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File: TC8316  
Report: 08CA44952-FCCP25-A1  
Date: Nov.15, 2011  
Model: XT DUAL

## FCC Test Report

### Satellite Mobile Hand Held Terminal Model : XT DUAL

For

**Asia Pacific Satellite Industries Co., Ltd.**

**9FL, Lotte IT Castle 2-Dong,  
#550-1, Gasan-Dong, GeumCheon-Gu,  
Seoul, Korea, 153-768**

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## 1 Revision History

Revision	Issue Date	Revision Details	Revised By
Original	July 31, 2009	Original Report issued	KY Kim
A1	Nov.15, 2011	1. Model name change 2. Brand logo change	KY Kim

## Test Report Details

Tests Performed By: UL Korea Ltd.  
33<sup>rd</sup> FL. GFC Center, 737 Yeoksam-dong,  
Kangnam-ku, Seoul, 135-984, Korea

Test Site: Chungbuk Technopark EMC Center  
685-3 Yangcheong-ri, Ochang-eub, Cheongwon-kun, Chungbuk-province,  
Republic of Korea.

Applicant: Asia Pacific Satellite Industries Co., Ltd.  
9FL, Lotte IT Castle 2-Dong, #550-1,Gasan-Dong,  
GeumCheon-Gu, Seoul, Korea, 153-768

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Equipment Class: TNE - Licensed Non-Broadcast Transmitter Held to Ear

Product Type: Satellite Mobile Hand Held Terminal

FCC ID: TZ5XTDUAL

Model Number: XT DUAL

Test standards: FCC 47 CFR Part 25 : Satellite Communications\_ Oct.1. 2007  
FCC 47 CFR Part 15 : Radio Frequency devices Subpart C\_Oct. 1, 2007  
FCC 47 CFR Part 2 : General Rules and Regulations

Sample Serial Number: Prototype

Sample Receive Date: 2008-08-20

Testing Date: 2008-08-20 ~ 09-25

Test Report Date: 2009-03-13

Test Report Reissue Date: 2011-11-15

**Overall Results:** Pass

UL Korea as an affiliate of Underwriters Laboratories Inc. EMC report apply only to the specific test samples and test results submitted for UL's review. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. UL Korea Ltd. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL Korea Ltd. issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or any agency of the National Authorities. This report may contain test results that are not covered by the NVLAP or KOLAS accreditation.

## Summary of Testing

The following tests were performed on a sample submitted for evaluation of compliance with 47 CFR Part 25\_2008 Satellite Communications\_Portable Earth Station Transceiver in the 1,5/1,6 GHz bands

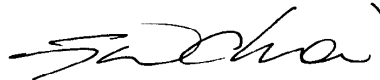
No.	47 CFR Part 2, Part 15 and Part 25 Technical Requirements	Result	Remark
1	Conducted Emissions - §15.107(a)	Complied	
2	Radiated Emissions - §15.109(a)	Complied	
3	Frequency tolerance of Earth stations - §25.202(d), §2.1055	Complied	
4	Emission limitations Conducted measurement - §25.202(f), §2.1051	Complied	
5	Emission limitations Radiated measurement - §25.202(f), §2.1053	Complied	
6	Power limits - §25.204(a), §2.1046	Complied	
7	Limits on emissions for aeronautical radio navigation-satellite service - §25.216 (c) (h), (i)	Complied	

### Conclusion:

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by UL Korea Ltd. in accordance with the procedures stated in each test requirement and specification. The test list was determined by the Applicant as being applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.



Tested by  
Sung Hoon Baek, Project Engineer  
Conformity Assessment Services – 3014ASEO  
UL Korea Ltd.



Reviewed by  
Jeawoon, Choi, Senior Project Engineer  
Conformity Assessment Services – 3014ASEO  
UL Korea Ltd.

## 2 General Product Information

### 2.1 Equipment Description

XT is the **Satellite Mobile Hand Held Terminal** for Thuraya satellite mobile communication service based on GMR-1 and GMPRS-1. It supports various services such as voice, circuit data, packet data and fax etc.

### 2.2 Details of Test Equipment (EUT)

- Equipment Type : Satellite Mobile Hand Held Terminal
- Model No. : XT DUAL
- Trade name : Thuraya
- Type of test Equipment : Portable Equipment
- Operating characteristic : MES(Mobile Earth Station) used in the S-PCN
- Manufacturer : Asia Pacific Satellite Industries Co., Ltd.  
9FL, Lotte IT Castle 2-Dong, #550-1,  
Gasan-dong, Geumcheon-gu, Seoul, Korea, 153-768

### Equipment Configuration

The EUT is consisted of the following component provided by the manufacturer.

No.	Product Type	Manufacturer	Model	Comments
1	Satellite Mobile Terminal	Asia Pacific Satellite Industries Co., Ltd.	XT DUAL	EUT
2	Travel Charger	Phihong Technology Co Ltd.	PSC11R-050	
3	Ear Set	Cresyin	EMB-ATS 106TKA	

## Technical Data

Frequency Ranges	: Transmitter 1626.5 – 1660.5 MHz Receiver 1525~1559 MHz		
Channel spacing <sup>1)</sup>	: 31.25 kHz		
Output power	: Max. 2.0 W	Typical	: 1.8 W
Radiated power (EIRP) <sup>2)</sup>	: Max. 7.0 dBW	Min	: 5.0 dBW
Intermediate frequency	: 246MHz	Level	: -20 dBm
Frequency Accuracy	: Uncorrected: < ±5ppm Corrected : < ±0.006ppm		
Kind of modulation (s)	: $\pi/4$ – CQPSK Single mode		
Kind of base-band signal	: voice / circuit data / packet data/ fax		
Data rate(s)	: Tx : 2.4Kbps /4.8Kbps/ 9.6Kbps /14.4Kbps Rx : 2.4Kbps /4.8Kbps/ 9.6Kbps /60Kbps		
FEC	: Convolution (1/2, 1/3, 1/4, 1/5)		
Working temperature	: -20°C ~ 60°C		
Supply Voltage	: Battery 3.7 V, 2520mAh		
Charger Power Rating	: Input 100 - 240 Vac, 50/60 Hz, 0.3A Output 5-12 Vdc, 2 - 0.71 A		

### Note ;

1. All the technical data described above were provided by the manufacturer.

<sup>1)</sup> channel spacing of MES(Mobile Earth Station)

<sup>2)</sup> antenna was provided by the manufacturer

## Antenna Information

Antenna Type	: Passive, Quadrifilar Helical Type
Manufacturer	: Asia Pacific Satellite Industries Co., Ltd.
Transmit Gain dBi	: LHCP Max. 3.0 dBi

## Equipment Type :

- Radio and ancillary equipment for fixed or semi-fixed use  
 Radio and ancillary equipment for vehicular mounted use  
 Radio and ancillary equipment for portable or handheld use
- Stand alone     Host connected     Host connected
- Self contained single unit     Module with associated connection or interface

**Technical descriptions and documents**

The following documents was provided by the manufacturer.

No.	Document Title and Description
1	APSI, Satellite Hand Held Terminal Technical Description.doc
2	APSI, Type Approval Block Diagram & Feature
3	APSI, CMF declaration.doc
4	APSI, XT Antenna.doc

**2.3 Equipment Marking Plate**



**3 Test Specification**

The following test specifications and standards have been applied and used for testing.

- 1) FCC 47 CFR Part 15: Radio frequency devices**
  - §15.107(a) Conducted limits
  - §15.109(a) Raadiated emission limits
- 2) FCC 47 CFR Part 25: Satellite communications**
  - §25.202(d) Frequency tolerance of Earth stations
  - §25.202(f) Emission limitations
  - §25.204(a) Power limits
  - §25.216(h) Limits on emissions for aeronautical radio navigation-satellite service



## 4 Test Conditions

### 4.1 Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
EUT	Thuraya Repeater	Asia Pacific Satellite Industries Co., Ltd.	ThurayaSingle	Main Unit
EUT	Charger	Phihong Technology Co Ltd.	PSC11R-050	External Adapter
SIM	Satellite Emulator	National Instruments	PXI-1042	Satellite Signal generator
AE	Monitor	Monitor Top Victory Electronics	ELM-728	2925CJA021461
AE	Notebook	FUJITSU	C1410	

Note:

\* EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment, or SIM - Simulator (Not Subjected to Test)

### 4.2 Input/Output Ports

No	Port Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
0	Enclosure	-	-	-	Non-metal enclosure
1	DC Input port	DC	< 3m	Unshield	Connected to Charger
2	UDC port	I/O	< 3m	Shield	Connected to Satellite simulator
3	Ear set	I/O	< 3m	Unshield	Connected to Mono Ear set

Note:

-. All the interface cables and Power Cable have been provided by the manufacturer  
 -. UDC port is not user interface port for data download purpose only.

### 4.3 Power Interface

Mode #	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	3.7 V	-	-	DC	-	Internal Battery Rating
1	3.7 V	-	-	DC	-	Normal operating voltage
2	3.5 V	-	-	DC	-	Battery End Point
3	4.2 V	-	-	DC	-	Battery Full charged voltage
4	110 V	0.3	-	AC 60Hz	1	External adapter (charger)

#### 4.4 Operating Frequencies

Mode #	Frequency tested
1	Carrier on state for 3 frequencies in the Transmitter band -. Low : 1626.59375 MHz / CH = 3 -. Mid : 1643.5 MHz / CH = 544 -. Top : 1660.46875 MHz / CH= 1087
2	Carrier off state for Idle-mode
Note : The carrier signal was modulated with /4 CQPSK as following format. -. Bits/ Symbol : 2 -. Symbol Rate : 23.4 kbps -. Filter : RNYQ(a=0.350)EVM -. I/Q Scaling : 100 % -. Data : PN23 -. FPOL : Normal -. Diff Encode : off	

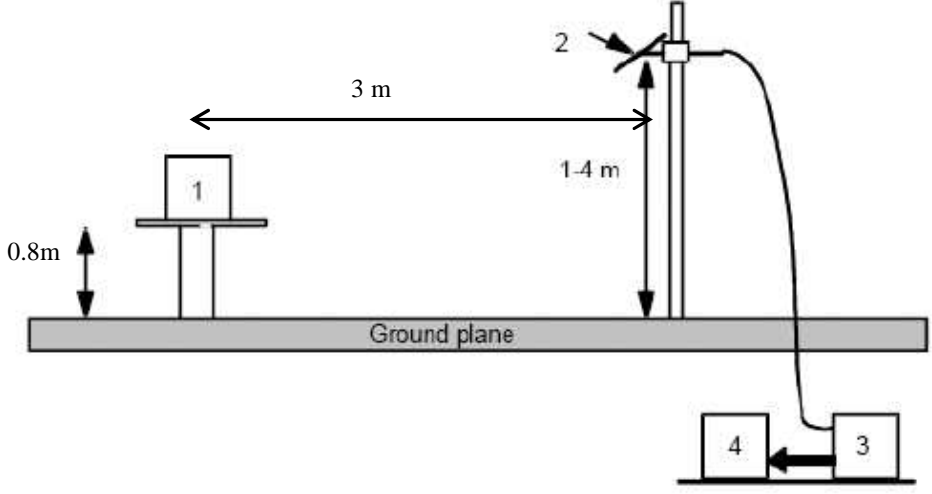
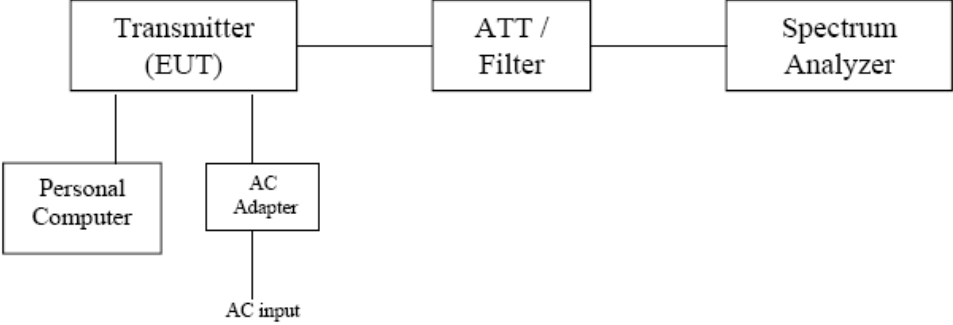
#### 4.5 Operation Modes

Mode #	Description
1	Carrier on mode: RF signal from the MES was generated continuously for the representative channels (Low, Mid, High) by the test program connected to the notebook PC
2	Carrier off (Idle) mode: RF carrier was not activated by the MES
Note : N/A	

#### 4.6 Environment Conditions

Parameters	Normal condition	Extreme condition
Temperature	+ 15 °C ~ +35 °C	-20 °C / +60 °C
Humidity	20% ~ 75%	No excessive condensation occur
Supply voltage	3.7Vdc (Rated nominal voltage)	3.5 Vdc / 4.2 Vdc
Note ; -. The extreme condition is applied to the boundary limits of the declared operational environmental condition by the manufacturer. -. The operating condition for humidity requirement has not been declared in the manufacturer's specification.		

### 4.7 Test Configurations

Mode #	Description
1	 <p>1) equipment under test;                  2) test antenna;                  3) high pass filter (if necessary);                  4) spectrum analyser or measuring receiver.</p> <p style="text-align: center;">Test Configuration of Radiated Measurement</p>
2	 <p style="text-align: center;">Test Configuration of Conducted Measurement</p>

## 5 Overview of Technical requirements

The following test items show that the correspondence of test items and the performance of output power and its spectrum transmission are in accordance to the technical description.

The test results shows

- No deviations to the technical requirements were ascertained during the tests performed.  
 Deviations as specified in this report were ascertained during the tests performed.

### 5.1 Conducted Emissions

Reference : FCC 47 CFR Part 15 Radio Frequency devices\_Sep. 20, 2007

Clause : Section 15.107 Conducted limits

#### Technical requirements

An intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the section §15.107 (a) .

#### Result of test

- Pass  
 Fail  
 Already tested(refer to test report no.\_\_\_\_\_)  
 Not applicable

Remarks : None

### 5.2 Radiated Emissions

Reference : FCC 47 CFR Part 15 Radio Frequency devices\_Sep. 20, 2007

Clause : Section 15.109 Radiated emission limits

#### Technical requirements

The emissions from an intentional radiator shall not exceed the field strength levels specified in the table of §15.109 (a).

#### Result of test

- Pass  
 Fail  
 Already tested(refer to test report no.\_\_\_\_\_)  
 Not applicable

Remarks : None

### 5.3 Frequency Tolerance of Earth stations

Reference : FCC 47 CFR Part 25 Satellite Communications\_Oct. 01, 2007  
Clause : Section 25.202(d) Frequency tolerance of Earth stations  
Section 2.1055 Frequency Stability

#### Technical requirements

The carrier frequency of each earth station transmitter authorized in these services shall be maintained within 0.001 percent of the reference frequency.

#### Result of test

- Pass  
 Fail  
 Already tested(refer to test report no. \_\_\_\_\_)  
 Not applicable

Remarks : None

### 5.4 Emission Limitations

Reference : FCC 47 CFR Part 25 Satellite Communications\_Oct. 01, 2007  
Clause : Section 25.202(f) Emission limitations  
Section 2.1051 Spurious emission at antenna terminal

#### Technical requirements

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the requirements specified in the section §25.202(f)(1), (2) and (3).

#### Result of test

- Pass  
 Fail  
 Already tested(refer to test report no. \_\_\_\_\_)  
 Not applicable

Remarks : None

### 5.5 Emission Limitations

Reference : FCC 47 CFR Part 25 Satellite Communications\_Oct. 01, 2007  
Clause : Section 25.202(f) Emission limitations  
Section 2.1053 Field strength of spurious radiation

#### Technical requirements

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the requirements specified in the section §25.202(f)(1), (2) and (3).

#### Result of test

- Pass  
 Fail  
 Already tested(refer to test report no. \_\_\_\_\_)  
 Not applicable

Remarks : None

## 5.6 Power limits

Reference : FCC 47 CFR Part 25 Satellite Communications\_Oct. 01, 2007

Clause : Section 25.204 Power Limits

### Technical requirements

The equivalent isotropically radiated power transmitted in any direction towards the horizon by an earth station operating in frequency bands between 1 and 15 GHz, shall not exceed the requirement specified in the section §25.204(a)

### Result of test

- Pass  
 Fail  
 Already tested(refer to test report no.\_\_\_\_\_)  
 Not applicable

Remarks : None

## 5.7 Limits on emissions for aeronautical radio navigation-satellite service

Reference : FCC 47 CFR Part 25 Satellite Communications\_Oct. 01, 2007

Clause : Section 25.216 Limits on emissions from mobile earth stations for protection of aeronautical  
Radio navigation-satellite service

### Technical requirements

The e.i.r.p density of carrier-off state emissions from mobile earth stations with assigned uplink frequencies in the 1626.5-1660.5 MHz band shall suppress the power density of emissions in the 1605-1610 MHz band shall not exceed the requirement specified in the section §25.216 (c), (h),(i)

### Result of test

- Pass  
 Fail  
 Already tested(refer to test report no.\_\_\_\_\_)  
 Not applicable

Remarks : None

## 6 Test Results

### 6.1 Conducted Emissions Test

1	<b>TEST:</b> Limits of mains terminal disturbance voltage			
Method	Measurements were made on a ground plane that extends 1-meter minimum beyond all sides of the system under test. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.			—
Basic Standard	ANSI C63.4:2003 , Section 15.107(a)			
Parameters required prior to the test	Laboratory Ambient Temperature	10 to 40 °C		
	Relative Humidity	10 to 90 %		
Parameters recorded during the test	Laboratory Ambient Temperature	22.0°C		
	Relative Humidity	41.0%		
	Frequency range on each side of line	Measurement Point		
Fully configured sample scanned over the following frequency range	150kHz to 30MHz	AC Input – LI , N		
<b>Limits - Class A</b>				
Frequency (MHz)	Limit (dBµV)			
	Quasi-Peak	Result	Average	Result
0.15 to 0.50	79	N/A	66	N/A
0.50 to 30	73	N/A	60	N/A
<b>Limits – FCC 47 CFR Part 15 §15.107 (a)</b>				
Frequency (MHz)	Limit (dBµV)			
	Quasi-Peak	Result	Average	Result
0.15 to 0.50	66 to 56	<b>PASS</b>	56 to 46	<b>PASS</b>
0.50 to 5	56	<b>PASS</b>	46	<b>PASS</b>
5 to 30	60	<b>PASS</b>	50	<b>PASS</b>
Supplementary information: Pre test with Peak and final measurement with Quasi-peak and Average detectors.				

**Conducted Emissions EUT Configuration Settings**

Power Interface Mode # (See Section 3.3)	EUT Configurations Mode # (See Section 3.7)	EUT Operation Mode # (See 3.5)
4	1	1
Supplementary information: The transmitter was modulated with normal test modulation by an internal signal source capable of delivering the normal test modulation as specified in clause 2.4 of this report.		

**Conducted Emissions Test Equipment**

Conducted Emissions Test Equipment used:				
Description	Manufacturer	Model	Identifier	Cal. Due
Test Receiver	Rohde & Schwarz	ESIB26	100359	2009.05.26
LISN	Rohde & Schwarz	ESH2-Z5	100146	2009.03.28



**Figure 1. Test Setup for Conducted Emissions**

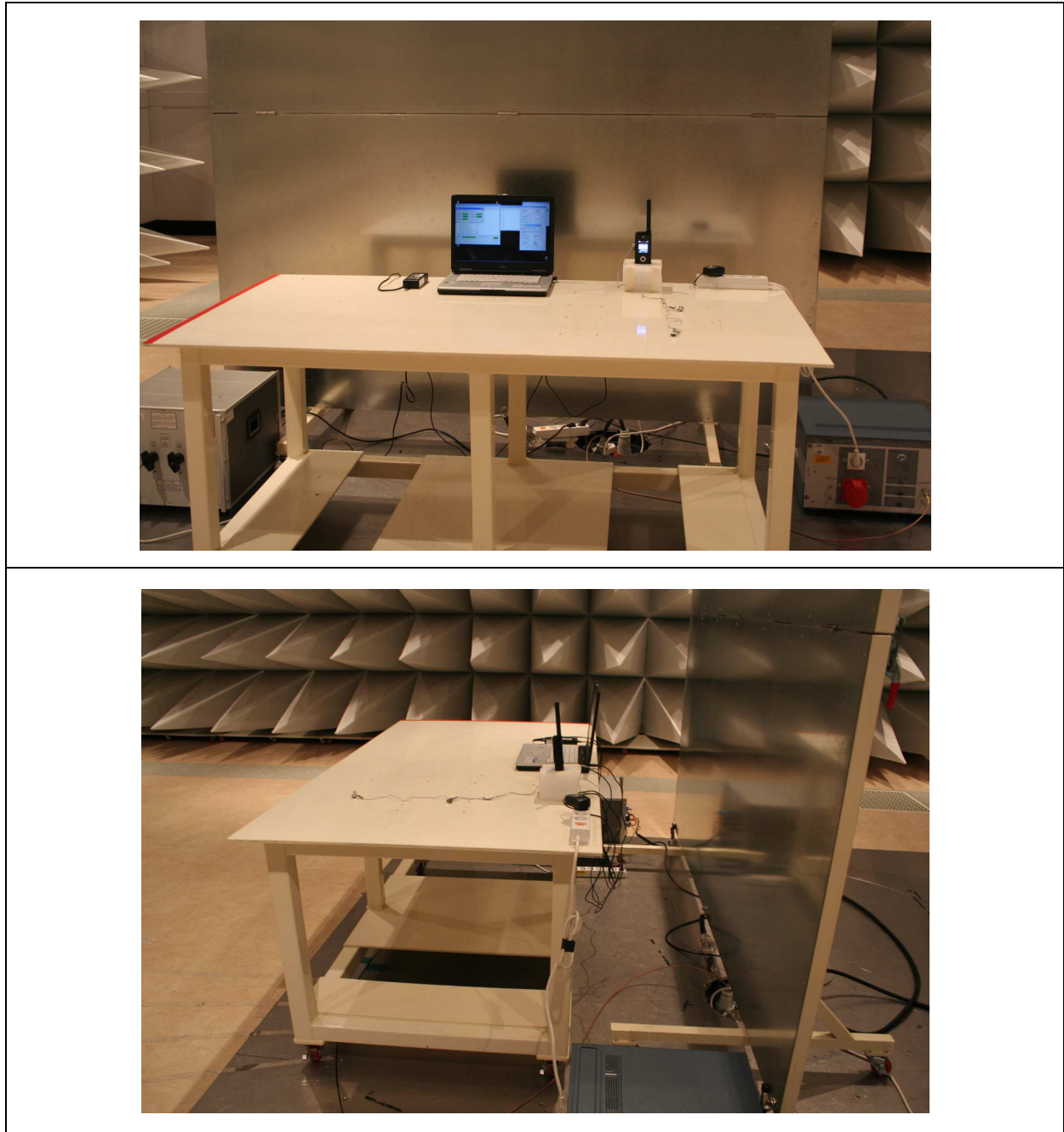


Figure 2-1. Conducted Emissions Graph

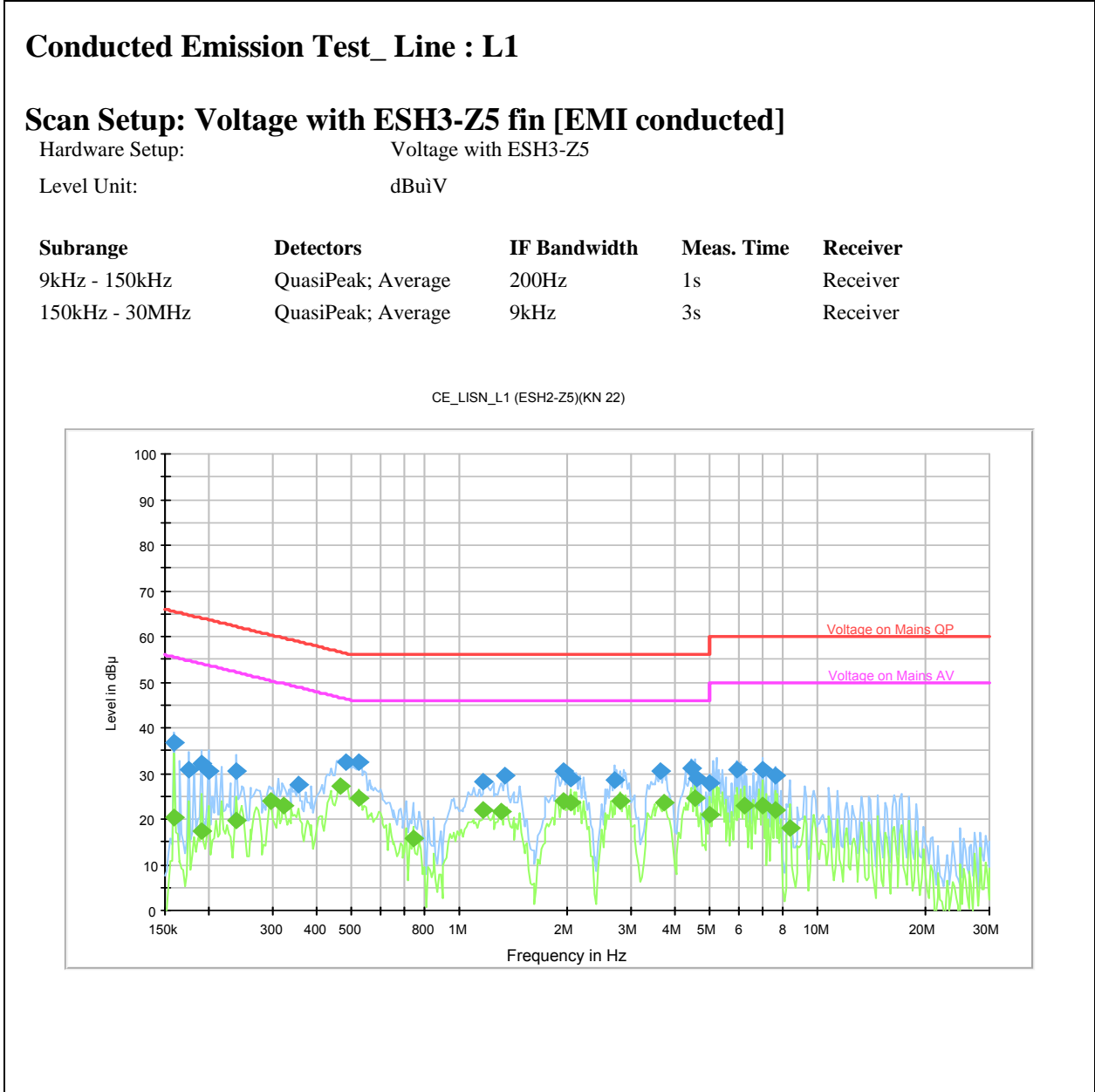
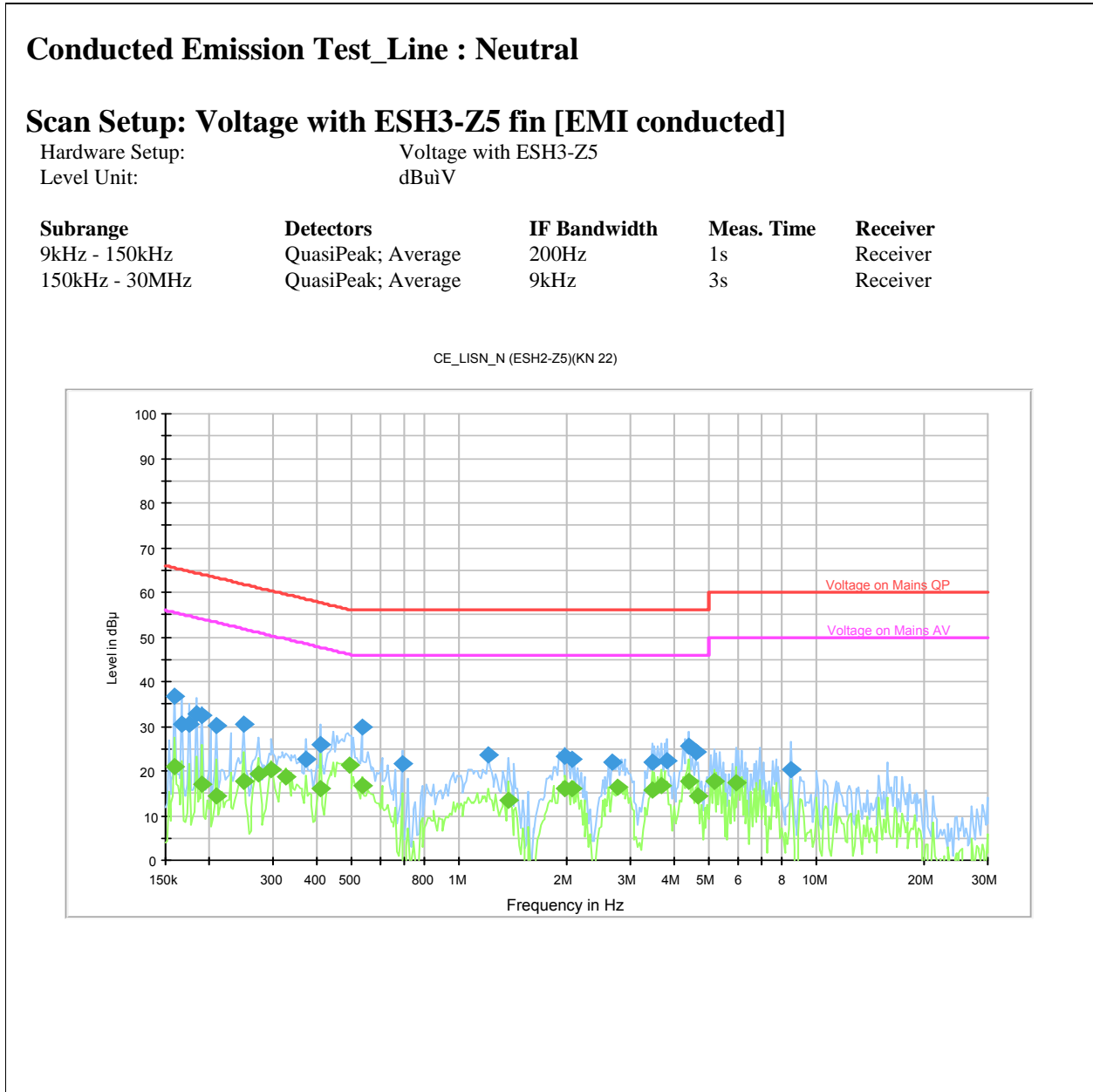


Figure 2-2. Conducted Emissions Graph



**Table 1. Conducted Emissions Data Table**

Communication link mode : Center channel of the SAT. Tx band

Test Frequency (MHz)	Correction Factor		Reading value (dBuV)		Line	Level (dBuV)		Limit (dBuV)		Margin (dB)	
	Cable	LISN	QP	AV		QP	AV	QP	AV	QP	AV
0.16	10.06	0.08	28.76	10.96	N	38.90	21.10	65.30	55.30	26.40	34.20
0.20	10.06	0.08	26.76	9.86	N	36.90	20.00	63.80	53.80	26.90	33.80
0.21	10.06	0.08	24.06	8.66	N	34.20	18.80	63.00	53.00	28.80	34.20
0.23	10.07	0.08	25.45	14.55	L1	35.60	24.70	62.40	52.40	26.80	27.70
1.84	10.16	0.12	24.22	15.22	L1	34.50	25.50	56.00	46.00	21.50	20.50
2.61	10.21	0.14	23.35	15.75	L1	33.70	26.10	56.00	46.00	22.30	19.90
4.88	10.29	0.14	22.57	15.77	L1	33.00	26.20	56.00	46.00	23.00	19.80
5.72	10.33	0.19	21.88	14.38	L1	32.40	24.90	60.00	50.00	27.60	25.10
6.20	10.34	0.19	23.87	15.77	L1	34.40	26.30	60.00	50.00	25.60	23.70
7.27	10.36	0.24	19.80	10.96	N	38.90	21.10	65.30	55.30	34.90	34.20

Note:

1. If no frequencies are specified in the tables, measurement for quasi-peak or average was not necessary.

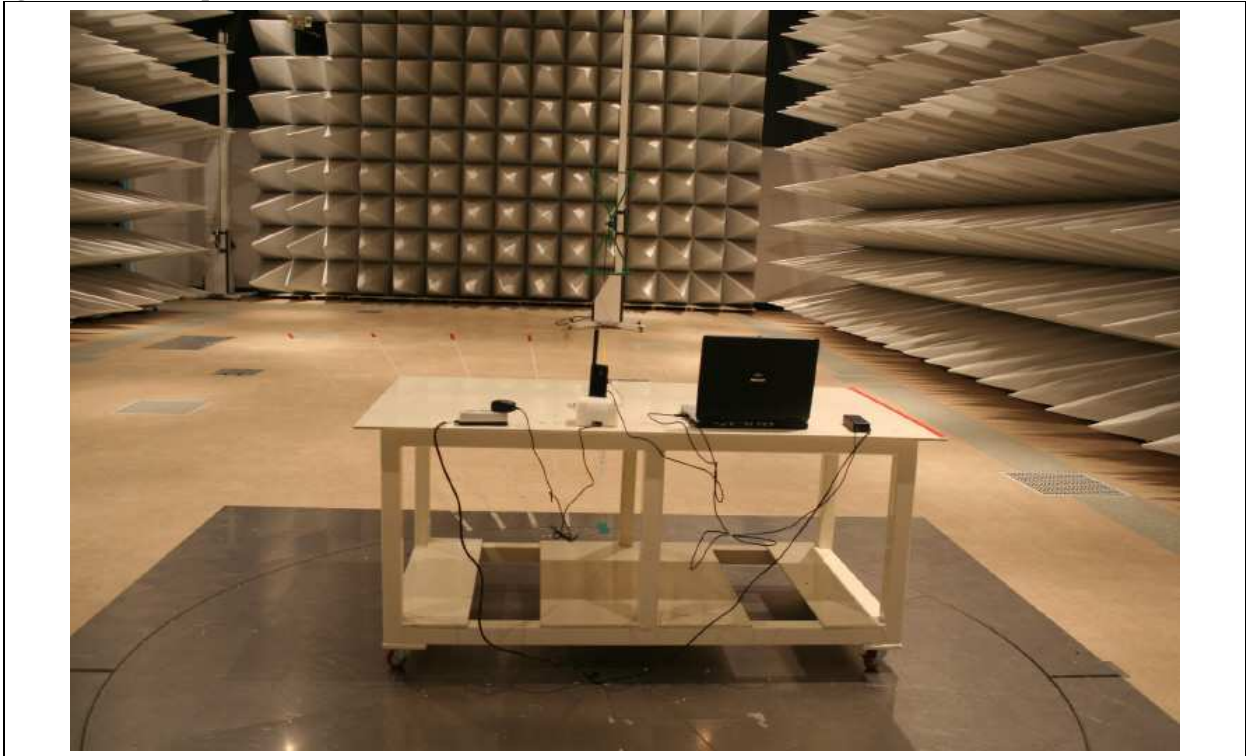
## 6.2 Radiated Emissions Test

	<b>TEST:</b> Limits for Radiated emissions	
Method	Measurements were made in a 10-meter semi-anechoic chamber that complies to CISPR 16/ANSI C63.4. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3meter. The EUT was rotated 360° about its azimuth with the receive antenna located at 1, 2, 3 and 4 meter heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4-meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.	
Basic Standards	ANSI C63.4:2003 , Section 15.209	
Parameters required prior to the test	Laboratory Ambient Temperature	10 to 40 °C
	Relative Humidity	10 to 90 %
Parameters recorded during the test	Laboratory Ambient Temperature	23.0°C
	Relative Humidity	47.0 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30MHz – 1GHz	3 meter distance
<b>Limits – Section 15.109(a)</b>		
Frequency (MHz)	Limit	
	Quasi-Peak(uV/m)	Quasi-Peak(dBuV/m)
30–88	100	40.0
88–216	150	43.5
216–960	200	46.0
Above 960	500	54.0
<b>EUT Configuration Settings</b>		
Power Interface Mode # (See Section 3.3)	EUT Configurations Mode # (See Section 3.7)	EUT Operation Mode # (See 3.5)
4	1	1
Supplementary information:		

### Radiated Emissions Test Equipment

Description	Manufacturer	Model	Identifier	Cal. Due
Test Receiver	Rohde & Schwarz	ESIB26	100359	2009.05.26
BiconiLog ANT	CBL6112D	Schaffner	21784	2010.04.21
Horn Antenna	EMCO	3115	00056768	2010.03.24
Position controller	Inn-co	CO 2000	11261105/L	-
Antenna Mast	Inn-co	MA 4000	-	-
Turntable	Inn-co	DT 3000	-	-

**Figure 3. Test Setup for Radiated Emission**



**Table 2. Radiated emissions data**

<b>Scan Setup: Electric Field Strength</b>							
Hardware Setup:		Communication link at center channel					
Level Unit:		dBuV/m					
<b>Subrange</b>	<b>Detectors</b>	<b>IF Bandwidth</b>	<b>Meas. Time</b>	<b>Receiver</b>			
30MHz - 1GHz	QuasiPeak	120kHz	1s	Receiver			
1 GHz - 18 GHz	Average	1 MHz	1s	Receiver			
Communication link at Tx center channel							
Frequency Reading (MHz)	Reading (dBuV/m)	Polarization	Ant. Factor (dB)	Cable Loss (dB)	Limit (dBuV/m)	Emission Level (dBuV/m)	Margin (dB)
144.69	4.70	H	10.90	1.80	30.00	17.40	12.60
193.55	9.70	H	8.60	2.20	30.00	20.50	9.50
206.89	15.80	V	8.80	2.30	30.00	26.90	3.10
246.00	19.10	V	11.40	2.50	37.00	33.00	4.00
Supplementary information:							
<ul style="list-style-type: none"> <li>- The correction value has been included the Emission level measured value with offset</li> <li>- Correction = Cable loss + Antenna Factor</li> <li>- No emissions more than 20 dB below to the limit were reported.</li> <li>- The EUT was positioned to 3 axis on the table and Front vertical (X-axis) was the worst case position and reported</li> </ul>							

### 6.3 Frequency Stability Test

<b>TEST: Frequency Tolerance of Earth stations</b>		
Method	For Temperature Frequency Stability, measurements were made with the product placed in an environmental chamber and the temperature varied from -30°C to +50°C at the normal supply voltage. The frequency drift of the fundamental frequency was measured with a spectrum analyzer. At each temperature to be tested, test was paused for at least 15 minutes for temperature compensation of the EUT  For Power Supply stability, measurements were made in a laboratory environment and the supply voltage varied from battery end point to max operating voltage. The ambient temperature was 20 °C.	
Reference Clause	47 CFR § 2.1055, § 25.202(d)	
Parameters recorded during the test	Laboratory Ambient Temperature	-30 °C - +50°C
	Relative Humidity	48 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	Center channel (ch no. 544)	Antenna port

#### Configuration Settings

Power Interface Mode # (See Section 3.3)	Test Configurations Mode # (See Section 3.7)	EUT Operation Mode # (See 3.5)
1, 2, 3	2	1
Supplementary information: Testing has been performed with frequency setting of satellite phone to the mid channel 1643.5 MHz ( CH = 544)		

#### Limits

The carrier frequency shall be maintained within 0.001 percent of the reference frequency(10 ppm)
---------------------------------------------------------------------------------------------------

#### Test Equipment Used

Description	Manufacturer	Model	Identifier	Cal. Due
SpectrumAnalyzer	Agilent Tecnologies	E4440A	MY46186519	2009.03.29
RF Power Meter	Agilent Tecnologies	E4418B	MY45105913	2009.03.29
Power Sensor	Agilent Tecnologies	8481H	MY41092319	2009.03.29
Coaxial Attenuator	Agilent Tecnologies	8491B	90466	2009.03.29
High Pass Filter	Wainwright	WHK3.3/18G-10EF	10Z	2009.08.20
Programmable DC Power Supply	GW Instek	PSH-2050A	EH160824	2009.03.30
Temp & Humid Test Chamber	Climats	EX2213-HA	7558	2009.06.23



**Table 3. Frequency Stability Test results**

**Frequency Stability with variation of Ambient Temperature**

Carrier Band	Temperature (°C)	Assigned Frequency (Hz)	Measured Frequency (Hz)	Drift (ppm)	Limit (ppm)
1643.5 MHz Mid channel	50	1,643,500,000.000	1,643,500,004.000	0.000243	10.0
	40	1,643,500,000.000	1,643,500,005.000	0.000304	10.0
	30	1,643,500,000.000	1,643,500,002.000	0.000122	10.0
	20	Reference			
	10	1,643,500,000.000	1,643,500,000.000	0.000000	10.0
	0	1,643,500,000.000	1,643,500,001.000	0.000061	10.0
	-10	1,643,500,000.000	1,643,499,999.300	-0.000043	10.0
	-20	1,643,500,000.000	1,643,499,997.000	-0.000183	10.0
	-30	1,643,500,000.000	1,643,499,998.000	-0.000122	10.0

Supplementary information:

- Mid channel of the operating band was tuned
- No modulation,
- Before the testing, the signal generator and spectrum analyzer were synchronized by using the external sync. Frequency measurement was made by spectrum analyzer
- Reference input voltage : 3.7 Vdc

**Frequency Stability with variation of Input voltage**

Carrier Band	Input voltage (V)	Assigned Frequency (Hz)	Measured Frequency (Hz)	Drift (ppm)	Limit (ppm)
1643.5 MHz Mid channel	3.5 Vdc	1,643,500,000.000	1,643,500,000.000	0.000000	10.0
	4.2 Vdc	1,643,500,000.000	1,643,500,000.000	0.000000	10.0

Supplementary information:

- Mid channel of the operating band was tuned
- No modulation,
- Before the testing, the signal generator and spectrum analyzer were synchronized by using the external sync. Frequency measurement was made by spectrum analyzer
- Reference temperature : 20°C

**Measurement Plots :** No plots provided

**Remarks :** None

**Result of test :** Complied with technical requirement of 47 CFR § 25.202(d)

Complied  Failed

### 6.4 Emission Limitations

<b>TEST: Emission Mask &amp; Spurious emissions : Conducted Measurement</b>		
Method	Measurements were made in the laboratory environment. Emission mask measurement was made using a direct connection between RF output of the EUT and spectrum analyzer. Measurement has been performed with the EUT set to maximum output level at low, mid and high channel frequencies.	
Reference Clause	FCC 47 CFR Part 25 §25.202(f)(1), (2) and (3). FCC 47 CFR Part 2 §2.1051	
Parameters required prior to the test	Laboratory Ambient Temperature	10 to 40 °C
	Relative Humidity	10 to 90 %
Parameters recorded during the test	Laboratory Ambient Temperature	22 °C
	Relative Humidity	40 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30 MHz – 20 GHz	Antenna port

#### Configuration Settings

Power Interface Mode # (See Section 3.3)	Test Configurations Mode # (See Section 3.7)	EUT Operation Mode # (See 3.5)
1	2	1
Supplementary information: -. Normal condition only.		

#### Limits

Frequency Range (MHz)	Attenuation to Carrier power (dBc)	Measurement Bandwidth	Measurement method
50 – 100% of assigned BW	-25	4 kHz	Peak Hold
100 – 250% of assigned BW	-35	4 kHz	Peak Hold
> 250 % of assigned BW	-(43+10log(Pmax))	4 kHz	Peak Hold

NOTE : §25.202(f)(1), (2) and (3)

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following

- (1) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50 % up to and including 100 % of the authorized bandwidth: 25 dB
- (2) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100 % up to and including 250 % of the authorized bandwidth: 35 dB
- (3) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 % 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;

#### Test Equipment Used

Description	Manufacturer	Model	Identifier	Cal. Due
Spectrum Analyzer	Agilent Technologies	E4440A	MY46186519	2009.03.29
RF Power Meter	Agilent Technologies	E4418B	MY45105913	2009.03.29
Power Sensor	Agilent Technologies	8481H	MY41092319	2009.03.29
Coaxial Attenuator	Agilent Technologies	8491B	90466	2009.03.29
High Pass Filter	Wainwright	WHK3.3/18G-10EF	10Z	2009.08.20
Programmable DC Power Supply	GW Instek	PSH-2050A	EH160824	2009.03.30
Temp & Humid Test Chamber	Climats	EX2213-HA	7558	2009.06.23

**Measurement Plots :** Refer to the provided measurement plot no. 7 – 45 in Annex I.

**Remarks :** None

**Result of test**

Complied with the technical requirement of FCC 47 CFR Part 25 §25.202(f)(1), (2) and (3).

Complied

Failed

### 6.5 Emission limitations : Field strength spurious radiation

<b>TEST: Field strength of spurious radiation : Radiated Measurements</b>		
Method	To measure the EIRP, the EUT was placed on a table in a 10 meter test chamber. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. The receiving antenna was placed in 3 meter distance on the antenna mast. Both horizontal and vertical polarization of the antenna were measured by rotating the EUT. Measurement were performed on three orthogonal axis. The receiving level was recorded. The EUT was replaced with a substitution transmit antenna and signal generator. The TX power from the signal generator was tuned to get the same reading level of the predetermined receiving level. The signal generator output level, cable loss and substitution antenna gain were considered to calculate the EIRP..	
Reference Clause	FCC 47 CFR Part 25 §25.202(f) , Part 2 §2.1053	
Parameters required prior to the test	Laboratory Ambient Temperature	10 to 40 °C
	Relative Humidity	10 to 90 %
Parameters recorded during the test	Laboratory Ambient Temperature	22 °C
	Relative Humidity	40 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30 MHz – 20 GHz	Cabinet Radiation

#### Configuration Settings

Power Interface Mode # (See Section 3.3)	Test Configurations Mode # (See Section 3.7)	EUT Operation Mode # (See 3.5)
4	2	1
Supplementary information: -. Normal condition only.		

#### Limits

Frequency Range (MHz)	Attenuation to Carrier power (dBc)	Measurement Bandwidth	Measurement method
50 – 100% of assigned BW	-25	4 kHz	Peak Hold
100 – 250% of assigned BW	-35	4 kHz	Peak Hold
> 250 % of assigned BW	-(43+10log(Pmax))	4 kHz	Peak Hold

**NOTE : §25.202(f)(1), (2) and (3)**

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following

- (4) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50 % up to and including 100 % of the authorized bandwidth: 25 dB
- (5) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100 % up to and including 250 % of the authorized bandwidth: 35 dB
- (6) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 % 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;

**Test Equipment Used**

Description	Manufacturer	Model	Identifier	Cal. Due
Spectrum Analyzer	Agilent Technologies	E4440A	MY46186519	2009.03.29
RF Power Meter	Agilent Technologies	E4418B	MY45105913	2009.03.29
Power Sensor	Agilent Technologies	8481H	MY41092319	2009.03.29
Coaxial Attenuator	Agilent Technologies	8491B	90466	2009.03.29
High Pass Filter	Wainwright	WHK3.3/18G-10EF	10Z	2009.08.20
Programmable DC Power Supply	GW Instek	PSH-2050A	EH160824	2009.03.30
Test Receiver	Rohde & Schwarz	ESIB26	100359	2009.05.26
BiconiLog ANT	CBL6112D	Schaffner	21784	2010.04.21
Horn Antenna	EMCO	3115	00056768	2010.03.24
Horn Antenna	Rohde & Schwarz	BBHA9120D	539	2009.03.24
Position controller	Inn-co	CO 2000	11261105/L	-
Antenna Mast	Inn-co	MA 4000	-	-
Turntable	Inn-co	DT 3000	-	-
Temp & Humid Test Chamber	Climats	EX2213-HA	7558	2009.06.23

**Table 4-1. Test Result of Radiated spurious emissions**

Measurement method :  Radiated  Conducted  
 Measurement procedure TIA/EIA-603-1\_1998  
 Mode of operation : Carrier-on with modulation, Carrier tuned @ Low channel=1626.59375 MHz  
 Power setting : Max. Power condition  
 Duty cycle : n/a  
 Antenna Gain : Max. 3.0 dBi  
 Environment Condition : Temp. 23 °C Humidity 45 %RH Supply voltage : 110 Vac

Frequency (MHz)	Received Power (dBuV)	Ant. Polarity	S.G Level (dBm)	Cable loss (dB)	Ant. Gain (dB)	EIRP Level (dBm)	Limit (dBm)
3253.066	20.35	V	-75.7	10.52	11.5	-74.72	-13
4879.602	13.52	V	-83.2	10.90	12.3	-81.80	-13
-	-			-		-	-
-	-			-		-	-
-	-			-		-	-

Supplementary information:  
 -. Limit §25.202(f) : 43+10log P max dBc = 47 dBc  
 -. Any emission having a level below than the above listed level was not reported.  
 -. Emission Level = Signal Generator output level - Cable loss + Antenna Gain(Substitution )  
 -. Spectrum analyser setting : RBW as specified in limit table, VBW as 3 times RBW, Peak Hold  
 -. Spectrum analyser noise floor was at least 6 dB below the specified limits.  
 -. EUT was positioned to 3 axis and worst case was Top side front (Z-axis ) position.

**Measurement Plots :** No plots provided.

**Remarks :** None

**Result of test**

Complied with the technical requirement of FCC 47 CFR Part 25 §25.202(f)(1), (2) and (3).

Complied  Failed

**Table 4-2. Test Result of Radiated spurious emissions**

Measurement method :  Radiated  Conducted  
 Measurement procedure TIA/EIA-603-1\_1998  
 Mode of operation : Carrier-on with modulation, Carrier tuned @ Mid channel=1643.5 MHz  
 Power setting : Max. Power condition  
 Duty cycle : n/a  
 Antenna Gain : Max. 3.0 dBi  
 Environment Condition : Temp. 23 °C Humidity 45 %RH Supply voltage : 110 Vac

Frequency (MHz)	Received Power (dBuV)	Ant. Polarity	S.G Level (dBm)	Cable loss (dB)	Ant. Gain (dB)	EIRP Level (dBm)	Limit (dBm)
3253.196	21.85	V	-74.5	10.52	11.5	-73.52	-13
4879.793	9.27	V	-87.3	10.90	12.3	-85.90	-13
-	-			-		-	-
-	-			-		-	-
-	-			-		-	-

Supplementary information:  
 -. Limit §25.202(f) :  $43+10\log P$  max dBc = 47 dBc  
 -. Any emission having a level below than the above listed level was not reported.  
 -. Emission Level = Signal Generator output level - Cable loss + Antenna Gain(Substitution )  
 -. Spectrum analyser setting : RBW as specified in limit table, VBW as 3 times RBW, Peak Hold  
 -. Spectrum analyser noise floor was at least 6 dB below the specified limits.  
 -. EUT was positioned to 3 axis and worst case was Top side front (Z-axis ) position.

**Measurement Plots :** No plots provided.

**Remarks :** None

**Result of test**

Complied with the technical requirement of FCC 47 CFR Part 25 §25.202(f)(1), (2) and (3).

Complied  Failed

**Table 4-3. Test Result of Radiated spurious emissions**

Measurement method :  Radiated  Conducted  
 Measurement procedure TIA/EIA-603-1\_1998  
 Mode of operation : Carrier-on with modulation, Carrier tuned @ High channel=1660.46875 MHz  
 Power setting : Max. Power condition  
 Duty cycle : n/a  
 Antenna Gain : Max. 3.0 dBi  
 Environment Condition : Temp. 23 °C Humidity 45 %RH Supply voltage : 110 Vac

Frequency (MHz)	Received Power (dBuV)	Ant. Polarity	S.G Level (dBm)	Cable loss (dB)	Ant. Gain (dB)	EIRP Level (dBm)	Limit (dBm)
3320.945	22.40	V	-74.0	10.52	11.5	-73.02	-13
4981.397	14.10	V	-82.5	10.90	12.3	-81.10	-13
-	-			-		-	-
-	-			-		-	-
-	-			-		-	-

Supplementary information:  
 -. Limit §25.202(f) : 43+10log P max dBc = 47 dBc  
 -. Any emission having a level below than the above listed level was not reported.  
 -. Emission Level = Signal Generator output level - Cable loss + Antenna Gain(Substitution )  
 -. Spectrum analyser setting : RBW as specified in limit table, VBW as 3 times RBW, Peak Hold  
 -. Spectrum analyser noise floor was at least 6 dB below the specified limits.  
 -. EUT was positioned to 3 axis and worst case was Top side front (Z-axis ) position.

**Measurement Plots :** No plots provided.

**Remarks :** None

**Result of test**

Complied with the technical requirement of FCC 47 CFR Part 25 §25.202(f)(1), (2) and (3).

Complied  Failed



## 6.6 Power Limits

<b>TEST: RF Power limits</b>		
Method	To measure the EIRP, the EUT was placed on a table in a 10 meter test chamber. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. The receiving antenna was placed in 3 meter distance on the antenna mast. Both horizontal and vertical polarization of the antenna were measured by rotating the EUT. Measurement were performed on three orthogonal axis. The receiving level was recorded. The EUT was replaced with a substitution transmit antenna and signal generator. The TX power from the signal generator was tuned to get the same reading level of the predetermined receiving level. The signal generator output level, cable loss and substitution antenna gain were considered to calculate the EIRP..	
Reference Clause	§25.204(a), §2.1046	
Parameters required prior to the test	Laboratory Ambient Temperature	10 to 40 °C
	Relative Humidity	10 to 90 %
Parameters recorded during the test	Laboratory Ambient Temperature	23 °C
	Relative Humidity	45 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	1,624.5 MHz – 1,662.5 MHz	Antenna out port

### Configuration Settings

Power Interface Mode # (See Section 3.3)	Test Configurations Mode # (See Section 3.7)	EUT Operation Mode # (See 3.5)
1	2	1
Supplementary information: None		

### Limits of RF Power

(a) 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 +40 dBW in any 4 kHz band.
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

### Test Equipment Used

Description	Manufacturer	Model	Identifier	Cal. Due
Spectrum Analyzer	Agilent Technologies	E4440A	MY46186519	2009.03.29
RF Power Meter	Agilent Technologies	E4418B	MY45105913	2009.03.29
Power Sensor	Agilent Technologies	8481H	MY41092319	2009.03.29
Coaxial Attenuator	Agilent Technologies	8491B	90466	2009.03.29
High Pass Filter	Wainwright	WHK3.3/18G-10EF	10Z	2009.08.20

Programmable DC Power Supply	GW Instek	PSH-2050A	EH160824	2009.03.30
Test Receiver	Rohde & Schwarz	ESIB26	100359	2009.05.26
BiconiLog ANT	CBL6112D	Schaffner	21784	2010.04.21
Horn Antenna	EMCO	3115	00056768	2010.03.24
Horn Antenna	Rohde & Schwarz	BBHA9120D	539	2009.03.24
Position controller	Inn-co	CO 2000	11261105/L	-
Antenna Mast	Inn-co	MA 4000	-	-
Turntable	Inn-co	DT 3000	-	-
Temp & Humid Test Chamber	Climats	EX2213-HA	7558	2009.06.23

**Table 5. Test Result of Radiated RF Power**

Measurement method :  Radiated  Conducted  
 Measurement procedure : TIA/EIA-603-1\_1998  
 Mode of operation : Carrier-on with modulation, Carrier tuned @ Low, Mid and High channel  
 Power setting : Max. Power condition  
 Duty cycle : n/a  
 Antenna Gain : Max. 3.0 dBi  
 Environment Condition : Temp. 23 °C Humidity 45 %RH Supply voltage : 3.7 Vdc

**RF Power measurement**

Channel	Frequency (MHz)	Receiving Signal (dBm)	S.G Power (dBm)	Cable loss (dB)	Ant. Gain (dB)	EIRP (dBm)	Limit (dBm/dBW)
3	1626.59375	13.11	25.13	0.95	8.5	32.68	70 / 40
544	1643.50000	12.77	24.57	0.95	8.5	32.12	70 / 40
1087	1660.46875	12.33	24.14	0.95	8.5	31.69	70 / 40
-	-		-		-	-	-

Supplementary information:

- The correction value has been included the Emission level measured value with offset
- EIRP = S.G level -Cable loss + Antenna Factor
- The Spectrum analyzer was set to a 3kHz resolution bandwidth ad corresponding BW correction factor was added to the reading level (3K to 4K: 1.25dB)

**Measurement Plots :** No plots are provided.

**Remarks :** None

**Result of test**

Complied with the technical requirement of FCC 47 CFR Part 25 §25.204(a)

Complied  Failed

**Table 6. Test Result of RF Power at Antenna port**

Measurement method :  Radiated  Conducted  
 Measurement procedure : FCC 47 CFR Part 2 §2.1046(RF Output Power) , §2.1049(Occupied Bandwidth)  
 Mode of operation : Carrier-on with modulation, Carrier tuned @ Low, Mid and High channel  
 Power setting : Max. Power condition  
 Duty cycle : n/a  
 Antenna Gain : Max. 3.0 dBi  
 Environment Condition : Temp. 23 °C Humidity 45 %RH Supply voltage : 3.7 Vdc

**RF Power measurement**

Channel	Frequency (MHz)	Measured Power (dBm)	EIRP (dBm)	EIRP (dBW)	Emission Limit (dBm/dBW)
3	1626.59375	34.22	37.22	7.22	70 / 40
544	1643.50000	33.16	36.16	6.16	70 / 40
1087	1660.46875	33.88	36.88	6.88	70 / 40

**Occupied Bandwidth(20dB Bandwidth)**

Channel	Frequency (MHz)	20dB Bandwidth (kHz)	Norminated Bandwidth (kHz)	Bn Range
3	1626.59375	33.21	31.25	-
544	1643.50000	33.54	31.25	-
1087	1660.46875	32.86	31.25	-

**Measurement Plots :** Refer to the provided measurement plot in Annex 1 no. 1 - 6

**Remarks :**

**Result of test**

Complied with the technical requirement of FCC 47 CFR Part 25 §2.1046 and §2.1049

Complied  Failed

### 6.7 Limits on emissions for aeronautical radio navigation-satellite service

<b>TEST: Conducted emissions at Antenna port</b>		
Method	Measurements were made in the laboratory environment. Conducted spurious emission measurement was made using a direct connection between RF output of the EUT and spectrum analyzer through RF attenuator. Measurement has been performed with the EUT set to maximum output level at lowest and highest channel frequencies. The spectrum was investigated from 1,559 MHz to 1,610 MHz.	
Reference Clause	§25.216 (c), (h) & (i)	
Parameters required prior to the test	Laboratory Ambient Temperature	10 to 40 °C
	Relative Humidity	10 to 90 %
Parameters recorded during the test	Laboratory Ambient Temperature	23 °C
	Relative Humidity	45 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	1,559 MHz – 1,610 MHz	Antenna port

#### Configuration Settings

Power Interface Mode # (See Section 3.3)	Test Configurations Mode # (See Section 3.7)	EUT Operation Mode # (See 3.5)
1	1	1, 2
Supplementary information: None		

#### Limits

Frequency (MHz)	Maximum EIRP (dBW)	Resolution Bandwidth	Condition
1559 - 1605	-70	1 MHz	Carrier-on
1559 - 1605	-80	700 Hz	discrete
1605 - 1610	-70 to -46	1 MHz	Carrier-on
1605 - 1610	-80 to -56	700 Hz	discrete
1559 - 1610	-80	1	Carrier-off

Supplementary information: §25.216 (c), (h) & (i)

(c) The e.i.r.p. density of emissions from mobile earth stations with assigned uplink frequencies between 1610 MHz - 1660.5 MHz shall not exceed -70 dBW/MHz, averaged over any 2 millisecond active transmission interval, in the band 1559–1605 MHz.

The e.i.r.p. of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed -80 dBW, averaged over any 2 millisecond active transmission interval, in the 1559–1605 MHz band.

(h) Mobile earth stations with assigned uplink frequencies in the 1626.5–1660.5 MHz band shall suppress the power density of emissions in the 1605–1610 MHz band-segment to an extent determined by linear interpolation from -70 dBW/MHz at 1605 MHz to -46 dBW/MHz at 1610 MHz, averaged over any 2 millisecond active transmission interval.

The e.i.r.p. of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed a level

determined by linear interpolation from -80 dBW at 1605 MHz to -56 dBW at 1610 MHz, averaged over any 2 millisecond active transmission interval.

(i) The e.i.r.p density of carrier-off state emissions from mobile earth stations with assigned uplink frequencies between 1 and 3 GHz shall not exceed -80 dBW/MHz in the 1559–1610 MHz band averaged over any two millisecond interval.

**Test Equipment Used**

Description	Manufacturer	Model	Identifier	Cal. Due
Spectrum Analyzer	Agilent Technologies	E4440A	MY46186519	2009.03.29
RF Power Meter	Agilent Technologies	E4418B	MY45105913	2009.03.29
Power Sensor	Agilent Technologies	8481H	MY41092319	2009.03.29
Coaxial Attenuator	Agilent Technologies	8491B	90466	2009.03.29
High Pass Filter	Wainwright	WHK3.3/18G-10EF	10Z	2009.08.20
Programmable DC Power Supply	GW Instek	PSH-2050A	EH160824	2009.03.30
Temp & Humid Test Chamber	Climats	EX2213-HA	7558	2009.06.23

**Measurement Plots :** Refer to the provided measurement plot no. 46 - 52

**Remarks :**

Regarding the measurement with less than 700 Hz bandwidth, there was no detection of any discrete emissions from the mobile phone with this bandwidth. The test plots for 1MHz bandwidth as a worst case were reported.

**Result of test**

Complied with the technical requirement of FCC 47 CFR Part 25 §25.216 (c), (h) & (i), (2)

Complied                       Failed