

FCC Test Report

Report No.: RF131118E02C

FCC ID: 2ABC8-PP200850SE

Test Model: DT8035

Series Model: DT8050

Received Date: Dec. 26, 2018

Test Date: Jan. 02 to 11, 2019

Issued Date: Mar. 27, 2019

Applicant: Honeywell Security Sensor CoE

Address: 2 Corporate Center Dr. Melville New York 11747 United States

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Hsin Chu Laboratory

Lab Address: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
Taiwan R.O.C.

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**FCC Registration /
Designation Number:** 723255 / TW2022



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Table of Contents

| | |
|--|-----------|
| Release Control Record | 3 |
| 1 Certificate of Conformity..... | 4 |
| 2 Summary of Test Results | 5 |
| 2.1 Measurement Uncertainty | 5 |
| 2.2 Modification Record | 5 |
| 3 General Information..... | 6 |
| 3.1 General Description of EUT | 6 |
| 3.2 Description of Test Modes | 7 |
| 3.2.1 Test Mode Applicability and Tested Channel Detail..... | 8 |
| 3.3 Duty Cycle of Test Signal | 10 |
| 3.4 Description of Support Units | 11 |
| 3.4.1 Configuration of System under Test | 12 |
| 3.5 General Description of Applied Standards | 13 |
| 4 Test Types and Results | 14 |
| 4.1 Radiated Emission and Bandedge Measurement..... | 14 |
| 4.1.1 Limits of Radiated Emission and Bandedge Measurement | 14 |
| 4.1.2 Test Instruments | 16 |
| 4.1.3 Test Procedures..... | 18 |
| 4.1.4 Deviation from Test Standard | 19 |
| 4.1.5 Test Setup..... | 20 |
| 4.1.6 EUT Operating Conditions..... | 21 |
| 4.1.7 Test Results | 22 |
| 4.2 Conducted Emission Measurement | 26 |
| 4.2.1 Limits of Conducted Emission Measurement..... | 26 |
| 4.2.2 Test Instruments | 26 |
| 4.2.3 Test Procedures..... | 27 |
| 4.2.4 Deviation from Test Standard | 27 |
| 4.2.5 Test Setup..... | 27 |
| 4.2.6 EUT Operating Conditions..... | 27 |
| 4.2.7 Test Results | 28 |
| 4.3 20dB bandwidth Measurement | 30 |
| 4.3.1 Limits of 20dB bandwidth Measurement | 30 |
| 4.3.2 Test Instruments | 30 |
| 4.3.3 Test Procedures..... | 30 |
| 4.3.4 Deviation from Test Standard | 30 |
| 4.3.5 Test Setup..... | 30 |
| 4.3.6 EUT Operating Conditions..... | 30 |
| 4.3.7 Test Results | 31 |
| 5 Pictures of Test Arrangements | 32 |
| Appendix – Information of the Testing Laboratories | 33 |

Release Control Record

| Issue No. | Description | Date Issued |
|--------------|-------------------|---------------|
| RF131118E02C | Original release. | Mar. 27, 2019 |

1 Certificate of Conformity

Product: DUAL TEC Motion Sensor

Brand: Honeywell

Test Model: DT8035

Series Model: DT8050

Sample Status: ENGINEERING SAMPLE

Applicant: Honeywell Security Sensor CoE

Test Date: Jan. 02 to 11, 2019

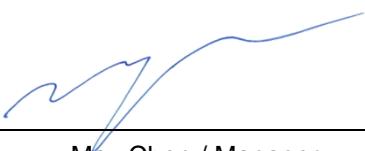
Standards: 47 CFR FCC Part 15, Subpart C (Section 15.245)

ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : , **Date:** Mar. 27, 2019

Cindy Hsin / Specialis

Approved by : , **Date:** Mar. 27, 2019

May Chen / Manager

2 Summary of Test Results

| 47 CFR FCC Part 15, Subpart C (SECTION 15.245) | | | |
|--|-----------------------------|--------|--|
| FCC Clause | Test Item | Result | Remarks |
| 15.207 | AC Power Conducted Emission | PASS | Meet the requirement of limit. Minimum passing margin is -34.74dB at 20.14063MHz. |
| 15.245 | Radiated Emission Test | PASS | Meet the requirement of limit Minimum passing margin is -4.4dB at 10500.00MHz |
| 15.215 (c) | 20dB Bandwidth | PASS | Meet the requirement of limit |
| 15.203 | Antenna Requirement | PASS | No antenna connector is used. |

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

| Measurement | Frequency | Expanded Uncertainty (k=2) (±) |
|------------------------------------|----------------|--------------------------------|
| Conducted Emissions at mains ports | 150kHz ~ 30MHz | 1.84 dB |
| Radiated Emissions | 30MHz ~ 1GHz | 5.33 dB |
| | 1GHz ~ 6GHz | 5.10 dB |
| | 6GHz ~ 18GHz | 4.85 dB |
| | 18GHz ~ 40GHz | 5.24 dB |

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

| | |
|---------------------|-------------------------------------|
| Product | DUAL TEC Motion Sensor |
| Brand | Honeywell |
| Test Model | DT8035 |
| Series Model | DT8050 |
| Status of EUT | ENGINEERING SAMPLE |
| Power Supply Rating | DC 9~15V, 15mA |
| Modulation Type | GFSK |
| Carrier Frequency | 10.525GHz |
| Number of Channel | 1 |
| Antenna Type | Integral PCB antenna with 7dBi gain |
| Antenna Connector | NA |
| Accessory Device | NA |
| Data Cable Supplied | NA |

Note:

1. This report is prepared for FCC class II permissive change. The difference compared with the Report No.: RF131118E02A design is as the following information:
 - ◆ Upgraded standard to ANSI C63.10: 2013.
 - ◆ The FET electrical characteristics are quite closed, yet there are some difference in component shape and dimension.
 - ◆ Detail change list as refer as below, Confirmed RF circuit and performance are no changed:
 1. Replace NE4210S01(300-06289) with CE3512K2(300-09313)
 2. Replace DR(300-06688) with DR(300-08959)
 3. Replace Resistor 21ohm(5-108-2212-00) with 33ohm(RJ6-3301)
 4. PCB minor changed (replace PCB footprint of NE4210S01 with CE3512K2')
 - ◆ More detailed information, please refer to CI2PC request form.
2. According to above condition, all test items need to be performed. And all data were verified to meet the requirements.
3. From the power supply, the worse case was found in voltage: **DC 9V**. Therefore only the test data of the mode was recorded in this report.
4. The EUT have two model names, which are identical to each other in all aspects except for the following table:

| Brand | Model No. | Difference |
|-----------|-----------|--------------------------------------|
| Honeywell | DT8050 | 50ft(range) / Microwave Module (16m) |
| | DT8035 | 35ft(range) / Microwave Module (12m) |

From the above models, model: **DT8035** was selected as representative model for the test and its data was recorded in this report.

5. DUAL TEC Motion Sensor is applying Doppler radar phenomenon to sense motion. It transmits a low power microwave and receives energy reflected by objects.
6. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

1 channel is provided for test:

| Channel | Frequency |
|---------|------------|
| 1 | 10.525 GHz |

3.2.1 Test Mode Applicability and Tested Channel Detail

| EUT CONFIGURE MODE | APPLICABLE TO | | | | DESCRIPTION |
|--------------------------|---------------|-------|-----|----|-------------|
| | RE≥1G | RE<1G | PLC | BW | |
| - | √ | √ | √ | √ | - |

Where
RE≥1G: Radiated Emission above 1GHz & Bandedge Measurement
RE<1G: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission
BW: 20dB Bandwidth Measurement

Radiated Emission Test (Above 1GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

| TESTED CHANNEL | MODULATION TYPE |
|-------------------|--------------------|
| 1 | GFSK |

Radiated Emission Test (Below 1GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

| TESTED CHANNEL | MODULATION TYPE |
|-------------------|--------------------|
| 1 | GFSK |

Power Line Conducted Emission Test:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

| TESTED CHANNEL | MODULATION TYPE |
|-------------------|--------------------|
| 1 | GFSK |

20dB Bandwidth Measurement:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

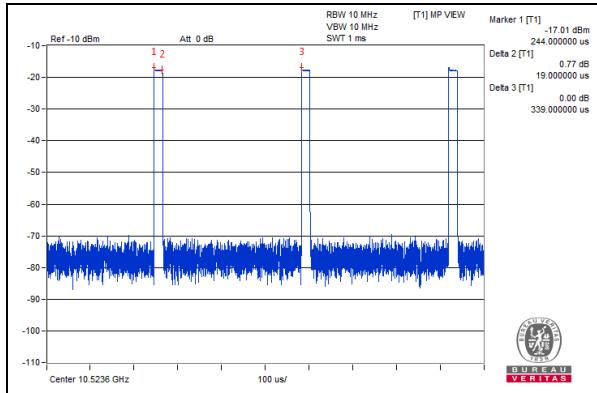
| TESTED CHANNEL | MODULATION TYPE |
|-------------------|--------------------|
| 1 | GFSK |

Test Condition:

| APPLICABLE TO | ENVIRONMENTAL CONDITIONS | INPUT POWER | TESTED BY |
|---------------|--------------------------|-----------------------|---------------|
| RE≥1G | 24deg. C, 71%RH | DC 9V | Robert Cheng |
| RE<1G | 25deg. C, 70%RH | DC 9V | Robert Cheng |
| PLC | 24deg. C, 74%RH | 120Vac, 60Hz (system) | Andy Ho |
| BW | 25deg. C, 60%RH | DC 9V | Anderson Chen |

3.3 Duty Cycle of Test Signal

Duty cycle = 0.019 ms/0.339 ms = 0.056



3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| ID | Product | Brand | Model No. | Serial No. | FCC ID | Remarks |
|----|-----------------|--------------------------------------|-----------|------------|--------|-----------------|
| A | DC Power Supply | GOOD WILL INSTRUMENT CO., LTD. | GPC-3030D | 7700087 | NA | Provided by Lab |

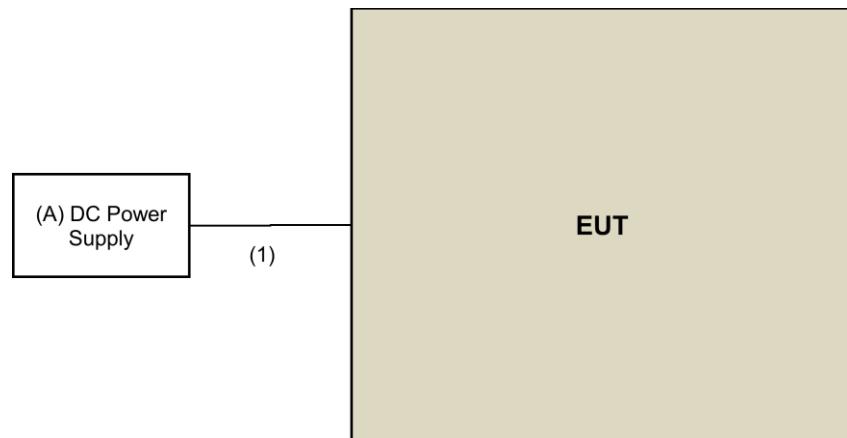
Note:

1. All power cords of the above support units are non-shielded (1.8m).

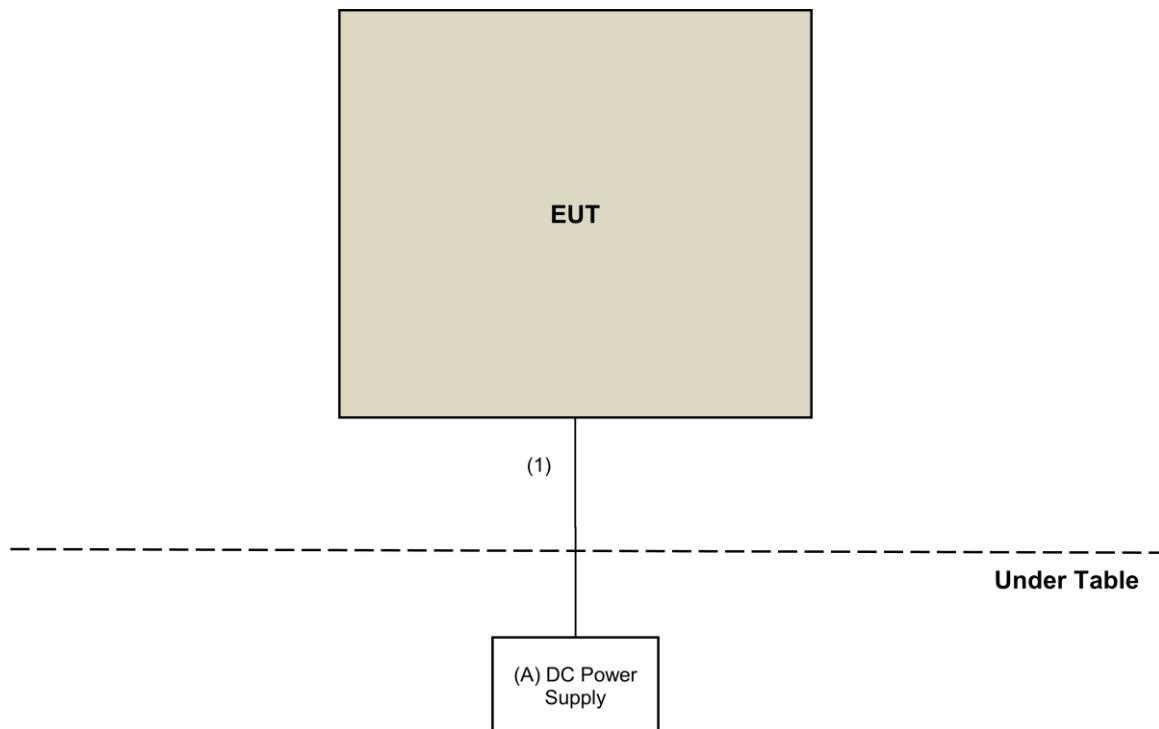
| ID | Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks |
|----|--------------|------|------------|--------------------|--------------|-----------------|
| 1 | DC Cable | 1 | 2 | No | 0 | Provided by Lab |

3.4.1 Configuration of System under Test

For conducted emission test:



For other test:



3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.245)

ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

According to 15.245 the field strength of emissions from intentional radiators operated under these frequencies bands shall not exceed the following:

| Fundamental Frequency (MHz) | Field Strength of Fundamental (dBuV/m) | |
|--------------------------------------|--|---------|
| | Peak | Average |
| 10500 ~10550 | 147.9 | 127.9 |
| Field Strength of Harmonics (dBuV/m) | | |
| | 107.9 | 87.9 |

Harmonic emissions in the restricted bands at and above 17.7 GHz shall not exceed the following field strength limits:

| Application | Field Strength of Harmonics (dBuV/m) |
|--|---|
| Field disturbance sensors operating in the 24075-24175 MHz band and for Other field disturbance sensors designed for use only within a building or to open building doors. | 87.9 |
| All other field disturbance sensors | 77.5 |

Note: Field disturbance sensors designed to be used in motor vehicles or aircraft must include features to prevent continuous operation unless their emissions in the restricted bands, other than the second and third harmonics from devices operating in the 24075-24175 MHz band, fully comply with the limits given in Section 15.209.

- (1) Field strength limits are specified at a distance of 3 meters.
- (2) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

| Frequencies (MHz) | Field strength (microvolts/meter) | Measurement distance (meters) |
|-------------------|-----------------------------------|-------------------------------|
| 0.009-0.490 | 2400/F(kHz) | 300 |
| 0.490-1.705 | 24000/F(kHz) | 30 |
| 1.705-30.0 | 30 | 30 |
| 30-88 | 100 | 3 |
| 88-216 | 150 | 3 |
| 216-960 | 200 | 3 |
| Above 960 | 500 | 3 |

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dB_{UV}/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 Test Instruments

Below 40GHz test:

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|---|----------------------|-------------|-----------------|------------------|
| Test Receiver Keysight | N9038A | MY54450088 | July 05, 2018 | July 04, 2019 |
| Pre-Amplifier EMCI | EMC001340 | 980142 | Feb. 09, 2018 | Feb. 08, 2019 |
| Loop Antenna Electro-Metrics | EM-6879 | 269 | Sep. 07, 2018 | Sep. 06, 2019 |
| RF Cable | NA | LOOPCAB-001 | Jan. 15, 2018 | Jan. 14, 2019 |
| RF Cable | NA | LOOPCAB-002 | Jan. 15, 2018 | Jan. 14, 2019 |
| Pre-Amplifier Mini-Circuits | ZFL-1000VH2B | AMP-ZFL-01 | Oct. 30, 2018 | Oct. 29, 2019 |
| Trilog Broadband Antenna SCHWARZBECK | VULB 9168 | 9168-406 | Nov. 22, 2018 | Nov. 21, 2019 |
| RF Cable | 8D | 966-4-1 | Mar. 21, 2018 | Mar. 20, 2019 |
| RF Cable | 8D | 966-4-2 | Mar. 21, 2018 | Mar. 20, 2019 |
| RF Cable | 8D | 966-4-3 | Mar. 21, 2018 | Mar. 20, 2019 |
| Fixed attenuator Mini-Circuits | UNAT-5+ | PAD-3m-4-01 | Sep. 27, 2018 | Sep. 26, 2019 |
| Horn_Antenna SCHWARZBECK | BBHA 9120D | 9120D-783 | Nov. 25, 2018 | Nov. 24, 2019 |
| Pre-Amplifier Mini-Circuits | ZVA-183-S+ | AMP-ZVA-03 | May 10, 2018 | May 09, 2019 |
| RF Cable | EMC104-SM-SM-1200 | 160923 | Jan. 29, 2018 | Jan. 28, 2019 |
| RF Cable | EMC104-SM-SM-2000 | 150318 | Jan. 29, 2018 | Jan. 28, 2019 |
| RF Cable | EMC104-SM-SM-5000 | 150321 | Jan. 29, 2018 | Jan. 28, 2019 |
| Pre-Amplifier EMCI | EMC184045SE | 980387 | Jan. 29, 2018 | Jan. 28, 2019 |
| Horn_Antenna SCHWARZBECK | BBHA 9170 | BBHA9170608 | Nov. 25, 2018 | Nov. 24, 2019 |
| RF Cable | EMC102-KM-KM-1200 | 160925 | Jan. 29, 2018 | Jan. 28, 2019 |
| Software | ADT_Radiated_V8.7.08 | NA | NA | NA |
| Boresight Antenna Tower & Turn Table Max-Full | MF-7802BS | MF780208530 | NA | NA |

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 966 Chamber No. 4.
3. The CANADA Site Registration No. is 20331-2
4. Loop antenna was used for all emissions below 30 MHz.
5. Tested Date: Jan. 02 to 04, 2019

Above 40GHz test:

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|---|-----------|-------------|-----------------|------------------|
| Spectrum Analyzer Agilent | E4446A | MY48250254 | Nov. 14, 2018 | Nov. 13, 2019 |
| *Harmonic Mixer (33~55GHz) OML | M22HWD | 110215-1 | Oct. 17, 2017 | Oct. 16, 2019 |
| *Horn Antenna (33~55GHz) OML | M22RH | 110215-1 | Oct. 17, 2017 | Oct. 16, 2019 |
| *Harmonic Mixer (50~75GHz) OML | M15RH | 110215-1 | Oct. 17, 2017 | Oct. 16, 2019 |
| *Horn Antenna (50~75GHz) OML | M15HWD | 110215-1 | Oct. 17, 2017 | Oct. 16, 2019 |
| *Diplexer EMCI | DPL26 | DPL26_01 | Oct. 17, 2017 | Oct. 16, 2019 |
| *Diplexer EMCI | DPL26 | DPL26_02 | Oct. 17, 2017 | Oct. 16, 2019 |
| *Precision 30dB Attenuator Keysight | 11708A | MY55260015 | Oct. 17, 2017 | Oct. 16, 2019 |
| *Zero-Bias Detector (50~75GHz) Vdi | WR15ZBD | WR15R5 1-30 | Oct. 17, 2017 | Oct. 16, 2019 |
| *WR15CH Conical Horn Keysight | WR15CH | WR15CH-01 | Oct. 17, 2017 | Oct. 16, 2019 |
| *WR10CH Conical Horn Keysight | WR10CH | WR10CH-01 | Oct. 17, 2017 | Oct. 16, 2019 |
| *Millimeter-Wave Signal Generator Frequency Extension Module (50~75 GHz) Keysight | E8257DV15 | US54250106 | Oct. 17, 2017 | Oct. 16, 2019 |
| PSG analog signal generator Keysight | E8257D | MY53401987 | June 26, 2018 | June 25, 2019 |
| Antenna Tower & Turn Table CT | NA | NA | NA | NA |

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. *The calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 4.
4. The FCC Site Registration No. is 966073.
5. The VCCI Site Registration No. is G-137.
6. The CANADA Site Registration No. is IC 7450H-2.
7. Tested Date: Jan. 04, 2019

4.1.3 Test Procedures

For Radiated emission: Below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission: 30MHz ~ 18GHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection (PK) at frequency from 1GHz to 18GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $< 98\%$) or 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency from 1GHz to 18GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

For Radiated emission: Above 18GHz

External harmonic mixers are utilized.

- a. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meters chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The distance at which limits are typically specified is 3 meter; however, closer measurement distances may be utilized.
- c. Begin handheld measurements with the test antenna (horn) at a distance of 1 meter from the EUT, in a horizontally polarized position. Slowly adjust its position, entirely covering the plane 1 meter from the EUT.
- d. Repeat (b) with the horn in a vertically polarized position.
- e. If the emission cannot be detected at 1 meter, reduce the RBW in order to increase system sensitivity. Note the value. If the emission still cannot be detected, move the horn closer to the EUT, noting the distance at which a measurement is made.
- f. Note the maximum level indicated on the Spectrum Analyzer.
- g. Based on the distance at which the measurement was made and the calculated distance to the edge of the far field, determine the appropriate distance attenuation factor. Apply this factor to the calculated field strength in order to determine the equivalent field strength at the distance at which the regulatory limit is specified. Compare to the appropriate limits
- h. Repeat (a) - (f) for every emission that must be measured, up through the required frequency range of investigation

NOTE:

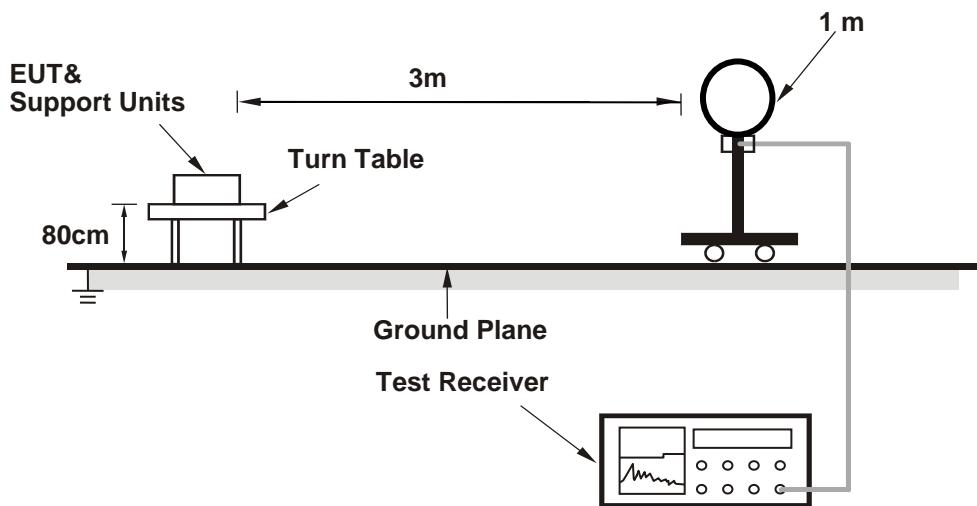
1. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection (PK).
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $< 98\%$) or 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV).

4.1.4 Deviation from Test Standard

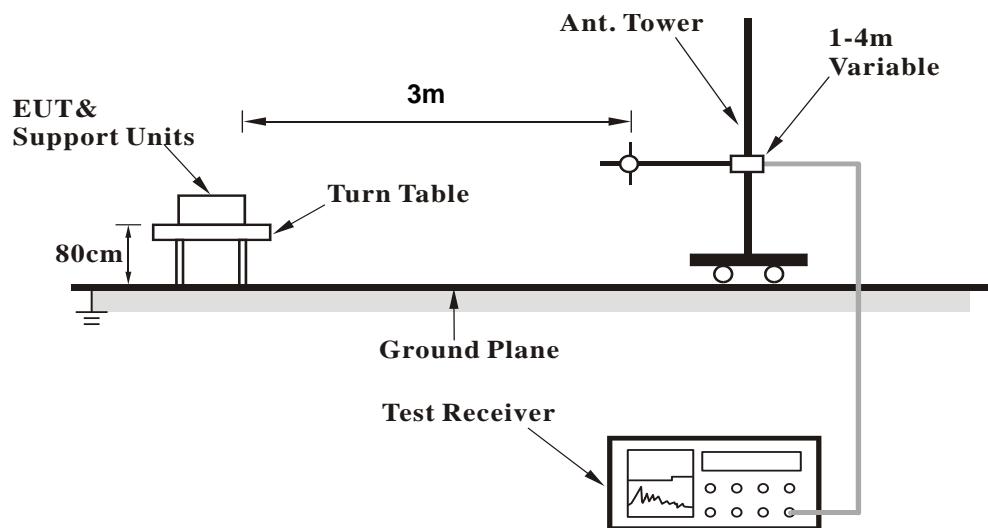
No deviation.

4.1.5 Test Setup

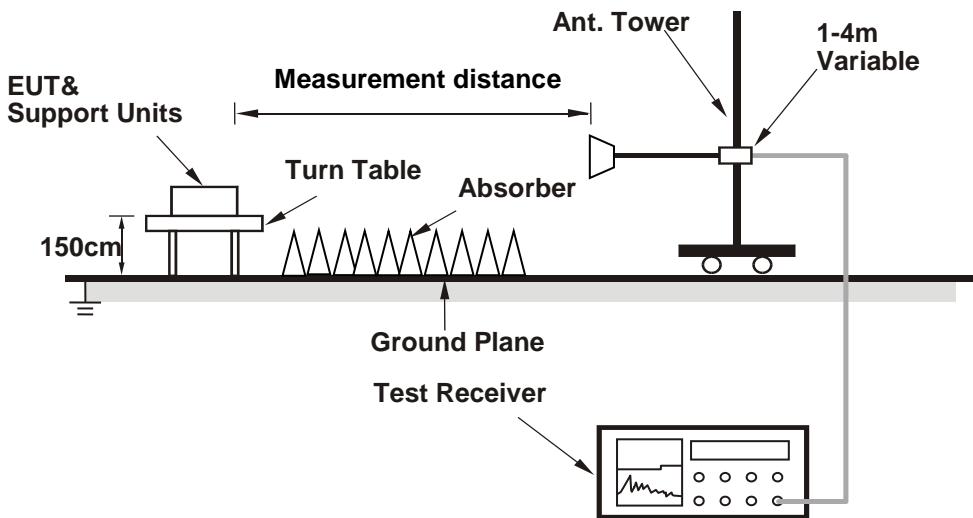
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

Set the EUT under transmission / receiver condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz Data :

| | | | |
|------------------------|--------------|------------------------------|--------------|
| CHANNEL | TX Channel 1 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 18GHz | | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|-----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 10500.00 | 60.1 PK | 74.0 | -13.9 | 1.00 H | 65 | 46.4 | 13.7 |
| 2 | 10500.00 | 49.6 AV | 54.0 | -4.4 | 1.00 H | 65 | 35.9 | 13.7 |
| 3 | *10523.60 | 112.2 PK | 147.9 | -35.7 | 1.00 H | 65 | 98.4 | 13.8 |
| 4 | *10523.60 | 110.1 AV | 127.9 | -17.8 | 1.00 H | 65 | 96.3 | 13.8 |
| 5 | 10550.00 | 59.9 PK | 74.0 | -14.1 | 1.00 H | 65 | 46.1 | 13.8 |
| 6 | 10550.00 | 49.3 AV | 54.0 | -4.7 | 1.00 H | 65 | 35.5 | 13.8 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | |
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 10500.00 | 58.6 PK | 74.0 | -15.4 | 2.11 V | 85 | 44.9 | 13.7 |
| 2 | 10500.00 | 49.1 AV | 54.0 | -4.9 | 2.11 V | 85 | 35.4 | 13.7 |
| 3 | *10523.60 | 97.6 PK | 147.9 | -50.3 | 2.11 V | 85 | 83.8 | 13.8 |
| 4 | *10523.60 | 95.8 AV | 127.9 | -32.1 | 2.11 V | 85 | 82.0 | 13.8 |
| 5 | 10550.00 | 59.7 PK | 74.0 | -14.3 | 2.11 V | 85 | 45.9 | 13.8 |
| 6 | 10550.00 | 49.0 AV | 54.0 | -5.0 | 2.11 V | 85 | 35.2 | 13.8 |

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

| | | | |
|------------------------|--------------|------------------------------|--------------|
| CHANNEL | TX Channel 1 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 18GHz ~53GHz | | Average (AV) |

| ANTENNA POLARITY: HORIZONTAL | | | | | | | | |
|------------------------------|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 21047.20 | 50.3 PK | 97.5 | -47.2 | 1.50 H | 99 | 60.9 | -10.6 |
| 2 | 21047.20 | 47.2 AV | 77.5 | -30.3 | 1.50 H | 99 | 57.8 | -10.6 |
| 3 | 31570.80 | 47.9 PK | 97.5 | -49.6 | 1.50 H | 222 | 56.6 | -8.7 |
| 4 | 31570.80 | 46.8 AV | 77.5 | -30.7 | 1.50 H | 222 | 55.5 | -8.7 |
| ANTENNA POLARITY: VERTICAL | | | | | | | | |
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 21047.20 | 49.3 PK | 97.5 | -48.2 | 1.50 V | 88 | 59.9 | -10.6 |
| 2 | 21047.20 | 46.4 AV | 77.5 | -31.1 | 1.50 V | 88 | 57.0 | -10.6 |
| 3 | 31570.80 | 47.6 PK | 97.5 | -49.9 | 1.50 V | 100 | 56.3 | -8.7 |
| 4 | 31570.80 | 46.4 AV | 77.5 | -31.1 | 1.50 V | 100 | 55.1 | -8.7 |

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. Measurements made at 1 meter distance. Test value converted to account for 3-meter measurement distance.

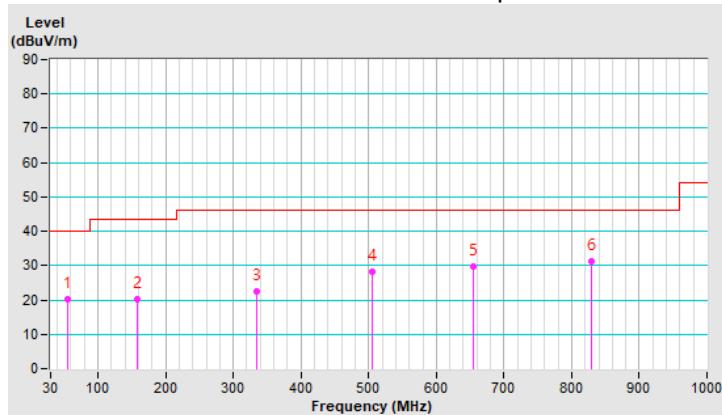
Below 1GHz Data:

| | | | |
|------------------------|--------------|------------------------------|-----------------|
| CHANNEL | TX Channel 1 | DETECTOR FUNCTION | Quasi-Peak (QP) |
| FREQUENCY RANGE | 9kHz ~ 1GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 54.31 | 20.1 QP | 40.0 | -19.9 | 1.65 H | 100 | 28.0 | -7.9 |
| 2 | 157.10 | 20.2 QP | 43.5 | -23.3 | 1.65 H | 211 | 28.0 | -7.8 |
| 3 | 334.41 | 22.5 QP | 46.0 | -23.5 | 1.65 H | 100 | 29.2 | -6.7 |
| 4 | 505.82 | 28.1 QP | 46.0 | -17.9 | 1.77 H | 100 | 30.7 | -2.6 |
| 5 | 654.85 | 29.8 QP | 46.0 | -16.2 | 1.44 H | 200 | 29.5 | 0.3 |
| 6 | 828.99 | 31.1 QP | 46.0 | -14.9 | 1.65 H | 100 | 28.1 | 3.0 |

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

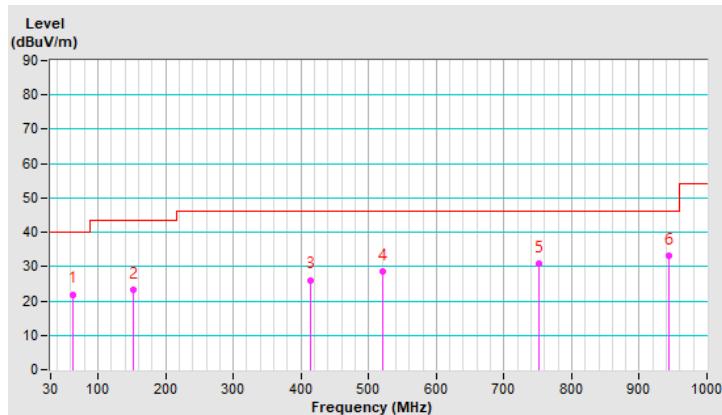


| | | | |
|------------------------|--------------|------------------------------|-----------------|
| CHANNEL | TX Channel 1 | DETECTOR FUNCTION | Quasi-Peak (QP) |
| FREQUENCY RANGE | 9kHz ~ 1GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | |
|---|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 62.95 | 21.9 QP | 40.0 | -18.1 | 1.32 V | 220 | 30.8 | -8.9 |
| 2 | 152.65 | 23.4 QP | 43.5 | -20.1 | 1.33 V | 165 | 31.4 | -8.0 |
| 3 | 414.82 | 26.1 QP | 46.0 | -19.9 | 1.21 V | 241 | 31.0 | -4.9 |
| 4 | 520.45 | 28.4 QP | 46.0 | -17.6 | 1.32 V | 65 | 30.7 | -2.3 |
| 5 | 751.21 | 30.9 QP | 46.0 | -15.1 | 1.33 V | 98 | 28.8 | 2.1 |
| 6 | 943.82 | 33.1 QP | 46.0 | -12.9 | 1.88 V | 99 | 28.5 | 4.6 |

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

| Frequency (MHz) | Conducted Limit (dBuV) | |
|-----------------|------------------------|---------|
| | Quasi-peak | Average |
| 0.15 - 0.5 | 66 - 56 | 56 - 46 |
| 0.50 - 5.0 | 56 | 46 |
| 5.0 - 30.0 | 60 | 50 |

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2.2 Test Instruments

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|--|-------------------------|------------|-----------------|------------------|
| Test Receiver R&S | ESCS 30 | 847124/029 | Oct. 24, 2018 | Oct. 23, 2019 |
| Line-Impedance Stabilization Network (for EUT) R&S | ESH3-Z5 | 848773/004 | Oct. 22, 2018 | Oct. 21, 2019 |
| Line-Impedance Stabilization Network (for Peripheral) R&S | ENV216 | 100072 | June 04, 2018 | June 03, 2019 |
| 50 ohms Terminator | N/A | 3 | Oct. 22, 2018 | Oct. 21, 2019 |
| RF Cable | 5D-FB | COCCAB-001 | Sep. 28, 2018 | Sep. 27, 2019 |
| Fixed attenuator EMCI | STI02-2200-10 | 003 | Mar. 16, 2018 | Mar. 15, 2019 |
| Software BVADT | BVADT_Cond_ V7.3.7.4 | NA | NA | NA |

Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conduction 1.
3. Tested Date: Jan. 05, 2019

4.2.3 Test Procedures

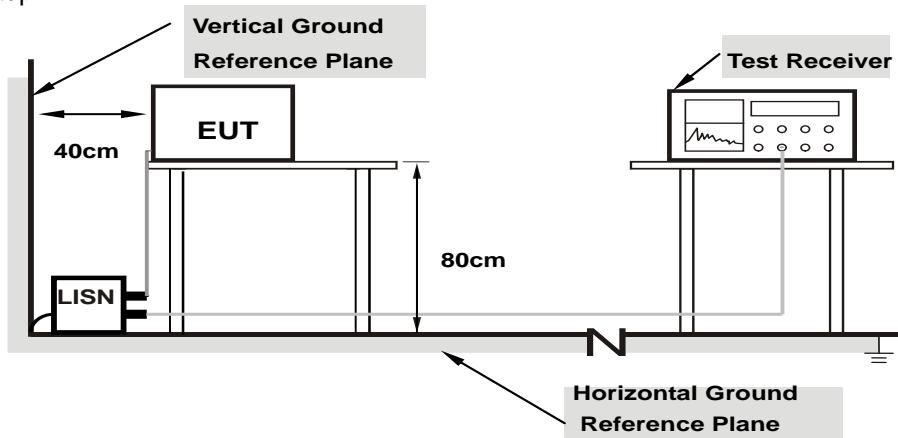
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1. Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Conditions

Same as 4.1.6.

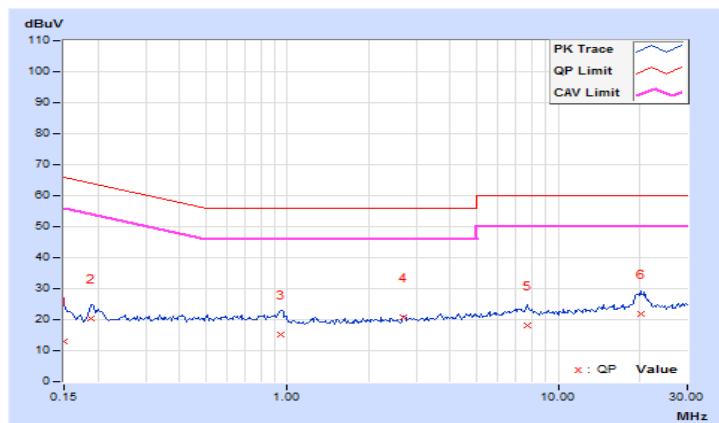
4.2.7 Test Results

| Phase | Line (L) | Detector Function | Quasi-Peak (QP) / Average (AV) |
|-------|----------|-------------------|--------------------------------|
|-------|----------|-------------------|--------------------------------|

| Phase Of Power : Line (L) | | | | | | | | | | |
|---------------------------|-----------------|------------------------|----------------------|-------------|-----------------------|--------------|--------------|--------------|---------------|---------------|
| No | Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) | | Emission Level (dBuV) | | Limit (dBuV) | | Margin (dB) | |
| | | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.15000 | 10.02 | 3.09 | -3.57 | 13.11 | 6.45 | 66.00 | 56.00 | -52.89 | -49.55 |
| 2 | 0.18906 | 10.04 | 10.34 | 1.23 | 20.38 | 11.27 | 64.08 | 54.08 | -43.70 | -42.81 |
| 3 | 0.95078 | 10.11 | 4.98 | -9.69 | 15.09 | 0.42 | 56.00 | 46.00 | -40.91 | -45.58 |
| 4 | 2.69922 | 10.19 | 10.58 | -14.02 | 20.77 | -3.83 | 56.00 | 46.00 | -35.23 | -49.83 |
| 5 | 7.68359 | 10.42 | 7.69 | -11.94 | 18.11 | -1.52 | 60.00 | 50.00 | -41.89 | -51.52 |
| 6 | 20.14063 | 11.07 | 10.88 | 4.19 | 21.95 | 15.26 | 60.00 | 50.00 | -38.05 | -34.74 |

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



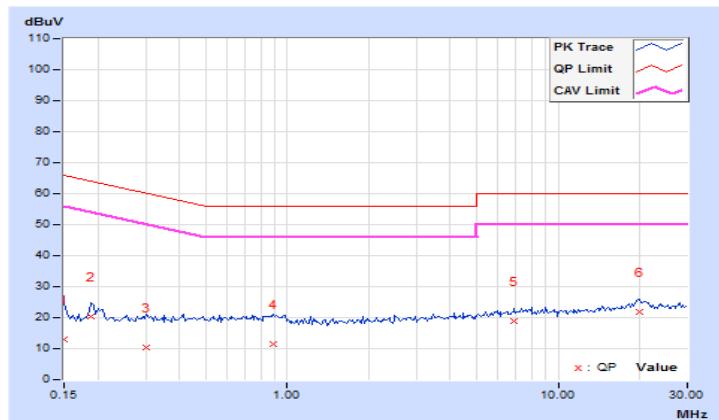
| | | | |
|-------|-------------|-------------------|--------------------------------|
| Phase | Neutral (N) | Detector Function | Quasi-Peak (QP) / Average (AV) |
|-------|-------------|-------------------|--------------------------------|

Phase Of Power : Neutral (N)

| No | Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) | | Emission Level (dBuV) | | Limit (dBuV) | | Margin (dB) | |
|----|--------------------|------------------------------|-------------------------|--------|--------------------------|-------|-----------------|-------|----------------|--------|
| | | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.15000 | 9.93 | 3.01 | -3.53 | 12.94 | 6.40 | 66.00 | 56.00 | -53.06 | -49.60 |
| 2 | 0.18906 | 9.94 | 10.38 | 1.27 | 20.32 | 11.21 | 64.08 | 54.08 | -43.76 | -42.87 |
| 3 | 0.30234 | 9.95 | 0.45 | -6.68 | 10.40 | 3.27 | 60.18 | 50.18 | -49.78 | -46.91 |
| 4 | 0.89219 | 9.98 | 1.58 | -11.01 | 11.56 | -1.03 | 56.00 | 46.00 | -44.44 | -47.03 |
| 5 | 6.90625 | 10.25 | 8.47 | -12.56 | 18.72 | -2.31 | 60.00 | 50.00 | -41.28 | -52.31 |
| 6 | 19.97266 | 10.87 | 11.13 | 3.33 | 22.00 | 14.20 | 60.00 | 50.00 | -38.00 | -35.80 |

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



4.3 20dB bandwidth Measurement

4.3.1 Limits of 20dB bandwidth Measurement

According to 15.215(c), the requirement is to ensure the 20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified, is contained within the frequency band designated in the rule section under which the equipment is operated.

4.3.2 Test Instruments

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|----------------------------|-----------|------------|-----------------|------------------|
| Spectrum Analyzer R&S | FSV40 | 100964 | June 20, 2018 | June 19, 2019 |

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. Tested date: Jan. 11, 2019

4.3.3 Test Procedures

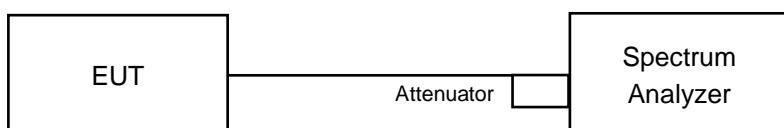
The bandwidth of the fundamental frequency was measured by spectrum analyzer with 300 kHz RBW and 1 MHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

Set both RBW and VBW of spectrum analyzer to 100 kHz and 300 kHz with suitable frequency span from band edge. The bandedge was measured and recorded.

4.3.4 Deviation from Test Standard

No deviation

4.3.5 Test Setup

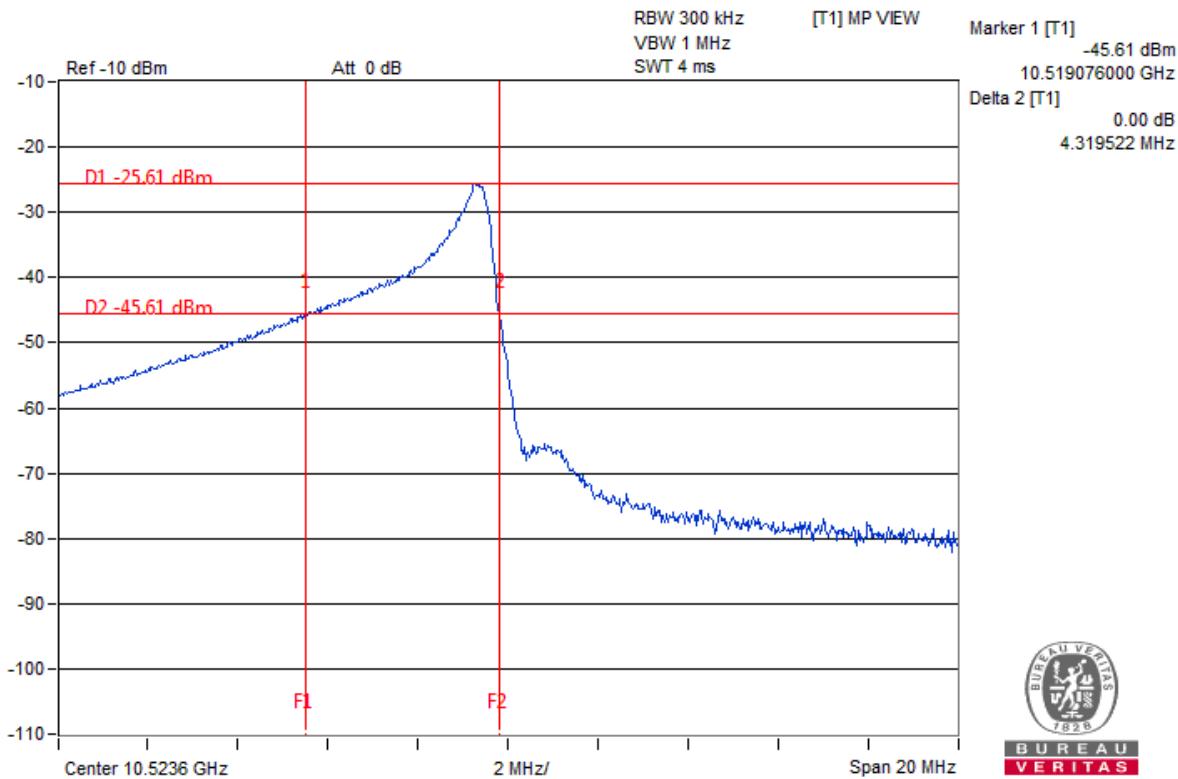


4.3.6 EUT Operating Conditions

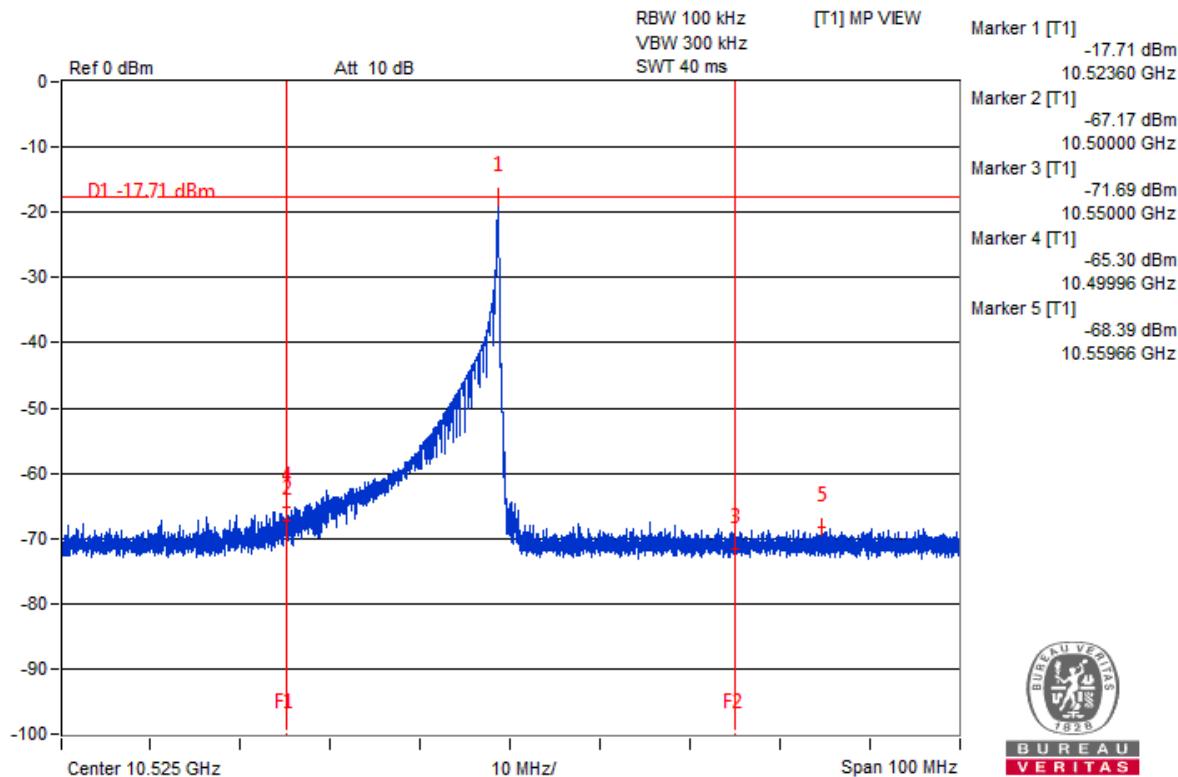
Set the EUT under transmission / receiver condition continuously.

4.3.7 Test Results

For 20dB Bandwidth



For Bandedge



5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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