RADIO TEST REPORT

REPORT NO.:	RE140718E03
MODEL NO.:	ECW5320, ECW5320-L, ECW5320-C, ECW3320, ECW3320-L, ECW3320-C, SS-N300-EU, SS-AC1200-EU
RECEIVED:	July 01, 2014
TESTED:	July 01 to Aug. 12, 2014
ISSUED:	Aug. 28, 2014
APPLICANT:	Accton Technology Corporation
ADDRESS:	No.1, Creation Rd. III, Science-based Industrial Park, Hsinchu, Taiwan, R.O.C.
ISSUED BY:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
LAB ADDRESS:	No. 81-1, Lu Liao Keng, 9th Ling,Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan, R.O.C.

This report should not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

Table of Contents

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RE140718E03	Original release	Aug. 28, 2014

1 CERTIFICATION

PRODUCT:	802.11ac Dual-Band Wireless Access Point, 802.11b/g/n Wireless Access Point, 2.4G eiling/Wall/Desktop Enterprise AP, Dualband Ceiling/Wall/Desktop Enterprise AP (802.11ac)
BRAND NAME:	Edge-corE, IgniteNet
MODEL NO:	ECW5320, ECW5320-L, ECW5320-C, ECW3320, ECW3320-L, ECW3320-C, SS-N300-EU, SS-AC1200-EU
TEST SAMPLE:	ENGINEERING SAMPLE
APPLICANT:	Accton Technology Corporation
TESTED:	July 01 to Aug. 12, 2014
STANDARDS:	**EN 300 328 V1.8.1 (2012-06)** **EN 301 893 V1.7.1 (2012-06)**

The above equipment (Model: SS-AC1200-EU) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : _____, **DATE:** *Aug. 28, 2014*

(Midoli Peng, Specialist)

APPROVED BY : _____ , **DATE:** *Aug. 28, 2014*

(May Chen, Manager)

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

EN 300 328 V1.8.1		
Clause	**Test Parameter**	**Results**
	TRANSMITTER PARAMETERS	
4.3.1.1 or 4.3.2.1	RF Output Power	Pass
4.3.2.2	Power Spectral Density (Modulations other than FHSS equipment)	Pass
4.3.1.2 or 4.3.2.3	Duty cycle, Tx-Sequence, Tx-gap (Non-adaptive equipment)	Not Applicable
4.3.1.3	Dwell time, Minimum Frequency Occupation & Hopping Sequence (FHSS equipment)	Not Applicable
4.3.1.4	Hopping Frequency Separation (FHSS equipment)	Not Applicable
4.3.1.5 or 4.3.2.4	Medium Utilisation (Non-adaptive equipment)	Not Applicable
4.3.1.6 or 4.3.2.5	Adaptivity (Adaptive equipment)	Pass
4.3.1.7 or 4.3.2.6	Occupied Channel Bandwidth	Pass
4.3.1.8 or 4.3.2.7	Transmitter unwanted emission in the OOB domain	Pass
4.3.1.9 or 4.3.2.8	Transmitter unwanted emissions in the spurious domain	Pass
	RECEIVER PARAMETERS	
4.3.1.10 or 4.3.2.9	Receiver Spurious Emissions	Pass
4.3.1.11 or 4.3.2.10	Receiver Blocking (Only for adaptive equipment)	Pass

EN 301 893 V1.7.1		
Clause	**Test Parameter**	**Results**
	TRANSMITTER PARAMETERS	
4.2	Centre Frequencies	Pass
4.3	Nominal and Occupied Channel Bandwidth	Pass
4.4	Transmitter Power Control	Not Applicable
4.4	RF Output Power	Pass
4.4	Power Density	Pass
4.9	Adaptivity (Channel Access Mechanism)	Pass
4.10	User Access Restrictions	Pass
4.5.1	Transmitter unwanted emissions outside the HIPERLAN bands	Pass
4.5.2	Transmitter unwanted emissions within the HIPERLAN bands	Pass
4.7	Dynamic Frequency Selection	Not Applicable
	RECEIVER PARAMETERS	
4.6	Spurious Emissions	Pass

2.1 TEST INSTRUMENTS

For 2.4GHz: 2TX/RX Spurious Emissions below 1GHz & 1TX/2TX Spurious Emissions above 1GHz test:
For 5GHz: 2TX/RX Spurious Emissions below 1GHz test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSP 40	100060	May 08, 2014	May 07, 2015
Pre_Amplifier Mini-Circuits	ZFL-1000VH2	QA0838008	Nov. 13, 2013	Nov. 12, 2014
Pre_Amplifier HP	8449B	3008A01281	Jan. 18, 2014	Jan. 17, 2015
TRILOG Antenna SCHWARZBECK	VULB 9168	9168-406	Mar. 03, 2014	Mar. 02, 2015
Horn_Antenna SCHWARZBECK	BBHA9120-D	9120D-406	May 09, 2014	May 08, 2015
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Oct. 08, 2013	Oct. 07, 2014
Software	ADT_Radiated _V7.6.15.9.4	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA
Power meter Anritsu	ML2495A	1014008	Apr. 30, 2014	Apr. 29, 2015
Power sensor Anritsu	MA2411B	0917122	Apr. 30, 2014	Apr. 29, 2015
ESG Vector signal generator Agilent	E4438C	MY47271330 506 602 UNJ	Apr. 28, 2014	Apr. 27, 2015

NOTE: 1. The test was performed in RF Chamber No. C.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: Aug. 05, 2014

For 2.4GHz: 1TX Spurious Emissions below 1GHz & RX Spurious Emissions above 1GHz test:
For 5GHz: 1TX Spurious Emissions below 1GHz test & 1TX/2TX Spurious Emission above 1GHz test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSP 40	100060	May 08, 2014	May 07, 2015
Pre_Amplifier Juniper	8447D	2944A10626	Feb. 22, 2014	Feb. 21, 2015
Pre_Amplifier HP	8449B	3008A01922	Sep. 21, 2013	Sep. 20, 2014
TRILOG Antenna SCHWARZBECK	VULB9168	138	Feb. 27, 2014	Feb. 26, 2015
Horn_Antenna SCHWARZBECK	BBHA9120-D1	D124	Dec. 06, 2013	Dec. 05, 2014
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Oct. 08, 2013	Oct. 07, 2014
Software	ADT_Radiated _V7.6.15.9.4	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA
Power meter Anritsu	ML2495A	1014008	Apr. 30, 2014	Apr. 29, 2015
Power sensor Anritsu	MA2411B	0917122	Apr. 30, 2014	Apr. 29, 2015
ESG Vector signal generator Agilent	E4438C	MY47271330 506 602 UNJ	Apr. 28, 2014	Apr. 27, 2015
POWER SPLITTER Mini-Circuits	ZN2PD-9G-S+	SF038700723-2	Aug. 15, 2013	Aug. 14, 2014
POWER SPLITTER Mini-Circuits	ZN2PD-9G-S+	SF038700723-3	Aug. 15, 2013	Aug. 14, 2014

NOTE: 1. The test was performed in RF Chamber No. E.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: Aug. 12, 2014

For other test items:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSP 40	100037	Oct. 31, 2013	Oct. 30, 2014
Spectrum Analyzer Agilent	E4446A	MY48250253	Aug. 28, 2013	Aug. 27, 2014
AC Power Source EXTECH Electronics	6502	1140503	NA	NA
Temperature & Humidity Chamber TERCHY	MHU-225AU	911033	Dec. 09, 2013	Dec. 08, 2014
DC Power Supply GOOD WILL INSTRUMENT CO., LTD.	GPC - 3030D	7700087	NA	NA
ESG Vector signal generator Agilent	E4438C	MY47271330 506 602 UNJ	Apr. 28, 2014	Apr. 27, 2015
Upgrade the software license on current E4438C ESG Agilent	E4438CK-403	ESG E4_010004	NA	NA
ESG Vector signal generator Agilent	E4438C	MY45094468/0 05 506 602 UK6 UNJ	Dec. 06, 2013	Dec. 05, 2014
Upgrade the software license on current E4438C ESG Agilent	E4438CK-403	ESG E4_010001	NA	NA
Power meter Anritsu	ML2495A	0824006	May 22, 2014	May 21, 2015
Power sensor Anritsu	MA2411B	0738172	May 22, 2014	May 21, 2015
Power meter Anritsu	ML2495A	1014008	Apr. 30, 2014	Apr. 29, 2015
Power sensor Anritsu	MA2411B	0917122	Apr. 30, 2014	Apr. 29, 2015
Software	Total Power Measurement Tools V7.1	NA	NA	NA
Software	ADT_RF Test Software V6.6.5.3	NA	NA	NA

NOTE: 1. The test was performed in Oven room A.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: July 01 to Aug. 11, 2014

2.2 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.

EN 300 328

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
Humidity	±2.5%
DC and low frequency voltages	±0.04%
Time	±5 %
Duty Cycle	±5 %

EN 301 893

Parameter	Uncertainty
RF frequency	±1.132x10^{-6}
RF power conducted	±1.017dB
RF power radiated	±2.855dB
Spurious emissions, conducted	±1.68dB
Spurious emissions, radiated	±2.855dB
Humidity	±2.5%
Temperature	±0.7°C
Time	±3%

2.3 MAXIMUM MEASUREMENT UNCERTAINTY

For the test methods, according to ETSI 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
Humidity	±5 %
DC and low frequency voltages	±3 %
Time	±5 %
Duty Cycle	±5 %

For the test methods, according to ETSI EN 301 893 standard, the measurement uncertainty figures shall be calculated in accordance with TR 100 028-1 [2] and TR 100 028-2 [3] 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
RF frequency	$\pm 1 \times 10^{-5}$
RF power conducted	±1,5 dB
RF power radiated	±6 dB
Spurious emissions, conducted	±3 dB
Spurious emissions, radiated	±6 dB
Humidity	±5 %
Temperature	±1°C
Time	±10 %

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	802.11ac Dual-Band Wireless Access Point, 802.11b/g/n Wireless Access Point, 2.4G Ceiling/Wall/Desktop Enterprise AP, Dualband Ceiling/Wall/Desktop Enterprise AP (802.11ac)
MODEL NO.	ECW5320, ECW5320-L, ECW5320-C, ECW3320, ECW3320-L, ECW3320-C, SS-N300-EU, SS-AC1200-EU
TYPE OF THE EQUIPMENT	Stand-alone
NOMINAL VOLTAGE	DC12V from power adapter or DC 48V from PoE
EXTREME/NORMAL TESTING VOLTAGES	Vnom= 230Vac Vmin= 207Vac Vmax= 253Vac
MODULATION TYPE	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode only.
MODULATION TECHNOLOGY	DSSS,OFDM
TRANSFER RATE	802.11b: up to 11Mbps 802.11a/g: up to 54Mbps 802.11n : up to 300Mbps 802.11ac: up to 866.7Mbps
OPERATING FREQUENCY	**For 2.4GHz:** 2412MHz ~ 2472MHz **For 5GHz:** 5180MHz ~5240MHz
NUMBER OF CHANNEL	**For 2.4GHz:** 802.11b/g, 802.11n (HT20): 13 802.11n (HT40) : 9 **For 5GHz :** 802.11a, 802.11n (HT20) , 802.11ac (VHT20): 4 802.11n (HT40) , 802.11ac (VHT40): 2 802.11ac (VHT80): 1
ADAPTIVE/NON-ADAPTIVE	Adaptive equipment without the possibility to switch to a non-adaptive mode
EIRP POWER (Measured Max. Average)	**For 2.4GHz:** 19.90dBm **For 5GHz:** 22.70dBm
TEMPERATURE RANGE	0℃ ~ 40℃
ANTENNA TYPE	Please see NOTE
DATA CABLE	NA
I/O PORTS	Refer to user's manual
ASSOCIATED DEVICES	Adapter × 1

Note:

1. 2.4GHz and 5GHz technology can transmit at same time.
2. The emission of the simultaneous operation (2.4GHz & 5GHz) has been evaluated and no non-compliance was found.
3. The EUT has two brand names, four product names and eight model names, which are identical to each other in all aspects except for the following:

Brand	Product Name	Model Name	Radio 2.4G	Radio 5G	Software
Edge-corE	802.11b/g/n Wireless Access Point	ECW3320	Support	Non-Support	Fat
		ECW3320-L			Fit
		ECW3320-C			Fit
	802.11ac Dual-Band Wireless Access Point	ECW5320	Support	Support	Fat
		ECW5320-L			Fit
		ECW5320-C			Fit
IgniteNet	2.4G Ceiling/Wall/Desktop Enterprise AP	SS-N300-EU	Support	Non-Support	Fat
	Dualband Ceiling/Wall/Desktop Enterprise AP (802.11ac)	SS-AC1200-EU	Support	Support	Fat
From the above models, model: **SS-AC1200-EU** was selected as representative model for the test and its data were recorded in this report.					

4. The antennas provided to the EUT, please refer to the following table:

For 2.4G WLAN used						
Set	Transmitter Circuit	Antenna Gain(dBi) <including cable loss>	Frequency range (MHz ~ MHz)	Antenna Type	Connecter Type	Cable Length (mm)
1	Chain (0)	3.16	2400~2500	PCB Dipole	IPEX	255 (Gray)
	Chain (1)	4.04				150 (Blue)
For 5G WLAN used						
Set	Transmitter Circuit	Antenna Gain(dBi) <including cable loss>	Frequency range (MHz ~ MHz)	Antenna Type	Connecter Type	Cable Length (mm)
1	Chain (0)	5.07	5150~5850	PCB Dipole	MMCS	65 (White)
	Chain (1)	3.97				140 (Black)

5. The EUT must be supplied with a power adapter as following table:

Brand	Model No.	Spec.
Sunny	SYS1308-2412-W2E	Input: 100-240V, 1.0A, 50-60Hz Output: 12V, 2A DC power cable: 1.83m, unshielded

6. The EUT incorporates a MIMO function without beamforming.

MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11a	6 ~ 54Mbps	1TX (Diversity)	2RX
802.11b	1 ~ 11Mbps	1TX (Diversity)	2RX
802.11g	6 ~ 54Mbps	1TX (Diversity)	2RX
802.11n (HT20) & 802.11n (HT40)	MCS 0~7	1TX (Diversity)	2RX
	MCS 8~15	2TX	2RX
802.11ac (VHT20)	MCS0~8 (256QAM) Nss= 1	1TX (Diversity)	2RX
	MCS0~8 (256QAM) Nss= 2	2TX	2RX
802.11ac (VHT40) & 802.11ac (VHT80)	MCS0~9 (256QAM) Nss= 1	1TX (Diversity)	2RX
	MCS0~9 (256QAM) Nss= 2	2TX	2RX

Note: The modulation and bandwidth are similar for 802.11n mode for 20MHz (40MHz) and 802.11ac mode for 20MHz (40MHz), therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.3)

7. Test modes are presented in the report as below.

Pre-test Mode	Power Source
A	With Adapter
B	With PoE (PoE only test not sale)

Note: From the above pre-test modes, the worse spurious emission was found in **Mode A**. Therefore only the test data of the mode was recorded in this report.

8. The above EUT information was declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

For 2.4GHz

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

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		

For 5GHz:

4 channels are provided to for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency
36	5180 MHz
40	5200 MHz
44	5220 MHz
48	5240 MHz

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency
38	5190 MHz
46	5230 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
42	5210 MHz

3.3 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

For 802.11b/g/n:

EUT CONFIGURE MODE	APPLICABLE TO												DESCRIPTION
	ROP	PSD	DC/TS/TG	DT/MFO/HS	HFS	MU	AD	OCB	EOB	SE< 1G	SE[3] 1G	RB	
-	√	√	-	-	-	-	√	√	√	√	√	√	-

Where **ROP:** RF Output Power **PSD:** Peak Spectral Density

DC/TS/TG: Duty Cycle/ Tx-Sequence / Tx-gap **DT/MFO/HS:** Dwell time/ Minimum Frequency Occupation/ Hopping Sequence

HFS: Hopping Frequency Separation **MU:** Medium Utilisation

AD: Adaptivity (Channel Access Mechanism) **OCB:** Occupied Channel Bandwidth

EOB: Transmitter unwanted emission in the out-of-band domain **SE<1G:** Spurious Emissions below 1GHz

SE[3]1G: Spurious Emissions above 1GHz **RB:** Receiver Blocking

Note: The EUT had been pre-tested on the positioned of each 2 axis. The worst case was found when positioned on **X-plane**.

RF OUTPUT POWER TEST:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 13	1, 7, 13	DSSS	DBPSK	1
802.11g	1 to 13	1, 7, 13	OFDM	BPSK	6
802.11n (HT20)	1 to 13	1, 7, 13	OFDM	BPSK	13
802.11n (HT40)	3 to 11	3, 7, 11	OFDM	BPSK	27

PEAK SPECTRAL DENSITY TEST:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 13	1, 7, 13	DSSS	DBPSK	1
802.11g	1 to 13	1, 7, 13	OFDM	BPSK	6
802.11n (HT20)	1 to 13	1, 7, 13	OFDM	BPSK	13
802.11n (HT40)	3 to 11	3, 7, 11	OFDM	BPSK	27

ADAPTIVITY TEST:

☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY
802.11b	1 to 13	1, 13	DSSS
802.11g	1 to 13	1, 13	OFDM
802.11n (HT20)	1 to 13	1, 13	OFDM
802.11n (HT40)	3 to 11	3, 11	OFDM

OCCUPIED CHANNEL BANDWIDTH TEST:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 13	1, 13	DSSS	DBPSK	1
802.11g	1 to 13	1, 13	OFDM	BPSK	6
802.11n (HT20)	1 to 13	1, 13	OFDM	BPSK	13
802.11n (HT40)	3 to 11	3, 11	OFDM	BPSK	27

TRANSMITTER UNWANTED EMISSIOIN IN THE OUT-OF-BAND DOMAIN TEST:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 13	1, 13	DSSS	DBPSK	1
802.11g	1 to 13	1, 13	OFDM	BPSK	6
802.11n (HT20)	1 to 13	1, 13	OFDM	BPSK	13
802.11n (HT40)	3 to 11	3, 11	OFDM	BPSK	27

SPURIOUS EMISSIONS TEST (BELOW 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 13	13	DSSS	DBPSK	1
802.11n (HT20)	1 to 13	13	OFDM	BPSK	13
Receiver	1 to 13	13	-	-	-

SPURIOUS EMISSIONS TEST (ABOVE 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 13	1, 13	DSSS	DBPSK	1
802.11n (HT20)	1 to 13	1, 13	OFDM	BPSK	13
Receiver	1 to 13	1, 13	-	-	-

RECEIVER BLOCKING TEST:

☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY
802.11b	1 to 13	1, 13	DSSS
802.11g	1 to 13	1, 13	OFDM
802.11n (HT20)	1 to 13	1, 13	OFDM
802.11n (HT40)	3 to 11	3, 11	OFDM

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
ROP	25deg. C, 60%RH	230Vac, 50Hz	Nelson Teng
PSD	25deg. C, 60%RH	230Vac, 50Hz	Nelson Teng
AD	25deg. C, 60%RH	230Vac, 50Hz	Look Huang
OCB	25deg. C, 60%RH	230Vac, 50Hz	Nelson Teng
EOB	25deg. C, 60%RH	230Vac, 50Hz	Nelson Teng
SE<1G	29deg. C, 77%RH	230Vac, 50Hz	Denny Liu
	29deg. C, 77%RH	230Vac, 50Hz	Chiashiang Lin
SE≥1G	25deg. C, 65%RH	230Vac, 50Hz	Nelson Teng
	22deg. C, 79%RH	230Vac, 50Hz	Denny Liu
RB	25deg. C, 60%RH	230Vac, 50Hz	Look Huang

For 802.11a/n/ac:

EUT CONFIGURE MODE	APPLICABLE TO									DESCRIPTION
	CF	OCB	ROP	TPC	PD	AD	SE<1G	SE≥1G	TSPM	
-	√	√	√	-	√	√	√	√	√	-

Where **CF:** Centre Frequency

OCB: Nominal and Occupied Channel Bandwidth

ROP: RF output power

TPC: Transmit Power Control

PD: Power Density

AD: Adaptivity (Channel Access Mechanism)

SE≥1G: Spurious Emissions above 1GHz

SE<1G: Spurious Emissions below 1GHz

TSPM: Transmit spectral power mask

Note: The EUT had been pre-tested on the positioned of each 2 axis. The worst case was found when positioned on **X-plane**.

CENTRE FREQUENCIES:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	36 to 48	36	-	-	-

NOMINAL AND CHANNEL OCCUPIED BANDWIDTH MEASUREMENT:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	36 to 48	48	OFDM	BPSK	6
802.11n (HT20)	36 to 48	48	OFDM	BPSK	13
802.11n (HT40)	38 to 46	38	OFDM	BPSK	27
802.11ac (VHT80)	42	42	OFDM	BPSK	29.3

RF OUTPUT POWER:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	36 to 48	36, 48	OFDM	BPSK	6
802.11n (HT20)	36 to 48	36, 48	OFDM	BPSK	13
802.11n (HT40)	38 to 46	38, 46	OFDM	BPSK	27
802.11ac (VHT80)	42	42	OFDM	BPSK	29.3

POWER DENSITY:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	36 to 48	36, 48	OFDM	BPSK	6
802.11n (HT20)	36 to 48	36, 48	OFDM	BPSK	13
802.11n (HT40)	38 to 46	38, 46	OFDM	BPSK	27
802.11ac (VHT80)	42	42	OFDM	BPSK	29.3

ADAPTIVITY TEST:

☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY
802.11ac (VHT80)	42	42	OFDM

SPURIOUS EMISSIONS TEST (BELOW 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	36 to 48	48	OFDM	BPSK	6
802.11n (HT20)	36 to 48	48	OFDM	BPSK	13
Receiver	36 to 48	48	-	-	-

SPURIOUS EMISSIONS TEST (ABOVE 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	36 to 48	48	OFDM	BPSK	6
802.11n (HT20)	36 to 48	48	OFDM	BPSK	13
Receiver	36 to 48	48	-	-	-

TRANSMITTER UNWANTED EMISSIONS WITHIN THE HIPERLAN BANDS (SIGNAL UNDER SPECTRUM MASK):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATIOT YPE	DATA RATE (Mbps)
802.11a	36 to 48	36, 48	OFDM	BPSK	6
802.11n (HT20)	36 to 48	36, 48	OFDM	BPSK	13
802.11n (HT40)	38 to 46	38, 46	OFDM	BPSK	27
802.11ac (VHT80)	42	42	OFDM	BPSK	29.3

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
CF	25deg. C, 60%RH	230Vac, 50Hz	Nelson Teng
OCB	25deg. C, 60%RH	230Vac, 50Hz	Nelson Teng
ROP	25deg. C, 60%RH	230Vac, 50Hz	Nelson Teng
TPC	25deg. C, 60%RH	230Vac, 50Hz	Nelson Teng
PD	25deg. C, 60%RH	230Vac, 50Hz	Nelson Teng
AD	25deg. C, 60%RH	230Vac, 50Hz	Look Huang
SE<1G	29deg. C, 77%RH	230Vac, 50Hz	Denny Liu
SE≥1G	22deg. C, 79%RH	230Vac, 50Hz	Denny Liu
TSPM	25deg. C, 60%RH	230Vac, 50Hz	Nelson Teng

3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product. According to the specifications of the manufacturers, it must comply with the requirements of the following standards:

EN 300 328 V1.8.1 (2012-06)

EN 301 893 V1.7.1 (2012-06)

All tests have been performed and recorded as per the above standards.

3.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

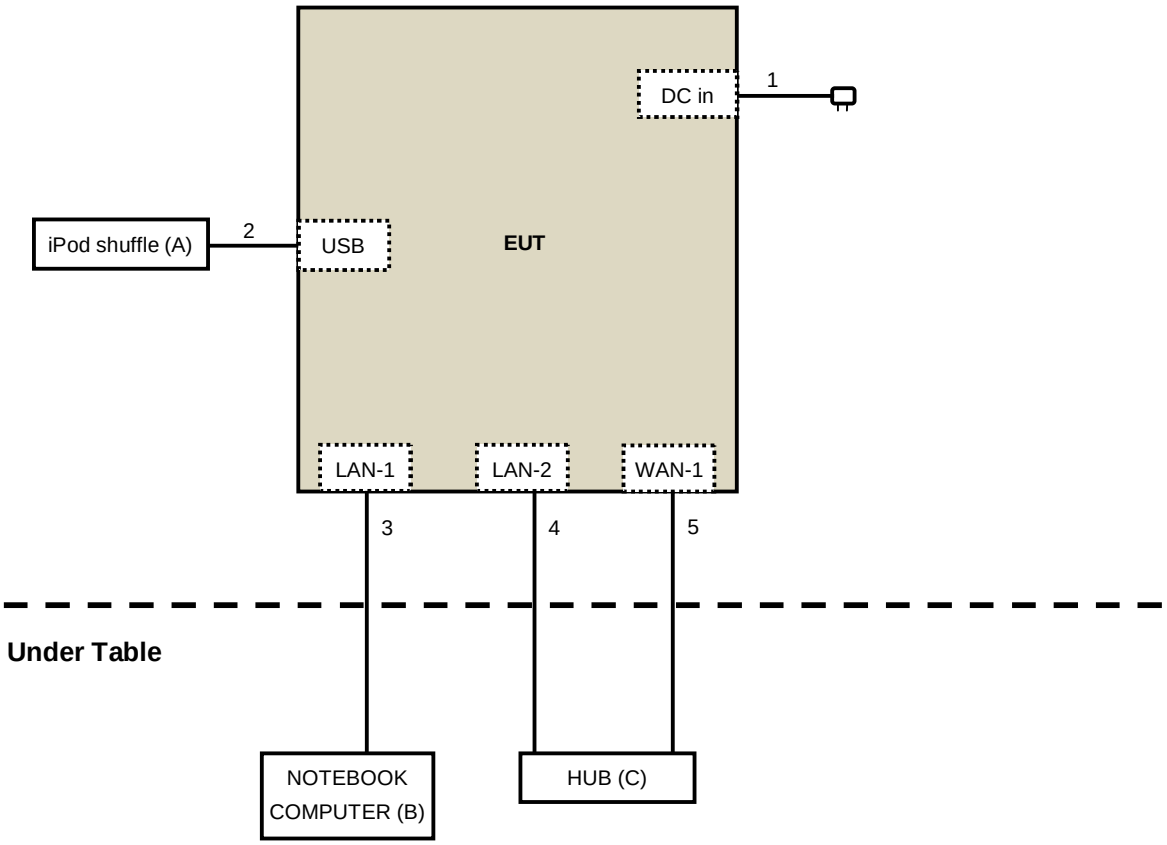
No.	Product	Brand	Model No.	Serial No.	FCC ID	Remark
A	iPod shuffle	Apple	MD778TA/A	CC4JG680F4T1	NA	Provided by Lab
B	NOTEBOOK COMPUTER	DELL	PP32LA	DSLB32S	FCC DoC	Provided by Lab
C	HUB	ZyXEL	ES-116P	S060H02000215	FCC DoC	Provided by Lab

NOTE:

1. All power cords of the above support units are non-shielded (1.8 m).

No.	Cable	Qty.	Length (m)	Shielded (Yes/ No)	Cores (Number)	Remark
1	DC	1	1.83	No	0	Supplied by client
2	USB	1	0.3	Yes	0	Provided by Lab
3	RJ-45	1	10	No	0	Provided by Lab
4	RJ-45	1	1.8	No	0	Provided by Lab
5	RJ-45	1	1.8	No	0	Provided by Lab

3.6 CONFIGURATION OF SYSTEM UNDER TEST



4 TEST PROCEDURES AND RESULTS (FOR 2.4GHz)

TRANSMITTER PARAMETERS

4.1 RF OUTPUT POWER

4.1.1 LIMITS OF RF OUTPUT POWER

CONDITION	FREQUENCY BAND	LIMIT (e.i.r.p.)
Under all test conditions	2400 ~ 2483.5 MHz	AV: 20dBm

4.1.2 TEST PROCEDURE

Refer to chapter 5.3.2.2 of ETSI EN 300 328 V1.8.1.

Measurement	
☒Conducted measurement	☐Radiated measurement

4.1.3 DEVIATION FROM TEST STANDARD

No deviation

4.1.4 TEST SETUP

The measurements for RF output power was performed at both normal environmental conditions and at the extremes of the operating temperature. Controlling software (MP_TEST.exe [RTL819x 2.3]) has been activated to set the EUT on specific channel and power level.

4.1.5 TEST RESULTS

TEST CONDITION			EIRP POWER (dBm)		
			(CH1) 2412 MHz	(CH7) 2442 MHz	(CH13) 2472 MHz
802.11b					
Tnom(℃)	25	Vnom(v)	17.58	17.58	17.72
Tmin(℃)	0	Vnom(v)	19.70	19.52	19.74
Tmax(℃)	40	Vnom(v)	17.10	17.09	17.21
802.11g					
Tnom(℃)	25	Vnom(v)	19.08	18.57	18.49
Tmin(℃)	0	Vnom(v)	19.40	19.84	19.77
Tmax(℃)	40	Vnom(v)	18.60	18.04	17.99
802.11n (HT20)					
Tnom(℃)	25	Vnom(v)	18.41	18.71	18.92
Tmin(℃)	0	Vnom(v)	19.51	19.59	19.85
Tmax(℃)	40	Vnom(v)	17.91	18.21	18.45
TEST CONDITION			EIRP POWER (dBm)		
			(CH3) 2422 MHz	(CH7) 2442 MHz	(CH11) 2462 MHz
802.11n (HT40)					
Tnom(℃)	25	Vnom(v)	17.30	16.79	16.63
Tmin(℃)	0	Vnom(v)	19.84	19.90	19.40
Tmax(℃)	40	Vnom(v)	16.51	16.03	16.08

4.2 POWER SPECTRAL DENSITY

4.2.1 LIMIT OF POWER SPECTRAL DENSITY

CONDITION	FREQUENCY BAND	LIMIT (e.i.r.p.)
Under normal conditions	2400 ~ 2483.5 MHz	10dBm / 1MHz

4.2.2 TEST PROCEDURE

Refer to chapter 5.3.3.2 of ETSI EN 300 328 V1.8.1.

Measurement	
☒Conducted measurement	☐Radiated measurement

4.2.3 DEVIATION FROM TEST STANDARD

No deviation.

4.2.4 TEST SETUP

The test setup has been constructed as the normal test condition. The peak power density as defined in EN 300 328 clause 4.3.2.2 shall be measured and recorded. Controlling software (MP_TEST.exe [RTL819x 2.3]) has been activated to set the EUT on specific status.

4.2.5 TEST RESULTS

802.11b

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER DENSITY (dBm/1MHz) (EIRP)	LIMIT (dBm/1MHz) (EIRP)	PASS/FAIL
1	2412	9.42	10	PASS
7	2442	9.49	10	PASS
13	2472	9.62	10	PASS

802.11g

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER DENSITY (dBm/1MHz) (EIRP)	LIMIT (dBm/1MHz) (EIRP)	PASS/FAIL
1	2412	7.88	10	PASS
7	2442	7.46	10	PASS
13	2472	7.51	10	PASS

802.11n (HT20)

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER DENSITY (dBm/1MHz) (EIRP)	LIMIT (dBm/1MHz) (EIRP)	PASS/FAIL
1	2412	7.20	10	PASS
7	2442	7.45	10	PASS
13	2472	7.41	10	PASS

802.11n (HT40)

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER DENSITY (dBm/1MHz) (EIRP)	LIMIT (dBm/1MHz) (EIRP)	PASS/FAIL
3	2422	4.81	10	PASS
7	2442	4.99	10	PASS
11	2462	5.02	10	PASS

4.3 OCCUPIED CHANNEL BANDWIDTH

4.3.1 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

4.3.2 TEST PROCEDURE

Refer to chapter 5.3.8.2 of ETSI EN 300 328 V1.8.1.

Measurement	
☒Conducted measurement	☐Radiated measurement

4.3.3 DEVIATION FROM TEST STANDARD

No deviation.

4.3.4 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. Controlling software (MP_TEST.exe [RTL819x 2.3]) has been activated to set the EUT on specific status.

4.3.5 TEST RESULTS

802.11b

CHANNEL	CHANNEL FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)	Measured frequencies		LIMIT	PASS/FAIL
			FL (MHz)	FH (MHz)		
1	2412	15.12	2404.56	2419.68	FL > 2400 MHz and FH < 2483.5 MHz	PASS
13	2472	15.04	2464.4	2479.44		PASS

802.11g

CHANNEL	CHANNEL FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)	Measured frequencies		LIMIT	PASS/FAIL
			FL (MHz)	FH (MHz)		
1	2412	16.88	2403.52	2420.4	FL > 2400 MHz and FH < 2483.5 MHz	PASS
13	2472	16.88	2463.36	2480.24		PASS

802.11n (HT20)

CHANNEL	CHANNEL FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)	Measured frequencies		LIMIT	PASS/FAIL
			FL (MHz)	FH (MHz)		
1	2412	17.92	2403.04	2420.96	FL > 2400 MHz and FH < 2483.5 MHz	PASS
13	2472	18	2462.96	2480.96		PASS

802.11n (HT40)

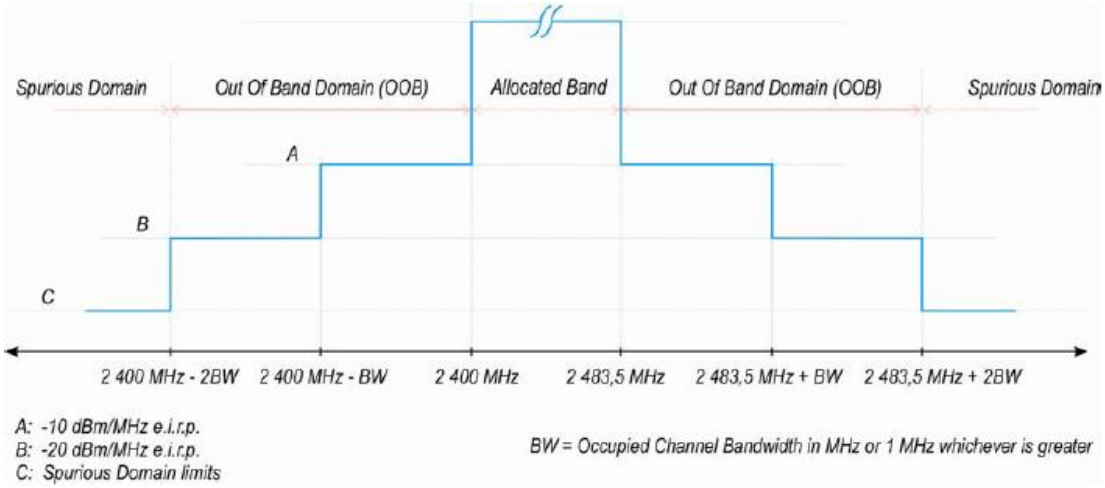
CHANNEL	CHANNEL FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)	Measured frequencies		LIMIT	PASS/FAIL
			FL (MHz)	FH (MHz)		
3	2422	36.64	2403.76	2440.4	FL > 2400 MHz and FH < 2483.5 MHz	PASS
11	2462	36.48	2443.6	2480.08		PASS

Note: FL is the lowest frequency of the 99% occupied bandwidth of power envelope.
FH is the highest frequency of the 99% occupied bandwidth of power envelope.

4.4 TRANSMITTER UNWANTED EMISSIONS IN THE OUT-OF-BAND DOMAIN

4.4.1 LIMITS OF TRANSMITTE UNWANTED EMISSIOIN 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.



4.4.2 TEST PROCEDURE

Refer to chapter 5.3.9.2 of ETSI EN 300 328 V1.8.1.

Measurement	
☒Conducted measurement	☐Radiated measurement

4.4.3 DEVIATION FROM TEST STANDARD

No deviation

4.4.4 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. The frequency has to be recorded for the right and left end above threshold of highest and lowest channel respectively.

4.4.5 TEST RESULTS

802.11b

CHANNEL FREQUENCY		2412MHz				2472MHz			
TEST CONDITION		OOB EMISSION (MHz)				OOB EMISSION (MHz)			
		2384.88 ~ 2400		2369.76 ~ 2384.88		2483.5 ~ 2498.54		2498.54 ~ 2513.58	
		FREQ. (MHz)	POWER (dBm/ MHz)	FREQ. (MHz)	POWER (dBm/ MHz)	FREQ. (MHz)	POWER (dBm/ MHz)	FREQ. (MHz)	POWER (dBm/ MHz)
Tnom 25℃	Vnom(v)	2399.50	-31.00	2384.50	-55.05	2484.00	-27.41	2499.00	-55.79
Tmin 0℃	Vnom(v)	2399.50	-30.92	2384.50	-55.04	2484.00	-27.38	2499.00	-55.87
Tmax 40℃	Vnom(v)	2399.50	-31.08	2384.50	-54.94	2484.00	-27.60	2499.00	-55.69
Power Limit (dBm/MHz)		-10.00		-20.00		-10.00		-20.00	
PASS/FAIL		PASS		PASS		PASS		PASS	

802.11g

CHANNEL FREQUENCY		2412MHz				2472MHz			
TEST CONDITION		OOB EMISSION (MHz)				OOB EMISSION (MHz)			
		2383.12 ~ 2400		2366.24 ~ 2383.12		2483.5 ~ 2500.38		2500.38 ~ 2517.26	
		FREQ. (MHz)	POWER (dBm/ MHz)	FREQ. (MHz)	POWER (dBm/ MHz)	FREQ. (MHz)	POWER (dBm/ MHz)	FREQ. (MHz)	POWER (dBm/ MHz)
Tnom 25℃	Vnom(v)	2399.50	-20.00	2383.05	-50.26	2484.00	-20.39	2511.00	-50.71
Tmin 0℃	Vnom(v)	2399.50	-19.92	2383.05	-50.25	2484.00	-20.36	2511.00	-50.79
Tmax 40℃	Vnom(v)	2399.50	-20.08	2383.05	-50.15	2484.00	-20.58	2511.00	-50.61
Power Limit (dBm/MHz)		-10.00		-20.00		-10.00		-20.00	
PASS/FAIL		PASS		PASS		PASS		PASS	

802.11n (HT20)

CHANNEL FREQUENCY		2412MHz				2472MHz			
TEST CONDITION		OOB EMISSION (MHz)				OOB EMISSION (MHz)			
		2382.08 ~ 2400		2364.16 ~ 2382.08		2483.5 ~ 2501.5		2501.5 ~ 2519.5	
		FREQ. (MHz)	POWER (dBm/ MHz)	FREQ. (MHz)	POWER (dBm/ MHz)	FREQ. (MHz)	POWER (dBm/ MHz)	FREQ. (MHz)	POWER (dBm/ MHz)
Tnom 25℃	Vnom(v)	2399.50	-21.78	2375.58	-47.90	2484.00	-17.72	2507.92	-48.26
Tmin 0℃	Vnom(v)	2399.50	-21.70	2375.58	-47.89	2484.00	-17.69	2507.92	-48.34
Tmax 40℃	Vnom(v)	2399.50	-21.86	2375.58	-47.79	2484.00	-17.91	2507.92	-48.16
Power Limit (dBm/MHz)		-10.00		-20.00		-10.00		-20.00	
PASS/FAIL		PASS		PASS		PASS		PASS	

802.11n (HT40)

CHANNEL FREQUENCY		2422MHz				2462MHz			
TEST CONDITION		OOB EMISSION (MHz)				OOB EMISSION (MHz)			
		2363.36 ~ 2400		2326.72 ~ 2363.36		2483.5 ~ 2519.98		2519.98 ~ 2556.46	
		FREQ. (MHz)	POWER (dBm/ MHz)	FREQ. (MHz)	POWER (dBm/ MHz)	FREQ. (MHz)	POWER (dBm/ MHz)	FREQ. (MHz)	POWER (dBm/ MHz)
Tnom 25℃	Vnom(v)	2399.50	-27.57	2357.86	-48.16	2484.00	-23.61	2537.64	-47.98
Tmin 0℃	Vnom(v)	2399.50	-27.49	2357.86	-48.15	2484.00	-23.58	2537.64	-48.06
Tmax 40℃	Vnom(v)	2399.50	-27.65	2357.86	-48.05	2484.00	-23.80	2537.64	-47.88
Power Limit (dBm/MHz)		-10.00		-20.00		-10.00		-20.00	
PASS/FAIL		PASS		PASS		PASS		PASS	

4.5 ADAPTIVITY (CHANNEL ACCESS MECHANISM)

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.

Applicability of adaptive requirements and limit for wide band modulation techniques

Requirement	Operational Mode			
	Non-LBT based Detect and Avoid	LBT based Detect and Avoid		
		Frame Based Equipment	Load Based Equipment (CCA using 'energy detect')	Load Based Equipment (CCA not using any of the mechanisms referenced as IEEE spec.)
Minimum Clear Channel Assessment (CCA) Time	NA	20 us (see note 1)	(see note 2)	20 us (see note 1)
Maximum Channel Occupancy (COT) Time	40 ms	1 ms to 10 ms	(see note 2)	(13/32)*q ms (see note 3)
Minimum Idle Period	5us	5% of COT	(see note 2)	CCA to q*CCA
Extended CCA check	NA	NA	(see note 2)	R*CCA (see note 4)
Short Control Signalling Transmissions	Maximum duty cycle of 10 % within an observation period of 50 ms (see note 5)			

NOTE 1: The CCA time used by the equipment shall be declared by the supplier.
NOTE 2: Minimum required of EN300 328 section 4.3.2.5.2.2.2 or Load Based Equipment may implement an LBT based spectrum sharing mechanism based on the Clear Channel Assessment (CCA) mode using energy detect, as described in IEEE Std. 802.11™-2007clauses 9, 15, 18 or 19, in IEEE Std. 802.11n™-2009, clauses 9, 11 and 20 or in IEEE Std. 802.15.4™-2011, clauses 4 and 5.
NOTE 3: q is selected by the manufacturer in the range [4…32]
NOTE 4: The value of R shall be randomly selected in the range [1..q]
NOTE 5: Adaptive equipment may or may not have Short Control Signalling Transmissions

Interference threshold level

Maximum transmit power (P_H) EIRP dBm	Threshold level (TL) (see notes 1 and 2)
20	-70 dBm / MHz

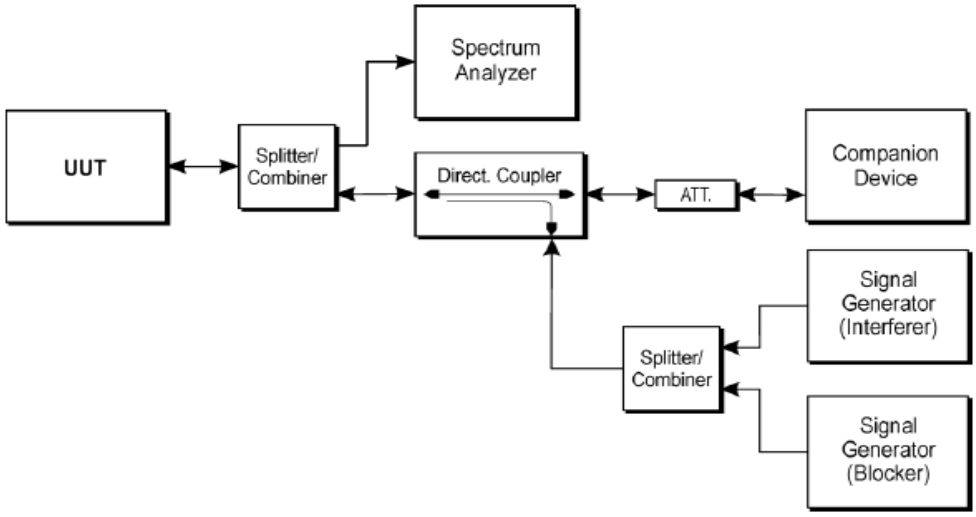
NOTE 1: TL = -70 dBm/MHz + 20 - PH (assuming a 0dBi receive antenna and PH specified in dBm e.i.r.p.).
NOTE 2: transmitter the CCA threshold level (TL) shall be equal or lower than -70 dBm/MHz at the input to the receiver (assuming a 0 dBi receive antenna).

4.5.1 TEST PROCEDURE

Refer to chapter 5.3.7.2 of ETSI EN 300 328 V1.8.1.

Measurement	
☒Conducted measurement	☐Radiated measurement

4.5.2 TEST SETUP CONFIGURATION



UUT SOFTWARE AND FIRMWARE VERSION

Product	Model No.	Software/Firmware Version
Dualband Ceiling/Wall/Desktop Enterprise AP (802.11ac)	SS-AC1200-EU	v3.4.6.3

COMPANION DEVICE INFORMATION

Product	Brand	Model No.	Software/Firmware Version
802.11a/b/g/n/ac RTL8821AE Combo module	REALTEK	RTL8821AE BT	2014/01/08 2012.7.1231.2013

4.5.3 LIST OF MEASUREMENTS

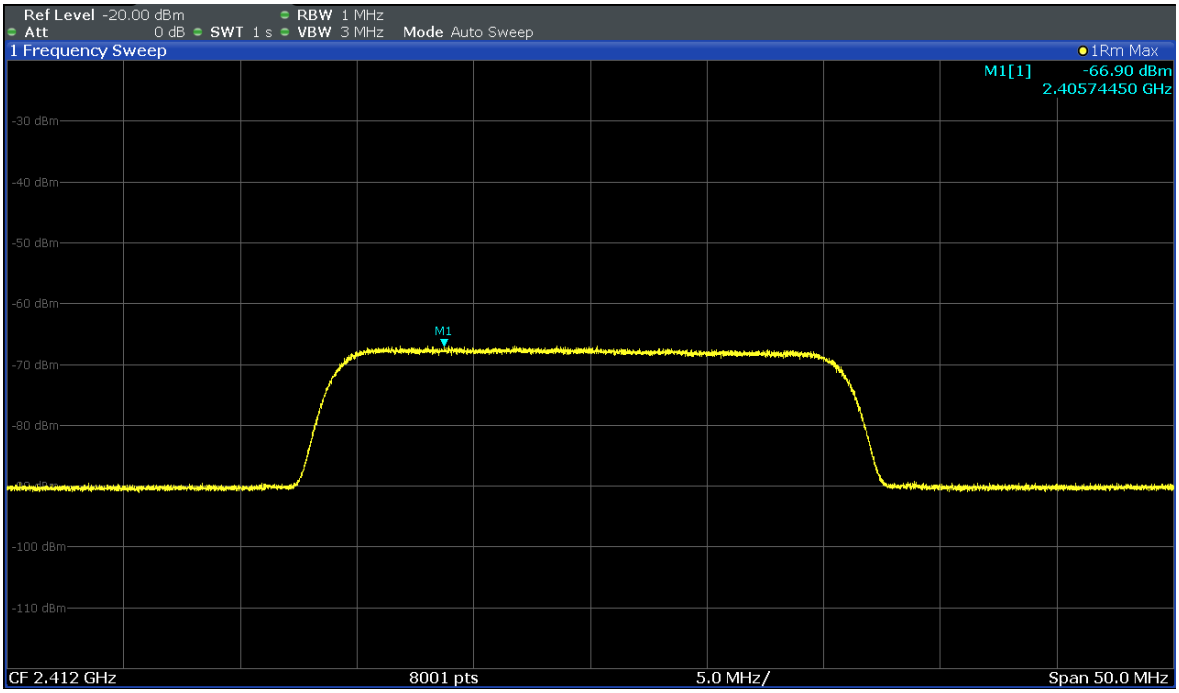
UUT Operational Mode	Applicable	Limitation	
		The Maximum Channel Occupancy Time	The Minimum idle Period
Load Based Equipment (CCA using 'energy detect')	**P**	Max. COT< __13__ms [Max. COT=(13/32) × q ms.]	Between CCA =__20__us to q=__32__xCCA = __640___us

Note: The value of q is declared by the manufacturer.

Clause	Test Parameter	Remarks	Pass/Fail
4.3.2.5.2.2.1	Adaptive (Frame Based Equipment)	Not Applicable	NA
4.3.2.5.2.2.2	Adaptive (Load Based Equipment)	Applicable	Pass
4.3.2.5.3	Short Control Signalling Transmissions	Applicable	Pass

4.5.4 INTERFERENCE THRESHOLD LEVEL

Detection Threshold Level
The maximum EIRP power is 19.9dBm and antenna gain is 3.16dBi. Detection Threshold level= -70dBm/MHz + 20 – Pout EIRP(19.9dBm) + G (3.16dBi) = -66.74dBm/MHz . The interference signal level to the UUT is -66.74dBm/MHz.



Detection Threshold Level

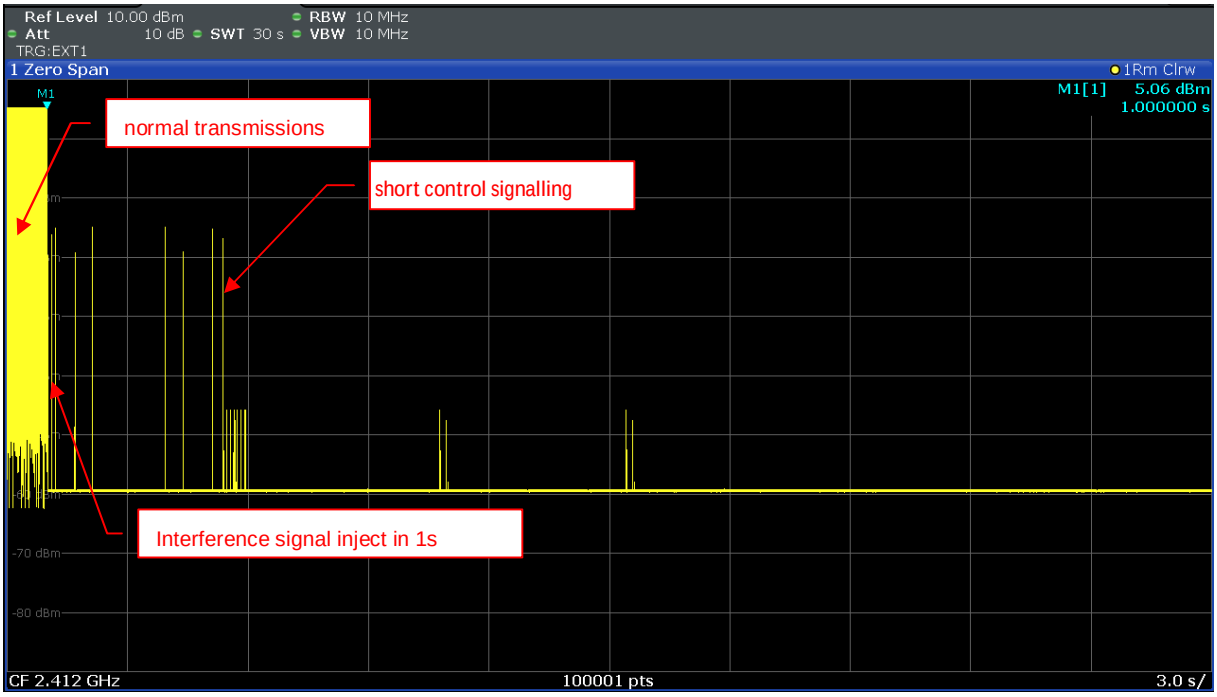
4.5.5 TEST RESULT

4.5.5.1 ADAPTIVE RESULT

OPERATING FREQUENCY BANDS AND MODE OF EUT

Operational Mode	Operating Frequency (Low Channel, MHz)	Operating Frequency (High Channel, MHz)	Test Result
802.11b	2412	2472	PASS
802.11g	2412	2472	PASS
802.11n (HT20)	2412	2472	PASS
802.11n (HT40)	2422	2462	PASS

802.11b CH01 2412 MHz



(The test plot was presents representative mode (11b Ch01) in report)

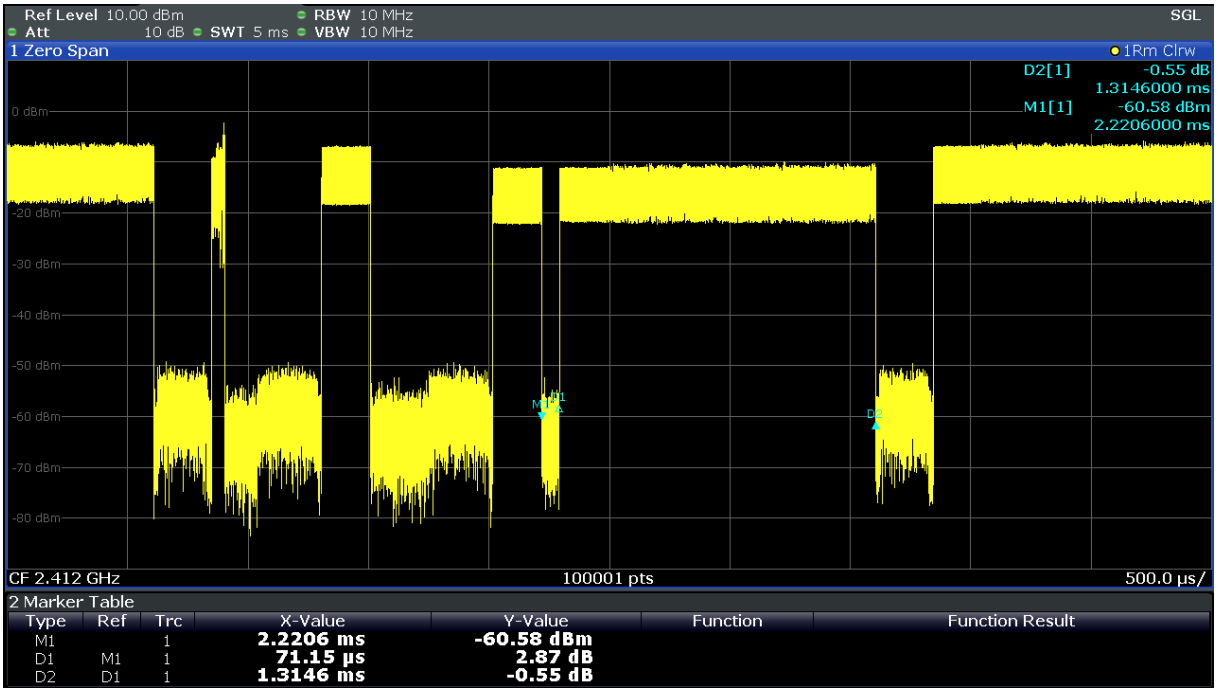
Adaptive Result

4.5.5.2 THE CHANNEL OCCUPANCY TIME RESULT

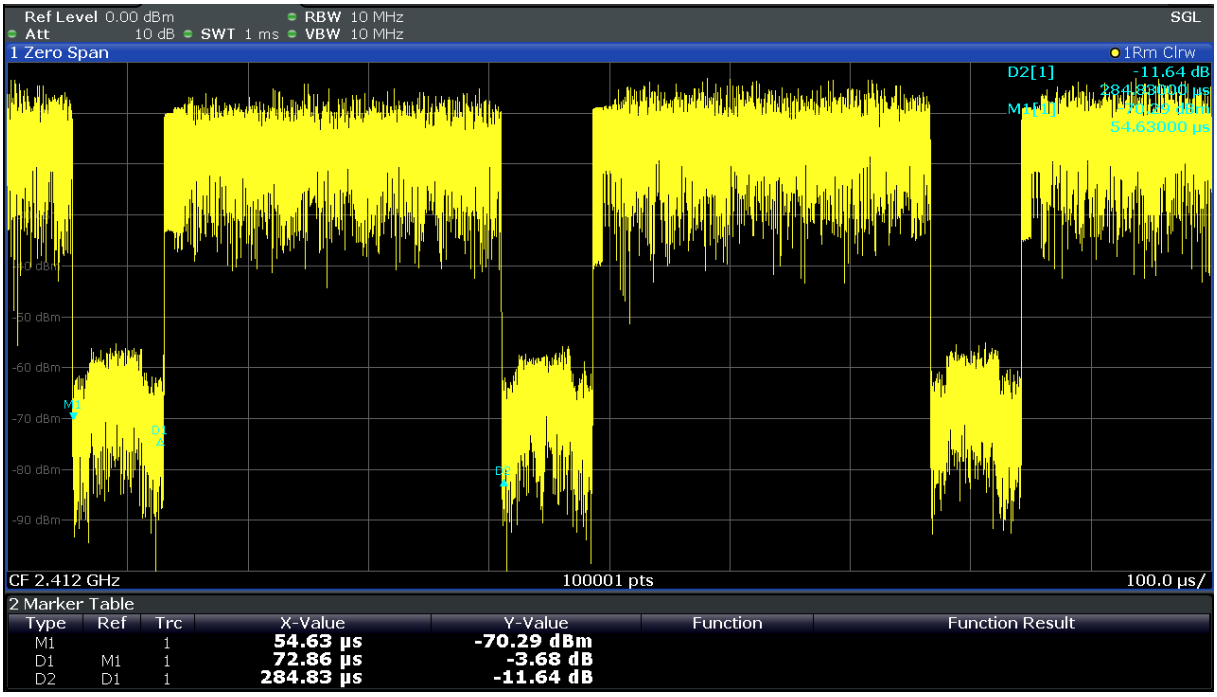
OPERATING FREQUENCY BANDS AND MODE OF EUT

Operational Mode	Operating Frequency Low Channel (MHz)	The Channel Occupancy Time (ms)	Minimum Idle Period (ms)	Test Result
802.11b	2412	1.31	0.07	PASS
802.11g	2412	0.28	0.07	PASS
802.11n (HT20)	2412	0.9	0.1	PASS
802.11n (HT40)	2422	0.3	0.1	PASS

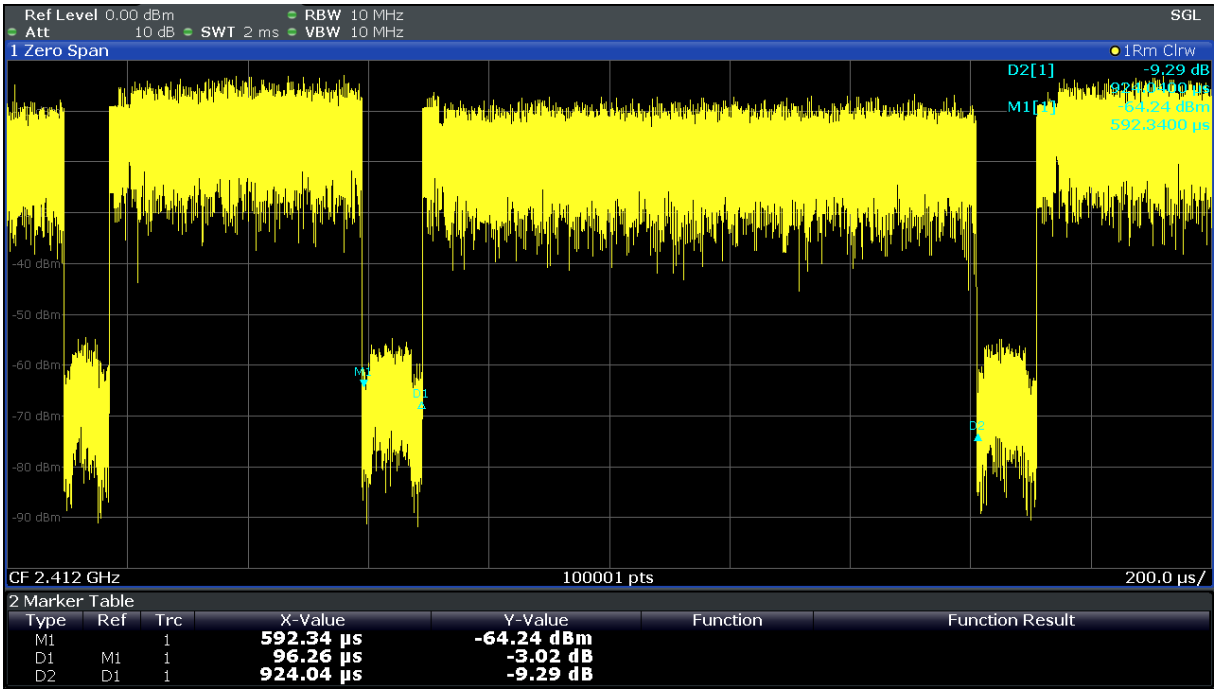
802.11b mode



802.11g mode



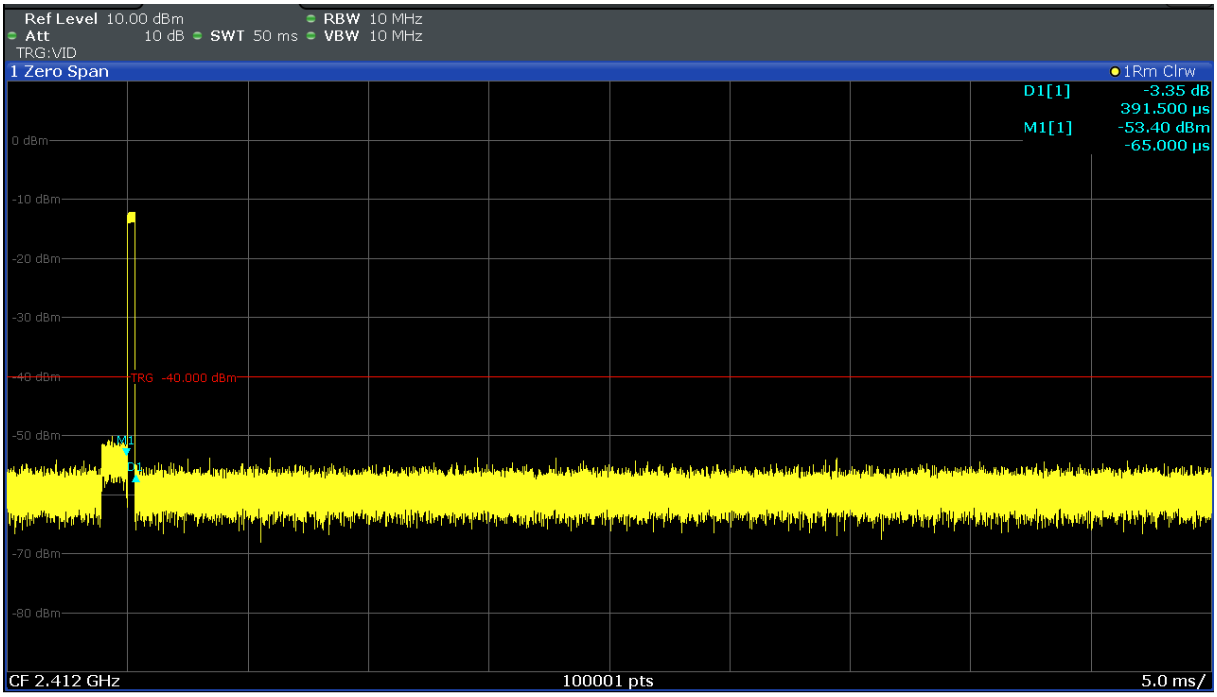
802.11n (HT20) mode



802.11n (HT40) mode

4.5.5.3 SHORT CONTROL SIGNALLING TRANSMISSIONS RESULT

SHORT CONTROL SIGNALLING TRANSMISSION RESULT
The SCST limit is 5ms
The SCST total on time is 391.5us < SCST limit



The short control signalling transmission length

4.6 TRANSMITTER SPURIOUS EMISSIONS

4.6.1 LIMITS OF TRANSMITTER SPURIOUS EMISSIONS

Frequency Range	Maximum Power Limit (ERP (≤ 1 GHz) EIRP (> 1 GHz))	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 862 MHz	-54dBm	100kHz
862 MHz to 1 GHz	-36dBm	100kHz
1GHz ~ 12.75GHz	-30dBm	1MHz

4.6.2 TEST PROCEDURE

Refer to chapter 5.3.10.2 of ETSI EN 300 328 V1.8.1.

Measurement	
☐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 1 MHz 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 × log10 (N) (number of active transmit chains).	

4.6.3 DEVIATION FROM TEST STANDARD

No deviation.

4.6.4 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. Controlling software (MP_TEST.exe [RTL819x 2.3]) has been activated to set the EUT on specific status.

.

4.6.5 TEST RESULTS

BELOW 1GHz WORST-CASE DATA

802.11b

SPURIOUS EMISSION FREQUENCY RANGE	30MHz ~ 1GHz	OPERATING CHANNEL	13

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
92.38	V	-66.64	-54.00	-12.64
102.47	H	-72.84	-54.00	-18.84
103.25	V	-63.44	-54.00	-9.44
223.55	H	-74.01	-54.00	-20.01
479.98	H	-73.98	-54.00	-19.98
577.87	H	-71.07	-54.00	-17.07
599.99	H	-70.17	-54.00	-16.17
625.02	H	-71.32	-54.00	-17.32
625.02	V	-72.25	-54.00	-18.25
648.89	V	-74.60	-54.00	-20.60
650.54	H	-75.80	-54.00	-21.80
677.51	V	-74.94	-54.00	-20.94
687.40	H	-75.71	-54.00	-21.71
740.47	V	-75.29	-54.00	-21.29
749.98	H	-65.28	-54.00	-11.28
749.98	V	-63.93	-54.00	-9.93
797.04	V	-75.59	-54.00	-21.59
799.95	H	-74.06	-54.00	-20.06
826.14	V	-75.72	-54.00	-21.72
854.57	V	-75.07	-54.00	-21.07

802.11n (HT20)

SPURIOUS EMISSION FREQUENCY RANGE	30MHz ~ 1GHz	OPERATING CHANNEL	13

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
39.51	V	-73.12	-36.00	-37.12
73.27	V	-67.95	-54.00	-13.95
101.79	H	-72.74	-54.00	-18.74
101.89	V	-63.55	-54.00	-9.55
172.91	V	-80.74	-36.00	-44.74
192.02	H	-76.53	-54.00	-22.53
223.36	V	-76.47	-54.00	-22.47
223.55	H	-74.57	-54.00	-20.57
400.03	H	-72.26	-36.00	-36.26
400.03	V	-74.88	-36.00	-38.88
599.99	H	-71.26	-54.00	-17.26
624.92	H	-70.68	-54.00	-16.68
625.02	V	-73.05	-54.00	-19.05
749.98	H	-64.37	-54.00	-10.37
749.98	V	-63.50	-54.00	-9.50
874.94	H	-67.44	-36.00	-31.44
874.94	V	-70.52	-36.00	-34.52
960.03	H	-71.82	-36.00	-35.82
1000.00	H	-68.12	-36.00	-32.12
1000.00	V	-66.97	-36.00	-30.97

ABOVE 1GHz WORST-CASE DATA

802.11b

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 12.75GHz	OPERATING CHANNEL	1, 13

SPURIOUS EMISSION LEVEL					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
1	4823.50	H	-49.04	-30.00	-19.04
	4823.85	V	-47.10	-30.00	-17.10
	9647.75	H	-48.52	-30.00	-18.52
	9647.90	V	-46.94	-30.00	-16.94
13	4943.23	H	-49.21	-30.00	-19.21
	4943.51	V	-48.81	-30.00	-18.81
	9888.12	V	-47.66	-30.00	-17.66
	9888.30	H	-48.68	-30.00	-18.68

802.11n (HT20)

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 12.75GHz	OPERATING CHANNEL	1, 13

SPURIOUS EMISSION LEVEL					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
1	4823.05	V	-48.59	-30.00	-18.59
	4823.92	H	-50.59	-30.00	-20.59
	9647.70	H	-47.38	-30.00	-17.38
	9647.99	V	-46.13	-30.00	-16.13
13	4942.37	V	-50.00	-30.00	-20.00
	4942.39	H	-51.02	-30.00	-21.02
	9887.75	V	-47.51	-30.00	-17.51
	9887.83	H	-48.83	-30.00	-18.83

4.7 RECEIVER SPURIOUS RADIATION

4.7.1 LIMITS OF RECEIVER SPURIOUS RADIATION

Frequency Range	Maximum Power Limit (e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz))
30MHz ~ 1GHz	-57dBm
1GHz ~ 12.75GHz	-47dBm

4.7.2 TEST PROCEDURE

Refer to chapter 5.3.11.2 of ETSI EN 300 328 V1.8.1.

Measurement	
☐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 1 MHz 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 × log10 (N) (number of active transmit chains).	

4.7.3 DEVIATION FROM TEST STANDARD

No deviation.

4.7.4 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. Controlling software (MP_TEST.exe [RTL819x 2.3]) has been activated to set the EUT on specific status.

4.7.5 TEST RESULTS

RX WORST-CASE DATA

SPURIOUS EMISSION FREQUENCY RANGE	30MHz ~ 1GHz	OPERATING CHANNEL	13

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
101.89	H	-74.04	-57.00	-17.04
101.89	V	-65.14	-57.00	-8.14
108.78	V	-65.88	-57.00	-8.88
141.38	V	-79.63	-57.00	-22.63
157.58	H	-76.43	-57.00	-19.43
180.48	V	-80.13	-57.00	-23.13
225.88	V	-76.33	-57.00	-19.33
226.85	H	-73.24	-57.00	-16.24
331.15	V	-78.94	-57.00	-21.94
362.49	H	-74.63	-57.00	-17.63
362.49	V	-76.23	-57.00	-19.23
399.93	H	-70.08	-57.00	-13.08
479.98	H	-72.87	-57.00	-15.87
624.92	H	-72.27	-57.00	-15.27
749.98	H	-64.36	-57.00	-7.36
749.98	V	-62.56	-57.00	-5.56
874.94	H	-67.91	-57.00	-10.91
874.94	V	-68.86	-57.00	-11.86
1000.00	H	-64.38	-57.00	-7.38
1000.00	V	-66.16	-57.00	-9.16

RX ABOVE 1GHz DATA

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 12.75GHz	OPERATING CHANNEL	1, 13

SPURIOUS EMISSION LEVEL					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
1	9647.70	V	-48.26	-47.00	-1.26
	9647.81	H	-51.81	-47.00	-4.81
13	9887.78	H	-52.23	-47.00	-5.23
	9887.84	V	-49.73	-47.00	-2.73

4.8 RECEIVER BLOCKING

4.8.1 LIMITS OF RECEIVER BLOCKING

Adaptive equipment using wide band modulations other than FHSS, shall comply with the requirements defined in non-LBT based DAA or LBT based DAA in the presence of a blocking signal with characteristics as provided in below table.

Equipment Type (LBT / non- LBT)	Wanted signal mean power from companion device	Blocking signal frequency [MHz]	Blocking signal power [dBm]	Type of interfering signal
LBT	sufficient to maintain the link (see note 2)	2 395 or 2 488,5 (see note 1)	-30	CW
Non-LBT	-30 dBm			
NOTE 1: The highest blocking frequency shall be used for testing the lowest operating channel, while the lowest blocking frequency shall be used for testing the highest operating channel.				
NOTE 2: A typical value which can be used in most cases is -50 dBm/MHz.				

4.8.2 TEST PROCEDURE

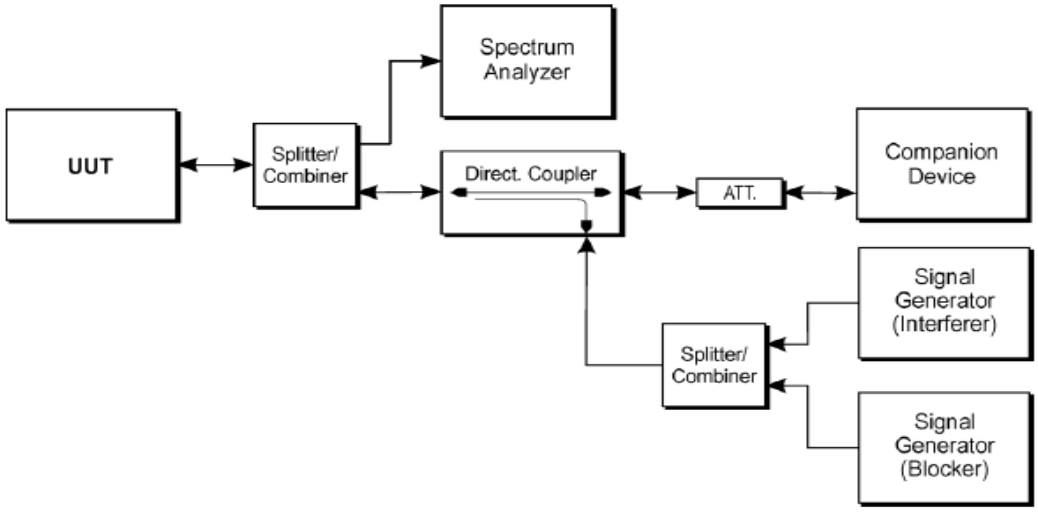
Refer to chapter 5.3.7.2.1. of ETSI EN 300 328 V1.8.1.

Measurement	
☒Conducted measurement	☐Radiated measurement

4.8.3 DEVIATION FROM TEST STANDARD

No deviation.

4.8.4 TEST SETUP CONFIGURATION



4.8.5 TEST RESULT

802.11b

CHANNEL	CHANNEL FREQUENCY (MHz)	Wanted signal mean power from companion device (dBm/MHz)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	PASS/FAIL
1	2412	-50	2488.5	-30	PASS
13	2472	-50	2395	-30	PASS

802.11g

CHANNEL	CHANNEL FREQUENCY (MHz)	Wanted signal mean power from companion device (dBm/MHz)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	PASS/FAIL
1	2412	-50	2488.5	-30	PASS
13	2472	-50	2395	-30	PASS

802.11n (HT20)

CHANNEL	CHANNEL FREQUENCY (MHz)	Wanted signal mean power from companion device (dBm/MHz)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	PASS/FAIL
1	2412	-50	2488.5	-30	PASS
13	2472	-50	2395	-30	PASS

802.11n (HT40)

CHANNEL	CHANNEL FREQUENCY (MHz)	Wanted signal mean power from companion device (dBm/MHz)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	PASS/FAIL
3	2422	-50	2488.5	-30	PASS
11	2462	-50	2395	-30	PASS

5 TEST PROCEDURES AND RESULTS (FOR 5GHz)

TRANSMITTER PARAMETERS

5.1 CENTRE FREQUENCIES

5.1.1 LIMITS OF CENTRE FREQUENCIES

The actual centre frequency for any given channel declared by the manufacturer shall be maintained within the range fc ± 20 ppm.

5.1.2 TEST PROCEDURE

Reference to ETSI EN 301 893 V1.7.1 clause 5.3.2.2

Measurement	
☒ Conducted measurement	☐ Radiated measurement
☒ Option 1: Equipment operating without modulation	
☐ Option 2: Equipment operating with modulation	

5.1.3 DEVIATION FROM TEST STANDARD

No deviation

5.1.4 TEST SETUP

The EUT was placed into the temperature oven. The power source of the EUT has to be connected with the power supply for voltage change. The frequency has to be recorded for the above threshold.

5.1.5 TEST RESULTS

802.11a

TEST CONDITION			CARRIER CENTRE FREQUENCIES f_c (MHz)	
			(CH36) 5180 MHz	
			Reading	ppm
Tnom(℃)	25	Vnom(v)	5180.0106	2.0463
Tmin(℃)	0	Vmin(v)	5180.0017	0.3282
		Vmax(v)	5180.0025	0.4826
Tmax(℃)	40	Vmin(v)	5179.9891	-2.1042
		Vmax(v)	5179.9870	-2.5097
Limit			f_c +/- 20ppm	

5.2 NOMINAL AND OCCUPIED CHANNEL BANDWIDTH

5.2.1 LIMITS OF NOMINAL AND OCCUPIED CHANNEL BANDWIDTH

The Nominal Channel Bandwidth shall be at least 5 MHz at all times.
The Occupied Channel Bandwidth shall be between 80 % and 100 % of the declared Nominal Channel Bandwidth. In case of smart antenna systems (devices with multiple transmit chains) each of the transmit chains shall meet this requirement

NOTE: 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.

5.2.2 TEST PROCEDURE

Reference to ETSI EN 301 893 V1.7.1 clause 5.3.3.2

Measurement	
☒ Conducted measurement	☐Radiated measurement

5.2.3 DEVIATION FROM TEST STANDARD

No deviation.

5.2.4 TEST SETUP

The test setup has been constructed as the normal use condition. Controlling software (MP_TEST.exe [RTL819x 2.3]) has been activated to set the EUT on specific status.

5.2.5 TEST RESULTS

802.11a

CHANNEL	CHANNEL FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)	MINIMUM LIMIT(MHz)	MAXIMUN LIMIT(MHz)	PASS / FAIL
48	5240	16.56	16	20	PASS

802.11n (HT20)

CHANNEL	CHANNEL FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)	MINIMUM LIMIT(MHz)	MAXIMUN LIMIT(MHz)	PASS / FAIL
48	5240	17.76	16	20	PASS

802.11n (HT40)

CHANNEL	CHANNEL FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)	MINIMUM LIMIT(MHz)	MAXIMUN LIMIT(MHz)	PASS / FAIL
38	5190	36.48	32	40	PASS

802.11ac (VHT80)

CHANNEL	CHANNEL FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)	MINIMUM LIMIT(MHz)	MAXIMUN LIMIT(MHz)	PASS / FAIL
42	5210	75.2	64	80	PASS

5.3 RF OUTPUT POWER

5.3.1 LIMITS OF RF OUTPUT POWER

Frequency Range (MHz)	Mean e.i.r.p. limit (dBm)	
	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 20 dBm, 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 23 dBm.

NOTE 2: Slave devices without a Radar Interference Detection function shall comply with the limits for the band 5 250 MHz to 5 350 MHz.

NOTE 3: In case of multiple (adjacent or non-adjacent) channels within the same sub-band, the total RF output power of all channels in that sub-band shall not exceed the limits defined above table.

In case of multiple, non-adjacent channels operating in separate sub-bands, the total RF output power in each of the sub-bands shall not exceed the limits defined above table.

5.3.2 TEST PROCEDURE

Reference to ETSI EN 301 893 V1.7.1 clause 5.3.4.2

Measurement	
☒Conducted measurement	☐Radiated measurement
☒ Option 1: 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).	
☐Option 2: For equipment without continuous transmission capability and operating (or with the capability to operate) in only one sub-band.	
☐Option 3 For equipment without continuous transmission capability and having simultaneous transmissions in both sub-bands.	

5.3.3 DEVIATION FROM TEST STANDARD

No deviation.

5.3.4 TEST SETUP

The test setup has been constructed as the normal and extreme test conditions. The RF power as defined in EN 301 893 clause 4.4.1.1 shall be measured and recorded. Controlling software (MP_TEST.exe [RTL819x 2.3]) has been activated to set the EUT on specific status.

5.3.5 TEST RESULTS FOR RF OUTPUT POWER

802.11a

TEST CONDITION			TRANSMITTER POWER (dBm)	
			(CH36) 5180 MHz	(CH48) 5240 MHz
			Average EIRP	Average EIRP
Tnom(℃)	25	Vnom(v)	21.32	21.35
Tmin(℃)	0	Vmin(v)	20.72	21.36
		Vmax(v)	20.74	21.37
Tmax(℃)	40	Vmin(v)	20.63	20.84
		Vmax(v)	20.63	20.82

802.11n (HT20)

TEST CONDITION			TRANSMITTER POWER (dBm)	
			(CH36) 5180 MHz	(CH48) 5240 MHz
			Average EIRP	Average EIRP
Tnom(℃)	25	Vnom(v)	21.23	21.55
Tmin(℃)	0	Vmin(v)	20.92	21.59
		Vmax(v)	20.94	21.60
Tmax(℃)	40	Vmin(v)	20.79	20.99
		Vmax(v)	20.79	20.97

802.11n (HT40)

TEST CONDITION			TRANSMITTER POWER (dBm)	
			(CH38) 5190 MHz	(CH46) 5320 MHz
			Average EIRP	Average EIRP
Tnom(℃)	25	Vnom(v)	22.68	22.64
Tmin(℃)	0	Vmin(v)	22.38	22.20
		Vmax(v)	22.40	22.21
Tmax(℃)	40	Vmin(v)	22.25	22.01
		Vmax(v)	22.25	21.99

802.11ac (VHT80)

TEST CONDITION			TRANSMITTER POWER (dBm)
			(CH42) 5210 MHz
			Average EIRP
Tnom(℃)	25	Vnom(v)	22.49
Tmin(℃)	0	Vmin(v)	22.66
		Vmax(v)	22.70
Tmax(℃)	40	Vmin(v)	22.06
		Vmax(v)	22.02

5.4 POWER DENSITY

5.4.1 LIMITS OF POWER DENSITY

Frequency Band (MHz)	Mean e.i.r.p. density limit (dBm/MHz)	
	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 7 dBm/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 10 dBm/MHz. NOTE 2: Slave devices without a Radar Interference Detection function shall comply with the limits for the band 5 250 MHz to 5 350 MHz. NOTE 3: In case of multiple (adjacent or non-adjacent) channels within the same sub-band, the total RF output power of all channels in that sub-band shall not exceed the limits defined above table. In case of multiple, non-adjacent channels operating in separate sub-bands, the total RF output power in each of the sub-bands shall not exceed the limits defined above table		

5.4.2 TEST PROCEDURE

Reference to ETSI EN 301 893 V1.7.1 clause 5.3.4.2.1.3

Measurement	
☒Conducted measurement	☐Radiated measurement
☒ Option 1: 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)	
☐Option 2: For equipment without continuous transmission capability and without the capability to transmit with a constant duty cycle	

5.4.3 DEVIATION FROM TEST STANDARD

No deviation.

5.4.4 TEST SETUP

The transmitter shall be connected to the measuring equipment via a suitable attenuator and the power density value shall be measured and recorded.

5.4.5 TEST RESULTS

802. 11a

Channel Number	Channel Frequency (MHz)	Power Density (dBm/1MHz) (EIRP)	Limit (dBm/1MHz) (EIRP)	PASS/FAIL
36	5180	8.96	10	PASS
48	5240	9.15	10	PASS

802.11n (HT20)

Channel Number	Channel Frequency (MHz)	Power Density (dBm/1MHz) (EIRP)	Limit (dBm/1MHz) (EIRP)	PASS/FAIL
36	5180	9.41	10	PASS
48	5240	9.78	10	PASS

802.11n (HT40)

Channel Number	Channel Frequency (MHz)	Power Density (dBm/1MHz) (EIRP)	Limit (dBm/1MHz) (EIRP)	PASS/FAIL
38	5190	7.39	10	PASS
46	5230	7.67	10	PASS

802.11ac (VHT80)

Channel Number	Channel Frequency (MHz)	Power Density (dBm/1MHz) (EIRP)	Limit (dBm/1MHz) (EIRP)	PASS/FAIL
42	5210	6.66	10	PASS

5.5 ADAPTIVITY (CHANNEL ACCESS MECHANISM)

This requirement applies to equipment, testing shall be performed using the highest nominal channel Bandwidth. The manufacturer shall state whether the UUT is capable of operating as a Frame Based Equipment or Load Based Equipment. See tables for the applicability of adaptive requirements and limit for each of the operational modes.

Applicability of adaptive requirements and limit

Requirement	Operational Mode		
	Frame Based Equipment	**Load Based Equipment** (CCA using 'energy detect')	**Load Based Equipment** (CCA not using any of the mechanisms referenced as IEEE spec.)
Minimum Clear Channel Assessment (CCA) Time	20us (see note 1)	(see note 2)	20us (see note 1)
Maximum Channel Occupancy (COT) Time	1 ms to 10 ms	(see note 2)	(13/32)*q ms (see note 3)
Minimum Idle Period	5% COT	(see note 2)	CCA to q*CCA
Extended CCA check	NA	(see note 2)	N*CCA (see note 4)
Short Control Signalling Transmissions	Maximum duty cycle of 5 % within an observation period of 50 ms (see note 5)		

NOTE 1: The CCA time used by the equipment shall be declared by the manufacturer.
NOTE 2: Minimum required of EN301 893 section 4.9.2.2 or LBT based spectrum sharing mechanism based on the Clear Channel Assessment (CCA) mode using 'energy detect', as described in IEEE 802.11™-2007 [9], clauses 15 and 17, in IEEE 802.11n™-2009 [10], clause 20
NOTE 3: q is selected by the manufacturer in the range [4..32]
NOTE 4: The value of N shall be randomly selected in the range [1..q]
NOTE 5:Adaptive equipment may or may not have Short Control Signalling Transmissions.

Interference threshold level

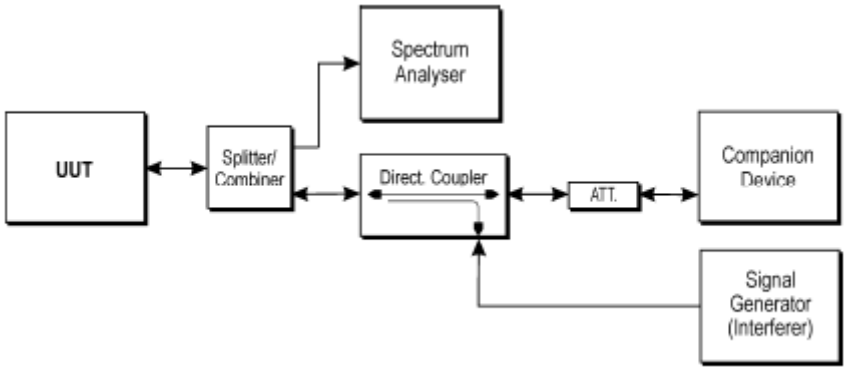
Maximum transmit power (P_H) EIRP dBm	Threshold level (TL) (see notes 1 and 2)
23	-73 dBm / MHz

NOTE 1: TL = -73 dBm/MHz + 23 - PH (assuming a 0dBi receive antenna and PH specified in dBm e.i.r.p.).
NOTE 2: transmitter the CCA threshold level (TL) shall be equal or lower than -73 dBm/MHz at the input to the receiver (assuming a 0 dBi receive antenna).

5.5.1 TEST PROCEDURE

Reference to ETSI EN 301 893 V1.7.1 clause 5.3.9.2

5.5.2 TEST SETUP CONFIGURATION



UUT SOFTWARE AND FIRMWARE VERSION

Product	Model No.	Software/Firmware Version
Dualband Ceiling/Wall/Desktop Enterprise AP (802.11ac)	SS-AC1200-EU	v3.4.6.3

Companion Device information

Product	Brand	Model No.	Software/Firmware Version
802.11a/b/g/n/ac RTL8821AE Combo module	REALTEK	RTL8821AE BT	2014/01/08 2012.7.1231.2013

5.5.3 LIST OF MEASUREMENTS

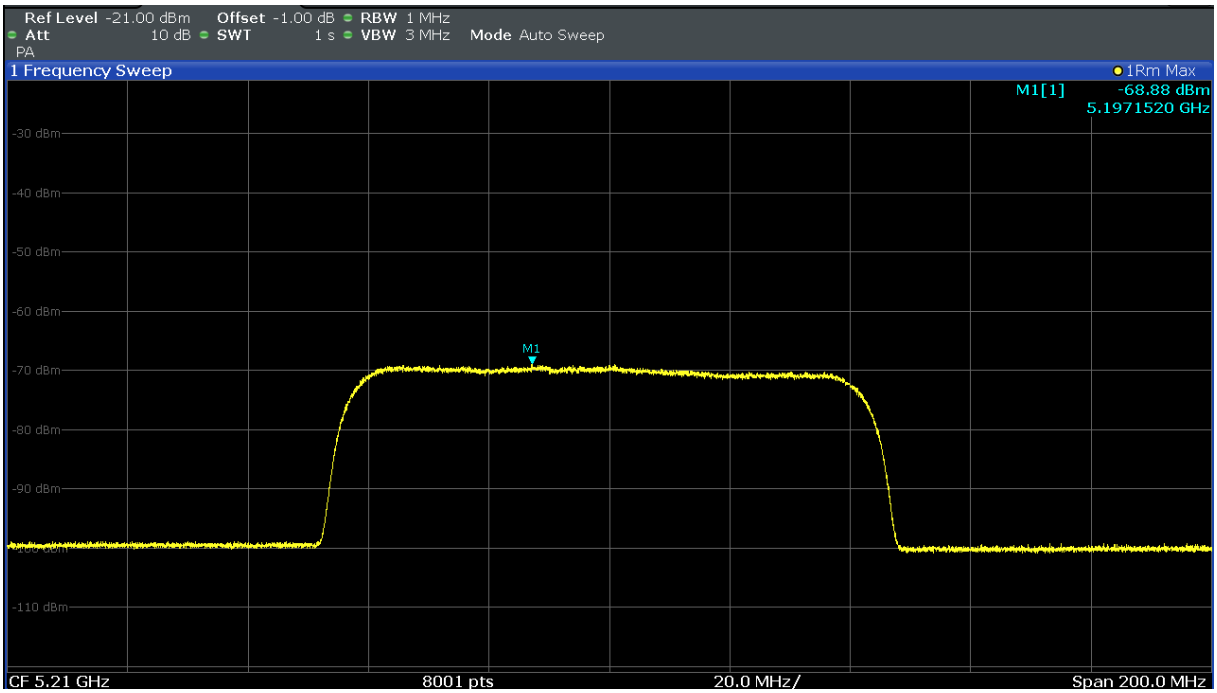
UUT Operational Mode	Applicable	Limitation	
		The Maximum Channel Occupancy Time	The Minimum idle Period
Load Based Equipment (CCA using 'energy detect')	**P**	Max. COT< __13__ ms [Max. COT=(13/32) × q ms.]	Between CCA =__20__us to q=__32__xCCA = __640___us

Note: The value of q is declared by the manufacturer.

Clause	Test Parameter	Remarks	Pass/Fail
4.9.2.1	Adaptive (Frame Based Equipment)	Not Applicable	NA
4.9.2.2	Adaptive (Load Based Equipment)	Applicable	Pass
4.9.2.3	Short Control Signalling Transmissions	Applicable	Pass

5.5.4 INTERFERENCE THRESHOLD LEVEL

Detection Threshold Level
The maximum EIRP power is 22.7dBm and antenna gain is 3.97dBi. Detection Threshold level= -73dBm/MHz + 23 – Pout EIRP(22.7dBm) + G (3.97dBi) = -68.73dBm/MHz . The interference signal level to the UUT is -68.73dBm/MHz.



Detection Threshold Level

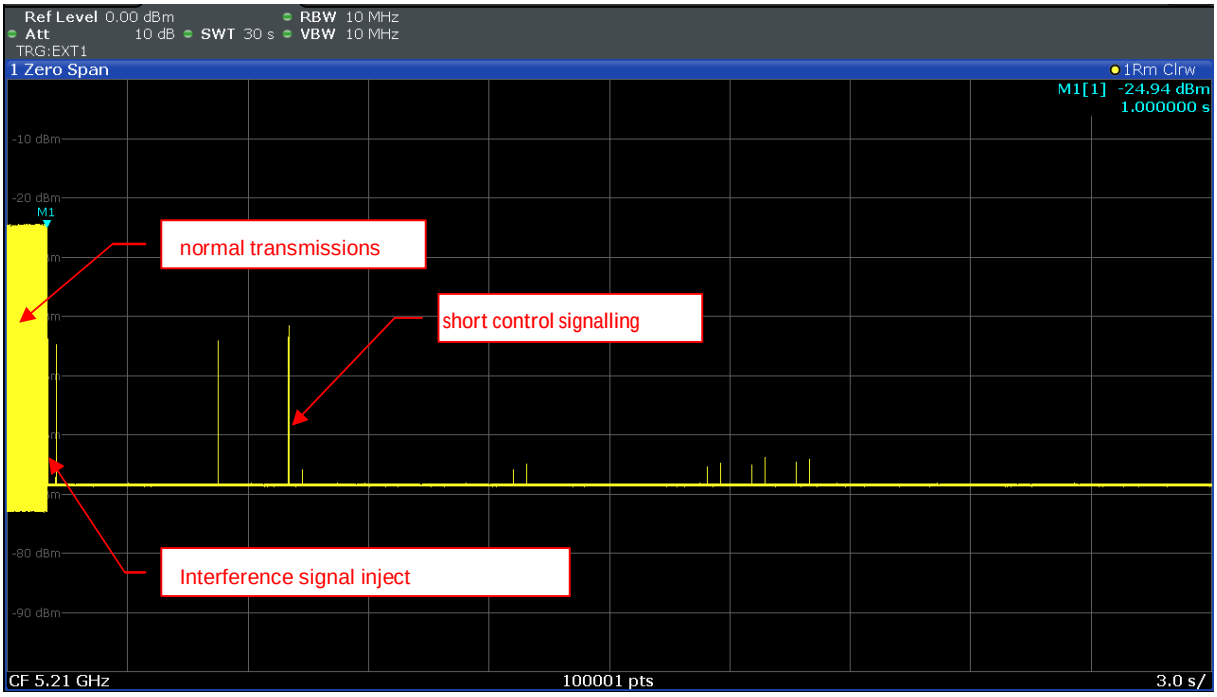
5.5.5 TEST RESULT

5.5.5.1 ADAPTIVITY RESULT

OPERATING FREQUENCY BANDS AND MODE OF EUT

Operational Mode	Operating Frequency (MHz)	Test Result
802.11ac (VHT80)	5210	PASS

802.11ac (VHT80) Ch42 5210MHz



(The test plot was presents representative mode (11ac (VHT80) Ch42) in report)

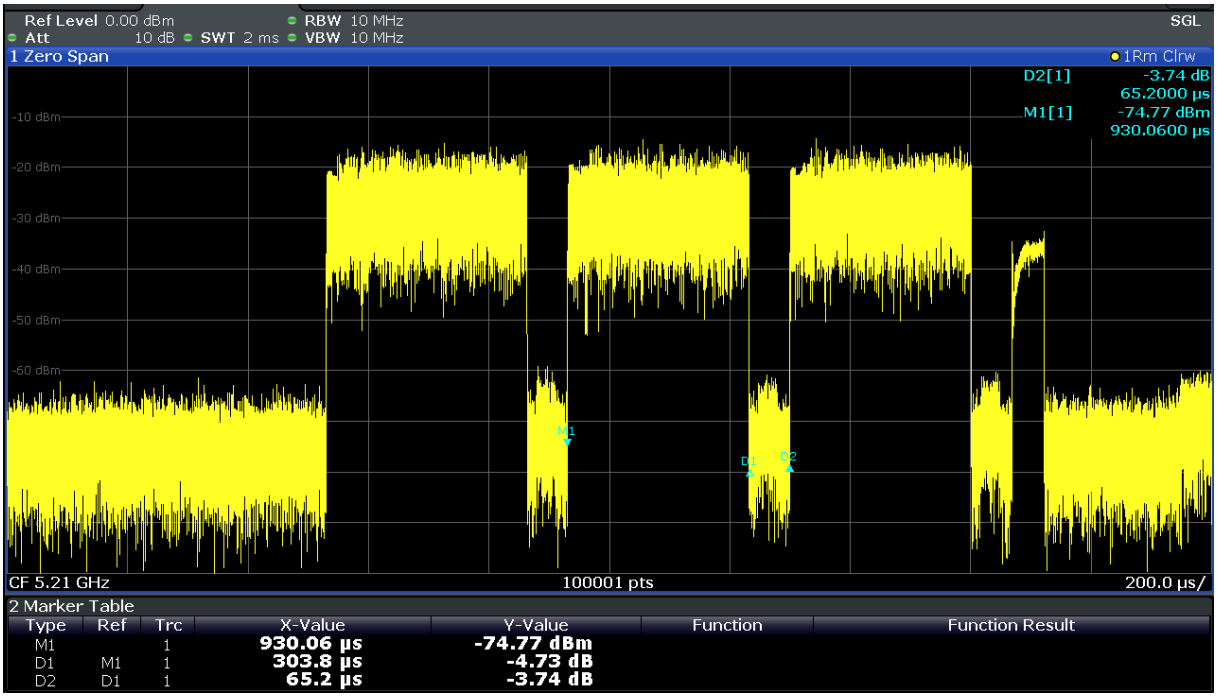
Adaptive Result

5.5.5.2 THE CHANNEL OCCUPANCY TIME RESULT

OPERATING FREQUENCY BANDS AND MODE OF EUT

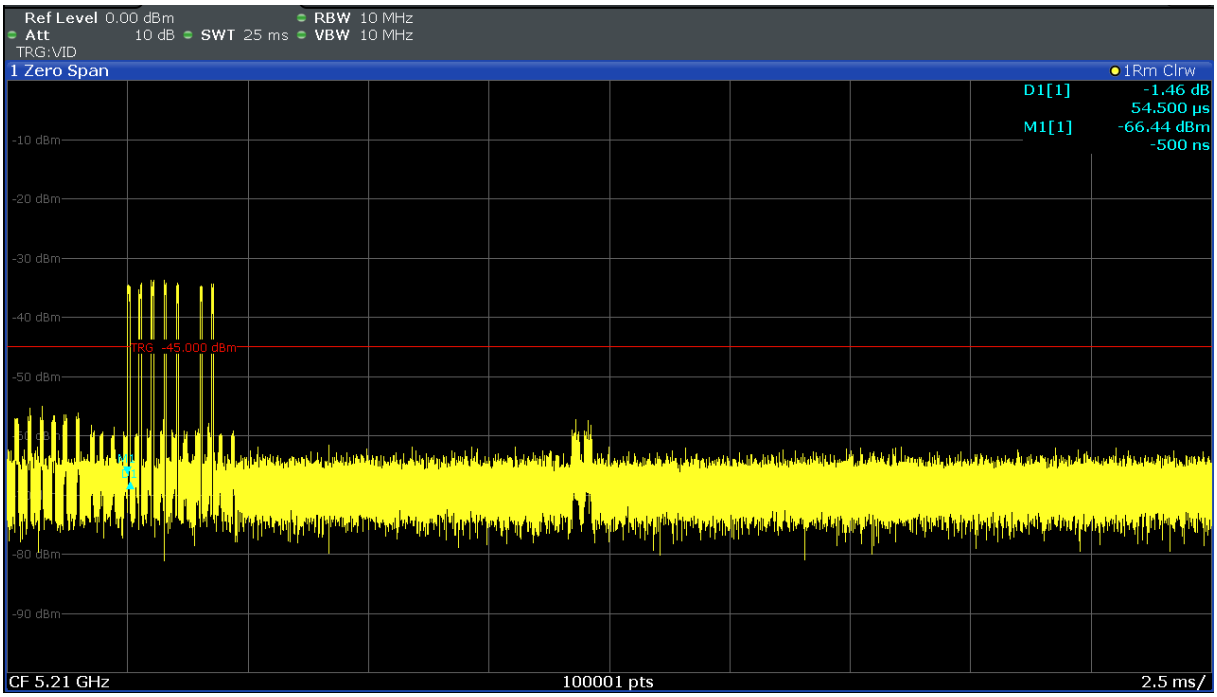
Operational Mode	Operating Frequency Low Channel (MHz)	The Channel Occupancy Time (ms)	Minimum Idle Period (ms)	Test Result
802.11ac (VHT80)	5210	0.3	0.07	PASS

802.11ac (VHT80) mode CH42 5210MHz



5.5.5.3 SHORT CONTROL SIGNALLING TRANSMISSIONS RESULT

SHORT CONTROL SIGNALLING TRANSMISSION RESULT
The SCST limit is 2.5ms
The SCST total on time is 54us*7=358us < SCST limit



The short control signalling transmission length

5.6 USER ACCESS RESTRICTIONS

5.6.1 DEFINITION

User Access Restrictions are restraints implemented in the RLAN to restrict access for the user to certain hardware and/or software settings of the equipment.

5.6.2 REQUIREMENT

Manufacturer provides declaration form to meet this requirement.

5.7 TRANSMITTER UNWANTED EMISSIONS OUTSIDE THE HIPERLAN BANDS

5.7.1 LIMITS OF UNWANTED EMISSIONS OUTSIDE THE HIPERLAN BANDS

Frequency Range (MHz)	Maximum power, ERP (dBm)	Bandwidth (kHz)
30 to 47	-36	100
47 to 74	-54	100
74 to 87.5	-36	100
87.5 to 118	-54	100
118 to 174	-36	100
174 to 230	-54	100
230 to 470	-36	100
470 to 862	-54	100
862 to 1000	-36	100
Frequency Range (GHz)	**Maximum power, EIRP (dBm)**	**Bandwidth (MHz)**
1 to 5.15	-30	1
5.35 to 5.47	-30	1
5.725 to 26	-30	1

5.7.2 TEST PROCEDURE

Reference to ETSI EN 301 893 V1.7.1 clause 5.3.5.2

Measurement	
☐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 1 MHz 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 × log10 (N) (number of active transmit chains).	

5.7.3 DEVIATION FROM TEST STANDARD

No deviation.

5.7.4 TEST SETUP

1. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).
2. The test setup has been constructed as the normal use condition. Controlling software (MP_TEST.exe [RTL819x 2.3]) has been activated to set the EUT on specific status.

5.7.5 TEST RESULTS

BELOW 1GHz WORST-CASE DATA

802.11a

SPURIOUS EMISSION FREQUENCY RANGE	30MHz ~ 1GHz	OPERATING CHANNEL	48

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
98.20	H	-73.89	-54.00	-19.89
101.89	V	-65.14	-54.00	-11.14
110.72	V	-65.95	-54.00	-11.95
226.85	H	-73.24	-54.00	-19.24
479.98	H	-72.87	-54.00	-18.87
576.80	H	-74.58	-54.00	-20.58
599.89	H	-71.51	-54.00	-17.51
599.89	V	-75.68	-54.00	-21.68
624.92	H	-72.27	-54.00	-18.27
625.02	V	-73.07	-54.00	-19.07
660.14	V	-74.78	-54.00	-20.78
682.75	V	-75.51	-54.00	-21.51
726.79	H	-74.63	-54.00	-20.63
740.96	V	-75.14	-54.00	-21.14
749.98	H	-64.36	-54.00	-10.36
749.98	V	-62.56	-54.00	-8.56
787.82	V	-75.27	-54.00	-21.27
788.89	H	-75.51	-54.00	-21.51
821.10	H	-74.85	-54.00	-20.85
826.53	V	-75.01	-54.00	-21.01

802.11n (HT20)

SPURIOUS EMISSION FREQUENCY RANGE	30MHz ~ 1GHz	OPERATING CHANNEL	48

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
36.02	V	-75.14	-36.00	-39.14
73.17	V	-67.73	-54.00	-13.73
101.89	V	-63.42	-54.00	-9.42
156.42	H	-74.48	-36.00	-38.48
183.10	V	-80.49	-54.00	-26.49
225.69	V	-77.34	-54.00	-23.34
231.70	H	-74.37	-36.00	-38.37
249.94	H	-76.93	-36.00	-40.93
399.93	H	-71.84	-36.00	-35.84
600.09	H	-69.48	-54.00	-15.48
624.92	H	-71.04	-54.00	-17.04
625.02	V	-73.74	-54.00	-19.74
749.98	H	-63.45	-54.00	-9.45
749.98	V	-63.50	-54.00	-9.50
874.94	H	-67.47	-36.00	-31.47
874.94	V	-70.15	-36.00	-34.15
949.84	V	-72.66	-36.00	-36.66
960.03	H	-72.04	-36.00	-36.04
1000.00	H	-67.28	-36.00	-31.28
1000.00	V	-67.83	-36.00	-31.83

ABOVE 1GHz WORST-CASE DATA

802.11a

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 26GHz	OPERATING CHANNEL	48

SPURIOUS EMISSION LEVEL					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
36	10480.00	H	-51.09	-30.00	-21.09
	10480.20	V	-46.10	-30.00	-16.10
	15719.97	H	-56.42	-30.00	-26.42
	15720.30	V	-55.76	-30.00	-25.76
	20959.90	V	-57.28	-30.00	-27.28
	20959.92	H	-56.45	-30.00	-26.45

802.11n (HT20)

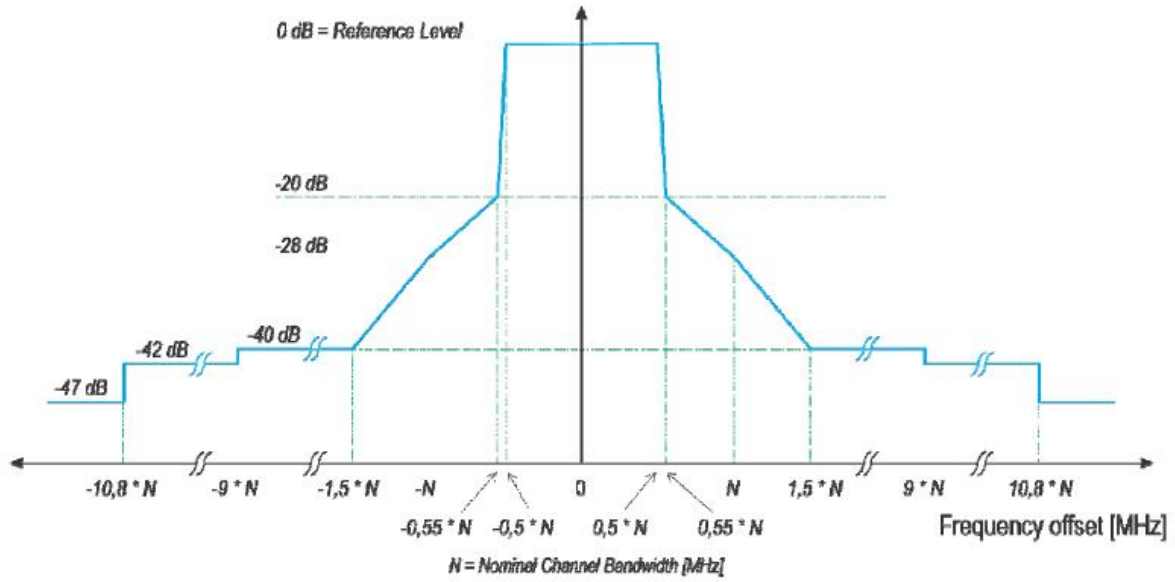
SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 26GHz	OPERATING CHANNEL	48

SPURIOUS EMISSION LEVEL					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
48	10480.60	V	-45.10	-30.00	-15.10
	10481.40	H	-49.27	-30.00	-19.27
	15720.03	H	-56.00	-30.00	-26.00
	15720.20	V	-55.89	-30.00	-25.89
	20959.90	V	-57.66	-30.00	-27.66
	20959.97	H	-57.73	-30.00	-27.73

5.8 TRANSMITTER UNWANTED EMISSIONS WITHIN THE HIPERLAN BANDS

5.8.1 LIMITS OF UNWANTED EMISSIONS WITHIN THE HIPERLAN BANDS

The average level of the transmitted spectrum shall not exceed the limits given in the following figure:



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

5.8.2 TEST PROCEDURE

Reference to ETSI EN 301 893 V1.7.1 clause 5.3.6.2

Measurement	
☒ Conducted measurement	☐ Radiated measurement
☒ Option 1: For equipment with continuous transmission capability	
☐ Option 2: For equipment without continuous transmission capability	

5.8.3 DEVIATION FROM TEST STANDARD

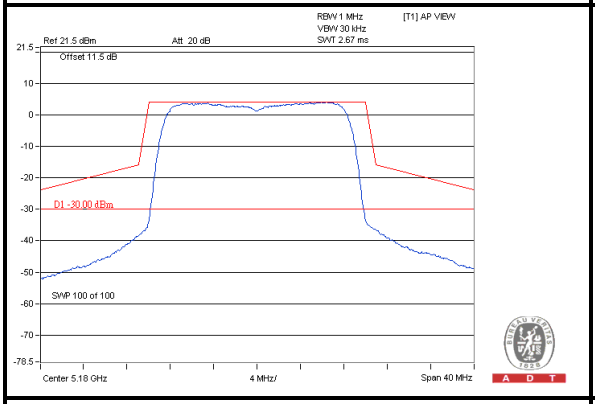
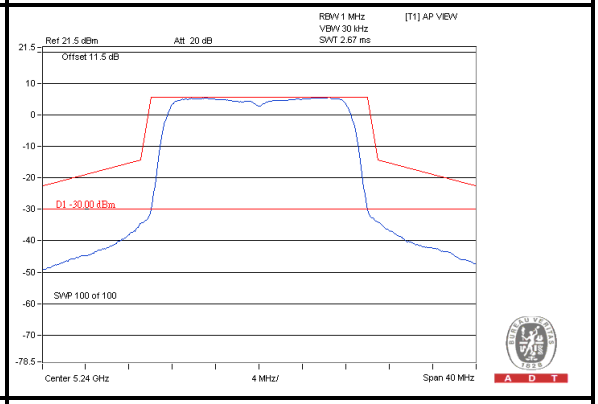
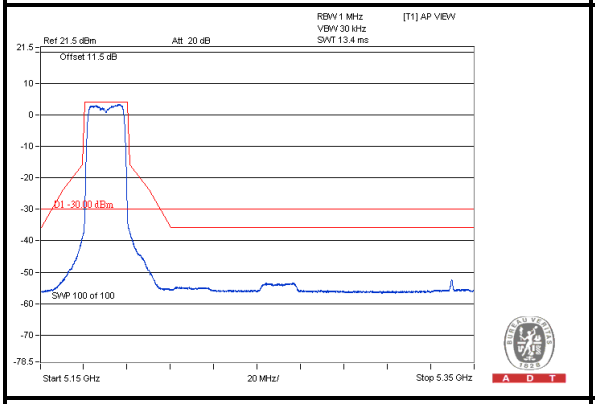
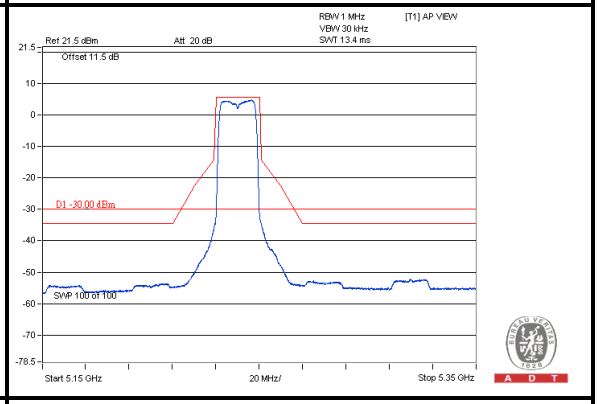
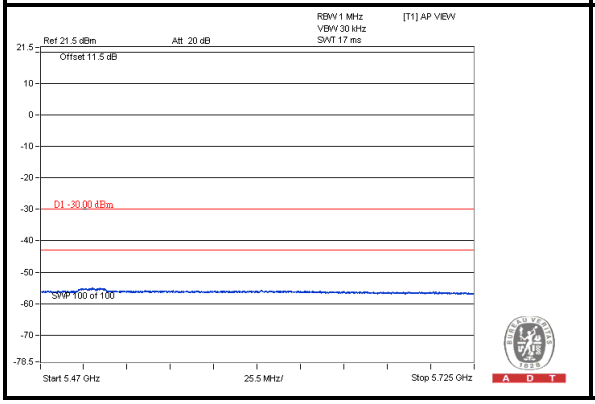
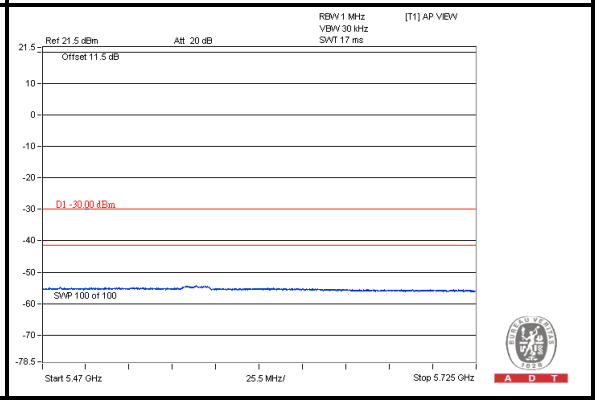
No deviation.

5.8.4 TEST SETUP

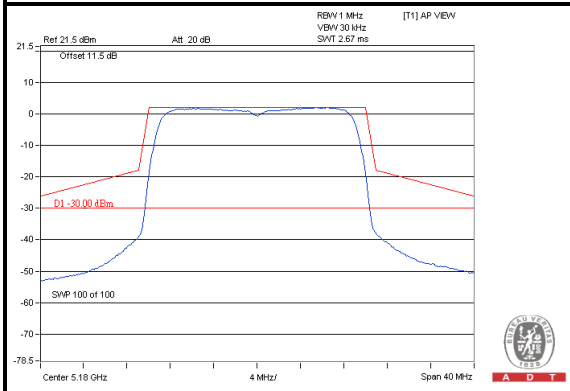
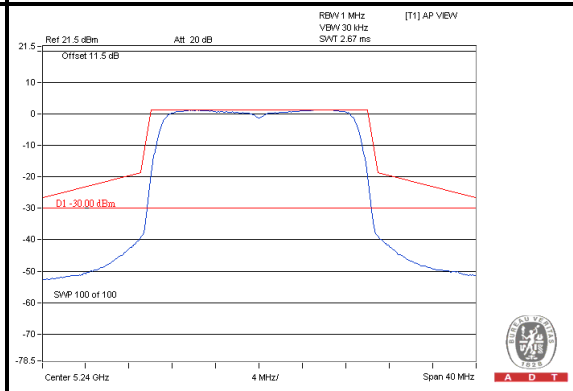
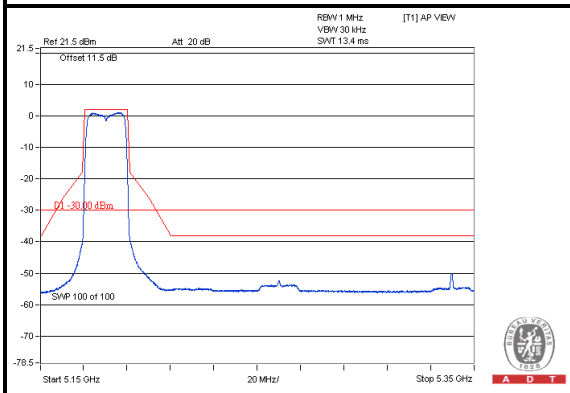
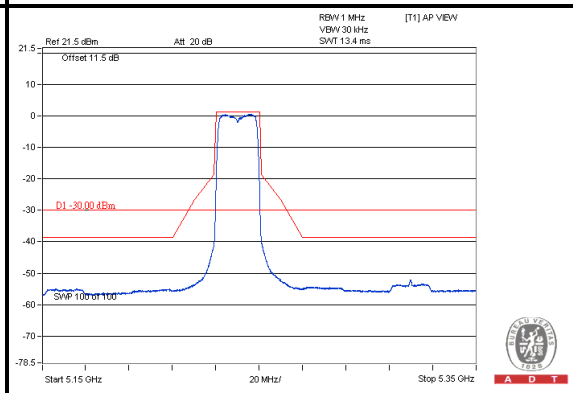
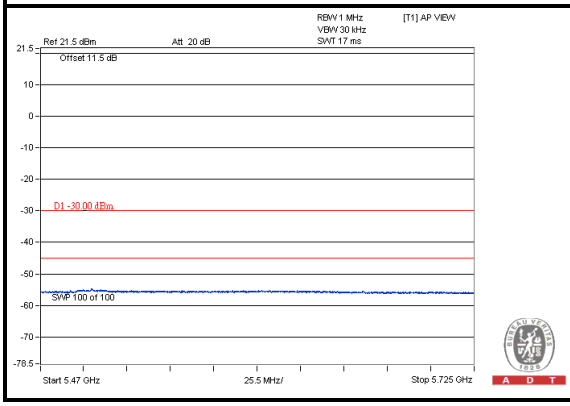
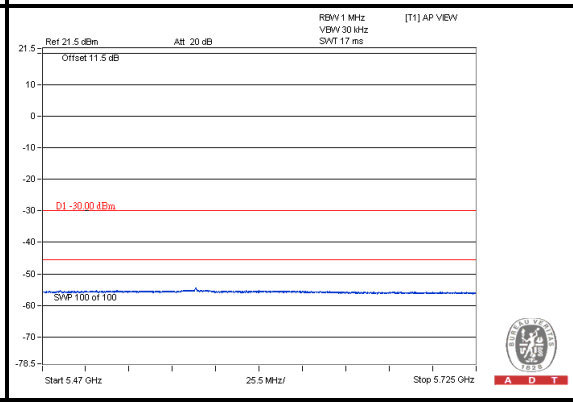
The test setup has been constructed as the normal test conditions. Controlling software (MP_TEST.exe [RTL819x 2.3]) has been activated to set the EUT on specific status.

5.8.5 TEST RESULTS

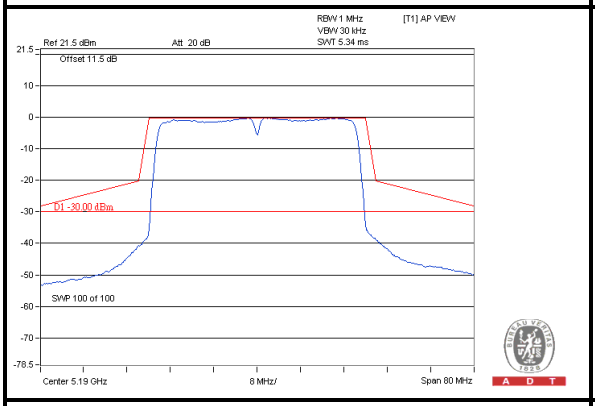
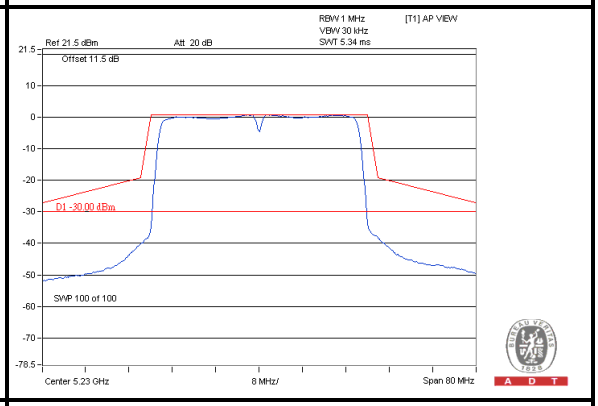
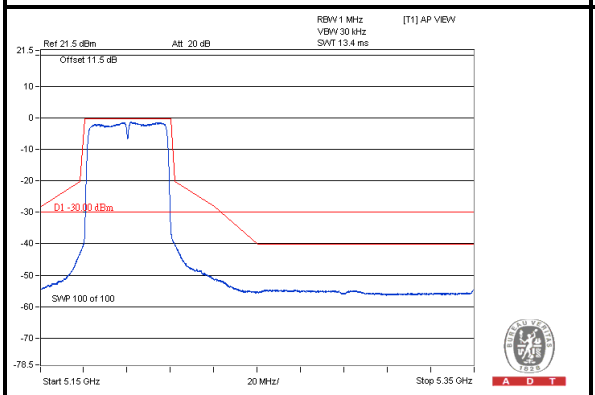
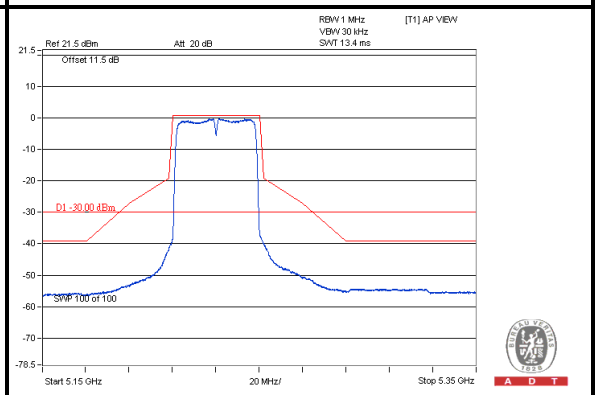
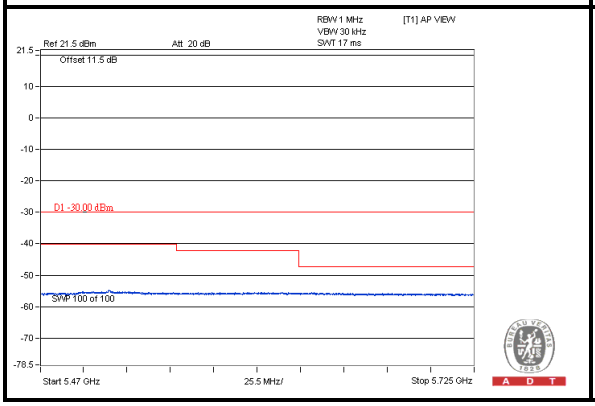
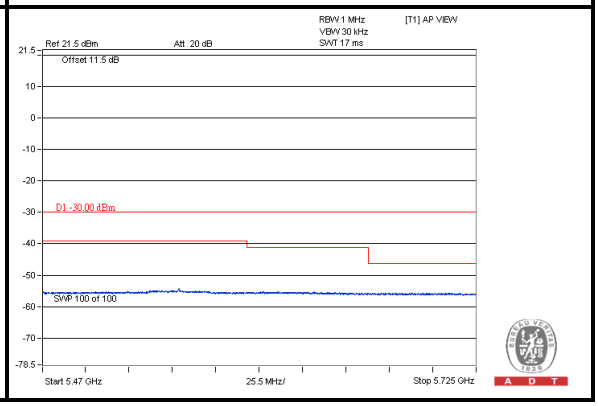
802.11a

CH 36	CH 48
	
	
	

802.11n (HT20)

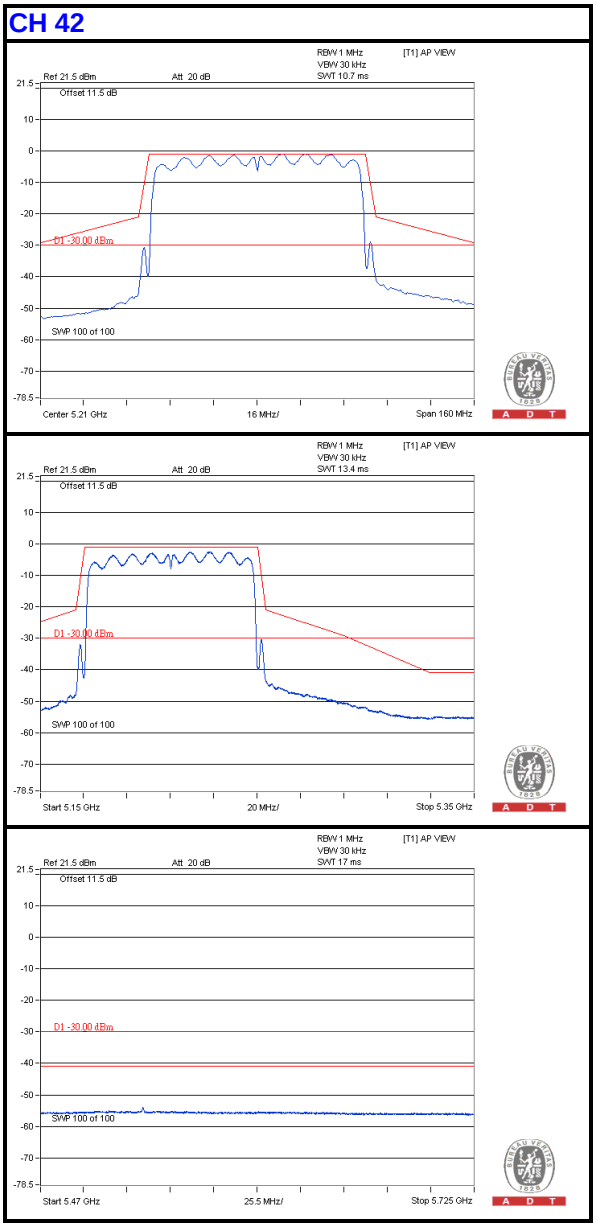
CH 36	CH 48
	
	
	

802.11n (HT40)

CH 38	CH 46
	
	
	

802.11ac (VHT80)

CH 42



RECEIVER PARAMETERS

5.9 RECEIVER SPURIOUS EMISSION

5.9.1 LIMITS OF RECEIVER SPURIOUS EMISSION

Frequency Band	Limit	Measurement Bandwidth
30MHz ~ 1GHz	-57dBm (e.r.p.)	100kHz
Above 1GHz ~ 26GHz	-47dBm (e.i.r.p.)	1MHz

5.9.2 TEST PROCEDURE

Reference to ETSI EN 301 893 V1.7.1 clause 5.3.7.2

Measurement	
☐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 1 MHz 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 × log10 (N) (number of active transmit chains).	

5.9.3 DEVIATION FROM TEST STANDARD

No deviation.

5.9.4 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 test setup has been constructed as the normal use condition. Controlling software (MP_TEST.exe [RTL819x 2.3]) has been activated to set the EUT on specific status.

5.9.5 TEST RESULTS

RX WORST-CASE DATA

SPURIOUS EMISSION FREQUENCY RANGE	30MHz ~ 1GHz	OPERATING CHANNEL	48

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
72.98	V	-68.57	-57.00	-11.57
92.38	V	-66.64	-57.00	-9.64
102.47	H	-72.84	-57.00	-15.84
103.25	V	-63.44	-57.00	-6.44
148.17	V	-83.45	-57.00	-26.45
157.19	H	-71.64	-57.00	-14.64
166.99	H	-69.43	-57.00	-12.43
223.55	H	-74.01	-57.00	-17.01
226.85	V	-77.22	-57.00	-20.22
390.04	H	-72.05	-57.00	-15.05
393.24	V	-75.83	-57.00	-18.83
599.99	H	-70.17	-57.00	-13.17
625.02	V	-72.25	-57.00	-15.25
749.98	H	-65.28	-57.00	-8.28
749.98	V	-63.93	-57.00	-6.93
874.94	H	-68.09	-57.00	-11.09
874.94	V	-70.10	-57.00	-13.10
959.93	H	-71.64	-57.00	-14.64
1000.00	H	-67.99	-57.00	-10.99
1000.00	V	-66.96	-57.00	-9.96

RX ABOVE 1GHz DATA

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 26GHz	OPERATING CHANNEL	48

SPURIOUS EMISSION LEVEL					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
48	10479.92	H	-57.84	-47.00	-10.84
	10479.93	V	-56.12	-47.00	-9.12

6 PHOTOGRAPHS OF THE TEST CONFIGURATION

TX / RX SPURIOUS EMISSION TEST

7 INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:
Tel: 886-2-26052180
Fax: 886-2-26052943

Hsin Chu EMC/RF Lab:
Tel: 886-30935343
Fax: 886-30935342

Hwa Ya EMC/RF/Safety/Telecom Lab:
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

--- END ---