RF - TEST REPORT

Report Number	:	**64.972.23.30372.01-R1**	Date of Issue:	2023-04-17
Model / Serial No.	:	HMS-600W, HMS-600W-C, HMS-800W, HMS-800W-C		
Product Type	:	Converter (Micro inverter)		
Applicant		Suzhou Hypontech Co., Ltd.		
Manufacturer		Suzhou Hypontech Co., Ltd.		
Address	:	No.1508 Xiangjiang Road, SND, 215010 Suzhou PEOPLE'S REPUBLIC OF CHINA		
Test Result	:	■ **Positive** ☐ **Negative**		
Total pages including Appendices	:	**29**		

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Table of Content

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1 Report Version

Revision	Release Date	History/Memo.
1.1	2023-04-17	Initial Release

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2 General Information

2.1 Notes

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Prepared By	2023-04-17	Charlie Wu	Charlie Wu
	Date	Name	Signature
Approved by	2023-04-17	Wendy Ye	Wendy Ye
	Date	Name	Signature

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2.2 Testing Laboratory

Test Laboratory:

Jiangsu Product Quality Testing&Inspection Institute
Address: No.1368,Wuzhongdadao Avenue,Suzhou,China

2.3 Application Details

Date of receipt of test item:	**2023-03-09**
Date of test:	**2023-03-09 to 2023-03-09**

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2.4 Applied Standard

Test Standards	
EN 300 328 V2.2.2 (2019-07)	**Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU**
EN 62479:2010	**Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)**
EN 50663:2017	**Generic standard for assessment of low power electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (10Hz to 300 GHz)**

2.5 Test Summary

Table1. Summary of results

Conformance requirement according to ETSI EN 300 328 V2.2.2 (2019-07)		**Result**
Essential parameter	**Corresponding technical requirements**	
Transmitter requirements	4.3.2.2 RF output power	N/P
	4.3.2.3 Power Spectral Density	N/P
	4.3.2.4 Duty Cycle, Tx-sequence, Tx-gap *	N/A
	4.3.2.5 Medium Utilisation (MU) factor *	N/A
	4.3.2.6 Adaptivity **	N/P
	4.3.2.7 Occupied Channel Bandwidth	N/P
	4.3.2.8 Transmitter unwanted emissions in the out-of-band domain	N/P
	4.3.2.9 Transmitter unwanted emissions in the spurious domain	PASS
Receiver requirements	4.3.2.10 Receiver spurious emissions	PASS
	4.3.2.11 Receiver Blocking	N/P
	4.3.2.12 Geo-location capability	N/A

Note1: N/A = Not Applicable; N/P = Not Performed

Note2: Measurement taken is within the measurement uncertainty of measurement system.

Note3: "*"This requirement does not apply to adaptive equipment unless operating in a non-adaptive mode.

Note4: "**"These requirements do not apply for equipment with a maximum declared RF Output power of less than 10 dBm e.i.r.p.

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3 Equipment Specification

3.1 General Description

All models are using the same Bluetooth module, and the RF module had been approved in report No. RSHA220223001-01C. This time we selected HMS-800W for spurious emission below 1GHz tests only. Other Bluetooth test data can refer to report RSHA220223001-01C.

Model list

Model name		HMS-800W HMS-800W-C	HMS-600W HMS-600W-C
PV Input	Max. input voltage	d.c. 60V	d.c. 60V
	MPP voltage range	d.c. 25-55V	d.c. 25-55V
	Max. input current	d.c. 15/15A	d.c. 15/15A
	Isc PV(absolute maximum)	d.c. 20/20A	d.c. 20/20A
Grid Output	Rated output voltage	1/N/PE AC 220/230/240V	1/N/PE AC 220/230/240V
	Rated output frequency	50/60Hz	50/60Hz
	Max. AC output current	a.c 3.6A	a.c 2.7A
	Rated AC output power	800W	600W
	Rated/Max. apparent AC power	800VA	600VA
	Power factor	>0.99	>0.99
General	Overvoltage category	III(AC), II(DC)	III(AC), II(DC)
	Ingress protection	IP67	IP67
	Protective class	I	I
	Operating temperature range	-40ºC to 65ºC	-40ºC to 65ºC
	Inverter topology	Isolated	Isolated

All models have the same electronic components except amount of AC output port and output power/current by software control.
Models HMS-800W, HMS-600W have two output ports and models HMS-800W-C, HMS-600W-C only have one output port.

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3.2 EUT Identity

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

3.2.1 Technical data

Description:	Converter (Micro inverter)
Models:	HMS-800W
Nominal voltage	DC 60V

Remark: The above EUT's information is declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

3.3 Product Description –manufacturer description

3.3.1 Type of Tested Equipment

☒ Bluetooth (BLE)	☐ IEEE 802.11	Other supply full details:_____	
☐ Stand-alone	☐ Plug-in radio	☒ Combined equipment	☐ Other

3.3.2 Extreme operating condition as declared by manufacturer

Power source description			
☐ **AC mains voltage**		☒ **DC voltage Nominal**	
Type of DC			
☐ Internal Power Supply	☐ External AC/DC Adapter	☐ Battery	☐ Other:through USB port

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EXTREME TEMPERATURE RANGE [manufacturer declared]			
Environment class /Operating Temperature	**TL = Minimum Temperature [°C]**	**TN = Normal Temperature [°C]**	**TH = Maximum Temperature [°C]**
☒ **Outdoor and indoor usage**	-40	25	65
☐ **Indoor usage only**	5	25	35
☐ **Other [declared by manufacturer in UM]**	0		50

3.3.3 Type of adaptivity used

☐ **Non-adaptive**	☒ **Adaptive**	☐ **LBT**	☐ **Non LBT**
	☐ **The system can operate in more than one adaptive mode**	☐ **System can operate both adaptive & non adaptive mode**	
	☐ **Frame Based Equipment**	☒ **Load Based Equipment**	
		CCA time implemented [uS]	>20
		q as referred by 4.3.2.5.2.2.2	4-32

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3.3.4 Antenna Assembles Profiles

Antenna Type	**☐ Integrated**	**☒ External**	
Temporary RF connector	**☐ Provided**	**☒ Not- provided**	
☒ SISO - Single antenna equipment		**Antenna gain [dBi] =**	**2.33dBi**
☐ MIMO - Multiple antenna without bean forming		**Number of transmit antennas=**	**1**
☐ MIMO/B - Multiple antenna with bean forming		**Bean forming gain [dB] Y =**	**….**
Number of receive chains	**1**	**☐ Symmetrical power distribution**	
Number of transceive chains	**1**	**☐ Asymmetrical power distribution**	
☐ Tx power control (TPC) (antenna connectorwith multiple power setting)		**Nr. of different power level**	**…..**

3.4 Operating Frequency Range, Modulation and Throughput

Transmitter / Receiver Frequency Range				
[✓]	**Range 1 : from :**	**2402 MHz**	**To**	**2480 MHz**
[ ]	**Range 2 : from :**			
[ ]	**Other - (include frequency ranges supported):**			

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3.5 Additional information

The transmitter can operate only:

☒ **Modulated**

☐ **Un-modulated**

ITU Class of emissions 1. 22

Duty Cycle: The transmitter is intended for

☐ **Continuous duty**

☐ **Intermittent duty, duty**

☒ **Continuous operation possible for testing purposes**

About the EUT:

☒ **The equipment submitted is representative production models.**

☐ **If not, the equipment submitted is pre-production models.**

☐ **If preproduction equipment is submitted, the final production equipment will be identical in all respects with the equipment tested.**

☐ **If not, supply full details:**_____

3.6 Worst case operational mode as declared by supplier

Test	Operating mode
RF Output Power	N/A
Power spectral density	N/A
Duty cycle,Tx – Sequence, TX gap	N/A
Medium Utilisation	N/A
Adaptivity and receiver blocking	N/A
Ocuppied Channel Bandwidth	N/A
Transmiter unwantd emision in OOB domanin	N/A
Transmiter unwantd emision in spurious domanin	Continuous transmitting
Receiver spurious domanin	Normal operating

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4 General Test Conditions / Configurations

4.1 Test Sample

☒ The report applies to single model number of HMS-800W.

☐ The report applies to several models. The practical measurements are performed using the model number of.

4.2 Test Modes

NOTE: Typical working modes for each IEEE 802.11 mode are selected to perform tests.

Test Mode	Test Modes Description
Normal	Normal operating
CT	Continuous transmitting
CR	Continuous receiving

4.3 Frequencies under Test

Test Mode	RF Channel		
	Lowest/Bottom (B)	Middle (M)	Highest/Top (T)
Normal	2402MHz	2440MHz	2480MHz
CT	2402MHz	2440MHz	2480MHz
CR	2402MHz	2440MHz	2480MHz

4.4 Test Setups

NOTE: See Appendix H for practical Test Setup Photos.

4.4.1 General Test Setup Configurations

Configuration	Description
Test Antenna Ports	**Until declared, all Transmitter tests are performed at all antenna ports of the EUT; all Receiver tests are performed at all antenna ports.**
Multiple RF Sources	**Other non-WLAN RF source(s) (if applicable) of the EUT are disabled or shutdown during measurements for WLAN RF source, which is considered in the present report.**

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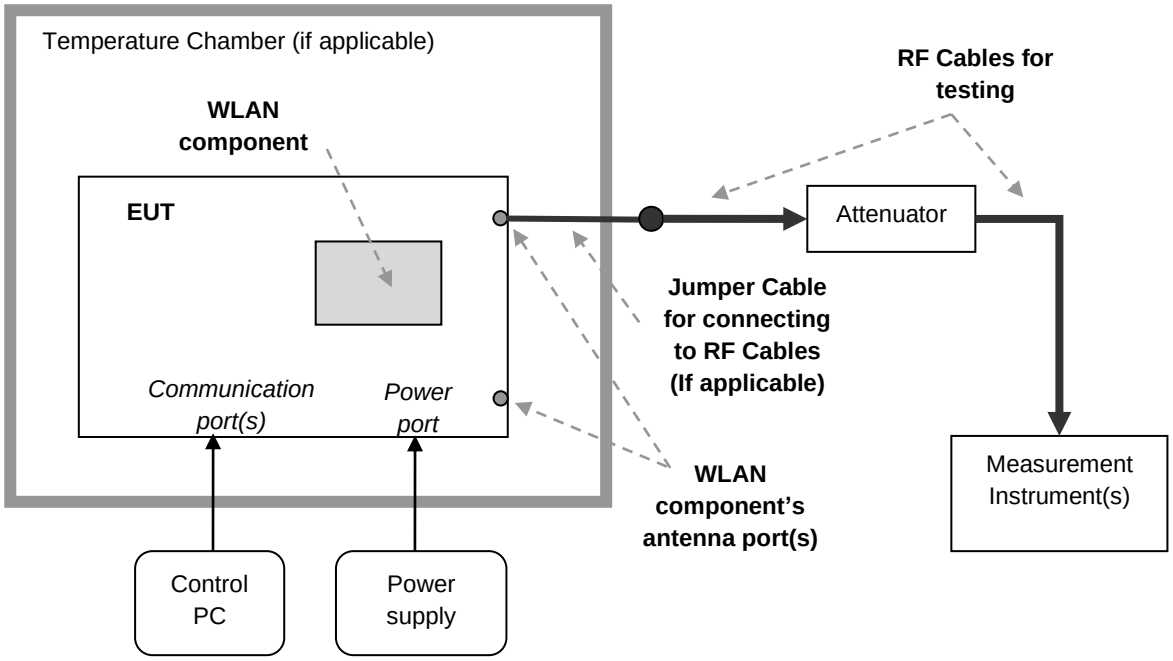
4.4.2 Test Setup for Conducted Measurements

The EUT (WLAN unit) is placed in a Temperature Chamber (if applicable), and is powered by a Power Supplier. An external Control PC associated with special software(s) is used to configure the EUT (WLAN unit) with the purpose of fulfilling the test requirements by EN standard.

The antenna port(s) of the EUT (WLAN unit) are connected to the Measurement Instrument(s) through an appropriate Attenuator. For the antenna port(s) which are not tested, appropriate 50 Ohm terminations are used.

In addition, different setting options (e.g. Option 1) for Measurement Instrument(s) for conducted measurement methods can be used for some test items according to the EN standard. The selected option is specified in test conditions for each test case.



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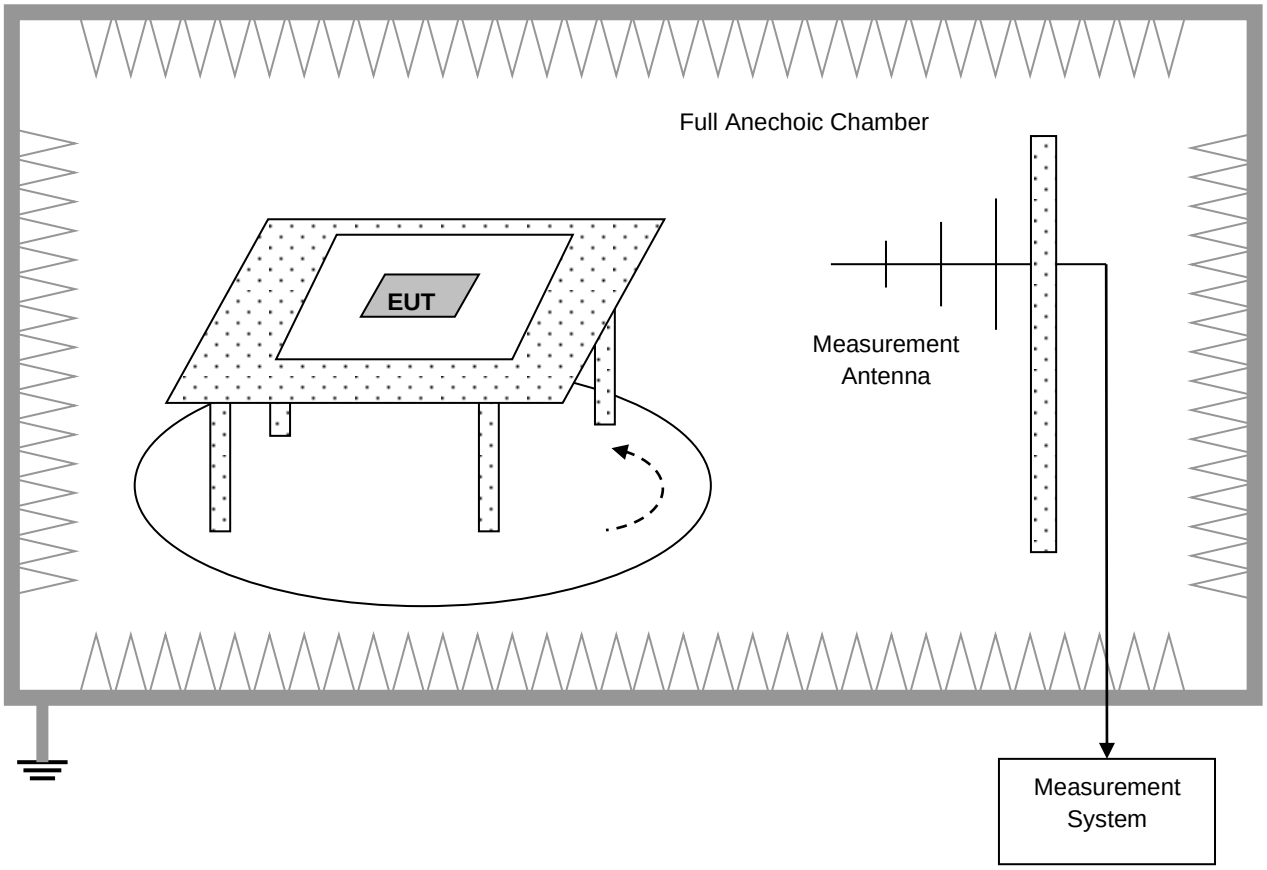
4.4.3 Test Setup for Radiated Measurements

The EUT (WLAN unit) is placed in a Fully Anechoic Chamber simulating the free-space conditions. The whole device is positioned on a non-conducting support and is powered by a Power Supplier. An external Control PC associated with special software(s) is used to configure the EUT (WLAN unit) with the purpose of fulfilling the test requirements by EN standards.

An appropriate Measurement Antenna (according to different test frequency ranges) with the distance of 3 m to the whole device is used to obtain maximum response from the whole device, which is rotated when measurement running. The measurement is performed with the Measurement Antenna in both horizontal and vertical polarization planes.



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4.5 Test Conditions

Test Case	Test Conditions	
	Configuration	**Description**
	Test Frequency	L, H
Transmitter unwanted emissions in the spurious domain	**Measurement Method**	Radiated
	Test Conditions	NTNV
	Smart Antenna Systems	Ant 1
	Test Modes	CT
	Transmitter Mode	Operating
	Test Frequency	L, H
Receiver Spurious Emissions	**Measurement Method**	Radiated
	Test Conditions	NTNV
	Smart Antenna Systems	Ant 1
	Test Modes	Normal
	Receiver Mode	Continues Receiving
	Test Frequency	L, H

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5 Test Results

No.	Test Item	Test Result
1	4.3.2.2 RF output power	N/A
2	4.3.2.3 Power Spectral Density	N/A
3	4.3.2.4 Duty Cycle, Tx-sequence, Tx-gap	N/A
4	4.3.2.5 Medium Utilisation (MU) factor	N/A
5	4.3.2.6 Adaptivity	N/A
6	4.3.2.7 Occupied Channel Bandwidth	N/A
7	4.3.2.8 Transmitter unwanted emissions in the out-of-band domain	N/A
8	4.3.2.9 Transmitter unwanted emissions in the spurious domain	Appendix A
9	4.3.2.10 Receiver spurious emissions	Appendix B
10	4.3.2.11 Receiver Blocking	N/A

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6 Test Requirements

6.1 RF output power

The equivalent isotropic radiated power (as EIRP) shall be equal to or less than 100 mW (≤ 20 dBm). This limit shall apply for any combination of power level and intended antenna assembly.

6.2 Maximum EIRP Spectral Density

For wide band modulations other than FHSS (e.g. DSSS, OFDM, etc.), the maximum e.i.r.p. spectral density (as PD) is limited to 10 mW per MHz (= 10 dBm/MHz).

6.3 Adaptivity

Adaptivity:

The equipment used Non-LBT based Detect and Avoid mechanism shall comply with the requirements defined in clause 4.3.2.6.2.2.

LBT based Detect and Avoid mechanism: This mechanism defines 2 types of adaptive equipment using wide band modulations and that uses an LBT based Detect and Avoid mechanism: Frame Based Equipment and Load Based Equipment. The kind of the equipment shall comply with the requirements defined in clause 4.3.2.6.3.2.

Short Control Signalling Transmissions: The transmissions used by adaptive equipment to send control signals (e.g. ACK/NACK signals, etc.) without sensing the operating channel for the presence of other signals. Adaptive equipment may or may not have Short Control Signalling Transmissions. If implemented, the limit of Short Control Signalling Transmissions of adaptive equipment using wide band modulations shall have a maximum duty cycle of 10 % within an observation period of 50 ms.

6.4 Occupied Channel Bandwidth

The Occupied Channel Bandwidth shall fall completely within the band given in clause 1.

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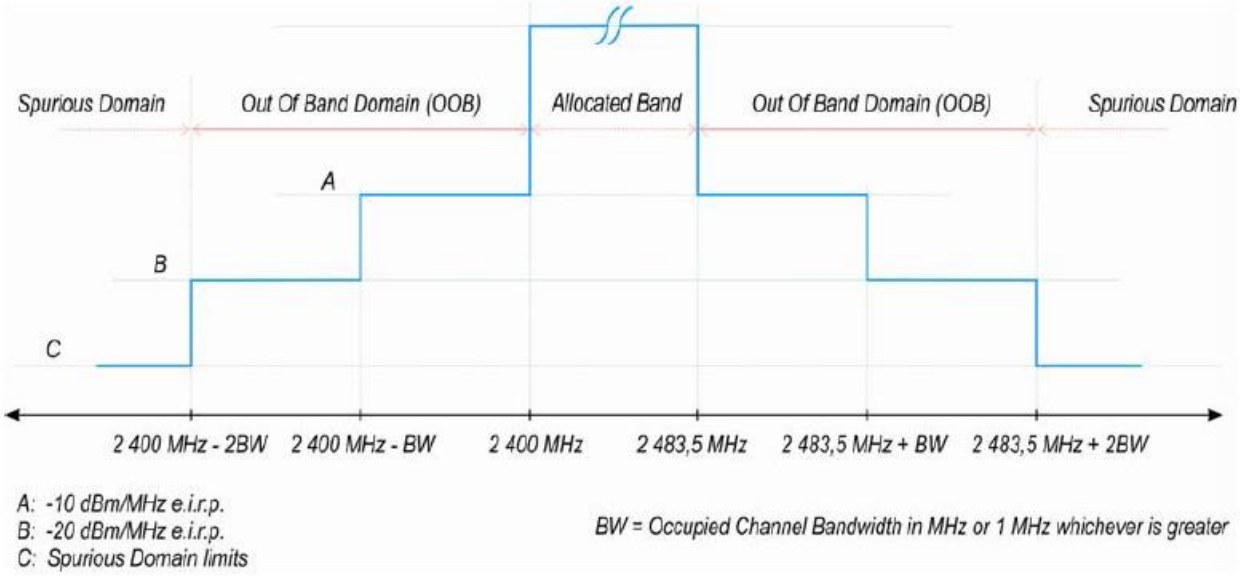
6.5 Transmitter unwanted emissions in the out-of-band domain

The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in below figure.



NOTE: Within the 2 400 MHz to 2 483,5 MHz band, the Out-of-band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement in clause 4.3.2.6.

6.6 Transmitter Spurious Emissions

The spurious emissions of the transmitter shall not exceed the values in following tables in the indicated bands.

Frequency Range	Limit When Operating	Limit When in Standby
30MHz to 47MHz	-36dBm	-57 dBm
47MHz-74MHz	-54dBm	-57 dBm
74MHz-87.5MHz	-36dBm	-57 dBm
87.5MHZ-118MHz	-54dBm	-57 dBm
118MHz-174MHz	-36dBm	-57 dBm
174MHz-230MHz	-54dBm	-57 dBm
230MHz-470MHz	-36dBm	-57 dBm
470MHz-862MHz	-54dBm	-57 dBm
862MHz-1GHz	-36dBm	-57 dBm
Above 1GHz to 12.75GHz	-30dBm	-47 dBm

NOTE: The above limit values apply to narrowband emissions, e.g. as caused by local oscillator leakage. The measurement bandwidth for such emissions may be as small as necessary to achieve a reliable measurement result.

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6.7 Receiver Spurious Emissions

The spurious emissions of the receiver shall not exceed the values in following tables in the indicated bands.

Frequency Range	Limit
30 MHz to 1 GHz	-57 dBm
1 GHz to 12.75 GHz	-47 dBm

Note: The above limit values apply to narrowband emissions, e.g. as caused by local oscillator leakage. The measurement bandwidth for such emissions may be as small as necessary to achieve a reliable measurement result.

6.8 Receiver Blocking

Receiver Blocking:

Adaptive equipment using wide band modulations other than FHSS, shall comply with the requirements defined in clauses 4.3.2.11.4 in the presence of a blocking signal with characteristics as provided:

Table 14: Receiver Blocking parameters for Receiver Category 1 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 4)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 4)	Type of blocking signal
(-133 dBm + 10 × $\log_{10}$(OCBW)) or -68 dBm whichever is less (see note 2)	2 380 2 504	-34	CW
(-139 dBm + 10 × $\log_{10}$(OCBW)) or -74 dBm whichever is less (see note 3)	2 300 2 330 2 360 2 524 2 584 2 674		
NOTE 1: OCBW is in Hz. NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 26 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 20 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

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Table 15: Receiver Blocking parameters receiver Category 2 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × $\log_{10}$(OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW

NOTE 1: OCBW is in Hz.
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 26 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

Table 16: Receiver Blocking parameters receiver Category 3 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × $\log_{10}$(OCBW) + 20 dB) or (-74 dBm + 20 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW

NOTE 1: OCBW is in Hz.
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 30 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

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7 Main Test Instruments

	Instrument	Model No.	Manufacture	Serial No.	Cal. to
RE	3m Anechoic Chamber	EMCT-3	TDK	NTIe-511-062-00-P	2026.11.24
	Universal Radio Communication Tester	CMU 200	R&S	NTIe-511-011-04-P	2023.08.24
	EMI Test Receiver	ESU40	R&S	NTIe-511-011-01-P	2023.07.14
	Log Periodic Antenna	VULB 9163	Schwarzbeck	NTIe-511-011-09-P	2023.04.24
	Horn Antenna	HF907	R&S	NTIe-511-011-10-P	2023.04.12

Conducted RF tests –C

- **RF output power**
- **Power Spectral Density**
- **Duty Cycle, Tx-sequence, Tx-gap**
- **Medium Utilisation**
- **Adaptivity &Receiver Blocking**
- **Occupied Channel Bandwidth**
- **Transmitter unwanted emissions OOB**

- Radiated RF tests -RE

- **Radiated unwanted emissions spurious TX**
- **Radiated unwanted emissions spurious RX**

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8 System Measurement Uncertainty

System Measurement Uncertainty		
Test Items		Extended Uncertainty
1	Uncertainty for Radiated Spurious Emission 25MHz-3000MHz	Horizontal: 4.33dB; Vertical: 4.41dB;

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9 Appendix A: Transmitter Spurious Emissions – Operating Mode

NOTE 1: The whole testing range is from “30 MHz to 12.75 GHz” is divided into 2 parts according to the test site settings, which are:
- Part 1: Test range of “30 MHz to 1GHz”,
- Part 2: Test range of “1 GHz to 12.75 GHz”.

NOTE 2: In this Appendix, X = Duty Cycle and G = Antenna Gain. The test path transducer was directly calculated into results for each test range.

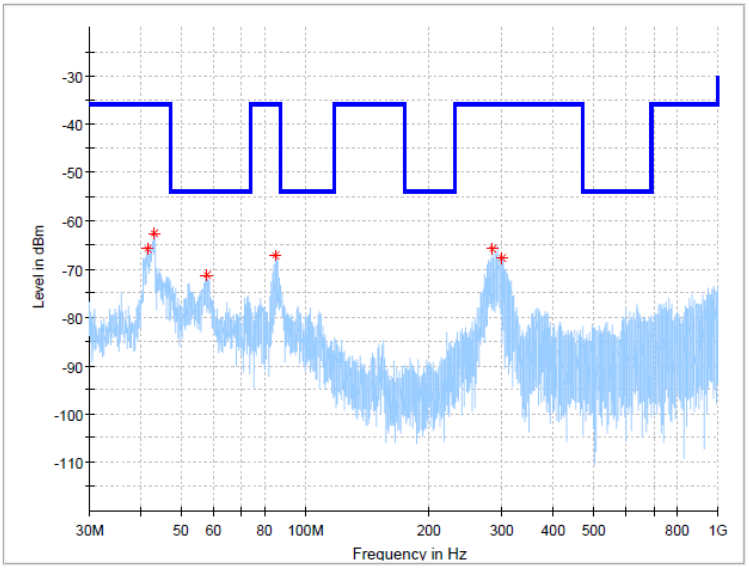
(1) Common Parameter

Test Mode	Power Level Setting defined by Manufacturer	X [%]	G [dBi]
Normal	Ant 1: highest	100	+2.33dBi

(2) Test Result

Note: The test results for testing range of “30 MHz to 12.75 GHz” showed as below is the WORST case for all Test Modes and Channels.

Operating Condition: Tx, below 1GHz, Horizontal



Frequency (MHz)	MaxPeak (dBm)
41.322000	-65.77
43.024000	-62.46
57.713000	-71.18
84.945000	-67.09
285.337000	-65.72
299.323000	-67.69

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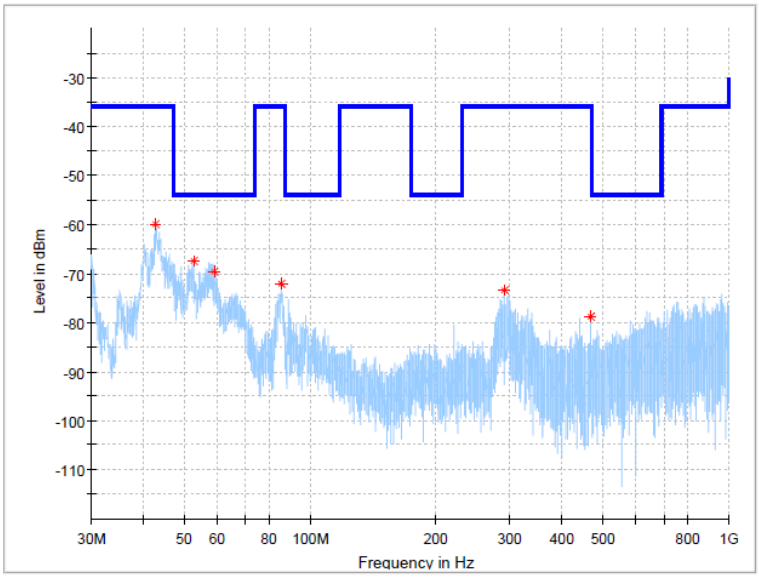
Operating Condition: Tx, below 1GHz, Vertical



Frequency (MHz)	MaxPeak (dBm)
42.839000	-59.90
52.607000	-67.51
58.897000	-69.64
85.537000	-72.09
291.479000	-73.40
466.320000	-78.76

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10 Appendix B: Receiver Spurious Emissions

NOTE 1: The whole testing range is from “30 MHz to 12.75 GHz” is divided into 2 parts according to the test site settings, which are:
- Part 1: Test range of “30 MHz to 1 GHz”,
- Part 2: Test range of “1 GHz to 12.75 GHz”.

NOTE 2: In this Appendix, X = Duty Cycle and G = Antenna Gain. The test path transducer was directly calculated into results for each test range.

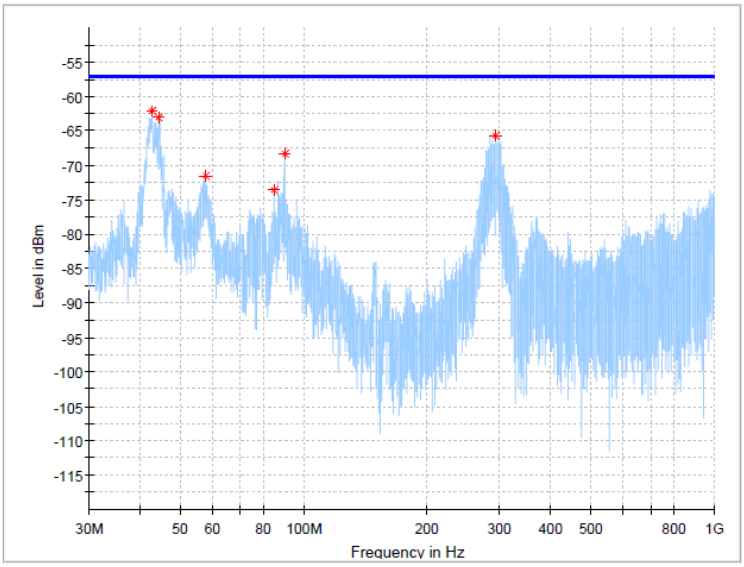
(1) Common Parameter

Test Mode	Power Level Setting defined by Manufacturer	X [%]	G [dBi]
Normal	Ant 1: highest	100	+1.72dBi

(2) Test Result

NOTE: Only test results and plots under the WORST case are reported.

Operating Condition: Rx, below 1GHz, Horizontal



Frequency (MHz)	MaxPeak (dBm)
42.654000	-62.01
44.393000	-63.05
57.713000	-71.54
84.797000	-73.51
89.681000	-68.30
293.329000	-65.67

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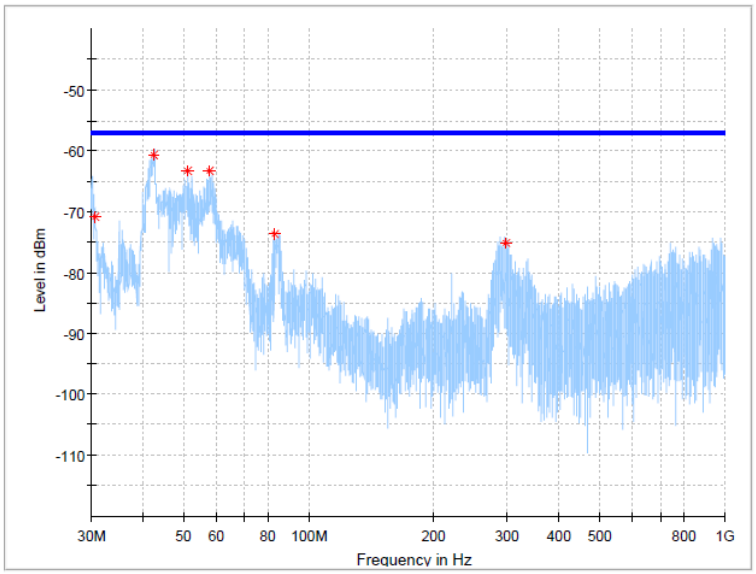
Operating Condition: Rx, below 1GHz, Vertical



Frequency (MHz)	MaxPeak (dBm)
30.703000	-70.85
42.321000	-60.70
51.164000	-63.31
57.824000	-63.37
82.688000	-73.64
297.732000	-75.10

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11 Appendix C:Estimation of Exposure of Human to Electromagnetic Fields

The product: HMS-800W has an operation frequency of 2402-2480MHz and a maximum transmitted power of 7.67dBm. The maximum transmitted power refer report RSHA220223001-01C.

According with EN 62479:2010 & EN 50663:2017, clause 4.2, Low-power electronic and electrical equipment is deemed to comply with the provisions of this standard if it can be demonstrated using routes B, C or D that the available antenna power and/or the average total radiated power is less than or equal to the applicable low-power exclusion level P_{max}. The peak output power [7.67dBm] mounted RF receiver is 5.84mW it is less than the limit 20mW which list in the table A1, so the equipment complies with EMF basic restrictions in EN 62479:2010 & EN 50663:2017.

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12 Appendix D: Test Setup Photos

Spurious Emission Below 1GHz

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13 Appendix E: EUT Photos

Refer to report No.: 64.972.23.30372.01

THE END

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