

ELECTROMAGNETIC EMISSIONS **COMPLIANCE REPORT**



Applicant: Manufacturer:	B&W Group Ltd. Dale Road, Worthing, West Sussex, BN11 2BH, United Kingdom B&W Group Ltd.
	Dale Road, Worthing, West Sussex, BN11 2BH, United Kingdom
Product Name:	Noise Cancelling Wireless Headphones
Brand Name:	Bowers & Wilkins
Model No.: /ISED HVIN:	Px7 S3
Family Model No.: / Family ISED HVIN:	Px8 S2
Model Difference:	Refer to page4
Report Number:	TERF2411003700E2
FCC ID	2ACIX-PX8S2
IC:	11946B-PX8S2
Date of EUT Received:	November 20, 2024
Date of Test:	November 21, 2024 \sim December 13, 2024
Issue Date:	December 26, 2024

Aken Huand

Approved By

Aken Huana

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT comply with FCC rule part §15.247, ISED RSS-247.

The results of this report relate only to the sample identified in this report.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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Revision History							
Report Number	Revision	Description	Issue Date	Revised By	Remark		
TERF2411003700E2	00	Original	December 26, 2024	Yuri Tsai			

Note:

- 1 The remark "*" indicates modification of the report upon requests from certification body.
- 2 · Variant information of model numbers is provided by the applicant, test results of this report are applicable to the sample EUT(s) received.

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GENERAL INFORMATION 1

1.1 **Product Description**

Product Name:	Noise Cancelling Wireless Headphones
Brand Name:	Bowers & Wilkins
Model No.: /ISED HVIN:	Px7 S3
Family Model No.: / Family ISED HVIN:	Px8 S2
Hardware Version:	Dv2.1
Firmware Version:	N/A
EUT Series No.:	PE453302443DV00057
Power Supply:	3.85 Vdc
Test Software (Name/Version)	BlueTest3

1.2 Model Difference

- The appearance material and color are different. a)
- The display names differ due to the software (traditional Bluetooth name, USB device name, BLE b) name, USB PID, configuration design, and speaker distinction).
- The antenna gain is different. c)

1.3 **RF** Specification

-	
Radio Technology:	BT BR+EDR
Channel number:	79 channels
Modulation type:	GFSK + π/4DQPSK + 8DPSK
Transmit Power:	12.77 dBm
Frequency Range:	2.402GHz – 2.480GHz
Dwell Time:	\leq 0.4s

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Antenna Designation 1.4

Antenna Type	Antenna		Peak Antenna Gain (dBi)
FDC	HDT559	24011-	1.99
FPC	HDT659	2.4GHz	1.02

Note:

Pre-scanned was done on the above antennas, measurements were demonstrated by using the an-1. tenna with the highest gain as the worst case scenarios.

2. Antenna information is provided by the applicant.

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Test Methodology of Applied Standards 1.5

FCC Part 15, Subpart C §15.247 FCC KDB 558074 D01 15.247 Meas. Guidance v05r02 RSS-247 issue 3 Aug. 2023 RSS-Gen, Issue 5 April 2018, Amendment 2 (February 2021) ANSI C63.10:2013

1.6 **Test Facility**

Laboratory	Test Site Address	Test Site Name	FCC Designa- tion number	IC CAB identifier
		SAC 1		
		SAC 2		
		SAC 3		
	No. 404 Min Kuran Deed, Now Teinei	Conduction 1		
	No.134, Wu Kung Road, New Taipei	Conducted 1	T\4/0027	
	Industrial Park, Wuku District, New	Conducted 2	TW0027	TW3702
	Taipei City, Taiwan.	Conducted 3		
		Conducted 4	-	
		Conducted 5		
SGS Taiwan Ltd.		Conducted 6		
Central RF Lab.		Conduction C		
(TAF code 3702)		SAC C		
		SAC D		
		SAC G		
	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	Conducted A		
		Conducted B	TW0028	
		Conducted C		
		Conducted D		
		Conducted E]	
		Conducted F]	
		Conducted G		

Note: Test site name is remarked on the equipment list in each section of this report as an indication where measurements occurred in specific test site and address.

1.7 **Special Accessories**

There is no special accessory used while test was conducted.

1.8 **Equipment Modifications**

There was no modification incorporated into the EUT.

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SYSTEM TEST CONFIGURATION 2

2.1 **EUT Configuration**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 **EUT Exercise**

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

Test Procedure 2.3

2.3.1 **Conducted Emissions**

The EUT is a placed on a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed. The two LISNs provide 50uH/50 ohm of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 **Conducted Test (RF)**

The active antenna port of the unlicensed wireless device is connected to the spectrum analyzer with attenuator to protect the instrumentation. If a second antenna port is available, it is tested at one operating frequency, with other port(s) appropriately terminated, to verify it has similar output characteristics as the fully tested port.

2.3.3 Radiated Emissions

The EUT is a placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

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2.4 Measurement Results Explanation Example

2.4.1 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

Radiated emission below 30MHz is measured in a 9m*6m*6m semi-ane choic chamber, the measurements correspond to those obtained at an open-field test site.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

2.4.2 For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

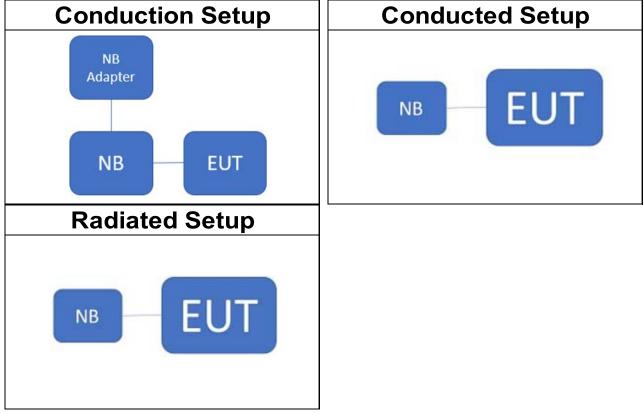
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Test Configuration 2.5



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Control Unit(s) 2.6

AC Power-Line Conducted Emission Test Site: Conduction C							
EQUIPMENT TYPE	MFR	FR MODEL NUMBER SERIAL NUMBER (LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)		
NB Adapter	Lenovo	ADLX65YLC3A	8SSA10M13945L1CZ 88N0F8W	N/A	N/A		
Notebook	Lenovo	T14	P0003332	N/A	N/A		
USB-C to C Cable	Liangang Optoelectronic Technology Co., Ltd.	112440001105	NA	N/A	N/A		
	C	onducted Emission T	est Site: Conducted D)			
EQUIPMENT TYPE	MFR MODEL NUMBER SERIAL NUM		SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)		
Notebook	Lenovo	T14	P0003332	N/A	N/A		
USB-C to C Cable	Liangang Optoelectror Technology Co., Ltd.	112440001105	N/A	N.C.R	N.C.R		
		Radiated Emissio	n Test Site: SAC D				
EQUIPMENT TYPE	MFR	MODEL NUMBER SERIAL NUMBER		LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)		
Notebook	Lenovo	T14	P0003332	N/A	N/A		
USB-C to C Cable	Liangang		N/A	N/A			

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SUMMARY OF TEST RESULTS 3

FCC Rules	ISED Rules	Description Of Test	Result	
§15.207(a)	RSS-Gen §8.8	AC Power Line Conducted Emis- sion	Compliant	
§15.247(b)(1)	RSS-247 §5.4 b	Peak Output Power	Compliant	
§15.247(a)(1)	RSS-247 §5.1 b RSS-Gen §6.7	Emission Bandwidth	Compliant	
§15.247(d)	RSS-247 §5.5	Conducted Band Edge	Compliant	
§15.209	RSS-Gen §8.9	and Spurious Emission	Compliant	
§15.247(d)	RSS-247 §5.5	Radiated Band Edge	Compliant	
§15.209	RSS-Gen §8.9	and Spurious Emission	Compliant	
§15.205	RSS-Gen § 8.10	Restricted Bands	Compliant	
§15.247(a)(1)	RSS-247 §5.1 b	Frequency Separation	Compliant	
§15.247(a)(1)(iii)	RSS-247 §5.1 d	Number of hopping frequency Time of Occupancy	Compliant	
§15.203	N/A	Antenna Requirement	Compliant	

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DESCRIPTION OF TEST MODES 4

4.1 Operated in 2400 ~ 2483.5MHz Band

2400~2483.5 MHz							
СН	Freq. (MHz)	СН	Freq. (MHz)	СН	Freq. (MHz)	СН	Freq. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

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4.2 The Worst Test Modes and Channel Details

- 1 The EUT has been tested under operating condition.
- 2 Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.
- 3 The field strength of radiated emission was measured as the EUT positioned in different orthogonal planes (E1/E2/H) based on actual usage of the EUT to pre-scan the emissions for determining the worst case scenario.
- 4 Investigation has been done on all the possible configurations for searching the worst case.

ANTNNA PORT CONDUCTED TEST								
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	PACKET TYPE				
	Peak Output Power, 20dB Band Width, Spurious Emission							
	0 to 78	0,39,78	GFSK	DH5				
Bluetooth	0 to 78	0,39,78	π/4-DQPSK	2DH5				
	0 to 78	0,39,78	8-DPSK	3DH5				
		Band Edge						
Bluetooth	0 to 78	0,78	GFSK/8-DPSK	DH5/3DH5				
		Frequency Separa	tion	·				
		0,1,2,	GFSK	DH5				
Bluetooth	0 to 78	38,39,40,	π/4-DQPSK	2DH5				
		76,77,78	8-DPSK	3DH5				
	Number of H	opping Frequency, H	opping Band edge					
Bluetooth	0 to 78	0 to 78	GFSK/8-DPSK	DH5/3DH5				
	Ti	me of Occupancy(Dw	vell time)					
			GFSK	DH1/DH3/DH5				
Bluetooth	0 to 78	39	π/4-DQPSK	2DH1/2DH3/2DH				
			8-DPSK	3DH1/3DH3/3DH				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	PACKET TYPE				
	TRANSMIT RAD	DIATED EMISSION TE	EST (BELOW 1 GHz)					
Bluetooth	0 to 78	39	GFSK	DH5				
	TRANSMIT RAI	DIATED EMISSION TI	EST (ABOVE 1 GHz)					
Bluetooth	0 to 78	0,39,78	GFSK/8-DPSK	DH5/3DH5				

Note: The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for channel Low, Mid and High, the worst case position was reported.

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MEASUREMENT UNCERTAINTY 5

Test Items	U	ncertair	nty
AC Power Line Conducted Emission	+/-	1.54	dB
Output Power measurement	+/-	0.97	dB
Emission Bandwidth	+/-	1.38	Hz
Conducted emission measurement	+/-	0.77	dB
Frequency Separation	+/-	1.48	Hz
Number of hopping frequency	+/-	1.48	Hz
Time of Occupancy	+/-	1.48	Hz
Temperature	+/-	0.6	°C
Humidity	+/-	3	%
DC / AC Power Source	+/-	1	%

Radiated Spurious Emission Measurement Uncertainty				
	+/-	1.89	dB	9kHz~30MHz
Polarization: Vertical	+/-	4.15	dB	30MHz - 1000MHz
	+/-	3.43	dB	1GHz - 18GHz
	+/-	3.86	dB	18GHz - 40GHz
Polarization: Horizontal	+/-	1.89	dB	9kHz~30MHz
	+/-	4.02	dB	30MHz - 1000MHz
Foldi ization. Horizontai	+/-	3.43	dB	1GHz - 18GHz
	+/-	3.86	dB	18GHz - 40GHz
	+/-	2	dB	33GHz-50GHz
	+/-	1.59	dB	50GHz-60GHz
Radiated Spurious Emission	+/-	1.7	dB	60GHz-90GHz
	+/-	1.64	dB	90GHz-140GHz
	+/-	3.83	dB	140GHz-220GHz

Note:

- 1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
- 2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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MEASUREMENT EQUIPMENT USED 6

6.1 **Emission from AC power line**

AC Power-Line Conducted Emission Test Site: Conduction C							
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)		
Coaxial Cable	EC Lab	RF-HY-CAB-250	RF-HY-CAB-250-01	03/27/2024	03/26/2025		
EMI Test Receiver	R&S	ESCI	101342	04/29/2024	04/28/2025		
LISN	SCHWARZBECK Mess-Elektronik	NSLK8127	974	06/26/2024	06/25/2025		
Pulse Limiter	EC Lab	VTSD 9561F-N	485	03/27/2024	03/26/2025		
Test Software	audix	e3	E3 20923 SGS Ver.9 (C)	N.C.R	N.C.R		

6.2 **Conducted Measurement**

Conducted Emission Test Site: Conducted D						
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)	
Attenuator	Woken	WATT-218FS-10	RF18	11/14/2024	11/13/2025	
Attenuator	Woken	WATT-218FS-10	RF19	11/14/2024	11/13/2025	
DC Block	PASTERNACK	PE8210	RF157	11/14/2024	11/13/2025	
Power Meter	Anritsu	ML2496A	2138002	08/28/2024	08/27/2025	
Power Sensor	Anritsu	MA2411B	1911390	08/28/2024	08/27/2025	
Power Sensor	Anritsu	MA2411B	1911398	08/28/2024	08/27/2025	
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/17/2024	06/16/2025	
Test Software	Keysight	IOT0047A	Ver.24.4.19.13	N.C.R	N.C.R	
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R	

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Radiated Measurement 6.3

	Radiated Emission Test Site: SAC D					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)	
3m Site NSA	SGS	966 chamber D	N/A	04/30/2024	04/29/2025	
Active Loop Antenna	COM-POWER	AL-130R	10160105	12/11/2024	12/10/2025	
Attenuator	Woken	WATT-218FS-10	RF17	11/14/2024	11/13/2025	
Band Rejection Filter	Micro Tronics	BRM50701-01	RF201	11/14/2024	11/13/2025	
Broadband Antenna	SCHWARZBECK	VULB 9168	9168-617	12/14/2023	12/13/2024	
Coaxial Cable	Huber+Suhner	EMC106-SM-SM- 7200	150703	11/14/2024	11/13/2025	
Coaxial Cable	Huber+Suhner	RG 214/U	W21.01	11/14/2024	11/13/2025	
Highpass Filter	R&S	F13 HPF 3GHz	RF175	11/14/2024	11/13/2025	
Horn Antenna	Schwarzbeck	BBHA9120D	1341	05/30/2024	05/29/2025	
Horn Antenna	Schwarzbeck	BBHA9170	185	08/15/2024	08/14/2025	
Lowpass Filter	Woken	EWT-56-0019	RF173	11/14/2024	11/13/2025	
Pre-Amplifier	EMC Instruments	EMC12630SE	980273	11/14/2024	11/13/2025	
Pre-Amplifier	EMC Instruments	EMC184045SEE	980881	11/14/2024	11/13/2025	
Pre-Amplifier	EMC Instruments	EMC9135	980234	11/14/2024	11/13/2025	
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/17/2024	06/16/2025	
Test Software	audix	е3	E3 20923 SGS Ver.9 (C)	N.C.R	N.C.R	

NOTE: N.C.R refers to Not Calibrated Required.

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CONDUCTED EMISSION TEST 7

7.1 **Standard Applicable**

Frequency within 150 kHz to 30MHz shall not exceed the limit table as below.

Frequency range	Limits dB(uV)		
MHz	Quasi-peak	Average	
0.15 to 0.50	66 to 56	56 to 46	
0.50 to 5	56	46	
5 to 30	60	50	
Note			

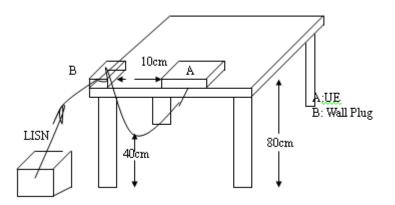
1. The lower limit shall apply at the transition frequencies

2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

7.2 EUT Setup:

- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

7.3 **Test Setup**



7.4 **Measurement Procedure**

- 1. The EUT was placed on a table which is 0.8m above ground plane.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all frequency measured were complete.

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7.5 **Measurement Result**

Note: Refer to next page for measurement data and plots. Note2: The * reveals the worst-case results that closest to the limit.

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AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number Test Mode Power Probe	:TERF2411003700E2 :BT :120V/60Hz :L1	Test Site Test Date Temp./Humi. Engineer	:Conduction C :2024-12-12 :22.4℃/64% :Howard Huang	
100 Level (dBu)	n			
90				
80				
70				
60				
50 245				
40 3	where we	7		
30	Marin and Williams	NULL LIMMAN	handle compension	
20	las conditions of	and the second sec	and a second and a second	
10				
0.15 0.2				
0.15 0.2	0.5 1 Free	25 quency (MHz)	10 20 30)
Freq.	Detector Spectrum	Factor Actu		Margin
	Mode Reading Level	FS		
MHz	PK/QP/AV dBµV	dB dBµ	dBµV	dB
0.163	Average 25.80	10.65 36.4	45 55.29	-18.84
0.163	QP 37.60	10.65 48.2		-17.04
0.185	Average 25.30	10.65 35.9		-18.29
0.185	QP 34.70	10.65 45.3		-18.89
0.207	Peak 36.39	10.65 47.0	63.32	-16.28
0.497	Peak 30.74	10.62 41.3		-14.70
3.976	Peak 25.09	10.90 35.9		-20.01
5.680	Peak 21.51	10.96 32.4	46 60.00	-27.54

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Margin

dB



Test Mode Power	:TERF2411003700E2 :BT :120V/60Hz	Test Site Test Date Temp./Humi.	
Probe	:N	Engineer	:Howard Huang
100 Level (dBuV	0		
90			
80			
70			
60			
50 24 3			
40 40 44	man		
30	man har we do do	mm	man Anna
20	Ma Marth Martin and Martin	No. AND	
10			
0.15 0.2	0.5 1 2 Frequency	5 y (MHz)	10 20
Freq.	Detector Spectrum Fa Mode Reading Level	actor Actu FS	
MHz F	<u> </u>	dB dBµ	

Average	19.90	10.66	30.56	55.65	-25.09
QP	36.40	10.66	47.06	65.65	-18.59
Peak	38.91	10.65	49.57	64.59	-15.02
Peak	32.22	10.64	42.87	62.83	-19.96
Peak	28.63	10.60	39.24	56.00	-16.76
Peak	18.48	10.89	29.37	56.00	-26.63
Peak	20.42	10.99	31.40	60.00	-28.60
	QP Peak Peak Peak Peak Peak	QP36.40Peak38.91Peak32.22Peak28.63Peak18.48	QP36.4010.66Peak38.9110.65Peak32.2210.64Peak28.6310.60Peak18.4810.89	QP36.4010.6647.06Peak38.9110.6549.57Peak32.2210.6442.87Peak28.6310.6039.24Peak18.4810.8929.37	QP36.4010.6647.0665.65Peak38.9110.6549.5764.59Peak32.2210.6442.8762.83Peak28.6310.6039.2456.00Peak18.4810.8929.3756.00

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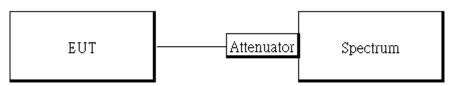


8 FREQUENCY SEPARATION

8.1 Standard Applicable

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.

8.2 Test Setup



8.3 Measurement Procedure

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows ANSI C63.10:2013.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set center frequency of spectrum analyzer = middle of hopping channel.
- 5. Set the RBW approximately 30% of the channel spacing, $VBW \ge RBW$.
- 6. Adjust Span to Wide enough to capture the peaks of two adjacent channels.
- 7. Sweep = auto.
- 8. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

8.4 Measurement Result

Channel separation (MHz)	Limit	Result
1	≧25 kHz or 2/3 times 20dB bandwidth	PASS

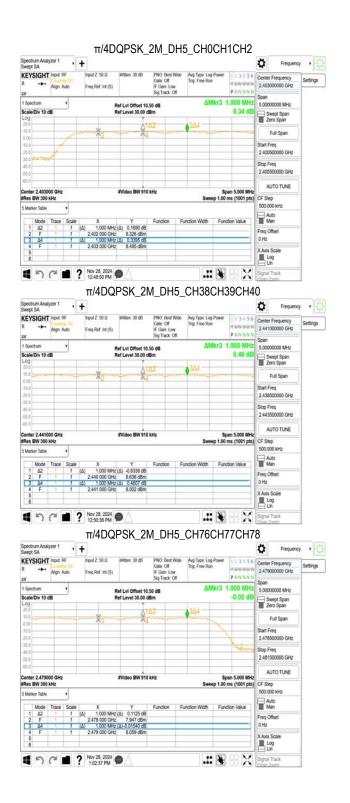
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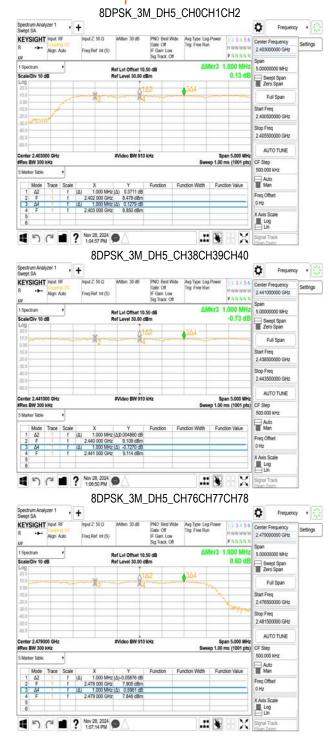
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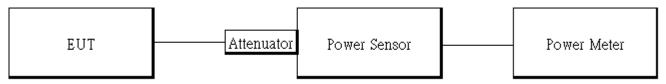
9 PEAK OUTPUT POWER MEASUREMENT

9.1 Standard Applicable

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, The Limit: 1Watt. For all other frequency hopping systems in the 2400 – 2483.5MHz band: The Limit: 0.125 Watts. The power limit for 1Mbps is 1watt, and 2Mbps, 3Mbps and AFH mode are 0.125 watts.

The e.i.r.p. shall not exceed 4 W.

9.2 Test Setup



9.3 Measurement Procedure:

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows ANSI C63.10 Measurement Guidelines.
- 3. Duty cycle of test signal is < 98 %, duty factor shall be considered.
- Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (Max Hold, Detector = Peak, RBW >=20dB bandwidth)
- 5. Record the max. reading.
- 6. Repeat above procedures until all default test channel is completed.

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9.4 Peak & Average Power Measurement Result

	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log(1/Duty Cycle)
DH5	77.20	1.12
2DH5	77.20	1.12
3DH5	76.80	1.15

1M BR mode (Peak):

СН	Freq. (MHz)	Power Setting	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	11(Max)	9.35	8.610	1000
39	2441	11(Max)	8.94	7.834	1000
78	2480	11(Max)	8.51	7.096	1000

1M BR mode (Average):

сн	Freq. (MHz)	Power Setting	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	11(Max)	9.32	8.558	1000
39	2441	11(Max)	8.92	7.805	1000
78	2480	11(Max)	8.49	7.069	1000

2M EDR mode (Peak):

СН	Freq. (MHz)	Power Setting	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	11(Max)	12.25	16.788	125
39	2441	11(Max)	11.82	15.205	125
78	2480	11(Max)	11.33	13.583	125

2M EDR mode (Average):

СН	Freq. (MHz)	Power Setting	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	11(Max)	9.62	9.170	125
39	2441	11(Max)	9.24	8.402	125
78	2480	11(Max)	8.72	7.454	125

3M EDR mode (Peak):

сн	Freq. (MHz)	Power Setting	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	11(Max)	12.77	18.923	125
39	2441	11(Max)	12.35	17.179	125
78	2480	11(Max)	11.89	15.453	125

3M EDR mode (Average):

СН	Freq. (MHz)	Power Setting	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	11(Max)	9.81	9.564	125
39	2441	11(Max)	9.30	8.504	125
78	2480	11(Max)	8.90	7.756	125

*Note: Avg. output power has been calculated with duty factor.

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9.5 **EIRP Measurement Result**

1M BR mode EIRP

Channel	Frequency (MHz)	Power Setting	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
0	2402	11(Max)	9.32	1.99	13.533	4000
39	2441	11(Max)	8.92	1.99	12.342	4000
78	2480	11(Max)	8.49	1.99	11.178	4000

2M EDR mode EIRP

Channel	Frequency (MHz)	Power Setting	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
0	2402	11(Max)	9.62	1.99	14.500	4000
39	2441	11(Max)	9.24	1.99	13.286	4000
78	2480	11(Max)	8.72	1.99	11.786	4000

3M EDR mode EIRP

Channel	Frequency (MHz)	Power Setting	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
0	2402	11(Max)	9.81	1.99	15.123	4000
39	2441	11(Max)	9.30	1.99	13.447	4000
78	2480	11(Max)	8.90	1.99	12.264	4000

* Note: EIRP = Average Power + Gain

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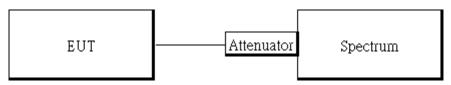


10 EMISSION BANDWIDTH MEASUREMENT

Standard Applicable 10.1

For frequency hopping systems operating in the 2400 MHz-2483.5 MHz no limit for 20dB bandwidth.

10.2 Test Setup



Measurement Procedure 10.3

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows ANSI C63.10:2013.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set the spectrum analyzer as RBW= 1% to 5% of OBW, VBW = 3 X RBWSpan= 2 to 5 times of the OBW, Sweep=auto, Detector = Peak, and Max hold for 20dB Bandwidth test.
- 5. Mark the peak frequency and -20dB (upper and lower) frequency
- 6. Set the spectrum analyzer as

RBW= 1 % to 5% of 99% Bandwidth,

VBW \geq 3 X RBW,

Span= large enough to capture all products of the modulation process, Sweep=auto,

Detector = Peak, and Max hold for 99% Bandwidth test.

- 7. Mark the peak frequency and 99%dB (upper and lower) frequency
- 8. Repeat above procedures until all test default channel is completed

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GFSK

СН	20 dB BW (MHz)	2/3 BW (MHz)
0	0.9635	0.64
39	0.9616	0.64
78	0.9634	0.64

π/4-DQPSK

СН	20 dB BW	2/3 BW
011	(MHz)	(MHz)
0	1.335	0.89
39	1.335	0.89
78	1.335	0.89

8-DPSK

СН	20 dB BW	2/3 BW
	(MHz)	(MHz)
0	1.310	0.87
39	1.312	0.87
78	1.312	0.87

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10.5 99% Bandwidth

GFSK

СН	99% BW	
СП	(MHz)	
0	0.87721	
39	0.87636	
78	0.8771	

π/4-DQPSK

СН	99% BW
СП	(MHz)
0	1.1872
39	1.1874
78	1.1895

8-DPSK

СН	99% BW
	(MHz)
0	1.1863
39	1.1872
78	1.1868

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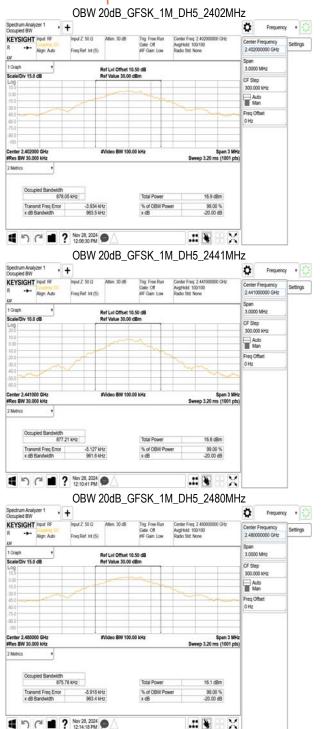
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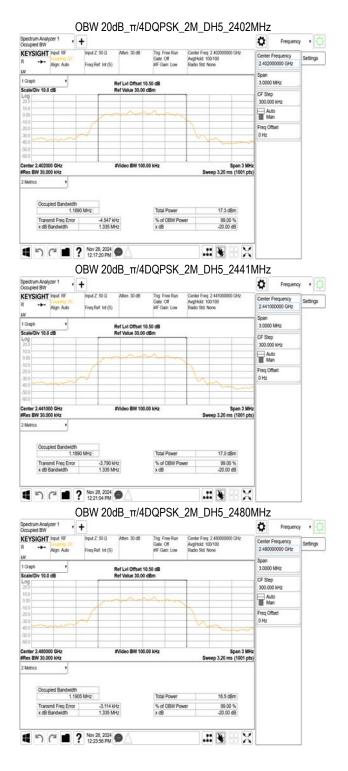
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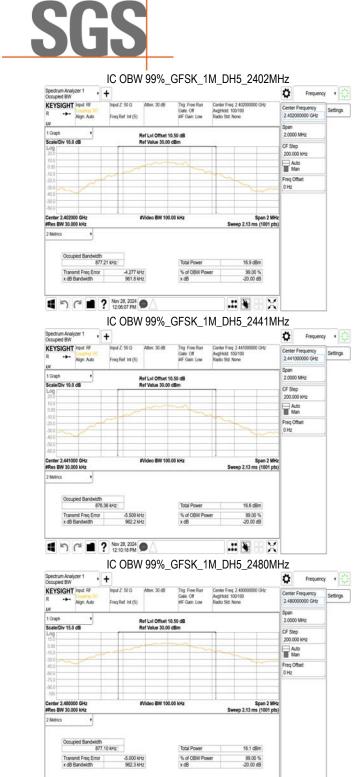
OBW 20dB 8DPSK 3M DH5 2402MHz Spectrum Analyzer 1 Occupied BW Frequency . • + Ö Trig. Free Run Gate: Off #IF Gain: Low KEYSIGHT Input RF nout 7:50 0 Atien 30 dB Center Freq 2 4020 Center Fri Center Frequency 2.402000000 GHz Settings Aug/Hold 100/100 Radio Strf Nore + Algn Auto Freq Ref. Int (S) 1 Graph 3 0000 MHz Ref Lvi Offset 10.50 dB Ref Value 30.00 dBm Scale/Div 10.0 dB CF Step 300.000 kHz Auto Man Freq Offset 0 Hz Notes BW 100 00 kW 2 402000 0 #Res BW 30.000 kHz Sweep 3.20 m Metrics Occupied Bandwidth 1.1885 MHz Total Power 17.5 dBm Transmit Freq Error x dB Bandwidth % of OBW Power x dB -2.734 kHz 1.310 MHz 99.00 % -20.00 dB 1 5 C 1 1 ? Nov 28, 2024 .# 🕷 – 🗙 OBW 20dB_8DPSK_3M_DH5_2441MHz Spectrum Analyzer 1 Occupied BW · + Ö Frequency + Trig Free Run Gale: Off KEYSIGHT Input RF Input 7:50 0 Atlen: 30 dB Center Freq: 2.441000000 GHz Center Frequency 2.441000000 GHz Settings + Align: Auto Free Ref. Int (S) 1 Graph 3 0000 MHz Ref LvI Offset 10.50 dB Ref Value 30.00 dBm Scale/Div 10.0 dB CF Step 300.000 kHz Auto Man Freq Offset 0 Hz r 2.441000 #Video BW 100.00 kHz Span 3 MHz Sweep 3.20 ms (1001 pts) #Res BW 30.000 kHz Occupied Bandwidth 1.1895 MHz Total Power 17.2 dBm Transmit Freq Error x dB Bandwidth % of OBW Power x dB 99.00 % -20.00 dB -2.194 kHz 1.312 MHz 1 5 C 1 ? Nov 28, 2024 .# 🕷 – 🗙 OBW 20dB_8DPSK_3M_DH5_2480MHz Spectrum Analyzer 1 Occupied BW Ö Frequency . . + KEYSIGHT Input RF Input Z: 50 () Atten: 30 dB Trig Free Run Gate: Off #IF Gain: Low Center Freq 2.4800 2.48000000 GHz Settings + Algn Auto Avg(Hold: 100/100 Radio Std: None Freq Ref. Int (S) LOT 1 Ref LvI Offset 10.50 dB Ref Value 30.00 dBm 3.0000 MHz Scale/Div 10.0 dB CF Step 300.000 kHz Auto Man Freq Offset 0 Hz #Video BW 100.00 kHz Span 3 MHz Sweep 3.20 ms (1001 pts) ter 2.480000 GH #Res BW 30.000 kHz Occupied Bandwidth 1.1890 MHz Total Power 16.6 dBm Transmit Freq Error k dB Bandwith % of OBW Power x dB 99.00 % -20.00 dB -2.082 kHz 1.312 MHz 1 5 C 1 ? Nov 28, 2024 .: 🗑 – X

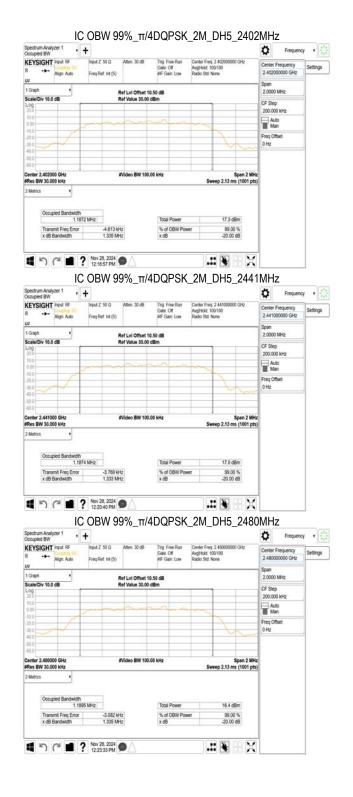
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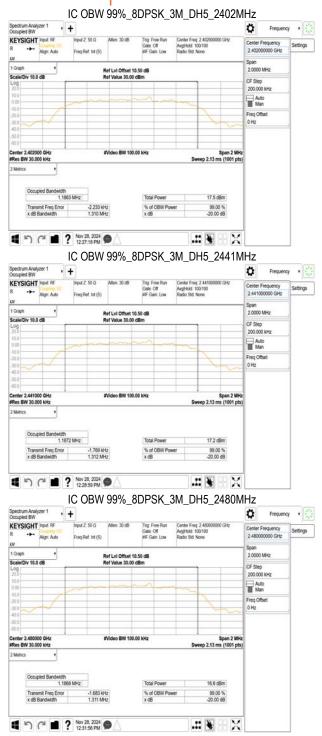
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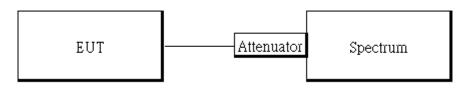


11 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

11.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) & RSS-Gen §8.10, must also comply with the radiated emission limits specified in §15.209(a) & RSS-Gen §8.9.

11.2 Test Setup



11.3 Measurement Procedure

11.3.1 Conducted Band Edge:

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows ANSI C63.10:2013.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set center frequency of spectrum analyzer = operating frequency.
- 5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Sweep = auto
- 6. Mark Peak, below 2.4GHz and above 2.4835GHz and record the max. level.
- 7. Repeat above procedures until all frequency measured were complete.

11.3.2 Conducted Spurious Emission:

- 1. To connect Antenna Port of EUT to Spectrum.
- 2. The testing follows ANSI C63.10:2013.
- 3. Set RBW = 100 kHz & VBW = 300 kHz, Detector =Peak, Sweep = Auto
- 4. Allow trace to fully stabilize.
- 5. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
- 6. Repeat above procedures until all default test channel measured were complete.

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11.4 Measurement Result See next page for test plots.

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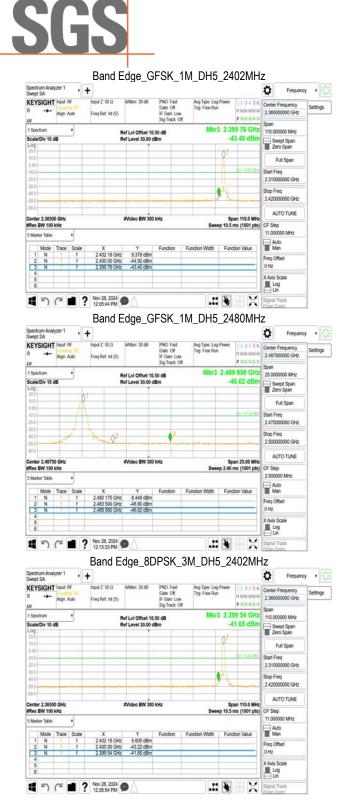
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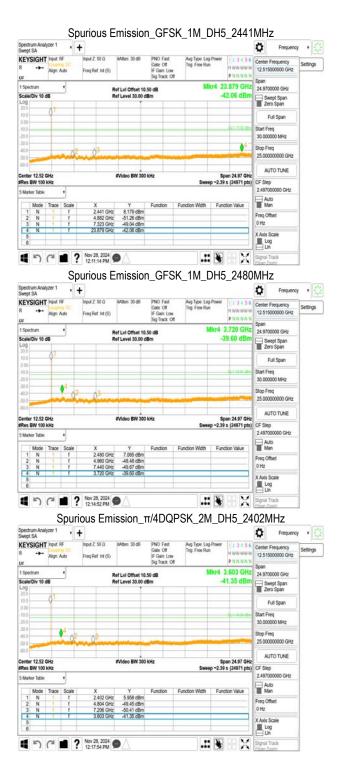
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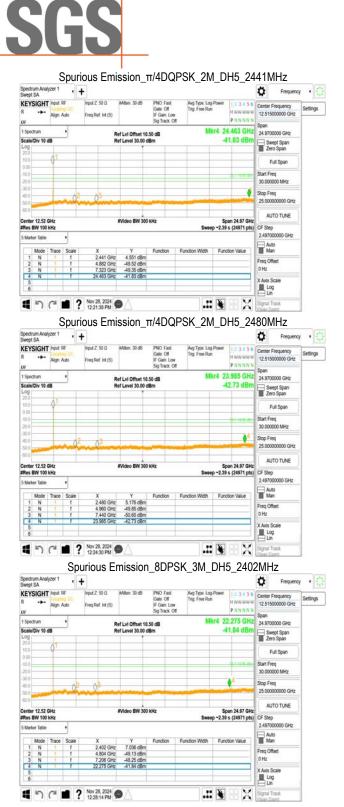
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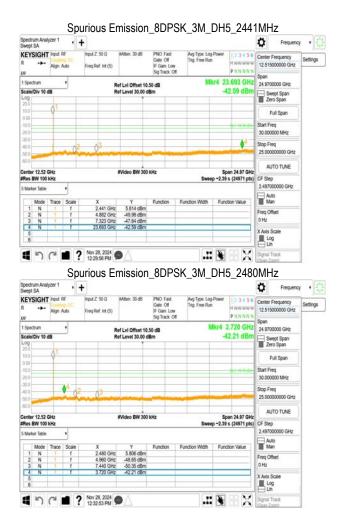
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12 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

12.1 Standard Applicable

12.1.1 Duty Cycle Correction Factor

According to 15. 35(c) and RSS-Gen §8.2, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification.

12.1.2 Spurious Emission

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 and RSS-Gen §8.9 Table 5 and 6 limit as below.

And according to §15.33(a) (1) & RSS-Gen §6.13.2.a, for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

1. The lower limit shall apply at the transition frequencies.

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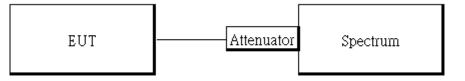
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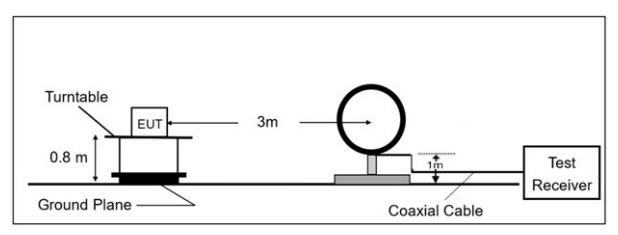
Test Setup 12.2

12.2.1 **Duty Cycle Correction Factor**

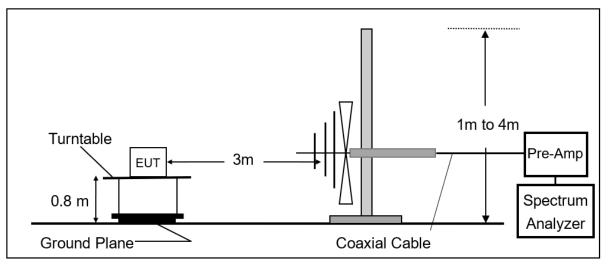


12.2.2 **Radiated Emission**

(A) Radiated Emission Test Set-Up, Frequency Below 30MHz.



(B) Radiated Emission Test Set-Up, Frequency From 30MHz to 1000MHz.



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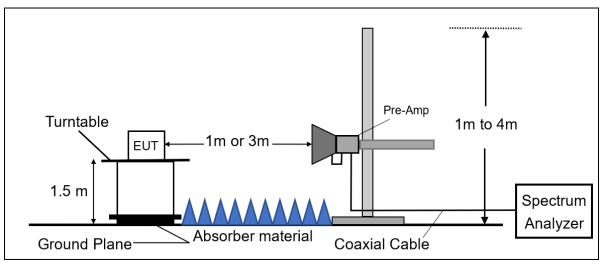
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(C) Radiated Emission Test Set-Up, Frequency Above 1 GHz.



12.3 Measurement Procedure

12.3.1 Duty Cycle Correction Factor

- 1.Adjust and configure any EUT switches, controls, or input data streams to ensure that the EUT is transmitting or encoded to obtain the "worst-case" pulse ON time.
- 2. The testing follows ANSI C63.10:2013.
- 3.Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set center frequency of spectrum analyzer = operating frequency.
- 5.Set the spectrum analyzer as RBW, VBW=1MHz, 3MHz, Span = 0Hz , Detector = Peak, Adjust Sweep=100ms.
- 6. Repeat above procedures until all frequency of the interest measured were complete.

12.3.2 Radiated Emission

- 1. The testing follows the Measurement Procedure of ANSI C63.10:2013.
- 2. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plane.
- 3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
- 4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
- 5. Set the spectrum analyzer as RBW=100 kHz and VBW=300 kHz for Peak Detector (PK) at frequency between 30MHz and 1 GHz.
- 6. Use receiver mode as RBW=120 kHz for Quasi-peak (QP) at frequency between 30MHz and 1 GHz.

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- 7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Maximum Emission Measurements at frequency above 1 GHz.
- 8. According to C63.10:2013 Section 7.5 Procedure for determining the average value of pulsed emissions with duty cycle correction factor 20 log (Ton/100ms).
- 9. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
- 10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 11. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 12. Repeat above procedures until all default test channel measured were complete.

12.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL – AG

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

The limit of the emission level is expressed in dBuV/m, which converts 20*log(uV/m)

Actual FS(dB μ V/m) = SPA. Reading level(dB μ V) + Factor(dB) Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Average value($dB\mu V/m$)=Peak Actual FS($dB\mu V/m$)+ Duty Cycle Correction Factor(dB) Duty Cycle Correction Factor(dB) = 20 log ($T_{on}/100 \text{ ms}$)

12.5 Test Results of Radiated Spurious Emissions form 9 kHz to 30 MHz

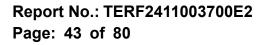
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) & RSS-GEN §6.13.2 was not reported.

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Measurement Result: 12.6

12.6.1 **Duty Cycle Correction Factor**

Bluetooth 1M

Time ON of 100ms: 8,700 ms

Duty Cycle=8.7ms / 100ms= 0.087

Duty Cycle correction factor=20 LOG 0.087 = -21.2 dB

Bluetooth 3M

Time ON of 100ms: 8.700 ms

Duty Cycle=8.7ms / 100ms= 0.087

Duty Cycle correction factor=20 LOG 0.087 = -21.2 dB

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12.6.2 **Duty Cycle test plot**



Rev BF S00 DC enter Freq 2.441000000 GHz IFGainLow Trig: Free Run IFGainLow Atten: 10 dB Key RL 05:47:18 PM Dec 11, 2024 TRACE 1 2 3 4 5 TYPE DET P N N N N ALIGN AUT Avg Type: Voltage Frequency ΔMkr5 2.900 ms 0.47 dB Ref 0.00 dB Center Fre 5∆6 2.441000000 GHz 1.4 12 ∆3∆4 2.441000000 GHz 2.441000000 GHz

CF Step 8.000000 MHz	s)			Center 2.441000000 GHz Res BW 8 MHz #VBW 8.0 MHz							
<u>to</u> Man	_ Au	FUNCTION VALUE	FUNCTION WIDTH	FUNCTION	Y		x	×	IC SCI	ODE T	MKR
					-0.04 dB	i (Δ)	2.900 ms	(<u>(</u>)	t	2 1	1
Eren Offert					-29.20 dBm		52.80 ms		- t	F 1	2
Freq Offset					0.05 dB		2.900 ms	(<u>(</u>)	1	4 1	3
0 Hz					-42.93 dBm		60.30 ms		1	E 1	4
	1				0.47 dB -27.33 dBm		2.900 ms 79.00 ms	(<u>(</u>)	1	16 1 F	6
	UH-				-27.33 dBm	-	79.00 ms		+	-	- 2
Scale Type						-			+	-	8
											9
a Lin	Lo										9 10
o <u>citi</u>	-										11
		•							-		< []

EDR

Keysight Spectrum Analyzer - Swep					
Center Freq 2.44100	0000 GHz	SENSE:INT	ALIGN AUTO Avg Type: Voltage	05:45:01 PM Dec 11, 2024 TRACE 1 2 3 4 5 6 TVPE WWWWWWW	Frequency
		rig: Free Run Atten: 10 dB		DET P NNNNN	Auto Tune
10 dB/div Ref 0.00 dB	m		Δ	Mkr5 2.900 ms 2.91 dB	
-10.0					Center Free
-20.0	w	^{1∆2}	304 Xa		2.441000000 GH
40.0	28	.2	104 NO		Start Fre
50.0	a strate det son af hereken a	in methodate		والمأت فاحرابنا والقامات ال	2.441000000 GH
60.0 h-synel, uspel, b-terref, d-te-ref 70.0		*****	ar waterier years	********	
80.0					Stop Fre 2.441000000 GH
90.0					
Center 2.441000000 G Res BW 8 MHz	Hz #VBW 8.	0 MHz	Sweep 10	Span 0 Hz 00.0 ms (1001 pts)	CF Ste 8.000000 MH
MTE MODE TRC SCL 1 Δ2 1 t (Δ)	× 2.900 ms (Δ)	Y FUNC 2.74 dB	TION FUNCTION WDTH	FUNCTION VALUE	<u>Auto</u> Ma
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	42.30 ms -; 2.900 ms (Δ)	29.84 dBm 2.64 dB			Freq Offse
4 F 1 t 5 Δ6 1 t (Δ)	61.00 ms -; 2.900 ms (Δ)	29.12 dBm 2.91 dB			0 H
6 F 1 t 7 8	72.30 ms -	26.37 dBm			Scale Typ
9 10					Log Li
11				· ·	
sa			STATUS		

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Auto Tur

Start Fre

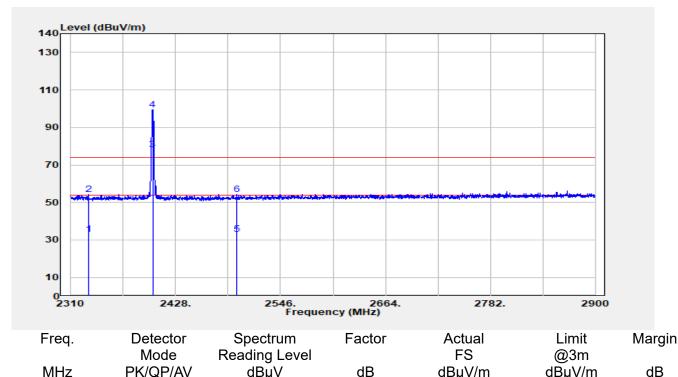
Stop Free

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12.6.3 Bandedge Result

Report Number	:TERF2411003700E2	Test Site	:SAC D
Operation Mode	:BR	Test Date	:2024-12-11
Test Frequency	:2402 MHz	Temp./Humi.	:21.6°C/67%
Test Mode	:Bandedge	Antenna Pol.	:Vertical
EUT Pol	:E2 Plane	Engineer	:Howard Huang



		a D p 1	45	abatim	abat/m	40
2330.26	Average	-	-	33.04	54.00	-20.96
2330.26	Peak	51.30	2.94	54.24	74.00	-19.76
2402.00	Average	-	-	78.23	-	-
2402.00	Peak	96.47	2.96	99.43	-	-
2496.50	Average	-	-	32.87	54.00	-21.13
2496.50	Peak	51.06	3.01	54.07	74.00	-19.93

Average Duty Cycle Factor=-21.20 (dB)

Average Level= Peak Level+ Duty Cycle Factor

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

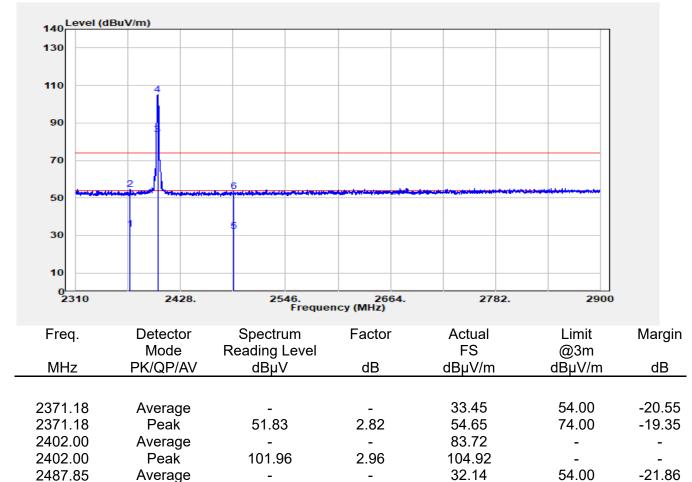
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Report Number	:TERF2411003700E2
Operation Mode	:BR
Test Frequency	:2402 MHz
Test Mode	:Bandedge
EUT Pol	:E2 Plane

Test Site	:SAC D
Test Date	:2024-12-11
Temp./Humi.	:21.6°C/67%
Antenna Pol.	:Horizontal
Engineer	:Howard Huang



2487.85

Average Level= Peak Level+ Duty Cycle Factor

Peak

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50.35

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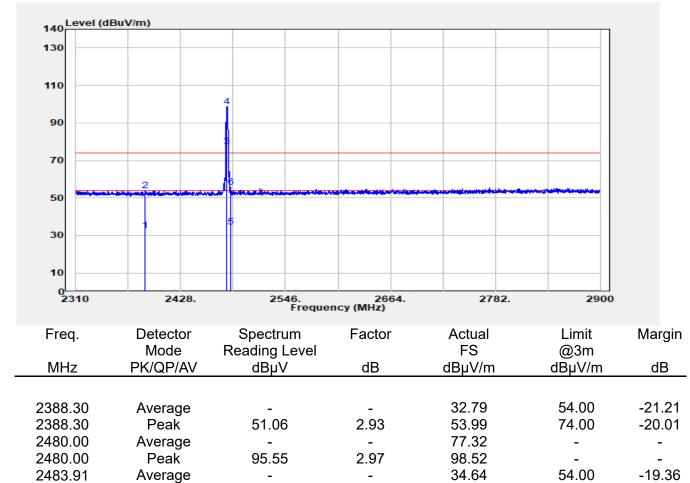
74.00

-20.66



Report Number	:TERF2411003700E2
Operation Mode	:BR
Test Frequency	:2480 MHz
Test Mode	:Bandedge
EUT Pol	:E2 Plane

Test Site	:SAC D
Test Date	:2024-12-11
Temp./Humi.	:21.6°C/67%
Antenna Pol.	:Vertical
Engineer	:Howard Huang



2483.91

Average Level= Peak Level+ Duty Cycle Factor

Peak

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52.86

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55.84

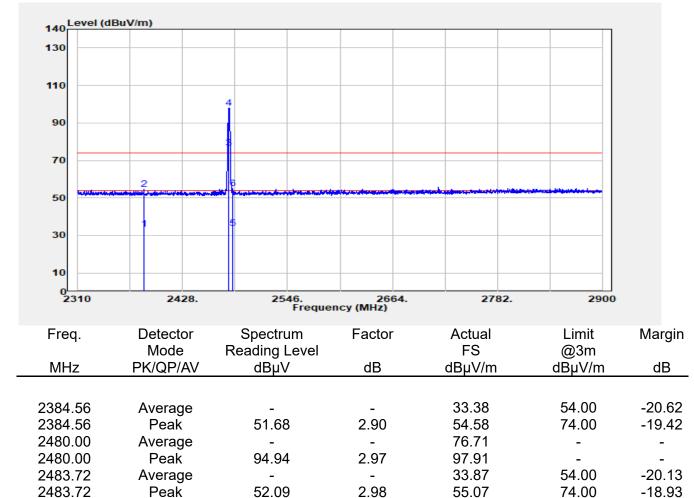
74.00

-18.16



Report Number	:TERF2411003700E2
Operation Mode	:BR
Test Frequency	:2480 MHz
Test Mode	:Bandedge
EUT Pol	:E2 Plane

Test Site	:SAC D
Test Date	:2024-12-11
Temp./Humi.	:21.6°C/67%
Antenna Pol.	:Horizontal
Engineer	:Howard Huang



Average Level= Peak Level+ Duty Cycle Factor

Peak

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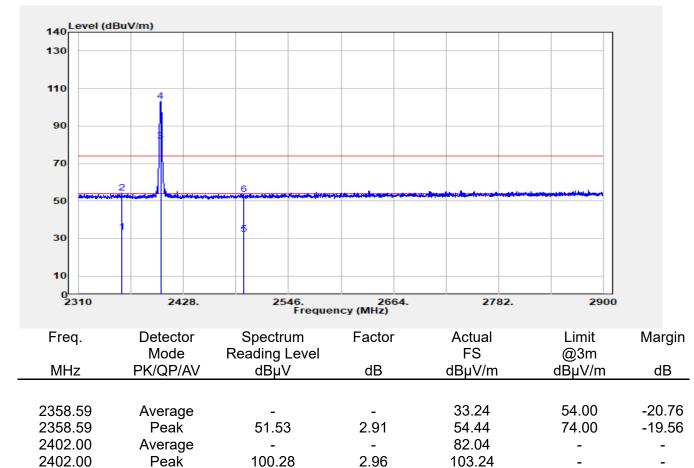
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Report Number	:TERF2411003700E2
Operation Mode	:EDR 3M
Test Frequency	:2402 MHz
Test Mode	:Bandedge
EUT Pol	:E2 Plane

Test Site	:SAC D
Test Date	:2024-12-11
Temp./Humi.	:21.6°C/67%
Antenna Pol.	:Vertical
Engineer	:Howard Huang



2495.13

2495.13

Average Level= Peak Level+ Duty Cycle Factor

Average

Peak

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3.01

f (886-2) 2298-0488

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54.00

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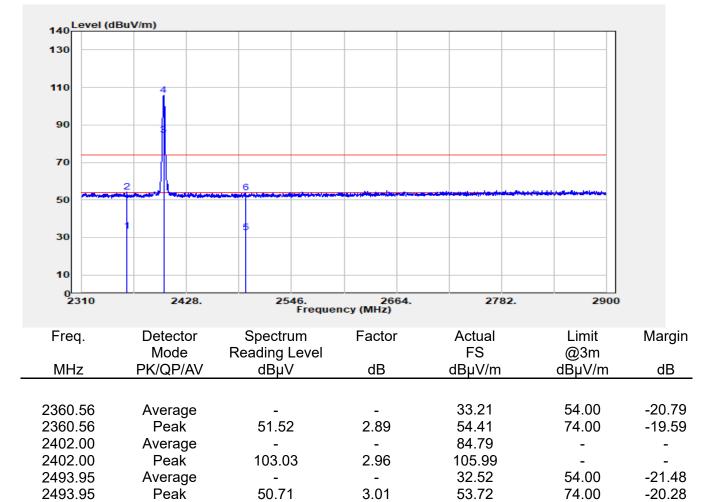
-21.66

-20.46



Report Number	:TERF2411003700E2
Operation Mode	:EDR 3M
Test Frequency	:2402 MHz
Test Mode	:Bandedge
EUT Pol	:E2 Plane

Test Site :SAC D Test Date :2024-12-11 Temp./Humi. :21.6°C/67% Antenna Pol. :Horizontal Engineer :Howard Huang



Average Duty Cycle Factor=-21.20 (dB)

Average Level= Peak Level+ Duty Cycle Factor

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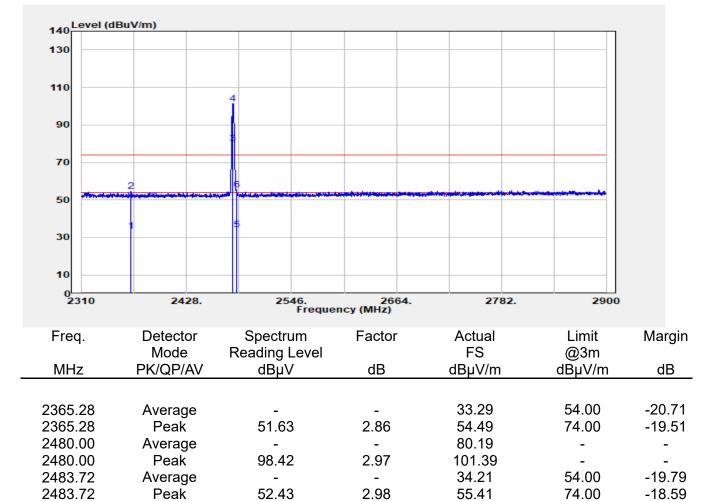
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Report Number	:TERF2411003700E2
Operation Mode	:EDR 3M
Test Frequency	:2480 MHz
Test Mode	:Bandedge
EUT Pol	:E2 Plane

Test Site :SAC D Test Date :2024-12-11 Temp./Humi. :21.6°C/67% Antenna Pol. :Vertical Engineer :Howard Huang



Average Duty Cycle Factor=-21.20 (dB)

Average Level= Peak Level+ Duty Cycle Factor

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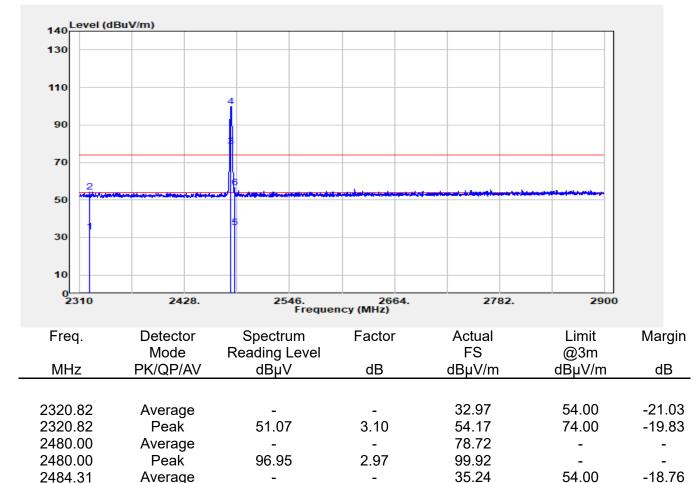
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Report Number	:TERF2411003700E2
Operation Mode	:EDR 3M
Test Frequency	:2480 MHz
Test Mode	:Bandedge
EUT Pol	:E2 Plane

Test Site :SAC D Test Date :2024-12-11 Temp./Humi. :21.6°C/67% Antenna Pol. :Horizontal Engineer :Howard Huang



Average Duty Cycle Factor=-21.20 (dB)

2484.31

Average Level= Peak Level+ Duty Cycle Factor

Peak

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53.46

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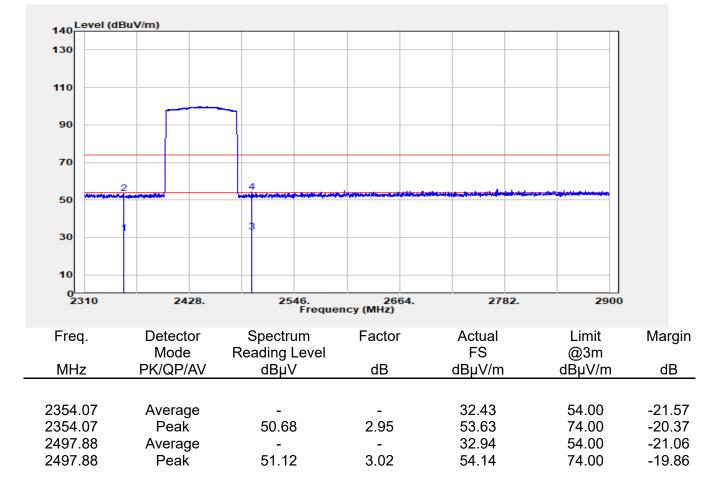
74.00

-17.56



Report Number	:TERF2411003700E2	Test Site
Operation Mode	:BR Hopping	Test Date
Test Frequency	:2402~2480 MHz	Temp./Hu
Test Mode	:Bandedge	Antenna
EUT Pol	:E2 Plane	Engineer

:SAC D :2024-12-11 е umi. :21.6℃/67% Pol. :Vertical :Howard Huang r



Average Duty Cycle Factor=-21.20 (dB)

Average Level= Peak Level+ Duty Cycle Factor

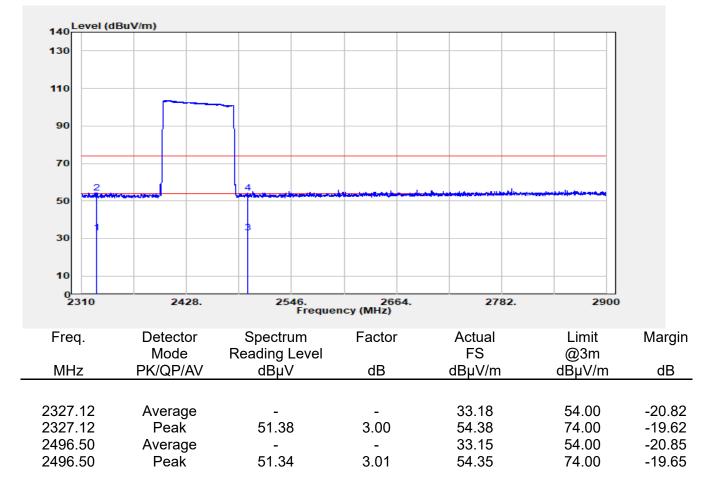
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Report Number	:TERF2411003700E2	Tes
Operation Mode	:BR Hopping	Tes
Test Frequency	:2402~2480 MHz	Ter
Test Mode	:Bandedge	Ant
EUT Pol	:E2 Plane	Eng

Test Site	:SAC D
Test Date	:2024-12-11
Temp./Humi.	:21.6°C/67%
Antenna Pol.	:Horizontal
Engineer	:Howard Huang



Average Level= Peak Level+ Duty Cycle Factor

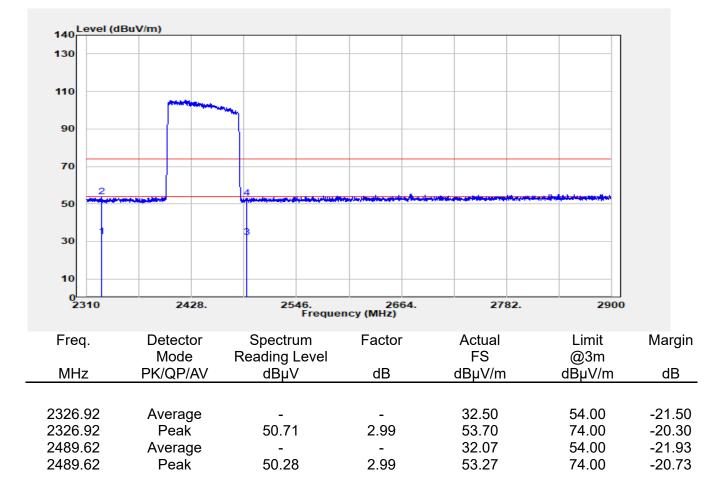
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Report Number :TERF2411003700E2 **Operation Mode** :EDR 3M Hopping Test Frequency :2402~2480 MHz Test Mode :Bandedge EUT Pol :E2 Plane

Test Site :SAC D Test Date :2024-12-11 Temp./Humi. :21.6°C/67% Antenna Pol. :Vertical Engineer :Howard Huang



Average Duty Cycle Factor=-21.20 (dB)

Average Level= Peak Level+ Duty Cycle Factor

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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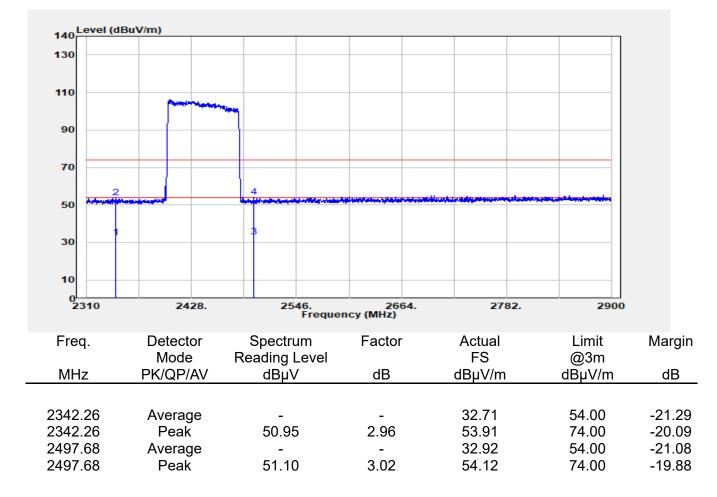
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Report Number :TERF2411003700E2 **Operation Mode** :EDR 3M Hopping Test Frequency :2402~2480 MHz Test Mode :Bandedge EUT Pol :E2 Plane

Test Site :SAC D Test Date :2024-12-11 Temp./Humi. :21.6°C/67% Antenna Pol. :Horizontal Engineer :Howard Huang



Average Duty Cycle Factor=-21.20 (dB)

Average Level= Peak Level+ Duty Cycle Factor

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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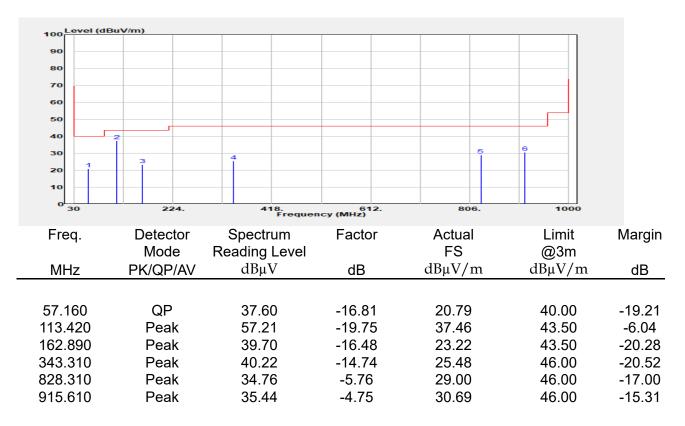
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12.6.4 Radiated Spurious Emission 1st

Report Number	:TERF2411003700E2
Operation Mode	:EDR 3M
Test Frequency	:2441 MHz
Test Mode	:Tx
EUT Pol	:E2 Plane

Test Site	:SAC D
Test Date	:2024-12-12
Temp./Humi.	:22.0 ℃/58%
Antenna Pol.	:Vertical
Engineer	:Howard Huang



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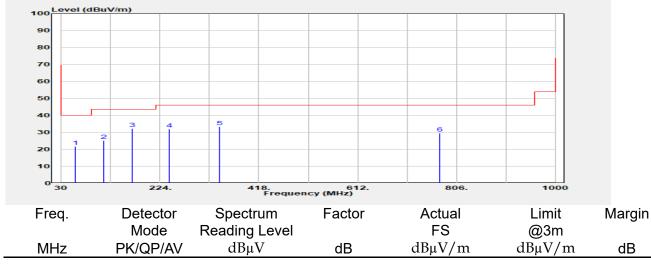
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Report No.: TERF2411003700E2 Page: 58 of 80



Report Number	:TERF2411003700E2
Operation Mode	:EDR 3M
Test Frequency	:2441 MHz
Test Mode	:Tx
EUT Pol	:E2 Plane

Test Site	:SAC D
Test Date	:2024-12-12
Temp./Humi.	:22.0 ℃/58%
Antenna Pol.	:Horizontal
Engineer	:Howard Huang



QP	38.40	-16.81	21.59	40.00	-18.41
QP	45.00	-19.75	25.25	43.50	-18.25
Peak	49.09	-16.82	32.27	43.50	-11.23
Peak	49.78	-17.77	32.01	46.00	-13.99
Peak	48.15	-14.72	33.44	46.00	-12.56
Peak	36.40	-6.85	29.55	46.00	-16.45
	QP Peak Peak Peak	QP45.00Peak49.09Peak49.78Peak48.15	QP45.00-19.75Peak49.09-16.82Peak49.78-17.77Peak48.15-14.72	QP45.00-19.7525.25Peak49.09-16.8232.27Peak49.78-17.7732.01Peak48.15-14.7233.44	QP45.00-19.7525.2543.50Peak49.09-16.8232.2743.50Peak49.78-17.7732.0146.00Peak48.15-14.7233.4446.00

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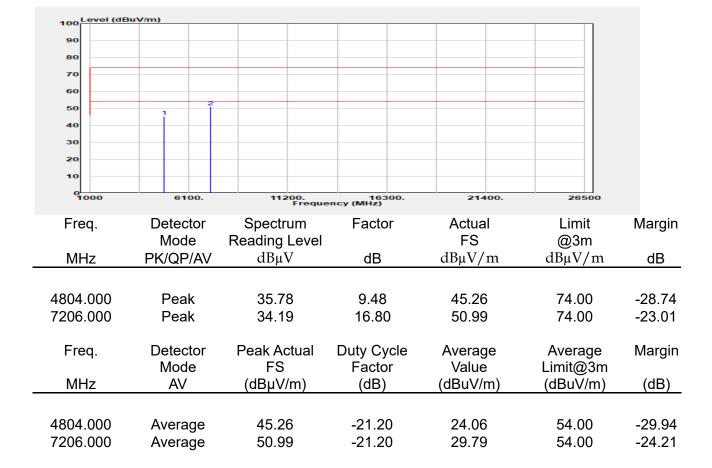
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Report No.: TERF2411003700E2 Page: 59 of 80



Report Number	:TERF2411003700E2
Operation Mode	:BR
Test Frequency	:2402 MHz
Test Mode	:Tx
EUT Pol	:E2 Plane

Test Site	:SAC D
Test Date	:2024-12-11
Temp./Humi.	:21.6°℃/67%
Antenna Pol.	:Vertical
Engineer	:Howard Huang



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Report No.: TERF2411003700E2 Page: 60 of 80



Report Number	:TERF2411003700E2
Operation Mode	:BR
Test Frequency	:2402 MHz
Test Mode	:Tx
EUT Pol	:E2 Plane

Test Site	:SAC D
Test Date	:2024-12-11
Temp./Humi.	:21.6°℃/67%
Antenna Pol.	:Horizontal
Engineer	:Howard Huang

100 Level (dB	uV(m)					
90						
80						
70						
60						
50	2					
40						
30						
20						
10						
01000	6100.	11200. Freque	16300. ency (MHz)	21400.	26500	
Freq.	Detector	Spectrum	Factor	Actual FS	Limit	Margin
MHz	Mode PK/QP/AV	Reading Level dBµV	dB	го dBµV/m	@3m dBµV/m	dB
4804.000	Peak	35.79	9.48	45.27	74.00	-28.73
7206.000	Peak	35.91	16.80	52.72	74.00	-21.28
Freq.	Detector	Peak Actual	Duty Cycle	Average	Average	Margin
•	Mode	FS	Factor	Value	Limit@3m	0
MHz	AV	(dBµV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
4804.000	Average	45.27	-21.20	24.07	54.00	-29.93
7206.000	Average	52.72	-21.20	31.52	54.00	-22.48

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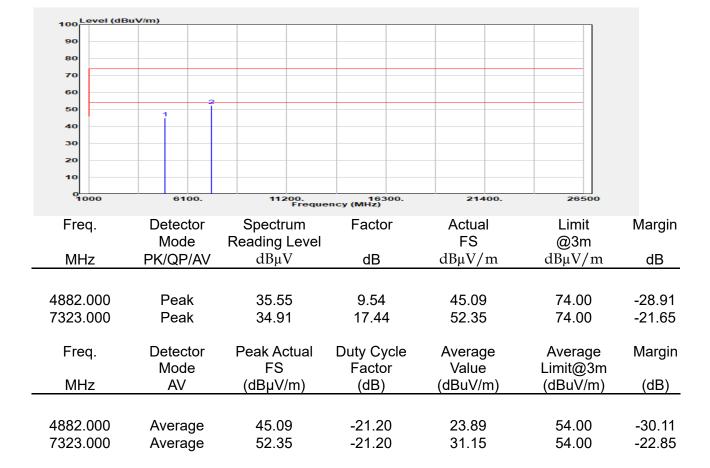
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Report Number	:TERF2411003700E2
Operation Mode	:BR
Test Frequency	:2441 MHz
Test Mode	:Tx
EUT Pol	:E2 Plane

Test Site	:SAC D
Test Date	:2024-12-11
Temp./Humi.	:21.6°℃/67%
Antenna Pol.	:Vertical
Engineer	:Howard Huang



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Report No.: TERF2411003700E2 Page: 62 of 80



:TERF2411003700E2
:BR
:2441 MHz
:Tx
:E2 Plane

Test Site	:SAC D
Test Date	:2024-12-11
Temp./Humi.	:21.6℃/67%
Antenna Pol.	:Horizontal
Engineer	:Howard Huang

100 Level (dB 90 80 70 50 50	2 1					
40 30 20 10						
0 1000	6100.	11200. Freque	16300. ency (MHz)	21400.	26500	
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBμV	dB	dBµV/m	dBµV/m	dB
4882.000 7323.000	Peak Peak	35.89 34.86	9.54 17.44	45.43 52.30	74.00 74.00	-28.57 -21.70
Freq.	Detector Mode	Peak Actual FS	Duty Cycle Factor	Average Value	Average Limit@3m	Margin
MHz	AV	(dBµV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
4882.000 7323.000	Average	45.43	-21.20	24.23	54.00	-29.77

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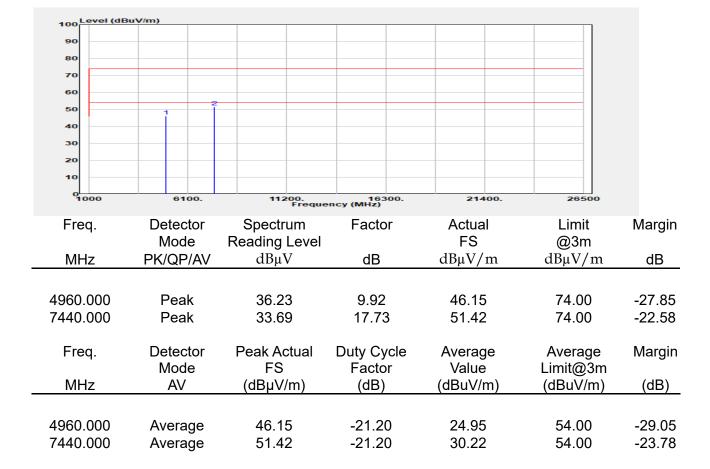
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Test Site	:SAC D
Test Date	:2024-12-11
Temp./Humi.	:21.6°℃/67%
Antenna Pol.	:Vertical
Engineer	:Howard Huang



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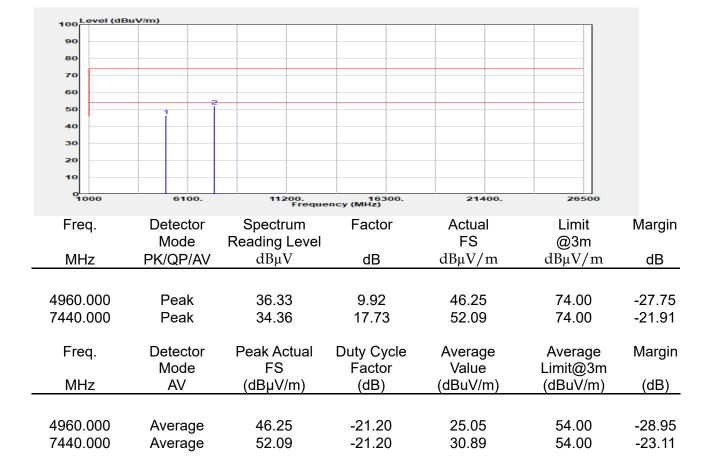
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Report No.: TERF2411003700E2 Page: 64 of 80



Report Number	:TERF2411003700E2
Operation Mode	:BR
Test Frequency	:2480 MHz
Test Mode	:Tx
EUT Pol	:E2 Plane

Test Site	:SAC D
Test Date	:2024-12-11
Temp./Humi.	:21.6°C/67%
Antenna Pol.	:Horizontal
Engineer	:Howard Huang



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Report Number	:TERF2411003700E2
Operation Mode	:EDR 3M
Test Frequency	:2402 MHz
Test Mode	:Tx
EUT Pol	:E2 Plane

Test Site	:SAC D
Test Date	:2024-12-11
Temp./Humi.	:21.6°℃/67%
Antenna Pol.	:Vertical
Engineer	:Howard Huang

100 Level (dB	8uV/m)					
90						
80						
70						
60						
50	2					
40						
30						
20						
10						
0						
1000	6100.	11200. Freque	16300. ency (MHz)	21400.	26500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	•
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4804.000	Peak	35.74	9.48	45.22	74.00	-28.78
7206.000	Peak	34.81	16.80	51.61	74.00	-22.39
Freq.	Detector	Peak Actual	Duty Cycle	Average	Average	Margin
•	Mode	FS	Factor	Value	Limit@3m	0
MHz	AV	(dBµV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
		· · /		· · ·	· · ·	· · · /
4804.000	Average	45.22	-21.20	24.02	54.00	-29.98
7206.000	Average	51.61	-21.20	30.41	54.00	-23.59
1200.000	Average	51.01	-21.20	50.71	07.00	-20.00

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Report No.: TERF2411003700E2 Page: 66 of 80



Report Number	:TERF2411003700E2
Operation Mode	:EDR 3M
Test Frequency	:2402 MHz
Test Mode	:Tx
EUT Pol	:E2 Plane

Test Site	:SAC D
Test Date	:2024-12-11
Temp./Humi.	:21.6℃/67%
Antenna Pol.	:Horizontal
Engineer	:Howard Huang

2 1					
6100.	11200. Freque	16300. ency (MHz)	21400.	26500	
Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
_ .		0.40		- / 00	~~ ~~
					-28.70 -20.95
I Cak	50.24	10.00	55.05	74.00	-20.95
Detector Mode	Peak Actual FS	Duty Cycle Factor	Average Value	Average Limit@3m	Margin
AV	(dBµV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
A	45 00	04.00	04.40	F4 00	-29.90
	Detector Mode PK/QP/AV	Image: state of the state o	Image: state of the state o	1 2 1	Image: Spectrum Mode Factor Actual FS Image: Spectrum Back State Factor Actual FS Image: Spectrum Back State PK/QP/AV BauV dB dB µV/m dB µV/m dB µV/m Peak 35.82 9.48 45.30 74.00 Peak 36.24 16.80 53.05 74.00 Detector Mode Peak Actual Duty Cycle Average Value Average Limit@3m

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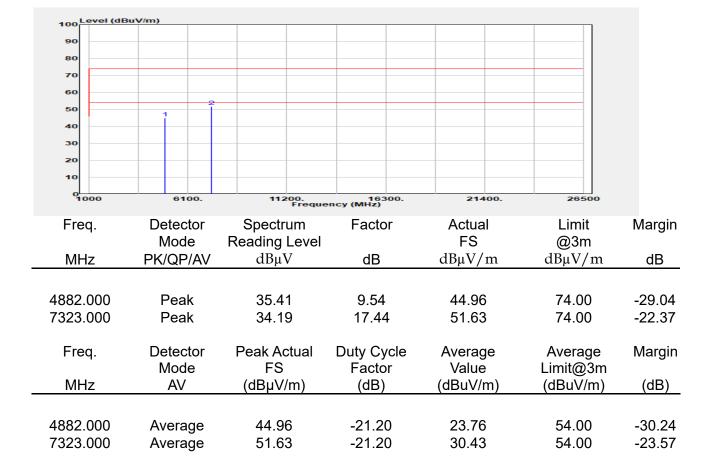
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Report No.: TERF2411003700E2 Page: 67 of 80



Report Number	:TERF2411003700E2
Operation Mode	:EDR 3M
Test Frequency	:2441 MHz
Test Mode	:Tx
EUT Pol	:E2 Plane

Test Site	:SAC D
Test Date	:2024-12-11
Temp./Humi.	:21.6°C/67%
Antenna Pol.	:Vertical
Engineer	:Howard Huang



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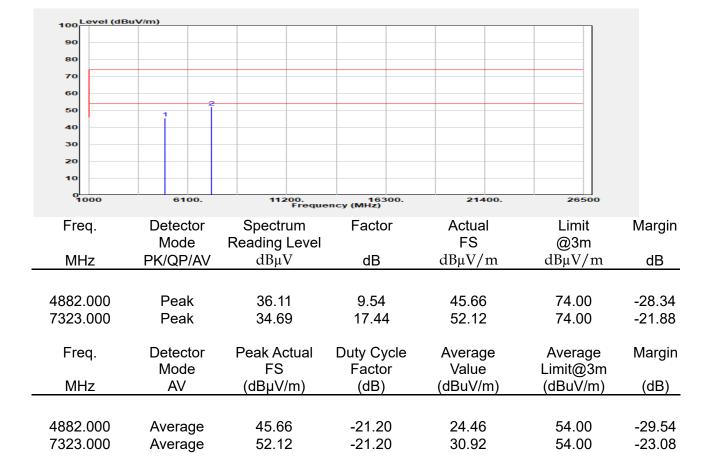
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Report No.: TERF2411003700E2 Page: 68 of 80



Report Number	:TERF2411003700E2
Operation Mode	:EDR 3M
Test Frequency	:2441 MHz
Test Mode	:Tx
EUT Pol	:E2 Plane

Test Site	:SAC D
Test Date	:2024-12-11
Temp./Humi.	:21.6°℃/67%
Antenna Pol.	:Horizontal
Engineer	:Howard Huang



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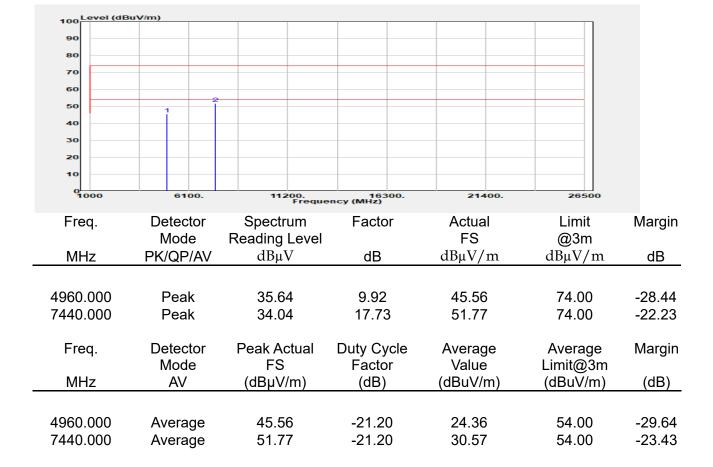
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Report No.: TERF2411003700E2 Page: 69 of 80



Report Number	:TERF2411003700E2
Operation Mode	:EDR 3M
Test Frequency	:2480 MHz
Test Mode	:Tx
EUT Pol	:E2 Plane

Test Site	:SAC D
Test Date	:2024-12-11
Temp./Humi.	:21.6°C/67%
Antenna Pol.	:Vertical
Engineer	:Howard Huang



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Report No.: TERF2411003700E2 Page: 70 of 80



Report Number	:TERF2411003700E2
Operation Mode	:EDR 3M
Test Frequency	:2480 MHz
Test Mode	:Tx
EUT Pol	:E2 Plane

Test Site	:SAC D
Test Date	:2024-12-11
Temp./Humi.	:21.6℃/67%
Antenna Pol.	:Horizontal
Engineer	:Howard Huang

100 Level (dE	suV/m)					
90						
80						
70						
60						
50	2					
40						
30						
20						
10						
0 1000	6100.	11200. Freque	16300. ency (MHz)	21400.	26500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	-
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4960.000	Peak	36.20	9.92	46.12	74.00	-27.88
7440.000	Peak	34.08	17.73	51.81	74.00	-22.19
Freq.	Detector	Peak Actual	Duty Cycle	Average	Average	Margin
	Mode	FS	Factor	Value	Limit@3m	margin
MHz	AV	(dBµV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
			· ·	·		
4960.000	Average	46.12	-21.20	24.92	54.00	-29.08
7440.000	Average	51.81	-21.20	30.61	54.00	-23.39

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Report No.: TERF2411003700E2 Page: 71 of 80



Report Number	:TERF24	11003700E2		Test Site	:SAC D	
Operation Mode	e :EDR 3M			Test Date	:2024-12-12	
Test Frequency	:2441 MH	z		Temp./Humi.	:22.0 °C/58%	
Test Mode	:Tx			Antenna Pol.	:Vertical	
EUT Pol	:E2 Plane)		Engineer	:Howard Huang	
100 Level (dBuV	//m)				_	
90						
80						
70						
60 50						
40						
30 2	3	5 6				
20 1						
10						
30	224.	418. Frequen	612. cy (MHz)	806.	1000	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
N 41 I	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
F7 400		00.00	40.04	40.70	40.00	00.04
57.160 101.780	QP Peak	36.60 51.90	-16.81 -21.64	19.79 30.26	40.00 43.50	-20.21 -13.24
162.890	Peak	43.21	-21.04 -16.48	26.73	43.50	-13.24
217.210	Peak	43.39	-19.68	23.71	46.00	-22.29
316.150	Peak	40.26	-15.17	25.09	46.00	-20.91
437.400	Peak	37.13	-12.18	24.95	46.00	-21.05

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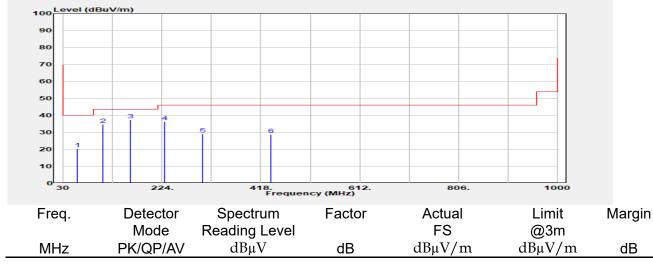
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Report Number	:TERF2411003700E2
Operation Mode	:EDR 3M
Test Frequency	:2441 MHz
Test Mode	:Tx
EUT Pol	:E2 Plane

Test Site	:SAC D
Test Date	:2024-12-12
Temp./Humi.	:22.0 ℃/58%
Antenna Pol.	:Horizontal
Engineer	:Howard Huang



57.160	QP	37.10	-16.81	20.29	40.00	-19.71
107.600	Peak	54.98	-20.34	34.64	43.50	-8.86
160.950	Peak	53.88	-16.49	37.39	43.50	-6.11
228.850	Peak	56.15	-19.72	36.43	46.00	-9.57
303.540	Peak	44.80	-15.76	29.05	46.00	-16.95
437.400	Peak	41.02	-12.18	28.84	46.00	-17.16

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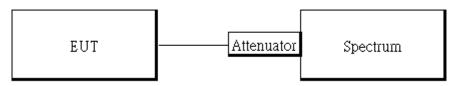


13 NUMBER OF HOPPING FREQUENCY

Standard Applicable 13.1

Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands shall use at least 15 hopping frequencies.

13.2 Test Setup



13.3 **Measurement Procedure**

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows ANSI C63.10:2013.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set spectrum analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = auto.
- 5. Set the spectrum analyzer as RBW = 30% of the channel spacing, VBW \geq RBW., Detector = Peak
- 6. Max hold, view and count how many channel in the band.

13.4 Measurement Result

Tabular Data of Total Channel Number

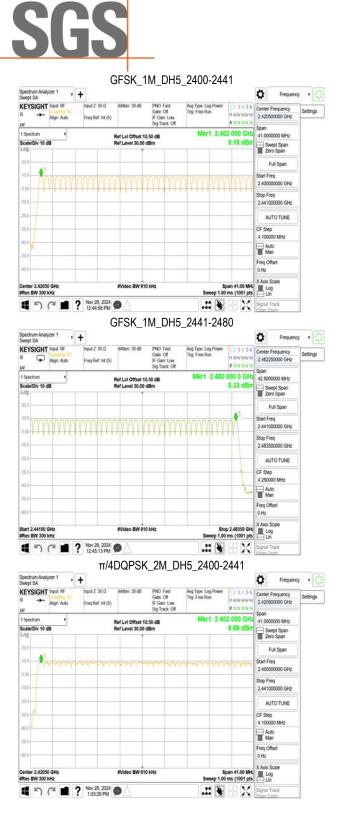
	Channel Number	Limit
2.4 GHz – 2.441 GHz	40	
2.441 GHz – 2.4835 GHz	39	>15
2.4 GHz ~2.4835 GHz	(40+39) = 79	

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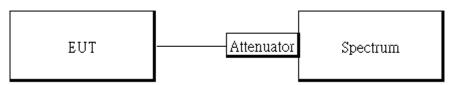


14 TIME OF OCCUPANCY (DWELL TIME)

14.1 Standard Applicable

Frequency hopping systems operating in the 2400MHz-2483.5MHz. The average time of occupancy on any frequency shall not greater than 0.4 s within period of 0.4 seconds multiplied by the number of hopping channel employed.

14.2 Test Setup



14.3 Measurement Procedure

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows ANSI C63.10:2013.
- 3.Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set center frequency of spectrum analyzer = operating frequency.

5.Set the spectrum analyzer as RBW, VBW=1MHz, 3MHz, Span = 0Hz , Detector = Peak, Adjust Sweep = 2~8ms.

6. Repeat above procedures until all frequency of the interest measured were complete.

Formula Deduced: time occupancy of one time slot X Hopping rate / total slot in one channel / total channel that hops X period of working channels.

Where, standard hopping rate is 1600 hops/s, slot in one channel for DH1, DH3, and DH5 is 2, 4, and 6, respectively.

DH1 consists of single time slot of the uplink, and one slot of the downlink Total Slot: 2 DH3 consists of three time slot of the uplink, and one slot of the downlink. Total Slot: 4 DH5 consists of five time slot of the uplink, and one slot of the downlink. Total Slot: 6

Note: the result of the complete test default channel at 1Mbps is recorded on the test report, 2Mbps, and 3Mbps only records the measurement result at middle channel that reveals no much deviation.

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14.4 Measurement Result

GFSK (1Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
	DH1	123.20	400
39	DH3	262.40	400
	DH5	308.80	400

π/4 DQPSK (2Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)		
	2DH1	123.20	400		
39	2DH3	262.40	400		
	2DH5	308.80	400		

8-DPSK (3Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)		
	3DH1	124.80	400		
39	3DH3	262.40	400		
	3DH5	307.20	400		

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GFSK (1Mbps):

CH Mid	DH1 time slot	=	0.385 *	(1600/2/79)	*	31.6	=	123.20 (ms)
	DH3 time slot	=	1.640 *	(1600/4/79)	*	31.6	=	262.40 (ms)
	DH5 time slot	=	2.895 *	(1600/6/79)	*	31.6	=	308.80 (ms)

$\pi/4$ -DQPSK (2Mbps):

CH Mid	2DH1 time slot	=	0.385 *	(1600/2/79)	*	31.6	=	123.20 (ms)
	2DH3 time slot	=	1.640 *	(1600/4/79)	*	31.6	=	262.40 (ms)
	2DH5 time slot	=	2.895 *	(1600/6/79)	*	31.6	=	308.80 (ms)

8-DPSK (3Mbps):

CH Mid	3DH1 time slot	=	0.390 *	(1600/2/79)	*	31.6	=	124.80 (ms)
	3DH3 time slot	=	1.640 *	(1600/4/79)	*	31.6	=	262.40 (ms)
	3DH5 time slot	=	2.880 *	(1600/6/79)	*	31.6	=	307.20 (ms)

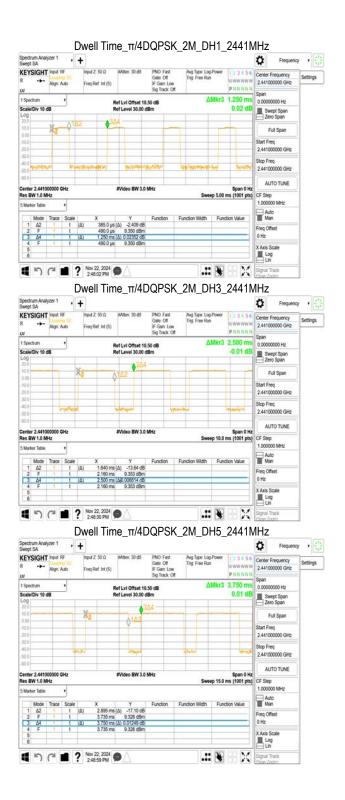
A period time = 0.4 (s) * 79 = 31.6 (s)

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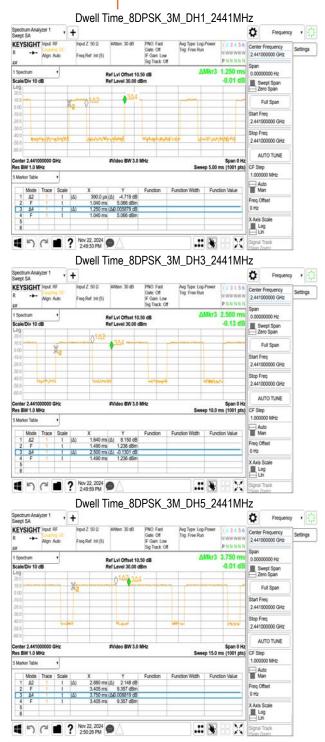
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15 ANTENNA REQUIREMENT

15.1 Standard Applicable

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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 manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§ 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

15.2 Antenna Connected Construction:

The antenna complies with this requirement and no consideration of replacement. Please see EUT photo for details.

~ End of Report ~

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