FCC CFR47 PART 90 CERTIFICATION

TEST REPORT

FOR

SECURITY TRANSMITTER (STEERING WHEEL LOCK)

MODEL: S-2100

FCC ID: P4RS-2100

REPORT NUMBER: 01U0993-1

ISSUE DATE: MARCH 21, 2002

Prepared for
GREAT REACH INTERNATIONAL INC.
425 BLUFFROAD
FORT LEE, NJ 07024, USA

Prepared by
COMPLIANCE CERTIFICATION SERVICES
561F MONTEREY ROAD
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TABLE OF CONTENT

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1. TEST RESULT CERTIFICATION

COMPANY NAME: GREAT REACH INTERNATIONAL INC.
425 BLUFFROAD
FORT LEE, NJ 07024 , USA

CONTACT PERSON: GRACE YING/GM

TELPHONE NO: (201) 969 – 0852

EUT DESCRIPTION: 451.350 MHZ SECURITY TRANSMITTER (STEERING WHEEL LOCK)

MODEL NAME: S-2100

DATE TESTED: DECEMBER 3, 2001

TYPE OF EQUIPMENT	INTENTIONAL RADIATOR
EQUIPMENT TYPE	451.350 MHz TRANSMITTER
MEASUREMENT PROCEDURE	ANSI 63.4 / 1992, TIA/EIA 603
PROCEDURE	CERTIFICATION
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.

Released For CCS By:

MIKE HECKROTTE
CHIEF EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

Tested By:

THU TRAN
SENIOR EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

COMPLIANCE CERTIFICATION SERVICES DOCUMENT NO: CCSUP4031A
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2. EUT DESCRIPTION

The EUT is an auto alarm – paging system. Once it is mounted on the steering wheel, any vibrations of the EUT will trigger the alarm. The EUT will send out a signal to the pager. The pager will then beep telling you that the steering wheel has been tempered with. The alarm will emit a loud noise. The pager can opereate up to 1000m from the alarm.

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))

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6. MEASURING INSTRUMENT

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.

TEST EQUIPMENTS LIST				
Name of Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Due Date**
Spectrum Analyzer	**HP100Hz - 22GHz**	**8566B**	**3014A06685**	**6/28/02**
Spectrum Display	**HP**	**85662A**	**3026A19146**	**6/28/02**
Quasi-Peak Detector	**HP9K - 1GHz**	**85650A**	**3145A01654**	**6/28/02**
Pre-Amplifier,25 dB	**HP0.1 - 1300MHz**	**8447D (P5)**	**44A06550**	**8/10/02**
Antenna, Bilog	**Chase 30 - 2000MHz**	**CBL6112B**	**2586**	**8/2/02**
Signal Generator (1-26GHz)	**HP**	**83732B**	**US34490599**	**3/21/02**
Antenna, Tuned Dipole,(30M - 1GHz)	**ComplianceDesign**	**Roberts**	**116**	**5/5/02**
Oscilloscope	**Tektronix**	**11403**	**B010618**	**N.C.R.**
Horn Antenna(1 - 18GHz)	**EMCO**	**3115**	**9001-3245**	**6/20/02**
Horn Antenna(1 - 18GHz)	**EMCO**	**3115**	**2238**	**6/20/02**
Pre-amplifier,35.5 dB (1 - 26.5GHz)	**Miteq**	**NSP2600-44**	**646456**	**4/12/02**
10dB Attenuator	**Mini-Circuit**	**MCLBW-S10W2**	**0026**	**In House Cal**
Modulations Analyzer	**HP**	**8901B**	**3438A05272**	**5/31/02**

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7. APPLICABLE RULES

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

Specification limit: 2W maximum.

§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.

Specification limit: As stated above.

§90.209- BANDWIDTH LIMITATION

According to 90.209(3) For all other types of emissions, the maximum authorized bandwidth shall not be more than that normally authorized for voice operations.

According to 90.209(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.

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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.

Specification limit: 20.0 kHz.

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§90.210- EMISSIONS MASKS

According to 90.210(c), Emission Mask C – For transmitters that are not equipped with an audio low-pass filter pursuant to§90.211(b), the power of any emission must be attenuated below the unmodulated carrier output power (P) as fellows:

(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5kHz, but not more than 10kHz: At least 83 x log (fd/5) dB.
(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 10kHz, but not more than 250% of the authorized bandwidth: At least 29 x log (fd^2 / 11) dB or 50dB, whichever is the lesser attenuation.
(3) On any frequency removed from the center of the authorized bandwidth by more than 250% of the authorized bandwidth: At least 43 + 10 x log (P) dB.

Specification limit: Specified as above.

§90.212- SCRAMBLING DEVICES AND DIGITAL VOICE MODULATION

Not applicable.

Specification limit: Not applicable.

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§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
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.

Specification limit: 5 ppm

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§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

Specification limit: ±12.5 KHz during time period t_2

§90.217- EXEMPTION FROM TECHNICAL STANDARDS

Specification limit: Not applicable.

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§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.

Specification limit: Frequency investigation range 30 MHz to 5GHz.

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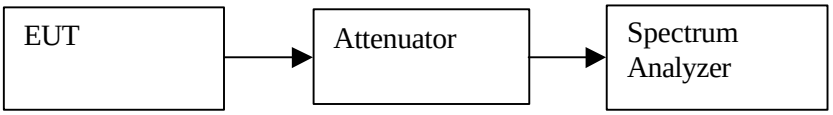
8. TEST SETUP, PROCEDURE AND RESULT

When the project started, the name used was Super Sun, therefore, some test plots show this name. During the project, the name was changed to Great Reach International.

8.1. CONDUCTED OUTPUT POWER

TEST SETUP



TEST PROCEDURE

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

RESULT

No non-compliance noted. 22.95 dBm = 0.197 Watts.

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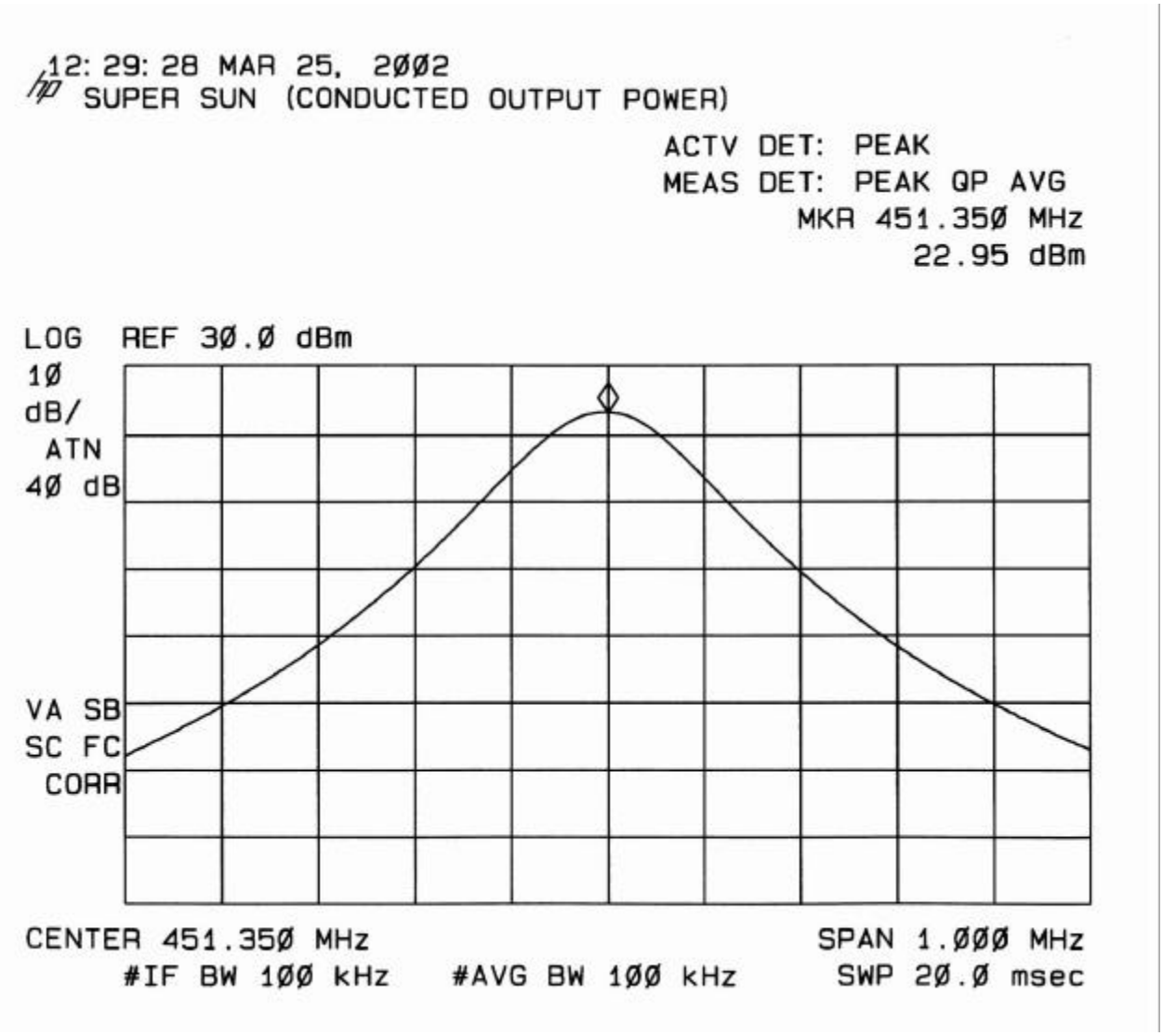

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8.2. RADIATED OUTPUT POWER (ERP)

INSTRUMENTS LIST
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

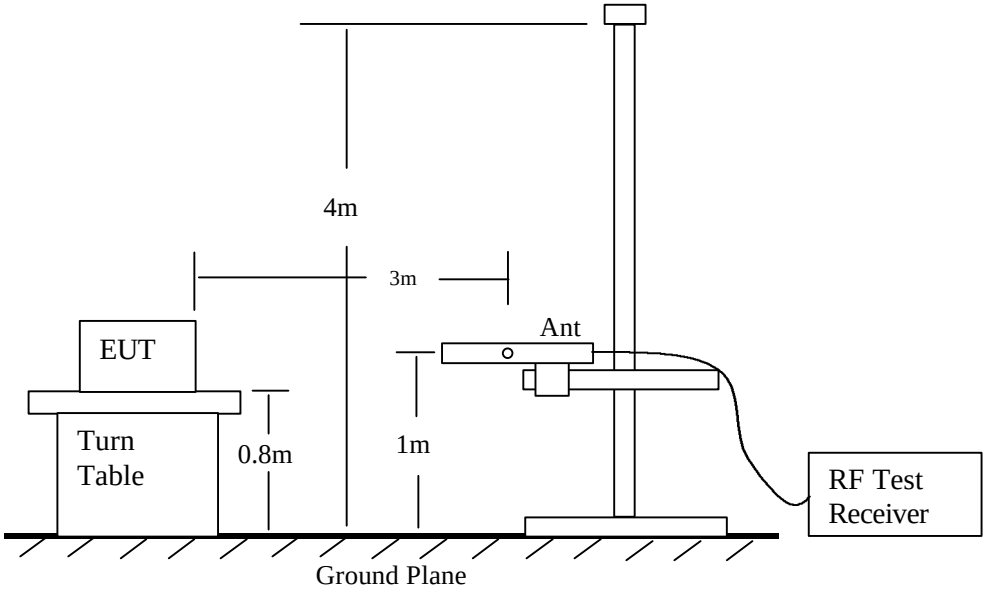

Fig 1: Radiated Emission Measurement

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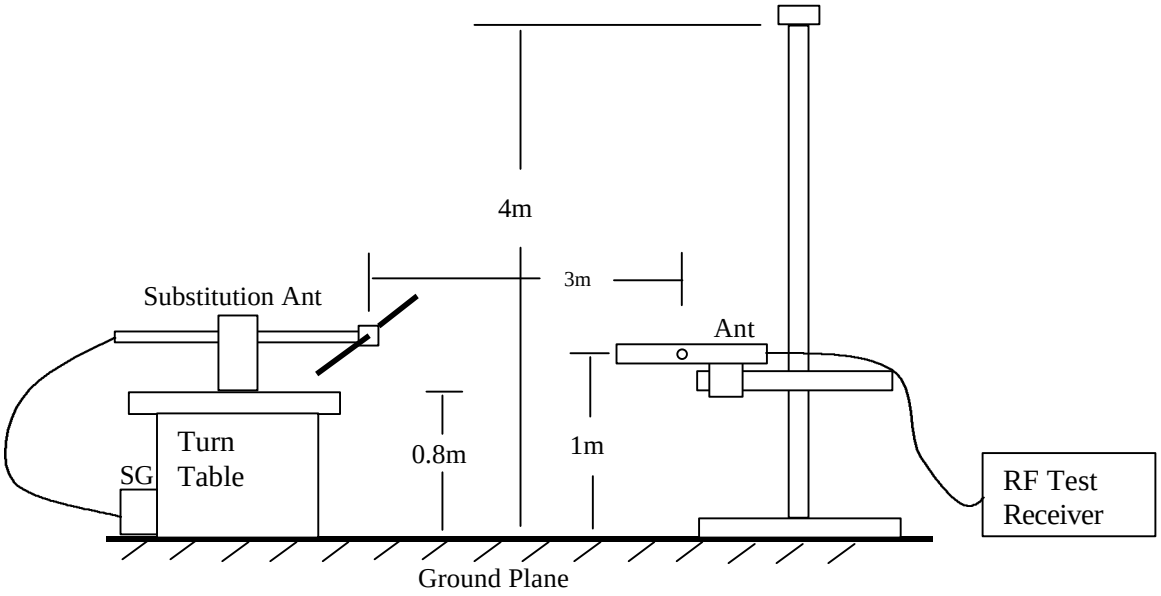

Fig 2: Radiated Emission – Substitution Method set-up

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.

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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.

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RESULT

No non-compliance noted.

Compliance Certification Services

Radiated Emissions 3/20/02
90 B-Site (3 meter)
Thu Tran
Super Sun Precision Co. LTD. Report#:01U0993-1

Frequency (MHz)	SA reading (dBuV)	SG reading (dBm)	CL (dB)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)
451.35V	91.9	3.9	0.1	0	3.8	33	-29.2
451.35H	98.1	21	0.1	0	20.9	33	-12.1
902.7H	73	-25.7	0.1	0	-25.8	-13	-12.8
902.7V	61	-38	0.1	0	-38.1	-13	-25.1

Note: Used Dipole as substitutions antenna. Site B.

Frequency (MHz)	SA reading (dBuV)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)
1354V	58.9	-53.7	2.55	7	4.85	-51.4	-13	-38.4
1354H	78.6	-23.3	2.55	7	4.85	-21	-13	-8
1805.4V	63.6	-44.7	3.06	8.8	6.65	-41.11	-13	-28.11
1805.4H	67.5	-43.7	3.06	8.8	6.65	-40.11	-13	-27.11
2256.8V	67.6	-37.4	3.23	8.8	6.65	-33.98	-13	-20.98
2256.8H	63.2	-45.1	3.23	8.8	6.65	-41.68	-13	-28.68
2708V	60.8	-49.1	3.57	8.8	6.65	-46.02	-13	-33.02
2708H	53.3	-48.7	3.57	8.8	6.65	-45.62	-13	-32.62
3159.5V	49.4	-59.7	3.91	8.8	6.65	-56.96	-13	-43.96
3159.5H	47.2	-58.2	3.91	8.8	6.65	-55.46	-13	-42.46
3610.8V	47.2	-60	4.42	8.2	6.05	-58.37	-13	-45.37
3610.8H	45.8	-60	4.42	8.2	6.05	-58.37	-13	-45.37
4062.2V	47.2	-60	4.76	9.9	7.75	-57.01	-13	-44.01
4062.2H	46.2	-60	4.76	9.9	7.75	-57.01	-13	-44.01
4513.5V	53.2	-47.4	4.93	10.7	8.55	-43.78	-13	-30.78
4513.5H	50.7	-49.8	4.93	10.7	8.55	-46.18	-13	-33.18

Note:Used Horn as substitutions antenna. Site B.

Note2: H=horizontal and V=vertical

EIRP = SG reading - CL + Gain (dBi)
Margin = EIRP - Limit

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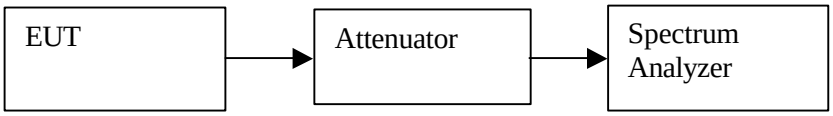
8.3. TYPE OF EMISSION

RESULT

No non-compliance noted. EUT uses F1D emission. See product documentation.

8.4. EMISSION BANDWIDTH

TEST SETUP



TEST PROCEDURE

The EUT is configured on a test bench as shown above in a continuously transmitting mode. The analyzer was enabled to capture the whole emission.

RESULT

No non-compliance noted. Bandwidth equals 7.58 KHz.

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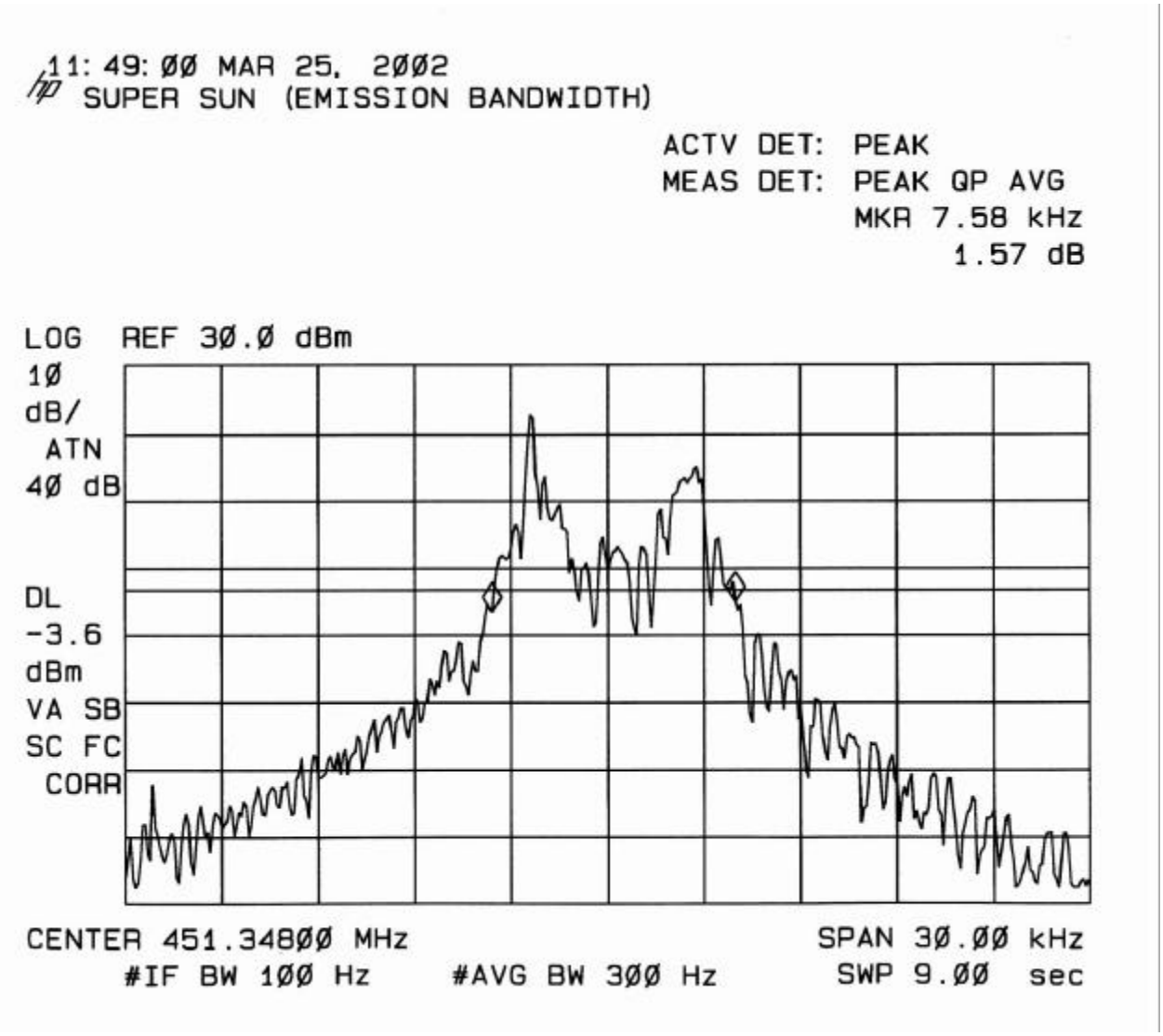

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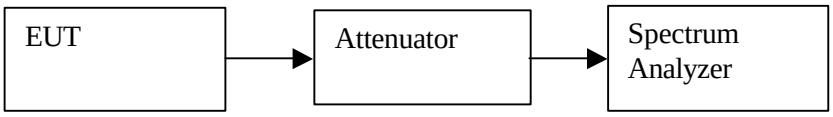
8.5. EMISSIONS MASKS

TEST SETUP



TEST PROCEDURE

The EUT is configured on a test bench as shown above in a continuously transmitting / receiving mode. The analyzer was enabled to capture the whole emission.

RESULT

No non-compliance noted. See plots:

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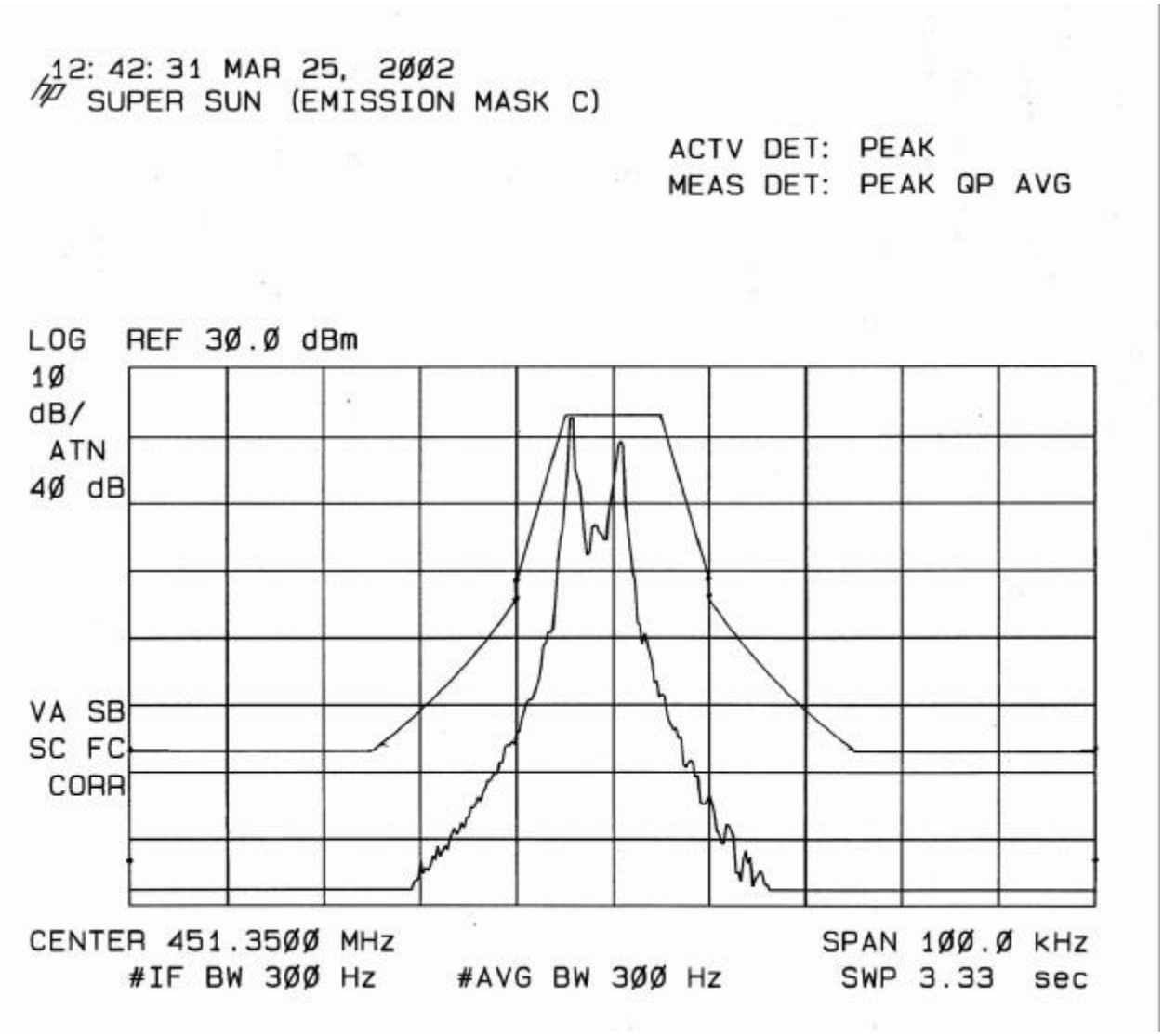

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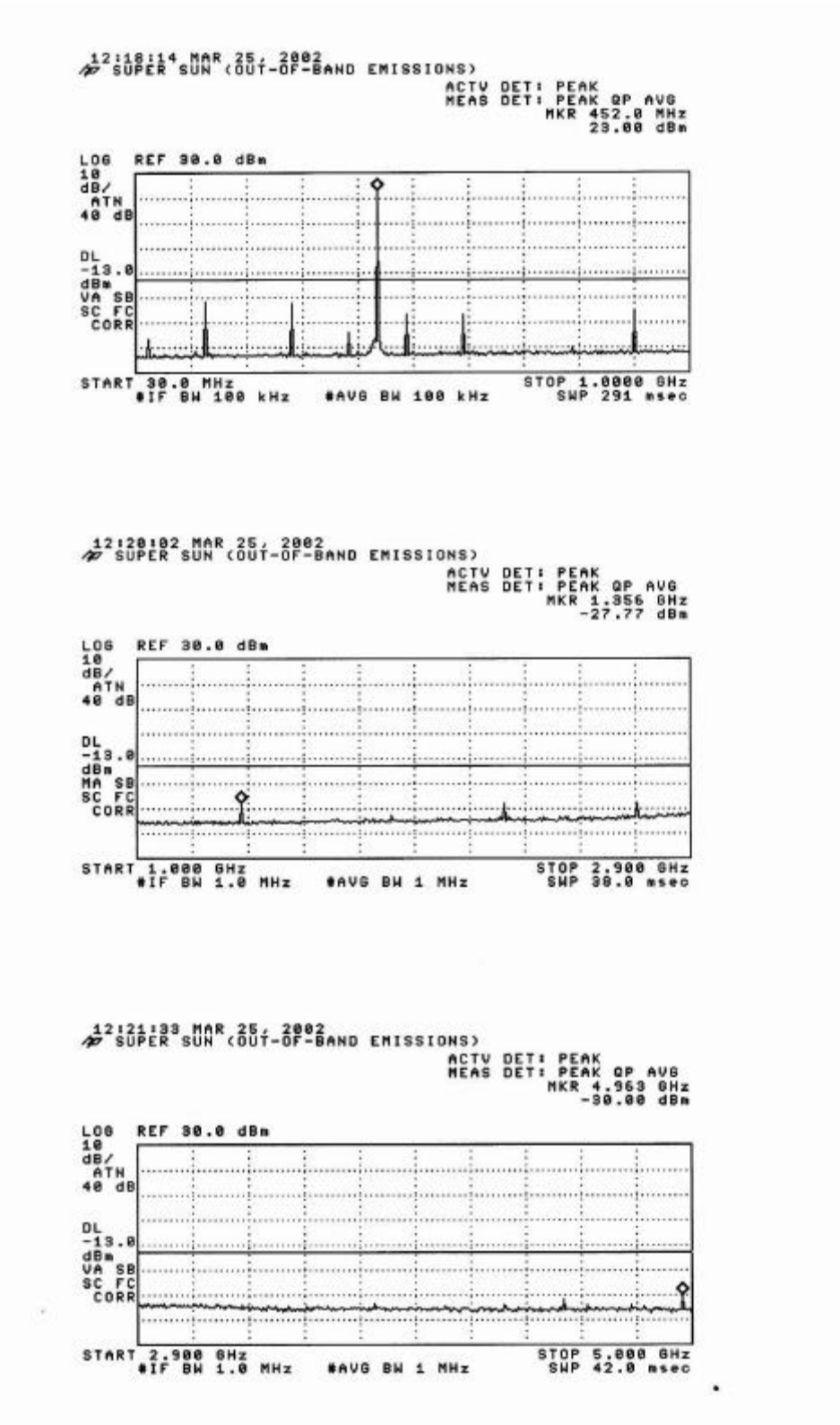

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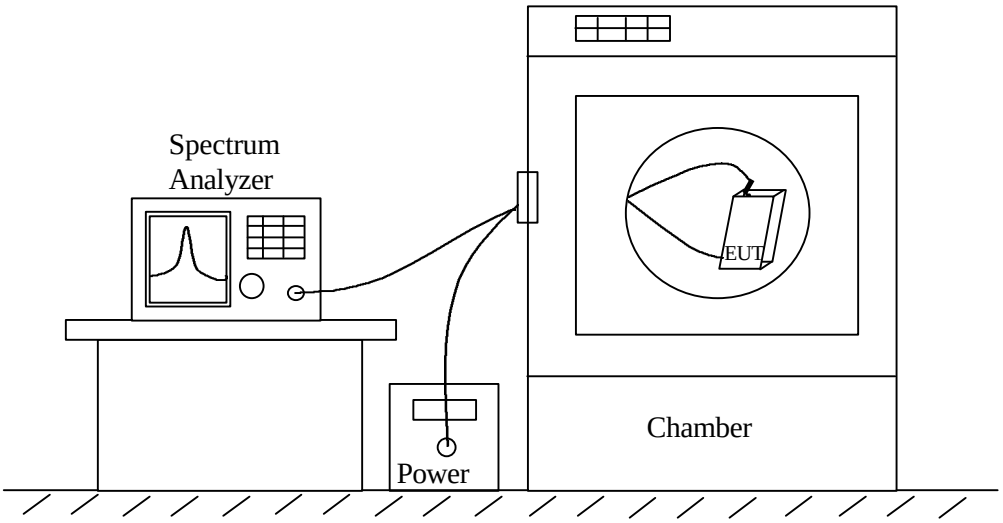
8.6. FREQUENCY STABILITY

TEST PROCEDURE

Perform the tests in the following sequence:

1. Frequency Stability Setup
2. Frequency Stability Versus Supply Voltage
3. Frequency Stability Versus Environmental Temperature



Equipment Setup For Frequency Stability Test

FREQUENCY STABILITY SETUP

1. Place the EUT in the environmental chamber. All measuring equipment and the variable power supply are placed outside the environmental chamber. After routing the power and coaxial cables through the chamber access hole, install a foam plug in the access hole. Connect the EUT power to a variable power supply appropriate to the EUT power requirements (AC or DC, and proper voltage range).

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2. Set the variable power supply to the EUT nominal supply voltage.

3. If the EUT is equipped with a removable antenna, disconnect the antenna and connect the spectrum analyzer to the EUT antenna port. Otherwise use a pickup loop or a pickup wire to couple the EUT antenna to the spectrum analyzer coaxial feed cable.

4. Set the EUT to transmit an unmodulated signal. Set the spectrum analyzer center frequency to the EUT transmitter frequency, and the span and bandwidth low enough to display at least 6 decimal places of the marker frequency.

5. Close the chamber door and set the chamber temperature to +25 °C.

6. Allow all equipment to stabilize for 1 hour. Record the transmitter reference frequency.

FREQUENCY STABILITY VERSUS DC SUPPLY VOLTAGE

1. Lower the supply voltage to the battery end-point voltage.

2. Allow the EUT to stabilize for 5 minutes. Record the transmitter frequency and calculate the deviation from the reference frequency.

FREQUENCY STABILITY VERSUS ENVIRONMENTAL TEMPERATURE

1. If the frequency stability versus supply voltage test was performed, readjust the supply voltage to the EUT nominal voltage, allow the EUT to stabilize for 5 minutes and record a new transmitter reference frequency. Otherwise use the reference frequency recorded during the initial setup procedure.

2. Set the temperature of the chamber to -30 °C. Allow the EUT to stabilize for 1 hour. Record the transmitter frequency and calculate the deviation from the reference frequency.

3. Increase the temperature of the chamber by 10 °C delta. Allow the EUT to stabilize for 30 minutes. Record the transmitter frequency and calculate the frequency deviation from the reference frequency.

4. Repeat Step 3 until the highest temperature (+50 °C) is reached.

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RESULT

No non-compliance noted.

Frequency Stability Versus DC Supply Voltage

Reference Frequency: 451.350525 MHz @ 9 VDC			Limit: 5 ppm (2255 Hz)
Supply Voltage (VDC)	Frequency (MHz)	Deviation (Hz)	Deviation (ppm)
7.65	451.350325	-200	0.4

Frequency Stability Versus Environmental Temperature

Reference Frequency: 451.350013 MHz @ +25 ºC			Limit: 5 ppm (2255 Hz)
Temperature (°C)	Frequency (MHz)	Deviation (Hz)	Deviation (ppm)
-30	451.350461	448	1.0
-20	451.350350	337	0.8
-10	451.350215	202	0.5
0	451.350150	137	0.3
+10	451.350231	218	0.5
+20	451.350338	325	0.7
+30	451.350538	525	1.2
+40	451.349276	-737	-1.6
+50	451.349238	-775	-1.7

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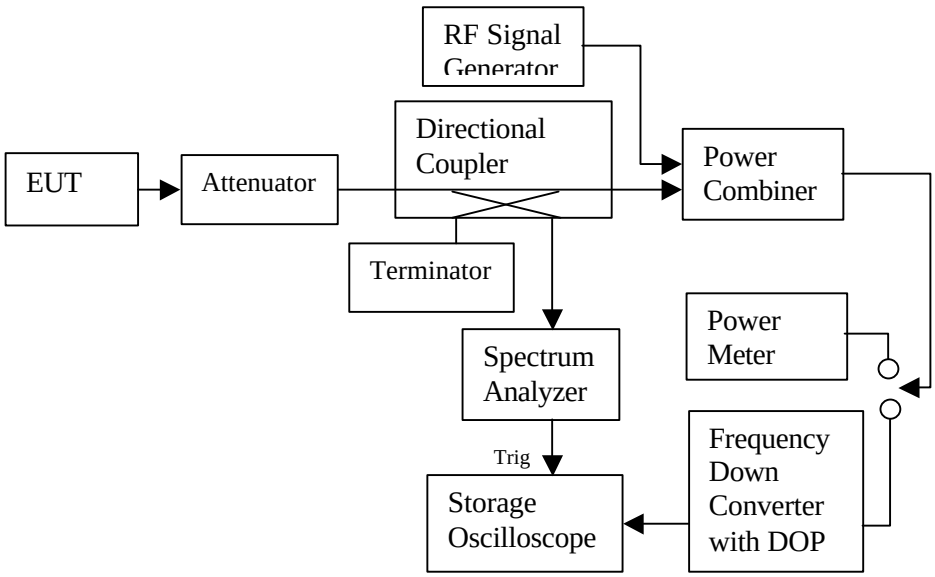
8.7. TRANSIENT FREQUENCY BEHAVIOR

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

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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

No non-compliance noted. See plots.

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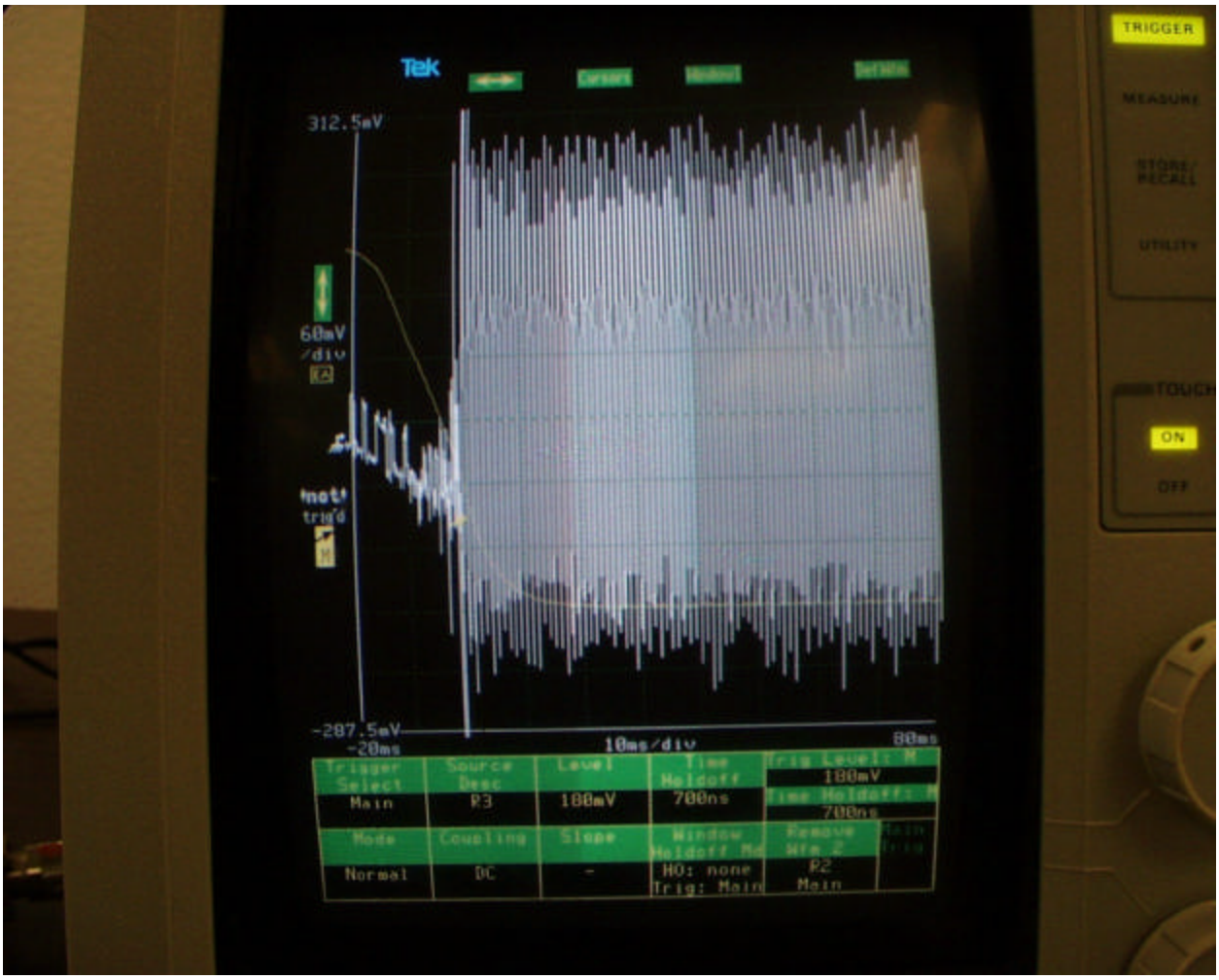

Note: Frequency Transient Response – TURNING OFF

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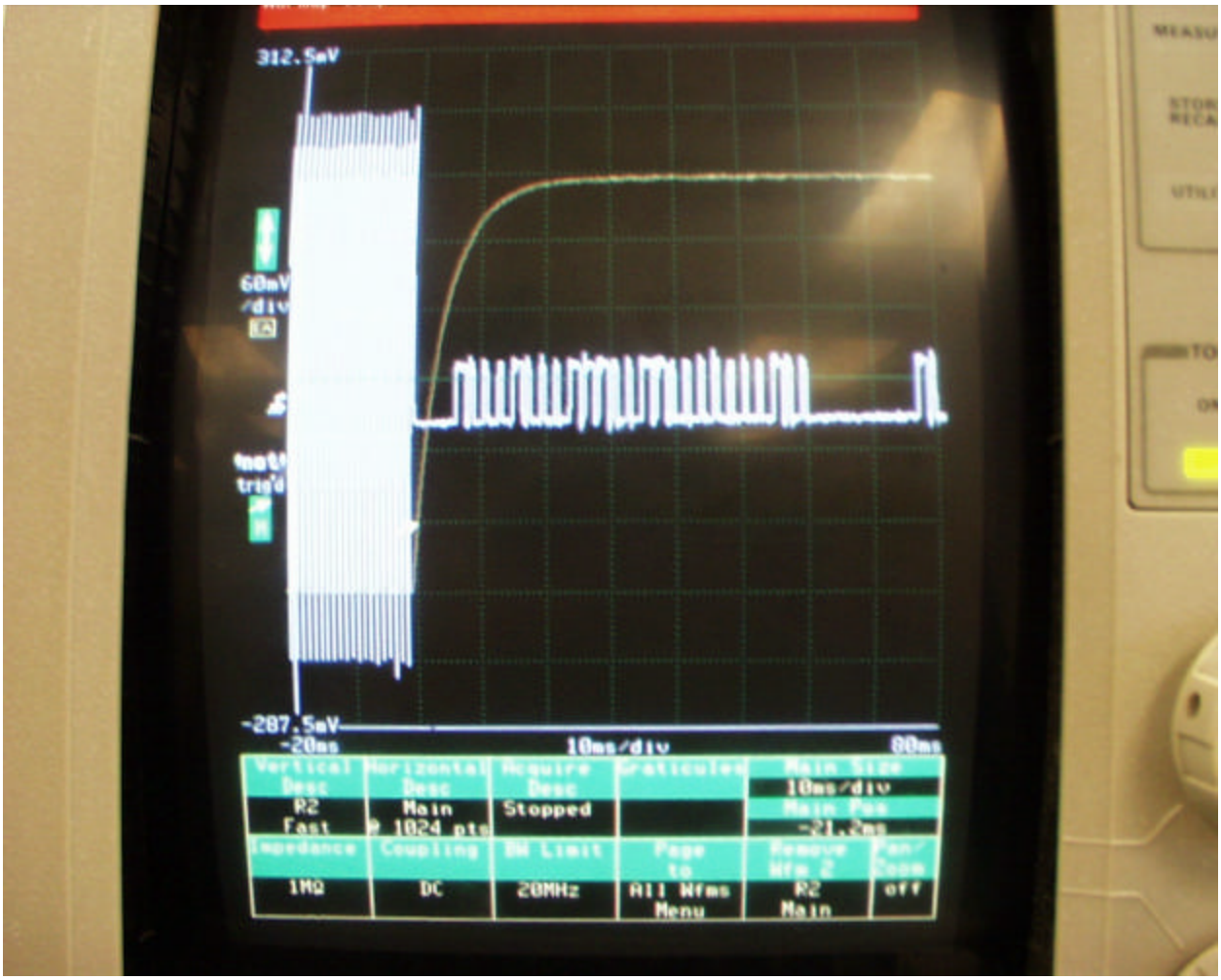

Note: Frequency Transient Response – TURNING ON

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9. SETUP PHOTOS

Radiated Emission

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