

APPLICATION FOR CERTIFICATION

On Behalf of
Prod-art Co., Ltd.
FRS

Model : PF-818

Prepared for : Prod-art Co., Ltd.
Flat 12-16, 5/F., Block A, Focal Ind. Centre,
21 Man Lok St., Hung Hom,
Kowloon, Hong Kong.

Prepared By : Audix Technology (Shenzhen) Co., Ltd.
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Report Number : ACS-20F155
Date of Test : Nov. 09~Dec. 08, 2000
Date of Report : Dec. 14, 2000

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TEST REPORT CERTIFICATION

Applicant : Prod-art Co., Ltd.
 Manufacturer : Prod-art Co., Ltd.
 EUT Description : FRS
 (A) MODEL NO. : PF-818
 (B) POWER SUPPLY : +4.5V DC Battery

Test Procedure Used:

FCC RULES AND REGULATIONS:

Part 2 Subpart J and Part 15 Subpart B & C: October 1998

Part 95 Subpart B and Subpart E, Family Radio Service : October 1998

And FCC / ANSI C63.4-1992

The device described above was tested by AUDIX TECHNOLOGY (SHENZHEN) CO., LTD. to determine the maximum emission levels emanating from the device. The test results were contained in this test report and AUDIX TECHNOLOGY (SHENZHEN) CO., LTD. was assumed full responsibility for the accuracy and completeness of these tests. Also, this report shows that the EUT to be technically compliance with the FCC Part 2 、 Part 15 、 Part 95 FRS official requirements.

This report applied to the above tested sample only. This report shall not be reproduced in part without written approval by AUDIX TECHNOLOGY (SHENZHEN) CO., LTD.

Date of Test :

Nov. 09~Dec. 08, 2000

Prepared by :

Fanny Yang

Fanny Yang / Assistant

Reviewer :

Alex Deng

Alex Deng / Assistant Manager

For and on behalf of
AUDIX TECHNOLOGY (SHENZHEN) CO., LTD.

Approved & Authorized Signer :

..... Smart Test Manager
Authorized Signature(s)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

Description	:	FRS
Model Number	:	PF-818
FCC ID	:	KHW010
Applicant	:	Prod-art Co., Ltd. Flat 12-16, 5/F., Block A, Focal Ind. Centre, 21 Man Lok St., Hung Hom, Kowloon, Hong Kong.
Manufacturer	:	Prod-art Co., Ltd. Flat 12-16, 5/F., Block A, Focal Ind. Centre, 21 Man Lok St., Hung Hom, Kowloon, Hong Kong.
Frequency Range	:	462~468 MHz 462.5625MHz(Channel 1) and 467.5625 (Channel 8) were tested and including in this report.
Data of Receipt of Sample	:	Nov. 02, 2000
Date of Test	:	Nov. 09~Dec. 08, 2000

1.2. Test Facility

Site Description

3m Anechoic Chamber	:	Certificated by FCC, USA Aug. 24, 2000
3m & 10m Open Site	:	Certificated by FCC, USA Feb. 13, 1998
EMC Lab.		Certificated by VCCI, Japan Oct. 29, 1998
		Certificated by DATech, German Feb. 02, 1999
		Certificated by NVLAP, USA Until Mar. 03, 2001 NVLAP Code: 200372-0
Name of Firm	:	Audix Technology (Shenzhen) Co., Ltd.
Site Location	:	No. 6, Ke Feng Rd., 52 Block, Shenzhen Science & Industrial Park, Nantou, Shenzhen, Guangdong, China

1.3. Test Uncertainty

Conducted Emission Uncertainty	=	$\pm 2.66\text{dB}$
Radiated Emission Uncertainty	=	$\pm 4.26\text{dB}$

2. FREQUENCY STABILITY TEST

2.1. Test Equipment

The following test equipment were used during the Frequency Stability Test :

2.1.1. Temperature Variation Test

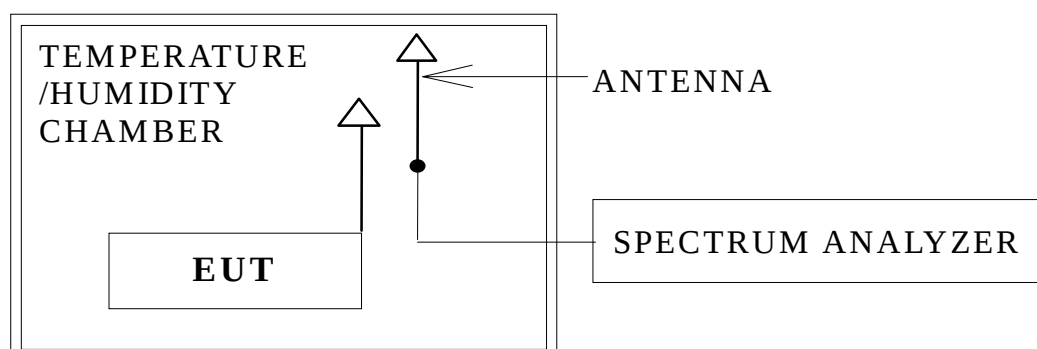
Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Temperature /Humidity Chamber	Giant Force	GTH-066P	94075-2	Apr. 27, 00'	1 Year
2.	Spectrum Analyzer	HP	8591EM	3628A00914	Jun. 04, 00'	1 Year
3.	Antenna	KENWOOD	UHF	N/A	Jun. 04, 00'	1 Year

2.1.2. Primary Supply Voltage Variation Test

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	HP	8591EM	3628A00914	Jun. 04, 00'	1 Year
2.	Antenna	KENWOOD	UHF	N/A	Jun. 04, 00'	1 Year
3.	DC Power Supply	KING INSTRUMENT	DSP-1303D	821956	Jun. 04, 00'	1 Year

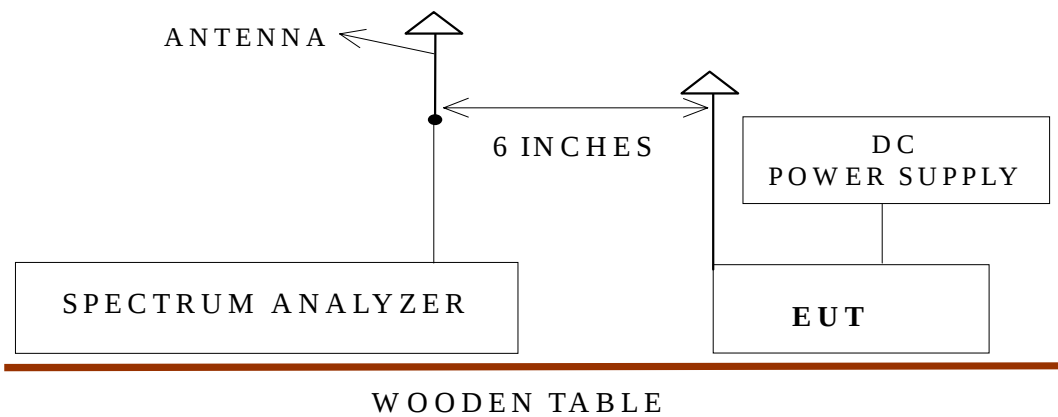
2.2. Block Diagram of Test Setup

2.2.1. Temperature Variation Test Setup



2.2.2. Primary Supply Voltage Variation Test Setup

2.2.2.1. For DC Battery (DC 4.5V)



2.3. Test Rules

CFR 47 Part 2 § 2.1055, (a)-(1) and (d)-(1)

2.4. Specification Limits

Each FRS unit must be maintained within a frequency tolerance of 0.00025% according to Part 95 § 95.627.

2.5. EUT's Configuration during Compliance Test

The following equipment was installed on FREQUENCY STABILITY Test to meet the commission requirement.

2.5.1. FRS (EUT)

Model Number	:	PF-818
FCC ID	:	KHW010
Manufacturer	:	Prod-art Co., Ltd.
Power Supply	:	4.5VDC Battery

2.6. Test Procedure

1.1.1. Temperature Variation

2.6.1.1. Setup the EUT and test equipment as shown on 3.2.1.

2.6.1.2. Set the EUT at channel 1 (462.5625MHz) or channel 8 (467.5625MHz),

varied the temperature from -30°C to +50°C with 10°C increment for each

step to find out the maximum frequency stability tolerance and minimum

frequency tolerance.

2.6.2. Primary Supply Voltage Variation

2.6.2.1. Setup the EUT and test equipment as shown on 3.2.2.

1.1.1.2. Set the EUT at channel 1 (462.5625MHz) or channel 8 (467.5625MHz),

varied the primary supply voltage by a transformer from 85 % to 115 % of

the nominal operation power to find out the maximum frequency stability

tolerance and minimum frequency tolerance.

2.7. Test Results

PASSED. Please refer to the following pages.

2.8. Frequency Stability Test Results

1.1.1. For Channel 1 Temperature Variation Test Results

Varied ambient temperature from -30° C to +50°C.

Temp. (°C)	Frequency Stability vs. Temperature					
	2 min		5 min		10 min	
	Measured Max. Freq. (MHz)	Tolerance (%)	Measured Max. Freq. (MHz)	Tolerance (%)	Measured Max. Freq. (MHz)	Tolerance (%)
-30	462.5629	0.00008	462.56284	0.00007	462.5621	0.00008
-20	462.5628	0.00006	462.5621	0.00008	462.56241	0.00002
-10	462.56293	0.00009	462.56278	0.00006	462.5631	0.00013
0	462.56194	0.00012	462.56233	0.00003	462.56216	0.00007
10	462.56208	0.00009	462.56194	0.00012	462.5626	0.00001
20	462.5623	0.00004	462.56208	0.00009	462.56215	0.00007
30	462.56285	0.00007	462.56219	0.00006	462.56257	0.00001
40	462.56288	0.00008	462.56214	0.00006	462.56294	0.00011
50	462.5622	0.00006	462.5624	0.00002	462.5621	0.00008

2.8.2. For Channel 8 Temperature Variation Test Results

Varied ambient temperature from -30° C to +50°C.

Temp. (°C)	Frequency Stability vs. Temperature					
	2 min		5 min		10 min	
	Measured Max. Freq. (MHz)	Tolerance (%)	Measured Max. Freq. (MHz)	Tolerance (%)	Measured Max. Freq. (MHz)	Tolerance (%)
-30	467.59294	0.00011	467.56218	0.00006	467.56204	0.00009
-20	467.56285	0.00007	467.5630	0.0001	467.5623	0.00004
-10	467.56274	0.00005	467.56266	0.00003	467.56259	0.00001
0	467.5621	0.00006	467.56233	0.00003	467.5627	0.00004
10	467.56218	0.00006	467.56259	0.00001	467.5623	0.00004
20	467.5624	0.00005	467.56214	0.00007	467.5628	0.00006
30	467.56211	0.00006	467.56286	0.00007	467.56205	0.00009
40	467.56204	0.00009	467.56218	0.00006	467.56259	0.00001
50	467.5628	0.00004	467.56266	0.00003	467.56272	0.00004

2.8.3. For Channel 1 Primary Supply Voltage Variation Test Results

Temperature: 22°C

Varied primary supply voltage from 85% to 115%

Supply Voltage (Vdc)	Test Frequency (MHz)	Tolerance (%)
3.825(85%)	462.5619	0.00012
4.5(100%)	462.5621	0.00008
5.175(115%)	462.5628	0.00006

2.8.4. For Channel 8 Primary Supply Voltage Variation Test Results

Temperature: 22°C

Varied primary supply voltage from 85% to 115%

Supply Voltage (Vdc)	Test Frequency (MHz)	Tolerance (%)
3.825(85%)	467.5621	0.00008
4.5(100%)	467.5618	0.00015
5.175(115%)	467.5632	0.00015

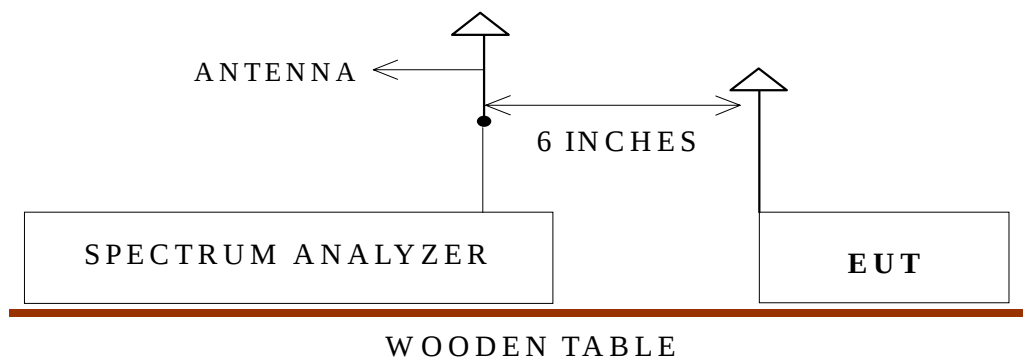
3. FREQUENCIES AND CHANNELS TEST

3.1. Test Equipment

The following test equipment were used during the Frequencies and Channels Test :

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	HP	8591EM	3628A00914	Jun. 04, 00'	1 Year
2.	Antenna	KENWOOD	UHF	N/A	Jun. 04, 00'	1 Year

3.2. Block Diagram of Test Setup



3.3. Test Rules

CFR 47 Part 95 § 95.627

3.4. Specification Limits

Each FRS unit must be maintained within a frequency tolerance of 0.00025% .

3.5. EUT's Configuration during Compliance Test

The following equipment was installed on FREQUENCYS AND CHANNELS Test to meet the commission requirement.

3.5.1. FRS (EUT)

Model Number	:	PF-818
FCC ID	:	KHW010
Manufacturer	:	Prod-art Co., Ltd.
Power Supply	:	4.5VDC Battery

3.6. Test Procedure

3.6.1. Setup the EUT and test equipment as shown on 4.2.

1.1.2. The EUT was placed on a wooden table and through RF Communication Test Set to check the channels frequencies' tolerance.

3.7. Test Results

PASSED.

3.8. Frequencies and Channels Test Results

Date of Test: Dec. 07, 2000

CH. No.	Frequency (MHz)	Measured Freq. (MHz)	Tolerance (%)	CH. No.	Frequency (MHz)	Measured Freq. (MHz)	Tolerance (%)
1	462.5625	462.5623	0.00005	8	467.5625	467.5625	0.00001
2	462.5875	462.5872	0.00001	9	467.5875	467.5877	0.00003
3	462.6125	462.6127	0.00004	10	467.6125	467.6126	0.00002
4	462.6375	462.6376	0.00002	11	467.6375	467.6371	0.00007
5	462.6625	462.6624	0.00002	12	467.6625	467.6624	0.00001
6	462.6875	462.6871	0.00008	13	467.6875	467.6871	0.00004
7	462.7125	462.7121	0.00007	14	467.7125	467.7128	0.00005

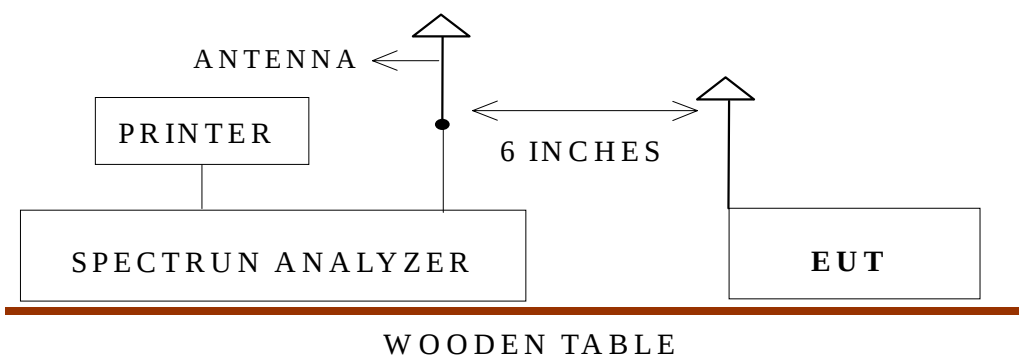
4. TRANSMITTER EMISSION TYPE TEST

4.1. Test Equipment

The following test equipment were used during the Transmitter Emission Type Test :

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	HP	8590L	3710A01838	Jul. 03, 00'	1 Year
2.	Antenna	EMCO	4610	9410-1274	Dec. 28, 99'	1 Year

4.2. Block Diagram of Test Setup



4.3. Test Rules

CFR 47 Part 95 § 95.631 (d)

4.4. Specification Limits

An FRS unit may transmit only emission type F3E.

4.5. EUT's Configuration during Compliance Test

The configuration of EUT were same as section 4.5.

4.6. Test Procedure

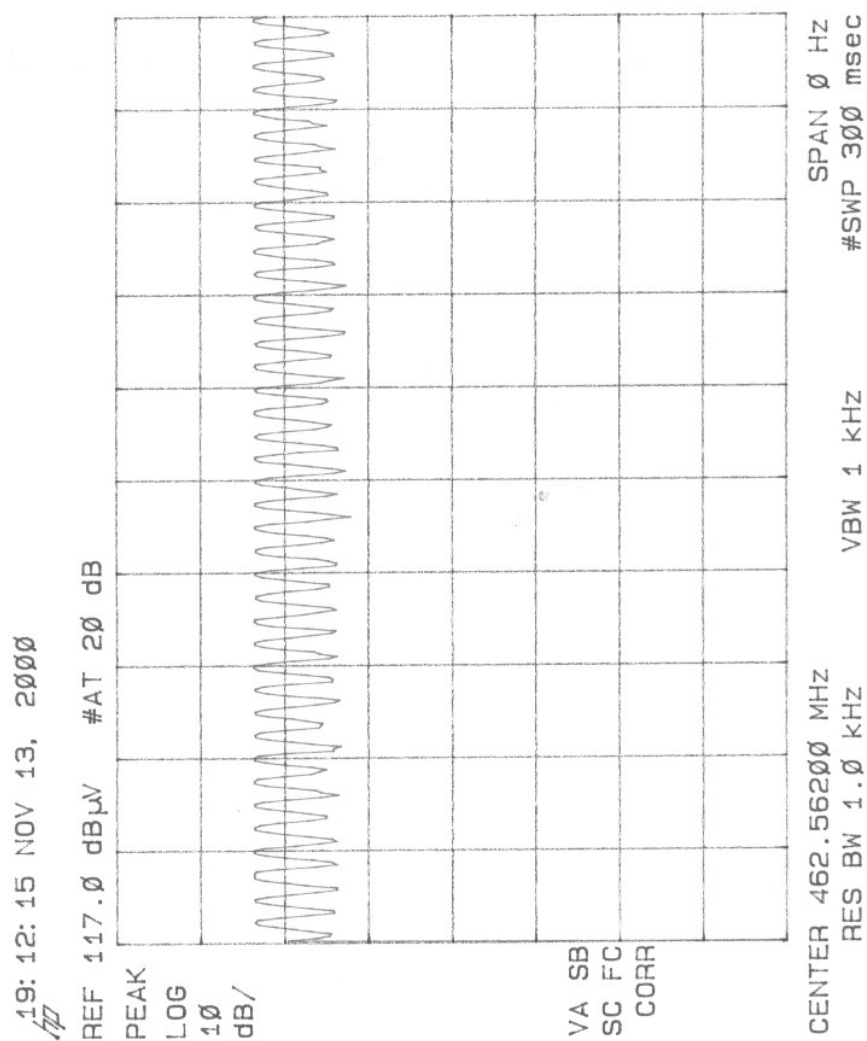
4.6.1. Setup the EUT and simulator as shown on 5.2.

4.6.2. The EUT was placed on a wooden table to check the transmitter emission type by using spectrum analyzer.

4.7. Transmitter Emission Type Test Results

Date of Test: Dec. 06, 2000

This FRS unit its emission type is F3E. The test data is attached in next figure.



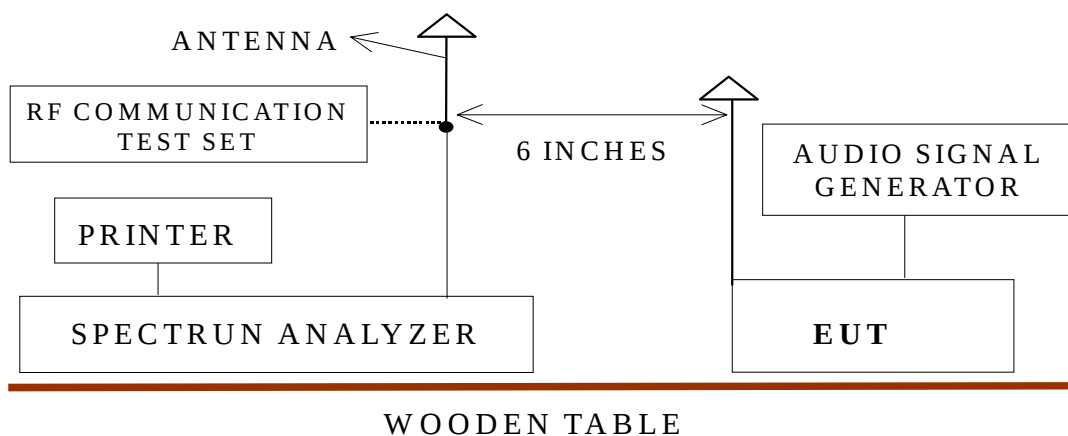
5. EMISSION BANDWIDTH TEST

5.1. Test Equipment

The following test equipment were used during the Emission Bandwidth Test :

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	RF Communication Test Set	HP	8920A	3524A07043	Dec. 07, 99'	1 Year
2.	Spectrum Analyzer	HP	8590L	3710A01838	Jul. 03, 00'	1 Year
3.	Audio Signal Generator	HP	8904A	3633A08312	Dec. 08, 99'	1 Year
4.	Antenna	EMCO	4610	9410-1274	Dec. 28, 99'	1 Year

5.2. Block Diagram of Test Setup



5.3. Test Rules

CFR 47 Part 95 § 95.633 (c)

5.4. Specification Limits

The authorized bandwidth for emission type F3E transmitted by a FRS unit is 12.5KHz.

5.5. EUT's Configuration during Compliance Test

The configuration of EUT were same as section 4.5.

5.6. Test Procedure

- 5.6.1. Setup the EUT and test equipment as shown on 6.2.
- 5.6.2. Supply the EUT with nominal operating voltage and set at Channel 1 or Channel 8.
- 5.6.3. Set a reference level on the measuring instrument at any location that will allow measuring the specified bandwidth.
- 5.6.4. Supply the EUT with modulation to observe and record with plotted graphs the worst –case occupied bandwidth by these different modulation sources.

5.7. Emission Bandwidth Test Results

Date of Test: Nov. 20, 2000

Channel No.	Frequency (MHz)	Bandwidth (KHz)
1	462.5625	10.70
8	467.5625	12.35

The bandwidth test data are attached in next page.

Channel 1: 462.5625MHz

10:57:36 NOV 21, 2000

MARKER Δ
10.70 kHz
-54 dBACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 10.70 kHz
-54 dBMARKER
NORMALMARKER
 Δ MARKER
AMPTDSELECT
1 2 3 4MARKER 1
ON OFFMore
1 of 3LOG REF 120.0 dB μ V10
dB/
ATN
30 dBVA SB
SC FC
CORR

CENTER 462.56121 MHz

#IF BW 1.0 kHz

#AVG BW 1 kHz

SPAN 20.00 kHz

#SWP 300 msec

Channel 8 : 467.5625MHz

09:35:57 NOV 27, 2000

MARKER Δ
12.35 kHz
-40 dBACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 12.35 kHz
-40 dBMARKER
NORMALMARKER
 Δ MARKER
AMPTDSELECT
1 2 3 4MARKER 1
ON OFFMore
1 of 3LOG REF 120.0 dB μ V10
dB/
ATN
30 dBMA SB
SC FC
CORR

CENTER 467.56325 MHz

#IF BW 1.0 kHz

#AVG BW 30 kHz

SPAN 20.00 kHz

#SWP 300 msec

6. RADIATED EMISSION TEST

6.1. Test Equipment

The following test equipment were used during the Radiated Emission Test :

1.1.1. Radiation Test (for 30MHz~6GHz)

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	HP	8592B	2952A00273	Jun. 04, 00	1 Year
2.	Spectrum Analyzer	Anritsu	MS2601B	MT79931	Jun. 04, 00	1 Year
3.	Pre-Amplifier	HP	8447D	1937A03021	Oct. 12, 00	1/2 Year
4.	Pre-Amplifier	HP	8449B	3008A00863	Jun. 04, 00	1 Year
5.	Computer	N/A	486SLC	N/A	N/A	N/A
6.	Printer	NEC	P3800	568101453S	N/A	N/A
7.	Bilog Antenna	Chase	CBL6111	1159	Sep. 26, 00	1 Year
8.	Double Ridge Horn Antenna	EMCO	3115	9510-4580	Apr. 05, 00	1.5 Year

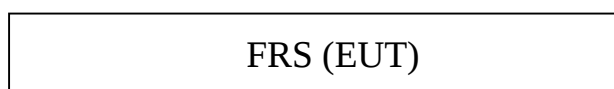
6.1.2. Radiation Test (for Channel Center Attenuation)

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	HP	8591EM	3628A00914	Jun. 04, 00'	1 Year
2.	Antenna	KENWOOD	UHF	N/A	Jun. 04, 00'	1 Year

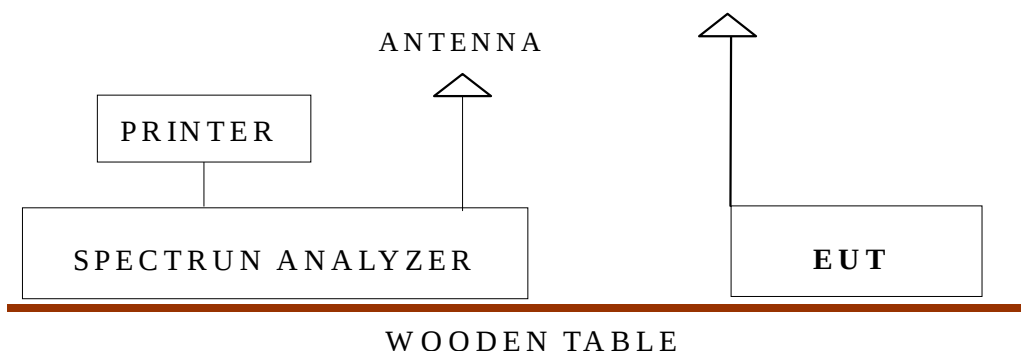
6.2. Block Diagram of Test Setup

6.2.1. Block Diagram of connection between EUT and simulators

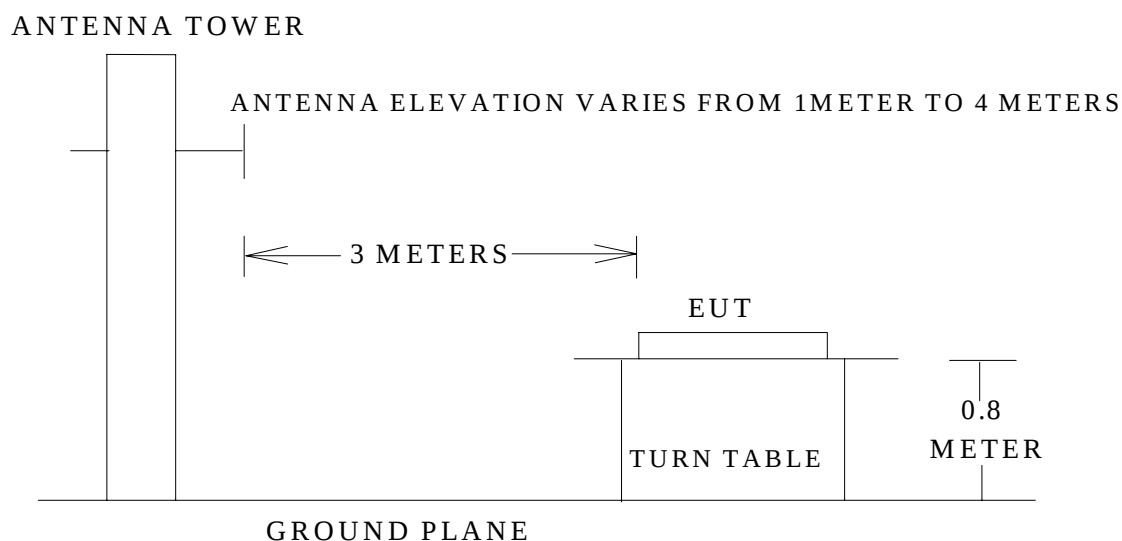
6.2.1.1. Radiation Test at Open Field Test Site



6.2.1.2. Radiation Test for Channel Center Attenuation



6.2.2. In Anechoic Chamber Test Site Setup Diagram (30MHz~6GHz, 3m)



6.3. Test Rules

CFR 47 Part 95 § 95.635, FRS Transmitter, Emission Type F3E.

CFR 47 Part 15 Subpart B & C, § 15.209

6.4. Specification Limits

6.4.1. Transmitter, Channel Center Attenuation (Part 95 Subpart E, § 95.635)

- (i) Emissions 12.5KHz to 22.5KHz away from the channel center frequency: at least 30 dB; and
- (ii) Emissions more than 22.5KHz away from the channel center frequency: at least $43 + 10\log(\text{carrier power in watts})$ dB.

6.4.2. Transmitter, Radiation Limit (Part 95 Subpart E, § 95.635)

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMITS dB μ V/m
Fundamental Freq.	3	No limits
Harmonic Emission	3	85.71

Remark : (1) Channel center frequency: at least $43 + 10\log(\text{carrier power in watts})$ dB.

(2) Distance refers to the distance in meters between the measuring antenna and the closed point of any part of the device or system.

(3) Harmonic emission limits = Fundamental Freq. max. emission level - $43 + 10\log(\text{carrier power in watts})$ dB.

6.4.3. Receiver, Radiation Limit (Part 15 Subpart B & C, § 15.209)

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMITS	
		μ V/M	dB μ V/m
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
Above 960	3	500	54.0

Remark : (1) Emission level (dB μ V/m) = 20 log Emission level (μ V/m)

(2) The tighter limit applies at the edge between two frequency bands.

(3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

6.5. EUT's Configuration during Compliance Test

The configuration of EUT were same as section 3.5.

6.6. Operating Condition of EUT

6.6.1. Setup the EUT and simulator as shown on 7.2.

6.6.2. Turned on the power of all equipment.

6.6.3. Operated the FRS (EUT) on transmitting status during the testing.

6.6.4. Operated the FRS (EUT) on receiving status during the testing.

6.7. Test Procedure

6.7.1. Radiation test for Channel Center Attenuation

6.7.1.1. Setup the EUT and test equipment as shown on 7.2.1.2.

6.7.1.2. Setup the EUT at channel 1 (462,5625MHz).

6.7.1.3. Setup the spectrum analyzer's RES BW at 1KHz, VBW at 1KHz, SPAN 50KHz and center frequency at 462.5625MHz.

6.7.1.4. Check the emissions 12.5KHz to 22.5KHz away from the channel center frequency from spectrum analyzer to see at least 30dB below the peak or not.

6.7.1.5. Setup the spectrum analyzer's RES BW at 300KHz, VBW at 100KHz, SPAN 50KHz and center frequency at 462.5625MHz.

6.7.1.6. Check the emissions more than 22.5KHz away from the channel center frequency to see at least $43 + 10\log$ (carrier power in watts) dB below the peak or not.

6.7.2. Radiation test for 30MHz~6GHz frequency range

The EUT and its simulators were placed on a turn table which was 0.8 meter above the ground. The turn table rotated 360 degrees to determine the position of the maximum emission level. For 30MHz to 6GHz frequency range, EUT was set at 3 meters away from the receiving antenna which was mounted on a antenna tower. The antenna moved up and down between 1 to 4 meters for 30MHz to 6GHz frequency range to find out the maximum emission level. Broadband antenna such as calibrated biconical and log- periodical antenna or horn antenna were used as a receiving antenna. Both horizontal and vertical polarization of the antenna were set on test. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4-1992 regulation.

The bandwidth of test receiver was set at 120KHz and resolution bandwidth of spectrum analyzer was set at 1MHz.

6.8. Test Results

PASSED. Please refer to the following pages.

Radiation test for channel center attenuation and all the test results were shown on section 6.9.1.

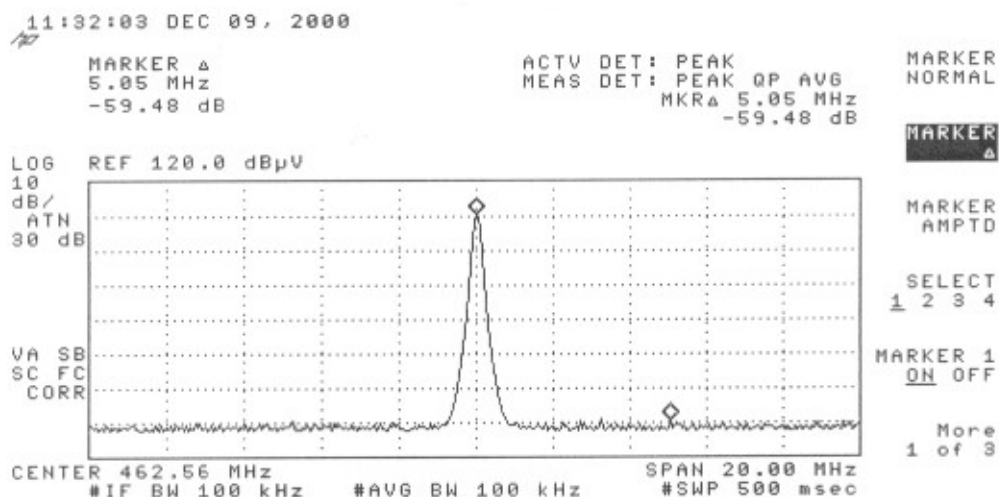
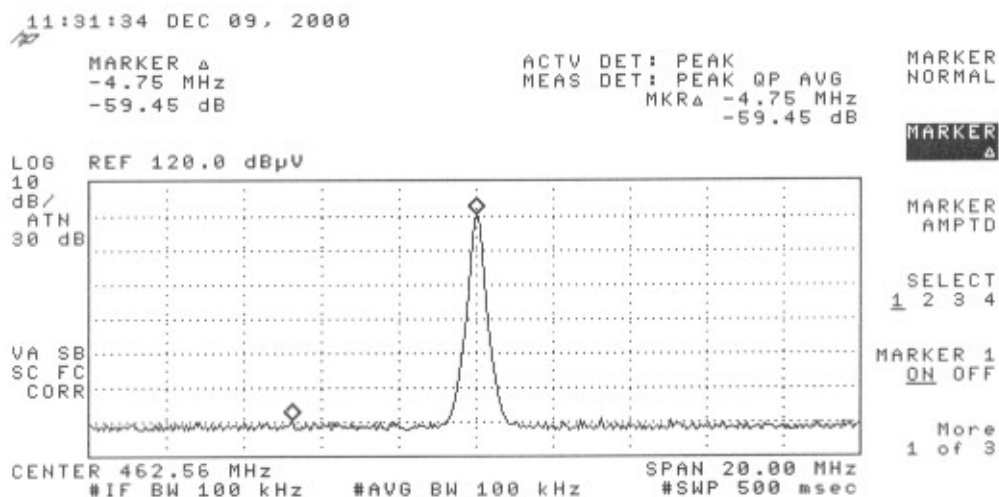
EUT with transmitting mode were done during radiated test (30MHz~6GHz frequency range, at No.1 Open Test Site) and all the test results were shown on section 6.9.2.

EUT with receiving mode were done during radiated test (30MHz~6GHz frequency range, at No.1 Open Test Site) and all the test results were shown on section 6.9.3.

6.9. Radiated Emission Test Results

6.9.1. Channel Center Attenuation Test Results

Channel 1 : 462.5625MHz



Channel 1 : 462.5625MHz

11:24:22 DEC 09, 2000

MARKER Δ
-12.38 kHz
-55.24 dBACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR Δ -12.38 kHz
-55.24 dBMARKER
NORMALMARKER Δ MARKER
AMPTDSELECT
1 2 3 4MARKER 1
ON OFFMore
1 of 3LOG REF 120.0 dB μ V10
dB/
ATN
30 dBVA SB
SC FC
CORR

CENTER 462.56250 MHz

#IF BW 1.0 kHz

#AVG BW 1 kHz

SPAN 50.00 kHz

#SWP 500 msec

11:24:49 DEC 09, 2000

MARKER Δ
13.88 kHz
-58.33 dBACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR Δ 13.88 kHz
-58.33 dBMARKER
NORMALMARKER Δ MARKER
AMPTDSELECT
1 2 3 4MARKER 1
ON OFFMore
1 of 3LOG REF 120.0 dB μ V10
dB/
ATN
30 dBVA SB
SC FC
CORR

CENTER 462.56250 MHz

#IF BW 1.0 kHz

#AVG BW 1 kHz

SPAN 50.00 kHz

#SWP 500 msec

Channel 8 : 467.5625MHz

08:51:03 DEC 11, 2000

MARKER Δ
-12.50 kHz
-57.53 dBACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR Δ -12.50 kHz
-57.53 dBMARKER
NORMALMARKER
 Δ MARKER
AMPTDSELECT
1 2 3 4MARKER 1
ON OFFMore
1 of 3LOG REF 120.0 dB μ V10
dB/
ATN
30 dBVA SB
SC FC
CORR

CENTER 467.56250 MHz

#IF BW 1.0 kHz

#AVG BW 1 kHz

SPAN 50.00 kHz

SWP 300 msec

08:51:36 DEC 11, 2000

MARKER Δ
12.38 kHz
-59.36 dBACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR Δ 12.38 kHz
-59.36 dBMARKER
NORMALMARKER
 Δ MARKER
AMPTDSELECT
1 2 3 4MARKER 1
ON OFFMore
1 of 3LOG REF 120.0 dB μ V10
dB/
ATN
30 dBVA SB
SC FC
CORR

CENTER 467.56250 MHz

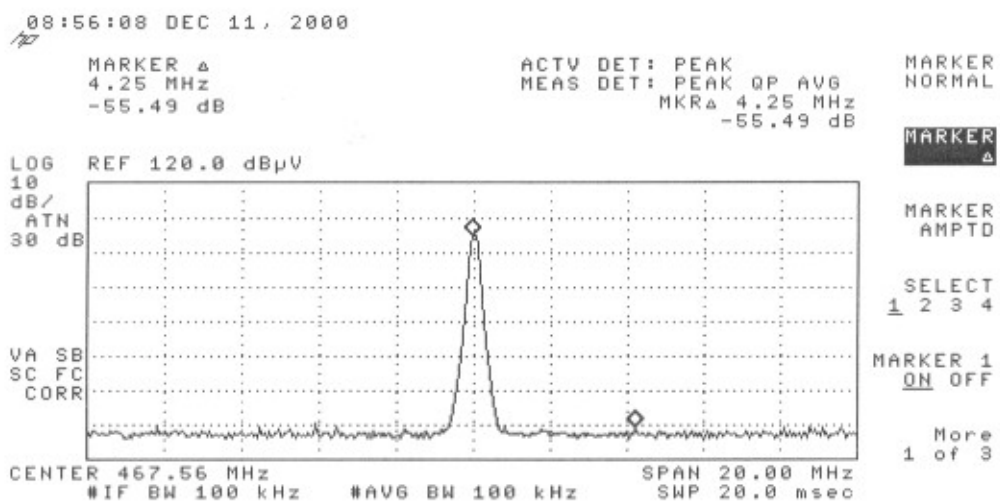
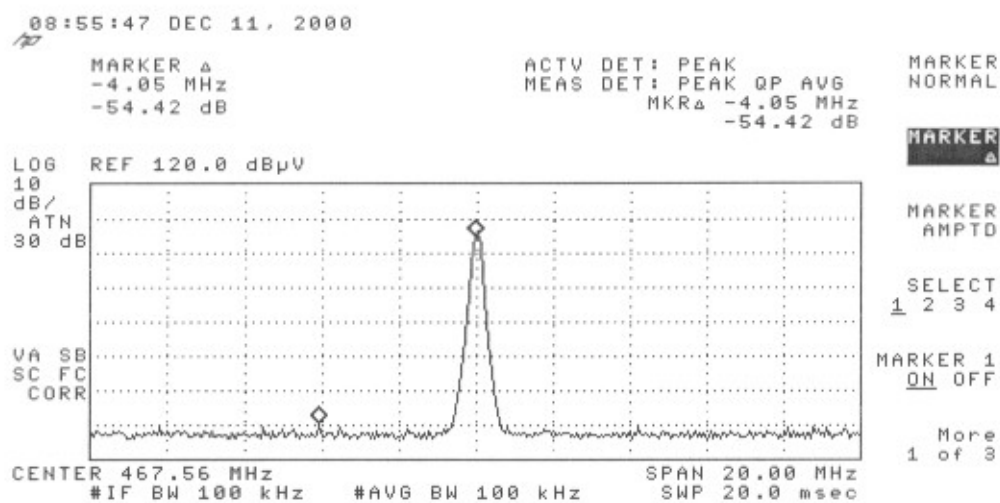
#IF BW 1.0 kHz

#AVG BW 1 kHz

SPAN 50.00 kHz

SWP 300 msec

Channel 8 : 467.5625MHz



6.9.2. Receiver, 30MHz ~ 1GHz Frequency Range Test Results

The frequency spectrum from 30 MHz to 1GHz was investigated. All the emissions not reported below are too low against the FCC official limit. As the peak value is too low against the limit, so the Quasi-peak have been omitted. The scanning waveform is put in Appendix I.

6.9.3. Transmitter, 30MHz ~ 6GHz Frequency Range Test Results

The frequency spectrum from 30 MHz to 6GHz MHz was investigated. All the emissions not reported below are too low against the FCC official limit. The scanning waveform is put in Appendix II.

Date of Test : Dec. 06, 2000 Temperature : 23.1°C
 EUT : FRS Humidity : 67%
 Test Mode : Transmitter Channel 1 / Transmitting Mode

Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading		Emission Level		Margin dB
			Horizontal dB μ V	Horizontal dB μ V/m	Horizontal dB μ V/m	Limits dB μ V/m	
462.578	27.55	4.93	69.36	96.91	Fundamental Freq.		
925.139	32.72	5.98	20.55	53.26	85.71	32.45	
1387.670	35.30	3.87	41.32	36.14	85.71	49.57	

- Remark :
1. All readings are peak values.
 2. Test up to 10th harmonic (6GHz) but the emission level above 3GHz were too low against the official limit and not reported.
 3. Harmonic limits is
 = max. emission level – 43+10 log (carrier power in watts)
 = 111.61 – 43+10 log (0.0195) = 85.71dB.

Date of Test : Dec. 06, 2000 Temperature : 23.1°C
 EUT : FRS Humidity : 67%
 Test Mode : Transmitter Channel 1/ Transmitting Mode

Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Vertical dB μ V	Emission Level Vertical dB μ V/m	Limits dB μ V/m	Margin dB
462.575	27.31	4.93	84.30	111.61	Fundamental Freq.	
925.138	32.86	5.98	22.40	55.26	85.71	30.45
1387.663	35.30	3.87	52.40	47.22	85.71	38.49

- Remark :
1. All readings are peak values.
 2. Test up to 10th harmonic (6GHz) but the emission level above 3GHz were too low against the official limit and not reported.
 3. Harmonic limits is
 = max. emission level – 43+10 log (carrier power in watts)
 = 111.61 – 43+10 log (0.0195) = 85.71dB.

Date of Test : Dec. 06, 2000 Temperature : 23.1°C
 EUT : FRS Humidity : 67%
 Test Mode : Transmitter Channel 8 / Transmitting Mode

Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading		Emission Level	
			Horizontal dB μ V	Horizontal dB μ V/m	Limits dB μ V/m	Margin dB
467.562	27.59	4.95	76.50	104.09	Fundamental Freq.	
935.136	32.81	5.99	28.70	61.51	85.71	24.2
1402.671	35.29	3.91	54.56	49.46	85.71	36.25
1870.230	34.94	4.86	39.36	38.01	85.71	47.7
2805.357	34.45	6.19	35.12	37.97	85.71	47.74

- Remark :
1. All readings are peak values.
 2. Test up to 10th harmonic (6GHz) but the emission level above 3GHz were too low against the official limit and not reported.
 3. Harmonic limits is
 $= \text{max. emission level} - 43 + 10 \log (\text{carrier power in watts})$
 $= 111.61 - 43 + 10 \log (0.0195) = 85.71\text{dB}.$

Date of Test : Dec. 06, 2000 Temperature : 23.1°C
 EUT : FRS Humidity : 67%
 Test Mode : Transmitter Channel 8/ Transmitting Mode

Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Vertical dB μ V	Emission Level Vertical dB μ V/m	Limits dB μ V/m	Margin dB
467.552	27.42	4.95	81.40	108.82	Fundamental Freq.	
935.123	33.11	5.99	34.10	67.21	85.71	18.5
1402.668	35.29	3.91	46.43	41.33	85.71	44.38
1870.231	34.94	4.86	34.35	33.00	85.71	52.71
2805.353	34.45	6.19	34.10	36.95	85.71	48.76

- Remark :
1. All readings are peak values.
 2. Test up to 10th harmonic (6GHz) but the emission level above 3GHz were too low against the official limit and not reported.
 3. Harmonic limits is
 = max. emission level – 43+10 log (carrier power in watts)
 = 111.61 – 43+10 log (0.0195) = 85.71dB.

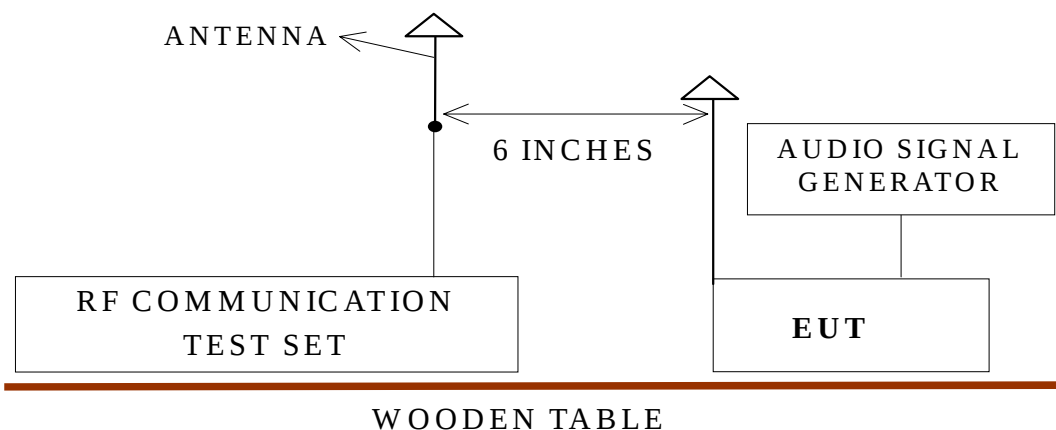
7. PEAK FREQUENCY TEST

7.1. Test Equipment

The following test equipment were used during the Peak Frequency Test :

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	RF Communication Test Set	HP	8920A	3524A07043	Dec. 07, 99'	1 Year
2.	Audio Signal Generator	HP	8904A	3633A08312	Dec. 08, 99'	1 Year
3.	Antenna	EMCO	4610	9410-1274	Dec. 28, 99'	1 Year

7.2. Block Diagram of Test Setup



7.3. Test Rules

CFR 47 Part 95 § 95.637 (a)

7.4. Specification Limits

A FRS unit that transmits emission type F3E must not exceed a peak frequency deviation of plus or minus 2.5KHz.

7.5. EUT's Configuration during Compliance Test

The configuration of EUT were same as section 3.5.

7.6. Test Procedure

- 7.6.1. Setup the EUT and test equipment as shown on 8.2.
- 7.6.2. Feed 1KHz Signal into audio input terminal with enough field strength to let system to have 50% deviation.
- 7.6.3. Increasing signal strength up to 16dB and changing the frequency from 300Hz to 3KHz with 300Hz increment for each step.
- 7.6.4. Recording the peak frequency deviation.

7.7. Frequency Modulation Test Results

Date of Test: Dec. 06, 2000

Test Channel No.: Channel 1

Frequency (MHz)	Peak Frequency Deviation (KHz)
300 Hz	0.30
600 Hz	0.50
900 Hz	0.60
1200 Hz	1.00
1500 Hz	0.90
1800 Hz	0.70
2100 Hz	0.80
2400 Hz	0.60
2700 Hz	0.60
3000 Hz	0.50

8. MAXIMUM TRANSMITTER POWER TEST

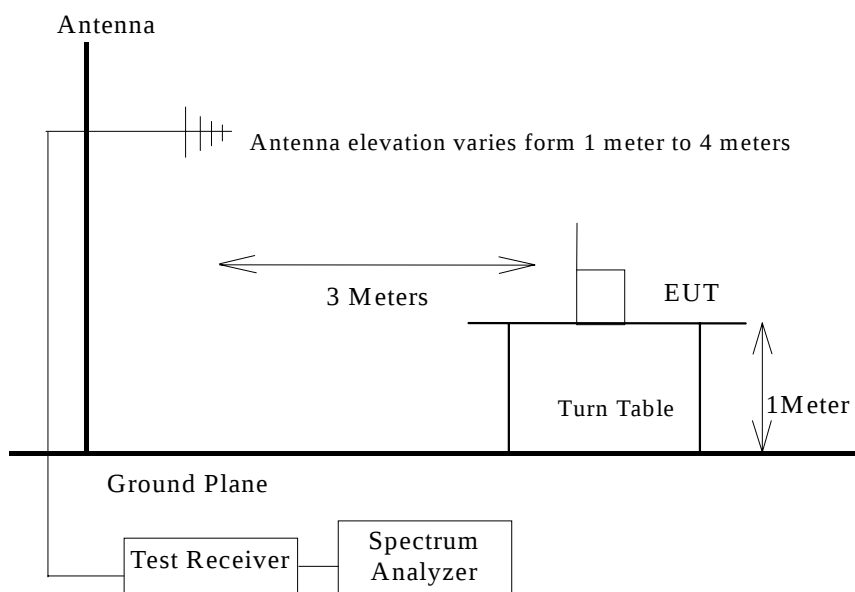
8.1. Test Equipment

The following test equipment were used during the Maximum Transmitter Power Test :

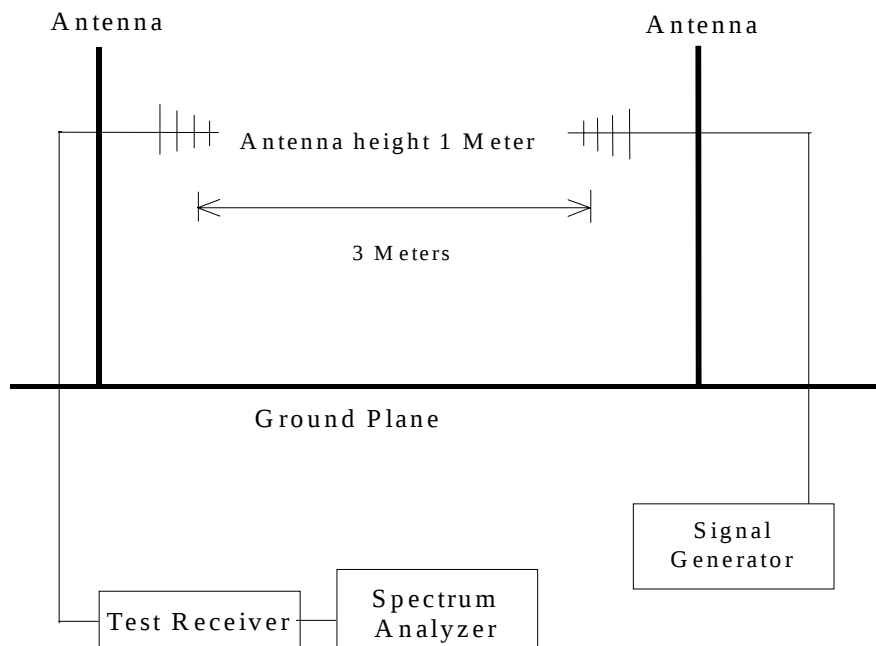
Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	HP	8591EM	3628A00914	Jun. 04, 00'	1 Year
2.	Signal Generator	HP	8648A	3625U00572	Jun. 04, 00'	1 Year
3.	Pre-Amplifier	HP	8447D	1937A03021	Oct. 12, 00	1/2 Year
4.	Precision Dipoles	Schwarzbeck	UHAP	674	Jun. 04, 00'	2 Year
5.	Bilog Antenna	Chase	CBL6111	1159	Sep. 26, 00'	1 Year

8.2. Block Diagram of Test Setup

8.2.1. Block Diagram of Replaced Measure Test Setup (一)



8.2.2. Block Diagram of Replaced Measure Test Setup (二)



8.3. Test Rules

CFR 47 Part 95 § 95.639 (d)

8.4. Specification Limits

A FRS unit, under any condition of modulation, shall exceed 0.5000W effective radiated power.

8.5. EUT's Configuration during Compliance Test

The configuration of EUT were same as section 2.5.

8.6. Test Procedure

- 8.6.1. Setup the EUT and test equipment as shown on 8.2.1.
- 8.6.2. Measured the EUT maximum emission level and record the value.
- 8.6.3. Remove the EUT from the turntable and replaced it by Signal Generator as shown on 8.2.2.
- 8.6.4. Adjust the Signal Generator output level to as the EUT maximum emission level, then the maximum emission power from the Signal Generator showing was the Maximum Transmitter Power.

8.7. Maximum Transmitter Power Test Results

Date of Test: Dec. 02, 2000

Test Channel : Channel 1

This FRS unit its maximum transmitter power is 0.019498W (19.498mW).

The maximum emission level is 119.9 dB μ V

According to

dB μ V $\doteq$ (dBm+107dB) and

dBm = 1mW = 10 log 1mW/1mW

The maximum transmitter power can then be detemined by the above equation:

119.9 dB μ V $\doteq$ 12.9dBm = 0.019498W (19.498mW)

9. FRS UNIT TRANSMITTER ANTENNA

9.1. Compliance Rules

CFR 47 Part 95 § 95.647

9.2. Results

This EUT's transmitter antenna is an integral part of the transmitter , no gain and vertically polarized, please refer to attached EUT photographs .

10.MODIFICATIO TO EUT

【NONE】

11.DEVIATION TO TEST SPECIFICATIONS

【NONE】