

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



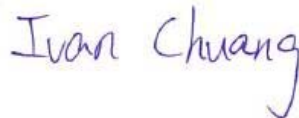
Product Name	BMW Door Handle
Applicant	Huf Hülsbeck & Fürst GmbH & Co. KG
Address	Steege Strasse 17, 42551 Velbert, Germany
Manufacturer	Huf Hülsbeck & Fürst GmbH & Co. KG
Model No.	INT TAGE NFC
FCC ID.	YGOINTTAGE
EUT Rated Voltage	DC 12V (Power by Battery)
EUT Test Voltage	DC 12V (Power by Battery)
Trade Name	HUF
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C 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)

TABLE OF CONTENTS

Description	Page
1. GENERAL INFORMATION	5
1.1. EUT Description.....	5
1.2. Tested System Details.....	6
1.3. Configuration of tested System	6
1.4. EUT Exercise Software	6
1.5. Test Facility	7
1.6. List of Test Equipment	8
2. Conducted Emission.....	10
2.1. Test Setup	10
2.2. Limits	10
2.3. Test Procedure	11
2.4. Test Result of Conducted Emission.....	12
3. Radiated Emission.....	13
3.1. Test Setup	13
3.2. Limits	14
3.3. Test Procedure	15
3.4. Test Result of Radiated Emission.....	16
4. Band Edge	28
4.1. Test Setup	28
4.2. Limits	28
4.3. Test Procedure	28
4.4. Test Result of Band Edge	29
5. Frequency Tolerance	31
5.1. Test Setup	31
5.2. Limits	31
5.3. Test Procedure	31
5.4. Test Result of Frequency Stability.....	32
6. EMI Reduction Method During Compliance Testing	34
Attachment 1: EUT Test Photographs	
Attachment 2: EUT Detailed Photographs	

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
-----------	------------------

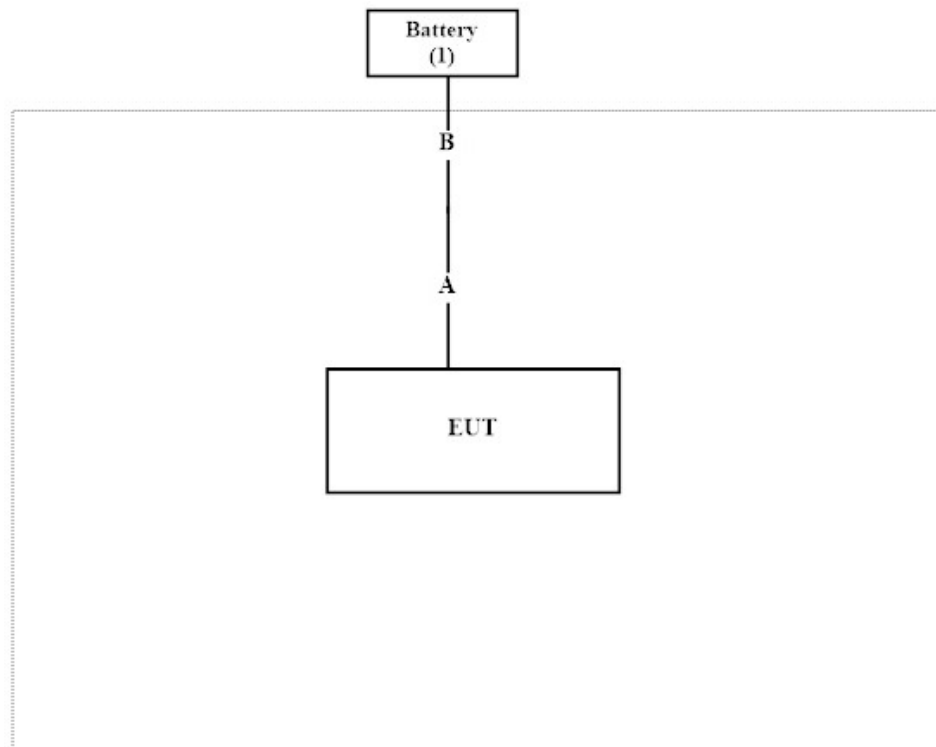
1.2. Tested System Details

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
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.

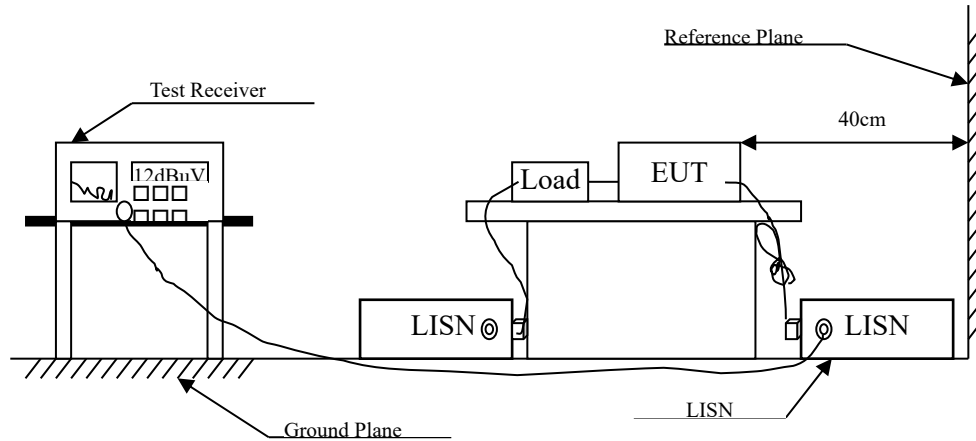
The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

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	± 3.42 dB	
Radiated Emission	Under 1GHz ± 4.06 dB	Above 1GHz ± 3.73 dB
Band Edge	Under 1GHz ± 4.06 dB	Above 1GHz ± 3.73 dB
Frequency Tolerance	± 682.83 Hz	

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56 _(註)	56-46 _(註)
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.

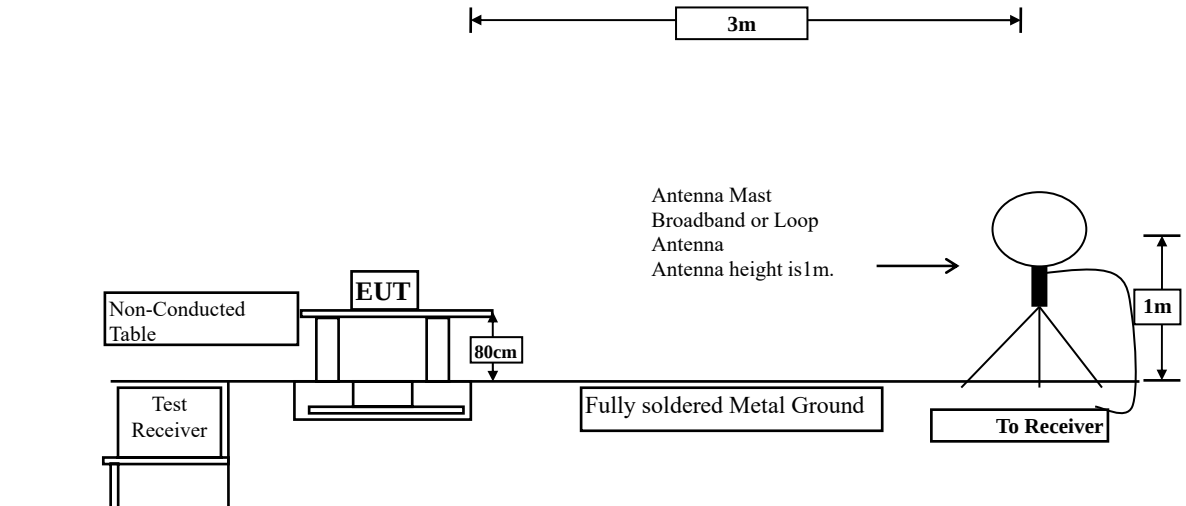
2.4. Test Result of Conducted Emission

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

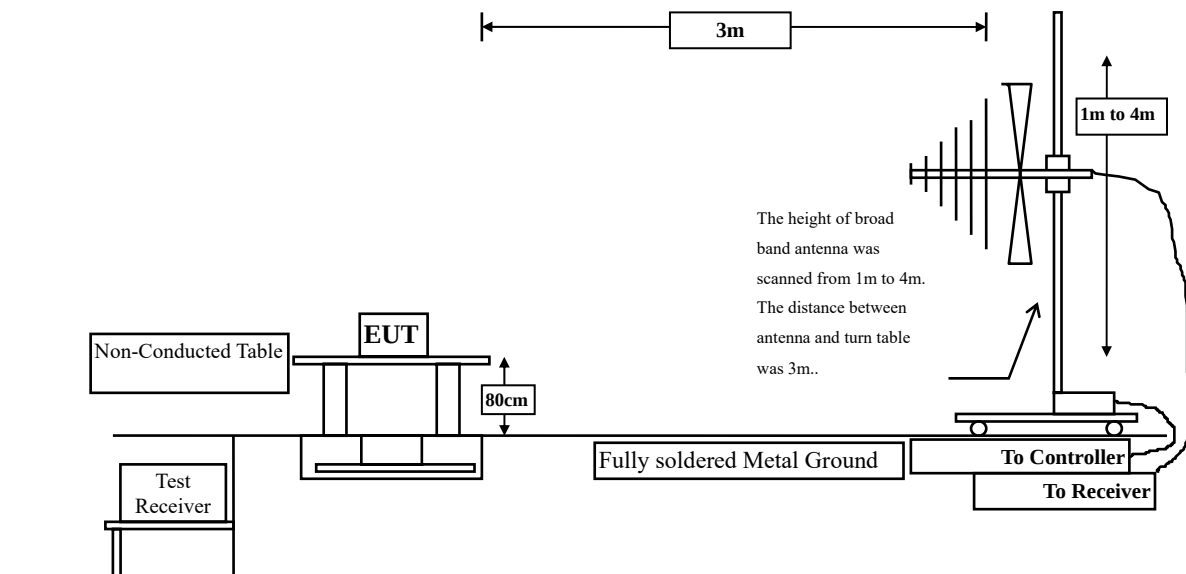
3. Radiated Emission

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 MHz	Field strength of fundamental			
	uV/m	Distance (meter)	dBuV/m	Distance (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 MHz	Field strength (microvolts/meter)	Measurement distance (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.

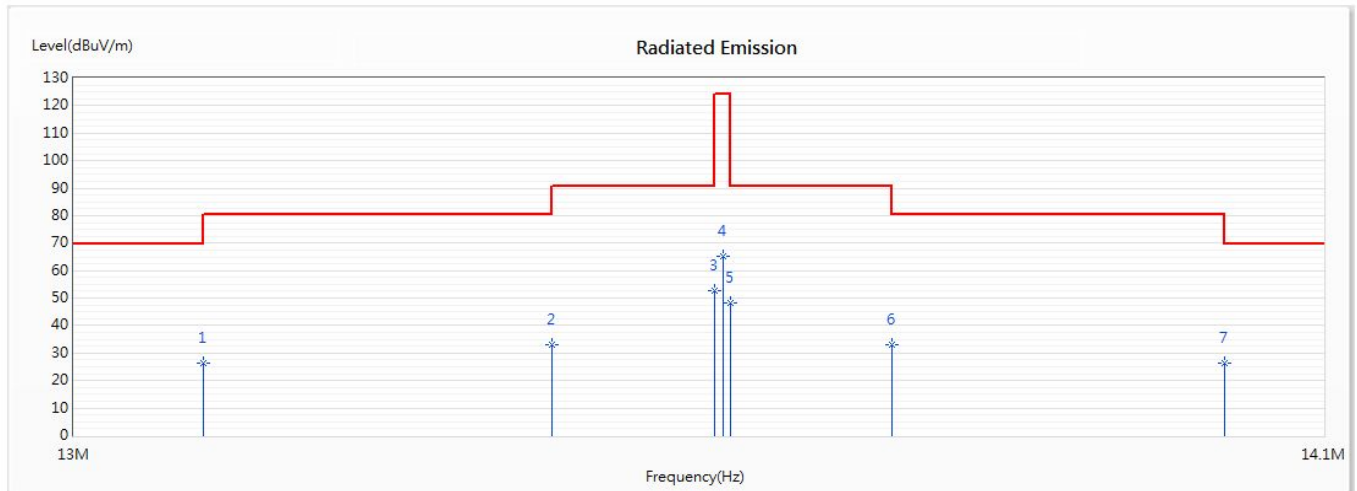
The bandwidth below 30MHz setting on the field strength meter is 9kHz and above 30MHz is 120kHz. The frequency range from 9kHz to 10th harmonics is checked.

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

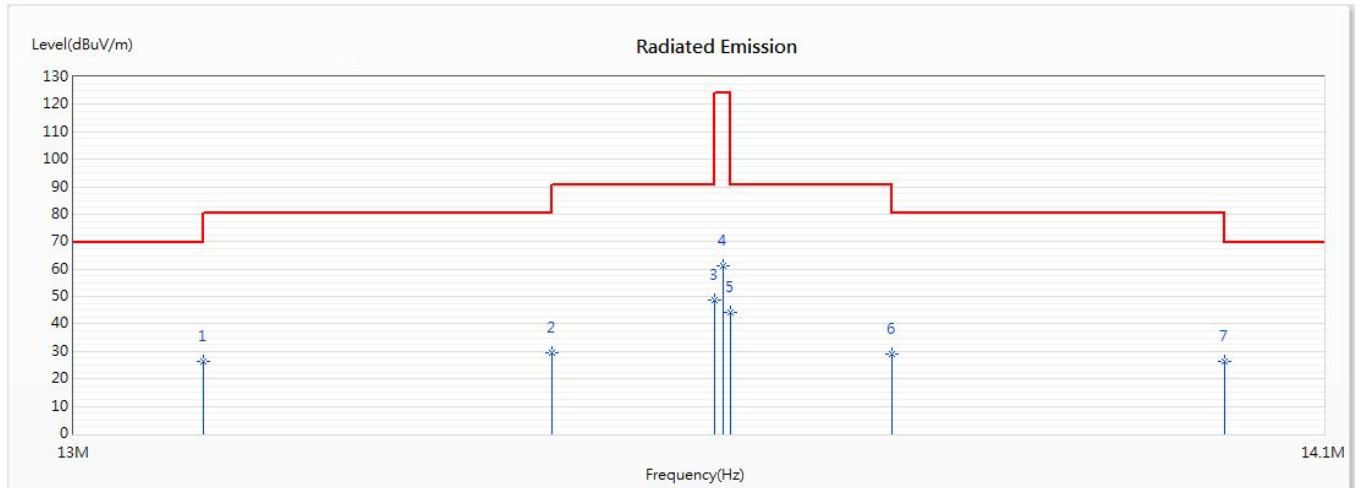
Note:

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

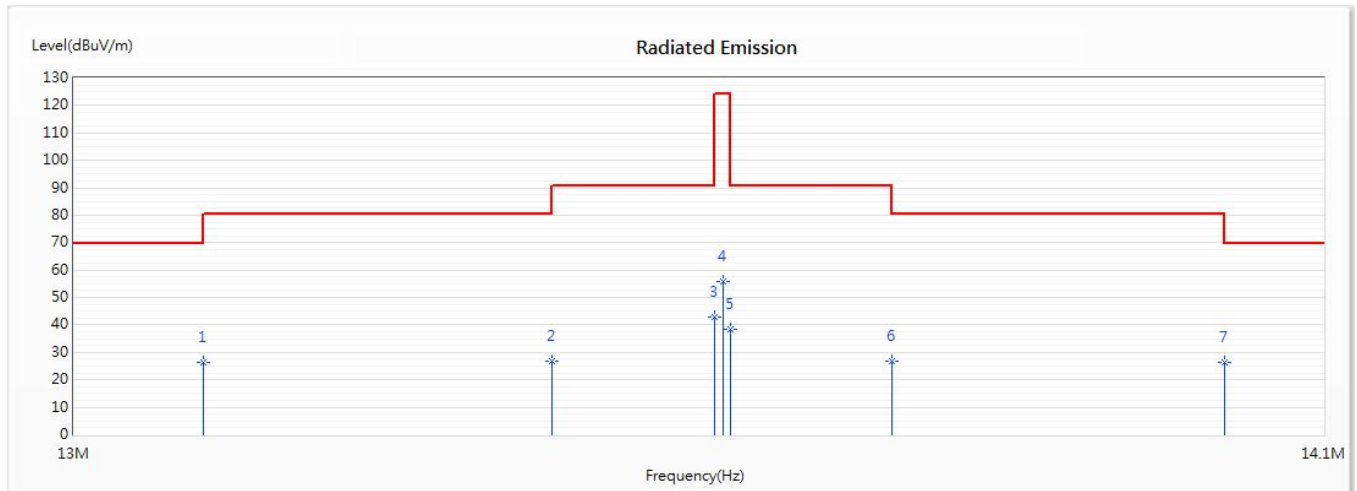
Note:

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

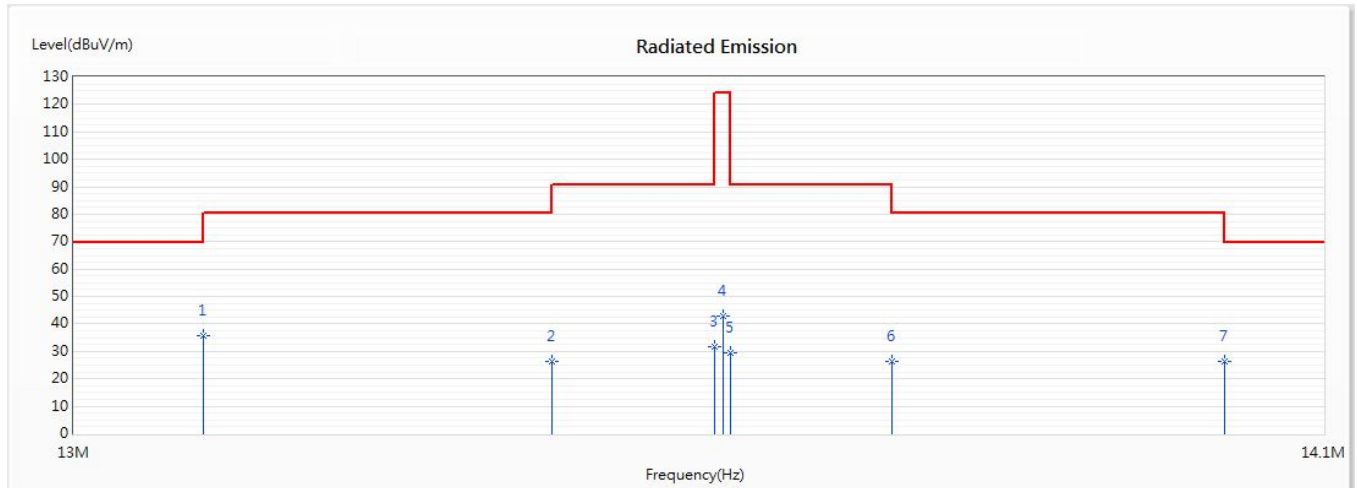
Note:

1. Fundamental Limit=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_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

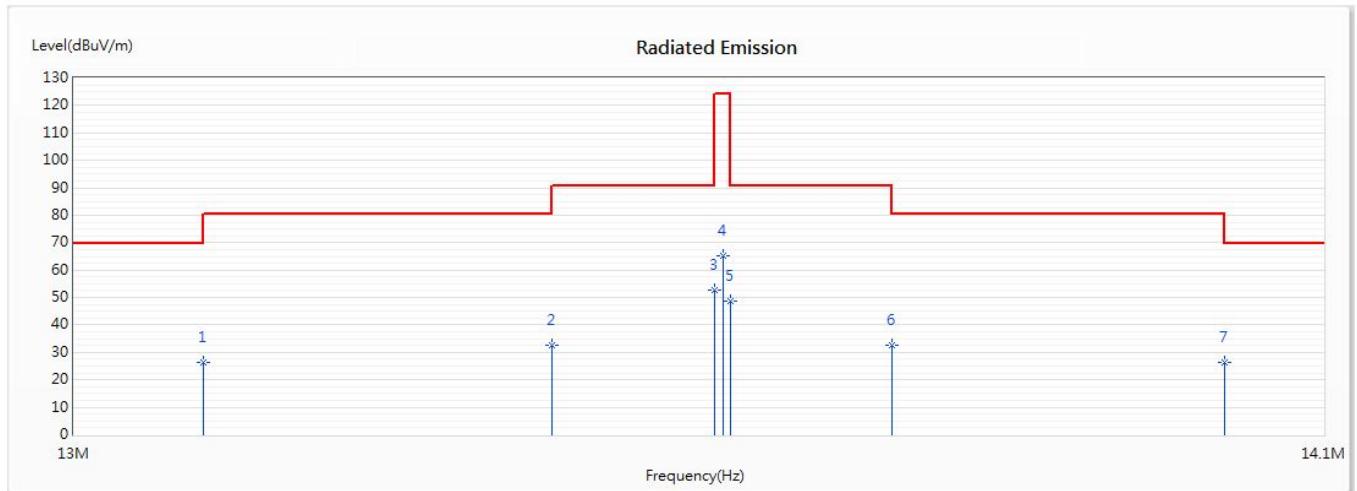
Note:

1. Fundamental Limit = $84 \text{ dBuV/m} + 40 \cdot \log(30 \text{ m} / 3 \text{ m}) = 124 \text{ dBuV/m}$
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_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

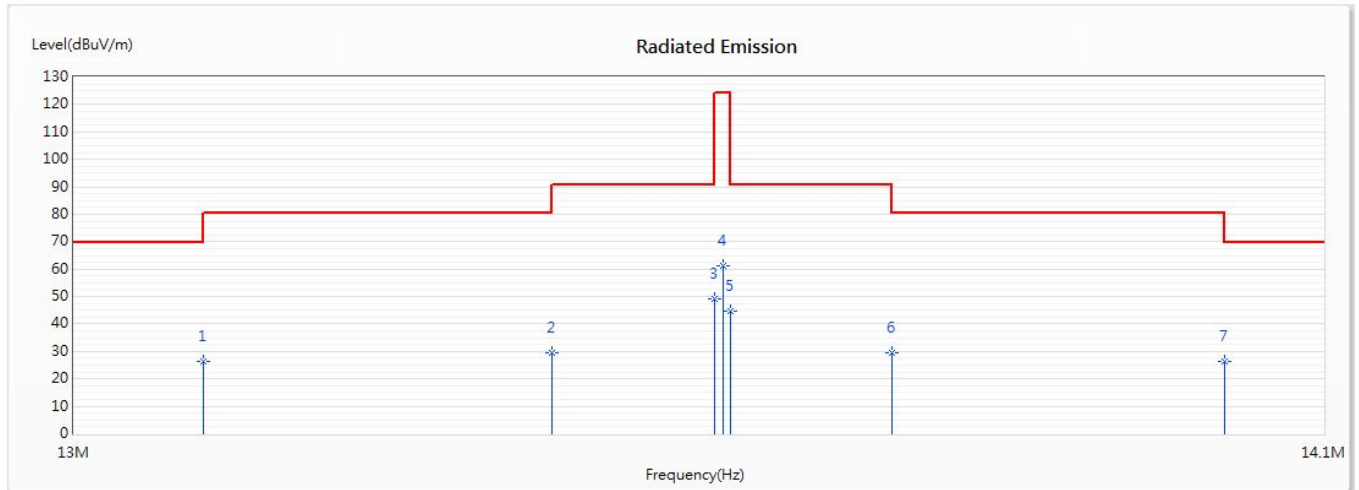
Note:

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

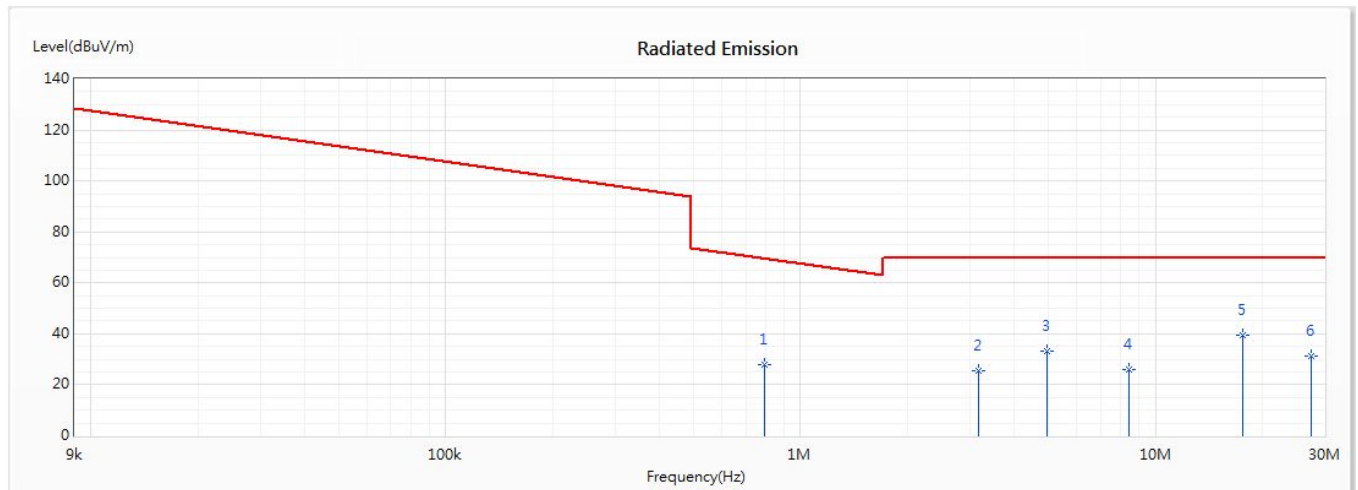
Note:

1. Fundamental Limit = $84 \text{ dBuV/m} + 40 \cdot \log(30 \text{ m} / 3 \text{ m}) = 124 \text{ dBuV/m}$
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 : 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

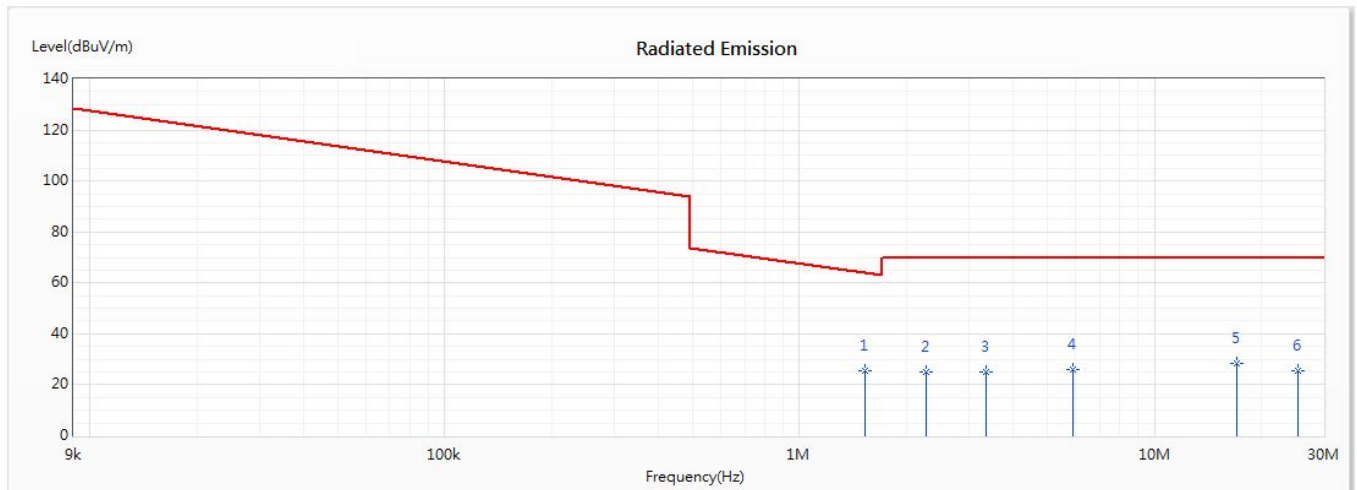
Note:

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

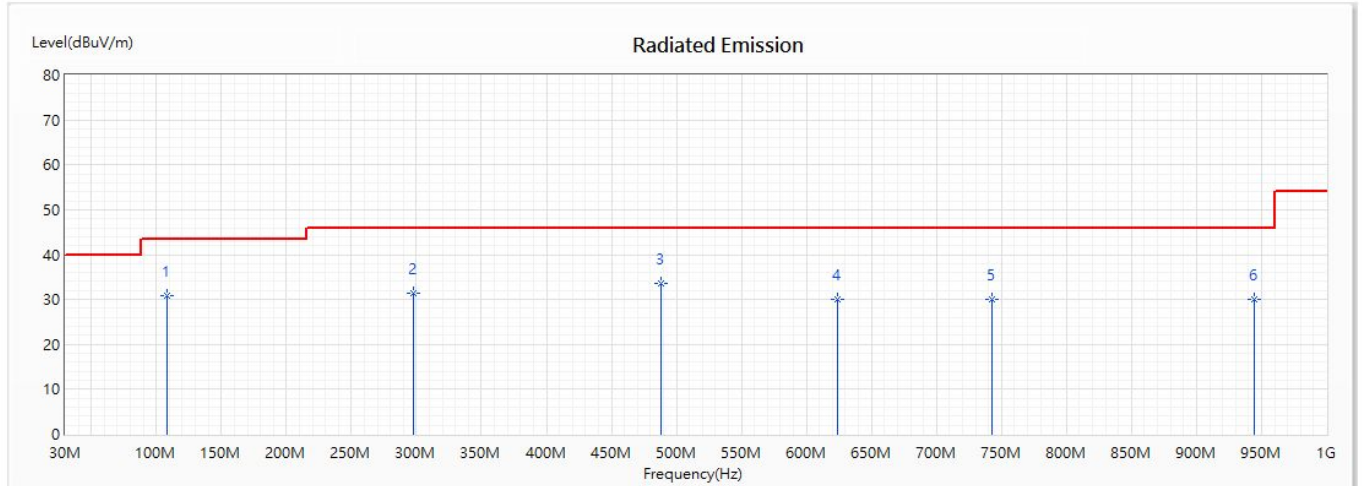
Note:

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

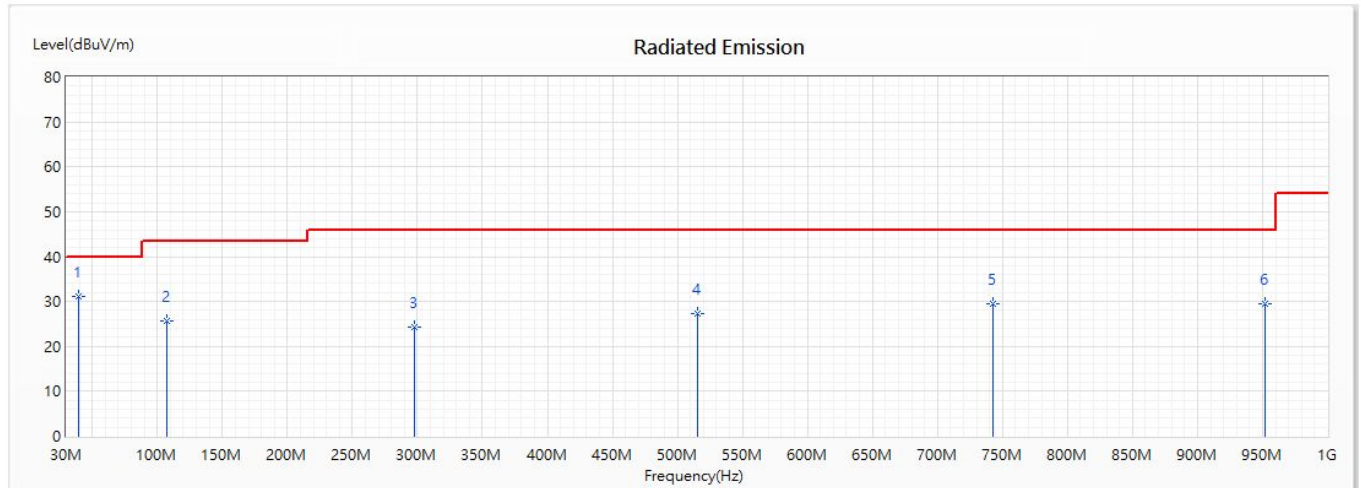
Note:

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

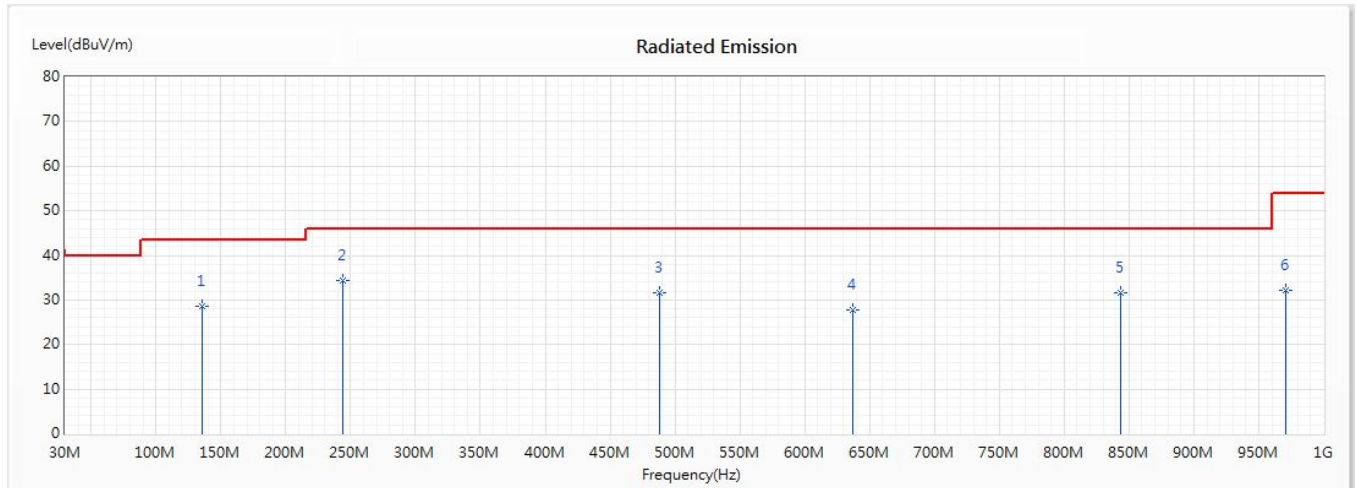
Note:

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

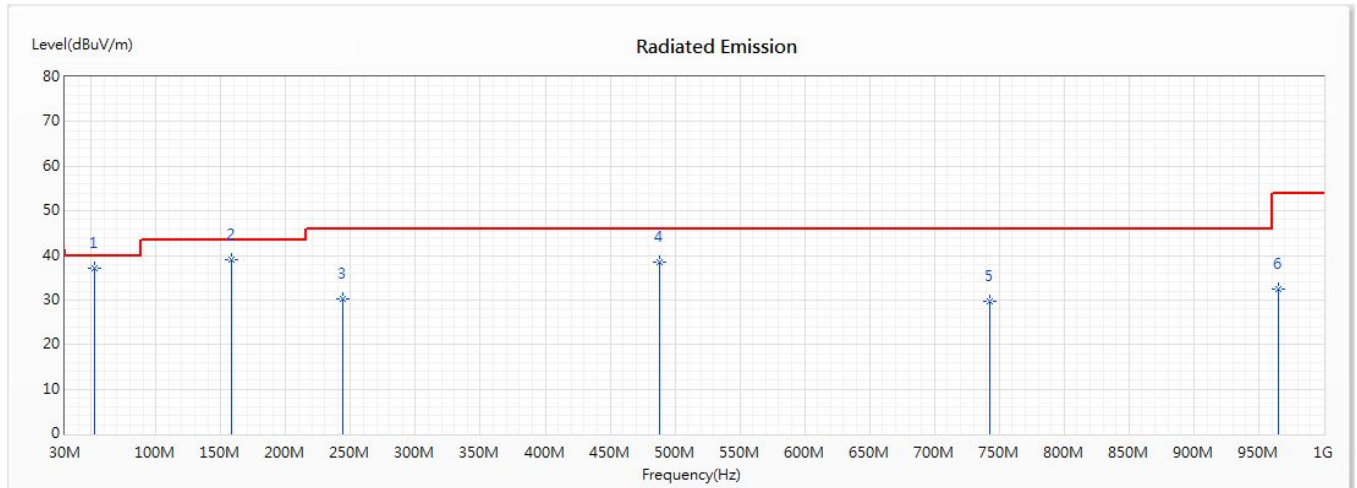
Note:

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



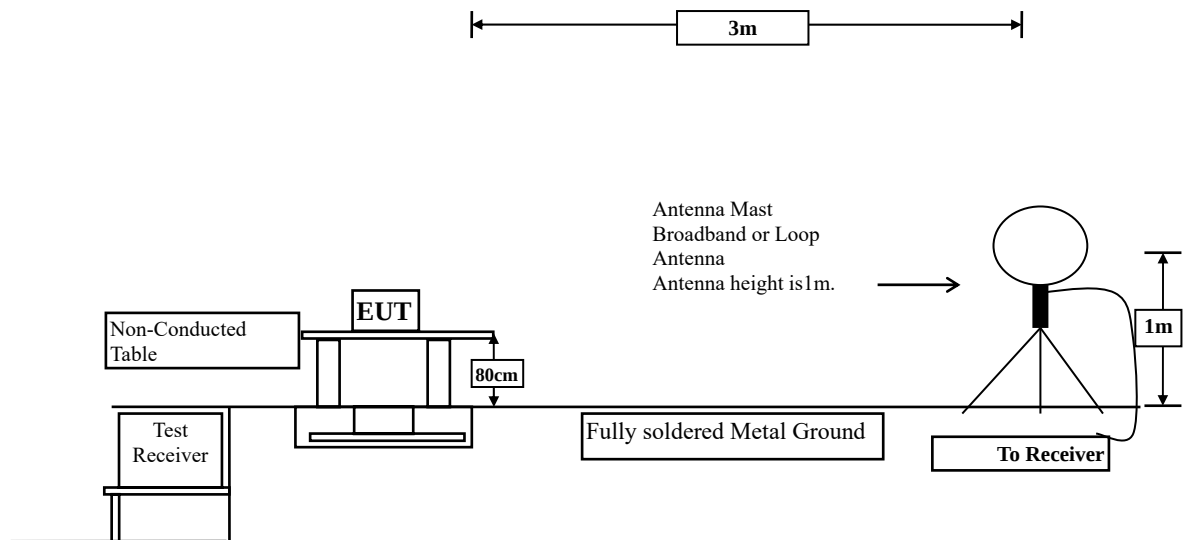
Note:

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.

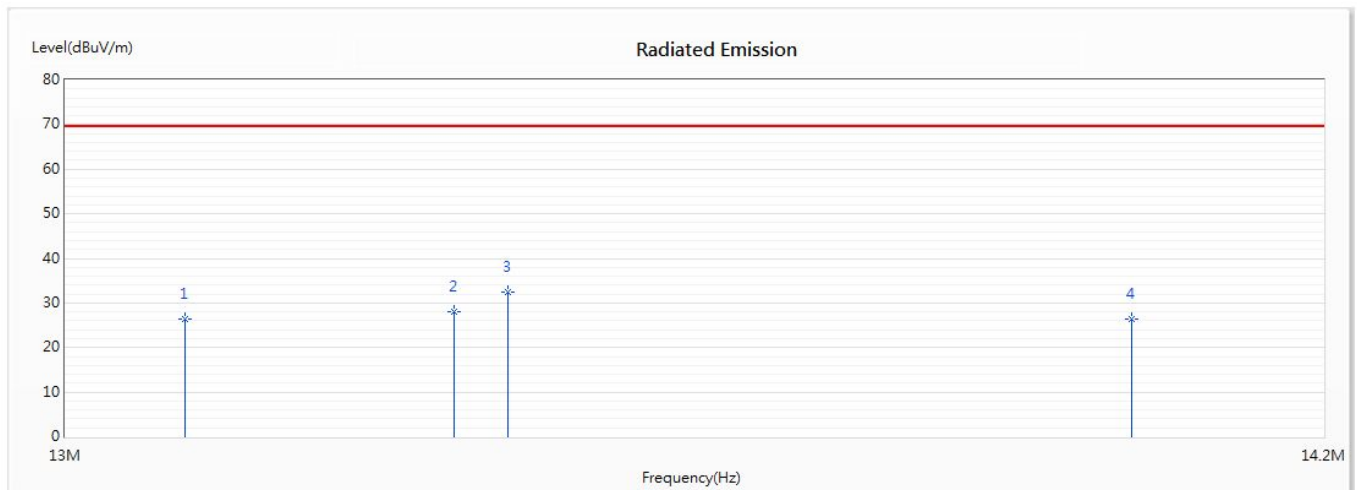
The bandwidth below 30MHz setting on the field strength meter is 9kHz and above 30MHz is 120kHz.

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



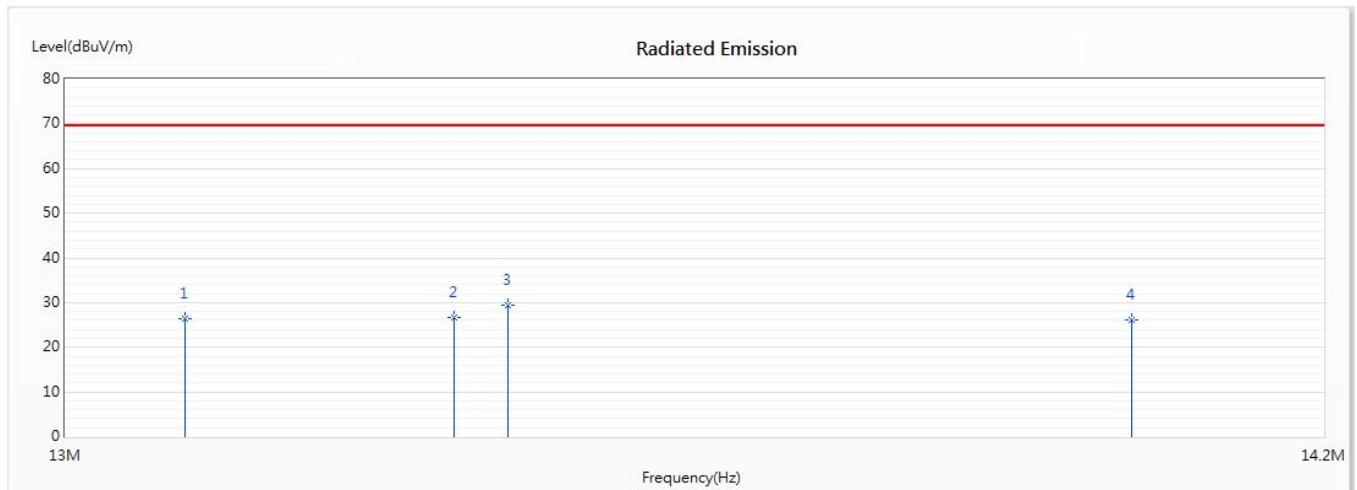
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	13.11	26.26	69.54	-43.28	4.00	22.26	QP
2	13.36	27.97	69.54	-41.57	5.70	22.27	QP
* 3	13.41	32.57	69.54	-36.97	10.30	22.27	QP
4	14.01	26.40	69.54	-43.14	4.10	22.30	QP

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



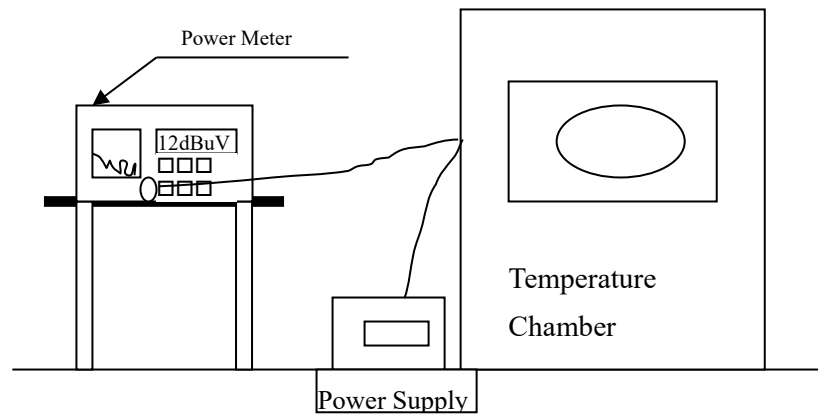
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	13.11	26.26	69.54	-43.28	4.00	22.26	QP
2	13.36	26.67	69.54	-42.87	4.40	22.27	QP
* 3	13.41	29.37	69.54	-40.17	7.10	22.27	QP
4	14.01	26.20	69.54	-43.34	3.90	22.30	QP

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 (°C)	Voltage (V)	Observe Time	Declared Frequency (MHz)	Read Frequency (MHz)	Tolerance (%)	Limit (%)
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.