

TEST REPORT

Report No.: 24020231HKG-003

Yoto Ltd.

Application For Certification
(Original Grant)

FCC ID: 2AS6W-YP004

IC: 24624-YP004

Transceiver

This report contains the data of RFID portion only

Prepared and Checked by:

Approved by:

Signed On File

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Date: October 07, 2024

TEST REPORT**GENERAL INFORMATION**

Grantee:	Yoto Ltd.
Grantee Address:	124 City Road, London, EC1V 2NX, United Kingdom.
Manufacturer:	Victory Telecom (Huizhou) Ltd.
Manufacturer Address:	No. 101 Xintian, Dongya Village, Ruhu Town, Huicheng District, Huizhou City, Guangdong Province, 516021, P. R. China.
FCC Specification Standard:	FCC Part 15, October 1, 2023 Edition
FCC ID:	2AS6W-YP004
FCC Model(s):	YP004
IC Specification Standards:	RSS-210 Issue 11, June 2024 RSS-Gen Issue 5 Amendment 2, February 2021
IC:	24624-YP004
HVIN:	YP004
PMN:	YP004
Type of EUT:	Transceiver
Description of EUT:	Yoto Player V3
Brand Name:	Yoto
Date of Sample Submitted:	February 06, 2024
Date of Test:	February 06, 2024 to June 19, 2024
Report Date:	October 07, 2024
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%
Conclusion:	Test was conducted by client submitted sample. The submitted sample as received complied with the 47 CFR Part 15 / RSS-210 Issue 11 Certification.

This report contains the data of RFID portion only

TEST REPORT**SUMMARY OF TEST RESULT**

Test Specification	Reference	Results
Transmitter Power Line Conducted Emissions	15.207 / RSS-Gen 8.8	Pass
Transmitter Field Strength	15.225 / RSS-210 B.6	Pass
Frequency Stability		
Radiated Emission	15.209 / RSS-210 4.4	Pass
Radiated Emission on the Bandedge		
Radiated Emission in Restricted Bands	15.205 / RSS-210 4.1	Pass

For all technical data, which can be referred to Annex B – Report cover sheet.

For electronic filing, the Annex B – Report cover sheet is saved with filename: Annex B.pdf.

The equipment under test is found to be complying with the following standards:

FCC Part 15, October 1, 2023 Edition

RSS-210 Issue 11, June 2024

RSS-Gen Issue 5 Amendment 2, February 2021

Note: 1. The EUT uses a permanently attached antenna which, in accordance to section 15.203, is considered sufficient to comply with the provisions of this section.
2. Pursuant to FCC part 15 Section 15.215(c), the 20 dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over expected variations in temperature and supply voltage were considered.

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TEST REPORT

1.0 GENERAL DESCRIPTION

1.1 Product Description

The Equipment Under Test (EUT) is a Wi-Fi, BT, BLE and RFID Transceiver for an audio player.

For Wi-Fi portion, the Equipment Under Test (EUT) operates at frequency range of 2412MHz to 2462MHz with 11 channels and 2422MHz to 2452MHz with 9 channels. For BT Portion, it operates at frequency range of 2402.000 MHz to 2480.000 MHz with 79 channels, the channels are separated with 1MHz spacing. For BLE Portion, it operates at frequency range of 2402.000 MHz to 2480.000 MHz with 40 channels, the channels are separated with 2MHz spacing. For RFID Portion, it operates at a single channel, 13.56MHz.

Wi-Fi and RFID portions can be functioned simultaneously while BT and BLE portions are disabled when Wi-Fi and RFID portions are functioning and vice versa.

The EUT is powered by 1 x 3.7V Lithium-ion Battery or USB port.

Antenna Type: Internal, Integral

For electronic filing, the brief circuit description is saved with filename: Descri.pdf.

1.2 Related Submittal(s) Grants

This is a single application for certification of a transceiver (RFID Portion).

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). All radiated measurements were performed in an 3m Chamber. Preliminary scans were performed in the 3m Chamber only to determine worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "Justification Section" of this Application.

1.4 Test Facility

The 3m Chamber and conducted measurement facility used to collect the radiated data is located at Workshop No. 3, G/F., World-Wide Industrial Centre, 43-47 Shan Mei Street, Fo Tan, Sha Tin, N.T., Hong Kong SAR, China. This test facility and site measurement data have been placed on file with the FCC and IC No. 2042H.

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2.0 SYSTEM TEST CONFIGURATION

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.10 (2013).

The device was powered by 3.7VDC (1 x 3.7V Lithium-ion Battery) or USB port.

For maximizing emissions below 30 MHz, the EUT was rotated through 360°, the centre of the loop antenna was placed 1 meter above the ground, and the antenna polarization was changed. For maximizing emission at and above 30 MHz, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step-by-step procedure for maximizing emissions led to the data report in Exhibit 3.0.

The rear of unit shall be flushed with the rear of the table.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was mounted to a plastic stand if necessary and placed on the wooden turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

For simultaneous transmission, both Wi-Fi and RFID portions are also switched on when taking radiated emission for determining worst-case spurious emission.

2.2 EUT Exercising Software

The EUT Exercise program (EspRFTTestTool v3.6) used during radiated testing was designed to exercise the various system components in a manner similar to a typical use.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

2.4 Measurement Uncertainty

Decision Rule for compliance: For FCC/IC standard, the measured value must be within the limits of applicable standard without accounting for the measurement uncertainty. For EN/IEC/HKTA/HKTC standard, conformity rules will be used as per standard directly excepted EN/IEC 61000-3-2, EN/IEC 61000-3-3, HKTA1004, HKCA1008, HKTA1019, HKTA1020, HKTA1041 and HKTA1044.

2.5 Support Equipment List and Description

Description	Remark
HP 820G1 Notebook	Provided by Intertek
1.5m USB Type-C Charging Cable	Provided by Applicant

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3.0 EMISSION RESULTS

Data is included of the worst-case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.1 Field Strength Calculation

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

$$FS = RA + AF + CF - AG - AV$$

where FS = Field Strength in dB μ V/m

RA = Receiver Amplitude (including preamplifier) in dB μ V

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

AV = Average Factor in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

$$FS = RR + LF$$

where FS = Field Strength in dB μ V/m

RR = RA - AG - AV in dB μ V

LF = CF + AF in dB

Assume a receiver reading of 52.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB and average factor of 5 dB are subtracted, giving a field strength of 27 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 52.0 \text{ dB}\mu\text{V}/\text{m}$$

$$AF = 7.4 \text{ dB}$$

$$RR = 18.0 \text{ dB}\mu\text{V}$$

$$CF = 1.6 \text{ dB}$$

$$LF = 9.0 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$AV = 5.0 \text{ dB}$$

$$FS = RR + LF$$

$$FS = 18 + 9 = 27 \text{ dB}\mu\text{V}/\text{m}$$

$$\text{Level in } \mu\text{V}/\text{m} = \text{Common Antilogarithm } [(27 \text{ dB}\mu\text{V}/\text{m})/20] = 22.4 \mu\text{V}/\text{m}$$

TEST REPORT

3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 372.53125 MHz

For electronic filing, the worst-case radiated emission configuration photographs are saved with filename: Setup Photos.pdf.

3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgment: Passed by 3.8 dB

TEST REPORT**RADIATED EMISSIONS**

Model: YP004

Date of Test: April 16, 2024

Worst-Case Operating Mode: Transmitting

Table 1
Pursuant to FCC Part 15 Section 15.225 / RSS-210 B6 Requirement

Polari-zation	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Distance Factor (-dB)	Calculated at 30m (dB μ V/m)	Limit at 30m (dB μ V/m)	Margin (dB)
O	13.560	41.9	0	10.8	52.7	40.0	12.7	84.0	-71.3
O	27.120	7.3	0	9.5	16.8	40.0	-23.2	29.5	-52.7

NOTES:

1. Quasi-Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters.
3. Negative sign in the column shows value below limit.
4. Loop antenna is used for the emissions below 30MHz.
5. Emission within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-210 4.1.
6. Measurement Uncertainty is ± 5.3 dB at a level of confidence of 95%.

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Model: YP004

Date of Test: June 19, 2024

Worst-Case Operating Mode: Wi-Fi and RFID Operating

Table 4
Pursuant to FCC Part 15 Section 15.209 / RSS-210 4.4 Requirement

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
V	40.670	39.5	16	10.0	33.5	40.0	-6.5
V	78.985	40.7	16	6.0	30.7	40.0	-9.3
V	169.316	31.6	16	18.0	33.6	43.5	-9.9
V	372.531	34.2	16	24.0	42.2	46.0	-3.8
V	507.968	27.5	16	27.0	38.5	46.0	-7.5
V	800.059	24.9	16	31.0	39.9	46.0	-6.1

NOTES:

1. Peak and Quasi-Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters.
3. Negative sign in the column shows value below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-210 4.1.
6. Measurement Uncertainty is ± 5.3 dB at a level of confidence of 95%.

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3.4 AC Power Line Conducted Emission

- Not Applicable – EUT is only powered by battery for operation.
- EUT connects to AC power line. Emission Data is listed in following pages.
- Base Unit connects to AC power line and has transmission. Handset connects to AC power line but has no transmission. Emission Data of Base Unit is listed in following pages.

3.4.1 AC Power Line Conducted Emission Configuration

Worst Case Line-Conducted Configuration at 0.1905 MHz.

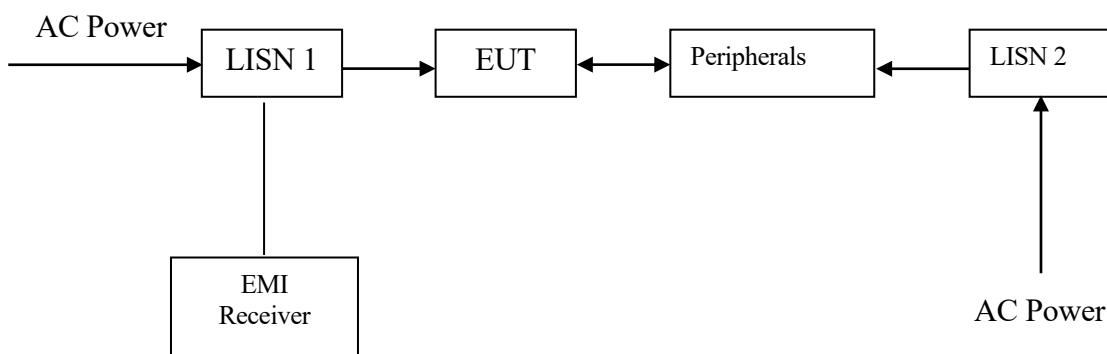
For electronic filing, the worst-case line-conducted configuration photographs are saved with filename: Setup Photos.pdf.

3.4.2 AC Power Line Conducted Emission Data

The plot(s) and data in the following pages list the significant emission frequencies, the limit and the margin of compliance.

Passed by 13.7 dB margin

3.4.3 Conducted Emission Test Setup

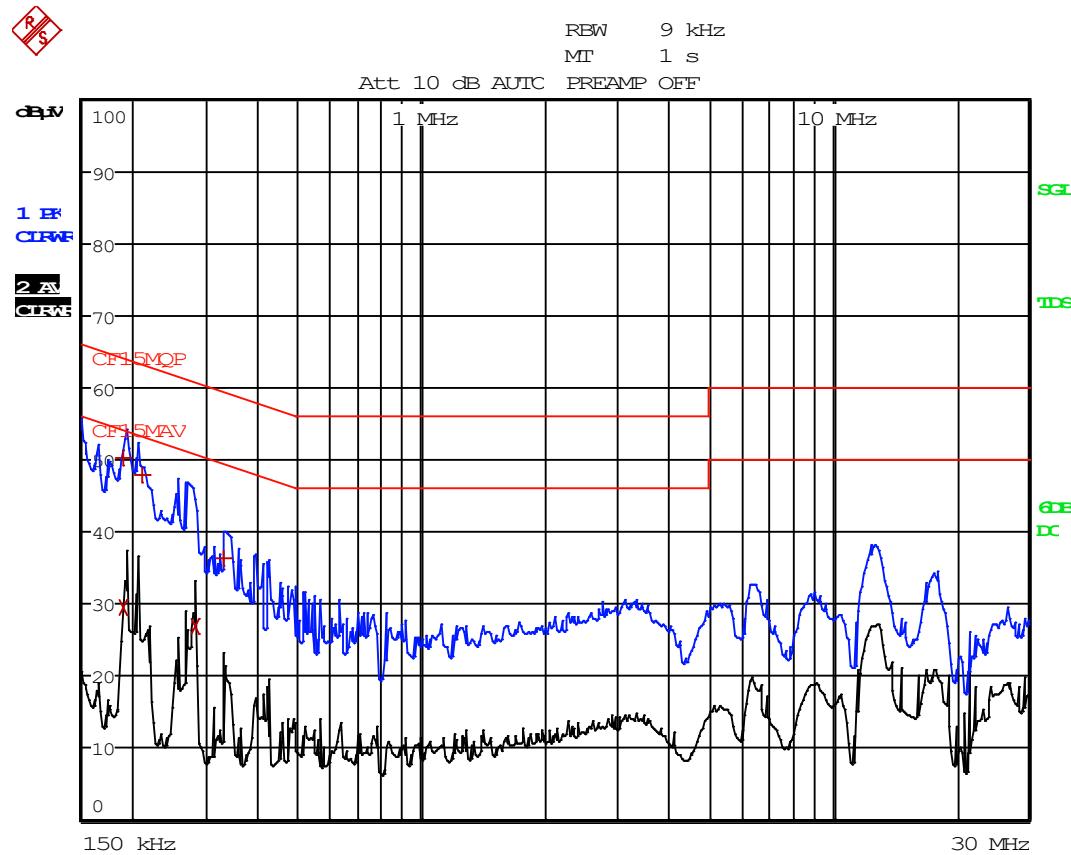


The EUT along with its peripherals were placed on a 1.0m(W)×1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled.

All connecting cables of EUT and peripherals were moved to find the maximum emission.

TEST REPORT**AC POWER LINE CONDUCTED EMISSION**

Worst Case: Wi-Fi and RFID Operating



TEST REPORT**AC POWER LINE CONDUCTED EMISSION**

Worst Case: Wi-Fi and RFID Operating

EDIT PEAK LIST (Final Measurement Results)					
Trace1:	CF15MQP				
Trace2:	CF15MAV				
Trace3:	----				
TRACE	FREQUENCY	LEVEL dB _μ V		DELTA	LIMIT dB
1	Quasi Peak 190.5 kHz	50.31	N	-	-13.70
2	CISPR Average 190.5 kHz	29.56	N	-	-24.45
1	Quasi Peak 213 kHz	47.82	N	-	-15.26
2	CISPR Average 280.5 kHz	26.80	N	-	-23.99
1	Quasi Peak 330 kHz	36.39	N	-	-23.05

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3.5 Frequency Stability

FCC Part 15 Section 15.225 / RSS-210 Section B.6

Data Table
Frequency Deviation with Voltage Variation

Operating frequency		13.559282MHz				
Test Voltage (V)	Temperature (°C)	Measured frequency (MHz)	Frequency error (%)	Limit (%)	Frequency error (ppm)	Limit (ppm)
120	+ 50	13.559215	-0.0004904	±0.01	4.904389553	±100
	+ 40	13.559236	-0.0003415	±0.01	3.414635132	±100
	+ 30	13.559259	-0.0001704	±0.01	1.703630055	±100
	+ 20	13.559282	0	±0.01	0	±100
	+ 10	13.559293	0.0000856	±0.01	0.855502538	±100
	0	13.559291	0.0000642	±0.01	0.641626904	±100
	- 10	13.559279	-0.0000207	±0.01	0.206500610	±100
	- 20	13.559253	-0.0002131	±0.01	2.131381324	±100
102	+ 20	13.559244	-0.0002773	±0.01	2.773008228	±100
138	+ 20	13.559234	-0.0003562	±0.01	3.562135570	±100

The device is deemed to comply with the requirement of FCC15.225(e) / RSS-210. Data was taken for different time durations, when the EUT just reached the required temperature at startup, after 2 minutes, after 5 minutes and after 10 minutes. Only the worst-case data is shown in the above table.

TEST REPORT

4.0 EQUIPMENT PHOTOGRAPHS

For electronic filing, the photographs are saved with filename: External Photos.pdf and Internal Photos.pdf.

5.0 PRODUCT LABELLING

For electronic filing, the FCC ID label artwork and the label location are saved with filename: Label.pdf.

6.0 TECHNICAL SPECIFICATIONS

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: Block.pdf and Circuit.pdf respectively.

7.0 INSTRUCTION MANUAL

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: Manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States and Canada.

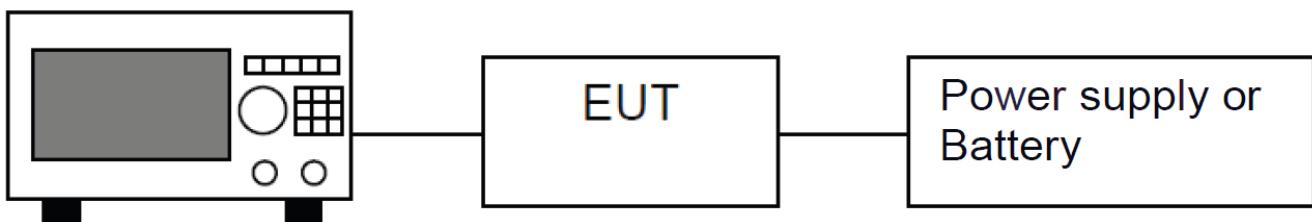
TEST REPORT

8.0 MISCELLANEOUS INFORMATION

The miscellaneous information includes details of the test procedure and measured bandwidth.

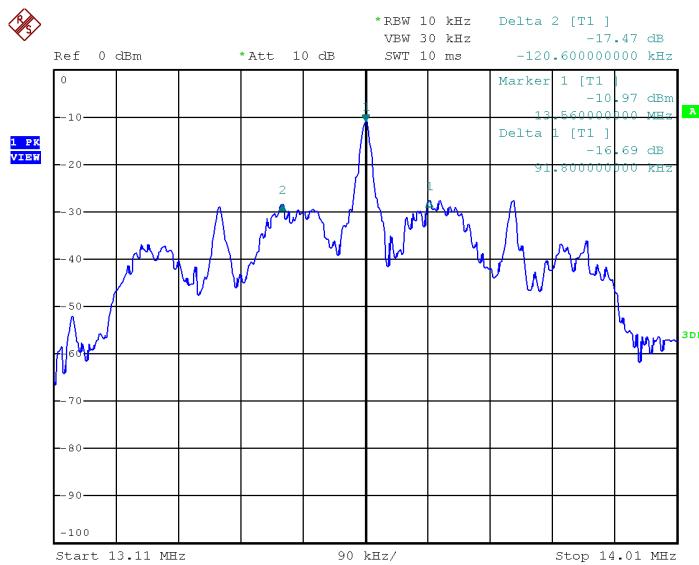
8.1 Measured Bandwidth

The following graph shows the fundamental emission is confined in the specified band. The emission of the fundamental is 12.7 dB μ V/m and it is below the limit of 50.5 dB μ V/m in the range of (13.410-13.553MHz) and (13.710-14.010MHz) and the limit of 40.5 dB μ V/m in the frequency range of (13.110-14.410MHz) and (13.710-14.010MHz). In the frequency range from 13.110-14.010MHz, we cannot find any emission higher than the fundamental emission. Therefore, they meet the requirement of Section 15.225(a), (b), (c), & (d).



Spectrum Analyzer

Block diagram of Test setup



TEST REPORT

8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. Since the transmitter transmits the RF signal continuously.

8.3 Calculation of Average Factor

N/A

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8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of transmitter operating under the Part 15, Subpart C rules.

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately 0.8m in height above the ground plane for emission measurement at or below 1GHz and 1.5m in height above the ground plane for emission measurement above 1GHz. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axis to obtain maximum emission levels. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line conducted emissions, the range scanned is 150 kHz to 30 MHz.

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements were made as described in ANSI C63.10 (2013).

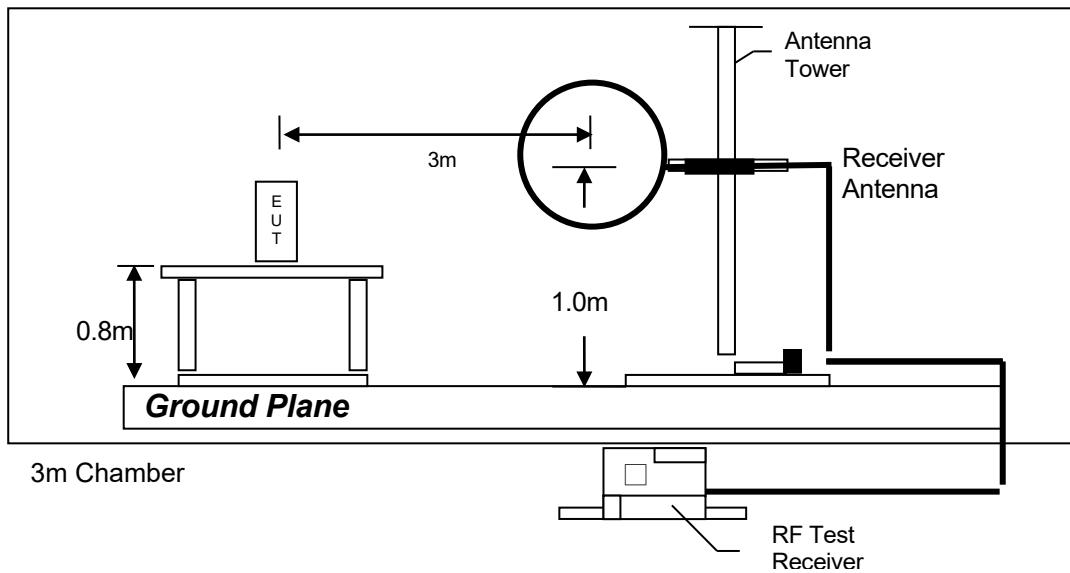
The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.1). Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.

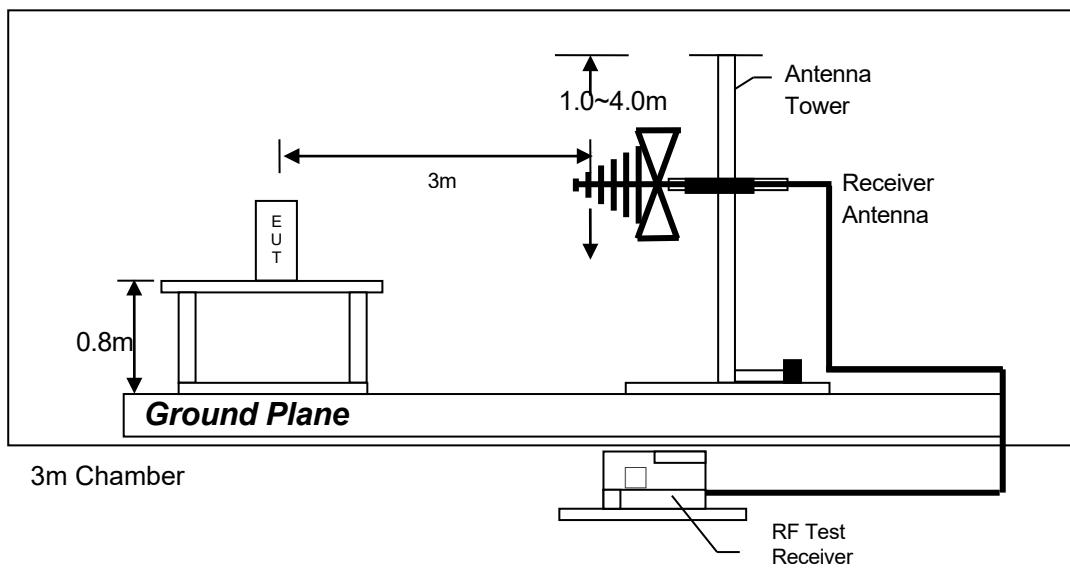
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8.4.1 Radiated Emission Test Setup

The figure below shows the test setup, which is utilized to make these measurements.



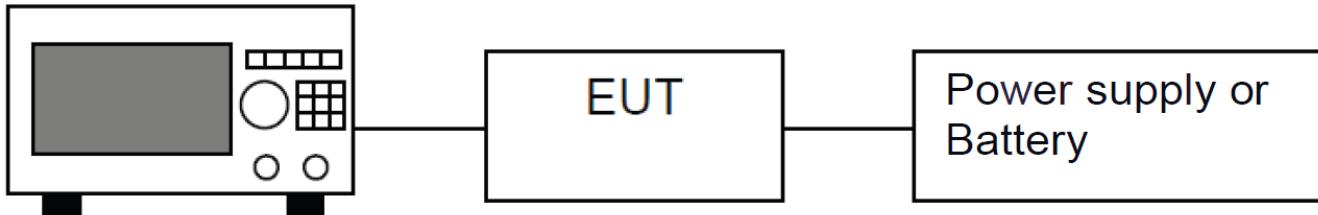
Test setup of radiated emissions 9kHz to 30MHz



Test setup of radiated emissions 30MHz to 1GHz

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8.5 Occupied Bandwidth



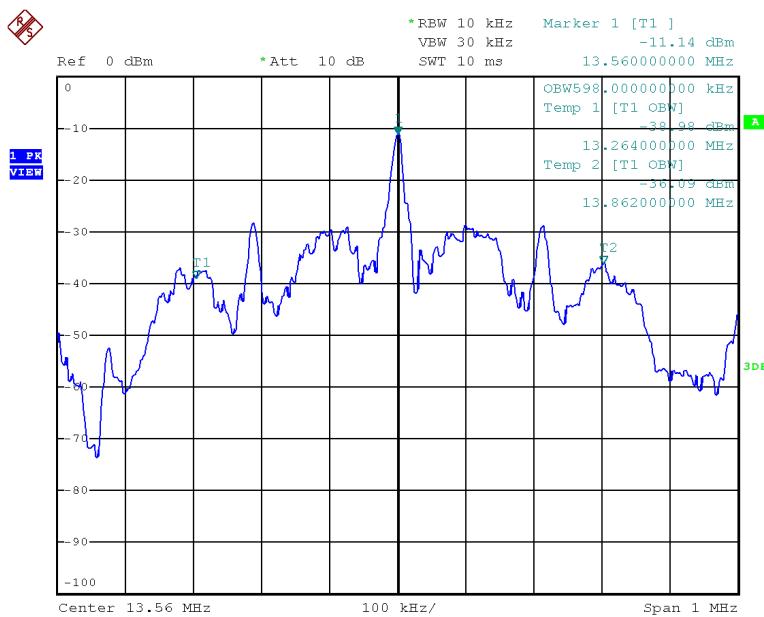
Spectrum Analyzer

Block diagram of Test setup

Occupied Bandwidth Results:

Frequency (MHz)	Occupied Bandwidth (kHz)
13.56MHz	598

The worst case is shown as below



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9.0 EQUIPMENT LIST

1) Radiated Emissions Test

Equipment	EMI Test Receiver (9kHz to 26.5GHz)	Biconical Antenna (30MHz to 300MHz)	Log Periodic Antenna
Registration No.	EW-3156	EW-3242	EW-3243
Manufacturer	ROHDE SCHWARZ	EMCO	EMCO
Model No.	ESR26	3110C	3148B
Calibration Date	January 31, 2024	April 26, 2022	October 30, 2022
Calibration Due Date	January 31, 2025	July 26, 2024	July 30, 2024
Equipment	Double Ridged Guide Antenna (1GHz - 18GHz)	Active Loop Antenna (H-field) (9kHz to 30MHz)	RF Preamplifier (9kHz to 6000MHz)
Registration No.	EW-0194	EW-3326	EW-3006b
Manufacturer	EMCO	EMCO	SCHWARZBECK
Model No.	3115	6502	BBV9718
Calibration Date	May 10, 2023	January 05, 2024	October 20, 2023
Calibration Due Date	November 10, 2024	July 05, 2025	October 20, 2024
Equipment	2.4GHz Notch Filter	14m Double Shield RF Cable (9kHz - 6GHz)	RF Cable 14m (1GHz to 26.5GHz)
Registration No.	EW-3435	EW-2376	EW-2781
Manufacturer	MICROWAVE	RADIALL	GREATBILLION
Model No.	N0324413	n m/br56/bnc m 14m	SMA m/SHF5MPU /SMA m ra14m,26G
Calibration Date	September 26, 2023	September 19, 2023	January 16, 2024
Calibration Due Date	September 26, 2024	September 19, 2024	January 16, 2025
Equipment	12 metre RF Cable (1- 40)GHz	Pyramidal Horn Antenna	
Registration No.	EW-2774	EW-0905	
Manufacturer	GREATBILLION	EMCO	
Model No.	SMA m-m ra 12m 40G outdoor	3160-09	
Calibration Date	January 16, 2024	December 15, 2023	
Calibration Due Date	January 16, 2025	June 15, 2025	

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2) Bandedge & OBW Measurement

Equipment	EMI Test Receiver (9kHz to 26.5GHz)
Registration No.	EW-3156
Manufacturer	ROHDE SCHWARZ
Model No.	ESR26
Calibration Date	January 31, 2024
Calibration Due Date	January 31, 2025

3) Frequency Error Measurement

Equipment	RF Cable 240cm (RG142) (9kHz to 30MHz)	EMI Test Receiver (9kHz to 26.5GHz)	Temperature &Humidity Chamber
Registration No.	EW-2454	EW-3156	EW-2517
Manufacturer	RADIALL	ROHDE SCHWARZ	KINGSON
Model No.	Bnc m st / 142 / bnc mra 240cm	ESR26	KTHD-410TBS
Calibration Date	June 13, 2023	January 31, 2024	April 01, 2022
Calibration Due Date	September 13, 2024	January 31, 2025	June 30, 2024

4) Conducted Emissions Test

Equipment	RF Cable 240cm (RG142) (9kHz to 30MHz)	Artificial Mains Network	EMI Test Receiver (9kHz to 3GHz)
Registration No.	EW-2454	EW-3360	EW-3095
Manufacturer	RADIALL	ROHDE SCHWARZ	ROHDE SCHWARZ
Model No.	Bnc m st / 142 / bnc mra 240cm	ENV-216	ESCI
Calibration Date	June 13, 2023	April 07, 2024	January 18, 2024
Calibration Due Date	September 13, 2024	April 07, 2025	January 18, 2025

5) Control Software for Radiated Emission

Software Information	
Software Name	EMC32
Manufacturer	ROHDE SCHWARZ
Software version	10.50.40

END OF TEST REPORT