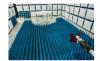


## PCTEST

13, Heungdeok 1-ro, Giheung-gu, Yongin-si, Gyeonggi-do, 16954 South Korea Tel. 031.660.7319 / Fax 031.660.7318 http://www.pctest.com



# **MEASUREMENT REPORT**

### Bluetooth

#### **Applicant Name:**

Samsung Electronics Co., Ltd. 129, Samsung-ro, Yeongtong-gu, Suwon-si Gyeonggi-do, 16677, Korea Date of Testing: 5/13 - 6/1/2021 Test Site/Location: PCTEST Lab. Yongin-Si, Gyeonggi-do, South Korea Test Report Serial No.: 1K2106030020-03.A3L

### FCC ID:

### A3LSMA127M

### APPLICANT:

# Samsung Electronics Co., Ltd.

Application Type: Model: Additional Model(s): EUT Type: Max. RF Output Power: Frequency Range: Type of Modulation: FCC Classification: Test Procedure(s):

Certification SM-A127M/DS SM-A127M Portable Handset 12.56 mW (10.99 dBm) Peak Conducted 2402 – 2480MHz GFSK,  $\pi$ /4-DQPSK, 8DPSK FCC Part 15 Spread Spectrum Transmitter (DSS) ANSI C63.10-2013, KDB 558074 D01 v05r02

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 ANSI C63.10-2013. 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.

Prepared by

Ń

Reviewed by

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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 facility located at 13, Heungdeok 1-ro, Giheung-gu, Yongin-si, Gyeonggi-do, 16954, South Korea. 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 13, Heungdeok 1-ro, Giheung-gu, Yongin-si, Gyeonggi-do, 16954 South Korea.

- PCTEST is an ISO 17025-2017 accredited test facility under the National Voluntary Laboratory Accreditation Program (NVLAP) with Certificate number 600143-0 for Specific Absorption Rate (SAR), and Electromagnetic Compatibility (EMC) & Telecommunications testing for FCC and Innovation, Science, and Economic Development Canada (ISED) 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 (26168) 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 : A3LSMA127M**. The test data contained in this report pertains only to the emissions due to the EUT's Bluetooth transmitter.

• This Bluetooth module has been tested by a Bluetooth Qualification Lab, and we confirm the following:

- A) The hopping sequence is pseudorandom
- B) All channels are used equally on average
- C) The receiver input bandwidth equals the transmit bandwidth
- D) The receiver hops in sequence with the transmit signal
- 15.247(g): In accordance with the Bluetooth Industry Standard, the system is designed to comply with all of the regulations in Section 15.247 when the transmitter is presented with a continuous data (or information) system.
- 15.247(h): In accordance with the Bluetooth Industry Standard, the system does not coordinate its channels selection/ hopping sequence with other frequency hopping systems for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters.
- 15.247(h): The EUT employs Adaptive Frequency Hopping (AFH) which identifies sources of interference namely devices
  operating in 802.11 WLAN and excludes them from the list of available channels. The process of re-mapping reduces the
  number of test channels from 79 channels to a minimum number of 20 channels.

Test Device Serial No.: 2950M, 2951M, 2866M, 2891M

### 2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 802. 11b/g/n WLAN, Bluetooth (1x, EDR, LE)

Frequency (MHz)
2402
:
2441
:
2480

Table 2-1. Frequency/ Channel Operations

**Note:** This device is capable of operating in hopping and non-hopping mode. The EUT can hop between 79 different channels in the 2400 – 2483.5MHz band.

### 2.3 Antenna Description

Following antenna was used for the testing.

Frequency [GHz]	Antenna Gain [dBi]		
2.4	-4.75		
Table 2-2. Antenna Peak Gain			

**Note:** This device is capable of operating in hopping and non-hopping mode. The EUT can hop between 79 different channels in the 2400 – 2483.5MHz band.

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### 2.4 Test Configuration

The EUT was tested per the guidance of ANSI C63.10-2013. ANSI C63.10-2013 was also used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See Sections 7.12 for AC line conducted emissions test setups, 3.3 for radiated emissions test setups, and 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, and 7.8 for antenna port conducted emissions test setups. The worst case radiated emissions data is shown in this report.

### 2.5 Software and Firmware

The test was conducted with firmware version A127FXXE0AUE7 installed on the EUT.

### 2.6 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 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) and the guidance provided in KDB 558074 D01 v05r02 were used in the measurement of the EUT.

Deviation from measurement procedure.....None

### 3.2 AC Line Conducted Emissions

The line-conducted facility is located inside a 10'x16'x9' shielded enclosure. The shielded enclosure is manufactured by SY cooperation RF Enclosures. The line-conducted facility is located inside a 7m x 3.66m x 2.7m shielded enclosure. The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-5. A 1m x 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz,  $50\Omega/50\mu$ H Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. The external power line filter is an ETS Lindgren Model LPRX-4X30 (100dB Attenuation, 14kHz-18GHz) and the two EMI/RFI filters are ETS Lindgren Model LRW-2030-S1 (100dB Minimum Insertion Loss, 14kHz – 10GHz). These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The spectrum was scanned from 150kHz to 30MHz with a spectrum analyzer. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions is used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

Line conducted emissions test results are shown in Section 7.12. The EMI Receiver mode of the R&S ESW was used to perform AC line conducted emissions testing. Automated test software was used to perform the AC line conducted emissions testing. Automated measurement software utilized is Rohde & Schwarz EMC32, Version 10.20.01.

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### 3.3 Radiated 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. An 80cm tall test table made of Innco is placed on top of the turn table. For measurements above 1GHz, an additional Innco table is placed on top of the test table to bring the total table height to 1.5m.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33 depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions.

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.

### 3.4 Environmental Conditions

The temperature is controlled within range of 15°C to 35°C. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

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## 4.0 ANTENNA REQUIREMENTS

#### Excerpt from §15.203 of the FCC Rules/Regulations:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

- The antennas of the EUT are permanently attached.
- There are no provisions for connection to an external antenna.

#### Conclusion:

The EUT complies with the requirement of §15.203.

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## 5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. 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 (±dB)
Conducted Bench Top Measurements	1.20
Line Conducted Disturbance	3.07
Radiated Disturbance (<1GHz)	3.01
Radiated Disturbance (>1GHz)	5.56
Radiated Disturbance (>18GHz)	3.16

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## 6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements 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
Agilent	N9030A	PXA Signal Analyzer	6/29/2020	Annual	6/28/2021	MY49432391
Antritsu	\$820E	Cable and Antenna Analyzer	6/29/2020	Annual	6/28/2021	1839097
Antritsu	MA24106A	USB Power Sensor	6/29/2020	Annual	6/28/2021	1244512
Com-Power	AL-130R	Active Loop Antenna	10/29/2020	Biennial	10/28/2022	10160045
Schwarzbeck	VULB9162	Broadband TRILOG Antenna	7/9/2019	Biennial	7/8/2021	9162-217
Sunol Sciences	DRH-118	Horn Antenna	8/9/2019	Biennial	8/8/2021	A102416-1
Keysight Technologies	N9030B	PXA Signal Analyzer	5/1/2021	Annual	4/30/2022	MY57142018
Mini-Circuits	ZHDC-16-63-S+	Coupler	6/29/2020	Annual	6/28/2021	F709401716
Mini-Circuits	ZNDC-18-2G-S+	Coupler	6/29/2020	Annual	6/28/2021	F280401542
Mini-Circuits	BW-N10W5+	Attenuator	6/29/2020	Annual	6/28/2021	1607
Mini-Circuits	BW-N10W5+	Attenuator	6/29/2020	Annual	6/28/2021	1607
Rohde & Schwarz	TS-PR18	Preamplifier	6/29/2020	Annual	6/28/2021	102141
Rohde & Schwarz	TS-PR1840	Preamplifier	6/29/2020	Annual	6/28/2021	100049
Rohde & Schwarz	ENV216	Two-Line V-Network	5/24/2021	Annual	5/23/2022	101319
Rohde & Schwarz	FSW43	Signal & Spectrum Analyzer	9/17/2020	Annual	9/16/2021	101250
Rohde & Schwarz	TS-SFUNIT-Rx	Shielded Filter Unit	2/19/2021	Annual	2/18/2022	102131

Table 6-1. Annual Test Equipment Calibration Schedule

#### Notes:

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.

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## 7.0 TEST RESULTS

### 7.1 Summary

Company Name:	Samsung Electronics Co., Ltd.
FCC ID:	A3LSMA127M
Method/System:	Frequency Hopping Spread Spectrum (FHSS)
Number of Channels:	<u>79</u>

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(1)(iii)	RSS-247 [5.1(1)]	20dB Bandwidth	N/A		PASS	Section 7.2
15.247(b)(1)	RSS-247 [5.4(2)]	Peak Transmitter Output Power	< 1 Watt if <u>&gt;</u> 75 non- overlapping channels used		PASS	Section 7.3
15.247(a)(1)	RSS-247 [5.1(2)]	Channel Separation	> 2/3 of 20 dB BW for systems with Output Power < 125mW	CONDUCTED	PASS	Section 7.5
15.247(a)(1)(iii)	RSS-247 [5.1(4)]	Number of Channels	> 15 Channels		PASS	Section 7.7
15.247(a)(1)(iii)	RSS-247 [5.1(4)]	Time of Occupancy	< 0.4 sec in 31.6 sec period		PASS	Section 7.6
15.247(d)	RSS-247 [5.5]	Band Edge / Out-of-Band Emissions	Conducted > 20dBc		PASS	Section 7.4, Section 7.8
15.205 15.209	RSS-Gen [8.9]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-247 limits)	RADIATED	PASS	Section 7.9, Section 7.10, Section 7.11
15.207	RSS-Gen [8.8]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits (RSS-Gen [8.8] limits)	LINE CONDUCTED	PASS	Section 7.12

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 shown in this section 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) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "BT Auto," Version 3.5.
- 5) For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "Chamber Automation," Version 1.3.1.

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# 7.2 20dB Bandwidth Measurement

<u>§15.247 (a.1.iii); RSS-247 [5.1(1)]</u>

#### **Test Overview and Limit**

The bandwidth at 20dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies.

#### Test Procedure Used

ANSI C63.10-2013 – Section 6.9.2

#### **Test Settings**

- The signal analyzers' automatic bandwidth measurement capability of the spectrum analyzer was used to perform the 20dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 20. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
- 2. RBW = 1 5% OBW
- 3. VBW  $\geq$  3 x RBW
- 4. Reference level set to keep signal from exceeding maximum input mixer level for linear operation.
- 5. Detector = Peak
- 6. Trace mode = max hold
- 7. Sweep = auto couple
- 8. The trace was allowed to stabilize

#### **Test Setup**

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



#### Figure 7-1. Test Instrument & Measurement Setup

#### Test Notes

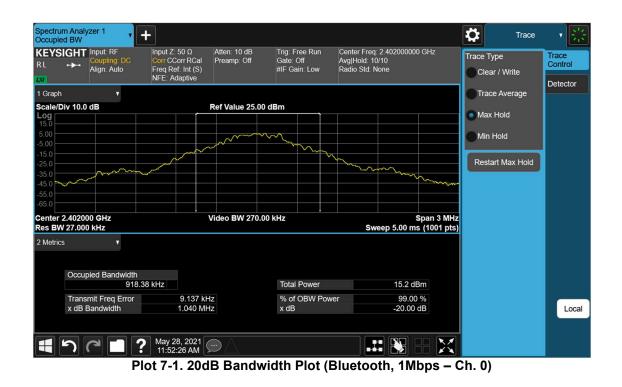
#### None

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Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	20dB Bandwidth Test Results [kHz]
2402	1.0	GFSK	0	1040.00
2441	1.0	GFSK	39	922.40
2480	1.0	GFSK	78	1040.00
2402	2.0	π/4-DQPSK	0	1346.00
2441	2.0	π/4-DQPSK	39	1342.00
2480	2.0	π/4-DQPSK	78	1345.00
2402	3.0	8DPSK	0	1322.00
2441	3.0	8DPSK	39	1310.00
2480	3.0	8DPSK	78	1346.00

Table 7-2. Conducted 20dB Bandwidth Measurements



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Spectrum	d BW ´		+								\$	Trace	- 7 😤
KEYSI RL	IGHT ·✦·	Input: RF Coupling: DC Align: Auto	Input Z: 50 Ω Corr CCorr RCa Freq Ref: Int (S NFE: Adaptive			rig: Free Ru Gate: Off IF Gain: Low		Center Freq Avg Hold: 10 Radio Std: N		) GHz	Trace Ty Clear	pe r / Write	Trace Control
1 Graph		•									Trace	e Average	Delector
Scale/D Log 15.0 -5.00 -15.0 -25.0 -35.0 -45.0 -55.0 -65.0			hundra	Ref Value 2			m V	monto	w. Many W	morto	Max Min H Resta		
Center 2 Res BW	2.44100	0 GHz		Video BW 2				Sw	s eep 5.00 ms	Span 3 MHz s (1001 pts)			
2 Metrics	Occup	v ied Bandwidt 85 nit Freq Error andwidth	94.17 kHz		1	Total Powe % of OBW x dB	8	r	13.6 dE 99.00 -20.00 d	%			
	า (		<b>?</b> May 28, 202 11:55:47 AM										

Plot 7-2. 20dB Bandwidth Plot (Bluetooth, 1Mbps – Ch. 39)



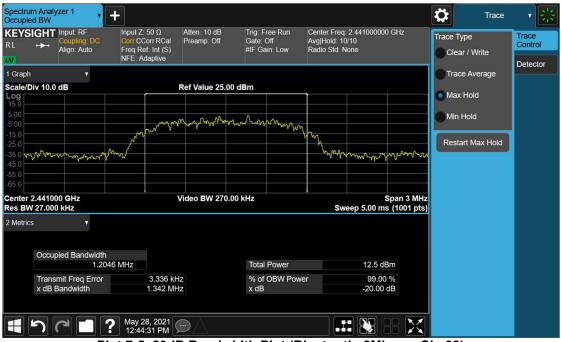
Plot 7-3. 20dB Bandwidth Plot (Bluetooth, 1Mbps - Ch. 78)

FCC ID: A3LSMA127M	PCTEST <sup>®</sup> Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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Spectrur Occupie		zer 1	+									\$	Trace	- 7 😤
RL RL	-	Input: RF Coupling: DC Align: Auto	Freq R	Corr RCal ef: Int (S)	Atten: 10 dB Preamp: Off		Gate:	ree Run Off ain: Low	Center Free Avg Hold: 1 Radio Std: 1		) GHz	Trace Cl	Type ear / Write	Trace Control
1 Graph		Ţ	NFE: A	daptive								Tr	ace Average	Detector
Scale/D					Ref Value 25.	00 dB	m						ace Average	
Log 15.0									1			💿 Ma	ax Hold	
5.00												Mi	n Hold	
-5.00			~	mont	moun	୶ୄଐ୳ୣ୷୲	- American	Mar and Mary	No.					
-25.0			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~						» M			Re	start Max Hold	
-35.0	- mangara	man	han the						4m	harrow	Northan			
-55.0														
Center 2	2 40200	0 GH7			video BW 270	1.00 ki	H7				Span 3 MHz			
Res BW						5.00 IK			Sv	veep 5.00 m				
2 Metrics	s	•												
	Occupi	ied Bandwidt						_			_			
	<b>T</b>		292 MHz	7 454 141				Power		11.1 dE				
		nit Freq Erroi andwidth	r	-7.154 kH 1.346 MH			% of x dB	OBW Powe	er	99.00 -20.00				
	5		<b>?</b> May 2	28, 2021 4:00 PM										

Plot 7-4. 20dB Bandwidth Plot (Bluetooth, 2Mbps – Ch. 0)



Plot 7-5. 20dB Bandwidth Plot (Bluetooth, 2Mbps - Ch. 39)

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Spectrun		er 1 🔻	+						\$	Trace	<ul><li>▼ </li></ul>
RL		nput: RF Coupling: DC Align: Auto	Input Ζ: 50 Ω Corr CCorr RCal Freq Ref: Int (S) NFE: Adaptive	Atten: 10 dB Preamp: Off	Trig: Free Run Gate: Off #IF Gain: Low	Center Freq Avg Hold: 10 Radio Std: N		GHz	Trace Typ Clear	oe / Write	Trace Control
1 Graph		•							Trace	Average	Delector
Scale/Di Log 15.0	iv 10.0 d	IB		Ref Value 25.00 o	dBm	1			💿 Max H	Hold	
5.00			a want	M whow have	, www.www.				Min H	lold	
-15.0 -25.0 -35.0 fvr	᠁ᢕᡐᠬ	Mujara	- A -			a m		ᡁᠧᡔᢇᢦᢞᡃ᠋᠆ᠰᡗ	Restar	t Max Hold	
-45.0 -55.0 -65.0											
Center 2 Res BW			<u> </u>	Video BW 270.00	kHz	Sw	s veep 5.00 ms	pan 3 MHz (1001 pts)			
2 Metrics		۲									
	Occupie	ed Bandwidth 1.22	60 MHz		Total Power		11.5 dB	m			
		it Freq Error andwidth	2.212 kH 1.345 MH		% of OBW Powe x dB	er	99.00 -20.00 c				
	า (	· ا ا ا	May 28, 2021 12:45:21 PM	$\mathbb{D}$							

Plot 7-6. 20dB Bandwidth Plot (Bluetooth, 2Mbps – Ch. 78)



Plot 7-7. 20dB Bandwidth Plot (Bluetooth, 3Mbps – Ch. 0)

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Spectrum Occupied		zer 1	•	-										Trace	<b>→</b> 😤
RL	GHT ·≁·	Input: RF Coupling Align: Au	DC	Input Z: Corr CC Freq Re NFE: Ac	orr RCal f: Int (S)	Atten: 10 dB Preamp: Off		Gate: (	ree Run Off iin: Low	Center Freq Avg Hold: 10 Radio Std: N		) GHz	Trace Cle	Type ear / Write	Trace Control
1 Graph			7										<b>Tra</b>	ace Average	Detector
Scale/Di	v 10.0	dB			I	Ref Value 25.	00 dBr	n					Ma	ax Hold	
Log 15.0 5.00 -5.00					mar	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	4444	Ann	month				Mi	n Hold	
-15.0 -25.0 -35.0	h	mar	M.N.	not not	ý~'					wy c	mont	monthe	Res	start Max Hold	
-45.0 -55.0 -65.0															
Center 2 Res BW					, \ \	/ideo BW 270	).00 kH	z		, Sw		Span 3 MHz s (1001 pts)			
2 Metrics	i.	,	7												
	Occup	ied Band	dwidth 1.1941	MHz				Total	Power		12.2 dE	3m			
		nit Freq 3andwidt			4.002 kH 1.310 MH			% of x dB	OBW Powe	r	99.00 -20.00				
	า (	7	]?	May 2 12:46	8, 2021 :28 PM										

Plot 7-8. 20dB Bandwidth Plot (Bluetooth, 3Mbps - Ch. 39)

Spectrun Occupied		zer 1 🗸	+									Trace	· <b>₩</b>
KEYSI RL	GHT ·≁·	Input: RF Coupling: DC Align: Auto	Input Z: 50 Corr CCorr Freq Ref: 1 NFE: Adap	r RCal Pream Int (S)		Gate: (	ree Run Off in: Low	Center Freq Avg Hold: 10 Radio Std: N		) GHz	Trace <sup>·</sup> Cle	Type ear / Write	Trace Control
1 Graph		V									🔵 Tra	ice Average	Delector
Scale/Di	iv 10.0	dB		Ref Va	ue 25.00 dl	Зm		•			O Ma	x Hold	
<b>Log</b> 15.0													
5.00				mmhmm	mm	h	mann.				Mir	n Hold	
-15.0			- And					W			Res	tart Max Hold	
-25.0 -35.0 Ma	mon	month	mm					June	mont	Who was my for	The s		
-45.0													
-65.0													
Center 2 Res BW			•	Video E	SW 270.00 F	(Hz		Sw	eep 5.00 ms	Span 3 MHz s (1001 pts)			
2 Metrics													
	Occup	ied Bandwidtl											
			298 MHz				Power		11.7 dE				
		nit Freq Error Bandwidth		.678 kHz 346 MHz		% of x dB	OBW Powe	r	99.00 -20.00				
	า (		<b>?</b> May 28, 12:46:01	2021 💮 🔿	4								

Plot 7-9. 20dB Bandwidth Plot (Bluetooth, 3Mbps – Ch. 78)

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#### 7.3 Output Power Measurement §15.247 (b.1); RSS-247 [5.4(2)]

#### **Test Overview and Limits**

Measurement is made while the EUT is operating in non-hopping transmission mode. The powers shown below were measured using a spectrum analyzer with a Bluetooth signaling test set (Agilent Model: N4010A) used only to maintain a Bluetooth link with the EUT. Average power measurements are performed using the analyzer's "burst power" function with RBW = 3MHz. The burst power function triggers on a single set burst set to maximum power and measures the maximum average power on the on-time.

#### The maximum permissible output power is 1 Watt.

#### Test Procedure Used

ANSI C63.10-2013 - Section 7.8.5

#### Test Settings

#### Peak Power Measurement

- 1. Span = approximately 5x 20dB bandwidth, centered on hopping channel
- 2. RBW > 20dB bandwidth of emission being measured
- 3. VBW ≥ RBW
- 4. Sweep = auto
- 5. Detector = peak
- 6. Trace mode = max hold
- 7. The trace was allowed to stabilize

#### Test Setup

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



Figure 7-2. Test Instrument & Measurement Setup

#### Note

This unit was tested with all possible data rates and the highest peak power is reported with the unit transmitting at 3Mbps. The EUT was tested for the average power with a broadband power meter for reporting purposes only. Final results were obtained using calibrated couplers, attenuators and cables. The following formula was used:

Output Power (dBm) = Raw Analyzer Level (dBm) + Cable Loss (dB) + Loss in Directional Coupler/Insertion Loss (dB)

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_	Data		Channel		nducted wer	-	nducted wer
Frequency [MHz]	Rate [Mbps]	Mod.	Channel No.	[dBm]	[mW]	[dBm]	[mW]
2402	1.0	GFSK	0	9.53	8.974	8.88	7.720
2441	1.0	GFSK	39	10.15	10.351	8.88	7.723
2480	1.0	GFSK	78	9.64	9.204	9.05	8.031
2402	2.0	π/4-DQPSK	0	9.88	9.727	7.16	5.204
2441	2.0	π/4-DQPSK	39	10.45	11.092	7.81	6.045
2480	2.0	π/4-DQPSK	78	9.71	9.354	7.40	5.500
2402	3.0	8DPSK	0	10.49	11.194	7.14	5.179
2441	3.0	8DPSK	39	10.99	12.560	7.84	6.087
2480	3.0	8DPSK	78	10.44	11.066	6.14	4.115

**Table 7-3. Conducted Output Power Measurements** 



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Plot 7-11. Peak Conducted Power (1Mbps – Ch. 39)



Plot 7-12. Peak Conducted Power (1Mbps – Ch. 78)

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Plot 7-13. Peak Conducted Power (2Mbps – Ch. 0)



Plot 7-14. Peak Conducted Power (2Mbps – Ch. 39)

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Plot 7-15. Peak Conducted Power (2Mbps – Ch. 78)



Plot 7-16. Peak Conducted Power (3Mbps - Ch. 0)

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Plot 7-17. Peak Conducted Power (3Mbps – Ch. 39)



Plot 7-18. Peak Conducted Power (3Mbps – Ch. 78)

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Spectrum Burst Pow	Analyzer 1 er	Spectrum Swept SA	n Analyzer 2 A	+								Frequency	· • 🛞
	HT Input: RF Coupling: D Align: Auto	C Corr	t Z: 50 Ω CCorr RCal Ref: Int (S)	Atten: 34 dB Preamp: Off		rig: RF   Gain: I		Avg Hold: 1	Center Freq: 2.402000000 GHz Avg Hold: 100/100 Radio Std: None			r Frequency 000000 GHz	Settings
1 Graph	•										CF Ste 3.000	ep 1000 MHz	
Scale/Div	10.00 dB		F	Ref Value 20.	00 dBn	n						uto Ian	
0.00 -10.0 -20.0 -30.0											Freq ( 0 Hz	Offset	
-40.0 -50.0 -60.0 -70.0													
0.00 s Res BW 3	.0000 MHz							Sweep	3.5000 ms	3.50 ms (52501 pts)			
2 Metrics	T				Abs	Amplitu	ide Thres	hold	-20.49 dBr	n			
	Output Power	d 1 N	8.8762 dE	Rm	Rel A	Amplitu	de Thresl	hold	-30.00 di	В			
	(Above Threshol	d Level)	0.0702 02		Curre	ent Dat	a						
	Above Thresho	ld Pts	433	304	Outp	ut Pow	er		8.8775 dBr	n			
					Max	Point F	Power		9.5139 dBr	n			
					Min F	Point P	ower		-81.264 dBr	n			
-		<b>?</b> May 4:5	y 24, 2021 55:37 PM	$\Box \triangle$									

Plot 7-19. Average Conducted Power (1Mbps – Ch. 0)

Spectrum Burst Pow		zer 1	Spectrum A Swept SA	Analyzer 2	+							Frequency	- 7 🐺
RL +	GHT	Input: RF Coupling: DC Align: Auto			Atten: 34 dB Preamp: Off		j: RF Burst Gain: Low	Center Freq Avg Hold: 10 Radio Std: N		0 GHz	2.4410	Frequency 000000 GHz	Settings
1 Graph		v									CF Ste 3.0000	P )00 MHz	
Scale/Div	10.00	) dB		R	ef Value 20.0	00 dBm					AL Ma		
10.0 0.00 -10.0 -20.0 -30.0						******					Freq O 0 Hz		
-40.0 -50.0 -60.0 -70.0													
0.00 s Res BW 3	.0000	MHz						Sweep	3.5000 ms	3.50 ms (52501 pts)			
2 Metrics		v				Abs Ar	mplitude Thres	shold	-20.56 dBr	n			
	Out	out Power				Rel An	nplitude Thres	hold	-30.00 d	В			
	(Abc	ve Threshold	Level)	8.8777 dB	im	Currer	nt Data						
	Abo	ve Threshold	d Pts	433	07	Output	t Power		8.8718 dBr	n			
						Max P	oint Power		9.4433 dBr	_			
						Min Po	bint Power		-88.440 dBr	n			
4	)		<b>?</b> May 4:52	24, 2021 2:44 PM	$\supset \triangle$			l i					

Plot 7-20. Average Conducted Power (1Mbps – Ch. 39)

FCC ID: A3LSMA127M	Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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Spectrum Burst Pow	er	Spectrum Analyzer Swept SA	·2	-						\$	Frequency	· • 🔆
	<ul> <li>► Input: RF</li> <li>Coupling: DC</li> <li>Align: Auto</li> </ul>	Input Ζ: 50 Ω Corr CCorr RCa Freq Ref: Int (S			Trig: R IF Gail	F Burst n: Low	Center Fred Avg Hold: 1 Radio Std: I		0 GHz	and the second se	Frequency 000000 GHz	Settings
1 Graph	•									CF Ste 3.000	ep 000 MHz	
Scale/Div	10.00 dB		Ref Value	20.00 de	Bm						uto an	
0.00 -10.0 -20.0 -30.0				فنداین این محکو کی محکو کی				المتنظمين ( المتحمي ال المتحمي ال		Freq C 0 Hz	Offset	
-40.0 -50.0 -60.0 -70.0												
0.00 s	.0000 MHz						Sweep	o 3.5000 ms	3.50 ms (52501 pts)			
2 Metrics	•			Ab	os Amp	litude Thre:	shold	-20.36 dBn	n			
	Output Power	0.047		Re	el Ampl	itude Thres	hold	-30.00 dE	3			
	(Above Threshold	Level) 9.047	'9 dBm	Cu	irrent C	)ata						
	Above Threshold	d Pts	43308	Ou	utput P	ower		9.0581 dBn	n			
				Ma	ax Poin	t Power		9.6442 dBn	n			
				Mi	n Point	Power		-79.208 dBn	n			
•	って	May 24, 202 4:56:05 PM										

Plot 7-21. Average Conducted Power (1Mbps – Ch. 78)

Spectrum A Burst Powe		Spectrum Analyzer 2 Swept SA	+				₽	Frequency	- 7 🔆
	HT Input: RF Coupling: DC Align: Auto	Input Z: 50 Ω Corr CCorr RCal Freq Ref: Int (S)	Atten: 34 dB Preamp: Off	Trig: RF Burst IF Gain: Low	Center Freq: 2.402000000 Avg Hold: 100/100 Radio Std: None	GHz	Center Fre 2.4020000		Settings
1 Graph	•						CF Step 3.000000	MHz	
Scale/Div	10.00 dB		Ref Value 20.00	dBm			Auto Man		
10.0 0.00 -10.0 -20.0 -30.0	over a state of the second sec	<mark>)   i<sub>n a</sub> heriologi kan ber</mark> den <mark>heriologi kan b</mark> er	1	an a ta an	esta terbanomi () <sub>ter</sub> re diri anti () <sub>ter</sub> r		Freq Offset 0 Hz	:	
-40.0 -50.0 -60.0 -70.0									
0.00 s Res BW 3.	.0000 MHz				Sweep 3.5000 ms (	3.50 ms 52501 pts)			
2 Metrics	•		F	Abs Amplitude Thres	hold -20.12 dBm				
	Output Power			Rel Amplitude Threst	-30.00 dB				
	(Above Threshold	Level) 7.1631 d		Current Data					
	Above Threshold	d Pts 43	392 0	Dutput Power	7.1549 dBm				
			N	Max Point Power	9.8755 dBm				
			Ν	/lin Point Power	-86.127 dBm				
4		May 24, 2021 4:59:47 PM							

Plot 7-22. Average Conducted Power (2Mbps – Ch. 0)

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