

TEST REPORT



DT&C Co., Ltd.

42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17042
Tel : 031-321-2664, Fax : 031-321-1664

1. Report No : DRTFCC1712-0278
2. Customer
 - Name : Namsung Corporation
 - Address : ACE Techno Tower 13th Fl, 197-22, Guro-dong, Guro-gu, Seoul South Korea
3. Use of Report : FCC Original Grant
4. Product Name / Model Name : KESM System / PTS-1
FCC ID : GJW-PTS-1
5. Test Method Used : ANSI C63.10-2013
Test Specification : FCC Part 15.231
6. Date of Test : 2017.11.27
7. Testing Environment : See appended test report.
8. Test Result : Refer to the attached test result.

| | | |
|-------------|--|--|
| Affirmation | Tested by Name : Jaejin Lee  (Signature) | Reviewed by Name : Geunki Son  (Signature) |
|-------------|--|--|

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose. This test report shall not be reproduced except in full, without the written approval of DT&C Co., Ltd.

2017 . 12 . 26 .

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If this report is required to confirmation of authenticity, please contact to report@dtnc.net

Test Report Version

| Test Report No. | Date | Description |
|------------------------|---------------|--------------------|
| DRTFCC1712-0278 | Dec. 26, 2017 | Initial issue |
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1. General Information

1.1. Testing Laboratory

DT&C Co., Ltd.

The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042. The site is constructed in conformance with the requirements.

- FCC MRA Accredited Test Firm No. : KR0034

www.dtnc.net

| | | |
|-----------|---|------------------|
| Telephone | : | + 82-31-321-2664 |
| FAX | : | + 82-31-321-1664 |

1.2. Testing Environment

Ambient Condition

| | |
|---------------------|-------------|
| ▪ Temperature | +22 ~ 23 °C |
| ▪ Relative Humidity | 36 ~ 38 % |

1.3. Measurement Uncertainty

| Test items | Measurement uncertainty |
|--|--|
| AC conducted emission | 2.4 dB (The confidence level is about 95 %, k = 2) |
| Radiated spurious emission (1 GHz Below) | 5.1 dB (The confidence level is about 95 %, k = 2) |
| Radiated spurious emission (1 GHz ~ 18 GHz) | 5.4 dB (The confidence level is about 95 %, k = 2) |

1.4. Description of EUT

| | |
|----------------------------|---|
| FCC Equipment Class | Part 15 Security/Remote Control Transmitter |
| EUT | KESM system |
| Model Name | PTS-1 |
| Hardware version | 2.0 |
| Software version | 001 |
| Power Supply | DC 3 V(Battery) |
| Frequency Band | 433.92 MHz |
| Modulation Type | FSK |
| Antenna type | PCB Pattern Antenna |

2. Information about test items

2.1 Operating mode

| | |
|-------------------------|---|
| Operating Mode 1 | This device was tested with continuous TX mode for 20 dB BW |
| Operating Mode 2 | Normal operating mode was used for automatically deactivate |

2.2 Tested frequency

| Mode | Frequency(MHz) |
|-------------------|----------------|
| Transmitting mode | 433.94 |
| - | - |

2.3 Auxiliary equipment

| Equipment | Model No. | Serial No. | Manufacturer | Note |
|-----------|-----------|------------|--------------|------|
| - | - | - | - | - |

2.4 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

3. Test Report

3.1 Summary of tests

| FCC Part Section(s) | RSS section(s) | Parameter | Test Condition | Status Note 1 |
|----------------------|---------------------------------|--|-------------------|---------------|
| I. Test Items | | | | |
| 15.231(b) | RSS-210[A1.2] | Field strength of fundamental and spurious emissions | Radiated | NT Note 2 |
| 15.205 15.209 | RSS-GEN [8.9] RSS-GEN [8.10] | General Field Strength Limits (Restricted Bands and Radiated Emission Limits) | | NT Note 2 |
| 15.231(a) | RSS-210[A1.1] | Automatically deactivate | Conducted | C |
| 15.231(c) | - | 20dB bandwidth | | C |
| - | RSS-210[A1.3] | Occupied bandwidth | | NA |
| 15.207 | RSS-Gen[8.8] | AC Power Line Conducted Emission | AC Line Conducted | NA Note 3 |
| 15.203 | - | Antenna Requirements | - | C |

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable

Note 2: According to applicant's request, this test item was performed at KCTL.

Please refer to the "Report No: KR17-SRF0096" test report

Note 3: This device is used Battery for power supplying.

3.2 Transmitter requirements

3.2.1 20dB & Occupied bandwidth

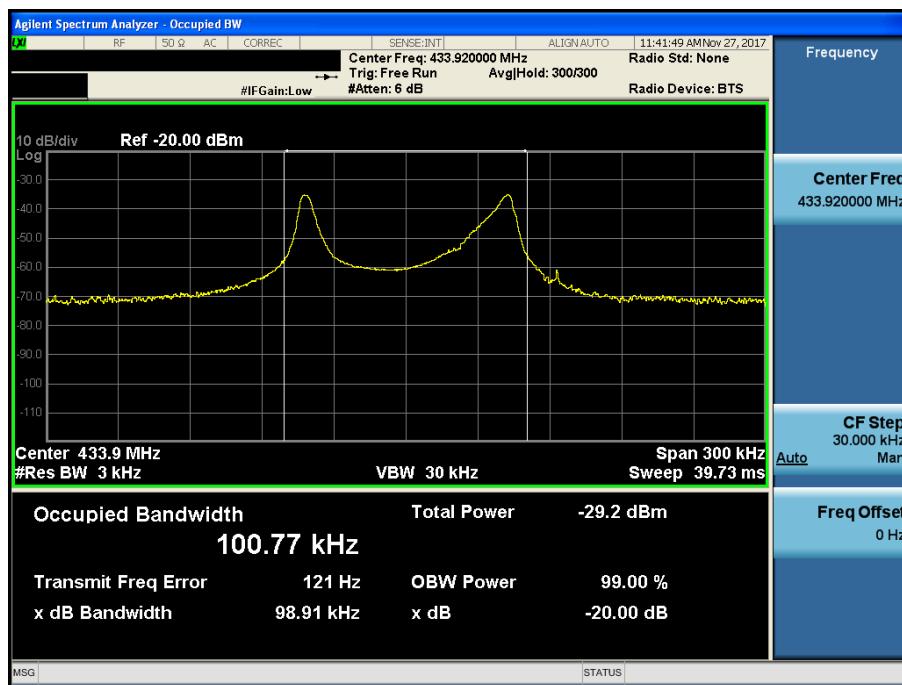
- Procedure:

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of **ANIS 63.10-2013**.

RBW: 1% to 5% of the OBW
 VBW: Approximately three times the RBW
 Detector: Peak
 Trace: Max hold
 Sweep: Auto couple

- Measurement Data: **Comply**

| Frequency (MHz) | 20dB Bandwidth (kHz) | 99% Bandwidth (kHz) | Limit (kHz) |
|-----------------|----------------------|---------------------|-------------|
| 433.92 | 98.91 | - | 1084.00 |



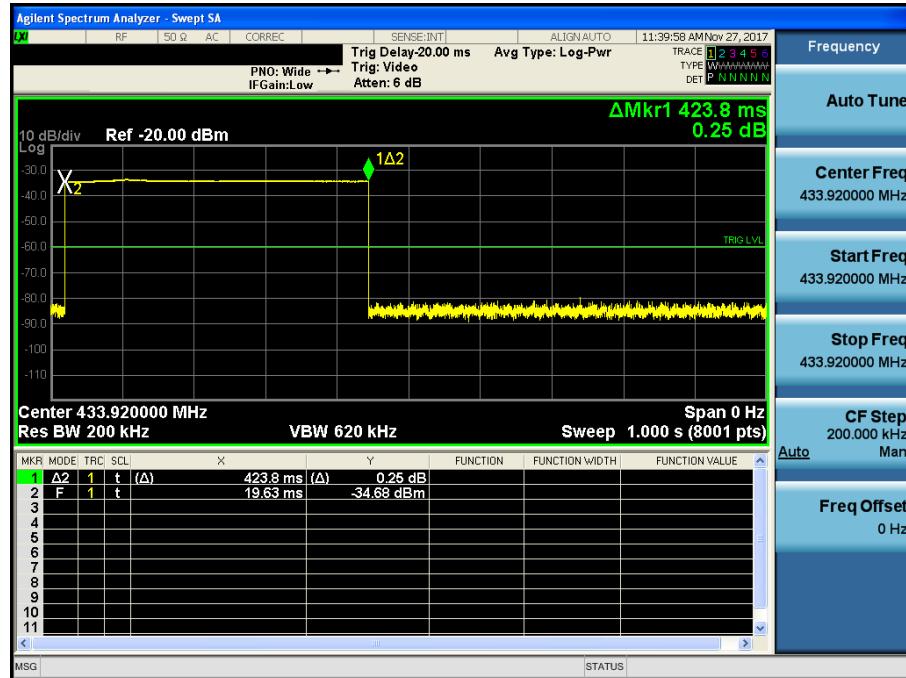
- Limit: § 15.209(c)

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

3.2.2 Automatically deactivate

- Measurement Data:

| One operation time (s) | Limit (s) |
|------------------------|-----------|
| 0.424 | 5 |



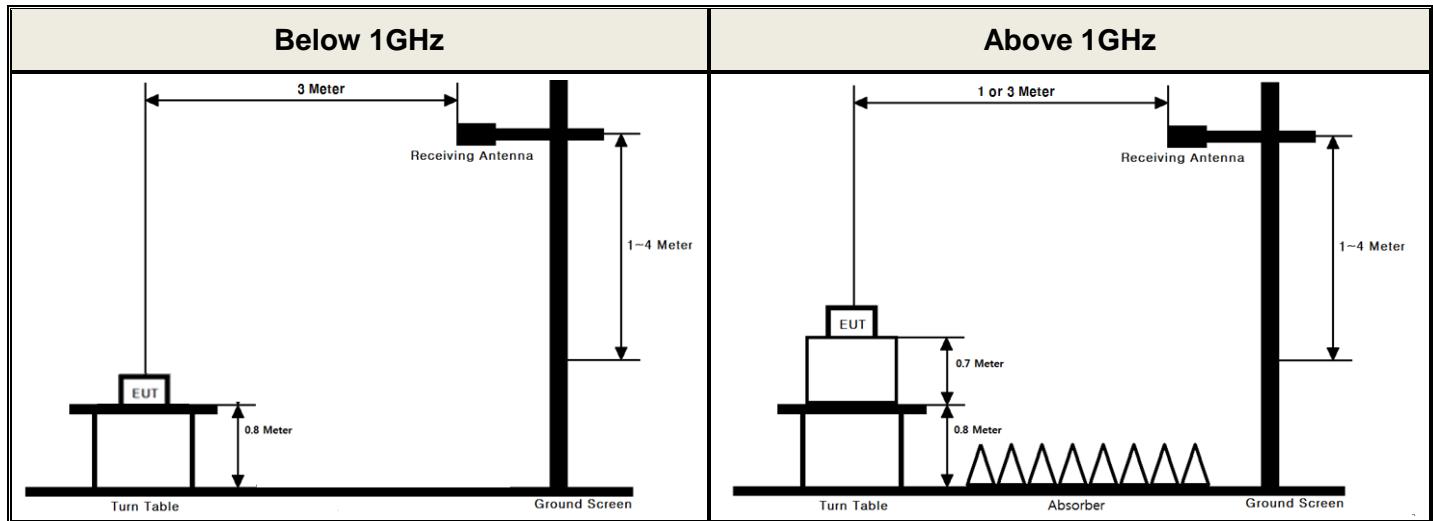
- Limit: § 15.231(a)

(a) The provisions of this section are restricted to periodic operation within the band 40.66-40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

- (1) **A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.**
- (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
- (3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.
- (4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.
- (5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

3.2.3 Field strength of fundamental and spurious emissions

- Test set up diagrams:



- Procedure:

1. The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1 m to 4 m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

- Limit:

§ 15.205(a) and (b), only spurious emissions are permitted in any of the frequency bands listed below:

| MHz | MHz | MHz | MHz | GHz | GHz |
|-------------------|---------------------|-------------------|-----------------|--------------|---------------|
| 0.009 ~ 0.110 | 8.41425 ~ 8.41475 | 108 ~ 121.94 | 1300 ~ 1427 | 4.5 ~ 5.15 | 14.47 ~ 14.5 |
| 0.495 ~ 0.505 | 12.29 ~ 12.293 | 123 ~ 138 | 1435 ~ 1626.5 | 5.35 ~ 5.46 | 15.35 ~ 16.2 |
| 2.1735 ~ 2.1905 | 12.51975 ~ 12.52025 | 149.9 ~ 150.05 | 1645.5 ~ 1646.5 | 7.25 ~ 7.75 | 17.7 ~ 21.4 |
| 4.125 ~ 4.128 | 12.57675 ~ 12.57725 | 156.52475 ~ | 1660 ~ 1710 | 8.025 ~ 8.5 | 22.01 ~ 23.12 |
| 4.17725 ~ 4.17775 | 13.36 ~ 13.41 | 156.52525 | 1718.8 ~ 1722.2 | 9.0 ~ 9.2 | 23.6 ~ 24.0 |
| 4.20725 ~ 4.20775 | 16.42 ~ 16.423 | 156.7 ~ 156.9 | 2200 ~ 2300 | 9.3 ~ 9.5 | 31.2 ~ 31.8 |
| 6.215 ~ 6.218 | 16.69475 ~ 16.69525 | 162.0125 ~ 167.17 | 2310 ~ 2390 | 10.6 ~ 12.7 | 36.43 ~ 36.5 |
| 6.26775 ~ 6.26825 | 16.80425 ~ 16.80475 | 167.72 ~ 173.2 | 2483.5 ~ 2500 | 13.25 ~ 13.4 | Above 38.6 |
| 6.31175 ~ 6.31225 | 25.5 ~ 25.67 | 240 ~ 285 | 2655 ~ 2900 | | |
| 8.291 ~ 8.294 | 37.5 ~ 38.25 | 322 ~ 335.4 | 3260 ~ 3267 | | |
| 8.362 ~ 8.366 | 73 ~ 74.6 | 399.90 ~ 410 | 3332 ~ 3339 | | |
| 8.37625 ~ 8.38675 | 74.8 ~ 75.2 | 608 ~ 614 | 3345.8 ~ 3358 | | |
| | | 960 ~ 1240 | 3600 ~ 4400 | | |

§ 15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency [MHz] | Field Strength of Fundamental Frequency [uV/m] | Measurement Distance [m] |
|-----------------|--|--------------------------|
| 30 ~ 88 | 100 | 3 |
| 88 ~ 216 | 150 | 3 |
| 216 ~ 960 | 200 | 3 |
| Above 960 | 500 | 3 |

§ 15.231(b), In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

| Frequency [MHz] | Field Strength of Fundamental Frequency [uV/m] | Field Strength of Spurious Emissions [uV/m] |
|-----------------|--|---|
| 40.66 ~ 40.70 | 2,250 | 225 |
| 70 ~ 130 | 1,250 | 125 |
| 130 ~ 174 | ¹ 1,250 to 3,750 | ¹ 125 to 375 |
| 174 ~ 260 | 3,750 | 375 |
| 260 ~ 470 | ¹ 3,750 to 12,500 | ¹ 375 to 1,250 |
| Above 470 | 12,500 | 1,250 |

¹Linear interpolations

- Measurement Data: **NT**

3.2.4 AC power line conducted emission

- Procedure:

1. The test procedure is performed in a 6.5 m x 3.5 m x 3.5 m (L x W x H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) x 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

- Measurement Data: **NA**

- Limit:

According to §15.207(a) for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 uH/50 ohm line impedance stabilization network(LISN).

Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

| Frequency Range (MHz) | Conducted Limit (dBuV) | |
|-----------------------|------------------------|------------|
| | Quasi-Peak | Average |
| 0.15 ~ 0.5 | 66 to 56 * | 56 to 46 * |
| 0.5 ~ 5 | 56 | 46 |
| 5 ~ 30 | 60 | 50 |

* Decreases with the logarithm of the frequency

3.2.5 Antenna requirement

- According to FCC 47 CFR §15.203:

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The antenna is permanently attached on PCB.

Therefore this E.U.T Complies with the requirement of §15.203.

APPENDIX I

TEST EQUIPMENT FOR TESTS

| Type | Manufacturer | Model | Cal.Date (yy/mm/dd) | Next.Cal.Date (yy/mm/dd) | S/N |
|-------------------|----------------------|----------|------------------------|-----------------------------|------------|
| Spectrum Analyzer | Agilent Technologies | N9020A | 17/09/06 | 18/09/06 | MY50200834 |
| Signal Generator | Rohde Schwarz | SMBV100A | 17/01/04 | 18/01/04 | 255571 |
| DC power supply | Agilent Technologies | 66332A | 17/09/05 | 18/09/05 | US37473422 |
| Multimeter | FLUKE | 17B | 17/04/12 | 18/04/12 | 26030065WS |
| Thermohygrometer | BODYCOM | BJ5478 | 17/01/11 | 18/01/11 | 1209 |