

ELEMENT WASHINGTON DC LLC

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MEASUREMENT REPORT

Bluetooth (Low Energy)

Applicant Name:

Samsung Electronics Co., Ltd. 129, Samsung-ro, Yeongtong-gu, Suwon-si Gyeonggi-do, 16677, Korea Date of Testing: 09/03/2024 – 12/05/2024 Test Report Issue Date: 12/05/2024 Test Site/Location: Element lab., Columbia, MD, USA Test Report Serial No.: 1M2408260070-18.A3L

FCC ID:

A3LSMS938JPN

APPLICANT:

Samsung Electronics Co., Ltd.

Application Type:	Certification
Model:	SC-52F
Additional Model(s):	SCG32
EUT Type:	Portable Handset
Max. RF Output Power:	17.128 mW (12.34 dBm) Peak Conducted
Frequency Range:	2402 – 2480MHz
FCC Classification:	Digital Transmission System (DTS)
FCC Rule Part(s):	Part 15 Subpart C (15.247)
Test Procedure(s):	ANSI C63.10-2013, KDB 558074 D01 v05r02, KDB 648474 D03 v01r04

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 and KDB 558074 D01 v05r02. 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.

RJ Ortanez Executive Vice President



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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 Element Test Location

These measurement tests were conducted at the Element laboratory 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 Element lab located in Columbia, MD 21046, U.S.A.

- Element Washington DC LLC 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.
- Element Washington DC LLC 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).
- Element Washington DC LLC facility is a registered (2451B) test laboratory with the site description on file with ISED.
- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under U.S. and Canada Mutual Recognition Agreements (MRAs).

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMS938JPN**. The data found in this test report was taken with the EUT operating in Bluetooth low energy mode. While in low energy mode, the Bluetooth transmitter hops pseudo-randomly between 40 channels, three of which are "advertising channels". When the transmitter is hopping only between the three advertising channels, the EUT does not fall under the category of a "hopper" as defined in 15.247(a)(iii) which states that a "frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels." As operation on only the advertising channels does not qualify the EUT as a hopper, the EUT is certified as a DTS device in this mode. The data found in this report is representative of the device when it transmits on its advertising channels. Typical Bluetooth operation is covered under the DSS report found with this application.

Test Device Serial No.: 0568M, 0304M, 0298M, 0073M, 0076M, 0111M, 0108M, 0131M, 0079M, 0066M, 0835M, 0823M, 0630R, 0635R

2.2 Device Capabilities

This device contains the following capabilities:

850/1700/1900 WCDMA/HSPA, 850/1900 GSM/GPRS/EDGE Multi-Band LTE, MultiBand 5G NR (FR1),

802.11b/g/n/ac/ax/be WLAN, 802.11a/n/ac/ax/be UNII (5GHz and 6GHz), Bluetooth (1x, EDR, LE), Wireless Power Transfer, UWB

Ch.	Frequency (MHz)
37	2402
:	:
19	2440
:	:
39	2480

Table 2-1. Frequency / Channel Operations

2.3 Antenna Description

Following antenna was used for the testing.

Frequency [GHz]	Antenna-1 Gain (dBi)	Antenna-2 Gain (dBi)	Directional Antenna Gain (dBi)	
2.4	-1.39	-3.33	0.70	
Table 2.2 Antonna Boak Gain				

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 and KDB 558074 D01 v05r02. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See Sections 3.2 for AC line conducted emissions test setups, 3.3 for radiated emissions test setups, and 7.2, 0, 7.4, 0, and 7.6 for antenna port conducted emissions test setups.

There are two vendors of the WiFi/Bluetooth radio modules, variant 1 and variant 2. Both radio modules have the same mechanical outline, same on-board antenna matching circuit, identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances. The worst case configuration was found between the two variants. The EUT was also investigated with and without charger.

The emissions below 1GHz and above 18GHz were tested with the highest transmitting power channel and the worst case configuration.

The EUT was manipulated through three orthogonal planes of X-orientation (flatbed), Y-orientation (landscape), and Z-orientation (portrait) during the testing. Only the worst case emissions were reported in this test report. The worst orientation was found to be Y-orientation (landscape).

For AC line conducted and radiated test below 1GHz, following configuration were investigated and EUT powered by AC/DC was the worst case.

- EUT powered by AC/DC adaptor via USB cable with wire charger
- EUT powered by host PC via USB cable with wire charger

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r04. Additional radiated spurious emission measurements were performed with the EUT lying flat on an authorized wireless charging pad (WCP) Model NQ-WC-06 while operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

2.5 Software and Firmware

The test was conducted with software/firmware version S938QOPU0AXJK installed on the EUT.

2.6 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or 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 ETS Lindgren RF Enclosures. The line-conducted facility is located inside a 7m x 3.66m x 2.7m shielded enclosure. The shielded enclosure is manufactured by AP Americas. 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 groundplane. Power cables for support equipment were routed down to the second LISN while ensuring that those 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 7.10. The EMI Receiver mode of the Agilent MXE was used to perform AC line conducted emissions testing.

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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 Styrodur is placed on top of the turn table. For measurements above 1GHz, an additional Styrodur pedestal 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 v01r01.

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 antenna(s) 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	1.13
Line Conducted Disturbance	3.09
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

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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
-	WL25-1	Conducted Cable Set (25GHz)	4/2/2024	Annual	4/2/2025	WL25-1
-	WL25-2	Conducted Cable Set (25GHz)	4/2/2024	Annual	4/2/2025	WL25-2
-	WL40-1	Conducted Cable Set (40GHz)	4/2/2024	Annual	4/2/2025	WL40-1
-	AP1-002	EMC Cable and Switch System	4/2/2024	Annual	4/2/2025	AP1-002
-	ETS-001	EMC Cable and Switch System	4/2/2024	Annual	4/2/2025	ETS-001
-	ETS-002	EMC Cable and Switch System	4/2/2024	Annual	4/2/2025	ETS-002
-	MD 1M 18-40	EMC Cable and Switch System	4/2/2024	Annual	4/2/2025	MD 1M 18-40
Anritsu	MA24408A	Microw ave Peak Pow er Sensor	5/21/2024	Annual	5/21/2025	11675
Anritsu	MA24408A	Microw ave Peak Pow er Sensor	4/10/2024	Annual	4/10/2025	12798
ETS-Lindgren	3116C	Horn Antenna (18-40GHz)	2/27/2023	Biennial	2/27/2025	218893
Rohde & Schwarz	TC-TA18	Vivaldi Antenna	2/23/2023	Biennial	2/23/2025	26040036
Rohde & Schwarz	FSW26	Signal and Spectrum Analyzer (26.5GHz)	3/8/2024	Annual	3/8/2025	103187
Rohde & Schw arz	ESU26	EMI Test Receiver (26.5GHz)	9/25/2023	Annual	9/25/2024	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/11/2023	Annual	9/11/2024	100348
Rohde & Schw arz	ESW44	EMI Test Receiver (44GHz)	4/5/2024	Annual	4/5/2025	101716
Pasternak	NMLC-2	EMI Test Receiver (2Hz to 44GHz)	4/2/2024	Annual	4/2/2025	NMLC-2
Rohde & Schwarz	ENV216	Tw o-Line V-Netw ork	1/31/2023	Biennial	1/31/2025	101379
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	4/9/2024	Annual	4/9/2025	MY 52350166
Keysight Technologies	N9020A	MXA Signal Analyzer	4/11/2024	Annual	4/11/2025	MY 54500644
Keysight Technologies	N9030A	PXA Signal Analyzer	2/29/2024	Annual	3/1/2025	MY 55410501
Keysight Technologies	N9030B	PXA Signal Analyzer, Multi-touch	9/19/2024	Annual	9/19/2025	MY57141001
Sunol	JB6	JB6 Antenna	3/2/2023	Biennial	3/2/2025	A082816
Sunol	JB5	Bi-Log Antenna (20M-5GHz)	9/11/2024	Biennial	9/11/2026	A051107
Rohde & Schw arz	SMW200A	Vector Signal Generator	4/4/2024	Annual	4/4/2025	109456

Table 6-1. Annual Test Equipment Calibration Schedule

Note:

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:	A3LSMS938JPN
FCC Classification:	Digital Transmission System (DTS)
Number of Channels:	<u>40</u>

FCC Part Section(s)	RSS Section(s) Test Description Test Limit		Test Condition	Test Result	Reference	
15.247(a)(2)	RSS-247 [5.2]	6dB Bandwidth	> 500kHz		PASS	Section 7.2
15.247(b)(3)	RSS-247 [5.4(4)]	Transmitter Output Power	< 1 Watt		PASS	Sections 7.3
15.247(e)	RSS-247 [5.2]	Transmitter Power Spectral Density	< 8dBm / 3kHz Band	CONDUCTED	PASS	Section 7.4
15.247(d)	RSS-247 [5.5]	Band Edge / Out-of-Band Emissions	≥ 20dBc		PASS	Sections 7.5, 7.6
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-Gen [8.9])	RADIATED	PASS	Sections 7.7, 7.8
15.207	RSS-Gen [8.8]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits (RSS-Gen[8.8])	LINE CONDUCTED	PASS	Section 7.10

Table 7-1. Summary of Test Results

Notes:

- 1. All modes of operation 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 and attenuators used as part of the system to connect the EUT to the analyzer 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 and attenuators.
- 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 "Bluetooth LE Automation," Version 3.6.
- 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 6dB Bandwidth Measurement – Bluetooth (LE)

<u>§15.247(a.2); RSS-247 [5.2]</u>

Test Overview and Limit

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the transmitter antenna terminal of the EUT while the EUT is operating at maximum power and at the appropriate frequencies. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible 6dB bandwidth is 500 kHz.

Test Procedure Used

ANSI C63.10-2013 – Section 11.8.2 Option 2 KDB 558074 D01 v05r02 – Section 8.2

Test Settings

- The signal analyzers' automatic bandwidth measurement capability of the spectrum analyzer was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 6. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
- 2. RBW = 100kHz
- 3. VBW \geq 3 x RBW
- 4. Detector = Peak
- 5. Trace mode = max hold
- 6. Sweep = auto couple
- 7. The trace was allowed to stabilize

Test Setup

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





Test Notes

None

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Frequency [MHz]	Data Rate	Channel No.	Bluetooth Mode	Measured Bandwidth [kHz]	Minimum Bandwidth [kHz]	Pass / Fail
2402	125 kbps	37	LE	608.4	500	Pass
2440	125 kbps	17	LE	608.3	500	Pass
2480	125 kbps	39	LE	609.2	500	Pass
2402	500 kbps	37	LE	659.3	500	Pass
2440	500 kbps	17	LE	660.1	500	Pass
2480	500 kbps	39	LE	656.2	500	Pass
2402	1 Mbps	37	LE	663.5	500	Pass
2440	1 Mbps	17	LE	664.8	500	Pass
2480	1 Mbps	39	LE	661.6	500	Pass
2404	2 Mbps	0	LE	1142.6	500	Pass
2440	2 Mbps	17	LE	1144.1	500	Pass
2478	2 Mbps	36	LE	1141.7	500	Pass

Table 7-2. Conducted Bandwidth Measurements – Ant 1

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Test Report S/N:	Test Dates:	EUT Type:	Dego 12 of 04		
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Keysight Spectrum Analyzer - Occupied	BW						- 6 💌
XIRL RF 50Ω DC	Cent	SENSE:INT Ser Freq: 2.402000000 G : Free Run Avg en: 26 dB	ALIGN AUTO Hz Hold: 100/100	07:34:49 A Radio Std: Radio Dev		Trace/I	Detector
10 dB/div Ref 15.00 dl							
5.00	LA CONTRACTOR	In Ward An and a start of the s				CI	ear Writ
25.0							Averag
55.0						1	Max Ho
Center 2.402000 GHz Res BW 100 kHz		#VBW 300 kHz		Span 2 Sweep	.000 MHz 3.333 ms		Min Ho
Occupied Bandwi	dth .0413 MHz	Total Power	14.	ō dBm			Detecto Peak
Transmit Freq Error x dB Bandwidth	-1.669 kHz 608.4 kHz	% of OBW P x dB		9.00 % 00 dB		Auto	Ma
SG			STATU	5			

Plot 7-1. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps - Ch. 37) - Ant 1



Plot 7-2. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps – Ch. 17) – Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)				Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dego 14 of 04		
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🔤 Keysight Spectrum Analyzer - Occupied BW							
K RL RF 50Ω DC	Trig: I	SENSE:INT Freq: 2.480000000 GHz Free Run Avg Ho n: 26 dB	ALIGN AUTO	07:37:21 / Radio Std Radio Dev		Trace	e/Detector
10 dB/div Ref 15.00 dBm		print					
5.00 -5.00 -15.0						(Clear Write
-25.0							Average
-55.0 -65.0 -75.0							Max Hold
Center 2.480000 GHz #Res BW 100 kHz	#	VBW 300 kHz		Sweep	2.000 MHz 3.333 ms		Min Hol
Occupied Bandwidt	h 0404 MHz	Total Power	14.7	/ dBm			Detecto Peak
Transmit Freq Error	-421 Hz	% of OBW Po		9.00 %		Auto	Ma
x dB Bandwidth	609.2 kHz	x dB	-6.	00 dB			
MSG			STATUS	S			

Plot 7-3. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps - Ch. 39) - Ant 1



Plot 7-4. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps - Ch. 37) - Ant 1

FCC ID: A3LSMS938JPN		MEASUREMENT REPORT (CERTIFICATION)		
Test Report S/N:	Test Dates:	EUT Type:	Dage 15 of 04	
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🔤 Keysight Spectrum Analyzer - Occupied BW							×
LXIRL RF 50Ω DC	CORREC	SENSE:INT ter Freg: 2.440000000 (ALIGN AUTO	07:39:44 / Radio Std	M Dec 05, 2024	Trace/Detec	tor
NFE	🛶 Trig		Hold: 100/100	Radio Dev	vice: BTS		
	#IFGallI.LOW #/10			Rualo Be			
10 dB/div Ref 15.00 dBm							
5.00							
-5.00						ClearV	Vrite
-15.0							_
-25.0							
-35.0						Ave	rage
-45.0							
-55.0							
-65.0						Max	Hold
-75.0						max	Tora
Center 2.440000 GHz				- Cnon f			
#Res BW 100 kHz		#VBW 300 kHz			2.000 MHz 3.333 ms	Min	Hold
Occupied Bandwidth	n	Total Powe	r 18.	8 dBm			
	0455 MHz					Dete	ector
						P	eak▶
Transmit Freq Error	69 Hz	% of OBW F	ower 9	9.00 %		Auto	Man
x dB Bandwidth	660.1 kHz	x dB	-6	.00 dB			
MSG			STATU	JS			

Plot 7-5. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps - Ch. 17) - Ant 1



Plot 7-6. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps - Ch. 39) - Ant 1

FCC ID: A3LSMS938JPN		Approved by: Technical Manager				
Test Report S/N:	Test Dates:	EUT Type:	Dage 16 of 04			
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Keysight Spectrum Analyzer - Occupied BW							7 ×
XIRL RF 50Ω DC	CORREC	SENSE:INT Freg: 2.402000000 G	ALIGN AUTO	07:20:20 / Radio Std	M Dec 05, 2024	Trace/Dete	ctor
NFE	Trig:		Hold: 100/100	Radio Dev			
10 dB/div Ref 15.00 dBm							
5.00						Clear	Write
15.0						oroan	
25.0						Ave	eraq
45.0							5
65.0						Мах	Hol
-75.0							
Center 2.402000 GHz #Res BW 100 kHz	#	¢VBW 300 kHz			2.000 MHz 3.333 ms	Min	Hol
Occupied Bandwidt		Total Power	16.	5 dBm			
1.0	0317 MHz						ecto Peak
Transmit Freq Error	-1.775 kHz	% of OBW P	ower 99	9.00 %		Auto	Ma
x dB Bandwidth	663.5 kHz	x dB	-6	.00 dB			
G			STATU	IS			

Plot 7-7. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps - Ch. 37) - Ant 1



Plot 7-8. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps - Ch. 17) - Ant 1

FCC ID: A3LSMS938JPN		MEASUREMENT REPORT (CERTIFICATION)			
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Keysight Spectrum Analyzer -		3W									
RL RF 5	0Ω DC	CORREC		SENSE:INT Freq: 2.4800		ALIGN AU			M Dec 05, 2024	Trac	e/Detector
	NFE	⊷ _#IFGain:Low		ree Run	Avg Hold	: 100/10	0		ice: BTS		
0 dB/div Ref 15	i.00 dB	m									
.og 5.00			`								Clear Writ
5.00	/										
5.0											•
5.0											Avera
5.0											
5.0											Max Ho
enter 2.480000 GH Res BW 100 kHz	lz		#\	/BW 3001	kH7				.000 MHz 3.333 ms		
Occupied Bar	ndwid	th		Total F		1	6.4 dB				Min Ho
		.0342 M	Hz								Detect
Transmit Freq I	Irror	-90	4 Hz	% of O	BW Powe	ər	99.00	%		Auto	Main Main Main Main Main Main Main Main
x dB Bandwidth	n	661.6	kHz	x dB			-6.00 d	B			
G						S	TATUS				

Plot 7-9. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps - Ch. 39) - Ant 1



Plot 7-10. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 0) – Ant 1

FCC ID: A3LSMS938JPN		Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dage 19 of 04
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Plot 7-11. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps - Ch. 17) - Ant 1



Plot 7-12. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps - Ch. 36) - Ant 1

FCC ID: A3LSMS938JPN		Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dege 10 of 04
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Frequency [MHz]	Data Rate	Channel No.	Bluetooth Mode	Measured Bandwidth [kHz]	Minimum Bandwidth [kHz]	Pass / Fail
2402	125 kbps	37	LE	608.8	500	Pass
2440	125 kbps	17	LE	608.0	500	Pass
2480	125 kbps	39	LE	608.0	500	Pass
2402	500 kbps	37	LE	658.6	500	Pass
2440	500 kbps	17	LE	659.9	500	Pass
2480	500 kbps	39	LE	658.1	500	Pass
2402	1 Mbps	37	LE	663.9	500	Pass
2440	1 Mbps	17	LE	664.4	500	Pass
2480	1 Mbps	39	LE	665.3	500	Pass
2404	2 Mbps	0	LE	1142.0	500	Pass
2440	2 Mbps	17	LE	1145.6	500	Pass
2478	2 Mbps	36	LE	1142.2	500	Pass

Table 7-3. Conducted Bandwidth Measurements – Ant 2

FCC ID: A3LSMS938JPN		Approved by: Technical Manager				
Test Report S/N:	Test Dates:	EUT Type:	Dage 20 of 04			
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Plot 7-13. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps - Ch. 37) - Ant 2



Plot 7-14. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps – Ch. 17) – Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Plot 7-15. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps - Ch. 39) - Ant 2



Plot 7-16. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps - Ch. 37) - Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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🔤 Keysight Spectrum Analyzer - Occup	ed BW						×
LXI RL RF 50 Ω		SENSE:INT	ALIGN AUTO	07:58:22 AM Radio Std:	1Dec 05, 2024	Trace/Detect	or
NF			Hold: 100/100	Radio Devi			
10 dB/div Ref 15.00 d	dBm						
5.00						ClearW	/rite
-5.00							
-25.0						Aver	rage
-45.0							
-65.0						MaxH	lolo
-75.0							
Center 2.440000 GHz #Res BW 100 kHz		#VBW 300 kHz		Span 2. Sweep	.000 MHz 3.333 ms	Min H	lol
Occupied Bandw		Total Powe	16.6	6 dBm			
	1.0426 MHz	Ζ				Dete	cto eak
Transmit Freq Erro	r 161 H	z % of OBW F	ower 99	9.00 %			Ma
x dB Bandwidth	659.9 kH	z xdB	-6.	00 dB			
SG			STATUS	5			

Plot 7-17. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps - Ch. 17) - Ant 2



Plot 7-18. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps – Ch. 39) – Ant 2

FCC ID: A3LSMS938JPN		MEASUREMENT REPORT (CERTIFICATION)		
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Keysight Spectrum Analyzer - Occupied BW							
C RL RF 50 Ω DC	CORREC	SENSE:INT r Freg: 2.402000000	ALIGN AUTO	07:44:53 A Radio Std	M Dec 05, 2024	Trace/De	tector
NFE	Trig: I		Hold:>100/100	Radio Dev			
IO dB/div Ref 15.00 dBm							
5.00						Clea	ar Writ
15.0				The	nuranda		
35.0						A	verag
5.0							_
75.0						M	ax Hol
enter 2.402000 GHz Res BW 100 kHz	#	VBW 300 kHz			2.000 MHz 3.333 ms	м	in Ho
Occupied Bandwidt	h	Total Powe	16.4	1 dBm			
1.0	0317 MHz					D	etect Peak
Transmit Freq Error	919 Hz	% of OBW F	ower 99	9.00 %		Auto	Ma
x dB Bandwidth	663.9 kHz	x dB	-6.	.00 dB			
G			STATU	s			

Plot 7-19. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps - Ch. 37) - Ant 2



Plot 7-20. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps - Ch. 17) - Ant 2

FCC ID: A3LSMS938JPN		MEASUREMENT REPORT (CERTIFICATION)		
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Keysight Spectrum Analyzer - Occupied BW						-	- 6
RL RF 50Ω DC	CORREC	SENSE:INT	ALIGN	AUTO 07:46:59 Radio St	AM Dec 05, 2024	Trace/I	Detector
NFE	🛶 Trig	g: Free Run ten: 26 dB	Avg Hold:>100	/100	vice: BTS		
0 dB/div Ref 15.00 dBm							
og 5.00						CI	ear Writ
15.0							
35.0							Averaç
5.0							
5.0						'	Max Ho
enter 2.480000 GHz Res BW 100 kHz		#VBW 300 k	Hz		2.000 MHz 3.333 ms		Min Ho
Occupied Bandwidth		Total Po	ower	16.2 dBm			_
1.0	310 MHz						Detect Peal
Transmit Freq Error	374 Hz	% of OE	W Power	99.00 %		Auto	M
x dB Bandwidth	665.3 kHz	x dB		-6.00 dB			
G				STATUS			

Plot 7-21. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps - Ch. 39) - Ant 2



Plot 7-22. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps – Ch. 0) – Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Plot 7-23. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps - Ch. 17) - Ant 2



Plot 7-24. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps - Ch. 36) - Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager	
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7.3 Output Power Measurement – Bluetooth (LE)

<u>§15.247(b.3); RSS-247 [5.4(4)]</u>

Test Overview and Limits

The transmitter antenna terminal of the EUT is connected to the input of a spectrum analyzer. Measurements are made while the EUT is operating at maximum power and at the appropriate frequencies.

The maximum permissible conducted output power is 1 Watt.

Test Procedure Used

ANSI C63.10-2013 – Section 11.9.1.1 KDB 558074 D01 v05r02 – Section 8.3.1.1

Test Settings

- 1. RBW = 3MHz
- 2. VBW = 50MHz
- 3. Span ≥ 3 x RBW
- 4. Sweep = auto couple
- 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

Test Notes

None

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Frequency	Data Rate	Channel	Bluetooth	Peak Condu	cted Power
[MHz]	[Mbps]	No.	Mode	[dBm]	[mW]
2402	125 kbps	37	LE	11.02	12.647
2440	125 kbps	17	LE	12.32	17.049
2480	125 kbps	39	LE	11.31	13.533
2402	500 kbps	37	LE	11.32	13.561
2440	500 kbps	17	LE	12.34	17.128
2480	500 kbps	39	LE	11.55	14.296
2402	1 Mbps	37	LE	9.98	9.954
2440	1 Mbps	17	LE	10.74	11.847
2480	1 Mbps	39	LE	9.97	9.931
2404	2 Mbps	0	LE	10.03	10.069
2440	2 Mbps	17	LE	10.83	12.112
2478	2 Mbps	36	LE	10.13	10.306

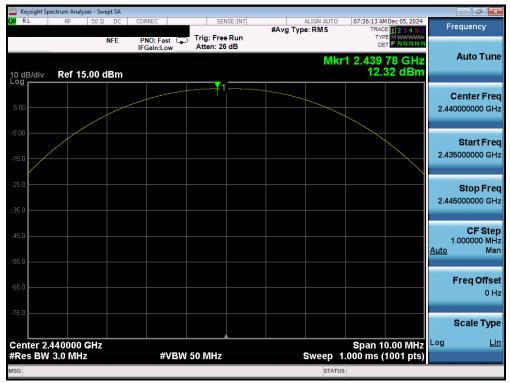
Table 7-4. Conducted Output Power Measurements (Bluetooth (LE)) - Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Keysight Spectrum Analyzer - Swept SA					
RL RF 50Ω DC	CORREC	SENSE:INT #	ALIGN AUTO	07:34:40 AM Dec 05, 2024 TRACE 1 2 3 4 5 (Peak Search
NFE		: 26 dB		TYPE M WWWWW DET P NNNN	
0 dB/div Ref 15.00 dBm			Mkr	1 2.402 23 GHz 11.020 dBm	NextPea
og					1
5.00					Next Pk Rig
5.00					
15.0					Next Pk Le
13.0					
25.0					Marker Del
35.0					
45.0					Mkr→C
56.0					IVIRI→C
65.0					Mkr→RefL
75.0					
					Мо
enter 2.402000 GHz				Span 10.00 MHz .000 ms (1001 pts)	1 of
Res BW 3.0 MHz	#VBW 50 MH	z	Sweep 1	.000 ms (1001 pts)	

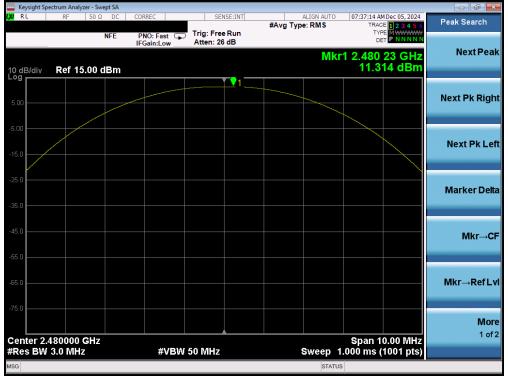
Plot 7-25. Peak Power Plot (Bluetooth (LE), 125kbps - Ch. 37) - Ant 1



Plot 7-26. Peak Power Plot (Bluetooth (LE), 125kbps - Ch. 17) - Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Plot 7-27. Peak Power Plot (Bluetooth (LE), 125kbps - Ch. 39) - Ant 1



Plot 7-28. Peak Power Plot (Bluetooth (LE), 500kbps - Ch. 37) - Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 20 of 04
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	ectrum Analyze						- 5 💌
L <mark>XI</mark> RL	RF	50 Ω DC	CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	07:39:36 AM Dec 05, 2024 TRACE 1 2 3 4 5 6	Peak Search
		NFE	PNO: Fast 🕞	Trig: Free Run Atten: 26 dB			NextPeak
10 dB/div Log	Ref 15.0	00 dBm			MKr	1 2.439 86 GHz 12.34 dBm	
5.00				¥1			Next Pk Right
-5.00							
-15.0							Next Pk Leff
-25.0							Marker Delta
-35.0							
-55.0							Mkr→CF
65.0							Mkr→RefLv
75.0							More
	440000 G 3.0 MHz	Hz	#VBW	50 MHz	Sweep 1	Span 10.00 MHz .000 ms (1001 pts)	1 of 2
MSG					STATUS		

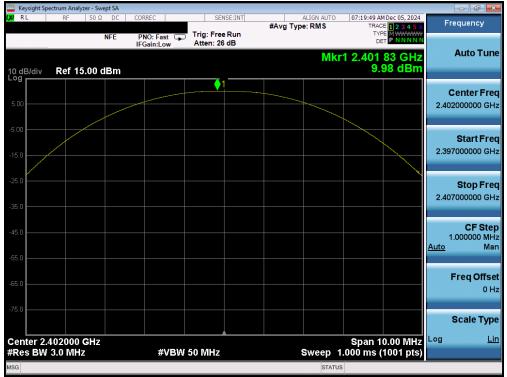
Plot 7-29. Peak Power Plot (Bluetooth (LE), 500kbps - Ch. 17) - Ant 1



Plot 7-30. Peak Power Plot (Bluetooth (LE), 500kbps - Ch. 39) - Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Plot 7-31. Peak Power Plot (Bluetooth (LE), 1Mbps - Ch. 37) - Ant 1



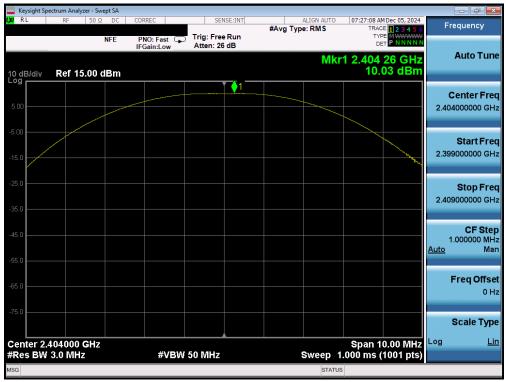
Plot 7-32. Peak Power Plot (Bluetooth (LE), 1Mbps - Ch. 17) - Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Keysight Spectrum Analyzer - RL RF 5					2 2 4 22 4 4 2	
KL R⊢ 5	0Ω DC CORRE		#Avg Ty		7:24:30 AM Dec 05, 2024 TRACE 1 2 3 4 5 6	Peak Search
	NFE PNO IFGai	: Fast Trig: Free in:Low Atten: 26	dB		TYPE MWWWW DET PNNNNN	
) dB/div Ref 15.0	0 dBm			Mkr1 2	2.480 22 GHz 9.97 dBm	Next Pea
°g						
5.00						Next Pk Rig
5.0						Next Pk Le
5.0						
5.0						Marker Del
15.0						Marker Dei
5.0						Mkr→C
5.0						
6.0						Mkr→RefL
5.0						
						Мо
enter 2.480000 GH	lz				Span 10.00 MHz 0 ms (1001 pts)	1 of
Res BW 3.0 MHz		#VBW 50 MHz		Sweep 1.00	0 ms (1001 pts)	

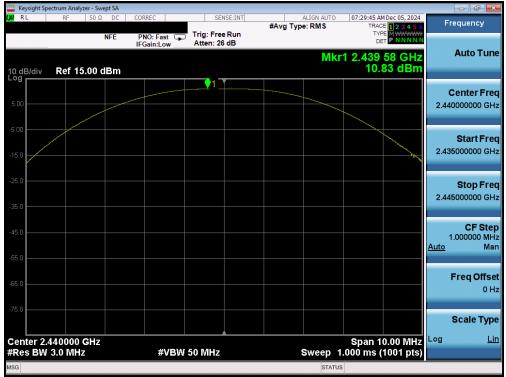
Plot 7-33. Peak Power Plot (Bluetooth (LE), 1Mbps - Ch. 39) - Ant 1



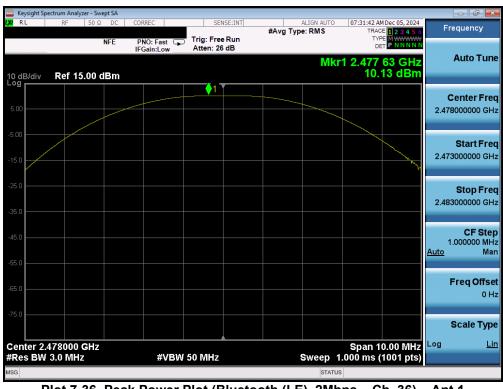
Plot 7-34. Peak Power Plot (Bluetooth (LE), 2Mbps - Ch. 0) - Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Plot 7-35. Peak Power Plot (Bluetooth (LE), 2Mbps - Ch. 17) - Ant 1



Plot 7-36. Peak Power Plot (Bluetooth (LE), 2Mbps - Ch. 36) - Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Frequency	Data Rate	Channel	Channel Bluetooth		cted Power
[MHz]	[Mbps]	No.	Mode	[dBm]	[mW]
2402	125 kbps	37	LE	9.52	8.943
2440	125 kbps	17	LE	10.36	10.872
2480	125 kbps	39	LE	9.64	9.200
2402	500 kbps	37	LE	9.29	8.496
2440	500 kbps	17	LE	10.17	10.409
2480	500 kbps	39	LE	9.66	9.247
2402	1 Mbps	37	LE	9.55	9.014
2440	1 Mbps	17	LE	10.19	10.438
2480	1 Mbps	39	LE	9.66	9.238
2404	2 Mbps	0	LE	9.45	8.810
2440	2 Mbps	17	LE	10.28	10.666
2478	2 Mbps	36	LE	10.02	10.048

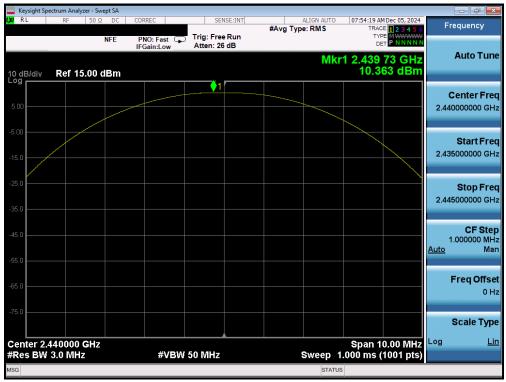
Table 7-5. Conducted Output Power Measurements (Bluetooth (LE)) – Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:		
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	m Analyzer - Swept					
RL	RF 50 Ω 1	DC CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	07:53:15 AM Dec 05, 2024 TRACE 1 2 3 4 5 6	Peak Search
	NF	E PNO: Fast IFGain:Low	Trig: Free Run Atten: 26 dB		DET P NNNN	
dB/div R	ef 15.00 dB	m		Mkı	1 2.401 76 GHz 9.52 dBm	Next Pea
.00			¹			Next Pk Rig
00						
5.0						Next Pk L
5.0						
5.0						Marker De
5.0						
5.0						Mkr→
5.0						Mkr→Refl
i.0						wiki →Keri
						M c 1 c
enter 2.402 Res BW 3.0		#V	3W 50 MHz	Sweep 1	Span 10.00 MHz 1.000 ms (1001 pts)	10
g				STATU		

Plot 7-37. Peak Power Plot (Bluetooth (LE), 125kbps - Ch. 37) - Ant 2



Plot 7-38. Peak Power Plot (Bluetooth (LE), 125kbps - Ch. 17) - Ant 2

FCC ID: A3LSMS938JPN		Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dage 26 of 04
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Keysight Spectrum Analyzer						- d ×
LXI RL RF	50 Ω DC	CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	07:55:19 AM Dec 05, 2024 TRACE 1 2 3 4 5 6	Frequency
10 dB/div Ref 15.0			Trig: Free Run Atten: 26 dB		туре Муники Det P NNNNN 1 2.479 78 GHz 9.64 dBm	Auto Tune
5.00			<u>1</u>			Center Freq 2.480000000 GHz
-15.0						Start Freq 2.475000000 GHz
-25.0						Stop Freq 2.485000000 GHz
-45.0						CF Step 1.000000 MHz <u>Auto</u> Man
-65.0						Freq Offset 0 Hz
-75.0						Scale Type
Center 2.480000 G #Res BW 3.0 MHz	Hz	#VBW 5	0 MHz	Sweep 1	Span 10.00 MHz I.000 ms (1001 pts)	Log <u>Lin</u>
MSG				STATU	S	

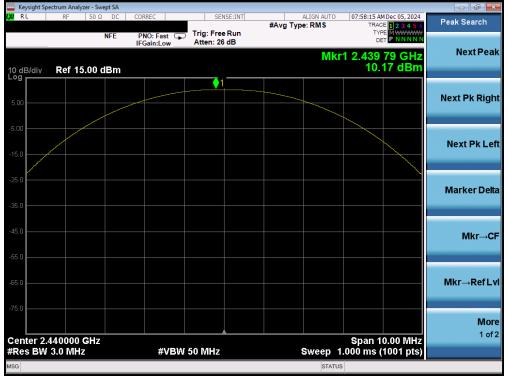
Plot 7-39. Peak Power Plot (Bluetooth (LE), 125kbps - Ch. 39) - Ant 2



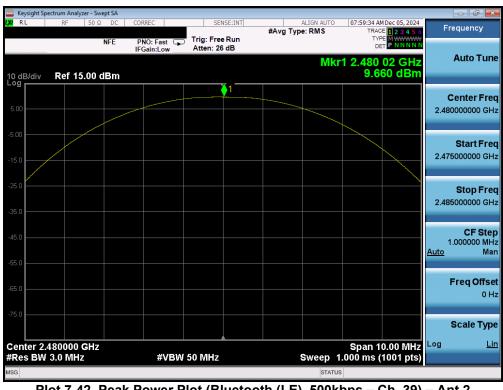
Plot 7-40. Peak Power Plot (Bluetooth (LE), 500kbps - Ch. 37) - Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 27 of 04
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Plot 7-41. Peak Power Plot (Bluetooth (LE), 500kbps - Ch. 17) - Ant 2



Plot 7-42. Peak Power Plot (Bluetooth (LE), 500kbps - Ch. 39) - Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dega 29 of 04
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	ectrum Analyze							
L <mark>XI</mark> RL	RF	50 Ω DC	CORREC	SENSE:INT	ALIGN #Avg Type: RI	MS TRA	AM Dec 05, 2024 ACE 1 2 3 4 5 6	Frequency
		NFE	PNO: Fast 🖵 IFGain:Low	Trig: Free Run Atten: 26 dB		Mkr1 2.401		Auto Tune
10 dB/div Log	Ref 15.	00 dBm				9.8	549 dBm	
5.00								Center Freq 2.402000000 GHz
-5.00								Start Freq 2.397000000 GHz
-25.0								Stop Fre q 2.407000000 GHz
-45.0								CF Step 1.000000 MH: <u>Auto</u> Mar
-65.0								Freq Offse 0 Hi
-75.0								Scale Type
Center 2.4 #Res BW		Hz	#VBW	50 MHz	Swe	Span Span 1.000 ms		Log <u>Lin</u>
MSG						STATUS		

Plot 7-43. Peak Power Plot (Bluetooth (LE), 1Mbps - Ch. 37) - Ant 2



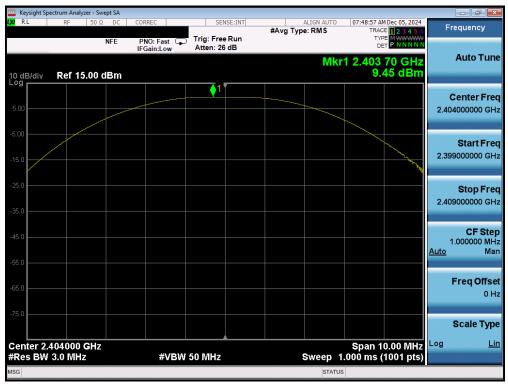
Plot 7-44. Peak Power Plot (Bluetooth (LE), 1Mbps - Ch. 17) - Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 20 of 04
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Keysight Spectrum Anal						
RL RF	50 Ω DC	CORREC	SENSE:INT	ALIGN AUTO	07:46:51 AM Dec 05, 2024	Frequency
	NFE	PNO: Fast 😱 IFGain:Low	Trig: Free Run Atten: 26 dB	#Avg Type: RMS	TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P NNNNN	
0 dB/div Ref 1:	5.00 dBm			Mkr	1 2.479 89 GHz 9.66 dBm	Auto Tui
°g			↓ 1			Center Fr
5.00						2.480000000 G
.00						2.4000000000
.00						Start Fr
5.0						2.475000000 G
5.0						Stop Fr
						2.485000000 G
5.0						
						CF St
5.0						1.000000 M
						<u>Auto</u> M
5.0						
5.0						Freq Offs
3.0						0
5.0						
						Scale Ty
	011-					Log
enter 2.480000 Res BW 3.0 MH		#VBW	50 MHz	Sween 1	Span 10.00 MHz .000 ms (1001 pts)	
		#VDVV	50 Mill2			
3				STATUS	3	

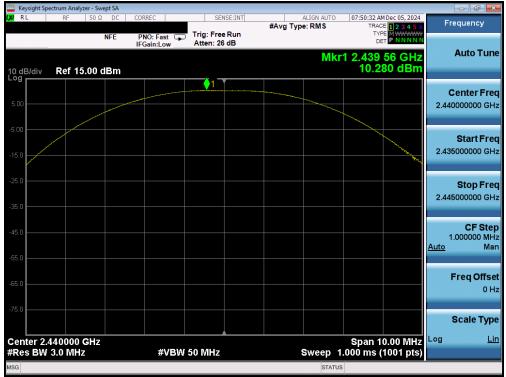
Plot 7-45. Peak Power Plot (Bluetooth (LE), 1Mbps - Ch. 39) - Ant 2



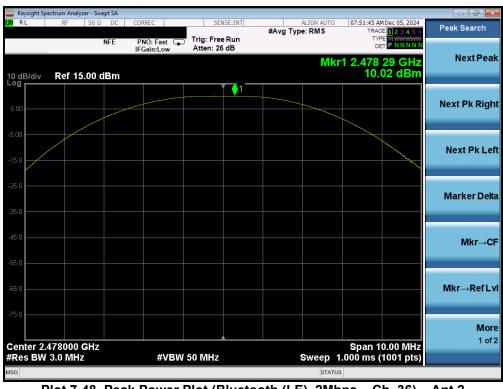
Plot 7-46. Peak Power Plot (Bluetooth (LE), 2Mbps - Ch. 0) - Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Plot 7-47. Peak Power Plot (Bluetooth (LE), 2Mbps - Ch. 17) - Ant 2



Plot 7-48. Peak Power Plot (Bluetooth (LE), 2Mbps - Ch. 36) - Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 41 of 04
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7.4 Power Spectral Density – Bluetooth (LE)

§15.247(e); RSS-247 [5.2]

Test Overview and Limit

The peak power density is measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power and at the appropriate frequencies.

The maximum permissible power spectral density is 8 dBm in any 3 kHz band.

Test Procedure Used

ANSI C63.10-2013 – Section 11.10.2 Method PKPSD KDB 558074 D01 v05r02 – Section 8.4 DTS Maximum Power Spectral Density level in the fundamental emission

Test Settings

- 1. Analyzer was set to the center frequency of the DTS channel under investigation
- 2. Span = 1.5 times the DTS channel bandwidth
- 3. RBW = 3kHz
- 4. VBW = 1MHz
- 5. Detector = peak
- 6. Sweep time = auto couple
- 7. Trace mode = max hold
- 8. Trace was allowed to stabilize

Test Setup

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



Figure 7-3. Test Instrument & Measurement Setup

Test Notes

None

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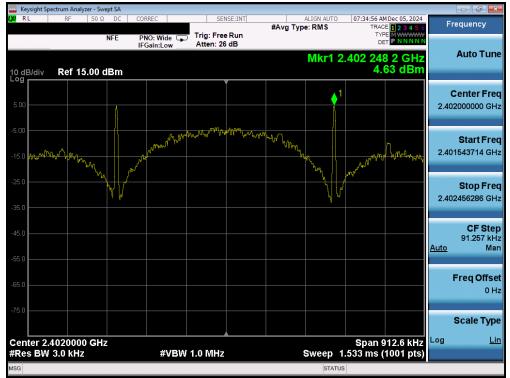


Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Measured Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]
2402	125 kbps	37	LE	4.63	8.0	-3.37
2440	125 kbps	17	LE	6.00	8.0	-2.00
2480	125 kbps	39	LE	4.91	8.0	-3.09
2402	500 kbps	37	LE	4.78	8.0	-3.22
2440	500 kbps	17	LE	5.84	8.0	-2.16
2480	500 kbps	39	LE	4.77	8.0	-3.23
2402	1 Mbps	37	LE	-6.18	8.0	-14.18
2440	1 Mbps	17	LE	-5.35	8.0	-13.35
2480	1 Mbps	39	LE	-6.46	8.0	-14.46
2404	2 Mbps	0	LE	-9.13	8.0	-17.13
2440	2 Mbps	17	LE	-8.46	8.0	-16.46
2478	2 Mbps	36	LE	-9.17	8.0	-17.17

Table 7-6. Conducted Power Density Measurements – Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager	
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Plot 7-49. Power Spectral Density Plot (Bluetooth (LE), 125kbps - Ch. 37) - Ant 1



Plot 7-50. Power Spectral Density Plot (Bluetooth (LE), 125kbps - Ch. 17) - Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dama 44 - 604	
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	ght Spectrun												
RL	F	KF 50			ORREC			#Avg Typ	ALIGN AUTO e: RMS	TRAC	M Dec 05, 2024	F	requency
0 dB/c	div Re	ef 15.00	NF I dB	IF	PNO:Wide C Gain:Low	Atten: 20			Mkr1 2	.480 24	ET P NNNNN 8 6 GHz 91 dBm		Auto Tur
5.00									¢ ¹				Center Fre
5.00	wany yang	physic why		av d	and the start and start an	WWWWWWWW	Am Why	hwyny wryny		Manaly	May Williams	2.4	Start Fre 79543093 GI
25.0		۲ 	LANN A									2.4	Stop Fr 30456907 GI
i5.0												<u>Auto</u>	CF Ste 91.381 kl M
5.0 -													Freq Offs 0
'5.0													Scale Typ
	er 2.480 BW 3.0		Hz		#VB	W 1.0 MHz			Sweep 1	Span 9 .533 ms (913.8 kHz 1001 pts)	Log	L
SG									STATU				

Plot 7-51. Power Spectral Density Plot (Bluetooth (LE), 125kbps - Ch. 39) - Ant 1

	Spectrum Analyze						
RL	RF	50 Ω DC	CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	07:38:32 AM Dec 05, 2024 TRACE 1 2 3 4 5 6 TYPE M	Frequency
		NFE	PNO: Wide 🖵 IFGain:Low	Trig: Free Run Atten: 26 dB		DET	
I0 dB/div	Ref 15.	00 dBm			Mkr1 2	.401 748 8 GHz 4.78 dBm	Auto Tun
^{-og}			1	Ĭ			Center Fre
5.00							2.402000000 GH
-5.00		AND and a	WWWWW	allow of the second	WWWWWWWWWWWWW	Minlan - na	Start Fre
-15.0		Addibater.			1	mand and the second sec	2.401505535 GH
25.0							Stop Fre
35.0							2.402494465 GH
45.0							CF Ste
							98.893 kH <u>Auto</u> Ma
55.0							
65.0							FreqOffse 0 ⊢
75.0							0
							Scale Typ
	2.4020000 N 3.0 kHz	GHz	#VBW	1.0 MHz	Sweep 1	Span 988.9 kHz .667 ms (1001 pts)	Log <u>Li</u>
ISG					STATU		

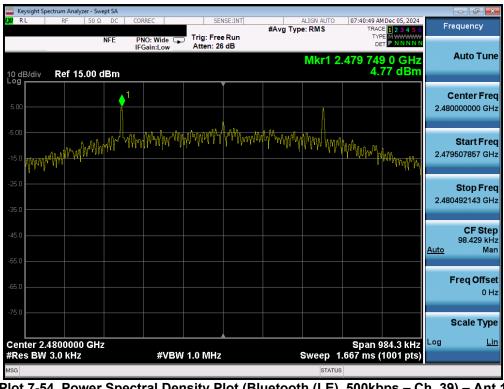
Plot 7-52. Power Spectral Density Plot (Bluetooth (LE), 500kbps - Ch. 37) - Ant 1

FCC ID: A3LSMS938JPN		MEASUREMENT REPORT (CERTIFICATION)				
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Mikr 2.439 748 5 GHz Center Freq 10 dB/div Ref 15.00 dBm 5.84 dBm 500 1 1 1 500 1 1 1 500 1 1 1 1 500 1 1 1 1 1 500 1 1 1 1 1 1 500 1 1 1 1 1 1 1 1 2.440000000 GHz 2.440000000 GHz 2.440040000 GHz 2.439504924 GHz 2.439504924 GHz 2.4400495076 GHz 2.4400 Man Freq Offset 0 Hz 0 Hz <t< th=""><th>Keysight Spectrum Analyzer - Swept SA</th><th></th><th></th><th></th><th></th></t<>	Keysight Spectrum Analyzer - Swept SA				
Mit Atten: 26 dB Mitri 2.439 748 5 GHz Auto Tune 10 dB/div Ref 15.00 dBm 5.84 dBm 2.44000000 GHz 500 1 1 1 1 1 1 1 500 1 </th <th>KI RF 50Ω DC</th> <th>CORREC SEN</th> <th></th> <th></th> <th></th>	KI RF 50Ω DC	CORREC SEN			
500 1	10 dB/div Ref 15.00 dBm		dB	Mkr1 2.439 74	B 5 GHz Auto Tune
-250	5.00	1		1	Center Freq 2.440000000 GHz
	-5.00 -15.0 pppppppppppppppppppppppppppppppppppp	Almalland and a second and a second	Y ^{AYA} MAYIMINI MANJUNA Y	they have are many	ALL 2 439504924 GHz
4450 4450 4570 45700 4570 45700 4570 4570 4570 4570 4570 4570 4570 4570	-25.0				Stop Freq 2.440495076 GHz
4650 0 Hz .750 0 Hz Center 2.4400000 GHz Span 990.2 kHz #Res BW 3.0 kHz #VBW 1.0 MHz	-45.0				99.015 kHz
Center 2.4400000 GHz #Res BW 3.0 kHz #VBW 1.0 MHz Sweep 1.667 ms (1001 pts)	-65.0				
	Center 2.4400000 GHz			Span 9	990.2 kHz
		#VBW 1.0 MHz			1001 pts)

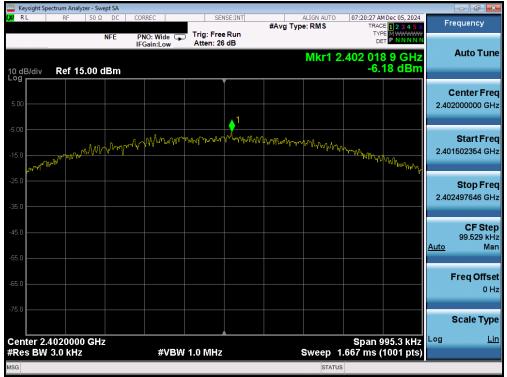
Plot 7-53. Power Spectral Density Plot (Bluetooth (LE), 500kbps - Ch. 17) - Ant 1



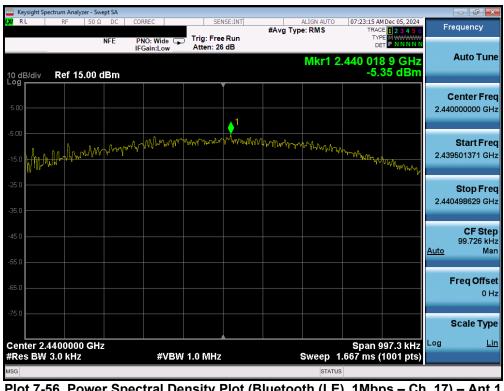
Plot 7-54. Power Spectral Density Plot (Bluetooth (LE), 500kbps - Ch. 39) - Ant 1

FCC ID: A3LSMS938JPN		MEASUREMENT REPORT (CERTIFICATION)				
Test Report S/N:	Test Dates:	EUT Type:	Dage 46 of 04			
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Plot 7-55. Power Spectral Density Plot (Bluetooth (LE), 1Mbps - Ch. 37) - Ant 1

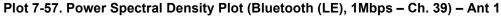


Plot 7-56. Power Spectral Density Plot (Bluetooth (LE), 1Mbps - Ch. 17) - Ant 1

FCC ID: A3LSMS938JPN		MEASUREMENT REPORT (CERTIFICATION)				
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	pectrum Analyzer -						
X/RL	RF 5	0Ω DC	CORREC	Trig: Free Run	ALIGN AUTO #Avg Type: RMS	07:24:47 AM Dec 05, 2024 TRACE 1 2 3 4 5 6	Frequency
10 dB/div	Ref 15.0	NFE 0 dBm	PNO: Wide	Atten: 26 dB	Mkr1 2	480 019 8 GHz -6.46 dBm	Auto Tun
5.00							Center Fre 2.480000000 GH
5.00 15.0	mmmmm	MrvMyr	MAMAN	www.waleryMaywelly	VIDATOWAY-AND WINDA	www.harrowww.	Start Fre 2.479503820 GF
25.0 35.0							Stop Fr 2.480496180 G
¥5.0							CF Ste 99.236 ki <u>Auto</u> M
i5.0							Freq Offs 0
75.0							Scale Ty
	.4800000 G / 3.0 kHz	Hz	#VBW		Sweep 1	Span 992.4 kHz .667 ms (1001 pts)	Log <u>L</u>
SG					STATUS	3	



	ectrum Analyz	er - Swept	t SA										
X/RL	RF	50 Ω NF	DC FE	CORREC		Trig: Fre		#Avg Typ	ALIGN AUTO	TRAC	M Dec 05, 2024 E 1 2 3 4 5 6 PE M WWWW P N N N N N	F	requency
10 dB/div	Ref 15	.00 dE	3m	IFGain:L	_ow	Atten: 26	dB		Mkr1 2	.404 00	5 1 GHz 13 dBm		Auto Tun
5.00													Center Fre 04000000 GH
15.00	Malalan .	lven	M	1 million	, mun	mentiont	1 Milirande	WW.M.M.	unhaladation	uhahuhan	Martwood In	2.40	Start Fre 03143062 GH
35.0												2.40	Stop Fre 04856938 GH
45.0												<u>Auto</u>	CF Ste 171.388 kH Ma
65.0													Freq Offs 0 H
75.0													Scale Typ
	4040000 3.0 kHz	GHz		;	#VBW	1.0 MHz			Sweep 2	Span 1 .867 ms (.714 MHz 1001 pts)	Log	Li
ISG									STATUS	5			

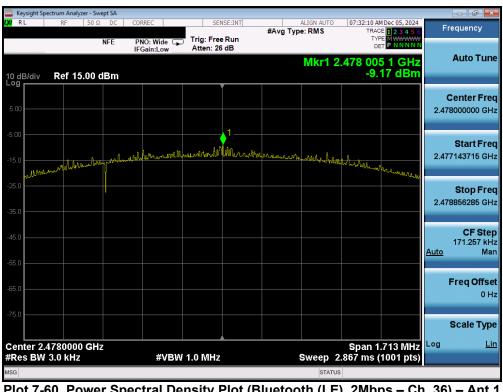
Plot 7-58. Power Spectral Density Plot (Bluetooth (LE), 2Mbps - Ch. 0) - Ant 1

FCC ID: A3LSMS938JPN		MEASUREMENT REPORT (CERTIFICATION)				
Test Report S/N:	Test Dates:	EUT Type:	Dage 49 of 04			
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	ectrum Analyzer										
LXI RL	RF 5	i0 Ω DC	CORREC		SE:INT	#Avg Typ	ALIGN AUTO e: RMS	TRAC	Dec 05, 2024	F	requency
10 dB/div	Ref 15.0	NFE 0 dBm	PNO: Wide IFGain:Low	Atten: 26			Mkr1 2	.440 00	5 1 GHz 46 dBm		Auto Tune
5.00					.1						Center Freq 10000000 GHz
-5.00 -15.0	marthlater	Antorenation	mulitaraman	mm	Warna	warm		Washing	har markely	2.43	Start Freq 9141955 GHz
-25.0										2.44	Stop Freq 0858045 GHz
-45.0										<u>Auto</u>	CF Step 171.609 kH Mar
-65.0											Freq Offsel 0 Hz
-75.0											Scale Type
Center 2. #Res BW	4400000 G 3.0 kHz	SHz	#VBW	1.0 MHz			Sweep 2	Span 1 .867 ms (.716 MHz 1001 pts)	Log	Lin
MSG							STATUS	6			

Plot 7-59. Power Spectral Density Plot (Bluetooth (LE), 2Mbps - Ch. 17) - Ant 1



Plot 7-60. Power Spectral Density Plot (Bluetooth (LE), 2Mbps - Ch. 36) - Ant 1

FCC ID: A3LSMS938JPN		MEASUREMENT REPORT (CERTIFICATION)				
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Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Measured Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]
2402	125 kbps	37	LE	3.07	8.0	-4.93
2440	125 kbps	17	LE	3.75	8.0	-4.25
2480	125 kbps	39	LE	3.22	8.0	-4.78
2402	500 kbps	37	LE	2.97	8.0	-5.03
2440	500 kbps	17	LE	3.67	8.0	-4.33
2480	500 kbps	39	LE	3.12	8.0	-4.88
2402	1 Mbps	37	LE	-6.63	8.0	-14.63
2440	1 Mbps	17	LE	-5.90	8.0	-13.90
2480	1 Mbps	39	LE	-6.43	8.0	-14.43
2404	2 Mbps	0	LE	-9.80	8.0	-17.80
2440	2 Mbps	17	LE	-9.02	8.0	-17.02
2478	2 Mbps	36	LE	-9.51	8.0	-17.51

Table 7-7. Conducted Power Density Measurements – Ant 2

FCC ID: A3LSMS938JPN		MEASUREMENT REPORT (CERTIFICATION)						
Test Report S/N:	Test Dates:	EUT Type:	Dega 50 of 04					
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Plot 7-61. Power Spectral Density Plot (Bluetooth (LE), 125kbps - Ch. 37) - Ant 2



Plot 7-62. Power Spectral Density Plot (Bluetooth (LE), 125kbps - Ch. 17) - Ant 2

FCC ID: A3LSMS938JPN		MEASUREMENT REPORT (CERTIFICATION)				
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Keysi RL	ight Spectrum				1							_	
KL	H	KF 50	Ω DC NFE	PNC): Wide 🗔	Trig: Free		#Avg Typ	ALIGN AUTO	TRAC	M Dec 05, 2024 E 1 2 3 4 5 6 PE M WWWW T P N N N N N	F	requency
0 dB/	div Re	ef 15.00	dBm		ain:Low	Atten: 26	dB		Mkr1 2	.479 74	9 2 GHz 22 dBm		Auto Tur
5.00				1					1				Center Fre
5.00	whony N	/ ^M าใ _{้ป} ากบา		. Ma	and And	WWWWWWWWWW	Lann ann ann ann ann ann ann ann ann ann	NANG WWW	And A		Auroun	2.4	Start Fre 79543998 Gi
25.0 - 35.0 -		· · · · ·								en e		2.4	Stop Fr 80456002 GI
i5.0												<u>Auto</u>	CF Ste 91.200 kl M
i5.0 —													Freq Offs 01
75.0 -													Scale Typ
ente Res	er 2.480 BW 3.0	0000 GI kHz	Iz		#VBW	/ 1.0 MHz			Sweep 1	Span 9 .533 ms (912.0 kHz 1001 pts)	Log	L
SG									STATUS				

Plot 7-63. Power Spectral Density Plot (Bluetooth (LE), 125kbps - Ch. 39) - Ant 2

	B-6 45 00						MKr1 2	.401 74	91 GHz 97 dBm		Auto Tui
0 dB/div ^{og} r	Ref 15.00	dBm			,			Z.	эт авш		
		1									Center Fr
		T I					Å			2.40	2000000 G
.00			0.0.0.0.	B = = off		4.04 0					
	an alashi	1	MMWWW	MMMMM	YAM ANA AN	hh. MArul h	MMW KIMMI	ไปประก เบ		2 40	Start Fr 1506046 G
5.0 MMM	WAR WANG CONTRACTION OF THE CONTRACT OF THE CONTRACT.	Υ ι				,		I. III WII	WILLING MAR	2.40	1506046 G
5.0									י יווי יו		Stop Fr
										2.40	2493954 G
5.0											
5.0											CF St
										Auto	98.791 k M
5.0											
5.0											Freq Offs
9.U											0
5.0											
											Scale Ty

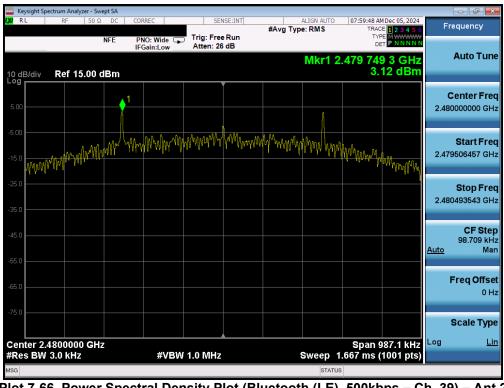
Plot 7-64. Power Spectral Density Plot (Bluetooth (LE), 500kbps - Ch. 37) - Ant 2

FCC ID: A3LSMS938JPN		MEASUREMENT REPORT (CERTIFICATION)				
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Keysight Spectrum Analyzer - Swept SA					- đ ×
LXX RL RF 50Ω DC	CORREC	SENSE:INT	#Avg Type: RMS	07:58:30 AM Dec 05, 2024 TRACE 1 2 3 4 5 6	Frequency
NFE	PNO: Wide IFGain:Low	Trig: Free Run Atten: 26 dB	Mkr1 2	439 748 6 GHz 3.67 dBm	Auto Tune
5.00	1				Center Freq 2.440000000 GHz
-5.00 -15.0 ppppppppp	MMMMMMM	al warden and a factor of the second se	ngolinovskiluriteljskih plikte	HAMPAR MUNITURA	Start Freq 2.439505072 GHz
-25.0					Stop Freq 2.440494928 GHz
-45.0					CF Step 98.986 kHz <u>Auto</u> Man
-65.0					Freq Offset 0 Hz
Center 2.4400000 GHz #Res BW 3.0 kHz	#\/B\A(1.0 MHz	Swaan 1	Span 989.9 kHz .667 ms (1001 pts)	Scale Type
#Res BW 3.0 KHZ	#VBVV		status		

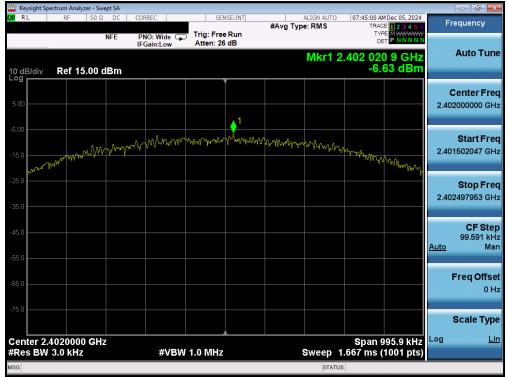
Plot 7-65. Power Spectral Density Plot (Bluetooth (LE), 500kbps - Ch. 17) - Ant 2



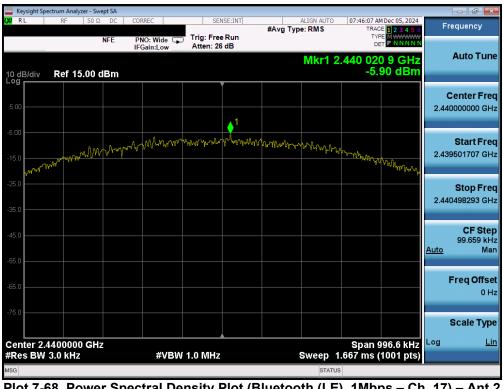
Plot 7-66. Power Spectral Density Plot (Bluetooth (LE), 500kbps - Ch. 39) - Ant 2

FCC ID: A3LSMS938JPN		MEASUREMENT REPORT (CERTIFICATION)				
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Plot 7-67. Power Spectral Density Plot (Bluetooth (LE), 1Mbps - Ch. 37) - Ant 2

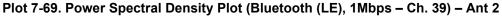


Plot 7-68. Power Spectral Density Plot (Bluetooth (LE), 1Mbps - Ch. 17) - Ant 2

FCC ID: A3LSMS938JPN		MEASUREMENT REPORT (CERTIFICATION)				
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	ectrum Analyze						- 6
XIRL	RF	50 Ω DC	CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	07:47:06 AM Dec 05, 2024 TRACE 1 2 3 4 5 6	Frequency
		NFE	PNO: Wide G	Trig: Free Run Atten: 26 dB		TYPE MWWWW DET PNNNNN	Auto Tun
I0 dB/div	Ref 15.0	00 dBm			Mkr1 2	2.480 021 0 GHz -6.43 dBm	Auto Tun
							Center Fre
5.00				_ 1			2.480000000 GH
5.00		Ana - Aman	MANN	wypys yr w yr hogogadd	WWW. Contraction and	a	Start Fre
15.0	WWW WARDOW	<u>Ulin A i</u>			witherstown	wmmyhullewhangave	2.479500988 GH
25.0						<u> </u>	Stop Fre
35.0							2.480499012 GI
15.0							CF Ste 99,802 kl
i5.0							Auto M
							Freq Offs
i5.0							01
'5.0							Scale Typ
	4800000	GHz				opan 330.0 km2	Log <u>L</u>
	3.0 kHz		#VBW	/ 1.0 MHz		1.667 ms (1001 pts)	
G					STATU	S	



	pectrum Analyzer										
XI RL	RF	50 Ω DC	CORREC	Trig: Free		#Avg Typ	ALIGN AUTO e: RMS	TRAC	M Dec 05, 2024 E 1 2 3 4 5 6 PE M WWWW T P N N N N N	F	requency
10 dB/div	Ref 15.0		IFGain:Low	Atten: 26	dΒ		Mkr1 2	.404 00	5 1 GHz 00 dBm		Auto Tun
-og 5.00											Center Fre 04000000 GH
5.00 15.0	www.white	July rolling	mulplannownum	mentindet	1 Murrit	hannenade	-	whenner	Mr. M. M. M. D. R. M.	2.40	Start Fre 03143519 GH
35.0										2.40	Stop Fre 04856481 GH
45.0										<u>Auto</u>	CF Ste 171.296 kH Ma
65.0											Freq Offs 0 H
75.0											Scale Typ
	4040000 C 3.0 kHz	GHz	#VBW	/ 1.0 MHz			Sweep 2	Span 1 .867 ms (.713 MHz 1001 pts)	Log	Li
ISG							STATUS	5			

Plot 7-70. Power Spectral Density Plot (Bluetooth (LE), 2Mbps - Ch. 0) - Ant 2

FCC ID: A3LSMS938JPN		MEASUREMENT REPORT (CERTIFICATION)				
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	pectrum Analyzer - S							
LXI RL	RF 50	Ω DC	CORREC	SENSE	#A\	ALIGN AUTO	07:50:47 AM Dec 05, 2024 TRACE 1 2 3 4 5	Frequency
10 dB/div	Ref 15.00	NFE dBm	PNO: Wide	Atten: 26 dB		Mkr1 2	2.440 005 2 GHz -9.02 dBm	Auto Tune
5.00								Center Freq 2.440000000 GHz
-5.00 -15.0	www.of al al allower to	NSTATION	and was never	warmali	www.www.	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	tothe manufally	Start Freq 2.439140786 GHz
-25.0								Stop Freq 2.440859214 GHz
-45.0								CF Step 171.843 kHz <u>Auto</u> Man
-65.0								Freq Offset 0 Hz
	.4400000 GH						Span 1.718 MHz	Scale Type
#Res BW		12	#VBW	/ 1.0 MHz		Sweep 2	Span 1.718 MHz 2.867 ms (1001 pts	
MSG						STATU	IS	

Plot 7-71. Power Spectral Density Plot (Bluetooth (LE), 2Mbps - Ch. 17) - Ant 2



Plot 7-72. Power Spectral Density Plot (Bluetooth (LE), 2Mbps - Ch. 36) - Ant 2

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7.5 Conducted Emissions at the Band Edge

<u>§15.247(d); RSS-247 [5.5]</u>

Test Overview and Limit

For the following out of band conducted spurious emissions plots at the band edge, the EUT was set to transmit at maximum power with the largest packet size available. These settings produced the worst-case emissions.

The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100kHz bandwidth.

Test Procedure Used

ANSI C63.10-2013 – Section 11.11.3 KDB 558074 D01 v05r02 – Section 8.7.2

Test Settings

- 1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
- 2. Span was set large enough so as to capture all out of band emissions near the band edge
- 3. RBW = 100kHz
- 4. VBW = 300kHz
- 5. Detector = Peak
- 6. Number of sweep points $\geq 2 \times \text{Span/RBW}$
- 7. Trace mode = max hold
- 8. Sweep time = auto couple
- 9. The trace was allowed to stabilize

Test Setup

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





Test Notes

None

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