

## TEST REPORT

|                                  |  |
|----------------------------------|--|
| Report Number                    | 190200116SEL-EMC5  |
| Applicant Name/Address           | Haenim CO.,LTD.<br>15, Saryeom-ro 21beon-gil, Seo-gu, Incheon, Republic of Korea |
| Test Sample Description          |  |
| - Product .....                  | Electric UV Sterilizer, UV Sterilizer & Dryer, UV Sanitizer & Dryer              |
| - Model and/or Brand name .....  | HN-04-WG-BLE   |
| - Variant model name .....       | See page 4   |
| - Manufacturer Name / Address .. | Haenim CO.,LTD.<br>15, Saryeom-ro 21beon-gil, Seo-gu, Incheon, Republic of Korea |
| - Rating(s) .....                | AC 120 V, 60 Hz  |
| Receipt of sample(s)             | 01 Apr. 2019   |
| Date of Test                     | 03 Jul. 2019   |
| Test Method(s)                   | FCC/OST MP-5 (1986)<br>FCC Part 18   |
| Test Results & Uncertainty       | See EMC Results Conclusion   |
| Issue date                       | 13 Aug. 2019   |

Note 1: The results shown in this test report refer only to the sample(s) tested.

Note 2: This report shall not be reproduced except in full, without the written approval of Intertek.

Note 3: This laboratory is not accredited for the test results marked as \*.

Tested by;



Name: Walter Lee  
EMC Engineer

Approved by;



Name: Rina Bae  
EMC Technical Manager

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## SECTION 2 EMC RESULTS CONCLUSION (WITH JUSTIFICATION)

We tested the Electric UV Sterilizer, UV Sterilizer & Dryer, UV Sanitizer & Dryer, Model: HN-04-WG-BLE, to determine if it was in compliance with the relevant US standards as marked on the test report. We found that the unit met the requirement of FCC Part 18 standards when tested as received.

| Test Items                            | Applied Standards                  | Results                             |                          |                          |                                     |
|---------------------------------------|------------------------------------|-------------------------------------|--------------------------|--------------------------|-------------------------------------|
|                                       |                                    | Comply                              | Not Comply               | N/A                      | See Note                            |
| Disturbance Voltage                   | FCC/OST MP-5 (1986)<br>FCC Part 18 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Radiated disturbance<br>(Below 1 GHz) | FCC/OST MP-5 (1986)<br>FCC Part 18 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

Note 1) When determining the test conclusion, the Measurement Uncertainty of test has been considered.

### Measurement Uncertainty

|                    |   |  |
|--------------------|---|--|
| Conducted Emission | 150 kHz – 30 MHz                                | $U = 3.3$ [dB]   |
|                    | (Confidence level approximately 95 %, $k = 2$ ) |  |
| Radiated Emissions | 9 kHz – 30 MHz                                  | $U = 4.5$ [dB]   |
|                    | 30 MHz – 1 000 MHz                              | Horizontal: $U = 4.3$ [dB]<br>Vertical: $U = 4.6$ [dB] |
|                    | 1 GHz – 6 GHz                                   | Horizontal: $U = 5.7$ [dB]<br>Vertical: $U = 5.7$ [dB] |
|                    | 6 GHz – 18 GHz                                  | Horizontal: $U = 5.7$ [dB]<br>Vertical: $U = 5.8$ [dB] |
|                    | Confidence level approximately 95 %, $k = 2$ )  |  |

## SECTION 3 TEST ENVIRONMENT AND CONDITIONS

### Test Environment

| Test Item                             | Test Site        | Test date (MM-DD) | Temp (°C)  | Humidity (% R.H.) | Pressure (kPa) |
|---------------------------------------|------------------|-------------------|------------|-------------------|----------------|
| Disturbance Voltage                   | Shielded Room #2 | 07-03             | 23.1 ± 1.0 | 39.8 ± 1.0        | -              |
| Radiated disturbance<br>(Below 1 GHz) | 10 m chamber     | 07-03             | 24.1 ± 1.5 | 40.3 ± 1.0        |                |



## SECTION 4 EUT INFORMATION

|   |  |
|---|--|
| <b>Equipment Under Test (EUT):</b>      | Electric UV Sterilizer, UV Sterilizer & Dryer,<br>UV Sanitizer & Dryer   |
| <b>Model:</b>                           | HN-04-WG-BLE   |
| <b>Variant Model:</b>                   | HN-04-WM-BLE, HN-04-WB-BLE, HN-04-WS-BLE, HN-04-WGN-BLE, HN-04-WP-BLE, HN-04-WBL-BLE, HN-04-WGY-BLE, HN-04-BM-BLE, HN-04-BG-BLE, HN-04-BB-BLE, HN-04-BS-BLE, HN-04-BGN-BLE, HN-04-BP-BLE, HN-04-BBL-BLE, HN-04-BGY-BLE, HN-04-GM-BLE, HN-04-GG-BLE, HN-04-GB-BLE, HN-04-GS-BLE, HN-04-GGN-BLE, HN-04-GP-BLE, HN-04-GBL-BLE, HN-04-GGY-BLE, HN-04-SWM-BLE, HN-04-SWG-BLE, HN-04-SWB-BLE, HN-04-SWS-BLE, HN-04-SWGN-BLE, HN-04-SWP-BLE, HN-04-SWBL-BLE, HN-04-SWGY-BLE |
| <b>Serial No.:</b>                      | -  |
| <b>Rated Voltage:</b>                   | AC 120 V, 60 Hz  |
| <b>Internal clock frequency:</b>        | 11.0592 MHz  |
| <b>UV lighting operating frequency:</b> | 60 kHz   |
| <b>Variant model information:</b>       | The basic model and variant models have the same electrical circuit, structure and performance, only the difference in model name according to appearance colors.  |

**HN – 04 --   (1)     (2)   -BLE**

(1) : Body Color

W : WHITE, B : BLACK, G : GRAY , SW : SHINY

(2) : Handle Color

M : METAL, G : GOLD , B : BLACK , S : SILVER ,  
GN : GREEN , P : PINK , BL : BLUE , GY : GRAY



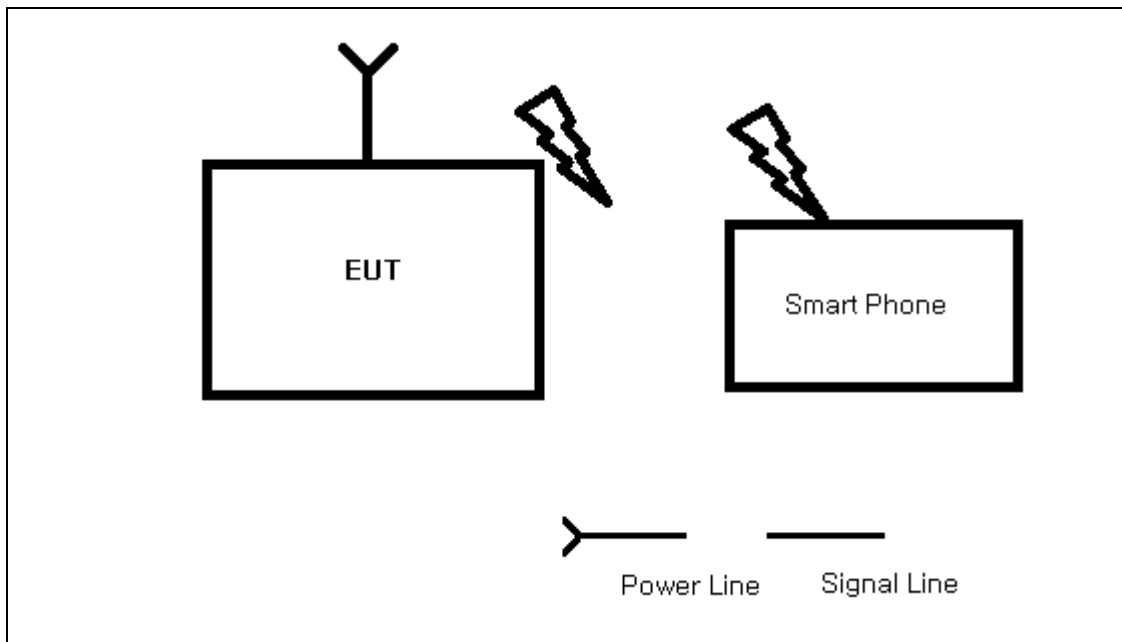
## SECTION 5 TEST CONFIGURATION, OPERATION MODE AND SET-UP

| Equipment   | Model No.    | Serial No. | Manufacturer                  | Connect type | CABLE Length (m) | Shield     |
|---|--------------|------------|-------------------------------|--------------|------------------|------------|
| Electric UV Sterilizer, UV Sterilizer & Dryer, UV Sanitizer & Dryer | HN-04-WG-BLE | -          | Haenim CO.,LTD.               | AC IN        | 1.7              | Unshielded |
| Smart Phone   | -            | -          | Samsung Electronics Co., Ltd. | -            | -                | -          |
| UV Lamp   | HNS 4W G5    | -          | OSRAM                         | -            | -                | -          |

### Test Operation Mode

- Bluetooth Mode : It was controlling UV lamp by connecting smartphone with Bluetooth.

### Test Setup





## SECTION 6 EMISSION

### Radiated disturbance test

#### Test Method and Summary

Test standard: FCC/OST MP-5 (1986), FCC Part 18

#### Used Test Equipment

| Control No. | Equipment         | Manufacturer | Model No. | Serial No. | Next Cal.  | Cal Int. |
|-------------|-------------------|--------------|-----------|------------|------------|----------|
| EMC001      | EMI Test Receiver | R & S        | ESU40     | 100478     | 2020.01.03 | 1Y       |
| EMC025      | Biconilog (Type7) | ETS-Lindgren | 3142E     | 00203547   | 2021.02.25 | 2Y       |
| EMC077      | AMP               | R & S        | SCU-18D   | 1952128    | 2020.06.28 | 1Y       |

#### Operating Environment

Test Voltage: AC 120 V, 60 Hz

#### Test Setup and Procedure

The EUT along with its peripherals were placed on a non-conducted table with a height of 0.8 m in height table above the reference ground plane.

Rotate the EUT from (0 ~ 360)° and position the receiving antenna at heights from (1 ~ 4) m above the reference ground plane continuously to determine associated with higher emission levels and record them.

The measurement was made in both the vertical and horizontal polarization, and the maximum value is presented in the report.

For measurements above 1 GHz,

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.

The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal.

The final measurement antenna elevation shall be that which maximizes the emissions.

**Limits**

- The test frequency range of Radiated Disturbance measurements are listed below.

| Frequency band in which device operates (MHz) | Upper frequency of measurement range(MHz)                               |   |
|---|---|---|
|   | Lowest frequency  | Highest frequency                                 |
| Below 1.705                                   | Lowest frequency generated in the device, but not lower than 9 kHz      | 30 MHz.   |
| 1.705 to 30                                   | Lowest frequency generated in the device, but not lower than 9 kHz      | 400 MHz.  |
| 30 to 500                                     | Lowest frequency generated in the device or 25 MHz, whichever is lower  | Tenth harmonic or 1,000 MHz, whichever is higher. |
| 500 to 1,000                                  | Lowest frequency generated in the device or 100 MHz, whichever is lower | Tenth harmonic.                                   |
| Above 1,000                                   | .....do   | Tenth harmonic or highest detectable emission.    |

(a) ISM equipment operating on a frequency specified in 18.301 is permitted unlimited radiated energy in the band specified for that frequency :

| ISM frequency | Tolerance  |
|---------------|------------|
| 6.78 MHz      | ±15.0 kHz  |
| 13.56 MHz     | ±7.0 kHz   |
| 27.12 MHz     | ±163.0 kHz |
| 40.68 MHz     | ±20.0 kHz  |
| 915 MHz       | ±13.0 MHz  |
| 2,450 MHz     | ±50.0 MHz  |
| 5,800 MHz     | ±75.0 MHz  |
| 24,125 MHz    | ±125.0 MHz |
| 61.25 GHz     | ±250.0 MHz |
| 122.50 GHz    | ±500.0 MHz |
| 245.00 GHz    | ±1.0 GHz   |



(b) The field strength level of emissions which lie outside the bands specified in 18.301 unless otherwise indicated, shall not exceed the following :

| Equipment   | Operating frequency   | RF Power generated by equipment (W) | Field strength limit (µV/m)                                | Distance (meters)       |
|---|-----------------------|-------------------------------------|--|-------------------------|
| Any type unless otherwise specified (miscellaneous) | Any ISM frequency     | Below 500<br>500 or more            | 25<br>$25 \times \text{SQRT}(\text{power}/500)$            | 300<br><sup>1</sup> 300 |
|   | Any non-ISM frequency | Below 500<br>500 or more            | 15<br>$15 \times \text{SQRT}(\text{power}/500)$            | 300<br><sup>1</sup> 300 |
| Industrial heaters and RF stabilized arc welders    | On or below 5,725 MHz | Any                                 | 10   | 1 600                   |
|   | Above 5,725 MHz       | Any                                 | (2)  | (2)                     |
| Medical diathermy                                   | Any ISM frequency     | Any                                 | 25   | 300                     |
|   | Any non-ISM frequency | Any                                 | 15   | 300                     |
| Ultrasonic  | Below 490 kHz         | Below 500                           | $2,400/F(\text{kHz})$                                      | 300                     |
|   |                       | 500 or more                         | $2,400/F(\text{kHz}) \times \text{SQRT}(\text{power}/500)$ | <sup>3</sup> 300        |
|   | 490 to 1,600 kHz      | Any                                 | $24,000/F(\text{kHz})$                                     | 30                      |
|   | Above 1,600 kHz       | Any                                 | 15   | 30                      |
| Induction cooking ranges                            | Below 90 kHz          | Any                                 | 1,500  | <sup>4</sup> 30         |
|   | On or above 90 kHz    | Any                                 | 300  | <sup>4</sup> 30         |

1. Field strength may not exceed 10 µV/m at 1 600 meters. Consumer equipment operating below 1 000 MHz is not permitted the increase in field strength otherwise permitted here for power over 500 W.
2. Reduced to the greatest extent possible.
3. Field strength may not exceed 10 µV/m at 1 600 meters. Consumer equipment is not permitted the increase in field strength otherwise permitted here for over 500 W.
4. Induction cooking ranges manufactured prior to February 1, 1 980, shall be subject to the field strength limits for miscellaneous ISM equipment.

(c) The field strength limits for RF lighting devices shall be the following:

| Frequency (MHz)         | Field strength limit at 30 meters (µV/m) |
|-------------------------|--|
| Non-consumer equipment: |  |
| 30 - 88                 | 30                                       |
| 88 - 216                | 50                                       |
| 216 – 1000              | 70                                       |
| Consumer equipment:     |  |
| 30 - 88                 | 10                                       |
| 88 - 216                | 15                                       |
| 216 – 1000              | 20                                       |

1. The tighter limit shall apply at the boundary between two frequency ranges.
2. Testing for compliance with these limits may be made at closer distances, provided a sufficient number of measurements are taken to plot the radiation pattern, to determine the major lobes of radiation, and to determine the expected field strength level at 30, 300, or 1 600 meters. Alternatively, if measurements are made at only one closer fixed distance, then the permissible field strength limits shall be adjusted using 1/d as an attenuation factor.

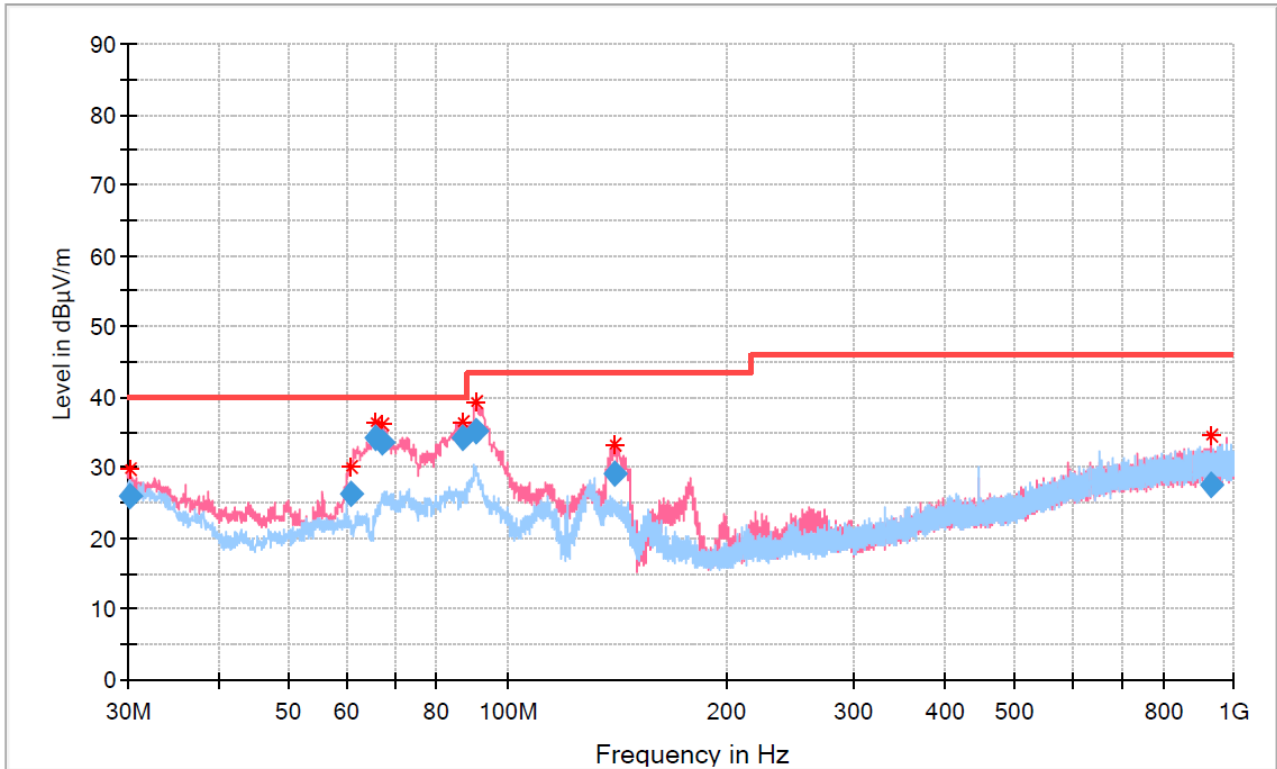




## Test Data

[Below 1 GHz]

[Bluetooth Mode]



## Final Result

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-------------|-----|---------------|------------|
| 30.12           | 26.05              | 40.00          | 13.95       | 100.0       | V   | 8.00          | -13.01     |
| 60.82           | 26.40              | 40.00          | 13.60       | 200.0       | V   | 122.00        | -21.30     |
| 66.08           | 34.21              | 40.00          | 5.79        | 100.0       | V   | 144.00        | -21.25     |
| 67.33           | 33.57              | 40.00          | 6.43        | 100.0       | V   | 144.00        | -21.21     |
| 86.89           | 34.16              | 40.00          | 5.84        | 100.0       | V   | 238.00        | -21.08     |
| 90.65           | 35.30              | 43.52          | 8.22        | 100.0       | V   | 107.00        | -20.79     |
| 140.63          | 29.05              | 43.52          | 14.47       | 100.0       | V   | 107.00        | -20.03     |
| 933.93          | 27.59              | 46.02          | 18.43       | 400.0       | V   | 147.00        | -1.26      |

### Sample calculation (example : at 80 MHz)

- Limit = 30 dBµV/m at 10 m
- Level (20 dBµV/m)  
= Meter Reading (40 dBµV) + Factor (- 20 dB (1/m) = antenna factor + cable loss – amplifier gain)
- Margin (10 dB) = Limit (30 dBµV/m) - Level (20 dBµV/m) = 10 dB below limit



## Disturbance Voltage Test

### Test Method and Summary

Test standard : FCC/OST MP-5 (1986), FCC Part 18

### Used Test Equipment

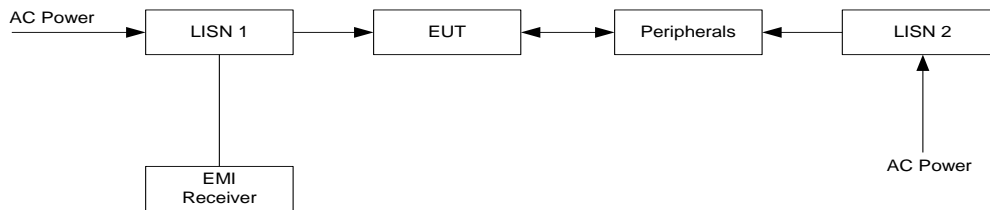
| Control No. | Equipment          | Manufacturer | Model No. | Serial No. | Next Cal.  | Cal Int. |
|-------------|--------------------|--------------|-----------|------------|------------|----------|
| EMC004      | EMI Test Receiver  | R & S        | ESR7      | 101560     | 2020.01.02 | 1Y       |
| EMC007      | Two-Line V-Network | R & S        | ENV216    | 101982     | 2019.10.31 | 1Y       |

### Operating Environment

Test Voltage: AC 120 V, 60 Hz

### Test Setup and Procedure

#### Disturbance Voltage Test at Mains Terminal:



The EUT along with its peripherals were placed on a 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 m space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50 characteristic coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled.

**Limits**

(a) All Induction cooking ranges and ultrasonic equipment:

| Frequency (MHz) | Conducted limit (dB $\mu$ V) |         |
|-----------------|------------------------------|---------|
|                 | Quasi-peak                   | Average |
| 0.009 – 0.05    | 110                          | -       |
| 0.05 – 0.15     | 90 – 80                      | -       |
| 0.15 – 0.5      | 66 – 56                      | 56 – 46 |
| 0.5 – 5         | 56                           | 46      |
| 5 – 30          | 60                           | 50      |

(b) All other part 18 consumer devices:

| Frequency (MHz) | Conducted limit (dB $\mu$ V) |           |
|-----------------|------------------------------|-----------|
|                 | Quasi-peak                   | Average   |
| 0.15 – 0.5      | 66 – 56                      | 56 – 46 * |
| 0.5 – 5         | 56                           | 46        |
| 5 – 30          | 60                           | 50        |

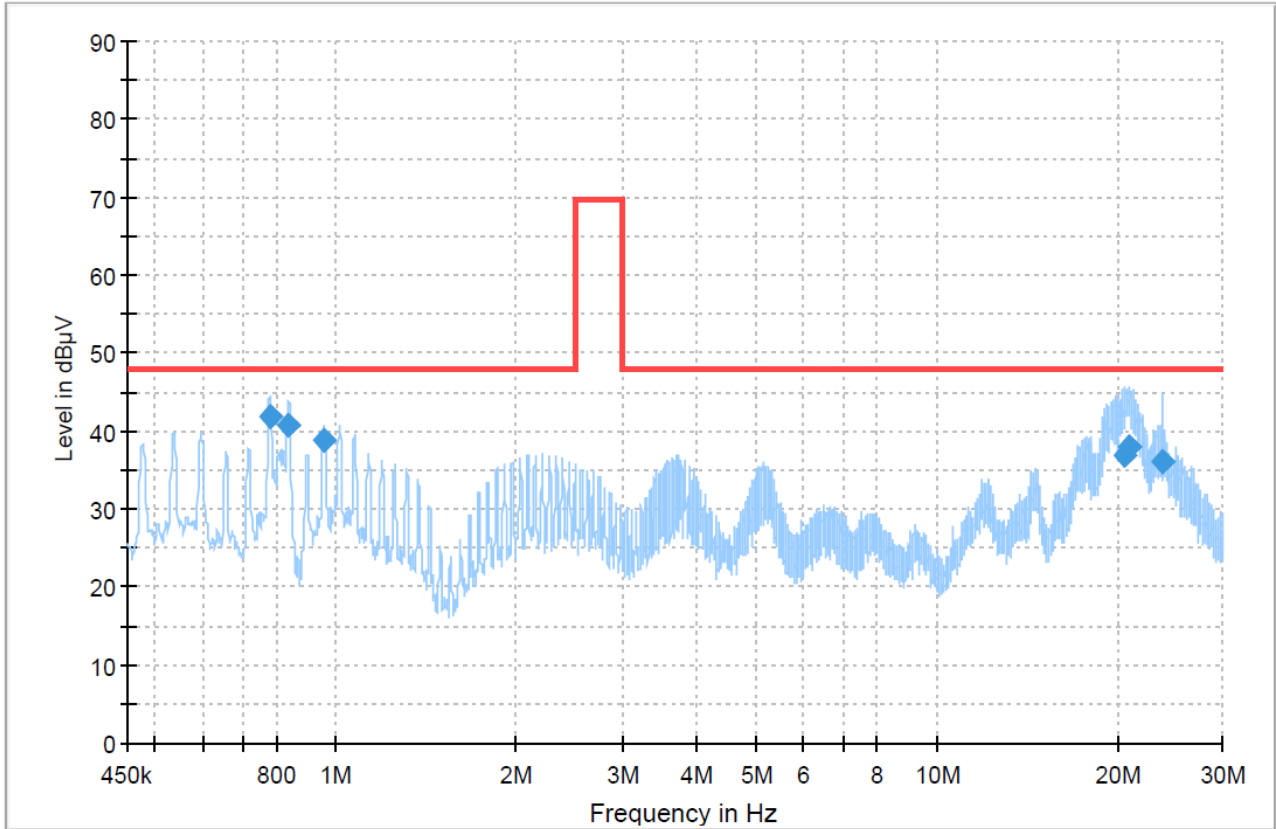
(c) RF lighting devices:

| Frequency (MHz)    | Maximum RF line voltage measured with a 50 $\mu$ H/50 ohm LISN ( $\mu$ V) |  |
|--------------------|---|--|
|                    | Non-consumer equipment  |  |
| 0.45 – 1.6         | 1 000   |  |
| 1.6 – 30           | 3 000   |  |
| Consumer equipment |   |  |
| 0.45 – 2.51        | 250   |  |
| 2.51 – 3.0         | 3 000   |  |
| 3.0 – 30           | 250   |  |



### Test Data

[Bluetooth Mode\_Live]

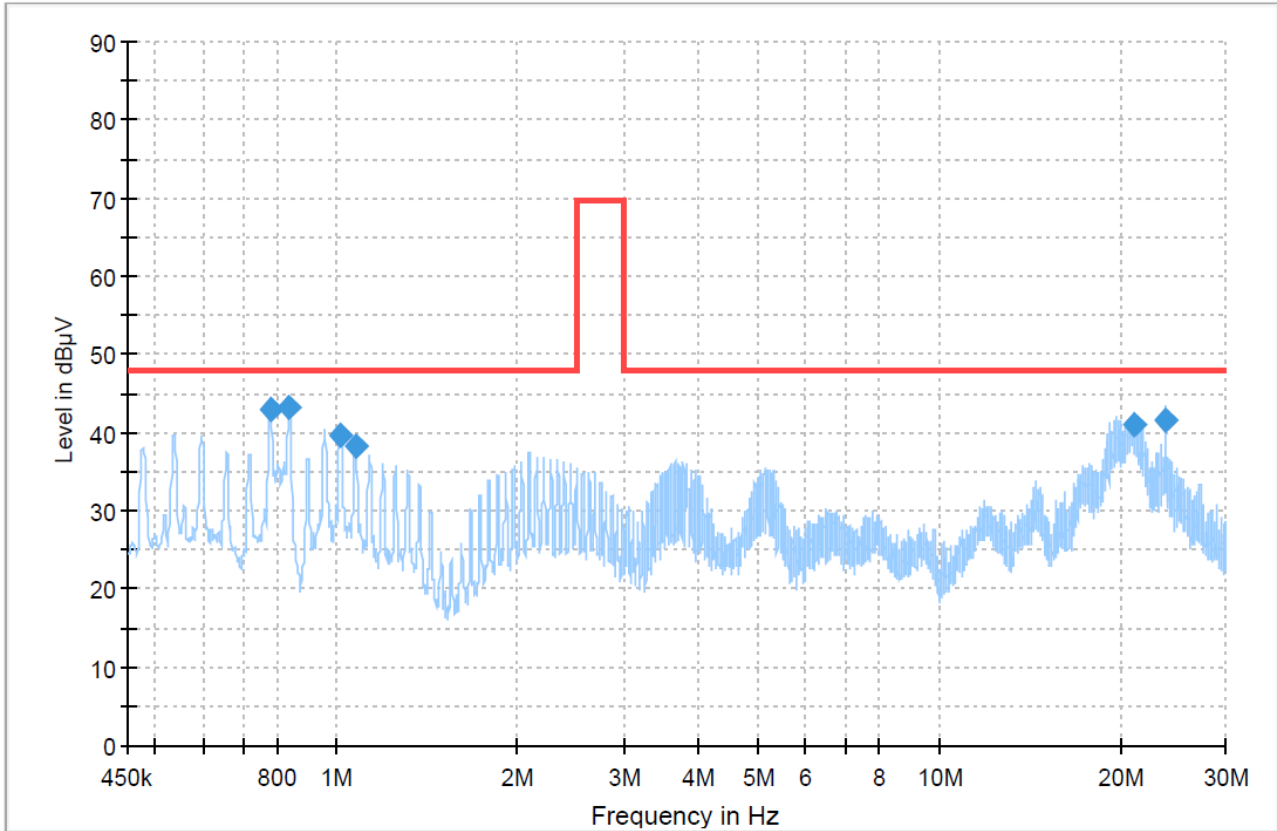


### Final Result

| Frequency (MHz) | QuasiPeak (dBµV) | Limit (dBµV) | Margin (dB) | Bandwidth (kHz) | Line | Filter | Corr. (dB) |
|-----------------|------------------|--------------|-------------|-----------------|------|--------|------------|
| 0.775050        | 41.77            | 47.96        | 6.19        | 9.000           | L1   | ON     | 9.9        |
| 0.833165        | 40.70            | 47.96        | 7.26        | 9.000           | L1   | ON     | 9.8        |
| 0.955305        | 38.76            | 47.96        | 9.20        | 9.000           | L1   | ON     | 9.9        |
| 20.532180       | 36.97            | 47.96        | 10.99       | 9.000           | L1   | ON     | 10.0       |
| 20.879885       | 37.88            | 47.96        | 10.08       | 9.000           | L1   | ON     | 10.0       |
| 23.877240       | 36.02            | 47.96        | 11.94       | 9.000           | L1   | ON     | 10.0       |



[Bluetooth Mode\_Neutral]



## Final Result

| Frequency (MHz) | QuasiPeak (dBµV) | Limit (dBµV) | Margin (dB) | Bandwidth (kHz) | Line | Filter | Corr. (dB) |
|-----------------|------------------|--------------|-------------|-----------------|------|--------|------------|
| 0.776035        | 43.01            | 47.96        | 4.95        | 9.000           | N    | ON     | 9.9        |
| 0.835135        | 43.17            | 47.96        | 4.79        | 9.000           | N    | ON     | 9.9        |
| 1.015390        | 39.75            | 47.96        | 8.21        | 9.000           | N    | ON     | 9.9        |
| 1.074490        | 38.21            | 47.96        | 9.75        | 9.000           | N    | ON     | 9.9        |
| 21.109390       | 41.13            | 47.96        | 6.83        | 9.000           | N    | ON     | 10.1       |
| 23.872315       | 41.54            | 47.96        | 6.42        | 9.000           | N    | ON     | 10.1       |

### Sample calculation (example : at 10 MHz)

- Limit = 60 dBµV (Quasi-peak limit)
- Level (50 dBµV) = Meter Reading (40.2 dBµV) + Factor (9.9 dB = AMN factor 9.8 dB + Cable loss 0.1 dB)
- Margin (10 dB) = Limit (60 dBµV) - Level (50 dBµV) = 10 dB below limit



**SECTION 7 APPENDIX I**

**Photographs of Test Configurations**



Disturbance Voltage Test



Disturbance Voltage Test



Radiated disturbance (Below 1 GHz)



Radiated disturbance (Below 1 GHz)



**SECTION 8 APPENDIX II**

**Photographs of EUT**



Front



Rear