Shenzhen GUOREN Certification Technology Service Co., Ltd.

101#, Building K & Building T, The Second Industrial Zone, Jiazitang Community, Fenghuang Street, Guangming District, Shenzhen, China

FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.249

Report Reference No.....:	**GRCTR250603033-01**
FCC ID..... :	**2BQNH-1024C**
Compiled by (position+printed name+signature)..:	Testing Engineer Jimmy Wang
Supervised by (position+printed name+signature)..:	Project Engineer Kelley Zhang
Approved by (position+printed name+signature)..:	Manager Sam Wang
Date of issue.....:	Jun. 26, 2025

Testing Laboratory Name .....:	**Shenzhen GUOREN Certification Technology Service Co., Ltd.**
Address .....:	101#, Building K & Building T, The Second Industrial Zone, Jiazitang Community, Fenghuang Street, Guangming District, Shenzhen, China
Applicant's name.....:	**CHONGQING AITE OPTICAL AND ELECTRONICS CO.,LTD.**
Address .....:	Building 24 (B6), No. 105 Semiconductor Industrial Park, Yunhan Road,Beibei Dist, Chongqing, China
Test specification .....:	
Standard .....:	**FCC Part 15.249**

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Test item description .....:	Launch Monitor
Trade Mark .....:	/
Manufacturer .....:	CHONGQING AITE OPTICAL AND ELECTRONICS CO.,LTD.
Model/Type reference.....:	1024C
Listed Models .....:	1024D,1024E,1024F,1024G,1024H,1024J,1024K,1024L
Firmware Version .....:	V1.0
Hardware Version.....:	V1.0
Ratings .....:	Input: 5V ⎓2A Battery: 3.7V 1800mAh 6.66Wh
Result.....:	**PASS**

T E S T R E P O R T

Equipment under Test	:	Launch Monitor
Model /Type	:	1024C
Listed Models	:	1024D,1024E,1024F,1024G,1024H,1024J,1024K,1024L
Applicant	:	**CHONGQING AITE OPTICAL AND ELECTRONICS CO.,LTD.**
Address	:	Building 24 (B6), No. 105 Semiconductor Industrial Park, Yunhan Road,Beibei Dist, Chongqing, China
Manufacturer	:	**CHONGQING AITE OPTICAL AND ELECTRONICS CO.,LTD.**
Address	:	Building 24 (B6), No. 105 Semiconductor Industrial Park, Yunhan Road,Beibei Dist, Chongqing, China

Test Result:	**PASS**

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.

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.249:Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHZ, and 24.0–24.25 GHz.
ANSI C63.10-2020: American National Standard for Testing Unlicensed Wireless Devices

2 SUMMARY

2.1 General Remarks

Date of receipt of test sample	:	Jun. 12, 2025
Testing commenced on	:	Jun. 12, 2025
Testing concluded on	:	Jun. 26, 2025

2.2 Product Description

Product Name:	Launch Monitor
Model/Type reference:	1024C
Listed Models:	1024D,1024E,1024F,1024G,1024H,1024J,1024K,1024L(The PCB board, circuit, structure and internal of these models are the same, Only model number and colour is different for these model.)
Power supply:	Input: 5V ⎓2A Battery: 3.7V 1800mAh 6.66Wh
Testing sample ID:	GRCTR250603033-1# (Engineer sample), GRCTR250603033-2# (Normal sample)
Frequency:	24.22 GHz
Number of Channels:	1 (Fxied)
Modulation Type:	FMCW modulation (CW only)
Antenna:	Microstrip Array Antenna Number of Antenna
Antenna gain*(Supplied by the customer):	11.84 dBi
Remark:*When the information provided by the customer was used to calculate test results, if the information provided by the customer is not accurate, shenzhen GUOREN Certification Technology Service Co., Ltd. does not assume any responsibility.	

2.3 Equipment Under Test

Power supply system utilised

Power supply voltage	:	○	230V / 50 Hz	○	120V / 60Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 5V From External Circuit

2.4 Short description of the Equipment under Test (EUT)

This is a Launch Monitor.
For more details, refer to the user's manual of the EUT.

2.5 EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

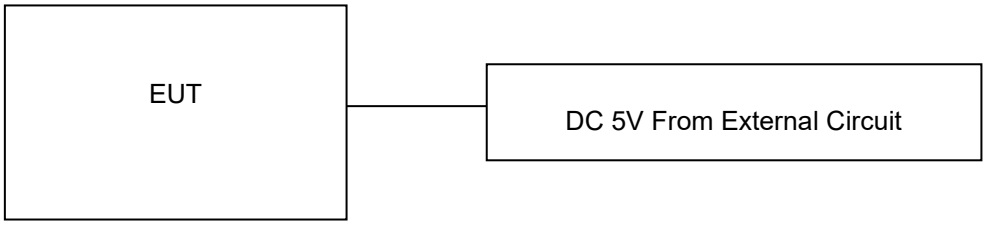
○ - supplied by the lab

○	Adapter	M/N:	TPA-83A050200CU01
		Manufacturer:	Tianyin

2.6 EUT Operation Mode

EUT operating mode no	Description of operating modes	Additional information
op. 1	Continuously transmitting and receiving mode	Carrier modulation (normal mode). 24.22 GHz, a continuous wave with 100% duty cycle

2.7 Block Diagram of Test Setup



2.8 Modifications

No modifications were implemented to meet testing criteria.

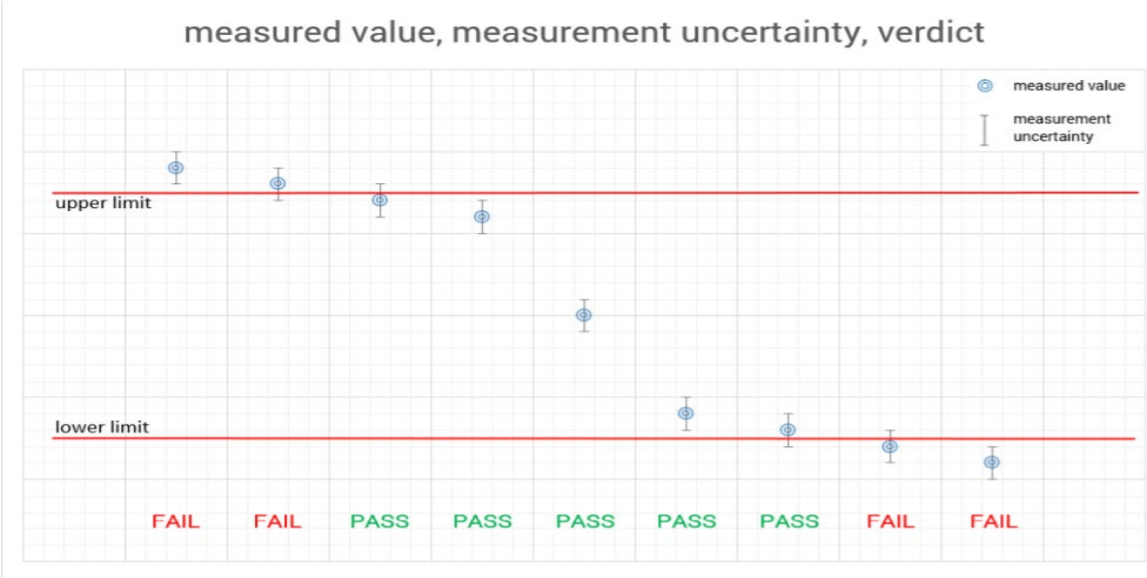
2.9 Formula for determination of correction values (Ec)

$E_C = E_R + AF + C_L + D_F - G_A$ (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.

2.10 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."



2.11 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

Shenzhen GUOREN Certification Technology Service Co., Ltd.
101#, Building K & Building T, The Second Industrial Zone, Jiazitang Community, Fenghuang Street, Guangming District, Shenzhen, China

3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 920798 Designation Number: CN1304

Shenzhen GUOREN Certification Technology Service Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA-Lab Cert. No.: 6202.01

Shenzhen GUOREN Certification Technology Service Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

ISED#: 27264 CAB identifier: CN0115
Shenzhen GUOREN Certification Technology Service Co., Ltd. has been listed by Innovation, Science and Economic Development Canada to perform electromagnetic emission measurement.

CNAS-Lab Code: L15631
Shenzhen GUOREN Certification Technology Service Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories for the Competence of Testing and Calibration Laboratories.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

3.3 Environmental conditions

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

Normal Temperature	15-35 ℃
Relative Humidity	30-60 %
Air Pressure	950-1050mbar

3.4 Summary of measurement results

Test Specification Clause	Test Case	Temperature Condition	Power Supply	PASS	FAIL	NA	NP	Results
FCC Part 15C § 15.249 (a)	Field strength of emissions (wanted signal)	Nominal	Nominal	☒	☐	☐	☐	
FCC Part 15.215(c)	Occupied bandwidth (20dB)	Nominal	Nominal	☒	☐	☐	☐	
§2.1049	Occupied bandwidth (99%)	Nominal	Nominal	☒	☐	☐	☐	
§15.209(a) §15.249(a) (d)	Field strength of emissions (spurious & harmonics)	Nominal	Nominal	☒	☐	☐	☐	
§15.207	AC power-line conducted emissions limits	Nominal	Nominal	☒	☐	☐	☐	
§15.203	Antenna requirement	-/-	-/-	☒	☐	☐	☐	

Remark:
1. The measurement uncertainty is not included in the test result.
2. We tested all test mode and recorded worst case in report.
3. N/A means “not applicable”.

3.5 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 Shenzhen GUOREN Certification Technology Service 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 Shenzhen GUOREN Certification Technology Service Co., Ltd.:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.06 dB	(1)
Radiated Emission	1~18GHz	5.14 dB	(1)
Radiated Emission	18-40GHz	5.38 dB	(1)
Radiated Emission	Above 40 GHz	5.52 dB	(1)
Conducted Disturbance	0.15~30MHz	2.14 dB	(1)

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

3.6 Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Equipment No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	GRCTEE009	2024/09/19	2025/09/18
LISN	R&S	ENV216	GRCTEE010	2024/09/19	2025/09/18
EMI Test Receiver	R&S	ESPI	GRCTEE017	2024/09/19	2025/09/18
EMI Test Receiver	R&S	ESCI	GRCTEE008	2024/09/19	2025/09/18
Spectrum Analyzer	Agilent	N9020A	GRCTEE002	2024/09/19	2025/09/18
Spectrum Analyzer	R&S	FSP	GRCTEE003	2024/09/20	2025/09/19
Spectrum Analyzer	R&S	FSW43	GRCTEE063	2024/09/19	2025/09/18
Vector Signal generator	Agilent	N5181A	GRCTEE007	2024/09/19	2025/09/18
Analog Signal Generator	R&S	SML03	GRCTEE006	2024/09/19	2025/09/18
Climate Chamber	QIYA	LCD-9530	GRCTES016	2024/09/19	2025/09/18
Ultra-Broadband Antenna	Schwarzbeck	VULB9163	GRCTEE018	2023/09/28	2026/09/27
Horn Antenna	Schwarzbeck	BBHA 9120D	GRCTEE019	2023/09/28	2026/09/27
Loop Antenna	Zhinan	ZN30900C	GRCTEE020	2023/10/15	2026/10/14
Horn Antenna	Beijing Hangwei Dayang	OBH100400	GRCTEE049	2023/09/28	2026/09/27
Radiated Test Receiving Unit	Tonscend	RTRU(QW01)-18G40G	GRCTEE057	2024/09/19	2025/09/18
MM-Wave Frequency Conversion Receiving Unit	Tonscend	MMFC(QWO1)-R190	GRCTEE058	N/A	N/A
MM-Wave Frequency Conversion Receiving Unit	Tonscend	MMFC(QWO1)-R150	GRCTEE059	N/A	N/A
MM-Wave Frequency Conversion Receiving Unit	Tonscend	MMFC(QWO1)-R100	GRCTEE062	N/A	N/A
MM-Wave Frequency Conversion Receiving Unit	Tonscend	MMFC(QW01)-R060	GRCTEE064	N/A	N/A
MM-Wave Frequency Conversion Receiving Unit	Tonscend	MMFC(QW01)-R040	GRCTEE065	N/A	N/A
Amplifier	Schwarzbeck	BBV 9745	GRCTEE021	2024/09/19	2025/09/18
Amplifier	Taiwan chengyi	EMC051845B	GRCTEE022	2024/09/19	2025/09/18

Temperature/Humidity Meter	Huaguan	HG-308	GRCTES037	2024/09/19	2025/09/18
Directional coupler	NARDA	4226-10	GRCTEE004	2024/09/19	2025/09/18
High-Pass Filter	XingBo	XBLBQ-GTA18	GRCTEE053	2024/09/19	2025/09/18
High-Pass Filter	XingBo	XBLBQ-GTA27	GRCTEE054	2024/09/19	2025/09/18
Automated filter bank	Tonscend	JS0806-F	GRCTEE055	2024/09/19	2025/09/18
Power Sensor	Agilent	U2021XA	GRCTEE070	2024/09/19	2025/09/18
Cable	Times	Cable-CE	GRCTEE086	2024/09/19	2025/09/18
Cable	Times	Cable-RE-1	GRCTEE087	2024/09/19	2025/09/18
Cable	Times	Cable-RE-2	GRCTEE088	2024/09/19	2025/09/18
Cable	Times	Cable-RE-3	GRCTEE089	2024/09/19	2025/09/18
EMI Test Software	ROHDE & SCHWARZ	ESK1-V1.71	GRCTEE060	N/A	N/A
EMI Test Software	Fera	EZ-EMC	GRCTEE061	N/A	N/A

4 TEST CONDITIONS AND RESULTS

4.1 Field Strength of Emissions

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 – 2483.5	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.

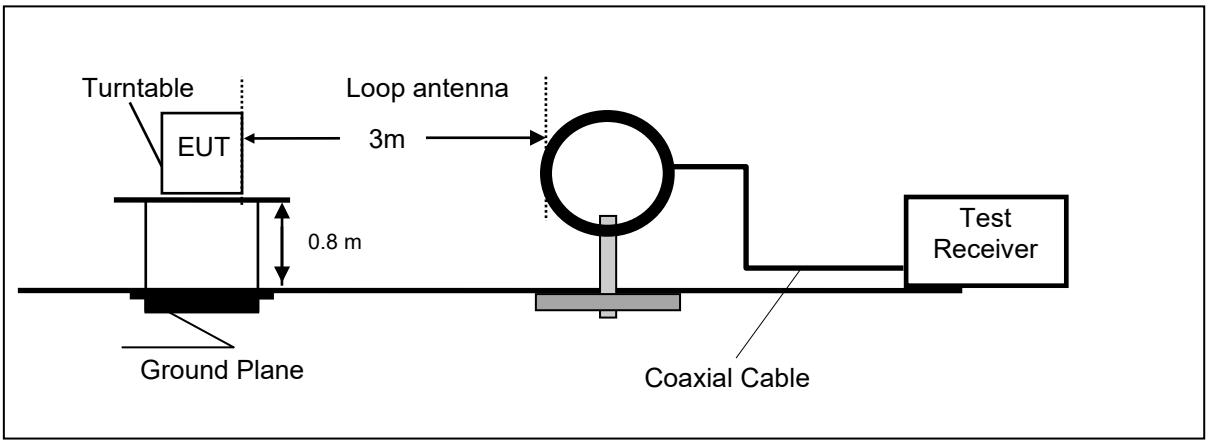
Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

(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.

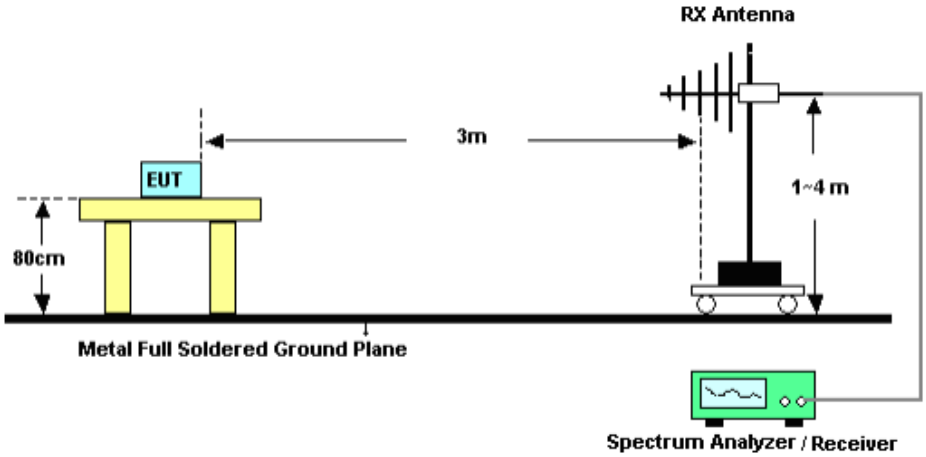
(2) The emission limits shown above are based on measurement instrumentation employing an average detector. The provisions in § 15.35 and RSS-Gen for limiting peak emissions apply.

TEST CONFIGURATION

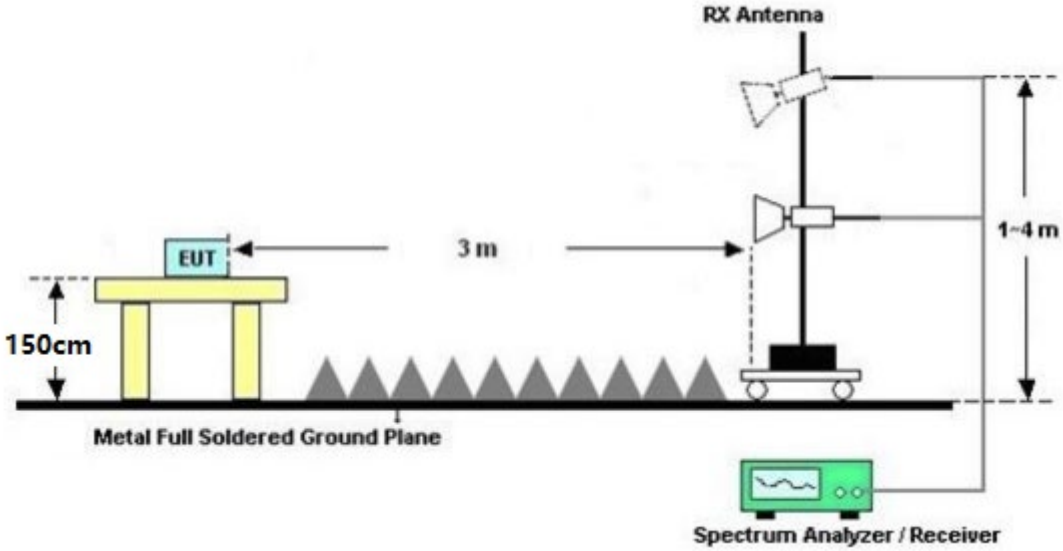
(a) Frequency range 9 KHz – 30MHz



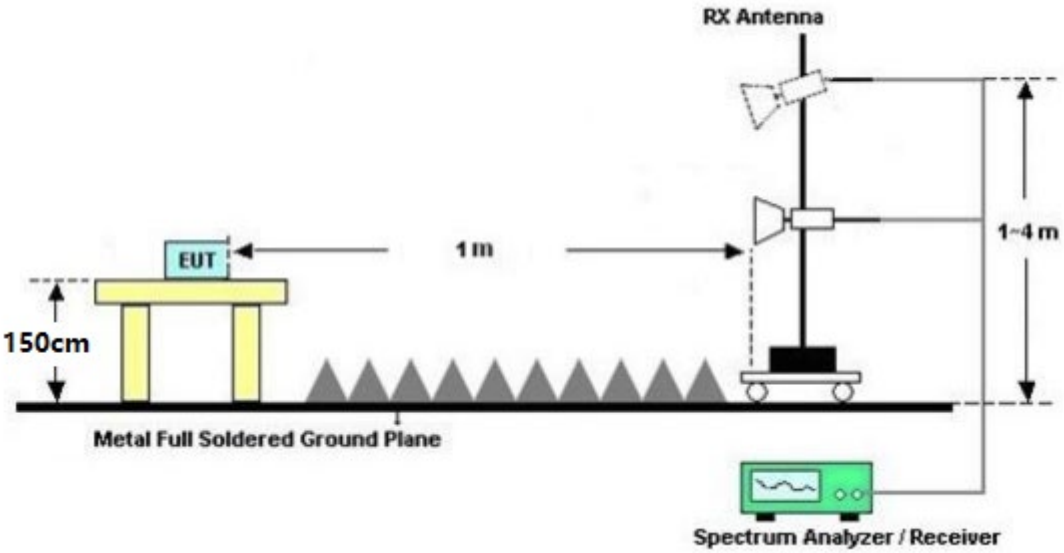
(b) Radiated emission test set-up, frequency range: 30 - 1000MHz



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



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



TEST PROCEDURE

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.

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.

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.

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.

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.

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	

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

Sample Calculations

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 / $f_{MH}z$], 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
$D_{measure}d$ 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

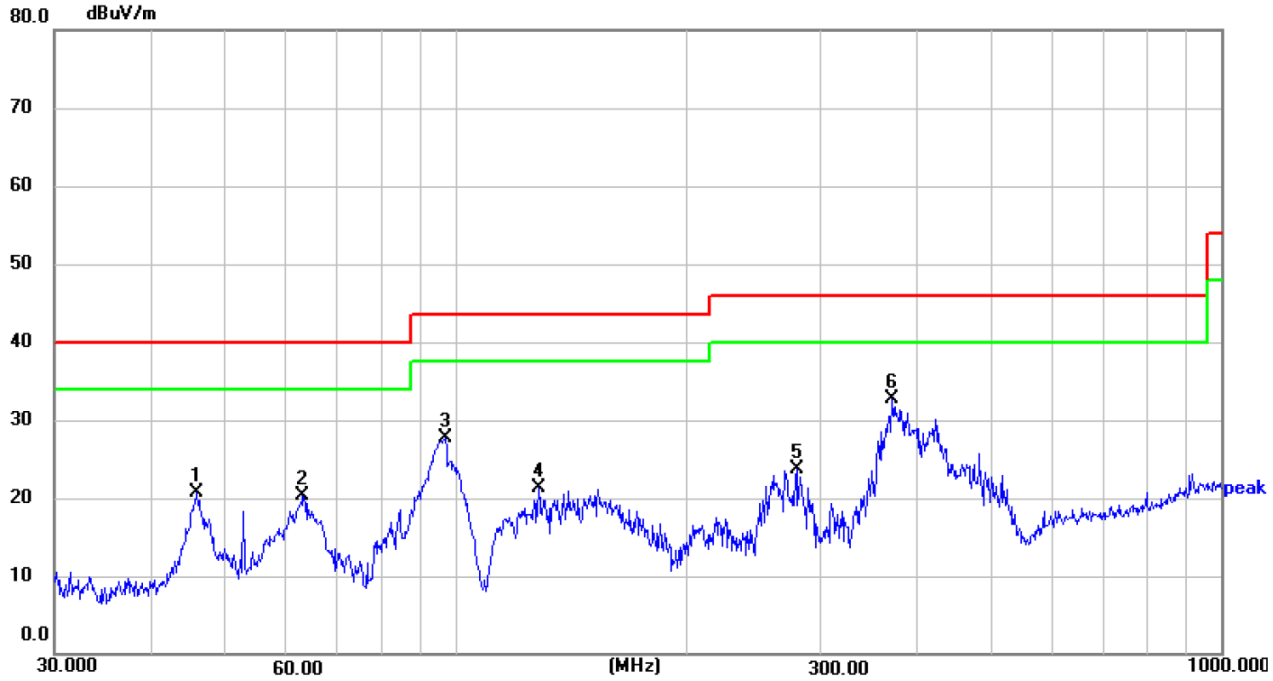
PASS

Remark:

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

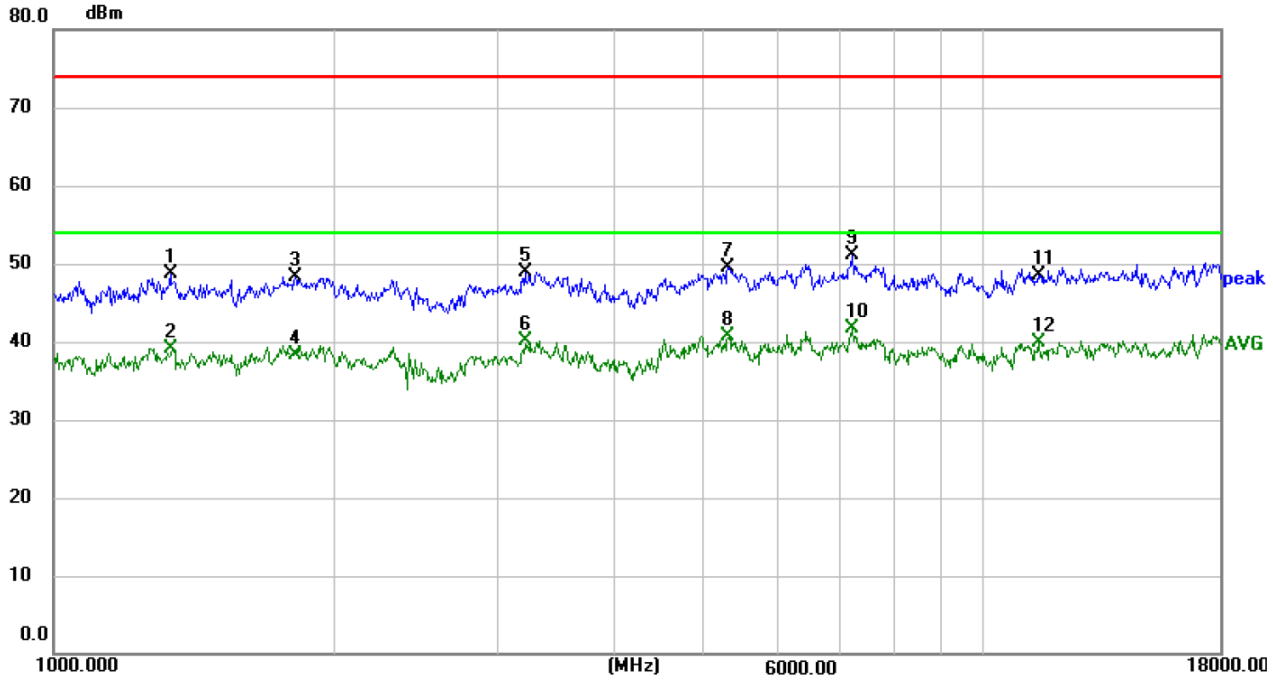
Test Condictions	EUT/Antenna Orientation	Maximum Field Strength [dBuV/m @ 3m]				Test Results
		Peak	Peak Limit	Average	Average Limit	
T_{nom} / V_{nom}	X/H&V	103.68	127.96	95.82	107.96	PASS

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



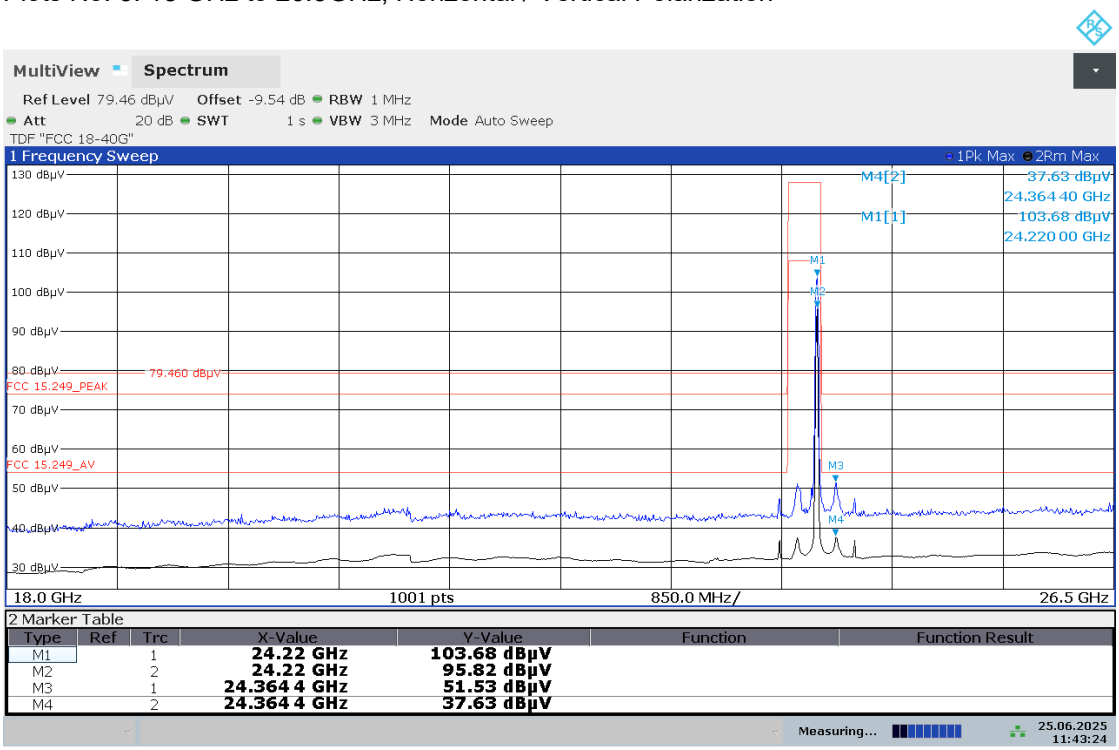
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	46.0162	38.25	-17.54	20.71	40.00	-19.29	peak	200	333	P	
2	63.3132	39.81	-19.60	20.21	40.00	-19.79	peak	100	123	P	
3	97.1148	47.31	-19.55	27.76	43.50	-15.74	peak	100	56	P	
4	128.5629	43.69	-22.47	21.22	43.50	-22.28	peak	300	21	P	
5	279.0436	41.16	-17.54	23.62	46.00	-22.38	peak	200	90	P	
6 *	372.0045	48.79	-16.17	32.62	46.00	-13.38	peak	100	110	P	

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



No.	Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	1335.141	64.14	-15.53	48.61	74.00	-25.39	peak	100	68	P	
2	1335.141	54.70	-15.53	39.17	54.00	-14.83	AVG	100	68	P	
3	1819.036	62.45	-14.16	48.29	74.00	-25.71	peak	100	54	P	
4	1819.036	52.49	-14.16	38.33	54.00	-15.67	AVG	100	54	P	
5	3214.623	62.08	-13.08	49.00	74.00	-25.00	peak	100	36	P	
6	3214.623	53.25	-13.08	40.17	54.00	-13.83	AVG	100	36	P	
7	5315.541	58.70	-9.22	49.48	74.00	-24.52	peak	100	308	P	
8	5315.541	49.88	-9.22	40.66	54.00	-13.34	AVG	100	308	P	
9	7221.150	57.06	-5.91	51.15	74.00	-22.85	peak	100	129	P	
10 *	7221.150	47.70	-5.91	41.79	54.00	-12.21	AVG	100	129	P	
11	11490.000	51.94	-3.52	48.42	74.00	-25.58	peak	100	135	P	
12	11490.000	43.51	-3.52	39.99	54.00	-14.01	AVG	100	135	P	

Plots No. 3: 18 GHz to 26.5GHz, Horizontal / Vertical Polarization



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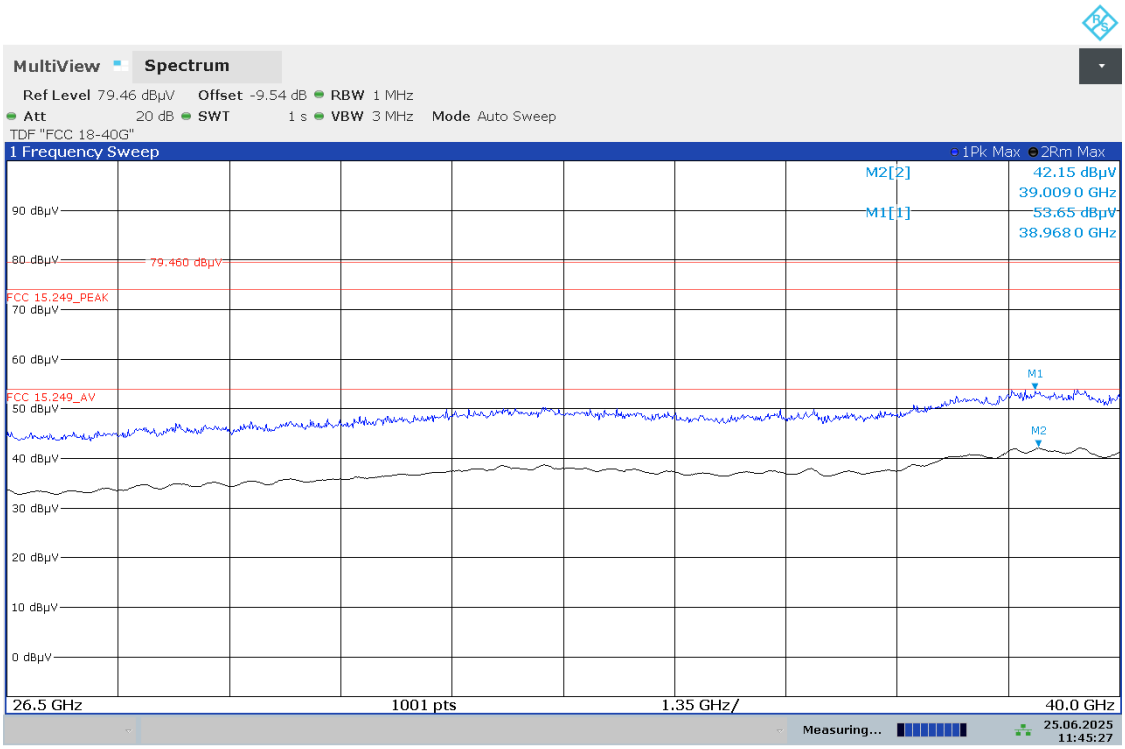
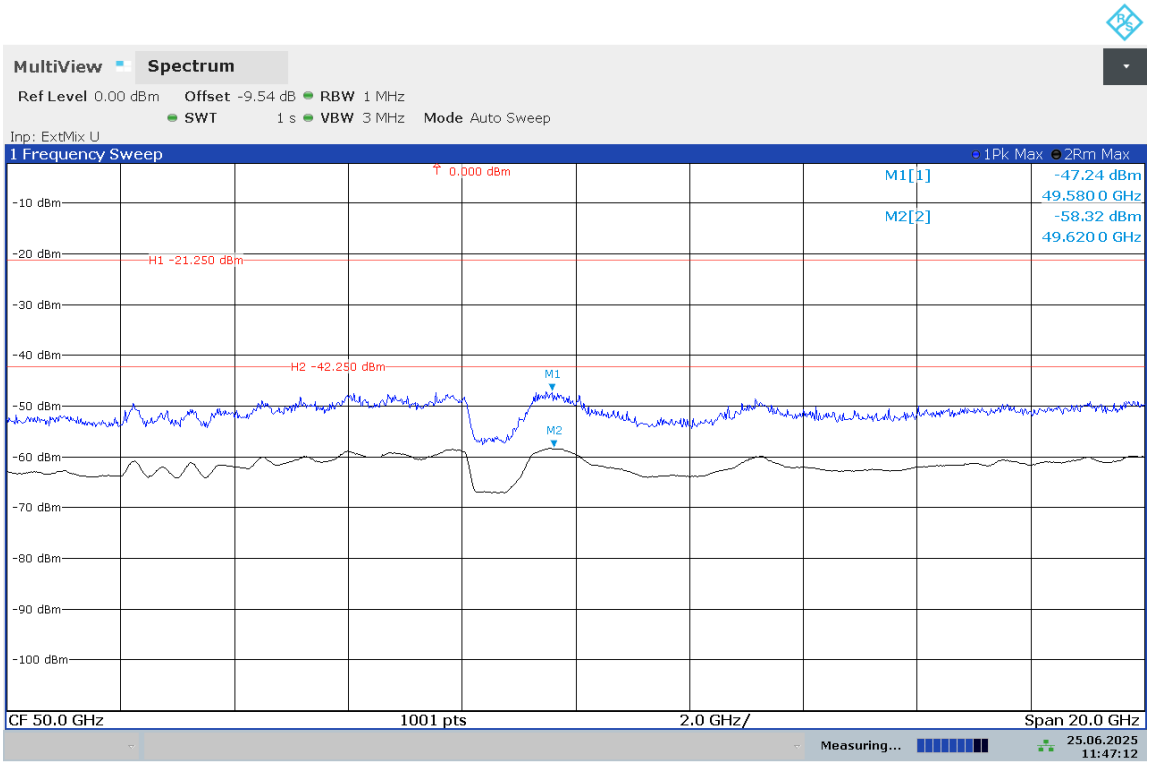
Plots No. 4: 26.5 GHz to 40GHz, Horizontal / Vertical Polarization



11:45:27 25.06.2025

Plots No. 5: 40 GHz to 60GHz, Horizontal / Vertical Polarization



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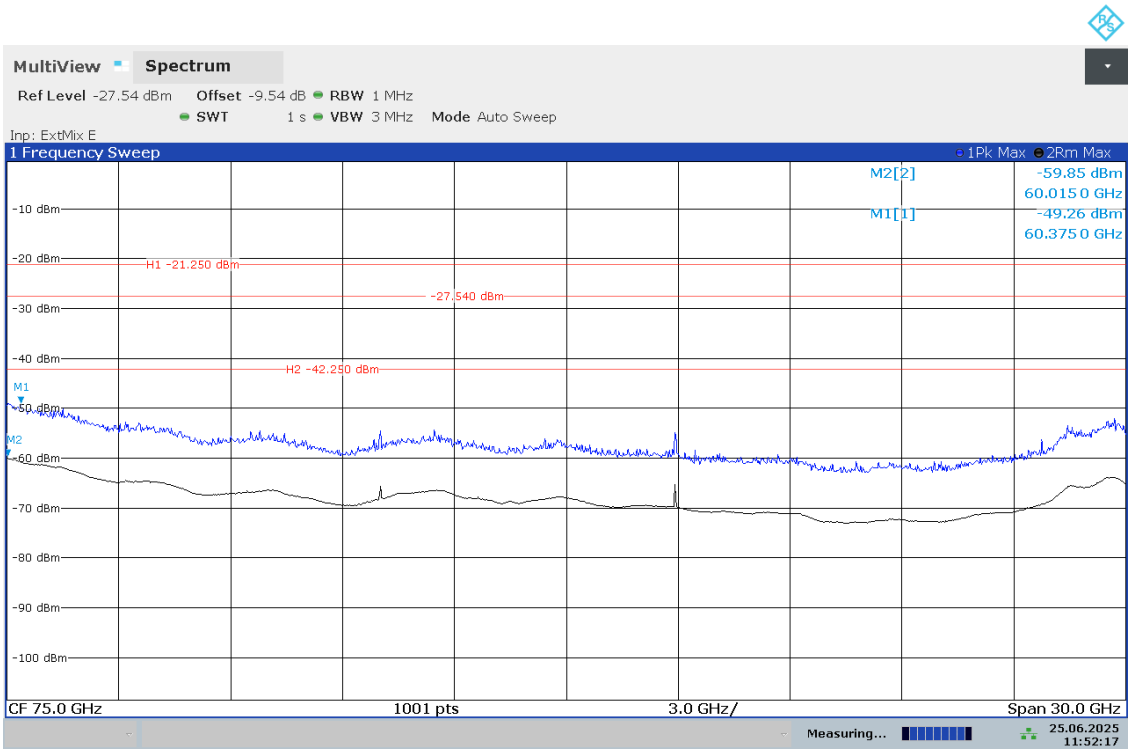
Plots No. 6: 60 GHz to 90GHz, Horizontal / Vertical Polarization



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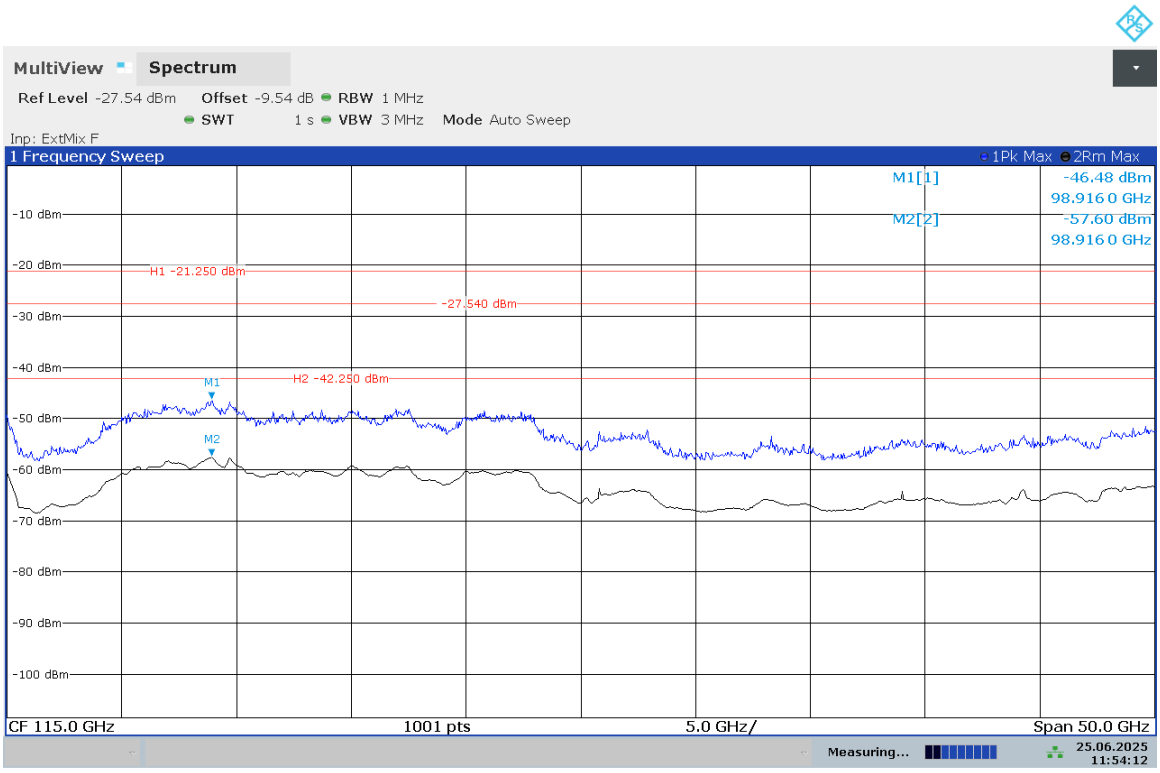
Plots No. 7: 60 GHz to 140GHz, Horizontal / Vertical Polarization



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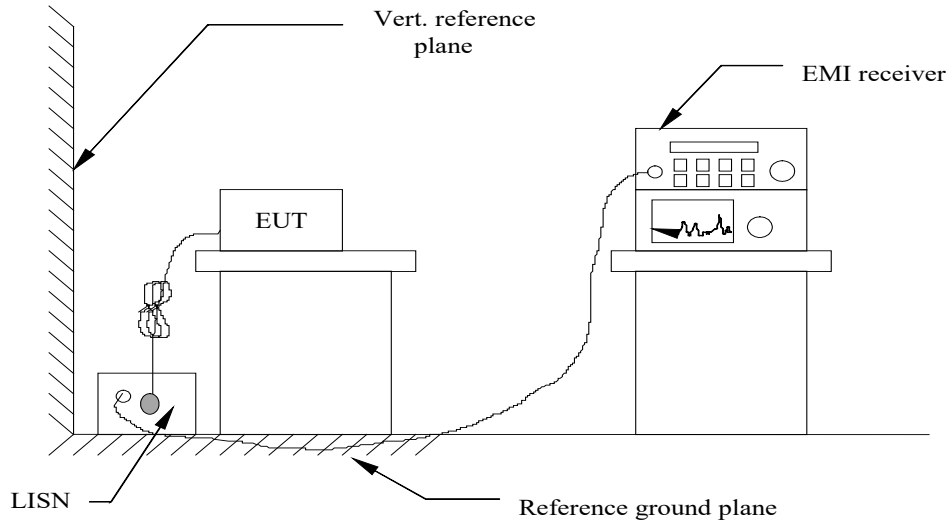
4.2 AC Conducted Emission

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.		

TEST CONFIGURATION



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 C63.10-2020.
2. Support equipment, if needed, was placed as per ANSI C63.10-2020
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.

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:

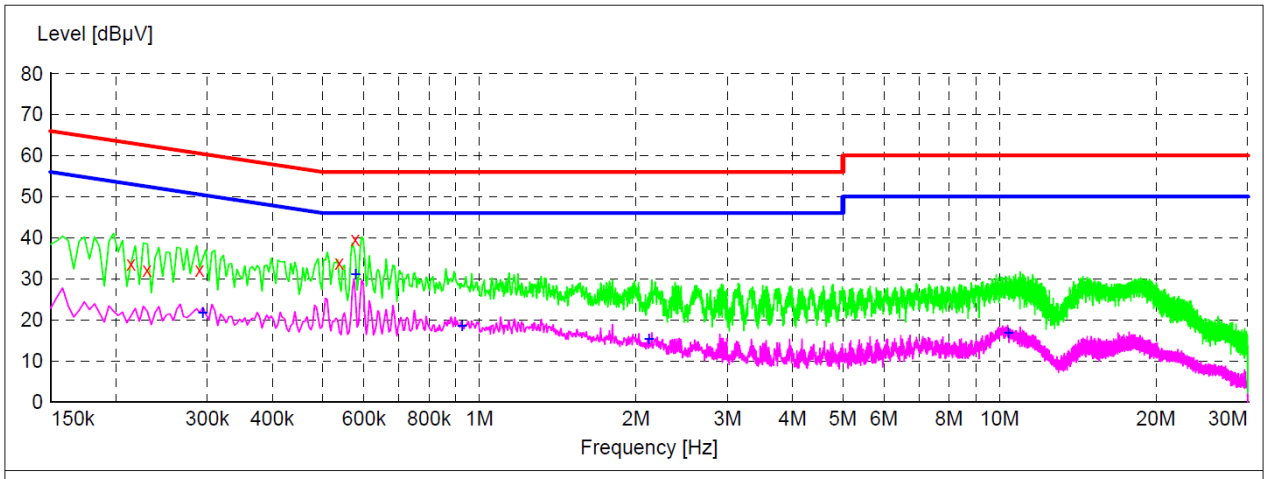
CD (dBuV) = RA (dBuV) + PL (dB) + CL (dB)

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

TEST RESULTS

PASS

Power supply:	DC 5V From adapter AC 120V/60Hz	Polarization	L



x x x MES GRC250625001_fin

MEASUREMENT RESULT: "GRC250625001_fin"

6/25/2025 10:45AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.214000	33.70	10.4	63	29.3	QP	L1	GND
0.230000	32.20	10.3	62	30.2	QP	L1	GND
0.290000	32.10	10.2	61	28.4	QP	L1	GND
0.538000	33.90	10.3	56	22.1	QP	L1	GND
0.578000	39.50	10.4	56	16.5	QP	L1	GND

MEASUREMENT RESULT: "GRC250625001_fin2"

6/25/2025 10:45AM

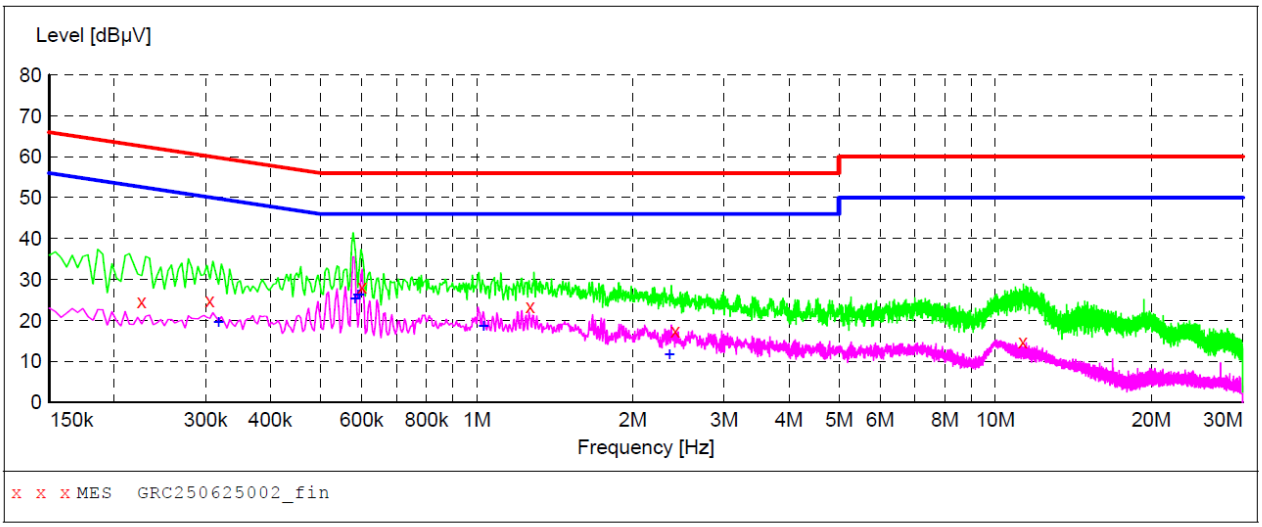
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.294000	21.80	10.2	50	28.6	AV	L1	GND
0.578000	31.20	10.4	46	14.8	AV	L1	GND
0.926000	18.60	10.3	46	27.4	AV	L1	GND
2.118000	15.30	10.6	46	30.7	AV	L1	GND
10.390000	16.80	10.7	50	33.2	AV	L1	GND

Note:1).Level (dBµV)= Reading (dBµV)+ Transducer (dB)

2). Transducer (dB)=insertion loss of LISN (dB) + Cable loss (dB)

3). Margin(dB) = Limit (dBµV) - Level (dBµV)

Power supply:	DC 5V From adapter AC 120V/60Hz	Polarization	N



MEASUREMENT RESULT: "GRC250625002_fin"

6/25/2025 10:49AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.226000	24.60	10.3	63	38.0	QP	N	GND
0.306000	24.90	10.2	60	35.2	QP	N	GND
0.602000	28.30	10.5	56	27.7	QP	N	GND
1.270000	23.40	10.5	56	32.6	QP	N	GND
2.418000	17.60	10.6	56	38.4	QP	N	GND
11.318000	14.90	10.7	60	45.1	QP	N	GND

MEASUREMENT RESULT: "GRC250625002_fin2"

6/25/2025 10:49AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.318000	19.60	10.3	50	30.2	AV	N	GND
0.582000	25.40	10.4	46	20.6	AV	N	GND
0.590000	26.40	10.5	46	19.6	AV	N	GND
0.594000	26.30	10.5	46	19.7	AV	N	GND
1.030000	18.60	10.2	46	27.4	AV	N	GND
2.354000	11.90	10.6	46	34.1	AV	N	GND

Note:1).Level (dBµV)= Reading (dBµV)+ Transducer (dB)

2). Transducer (dB)=insertion loss of LISN (dB) + Cable loss (dB)

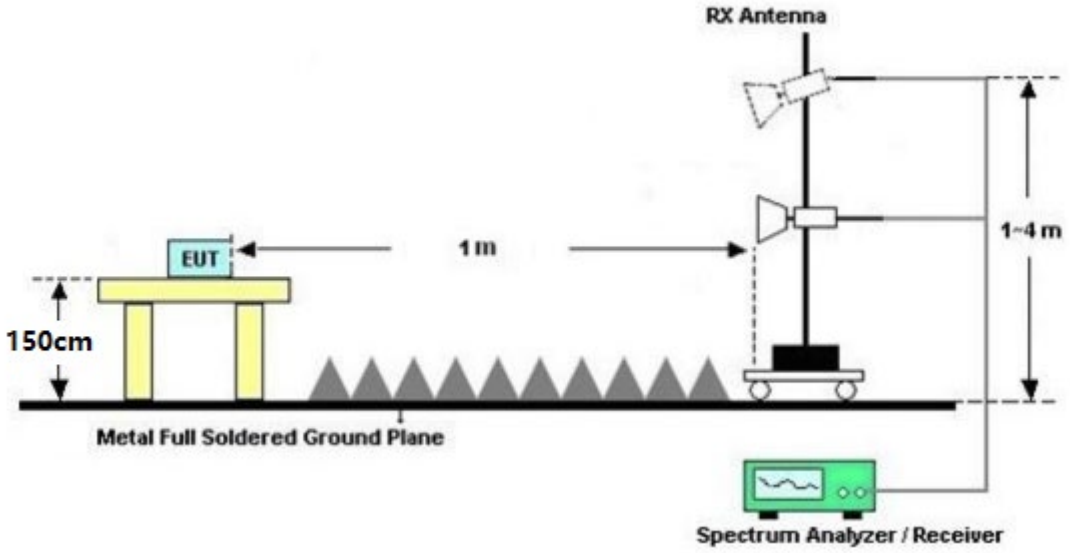
3). Margin(dB) = Limit (dBµV) - Level (dBµV)

4.3 Occupied Bandwidth (99% Bandwidth)

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 RSS.

TEST CONFIGURATION



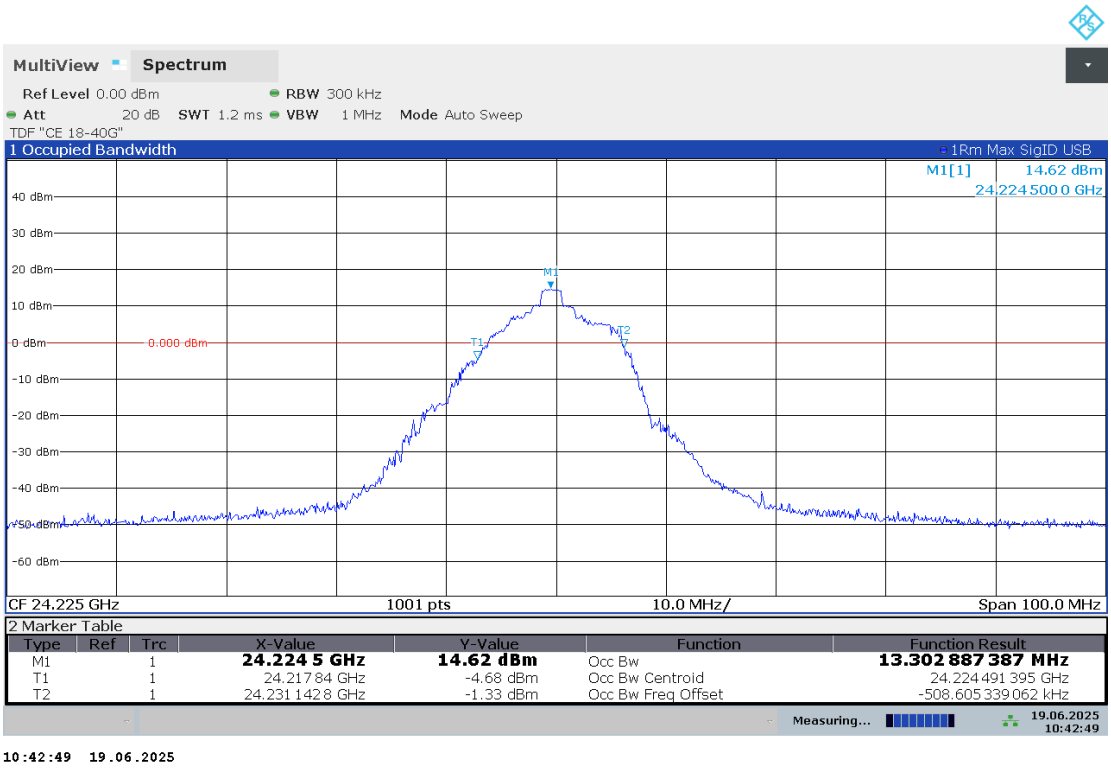
TEST PROCEDURE

- 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.

TEST RESULTS

Test Condictions	EUT/Antenna Orientation	Occupied Bandwidth (99%) [MHz]	Test Results
T_{nom} / V_{nom}	X/H&V	13.3028	PASS

Plots No. 8: 99% Occupied Bandwidth, Horizontal / Vertical Polarization



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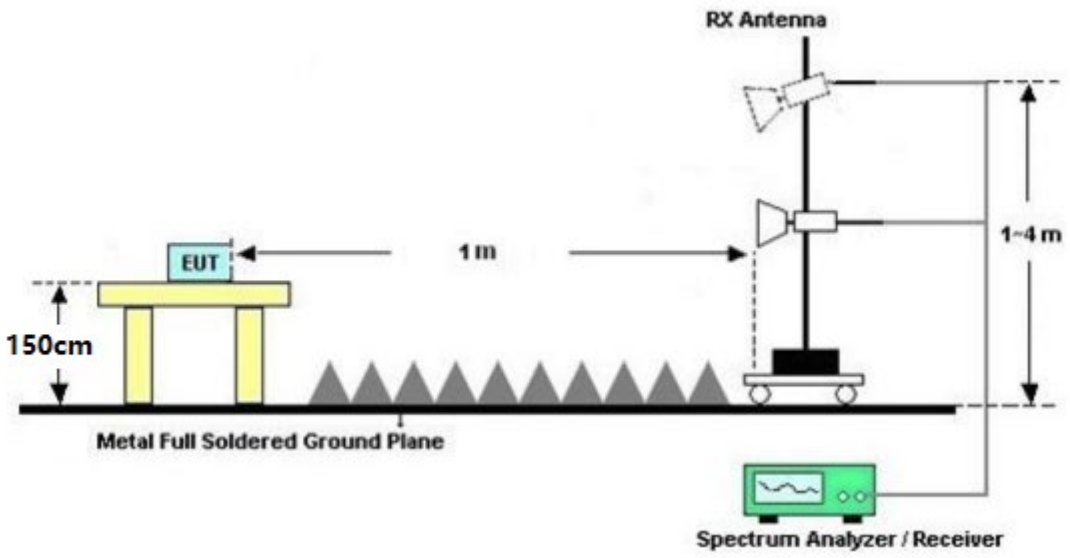
4.4 20dB Bandwidth

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.

TEST CONFIGURATION



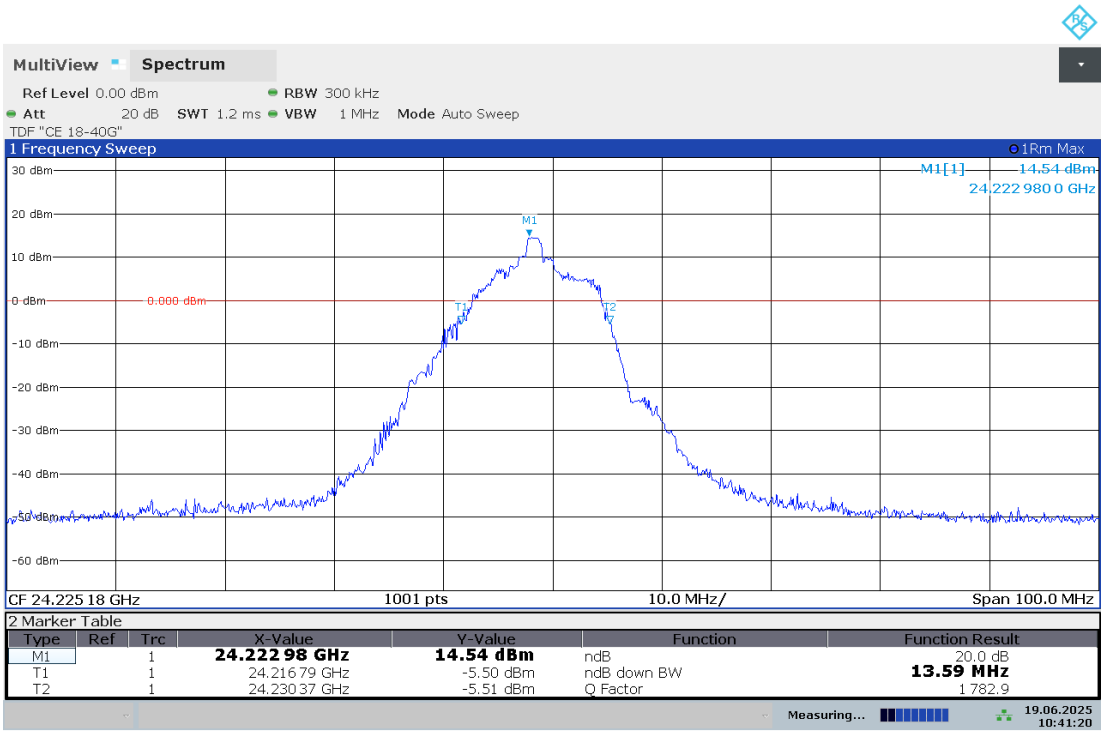
TEST PROCEDURE

- 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.

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	24.21679	24.00	24.23037	24.25	13.580	PASS

Plots No. 9: 20dB Bandwidth, Horizontal / Vertical Polarization



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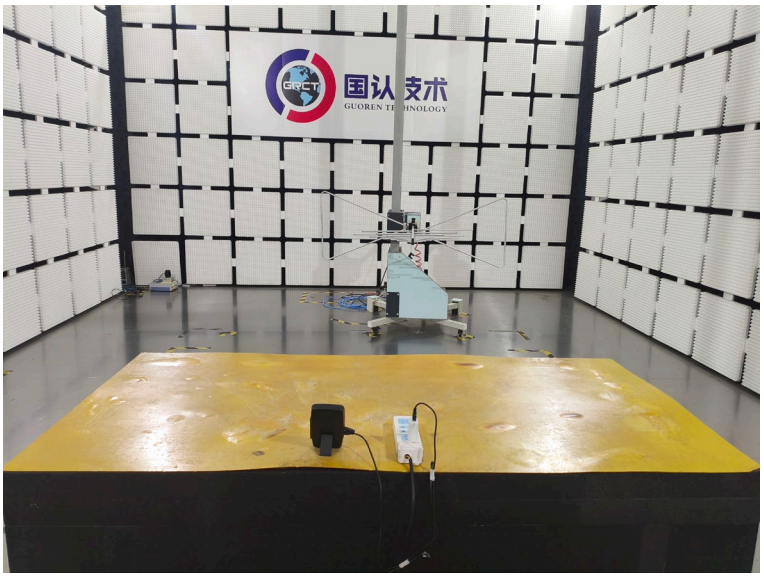
Notes: The 20 dB bandwidth of the emission is contained within the frequency band.

4.5 Antenna Requirement

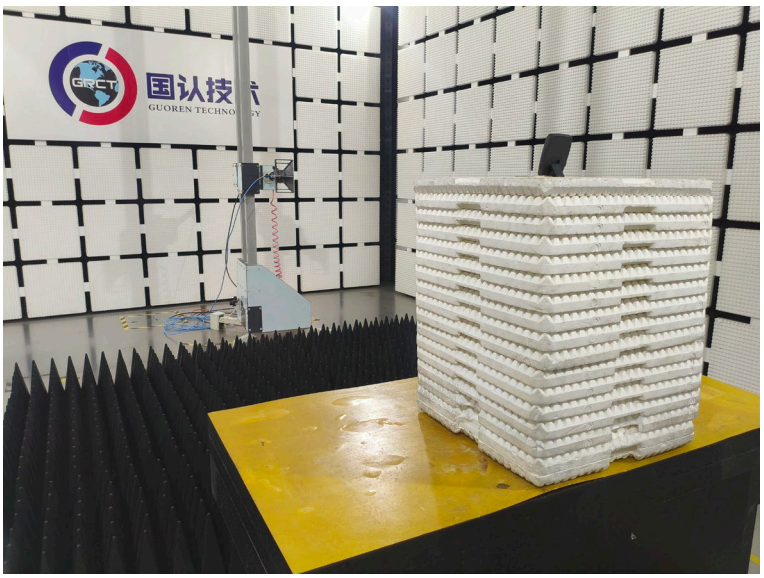
Requirement
According to § 15.203 and RSS-Gen: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional 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

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

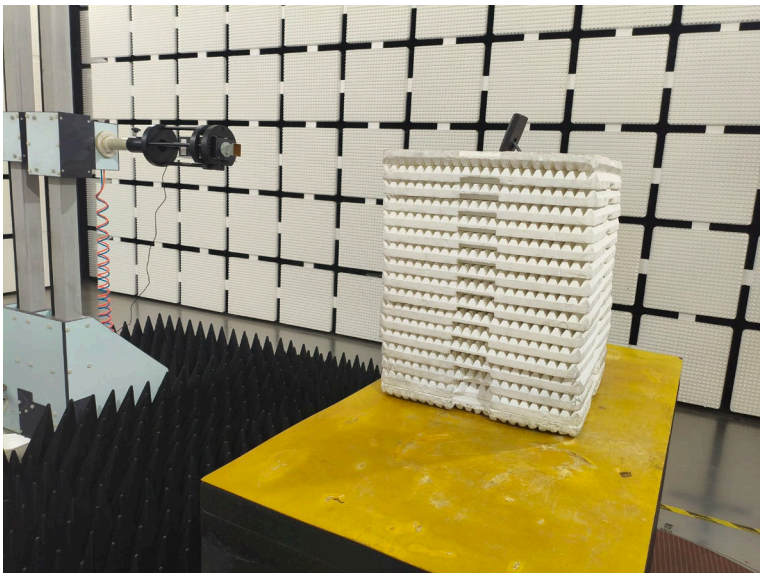
5 Test Set-up Photos of the EUT



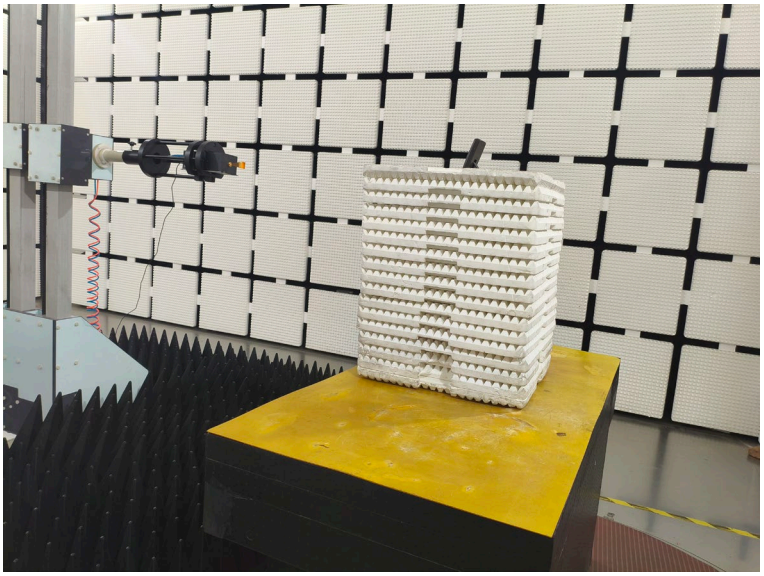
Radiated Emission (30 MHz – 1 GHz)



Radiated Emission (1 GHz – 18 GHz)



Radiated Emission (18 GHz – 40 GHz)



Radiated Emission (Above 40 GHz)

Conducted Emission

6 EXTERNAL Photos of the EUT

Please refer to separated files for External Photos of the EUT.

7 Internal Photos of the EUT

Please refer to separated files for Internal Photos of the EUT.

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