

TEST REPORT

Report No.: 24120213HKG-003

Spin Master Toys Far East Ltd.

Application For Certification
(Original Grant)

FCC ID: PQN66658RX2G4

Transceiver – 2.4GHz RC Dragon

Prepared and Checked by:

Approved by:

Signed on File
Leung Pak To, Alex
Assistant Engineer

 Digitally signed
by Jess Tang
Location:
Intertek Testing
Services Hong
Kong Limited

Tang Kwan Mo, Jess
Assistant Supervisor
Date: January 20, 2025

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TEST REPORT

GENERAL INFORMATION

Grantee:	Spin Master Toys Far East Ltd.
Grantee Address:	Room 1113, 11/F., Chinachem Golden Plaza, 77 Mody Road, Tsim Sha Tsui East, Kowloon, Hong Kong.
FCC ID:	PQN66658RX2G4
Model:	66658RX
Additional Model:	1093152/1095617, 6072292/6074369
Type of EUT:	Transceiver
Description of EUT:	DWD INA MvieFlyngToothls WLMX GML2pkSLD,DWD INA MvFlyingTthlss RC INTL GML2pkSLD, DWD INA MvieFlyngToothls (Date Code: 41122AWK)
Brand Name:	DWD INA MvieFlyngToothls
Serial Number:	Not Labelled
Phantom No.:	20150862/20154235
Sample Receipt Date:	December 05, 2024
Date of Test:	December 05, 2024 to January 14, 2025
Report Date:	January 20, 2025
Environmental Conditions:	Temperature: +10 to 40°C Relative Humidity: 10 to 90%
Conclusion:	Test was conducted by client submitted sample. The submitted sample as received complied with the 47 CFR Part 15 Certification.

TEST REPORT

SUMMARY OF TEST RESULT

Test Items	FCC Part 15 Section	Results
Transmitter Power Line Conducted Emissions	15.207	Not Applicable
Radiated Emission	15.249, 15.209	Complied
Radiated Emission on the Bandedge		Complied
Radiated Emission in Restricted Bands	15.205	Complied

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

FCC Part 15, October 1, 2023 Edition

- Note:
1. The EUT uses a permanently attached antenna which, in accordance to section 15.203, is considered sufficient to comply with the pervisions of this section.
 2. Pursuant to FCC Part 15 Section 15.215(c), the 20dB 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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1.0 GENERAL DESCRIPTION

1.1 Product Description

The Equipment Under Test (EUT), is a portable 2.4GHz Transceiver (Dragon Unit) for a RC controller. The sample supplied operated on 46 channels, normally at 2420 - 2465MHz. The channels are separated with 1MHz spacing.

The EUT is powered by 1 x 3.7V lithium-ion battery. After switching on the controller, the EUT will be flew in different directions based on the switches pressed in the controller.

The Models: 1093152/1095617 and 6072292/6074369 are the same as the Model: 66658RX in hardware aspect as declared by client. The models are different in model number only as declared by client.

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.

The Certificate procedure of transceiver for this transceiver (with FCC ID: PQN66658TX2G4) is being processed as the same time of this application.

1.3 Test Methodology

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 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.

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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).

For maximizing emissions, 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 reported in Exhibit 3.0.

The unit was operated standalone and placed in the center of the turntable.

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.

2.2 EUT Exercising Software

The EUT exercise program (if any) 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

Not Applicable

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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
AF = Antenna Factor in dB
CF = Cable Attenuation 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 29.0 dB and average factor of 5.0 dB are subtracted, giving a field strength of 27.0 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

RA	=	52.0 dB μ V/m	
AF	=	7.4 dB	RR = 18.0 dB μ V
CF	=	1.6 dB	LF = 9.0 dB
AG	=	29.0 dB	
AV	=	5.0 dB	
FS	=	RR + LF	
FS	=	18.0 + 9.0 = 27.0 dB μ V/m	

Level in μ V/m = Common Antilogarithm [(27.0 dB μ V/m)/20] = 22.4 μ V/m

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3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 12100 MHz

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: Radiated 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 7.9 dB

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RADIATED EMISSIONS

Model: 66658RX
Date of Test: December 05, 2024
Worst-Case Operating Mode: Transmitting

Table 1

Pursuant to FCC Part 15 Section 15.249 Requirement

Lowest Channel

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
H	2420.000	59.0	33	29.4	55.4	94.0	-38.6
H	2400.000	36.2	33	29.4	32.6	54.0	-21.4
H	4840.000	37.4	33	34.9	39.3	54.0	-14.7
H	7260.000	25.5	33	37.9	30.4	54.0	-23.6
V	9680.000	34.5	33	40.4	41.9	54.0	-12.1
H	12100.000	38.6	33	40.5	46.1	54.0	-7.9
H	14520.000	39.3	33	38.4	44.7	54.0	-9.3

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
H	2420.000	75.7	33	29.4	72.1	114.0	-41.9
H	2400.000	50.2	33	29.4	46.6	74.0	-27.4
H	4840.000	56.3	33	34.9	58.2	74.0	-15.8
H	7260.000	40.3	33	37.9	45.2	74.0	-28.8
V	9680.000	48.0	33	40.4	55.4	74.0	-18.6
H	12100.000	51.3	33	40.5	58.8	74.0	-15.2
H	14520.000	52.6	33	38.4	58.0	74.0	-16.0

- Notes: 1. Peak Detector Data unless otherwise stated.
2. Average detector is applied according to ANSI C63.10.
3. All measurements were made at 3 meters.
4. Negative value in the margin column shows emission below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emissions within the restricted band meet the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ± 5.3 dB at a level of confidence of 95%.

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RADIATED EMISSIONS

Model: 66658RX
Date of Test: December 05, 2024
Worst-Case Operating Mode: Transmitting

Table 2

Pursuant to FCC Part 15 Section 15.249 Requirement

Middle Channel

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
H	2440.000	60.0	33	29.4	56.4	94.0	-37.6
H	4880.000	33.8	33	34.9	35.7	54.0	-18.3
H	7320.000	32.1	33	37.9	37.0	54.0	-17.0
H	9760.000	34.2	33	40.4	41.6	54.0	-12.4
V	12200.000	38.1	33	40.5	45.6	54.0	-8.4
H	14640.000	39.0	33	38.4	44.4	54.0	-9.6

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
H	2440.000	76.3	33	29.4	72.7	114.0	-41.3
H	4880.000	50.7	33	34.9	52.6	74.0	-21.4
H	7320.000	45.1	33	37.9	50.0	74.0	-24.0
H	9760.000	47.8	33	40.4	55.2	74.0	-18.8
V	12200.000	50.9	33	40.5	58.4	74.0	-15.6
H	14640.000	52.2	33	38.4	57.6	74.0	-16.4

- Notes: 1. Peak Detector Data unless otherwise stated.
2. Average detector is applied according to ANSI C63.10.
3. All measurements were made at 3 meters.
4. Negative value in the margin column shows emission below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emissions within the restricted band meet the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ± 5.3 dB at a level of confidence of 95%.

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RADIATED EMISSIONS

Model: 66658RX
Date of Test: December 05, 2024
Worst-Case Operating Mode: Transmitting

Table 3

Pursuant to FCC Part 15 Section 15.249 Requirement

Highest Channel

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
V	2465.000	59.5	33	29.4	55.9	94.0	-38.1
V	2483.500	36.7	33	29.4	33.1	54.0	-20.9
H	4930.000	32.9	33	34.9	34.8	54.0	-19.2
V	7395.000	26.0	33	37.9	30.9	54.0	-23.1
H	9860.000	33.7	33	40.4	41.1	54.0	-12.9
H	12325.000	37.8	33	40.5	45.3	54.0	-8.7
V	14790.000	38.6	33	38.4	44.0	54.0	-10.0

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
V	2465.000	75.5	33	29.4	71.9	114.0	-42.1
V	2483.500	50.0	33	29.4	46.4	74.0	-27.6
H	4930.000	50.2	33	34.9	52.1	74.0	-21.9
V	7395.000	41.6	33	37.9	46.5	74.0	-27.5
H	9860.000	47.4	33	40.4	54.8	74.0	-19.2
H	12325.000	50.6	33	40.5	58.1	74.0	-15.9
V	14790.000	51.8	33	38.4	57.2	74.0	-16.8

- Notes:
1. Peak Detector Data unless otherwise stated.
 2. Average detector is applied according to ANSI C63.10.
 3. All measurements were made at 3 meters.
 4. Negative value in the margin column shows emission below limit.
 5. Horn antenna is used for the emission over 1000MHz.
 6. Emissions within the restricted band meet the requirement of FCC Part 15 Section 15.205.
 7. Measurement Uncertainty is ± 5.3 dB at a level of confidence of 95%.

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RADIATED EMISSIONS

Model: 66658RX
Date of Test: December 20, 2024
Worst-Case Operating Mode: Transmitting

Table 4

Pursuant to FCC Part 15 Section 15.209 Requirement

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)
H	30.849	24.8	16	10.0	18.8	40.0	-21.2
V	42.853	17.2	16	10.0	11.2	40.0	-28.8
H	335.429	12.0	16	24.0	20.0	46.0	-26.0
H	491.963	14.1	16	26.0	24.1	46.0	-21.9
V	653.225	15.9	16	29.0	28.9	46.0	-17.1
H	942.164	13.6	16	33.0	30.6	46.0	-15.4

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

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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 electronics 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.

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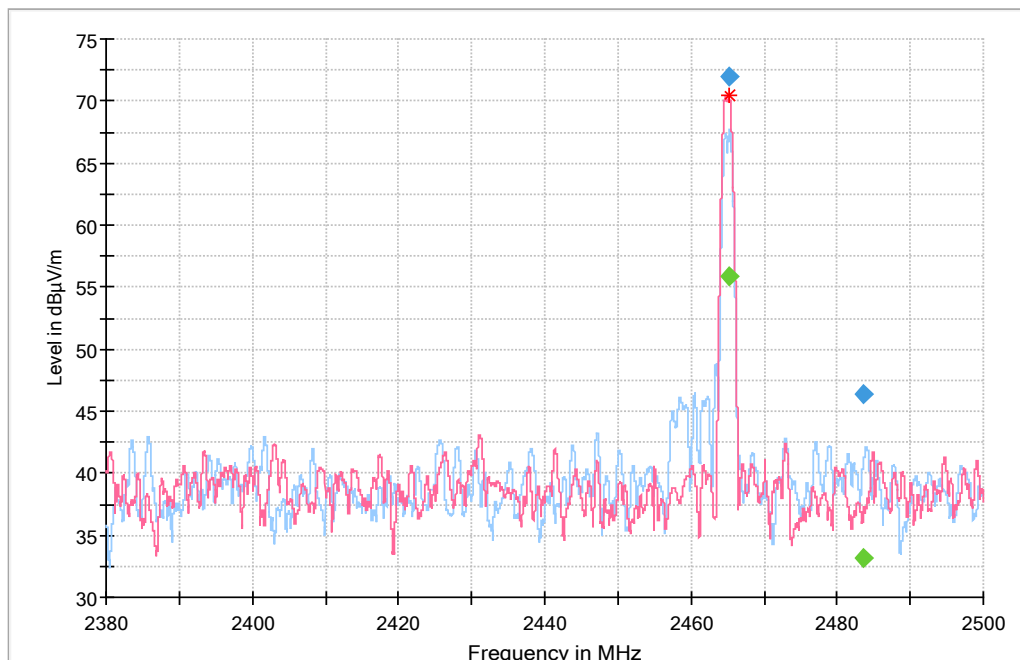
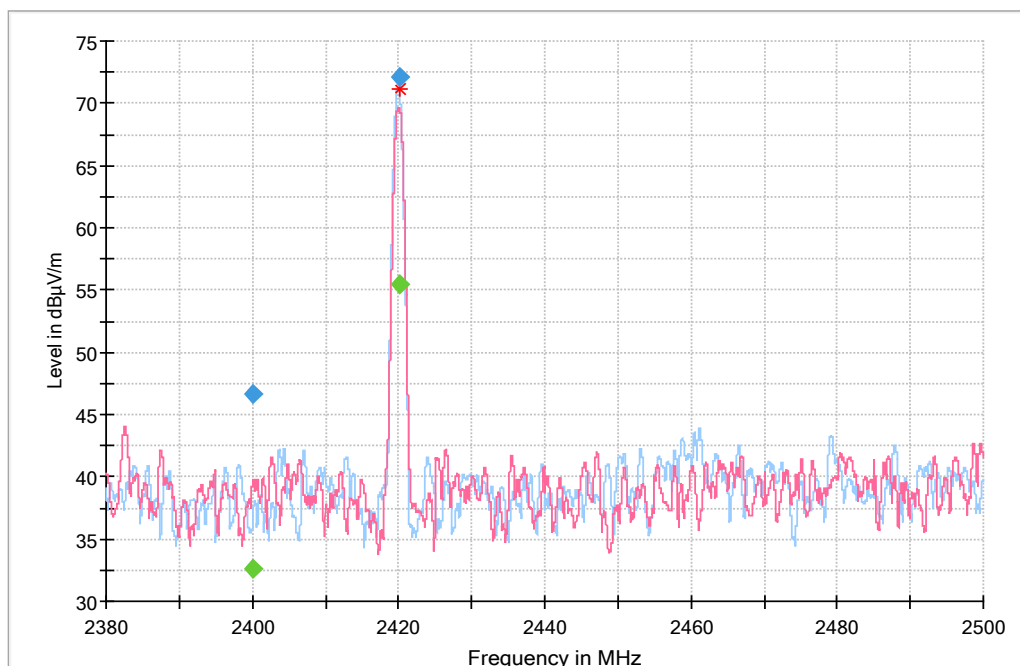
8.0 MISCELLANEOUS INFORMATION

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

8.1 Radiated Emission on the Bandedge

The emission of bandedge data were shown on the above radiated data table of 1 & 3 respectively.

Emissions radiated outside of the specified frequency bands, except harmonics, are attenuated by 50dB below the level of the fundamental or to the general radiated emissions limits in Section 15.209, whichever is the lesser attenuation, which meet the requirement of Part 15.249(d).



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8.2 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.

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).

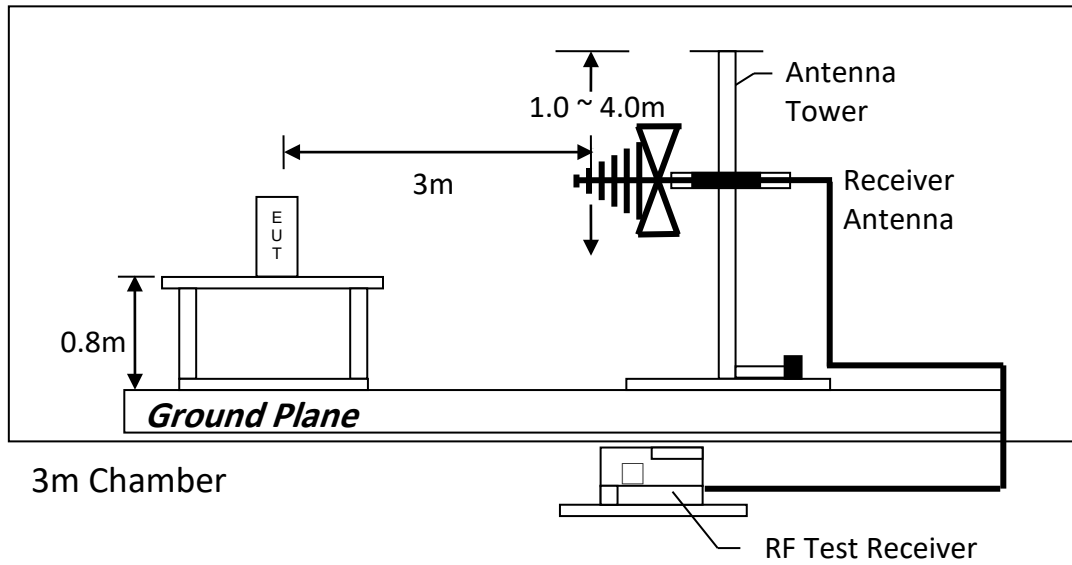
The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion 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 10 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.

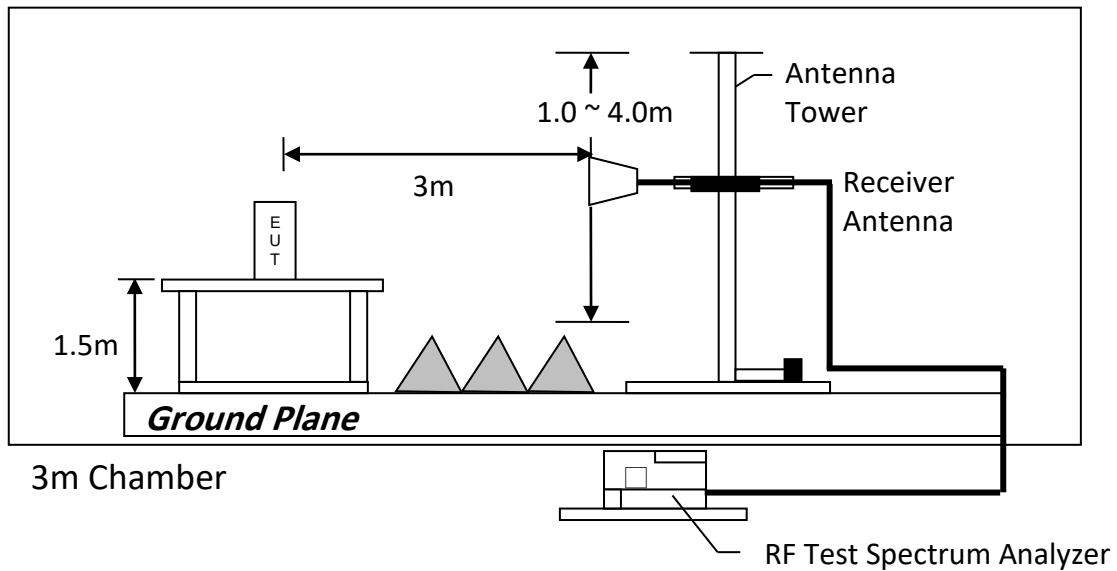
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8.2.1 Radiated Emission Test Setup

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



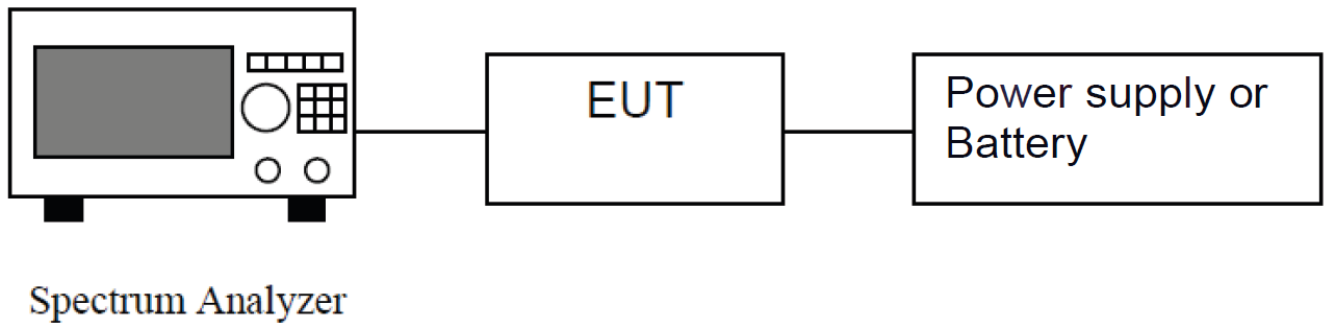
Test setup of radiated emissions up to 1GHz



Test setup of radiated emissions above 1GHz

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8.3 Occupied Bandwidth

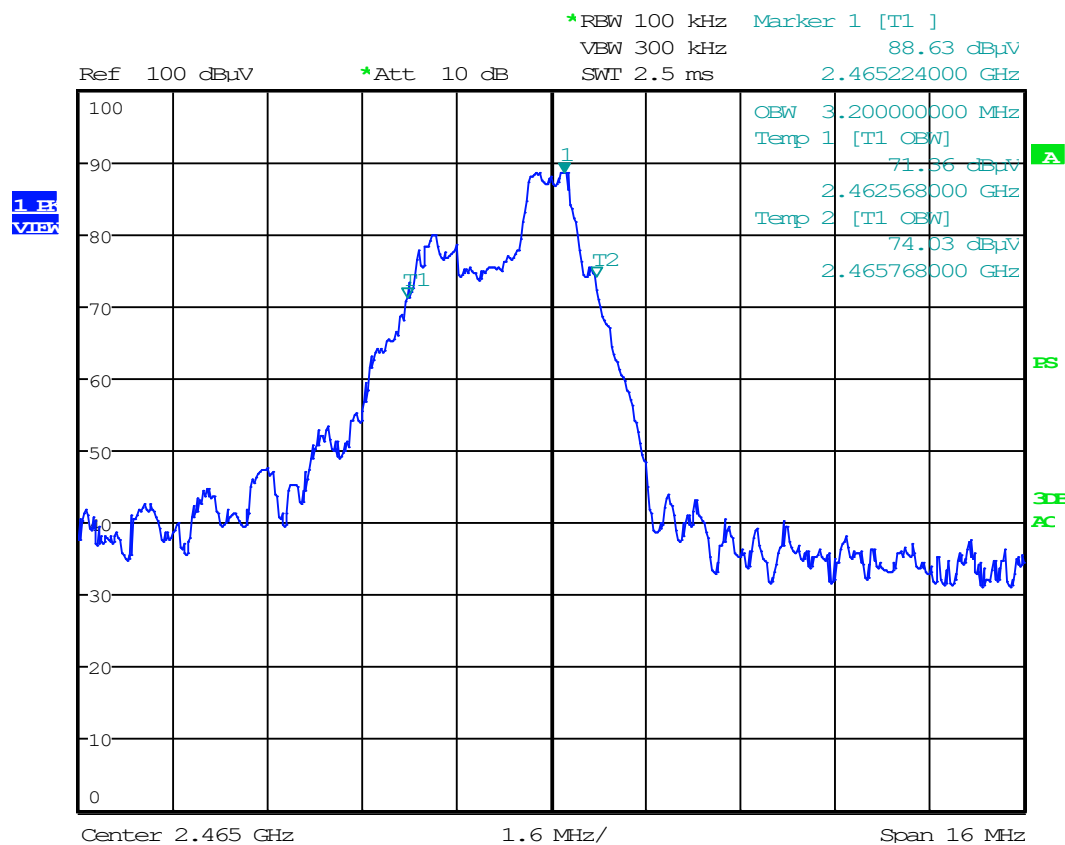


Block diagram of Test setup

Occupied Bandwidth Results:

	Occupied Bandwidth (kHz)
Low Channel: 2420	1600
Middle Channel: 2440	1616
High Channel: 2465	3200

The worst case is shown as below:



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9.0 CONFIDENTIALITY REQUEST

For electronic filing, a preliminary copy of the confidentiality request is saved with filename: Request.pdf.

10.0 EQUIPMENT LIST

1) Radiated Emissions Test & Bandedge Measurement

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	ROHDESCHWARZ	EMCO	EMCO
Model No.	ESR26	3110C	3148B
Calibration Date	January 31, 2024	July 30, 2024	July 30, 2024
Calibration Due Date	January 31, 2025	July 30, 2026	July 30, 2026

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	February 10, 2025	July 05, 2025	January 20, 2025

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	October 09, 2024	October 09, 2024	January 16, 2024
Calibration Due Date	October 09, 2025	October 09, 2025	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) OBW Measurement

Equipment	EMI Test Receiver (9kHz to 3GHz)
Registration No.	EW-3095
Manufacturer	ROHDESCHWARZ
Model No.	ESCI
Calibration Date	January 18, 2024
Calibration Due Date	January 18, 2025

3) Control Software for Radiated Emission

Software Information	
Software Name	EMC32
Manufacturer	ROHDESCHWARZ
Software version	10.50.40

END OF TEST REPORT