

# FCC Test Report

|              |                 |
|--------------|-----------------|
| Product Name | BMW Door Handle |
| Model No.    | INT TAGE NFC    |
| FCC ID       | YGOINTTAGE      |

|           |                                            |
|-----------|--------------------------------------------|
| Applicant | Huf Hülsbeck & Fürst GmbH & Co. KG         |
| Address   | Steeger Strasse 17, 42551 Velbert, Germany |

|                 |                      |
|-----------------|----------------------|
| Date of Receipt | Sep. 10, 2020        |
| Issued Date     | Dec. 07, 2020        |
| Report No.      | 2090350R-E3032110103 |
| Report Version  | V1.0                 |



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

This report must not be used to claim product endorsement by TAF or any agency of the government.

The test report shall not be reproduced without the written approval of DEKRA Testing and Certification Co., Ltd.

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

# Test Report

Issued Date: Dec. 07, 2020

Report No.: 2090350R-E3032110103



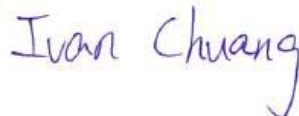
|                     |                                                                           |
|---------------------|---------------------------------------------------------------------------|
| Product Name        | BMW Door Handle                                                           |
| Applicant           | Huf Hülsbeck & Fürst GmbH & Co. KG                                        |
| Address             | Steege Strasse 17, 42551 Velbert, Germany                                 |
| Manufacturer        | Huf Hülsbeck & Fürst GmbH & Co. KG                                        |
| Model No.           | INT TAGE NFC                                                              |
| FCC ID.             | YGOINTTAGE                                                                |
| EUT Rated Voltage   | DC 12V (Power by Battery)                                                 |
| EUT Test Voltage    | DC 12V (Power by Battery)                                                 |
| Trade Name          | HUF                                                                       |
| Applicable Standard | FCC CFR Title 47 Part 15 Subpart C<br>ANSI C63.4: 2014, ANSI C63.10: 2013 |
| Test Result         | Complied                                                                  |

Documented By :



( Adm. Specialist / Ida Tung )

Tested By :



( Senior Engineer / Ivan Chuang )

Approved By :



( Director / Vincent Lin )

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## **Revision History**

| Report No.           | Version | Description              | Issued Date   |
|----------------------|---------|--------------------------|---------------|
| 2090350R-E3032110103 | V1.0    | Initial issue of report. | Dec. 07, 2020 |

## 1. GENERAL INFORMATION

### 1.1. EUT Description

|                 |                 |
|-----------------|-----------------|
| Product Name    | BMW Door Handle |
| Trade Name      | HUF             |
| Model No.       | INT TAGE NFC    |
| FCC ID          | YGOINTTAGE      |
| Frequency Range | 13.56MHz        |
| Modulation      | ASK             |
| Antenna Type    | Loop Antenna    |

Frequency of Each Channel:

| Channel    | Frequency |
|------------|-----------|
| Channel 1: | 13.56 MHz |

Note:

1. This device is a BMW Door Handle with a built-in 13.56MHz transceiver.
2. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.225.
3. This device has two interfaces (PCB version G26 has UART interface and PCB version U06 doesn't have UART interface). G26 is worst.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

|           |                  |
|-----------|------------------|
| Test Mode | Mode 1: Transmit |
|-----------|------------------|

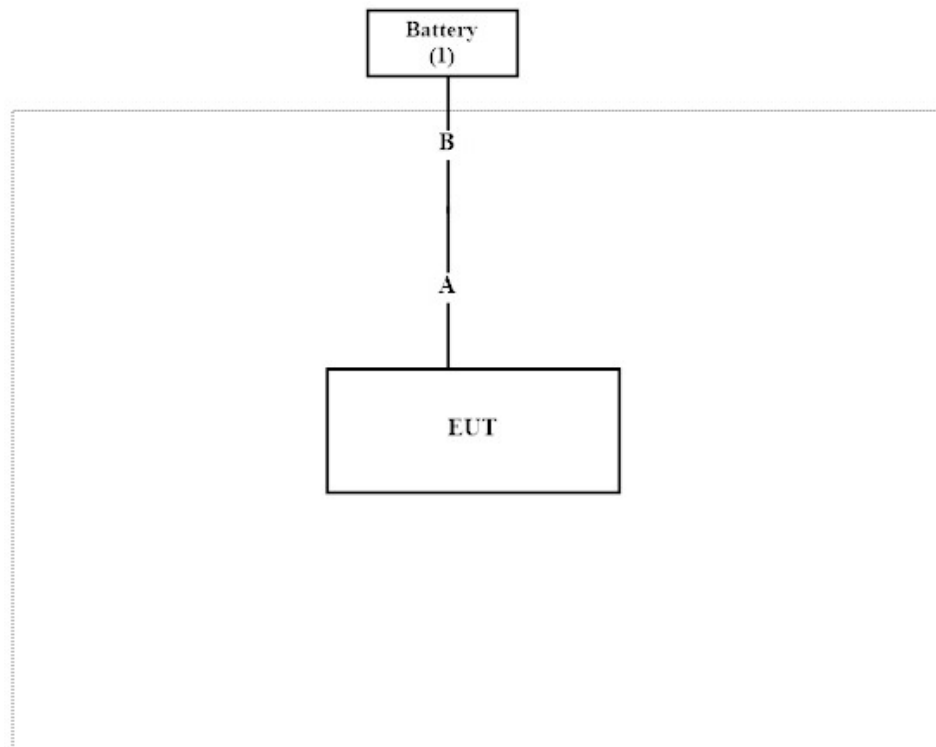
## 1.2. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

| Product   | Manufacturer | Model No.     | Serial No. | Power Cord |
|-----------|--------------|---------------|------------|------------|
| 1 Battery | YUASA        | 55B24L-CMF II | N/A        | N/A        |

| Signal Cable Type | Signal cable Description |
|-------------------|--------------------------|
| A Power Cable     | Non-shielded, 0.25m      |
| B Power Cable     | Non-shielded, 1.8m       |

## 1.3. Configuration of tested System



## 1.4. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.3
- (2) Turn on the power of all equipment.
- (3) Using tag to trigger NFC continuous transmission.
- (4) Verify that the EUT works properly.

## 1.5. Test Facility

Ambient conditions in the laboratory:

| Performed Item    | Items            | Required | Actual  |
|-------------------|------------------|----------|---------|
| Radiated Emission | Temperature (°C) | 10~40 °C | 21.0 °C |
|                   | Humidity (%RH)   | 10~90 %  | 62.7 %  |
| Conductive        | Temperature (°C) | 10~40 °C | 21.8 °C |
|                   | Humidity (%RH)   | 10~90 %  | 62.0 %  |

**USA : FCC Registration Number: TW0023**

**Canada : IC Registration Number: 25880**

Site Description : Accredited by TAF  
Accredited Number: 3023

Test Laboratory : DEKRA Testing and Certification Co., Ltd  
Address : No.159, Sec. 2, Wenhua 1st Rd., Linkou Dist.,  
New Taipei City 24457, Taiwan, R.O.C.  
Phone number : 886-2-2602-7968  
Fax number : 866-2-2602-3286  
Email address : [info.tw@dekra.com](mailto:info.tw@dekra.com)  
Website : <http://www.dekra.com.tw>

## 1.6. List of Test Equipment

### For Conduction measurements /ASR1

|  | Equipment          | Manufacturer | Model No. | Serial No. | Cali. Data | Due. Data  |
|--|--------------------|--------------|-----------|------------|------------|------------|
|  | EMI Test Receiver  | R&S          | ESR7      | 101601     | 2020.05.28 | 2021.05.27 |
|  | Two-Line V-Network | R&S          | ENV216    | 101306     | 2020.03.25 | 2021.03.24 |
|  | Two-Line V-Network | R&S          | ENV216    | 101307     | 2020.04.17 | 2021.04.16 |
|  | Coaxial Cable      | Quietek      | RG400_BNC | RF001      | 2020.05.24 | 2021.05.23 |

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version : DEKRA Testing System V2.0

### For Conducted measurements /ASR3

|   | Equipment           | Manufacturer | Model No.   | Serial No. | Cali. Data | Due. Data  |
|---|---------------------|--------------|-------------|------------|------------|------------|
| X | Temperature Chamber | KSON         | THS-D4T-100 | A0606      | 2020.04.22 | 2021.04.21 |
| X | Spectrum Analyzer   | R&S          | FSV40       | 101149     | 2019.12.16 | 2020.12.15 |

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version : DEKRA Conduction Test System V9.0.5

### For Radiated measurements /ACB1

|   | Equipment         | Manufacturer  | Model No.    | Serial No. | Cali. Data | Due. Data  |
|---|-------------------|---------------|--------------|------------|------------|------------|
| X | Loop Antenna      | AMETEK        | HLA6121      | 49611      | 2020.03.16 | 2021.03.15 |
| X | Bi-Log Antenna    | SCHWARZBECK   | VULB9168     | 9168-953   | 2020.01.03 | 2021.01.02 |
|   | Horn Antenna      | ETS-Lindgren  | 3117         | 00203800   | 2019.12.12 | 2020.12.11 |
|   | Horn Antenna      | Com-Power     | AH-840       | 101087     | 2020.06.08 | 2021.06.07 |
| X | Pre-Amplifier     | EMCI          | EMC001330    | 980316     | 2020.06.23 | 2021.06.22 |
|   | Pre-Amplifier     | EMCI          | EMC051835SE  | 980311     | 2020.06.23 | 2021.06.22 |
|   | Pre-Amplifier     | EMCI          | EMC05820SE   | 980310     | 2020.06.24 | 2021.06.23 |
|   | Pre-Amplifier     | EMCI          | EMC184045SE  | 980314     | 2020.06.10 | 2021.06.09 |
|   | Filter            | MICRO TRONICS | BRM50702     | G251       | 2020.09.17 | 2021.09.16 |
|   | Filter            | MICRO TRONICS | BRM50716     | G188       | 2020.09.17 | 2021.09.16 |
| X | EMI Test Receiver | R&S           | ESR7         | 101602     | 2019.12.16 | 2020.12.15 |
| X | Spectrum Analyzer | R&S           | FSV40        | 101148     | 2020.03.16 | 2021.03.15 |
| X | Coaxial Cable     | SUHNER        | SUCOFLEX 106 | RF002      | 2020.07.03 | 2021.07.02 |
|   | Mircoflex Cable   | HUBER SUHNER  | SUCOFLEX 102 | MY3381/2   | 2020.06.10 | 2021.06.09 |

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version : DEKRA Testing System V2.0



## 1.7. Uncertainty

Uncertainties have been calculated according to the DEKRA internal document, and is described in each test chapter of this report.

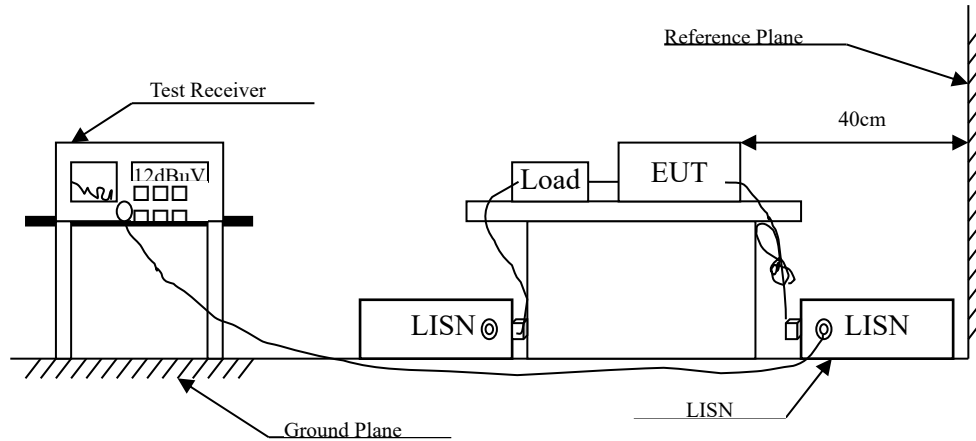
The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95%.

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

| Test item           | Uncertainty                 |                             |
|---------------------|-----------------------------|-----------------------------|
| Conducted Emission  | $\pm 3.42$ dB               |                             |
| Radiated Emission   | Under 1GHz<br>$\pm 4.06$ dB | Above 1GHz<br>$\pm 3.73$ dB |
| Band Edge           | Under 1GHz<br>$\pm 4.06$ dB | Above 1GHz<br>$\pm 3.73$ dB |
| Frequency Tolerance | $\pm 682.83$ Hz             |                             |

## 2. Conducted Emission

### 2.1. Test Setup



### 2.2. Limits

| FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit |                      |                      |
|-----------------------------------------------------|----------------------|----------------------|
| Frequency<br>MHz                                    | Limits               |                      |
|                                                     | QP                   | AV                   |
| 0.15 - 0.50                                         | 66-56 <sup>(註)</sup> | 56-46 <sup>(註)</sup> |
| 0.50-5.0                                            | 56                   | 46                   |
| 5.0 - 30                                            | 60                   | 50                   |

### 2.3. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

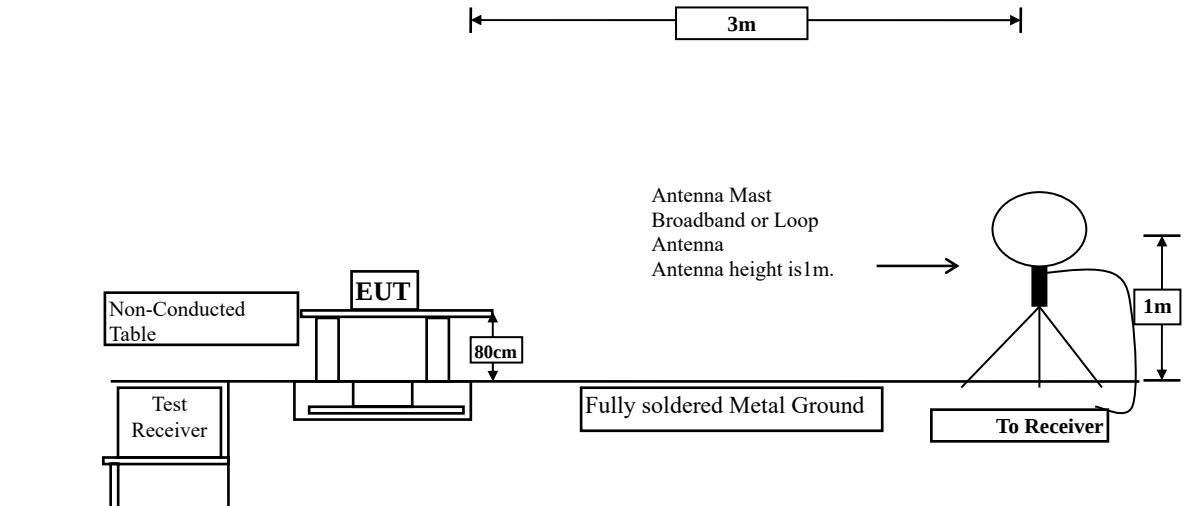
## **2.4. Test Result of Conducted Emission**

Owing to the battery operation of EUT, this test item is not performed.

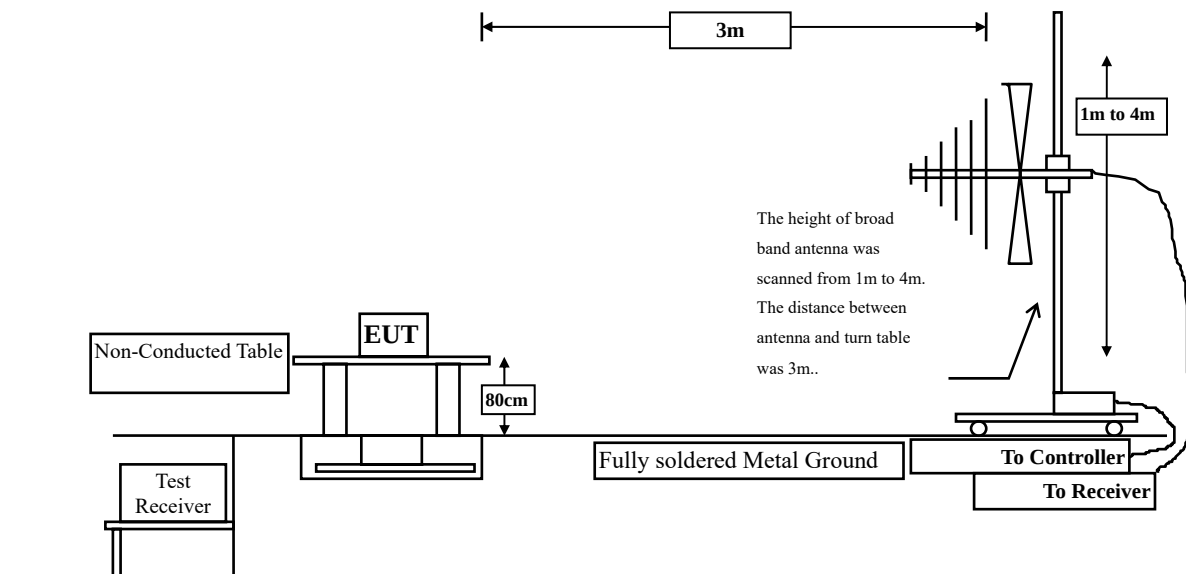
### 3. Radiated Emission

#### 3.1. Test Setup

Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



### 3.2. Limits

#### ➤ Fundamental electric field strength Limit

| FCC Part 15 Subpart C Paragraph 15.225 Limits |                               |                     |        |                     |
|-----------------------------------------------|-------------------------------|---------------------|--------|---------------------|
| Fundamental Frequency<br>MHz                  | Field strength of fundamental |                     |        |                     |
|                                               | uV/m                          | Distance<br>(meter) | dBuV/m | Distance<br>(meter) |
| 13.553 – 13.567                               | 15848                         | 30                  | 124    | 3                   |
| 13.410 – 13.553 and 13.567 – 13.710           | 334                           | 30                  | 90.47  | 3                   |
| 13.110 – 13.410 and 13.710 – 14.010           | 106                           | 30                  | 80.50  | 3                   |
| Outside of the 13.110 – 14.010                | See 15.209 Limits             |                     |        |                     |

Remarks :

1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
3. The emission limit in this paragraph is based on measurement instrumentation employing an quasi-peak detector.

#### ➤ Spurious electric field strength Limit

| FCC Part 15 Subpart C Paragraph 15.209 Limits |                                      |                                 |
|-----------------------------------------------|--------------------------------------|---------------------------------|
| Frequency<br>MHz                              | Field strength<br>(microvolts/meter) | Measurement distance<br>(meter) |
| 0.009-0.490                                   | 2400/F(kHz)                          | 300                             |
| 0.490-1.705                                   | 24000/F(kHz)                         | 30                              |
| 1.705-30                                      | 30                                   | 30                              |
| 30-88                                         | 100                                  | 3                               |
| 88-216                                        | 150                                  | 3                               |
| 216-960                                       | 200                                  | 3                               |
| Above 960                                     | 500                                  | 3                               |

Remarks :

1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

### 3.3. Test Procedure

Fundamental electric field strength:

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum electric field strength.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna which is 1 meter above ground. All X-axis, Y-axis and Z-axis polarization of the antenna are set on measurement.

Spurious electric field strength:

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

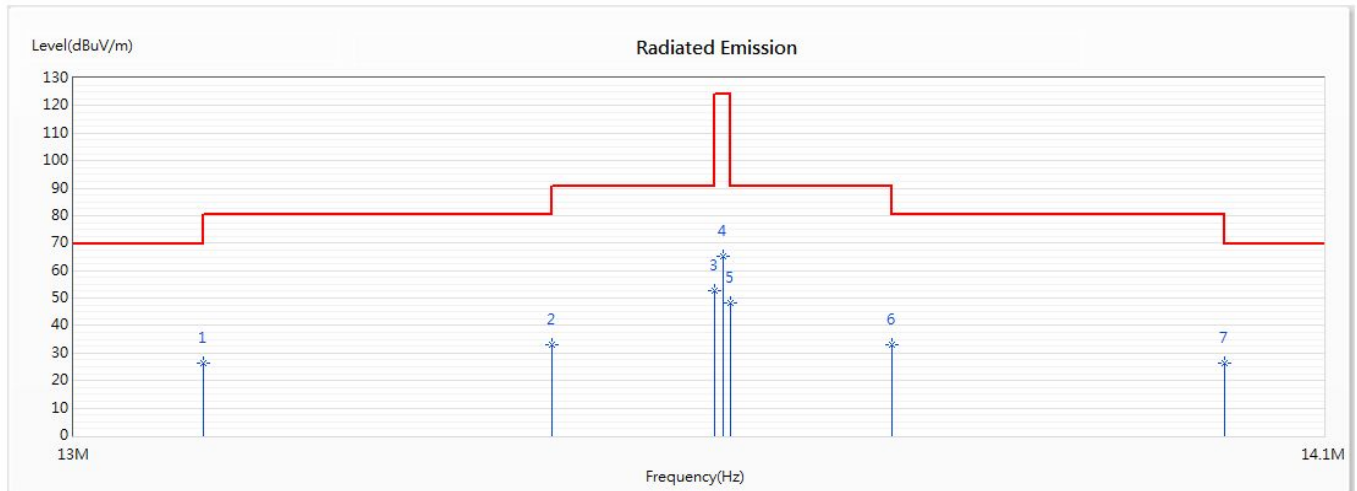
The bandwidth below 30MHz setting on the field strength meter is 9kHz and above 30MHz is 120kHz. The frequency range from 9kHz to 10th harmonics is checked.

### 3.4. Test Result of Radiated Emission

Product : BMW Door Handle  
 Test Item : Fundamental Radiated Emission  
 Test Mode : Mode 1: Transmit  
 Test date : 2020/10/06

#### G26

#### Horizontal\_X-axis



| No  | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Reading Level (dBuV) | Correct Factor (dB/m) | Detector Type |
|-----|-----------------|-------------------------|----------------|-------------|----------------------|-----------------------|---------------|
| 1   | 13.11           | 26.36                   | 69.50          | -43.14      | 4.10                 | 22.26                 | QP            |
| 2   | 13.41           | 33.17                   | 80.50          | -47.33      | 10.90                | 22.27                 | QP            |
| * 3 | 13.553          | 52.78                   | 90.47          | -37.69      | 30.50                | 22.28                 | QP            |
| 4   | 13.56           | 65.18                   | 124.00         | -58.82      | 42.90                | 22.28                 | QP            |
| 5   | 13.567          | 48.28                   | 90.47          | -42.19      | 26.00                | 22.28                 | QP            |
| 6   | 13.71           | 33.19                   | 80.50          | -47.31      | 10.90                | 22.29                 | QP            |
| 7   | 14.01           | 26.30                   | 69.50          | -43.20      | 4.00                 | 22.30                 | QP            |

Note:

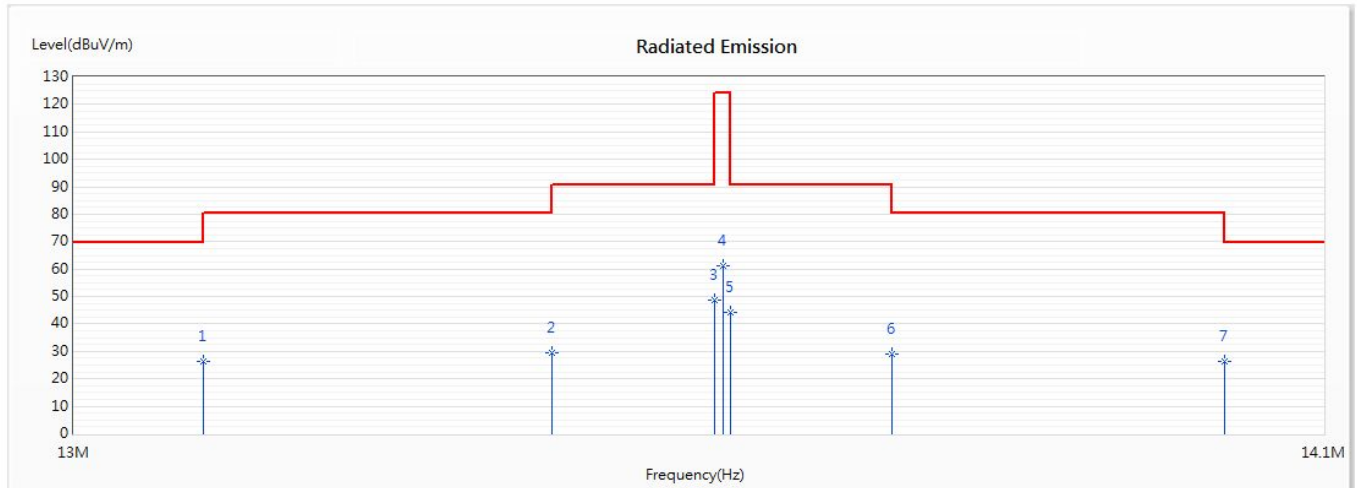
1. Fundamental Limit =  $84 \text{ dBuV/m} + 40 \cdot \log(30 \text{ m} / 3 \text{ m}) = 124 \text{ dBuV/m}$
2. All Readings below 1GHz are Quasi-Peak, above are average value.
3. "\*" means the worst emission level.
4. Measurement Level = Reading Level + Correct Factor.



Product : BMW Door Handle  
 Test Item : Fundamental Radiated Emission  
 Test Mode : Mode 1: Transmit  
 Test date : 2020/10/06

## G26

### Vertical\_X-axis



| No  | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Reading Level (dBuV) | Correct Factor (dB/m) | Detector Type |
|-----|-----------------|-------------------------|----------------|-------------|----------------------|-----------------------|---------------|
| 1   | 13.11           | 26.16                   | 69.50          | -43.34      | 3.90                 | 22.26                 | QP            |
| 2   | 13.41           | 29.37                   | 80.50          | -51.13      | 7.10                 | 22.27                 | QP            |
| * 3 | 13.553          | 48.78                   | 90.47          | -41.69      | 26.50                | 22.28                 | QP            |
| 4   | 13.56           | 61.18                   | 124.00         | -62.82      | 38.90                | 22.28                 | QP            |
| 5   | 13.567          | 44.28                   | 90.47          | -46.19      | 22.00                | 22.28                 | QP            |
| 6   | 13.71           | 28.89                   | 80.50          | -51.61      | 6.60                 | 22.29                 | QP            |
| 7   | 14.01           | 26.20                   | 69.50          | -43.30      | 3.90                 | 22.30                 | QP            |

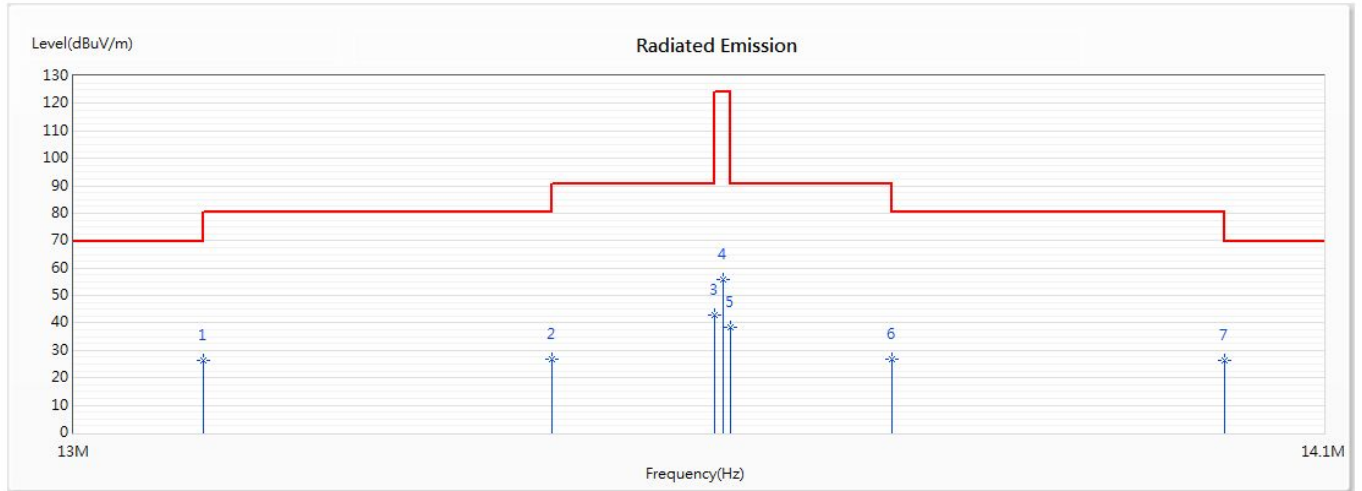
#### Note:

1. Fundamental Limit =  $84 \text{ dBuV/m} + 40 \cdot \log(30 \text{ m} / 3 \text{ m}) = 124 \text{ dBuV/m}$
2. All Readings below 1GHz are Quasi-Peak, above are average value.
3. "\*" means the worst emission level.
4. Measurement Level = Reading Level + Correct Factor.

Product : BMW Door Handle  
 Test Item : Fundamental Radiated Emission  
 Test Mode : Mode 1: Transmit  
 Test date : 2020/10/06

## G26

### Horizontal\_Y-axis

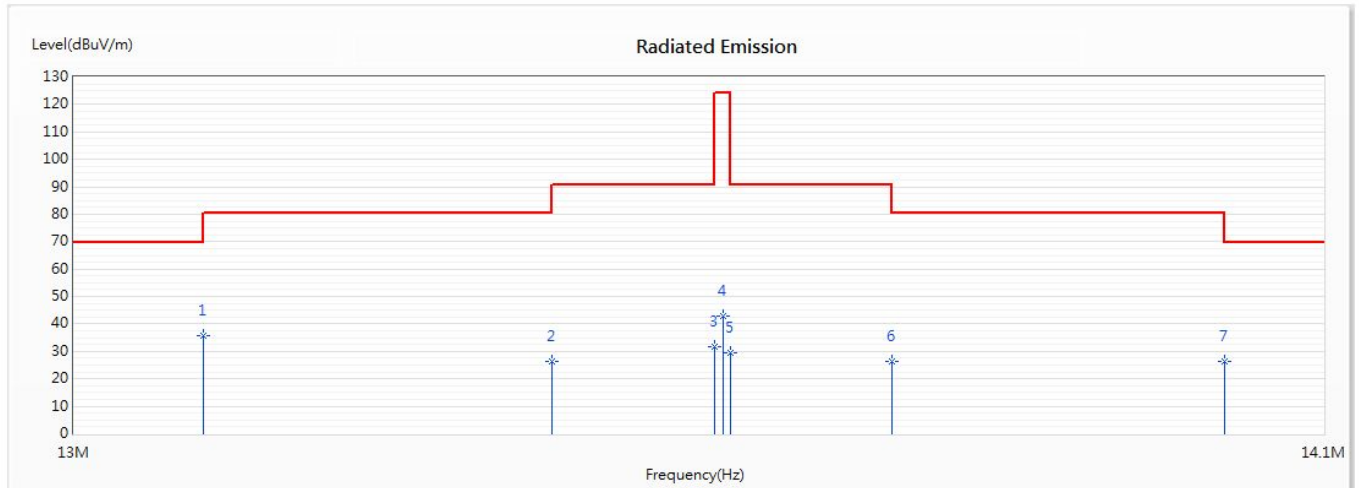


| No  | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Reading Level (dBuV) | Correct Factor (dB/m) | Detector Type |
|-----|-----------------|-------------------------|----------------|-------------|----------------------|-----------------------|---------------|
| 1   | 13.11           | 26.26                   | 69.50          | -43.24      | 4.00                 | 22.26                 | QP            |
| 2   | 13.41           | 26.67                   | 80.50          | -53.83      | 4.40                 | 22.27                 | QP            |
| 3   | 13.553          | 42.68                   | 90.47          | -47.79      | 20.40                | 22.28                 | QP            |
| 4   | 13.56           | 55.78                   | 124.00         | -68.22      | 33.50                | 22.28                 | QP            |
| 5   | 13.567          | 38.38                   | 90.47          | -52.09      | 16.10                | 22.28                 | QP            |
| 6   | 13.71           | 26.59                   | 80.50          | -53.91      | 4.30                 | 22.29                 | QP            |
| * 7 | 14.01           | 26.50                   | 69.50          | -43.00      | 4.20                 | 22.30                 | QP            |

Note:

1. Fundamental Limit =  $84 \text{ dBuV/m} + 40 \cdot \log(30 \text{ m} / 3 \text{ m}) = 124 \text{ dBuV/m}$
2. All Readings below 1GHz are Quasi-Peak, above are average value.
3. "\*" means the worst emission level.
4. Measurement Level = Reading Level + Correct Factor.

Product : BMW Door Handle  
 Test Item : Fundamental Radiated Emission  
 Test Mode : Mode 1: Transmit  
 Test date : 2020/10/06

**G26****Vertical\_Y-axis**

| No  | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Reading Level (dBuV) | Correct Factor (dB/m) | Detector Type |
|-----|-----------------|-------------------------|----------------|-------------|----------------------|-----------------------|---------------|
| * 1 | 13.11           | 35.86                   | 69.50          | -33.64      | 13.60                | 22.26                 | QP            |
| 2   | 13.41           | 26.17                   | 80.50          | -54.33      | 3.90                 | 22.27                 | QP            |
| 3   | 13.553          | 31.88                   | 90.47          | -58.59      | 9.60                 | 22.28                 | QP            |
| 4   | 13.56           | 42.68                   | 124.00         | -81.32      | 20.40                | 22.28                 | QP            |
| 5   | 13.567          | 29.38                   | 90.47          | -61.09      | 7.10                 | 22.28                 | QP            |
| 6   | 13.71           | 26.19                   | 80.50          | -54.31      | 3.90                 | 22.29                 | QP            |
| 7   | 14.01           | 26.20                   | 69.50          | -43.30      | 3.90                 | 22.30                 | QP            |

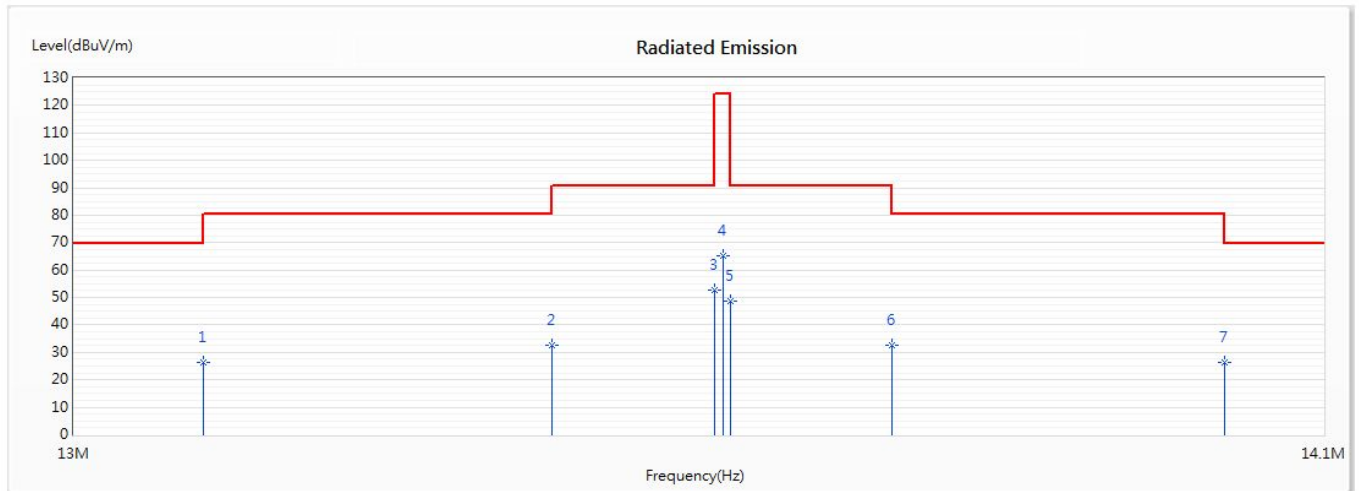
**Note:**

1. Fundamental Limit=84dBuV/m + 40\*Log (30(m)/3(m))=124dBuV/m
2. All Readings below 1GHz are Quasi-Peak, above are average value.
3. “\*” means the worst emission level.
4. Measurement Level = Reading Level + Correct Factor.

Product : BMW Door Handle  
 Test Item : Fundamental Radiated Emission  
 Test Mode : Mode 1: Transmit  
 Test date : 2020/10/06

## G26

### Horizontal\_Z-axis



| No  | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Reading Level (dBuV) | Correct Factor (dB/m) | Detector Type |
|-----|-----------------|-------------------------|----------------|-------------|----------------------|-----------------------|---------------|
| 1   | 13.11           | 26.26                   | 69.50          | -43.24      | 4.00                 | 22.26                 | QP            |
| 2   | 13.41           | 32.57                   | 80.50          | -47.93      | 10.30                | 22.27                 | QP            |
| * 3 | 13.553          | 52.78                   | 90.47          | -37.69      | 30.50                | 22.28                 | QP            |
| 4   | 13.56           | 65.28                   | 124.00         | -58.72      | 43.00                | 22.28                 | QP            |
| 5   | 13.567          | 48.58                   | 90.47          | -41.89      | 26.30                | 22.28                 | QP            |
| 6   | 13.71           | 32.59                   | 80.50          | -47.91      | 10.30                | 22.29                 | QP            |
| 7   | 14.01           | 26.40                   | 69.50          | -43.10      | 4.10                 | 22.30                 | QP            |

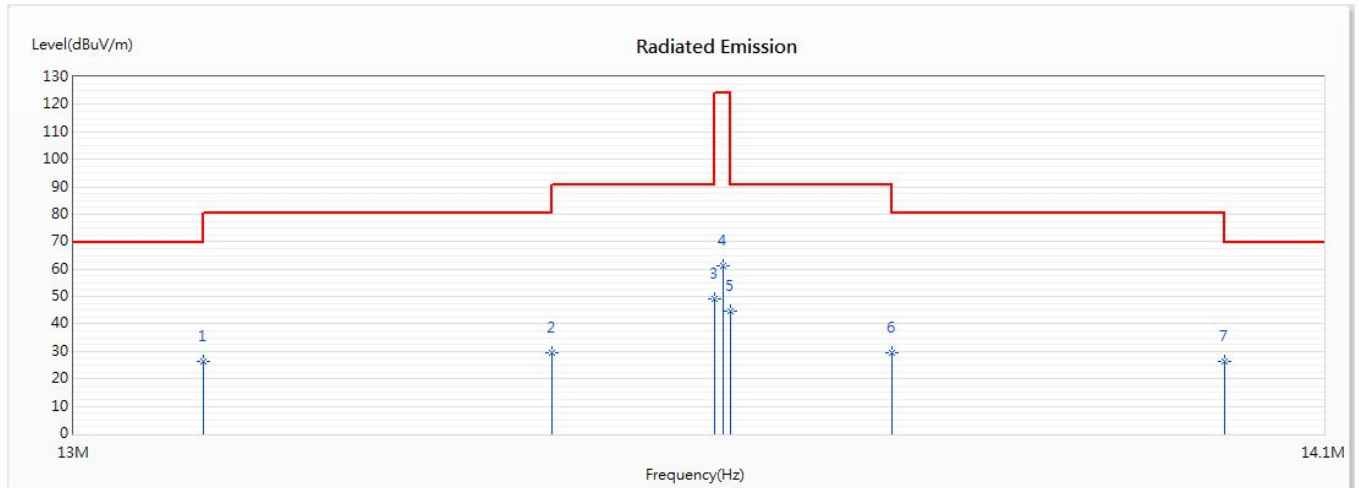
Note:

1. Fundamental Limit=84dBuV/m + 40\*Log (30(m)/3(m))=124dBuV/m
2. All Readings below 1GHz are Quasi-Peak, above are average value.
3. "\*" means the worst emission level.
4. Measurement Level = Reading Level + Correct Factor.

Product : BMW Door Handle  
 Test Item : Fundamental Radiated Emission  
 Test Mode : Mode 1: Transmit  
 Test date : 2020/10/06

## G26

### Vertical\_Z-axis



| No  | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Reading Level (dBuV) | Correct Factor (dB/m) | Detector Type |
|-----|-----------------|-------------------------|----------------|-------------|----------------------|-----------------------|---------------|
| 1   | 13.11           | 26.26                   | 69.50          | -43.24      | 4.00                 | 22.26                 | QP            |
| 2   | 13.41           | 29.37                   | 80.50          | -51.13      | 7.10                 | 22.27                 | QP            |
| * 3 | 13.553          | 48.98                   | 90.47          | -41.49      | 26.70                | 22.28                 | QP            |
| 4   | 13.56           | 61.28                   | 124.00         | -62.72      | 39.00                | 22.28                 | QP            |
| 5   | 13.567          | 44.58                   | 90.47          | -45.89      | 22.30                | 22.28                 | QP            |
| 6   | 13.71           | 29.69                   | 80.50          | -50.81      | 7.40                 | 22.29                 | QP            |
| 7   | 14.01           | 26.20                   | 69.50          | -43.30      | 3.90                 | 22.30                 | QP            |

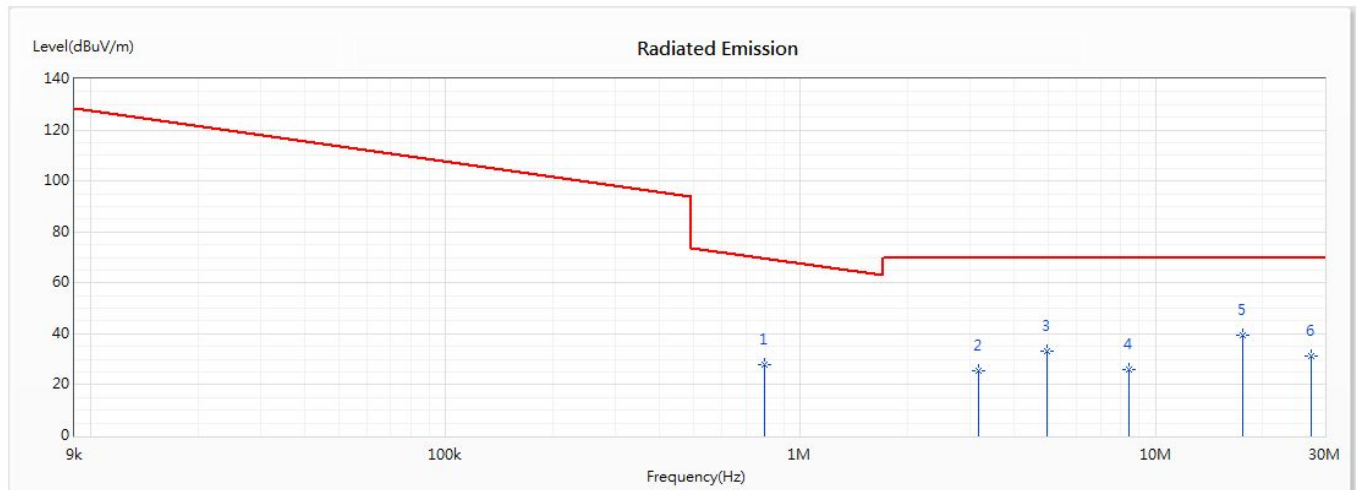
#### Note:

1. Fundamental Limit=84dBuV/m + 40\*Log (30(m)/3(m))=124dBuV/m
2. All Readings below 1GHz are Quasi-Peak, above are average value.
3. "\*" means the worst emission level.
4. Measurement Level = Reading Level + Correct Factor.

Product : BMW Door Handle  
 Test Item : General Radiated Emission Data (below 30MHz)  
 Test Mode : Mode 1: Transmit  
 Test date : 2020/10/06

## G26

### Horizontal



| No  | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Reading Level (dBuV) | Correct Factor (dB/m) | Detector Type |
|-----|-----------------|-------------------------|----------------|-------------|----------------------|-----------------------|---------------|
| 1   | 0.791           | 28.14                   | 69.65          | -41.50      | 7.70                 | 20.44                 | QP            |
| 2   | 3.182           | 25.28                   | 69.54          | -44.26      | 5.30                 | 19.98                 | QP            |
| 3   | 4.964           | 33.08                   | 69.54          | -36.46      | 12.30                | 20.78                 | QP            |
| 4   | 8.398           | 26.08                   | 69.54          | -43.46      | 4.40                 | 21.68                 | QP            |
| * 5 | 17.569          | 39.28                   | 69.54          | -30.26      | 16.80                | 22.48                 | QP            |
| 6   | 27.392          | 31.37                   | 69.54          | -38.17      | 8.40                 | 22.97                 | QP            |

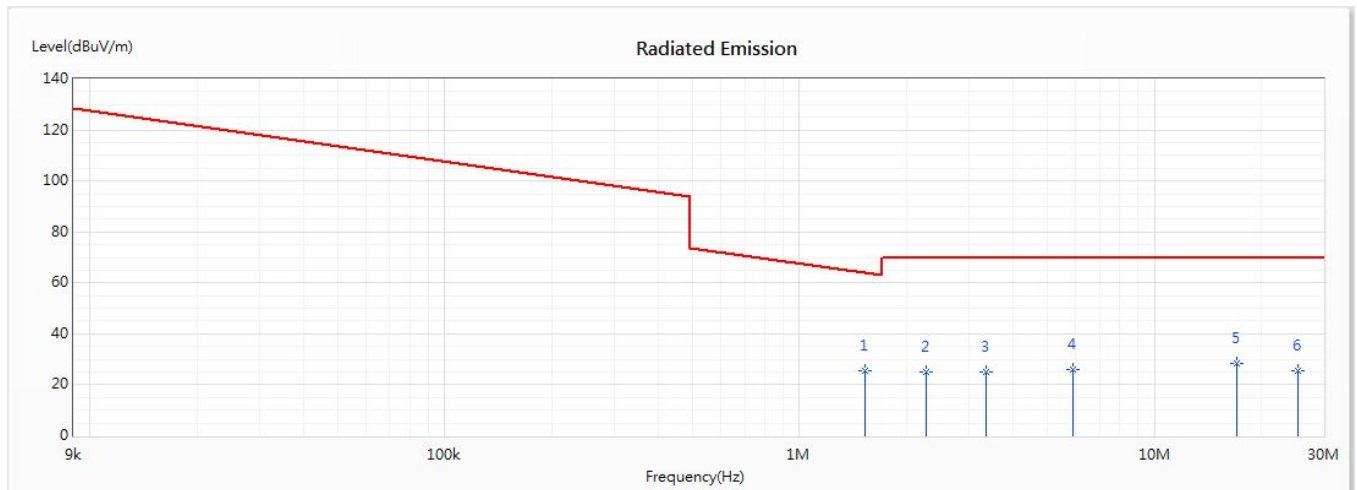
#### Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. "\*" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Product : BMW Door Handle  
 Test Item : General Radiated Emission Data (below 30MHz)  
 Test Mode : Mode 1: Transmit  
 Test date : 2020/10/06

## G26

### Vertical



| No  | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Reading Level (dBuV) | Correct Factor (dB/m) | Detector Type |
|-----|-----------------|-------------------------|----------------|-------------|----------------------|-----------------------|---------------|
| * 1 | 1.53            | 25.27                   | 63.93          | -38.66      | 5.00                 | 20.27                 | QP            |
| 2   | 2.269           | 25.08                   | 69.54          | -44.46      | 5.00                 | 20.08                 | QP            |
| 3   | 3.356           | 25.06                   | 69.54          | -44.48      | 5.00                 | 20.06                 | QP            |
| 4   | 5.877           | 25.93                   | 69.54          | -43.61      | 4.90                 | 21.03                 | QP            |
| 5   | 17.047          | 28.55                   | 69.54          | -40.99      | 6.10                 | 22.45                 | QP            |
| 6   | 25.436          | 25.67                   | 69.54          | -43.87      | 2.80                 | 22.87                 | QP            |

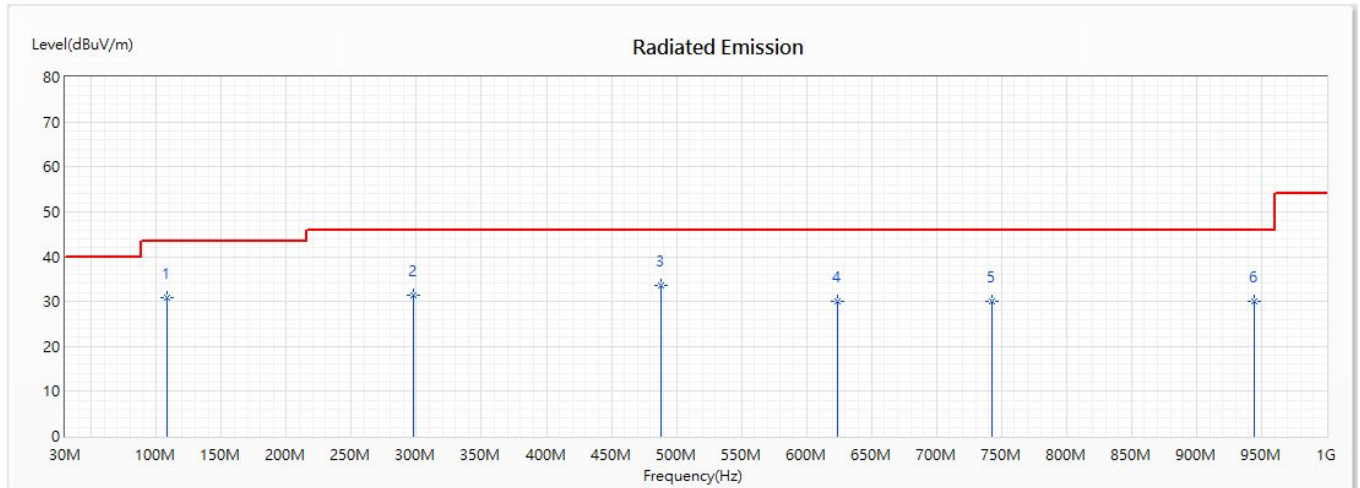
#### Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. "\*" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Product : BMW Door Handle  
 Test Item : General Radiated Emission Data (above 30MHz)  
 Test Mode : Mode 1: Transmit  
 Test date : 2020/09/17

## G26

### Horizontal



| No  | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Reading Level (dBuV) | Correct Factor (dB/m) | Detector Type |
|-----|-----------------|-------------------------|----------------|-------------|----------------------|-----------------------|---------------|
| 1   | 108.57          | 30.82                   | 43.50          | -12.68      | 40.76                | -9.94                 | QP            |
| 2   | 297.72          | 31.44                   | 46.00          | -14.56      | 39.29                | -7.85                 | QP            |
| * 3 | 487.84          | 33.53                   | 46.00          | -12.47      | 37.46                | -3.93                 | QP            |
| 4   | 623.64          | 29.96                   | 46.00          | -16.04      | 30.87                | -0.91                 | QP            |
| 5   | 742.95          | 30.15                   | 46.00          | -15.85      | 31.09                | -0.94                 | QP            |
| 6   | 944.71          | 30.15                   | 46.00          | -15.85      | 30.76                | -0.61                 | QP            |

#### Note:

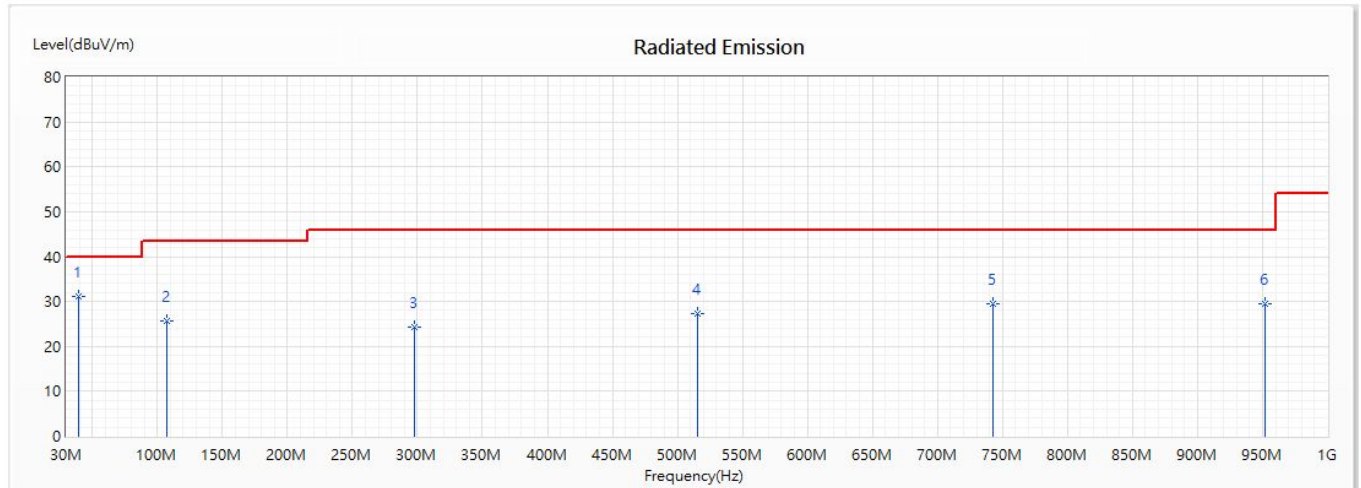
1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. "\*" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor



Product : BMW Door Handle  
 Test Item : General Radiated Emission Data (above 30MHz)  
 Test Mode : Mode 1: Transmit  
 Test date : 2020/09/17

## G26

### Vertical



| No  | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Reading Level (dBuV) | Correct Factor (dB/m) | Detector Type |
|-----|-----------------|-------------------------|----------------|-------------|----------------------|-----------------------|---------------|
| * 1 | 39.7            | 31.19                   | 40.00          | -8.81       | 43.19                | -12.00                | QP            |
| 2   | 107.6           | 25.72                   | 43.50          | -17.78      | 35.63                | -9.91                 | QP            |
| 3   | 297.72          | 24.21                   | 46.00          | -21.79      | 32.06                | -7.85                 | QP            |
| 4   | 515             | 27.29                   | 46.00          | -18.71      | 30.24                | -2.95                 | QP            |
| 5   | 742.95          | 29.51                   | 46.00          | -16.49      | 30.45                | -0.94                 | QP            |
| 6   | 951.5           | 29.62                   | 46.00          | -16.38      | 30.44                | -0.82                 | QP            |

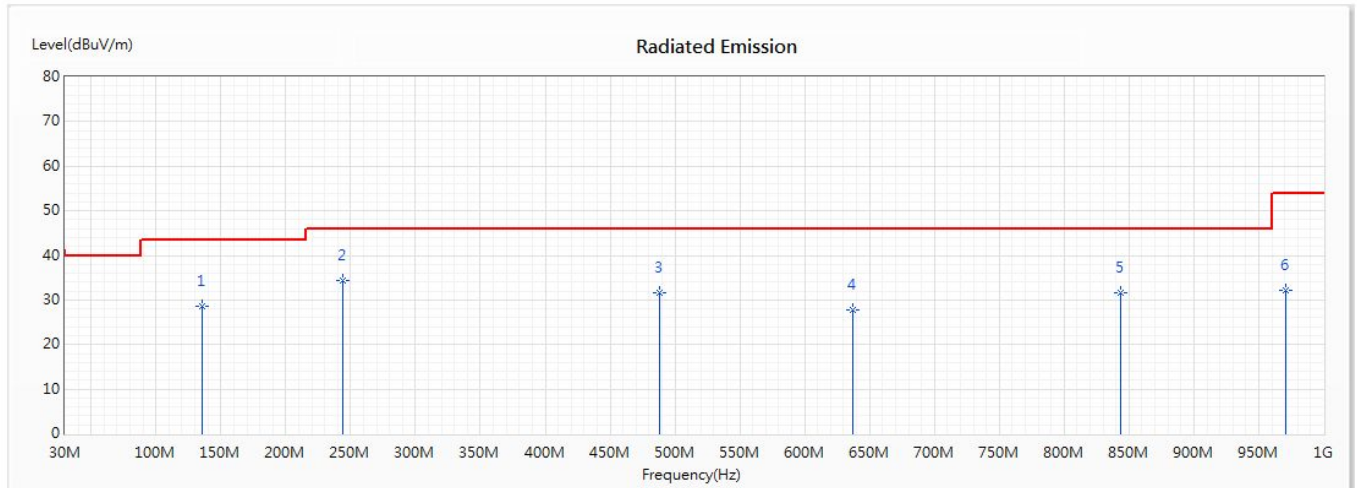
#### Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. "\*" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : BMW Door Handle  
 Test Item : General Radiated Emission Data (above 30MHz)  
 Test Mode : Mode 1: Transmit  
 Test date : 2020/10/06

## U06

### Horizontal



| No  | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Reading Level (dBuV) | Correct Factor (dB/m) | Detector Type |
|-----|-----------------|-------------------------|----------------|-------------|----------------------|-----------------------|---------------|
| 1   | 135.435         | 28.58                   | 43.50          | -14.92      | 39.88                | -11.30                | QP            |
| * 2 | 243.681         | 34.29                   | 46.00          | -11.71      | 45.27                | -10.98                | QP            |
| 3   | 488.29          | 31.49                   | 46.00          | -14.51      | 36.14                | -4.65                 | QP            |
| 4   | 637.304         | 27.90                   | 46.00          | -18.10      | 29.75                | -1.85                 | QP            |
| 5   | 843.957         | 31.67                   | 46.00          | -14.33      | 30.47                | 1.20                  | QP            |
| 6   | 970.478         | 32.12                   | 54.00          | -21.88      | 29.48                | 2.64                  | QP            |

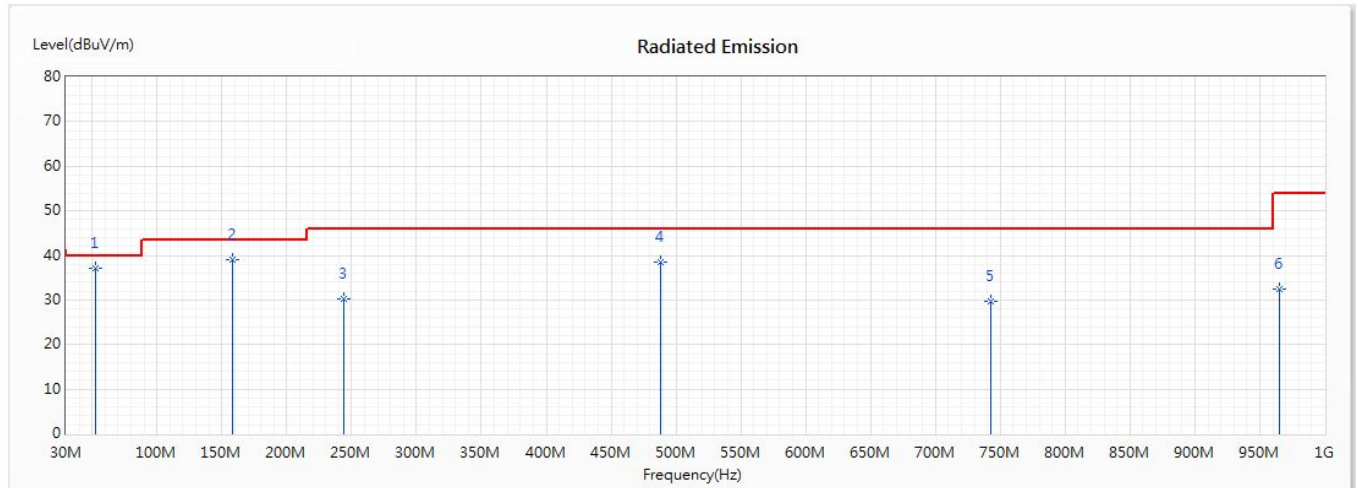
#### Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. "\*" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : BMW Door Handle  
 Test Item : General Radiated Emission Data (above 30MHz)  
 Test Mode : Mode 1: Transmit  
 Test date : 2020/10/06

## U06

### Vertical



| No  | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Reading Level (dBuV) | Correct Factor (dB/m) | Detector Type |
|-----|-----------------|-------------------------|----------------|-------------|----------------------|-----------------------|---------------|
| * 1 | 52.493          | 36.98                   | 40.00          | -3.02       | 47.09                | -10.11                | QP            |
| 2   | 157.928         | 38.99                   | 43.50          | -4.51       | 49.19                | -10.20                | QP            |
| 3   | 243.681         | 30.22                   | 46.00          | -15.78      | 41.20                | -10.98                | QP            |
| 4   | 488.29          | 38.44                   | 46.00          | -7.56       | 43.09                | -4.65                 | QP            |
| 5   | 742.739         | 29.70                   | 46.00          | -16.30      | 29.79                | -0.09                 | QP            |
| 6   | 964.855         | 32.52                   | 54.00          | -21.48      | 29.70                | 2.82                  | QP            |

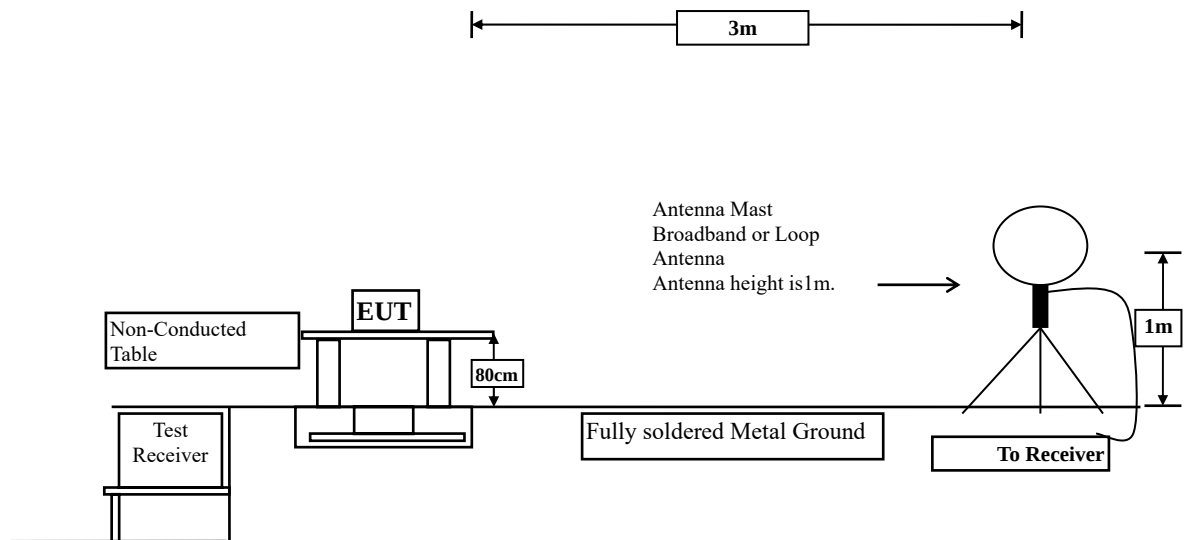
#### Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. "\*" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

## 4. Band Edge

### 4.1. Test Setup

Radiated Emission Under 30MHz



### 4.2. Limits

The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in Section 15.209. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209.

### 4.3. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

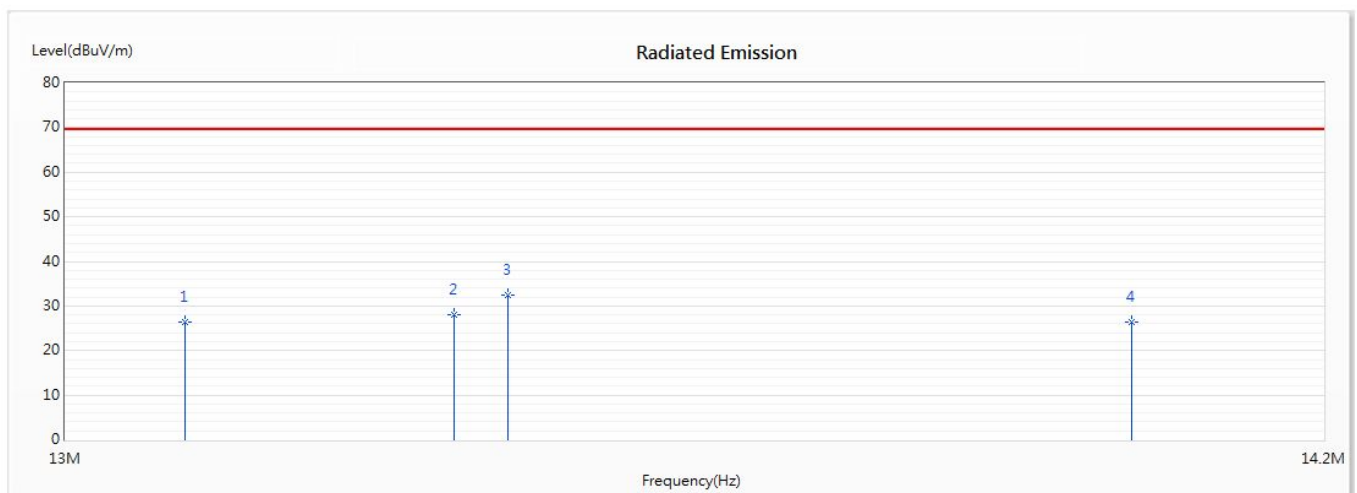
The bandwidth below 30MHz setting on the field strength meter is 9kHz and above 30MHz is 120kHz.

#### 4.4. Test Result of Band Edge

Product : BMW Door Handle  
 Test Item : Band Edge Data  
 Test Mode : Mode 1: Transmit  
 Test date : 2020/10/06

#### G26

##### Horizontal



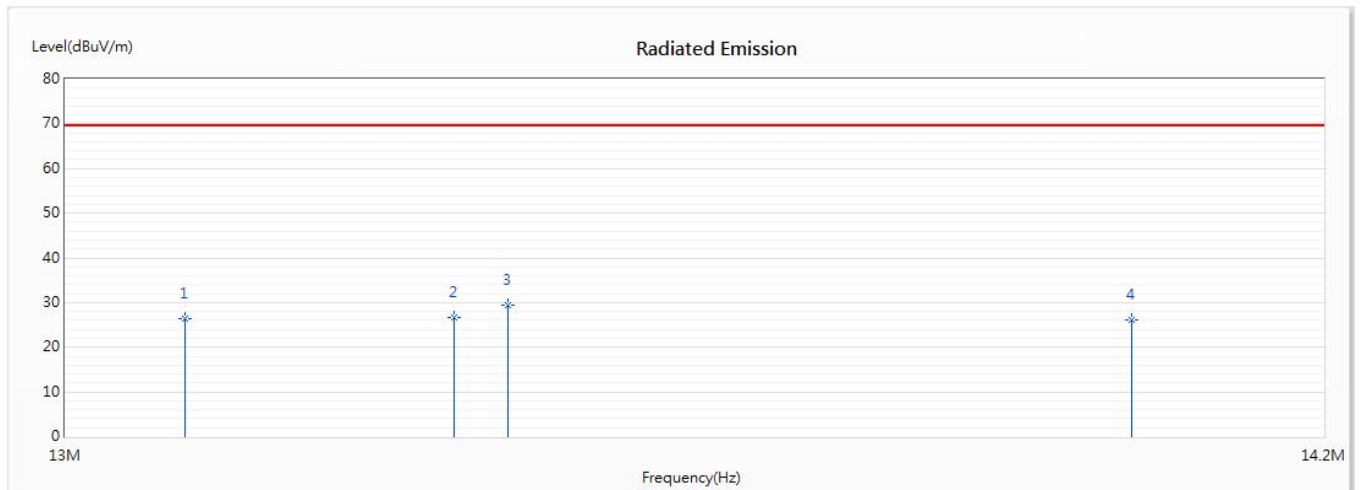
| No  | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Reading Level (dBuV) | Correct Factor (dB/m) | Detector Type |
|-----|-----------------|-------------------------|----------------|-------------|----------------------|-----------------------|---------------|
| 1   | 13.11           | 26.26                   | 69.54          | -43.28      | 4.00                 | 22.26                 | QP            |
| 2   | 13.36           | 27.97                   | 69.54          | -41.57      | 5.70                 | 22.27                 | QP            |
| * 3 | 13.41           | 32.57                   | 69.54          | -36.97      | 10.30                | 22.27                 | QP            |
| 4   | 14.01           | 26.40                   | 69.54          | -43.14      | 4.10                 | 22.30                 | QP            |

##### Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. "\*" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Product : BMW Door Handle  
 Test Item : Band Edge Data  
 Test Mode : Mode 1: Transmit  
 Test date : 2020/10/06

## G26 Vertical



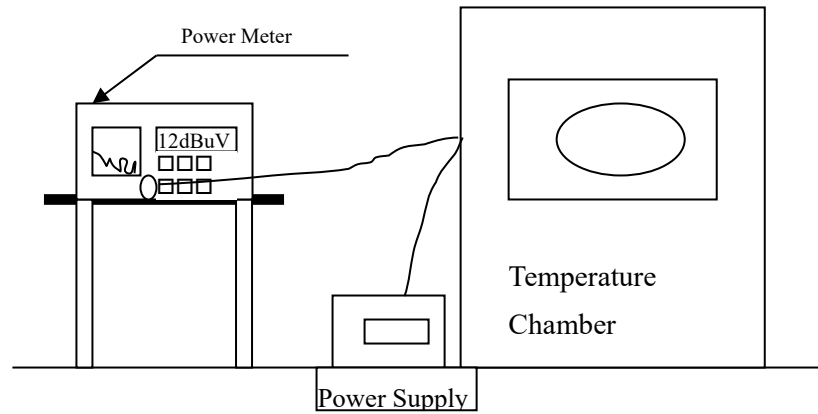
| No  | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Reading Level (dBuV) | Correct Factor (dB/m) | Detector Type |
|-----|-----------------|-------------------------|----------------|-------------|----------------------|-----------------------|---------------|
| 1   | 13.11           | 26.26                   | 69.54          | -43.28      | 4.00                 | 22.26                 | QP            |
| 2   | 13.36           | 26.67                   | 69.54          | -42.87      | 4.40                 | 22.27                 | QP            |
| * 3 | 13.41           | 29.37                   | 69.54          | -40.17      | 7.10                 | 22.27                 | QP            |
| 4   | 14.01           | 26.20                   | 69.54          | -43.34      | 3.90                 | 22.30                 | QP            |

### Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. "\*" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

## 5. Frequency Tolerance

### 5.1. Test Setup



### 5.2. Limits

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency.

### 5.3. Test Procedure

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency over a temperature variation of  $-20$  degrees to  $+50$  degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

#### 5.4. Test Result of Frequency Stability

Product : BMW Door Handle  
 Test Item : Frequency Tolerance  
 Test Mode : Mode 1: Transmit  
 Test date : 2020/10/26

##### G26

| Temperature<br>(°C) | Voltage<br>(V) | Observe<br>Time | Declared<br>Frequency<br>(MHz) | Read<br>Frequency<br>(MHz) | Tolerance<br>(%) | Limit<br>(%) |
|---------------------|----------------|-----------------|--------------------------------|----------------------------|------------------|--------------|
| 20                  | 12             | start           | 13.56                          | 13.56000                   | 0.000000         | ± 0.01 %     |
|                     |                | 2mins           | 13.56                          | 13.56000                   | 0.000000         |              |
|                     |                | 5mins           | 13.56                          | 13.56000                   | 0.000000         |              |
|                     |                | 10mins          | 13.56                          | 13.56000                   | 0.000000         |              |
| 20                  | 13.8           | start           | 13.56                          | 13.56000                   | 0.000000         | ± 0.01 %     |
|                     |                | 2mins           | 13.56                          | 13.56000                   | 0.000000         |              |
|                     |                | 5mins           | 13.56                          | 13.56000                   | 0.000000         |              |
|                     |                | 10mins          | 13.56                          | 13.56000                   | 0.000000         |              |
| 20                  | 10.2           | start           | 13.56                          | 13.56000                   | 0.000000         | ± 0.01 %     |
|                     |                | 2mins           | 13.56                          | 13.56000                   | 0.000000         |              |
|                     |                | 5mins           | 13.56                          | 13.56000                   | 0.000000         |              |
|                     |                | 10mins          | 13.56                          | 13.56000                   | 0.000000         |              |
| 50                  | 12             | start           | 13.56                          | 13.55901                   | -0.007301        | ± 0.01 %     |
|                     |                | 2mins           | 13.56                          | 13.55901                   | -0.007301        |              |
|                     |                | 5mins           | 13.56                          | 13.55901                   | -0.007301        |              |
|                     |                | 10mins          | 13.56                          | 13.55901                   | -0.007301        |              |
| 40                  | 12             | start           | 13.56                          | 13.55906                   | -0.006932        | ± 0.01 %     |
|                     |                | 2mins           | 13.56                          | 13.55906                   | -0.006932        |              |
|                     |                | 5mins           | 13.56                          | 13.55906                   | -0.006932        |              |
|                     |                | 10mins          | 13.56                          | 13.55906                   | -0.006932        |              |
| 30                  | 12             | start           | 13.56                          | 13.56007                   | 0.000516         | ± 0.01 %     |
|                     |                | 2mins           | 13.56                          | 13.56007                   | 0.000516         |              |
|                     |                | 5mins           | 13.56                          | 13.56007                   | 0.000516         |              |
|                     |                | 10mins          | 13.56                          | 13.56007                   | 0.000516         |              |



|     |    |        |       |          |          |          |
|-----|----|--------|-------|----------|----------|----------|
| 10  | 12 | start  | 13.56 | 13.56000 | 0.000000 | ± 0.01 % |
|     |    | 2mins  | 13.56 | 13.56000 | 0.000000 |          |
|     |    | 5mins  | 13.56 | 13.56000 | 0.000000 |          |
|     |    | 10mins | 13.56 | 13.56000 | 0.000000 |          |
| 0   | 12 | start  | 13.56 | 13.56002 | 0.000147 | ± 0.01 % |
|     |    | 2mins  | 13.56 | 13.56002 | 0.000147 |          |
|     |    | 5mins  | 13.56 | 13.56002 | 0.000147 |          |
|     |    | 10mins | 13.56 | 13.56002 | 0.000147 |          |
| -10 | 12 | start  | 13.56 | 13.56023 | 0.001696 | ± 0.01 % |
|     |    | 2mins  | 13.56 | 13.56023 | 0.001696 |          |
|     |    | 5mins  | 13.56 | 13.56023 | 0.001696 |          |
|     |    | 10mins | 13.56 | 13.56023 | 0.001696 |          |
| -20 | 12 | start  | 13.56 | 13.56011 | 0.000811 | ± 0.01 % |
|     |    | 2mins  | 13.56 | 13.56011 | 0.000811 |          |
|     |    | 5mins  | 13.56 | 13.56011 | 0.000811 |          |
|     |    | 10mins | 13.56 | 13.56011 | 0.000811 |          |

## **6. EMI Reduction Method During Compliance Testing**

No modification was made during testing.