TEST REPORT

Reference No.	:	WTX24X09214732W003
Manufacturer	:	Descartes Systems Group Inc.
Address	:	105 Trafalgar Street, Floor 2, Nelson, Tasman 7010, New Zealand
Product Name	:	Pallet tag
Model No.	:	PLT005
Standards	:	**ETSI EN 301 489-1 V2.2.3 (2019-11)** **ETSI EN 301 489-17 V3.2.4 (2020-09)**
Date of Receipt sample	:	2024-09-12
Date of Test	:	2024-09-12 to 2024-09-25
Date of Issue	:	2024-09-25
Test Report Form No.	:	WTX_ETSI EN 301 489_1_2019W
Test Result	:	**Pass**

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of approver.

Prepared By:

Waltek Testing Group (Shenzhen) Co., Ltd.

Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road,

Block 70 Bao'an District, Shenzhen, Guangdong, China

Tel.: +86-755-33663308 Fax.: +86-755-33663309 Email: sem@waltek.com.cn

Tested by:

Mike Shi

Approved by:

Jason Su

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Version No.	Date of issue	Description
Rev.00	2024-09-25	Original
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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

General Description of EUT	
Product Name:	Pallet tag
Trade Name:	/
Model No.:	PLT005
Adding Model(s):	/
Rated Voltage:	DC3V
Battery Capacity:	/
Power Adapter:	/
Software Version:	plt005_v65.1.1
Hardware Version:	1.0
Note: The test data is gathered from a production sample, provided by the manufacturer.	

Technical Characteristics of EUT	
Bluetooth	
Bluetooth Version:	Bluetooth V5.3(BLE Mode)
Frequency Range:	2402MHz-2480MHz
Max.RF Output Power:	1Mbps:7.49dBm (EIRP) 2Mbps:7.48dBm (EIRP)
Type of Modulation:	GFSK
Data Rate:	1Mbps, 2Mbps
Quantity of Channels	40
Channel Separation:	2MHz
Type of Antenna:	Mini Patch Antenna
Antenna Gain:	3.5dBi
Note: The Antenna Gain is provided by the customer and can affect the validity of results.	

1.2 Test Standards

The tests were performed according to following standards:

ETSI EN 301 489-1 V2.2.3 (2019-11): Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for Electromagnetic Compatibility.
ETSI EN 301 489-17 V3.2.4 (2020-09): ElectroMagnetic Compatibility (EMC) standard for radio equipment and services;Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard for ElectroMagnetic Compatibility

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product maybe which result in lowering the emission/immunity should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with the standard ETSI EN 301489-1, Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements.

1.4 Test Facility

Address of the test laboratory
Laboratory: Waltek Testing Group (Shenzhen) Co., Ltd.
Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road, Block 70 Bao'an District, Shenzhen, Guangdong, China

FCC – Registration No.: 125990
Waltek Testing Group (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A
The 3m Semi-anechoic chamber of Waltek Testing Group (Shenzhen) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

1.5 EUT Setup and Operation Mode

The equipment under test (EUT) was configured to measure its highest possible emission/immunity level. The test modes were provided by the manufacturer, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	Normal working	The EUT was powered by the battery. During the testing, it was monitored via the nRF connect APP.
TM2	Bluetooth	TR, CR, TT, CT for EMS testing

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Computer	Lenovo	L13 Yoga	/

1.6 Performance Criteria for EMS

➢ **EN 301 489-17, The performance criteria are:**

• performance criteria A for immunity tests with phenomena of a continuous nature;

• performance criteria B for immunity tests with phenomena of a transient nature;

• performance criteria C for immunity tests with power interruptions exceeding a certain time.

The equipment shall meet the minimum performance criteria as specified in the following clauses.

Table 1: Performance criteria

Criteria	During test	After test
A	Shall operate as intended. (see note 1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 3). Shall be no loss of function. Shall be no loss of stored data or user programmable
B	May show loss of function (one or more). May show degradation of performance (see note 2). Shall be no unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3). Shall be no loss of stored data or user programmable functions.
C	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3).

NOTE 1: Operate as intended during the test allows a level of degradation not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 2: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 3: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

1.7 Measurement Uncertainty

Measurement uncertainty	
Parameter	**Uncertainty**
Uncertainty for Radiated Emission in 3m chamber	@30-200MHz ±4.52dB @0.2-1GHz ±5.56dB @1-6GHz ±3.84dB @6-18GHz ±3.92dB
Uncertainty for Conducted Emission	@9-150kHz ±3.74dB @0.15-30MHz ±3.34dB
Uncertainty for Harmonic test	3.26%
Uncertainty for Flicker test	4.76%
Uncertainty for RS test	21%, k=2
Uncertainty for CS test	29%, k=2
Uncertainty for ESD test	The immunity measurement system uncertainty is within standard requirement and is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.
Uncertainty for EFT test	
Uncertainty for Surges test	
Uncertainty for Voltage Dips, Voltage Variations and Short Interruptions Test	
Uncertainty for PFMF test	

1.8 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
☐Chamber A: Below 1GHz					
Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2024-02-24	2025-02-23
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2024-03-19	2025-03-18
Amplifier	HP	8447F	2805A03475	2024-02-24	2025-02-23
Loop Antenna	Schwarz beck	FMZB 1516	9773	2024-02-26	2025-02-25
Trilog Broadband Antenna	Schwarz beck	VULB9163	9163-333	2024-02-24	2025-02-23
☐Chamber A: Above 1GHz					
Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2024-02-24	2025-02-23
Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2024-02-24	2025-02-23
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2024-03-19	2025-03-18
Amplifier	C&D	PAP-1G18	2002	2024-02-27	2025-02-26
Horn Antenna	ETS	3117	00086197	2024-02-26	2025-02-25
DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2024-03-17	2025-03-16
Pre-amplifier	Schwarzbeck	BBV 9721	9721-031	2024-02-29	2025-02-28
☐Chamber B:Below 1GHz					
Trilog Broadband Antenna	Schwarz beck	VULB9163(B)	9163-635	2024-03-17	2027-03-16
Amplifier	Agilent	8447D	2944A10457	2024-02-24	2025-02-23
EMI Test Receiver	Rohde & Schwarz	ESPI	101391	2024-02-24	2025-02-23
☒Chamber C:Below 1GHz					
EMI Test Receiver	Rohde & Schwarz	ESIB 26	100401	2024-02-27	2025-02-26
Trilog Broadband Antenna	Schwarz beck	VULB 9168	1194	2024-04-18	2027-04-17
Loop Antenna	Schwarz beck	FMZB 1516	9773	2024-02-26	2025-02-25
Amplifier	HP	8447F	2944A03869	2024-02-24	2025-02-23
☒Chamber C: Above 1GHz					
EMI Test Receiver	Rohde & Schwarz	ESIB 26	100401	2024-02-27	2025-02-26
Horn Antenna	POAM	RTF-118A	1820	2023-03-10	2026-03-09
Amplifier	Tonscend	TAP01018050	AP22E806235	2024-02-27	2025-02-26
DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2024-03-17	2025-03-16
Pre-amplifier	Schwarzbeck	BBV 9721	9721-031	2024-02-29	2025-02-28
☐Conducted Room 1#					
EMI Test Receiver	Rohde & Schwarz	ESCI	100525	2023-12-12	2024-12-11
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2024-02-24	2025-02-23
AC LISN	Schwarz beck	NSLK8126	8126-279	2024-02-24	2025-02-23
8-WIRE ISN CAT5	Schwarz beck	8158	CAT5-8158-0117	2024-02-24	2025-02-23
☒Conducted Room 2#					

EMI Test Receiver	Rohde & Schwarz	ESPI	101259	2024-02-24	2025-02-23
LISN	Rohde & Schwarz	ENV 216	100097	2024-02-24	2025-02-23
PFMF					
PMF Generator	LIONCEL	PMF-801C-C	0171101	2024-02-24	2025-02-23
PMF Antenna	LIONCEL	PMF-801C-A	0180302	2024-02-24	2025-02-23
Instantaneous PMF Generator Module	LIONCEL	PMF-801C-T	0171001	2024-02-24	2025-02-23
H/F					
Digital Power Analyzer	California Instrument	CTS	72831	2024-02-24	2025-02-23
Power Source	California Instrument	5001IX-CTS-400	60077	2024-02-24	2025-02-23
ESD					
ESD Generator	LIONCEL	ESD-203B	0170901	2024-02-26	2025-02-25
EFT/SURGE/DIPS					
Transient 2000	EMC PARTNER	TRA2000	836	2024-03-19	2025-03-18
Couple Clamp	EMC PARTNER	CN-EFT1000	513	2024-03-19	2025-03-18
CS					
CONDUCTED IMMUNITY TEST SYSTEM	FRANKONIA	CIT-10/75	126B1247/2013	2024-02-27	2025-02-26
Attenuator	EMTEST	MA-5100/6BF2	1009	2024-02-27	2025-02-26
CDN	Luthi	L-801M2/M3	2665	2024-02-27	2025-02-26
CDN	LIONCEL	CDN-T8	0210401	2024-02-24	2025-02-23
EM Clamp	TESEQ	KEMZ801A	45028	2024-02-26	2025-02-25
RS					
Signal Generator	HP	8665B	3438A00604	2024-02-27	2025-02-26
Power Sensor	Agilent	E9301A	MY52450001	2024-02-27	2025-02-26
Power Sensor	Agilent	E9304A	MY55081055	2024-02-27	2025-02-26
RF Power Amplifier	MicoTop	MPA-80-1000-250	MPA1906239	2024-02-27	2025-02-26
RF Power Amplifier	MicoTop	MPA-80-6000-100	MPA1906238	2024-02-27	2025-02-26
Antenna	SCHWARZBECK	STLP 9129	9129 114	N/A	N/A
Power Meter	Agilent	E4419B	GB42420578	2024-02-27	2025-02-26

Software List			
Description	Manufacturer	Model	Version
EMI Test Software (Radiated Emission A)*	Farad	EZ-EMC	RA-03A1 (1.1.4.2)
EMI Test Software (Radiated Emission B)*	Farad	EZ-EMC	RA-03A1 (1.1.4.2)
EMI Test Software (Radiated Emission C)*	Farad	EZ-EMC	RA-03A1-2 (1.1.4.2)
EMI Test Software (Conducted Emission Room 1#)*	Farad	EZ-EMC	3A1*CE-RE 1.1.4.3
EMI Test Software (Conducted Emission Room 2#)*	Farad	EZ-EMC	3A1*CE-RE 1.1.4.3

*Remark: indicates software version used in the compliance certification testing.

2. SUMMARY OF TEST RESULTS

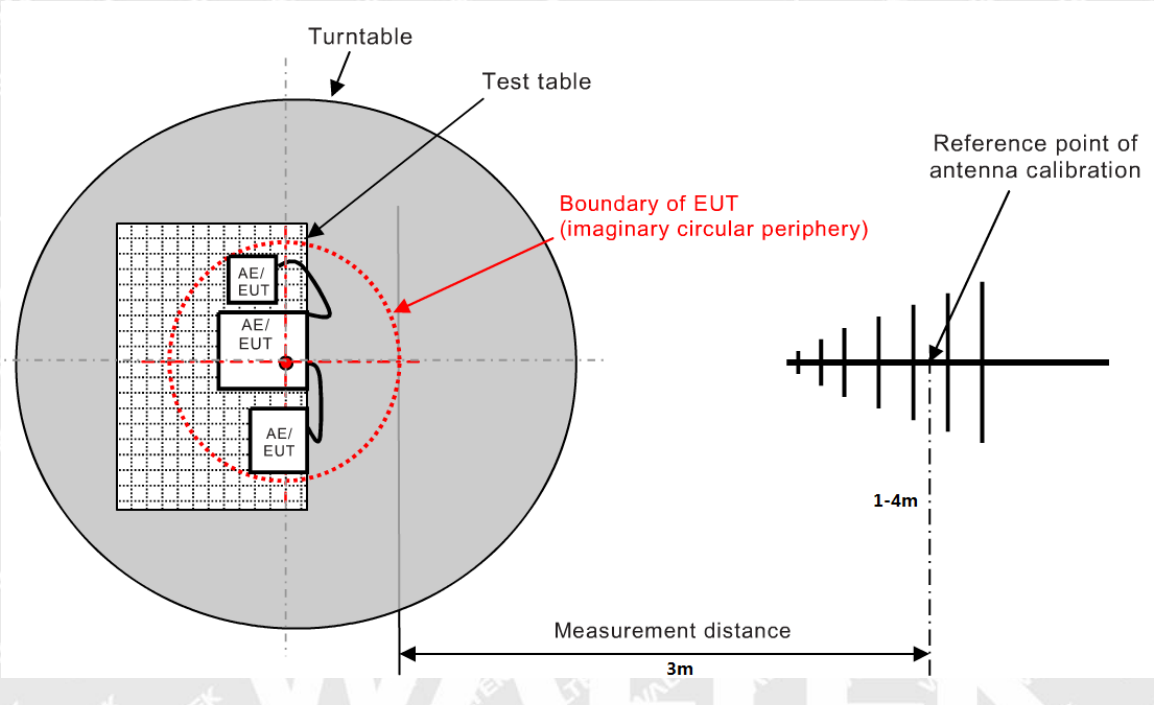
Standards	Reference	Description of Test Item	Result
ETSI EN 301 489-1	8.2	Radiated Emissions	Pass
	8.3	Conducted Emissions for DC Power Port	N/A
	8.4	Conducted Emissions for AC Power Port	N/A
	8.5	Harmonic Current Emissions	N/A
	8.6	Voltage Fluctuations and Flicker	N/A
	8.7	Telecommunication Ports	N/A
	9.2	Radio Frequency Electromagnetic Field	Pass
	9.3	Electrostatic Discharge	Pass
	9.4	Fast Transients, Common Mode	N/A
	9.5	Radio Frequency, Common Mode	N/A
	9.6	Transient and Surges in the Vehicular Environment	N/A
	9.7	Voltage Dips and Interruptions	N/A
	9.8	Surges	N/A

Pass: The EUT complies with the essential requirements in the standard.
Fail: The EUT does not comply with the essential requirements in the standard.
N/A: Not applicable.

3. RADIATED EMISSIONS

3.1 Test Procedure

Test is conducted under the description of EN55032 Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement.



3.2 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit for Class B device. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – EN 301489 Class B Limit

3.3 Environmental Conditions

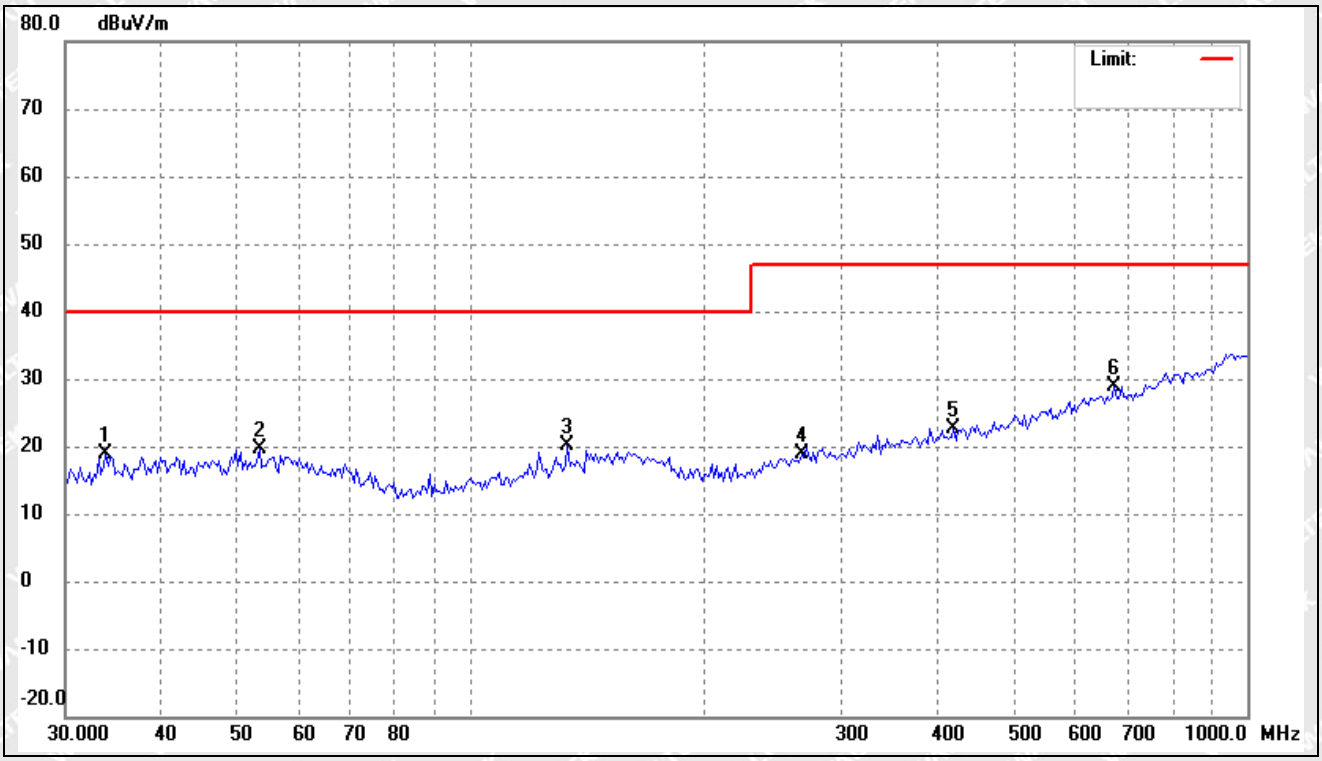
Temperature:	26.4° C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

3.4 Summary of Test Results/Plots

Note: Only show the worst case in the test report

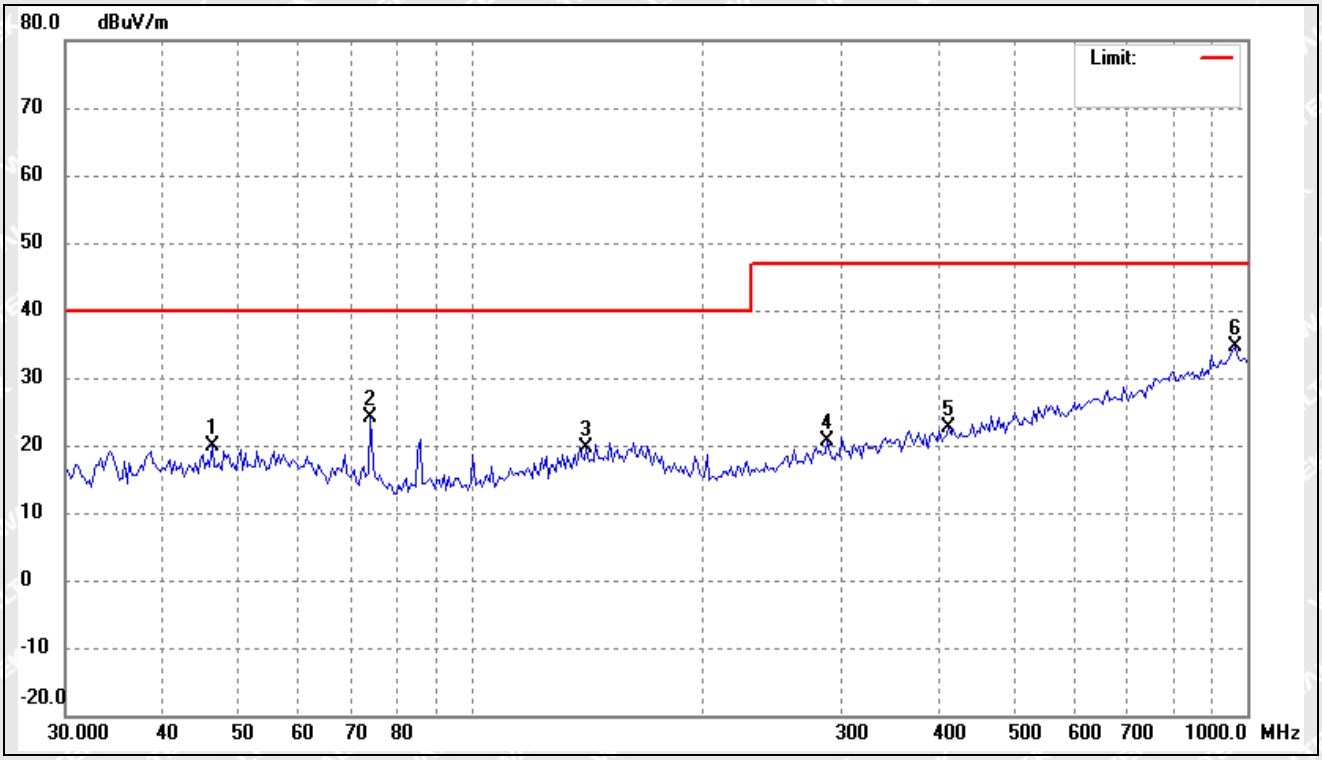
➢ 30MHz to 1GHz

Test mode:	TM1	Polarity:	Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	33.8067	27.92	-9.16	18.76	40.00	-21.24	-	-	QP
2	53.3794	27.51	-7.95	19.56	40.00	-20.44	-	-	QP
3	133.0809	29.28	-9.18	20.10	40.00	-19.90	-	-	QP
4	266.8395	27.80	-9.00	18.80	47.00	-28.20	-	-	QP
5	418.3784	28.62	-5.88	22.74	47.00	-24.26	-	-	QP
6	674.6768	30.22	-1.37	28.85	47.00	-18.15	-	-	QP

Test mode:	TM1	Polarity:	Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	46.3806	27.73	-7.86	19.87	40.00	-20.13	-	-	QP
2	74.2696	35.30	-11.18	24.12	40.00	-15.88	-	-	QP
3	140.7767	28.42	-8.83	19.59	40.00	-20.41	-	-	QP
4	288.2840	28.91	-8.23	20.68	47.00	-26.32	-	-	QP
5	412.5395	28.62	-6.00	22.62	47.00	-24.38	-	-	QP
6	965.4742	31.33	3.37	34.70	47.00	-12.30	-	-	QP

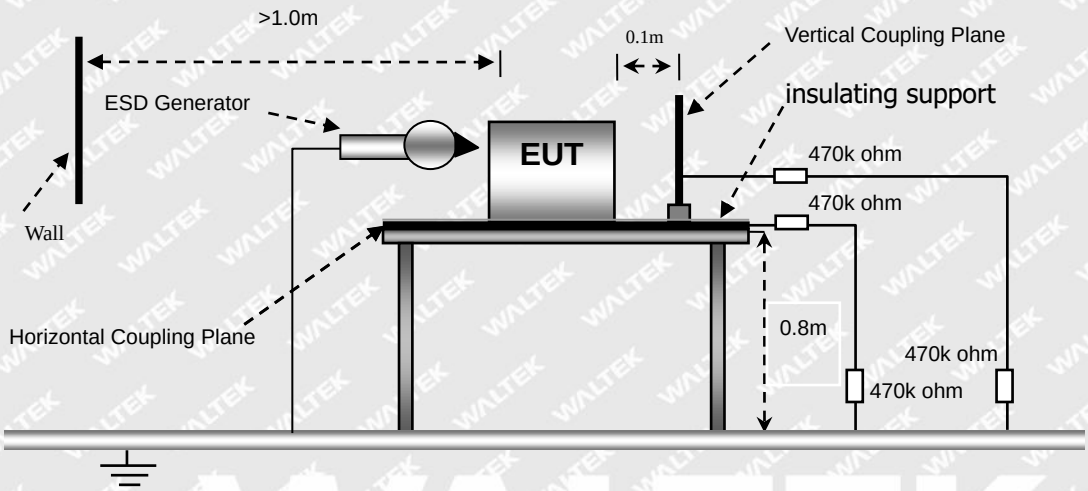
Remark:'-'Means' the test Degree and Height are not recorded by the test software and only show the worst case in the test report.

4. ELECTROSTATIC DISCHARGE (ESD)

4.1 Test Procedure

Test is conducted under the description of EN 61000-4-2.

4.2 Test Setup Block Diagram



4.3 Test Performance

Required Performance Criterion:	B
Mode:	TM1-TM2
Note:TM2 for TT,TR	

4.4 Environmental Conditions

Temperature:	26 °C
Relative Humidity:	55%
ATM Pressure:	1011 mbar

4.5 Electrostatic Discharge Immunity Test Data

Test mode	TM1-TM2							
EN 61000-4-2	Test Levels (kV)							
Test Points	-2	+2	-4	+4	-6	+6	-8	+8
Air Discharge								
Enclosure	A	A	A	A	A	A	A	A
Direct Contact Discharge								
/	/	/	/	/	/	/	/	/
Indirect Contact Discharge								
HCP (6 Sides)	A	A	A	A	/	/	/	/
VCP (4 Sides)	A	A	A	A	/	/	/	/

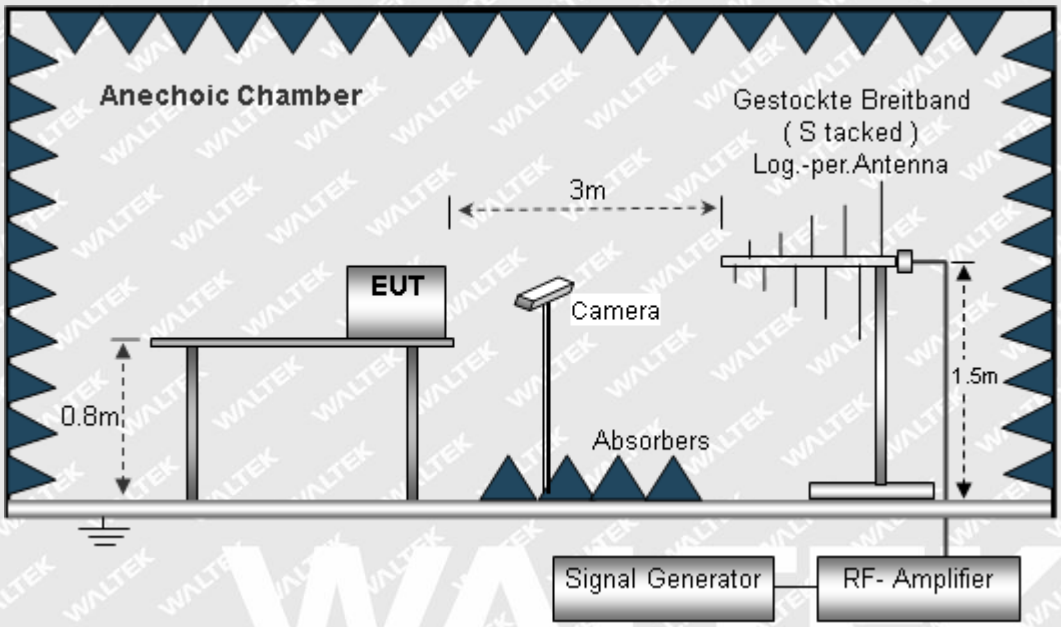
Test Result: Pass

5. RADIO FREQUENCY ELECTROMAGNETIC FIELD (R/S)

5.1 Test Procedure

Test is conducted under the description of EN 61000-4-3.

5.2 Test Setup Block Diagram



5.3 Test Performance

Required Performance Criterion:	A
Mode:	TM1-TM22
Note: TM2 for CT,CR	

5.4 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1010 mbar

5.5 Continuous Radiated Disturbances Test Data

Frequency step: 1% of fundamental
Dwell time: 1 second
Modulation: AM by 1kHz sine wave with 80% modulation depth

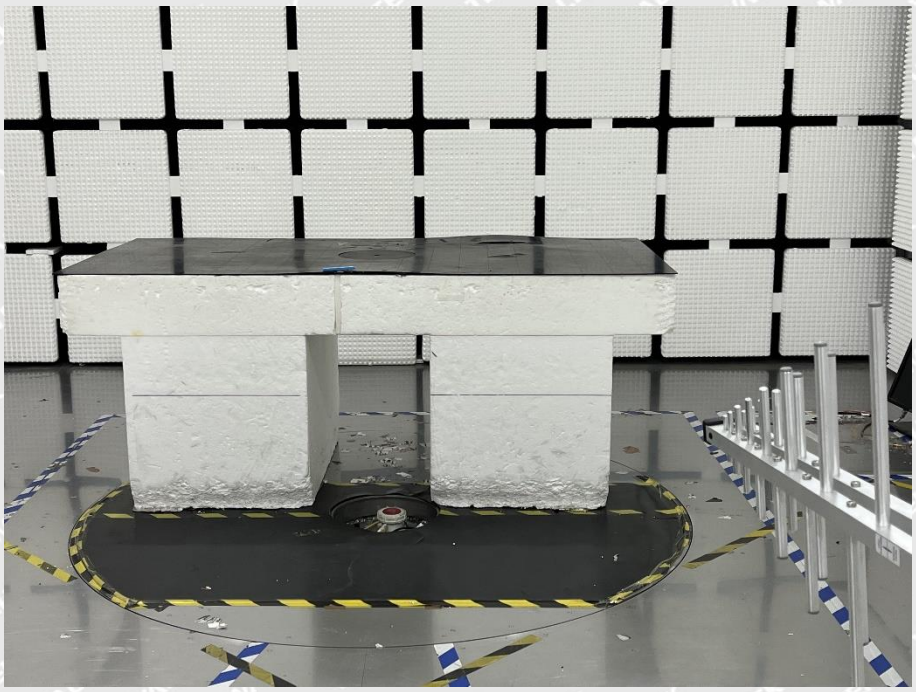
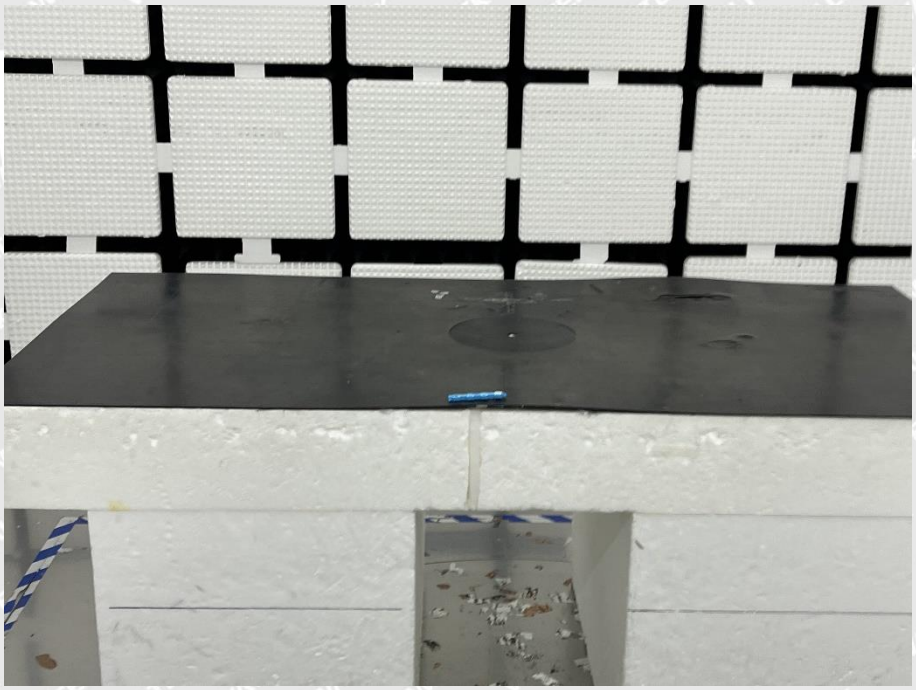
Test mode		TM1-TM2							
Frequency Range(MHz)	Field (V/m)	Front		Rear		Left Side		Right Side	
		VERT	HORI	VERT	HORI	VERT	HORI	VERT	HORI
80-1000	3	A	A	A	A	A	A	A	A
1000-3000	3	A	A	A	A	A	A	A	A
3000-6000	3	A	A	A	A	A	A	A	A

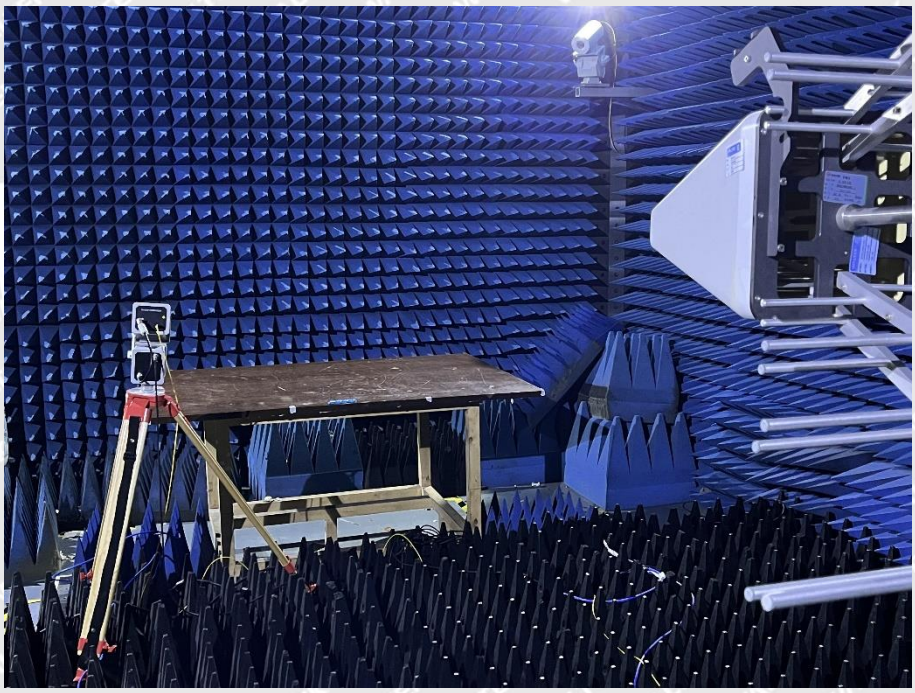
Test Result: Pass

EXHIBIT 1 - EUT PHOTOGRAPHS

Please refer to “ANNEX”.

EXHIBIT 2 - TEST SETUP PHOTOGRAPHS

Radiation Emission Test View(30MHz to 1GHz)	
	

EN 61000-4-2 Test View	
EN 61000-4-3 Test View	

******* END OF REPORT *******