ETSI EN 301 893 V2.1.1

TEST REPORT

For

WIFI+BT module

MODEL NUMBER: 6233A-SRB

REPORT NUMBER: E04A24071288R00302

ISSUE DATE: September 13, 2024

Prepared for

FN-LINK TECHNOLOGY LIMITED

No.8, Litong Road, Liuyang Economic & Technical Development Zone, Changsha, Hunan, China

Prepared by

Guangdong Global Testing Technology Co., Ltd.

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Revision History

Rev.	Issue Date	Revisions	Revised By
V0	September 20, 2024	Initial Issue	

Summary of Test Results

Test Item	Clause	Limit/Requirement	Result
Nominal Centre frequencies	Clause 5.4.2.2	Clause 4.2.1	Pass
Nominal Channel Bandwidth and Occupied Channel Bandwidth	Clause 5.4.3.2	Clause 4.2.2	Pass
RF output power	Clause 5.4.4.2	Clause 4.2.3	Pass
Power density	Clause 5.4.4.2	Clause 4.2.3	Pass
Transmitter unwanted emissions outside the 5 GHz RLAN bands	Clause 5.4.5.2	Clause 4.2.4.1	Pass
Transmitter unwanted emissions within the 5 GHz RLAN bands	Clause 5.4.6.2	Clause 4.2.4.2	Pass
Receiver spurious emissions	Clause 5.4.7.2	Clause 4.2.5	Pass
Dynamic Frequency Selection (Slave)	Clause 5.4.8.2	Clause 4.2.6	Pass
Adaptivity (Channel Access Mechanism)	Clause 5.4.9.2, Clause 5.4.9.3	Clause 4.2.7	Pass
Receiver Blocking	Clause 5.4.10.2	Clause 4.2.8	Pass
User Access Restrictions	N/A	Clause 4.2.9	Pass
Radiated Spurious Emission	Clause 5.4.5.2	Clause 4.2.4.1	Pass

*This test report is only published to and used by the applicant, and it is not for evidence purpose in China.
*The measurement result for the sample received is <Pass> according to <ETSI EN 301 893 V2.1.1> when <Accuracy Method> decision rule is applied.

CONTENTS

1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name:	FN-LINK TECHNOLOGY LIMITED
Address:	No.8, Litong Road, Liuyang Economic & Technical Development Zone, Changsha, Hunan, China

Manufacturer Information

Company Name:	FN-LINK TECHNOLOGY LIMITED
Address:	No.8, Litong Road, Liuyang Economic & Technical Development Zone, Changsha, Hunan, China

EUT Information

Product Description:	WIFI+BT module
Model:	6233A-SRB
Brand:	FN-LINK
Sample Received Date:	August 22, 2024
Sample Status:	Normal
Sample ID:	A24071288 001
Date of Tested:	August 22, 2024 to September 13, 2024

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
ETSI EN 301 893 V2.1.1	**Pass**

Prepared By:

Win Huang

Win Huang

Project Engineer

Checked By:

Alan He

Alan He

Laboratory Leader

Approved By:

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Laboratory Manager

Guangdong Global Testing Technology Co., Ltd. CERTIFICATE

2. TEST METHODOLOGY

All tests were performed in accordance with the standard ETSI EN 301 893 V2.1.1

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	**A2LA (Certificate No.: 6947.01)** Guangdong Global Testing Technology Co., Ltd. has been assessed and proved to be in compliance with A2LA. **FCC (FCC Designation No.: CN1343)** Guangdong Global Testing Technology Co., Ltd. has been recognized to perform compliance testing on equipment subject to Supplier's Declaration of Conformity (SDoC) and Certification rules **ISED (Company No.: 30714)** Guangdong Global Testing Technology Co., Ltd. has been registered and fully described in a report filed with ISED. The Company Number is 30714 and the test lab Conformity Assessment Body Identifier (CABID) is CN0148.

Note: All tests measurement facilities use to collect the measurement data are located at Room 101-105, 203-210, Building 1, No.2, Keji 8 Road, Songshan Lake Park, Dongguan city, Guangdong, People's Republic of China, 523808

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

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

Test Items	k	Uncertainty
Centre frequencies	1.96	± 9.0 PPM
Occupied Channel Bandwidth	1.96	± 9.0 PPM
RF output power	1.96	± 1.2 dB
Transmit Power Control (TPC)	1.96	± 1.2 dB
power density	1.96	± 2.1 dB
Conducted spurious emissions	1.96	30 MHz-1 GHz: ±1.5 dB 1 GHz-12.75 GHz: ±1.8 dB 12.75 GHz-26.5 GHz: ± 2.1dB
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.		

Test Item	Measurement Frequency Range	K	U(dB)
Radiated emissions	30 MHz ~ 1 GHz	2	3.79
Radiated emissions	1 GHz ~ 18 GHz	2	5.62
Radiated emissions	18 GHz ~ 40 GHz	2	5.54
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.			

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT Name		WIFI+BT module
Model		6233A-SRB
Series Model		N/A
Hardware Version		V1.0
Software Version		V0.39
Ratings		DC 3.3V
Power Supply	DC	3.3V
	Battery	N/A

Frequency Bands:	5150 MHz to 5350 MHz; 5470 MHz to 5725 MHz
Frequency Range:	5180 MHz to 5320 MHz; 5500 MHz to 5700 MHz
Support Standards:	IEEE 802.11a/n
Geo-location Capability:	Not Support
TPC Function:	Not Support
DFS Operational mode:	Slave without radar Interference detection function
Type of Modulation:	IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM(64QAM, 16QAM, QPSK, BPSK)
Channel Spacing:	IEEE 802.11a/n-HT20: 20 MHz IEEE 802.11n-HT40: 40 MHz
Data Rate:	IEEE 802.11a: Up to 54 Mbps IEEE 802.11n-HT20: Up to MCS7 IEEE 802.11n-HT40: Up to MCS7
Number of Channels:	5150 MHz to 5350 MHz: 8 for 802.11a/n-HT20 4 for 802.11n-HT40) 5470 MHz to 5725 MHz: 11 for 802.11a/n-HT20 5 for 802.11n-HT40
Maximum EIRP: (5150 MHz to 5350 MHz)	IEEE 802.11a: 17.70 dBm IEEE 802.11n-HT20: 17.57 dBm IEEE 802.11n-HT40: 16.99 dBm
Maximum EIRP: (5470 MHz to 5725 MHz)	IEEE 802.11a: 17.44 dBm IEEE 802.11n-HT20: 16.70 dBm IEEE 802.11n-HT40: 16.58 dBm
Antenna Type:	PIFA Antenna
Antenna Gain:	3.99 dBi
Normal Test Voltage:	3.3 Vdc
Extreme Test Voltage:	2.97 to 3.63 Vdc
Extreme Test Temperature:	General: 0 °C to 70 °C
EUT Test software:	Terminal
Note: The Antenna Gain was provided by customer, and this information may affect the validity of the results, customer should be responsible for this.	

5.2. CHANNEL LIST

Lower Sub-Band (BW 20MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	48	5240	60	5300	/	/
40	5200	52	5260	64	5320	/	/
44	5220	56	5280		/	/	/

Higher Sub-Band (BW 20MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
100	5500	112	5560	124	5620	136	5680
104	5520	116	5580	128	5640	140	5700
108	5540	120	5600	132	5660	/	/

Lower Sub-Band (BW 40MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	5190	46	5230	54	5270	62	5310

Higher Sub-Band (BW 40MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
102	5510	118	5590	134	5670	/	/
110	5550	126	5630	/	/	/	/

5.3. MAXIMUM EIRP

Frequency Range (MHz)	Max Number of Transmit chains (NTX)	IEEE Std. 802.11	Frequency (MHz)	Max EIRP (dBm)
5180-5350 (Lower Sub-Band)	1	a	5180-5320	17.70
5180-5350 (Lower Sub-Band)	1	n HT20	5180-5320	17.57
5180-5350 (Lower Sub-Band)	1	n HT40	5190-5310	16.99
5470-5725 (HIGH Sub-Band)	1	a	5500-5700	17.44
5470-5725 (HIGH Sub-Band)	1	n HT20	5500-5700	16.70
5470-5725 (HIGH Sub-Band)	1	n HT40	5510-5670	16.58

5.4. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter	
Test Software	Terminal

Mode	Rate	Channel	Soft set value
			ANT1
11a	6M	36	85
		64	83
		100	82
		140	80
11n HT20	MCS0	36	80
		64	80
		100	80
		140	80
11n HT40	MCS0	38	67
		62	67
		102	69
		134	68

The EUT was tested in the following configuration(s):

Controlled in test mode using a software application on the EUT supplied by customer. The application was used to enable a continuous transmission and to select the mode, test channels, bandwidth, data rates as required.

Worst-case data rates as provided by the client were:

802.11a mode: 6 Mbps
802.11n HT20 mode: MCS0
802.11n HT40 mode: MCS0

5.5. DESCRIPTION OF AVAILABLE ANTENNAS

Antenna No.	Frequency (MHz)	Antenna Type	Max Antenna Gain (dBi)
1	5180MHz-5725MHz	PIFA	3.99

IEE Std. 802.11	Transmit and Receive Mode	Description
802.11a	☒TX, RX	ANT 1 can be used as transmitting/receiving antenna.
802.11n HT20	☒TX, RX	ANT 1 can be used as transmitting/receiving antenna.
802.11n HT40	☒TX, RX	ANT 1 can be used as transmitting/receiving antenna.

5.6. ENVIROMENTAL CONDITIONS FOR TESTING

Environment Parameter	Selected Values During Tests
Test Condition	Ambient

	Temperature (°C)	Voltage	Relative Humidity (%)
NVNT	0 to 70	3.3 V	20 to 75
NVLT	0	3.3 V	20 to 75
NVHT	70	3.3 V	20 to 75
LVNT	0 to 70	2.97 V	20 to 75
HVNT	0 to 70	3.63 V	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

5.7. SUPPORT UNITS FOR SYSTEM TEST

The following support units or accessories were used to form a representative test configuration during the tests.

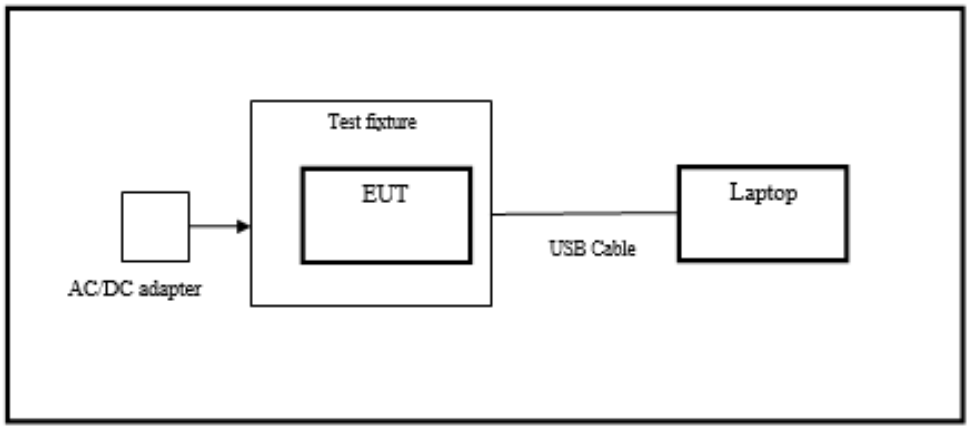
Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Laptop	Lenovo	Thinkpad T14	PF-3EAKYR	GTG Support
E-2	Adapter	Xingyuan	JYSY1580-0501000E	N/A	GTG Support

The following cables were used to form a representative test configuration during the tests.

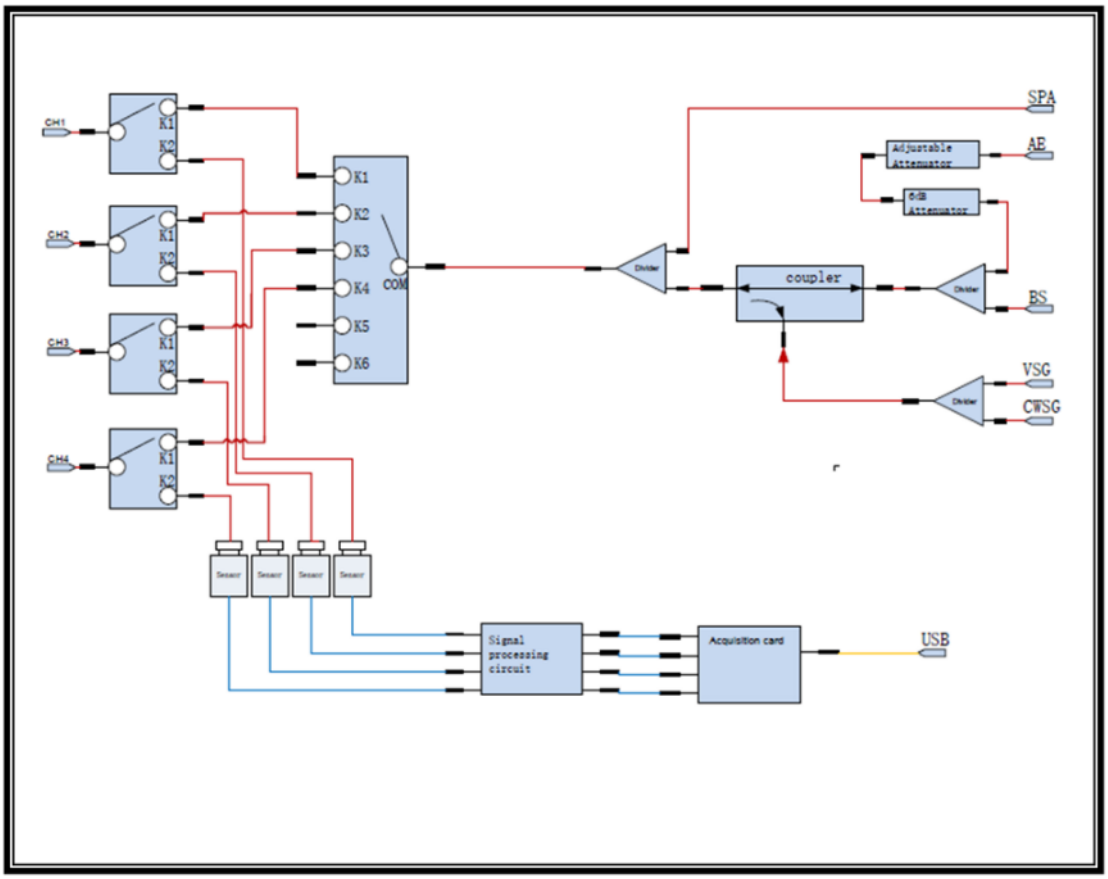
Item	Type of cable	Shielded Type	Ferrite Core	Length
C-1	USB cable	Unshielded	without ferrite	1.23 m

5.8. SETUP DIAGRAM

Radiated emissions:



5.9. TEST SYSTEM CONFIGURATION



5.10. DESCRIPTION OF THE EQUIPMENT UNDER TESTED

(INFORMATION AS REQUIRED BY ETSI EN 301 893 (V2.1.1), clause 5.4.1)

a)	**The Nominal Channel Bandwidth(s)**		
	Nominal Channel Bandwidth 1	☒20MHZ	
	Nominal Channel Bandwidth 2	☒40MHZ	
	Nominal Channel Bandwidth 3	☐80MHZ	
	Nominal Channel Bandwidth 4	☐160MHz	
	The associated center frequencies		
	☒For Nominal Channel Bandwidth 1		
	For the band 5150 MHz to 5350 MHz	CH36 (5180MHz)	CH64 (5320MHz)
	For the band 5470 MHz to 5725 MHz	CH100 (5500MHz)	CH140 (5700MHz)
	☒For Nominal Channel Bandwidth 2		
	For the band 5150 MHz to 5350 MHz	CH38 (5190MHz)	CH62 (5310MHz)
	For the band 5470 MHz to 5725 MHz	CH102 (5500MHz)	CH134 (5670MHz)
	☐For Nominal Channel Bandwidth 3		
	For the band 5150 MHz to 5350 MHz	CH42 (5210MHz)	CH58 (5290MHz)
	For the band 5470 MHz to 5725 MHz	CH106 (5530MHz)	CH122 (5610MHz)
	☐For Nominal Channel Bandwidth 4		

	For the band 5150 MHz to 5350 MHz	CH50 (5250MHz)	
	For the band 5470 MHz to 5725 MHz		
b)	**If the Load Based Equipment can support multi-channel operation (see clause 4.2.7.3.2.3), the following shall be provided:**		
	Whether the LBE equipment uses Option 1 and/or Option 2 (see clause 4.2.7.3.2.3) for its multi-channel operation	☒ Option 1	
		☐ Option 2	
	Whether or not these channels are adjacent or non-adjacent	☐ Yes ☒ No	
	Whether or not these channels are in different sub-bands	☐ Yes ☒ No	
	For equipment implementing option 1 (see clause 4.2.7.3.2.3), the number of channels used for multi-channel operation when performing the test described in clause 5.4.9.3.2.3.1.		
c)	**The different transmit operating modes (see clause 5.3.3.2) (tick all that apply)**		
	☒Operating mode 1: Single Antenna Equipment	☒Equipment with only one antenna	
		☐Equipment with two diversity antennas but at any moment in time only one antenna is used.	
		☐ Smart antenna system with two or more antennas, but operating in a mode where only one antenna is used.	
	☐ Operating mode 2: Smart Antenna Systems - Multiple Antennas without beamforming	The equipment that can operate in this mode contains a smart antenna system using two or more transmit chains simultaneously but without beamforming.	
	☐ Operating mode 3: Smart Antenna Systems - Multiple Antennas with beamforming	The equipment that can operate in this mode contains a smart antenna system using two or more transmit chains simultaneously with beamforming. In addition to the antenna assembly gain G, the beamforming gain Y may have to be taken into account when performing the measurements described in the present document.	
d)	**In case of Smart Antenna Systems or multiple antenna systems**		
	The number of Receive chains	1	
	The number of Transmit chains	1	
	Equal power distribution among the transmit chains	☐Yes	☒No
	In case of beamforming, the maximum (additional) beamforming gain	N/A	
e)	**TPC feature available** ☐Yes	☒No	
f)	**For devices with a TPC feature, for each TPC range:**		
	TPC range 1: Applicable Frequency Range	☐5150 MHz to 5350 MHz and 5470 MHz to 5725 MHz (Indoor)	Simultaneous transmissions in both sub-bands ☐Yes ☒No
		☐5 470 MHz to 5 725 MHz only (Outdoor only)	
	Power levels are specified for (integrated antenna equipment)	☐Tx out	☐e.i.r.p
	The lowest power level		
	The highest power level		
g)	**For devices operating in a mode without a TPC feature:**		

	TPC range 1: Applicable Frequency Range	☐5150 MHz to 5350 MHz and 5470 MHz to 5725 MHz (Indoor)	Simultaneous transmissions in both sub-bands	
			☐Yes	☐No
		☐5 470 MHz to 5 725 MHz only (Outdoor only)		
	Power levels are specified for (integrated antenna equipment)		☐Tx out	☐e.i.r.p
	The highest power level			
h)	**The DFS related operating mode(s) of the equipment**			
	☐Master	☐ Slave with radar detection	☒ Slave without radar detection	
i)	**User access restrictions (please check box below to confirm)**			
	☒The equipment is constructed to comply with the requirements contained in clause 4.2.9 in ETSI EN 301 893 V2.1.1 (2017-05)			
j)	**For equipment with Off-Channel CAC functionality**			
	The equipment has an "Off-Channel CAC" function	☐ Yes ☒ No		
		For channels outside the 5 600 MHz to 5 650 MHz range		hours
		If applicable, for channels (partially) within the 5 600 MHz to 5 650 MHz range		hours
k)	The equipment can operate in ad-hoc mode			
	☐ no ad-hoc operation			
	☐ ad-hoc operation in the frequency range 5 150 MHz to 5 250 MHz without DFS			
	☒ ad-hoc operation with DFS			
l)	**Operating Frequency Range(s):**			
	☒ Range 1	5 150 MHz to 5 350 MHz and 5 470 MHz to 5 725 MHz		
	☐ Range 2	5 470 MHz to 5 725 MHz		
	☐ Range 3	5 150 MHz to 5 250 MHz		
	☐ Range 4	other		
m)	**The operational environmental profile (e.g. the normal test conditions and the extreme test conditions) that applies to the equipment.**			
	☐-20 °C to +35 °C (Outdoor & Indoor usage)	☐0 °C to +35 °C (Indoor usage only)	☒Other 0 °C to 70 °C	
n)	**The test sequence/test software used by the UUT.**			
	The test sequence			
	The test software			
o)	**Type of Equipment**			
	☒ Stand-alone			
	☐ Combined Equipment (Equipment where the radio part is fully integrated within another type of equipment)			
	☐ Plug-in radio device (Equipment intended for a variety of host systems)			
	☐ Other			
p)	**Adaptivity (Channel Access Mechanism)**			
	☐ Frame Based Equipment			
	☒ Load Based Equipment			
q)	**With regards to Adaptivity for Frame Based Equipment:**			

	☐ The Frame Based Equipment operates as an Initiating Device	
	☒ The Frame Based Equipment operates as an Responding Device	
	☐ The Frame Based Equipment can operate as an Initiating Device and as a Responding Device	
	The Frame Based Equipment has implemented the following Fixed Frame Period(s): ms	
r)	**With regards to Adaptivity for Load Based Equipment**	
	☐ The Load Based Equipment operates as a Supervising Device	
	☒ The Load Based Equipment operates as a Supervised Device	
	☐ The Load Based Equipment can operate as a Supervising and as a Supervised Device	
	☐ The Load Based Equipment makes use of note 1 in table 7 or note 1 in table 8 of ETSI EN 301 893 V2.1.1	
	☐ The Load Based Equipment, when operating as a Supervising Device, makes use of note 2 in table 7 of ETSI EN 301 893 V2.1.1 (2017-05)	
	The Priority Classes implemented by the Load Based Equipment	
	When operating as a Supervising Device	Priority Class 2
	When operating as a Supervised Device	NA
	☐ The Load Based Equipment operates as an Initiating Device	
	☒ The Load Based Equipment operates as a Responding Device	
	☐ The Load Based Equipment can operate as an Initiating Device and as a Responding Device	
	With regard to Energy Detection Threshold, the Load Based Equipment has implemented either option 1 of clause 4.2.7.3.2.5 of ETSI EN 301 893 V2.1.1 (2017-05) or option 2 of clause 4.2.7.3.2.5 of ETSI EN 301 893 V2.1.1 (2017-05):	
	☒Option 1	☐Option 2
	Specify which protocol has been implemented	
	☒IEEE 802.11™	☐Other:
s)	**The equipment supports a geo-location capability as defined in clause 4.2.10 of ETSI EN 301 893 V2.1.1 (2017-05)**	
	☐YES	☒NO
t)	**The minimum performance criteria (see ETSI EN 301 893 V2.1.1 (2017-05), clause 4.2.8.3) that corresponds to the intended use of the equipment:**	
	A Mode 6 Mbps : PER 10%, Pmin= -91.16 dBm	
u)	**The theoretical maximum radio performance of the equipment (e.g. maximum throughput) (see ETSI EN 301 893 V2.1.1 (2017-05), clause 5.4.9.3.1)**	

6. MEASURING EQUIPMENT AND SOFTWARE USED

Test Equipment of Conducted RF					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
Spectrum Analyzer	Rohde & Schwarz	FSV40	102257	2023/09/18	2024/09/17
Spectrum Analyzer	KEYSIGHT	N9020A	MY51285127	2023/09/18	2024/09/17
EXG Analog Signal Generator	KEYSIGHT	N5173B	MY61253075	2023/09/18	2024/09/17
Vector Signal Generator	Rohde & Schwarz	SMM100A	101899	2023/09/18	2024/09/17
RF Control box	MWRF-test	MW100-RFCB	MW220926GTG	2023/09/18	2024/09/17
Wideband Radio Communication Tester	Rohde & Schwarz	CMW270	102792	2023/09/18	2024/09/17
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	103235	2023/09/18	2024/09/17
temperature humidity chamber	Espec	SH-241	SH-241-2014	2023/09/18	2024/09/17
RF Test Software	MWRF-test	MTS8310E (Ver. V2/0)	N/A	N/A	N/A

Test Equipment of Radiated emissions below 1GHz					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
3m Semi-anechoic Chamber	ETS	9m*6m*6m	Q2146	2022/08/30	2025/08/29
EMI Test Receiver	Rohde & Schwarz	ESCI3	101409	2023/09/18	2024/09/17
Spectrum Analyzer	KEYSIGHT	N9020A	MY51283932	2023/09/18	2024/09/17
Pre-Amplifier	HzEMC	HPA-9K0130	HYPA21001	2023/09/18	2024/09/17
Biconilog Antenna	Schwarzbeck	VULB 9168	01315	2022/10/10	2025/10/09
Biconilog Antenna	ETS	3142E	00243646	2022/03/23	2025/03/22
Loop Antenna	ETS	6502	243668	2022/03/30	2025/03/29
Test Software	Farad	EZ-EMC (Ver.FA-03A2 RE)	N/A	N/A	N/A

Test Equipment of Radiated emissions above 1GHz					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
3m Semi-anechoic Chamber	ETS	9m*6m*6m	Q2149	2022/08/30	2025/08/29
Spectrum Analyzer	Rohde & Schwarz	FSV40	101413	2023/09/18	2024/09/17
Spectrum Analyzer	KEYSIGHT	N9020A	MY51283932	2023/09/18	2024/09/17
Pre-Amplifier	A-INFO	HPA-1G1850	HYPA21003	2023/09/18	2024/09/17
Horn antenna	A-INFO	3117	246069	2022/03/11	2025/03/10
Pre-Amplifier	ZKJC	HPA-184057	HYPA21004	2023/09/18	2024/09/17

Horn antenna	ZKJC	3116C	246265	2022/03/29	2025/03/28
Test Software	Farad	EZ-EMC (Ver.FA-03A2 RE+)	N/A	N/A	N/A

7. RADIATED TEST RESULTS

LIMITS

Transmitter Unwanted Emissions In The Spurious Domain		
Frequency Range	Maximum Power Limit (E.R.P.(≤1 GHz) E.I.R.P.(> 1 GHz))	Bandwidth
30 MHz to 47 MHz	-36dBm	100 kHz
47 MHz to 74 MHz	-54dBm	100 kHz
74 MHz to 87.5 MHz	-36dBm	100 kHz
87.5 MHz to 118 MHz	-54dBm	100 kHz
118 MHz to 174 MHz	-36dBm	100 kHz
174 MHz to 230 MHz	-54dBm	100 kHz
230 MHz to 470 MHz	-36dBm	100 kHz
470 MHz to 862 MHz	-54dBm	100 kHz
862 MHz to 1 GHz	-36dBm	100 kHz
1 GHz ~ 5.15 GHz	-30dBm	1 MHz
5.35 GHz ~ 5.47 GHz	-30dBm	1 MHz
5.725 GHz ~ 26 GHz	-30dBm	1 MHz

Receiver Spurious Emissions		
Frequency Range	Maximum Power Limit (E.R.P.(≤1 GHz) E.I.R.P.(> 1 GHz))	Measurement Bandwidth
30 MHz ~ 1 GHz	-57dBm	100KHz
1 GHz ~ 12.75 GHz	-47dBm	1MHz

TEST PROCEDURE

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.5

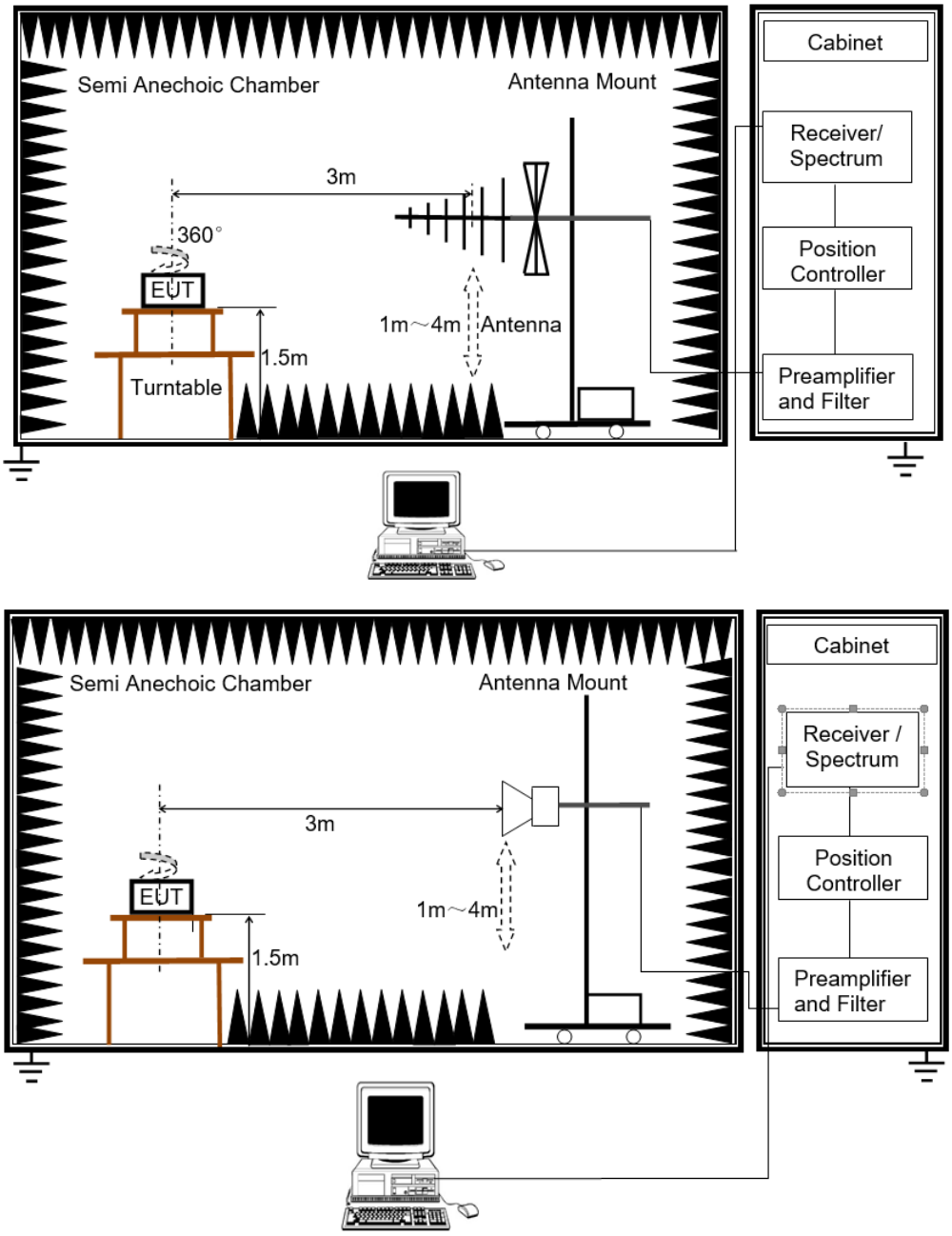
Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.7.2

The setting of the Receiver

RBW	100kHz(＜1GHz) / 1MHz(＞1GHz)
VBW	300 kHz(＜1GHz) / 3MHz(＞1GHz)

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.5.2

TEST SETUP



TEST ENVIRONMENT

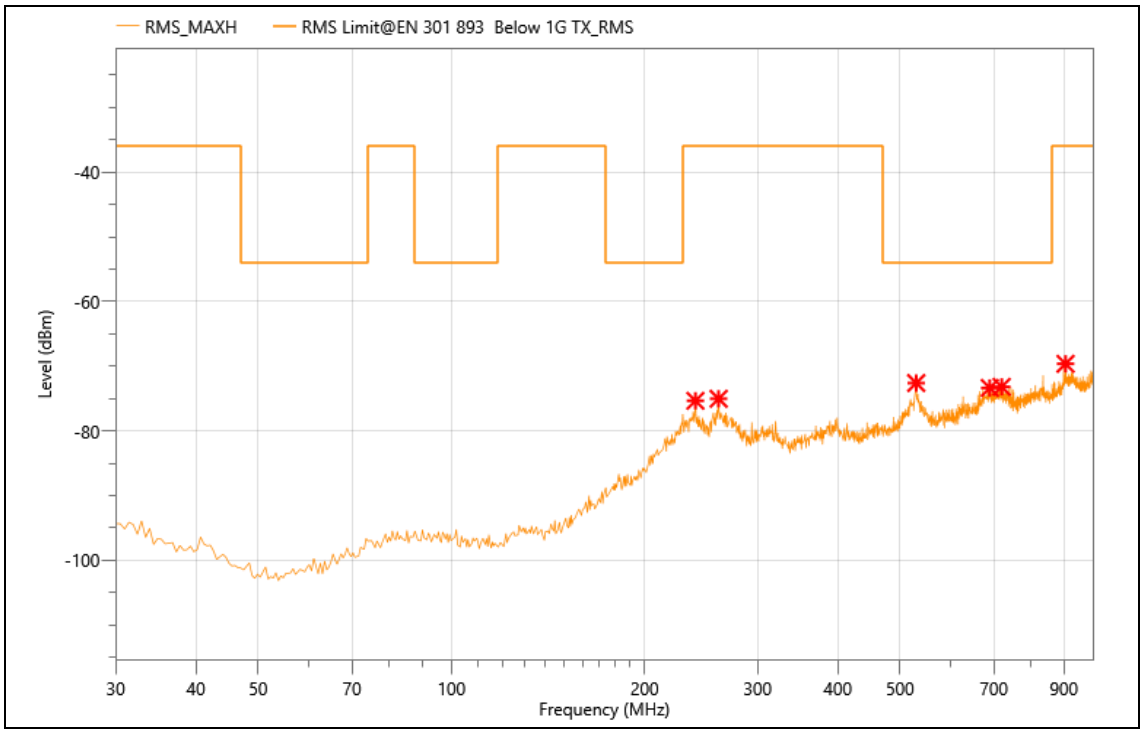
Temperature	23.6℃	Relative Humidity	53%
Atmosphere Pressure	101kPa		

TEST RESULTS

Undesirable radiated Spurious Emission below 1GHz (30MHz to 1GHz)

All modes have been tested and the worst result as bellow:

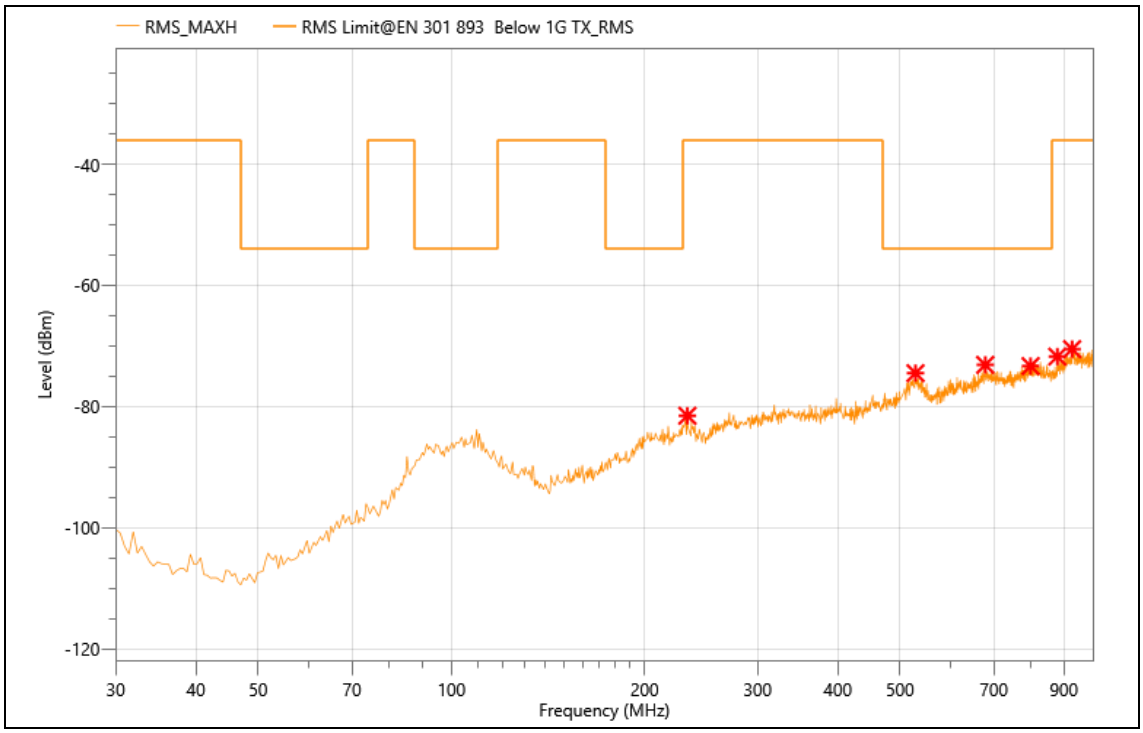
Mode:	A-5180
Power:	DC 5V
TE:	Berny
Date	2024/8/30
T/A/P	23.6□/53%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBm)	Limit (dBm)	Margin (dB)	Det.	Pol.
1	240.005	-76.12	0.78	-75.34	-36.00	39.34	RMS	H
2	260.860	-74.97	-0.06	-75.03	-36.00	39.03	RMS	H
3	530.035	-79.72	7.13	-72.59	-54.00	18.59	RMS	H
4	690.085	-80.99	7.64	-73.35	-54.00	19.35	RMS	H
5	720.155	-81.13	7.95	-73.18	-54.00	19.18	RMS	H
6	905.425	-79.84	10.22	-69.62	-36.00	33.62	RMS	H

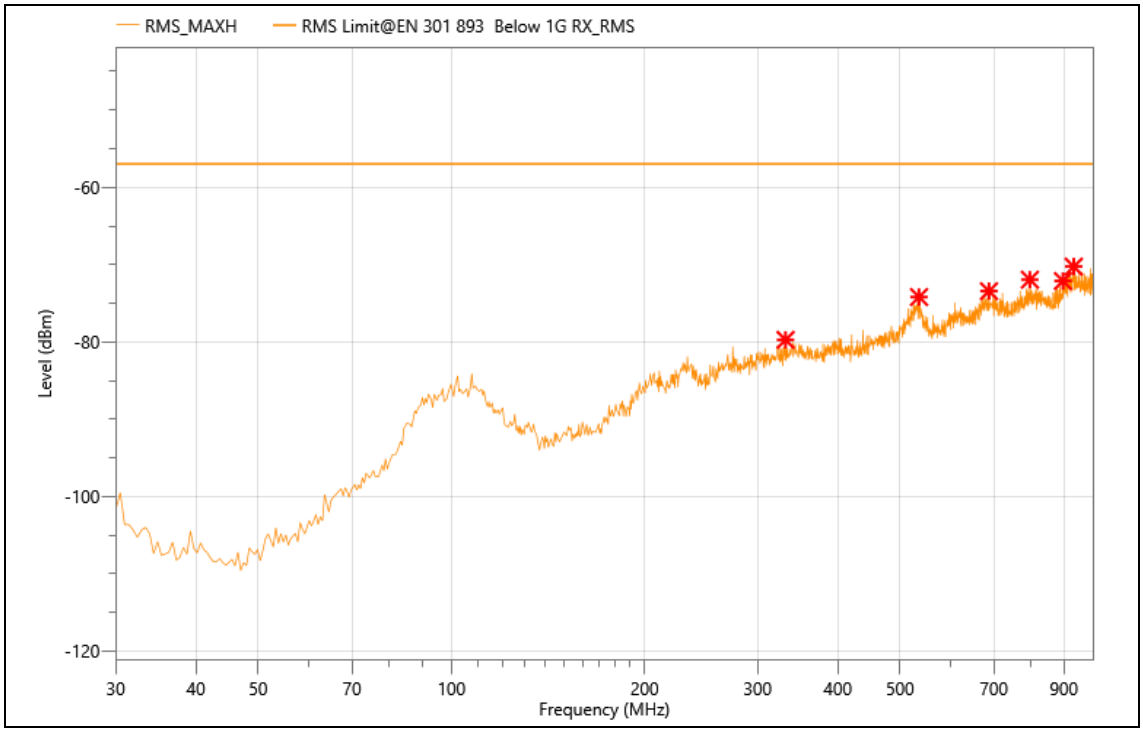
Mode:	A-5180
Power:	DC 5V
TE:	Berny
Date	2024/8/26
T/A/P	23.6□/53%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBm)	Limit (dBm)	Margin (dB)	Det.	Pol.
1	233.215	-77.96	-3.57	-81.53	-36.00	45.53	RMS	V
2	528.580	-80.77	6.28	-74.49	-54.00	20.49	RMS	V
3	678.930	-80.39	7.27	-73.12	-54.00	19.12	RMS	V
4	798.725	-81.71	8.39	-73.32	-54.00	19.32	RMS	V
5	879.235	-79.90	8.14	-71.76	-36.00	35.76	RMS	V
6	927.250	-81.04	10.51	-70.53	-36.00	34.53	RMS	V

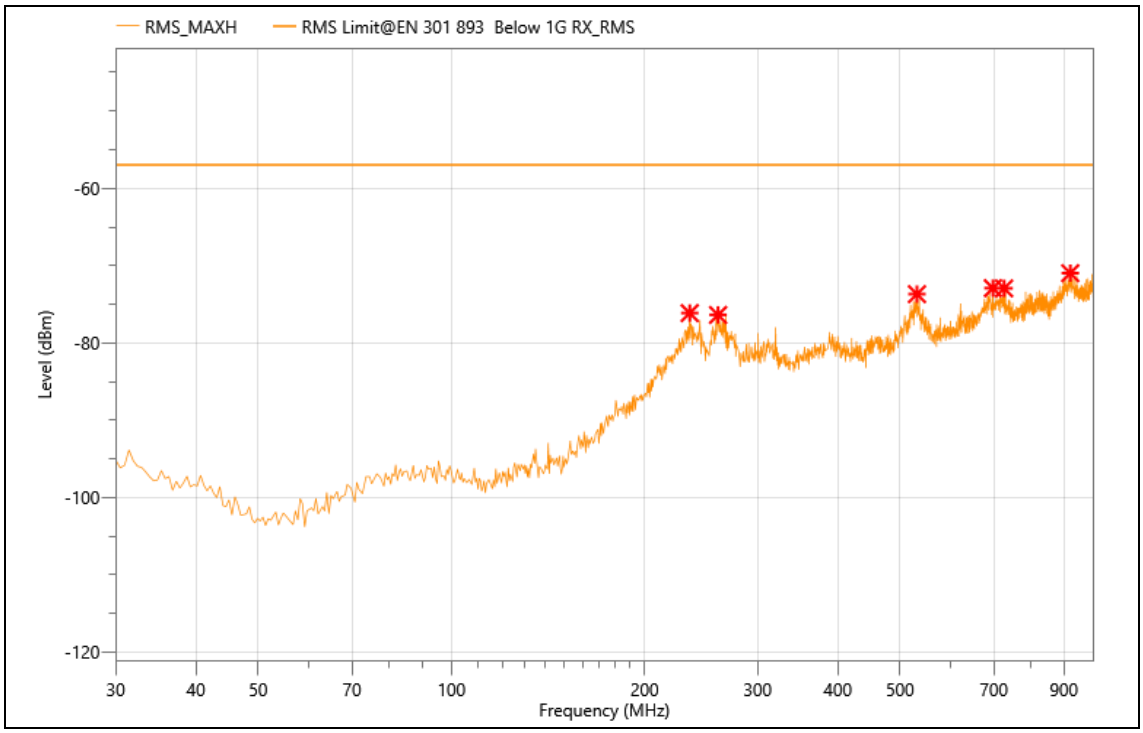
Mode:	A-5180
Power:	DC 5V
TE:	Berny
Date	2024/8/26
T/A/P	23.6□/53%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBm)	Limit (dBm)	Margin (dB)	Det.	Pol.
1	331.670	-80.36	0.63	-79.73	-57.00	22.73	RMS	V
2	535.370	-80.15	5.96	-74.19	-57.00	17.19	RMS	V
3	688.145	-80.76	7.33	-73.43	-57.00	16.43	RMS	V
4	796.785	-80.38	8.43	-71.95	-57.00	14.95	RMS	V
5	897.180	-81.28	9.16	-72.12	-57.00	15.12	RMS	V
6	932.585	-80.87	10.61	-70.26	-57.00	13.26	RMS	V

Mode:	A-5180
Power:	DC 5V
TE:	Berny
Date	2024/8/26
T/A/P	23.6□/53%/101Kpa



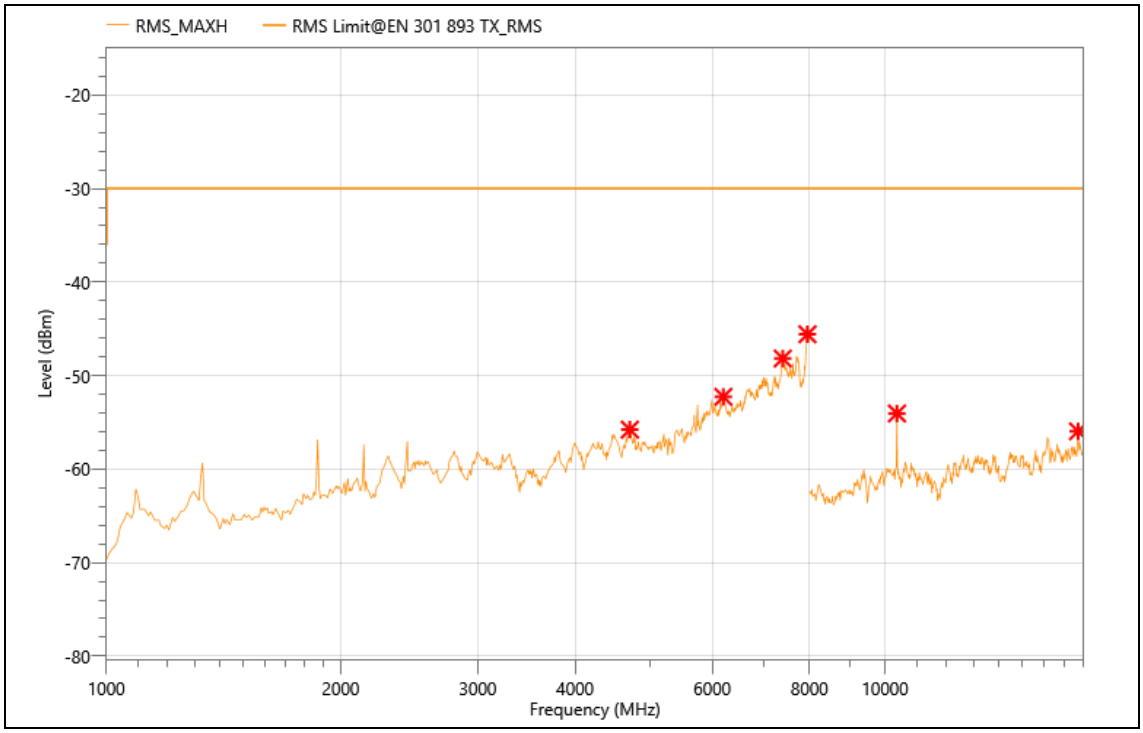
Critical_Freqs

No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBm)	Limit (dBm)	Margin (dB)	Det.	Pol.
1	235.155	-76.80	0.66	-76.14	-57.00	19.14	RMS	H
2	260.375	-76.39	0.01	-76.38	-57.00	19.38	RMS	H
3	531.490	-80.63	6.94	-73.69	-57.00	16.69	RMS	H
4	697.845	-80.50	7.59	-72.91	-57.00	15.91	RMS	H
5	726.460	-80.58	7.64	-72.94	-57.00	15.94	RMS	H
6	920.945	-81.50	10.53	-70.97	-57.00	13.97	RMS	H

Undesirable radiated Spurious Emission Above 1GHz (1GHz to 40GHz)

All modes have been tested and the worst result as bellow:

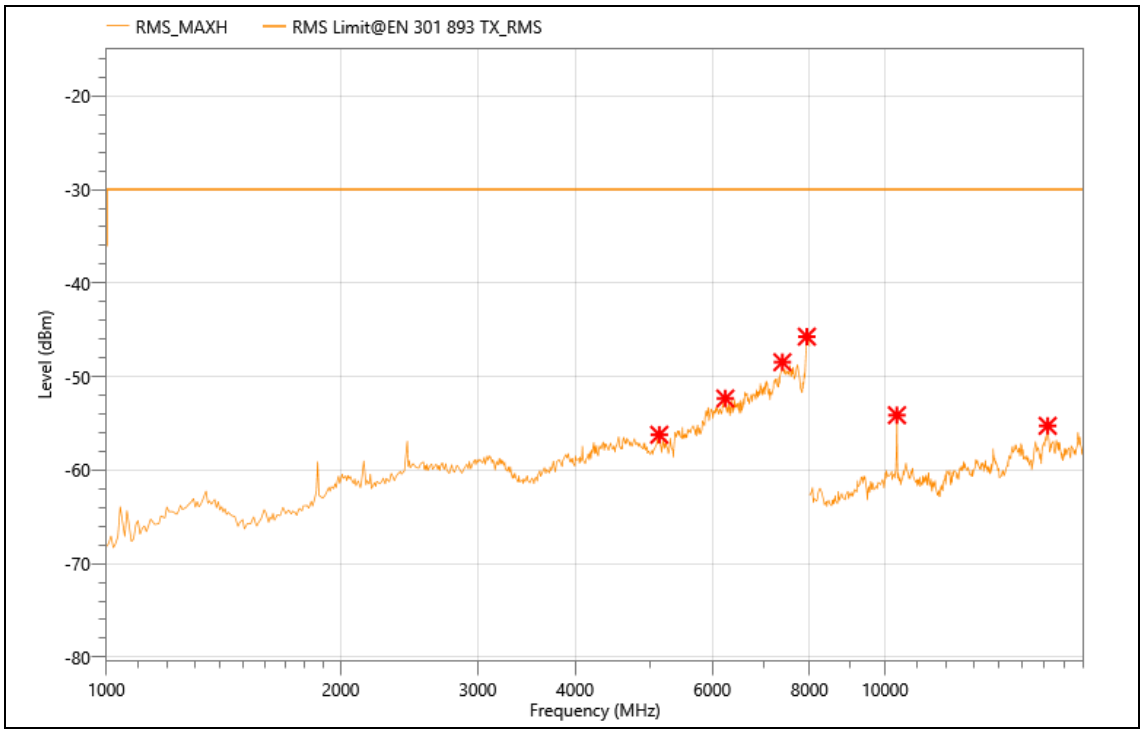
Mode:	A-5180
Power:	DC 5V
TE:	Berny
Date	2024/8/30
T/A/P	23.6℃/53%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBm)	Limit (dBm)	Margin (dB)	Det.	Pol.
1	4703.000	-64.81	9.03	-55.78	-30.00	25.78	RMS	V
2	6201.000	-66.16	13.89	-52.27	-30.00	22.27	RMS	V
3	7391.000	-72.60	24.43	-48.17	-30.00	18.17	RMS	V
4	7951.000	-75.54	29.96	-45.58	-30.00	15.58	RMS	V
5	10360.000	-62.18	8.13	-54.05	-30.00	24.05	RMS	V
6	17700.000	-69.50	13.54	-55.96	-30.00	25.96	RMS	V

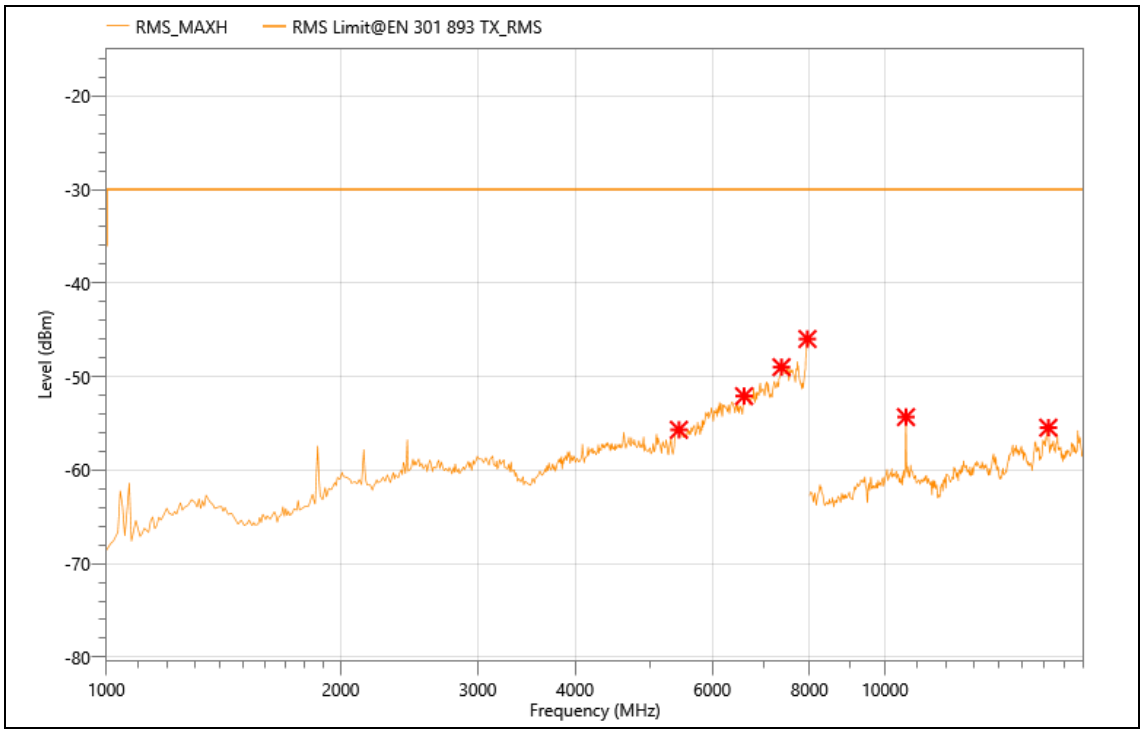
Mode:	A-5180
Power:	DC 5V
TE:	Berny
Date	2024/8/30
T/A/P	23.6℃/53%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBm)	Limit (dBm)	Margin (dB)	Det.	Pol.
1	5130.000	-65.50	9.28	-56.22	-30.00	26.22	RMS	H
2	6236.000	-66.37	14.03	-52.34	-30.00	22.34	RMS	H
3	7384.000	-72.71	24.25	-48.46	-30.00	18.46	RMS	H
4	7937.000	-75.20	29.47	-45.73	-30.00	15.73	RMS	H
5	10360.000	-61.96	7.83	-54.13	-30.00	24.13	RMS	H
6	16180.000	-70.63	15.36	-55.27	-30.00	25.27	RMS	H

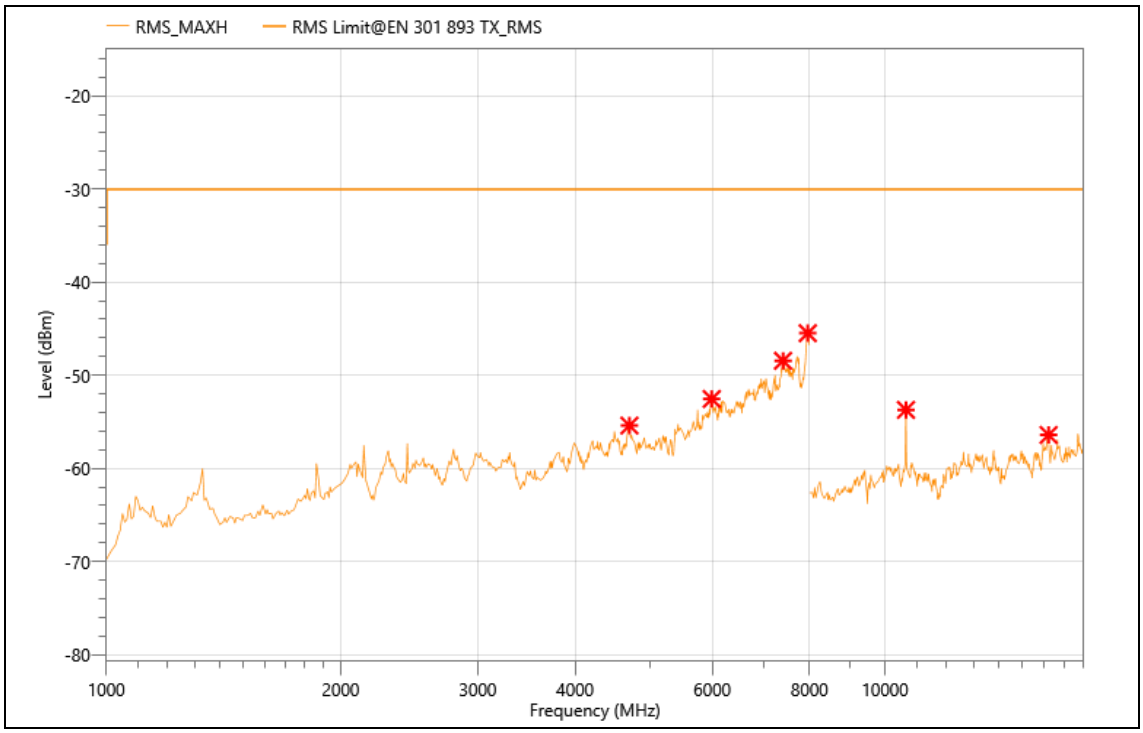
Mode:	A-5320
Power:	DC 5V
TE:	Berny
Date	2024/8/30
T/A/P	23.6℃/53%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBm)	Limit (dBm)	Margin (dB)	Det.	Pol.
1	5438.000	-65.68	9.99	-55.69	-30.00	25.69	RMS	H
2	6593.000	-69.53	17.44	-52.09	-30.00	22.09	RMS	H
3	7363.000	-72.65	23.66	-48.99	-30.00	18.99	RMS	H
4	7951.000	-75.71	29.73	-45.98	-30.00	15.98	RMS	H
5	10640.000	-63.71	9.38	-54.33	-30.00	24.33	RMS	H
6	16210.000	-70.28	14.82	-55.46	-30.00	25.46	RMS	H

Mode:	A-5320
Power:	DC 5V
TE:	Berny
Date	2024/8/30
T/A/P	23.6℃/53%/101Kpa



Critical_Freqs

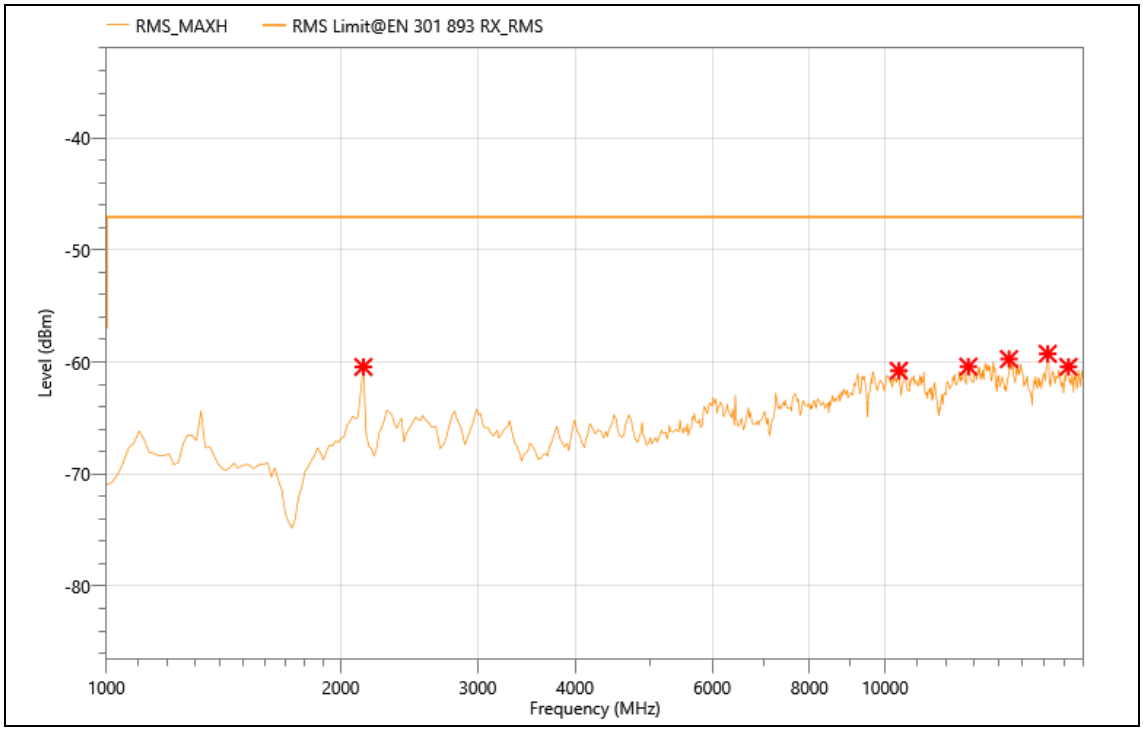
No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBm)	Limit (dBm)	Margin (dB)	Det.	Pol.
1	4696.000	-64.52	9.12	-55.40	-30.00	25.40	RMS	V
2	5991.000	-65.12	12.57	-52.55	-30.00	22.55	RMS	V
3	7398.000	-73.07	24.62	-48.45	-30.00	18.45	RMS	V
4	7958.000	-75.21	29.73	-45.48	-30.00	15.48	RMS	V
5	10640.000	-63.26	9.54	-53.72	-30.00	23.72	RMS	V
6	16220.000	-70.30	13.89	-56.41	-30.00	26.41	RMS	V

Mode:	A-5180
Power:	DC 5V
TE:	Berny
Date	2024/8/30
T/A/P	23.6℃/53%/101Kpa

Critical_Freqs

No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBm)	Limit (dBm)	Margin (dB)	Det.	Pol.
1	2139.000	-56.58	-5.2	-61.78	-47.00	14.78	RMS	H
2	10401.000	-68.43	7.53	-60.90	-47.00	13.90	RMS	H
3	12662.000	-70.54	10.07	-60.47	-47.00	13.47	RMS	H
4	14566.000	-71.84	12.76	-59.08	-47.00	12.08	RMS	H
5	16198.000	-73.87	15.32	-58.55	-47.00	11.55	RMS	H
6	17728.000	-74.14	14.89	-59.25	-47.00	12.25	RMS	H

Mode:	A-5180
Power:	DC 5V
TE:	Berny
Date	2024/8/30
T/A/P	23.6℃/53%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBm)	Limit (dBm)	Margin (dB)	Det.	Pol.
1	2139.000	-55.64	-4.8	-60.44	-47.00	13.44	RMS	V
2	10418.000	-68.62	7.84	-60.78	-47.00	13.78	RMS	V
3	12798.000	-71.16	10.75	-60.41	-47.00	13.41	RMS	V
4	14430.000	-70.98	11.24	-59.74	-47.00	12.74	RMS	V
5	16181.000	-74.17	14.9	-59.27	-47.00	12.27	RMS	V
6	17201.000	-73.29	12.86	-60.43	-47.00	13.43	RMS	V

Note: 1. All the modes had been tested, but only the worst data was recorded in the report.
2.For the radiation test from 18 GHz to 26 GHz, a pre-scan was performed, and the result was 20 dB lower than the limit line, the test data was not shown in the report.

8. TEST PROCEDURES AND RESULTS

8.1. NOMINAL CENTRE FREQUENCIES

LIMITS

CARRIER FREQUENCIES AND CHANNELIZATION	
Condition	Limit
Normal Conditions	f_c +/- 20 ppm
Extreme Conditions	f_c +/- 20 ppm

TEST PROCEDURE

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.2.2

Measurement	
☒Conducted measurement	☐Radiated measurement

1. Equipment operating without modulation

This test method requires that the UUT can be operated in an unmodulated test mode.

The UUT shall be connected to a frequency counter and operated in an unmodulated mode.

The result shallbe recorded.

2. Equipment operating with modulation

This method is an alternative to the above method in case the UUT cannot be operated in an un-modulated mode.

The UUT shall be connected to spectrum analyser.

The settings of the spectrum analyser shall be adjusted to optimize the instruments frequency accuracy.

Max Hold shall be selected and the centre frequency adjusted to that of the UUT.

The peak value of the power envelope shall be measured and noted. The span shall be reduced and the marker moved in a positive frequency increment until the upper, (relative to the centre frequency), -10 dBc point is reached. This value shall be noted as f1.

The marker shall then be moved in a negative frequency increment until the lower, (relative to the centre frequency), -10 dBc point is reached. This value shall be noted as f2.

The centre frequency is calculated as (f1 + f2) / 2.

TEST ENVIRONMENT

Temperature	22.6℃	Relative Humidity	51%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

8.2. NOMINAL CHANNEL BANDWIDTH AND OCCUPIED CHANNEL BANDWIDTH

LIMITS

NOMINAL CHANNEL BANDWIDTH AND OCCUPIED BANDWIDTH	
Condition	Limit
Nominal Channel Bandwidth	5 MHz
Occupied Bandwidth	80 % and 100 % of the declared Nominal Channel Bandwidth
During an established communication, a device is allowed to operate temporarily in a mode where its Occupied Channel Bandwidth may be reduced to as low as 40 % of its Nominal Channel Bandwidth with a minimum of 4 MHz	

TEST PROCEDURE

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.3.2

Measurement	
☒Conducted measurement	☐Radiated measurement

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Frequency Span	2 × Occupied Channel Bandwidth (e.g. 40 MHz for a 20 MHz channel)
Detector	RMS
RBW	100K
VBW	300K
Trace	Max hold
Detector Mode	RMS
Sweep time	> 1 s; for larger Nominal Bandwidths, the sweep time may be increased until a value where the sweep time has no impact on the RMS value of the signal

TEST ENVIRONMENT

Temperature	22.6℃	Relative Humidity	51%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

8.3. RF OUTPUT POWER

LIMITS

RF output power		
Frequency Range	Limit	
	With TPC	Without TPC
5150 to 5350	23	20/23 (See note 1)
5470 to 5725	30 (See note 2)	27 (See note 2)
Note 1	The applicable limit is 20dBm, except for transmissions whose nominal bandwidth falls completely within the band 5 150 MHz to 5 250 MHz, in which case the applicable limit is 23dBm.	
Note 2	Slave devices without a Radar Interference Detection function shall comply with the limits for the band 5 250 MHz to 5 350MHz.	

RF output power at the lowest power level of the TPC range	
Frequency Range	Limit
5150 to 5350	17
5470 to 5725	24 (See note 1)
Note	Slave devices without a Radar Interference Detection function shall comply with the limits for the band 5 250 MHz to 5 350MHz.

TEST PROCEDURE

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.4.2.1.1 and 5.4.4.2.1.2

Measurement	
☒Conducted measurement	☐Radiated measurement

JS0806-2 module is used for power measurement, and it supports High sampling rate greater than 1 M sample/s and measurement time of up to 32 s at 1 M sample/s. JS1120-3 software is used to control the power detector and the sampling unit.
For adaptive equipment, the measurement duration shall be long enough to ensure a minimum number of bursts (at least 10) are captured.

For equipment with continuous transmission capability or for equipment operating (or with the capability to operate) with a constant duty cycle (e.g. Frame Based equipment)
P_H /P_L (EIRP) = A + G + Y+ 10 × log (1 / x)
For equipment without continuous transmission capability and operating (or with the capability to operate) in only one sub-band
P_H /P_L (EIRP) = A + G + Y

For equipment without continuous transmission capability and having simultaneous transmissions in both sub-bands

1. Measuring the Total Peak Power within the lower sub-band
2. Measuring the Total Peak Power within the upper sub-band
3. Calculate the total peak power by adding the measured value for the band 5 150 MHz to 5350 MHz in step 1 to the value measured for the band 5 470 MHz to 5 725 MHz in step 2
4. Measuring Total Mean Output Power
5. Calculating the Peak to Mean Power Ratio
6. Calculating the RF Output Power (e.i.r.p.) for each sub-band

PH /PL (EIRP) = A + G + Y

Where,

EIRP is the effective isotropic radiated power in dBm

PH is RF output power at the highest power

PL is RF output power at the lowest power level of the TPC range

A is the highest of all Pburst values as measured by the test system in dBm

G is stated assembly antenna gain of the individual antenna in dBi

Y is any additional beam-forming gain

X is duty cycle of the transmitter (Tx on / (Tx on + Tx off)) shall be noted as x ($0 < x \leq 1$)

TEST ENVIRONMENT

Temperature	22.6℃	Relative Humidity	51%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

8.4. POWER DENSITY

LIMITS

Power Density at The Highest Power Level		
Frequency Range	Limit	
	With TPC	Without TPC
5150 to 5350	10	7/10 (See note 1)
5470 to 5725	17 (See note 2)	14 (See note 2)
Note 1	The applicable limit is 7dBm/MHz, except for transmissions whose nominal bandwidth falls completely within the band 5 150 MHz to 5 250 MHz, in which case the applicable limit is 10dBm/MHz	
Note 2	Slave devices without a Radar Interference Detection function shall comply with the limits for the band 5 250 MHz to 5 350MHz	

TEST PROCEDURE

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.4.2.1.3

JS1120-3 software is used to control the spectrum analyzer to use the following settings:

For equipment with continuous transmission capability or for equipment operating (or with the capability to operate) with a constant duty cycle (e.g. Frame Based equipment):

Centre Frequency	The centre frequency of the channel under test
Frequency Span	2 × Nominal Bandwidth (e.g. 40 MHz for a 20 MHz channel)
Detector	Peak
Sweep Time	1 minute
RBW	1MHz
VBW	3MHz
Trace Mode	Max Hold

PD = D + G + Y + 10 × log (1 / x)

D is power density at the highest power level in dBm/MHz

G is stated assembly antenna gain of the individual antenna in dBi

Y is any additional beam-forming gain

X is duty cycle of the transmitter (Tx on / (Tx on + Tx off)) shall be noted as x ($0 < x \leq 1$)

For equipment without continuous transmission capability and without the capability to transmit with a constant duty cycle:

Start Frequency	lower band edge of applicable sub-band (e.g. 5150 MHz or 5470 MHz)
Stop Frequency	upper band edge of applicable sub-band (e.g. 5350 MHz or 5725 MHz)
Detector	Peak

Sweep Time	30s
RBW	10KHz
VBW	30KHz
Trace Mode	Max Hold
Sweep Points	> 20 000 (for 5 150 MHz to 5 350 MHz) > 25 500 (for 5 470 MHz to 5 725 MHz)

JS1120-3 software acquires the trace data and calculate the Spectral Density in 1MHz.

Measurement	
☒Conducted measurement	☐Radiated measurement

TEST ENVIRONMENT

Temperature	22.6℃	Relative Humidity	51%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

8.5. TRANSMITTER UNWANTED EMISSIONS OUTSIDE THE 5 GHZ RLAN BANDS

LIMITS

Transmitter Unwanted Emissions In The Spurious Domain		
Frequency Range	Maximum Power Limit (E.R.P.(≤1 GHz) E.I.R.P.(> 1 GHz))	Bandwidth
30 MHz to 47 MHz	-36dBm	100 kHz
47 MHz to 74 MHz	-54dBm	100 kHz
74 MHz to 87.5 MHz	-36dBm	100 kHz
87.5 MHz to 118 MHz	-54dBm	100 kHz
118 MHz to 174 MHz	-36dBm	100 kHz
174 MHz to 230 MHz	-54dBm	100 kHz
230 MHz to 470 MHz	-36dBm	100 kHz
470 MHz to 862 MHz	-54dBm	100 kHz
862 MHz to 1 GHz	-36dBm	100 kHz
1 GHz ~ 5.15 GHz	-30dBm	1 MHz
5.35 GHz ~ 5.47 GHz	-30dBm	1 MHz
5.725 GHz ~ 26 GHz	-30dBm	1 MHz

TEST PROCEDURE

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.5

Measurement	
☒Conducted measurement	☐Radiated measurement

The setting of the Receiver

RBW	100kHz(＜1GHz) / 1MHz(＞1GHz)
VBW	300 kHz(＜1GHz) / 3MHz(＞1GHz)

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.5.2

TEST ENVIRONMENT

Temperature	22.6℃	Relative Humidity	51%
Atmosphere Pressure	101kPa		

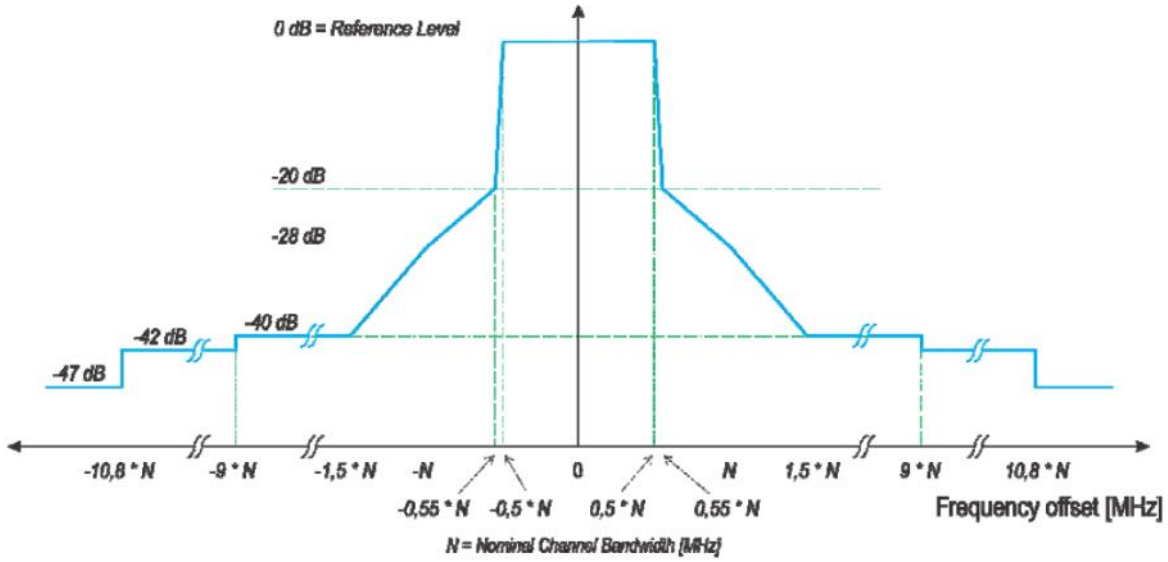
TEST RESULTS

Please refer to section "Test Data" - Appendix A

8.6. TRANSMITTER UNWANTED EMISSIONS WITHIN THE 5 GHZ RLAN BANDS

LIMITS

ETSI EN 301 893 Clause 4.2.4.2.2, Figure 1



NOTE: dBc is the spectral density relative to the maximum spectral power density of the transmitted signal.

Figure 1: Transmit spectral power mask

TEST PROCEDURE

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.6

Measurement	
☒Conducted measurement	☐Radiated measurement

Connect the UUT to the spectrum analyser and use the following settings:

Centre Frequency	Centre frequency of the channel being tested
Span	2 × Nominal Channel Bandwidth
Filter Mode	Channel Filter
Trace Mode	Video Average
Sweep Time	Coupled
Detector	Peak
Sweep Point / Sweep Mode	5000 / Continuous
RBW / VBW	1MHz / 30KHz

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.6.2

TEST ENVIRONMENT

Temperature	22.6℃	Relative Humidity	51%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

8.7. RECEIVER SPURIOUS EMISSIONS

LIMITS

Receiver Spurious Emissions		
Frequency Range	Maximum Power Limit (E.R.P.(≤1 GHz) E.I.R.P.(> 1 GHz))	Measurement Bandwidth
30 MHz ~ 1 GHz	-57dBm	100KHz
1 GHz ~ 12.75 GHz	-47dBm	1MHz

TEST PROCEDURE

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.7

Measurement	
☒Conducted measurement	☐Radiated measurement

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.7.2
Please refer to clause 6.9 TRANSMITTER UNWANTED EMISSIONS OUTSIDE THE 5 GHZ RLAN BANDS TEST SETUP and TEST PROCEDURE

TEST ENVIRONMENT

Temperature	22.6℃	Relative Humidity	51%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

8.8. DYNAMIC FREQUENCY SELECTION (SLAVE)

LIMITS

Applicability of DFS requirements			
Requirement	DFS Operational mode		
	☐ Master	☒ Slave without radar detection (See Note 2)	☐ Slave with radar detection (See Note 2)
Channel Availability Check (CAC)	Required	Not required	Required (See Note 3)
Off-Channel CAC (see note 1)	Required	Not required	Required (See Note 3)
In-Service Monitoring	Required	Not required	Required
Channel Shutdown	Required	Required	Required
Non-Occupancy Period	Required	Not required	Required
Uniform Spreading	Required	Not required	Not required
Note 1	Where implemented by the manufacturer.		
Note 2	A slave with radar detection is not required to perform a CAC or Off-Channel CAC at initial use of the channel but only after the slave has detected a radar signal on the Operating Channel by In-Service Monitoring.		

Channel Availability Check

The Channel Availability Check shall be performed during a continuous period in time (Channel Availability Check Time) which shall not be less than the value defined in table D.1.
During the Channel Availability Check, the RLAN device shall be capable of detecting any of the radar test signals that fall within the ranges given by table D.4 with a level above the Radar Detection Threshold Level defined in table D.2.
The RLAN device shall comply with the minimum detection probability as defined in table D.5.

In-Service Monitoring

The In-Service Monitoring shall be used to monitor each Operating Channel.
The In-Service-Monitoring shall start immediately after the RLAN device has started transmissions on a channel.
During the In-Service Monitoring, the RLAN device shall be capable of detecting any of the radar test signals that fall within the ranges given by table D.4 with a level above the Radar Detection Threshold Level defined in table D.2.
The RLAN device shall comply with the minimum detection probability associated with a given radar test signal as defined in table D.5.

Off-Channel CAC (Off-Channel Channel Availability Check)

Where implemented, the Off-Channel CAC Time shall be declared by the manufacturer. However, the declared Off-Channel CAC Time shall be within the range specified in table D.1.
During the Off-Channel CAC, the RLAN device shall be capable of detecting any of the radar test signals that fall within the ranges given by table D.4 with a level above the Radar Detection Threshold Level defined in table D.2.
The RLAN device shall comply with the minimum detection probability as defined in table D.5.

Channel Shutdown

The Channel Move Time shall not exceed the limit defined in table D.1.
The Channel Closing Transmission Time shall not exceed the limit defined in table D.1.

Non-Occupancy Period

The Non-Occupancy Period shall not be less than the value defined in table D.1.

Uniform Spreading

Each of the declared Channel Plans (see clause 3.1) shall make use of at least 60 % of the spectrum available in the
applicable sub-band(s).
The Uniform Spreading is limited to the usable channels being declared as part of the channel plan.
Usable channels do not include channels which are precluded by either:
1) the intended outdoor usage of the RLAN; or
2) previous detection of a radar on the channel (Unavailable Channel or Unusable Channel); or
3) national regulations; or
4) the restriction to only operate in the band 5 150 MHz to 5 250 MHz for RLAN devices without a radar detection capability.
Each of the Usable Channels shall be used with approximately equal probability. RLAN equipment for which the declared channel plan includes channels whose nominal bandwidth falls completely or partly within the band 5 600 MHz to 5 650 MHz may omit these channels from the list of Usable Channels at initial power up or at initial installation. Channels being used by other RLAN equipment may be omitted from the list of Usable Channels.

Table D.1: DFS requirement values

Parameter	Value
Channel Availability Check Time	60 s (see note 1)
Minimum Off-Channel CAC Time	6 minutes (see note 2)
Maximum Off-Channel CAC Time	4 hours (see note 2)
Channel Move Time	10 s
Channel Closing Transmission Time	1 s
Non-Occupancy Period	30 minutes
NOTE 1: For channels whose nominal bandwidth falls completely or partly within the band 5 600 MHz to 5 650 MHz, the *Channel Availability Check Time* shall be 10 minutes. NOTE 2: For channels whose nominal bandwidth falls completely or partly within the band 5 600 MHz to 5 650 MHz, the *Off-Channel CAC Time* shall be within the range 1 hour to 24 hours.	

Table D.2: Radar Detection Threshold Levels

e.i.r.p. Spectral Density (dBm/MHz)	Value (see note 1 and note 2)
10	-62 dBm

NOTE 1: This is the level at the input of the receiver of an RLAN device with a maximum e.i.r.p. density of 10 dBm/MHz and assuming a 0 dBi receive antenna. For devices employing different e.i.r.p. spectral density and/or a different receive antenna gain G (dBi) the Radar Detection Threshold Level at the receiver input follows the following relationship:
DFS Detection Threshold (dBm) = -62 + 10 - e.i.r.p. Spectral Density (dBm/MHz) + G (dBi); however the Radar Detection Threshold Level shall not be less than -64 dBm assuming a 0 dBi receive antenna gain.

NOTE 2: Slave devices with a maximum e.i.r.p. of less than 23 dBm do not have to implement radar detection unless these devices are used in fixed outdoor point to point or fixed outdoor point to multipoint applications (see clause 4.2.6.1.3).

Table D.3: Parameters of the reference DFS test signal

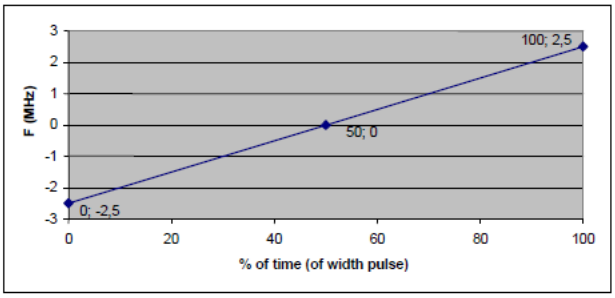
Pulse width W (µs)	Pulse repetition frequency PRF (PPS)	Pulses per burst (PPB)
1	700	18

Table D.4: Parameters of radar test signals

Radar test signal # (see note 1 to note 3)	Pulse width W (µs)		Pulse repetition frequency PRF (PPS)		Number of different PRFs	Pulses per burst for each PRF (PPB) (see note 5)
	Min	Max	Min	Max		
1	0,5	5	200	1 000	1	10 (see note 6)
2	0,5	15	200	1 600	1	15 (see note 6)
3	0,5	15	2 300	4 000	1	25
4	20	30	2 000	4 000	1	20
5	0,5	2	300	400	2/3	10 (see note 6)
6	0,5	2	400	1 200	2/3	15 (see note 6)

NOTE 1: Radar test signals #1 to #4 are constant PRF based signals. See figure D.1. These radar test signals are intended to simulate also radars using a packet based Staggered PRF. See figure D.2.

NOTE 2: Radar test signal #4 is a modulated radar test signal. The modulation to be used is a chirp modulation with a ±2,5 MHz frequency deviation which is described below.



NOTE 3: Radar test signals #5 and #6 are single pulse based Staggered PRF radar test signals using 2 or 3 different PRF values. For radar test signal #5, the difference between the PRF values chosen shall be between 20 PPS and 50 PPS. For radar test signal #6, the difference between the PRF values chosen shall be between 80 PPS and 400 PPS. See figure D.3.

NOTE 4: Apart for the Off-Channel CAC testing, the radar test signals above shall only contain a single burst of pulses. See figure D.1, figure D.3 and figure D.4.
For the Off-Channel CAC testing, repetitive bursts shall be used for the total duration of the test. See figure D.2 and figure D.5. See also clause 4.2.6.2.3, clause 5.4.8.2.1.4.2 and clause 5.4.8.2.1.4.3.

NOTE 5: The total number of pulses in a burst is equal to the number of pulses for a single PRF multiplied by the number of different PRFs used.

NOTE 6: For the CAC and Off-Channel CAC requirements, the minimum number of pulses (for each PRF) for any of the radar test signals to be detected in the band 5 600 MHz to 5 650 MHz shall be 18.

Table D.5: Detection probability

Parameter	Detection Probability (P_d)	
	Channels whose nominal bandwidth falls partly or completely within the 5 600 MHz to 5 650 MHz band	Other channels
CAC, Off-Channel CAC	99,99 %	60 %
In-Service Monitoring	60 %	60 %
NOTE: P_d gives the probability of detection per simulated radar burst and represents a minimum level of detection performance under defined conditions. Therefore P_d does not represent the overall detection probability for any particular radar under real life conditions.		

TEST PROCEDURE

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.8.2

Measurement	
☒Conducted measurement	☐Radiated measurement

Channel Availability Check (CAC)

Tests with a radar burst at the beginning of the Channel Availability Check Time

The steps below define the procedure to verify the radar detection capability on the selected channel Chr when a radar burst occurs at the beginning of the Channel Availability Check Time:
a) The signal generator and UUT are connected using Set-up A as described in clause 5.4.8.1.3.1. The power of the UUT is switched off.
b) The UUT is powered on at T0. T1 denotes the instant when the UUT has completed its power-up sequence (Tpower_up) and is ready to start the radar detection. The Channel Availability Check is expected to commence on Chr at instant T1 and is expected to end no sooner than T1 + Tch_avail_check unless the radar test signal is detected sooner.
Additional verification may be needed to define T1 in case it is not exactly known or indicated by the UUT.
c) A single radar burst is generated on Chr using the reference test signal defined in table D.3 at a level of up to 10 dB above the level defined in clause 5.4.8.2.1.1. This single-burst radar test signal shall commence within 2 s after time T1.
d) It shall be recorded if the radar test signal was detected.
e) A timing trace or description of the observed timing and behaviour of the UUT shall be recorded.

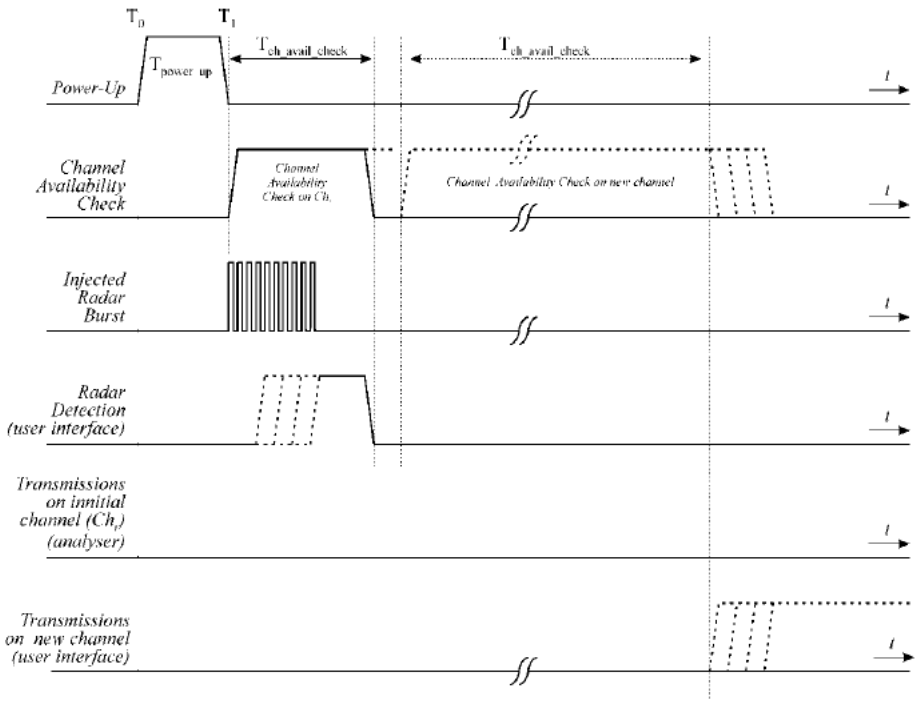


Figure 8: Example of timing for radar testing at the beginning of the Channel Availability Check Time

Tests with radar burst at the end of the Channel Availability Check Time

The steps below define the procedure to verify the radar detection capability on the selected channel Chr when a radar burst occurs at the end of the Channel Availability Check Time (see note). This is illustrated in figure 9.
NOTE: The applicable Channel Availability Check Times are given by table D.1.
a) The signal generator and UUT are connected using Set-up A described in clause 5.4.8.1.3.1. The power of the UUT is switched off.
b) The UUT is powered up at T0. T1 denotes the instant when the UUT has completed its power-up sequence (Tpower_up) and is ready to start the radar detection. The Channel Availability Check is expected to commence
on Chr at instant T1 and is expected to end no sooner than T1 + Tch_avail_check unless the radar test signal is detected sooner.
Additional verification may be needed to define T1 in case it is not exactly known or indicated by the UUT.
c) A single radar burst is generated on Chr using the reference test signal defined in table D.3 at a level of up to 10 dB above the level defined in clause 5.4.8.2.1.1. This single-burst radar test signal shall commence towards
the end of the minimum required Channel Availability Check Time but not before time
T1 + Tch_avail_check - 2 s.
d) It shall be recorded if the radar test signal was detected.
e) A timing trace or description of the observed timing and behaviour of the UUT shall be recorded.

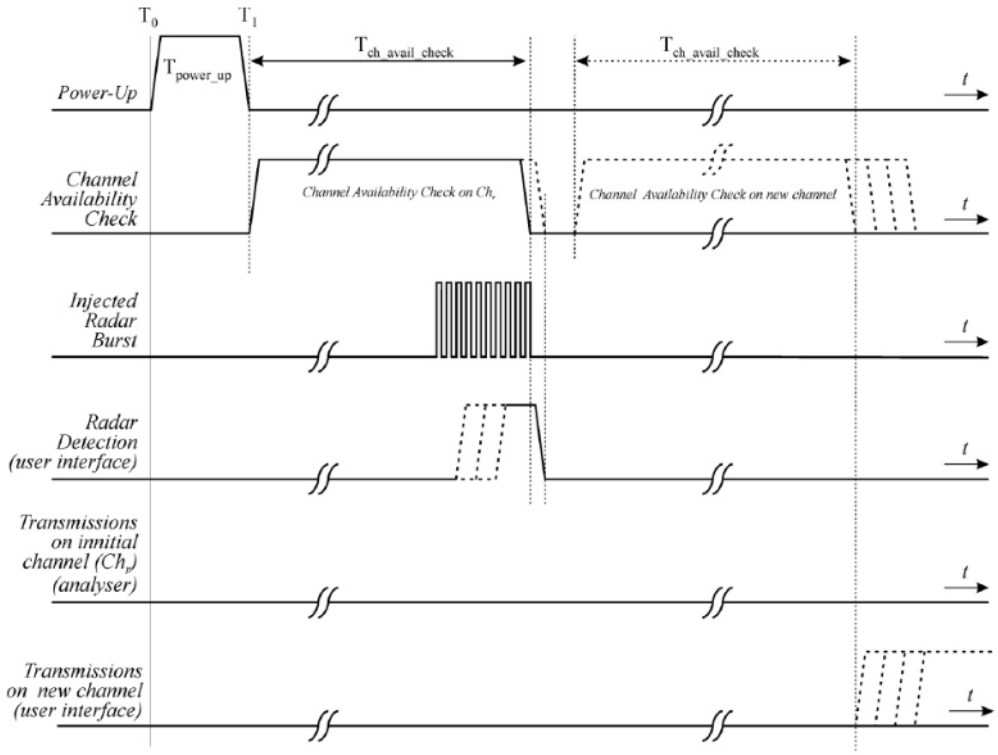


Figure 9: Example of timing for radar testing towards the end of the Channel Availability Check Time

Radar Detection Threshold (during the Channel Availability Check)

a) The signal generator, the UUT (master device) and a slave device associated with the UUT, are connected using Set-up A described in clause 5.4.8.1.3.1.
b) The UUT shall transmit a test transmission sequence in accordance with clause 5.3.1.2 on (all) the Operating Channel(s).
c) A multi burst radar test signal is generated on Chr using any of the radar test signals defined in table D.4 at a level defined in clause 5.4.8.2.1.1. The radar test signal used shall be recorded in the report. This multi burst radar test signal shall commence at T3 and shall continue for the total duration of the Off-Channel CAC Time
(TOff-Channel_CAC) as declared by the manufacturer in accordance with table D.1. For channels within the 5 600 MHz to 5 650 MHz band test signals #3 and #4 shall not be used and the Burst Interval Time (BIT) during the test shall be varied between 8 min and 10 min. For channels outside this band, the Burst Interval Time (BIT) during the test shall be varied between 45 s and 60 s.
d) The UUT shall detect the radar test signal before the end of the Off-Channel CAC Time and this shall be recorded.
For the purpose of reducing test time, the test may be terminated immediately once the UUT has reported detection of the radar test signal.

In-Service Monitoring

The steps below define the procedure to verify the In-Service Monitoring and the Radar Detection Threshold Level during the In-Service Monitoring.
The channel, on which the In-Service Monitoring test will be performed, shall be selected in accordance with clause 5.3.2. This channel, designated as Chr, is an Operating Channel.

a) When the UUT is a master device, a slave device will be used that associates with the UUT. The signal generator and the UUT are connected using Set-up A described in clause 5.4.8.1.3.1. When the UUT is a slave device with a Radar Interference Detection function, the UUT shall associate with a master device. The signal generator and the UUT are connected using Set-up C described in clause 5.4.8.1.3.3.
b) The UUT shall transmit a test transmission sequence in accordance with clause 5.3.1.2 on the selected channel Chr. While the testing is performed on Chr, the equipment is allowed to have simultaneous transmissions on other adjacent or non-adjacent Operating Channels.
c) At a certain time T0, a single burst radar test signal is generated on Chr using radar test signal #1 defined in table D.4 and at a level defined in clause 5.4.8.2.1.1. T1 denotes the end of the radar burst.
d) It shall be recorded if the radar test signal was detected.
e) Step b) to step d) shall be performed 20 times, each time a random value shall be chosen for pulse width and pulse repetition frequency from the corresponding ranges provided in table D.4. For radar test signal #5 and radar test signal #6 provided in table D.4 the number of PRF values shall vary between 2 or 3. The radar test signal shall be detected at least 12 times out of the 20 trials in order to comply with the detection probability specified in table D.5.
f) Step b) to step e) shall be repeated for each of the radar test signals defined in table D.4 and as described in clause 5.4.8.1.2.
Figure 12 provides an example of the timing of a UUT when radar signals are detected during the In-Service Monitoring.

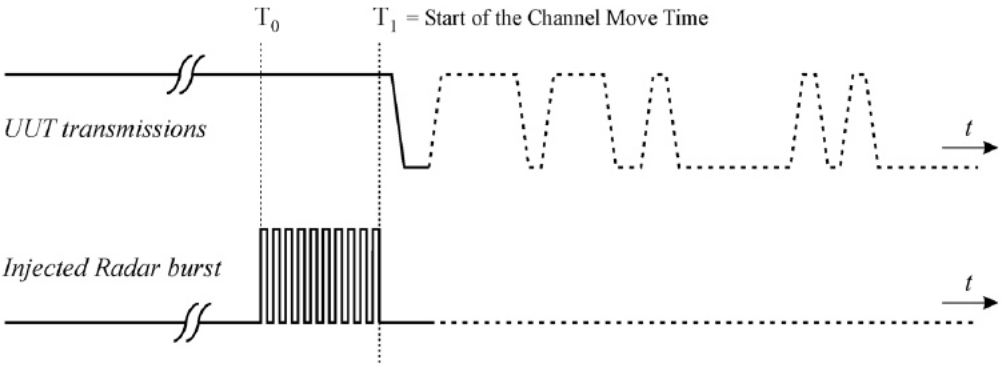


Figure 12: Example of timing for radar testing during In-Service Monitoring

Channel Shutdown and Non-Occupancy Period

The steps below define the procedure to verify the Channel Shutdown process and to determine the Channel Closing Transmission Time, the Channel Move Time and the Non-Occupancy Period. This is illustrated in figure 13.
The channel, on which these tests will be performed, shall be selected in accordance with clause 5.3.2. This channel, designated as Chr, is an Operating Channel.

a) When the UUT is a master device, a slave device will be used that associates with the UUT. The signal generator and the UUT shall be connected using Set-up A described in clause 5.4.8.1.3.1.
When the UUT is a slave device (with or without a Radar Interference Detection function), the UUT shall associate with a master device. The signal generator and the UUT shall be connected using Set-up B described in clause 5.4.8.1.3.2.
In both cases, it is assumed that the channel selection mechanism for the Uniform Spreading requirement is disabled in the master.
b) The UUT shall transmit a test transmission sequence in accordance with clause 5.3.1.2 on the selected channel Chr. While the testing is performed on Chr, the equipment is allowed to have simultaneous transmissions on other adjacent or non-adjacent Operating Channels.
c) At a certain time T0, a single burst test signal is generated on Chr using the reference DFS test signal defined in table D.3 and at a level of up to 10 dB above the level defined in clause 5.4.8.2.1.1 on the selected channel.
T1 denotes the end of the radar burst.
d) The transmissions of the UUT following instant T1 on the selected channel Chr shall be observed for a period greater than or equal to the Channel Move Time defined in table D.1. The aggregate duration (Channel Closing Transmission Time) of all transmissions from the UUT on Chr during the Channel Move Time shall be compared to the limit defined in table D.1. For equipment capable of having simultaneous transmissions on multiple (adjacent or non-adjacent) Operating Channels, the equipment is allowed to continue transmissions on other Operating Channels (different from Chr).
The aggregate duration of all transmissions of the UUT does not include quiet periods in between transmissions of the UUT.
e) T2 denotes the instant when the UUT has ceased all transmissions on the channel Chr. The time difference between T1 and T2 shall be measured. This value (Channel Move Time) shall be noted and compared with the limit defined in table D.1.
f) Following instant T2, the selected channel Chr shall be observed for a period equal to the Non-Occupancy Period (T3-T2) to verify that the UUT does not resume any transmissions on this channel.

g) When the UUT is a slave device with a Radar Interference Detection function step b) to step f) shall be repeated with the generator connected to the UUT using Set-up C as described in clause 5.4.8.1.3.3. See also note 2 in table D.2.

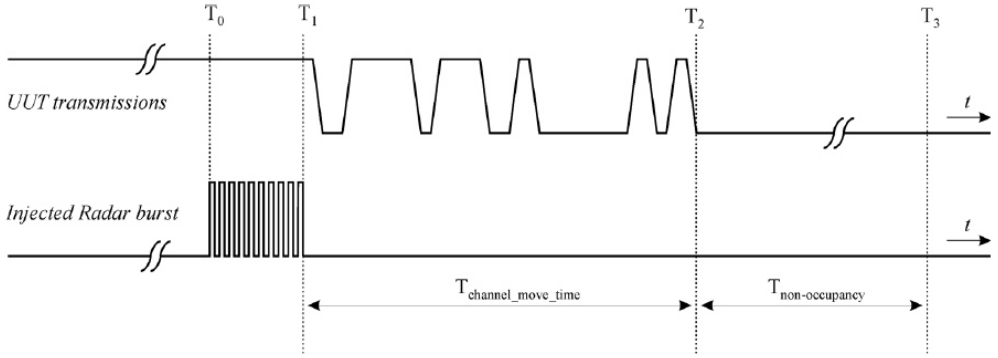


Figure 13: Channel Closing Transmission Time, Channel Move Time and Non-Occupancy Period

TEST ENVIRONMENT

Temperature	22.6℃	Relative Humidity	51%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

8.9. ADAPTIVITY (CHANNEL ACCESS MECHANISM)

LIMITS

Measurement	
☐Frame Based Equipment (FBE)	☒Load Based Equipment (LBE)
☒Supervising Devices	☒Supervised Devices

Table 8: Priority Class dependent Channel Access parameters for *Supervised Devices*

Class #	p_0	CW_{min}	CW_{max}	Maximum Channel Occupancy Time (COT)
4	2	3	7	2 ms
3	2	7	15	4 ms
2	3	15	1 023	6 ms (see note 1)
1	7	15	1 023	6 ms (see note 1)

NOTE 1: The maximum *Channel Occupancy Time* (COT) of 6 ms may be increased to 8 ms by inserting one or more pauses. The minimum duration of a pause shall be 100 µs. The maximum duration (Channel Occupancy) before including any such pause shall be 6 ms. Pause duration is not included in the channel occupancy time.
NOTE 2: The values for p_0, CW_{min}, CW_{max} are minimum values. Greater values are allowed.

Table 7: Priority Class dependent Channel Access parameters for *Supervising Devices*

Class #	p_0	CW_{min}	CW_{max}	Maximum Channel Occupancy Time (COT)
4	1	3	7	2 ms
3	1	7	15	4 ms
2	3	15	63	6 ms (see note 1 and note 2)
1	7	15	1 023	6 ms (see note 1)

NOTE 1: The maximum *Channel Occupancy Time* (COT) of 6 ms may be increased to 8 ms by inserting one or more pauses. The minimum duration of a pause shall be 100 µs. The maximum duration (Channel Occupancy) before including any such pause shall be 6 ms. Pause duration is not included in the channel occupancy time.
NOTE 2: The maximum Channel Occupancy Time (COT) of 6 ms may be increased to 10 ms by extending CW to CW × 2 + 1 when selecting the random number q for any backoff(s) that precede the Channel Occupancy that may exceed 6 ms or which follow the Channel Occupancy that exceeded 6 ms. The choice between preceding or following a Channel Occupancy shall remain unchanged during the operation time of the device.
NOTE 3: The values for p_0, CW_{min}, CW_{max} are minimum values. Greater values are allowed.

The use of Short Control Signalling Transmissions is constrained as follows:

- within an observation period of 50 ms, the number of *Short Control Signalling Transmissions* by the equipment shall be equal to or less than 50; and
- the total duration of the equipment's *Short Control Signalling Transmissions* shall be less than 2 500 µs within said observation period.

ED Threshold Level (Energy Detection Threshold Level)
Equipment shall consider a channel to be occupied as long as other RLAN transmissions are detected at a level greater than the ED Threshold Level (TL). The ED Threshold Level (TL) is

integrated over the total Nominal Channel Bandwidth of all Operating Channels used by the equipment.

The ED Threshold level (TL) depends on the type of equipment:
Option 1: For equipment that for its operation in the 5 GHz bands is conforming to IEEE 802.11™-2016 [9], clause 17, clause 19 or clause 21, or any combination of these clauses, the ED Threshold Level (TL) is independent of the equipment's maximum transmit power (PH).
Assuming a 0 dBi receive antenna the ED Threshold Level (TL) shall be:
TL = -75 dBm/MHz

Option 2: For equipment conforming to one or more of the clauses listed in Option 1, and to at least one other operating mode, and for equipment conforming to none of the clauses listed in Option 1, the ED Threshold Level (TL) shall be proportional to the equipment's maximum transmit power (PH).
Assuming a 0 dBi receive antenna the ED Threshold Level (TL) shall be:

For PH
≤ 13 dBm: TL = -75 dBm/MHz
For 13 dBm < PH < 23 dBm: TL = -85 dBm/MHz + (23 dBm - PH) (3)

For PH
≥ 23 dBm: TL = -85 dBm/MHz
Equipment shall consider a channel to be occupied as long as other RLAN transmissions are detected at a level greater than the TL.

TEST PROCEDURE

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.9

Measurement	
☒Conducted measurement	☐Radiated measurement

TEST ENVIRONMENT

Temperature	22.6℃	Relative Humidity	51%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

8.10. RECEIVER BLOCKING

LIMITS

Receiver Blocking Parameters

Table 9: Receiver Blocking parameters

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)		Type of blocking signal
		Master or Slave with radar detection (see table D.2, note 2)	Slave without radar detection (see table D.2, note 2)	
Pmin + 6 dB	5 100	-53	-59	Continuous Wave
Pmin + 6 dB	4 900 5 000 5 975	-47	-53	Continuous Wave
NOTE 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined clause 4.2.8.3 in the absence of any blocking signal. NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the same levels should be used at the antenna connector irrespective of antenna gain.				

The minimum performance criterion shall be a PER less than or equal to 10 %.

TEST PROCEDURE

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.10.2

Measurement	
☒Conducted measurement	☐Radiated measurement

Step 1:
• The UUT shall be set to the first operating frequency to be tested (see clause 5.3.2).

Step 2:
• The blocking signal generator is set to the first frequency as defined in table 9.

Step 3:
• With the blocking signal generator switched off a communication link is set up between the UUT and the associated companion device using the test setup shown in figure 18. The attenuation of the variable attenuator shall be increased in 1 dB steps to a value at which the minimum performance criteria as specified in clause 4.2.8.3 is still met. The resulting level for the wanted signal at the input of the UUT is Pmin.

• This signal level (Pmin) is increased by 6 dB resulting in a new level (Pmin + 6 dB) of the wanted signal at the UUT receiver input.

Step 4:
• The level of the blocking signal at the UUT input is set to the level provided in table 9. It shall be verified and recorded in the test report that the performance criteria as specified in clause 4.2.8.3 are met.

• If the performance criteria as specified in clause 4.2.8.3 are met, the level of the blocking signal at the UUT may be further increased (e.g. in steps of 1 dB) until the level whereby the

performance criteria as specified in clause 4.2.8.3 are no longer met. The highest level at which the performance criteria are met is recorded in the test report.

Step 5:
• Repeat step 4 for each remaining combination of frequency and level as specified in table 9.
Direct. Coupler Splitter/ UUT Combiner Performance Monitoring Device Optional ATT.
Spectrum Analyzer Signalling Unit or Companion Device Variable attenuator step size ≤ 1 dB
Shielding or Shielded Room Blocking Signal Generator.

Step 6:
• Repeat step 2 to step 5 with the UUT operating at the other operating frequencies at which the blocking test has to be performed. See clause 5.3.2.

TEST ENVIRONMENT

Temperature	22.6℃	Relative Humidity	51%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

8.11. USER ACCESS RESTRICTIONS

REQUIREMENT

The equipment shall be so constructed that settings (hardware and/or software) related to DFS shall not be accessible to the user if changing those settings result in the equipment no longer being compliant with the DFS requirements in clause 4.7.
The above requirement includes the prevention of indirect access to any setting that impacts DFS.

DESCRIPTION

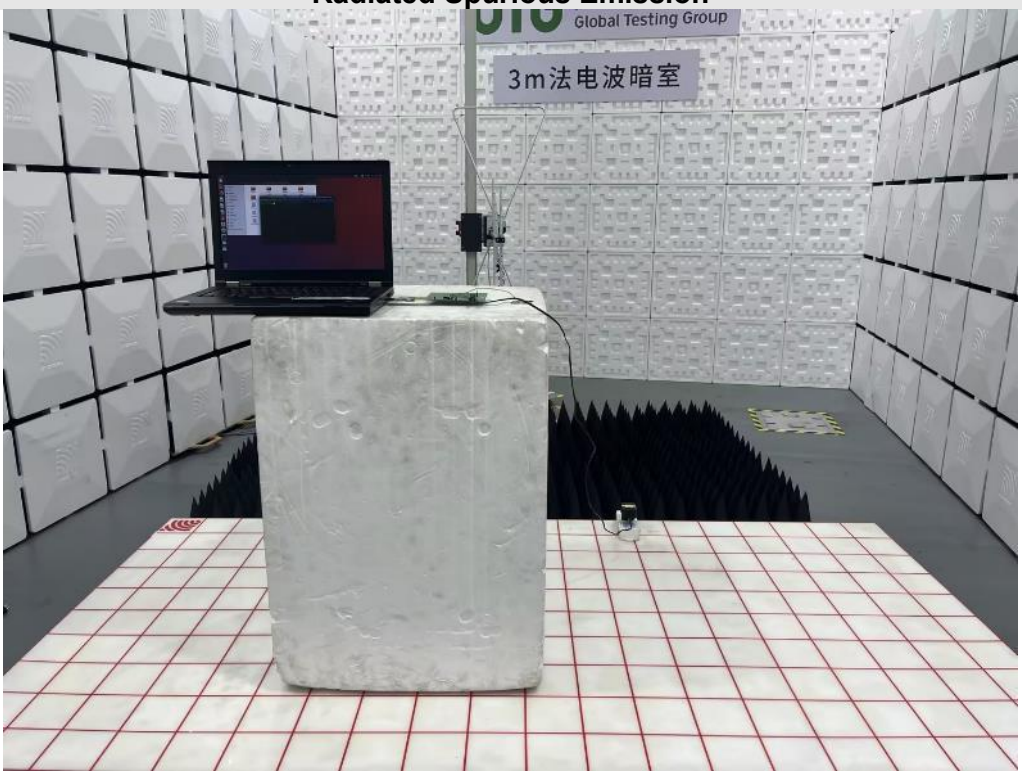
Pass.

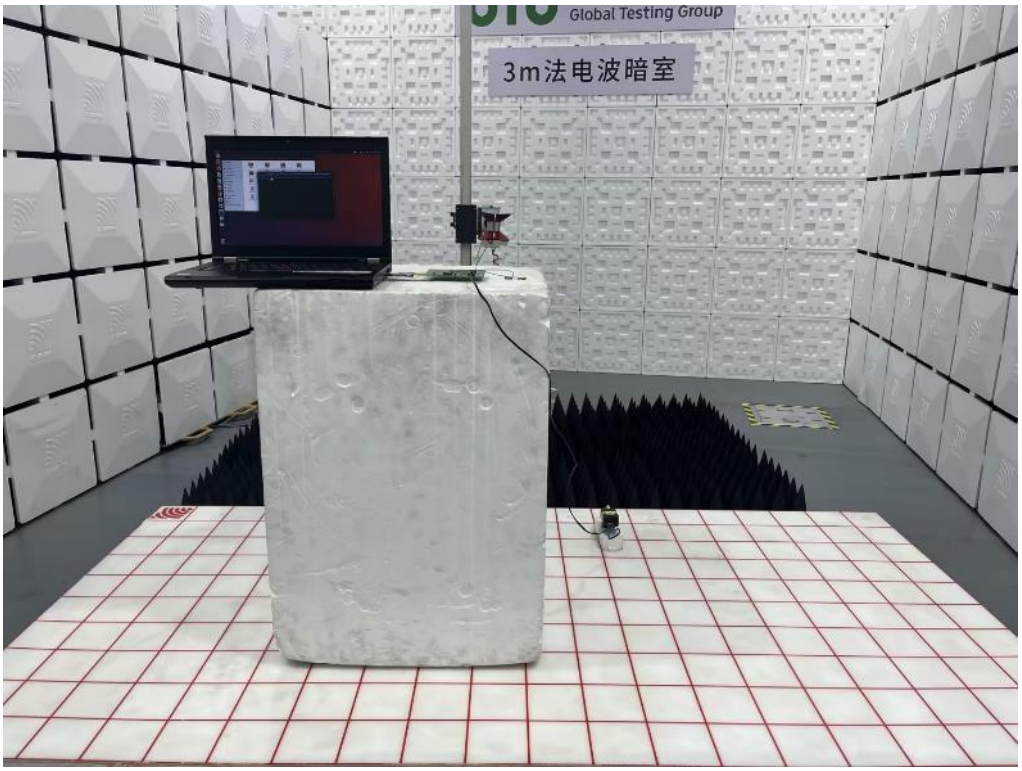
9. TEST DATA

Please refer to section "Test Data" - Appendix A.

APPENDIX: PHOTOGRAPHS OF TEST CONFIGURATION

Radiated Spurious Emission





APPENDIX: PHOTOGRAPHS OF THE EUT

Please refer to the report: E04A24071288E00301.

END OF REPORT