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Project: 11CA51352  
File: TC8516  
Report: 11CA51352-FCC  
Date: November 25, 2011  
Model: Satellite Smart Phone Car Kit

## FCC Test Report

### Satellite Smart Phone Car Kit Model : SSPCK-001

For

**Intelibs, Inc.**  
1500 Stony Brook Road, Suite 385 Stony  
Brook, NY 11794

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Product : Satellite Smart Phone Car Kit  
FCC ID : Z69D01T4JX1

## 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: Digital EMC Co., Ltd.  
683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Kyunggi-Do, 449-080, Korea

Applicant: Intelibs, Inc.  
1500 Stony Brook Road, Suite 385 Stony Brook, NY 11794

Applicant Contact: Seyong Park

Manufacturer: AHN Inc.  
1107, IT Premier Tower, 345-50, Gasan-Dong, Geumcheon-Gu, Seoul, Korea

Manufacturer Contact: HyungWon, Ahn  
Title: Manager of R&D Center  
Phone: +82 2--868-6705  
Fax: +82 2-868-6760  
E-mail: hwahn@ahnspace.com

Equipment Class: TNB – Licensed Non-broadcast station Transmitter

Product Type: Satellite Smart Phone Car Kit

FCC ID: Z69D01T4JX1

Model Number: SSPCK-001

Sample Serial Number: Prototype

Test standards: FCC 47 CFR Part 25 : Satellite Communications\_Oct.01, 2011

Sample Serial Number: Prototype

Sample Receive Date: 2011-11-09

Testing Date: 2011-11-07 ~14

Test Report Date: 2011-11-25

**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.

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Product : Satellite Smart Phone Car Kit  
FCC ID : Z69D01T4JX1

## Summary of Testing

The following tests were performed on a sample submitted for evaluation of compliance with 47 CFR Part 25\_ 2011 Satellite Communications\_2 GHz Mobile-Satellite Service: 2000-2020 MHz User-to-Satellite link, 2180-2200 MHz:Satellite-to-User link.

No.	47 CFR Part 2, Part 25 Technical Requirements	Result Verdict	Remark
1	Frequency tolerance - §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:



SungHoon, Baek  
EMC Engineer  
UL Korea Ltd.

Reviewed By:



Jea Woon, Choi  
Senior EMC Engineer  
UL Korea Ltd.

## 1 General Product Information

### 1.1 Equipment Description

Satellite Smart Phone Car Kit is a signal booster which extends the reach and functionality of the TerreStar GENUS by enabling in-car mobile coverage with continuous power supply. This transceiver boost the radio signal from GENUS handset to satellite while it also amplifies the received signal from satellite.

### 1.2 Details of Test Equipment (EUT)

- Equipment Type : Satellite Mobile Signal Booster
- Trade name : Terrestar
- Model No. : SSPCK-001
- Product name : Satellite Smart Phone Car Kit
- Operating characteristic : 2GHz MSS(Mobile-Satellite Service):  
2000–2020 MHz: User-to-Satellite Link;  
2180–2200 MHz: Satellite-to-User Link
- Manufacturer : AHN Inc.  
1107,IT Premier Tower, 345-50, Gasan-Dong, Geumcheon-Gu, Seoul, Korea

### Equipment Configuration

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

No.	Product Type	Manufacturer	Model	Comments
1	Satellite Mobile Terminal	AHN Inc..	SSPCK-001	EUT
2	External Antenna	AHN Inc.	Car Kit Antenna	EUT

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Product : Satellite Smart Phone Car Kit  
FCC ID : Z69D01T4JX1

## Technical Data

Frequency Ranges : Tx : 2000 - 2020 MHz, Rx : 2180 - 2200 MHz  
Output power : Max. 34 dBm  
Gain : Tx : Max. 3.75 dB , Rx ; Max. 9 dB  
NF : Rx 2.31 dB typical  
V.S.W.R : <1.5:1  
Impedance : 50 ohm  
Kind of base-band signal : voice / circuit data / packet data/ fax  
Interface : Tx : SMA(F), Rx : SMA(M)  
Housing : Diecasting with Heat sink  
Working temperature : -20°C ~ 60°C  
Supply Voltage : +12Vdc 1.7A from Battery  
Size & Weight : 130 x 125 x 33.5(mm), 1.2 kg

Note ;

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

## Antenna Information

Antenna Type : Micro Strip cornical beam Antenna  
Manufacturer : AHN Inc.  
Gain dBi : Tx : 3.0 dBi ( $30^\circ < f < 60^\circ$ ), Rx : LHCP Max. 3.0 dBi ( $30^\circ < f < 60^\circ$ )  
Beam width : Azimuth  $360^\circ$  , Elevation :  $10^\circ \sim 60^\circ$

## Equipment Type :

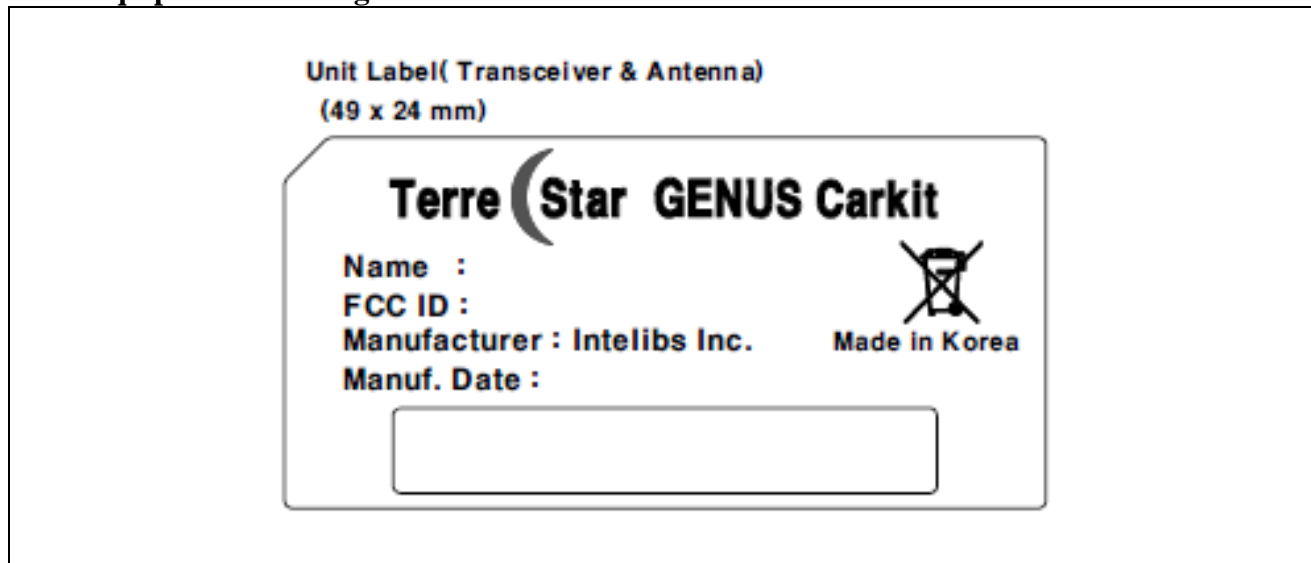
- ☐ Radio and ancillary equipment for fixed or semi-fixed use  
☒ Radio and ancillary equipment for vehicular mounted use  
☐ Radio and ancillary equipment for portable or handheld use
- ☒ Stand alone    ☐ Host connected    ☐ Host connected
- ☒ Self contained single unit    ☐ Module with associated connection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

## Technical descriptions and documents

The following documents was provided by the manufacturer.

No.	Document Title and Description
1	User manual
2	Installation Guide
3	Antenna Specification
4	Schematics
5	Block diagram

### 1.3 Equipment Marking Plate



## 2 Test Specification

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

### 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

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### 3 Test Conditions

#### 3.1 Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
EUT	Thuraya Repeater	Asia Pacific Satellite Industries Co., Ltd.	ThurayaSingle	Main Unit

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

#### 3.2 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	DC	< 3m	Unshield	Connected to external DC supply
2	Tx Ant	SMA	> 3m	Coaxial	Connected to external SAT. Antenna
3	Rx Ant	SMA	> 3m	Coaxial	Connected to external SAT. Antenna
4	RF cradle	SMA	> 3m	Coaxial	Connected to Cradle
5	DC out	DC	> 3m	Unshield	Connected to Cradle

Note:  
\*AC = AC Power Port      DC = DC Power Port      N/E = Non-Electrical  
I/O = Signal Input or Output Port (Not Involved in Process Control)  
TP = Telecommunication Ports

#### 3.3 Power Interface

Mode #	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	3.7 V	-	-	DC	-	Internal Battery Rating
1	12.0 V	-	-	DC	-	Normal operating voltage
2	10.2 V	-	-	DC	-	Battery End Point
3	13.8 V	-	-	DC	-	Battery Full charged voltage



### 3.4 Operating Frequency & Mode

Mode #	Bandwidth	Modulation Type	Test Frequency (MHz)		
			Lowest	Middle	Highest
1	31.25kHz	$\pi/2$ BPSK	2000.015625	2009.984375	2019.984375
2	31.25kHz	$\pi/4$ QPSK	2000.015625	2009.984375	2019.984375
3	62.5 kHz	$\pi/4$ QPSK	2000.031250	2010.000000	2019.968750
4	156.25 kHz	$\pi/4$ QPSK	2000.078125	2009.984375	2019.921875
Note : - The Equipment Under Test (EUT) is set in continuous transmission in the above indicated channels with different modulation modes and nominal bandwidths using a PC laptop and AT commands.					

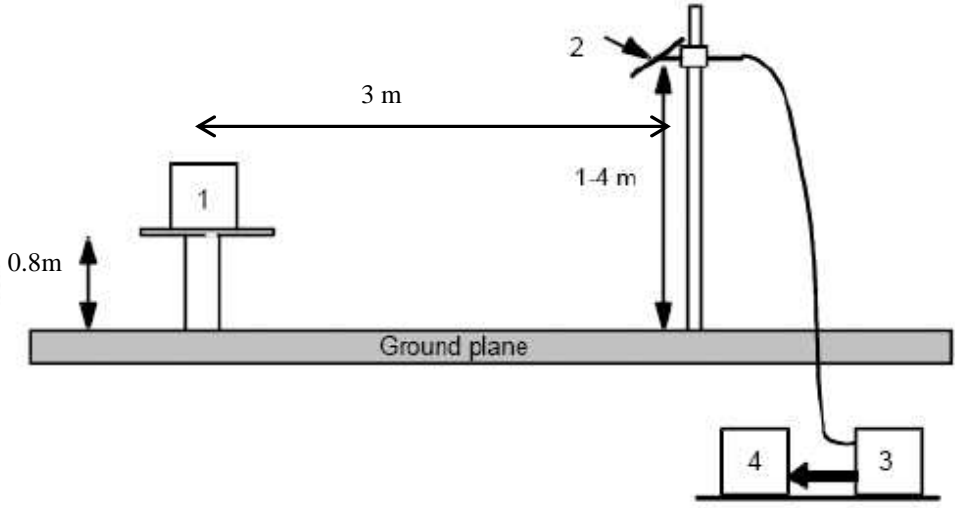
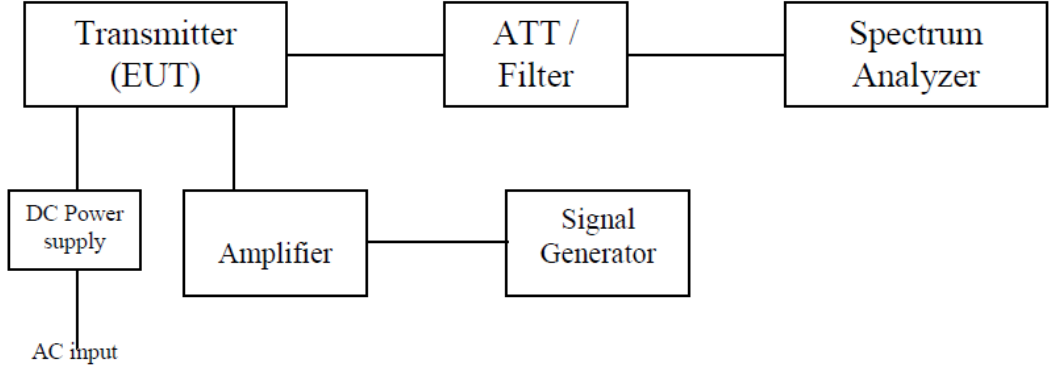
### 3.5 Operating Condition

Mode #	Bandwidth	Level of Input Signal
1	31.25kHz	-8.7 dBm
2	31.25kHz	-8.6 dBm
3	62.5 kHz	-8.5 dBm
4	156.25 kHz	-8.0 dBm
Note : Carrier modulation mode: RF carrier signal from the Mobile transceiver was applied to the input of the booster with the representative modulation by the test program connected to the notebook PC.		

### 3.6 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	+12Vdc (Rated nominal voltage)	10.2Vdc – 13.8 Vdc
Note ; - The extreme condition is applied to the boundary limits of the declared operational environmental condition by the manufacturer.		

### 3.7 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>Test Configuration of Radiated Measurement</p>
2	 <p>Test Configuration of Conducted Measurement</p>

## 4 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.

### 4.1 Power limits

Reference : FCC 47 CFR Part 25 Satellite Communications\_Oct. 01, 2011

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

### 4.2 Emission Limitations

Reference : FCC 47 CFR Part 25 Satellite Communications\_Oct. 01, 2011

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

### 4.3 Emission Limitations

Reference : FCC 47 CFR Part 25 Satellite Communications\_Oct. 01, 2011

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

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

Reference : FCC 47 CFR Part 25 Satellite Communications\_Oct. 01, 2011

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

#### 4.5 Frequency Tolerance of Earth stations

Reference : FCC 47 CFR Part 25 Satellite Communications\_Oct. 01, 2011

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 Test Results

### 5.1 Power Limits

	<b>TEST: RF Power limits</b>	
Method	<u>Effective Radiated Power Output Measurements by Substitution Method according to ANSI/TIA/EIA-603-C 2004</u> 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. 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	2000 MHz – 2020 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.
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### Test Equipment Used

	Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Cal.Du date (yy/mm/dd)	S/N
<input checked="" type="checkbox"/>	Spectrum Analyzer	Agilent	E4440A	11/09/30	12/09/30	MY45304199
<input checked="" type="checkbox"/>	Digital Multimeter	H.P	34401A	11/03/07	12/03/07	3146A13475, US36122178
<input checked="" type="checkbox"/>	Signal Generator	Rohde Schwarz	SMR20	11/03/08	12/03/08	101251
<input checked="" type="checkbox"/>	Vector Signal Generator	Rohde Schwarz	SMJ100A	11/01/11	12/01/11	100148
<input checked="" type="checkbox"/>	Thermo hygrometer	BODYCOM	BJ5478	11/01/13	12/01/13	090205-2
<input checked="" type="checkbox"/>	DC Power Supply	HP	6622A	11/03/07	12/03/07	3448A03760
<input checked="" type="checkbox"/>	High-pass filter	Wainwright	WHNX3.0	11/09/30	12/09/30	9
<input checked="" type="checkbox"/>	HORN ANT	ETS	3115	11/09/06	12/09/06	21097
<input checked="" type="checkbox"/>	HORN ANT	ETS	3115	11/03/22	12/03/22	6419
<input checked="" type="checkbox"/>	HORN ANT	A.H.Systems	SAS-574	11/03/25	13/03/25	154
<input checked="" type="checkbox"/>	HORN ANT	A.H.Systems	SAS-574	11/03/25	13/03/25	155
<input checked="" type="checkbox"/>	HORN ANT	SCHWARZBECK	BBHA9120A	10/04/13	12/04/13	322
<input checked="" type="checkbox"/>	Dipole Antenna	Schwarzbeck	VHA9103	10/11/29	11/11/29	2116
<input checked="" type="checkbox"/>	Dipole Antenna	Schwarzbeck	VHA9103	10/11/29	11/11/29	2117
<input checked="" type="checkbox"/>	Dipole Antenna	Schwarzbeck	UHA9105	10/11/29	11/11/29	2261
<input checked="" type="checkbox"/>	Dipole Antenna	Schwarzbeck	UHA9105	10/11/29	11/11/29	2262
<input checked="" type="checkbox"/>	Attenuator (3dB)	WEINSCHL	56-3	11/09/30	12/09/30	Y2342
<input checked="" type="checkbox"/>	Attenuator (10dB)	WEINSCHL	23-10-34	11/09/30	12/09/30	BP4386
<input checked="" type="checkbox"/>	Attenuator (10dB)	WEINSCHL	86-10-11	11/09/30	12/09/30	446
<input checked="" type="checkbox"/>	Amplifier (30dB)	H.P	8449B	11/03/07	12/03/07	3008A00370
<input checked="" type="checkbox"/>	Amplifier	EMPOWER	BBS3Q7ELU	11/09/30	12/09/30	1020
<input checked="" type="checkbox"/>	BILOG ANTENNA	SCHAFFNER	CBL6112B	10/07/14	12/07/14	2737
<input checked="" type="checkbox"/>	Amplifier (25dB)	Agilent	8447D	11/03/07	12/03/07	2944A10144
<input checked="" type="checkbox"/>	Vector signal Generator	Agilent	E4438C	11/08/05	12/08/05	MY42082928

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**Table 1. Test Result of RF Output Power (Conducted EIRP)**

Measurement method : ☐ Radiated ☒ Conducted

Measurement procedure : FCC 47 CFR Part 2 §2.1046(RF Output Power) , §2.1049(Occupied Bandwidth)

Mode of operation : Max. power at each modulation

Antenna Gain : Max. 3.0 dBi

Environment Condition : Temp. 18 °C Humidity 40 %RH Supply voltage : 12.0 Vdc

**RF Output Power conducted**

Mode	Bandwidth	Modulation Type	RF Output Power(dBm / W)					
			Low		Mid		High	
1	31.25kHz	$\pi/2$ BPSK	<b>35.53</b>	3.573	34.95	3.126	34.24	2.655
2	31.25kHz	$\pi/4$ QPSK	<b>34.84</b>	3.048	34.52	2.831	33.85	2.427
3	62.5 kHz	$\pi/4$ QPSK	<b>35.49</b>	3.540	34.93	3.112	34.24	2.655
4	156.25 kHz	$\pi/4$ QPSK	<b>35.74</b>	3.750	35.17	3.289	34.62	2.897
Note : -. The conducted RF Output power measurements were made at the RF output terminals of the EUT using an attenuator and a spectrum analyzer. The EUT was set in continuous transmission and different modes of modulation and nominal bandwidths.								

**EIRP Power conducted**

Mode	Frequency (MHz)	Measured Power (dBm)	EIRP (dBm)	EIRP (dBW)	Emission Limit (dBm/dBW)
1	2000.015625	<b>35.53</b>	<b>38.53</b>	8.53	70 / 40
	2009.984375	34.95	37.95	7.95	70 / 40
	2019.984375	34.24	37.24	7.24	70 / 40
2	2000.015625	<b>34.84</b>	<b>37.84</b>	7.84	70 / 40
	2009.984375	34.52	37.52	7.52	70 / 40
	2019.984375	33.85	36.85	6.85	70 / 40
3	2000.031250	<b>35.49</b>	<b>38.49</b>	8.49	70 / 40
	2010.000000	34.93	37.93	7.93	70 / 40
	2019.968750	34.24	37.24	7.24	70 / 40
4	2000.078125	<b>35.74</b>	<b>38.74</b>	8.74	70 / 40
	2009.984375	35.17	38.17	8.17	70 / 40
	2019.921875	34.62	37.62	7.62	70 / 40

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**Table 2. Test Result of Occupied Bandwidth**

**Occupied Bandwidth (99% Bandwidth)**

Mode	Nominal Bandwidth	Modulation Type	Occupied Bandwidth (kHz)		
			Lowest	Middle	Highest
1	31.25 kHz	$\pi/2$ BPSK	27.0956	27.1212	27.0707
2	31.25 kHz	$\pi/4$ QPSK	27.3185	27.2861	27.3017
3	62.50 kHz	$\pi/4$ QPSK	55.7292	56.3313	56.2336
4	156.25 kHz	$\pi/4$ QPSK	110.966	110.671	110.284

**Occupied Bandwidth (26 dBc Bandwidth)**

Mode	Nominal Bandwidth	Modulation Type	Occupied Bandwidth (kHz)		
			Lowest	Middle	Highest
1	31.25 kHz	$\pi/2$ BPSK	31.545	31.644	31.617
2	31.25 kHz	$\pi/4$ QPSK	31.237	31.313	31.185
3	62.50 kHz	$\pi/4$ QPSK	61.712	61.552	61.787
4	156.25 kHz	$\pi/4$ QPSK	124.49	124.61	124.63

**Measurement Plots :** Refer to the provided measurement plot in Annex 1 page 1 - 12

**Remarks :**

**Result of test**

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

☒ Complied

☐ Failed



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**Table 3. Test Result of Radiated RF Output Power (EIRP)**

Measurement method : ☒ Radiated ☐ Conducted

Measurement procedure : TIA/EIA-603-C 2004

Mode of operation : Carrier-on with modulation, Carrier tuned @ Low, Mid and High channel

Power setting : Max. Power condition

Antenna Gain : Max. 3.0 dBi

Environment Condition : Temp. 18 °C Humidity 40 %RH Supply voltage : 12.0.7 Vdc

**RF Power measurement EIRP**

Mode	Frequency (MHz)	Pol. (H/V)	S.A Reading (dBm)	S.G Power (dBm)	Ant. Gain (dB)	EIRP (dBm)	Corrcted EIRP	
							dBm	W
1	2000.015625	V	-3.59	26.42	9.05	35.47	36.72	4.699
	2009.984375	V	-5.06	24.97	9.06	34.03	35.28	3.373
	2019.984375	V	-5.53	24.54	9.06	33.6	34.85	3.055
2	2000.015625	V	-6.34	23.67	9.05	32.72	33.97	2.495
	2009.984375	V	-7.63	22.40	9.06	31.46	32.71	1.866
	2019.984375	V	-7.67	22.40	9.06	31.46	32.71	1.866
3	2000.031250	V	-5.38	24.63	9.05	33.68	34.93	3.112
	2010.000000	V	-6.99	23.04	9.06	32.1	33.35	2.163
	2019.968750	V	-6.76	23.31	9.06	32.37	33.62	2.301
4	2000.078125	V	-9.43	20.58	9.05	29.63	30.88	1.225
	2009.984375	V	-10.92	19.11	9.06	28.17	29.42	0.875
	2019.921875	V	-10.79	19.28	9.06	28.34	29.59	0.91

Supplementary information:

- . The Spectrum analyzer was set to a 3kHz resolution bandwidth and corresponding 4kHz BW correction factor 1.25dB was added to the EIRP level
- . BW correction factor =  $10\log(4\text{kHz}/3\text{kHz}) = 1.25 \text{ dB}$

**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

## 5.2 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 50 ohm attenuator connection between RF output of the EUT and spectrum analyzer. The reading of the spectrum analyzer is corrected with the attenuation loss. The resolution bandwidth used is 3 kHz and an additional correction of 1.25 dB ( $10 \cdot \log 4/3$ ) is added to the instrument reading to extrapolate the result for 4 kHz measurement bandwidth. 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	$-(43+10\log(P_{max}))$	4 kHz	Peak Hold

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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

	Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Cal.Du date (yy/mm/dd)	S/N
<input checked="" type="checkbox"/>	Spectrum Analyzer	Agilent	E4440A	11/09/30	12/09/30	MY45304199
<input checked="" type="checkbox"/>	TEMP & HUMIDITY Chamber	JISCO	KR-100/J-RHC2	11/09/30	12/09/30	30604493/021031
<input checked="" type="checkbox"/>	Digital Multimeter	H.P	34401A	11/03/07	12/03/07	3146A13475, US36122178
<input checked="" type="checkbox"/>	Signal Generator	Rohde Schwarz	SMR20	11/03/08	12/03/08	101251
<input checked="" type="checkbox"/>	Vector Signal Generator	Rohde Schwarz	SMJ100A	11/01/11	12/01/11	100148
<input checked="" type="checkbox"/>	Thermo hygrometer	BODYCOM	BJ5478	11/01/13	12/01/13	090205-2
<input checked="" type="checkbox"/>	DC Power Supply	HP	6622A	11/03/07	12/03/07	3448A03760
<input checked="" type="checkbox"/>	High-pass filter	Wainwright	WHNX3.0	11/09/30	12/09/30	9
<input checked="" type="checkbox"/>	Attenuator (3dB)	WEINSCHL	56-3	11/09/30	12/09/30	Y2342
<input checked="" type="checkbox"/>	Attenuator (10dB)	WEINSCHL	23-10-34	11/09/30	12/09/30	BP4386
<input checked="" type="checkbox"/>	Attenuator (10dB)	WEINSCHL	86-10-11	11/09/30	12/09/30	446
<input checked="" type="checkbox"/>	Amplifier (30dB)	H.P	8449B	11/03/07	12/03/07	3008A00370
<input checked="" type="checkbox"/>	Amplifier	EMPOWER	BBS3Q7ELU	11/09/30	12/09/30	1020
<input checked="" type="checkbox"/>	BILOG ANTENNA	SCHAFFNER	CBL6112B	10/07/14	12/07/14	2737
<input checked="" type="checkbox"/>	Amplifier (25dB)	Agilent	8447D	11/03/07	12/03/07	2944A10144
<input checked="" type="checkbox"/>	Vector signal Generator	Agilent	E4438C	11/08/05	12/08/05	MY42082928

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**Table 4. Test Result of Conducted Spurious Emissions**

Measurement method : ☐ Radiated ☒ Conducted

Power setting : Max. Power condition

Antenna Gain : Max. 3.0 dBi

Environment Condition : Temp. 18 °C Humidity 40 %RH Supply voltage : 12.0.7 Vdc

Normal BW (kHz)	Modulation Type	Channel	Result			Limit (dBm)	Margin (dB)
			Frequency (MHz)	3kHz BW (dBm)	4kHz BW (dBm)		
31.25	$\pi/2$ BPSK	Lowest	4000.0308	-35.34	-34.09	-13.00	21.09
			6000.0464	-21.66	-20.41	-13.00	7.41
			8000.0613	-30.14	-28.89	-13.00	15.89
			1000.0769	-31.70	-30.45	-13.00	17.45
		Middle	4019.9680	-27.27	-26.02	-13.00	13.02
			6029.9525	-21.47	-20.22	-13.00	7.22
			8039.9364	-30.77	-29.52	-13.00	16.52
			10049.8848	-35.66	-34.41	-13.00	21.41
		Highest	4039.9679	-36.69	-35.44	-13.00	22.44
			6059.9523	-23.60	-22.35	-13.00	9.35
			8079.9363	-32.38	-31.13	-13.00	18.13
			10099.9207	-35.73	-34.48	-13.00	21.48

NBW (kHz)	Modulation Type	Channel	Result			Limit (dBm)	Margin (dB)
			Frequency (MHz)	3kHz BW (dBm)	4kHz BW (dBm)		
31.25	$\pi/4$ QPSK	Lowest	4000.0130	-36.69	-35.44	-13.00	22.44
			6000.0560	-23.60	-22.35	-13.00	9.35
			8000.0490	-32.38	-31.13	-13.00	18.13
			10000.0940	-35.73	-34.48	-13.00	21.48
		Middle	4019.9500	-29.87	-28.62	-13.00	15.62
			6029.6290	-22.55	-21.30	-13.00	8.30
			8039.9010	-34.09	-32.84	-13.00	19.84
			10049.8940	-36.28	-35.03	-13.00	22.03
		Highest	4039.9506	-31.88	-30.63	-13.00	17.63
			6059.9617	-36.32	-35.07	-13.00	22.07
			8079.9009	-35.48	-34.23	-13.00	21.23
			10099.9375	-40.38	-39.13	-13.00	26.13

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NBW (kHz)	Modulation Type	Channel	Result			Limit (dBm)	Margin (dB)
			Frequency (MHz)	3kHz BW (dBm)	4kHz BW (dBm)		
62.5	$\pi/4$ QPSK	Lowest	4000.0676	-33.62	-32.37	-13.00	19.37
			6000.1014	-21.48	-20.23	-13.00	7.23
			8000.1358	-31.65	-30.40	-13.00	17.40
			10000.1699	-33.18	-31.93	-13.00	18.93
		Middle	4020.0050	-27.84	-26.59	-13.00	13.59
			6030.0080	-21.48	-20.23	-13.00	7.23
			8040.0105	-30.43	-29.18	-13.00	16.18
			10050.0131	-33.21	-31.96	-13.00	18.96
		Highest	4039.9431	-30.73	-29.48	-13.00	16.48
			6059.9144	-35.18	-33.93	-13.00	20.93
			8079.8853	-32.20	-30.95	-13.00	17.95
			10099.8568	-37.11	-35.86	-13.00	22.86

NBW (kHz)	Modulation Type	Channel	Result			Limit (dBm)	Margin (dB)
			Frequency (MHz)	3kHz BW (dBm)	4kHz BW (dBm)		
156.25	$\pi/4$ QPSK	Lowest	4000.1788	-37.66	-36.41	-13.00	23.41
			6000.2691	-25.10	-23.85	-13.00	10.85
			8000.3575	-32.40	-31.15	-13.00	18.15
			10000.4487	-34.46	-33.21	-13.00	20.21
		Middle	4019.9919	-29.14	-27.89	-13.00	14.89
			6029.9884	-25.12	-23.87	-13.00	10.87
			8039.9824	-33.40	-32.15	-13.00	19.15
			10049.9784	-35.41	-34.16	-13.00	21.16
		Highest	4039.8665	-31.81	-30.56	-13.00	17.56
			6059.7996	-38.26	-37.01	-13.00	24.01
			8079.7334	-32.55	-31.30	-13.00	18.30
			10099.6669	-40.74	-39.49	-13.00	26.49

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**Measurement Plots :** Refer to the provided measurement plot in Annex A1. Page 13 - 24.

**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

### 5.3 Emission limitations : Field strength spurious radiation

	<b>TEST: Field strength of spurious radiation : Radiated Measurements</b>	
Method	<u>Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-C 2004:</u> 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. 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

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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

	Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Cal.Du date (yy/mm/dd)	S/N
<input checked="" type="checkbox"/>	Spectrum Analyzer	Agilent	E4440A	11/09/30	12/09/30	MY45304199
<input checked="" type="checkbox"/>	TEMP & HUMIDITY Chamber	JISCO	KR-100/J-RHC2	11/09/30	12/09/30	30604493/021031
<input checked="" type="checkbox"/>	Digital Multimeter	H.P	34401A	11/03/07	12/03/07	3146A13475, US36122178
<input checked="" type="checkbox"/>	Signal Generator	Rohde Schwarz	SMR20	11/03/08	12/03/08	101251
<input checked="" type="checkbox"/>	Vector Signal Generator	Rohde Schwarz	SMJ100A	11/01/11	12/01/11	100148
<input checked="" type="checkbox"/>	Thermo hygrometer	BODYCOM	BJ5478	11/01/13	12/01/13	090205-2
<input checked="" type="checkbox"/>	DC Power Supply	HP	6622A	11/03/07	12/03/07	3448A03760
<input checked="" type="checkbox"/>	High-pass filter	Wainwright	WHNX3.0	11/09/30	12/09/30	9
<input checked="" type="checkbox"/>	HORN ANT	ETS	3115	11/09/06	12/09/06	21097
<input checked="" type="checkbox"/>	HORN ANT	ETS	3115	11/03/22	12/03/22	6419
<input checked="" type="checkbox"/>	HORN ANT	A.H.Systems	SAS-574	11/03/25	13/03/25	154
<input checked="" type="checkbox"/>	HORN ANT	A.H.Systems	SAS-574	11/03/25	13/03/25	155
<input checked="" type="checkbox"/>	HORN ANT	SCHWARZBECK	BBHA9120A	10/04/13	12/04/13	322
<input checked="" type="checkbox"/>	Dipole Antenna	Schwarzbeck	VHA9103	10/11/29	11/11/29	2116
<input checked="" type="checkbox"/>	Dipole Antenna	Schwarzbeck	VHA9103	10/11/29	11/11/29	2117
<input checked="" type="checkbox"/>	Dipole Antenna	Schwarzbeck	UHA9105	10/11/29	11/11/29	2261
<input checked="" type="checkbox"/>	Dipole Antenna	Schwarzbeck	UHA9105	10/11/29	11/11/29	2262
<input checked="" type="checkbox"/>	Attenuator (3dB)	WEINSCHL	56-3	11/09/30	12/09/30	Y2342
<input checked="" type="checkbox"/>	Attenuator (10dB)	WEINSCHL	23-10-34	11/09/30	12/09/30	BP4386
<input checked="" type="checkbox"/>	Attenuator (10dB)	WEINSCHL	86-10-11	11/09/30	12/09/30	446
<input checked="" type="checkbox"/>	Amplifier (30dB)	H.P	8449B	11/03/07	12/03/07	3008A00370
<input checked="" type="checkbox"/>	Amplifier	EMPOWER	BBS3Q7ELU	11/09/30	12/09/30	1020
<input checked="" type="checkbox"/>	BILOG ANTENNA	SCHAFFNER	CBL6112B	10/07/14	12/07/14	2737
<input checked="" type="checkbox"/>	Amplifier (25dB)	Agilent	8447D	11/03/07	12/03/07	2944A10144
<input checked="" type="checkbox"/>	Vector signal Generator	Agilent	E4438C	11/08/05	12/08/05	MY42082928



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**Table 5 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 @ L, M, H channels

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

**Mode 1 : Norminal BW 31.25 kHz with  $\pi/2$  BPSK**

Measured Frequency (MHz)	Pol. (H/V)	S.A Reading (dBm)	S.G Power (dBm)	Ant. Gain (dB)	Corrcted EIRP		Limit (dBm)	Margin (dB)
					dBm	W		
Lowest channel Tuned :								
4000.032	V	-37.40	-35.05	9.70	-25.35	-24.10	-13	11.10
6000.047	V	-41.58	-39.76	11.36	-28.4	-27.15	-13	14.15
8000.062	V	-55.06	-48.84	11.39	-37.45	-36.20	-13	23.20
10000.08	V	-63.17	-54.75	12.30	-42.45	-41.20	-13	28.20
Middle channel Tuned :								
4019.968	V	-35.24	-32.49	9.72	-22.77	-21.52	-13	8.52
6029.953	V	-45.67	-43.11	11.37	-31.74	-30.49	-13	17.49
8039.937	V	-56.52	-49.04	11.38	-37.66	-36.41	-13	23.41
10049.92	V	-60.37	-52.15	12.32	-39.83	-38.58	-13	25.58
Highest channel Tuned :								
4039.969	V	-41.62	-37.85	9.74	-28.11	-26.86	-13	13.86
6059.953	V	-54.27	-50.49	11.38	-39.11	-37.86	-13	24.86
8079.937	V	-62.71	-53.09	11.37	-41.72	-40.47	-13	27.47
10099.92	V	-70.82	-56.34	12.33	-44.01	-42.76	-13	29.76

Supplementary information:

- . Limit §25.202(f) :  $43+10\log P$  max dBc = 47 dBc or -13 dBm
- . Any emission having a level below than the above listed level was not reported.
- . EIRP 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
- . The resolution bandwidth used for measuring each emission peak detected is 3 kHz and an additional correction of 1.25 dB ( $10*\log 4/3$ ) is added to the instrument reading to extrapolate the result for 4 kHz measurement bandwidth.
- . Frequency range 30 MHz-1000 MHz : No spurious signals were found in all the range.

**Mode 2 : Norminal BW 31.25 kHz with  $\pi/4$  QPSK**

Measured Frequency (MHz)	Pol. (H/V)	S.A Reading (dBm)	S.G Power (dBm)	Ant. Gain (dB)	Corrcted EIRP		Limit (dBm)	Margin (dB)
					dBm	W		
Lowest channel Tuned :								
4000.0317	V	-46.06	-43.71	9.70	-34.01	-32.76	-13	19.76
6000.0549	V	-48.21	-46.39	11.36	-35.03	-33.78	-13	20.78
8000.0506	V	-59.54	-53.32	11.39	-41.93	-40.68	-13	27.68
10000.059	V	-67.65	-59.23	12.30	-46.93	-45.68	-13	32.68
Middle channel Tuned :								
4019.969	V	-43.91	-41.16	9.72	-31.44	-30.19	-13	17.19
6029.9488	V	-52.32	-49.76	11.37	-38.39	-37.14	-13	24.14
8039.9256	V	-60.98	-53.50	11.38	-42.12	-40.87	-13	27.87
10049.942	V	-67.24	-56.32	12.32	-44	-42.75	-13	29.75
Highest channel Tuned :								
4039.9664	V	-50.30	-46.53	9.74	-36.79	-35.54	-13	22.54
6059.9455	V	-60.91	-57.13	11.38	-45.75	-44.50	-13	31.5
8079.9255	V	-67.22	-57.60	11.37	-46.23	-44.98	-13	31.98
10099.903	V	-74.88	-60.40	12.33	-48.07	-46.82	-13	33.82

Supplementary information:

- . Limit §25.202(f) :  $43+10\log P$  max dBc = 47 dBc or -13 dBm
- . Any emission having a level below than the above listed level was not reported.
- . EIRP 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
- . The resolution bandwidth used for measuring each emission peak detected is 3 kHz and an additional correction of 1.25 dB ( $10*\log 4/3$ ) is added to the instrument reading to extrapolate the result for 4 kHz measurement bandwidth.
- . Frequency range 30 MHz-1000 MHz : No spurious signals were found in all the range.

**Mode 3 : Norminal BW 62.5 kHz with  $\pi/4$  QPSK**

Measured Frequency (MHz)	Pol. (H/V)	S.A Reading (dBm)	S.G Power (dBm)	Ant. Gain (dB)	Corrcted EIRP		Limit (dBm)	Margin (dB)
					dBm	W		
Lowest channel Tuned :								
4000.0547	V	-45.28	-42.93	9.7	-33.23	-31.98	-13	18.98
6000.1065	V	-48.39	-46.57	11.36	-35.21	-33.96	-13	20.96
8000.1012	V	-57.83	-51.61	11.39	-40.22	-38.97	-13	25.97
10000.117	V	-63.33	-54.91	11.3	-43.61	-42.36	-13	29.36
Middle channel Tuned :								
4019.992	V	-43.13	-40.38	9.72	-30.66	-29.41	-13	16.41
6029.973	V	-52.5	-49.94	11.70	-38.24	-36.99	-13	23.99
8039.977	V	-59.27	-41.79	11.38	-30.41	-29.16	-13	16.16
10049.958	V	-62.92	-52.00	12.32	-39.68	-38.43	-13	25.43
Highest channel Tuned :								
4039.917	V	-49.52	-45.75	9.74	-36.01	-34.76	-13	21.76
6059.919	V	-61.09	-57.31	11.38	-45.93	-44.68	-13	31.68
8079.899	V	-65.51	-55.89	11.37	-44.52	-43.27	-13	30.27
10099.878	V	-70.56	-56.08	12.33	-43.75	-42.50	-13	29.50

Supplementary information:

- . Limit §25.202(f) :  $43+10\log P$  max dBc = 47 dBc or -13 dBm
- . Any emission having a level below than the above listed level was not reported.
- . EIRP 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
- . The resolution bandwidth used for measuring each emission peak detected is 3 kHz and an additional correction of 1.25 dB ( $10\log 4/3$ ) is added to the instrument reading to extrapolate the result for 4 kHz measurement bandwidth.
- . Frequency range 30 MHz-1000 MHz : No spurious signals were found in all the range.

**Mode 4 : Norminal BW 156.25 kHz with  $\pi/4$  QPSK**

Measured Frequency (MHz)	Pol. (H/V)	S.A Reading (dBm)	S.G Power (dBm)	Ant. Gain (dB)	Corrcted EIRP		Limit (dBm)	Margin (dB)
					dBm	W		
Lowest channel Tuned :								
4000.1482	V	-45.03	-42.68	9.7	-32.98	-31.73	-13	18.73
6000.247	V	-47.3	-45.5	11.36	-34.14	-32.89	-13	19.89
8000.2879	V	-58.16	-51.94	11.39	-40.55	-39.3	-13	26.3
10000.47	V	-65.47	-57.05	12.3	-44.75	-43.5	-13	30.5
Middle channel Tuned :								
4019.963	V	-42.88	-40.13	9.72	-30.41	-29.16	-13	16.16
6029.939	V	-51.43	-48.87	11.37	-37.50	-36.25	-13	23.25
8039.985	V	-59.60	-52.12	11.38	-40.74	-39.49	-13	26.49
10049.838	V	-65.06	-54.14	12.32	-41.82	-40.57	-13	27.57
Highest channel Tuned :								
439.837	V	-36.98	-45.50	9.74	-35.76	-34.51	-13	21.51
6059.753	V	-45.01	-56.24	11.38	-44.86	-43.61	-13	30.61
8079.941	V	-44.32	-56.22	11.37	-44.85	-43.60	-13	30.60
10099.527	V	-46.92	-58.21	12.33	-45.88	-44.63	-13	31.63

Supplementary information:

- . Limit §25.202(f) :  $43+10\log P$  max dBc = 47 dBc or -13 dBm
- . Any emission having a level below than the above listed level was not reported.
- . EIRP 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
- . The resolution bandwidth used for measuring each emission peak detected is 3 kHz and an additional correction of 1.25 dB ( $10*\log 4/3$ ) is added to the instrument reading to extrapolate the result for 4 kHz measurement bandwidth.
- . Frequency range 30 MHz-1000 MHz : No spurious signals were found in all the range.

**Measurement Plots :** Refer to the provided measurement plot in Annex A1. Page 25 - 32.

**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

## 5.4 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 (e)	
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 - 1610	-70	1 MHz	Carrier-on
1559 - 1605	-80	700 Hz	discrete
1605 - 1610	-80	700Hz	discrete
1559 - 1610	-80	1	Carrier-off

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

(e) The e.i.r.p density of emissions from mobile earth stations with assigned uplink frequencies between 1990 MHz and 2025 MHz shall not exceed –70 dBW/MHz, averaged over any 2 millisecond active transmission interval, in frequencies between 1559 MHz and 1610 MHz. The e.i.r.p. of discrete emissions of less than 700 Hz bandwidth from such stations between 1559 MHz and 1605 MHz shall not exceed –80 dBW, 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 between 1605 MHz and 1610 MHz manufactured more than six months after Federal Register publication of the rule changes adopted in FCC 03–283 shall not exceed –80 dBW, 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

	Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Cal.Du date (yy/mm/dd)	S/N
<input checked="" type="checkbox"/>	Spectrum Analyzer	Agilent	E4440A	11/09/30	12/09/30	MY45304199
<input checked="" type="checkbox"/>	TEMP & HUMIDITY Chamber	JISCO	KR-100/J-RHC2	11/09/30	12/09/30	30604493/021031
<input checked="" type="checkbox"/>	Digital Multimeter	H.P	34401A	11/03/07	12/03/07	3146A13475, US36122178
<input checked="" type="checkbox"/>	Signal Generator	Rohde Schwarz	SMR20	11/03/08	12/03/08	101251
<input checked="" type="checkbox"/>	Vector Signal Generator	Rohde Schwarz	SMJ100A	11/01/11	12/01/11	100148
<input checked="" type="checkbox"/>	Thermo hygrometer	BODYCOM	BJ5478	11/01/13	12/01/13	090205-2
<input checked="" type="checkbox"/>	DC Power Supply	HP	6622A	11/03/07	12/03/07	3448A03760
<input checked="" type="checkbox"/>	High-pass filter	Wainwright	WHNX3.0	11/09/30	12/09/30	9
<input checked="" type="checkbox"/>	Attenuator (3dB)	WEINSCHL	56-3	11/09/30	12/09/30	Y2342
<input checked="" type="checkbox"/>	Attenuator (10dB)	WEINSCHL	23-10-34	11/09/30	12/09/30	BP4386
<input checked="" type="checkbox"/>	Attenuator (10dB)	WEINSCHL	86-10-11	11/09/30	12/09/30	446
<input checked="" type="checkbox"/>	Amplifier (30dB)	H.P	8449B	11/03/07	12/03/07	3008A00370
<input checked="" type="checkbox"/>	Amplifier	EMPOWER	BBS3Q7ELU	11/09/30	12/09/30	1020
<input checked="" type="checkbox"/>	BILOG ANTENNA	SCHAFFNER	CBL6112B	10/07/14	12/07/14	2737
<input checked="" type="checkbox"/>	Amplifier (25dB)	Agilent	8447D	11/03/07	12/03/07	2944A10144
<input checked="" type="checkbox"/>	Vector signal Generator	Agilent	E4438C	11/08/05	12/08/05	MY42082928

**Measurement Plots :** Refer to the provided measurement plot in page 33.

#### 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 (e) & (i)

☒ Complied

☐ Failed

## 5.5 Frequency Stability Test

	<b>TEST: Frequency Tolerance of Earth-mobile stations</b>	
Method	<p>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</p> <p>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.</p>	
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	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

	Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Cal.Du date (yy/mm/dd)	S/N
<input checked="" type="checkbox"/>	Spectrum Analyzer	Agilent	E4440A	11/09/30	12/09/30	MY45304199
<input checked="" type="checkbox"/>	TEMP & HUMIDITY Chamber	JISCO	KR-100/J-RHC2	11/09/30	12/09/30	30604493/021031
<input checked="" type="checkbox"/>	Digital Multimeter	H.P	34401A	11/03/07	12/03/07	3146A13475, US36122178
<input checked="" type="checkbox"/>	Thermo hygrometer	BODYCOM	BJ5478	11/01/13	12/01/13	090205-2
<input checked="" type="checkbox"/>	DC Power Supply	HP	6622A	11/03/07	12/03/07	3448A03760

Project Number: 11CA51352  
 Product : Satellite Smart Phone Car Kit  
 FCC ID : Z69D01T4JX1

File Number : TC8516

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<input checked="" type="checkbox"/>	Attenuator (10dB)	WEINSCHEL	23-10-34	11/09/30	12/09/30	BP4386
<input checked="" type="checkbox"/>	Amplifier (30dB)	H.P	8449B	11/03/07	12/03/07	3008A00370
<input checked="" type="checkbox"/>	Vector signal Generator	Agilent	E4438C	11/08/05	12/08/05	MY42082928

**Table 6. 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)
2,009.984,375 MHz Mid channel	50	2,009,984,375	2,009,984,378	0.001	10.0
	40	2,009,984,375	2,009,984,374	0.000	10.0
	30	2,009,984,375	2,009,984,376	0.000	10.0
	20	Reference			
	10	2,009,984,375	2,009,984,378	0.001	10.0
	0	2,009,984,375	2,009,984,373	-0.001	10.0
	-10	2,009,984,375	2,009,984,372	-0.001	10.0
	-20	2,009,984,375	2,009,984,377	0.001	10.0
	-30	2,009,984,375	2,009,984,373	-0.001	10.0

Supplementary information:

- . 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 : 12.0 Vdc

**Frequency Stability with variation of Input voltage**

Carrier Band	Input voltage (V)	Assigned Frequency (Hz)	Measured Frequency (Hz)	Drift (ppm)	Limit (ppm)
2,009.984,375 MHz Mid channel	10.2 Vdc	2,009,984,375	2,009,984,377	0.001	10.0
	13.8 Vdc	2,009,984,375	2,009,984,374	0.000	10.0

Supplementary information:

- . 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

☒ Complied

☐ Failed