Prüfbericht-Nr.: *Test Report No.:*	**50347619 001**	**Auftrags-Nr.:** *Order No.:*	**244218640**	**Seite 1 von 21** *Page 1 of 21*
Kunden-Referenz-Nr.: *Client Reference No.:*	**2021316**	**Auftragsdatum:** *Order date.:*	**27.02.2020**	
Auftraggeber: *Client:*	**Yanfeng Visteon Automotive Electronics Co., Ltd.** No. 300, Minolta Road, Songjiang District, 201600 Shanghai, P.R. China			
Prüfgegenstand: *Test item:*	**MB Audio System**			
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	**VS20**			
Auftrags-Inhalt: *Order content:*	**EMC test**			
Prüfgrundlage: *Test specification:*	**FCC 47 CFR Part 15, Subpart B:2019 Class B**			
Wareneingangsdatum: *Date of receipt:*	**03.03.2020**			
Prüfmuster-Nr.: *Test sample No.:*	**A001067791-006**			
Prüfzeitraum: *Testing period:*	**Refer to test report**			
Ort der Prüfung: *Place of testing:*	**EMC laboratory**			
Prüflaboratorium: *Testing laboratory:*	**TÜV Rheinland (Shanghai) Co., Ltd.**			
Prüfergebnis*: *Test result*:*	**Pass**			

geprüft von / *tested by:*

Jessie Xu

Datum *Date*	Name/Stellung *Name/Position*	Unterschrift *Signature*
21.04.2020	Jessie Xu/Senior project engineer	

kontrolliert von / *reviewed by:*

Jiayi Zhou

Datum *Date*	Name/Stellung *Name/Position*	Unterschrift *Signature*
21.04.2020	Jiayi Zhou/Senior manager	

Sonstiges / *Other:*

Zustand des Prüfgegenstandes bei Anlieferung:
Condition of the test item at delivery:

Prüfmuster vollständig und unbeschädigt
Test item complete and undamaged

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhalt
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	1 = very good	2 = good	3 = satisfactory	4 = sufficient	5 = poor
	P(ass) = passed a.m. test specifications(s)		F(ail) = failed a.m. test specifications(s)	N/A = not applicable	N/T = not tested

TEST SUMMARY

4.1.1 RADIATED EMISSION IN THE FREQUENCY RANGE UP 1 GHZ
Result:
Passed

4.1.2 RADIATED EMISSION IN THE FREQUENCY RANGE ABOVE 1 GHZ
Result:
Passed

Contents

1 Test Sites

1.1 Test Facilities

Laboratory: TÜV Rheinland (Shanghai) Co., Ltd.
Address: No.177, 178, Lane 777 West Guangzhong Road, Jing'an District, Shanghai, China

The used test equipment is in accordance with CISPR 16-1 series standards for measurement of radio interference.

Refer to Clause 6 for test and measurement instruments.

2 General Product Information

2.1 Product Function and Intended Use

The EUT (equipment under test) is an ordinary MB audio system for household and similar use. For the further information, refer to the user's manual.

2.2 Ratings and System Details

Rated input	:	DC 13 V
Protection class	:	III

2.3 Independent Operation Modess

The basic operation modes are "BT operation", "FM/AM operation" and "Audio play". Refer to the user's manual for further information.

2.4 Description of interconnecting cables

None.

2.5 Noise Generating and Noise Suppressing Parts

Refer to the circuit diagram for further information.

2.6 Highest frequency generated or used in the device or on which the device operates or tunes

The highest frequency used in the EUT is the 2480 MHz operated frequency of Bluetooth.

2.7 Submitted Documents

Circuit diagram, user's manual and label.

3 Test Set-up and Operation Modes

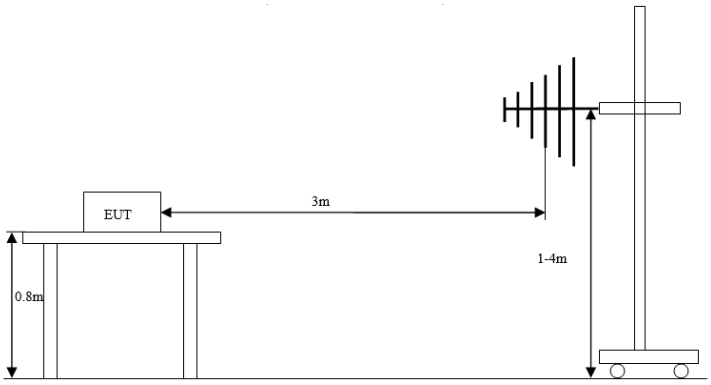
3.1 Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible emission level. The test conditions were adapted accordingly in reference to the instructions for use.

Refer to the related paragraph of this report.
The sequence of testing:
Radiated emission tests were performed on 11.03.2020-16.03.2020

3.2 Equipment and cable arrangement

Block diagram for radiated emission tests is as follows:



(Radiated emission)

Also refer to photograph on clause 5 for test setup for radiated emission test.

3.3 Test Software

No special test software was used during the tests.

3.4 Special Accessories and Auxiliary Equipment

During the test, the matched resistance and loudspeakers connected to input port of USB port, input port of microphone and output port of loudspeakers respectively.

3.5 Countermeasures to achieve EMC Compliance

No other special measure is employed to achieve the requirement.

4 Test Results E M I S S I O N

4.1 Emission in the Frequency Range above 30 MHz

4.1.1 Radiated emission in the frequency range up 1 GHz

Result:	**Passed**

Date of testing	:	16.03.2020
Test procedure	:	FCC 47 CFR Part 15, Subpart B:2019, ANSI C63.4-2014 and CISPR 16-1 series standards
Product classification	:	Class B
Frequency range	:	30 – 1000 MHz
Limits	:	Quasi-peak limits (3 m distance): 30 – 88 MHz, 40 dBµV/m; 88 – 216 MHz, 43.5 dBµV/m; 216 – 960 MHz, 46 dBµV/m; Above 960 MHz, 54 dBµV/m.
Bandwidth of EMI receiver for final measurement	:	120 kHz
Measurement time for final measurement	:	1 s
Kind of test site	:	Semi-anechoic chamber
Operational mode	:	Mode 1: FM radio play Mode 2: USB audio play
Ambient condition	:	Temperature: 21.4 °C; Relative humidity: 47.8 %
Expanded measurement uncertainty (k=2)	:	5.49 dB

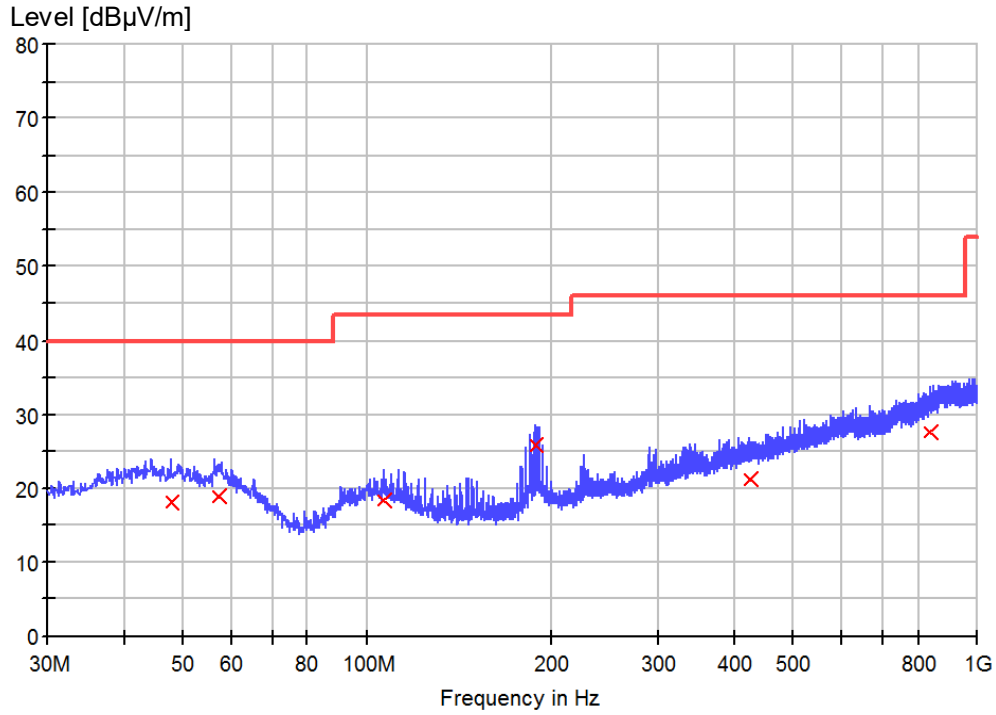
The radiated disturbance test was carried out in a semi-anechoic chamber. The test distance from the receiving antenna to the EUT is 3 m. The normalized site attenuation of the semi-anechoic chamber is regularly calibrated to ensure the radiated disturbance test results are valid. During the test, the EUT was placed on a 80 cm wooden support above the reference ground plane. The wooden support was rotated 360° around and the height of the antenna was varied from 1 m to 4 m to find the maximum disturbance. The test was performed with the antenna both in its horizontal and vertical polarizations.

The following figures and tables were those measured by an automatic measurement system. A preview test was firstly performed with peak detector. The final test was performed with quasi-peak at those critical frequencies during the preview test. In the following spectral diagram, "×" means quasi-peak test results.

Notes on following tables of radiated emission results and conversions:

QuasiPeak (dBµV/m): final measurement results by using quasi-peak detector
Corr. (dB): correction factor including: antenna factor, cable loss, and gain of pre-amplifier (if used)
Margin: Limit (dBµV/m) - QuasiPeak (dBµV/m)

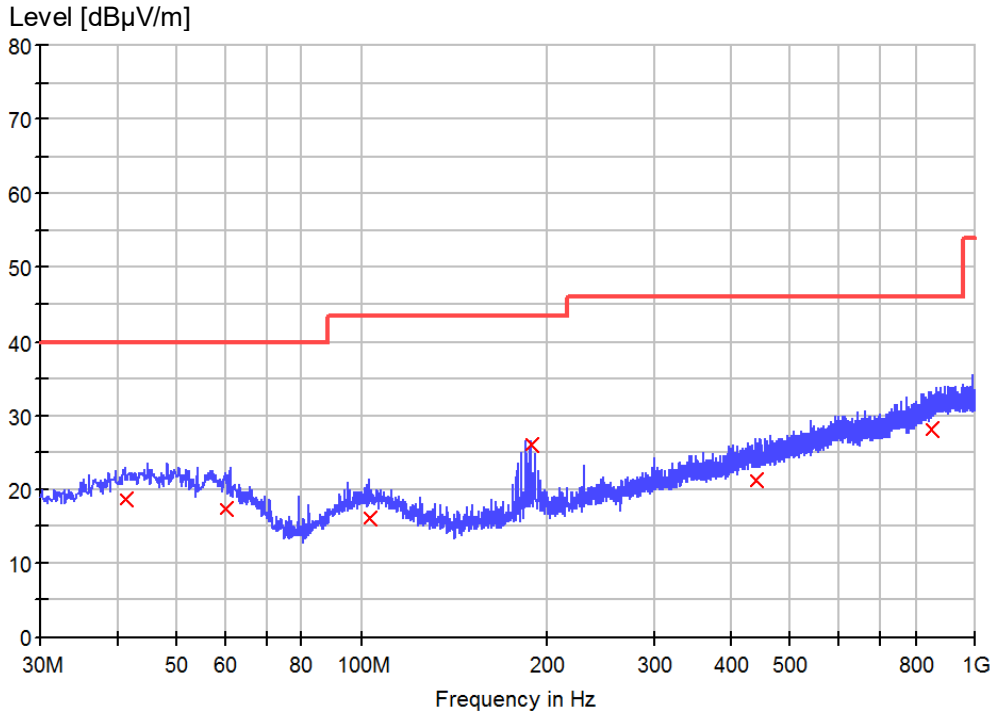
Figure 1: Spectral Diagrams, Radiated Emission, 30 MHz-1000 MHz, Horizontal polarization for mode 1



Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
47.823750	18.2	1000.0	120.000	140.0	H	12.0	15.0	21.8	40.0
57.038750	18.9	1000.0	120.000	120.0	H	30.0	15.2	21.1	40.0
106.508750	18.3	1000.0	120.000	150.0	H	90.0	12.6	25.2	43.5
188.716250	25.9	1000.0	120.000	150.0	H	180.0	11.5	17.6	43.5
425.275000	21.2	1000.0	120.000	147.0	H	23.0	17.6	24.8	46.0
834.857500	27.5	1000.0	120.000	200.0	H	25.0	23.1	18.5	46.0

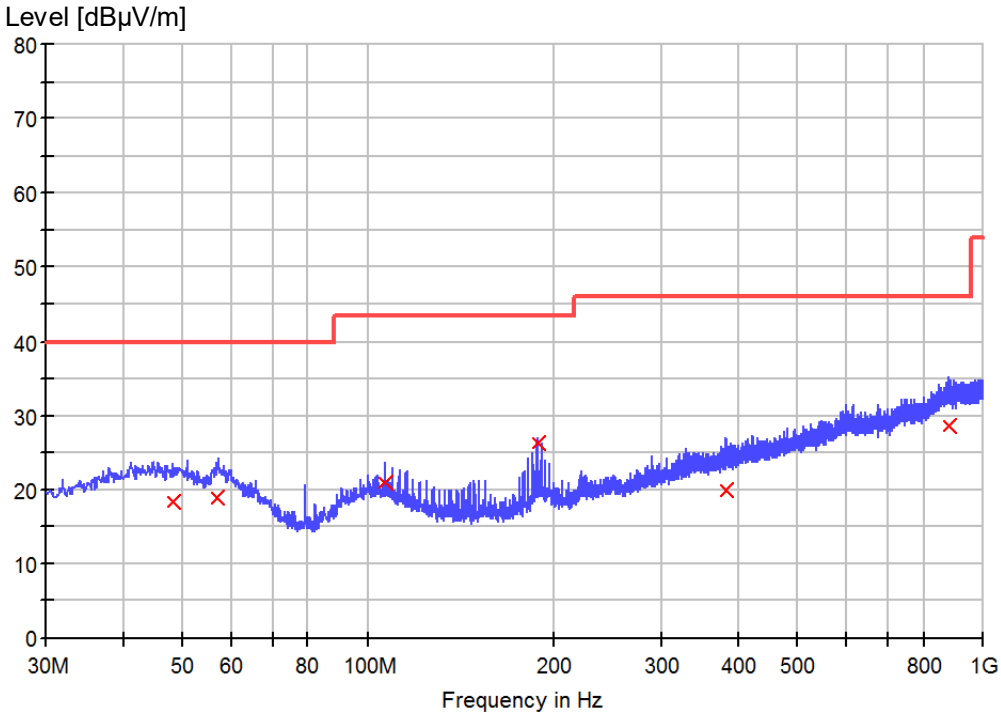
Figure 2: Spectral Diagrams, Radiated Emission, 30 MHz-1000 MHz, Vertical polarization for mode 1



Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
41.155000	18.6	1000.0	120.000	100.0	V	12.0	15.1	21.4	40.0
59.948750	17.5	1000.0	120.000	100.0	V	0.0	13.9	22.5	40.0
102.628750	16.0	1000.0	120.000	100.0	V	13.0	12.8	27.5	43.5
188.837500	26.0	1000.0	120.000	100.0	V	147.0	11.5	17.5	43.5
438.370000	21.3	1000.0	120.000	102.0	V	12.0	17.7	24.7	46.0
849.650000	28.1	1000.0	120.000	120.0	V	130.0	23.4	17.9	46.0

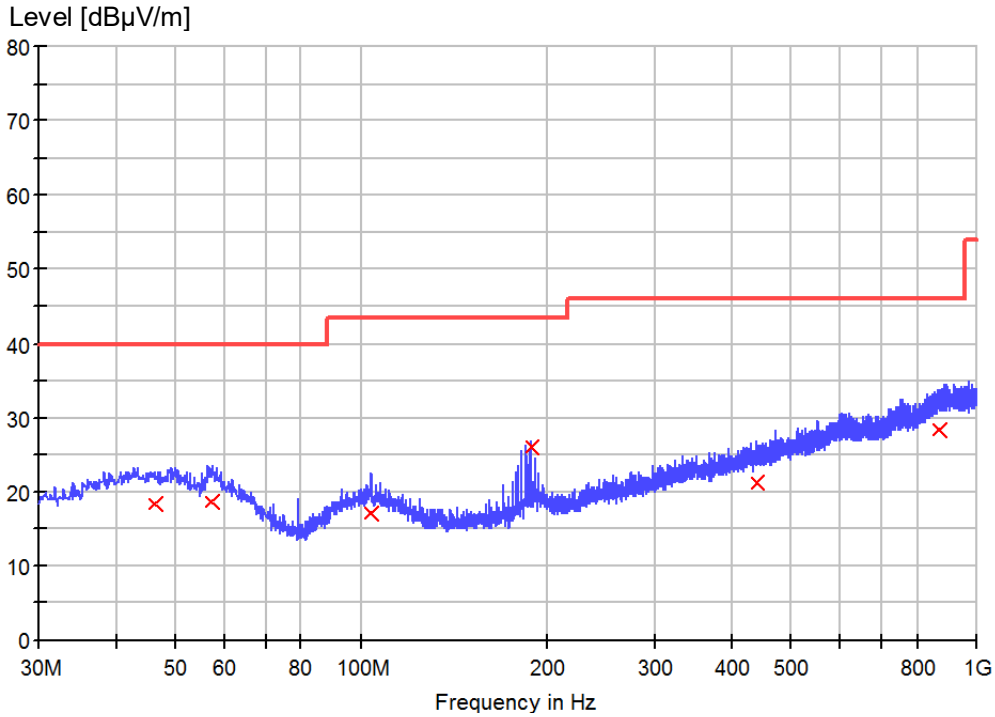
Figure 3: Spectral Diagrams, Radiated Emission, 30 MHz-1000 MHz, Horizontal polarization for mode 2



Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
48.066250	18.4	1000.0	120.000	140.0	H	0.0	15.0	21.6	40.0
56.917500	18.9	1000.0	120.000	150.0	H	12.0	15.2	21.1	40.0
106.508750	20.9	1000.0	120.000	150.0	H	30.0	12.6	22.6	43.5
188.595000	26.3	1000.0	120.000	200.0	H	153.0	11.5	17.2	43.5
382.837500	20.1	1000.0	120.000	160.0	H	30.0	16.6	25.9	46.0
880.690000	28.6	1000.0	120.000	144.0	H	12.0	23.7	17.4	46.0

Figure 4: Spectral Diagrams, Radiated Emission, 30 MHz-1000 MHz, Vertical polarization for mode 2



Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
46.126250	18.5	1000.0	120.000	100.0	V	12.0	15.1	21.6	40.0
57.160000	18.8	1000.0	120.000	100.0	V	20.0	15.1	21.2	40.0
103.962500	17.0	1000.0	120.000	100.0	V	45.0	12.9	26.5	43.5
188.595000	26.1	1000.0	120.000	100.0	V	180.0	11.5	17.4	43.5
440.552500	21.3	1000.0	120.000	102.0	V	87.0	17.7	24.7	46.0
865.048750	28.4	1000.0	120.000	105.0	V	153.0	23.6	17.6	46.0

4.1.2 Radiated Emission in the frequency range above 1 GHz

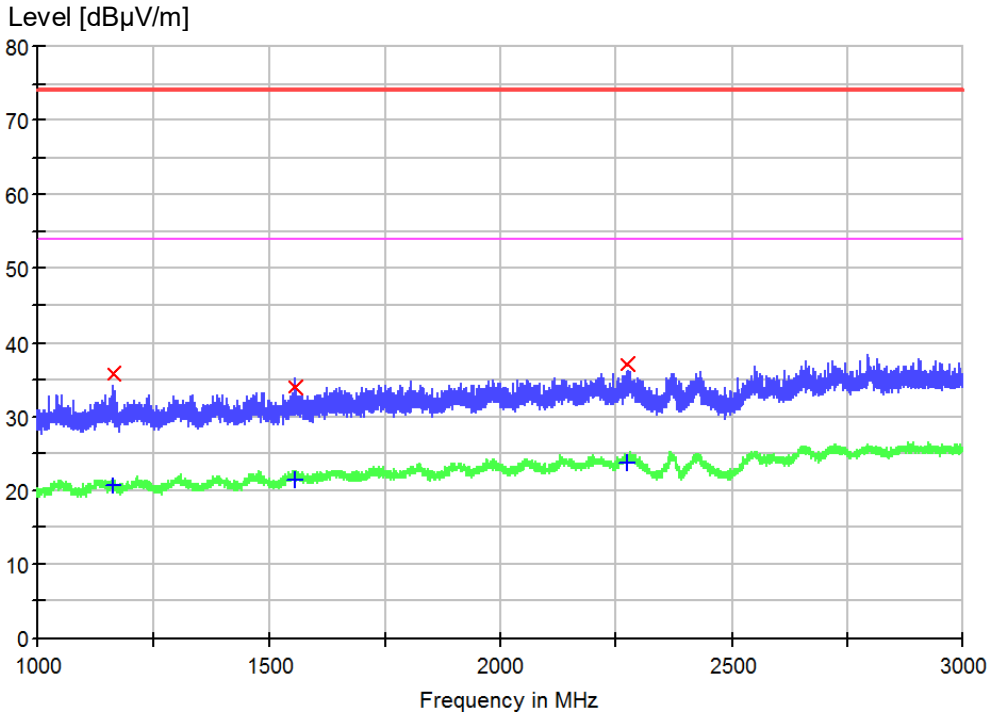
Result:	**Passed**

Date of testing	:	11.03.2020
Port	:	Enclosure
Test procedure	:	FCC 47 CFR Part 15, Subpart B:2019, ANSI C63.4-2014 and CISPR 16-1 series standards
Product classification	:	Class B
Limit	:	MaxPeak limits (3 m distance): 1-12.5 GHz, 74 dBµV/m Average limits (3 m distance): 1-12.5 GHz, 54 dBµV/m
Frequency range	:	1 GHz-12.5 GHz (Note: The highest frequency in the EUT is 2480 MHz. According to FCC Part 15 subpart B §15.33 (b) (1), the upper frequency for radiated emission measurement is 12.5 GHz.
Kind of test site	:	Fully anechoic chamber
Test distance	:	3 m
Operational mode	:	Mode 1: FM radio play Mode 2: USB audio play
Earthing	:	No earthing
Ambient condition	:	Temperature: 21.4 °C; Relative humidity: 47.8 %
Expanded measurement uncertainty (k=2)	:	5.17 dB

The radiated disturbance test was carried out in a fully anechoic room. The test distance from the receiving antenna to the EUT is 3 m. The normalized site attenuation of the fully-anechoic chamber is regularly calibrated to ensure the radiated disturbance test results are valid. During the test, the EUT was placed on a wooden support, which is 80 cm high. And the wooden support was rotated 360° around. The test was performed with the antenna both in its horizontal and vertical polarizations.

The following figures and tables were those measured by an automatic measurement system. The final test was performed with peak detector and average detector at those critical frequencies during the preview test. In the following figure, "× (red)" means measurement results with peak detector and "+ (blue)" means measurement results with average detector.

Figure 5: Spectral Diagrams and measurement results, 1 GHz-3 GHz, horizontal polarization for mode 1



Final maxpeak measurement result:

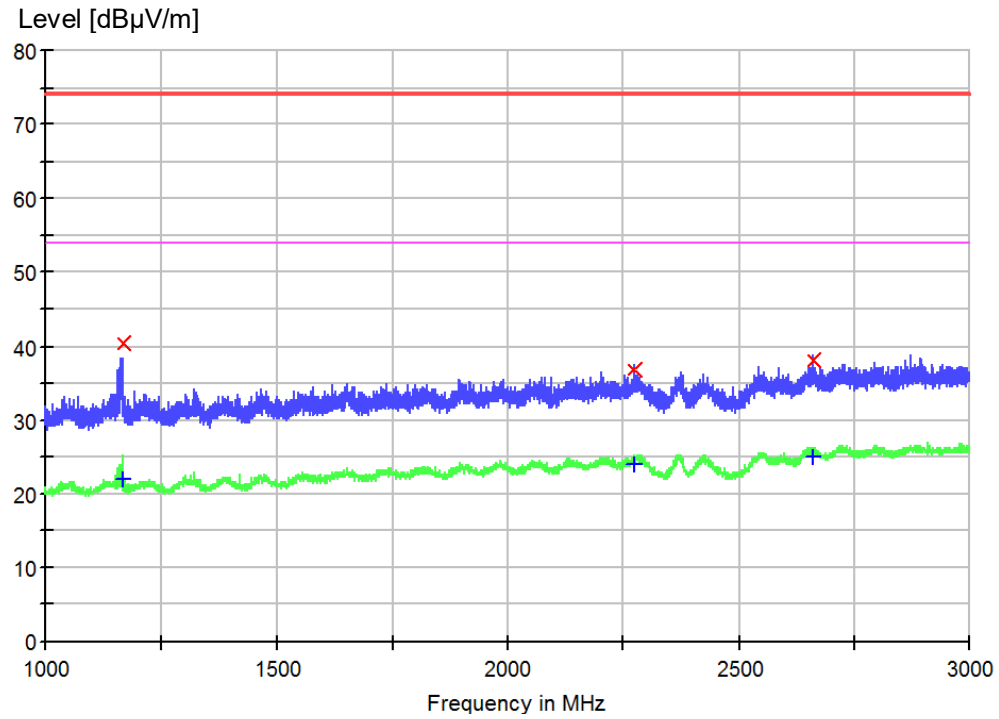
Frequency (MHz)	MaxPeak (dB µ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - PK+ (dB)	Limit - PK+ (dB µ V/m)
1164.600000	35.7	1000.0	1000.000	120.0	H	-145.0	-20.3	38.3	74.0
1553.600000	34.1	1000.0	1000.000	100.0	H	25.0	-19.0	39.9	74.0
2274.800000	37.1	1000.0	1000.000	100.0	H	-5.0	-16.3	36.9	74.0

Final average measurement result:

Frequency (MHz)	Average (dB µ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dB µ V/m)
1164.600000	20.6	1000.0	1000.000	100.0	H	45.0	-20.3	33.4	54.0
1553.600000	21.5	1000.0	1000.000	100.0	H	65.0	-19.0	32.5	54.0
2274.800000	23.7	1000.0	1000.000	100.0	H	35.0	-16.3	30.3	54.0

Note: Other frequency was 20dB below limit line within 3-13GHz, there is not show in the report.

Figure 6: Spectral Diagrams and measurement results, 1 GHz-3 GHz, vertical polarization for mode 1



Final maxpeak measurement result:

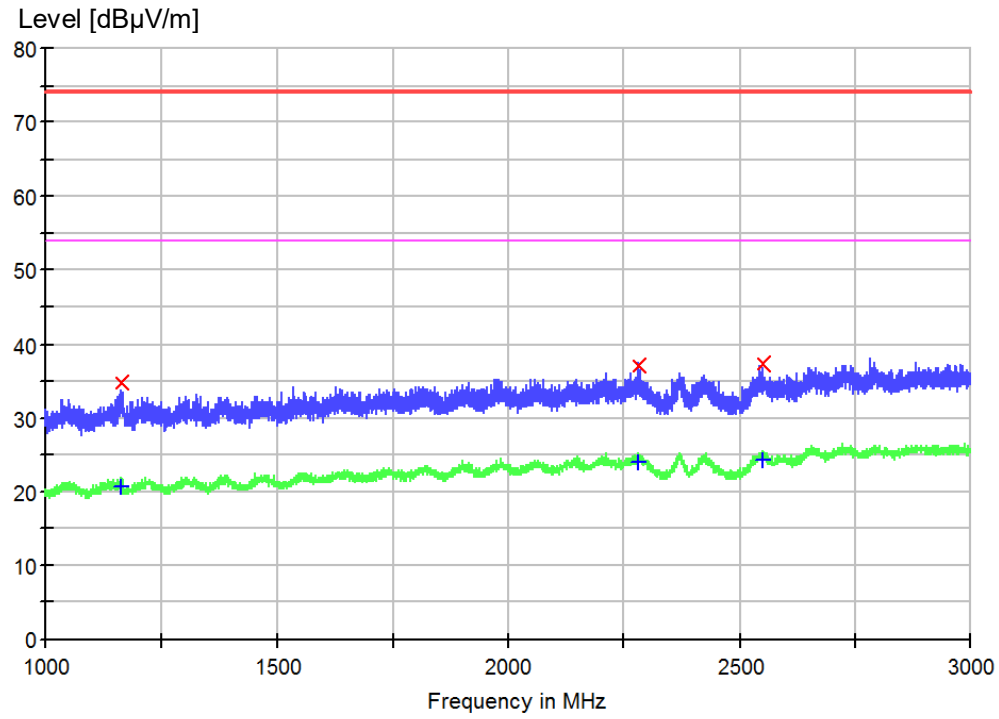
Frequency (MHz)	MaxPeak (dB µ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - PK+ (dB)	Limit - PK+ (dB µ V/m)
1168.000000	40.4	1000.0	1000.000	100.0	V	-55.0	-20.3	33.6	74.0
2272.200000	36.9	1000.0	1000.000	110.0	V	35.0	-16.3	37.1	74.0
2660.800000	38.0	1000.0	1000.000	100.0	V	-45.0	-15.1	36.0	74.0

Final average measurement result:

Frequency (MHz)	Average (dB µ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dB µ V/m)
1168.000000	22.1	1000.0	1000.000	100.0	V	115.0	-20.3	31.9	54.0
2272.200000	23.9	1000.0	1000.000	100.0	V	65.0	-16.3	30.1	54.0
2660.800000	25.1	1000.0	1000.000	100.0	V	-145.0	-15.1	28.9	54.0

Note: Other frequency was 20dB below limit line within 3-13GHz, there is not show in the report.

Figure 7: Spectral Diagrams and measurement results, 1 GHz-3 GHz, horizontal polarization for mode 2



Final maxpeak measurement result:

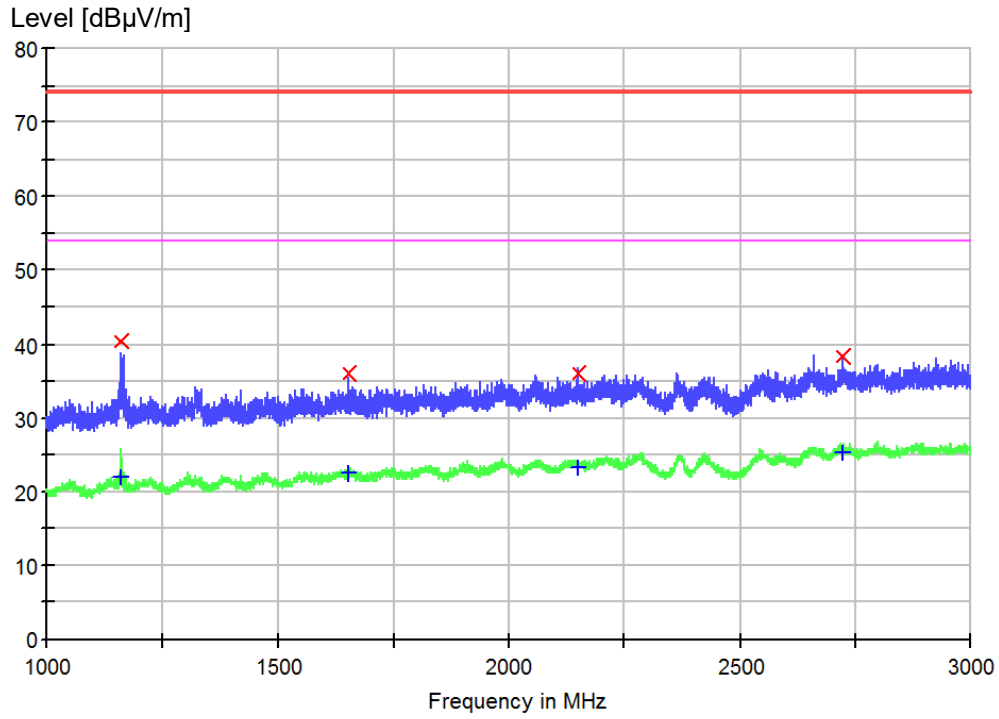
Frequency (MHz)	MaxPeak (dB µ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - PK+ (dB)	Limit - PK+ (dB µ V/m)
1164.800000	34.6	1000.0	1000.000	110.0	H	-145.0	-20.3	39.4	74.0
2280.200000	37.0	1000.0	1000.000	120.0	H	-145.0	-16.3	37.0	74.0
2551.000000	37.4	1000.0	1000.000	100.0	H	65.0	-15.5	36.6	74.0

Final average measurement result:

Frequency (MHz)	Average (dB µ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dB µ V/m)
1164.800000	20.7	1000.0	1000.000	110.0	H	-45.0	-20.3	33.3	54.0
2280.200000	24.1	1000.0	1000.000	100.0	H	55.0	-16.3	29.9	54.0
2551.000000	24.4	1000.0	1000.000	100.0	H	-45.0	-15.5	29.6	54.0

Note: Other frequency was 20dB below limit line within 3-13GHz, there is not show in the report.

Figure 8: Spectral Diagrams and measurement results, 1 GHz-3 GHz, vertical polarization for mode 2



Final maxpeak measurement result:

Frequency (MHz)	MaxPeak (dB µ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - PK+ (dB)	Limit - PK+ (dB µ V/m)
1157.400000	40.4	1000.0	1000.000	120.0	V	115.0	-20.3	33.6	74.0
1651.800000	36.0	1000.0	1000.000	100.0	V	35.0	-18.6	38.0	74.0
2151.000000	36.1	1000.0	1000.000	100.0	V	95.0	-16.7	37.9	74.0
2724.000000	38.4	1000.0	1000.000	100.0	V	-45.0	-14.9	35.6	74.0

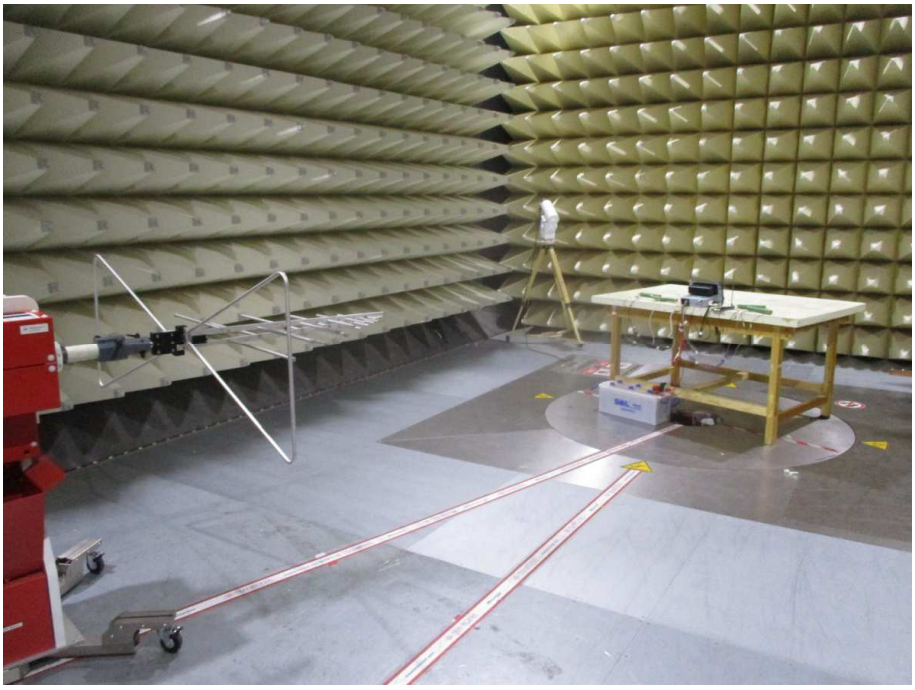
Final average measurement result:

Frequency (MHz)	Average (dB µ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dB µ V/m)
1157.400000	22.1	1000.0	1000.000	100.0	V	-45.0	-20.3	31.9	54.0
1651.800000	22.4	1000.0	1000.000	100.0	V	-35.0	-18.6	31.6	54.0
2151.000000	23.3	1000.0	1000.000	120.0	V	15.0	-16.7	30.7	54.0
2724.000000	25.3	1000.0	1000.000	100.0	V	65.0	-14.9	28.7	54.0

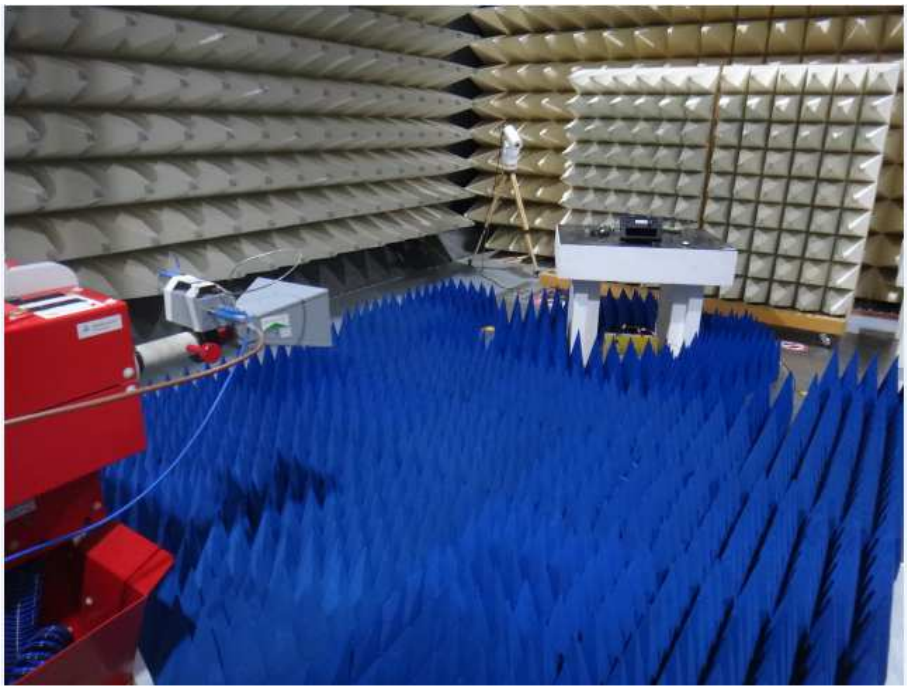
Note: Other frequency was 20dB below limit line within 3-13GHz, there is not show in the report.

5 Photographs of the Test Set-Up

Photograph 1: Set-up for measurement of radiated emission



(30-1000 MHz)



(1000-3000 MHz)

6 List of Test and Measurement Instruments

Equip.	Description	Model	Manufacturer	Due Date DD.MM.YYYY	Cal. interval
G1811378	3m modified semi-anechoic chamber	SAC3	Frankonia	27.06.2022	3 years
G1811410	Trilog broadband antenna	VULB 9163	Schwarzbeck	12.09.2022	3 years
G1822702	Spectrum analyser	FSV40	Rohde&Schwarz	01.11.2021	3 years
G1825371	Preamplifier	EMC051845SE	Taiwan EMCI	06.03.2021	3 years
G1811391	EMI test receiver	ESCI	Rohde&Schwarz	01.11.2020	1 year
G1822694	Double ridged broadband horn antenna	BBHA 9120 D	Schwarzbeck	29.03.2021	5 years

7 List of Figures

8 List of Photographs

End of test report