



RADIO TEST REPORT

FCC ID : MSQ-RTAXE4P00
Equipment : AXE11000 Tri Band WiFi Router
Brand Name : ASUS
Model Name : ET12, ZenWiFi ET12, ASUS ZenWiFi ET12
Applicant : ASUSTeK COMPUTER INC.
1F., No. 15, Lide Rd., Beitou, Taipei 112, Taiwan
Standard : 47 CFR FCC Part 15.247

The product was received on Sep. 02, 2023, and testing was started from Apr. 08, 2024 and completed on Apr. 08, 2024. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.



Approved by: Sam Chen

Sporton International Inc. Hsinchu Laboratory

No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)



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Photographs of EUT v01



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	-
3.1	15.247(d)	Emissions in Restricted Frequency Bands	PASS	-

Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the chapter "Measurement Uncertainty".

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Sam Chen

Report Producer: Vicky Huang



1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	Bluetooth Mode	Ch. Frequency (MHz)	Channel Number
2400-2483.5	LE	2402-2480	0-39 [40]

Band	Mode	BWch (MHz)	Nant
2.4-2.4835GHz	BT-LE(1Mbps)	1.0	1TX

Note:

- ♦ Bluetooth LE uses a GFSK modulation.
- ♦ BWch is the nominal channel bandwidth.



1.1.2 Antenna Information

Ant.	Port				Brand	Model Name	Antenna Type	Connector	Gain (dBi)
	WLAN 2.4GHz	WLAN 5GHz	WLAN 6GHz	Bluetooth					
1	-	-	3	-	WHA YU	C660-510565-A	PIFA	I-PEX	Note1
2	-	-	2	-	WHA YU	C660-510565-A	PIFA	I-PEX	
3	-	-	1	-	WHA YU	C660-510565-A	PIFA	I-PEX	
4	-	-	4	-	WHA YU	C660-510565-A	PIFA	I-PEX	
5	3	2	-	-	WHA YU	C660-510565-A	PIFA	I-PEX	
6	4	1	-	-	WHA YU	C660-510565-A	PIFA	I-PEX	
7	1	4	-	-	WHA YU	C660-510565-A	PIFA	I-PEX	
8	2	3	-	-	WHA YU	C660-510565-A	PIFA	I-PEX	
9	-	-	-	1	YAGEO	ANT3216A063R2400A	Chip	N/A	

Note1:

Ant.	Port				Antenna Gain (dBi)												
	WLAN 2.4GHz	WLAN 5GHz	WLAN 6GHz	Bluetooth	WLAN 2.4GHz	WLAN 5GHz				WLAN 6GHz				Bluetooth			
						UNII 1	UNII 2A	UNII 2C	UNII 3	UNII 5	UNII 6	UNII 7	UNII 8				
1	-	-	3	-	-	-	-	-	-	0.97	0.81	1.07	1.14	-			
2	-	-	2	-	-	-	-	-	-					-	-	-	
3	-	-	1	-	-	-	-	-	-					-	-	-	-
4	-	-	4	-	-	-	-	-	-					-	-	-	-
5	3	2	-	-	3.03	3.63	3.43	3.18	4.44	-	-	-	-	-			
6	4	1	-	-	2.13	4.04	3.59	2.73	3.14	-	-	-	-	-			
7	1	4	-	-	2.34	2.76	3.12	3.17	3.46	-	-	-	-	-			
8	2	3	-	-	3.67	4.17	4.44	4.41	4.94	-	-	-	-	-			
9	-	-	-	1	-	-	-	-	-	-	-	-	-	1.69			

Note2: The above information was declared by manufacturer.

WLAN 6GHz: The directional gain is calculated which follows the procedure of KDB 662911 D01.

WLAN 2.4GHz/5GHz: The directional gain is measured which follows the procedure of KDB 662911 D03.

For 2.4GHz function:

For IEEE 802.11b/g/n/VHT/ax (4TX/4RX):

Port 1, Port 2, Port 3 and Port 4 can be used as transmitting/receiving antenna.

Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously.

For 5GHz function:

For IEEE 802.11a/n/ac/ax (4TX/4RX):

Port 1, Port 2, Port 3 and Port 4 can be used as transmitting/receiving antenna.

Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously.

For 6GHz function:

For IEEE 802.11ax (4TX/4RX):



Port 1, Port 2, Port 3 and Port 4 can be used as transmitting/receiving antenna.
Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously.

For Bluetooth Function:

For Bluetooth mode (1TX/1RX)

Only Port 1 can be use as transmit and receive antenna.

1.1.3 EUT Operational Condition

EUT Power Type	From Power Adapter		
Function	<input checked="" type="checkbox"/> Point-to-multipoint	<input type="checkbox"/> Point-to-point	
Test Software Version	DOS [6.1.7601]		
Support Mode	<input checked="" type="checkbox"/> LE 1M PHY: 1 Mb/s		
	<input type="checkbox"/> LE Coded PHY (S=2): 500 Kb/s		
	<input type="checkbox"/> LE Coded PHY (S=8): 125 Kb/s		
	<input type="checkbox"/> LE 2M PHY: 2 Mb/s		

Note: The above information was declared by manufacturer.

1.1.4 EUT Operational Condition

EUT Power Type	From Power Adapter
Test Software Version	DOS [6.1.7601]

1.1.5 Table for Multiple Listing

Brand Name	Model Name	Description
ASUS	ET12	All the models are identical, the different model names served as a marketing strategy.
	ZenWiFi ET12	
	ASUS ZenWiFi ET12	

Note1: From the above model: ET12 was selected as representative model for the test and its data was recorded in this report.

Note2: The above information was declared by manufacturer.



1.1.6 Table for Components Source Information

Items	Main Source	Second Source
Transceiver (2.5G LAN)	Brand: MAXLINEAR Model: GPY211	Brand: Broadcom Model: BCM50991
MLCC on the path of the CPU (Location: CA15,CA16,CA17,CA18,CB15,CB16, CB17,CB18,CE15,CE16,CE17,CE18)	Brand: MURATA Model: GRM0335C1E100JA01D	Brand: WALSIN Model: RF03N100J250CT
MLCC on the path of the CPU (Location: CA281,CA282,CB121,CB221,CB281, CB282,CB321,CB421,CC117,CC119, CC121,CC217,CC219,CC221,CC317, CC319,CC321,CC417,CC419,CC421, CE281,CE282)	Brand: WALSIN Model: RF03N1R0B250CT	Brand: MURATA Model: GRM0335C1E1R0BA01D

Note: The above information was declared by manufacturer.

1.1.7 Table for EUT Information

EUT	Transceiver (2.5G LAN)	MLCC on the path of the CPU (Location: CA15,CA16,CA17,CA18,CB15, CB16,CB17,CB18,CE15,CE16, CE17 ,CE18)	MLCC on the path of the CPU (Location: CA281,CA282,CB121,CB221,CB281, CB282,CB321,CB421,CC117,CC119, CC121,CC217,CC219,CC221,CC317,CC319, CC321,CC417,CC419,CC421,CE281, CE282)
EUT 1	Main Source	Main Source	Main Source
EUT 2	Second Source	Main 0Source	Main Source
EUT 3	Main Source	Second Source	Second Source

Note1: From the above, EUT 3 has been selected as representative mode for the test and its data was recorded in this report.

Note2: The above information was declared by manufacturer.

1.1.8 Table for EUT Supports Function

Function	Support Type	Remark
AP Router	Master	Support 2.4GHz/5GHz/6GHz
Bridge	Slave without radar detection	Support 2.4GHz/5GHz
Repeater	Master	Support 2.4GHz/5GHz
Mesh	Master	Support 2.4GHz/5GHz/6GHz

Note1: From the above, AP Router (Master) has been selected to test Emissions in Restricted Frequency Bands below 1GHz.

Note2: The above information was declared by manufacturer.



1.1.9 Table for Permissive Change

This product is an extension of original one reported under Sporton project number: FR0D2518AC

Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
1. Add the second source for MLCC on the path of the CPU Location:CA15,CA16,CA17,CA18,CB15,CB16,CB17,CB18, CE15,CE16,CE17,CE18,CA281,CA282,CB121,CB221,CB281, CB282,CB321,CB421,CC117,CC119,CC121,CC217,CC219, CC221,CC317,CC319,CC321,CC417,CC419,CC421, CE281,CE282)	Emissions in Restricted Frequency Bands below 1GHz test
2. Removing Manufacturer name and address.	After evaluating, it does not affect the test.



1.2 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ◆ 47 CFR FCC Part 15.247
- ◆ ANSI C63.10-2013

The following reference test guidance is not within the scope of accreditation of TAF.

- ◆ FCC KDB 558074 D01 v05r02
- ◆ FCC KDB 414788 D01 v01r01

1.3 Testing Location Information

Testing Location Information	
Test Lab. : Sporton International Inc. Hsinchu Laboratory	
Hsinchu (TAF: 3787)	ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.) TEL: 886-3-656-9065 FAX: 886-3-656-9085 Test site Designation No. TW3787 with FCC. Conformity Assessment Body Identifier (CABID) TW3787 with ISED.

Test Condition	Test Site No.	Test Engineer	Test Environment (°C / %)	Test Date
Radiated<1GHz	03CH05-CB	Roy Mai	21.9-22.4 / 55-58	Apr. 08, 2024

1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

Test Items	Uncertainty	Remark
Radiated Emission (9kHz ~ 30MHz)	3.7 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	5.1 dB	Confidence levels of 95%



2 Test Configuration of EUT

2.1 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests	
Tests Item	Emissions in Restricted Frequency Bands
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.
Operating Mode < 1GHz	Normal Link
	1. The EUT was performed at X axis, Y axis and Z axis position for Emissions in Restricted Frequency Bands above 1GHz test, and the worst case was found at Y axis. So the measurement will follow this same test configuration. 2. There are two Adapters, after evaluating, Adapter 1 has been evaluated to be the worst case, thus measurement will follow this same test configuration.
1	EUT 3 in Y axis + Adapter 1

2.2 EUT Operation during Test

During the test, the EUT operation to normal function.

2.3 Accessories

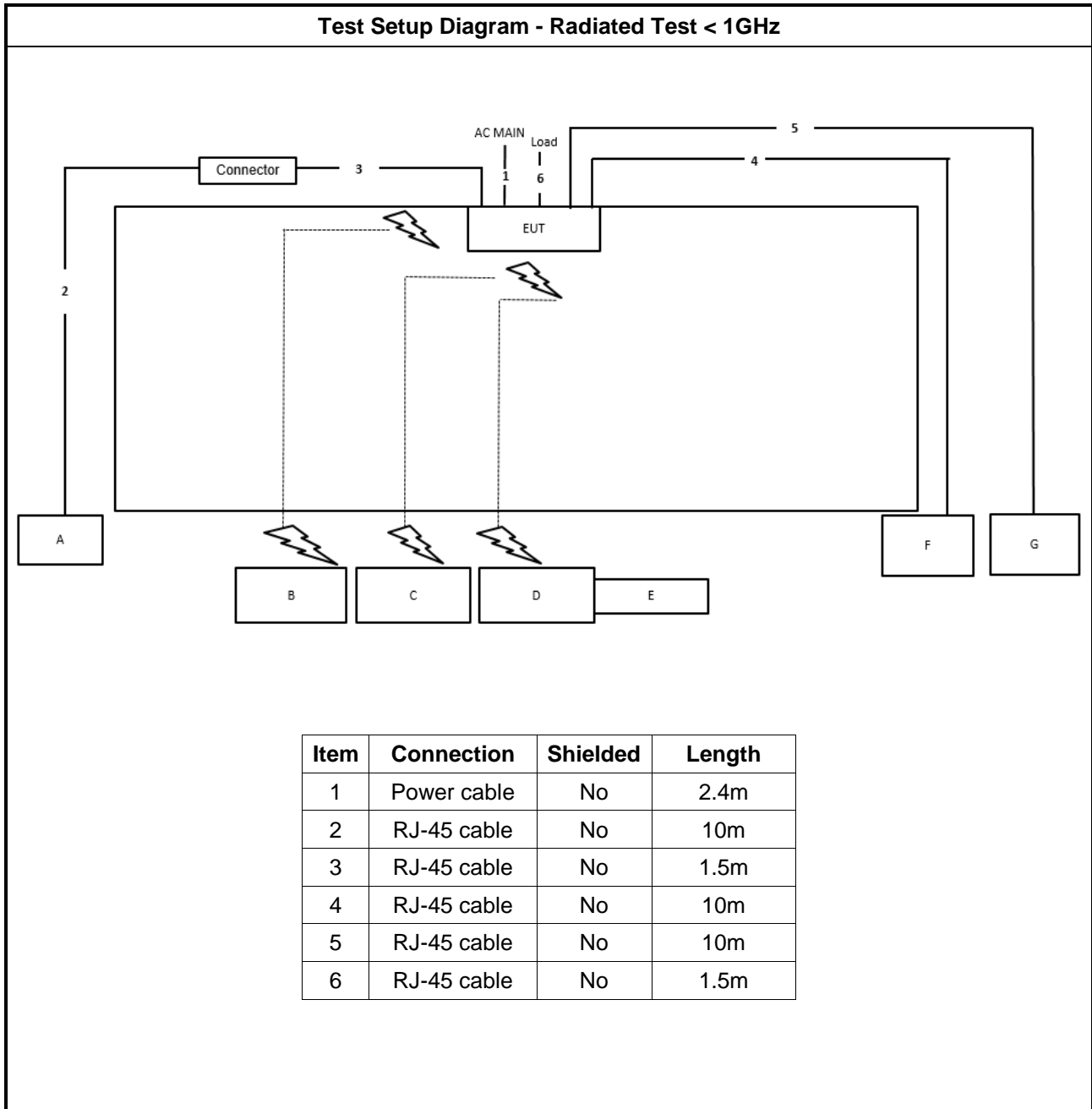
Accessories				
Equipment Name	Brand Name	Model Name	Rating	Remark
Adapter 1	DELTA	ADP-45FE	INPUT: 100-240V~1.2A, 50-60Hz OUTPUT: 19.0V, 2.37A, 45.0W	With the DC Power cable: Non-shielded, 1.5m
Adapter 2	AcBel	ADH011	INPUT: 100-240V~1.4A, 50-60Hz OUTPUT: 19.5V, 2.31A, 45.0W	With the DC Power cable: Non-shielded, 1.5m
Others				
Power cable*1: Non-shielded, 0.9m RJ-45 cable*1: Non-shielded, 1.5m				



2.4 Support Equipment

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
A	NB	DELL	E4300	N/A
B	2.4G NB	DELL	E4300	N/A
C	5G NB	DELL	E4300	N/A
D	WLAN module	Intel	AX210NGW	PD9AX210NG
E	6G NB	DELL	E4300	N/A
F	2.5G LAN PC	DELL	E4300	N/A
G	2.5G WAN PC	DELL	E4300	N/A

2.5 Test Setup Diagram





3 Transmitter Test Result

3.1 Emissions in Restricted Frequency Bands

3.1.1 Emissions in Restricted Frequency Bands Limit

Restricted Band Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB / decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Note 3: Using the distance of 1m during the test for above 18 GHz, and the test value to correct for the distance factor at 3m.

3.1.2 Measuring Instruments

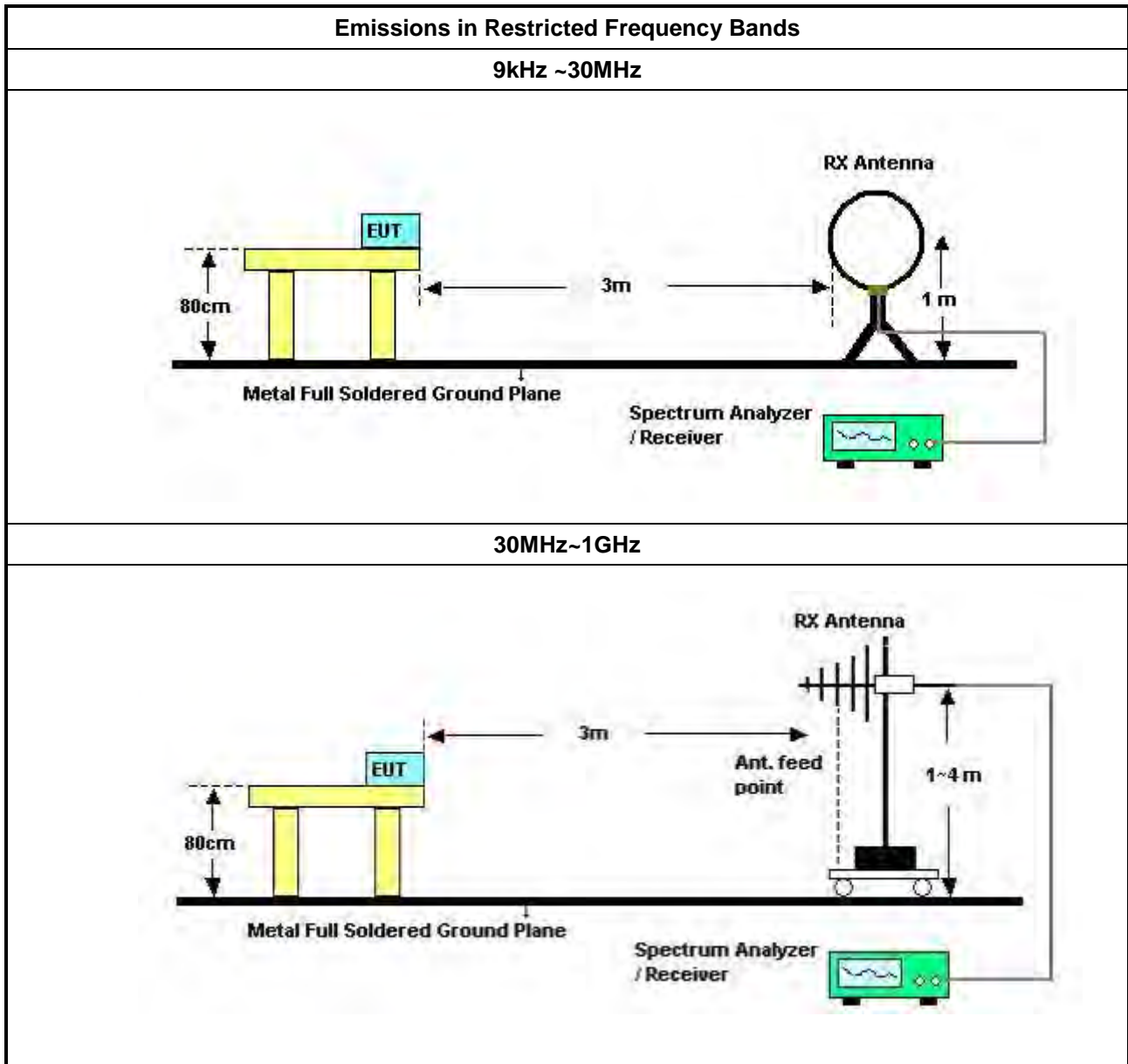
Refer a test equipment and calibration data table in this test report.



3.1.3 Test Procedures

Test Method	
<ul style="list-style-type: none"> ▪ The average emission levels shall be measured in [duty cycle \geq 98 or duty factor]. 	
<ul style="list-style-type: none"> ▪ Refer as ANSI C63.10, clause 6.10.3 band-edge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band. 	
<ul style="list-style-type: none"> ▪ For the transmitter unwanted emissions shall be measured using following options below: 	
	<ul style="list-style-type: none"> ▪ Refer as FCC KDB 558074, clause 8.6 for unwanted emissions into restricted bands.
	<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.1(trace averaging for duty cycle \geq 98%).
	<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.2(trace averaging + duty factor).
	<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.3(Reduced VBW \geq 1/T).
	<input type="checkbox"/> Refer as ANSI C63.10, clause 11.12.2.5.3 (Reduced VBW). VBW \geq 1/T, where T is pulse time.
	<input type="checkbox"/> Refer as ANSI C63.10, clause 7.5 average value of pulsed emissions.
	<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.4 measurement procedure peak limit.
<ul style="list-style-type: none"> ▪ For the transmitter band-edge emissions shall be measured using following options below: 	
	<ul style="list-style-type: none"> ▪ Refer as FCC KDB 558074 clause 8.7 & c63.10 clause 11.13.1, When the performing peak or average radiated measurements, emissions within 2 MHz of the authorized band edge may be measured using the marker-delta method described below.
	<ul style="list-style-type: none"> ▪ Refer as FCC KDB 558074, clause 8.7 (ANSI C63.10, clause 6.10.6) for marker-delta method for band-edge measurements.
	<ul style="list-style-type: none"> ▪ Refer as FCC KDB 558074, clause 8.7 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).
	<ul style="list-style-type: none"> ▪ For conducted unwanted emissions into restricted bands (absolute emission limits). Devices with multiple transmit chains using options given below: (1) Measure and sum the spectra across the outputs or (2) Measure and add 10 log(N) dB
	<ul style="list-style-type: none"> ▪ For FCC KDB 662911 The methodology described here may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance may be demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred.

3.1.4 Test Setup



3.1.5 Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: $\text{Antenna factor (AF)} + \text{Cable loss (CL)} + \text{Read level (Raw)} - \text{Preamp factor (PA)} (\text{if applicable}) = \text{Level}$.



3.1.6 Emissions in Restricted Frequency Bands (Below 30MHz)

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to KDB414788 Radiated Test Site, and the result came out very similar.

All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10th harmonic or 40 GHz, whichever is appropriate.

3.1.7 Test Result of Emissions in Restricted Frequency Bands

Refer as Appendix A



4 Test Equipment and Calibration Data

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH05-CB	30 MHz ~ 1 GHz	Aug. 02, 2023	Aug. 01, 2024	Radiation (03CH05-CB)
Bilog Antenna with 6dB Attenuator	TESEQ & EMCI	CBL 6112D & N-6-06	35236 & AT-N0610	30MHz ~ 2GHz	Mar. 23, 2024	Mar. 22, 2025	Radiation (03CH05-CB)
Amplifier	EMCI	EMC330N	980331	20MHz ~ 3GHz	May 03, 2023	May 02, 2024	Radiation (03CH05-CB)
Spectrum Analyzer	R&S	FSP40	100304	9kHz ~ 40GHz	Apr. 18, 2023	Apr. 17, 2024	Radiation (03CH05-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	Jun. 13, 2023	Jun. 12, 2024	Radiation (03CH05-CB)
RF Cable-low	Woken	RG402	Low Cable-04+23	30MHz~1GHz	Dec. 06, 2023	Dec. 05, 2024	Radiation (03CH05-CB)
Loop Antenna	Teseq	HLA 6121	65417	9kHz - 30 MHz	Oct. 13, 2023	Oct. 12, 2024	Radiation (03CH05-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH05-CB)

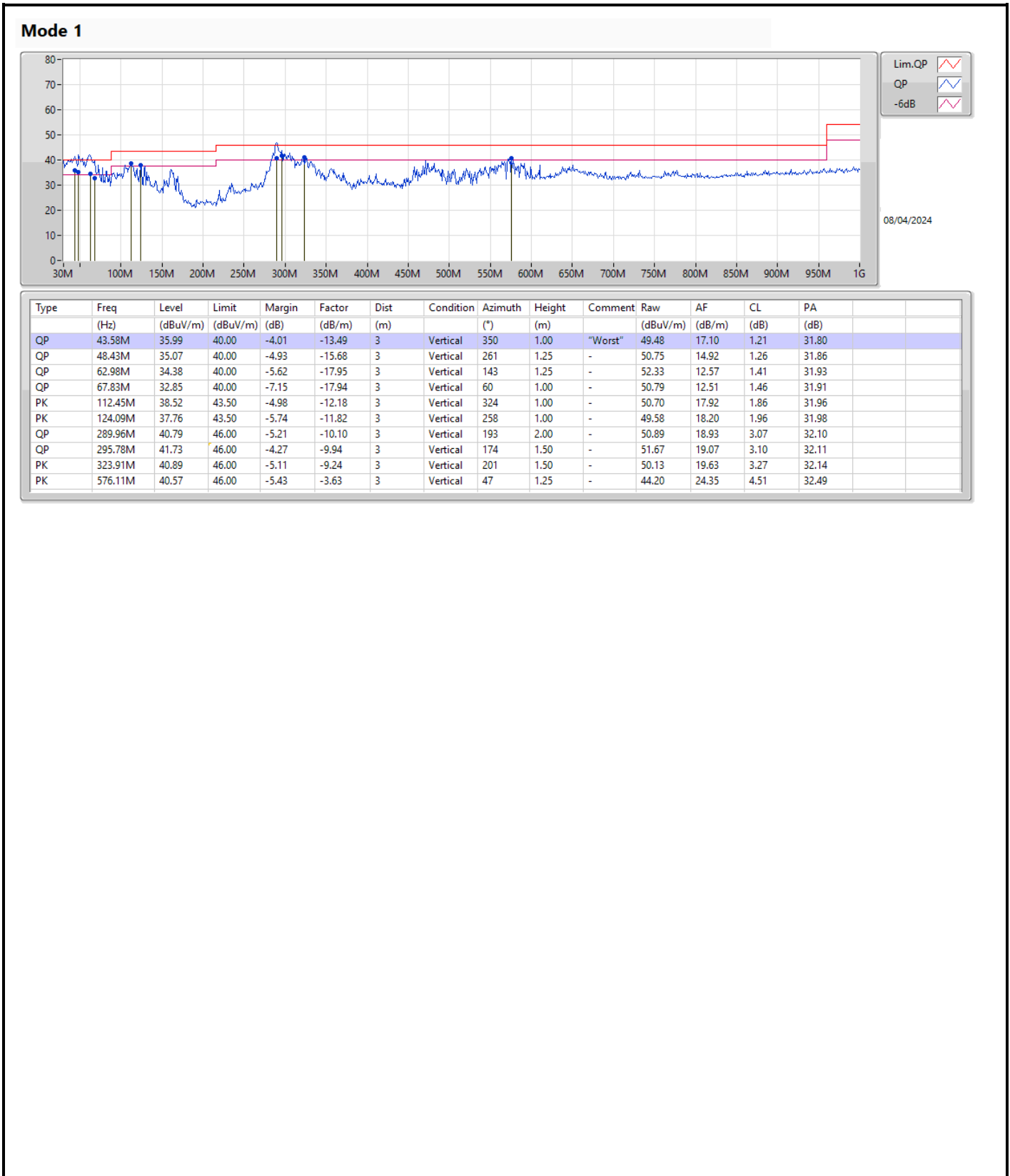
Note: Calibration Interval of instruments listed above is one year.

N.C.R. means Non-Calibration required.

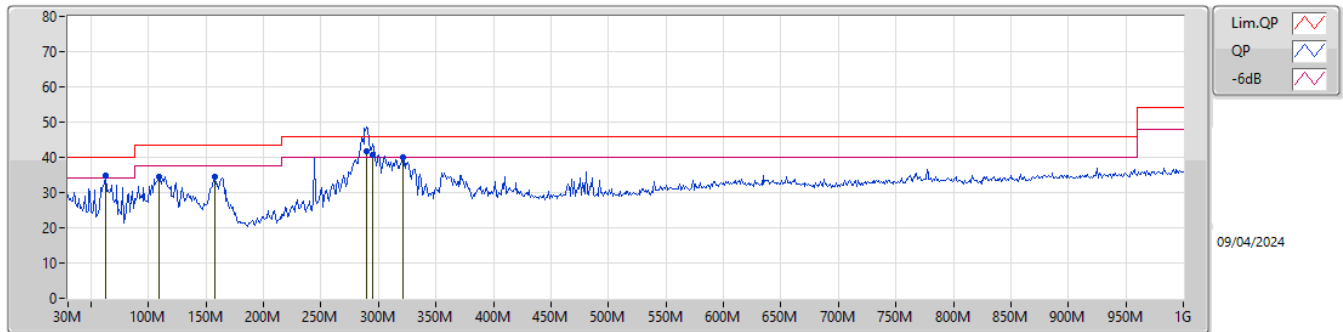


Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Condition
Mode 1	Pass	QP	43.58M	35.99	40.00	-4.01	Vertical



Mode 1



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB/m)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV/m)	AF (dB/m)	CL (dB)	PA (dB)
PK	62.98M	34.79	40.00	-5.21	-17.95	3	Horizontal	0	1.50	-	52.74	12.57	1.41	31.93
PK	109.54M	34.59	43.50	-8.91	-12.38	3	Horizontal	63	3.00	-	46.97	17.74	1.84	31.96
PK	158.04M	34.48	43.50	-9.02	-13.79	3	Horizontal	355	3.00	-	48.27	16.04	2.21	32.04
QP	289.96M	41.83	46.00	-4.17	-10.10	3	Horizontal	292	1.25	"Worst"	51.93	18.93	3.07	32.10
QP	294.81M	40.84	46.00	-5.16	-9.96	3	Horizontal	241	1.00	-	50.80	19.05	3.10	32.11
PK	321M	40.05	46.00	-5.95	-9.30	3	Horizontal	206	1.25	-	49.35	19.58	3.26	32.14