

Directive 2014/53/EU (RED) EN 301 489-1/-17 EMC TEST REPORT

FOR

Applicant : Texas Instruments Incorporated

Product Name : BLE and 802.15.4 module

Brand Name : Texas Instruments Incorporated

Model No. : CC2650MODA

Added Model(s) : N/A

Model Different : N/A

Based On SGS EMC Report No. : E1/2016/40146-01

Issue Date : Feb. 25, 2021

Test Site : SGS Taiwan Ltd.
Electromagnetic Compatibility Laboratory
No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan



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Applicant : Texas Instruments Incorporated
12500 TI BLVD., Dallas Texas, 75243, USA
Manufacturer : Texas Instruments Incorporated
12500 TI BLVD., Dallas Texas, 75243, USA
Product Name : BLE and 802.15.4 module
Brand Name : Texas Instruments Incorporated
Model No. : CC2650MODA
Added Model(s) : N/A
Model Difference : N/A
File Number : MH/2020/B0075
Date of Sample Receipt : Nov. 09, 2020
Date of Test : Dec. 14, 2020 ~ Jan. 14, 2021

APPLICABLE STANDARDS

| | |
|--------------------------------|-------------------------------------|
| EN 301 489 -1 v2.2.3 : 2019-11 | EN 301 489 -17 v3.2.4 : 2020-09 |
| EMI: EN 55032 : 2015+A11:2020 | |
| EMS: EN 61000-4-2 : 2009 | EN 61000-4-3 : 2006+A1:2008+A2:2010 |

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

Remarks:

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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Approved By**Eddy Cheng (Asst. Supervisor)****Date**

Feb. 25, 2021

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Revision History

| Revision | Description | Issue Date | Remark |
|----------|---------------------------------|---------------|------------------|
| 00 | Original. | Aug. 04, 2016 | E1/2016/40146 |
| 01 | See the following note Rev.(01) | Jun. 12, 2017 | E1/2016/40146-01 |
| 02 | See the following note Rev.(02) | Feb. 25, 2021 | MH/2020/B0075 |

Note:

Rev.(01):

1. Update Directive to 2014/53/EU (RED). Spot check CE, Below RE, Above RE, RS.
2. Removed EN 301 489 –3

Rev.(02):

1. The Electromagnetic Compatibility Laboratory of SGS Taiwan Ltd. was split from the Electronics & Communication Laboratory of SGS Taiwan Ltd. , it undertakes the original EMC test data and test report of Electronics & Communication Laboratory, this report is based on Electronics & Communication Laboratory report number E1/2016/40146-01 to remake it.
2. Update all standards.
3. Change information of applicant as follows.

| | | |
|--------------|-----------|---|
| Applicant | Original: | Texas Instruments Norway AS Postboks 264 Skøyen Oslo N-0213 Norway |
| | Modified: | Texas Instruments Incorporated 12500 TI BLVD., Dallas Texas, 75243, USA |
| Manufacturer | Original: | JORJIN Technologies Inc. 17F,No.239, Sec.1, Datong Rd., Xizhi Dist., New Taipei City |
| | Modified: | Texas Instruments Incorporated 12500 TI BLVD., Dallas Texas, 75243, USA |

4. EMI test data based on MH/2020/B0073, because they are the same EUT, test method and test configuration.

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1. General Description

1.1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

General:

| | |
|----------------------------|--------------------------------|
| Product Name | BLE and 802.15.4 module |
| Brand Name | Texas Instruments Incorporated |
| Model No. | CC2650MODA |
| Added Model(s) | N/A |
| Model Difference | N/A |
| Power Supply | DC 5V From PC |
| Highest internal frequency | 2400MHz |

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1.2 General Requirements of Test Set up

For EN 301489-1:

The signal source providing the transmitter under test with the modulation signal for the normal test modulation shall be located outside the test environment, unless the transmitter is modulated by its own internal source, see the relevant part of EN 301 489 series.

The transmitter shall be modulated with normal test modulation, by an internal or external signal source capable of delivering the normal test modulation as specified in the relevant part of EN 301 489 series.

The measuring equipment for the wanted RF output signal from the transmitter under test shall be located outside the test environment.

For transmitters with an integral antenna, the wanted RF output signal to establish a communication link shall be delivered from the EUT to an antenna located within the test environment. This antenna shall be connected to the external measuring equipment by a coaxial cable.

For transmitters with a removable antenna, the wanted RF output signal to establish a communication link shall be delivered from the antenna connector to the external measuring equipment by a shielded transmission line, such as a coaxial cable. Adequate measures shall be taken to minimize the effect of unwanted common mode currents on the external conductor of the transmission line at the point of entry to the transmitter.

Unless otherwise specified in the relevant part of EN 301 489 series [i.13] for the particular type of radio equipment, the level of the wanted RF output signal in transmit mode of operation shall be set to the maximum rated RF power for the EUT, modulated with the normal test modulation.

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For EN 301489-17:

The wanted signals and/or controls required to establish a communications link shall be defined by the manufacturer.

The transmitter shall be operated at maximum rated power.

The manufacturer may provide a suitable companion receiver that can be used to receive messages or to set up a communication link.

WLAN:

1. Start the wireless and wired function of EUT and connected with support unit Notebook wireless.
2. Execute "PING IP" function under cmd of Window 10 to transfer packet bi-directionally.
3. Monitor the condition between EUT and notebook by seeing the window of cmd.

BT:

1. Enable BT function from EUT.
2. Links with BT device (creative speaker).
3. Transfer the packet of data from notebook to EUT.
4. Monitor the status of connection.

2.4G Devices(Mouse, Keyboard, Dongle):

1. The EUT is connected to the PC and other peripherals, placed in the test table and turn on the computer.
2. Computer running Windows 10 operating system.
3. Periphery (Mouse) placed on the fan, and makes it continuous operation.
4. Periphery (Keyboard) to open Notepad, continuous pressing H.
5. Confirm all peripheral work normally and execute WINFCC program and the screen is full of "H" pattern.

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1.3 Description of Test Modes

The following modes were selected for evaluation to find the worst mode (modes):

Modes/Function:

Mode 1. BT Link

Mode 2. Zigbee Link

Mode 3. Worst BT Standby

Then the following mode (modes) was found to be the worst one and reported as the worst case:

Worst Case:

CE Worst case : Mode 2

ISN Worst case : N/A

Below 1GHz RE Worst case : Mode 1

Above 1GHz RE Worst case : Mode 2

1.4 Modification List

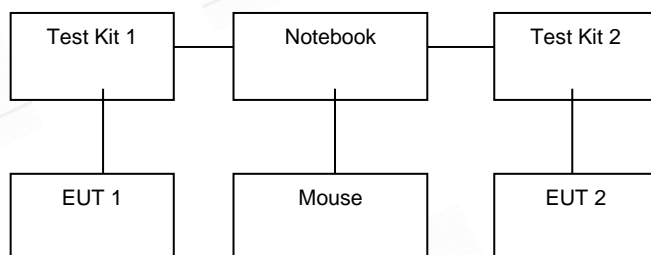
No modification was executed by SGS Taiwan Electromagnetic Compatibility Laboratory.

1.5 Test Condition

Refer to EN 301 489-1, Section 4 and EN 301 489-17 for the details.

1.6 Configuration of Tested System

Mode1 & 2



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Table 1-1 Support Equipment Used in Tested System

| PRODUCT | MANUFACTURER | MODEL NO. | SERIAL NO. |
|------------|--------------|----------------|--------------|
| Notebook | DELL | Latitude E6440 | CYRVQ32 |
| Test Kit 1 | TI | CC1352R1 | N/A |
| Test Kit 2 | TI | CC1352R1 | N/A |
| Mouse | Logitech | M90 | 1738HS05FHF8 |

Support Equipment Used in Tested Cable

| Cable Type | Core | Length | Shielding/Non-shielding |
|----------------|----------|--------|-------------------------|
| USB cable | N/A | 1.5m | Shielding |
| USB cable | Near EUT | 0.6m | Shielding |
| Test Kit cable | Near EUT | 0.1m | Non-shielding |

Note: All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

Grounding: Grounding was set in accordance with the manufacturer's requirements and conditions for intended use.

Table 1-2 Accessories Cable List

| Cable Type | Core | Length | Shielding/Non-shielding |
|------------|------|--------|-------------------------|
| N/A | N/A | N/A | N/A |

1.7 Operation Procedure

Mode 1 & 2:

1. Let EUT_1 & EUT_2 connect to the fixture, NB with USB Cable and turn it on.
2. Turn on SmartRF Studio 7.exe on NB, you can find two EUTs, click EUT directly to select BT/Zigbee according to Test Mode, set one Tx / one Rx, and press Start, Rx can see the message sent by Tx.
3. Start the test.

1.8 Decision Rules Result

Reported measurement data comply with EN 55032 : 2015+A11:2020.

Measurement instrumentation uncertainty shall not be taken into account in the determination of compliance.

1.9 Reporting Statements of Conformity

The conformity statement in this report is based solely on the test results, measurement uncertainty is excluded.

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2. EMISSION

EN 301 489-1/-17

EN 55032

2.1 Test Configuration

Refer to EN 301 489-1, Section 8.1.2

2.2 Special Conditions

EN 301 489-17

Arrangements for test conditions shall be as specified in EN 301 489-17 clause 4 of the present document.

Arrangements for performance criteria shall be as specified in EN 301 489-17 clause 6 of the present document

2.3 Summary of Test Results

| Test Items | Performance Section | Result |
|---|--------------------------|--------|
| Enclosure of ancillary equipment measured on a stand alone basis, EN 55032, Class B | EN 301 489-1 Section 8.2 | PASS |
| DC mains power input/output ports, EN 55032, Class B | EN 301 489-1 Section 8.3 | N/A |
| AC mains power input/output ports, EN 55032, Class B | EN 301 489-1 Section 8.4 | PASS |
| Current harmonics emission | EN 301 489-1 Section 8.5 | N/A |
| Voltage fluctuations and flicker | EN 301 489-1 Section 8.6 | N/A |
| Wired network Ports | EN 301 489-1 Section 8.7 | N/A |

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2.4 Enclosure of ancillary equipment measured on a stand alone basis (Refer to EN 301 489-1 Section 8.2)

2.4.1 Test Method:

| Standard | Edition | Description |
|----------|---------------|--|
| EN 55032 | 2015+A11:2020 | Information technology equipment – Radio disturbance characteristics - Limits and methods of measurement |

2.4.2 Limit:

Maximum permissible level of Radiated Emission measured at 10 meter

| FREQUENCY (MHz) | Class A(dBuV/m) | Class B(dBuV/m) |
|--------------------|-----------------|-----------------|
| | Quasi - peak | Quasi - peak |
| 30 - 230 | 40 | 30 |
| 230 - 1000 | 47 | 37 |

Note : The lower limit shall apply at the transition frequency.

Maximum permissible level of Radiated Emission measured at 3 meter

| FREQUENCY (MHz) | Class A(dBuV/m) | Class B(dBuV/m) |
|--------------------|-----------------|-----------------|
| | Quasi - peak | Quasi - peak |
| 30 - 230 | 50 | 40 |
| 230 - 1000 | 57 | 47 |

Note : The lower limit shall apply at the transition frequency.

Limits above 1 GHz

Limits for radiated disturbance of Class A ITE at a measurement distance of 3m

| Frequency range GHz | Average Limit dB(μV/m) | Peak Limit dB(μV/m) |
|------------------------|---------------------------|------------------------|
| 1 to 3 | 56 | 76 |
| 3 to 6 | 60 | 80 |

Note : The lower limit applies at the transition frequency.

Limits for radiated disturbance of Class B ITE at a measurement distance of 3m

| Frequency range GHz | Average Limit dB(μV/m) | Peak Limit dB(μV/m) |
|------------------------|---------------------------|------------------------|
| 1 to 3 | 50 | 70 |
| 3 to 6 | 54 | 74 |

Note : The lower limit applies at the transition frequency.

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If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz.

If the highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz.

If the highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz.

If the highest frequency of the internal sources of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less.

The highest internal source of EUT is higher than 1GHz.

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2.4.3 Test Instruments: Below 1GHz

| SGS Radiated_Below_1GHz HWAYA 10m EMC | | | | | |
|---------------------------------------|-----------------|-----------------|------------------------|------------------|-----------------|
| EQUIPMENT TYPE | Manufacturer | Model Number | Serial Number | Calibration Date | Calibration Due |
| EMI Test Receiver | R&S | ESCI 7 | 100950 | 2020/11/30 | 2021/11/29 |
| EMI Test Receiver | R&S | ESCI 3 | 101343 | 2020/2/17 | 2021/2/16 |
| Broadband Antenna | SCHWAZBECK | VULB9168 | 9168-628 | 2020/9/8 | 2021/9/7 |
| Broadband Antenna | SCHWAZBECK | VULB9168 | 9168-629 | 2020/9/14 | 2021/9/13 |
| Loop Antenna | COM-POWER | AL-130 | 121060 | 2020/5/8 | 2021/5/7 |
| Pre Amplifier | EMC Instruments | EMC330 | 980178 | 2020/3/31 | 2021/3/30 |
| Pre Amplifier | EMC Instruments | EMC330 | 980179 | 2020/3/31 | 2021/3/30 |
| Coaxial Cable | EMC Instruments | EMCCFD400-NM-NM | 150917 | 2020/9/18 | 2021/9/17 |
| Coaxial Cable | EMC Instruments | EMCCFD400-NM-NM | 150919 | 2020/9/18 | 2021/9/17 |
| Coaxial Cable | EMC Instruments | EMCCFD400-NM-NM | 150820 | 2020/9/18 | 2021/9/17 |
| Coaxial Cable | EMC Instruments | EMCCFD400-NM-NM | 150918 | 2020/9/18 | 2021/9/17 |
| Coaxial Cable | EMC Instruments | EMCCFD400-NM-NM | 150821 | 2020/9/18 | 2021/9/17 |
| Coaxial Cable | EMC Instruments | EMCCFD400-NM-NM | 150822 | 2020/9/18 | 2021/9/17 |
| Site NSA | SGS | 10m Chamber | 10M SAC | 2020/12/31 | 2021/12/30 |
| Test S/W | Farad | EZ-EMC | Ver. SGS 10m-03A2-5 | N.C.R. | N.C.R. |

Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan
Measurement Uncertainty of Radiated Emission
Expanded uncertainty U_{lab} (k=2) of Radiated Emission is 4.43 dB.(30MHz-1000MHz)
Expanded uncertainty CISPR 16-4-2:2011+A1:2014+A2:2018 (k=2) of Radiated Emission measurement is 5.22 dB.(30MHz-1000MHz)

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Above 1GHz

| SGS Radiated_Above_1GHz HWAYA 966A EMC | | | | | |
|---|-----------------|-----------------|-----------------|------------------|-----------------|
| EQUIPMENT TYPE | Manufacturer | Model Number | Serial Number | Calibration Date | Calibration Due |
| Spectrum Analyzer | Agilent | E4446A | MY48250064 | 2020/4/6 | 2021/4/5 |
| EMI Test Receiver | R&S | ESR 7 | 101459 | 2020/2/24 | 2021/2/23 |
| Horn Antenna | Schwarzbeck | BBHA9120D | BBHA9120D285 | 2020/4/29 | 2021/4/28 |
| Pre Amplifier | EMC Instruments | EMC012645B | 980216 | 2020/4/25 | 2021/4/24 |
| Coaxial Cable | JUNFLOW | MWX221-NMSNMS | J0778929 | 2020/4/23 | 2021/4/22 |
| Coaxial Cable | Huber+Suhner | SUCOFLEX 104PEA | 30255/4PEA | 2020/4/23 | 2021/4/22 |
| Coaxial Cable | EMC Instruments | EMC104-SM-SM | 140927 | 2020/4/23 | 2021/4/22 |
| Coaxial Cable | Huber+Suhner | SUCOFLEX 102 | 520415/2 | 2020/6/5 | 2021/6/4 |
| Coaxial Cable | Huber+Suhner | SUCOFLEX 102 | MY 2153/2 | 2020/6/5 | 2021/6/4 |
| Site VSWR | SGS | 966 Chamber A | SAC-A | 2020/1/12 | 2021/1/11 |
| Test Software | Farad | EZ-EMC | Ver. SGS-03A2-5 | N.C.R. | N.C.R. |
| Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan | | | | | |
| Measurement Uncertainty of Radiated Emission | | | | | |
| Expanded uncertainty U _{lab} (k=2) of Radiated Emission measurement is 4.90 dB.(1-6GHz) | | | | | |
| Expanded uncertainty CISPR 16-4-2:2011+A1:2014+A2:2018 (k=2) of Radiated Emission measurement is 5.18 dB.(1-6GHz) | | | | | |

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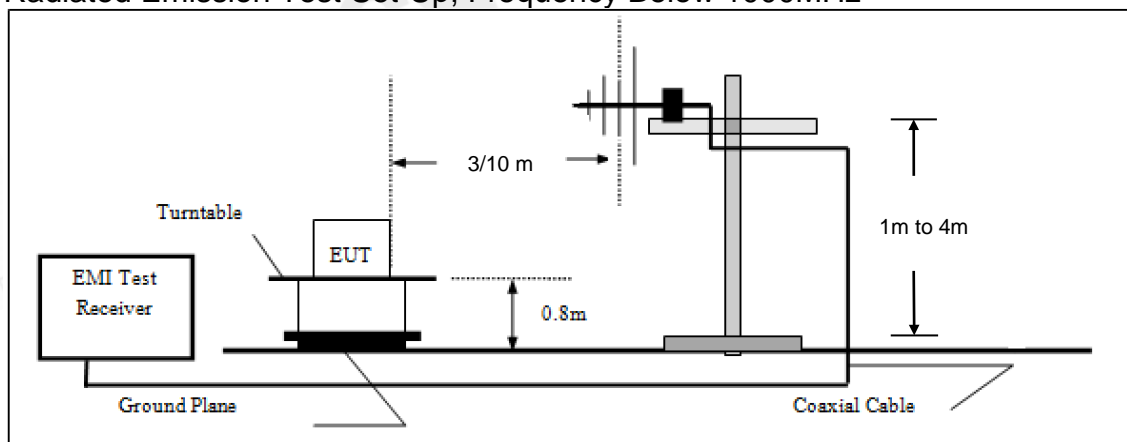
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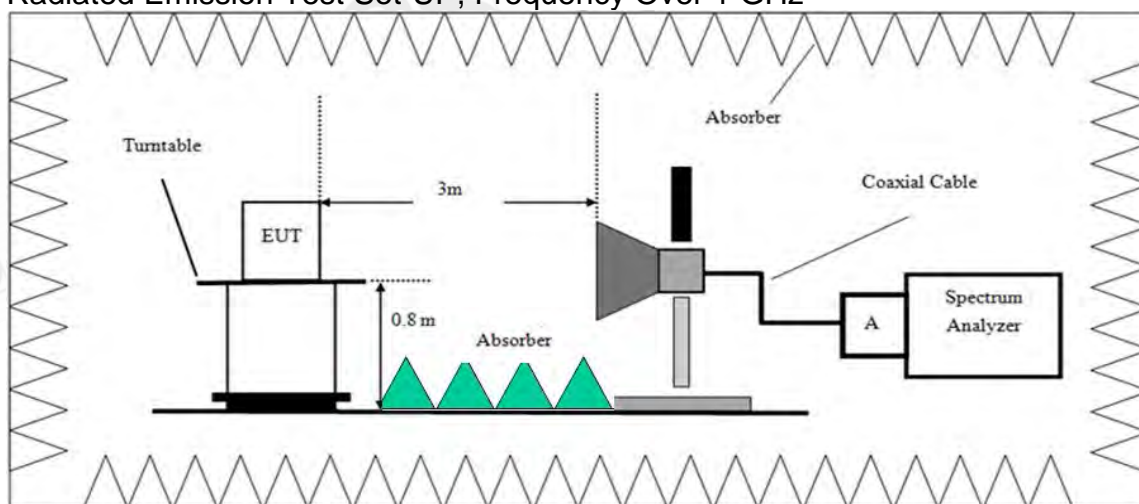
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2.4.4 Test Set-Up (Block Diagram of Configuration):

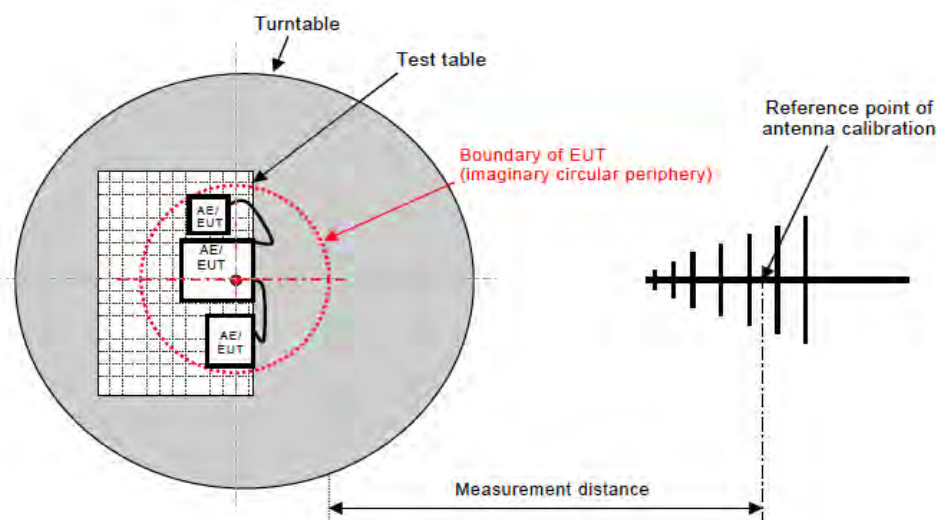
(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP, Frequency Over 1 GHz



(C) Measurement Distance for Radiated Emissions Measurements



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**2.4.5 Measurement Level Calculation:**

Correction Factor = Antenna Factor + Cable loss- Amplifier Gain

Measurement Level = Reading Level + Correction Factor

Over (Margin) = Measurement Level – Limit

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2.4.6 Measurement Data: Below 1GHz

Model No.: CC2650MODA

Mode_1_H



*:Maximum data x:Over limit l:over margin

Page: 1

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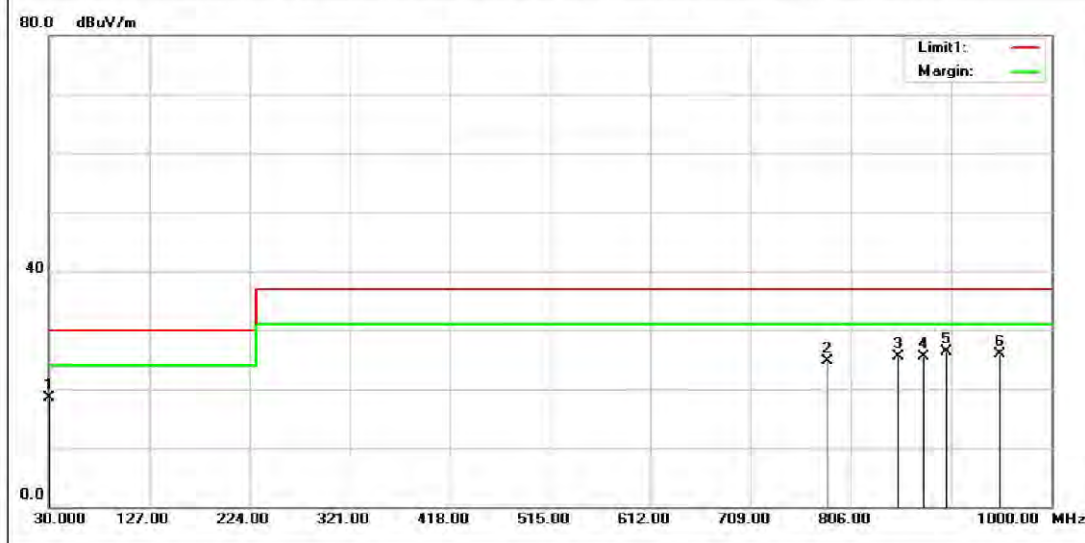
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Mode_1_V

| | | |
|--------------------------------------|-------------------------------|-----------------------|
| Site: SGS 10m Chamber | Date: 2021/1/12 | Time: 下午 07:45:14 |
| Limit: EN55032 Class B 10m Radiation | Polarization: Vertical | Temperature: 15 °C |
| Mode: Mode 1 | Power: AC230V/50Hz | Humidity: 46 %RH |
| Report: File :MH-2020-B0073 | Distance: 10m | Air Pressure: 990 hpa |
| Tester: Moore Cheng | | |
| Note: | | |

SGS Taiwan Ltd.-Electromagnetic Compatibility Laboratory Address: No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333



| No. | Mk | Freq. | Reading | Factor | Measurement | Limit | Over | Height | Degree | Detector | Comment |
|-----|----|----------|---------|--------|-------------|----------|--------|--------|--------|----------|---------|
| | | MHz | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg.) | | |
| 1 | | 30.9700 | 30.84 | -12.28 | 18.56 | 30.00 | -11.44 | | | QP | |
| 2 | | 782.7200 | 23.06 | 1.72 | 24.78 | 37.00 | -12.22 | | | QP | |
| 3 | | 851.5900 | 23.29 | 2.19 | 25.48 | 37.00 | -11.52 | | | QP | |
| 4 | | 875.8400 | 23.41 | 2.19 | 25.60 | 37.00 | -11.40 | | | QP | |
| 5 | * | 898.1500 | 24.06 | 2.21 | 26.27 | 37.00 | -10.73 | 220 | 5 | QP | |
| 6 | | 950.5300 | 23.31 | 2.69 | 26.00 | 37.00 | -11.00 | | | QP | |

*:Maximum data x:Over limit l:over margin

Page: 1

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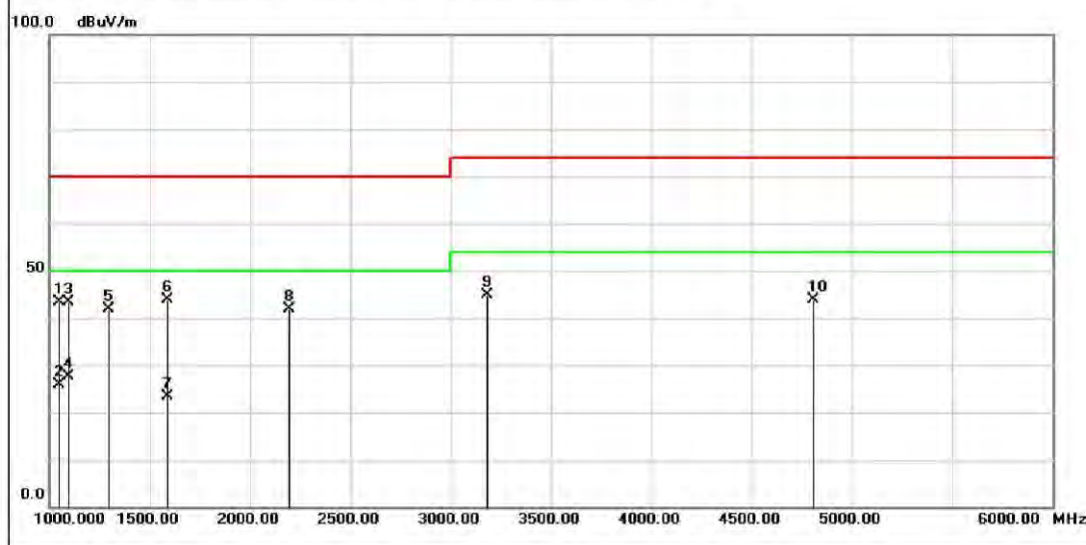
Above 1GHz

Model No.: CC2650MODA

Mode_2_H

| | | |
|-------------------------------------|---------------------------------|-----------------------|
| Site: SGS 966 Chamber A | Date: 2020/12/14 | Time: 下午 07:04:52 |
| Limit: EN 55032 Class B 1G-6G(Peak) | Polarization: Horizontal | Temperature: 20 ℃ |
| Mode: Mode 2 | Power: AC 230V/50Hz | Humidity: 69 %RH |
| Report: MH-2020-B0073 | Distance: 3m | Air Pressure: 990 hpa |
| Tester: Boris Liao | | |
| Note: | | |

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| No. | Mk | Freq. (MHz) | Reading (dBuV) | Factor (dB/m) | Measurement (dBuV/m) | Limit (dBuV/m) | Over (dB) | Height (cm) | Degree (deg) | Detector | Comment |
|-----|----|----------------|-------------------|------------------|-------------------------|-------------------|--------------|----------------|-----------------|----------|---------|
| 1 | | 1050.000 | 68.06 | -24.64 | 43.42 | 70.00 | -26.58 | | | peak | |
| 2 | | 1050.000 | 50.41 | -24.64 | 25.77 | 50.00 | -24.23 | | | AVG | |
| 3 | | 1095.000 | 67.74 | -24.37 | 43.37 | 70.00 | -26.63 | 100 | 134 | peak | |
| 4 | * | 1095.000 | 51.95 | -24.37 | 27.58 | 50.00 | -22.42 | 100 | 134 | AVG | |
| 5 | | 1295.000 | 64.94 | -23.10 | 41.84 | 70.00 | -28.16 | | | peak | |
| 6 | | 1590.000 | 66.86 | -23.03 | 43.83 | 70.00 | -26.17 | | | peak | |
| 7 | | 1590.000 | 46.44 | -23.03 | 23.41 | 50.00 | -26.59 | | | AVG | |
| 8 | | 2195.000 | 60.71 | -18.79 | 41.92 | 70.00 | -28.08 | | | peak | |
| 9 | | 3185.000 | 62.56 | -17.79 | 44.77 | 74.00 | -29.23 | | | peak | |
| 10 | | 4810.000 | 58.21 | -14.29 | 43.92 | 74.00 | -30.08 | | | peak | |

*:Maximum data x:Over limit !:over margin

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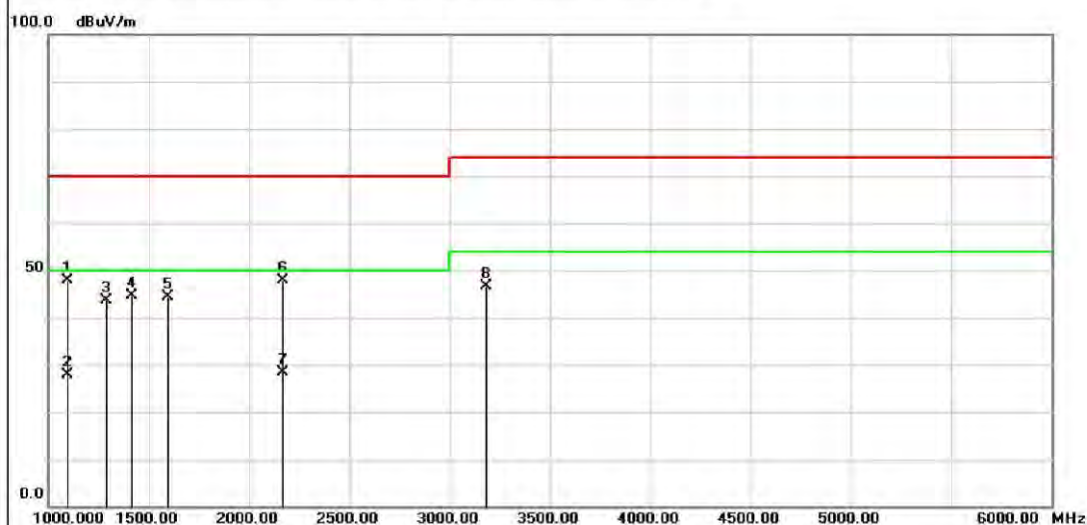
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Mode_2_V

| | | |
|-------------------------------------|-------------------------------|-----------------------|
| Site: SGS 966 Chamber A | Date: 2020/12/14 | Time: 下午 07:19:30 |
| Limit: EN 55032 Class B 1G-6G(Peak) | Polarization: Vertical | Temperature: 20 ℃ |
| Mode: Mode 2 | Power: AC 230V/50Hz | Humidity: 69 %RH |
| Report: MH-2020-B0073 | Distance: 3m | Air Pressure: 990 hpa |
| Tester: Boris Liao | | |
| Note: | | |

SGS Taiwan Ltd.-Electromagnetic Compatibility Laboratory Address: No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333



| No. | Mk | Freq. (MHz) | Reading (dBuV) | Factor (dB/m) | Measurement (dBuV/m) | Limit (dBuV/m) | Over (dB) | Height (cm) | Degree (deg) | Detector | Comment |
|-----|----|----------------|-------------------|------------------|-------------------------|-------------------|--------------|----------------|-----------------|----------|---------|
| 1 | | 1095.000 | 72.31 | -24.37 | 47.94 | 70.00 | -22.06 | | | peak | |
| 2 | | 1095.000 | 52.32 | -24.37 | 27.95 | 50.00 | -22.05 | | | AVG | |
| 3 | | 1290.000 | 66.70 | -23.14 | 43.56 | 70.00 | -26.44 | | | peak | |
| 4 | | 1415.000 | 67.34 | -22.67 | 44.67 | 70.00 | -25.33 | | | peak | |
| 5 | | 1595.000 | 67.53 | -23.03 | 44.50 | 70.00 | -25.50 | | | peak | |
| 6 | | 2170.000 | 67.06 | -19.09 | 47.97 | 70.00 | -22.03 | 101 | 0 | peak | |
| 7 | * | 2170.000 | 47.53 | -19.09 | 28.44 | 50.00 | -21.56 | 101 | 0 | AVG | |
| 8 | | 3185.000 | 64.30 | -17.79 | 46.51 | 74.00 | -27.49 | | | peak | |

*:Maximum data x:Over limit !:over margin

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2.5 DC power input/output ports measurement (Refer to EN 301 489-1 Section 8.3)**2.5.1 Test Method:**

| Standard | Edition | Description |
|----------|---------------|--|
| EN 55032 | 2015+A11:2020 | Information technology equipment – Radio disturbance characteristics - Limits and methods of measurement |

Refer to section 8.3.2 of EN 301489-1 for detail.

2.5.2 Limit:**Maximum permissible level of Line Conducted Emission**

| FREQUENCY (MHz) | Class A(dBuV) | | Class B(dBuV) | |
|--------------------|---------------|---------|---------------|---------|
| | Quasi-peak | Average | Quasi-peak | Average |
| 0.15 - 0.5 | 79 | 66 | 66 - 56 | 56 - 46 |
| 0.50 - 5.0 | 73 | 60 | 56 | 46 |
| 5.0 - 30.0 | 73 | 60 | 60 | 50 |

Note : The lower limit shall apply at the transition frequency.

**Maximum permissible level of Common Mode Conducted Emission
(Telecommunication Ports)****CLASS A**

| FREQUENCY (MHz) | Voltage Limit(dBuV) | | Current Limit(dBuA) | |
|--------------------|---------------------|---------|---------------------|---------|
| | Quasi-peak | Average | Quasi-peak | Average |
| 0.15 - 0.5 | 97 - 87 | 84 - 74 | 53 - 43 | 40 - 30 |
| 0.5 - 30.0 | 87 | 74 | 43 | 30 |

CLASS B

| FREQUENCY (MHz) | Voltage Limit(dBuV) | | Current Limit(dBuA) | |
|--------------------|---------------------|---------|---------------------|---------|
| | Quasi-peak | Average | Quasi-peak | Average |
| 0.15 - 0.5 | 84 - 74 | 74 - 64 | 40 - 30 | 30 - 20 |
| 0.5 - 30.0 | 74 | 64 | 30 | 20 |

Note : The lower limit shall apply at the transition frequency.

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2.5.3 Test Instruments:

| SGS Conducted Emission HWAYA Conducted Room No.A EMC | | | | | |
|--|-----------------------|--------------|-----------------|------------------|-----------------|
| EQUIPMENT TYPE | Manufacturer | Model Number | Serial Number | Calibration Date | Calibration Due |
| EMI Test Receiver | R&S | ESCI 3 | 101311 | 2020/7/8 | 2021/7/7 |
| Coaxial Cables | EMC Instruments Corp. | HY-CE-CABLE | HYCE-2000-01 | 2020/5/19 | 2021/5/18 |
| LISN | Schwarzbeck | NSLK 8127 | 8127-648 | 2020/7/14 | 2021/7/13 |
| LISN | Schwarzbeck | NSLK 8128 | NSLK8128-300 | 2020/9/10 | 2021/9/9 |
| Pulse Limiter | Narda S.T.S. | PMM PL01 | 1110X30602 | 2020/8/12 | 2021/8/11 |
| Test Software | Farad | EZ-EMC | Ver. SGS-03A2-5 | N.C.R. | N.C.R. |
| Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan | | | | | |
| Measurement Uncertainty of Conducted Emission | | | | | |
| Expanded uncertainty U _{lab} (k=2) of Conducted Emission is 2.28 dB. | | | | | |
| Expanded uncertainty CISPR 16-4-2:2011+A1:2014+A2:2018 (k=2) of Conducted Emission measurement is 3.44 dB. | | | | | |

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[illegible]

Factor = LISN insertion loss + Cable loss + Pulse Limiter insertion loss
Measurement Level = Reading Level + Factor
Over (Margin) = Measurement Level – Limit

N/A, this EUT not applicable for vehicular use.

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2.6 AC mains power input/output ports measurement (Refer to EN 301 489-1 Section 8.4)

2.6.1 Test Method:

| Standard | Edition | Description |
|----------|---------------|--|
| EN 55032 | 2015+A11:2020 | Information technology equipment – Radio disturbance characteristics - Limits and methods of measurement |

Refer to section 8.4.2 of EN 301489-1 for detail.

2.6.2 Limit:

Refer to 2.5.2

2.6.3 Test Instruments:

Refer to 2.5.3

2.6.4 Conduction Emission Test Set-up:

Refer to 2.5.4

2.6.5 Measurement Level Calculation:

Factor = LISN insertion loss + Cable loss + Pulse Limiter insertion loss

Measurement Level = Reading Level + Factor

Over (Margin) = Measurement Level – Limit

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2.6.6 Measurement Data:

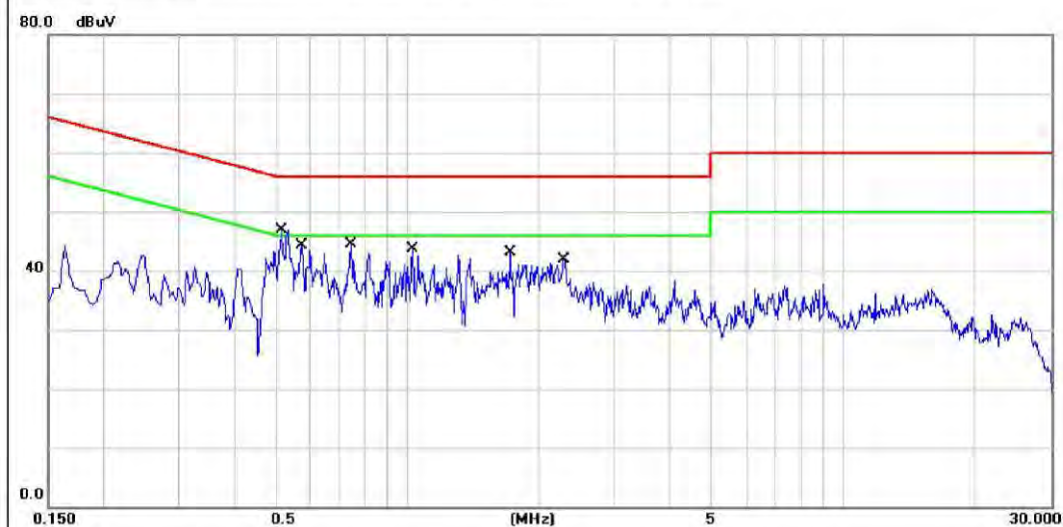
Model No.: CC2650MODA

Mode_2_L

| | | |
|--|--------------------|-----------------------|
| Site: : Conduction Room A | Date: 2020/12/15 | Time: 下午 01:39:38 |
| Limit: EN 55032 Class B Conduction(QP) | Phase: L1 | Temperature: 20 ℃ |
| Mode: Mode 2 | Power: AC230V/50Hz | Humidity: 63 %RH |
| Report: MH-2020-B0073 | | Air Pressure: 990 hpa |
| Tester: Stan Lin | | |

Note:

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| No. | Mk | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Measurement (dBuV) | Limit (dBuV) | Over (dB) | Detector | Comment |
|-----|----|----------------|-------------------|----------------|-----------------------|-----------------|--------------|----------|---------|
| 1 | | 0.5144 | 42.89 | 0.01 | 42.90 | 56.00 | -13.10 | QP | |
| 2 | | 0.5144 | 29.09 | 0.01 | 29.10 | 46.00 | -16.90 | AVG | |
| 3 | * | 0.5730 | 44.49 | 0.01 | 44.50 | 56.00 | -11.50 | QP | |
| 4 | | 0.5730 | 32.59 | 0.01 | 32.60 | 46.00 | -13.40 | AVG | |
| 5 | | 0.7440 | 38.58 | 0.02 | 38.60 | 56.00 | -17.40 | QP | |
| 6 | | 0.7440 | 31.68 | 0.02 | 31.70 | 46.00 | -14.30 | AVG | |
| 7 | | 1.0275 | 38.38 | 0.02 | 38.40 | 56.00 | -17.60 | QP | |
| 8 | | 1.0275 | 27.42 | 0.02 | 27.44 | 46.00 | -18.56 | AVG | |
| 9 | | 1.7250 | 38.20 | 0.10 | 38.30 | 56.00 | -17.70 | QP | |
| 10 | | 1.7250 | 32.90 | 0.10 | 33.00 | 46.00 | -13.00 | AVG | |
| 11 | | 2.2920 | 37.36 | 0.14 | 37.50 | 56.00 | -18.50 | QP | |
| 12 | | 2.2920 | 29.96 | 0.14 | 30.10 | 46.00 | -15.90 | AVG | |

*:Maximum data x:Over limit !:over margin

Page: 1

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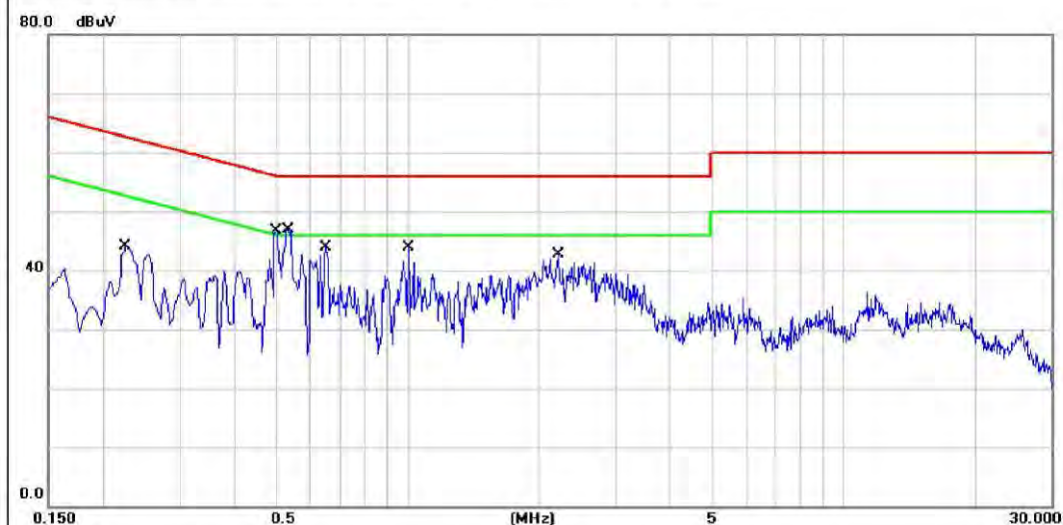
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Mode_2_N

| | | |
|--|--------------------|-----------------------|
| Site: : Conduction Room A | Date: 2020/12/15 | Time: 下午 01:43:49 |
| Limit: EN 55032 Class B Conduction(QP) | Phase: N | Temperature: 20 ℃ |
| Mode: Mode 2 | Power: AC230V/50Hz | Humidity: 63 %RH |
| Report: MH-2020-B0073 | | Air Pressure: 990 hpa |
| Tester: Stan Lin | | |
| Note: | | |

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| No. | Mk | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Measurement (dBuV) | Limit (dBuV) | Over (dB) | Detector | Comment |
|-----|----|----------------|-------------------|----------------|-----------------------|-----------------|--------------|----------|---------|
| 1 | | 0.2265 | 40.69 | 0.01 | 40.70 | 62.58 | -21.88 | QP | |
| 2 | | 0.2265 | 32.39 | 0.01 | 32.40 | 52.58 | -20.18 | AVG | |
| 3 | | 0.5010 | 44.78 | 0.01 | 44.79 | 56.00 | -11.21 | QP | |
| 4 | | 0.5010 | 32.89 | 0.01 | 32.90 | 46.00 | -13.10 | AVG | |
| 5 | * | 0.5325 | 45.29 | 0.01 | 45.30 | 56.00 | -10.70 | QP | |
| 6 | | 0.5325 | 31.89 | 0.01 | 31.90 | 46.00 | -14.10 | AVG | |
| 7 | | 0.6495 | 41.13 | 0.01 | 41.14 | 56.00 | -14.86 | QP | |
| 8 | | 0.6495 | 30.79 | 0.01 | 30.80 | 46.00 | -15.20 | AVG | |
| 9 | | 1.0095 | 38.08 | 0.02 | 38.10 | 56.00 | -17.90 | QP | |
| 10 | | 1.0095 | 27.38 | 0.02 | 27.40 | 46.00 | -18.60 | AVG | |
| 11 | | 2.2290 | 37.66 | 0.14 | 37.80 | 56.00 | -18.20 | QP | |
| 12 | | 2.2290 | 32.56 | 0.14 | 32.70 | 46.00 | -13.30 | AVG | |

*:Maximum data x:Over limit !:over margin

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2.7 Current Harmonics Emission (AC mains input port) measurement (Refer to EN 301 489-1 Section 8.5)

2.7.1 Test Method:

Refer to EN 61000-3-2 : 2014

2.7.2 Test Instruments:

| SGS Harmonic EN61000-3-2 HWAYA EMC | | | | | |
|---|--------------|--------------|---------------|------------------|-----------------|
| EQUIPMENT TYPE | Manufacturer | Model Number | Serial Number | Calibration Date | Calibration Due |
| Power Analyzer | TESEQ | CCN 1000-1 | 1504A02654 | 2017/3/20 | 2018/3/19 |
| AC Power Source | TESEQ | NSG 1007 | 1504A02654 | 2017/3/20 | 2018/3/19 |
| Test Software | TESEQ | Win2100 V4 | Ver. 4.5.8 | N.C.R. | N.C.R. |
| Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan | | | | | |

2.7.3 Measurement Result:

N/A, the EUT power from system, no necessary to perform the test.

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2.8 Voltage Fluctuations and Flicker (AC mains input port) measurement (Refer to EN 301 489-1 Section 8.6)

2.8.1 Test Method:

Refer to EN 61000-3-3 : 2013+A1:2019

2.8.2 Test Instruments:

| SGS Flicker EN61000-3-3 HWAYA EMC | | | | | |
|---|--------------|--------------|---------------|------------------|-----------------|
| EQUIPMENT TYPE | Manufacturer | Model Number | Serial Number | Calibration Date | Calibration Due |
| Power Analyzer | TESEQ | CCN 1000-1 | 1504A02654 | 2017/3/20 | 2018/3/19 |
| AC Power Source | TESEQ | NSG 1007 | 1504A02654 | 2017/3/20 | 2018/3/19 |
| Test Software | TESEQ | Win2100 V4 | Ver. 4.5.8 | N.C.R. | N.C.R. |
| Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan | | | | | |

2.8.3 Measurement Result:

N/A, the EUT power from system, no necessary to perform the test.

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2.9 Wired network Ports (Refer to EN 301 489-1 Section 8.7)**2.9.1 Test Method:**

| Standard | Edition | Description |
|----------|---------------|--|
| EN 55032 | 2015+A11:2020 | Information technology equipment – Radio disturbance characteristics - Limits and methods of measurement |

Refer to section 8.7.2 of EN 301489-1 for detail.

2.9.2 Limit: Limits for conducted emission from Wired network ports:

| Frequency range | Voltage limits (dB μ V) | | Current limits (dB μ A) | |
|---|-----------------------------|----------|-----------------------------|----------|
| | Quasi-peak | Average | Quasi-peak | Average |
| 0.15 MHz to 0.5 MHz | 84 to 74 | 74 to 64 | 40 to 30 | 30 to 20 |
| 0.5 MHz to 30 MHz | 74 | 64 | 30 | 20 |
| NOTE 1: The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz. | | | | |
| NOTE 2: The current and voltage disturbance limits are derived for use with an Impedance Stabilization Network (ISN) which presents a common mode (asymmetric mode) impedance of 150 to the telecommunication port under test (conversion factor is $20 \log_{10} 150/I = 44\text{dB}$). | | | | |

2.9.3 Test Instruments:

Refer to 2.5.3

2.9.4 Wired network ports Emission Test Set-up:

Refer to 2.5.4

2.9.5 Measurement level calculation method:

Factor = ISN insertion loss + Cable loss + Pulse Limiter insertion loss

Measurement Level = Reading Level + Factor

Over (Margin) = Measurement Level – Limit

2.9.6 Measurement Result:

N/A, without wired telecommunication port exist in this EUT, no necessary to perform the test.

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3. IMMUNITY

EN 301 489-1/-17

3.1 Test Configuration

Refer to EN 301 489-1, section 9.1

3.2 Special Conditions

EN 301 489-17

Arrangements for test conditions shall be as specified in EN 301 489-17 clause 4 of the present document.

Arrangements for performance criteria shall be as specified in EN 301 489-17 clause 6 of the present document.

3.3 Summary of Test Results

| Test Items | Performance Section | Result |
|---|--------------------------|--------|
| Radio frequency electromagnetic field (80 to 1000MHz and 1000MHz to 6000MHz) | EN 301 489-1 Section 9.2 | PASS |
| Electrostatic discharge | EN 301 489-1 Section 9.3 | PASS |
| Fast transients, common mode | EN 301 489-1 Section 9.4 | N/A |
| Radio frequency, common mode | EN 301 489-1 Section 9.5 | N/A |
| Transients and surges in the vehicular environment | EN 301 489-1 Section 9.6 | N/A |
| Voltage dips and interruptions | EN 301 489-1 Section 9.7 | N/A |
| Surges | EN 301 489-1 Section 9.8 | N/A |

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3.4 Performance Criteria Description

EN 301 489-17

General performance criteria

The performance criteria are:

- performance criteria A for immunity tests with phenomena of a continuous nature;
- performance criteria B for immunity tests with phenomena of a transient nature;
- performance criteria C for immunity tests with power interruptions exceeding a certain time.

The equipment shall meet the minimum performance criteria as specified in the following clauses.

Performance criteria table

| Criteria | During test | After test (i.e. as a result of the application of the test) |
|----------|--|---|
| A | Shall operate as intended. (see note). Shall be no loss of function. Shall be no unintentional transmissions. | Shall operate as intended. Shall be no degradation of performance. Shall be no loss of function. Shall be no loss of critical stored data. |
| B | May be loss of function. | Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no loss of critical stored data. |
| C | May be loss of function. | Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no loss of critical stored data. |

NOTE: Operate as intended during the test allows a level of degradation in accordance with clause 6.2.2.

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Performance criteria for Continuous phenomena applied to Transmitters (CT)

The performance criteria A shall apply.

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an ACKnowledgement (ACK) or Not ACKnowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Transient phenomena applied to Transmitters (TT)

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5,000 ms duration, for which performance criteria C shall apply.

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an acknowledgement (ACK) or not-acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Continuous phenomena applied to Receivers (CR)

The performance criteria A shall apply.

Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Transient phenomena applied to Receivers (TR)

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5,000 ms duration for which performance criteria C shall apply.

Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

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Pass/Fail verdict:

Wi-Fi-RS/CS/Section 9.6 Pulse 3a/3b (CT/CR): During the test, the window of CMD executed by notebook shall continuously return acknowledge copy from EUT until the end of the test.

Wi-Fi-other test items (TT/TR): During the test, the disconnection would occur if message of "TIME OUT" is displayed. Ack/NACK would automatically recover after the test.

BT (Data transfer)-RS/CS/Section 9.6 Pulse 3a/3b (CT/CR): During the test, the status bar on the screen of notebook would continuously progress without any halt until the completion of the test.

BT (Data transfer)-other test items (TT/TR): During the test, the status bar on the screen of notebook would discontinue with halt until the end of the test would be automatically recover.

BT Headset/BT Speaker-RS/CS/Section 9.6 Pulse 3a/3b (CT/CR): During the test, the voice (1kHz or 400Hz) would be monitor voice and communication with same quality.

BT Headset/BT Speaker-Other test items (TT/TR): During the tests, the voice or communication would be discontinued or variable voice frequency tone. After the test would be automatically recover.

Monitoring:

For WLAN: The status as displayed on CMD of notebook

For BT: The status as displayed on CMD of notebook

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3.5 Radio Frequency Electromagnetic Field (80 to 1000MHz and 1000 to 6000MHz) (Refer to EN 301 489-1 Section 9.2 for the measurement)

3.5.1 Test Method and Procedure:

EN 61000-4-3 : 2006+A1:2008+A2:2010, and EN 301 489-1 Section 9.2.2.

3.5.2 Performance Criteria:

Refer to EN 301 489-1 Section 9.2.3.

3.5.3 Test Instruments:

| SGS RS EN61000-4-3 HWAYA SAC-F EMC | | | | | |
|---|--------------|---------------|-----------------|------------------|-----------------|
| EQUIPMENT TYPE | Manufacturer | Model Number | Serial Number | Calibration Date | Calibration Due |
| RS Test Site | Chance Most | 8*5*3 Chamber | SAC-F | 2020/2/24 | 2021/2/23 |
| Signal Generator | R&S | SMB 100A | 114674 | 2020/11/6 | 2021/11/5 |
| Power Sensor | R&S | NRP-Z11 | 112186 | 2020/4/13 | 2021/4/12 |
| Power Sensor | R&S | NRP-Z11 | 111682 | 2020/4/15 | 2021/4/14 |
| Power Amplifier | R&S | BBA100 | 101075 | N.C.R. | N.C.R. |
| Power Amplifier | R&S | BBA100 | 101021 | N.C.R. | N.C.R. |
| Power Amplifier | R&S | BBA150 | 102229 | N.C.R. | N.C.R. |
| E-Field Generating Antenna | ifi | EFG-3 | U2137-0217 | N.C.R. | N.C.R. |
| High Gain Log-Per. Antenna | R&S | HL046E | 100112 | N.C.R. | N.C.R. |
| Calibrated Broadband Log-Per. Test-Antenna | Schwarzbeck | STLP 9149 | 9149-151 | N.C.R. | N.C.R. |
| Electric Field Probes | AR | FL7006+FI7000 | 0330722+0330847 | 2020/7/24 | 2021/7/23 |
| Test Software | R&S | EMC 32 | V10.20.01 | N.C.R. | N.C.R. |
| Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan | | | | | |

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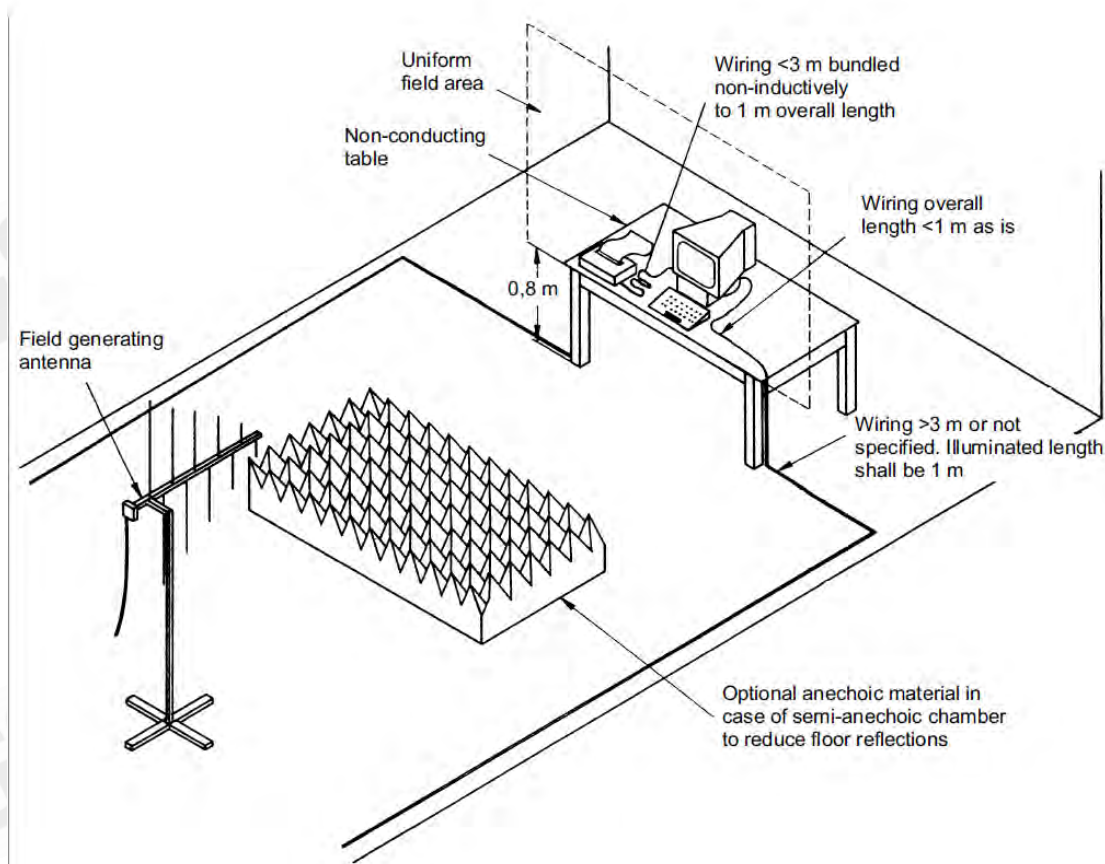
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3.5.4 Test Setup (Block Diagram of Configuration):



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3.5.5 Measurement Data:

Model No.: CC2650MODA

| | | | |
|-----------------|--------|--------------|---------------|
| Operation Mode: | Mode 2 | Tested Date: | Jan. 14, 2021 |
| Temperature: | 21 °C | Humidity: | 55 % |
| | | Tested By: | James Ho |

Basic Standard : EN 61000-4-3
 Frequency Range : 80 to 1000MHz and 1000 to 6000 MHz
 Field Strength : 3 V/m
 Modulation : AM 80 %, 1 kHz sinewave
 Frequency Step : 1 % of fundamental
 Dwell Time : 3 sec
 Polarity of Antenna : Horizontal and Vertical
 Test Distance : 3 m (EUT to antenna reference point)

| No. | Frequency (MHz) | Antenna Orientation | Criterion | EUT Orientation |
|-----|-----------------|---------------------|------------|-----------------|
| 1 | 80 – 1000 | Vertical/Horizontal | A (CT, CR) | 0 degree |
| 2 | 80 – 1000 | Vertical/Horizontal | A (CT, CR) | 90 degree |
| 3 | 80 – 1000 | Vertical/Horizontal | A (CT, CR) | 180 degree |
| 4 | 80 – 1000 | Vertical/Horizontal | A (CT, CR) | 270 degree |

| No. | Frequency (MHz) | Antenna Orientation | Criterion | EUT Orientation |
|-----|-----------------|---------------------|------------|-----------------|
| 1 | 1000 – 6000 | Vertical/Horizontal | A (CT, CR) | 0 degree |
| 2 | 1000 – 6000 | Vertical/Horizontal | A (CT, CR) | 90 degree |
| 3 | 1000 – 6000 | Vertical/Horizontal | A (CT, CR) | 180 degree |
| 4 | 1000 – 6000 | Vertical/Horizontal | A (CT, CR) | 270 degree |

Observation:

A : No degradation in the performance of the EUT was observed.
 CT, CR: No degradation in the performance of the EUT was observed.
 N/A : Not Applicable.

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3.6 Electrostatic Discharge Measurement (Refer to EN 301 489-1 Section 9.3)

3.6.1 Test Method and Procedure:

EN 61000-4-2 : 2009 and EN 301 489-1 Section 9.3.2

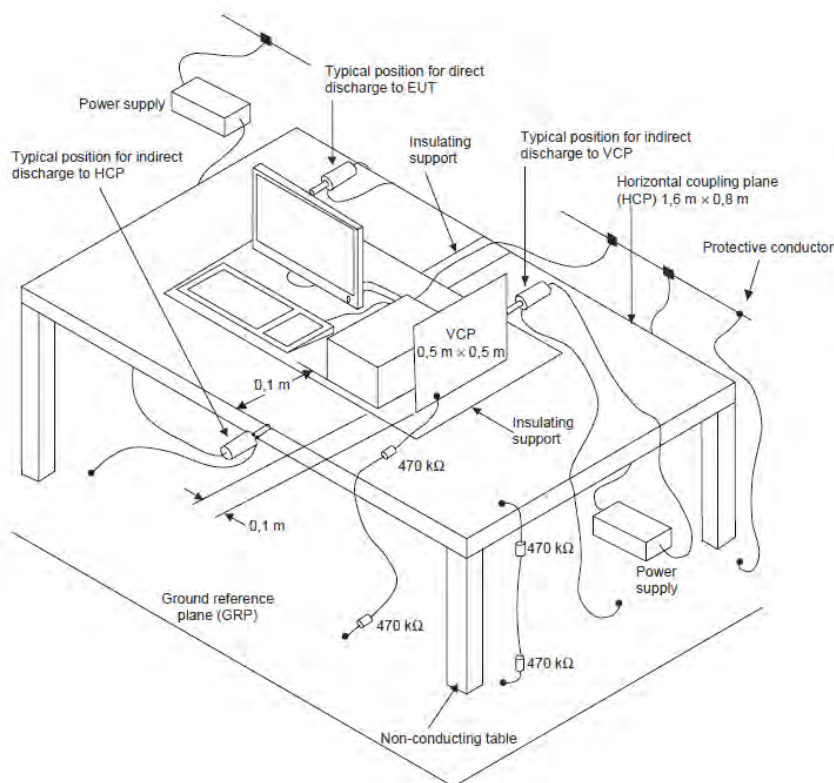
3.6.2 Performance Criteria:

Refer to EN 301 489-1 Section 9.3.3.

3.6.3 Test Instruments:

| SGS ESD EN61000-4-2 HwaYa No.1_EMC | | | | | |
|---|--------------|--------------|---------------|------------------|-----------------|
| EQUIPMENT TYPE | Manufacturer | Model Number | Serial Number | Calibration Date | Calibration Due |
| ESD Simulator | NoiseKen | ESS-B3011 | ESS12Z5075 | 2020/9/21 | 2021/9/20 |
| HCP | N/A | 1.6 x 0.8 m | N/A | N.C.R. | N.C.R. |
| VCP | N/A | 0.5 x 0.5 m | N/A | N.C.R. | N.C.R. |
| Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan | | | | | |

3.6.4 Test Setup (Block Diagram of Configuration):



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3.6.5 Measurement Data:

Model No.: CC2650MODA

| | | | |
|-----------------|--------|--------------|---------------|
| Operation Mode: | Mode 2 | Tested Date: | Dec. 18, 2020 |
| Temperature: | 24 °C | Humidity: | 54 % |
| | | Tested By: | Ricky Chen |

Basic Standard : EN 61000-4-2

Discharge Impedance : 330 ohm /150 pF

Discharge Voltage : Air Discharge: +/- 2, 4, 8 kV
 Contact Discharge: +/- 2, 4 kV
 VCP/HCP: +/- 2, 4 kV

Polarity : Positive/Negative

Number of Discharge : Minimum 10/50 times at each test point

Discharge Mode : Single Discharge

Discharge Period : 1 second minimum

Note 1: For contact discharge, the EUT was exposed to at least 20 discharges, 10 each at negative and positive polarity.

Note 2: Refer to Appendix 1 of test report for test points.

A. Observations for following test points:

N/A

| Direct Application | | | Test Results | |
|----------------------|----------------|------------|-------------------|---------------|
| Discharge Level (kV) | Polarity (+/-) | Test Point | Contact Discharge | Air Discharge |
| 2, 4, 8 | +/- | N/A | N/A | N/A |
| 2, 4 | +/- | N/A | N/A | N/A |

B. Observations for following test points:

1. Front side 2. Rear side 3. Left side 4. Right side

| Indirect Application | | | Test Results | |
|----------------------|----------------|------------|---------------------|-------------------|
| Discharge Level (kV) | Polarity (+/-) | Test Point | Horizontal Coupling | Vertical Coupling |
| 2, 4 | +/- | 1~4 | A (TT, TR) | A (TT, TR) |

Observation:

A : No degradation in the performance of the EUT was observed.

TT, TR: "TT, TR" means during the test, the charge indicator disappeared. It recovered by itself at the end of test.

N/A : Not Applicable.

3.7 Fast Transients, Common Mode Measurement (Refer to EN 301 489-1 Section 9.4)

3.7.1 Test Method and Procedure:

EN 61000-4-4 : 2012 and EN 301 489-1 Section 9.4.2

3.7.2 Performance criteria:

Refer to EN 301 489-1 Section 9.4.3.

3.7.3 Test Instruments:

| SGS EFT EN61000-4-4 HWAYA EMC | | | | | |
|---|--------------|--------------|---------------|------------------|-----------------|
| EQUIPMENT TYPE | Manufacturer | Model Number | Serial Number | Calibration Date | Calibration Due |
| Burst Generator | TESEQ | NSG 3025 | 35177 | 2015/12/2 | 2016/12/1 |
| EFT Clamp | Thermo | CCL | 612359 | 2015/12/2 | 2016/12/1 |
| Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan | | | | | |

3.7.4 Test Setup (Block Diagram of Configuration):

Refer to Appendix 1 for setup photo.

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3.7.5 Measurement Data:

| | | | |
|-----------------|--------|--------------|-------|
| Operation Mode: | N/A | Tested Date: | N/A |
| Temperature: | N/A °C | Humidity: | N/A % |
| | | Tested By: | N/A |

Basic Standard : EN 61000-4-4
 Test Voltage : 1 kV for AC Input
 Signal/Comm. : ± 0.5 kV
 Polarity : Positive/Negative
 Impulse Frequency : 5 kHz
 Tr/Th : 5/50ns
 Burst : 15/300ms

| Test Point | Polarity | Test Level (kV) | Results |
|--------------|----------|-----------------|---------|
| L | +/- | 1 | N/A |
| N | +/- | 1 | N/A |
| PE | +/- | 1 | N/A |
| L-N | +/- | 1 | N/A |
| L-PE | +/- | 1 | N/A |
| N-PE | +/- | 1 | N/A |
| L-N-PE | +/- | 1 | N/A |
| DC Input | +/- | 0.5 | N/A |
| Signal/Comm. | +/- | 0.5 | N/A |

Observation:

N/A : Not Applicable, the EUT power from system and without PE exist and no signal/Comm. port cable length > 3m, no necessary to perform test.

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3.8 Radio Frequency, Common Mode Measurement (Refer to EN 301 489-1 Section 9.5)

3.8.1 Test Method and Procedure:

EN 61000-4-6 : 2014 and EN 301 489-1 Section 9.5.2

3.8.2 Performance Criteria:

Refer to EN 301 489-1 Section 9.5.3.

3.8.3 Test Instruments:

| SGS CS EN61000-4-6 HwaYa_EMC | | | | | |
|---|--------------|-----------------|---------------|------------------|-----------------|
| EQUIPMENT TYPE | Manufacturer | Model Number | Serial Number | Calibration Date | Calibration Due |
| Signal Generator | R&S | SMB 100A | 102920 | 2016/5/10 | 2017/5/9 |
| Power Sensor | R&S | NRP-Z91 | 100373 | 2015/12/3 | 2016/12/2 |
| Power Sensor | R&S | NRP-Z91 | 100547 | 2016/2/15 | 2017/2/14 |
| Power Amplifier | R&S | BBA150 | 102118 | N.C.R. | N.C.R. |
| CDN | LUTHI | CDN M2 | P1317118042 | 2016/5/26 | 2017/5/25 |
| CDN | LUTHI | CDN M3 | P1318118505 | 2016/5/20 | 2017/5/19 |
| CDN | FCC | FCC-801-T2-RJ11 | 5032 | 2016/2/26 | 2017/2/25 |
| CDN | FCC | FCC-801-T8-RJ45 | 5034 | 2016/2/26 | 2017/2/25 |
| EM Injection Clamp | LUTHI | EM 101 | 36158 | 2016/5/18 | 2017/5/17 |
| CDN | Frankonia | CDN M2+M3 | A3011070 | N.C.R. | N.C.R. |
| Test Software | R&S | EMC 32 | V9.25.00 | N.C.R. | N.C.R. |
| Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan | | | | | |

3.8.4 Test Setup (Block Diagram of Configuration):

Refer to Appendix 1 for setup photo.

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3.8.5 Measurement Data:

| | | | |
|-----------------|--------|--------------|-------|
| Operation Mode: | N/A | Tested Date: | N/A |
| Temperature: | N/A °C | Humidity: | N/A % |
| | | Tested By: | N/A |

Basic Standard : EN 61000-4-6
Frequency Range : 0.15 MHz - 80 MHz
Field Strength : 3 V_{rms}
Modulation : AM 80 %, 1 kHz Sinewave
Frequency Step : 1 % of fundamental
Dwell Time : 3 seconds
Coupling Method : N/A

| Port Description | Frequency (MHz) | Meet Criteria for |
|------------------|-----------------|-------------------|
| AC input | 0.15 – 80 | N/A |
| DC input | 0.15 – 80 | N/A |
| Signal/Comm. | 0.15 – 80 | N/A |

Observation:

N/A : Not Applicable, the EUT power from system and no signal/Comm. port cable length > 3m, no necessary to perform test.

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3.9 Transients and surges in the vehicular environment measurement (Refer to EN 301 489-1 Section 9.6)

3.9.1 Test Method and Procedure:

Refer to ISO 7637-2 : 2004 for 12V_{dc} and 24V_{dc} equipment and EN 301 489-1 Section 9.6.2.

3.9.2 Performance Criteria:

Refer to EN 301 489-1 Section 9.6.3.

3.9.3 Test Instruments:

| SGS ISO_7637_2 HwaYa_EMC | | | | | |
|---|--------------|--------------|---------------|------------------|-----------------|
| EQUIPMENT TYPE | Manufacturer | Model Number | Serial Number | Calibration Date | Calibration Due |
| LISN | TESEQ | LISN2-S | F343 | 2013/7/8 | 2016/7/7 |
| Load Dump Generator | TESEQ | LD 5505 | 1233 | 2015/12/11 | 2017/12/10 |
| Function Generator | TESEQ | FG 5620 | 1231 | 2015/12/11 | 2017/12/10 |
| Power Amplifier | TESEQ | PA 5840-75 | 4106 | 2015/12/11 | 2017/12/10 |
| Burst Attenuator | TESEQ | INA 5030B | 1221 | 2015/12/11 | 2017/12/10 |
| Micro Transient Generator | TESEQ | MT 5511 | 1241 | 2015/12/11 | 2017/12/10 |
| Fast Transient Generator | TESEQ | FT 5530 | 123 | 2015/12/11 | 2017/12/10 |
| Resistor Modul | TESEQ | RM 5505 | 1216 | 2015/12/11 | 2017/12/10 |
| Oscilloscope | Agilent | DSOX3102A | MY53160306 | 2015/6/29 | 2016/6/28 |
| High Voltage Probe | Keysight | 10076C | 10076-60003 | 2016/2/22 | 2017/2/21 |
| Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan | | | | | |

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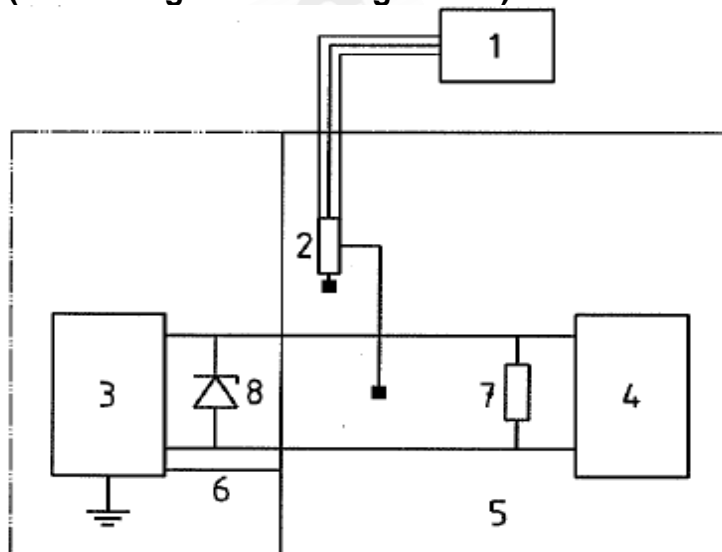
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3.9.4 Test Setup (Block Diagram of Configuration):



| No. | Note name | No. | Note name |
|-----|--|-----|--|
| 1 | Oscilloscope or equivalent | 5 | Ground plane |
| 2 | Voltage probe | 6 | Ground connection (maximum length for test pulse 3: 100 mm) |
| 3 | Test pulse generator with internal power supply 3: 100 mm)resistance R_i | 7 | optional resistor (R_v) a |
| 4 | DUT | 8 | optional diode bridge b |

3.9.5 Measurement Data:

N/A, this EUT not applicable for vehicular use.

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3.10 Voltage Dips and Interruptions Measurement (Refer to EN 301 489-1 Section 9.7)

3.10.1 Test Method and Procedure:

EN 61000-4-11 : 2004+A1:2017 and EN 301 489-1 Section 9.7.2

3.10.2 Performance Criteria:

Refer to EN 301 489-1 Section 9.7.3.

3.10.3 Test Instruments:

| SGS DIP EN61000-4-11 HWAYA EMC | | | | | |
|---|--------------|--------------|---------------|------------------|-----------------|
| EQUIPMENT TYPE | Manufacturer | Model Number | Serial Number | Calibration Date | Calibration Due |
| EMCPRO-PLUS Immunity Test System | Thermo | EMCPRO | 612355 | 2015/6/30 | 2016/6/29 |
| Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan | | | | | |

3.10.4 Test Setup (Block Diagram of Configuration):

Refer to Appendix 1 for setup photo.

3.10.5 Measurement Data:

| | | | |
|-----------------|--------|--------------|-------|
| Operation Mode: | N/A | Tested Date: | N/A |
| Temperature: | N/A °C | Humidity: | N/A % |
| | | Tested By: | N/A |

Basic Standard : EN 61000-4-11
 EUT Tested Voltage: 230 Vac, 50 Hz
 Residual Voltage : 0 %, 70 % Ut
 Phase Angle : 0, 180 degree
 Total Events : 3 dropouts
 Event Interval : 10 seconds

| Events | Cycles | Meet Criteria for |
|--|--------|-------------------|
| Voltage dip: 0 % residual voltage | 0.5 | N/A |
| Voltage dip: 0 % residual voltage | 1 | N/A |
| Voltage dip: 70 % residual voltage | 25 | N/A |
| Voltage interruption: 0 % residual voltage | 250 | N/A |

Observation:

N/A : Not Applicable, the EUT power from system, no necessary to perform test.

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3.11 Surges Measurement (Refer to EN 301 489-1 Section 9.8)**3.11.1 Test Method and Procedure:**

EN 61000-4-5 : 2014+A1:2017 and EN 301 489-1 Section 9.8.2

3.11.2 Performance Criteria:

Refer to EN 301 489-1 Section 9.8.3.

3.11.3 Test Instruments:

| SGS Surge EN61000-4-5 HWAYA EMC | | | | | |
|---|--------------|----------------|---------------|------------------|-----------------|
| EQUIPMENT TYPE | Manufacturer | Model Number | Serial Number | Calibration Date | Calibration Due |
| Surge Tester | EMC Partner | MIG0603IN2 S-T | 1515 | 2016/5/17 | 2017/5/16 |
| Universal Surge CDN | EMC Partner | CDN-UTP8 | CDN-UTP8-1516 | 2016/5/25 | 2017/5/24 |
| Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan | | | | | |

3.11.4 Test Setup (Block Diagram of Configuration):

Refer to Appendix 1 for setup photo.

3.11.5 Measurement Data:

| | | | |
|-----------------|--------|--------------|-------|
| Operation Mode: | N/A | Tested Date: | N/A |
| Temperature: | N/A °C | Humidity: | N/A % |
| | | Tested By: | N/A |

Basic Standard : EN 61000-4-5

Test Rate : 1 pulse / minute

No. of Tests : 5 positive and 5 negative pulses

Observation Description

| Test Point | Phase Angle (degree) | Polarity (+/-) | Test Level (kV) | Meet Criteria for |
|------------|----------------------|----------------|-----------------|-------------------|
| L – N | 0, 90, 180, 270 | +/- | 1 | N/A |
| L – PE | 0, 90, 180, 270 | +/- | 2 | N/A |
| N – PE | 0, 90, 180, 270 | +/- | 2 | N/A |
| DC input | N/A | +/- | 0.5 | N/A |
| Signal I/O | N/A | +/- | 1 | N/A |

Observation:

N/A : Not Applicable, the EUT power from system and no signal I/O port cable length > 3m or used for outdoor, no necessary to perform test.

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APPENDIX 1

PHOTOGRAPHS OF TEST SETUP

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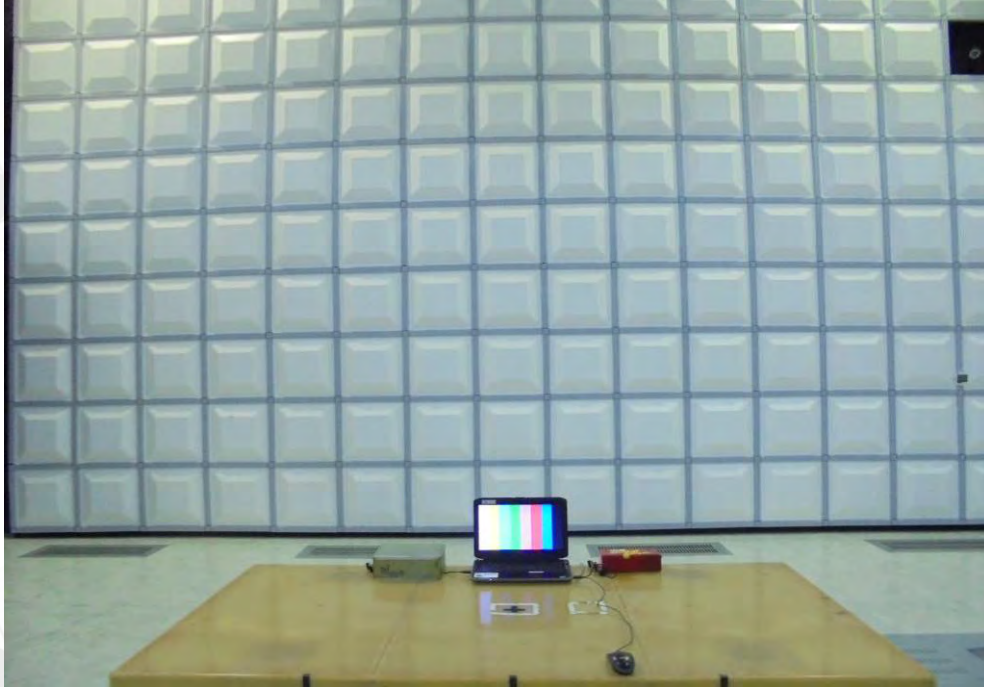
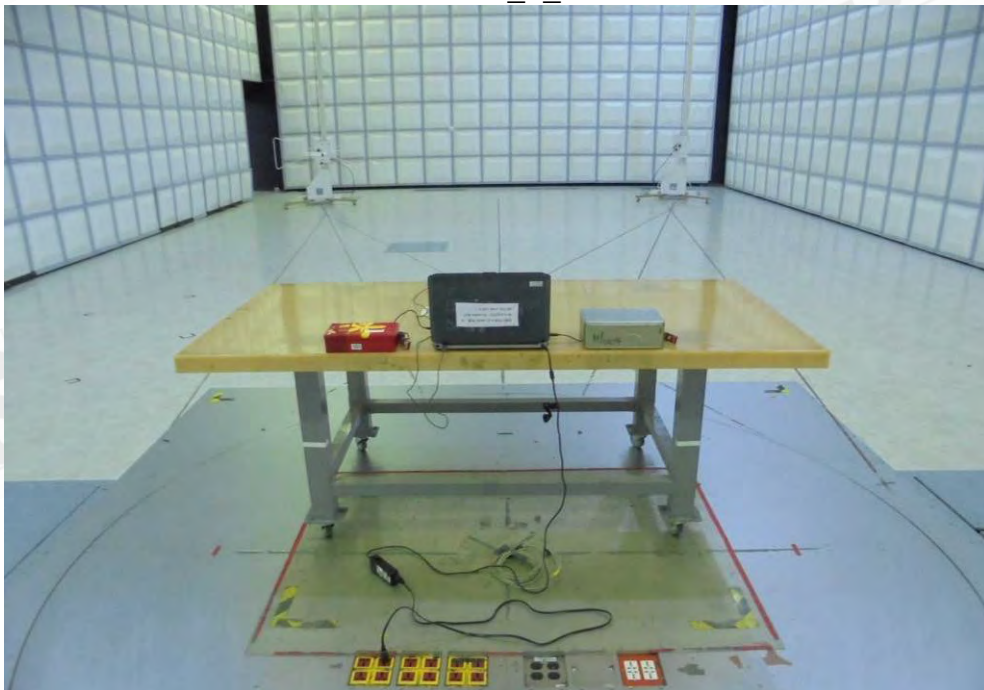
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**Radiated Emission Test Setup Photos - Below 1GHz****Model No.: CC2650MODA****Mode_1_+****Mode_1_-**

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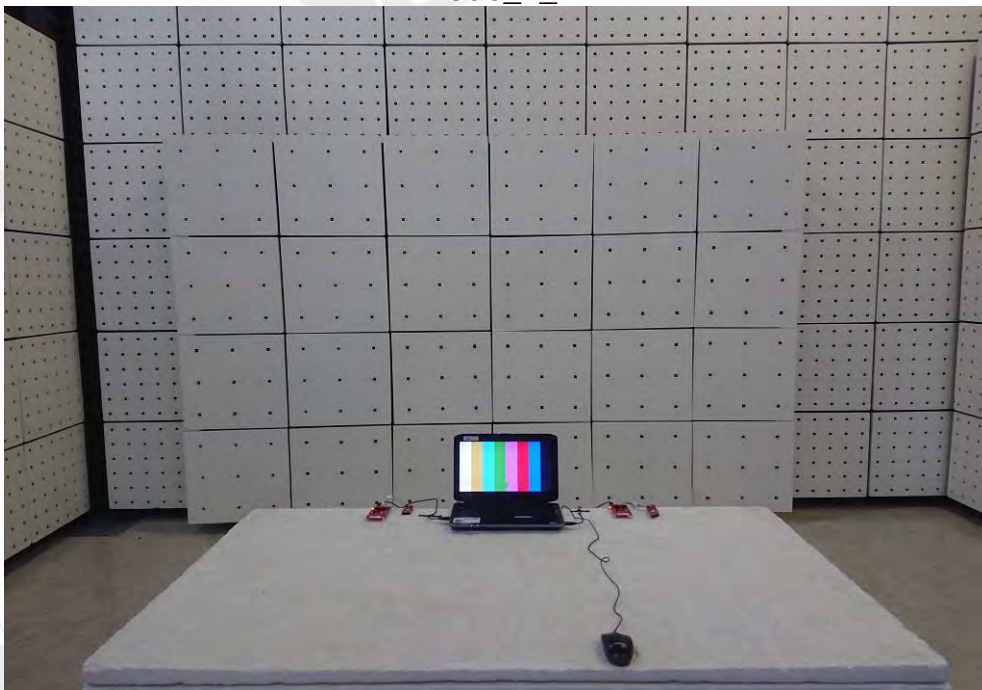
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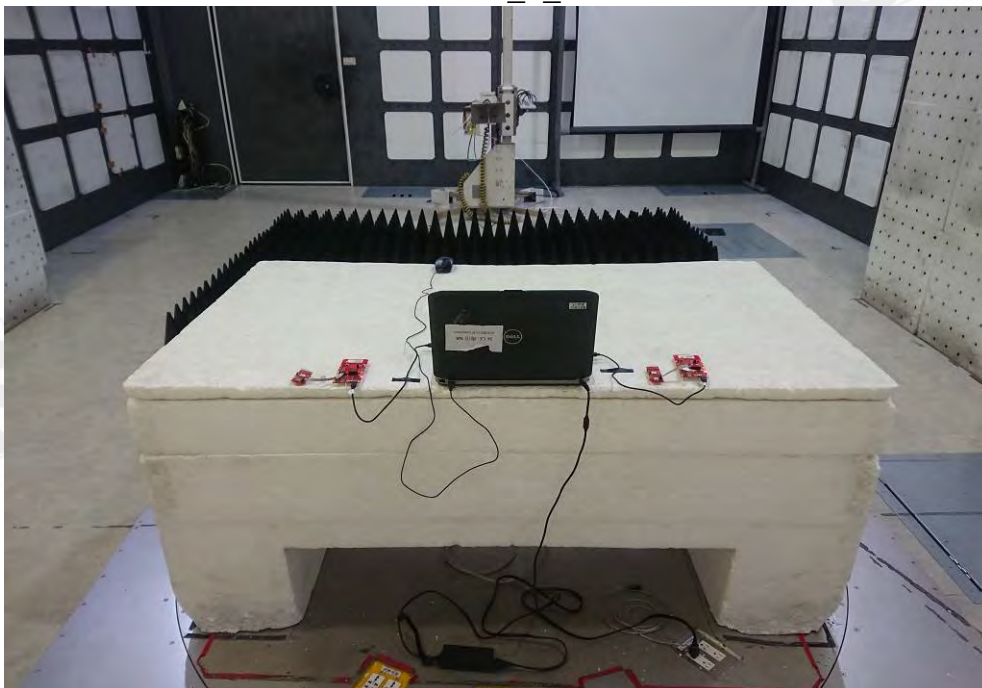
Radiated Emission Test Setup Photos - Above 1GHz

Model No.: CC2650MODA

Mode_2_+



Mode_2_-



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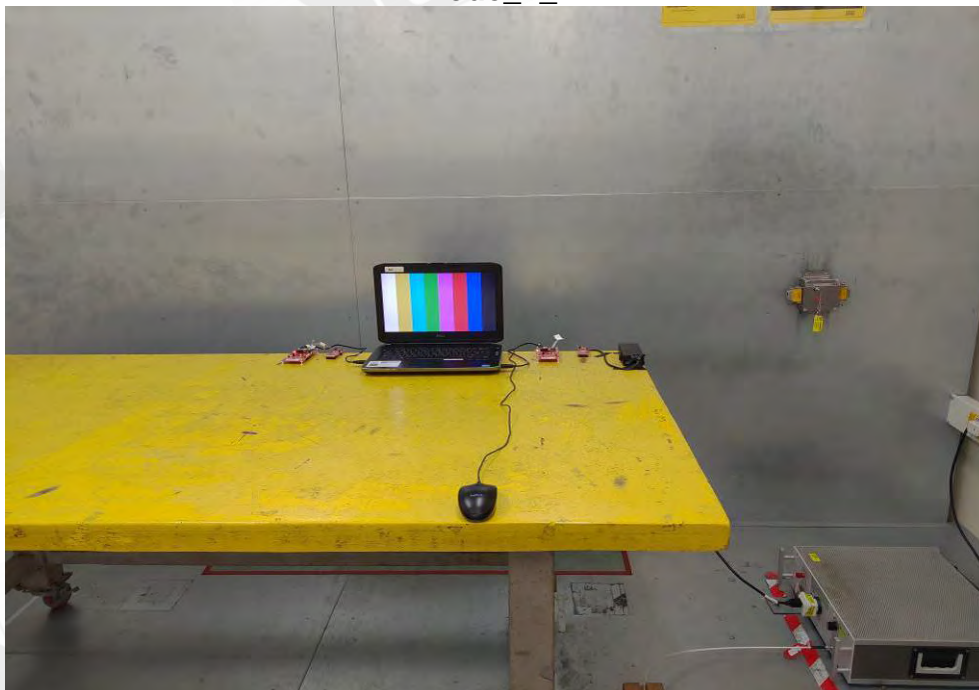
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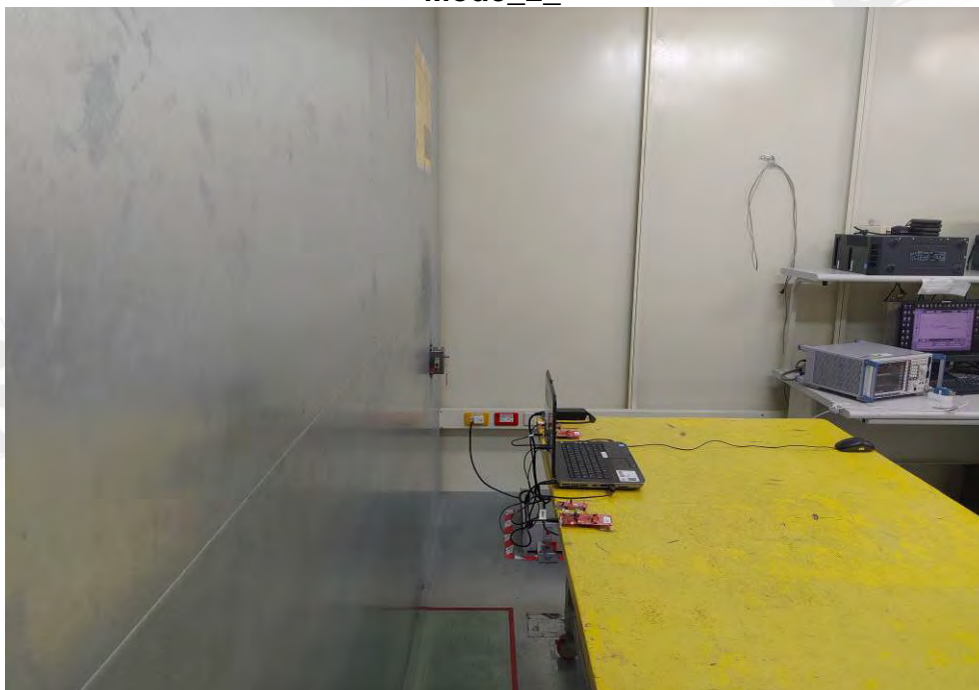
Conducted Emission Test Setup Photos

Model No.: CC2650MODA

Mode_2_+



Mode_2_-



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Radio Frequency Electromagnetic Field Test Setup Photos (EN 61000-4-3)

Model No.: CC2650MODA

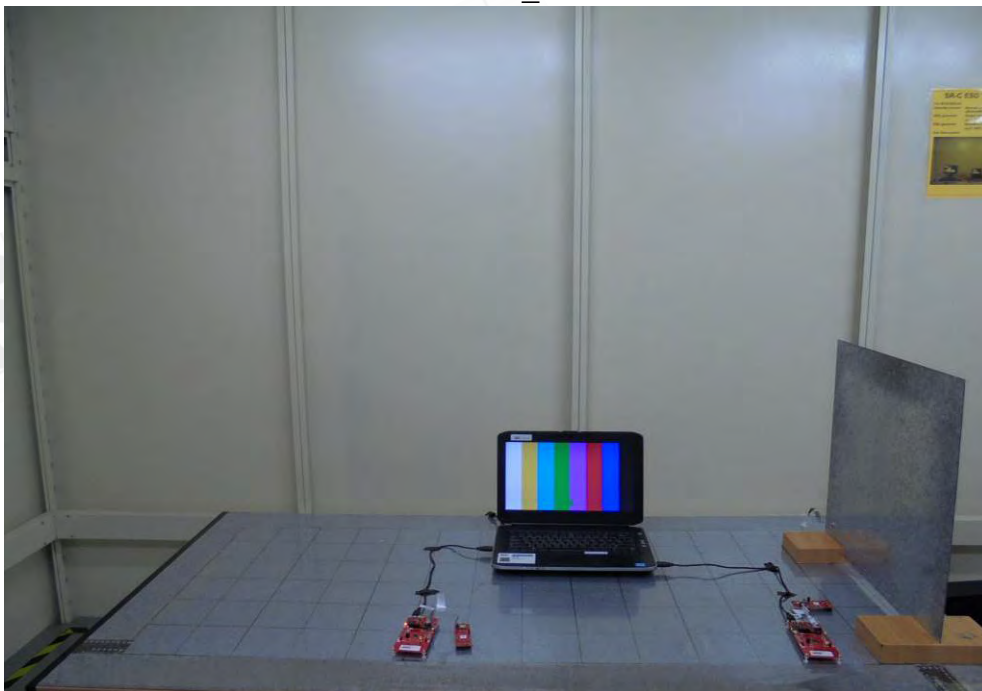
Mode_2



Electrostatic Discharge Measurement Test Setup Photos (EN 61000-4-2)

Model No.: CC2650MODA

Mode_2



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APPENDIX 2

PHOTOGRAPHS OF THE EUT

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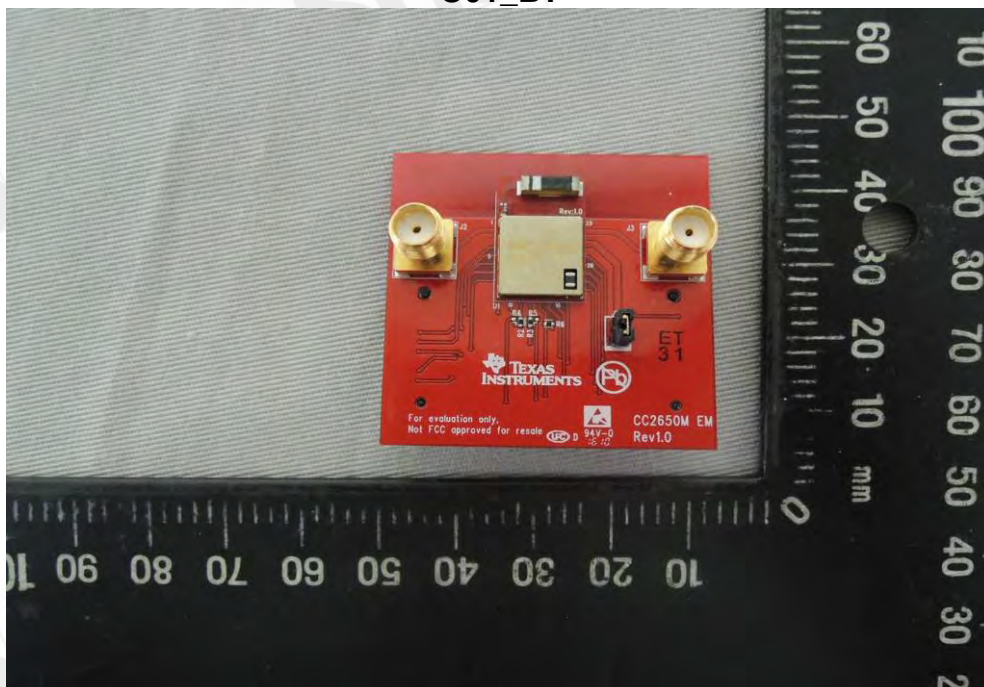
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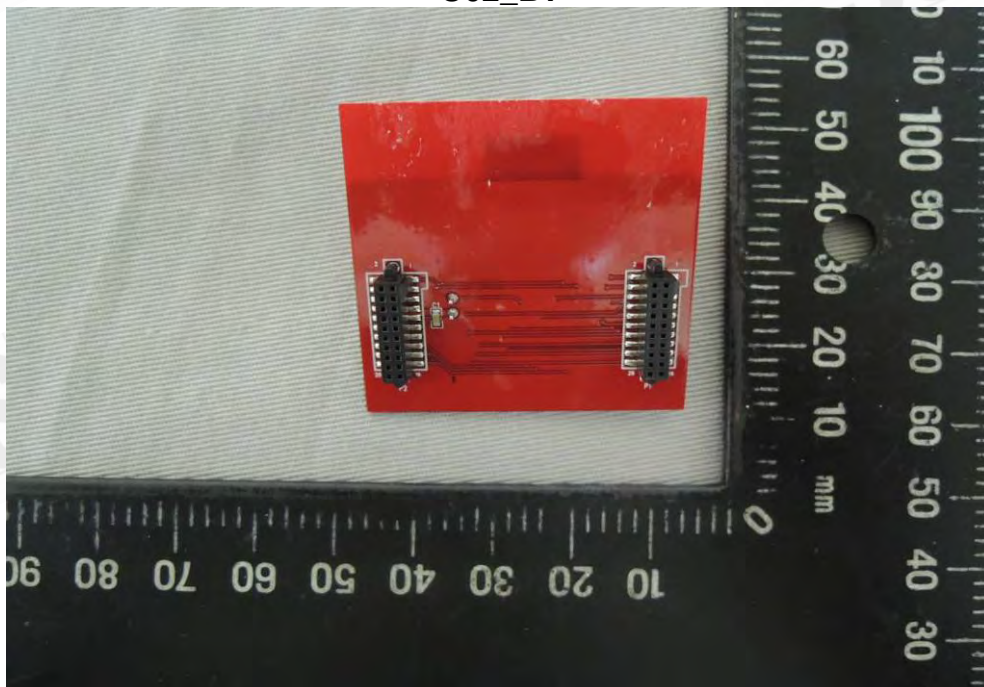
Exterior of the EUT

Model No.: CC2650MODA

O01_BT



O02_BT



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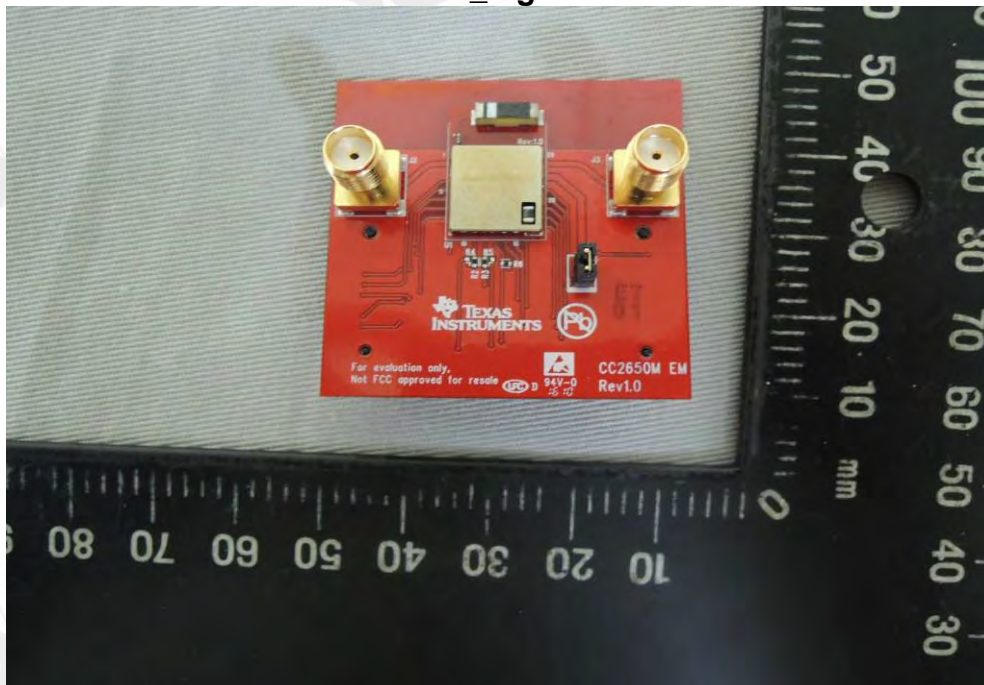
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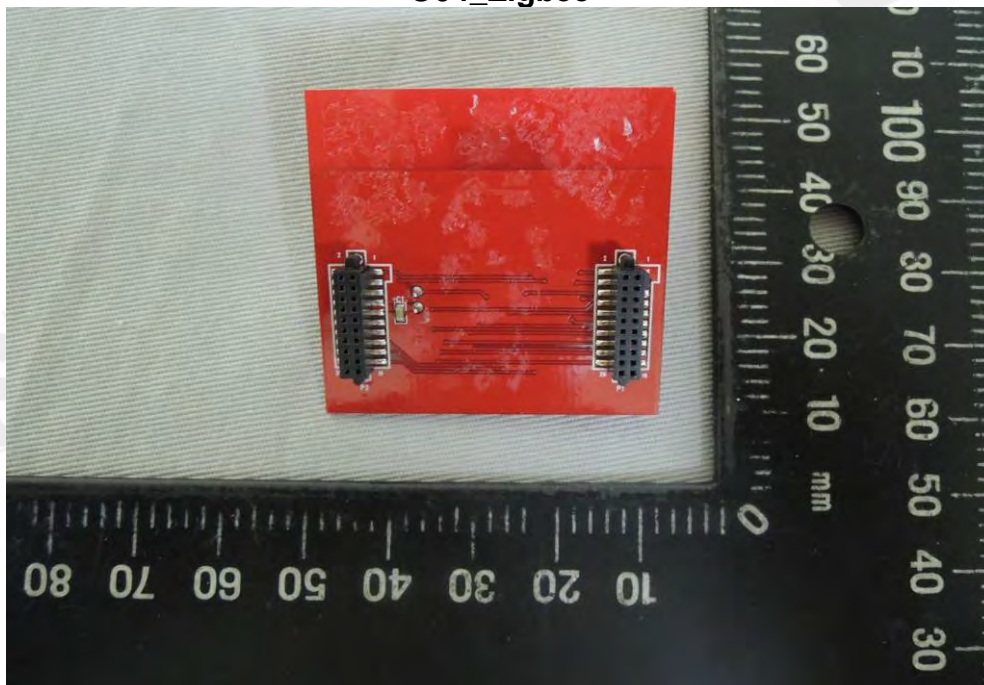
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O03_Zigbee



O04_Zigbee



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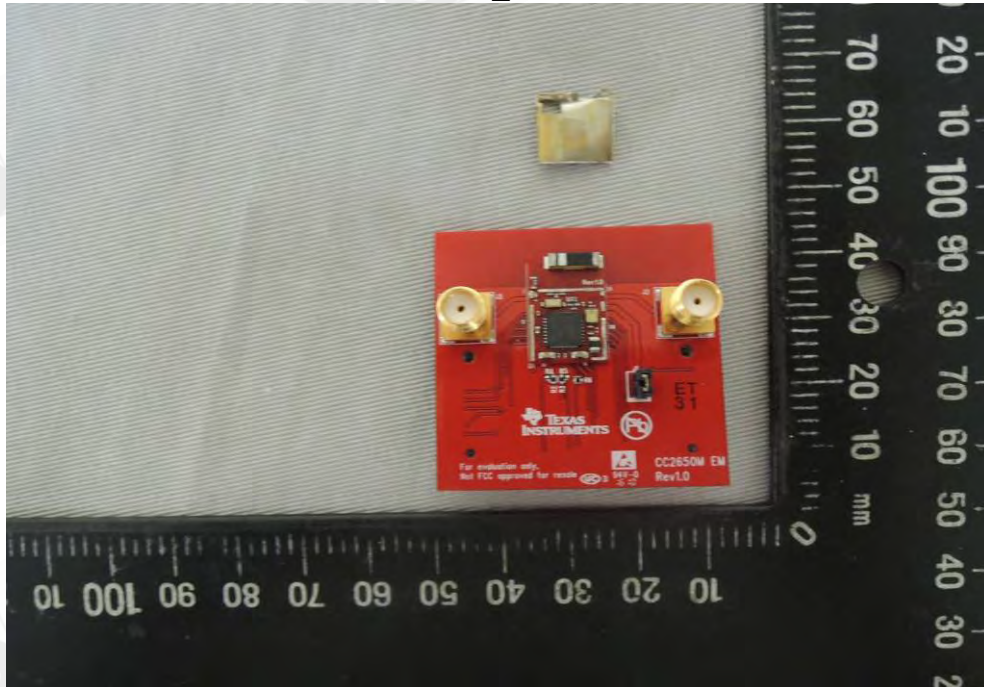
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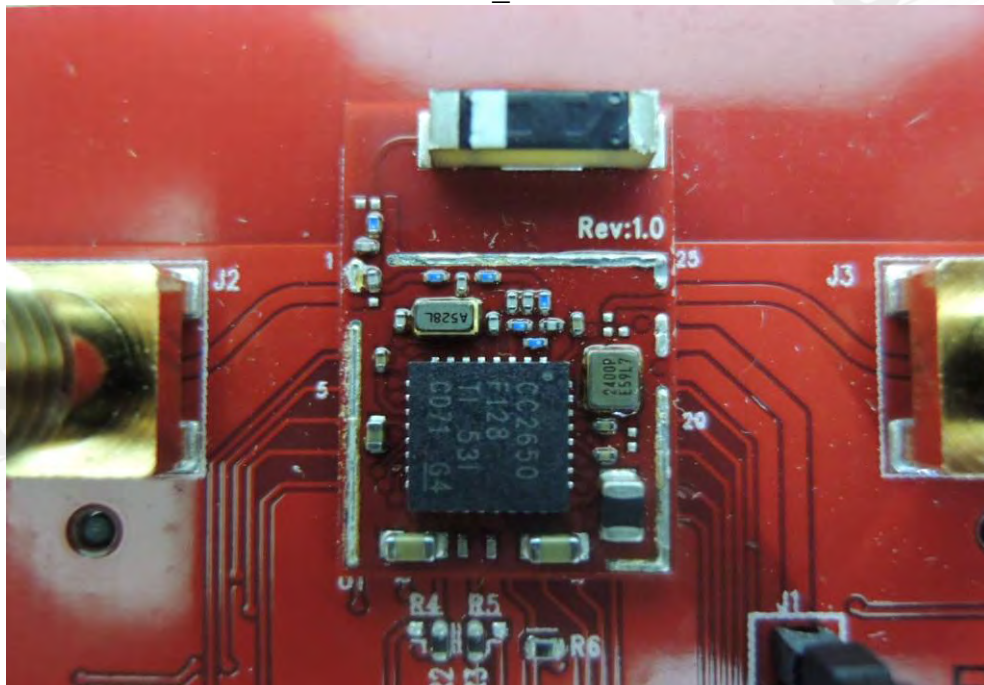
Interior of the EUT

Model No.: CC2650MODA

I01_BT



I02_BT



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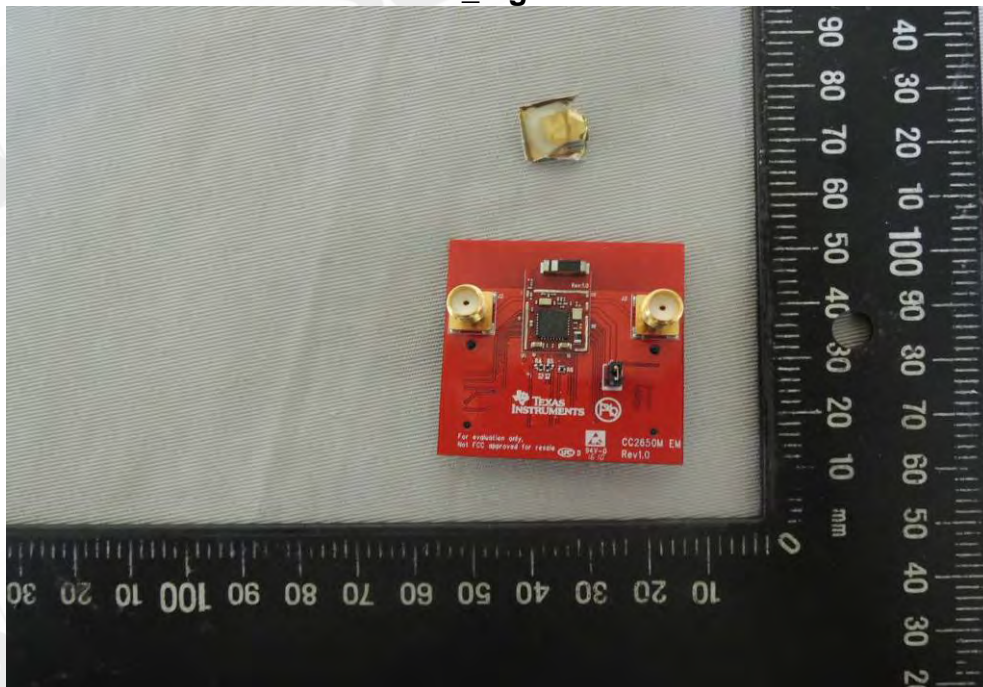
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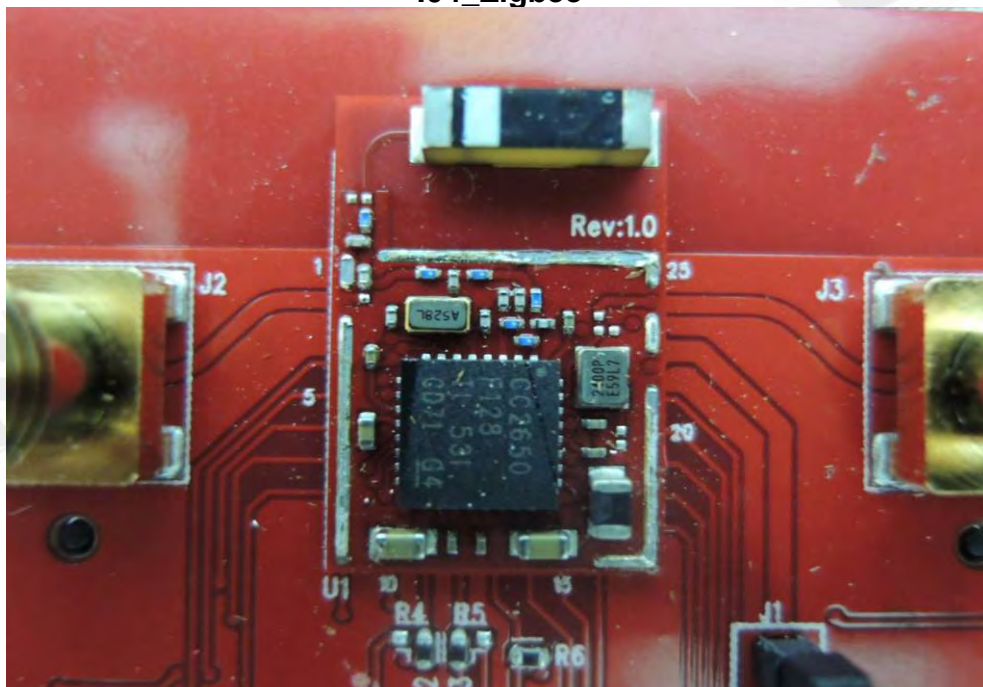
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I03_Zigbee



I04_Zigbee



**** End of Report ****

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