FCC Radio Test Report

FCC ID: 2BCGWHX510V2

This report concerns: Class II permissive Change

Project No.	:	2506C147
Equipment	:	AX3000 Whole Home Mesh Wi-Fi AP
Brand Name	:	tp-link
Model Name	:	HX510
Applicant	:	TP-LINK CORPORATION PTE. LTD.
Address	:	7 Temasek Boulevard #29-03 Suntec Tower One, Singapore 038987
Manufacturer	:	TP-LINK CORPORATION PTE. LTD.
Address	:	7 Temasek Boulevard #29-03 Suntec Tower One, Singapore 038987
Date of Receipt	:	Jun. 11, 2025
Date of Test	:	Jun. 12, 2025 ~ Jul. 10, 2025
Issued Date	:	Aug. 14, 2025
Test Sample	:	Engineering Sample No.: DG20250611181
Standard(s)	:	FCC CFR Title 47, Part 15, Subpart E

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc. (Dongguan).

Prepared by : Sheldon Ou

Approved by : Chay Cai

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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. BTL assumes no responsibility for the data provided by the customer, any statements, inferences or generalizations drawn by the customer or others from the reports issued by BTL.

The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the U.S. Government.

This report is the confidential property of the client. As a mutual protection to the clients, the public and ourselves, the test report shall not be reproduced, except in full, without our written approval.

BTL's laboratory quality assurance procedures are in compliance with the ISO/IEC 17025: 2017 requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.
Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

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REVISION HISTORY

Report No.	Version	Description	Issued Date	Note
BTL-FCCP-2-2506C147	R00	This is a supplementary report to the original test report (BTL-FCCP-2-2405G108). 1. Changed the FEM. 2. Changed the FCC ID. 3. Changed the information of applicant and manufacturer. Based on above described changes, the radiated emissions used original worst case to test and recorded in this report. The other test results please refer to original report.	Aug. 14, 2025	Valid

1. APPLICABLE STANDARDS

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:
ANSI C63.10-2013
The following reference test guidance is not within the scope of accreditation of A2LA:
KDB 789033 D02 General UNII Test Procedures New Rules v02r01
KDB 662911 D01 Multiple Transmitter Output v02r01

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC CFR Title 47, Part 15, Subpart E				
Standard(s) Section	**Test Item**	**Test Result**	**Judgment**	**Remark**
15.407(b) 15.205(a) 15.209(a)	Radiated Emission	APPENDIX A APPENDIX B	PASS	------

Note:
(1) “N/A” denotes test is not applicable in this test report.

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No.3, Jinshagang 1st Road, Dalang, Dongguan, Guangdong People's Republic of China.
BTL's Registration Number for FCC: 747969
BTL's Designation Number for FCC: CN1377

2.2 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 95.45% confidence level (based on a coverage factor (k=2))
The BTL measurement uncertainty as below table:

A. Radiated emissions test:

Test Site	Method	Measurement Frequency Range	Ant. H / V	*U*,(dB)
DG-CB03 (3m)	CISPR	30MHz ~ 200MHz	V	4.40
		30MHz ~ 200MHz	H	3.62
		200MHz ~ 1,000MHz	V	4.58
		200MHz ~ 1,000MHz	H	3.98

Test Site	Method	Measurement Frequency Range	*U*,(dB)
DG-CB03 (3m)	CISPR	1GHz ~ 6GHz	4.08

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

2.3 TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Test Voltage	Tested By	Test Date
Radiated Emissions -30MHz to 1000MHz	22°C	56%	AC 120V/60Hz	Calvin Wen	Jul. 03, 2025
Radiated Emissions -Above 1000 MHz	22°C	56%	AC 120V/60Hz	Calvin Wen	Jul. 03, 2025

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	AX3000 Whole Home Mesh Wi-Fi AP
Brand Name	tp-link
Test Model	HX510
Model Name	HX510
Model Difference(s)	N/A
Power Source	DC voltage supplied from AC adapter. Model: T120150-2B1
Power Rating	Input: 100-240V~, 50/60Hz, 0.6A Output: 12.0Vdc, 1.5A
Operation Frequency Band(s)	UNII-1: 5150 MHz ~ 5250 MHz UNII-2A: 5250 MHz ~ 5350 MHz UNII-2C: 5470 MHz ~ 5725 MHz UNII-3: 5725 MHz ~ 5850 MHz
Modulation Type	IEEE 802.11a/n/ac: OFDM IEEE 802.11ax: OFDMA
Bit Rate of Transmitter	IEEE 802.11a: 54/48/36/24/18/12/9/6 Mbps IEEE 802.11n: up to 300 Mbps IEEE 802.11ac: up to 1733.4 Mbps IEEE 802.11ax: up to 2402 Mbps

Note:

1. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

2. Channel List:

IEEE 802.11a IEEE 802.11n(HT20) IEEE 802.11ac(VHT20) IEEE 802.11ax(HE20)		IEEE 802.11n(HT40) IEEE 802.11ac(VHT40) IEEE 802.11ax(HE40)		IEEE 802.11ac(VHT80) IEEE 802.11ax(HE80)	
UNII-1		UNII-1		UNII-1	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	38	5190	42	5210
40	5200	46	5230		
44	5220				
48	5240				

IEEE 802.11a IEEE 802.11n(HT20) IEEE 802.11ac(VHT20) IEEE 802.11ax(HE20)		IEEE 802.11n(HT40) IEEE 802.11ac(VHT40) IEEE 802.11ax(HE40)		IEEE 802.11ac(VHT80) IEEE 802.11ax(HE80)	
UNII-2A		UNII-2A		UNII-2A	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
52	5260	54	5270	58	5290
56	5280	62	5310		
60	5300				
64	5320				

IEEE 802.11a IEEE 802.11n(HT20) IEEE 802.11ac(VHT20) IEEE 802.11ax(HE20)		IEEE 802.11n(HT40) IEEE 802.11ac(VHT40) IEEE 802.11ax(HE40)		IEEE 802.11ac(VHT80) IEEE 802.11ax(HE80)	
UNII-2C		UNII-2C		UNII-2C	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
100	5500	102	5510	106	5530
104	5520	110	5550	122	5610
108	5540	118	5590		
112	5560	126	5630		
116	5580	134	5670		
120	5600				
124	5620				
128	5640				
132	5660				
136	5680				
140	5700				

IEEE 802.11a IEEE 802.11n(HT20) IEEE 802.11ac(VHT20) IEEE 802.11ax(HE20)		IEEE 802.11n(HT40) IEEE 802.11ac(VHT40) IEEE 802.11ax(HE40)		IEEE 802.11ac(VHT80) IEEE 802.11ax(HE80)	
UNII-3		UNII-3		UNII-3	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	151	5755	155	5775
153	5765	159	5795		
157	5785				
161	5805				
165	5825				

IEEE 802.11ac(VHT160) IEEE 802.11ax(HE160)	
Channel	Frequency (MHz)
50	5250
114	5570

3. Table for Filed Antenna:

Antenna No.	Frequency Band	Antenna Type	Max Antenna Gain (dBi)
2	5150-5850	PCB	1
4	5150-5850	PCB	1

The EUT support Cyclic Shift Diversity(CDD) mode.

MIMO output power port and MIMO PSD port summing were performed in accordance with KDB 662911 D01. For the CDD results the Directional Gain was calculated in accordance with the following mothed.

For output power measurements:
Directional gain= G_{ANT} + Array Gain = 1 dBi
G_{ANT} : equal to the gain of the antenna having the highest gain
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$

For power spectral density (PSD) measurements:
Directional gain= G_{ANT} + Array Gain = 4.01 dBi
Array Gain = 10 log(N_{ANT}/Nss) dB.
N_{ANT} : number of transmit antennas
Nss : number of spatial streams, The worst case directional gain will occur when Nss = 1

For TX Beamforming:
Directional gain= G_{ANT} + 10 log(N_{ANT}/Nss) = 4.01 dBi

IEE Std. 802.11	Transmit and Receive Mode	Description
802.11a	☒2TX, 2RX	ANT 2 and ANT 4 can be used as transmitting/receiving antenna.
802.11n HT20	☒2TX, 2RX	ANT 2 and ANT 4 can be used as transmitting/receiving antenna.
802.11n HT40	☒2TX, 2RX	ANT 2 and ANT 4 can be used as transmitting/receiving antenna.
802.11ac VHT20	☒2TX, 2RX	ANT 2 and ANT 4 can be used as transmitting/receiving antenna.
802.11ac VHT40	☒2TX, 2RX	ANT 2 and ANT 4 can be used as transmitting/receiving antenna.
802.11ac VHT80	☒2TX, 2RX	ANT 2 and ANT 4 can be used as transmitting/receiving antenna.
802.11ac VHT160	☒2TX, 2RX	ANT 2 and ANT 4 can be used as transmitting/receiving antenna.
802.11ax HE20	☒2TX, 2RX	ANT 2 and ANT 4 can be used as transmitting/receiving antenna.
802.11ax HE40	☒2TX, 2RX	ANT 2 and ANT 4 can be used as transmitting/receiving antenna.
802.11ax HE80	☒2TX, 2RX	ANT 2 and ANT 4 can be used as transmitting/receiving antenna.
802.11ax HE160	☒2TX, 2RX	ANT 2 and ANT 4 can be used as transmitting/receiving antenna.

3.2 DESCRIPTION OF TEST MODES

The test system was pre-tested based on the consideration of all possible combinations of EUT operation mode.

Pretest Mode	Description
Mode 1	TX AX(HE40) Mode Channel 38
Mode 2	TX AC(VHT160) Mode Channel 50

Following mode(s) was (were) found to be the worst case(s) and selected for the final test.

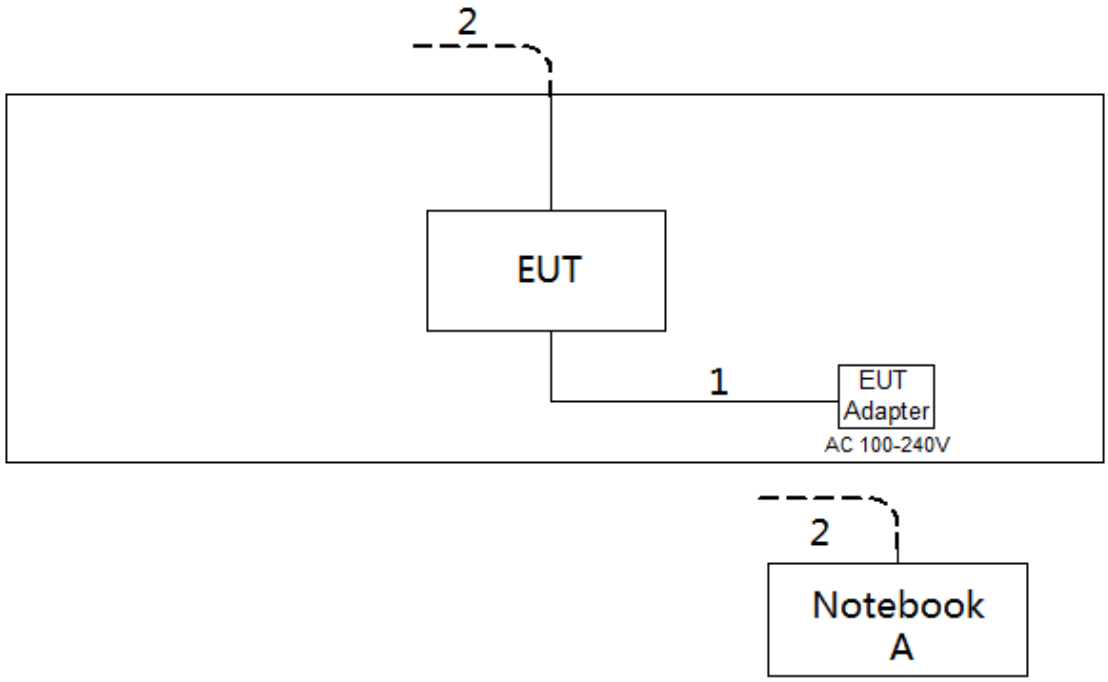
Radiated emissions test - Below 1GHz	
Final Test Mode	Description
Mode 1	TX AX(HE40) Mode Channel 38

Radiated emissions test - Above 1GHz	
Final Test Mode	Description
Mode 2	TX AC(VHT160) Mode Channel 50

Note:

1. For radiated emission Above 1 GHz test, the polarization of Vertical and Horizontal are evaluated, the worst case is Vertical and recorded.

3.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.4 SUPPORT UNITS

Item	Equipment	Brand	Model No.	Series No.
A	Notebook	Honor	Nbl-WAQ9HNRP	N/A

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	DC Cable	NO	NO	1.5m
2	RJ45 Cable	NO	NO	10m

3.5 CUSTOMER INFORMATION DESCRIPTION

1) The antenna gain and beamforming gains are provided by the manufacturer.

4. RADIATED EMISSIONS

4.1 LIMIT

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

LIMITS OF RADIATED EMISSIONS MEASUREMENT (30 MHz to 1000 MHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS (Above 1000 MHz)

Frequency (MHz)	EIRP Limit (dBm/MHz)	Band edge at 3m (dBμV/m)	Harmonic at 1m (dBμV/m)
5150-5250	-27	68.2	77.7 (Note 3)
5250-5350	-27	68.2	77.7 (Note 3)
5470-5725	-27	68.2	77.7 (Note 3)
5725-5850 **NOTE (2)**	-27	68.2	77.7 (Note 3)
	10	105.2	114.7 (Note 3)
	15.6	110.8	120.3 (Note 3)
	27	122.2	131.7 (Note 3)

NOTE:

(1) The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp (Watts)

(2) According to 15.407(b)(4)(i), all emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(3)

$$FS_{\text{limit}} = FS_{\text{max}} - 20\log\left(\frac{d_{\text{limit}}}{d_{\text{measure}}}\right)$$

20log ($d_{limit}/d_{measure}$)=20log (3/1)=9.5 dB.
FS_{limit}: Harmonic at 3m Peak and Average limit.
FS_{max}: Harmonic at 1m Peak and Average Maximum value.
d_{limit}: Harmonic at 3m test distance.
$d_{measure}$: Harmonic Actual test distance.

(4) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)
Margin Level = Measurement Value - Limit Value

4.2 TEST PROCEDURE

a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
b. The measuring distance of 3 m or 1m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
c. The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn‘t perform. (below 1 GHz)
h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn‘t perform. (above 1 GHz)
i. For the actual test configuration, please refer to the related Item –EUT Test Photos.

The following table is the setting of the receiver:

Spectrum Parameters	Setting
Start ~ Stop Frequency	30 MHz~1000 MHz for RBW 100 kHz

Spectrum Parameters	Setting
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic or 40 GHz, whichever is lower
RBW / VBW (Emission in restricted band)	1 MHz / 3 MHz for PK value 1 MHz / 1/T Hz for AVG value

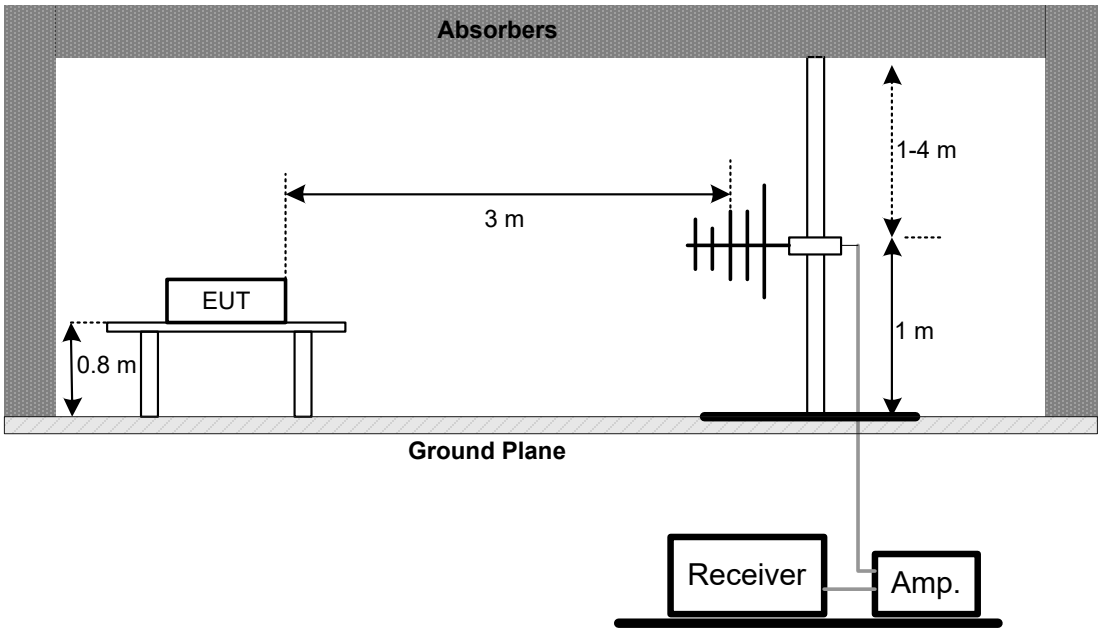
Receiver Parameters	Setting
Start ~ Stop Frequency	30 MHz~1000 MHz for QP detector
Start ~ Stop Frequency	1 GHz~40 GHz for PK/AVG detector

4.3 DEVIATION FROM TEST STANDARD

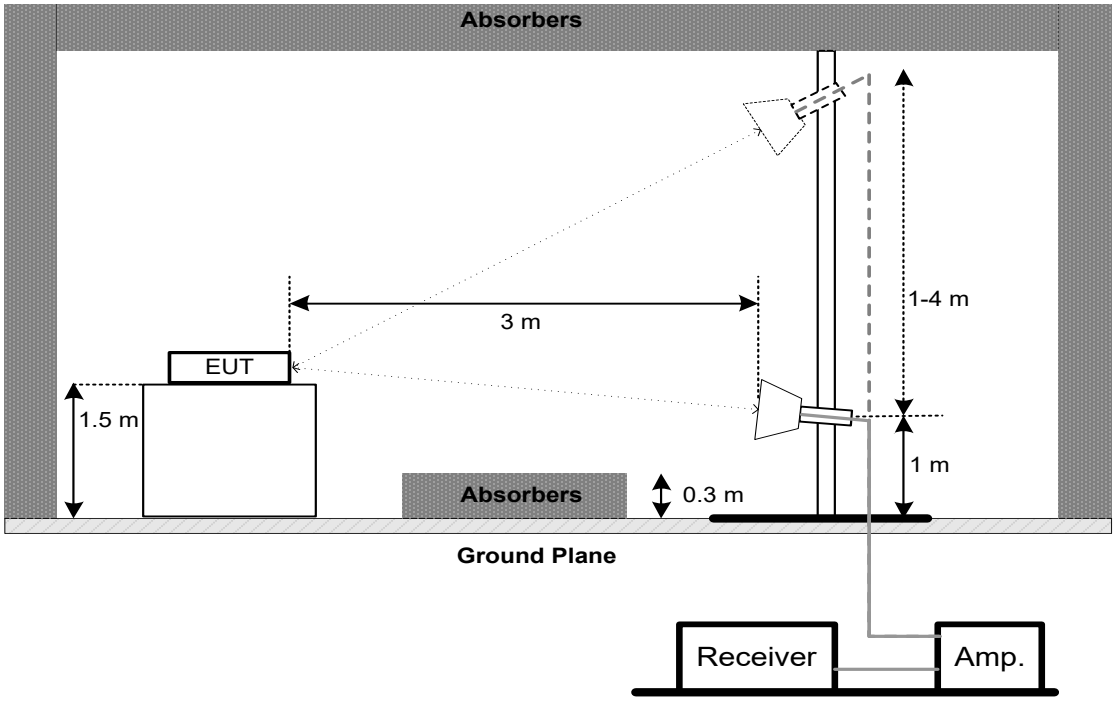
No deviation.

4.4 TEST SETUP

30 MHz to 1 GHz



Above 1 GHz
Band edge



4.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

4.6 TEST RESULTS - 30 MHZ TO 1000 MHZ

Please refer to the APPENDIX A.

4.7 TEST RESULTS - ABOVE 1000 MHZ

Please refer to the APPENDIX B.

Remark:

(1) No limit: This is fundamental signal, the judgment is not applicable.
For fundamental signal judgment was referred to Peak output test.

5. MEASUREMENT INSTRUMENTS LIST

Radiated Emissions - 30 MHz to 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	01462	Dec. 14, 2025
2	Attenuator	EMC INSTRUMENT	EMCI-N-6-06	AT-06009	Dec. 14, 2025
3	Preamplifier	EMC INSTRUMENT	EMC001330	980998	May 17, 2026
4	Cable	RegalWay	LMR400-NMNM-12.5m	N/A	Jun. 04, 2026
5	Cable	RegalWay	LMR400-NMNM-3m	N/A	Jun. 04, 2026
6	Cable	RegalWay	LMR400-NMNM-0.5m	N/A	Jun. 04, 2026
7	Receiver	Agilent	N9038A	MY52130039	Jan. 10, 2026
8	Positioning Controller	MF	MF-7802	N/A	N/A
9	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
10	966 Chamber room	CM	9*6*6	N/A	May 09, 2026

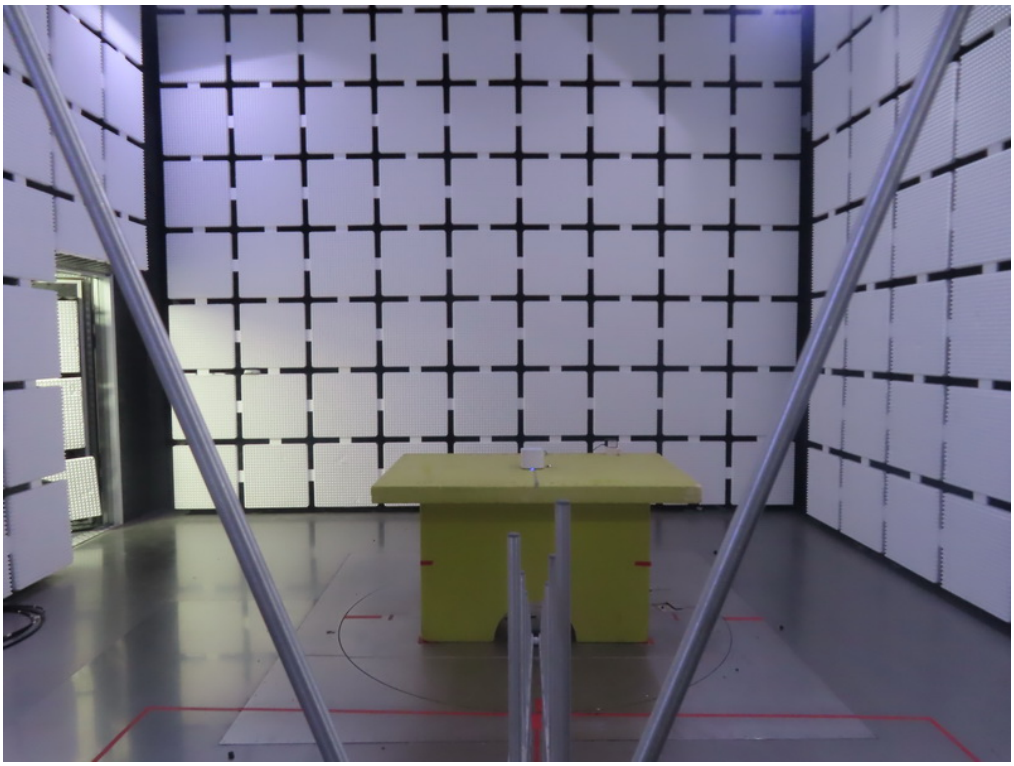
Radiated Emissions - Above 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Multi-Device Controller	ETS-Lindgren	N/A	N/A	N/A
2	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
3	966 Chamber room	CM	9*6*6	N/A	May 09, 2026
4	Cable	RegalWay	RWLP50-4.0A-SMSM-12.5M	N/A	Jun. 29, 2026
5	Cable	RegalWay	RWLP50-4.0A-NMRASM-2.5M	N/A	Jun. 29, 2026
6	Cable	RegalWay	RWLP50-4.0A-NMRASMRA-0.8M	N/A	Jun. 29, 2026
7	Receiver	Agilent	N9038A	MY52130039	Jan. 10, 2026
8	Double Ridged Guide Antenna	ETS	3115	75846	Mar. 02, 2026
9	Preamplifier	EMC INSTRUMENT	EMC118A45SE	980888	Oct. 29, 2025
10	Attenuator	Talent Microwave	TA10A2-S-18	N/A	N/A
11	Filter	STI	STI15-9969	N/A	May 28, 2026

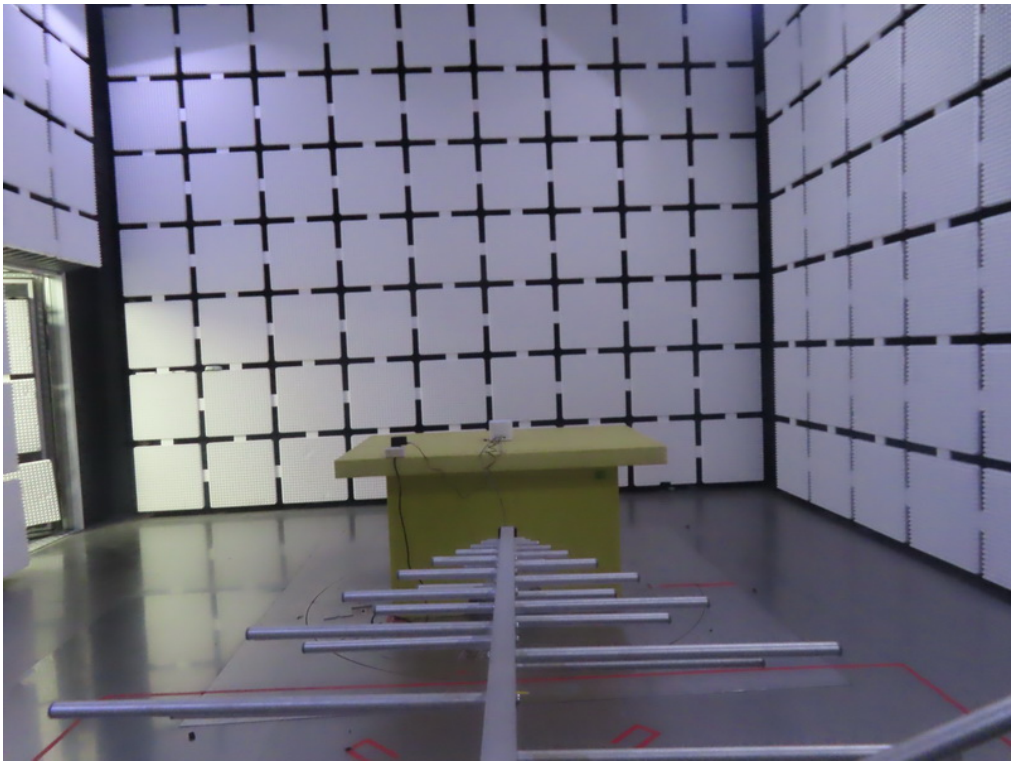
Remark "N/A" denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

6. EUT TEST PHOTO

Radiated Emissions Test Photos

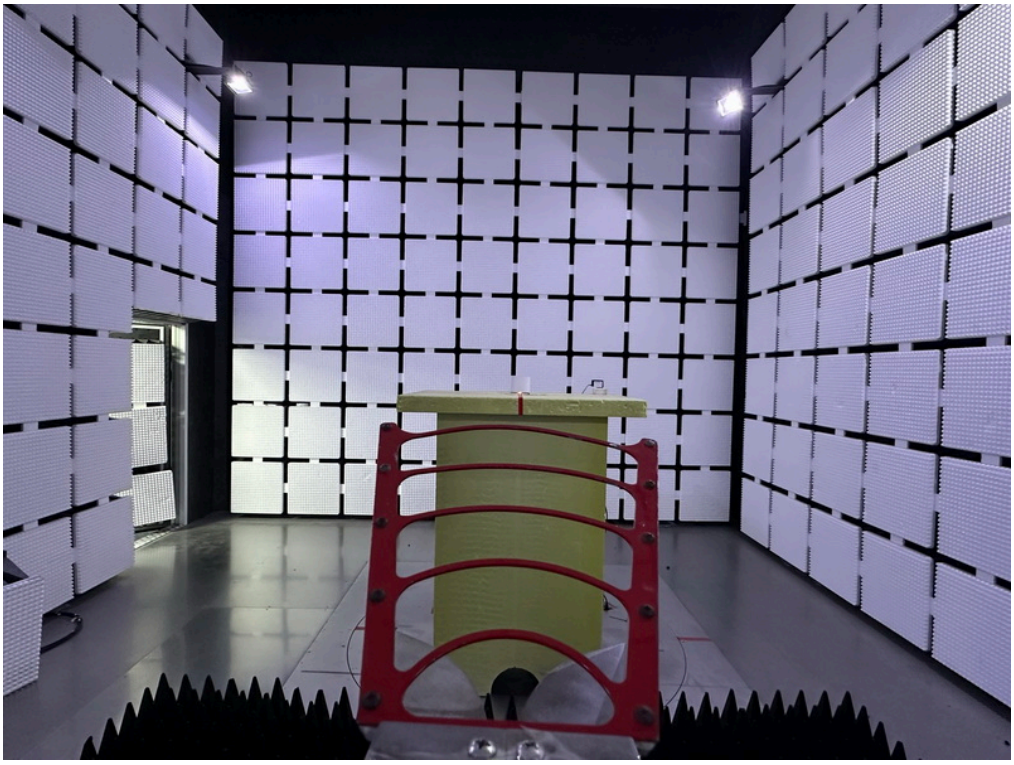
30 MHz to 1 GHz

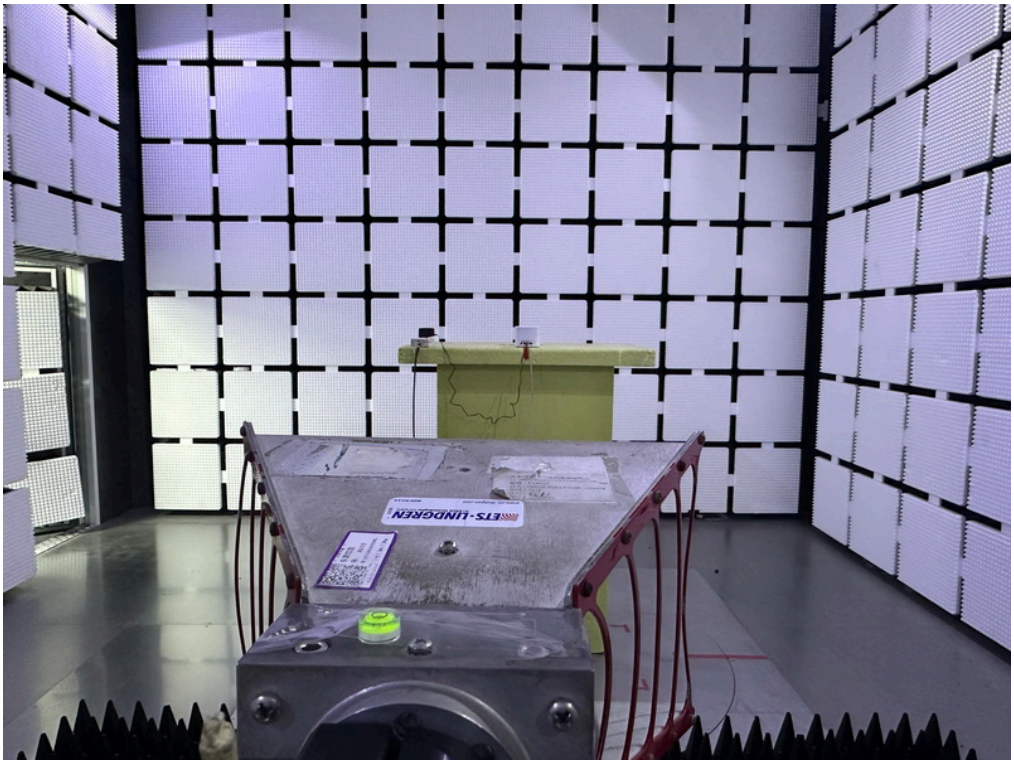




Radiated Emissions Test Photos

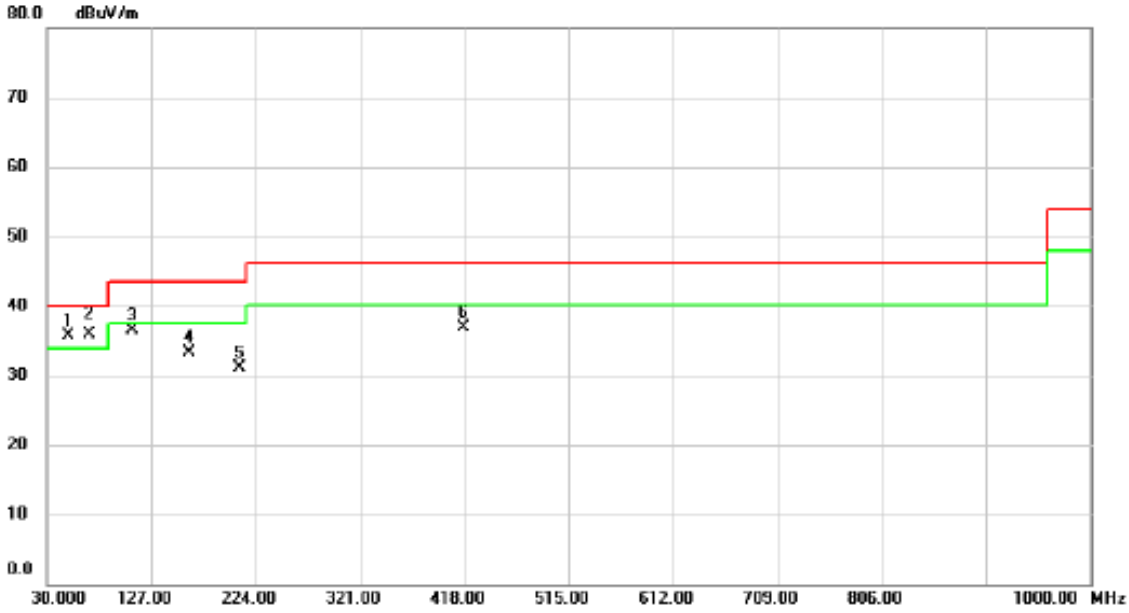
Band edge





APPENDIX A - RADIATED EMISSION - 30 MHZ TO 1000 MHZ

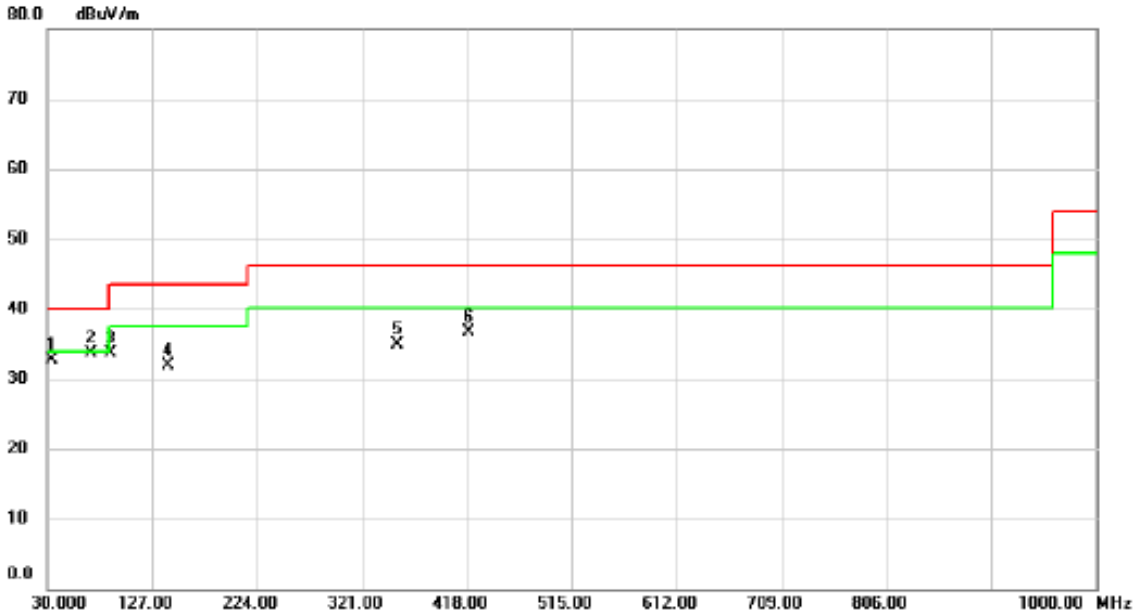
Test Mode	TX AX(HE40) Mode Channel 38	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	!	50.370	46.87	-11.07	35.80	40.00	-4.20	peak	
2	*	69.770	48.83	-12.93	35.90	40.00	-4.10	QP	
3		109.540	50.52	-14.04	36.48	43.52	-7.04	peak	
4		161.920	43.93	-10.55	33.38	43.52	-10.14	peak	
5		208.480	44.77	-13.65	31.12	43.52	-12.40	peak	
6		417.030	43.84	-6.91	36.93	46.02	-9.09	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX AX(HE40) Mode Channel 38	Polarization	Horizontal

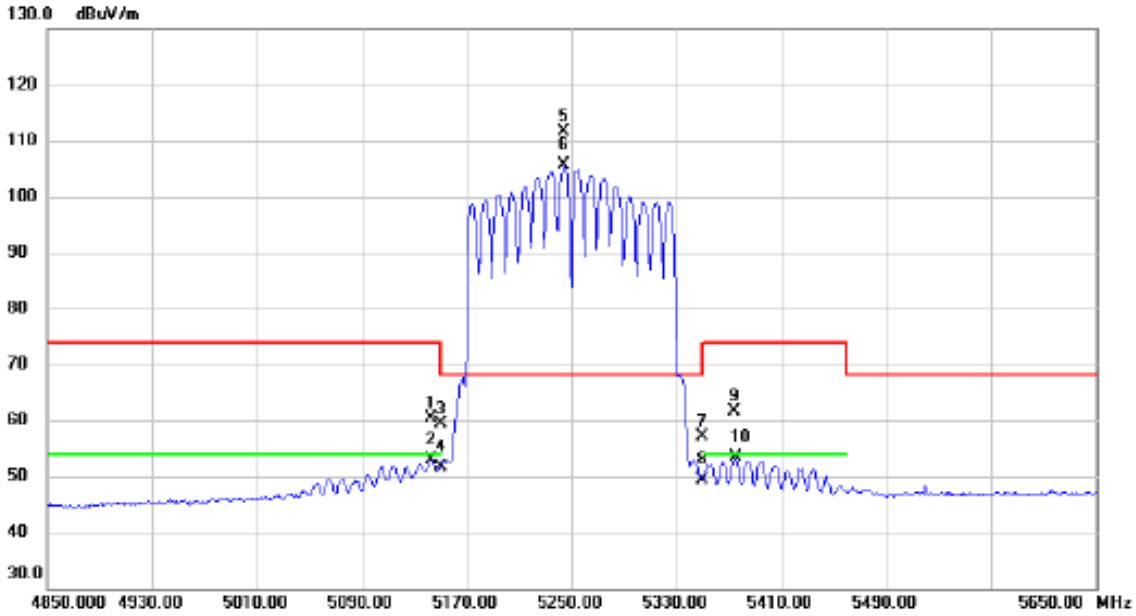


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		34.850	44.98	-12.19	32.79	40.00	-7.21	peak	
2	*	70.740	46.90	-13.12	33.78	40.00	-6.22	peak	
3		89.170	50.13	-16.41	33.72	43.52	-9.80	peak	
4		141.550	43.09	-11.12	31.97	43.52	-11.55	peak	
5		353.980	43.48	-8.54	34.94	46.02	-11.08	peak	
6		419.940	43.43	-6.82	36.61	46.02	-9.41	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value

APPENDIX B - RADIATED EMISSION - ABOVE 1000 MHZ

Test Mode	TX AC(VHT160) Mode Channel 50	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		5142.800	45.56	14.87	60.43	74.00	-13.57	peak	
2		5142.800	38.06	14.87	52.93	54.00	-1.07	AVG	
3		5150.000	44.46	14.90	59.36	74.00	-14.64	peak	
4		5150.000	36.70	14.90	51.60	54.00	-2.40	AVG	
5	*	5243.600	96.59	15.16	111.75	68.20	43.55	peak	No Limit
6	X	5244.400	90.44	15.17	105.61	68.20	37.41	AVG	No Limit
7		5350.000	41.72	15.46	57.18	74.00	-16.82	peak	
8		5350.000	33.83	15.46	49.29	54.00	-4.71	AVG	
9		5374.000	46.02	15.54	61.56	74.00	-12.44	peak	
10		5374.800	37.75	15.54	53.29	54.00	-0.71	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

End of Test Report