



RADIO TEST REPORT

FCC ID : 2A95Z20231001

Equipment : TRUE BALLISTIC Chronograph

Brand Name : FX Airguns, FX outdoors

Model Name : TRUE BALLISTIC Chronograph

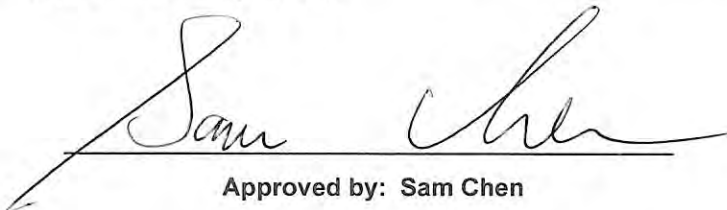
Applicant : EXC Taiwan Co Ltd
No 8-9, Xinhe Rd, Daya District, Taichung city
40863, Taiwan

Manufacturer : EXC Taiwan Co Ltd
No 8-9, Xinhe Rd, Daya District, Taichung city
40863, Taiwan

Standard : 47 CFR FCC Part 15.245

The product was received on Feb. 21, 2023, and testing was started from Feb. 22, 2023 and completed on Mar. 09, 2023. 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 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.)



Table of Contents

History of this test report.....	3
Summary of Test Result.....	4
1 General Description	5
1.1 Information.....	5
1.2 Applicable Standards	7
1.3 Testing Location Information	7
1.4 Measurement Uncertainty	7
2 Test Configuration of Equipment under Test.....	8
2.1 Parameters of Test Software Setting	8
2.2 Conformance Tests and Related Test Frequencies.....	8
2.3 EUT Operation during Test	8
2.4 Accessories	9
2.5 Support Equipment.....	9
2.6 EUT Setups	10
3 Transmitter Test Result	12
3.1 AC Power Conducted Emissions	12
3.2 Occupied Bandwidth	17
3.3 Field Strength of Fundamental	22
3.4 Transmitter Spurious Emissions.....	30
3.5 Antenna Requirements.....	52
4 Test Equipment and Calibration Data	53

Appendix A. Test Photos

Photographs of EUT v01



History of this test report

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A8_1 Ver1.3

Page Number : 3 of 54
Issued Date : Mar. 27, 2023
Report Version : 01



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.207	AC Power Conducted Emissions	PASS	-
3.2	15.215(c)	Occupied Bandwidth	PASS	-
3.3	15.245(b)	Field Strength of Fundamental	PASS	-
3.4	15.245(b)	Transmitter Spurious Emissions	PASS	-
3.5	15.203	Antenna Requirements	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/manufacture 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: Sophia Shiung



1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information	
Frequency Range	24075 - 24175 MHz
Operation Frequency	24080 - 24168 MHz
Channel Number	12
Modulation	FMCW

Note: The above information was declared by manufacturer.

1.1.2 Antenna Information

Ant.	Port		Brand	Model Name	Antenna Type	Connector	Gain (dBi)	
	WLAN 24GHz	Bluetooth					WLAN 24GHz	Bluetooth
1	1	-	EXC	#EX080424001	Patch Antenna	N/A	19.6	-
2	-	1	EXC	#EXBL01L001	PCB Antenna	N/A	-	3.05

Note 1: The above information was declared by manufacturer.

Note 2: **For 24GHz function (1TX/1RX):**

Only Port 1 can be used as transmitting/receiving antenna.

For bluetooth function (1TX/1RX):

Only Port 1 can be used as transmitting/receiving antenna.

1.1.3 Field Strength of Fundamental

Field Strength of Fundamental							
Applicable power levels:	<input type="checkbox"/> Conducted <input type="checkbox"/> EIRP <input checked="" type="checkbox"/> Field Strength at 3m						
Frequency	Highest setting (P_{high}): (dBuV/m)						
	Power Setting	Modulation	Data Rate (Mb/s)	Average Level	Peak Level	Average Level Limit	Peak Level Limit
24080 MHz	Default	FMCW	N/A	101.21	101.38	137.54	157.54
24120 MHz	Default	FMCW	N/A	101.28	101.49	137.54	157.54
24168 MHz	Default	FMCW	N/A	101.33	101.54	137.54	157.54

Note: Field Strength of Fundamental = measurement level at 1m - distance extrapolation factor [9.54 dB].

**1.1.4 Duty Cycle**

On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
100.000	100.000	100.00%	0.00	0.01

1.1.5 EUT Operational Condition

EUT Power Type	Powered by Battery or from system via USB cable
Test Software Version	Default

Note: The above information was declared by manufacturer.



1.2 Applicable Standards

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

- ♦ ANSI C63.10-2013
- ♦ 47 CFR FCC Part 15.245

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

- ♦ FCC KDB 414788 D01 v01r01

1.3 Testing Location Information

Testing Location Information	
Test Lab. : Sporton International Inc. Hsinchu Laboratory	
Hsinchu	ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)
(TAF: 3787)	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	03CH04-CB	Chris Li	21.6~22.2 / 62~65	Feb. 22, 2023~ Mar. 08, 2023
AC Conduction	CO01-CB	Elvin Yeh	22~23 / 50~51	Mar. 09, 2023

1.4 Measurement Uncertainty

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	3.4 dB	Confidence levels of 95%
Radiated Emission (9kHz ~ 30MHz)	3.4 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	5.6 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	5.2 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	4.7 dB	Confidence levels of 95%
Radiated Emission (40GHz ~ 60GHz)	3.0 dB	Confidence levels of 95%
Radiated Emission (60GHz ~ 90GHz)	3.2 dB	Confidence levels of 95%
Radiated Emission (90GHz ~ 200GHz)	4.3 dB	Confidence levels of 95%



2 Test Configuration of Equipment under Test

2.1 Parameters of Test Software Setting

Software Setting	
Test Frequencies	24080 MHz / 24120 MHz / 24168 MHz
Software Setting	Default

2.2 Conformance Tests and Related Test Frequencies

Test	Test Frequencies
AC Power Conducted Emissions Test Voltage: 120Vac / 60Hz	Random
Emission Bandwidth	24080 MHz / 24120 MHz / 24168 MHz
Field Strength of Fundamental	24080 MHz / 24120 MHz / 24168 MHz
Transmitter Spurious Emissions	24080 MHz / 24120 MHz / 24168 MHz

AC Power Line Conducted Emissions Test

Operating mode: Normal link

Mode 1. EUT + Powered from system via USB cable

Radiated Emissions Test < 1GHz

Operating mode: CTX

After evaluating, EUT in Y axis was the worst case. So the measurement will follow this same test configuration.

Mode 1. EUT in Y axis_Bluetooth + Powered from battery

Mode 2. EUT in Y axis_Bluetooth + Powered from system via USB cable

Mode 2 has been evaluated to be the worst case among Mode 1~2, thus measurement for Mode 3 will follow this same power supply.

Mode 3. EUT in Y axis_24GHz + Powered from system via USB cable

For operating, mode 3 is the worst case and it was record in this test report.

Radiated Emissions Test > 1GHz

Operating mode: CTX

After evaluating, EUT in Y axis was the worst case. So the measurement will follow this same test configuration.

Mode 1. EUT in Y axis

2.3 EUT Operation during Test

For Normal Link Mode:

During the test, the EUT operation to normal function.

For CTX Mode:

The EUT was programmed to be in continuously transmitting mode.



2.4 Accessories

Accessories			
Power	Brand	Model	Rating
Rechargeable Li-ion battery*2	SANYO	INR18650A260A-1S1P	DC 3.6V - 2.6Ah
Others			
USB cable*1: Shielded,:1m			
Base bracket*1			

2.5 Support Equipment

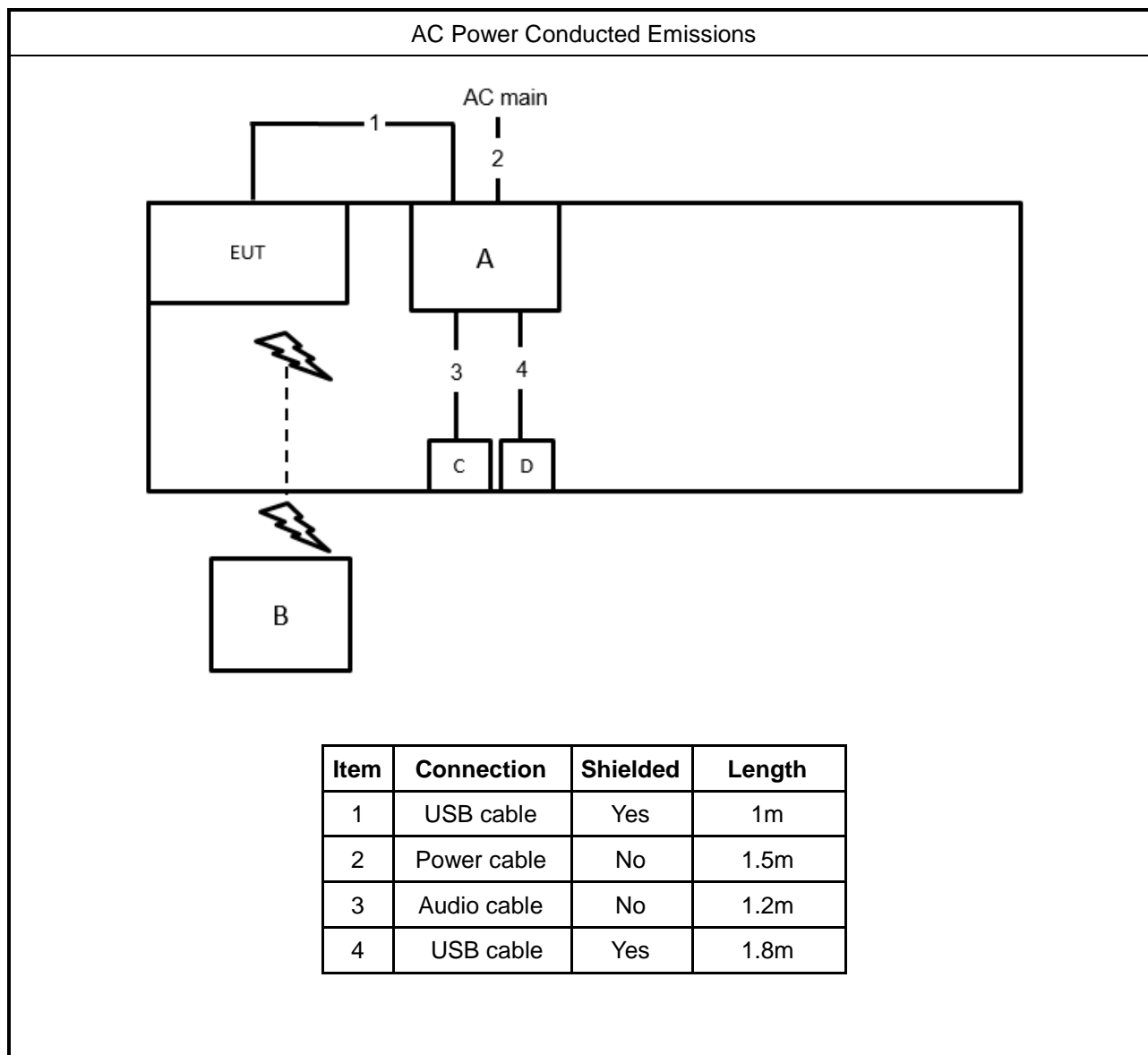
For AC Conduction:

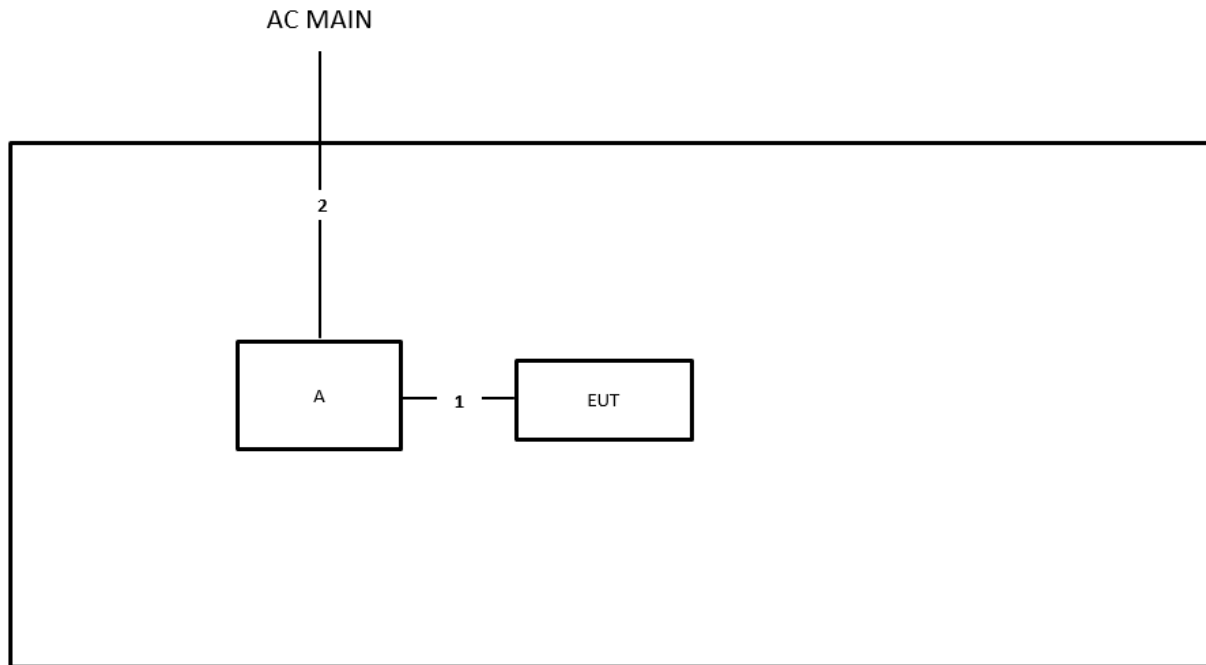
Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
A	Type-C NB	DELL	E6430	N/A
B	iPhone 12	Apple	A2403	BCG-E3544A
C	Earphone	SHYARO CHI	MIC-04	N/A
D	Mouse	Logitech	M-U0026	N/A

For Radiated:

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
A	NB	Lenovo	L440	N/A

2.6 EUT Setups



Transmitter Spurious Emissions


Item	Connection	Shielded	Length
1	USB cable	Yes	1m
2	Power cable	No	1m



3 Transmitter Test Result

3.1 AC Power Conducted Emissions

3.1.1 Limit of AC Power Conducted Emissions

AC Power Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note: * Decreases with the logarithm of the frequency.

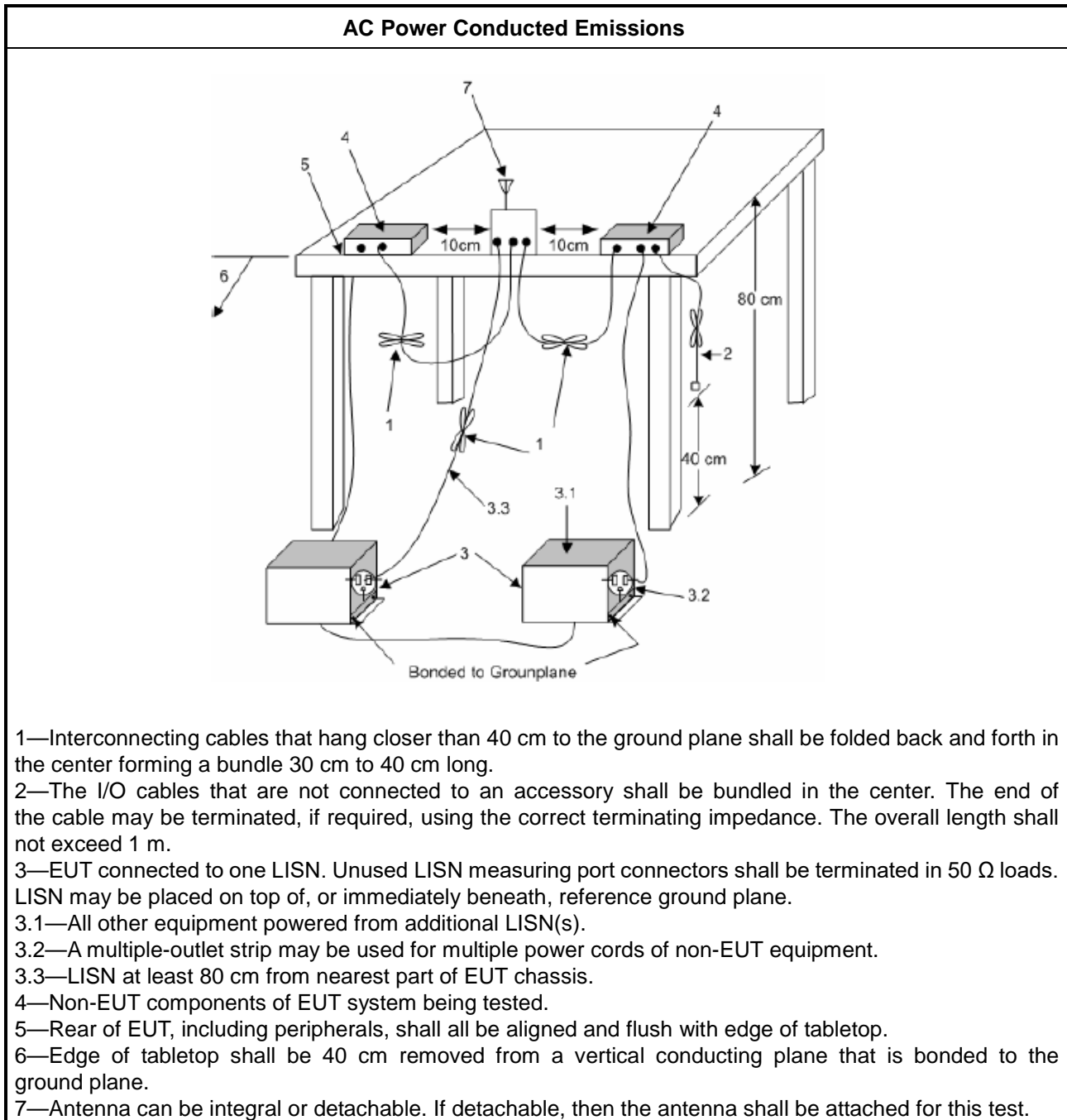
3.1.2 Measuring Instruments

Refer a measuring instruments list in this test report.

3.1.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clause 6.2.

3.1.4 Test Setup



3.1.5 Measurement Results Calculation

The measured Level is calculated using:

- Corrected Reading: LISN Factor (LISN) + Attenuator (AT/AUX) + Cable Loss (CL) + Read Level (Raw) = Level
- Margin = -Limit + Level

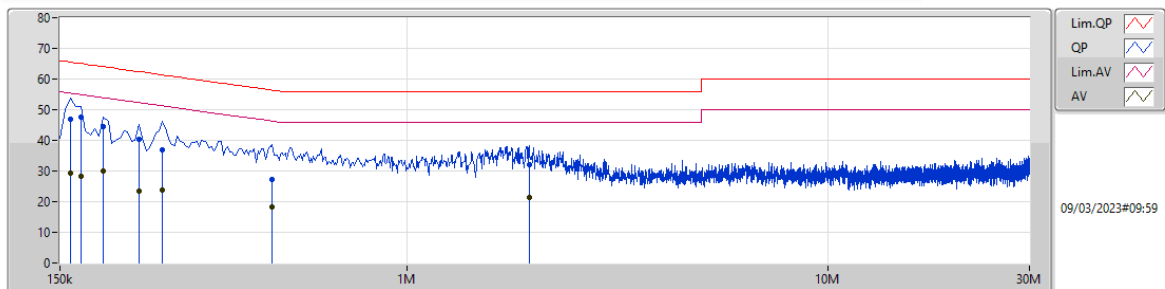


3.1.6 Test Result of AC Power Conducted Emissions

Test Conditions:	see ANSI C63.10, clause 5.11
Test Setup:	see ANSI C63.10, clause 6.2.3
<p>Note 1: If equipment having different channel plan and nominal channel bandwidth modes, the measurements are uninfluenced by different channel plan and nominal channel bandwidth modes, may not need to be repeated for all modes. If equipment having different transmit operating modes, the measurements are uninfluenced by different transmit operating modes, may not need to be repeated for all the operating modes. Similar, if the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.12 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worse case combination to be used for the conformance testing.</p> <p>Note 2: ">20dB" means the tables in this clause should only list values of spurious emissions that exceed the level of 20 dB below the applicable limit, see ANSI C63.4, clause 10.1.8.1.</p>	



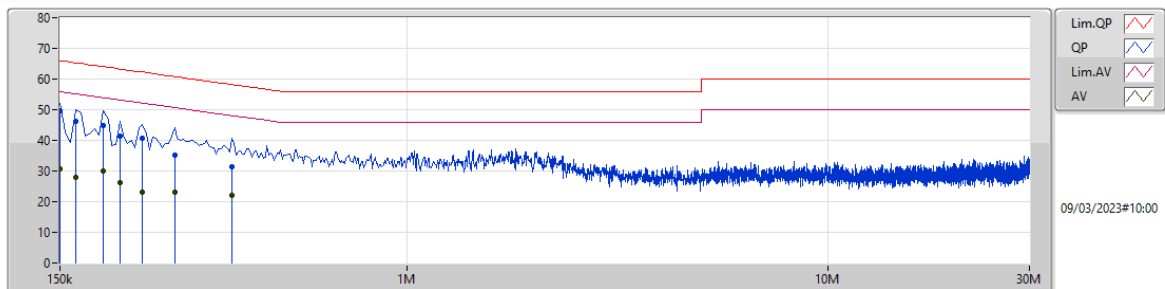
Phase	Line	Configuration	Normal Link
-------	------	---------------	-------------

Mode 1

Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	LISN (dB)	CL (dB)	AT (dB)						
QP	159k	46.96	65.52	-18.56	9.97	Line	-	36.99	0.06	0.04	9.87						
AV	159k	29.46	55.52	-26.06	9.97	Line	-	19.49	0.06	0.04	9.87						
QP	168k	47.45	65.06	-17.61	9.97	Line	"Worst"	37.48	0.06	0.04	9.87						
AV	168k	28.34	55.06	-26.72	9.97	Line	-	18.37	0.06	0.04	9.87						
QP	190.5k	44.34	64.01	-19.67	9.96	Line	-	34.38	0.06	0.04	9.86						
AV	190.5k	29.99	54.01	-24.02	9.96	Line	-	20.03	0.06	0.04	9.86						
QP	231k	40.46	62.41	-21.95	9.97	Line	-	30.49	0.06	0.04	9.87						
AV	231k	23.42	52.41	-28.99	9.97	Line	-	13.45	0.06	0.04	9.87						
QP	262.5k	36.75	61.35	-24.60	9.99	Line	-	26.76	0.06	0.05	9.88						
AV	262.5k	23.78	51.35	-27.57	9.99	Line	-	13.79	0.06	0.05	9.88						
QP	478.5k	27.40	56.36	-28.96	10.02	Line	-	17.38	0.06	0.06	9.90						
AV	478.5k	18.29	46.36	-28.07	10.02	Line	-	8.27	0.06	0.06	9.90						
QP	1.95M	32.07	56.00	-23.93	10.08	Line	-	21.99	0.09	0.09	9.90						
AV	1.95M	21.42	46.00	-24.58	10.08	Line	-	11.34	0.09	0.09	9.90						



Phase	Neutral	Configuration	Normal Link
-------	---------	---------------	-------------

Mode 1

Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	LISN (dB)	CL (dB)	AT (dB)						
QP	150k	49.56	66.00	-16.44	9.98	Neutral	"Worst"	39.58	0.07	0.04	9.87						
AV	150k	30.56	56.00	-25.44	9.98	Neutral	-	20.58	0.07	0.04	9.87						
QP	163.5k	46.28	65.27	-18.99	9.98	Neutral	-	36.30	0.07	0.04	9.87						
AV	163.5k	27.95	55.27	-27.32	9.98	Neutral	-	17.97	0.07	0.04	9.87						
QP	190.5k	44.92	64.01	-19.09	9.97	Neutral	-	34.95	0.07	0.04	9.86						
AV	190.5k	29.95	54.01	-24.06	9.97	Neutral	-	19.98	0.07	0.04	9.86						
QP	208.5k	41.30	63.27	-21.97	9.97	Neutral	-	31.33	0.07	0.04	9.86						
AV	208.5k	26.27	53.27	-27.00	9.97	Neutral	-	16.30	0.07	0.04	9.86						
QP	235.5k	40.63	62.25	-21.62	9.98	Neutral	-	30.65	0.07	0.04	9.87						
AV	235.5k	23.04	52.25	-29.21	9.98	Neutral	-	13.06	0.07	0.04	9.87						
QP	280.5k	35.26	60.80	-25.54	10.00	Neutral	-	25.26	0.07	0.05	9.88						
AV	280.5k	23.10	50.80	-27.70	10.00	Neutral	-	13.10	0.07	0.05	9.88						
QP	384k	31.25	58.20	-26.95	10.03	Neutral	-	21.22	0.07	0.06	9.90						
AV	384k	21.90	48.20	-26.30	10.03	Neutral	-	11.87	0.07	0.06	9.90						

3.2 Occupied Bandwidth

3.2.1 Limit of Occupied Bandwidth

20dB Bandwidth (see Note 1)	None
99% Occupied Bandwidth (see Note 2)	None

Note 1: Refer as 15.215(c). Ensure that the 20 dB occupied bandwidth shall be fall in the specified operating frequency range.

Note 2: The 99% occupied bandwidth is the frequency bandwidth of the signal power at the 99% channel power of occupied bandwidth when resolution bandwidth should be approximately 1 % to 5 % of the occupied bandwidth (OBW). These measurements shall also be performed at normal test conditions.

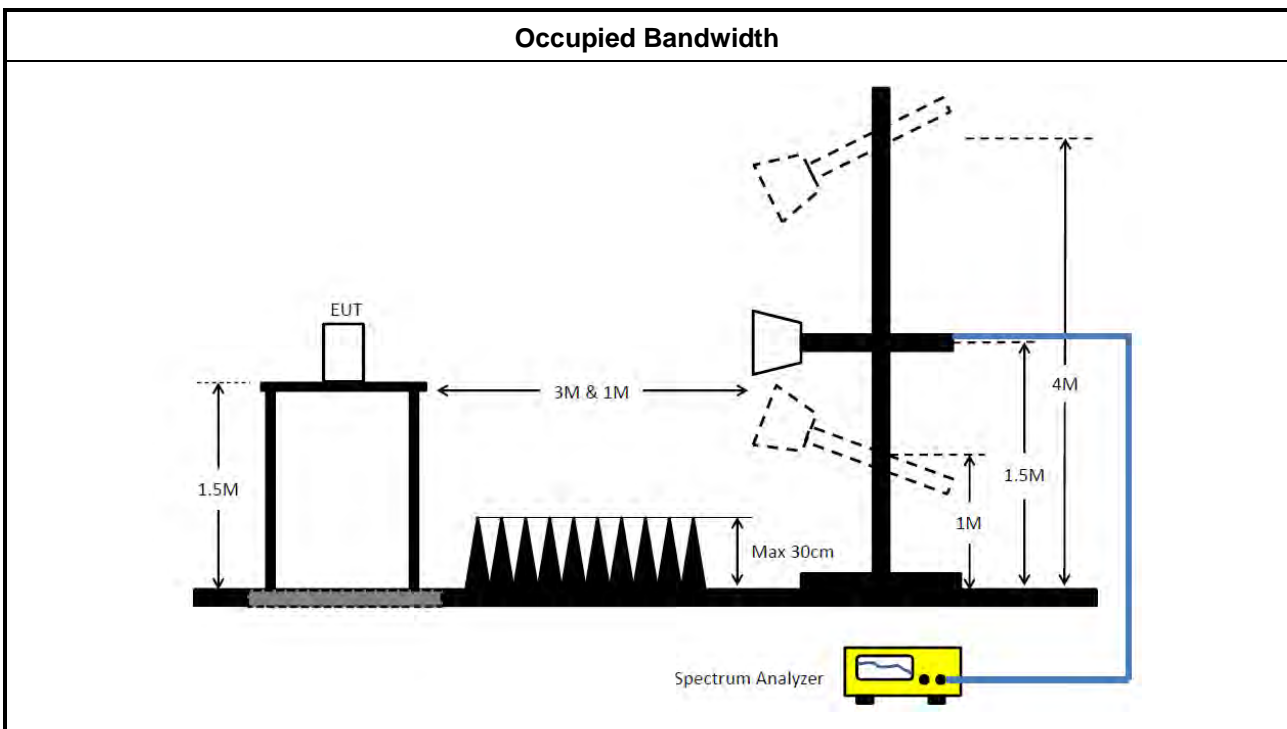
3.2.2 Measuring Instruments

Refer a measuring instruments list in this test report.

3.2.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clauses 6.6 and 6.9.1.

3.2.4 Test Setup



**3.2.5 Test Result of Occupied Bandwidth**

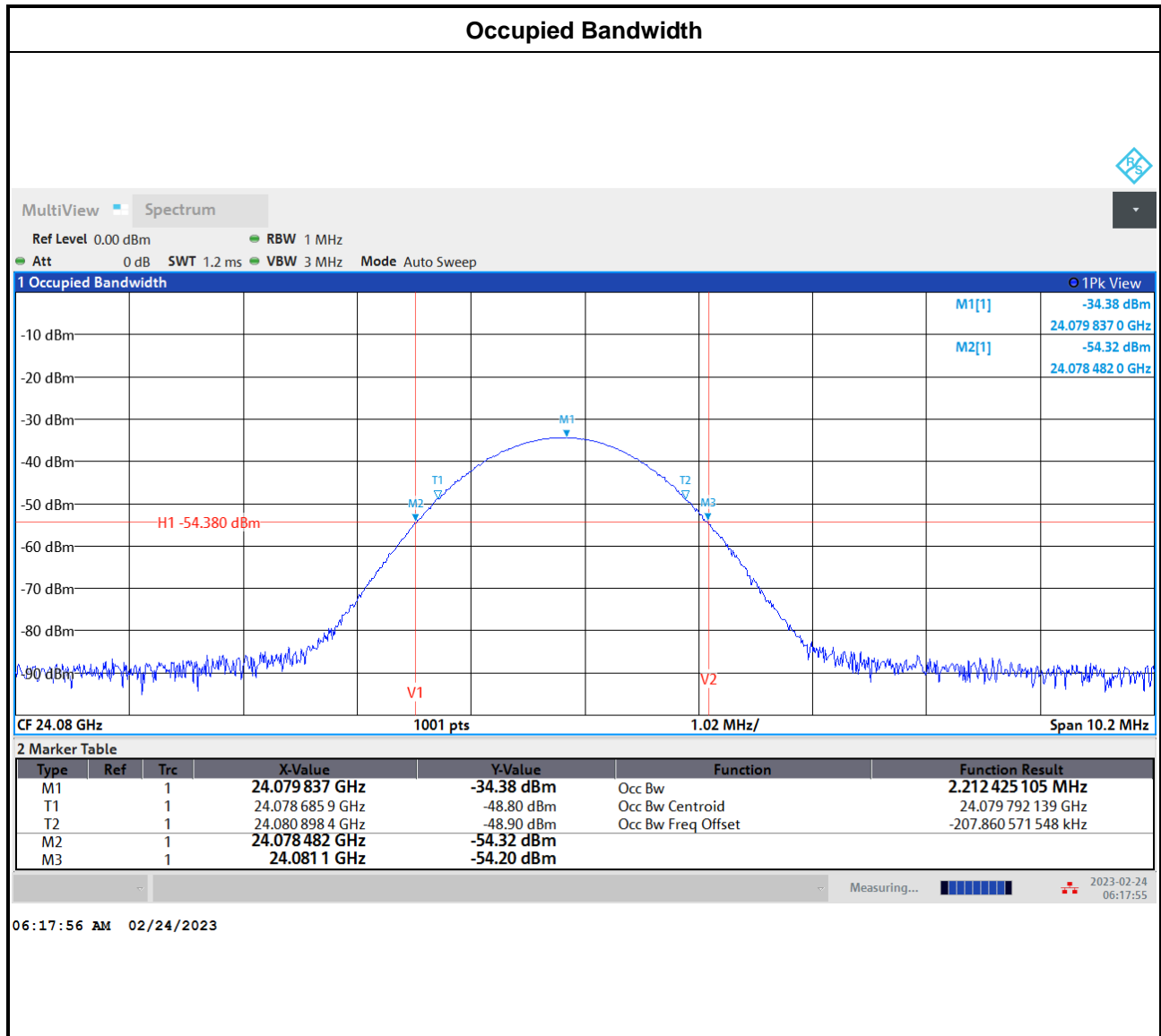
Test Conditions:	see ANSI C63.10, clause 5.11
Test Setup:	see ANSI C63.10, clause 6.6
<p>Note: If equipment having different transmit operating modes, the measurements are uninfluenced by different transmit operating modes, may not need to be repeated for all the operating modes. Similar, if the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.12 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worse case combination to be used for the conformance testing. Refer as ANSI C63.10, clause 6.9.1, observe and record with plotted graphs or photographs the worst-case (i.e., widest) occupied bandwidth produced by these different modulation sources.</p>	

Test Conditions: see ANSI C63.10, clause 5.12				
Test Frequency (MHz)	Test Results			
	20dB Bandwidth (MHz)	99% Bandwidth (MHz)	Frequency range (MHz) fL > 24075.00 MHz	Frequency range (MHz) fH < 24175.00 MHz
24080	2.618	2.212	24078.482	-
24120	2.680	2.284	-	-
24168	2.629	2.246	-	24169.111



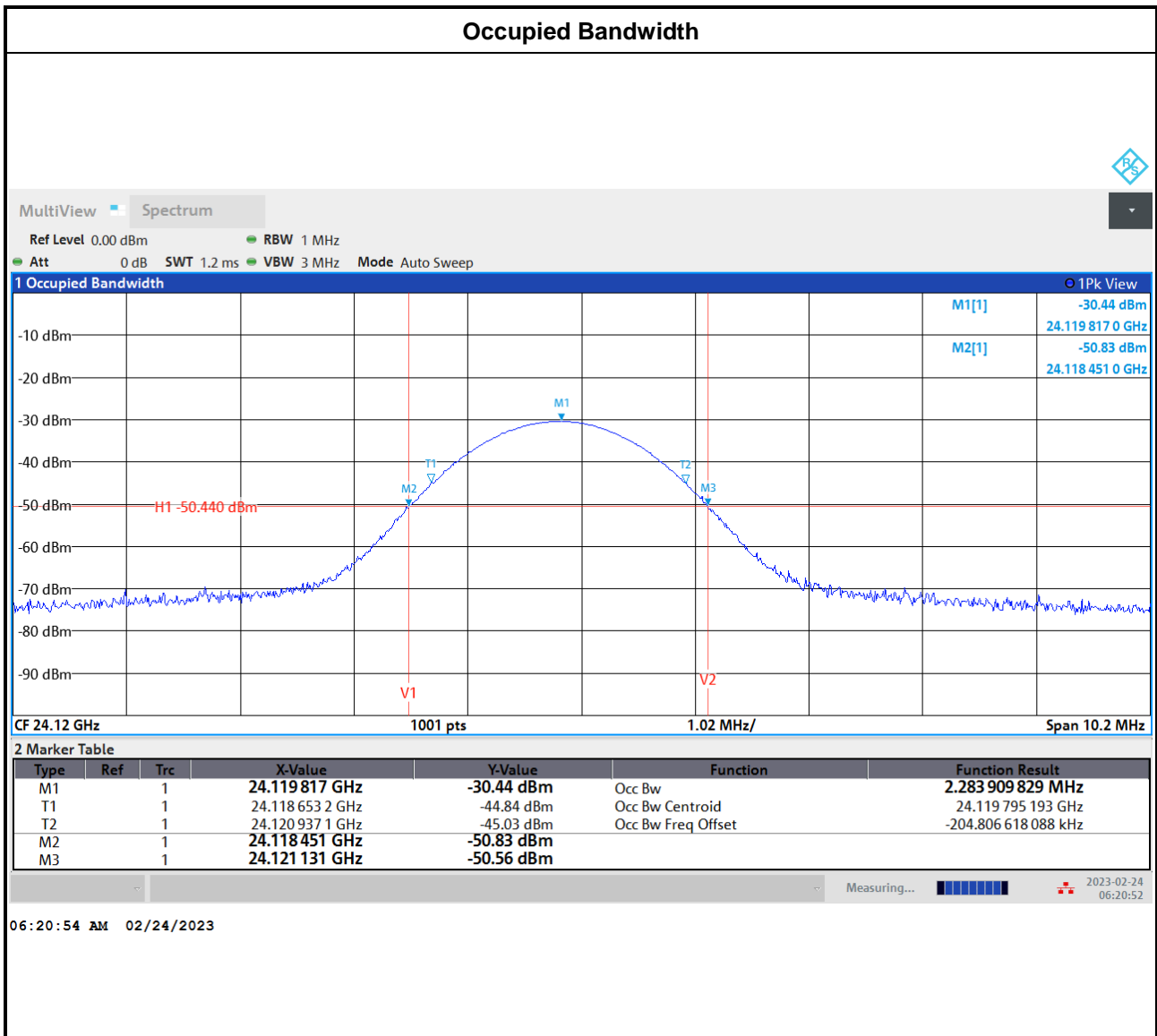
3.2.6 Occupied Bandwidth Plots

Test Frequency: 24080 MHz



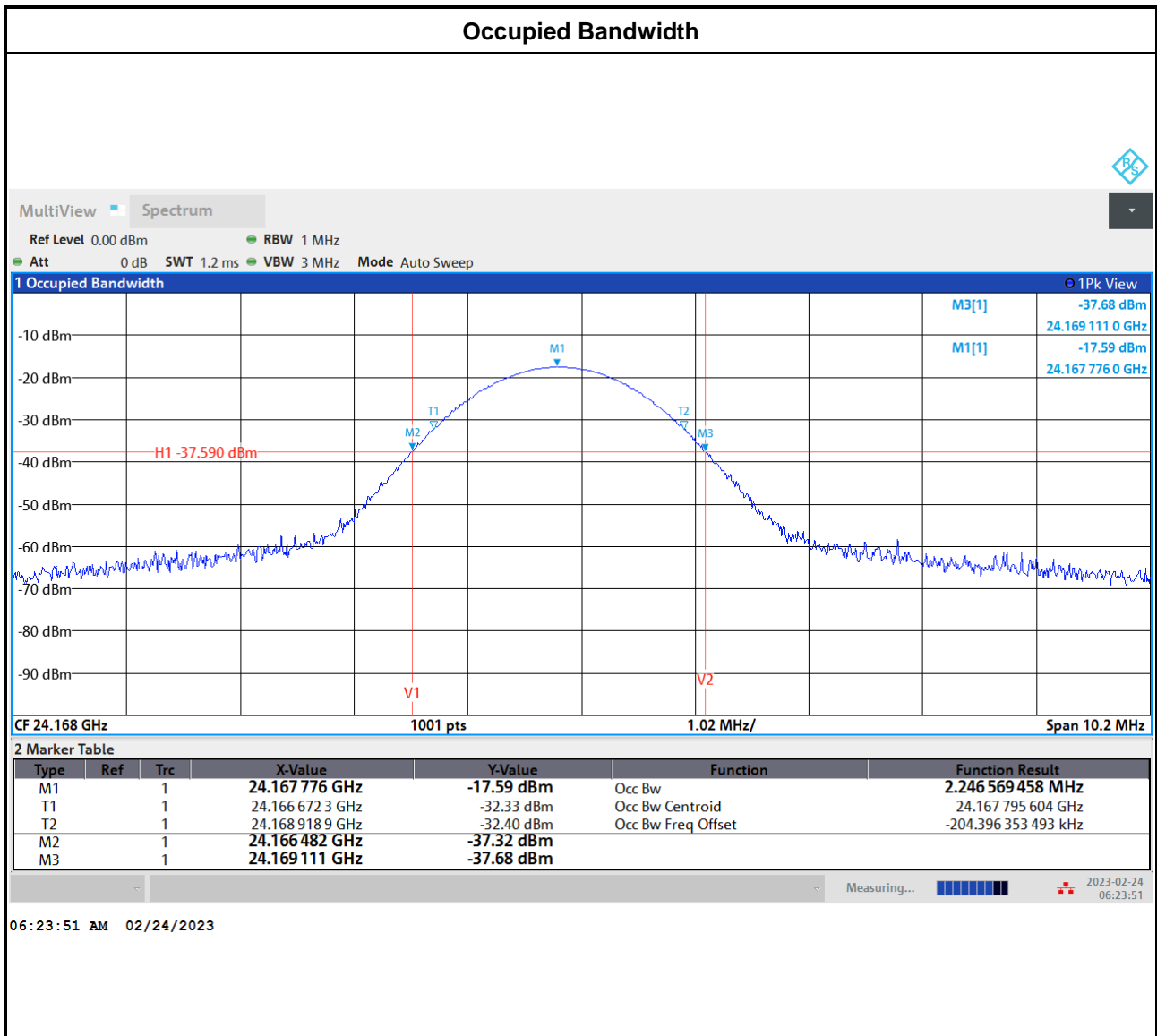


Test Frequency: 24120 MHz





Test Frequency: 24168 MHz



3.3 Field Strength of Fundamental

3.3.1 Limit of Field Strength of Fundamental

Frequencies (MHz)	Field Strength (mV/meter)	Field Strength (dBuV/m) at 3m
902~928 MHz	500 at 3m	114 (Average)
902~928 MHz	5000 at 3m	134 (Peak)
2435~2465MHz	500 at 3m	114 (Average)
2435~2465MHz	5000 at 3m	134 (Peak)
5785~5815 MHz	500 at 3m	114 (Average)
5785~5815 MHz	5000 at 3m	134 (Peak)
10.5~10.55 GHz	2500 at 3m	128 (Average)
10.5~10.55 GHz	25000 at 3m	148 (Peak)
24.075~24.175 GHz	2500 at 3m	128 (Average)
24.075~24.175 GHz	25000 at 3m	148 (Peak)

Note1: For the applicable limit, see 15.245(b)

Note2: The limit shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.

Distance extrapolation factor = $20 \log (\text{specific distance [3m]} / \text{test distance [1m]})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].

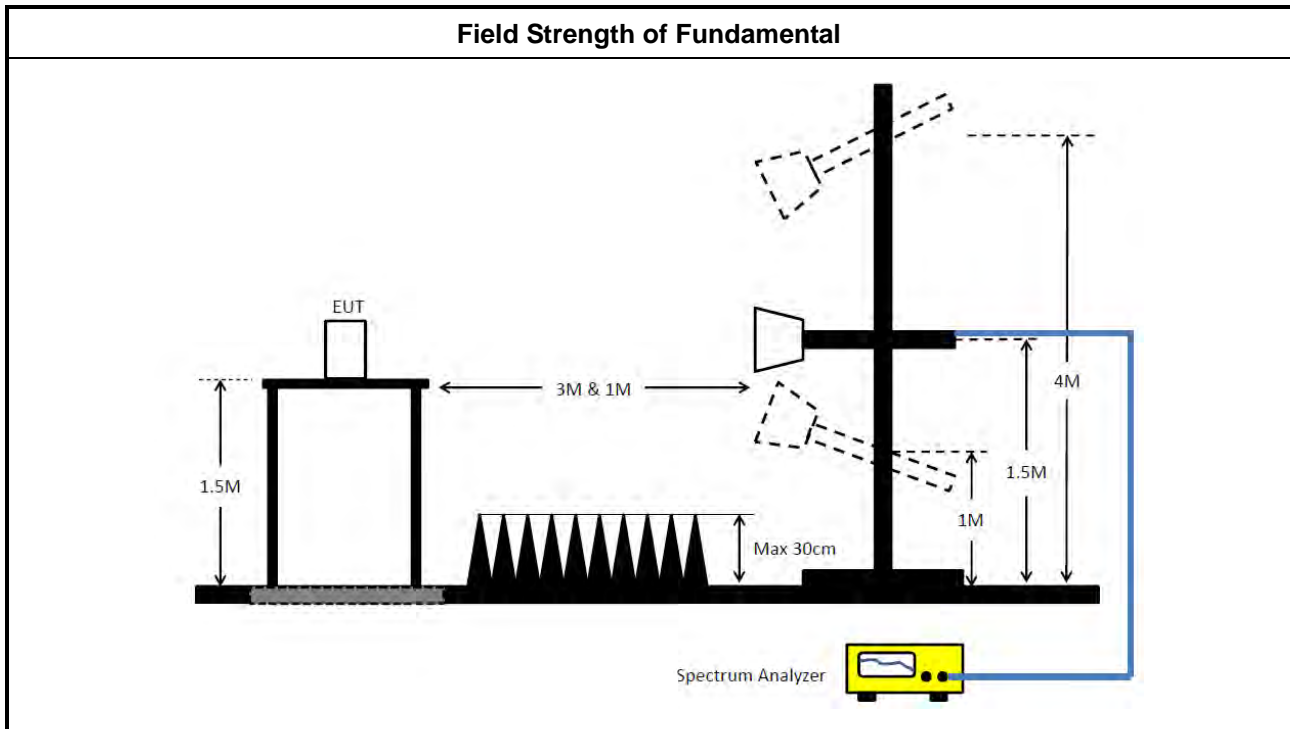
3.3.2 Measuring Instruments

Refer a measuring instruments list in this test report.

3.3.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clause 6.6.

3.3.4 Test Setup



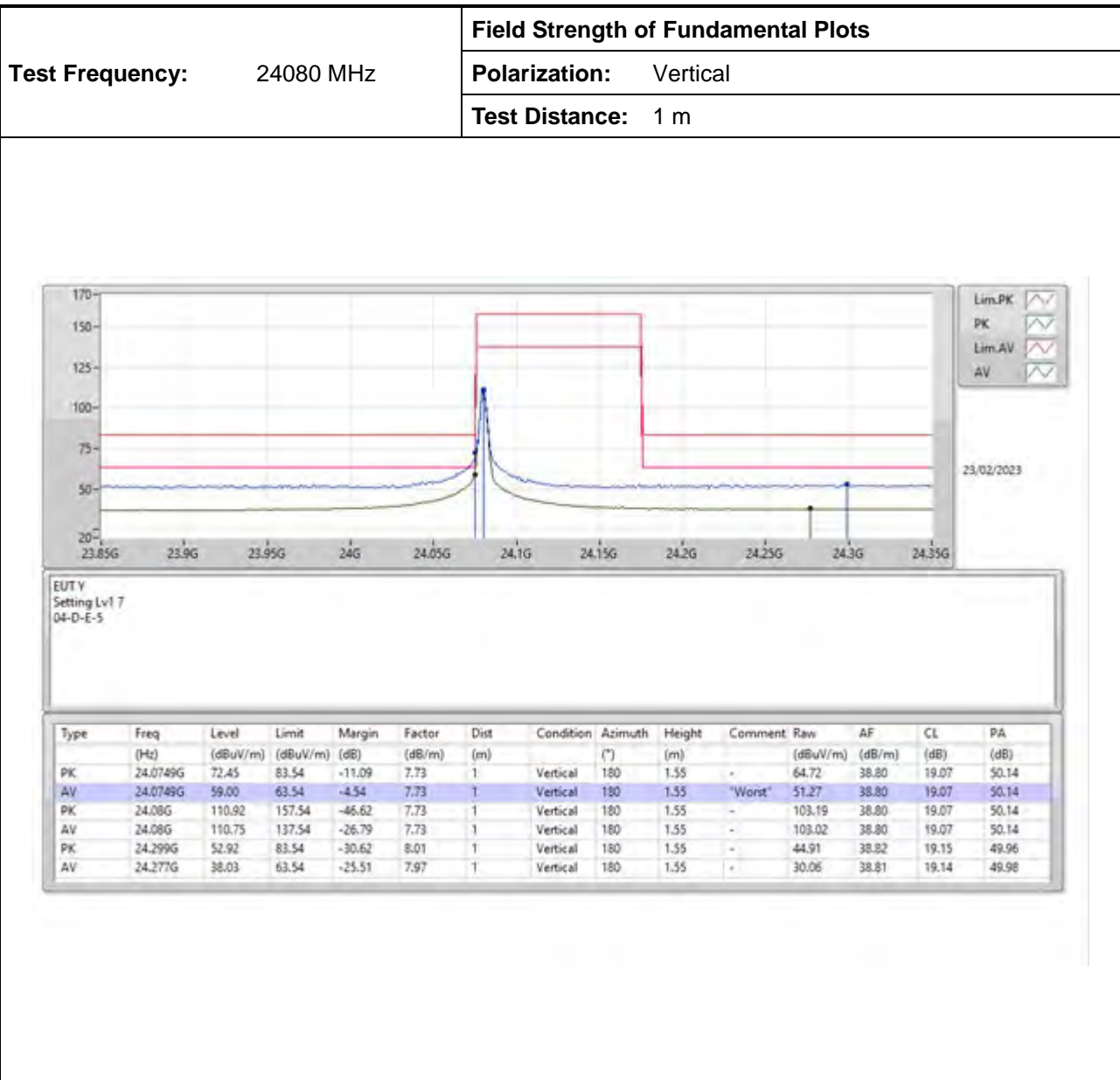
3.3.5 Measurement Results Calculation

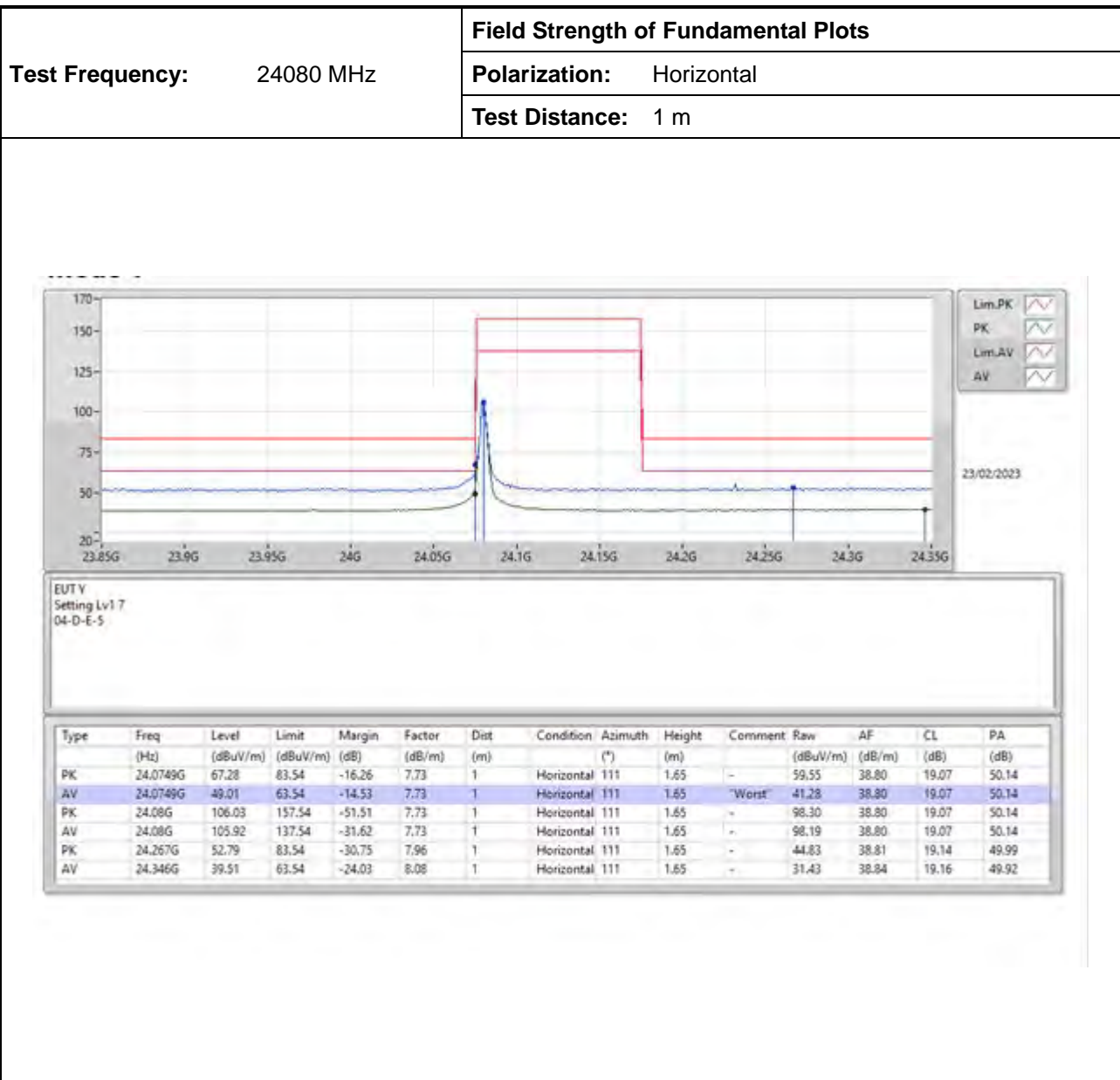
The measured Level is calculated using:

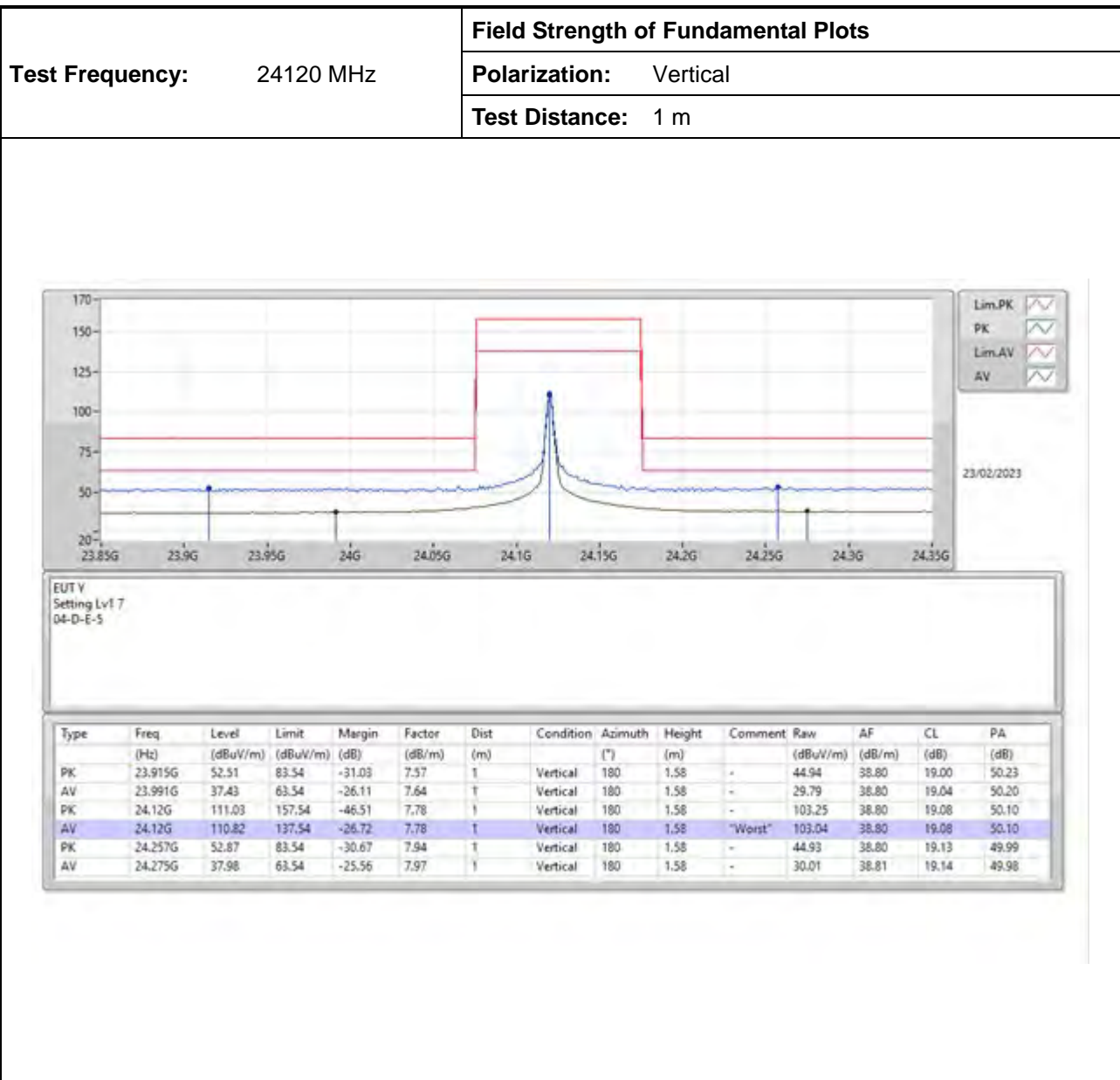
Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA)(if applicable) = Level.

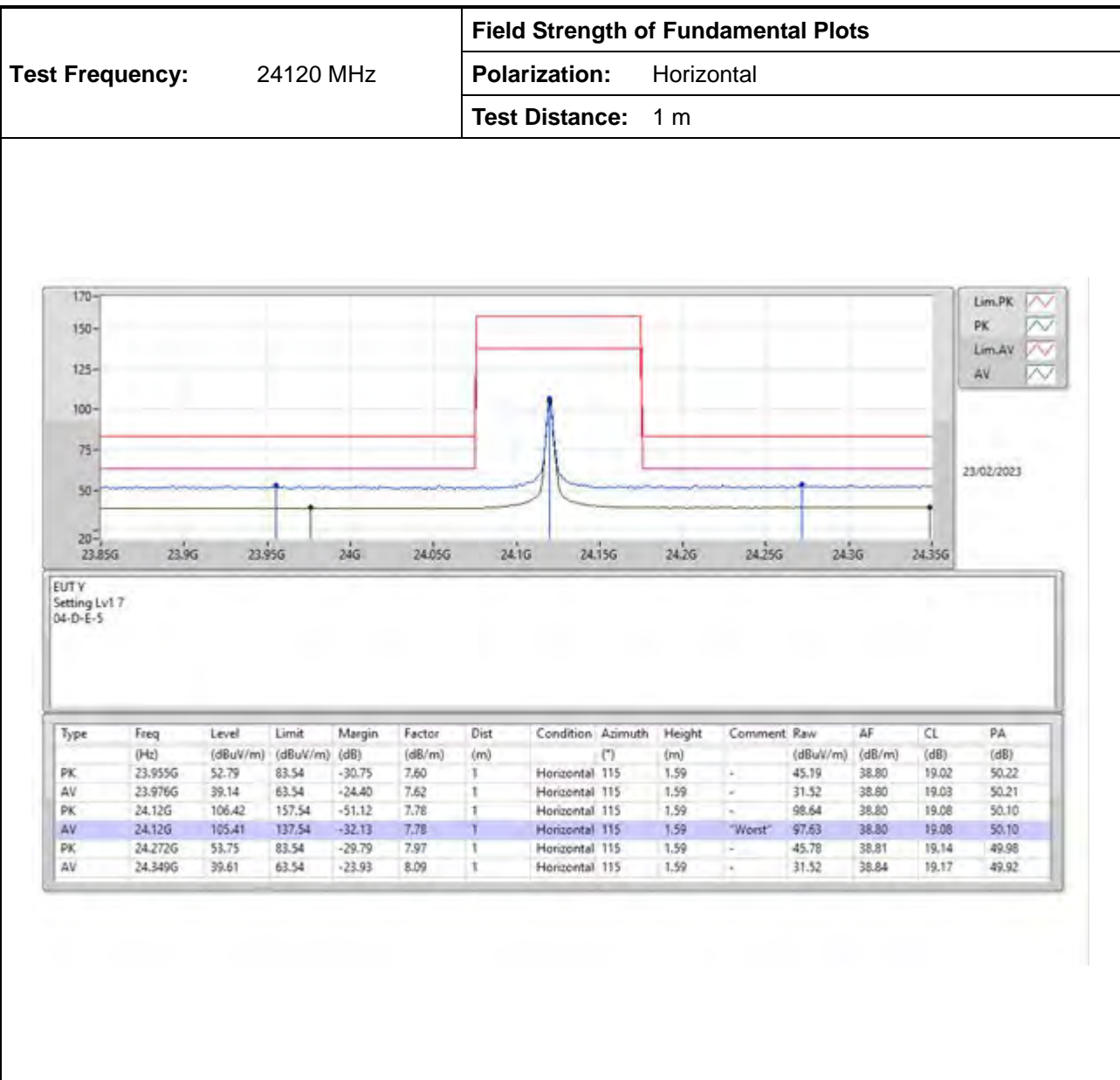
3.3.6 Test Result of Field Strength of Fundamental

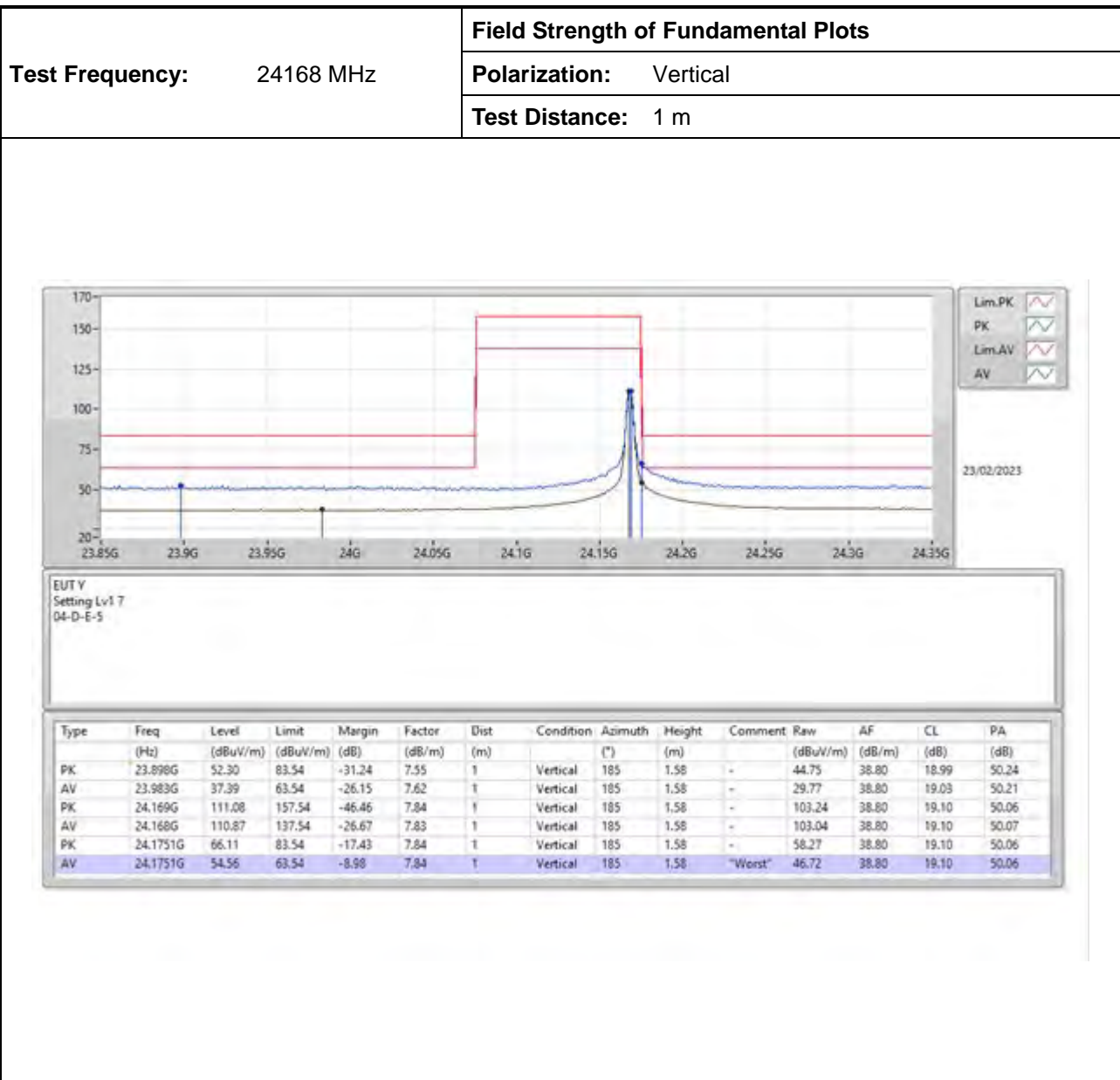
Test Conditions:	see ANSI C63.10, clause 5.11
Test Setup:	see ANSI C63.10, clause 6.6
<p>Note1: If the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.12 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worse case combination to be used for the conformance testing.</p> <p>Note2: Conformance tests have to be performed over the frequency range(s) that has been declared with this Field Strength of Fundamental and using the antenna gain of the antenna with the highest gain among those that have been declared with this Field Strength of Fundamental. For smart antenna systems, the antenna beam forming gain may have to be taken into account as well.</p>	

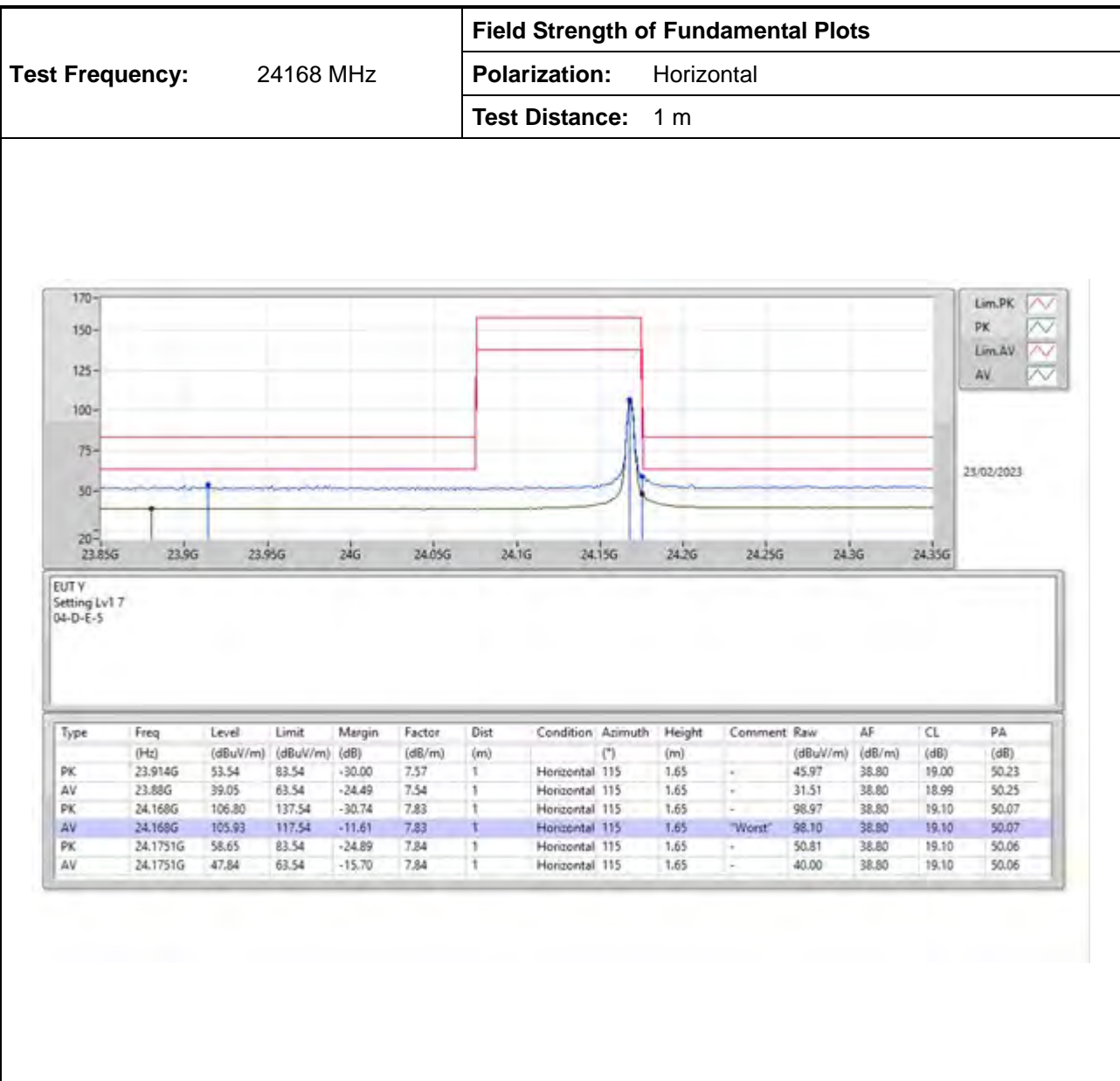
**3.3.7 Test Result of Field Strength of Fundamental**













3.4 Transmitter Spurious Emissions

3.4.1 Limit of Transmitter Spurious Emissions

Transmitter Spurious Emissions	
1.	902 - 928MHz, Field disturbance sensors
♦	Harmonic emissions in the restricted bands: 15.209 limit
♦	Harmonic emissions in the non-restricted bands: 1.6mV/m
♦	Except harmonic emissions, spurious emissions: FCC 15.209 limit or 50 dB below the fundamental, whichever is the lesser attenuation.
2.	2435 - 2465MHz, 5785 - 5815MHz, Field disturbance sensors
♦	Harmonic emissions in the restricted bands at and below 17.7 GHz: 15.209 limit
♦	Harmonic emissions in the restricted bands at and above 17.7 GHz: 7.5mV/m
♦	Harmonic emissions in the non-restricted bands: 1.6mV/m
♦	Except harmonic emissions, spurious emissions: FCC 15.209 limit or 50 dB below the fundamental, whichever is the lesser attenuation.
3.	10500 – 10550MHz, Field disturbance sensors
♦	Harmonic emissions in the restricted bands at and above 17.7 GHz: 7.5mV/m
♦	Harmonic emissions in the non-restricted bands: 25mV/m
♦	Except harmonic emissions, spurious emissions: FCC 15.209 limit or 50 dB below the fundamental, whichever is the lesser attenuation.
4.	24075-24175 MHz, Field disturbance sensors
♦	Second and third harmonics: 25 mV/m
♦	Except harmonic emissions, spurious emissions: FCC 15.209 limit or 50 dB below the fundamental, whichever is the lesser attenuation.

Note: The limit shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.

Distance extrapolation factor = $20 \log (\text{specific distance [3m]} / \text{test distance [1m]})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].

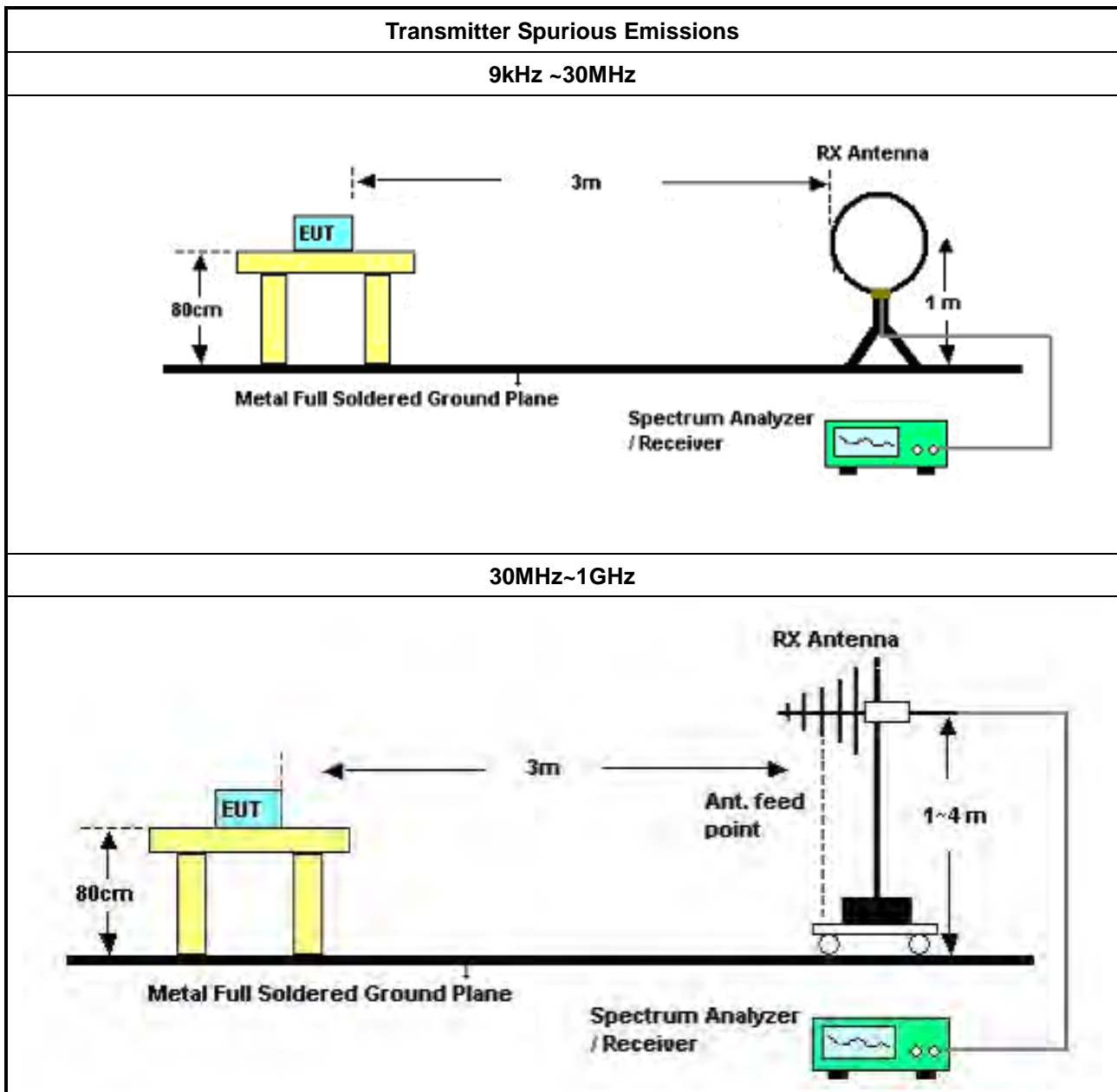
3.4.2 Measuring Instruments

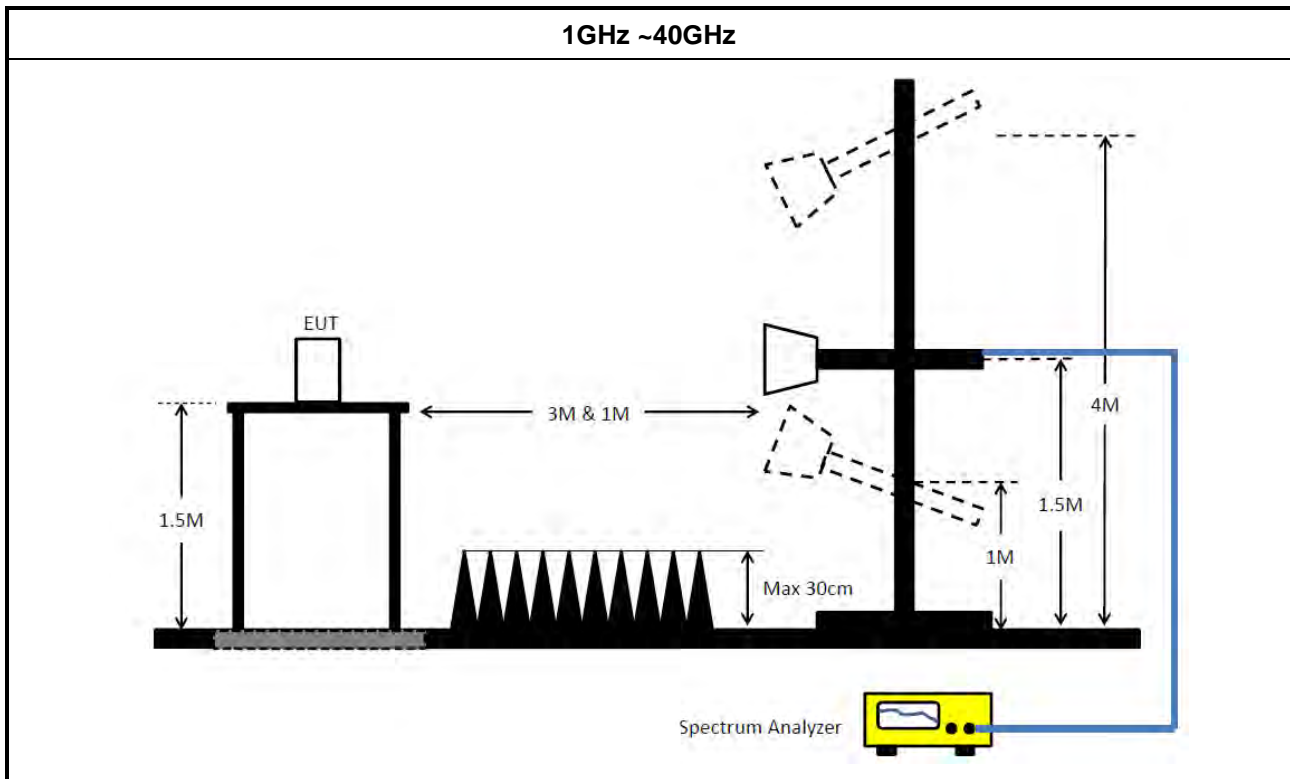
Refer a measuring instruments list in this test report.

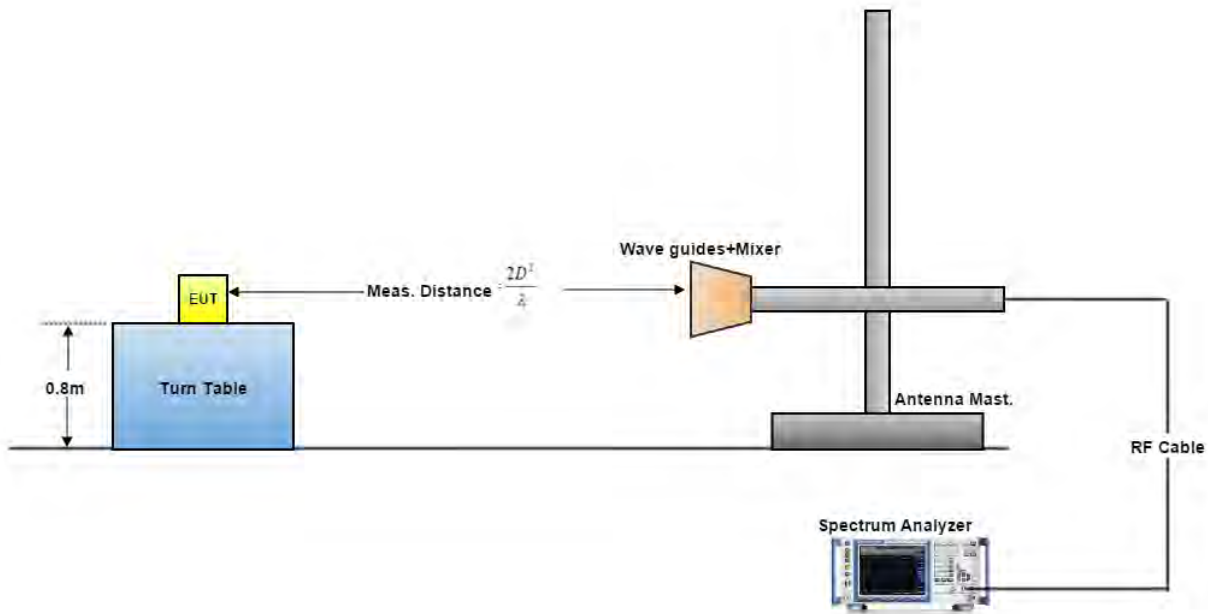
3.4.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clauses 6.3, 6.4, 6.5, 6.6 and 9.12.

3.4.4 Test Setup





Above 40GHz


A measuring distance of at 3 m shall be used for measurements at frequencies up to 15 GHz. For frequencies above 15 GHz, any suitable measuring distance may be used. The measurement distance is chosen up to far field distance, depending on the test system noise floor for detecting spurious emission signals. Then above 15 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from spec. distance (3 m) to measurement distance. Distance extrapolation factor = $20 \log (\text{spec. distance [3 m]} / \text{measurement distance [N m]})$ (dB). The measurements described in ANSI C63.10, clause 7.8.6. If the emission cannot be detected at 1 m, reduce the RBW to increase system sensitivity. Note the value. If the emission still cannot be detected, move the horn closer to the EUT, noting the distance at which a measurement is made.

3.4.5 Measurement Results Calculation

The measured Level is calculated using:

For below 40GHz

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

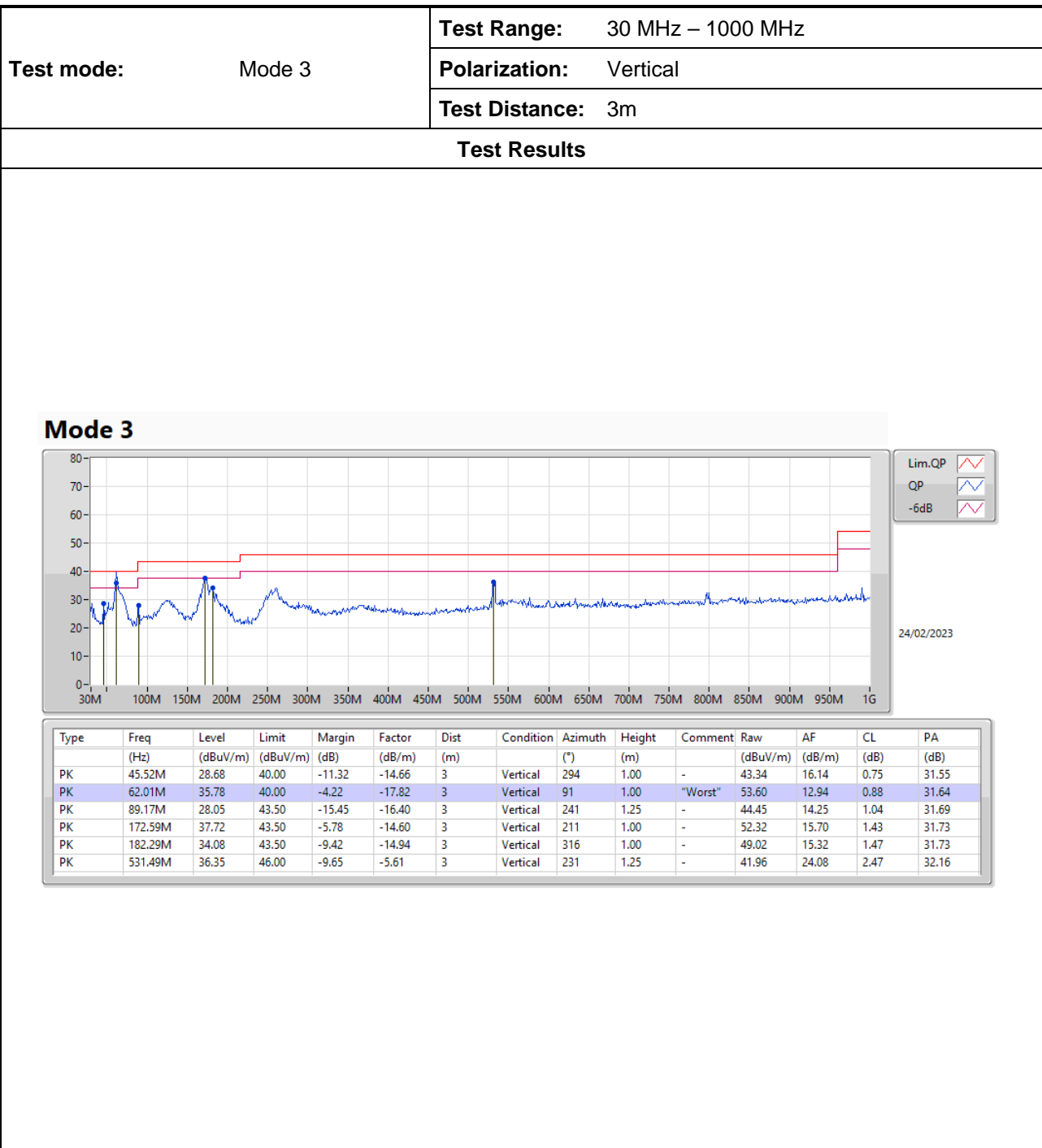
For above 40GHz

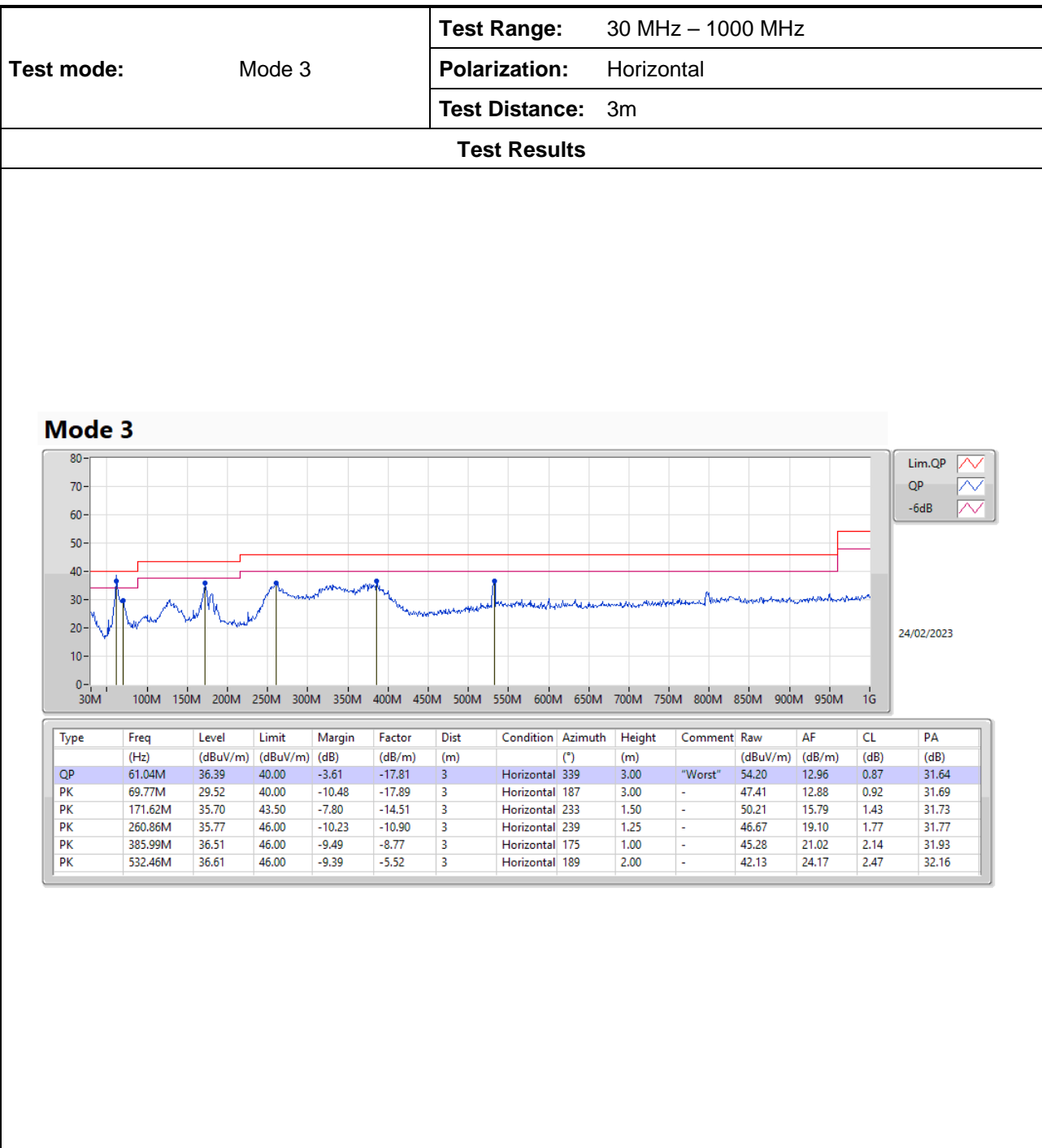
$\text{EIRP} = \text{Meas. Level} - \text{RX Antenna Gain} + 20 \cdot \log(4 \cdot \pi \cdot (3.14159) \cdot D / (300 / (\text{Frequency} \cdot 1000)))$

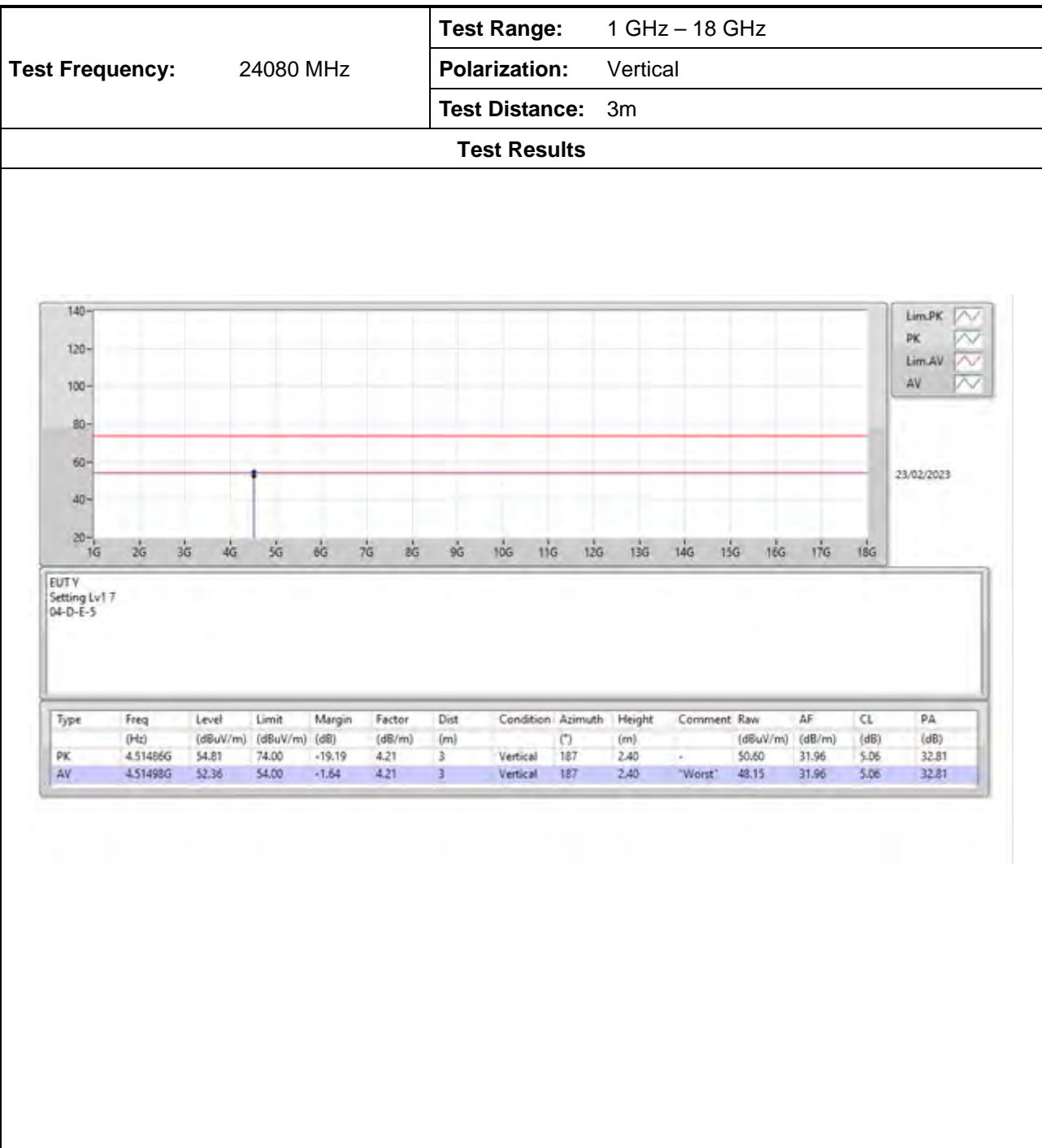
**3.4.6 Test Result of Transmitter Spurious Emissions**

Test Conditions:	see ANSI C63.10, clause 5.11
Test Setup:	see ANSI C63.10, clauses 6.3, 6.4, 6.5, 6.6 and 9.12
Note1: If equipment having different channel plan and nominal channel bandwidth modes, the measurements are uninfluenced by different channel plan and nominal channel bandwidth modes, may not need to be repeated for all modes.	
Note2: Note: Conformance tests have to be performed over the frequency range(s) that has been declared with this Field Strength of Fundamental and using the antenna gain of the antenna with the highest gain among those that have been declared with this Field Strength of Fundamental. For smart antenna systems, the antenna beam forming gain may have to be taken into account as well.	

Test Range:		9 kHz - 30 MHz			
Test Results					
Test Range	Emission Frequency (MHz)	Emission Observed (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
9 kHz - 30 MHz	N/F	N/F	-	-	Peak
Note: 1.“N/F” means Nothing Found (No spurious emissions were detected.) 2.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.					

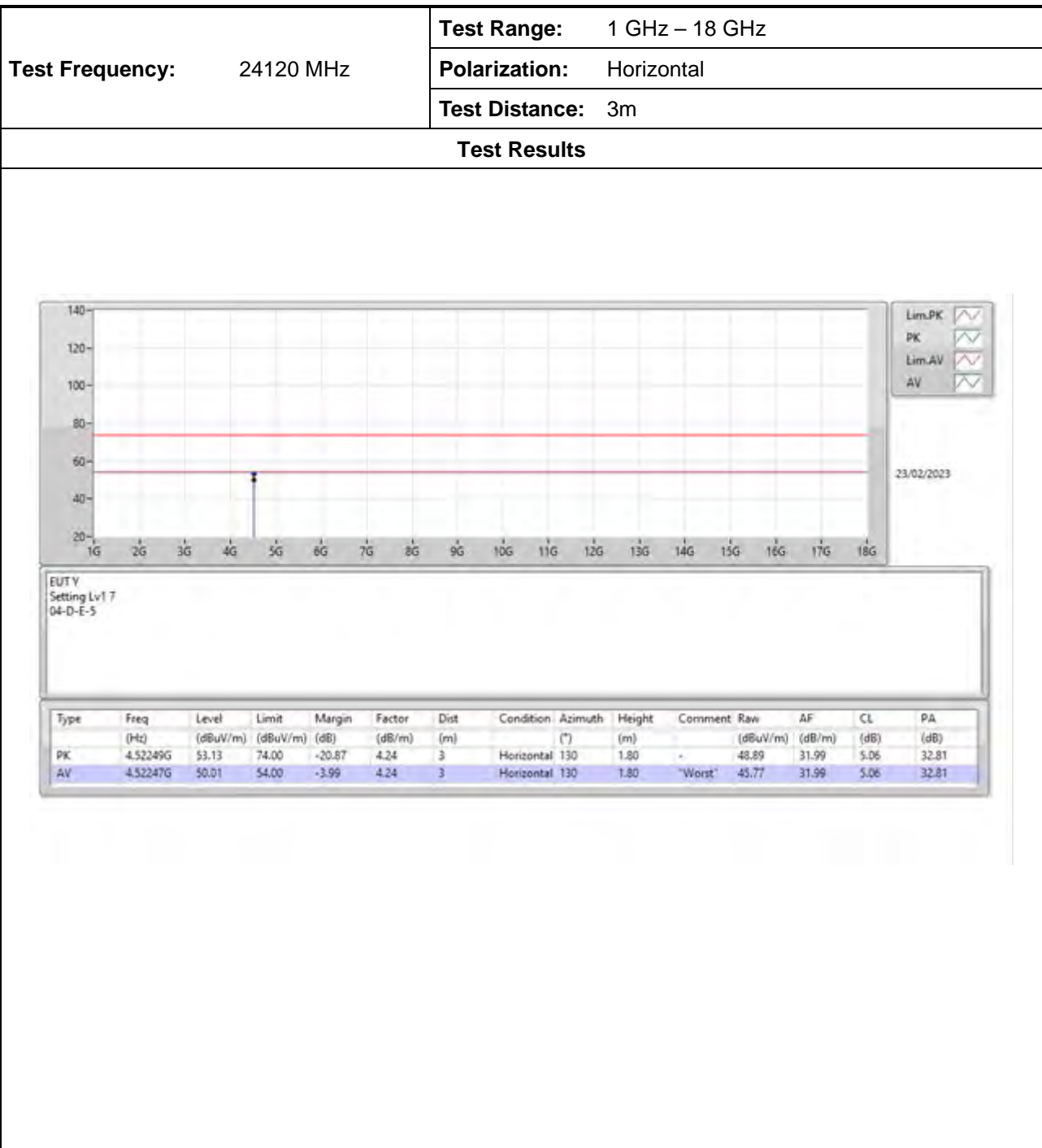




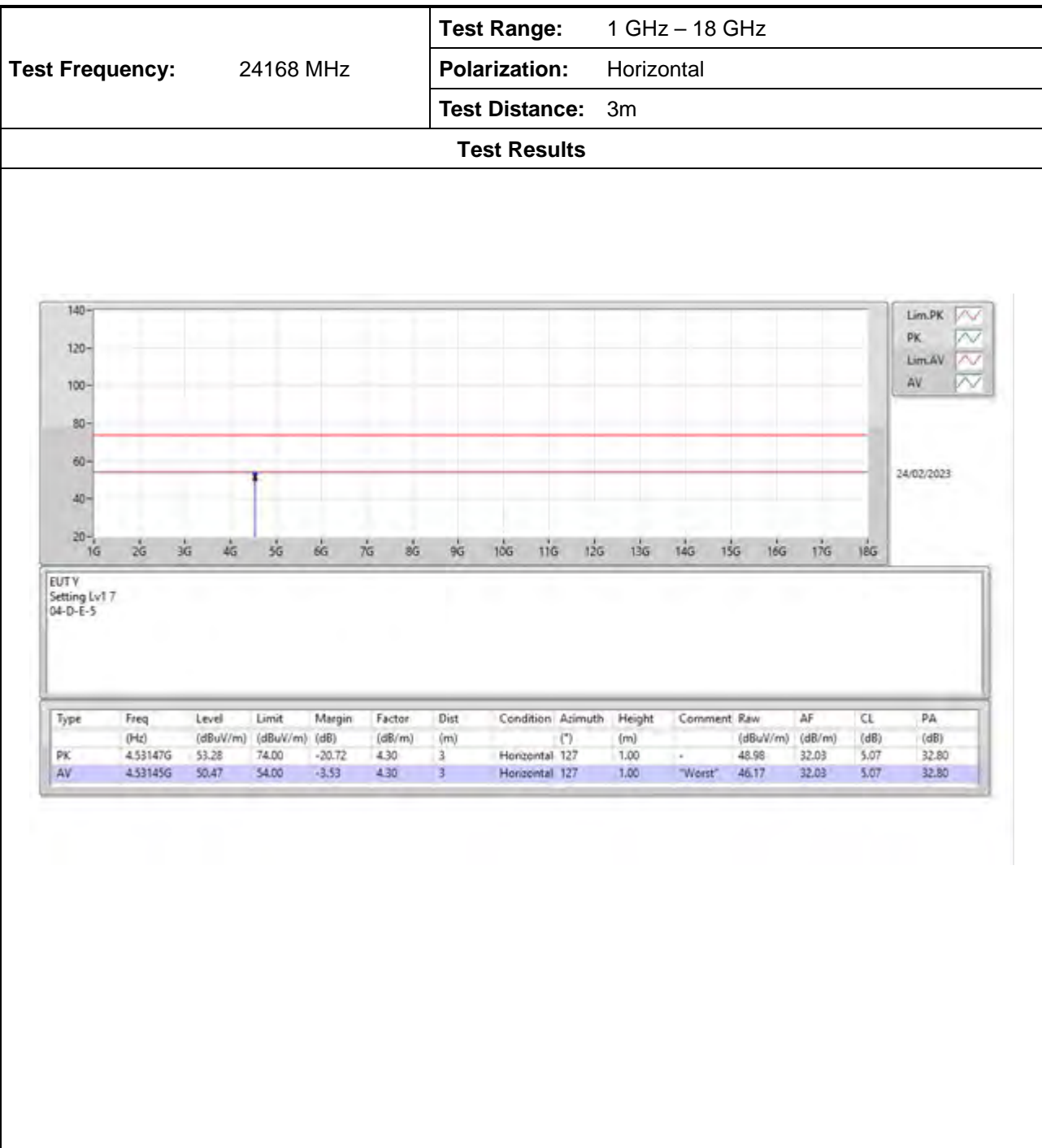


























Test Frequency: 24080 MHz				Test Range: 40 GHz – 100 GHz				
				Test Distance: 0.5m				
Test Results								
Frequency (MHz)	Measurement Distance (m)	Read Level (dBm)	Rx Antenna Gain (dBi)	Measurement Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Result
24080	0.5	-52.72	23.9	94.29	123.52	-29.23	Peak	Pass
	0.5	-52.81	23.9	94.20	103.52	-9.32	Average	Pass
Frequency (MHz)	Measurement Distance (m)	Read Level (dBm)	Rx Antenna Gain (dBi)	Measurement Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Result
24080	0.5	-83.63	24	66.80	123.52	-56.72	Peak	Pass
	0.5	-85.07	24	65.36	103.52	-38.16	Average	Pass
Frequency (MHz)	Measurement Distance (m)	Read Level (dBm)	Rx Antenna Gain (dBi)	Measurement Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Result
24080	0.5	-77.65	24	75.28	123.52	-48.24	Peak	Pass
	0.5	-79.97	24	72.96	103.52	-30.56	Average	Pass



Test Frequency: 24120 MHz				Test Range: 40 GHz – 100 GHz				
				Test Distance: 0.5m				
Test Results								
Frequency (MHz)	Measurement Distance (m)	Read Level (dBm)	Rx Antenna Gain (dBi)	Measurement Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Result
24120	0.5	-53.86	23.9	93.17	123.52	-30.36	Peak	Pass
	0.5	-54.19	23.9	92.84	103.52	-10.69	Average	Pass
Frequency (MHz)	Measurement Distance (m)	Read Level (dBm)	Rx Antenna Gain (dBi)	Measurement Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Result
24120	0.5	-82.71	24	67.74	123.52	-55.79	Peak	Pass
	0.5	-85.75	24	64.69	103.52	-38.83	Average	Pass
Frequency (MHz)	Measurement Distance (m)	Read Level (dBm)	Rx Antenna Gain (dBi)	Measurement Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Result
24120	0.5	-77.37	24	75.58	123.52	-47.94	Peak	Pass
	0.5	-80.31	24	72.64	103.52	-30.88	Average	Pass



Test Frequency: 24168 MHz				Test Range: 40 GHz – 100 GHz				
				Test Distance: 0.5m				
Test Results								
Frequency (MHz)	Measurement Distance (m)	Read Level (dBm)	Rx Antenna Gain (dBi)	Measurement Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Result
24168	0.5	-53.94	23.9	93.10	123.52	-30.42	Peak	Pass
	0.5	-54.53	23.9	92.51	103.52	-11.01	Average	Pass
Frequency (MHz)	Measurement Distance (m)	Read Level (dBm)	Rx Antenna Gain (dBi)	Measurement Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Result
24168	0.5	-82.45	24	68.02	123.52	-55.51	Peak	Pass
	0.5	-85.41	24	65.06	103.52	-38.46	Average	Pass
Frequency (MHz)	Measurement Distance (m)	Read Level (dBm)	Rx Antenna Gain (dBi)	Measurement Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Result
24168	0.5	-78.76	24	74.20	123.52	-49.32	Peak	Pass
	0.5	-80.15	24	72.81	103.52	-30.71	Average	Pass



3.5 Antenna Requirements

3.5.1 Limit of Antenna Requirements

Limits for Antenna Requirements
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

3.5.2 EUT Antenna

See test report clause 1.1.2, EUT antenna complied with antenna requirements.



4 Test Equipment and Calibration Data

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.4GHz	Feb. 20, 2023	Feb. 19, 2024	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Feb. 16, 2023	Feb. 15, 2024	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Apr. 12, 2022	Apr. 11, 2023	Conduction (CO01-CB)
Pulse Limiter	Rohde& Schwarz	ESH3-Z2	100430	9kHz ~ 30MHz	Feb. 09, 2023	Feb. 08, 2024	Conduction (CO01-CB)
COND Cable	Woken	Cable	Low cable-CO 01	9kHz ~ 30MHz	Oct. 18, 2022	Oct. 17, 2023	Conduction (CO01-CB)
Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	May 14, 2022	May 13, 2023	Radiation (03CH04-CB)
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH04-CB	30 MHz ~ 1 GHz	Aug. 02, 2022	Aug. 01, 2023	Radiation (03CH04-CB)
3m Semi Anechoic Chamber VSWR	TDK	SAC-3M	03CH04-CB	1GHz ~18GHz 3m	Feb. 24, 2022	Feb. 23, 2023	Radiation (03CH04-CB)
3m Semi Anechoic Chamber VSWR	TDK	SAC-3M	03CH04-CB	1GHz ~18GHz 3m	Feb. 23, 2023	Feb. 22, 2024	Radiation (03CH04-CB)
BILOG ANTENNA with 6 dB attenuator	Schaffner & EMCI	CBL6112B & N-6-06	22021&AT-N06 07	30MHz ~ 1GHz	Oct. 08, 2022	Oct. 07, 2023	Radiation (03CH04-CB)
Horn Antenna	ETS • Lindgren	3115	00143147	750MHz~18GHz	Oct. 12, 2022	Oct. 11, 2023	Radiation (03CH04-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Aug. 22, 2022	Aug. 21, 2023	Radiation (03CH04-CB)
Pre-Amplifier	EMCI	EMC330N	980391	20MHz ~ 3GHz	May 19, 2022	May 18, 2023	Radiation (03CH04-CB)
Pre-Amplifier	Agilent	83017A	MY53270063	0.5GHz ~ 26.5GHz	Jul. 01, 2022	Jun. 30, 2023	Radiation (03CH04-CB)
Pre-Amplifier	SGH	SGH184	20221107-3	18GHz ~ 40GHz	Nov. 16, 2022	Nov. 15, 2023	Radiation (03CH04-CB)
Spectrum Analyzer	R&S	FSP40	100142	9kHz~40GHz	Mar. 28, 2022	Mar. 27, 2023	Radiation (03CH04-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	Jun. 17, 2022	Jun. 16, 2023	Radiation (03CH04-CB)
RF Cable-low	Woken	RG402	Low Cable-03+67	30MHz – 1GHz	Oct. 03, 2022	Oct. 02, 2023	Radiation (03CH04-CB)



Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
RF Cable-high	Woken	RG402	High Cable-21	1GHz - 18GHz	Oct. 03, 2022	Oct. 02, 2023	Radiation (03CH04-CB)
RF Cable-high	Woken	RG402	High Cable-21+67	1GHz - 18GHz	Oct. 03, 2022	Oct. 02, 2023	Radiation (03CH04-CB)
High Cable	Woken	WCA0929M	40G#5+6	1GHz ~ 40 GHz	Dec. 07, 2022	Dec. 06, 2023	Radiation (03CH04-CB)
High Cable	Woken	WCA0929M	40G#5	1GHz ~ 40 GHz	Dec. 07, 2022	Dec. 06, 2023	Radiation (03CH04-CB)
High Cable	Woken	WCA0929M	40G#6	1GHz ~ 40 GHz	Dec. 07, 2022	Dec. 06, 2023	Radiation (03CH04-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH04-CB)
Signal Analyzer	R&S	FSV3044	101320	9kHz ~ 44GHz	May 20, 2022	May 19, 2023	Radiation (03CH04-CB)
*Mixer	OML	M19HWA	U91113-1	40 ~ 60 GHz	Mar. 10, 2022	Mar. 09, 2024	Radiation (03CH04-CB)
*Mixer	OML	M12HWA	E91113-1	60 ~ 90 GHz	Oct. 22, 2022	Oct. 21, 2024	Radiation (03CH04-CB)
*Mixer	OML	M08HWA	F91113-1	90 ~ 140 GHz	Mar. 10, 2022	Mar. 09, 2024	Radiation (03CH04-CB)
Standard Horn Antenna	Custom Microwave	M19RH	U91113-A	40 ~ 60 GHz	N.C.R.	N.C.R.	Radiation (03CH04-CB)
Standard Horn Antenna	Custom Microwave	M12RH	E91113-A	60 ~ 90 GHz	N.C.R.	N.C.R.	Radiation (03CH04-CB)
Standard Horn Antenna	Custom Microwave	M08RH	F91113-A	90 ~ 140 GHz	N.C.R.	N.C.R.	Radiation (03CH04-CB)

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

*** Calibration Interval of instruments listed above is two years.

NCR means Non-Calibration required.