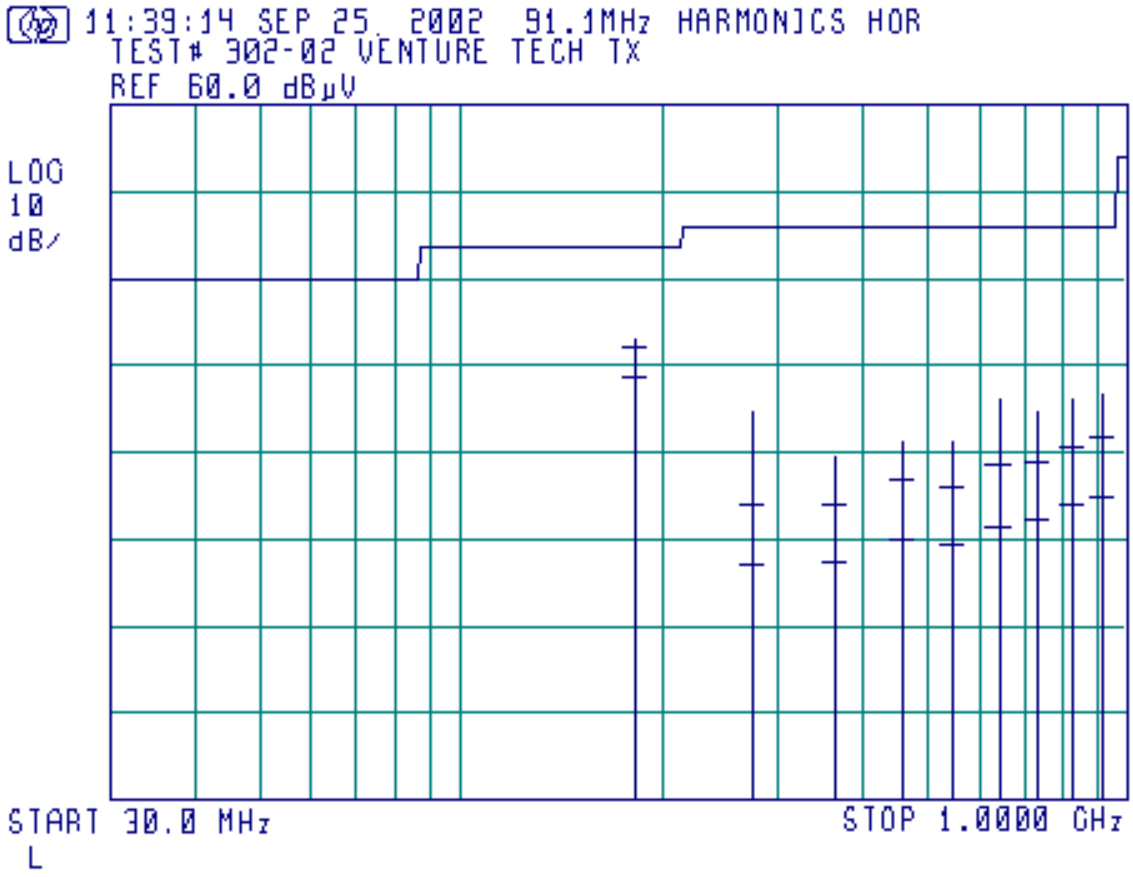
Radiated Horizontal Data Log Plot CH C



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Radiated Horizontal Tabular Data CH C

Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP Limit (dBuV)	QP Margin (dB)
182.244325	33.44	32.46	43.50	-11.04
273.367775	25.18	14.17	46.00	-31.83
364.505900	19.79	14.09	46.00	-31.91
455.610425	21.67	16.81	46.00	-29.19
546.830625	21.68	16.15	46.00	-29.85
638.037425	26.28	19.00	46.00	-27.00
729.251500	25.19	19.30	46.00	-26.70
820.371900	26.08	20.75	46.00	-25.25
911.485700	27.00	21.76	46.00	-24.24

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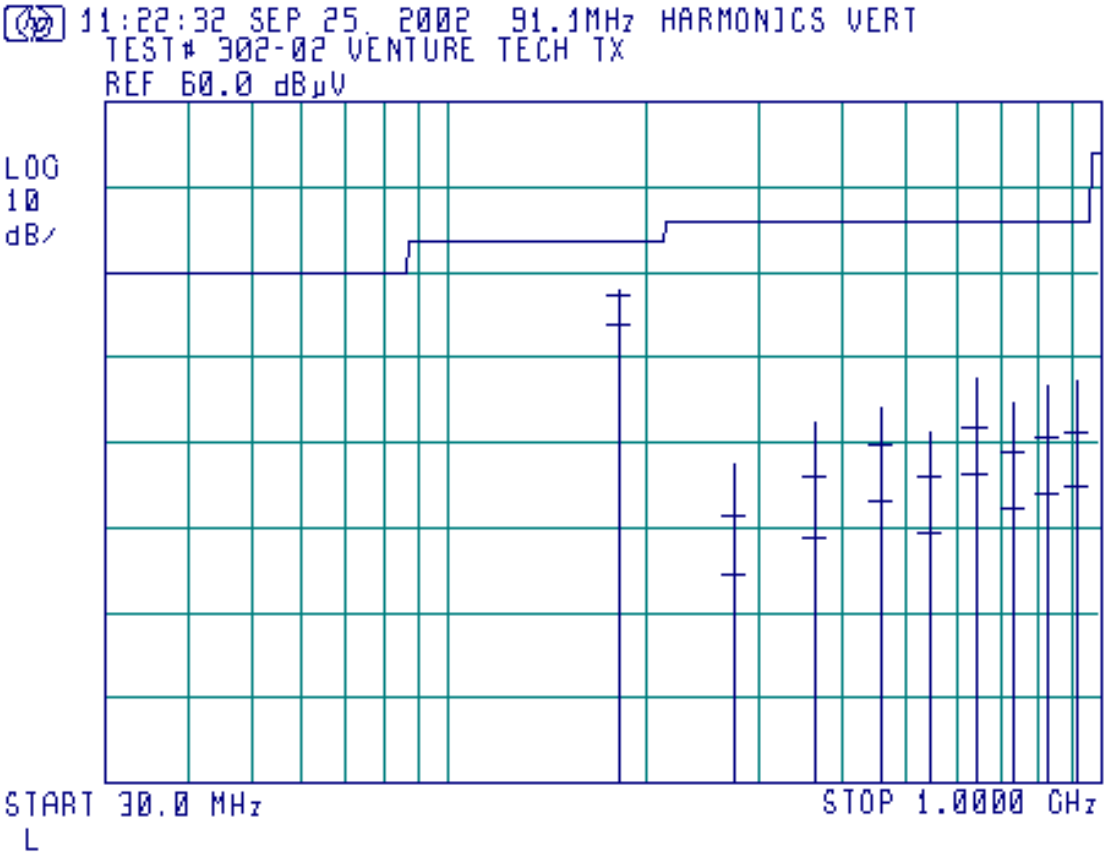
Radiated Vertical Data Log Plot CH C



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Radiated Vertical Tabular Data CH C

Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP Limit (dBuV)	QP Margin (dB)
182.244325	38.14	37.44	43.50	-6.06
273.367775	17.73	11.29	46.00	-34.71
364.505900	22.37	16.08	46.00	-29.92
455.610425	24.47	20.08	46.00	-25.92
546.830625	21.69	16.15	46.00	-29.85
638.037425	27.74	21.78	46.00	-24.22
729.251500	25.12	19.17	46.00	-26.83
820.371900	27.19	20.69	46.00	-25.31
911.485700	27.23	21.75	46.00	-24.25

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RADIATED OUTPUT POWER & OCCUPIED BANDWIDTH TEST RESULTS

Frequency Range:	88-108 MHz.
Measurement Distance:	3.0 Meters.
Bandwidth:	As Noted, Per ANSI C63.4-1992.
Detector Functions:	Peak, Quasi Peak, Average.
Video Filter:	300 kHz
Table Height:	0.8 meters
Antenna Height Variation:	1 - 4 Meters.

Horizontal and Vertical Polarization Measurements Taken, Worst Case Reported.

PLEASE SEE NEXT PAGE(S) FOR OCCUPIED BANDWIDTH RADIATED TEST DATA

Output power was examined at 10 VDC, 12.4 VDC and 14.8 VDC, no change in amplitude was observed. Final tests done at 12.4 VDC.

Modulation was examined at 500 Hz, 1 kHz, 2 kHz, and 5 kHz. 1 kHz at 1.0 VPP was found to be worst case and used in the final measurements. Per the manufacturer, the typical input voltages will be less than 1VPP and above 1kHz will typically be less than 0.5 VPP.

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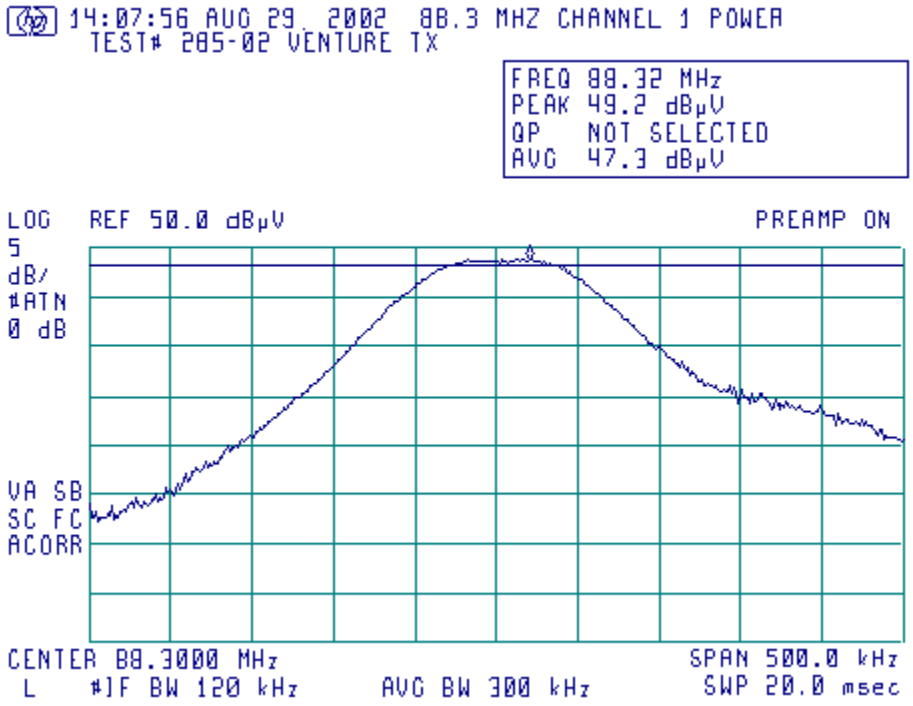
Channel A Output Power Plot



Frequency (MHz)	Peak Amplitude (dBuV/m)	Avg Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
88.3000	49.2	47.3	48	-0.7

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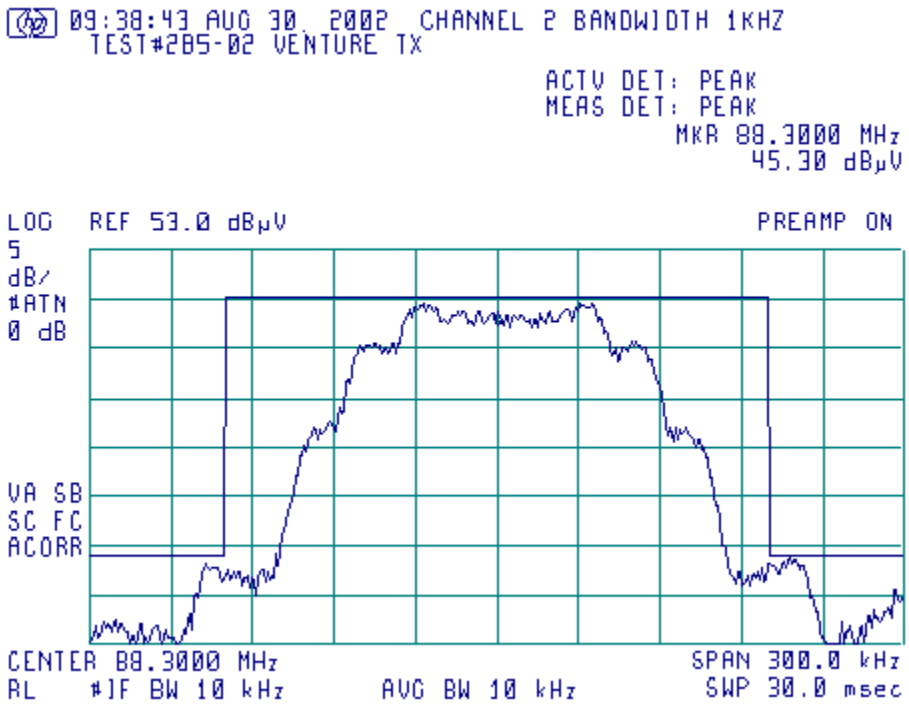
Channel A Occupied Bandwidth Plot



Display shows a mask with the top limit at 48 dBuV, and the lower flanks 200 kHz wide and 26 dB below the top limit.

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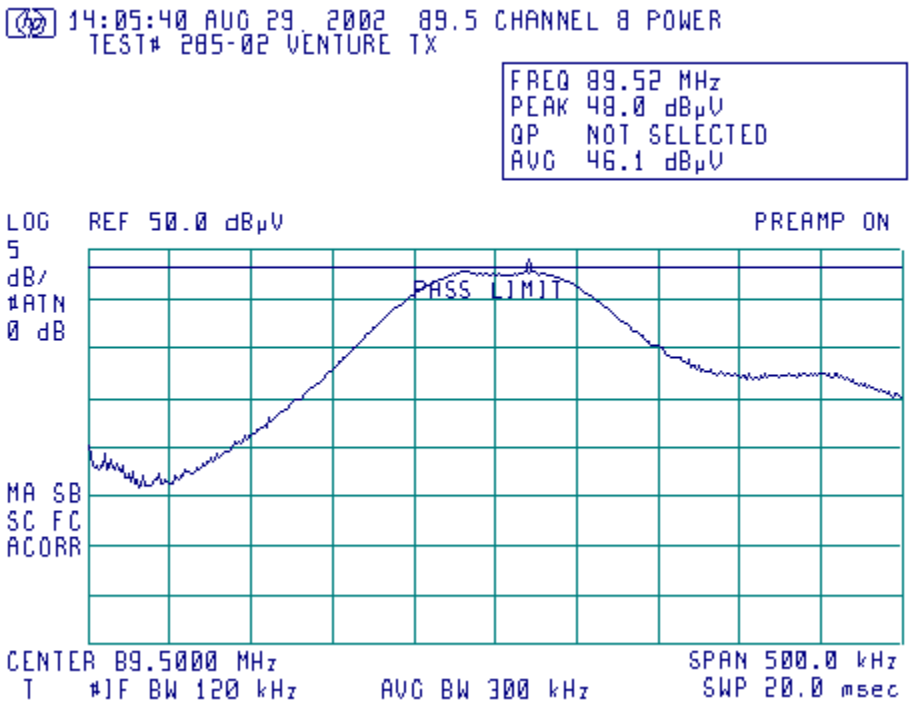
Channel B Output Power Plot



Frequency (MHz)	Peak Amplitude (dBuV/m)	Avg Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
89.5000	48.0	46.1	48	-1.9

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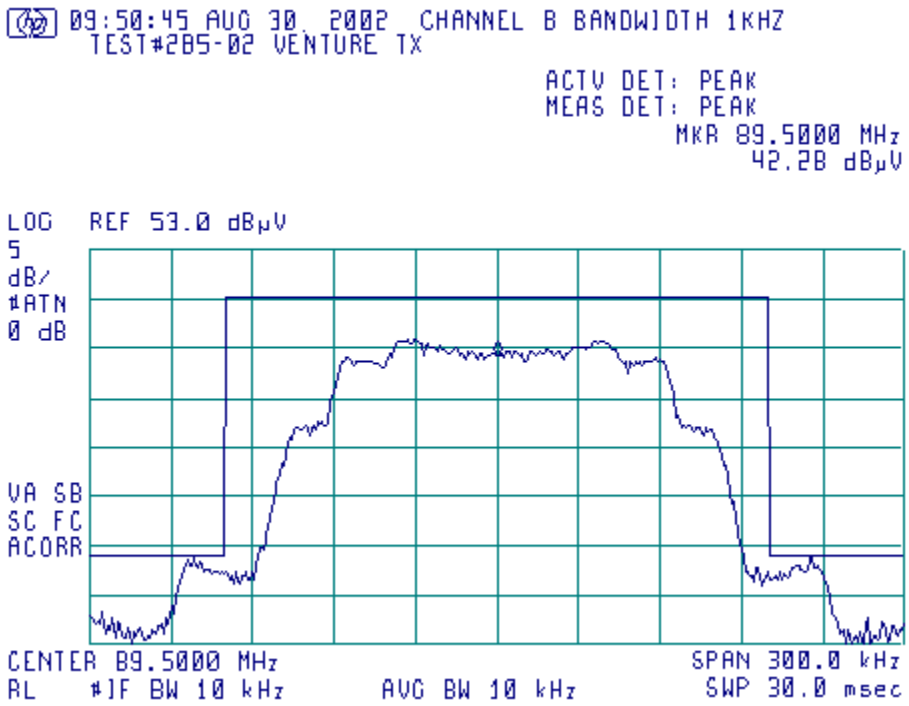
Channel B Occupied Bandwidth Plot



Display shows a mask with the top limit at 48 dBuV, and the lower flanks 200 kHz wide and 26 dB below the top limit.

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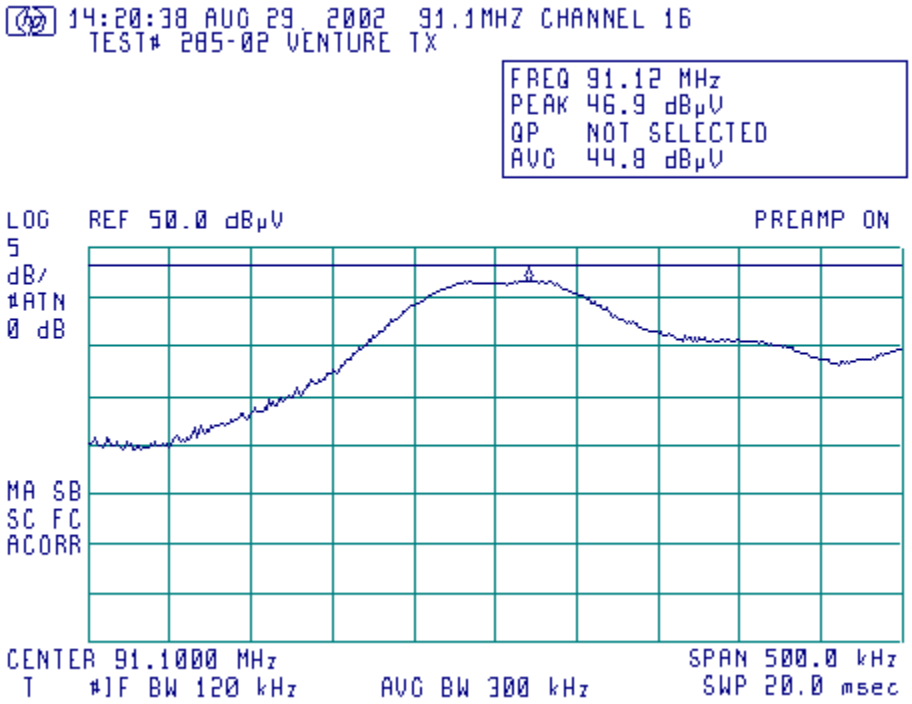
Channel C Output Power Plot



Frequency (MHz)	Peak Amplitude (dBuV/m)	Avg Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
91.1000	46.9	44.8	48	-3.2

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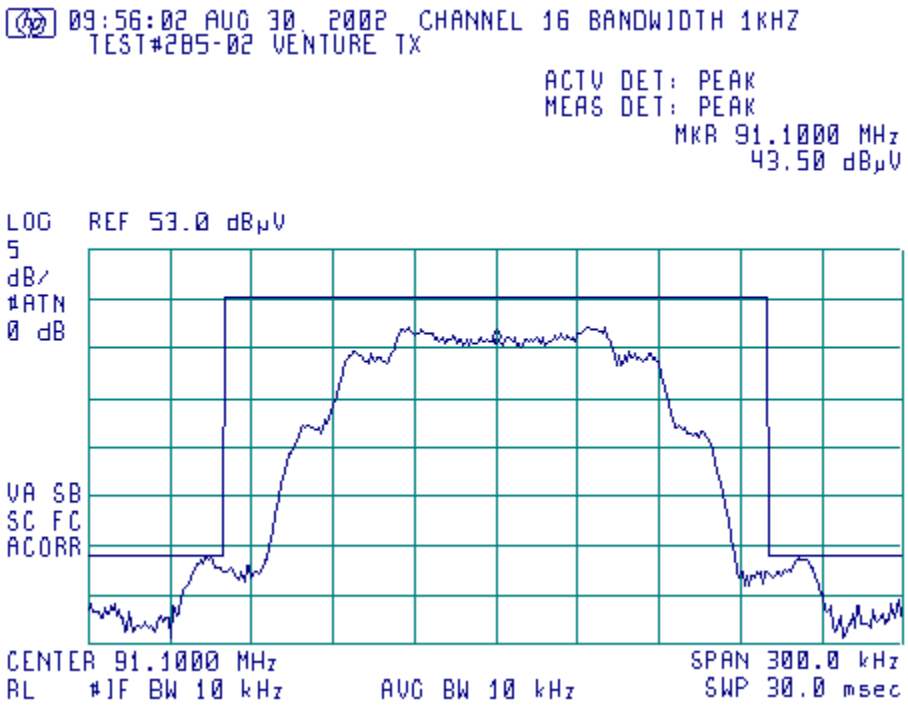
Channel C Occupied Bandwidth Plot



Display shows a mask with the top limit at 48 dBuV, and the lower flanks 200 kHz wide and 26 dB below the top limit.

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CONDUCTED TEST RESULTS

Frequency Range:	450 kHz to 30.0 MHz.
Bandwidth:	9 kHz per ANSI C63.4-1992.
Detector Functions:	Peak, Quasi-Peak, Average
Table Height:	0.8 meters
Video Bandwidth:	30 kHz.

Phase and Neutral Measurements Taken.

PLEASE SEE NEXT PAGE FOR CONDUCTED TEST DATA

Conducted tests were not performed, as this device will have no AC mains connection. It will be powered from the automobile's electrical system.