FCC CFR47 PART 90 CERTIFICATION

TEST REPORT

FOR

GAMING TABLE MANAGEMENT SYSTEM
(451MHz TRANSCEIVER)

MODEL: PM-9900

FCC ID: PM8PM-9900

REPORT NUMBER: 00I0629-1

ISSUE DATE: April 17, 2001

Prepared for
AL TECH, INC.
WOONJAE BLDG. 2F, 1534-1 SEOCHO-3DONG
SEOCHO-GU SEOUL 137-872
KOREA

Prepared by
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d.b.a
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LAB CODE:200065-0

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1. TEST RESULT CERTIFICATION

COMPANY NAME: AL TECH, INC.
WOONJAE BLDG. 2F, 1534-1 SEOCHO-3DONG
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CONTACT PERSON: CHAN SEOK PARK/ ENGINEER

TELPHONE NO: 82-2-597-6093

EUT DESCRIPTION: GAMING TABLE MANAGEMENT SYSTEM
(451MHZ TRANSCEIVER)

MODEM NAME: PM-9900

DATE TESTED: APRIL 08, 2001

TYPE OF EQUIPMENT	INTENTIONAL RADIATOR
EQUIPMENT TYPE	451MHz TRANSCEIVER
MEASUREMENT PROCEDURE	ANSI 63.4 / 1992, TIA/EIA 603
PROCEDURE	CIRTIFICATION
FCC RULE	CFR 47 PART 90

Compliance Certification Services, Inc. tested the above equipment for compliance with the requirement set forth in CFR 47, PART 90-Private Land Mobile Radio Service. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

Warning : 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
MANAGER OF EMC DEPARTMENT
COMPLIANCE CERTIFICATION SERVICES

Test By:

PETE KREBILL
EMC ASSOCIATE ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. EUT DESCRIPTION

The GAMING TABLE MANAGEMENT SYSTEM (GTMS) is a data gathering system that communicates with Personal Computer (PC). From these data, you can manage gaming table.

The GTMS has the following two sub-modules.

Table Module (TM-9900): TM is installed in gaming table. When dealer or customer press the key, TM sends key data to PC Module (PM) via wireless connection.

PC Module (PM-9900): PM is installed in management table. It is connected to PC with RS-232C cable. PM gather the data from TM and relay it to PC.

3. 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.

4. 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.

5. 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. 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. APPLICABLE RULES AND BRIEF TEST RESULT

§90.205- POWER LIMIT

According to 90.205(g) 450–470 MHz. The maximum allowable station effective radiated power (ERP) is dependent upon the station's antenna HAAT and required service area and will be authorized in accordance with table 2. (I.e. 2W for service area less than 3 km.)

Table 2-450-470 MHz-Maximum ERP/Reference HAAT for a Specific Service Area Radius

	Service area radius (km)									
	3	8	13	16	24	32	40	48	64	80
Maximum ERP (w) [1].....	2	100	500	500	500	500	500	500	500	500
Up to reference HAAT (m) [3]....	15	15	15	27	63	125	250	410	950	2700

[1] Maximum ERP indicated provides for a 39 dBuV signal strength at the edge of the service area per FCC Report R-6602, Fig. 29 (See Sec. 73.699, Fig. 10 b).

[3] When the actual antenna HAAT is greater than the reference HAAT, the allowable ERP will be reduced in accordance with the following equation:

ERP allow $= ERP_{max} \times (HAAT_{ref} / HAAT_{actual})^2$.

Spec limit: As specified above, 2W maximum.
Test result: Complies, The measured ERP power is –14.7dBm =0.034mW.

§90.207- TYPE OF EMISSION

According to 90.207(e) for non-voice paging operations, only A1A, A1D, A2B, A2D, F1B, F1D, F2B, F2D, G1B, G1D, G2B, or G2D emissions will be authorized.

Spec limit: As stated above.
Test result: Complies, this EUT use F1D emission to page each other.

§90.209- BANDDWIDTH LIMITATION

According to 90.200(3) For all other types of emissions, the maximum authorized bandwidth shall not be more than that normally authorized for voice operations.

According to 90.200(5), unless specified elsewhere, channel spacings and bandwidths that will be authorized in the following frequency bands are given in the following "STANDARD CHANNEL SPACING/BANDWIDTH" table.

Standard Channel Spacing/Bandwidth

Frequency band (MHz)	Channel spacing (kHz)	Authorized bandwidth (kHz)
Below 25		
25-50	20	20
72-76	20	20
150-174	[1] 7.5	[1,3] 20/11.25/6
220-222	5	4
421-512	[1] 6.25	[1,3] 20/11.25/6
806-821/851-866	25	20
821-824/866-869	12.5	20
896-901/935-940	12.5	13.6
902-928		
929-930	25	20
1427-1435		
2450-2483.52		
Above 2500		

1) For stations authorized on or after August 18, 1995.
3) Operations using equipment designed to operate with a 25 kHz channel bandwidth will be authorized a 20 kHz bandwidth. Operations using equipment designed to operate with a 12.5 kHz channel bandwidth will be authorized an 11.25 kHz bandwidth. Operations using equipment designed to operate with a 6.25 kHz channel bandwidth will be authorized a 6 kHz bandwidth.

Spec limit: EUT Authorized Bandwidth is 11.25 kH..
Test result: This EUT comply with Authorized Bandwidth of 11.25 kHz.

§90.210- EMISSIONS MASKS

According to 90.210(d), Emission Mask D -12.5 kHz channel bandwidth equipment. For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:
(1) On any frequency from the center of the authorized bandwidth f0 to 5.625 kHz removed from f0: Zero dB.
(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least 7.27(fd -2.88 kHz) dB.
(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5KHz; At least 50+10log(P) dB or 70 dB, whichever is the lesser attenuation.

(4) The reference level for showing compliance with the emission mask shall be established using a resolution bandwidth sufficiently wide (usually two to three times the channel bandwidth) to capture the true peak emission of the equipment under test. In order to show compliance with the emissions mask up to and including 50 kHz removed from the edge of the authorized bandwidth; adjust the resolution bandwidth to 100 Hz with the measuring instrument in a peak hold mode. A sufficient number of sweeps must be measured to insure that the emission profile is developed. If video filtering is used, its bandwidth must not be less than the instrument resolution bandwidth. For emissions beyond 50 kHz from the edge of the authorized bandwidth, see paragraph (m) of this section. If it can be shown that use of the above instrumentation settings do not accurately represent the true interference potential of the equipment under test, then an alternate procedure may be used provided prior Commission approval is obtained.

Spec limit: Specified as above.
Test result: This measurement results shows that the EUT complies with the rule.

§90.211- MODULATION REQUIREMENTS

The requirements of this paragraph do not apply to mobile stations that are authorized to operate with a maximum power output of 2 watts or less.

Spec limit: Not applicable, EUT maximum output power is 0.034mW (less than 2W.)
Test result: Not applicable.

§90.212- SCRAMBLING DEVICES AND DIGITAL VOICE MODULATION

Not applicable.

Spec limit: Not applicable.
Test result: Not applicable. This EUT use F1D emission for data transmission only.

§90.213- FREQUENCY STABILITY

(a) Unless noted elsewhere, transmitters used in the services governed by this part must have minimum frequency stability as specified in the following table.

Minimum Frequency Stability
[Parts per million (ppm)]

	Fixed and base stations	Mobile Stations	
		Over 2W output power	2 watts or less output power
Below 25	100	100	200
25-50	20	20	50
72-76	5	-------	50
150-174	5	5	50
220-222	0.1	1.5	1.5

	Fixed and base stations	Mobile Stations	
		Over 2W output power	2 watts or less output power
421-512	1.5	5	[8]5
806-821	1.0	2.5	2.5
821-824	1.5	1.5	1.5
851-866	2.5	2.5	2.5
866-869	1.0	1.5	1.5
896-901	0.1	1.5	1.5
902-928	2.5	2.5	2.5
902-928	2.5	2.5	2.5
929-930	1.5	--------	--------
935-940	0.1	1.5	1.5
1427-1435	300	300	300
Above 2450	---------	----------	----------

[8]In the 421-512 MHz band, mobile stations designed to operate with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm. Mobile stations designed to operate with a 6.25 kHz channel bandwidth must have a frequency stability of 1.0 ppm.

(b) For the purpose of determining the frequency stability limits, the power of a transmitter is considered to be the maximum rated output power as specified by the manufacturer.

Spec limit: 2.5 ppm
Test result: Complies, measured EUT maximum frequency drift was 1.61 ppm.

§90.214- TRANSIENT FREQUENCY BEHAVIOR

Transmitters designed to operate in the 150-174 MHz and 421-512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Time Intervals	Maximum Frequency Difference	All Equipment	
		150 to 174MHz	421 to 512MHz
Transient frequency Behavior for Equipment Designed to Operate on 25kHz Channels			
t_1[4]	±25.0kHz	5.0ms	10.0ms
t_2	±12.5kHz	20.0ms	25.0ms
t_3[4]	±25.0kHz	5.0ms	10.0ms
Transient frequency Behavior for Equipment Designed to Operate on 12.5kHz Channels			
t_1[4]	±12.5Hz	5.0ms	10.0ms
t_2	±6.25kHz	20.0ms	25.0ms
t_3[4]	±12.5kHz	5.0ms	10.0ms
Transient frequency Behavior for Equipment Designed to Operate on 6.25kHz Channels			
t_1[4]	±6.25Hz	5.0ms	10.0ms
t_2	±3.125kHz	20.0ms	25.0ms
t_3[4]	±6.25kHz	5.0ms	10.0ms

[1]t_{on} is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.
[4]If the transmitter carrier output power rating is 6 dB watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.
t_1 is the time period immediately following t_{on}
t_2 is the time period immediately following t_1

Spec limit: t_2 < 25.0ms
Test result: EUT compliance with the limits.

§90.217- EXEMPTION FROM TECHNICAL STANDARDS

Spec limit: Not applicable.
Test result: Not applicable.

§2.1057- SPECTRUM RANGE TO BE INVESTIGATED

Lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to at least the frequency shown below:

(1) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

(2) If the equipment operates at or above 10 GHz and below 30 GHz:
to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

(3) If the equipment operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower.

(b) Particular attention should be paid to harmonics and sub-harmonics of the carrier frequency as well as to those frequencies removed from the carrier by multiples of the oscillator frequency.
Radiation at the frequencies of multiplier stages should also be checked.

(c) The amplitude of spurious emissions, which are attenuated more than 20 dB below the permissible value, need not be reported.

(d) Unless otherwise specified, measurements above 40 GHz shall be performed using a minimum resolution bandwidth of 1 MHz.

Spec limit: Frequency investigation range from 9K to tenth harmonic (i.e. 4.52GHz.).

§PART 15 RADIATED AND CONDUCTED EMISSION

Since digital control device is also used in the EUT to control the Tx and Rx, The part 15 compliance test was also performed to evaluate the compliance with the applicable rule 15.107 and 15.109

FCC PART 15 CLASS A

MEASURING DISTANCE OF 10 METER		
FREQUENCY RANGE (MHz)	FIELD STRENGTH (Microvolts/m)	FIELD STRENGTH (dBuV/m)
30-88	90	39.1
88-216	150	43.5
216-960	210	46.4
Above 960	300	49.5

FCC PART 15 CLASS B

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

FCC CLASS A

FREQUENCY RANGE	FIELD STRENGTH (Microvolts)	FIELD STRENGTH (dBuV)/QP
450kHz-1.705MHz	1000	60
1.705MHz - 30MHz	3000	69.54

FCC CLASS B

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

Spec limit: As specified above.
Test result: Complies. No radiated emissions were detected other than the fundamental frequency and harmonics. Line conducted emissions comply.

§SUBPART J- NON-VOICE AND OTHER SPECIALIZED OPERATION

Spec limit: Not applicable.
Test result: Not applicable.

8. TEST SETUP, PROCEDURE AND RESULT

8.1. CONDUCTED POWER

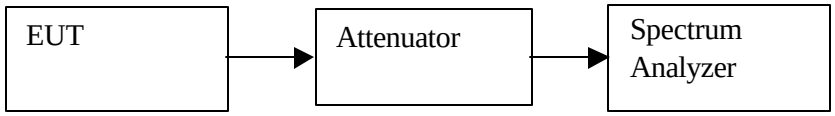
INSTRUMENTS LIST

EQUIPMENT	MANUFACTURE	MODEL NO.	CAL. DUE DATE
Spectrum Analyzer	HP	8593EM	05/25/01
Attenuator	MINI CIRCUITS	MCL BW-S20W2	NA

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
30 to 1000	☒ Peak ☐ Quasi Peak	☒ 100 KHz ☐ 120 KHz	☒ 100 KHz ☐ 120 KHz
Above 1000	☒ Peak ☐ Average	☒ 1 MHz ☐ 1 MHz	☒ 1 MHz ☐ 10 Hz

TEST SETUP



TEST PROCEDURE

The EUT is configured on a test bench as shown above in a continuously transmitting / receiving mode. While the transceiver started, the analyzer MAX HOLD function is used to capture the emissions.

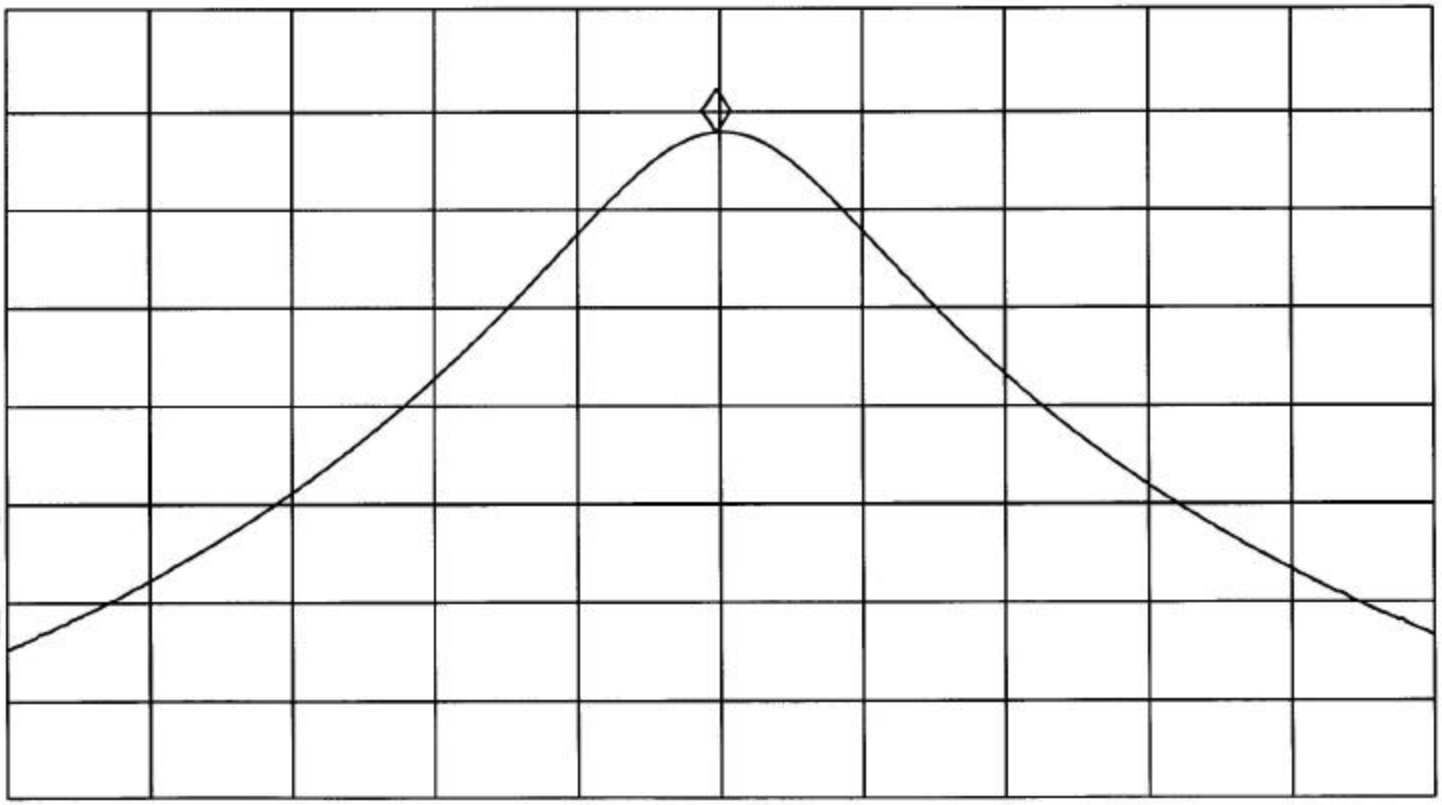
RESULT

Complies, output power was measured as –1.57dBm. See plot *OutputPower*.

12: 35: 21 MAY 19, 2ØØ1
AIRLINK PM 9Ø.2Ø5(g) Output Power

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 451.19Ø MHz
-1.57 dBm

REF OFFST 11.Ø dB
LOG REF 11.Ø dBm
1Ø
dB/
ATN
1Ø dB



VA SB
SC FC
CORR

START 45Ø.693 MHz
STOP 451.693 MHz
#IF BW 1ØØ kHz
#AVG BW 1ØØ kHz
SWP 2Ø.Ø msec

8.2. RADIATED OUTPUT POWER (ERP)

INSTRUMENTS LIST

EQUIPMENT	MANUFACTURE	MODEL NO.	CAL. DUE DATE
Spectrum Analyzer	HP	8593EM	05/25/01
Bilog Antenna	CHASE EMC LTD	CBL6112	11/23/00
Dipole Antenna	COMPLIANCE DESIGN	ROBERTS	5/5/01
RF Synthesizer	HP	83732B	2/11/02
Amplifier	HP	8449B	4/12/01
LP Antenna	Emco	3146	9/7/01

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
30 to 1000	☒ Peak ☐ Quasi Peak	☒ 100 KHz ☐ 120 KHz	☒ 100 KHz ☐ 120 KHz
Above 1000	☒ Peak ☐ Average	☒ 1 MHz ☐ 1 MHz	☒ 1 MHz ☐ 10 Hz

TEST SETUP

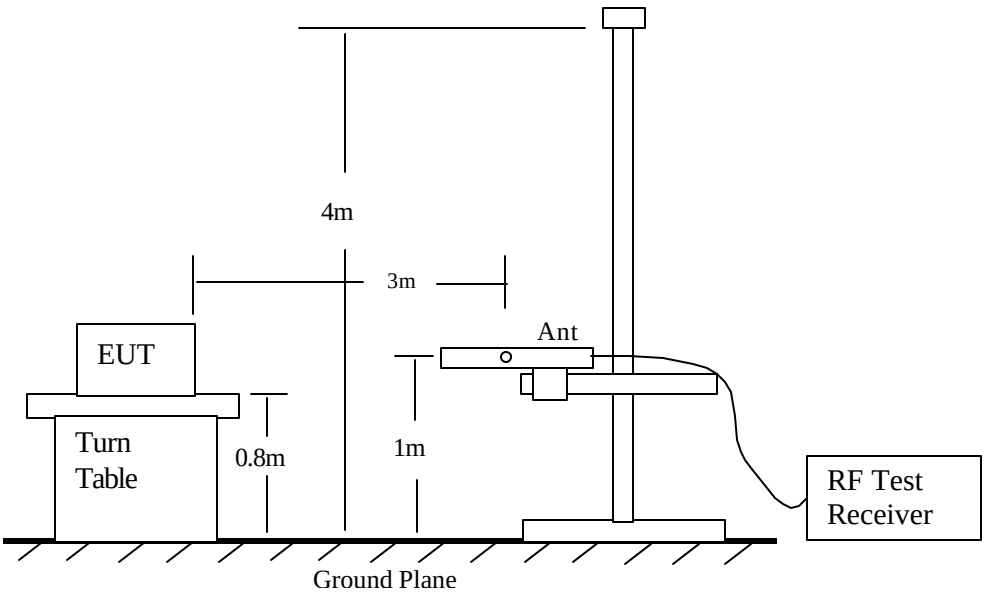


Fig 1: Radiated Emission Measurement

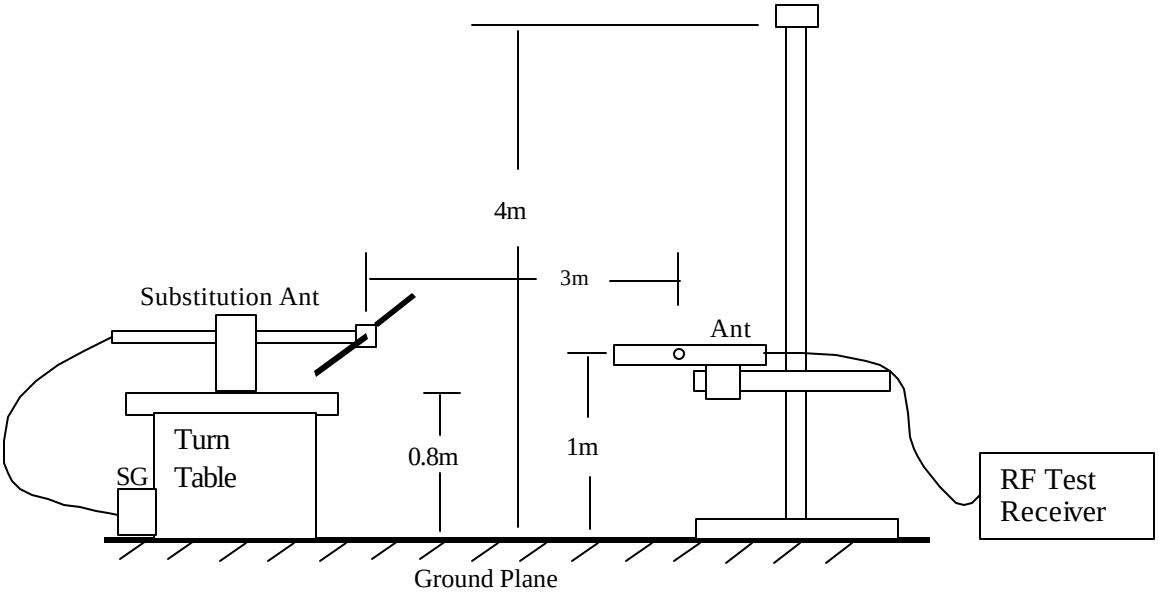


Fig 2: Radiated Emission – Substitution Method set-up

TEST PROCEDURE

1). On a test site, the EUT shall be placed on a turntable, and in the position closest to the normal use as declared by the user.
2). The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the frequency of the transmitter.
3). The output of the test antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
4). The transmitter shall be switched on, if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
5). The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
6). The transmitter shall than be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
7). The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
8). The maximum signal level detected by the measuring receiver shall be noted.
9). The transmitter shall be replaced by a substitution antenna.
10). The substitution antenna shall be oriented for vertical polarization and the length (if a dipole antenna is used) of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
11). The substitution antenna shall be connected to a calibrated signal generator.
12). If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
13). The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.

14). The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.
15). The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
16). The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.
17). The measure of the effective radiated power is the larger of the two levels recorded, at the input to the substitution antenna, corrected for the gain of the substitution antenna if necessary.

RESULT

Complies, as shown below.

Frequency	SA reading	Sig Gen	CL	Gain	Gain	ERP	Limit	Margin
MHz	dBuV	dBm	dB	dBi	dBd	dBm	dBm	dB
PM								
451.19	71.8	-5.5	0.1	0	0	-5.6	33	-38.6

8.3. TYPE OF EMISSION

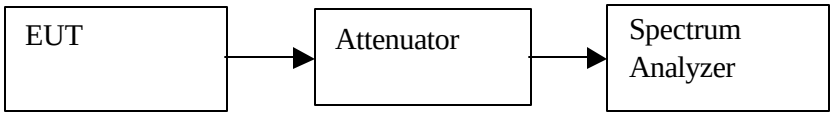
INSTRUMENTS LIST

EQUIPMENT	MANUFACTURE	MODEL NO.	CAL. DUE DATE
Spectrum Analyzer	HP	8593EM	05/25/01
Attenuator	MINI CIRCUITS	MCL BW-S20W2	NA

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
30 to 1000	☒ Peak ☐ Quasi Peak	☒ 100 Hz ☐ 120 KHz	☒ 100 Hz ☐ 120 KHz
Above 1000	☒ Peak ☐ Average	☒ 1 MHz ☐ 1 MHz	☒ 1 MHz ☐ 10 Hz

TEST SETUP



TEST PROCEDURE

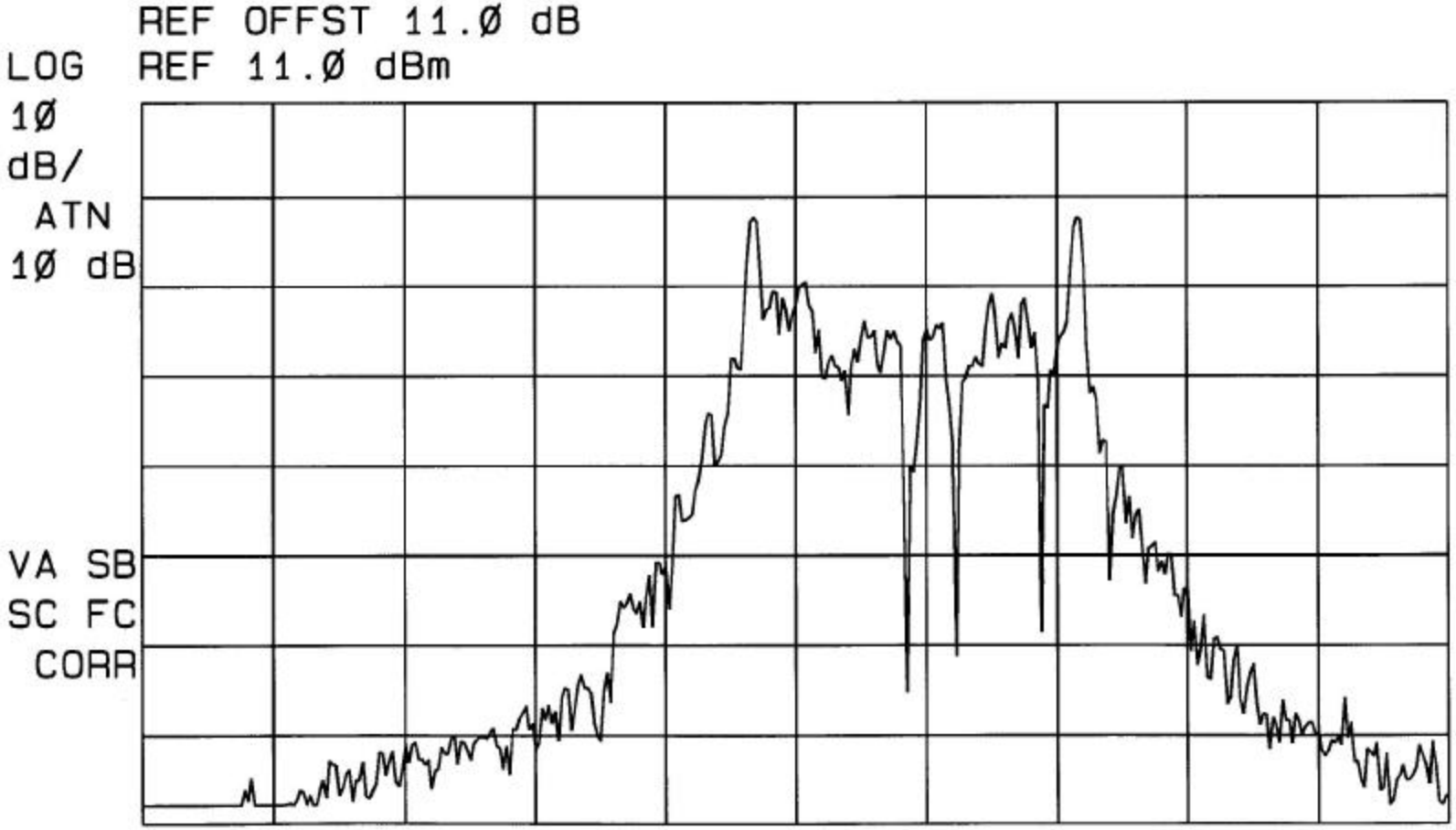
The EUT is configured on a test bench as shown above in a continuously transmitting mode.
While the transceiver started, the analyzer MAX HOLD function was enabled and the frequency SPAN was adjusted to capture the whole emission.

RESULT

Complies, see plot *ModulationType*.

13: Ø8: 32 MAY 19, 2ØØ1
AIRLINK PM 9Ø.2Ø7 Modulation Type

ACTV DET: PEAK
MEAS DET: PEAK QP AVG



8.4. BANDWIDTH LIMITATION

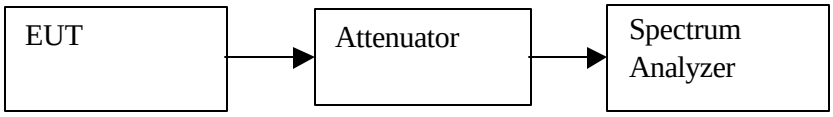
INSTRUMENTS LIST

EQUIPMENT	MANUFACTURE	MODEL NO.	CAL. DUE DATE
Spectrum Analyzer	HP	8593EM	05/25/01
Attenuator	MINI CIRCUITS	MCL BW-S20W2	NA

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
30 to 1000	☒ Peak ☐ Quasi Peak	☒ 100 Hz ☐ 120 KHz	☒ 100 Hz ☐ 120 KHz
Above 1000	☒ Peak ☐ Average	☒ 1 MHz ☐ 1 MHz	☒ 1 MHz ☐ 10 Hz

TEST SETUP



TEST PROCEDURE

The EUT is configured on a test bench as shown above in a continuously transmitting mode.
While the transceiver started, the analyzer MAX HOLD function was enabled and the frequency SPAN was adjusted to capture the whole emission.

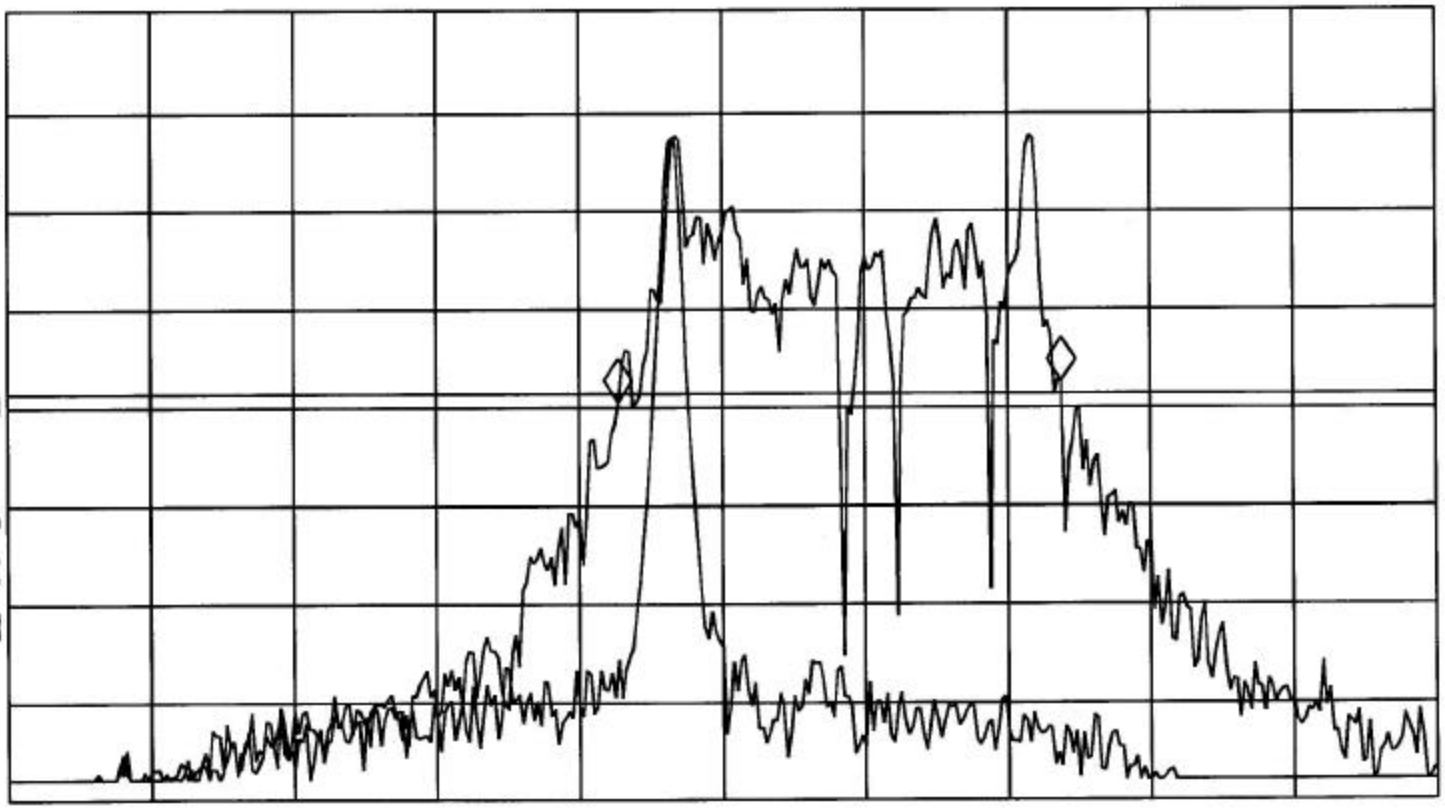
RESULT

Complies. The frequency bandwidth which contains 99% of the power is between frequencies 451.185MHz and 451.191MHz. Bandwidth equals 6.2KHz. See plot *Bandwidth*.

13: 35: 3Ø MAY 19, 2ØØ1
AIRLINK PM 9Ø.2Ø9(b) (3) Bandwidth

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 6.2Ø kHz
2.Ø9 dB

REF OFFST 11.Ø dB
LOG REF 11.Ø dBm
1Ø
dB/
ATN
1Ø dB
DL
-27.9
dBm
VA VB
SC FC
CORR



START 451.176ØØ MHz
#IF BW 1ØØ Hz
#AVG BW 1ØØ Hz
STOP 451.196ØØ MHz
SWP 6.ØØ sec

8.5. EMISSIONS MASKS

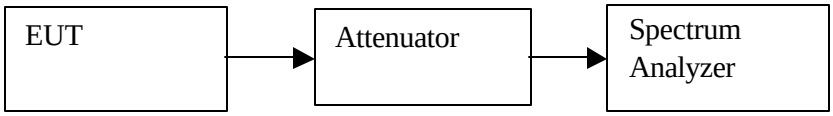
INSTRUMENTS LIST

EQUIPMENT	MANUFACTURE	MODEL NO.	CAL. DUE DATE
Spectrum Analyzer	HP	8593EM	05/25/01
Attenuator	MINI CIRCUITS	MCL BW-S20W2	NA

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
Within 50KHz of authorized bandwidth	☒ Peak ☐ Quasi Peak	☒ 100 Hz ☐ 120 KHz	☒ 100 Hz ☐ 120 KHz
30 to 1000	☒ Peak ☐ Quasi Peak	☒ 30 KHz ☐ 120 KHz	☒ 30 KHz ☐ 120 KHz
Above 1000	☒ Peak ☐ Average	☒ 1 MHz ☐ 1 MHz	☒ 1 MHz ☐ 10 Hz

TEST SETUP



TEST PROCEDURE

The EUT is configured on a test bench as shown above in a continuously transmitting / receiving mode. While the transceiver started, the analyzer MAX HOLD function was enabled and the frequency SPAN was adjusted to capture the whole emission.

RESULT

Complies. See plots: *Mask1, OutofBand1, OutofBand2 and OutofBand3*.
Please use the following formula to convert dBµV to dBm
dBm=dBµV-107
For example, 107dBµV=0dBm.

COMPLIANCE
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CL,CSA,TUV

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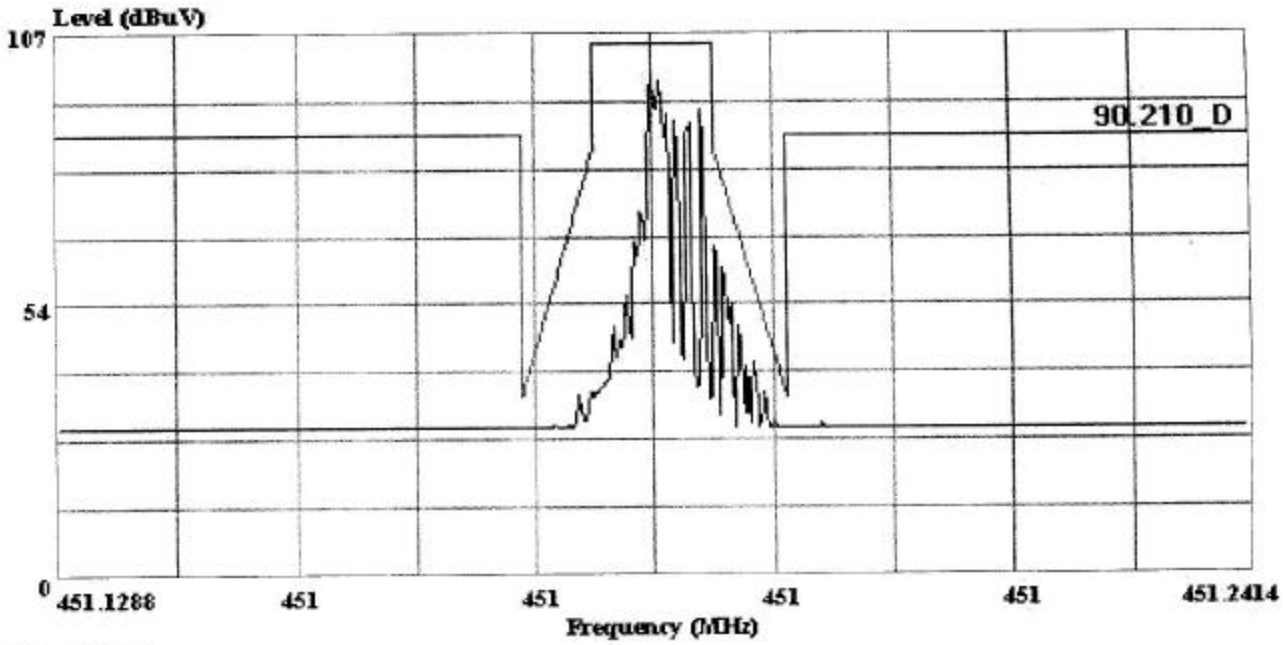
Tel: (408) 752-8166
Fax: (408) 752-8168

Data#: 5 File#: 42901.emi Date: 04-29-2001 Time: 11:46:55



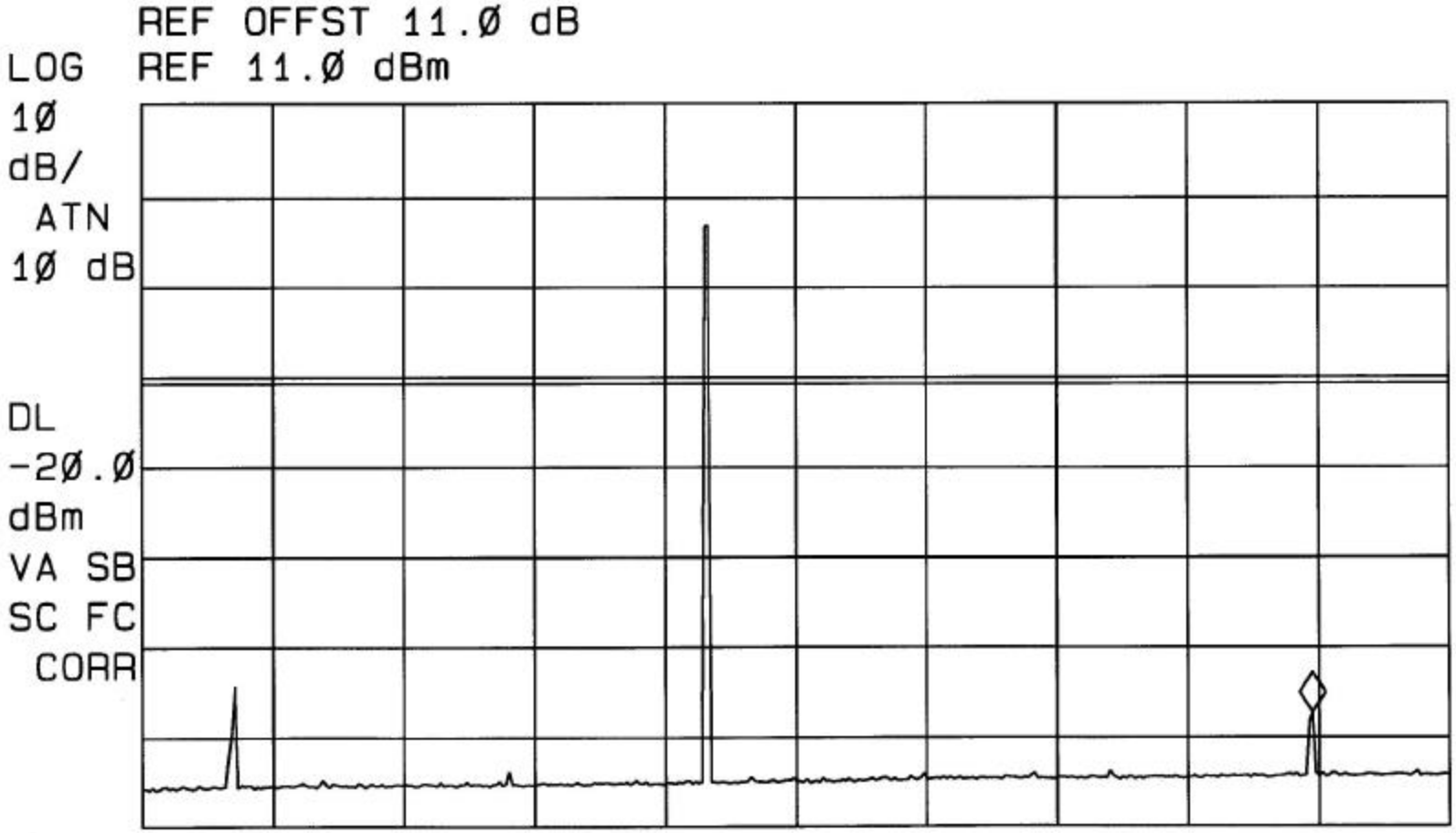
(Compliance)

Trace: Ref Trace:

Report NO. : 42901
Test Engr : Pete Krebill
Company : AIRLINK
EUT : PM
Test Config: EUT Only
Test Target: FCC 90.210(d)
Test Mode : TX Unmodulated

14:04:55 MAY 19, 2001
AIRLINK PM 90.210(d) Out of Band

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 898.2 MHz
-56.33 dBm

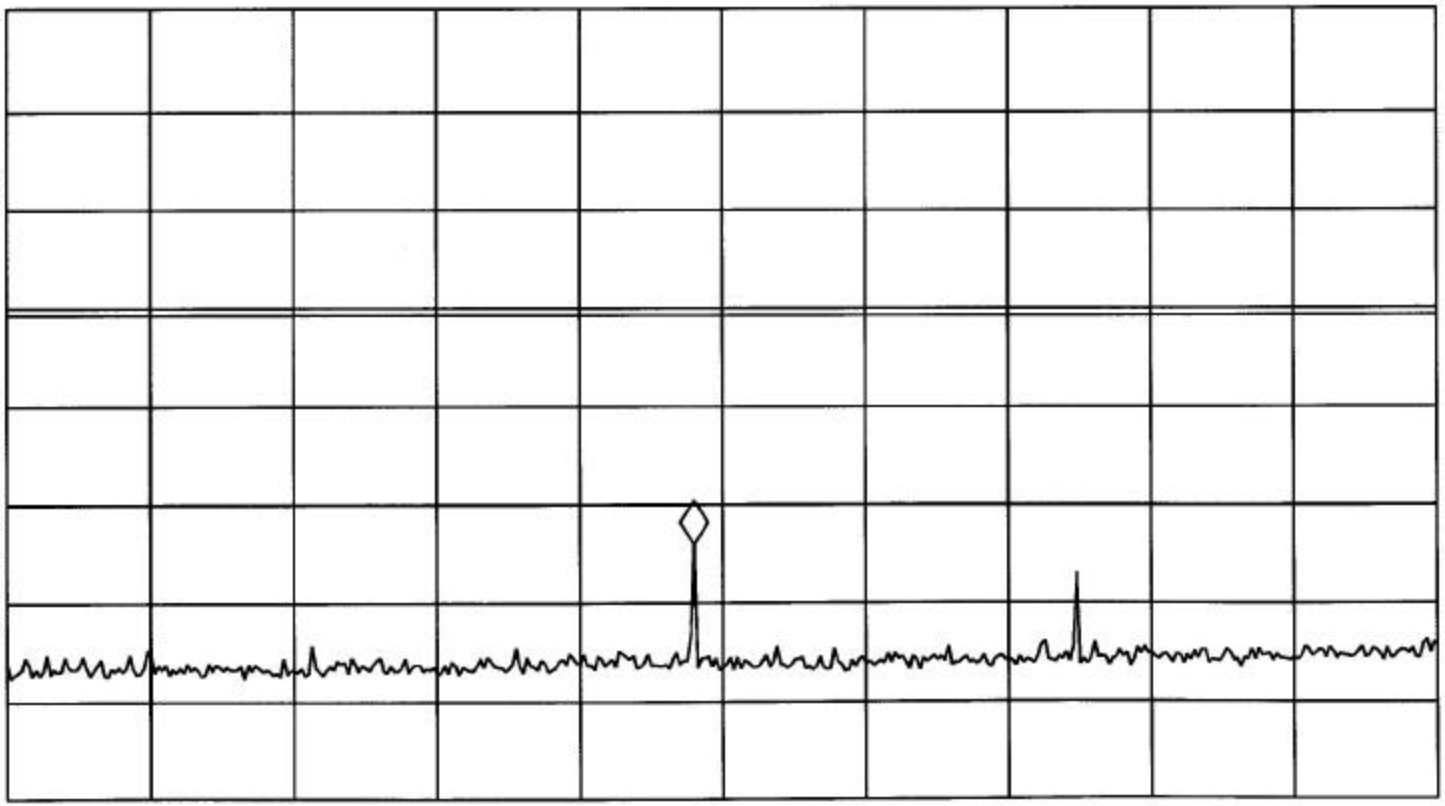


START 30.0 MHz
#IF BW 30 kHz
#AVG BW 30 kHz
STOP 1.0000 GHz
SWP 3.23 sec

14: Ø5: 29 MAY 19, 2ØØ1
AIRLINK PM 9Ø.21Ø(d) Out of Band

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 1.8Ø6 GHz
-43.21 dBm

REF OFFST 11.Ø dB
LOG REF 11.Ø dBm
1Ø
dB/
ATN
1Ø dB



DL
-2Ø.Ø
dBm
VA SB
SC FC
CORR

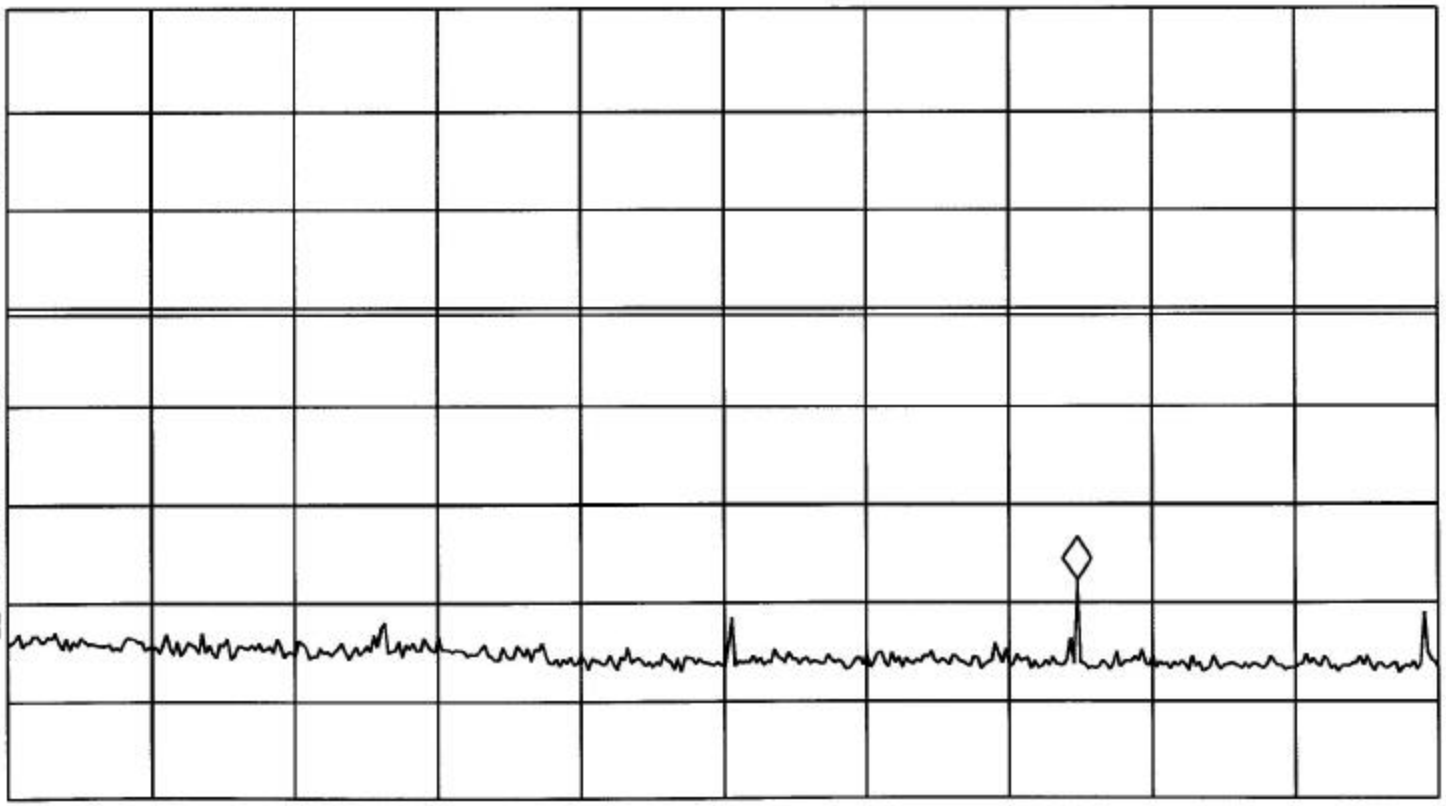
START 1.ØØØ GHz
#IF BW 1.Ø MHz #AVG BW 1 MHz
STOP 2.679 GHz
SWP 33.6 msec

14:06:47 MAY 19, 2001
AIRLINK PM 90.210(d) Out of Band

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 4.055 GHz
-46.88 dBm

REF OFFST 11.0 dB
LOG REF 11.0 dBm
10
dB/
ATN
10 dB

DL
-20.0
dBm
VA SB
SC FC
CORR



START 2.679 GHz
#IF BW 1.0 MHz #AVG BW 1 MHz
STOP 4.520 GHz
SWP 36.8 msec

8.6. FREQUENCY STABILITY

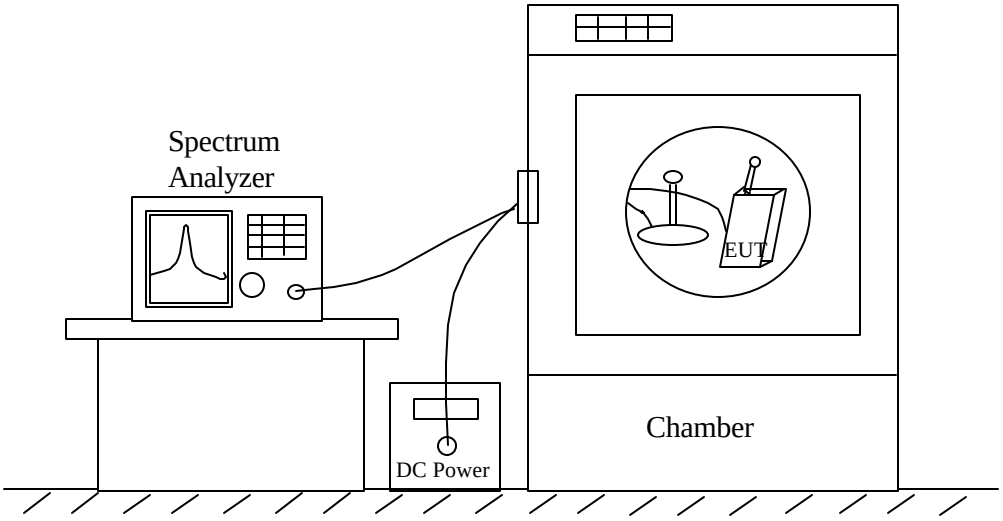
INSTRUMENTS LIST

EQUIPMENT	MANUFACTURE	MODEL NO.	CAL. DUE DATE
Spectrum Analyzer	HP	8593EM	05/25/01
Attenuator	MINI CIRCUITS	MCL BW-S20W2	NA
Environmental Chamber	TENNY	TEN	5/12/01

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
30 to 1000	Peak	10 Hz	10 Hz
Above 1000	Peak	200 Hz	200 Hz

TEST SETUP



TEST PROCEDURE

- **Frequency stability versus environmental temperature**

1). Setup the configuration per figure 6 for frequencies measurement inside the environmental chamber. Set the temperature of the chamber to 25°C and Install new batteries to the EUT if it is battery powered. Set SA Resolution Bandwidth low enough to obtain the desired frequency resolution and measure the EUT 25°C operating frequency as reference frequency.
2). Turn EUT off and set Chamber temperature to -30°C.
3). Allow sufficient time (approximately 20 to 30 minus after chamber reach the assigned temperature) for EUT to stabilize. Turn on EUT and measure the EUT operating frequency. Turn off EUT after the measurement.
4). Repeat step 3 with a 10°C increased per stage until the highest temperature of +50°C reached, record all measured frequencies on each temperature step.

- **Frequency stability versus DC input voltage**

1). Setup the configuration per figure 6 and set chamber temperature to 25°C. Use a variable DC power supply to power the EUT and set DC output voltage to EUT nominal input DC voltage. Set SA Resolution Bandwidth low enough to obtain the desired frequency resolution and measure the EUT 25°C operating frequency as reference frequency.
2). Slowly reduce the EUT input voltage to specified extreme voltage variation or battery-end-point voltage (if battery powered) and record the maximum frequency change.

RESULT

Complies, as shown below.

Frequency stability versus environmental temperature

Reference Frequency: 451.186011 MHz		Limit: 2.5 ppm	
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency deviation measured with time elapse	
		MHz	ppm
50	Fixed ext DC 3.8V	451.185399	-1.36
40	Fixed ext DC 3.8V	451.185286	-1.61
30	Fixed ext DC 3.8V	451.185611	-0.89
20	Fixed ext DC 3.8V	451.186011	0.00
10	Fixed ext DC 3.8V	451.186361	0.78
0	Fixed ext DC 3.8V	451.186336	0.72
-6	Fixed ext DC 3.8V	451.185949	-0.14
-10	Fixed ext DC 3.8V	EUT auto shut down	N/A
-20	Fixed ext DC 3.8V	EUT auto shut down	N/A
-30	Fixed ext DC 3.8V	EUT auto shut down	N/A

Frequency stability versus DC input voltage

Reference Frequency: MHz		Limit: 2.5 ppm	
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency deviation measured with time elapse	
		MHz	ppm
20	97.8	451.1855194	0.0195
20	120	451.1855106	0.0
20	138	451.1855082	0.0053

8.7. TRANSIENT FREQUENCY BEHAVIOR

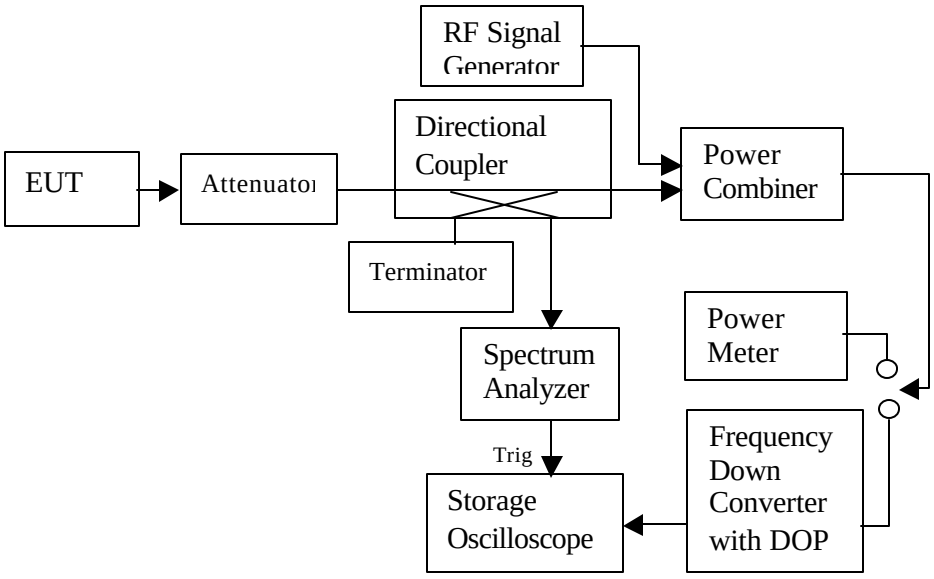
INSTRUMENTS LIST

EQUIPMENT	MANUFACTURE	MODEL NO.	CAL. DUE DATE
Spectrum Analyzer	HP	8593EM	05/25/01
Modulation Analyzer	HP	8901A	4/12/01
RF Synthesizer	HP	83732B	2/11/02
Storage Oscilloscope	Tektronix	11403B	4/01/99
Power Meter	HP	436B	4/2/02

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
30 to 1000	☒ Peak ☐ Quasi Peak	☒ 100 KHz ☐ 120 KHz	☒ 100 KHz ☐ 120 KHz
Above 1000	☒ Peak ☐ Average	☒ 1 MHz ☐ 1 MHz	☒ 1 MHz ☐ 10 Hz

TEST SETUP



*p.s. Setup in according to TIA/EIA 603

TEST PROCEDURE

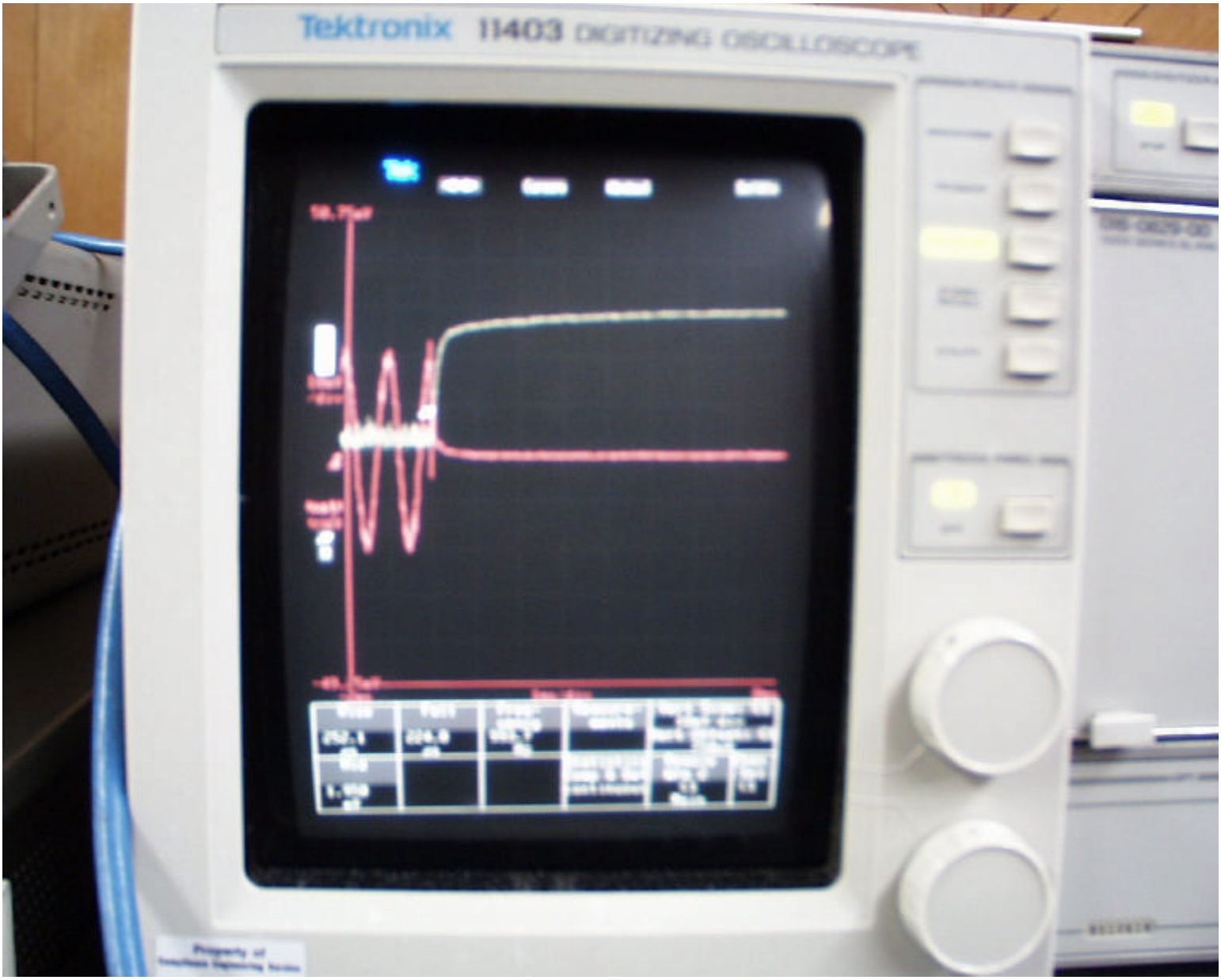
a) Connect the equipment as illustrated.
b) Connect the test receiver's Demodulator Output Port (DOP) to the vertical input channel of the storage oscilloscope. Connect the output of the RF peak detector to the external trigger on the storage oscilloscope. Connect the output of the RF combiner to the RF power meter.
c) Set the test receiver to measure FM deviation with the audio bandwidth set at ≤ 50 Hz to ≥15,000 Hz and tune the RF frequency to the transmitter assigned frequency.

d) Set the signal generator to the assigned transmitter frequency and modulated it with a 1 kHz tone at ±25 kHz deviation and set its output level to −100 dBm.
e) Turn the transmitter on.
f) Supply sufficient attenuation via the RF attenuator to provide an input level to the test receiver which is approximately 40 dB below the test receiver's maximum allowed input power when the transmitter is operating at its rated power level. Note this power level on the RF power meter.
g) Turn the transmitter off.
h) Adjust the RF level of the signal generator to provide RF power into the RF power meter 20dB below the level noted in step f). This signal generator RF level shall be maintained throughout the rest of the measurement.
i) Disconnect the RF power meter and connect the output of the RF combiner network to the input of the test receiver.
j) Set the horizontal sweep rate on the storage oscilloscope to 10 milliseconds per division and adjust the display to continuously view the 1000 Hz tone from the DOP. Adjust the vertical amplitude control of the oscilloscope to display the 1000 Hz at ±4 divisions vertically centered on the display.
k) Adjust the oscilloscope so it will trigger on an increasing magnitude from the RF peak detector at 1 division from the left side of the display when the transmitter is turned on. Set the controls to store the display.
l) Reduce the attenuation of the RF attenuator so the input to the RF peak detector and the RF combiner is increased by 30 dB when the transmitter is turned on.
m) Turn on the transmitter and observe the stored display. The output at the DOP, due to the change in the ratio of power between the signal generator input power and the transmitter output power will, because of the capture effect of the test receiver, produce a change in display. For the first part of the sweep it will show the 1 kHz test signal. Then once the receiver's demodulator has been captured by the transmitter power, the display will show the frequency difference from the assigned frequency to the actual transmitter frequency versus time. The instant when the 1 kHz test signal is completely suppressed (including any capture time due phasing) is considered to be $t_{on.}$ The trace should be maintained within the allowed divisions during the period t_1 and t_2. See the figure in the appropriate standards section.
n) During the time from the end of t_2 to the beginning of t_3 the frequency difference should not exceed the limits set by the FCC in part 90.213 and outlined in the Carrier Frequency Stability sections. The allowed limit is equal to the transmitter frequency times its FCC frequency tolerance times ±4 display divisions divided by 25 kHz. For example, at a transmitter assigned frequency of 500 MHz and a frequency tolerance of 5 ppm. This would be 500 MHz times 5 ppm times ±4 divisions divided by 25 kHz. This equals ±0.4 divisions in this example. Greater vertical sensitivity may be required to view this accuracy.
o) Turn on the transmitter and observe the stored display. The trace should be maintained within the allowed divisions after the end of t_2 and remain within it until the end of the trace. See the figure in the appropriate standards sections.
p) To test t he transient frequency behavior during the period t_3, the transmitter shall be switched on.
q) Adjust the oscilloscope trigger controls so it will trigger on a decreasing magnitude from the RF peak detector, at 1 division from the right side of the display, when the transmitter is turned off. Set the controls to store the display. The moment when the 1 kHz test signal starts to rise is considered to provide $t_{off.}$
r) The transmitter shall be switched off.
s) Observe the display. The trace should remain within the allowed divisions during period $t_{3.}$ See the figures in the appropriate standards section.

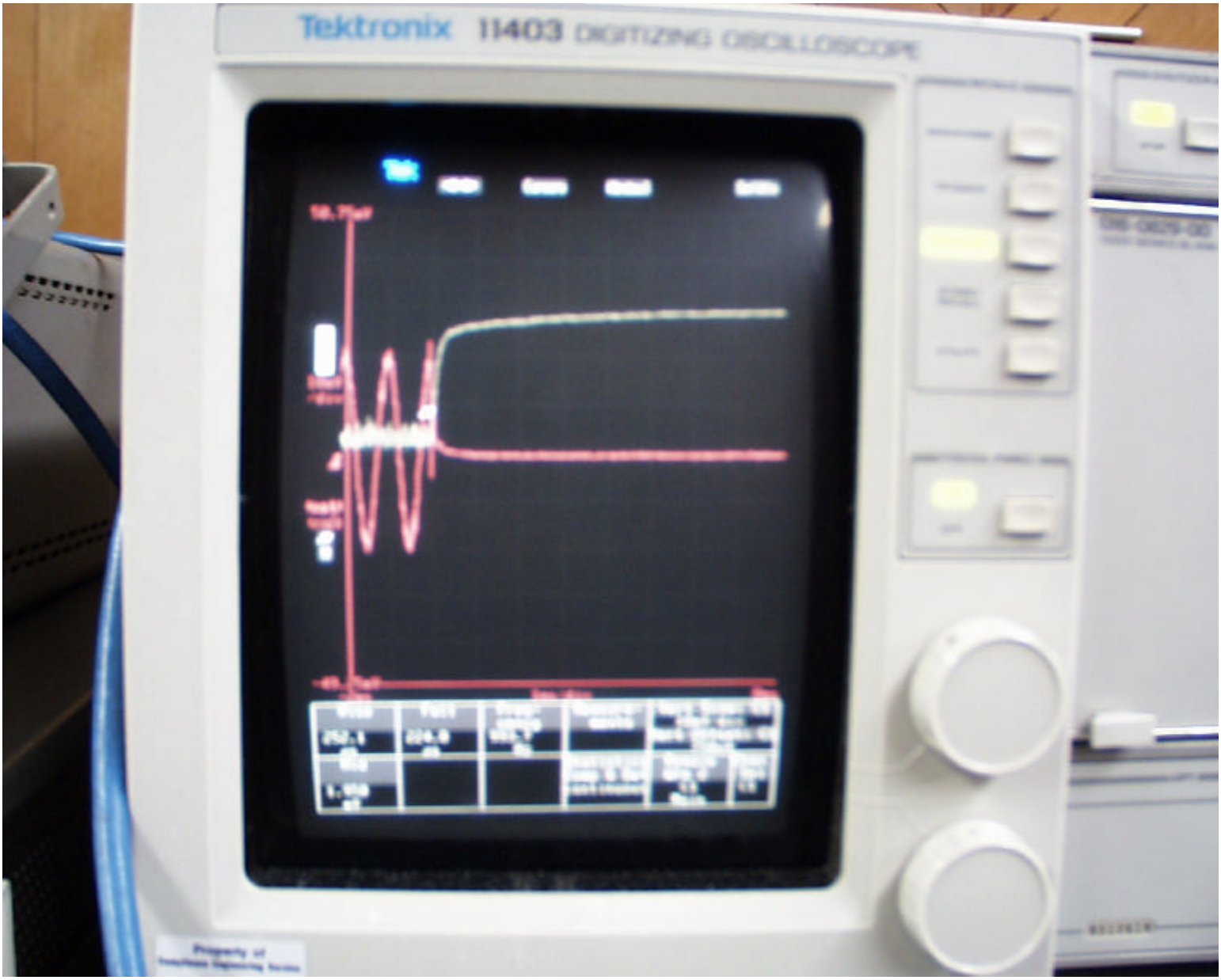
RESULT

Complies. See plots *TransientOn* and *TransientOff*.


Tektronix 11403 DIGITIZING OSCILLOSCOPE


Tektronix 11403 DIGITIZING OSCILLOSCOPE


Tektronix 11403 DIGITIZING OSCILLOSCOPE
Property of
N 02468


Tektronix 11403 DIGITIZING OSCILLOSCOPE

8.8. RADIATED EMISSION

INSTRUMENTS LIST

EQUIPMENT	MANUFACTURE	MODEL NO.	CAL. DUE DATE
Spectrum Analyzer	HP	8593EM	05/25/01
Bilog Antenna	CHASE EMC LTD	CBL6112	11/23/00
Dipole Antenna	COMPLIANCE DESIGN	ROBERTS	5/5/01
RF Synthesizer	HP	83732B	2/11/02
Amplifier	HP	8449B	4/12/01
LP Antenna	Emco	3146	9/7/01

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
30 to 1000	☒ Peak ☐ Quasi Peak	☒ 100 KHz ☐ 120 KHz	☒ 100 KHz ☐ 120 KHz
Above 1000	☒ Peak ☐ Average	☒ 1 MHz ☐ 1 MHz	☒ 1 MHz ☐ 10 Hz

TEST SETUP & PROCEDURE

Same as section 8.2 - Radiated Power Measurement setup.

RESULT

Complies, as shown below.

Frequency MHz	SA reading dBuV	Sig Gen dBm	CL dB	Gain dBi	Gain dBd	ERP dBm	Limit dBm	Margin dB
902	38.31	-55.1	2.7	6.7	4.5	-53.3	-13	-40.3
1353	60.9	-60	3	8.3	6.1	-56.9	-13	-43.9
1804	67.19	-46.5	3.75	9.1	6.9	-43.35	-13	-30.35
2256	67.5	-42.5	4.35	8.9	6.7	-40.15	-13	-27.15
2707	57	-48.5	4.95	9	6.8	-46.65	-13	-33.65
3458	52.7	-54.1	5.4	8.4	6.2	-53.3	-13	-40.3
3609	49.9	-58.8	5.7	9	6.8	-57.7	-13	-44.7
4060	52.5	-58.8	6	10.2	8	-56.8	-13	-43.8
4511	56.3	-49.2	6.3	10.7	8.5	-47	-13	-34

8.9. POWER LINE CONDUCTED EMISSION

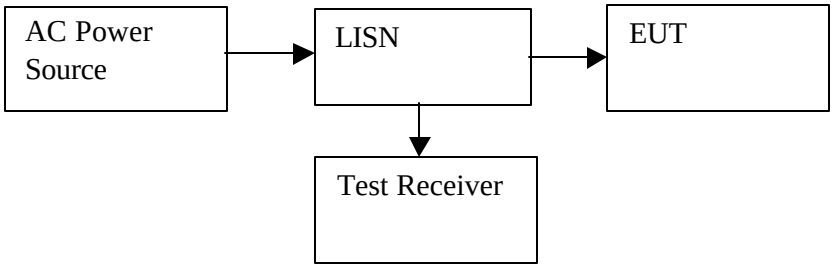
INSTRUMENTS LIST

EQUIPMENT	MANUFACTURE	MODEL NO.	CAL. DUE DATE
Test Receiver	Rohde & Schwarz	ESHS 20	2/28/02
LISN	Fischer	50/250/25/2	7/5/01

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
450 K to 30 MHz	☒ Peak ☐ CISPR Quasi Peak	☒ 9 KHz	☒ 9 KHz

TEST SETUP



TEST PROCEDURE

1. The EUT was placed on a wooden table 40 cm from a vertical ground plane and approximately 80 cm above the horizontal ground plane on the floor. The EUT was set to transmit in a continuous mode.

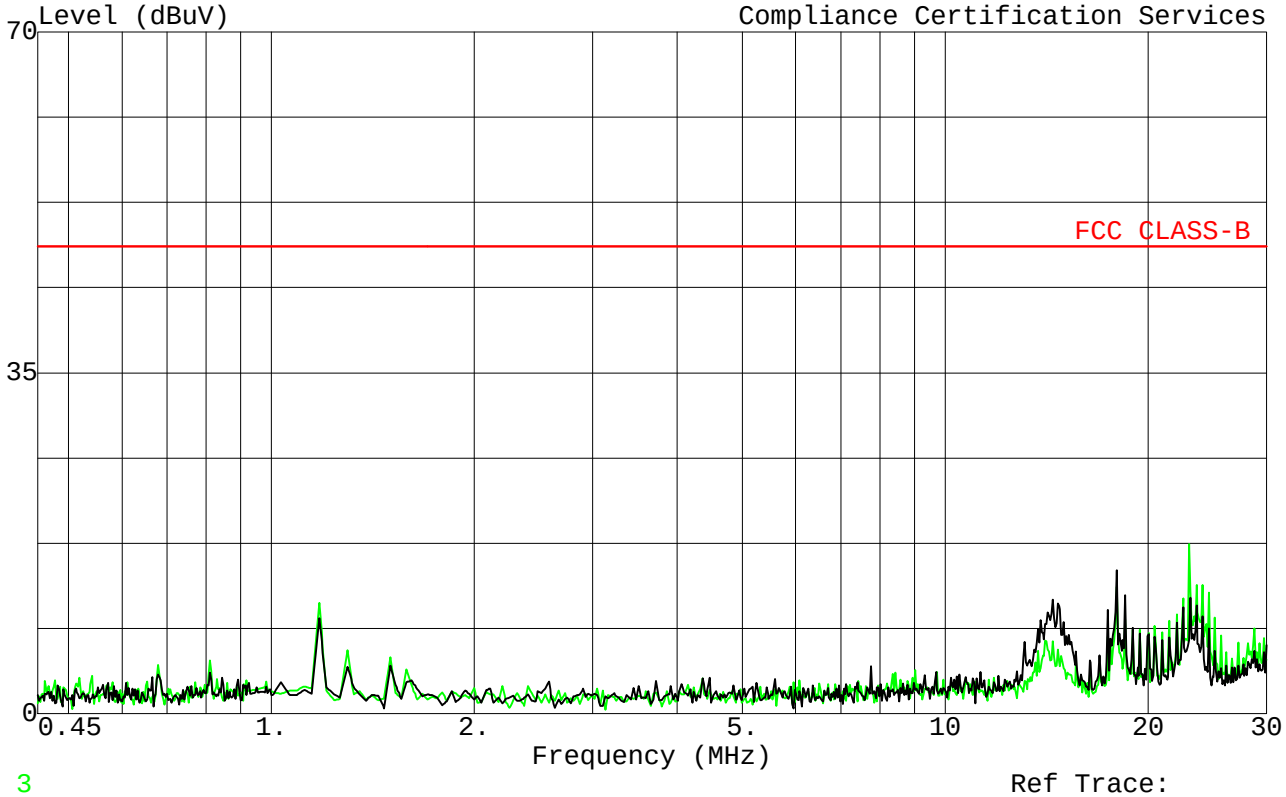
2. Line conducted data was recorded for both NEUTRAL and HOT lines.

RESULT

Complies. See plot *LineConduction*.

561 F Monterey Road, Route 2
Morgan Hill, CA 95037-9001 USA
Tel: (408) 463-0885
Fax: (408) 463-0888

Data#: 7 File#: 00I0629.EMI Date: 02-08-2001 Time: 10:44:08



Trace: 3 Ref Trace:

Project No. : 00I0629-1
Report No. : 00I0629-1
Test Engr : STEVE CHENG
Company : AIR LINK TECHNOLOGY, INC.
EUT Description : GAMING TABLE MANAGEMENT SYSTEMS (GTMS)
Model : PM-9900A
EUT Config. : EUT ONLY
Type of Test : FCC CLASS B
Mode of Operation: CONTINUOUSLY SEND DATA
: 115Vac, 60Hz