UltraTech
Group of Labs

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Canada
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entela

00-034

3000 Bristol Circle,
Oakville, Ontario, Canada
L6H 6G4

Telephone (905) 829-1570
Facsimile (905) 829-8050

Website: www.ultratech-labs.com
Email: vic@ultratech-labs.com

Mar. 11, 2002

FEDERAL COMMUNICATIONS COMMISSION
7435 Oakland Mills Road
Columbia, MD 21046
USA

Subject: **Type Acceptance Application under FCC CFR 47, Parts 2 and 22 (Subpart H) - Cellular Telephone Services Operating in the frequency bands 824-849 MHz (portable/handheld) (30 kHz Channel Spacing).**

Applicant: **New Horizon Technologies International**
Product: **Portable/Handheld Cellular Phone**
Model: **1100A**
FCC ID: **P4F1100A**

Dear Sir/Madam,

As appointed agent for **New Horizon Technologies International**, we would like to submit the application to Federal Communications Commission for certification of the above product. Please review all necessary files uploaded to FCC OET site.

If you have any queries, please do not hesitate to contact us by our TOLL FREE number:

OUR TELEPHONE NO.: 1-877-765-4173

Yours truly,

Tri Minh Luu, P. Eng.,
V.P., Engineering

TML/DH

Encl.

UltraTech
Group of Labs

Mar. 11, 2002

New Horizon Technologies International, Inc.
5575S Sermoran Blvd., Suite 30
Orlando, FL
USA, 32822

Attn.: **Ms. Karen Wilson**

Subject: **Certification Testing in accordance with FCC CFR 47, Parts 2 and 22 (Subpart H) - Cellular Telephone Services Operating in the frequency bands 824-849 MHz (portable/handheld) (30 kHz Channel Spacing).**

Product: **Portable/Handheld Cellular Phone**
Model: **1100A**
FCC ID: **P4F1100A**

Dear Ms. Wilson,

The product sample has been tested in accordance with **FCC CFR 47, Parts 2 and 22 (Subpart H) - Cellular Telephone Services Operating in the frequency bands 824-849 MHz (portable/handheld) (30 kHz Channel Spacing),** and the results and observation were recorded in the engineering report, Our File No.: NHT-001Q

Enclosed you will find copy of the engineering report. If you have any queries, please do not hesitate to contact us.

Yours truly,

Tri Minh Luu, P.Eng
Vice President - Engineering

Encl.

3000 Bristol Circle,
Oakville, Ontario, Canada
L6H 6G4

Telephone (905) 829-1570
Facsimile (905) 829-8050

ENGINEERING TEST REPORT

Portable/Handheld Cellular Phone
Model No.: 1100A
FCC ID: P4F1100A

Applicant: **New Horizon Technologies International**
5575S Semoran Blvd., Suite 30
Orlando, FL
USA, 32822

Tested in Accordance With

Federal Communications Commission (FCC)
CFR 47, PARTS 2 and 22 (Subpart H)
Cellular Telephone Services
Operating in the frequency bands 824-849 MHz (portable/handheld)
(30 kHz Channel Spacing)

UltraTech's File No.: NHT-001Q

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs Date: Mar. 11, 2002	
Report Prepared by: Tri Luu, P. Eng. Issued Date: Mar. 11, 2002	Tested by: Hung Trinh, EMI/RFI Technician Test Dates: Mar. 01-07, 2002

The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.

UltraTech

3000 Bristol Circle, Oakville, Ontario, Canada, L6H 6G4
Telephone (905) 829-1570 Facsimile (905) 829-8050

Website: www.ultratech-labs.com Email: vic@ultratech-labs.com

TABLE OF CONTENTS

EXHIBIT 1. SUBMITTAL CHECK LIST

Annex No.	Exhibit Type	Description of Contents	Quality Check (OK)
--	Test Report	▪ Exhibit 1: Submittal check lists ▪ Exhibit 2: Introduction ▪ Exhibit 3: Performance Assessment ▪ Exhibit 4: EUT Operation and Configuration during Tests ▪ Exhibit 5: Summary of test Results ▪ Exhibit 6: Measurement Data ▪ Exhibit 7: Measurement Uncertainty ▪ Exhibit 8: Measurement Methods	OK
1	Test Report - Plots of Measurement Data	Plots # 1 to 48	OK
2	Test Setup Photos	Photos # 1 to 3	OK
3	External Photos of EUT	Photos # 1 to 2	OK
4	Internal Photos of EUT	Photos of 1 to 6	OK
5	Cover Letters	Letter from Ultratech for Certification Request	OK
6	Attestation Statements	▪ Letter from the Applicant to appoint Ultratech to act as an agent ▪ Letter from the Applicant to request for Confidentiality Filing	OK OK
7	ID Label/Location Info	ID Label Location of ID Label	OK OK
8	Block Diagrams	Block diagrams	OK
9	Schematic Diagrams	Schematic diagrams	OK
10	Parts List/Tune Up Info		OK
11	Operational Description		OK
12	RF Exposure Info	Please refer to the attached SAR test report	OK
13	Users Manual	OK	OK

EXHIBIT 2. INTRODUCTION

2.1. SCOPE

Reference:	FCC Parts 2 and 22
Title:	Telecommunication - Code of Federal Regulations, CFR 47, Parts 2 and 22
Purpose of Test:	To gain FCC Certification Authorization for Radio operating in the frequency bands 824-849 MHz (portable/handheld) (30 kHz Channel Spacing).
Test Procedures:	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

2.2. RELATED SUBMITAL(S)/GRANT(S)

None

2.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 0-19, 80-End	2000	Code of Federal Regulations – Telecommunication
ANSI C63.4	1992	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
CISPR 22 & EN 55022	1997 1998	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
CISPR 16-1		Specification for Radio Disturbance and Immunity measuring apparatus and methods

EXHIBIT 3. PERFORMANCE ASSESSMENT

3.1. CLIENT INFORMATION

APPLICANT	
Name:	New Horizon Technologies International, Inc.
Address:	5575S Semoran Blvd., Suite 30 Orlando, FL USA, 32822
Contact Person:	Ms. Karen Wilson Phone #: 407-736-9220 Fax #: 407-736-9269 Email Address: nhtikaren@aol.com

MANUFACTURER	
Name:	New Horizon Technologies International, Inc.
Address:	5575S Semoran Blvd., Suite 30 Orlando, FL USA, 32822
Contact Person:	Ms. Karen Wilson Phone #: 407-736-9220 Fax #: 407-736-9269 Email Address: nhtikaren@aol.com

3.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	Cuclone
Product Name:	Portable/Handheld Cellular Phone
Model Name or Number:	1100A
Serial Number:	Pre-production
Type of Equipment:	Cellular Telephone Services
External Power Supply:	N/A
Transmitting/Receiving Antenna Type:	Integral
Primary User Functions of EUT:	Voice communication through air

3.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	[x] Portable [ ] Mobile [ ] Base station (fixed use)
Intended Operating Environment:	[ ] Commercial [ ] Light Industry & Heavy Industry
Power Supply Requirement:	Type AA Alkaline batteries
RF Output Power Rating:	0.355 Watts (conducted) / 0.447 Watts (ERP)
Operating Frequency Range:	824-849 MHz (portable/handheld)
RF Output Impedance:	50 Ohms
Channel Spacing:	30 kHz
Occupied Bandwidth (99%):	39.4 kHz maximum (SAT+ST) 18.6 kHz (Analog) 22.3 kHz (wideband digital)
Modulation	AMPS
Emission Designation*:	40K0F3E and 40K0F1D
Frequency Tolerance:	±1.5 ppm
Battery Pack:	3 x Type AA Akaline batteries
Antenna Connector Type:	Integral

3.4. LIST OF EUT'S PORTS

None

3.5. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

A laptop computer and a test jig are used to configure the channel frequency and test mode of the EUT.

EXHIBIT 4. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

4.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21°C
Humidity:	51%
Pressure:	102 kPa
Power input source:	4.5 Vdc, 0.6 Amps nominal using (Type AA Alkaline batteries)

4.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TEST SIGNALS

Operating Modes:	The transmitter was operated in a continuous transmission mode with the carrier modulated as specified in the Test Data.
Special Test Software:	Special test software provided by New Horizon Technologies International to configure the cellular phone with different channel frequency and operating modes (analog, SAT, ST, SAT+ST, wide band digital).
Special Hardware Used:	Special test jig is used to connect the cellular phone to the laptop computer for testing.
Transmitter Test Antenna:	The EUT is tested with the transmitter antenna port terminated to a 50 Ohms RF Load.

Transmitter Test Signals	
Frequency Band(s): 824 - 849 MHz band:	Near lowest, near middle & near highest frequencies in each frequency bands that the transmitter covers: 824.054, 836.522 and 848.97 MHz
Transmitter Wanted Output Test Signals: RF Power Output (measured maximum output power): Normal Test Modulation Modulating signal source:	 0.355 Watts (conducted) / 0.447 Watts (ERP) FM with analog & wideband digital

EXHIBIT 5. SUMMARY OF TEST RESULTS

5.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

AC Powerline Conducted Emissions were performed in UltraTech's shielded room, 16'(L) by 12'(W) by 12'(H).

Radiated Emissions were performed at the Ultratech's 3 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario.

The above sites have been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville Open Field Test Site has been filed with FCC office (FCC File No.: 31040/SIT 1300B3) and Industry Canada office (Industry Canada File No.: IC2049). Last Date of Site Calibration: Aug. 08, 2001.

5.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC PARAGRAPH.	TEST REQUIREMENTS	APPLICABILITY (YES/NO)
22.913 & 2.1046	RF Power Output	Yes
1.1307, 1.1310, 2.1091 & 2.1093	RF Exposure Limit	Yes
22.101(a) & 2.1055	Frequency Stability	Yes
22.915(d) & 2.1047(a)	Audio Frequency Response	Yes
22.915(a), (b) & (c) & 2.1047(b)	Modulation Limiting	Yes
22.917(a),(b),(c) & (d) & 2.1049	Emission Limitation & Emission Mask	Yes
22.917(e), (f) & (g), 2.1057 & 2.1051	Emission Limits - Spurious Emissions at Antenna Terminal	Yes
22.917(e), (f) & (g), 2.1057 & 2.1053	Emission Limits - Field Strength of Spurious Emissions	Yes
Portable/Handheld Cellular Phone, **Model No.: 1100A**, by **New Horizon Technologies International** has also been tested and found to comply with **FCC Part 15, Subpart B - Radio Receivers and Class A Digital Devices**. The engineering test report has been documented and kept in file and it is available anytime upon FCC request.		

5.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None

5.4. DEVIATION OF STANDARD TEST PROCEDURES

None

EXHIBIT 6. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

6.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in Exhibit 8 of this report

6.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with requirements of UKAS Document NIS 81 with a confidence level of 95%. Please refer to Exhibit 7 for Measurement Uncertainties.

6.3. MEASUREMENT EQUIPMENT USED:

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4:1992 and CISPR 16-1.

6.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER:

The essential function of the EUT is to correctly communicate voice to and from radios over RF link.

6.5. EFFECTIVE RADIATED POWER (ERP) @ FCC 2.1046 & 22.913

6.5.1. Limits

The effective radiated power (ERP) of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section:

	Maximum ERP (Watts)
Base Transmitters (869-894 MHz)	500 Watts
Mobile Transmitters & Auxiliary TestTransmitters (824-849 MHz)	7 Watts

6.5.2. Method of Measurements

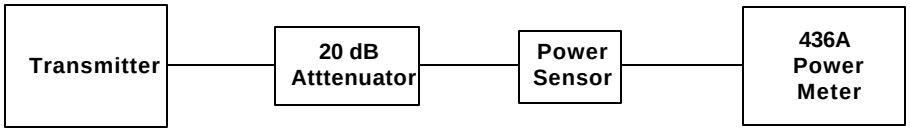
Please refer to Exhibit 8, § 8.1 (Conducted) and § 8.2 (Radiated) for test procedures and test setup.

6.5.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8546A	…	9 kHz to 5.6 GHz with built-in 30 dB Gain Pre-selector, QP, Average & Peak Detectors.
Attenuator(s)	Bird	…	…	DC – 22 GHz
Spectrum Analyzer/ EMI Receiver	Advantest	R3271	15050203	100 Hz – 26.5 GHz
Attenuator(s)	Weinschel Corp	24-20-34	BJ2357	DC – 8.5 GHz
Dipole Antenna	EMCO	3121C	8907-440	30 MHz – 1 GHz
Dipole Antenna	EMCO	3121C	8907-434	30 MHz – 1 GHz
Power Meter	Hewlett Packard	436A	1725A02249	10 kHz – 50 GHz, sensor dependent
Power Sensor	Hewlett Packard	8481A	2702A68983	10 MHz – 18 GHz
Synthesize Sweeper	Hewlett Packard	83752B	3610A00457	0.01 – 20 GHz

6.5.4. Test Arrangement

Power at RF Power Output Terminals



For ERP test arrangement, refer to section 8.2 of this test report for details

6.5.5. Test Data

	Measured Conducted Average Power (P) – dBm					
FUNDAMENTAL FREQUENCY (MHz)	**Analog**	**ST**	**SAT (6000Hz)**	**DTMF**	**WBS**	**LIMIT (dBm)**
824.05	25.5	Not required	Not required	Not required	25.5	38.5
836.52	25.5	Not required	Not required	Not required	25.5	38.5
848.97	25.5	Not required	Not required	Not required	25.5	38.5

EIRP MEASUREMENTS FOR ANALOG MODULATION – SUBSTITUTION METHOD

Modulation: FM Modulated with 2.5 kHz Sine Wave Signal, Frequency deviation =±12 kHz						
Frequency (MHz)	**E-Field E1 in 1 MHz BW @ 3m (dBuV/m)**	**Antenna Polarization (V/H)**	**Power from Signal GEN. Ps (dBm)**	**Substitution Antenna Gain Gd (dBi)**	**Measured ERP in 1 MHz BW (Ps + Gd - 2.15) (dBm/MHz)**	**ERP LIMIT (dBm)**
824.05	121.66	V	26.86	1.60	26.31	38.5
824.05	121.16	H	25.06	1.60	24.51	38.5
836.52	120.94	V	24.84	1.20	23.89	38.5
836.52	123.06	H	26.96	1.20	26.01	38.5
848.97	123.75	V	27.85	0.90	26.25	38.5
848.97	123.94	H	27.74	0.90	26.50	38.5

Calculated EUT's Maximum Antenna Gain = 3.15 dBi

EIRP MEASUREMENTS FOR WIDEBAND DIGITAL MODULATION MODULATION – SUBSTITUTION METHOD

Modulation: FM Modulated with 2.5 kHz Sine Wave Signal, Frequency deviation =±12 kHz						
Frequency (MHz)	**E-Field E1 in 1 MHz BW @ 3m (dBuV/m)**	**Antenna Polarization (V/H)**	**Power from Signal GEN. Ps (dBm)**	**Substitution Antenna Gain Gd (dBi)**	**Measured ERP in 1 MHz BW (Ps + Gd - 2.15) (dBm/MHz)**	**ERP LIMIT (dBm)**
824.05	121.66	V	26.86	1.60	26.31	38.5
824.05	121.16	H	25.06	1.60	24.51	38.5
836.52	120.94	V	24.84	1.20	23.89	38.5
836.52	123.06	H	26.96	1.20	26.01	38.5
848.97	123.75	V	27.85	0.90	26.25	38.5
848.97	123.94	H	27.74	0.90	26.50	38.5

Calculated EUT's Maximum Antenna Gain = 3.15 dBi

6.6. RF EXPOSURE REQUIRMENTS @ 1.1310 & 2.1091

Please refer to the SAR test report NHT-001SAR for detailed test methods and results.

6.7. FREQUENCY STABILITY @ FCC 2.1055 & 22.101(A)

6.7.1. Limits

Please refer to FCC CFR 47, Part 22, Subpart H, Sec. 101(a)

FREQUENCY RANGE (MHz)	FREQUENCY TOLERANCE (ppm)
824-849 (portable/handheld)	±1.5
869-894 (base)	±2.5

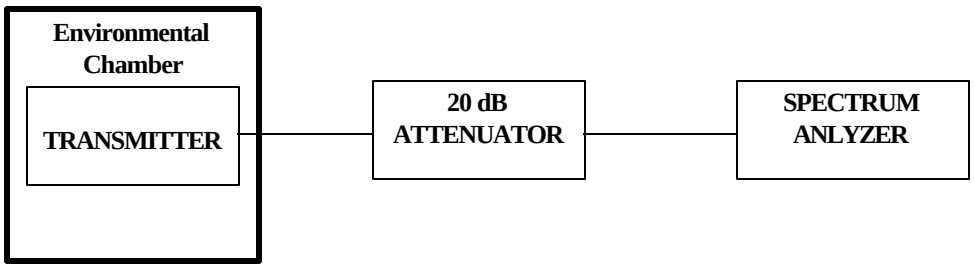
6.7.2. Method of Measurements

Refer to Exhibit 8, § 8.3 of this report for measurement details

6.7.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz
Attenuator(s)	Bird	..	…	DC – 22 GHz
Temperature & Humidity Chamber	Tenney	T5	9723B	-40° to +60 ° C range

6.7.4. Test Arrangement



6.7.5. Test Data

Frequency Band	824 – 849 MHz
Center Frequency	824 MHz
Full Power Level	25.5 dBm (conducted)
Frequency Tolerance Limit	1.5ppm or 1236 Hz
Max. Frequency Tolerance Measured	-978 Hz or -1.19 ppm
Input Voltage Rating	4.5 Vdc, 0.6 Amps nominal

CENTER FREQUENCY & RF POWER OUTPUT VARIATION			
Ambient Temperature (^{o}C)	**Supply Voltage (Nominal) 4.5 Volts**	**Supply Voltage 3.2 Volts dc (Battery End Point)**	**Supply Voltage (115% of Nominal) Volts**
	Hz	**Hz**	**Hz**
-30	-228	N/A	N/A for battery operating
-20	-814	N/A	N/A for battery operating
-10	-978	N/A	N/A for battery operating
0	-514	N/A	N/A for battery operating
+10	-271	N/A	N/A for battery operating
+20	-57	+40	N/A for battery operating
+30	+29	N/A	N/A for battery operating
+40	-57	N/A	N/A for battery operating
+50	-142	N/A	N/A for battery operating

Battery Voltage and Current Drops wrt Time		
Time (minutes)	Voltage (Vdc)	Current (Amps)
0	4.7	0.65
5	4.1	0.66
10	4.0	0.66
15	3.8	0.66
20	3.7	0.66
25	3.5	0.66
30	3.4	0.66
35	3.3	0.66
40	3.2 (Just before battery end point)	0.66 (Just before battery end point)

6.8. AUDIO FREQUENCY RESPONSE @ FCC 2.1047(A) & 22.915(D)

6.8.1. Limits

Recommended audio filter attenuation characteristics are give below:

- Radiotelephony signals applied to the modulator from the modulation limiter must be attenuated as a function of frequency as specified in this paragraph.
- For mobile stations, these signal must be attenuated, relative to the level at 1 kHz, as follows:

Frequency Ranges	Attenuation (dB) wrt. 1 kHz
3.0 - 5.9 kHz	40*log(f/3), f in kHz
5.9 - 6.1 kHz	35
6.1 - 15.0 kHz	40*log(f/3), f in kHz
Above 15 kHz	20 dB

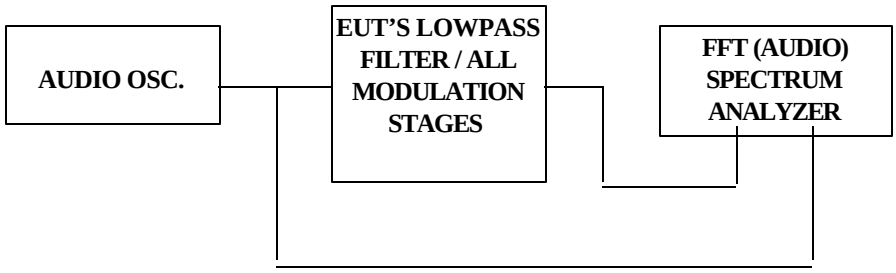
6.8.2. Method of Measurements

- Operate the transmitter with the compressor disabled
- An audio signal of 1.0 kHz was applied to the input of the filter
- Set the input level high enough before the audio output level was clipped off.
- Measure the input and output levels of the audio lowpass filter
- Using level measured at 1 kHz as a reference (0 dB), vary the frequency from 3 kHz to 20 kHz
- Record the change in output level while maintaining a constant input level.

6.8.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
FFT (audio) Spectrum Analyzer	Advantest	R9211E	…	10 mHz – 100 kHz, 1 MHz Input Impedance
Audio Oscillator	Hewlett Packard	HP 204C	0989A08798	DC to 1.2 MHz

6.8.4. Test Arrangement



6.8.5. Test Data

Since the Audio lowpass filter is built inside the IC 106 (Part No.: AK2336 manufactured by Asahi Kasei Microsyste), the Audio Frequency of the Audio Lowpass Filter can not be easily performed without a special test jig just for this IC. Below please find the Plots of Audio Frequency Response of the Lowpass Filter inside the IC106 to show complaince with FCC Part 22.915d

ASAHI KASEI [AK2336]

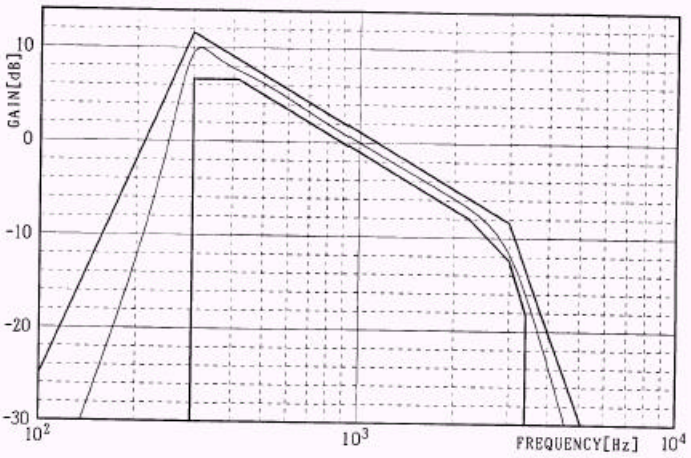


Fig - 1 Total Frequency Response of Receiver Section

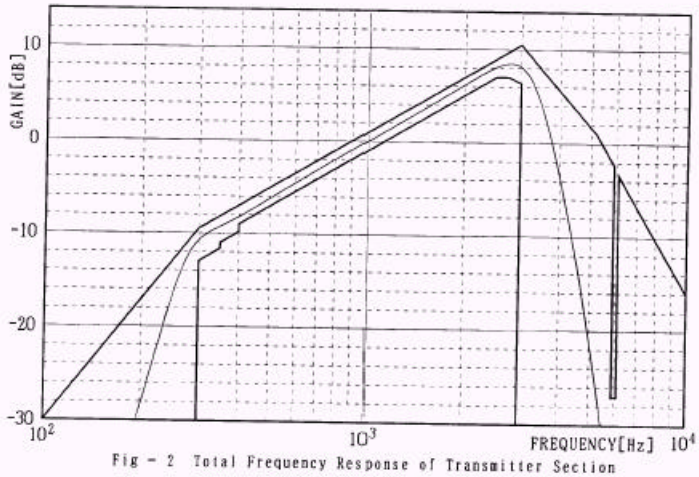


Fig - 2 Total Frequency Response of Transmitter Section

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ASAHI KASEI [AK2336]

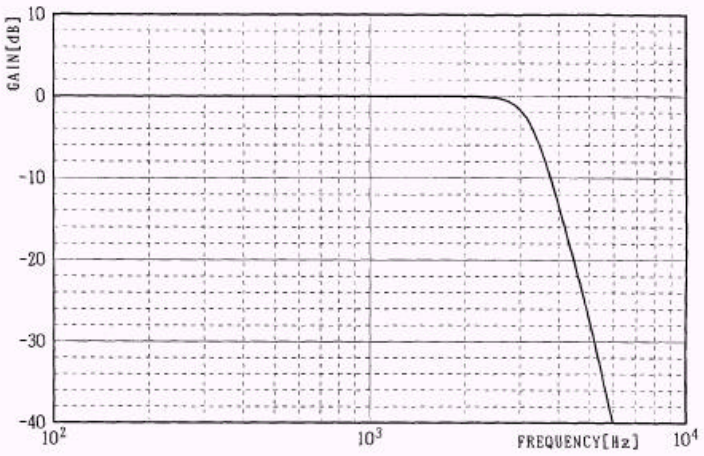


Fig - 3 Frequency Response of Splatter Filter

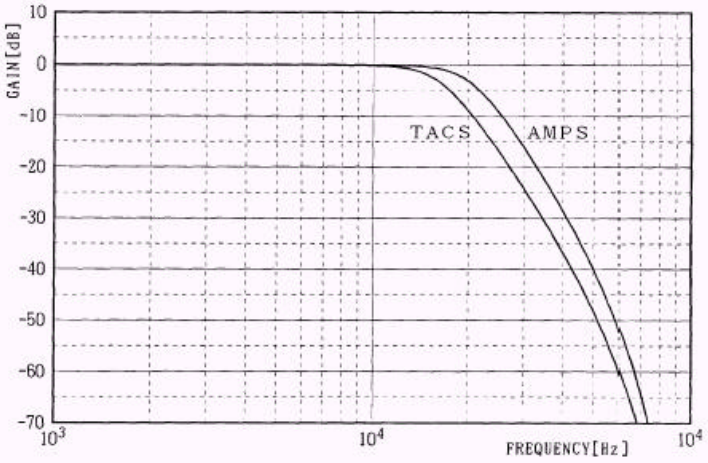


Fig - 4 Frequency Response of Transmitter Data Filter

6.9. MODULATION LIMITING @ FCC 2.1047(B) & 22.915(A), (B) & (C)

6.9.1. Limits

- **Non-voice modulating signals**. Modulating signals other than voice signals such as data signals, may be transmitted, provided the resulting modulated emission exhibits spectral characteristics not exceeding those resulting from voice modulation.
- **Modulation Levels**. The level of the modulating signals must be set to the values specified in this paragraph and must be maintained within ±10% of those values:
- The instantaneous frequency deviation resulting from the main modulating signal must be ±12 kHz.
- The instantaneous frequency deviation resulting from the supervisory audio tones must be ±2 kHz.
- The instantaneous frequency deviation resulting from the signaling tone must be ±8 kHz.
- The instantaneous frequency deviation resulting from the wideband data signals must be ±8 kHz.
- **Deviation Limitation Circuitry**. Cellular transmitters must be equipped with circuitry that automatically prevents modulation levels for voice transmission from exceeding the limits specified in this section.

6.9.2. Method of Measurements

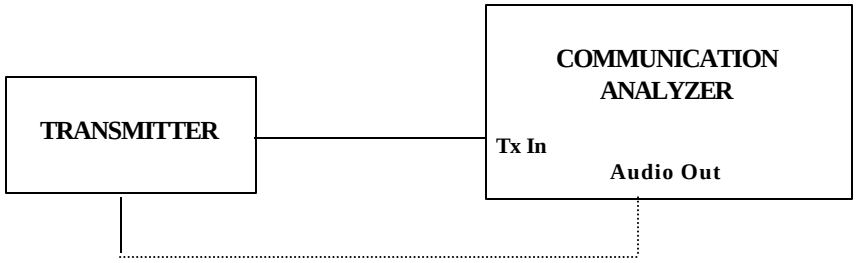
- Adjust audio input frequency to 1 kHz and peak deviation to ± 8 kHz, with 2:1 compressor enabled and the Supervisory Audio Tone (SAT) disabled.
- The audio is increased by 20 dB (or 10mV) in one step (rise time between the 10% and 90% points shall be 0.1 seconds maximum). Both maximum initial and subsequent steady state values of the peak frequency deviation, at and following the time of the 20 dB increase, shall be measured and recorded.
- With the input level held constant at 20 dB level, vary the frequency and observe the deviation for all frequencies between 300 Hz and 3.0 kHz

For Data Transmitter with Maximum Frequency Deviation set by Factory:- The EUT was set at maximum frequency deviation, and its peak frequency deviation was then measured using EUT's internal random data source.

6.9.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Communication Analyzer	Rohde & Schawrz	SMF02	879988/057	400 kHz - 1000 MHz including AF & RF Signal Generators, SINAD, DISTORTION, DEVIATION meters and etc

6.9.4. Test Arrangement



6.9.5. Test Data

6.9.5.1. Data Modulation Limiting: FM modulation with random data and Modulation Limiter set at a Maximum Frequency Deviation (Factory Setting).

Modulation Modes	Pak Frequency Deviation (KHz)	Limits (kHz)
Supervisory Audio Tone (SAT 6000 Hz)	2.2	±1.8 to ±2.2
Signaling Tone (ST)	8.5	±7.2 to ±8.8
Wideband Data Signal Data Baud Rate:10kb/s	7.4	±7.2 to ±8.8
DTMF	7.4	±7.2 to ±8.8

6.9.5.2. Voice Modulation Limiting:

1kHz MODULATING SIGNAL LEVEL (dBmV)	PEAK FREQUENCY DEVIATION (KHz)	MAXIMUM LIMIT (KHz)
20	6.4	±10.8 to ±13.2
40	11.0	±10.8 to ±13.2
60	11.0	±10.8 to ±13.2
80	11.0	±10.8 to ±13.2
100	11.0	±10.8 to ±13.2
120	11.0	±10.8 to ±13.2
140	11.0	±10.8 to ±13.2
160	11.0	±10.8 to ±13.2
180	11.0	±10.8 to ±13.2
200	11.0	±10.8 to ±13.2

Voice Signal Input Level = 40 dBmV

MODULATING FREQUENCY (KHz)	PEAK FREQUENCY DEVIATION (KHz)	MAXIMUM LIMIT (KHz)
0.3	6.0	±10.8 to ±13.2
0.4	6.6	±10.8 to ±13.2
0.6	8.5	±10.8 to ±13.2
0.8	9.8	±10.8 to ±13.2
1.0	11.0	±10.8 to ±13.2
1.2	11.4	±10.8 to ±13.2
1.4	11.4	±10.8 to ±13.2
1.6	11.5	±10.8 to ±13.2
1.8	11.6	±10.8 to ±13.2
2.0	11.8	±10.8 to ±13.2
2.2	11.8	±10.8 to ±13.2
2.4	11.8	±10.8 to ±13.2
2.6	11.7	±10.8 to ±13.2
2.8	11.3	±10.8 to ±13.2
3.0	11.0	±10.8 to ±13.2

6.10. 99% OBW AND EMISSION MASK @ FCC 2.1049, 22.917(A), (B), (C) & (D)

6.10.1. Limits

Emissions shall be attenuated below the mean output power of the transmitter as follows:

	EMISISON MASK @ FCC 22.917	
EMISSION TYPE	Frequency removed from the carrier frequency	Attenuation wrt Carrier Level
F3E (radiotelephony) & F3D (SAT) - with audio filter	20 kHz to 45 kHz 45 kHz to 2*Fc	26 dBc 60 dBc or 43+10*log(P) dBc (P in Watts) whichever is less
F1D (Wideband Data Mode) / F3D (Signaling Tone)	20 kHz to 45 kHz 45 kHz to 90 kHz 90 kHz to 2*Fc	26 dBc 45 dBc 60 dBc or 43+10*log(P) dBc (P in Watts) whichever is less

6.10.2. Method of Measurements

- **For F3E Voice Mode**:- The transmitter had its compressor disabled and was modulated with a 2.5 kHz sine wave at a level 13.5 dB greater that that required to produce ±8 kHz peak deviation at 1.0 kHz. The spectrum of the transmitter was determined with a spectrum analyzer with the following setting:

  For emission less than or equal to 45 kHz removed from the carrier (fc): RBW = 300 Hz, VBW ≥ RBW.
  For emission greater than 45 kHz removed from the carrier (fc): RBW = 30 kHz minimum, VBW ≥ RBW.

- **For F1D Wideband Data Mode**:- The transmitter was modulated with a pseudo-random 10 Kilobits/second data pattern at ±8 kHz peak frequency deviation. The spectrum of the transmitter was determined with a spectrum analyzer with the following setting:

  For emission less than or equal to 60 kHz removed from the carrier (fc): RBW = 300 Hz, VBW ≥ RBW.
  For emission greater than 60 kHz removed from the carrier (fc): RBW = 30 kHz minimum, VBW ≥ RBW.

- **For F3D Supervisory Audio Tone Mode**: - The transmitter was modulated with 6000 Hz SAT frequency at ± 2 kHz peak frequency deviation. The spectrum of the transmitter was determined with a spectrum analyzer with the following setting:

  For emission less than or equal to 45 kHz removed from the carrier (fc): RBW = 300 Hz, VBW ≥ RBW.
  For emission greater than 45 kHz removed from the carrier (fc): RBW = 30 kHz minimum, VBW ≥ RBW.

- **For F3D Signalling Tone Tone Mode**: - The transmitter was modulated with 10 kHz signalling tone frequency with ± 8 kHz peak frequency deviation. The spectrum of the transmitter was determined with a spectrum analyzer with the following setting:

  For emission less than or equal to 45 kHz removed from the carrier (fc): RBW = 300 Hz, VBW ≥ RBW.
  For emission greater than 45 kHz removed from the carrier (fc): RBW = 30 kHz minimum, VBW ≥ RBW.

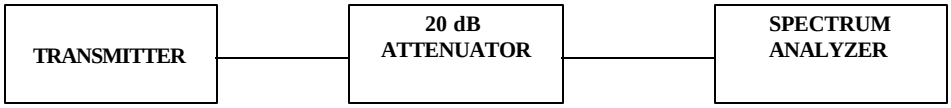
- **For F3D Signalling Tone Tone Mode**: - The transmitter was modulated with 10 kHz signalling tone frequency with ± 8 kHz peak frequency deviation. The spectrum of the transmitter was determined with a spectrum analyzer with the following setting:

  For emission less than or equal to 45 kHz removed from the carrier (fc): RBW = 300 Hz, VBW ≥ RBW.
  For emission greater than 45 kHz removed from the carrier (fc): RBW = 30 kHz minimum, VBW ≥ RBW.

6.10.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz
Attenuator(s)	Bird	..	…	DC – 22 GHz
Audio Oscillator	Hewlett Packard	HP 204C	0989A08798	DC to 1.2 MHz

6.10.4. Test Arrangement



6.10.5. Test Data

6.10.5.1. 99% Occupied Bandwidth

Modulation Mode	Frequency (MHz)	Measured 99% OBW (kHz)
Analog Mode	824.05	18.6
	836.52	18.4
	848.97	18.6
Supervisory Audio Tone Mode (SAT)	824.05	13.0
	836.52	12.7
	848.97	13.0
Signalling Tone Mode (ST)	824.05	39.2
	836.52	38.6
	848.97	39.0
SAT + ST Mode	824.05	39.4
	836.52	38.1
	848.97	38.8
TDMF	824.05	19.2
	836.52	19.4
	848.97	18.9
Wide-band Digital Mode	824.05	22.3
	836.52	21.9
	848.97	21.3

Note: Please refer to Plots # 1 through # 18 in Annex 1 for Details of measurements

6.10.5.2. Emission Masks

- **Emission Masks for For F3E Voice Mode**:- Conforms. Refer to Plots # 19 to 21.
- **Emission Masks for F3D Supervisory Audio Tone (SAT) Mode**: - Conforms. Refer to Plots # 22 to 24.
- **Emissions Maks for F3D Signalling Tone (ST) Mode**: - Conforms. Refer to Plots # 25 to 27 in Annex 1.
- **Emissions Maks for F3D (SAT) + (ST) Mode**: - Conforms. Refer to Plots # 28 to 30 in Annex 1.
- **Emissions Maks for F3D TDMF Mode**: - Conforms. Refer to Plots # 31 to 33 in Annex 1.
- **For F1D Wideband Data Mode**:- Conforms. Refer to Plots # 34 to 36 in Annex 1.

6.11. TRANSMITTER ANTENNA POWER SPURIOUS/HARMONIC CONDUCTED EMISSIONS @ FCC 22.917(A), (B), (C) & (D)

6.11.1. Limits

Emissions shall be attenuated below the mean output power of the transmitter as follows:

FCC RULES	ATTENUATION LIMIT
FCC 22.917(e)	43+10*log(P) dBc, P is power in watts
FCC 22.917(f) for Mobile emissions	Mean power in 869-894 MHz band shall be less than –80 dBm
FCC 22.917(g)	If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

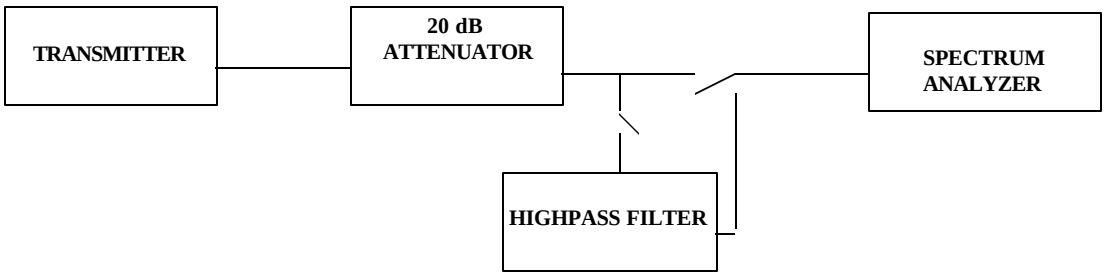
6.11.2. Method of Measurements

Refer to Exhibit 8 § 8.5 of this report for measurement details

6.11.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz
Attenuator(s)	Bird	..	…	DC – 22 GHz
Audio Oscillator	Hewlett Packard	HP 204C	0989A08798	DC to 1.2 MHz
Highpass Filter, Microphase	Microphase	CR220HID	IITI11000AC	Cut-off Frequency at 600 MHz, 1.3 GHz or 4 GHz

6.11.4. Test Arrangement



6.11.5. Plots

Please refer to plots # 37 through # 48 in Annex 1 for details of measurements

6.11.6. Test Data

6.11.6.1. Near Lowest Frequency (824.04 MHz)

Fundamental Frequency: 824.04 MHz
RF Output Power: 25.5 dBm
Modulation: FM modulation with 2.5 kHz Sine Wave Signal
Limit: 43 + 10 log (0.355W) = 38.5 dBc

FREQUENCY	TRANSMITTER CONDUCTED ANTENNA EMISSIONS		LIMIT	MARGIN	PASS/
(MHz)	(dBm)	(dBc)	(dBc)	(dB)	FAIL
1648.08	-34.4	-59.9	-38.5	-21.4	PASS
2472.12	-32.9	-58.4	-38.5	-19.9	PASS
3296.16	-37.3	-62.8	-38.5	-24.3	PASS
4120.20	-49.9	-75.4	-38.5	-36.9	PASS
4944.24	-50.0	-75.5	-38.5	-37.0	PASS
6592.32	-62.7	-88.2	-38.5	-49.7	PASS
7416.36	-55.0	-80.5	-38.5	-42.0	PASS
8240.40	-56.6	-82.1	-38.5	-43.6	PASS

- The emissions were scanned from 10 MHz to 10 GHz and all emissions within 20 dB below the limits were recorded.
- Refer to Plots # 37 to 38 in Annex 1 for detailed measurement data

Fundamental Frequency: 824.04 MHz
RF Output Power: 25.5 dBm
Modulation: FM modulation with 10 kb/s wide band data
Limit: 43 + 10 log (0.355W) = 38.5 dBc

FREQUENCY	TRANSMITTER CONDUCTED ANTENNA EMISSIONS		LIMIT	MARGIN	PASS/
(MHz)	(dBm)	(dBc)	(dBc)	(dB)	FAIL
1648.08	-25.6	-51.1	-38.5	-12.6	PASS
2472.12	-39.5	-65.0	-38.5	-26.5	PASS
3296.16	-30.0	-55.5	-38.5	-17.0	PASS
4944.24	-45.0	-70.5	-38.5	-32.0	PASS

- The emissions were scanned from 10 MHz to 10 GHz and all emissions within 20 dB below the limits were recorded.
- Refer to Plots # 43 to 44 in Annex 1 for detailed measurement data

6.11.6.2. Near Middle Frequency (836.52 MHz)

Fundamental Frequency: 836.52 MHz
RF Output Power: 25.5 dBm
Modulation: FM modulation with 2.5 kHz Sine Wave Signal
Limit: 43 + 10 log (0.355W) = 38.5 dBc

FREQUENCY (MHz)	TRANSMITTER CONDUCTED ANTENNA EMISSIONS (dBm)	(dBc)	LIMIT (dBc)	MARGIN (dB)	PASS/ FAIL
1673.04	-22.6	-48.1	-38.5	-9.6	PASS
2509.56	-34.4	-59.9	-38.5	-21.4	PASS
3346.08	-26.1	-51.6	-38.5	-13.1	PASS
4182.60	-60.9	-86.4	-38.5	-47.9	PASS
5019.12	-38.4	-63.9	-38.5	-25.4	PASS
6692.16	-59.8	-85.3	-38.5	-46.8	PASS
7528.68	-60.6	-86.1	-38.5	-47.6	PASS
8365.20	-56.1	-81.6	-38.5	-43.1	PASS

- The emissions were scanned from 10 MHz to 10 GHz and all emissions within 20 dB below the limits were recorded.
- Refer to Plots # 39 to 40 in Annex 1 for detailed measurement data

Fundamental Frequency: 836.52 MHz
RF Output Power: 25.5 dBm
Modulation: FM modulation with 10 kb/s wide band data
Limit: 43 + 10 log (0.355W) = 38.5 dBc

FREQUENCY (MHz)	TRANSMITTER CONDUCTED ANTENNA EMISSIONS (dBm)	(dBc)	LIMIT (dBc)	MARGIN (dB)	PASS/ FAIL
1673.04	-37.6	-63.1	-38.5	-24.6	PASS
2509.56	-38.8	-64.3	-38.5	-25.8	PASS
3346.08	-37.0	-62.5	-38.5	-24.0	PASS
5019.12	-51.9	-77.4	-38.5	-38.9	PASS
5855.64	-55.0	-80.5	-38.5	-42.0	PASS

- The emissions were scanned from 10 MHz to 10 GHz and all emissions within 20 dB below the limits were recorded.
- Refer to Plots # 45 to 46 in Annex 1 for detailed measurement data

6.11.6.3. Near Highest Frequency (848.97 MHz)

Fundamental Frequency: 848.97 MHz
RF Output Power: 25.5 dBm
Modulation: FM modulation with 2.5 kHz Sine Wave Signal
Limit: 43 + 10 log (0.355W) = 38.5 dBc

FREQUENCY	TRANSMITTER CONDUCTED ANTENNA EMISSIONS		LIMIT	MARGIN	PASS/
(MHz)	(dBm)	(dBc)	(dBc)	(dB)	FAIL
1697.94	-53.3	-78.8	-38.5	-40.3	PASS
2546.91	-34.5	-60.0	-38.5	-21.5	PASS
3395.88	-42.8	-68.3	-38.5	-29.8	PASS
4244.85	-44.7	-70.2	-38.5	-31.7	PASS
5093.82	-41.1	-66.6	-38.5	-28.1	PASS
6791.76	-59.7	-85.2	-38.5	-46.7	PASS
7640.73	-52.5	-78.0	-38.5	-39.5	PASS
8489.70	-54.1	-79.6	-38.5	-41.1	PASS

- The emissions were scanned from 10 MHz to 10 GHz and all emissions within 20 dB below the limits were recorded.
- Refer to Plots # 41 to 42 in Annex 1 for detailed measurement data

Fundamental Frequency: 848.97 MHz
RF Output Power: 25.5 dBm
Modulation: FM modulation with 10 kb/s wide band data
Limit: 43 + 10 log (0.355W) = 38.5 dBc

FREQUENCY	TRANSMITTER CONDUCTED ANTENNA EMISSIONS		LIMIT	MARGIN	PASS/
(MHz)	(dBm)	(dBc)	(dBc)	(dB)	FAIL
1697.94	-35.8	-61.3	-38.5	-22.8	PASS
2546.91	-39.7	-65.2	-38.5	-26.7	PASS
3395.88	-48.1	-73.6	-38.5	-35.1	PASS
5093.82	-39.0	-64.5	-38.5	-26.0	PASS

- The emissions were scanned from 10 MHz to 10 GHz and all emissions within 20 dB below the limits were recorded.
- Refer to Plots # 47 to 48 in Annex 1 for detailed measurement data

6.12. TRANSMITTER SPURIOUS/HARMONIC RADIATED EMISSIONS @ FCC 22.917(A), (B), (C) & (D)

6.12.1. Limits

Emissions shall be attenuated below the mean output power of the transmitter as follows:

FCC RULES	ATTENUATION LIMIT
FCC 22.917(e)	43+10*log(P) dBc, P is power in watts
FCC 22.917(f) for Mobile emissions	Mean power in 869-894 MHz band shall be less than –80 dBm
FCC 22.917(g)	If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

6.12.2. Method of Measurements

The spurious/harmonic ERP measurements are using substitution method specified in Exhibit 8, § 8.2 of this report and its value in dBc is calculated as follows:

- If the transmitter's antenna is an integral part of the EUT, the ERP is measured using substitution method.
- Spurious /harmonic emissions levels expressed in dBc (dB below carrier) are as follows:

ERP of spurious/harmonic (dBc) = ERP of carrier (dBm) – ERP of spurious/harmonic emission (dBm)

6.12.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Advantest	R3271	15050203	100 Hz to 32 GHz with external mixer for frequency above 32 GHz
Microwave Amplifier	Hewlett Packard	HP 83017A	3116A00661	1 GHz to 26.5 GHz
Active Loop Antenna	EMCO	6507	8906-1167	1 kHz – 30 MHz
Biconilog Antenna	EMCO	3143	1029	20 MHz to 2 GHz
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz
Horn Antenna with Mixer	EMCO	3160-09	1007	18 GHz – 26.5 GHz
Horn Antenna with Mixer	EMCO	3160-10	1001	26.5 GHz – 40 GHz

6.12.4. Test Setup

Please refer to Photos # 1 to 3 in Annex 2 for detailed of test setup.

6.12.5. Test Data

Remarks:

The radiated emissions with FM analog modulation were performed and represent the worst case for the following reasons:

(1) The conducted spurious/harmonic show no significant difference between the transmission with FM analog modulation and FM 10kb/s pseudo random wide band data.

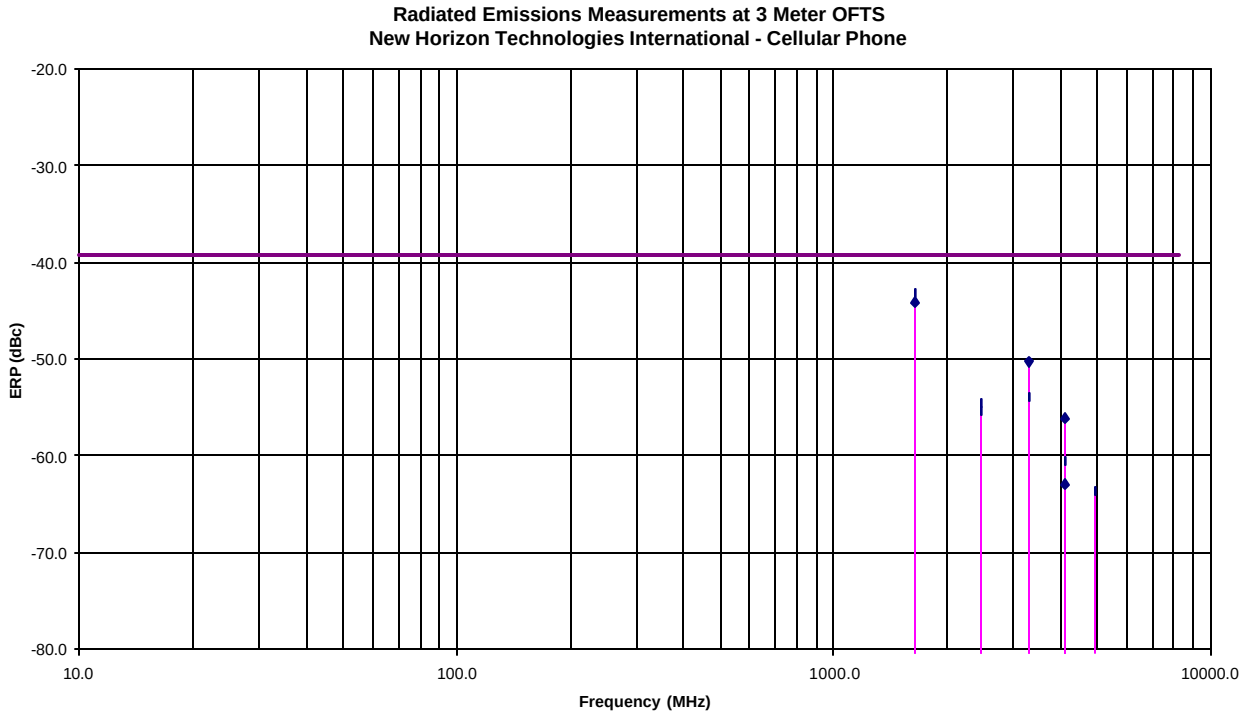
(2) The operation mode with FM modulation with 10kb/s pseudo random wideband data is only a burst transmission for sending messaging to base station; therefore, its average emissions shall be lower than those of the FM analog transmission.

6.12.5.1. Near Lowest Frequency (824.04 MHz)

Fundamental Frequency: 824.04 MHz
ERP: 26.3 dBm
Modulation: FM modulation with 2.5 kHz Sine Wave Signal
Limit: 43 + 10 log (0.427W) = 39.3 dBc

FREQUENCY (MHz)	E-FIELD Level @3m (dBuV/m)	ERP measured by Substitution Method (dBm)	ERP measured by Substitution Method (dBc)	EMI Receiver Detector (Peak/QP)	ANTENNA PLANE (H/V)	ANTENNA LIMIT (dBc)	MARGIN (dB)	PASS/ FAIL
1648.08	86.8	-16.8	-43.1	PEAK	H	-39.3	-3.8	PASS
1648.08	85.8	-17.8	-44.1	PEAK	V	-39.3	-4.8	PASS
2472.12	75.2	-28.3	-54.6	PEAK	H	-39.3	-15.3	PASS
2472.12	75.0	-29.1	-55.4	PEAK	V	-39.3	-16.1	PASS
3296.16	73.5	-27.6	-53.9	PEAK	H	-39.3	-14.6	PASS
3296.16	78.4	-24.0	-50.3	PEAK	V	-39.3	-11.0	PASS
4120.20	72.7	-29.8	-56.1	PEAK	H	-39.3	-16.8	PASS
4120.20	67.7	-34.2	-60.5	PEAK	V	-39.3	-21.2	PASS
4944.24	65.1	-37.3	-63.6	PEAK	H	-39.3	-24.3	PASS
4944.24	67.1	-36.6	-62.9	PEAK	V	-39.3	-23.6	PASS

- The emissions were scanned from 10 MHz to 10 GHz and all emissions within 20 dB below the limits were recorded.
- No rf emissions were observed in the base cellular band of 869-894 MHz with the EMI receiver noise floor set at least 90dBc.

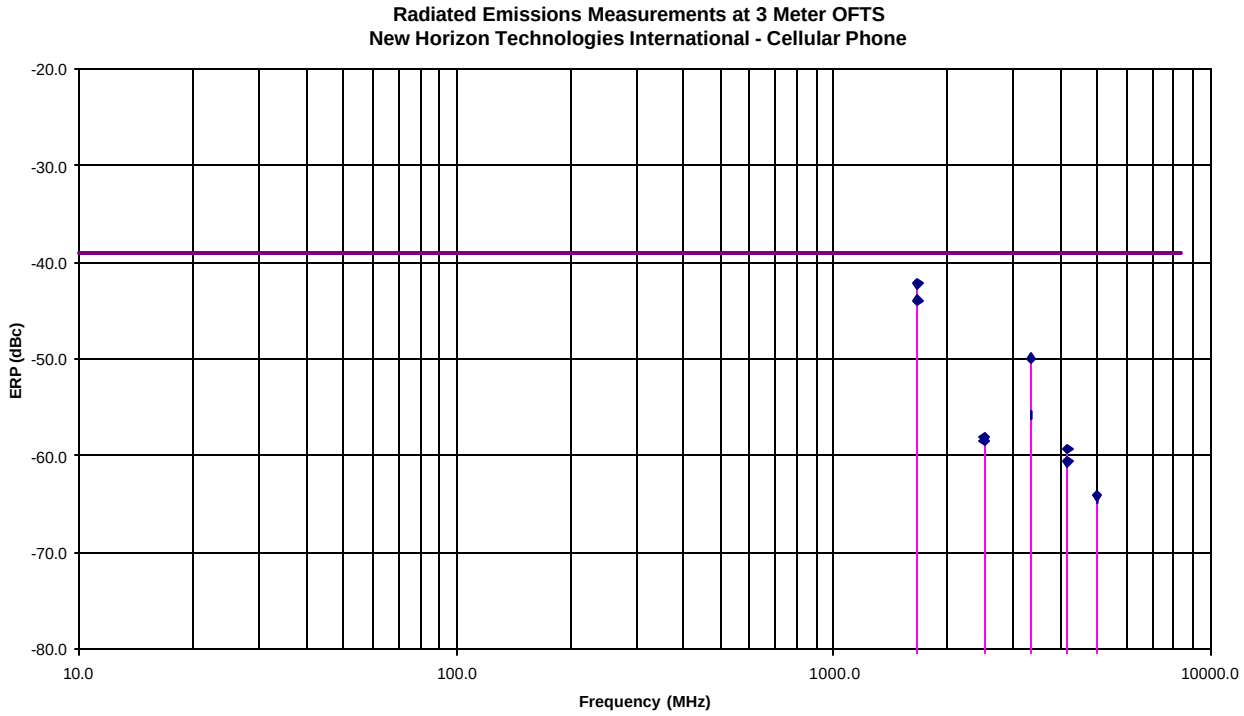

Radiated Emissions Measurements at 3 Meter OFTS
New Horizon Technologies International - Cellular Phone
ERP (dBc)
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
10.0
100.0
1000.0
10000.0
Frequency (MHz)

6.12.5.2. Near Middle Frequency (836.52 MHz)

Fundamental Frequency: 836.52 MHz
ERP: 26.01 dBm
Modulation: FM modulation with 2.5 kHz Sine Wave Signal
Limit: 43 + 10 log (0.399W) = 39.0 dBc

FREQUENCY (MHz)	E-FIELD Level @3m (dBuV/m)	ERP measured by Substitution Method (dBm)	ERP measured by Substitution Method (dBc)	EMI Receiver Detector (Peak/QP)	ANTENNA PLANE (H/V)	ANTENNA LIMIT (dBc)	MARGIN (dB)	PASS/ FAIL
1673.04	85.2	-17.9	-43.9	PEAK	H	-39.0	-4.9	PASS
1673.04	87.6	-16.2	-42.2	PEAK	V	-39.0	-3.2	PASS
2509.56	70.6	-32.0	-58.0	PEAK	H	-39.0	-19.0	PASS
2509.56	72.0	-32.5	-58.5	PEAK	V	-39.0	-19.5	PASS
3346.08	72.4	-29.8	-55.8	PEAK	H	-39.0	-16.8	PASS
3346.08	79.1	-23.9	-49.9	PEAK	V	-39.0	-10.9	PASS
4182.60	68.8	-34.6	-60.6	PEAK	H	-39.0	-21.6	PASS
4182.60	66.7	-33.3	-59.3	PEAK	V	-39.0	-20.3	PASS
5019.12	64.3	-38.4	-64.4	PEAK	H	-39.0	-25.4	PASS
5019.12	65.6	-38.1	-64.1	PEAK	V	-39.0	-25.1	PASS

- The emissions were scanned from 10 MHz to 10 GHz and all emissions within 20 dB below the limits were recorded.
- No rf emissions were observed in the base cellular band of 869-894 MHz with the EMI receiver noise floor set at least 90dBc.


Radiated Emissions Measurements at 3 Meter OFTS
New Horizon Technologies International - Cellular Phone
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
ERP (dBc)
10.0
100.0
1000.0
10000.0
Frequency (MHz)

6.12.5.3. Near Highest Frequency (848.97 MHz)

Fundamental Frequency: 848.97 MHz
ERP: 26.5 dBm
Modulation: FM modulation with 2.5 kHz Sine Wave Signal
Limit: 43 + 10 log (0.447W) = 40.0 dBc

FREQUENCY (MHz)	E-FIELD Level @3m (dBuV/m)	ERP measured by Substitution Method (dBm)	ERP measured by Substitution Method (dBc)	EMI Receiver Detector (Peak/QP)	ANTENNA PLANE (H/V)	ANTENNA LIMIT (dBc)	MARGIN (dB)	PASS/ FAIL
1697.94	86.3	-15.6	-42.1	PEAK	V	-40.0	-2.1	PASS
1697.94	85.6	-18.5	-45.0	PEAK	H	-40.0	-5.0	PASS
2546.91	78.9	-24.5	-51.0	PEAK	V	-40.0	-11.0	PASS
2546.91	78.8	-25.8	-52.3	PEAK	H	-40.0	-12.3	PASS
3395.88	75.9	-26.7	-53.2	PEAK	V	-40.0	-13.2	PASS
3395.88	79.8	-24.1	-50.6	PEAK	H	-40.0	-10.6	PASS
4244.85	67.6	-36.0	-62.5	PEAK	V	-40.0	-22.5	PASS
4244.85	63.1	-38.6	-65.1	PEAK	H	-40.0	-25.1	PASS
5093.82	62.1	-42.0	-68.5	PEAK	V	-40.0	-28.5	PASS
5093.82	66.1	-35.1	-61.6	PEAK	H	-40.0	-21.6	PASS
7640.73	63.2	-40.5	-67.0	PEAK	V	-40.0	-27.0	PASS
7640.73	63.3	-45.2	-71.7	PEAK	H	-40.0	-31.7	PASS

- The emissions were scanned from 10 MHz to 10 GHz and all emissions within 20 dB below the limits were recorded.
- No rf emissions were observed in the base cellular band of 869-894 MHz with the EMI receiver noise floor set at least 90dBc.

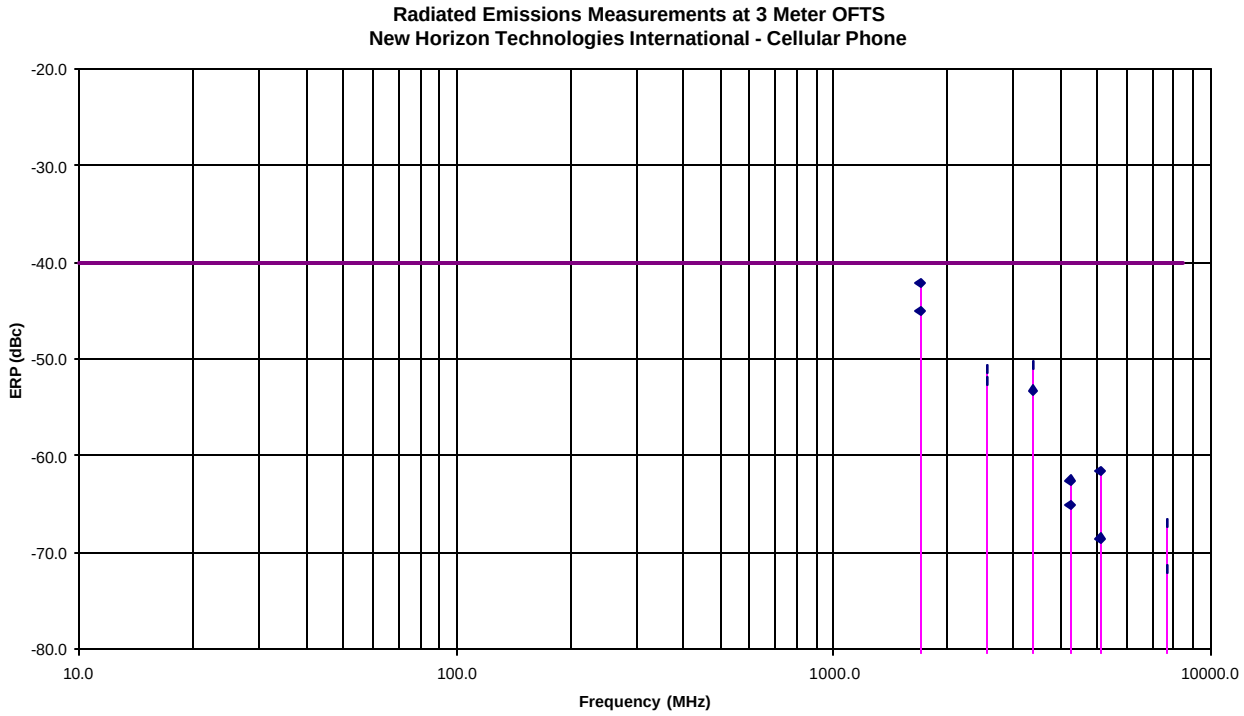

Radiated Emissions Measurements at 3 Meter OFTS
New Horizon Technologies International - Cellular Phone
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
ERP (dBc)
10.0
100.0
1000.0
10000.0
Frequency (MHz)

EXHIBIT 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and NIS 81 (1994)

7.1. RADIATED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Radiated Emissions)	PROBABILITY DISTRIBUTION	UNCERTAINTY (± dB)	
		3 m	10 m
Antenna Factor Calibration	Normal (k=2)	±1.0	±1.0
Cable Loss Calibration	Normal (k=2)	±0.3	±0.5
EMI Receiver specification	Rectangular	±1.5	±1.5
Antenna Directivit	Rectangular	+0.5	+0.5
Antenna factor variation with height	Rectangular	±2.0	±0.5
Antenna phase center variation	Rectangular	0.0	±0.2
Antenna factor frequency interpolation	Rectangular	±0.25	±0.25
Measurement distance variation	Rectangular	±0.6	±0.4
Site imperfections	Rectangular	±2.0	±2.0
Mismatch: Receiver VRC $\Gamma_1 = 0.2$ Antenna VRC $\Gamma_R = 0.67$(Bi) 0.3 (Lp) Uncertainty limits 20Log(1±$\Gamma_1\Gamma_R$)	U-Shaped	+1.1 -1.25	±0.5
System repeatability	Std. Deviation	±0.5	±0.5
Repeatability of EUT		-	-
Combined standard uncertainty	Normal	+2.19 / -2.21	+1.74 / -1.72
Expanded uncertainty U	Normal (k=2)	+4.38 / -4.42	+3.48 / -3.44

Calculation for maximum uncertainty when 3m biconical antenna including a factor of k=2 is used:

$U = 2u_c(y) = 2x(+2.19) = +4.38$ dB And $U = 2u_c(y) = 2x(-2.21) = -4.42$ dB

EXHIBIT 8. MEASUREMENT METHODS

8.1. CONDUCTED POWER MEASUREMENTS

The following shall be applied to the combination(s) of the radio device and its intended antenna(e).

- I f the RF level is user adjustable, all measurements shall be made with the highest power level available to the user for that combination.
- The following method of measurement shall apply to both conducted and radiated measurements.
- The radiated measurements are performed at the Ultratech Calibrated Open Field Test Site.
- The measurement shall be performed using normal operation of the equipment with modulation.

Test procedure shall be as follows:

Step 1: Duty Cycle measurements if the transmitter's transmission is transient

- Using a EMI Receiver with the frequency span set to 0 Hz and the sweep time set at a suitable value to capture the envelope peaks and the duty cycle of the transmitter output signal;
- The duty cycle of the transmitter, x = Tx on / (Tx on + Tx off) with $0<x<1$, is measure and recorded in the test report. For the purpose of testing, the equipment shall be operated with a duty cycle that is equal or more than 0.1.

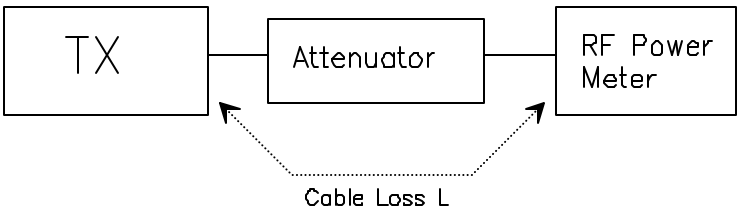
Step 2: Calculation of Average EIRP. See Figure 1

- The average output power of the transmitter shall be determined using a wideband, calibrated RF average power meter with the power sensor with an integration period that exceeds the repetition period of the transmitter by a factor 5 or more. The observed value shall be recorded as "A" (in dBm);
- The e.i.r.p. shall be calculated from the above measured power output "A", the observed duty cycle x, and the applicable antenna assembly gain "G" in dBi, according to the formula:

EIRP = A + G + 10log(1/x)

{ X = 1 for continuous transmission => 10log(1/x) = 0 dB }

Figure 1.



8.2. RADIATED POWER MEASUREMENTS (ERP & EIRP) USING SUBSTITUTION METHOD

8.2.1. Maximizing RF Emission Level (E-Field)

- The measurements was performed with full rf output power and modulation.
- Test was performed at listed 3m open area test site (listed with FCC, IC, ITI, NVLAP, ACA & VCCI).
- The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
- The BICONILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.
- Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level

  Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
  E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)

- Set the EMI Receiver #1 and #2 as follows:

Center Frequency:	test frequency
Resolution BW:	100 kHz
Video BW:	same
Detector Mode:	positive
Average:	off
Span:	3 x the signal bandwidth

- The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
- The transmitter was rotated through 360° about a vertical axis until a higher maximum signal was received.
- The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
- The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
- The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.
- Repeat for all different test signal frequencies

8.2.2. Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method

- Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring EIRP) as follows:

Center Frequency:	equal to the signal source
Resolution BW:	10 kHz
Video BW:	same
Detector Mode:	positive
Average:	off
Span:	3 x the signal bandwidth

- Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level

  Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
  E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)

- Select the frequency and E-field levels obtained in the Section 8.2.1 for ERP/EIRP measurements.
- Substitute the EUT by a signal generator and one of the following transmitting antenna (substitution antenna):
  - DIPOLE antenna for frequency from 30-1000 MHz or
  - HORN antenna for frequency above 1 GHz }.
- Mount the transmitting antenna at 1.5 meter high from the ground plane.
- Use one of the following antenna as a receiving antenna:
  - DIPOLE antenna for frequency from 30-1000 MHz or
  - HORN antenna for frequency above 1 GHz }.
- If the DIPOLE antenna is used, tune it's elements to the frequency as specified in the calibration manual.
- Adjust both transmitting and receiving antenna in a VERTICAL polarization.
- Tune the EMI Receivers to the test frequency.
- Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
- The transmitter was rotated through 360° about a vertical axis until a higher maximum signal was received.
- Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
- Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.
- Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:

  P = P1 - L1 = (P2 + L2) – L1 = P3 + A + L2 - L1
  EIRP = P + G1 = P3 + L2 - L1 + A + G1
  ERP = EIRP – 2.15 dB
  Total Correction factor in EMI Receiver # 2 = L2 – L1 + G1

  Where: P: Actual RF Power fed into the substitution antenna port after corrected.
  P1: Power output from the signal generator
  P2: Power measured at attenuator A input
  P3: Power reading on the Average Power Meter
  EIRP: EIRP after correction
  ERP: ERP after correction

- Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)
- Repeat step (d) to (o) for different test frequency
- Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.

- Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.:

Figure 2

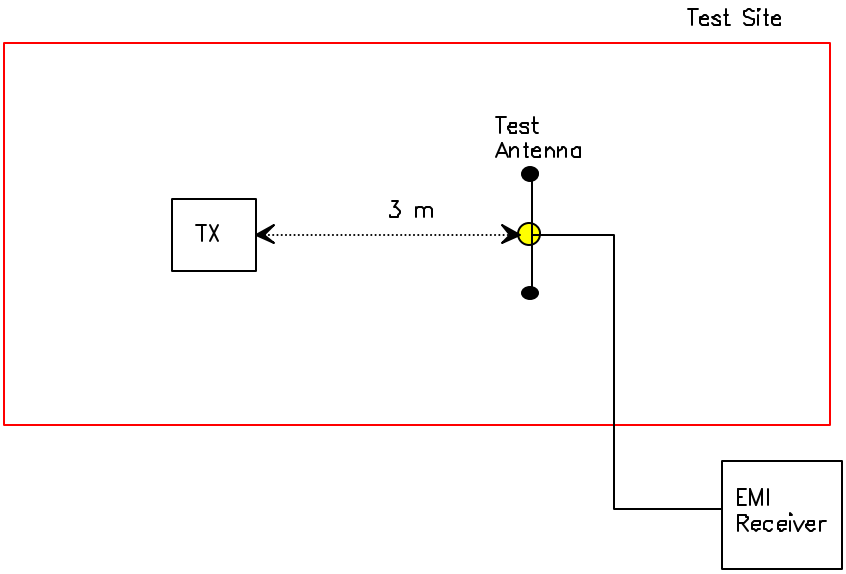
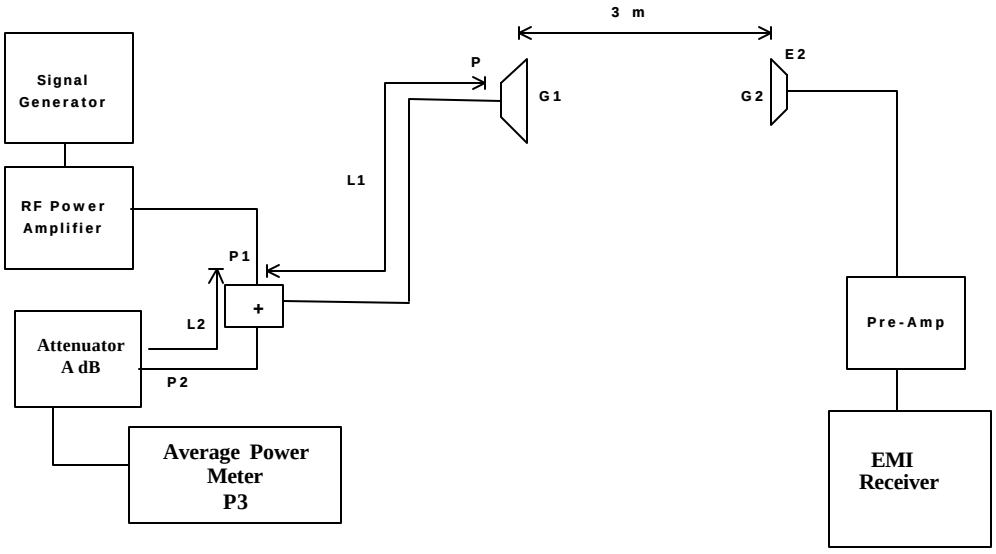


Figure 3



8.3. FREQUENCY STABILITY

(a) The frequency stability shall be measured with variation of ambient temperature as follows: From -30 to +50 centigrade except that specified in subparagraph (2) & (3) of this paragraph.

(b) Frequency measurements shall be made at extremes of the specified temperature range and at intervals of not more than 10 centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stability circuitry need be subjected to the temperature variation test.

(d) The frequency stability supply shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provide with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

(e) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) and (d) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment).

8.4. SPURIOUS EMISSIONS (CONDUCTED)

The transmitter spurious and harmonic emissions were scanned. The spurious and harmonic emissions were measured with the EMI Receiver controls set as RBW = 100 kHz (for frequencies < 1 GHz) and 1 MHz (for frequencies > 1GHz), VBW $\geq$ RBW and SWEEP TIME = AUTO). The transmitter was operated at a full rated power output, and modulated as follows:

- **Frequency spectrum to be investigated:-** The spectrum was investigated from the lowest radio generated in the equipment up to at least the 10^{th} harmonic of the carrier frequency or to the highest frequency practicable in the present state of the art of measuring techniques, whichever is lower. Particular attention should be paid to harmonics and subharmonics of the carrier frequency. Radiation at the frequencies of multiplier stages should be checked. The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

- **Spurious Emissions at Antenna Terminal:-** The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of the harmonic and other spurious emission that can be detected when the equipment is operated under the conditions as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.