

CERTIFICATION TEST REPORT

Report Number. : 4790976580-E7V1

- Applicant : SAMSUNG ELECTRONICS CO., LTD. 129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI, GYEONGGI-DO, 16677, KOREA
 - Model : SC-51E, SCG25
 - FCC ID : A3LSMS921JPN
- **EUT Description** : GSM/WCDMA/LTE 5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, NFC and WPT
- Test Standard(s) : FCC 47 CFR PART 15 SUBPART C

Date Of Issue: 2024-01-23

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Revision History

Rev.	Issue Date	Revisions	Revised By		
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

EUT DESCRIPTION: GSM/WCDMA/LTE 5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, NFC and WPT

MODEL: SC-51E, SCG25

SERIAL NUMBER: R3CWB0FGWAL, R3CWB0FGWFP (CONDUCTED); R3CWB0FGX5Z, R3CWB0FGXEX (RADIATED);

DATE TESTED:

2023-12-12 ~ 2024-01-22

	APPLICABLE STANDARDS				
STANDARD TEST RESULTS					
	47 CFR Part 15 Subpart C	Complies			

UL KOREA LTD. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL KOREA LTD. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL KOREA LTD. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL KOREA LTD. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with following methods.

- 1. FCC 47 CFR Part 2.
- 2. FCC 47 CFR Part 15.
- 3. KDB 558074 D01 15.247 Meas Guidance v05r02.
- 4. KDB 662911 D01 v02r01
- 5. ANSI C63.10-2013.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

218 Maeyeong-ro			
Chamber 1(3m semi-anechoic chamber)			
Chamber 2(3m semi-anechoic chamber)			
Chamber 3(3m semi-anechoic chamber)			
Chamber 4(3m Full-anechoic chamber)			
Chamber 5(3m Full-anechoic chamber)			

UL KOREA LTD. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <u>https://www.iasonline.org/wp-content/uploads/2017/05/TL-637-cert-New.pdf</u>.

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4. DECISION RULES AND MEASUREMENT UNCERTAINTY

4.1. METROLOGICAL TRACEABILITY

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB) 36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

AC Corrected Reading (dBuV) = Measured Voltage (dBuV) + Extension Cord Loss (dB) + Cable Loss (dB) 44.72 dBuV = 34.72 dBuV + 9.9 dB + 0.1 dB

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	2.80 dB
Radiated Disturbance, 30 MHz to 1 GHz	3.92 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.06 dB
Radiated Disturbance, 18 GHz to 40 GHz	6.02 dB

Uncertainty figures are valid to a confidence level of 95%.

4.4. DECISION RULES

Decision rule for statement(s) of conformity is based on Procedure 2, Clause 4.4.3 in IEC Guide 115:2021.

5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

The EUT is a GSM/WCDMA/LTE 5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, NFC and WPT. This test report addresses the DSS(Bluetooth) operational mode.

Representative	Difference	Derivative model		
model	Difference	SCG25		
SC-51E	Hardware	Same as SC-51E		
30-51E	Software	Different UI		

The model SC-51E was used for final testing and is representative of the test results in this report.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range [MHz]	Mode	Power Mode	Output Power [dBm]	Output Power [mW]
	Basic GFSK	Peak	18.420	69.502
	Basic GF3N	Average	18.014	63.299
2 402 ~ 2 480	Enhanced Pi/4-DPSK	Peak	17.390	54.828
2 402 ~ 2 400		Average	14.291	26.860
		Peak	17.920	61.944
	Enhanced of SK	Average	14.305	26.946

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5.3. DESCRIPTION OF AVAILABLE ANTENNAS

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 internal antenna was Permanently attached. Therefore this E.U.T Complies with the requirement of §15.203.

The radio utilizes a internal antenna, with a maximum gain of:

Frequency	ANT1 Gain	ANT2 Gain	Correlated Chains
Band[MHz]	[dBi]	[dBi]	Directional Gain[dBi]
DTS 2400 – 2483.5	-2.44	-3.89	-0.12

Directional gain for the MIMO operations is determined using KDB 662911 D01 Multiple Transmitter Output section F (2)(d)(1) for *Unequal antenna gains, with equal transmit powers*. The gain is calculated using the formula for correlated transmissions across the two transmit antennas.

Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2 / N_{ANT}] dBi.$ Sample calculation for this device with $N_{ANT} = 2$ Directional gain = $10 \log[(10^{-3.5/20} + 10^{-7.1/20})^2 / 2] = -2.1 dBi$

"BT/WIFI #1_2.4GHz" and "BT/WIFI #2_2.4GHz (SUB6_Ant J)" as indicated in antenna specification are written as ANT1 and ANT2 in this report.

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5.4. WORST-CASE CONFIGURATION AND MODE

Both Bluetooth Diversity mode and DUAL mode have been investigated and confirmed.

The fundamentals of the EUT were investigated in three orthogonal orientations X, Y and Z. It was determined that below table's orientation was the worst-case orientation.

ANT1	ANT2	DUAL
Х	Х	Х

For conducted power test, both Diversity and DUAL mode were verified and reported. In DUAL mode, except power test, no noticeable data was found. Tests was performed on Diversity mode.

Diversity mode test was performed on SISO and DUAL iPA mode.

Radiated and power line conducted tests were performed with EUT connected to AC power adapter as the worst-case configuration. Radiated harmonics spurious 1~18 GHz Low/Mid/High channels,18-26GHz were performed with the EUT set at the Diversity and DUAL mode. Radiated emission below 1GHz and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

For Radiated band-edge and spurious test, tests were performed on Diversity mode and DUAL mode.

All radiated and power line conducted tests were performed attached with travel adapter for the worst-case condition mode.

GFSK, Pi/4-DQPSK, 8PSK average Power are all investigated, The GFSK & 8PSK Power are the worst case. Testing is based on this mode to showing compliance.

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5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List							
Description	Description Manufacturer Model Serial Number FCC ID						
Charger	SAMSUNG	EP-TA800	R37W61WENTASEA	N/A			
Data Cable	SAMSUNG	EP-DN980	GH39-02117A	N/A			

I/O CABLE

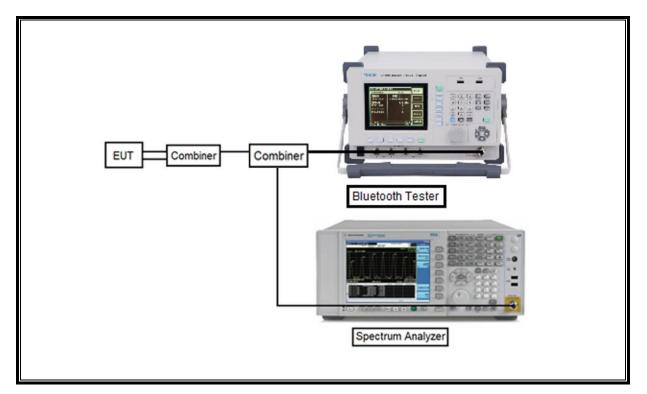
I/O Cable List							
Cable No.Port# of identical portsConnector TypeCable TypeCable Length (m)Remarks						Remarks	
1	DC Power	1	С Туре	Shielded	1.0 m	N/A	

TEST SETUP

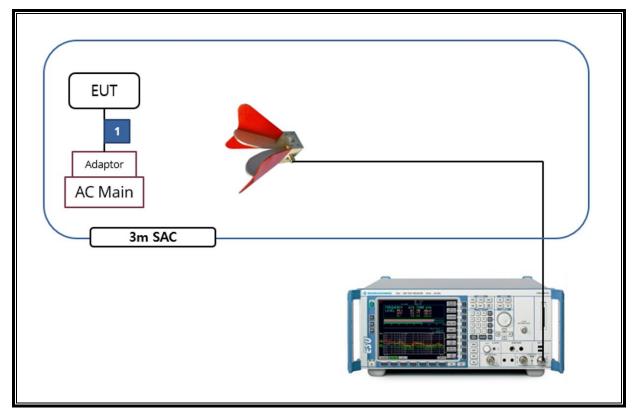
The EUT is continuously communicating to the Bluetooth tester during the tests. Test software enable BT communications.

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SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



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6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List							
Description	Manufacturer	Model	S/N	Cal Due			
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	2024-08-15			
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	2025-09-06			
Antenna, Horn, 18 GHz	ETS	3117	00168724	2024-08-04			
Antenna, Horn, 18 GHz	ETS	3117	00168717	2024-08-21			
Antenna, Horn, 40 GHz	ETS	3116C	00166155	2024-08-02			
Preamplifier	ETS	3115-PA	00167475	2024-07-25			
Preamplifier	ETS	3116C-PA	00168841	2024-07-25			
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	80108-0004	N/A			
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	110367-0003	N/A			
Preamplifier, 1000 MHz	Sonoma	310N	341282	2024-07-24			
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	2024-07-25			
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	2024-07-24			
Spectrum Analyzer, 44 GHz	KEYSIGHT	N9040B	MY60080268	2025-01-03			
Average Power Sensor	Agilent / HP	U2000	MY54270007	2024-07-23			
Average Power Sensor	Agilent / HP	U2000	MY54260010	2024-07-24			
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	2024-07-24			
Power Splitter	MINI-CIRCUITS	WA1534	UL003	2025-01-03			
Power Splitter	MINI-CIRCUITS	WA1534	UL004	2025-01-03			
Attenuator	PASTERNACK	PE7087-10	A009	2024-07-24			
Attenuator	PASTERNACK	PE7087-10	A001	2024-07-23			
EMI Test Receive, 40 GHz	R&S	ESU40	100439	2024-07-23			
EMI Test Receive, 40 GHz	R&S	ESU40	100457	2024-07-24			
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	2024-07-23			
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	2024-07-23			
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	2024-07-23			
LISN	R&S	ENV-216	101836	2024-07-23			
Termination	WEINSCHEL	M1406A	T09	2024-07-23			
	U	L Software					
Description	Manufacturer	Model	Ve	rsion			
Radiated software	UL	UL EMC	Ve	er 9.5			
AC Line Conducted software	UL	UL EMC	Ver 9.5				

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7. TEST RESULTS SUMMARY

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
2.1051, 15.247(d)	Band Edge / Conducted Spurious Emission	-20 dBc		Complies
15.247 (b)(1)	TX conducted output power	< 21 dBm		Complies
15.247 (a)(1)	Hopping frequency separation	> two-thirds of the 20 dB bandwidth	Conducted	Complies
15.247 (a)(1)(iii)	Number of Hopping channels	More than 15 non- overlapping channels		Complies
15.247 (a)(1)(iii)	Avg Time of Occupancy	< 8 dBm		Complies
15.207(a)	AC Power Line conducted emissions	Section 11	Power Line conducted	Complies
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m(Av)	Radiated	Complies

8. MEASUREMENT METHODS

20dB BW : ANSI C63.10, Section 6.9.2

99% BW : ANSI C63.10, Section 6.9.3

HOPPING FREQUENCY SEPARATION : ANSI C63.10, Section 7.8.2

NUMBER OF HOPPING CHANNELS : ANSI C63.10, Section 7.8.3

AVERAGE TIME OF OCCUPANCY : ANSI C63.10, Section 7.8.4

OUTPUT POWER : ANSI C63.10, Section 7.8.5.

Out-of-band EMISSIONS (Conducted) : ANSI C63.10, Section 7.8.6, 7.8.8

Out-of-band EMISSIONS IN NON-RESTRICTED BANDS: ANSI C63.10, Section 6.

Out-of-band EMISSIONS IN RESTRICTED BANDS : ANSI C63.10, Section 6.

AC Power Line Conducted Emission : ANSI C63.10-2013, Section 6.2.

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9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

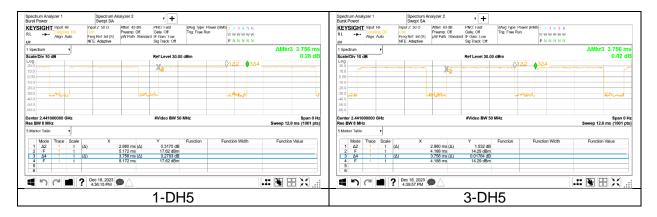
LIMITS

None; for reporting purposes only.

PROCEDURE

ANSI C63.10, Section 11.6 : Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS



Mode	On time [msec]	Period [msec]	Duty Cycle [%]	1/T Minimum VBW [kHz]
		2 400 ~ 2 4	83.5 MHz Band	
BDR	2.880	3.756	76.677	0.35
EDR	2.880	3.756	76.677	0.35

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9.2. 20 dB BANDWIDTH

<u>LIMITS</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW, unless otherwise specified by the applicable requirement. The sweep time is coupled.

RESULTS

Antenna	Channel	Frequency [MHz]	20 dB Bandwidth [kHz]
	0	2 402	942.6
ANT1	39	2 441	934.4
	78	2 480	938.0
	0	2 402	952.3
ANT2	39	2 441	950.0
	78	2 480	946.8
	Worst	952.3	

9.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

9.2.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Channel		Frequency	20 dB Bandwidth
Channel		[MHz]	[kHz]
	0	2 402	1 279.0
ANT1	39	2 441	1 278.0
	78	2 480	1 273.0
	0	2 402	1 320.0
ANT2	39	2 441	1 325.0
	78	2 480	1 328.0
Worst			1 328.0

Byscherum Analyzer 1 Descherum Analyzer 2 Spectrum Analyzer 3 Spectrum Analyzer 3 <th>Spectrum Analyzer 4 Occupied BW z</th>	Spectrum Analyzer 4 Occupied BW z
Bit Willing Part Value 50.00 dBm Bit Walue 50.00 dBm Long 30.0 30.0 30.0	
100 100 100 100 100 100 100 100	Span 3 Mitc Sweep 5.00 ms (1001 pts)
2 Metrics 2 Messare Trace 1 Total Power Total Power Total Power Not OBV Power	18.9 dBm
20 dB bandwidth / 0 CHANNEL 20 dB bandwidth / 0 CHA	
Spectrum Analyzer 1 Spectrum Analyzer 2 Spectrum Analyzer 2 Spectrum Analyzer 3 Spectr	Spectrum Analyzer 4 +
Example VS 60 @ Ref Value 50.00 dBm Ref Value 50.00 dBm 00 <	
Councer Control Total Power 24.1 dBm Transmit Freg Error -1.351 MHz % of OBW Power 90.00 % X dB Bandwidth % of OBW Power 90.00 % 7 X dB Bandwidth % of OBW Power 30.00 % % X dB Bandwidth % of OBW Power % of OBW Power % of OBW Power X dB Bandwidth % of OBW Power % of OBW Power % of OBW Power X dB Bandwidth % of OBW Power % of OBW Power % of OBW Power X dB Bandwidth % of OBW Power % of OBW Power % of OBW Power	18.7 dBm # 99.00 % -20.00 dB
20 dB bandwidth / 39 CHANNEL 20 dB bandwidth / 39 CHA	
Compinition 1 Compinit 1 Co	Span 3 Mic Sweep 5.00 ms (1001 pts) Trace 1 17.8 dBm r 98.00 % s -2000 dB
■ つ ⊂ ■ ? ¹ ¹ ¹ ¹ ² ² ² ² ¹ ²	

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EXAMPLE A LTD. Suwon Laboratory 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433 UL KOREA LTD. Confidential This report shall not be reproduced except in full with the rest This report shall not be reproduced except in full, without the written approval of UL KOREA LTD.

EDR ANT1	EDR ANT2			
Spectrum Analyzer 1 Spectrum Analyzer 2 + Burst Prover Occopied BW + Cocopied BW + KEVSIGHT Input RF Impa 25 00 Mitori 40 dB Ting Fice Run Conter Ficeg 240200000 GHz RL → Cogning US Corr Ficemp 000 Each 01 Adda 200/200 RL → Cogning US Corr Fice Run Paragroup Conter Ficeg 240200000 GHz	Bpectrum Analyzer 1 Spectrum Analyzer 2 Spectrum Analyzer 3 Spectrum Analyzer 4 • •			
DV IP+E / Anapose 1 Corph - ScabilDir 15.0 dB Ref Value 50.00 dBm 50.0 -	QV NFE: Adaptive 1 Graph			
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■ C ■ ? ^{CC}	20 dB bandwidth / 0 CHANNEL			
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Z Metrics • Occupied Bannwidth 1.1533 MHz: Trace 1 Total Power 21.0 dBm Transmit Froe time 50 of ORW Power x dB Bandwidth 1.278 MHz % of ORW Power 260.00 dB	2 Minics • Occupied Bandwidth 1.666 MHz; Transmi Preg Cran - 2,246 kHz; x dB Bandwidth 1.325 MHz; % of OBW Power % of OBW Power			
■ つ ⊂ ■ ? ^{00:18,203} ● 20 dB bandwidth / 39 CHANNEL	■っで■? Dec 19, 2022 ●△ 20 dB bandwidth / 39 CHANNEL			
Spectrum Analyzer 1 Spectrum Analyzer 2 ↓ Burst Power Cocupied BW ↓ KEVSIGHT Provider Image: Cocupied BW ↓ KEVSIGHT Provider Image: Cocupied BW ↓ RL ↓ Cocupied BW ↓ V Application Statement Provider ↓ V Application Statement Provider ↓	Spectrum Analyzer 1 Spectrum Analyzer 2 Spectrum Analyzer 3 Spectrum Analyzer 4 Smept SA Spectrum Analyzer 4 + + KEYSIGHT Incort Filter Spectrum Analyzer 4 + + A Spectrum Analyzer 5A Spectrum Analyzer 4 + + KEYSIGHT Incort Filter Spectrum Analyzer 5A Spectrum Analyzer 4 + + A + + Name 5A Spectrum Analyzer 4 + + L + Assoc 5B Filter Spectrum Analyzer 4 + + + L + Assoc 5B Filter Spectrum Analyzer 4 +			
Couph 1 Scale/DF 15.0 dB Part Value 50.00 dBm Log 1	1 Graph Scale Div 5.0 dB Ref Value 50.00 dBm			
200 500 100 400 400 400 500 700 800 700	200			
Center 240000 0Hz Span 3 MHz Span 3 MHz Span 5 MHz Span	Centre 2.460000 CHz Span 3 MHz #Res BW 30.000 KHz Sweep 5.00 ms (1001 pts) 2 Metrics •			
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■ つ C ■ ? 00:18,2023 ● 20 dB bandwidth / 78 CHANNEL				

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EXAMPLE A LTD. Suwon Laboratory 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433 UL KOREA LTD. Confidential This report shall not be reproduced except in full with the rest This report shall not be reproduced except in full, without the written approval of UL KOREA LTD.

9.3. HOPPING FREQUENCY SEPARATION

<u>LIMITS</u>

FCC §15.247 (a) (1)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

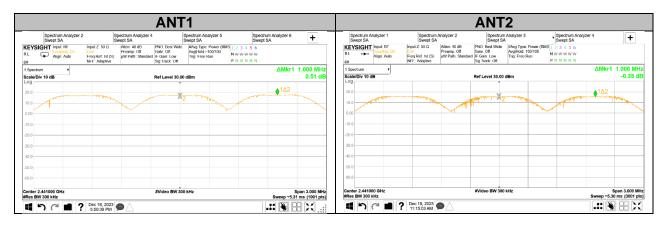
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel. The VBW is set to VBW >= RBW. The sweep time is coupled.

RESULTS

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9.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



9.3.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

	A	NT1			A	NT2	
Spectrum Analyzer 1 Swept SA	Spectrum Analyzer 2 Swept SA	Spectrum Analyzer 3 +		Spectrum Analyzer 1 Swept SA	Spectrum Analyzer 2 S Swept SA S	pectrum Analyzer 3 Spect wept SA Swep	trum Analyzer 4 et SA
RL + Coupling DC Corr Align: Auto Freq I	Z 50 0 Atten: 40 dB PNO B Preamp: Off Gate: 0 Ref. Int (S) µW Path: Standard IF Gain: Adaptive Sig Trac	AwgHold: 100/100 M W W W W Low Trig: Free Run M W W W W		RL +++ Align: Auto	Input Z: 50 Q Atten: 40 dB PNO: Bes Corr Preamp: Off Gate: Off Freq Rof. Int (S) WFE: Adaptive Standard IF Gain: U	Avg[Hold: 100/100 M W W W ow Trig: Free Run	FW W
1 Spectrum v Scale/Div 10 dB	Ref Lev	el 30.00 dBm	ΔMkr1 1.000 MHz -0.18 dB	1 Spectrum	Ref Leve	el 30.00 dBm	ΔMkr1 1.000 MH -2.03 dB
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10.0				-10.0			
-20.0				-20.0			
40.0				-40.0			
60.0				-60.0			
Center 2.441000 GHz Res BW 300 kHz	#Video	BW 300 kHz	Span 3.000 MHz Sweep ~5.30 ms (3001 pts)	Center 2.441000 GHz #Res BW 300 kHz		BW 300 kHz	Span 3.000 MF Sweep ~5.30 ms (3001 pt
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9.4. NUMBER OF HOPPING CHANNELS

LIMITS

FCC §15.247 (a) (1) (iii)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 nonoverlapping channels.

TEST PROCEDURE

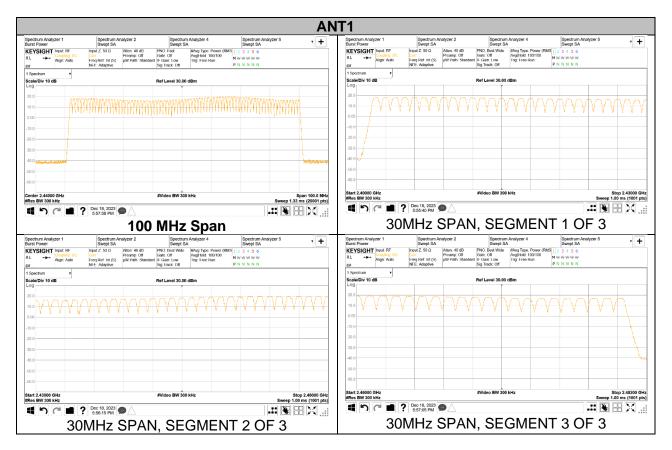
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller. The analyzer is set to Max Hold.

RESULTS

Normal Mode: All Channels Observed

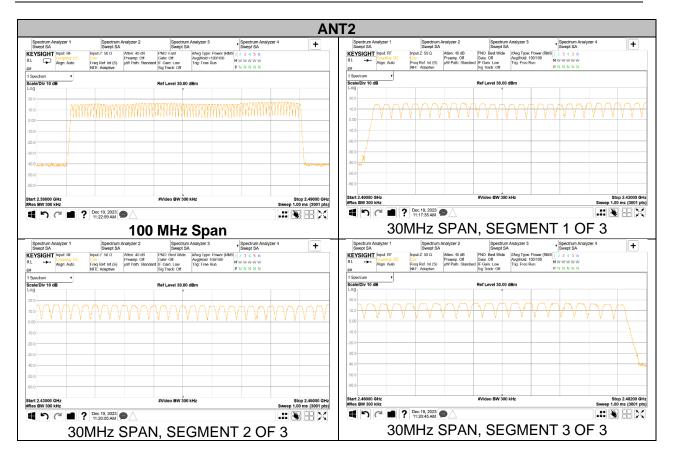
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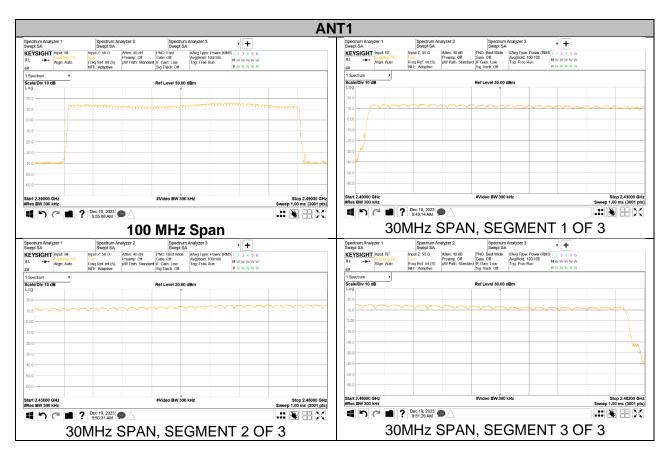
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REPORT NO: 4790976580-E7V1 FCC ID: A3LSMS921JPN



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9.4.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



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REPORT NO: 4790976580-E7V1 FCC ID: A3LSMS921JPN

					AN							
Spectrum Analyzer 1 Swept SA	Spectrum Analyzer 2 Swept SA Input Z: 50 Q Atten: 40 dB	Spectri Swept	um Analyzer 3 SA 4Avg Type: Power (RMS	Spectrum Analyzer 4 Swept SA	+	Spectrum Analyzer 1 Swept SA KEYSIGHT Input: RF	Spectrum Analyzer 2 Swept SA Input Z: 50 D Atten: 40 dB	Spectrur Swept S PNC: Best Wide	n Analyzer 3 A ///Avg Type: Power (I	Spectrum Anal Swept SA RMS 1 2 3 4 5 6	lyzer 4	+
L + Align: Auto	Corr Preamp: Off	Gate: Off IF Gain: Low Sig Track: Off	Avg(Hold: 100/100 Tria: Free Run	M W W W W W P N N N N N		RL ++ Coupling. DC Align: Auto	Corr Preamp. Off	Gate: Off IF Gain: Low Sig Track: Off	Avg Hold: 100/100 Trig: Free Run	MWWWWW PNNNN		
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0.0												
art 2.39000 GHz tes BW 300 kHz		#Video BW 3	00 kHz		Stop 2.49000 GHz ep 1.00 ms (3001 pts)	Start 2.40000 GHz #Res BW 300 kHz		#Video BW 30) kHz			p 2.43000 G ms (3001 p
	P Dec 19, 2023					4 h C 1	? Dec 19, 2023					
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L ++ Align: Auto	Spectrum Analyzer 2 Swept SA Input Z: 50 Q Atten: 40 dB Corr Preamp: Off	Spectri Swept PNO: Best Wide Gate: Off	um Analyzer 3 SA e #Avg Type: Power (RMS Avg[Hold: 100/100 Tria: Free Run	Swept SA		Spectrum Analyzer 1 Swept SA KEYSIGHT Input RF RL Auto	Spectrum Analyzer 2 Swept SA Input 2: 50 Q Atten: 40 dB Corr Preamp. Off	Spectrur Swept S PNC: Best Wide Gale: Off	n Analyzer 3 A #Avg Type: Power (I Avg Hold.>100/100	Spectrum Anal Swept SA		+
Swept SA	Spectrum Analyzer 2 Swept SA Input Z: 50 0 Corr Freq Ref. Int (S) W/Path: Stan	PND: Hest Wid Gate: Off IF Gain: Low	um Analyzer 3 SA e «Awg Type: Power (RMS Awg Hold: 100/100 Trig: Free Run	Swept SA 1 2 3 4 5 6 M W W W W W		Spectrum Analyzer 1 Sweet SA KEYSIGHT Input RF RL Coupling DC Align Auto Scale/DDV 10 dB	Spectrum Analyzer 2 Swept SA Input 2: 50 Ω Atten: 40 dB Corr Preamp. Off Frig Rof. Int (S) µW Path. Star	Spectrur Swept S PNO: Best Wide Gate: Off Indard IF Gain: Low	n Analyzer 3 A #Avg Type: Power (I Avg[Hoid.>100/100 Trig: Free Run	RMS 1 2 3 4 5 6 M W W W W		+
Swept SA EYSIGHT Input: RI- Coupling: DC Align: Auto Spectrum sale/Div 10 dB	Spectrum Analyzer 2 Swept SA Input Z: 50 0 Corr Freq Ref. Int (S) W/Path: Stan	Spectn Swept PNC: Hest Wid Gate: Off IF Gain: Low Sig Track: Off	um Analyzer 3 SA e «Awg Type: Power (RMS Awg Hold: 100/100 Trig: Free Run	Swept SA 1 2 3 4 5 6 M W W W W W		Spectrum Analyzer 1 Sweet SA KEYSIGHT Input RF RL Coopering DC Xign Auto U Seectrum Seector 10 dB	Spectrum Analyzer 2 Swept SA Input 2: 50 Ω Atten: 40 dB Corr Preamp. Off Frig Rof. Int (S) µW Path. Star	Spectrur Swept S Best Wide Gale. Off IF Gain. Low Sig Track: Off	n Analyzer 3 A #Avg Type: Power (I Avg[Hoid.>100/100 Trig: Free Run	RMS 1 2 3 4 5 6 M W W W W)+
Swept SA EYSIGHT Input RF Coupling DC Align: Auto Spectrum	Spectrum Analyzer 2 Swept SA Input Z: 50 0 Corr Freq Ref. Int (S) W/Path: Stan	Spectn Swept PNC: Hest Wid Gate: Off IF Gain: Low Sig Track: Off	um Analyzer 3 SA e «Awg Type: Power (RMS Awg Hold: 100/100 Trig: Free Run	Swept SA 1 2 3 4 5 6 M W W W W W		Spectrum Analyzer 1 Sweet SA KEYSIGHT Input RF RL Coupling DC Align Auto Scale/DDV 10 dB	Spectrum Analyzer 2 Swept SA Input 2: 50 Ω Atten: 40 dB Corr Preamp. Off Frig Rof. Int (S) µW Path. Star	Spectrur Swept S Best Wide Gale. Off IF Gain. Low Sig Track: Off	n Analyzer 3 A #Avg Type: Power (I Avg[Hoid.>100/100 Trig: Free Run	RMS 1 2 3 4 5 6 M W W W W)+
Swept SA EYSIGHT Input RI- Couping DC Align: Auto Spectrum	Spectrum Analyzer 2 Swept SA Input Z: 50 0 Corr Freq Ref. Int (S) W/Path: Stan	Spectn Swept PNC: Hest Wid Gate: Off IF Gain: Low Sig Track: Off	um Analyzer 3 SA e «Awg Type: Power (RMS Awg Hold: 100/100 Trig: Free Run	Swept SA 1 2 3 4 5 6 M W W W W W		Spectrum Analyzer 1 Sweet SA KEYSIGHT Input RF RL Coopering DC Xign Auto U Seectrum Seector 10 dB	Spectrum Analyzer 2 Swept SA Input 2: 50 Ω Atten: 40 dB Corr Preamp. Off Frig Rof. Int (S) µW Path. Star	Spectrur Swept S Best Wide Gale. Off IF Gain. Low Sig Track: Off	n Analyzer 3 A #Avg Type: Power (I Avg[Hoid.>100/100 Trig: Free Run	RMS 1 2 3 4 5 6 M W W W W]+
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Severt SA L V Agent Ado Agent Ado Severture 1 Severture 1 Severure 1 Severure 1 Severure 1 Severure 1 Severure 1	Spectrum Analyzer 2 Swept SA Input Z: 50 0 Corr Freq Ref. Int (S) WY Path: Stan	Spectn Swept PNC: Hest Wid Gate: Off IF Gain: Low Sig Track: Off	um Analyzer 3 SA e «Awg Type: Power (RMS Awg Hold: 100/100 Trig: Free Run	Swept SA 1 2 3 4 5 6 M W W W W W		Spectrum /resyster 1 KEYSIGHT Instant IP RI Views And Sector I Spectrum / Sector I Sector I Spectrum / Sector I 1 Spectrum / Sector I 20 20 20 20 20 20 20 20 20 20	Spectrum Analyzer 2 Swept SA Input 2: 50 Ω Atten: 40 dB Corr Preamp. Off Frig Rof. Int (S) µW Path. Star	Spectrur Swept S Best Wide Gale. Off IF Gain. Low Sig Track: Off	n Analyzer 3 A #Avg Type: Power (I Avg[Hoid.>100/100 Trig: Free Run	RMS 1 2 3 4 5 6 M W W W W		
Sector State	Spectrum Analyzer 2 Swept SA Input Z: 50 0 Corr Freq Ref. Int (S) WY Path: Stan	Spectn Swept PNC: Hest Wid Gate: Off IF Gain: Low Sig Track: Off	um Analyses 3 SA a fully tipe House (Alless Angled) total Top Free Run b0 dBm	20000056A 12 2 4 5 6 W W W W W P N N N N 	+ Stop 2.4600 CHz	300 300 300 300 300 300 300 300	Spectrum Analyzer 2 Swept SA Input 2: 50 Ω Atten: 40 dB Corr Preamp. Off Frig Rof. Int (S) µW Path. Star	Spectrur Swept S Best Wide Gale. Off IF Gain. Low Sig Track: Off	n Analyzer 3 App Tipos Prover (et al. 1997) App Tipos Prover (et al. 1997) App Face Prove (et al. 1997) App Face Pace (et al. 1997) App Face	RMS 1 2 3 4 5 6 M W W W W	yzar 4	p 2.48200 G
Severt SA EVSIGHT Implement All EVSIGHT Implement All Severture I Severture I	popular di la conservazione di la conserv	Spectra Severy (INR) Meta Vela Cate Off and JF Gara Low Sig Track: Off Ref Level 30.0	um Analyses 3 SA a fully tipe House (Alless Angled) total Top Free Run b0 dBm	30vert 5A 2 4 5 6 W W W W W P N N N N 	* \$100,2.46000 CHz; \$100,2.46000 CHz; \$100,000 (201) [25]	Spectrum Analyzer 1 Spectrum Analyzer 1 REVSIGHT Insut für RL Spectrum Sacharn S	Severe um Arabyzer 2 Severe 12 20 20 Prod 2 20 20 Prog Rof tr (15) Wert Adaptive	Spectrum IPAC Development Porto Entro Solution Ref Level 30.00 Porto Entro Porto Entro Po	n Analyzer 3 App Tipos Prover (et al. 1997) App Tipos Prover (et al. 1997) App Face Prove (et al. 1997) App Face Pace (et al. 1997) App Face	RMS 1 2 3 4 5 6 M W W W W	yzer 4	p 2.48200 GH
Sector A EVSGHT Percent Sector I Sector I	Spectrum Analyzer 2 Swept SA Input Z: 50 0 Corr Freq Ref. Int (S) WY Path: Stan	Spectra Swept Jacob Near Wal- Cate Off Ref Level 30. Sig Track: Off Ref Level 30.	um Analyses 3 SA a fully tipe House (Bitts Angled 1000) Top Free Run 80 dBm 00 kHz	30vept 6A 2 - 4 - 5 6 M W W W W W P N N N N 	Stop 2.46000 CHr. ep 1.00 ms (000 Pts)	Spectrum Analyzer 1 Spectrum Analyzer 1 REVSIGAIT Insur für RL 200 Spectrum V Sachart 2 Adelood Off- Start 2 Adelood Off-	Spectrum Analyzer 2 Swept SA Input 2: 50 Ω Atten: 40 dB Corr Preamp. Off Frig Rof. Int (S) µW Path. Star	Refer to the training of the t	n Analyzer 3 Kłosą Type Towar (b. Agilada - 100 Trig. Free Ram dBm dBm błłz błłz	Species in Arab Species in Arabitrary Species i	yzer 4	p 2.48200 Gi

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9.5. AVERAGE TIME OF OCCUPANCY

LIMITS

FCC §15.247 (a) (1) (iii)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 3.16 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

For AFH mode, the average time of occupancy in the specified 8 second period (20 channels * 0.4 seconds) is equal to 10 * (# of pulses in 0.8 s) * pulse width.

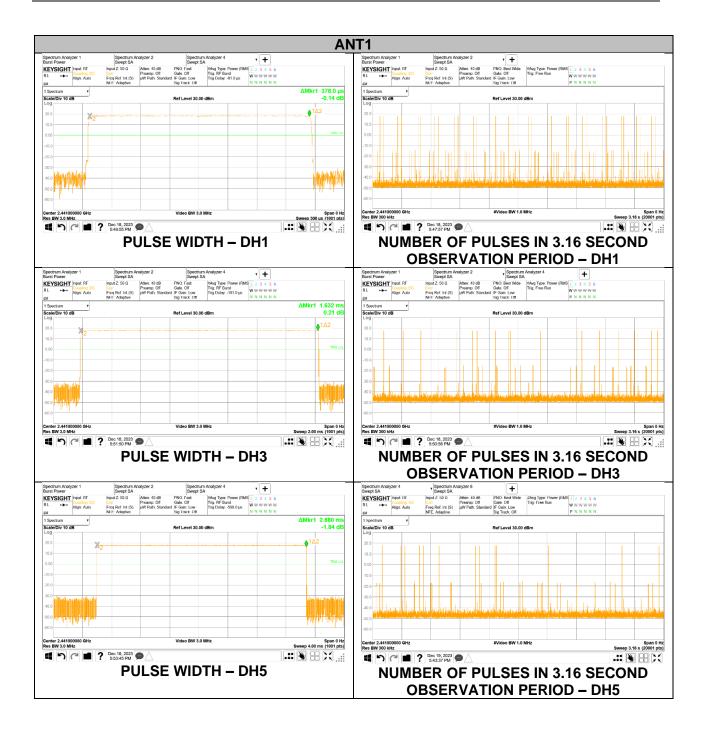
RESULTS

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9.5.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

DH Packet	Pulse Width [msec]	Number of Pulses in 3.16	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
	[iii3co]	seconds	[300]	[300]	[300]
		GFSK Norm	hal ANT1		
DH1	0.378	32	0.121	0.4	-0.279
DH3	1.632	19	0.310	0.4	-0.090
DH5	2.880	13	0.374	0.4	-0.026
DH Packet	Pulse	Number of	Average Time	Limit	Margin
	Width	Pulses in	of Occupancy		
	[msec]	0.8 seconds	[sec]	[sec]	[sec]
		GFSK AFI	HANT1		
DH1	0.378	8	0.030	0.4	-0.370
DH3	1.632	4.75	0.078	0.4	-0.322
DH5	2.880	3.25	0.094	0.4	-0.306

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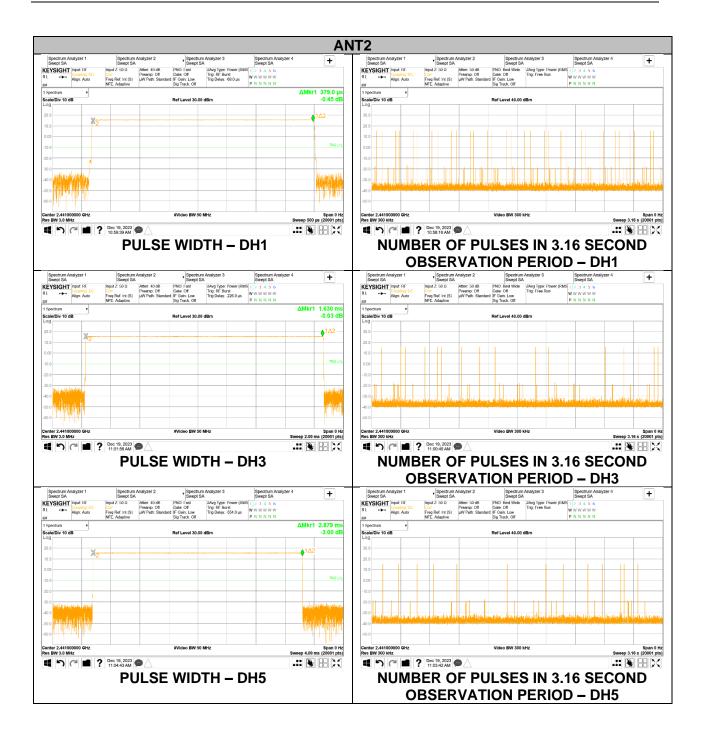


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DH Packet	Pulse Width [msec]	Number of Pulses in 3.16	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
		seconds			
		GFSK Norm	nal ANT2	1	
DH1	0.379	32	0.121	0.4	-0.279
DH3	1.630	17	0.277	0.4	-0.123
DH5	2.879	13	0.374	0.4	-0.026
DH Packet	Pulse	Number of	Average Time	Limit	Margin
	Width	Pulses in	of Occupancy		
	[msec]	0.8 seconds	[sec]	[sec]	[sec]
		GFSK AFI	HANT2		
DH1	0.379	8	0.030	0.4	-0.370
DH3	1.630	4.25	0.069	0.4	-0.331
DH5	2.879	3.25	0.094	0.4	-0.306

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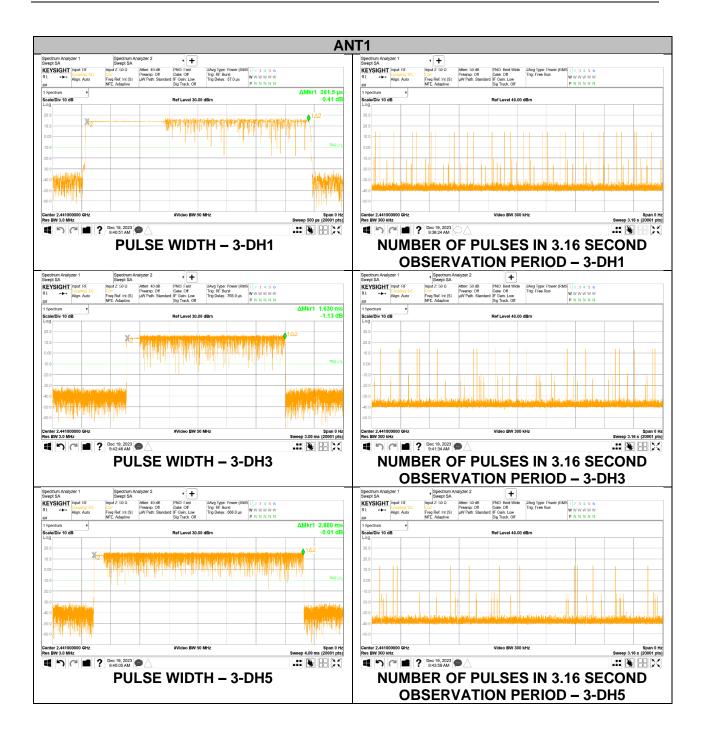
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9.5.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

DH Packet	Pulse Width [msec]	Number of Pulses in 3.16	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]			
	[]	seconds	[000]	[000]	[]			
		8PSK Norm	nal ANT1					
DH1	0.382	32	0.122	0.4	-0.278			
DH3	1.630	17	0.277	0.4	-0.123			
DH5	2.880	12	0.346	0.4	-0.054			
DH Packet	Pulse	Number of	Average Time	Limit	Margin			
	Width	Pulses in	of Occupancy					
	[msec]	0.8 seconds	[sec]	[sec]	[sec]			
8PSK AFH ANT1								
DH1	0.382	8	0.031	0.4	-0.369			
DH3	1.630	4.25	0.069	0.4	-0.331			
DH5	2.880	3	0.086	0.4	-0.314			

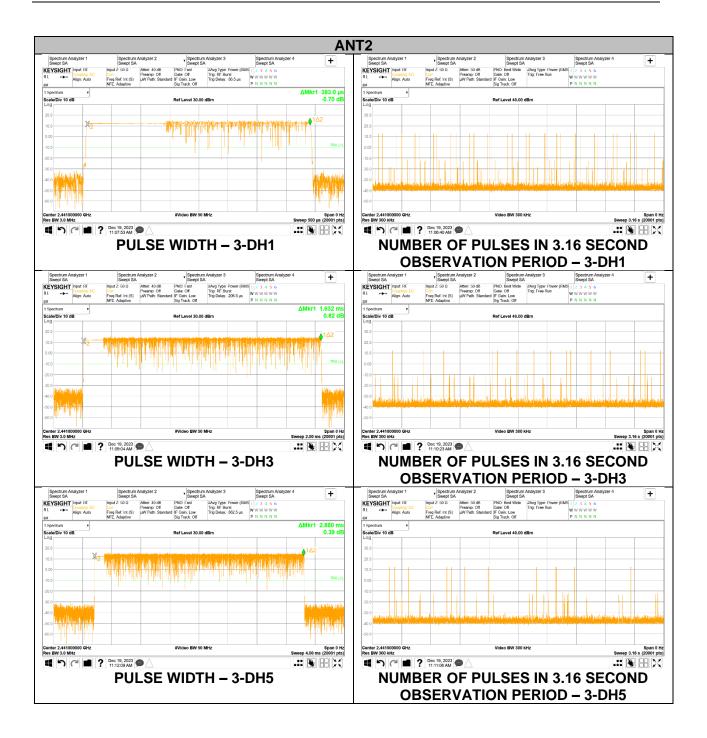
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DH Packet	Pulse Width [msec]	Number of Pulses inAverage Time3.16[sec]		Limit [sec]	Margin [sec]		
		seconds					
8PSK Normal ANT2							
DH1	0.383	32	0.123	0.4	-0.277		
DH3	1.632	16 0.261		0.4	-0.139		
DH5	2.880	11	11 0.317		-0.083		
DH Packet	Pulse	Number of Average Time		Limit	Margin		
	Width	Pulses in of Occupancy					
	[msec]	0.8 seconds	[sec]	[sec]	[sec]		
8PSK AFH ANT2							
DH1	0.383	8 0.031		0.4	-0.369		
DH3	1.632	4	0.065	0.4	-0.335		
DH5	2.880	2.75	0.079	0.4	-0.321		



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9.6. OUTPUT POWER

<u>LIMITS</u>

§15.247 (b) (1) The correlated maximum antenna gain + Beamforming gain is less than 6 dBi, therefore the limit is 21 dBm.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

Antenna	Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]
ANT1	0	2 402	18.42	21.00	-2.58
	39	2 441	18.37		-2.63
	78	2 480	17.84		-3.16
ANT2	0	2 402	15.52		-5.48
	39	2 441	16.82		-4.18
	78	2 480	14.86		-6.14
	Worst		18.42		-2.58

9.6.1. BASIC DATA RATE GFSK MODULATION

9.6.2. ENHANCED DATA RATE Pi/4-DPSK MODULATION

Antenna	Channel	Frequency	Peak Output Power	Limit	Margin
		[MHz]	[dBm]	[dBm]	[dB]
ANT1	0	2 402	17.18	21.00	-3.82
	39	2 441	17.39		-3.61
	78	2 480	16.62		-4.38
ANT2	0	2 402	14.59		-6.41
	39	2 441	15.44		-5.56
	78	2 480	14.06		-6.94
	Worst		17.39		-3.61

9.6.3. ENHANCED DATA RATE 8PSK MODULATION

Antenna	Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]
ANT1	0	2 402	17.71	21.00	-3.29
	39	2 441	17.92		-3.08
	78	2 480	17.24		-3.76
ANT2	0	2 402	15.19		-5.81
	39	2 441	15.81		-5.19
	78	2 480	14.74		-6.26
Worst			17.92		-3.08

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Antenna	Channel	Frequency	Peak Output Power	Limit	Margin
		[MHz]	[dBm]	[dBm]	[dB]
DUAL	0	2 402	11.75		
DUAL ANT1	39	2 441	12.05		
	78	2 480	11.23		
DUAL	0	2 402	10.32		
DUAL ANT2	39	2 441	11.23	21.00	
ANTZ	78	2 480	10.13	21.00	
	0	2 402	14.10		-6.90
DUAL ANT1+2	39	2 441	14.67		-6.33
ANT ITZ	78	2 480	13.73		-7.28
	Worst		14.67		-6.33

9.6.4. BASIC DATA RATE GFSK MODULATION(DUAL)

9.6.5. ENHANCED DATA RATE PI/4-DPSK MODULATION(DUAL)

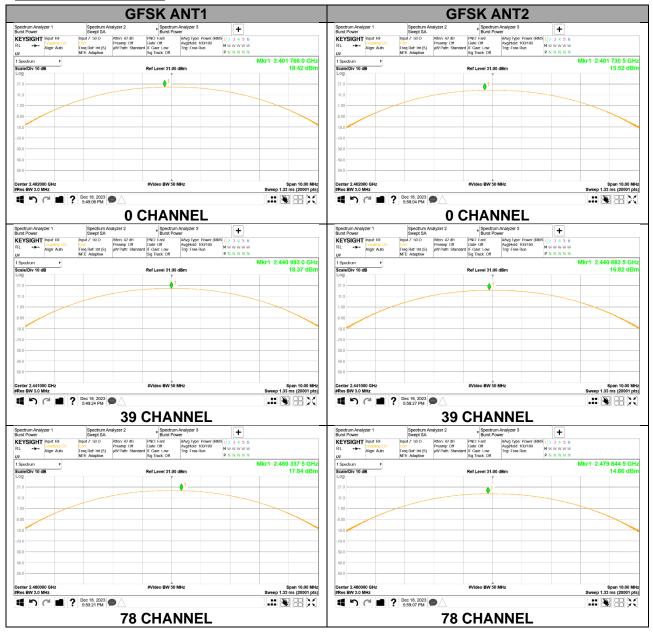
Antenna	Channel	Frequency	Peak Output Power	Limit	Margin
		[MHz]	[dBm]	[dBm]	[dB]
	0	2 402	10.92		
DUAL ANT1	39	2 441	11.77		
	78	2 480	10.14		
DUAL	0	2 402	9.10		
DUAL ANT2	39	2 441	10.14	21.00	
ANTZ	78	2 480	9.31	21.00	
	0	2 402	13.12		-7.89
DUAL ANT1+2	39	2 441	14.04		-6.96
	78	2 480	12.76]	-8.25
	Worst		14.04		-6.96

9.6.6. ENHANCED DATA RATE 8PSK MODULATION(DUAL)

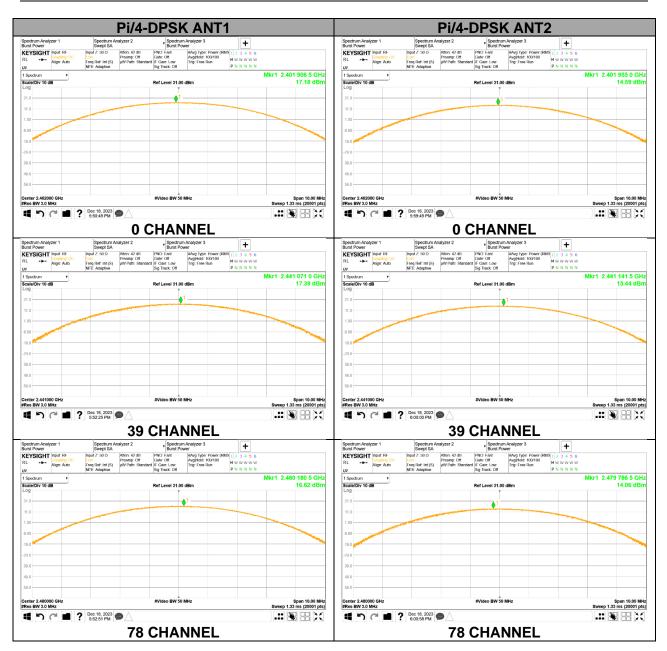
Antenna	Channel	Frequency	Peak Output Power	Limit	Margin
	-	[MHz]	[dBm]	[dBm]	[dB]
БЦАІ	0	2 402	11.35		
DUAL ANT1	39	2 441	11.57		
	78	2 480	10.46		
	0	2 402	9.34		
DUAL ANT2	39	2 441	10.46	21.00	
	78	2 480	9.47		
	0	2 402	13.47		-7.53
DUAL ANT1+2	39	2 441	14.06		-6.94
	78	2 480	13.00		-8.00
	Worst		14.06		-6.94

9.6.7. OUTPUT POWER PLOTS

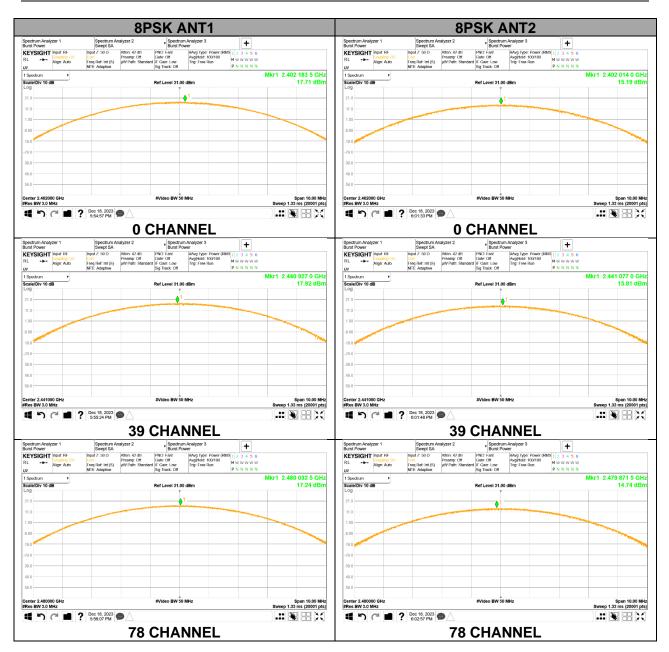
PEAK OUTPUT POWER



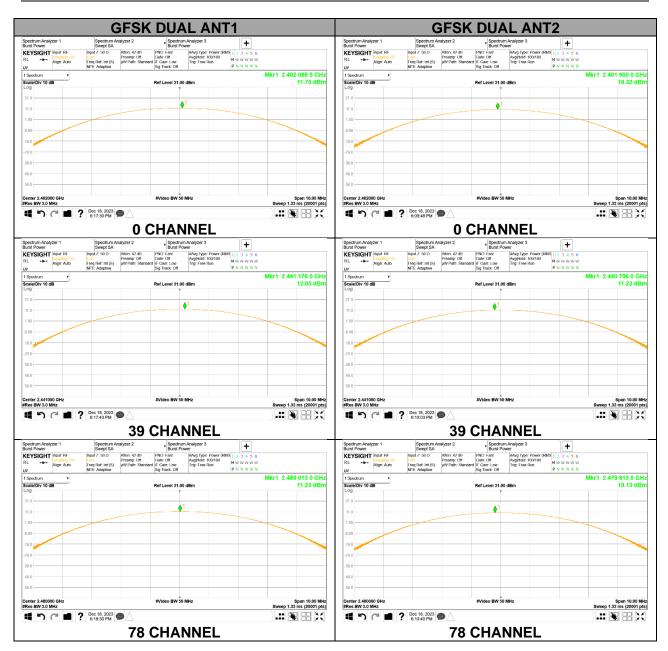
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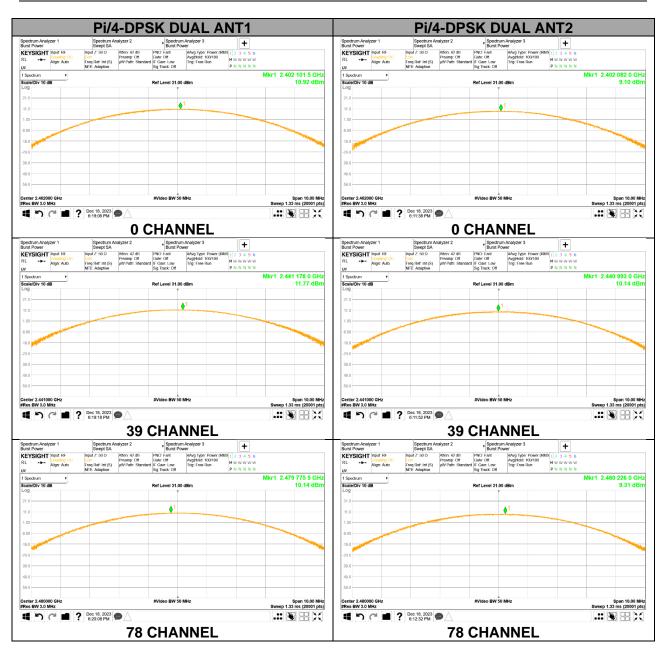
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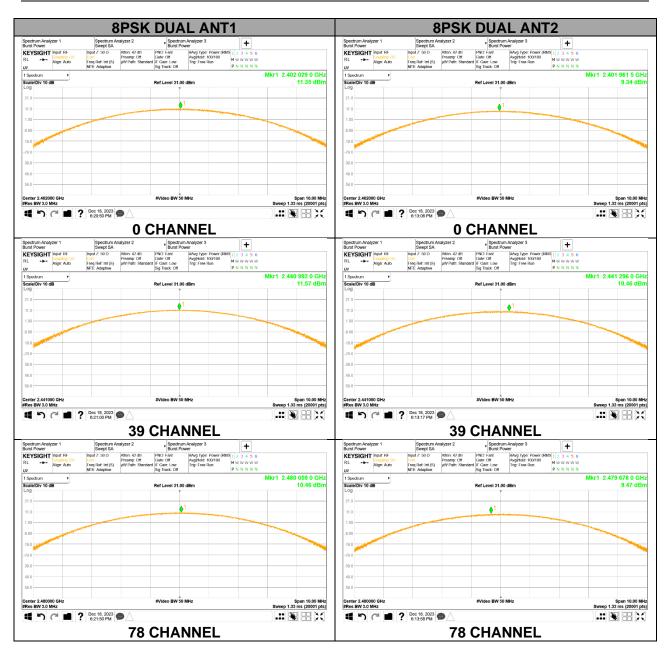
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9.7. AVERAGE POWER

<u>LIMITS</u>

None; for reporting purposes only

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter. The cable assembly insertion loss was entered as an offset in the power meter to allow for

I he cable assembly insertion loss was entered as an offset in the power meter to allow direct reading of power.

RESULTS

Antenna	Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]
	0	2 402	17.914	61.859
ANT1	39	2 441	18.014	63.299
	78	2 480	17.497	56.195
	0	2 402	15.041	31.923
ANT2	39	2 441	15.845	38.415
	78	2 480	14.487	28.100

9.7.1. BASIC DATA RATE GFSK MODULATION

9.7.2. ENHANCED DATA RATE PI/4-DQPSK MODULATION

Antenna	Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]
	0	2 402	13.972	24.957
ANT1	39	2 441	14.291	26.860
	78	2 480	13.745	23.686
	0	2 402	11.712	14.832
ANT2	39	2 441	12.340	17.140
	78	2 480	11.286	13.446

9.7.3. ENHANCED DATA RATE 8PSK MODULATION

Antenna	Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]
	0	2 402	14.027	25.276
ANT1	39	2 441	14.305	26.946
	78	2 480	13.787	23.917
	0	2 402	11.718	14.853
ANT2	39	2 441	12.366	17.242
	78	2 480	11.304	13.502

9.7.4. BASIC DATA RATE GFSK MODULATION(DUAL)

Antenna	Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]
DUAL	0	2 402	11.528	
DUAL ANT1	39	2 441	11.868	
	78	2 480	11.219	
DUAL	0	2 402	9.774	
DUAL ANT2	39	2 441	10.921	
ANTZ	78	2 480	9.777	
DUAL ANT1+2	0	2 402	13.749	23.709
	39	2 441	14.431	27.737
	78	2 480	13.568	22.740

9.7.5. ENHANCED DATA RATE PI/4-DQPSK MODULATION(DUAL)

Antenna	Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]
DUAL	0	2 402	8.550	
DUAL ANT1	39	2 441	10.400	
	78	2 480	7.980	
	0	2 402	6.674	
DUAL ANT2	39	2 441	7.490	
ANTZ	78	2 480	6.839	
DUAL ANT1+2	0	2 402	10.723	11.810
	39	2 441	12.194	16.575
	78	2 480	10.457	11.110

9.7.6. ENHANCED DATA RATE 8PSK MODULATION(DUAL)

Antenna	Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]
	0	2 402	8.545	
DUAL ANT1	39	2 441	10.059	
	78	2 480	7.992	
	0	2 402	6.716	
DUAL ANT2	39	2 441	7.730	
ANTZ	78	2 480	6.593	
DUAL ANT1+2	0	2 402	10.736	11.847
	39	2 441	12.059	16.066
	78	2 480	10.359	10.862

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9.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

Limit = -20 dBc

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

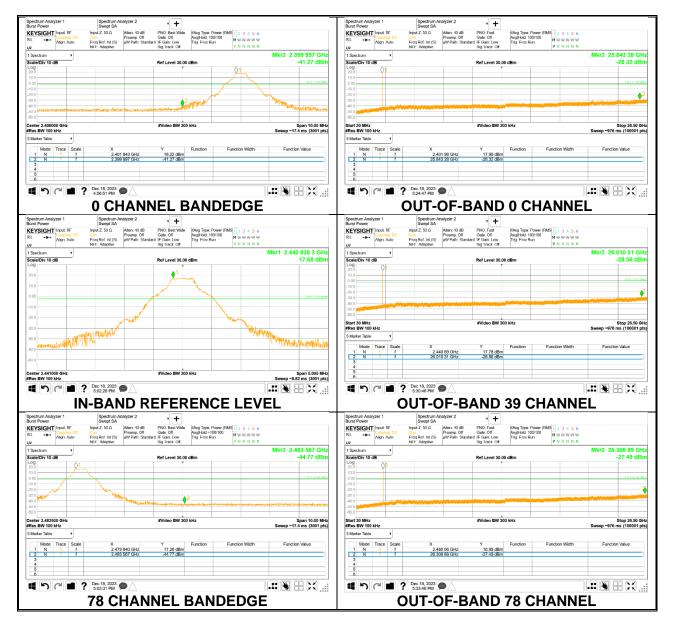
The band-edges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

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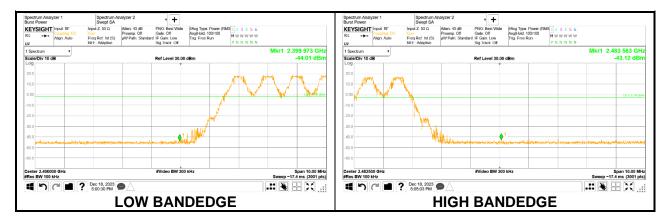
9.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

SPURIOUS EMISSIONS, NON-HOPPING - ANT1



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SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON - ANT1



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