

# TEST REPORT

**Application No.:** SHCR2308001541AT  
**FCC ID:** 2AEJ4R2220708  
**Applicant:** Sunwave Communications Co., Ltd.  
**Address of Applicant:** 581 Huoju Avenue, Binjiang District, Hangzhou, China  
**Manufacturer:** Sunwave Communications Co., Ltd.  
**Address of Manufacturer:** 581 Huoju Avenue, Binjiang District, Hangzhou, China  
**Equipment Under Test (EUT):**  
**EUT Name:** Remote Unit  
**Model No.:** PS-R222030708  
**Trade mark:** SUNWAVE  
**Standard(s) :** FCC Part 2  
 FCC Part 20  
 FCC Part 90  
**Date of Receipt:** 2023-07-11  
**Date of Test:** 2023-07-11 to 2023-07-31  
**Date of Issue:** 2023-07-31

|                     |              |
|---------------------|--------------|
| <b>Test Result:</b> | <b>Pass*</b> |
|---------------------|--------------|

\* In the configuration tested, the EUT complied with the standards specified above.

\*This case changed the antenna gain from 0dBi to 0.1dBi based on the original report SZCR210302000603, and no changes were made to the rest of the product. So we recalculated the ERP based on the conducted power of the original report SZCR210302000603, and re evaluated and tested the Radiated Spurious Emissions, with the remaining data referenced from the original report unchanged.

Parlan Zhan

Parlan Zhan  
Laboratory Manager



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EEC EMC Lab

NO. 588 West Jindu Road, Songjiang District, Shanghai China 201612  
中国·上海·松江区金都西路588号 邮编: 201612

t (86-21) 61915666  
t (86-21) 61915666

f (86-21) 61915678  
f (86-21) 61915678

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sgs.china@sgs.com

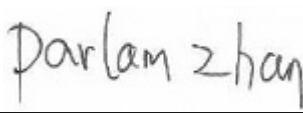


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Report No.: SHCR230800154101

Page: 2 of 27

| Revision Record |             |            |        |
|-----------------|-------------|------------|--------|
| Version         | Description | Date       | Remark |
| 00              | Original    | 2023-07-31 | /      |
|                 |             |            |        |
|                 |             |            |        |

|                          |  |                                                                                    |  |
|--------------------------|--|------------------------------------------------------------------------------------|--|
| Authorized for issue by: |  |                                                                                    |  |
|                          |  |   |  |
|                          |  |                                                                                    |  |
|                          |  | Micheal Niu /Project Engineer                                                      |  |
|                          |  |  |  |
|                          |  |                                                                                    |  |
|                          |  | Parlam Zhan /Reviewer                                                              |  |



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Report No.: SHCR230800154101

Page: 3 of 27

## 2 Test Summary

### 2.1 758MHz-775MHz for FCC Part 90 subpart R

| Test Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Reference        | Result |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------|
| RF Output Power, Amplifier Gain and Peak to Average Ratio                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | §2.1046; §90.541 | PASS   |
| Radiated Spurious Emissions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | §2.1053; §90.543 | PASS   |
| <p>Remark:</p> <p>EUT: In this whole report EUT means Equipment Under Test.</p> <p>Tx: In this whole report Tx (or tx) means Transmitter.</p> <p>Rx: In this whole report Rx (or rx) means Receiver.</p> <p>This case changed the antenna gain from 0dBi to 0.1dBi based on the original report SZCR210302000603, and no changes were made to the rest of the product. So we recalculated the ERP based on the conducted power of the original report SZCR210302000603, and re evaluated and tested the Radiated Spurious Emissions, with the remaining data referenced from the original report unchanged.</p> <p>Test method standard:</p> <p>ANSI C63.26-2015</p> <p>KDB 935210 D05 Indus Booster Basic Meas v01r04</p> <p>KDB 935210 D02 Signal Booster Certification v04r02</p> |                  |        |



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Report No.: SHCR230800154101

Page: 4 of 27

### 851MHz-869MHz for FCC Part 90 subpart S

| Test Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Reference                  | Result |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|
| RF Output Power, Amplifier Gain and Peak to Average Ratio                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | \$2.1046,\$90.635,\$90.637 | PASS   |
| Radiated Spurious Emissions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | \$2.1051, \$90.691         | PASS   |
| <p>Remark:</p> <p>EUT: In this whole report EUT means Equipment Under Test.</p> <p>Tx: In this whole report Tx (or tx) means Transmitter.</p> <p>Rx: In this whole report Rx (or rx) means Receiver.</p> <p>This case changed the antenna gain from 0dBi to 0.1dBi based on the original report SZCR210302000603, and no changes were made to the rest of the product. So we recalculated the ERP based on the conducted power of the original report SZCR210302000603, and re evaluated and tested the Radiated Spurious Emissions, with the remaining data referenced from the original report unchanged.</p> <p>Test method standard:</p> <p>ANSI C63.26-2015</p> <p>KDB 935210 D05 Indus Booster Basic Meas v01r04</p> <p>KDB 935210 D02 Signal Booster Certification v04r02</p> |                            |        |



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中国·上海·松江区金都西路588号 邮编: 201612

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### 3 Contents

|                                                        | Page      |
|--------------------------------------------------------|-----------|
| <b>1 COVER PAGE .....</b>                              | <b>1</b>  |
| <b>2 TEST SUMMARY .....</b>                            | <b>3</b>  |
| 2.1 758MHZ-775MHZ FOR FCC PART 90 SUBPART R.....       | 3         |
| 851MHZ-869MHZ FOR FCC PART 90 SUBPART S.....           | 4         |
| <b>3 CONTENTS .....</b>                                | <b>5</b>  |
| <b>4 GENERAL INFORMATION.....</b>                      | <b>6</b>  |
| 4.1 DETAILS OF E.U.T.....                              | 6         |
| 4.2 DESCRIPTION OF SUPPORT UNITS .....                 | 7         |
| 4.3 MEASUREMENT UNCERTAINTY .....                      | 7         |
| 4.4 TEST LOCATION .....                                | 8         |
| 4.5 TEST FACILITY .....                                | 8         |
| 4.6 DEVIATION FROM STANDARDS.....                      | 8         |
| 4.7 ABNORMALITIES FROM STANDARD CONDITIONS .....       | 8         |
| <b>5 EQUIPMENT LIST .....</b>                          | <b>9</b>  |
| <b>6 TEST RESULTS.....</b>                             | <b>10</b> |
| 6.1 TEST CONDITIONS .....                              | 10        |
| 6.2 TEST PROCEDURE & MEASUREMENT DATA.....             | 13        |
| 6.2.1 RF Output Power and Amplifier Gain .....         | 13        |
| 6.2.2 Radiated Spurious Emissions.....                 | 16        |
| <b>7 PHOTOGRAPHS - TEST SETUP .....</b>                | <b>27</b> |
| <b>8 PHOTOGRAPHS - EUT CONSTRUCTIONAL DETAILS.....</b> | <b>27</b> |



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t (86-21) 61915666 f (86-21) 61915678 www.sgsgroup.com.cn  
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## 4 General Information

### 4.1 Details of E.U.T.

|                       |                                                                                                                          |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------|
| Product Name:         | Remote Unit                                                                                                              |
| Device type           | Fixed production                                                                                                         |
| Model No.:            | PS-R222030708                                                                                                            |
| Antenna Type:         | External                                                                                                                 |
| Antenna Gain:         | 0.1 dBi for 758MHz to 775MHz (Provided by manufacturer)<br>0.1 dBi for 851MHz to 869MHz (Provided by manufacturer)       |
| Power Supply:         | AC 120V 60Hz                                                                                                             |
| Type of Modulation    | CQPSK/12.5kHz FM/TETRA in 758MHz to 775MHz<br>CQPSK/12.5kHz FM/TETRA in 851MHz to 869MHz                                 |
| Frequency Band:       | Downlink 758MHz to 775MHz<br>(The frequency bands 768MHz-775MHz for public safety services)<br>Downlink 851MHz to 869MHz |
| Power Control Method: | ALC                                                                                                                      |
| Temperature Range:    | -40°C to 50°C                                                                                                            |
| Antenna Delivery:     | SISO                                                                                                                     |
| Normal Output Power:  | 37dBm (downlink)                                                                                                         |
| System Gain:          | 47dB                                                                                                                     |



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## 4.2 Description of Support Units

| Description | Manufacture | Model No. | S/N |
|-------------|-------------|-----------|-----|
| Notebook    | ThinkPad    | K27       | /   |

## 4.3 Measurement Uncertainty

| No. | Item                            | Measurement Uncertainty |
|-----|---------------------------------|-------------------------|
| 1   | Radio Frequency                 | $8.4 \times 10^{-8}$    |
| 2   | Timeout                         | 2s                      |
| 3   | Duty Cycle                      | 0.37%                   |
| 4   | Occupied Bandwidth              | 3%                      |
| 5   | RF Conducted Power              | 0.6dB                   |
| 6   | RF Power Density                | 2.9dB                   |
| 7   | Conducted Spurious Emissions    | 0.75dB                  |
| 8   | RF Radiated Power               | 5.2dB (Below 1GHz)      |
|     |                                 | 5.9dB (Above 1GHz)      |
| 9   | Radiated Spurious Emission Test | 4.2dB (Below 30MHz)     |
|     |                                 | 4.5dB (30MHz-1GHz)      |
|     |                                 | 5.1dB (1GHz-18GHz)      |
|     |                                 | 5.4dB (Above 18GHz)     |
| 10  | Temperature Test                | 1°C                     |
| 11  | Humidity Test                   | 3%                      |
| 12  | Supply Voltages                 | 1.5%                    |
| 13  | Time                            | 3%                      |

Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



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All tests were performed at:

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No tests were sub-contracted.

Note:

- 1.SGS is not responsible for wrong test results due to incorrect information (e.g., max. internal working frequency, antenna gain, cable loss, etc) is provided by the applicant. (If applicable).
- 2.SGS is not responsible for the authenticity, integrity and the validity of the conclusion based on results of the data provided by applicant. (If applicable).

#### 4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• **A2LA (Certificate No. 6332.01)**

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• **FCC (Designation Number: CN1301)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been recognized as an accredited testing laboratory.

• **ISED (CAB Identifier: CN0020)**

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• **VCCI (Member No.: 3061)**

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#### 4.6 Deviation from Standards

None

#### 4.7 Abnormalities from Standard Conditions

None



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t (86-21) 61915666  
t (86-21) 61915666

f (86-21) 61915678  
f (86-21) 61915678

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## 5 Equipment List

| Equipment                 | Manufacturer | Model No                      | Inventory No          | Cal Date   | Cal Due Date |
|---------------------------|--------------|-------------------------------|-----------------------|------------|--------------|
| <b>RF Conducted Test</b>  |              |                               |                       |            |              |
| Spectrum Analyzer         | R&S          | FSP-30                        | SHEM002-1             | 2022-12-20 | 2023-12-19   |
| Spectrum Analyzer         | Keysight     | N9020B                        | SHEM241-1             | 2022-12-20 | 2023-12-19   |
| Spectrum Analyzer         | Agilent      | N9020A                        | SHEM181-1             | 2022-08-02 | 2023-08-01   |
| Signal Generator          | R&S          | SMR20                         | SHEM006-1             | 2022-08-02 | 2023-08-01   |
| Signal Generator          | Agilent      | N5182A                        | SHEM182-1             | 2022-08-02 | 2023-08-01   |
| Communication Tester      | R&S          | CMW270                        | SHEM183-1             | 2023-06-01 | 2024-05-31   |
| Communication Tester      | R&S          | CMW500                        | SHEM268-1             | 2023-06-01 | 2024-05-31   |
| Power Sensor              | Keysight     | U2021XA * 4                   | SHEM184-1             | 2022-08-02 | 2023-08-01   |
| Splitter                  | Anritsu      | MA1612A                       | SHEM185-1             | /          | /            |
| Coupler                   | e-meca       | 803-S-1                       | SHEM186-1             | /          | /            |
| High-low Temp Cabinet     | Suzhou Zhihe | TL-40                         | SHEM087-1             | 2022-11-08 | 2024-11-07   |
| AC Power Stabilizer       | APC          | KDF-31020T-V0-F0              | SHEM216-1             | 2022-12-20 | 2023-12-19   |
| DC Power Supply           | MCH          | MCH-303A                      | SHEM210-1             | 2022-12-20 | 2023-12-19   |
| Conducted test Cable      | /            | RF01~RF04                     | /                     | 2022-12-20 | 2023-12-19   |
| Switcher                  | Tonscend     | JS0806                        | SHEM184-1             | 2022-08-02 | 2023-08-01   |
| Test software             | Tonscend     | JS Tonscend<br>BT/WIFI System | Version: 2.6          | /          | /            |
| Coaxial Cable             | TST          |                               | SHEM263-1             | 2022-08-02 | 2023-08-01   |
| Test software             | TST          | TST PASS                      | Version: 2.0          | /          | /            |
| <b>RF Radiated Test</b>   |              |                               |                       |            |              |
| EMI test Receiver         | R&S          | ESU40                         | SHEM051-1             | 2022-12-20 | 2023-12-19   |
| Spectrum Analyzer         | R&S          | FSP-30                        | SHEM002-1             | 2022-12-20 | 2023-12-19   |
| Communication Tester      | R&S          | CMW500                        | SHEM268-1             | 2023-06-01 | 2024-05-31   |
| Loop Antenna (9kHz-30MHz) | Schwarzbeck  | FMZB1519                      | SHEM135-1             | 2022-12-20 | 2023-12-19   |
| Antenna (25MHz-2GHz)      | Schwarzbeck  | VULB9168                      | SHEM048-1             | 2021-09-11 | 2023-09-10   |
| Antenna (25MHz-2GHz)      | Schwarzbeck  | VULB9168                      | SHEM202-1             | 2022-05-07 | 2024-05-06   |
| Horn Antenna (1-18GHz)    | Schwarzbeck  | HF906                         | SHEM009-1             | 2022-08-11 | 2024-08-10   |
| Horn Antenna (1-18GHz)    | Schwarzbeck  | BBHA9120D                     | SHEM050-1             | 2021-09-18 | 2023-09-17   |
| Horn Antenna (14-40GHz)   | Schwarzbeck  | BBHA 9170                     | SHEM049-1             | 2021-09-18 | 2023-09-17   |
| Pre-Amplifier             | HP           | 8447D                         | SHEM236-1             | 2022-08-02 | 2023-08-01   |
| High-amplifier (14-40GHz) | Schwarzbeck  | 10001                         | SHEM049-2             | 2022-12-20 | 2023-12-19   |
| Band Filter               | LORCH        | 9BRX-875/X150                 | SHEM156-1             | /          | /            |
| Band Filter               | LORCH        | 13BRX-1950/X500               | SHEM083-2             | /          | /            |
| Band Filter               | LORCH        | 5BRX-2400/X200                | SHEM155-1             | /          | /            |
| Band Filter               | LORCH        | 5BRX-5500/X1000               | SHEM157-2             | /          | /            |
| High pass Filter          | Wainwright   | WHK3.0/18G                    | SHEM157-1             | /          | /            |
| High pass Filter          | Wainwright   | WHKS1700                      | SHEM157-3             | /          | /            |
| Semi/Fully Anechoic       | ST           | 11*6*6M                       | SHEM078-2             | 2021-05-25 | 2024-05-24   |
| RE test Cable             | /            | RE01, RE02, RE06              | /                     | 2023-01-07 | 2024-01-06   |
| Test software             | ESE          | E3                            | Version:<br>6.111221a | /          | /            |



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t (86-21) 61915666 f (86-21) 61915678 www.sgsgroup.com.cn  
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## 6 Test Results

### 6.1 Test conditions

|                        |                                                                                                                                                                                                                                                                                                                                            |                |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Input voltage:         | AC 120V/60Hz                                                                                                                                                                                                                                                                                                                               |                |
| Test voltage           | Normal                                                                                                                                                                                                                                                                                                                                     | AC 120V/60Hz   |
|                        | Extreme                                                                                                                                                                                                                                                                                                                                    | AC 102V-AC138V |
| Operating Environment: |                                                                                                                                                                                                                                                                                                                                            |                |
| Test Temperature:      | Normal                                                                                                                                                                                                                                                                                                                                     | 22°C~26°C      |
|                        | Extreme                                                                                                                                                                                                                                                                                                                                    | -40~50° C      |
| Humidity:              | 46%~56% RH                                                                                                                                                                                                                                                                                                                                 |                |
| Atmospheric Pressure:  | 990~1005mbar                                                                                                                                                                                                                                                                                                                               |                |
| Test Requirement:      | The RF output power of the EUT was measured at the antenna port, by adjusting the input power of signal generator to drive the EUT to get to maximum output power point and keep the EUT at maximum gain setting for all tests. The device should be tested on downlink.<br>For detail test Modulation and Frequency, please refer to 7.2. |                |

#### Remark:

#### FIBER-OPTIC AND OTHER SIMILAR RF DISTRIBUTION SYSTEMS

Fiber-optic distribution systems are a type of in-building radiation system that receives RF signals from an antenna, distributes the signal over fiber-optic cable, and then retransmits at another location for example within a building or tunnel. Most fiber-optic systems are signal boosters; however, some may be boosters. These systems generally have two enclosures typically called host (or local or donor unit) and remote. Some systems may also have an optional expander box for fan-out to multiple remotes. The system transmits downlink signals from the remote unit to handsets, portables, or clients, and transmits uplink signals via from the host unit. Usually but not always the uplink goes through an intermediate amplifier to a "donor" antenna. Therefore both uplink and downlink must be tested, unless filing effectively documents how connection of uplink to donor antenna with or without an intermediate amplifier will be prevented, such as for always only a cabled connection to a base station. Fiber-optic systems are not amplifiers (AMP equipment class) – they are equipment class TNB or PCB. The same approval procedures also apply for multiple-enclosure systems connected by coax cable.

*Synonyms and related terms: in-building radiation system, coverage enhancer, distributed antenna system, fiber-optic distribution system, converter, donor antenna*

Typical in-building or distributed antenna systems can consist of five different components (enclosures), not counting antennas:

#### 1) host unit

- transmits uplink to base station via antenna thru coax, **passive interface unit**, or **active interface unit** (amplifier)
- sends base-station downlink via fiber-optic or coax to **remote**
- receives handset uplink via fiber-optic or coax from **remote**



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- d) optional connection to **expansion unit** via fiber-optic
- e) separate FCC ID from **remote**, unless electrically identical
- f) **non-transmitting host unit**
- i) connects directly to a base station via coax cable but does not connect to antenna or amplifier
- ii) Part 15 digital device subject to Verification, no FCC ID
- 2) remote unit**
- a) receives base-station downlink via fiber-optic or coax from **host**, transmits via antenna to handsets
- b) returns handset uplink via fiber-optic or coax to **host**
- c) separate FCC ID from **remote**, unless electrically identical
- 3) fiber-optic expansion unit**
- a) fiber-optic or coax from **host**
- b) fiber-optic or coax fan-out to **remote(s)**
- c) Part 15 digital device subject to Verification, no FCC ID
- 4) RF expansion unit**
- a) internal or external device used to add band(s) and/or transmit mode(s) to a **remote**
- b) operates only when connected to a **remote unit** as part of a booster system
- c) contains signal-processing functions to convert baseband signal into modulated RF signal
- d) use equipment class PCB or TNB for an **RF expansion unit** (the associated **remote** uses an equipment class Bxx per **Table C.1** of this document, e.g., B2I)
- 5) passive interface unit**
- a) contains attenuators, splitters, combiners
- b) coax cable connection between **host** and base-station
- c) passive device, no FCC ID
- 6) active interface unit**
- a) amplifies uplink signal from **host unit** for transmit by donor antenna
- b) attenuates downlink from donor antenna
- c) coax cable connection between **host** and **active interface unit**
- d) usually has separate FCC ID; in some cases could be combined/included with **host** as one enclosure

## GENERAL DEFINITIONS FOR CERTIFICATION PURPOSES:

The following three general definitions follow from those stated in the Part 22, 24, 27 and 90 rule sections as listed above. Two of the definitions replace previous EAB internal definitions given for booster, booster and extender. The general term “extender” is the same as booster, but booster should be used rather than extender. The general term “translator” is the same as booster, but booster should be used rather than translator.

**External radio frequency power amplifier (ERFPA)** - any device which, (1) when used in conjunction with a radio transmitter signal source, is capable of amplification of that signal, and (2) is not an integral part of a radio transmitter as manufactured. The EAS equipment class AMP is used only for an ERFPA device inserted between a transmitter (TNB/PCB) and an antenna (has only one antenna port) **Booster** is a device that automatically reradiates signals from base transmitters without channel translation, for the purpose of improving the reliability of existing service by increasing the signal strength in dead spots. An



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中国·上海·松江区金都西路588号 邮编: 201612

t (86-21) 61915666 f (86-21) 61915678 www.sgsgroup.com.cn  
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Report No.: SHCR230800154101

Page: 12 of 27

“in-building radiation system” is a signal booster. These devices are not intended to extend the size of coverage from the originating base station. A booster can be either single or multiple channels.

**Booster** is a device that retransmits the signals of other stations. Boosters are different from boosters in that they can include frequency translation and can extend coverage beyond the design of the original base station. A booster is typically single channel but can also be multiple channels.

ERFPA (AMP) and boosters/boosters (TNB/PCB) can generally be authorized for all rule parts except 15 and 18.

Tests should be done with each typical signal. e.g., for F3E emissions use 2500 Hz with 2.5 or 5 kHz deviation. Use of CW signal for some tests is acceptable in lieu of actual emission, in some cases when CW signal gives worst case.



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f (86-21) 61915678

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t (86-21) 61915666

f (86-21) 61915678

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## 6.2 Test Procedure & Measurement Data

### 6.2.1 RF Output Power and Amplifier Gain

Test Requirement: 47 CFR Part 90.219(e)(1), 47 CFR Part 90.635  
 Test Method: KDB 935210 D05 Indus Booster Basic Meas v01r04  
 EUT Operation:  
 Status: Drive the EUT to maximum output power.  
 Conditions: Normal conditions  
 Application: Cellular Band RF output ports  
 Test Configuration:

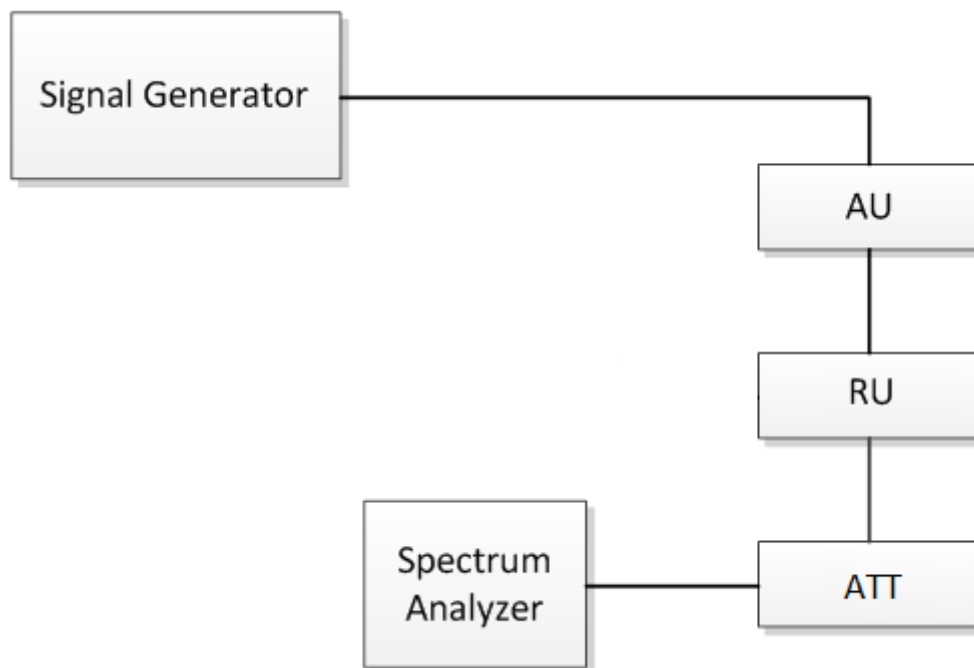


Fig.1 RF Output Power test configuration

## Test Procedure:

### RF output power test procedure:

- a) Connect a signal generator to the input of the EUT.
- b) Configure to generate the AWGN (broadband) test signal.
- c) The frequency of the signal generator shall be set to the frequency  $f_0$  as determined from 3.3.
- d) Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation as necessary.
- e) Set the signal generator output power to a level that produces an EUT output level that is just below the AGC threshold (see 3.2), but not more than 0.5 dB below.
- f) Measure and record the output power of the EUT; use 3.5.3 or 3.5.4 for power measurement.
- g) Remove the EUT from the measurement setup. Using the same signal generator settings, repeat the power measurement at the signal generator port, which was used as the input signal to the EUT, and record as the input power. EUT gain may be calculated as described in 3.5.5.
- h) Repeat steps f) and g) with input signal amplitude set to 3 dB above the AGC threshold level.
- i) Repeat steps e) to h) with the narrowband test signal.
- j) Repeat steps e) to i) for all frequency bands authorized for use by the EUT.

### Amplifier gain test procedure:

After the mean input and output power levels have been measured as described in the preceding subclauses, the mean gain of the EUT can be determined from:

Gain (dB) = output power (dBm) - input power (dBm).

### Peak to Average Ratio:

Please according to KDB 971168 D01 clause 5.7.

## Remark:

The system continuously monitors the input power.

## 6.2.1.1 Measurement Record:



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f (86-21) 61915678  
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Report No.: SHCR230800154101

Page: 15 of 27

| Mode     | Operation Band   | Frequency (MHz) | Signal Type | Signal Level (dBm) | Input Power (dBm) | Output Power (dBm) | Original ERP (dBm) | Current ERP (dBm) | Gain (dB) |
|----------|------------------|-----------------|-------------|--------------------|-------------------|--------------------|--------------------|-------------------|-----------|
| Downlink | 758MHz to 775MHz | 758.0125        | CW          | Pre-AGC            | -10               | 36.91              | 34.76              | 34.86             | 46.91     |
|          |                  |                 |             | 3dB Above AGC      | -7                | 36.92              | 34.77              | 34.87             | /         |
| Downlink | 758MHz to 775MHz | 766.5000        | CW          | Pre-AGC            | -10               | 36.95              | 34.80              | 34.90             | 46.95     |
|          |                  |                 |             | 3dB Above AGC      | -7                | 37.01              | 34.86              | 34.96             | /         |
| Downlink | 758MHz to 775MHz | 774.9875        | CW          | Pre-AGC            | -10               | 36.83              | 34.68              | 34.78             | 46.83     |
|          |                  |                 |             | 3dB Above AGC      | -7                | 36.85              | 34.7               | 34.80             | /         |

Note:

- 1) The nominal power is 37dBm and the measured output power which show in above table is within  $\pm 1.0$  dB tolerance
- 2) The ERP limit is 5W, the product satisfied with the limit.
- 3) ERP=Output power + Antenna Gain-2.15, Original Antenna Gain is 0, Current Antenna Gain is 0.1

| Mode     | Operation Band   | Frequency (MHz) | Signal Type | Signal Level (dBm) | Input Power (dBm) | Output Power (dBm) | Original ERP (dBm) | Current ERP (dBm) | Gain (dB) |
|----------|------------------|-----------------|-------------|--------------------|-------------------|--------------------|--------------------|-------------------|-----------|
| Downlink | 851MHz to 869MHz | 851.0125        | CW          | Pre-AGC            | -10               | 36.98              | 34.83              | 34.93             | 46.98     |
|          |                  |                 |             | 3dB Above AGC      | -7                | 37.32              | 35.17              | 35.27             | /         |
| Downlink | 851MHz to 869MHz | 860.0000        | CW          | Pre-AGC            | -10               | 36.94              | 34.79              | 34.89             | 46.94     |
|          |                  |                 |             | 3dB Above AGC      | -7                | 37.19              | 35.04              | 35.14             | /         |
| Downlink | 851MHz to 869MHz | 868.9875        | CW          | Pre-AGC            | -10               | 37.22              | 35.07              | 35.17             | 47.22     |
|          |                  |                 |             | 3dB Above AGC      | -7                | 36.98              | 34.83              | 34.93             | /         |

Note:

- 1) The nominal power is 37dBm and the measured output power which show in above table is within  $\pm 1.0$  dB tolerance
- 2) The ERP limit is 1000W, the product satisfied with the limit.
- 3) ERP=Output power + Antenna Gain-2.15, Original Antenna Gain is 0, Current Antenna Gain is 0.1



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### 6.2.2 Radiated Spurious Emissions

Test Requirement: §2.1051, §22.917, §24.238, §27.53, §90.543, §90.691

Test Method: KDB 935210 D05 Indus Booster Basic Meas v01r04

EUT Operation:

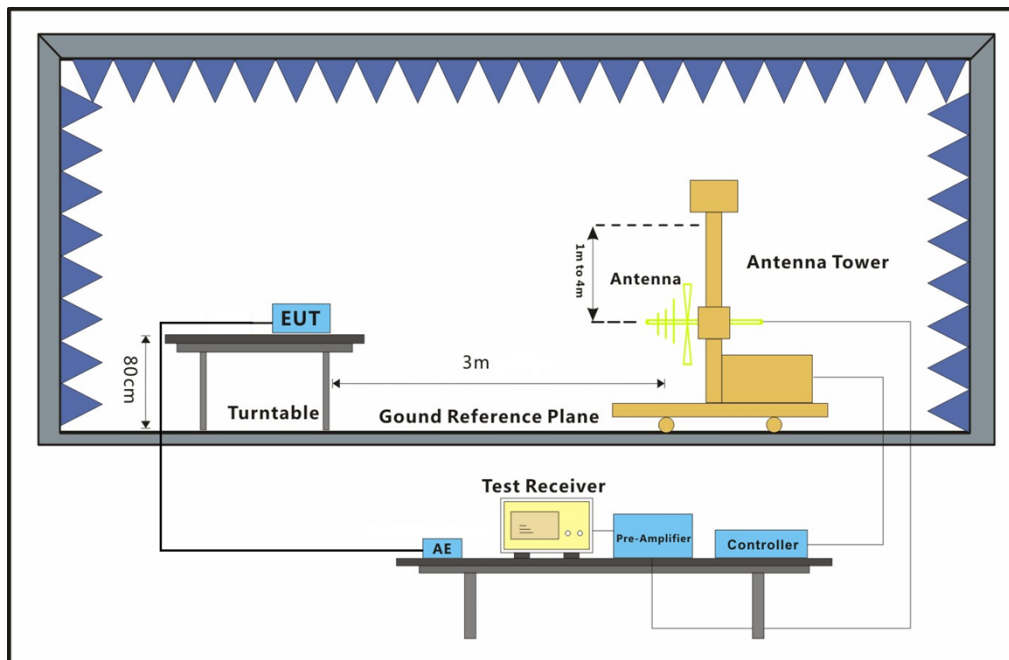
Status: Drive the EUT to maximum output power.

Conditions: Normal conditions

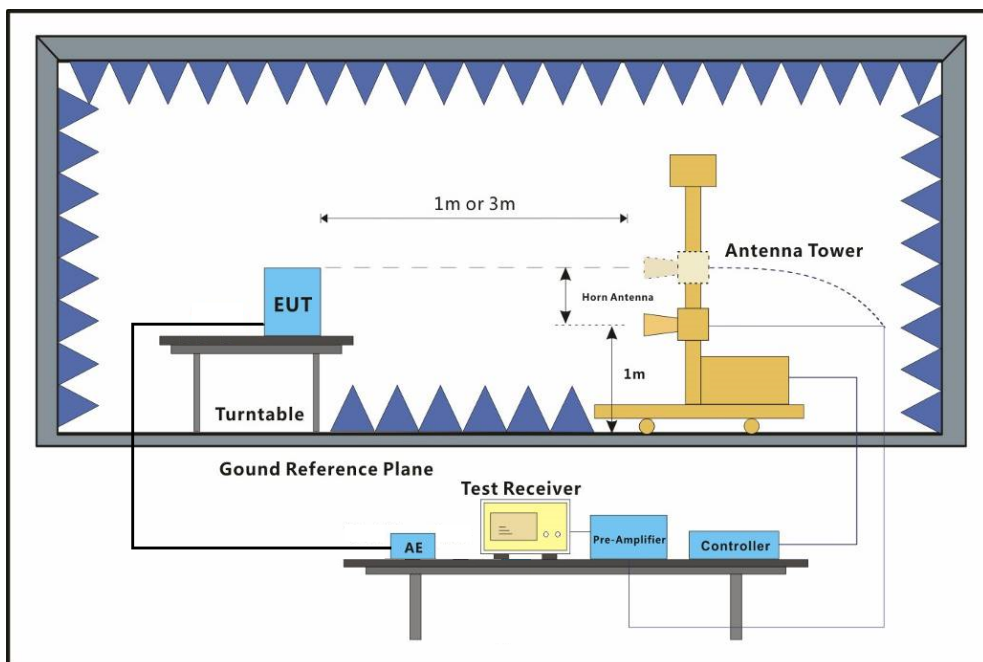
Application: Enclosure

Test Configuration:

30MHz to 1GHz emissions:



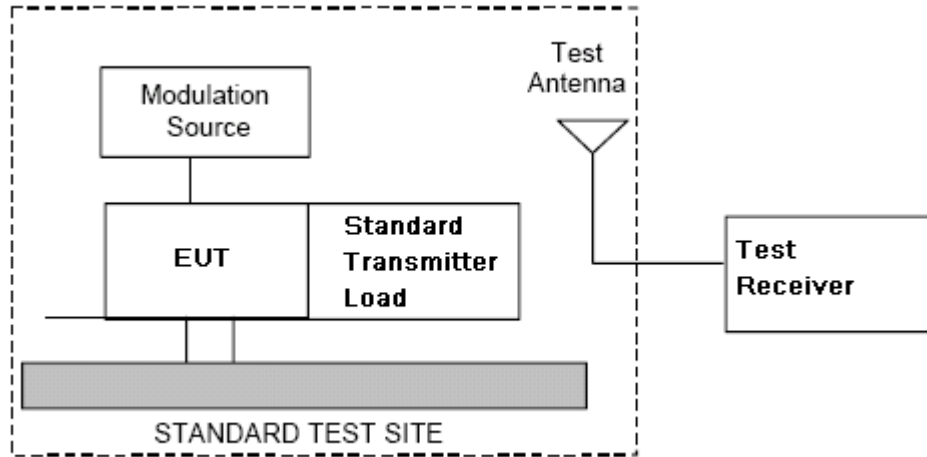
1GHz to 40GHz emissions:



Test Procedure:

1. Test the background noise level with all the test facilities;
2. Keep one transmitting path, all other connectors shall be connected by normal power or RF leads;
3. Select the suitable RF notch filter to avoid the test receiver or spectrum analyzer produce unwanted spurious emissions;
4. Keep the EUT continuously transmitting in max power;
5. Read the radiated emissions of the EUT enclosure.

Radiated Emissions Test Procedure:



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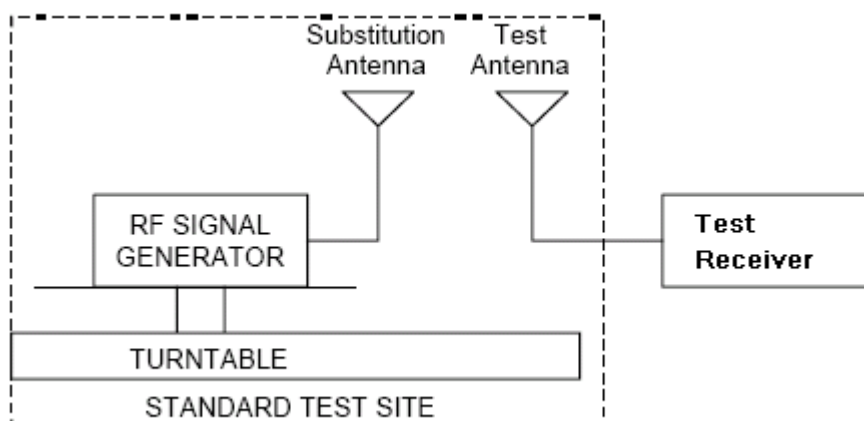
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t (86-21) 61915666

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- a) Connect the equipment as illustrated.
- b) Adjust the spectrum analyzer for the following settings:
  - 1) Resolution Bandwidth = 100 kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1GHz.
  - 2) Video Bandwidth = 300 kHz for spurious emissions below 1 GHz, and 3 MHz for spurious emissions above 1 GHz.
  - 3) Sweep Speed slow enough to maintain measurement calibration.
  - 4) Detector Mode = Positive Peak.
- c) Place the transmitter to be tested on the turntable in the standard test site, The transmitter is transmitting into a no radiating load that is placed on the turntable. The RF cable to this load should be of minimum length.
- d) Measurements shall be made from 30MHz to 10 times of fundamental carrier, except for the region close to the carrier equal to  $\pm$  the carrier bandwidth.
- e) Key the transmitter without modulation or normal modulation base the standard.
- f) For each spurious frequency, raise and lower the test antenna from 1 m to 4 m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Then the turntable should be rotated 360° to determine the maximum reading. Repeat this procedure to obtain the highest possible reading. Record this maximum reading.
- g) Repeat step f) for each spurious frequency with the test antenna polarized vertically.



- h) Reconnect the equipment as illustrated.
- i) Keep the spectrum analyzer adjusted as in step b).
- j) Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At the lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground.
- k) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non radiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.
- l) Repeat step k) with both antennas vertically polarized for each spurious frequency.
- m) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps k) and l) by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula:

$$Pd(\text{dBm}) = Pg(\text{dBm}) - \text{cable loss (dB)} + \text{antenna gain (dB)}$$

where:

$Pd$  is the dipole equivalent power and

$Pg$  is the generator output power into the substitution antenna.

### NOTE:

- 1) It is permissible to use other antennas provided they can be referenced to a dipole.
- 2) For below 1GHz signal, the *antenna gain* (dB) is dBd, and for above 1GHz signal, the *antenna gain* (dB) is dBi
- 3) Effective radiated power (e.r.p) refers to the radiation of a half wave tuned dipole instead of an isotropic antenna. There is a constant difference of 2.15 dB between e.i.r.p. and e.r.p.  
 $\text{e.r.p (dBm)} = \text{e.i.r.p. (dBm)} - 2.15$
- 4) For this test, the AU and EU are put outside of the chamber; connect to the RU through the optical fiber



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EEC EMC Lab

NO.588 West Jindu Road, Songjiang District, Shanghai China 201612  
中国·上海·松江区金都西路588号 邮编: 201612

t (86-21) 61915666  
t (86-21) 61915666

f (86-21) 61915678  
f (86-21) 61915678

www.sgsgroup.com.cn  
sgs.china@sgs.com

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Report No.: SHCR230800154101

Page: 21 of 27

## 6.2.2.1 Measurement Record:

DownLink\_758MHz to 775MHz

| Low Channel        |                                             |        |                |                    |         |
|--------------------|---------------------------------------------|--------|----------------|--------------------|---------|
| Frequency<br>(MHz) | Spurious Emission<br>Polarization and Level |        | Limit<br>(dBm) | Over Limit<br>(dB) | Verdict |
|                    | Polarization                                | dBm    |                |                    |         |
| 93.194             | Horizontal                                  | -59.52 | -13            | -46.52             | Pass    |
| 190.218            | Horizontal                                  | -60.25 | -13            | -47.25             | Pass    |
| 710.022            | Horizontal                                  | -58.99 | -13            | -45.99             | Pass    |
| 1333.070           | Horizontal                                  | -54.80 | -13            | -41.80             | Pass    |
| 5918.670           | Horizontal                                  | -50.86 | -13            | -37.86             | Pass    |
| 8594.360           | Horizontal                                  | -47.67 | -13            | -34.67             | Pass    |
| 82.400             | Vertical                                    | -60.20 | -13            | -47.20             | Pass    |
| 158.065            | Vertical                                    | -61.19 | -13            | -48.19             | Pass    |
| 853.189            | Vertical                                    | -60.68 | -13            | -47.68             | Pass    |
| 1312.830           | Vertical                                    | -51.87 | -13            | -38.87             | Pass    |
| 5903.360           | Vertical                                    | -51.61 | -13            | -38.61             | Pass    |
| 8615.640           | Vertical                                    | -44.63 | -13            | -31.63             | Pass    |



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EEC EMC Lab

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中国·上海·松江区金都西路588号 邮编: 201612

t (86-21) 61915666 f (86-21) 61915678 www.sgsgroup.com.cn  
t (86-21) 61915666 f (86-21) 61915678 sgs.china@sgs.com

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Report No.: SHCR230800154101

Page: 22 of 27

| Middle Channel     |                                             |        |                |                    |         |
|--------------------|---------------------------------------------|--------|----------------|--------------------|---------|
| Frequency<br>(MHz) | Spurious Emission<br>Polarization and Level |        | Limit<br>(dBm) | Over Limit<br>(dB) | Verdict |
|                    | Polarization                                | dBm    |                |                    |         |
| 89.630             | Horizontal                                  | -61.90 | -13            | -48.90             | Pass    |
| 332.295            | Horizontal                                  | -61.11 | -13            | -48.11             | Pass    |
| 745.809            | Horizontal                                  | -59.36 | -13            | -46.36             | Pass    |
| 1354.560           | Horizontal                                  | -53.35 | -13            | -40.35             | Pass    |
| 5579.840           | Horizontal                                  | -50.57 | -13            | -37.57             | Pass    |
| 8568.640           | Horizontal                                  | -45.62 | -13            | -32.62             | Pass    |
| 89.930             | Vertical                                    | -60.12 | -13            | -47.12             | Pass    |
| 178.285            | Vertical                                    | -60.02 | -13            | -47.02             | Pass    |
| 825.729            | Vertical                                    | -59.08 | -13            | -46.08             | Pass    |
| 1323.620           | Vertical                                    | -54.52 | -13            | -41.52             | Pass    |
| 5554.540           | Vertical                                    | -48.51 | -13            | -35.51             | Pass    |
| 8565.300           | Vertical                                    | -47.53 | -13            | -34.53             | Pass    |



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EEC EMC Lab

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中国·上海·松江区金都西路588号 邮编: 201612

t (86-21) 61915666 f (86-21) 61915678 www.sgsgroup.com.cn  
t (86-21) 61915666 f (86-21) 61915678 sgs.china@sgs.com

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Report No.: SHCR230800154101

Page: 23 of 27

| High Channel       |                                             |        |                |                    |         |
|--------------------|---------------------------------------------|--------|----------------|--------------------|---------|
| Frequency<br>(MHz) | Spurious Emission<br>Polarization and Level |        | Limit<br>(dBm) | Over Limit<br>(dB) | Verdict |
|                    | Polarization                                | dBm    |                |                    |         |
| 102.514            | Horizontal                                  | -62.15 | -13            | -49.15             | Pass    |
| 294.968            | Horizontal                                  | -58.16 | -13            | -45.16             | Pass    |
| 775.062            | Horizontal                                  | -59.45 | -13            | -46.45             | Pass    |
| 1309.960           | Horizontal                                  | -53.93 | -13            | -40.93             | Pass    |
| 5562.910           | Horizontal                                  | -50.27 | -13            | -37.27             | Pass    |
| 8572.980           | Horizontal                                  | -47.54 | -13            | -34.54             | Pass    |
| 83.410             | Vertical                                    | -62.85 | -13            | -49.85             | Pass    |
| 332.555            | Vertical                                    | -59.40 | -13            | -46.40             | Pass    |
| 745.179            | Vertical                                    | -57.55 | -13            | -44.55             | Pass    |
| 1325.070           | Vertical                                    | -52.94 | -13            | -39.94             | Pass    |
| 5558.840           | Vertical                                    | -50.75 | -13            | -37.75             | Pass    |
| 8593.300           | Vertical                                    | -48.19 | -13            | -35.19             | Pass    |



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EEC EMC Lab

NO.588 West Jindu Road, Songjiang District, Shanghai China 201612  
中国·上海·松江区金都西路588号 邮编: 201612

t (86-21) 61915666 f (86-21) 61915678 www.sgsgroup.com.cn  
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Page: 24 of 27

DownLink\_851MHz to 869MHz

| Low Channel        |                                             |        |                |                    |         |
|--------------------|---------------------------------------------|--------|----------------|--------------------|---------|
| Frequency<br>(MHz) | Spurious Emission<br>Polarization and Level |        | Limit<br>(dBm) | Over Limit<br>(dB) | Verdict |
|                    | Polarization                                | dBm    |                |                    |         |
| 96.930             | Horizontal                                  | -59.41 | -13            | -46.41             | Pass    |
| 161.385            | Horizontal                                  | -58.55 | -13            | -45.55             | Pass    |
| 772.429            | Horizontal                                  | -59.24 | -13            | -46.24             | Pass    |
| 1825.520           | Horizontal                                  | -52.51 | -13            | -39.51             | Pass    |
| 5692.150           | Horizontal                                  | -48.81 | -13            | -35.81             | Pass    |
| 8884.750           | Horizontal                                  | -44.84 | -13            | -31.84             | Pass    |
| 91.230             | Vertical                                    | -59.21 | -13            | -46.21             | Pass    |
| 154.525            | Vertical                                    | -59.14 | -13            | -46.14             | Pass    |
| 744.999            | Vertical                                    | -57.42 | -13            | -44.42             | Pass    |
| 1815.190           | Vertical                                    | -52.98 | -13            | -39.98             | Pass    |
| 5674.700           | Vertical                                    | -50.50 | -13            | -37.50             | Pass    |
| 8911.900           | Vertical                                    | -46.25 | -13            | -33.25             | Pass    |



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EEC EMC Lab

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中国·上海·松江区金都西路588号 邮编: 201612

t (86-21) 61915666 f (86-21) 61915678 www.sgsgroup.com.cn  
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| Middle Channel     |                                             |        |                |                    |         |
|--------------------|---------------------------------------------|--------|----------------|--------------------|---------|
| Frequency<br>(MHz) | Spurious Emission<br>Polarization and Level |        | Limit<br>(dBm) | Over Limit<br>(dB) | Verdict |
|                    | Polarization                                | dBm    |                |                    |         |
| 90.724             | Horizontal                                  | -62.21 | -13            | -49.21             | Pass    |
| 210.408            | Horizontal                                  | -58.77 | -13            | -45.77             | Pass    |
| 803.642            | Horizontal                                  | -57.99 | -13            | -44.99             | Pass    |
| 1814.130           | Horizontal                                  | -53.87 | -13            | -40.87             | Pass    |
| 5672.800           | Horizontal                                  | -50.54 | -13            | -37.54             | Pass    |
| 8876.890           | Horizontal                                  | -45.81 | -13            | -32.81             | Pass    |
| 107.225            | Vertical                                    | -59.25 | -13            | -46.25             | Pass    |
| 260.459            | Vertical                                    | -60.65 | -13            | -47.65             | Pass    |
| 730.776            | Vertical                                    | -57.84 | -13            | -44.84             | Pass    |
| 1849.780           | Vertical                                    | -54.25 | -13            | -41.25             | Pass    |
| 5705.380           | Vertical                                    | -50.86 | -13            | -37.86             | Pass    |
| 8906.370           | Vertical                                    | -45.17 | -13            | -32.17             | Pass    |



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EEC EMC Lab

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中国·上海·松江区金都西路588号 邮编: 201612

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Report No.: SHCR230800154101

Page: 26 of 27

| High Channel       |                                             |        |                |                    |         |
|--------------------|---------------------------------------------|--------|----------------|--------------------|---------|
| Frequency<br>(MHz) | Spurious Emission<br>Polarization and Level |        | Limit<br>(dBm) | Over Limit<br>(dB) | Verdict |
|                    | Polarization                                | dBm    |                |                    |         |
| 87.190             | Horizontal                                  | -60.76 | -13            | -47.76             | Pass    |
| 380.455            | Horizontal                                  | -59.51 | -13            | -46.51             | Pass    |
| 757.869            | Horizontal                                  | -58.32 | -13            | -45.32             | Pass    |
| 1840.000           | Horizontal                                  | -54.72 | -13            | -41.72             | Pass    |
| 5706.610           | Horizontal                                  | -50.41 | -13            | -37.41             | Pass    |
| 8887.500           | Horizontal                                  | -48.14 | -13            | -35.14             | Pass    |
| 93.910             | Vertical                                    | -59.93 | -13            | -46.93             | Pass    |
| 244.125            | Vertical                                    | -59.61 | -13            | -46.61             | Pass    |
| 872.099            | Vertical                                    | -60.61 | -13            | -47.61             | Pass    |
| 1837.740           | Vertical                                    | -53.15 | -13            | -40.15             | Pass    |
| 5720.610           | Vertical                                    | -49.84 | -13            | -36.84             | Pass    |
| 8922.290           | Vertical                                    | -46.25 | -13            | -33.25             | Pass    |



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EEC EMC Lab

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中国·上海·松江区金都西路588号 邮编: 201612

t (86-21) 61915666 f (86-21) 61915678 www.sgsgroup.com.cn  
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Page: 27 of 27

### 7 Photographs - Test Setup

Please refer to test setup photo

### 8 Photographs - EUT Constructional Details

Please refer to external and internal photo

--The End of Report--



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t (86-21) 61915666  
t (86-21) 61915666

f (86-21) 61915678  
f (86-21) 61915678

[www.sgsgroup.com.cn](http://www.sgsgroup.com.cn)  
[sgs.china@sgs.com](mailto:sgs.china@sgs.com)