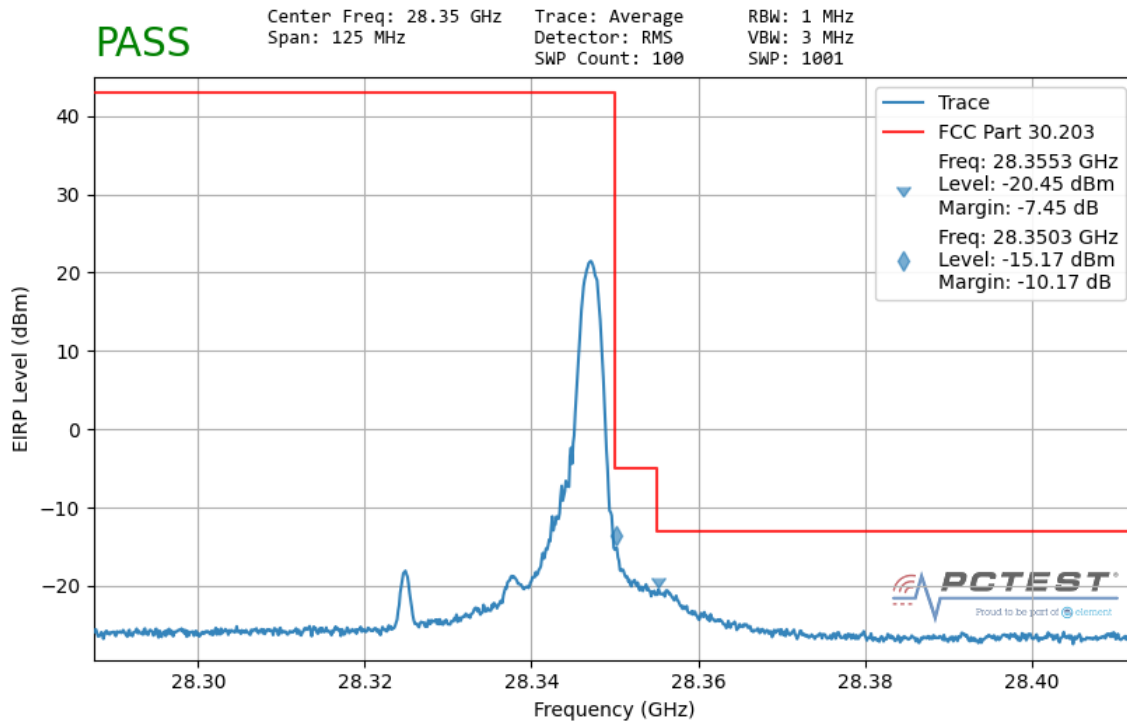
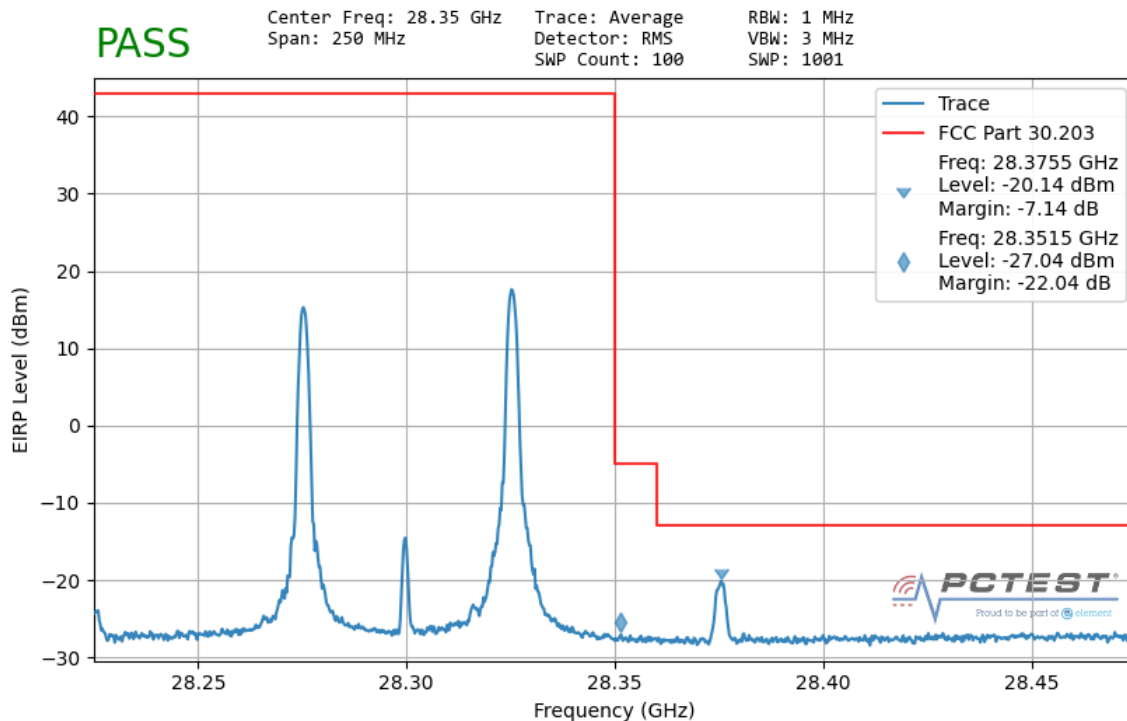


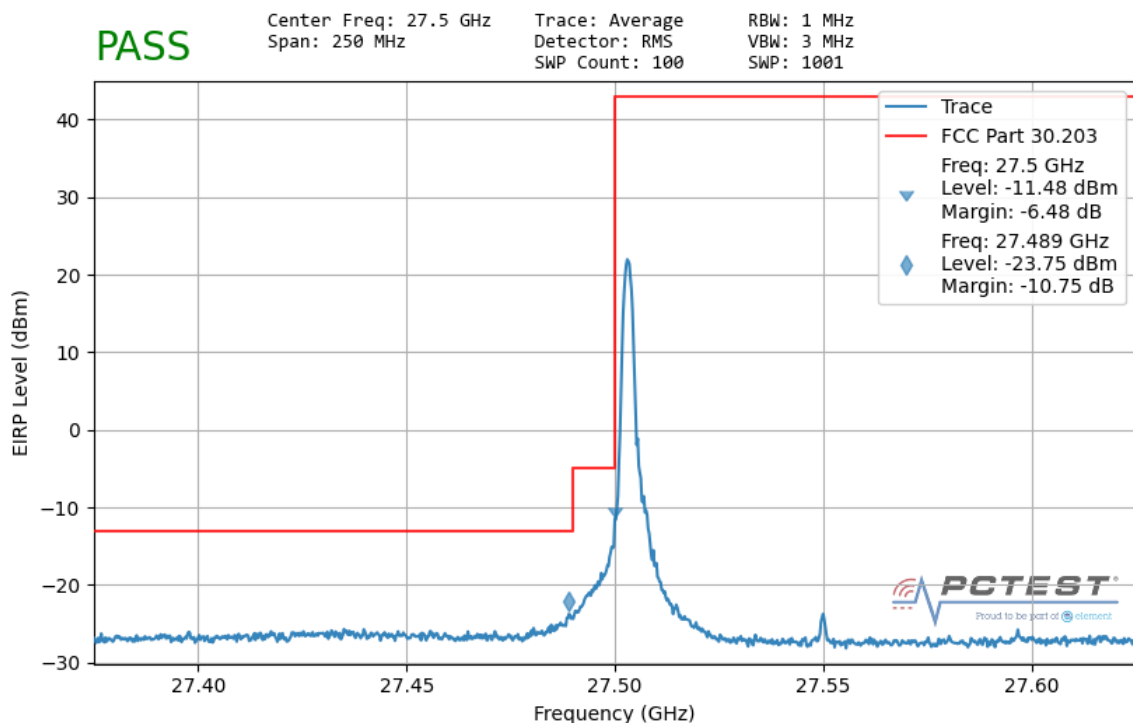


Plot 7-89. Ant 1 Upper Band Edge (50MHz-1CC – QPSK 1 RB)

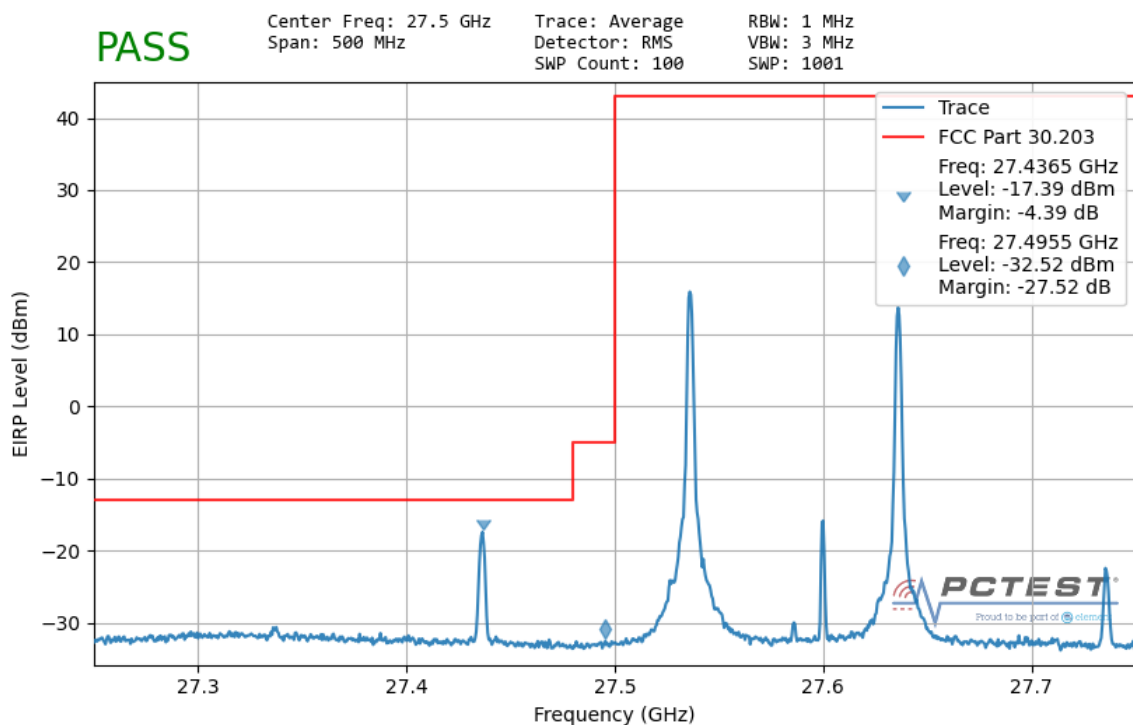


Plot 7-90. Ant 1 Upper Band Edge (50MHz-2CC – QPSK 1 RB)

FCC ID: A3LSMS901U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109080099-06.A3L	Test Dates: 09/15/2021-11/08/2021	EUT Type: Portable Handset		Page 153 of 186

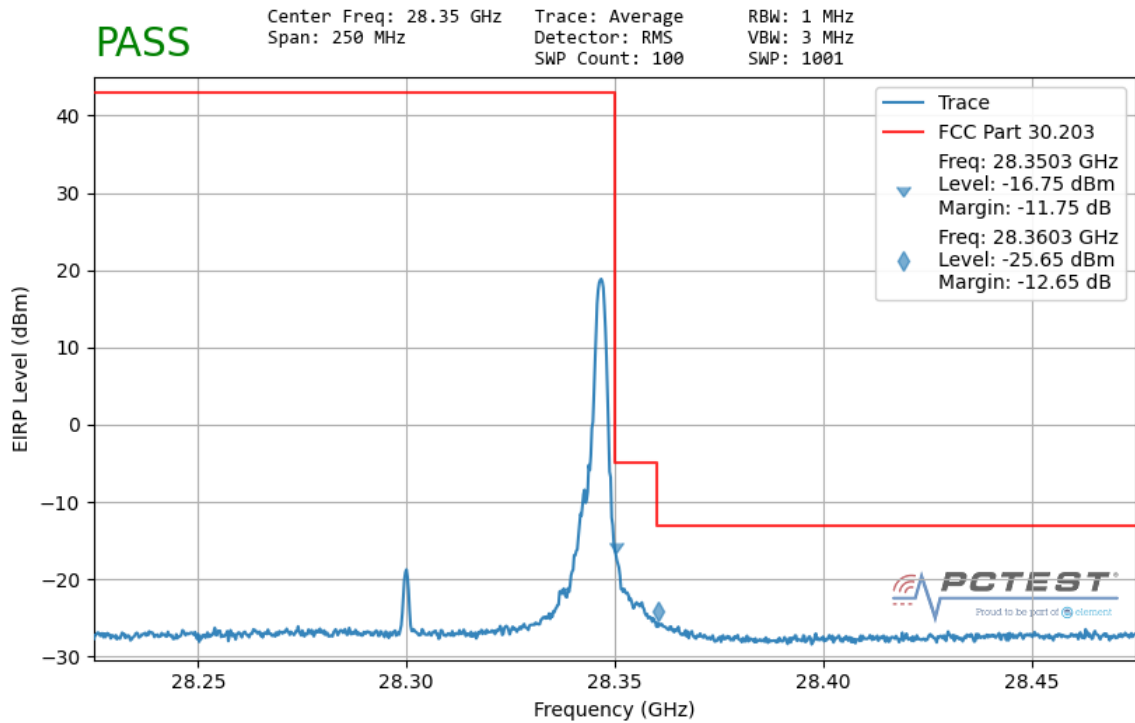


Plot 7-91. Ant 1 Lower Band Edge (100MHz-1CC – QPSK 1 RB)

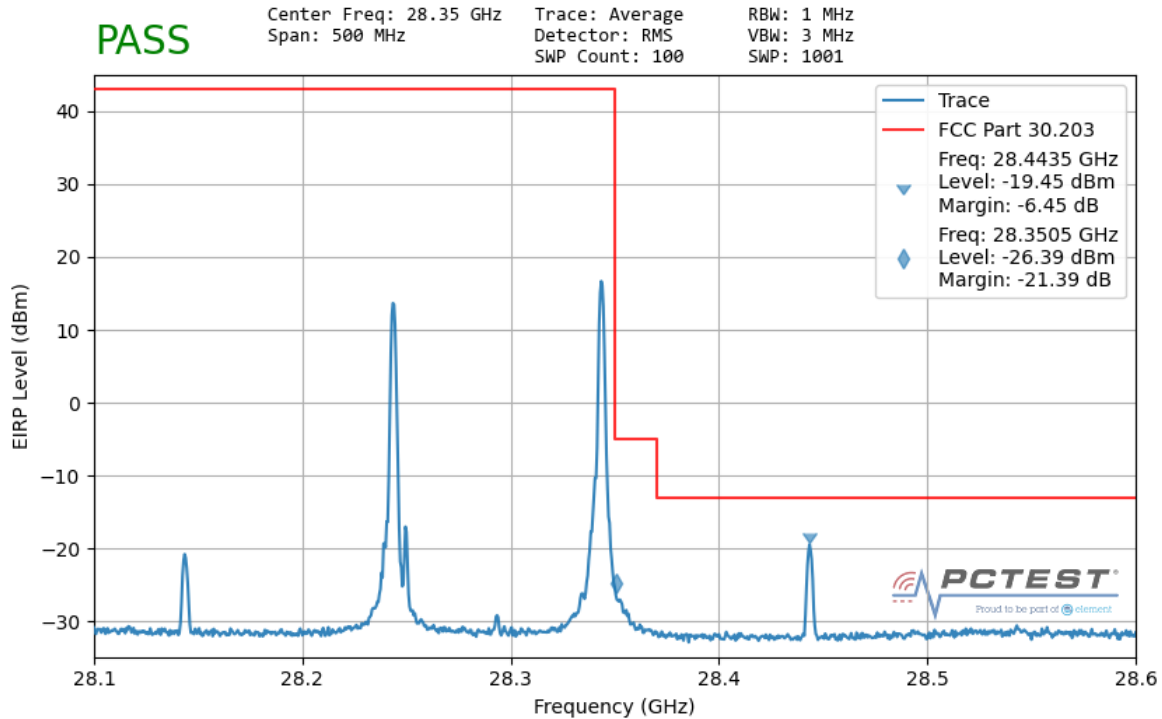


Plot 7-92. Ant 1 Lower Band Edge – TRP (100MHz-2CC – QPSK 1 RB)

FCC ID: A3LSMS901U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109080099-06.A3L	Test Dates: 09/15/2021-11/08/2021	EUT Type: Portable Handset		Page 154 of 186

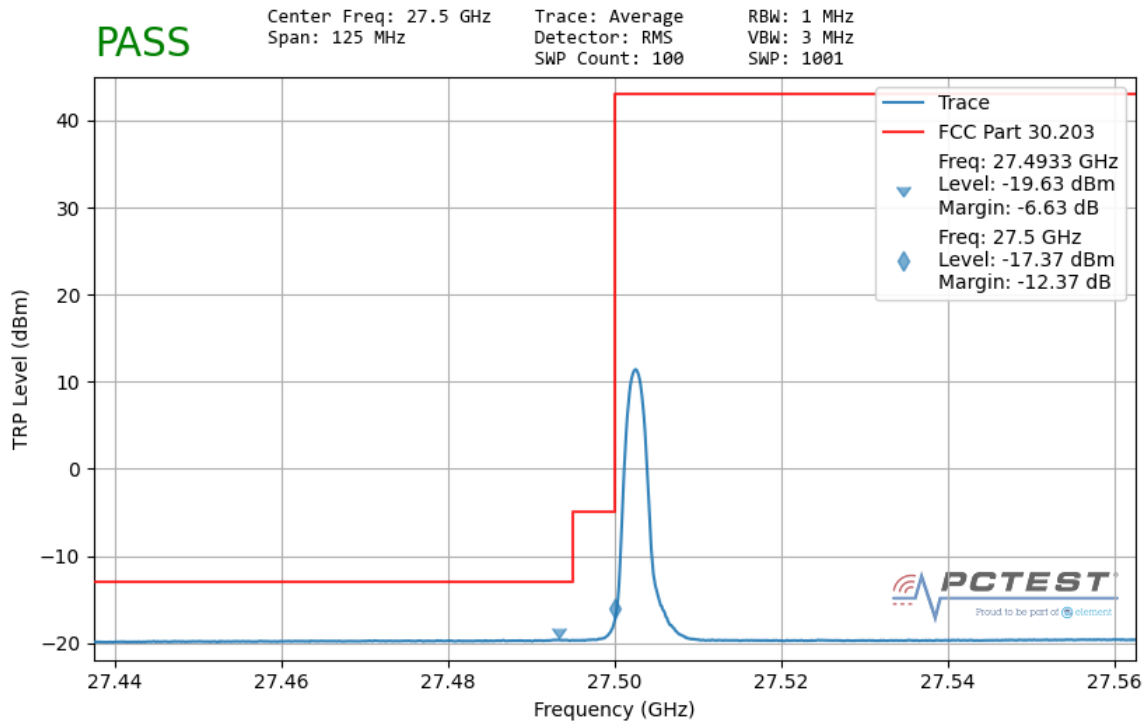


Plot 7-93. Ant 1 Upper Band Edge (100MHz-1CC – QPSK 1 RB)

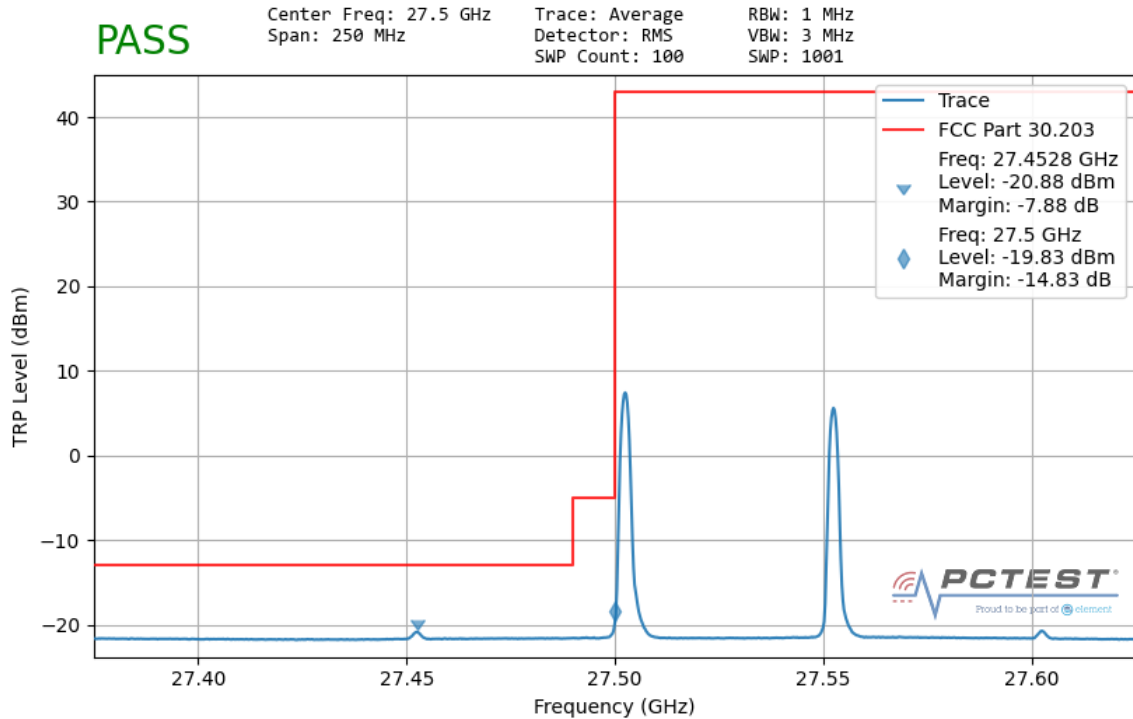


Plot 7-94. Ant 1 Upper Band Edge (100MHz-2CC – QPSK 1 RB)

FCC ID: A3LSMS901U	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109080099-06.A3L	Test Dates: 09/15/2021-11/08/2021	EUT Type: Portable Handset	Page 155 of 186

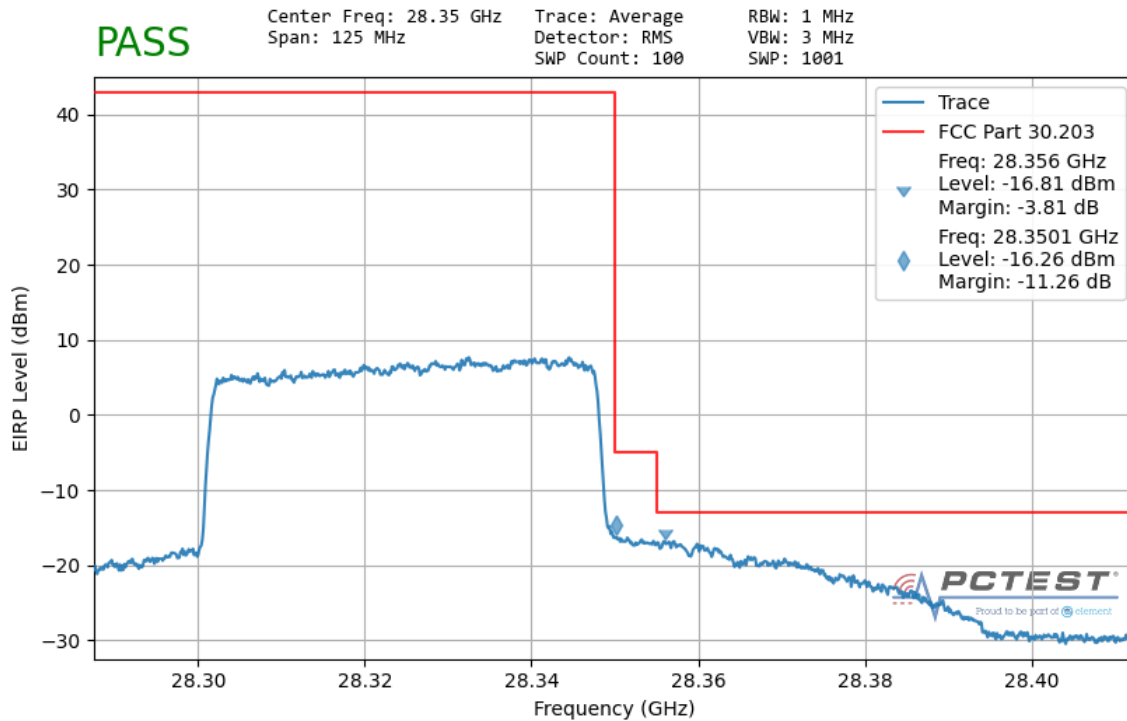


Plot 7-79. Ant 2 Lower Band Edge- TRP (50MHz-1CC – QPSK 1 RB)

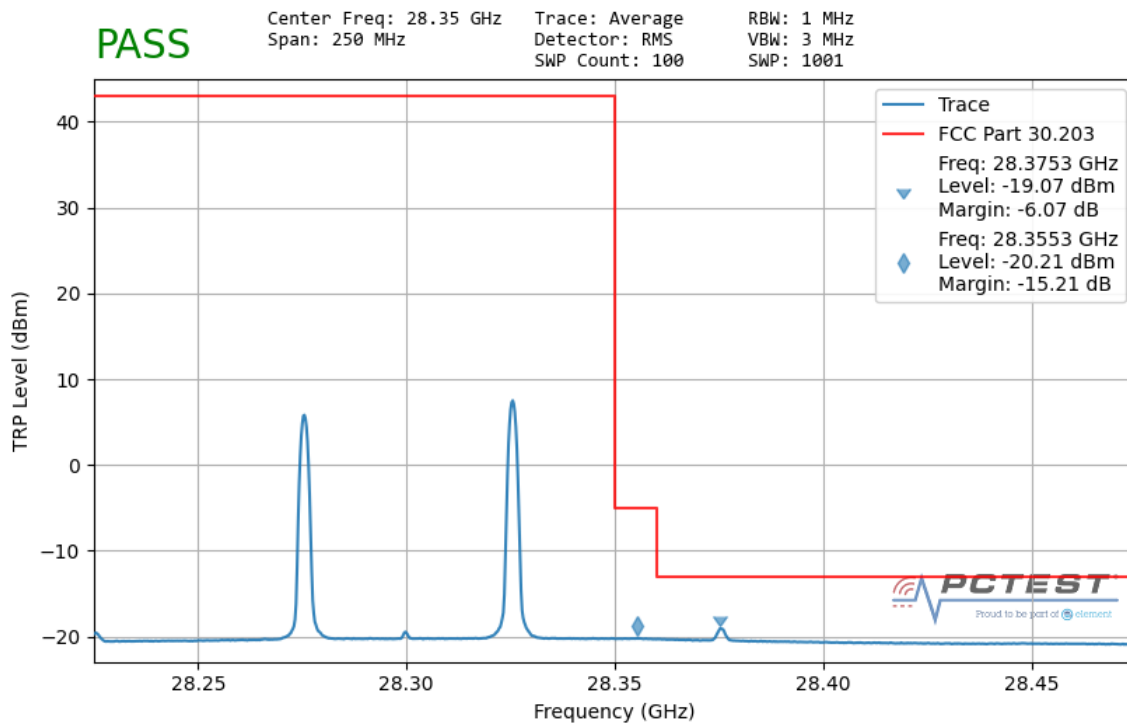


Plot 7-80. Ant 2 Lower Band Edge – TRP (50MHz-2CC – QPSK 1 RB)

FCC ID: A3LSMS901U	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109080099-06.A3L	Test Dates: 09/15/2021-11/08/2021	EUT Type: Portable Handset	Page 156 of 186

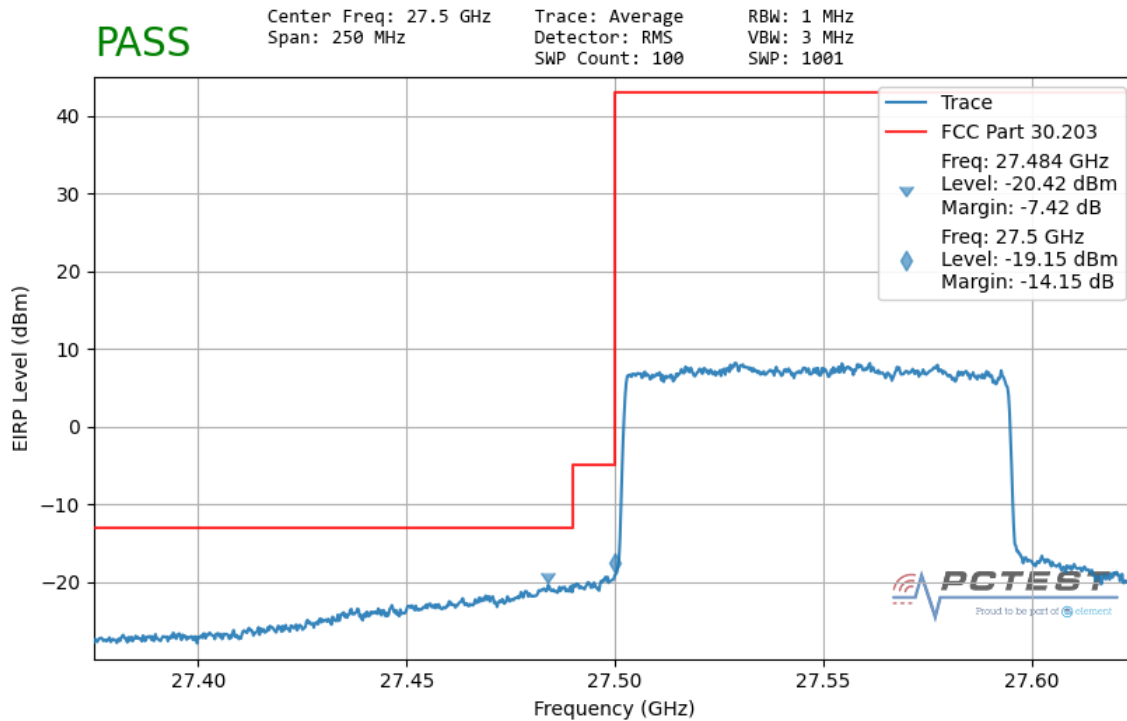


Plot 7-81. Ant 2 Upper Band Edge (50MHz-1CC – QPSK Full RB)

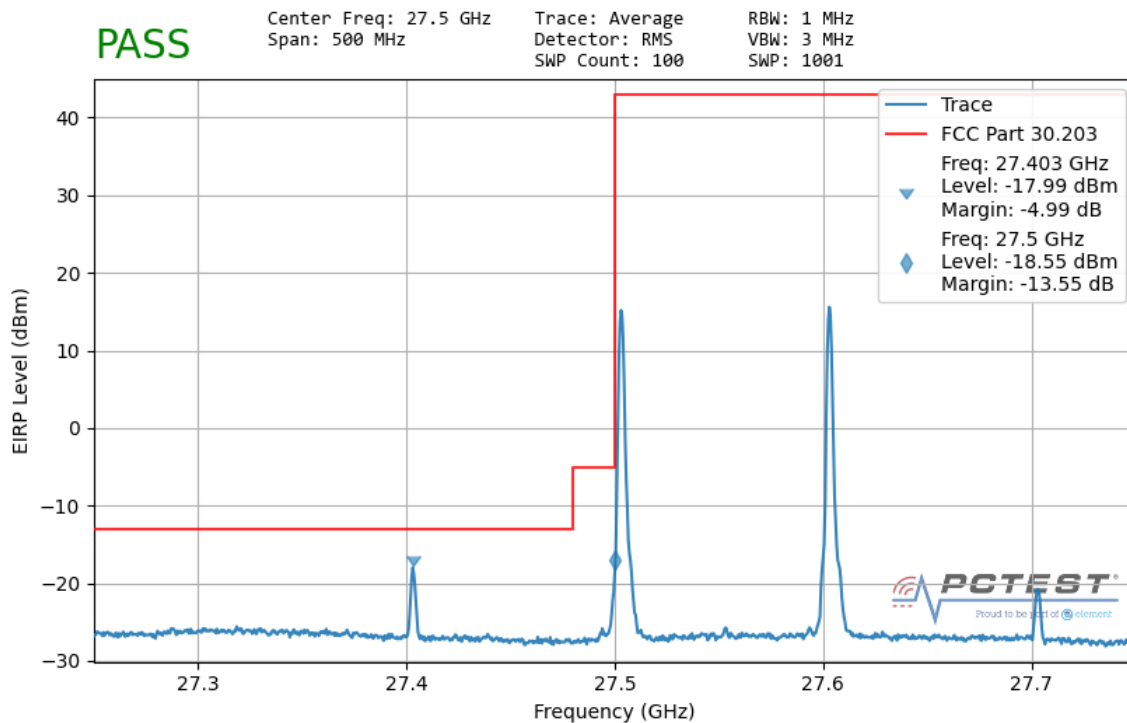


Plot 7-82. Ant 2 Upper Band Edge- TRP (50MHz-2CC – QPSK 1 RB)

FCC ID: A3LSMS901U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109080099-06.A3L	Test Dates: 09/15/2021-11/08/2021	EUT Type: Portable Handset		Page 157 of 186

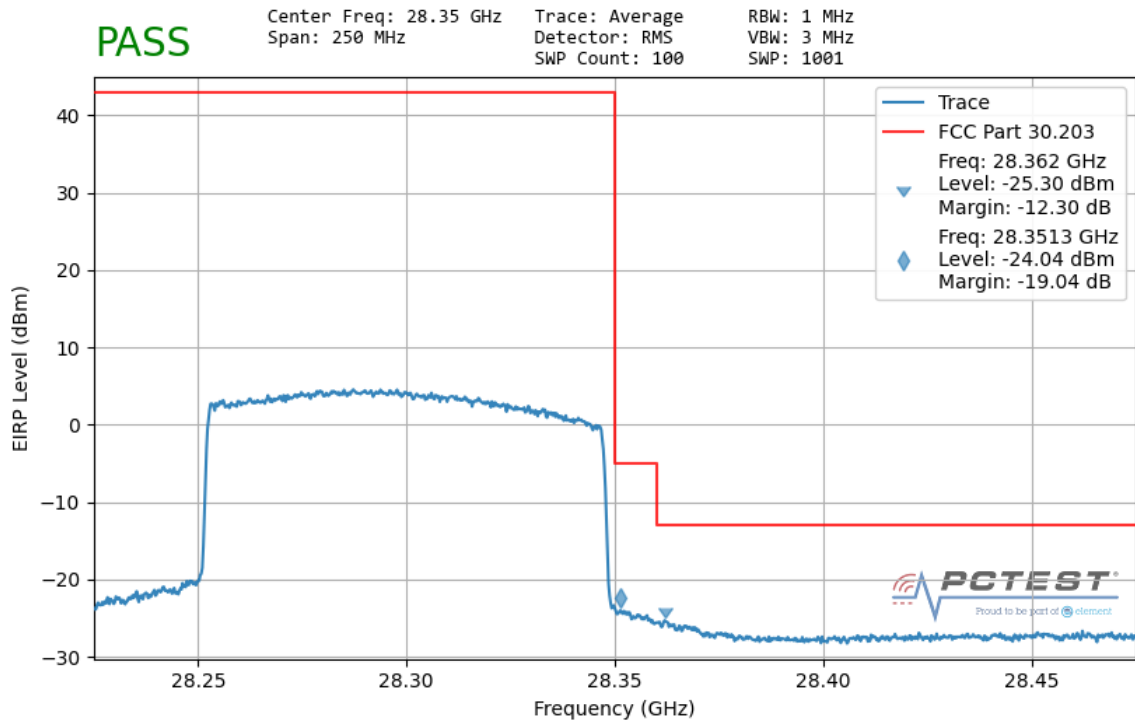


Plot 7-83. Ant 2 Lower Band Edge (100MHz-1CC – pi/2-BPSK Full RB)

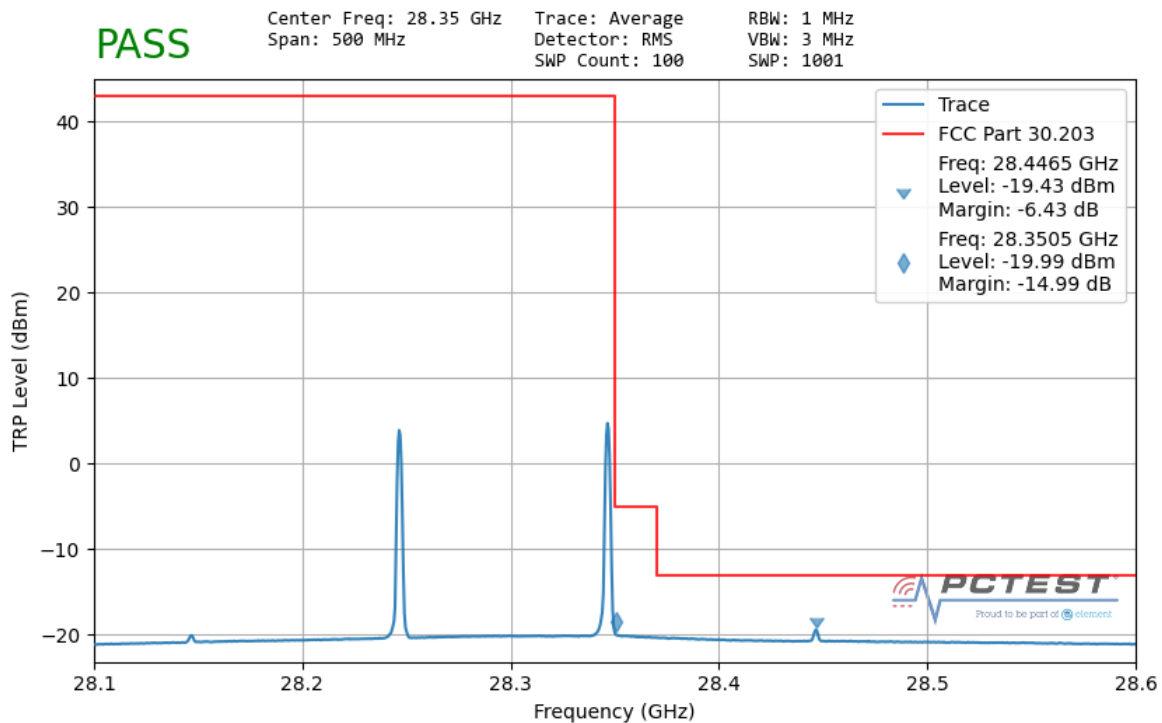


Plot 7-84. Ant 2 Lower Band Edge (100MHz-2CC – QPSK 1 RB)

FCC ID: A3LSMS901U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109080099-06.A3L	Test Dates: 09/15/2021-11/08/2021	EUT Type: Portable Handset		Page 158 of 186



Plot 7-85. Ant 2 Upper Band Edge (100MHz-1CC – QPSK Full RB)



Plot 7-86. Ant 2 Upper Band Edge – TRP (100MHz-2CC – QPSK 1 RB)

FCC ID: A3LSMS901U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109080099-06.A3L	Test Dates: 09/15/2021-11/08/2021	EUT Type: Portable Handset		Page 159 of 186

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 C63.5-2015 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).
2. 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.
3. 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 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).

FCC ID: A3LSMS901U	 PCTEST® Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109080099-06.A3L	Test Dates: 09/15/2021-11/08/2021	EUT Type: Portable Handset		Page 160 of 186

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Frequency Stability Measurements (Band n258-R1)

§2.1055

OPERATING FREQUENCY: 24,349,920,000 Hz
CHANNEL: 2018331
REFERENCE VOLTAGE: 4.43 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.43	+ 20 (Ref)	24,350,564,850	0	0.0000000
100 %		- 30	24,350,658,902	-94,052	-0.0003863
100 %		- 20	24,350,730,756	-165,906	-0.0006813
100 %		- 10	24,350,728,212	-163,361	-0.0006709
100 %		0	24,350,687,928	-123,078	-0.0005055
100 %		+ 10	24,350,636,575	-71,725	-0.0002946
100 %		+ 20	24,350,564,850	0	0.0000000
100 %		+ 30	24,350,518,535	46,316	0.0001902
100 %		+ 40	24,350,487,962	76,888	0.0003158
100 %		+ 50	24,350,511,385	53,465	0.0002196
BATT. ENDPOINT	3.36	+ 20	24,350,665,646	-100,796	-0.0004139

Table 7-99. Frequency Stability Data (n258-R1)

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.

FCC ID: A3LSMS901U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109080099-06.A3L	Test Dates: 09/15/2021-11/08/2021	EUT Type: Portable Handset	Page 161 of 186	

Frequency Stability Measurements (Band n258-R1)

§2.1055

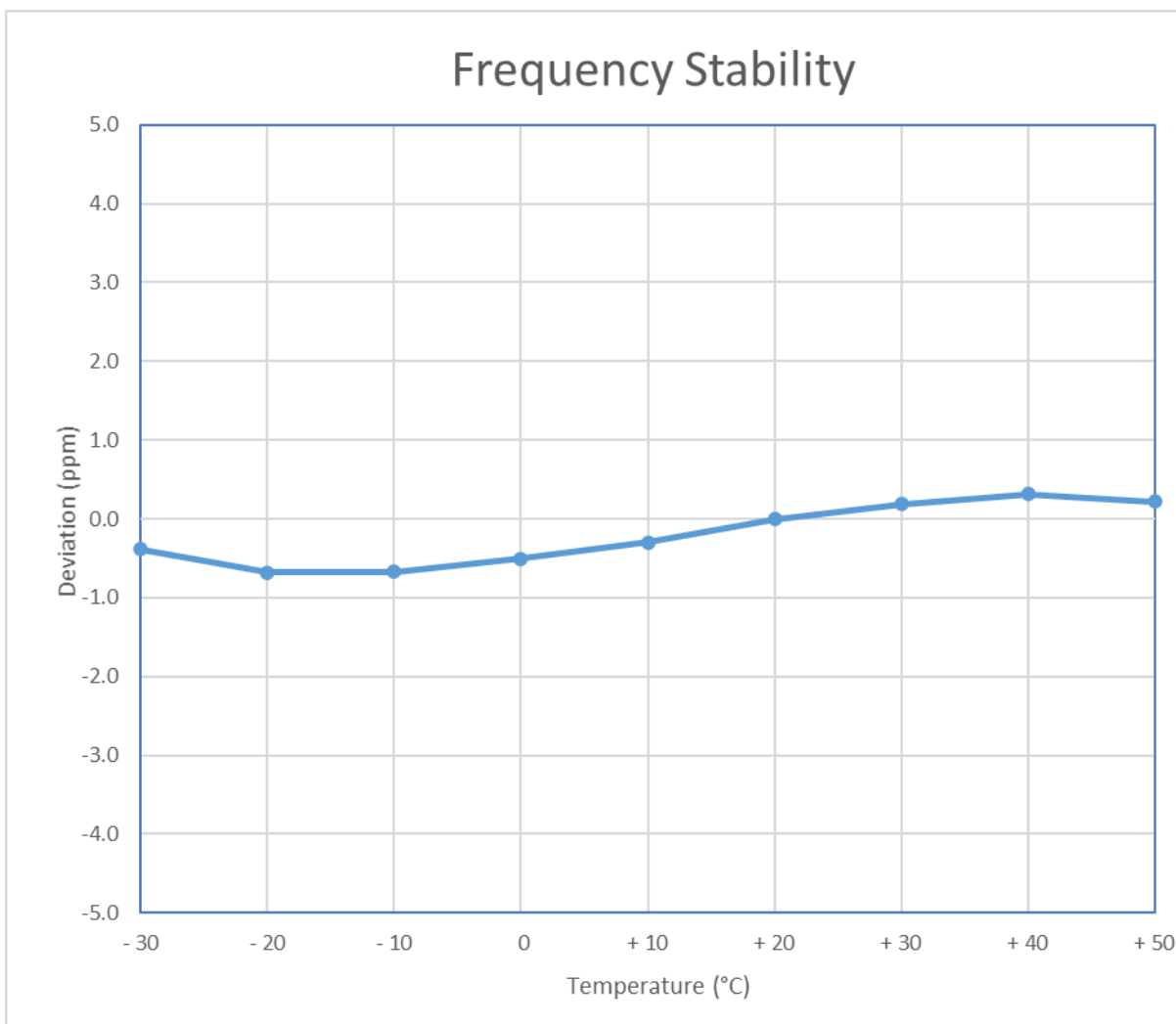


Figure 7-1. Frequency Stability Graph (n258-R1)

FCC ID: A3LSMS901U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109080099-06.A3L	Test Dates: 09/15/2021-11/08/2021	EUT Type: Portable Handset		Page 162 of 186

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Frequency Stability Measurements (Band n258-R2)

§2.1055

OPERATING FREQUENCY: 24,999,960,000 Hz
 CHANNEL: 2029165
 REFERENCE VOLTAGE: 4.43 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.43	+ 20 (Ref)	25,000,617,258	0	0.0000000
100 %		- 30	25,000,713,644	-96,386	-0.0003855
100 %		- 20	25,000,769,713	-152,455	-0.0006098
100 %		- 10	25,000,786,114	-168,857	-0.0006754
100 %		0	25,000,738,198	-120,941	-0.0004838
100 %		+ 10	25,000,672,493	-55,235	-0.0002209
100 %		+ 20	25,000,617,258	0	0.0000000
100 %		+ 30	25,000,538,734	78,524	0.0003141
100 %		+ 40	24,999,983,177	634,081	0.0025363
100 %		+ 50	24,999,919,259	697,998	0.0027920
BATT. ENDPOINT	3.36	+ 20	25,000,659,381	-42,124	-0.0001685

Table 7-100. Frequency Stability Data (n258-R2)

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.

FCC ID: A3LSMS901U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109080099-06.A3L	Test Dates: 09/15/2021-11/08/2021	EUT Type: Portable Handset		Page 163 of 186

Frequency Stability Measurements (Band n258-R2)

§2.1055

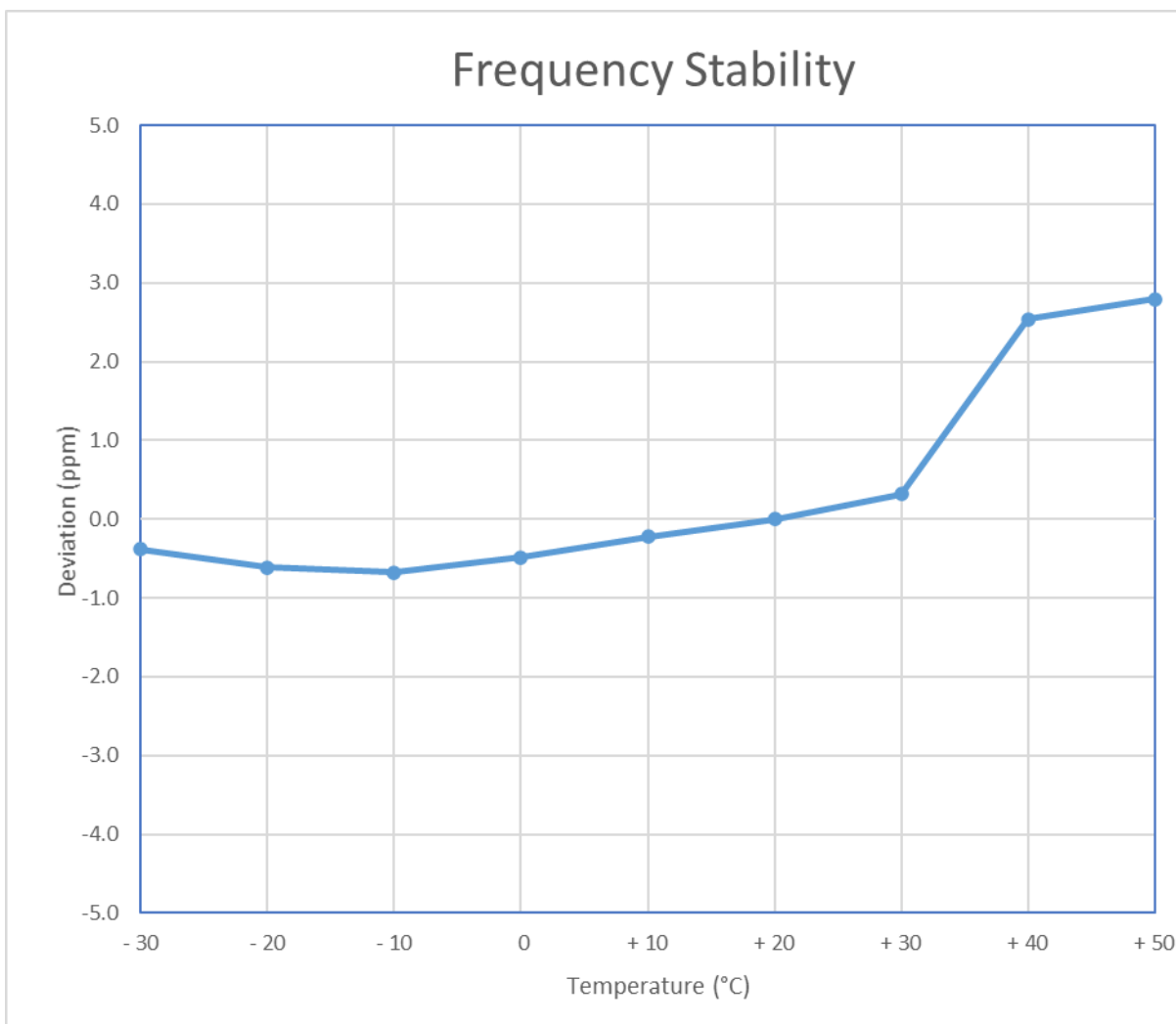


Figure 7-1. Frequency Stability Graph (n258-R2)

FCC ID: A3LSMS901U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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Frequency Stability Measurements (Band n261)

§2.1055

OPERATING FREQUENCY: 27,924,960,000 Hz
CHANNEL: 2077915
REFERENCE VOLTAGE: 4.43 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.43	+ 20 (Ref)	27,925,643,813	0	0.0000000
100 %		- 30	27,925,729,805	-85,992	-0.0003079
100 %		- 20	27,925,783,139	-139,327	-0.0004989
100 %		- 10	27,925,769,500	-125,688	-0.0004501
100 %		0	27,925,735,818	-92,005	-0.0003295
100 %		+ 10	27,925,683,426	-39,613	-0.0001419
100 %		+ 20	27,925,643,813	0	0.0000000
100 %		+ 30	27,925,538,351	105,461	0.0003777
100 %		+ 40	27,925,477,904	165,908	0.0005941
100 %		+ 50	27,925,552,240	91,573	0.0003279
BATT. ENDPOINT	3.36	+ 20	27,925,621,086	22,726	0.0000814

Table 7-101. 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.

FCC ID: A3LSMS901U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109080099-06.A3L	Test Dates: 09/15/2021-11/08/2021	EUT Type: Portable Handset	Page 165 of 186	

Frequency Stability Measurements (Band n261)

§2.1055

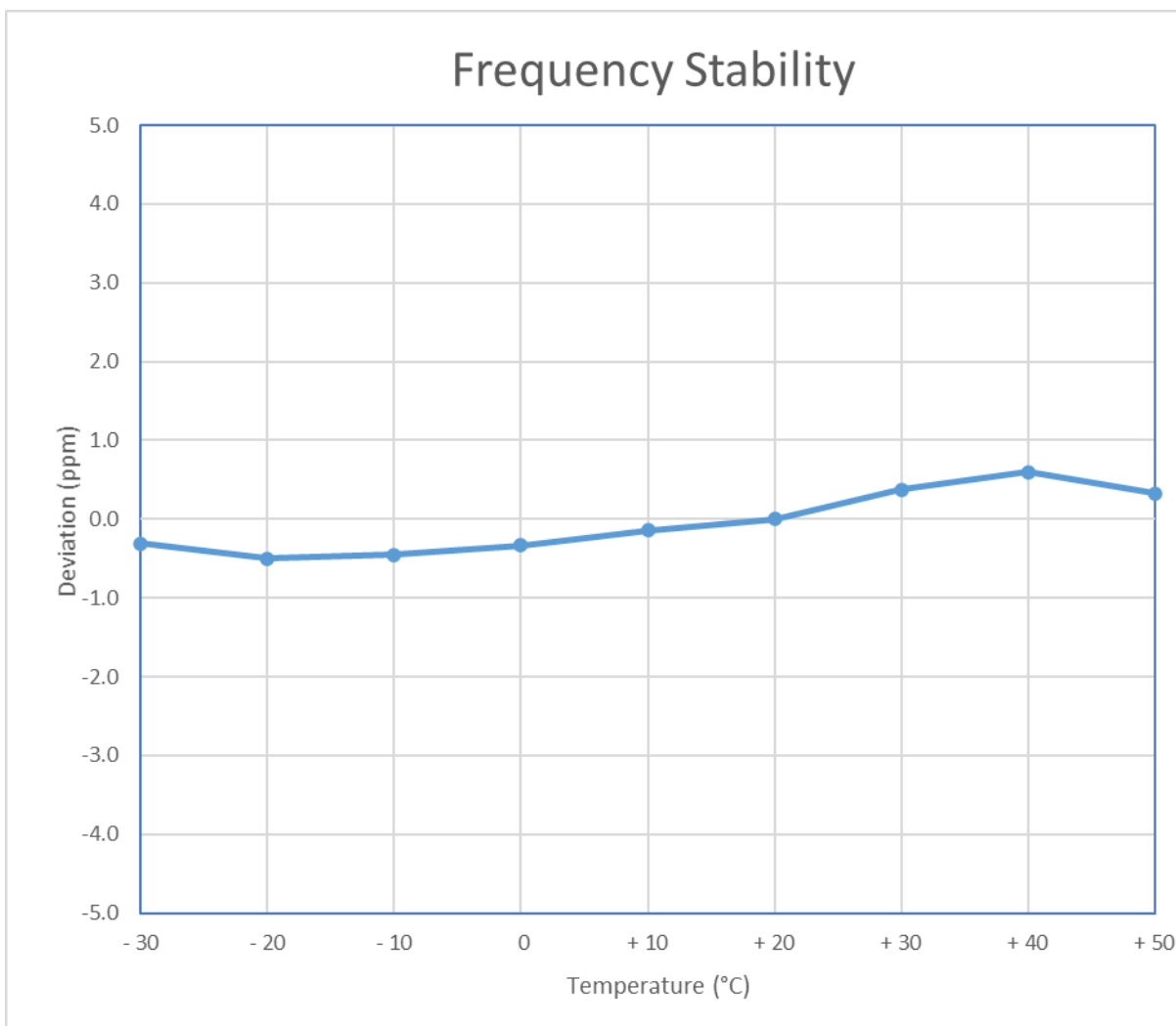


Figure 7-1. Frequency Stability Graph (n261)

FCC ID: A3LSMS901U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109080099-06.A3L	Test Dates: 09/15/2021-11/08/2021	EUT Type: Portable Handset		Page 166 of 186

Frequency Stability Measurements (Band n260)

§2.1055

OPERATING FREQUENCY: 38,495,520,000 Hz
 CHANNEL: 2254091
 REFERENCE VOLTAGE: 4.43 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.43	+ 20 (Ref)	38,500,649,749	0	0.0000000
100 %		- 30	38,500,887,735	-237,986	-0.0006182
100 %		- 20	38,500,831,889	-182,140	-0.0004731
100 %		- 10	38,500,341,247	308,502	0.0008014
100 %		0	38,500,818,057	-168,308	-0.0004372
100 %		+ 10	38,499,881,560	768,189	0.0019955
100 %		+ 20	38,500,649,749	0	0.0000000
100 %		+ 30	38,500,536,232	113,517	0.0002949
100 %		+ 40	38,499,941,520	708,229	0.0018398
100 %		+ 50	38,499,924,557	725,192	0.0018838
BATT. ENDPOINT	3.36	+ 20	38,500,953,666	-303,917	-0.0007895

Table 7-102. 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.

FCC ID: A3LSMS901U	 PCTEST® Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Frequency Stability Measurements (Band n260)

S2.1055

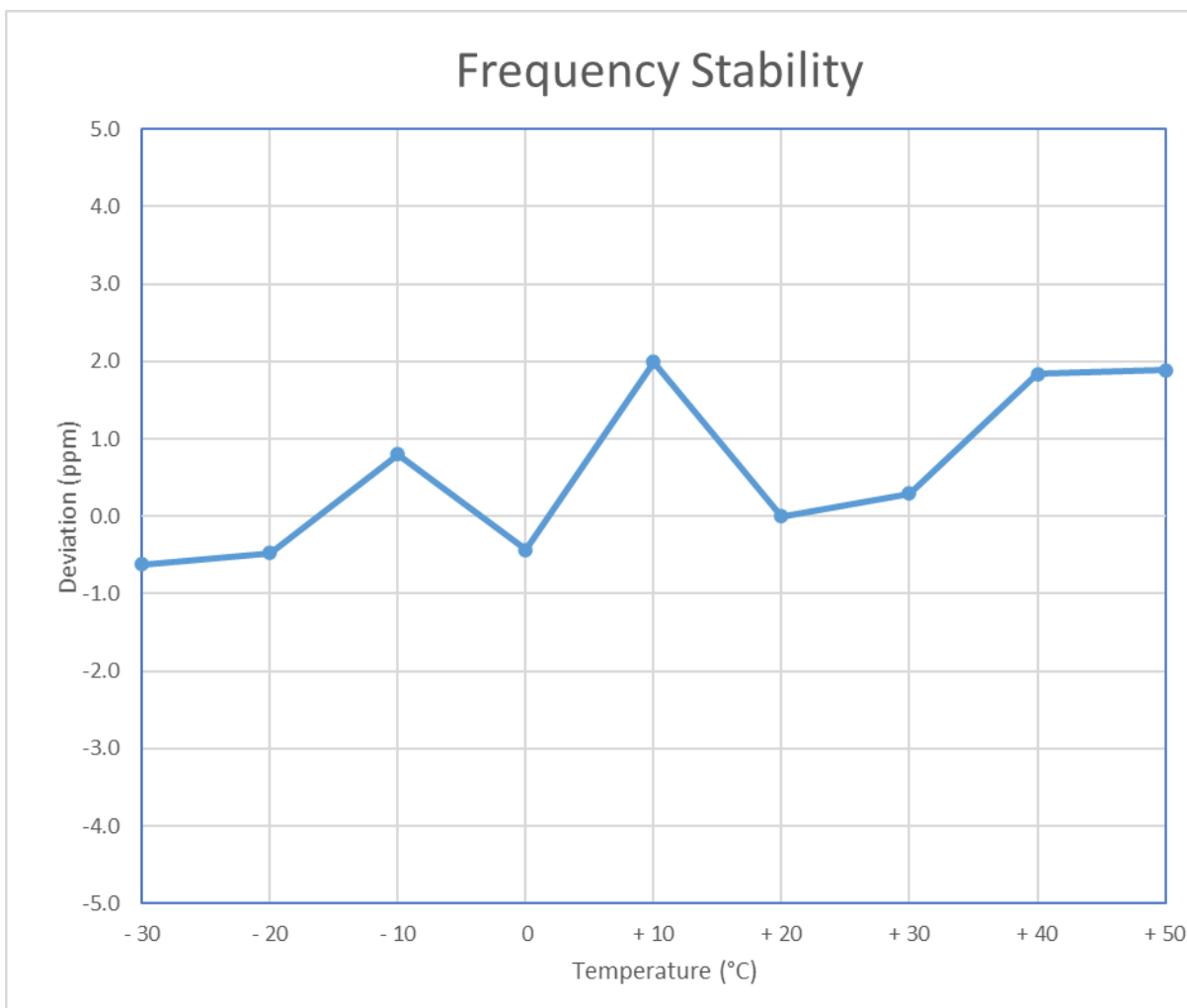


Figure 7-2. Frequency Stability Graph (n260)

FCC ID: A3LSMS901U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109080099-06.A3L	Test Dates: 09/15/2021-11/08/2021	EUT Type: Portable Handset		Page 168 of 186

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMS901U** complies with all the requirements of Part 30.

FCC ID: A3LSMS901U	 PCTEST [®] Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109080099-06.A3L	Test Dates: 09/15/2021-11/08/2021	EUT Type: Portable Handset		Page 169 of 186

9.0 APPENDIX A

9.1 VDI Mixer Verification Certificate



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

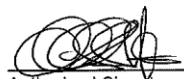
From: Virginia Diodes, Inc
979 2nd St. SE
Suite 309
Charlottesville, VA 22902

Packing List No: 202943
Shipping Date: 08/28/20

Today's Date: 08/28/20
PO Number: 200414.DP2

Quantity	Shipped	Unit	Description	Order-Job Number
1	EA	VDIWR19.0SAX-M-M4 WR19SAX-M-M4 / SN: SAX 679	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

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FCC ID: A3LSMS901U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109080099-06.A3L	Test Dates: 09/15/2021-11/08/2021	EUT Type: Portable Handset		Page 170 of 186



Virginia Diodes, Inc
979 2nd St. SE
Suite 309
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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	Unit	Description	Order-Job Number
1	EA	VDIWR12.0SAX-M-M6 S/N: SAX 680	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).

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Virginia Diodes, Inc



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FCC ID: A3LSMS901U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109080099-06.A3L	Test Dates: 09/15/2021-11/08/2021	EUT Type: Portable Handset		Page 171 of 186



Virginia Diodes, Inc
979 2nd St. SE
Suite 309
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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
Shipping Date: 10/22/20

Today's Date: 10/22/20
PO Number: 200414.DP2

Quantity	Shipped	Unit	Description	Order-Job Number
1		EA	VDIWR8.0SAX-M-M9 S/N: SAX 681	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

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FCC ID: A3LSMS901U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109080099-06.A3L	Test Dates: 09/15/2021-11/08/2021	EUT Type: Portable Handset		Page 172 of 186



Virginia Diodes, Inc
979 2nd St. SE
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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: 203281
Shipping Date: 09/24/20

Today's Date: 09/24/20
PO Number: 200414.DP2

Quantity	Shipped	Unit	Description	Order-Job Number
1	EA	VDIWR5.1SAX-M-M18	WR5.1SAX-M-M18 - Mini Spectrum Analyzer Extension Module; SN: SAX 682.	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).


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Virginia Diodes, Inc

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FCC ID: A3LSMS901U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109080099-06.A3L	Test Dates: 09/15/2021-11/08/2021	EUT Type: Portable Handset		Page 173 of 186

9.2 Test Scope Accreditation



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

PCTEST ENGINEERING LABORATORY, LLC
 7185 Oakland Mills Road
 Columbia, MD 21046
 Randy Ortanez Phone: 410 290 6652

ELECTRICAL¹

Valid To: May 31, 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 two 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:

Emissions
 Radiated and Conducted

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

Accessibility

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

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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:

SAR/RF Exposure

Test Method(s) ²:

IEEE 1528-2013; RSS 102 Issue 5 (2015);
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-002; SPR-001;
IEC TR 62630:2010; IEEE C95.3.1:2010; IEC TR 63170:2018;
AS/NZS 2772.2:2016; IEC 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

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); 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);
ETSI EN 300 220-1 Version 3.1.1 (2017-02);

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Test Technology:

European Radio (cont'd)

Korean Radio

Australia/New Zealand Radio

Licensed Wireless Devices

Wired and Wireless Conformance

5G NR

Test Method(s) ²:

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;

Regulations on Radio Equipment
(MSIT Ordinance MSIT No. 63, Dec. 24, 2020);
Unlicensed Radio Equipment Established Without Notice
(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)

AS/NZS 4268:2017

ANSI C63.26:2015

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 TS 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-Conformance (TS 38.533)

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Test Technology:

LTE

Test Method(s) ²:

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:

Carrier Aggregation

UICC

SunSpec Alliance

CBRS (OnGo) / WinnForum

Test Method(s) ²:

VZW Carrier Aggregation Supplementary RF;
VZW Carrier Aggregation Data Throughout

USIM/USAT/CSIM/ISIM Interaction Test Plan
(LTE/WCDMA/GSM/CDMA/MM);
3GPP TS 31.121; 3GPP TS 31.124;
ETSI TS 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 – 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 Alliance Certification Test Plan;
WinnForum Conformance and Performance Test Technical
Standards

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

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PCTEST ENGINEERING LABORATORY, LLC.
7195 Oakland Mills Rd, Suite A
Columbia, MD 21016

Test Technology:

Wireless

Test Method(s) ²:

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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Test Technology:

Emissions
Radiated and Conducted

Test Method(s) ²:

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

Accessibility

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 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 302 537 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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Test Technology:

European Radio (cont'd)

Korean Radio

Australia/New Zealand Radio

Licensed Wireless Devices

Test Method(s) ²:

ETSI EN 301 908-1 Version 13.1.1 (2019-11);
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;

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)

AS/NZS 4268:2017

ANSI C63.26:2015

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Test Technology:

OTA
OTA Anechoic Chambers

Test Method(s) ²:

CTIA Test Plan for Wireless Device Over-the-Air Performance 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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PCTEST ENGINEERING LABORATORY, LLC.
9017-F/G Mendenhall Court
Columbia, MD 21045

Test Technology:

Test Method(s) ²:

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
Battery Transportation Safety

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
Battery Performance and Safety

NASA Specification for Acceptance Testing of Commercial 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 Secondary Cells

IEC 62133; EN 62133

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Test Technology:

CEC: Energy Efficient Battery Charger System

Immunity

Test Method(s) ²:

Uniform Test Method for Measuring the Energy Consumption of Battery Chargers

EN/IEC 61000-4-2

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

Test Technology:

Radiated Emissions
(10 Meter Test Distance)
(Frequency Range, 30 MHz – 1 GHz)

Test Method(s) ²:

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

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 1 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 Declaration of Conformity and 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-NII without DFS Intentional Radiators Part 15E	ANSI C63.10:2013	40000 MHz

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Testing Activities Performed in Support of FCC Declaration of Conformity and 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
U-NII with DFS Intentional Radiators Part 15E	FCC KDB 905462 D02 (v02)	40000 MHz
UWB Intentional Radiators Part 15F	ANSI C63.10:2013	200000 MHz
BPL Intentional Radiators Part 15G	ANSI C63.10:2013	40000 MHz
White Space Device Intentional Radiators 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

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Testing Activities Performed in Support of FCC Declaration of Conformity and 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
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

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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