



Radio Test Report

Airspan Communications Ltd

AU587

47 CFR Part 27 Effective Date 1st October 2018
47 CFR Part 2 Effective Date 1st October 2018
TNB: Licensed Non-Broadcast station transmitter
Test Date: 6th February 2019
Report Number: 02-11146-1-19 Issue 01

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Certificate of Test 11146-1

The equipment noted below has been partially tested by R.N. Electronics Limited and, where appropriate, conforms to the relevant part of FCC Part 27. This is a certificate of test only and should not be confused with an equipment authorisation. Other standards may also apply.

Equipment:	AU587
Model Number:	AU587
Unique Serial Number:	AU587 FCC TEST UNIT
Applicant:	Airspan Communications Ltd Capital Point, 33 Bath Road Slough, UK SL1 3UF
Full measurement results are detailed in Report Number:	02-11146-1-19 Issue 01
Test Standards:	47 CFR Part 27 Effective Date 1st October 2018 47 CFR Part 2 Effective Date 1st October 2018 TNB: Licensed Non-Broadcast station transmitter

NOTE:

The above list is incomplete as only partial tests conducted at request of the manufacturer. For details refer to section 3 of this report. Certain tests were not performed based upon manufacturer's declarations. Certain other requirements are subject to manufacturer declaration only and have not been tested/verified. For details refer to section 3 of this report.

DEVIATIONS:

The following tests have not been performed at the request of Airspan Communications Ltd:- Spurious emissions at antenna terminals, RF Power Output, Frequency stability, Modulation characteristics, Occupied bandwidth.

This certificate relates only to the unit tested as identified by a unique serial number and in the condition at the time it was tested. It does not relate to any other similar equipment and performance of the product before or after the test cannot be guaranteed. Whilst every effort is made to assure quality of testing, type tests are not exhaustive and although no non-conformances may be found, this doesn't exclude the possibility of unit not meeting the intentions of the standard or the requirements of the Federal Regulations, particularly under different conditions to those during testing. Any compliance statements are made reliant on (a) the application of the product and use of the assigned band being acceptable to the FCC and (b) the modes of operation as instructed to us by the Customer based on their specific knowledge of the application and functionality of the EUT. Statements of compliance, where measurements were made, do not include the measurement uncertainty. The measurement uncertainty, where stated, is the expanded uncertainty based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

Date Of Test: 6th February 2019

Test Engineer:

Ian Rose
Digitally signed by: Ian Rose
DN: CN = Ian Rose email = ian@RNElectronics.
com C = GB O = RN Electronics Ltd
Date: 2019.02.22 08:16:21 Z

Approved By:
Radio Approvals Manager

Digitally signed by: Daniel Sims
DN: CN = Daniel Sims C = GB O = RN Electronics Ltd
Date: 2019.02.21 19:21:19 Z

Customer
Representative:

1 Contents

1	Contents	3
2	Equipment under test (EUT)	4
2.1	Equipment specification	4
2.2	Configurations for testing	5
2.3	Functional description	5
2.4	Modes of operation.....	5
2.5	Emissions configuration	6
3	Summary of test results	7
4	Specifications	8
4.1	Relevant standards	8
4.2	Deviations	8
5	Tests, methods and results.....	9
5.1	Spurious emissions at antenna terminals	9
5.2	RF Power Output.....	9
5.3	Frequency stability	9
5.4	Occupied bandwidth.....	9
5.5	Field strength of spurious radiations	10
5.6	Band edge emissions	12
5.7	Modulation characteristics.....	12
6	Plots/Graphical results	13
7	Photographs	14
7.1	Radiated emission diagrams	14
8	Test equipment calibration list	15
9	Auxiliary and peripheral equipment.....	16
9.1	Customer supplied equipment.....	16
9.2	RN Electronics supplied equipment	16
10	Condition of the equipment tested	17
10.1	Modifications before test	17
10.2	Modifications during test.....	17
11	Description of test sites	18
12	Abbreviations and units.....	19

2 Equipment under test (EUT)

2.1 Equipment specification

Applicant	Airspan Communications Ltd Capital Point 33 Bath Road Slough UK SL1 3UF	
Manufacturer of EUT	Airspan Networks Ltd	
Full Name of EUT	AU587	
Model Number of EUT	AU587	
Serial Number of EUT	AU587 FCC TEST UNIT	
Date Received	6th February 2019	
Date of Test:	6th February 2019	
Purpose of Test	To demonstrate design compliance to the relevant rules of Chapter 47 of the Code of Federal Regulations.	
Date Report Issued	8th February 2019	
Main Function	Indoor LTE/WiFi access point.	
Information Specification	Height	250 mm
	Width	350 mm
	Depth	150 mm
	Weight	<10 kg
	Voltage	110-230 V AC nominal
	Current	Not declared
EUT Supplied PSU	Manufacturer	DVE
	Model number	DSA-60PFE-12
	Serial number	32018000031
	Input voltage	100-240 V AC
	Input current	2 A
	Output	12 V DC @ 5 A

2.2 Configurations for testing

General Parameters	
EUT Normal use position	Indoor
Choice of model(s) for type tests	Prototype sample
Antenna details	Integral
Antenna port	No
Baseband Data port (yes/no)?	No
Highest Signal generated in EUT	Not declared
Lowest Signal generated in EUT	Not declared
Hardware Version	Not declared
Software Version	Not declared
Firmware Version	Not declared
Type of Equipment	Indoor LTE/WiFi access point
Technology Type	LTE/WiFi
Geo-location (yes/no)	Not declared
TX Parameters	
Alignment range – transmitter	eNode B Band 41, UE Band 41 and 25, WiFi 2.4-2.4835 GHz
EUT Declared Modulation Parameters	LTE/WiFi
EUT Declared Power level	eNodeB 4.4 W EIRP, UE 1W EIRP, 2.4 GHz WiFi 0.5 W EIRP
EUT Declared Signal Bandwidths	eNodeB 20 MHz, UE 20 MHz, 2.4 GHz WiFi 10 MHz
EUT Declared Channel Spacing's	Not declared
EUT Declared Duty Cycle	Not declared
Unmodulated carrier available?	Not declared
Declared frequency stability	Not declared

2.3 Functional description

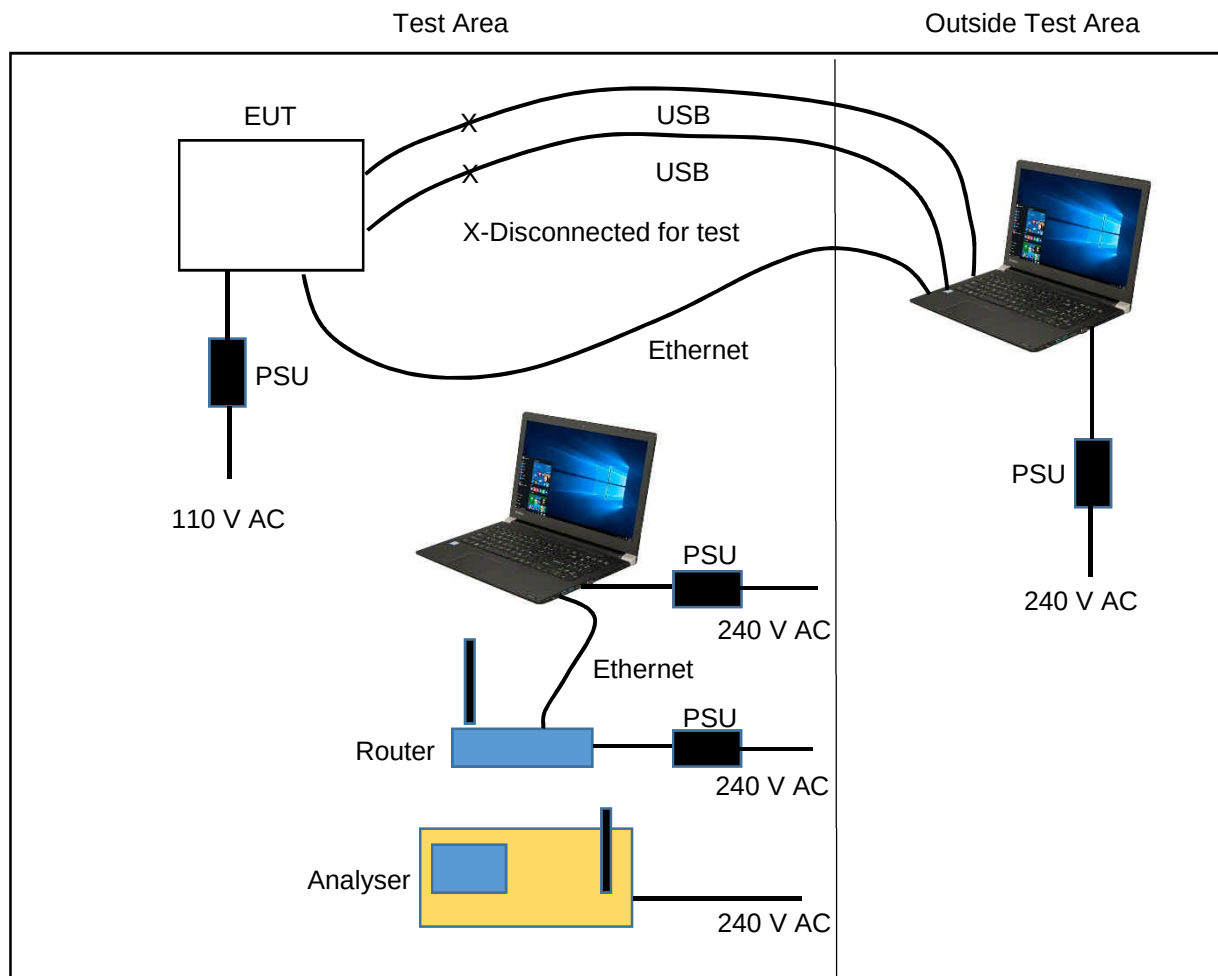
A free-standing unit with wireless backhaul which can be placed on window sills, tables and shelves. It supports LTE-A (FDD or TDD) and an optional WiFi AP (802.11n concurrent with 802.11ac). AirUnity is composed of an eNodeB for access, and a standard high-performance UE relay for wireless backhaul.

2.4 Modes of operation

Mode Reference	Description	Used for testing
Mode 1	eNodeB 2560 MHz, UE 2630 MHz, WiFi 2410 MHz	Yes
Mode 2	eNodeB 2680 MHz, UE 2510 MHz, WiFi 2460 MHz	Yes
Mode 3	eNodeB 2510 MHz, UE 1860 MHz, WiFi 2460 MHz	Yes

Note: Modes above were using 20MHz BW channels for eNodeB and UE and 10MHz BW for WiFi.
No other modes / channels / Bandwidths or modulation schemes were assessed, at the client's request.

2.5 Emissions configuration



The unit was powered from the dedicated AC/DC adapter. The unit was configured with engineering menus in software to allow permanent transmit of the device using eNodeB and UE on channels as stated within section 2.4 of this report. In addition, 2.4 GHz WiFi was active on a channel as stated within section 2.4 of this report with a link set up between the EUT and a companion router/laptop. The 2.4 GHz WiFi was monitored using the spectrum analyser. Both USB connections were temporary to allow set up of the EUT. Once the unit was set up the cables were disconnected leaving approximately 1m of unterminated USB cable. The Ethernet connection was always connected during test. Power levels set were as below: -

eNodeB 4.4 W EIRP, 20 MHz channel
UE 1 W EIRP, 20 MHz channel
WiFi 0.5 W EIRP, 10 MHz channel

2.5.1 Signal leads

Port Name	Cable Type	Connected
Power	2 core low voltage to mains adaptor	Yes
Ethernet	Shielded twisted pair	Yes

3 Summary of test results

The AU587 was tested for compliance to the following standard(s) :

47 CFR Part 27 Effective Date 1st October 2018
47 CFR Part 2 Effective Date 1st October 2018
TNB: Licensed Non-Broadcast station transmitter

Any compliance statements are made reliant on (a) the application of the product and use of the assigned band being acceptable to the FCC and (b) the modes of operation as instructed to us by the Customer based on their specific knowledge of the application and functionality of the EUT. Whilst every effort is made to assure quality of testing, type tests are not exhaustive and although no non-conformances may be found, this doesn't exclude the possibility of equipment not meeting the intentions of the standard or the essential requirements of the directive, particularly under different conditions to those during testing. Statements of compliance, where measurements were made, do not include the measurement uncertainty. The measurement uncertainty, where stated, is the expanded uncertainty based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

Title	References	Results
Transmitter Tests		
1. Spurious emissions at antenna terminals	FCC Part 27 Clause 27.53 FCC Part 2 Clause 2.1051	NOT TESTED ¹
2. RF Power Output	FCC Part 27 Clause 27.50 FCC Part 2 Clause 2.1046	NOT TESTED ¹
3. Frequency stability	FCC Part 2 Clause 2.1055	NOT TESTED ¹
4. Occupied bandwidth	FCC Part 2 Clause 2.1049	NOT TESTED ¹
5. Field strength of spurious radiations	FCC Part 27 Clause 27.53(m)2 FCC Part 2 Clause 2.1053	PASSED
6. Band edge emissions	FCC Part 27 Clause 27.53(m)4 FCC Part 2 Clause 2.1051	NOT TESTED ¹
7. Modulation characteristics	FCC Part 2 Clause 2.1047	NOT TESTED ¹

¹ Not tested at the request of the applicant.

4 Specifications

The tests were performed and operated in accordance with R.N. Electronics Ltd procedures and the relevant standards listed below.

4.1 Relevant standards

Ref.	Standard Number	Version	Description
4.1.1	FCC Part 27	2018	Miscellaneous Wireless Communications Services
4.1.2	47CFR part 2J	2018	Part 2 – Frequency Allocations and radio treaty matters; General rules and regulations
4.1.3	KDB 971168 D01 v03	2017	Federal Communications Commission Office of Engineering and Technology Laboratory Division; Measurement Guidance for Certification of Licensed Digital Transmitters
4.1.4	ANSI C63.26	2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

4.2 Deviations

The following tests have not been performed at the request of Airspan Communications Ltd:-
Spurious emissions at antenna terminals, RF Power Output, Frequency stability, Modulation characteristics, Occupied bandwidth.

5 Tests, methods and results

5.1 Spurious emissions at antenna terminals

NOT TESTED: Not tested at the request of the applicant.

5.2 RF Power Output

NOT TESTED: Not tested at the request of the applicant.

5.3 Frequency stability

NOT TESTED: Not tested at the request of the applicant.

5.4 Occupied bandwidth

NOT TESTED: Not tested at the request of the applicant.

5.5 Field strength of spurious radiations

5.5.1 Test methods

Test Requirements:	FCC Part 22 Clause 27.53(m)2 [Reference 4.1.1 of this report] FCC Part 2 Clause 2.1053 [Reference 4.1.2 of this report]
Test Method:	ANSI C63.26 2015 Clause 5.5 [Reference 4.1.4 of this report]
Limits:	FCC Part 27 Clause 27.53(m)2 [Reference 4.1.1 of this report]

5.5.2 Configuration of EUT

The EUT was placed on a 1.5 metres high turntable. The front edge of the EUT was initially positioned facing the antenna. The EUT was measured at a distance of 3 metres. The EUT was examined in its normal use position.

The EUT was operated in Modes 1 to 3.

5.5.3 Test procedure

Tests were made in accordance with the test method noted above using the measuring equipment listed in the 'Test Equipment' Section. Peak field strength pre-scans using the field strength method were performed. The EUT's emissions were maximised by rotating it 360 degrees. This method was used to determine any signals for substitution. A Peak detector was used for measurements. Final measurements where required, were performed using an RMS detector using a substitution method of measurement.

30MHz - 1GHz.

The measuring antenna was scanned 1 - 4m in both Horizontal and Vertical polarisations. Where required a Substitution method was performed using tuned dipoles / a calibrated bi-conical antenna. Measurement distance of 3metres was used.

1GHz – 26.5GHz.

The measuring antenna was used in both Horizontal and Vertical polarisations. Where required a Substitution method was performed using standard gain horn antennas. Measurement distances used were: 1 – 6 GHz at 3metres, 6 – 18 GHz at 1.2metres and 18 – 26.5 GHz at 1.2metres.

Tests were performed in test site M.

5.5.4 Test equipment

E136, E411, E429, E624, E743, LPE364, TMS78, TMS79, TMS82

See Section 9 for more details

5.5.5 Test results

Temperature of test environment	23°C
Humidity of test environment	44%
Pressure of test environment	102kPa

Setup Table

Band	1860-2680 MHz
Power Level	Maximum
Mod Scheme	LTE/WiFi
Single channel	Mode 1

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No emissions observed within 20 dB of limits				

Setup Table

Band	1860-2680 MHz
Power Level	Maximum
Mod Scheme	LTE/WiFi
Single channel	Mode 2

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No emissions observed within 20 dB of limits				

Setup Table

Band	1860-2680 MHz
Power Level	Maximum
Mod Scheme	LTE/WiFi
Single channel	Mode 3

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No emissions observed within 20 dB of limits				

LIMITS:

Parts 27.53 (m)2

Limits based on $43+10\log P$. dB attenuation below Output power in Watts: i.e. -13dBm.

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
30MHz - 1GHz ± 3.9 dB, 1 – 18 GHz ± 3.5 dB, 18 – 27 GHz ± 3.9 dB

5.6 Band edge emissions

NOT TESTED: Not tested at the request of the applicant.

5.7 Modulation characteristics

NOT TESTED: Not tested at the request of the applicant.

6 Plots/Graphical results

No plots included.

7 Photographs

No photographs have been included in this test report at the request of Airspan Communications Ltd.

7.1 Radiated emission diagrams

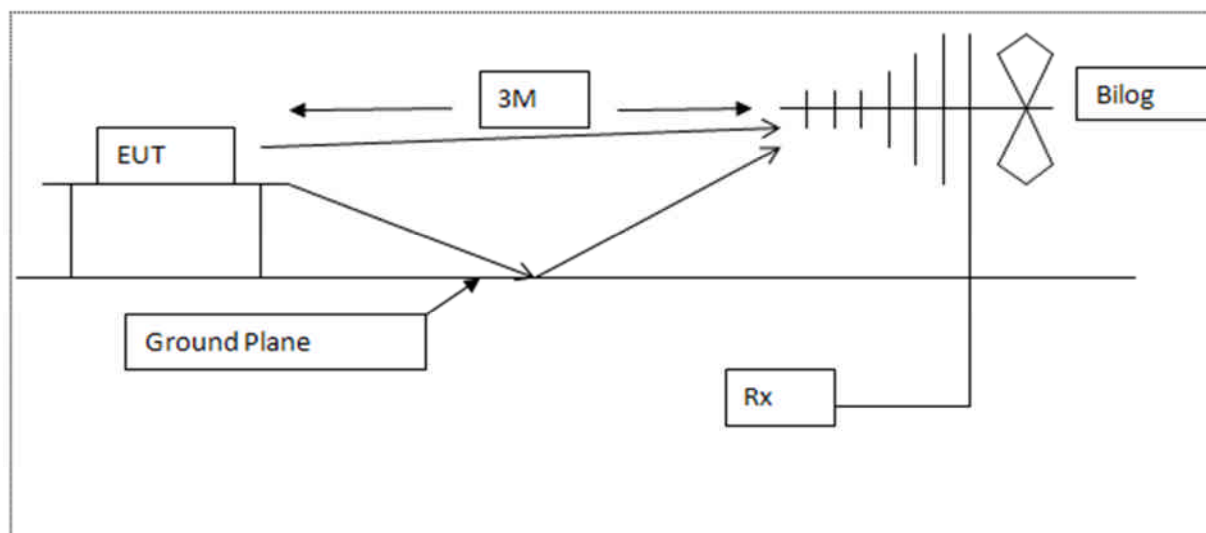


Diagram of the radiated emissions test setup 30 - 1000 MHz

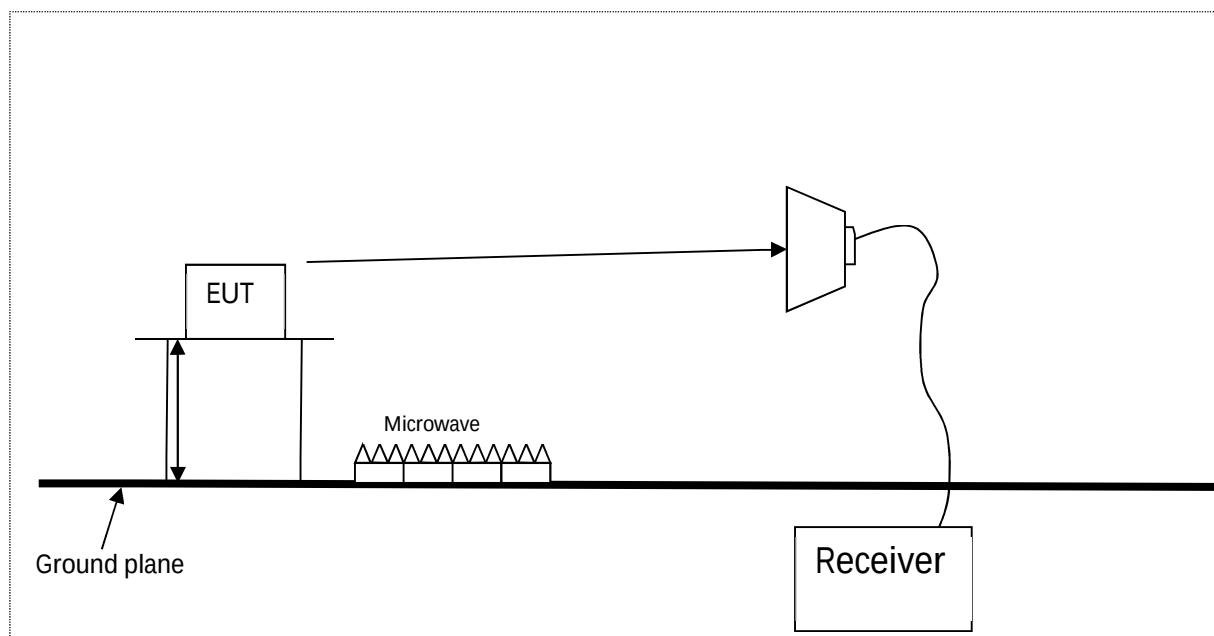


Diagram of the radiated emissions test setup above 1GHz

8 Test equipment calibration list

The following is a list of the test equipment used by R.N. Electronics Ltd to test the unit detailed within this report. In line with our procedures, the equipment was within calibration for the period during which testing was carried out.

RN No.	Model No.	Description	Manufacturer	Calibration date	Cal period
E136	3105	Horn Antenna 12.5GHz	EMCO	24-Apr-2018	12 months
E411	N9039A	9 kHz - 1 GHz RF Filter Section	Agilent Technologies	10-Jul-2018	12 months
E429	-	Filter Box 5 Switch Filters 0.91 GHz - 16.3 GHz	RN Electronics	28-Aug-2018	12 months
E624	E4440A	PSA 3 Hz - 26.5 GHz	Agilent Technologies	09-Jan-2018	24 months
E743	RR2017 4/2dB	Attenuator 4/2dB 30-1000MHz	RN Electronics	12-Feb-2018	12 months
H060	WHKX10-4050 -18000-40ST	Filter High Pass 4.5GHz	Wainwright	06-Feb-2019	12 months
H061	WHK2.9/ 18G-10SS	Filter High Pass 2.9GHz	Wainwright	06-Feb-2019	12 months
LPE364	CBL6112A	Antenna Bilog 30MHz - 2GHz	Chase Electronics Ltd	21-Mar-2018	24 months
TMS78	3160-08	Horn Std Gain 12.4-18 GHz	ETS Systems	26-Jul-2018	12 months
TMS79	3160-09	Horn Std Gain 18-26.5 GHz	ETS Systems	26-Jul-2018	12 months
TMS82	8449B	Pre-Amplifier 1GHz - 26.5GHz	Agilent Technologies	17-Dec-2018	12 months

9 Auxiliary and peripheral equipment

9.1 Customer supplied equipment

Item No.	Model No.	Description	Manufacturer	Serial No.
1	DSA-60PFE-12	MAins to 12V power adaptor	DVE	32018000031
2	WRT54G	Wireless router	Linksys	CDF50DB36855
3	FSQ 26	Signal analyser	Rohde and Schwarz	-
4	Latitude E7450	Laptop and PSU	Dell	Airspan 006875
5	-	Laptop and PSU	Dell	Airspan 006087

9.2 RN Electronics supplied equipment

No RN Electronics Ltd supplied equipment was used.

10 Condition of the equipment tested

In order for the EUT to produce the results shown within this report the following modifications, if any, were implemented.

10.1 Modifications before test

No modifications were made before test by RN Electronics Ltd.

10.2 Modifications during test

No modifications were made during test by RN Electronics Ltd.

11 Description of test sites

Site A	Radio / Calibration Laboratory and anechoic chamber
Site B	Semi-anechoic chamber FCC Registration No. 293246 IC Registration No. 5612A-4
Site B1	Control Room for Site B
Site C	Transient Laboratory
Site D	Screened Room (Conducted Immunity)
Site E	Screened Room (Control Room for Site D)
Site F	Screened Room (Conducted Emissions)
Site G	Screened Room (Control Room for Site H)
Site H	3m Semi-anechoic chamber (indoor OATS) FCC Registration No. 293246 IC Registration No. 5612A-2
Site J	Screened Room
Site K	Screened Room (Control Room for Site M)
Site M	3m Semi-anechoic chamber (indoor OATS) FCC Registration No. 293246 IC Registration No. 5612A-3
Site Q	Fully-anechoic chamber
Site OATS 3m and 10m Open Area Test Site	FCC Registration No. 293246 IC Registration No. 5612A-1
Site R	Screened Room (Conducted Immunity)
Site S	Safety Laboratory
Site T	Transient Laboratory

12 Abbreviations and units

%	Percent	LBT	Listen Before Talk
μA/m	microAmps per metre	LO	Local Oscillator
μV	microVolts	mA	milliAmps
μW	microWatts	max	maximum
AC	Alternating Current	kPa	Kilopascal
ALSE	Absorber Lined Screened Enclosure	Mbit/s	MegaBits per second
AM	Amplitude Modulation	MHz	MegaHertz
Amb	Ambient	mic	Microphone
ATPC	Automatic Transmit Power Control	min	minimum
BER	Bit Error Rate	mm	milliMetres
°C	Degrees Celsius	ms	milliSeconds
C/I	Carrier / Interferer	mW	milliWatts
CEPT	European Conference of Postal and Telecommunications Administrations	NA	Not Applicable
COFDM	Coherent OFDM	nom	Nominal
CS	Channel Spacing	nW	nanoWatt
CW	Continuous Wave	OATS	Open Area Test Site
dB	decibel	OFDM	Orthogonal Frequency Division Multiplexing
dBμA/m	decibel relative to 1μA/m	ppm	Parts per million
dBμV	decibel relative to 1μV	PRBS	Pseudo Random Bit Sequence
dBc	decibel relative to Carrier	QAM	Quadrature Amplitude Modulation
dBm	decibel relative to 1mW	QPSK	Quadrature Phase Shift Keying
DC	Direct Current	R&TTE	Radio and Telecommunication Terminal Equipment
DTA	Digital Transmission Analyser	Ref	Reference
EIRP	Equivalent Isotropic Radiated Power	RF	Radio Frequency
ERP	Effective Radiated Power	RFC	Remote Frequency Control
EU	European Union	RSL	Received Signal Level
EUT	Equipment Under Test	RTP	Room Temperature and Pressure
FM	Frequency Modulation	RTPC	Remote Transmit Power Control
FSK	Frequency Shift Keying	Rx	Receiver
g	Grams	s	Seconds
GHz	GigaHertz	SINAD	Signal to Noise And Distortion
Hz	Hertz	Tx	Transmitter
IF	Intermediate Frequency	V	Volts
kHz	kiloHertz		