ENGINEERING TEST REPORT

IsatDock
Model No.: AT1595-82 & AT1595-83
FCC ID: YP9AT1595

Applicant: **Beam Communications Pty Ltd**
5/8 Anzed Court
Mulgrave, Victoria
Australia 3170

Tested in Accordance With

Federal Communications Commission (FCC)
CFR 47, PARTS 2 and 25 (Subpart C)
1.6 GHz Mobile-Satellite Service

UltraTech's File No.: BEAM-014FCC25_R1.1

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs Date: November 10, 2010	
Report Prepared by: Dharmajit Solanki	Tested by: Wayne Wu, RFI Engineer
Issued Date: November 10, 2010	Test Dates: September 01-17, 2010

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.*

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FCC	VCCI	Industry Canada / Industrie Canada Approved Test Facility	NVLAP	BSMI	Korea KCC-RRL
91038	1309	46390-2049	NvLap Lab Code 200093-0	SL2-IN-E-1119R	CA2049

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DOCUMENT REVISION DETAILS

Revision Number	Reason	Revision Issued Date	Revision File Number	Revision Reviewed by
1.0	Update Product name/Model Nos, description of EUT	October 29, 2010	BEAM-014FCC25_R1.0	Mr. Tri Luu
1.1	Updated Sec 2.3 & Sec 2.4	November 10, 2010	BEAM-014FCC25_R1.1	Mr. Tri Luu

EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Parts 2 and 25 Subpart C
Title:	Telecommunication - Code of Federal Regulations, CFR 47, Parts 2 & 25 Subpart C
Purpose of Test:	To gain FCC Certification Authorization for Radio operating in the frequency bands 1626.5-1660.5 MHz
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.

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

None

1.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 2 and 25	2009	Code of Federal Regulations – Telecommunication
ANSI C63.4	2003	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 16-1-1	2004	Specification for Radio Disturbance and Immunity measuring apparatus and methods
TIA/EIA 603, Edition C	2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

APPLICANT:	
Name:	Beam Communications Pty Ltd
Address:	5/8 Anzed Court Mulgrave, Victoria Australia 3170
Contact Person:	Mr. Greg Incoll Phone #: +61 3 8851 0400 Fax #: +61 3 9560 9055 Email Address: greg.incoll@beamcommunications.com

MANUFACTURER:	
Name:	AeroAntenna Technology, Inc
Address:	20732 Lassen Street Chatsworth, CA 91311 USA
Contact Person:	Mr. Bill Eaton Phone #: (818) 993-3842 Email Address: ee2@aeroantenna.com

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

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

Brand Name:	Beam Communications Pty Ltd
Product Name:	IsatDock
Model Name or Number:	AT1595-82 (for Marine/Pro) & AT1595-83 (for Lite/Drive)
Serial Number:	Production prototype
EUT Application:	Satellite Docking Station and Active Antenna System
Type of Equipment:	Amplifier
Power Supply:	DC 32 Volts maximum

Note: Models AT1595-82 and AT1595-83 are exactly identical except for the antenna element types.

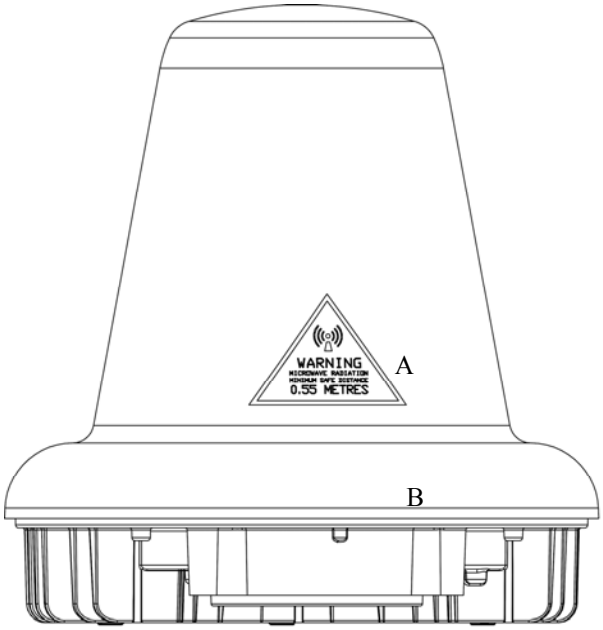
2.3. EUT'S TECHNICAL SPECIFICATIONS

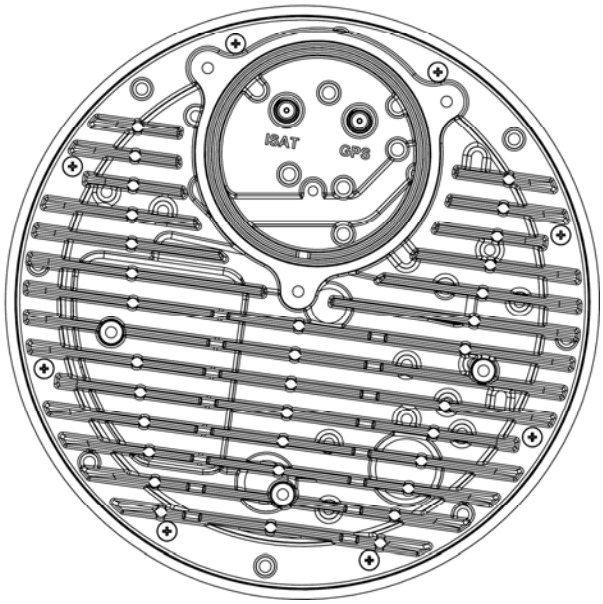
AMPLIFIER + INTEGRAL ANTENNA	
Equipment Type:	Mobile or Fixed Base Station
Intended Operating Environment:	[x] Commercial [x] Light Industry & Heavy Industry
Power Supply Requirement:	DC 26-40V (min – max) 32V typical
RF Input Power Rating:	30.0 dBm or 1.0 Watt (conducted)
RF Output Power Rating:	37.5 dBm or 5.6 Watts peak (conducted)
Duty Cycle:	N/A
Tx Operating Frequency Range:	1626.5 - 1660.5 MHz
Rx Operating Frequency Range:	1565.19– 1585.65 MHz (GPS) 1518-1559 MHz (Inmarsat)
RF Output Impedance:	50 Ohms
Channel Spacing:	N/A
Occupied Bandwidth (99%):	83.1 KHz
Modulation:	**TX Modulation:** GMSK **RX Modulation:** OQPSK
Emission Designation*:	G7W
Antenna Connector Type:	Integral
Antenna Description:	Manufacturer: Aeroantenna Technology, Inc. Type Maritime Model: AT1595-82 & AT1595-83 Frequency Range: GPS: 1565.19– 1585.65 MHz, Inamarsat Receive: 1518- 1559 MHz, Inamarsat Transmit: 1626.5-1660.5 MHz GPS Amplifier Gain: 26 dB max INMARSAT RECEIVE Amplifier: 26 dB max INMARSAT TRANSMIT Amplifier: 11 dB max Antenna: 6.0 dBi max (for model AT1595-83) Antenna: 3.5 dBi max (for model AT1595-82)
Ambient Temperature Rating:	-40 to +70 degree C

2.4. LIST OF EUT'S PORTS

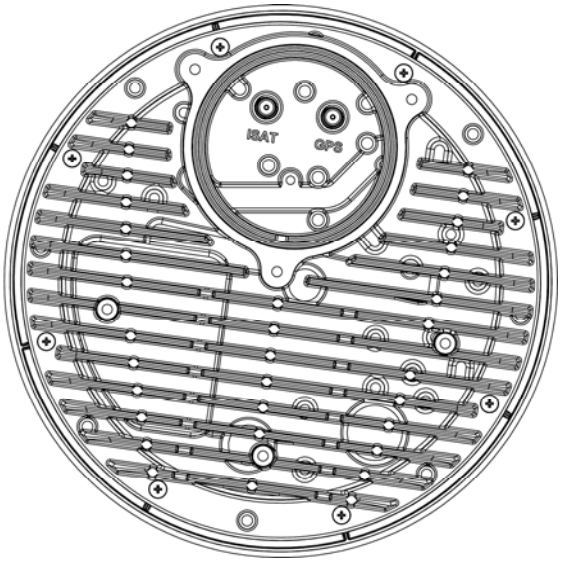
Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
A	GPS Antenna	1	SMA	Shielded coaxial cable
B	Inmarsat Antenna	1	SMA	Shielded coaxial cable

Model AT1595-82 (Marine/Pro)





Model AT1595-83 (Drive/Lite)



2.5. LIST OF ACCESSORIES:

The IsatDock is supplied with one of the following docking station:

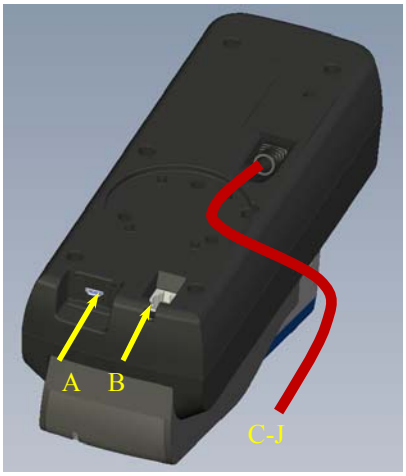
Index Number	Ancillary Equipment	Parts Number/ Model Number
1	IsatDock LITE + Immarsat Isatphone (Model 004401510019918, HW ID: 0322, FCC ID: YCT-ISATPHONE, IC: 8944A-ISATPHONE)	ISD LITE
2	IsatDock DRIVE + Immarsat Isatphone (Model 004401510019918, HW ID: 0322, FCC ID: YCT-ISATPHONE, IC: 8944A-ISATPHONE)	ISD DRIVE
3	IsatDock PRO + Immarsat Isatphone (Model 004401510019918, HW ID: 0322, FCC ID: YCT-ISATPHONE, IC: 8944A-ISATPHONE)	ISD PRO
4	IsatDock MARINE + Immarsat Isatphone (Model 004401510019918, HW ID: 0322, FCC ID: YCT-ISATPHONE, IC: 8944A-ISATPHONE)	ISD MARINE

2.5.1. IsatDock LITE, Model: ISD LITE

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
A	USB data interface	1	MicroUSB Type B Reverse	Shielded
B	RJ9 Privacy handset	1	RJ-9 (4P4C) modular jack	Non- Shielded
C	DC power and Accessory input	1	Micro-Fit3.0 Dual Row 4Way inline plug	Non- Shielded
D	GPS Antenna	1	SMA (F) inline connector	Shielded
E	Inmarsat Antenna	1	TNC (F) inline connector	Shielded

2.5.2. IsatDock DRIVE, Model: ISD DRIVE

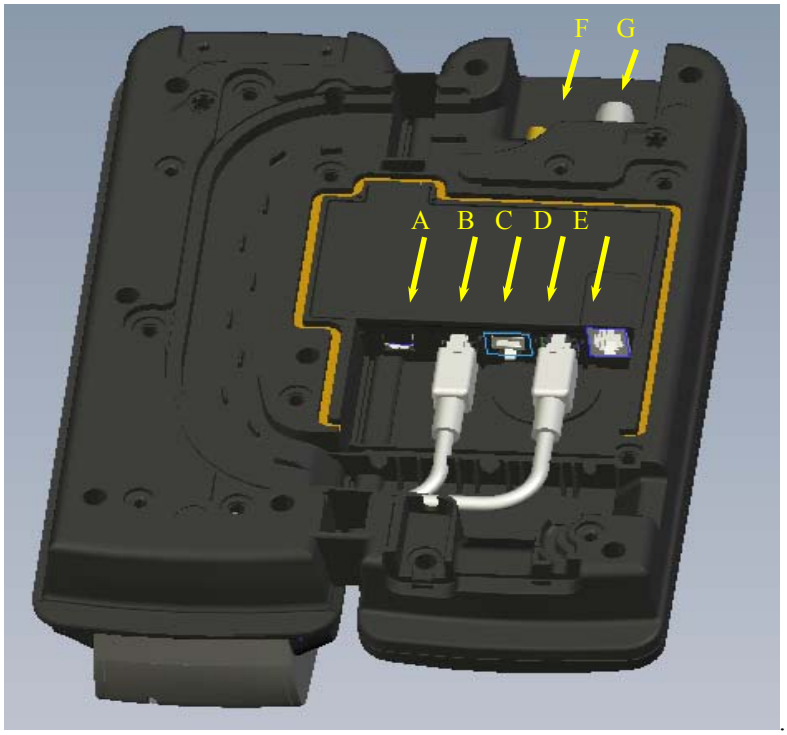
Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
A	USB data interface	1	MicroUSB Type B Reverse	Shielded
B	RJ9 Privacy handset	1	RJ-9 (4P4C) modular jack	Non- Shielded
C	DC power and Accessory input	1	Micro-Fit3.0 Dual Row 4Way inline plug	
D	GPS Antenna	1	SMA (F) inline connector	Non- Shielded
E	Inmarsat Antenna	1	TNC (F) inline connector	Shielded
F	Alert Loop	1	24AWG wire ends	Shielded
G	Horn	1	24AWG wire end	Non- Shielded
H	Radio Mute	1	24AWG wire end	Non- Shielded
I	Ext Speaker	1	Micro-Fit3.0 single Row 2Way inline plug	Non- Shielded
J	Ext Microphone	1	Micro-Fit3.0 Dual Row 2Way inline plug	Non- Shielded



2.5.3. IsatDock MARINE, Model: ISD MARINE / IsatDock PRO, Model: ISD PRO

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
A	USB data interface	1	MicroUSB Type B Reverse	Shielded
B	Alert loop cable	1	Micro-Fit3.0 single Row 2Way Header	Non- Shielded
C	RJ11 POTS interface	1	RJ11 (6P24C) modular jack	Non- Shielded
D	DC power and Accessory input	1	Micro-Fit3.0 Dual Row 4Way header	Non- Shielded
E	RJ9 Privacy handset	1	RJ-9 (4P4C) modular jack	Non- Shielded
F	GPS Antenna	1	SMA (F) bulkhead connector with O-ring	Shielded
G	Inmarsat Antenna	1	TNC (F) bulkhead connector with O-ring	Shielded

** The PRO Docking station has the same electrical interfaces and is only different from the Marine in that it is not waterproof and has different software features



2.6. LIST OF PERIPHERAL DEVICES USED FOR TESTING:

(1) Immarsat Isat Phone Pro Proto Handheld Transceiver, Model 004401510019918, HW ID: 0322, FCC ID: YCT-ISATPHONE, IC: 8944A-ISATPHONE
(2) AC/DC Adaptor, Cincon Ztectronics Co. Ltd., Model TRGA5A120-01 (1007Z02), S/N: 45120-0002015
(3) GMZ Speaker, Model SPK07-180
(4) Panasonic Phone Handset

2.7. TEST SETUP BLOCK DIAGRAM

Since the IsatDock is only a device that provides DC supply and RF signal path fed to the amplifier. Model ISD MARINE is chosen for testing which represents the worst case to include Models ISD LITE, ISD DRIVE and ISD Pro.

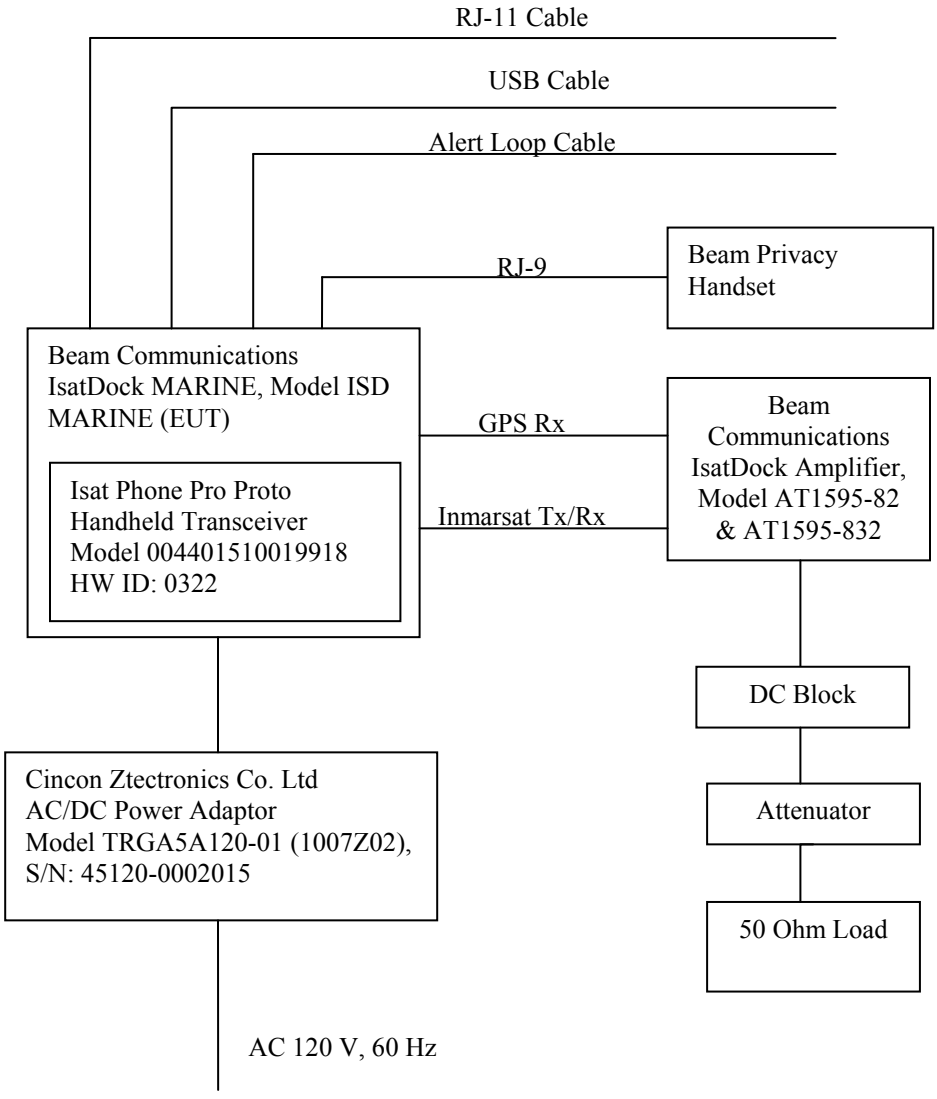


EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	23°C
Humidity:	55%
Pressure:	102 kPa
Power input source:	120 V 60 Hz using external AC/DC Adaptor

3.2. 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 Set-up Software used to setup frequency, power level and channel spacing.
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): ▪ 1626.5 - 1660.5 MHz band	Near lowest & near highest frequencies in each frequency bands that the transmitter covers: • 1626.5, 1643.5 & 1660.5 MHz
Transmitter Wanted Output Test Signals: ▪ Max. RF Input Power: ▪ Max. RF Output Power: ▪ Normal Test Modulation ▪ Modulating signal source:	 ▪ 30.0 dBm maximum (conducted) ▪ 37.5 dBm maximum (conducted) ▪ external ▪ external

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. 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.

- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site 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 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 91038) and Industry Canada office (Industry Canada File No.: 2049A-3). Expiry Date: 2011-05-01.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC PARAGRAPH	TEST REQUIREMENTS	APPLICABILITY (YES/NO)
2.1046(a), 25.204(a)	Power Limit	Yes
1.1307, 1.1310, 2.1091 & 2.1093	RF Exposure Limit	Yes, MPE is required
2.1049	99% Occupied Bandwidth	Yes
2.1055, 25.202(d)	Frequency Stability	N/A for amplifier operated as an extender
2.1051, 25.202(f) & 25.213	Emission Masks measured at antenna terminal	N/A for amplifier operated as an extender
2.1051, 25.202(f) & 25.213	Spurious Emissions at antenna terminal	Yes
2.1053, 25.202(f) & 25.213	Emission Limits - Field Strength of Spurious Emissions	Yes
FCC Guide Lines for Amplifier, Booster	Out of Band Rejection	Yes
IsatDock, **Model No.: AT1595-82 & AT1595-83**, by **Beam Communications Pty Ltd** has also been tested and found to comply with **FCC Part 15, Subpart B - Radio Receivers B Digital Devices (Models ISD LITE & DRIVE + AT1595-83 complies Class B Radiated Limits, Models ISD PRO & MARINE + AT1595-82 complies Class A Radiated Limits,**. The engineering test report has been documented and kept in file, RPDT-001FCC15B and it is available anytime upon FCC request.		

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None

4.4. DEVIATION OF STANDARD TEST PROCEDURES

None

EXHIBIT 5. TEST DATA

5.1. POWER LIMITS @ FCC 25.204(A)

5.1.1. Limits

§ 25.204(a) Power limits: In bands shared coequally with terrestrial radio communication services, the equivalent isotropically radiated power transmitted in any direction towards the horizon by an earth station, other than an ESV, operating in frequency bands between 1 and 15 GHz, shall not exceed the following limits except as provided for in paragraph (c) of this section:

+40 dBW in any 4 kHz band for $\Theta \leq 0°$
+40 + 3 Θ dBW in any 4 kHz band for $0° < \Theta \leq 5°$

where Θ is the angle of elevation of the horizon viewed from the center of radiation of the antenna of the earth station and measured in degrees as positive above the horizontal plane and negative below it.

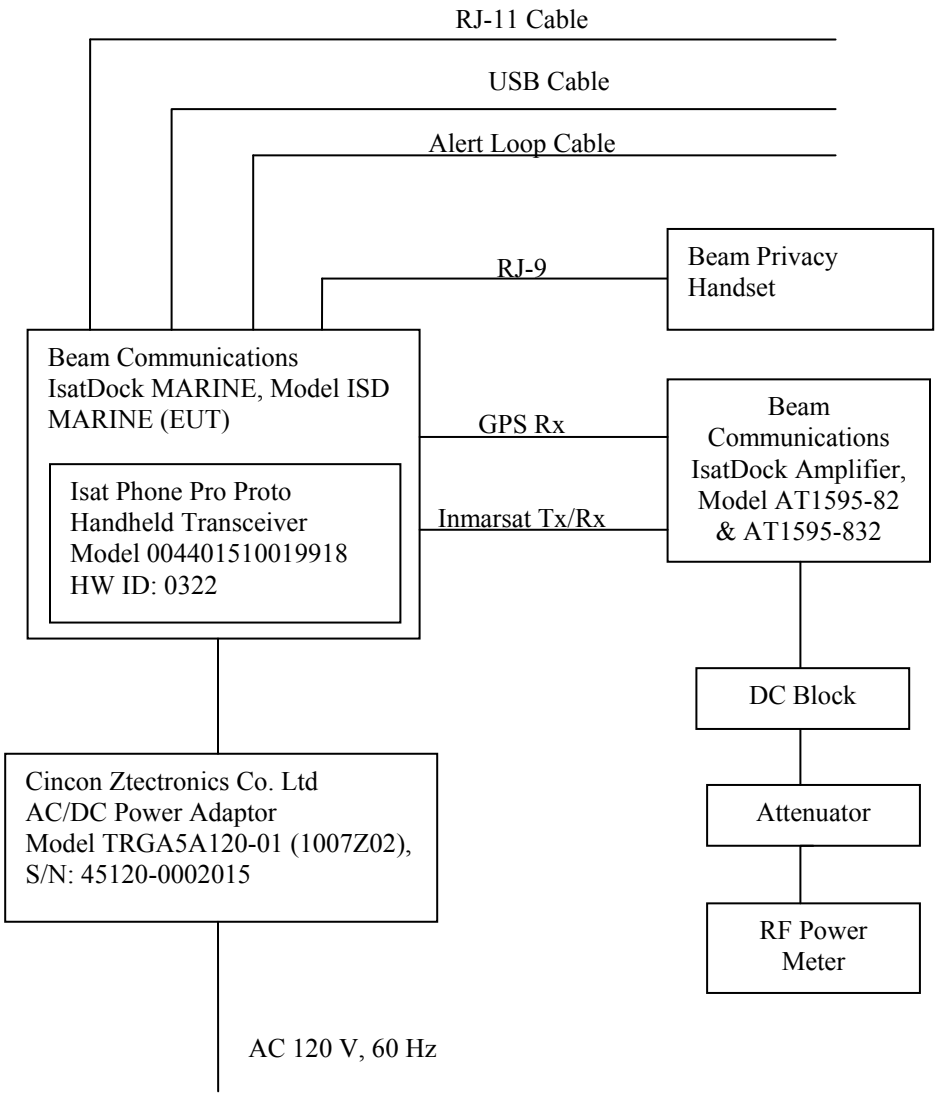
5.1.2. Method of Measurements

The output power was measured using an Average RF Power meter with the RF input set at maximum rated value.

5.1.3. Test Instrumentation

Please refer to Exhibit 7 for details of test instruments and calibration due dates.

5.1.4. Test Arrangement



5.1.5. Test Data

Maximum EIRP (dBm)

Channel Number	Fundamental Frequency (MHz)	Measured Conducted RF Input Power (dBm)	Measured Conducted RF Output Power (dBm)	Peak EIRP with Antenna Gain = 6 dBi (dBm)	RF Output Peak EIRP Power Limit (dBm)
0	1626.50	30.0	37.5	43.5	70.0
85	1643.50	30.0	36.3	42.3	70.0
169	1660.50	30.0	36.5	42.5	70.0

5.2. RF EXPOSURE REQUIRMENTS [§1.1310 & 2.1091]

The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation.

FCC 47 CFR § 1.1310:

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f^2)	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f^2)	30
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

5.2.1. Method of Measurements

Refer to Sections 1.1310, 2.1091

In order to demonstrate compliance with MPE requirements (see Section 2.1091), the following information is typically needed:

(1) Calculation that estimates the minimum separation distance (20 cm or more) between an antenna and persons required to satisfy power density limits defined for free space.
(2) Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement
(3) Any caution statements and/or warning labels that are necessary in order to comply with the exposure limits
(4) Any other RF exposure related issues that may affect MPE compliance

Calculation Method of RF Safety Distance:

$S = PG/4\Pi r^2 = EIRP/4\Pi r^2$

Where: P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power
S: power density mW/cm^2
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

$r = \sqrt{EIRP/4\Pi S}$

5.2.2. RF Evaluation

Evaluation of RF Exposure Compliance Requirements	
RF Exposure Requirements	**Compliance with FCC Rules**
Minimum calculated separation distance between antenna and persons required: 42.2 cm	**Manufacturer' instruction for separation distance between antenna and persons required: 55 cm.**
Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement	Antenna installation and device operating instructions shall be provided to installers to maintain and ensure compliance with RF exposure requirements.
Caution statements and/or warning labels that are necessary in order to comply with the exposure limits	Refer to User's Manual for RF Exposure Information.
Any other RF exposure related issues that may affect MPE compliance	None.

*The minimum separation distance between the antenna and bodies of users are calculated using the following formula:

RF EXPOSURE DISTANCE LIMITS: $r = (PG/4\Pi S)^{1/2} = (EIRP/4\Pi S)^{1/2}$

$S = 1.0\ mW/cm^2$
Antenna Gain = 6 dBi
Maximum Conducted Power = 37.5 dBm
Maximum EIRP = 37.5 dBm + 6 dBi = 43.5 dBm = 22387.21 mWatts

$r = (EIRP/4\Pi S)^{1/2} = (22387.21 /(4\Pi*1.0))^{1/2} = 42.2$ cm

for r = 1m , EIRP = 22.4 Watts

$S = PG/4\Pi r^2 = EIRP/4\Pi r^2 = 1.78\ W/m^2$

5.3. 99% OCCUPIED BANDWIDTH @ FCC 2.1049

5.3.1. Limits

Not Specified.

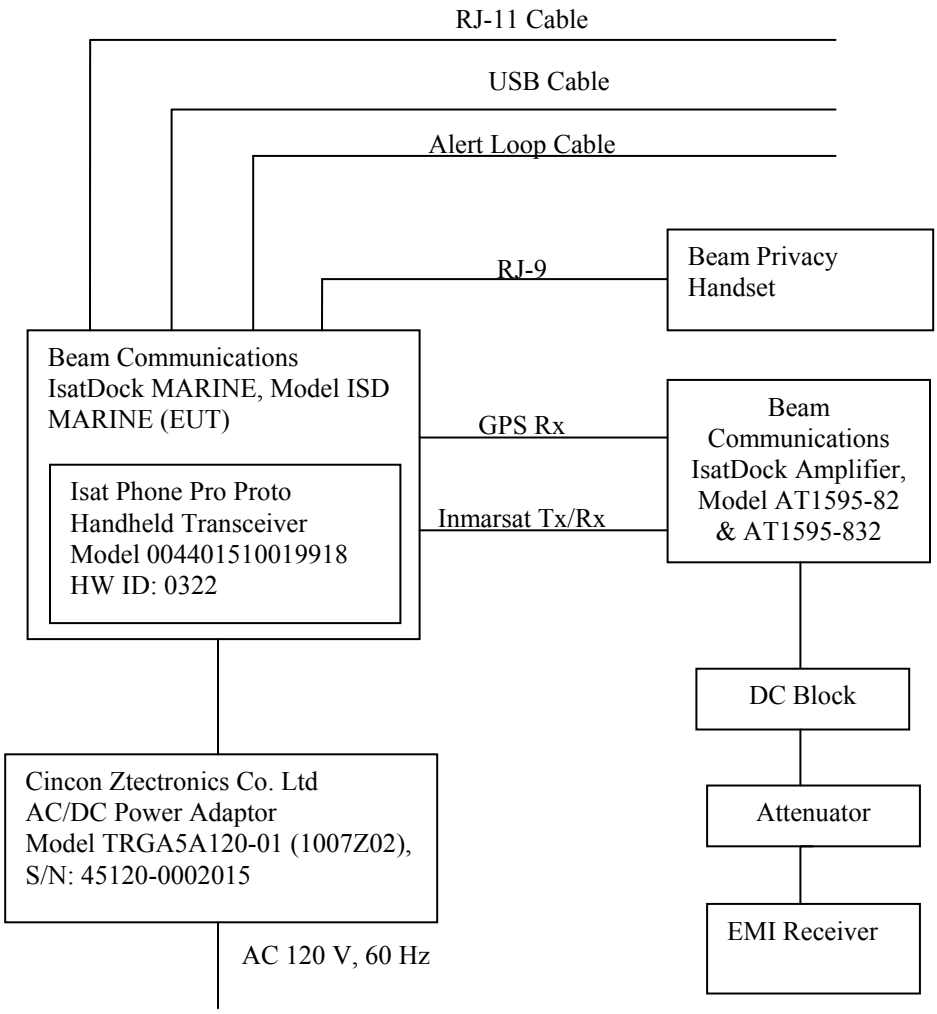
5.3.2. Method of Measurements

The 99% occupied bandwidth is measured using EMI receiver (spectrum analyzer) with RBW = 1% of 99% OBW, VBW >= RBW.

5.3.3. Test Instrumentation

Please refer to Exhibit 7 for details of test instruments and calibration due dates.

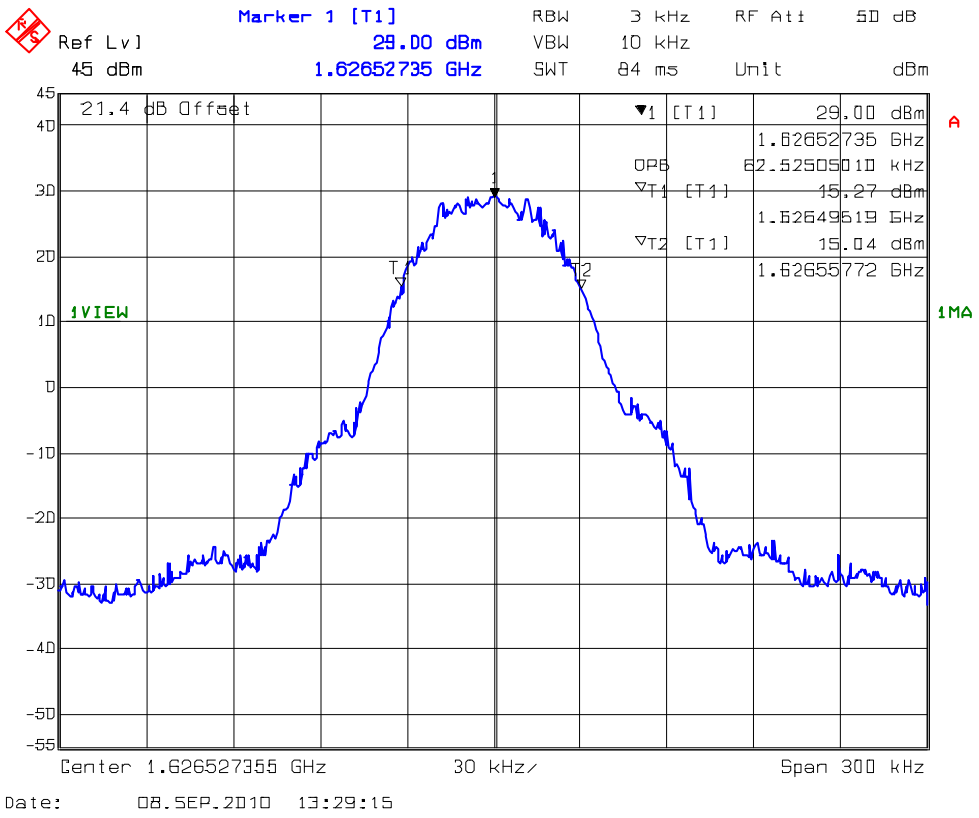
5.3.4. Test Arrangement



5.3.5. Test Data

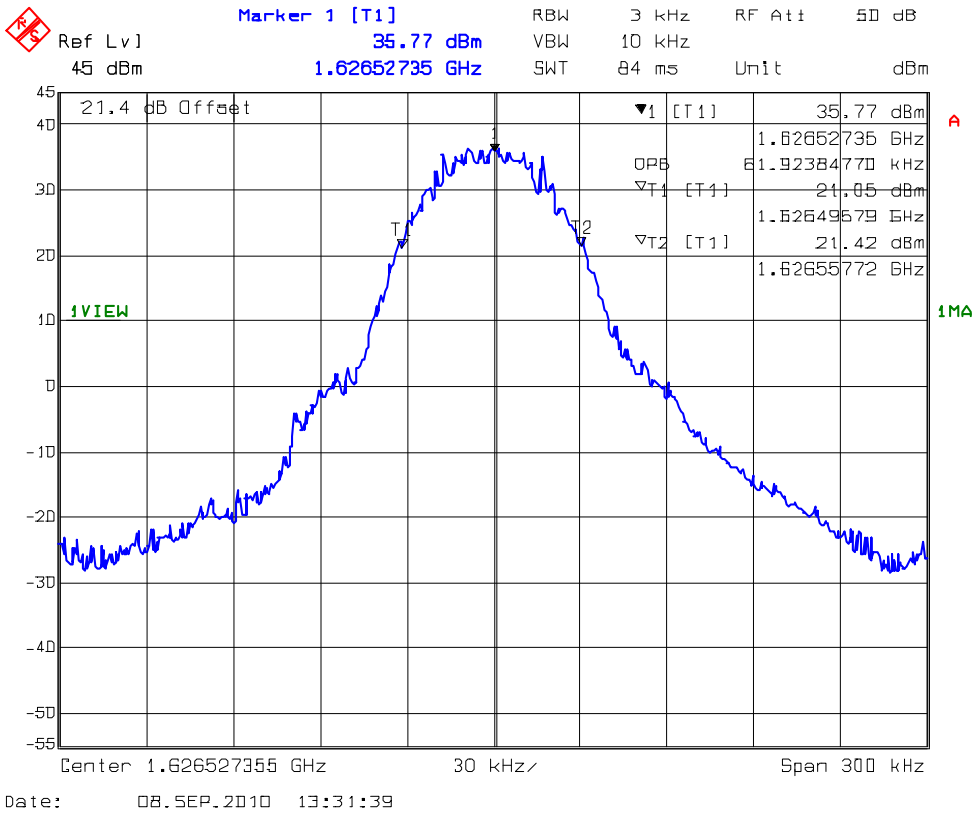
Transmitter Channel	Fundamental Frequency (MHz)	Measured 99% OBW of Amplifier Input (KHz)	Measured 99% OBW of Amplifier Output (KHz)
00	1626.5	82.5	81.9
85	1643.5	81.9	83.1
169	1660.5	82.5	82.5

Plot # 1.: Input: 99% Occupied Bandwidth (CH: 00, Frequency: 1626.5 MHz)

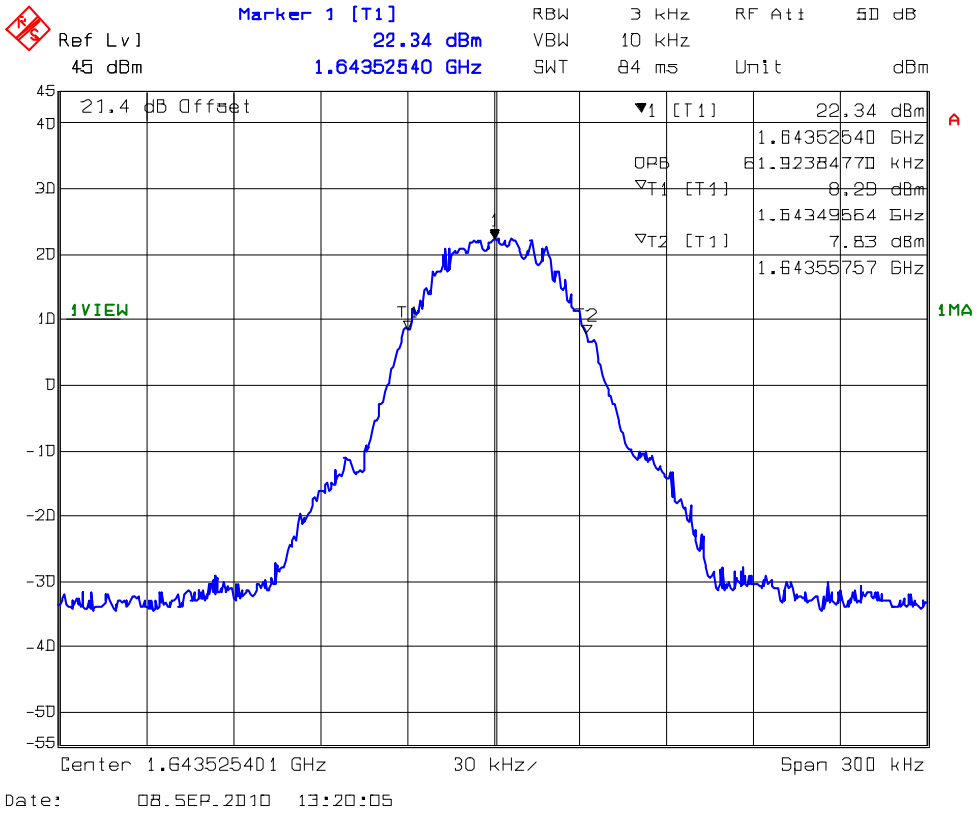


- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

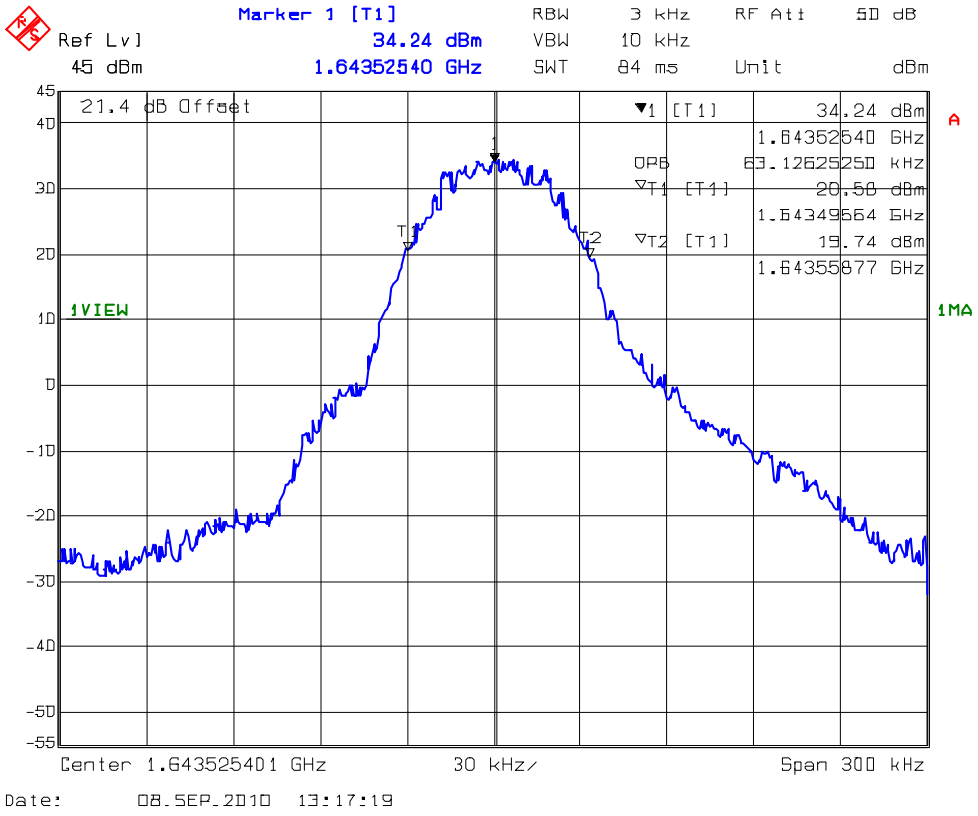
Plot # 2.: Output: 99% Occupied Bandwidth (CH: 00, Frequency: 1626.5 MHz)



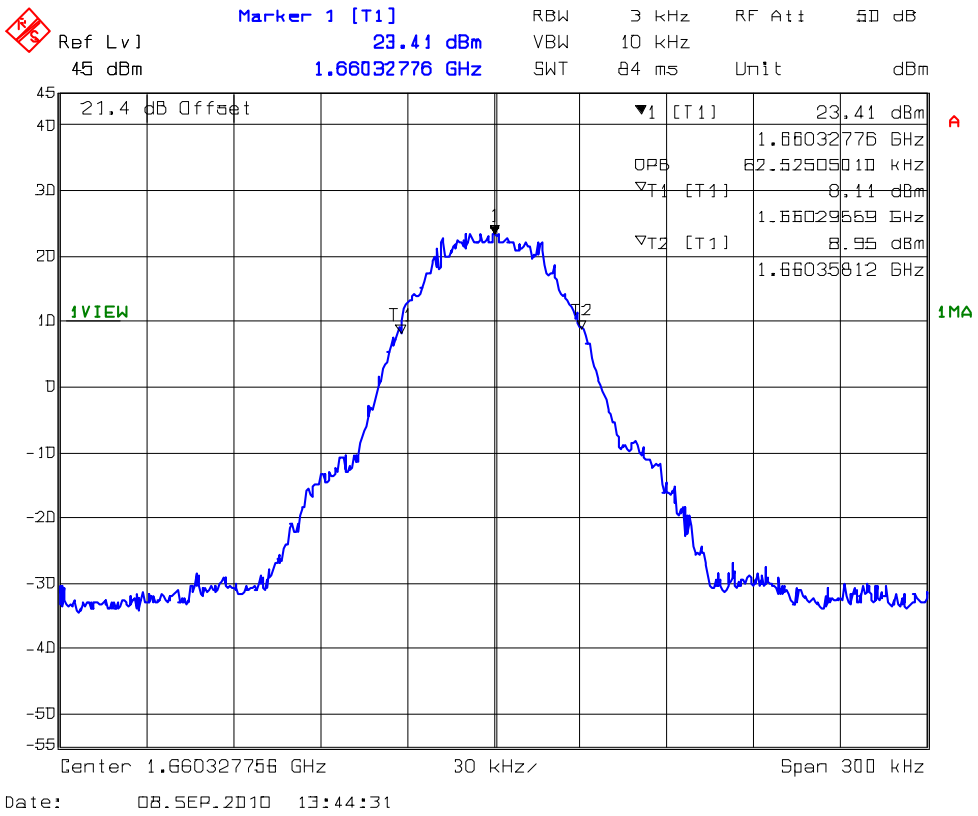
Plot # 3.: Input: 99% Occupied Bandwidth (CH: 85, Frequency: 1643.5 MHz)



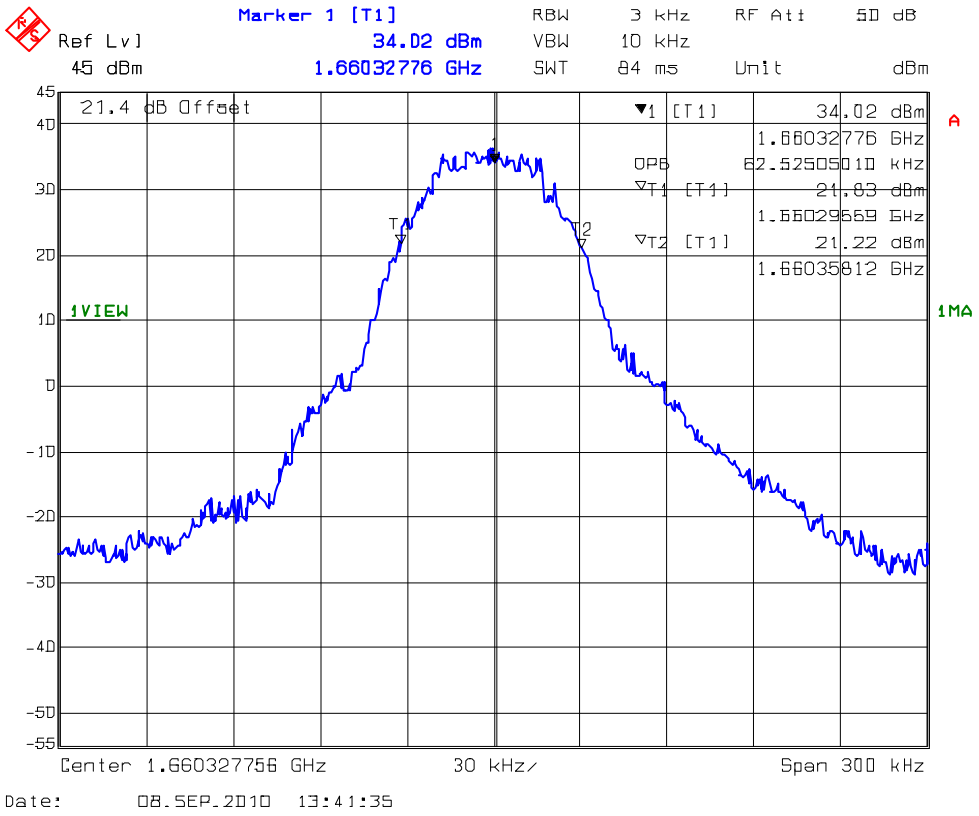
Plot # 4.: Output: 99% Occupied Bandwidth (CH: 85, Frequency: 1643.5 MHz)



Plot # 5.: Input: 99% Occupied Bandwidth (CH: 169, Frequency: 1660.5 MHz)



Plot # 6.: Output: 99% Occupied Bandwidth (CH: 169, Frequency: 1660.5 MHz)



5.4. TRANSMITTER SPURIOUS/HARMONIC CONDUCTED EMISSIONS @ FCC 2.1053, 25.202(F)(3) & 25.213

5.4.1. Limits @ 25.202(f)(3):

FCC Rules	Frequency Range	Attenuation Limit (dBc)
§ 25.202(f)(3)	10 MHz to Lowest frequency of the radio to 10th harmonic of the highest frequency of the radio	At least 43 + 10 log(P) or -13 dBm

In any event, when an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in paragraphs (f) (1), (2) and (3) of this section.

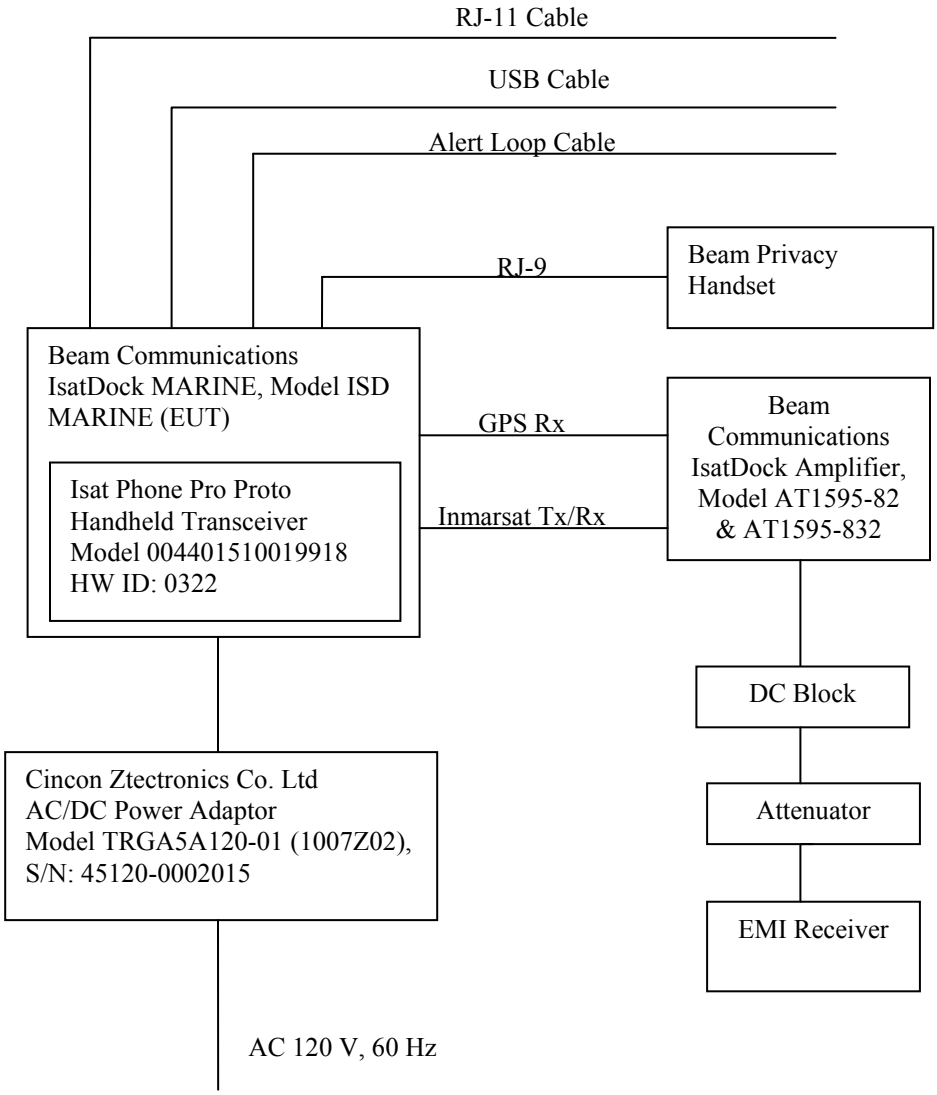
5.4.2. Method of Measurements

Refer to Section 8.4 of this report for measurement details

5.4.3. Test Instrumentation

Please refer to Exhibit 7 for details of test instruments and calibration due dates.

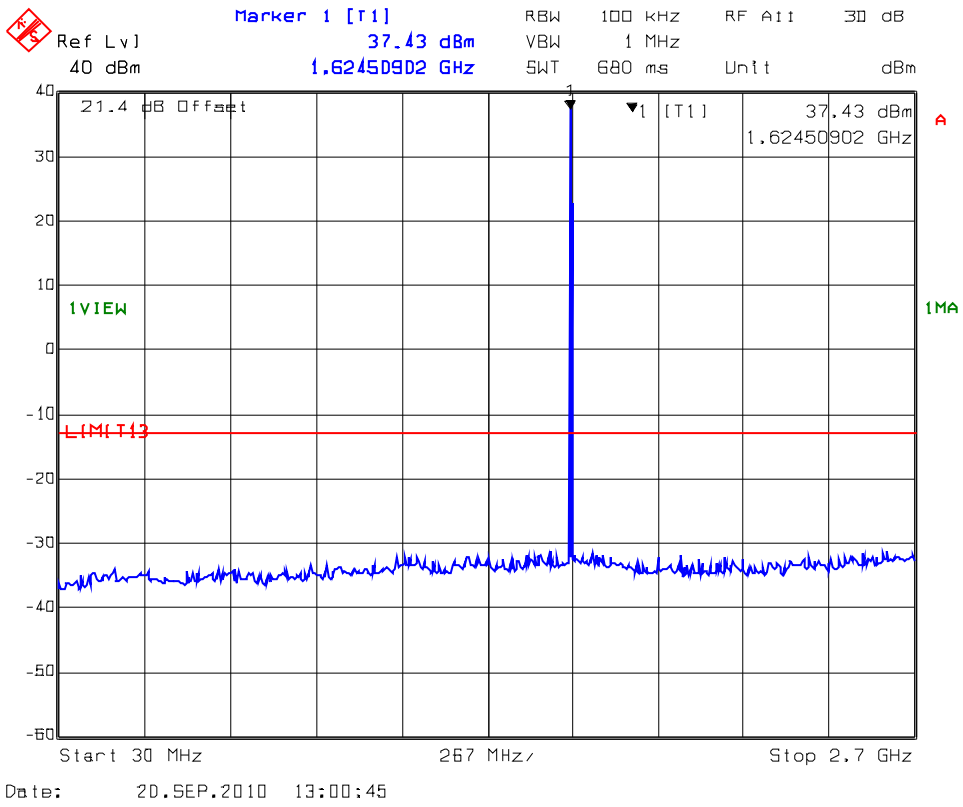
5.4.4. Test Arrangement



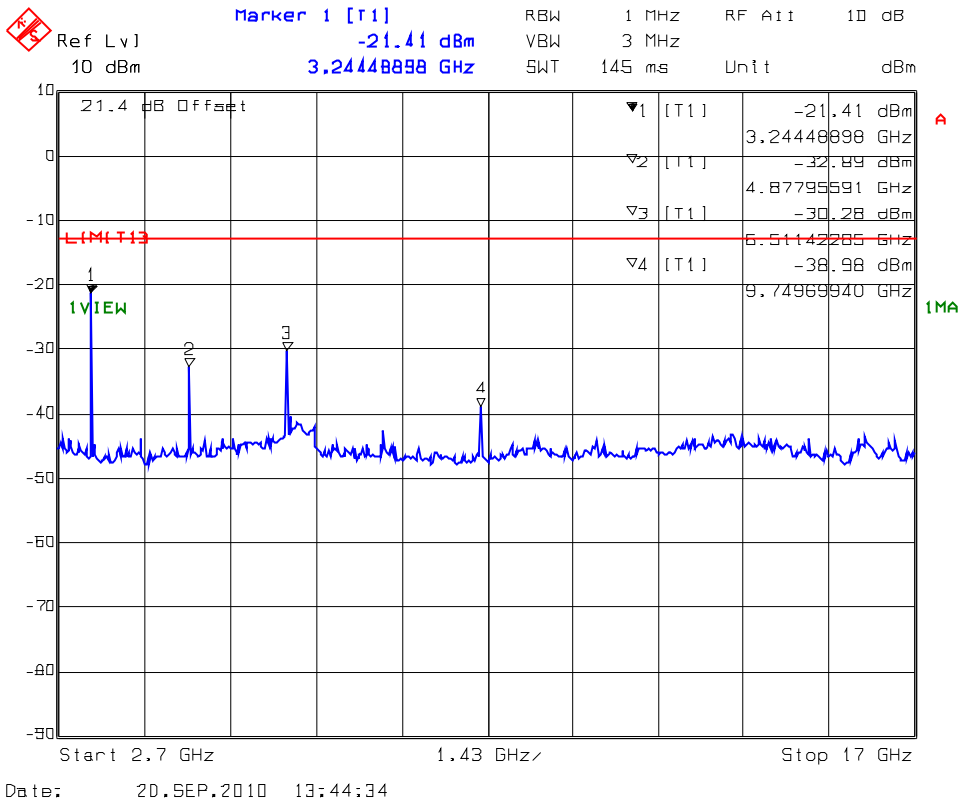
5.4.5. Test Data

Plot # 7.: Transmitter Spurious Emissions at Antenna Output Port @ 1626.5 MHz input

Fundamental Frequency:	1626.5 MHz
Maximum RF Input:	30.0 dBm (conducted)
Maximum RF Output Power:	37.5 dBm (conducted)
Test Frequency Range:	10 kHz to 17 GHz
Limits:	-13 dBm
Results:	Complies

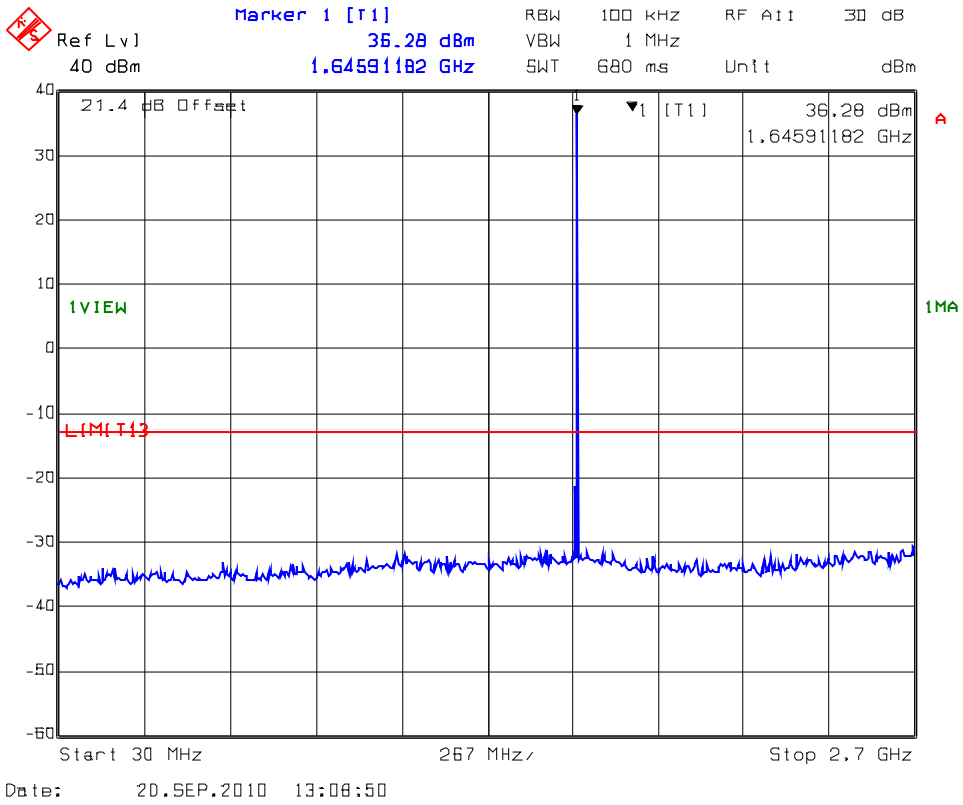


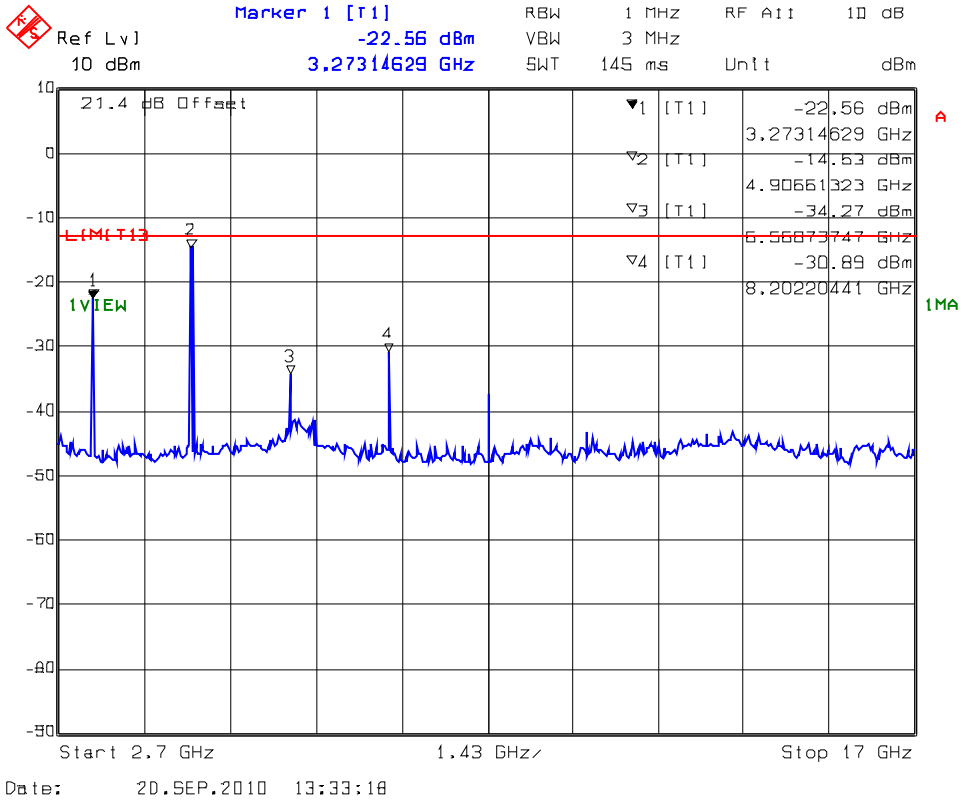
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*


Marker 1 [T1]
RBW 1 MHz
RF Att 10 dB
Ref Lvl
-21.41 dBm
VBW 3 MHz
10 dBm
3.24448898 GHz
SWT 145 ms
Unit dBm
21.4 dB Offset
1 [T1] -21.41 dBm
3.24448898 GHz
2 [T1] -32.89 dBm
4.87795591 GHz
3 [T1] -30.28 dBm
6.51142285 GHz
4 [T1] -38.98 dBm
9.74969940 GHz
LIMIT13
1VIEW
1MA
Start 2.7 GHz
1.43 GHz/
Stop 17 GHz
Date: 20.SEP.2010 13:44:34

Plot # 8.: Transmitter Spurious Emissions at Antenna Output Port @ 1643.5 MHz input

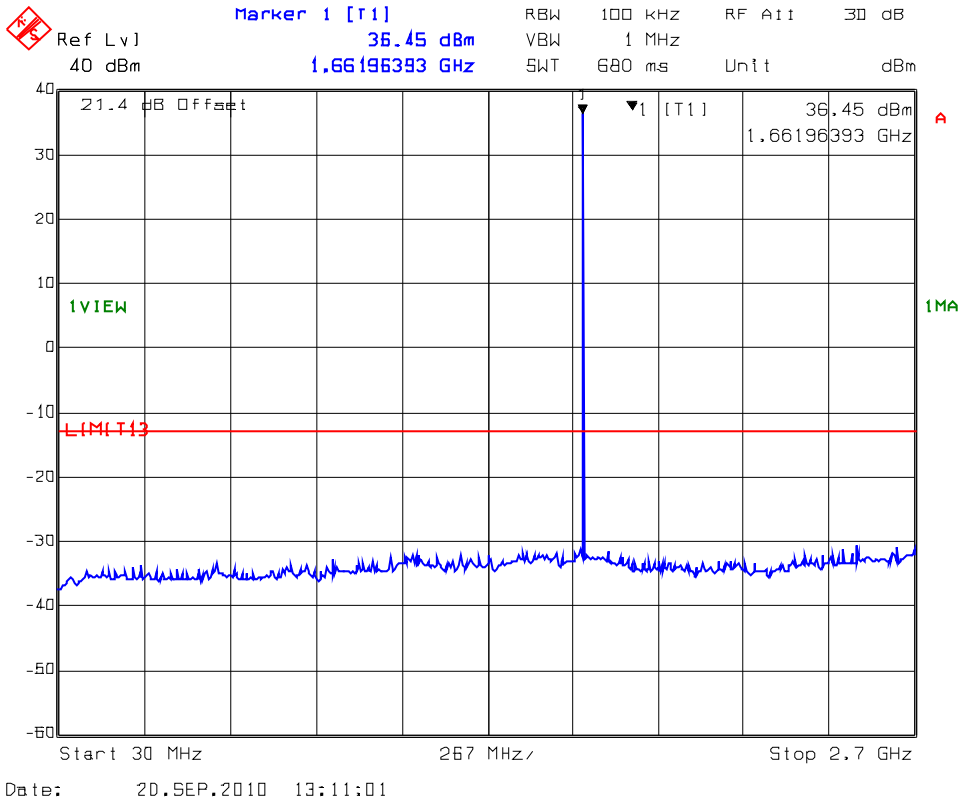
Fundamental Frequency:	1643.5 MHz
Maximum RF Input:	30.0 dBm (conducted)
Maximum RF Output Power:	36.3 dBm (conducted)
Test Frequency Range:	10 kHz to 17 GHz
Limits:	-13 dBm
Results:	Complies

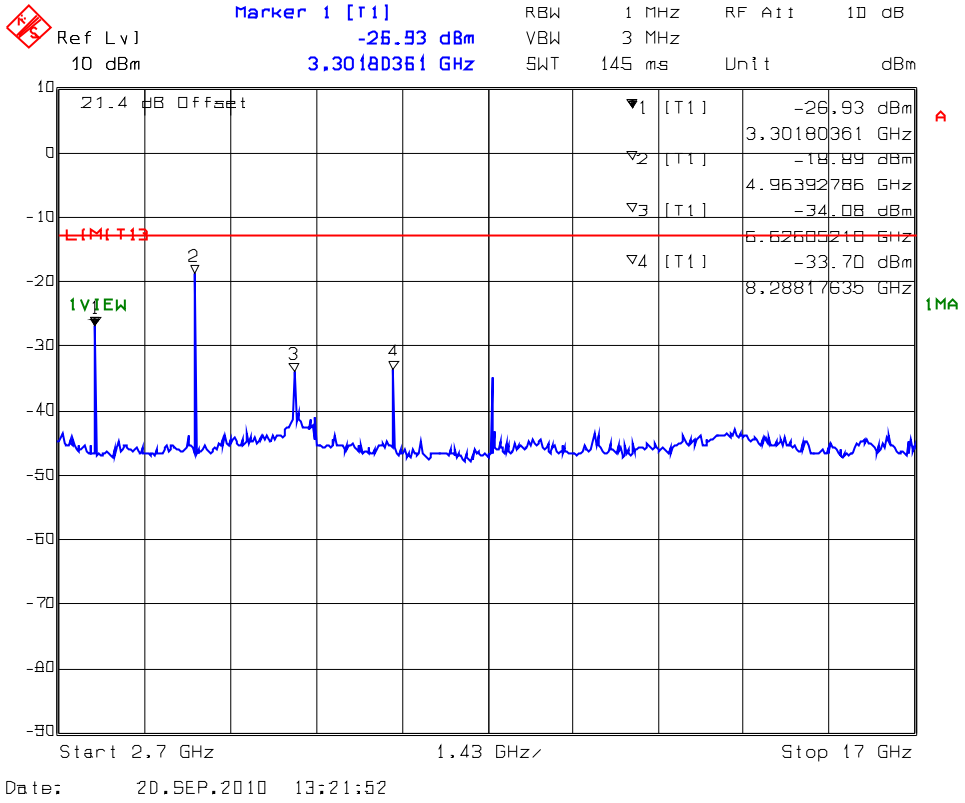



Marker 1 [T1]
RBW 1 MHz
RF All 10 dB
Ref Lvl
-22.56 dBm
VBW 3 MHz
10 dBm
3.27314629 GHz
SWT 145 ms
Unit dBm
21.4 dB Offset
1 [T1] -22.56 dBm
3.27314629 GHz
2 [T1] -14.53 dBm
4.90661323 GHz
3 [T1] -34.27 dBm
6.56873747 GHz
4 [T1] -30.89 dBm
8.20220441 GHz
LIMIT13
1VIEW
1MA
A
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Start 2.7 GHz
1.43 GHz/
Stop 17 GHz
Date: 20.SEP.2010 13:33:18

Plot # 9.: Transmitter Spurious Emissions at Antenna Output Port @ 1660.5 MHz input

Fundamental Frequency:	1660.5 MHz
Maximum RF Input:	30.0 dBm (conducted)
Maximum RF Output Power:	36.5 dBm (conducted)
Test Frequency Range:	10 kHz to 17 GHz
Limits:	-13 dBm
Results:	Complies




Marker 1 [T1]
Ref Lvl
10 dBm
-26.93 dBm
3.30180361 GHz
RBW 1 MHz
VBW 3 MHz
SWT 145 ms
RF Att 10 dB
Unit dBm
21.4 dB Offset
1 [T1] -26.93 dBm
3.30180361 GHz
2 [T1] -18.89 dBm
4.96392786 GHz
3 [T1] -34.08 dBm
6.62605210 GHz
4 [T1] -33.70 dBm
8.28817635 GHz
LIMIT13
1VIEW
1MA
A
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Start 2.7 GHz
1.43 GHz/
Stop 17 GHz
Date: 20.SEP.2010 13:21:52

5.5. TRANSMITTER SPURIOUS/HARMONIC RADIATED EMISSIONS @ FCC 2.1053, 25.202(F)(3) & 25.213

5.5.1. Limits @ 25.202(f)(3):

25.202(f)(3) - The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule: In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: An amount equal to 43 dB plus 10 times the logarithm (to the base 10) of the transmitter power in watts;

In any event, when an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in paragraphs (f) (1), (2) and (3) of this section.

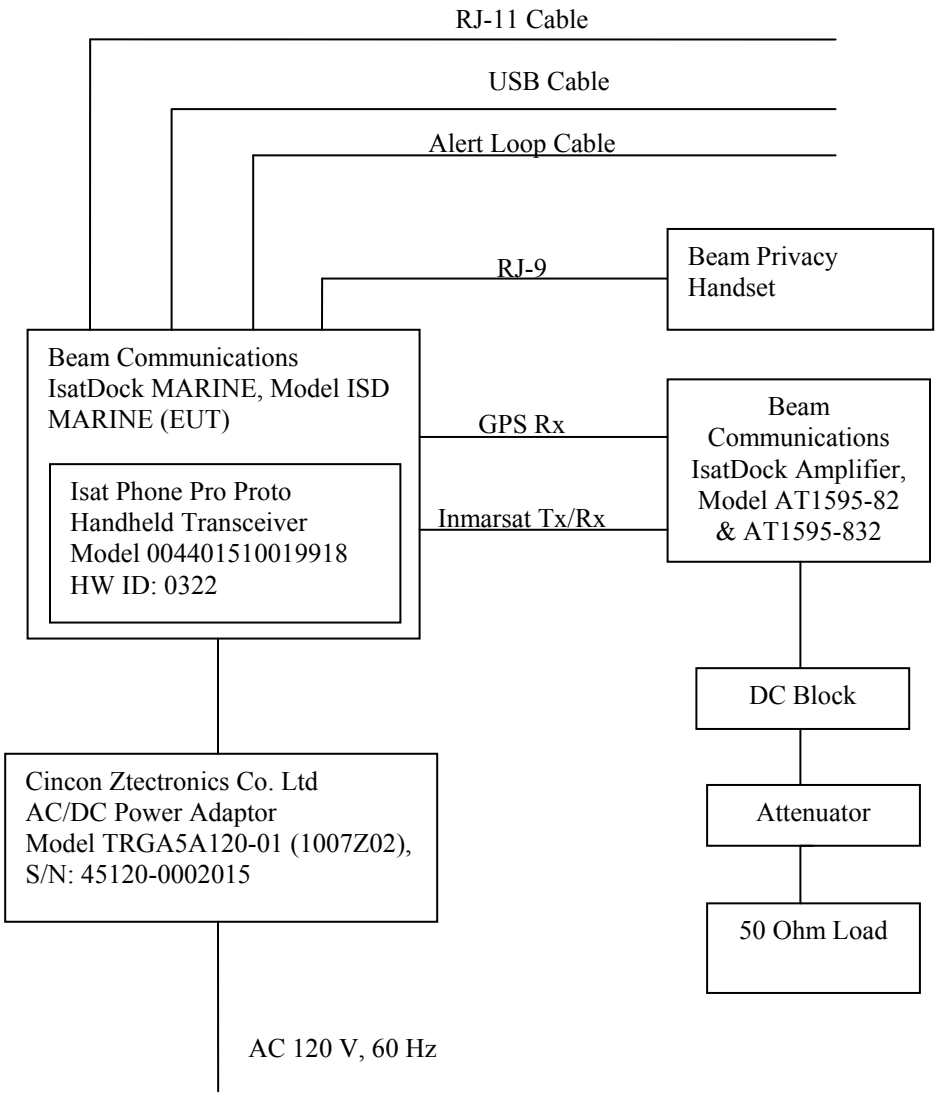
5.5.2. Method of Measurements

The spurious/harmonic ERP measurements are using substitution method specified in Exhibit 7, § 7.1 of this report and its value in dBc is calculated as follows:

1. If the transmitter's antenna is an integral part of the EUT, the ERP is measured using substitution method.
2. If the transmitter's antenna is non-integral and diverse, the lowest ERP of the carrier with 0 dBi antenna gain is used for calculation of the spurious/harmonic emissions in dBc:
3. Lowest ERP of the carrier = EIRP – 2.15 dB = Pc + G - 2.15 dB = xxx dBm (conducted) + 0 dBi – 2.15 dB
4. 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)

5.5.3. Test Arrangement



5.5.4. Test Data

5.5.4.1. IsatDock DRIVE, Model ISD DRIVE + AT1595-83 terminated by 50 Ohm Load

Fundamental Frequency:	1626.5 MHz
Maximum RF Input:	30.0 dBm (conducted)
Maximum RF Output Power:	37.5 dBm (conducted)
Test Frequency Range:	10 kHz to 17 GHz
Limits:	-13 dBm
Results:	Complies

FREQUENCY (MHz)	RF LEVEL @3m (dBuV/m)	DETECTOR USED (PEAK/QP)	ANTENNA PLANE (H/V)	ERP (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
31.52	37.0	PEAK	V	-56.06	-13.0	-43.1	PASS
31.52	32.6	PEAK	H	-60.46	-13.0	-47.5	PASS
44.45	38.5	PEAK	V	-54.56	-13.0	-41.6	PASS
83.99	44.1	PEAK	V	-48.96	-13.0	-36.0	PASS
83.99	32.8	PEAK	V	-60.26	-13.0	-47.3	PASS
110.62	48.9	PEAK	V	-44.16	-13.0	-31.2	PASS
110.62	31.5	PEAK	H	-61.56	-13.0	-48.6	PASS
119.19	46.5	PEAK	V	-46.56	-13.0	-33.6	PASS
119.19	31.5	PEAK	H	-61.56	-13.0	-48.6	PASS
132.00	39.9	PEAK	V	-53.16	-13.0	-40.2	PASS
132.00	26.0	PEAK	H	-67.06	-13.0	-54.1	PASS
141.13	40.5	PEAK	V	-52.56	-13.0	-39.6	PASS
141.13	25.8	PEAK	H	-67.26	-13.0	-54.3	PASS
536.85	38.4	PEAK	V	-54.66	-13.0	-41.7	PASS
536.85	39.9	PEAK	H	-53.16	-13.0	-40.2	PASS
812.50	38.6	PEAK	V	-54.46	-13.0	-41.5	PASS
812.50	43.4	PEAK	H	-49.66	-13.0	-36.7	PASS
870.19	44.5	PEAK	V	-48.56	-13.0	-35.6	PASS
870.19	45.6	PEAK	H	-47.46	-13.0	-34.5	PASS
875.00	40.0	PEAK	V	-53.06	-13.0	-40.1	PASS
875.00	40.2	PEAK	H	-52.86	-13.0	-39.9	PASS
3253.00	76.42	Peak	V	-22.56	-13.0	-9.6	PASS
3253.00	75.87	Peak	H	-22.35	-13.0	-9.3	PASS
4879.50	68.18	Peak	V	-31.17	-13.0	-18.2	PASS
4879.50	71.90	Peak	H	-27.31	-13.0	-14.3	PASS
6506.00	84.91	Peak	V	-16.25	-13.0	-3.3	PASS
6506.00	76.89	Peak	H	-21.53	-13.0	-8.5	PASS

Continued ….

- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

FREQUENCY (MHz)	RF LEVEL @3m (dBuV/m)	DETECTOR USED (PEAK/QP)	ANTENNA PLANE (H/V)	ERP (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
8132.50	80.25	Peak	V	-20.90	-13.0	-7.9	PASS
8132.50	74.97	Peak	H	-24.65	-13.0	-11.7	PASS
9759.00	69.71	Peak	V	-30.72	-13.0	-17.7	PASS
9759.00	61.58	Peak	H	-38.40	-13.0	-25.4	PASS
11385.50	58.22	Peak	V	-40.69	-13.0	-27.7	PASS
11385.50	59.95	Peak	H	-41.08	-13.0	-28.1	PASS

All other emissions are more than 50 dB below the limit.

Fundamental Frequency:	1643.5 MHz
Maximum RF Input:	30.0 dBm (conducted)
Maximum RF Output Power:	36.3 dBm (conducted)
Test Frequency Range:	10 kHz to 17 GHz
Limits:	-13 dBm
Results:	Complies

FREQUENCY (MHz)	RF LEVEL @3m (dBuV/m)	DETECTOR USED (PEAK/QP)	ANTENNA PLANE (H/V)	ERP (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
31.52	37.0	PEAK	V	-56.06	-13.0	-43.1	PASS
31.52	32.6	PEAK	H	-60.46	-13.0	-47.5	PASS
44.45	38.5	PEAK	V	-54.56	-13.0	-41.6	PASS
83.99	44.1	PEAK	V	-48.96	-13.0	-36.0	PASS
83.99	32.8	PEAK	V	-60.26	-13.0	-47.3	PASS
110.62	48.9	PEAK	V	-44.16	-13.0	-31.2	PASS
110.62	31.5	PEAK	H	-61.56	-13.0	-48.6	PASS
119.19	46.5	PEAK	V	-46.56	-13.0	-33.6	PASS
119.19	31.5	PEAK	H	-61.56	-13.0	-48.6	PASS
132.00	39.9	PEAK	V	-53.16	-13.0	-40.2	PASS
132.00	26.0	PEAK	H	-67.06	-13.0	-54.1	PASS
141.13	40.5	PEAK	V	-52.56	-13.0	-39.6	PASS
141.13	25.8	PEAK	H	-67.26	-13.0	-54.3	PASS
536.85	38.4	PEAK	V	-54.66	-13.0	-41.7	PASS
536.85	39.9	PEAK	H	-53.16	-13.0	-40.2	PASS
812.50	38.6	PEAK	V	-54.46	-13.0	-41.5	PASS
812.50	43.4	PEAK	H	-49.66	-13.0	-36.7	PASS

Continued …

FREQUENCY (MHz)	RF LEVEL @3m (dBuV/m)	DETECTOR USED (PEAK/QP)	ANTENNA PLANE (H/V)	ERP (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
870.19	44.5	PEAK	V	-48.56	-13.0	-35.6	PASS
870.19	45.6	PEAK	H	-47.46	-13.0	-34.5	PASS
875.00	40.0	PEAK	V	-53.06	-13.0	-40.1	PASS
875.00	40.2	PEAK	H	-52.86	-13.0	-39.9	PASS
3287.00	82.92	Peak	V	-16.06	-13.0	-3.1	PASS
3287.00	81.42	Peak	H	-16.80	-13.0	-3.8	PASS
4930.50	67.66	Peak	V	-31.69	-13.0	-18.7	PASS
4930.50	67.98	Peak	H	-31.23	-13.0	-18.2	PASS
6574.00	79.79	Peak	V	-21.37	-13.0	-8.4	PASS
6574.00	74.93	Peak	H	-23.49	-13.0	-10.5	PASS
8217.50	75.16	Peak	V	-25.99	-13.0	-13.0	PASS
8217.50	68.22	Peak	H	-31.40	-13.0	-18.4	PASS
9861.00	60.06	Peak	V	-40.37	-13.0	-27.4	PASS
9861.00	61.05	Peak	H	-38.93	-13.0	-25.9	PASS
11504.50	60.22	Peak	V	-38.69	-13.0	-25.7	PASS
11504.50	61.60	Peak	H	-39.43	-13.0	-26.4	PASS

All other emissions are more than 50 dB below the limit.

Fundamental Frequency:	1660.5 MHz
Maximum RF Input:	30.0 dBm (conducted)
Maximum RF Output Power:	36.5 dBm (conducted)
Test Frequency Range:	10 kHz to 17 GHz
Limits:	-13 dBm
Results:	Complies

FREQUENCY (MHz)	RF LEVEL @3m (dBuV/m)	DETECTOR USED (PEAK/QP)	ANTENNA PLANE (H/V)	ERP (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
31.52	37.0	PEAK	V	-56.06	-13.0	-43.1	PASS
31.52	32.6	PEAK	H	-60.46	-13.0	-47.5	PASS
44.45	38.5	PEAK	V	-54.56	-13.0	-41.6	PASS
83.99	44.1	PEAK	V	-48.96	-13.0	-36.0	PASS
83.99	32.8	PEAK	V	-60.26	-13.0	-47.3	PASS
110.62	48.9	PEAK	V	-44.16	-13.0	-31.2	PASS
110.62	31.5	PEAK	H	-61.56	-13.0	-48.6	PASS
119.19	46.5	PEAK	V	-46.56	-13.0	-33.6	PASS
119.19	31.5	PEAK	H	-61.56	-13.0	-48.6	PASS

Continued …

FREQUENCY (MHz)	RF LEVEL @3m (dBuV/m)	DETECTOR USED (PEAK/QP)	ANTENNA PLANE (H/V)	ERP (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
132.00	39.9	PEAK	V	-53.16	-13.0	-40.2	PASS
132.00	26.0	PEAK	H	-67.06	-13.0	-54.1	PASS
141.13	40.5	PEAK	V	-52.56	-13.0	-39.6	PASS
141.13	25.8	PEAK	H	-67.26	-13.0	-54.3	PASS
536.85	38.4	PEAK	V	-54.66	-13.0	-41.7	PASS
536.85	39.9	PEAK	H	-53.16	-13.0	-40.2	PASS
812.50	38.6	PEAK	V	-54.46	-13.0	-41.5	PASS
812.50	43.4	PEAK	H	-49.66	-13.0	-36.7	PASS
870.19	44.5	PEAK	V	-48.56	-13.0	-35.6	PASS
870.19	45.6	PEAK	H	-47.46	-13.0	-34.5	PASS
875.00	40.0	PEAK	V	-53.06	-13.0	-40.1	PASS
875.00	40.2	PEAK	H	-52.86	-13.0	-39.9	PASS
3321.00	79.95	Peak	V	-19.03	-13.0	-6.0	PASS
3321.00	77.11	Peak	H	-21.11	-13.0	-8.1	PASS
4981.50	65.71	Peak	V	-33.64	-13.0	-20.6	PASS
4981.50	67.39	Peak	H	-31.82	-13.0	-18.8	PASS
6642.00	72.51	Peak	V	-28.65	-13.0	-15.7	PASS
6642.00	66.35	Peak	H	-32.07	-13.0	-19.1	PASS
8302.50	62.43	Peak	V	-38.72	-13.0	-25.7	PASS
8302.50	61.45	Peak	H	-38.17	-13.0	-25.2	PASS
9963.00	64.19	Peak	V	-36.24	-13.0	-23.2	PASS
9963.00	61.73	Peak	H	-38.25	-13.0	-25.3	PASS
11623.50	59.76	Peak	V	-39.15	-13.0	-26.2	PASS
11623.50	59.57	Peak	H	-41.46	-13.0	-28.5	PASS

All other emissions are more than 50 dB below the limit.

5.5.4.2. IsatDock MARINE, Model ISD MARINE + AT1595-82 terminated by 50 Ohm Load

Fundamental Frequency:	1626.5 MHz
Maximum RF Input:	30.0 dBm (conducted)
Maximum RF Output Power:	37.5 dBm (conducted)
Test Frequency Range:	10 kHz to 17 GHz
Limits:	-13 dBm
Results:	Complies

FREQUENCY (MHz)	RF LEVEL @3m (dBµV/m)	DETECTOR USED (PEAK/QP)	ANTENNA PLANE (H/V)	ERP (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
35.00	34.0	PEAK	V	-59.06	-13.0	-46.1	PASS
35.00	24.0	PEAK	H	-69.06	-13.0	-56.1	PASS
39.00	38.4	PEAK	V	-54.66	-13.0	-41.7	PASS
39.00	30.3	PEAK	H	-62.76	-13.0	-49.8	PASS
49.30	36.8	PEAK	V	-56.26	-13.0	-43.3	PASS
49.30	32.7	PEAK	H	-60.36	-13.0	-47.4	PASS
51.30	42.9	PEAK	V	-50.16	-13.0	-37.2	PASS
51.30	40.8	PEAK	H	-52.26	-13.0	-39.3	PASS
59.50	36.4	PEAK	V	-56.66	-13.0	-43.7	PASS
59.50	30.1	PEAK	H	-62.96	-13.0	-50.0	PASS
84.00	36.7	PEAK	V	-56.36	-13.0	-43.4	PASS
84.00	38.3	PEAK	H	-54.76	-13.0	-41.8	PASS
88.30	36.9	PEAK	V	-56.16	-13.0	-43.2	PASS
88.30	31.5	PEAK	H	-61.56	-13.0	-48.6	PASS
92.30	39.0	PEAK	V	-54.06	-13.0	-41.1	PASS
92.30	30.7	PEAK	H	-62.36	-13.0	-49.4	PASS
96.50	41.0	PEAK	V	-52.06	-13.0	-39.1	PASS
96.50	32.8	PEAK	H	-60.26	-13.0	-47.3	PASS
98.30	39.1	PEAK	V	-53.96	-13.0	-41.0	PASS
98.30	29.9	PEAK	H	-63.16	-13.0	-50.2	PASS
112.80	39.8	PEAK	V	-53.26	-13.0	-40.3	PASS
112.80	36.9	PEAK	H	-56.16	-13.0	-43.2	PASS
117.30	37.7	PEAK	V	-55.36	-13.0	-42.4	PASS
117.30	31.3	PEAK	H	-61.76	-13.0	-48.8	PASS
143.10	39.7	PEAK	V	-53.36	-13.0	-40.4	PASS
143.10	36.1	PEAK	H	-56.96	-13.0	-44.0	PASS
152.30	40.4	PEAK	V	-52.66	-13.0	-39.7	PASS
152.30	37.3	PEAK	H	-55.76	-13.0	-42.8	PASS

Continued …

- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

FREQUENCY (MHz)	RF LEVEL @3m (dBµV/m)	DETECTOR USED (PEAK/QP)	ANTENNA PLANE (H/V)	ERP (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
210.80	39.5	PEAK	V	-53.56	-13.0	-40.6	PASS
210.80	41.4	PEAK	H	-51.66	-13.0	-38.7	PASS
288.10	35.4	PEAK	V	-57.66	-13.0	-44.7	PASS
288.10	36.2	PEAK	H	-56.86	-13.0	-43.9	PASS
527.50	38.3	PEAK	V	-54.76	-13.0	-41.8	PASS
527.50	38.1	PEAK	H	-54.96	-13.0	-42.0	PASS
553.70	36.8	PEAK	V	-56.26	-13.0	-43.3	PASS
553.70	37.4	PEAK	H	-55.66	-13.0	-42.7	PASS
3253.00	76.42	Peak	V	-22.56	-13.0	-9.6	PASS
3253.00	75.87	Peak	H	-22.35	-13.0	-9.3	PASS
4879.50	68.18	Peak	V	-31.17	-13.0	-18.2	PASS
4879.50	71.90	Peak	H	-27.31	-13.0	-14.3	PASS
6506.00	84.91	Peak	V	-16.25	-13.0	-3.3	PASS
6506.00	76.89	Peak	H	-21.53	-13.0	-8.5	PASS
8132.50	80.25	Peak	V	-20.90	-13.0	-7.9	PASS
8132.50	74.97	Peak	H	-24.65	-13.0	-11.7	PASS
9759.00	69.71	Peak	V	-30.72	-13.0	-17.7	PASS
9759.00	61.58	Peak	H	-38.40	-13.0	-25.4	PASS
11385.50	58.22	Peak	V	-40.69	-13.0	-27.7	PASS
11385.50	59.95	Peak	H	-41.08	-13.0	-28.1	PASS

All other emissions are more than 50 dB below the limit.

Fundamental Frequency:	1643.5 MHz
Maximum RF Input:	30.0 dBm (conducted)
Maximum RF Output Power:	36.3 dBm (conducted)
Test Frequency Range:	10 kHz to 17 GHz
Limits:	-13 dBm
Results:	Complies

FREQUENCY (MHz)	RF LEVEL @3m (dBµV/m)	DETECTOR USED (PEAK/QP)	ANTENNA PLANE (H/V)	ERP (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
35.00	34.0	PEAK	V	-59.06	-13.0	-46.1	PASS
35.00	24.0	PEAK	H	-69.06	-13.0	-56.1	PASS
39.00	38.4	PEAK	V	-54.66	-13.0	-41.7	PASS
39.00	30.3	PEAK	H	-62.76	-13.0	-49.8	PASS
49.30	36.8	PEAK	V	-56.26	-13.0	-43.3	PASS
49.30	32.7	PEAK	H	-60.36	-13.0	-47.4	PASS
51.30	42.9	PEAK	V	-50.16	-13.0	-37.2	PASS
51.30	40.8	PEAK	H	-52.26	-13.0	-39.3	PASS
59.50	36.4	PEAK	V	-56.66	-13.0	-43.7	PASS
59.50	30.1	PEAK	H	-62.96	-13.0	-50.0	PASS
84.00	36.7	PEAK	V	-56.36	-13.0	-43.4	PASS
84.00	38.3	PEAK	H	-54.76	-13.0	-41.8	PASS
88.30	36.9	PEAK	V	-56.16	-13.0	-43.2	PASS
88.30	31.5	PEAK	H	-61.56	-13.0	-48.6	PASS
92.30	39.0	PEAK	V	-54.06	-13.0	-41.1	PASS
92.30	30.7	PEAK	H	-62.36	-13.0	-49.4	PASS
96.50	41.0	PEAK	V	-52.06	-13.0	-39.1	PASS
96.50	32.8	PEAK	H	-60.26	-13.0	-47.3	PASS
98.30	39.1	PEAK	V	-53.96	-13.0	-41.0	PASS
98.30	29.9	PEAK	H	-63.16	-13.0	-50.2	PASS
112.80	39.8	PEAK	V	-53.26	-13.0	-40.3	PASS
112.80	36.9	PEAK	H	-56.16	-13.0	-43.2	PASS
117.30	37.7	PEAK	V	-55.36	-13.0	-42.4	PASS
117.30	31.3	PEAK	H	-61.76	-13.0	-48.8	PASS
143.10	39.7	PEAK	V	-53.36	-13.0	-40.4	PASS
143.10	36.1	PEAK	H	-56.96	-13.0	-44.0	PASS
152.30	40.4	PEAK	V	-52.66	-13.0	-39.7	PASS
152.30	37.3	PEAK	H	-55.76	-13.0	-42.8	PASS

Continued …

FREQUENCY (MHz)	RF LEVEL @3m (dBµV/m)	DETECTOR USED (PEAK/QP)	ANTENNA PLANE (H/V)	ERP (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
210.80	39.5	PEAK	V	-53.56	-13.0	-40.6	PASS
210.80	41.4	PEAK	H	-51.66	-13.0	-38.7	PASS
288.10	35.4	PEAK	V	-57.66	-13.0	-44.7	PASS
288.10	36.2	PEAK	H	-56.86	-13.0	-43.9	PASS
527.50	38.3	PEAK	V	-54.76	-13.0	-41.8	PASS
527.50	38.1	PEAK	H	-54.96	-13.0	-42.0	PASS
553.70	36.8	PEAK	V	-56.26	-13.0	-43.3	PASS
553.70	37.4	PEAK	H	-55.66	-13.0	-42.7	PASS
3287.00	82.92	Peak	V	-16.06	-13.0	-3.1	PASS
3287.00	81.42	Peak	H	-16.80	-13.0	-3.8	PASS
4930.50	67.66	Peak	V	-31.69	-13.0	-18.7	PASS
4930.50	67.98	Peak	H	-31.23	-13.0	-18.2	PASS
6574.00	79.79	Peak	V	-21.37	-13.0	-8.4	PASS
6574.00	74.93	Peak	H	-23.49	-13.0	-10.5	PASS
8217.50	75.16	Peak	V	-25.99	-13.0	-13.0	PASS
8217.50	68.22	Peak	H	-31.40	-13.0	-18.4	PASS
9861.00	60.06	Peak	V	-40.37	-13.0	-27.4	PASS
9861.00	61.05	Peak	H	-38.93	-13.0	-25.9	PASS
11504.50	60.22	Peak	V	-38.69	-13.0	-25.7	PASS
11504.50	61.60	Peak	H	-39.43	-13.0	-26.4	PASS

All other emissions are more than 50 dB below the limit.

Fundamental Frequency:	1660.5 MHz
Maximum RF Input:	30.0 dBm (conducted)
Maximum RF Output Power:	36.5 dBm (conducted)
Test Frequency Range:	10 kHz to 17 GHz
Limits:	-13 dBm
Results:	Complies

FREQUENCY (MHz)	RF LEVEL @3m (dBµV/m)	DETECTOR USED (PEAK/QP)	ANTENNA PLANE (H/V)	ERP (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
35.00	34.0	PEAK	V	-59.06	-13.0	-46.1	PASS
35.00	24.0	PEAK	H	-69.06	-13.0	-56.1	PASS
39.00	38.4	PEAK	V	-54.66	-13.0	-41.7	PASS
39.00	30.3	PEAK	H	-62.76	-13.0	-49.8	PASS
49.30	36.8	PEAK	V	-56.26	-13.0	-43.3	PASS
49.30	32.7	PEAK	H	-60.36	-13.0	-47.4	PASS
51.30	42.9	PEAK	V	-50.16	-13.0	-37.2	PASS
51.30	40.8	PEAK	H	-52.26	-13.0	-39.3	PASS
59.50	36.4	PEAK	V	-56.66	-13.0	-43.7	PASS
59.50	30.1	PEAK	H	-62.96	-13.0	-50.0	PASS
84.00	36.7	PEAK	V	-56.36	-13.0	-43.4	PASS
84.00	38.3	PEAK	H	-54.76	-13.0	-41.8	PASS
88.30	36.9	PEAK	V	-56.16	-13.0	-43.2	PASS
88.30	31.5	PEAK	H	-61.56	-13.0	-48.6	PASS
92.30	39.0	PEAK	V	-54.06	-13.0	-41.1	PASS
92.30	30.7	PEAK	H	-62.36	-13.0	-49.4	PASS
96.50	41.0	PEAK	V	-52.06	-13.0	-39.1	PASS
96.50	32.8	PEAK	H	-60.26	-13.0	-47.3	PASS
98.30	39.1	PEAK	V	-53.96	-13.0	-41.0	PASS
98.30	29.9	PEAK	H	-63.16	-13.0	-50.2	PASS
112.80	39.8	PEAK	V	-53.26	-13.0	-40.3	PASS
112.80	36.9	PEAK	H	-56.16	-13.0	-43.2	PASS
117.30	37.7	PEAK	V	-55.36	-13.0	-42.4	PASS
117.30	31.3	PEAK	H	-61.76	-13.0	-48.8	PASS
143.10	39.7	PEAK	V	-53.36	-13.0	-40.4	PASS
143.10	36.1	PEAK	H	-56.96	-13.0	-44.0	PASS
152.30	40.4	PEAK	V	-52.66	-13.0	-39.7	PASS
152.30	37.3	PEAK	H	-55.76	-13.0	-42.8	PASS

Continued …

FREQUENCY (MHz)	RF LEVEL @3m (dBµV/m)	DETECTOR USED (PEAK/QP)	ANTENNA PLANE (H/V)	ERP (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
210.80	39.5	PEAK	V	-53.56	-13.0	-40.6	PASS
210.80	41.4	PEAK	H	-51.66	-13.0	-38.7	PASS
288.10	35.4	PEAK	V	-57.66	-13.0	-44.7	PASS
288.10	36.2	PEAK	H	-56.86	-13.0	-43.9	PASS
527.50	38.3	PEAK	V	-54.76	-13.0	-41.8	PASS
527.50	38.1	PEAK	H	-54.96	-13.0	-42.0	PASS
553.70	36.8	PEAK	V	-56.26	-13.0	-43.3	PASS
553.70	37.4	PEAK	H	-55.66	-13.0	-42.7	PASS
3321.00	79.95	Peak	V	-19.03	-13.0	-6.0	PASS
3321.00	77.11	Peak	H	-21.11	-13.0	-8.1	PASS
4981.50	65.71	Peak	V	-33.64	-13.0	-20.6	PASS
4981.50	67.39	Peak	H	-31.82	-13.0	-18.8	PASS
6642.00	72.51	Peak	V	-28.65	-13.0	-15.7	PASS
6642.00	66.35	Peak	H	-32.07	-13.0	-19.1	PASS
8302.50	62.43	Peak	V	-38.72	-13.0	-25.7	PASS
8302.50	61.45	Peak	H	-38.17	-13.0	-25.2	PASS
9963.00	64.19	Peak	V	-36.24	-13.0	-23.2	PASS
9963.00	61.73	Peak	H	-38.25	-13.0	-25.3	PASS
11623.50	59.76	Peak	V	-39.15	-13.0	-26.2	PASS
11623.50	59.57	Peak	H	-41.46	-13.0	-28.5	PASS

All other emissions are more than 50 dB below the limit.

5.6. OUT-OF-BAND REJECTION

5.6.1. Limits:

No Limit. Only a plot of Filter Frequency Response of the Amplifier's Out-of-Band Rejection is required.

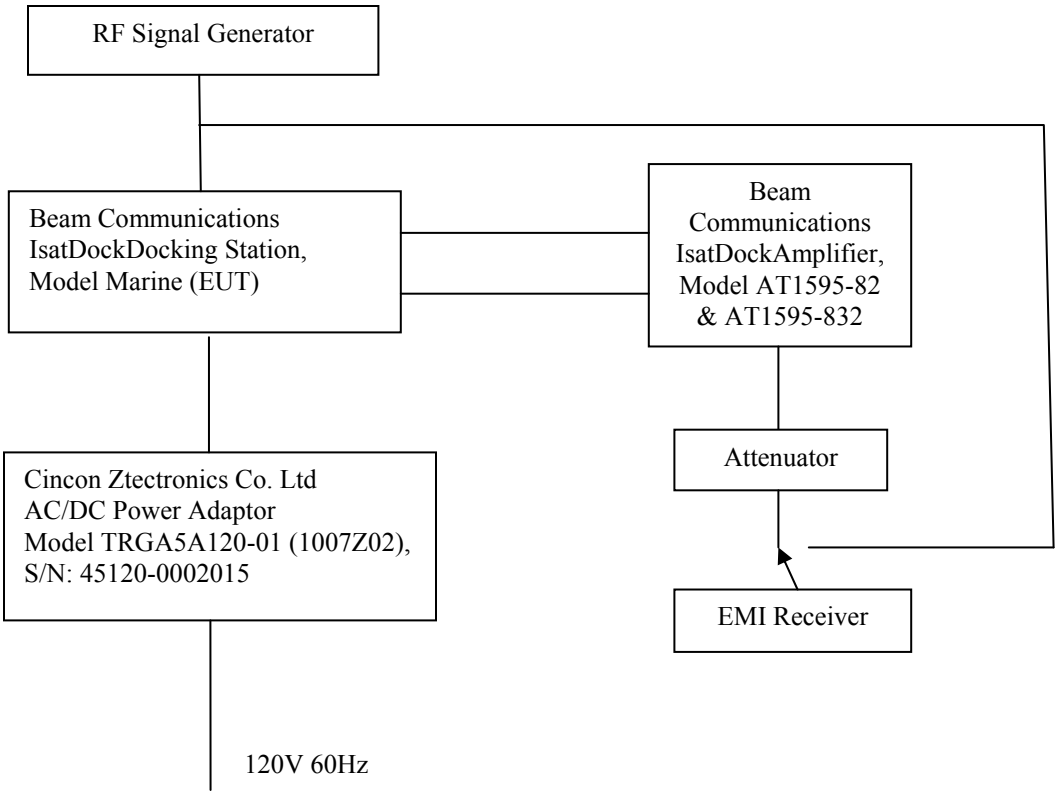
5.6.2. Method of Measurements

- Input RF signal was applied from a signal generator
- The input level in dBm was measured at the RF input port of the amplifier
- The RF input signal was swept from 1.58 GHz to 1.73 GHz at 5 MHz steps
- The RF output in dBm was measured at the output port of the amplifier
- The Gain of the amplifier was calculated, Gain = Output Level – Input Level

5.6.3. Test Instrumentation

Please refer to Exhibit 7 for details of test instruments and calibration due dates.

5.6.4. Test Arrangement



5.6.5. Test Data

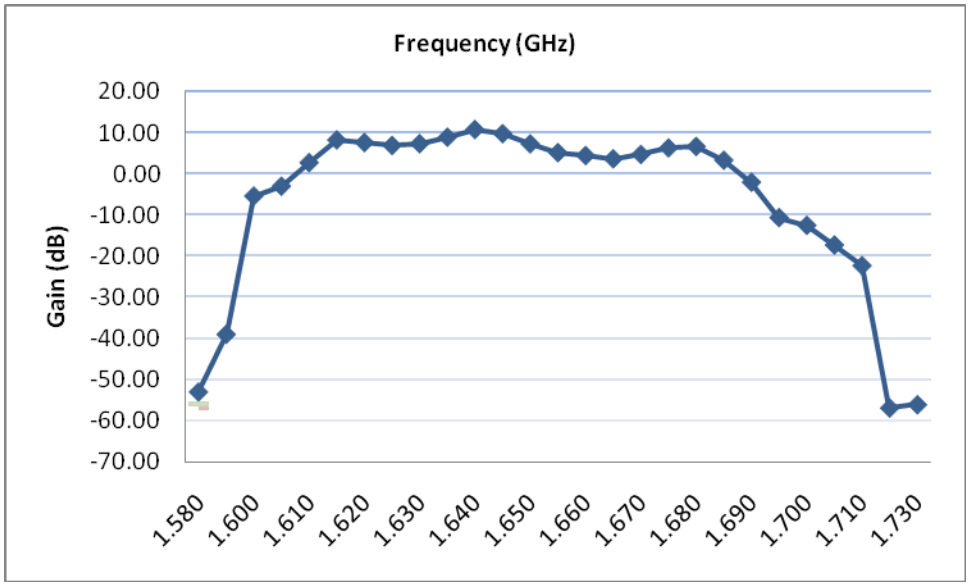
Results: From the Plot of Gain versus Frequency below thee -20 dB points are at about 1595 GHz and 1693 GHz which cover the FCC allowable operating frequency band of 1626.5 to 1660.5 MHz.

Frequency Response: Amplifier Gain versus Frequency

Frequency GHz	Amplifier Input dBm	Amplifier Output dBm	Amplifier Gain dB
1.580	27.11	-25.80	-52.91
1.590	26.73	-12.19	-38.92
1.600	26.22	20.84	-5.38
1.605	25.98	22.98	-3.00
1.610	25.45	28.15	2.70
1.615	24.77	32.99	8.22
1.620	23.99	31.57	7.58
1.625	23.19	30.07	6.88
1.630	22.71	30.03	7.32
1.635	22.49	31.37	8.88
1.640	**22.57**	**33.31**	**10.74**
1.645	22.90	32.64	9.74
1.650	23.48	30.75	7.27
1.655	24.09	29.22	5.13
1.660	24.04	28.48	4.44
1.665	24.93	28.58	3.65
1.670	24.99	29.68	4.69
1.675	25.24	31.52	6.28
1.680	25.59	32.22	6.63
1.685	26.01	29.31	3.30
1.690	26.48	24.45	-2.03
1.695	26.81	16.19	-10.62
1.700	26.92	14.42	-12.50
1.705	26.46	9.20	-17.26
1.710	25.49	3.24	-22.25
1.720	24.71	-32.09	-56.80
1.730	23.82	-32.18	-56.00

- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 10.: Frequency Response: Amplifier Gain versus Frequency



- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

EXHIBIT 6. TEST INSTRUMENTS & MEASUREMENT UNCERTAINTY (K=2, 95% CONFIDENCE LEVEL)

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement.

RADIATED EMISSION MEASUREMENT UNCERTAINTY

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Due Date
EMI Receiver	Rohde & Schawrz	ESU40	100037	20 Hz to 40 GHz	March 09, 2011
Pre Amplifier	AH System	PAM-0118	225	20 MHz to 18 GHz	March 08, 2011
Biconilog Antenna	EMCO	3142C	00026873	26 – 3000 MHz	April 18, 2011
Horn Antenna	EMCO	3115	5955	1GHz – 18 GHz	October 09, 2010
Semi-Anechoic Chamber	TDK	FCC: 91038 IC: 2049A-3	--	--	May 01, 2011

	Radiated Emission Measurement Uncertainty @ 3m, Horizontal (30-1000 MHz):	Measured	Limit
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)}$	**± 2.15**	**± 2.6**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 4.30**	**± 5.2**

	Radiated Emission Measurement Uncertainty @ 3m, Vertical (30-1000 MHz):	Measured	Limit
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)}$	**± 2.39**	**± 2.6**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 4.78**	**± 5.2**

	Radiated Emission Measurement Uncertainty @ 3 m, Horizontal & Vertical (1 – 18 GHz):	Measured	Limit
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)}$	**± 1.87**	Under consideration
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 3.75**	Under consideration

EXHIBIT 7. TEST INSTRUMENT LIST

Item #	Test instruments	Manufacturer	Model No	Serial No	General Specification	Cal Due
1	EMC Analyzer	Hewlett-Packard	8593EM	3412A00103	9KHz-26.5GHz	5-Oct-10
2	High Pass Filter	K&L	115H10-3000	4	Cut of Frequency 2700MHz	Note (1)
3	Attenuator	Weinschel	23-20-34	BH7876	20dB DC-18G Hz 10W	Note (1)
4	Spectrum Analyzer	ROHDE&SCHWARZ	FSEK	834157/005	9KHz--40GHz	26-Jul-11
5	Biconilog Antenna	ETS	3142B	1575	26MHz-2000MHz	15-Apr-11
6	Horn Antenna	ETS	3117	119425	1GHz-18GHz	15-Jan-11
7	Pre-Ampilifier	Hewlett-Packard	8447D	2944A07673	0.1MHz-1300MHz	Note (1)
8	Pre-Ampilifier	Hewlett-Packard	83017A	3116A00661	0.5GHz-26.5GHz	Note (1)
9	RF Signal Generator	Marconi	2024	112255/164	9KHz-2400MHz	23-Jul-11
10	Power Meter	Hewlett-Packard	438A	3008A06729	100KHz-50GHz Sensor Dependent	20-Aug-11
11	Power Sensor	Hewlett-Packard	8481A	2237A33409	10MHz-18GHz	27-Aug-11
12	Power Amplifier	OPHIR RF	GRF5058	1009	0.8-4GHz 13Watts	Note (1)
13	DC Block	Pasternack	PE8210		10MHz-18GHz	Note (1)
14	Bidirectional Coaxial Couplier	Narda	3022	75262	1GHz - 4GHz	Note (1)

Note (1): This device is calibrated by Ultratech prior to tests.

EXHIBIT 8. MEASUREMENT METHODS

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

8.1.1. MAXIMIZING RF EMISSION LEVEL (E-FIELD)

(a) The measurements were performed with full rf output power and modulation.
(b) Test was performed at listed 3m open area test site (listed with FCC, IC, ITI, NVLAP, ACA & VCCI).
(c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
(d) The BICONILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.
(e) 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 (dBμV/m) = Reading (dBμV) + Total Correction Factor (dB/m)

(f) Set the EMI Receiver 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

(g) The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
(h) The transmitter was rotated through 360^{o} about a vertical axis until a higher maximum signal was received.
(i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
(j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
(k) 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.
(l) Repeat for all different test signal frequencies.

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

(a) 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:	100 KHz
Video BW:	VBW > RBW
Detector Mode:	positive
Average:	off
Span:	3 x the signal bandwidth

(b) 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)

(c) Select the frequency and E-field levels obtained in the Section 8.2.1 for ERP/EIRP measurements.
(d) 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 }.

(e) Mount the transmitting antenna at 1.5 meter high from the ground plane.
(f) 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 }.

(g) If the DIPOLE antenna is used, tune it's elements to the frequency as specified in the calibration manual.
(h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.
(i) Tune the EMI Receivers to the test frequency.
(j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(k) The transmitter was rotated through 360^{o} about a vertical axis until a higher maximum signal was received.
(l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(m) 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.
(n) 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

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

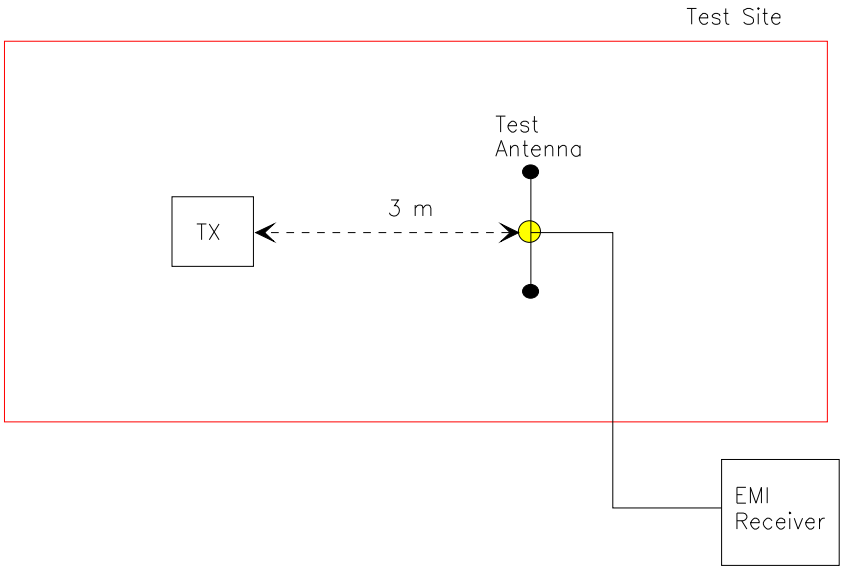
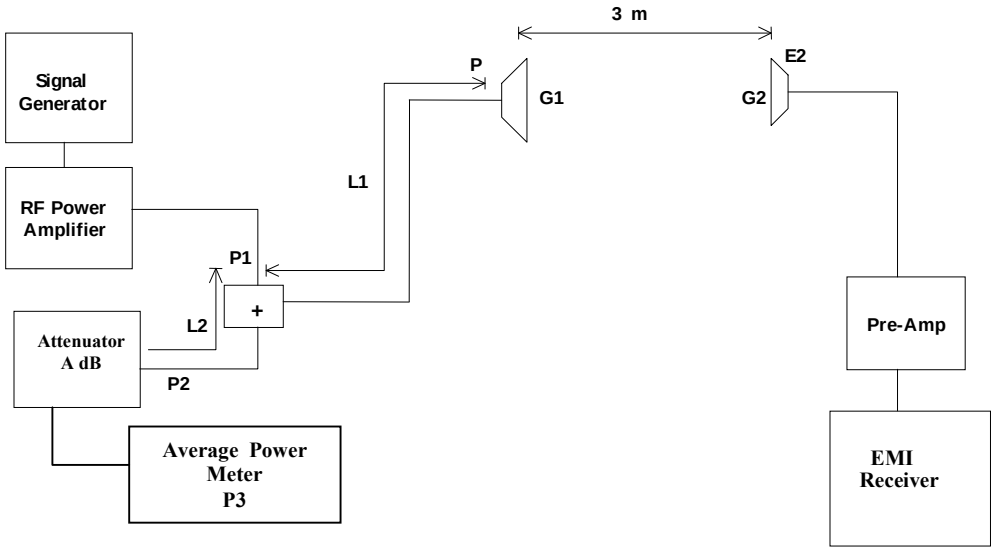


Figure 3



- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

8.2. FREQUENCY STABILITY

Refer to FCC @ 2.1055.

(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).

8.3. EMISSION MASK

Voice or Digital Modulation Through a Voice Input Port @ 2.1049(c)(i):- The transmitter was modulated by a 2.5 KHz tone signal at an input level 16 dB greater than that required to produce 50% modulation (e.g.: ±2.5 KHz peak deviation at 1 KHz modulating frequency). The input level was established at the frequency of maximum response of the audio modulating circuit.

Digital Modulation Through a Data Input Port @ 2.1049(h):- Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the Emission Masks shall be shown for operation with any devices used for modifying the spectrum when such devices are operational at the discretion of the user.

The following EMI Receiver bandwidth shall be used for measurement of Emission Mask/Out-of-Band Emission Measurements:

(1) For 25 KHz Channel Spacing: RBW = 300 Hz
(2) For 12.5 KHz or 6.25 KHz Channel Spacings: RBW = 100 Hz

The all cases the Video Bandwidth shall be equal or greater than the measuring bandwidth.

8.4. SPURIOUS EMISSIONS (CONDUCTED)

With transmitter modulation characteristics described in Out-of-Band Emissions measurements @ 2.1049, the transmitter spurious and harmonic emissions were scanned. The spurious and harmonic emissions were measured with the EMI Receiver controls set as RBW = 30 KHz minimum , VBW ≥ RBW and SWEEP TIME = AUTO). The transmitter was operated at a full rated power output, and modulated as follows:

FCC 47 CFR 2.1057 - 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.

FCC 47 CFR 2.1051 - 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 specified in 2.1049 as appropriate. The magnitude of spurious emissions, which are attenuated more than 20 dB below the permissible value, need not be specified.