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Testing Cert #:3902.01

TEST REPORT

For EMC

Report No. ..... :	**CHTEW22090086**	Report verification:
Project No.....:	**SHT2103098305EW**	
Applicant ..... :	**HARDWARIO a.s.**	
Address.....:	U Jezu 525/4, 460 01 Liberec, CZECHIA	
Product Name ..... :	**CHESTER**	
Trade Mark .....:	-	
Model No. .....:	CHESTER	
Listed Model(s) .....:	-	
Standard ..... :	**ETSI EN 301 489-1 V2.2.3:2019-11** **ETSI EN 301 489-3 V2.1.1:2019-03** **ETSI EN 301 489-17 V3.2.4 :2020-09** **ETSI EN 301 489-19 V2.1.1: 2019-04** **ETSI EN 301 489-52 V1.2.1 :2021-11**	
Date of receipt of test sample.....:	Jun. 29, 2022	
Date of testing.....:	Jun. 30, 2022- Sep. 20, 2022	
Date of issue.....:	Sep. 21, 2022	
Result..... .....:	**PASS**	

Compiled by (position+printedname+signature)...:	File administrators Silvia Li	Silvia Li
Supervised by (position+printedname+signature)....:	Project Engineer David Chen	David Chen
Approved by (position+printedname+signature)....:	RF Manager Hans Hu	Hans Hu

Testing Laboratory Name ..... :	**Shenzhen Huatongwei International Inspection Co., Ltd.**
Address.....:	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

Contents

1. TEST STANDARDS AND REPORT VERSION

1.1. 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 301 489-3 V2.1.1: 2019-03–ElectroMagnetic Compatibility (EMC)standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD)operating on frequencies between 9 kHz and 246 GHz; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU

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

ETSI EN 301 489-19 V2.1.1 : 2019-04 - ElectroMagnetic Compatibility (EMC) standard for radio equipment and services;Part 19: Specific conditions for Receive Only Mobile Earth Stations (ROMES) operating in the 1,5 GHz band providing data communications and GNSS receivers operating in the RNSS band providing positioning, navigation,and timing data;Harmonised Standard for ElectroMagnetic Compatibility

ETSI EN 301 489-52 V1.2.1: 2021-11 –ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 52: Specific conditions for Cellular Communication User Equipment (UE) radio and ancillary equipment;Harmonised Standard for ElectroMagnetic Compatibility

1.2. Report version information

Revision No.	Date of issue	Description
N/A	2022-09-21	Original

2. TEST DESCRIPTION

Section	Test Item	Standard requirement	Result	Test Engineer
5.1	Radiated emission	EN301 489-1 Clause 8.2	Pass	Junman Wang
	Conducted emission (AC Mains)	EN301 489-1 Clause 8.4	N/A	N/A
	Harmonic current emissions	EN301 489-1 Clause 8.5	N/A	N/A
	Voltage fluctuations and flicker	EN301 489-1 Clause 8.6	N/A	N/A
5.3	Electrostatic discharge	EN301 489-1 Clause 9.3	Pass	Letian Wang
5.4	Radio frequency electromagnetic field	EN301 489-1 Clause 9.2	Pass	Letian Wang
	Fast transients common mode	EN301 489-1 Clause 9.4	N/A	N/A
	Surges	EN301 489-1 Clause 9.8	N/A	N/A
	Radio frequency common mode	EN301 489-1 Clause 9.5	N/A	N/A
	Voltage Dips and Interruptions	EN301 489-1 Clause 9.7	N/A	N/A

Note: The measurement uncertainty is not included in the test result.

3. SUMMARY

3.1. Client information

Applicant:	HARDWARIO a.s.
Address:	U Jezu 525/4, 460 01 Liberec, CZECHIA
Manufacturer:	HARDWARIO a.s.
Address:	U Jezu 525/4, 460 01 Liberec, CZECHIA

3.2. Product description

Main unit information:	
Product Name:	CHESTER
Trade Mark:	-
Model/Type reference:	CHESTER
Listed Model(s)::	**-**
Power supply:	DC 3.6V
Hardware version:	R3.2
Software version:	v1.0.0

3.3. Radio specification description #1

LTE Cat M			
Operation Band:	☒ FDD Band 1	☒ FDD Band 3	☒ FDD Band 8
	☒ FDD Band 20	☒ FDD Band 28	
LTE NB-IoT			
Operation Band:	☒ FDD Band 1	☒ FDD Band 3	☒ FDD Band 8
	☒ FDD Band 20	☒ FDD Band 28	
Bluetooth			
Supported type:	☐ BR	☐ EDR	☒ LE-1Mbps
	☐ LE-2Mbps		
LoRa			
Operation Band:	863 ~ 871MHz		
GNSS			
Supported type:	☒GPS	☒GALILEO	☒GLONASS
	☒BeiDou		

Note

#1: Please refer to RF report for detailed technical specifications

3.4. Testing laboratory information

Laboratory Name	Shenzhen Huatongwei International Inspection Co., Ltd.
Laboratory Location	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China
Connect information:	Tel: 86-755-26715499 E-mail: cs@szhtw.com.cn http://www.szhtw.com.cn

4. TEST CONFIGURATION

4.1. Descriptions of test mode

Test mode	LTE NB-IoT		LTE Cat M		BT (BLE)	Lora	GNSS
	Link	Idle	Link	Idle			
CL1	■						
CI1		■					
CL2			■				
CI2				■			
S1					■		
S2						■	
GNSS							■

Note:

1) * is represent the following meaning in the test report

CL*: CL1, CL2

CI*: CI1, CI2

C**: CL1, CI1, CL2, CI2

S*: S1, S2

2) Operation channel as follows:

- 4G: shall be setting the middle ARFCN range.

Pre-scan above all test mode, found below test mode which it was worse case mode, so only show the test data for worse case mode on the test report.

Test item	Test mode (Worst case mode)
Radiated emission	CL1
Conducted emission(AC Mains)	N/A
Harmonic current cmissions	N/A
Voltage fluctuations and flicker	N/A
Electrostatic discharge	All modes
Radio frequency electromagnetic field	All modes
Fast transients common mode	N/A
Surges	N/A
Radio frequency common mode	N/A
Voltage Dips and Interruptions	N/A

4.2. Support unit used in test configuration and system

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The following peripheral devices and interface cables were connected during the measurement:

Whether support unit is used?				
✓ No				
Item	Equipment	Trade Name	Model No.	Other
1				
2				

4.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C
Lative Humidity	55 %
Air Pressure	989 hPa

4.4. Statement of the measurement uncertainty

Test Items	Measurement Uncertainty
Conducted Emission (0.15~30MHz)	3.25dB
Radiated emission	<1GHz: 4.22dB >1GHz: 5.06dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96

4.5. Equipments used during the test

● Radiated Emission-6th test site							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	HTWE0127	SAC-3m-02	C11121	2018/09/30	2022/09/29
●	EMI Test Receiver	R&S	HTWE0099	ESCI	100900	2021/09/14	2022/09/13
●	Ultra-Broadband Antenna	SCHWARZBECK	HTWE0119	VULB9163	546	2020/04/28	2023/04/27
●	Pre-Amplifer	SCHWARZBECK	HTWE0295	BBV 9742	N/A	2021/11/05	2022/11/04
●	RF Connection Cable	HUBER+SUHNER	HTWE0062-01	N/A	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0062-02	SUCOFLEX104	501184/4	2022/02/25	2023/02/24
●	Test Software	R&S	N/A	ES-K1	N/A	N/A	N/A

● Radiated emission-7th test site							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	HTWE0122	SAC-3m-01	N/A	2018/09/27	2022/09/26
●	Spectrum Analyzer	R&S	HTWE0098	FSP40	100597	2021/09/13	2022/09/12
●	Horn Antenna	SCHWARZBECK	HTWE0126	9120D	1011	2020/04/01	2023/03/31
●	Broadband Pre-amplifier	SCHWARZBECK	HTWE0201	BBV 9718	9718-248	2022/02/28	2023/02/27
●	RF Connection Cable	HUBER+SUHNER	HTWE0121-01	RE-7-FH	N/A	2022/03/04	2023/03/03
●	Test Software	Audix	N/A	E3	N/A	N/A	N/A

● Radio Frequency Electromagnetic Field							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	HTWE0127	SAC-3m-02	C11121	2018/09/30	2022/09/29
●	Signal Generator	R&S	HTWE0276	SMB100A	114360	2021/08/05	2022/08/04
●	Amplifier	R&S	HTWE0277	BBA150-BC500	102664	2021/08/18	2022/08/17
●	Amplifier	R&S	HTWE0395	BBA150 D400	104197	2021/07/29	2022/07/29
●	Amplifier	R&S	HTWE0396	BBA150 E400	104198	2021/07/29	2022/07/29
●	Power Head	R&S	HTWE0278	NRP18A	101010	2021/08/05	2022/08/04
●	Power Head	R&S	HTWE0389	NRP18A	101386	2021/05/27	2022/05/26
●	Transmit Antenna	Schwarzbeck	HTWE0280	STLP9129	00044	2022/03/30	2023/03/29
●	Field Probe	ETS-LINDGREN	HTWE0321	HI-6153	00130812	2019/05/23	2022/05/22
●	Test Software	R&S	N/A	EMC32	100916	N/A	N/A
●	Audio analyzer	R&S	HTWE3008	UPV	101371	2021/10/09	2022/10/08
●	Radio communication tester	R&S	HTWE0287	CMW500	137688-Lv	2021/09/13	2022/09/12

● Electrostatic Discharge							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	ESD Simulator	EM TEST	HTWE0001	DITO	0301-04	2021/07/21	2022/07/20

5. TEST CONDITIONS AND RESULTS

5.1. Radiated emission

LIMIT

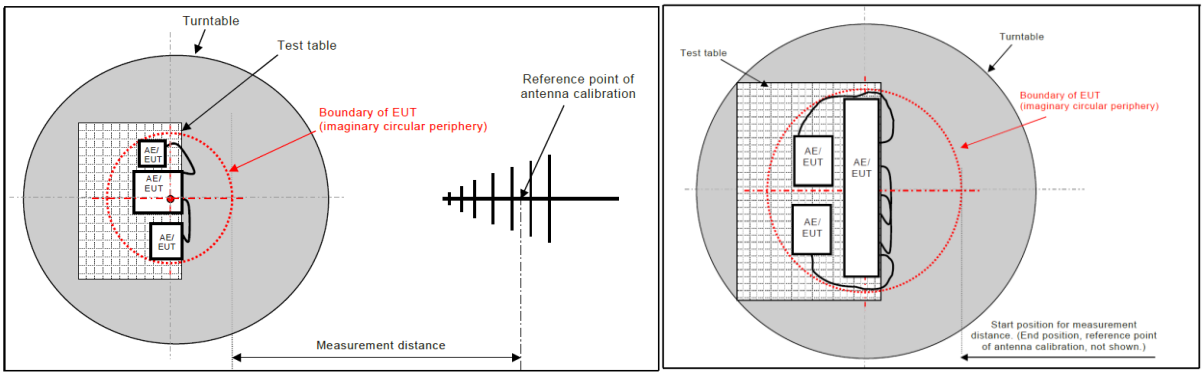
Please refer to ETSI EN301489-1 Clause 8.2.3, Table 4 and CENELEC EN 55032 Annex A Table A.4 & A.5

Frequency range (MHz)	Quasi-peak limitsdBμV/m@3m
30~230	40
230~1000	47

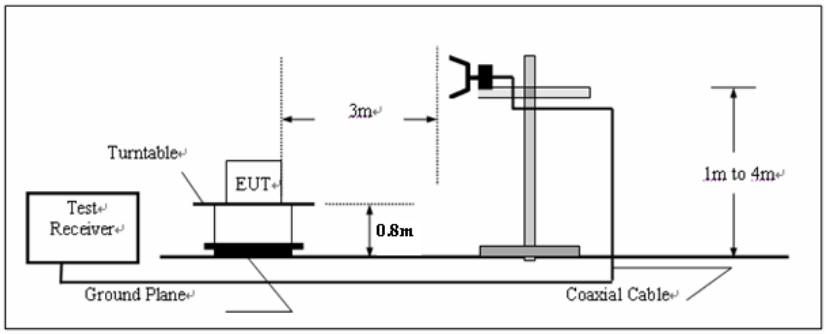
Frequency range (GHz)	Average limitsdBμV/m@3m	Peak limitsdBμV/m@3m
1 ~ 3	50	70
3 ~ 6	54	74

TEST CONFIGURATION

➢ below 1000MHz:



➢ Above 1000MHz



TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 8.2.3 and CENELEC EN 55032 Clause 6.3 for the measurement methods

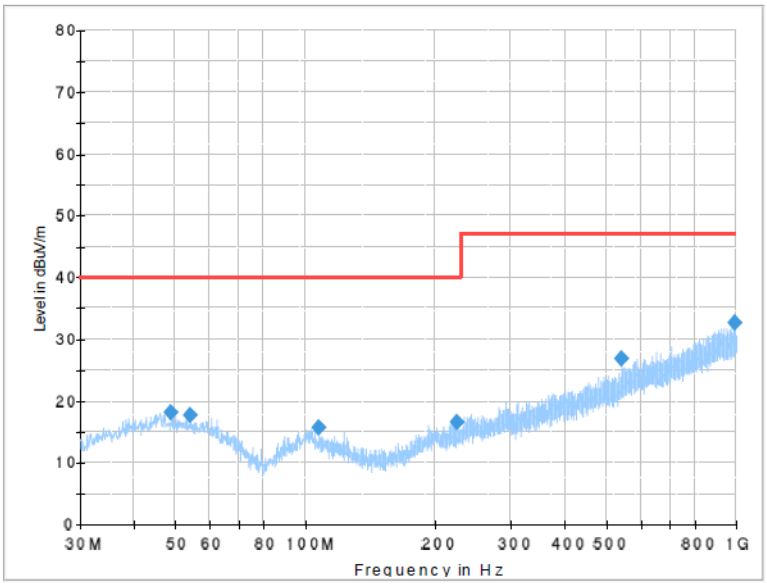
TEST MODE:

Please refer to the Clause 4.1

TEST RESULTS

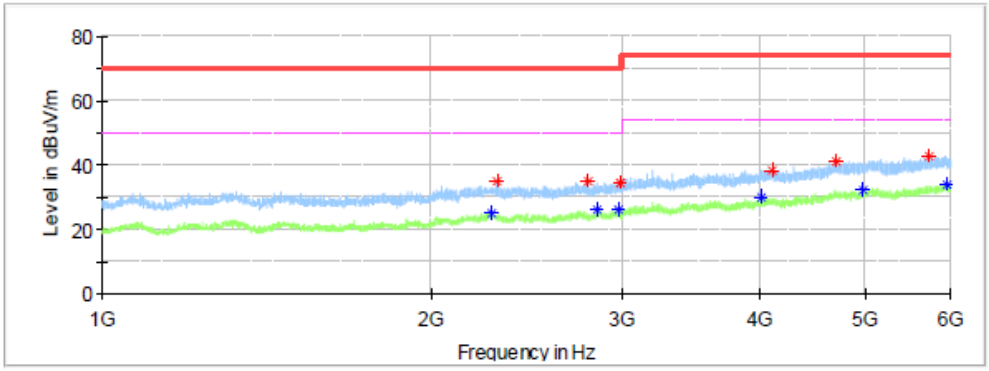
☒ **Passed** ☐ **Not Applicable**

Polarization	*Horizontal*



Final_Result

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
48.915000	18.18	40.00	21.82	100.0	H	77.0	-9.2
54.128750	17.68	40.00	22.32	100.0	H	238.0	-9.5
107.721250	15.68	40.00	24.32	100.0	H	190.0	-11.7
225.818750	16.51	40.00	23.49	100.0	H	118.0	-9.9
540.705000	26.71	47.00	20.29	100.0	H	158.0	-0.7
992.725000	32.64	47.00	14.36	100.0	H	58.0	7.8

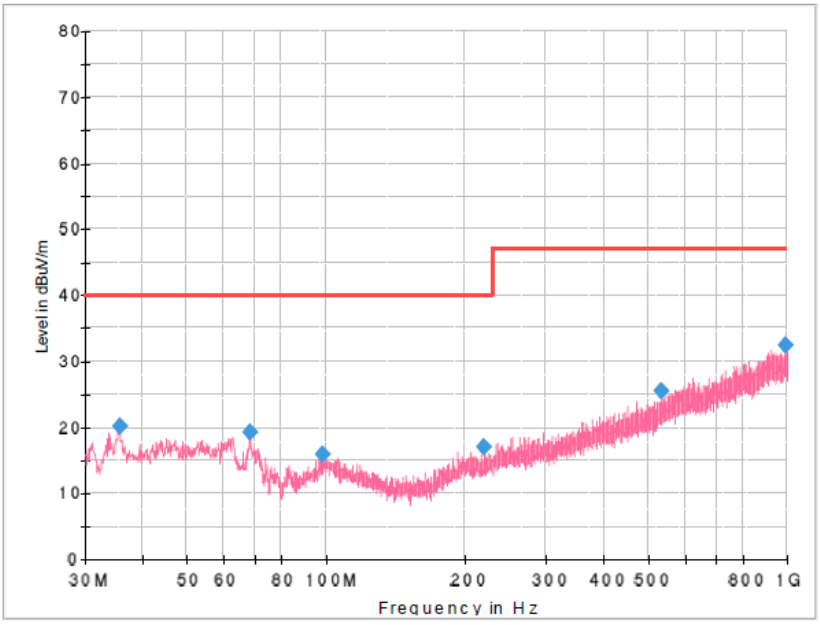


Serif;

Critical_Freqs

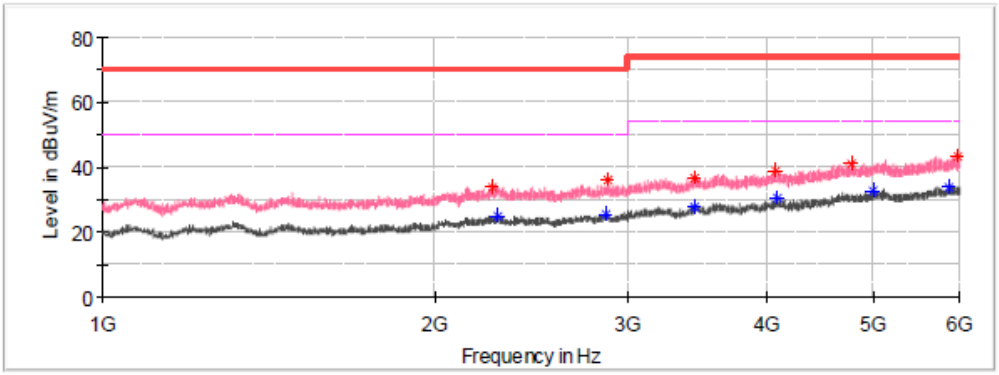
Frequency (MHz)	MaxPeak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
5958.125000	---	34.13	54.00	19.87	150.0	H	0.0	9.1
4022.500000	---	30.01	54.00	23.99	150.0	H	73.0	1.4
4106.875000	38.56	---	74.00	35.44	150.0	H	87.0	1.7
2972.500000	---	25.84	50.00	24.16	150.0	H	101.0	-3.0
4988.750000	---	32.07	54.00	21.93	150.0	H	115.0	6.3
2840.000000	---	26.06	50.00	23.94	150.0	H	129.0	-3.5
2794.375000	35.02	---	70.00	34.98	150.0	H	171.0	-3.5
5739.375000	42.92	---	74.00	31.08	150.0	H	232.0	8.1
4716.875000	41.21	---	74.00	32.79	150.0	H	246.0	5.3
2276.250000	---	25.19	50.00	24.81	150.0	H	288.0	-4.6
2980.625000	34.39	---	70.00	35.61	150.0	H	302.0	-2.9
2297.500000	35.23	---	70.00	34.77	150.0	H	344.0	-4.7

Polarization	*Vertical*



Final_Result

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
35.698750	20.17	40.00	19.83	100.0	V	5.0	-10.9
68.436250	19.32	40.00	20.68	100.0	V	165.0	-12.7
98.142500	15.84	40.00	24.16	100.0	V	0.0	-11.2
220.968750	16.92	40.00	23.08	100.0	V	243.0	-10.1
534.036250	25.45	47.00	21.55	100.0	V	313.0	-0.9
993.210000	32.31	47.00	14.69	100.0	V	0.0	7.8



Serif;

Critical_Freqs

Frequency (MHz)	MaxPeak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3451.875000	36.87	---	74.00	37.13	150.0	V	0.0	-1.1
3451.875000	---	28.01	54.00	25.99	150.0	V	0.0	-1.1
4084.375000	39.11	---	74.00	34.89	150.0	V	0.0	1.6
2256.250000	33.88	---	70.00	36.12	150.0	V	15.0	-4.6
4788.750000	41.18	---	74.00	32.82	150.0	V	15.0	5.5
4996.875000	---	32.83	54.00	21.17	150.0	V	15.0	6.4
2878.750000	36.15	---	70.00	33.85	150.0	V	113.0	-3.3
4098.125000	---	30.44	54.00	23.56	150.0	V	127.0	1.7
5968.125000	43.17	---	74.00	30.83	150.0	V	127.0	9.1
2867.500000	---	25.57	50.00	24.43	150.0	V	183.0	-3.3
2283.125000	---	25.17	50.00	24.83	150.0	V	211.0	-4.6
5855.625000	---	33.97	54.00	20.03	150.0	V	295.0	8.7

5.2. Performance criteria for immunity

Standard	Performance criteria		
	Continuous phenomena*1	Transient phenomena *2	Transient phenomena*3
EN301 489-3	A	B	B
EN301 489-17	A	B	C
EN301 489-19	CR	TR	TR
EN301 489-52	CT, CR	TP	TP
EN55035	A	B	C

Note:

*1: test item include Radio frequency electromagnetic field, Radio frequency common mode

*2: test item include Electrostatic discharge, Fast transients common mode, Surge, Voltage dips

*3: test item include Voltage interruption

EN301489-3

General performance criteria

- *Performance criterion A applies for immunity tests with phenomena of a continuous nature;*
- *Performance criterion B applies for immunity tests with phenomena of a transient nature.*

NOTE: Whether a phenomenon is considered transient, continuous or otherwise is indicated in the test procedures for the phenomenon in ETSI EN 301 489-1 [1], clause 9.

Criteria	*During test*	*After test*
A	*Operate as intended* *No loss of function* *No unintentional responses*	*Operate as intended* *No loss of function* *No degradation of performance* *No loss of stored data or user programmable functions*
B	*May show loss of function* *No unintentional responses*	*Operate as intended* *Lost function(s) shall be self-recoverable* *No degradation of performance* *No loss of stored data or user programmable functions*

EN301489-17

General performance criteria

- *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.*

NOTE: Whether a phenomenon is considered transient, continuous or otherwise is indicated in the test procedures for the phenomenon in ETSI EN 301 489-1 [1], clause 9.

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

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

NOTE 1:
Degradation of performance during the test is understood as a degradation to a level not below aminimum performance level specified by the manufacturer for the use of the apparatus as intended. Insome cases the specified minimum performance level may be replaced by a permissible degradationof performance.

If the minimum performance level or the permissible performance degradation is not specified by themanufacturer 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 ifused as intended.

NOTE 2:
No degradation of performance after the test is understood as no degradation below a minimumperformance level specified by the manufacturer for the use of the apparatus as intended. In somecases the specified minimum performance level may be replaced by a permissible degradation ofperformance. 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 themanufacturer 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 ifused as intended.

Performance criteria for Continuous phenomena applied toTransmitters (CT)

The performance criteria A shall apply.

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does notoccur. In systems using acknowledgement signals, it is recognized that an ACKnowledgement (ACK) or NotACKnowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmissionresulting from the application of the test is correctly interpreted.

Performance criteria for Transient phenomena applied toTransmitters (TT)

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5000 msduration, for which performance criteria C shall apply.

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does notoccur. In systems using acknowledgement signals, it is recognized that an acknowledgement (ACK) ornot-acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmissionresulting from the application of the test is correctly interpreted.

Performance criteria for Continuous phenomena applied toReceivers (CR)

The performance criteria A shall apply.

Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. Insystems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and stepsshould be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Transient phenomena applied toReceivers (TR)

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms durationfor which performance criteria C shall apply.

Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. Insystems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and stepsshould be taken to ensure that any transmission resulting from the application of the test is correctly interpreted

EN301489-19

General performance criteria

The EUT, for all immunity tests according to the present document, except the spot frequency test of the immunity test with radiated RF electromagnetic fields, shall be assessed for:

- *the storage of messages in the memory of the EUT at the start of the test;*
- *unintentional responses of the EUT during the test;*
- *the maintenance of the EUT memory assessed at the conclusion of the test;*
- *the ability to receive and store messages at the conclusion of the test.*

Performance criteria for Continuous phenomena applied to ROMES and ROGNSS receivers (CR)

For the EUT, excluding spot frequency tests as part of the immunity test with radiated RF electromagnetic fields:

- *the general performance criteria set out*
- *during the test no false calls shall occur;*
- *at the conclusion of the test comprising the series of individual exposures the EUT shall operate as intended with no loss of functions or stored data (messages), as declared by the manufacturer.*

Performance criteria for Transient phenomena applied to ROMES and ROGNSS receivers (TR)

For the EUT:

- *the general performance criteria set out ;*
- *during the test no false calls shall occur;*
- *at the conclusion of the test comprising the series of individual exposures, the EUT shall operate as intended with no loss of function and/or stored data (messages), as declared by the manufacturer.*

Performance criteria for equipment which does not provide a continuous communication link

For EUTs of a specialized nature and/or ancillary equipment tested on a stand alone basis the manufacturer shall define the method of test to determine the acceptable level of performance or degradation of performance during and/or after the test. Under these circumstances the manufacturer will also provide the following information:

- *the primary functions of the equipment to be tested during and after EMC stress;*
- *the intended functions of the EUT which shall be in accordance with the documentation accompanying the equipment;*
- *the pass/failure criteria for the equipment;*
- *the method of observing a degradation of performance of the equipment.*

The assessment of the performance or the degradation of performance which shall be carried out during and/or at the conclusion of the tests, shall be simple, but at the same time give adequate proof that the primary functions of the equipment are operational.

EN301489-52

Performance criteria for Continuous phenomena

(1) GSM and voice call

Performance criteria for Continuous phenomena applied to Transmitters (CT)

With a link established, during the test, the uplink speech output level shall be at least 35 dB less than the previously recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centred on 1 kHz (audio breakthrough check).

NOTE: When there is a high-level background noise present, the filter bandwidth may be reduced down to a minimum of 40 Hz.

In idle mode, the transmitter shall not operate unintentionally. At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or critical stored data, and the communication link shall have been maintained.

Performance criteria for Continuous phenomena applied to Receivers (CR)

During the test, the RXQUAL of the downlink shall not exceed the value of three, measured during each individual exposure in the test sequence.

In the case of narrow band responses, the procedure in clause 4.4.1 shall be followed.

During the test, the downlink speech output level shall be at least 35 dB less than the previously recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centred on 1 kHz (audio breakthrough check).

NOTE: When there is a high-level background noise present, the filter bandwidth may be reduced down to a minimum of 40 Hz.

At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or critical stored data, and the communication link shall have been maintained.

(2) UTRA

In the data transfer mode, the performance criteria can be one of the following:

- *if the BER (as referred in clause 5.3.1 of ETSI TS 134 109 [4]) is used, it shall not exceed 0,001 during the test sequence;*
- *if the BLER (as referred in ETSI TS 134 109 [4]) is used, it shall not exceed 0,01 during the test sequence.*

The BLER calculation shall be based on evaluating the CRC on each transport block. Details are specified in annex C. In the case of narrow band responses, the procedure in clause 4.4.2.1 shall be followed.

When testing a voice call, the performance criteria for GSM and voice call shall apply.

(3) E-UTRA, E-UTRA with LAA, inband or guard band NB-IoT, Standalone NB-IoT

In data transfer mode, the data throughput of the EUT shall not fall below 95 % of the maximum data throughput. Details are specified in annex C.

In the case of narrow band responses, the procedure in clause 4.4.2.2 shall be followed.

When testing a voice call, the performance criteria for GSM and voice call shall apply.

(4) NR

In data transfer mode, the data throughput of the EUT shall not fall below 95 % of the maximum data throughput. Details are specified in annex C.

In the case of narrow band responses, the procedure in clause 4.4.3 shall be followed.

When testing a voice call, the performance criteria for GSM and voice call shall apply.

Performance criteria for Transient phenomena (TP)

At the conclusion of each exposure of the transient phenomena, the EUT shall operate without loss of the communication link.

At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended without loss of user control functions or critical stored data.

In addition where the EUT supports idle mode it should be verified that the transmitter shall not unintentionally operate when transient phenomena are applied

5.3. Electrostatic discharge

PERFORMANCE CRITERION

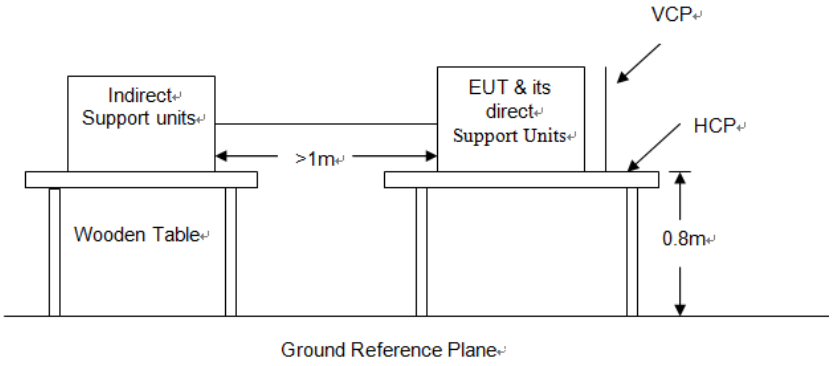
Please refer to the Clause 5.5

TEST LEVEL

Contact Discharge: ±2kV,±4kV

Air Discharge ±2kV,±4kV,±8kV

TEST CONFIGURATION



TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 9.3.2 and EN 61000-4-2 for the measurement methods.

Contact Discharge:

The ESD generator is held perpendicular to the surface to which the discharge is applied and the tip of the discharge electrode touch the surface of EUT. Then turn the discharge switch. The generator is then re-triggered for a new single discharge and repeated at least 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

Air Discharge:

Air discharge is used where contact discharge can't be applied.The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated at least 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

Indirect discharge for horizontal coupling plane:

At least 10 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT.

Indirect discharge for vertical coupling plane:

At least 10 single discharges shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

TEST MODE

Please refer to the Clause 4.1

TEST RESULTS

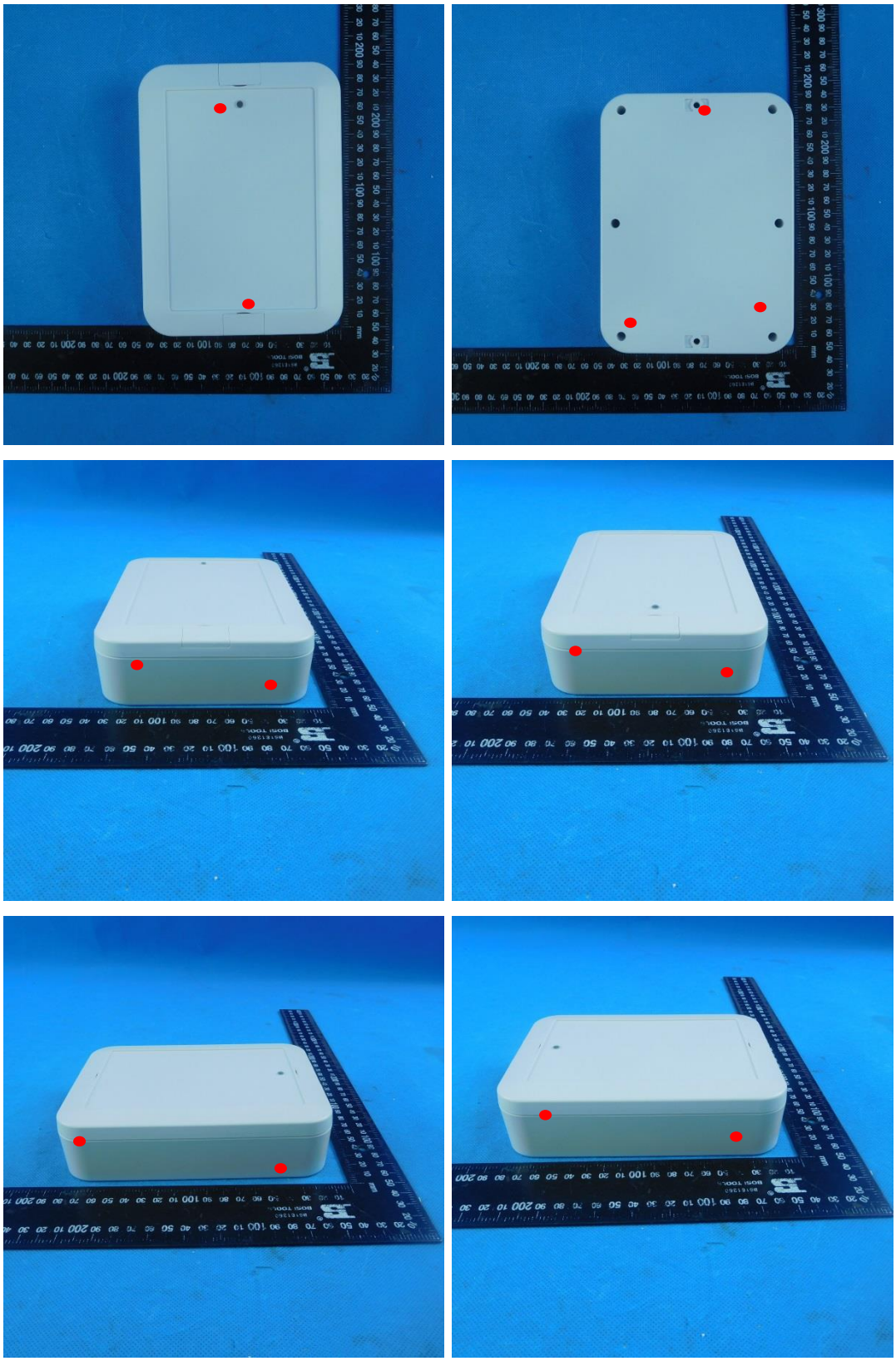
☒ **Passed** ☐ **Not Applicable**

Test mode		S*			
Type	Type of discharge	Discharge voltage (kV)	Observations Performance	Criteria Level	Result
Direct	Contact discharge	±2	No degradation in performance of the EUT was observed (A)	B	Pass
		±4	A	B	
	Air discharge	±2	A	B	
		±4	A	B	
		±8	A	B	
Indirect	HCP (6 sides)	±2	A	B	Pass
		±4	A	B	
	VCP (4 sides)	±2	A	B	
		±4	A	B	

Test mode		GNSS			
Type	Type of discharge	Discharge voltage (kV)	Observations Performance	Criteria Level	Result
Direct	Contact discharge	±2	No degradation in performance of the EUT was observed (A)	TR	Pass
		±4	A	TR	
	Air discharge	±2	A	TR	
		±4	A	TR	
		±8	A	TR	
Indirect	HCP (6 sides)	±2	A	TR	Pass
		±4	A	TR	
	VCP (4 sides)	±2	A	TR	
		±4	A	TR	

Test mode		C**			
Type	Type of discharge	Discharge voltage (kV)	Observations Performance	Criteria Level	Result
Direct	Contact discharge	±2	No degradation in performance of the EUT was observed (A)	TP	Pass
		±4	A	TP	
	Air discharge	±2	A	TP	
		±4	A	TP	
		±8	A	TP	
Indirect	HCP (6 sides)	±2	A	TP	Pass
		±4	A	TP	
	VCP (4 sides)	±2	A	TP	
		±4	A	TP	

Contact discharge-Yellow, Air discharge-Red



5.4. Radio frequency electromagnetic field

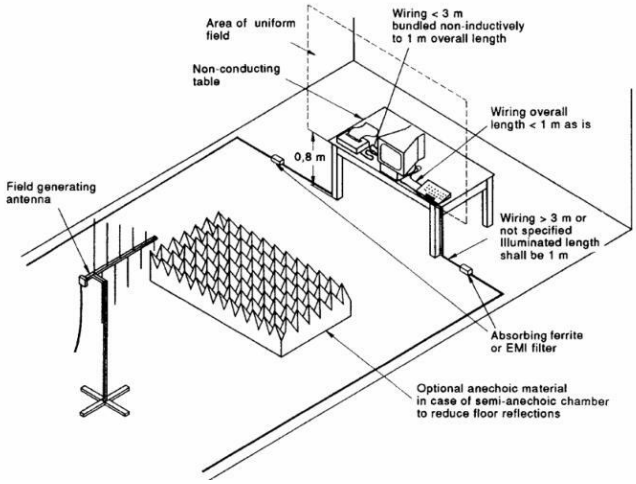
PERFORMANCE CRITERION

Please refer to the Clause 5.5

TEST LEVEL

Test frequency range:	80MHz~6000MHz
Test level:	3V/m (unmodulation)
Modulation type:	Amplitude Modulation, 80% depth
Modulated signal:	1KHz sinusoidal audio signal, 400Hz sinusoidal audio signal for audio breakthrough
Frequency increment step:	1%
Dwell time:	3 seconds

TEST CONFIGURATION



TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 9.2.2 and EN 61000-4-3 for the measurement methods.

TEST MODE

Please refer to the Clause 4.1

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Test mode:	S*		
Antenna Polarity	Observations (Performance Criterion)	Criteria Level	Result
Horizontal / Vertical	*No degradation in performance of the EUT was observed* (A)	A	Pass

Test mode:	GNSS		
Antenna Polarity	Observations (Performance Criterion)	Criteria Level	Result
Horizontal / *Vertical*	*No degradation in performance of the EUT was observed* (A) #6	CR	Pass

Note:

#6: the following frequencys have been tested

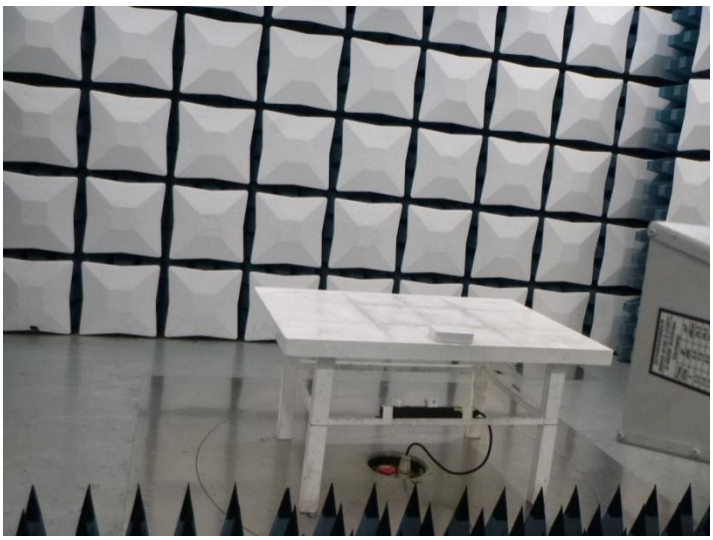
80 MHz, 104 MHz, 136 MHz, 165 MHz, 200 MHz, 260 MHz, 330 MHz, 430 MHz, 560 MHz, 714 MHz, 715 MHz ± 1 MHz, 920 MHz ± 1 MHz

Test mode:		CL*			
Type	Antenna Polarity	Observation item	Test Result	Limit	Result
LTE Band 1	H/V	Throughput	98.86	＞95	Pass
LTE Band 3	H/V	Throughput	97.79	＞95	Pass
LTE Band 8	H/V	Throughput	98.86	＞95	Pass
LTE Band 20	H/V	Throughput	98.44	＞95	Pass
LTE Band 28	H/V	Throughput	98.35	＞95	Pass

Test mode:		CI*		
Type	Antenna Polarity	Observations (Performance Criterion)	Criteria Level	Result
LTE Band 1	H/V	A	CT / CR	Pass
LTE Band 3	H/V	A	CT / CR	Pass
LTE Band 8	H/V	A	CT / CR	Pass
LTE Band 20	H/V	A	CT / CR	Pass
LTE Band 28	H/V	A	CT / CR	Pass

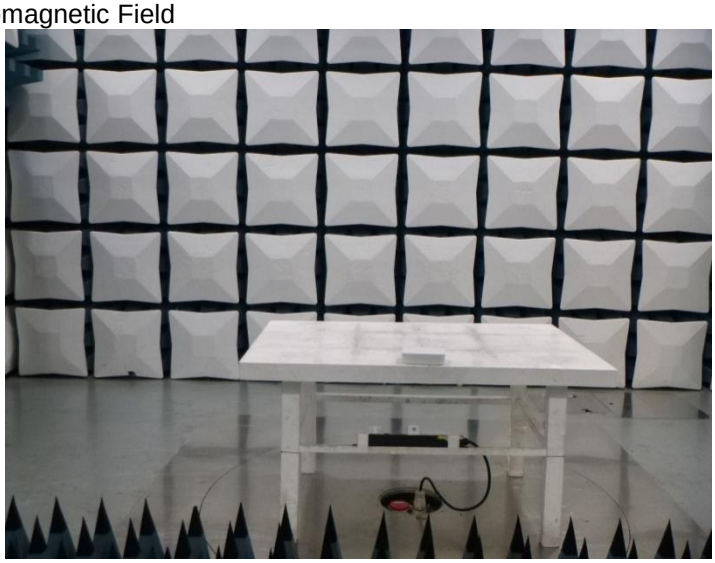
6. TEST SETUP PHOTOS OF THE EUT

Radiated Emission



Electrostatic Discharge

Radio Frequency Electromagnetic Field



7. EXTERNAL AND INTERNAL PHOTOS OF THE EUT

Reference to the test report No. CHTEW22090081

----------End of Report----------