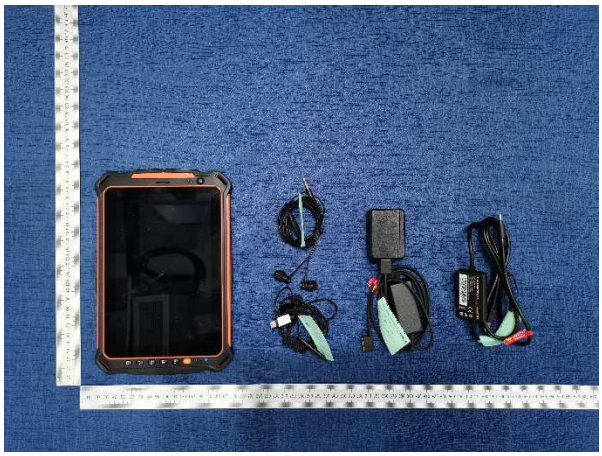
Prüfbericht-Nr.: *Test report no.:*	**60374756 004**	**Auftrags-Nr.:** *Order no.*:	**168264720**	Seite 1 von 21 *Page 1 of 21*
Kunden-Referenz-Nr.: *Client reference no.:*	**N/A**	**Auftragsdatum:** *Order date:*	2020-05-13	
Auftraggeber: *Client:*	i.safe MOBILE GmbH i_Park Tauberfranken 10, 97922 Lauda-Koenigshofen, Germany			
Prüfgegenstand: *Test item:*	Rugged tablet computer			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	M93A01			
Auftrags-Inhalt: *Order content*:	Test Report			
Prüfgrundlage: *Test specification:*	CFR47 FCC Part15: Subpart E Section 15.407 CFR47 FCC Part15: Subpart C Section 15.207 CFR47 FCC Part15: Subpart C Section 15.209		RSS-247 Issue 2 RSS-GEN Issue 5	

Wareneingangsdatum: *Date of sample receipt:*	2020-05-13
Prüfmuster-Nr.: *Test sample no:*	A002024323-004 A002024323-005
Prüfzeitraum: *Testing period:*	2020-05-24 – 2020-08-16
Ort der Prüfung: *Place of testing:*	TÜV Rheinland (Shenzhen) Co., Ltd.
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shenzhen) Co., Ltd.
Prüfergebnis*: *Test result*:*	Pass



geprüft von:
tested by:Lin Lin

Datum:
Date: 2020-10-09

Stellung / *Position:* Senior Project Manager

genehmigt von:
authorized by:Winnie Hou

Ausstellungsdatum:
Issue date: 2020-10-09

Stellung / *Position:* Technical Certifier

Sonstiges / *Other:*

FCC ID: 2AACZ-M93A01
IC: 11122A-M93A01
HVIN: M93A01

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Test Summary

5.1.1 Antenna Requirement

RESULT: *Pass*

5.1.2 Maximum output power

RESULT: *Pass*

5.1.3 Power Spectral Density

RESULT: *Pass*

5.1.4 Frequency Stability

RESULT: *Pass*

5.1.5 26dB Bandwidth and 99% Bandwidth

RESULT: *Pass*

5.1.6 6dB Bandwidth

RESULT: *Pass*

5.1.7 Radiated Spurious Emission

RESULT: *Pass*

5.1.8 Dynamic Frequency Selection (DFS)

RESULT: *Pass*

5.1.9 Conducted Emission on AC Mains

RESULT: *Pass*

Contents

1. General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendixes:
Appendix A: Photographs of the Test Set-up
Appendix B: Test data of 5GHz bands Wi-Fi
Appendix C: Radio Frequency Exposure

2. Test Sites

2.1 Test Facilities

TÜV Rheinland (Shenzhen) Co., Ltd.

No. 362 Huanguan Road Middle, Longhua District, Shenzhen 518110, People's Republic of China

FCC Accreditation Designation No.: CN1260
ISED Wireless Device Testing Laboratory: 25069

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Radio Spectrum Testing (TS8997)				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Cal. until**
Wireless Connectivity Tester	R&S	CMW270	101375	20.08.2020
Signal Analyzer	R&S	FSV 40	101441	20.08.2020
Vector Signal Generator	R&S	SMBV100A	263301	21.08.2020
Signal Generator	R&S	SMB100A	115186	21.08.2020
OSP	R&S	OSP 150	101017	17.12.2020
Control PC	DELL	OptiPlex 7050	FTJZ9P2	N/A
Test Software	R&S	WMS32 (V11.00.00)	N/A	N/A
Power Meter	R&S	NRP2	107105	17.12.2020
Wideband Power Sensor	R&S	NRP-Z81	105350	17.12.2020
Humid & Temp Programmable Tester	BOST	NTH090-60	19040801	10.04.2021
Shielding Room 8#	Albatross	SR8	APC17151-SR8	23.07.2020
Unwanted Emission Testing (TS8996)				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Cal. until**
Signal Generator	R&S	SMB100A	180840	20.08.2020
Wideband Radio Communication Tester	R&S	CMW500	165339	20.08.2020
Signal Analyzer	R&S	FSV 40	101440	21.08.2020
System Controller Interface	R&S	SCI-100	S10010036	N/A
OSP	R&S	OSP 120	102041	N/A
OSP	R&S	OSP 150	101385	17.12.2020
Pre-amplifier	R&S	SCU08F1	08320030	20.08.2020
Amplifier	R&S	SCU-18F	180079	20.08.2020
Trilog Broadband Antenna (30 MHz - 7 GHz)	Schwarzbeck	VULB 9162	192	02.09.2020
Double-Ridged Antenna (1 -18 GHz)	ETS-LINDGREN	3117	00218719	02.09.2020
Wideband Ridged Horn Antenna (12-18 GHz)	Steatite	QMS-00208	18312	02.09.2020
Biconical Broadband Antenna (30 MHz - 1 GHz)	Schwarzbeck	VUBA 9117	357	02.09.2020
Double Ridged Broadband Horn Antenna (1 – 18 GHz)	Schwarzbeck	BBHA 9120 D	01760	02.09.2020
Broadband Horn Antenna (15 – 40 GHz)	Schwarzbeck	BBHA 9170	00862	02.09.2020
Test software	R&S	EMC32 (V10.50.40)	N/A	N/A

Control PC	Dell	OptiPlex 7050	36NW9P2	N/A
3m Fully Anechoic Chamber	Albatross	FAC-3m	APC17151-FAC	06.07.2021

2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Uncertainty of Measurement

The value of the measurement uncertainty of each parameter is listed as below:

Table 2: Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	±1 x 10-7
RF Power (conducted)	±2.5 dB
Radiated Emission of Transmitter, valid up to 26.5 GHz	±6 dB
Radiated Emission of Receiver, valid up to 26.5 GHz	±6 dB
Conducted Emission, (9kHz to 150kHz)/(150kHz to 30MHz)	± 3.70 dB / ± 3.30 dB
Radiated Emission (3m SAC), 30MHz to 1000MHz	± 4.52 dB
Radiated Emission (3m SAC), above 1000MHz	± 4.37 dB
Temperature	±1 °C
Humidity	±5 %
Voltage (DC)	±1 %
Voltage (AC, <10kHz)	±2 %

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A and Appendix B of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) file for certification follow-up purposes.

2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. Test facility located at No. 362 Huanguan Road Middle, Longhua District, Shenzhen 518110, People's Republic of China is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a tablet which supports Bluetooth, 2.4G Wi-Fi 802.11 b/g/n, 5G Wi-Fi 802.11a/n/ac, NFC and GSM/WCDMA/LTE wireless technology.

Note: This report is for 5GHz Bands only.

For details refer to user manual and circuit diagram.

3.2 Ratings and System Details

Table 3: Technical Specification

Technical Specification	Value
Product Name	Rugged tablet computer
Model	M93A01
Trade Mark	i.safe MOBILE
FCC ID	2AACZ-M93A01
IC	11122A-M93A01
HVIN	M93A01
Operating Frequency Range	5150-5350MHz, 5470-5725MHz, 5725-5850MHz
Operating Frequency / Channels / Protocol	5GHz Wi-Fi: 5180-5320MHz, 14CHs, 802.11 a/n20/n40/ac20/ac40/ac80 5500-5700MHz, 21CHs, 802.11 a/n20/n40/ac20/ac40/ac80 5745-5825MHz, 8CHs, 802.11 a/n20/n40/ac20/ac40/ac80
Channel Spacing	5MHz, 20MHz, 40MHz, 80MHz
Modulation	DSSS (DBPSK, DQPSK, CCK) OFDM (BPSK, QPSK, 16QAM, 64QAM)
Type of Product	Adaptive equipment and does not support non-adaptive mode; LBT based Detect and Avoid (load based equipment)
Type of Product	Client Device without Radar Detection
TX Power Control (TPC)	Not Supported
Antenna Number	5GHz Wi-Fi: 1
Antenna Type	Integral antenna
Antenna Gain	5GHz Wi-Fi: 2.0dBi max.
Operation Voltage	DC 5V@2A input via power adapter
Power Adapter	Model: ICP12-050-2000B Input: AC 100-240V~50/60Hz, 0.3A Output: DC5V@2A
Other accessories	USB Cable Magnetic absorption charging cable 3.5mm Earphone

3.3 Independent Operation Modes

The basic operation modes are:

A. Tx, (5GHz Bands, 802.11a/n/ac)
   1. Lowest channel
   2. Middle channel
   3. Highest channel
B. WiFi on
C. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5 Submitted Documents

- Application Form
- Circuit Diagram
- Instruction Manual
- Photo Documents
- Technical Description
- Bill of Material
- Rating Label

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Radio Spectrum: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation

Test operation refers to test setup in chapter 5. All testing were performed according to the procedures in ANSI C63.10:2013.

4.3 Special Accessories and Auxiliary Equipment

Table 4: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	S/N
Laptop	Lenovo	T480	PF-16A6N8

4.4 Countermeasures to Achieve ERM Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF). No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

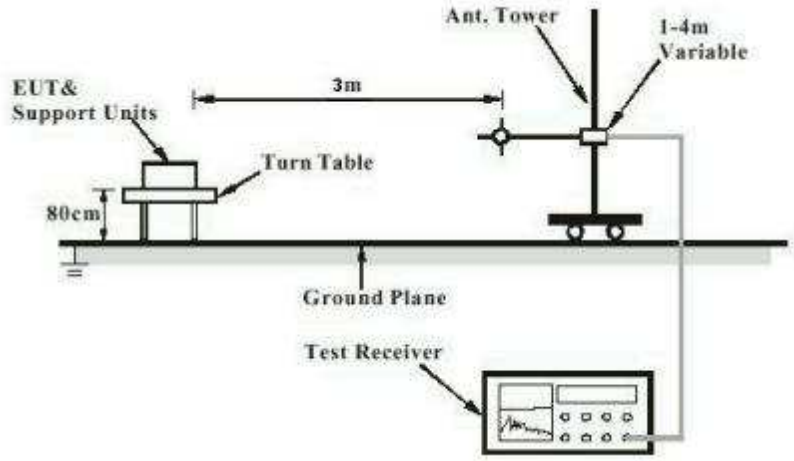


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

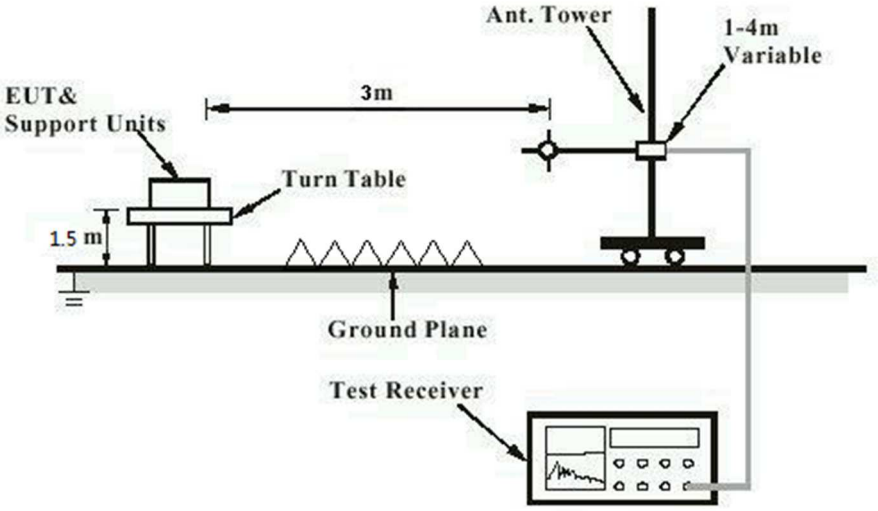


Diagram of Measurement Configuration for Mains Conduction Measurement

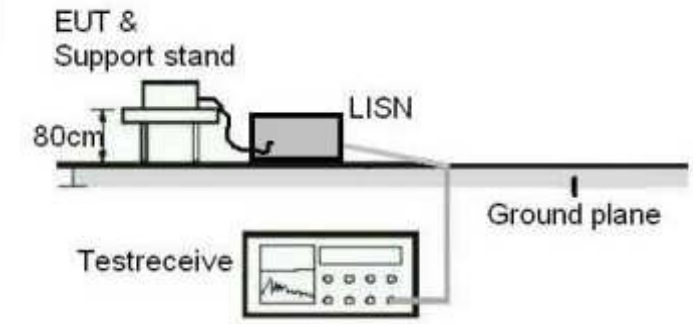


Diagram of Measurement Configuration for Conducted Transmitter Measurement

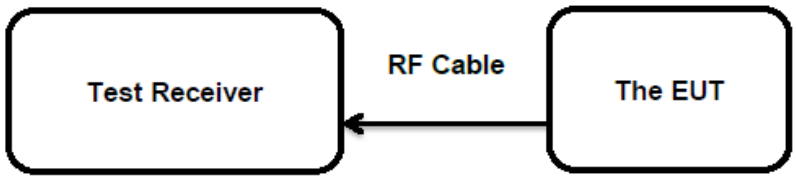
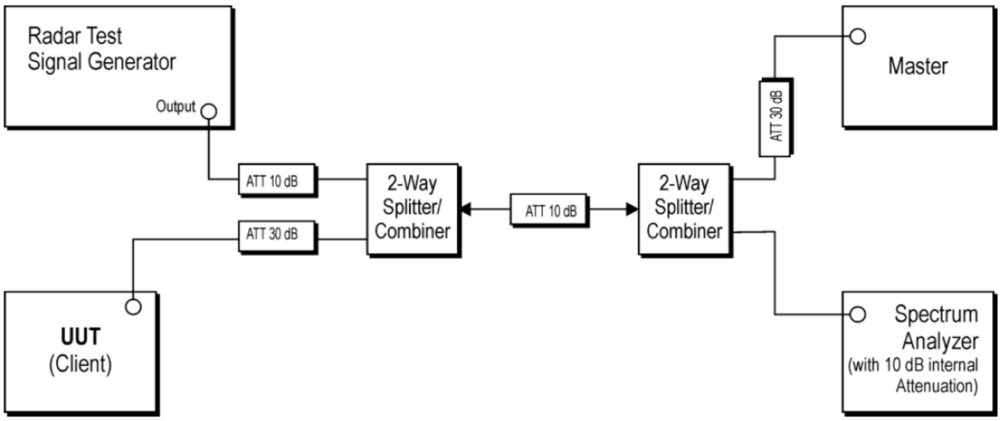


Diagram of Measurement Configuration for Dynamic Frequency Selection (DFS)



5. Test Results

5.1 Radio Test Requirement & Test Suites (5GHz Bands)

5.1.1 Antenna Requirement

RESULT: **Pass**

Test Specification
Test standard : FCC Part 15.203

The EUT has two integral antennas, the maximum gain of antenna is 2dBi for 5GHz Wi-Fi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

Therefore the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.

5.1.2 Maximum output power

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407 (a) RSS-247 clause 6.2
Basic standard	:	ANSI C63.10:2013
Limits	:	FCC: <250mW (24dBm) (5150-5250MHz) *<250mW (24dBm) (5250-5350MHz, 5470-5725MHz) *250 mW (24dBm) or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz, where is lesser. <1W (30dBm) (5725-5850MHz) IC: * Max e.i.r.p.<200mW (23dBm) (5150-5250MHz) *200 mW (23dBm) or 10 dBm + 10 logB, where B is the 99% emission bandwidth in MHz, where is lesser. *Max conducted output power < 250mW (24dBm) (5250-5350MHz) *250 mW (24dBm) or 11 dBm + 10 logB, where B is the 99% emission bandwidth in MHz, where is lesser. *Max e.i.r.p.<1W (30dBm) (5250-5350MHz) *1 W (30dBm) or 17 dBm + 10 log B, where B is the 99% emission bandwidth in MHz, where is lesser. Max conducted output power <1W (30dBm) (5725-5850MHz)
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2020-05-24 – 2020-08-16
Input voltage	:	Fully charged li-ion battery charged by power adapter (Adapter input AC 120V@60Hz)
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Note: Per RSS-247 section 6.2.3, transmission on channels which overlap 5600-5650MHz is prohibited. This device operates under these frequencies only under the control of a certified master device and does not support active scanning on these channels. This device does not transmit any beacons or initiate any transmissions in 5250-5350MHz or 5470-5725MHz.

Refer to attached Appendix B for details of test data.

5.1.3 Power Spectral Density

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407 (a) RSS-247 clause 6.2
Basic standard	:	ANSI C63.10:2013
Limits	:	FCC: <11dBm/MHz (5150-5250MHz 5250-5350MHz, 5470-5725MHz) <30dBm/500KHz (5725-5850MHz) IC: e.i.r.p. spectral density <10dBm/MHz (5150-5250MHz) <11dBm/1MHz (5250-5350MHz) <30dBm/500KHz (5725-5850MHz)
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2020-05-24 – 2020-08-16
Input voltage	:	Fully charged li-ion battery charged by power adapter (Adapter input AC 120V@60Hz)
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix B for details of test data.

5.1.4 Frequency Stability

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407 (g) RSS-Gen Clause 6.11
Basic standard	:	ANSI C63.10:2013
Limits	:	Within assigned bands
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2020-05-24 – 2020-08-16
Input voltage	:	Fully charged li-ion battery
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix B for details of test data.

5.1.5 26dB Bandwidth and 99% Bandwidth

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407 RSS-Gen Clause 6.6
Basic standard	:	ANSI C63.10:2013
Limits	:	N/A
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2020-05-24 – 2020-08-16
Input voltage	:	Fully charged li-ion battery charged by power adapter (Adapter input AC 120V@60Hz)
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix B for details of test data.

5.1.6 6dB Bandwidth

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407 (e) RSS-247 clause 6.2.4.1
Basic standard	:	ANSI C63.10:2013
Limits	:	At least 500KHz (5725-5850MHz)
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2020-05-24 – 2020-08-16
Input voltage	:	Fully charged li-ion battery charged by power adapter (Adapter input AC 120V@60Hz)
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix B for details of test data.

5.1.7 Radiated Spurious Emission

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407(b) & FCC Part 15.205 & FCC Part 15.209 RSS-247 clause 6.2 & RSS-GEN clause 8.9 and 8.10
Basic standard	:	ANSI C63.10:2013
Limits	:	• For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz. • For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz. • For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz. Emissions outside the band 5470-5600 MHz and 5650-5725 MHz shall not exceed -27 dBm/MHz e.i.r.p. • For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge. • Restricted Bands meet the requirement of 15.209 limit and RSS-GEN
Kind of test site	:	3m Semi-Anechoic Chamber (below 1GHz) 3m Anechoic Chamber (above 1GHz)

Test Setup

Date of testing	:	2020-05-24 – 2020-08-16
Input voltage	:	Fully charged li-ion battery charged by power adapter (Adapter input AC 120V@60Hz)
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	23 ℃
Relative humidity	:	48 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix B for details of test data.

5.1.8 Dynamic Frequency Selection (DFS)

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407(h) RSS-247 clause 6.3 5250-5350MHz, 5470-5725MHz
Limits	:	Channel Move Time: Within 10 seconds. Channel Closing Transmission Time: 200ms+aggregate of 60ms over remaining 10s period; Non-Occupancy Period: at least 30 minutes.
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2020-05-24 – 2020-08-16
Input voltage	:	Fully charged li-ion battery charged by power adapter (Adapter input AC 120V@60Hz)
Operation mode	:	A
Test channel	:	CH58 and CH106
Ambient temperature	:	23 ℃
Relative humidity	:	48 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix B for details of test data.

5.1.9 Conducted Emission on AC Mains

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.207 RSS-GEN clause 8.8
Basic standard	:	ANSI C63.10:2013
Frequency range	:	0.15 - 30MHz
Limits	:	FCC Part 15.207
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2020-05-24 – 2020-08-16
Input voltage	:	Fully charged li-ion battery charged by power adapter (Adapter input AC 120V@60Hz)
Operation mode	:	B
Earthing	:	Not connected
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix B for details of test data.

6. List of Tables