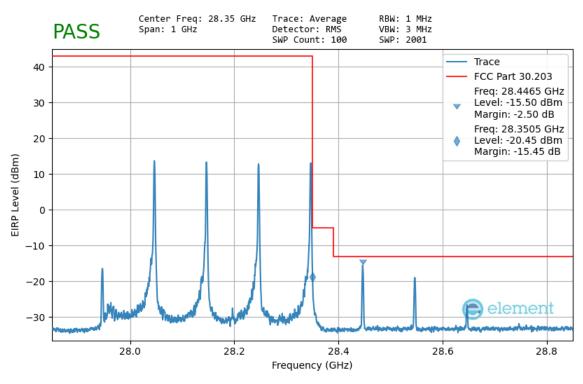


Plot 7-93. K Patch Upper Band Edge (100MHz-3CC – QPSK 1 RB)

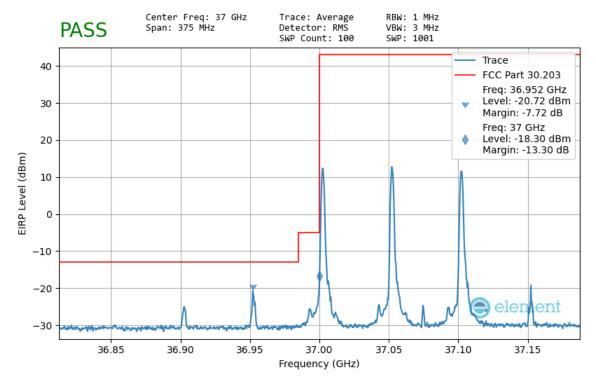


Plot 7-94. K Patch Upper Band Edge – (100MHz-4CC – π/2-BPSK 1 RB)

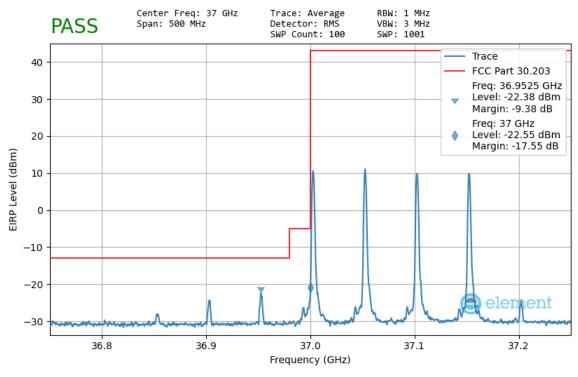
FCC ID:A3LSMF721U	PART 30 MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
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Band n260 - Worst Case



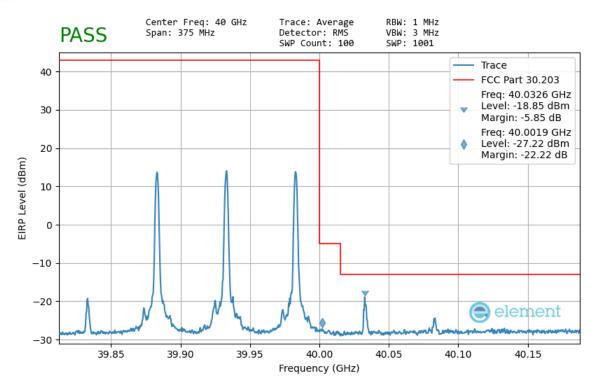
Plot 7-95. K Patch Lower Band Edge (50MHz-3CC - QPSK 1 RB)



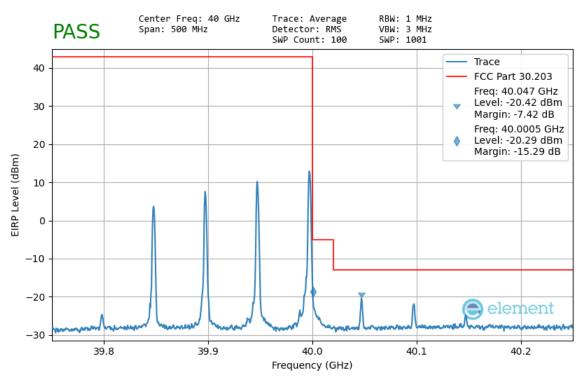
Plot 7-96. K Patch Lower Band Edge (50MHz-4CC - QPSK 1 RB)

		3 (
FCC ID:A3LSMF721U	PART 30 MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Page 78 of 107
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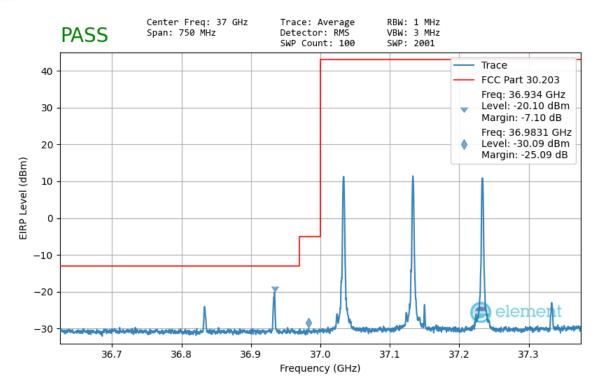
Plot 7-97. K Patch Upper Band Edge (50MHz-3CC - QPSK 1 RB)



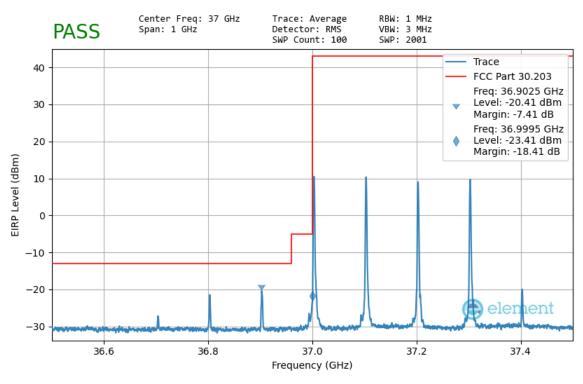
Plot 7-98. K Patch Upper Band Edge (50MHz-4CC - QPSK 1 RB)

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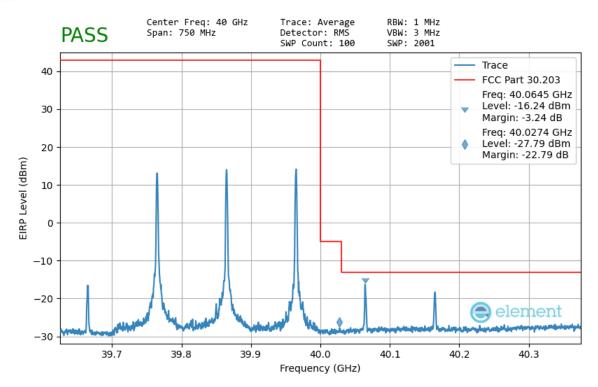
Plot 7-99. K Patch Lower Band Edge (100MHz-3CC – QPSK 1 RB)



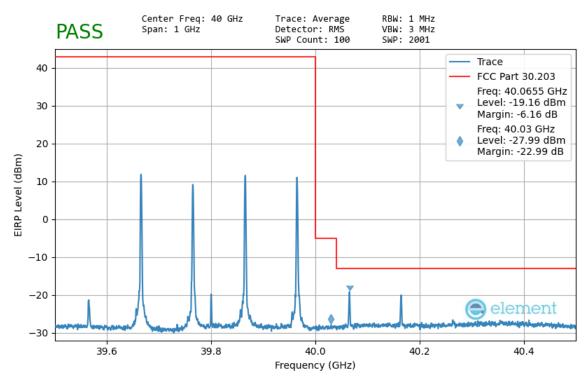
Plot 7-100. K Patch Lower Band Edge (100MHz-4CC - QPSK 1 RB)

FCC ID:A3LSMF721U	PART 30 MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
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Plot 7-101. K Patch Upper Band Edge (100MHz-3CC – QPSK 1 RB)



Plot 7-102. K Patch Upper Band Edge (100MHz-4CC - QPSK 1 RB)

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7.6 Frequency Stability / Temperature Variation §2.1055

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015. The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

Test Procedure Used

ANSI C63.26-2015 Section 5.6 KDB 842590 D01 v01r02 Section 4.5

Test Settings

- 1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
- The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
- Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Test Setup

The EUT was measured using horn antenna connected to a spectrum analyzer. The EUT was placed inside an environmental chamber that uses a foam plug to maintain the temperature condition inside the chamber. The horn antenna measured the frequency of the fundamental signal.

Test Notes

The Frequency Deviation column in the table below is the amount of deviation measured from the center frequency of the Reference measurement (first row).

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Frequency Stability Measurements (Band n258) §2.1055

OPERATING FREQUENCY: 24,325,878,533 Hz
REFERENCE VOLTAGE: 4.39 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.39	+ 20 (Ref)	24,325,878,533	0	0.0000000
100 %		- 30	24,325,891,982	-13,449	-0.0000553
100 %		- 20	24,325,820,710	57,823	0.0002377
100 %		- 10	24,325,871,111	7,422	0.0000305
100 %		0	24,325,896,489	-17,956	-0.0000738
100 %		+ 10	24,325,892,612	-14,079	-0.0000579
100 %		+ 30	24,325,871,499	7,034	0.0000289
100 %		+ 40	24,325,868,459	10,074	0.0000414
100 %		+ 50	24,325,845,986	32,547	0.0001338
BATT. ENDPOINT	3.54	+ 20	24,325,845,666	32,867	0.0001351

Table 7-29. Frequency Stability Data (n258)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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Frequency Stability Measurements (Band n258) §2.1055

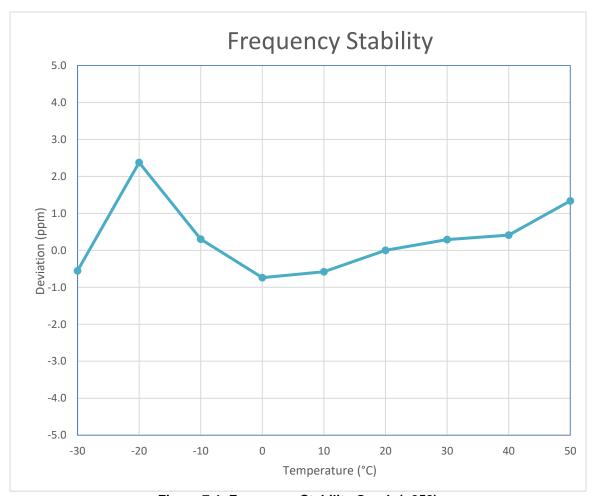


Figure 7-1. Frequency Stability Graph (n258)

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Frequency Stability Measurements (Band n261) §2.1055

OPERATING FREQUENCY: 28,024,269,452 Hz
REFERENCE VOLTAGE: 4.39 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.39	+ 20 (Ref)	28,024,269,452	0	0.0000000
100 %		- 30	28,024,268,222	1,230	0.0000044
100 %		- 20	28,024,282,111	-12,659	-0.0000452
100 %		- 10	28,024,260,192	9,260	0.0000330
100 %		0	28,024,305,621	-36,169	-0.0001291
100 %		+ 10	28,024,272,490	-3,038	-0.0000108
100 %		+ 30	28,024,260,123	9,329	0.0000333
100 %		+ 40	28,024,271,989	-2,537	-0.0000091
100 %		+ 50	28,024,312,450	-42,998	-0.0001534
BATT. ENDPOINT	3.54	+ 20	28,024,212,798	56,654	0.0002022

Table 7-30. Frequency Stability Data (n261)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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Frequency Stability Measurements (Band n261) §2.1055

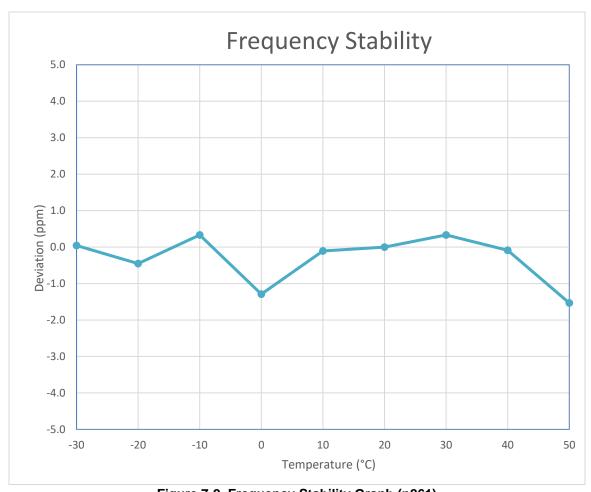


Figure 7-2. Frequency Stability Graph (n261)

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Frequency Stability Measurements (Band n260) §2.1055

OPERATING FREQUENCY: 38,425,150,241 Hz
REFERENCE VOLTAGE: 4.39 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.39	+ 20 (Ref)	38,425,150,241	0	0.0000000
100 %		- 30	38,425,109,449	40,792	0.0001062
100 %		- 20	38,425,121,008	29,233	0.0000761
100 %		- 10	38,425,148,922	1,319	0.0000034
100 %		0	38,425,116,000	34,241	0.0000891
100 %		+ 10	38,425,143,261	6,980	0.0000182
100 %		+ 30	38,425,162,321	-12,080	-0.0000314
100 %		+ 40	38,425,164,199	-13,958	-0.0000363
100 %		+ 50	38,425,175,698	-25,457	-0.0000663
BATT. ENDPOINT	3.54	+ 20	38,425,151,498	-1,257	-0.0000033

Table 7-31. Frequency Stability Data (n260)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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Frequency Stability Measurements (Band n260) §2.1055

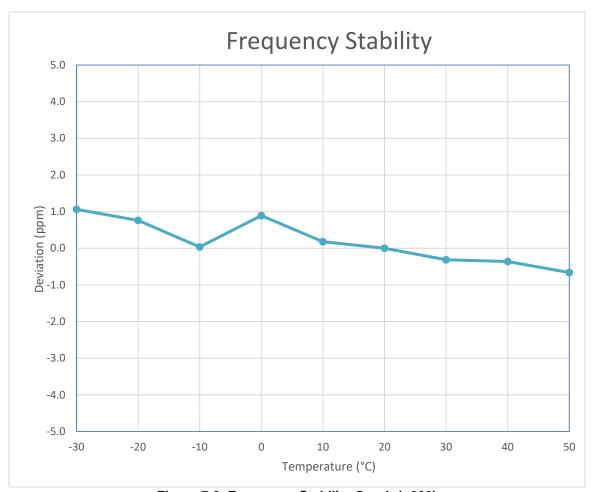


Figure 7-3. Frequency Stability Graph (n260)

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMF721U** complies with all the requirements of Part 30.

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APPENDIX A

VDI Mixer Verification Certificate 9.1



Virginia Diodes, Inc

979 2nd St. SE Suite 309 Charlottesville, VA 22902 Phone: 434-297-3257 Fax: 434-297-3258

Certificate of Conformance

To: PCTEST Engineering Laboratory 7185 Oakland Mills Road Columbia, MD 21046 United States

From: Virginia Diodes, Inc 979 2nd St. SE Suite 309 Charlottesville, VA 22902

Today's Date: 08/28/20 Packing List No: 202943 Shipping Date: 08/28/20 PO Number: 200414.DP2

Quantity

Shipped

1

Description

<u>Unit</u> EΑ

VDIWR19.0SAX-M-M4

WR19SAX-M-M4 / SN: SAX 679

Order-Job Number

20177A-01

The VDI product(s) in this shipment meet(s) the guidelines for performance specifications established in accordance with the corresponding Purchase Order. Data presented in the User Guide, where applicable, has been obtained in accordance with VDI's Quality Management System. All instruments, used to obtain data, which require calibration have been calibrated with equipment traceable to the National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI).

> Authorized Signature Virginia Diodes, Inc

FCC ID:A3LSMF721U	PART 30 MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
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Virginia Diodes, Inc

979 2nd St. SE Suite 309 Charlottesville, VA 22902 Phone: 434-297-3257 Fax: 434-297-3258

Certificate of Conformance

To: PCTEST Engineering Laboratory 7185 Oakland Mills Road Columbia, MD 21046 **United States**

From: Virginia Diodes, Inc 979 2nd St. SE Suite 309 Charlottesville, VA 22902

Packing List No: 202695 Shipping Date: 08/12/20 Today's Date: 08/14/20 PO Number: 200414.DP2

Quantity

Shipped

<u>Unit</u>

EΑ

VDIWR12.0SAX-M-M6 S/N: SAX 680

Order-Job <u>Number</u>

20177B-01

The VDI product(s) in this shipment meet(s) the guidelines for performance specifications established in accordance with the corresponding Purchase Order. Data presented in the User Guide, where applicable, has been obtained in accordance with VDI's Quality Management System. All instruments, used to obtain data, which require calibration have been calibrated with equipment traceable to the National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI).

> Authorized Signature Virginia Diodes, Inc.

FCC ID:A3LSMF721U	PART 30 MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
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Virginia Diodes, Inc

979 2nd St. SE Suite 309 Charlottesville, VA 22902 Phone: 434-297-3257 Fax: 434-297-3258

Certificate of Conformance

To: PCTEST Engineering Laboratory 7185 Oakland Mills Road Columbia, MD 21046 United States From: Virginia Diodes, Inc 979 2nd St. SE Suite 309 Charlottesville, VA 22902

 Packing List No:
 203623
 Today's Date:
 10/22/20

 Shipping Date:
 10/22/20
 PO Number:
 200414.DP2

Quantity

Shipped

<u>Unit</u> EA Description

VDIWR8.0SAX-M-M9 S/N: SAX 681

Order-Job Number 20177C-01

The VDI product(s) in this shipment meet(s) the guidelines for performance specifications established in accordance with the corresponding Purchase Order. Data presented in the User Guide, where applicable, has been obtained in accordance with VDI's Quality Management System. All instruments, used to obtain data, which require calibration have been calibrated with equipment traceable to the National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI).

Authorized Signature Virginia Diodes, Inc

FCC ID:A3LSMF721U	PART 30 MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Technical Manager
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Virginia Diodes, Inc

979 2nd St. SE Suite 309 Charlottesville, VA 22902 Phone: 434-297-3257 Fax: 434-297-3258

Certificate of Conformance

To: PCTEST Engineering Laboratory 7185 Oakland Mills Road Columbia, MD 21046 **United States**

From: Virginia Diodes, Inc 979 2nd St. SE Suite 309 Charlottesville, VA 22902

Today's Date: 09/24/20 Packing List No: 203281 Shipping Date: 09/24/20 PO Number: 200414.DP2

Quantity

Shipped <u>Unit</u> Description

1 EΑ VDIWR5.1SAX-M-M18

WR5.1SAX-M-M18 - Mini Spectrum Analyzer Extension Module; SN: SAX 682.

Order-Job Number

20177D-01

The VDI product(s) in this shipment meet(s) the guidelines for performance specifications established in accordance with the corresponding Purchase Order. Data presented in the User Guide, where applicable, has been obtained in accordance with VDI's Quality Management System. All instruments, used to obtain data, which require calibration have been calibrated with equipment traceable to the National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI).

> Authorized Signature Virginia Diodes, Inc

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Test Scope Accreditation 9.2



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

ELEMENT MATERIALS TECHNOLOGY WASHINGTON DC LLC

(formerly PCTEST) 7185 Oakland Mills Road Columbia, MD 21046 Randy Ortanez Phone: 410 290 6652

ELECTRICAL1

Valid To: September 30, 2022 Certificate Number: 2041.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory at the location listed above, as well as the three satellite laboratory locations listed below, to perform the following Electromagnetic Compatibility, SAR, HAC, Telecommunications, OTA, Battery, RF, and Conformance and Protocol testing of wireless devices:

Test Technology:	Test Method(s) 2:
rest recumology.	rest Method(s)

Emissions CFR 47, FCC Parts 15B/C/D/E/F/G/H (using ANSI C63.4:2014, Radiated and Conducted

ANSI C63.10:2013, ANSI C63.17:2013, and FCC KDB 905462

D02 (v02)), 18 (using MP-5:1986); ANSI C63.10:2020; KDB 987594;

ETSI TS 134 124 Universal Mobile Telecommunications System

(UMTS); (3GPP TS 34.124); (3GPP TS38.124 NR;

Electromagnetic Compatibility (EMC) Requirements for Mobile

Terminals and Ancillary Equipment);

ETSI TS 136 124 LTE; Evolved Universal Terrestrial Radio Access

(E-UTRA); (3GPP TS 36.124);

ETSI TS 151 010-1 Digital Cellular Telecommunications System

(Phase 2+) (GSM):

3GPP TS 51.010-1, Section 12 (Conducted and Radiated Spurious Emissions); EN55011; EN 55032; CNS 13438 (up to 6 GHz); AS/NZS CISPR 11; IEC/CISPR 11; CISPR 32; FCC OET/MP-5;

ICES-003; KN 11; KN 32; VCCI V-3(2016.11); VCCI V-3 (2015.04); VCCI 32-1: VCCI-CISPR 32

CFR 47, FCC Part 14 Accessibility

Transmitter/Receiver RSS 111; RSS 112; RSS 117; RSS 119; RSS 123; RSS 125;

RSS 127; RSS 130; RSS 131; RSS 132; RSS 133; RSS 134; RSS 135; RSS 137; RSS 139; RSS 140; RSS 141; RSS 142;

RSS 170; RSS 181; RSS 182; RSS 191; RSS 192; RSS 194;

RSS 195; RSS 196; RSS 197; RSS 199; RSS 210; RSS 211; RSS 213; RSS 215; RSS 216; RSS 220; RSS 222; RSS 236;

RSS 238; RSS 243; RSS 244; RSS 246; RSS 247; RSS 248;

RSS 251; RSS 252; RSS 287; RSS 288; RSS 310; RSS Gen

(A2LA Cert. No. 2041.01) Revised 05/20/2022

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5202 Presidents Court, Suite 220 | Frederick, MD 21703-8515 | Phone: 301 644 3248 | Fax: 240 454 9449 | www.A2LA.org

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Test Technology: Test Method(s) 2: IEEE 1528-2013; RSS 102 Issue 5 (2015); SAR/RF Exposure EN 50360-2017; EN 62209-1:2016; EN 62209-2:2010; IEC 62209-1 2nd Edition 2016; IEC 62209-2 2010; IEC PAS 63083-2017; EN 50566-2017; IEC 62209-2 AMD 1; Australian Communications Authority Radio Communications (Electromagnetic Radiation - Human Exposure) Standard 2014; FCC KDB 248227 D01; FCC KDB 447498 D01, D02, and D03; FCC KDB 615223 D01; FCC KDB 616217 D04; FCC KDB 643646 D01; FCC KDB 648474 D03 and D04; FCC KDB 680106 D01; FCC KDB 865664 D01 and D02; FCC KDB 941225 D01, D05, D05A, D06, and D07; EN 50401:2017; EN 50385:2017; IEC 62311:2008; IEC 62479:2010; EN 62479:2010; EN 50663:2017; EN 62311:2007; EN 62232:2017; IEC 62232:2017; IEEE C95.1-2005; IEEE C95.1-1992; IEEE C95.3-2002; RSS-102 (SAR. RF Exposure, NS), SPR-003; SPR-002; SPR-001; SPR-004; IEC TR 62630:2010; IEEE C95.3.1:2010; IEC TR 63170:2018; AS/NZS 2772.2:2016; EN 62209-3: 2019; IEC 62209-3:2019; C95.1: 2019; ICNIRP (100KHz - 300 GHz): 2020; IEC 62311:2019; EN 62311:2020; IEC/IEEE 62209-1528:2020; RRA Public Notification 2018-18, December 7, 2018 Hearing Aid Compatibility ANSI C63.19:2007; ANSI C63.19:2011; ANSI C63.19:2019; CTIA Test Plan for Hearing Aid Compatibility v.3.1.1 (2017); FCC KDB 285076, D01 & D02; RSS-HAC 47 CFR FCC Parts 20, 22, 24, 25, 27, 30, 73, 74, 80, 87, 90, 95, United States Radio 96, 97, 101 (using ANSI/TIA-603-E, TIA-102.CAAA-E, ANSI C63.26:2015); ANSI/TIA-603-D; TIA-102.CAAA-D; FCC KDB 935210 D03 (v04); FCC KDB 935210 D04 (v02); FCC KDB 935210 D05 (v01) European Radio ETSI EN 302 065-1 Version 2.1.1 (2016-11); ETSI EN 302 065-2 Version 2.1.1 (2016-11); ETSI EN 302 065-3 Version 2.1.1 (2016-11); ETSI EN 302 065-4 Version 1.1.1 (2016-11); ETSI EN 302 291-1 Version 1.1.1 (2005-07); ETSI EN 302 291-2 Version 1.1.1 (2005-07); ETSI EN 302 502 Version 2.1.3 (2017-07); ETSI EN 302 510-1 Version 1.1.1; ETSI EN 302 510-2 Version 1.1.1; ETSI EN 302 537 Version 2.1.1 (2016-10); ETSI EN 301 511 Version 12.5.1 (2017-03); ETSI EN 301 839 Version 2.1.1 (2016-04); ETSI EN 301 893 Version 2.1.1 (2017-05); ETSI EN 301 893 Version 1.8.1 (2015-03); ETSI EN 301 908-1 Version 13.1.1 (2019-11); ETSI EN 301 908-13 Version 13.1.1 (2019-11);

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<u>Test Technology:</u> <u>Test Method(s) ²:</u>

ETSI EN 300 220-1 Version 3.1.1 (2017-02); European Radio (cont'd) ETSI EN 300 220-2 Version 3.2.1 (2018-06);

ETSI EN 300 220-2 Version 3.2.1 (2016-00), ETSI EN 300 328 Version 2.1.1 (2016-11); ETSI EN 300 328 Version 2.2.2 (2019-07); ETSI EN 300 330 Version 2.1.1 (2017-02); ETSI EN 300 440 Version 2. (22.1 (2018-07);

ETSI EN 300 440-2 Version 1.4.1 (2010-08); KS X 3123, KS X 3142, KS X 3270, KS X 3271;

LP0002; DGT LP0002;

Korean Radio Regulations on Radio Equipment

(MSIT Ordinance MSIT No. 63, Dec. 24, 2020); Unlicensed Radio Equipment Established Without Notice (MSIT Public Notification 2020, 50, Oct. 16, 2020);

(MSIT Public Notification 2020-59, Oct. 16, 2020); Technical Requirements for the Human Protection against

Electromagnetic Waves

(MSIT Public Notification 2019-4, January 16, 2019);

Equipment to be Subject of the Test Procedure for Electromagnetic

Field Strength and Specific Absorption Rate

(RRA Public Notification 2019-1, January 17, 2019); Technical Requirements for Radio Equipment for

Telecommunication Services

(RRA Public Notification 2019-9, June 3, 2019);

Technical Requirements for Measurement and Test Procedure of

Specific Absorption Rate

(RRA Public Notification 2018-18, Dec 7, 2018);

Technical Requirements for Measurement of Electromagnetic Field

Strength (RRA Public Notification 2019-3, March 4, 2019)

Australia/New Zealand Radio AS/NZS 4268:2017

Licensed Wireless Devices ANSI C63.26:2015

Wired and Wireless Conformance

5G NR 3GPP TS 38.508-1; 3GPP TS 38.508-2; 3GPP TS 38.521-1;

3GPP TS 38.521-2; 3GPP TS 38.521-3; 3GPP TS 38.521-4; 3GPP TS 38.522; 3GPP TS 38.523-1; 3GPP TS 38.523-2; 3GPP 38.523-3; 3GPP TS 38.533; VZW 5G NR FR2 RFOTA;

VZW 5G Protocol Pre-Conformance (TS 38.523-1);

VZW 5G NR FR1 Supp RF;

VZW 5G NR RF Pre Conformance (TS 38.521-3); VZW 5G NR Radio Resource Management (RRM)

Pre-Confromance (TS 38.533)

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<u>Test Technology:</u> <u>Test Method(s) ²:</u>

LTE 3GPP TS 36.521-1; 3GPP TS 36.521-3; 3GPP TS 36.523-1;

3GPP 37.571-1; 3GPP 37.571-2; 3GPP TS 34.229;

3GPP Carrier Aggregation;

PTCRB NAPRD.03; PTCRB PPMD; PTCRB Cat-M (per RFT132 eMTC);

PVG.09 LTE Data Throughput & TR 37.901 Data Throughput

Performance;

PVG.04 PTCRB Radiated Spurious Emissions;

Global Certification Forum (GCF-CC) Certification / LTE Field

Test (TS.11) 3:

3GPP Cat-NB & Cat-M;

MetroPCS Lab Conformance; AT&T LTE Conformance;

AT&T IoT Accelerator Conformance, 19263; VZW Lab Conformance; VZW Supl RF;

VZW FR2 Supplementary RF, VZW FR1 Supplementary RF;

VZW Supl Signaling Conformance;

VZW Supl RRM;

VZW LTE LBS Performance;

VZW Safe for Network (SFN), VZW Phase 1, VZW Open Development and Field Interoperability Testing (FIT) ³; VZW Network Extender; VZW PCO; VZW Data Retry; VZW Data Throughput; VZW SMS; VZW AT Commands; VZW CMAS; VZW eMBMS; VZW APN; VZW Cat-M VolTE;

Live Network Extender and Android Test Plan;

Sprint LTE Test Plan; Sprint LTE Safe for Network (SFN);

Sprint LTE Conformance; Sprint LTE IoT;

Sprint Lab Conformance; USCC Lab Conformance; KDDI LTE Device Testing; SoftBank LTE Testing

WCDMA (UTRA) 3GPP TS 34.121-1; 3GPP TS 34.123-1;

SoftBank Mobile WCDMA Testing

SVLTE / Multimode CDMA-LTE Inter-RAT (iRAT); CDMA-LTE Inter-RAT SVD;

SVLTE: 1x RF with LTE Data Cal; SVLTE: LTE RF with 1x Voice Call;

SVD and SVLTE: LTE Data Throughput with 1x Voice Call; eHRPD; GMSS; SVD GMSS; E911 Data Call Processing; Stress Testing; RSSI for MM Devices; SVD Interband; LTE LBS Performance; VZW Multimode Supl Signaling; VZW Multimode SMS; VZW Multimode Data Retry

VoLTE IMS VoIP; Rich Communication Services (RCS);

VoLTE to 1xRTT Fallback for SVLTE (1xRTT Fallback);

IMS Registration and Retry; ePDG Live Network;

E911 for VoLTE; VZW hVoLTE; VZW VoIP and VT Performance; VZW Interband RRM and Protocol

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Test Technology: Test Method(s) 2:

Carrier Aggregation VZW Carrier Aggregation Supplementary RF;

VZW Carrier Aggregation Data Throughout

UICC USIM/USAT/CSIM/ISIM Interaction Test Plan

> (LTE/WCDMA/GSM/CDMA/MM); 3GPP TS 31.121; 3GPP TS 31.124;

ETSITS 102 230;

SIM Application Interaction Test Plan;

UICC USIM ISIM Electrical; UICC USIM ISIM Protocol (LTE/WCDMA/GSM/CDMA);

SWP/HCI ETSI TS 102 694-1; ETSI TS 102 695-1

SunSpec Alliance SunSpec - CSIP (Common Smart Inverter Profile) Conformance

Test Procedures;

 $SunSpec-Advanced\ Function\ Inverter\ Test\ Lab\ Specification;$ SunSpec - UL1741 Supplement SA/Rule 21 Implementation

Guide;

IEEE 2030.5-2018 Smart Energy Profile Application Protocol

CBRS (OnGo) / WInnForum CBRS Alliance Certification Test Plan;

WInnForum Conformance and Performance Test Technical

Standards

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¹ This accreditation covers testing performed at the main laboratory listed above, and the three satellite laboratories listed below:



7195 Oakland Mills Rd, Suite A Columbia, MD 21046

Test Technology: Test Method(s) $\frac{2}{3}$:

Wireless

3GPP2 C.S0011-C 20-Feb-2006 (TIA-98D/E/F)

(excluding Sections 3.2.1.3, 3.2.3.2, 3.3.3, 3.3.4, 3.3.5, 3.3.6,

3.4.6, 3.4.8, 3.4.10, 3.4.11, 3.4.12, 3.4.13, 3.7.2, 4.4.8, 4.4.9.2.1,

4.4.10, 4.4.11);

3GPP2 C.S0043-0 24-Sep-2004 (TIA-1035);

3GPP2 C.S0036-0 11-Mar-2002 (TIA-916);

3GPP2 C.S0036-A 23-May-2011 (TIA-916-A);

3GPP2 C.S0037-0 19-Apr-2002 (TIA-918);

3GPP2 C.S0056-0 22-Jul-2005 (TIA-1042);

3GPP2 C.S0059-0 20-Aug-2008 (TIA-1038);

3GPP2 C.S0060-0 06-Dec-2005 (TIA-1044);

3GPP2 C.S0061-0 22-Jun-2005 (TIA-1045);

3GPP2 C.S0062-0 14-May-2007 (TIA-1046);

3GPP2 C.S0073-0 26-Sep-2005 (TIA-1084);

3GPP2 C.S0073-B 21-Aug-2009 (TIA n/a); 3GPP2 C.S0094-0 30-Oct-2008 (TIA-1157);

CTIA Conformance Test Plan for CDMA Wireless Devices;

GCF Certification Criteria 2 (CAG2) Test Plan;

VZW Wireless Priority Services (WPS);

VZW Safe for Network (SFN);

VZW Open Development (OD) Device Specifications;

VZW Location Based Services (LBS);

VZW CMAS; VZW NBPCD; VZW Phase 1

EVDO 3GPP2 C.S0033-0 12-Dec-2003 (TIA-866);

3GPP2 C.S0033-A 14-Dec-2005 (TIA-866);

3GPP2 C.S0038-0 19-Apr-2002 (TIA-919);

3GPP2 C.S0038-A 26-Sep-2005 (TIA-919); 3GPP2 C.S0038-B 30-Mar-2009 (TIA n/a);

3GPP2 C.S0037-0 19-Apr-2002 (TIA-918);

CTIA Conformance Test Plan for CDMA Wireless Devices;

GCF Certification Criteria 2 (CAG2) Test Plan

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Accessibility

<u>Test Technology:</u> <u>Test Method(s) ²:</u>

Emissions CFR 47, FCC Parts 15B/C/D/E/F/G/H (using ANSI C63.4:2014, Radiated and Conducted ANSI C63.10:2020, ANSI C63.10:2013; ANSI C63.17:2013, FC

ANSI C63.10:2020, ANSI C63.10:2013; ANSI C63.17:2013, FCC KDB 905462, and KDB 987594, 18 (using MP-5:1986); ANSI

C63.10:2013; ETSI TS 134 124 Universal Mobile

Telecommunications System (UMTS); (3GPP TS 34.124); ETSI TS 136 124 LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); (3GPP TS 36.124); (3GPP TS38.124 NR; Electromagnetic Compatibility (EMC) Requirements for Mobile

Terminals and Ancillary Equipment);

ETSI TS 151 010-1 Digital Cellular Telecommunications System (Phase 2+) (GSM); 3GPP TS 51.010-1, Section 12 (Conducted and Radiated Spurious Emissions); EN55011; EN 55032; CNS 13438 (up to 6 GHz); AS/NZS CISPR 11; IEC/CISPR 11; CISPR 32; FCC OET/MP-5; ICES-003; KN 11; KN 32; VCCI V-3(2016.11); VCCI V-3 (2015.04); VCCI 32-1: VCCI-CISPR 32

CFR 47, FCC Part 14

Transmitter/Receiver RSS 111; RSS 112; RSS 117; RSS 119; RSS 123; RSS 125;

RSS 127; RSS 130; RSS 131; RSS 132; RSS 133; RSS 134; RSS 135; RSS 137; RSS 139; RSS 140; RSS 141; RSS 142; RSS 170; RSS 181; RSS 182; RSS 191; RSS 192; RSS 194; RSS 195; RSS 196; RSS 197; RSS 199; RSS 210; RSS 211; RSS 213; RSS 215; RSS 216; RSS 220; RSS 222; RSS 236; RSS 238; RSS 243; RSS 244; RSS 246; RSS 247; RSS 248;

RSS 238; RSS 243; RSS 244; RSS 246; RSS 247; RSS 248; RSS 251; RSS 252; RSS 287; RSS 288; RSS 310; RSS Gen

Hearing Aid Compatibility ANSI C63.19:2007; ANSI C63.19:2011; ANSI C63.19:2019;

CTIA Test Plan for Hearing Aid Compatibility v.3.1.1 (2017);

FCC KDB 285076, D01 & D02; RSS-HAC

United States Radio 47 CFR FCC Parts 20, 22, 24, 25, 27, 30, 73, 74, 80, 87, 90, 95,

96, 97, 101 (using ANSI/TIA-603-E, TIA-102.CAAA-E,

ANSI C63.26:2015); FCC KDB 935210;

European Radio ETSI EN 302 065-1 Version 2.1.1 (2016-11);

ETSI EN 302 065-2 Version 2.1.1 (2016-11); ETSI EN 302 065-3 Version 2.1.1 (2016-11); ETSI EN 302 065-4 Version 1.1.1 (2016-11); ETSI EN 302 291-1 Version 1.1.1 (2005-07); ETSI EN 302 291-2 Version 1.1.1 (2005-07); ETSI EN 302 502 Version 2.1.3 (2017-07);

ETSI EN 302 510-1 Version 1.1.1; ETSI EN 302 510-2 Version 1.1.1;

ETSI EN 302 510-2 Version 1.1.1; ETSI EN 302 537 Version 2.1.1 (2016-10);

ETSI EN 301 511 Version 12.5.1 (2017-03); ETSI EN 301 839 Version 2.1.1 (2016-04);

ETSI EN 301 893 Version 2.1.1 (2017-05); ETSI EN 301 893 Version 1.8.1 (2015-03);

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<u>Test Technology:</u> <u>Test Method(s) ²:</u>

ETSI EN 301 908-1 Version 13.1.1 (2019-11); European Radio (cont'd) ETSI EN 301 908-13 Version 13.1.1 (2019-11);

ETSI EN 300 220-1 Version 3.1.1 (2017-02); ETSI EN 300 220-2 Version 3.2.1 (2018-06); ETSI EN 300 328 Version 2.1.1 (2016-11); ETSI EN 300 328 Version 2.2.2 (2019-07); ETSI EN 300 330 Version 2.1.1 (2017-02); ETSI EN 300 440 Version 2. (22.1 (2018-07); ETSI EN 300 440-2 Version 1.4.1 (2010-08); KS X 3123, KS X 3142, KS X 3270, KS X 3271;

LP0002; DGT LP0002;

Korean Radio Regulations on Radio Equipment

(MSIT Ordinance MSIT No. 1 July 26, 2017);

Unlicensed Radio Equipment Established Without Notice (MSIT Public Notification 2019-105, December 23, 2019); Technical Requirements for the Human Protection against

Electromagnetic Waves

(MSIT Public Notification 2019-4, January 16, 2019); Equipment to be Subject of the Test Procedure for

Electromagnetic Field Strength and Specific Absorption Rate

(RRA Public Notification 2019-1, January 17, 2019); Technical Requirements for Radio Equipment for Telecommunication Services

(RRA Public Notification 2019-9, June 3, 2019);

Technical Requirements for Measurement of Electromagnetic Field Strength (RRA Public Notification 2019-3, March 4, 2019)

Australia/New Zealand Radio AS/NZS 4268:2017

Licensed Wireless Devices ANSI C63.26:2015

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<u>Test Technology:</u> <u>Test Method(s) ²:</u>

OTA CTIA Test Plan for Wireless Device Over-the-Air Performance OTA Anechoic Chambers for CDMA, 1xEVDO Rev0/A, GSM, GPRS, EGPRS, UMTS

for CDMA, 1xEVDO Rev0/A, GSM, GPRS, EGPRS, UMTS (W-CDMA), LTE, CDMA A-GPS, GSM A-GPS, UMTS

WCDMA A-GPS;

LTE A-GPS A-Glonass and SIB8 / SIB16; PTCRB NAPRD03; PTCRB PPMD;

OTA Carrier Aggregation;

OTA ECC Measurements;

VZW OTA Radiated Performance for CDMA & LTE Multimode

Devices;

VZW Location Determination Test Plan; VZW LTE-LBS Performance Test Plan; SPRINT OTA Antenna Performance Test Plan;

AT&T 13340 OTA; AT&T IoT Accelerator;

USCC CDMA Over The Air Radiated Test Plan; USCC LTE Over The Air Radiated Test Plan;

CTIA Test Plan for RF Performance Evaluation of Wi-Fi Mobile

Converged Devices (Wi-Fi Alliance);

GSMA TS.24 Operator Acceptance Values for Device Antenna

Performance;

3GPP TS 34.114 Technical Specification UE/MS OTA Antenna

Performance;

3GPP TS 37.544 Technical Specification UTRA & E-UTRA UE

OTA Antenna Performance

CTIA IoT Security CTIA Cybersecurity Certification Test Plan for IoT Devices

SunSpec Alliance SunSpec – CSIP (Common Smart Inverter Profile) Conformance

Test Procedures;

SunSpec – Advanced Function Inverter Test Lab Specification; SunSpec – UL1741 Supplement SA/Rule 21 Implementation

Guide;

IEEE 2030.5-2018 Smart Energy Profile Application Protocol

CBRS (OnGo) / WInnForum CBRS Alliance Certification Test Plan;

WInnForum Conformance and Performance Test Technical

Standards

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9017-F/G Mendenhall Court Columbia, MD 21045

<u>Test Technology:</u> <u>Test Method(s) ²:</u>

Battery Safety IEEE 1725 Standard for Rechargeable Batteries for Cellular

Telephones;

CTIA Certification Requirements for Battery System Compliance

to IEEE 1725;

IEEE 1625 Standard for Rechargeable Batteries for Multi-Cell

Mobile Computing Devices;

CTIA Certification Requirements for Battery System Compliance

to IEEE 1625;

UL1642 Standard for Lithium Batteries;

UL 2054 Household and Commercial Batteries;

UL 62133; IEC 62133 Secondary Cells and Batteries containing Alkaline or other Non-Acid Electrolytes – Safety Requirements for Portable Sealed Secondary Cells & Batteries made from them, for

use in Portable Applications

UNDOT United Nations Document ST/SG/AC.10/11/Section 38.3

Recommendations on the Transport of Dangerous Goods;

Manual of Tests and Criteria;

IEC 62281 - Safety of Primary and Secondary Lithium Cells and

Batteries During Transport
Altitude Simulation
Temperature Cycling
Mechanical Shock
Vibration
Short Circuit

Overcharge Impact/Crush Forced Discharge

Aerospace NASA Specification for Acceptance Testing of Commercial

Battery Performance and Safety Lithium Ion Cell Lots Engineering Directorate Propulsion & Power

Division, EP-WI-031

Hardware Reliability CTIA Device Hardware Reliability Test Plan

Determining Battery Life CTIA Battery Life Test Plan

Safety Requirement for Portable Sealed

Battery Transportation Safety

Secondary Cells

IEC 62133; EN 62133

CEC: Energy Efficient Battery Charger

System

Uniform Test Method for Measuring the Energy Consumption of

Battery Chargers

Immunity EN/IEC 61000-4-2

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3801 E. Plano Parkway, Ste 150 Plano, TX 75074

Test Technology:

Test Method(s) $\frac{2}{3}$:

Radiated Emissions (10 Meter Test Distance) (Frequency Range, 30 MHz – 1 GHz) CFR 47, FCC Parts 15B (using ANSI C63.4:2014)

EN55011; EN 55032; CNS 13438 (up to 6 GHz); AS/NZS CISPR 11; IEC/CISPR 11; CISPR 32; FCC OET/MP-5; ICES-003; KN 11;

KN 32; VCCI V-3(2016.11);

VCCI V-3 (2015.04); VCCI 32-1: VCCI-CISPR 32

Testing Activities Performed in Support of FCC Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.1⁴:

Rule Subpart/Technology	Test Method	Maximum Frequency
Unintentional Radiators Part 15B	ANSI C63.4:2014	40000 MHz
Industrial, Scientific, and Medical Equipment Part 18	FCC MP-5 (February 1986)	333000 MHz
Intentional Radiators Part 15C	ANSI C63.10:2013	333000 MHz
Unlicensed Personal Communication Systems Devices Part 15D	ANSI C63.17:2013	20000 MHz
U-NIII without DFS Intentional Radiators Part 15E	ANSI C63.10:2013	40000 MHz
U-NIII with DFS Intentional Radiators Part 15E	FCC KDB 905462 D02 (v02)	40000 MHz
UWB Intentional Radiators Part 15F	ANSI C63.10:2013	200000 MHz

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² When the date, revision or edition of a test method standard is not identified on the scope of accreditation, the laboratory is expected to be using the current version within one year of the date of publication, per part C., Section I of A2LA *R101 - General Requirements - Accreditation of ISO-IEC 17025 Laboratories.*

³ This laboratory meets A2LA R104 – General Requirements: Accreditation of Field Testing and Field Calibration Laboratories for these tests.



Testing Activities Performed in Support of FCC Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.14:

Rule Subpart/Technology	Test Method	Maximum Frequency
BPL Intentional Radiators Part 15G White Space Device Intentional Radiators	ANSI C63.10:2013	40000 MHz
Part 15H	ANSI C63.10:2013	40000 MHz
Commercial Mobile Services (FCC Licensed Radio Service Equipment) Parts 22 (cellular), 24, 25 (below 3 GHz), and 27	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	333000 MHz
General Mobile Radio Services (FCC Licensed Radio Service Equipment) Parts 22 (non-cellular), 90 (below 3 GHz), 95, 97 (below 3 GHz), and 101 (below 3 GHz)	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	333000 MHz
Citizens Broadband Radio Services (FCC Licensed Radio Service Equipment) Part 96	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	333000 MHz
Maritime and Aviation Radio Services Parts 80 and 87	ANSI/TIA-603-E; ANSI C63.26:2015	333000 MHz
Microwave and Millimeter Bands Radio Services Parts 25, 30, 74, 90 (M, DSRC, Y, Z), 95 (M and L), and 101	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	333000 MHz
Broadcast Radio Services Parts 73 and 74 (below 3 GHz)	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	333000 MHz
RF Exposure Devices Subject to SAR Requirements	IEEE Std 1528:2013	6000 MHz
Hearing Aid Compatibility Part 20 (HAC for Commercial Mobile Services)	ANSI C63.19:2011	6000 MHz
Signal Boosters Part 20 (Wideband Consumer Signal Boosters, Provider-specific signal boosters, and Industrial Signal Boosters) Section 90.219	ANSI C63.26:2015	333000 MHz
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⁴Accreditation does not imply acceptance to the FCC equipment authorization program. Please see the FCC website (https://apps.fcc.gov/oetcf/eas/) for a listing of FCC approved laboratories.

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Accredited Laboratory

A2LA has accredited

ELEMENT MATERIALS TECHNOLOGY WASHINGTON DC LCC

Columbia, MD

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017

General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 29th day of September 2020.

Vice President, Accreditation Services For the Accreditation Council Certificate Number 2041.01 Valid to September 30, 2022 Revised May 20, 2022

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

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