TEST REPORT N°: BVKJ-ESH-P23121382B-3

EN 300 328 RF Test Report

Applicant:	Jiangsu Hanchu Energy Technology Co.,Ltd
Address:	No.588,Jinhui Road,Huishan District ,Wuxi City,Jiangsu Province,China
Manufacturer:	Jiangsu Hanchu Energy Technology Co.,Ltd
Address:	No.588,Jinhui Road,Huishan District ,Wuxi City,Jiangsu Province,China
This document includes : 44 pages	

Product Name:	Grid-connected hybrid Inverter	
Model Number:	Refer to model list	
Brand:	HANCHU ESS	
Rated Voltage/Power	Refer to model list	
Received Date:	Dec.21, 2023	
Test Date:	--	
Applicable Standards:	**EN 300 328 V2.2.2(2019-07)**	
Clause Examined :	All Clauses Relevant	

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Test done by:	Approved by:
Yuan Zhang	Sean Yu
Name: Yuan ZHANG Title: Project Engineer Date: Dec.27, 2023	Name: Sean YU Title: RF Supervisor Date: Dec.27, 2023

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Release Control Record

Issue No.	Description	Date Issued
BVKJ-ESH-P23121382B-3	Original release	Dec.27, 2023

Special comments: This co-report is based on history report BVKJ-ESH-P23020225B-3. Only change applicant's information, manufacturer's information and model name.

Original model	Model in this report
ASW05kH-T2	HESS-HY-T-05K
ASW06kH-T2	HESS-HY-T-06K
ASW08kH-T2	HESS-HY-T-08K
ASW10kH-T2	HESS-HY-T-10K
ASW12kH-T2	HESS-HY-T-12K
ASW05kH-T3	HESS-HY-T1-05K
ASW06kH-T3	HESS-HY-T1-06K
ASW08kH-T3	HESS-HY-T1-08K
ASW10kH-T3	HESS-HY-T1-10K
ASW12kH-T3	HESS-HY-T1-12K

1 Summary of Test Results

The EUT has been tested according to the following specifications:

EN 300 328 V2.2.2		
Clause	**Test Parameter**	**Results**
4.3.2.2	RF Output Power	Pass
4.3.2.3	Power Spectral Density	Pass
4.3.2.6	Adaptivity (Adaptive Equipment using modulation other than FHSS)	Pass
4.3.2.7	Occupied Channel Bandwidth	Pass
4.3.2.8	Transmitter Unwanted Emissions in the out-of-band Domain	Pass
4.3.2.9	Transmitter Unwanted Emissions in the Spurious Domain	Pass
4.3.2.10	Receiver Spurious Emissions	Pass
4.3.2.11	Receiver Blocking	Pass
4.3.2.12	Geo-location capability	Not Applicable Note

Note: This product has no Geo-location capability, so the test is not applicable.

Special comments: Except RSE, All test results refer to **Certificate No.: B20040710 issued by Notified Body No.: 1313.**

1.1 Test Instruments

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Double Ridged Broadband Horn (30MHz-1.5GHz)	Schwarzbeck	VULB9168	E1A1001	Dec.19,23	Dec.18,25
Horn Antenna (1GHz -18GHz)	Schwarzbeck	BBHA9120D	E1A1017	Jul.25,22	Jul.24,24
Pre-Amplifier(9kHz-1GHz)	SONOMA	310	E1A2007	Mar.02,23	Mar.02,24
Pre-Amplifier(1GHz-26.5GHz)	Agilent	8449B	E1A2002	Mar.02,23	Mar.01,24
Signal Generator	Keysight	N5171B	E1S9016	Mar.02,23	Mar.01,24
Signal Generator	Keysight	N5182B	E1S9017	Mar.02,23	Mar.01,24
Wireless Connectivity Tester	R&S	CMW270	E1S9021	Oct.27,23	Oct.26,24
Spectrum Analyzer	R&S	FSQ	E1S1005	Aug.09,23	Aug.08,24
Spectrum Analyzer	Keysight	N9030B	E1S1003	Sep.14,23	Sep.13,24
Spectrum Analyzer	Keysight	N9020A	E1S1004	Mar.02,23	Mar.01,24
RF Control Unit	Toscend	JS0806-2	E1C5003	NCR	NCR
DC Power supply	Chroma	62024p-80-60	S1S1009	Mar.22,23	Mar.21,24
Humidity&Temp Programmable Tester	ESPEC	SE TH-Z-042U	C1TH002	Jun.07,23	Jun.06,24
Test Software	Toscend	JS1120-3	N/A	N/A	N/A
Test Software	Toscend	JS36-RSE	N/A	N/A	N/A

1.2 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Parameter	Uncertainty
Occupied Channel Bandwidth	±1.132x10^{-4} %
RF output power, conducted	±1.017dB
Power Spectral Density, conducted	±1.017dB
Unwanted Emissions, conducted	±2.855dB
All emissions, radiated	±2.855dB
Temperature	±0.7°C
Supply voltages	±0.04%
Time	±5 %

1.3 Maximum Measurement Uncertainty

For the test methods, according to EN 300 328 standard, the measurement uncertainty figures shall be calculated in accordance with ETR 100 028-1 [4] and shall correspond to an expansion factor (coverage factor) k = 1,96 or k = 2 (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Maximum measurement uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1,5 dB
Power Spectral Density, conducted	±3 dB
Unwanted Emissions, conducted	±3 dB
All emissions, radiated	±6 dB
Temperature	±1 °C
Supply voltages	±3 %
Time	±5 %

1.4 Modification Record

There were no modifications required for compliance.

2 General Information

2.1 General Description of EUT

Product	Grid-connected hybrid Inverter
Brand	HANCHU ESS
Model	Refer to model list
Nominal Voltage	Refer to model list
Temperature Operating Range	-25°C~60°C
Modulation Type	DSSS, OFDM
Modulation Technology	802.11b/g/n20/n40
Operating Frequency	802.11b, 802.11g and 802.11n (HT20):2412MHz~2472MHz, 802.11n (HT40):2422MHz~2462MHz
Number of Channel	802.11b, 802.11g and 802.11n (HT20):13, 802.11n (HT40):9
Adaptive/Non-Adaptive	☐ 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
EIRP Power (Measured Max. Average)	19.22dBm
Antenna Type	External Antenna
Antenna Gain	3.4dBi
Data Cable Supplied	--

Note:

1. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.
2. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

2.2 Model List

Model		HESS-HY-T -05K	HESS-HY-T -06K	HESS-HY-T -08K	HESS-HY-T -10K	HESS-HY-T -12K
PV input	VMaxpv [Vdc]	1100				
	Iscpv [A]	30				
	MPP Voltage Range [Vdc]	150 - 950		200-950		
	Full Power MPP Voltage Range [Vdc]	250-850	290-850	350-850	380-850	450-850
	Max. Input Current [A]	20				
	Start PV Voltage [Vdc]	180				
	Back feed Current [A]	0				
	Overvoltage Category (OVC)	II				
Battery input	Battery voltage range[Vdc]	120 - 600				
	Max. charging / discharging power[kW]	5	6	8	10	12
	Battery voltage range@nominal power[Vdc]	200-600	210-600	270-600	340-600	400-600
	Max. charging current / Max. discharging current [A]	30				
	Battery type	LiFePO4				
AC output	Rated Output Voltage [Vac]	220 / 380 V,230 / 400 V,240 / 415 ,3L/N/PE				
	Rated Output Frequency [Hz]	50 / 60				
	Rated Output Power [kW]	5	6	8	10	12
	Max.Apparent Power [kVA]	5.5	6.6	8.8	11.0	13.2
	Rated Output Current [A](@400V)	7.3	8.7	11.6	14.5	17.4
	Max.Output Current [A](@400V)	8.0	9.6	12.8	16.0	19.2
	Power Factor（cosφ）	1.0 (default)，0.80 lead，0.80 lag				
	Overvoltage Category (OVC)	III				
AC input	Rated Input Voltage [Vac]	220 / 380 V,230 / 400 V,240 / 415 ,3L/N/PE				
	Rated Input Frequency [Hz]	50 / 60				
	Max. input power from grid [kW]	10	12	16	20	24
	Max. input current from grid[A]	14.5	17.4	23.2	29.0	34.8
EPS output	Nominal Output Voltage [Vac]	220 / 380 V,230 / 400 V,240 / 415 ,3L/N/PE				
	Nominal Output Frequency [Hz]	50 /60				
	Max. apparent power[kVA]	5	6	8	10	12
	Rated Current[A] (@400V)	7.3	8.7	11.6	14.5	17.4
SYSTEM	Protective Class	I				
	Enclosure Protection [IP]	IP66				
	Operating Temperature Range [°C]	-25 °C … +60 °C				
	Pollution degree (PD)	PD 3				
	Max. operating altitude [m]	3000				
	Acoustic Noise [dB]	< 60				
	Weight [Kg]	24.5				
	Size (W / H / D) [mm]	545 / 465 / 205				
	Firmware Version	Master DSP：610-05001-00 Slave DSP：610-60015-00 Safety：610-11022-00				

1) For European market and Australian market, the max. apparent AC output power is equal to the rated power.

Model		HESS-HY-T1 -05K	HESS-HY-T1 -06K	HESS-HY-T1 -08K	HESS-HY-T1 -10K	HESS-HY-T1 -12K
PV input	VMaxpv [Vdc]	1100				
	Iscpv [A]	24				
	MPP Voltage Range [Vdc]	150 - 950		200-950		
	Full Power MPP Voltage Range [Vdc]	180~850V	200~850V	250~850V	320~850V	380~850V
	Max. Input Current [A]	16				
	Start PV Voltage [Vdc]	180				
	Back feed Current [A]	0				
	Overvoltage Category (OVC)	II				
Battery input	Battery voltage range[Vdc]	120 - 600				
	Max. charging / discharging power[kW]	5	6	8	10	12
	Battery voltage range@nominal power[Vdc]	200-600	210-600	270-600	340-600	400-600
	Max. charging current / Max. discharging current [A]	30				
	Battery type	LiFePO4				
AC output	Rated Output Voltage [Vac]	220 / 380 V,230 / 400 V,240 / 415 ,3L/N/PE				
	Rated Output Frequency [Hz]	50 / 60				
	Rated Output Power [kW]	5	6	8	10	12
	Max.Apparent Power [kVA]	5.5	6.6	8.8	11.0	13.2
	Rated Output Current [A](@400V)	7.3	8.7	11.6	14.5	17.4
	Max.Output Current [A](@400V)	8.0	9.6	12.8	16.0	19.2
	Power Factor (cosφ)	1.0 (default)，0.80 lead，0.80 lag				
	Overvoltage Category (OVC)	III				
AC input	Rated Input Voltage [Vac]	220 / 380 V,230 / 400 V,240 / 415 ,3L/N/PE				
	Rated Input Frequency [Hz]	50 / 60				
	Max. input power from grid [kW]	10	12	16	20	24
	Max. input current from grid[A]	14.5	17.4	23.2	29.0	34.8
EPS output	Nominal Output Voltage [Vac]	220 / 380 V,230 / 400 V,240 / 415 ,3L/N/PE				
	Nominal Output Frequency [Hz]	50 /60				
	Max. apparent power[kVA]	5	6	8	10	12
	Rated Current[A] (@400V)	11.6	14.5	11.6	14.5	17.4
SYSTEM	Protective Class	I				
	Enclosure Protection [IP]	IP66				
	Operating Temperature Range [°C]	-25 °C … +60 °C				
	Pollution degree (PD)	PD 3				
	Max. operating altitude [m]	3000				
	Acoustic Noise [dB]	< 60				
	Weight [Kg]	26				
	Size (W / H / D) [mm]	545 / 465 / 205				
	Firmware Version	Master DSP：610-05001-00 Slave DSP：610-60015-00 Safety：610-11022-00				

1) For European market and Australian market, the max. apparent AC output power is equal to the rated power.

2.3 Description of Test Modes

13 channels are provided for 802.11b, 802.11g, 802.11n (HT20) and 802.11n (HT40):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2412 MHz	8	2447 MHz
2	2417 MHz	9	2452 MHz
3	2422 MHz	10	2457 MHz
4	2427 MHz	11	2462 MHz
5	2432 MHz	12	2467 MHz
6	2437 MHz	13	2472 MHz
7	2442 MHz	-	-

9 channels are provided for 802.11n (HT40):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
3	2422 MHz	8	2447 MHz
4	2427 MHz	9	2452 MHz
5	2432 MHz	10	2457 MHz
6	2437 MHz	11	2462 MHz
7	2442 MHz	-	-

2.3.1 Test Mode Applicability:

EUT Configure Mode	Applicable to								Description
	ROP	PSD	AD	OCB	EOB	SE< 1G	SE>1G	RB	
-	-	-	-	-	-	√	√	-	-

Where **ROP:** RF Output Power

PSD: Power Spectral Density

DC/TS/TG: Duty Cycle/ Tx-Sequence / Tx-gap

MU: Medium Utilization

AD: Adaptivity (Channel Access Mechanism)

OCB: Occupied Channel Bandwidth

EOB: Transmitter unwanted emissions in the out-of-band domain

SE<1G: Unwanted Emissions in the Spurious Domain below 1 GHz

SE>1G: Unwanted Emissions in the Spurious Domain above 1 GHz

RB: Receiver Blocking

2.3.2 Test Condition:

Applicable to	Normal Environmental Conditions	Normal Input Power	Extreme Temperature conditions
ROP	25deg. C, 60%RH	-	√
PSD	25deg. C, 60%RH	-	-
AD	25deg. C, 60%RH	-	-
OCB	25deg. C, 60%RH	-	-
EOB	25deg. C, 60%RH	-	-
SE<1G	25deg. C, 60%RH	DC 5V	-
SE · 1G	25deg. C, 60%RH	DC 5V	-
RB	25deg. C, 60%RH	-	-

Extreme Temperature conditions	
Tmin	-25deg. C
Tmax	+60deg. C

2.4 Description of Support Units

The EUT has been tested as an independent unit together without other necessary accessories or support units.

2.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standard:

EN 300 328 V2.2.2 (2019-07)

All relaxed test items have been performed and recorded as per the above standard.

3 Test Procedure and Results

3.1 RF Output Power

3.1.1 Limits of RF Output Power

Condition	Frequency Band	Limit (e.i.r.p)
Under all test conditions	2400 ~ 2483.5 MHz	AV: 20dBm

3.1.2 Test Procedures

Refer to chapter 5.4.2.2 of EN 300 328 V2.2.2.

Measurement Method	
☒Conducted measurement	☐Radiated measurement

3.1.3 Deviation from Test Standard

No deviation.

3.1.4 Test Setup

The measurements for RF output power was performed at both normal environmental conditions and at the extremes of the operating temperature. The measurement was performed at the lowest, the middle, and the highest channel.

3.1.5 Test Results

The test result refer to report RSHD200116001-01AM1, Certificate No.: B20040710.

3.2 Power Spectral Density

3.2.1 Limit of Power Spectral Density

Condition	Frequency Band	Limit (e.i.r.p.)
Under normal conditions	2400 ~ 2483.5 MHz	10dBm / 1MHz

3.2.2 Test Procedures

Refer to chapter 5.4.3.2 of EN 300 328 V2.2.2.

Measurement Method	
☒ Conducted measurement	☐ Radiated measurement
☒ Option 1: For equipment with continuous and non-continuous transmissions	
☐ Option 2: For equipment with continuous transmission capability or for equipment operating (or with the capability to operate) with a constant duty cycle (e.g. Frame Basedequipment)	

3.2.3 Deviation of Test Standard

No deviation.

3.2.4 Test Setup

The test setup has been constructed as the normal test condition. The measurement was performed at the lowest, the middle, and the highest channel.

3.2.5 Test Results

The test result refer to report RSHD200116001-01AM1, Certificate No.: B20040710.

3.3 Adaptivity (adaptive equipment using modulations other than FHSS)

This requirement does not apply to non-adaptive equipment or adaptive equipment operating in a non-adaptive mode providing the equipment complies with the requirements and/or restrictions applicable to non-adaptive equipment.

In addition, this requirement does not apply for equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.

3.3.1 Limit of Adaptive

Applicability of adaptive requirements and limit for wide band modulation techniquesInterference threshold level

Requirement	Operational Mode			
	Non-LBT based Detect and Avoid	LBT based Detect and Avoid		
		Frame Based Equipment	Load Based Equipment (Base on 'Spectrum Sharing' mechanisms)	Load Based Equipment (Not using any of the mechanisms referenced)
Minimum Clear Channel Assessment (CCA) Time	NA	18 us (see note 1)	(see note 2)	18 us (see note 1)
Maximum Channel Occupancy (COT) Time	40 ms	1 ms to 10 ms	(see note 2)	13ms
Minimum Idle Period	5us	5% of COT	(see note 2)	18us (see note 3)
Extended CCA check	NA	NA	(see note 2)	18us~160us
Short Control Signalling Transmissions	Maximum duty cycle of 10 % within an observation period of 50 ms (see note 4)			

NOTE 1: The CCA time used by the equipment shall be declared by the supplier.

NOTE 2:Load Based Equipment may implement an LBT based spectrum sharing mechanism based on the Clear ChannelAssessment (CCA) mode using energy detect, as described in IEEE 802.11™-2012 clause 9, clause 10, clause 16,clause 17, clause 19 and clause 20, or in IEEE 802.15.4™-2011 [i.4], clause 4, clause 5 and clause 8

NOTE 3: The Idle Period in between transmissions is considered to be the CCA or the Extended CCA check as there are no transmissions during this period.

NOTE 4: Adaptive equipment may or may not have Short Control Signalling Transmissions

Threshold Level for Non-LBT based Detect and Avoid	
Maximum transmit power (P_H) **EIRP dBm**	**Threshold level (TL)** **(see notes 1 and 2)**
20	-70 dBm / MHz
NOTE 1: For a 20 dBm e.i.r.p. transmitter the detection threshold level (TL) shall be equal to or less than -70 dBm/MHz at the input to the receiver assuming a 0 dBi (receive) antenna assembly. This threshold level (TL) may be corrected for the (receive) antenna assembly gain (G) NOTE 2: For power levels less than 20 dBm e.i.r.p., the detection threshold level may be relaxed to: TL = -70 dBm/MHz + 10 × $\log_{10}$ (100 mW / Pout) ; (Pout in mW e.i.r.p.)	

Unwanted signal parameters for Non-LBT based Detect and Avoid		
Wanted signal mean power from companion device (dBm)	**Unwanted signal frequency (MHz)**	**Unwanted CW signal power (dBm)**
-30	2 395 or 2 488,5 (see note 1)	-35 (see note 2)
NOTE 1: The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz. NOTE 2: The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain.		

Threshold Level for LBT based Detect and Avoid (Frame Based Equipment)	
Maximum transmit power (P_H) **EIRP dBm**	**Threshold level (TL)** **(see notes 1 and 2)**
20	-70 dBm / MHz
NOTE 1: For a 20 dBm e.i.r.p. transmitter the CCA threshold level (TL) shall be equal to or less than -70 dBm/MHz at the input to the receiver assuming a 0 dBi (receive) antenna assembly. This threshold level (TL) may be corrected for the (receive) antenna assembly gain (G) NOTE 2: For power levels less than 20 dBm e.i.r.p. the CCA threshold level may be relaxed to: TL = -70 dBm/MHz + 10 × $\log_{10}$ (100 mW / Pout) ; (Pout in mW e.i.r.p.)	

Unwanted signal parameters for LBT based Detect and Avoid (Frame Based Equipment)		
Wanted signal mean power from companion device	**Unwanted signal frequency (MHz)**	**Unwanted signal power (dBm)**
sufficient to maintain the link (see note 2)	2 395 or 2 488,5 (see note 1)	-35 (see note 3)
NOTE 1: The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz. See clause 5.4.6.1.		
NOTE 2: A typical value which can be used in most cases is -50 dBm/MHz.		
NOTE 3: The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain.		

Threshold Level for LBT based Detect and Avoid (Load Based Equipment)	
Maximum transmit power (P_H) EIRP dBm	**Threshold level (TL) (see notes 1 and 2)**
20	-70 dBm / MHz
NOTE 1: For a 20 dBm e.i.r.p. transmitter the CCA threshold level (TL) shall be equal to or less than -70 dBm/MHz at the input to the receiver assuming a 0 dBi (receive) antenna assembly. This threshold level (TL) may be corrected for the (receive) antenna assembly gain (G)	
NOTE 2: For power levels less than 20 dBm e.i.r.p. the CCA threshold level may be relaxed to: $TL = -70\ dBm/MHz + 10 \times \log_{10}(100\ mW / Pout)$; (Pout in mW e.i.r.p.)	

Unwanted signal parameters for LBT based Detect and Avoid (Load Based Equipment)		
Wanted signal mean power from companion device	**Unwanted signal frequency (MHz)**	**Unwanted signal power (dBm)**
sufficient to maintain the link (see note 2)	2 395 or 2 488,5 (see note 1)	-35 (see note 3)
NOTE 1: The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz. See clause 5.4.6.1.		
NOTE 2: A typical value which can be used in most cases is -50 dBm/MHz.		
NOTE 3: The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain.		

3.3.2 Test Procedure

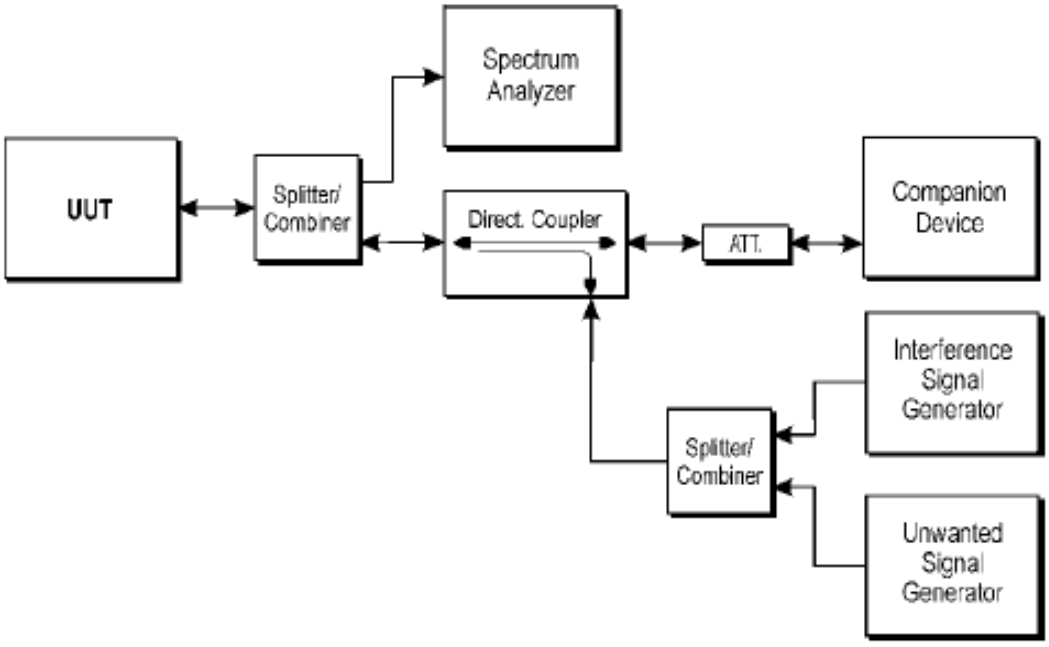
Refer to chapter 5.4.6.2 of EN 300 328 V2.2.2.

Measurement Method	
☒Conducted measurement	☐Radiated measurement

3.3.3 Deviation from Test Standard

No deviation.

3.3.4 Test Setup Configuration



3.3.5 List of Measurements

Clause	Test Parameter	Remarks	Pass/Fail
4.3.2.6.3.2.3	Adaptive (Load Based Equipment)	Applicable	Pass
4.3.2.6.4	Short Control Signalling Transmissions	Applicable	Pass

3.3.6 Test Result

The test result refer to report RSHD200116001-01AM1, Certificate No.: B20040710.

3.4 Occupied Channel Bandwidth

3.4.1 Limit of Occupied Channel Bandwidth

Condition		Limit
All types of equipment		Shall fall completely within the band 2400 to 2483.5 MHz.
Additional requirement	For non-adaptive using wide band modulations other than FHSS system and e.i.r.p >10dBm.	Less than 20MHz
	For non-adaptive Frequency Hopping system and e.i.r.p >10dBm.	Less than 5MHz

3.4.2 Test Procedure

Refer to chapter 5.4.7.2 of EN 300 328 V2.2.2.

Measurement	
☒ Conducted measurement	☐ Radiated measurement

3.4.3 Deviation from Test Standard

No deviation.

3.4.4 Test Setup

These measurements only were performed at normal test conditions. The measurement shall be performed only on the lowest and the highest frequency within the stated frequency range. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator.

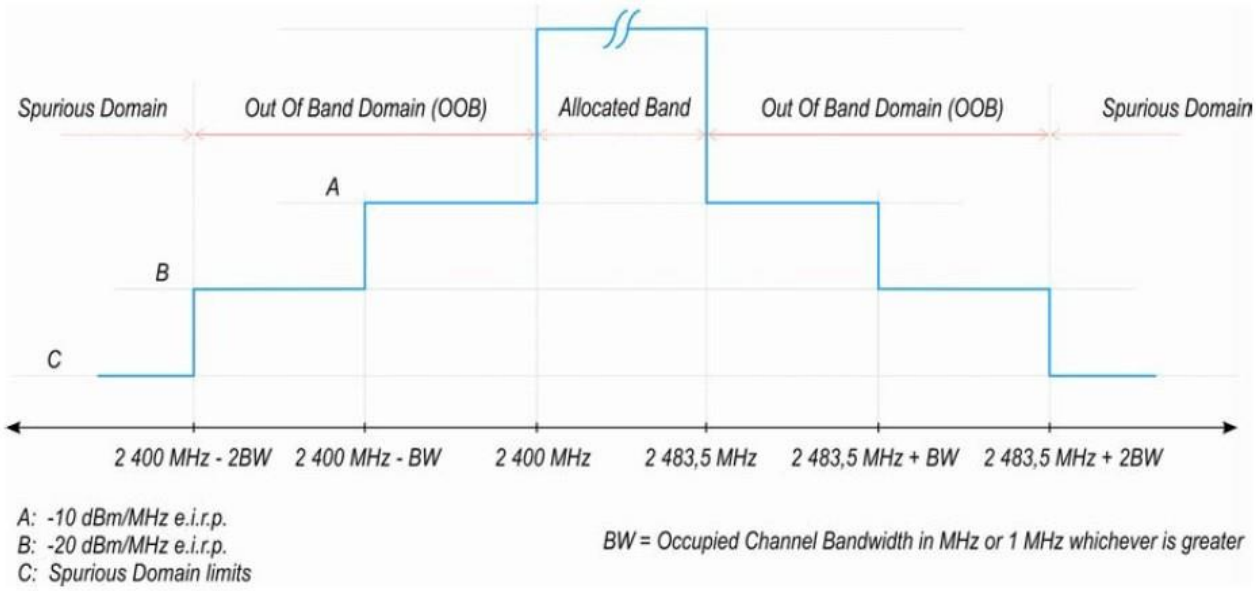
3.4.5 Test Results

The test result refer to report RSHD200116001-01AM1, Certificate No.: B20040710.

3.5 Transmitter Unwanted Emissions in the Out-of-band Domain

3.5.1 Limits of Transmitter Unwanted Emissions in the Out-of-band Domain

Condition	Limit
Under all test conditions	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.



3.5.2 Test Procedure

Refer to chapter 5.4.8.2 of EN 300 328 V2.2.2.

Measurement Method	
☒Conducted measurement	☐Radiated measurement

3.5.3 Deviation from Test Standard

No deviation

3.5.4 Test Setup

The measurements were performed at normal environmental conditions and shall be repeated at the extremes of the operating temperature. The measurement was performed at the lowest and the highest channel on which the equipment can operate. The equipment was configured to operate under its worst case situation with respect to output power. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator. The frequency has to be recorded for the right and left end above threshold of highest and lowest channel respectively.

3.5.5 Test Results

The test result refer to report RSHD200116001-01AM1, Certificate No.: B20040710.

3.6 Transmitter Spurious Emissions in the spurious domain

3.6.1 Limits of Transmitter Spurious Emissions

Frequency Range	Maximum Power Limit	Bandwidth
30 MHz to 47 MHz	-36dBm	100kHz
47 MHz to 74 MHz	-54dBm	100kHz
74 MHz to 87,5 MHz	-36dBm	100kHz
87,5 MHz to 118 MHz	-54dBm	100kHz
118 MHz to 174 MHz	-36dBm	100kHz
174 MHz to 230 MHz	-54dBm	100kHz
230 MHz to 470 MHz	-36dBm	100kHz
470 MHz to 694 MHz	-54dBm	100kHz
694 MHz to 1 GHz	-36dBm	100kHz
1GHz ~ 12.75GHz	-30dBm	1MHz

Note: These limits are e.r.p. for emissions up to 1 GHz and as e.i.r.p. for emissions above 1 GHz.

3.6.2 Test Procedure

Refer to chapter 5.4.9 of EN 300 328 V2.2.2.

Measurement Method	
☐ Conducted measurement	☒ Radiated measurement
For Conducted measurement: The level of unwanted emissions shall be measured as their power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment with the antenna connector(s) terminated by a specified load (cabinet radiation).	
Conducted measurement (For equipment with multiple transmit chains): ☐ Option 1: The results for each of the transmit chains for the corresponding 1MHz segments shall be added and compared with the limits. ☐ Option 2: The results for each of the transmit chains shall be individually compared with the limits after these limits have been reduced by 10 x log (N) (number of active transmit chains)	

3.6.3 Deviation from Test Standard

No deviation.

3.6.4 Test Setup

1. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).

2. The equipment was configured to operate under its worst case situation with respect to output power.

3. The test setup has been constructed as the normal use condition.

3.6.5 Test Results

Below 1GHz Worst-case Data

Frequency Range	30 MHz ~ 1 GHz	Operating Channel	802.11b

Spurious Emission Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
191.3110	H	-62.99	-54.00	8.99
215.9490	H	-61.53	-54.00	7.53
478.2370	H	-57.44	-54.00	3.44
525.2820	H	-60.67	-54.00	6.67
562.5300	H	-57.97	-54.00	3.97
640.0330	H	-57.50	-54.00	3.50
215.9490	V	-60.46	-54.00	6.46
335.4530	V	-51.99	-36.00	15.99
479.9830	V	-60.43	-54.00	6.43
557.9710	V	-61.33	-54.00	7.33
640.0330	V	-57.58	-54.00	3.58
933.9430	V	-60.06	-36.00	24.06

Above 1GHz Worst-case Data

802.11b

Frequency Range	1GHz ~ 12.75GHz	Operating Channel	1, 13

Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
1	4824.6250	H	-40.88	-30.00	10.88
	7236.9000	H	-44.94	-30.00	14.94
	4823.4500	V	-42.56	-30.00	12.56
	7236.9000	V	-43.13	-30.00	13.13
13	4944.4750	H	-39.88	-30.00	9.88
	7416.6750	H	-44.48	-30.00	14.48
	4944.4750	V	-38.67	-30.00	8.67
	7416.6750	V	-43.81	-30.00	13.81

802.11g

Frequency Range	1GHz ~ 12.75GHz	Operating Channel	1, 13

Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
1	4824.6250	H	-42.75	-30.00	12.75
	7236.9000	H	-44.40	-30.00	14.40
	4823.4500	V	-43.31	-30.00	13.31
	7236.9000	V	-45.15	-30.00	15.15
13	4943.3000	H	-37.94	-30.00	7.94
	7416.6750	H	-44.24	-30.00	14.24
	4944.4750	V	-39.85	-30.00	9.85
	7416.6750	V	-42.98	-30.00	12.98

802.11n (HT20)

Frequency Range	1GHz ~ 12.75GHz	Operating Channel	1, 13

Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
1	4817.5750	H	-45.65	-30.00	15.65
	7236.9000	H	-44.90	-30.00	14.90
	4949.1750	V	-45.77	-30.00	15.77
	7416.6750	V	-44.64	-30.00	14.64
13	4824.6250	H	-44.08	-30.00	14.08
	7416.6750	H	-44.61	-30.00	14.61
	4944.4750	V	-42.37	-30.00	12.37
	7416.6750	V	-43.78	-30.00	13.78

802.11n (HT40)

Frequency Range	1GHz ~ 12.75GHz	Operating Channel	3, 11

Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
3	4844.6000	H	-46.13	-30.00	16.13
	7266.2750	H	-44.26	-30.00	14.26
	4844.6000	V	-46.01	-30.00	16.01
	7266.2750	V	-43.59	-30.00	13.59
11	4924.5000	H	-45.09	-30.00	15.09
	7386.1250	H	-44.40	-30.00	14.40
	4924.5000	V	-45.89	-30.00	15.89
	7386.1250	V	-43.87	-30.00	13.87

3.7 Receiver Spurious Emissions

3.7.1 Limit of Receiver Spurious Radiation

Frequency Range	Maximum Power Limit	Bandwidth
30 MHz ~ 1 GHz	-57dBm	100 kHz
1 GHz ~ 12.75 GHz	-47dBm	1 MHz

Note: These limits are e.r.p. for emissions up to 1 GHz and as e.i.r.p. for emissions above 1 GHz.

3.7.2 Test Procedure

Refer to chapter 5.4.10 of EN 300 328 V2.2.2.

Measurement Method	
☐ Conducted measurement	☒ Radiated measurement
For Conducted measurement: The level of unwanted emissions shall be measured as their power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment with the antenna connector(s) terminated by a specified load (cabinet radiation).	
Conducted measurement (For equipment with multiple transmit chains): ☐ Option 1: The results for each of the transmit chains for the corresponding 1MHz segments shall be added and compared with the limits. ☐ Option 2: The results for each of the transmit chains shall be individually compared with the limits after these limits have been reduced by 10 x log (N) (number of active transmit chains)	

3.7.3 Deviation from Test Standard

No deviation.

3.7.4 Test Setup

1. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).
2. Testing was performed when the equipment was in a receive-only mode.
3. The test setup has been constructed as the normal use condition.

3.7.5 Test Results

RX Worst-case Data

Frequency Range	30 MHz ~ 1 GHz	Operating Channel	Receiver mode

Spurious Emission Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
149.9890	H	-65.85	-57.00	8.85
263.9640	H	-62.48	-57.00	5.48
407.1360	H	-60.56	-57.00	3.56
525.3790	H	-63.94	-57.00	6.94
571.9390	H	-61.90	-57.00	4.90
937.5320	H	-61.01	-57.00	4.01
191.2140	V	-63.72	-57.00	6.72
233.2150	V	-62.27	-57.00	5.27
430.2220	V	-60.62	-57.00	3.62
574.8490	V	-60.68	-57.00	3.68
658.9480	V	-59.45	-57.00	2.45
920.5570	V	-60.64	-57.00	3.64

Frequency Range	1 GHz ~ 12.75 GHz	Operating Channel	Receiver mode

Spurious Emission Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
1313.7250	H	-60.42	-47.00	13.42
2102.1500	H	-63.18	-47.00	16.18
4824.6250	H	-63.92	-47.00	16.92
5935.0000	H	-58.31	-47.00	11.31
7236.9000	H	-58.99	-47.00	11.99
8590.5000	H	-53.68	-47.00	6.68
1317.2500	V	-60.16	-47.00	13.16
2098.6250	V	-60.43	-47.00	13.43
4824.6250	V	-64.10	-47.00	17.10
6444.9500	V	-58.50	-47.00	11.50
7236.9000	V	-59.17	-47.00	12.17
8881.9000	V	-53.59	-47.00	6.59
1317.2500	V	-60.16	-47.00	13.16

3.8 Receiver Blocking

3.8.1 Limit of Receiver Blocking

This requirement applies to all receiver categories.

Receiver Category		
☒Category 1	☐Category 2	☐Category 3
Minimum performance criterion	☒PER ≦10%	
	☐Alternative performance criteria (See note)	
Note: The manufacturer was declared performance criteria is x% for the intended use of the equipment.		

Receiver Category 1 Equipment			
Wanted signal mean power from companion device (dBm)	**Blocking Signal Frequency (MHz)**	**Blocking Signal Power (dBm) (See note 2)**	**Type of blocking signal**
(-133 dBm + 10 × log10(OCBW)) or -68 dBm whichever is less (see note 2)	2 380 2 504	-34	CW
(-139 dBm + 10 × log10(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 Pmin + 26 dB where Pmin 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 Pmin + 20 dB where Pmin 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 0dBi 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.

Receiver Category 2 Equipment			
Wanted signal mean power from companion device (dBm)	**Blocking Signal Frequency (MHz)**	**Blocking Signal Power (dBm) (See note 2)**	**Type of blocking signal**
(-139 dBm + 10 × log10(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 Pmin + 26 dB where Pmin 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.			

Receiver Category 3 Equipment			
Wanted signal mean power from companion device (dBm)	**Blocking Signal Frequency (MHz)**	**Blocking Signal Power (dBm) (See note 2)**	**Type of blocking signal**
(-139 dBm + 10 × log10(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 the test may be performed using a wanted signal up to Pmin + 30 dB where Pmin 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 0dBi 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			

3.8.2 Test Procedure

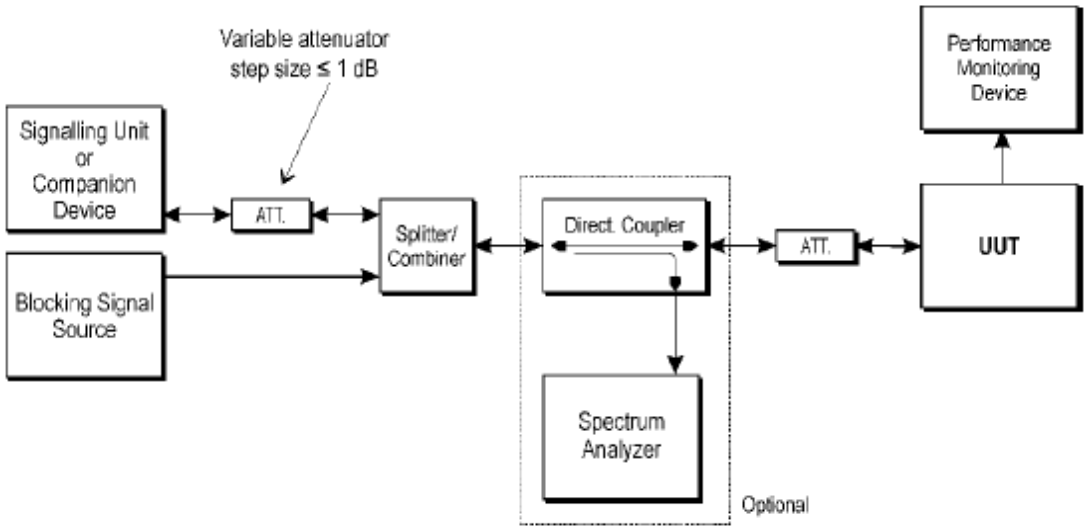
Refer to chapter 5.4.11.2 of EN 300 328 V2.2.2.

Measurement Method	
☒ Conducted measurement	☐ Radiated measurement

3.8.3 Deviation from Test Standard

No deviation.

3.8.4 Test Setup Configuration



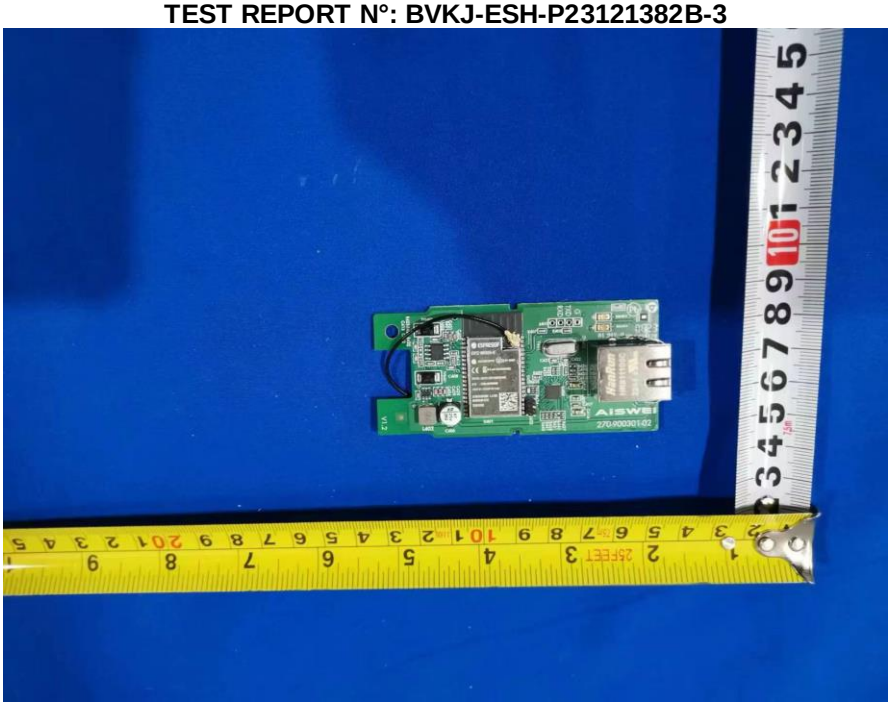
3.8.5 Test Results

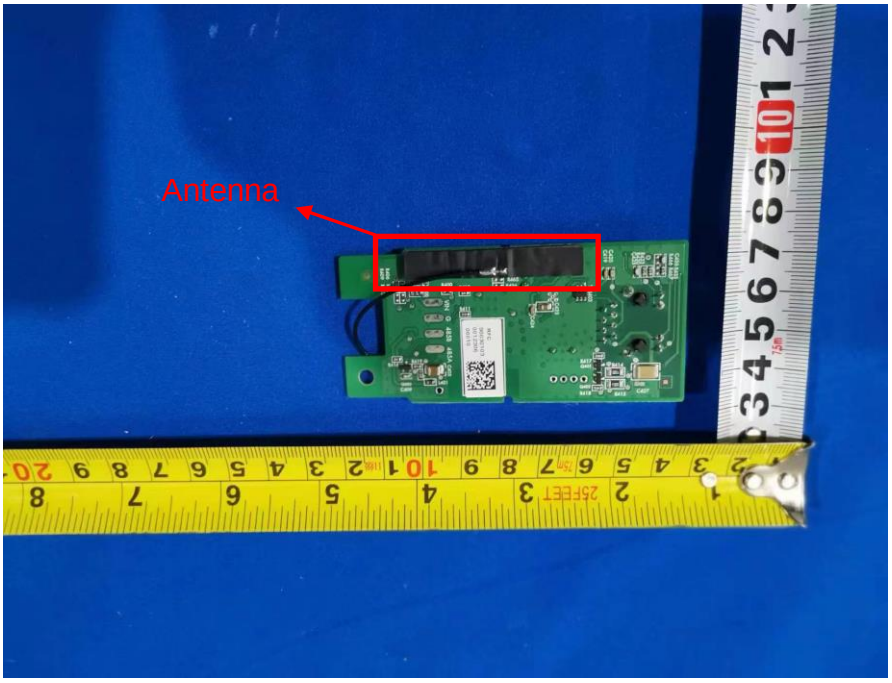
The test result refer to report RSHD200116001-01AM1, Certificate No.: B20040710.

4 Photographs of the Test Configuration

TX / RX SPURIOUS EMISSION TEST

5 Photographs of the EUT




Antenna

APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications were made to the EUT by the lab during the test.

---------- END ----------