

# TEST REPORT



**CTK Co., Ltd.**  
(Ho-dong), 113, Yejik-ro, Cheoin-gu,  
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Report No.:  
CTK-2019-01410  
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## 1. Client

- Name : SystemBase Co., Ltd.
- Address : Daerung Post Tower-1 16F, 288, Digital-ro, Guro-gu, Seoul, Republic of Korea
- Date of Receipt : 2019-01-25

## 2. Manufacturer

- Name : SystemBase Co., Ltd.
- Address : Daerung Post Tower-1 16F, 288, Digital-ro, Guro-gu, Seoul, Republic of Korea

**3. Use of Report** : For FCC Certification

**4. Test Sample / Model**: tLory-1010NCL / tLory



**5. Date of Test** : 2019-03-19 to 2019-04-02

**6. Test Standard(method) used** : FCC 47 CFR part 15 subpart C 15.247,  
ANSI C63.10-2013

**7. Testing Environment**: Temp.: (23 ± 1) °C, Humidity: (48 ± 5) % R.H.

**8. Test Results** : Compliance

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.

|             |   |  |
|-------------|---|--|
| Affirmation | Gwanyong Kim:  (Signature) | Technical Manager<br>Young-taek Lee:  (Signature) |
|-------------|---|--|

2019-04-19

Republic of KOREA **CTK Co., Ltd.**



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## REPORT REVISION HISTORY

| Date       | Revision                | Page No |
|------------|-------------------------|---------|
| 2019-04-19 | Issued (CTK-2019-01410) | all     |
|            |                         |         |

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## 1. General Product Description

### 1.1 Client Information

|                       |  |
|-----------------------|--|
| <b>Company</b>        | SystemBase Co., Ltd.   |
| <b>Contact Point</b>  | Daerung Post Tower-1 16F, 288, Digital-ro, Guro-gu, Seoul, Republic of Korea |
| <b>Contact Person</b> | Name : Jaeyong kim<br>E-mail : jykim2@sysbas.com<br>Tel : +82-2-855-0501     |

### 1.2 Product Information

|                            |                        |
|----------------------------|------------------------|
| <b>FCC ID</b>              | PROTLORY1010NCL        |
| <b>Product Description</b> | tLory-1010NCL          |
| <b>Model name</b>          | tlory                  |
| <b>Operating Frequency</b> | 917.3 MHz – 923.3 MHz  |
| <b>RF Output Power</b>     | 10.804 dBm (12.304 mW) |
| <b>Antenna type</b>        | helical antenna        |
| <b>Antenna gain</b>        | -1.31 dBi              |
| <b>Number of channels</b>  | 20                     |
| <b>Type of Modulation</b>  | DSSS                   |
| <b>Power Source</b>        | DC 3.6 V               |

### 1.3 Peripheral Devices

| Device            | Manufacturer | Model No.  | Serial No. |
|-------------------|--------------|------------|------------|
| Notebook Computer | HP           | 15-bs563TU | CND7253R6P |
| AC/DC Adapter     | HP           | HSTNN-LA40 | 7628207801 |



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## 2. Facility and Accreditations

### 2.1 Test Facility

The measurement facility is located at (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea.

### 2.2 Laboratory Accreditations and Listings

| Country | Agency | Registration Number |
|---------|--------|---------------------|
| USA     | FCC    | 805871              |
| CANADA  | ISED   | 8737A-2             |
| KOREA   | NRRA   | KR0025              |

### 2.3 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.



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### 3. Test Specifications

#### 3.1 Standards

| Section in FCC  | Requirement(s)                      | Status (Note 1) | Test Condition |
|---|-------------------------------------|-----------------|----------------|
| 15.247(a)   | 6 dB Bandwidth                      | NA(Note 5)      | Conducted      |
| 15.247(e)   | Transmitter power spectral density  | NA(Note 5)      |                |
| 15.247(b)   | Maximum peak conducted output power | NA(Note 5)      |                |
| 15.247(d)   | Unwanted emission                   | NA(Note 5)      |                |
| 15.209  | Transmitter emission                | C               | Radiated       |
| 15.207(a)   | AC Conducted Emission               | NA(Note 6)      | Line Conducted |
| <i>Note 1:</i> C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable   |                                     |                 |                |
| <i>Note 2:</i> The data in this test report are traceable to the national or international standards.   |                                     |                 |                |
| <i>Note 3:</i> The sample was tested according to the following specification: FCC Part 15.247, ANSI C63.10-2013                                  |                                     |                 |                |
| <i>Note 4:</i> The tests were performed according to the method of measurements prescribed in KDB No.558074.                                      |                                     |                 |                |
| <i>Note 5:</i> The equipment contains an approved single module(FCC ID : PROLORYPLUGCPUV10).<br>The test result is the same as the single module. |                                     |                 |                |
| <i>Note 6:</i> The equipment is operated on battery power only.   |                                     |                 |                |



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### 3.2 Mode of operation during the test

The EUT is operated in a manner representative of the typical of the equipments.  
During at testing, system components were manipulated within the confines of typical usage to maximize each emission. All modulation modes were tests.  
The results are only attached worst cases.

#### Test Frequency

| Lowest channel | Middle channel | Highest channel |
|----------------|----------------|-----------------|
| 917.3 MHz      | 920.3 MHz      | 923.3 MHz       |

#### Test mode

| Modulation | Duty Cycle                                  |
|------------|---|
| DSSS       | 24.6 %(On time : 246 ms, Off time : 753 ms) |

### 3.3 Maximum Measurement Uncertainty

The value of the measurement uncertainty for the measurement of each parameter.  
Coverage factor  $k = 2$ , Confidence levels of 95 %

| Description                          | Uncertainty |
|--------------------------------------|-------------|
| Conducted RF Output Power            | 1.5 dB      |
| Power Spectral Density               | 1.5 dB      |
| Occupied Bandwidth                   | 0.1 MHz     |
| Unwanted Emission(conducted)         | 3.0 dB      |
| Radiated Emissions ( $f \leq 1$ GHz) | 4.0 dB      |
| Radiated Emissions ( $f > 1$ GHz)    | 5.0 dB      |



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## 4. Technical Characteristic Test

### 4.1 Radiated Emission

#### Test Location

- 10 m SAC (test distance :  10 m,  3 m)  
 3 m SAC (test distance : 3 m)

#### Test Procedures

- 1) In the frequency range of 9 kHz to 30 MHz, magnetic field is measured with Loop Antenna. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- 2) In the frequency range above 30 MHz, Bi-Log Test Antenna(30 MHz to 1 GHz) and Horn Test Antenna(above 1 GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is carried from 1m to 4m above the ground to determine the maximum value of the field strength. The emissions levels at both horizontal and vertical polarizations should be tested.

#### Instrument Settings

Frequency Range = 9 kHz ~ 12.75 GHz (10<sup>th</sup> harmonic)

- a) RBW = 1 MHz for  $f \geq 1$  GHz, 120 kHz for  $f < 1$  GHz, 9 kHz for  $f < 30$  MHz
- b) VBW  $\geq$  RBW
- c) Sweep time = auto couple





**Limit :**

FCC Part 15 § 15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

**Table 1. Restricted Frequency Bands**

| MHz                      | MHz               | MHz                 | MHz           | MHz         | GHz                     |
|--------------------------|-------------------|---------------------|---------------|-------------|-------------------------|
| 0.09-0.11                | 8.37626-8.38675   | 73-74.6             | 399.9-410     | 2690-2900   | 10.6-12.7               |
| <sup>1</sup> 0.495-0.505 | 8.41425-8.41475   | 74.8-75.2           | 608-614       | 3260-3267   | 13.25-13.4              |
| 2.1735-2.1905            | 12.29-12.293      | 108-121.94          | 960-1240      | 3332-3339   | 14.47-14.5              |
| 4.125-4.128              | 12.51975-12.52025 | 123-138             | 1300-1427     | 3345.8-3358 | 15.35-16.2              |
| 4.17725-4.17775          | 12.57675-12.57725 | 149.9-150.05        | 1435-1626.5   | 3600-4400   | 17.7-21.4               |
| 4.20725-4.20775          | 13.36-13.41       | 156.52475-156.52525 | 1645.5-1646.5 | 4500-5150   | 22.01-23.12             |
| 6.215-6.218              | 16.42-16.423      | 156.7-156.9         | 1660-1710     | 5350-5460   | 23.6-24                 |
| 6.26775-6.26825          | 16.69475-16.69525 | 162.0125-167.17     | 1718.8-1722.2 | 7250-7750   | 31.2-31.8               |
| 6.31175-6.31225          | 16.80425-16.80475 | 167.72-173.2        | 2200-2300     | 8025-8500   | 36.43-36.5              |
| 8.291-8.294              | 25.5-25.67        | 240-285             | 2310-2390     | 9000-9200   | <sup>2</sup> Above 38.6 |
| 8.362-8.366              | 37.5-38.25        | 322-335.4           | 2483.5-2500   | 9300-9500   |                         |

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

§ 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

FCC Part 15 § 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 :

**Table 2. General Field Strength Limits for Licence-Exempt Transmitters**

| Frequency(MHz) | Field Strength<br>uV/m@3m | Field Strength<br>dBuV/m@3m | Measurement<br>Distance (meters) |
|----------------|---------------------------|-----------------------------|----------------------------------|
| 0.009-0.490    | 2400/F(kHz)               | -                           | 300                              |
| 0.490-1.705    | 24000/F(kHz)              | -                           | 30                               |
| 1.705-30       | 30                        | -                           | 30                               |
| 30-88          | 100**                     | 40                          | 3                                |
| 88-216         | 150**                     | 43.5                        | 3                                |
| 216-960        | 200**                     | 46                          | 3                                |
| Above 960      | 500                       | 54                          | 3                                |

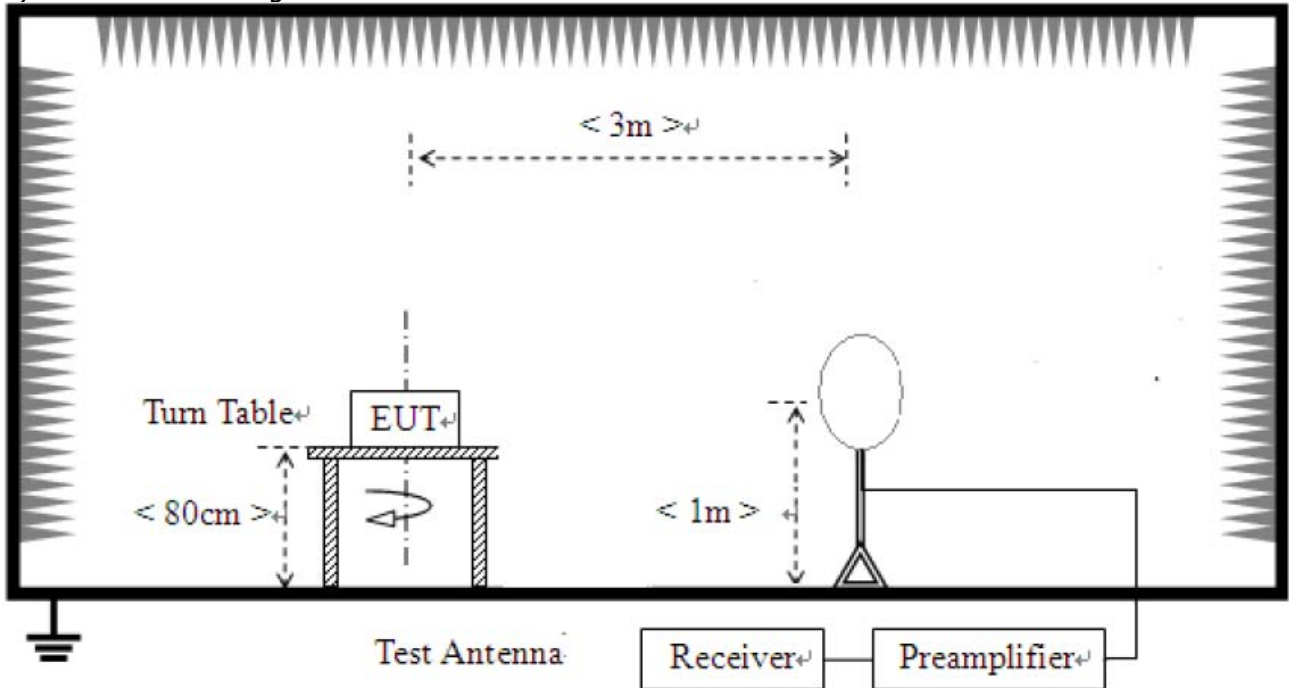
\*\* Except as provided in 15.209(g).fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88MHz, 174-216MHz, 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g.15.231 and 15.241.

Note :

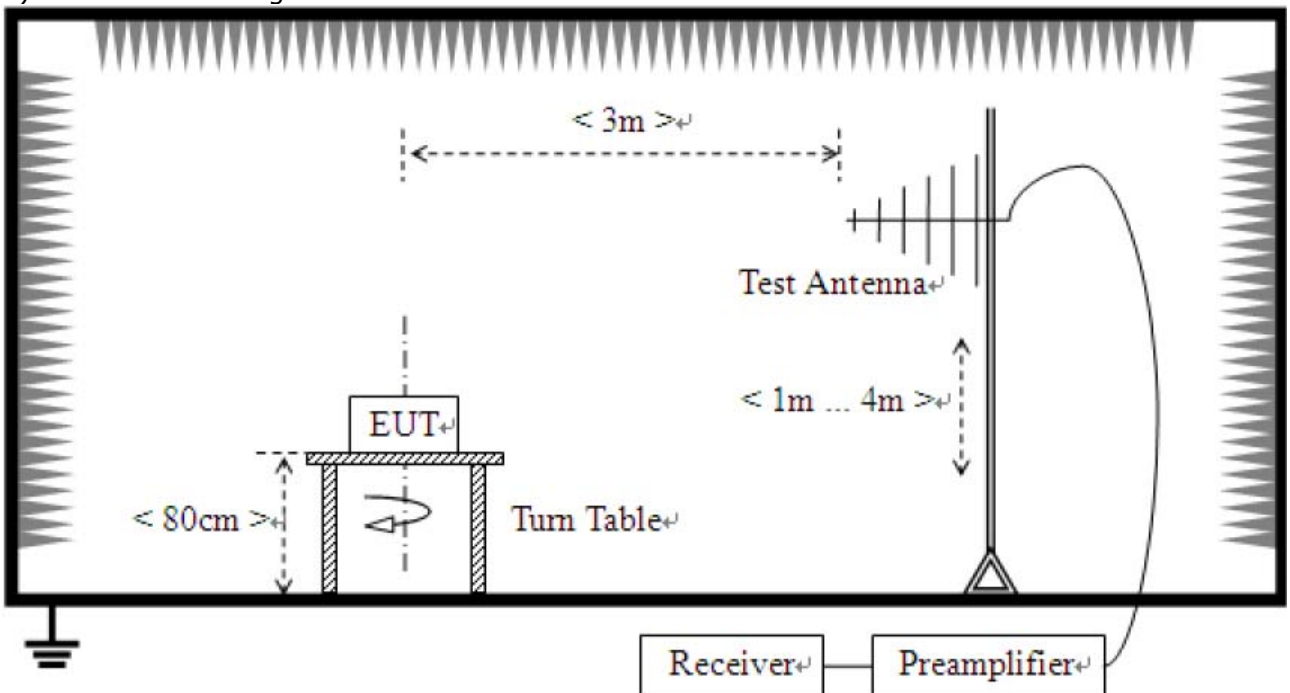
- 1) For above 1 GHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
- 2) For above 1 GHz, limit field strength of harmonics : 54 dBuV/m@3m (AV) and 74 dBuV/m@3m (PK)
- 3) For measurement above 1GHz, the resolution bandwidth is set to 1 MHz and video bandwidth is set to 3 MHz for peak measurement.

### Test Setup:

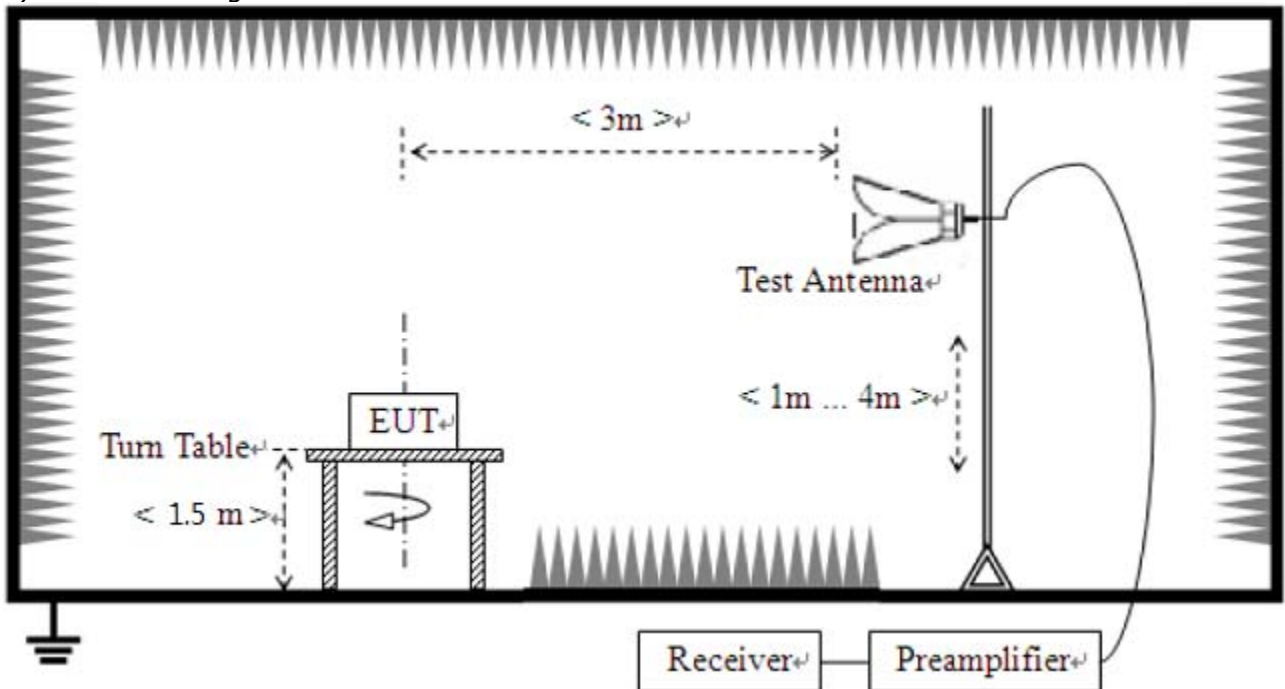
- 1) For field strength of emissions from 9 kHz to 30 MHz



- 2) For field strength of emissions from 30 MHz to 1 GHz



3) For field strength of emissions above 1 GHz



**Test results**

1) 9 kHz to 30 MHz

The requirements are:

Complies

| Frequency (MHz) | Measured Data (dBuV/m) | Margin (dB) | Remark   |
|-----------------|------------------------|-------------|----------|
| -               | -                      | -           | See note |

**Note :**

The amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

Distance extrapolation factor =  $40 \log (\text{specific distance} / \text{test distance})$  (dB)

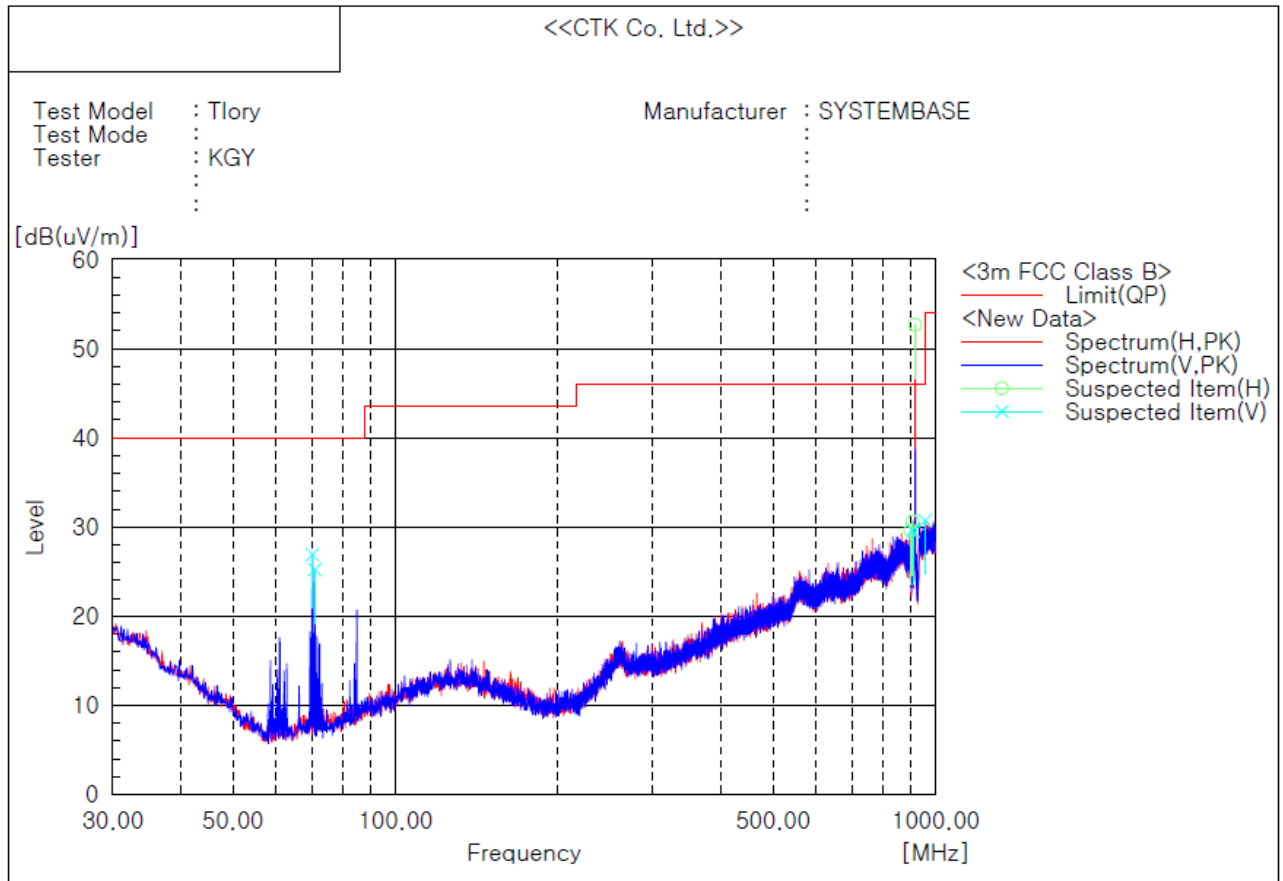
## 2) 30 MHz to 1 GHz

Test mode : Low Channel(Worst case)

The requirements are:

Complies

### Test Data



#### Spectrum Selection

| No. | Frequency [MHz] | (P) | Reading [dB(uV)] | c.f [dB(1/m)] | Result PK [dB(uV/m)] | Limit QP [dB(uV/m)] | Margin QP [dB] | Height [cm] | Angle [deg] |
|-----|-----------------|-----|------------------|---------------|----------------------|---------------------|----------------|-------------|-------------|
| 1   | 70.255          | V   | 44.3             | -17.4         | 26.9                 | 40.0                | 13.1           | 300.0       | 162.0       |
| 2   | 70.983          | V   | 42.5             | -17.3         | 25.2                 | 40.0                | 14.8           | 300.0       | 109.0       |
| 3   | 899.484         | H   | 24.8             | 4.8           | 29.6                 | 46.0                | 16.4           | 201.0       | 83.0        |
| 4   | 907.244         | H   | 25.2             | 5.4           | 30.6                 | 46.0                | 15.4           | 101.0       | 277.0       |
| 5   | 908.335         | V   | 24.1             | 5.5           | 29.6                 | 46.0                | 16.4           | 399.0       | 224.0       |
| 6   | 917.550         | H   | 46.8             | 5.9           | 52.7                 | 46.0                | -6.7           | 101.0       | 67.0        |
| 7   | 956.592         | V   | 23.5             | 7.2           | 30.7                 | 46.0                | 15.3           | 300.0       | 135.0       |

#### Remark :

- The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.
- Result = Reading + c.f(Correction factor)
- Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
- This data is the Peak(PK) value.
- No.6(Horizontal Polarization) are the carrier frequencies.



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### 3) 1 GHz to 12.75 GHz

The requirements are:

Complies

#### Test Data

| Channel | Frequency [MHz] | Ant. Pol. (V/H) | Reading [dBuV/m] | c.f [dB/m] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|---------|-----------------|-----------------|------------------|------------|-----------------|----------------|-------------|--------|
| Low     | 6 422.73        | H               | 47.00            | 5.9        | <b>52.90</b>    | 54             | 1.10        | Peak   |
|         | 6 420.09        | V               | 46.80            | 5.9        | <b>52.70</b>    | 54             | 1.30        | Peak   |
| Middle  | 2 653.72        | H               | 51.80            | -3.7       | <b>48.10</b>    | 54             | 5.90        | Peak   |
|         | 2 662.95        | V               | 56.00            | -3.6       | <b>52.40</b>    | 54             | 1.60        | Peak   |
| High    | 2 492.83        | H               | 51.90            | -3.7       | <b>48.20</b>    | 54             | 5.80        | Peak   |
|         | 2 661.63        | V               | 52.20            | -3.6       | <b>48.60</b>    | 54             | 5.40        | Peak   |

#### Remarks

1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain
4. The peak value is lower than the average limit value. (Peak < 54 dBuV/m)



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## APPENDIX A – Test Equipment Used For Tests

|    | Name of Equipment   | Manufacturer    | Model No. | Serial No.    | Cal Date   | Due Date   |
|----|---------------------|-----------------|-----------|---------------|------------|------------|
| 1  | Signal Analyzer     | Rohde & Schwarz | FSV40     | 101574        | 2019-01-28 | 2020-01-28 |
| 2  | Signal Generator    | Rohde & Schwarz | SMB100A   | 175528        | 2018-10-24 | 2019-10-24 |
| 3  | EMI Test Receiver   | Rohde & Schwarz | ESCI7     | 100814        | 2018-10-25 | 2019-10-25 |
| 4  | Bilog Antenna       | Schaffner       | CBL6111C  | 2551          | 2018-05-10 | 2020-05-10 |
| 5  | Active Loop Antenna | SCHWARZBECK     | FMZB 1513 | 1513-125      | 2018-05-02 | 2020-05-02 |
| 6  | 6dB Attenuator      | Rohde & Schwarz | DNF       | 272.4110.50-2 | 2018-10-25 | 2019-10-25 |
| 7  | 6dB Attenuator      | Rohde & Schwarz | DNF       | 272.4110.50-1 | 2019-03-06 | 2020-03-06 |
| 8  | AMPLIFIER           | SONOMA          | 310       | 291721        | 2019-01-28 | 2020-01-28 |
| 9  | Preamplifier        | Agilent         | 8449B     | 3008A02011    | 2018-12-03 | 2019-12-03 |
| 10 | Horn Antenna        | ETS-Lindgren    | 3115      | 00078895      | 2017-12-04 | 2019-12-04 |
| 11 | Horn Antenna        | ETS-Lindgren    | 3116      | 00062916      | 2017-12-04 | 2019-12-04 |

|   | Cable               | Manufacturer | Model No.    | Serial No.          | Check Date |
|---|---------------------|--------------|--------------|---------------------|------------|
| 1 | RF Cable (Radiated) | HUBER+SUHNER | SUCOFLEX 104 | MY27558/4           | 2018-12-19 |
| 2 | RF Cable (Radiated) | HUBER+SUHNER | SUCOFLEX 104 | N/A<br>(below 1GHz) | 2018-12-19 |
| 3 | RF Cable (Radiated) | HUBER+SUHNER | SUCOFLEX 104 | MY27573/4           | 2018-12-19 |
| 4 | RF Cable (Radiated) | HUBER+SUHNER | SUCOFLEX 106 | N/A<br>(above 1GHz) | 2018-12-19 |
| 5 | RF Cable (Radiated) | HUBER+SUHNER | SUCOFLEX 102 | MY2374/2            | 2018-12-19 |
| 6 | RF Cable (Radiated) | HUBER+SUHNER | SUCOFLEX 102 | MY4728/2            | 2018-12-19 |