

PART 22 MEASUREMENT REPORT

Applicant Name:
Samsung Electronics Co., Ltd.
129, Samsung-ro,
Yeongtong-gu, Suwon-si
Gyeonggi-do, 16677, Korea

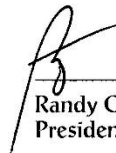
Date of Testing:
8/19/2021 - 8/31/2021
Test Report Issue Date:
9/3/2021
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M2108160095-01.A3L

FCC ID:	A3LSMA528B
Applicant Name:	Samsung Electronics Co., Ltd.

Application Type: Class II Permissive Change
Model: SM-A528B/DS
Additional Model(s): SM-A528B
EUT Type: Portable Handset
FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part: 22
Test Procedure(s): ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01
Class II Permissive Change: Please see FCC change document
Original Grant Date: 08/03/2021

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.


Randy Ortanez
President







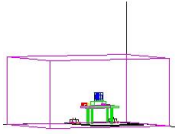
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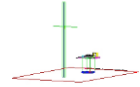
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Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	ERP	
				Max. Power [W]	Max. Power [dBm]
LTE Band 26/5	15MHz (Band 26 only)	QPSK	831.5 - 841.5	0.063	17.99
		16QAM	831.5 - 841.5	0.051	17.11
	10 MHz	QPSK	829.0 - 844.0	0.064	18.09
		16QAM	829.0 - 844.0	0.052	17.16
	5 MHz	QPSK	826.5 - 846.5	0.064	18.07
		16QAM	826.5 - 846.5	0.052	17.17
	3 MHz	QPSK	825.5 - 847.5	0.066	18.17
		16QAM	825.5 - 847.5	0.052	17.14
1.4 MHz	QPSK	824.7 - 848.3	0.062	17.93	
	16QAM	824.7 - 848.3	0.049	16.90	

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	ERP	
				Max. Power [W]	Max. Power [dBm]
NR Band n5	20 MHz	$\pi/2$ BPSK	834.0 - 839.0	0.050	17.03
		QPSK	834.0 - 839.0	0.056	17.45
		16QAM	834.0 - 839.0	0.041	16.09
	15 MHz	$\pi/2$ BPSK	831.5 - 841.5	0.051	17.05
		QPSK	831.5 - 841.5	0.054	17.32
		16QAM	831.5 - 841.5	0.042	16.23
	10 MHz	$\pi/2$ BPSK	829.0 - 844.0	0.052	17.12
		QPSK	829.0 - 844.0	0.056	17.51
		16QAM	829.0 - 844.0	0.041	16.09
	5 MHz	$\pi/2$ BPSK	826.5 - 846.5	0.050	16.97
		QPSK	826.5 - 846.5	0.057	17.53
		16QAM	826.5 - 846.5	0.039	15.89

Mode	Modulation	Tx Frequency Range [MHz]	ERP	
			Max. Power [W]	Max. Power [dBm]
GSM/GPRS	GMSK	824.2 - 848.8	0.372	25.71
EDGE	8-PSK	824.2 - 848.8	0.092	19.64
WCDMA	Spread Spectrum	826.4 - 846.6	0.072	18.59

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1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.



1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

1.3 Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.

- PCTEST is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).
- PCTEST facility is a registered (2451B) test laboratory with the site description on file with ISED.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMA528B**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 22.

Test Device Serial No.: 0362M, 0336M, 0382M

2.2 Device Capabilities

This device contains the following capabilities:



850/1900 GSM/GPRS/EDGE, 850/1700/1900, WCDMA/HSPA, Multi-band LTE, 5G NR (FR1), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII, Bluetooth (1x, EDR, LE), NFC

2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01.

2.4 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the “Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards” (ANSI/TIA-603-E-2016) and “Measurement Guidance for Certification of Licensed Digital Transmitters” (KDB 971168 D01 v03r01) were used in the measurement of the EUT.

Deviation from Measurement Procedure.....None

3.2 Radiated Power and Radiated Spurious Emissions

The radiated test facilities consisted of an indoor 3-meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer.

For radiated power measurements, substitution method is used per the guidance of ANSI/TIA-603-E-2016. A half-wave dipole is substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_d \text{ [dBm]} = P_g \text{ [dBm]} - \text{cable loss [dB]} + \text{antenna gain [dBd/dBi]};$$

where P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_g \text{ [dBm]} - \text{cable loss [dB]}$.

For radiated spurious emissions measurements and calculations, conversion method is used per the formulas in KDB 971168 Section 5.8.4. Field Strength (EIRP) is calculated using the following formulas:



$$E_{\text{[dB}\mu\text{V/m]}} = \text{Measured amplitude level}_{\text{[dBm]}} + 107 + \text{Cable Loss}_{\text{[dB]}} + \text{Antenna Factor}_{\text{[dB/m]}}$$

And

$$\text{EIRP}_{\text{[dBm]}} = E_{\text{[dB}\mu\text{V/m]}} + 20\log D - 104.8; \text{ where } D \text{ is the measurement distance in meters.}$$

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 414788 D01.



Radiated power and radiated spurious emission levels are investigated with the receive antenna horizontally and vertically polarized per ANSI/TIA-603-E-2016.

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4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty (\pm dB)
Conducted Bench Top Measurements	1.13
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

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5.0 TEST EQUIPMENT CALIBRATION DATA



Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurement antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	AP2	EMC Cable and Switch System	3/4/2021	Annual	3/4/2022	AP2
-	ETS	EMC Cable and Switch System	3/4/2021	Annual	3/4/2022	ETS
Espec	SH - 241	Environmental Chamber	7/2/2020	Biennial	7/2/2022	92002873
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	4/20/2021	Biennial	4/20/2023	00125518
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11208010032
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			100976
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			112347
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	5/25/2021	Annual	5/25/2022	100348
Rohde & Schwarz	ESW44	EMI Test Receiver 2Hz to 44 GHz	1/21/2021	Annual	1/21/2022	101716

Table 5-1. Test Equipment

Notes:

1. For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.
2. Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

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6.0 SAMPLE CALCULATIONS

GSM Emission Designator

Emission Designator = 250KGXW

GSM BW = 250 kHz

G = Phase Modulation

X = Cases not otherwise covered

W = Combination (Audio/Data)

EDGE Emission Designator

Emission Designator = 250KG7W

EDGE BW = 250 kHz

G = Phase Modulation

7 = Quantized/Digital Info

W = Combination (Audio/Data)

WCDMA Emission Designator

Emission Designator = 4M16F9W

WCDMA BW = 4.16 MHz

F = Frequency Modulation

9 = Composite Digital Info

W = Combination (Audio/Data)

QPSK Modulation

Emission Designator = 8M62G7D

LTE BW = 8.62 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 8M45W7D

LTE BW = 8.45 MHz

W = Amplitude/Angle Modulated



7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

Spurious Radiated Emission

Example: Spurious emission at 3700.40 MHz

The receive spectrum analyzer reading at 3 meters with the EUT on the turntable was -81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of -81.0 dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 3700.40 MHz. So 6.1 dB is added to the signal generator reading of -30.9 dBm yielding -24.80 dBm. The fundamental EIRP was 25.50 dBm so this harmonic was 25.50 dBm $- (-24.80) = 50.3$ dBc.

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7.0 TEST RESULTS

7.1 Summary



Company Name: Samsung Electronics Co., Ltd.
 FCC ID: A3LSMA528B
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
 Mode(s): GSM/GPRS/WCDMA/NR/LTE

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Frequency Stability	2.1055, 22.355	< 2.5 ppm	PASS	Section 7.4
	Effective Radiated Power / Equivalent Isotropic Radiated Power	22.913(a)(5)	< 7 Watts max. ERP	PASS	Section 7.2
RADIATED	Radiated Spurious Emissions	2.1053, 22.917(a)	> 43 + 10 log ₁₀ (P[Watts]) for all out-of-band emissions	PASS	Section 7.3

Table 7-1. Summary of Test Results

Notes:

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- 4) All conducted emissions measurements are performed with automated test software to capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST EMC Software Tool v1.0.

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7.2 Radiated Power (ERP)

Test Overview

Effective Radiated Power (ERP) measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at maximum power, and at the appropriate frequencies.



Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.2.1

ANSI/TIA-603-E-2016 – Section 2.2.17

Test Settings

1. Radiated power measurements are performed using the signal analyzer’s “channel power” measurement capability for signals with continuous operation. For signals with burst transmission, the signal analyzer’s “time domain power” measurement capability is used
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW \geq 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points \geq 2 x span / RBW
6. Detector = RMS
7. Trigger is set to “free run” for signals with continuous operation with the sweep times set to “auto”. Trigger is set to enable triggering only on full power bursts with the sweep time set less than or equal to the transmission burst duration
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation. For signals with burst transmission, the “gating” function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

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Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

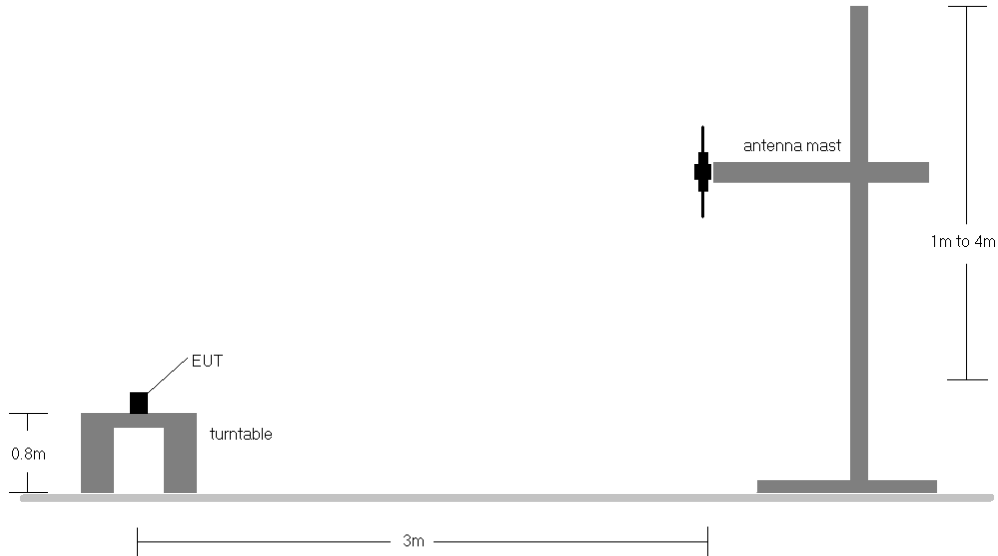




Figure 7-1. Radiated Test Setup <1GHz

Test Notes

- 1) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest powers is reported in GPRS mode while transmitting with one slot active.
- 2) This device employs UMTS technology with WCDMA (AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to "1".
- 3) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 4) This unit was tested with its standard battery.
- 5) For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

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Bandwidth	Modulation	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
15MHz (Band 26 only)	QPSK	831.5	H	224	299	6.73	1 / 37	13.41	17.99	0.063	38.45	-20.46
	QPSK	836.5	H	207	304	6.73	1 / 37	12.70	17.28	0.053	38.45	-21.17
	QPSK	841.5	H	209	293	6.73	1 / 0	12.72	17.30	0.054	38.45	-21.15
	16-QAM	831.5	H	224	299	6.73	1 / 37	12.53	17.11	0.051	38.45	-21.34
10 MHz	QPSK	829.0	H	224	299	6.70	1 / 25	13.54	18.09	0.064	38.45	-20.36
	QPSK	836.5	H	207	304	6.73	1 / 25	12.81	17.39	0.055	38.45	-21.06
	QPSK	844.0	H	209	293	6.76	1 / 25	12.78	17.39	0.055	38.45	-21.06
	16-QAM	829.0	H	224	299	6.70	1 / 25	12.61	17.16	0.052	38.45	-21.29
5 MHz	QPSK	826.5	H	224	299	6.67	1 / 12	13.54	18.07	0.064	38.45	-20.38
	QPSK	836.5	H	207	304	6.73	1 / 12	12.84	17.42	0.055	38.45	-21.03
	QPSK	846.5	H	209	293	6.78	1 / 12	12.89	17.52	0.056	38.45	-20.93
	16-QAM	826.5	H	224	299	6.67	1 / 12	12.65	17.17	0.052	38.45	-21.28
3 MHz	QPSK	825.5	H	224	299	6.66	1 / 7	13.66	18.17	0.066	38.45	-20.28
	QPSK	836.5	H	207	304	6.73	1 / 7	12.97	17.54	0.057	38.45	-20.91
	QPSK	847.5	H	209	293	6.79	1 / 7	12.94	17.59	0.057	38.45	-20.87
	16-QAM	825.5	H	224	299	6.66	1 / 7	12.63	17.14	0.052	38.45	-21.31
1.4 MHz	QPSK	824.7	H	224	299	6.66	1 / 3	13.42	17.93	0.062	38.45	-20.52
	QPSK	836.5	H	207	304	6.73	1 / 3	12.54	17.12	0.051	38.45	-21.34
	QPSK	848.3	H	209	293	6.77	1 / 3	12.63	17.25	0.053	38.45	-21.20
	16-QAM	824.7	H	224	299	6.66	1 / 3	12.39	16.90	0.049	38.45	-21.56
15MHz	QPSK (Opposite Pol.)	831.5	V	141	240	6.13	1 / 0	12.95	16.93	0.049	38.45	-21.52



Table 7-2. ERP Data (LTE Band 26/5)

Bandwidth	Modulation	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
20 MHz	$\pi/2$ BPSK	834.0	H	222	299	6.65	1 / 26	12.53	17.03	0.050	38.45	-21.42
	QPSK	834.0	H	222	299	6.65	1 / 26	12.95	17.45	0.056	38.45	-21.00
	QPSK	836.5	H	220	301	6.73	1 / 26	12.76	17.34	0.054	38.45	-21.11
	QPSK	839.0	H	222	292	6.80	1 / 26	12.49	17.14	0.052	38.45	-21.31
	16-QAM	834.0	H	222	299	6.65	1 / 26	11.59	16.09	0.041	38.45	-22.36
15 MHz	$\pi/2$ BPSK	831.5	H	222	299	6.73	1 / 58	12.48	17.05	0.051	38.45	-21.40
	QPSK	831.5	H	222	299	6.73	1 / 58	12.75	17.32	0.054	38.45	-21.13
	QPSK	836.5	H	220	301	6.73	1 / 20	12.70	17.28	0.053	38.45	-21.17
	QPSK	841.5	H	222	292	6.73	1 / 39	12.48	17.06	0.051	38.45	-21.39
	16-QAM	836.5	H	220	301	6.73	1 / 58	11.65	16.23	0.042	38.45	-22.22
10 MHz	$\pi/2$ BPSK	836.5	H	220	301	6.73	1 / 26	12.55	17.12	0.052	38.45	-21.33
	QPSK	829.0	H	222	299	6.70	1 / 38	12.96	17.51	0.056	38.45	-20.95
	QPSK	836.5	H	220	301	6.73	1 / 38	12.92	17.50	0.056	38.45	-20.95
	QPSK	844.0	H	222	292	6.76	1 / 38	12.70	17.31	0.054	38.45	-21.14
	16-QAM	836.5	H	220	301	6.73	1 / 26	11.51	16.09	0.041	38.45	-22.36
5 MHz	$\pi/2$ BPSK	836.5	H	220	301	6.73	1 / 12	12.39	16.97	0.050	38.45	-21.49
	QPSK	829.0	H	222	299	6.67	1 / 18	13.00	17.53	0.057	38.45	-20.92
	QPSK	836.5	H	220	301	6.73	1 / 12	12.91	17.49	0.056	38.45	-20.96
	QPSK	844.0	H	222	292	6.78	1 / 6	12.72	17.35	0.054	38.45	-21.10
20 MHz	16-QAM	836.5	H	220	301	6.73	1 / 18	11.31	15.89	0.039	38.45	-22.56
	QPSK (CP-OFDM)	834.0	H	222	299	6.65	1 / 26	11.58	16.08	0.041	38.45	-22.37
	QPSK (Opposite Pol.)	834.0	V	133	225	6.15	1 / 26	13.04	17.04	0.051	38.45	-21.41

Table 7-3. ERP Data (NR Band n5)



Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
824.2	GSM850	H	221	292	21.21	6.65	25.71	0.372	38.45	-12.74
836.6	GSM850	H	209	301	20.67	6.74	25.26	0.336	38.45	-13.19
848.8	GSM850	H	205	307	20.65	6.73	25.23	0.333	38.45	-13.23
824.2	GSM850	V	142	233	20.10	6.13	24.08	0.256	38.45	-14.37
824.2	EDGE850	H	221	292	15.14	6.65	19.64	0.092	38.45	-18.81

Table 7-4. ERP Data (GPRS Cell)

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Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
826.4	WCDMA850	H	221	284	14.07	6.67	18.59	0.072	38.45	-19.86
836.6	WCDMA850	H	201	293	13.77	6.74	18.36	0.069	38.45	-20.09
846.6	WCDMA850	H	204	288	13.58	6.78	18.21	0.066	38.45	-20.24
826.4	WCDMA850	V	134	284	13.10	6.07	17.02	0.050	38.45	-21.43

Table 7-5. ERP Data (WCDMA Cell)

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7.3 Radiated Spurious Emissions Measurements

Test Overview



Radiated spurious emissions measurements are performed using the field strength conversion method described in KDB 971168 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using horizontally and vertically polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW $\geq 3 \times$ RBW
3. Span = 1.5 times the OBW
4. No. of sweep points $\geq 2 \times$ span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

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Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

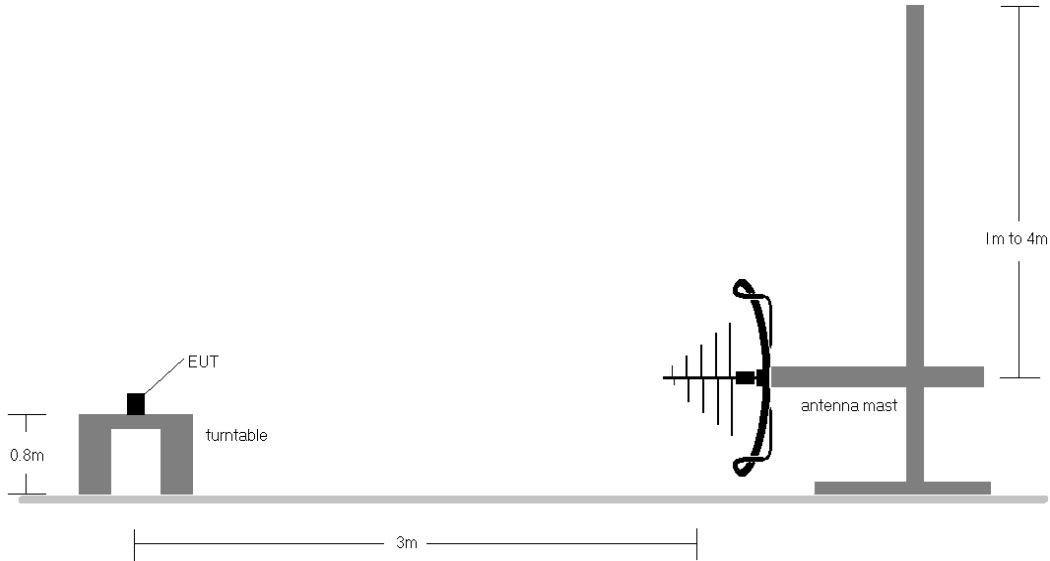


Figure 7-2. Test Instrument & Measurement Setup < 1GHz

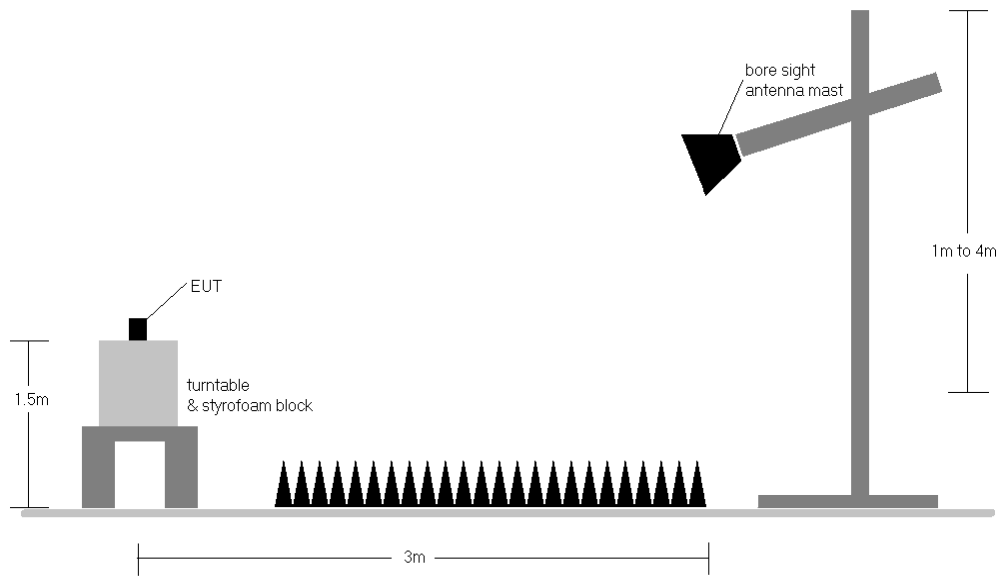




Figure 7-3. Test Instrument & Measurement Setup >1 GHz

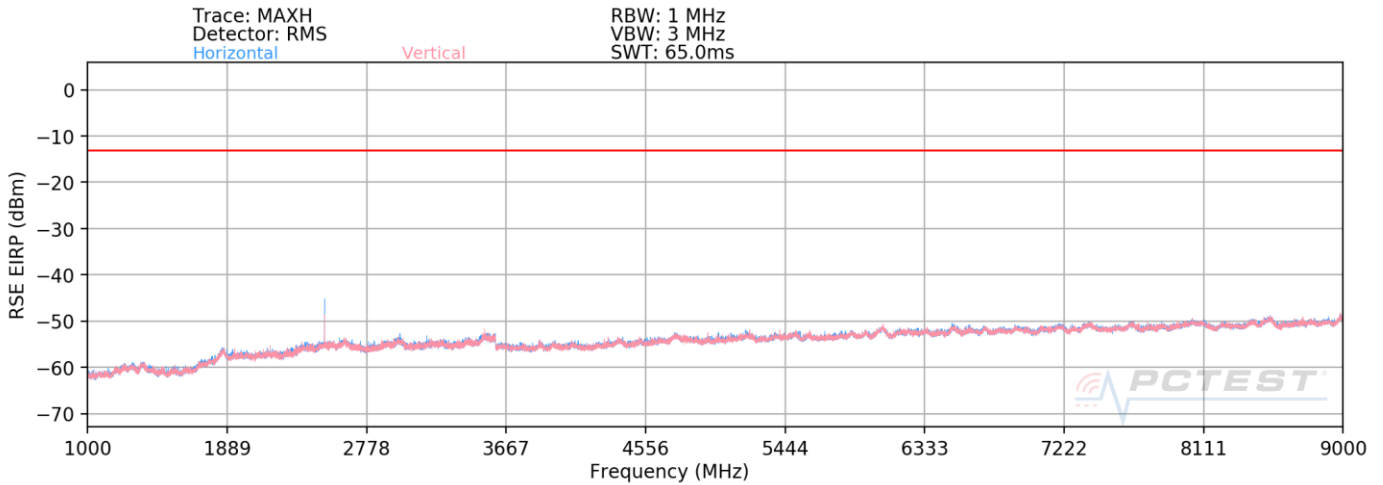
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Test Notes

- 1) Field strengths are calculated using the Measurement quantity conversions in KDB 971168 Section 5.8.4.
 - a) $E(\text{dB}\mu\text{V}/\text{m}) = \text{Measured amplitude level (dBm)} + 107 + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$
 - b) $\text{EIRP (dBm)} = E(\text{dB}\mu\text{V}/\text{m}) + 20\log D - 104.8$; where D is the measurement distance in meters.
- 2) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest powers is reported in GPRS mode while transmitting with one slot active.
- 3) This device employs UMTS technology with WCDMA (AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to "1".
- 4) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 5) This unit was tested with its standard battery.
- 6) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 7) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
- 8) The "-" shown in the following RSE tables are used to denote a noise floor measurement.
- 9) For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.
- 10) Spurious emissions shown in this section are measured while operating in EN-DC mode with Sub 6GHz NR carrier as well as an LTE carrier (anchor). Spurious emissions from the NR carrier device, is subject to the rules under which the NR carrier operates. Spurious emission caused by the LTE carrier must meet the requirements of the rules under which the LTE carrier operates.

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LTE Band 26/5





Plot 7-1. Radiated Spurious Plot (LTE Band 26)

Bandwidth (MHz):	15								
Frequency (MHz):	831.5								
RB / Offset:	1 / 37								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1663.0	H	-	-	-76.20	-2.41	28.39	-66.87	-13.00	-53.87
2494.5	H	111	318	-60.28	2.13	48.85	-46.41	-13.00	-33.41
3326.0	H	-	-	-76.93	2.41	32.48	-62.78	-13.00	-49.78
4157.5	H	-	-	-77.35	3.28	32.93	-62.33	-13.00	-49.33

Table 7-6. Radiated Spurious Data (LTE Band 26 – Low Channel)



Bandwidth (MHz):	15								
Frequency (MHz):	836.5								
RB / Offset:	1 / 37								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1673.0	H	-	-	-76.24	-2.27	28.49	-66.77	-13.00	-53.77
2509.5	H	121	312	-59.72	2.22	49.50	-45.76	-13.00	-32.76
3346.0	H	-	-	-76.75	2.42	32.67	-62.59	-13.00	-49.59
4182.5	H	-	-	-77.56	3.46	32.90	-62.35	-13.00	-49.35

Table 7-7. Radiated Spurious Data (LTE Band 26 – Mid Channel)

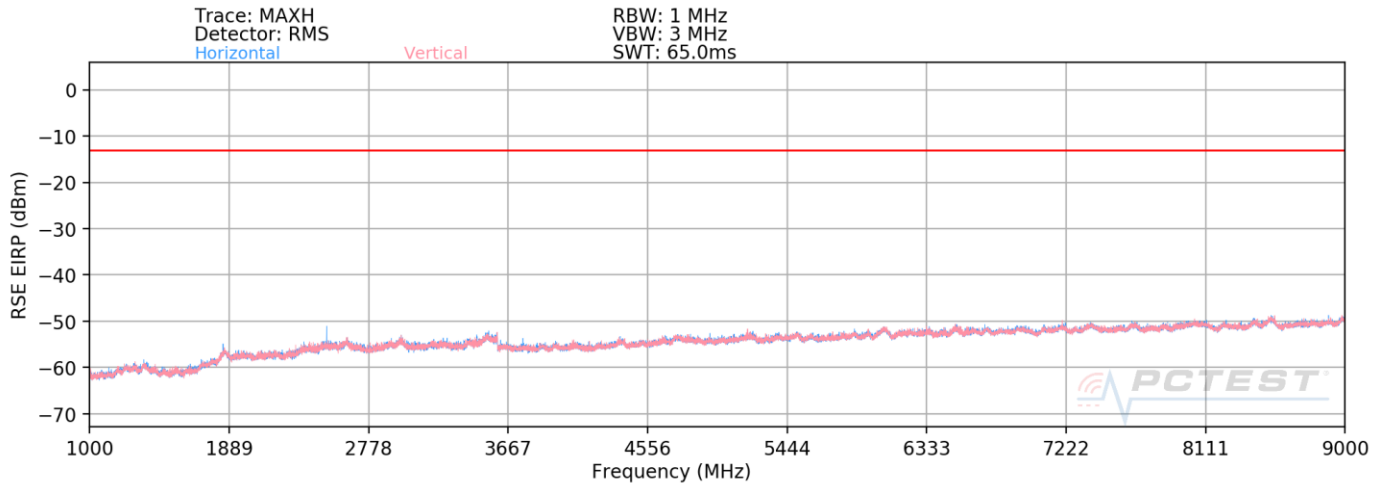
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Bandwidth (MHz):	15								
Frequency (MHz):	841.5								
RB / Offset:	1 / 37								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB μ V/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1683.0	H	-	-	-76.24	-2.06	28.70	-66.55	-13.00	-53.55
2524.5	H	128	319	-61.44	2.22	47.78	-47.48	-13.00	-34.48
3366.0	H	-	-	-76.97	2.32	32.35	-62.91	-13.00	-49.91
4207.5	H	-	-	-77.33	3.23	32.90	-62.35	-13.00	-49.35

Table 7-8. Radiated Spurious Data (LTE Band 26 – High Channel)

FCC ID: A3LSMA528B	 PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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NR Band n5



Plot 7-2. Radiated Spurious Plot (NR Band n5)

Bandwidth (MHz):	20								
Frequency (MHz):	834								
RB / Offset:	1 / 53								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1668.0	H	154	43	-75.77	-2.36	28.87	-66.38	-13.00	-53.38
2502.0	H	134	131	-69.98	2.20	39.22	-56.04	-13.00	-43.04
3336.0	H	-	-	-76.89	2.41	32.52	-62.74	-13.00	-49.74
4170.0	H	-	-	-78.06	3.40	32.34	-62.92	-13.00	-49.92

Table 7-9. Radiated Spurious Data (NR Band n5 – Low Channel)



Bandwidth (MHz):	20								
Frequency (MHz):	836.5								
RB / Offset:	1 / 53								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1673.0	H	158	46	-74.74	-2.27	29.99	-65.27	-13.00	-52.27
2509.5	H	122	150	-69.16	2.22	40.06	-55.20	-13.00	-42.20
3346.0	H	-	-	-76.86	2.42	32.56	-62.70	-13.00	-49.70
4182.5	H	-	-	-78.00	3.46	32.46	-62.79	-13.00	-49.79

Table 7-10. Radiated Spurious Data (NR Band n5 – Mid Channel)

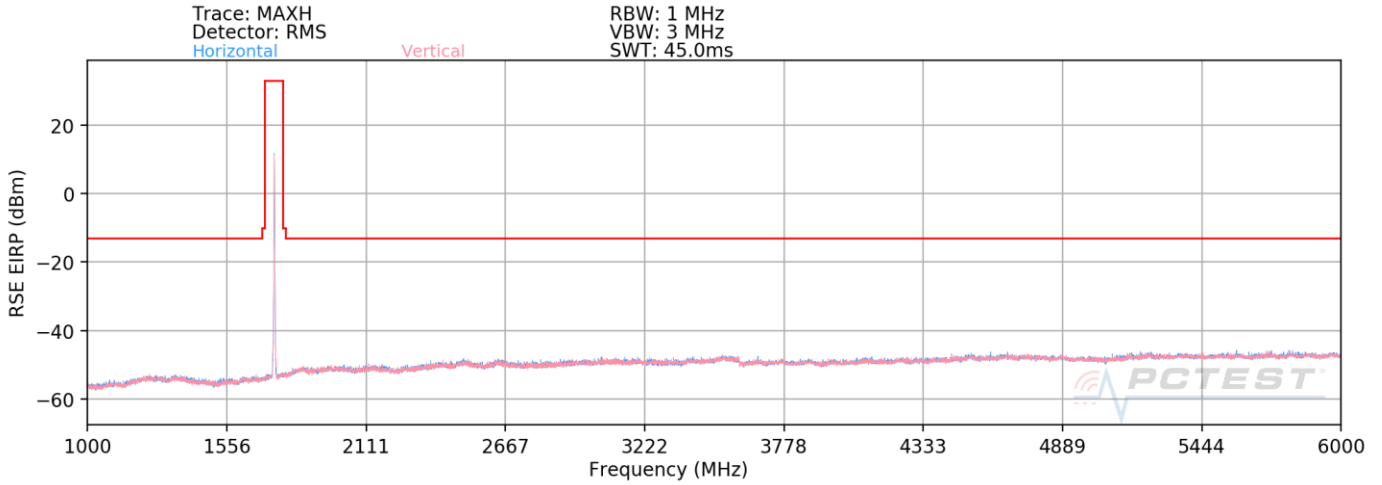
FCC ID: A3LSMA528B	PART 22 MEASUREMENT REPORT	Approved by: Technical Manager
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Bandwidth (MHz):	20								
Frequency (MHz):	839								
RB / Offset:	1 / 53								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1678.0	H	162	37	-75.78	-2.17	29.05	-66.20	-13.00	-53.20
2517.0	H	126	132	-73.00	2.26	36.26	-59.00	-13.00	-46.00
3356.0	H	-	-	-76.89	2.40	32.51	-62.75	-13.00	-49.75
4195.0	H	-	-	-77.64	3.37	32.73	-62.53	-13.00	-49.53

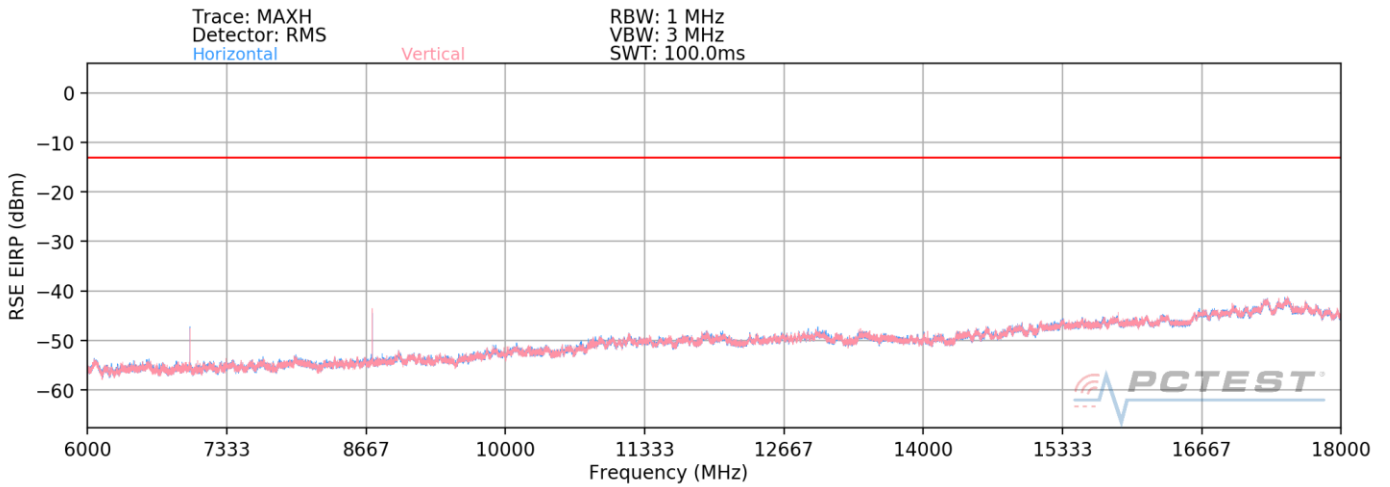
Table 7-11. Radiated Spurious Data (NR Band n5 – High Channel)

FCC ID: A3LSMA528B	 PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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EN-DC – n5 + LTE Band 66



Plot 7-3. Radiated Spurious Plot (n5 + Anchor B66 – EN-DC) 1 – 6 GHz






Plot 7-4. Radiated Spurious Plot (n5 + Anchor B66 – EN-DC) 6 – 18 GHz

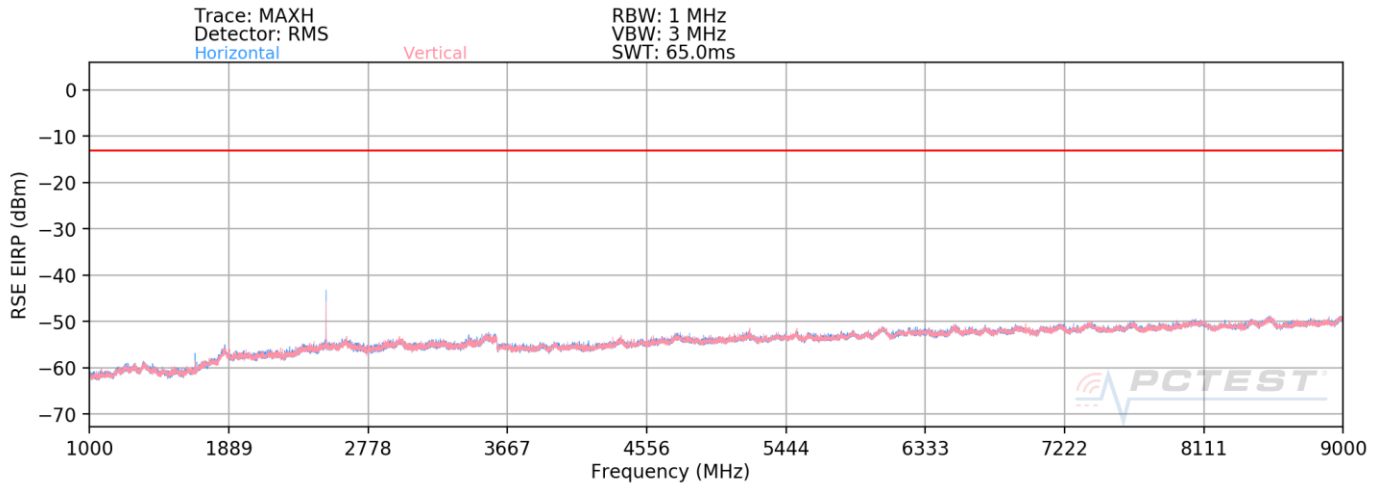
FCC ID: A3LSMA528B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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Bandwidth (MHz):	20 MHz								
Frequency (MHz):	836.5								
RB / Offset:	1 / 53								
Mode:	EN-DC								
Anchor Band:	B66								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1889.0	V	-	-	-76.82	12.13	42.31	-52.94	-13.00	-39.94
2653.5	V	-	-	-76.56	14.65	45.09	-50.17	-13.00	-37.17
2797.5	V	-	-	-78.78	15.52	43.74	-51.52	-13.00	-38.52
5235.0	V	349	340	-65.40	6.34	47.94	-47.32	-13.00	-34.32
6980.0	V	287	10	-66.90	7.60	47.70	-47.56	-13.00	-34.56
8725.0	V	346	330	-62.15	10.30	55.15	-40.11	-13.00	-27.11
10470.0	V	-	-	-80.53	13.98	40.45	-54.80	-13.00	-41.80

Table 7-12. Radiated Spurious Data (n5 + Anchor B66 – EN-DC)

FCC ID: A3LSMA528B	 PCTEST Proud to be part of 	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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GSM/GPRS Cell





Plot 7-5. Radiated Spurious Plot (GPRS Cell)

Mode:	GPRS 1 Tx Slot								
Channel:	128								
Frequency (MHz):	824.2								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1648.4	H	355	352	-62.89	-2.58	41.53	-53.72	-13.00	-40.72
2472.6	H	255	170	-58.35	1.99	50.64	-44.62	-13.00	-31.62
3296.8	H	-	-	-72.25	2.47	37.22	-58.03	-13.00	-45.03
4121.0	H	-	-	-75.83	3.44	34.61	-60.65	-13.00	-47.65

Table 7-13. Radiated Spurious Data (GPRS Cell – Low Channel)



Mode:	GPRS 1 Tx Slot								
Channel:	190								
Frequency (MHz):	836.6								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1673.2	H	346	354	-63.34	-2.27	41.39	-53.86	-13.00	-40.86
2509.8	H	251	162	-55.74	2.22	53.48	-41.77	-13.00	-28.77
3346.4	H	-	-	-71.81	2.42	37.61	-57.65	-13.00	-44.65
4183.0	H	118	13	-73.91	3.46	36.55	-58.71	-13.00	-45.71
5019.6	H	-	-	-76.46	5.32	35.86	-59.40	-13.00	-46.40
5856.2	H	-	-	-77.19	6.66	36.47	-58.79	-13.00	-45.79

Table 7-14. Radiated Spurious Data (GPRS Cell – Mid Channel)

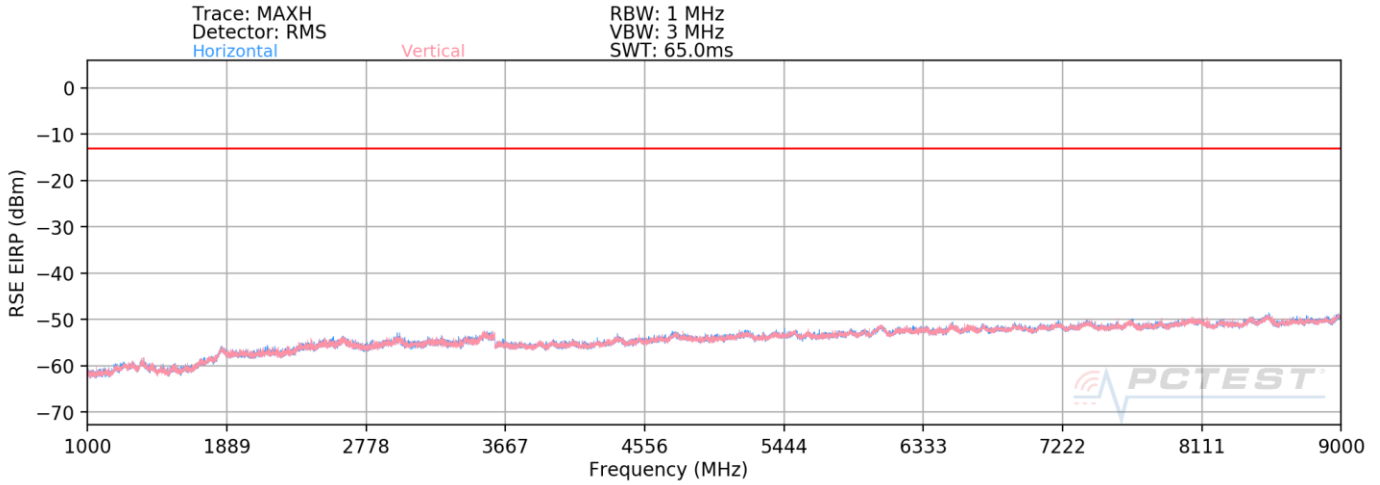
FCC ID: A3LSMA528B	 PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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Mode:	GPRS 1 Tx Slot								
Channel:	251								
Frequency (MHz):	848.8								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1697.6	H	338	350	-63.44	-1.68	41.88	-53.38	-13.00	-40.38
2546.4	H	244	168	-57.25	2.45	52.20	-43.06	-13.00	-30.06
3395.2	H	-	-	-71.42	2.39	37.97	-57.29	-13.00	-44.29
4244.0	H	113	11	-73.14	3.67	37.53	-57.72	-13.00	-44.72
5092.8	H	-	-	-76.40	5.43	36.03	-59.23	-13.00	-46.23
5941.6	H	-	-	-77.03	6.52	36.49	-58.77	-13.00	-45.77

Table 7-15. Radiated Spurious Data (GPRS Cell – High Channel)

FCC ID: A3LSMA528B	 PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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WCDMA Cell





Plot 7-6. Radiated Spurious Plot (WCDMA Cell)

Mode:	WCDMA RMC								
Channel:	4132								
Frequency (MHz):	826.4								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1652.8	H	-	-	-76.19	-2.52	28.29	-66.97	-13.00	-53.97
2479.2	H	253	172	-75.02	2.03	34.01	-61.25	-13.00	-48.25
3305.6	H	-	-	-77.18	2.42	32.24	-63.02	-13.00	-50.02
4132.0	H	-	-	-77.46	3.25	32.79	-62.47	-13.00	-49.47

Table 7-16. Radiated Spurious Data (WCDMA Cell – Low Channel)



Mode:	WCDMA RMC								
Channel:	4183								
Frequency (MHz):	836.6								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1673.2	H	-	-	-76.37	-2.27	28.36	-66.89	-13.00	-53.89
2509.8	H	250	157	-73.94	2.22	35.28	-59.97	-13.00	-46.97
3346.4	H	-	-	-76.93	2.42	32.49	-62.77	-13.00	-49.77
4183.0	H	-	-	-77.99	3.46	32.47	-62.79	-13.00	-49.79

Table 7-17. Radiated Spurious Data (WCDMA Cell – Mid Channel)

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Mode:	WCDMA RMC								
Channel:	4233								
Frequency (MHz):	846.6								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1693.2	H	-	-	-76.35	-1.82	28.83	-66.42	-13.00	-53.42
2539.8	H	241	167	-75.22	2.33	34.11	-61.15	-13.00	-48.15
3386.4	H	-	-	-76.71	2.32	32.61	-62.64	-13.00	-49.64
4233.0	H	-	-	-77.29	3.38	33.09	-62.17	-13.00	-49.17

Table 7-18. Radiated Spurious Data (WCDMA Cell – High Channel)

FCC ID: A3LSMA528B	 PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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7.4 Frequency Stability / Temperature Variation

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. 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.

For Part 22 and RSS-132, the frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ (± 2.5 ppm) of the center frequency.

Test Procedure Used

ANSI/TIA-603-E-2016

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 connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

Test Notes

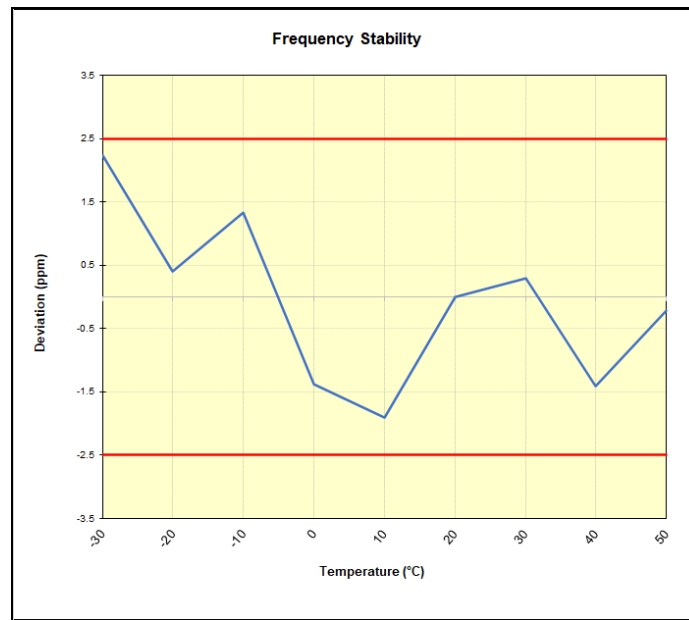
None

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LTE Band 26/5

		Operating Frequency (Hz):		836,500,000	
		Ref. Voltage (VDC):		4.38	
		Deviation Limit:		± 0.00025% or 2.5 ppm	
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.38	- 30	836,593,609	1,865	0.0002229
		- 20	836,592,084	340	0.0000406
		- 10	836,592,864	1,120	0.0001339
		0	836,590,594	-1,150	-0.0001375
		+ 10	836,590,149	-1,595	-0.0001907
		+ 20 (Ref)	836,591,744	0	0.0000000
		+ 30	836,591,987	243	0.0000290
		+ 40	836,590,561	-1,183	-0.0001414
		+ 50	836,591,558	-186	-0.0000222
Battery Endpoint	3.46	+ 20	836,590,089	-1,655	-0.0001978

Table 7-19. LTE Band 26/5 Frequency Stability Data



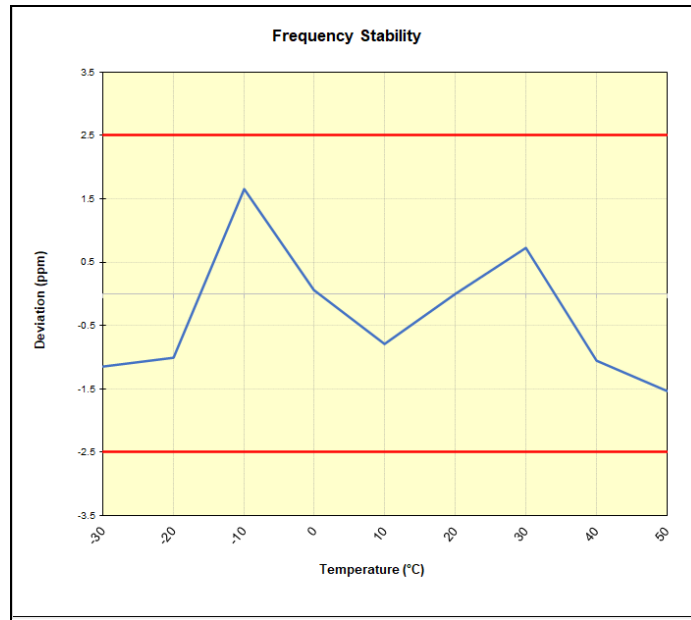
Plot 7-7. LTE Band 26/5 Frequency Stability Chart

FCC ID: A3LSMA528B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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NR Band n5

		Operating Frequency (Hz):		836,500,000	
		Ref. Voltage (VDC):		4.38	
		Deviation Limit:		± 0.00025% or 2.5 ppm	
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.38	- 30	836,581,227	-953	-0.0001139
		- 20	836,581,333	-847	-0.0001012
		- 10	836,583,569	1,389	0.0001660
		0	836,582,231	51	0.0000061
		+ 10	836,581,518	-662	-0.0000791
		+ 20 (Ref)	836,582,180	0	0.0000000
		+ 30	836,582,789	609	0.0000728
		+ 40	836,581,296	-884	-0.0001057
Battery Endpoint	3.46	+ 20	836,583,419	1,239	0.0001481

Table 7-20. NR Band n5 Frequency Stability Data



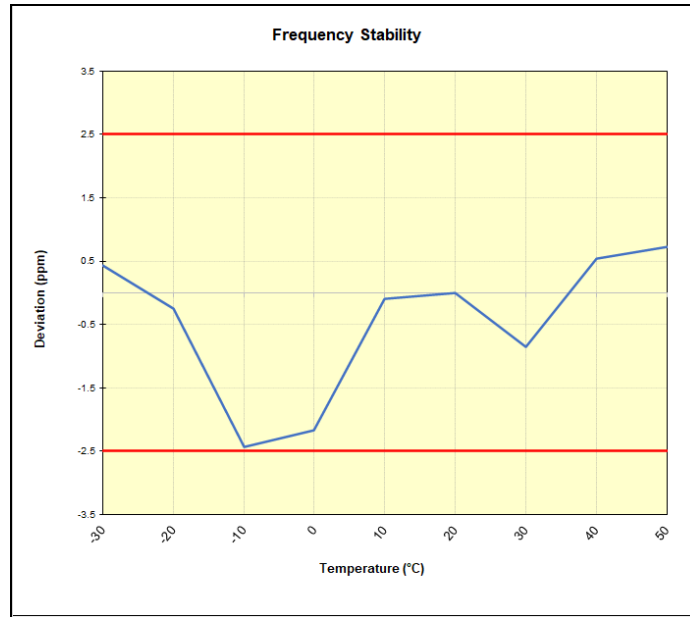
Plot 7-8. NR Band n5 Frequency Stability Chart

FCC ID: A3LSMA528B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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GSM/GPRS Cell

		Operating Frequency (Hz):	836,600,000		
		Ref. Voltage (VDC):	4.38		
		Deviation Limit:	± 0.00025% or 2.5 ppm		
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.38	- 30	836,603,005	369	0.0000441
		- 20	836,602,434	-202	-0.0000241
		- 10	836,600,609	-2,027	-0.0002423
		0	836,600,821	-1,815	-0.0002169
		+ 10	836,602,563	-73	-0.0000087
		+ 20 (Ref)	836,602,636	0	0.0000000
		+ 30	836,601,924	-712	-0.0000851
		+ 40	836,603,087	451	0.0000539
		+ 50	836,603,241	605	0.0000723
Battery Endpoint	3.46	+ 20	836,602,124	-512	-0.0000612

Table 7-21. GSM/GPRS Cell Frequency Stability Data



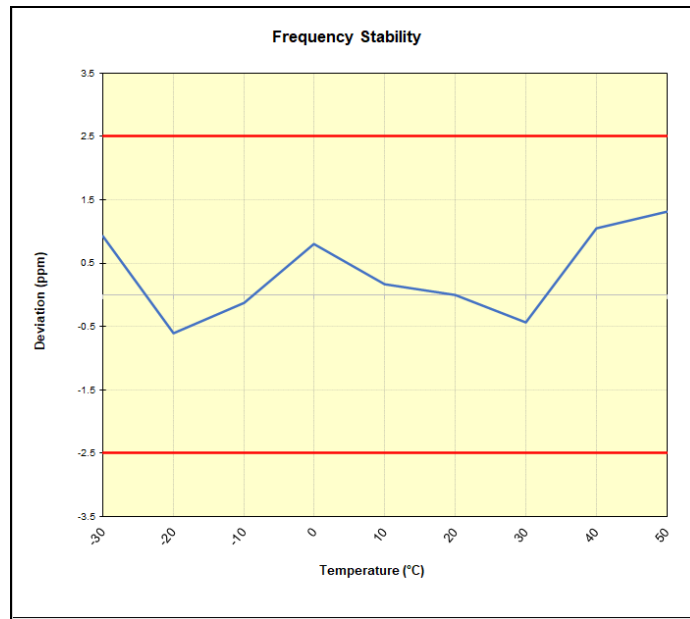
Plot 7-9. GSM/GPRS Cell Frequency Stability Chart

FCC ID: A3LSMA528B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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WCDMA Cell

Operating Frequency (Hz):		836,600,000			
Ref. Voltage (VDC):		4.38			
Deviation Limit:		± 0.00025% or 2.5 ppm			
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.38	- 30	836,602,005	776	0.0000928
		- 20	836,600,726	-503	-0.0000601
		- 10	836,601,125	-104	-0.0000124
		0	836,601,899	670	0.0000801
		+ 10	836,601,377	148	0.0000177
		+ 20 (Ref)	836,601,229	0	0.0000000
		+ 30	836,600,864	-365	-0.0000436
		+ 40	836,602,111	882	0.0001054
		+ 50	836,602,328	1,099	0.0001314
Battery Endpoint	3.46	+ 20	836,600,835	-394	-0.0000471

Table 7-22. WCDMA Cell Frequency Stability Data





Plot 7-10. WCDMA Cell Frequency Stability Chart

FCC ID: A3LSMA528B	 PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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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: A3LSMA528B** complies with all the requirements of Part 22 of the FCC rules.

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Test Report S/N: 1M2108160095-01.A3L	Test Dates: 8/19/2021 - 8/31/2021	EUT Type: Portable Handset	Page 33 of 33