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Testing Cert #:3902.01

TEST REPORT

For Bluetooth-LE

Report No. .....:	**CHTEW22090083**	Report verification **:**
Project No. .....:	**SHT2103098305EW**	
Applicant's Name ..... :	**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 300 328 V2.2.2: 2019-07**	
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 300 328V2.2.2: 2019-07–Wideband transmission systems; data transmission equipment operating in the 2,4 GHz band; harmonised Standard for access to radio spectrum

1.2. Report Version Information

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

2. TEST DESCRIPTION

Report clause	Test Items	Standard Requirement	Result	Test Engineer
	RF Output Power	clause 4.3.2.2	Pass*	N/A
	Power Spectral Density	clause 4.3.2.3	Pass*	N/A
	Occupied Channel Bandwidth	clause 4.3.2.7	Pass*	N/A
	Transmitter Unwanted Emissions in the Out-of-band Domain	clause 4.3.2.8	Pass*	N/A
5.1.1	Transmitter Unwanted Emissions in the Spurious Domain	clause 4.3.2.9	Pass	Pan Xie
5.2.1	Receiver Spurious Emissions	clause 4.3.2.10	Pass	Pan Xie
	Adaptivity	clause 4.3.2.6	N/A	N/A
	Receiver Blocking	clause 4.3.2.11	Pass*	N/A

Note:

1) #1: The test result does not include measurement uncertainty value
2) *: Refer to the module report which report No. is E2/2018/50088-02
3) This device has installed the certified modular which model number is MDBT50Q, so these conducted test data directly reference the modular's data.
4) In this device, only use BLE 1M, BLE 2M is shielded by software.

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 No.:	CHESTER
Listed Model(s):	**-**
Power supply:	DC 3.6V
Hardware version:	R3.2
Software version:	v1.0.0

3.3. Radio Specification Description

Technical index for Bluetooth	
Modulation:	GFSK
Data Rate	☒ 1Mbps ☐ 2Mbps
Operation Frequency:	2402MHz~2480MHz
Channel Number:	40
Channel Separation:	2MHz
Modulation:	☐ FHSS ☒ Other forms of modulation GFSK
Type of Equipment:	☒ Stand-alone ☐ Combined Equipment ☐ Plug-in radio device ☐ Other
Adaptive / Non-adaptive Equipment:	☐ non-adaptive Equipment ☒ adaptive Equipment without the possibility to switch to a non-adaptive mode ☐ adaptive Equipment which can also operate in a non-adaptive mode
Receiver Categories:	☐ Adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p. shall be considered as receiver category 1 equipment. ☐ Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % or adaptive equipment with a maximum RF output power of 10 dBm e.i.r.p. shall be considered as receiver category 2 equipment. ☒ Non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1 % or adaptive equipment with a maximum RF output power of 0 dBm e.i.r.p. shall be considered as receiver category 3 equipment.
Operating Mode:	☒ Single Antenna Equipment ☒ Equipment with only 1 antenna ☐ Equipment with 2 diversity antennas but only 1 antenna active at any moment in time ☐ Smart Antenna Systems with 2 or more antennas, but operating in a (legacy) mode where only 1antenna is used. ☐ Smart Antenna Systems - Multiple Antennas without beam forming ☐ Single spatial stream / Standard throughput ☐ High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 1 ☐ High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 2 ☐ Smart Antenna Systems - Multiple Antennas with beam forming ☐ Single spatial stream / Standard throughput ☐ High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 1 ☐ High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 2
Antenna Type: #	☒ PCB antenna ☒ Temporary RF connector provided ☐ No temporary RF connector provided Antenna Gain: .... 0.41.... dBi Beamforming gain: .....dB ☐ Dedicated Antennas (equipment with antenna connector) ☐ Single power level with corresponding antenna(s) ☐ Multiple power settings and corresponding antenna(s) Number of different Power Levels: ..... Power Level 1: ..... dBm Power Level 2: ..... dBm Power Level 3: ..... dBm

Information is provided by the supplier	
☐In Case of FHSS Modulation:	☐ In case of non-Adaptive Frequency Hopping equipment: The number of Hopping Frequencies: …….. ☐ In case of Adaptive Frequency Hopping Equipment: The maximum number of Hopping Frequencies: …….. The minimum number of Hopping Frequencies: ……..
	The Dwell Time: ……..
	The Minimum Channel Occupation Time: ……..
☒In Case of Adaptive Equipment:	The Channel Occupancy Time implemented by the equipment:../.. ms
	☒ The equipment has implemented an LBT based DAA mechanism In case of equipment using modulation different from FHSS: ☐ The equipment is Frame Based equipment ☒ The equipment is Load Based equipment ☐ The equipment can switch dynamically between Frame Based and Load Based equipment The CCA time implemented by the equipment: .... µs
	☐ The equipment has implemented an non-LBT based DAA mechanism
	☐ The equipment can operate in more than one adaptive mode
☐In Case of Non-adaptive Equipment	The maximum RF Output Power (e.i.r.p.): ……. dBm The maximum (corresponding) Duty Cycle: ……. %

The worst case operational mode for each of the following tests:	
Transmitter Unwanted Emissions in the Spurious Domain	Reference to section 5.1.1
Receiver Spurious Emissions	Reference to section 5.2.1
☐ FHSS	
Dwell time:	
Minimum Frequency Occupation:	
Hopping Sequence:	
Hopping Frequency Separation	
☐ Non-adaptive Equipment	
Duty cycle:	
Tx-Sequence:	
Tx-gap:	
Medium Utilisation:	

Note:
#: The antenna gain is provided by the applicant, and the applicant should be responsible for its authenticity, HTW lab has not verified the authenticity of its information

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

3.5. Modifications

No modifications were implemented to meet testing criteria.

4. TEST CONFIGURATION

4.1. Test frequency list

The Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, please see the below blue front.

Channel	Frequency (MHz)
CH-L	**2402**
⋮	⋮
CH-M	**2440**
⋮	⋮
CH-H	**2480**

4.2. Test mode

The EUT has been tested under typical operating condition. The Applicant provides software to control the EUT for staying in continuous transmitting and receiving mode for testing.

4.3. 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	Equipement	Trade Name	Model No.	Power cord
1				
2				

4.4. Testing environmental condition

Normal Condition	Temperature	15 °C to +35 °C
	Relative humidity	20 % to 75 %.
	Voltage	the equipment shall be the nominal voltage for which the equipment was designed.
Extreme Condition	Temperature	Measurements shall be made over the extremes of the operating temperature range as declared by the manufacturer
	Voltage	Measurements shall be made over the extremes of the operating voltage range as declared by the manufacturer

Normal Condition	T_N=Normal Temperature	25 °C
Extreme Condition	T_L=Lower Temperature	-20 °C
	T_H=Higher Temperature	40 °C

4.5. Measurement uncertainty

Test Items	Measurement Uncertainty	Notes
Frequency range	70Hz for <1GHz 130Hz for >1GHz	(1)
Occupied Bandwidth	70Hz for <1GHz 130Hz for >1GHz	(1)
Transmitter power conducted	0.77 dB	(1)
Power Spectral Density	0.77 dB	(1)
Conducted spurious emissions 9kHz~40GHz	0.77 dB	(1)
Radiated spurious emissions	4.36dB for <1GHz 5.10dB for >1GHz	(1)
Blocking	1.91 dB	(1)

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

4.6. 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	2023/09/29
●	EMI Test Receiver	R&S	HTWE0099	ESCI	100900	2022/08/30	2023/08/29
●	Loop Antenna	R&S	HTWE0170	HFH2-Z2	100020	2021/04/06	2024/04/05
●	Ultra-Broadband Antenna	SCHWARZBECK	HTWE0123	VULB9163	538	2021/04/06	2024/04/05
●	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	C11121	2018/09/27	2023/09/26
●	Spectrum Analyzer	R&S	HTWE0098	FSP40	100597	2022/08/25	2023/08/24
●	Horn Antenna	SCHWARZBECK	HTWE0126	9120D	1011	2020/04/01	2023/03/31
●	Broadband Horn Antenna	SCHWARZBECK	HTWE0103	BBHA9170	BBHA9170472	2020/04/27	2023/04/26
●	Pre-amplifier	CD	HTWE0071	PAP-0102	12004	2021/11/05	2022/11/04
●	Broadband Pre-amplifier	SCHWARZBECK	HTWE0201	BBV 9718	9718-248	2022/02/28	2023/02/27
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-01	6m 18GHz S Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-02	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0119-05	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-04	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	Test Software	Audix	N/A	E3	N/A	N/A	N/A

5. TEST CONDITIONS AND RESULTS

5.1. Transmitter Unwanted Emissions in the Spurious Domain

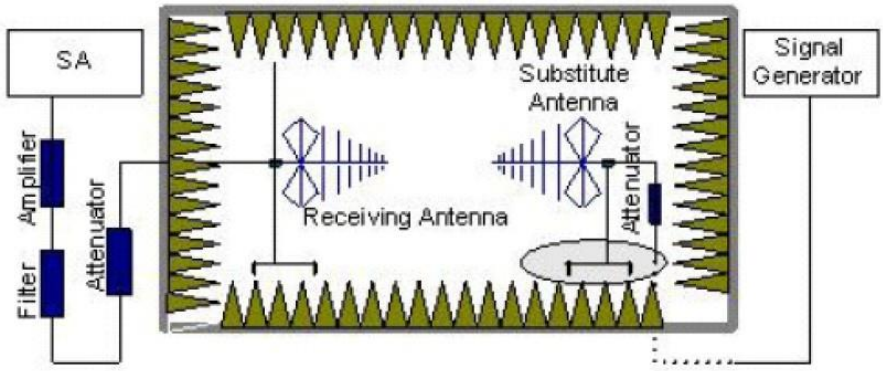
5.1.1. Radiated Measurements

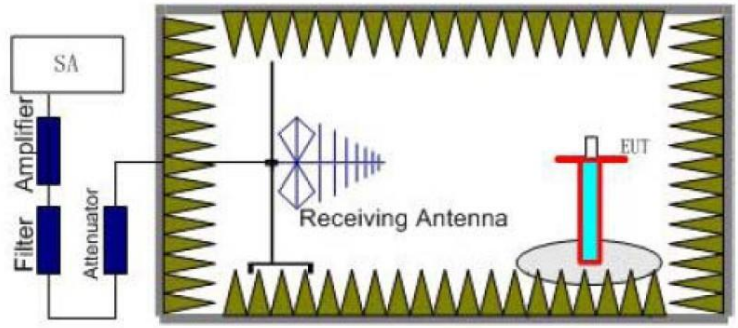
LIMIT

ETSI EN 300 328 Sub-clause 4.3.2.9.3
The transmitter unwanted emissions in the spurious domain shall not exceed the values given in the below table

Frequency range	Maximum power	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 694 MHz	-54 dBm	100 kHz
694 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12,75 GHz	-30 dBm	1 MHz

TEST CONFIGURATION





TEST PROCEDURE

1. The test conditions.

☒Normal condition ☐Extreme conditions

2. Please refer to ETSI EN 300 328 Sub-clause 5.4.9.2.2 for the measurement method.

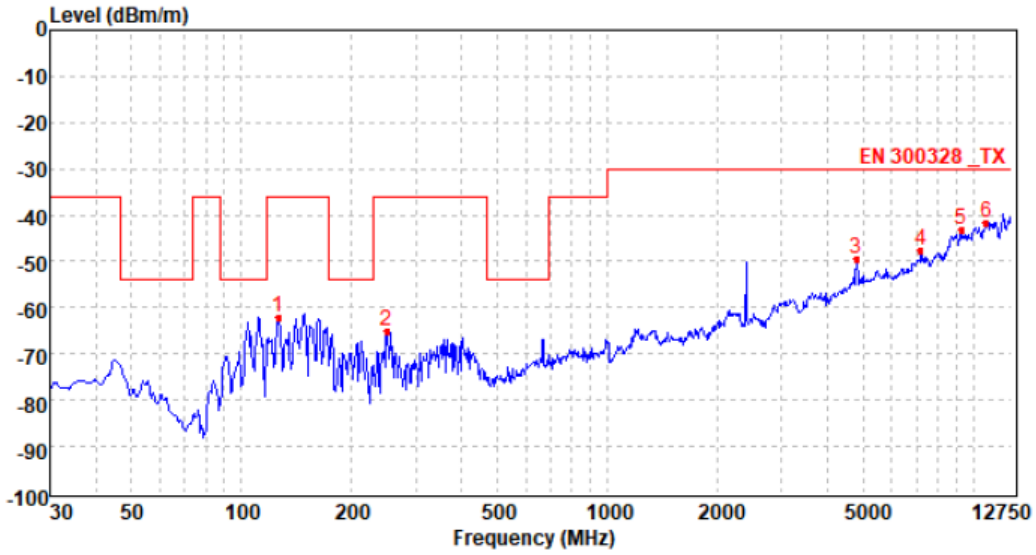
TEST MODE:

Continuously transmitting at the lowest, and the highest channel

TEST RESULTS

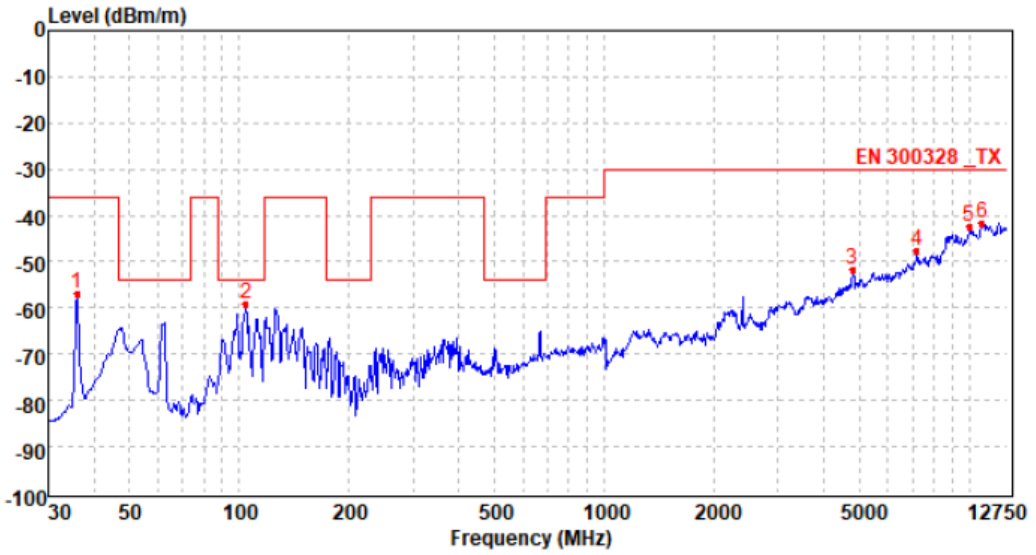
☒ **Passed** ☐ **Not Applicable**

Test Channel:	CH-L	Polarity:	Horizontal



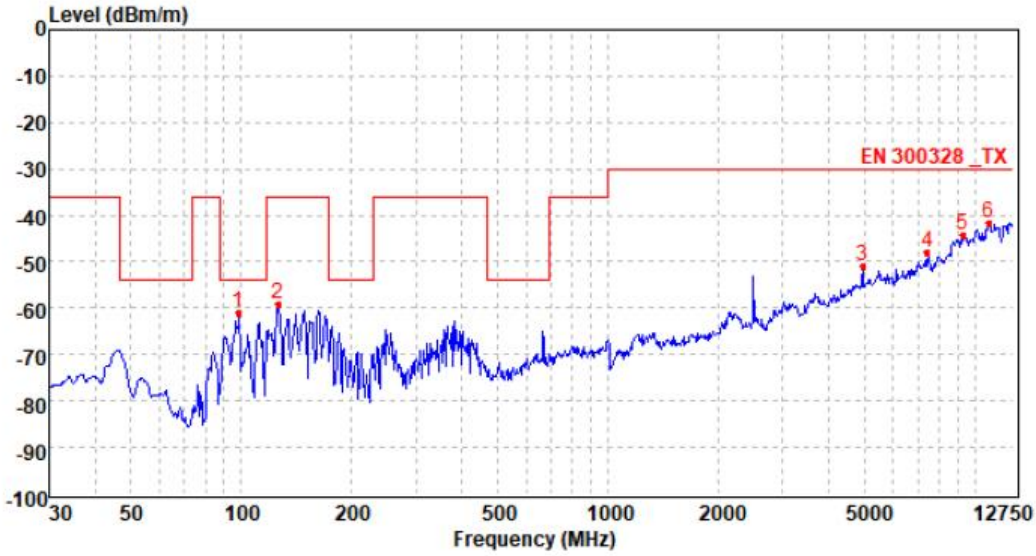
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	125.96	-55.36	16.32	7.70	30.84	-62.18	-36.00	-26.18	Peak
2	249.17	-65.77	22.87	8.44	30.57	-65.03	-36.00	-29.03	Peak
3	4797.27	-67.28	43.65	8.44	34.13	-49.32	-30.00	-19.32	Peak
4	7209.02	-72.26	47.89	10.01	33.23	-47.59	-30.00	-17.59	Peak
5	9275.16	-73.04	49.53	11.73	31.18	-42.96	-30.00	-12.96	Peak
6	10860.83	-74.13	52.57	12.51	32.46	-41.51	-30.00	-11.51	Peak

Test Channel:	CH-L	Polarity:	Vertical



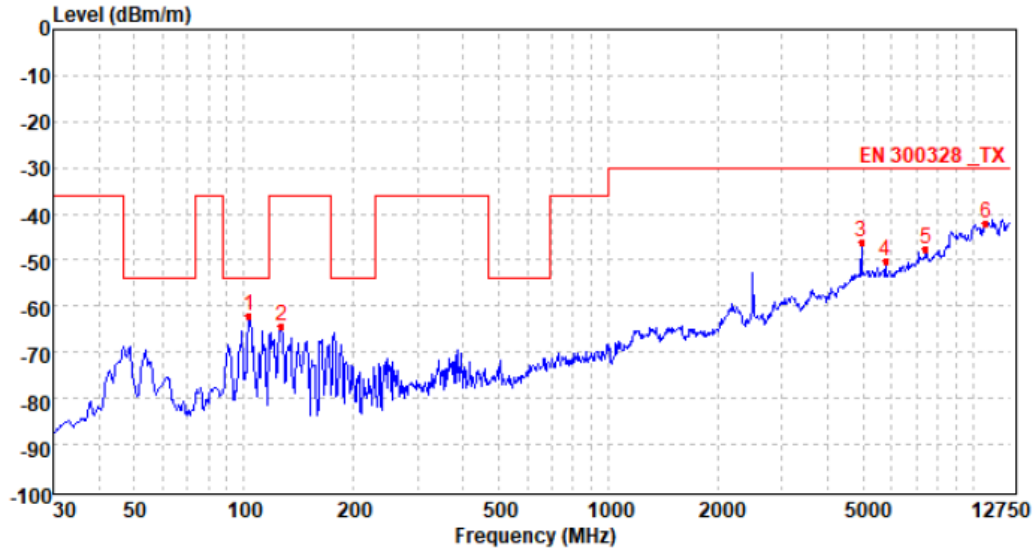
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	35.89	-52.82	19.87	6.88	30.89	-56.96	-36.00	-20.96	Peak
2	104.54	-60.88	25.14	7.56	30.92	-59.10	-54.00	-5.10	Peak
3	4797.27	-69.57	43.63	8.44	34.13	-51.63	-30.00	-21.63	Peak
4	7209.02	-73.00	48.64	10.01	33.23	-47.58	-30.00	-17.58	Peak
5	10036.73	-73.91	50.64	12.38	31.41	-42.30	-30.00	-12.30	Peak
6	10860.83	-74.28	52.66	12.51	32.46	-41.57	-30.00	-11.57	Peak

Test Channel:	CH-H	Polarity:	Horizontal



Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	98.47	-55.84	18.10	7.50	30.90	-61.14	-54.00	-7.14	Peak
2	125.96	-52.46	16.32	7.70	30.84	-59.28	-36.00	-23.28	Peak
3	4958.68	-69.40	44.22	8.77	34.69	-51.10	-30.00	-21.10	Peak
4	7451.57	-72.78	48.31	10.36	33.88	-47.99	-30.00	-17.99	Peak
5	9298.80	-74.30	49.63	11.82	31.22	-44.07	-30.00	-14.07	Peak
6	10916.26	-74.62	52.71	12.52	32.28	-41.67	-30.00	-11.67	Peak

Test Channel:	CH-H	Polarity:	Vertical



Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	103.44	-64.13	25.28	7.55	30.92	-62.22	-54.00	-8.22	Peak
2	126.85	-62.75	21.55	7.71	30.83	-64.32	-36.00	-28.32	Peak
3	4958.68	-64.34	44.33	8.77	34.69	-45.93	-30.00	-15.93	Peak
4	5762.24	-70.29	44.09	9.57	33.42	-50.05	-30.00	-20.05	Peak
5	7451.57	-72.40	48.50	10.36	33.88	-47.42	-30.00	-17.42	Peak
6	10860.83	-74.64	52.66	12.51	32.46	-41.93	-30.00	-11.93	Peak

5.2. Receiver Spurious Emissions

5.2.1. Radiated Measurements

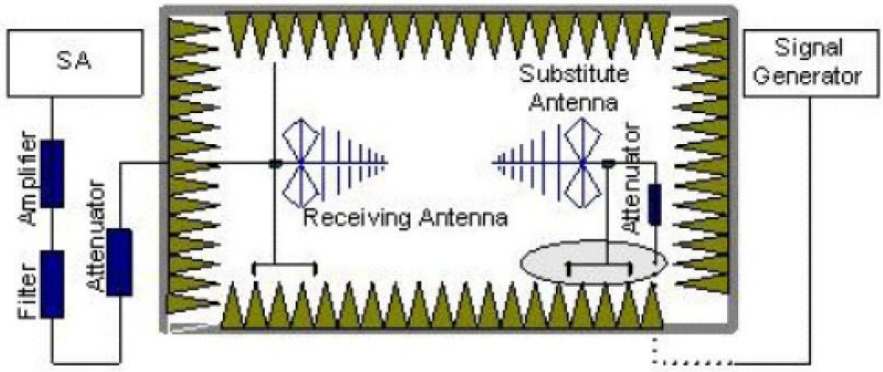
LIMIT

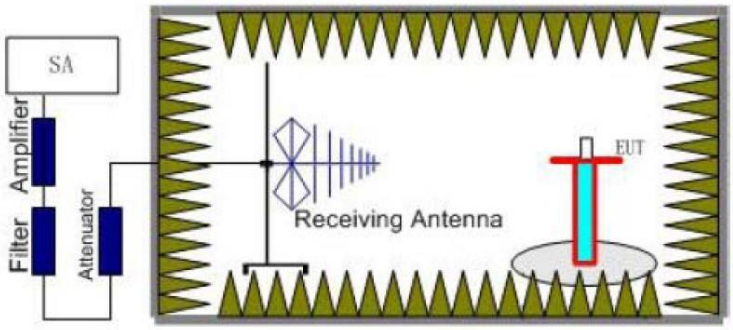
ETSI EN 300 328 Sub-clause 4.3.2.10.3

The spurious emissions of the receiver shall not exceed the values given in the below table

Frequency range	Maximum power	Measurement bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12,75 GHz	-47 dBm	1 MHz

TEST CONFIGURATION





TEST PROCEDURE

1. The test conditions.

☒Normal condition ☐Extreme conditions

2. Please refer to ETSI EN 300 328 Sub-clause 5.4.10.2.2 for the measurement method.

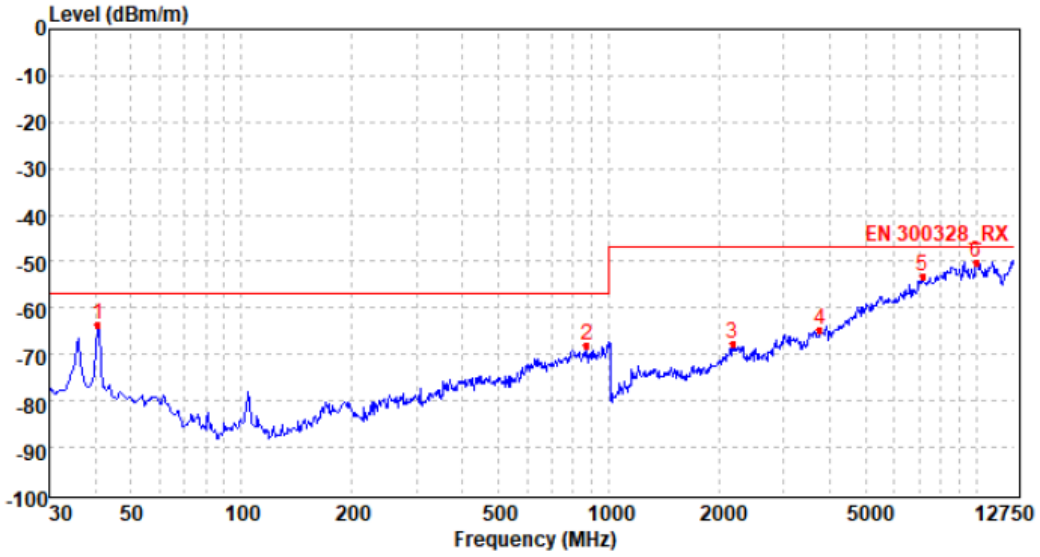
TEST MODE:

Continuously receiving at the lowest ,and the highest channel

TEST RESULTS

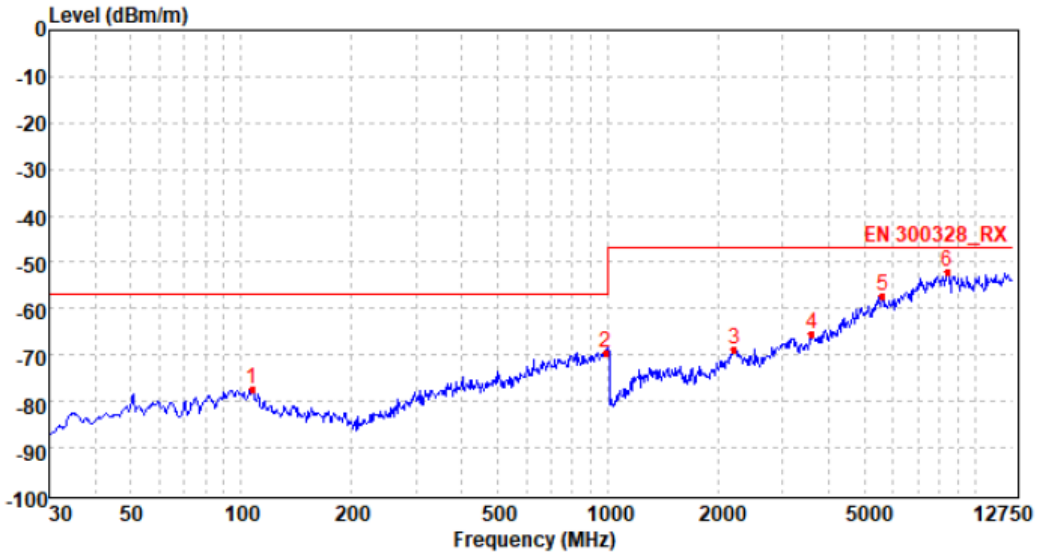
☒ **Passed** ☐ **Not Applicable**

Test Channel:	CH-L	Polarity:	Horizontal



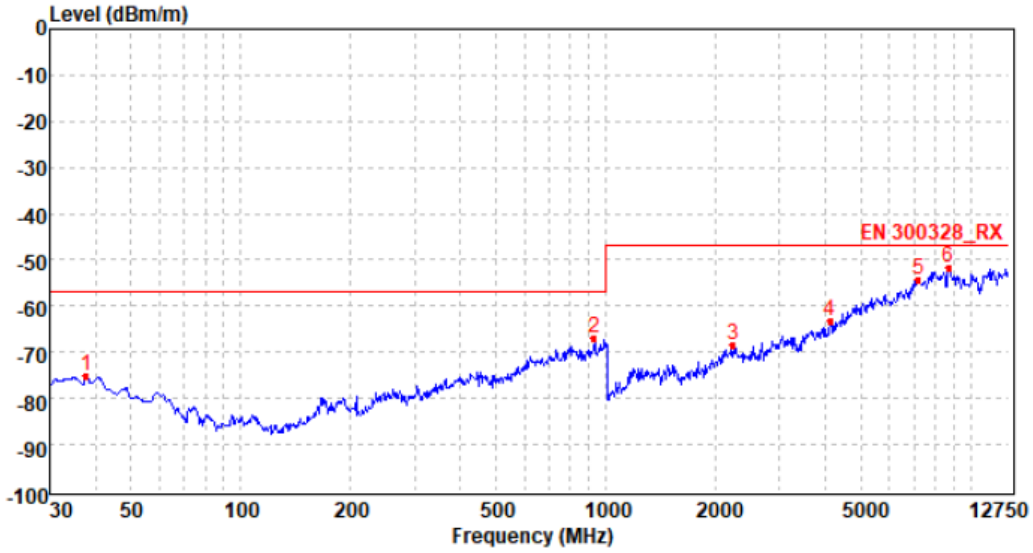
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	40.74	-66.96	27.43	6.94	30.85	-63.44	-57.00	-6.44	Peak
2	871.32	-78.38	29.61	10.78	30.10	-68.09	-57.00	-11.09	Peak
3	2173.61	-76.29	40.73	5.27	37.52	-67.81	-47.00	-20.81	Peak
4	3766.79	-77.16	42.22	7.09	36.97	-64.82	-47.00	-17.82	Peak
5	7154.17	-77.64	47.81	10.02	33.20	-53.01	-47.00	-6.01	Peak
6	10036.73	-81.78	50.50	12.38	31.41	-50.31	-47.00	-3.31	Peak

Test Channel:	CH-L	Polarity:	Vertical



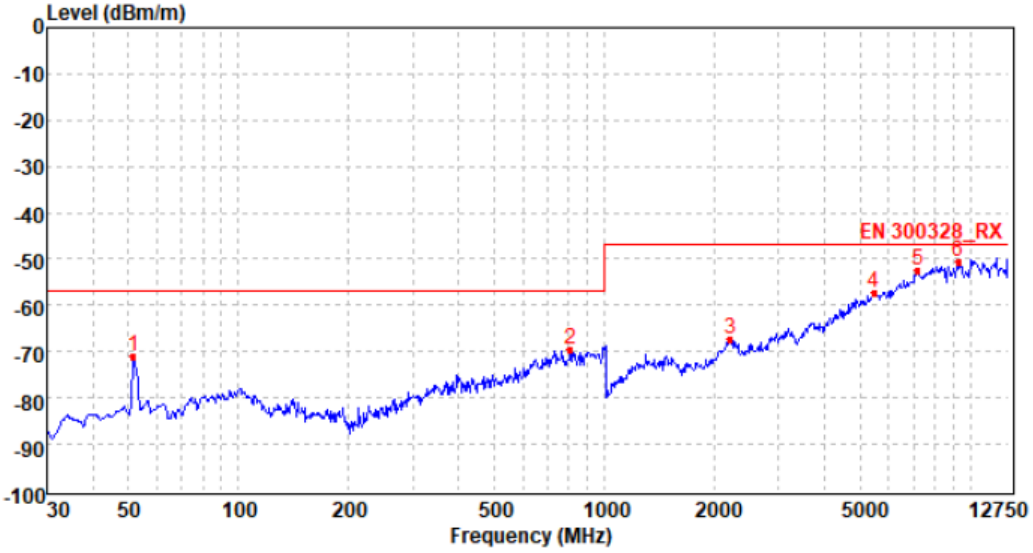
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	107.52	-78.75	24.75	7.58	30.94	-77.36	-57.00	-20.36	Peak
2	988.91	-80.95	30.37	11.12	29.94	-69.40	-57.00	-12.40	Peak
3	2207.06	-78.03	41.64	5.32	37.55	-68.62	-47.00	-21.62	Peak
4	3607.26	-77.91	42.60	6.92	37.01	-65.40	-47.00	-18.40	Peak
5	5617.41	-77.40	43.92	9.44	33.32	-57.36	-47.00	-10.36	Peak
6	8420.00	-78.93	47.61	11.46	32.14	-52.00	-47.00	-5.00	Peak

Test Channel:	CH-H	Polarity:	Horizontal



Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	37.84	-78.52	27.46	6.90	30.86	-75.02	-57.00	-18.02	Peak
2	931.53	-77.33	29.18	10.95	29.81	-67.01	-57.00	-10.01	Peak
3	2241.03	-77.13	40.73	5.35	37.44	-68.49	-47.00	-21.49	Peak
4	4117.79	-76.29	41.85	7.50	36.14	-63.08	-47.00	-16.08	Peak
5	7209.02	-78.80	47.89	10.01	33.23	-54.13	-47.00	-7.13	Peak
6	8725.48	-81.98	48.30	11.97	30.09	-51.80	-47.00	-4.80	Peak

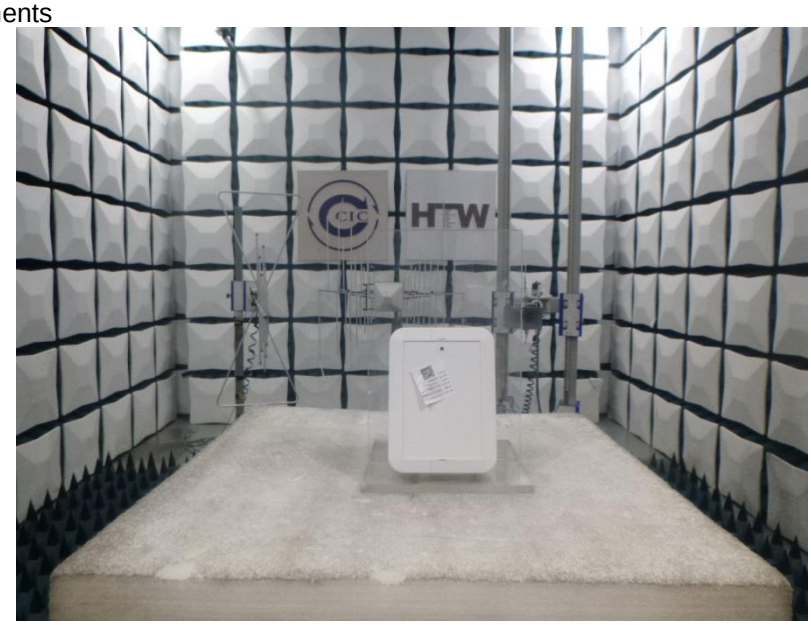
Test Channel:	CH-H	Polarity:	Vertical



Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	51.56	-69.33	22.36	7.06	31.03	-70.94	-57.00	-13.94	Peak
2	806.46	-79.77	29.52	10.59	29.91	-69.57	-57.00	-12.57	Peak
3	2207.06	-76.70	41.64	5.32	37.55	-67.29	-47.00	-20.29	Peak
4	5476.22	-78.10	44.03	9.35	32.48	-57.20	-47.00	-10.20	Peak
5	7190.69	-78.01	48.58	10.01	33.10	-52.52	-47.00	-5.52	Peak
6	9298.80	-81.01	49.78	11.82	31.22	-50.63	-47.00	-3.63	Peak

6. TEST SETUP PHOTOS OF THE EUT

Radiated measurements



7. EXTERNAL AND INTERNAL PHOTOS OF THE EUT

Please refer to test report No. CHTEW22090081

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