Test Report

Test Report No.: CQC-IVTS-2023-00285

Product Name	DashCam
Model Number	NBIQ2KUS
Applicant	Portable Multimedia Limited
Approval Types	FCC ID: 2AOT9-NBIQ2KUS IC: 28201-NBIQ2KUS

CQC Internet of Vehicles Technical Service (Shenzhen) Co., Ltd.

National Quality Inspection and Testing Center for Internet of Vehicles Products

TEST REPORT DECLARATION

Equipment under Test	:	**DashCam**
Model /Type	:	NBIQ1KUS
Listed Models	:	N/A
Applicant	:	**Portable Multimedia Limited**
Address	:	Unit 2, Caerphilly Business Park, Caerphilly, Mid Glamorgan CF83 3ED, United Kingdom
Manufacturer	:	**Shenzhen Samoon Technology Co.,Ltd**
Address	:	9th Floor,6th Floor west, Block7, ZhongYunTai Industry Park, Songbai Road,Shiyan Town,ShenZhen,China

The EUT described above is tested by CQC Internet of Vehicles Technical Service (Shenzhen) Co., Ltd. to determine the maximum emissions from the EUT. CQC Internet of Vehicles Technical Service (Shenzhen) Co., Ltd. is assumed full responsibility for the accuracy of the test results.

Project Engineer:	Yankun Wang (Yankun Wang 王炎坤)	Date: 2023-6-27
Checked by:	Haohao Li (Haohao Li 李昊昊)	Date: 2023-6-27
Approved by:	Wenliang Li (Wenliang Li 李文亮)	Date: 2023-6-27

Contents

1. TEST STANDARDS 4

2. SUMMARY 5

2.1. General Remarks 5
2.2. Product Description* 5
2.3. EUT Operation Mode* 5
2.4. Modifications 5
2.5. Test Item (Equipment Under Test) Description* 5
2.6. Auxiliary Equipment (AE) Description* 6
2.7. Test Item Set-ups Description 6
2.8. Test Conditions* 6
2.9. Additional Information 6
2.10. Test Location 6
2.11. Abnormalities from Standard Conditions 6
2.12. Possible verdicts of the results 6
2.13. Formula for determination of correction values (E_c) 7
2.14. Reporting Statements of Conformity – Decision Rule 7
2.15. Radiated Emission Measurement Distance 7

3. TEST ENVIRONMENT 8

3.1. Address of the test laboratory 8
3.2. Environmental conditions 8
3.3. Test Description 8
3.4. Statement of The Measurement Uncertainty 8
3.5. Equipments Used during the Test 9

4. TEST CONDITIONS AND RESULTS 10

4.1. Field Strength of Emissions 10
4.1.1. LIMITS 10
4.1.2. TEST CONFIGURATION 11
4.1.3. TEST PROCEDURE 12
4.1.4. FIELD STRENGTH CALCULATION 15
4.1.5. TEST RESULTS 15
4.2. AC Conducted Emission 21
4.2.1. LIMITS OF DISTURBANCE 21
4.2.2. TEST CONFIGURATION 21
4.2.3. TEST PROCEDURE 21
4.2.4. DISTURBANCE CALCULATION 21
4.2.5. TEST RESULTS 22
4.3. Occupied Bandwidth (99% Bandwidth) 23
4.3.1. LIMITS 23
4.3.2. TEST CONFIGURATION 23
4.3.3. TEST PROCEDURE 23
4.3.4. TEST RESULTS 23
4.4. 20dB Bandwidth 25
4.4.1. LIMITS 25
4.4.2. TEST CONFIGURATION 25
4.4.3. TEST PROCEDURE 25
4.4.4. TEST RESULTS 26
4.5. Antenna Requirement 27
4.5.1. REQUIREMENT 27
4.5.2. VERDICT 27

5. TEST SET-UP PHOTOS OF THE EUT 28

6. EXTERNAL AND INTERNAL PHOTOS OF THE EUT 30

1. TEST STANDARDS

The tests were performed according to following standards: The equipment under test (EUT) has been tested at CQC-IVTS's (own or subcontracted) laboratories according to the leading reference documents giving table below:

No	Identify	Document Title	Version/Date
1	FCC Part 15 C § 15.249	Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHZ, and 24.0–24.25 GHz.	5/16/2023
2	RSS-210 Annex B.10	Licence-Exempt Radio Apparatus: Category I Equipment - Bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz and 24-24.25 GHz	Issue 10/December 2019
3	RSS-Gen	General Requirements for Compliance of Radio Apparatus	Issue 5/April 2018
4	ANSI C63.4	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2014
5	ANSI C63.10	American National Standard for Testing Unlicensed Wireless Devices	2013

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	April 23, 2023
Testing commenced on	:	April 23, 2023
Testing concluded on	:	June 20, 2023

2.2. Product Description*

Product Name:	DashCam
Trade Mark	NEXTBASE
Model/Type reference:	NBIQ2KUS
FCC ID:	2AOT9-NBIQ2KUS
IC:	28201-NBIQ2KUS
HMN:	-/-
PMN:	DashCam
HVIN:	NBIQ2KUS
FVIN:	-/-
Hardware Version:	A3_003
Software Version:	0.6.6
Frequency range:	24.00 – 24.25 GHz
Nominal Frequency:	24.20 GHz
Number of Channels:	1 (Fxied)
Modulation Type:	No modulation (CW only)
Antenna:	Integrated patch antenna
Antenna Gain:	0 dBi
Specified Rated Output Power E.R.I.P.):	0.67 dBm
Power Supply:	DC 14V from DC Source
IC Classification:	Motion sensor device
Emission Designator:	N0N
Difference Declaration	The difference of Model: NBIQ2KUS (FCC ID: 2AOT9-NBIQ2KUS / IC: 28201-NBIQ2KUS) and model: NBIQ4KUS (FCC ID: 2AOT9-NBIQ4KUS / IC: 28201-NBIQ4KUS) are SoC Chip, Front Sensor, Cabin Sensor, Front Lens difference, this changes not effect Radar sensor Radio parameters. Refer to Annex A for difference declaration

*: declared by the applicant. CQC-IVTS not responsible for accuary.

2.3. EUT Operation Mode*

EUT operating mode no	Description of operating modes	Additional information
op. 1	Continuously transmitting and receiving mode	Carrier modulation (normal mode). 24.20 GHz, a continuous wave with 100% duty cycle

*: declared by the applicant

2.4. Modifications

No modifications were implemented to meet testing criteria

2.5. Test Item (Equipment Under Test) Description*

Short designation	EUT Name	EUT Description	Serial number	Hardware status	Software status
EUT A	NBIQ4KUS	DashCam	4KU030033	A3_003	0.6.6
EUT B	NBIQ2KUS	DashCam	2KU030022	A3_003	0.6.6

*: declared by the applicant.

2.6. Auxiliary Equipment (AE) Description*

AE short designation	EUT Name (if available)	EUT Description	Serial number (if available)	Software (if used)
AE 1	**-/-**	DC Power Source	-/-	-/-
AE 2	DC Power Cable	Length: 5m	-/-	-/-
			-/-	-/-

*: declared by the applicant.

2.7. Test Item Set-ups Description

set. 1	EUT A + AE 1 + AE2	EUT operating mode 1
set. 2	EUT B + AE 1 + AE2	EUT operating mode 2

2.8. Test Conditions*

Temperature, [°C]		Voltage, [V]	
T_{nom}	25.0	V_{nom}	DC 14.0 V
T_{min}	-10.0	V_{min}	DC 12.0 V
T_{max}	50.0	V_{max}	DC 16.0 V

*: declared by the applicant

2.9. Additional Information

Test items differences	None
Additional application considerations to test a component or sub-assembly	none

2.10. Test Location

Location 1

Company:	CQC Internet of Vehicles Technical Service (Shenzhen) Co., Ltd.
Address:	Building G5, TCL International E City, Xili Street, Nanshan District, Shenzhen, China
Post code:	518112
Contact Person:	Wenliang Li
Telephone:	+86-755-8618 9654
e-Mail:	liwenliang@cqc.com.cn

2.11. Abnormalities from Standard Conditions

None

2.12. Possible verdicts of the results

Test sample meets the requirements	P (PASS) ± the measured value is below the acceptance limit, AL = TL
Test sample does not meet the requirements	F (FAIL) ± the measured value is above the acceptance limit, AL = TL
Test case does not apply to the test sample	N/A (Not applicable)
Test case not performed	N/P (Not performed)

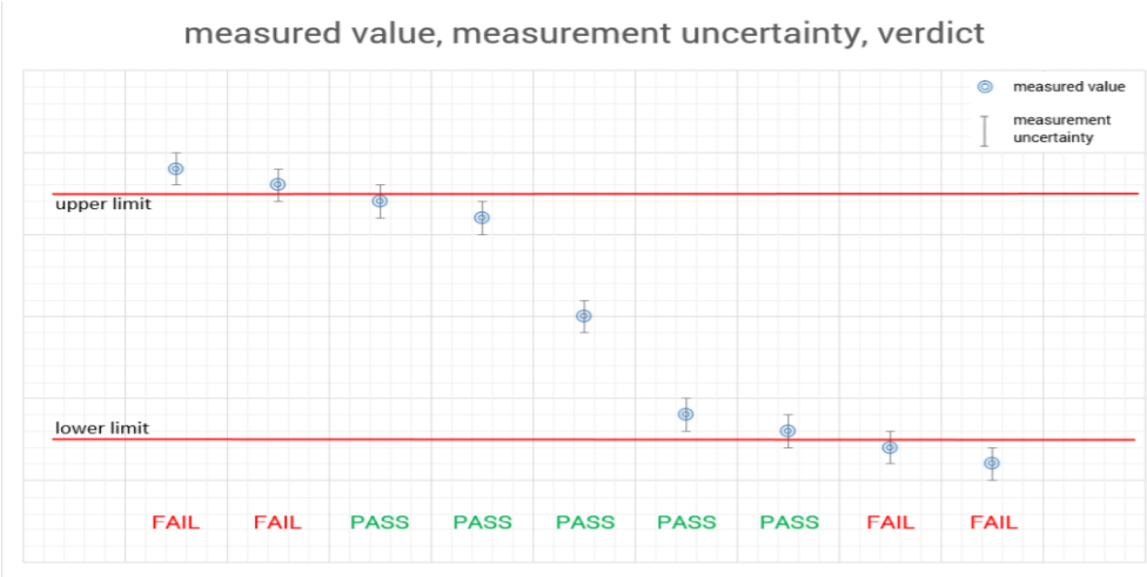
2.13. Formula for determination of correction values (E_c)

$E_C = E_R + AF + C_L + D_F - G_A$ (1)
$M = L_T - E_C$ (2)

E_C = Electrical field ± corrected value
E_R = Receiver reading
M = Margin
L_T = Limit
AF = Antenna factor
C_L = Cable loss
D_F = Distance correction factor (if used)
G_A = Gain of pre-amplifier (if used)
All units are dB-units, positive margin means value is below limit.

2.14. Reporting Statements of Conformity – Decision Rule

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed. The measurement uncertainty is mentioned in this test report, see chapter 9, but is not taken into account - neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong."



2.15. Radiated Emission Measurement Distance

The measurement antenna is in the far field of the EUT per formula $2D^2/\lambda$, where D is the larger between the dimension of the measurement antenna and the transmitting antenna of the EUT. In this case, “D” is the largest dimension of the measurement antenna. The EUT is manipulated through all orthogonal planes representative of its typical use and for both polarities of the measurement antenna in order to achieve the highest signal level. The worst-case position found was used for all radiated testing.

Frequency Range [GHz]	Wavelength [centimetres]	Far Field Distance [meters]	Measurement Distance [meters]
18 – 40	0.750	0.65	1.00
40 – 60	0.522	0.97	1.00
60 – 90	0.322	0.69	1.00
90 – 140	0.210	0.52	1.00
140 – 220	0.148	0.37	1.00
220 – 325	0.101	0.24	1.00

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

CQC Internet of Vehicles Technical Service (Shenzhen) Co., Ltd.
Building G5, TCL International E City, Xili Street, Nanshan District, Shenzhen, China
CQC-IVTS A2LA Certification Number: 6645.01;

3.2. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C
Lative Humidity	55 %
Air Pressure	989 hPa

3.3. Test Description

Test Specification Clause	Test Case	Temperature Condition	Power Supply	PASS	FAIL	NA	NP	Results
FCC Part 15C § 15.249 (a) RSS-210 B.10 (a)	Field strength of emissions (wanted signal)	Nominal	Nominal	☒	☐	☐	☐	
RSS-Gen	Occupied bandwidth (20dB)	Nominal	Nominal	☒	☐	☐	☐	
§2.1049 RSS-Gen	Occupied bandwidth (99%)	Nominal	Nominal	☒	☐	☐	☐	
§15.209(a) §15.249(a) (d) RSS-210 B.10 (a) (b) RSS-Gen	Field strength of emissions (spurious & harmonics)	Nominal	Nominal	☒	☐	☐	☐	
§15.207 RSS-Gen	AC power-line conducted emissions limits	Nominal	Nominal	☐	☐	☒	☐	
§15.203 RSS-Gen	Antenna requirement	-/-	-/-	☒	☐	☐	☐	

Remark:1. NA means “not applicable”; NP means Not Performed;
2.The measurement uncertainty is not included in the test result.

According to KDB 484596 D01 Referencing Test Data v01, the difference of model: NBIQ2KUS (FCC ID: 2AOT9-NBIQ2KUS / IC: 28201-NBIQ2KUS) and model: NBIQ4KUS (FCC ID: 2AOT9-NBIQ4KUS / IC: 28201-NBIQ4KUS) are SoC Chip, Front Sensor, Cabin Sensor, Front Lens difference, this changes not effect Radar sensor Radio parameters. Model: NBIQ2KUS (FCC ID: 2AOT9-NBIQ2KUS / IC: 28201-NBIQ2KUS) test report (Test Report No. CQC-IVTS-2023-00285) will referencing test data from original model: NBIQ4KUS (FCC ID: 2AOT9-NBIQ4KUS / IC: 28201-NBIQ4KUS) test report (Test Report No.: CQC-IVTS-2023-00188) after spot check Field strength of emissions (wanted signal), Occupied bandwidth (20dB), Occupied bandwidth (99%), worst case of Field strength of emissions (spurious &harmonics), model NBIQ2KUS spot check values not higher than model NBIQ4KUS; Model: NBIQ2KUS (FCC ID: 2AOT9-NBIQ2KUS / IC: 28201-NBIQ2KUS) test report (Test Report No. CQC-IVTS-2023-00285) will referencing test data from original model: NBIQ4KUS (FCC ID: 2AOT9-NBIQ4KUS / IC: 28201-NBIQ4KUS) test report (Test Report No.: CQC-IVTS-2023-00188) as;
Field strength of emissions (wanted signal), Occupied bandwidth (20dB), Occupied bandwidth (99%) and Field strength of emissions (spurious &harmonics).

3.4. Statement of The Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was

calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the CQC Internet of Vehicles Technical Service (Shenzhen) Co., Ltd..quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CQC Internet of Vehicles Technical Service (Shenzhen) Co., Ltd.:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.90 dB	(1)
Radiated Emission	1~6GHz	4.20 dB	(1)
Radiated Emission	6~18GHz	4.50 dB	(1)
Radiated Emission	18-40GHz	5.42 dB	(1)
Radiated Emission	Above 40 GHz	5.50 dB	(1)
Conducted Disturbance	0.15~30MHz	3.30 dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3.5. Equipments Used during the Test

Radiated Emission						
Item	Test Equipment	Manufacturer	Model No.	Equipment No.	Last Cal.	Cal.Due
1	EMI Test Receiver	R&S	ESW26	103003	2022/08/25	2023/08/24
2	Spectrum Analyzer	R&S	FSW43	10182	2022/08/25	2023/08/24
3	Ultra-Broadband Antenna	Schwarzbeck	VULB9168	1291	2021/09/05	2024/09/04
4	Horn Antenna	ETS-Lindgren	3117	102732	2021/09/05	2024/09/04
5	Amplifier	R&S	SCU01F	100369	2022/08/25	2023/08/24
6	Amplifier	R&S	SCU18F	100868	2022/08/25	2023/08/24
7	Amplifier	R&S	SCU26F	100781	2022/08/25	2023/08/24
8	Amplifier	R&S	SCU40F	102713	2022/08/25	2023/08/24
8	Horn Antenna	A-INFO	LB-180500H-2.4F	2110081000089	2021/09/05	2024/09/04
9	EMI Test Software	R&S	EMC32	N/A	N/A	N/A
10	TC-RX50	Tonscond	Receive Unit	1544	N/A	N/A
11	TC-RX75	Tonscond	Receive Unit	1545	N/A	N/A
12	TC-RX110	Tonscond	Receive Unit	1546	N/A	N/A
13	TC-RX170	Tonscond	Receive Unit	1547	N/A	N/A
14	TC-RX240	Tonscond	Receive Unit	1548	N/A	N/A
15	TC-RX40	Tonscond	Receive Unit	1543	N/A	N/A
16	Antenna Mast	Maturo	BAM4.0	N/A	N/A	N/A
17	Turntable	Maturo	TT3.5	N/A	N/A	N/A
18	Loop Antenna	R&S	HFH2-Z2E	101066	2021/09/05	2024/09/04

4. TEST CONDITIONS AND RESULTS

4.1. Field Strength of Emissions

4.1.1. LIMITS

(a) According to § 15.249(a) and RSS-210 B.10 (a): Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency (MHz)	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902 – 928	50	500
2400 – 2482.5	50	500
5725 – 5875	50	500
24000 – 24250	250	2500

(b) According to § 15.249(c) and RSS-210 B.10 (a):Field strength limits are specified at a distance of 3 meters.:

(c) According to § 15.249(d): Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

(d) According to RSS-210 B.10 (b): Emissions radiated outside of the specified frequency bands, except for harmonic emissions, shall be attenuated by at least 50 dB below the level of the fundamental emissions or to the general field strength limits listed in RSS-Gen, whichever is less stringent.

(e) According to § 15.249(b): Fixed, point-to-point operation as referred to in this paragraph shall be limited to systems employing a fixed transmitter transmitting to a fixed remote location. Point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information are not allowed. Fixed, point-to-point operation is permitted in the 24.05–24.25 GHz band subject to the following conditions:

(1) The field strength of emissions in this band shall not exceed 2500 millivolts/meter.

(2) The frequency tolerance of the carrier signal shall be maintained within ±0.001% 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.

(3) Antenna gain must be at least 33 dBi. Alternatively, the main lobe beamwidth must not exceed 3.5 degrees. The beamwidth limit shall apply to both the azimuth and elevation planes. At antenna gains over 33 dBi or beamwidths narrower than 3.5 degrees, power must be reduced to ensure that the field strength does not exceed 2500 millivolts/meter.

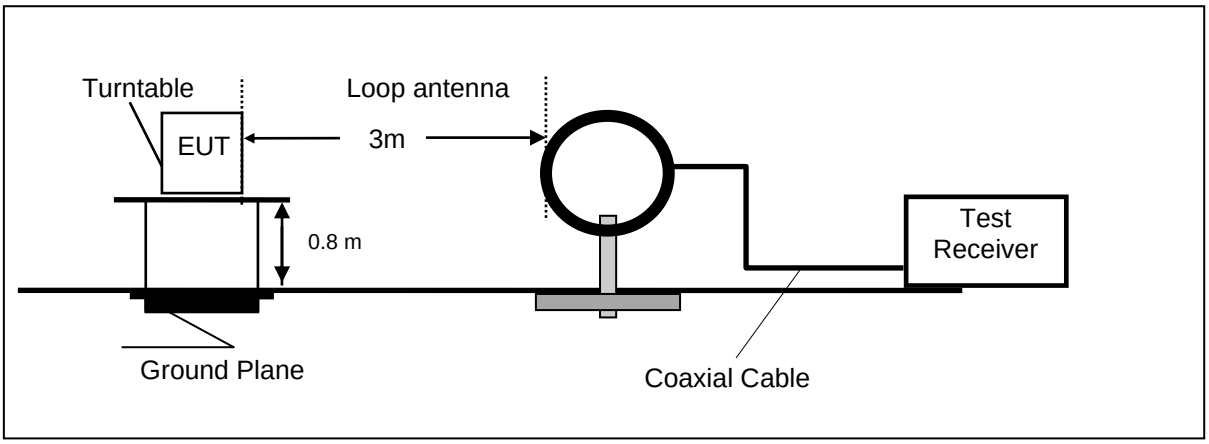
Frequency (MHz)	**Distance (Meters)**	**Radiated (dBμV/m)**	**Radiated (μV/m)**
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

(1) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209 and RSS-Gen, whichever is the lesser attenuation.

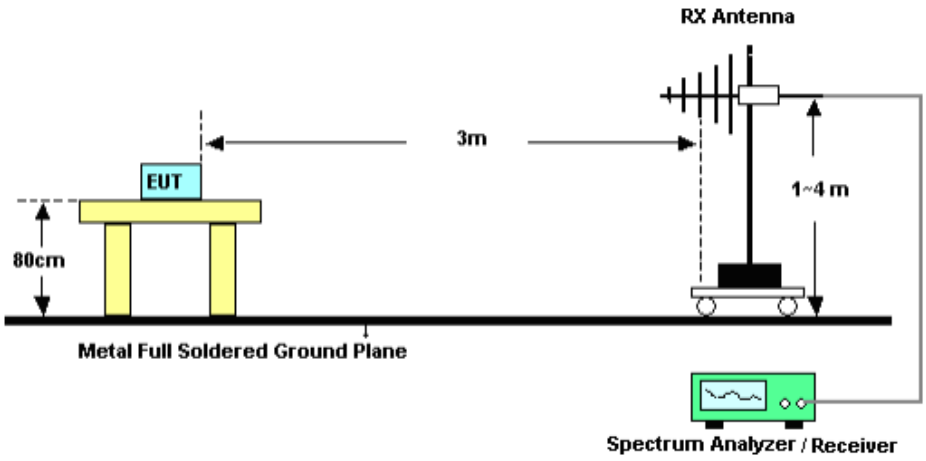
(2) The emission limits shown above are based on measurement instrumentation employing an average detector. The provisions in § 15.35 and RSS-Gen for limiting peak emissions apply.

4.1.2. TEST CONFIGURATION

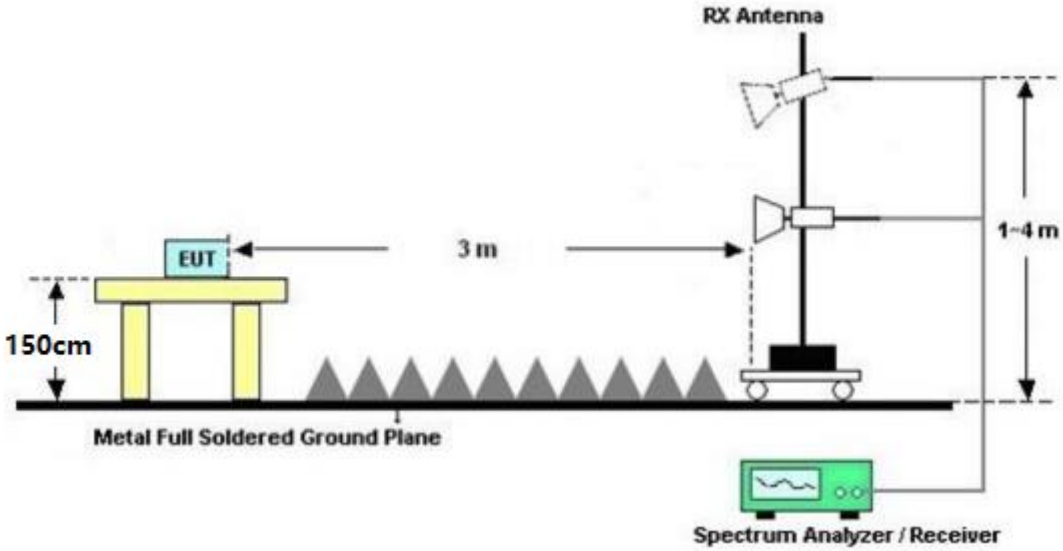
(a) Frequency range 9 KHz – 30MHz



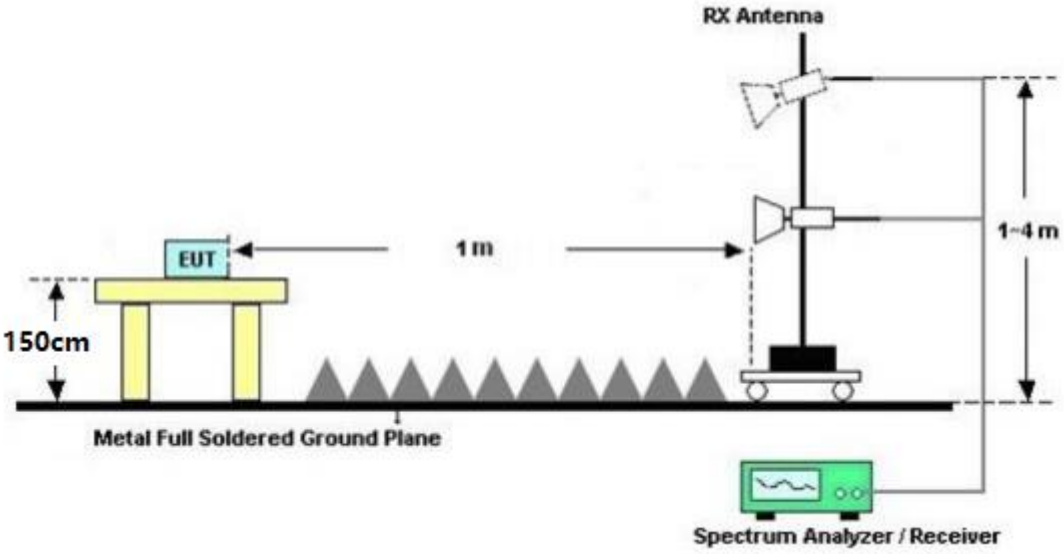
(b) Radiated emission test set-up, frequency range: 30 - 1000MHz



(c) Radiated emission test set-up, frequency range 1GHz – 18 GHz



(d) Radiated emission test set-up, frequency range above 18GHz



4.1.3. TEST PROCEDURE

4.1.3.1 Sequence of testing radiated spurious 9 KHz to 30 MHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer
- If the EUT is a tabletop system, 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measuremet distance is 3m (see ANSI C63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0 degree to 360 degree.
- The antenna height is 1m.
- Set RBW = 200 Hz / VBW = 1 KHz, sweep time: Auto
- At each turntable position the anzlyer sweeps with position-peak detector to find the maximum of all emissions.

Final measurement

- Identified emissions during the premeaurement are maximized by the software by rotating the turntable from 0 degree to 360 degree.
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, conrrection factor, margin to the limit and limit will be recorded. A plot with the graph of the measurement and the limit is stored.

4.1.3.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer
- If the EUT is a tabletop system, 0.8 m height is used, which is placed on the ground plance.
- If the EUT is a floor standing device, it is placed directly on the ground plane.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measuremet distance is 3m (see ANSI C63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0 degree to 360 degree.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1m to 4m.
- Set RBW = 120 KHz / VBW = 1 MHz, sweep time: Auto
- At each turntable position the anzlyer sweeps with position-peak detector to find the maximum of all emissions.

Final measurement

- The final neasurement is perormed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, conrrection factor, margin to the limit and limit will be recorded. A plot with the graph of the measurement and the limit is stored.

4.1.3.3 Sequence of testing radiated spurious 1 GHz to 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer
- If the EUT is a tabletop system, 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turntable.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measuremet distance is 3m (see ANSI C63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0 degree to 360 degree.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1m to 4m.
- Set RBW = 1 MHz / VBW = 3 MHz, sweep time: Auto, detector: Peak for Peak, RBW = 1 MHz / VBW = 3 MHz, sweep time: Auto, detector: Average for Average.
- At each turntable position the anzlyer sweeps with position-peak detector to find the maximum of all emissions.

Final measurement

- The final neasurement us perormed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable and antenna height between 1 and 4 m.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the height emissions with Peak and Average detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, conrrection factor, margin to the limit and limit will be recorded. A plot with the graph of the measurement and the limit is stored.

4.1.3.4 Sequence of testing radiated spurious above 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer
- If the EUT is a tabletop system, 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turntable.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measuremet distance is 1m (see ANSI C63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0 degree to 360 degree.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1m to 4m.
- Set RBW = 1 MHz / VBW = 3 MHz, sweep time: Auto, detector: Peak for Peak, RBW = 1 MHz / VBW = 3 MHz, sweep time: Auto, detector: Average for Average.
- At each turntable position the anzlyer sweeps with position-peak detector to find the maximum of all emissions.

Final measurement

- The final neasurement is perormed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable and antenna height between 1 and 4 m.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the height emissions with Peak and RMS detector (as described in ANSI C 63.4).
- All final levels should consider distance conversion factor as format: Final values (3 m) = Measurement values (1 m) + Distance conversion factor
  Distance conversion factor = 20 x Log_{10} (d/3), where d = measurement distance in m
  - Distance conversion factor = 20 x Log_{10} (1/3) = -9.54 [dB]
- Final levels, frequency, measuring time, bandwidth, turntable position, conrrection factor, margin to the limit and limit will be recorded. A plot with the graph of the measurement and the limit is stored.

4.1.3.5 Sequence of testing radiated spurious above 40 GHz with external mixers

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer
- If the EUT is a tabletop system, 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turntable.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measuremet distance is 1m (see ANSI C63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0 degree to 360 degree.
- The antenna with external mixer is polarized vertical and horizontal.
- The antenna height changes from 1m to 4m.
- Set RBW = 1 MHz / VBW = 3 MHz, sweep time: Auto, detector: Peak for Peak, RBW = 1 MHz / VBW = 3 MHz, sweep time: Auto, detector: Average for Average.
- At each turntable position the anzlyer sweeps with position-peak detector to find the maximum of all emissions.

Final measurement

- The final neasurement is perormed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable and antenna height between 1 and 4 m.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the height emissions with Peak and RMS detector (as described in ANSI C 63.4).
- All final levels should consider distance conversion factor as format: Final values (3 m) = Measurement values (1 m) + Distance conversion factor
  Distance conversion factor = 20 x Log_{10} (d/3), where d = measurement distance in m
  - Distance conversion factor = 20 x Log_{10} (1/3) = -9.54 [dB]
- Final levels, frequency, measuring time, bandwidth, turntable position, conrrection factor, margin to the limit and limit will be recorded. A plot with the graph of the measurement and the limit is stored.

4.1.4. FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS (dBuV/m) = RA (dBuV) + AF (dB/m) + CL (dB) – AG (dB)

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

4.1.5. TEST RESULTS

EIRP measurements were ensured to be taken in the Far-Field test distance are shown in Section 2.15.

<u>Sample Calculations</u>

Calculating Field Strength from substitution power:

$$E(dBuV/m) = 126.8 - 20\log(\lambda) + P - G$$

Where;
E is the field strength of the emission at the measurement distance, in dBuV/m
P is the power measured at the output of the test antenna, in dBm; where P includes all applicable instrument correction factors up to the connections to the test antenna.
λ is the wavelength of the emission under investigation [300 / f_{MHz}], in m.
G is the gain of the test antenna, in dBi.

Calculating EIRP from Field Strength;

$$EIRP_{[dBm]} = E_{measurement} + 20\log(D_{measured}) - 104.7$$

Where;
EIRP is the equivalent isotropic radiated power in dBm
$E_{measured}$ is the field strength of the emission at the measurement distance, in dBuV/m
$D_{measured}$ is the measurement distance in meters.

74 dBuV/m @ 3m measurement distance = -21.250 dBm @ 1m measurement distance
54 dBuV/m @ 3m measurement distance = -41.250 dBm @ 1m measurement distance
Harmonics level 2500 uV/m @ 3m measurement distance = 67.96 dBuV/m @ 3m measurement distance = -27.27 dBm @ 1m measurement distance
87.96 dBuV/m @ 3m measurement distance = -7.27 dBm @ 1m measurement distance

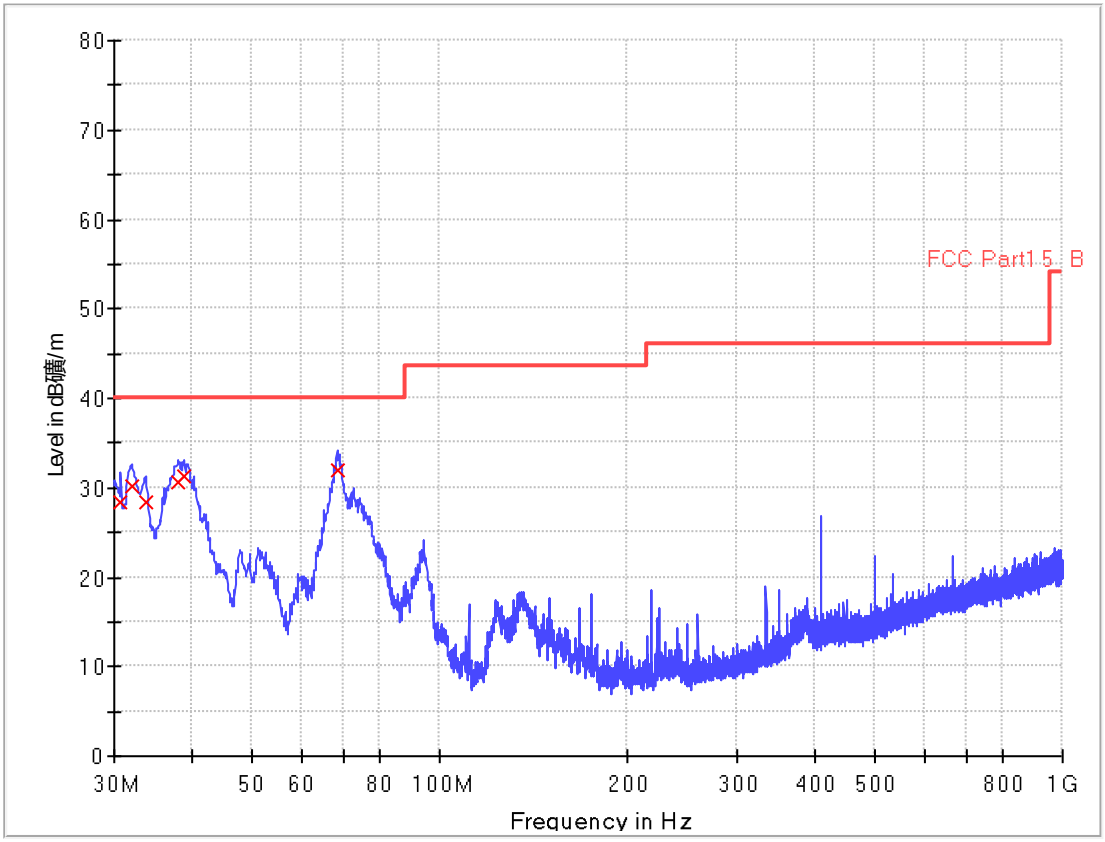
PASS

Remark:

1. Not recorded values after pre-test below 30 MHz (9 KHz – 30 MHz), values at least 20 dB below limit.

Test Condictions	EUT/Antenna Orientation	Maximum Field Strength [dBuV/m @ 3m]				Test Results
		Peak	Peak Limit	Average	Average Limit	
T_{nom} / V_{nom}	X/H&V	95.93	127.96	72.93	107.96	PASS

Plots No. 1: 30 MHz to 1 GHz, Horizontal / Vertical Polarization



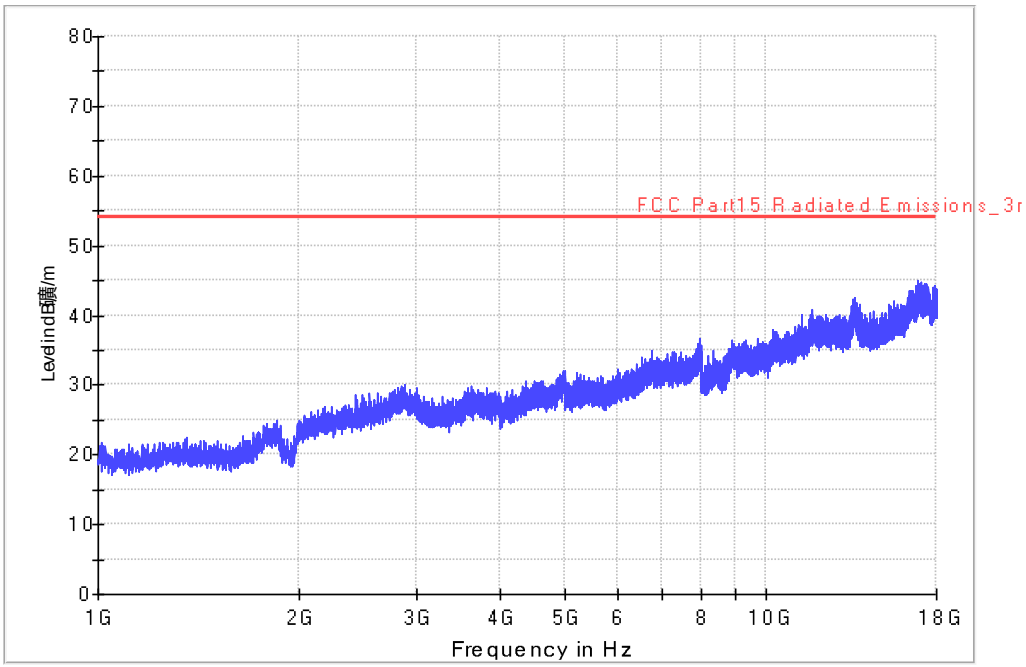
Limit and Margin

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)
30.760000	28.4	1000.0	120.000	100.0	V	0.0	-25.1	11.6
32.040000	30.1	1000.0	120.000	100.0	V	0.0	-25.1	9.9
33.680000	28.5	1000.0	120.000	100.0	V	0.0	-25.0	11.5
37.960000	30.7	1000.0	120.000	100.0	V	0.0	-24.5	9.3
38.840000	31.3	1000.0	120.000	100.0	V	0.0	-24.4	8.7
68.400000	32.1	1000.0	120.000	100.0	V	0.0	-26.9	8.0

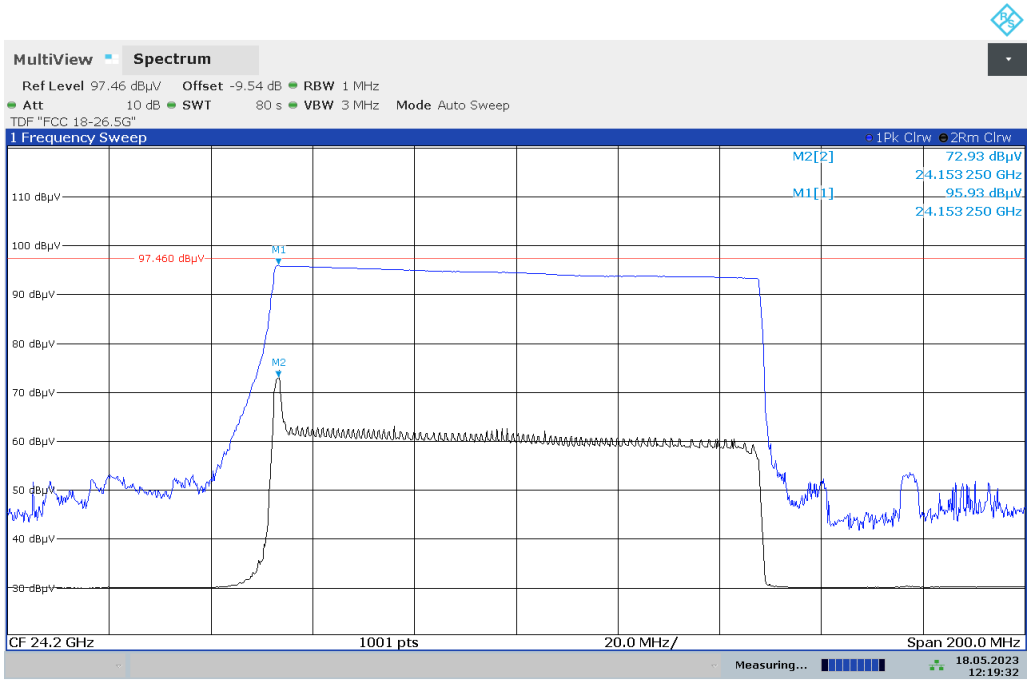
(continuation of the "Limit and Margin" table from column 15 ...)

Frequency (MHz)	Limit - QPK (dBµV/m)	Comment
30.760000	40.0	
32.040000	40.0	
33.680000	40.0	
37.960000	40.0	
38.840000	40.0	
68.400000	40.0	

Plots No. 2: 1 GHz to 18 GHz, Horizontal / Vertical Polarization

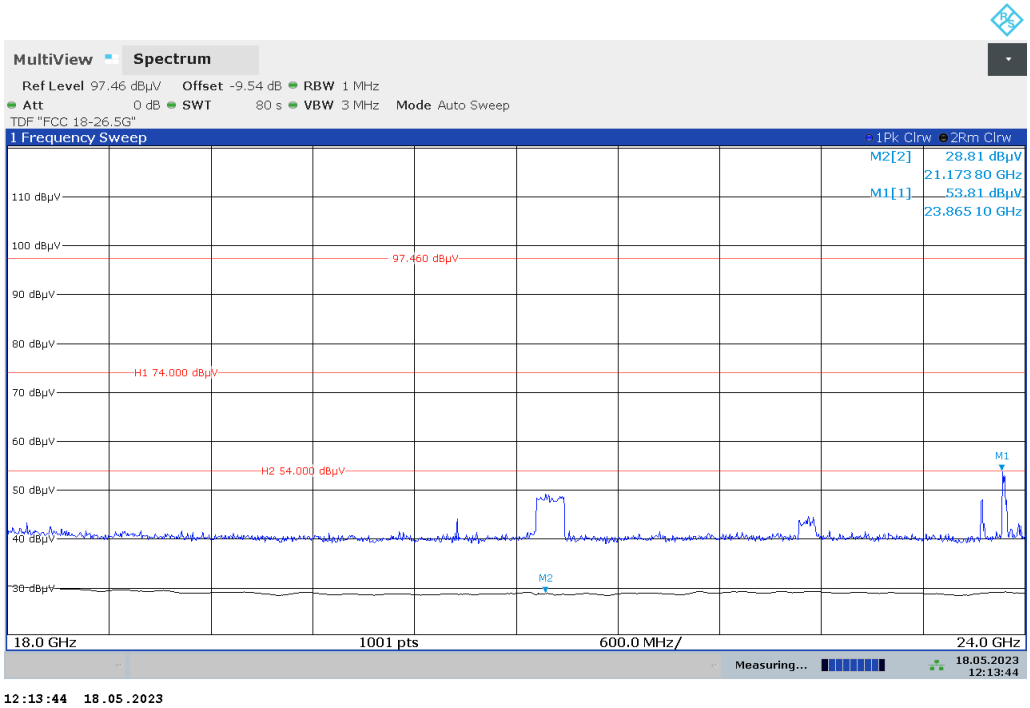


Plots No. 3: Radiated Maximum Field Strength, Horizontal / Vertical Polarization



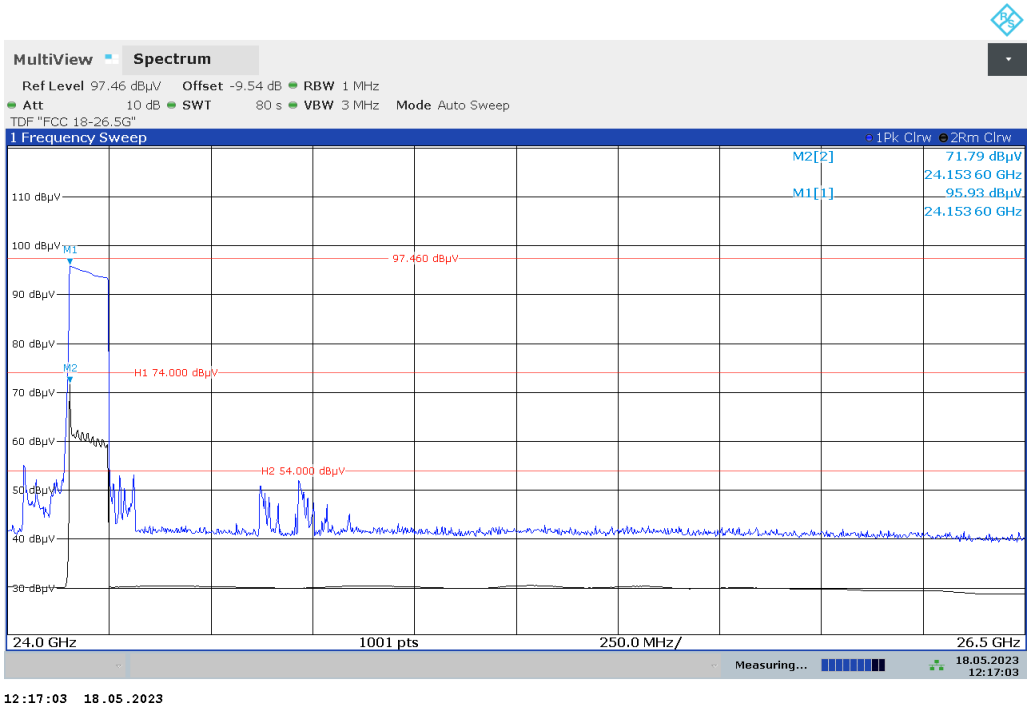
12:19:32 18.05.2023

Plots No. 4: Radiated Lower Band-edge, Horizontal / Vertical Polarization



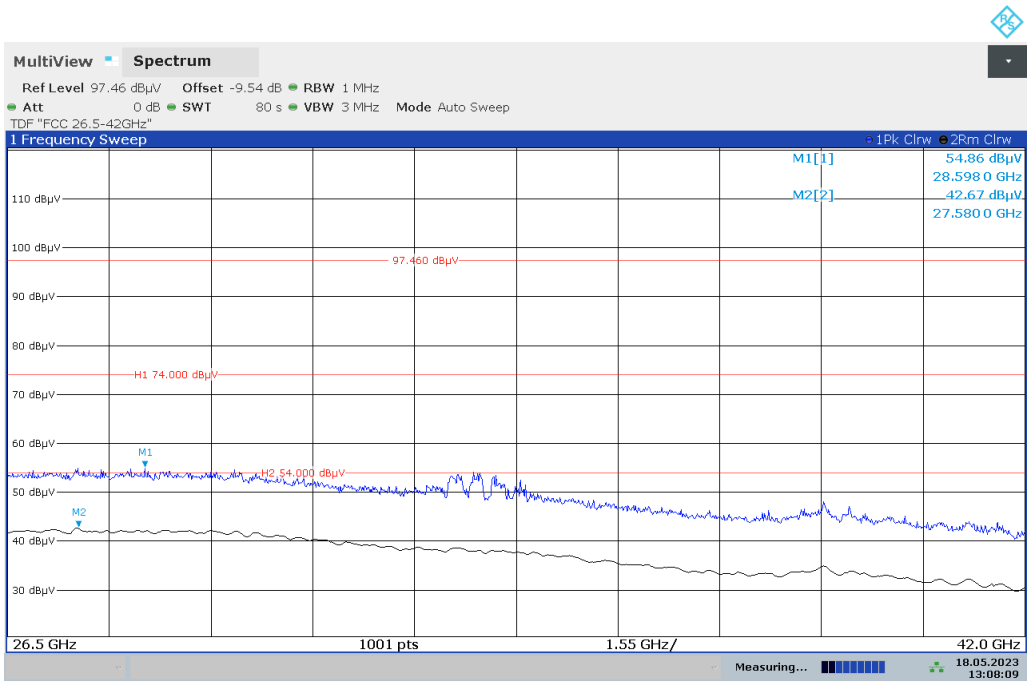
12:13:44 18.05.2023

Plots No. 5: Radiated Higher Band-edge, Horizontal / Vertical Polarization



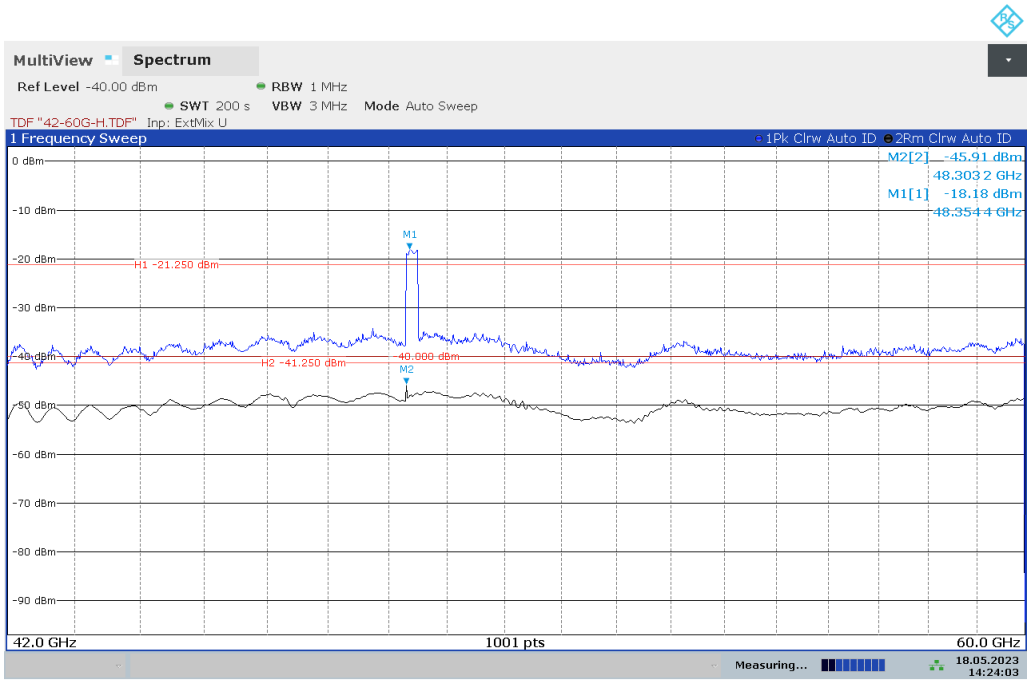
12:17:03 18.05.2023

Plots No. 6: 26.5 GHz to 42 GHz, Horizontal / Vertical Polarization



13:08:09 18.05.2023

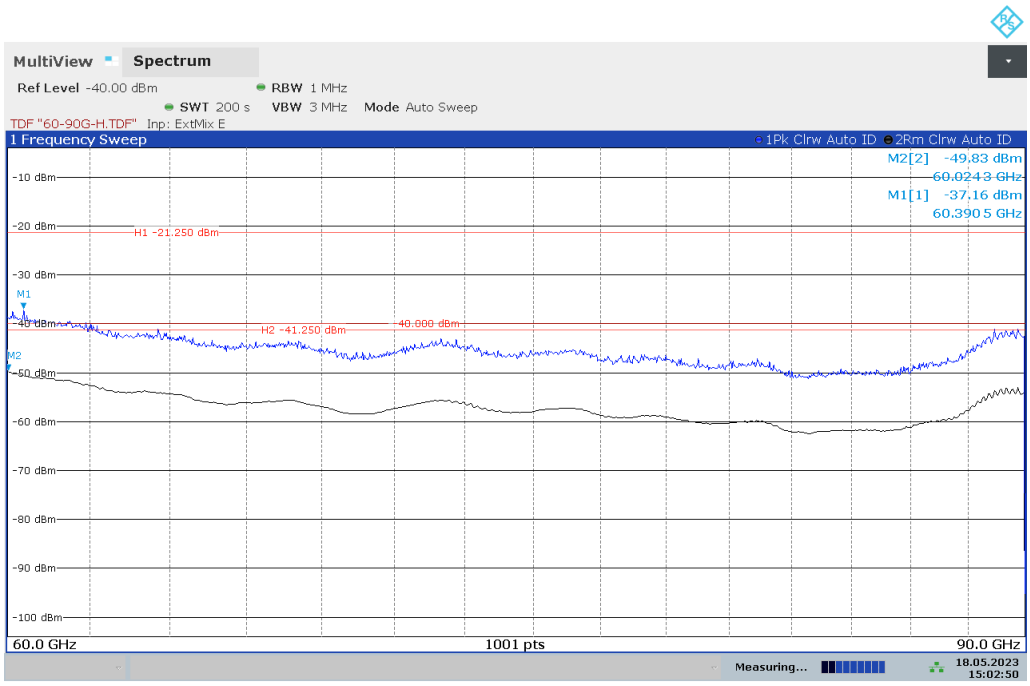
Plots No. 7: 42 GHz to 60 GHz, Horizontal / Vertical Polarization



14:24:03 18.05.2023

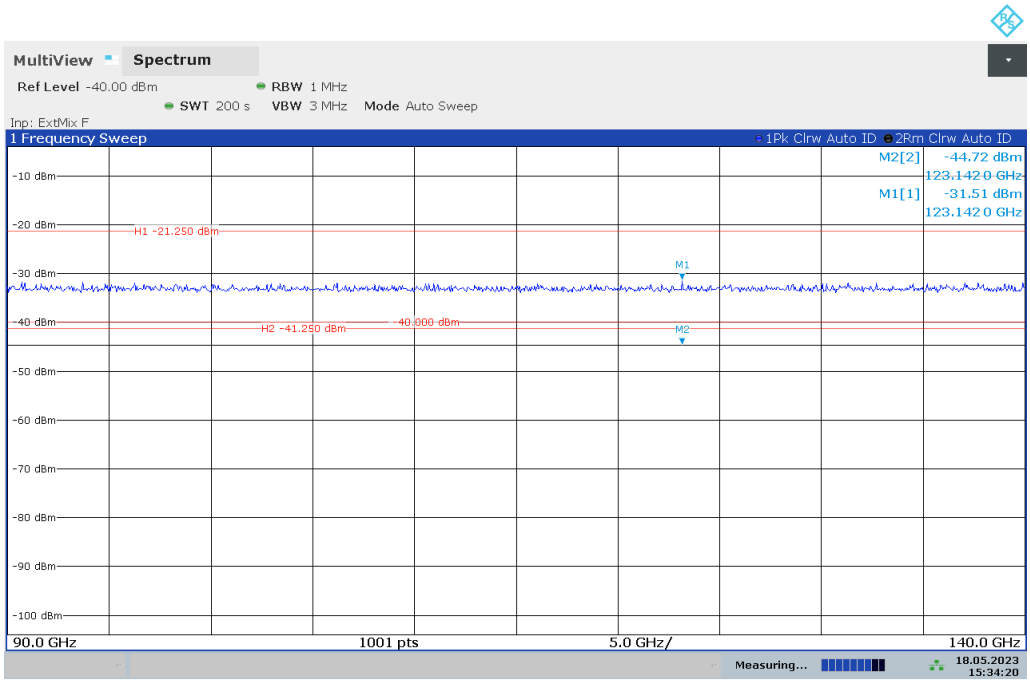
Note: Harmonics limit is -7.27 dBm (Peak mode) and -27.27 dBm (Average mode)

Plots No. 8: 60 GHz to 90 GHz, Horizontal / Vertical Polarization



15:02:50 18.05.2023

Plots No. 9: 90 GHz to 140 GHz, Horizontal / Vertical Polarization



15:34:20 18.05.2023

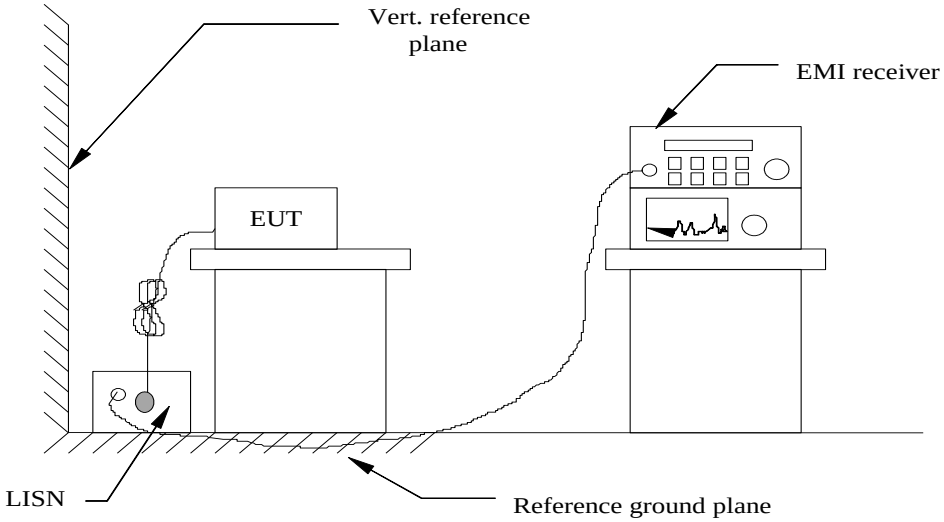
4.2. AC Conducted Emission

4.2.1. LIMITS OF DISTURBANCE

According to RSS Gen 8.8 and § 15.207(a) Line Conducted Emission Limits is as following:

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

4.2.2. TEST CONFIGURATION



4.2.3. TEST PROCEDURE

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
2. Support equipment, if needed, was placed as per ANSI C63.10-2013
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
4. The EUT received DC 12V power from adapter, the adapter received AC120V/60Hz and AC 240V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipment received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50-ohm load; the second scan had Line 1 connected to a 50-ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

4.2.4. DISTURBANCE CALCULATION

The AC mains conducted disturbance is calculated by adding the 10dB Pulse Limiter and Cable Factor and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

CD (dBuV) = RA (dBuV) + PL (dB) + CL (dB)

Where CD = Conducted Disturbance	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	PL = 10 dB Pulse Limiter Factor

4.2.5. TEST RESULTS

N/A*

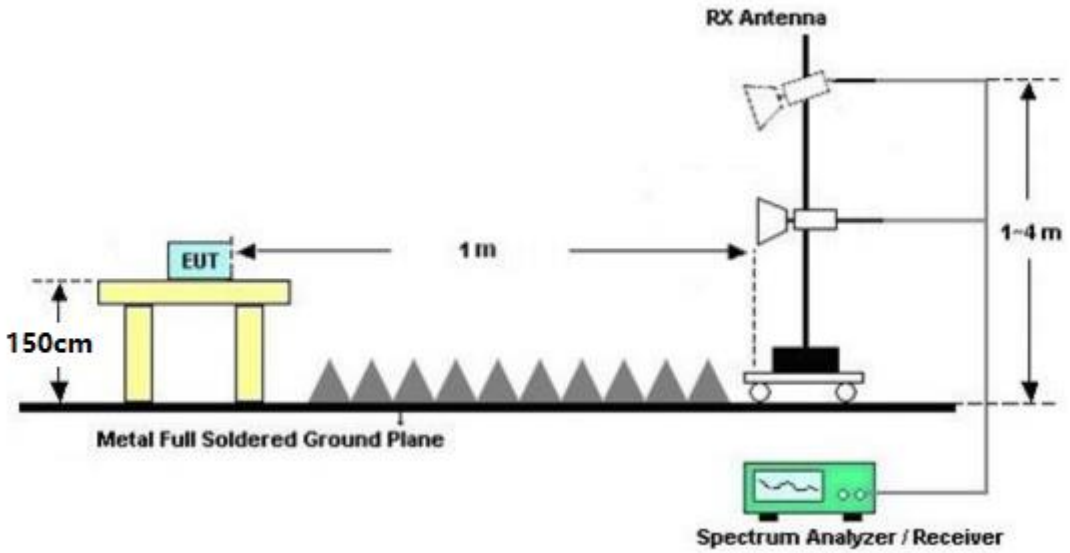
Not Applicable as powered by DC source.

4.3. Occupied Bandwidth (99% Bandwidth)

4.3.1. LIMITS

The occupied bandwidth is defined as the 99% bandwidth.
According to § 2.1049 and RSS-Gen section 6.7: The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

4.3.2. TEST CONFIGURATION



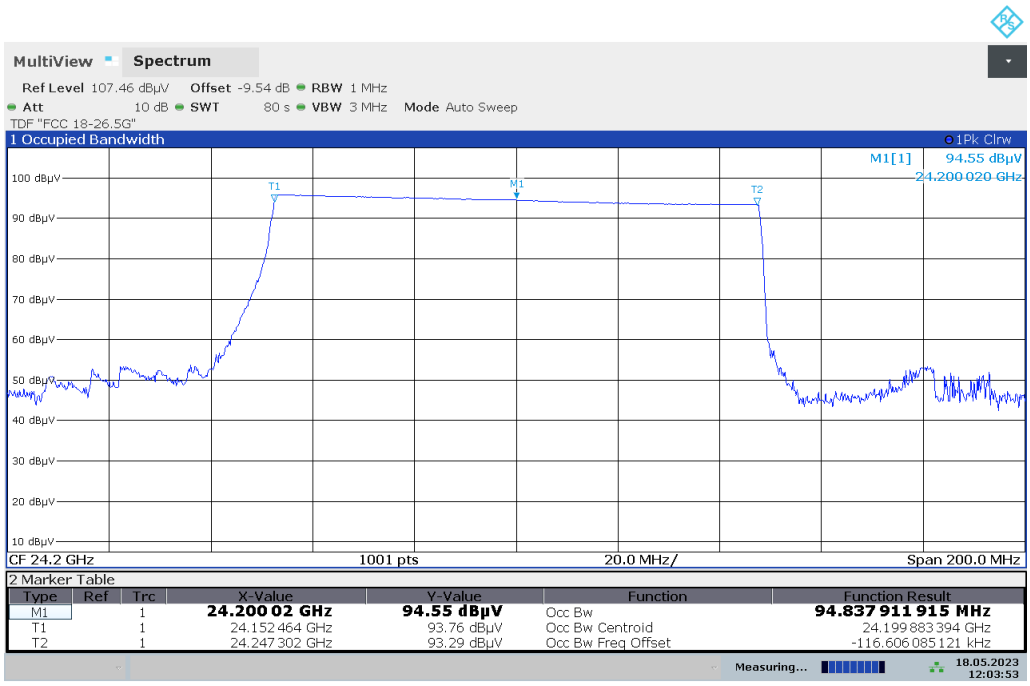
4.3.3. TEST PROCEDURE

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer
- If the EUT is a tabletop system, 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turntable.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measuremet distance is 1m (see ANSI C63.4) – see test details.
- EUT is set into operation.
- The turntable rotates from 0 degree to 360 degree.
- The antenna with external mixer is polarized vertical and horizontal.
- The antenna height changes from 1m to 4m.
- Set the resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

4.3.4. TEST RESULTS

Test Condictions	EUT/Antenna Orientation	Occupied Bandwidth (99%) [MHz]	Test Results
T_{nom} / V_{nom}	X/H&V	94.84	PASS

Plots No. 10: 99% Occupied Bandwidth, Horizontal / Vertical Polarization



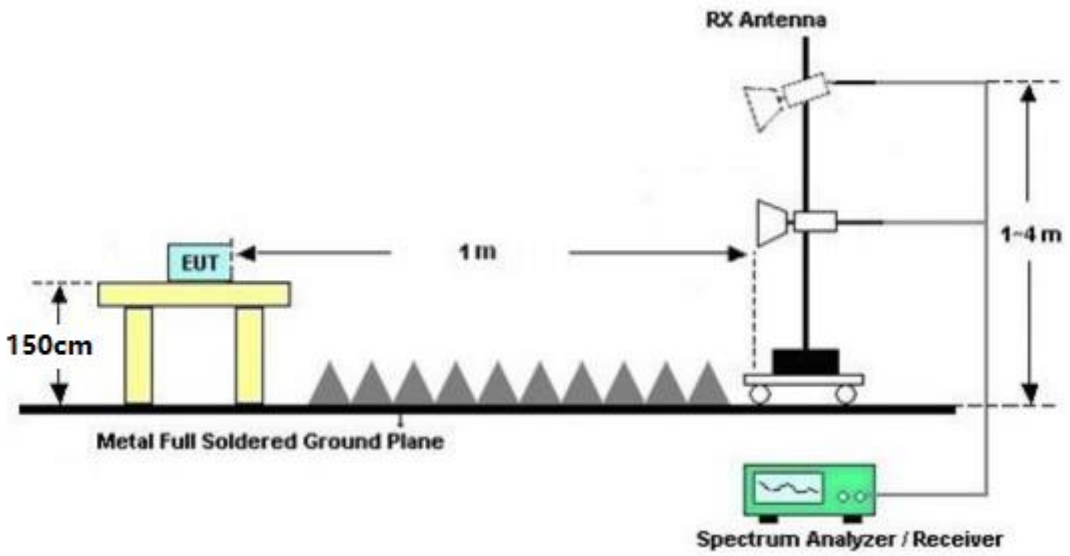
Notes: The RBW was set to 1.05% of OBW. (1 MHz / 94.838 MHz) x 100% = 1.05%

4.4. 20dB Bandwidth

4.4.1. LIMITS

According to § 15.215 (c): Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

4.4.2. TEST CONFIGURATION



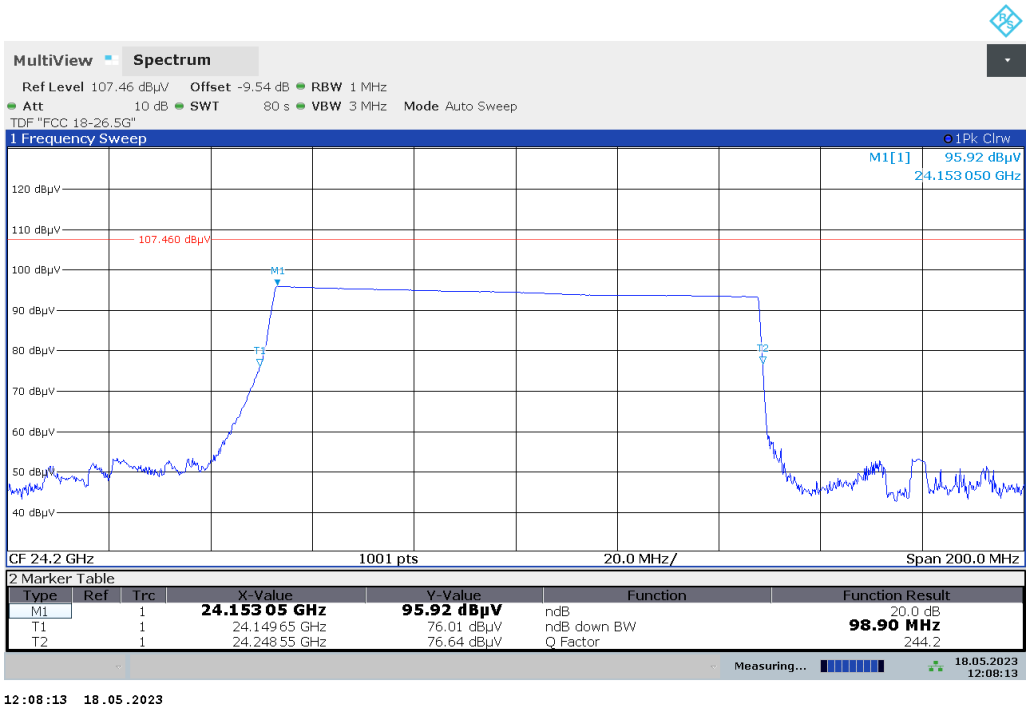
4.4.3. TEST PROCEDURE

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer
- If the EUT is a tabletop system, 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turntable.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measuremet distance is 1m (see ANSI C63.4) – see test details.
- EUT is set into operation.
- The turntable rotates from 0 degree to 360 degree.
- The antenna with external mixer is polarized vertical and horizontal.
- The antenna height changes from 1m to 4m.
- Set the resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

4.4.4. TEST RESULTS

Test Condictions	EUT/Antenna Orientation	20dB Bandwidth					Test Results
		F_L [GHz]	F_L Limit [GHz]	F_H [GHz]	F_H Limit [GHz]	20dB Bandwidth [MHz]	
T_{nom} / V_{nom}	X/H&V	24.14965	24.00	24.24855	24.25	98.90	PASS

Plots No. 11: 20dB Bandwidth, Horizontal / Vertical Polarization



Notes: The 20 dB bandwidth of the emission is contained within the frequency band.

4.5. Antenna Requirement

4.5.1. REQUIREMENT

According to § 15.203 and RSS-Gen: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited

4.5.2. VERDICT

The EUT has an internal antenna which is not user accessible. Hence it compliances with the antenna requirements.

6. External and Internal Photos of the EUT

External Photos

Pleae refer separate external of the EUT.

Internal Photos

Pleae refer separate internal of the EUT.

Annex A Model Difference Declaration Letter

Portable Multimedia Ltd

Unit 2, Caerphilly Business Park, Van Road, Caerphilly.Mid Glamorgan, CE83 3ED.

Date: April 21, 2023

Product Equality Declaration

We, Portable Multimedia Ltd, declare on our sole responsibility for the product NBIQ1KUS, NBIQ2KUS and NBIQ4KUS, The differences for these models are: model name, SOC chip, front sensor, cabin sensor and front lens. Please refer to the table below for details:

Model \ Item	SoC Chip	Front Sensor	Cabin Sensor	Front Lens
NBIQ1KUS	CV22A35	OS02H10	OS02H10	TRC-2117D6-02+H1910
NBIQ2KUS	CV22A75	OS04C10	OS04C10	TRC-2117D6-02+H1910
NBIQ4KUS	CV22A85	OS08A20	OS04C10	TRC-1011D25-02+H1902

Except listings above, the others are the same and has no effect on RF related parameters. The other part was evaluated and tested according to FCC/IC requirements.

Sincerely yours,

Contact Person: Keelan O'Connor
Company: Portable Multimedia Ltd
Tel: +44 (0) 290 20866429
E-Mail: keelan@nextbase.co.uk

Revision History

Revision	Issue Date	Revisions	Revised By
1.0	2023-06-27	Original Issue Referencing test data from original model: NBIQ4KUS (FCC ID: 2AOT9-NBIQ4KUS / IC: 28201-NBIQ4KUS) test report (Test Report No.: CQC-IVTS-2023-00188)	Wenliang Li

********** End of Report **********

DECLARATION

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.
If you have any questions on this report, please contact us within 15 days after issue this report.

CQC Internet of Vehicles Technical Service (Shenzhen) Co., Ltd.
Building G5, TCL International E City, Xili Street, Nanshan District, Shenzhen, China
Post: 518055
Phone: 0755-86189710
Fax: 0755-86189710
E-Mail：cvts-js@cqc.com.cn