



Page 1 of 84

Verified code: 246561

# **Test Report**

**Report No.:** E20220126055701-2

Customer:	OnePlus Technology (Shenzhen) Co., Ltd.	
Address:	18/E Towar C. Tai Dan Duilding, No 8 Tai Dan Dood, Shanzhan, China	
Address.	18/F, Tower C, Tai Ran Building, No.8 Tai Ran Road, Shenzhen, China	
Sample Name:	Wireless earphones	
	DEGE A	
Sample Model:	E505A	
Receive Sample Date:	Feb.14,2022	
Date.		
Test Date:	Feb.15,2022 ~ Mar.03,2022	
Reference	CFR 47, FCC Part 15 Subpart C	
Document:	RADIO FREQUENCY DEVICES:Subpart C—Intentional Radiators	
Test Result:	Pass	

Prepared by: Yong Zhaoyun Reviewed by: Jing Tors



# GUANGZHOU GRG METROLOGY & TEST CO., LTD.

Address: No.163, Pingyun Road, West of Huangpu Avenue, Guangzhou, Guangdong, China Tel: (+86) 400-602-0999 FAX: (+86) 020-38698685 Web: http://www.grgtest.com





# Statement

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2. The sample information is provided by the client and responsible for its authenticity; The content of the report is only valid for the samples sent this time.

3. When there are reports in both Chinese and English, the Chinese version will prevail when the language problems are inconsistent.

4. If there is any objection concerning the report, please inform us within 15 days from the date of receiving the report.

5. Without the agreement of the laboratory, the client is not authorized to use the test results for unapproved propaganda.

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FCC 47 CFR Part 15 Subpart C 15.247, ANSI C63.10-2013 KDB 558074 D01 15.247 measurement guidance v05r02			
Standard	Result		
	Antenna Requirement	Section 15.203	PASS
	20dB Bandwidth	Section 15.247(a)(1)	PASS
	Carrier Frequencies Separated	Section 15.247(a)(1)	PASS
	Hopping Channel Number	Section 15.247(a)(1)(ii)	PASS
FCC 47 CFR Part 15	Dwell Time	Section 15.247(a)(1)(iii)	PASS
Subpart C (15.247)	Maximum Peak Output Power	Section 15.247(b)(1)	PASS
	Conducted Emission	Section 15.207	Not Applicable
	Conducted band edges and Spurious Emission	Section 15.209 &15.247(d)	PASS
(js)	Radiated Spurious Emission	Section 15.209 &15.247(d)	PASS
	Restricted bands of operation	Section 15.247 (d) &15.205	PASS

The EUT antenna is FPC antenna. Max Antenna gain is -0.5dBi .which accordance 15.203.is considered sufficient to comply with the provisions of this section

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# 2. GENERAL DESCRIPTION OF EUT

# 2.1 APPLICANT

Name:	OnePlus Technology (Shenzhen) Co., Ltd.
Address:	18/F, Tower C, Tai Ran Building, No.8 Tai Ran Road, Shenzhen, China

# 2.2 MANUFACTURER

Name:	OnePlus Technology (Shenzhen) Co., Ltd.
Address:	18/F, Tower C, Tai Ran Building, No.8 Tai Ran Road, Shenzhen, China

# 2.3 FACTORY

Name:	Jiangxi Risound Electronics Co., Ltd.	
Address:	No.271, Innovation Avenue, Jinggangshan Economic and Technological Development Zone, Ji'an City, Jiangxi Province	

# 2.4 BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Equipment:	Wireless earphones
Model No.:	E505A
Adding Model:	1
Models discrepancy:	
Trade Name:	ONEPLUS
FCC ID:	2ABZ2-E505AL
Power supply:	DC 3.8V power supplied by earphones battery DC 5V power supplied by E505A charging case or DC 3.7V power supplied by charging case battery
Charging Case:	E505A Input: 5.0V 0.9A Output: 5.0V 0.3A Rated Capacity:480mAh 1.77Wh
Charging Case Battery Specification:	Rechargeable Li-ion Battery, Model:751443-1 Rated Voltage:3.7Vdc Rated Capacity:480mAh 1.77Wh Limited Charge voltage:4.35Vdc
Earphones Battery Specification:	Rechargeable Li-ion Cell , Model:1058PF3 Rated Voltage:3.8Vdc Rated Capacity:41mAh 0.155Wh
Frequency Band:	2402MHz~2480MHz

Report No.: E20220126055701-2

		Tage 7 G
GESK:13.01dBm		
π/4-DQPSK:12.96dBm 8DPSK: 12.97dBm		
FHSS (GFSK for 1Mbps, $\pi/4$ -DQPSK for	or 2Mbps,8DPSK f	for 3Mbps )
FPC antenna with - 0.5dBi gain (Max)		
0°C~35°C		
AA460_0		
V1.0.0		
E20220126055701-0005 E20220126055701-0007		
	GFSK:13.01dBm π/4-DQPSK:12.96dBm 8DPSK: 12.97dBm FHSS (GFSK for 1Mbps, π/4-DQPSK for FPC antenna with - 0.5dBi gain (Max) 0°C ~35°C AA460_0 V1.0.0 E20220126055701-0005	GFSK:13.01dBm π/4-DQPSK:12.96dBm 8DPSK: 12.97dBm FHSS (GFSK for 1Mbps, π/4-DQPSK for 2Mbps,8DPSK for FPC antenna with - 0.5dBi gain (Max) 0°C ~35°C AA460_0 V1.0.0 E20220126055701-0005

Earphone is E505A, Charging Case is E505A

# 2.5 TEST OPERATION MODE

Note:

Mode No.	Description of the modes
1	Bluetooth(BT) fixed frequency transmitting

# 2.6 LOCAL SUPPORTIVE

Name of Equipment	Manufacturer	Model	Serial Number	Note
Notebook	LENOVO	TianYi 310-14ISK	MP18DLC6	5/ 1

# 2.7 CONFIGURATION OF SYSTEM UNDER TEST



**Test software:** 

Software version	Test level
BQB.exe	3

, M

R

R

Report No.: E20220126055701-2

# 2.8 DUTY CYCLE

Test Mode

DH5

2DH5

3DH5

Environment: 23.1°C/53%RH Tested By: Lu Wei

				Date: 2022/02	2/17
Frequency (MHz)	ON Time [ms]	Period [ms]	DC [%]	T [s]	
2441	2.89	5.00	57.80	0.00289	

5.00

5.00

2.89

2.90

DH5	2441

2441

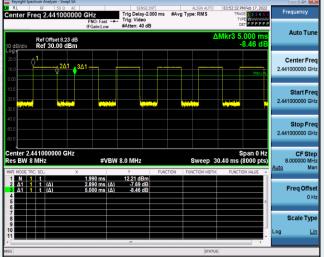
2441

Antenna

Ant1

Ant1

Ant1



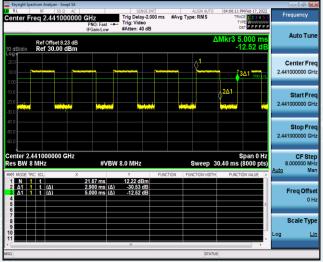
Keysight Sp	ectrum Analyzer - Swept S	4			_				_	0 0
RL	RF 50 Ω A req 2.4410000	C I		SENSE:INT Delay-2.000 ms ; Video		ALIGN AUTO e: RMS	TRAC	M Feb 17, 2022 E 1 2 3 4 5 6 E W 1 2 7 4 5 6 F P P P P P F		requency
10 dB/div	Ref Offset 8.23 d Ref 30.00 dBr	IFGain:Lov		en: 40 dB		Δ	Mkr3 5.			Auto Tu
20.0		Mana	Q1	2∆1 ♦3/	۵1	(m))		TRI9 L L		Center Fre
20.0					Gettin		wynulity		2.44	Start Fre
40.0 50.0									2.44	Stop Fr 1000000 G
Res BW 8		#\	'BW 8.0			· ·	0.40 ms (		Auto	CF Ste 8.000000 M M
2 41	RC SCL t (Δ) t (Δ)	× 11.99 ms 2.890 ms 5.000 ms	(Δ)	FUI 36 dBm 1.60 dB 3.71 dB	ICTION FUN	ICTION WIDTH	FUNCTION	DN VALUE		Freq Offs 0
6 7 8 9										Scale Ty
10									Log	l

57.80

58.00

DITE ALL





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Voltage: DC 3.8V

0.00289

0.00290

ETI

G

0

#### 3. LABORATORY AND ACCREDITATIONS

# **3.1 LABORATORY**

Tel

USA

The tests & measurements refer to this report were performed by Shenzhen EMC Laboratory of Guangzhou GRG Metrology & Test Co., Ltd.

Add : No.1301 Guanguang Road Xinlan Community, Guanlan Street, Longhua District Shenzhen, 518110, People's Republic of China

P.C. : 518000

Fax : 0755-61180008

# 3.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to GB/T 27025(ISO/IEC 17025:2017)

USA A2LA(Certificate #2861.01)

: 0755-61180008

China CNAS(L0446)

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada ISED (Company Number: 24897, CAB identifier:CN0069)

FCC (Registration Number: 759402, Designation Number: CN1198)

Copies of granted accreditation certificates are available for downloading from our web site, <a href="http://www.grgtest.com">http://www.grgtest.com</a>

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# 3.3 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measureme	nt	Frequency	Uncertainty
	Horizontal	9kHz~30MHz	4.46dB
		30MHz~1000MHz	4.30dB
		1GHz~18GHz	5.60dB
Radiated Emission		18GHz~26.5GHz	3.65dB
Radiated Emission	Vertical	9kHz~30MHz	4.46dB
		30MHz~1000MHz	4.30dB
	ventical	1GHz~18GHz	5.60dB
		18GHz~26.5GHz	3.65dB

Measurement	Uncertainty
RF frequency	6.0×10 <sup>-6</sup>
RF power conducted	0.78 dB
Occupied channel bandwidth	0.4 dB
Unwanted emission, conducted	0.68 dB
Humidity	6 %
Temperature	2°C

This uncertainty represents an expanded uncertainty factor of k=2.

ΞY

# 4. LIST OF USED TEST EQUIPMENT AT GRGT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Hopping Channel Number	•			
Spectrum Analyzer	Agilent	N9010A	MY52221469	2022-04-16
Dwell Time				
Spectrum Analyzer	Agilent	N9010A	MY52221469	2022-04-16
Radiated Spurious Emission	on&Restricted band	s of operation		·
Test S/W	EZ	CCS-2ANT	1	/
Test Receiver	R&S	ESCI	100088	2022-10-31
Preamplifier	EMEC	EM330	/	2022-03-21
Bi-log Antenna	TESEQ	CBL6143A	32399	2022-11-25
Spectrum Analyzer	Agilent	N9010A	MY52221469	2022-04-16
Loop Antenna	TESEQ	HLA6121	52599	2022-04-21
Horn Antenna	Schwarzbeck	BBHA9120D (1201)	02143	2022-10-22
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170-497	2022-10-16
Amplifier	Tonscend	TAP01018048	AP20E8060075	2022-05-09
Amplifier	Tonscend	TAP184050	AP20E806071	2022-05-17
Test S/W	Tonscend	JS36-RSE/2.5.1.	5	<u> </u>
20 dB Bandwidth				
Spectrum Analyzer	Agilent	N9010A	MY52221469	2022-04-16
Maximum Peak Output Po	ower			
Pulse power sensor	Agilent	MA2411B	1126150	2022-03-21
Power meter	Anritsu	ML2495A	1204003	2022-03-21
Conducted band edges and	l Spurious Emission			
Spectrum Analyzer	Agilent	N9010A	MY52221469	2022-04-16
Carrier Frequencies Separ	ated			
Spectrum Analyzer	Agilent	N9010A	MY52221469	2022-04-16

Note: The calibration interval of the above test instruments is 12 months.

5. EUT TEST CONDITIONS		
Type of antenna:	FPC antenna	
Test frequencies:	receivers, other than TV bro required. reported for each l	Measurements on intentional radiators or badcast receivers, shall be performed and. if band in which the device can be operated with number of frequencies in each band specified
Frequency range over which device operates	Number of frequencies	Location in the range of operation
1 MHz or less	1	Middle
1 to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top 1 near middle and 1 near bottom

# EUT channels and frequencies list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	14	2416	28	2430
1	2403	15	2417	29	2431
2	2404	16	2418	30	2432
3	2405	17	2419	31	2433
4	2406	18	2420	32	2434
5	2407	19	2421	33	2435
6	2408	20	2422	34	2436
7	2409	21	2423	35	2437
8	2410	22	2424	36	2438
9	2411	23	2425	37	2439
10	2412	24	2426	38	2440
11	2413	25	2427	39	2441
12	2414	26	2428	40	2442
13	2415	27	2429	41	2443

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
42	2444	55	2457	68	2470
43	2445	56	2458	69	2471
44	2446	57	2459	70	2472
45	2447	58	2460	71	2473
46	2448	59	2461	72	2474
47	2449	60	2462	73	2475
48	2450	61	2463	74	2476
49	2451	62	2464	75	2477
50	2452	63	2465	76	2478
51	2453	64	2466	77	2479
52	2454	65	2467	78	2480
53	2455	66	2468		
54	2456	67	2469		

Test frequency is the lowest channel: 0 frequency(2402MHz), middle channel: 39 frequency (2441MHz) and highest channel: 78 frequency(2480MHz)

#### 6. 20dB BANDWIDTH

# 6.1 LIMITS

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.

# 6.2 TEST PROCEDURES

- 1) Remove the antenna from the EUT, and then connect a low loss RF cable from antenna port to the spectrum analyzer.
- 2) Set the spectrum analyzer as RBW=20 kHz, VBW=62 kHz, Span=3MHz, Sweep = auto. Allow the trace to stabilize, record 20dB bandwidth value.
- 3) Repeat until all the test channels are investigated.

#### 6.3 TEST SETUP



#### 6.4 TEST RESULTS

Environment: 23.1 °C/53%RH Tested By: Lu Wei Voltage: DC 3.8V Date: 2022/02/17

Test mode	Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
	Lowest	2402	1011
DH5	Middle	2441	1017
	Highest	2480	1008
Test mode	Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
	Lowest	2402	1179
2DH5	Middle	2441	1203
A	Highest	2480	1179
Test mode	Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
	Lowest	2402	1179
3DH5	Middle	2441	1179
	Highest	2480	1236

# Result plot as follows:

# DH5

Lowest Channel



# Middle Channel



#### Highest Channel



#### Lowest Channel

Keysight Spectrum Analyzer - Swept SA				
RL RF 50 Ω AC Center Freg 2.402000000	GH7	ALIGN AUTO #Avg Type: RMS	02:02:49 PM Feb 17, 2022 TRACE 1 2 3 4 5 6	Frequency
Ref Offset 8.23 dB 10 dB/div Ref 30.00 dBm	PNO: Wide — Trig: Free Run IFGain:Low #Atten: 40 dB	ΔΜ	түре мужику DET P P P P P P kr3 1.179 MHz -0.22 dB	Auto Tune
Log 20.0 10.0 0.00		مىلىسىرىم3∆1		Center Freq 2.402000000 GHz
-10.0			-10.84 dBm	Start Freq 2.400500000 GHz
-40.0			d have have have	Stop Fred 2.403500000 GHz
Center 2.402000 GHz #Res BW 20 kHz MKRI MODEI TRCI SCLI X	#VBW 62 kHz	Sweep 2.3	Span 3.000 MHz 33 ms (1001 pts)	CF Step 300.000 kHz <u>Auto</u> Mar
1 N 1 f 2.40 <sup>°</sup> 2 N 1 f 2.40 <sup>°</sup>	1 400 GHz -10.92 dBm 1 988 GHz 9.36 dBm 1.179 MHz (Δ) -0.22 dB			<b>Freq Offset</b> 0 Hz
7 8 9 10				Scale Type
11 <b></b>				
MSG		STATUS		

# Middle Channel



Keysight Spectrum Analyzer - Swept SA			
RL   RF   50 Ω AC   Center Freq 2.480000000		ALIGN AUTO 02: #Avg Type: RMS	06:11 PM Feb 17, 2022 TRACE 1 2 3 4 5 6 TRACE 1 2 3 4 5 6
Ref Offset 8.23 dB 0 dB/div <b>Ref 30.00 dBm</b> -99	PNO: Wide Trig: Free Run IFGain:Low #Atten: 40 dB	ΔMkr3	TYPE DET P P P P P P 3 1.179 MHz -0.37 dB
20.0 10.0 0.00	2 1 mm mm W	Juntum 3∆1	Center Fre 2.480000000 GH
10.0 20.0 30.0			-10.00 dBr. Start Fre 2.478500000 GH
40.0 50.0 60.0			Stop Fre 2.481500000 GH
Center 2.480000 GHz #Res BW 20 kHz	#VBW 62 kHz	Sweep 2.333	Ann 3.000 MHz ms (1001 pts) FUNCTION VALUE Auto Ma
2 N 1 f 2.47	9 400 GHz -10.11 dBm 9 991 GHz 10.00 dBm 1.179 MHz (Δ) -0.37 dB		Freq Offse ₅ 0 ⊢
7 8 9 9 10 10 10 10 10 10 10 10 10 10 10 10 10			Scale Typ
sg		STATUS	•

3DH5

#### Lowest Channel 02:11:13 PM Feb 17, 2022 #Avg Type: RMS Frequency Center Freq 2.402000000 GHz IFGain:Low IFGain:Low 1 2 3 4 5 6 M W P P P P P TYPE DET Auto Tune ΔMkr3 1.179 MI Ref Offset 8.23 dB Ref 30.00 dBm -0.05 d 10 dB/div **Center Freq** 2.402000000 GHz Start Freq 2.400500000 GHz Stop Freq 2.403500000 GHz Center 2.402000 GHz #Res BW 20 kHz Span 3.000 MHz Sweep 2.333 ms (1001 pts) CF Step 300.000 kHz Man #VBW 62 kHz Auto -10.81 dBm 9.32 dBn -0.05 dB 2.401 421 GHz 2.401 988 GHz 1.179 MHz (Δ) Freq Offset 0 Hz Scale Type Log Lin

#### Middle Channel



# Highest Channel



#### 7. CARRIER FREQUENCIES SEPARATED

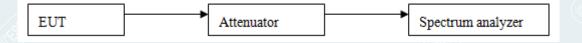
#### 7.1 LIMITS

1) 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.

# 7.2 TEST PROCEDURES

- 1) Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 2) Set center frequency of spectrum analyzer = middle of hopping channel.
- 3) Set the spectrum analyzer as RBW=100kHz, VBW=300kHz, Adjust Span to 3 MHz, Sweep = auto.
- 4) Use the marker-delta function to mark hopping channel carrier frequencies and record the channel separation.

#### 7.3 TEST SETUP



#### 7.4 TEST RESULTS

Environment: 23.1°C/53%RH Tested By: Lu Wei Voltage: DC 3.8V Date: 2022/02/17

#### DH5

Channel Separation (MHz)	Two-thirds of the 20 dB Bandwidth (kHz)	Channel Separation Limit	Result
0.996	678	> Two-thirds of the 20 dB Bandwidth	Pass

#### 2DH5

Channel Separation (MHz)	Two-thirds of the 20 dB Bandwidth (kHz)	Channel Separation Limit	Result	
1.002	802	> Two-thirds of the 20 dB Bandwidth	Pass	

#### 3DH5

Channel Separation (MHz)	Two-thirds of the 20 dB Bandwidth (kHz)	Channel Separation Limit	Result	
1.000	786	> Two-thirds of the 20 dB Bandwidth	Pass	

## Result plot as follows:

# DH5

Measurement of Channel Separation



# 2DH5

Measurement of Channel Separation



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## Test result: The unit does meet the FCC requirements.

# 8. HOPPING CHANNEL NUMBER

## 8.1 LIMITS

Regulation 15.247 (a) (1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

# 8.2 TEST PROCEDURES

- 1) Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 2) Set the spectrum analyzer as RBW=100kHz, VBW=300kHz.
- 3) Set the spectrum analyzer: start frequency = 2400MHz. stop frequency = 2483.5MHz. Submit the test result graph.

# 8.3 TEST SETUP

EUT Attenuator Spectrum analyzer
----------------------------------

# 8.4 TEST RESULTS

Environment: 23.1 °C/53%RH Tested By: Lu Wei Voltage: DC 3.8V Date: 2022/02/17 , M

GFSK

Result (No. of CH)	Limit (No. of CH)	Result
79	≥15	PASS

#### $\pi/4$ -DQPSK

Result (No. of CH)	Limit (No. of CH)	Result
79	≥15	PASS

#### **8DPSK**

Result (No. of CH)	Limit (No. of CH)	Result		
79	≥15	PASS		

# GFSK

 $2.400 \; GHz - 2.4835 \; GHz$ 

K RL	F	n Analyzer - Swe RF 50 Ω 2.44175	AC 60000 GI	<b>IZ</b> NO: Fast ⊂	Trig: Free		#Avg Typ	ALIGN AUTO e: RMS	02:59:01 PM Feb 17, 2022 TRACE 1 2 3 4 5 6 TYPE M	4
0 dB/d		ef Offset 8.2 ef 30.00 c	IF 23 dB	Gain:Low	#Atten: 4	0 dB			DETPPPPF	Auto Tune
. <b>og</b>					,					Center Freq 2.441750000 GHz
10.0				NAAAAAA AAAAAAA AAAAAAAAA AAAAAAAAAAAA	<u>}</u> } } } } } } } } } } } } } } } } } }	£? <u>^</u> 114 <u>4</u> 4 		╋╉ <u>╊</u> ╋╋╋ ╎ ╎	┍┝┍┍┍╡╕╷╡╡ ╵╵╵╵╵╵╵╵╵ ┥╵╵╵╵╵╵╵╵	Start Fred 2.400000000 GHz
10.0										<b>Stop Fred</b> 2.483500000 GHz
80.0										CF Step 8.350000 MHz <u>Auto</u> Mar
0.0										Freq Offset 0 Hz
	2.40000								Stop 2.48350 GHz	Scale Type
Res I	BW 100	) kHz		#VBW	300 kHz			Sweep	3.133 ms (1001 pts)	

# $\pi/4$ -DQPSK

	sight Spect	um Analyzer -	Swept SA	А									
RL ent	er Fre	rf 5	οΩ Α 7500	00 GH	Z IO: Fast Ģ jain:Low			#Avg Typ	ALIGN AUTO e: RMS	TRAC	M Feb 17, 2022 E 1 2 3 4 5 6 E M W Feb P P P P P P P P P P P P P P P P P P P	F	requency
) dBi		Ref Offset Ref 30.0											Auto Tu
- <b>3</b> 20.0 -							• 						<b>Center Fr</b> 11750000 G
0.0	//////	N A A A A A A A A A A A A A A A A A A A	MW	WW				MMM				2.40	Start Fi 00000000 G
0.0 0.0 -												2.48	<b>Stop F</b> 3500000 (
0.0												<u>Auto</u>	CF S 8.350000 I I
0.0 -													Freq Off
0.0													Scale Ty
		00 GHz 00 kHz				/ 300 kHz			0	Stop 2.4	3350 GHz 1001 pts)	Log	

# 0

ETI

# 8DPSK

2.400 GHz – 2.4835 GHz

ente		so Ω 2.44175	0000 GH	IZ NO:Fast ⊊ Gain:Low			#Avg Typ	ALIGN AUTO e: RMS	TRAC	4 Feb 17, 2022 E 1 2 3 4 5 6 PE M WWWWWW T P P P P P P	Freque	ency
) dB/	R div R	ef Offset 8.2 ef 30.00 c	3 dB	Jam.Low							Aut	to Tur
											Cent 2.441750	er Fre
0.0 .00	MM	WWW	MMMM	MAMA	1111 MMM	MMMM	MMM	MMM		MMA	<b>St</b> a 2.400000	art Fre 000 Gi
).0											Sto 2.483500	o <b>p Fr</b> 000 G
).O											0 8.350 <u>Auto</u>	CF St 000 M M
1.0 -											Free	q Offs 0
0.0											Sca	le Ty
	2.4000 BW 10			#VBW	300 kHz			Sweep 3	Stop 2.48 3.133 ms (	350 GHz 1001 pts)	Log	L

Test result: The unit does meet the FCC requirements.

## 9. DWELL TIME

#### 9.1 LIMITS

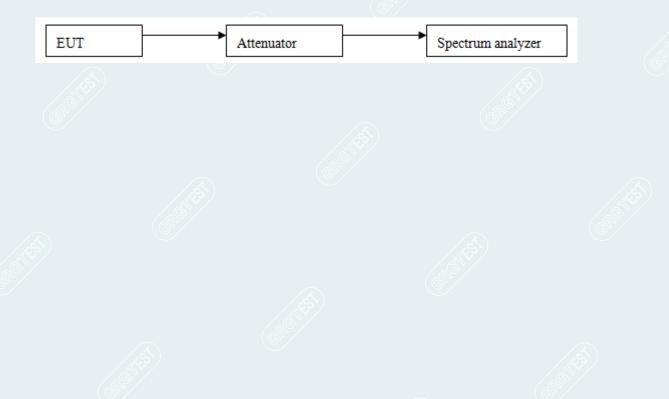
Regulation 15.247(a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

# 9.2 TEST PROCEDURES

1) Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

- 2) Set spectrum analyzer span = 0. centered on a hopping channel.
- 3) Set RBW = 1MHz and VBW = 3MHz.Sweep = as necessary to capture the entire dwell time per hopping channel. Detector Function = Peak. Trace = Max hold.
- 4) Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.). Repeat this test for each variation.
- 5) DH1 Packet permit maximum 1600 / 79 / 2 = 10.12 hops per second in each channel (1 time slot TX, 1 time slot RX).So, the dwell time is the time duration of the pulse times  $10.12 \times 31.6 = 320$  within 31.6 seconds.
- 6) DH3 Packet permit maximum 1600 / 79 / 4 = 5.06 hops per second in each channel (3 time slotsTX, 1 time slot RX).So, the dwell time is the time duration of the pulse times  $5.06 \times 31.6 = 160$  within 31.6 seconds.
- 7) DH5 Packet permit maximum 1600/79/6 = 3.37 hops per second in each channel (5 time slotsTX, 1 time slot RX).So, the dwell time is the time duration of the pulse times  $3.37 \times 31.6 = 106.6$  within 31.6 seconds.

# 9.3 TEST SETUP



Page 27 of 84

# 9.4 TEST RESULTS

Environment: 23.1°C/53%RH Tested By: Lu Wei

The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s

	-												
GFSK:	Middle Channe	l (2.441G	Hz)										
DH1	time slot=	0.39	(ms)*	(1600/(2*79))	*	31.6	=	124.8	ms				
DH3	time slot=	1.64	(ms)*	(1600/(4*79))	*	31.6	=	262.4	ms				
DH5	time slot=	2.89	(ms)*	(1600/(6*79))	*	31.6	=	308.3	ms				
$\pi$ / <b>4-DQPSK:</b> Middle Channel (2.441GHz)													
2DH1	time slot=	0.40	(ms)*	(1600/(2*79))	*	31.6	=	128	ms				
2DH3	time slot=	1.65	(ms)*	(1600/(4*79))	*	31.6	=	264	ms				
2DH5	time slot=	2.90	(ms)*	(1600/(6*79))	*	31.6	=	309.3	ms				
8DPSK	: Middle Chann	el (2.4410	GHz)										
3DH1	time slot=	0.40	(ms)*	(1600/(2*79))	*	31.6	=	128	ms				
3DH3	time slot=	1.65	(ms)*	(1600/(4*79))	*	31.6	=9	264	ms				
3DH5	time slot=	2.90	(ms)*	(1600/(6*79))	*	31.6	Š-	309.3	ms				

The results are not greater than 0.4 seconds. The unit does meet the requirements.

----- The following blanks -----

Voltage: DC 3.8V Date: 2022/02/17

# Please refer the graph as below:

# GFSK Middle Frequency (2.441GHz) DH1

							$(\sim )$				
	pectrum Analyzer - Swep	t SA									
Center F	RF 50 Ω Freq 2.441000	AC   0000 GH	Z IO: Fast +++	Trig Dela	vse:INT y-2.000 ms	#Avg Typ	ALIGN AUTO e: RMS	TRAC TYP	HFeb 17, 2022 E 1 2 3 4 5 6 E W	Fr	requency
10 dB(div	Ref Offset 8.23 Ref 30.00 dB	dB	Sain:Low	#Atten: 4	0 dB			⊡ ۵ <b>Mkr2 3</b> 1			Auto Tune
10 dB/div Log		2Δ1									<b>Center Freq</b> 1000000 GHz
10.0 0.00									TRIG LVL	2.44	Start Freq 1000000 GHz
-10.0 -20.0										2.44	Stop Freq 1000000 GHz
-30.0	upping a particular	A Market and the				Mileya Jipan,	i de la companya da company Companya da companya da com		unhan problem	Auto <sup>1</sup>	CF Step 1.000000 MHz Man
-50.0	hhter and the	<mark>(</mark> ) () ()	alla (p) (p) (p)				an la bara la		<u>ahj</u> arilater		Freq Offset 0 Hz
-60.0	444000000								non 0 He		Scale Type Lin
Center 2. Res BW	.441000000 GH 1.0 MHz	12	#VBW	3.0 MHz			Sweep 1	ອ 0.13 ms (	pan 0 Hz 8000 pts)		2011
MSG							STATUS				
_		_	_	_						_	

# DH3

Frequency	03:01:37 PM Feb 17, 2022 TRACE 1 2 3 4 5 6 TYPE WWWWWW	SN AUTO	#Avg Type	VSE:INT y-2.000 ms	Trig Dela	Z NO: Fast ↔	0 Ω AC 000000 G	RF 50 9	RL
Auto Tur	оет реререр Mkr2 1.642 ms 20.36 dB	Δ			#Atten: 4	Gain:Low	1 8.23 dB	Ref Offset 8 Ref 30.00	) dB/div
Center Fre 2.441000000 GH						▲2∆1			<b>, g</b>
<b>Start Fre</b> 2.441000000 GH	TRG LVL								0.0
<b>Stop Fre</b> 2.441000000 GF							 		).0
<b>CF St</b> e 1.000000 MI <u>Auto</u> Mi	hilen burn blenn boola			Herry Martin		<b>vi</b> )vi	- <u>111</u>	(webursh) webb	io <mark>Jpyda</mark>
Freq Offs 0 F		balla ti	Weeley (A.	K <sup>la</sup> lliti in	ilen institut	in the second se			
Scale Typ	Span 0 Hz							141000000	anter 2
_	.13 ms (8000 pts)	eep 10	\$		3.0 MHz	#VBW	U GHZ		enter 2. es BW 1

(&

3)

Keysight Spe R L	ectrum Analyzer - Swept SA RF 50 Ω AC		SENSE:INT			02-50-20 PM		
	req 2.441000000	PNO: Fast +++ T	rig Delay-2.000 ms rig: Video Atten: 40 dB	#Avg Typ	ALIGN AUTO e: RMS	TYPE	-eb 17, 2022 1 2 3 4 5 6 W	Frequency
dB/div	Ref Offset 8.23 dB Ref 30.00 dBm				Δ	Mkr2 2.8 14	391 ms .46 dB	Auto Tune
).0							_	Center Free 2.441000000 GH
0.0	1		2Δ1				TRIG LVL	<b>Start Fre</b> 2.441000000 GH
	\$'							<b>Stop Fre</b> 2.441000000 GH
	an da Hiy at da yana		to the state of th	la la d'apportant	<mark>11<sup>1</sup>111111111111111111111111111111111</mark>		wein pa	<b>CF Stej</b> 1.000000 MH <u>Auto</u> Ma
).0 .0			<mark>1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,</mark>	ant a station of the	al a faile a fa	u <mark>hi</mark> ni () (1444) Ani		<b>Freq Offse</b> 0 H
anter 2/	441000000 GHz					Gr	an 0 Hz	Scale Type
es BW 1		#VBW 3.	0 MHz		Sweep 1	ېږي 0.13 ms (8	000 pts)	

$\pi/4$ -DQPSK	
Middle Frequency	(2.441GHz)
2DH1	

DHI											
Keysight Spe	RF 50 Ω	AC AC	_	SEI	SE:INT		ALIGN AUTO	03:27:37 P	M Feb 17, 2022	_	
Center F	req 2.44100	PN	Z IO: Fast ↔ Gain:Low	Trig Dela	y-2.000 ms	#Avg Typ		TRAC	E 1 2 3 4 5 6 E W	F	requency
I0 dB/div	Ref Offset 8.23 Ref 30.00 d	3 dB Bm						ΔMkr2 3 1	395.2 μs 0.55 dB		Auto Tune
<sup>og</sup>											Center Freq
20.0										2.44	41000000 GHz
10.0		<b>™</b> 2∆1 -									Start Freq
0.00		1							TRIG LVL	2.44	41000000 GHz
10.0											Stop Freq
20.0										2.44	41000000 GHz
30.0											CF Step
<mark>Allipadi</mark> a	ayla, Jakob Mare	<mark>Hephele</mark>	and the second	(kodi <mark>laba))</mark>	<mark>lank to dillo</mark>	<mark>d kundelak ha</mark>	han an the star star star star star star star star	ANN MADA	app <mark>al phanel p</mark>	<u>Auto</u>	1.000000 MHz Man
<sup>io.o</sup> <mark>alpel</mark> et	haddiaith fach	NHW N		<b>(Perch</b> ette	innipi in	<b>okiny</b> (i	Nappleop	n an the	<mark>i waxa ili kap</mark>		
50.0				<u>' </u>		111					Freq Offset 0 Hz
50.0											
											Scale Type
enter 2.4 tes BW 1	441000000 GI .0 MHz	Hz	#VBW	3.0 MHz			Sweep 1	0.13 ms (	pan 0 Hz 8000 pts)	Log	Lin
SG							STATUS			-	

# Mid Frequency (2.441GHz) 2DH3

	ectrum Analyzer - Swept SA						- 2 -
X RL Center F				#Avg Type: R		30:42 PM Feb 17, 2022 TRACE 1 2 3 4 5 6 TYPE WWWWWW DET PPPPPP	Frequency
I0 dB/div _og <sub>w</sub>	Ref Offset 8.23 dB Ref 30.00 dBm				ΔMk	r2 1.648 ms 7.66 dB	Auto Tun
20.0							Center Fre 2.441000000 G⊦
10.0 D.00		2Δ1				TRIG LVL	<b>Start Fre</b> 2.441000000 G⊢
10.0							<b>Stop Fre</b> 2.441000000 G⊢
0.0 	li <mark>ntega kanalara</mark> n dari kanalaran dari kanalaran kanalaran kanalaran kanalaran kanalaran kanalaran kanalaran kanala		ad <mark>h (</mark> madh na	<mark>a pitan l</mark> andi <mark>tana</mark>	laite de la de	<mark>Ny Hang Kalung panalisa kalantan</mark>	CF Ste 1.000000 M⊢ <u>Auto</u> Ma
		, Cipple and a filler	amoyi (May)	di ka na kalimata pla	<mark>hinnen he</mark>	llynel (fylen)eerdelyde	FreqOffse 0⊢
50.0							Scale Typ
enter 2. les BW 1	441000000 GHz 1.0 MHz	#VBW 3.0 MH	z	Sw	eep 10.13	Span 0 Hz 3 ms (8000 pts)	Log <u>Li</u>
SG					STATUS		

Center Fr	RF 50 Ω eq 2.44100	00000	Hz PNO: Fast ↔ IFGain:Low	Trig Dela		#Avg Typ	ALIGN AUTO e: RMS		IFeb 17, 2022 E 1 2 3 4 5 6 E W P P P P P T P P P P P P		quency
10 dB/div Log	Ref Offset 8.2 Ref 30.00 (	23 dB d <b>Bm</b>					Δ	Mkr2 2. 1	896 ms 1.91 dB		Auto Tun
20.0											enter Fred 000000 GH
10.0 0.00		<b>.</b>			2∆1				TRIG LVL		Start Free
-10.0		/									<b>Stop Free</b> 000000 GH
-30.0	under <mark>Alteiler bestelle</mark>				an a	a president di fice de la	Lastra (de <sub>la</sub> stra)	len planedhi	n Haddildagii	1.0 <u>Auto</u>	CF Step 000000 MH Mar
-40.0 -50.0				ľ	in hunder in h	AP hay the	nderen filleren.	flaktion.	(Horodal)	F	r <b>eq Offse</b> 0 Hi
-60.0											cale Type
Center 2.4 Res BW 1.	41000000 C 0 MHz	HZ	#VBW	3.0 MHz			Sweep 1	S 0.13 ms (	pan 0 Hz 8000 pts)	LUg	Lir

2DH5

# 8DPSK Middle Frequency (2.441GHz) 3DH1

Keysight Spectrum Analyzer - Swept SA			
Center Freq 2.441000000 GHz	SENSE:INT Trig Delay-2.000 ms		42 PM Feb 17, 2022 TRACE 1 2 3 4 5 6 Frequency
PNO: Fast IFGain:Low	→ Trig: Video #Atten: 40 dB		
Ref Offset 8.23 dB 10 dB/div Ref 30.00 dBm Log		ΔMKr	2 396.5 µs 15.70 dB
			Center Freq
20.0			2.441000000 GHz
10.0			TRIO LVL Start Freq
0.00			2.441000000 GHz
-10.0			Stop Freq
-20.0			2.441000000 GHz
-30.0			CF Step
14 P (1914) (14 (14 (14 (14 (14 (14 (14 (14 (14 (14		an de la contra contra contra de la contra de La de la contra de la	Auto Man
-50.0	adout as white the		Freq Offset
			0 Hz
-60.0			Scale Type
Center 2.441000000 GHz Res BW 1.0 MHz #VE	SW 3.0 MHz	Sweep 10.13 m	Span 0 Hz Log Lin
MSG	///////////////////////////////////////	STATUS	

21	112	
)		

Keysight Sp R L	RF 50 Ω			CT4	SE:INT		ALIGN AUTO	02:48:40.0	M Feb 17, 2022		- 5 ×
	req 2.441000	0000 GH	Z IO: Fast ↔→ iain:Low	Trig Dela	y-2.000 ms	#Avg Typ		TRAC	DE 1 2 3 4 5 6 PE WWWWWWW ET P P P P P P	Fi	requency
) dB/div	Ref Offset 8.23 Ref 30.00 de	dB 3m					Δ		.645 ms 9.55 dB		Auto Tune
0.0											Center Fred 1000000 GH2
0.0		iiteatrii teat 1	<b>4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</b>						TRIO LVL	2.44	Start Fred
).0 ).0										2.44	Stop Fred
0.0  101 <sup>11</sup> 1	l <mark>alti</mark> netral diri		njih	e <mark>n Nord May</mark>	<u>te li tin a ti nan</u>	(P) (1911) and a	na da filo por portes	u <mark>l(</mark> ahollina)	u <mark>l populatere</mark>	<u>Auto</u>	CF Step 1.000000 MH: Mar
).0      <sup> </sup>				addell <mark>adard</mark>	la paticititi p		phone of	<mark>di l<sub>a</sub>danananananananananananananananananana</mark>	d <sup>all</sup> teinnitteini		Freq Offse 0 H:
											Scale Type
	441000000 GH 1.0 MHz	lz	#VBW	3.0 MHz			Sweep 1	S 0.13 ms (	pan 0 Hz (8000 pts)	Log	<u>Lir</u>
G							STATUS				

# 3DH5

Keysight Spectrum Analyzer - Swept SA					
Center Freq 2.441000000 GH		SE:INT /-2.000 ms #Avg Typ		PM Feb 17, 2022 ACE 1 2 3 4 5 6	Frequency
P	IO: Fast ⊷⊷ Trig: vide	0	T		
IFC	Gain:Low #Atten: 40	) dB			Auto Tune
Ref Offset 8.23 dB				2.896 ms 15.40 dB	
10 dB/div Ref 30.00 dBm				10.40 UB	
					Center Freq
20.0					2.441000000 GHz
	2	Δ1			
10.0					Start Freq
				TRIG LVL	2.441000000 GHz
0.00					2.441000000 0112
-10.0					
-10.0					Stop Freq
-20.0					2.441000000 GHz
10.0					
-30.0					CF Step
y da tida ta a ta ba da ta ba da da ba da da ba da	n n	bild, bilandahkan ba	dala dagailati mbadata.	as na diversita a da	1.000000 MHz <u>Auto</u> Man
-40.0 Traft for difficult trate lifet		and the following the list is	dalar nahi daran dalam	المتر ألاستا ألاليا	
A CALIFORNIA AND A DECEMBER OF A DECEMBER	T I	a de la della de la della de		utratio Auso	Freq Offset
-50.0					0 Hz
-60.0					Scale Type
					Scale Type
Center 2.441000000 GHz				opan o nz	Log <u>Lin</u>
Res BW 1.0 MHz	#VBW 3.0 MHz		Sweep 10.13 ms	(8000 pts)	
MSG			STATUS		

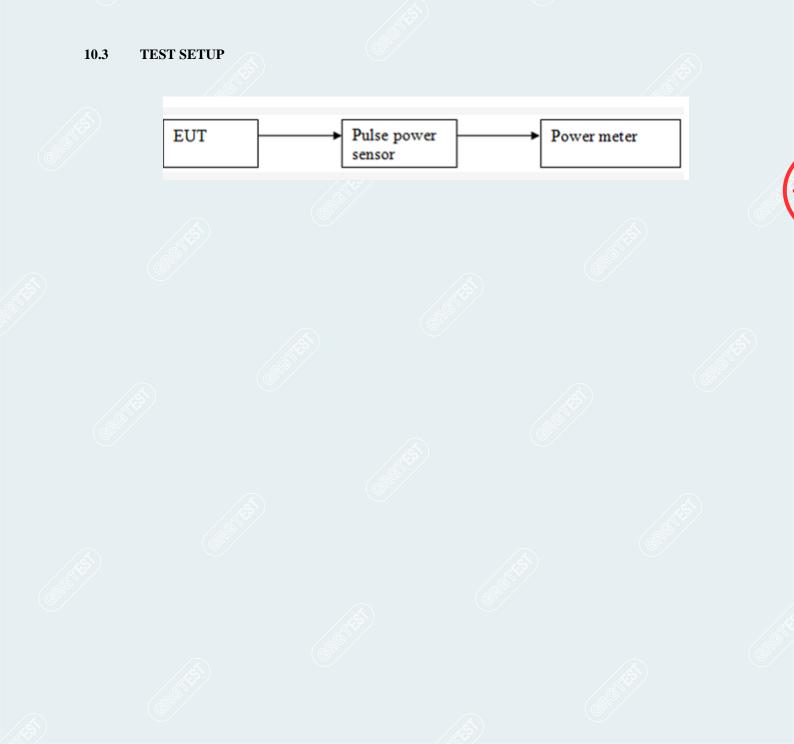
#### **10. MAXIMUM PEAK OUTPUT POWER**

# 10.1 LIMITS

Regulation 15.247 (b)(1)For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

# **10.2 TEST PROCEDURES**

- 1) Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the power meter and enable the EUT transmit continuously.
- 2) Keep the EUT in transmitting at lowest, middle and highest channel individually. Record the max value.



# 10.4 TEST RESULTS

Environment: 23.1°C/53%RH Tested By: Lu Wei

DH5

Test Channel	Fundamental Frequency (GHz)	Max Output Power(dBm)	Limit (dBm)	Peak/ Average	Pass/Fail
Lowest	2.402	12.54			Pass
Middle	2.441	13.01	20.97	Peak	Pass
Highest	2.480	12.92	]		Pass

2DH5

Test Channel	Fundamental Frequency (GHz)	Max Output Power(dBm)	Limit (dBm)	Peak/ Average	Pass/Fail
Lowest	2.402	12.31			Pass
Middle	2.441	12.72	20.97	Peak	Pass
Highest	2.480	12.96			Pass

3DH5

Test Channel	Fundamental Frequency (GHz)	Max Output Power(dBm)	Limit (dBm)	Peak/ Average	Pass/Fail	
Lowest	2.402	12.35	A	Ch	Pass	
Middle	2.441	12.74	20.97 Peak		Pass	
Highest	2.480	12.97			Pass	

Test result: The unit does meet the FCC requirements.

Voltage: DC 3.8V Date: 2022/02/17

#### 11. CONDUCTED BAND EDGES AND SPURIOUS EMISSIONS

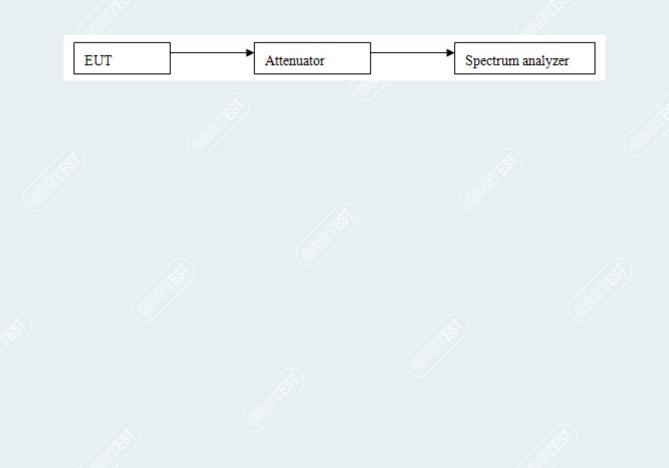
#### 11.1 LIMITS

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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

# **11.2 TEST PROCEDURES**

Test procedures follow KDB 558074 D01 DTS Measurement Guidance v05r02.

- 1) Remove the antenna from the EUT and then connect a low attenuation cable from the antenna port to the spectrum.
- 2) Set the spectrum analyzer: RBW =100kHz; VBW =300kHz, Frequency range = 30MHz to 26.5GHz; Sweep = auto; Detector Function = Peak. Trace = Max, hold.
- 3) Measure and record the results in the test report.
- 4) The RF fundamental frequency should be excluded against the limit line in the operating frequency band.



#### **11.3 TEST SETUP**

Report No.: E20220126055701-2

# 11.4 TEST RESULTS

Environment: 23.1℃/53%RH Tested By: Lu Wei

Test result plot as follows:

# **Band Edges**

# DH5

CH Low (2.30GHz ~2.405GHz)
----------------------------

	ectrum Analyzer - Swept	: SA						- 0 💌
LXI RL		AC	SENSE:IN		ALIGN AUTO Type: RMS	01:55:13 PM Feb 17, 20 TRACE 1 2 3 4		equency
Center F	req 2.352500	PNO: Fast	Trig: Free Rur		Type. Kino		₩	
		IFGain:Low	#Atten: 30 dB				_	Auto Tune
	Ref Offset 8.23 dB Mkr5 2.350 085 GHz							Auto Tune
10 dB/div Log	Ref 20.00 dE	3m				-44.66 dBr		
10.0						Y	c	enter Freq
0.00								2500000 GHz
-10.0						-8.27 d		
-20.0								
-30.0								Start Freq
			▲ 5				2.300	0000000 GHz
-40.0	4		<b>?</b>					
-50.0 partment	marta and have	AM Marganeering and the Hardships	all and the second states of the second states and	alafter for the part of the second second	4:01-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-	have have all at		Stop Freq
-60.0							2,405	5000000 GHz
-70.0								
Start 2.30						Stop 2.40500 GH		05.044
#Res BW		#VF	3W 300 kHz		Sweep 3	.867 ms (1001 pt		CF Step .500000 MHz
MKRI MODEI TR		X	Y	FUNCTION	•	· · ·	Auto	Man
	f	2.402 165 GHz	11.73 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	<b>^</b>	
2 N 1	f	2.400 000 GHz 2.390 000 GHz	-47.54 dBm -49.17 dBm				F	req Offset
3 N 1 4 N 1	f	2.310 000 GHz	-51.66 dBm					0 Hz
5 <u>N</u> 1	l f	2.350 085 GHz	-44.66 dBm				E	
7								
8								Scale Type
10							Log	Lin
							*	
MSG					STATU	S		
				_			_	_

Keysight Spectrum Analyzer - Sw	rept SA		, , , , , , , , , , , , , , , , , , ,		
Center Freq 2.3525	00000 GHz	SENSE:IN	#Avg Type: RMS		Frequency
Ref Offset 8. 10 dB/div Ref 20.00				<sub>рет</sub> ререре kr5 2.387 045 GHz -45.71 dBm	Auto Tune
10.0 0.00				-8.95 dBm	Center Freq 2.352500000 GHz
-20.0					<b>Start Freq</b> 2.300000000 GHz
-50.0	addagaaradawaqaawaA	<del>skinspolanestta AMUAN</del> A	nutrapart Malankarfue	unterstophets Strinklinnet	<b>Stop Freq</b> 2.405000000 GHz
Start 2.30000 GHz #Res BW 100 kHz	X	BW 300 kHz	Swee	Stop 2.40500 GHz p 3.867 ms (1001 pts)	<b>CF Step</b> 10.500000 MHz <u>Auto</u> Man
1 N 1 f 2 N 1 f 3 N 1 f 4 N 1 f 5 N 1 f 6	2.404 055 GHz 2.400 000 GHz 2.390 000 GHz 2.310 000 GHz 2.387 045 GHz	11.05 dBm -47.49 dBm -49.67 dBm -52.34 dBm -45.71 dBm			<b>Freq Offset</b> 0 Hz
7 8 9 10					Scale Type
11				-	
MSG			s	STATUS	

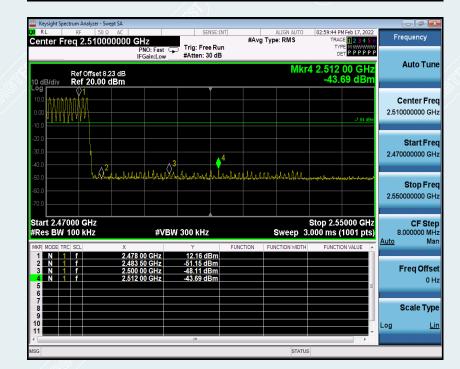
Voltage: DC 3.8V Date: 2022/02/17

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(&

Enter         Freq 2.510000000 GHz         Trig: Free Run         #Avg Type: RMS         Trace Distance         Frequency           PN0: Fast         Trig: Free Run         #Avg Type: RMS         Trace Distance         Auto T           PdB/div         Ref Offset 8 23 dB         Mkr4 2.532 00 GHz         Auto T           PdB/div         Ref 2000 dBm         -44.48 dBm         -44.48 dBm           Pg         1	Keysight Spe	ectrum Analyz			_	2ENCE di			01.50.55		_	
Ref Offset 8.23 dB         Mkr4 2.532 00 GHz         Auto T           dB/div         Ref 20.00 dBm         -44.48 dBm         -44.48 dBm         -251000000           0         - </th <th></th> <th></th> <th>50 Ω AC 10000000</th> <th>PNO: Fast</th> <th></th> <th>Free Run</th> <th>#Avg</th> <th>g Type: RMS</th> <th>TRA</th> <th>CE 1 2 2 4 5 6</th> <th></th> <th>equency</th>			50 Ω AC 10000000	PNO: Fast		Free Run	#Avg	g Type: RMS	TRA	CE 1 2 2 4 5 6		equency
Image: Control of the second secon								Mk				Auto Tu
N         1         f         2.480 00 GHz         Function         Function width         Function value         Auto           N         1         f         2.480 00 GHz         4.48 dBm         5.000 ms (1001 pts)         6.000000         6.000000         6.000000         6.	0 10									-7.61 dBm		
N         1         f         2.480 00 GHz         Stop 2.55000 GHz         Stop 2.55000 GHz           N         1         f         2.480 00 GHz         FUNCTION         FUNCTION WIDTH         FUNCTION VALUE         Auto           N         1         f         2.483 50 GHz         44.48 dBm         Freq OI         Scale T           N         1         f         2.553 00 GHz         44.48 dBm         Image: Stop 2.553 00 GHz         Auto	·		2		^3				4		2.470	<b>Start F</b> 0000000
es BW 100 kHz #VBW 300 kHz Sweep 3.000 ms (1001 pts) N 1 f 2.480 00 GHz 12.39 dBm N 1 f 2.480 00 GHz 47.96 dBm N 1 f 2.500 00 GHz -47.96 dBm N 1 f 2.502 00 GHz -44.48 dBm S 2.502 00 GHz -44.48 dBm	o ——		- Andragan Lawry	yhoysaaaybaybaybayba			an a	energensense i A	an a sa an	anagan sebahangan	2.550	<b>Stop F</b> 0000000
N         1         f         2.489 00 GHz         12.39 dBm         Function         Function width         Function value				#VI	BW 300 k	Hz		Sweep :				CF S 000000
N         1         f         2.500 00 GHz         -50.29 dBm         Freq Of           N         1         f         2.532 00 GHz         -44.48 dBm         Image: Compare the second s	N 1	1 f	2.	.480 00 GHz	12.3	9 dBm	FUNCTION	FUNCTION WIDTH	I FUNCT	ION VALUE	Auto	
Log	N 1 N 1		2.	.500 00 GHz	-50.29	9 dBm				E	ľ	Freq Of
												Scale T
		22									Log	

# CH High (2.47GHz ~ 2.55GHz)



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P

H Low (2.30GHz	~2.4050	JHZ )					
Keysight Spectrum Analyzer - Swept SA RL RF 50 Ω AC		SENSE:IN	er l	ALIGN AUTO	02:02:11 0	4 Feb 17, 2022	
Center Freq 2.352500000	GHz PNO: Fast 😱 IFGain:Low	Trig: Free Run #Atten: 30 dB	#Avg	g Type: RMS	TRAC	E 1 2 3 4 5 6 E M WWWWWW T P P P P P P	Frequency
Ref Offset 8.23 dB 0 dB/div Ref 20.00 dBm				Mkr5	2.349 9 -46.	80 GHz 72 dBm	Auto Tun
• 0 0 10.0 10.0						-8.45 dBm	Center Fre 2.352500000 GH
20.0		6			. <b>≬</b> ³	2	Start Fre 2.300000000 GH
50.0	nat koowaaa ka	towers the twee set		#Httman Articlare	www.	Waytown <sup>th</sup>	<b>Stop Fre</b> 2.405000000 GH
Start 2.30000 GHz ¢Res BW 100 kHz	#VBW	300 kHz		Sweep 3		1001 pts)	CF Stej 10.500000 MH Auto Ma
2 N 1 f 2.400 3 N 1 f 2.390 4 N 1 f 2.310	060 GHz 000 GHz 000 GHz 000 GHz 980 GHz	Y -11.55 dBm -47.42 dBm -50.34 dBm -51.96 dBm -46.72 dBm	FUNCTION	FUNCTION WIDTH	FUNCTIO	DN VALUE	Freq Offse
b         N         T         2.349           6         - <td>980 GH2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Scale Typ</td>	980 GH2						Scale Typ
		III		STATUS		•	

# 2DH5 CH Low (2.30GHz ~2.405GHz )

						/							97					
	ipectru	ım Analyzer																P X
LXI RL			50 Ω AC				SENS	E:INT	44		ALIGN AUTO e: RMS	0 (		M Feb 17, 20 CE 1 2 3 4		En	equen	cv
Center	Fre	q 2.354	250000		PNO: Fast		rig: Free l	Run	#0.4	a i àbi	e. KWI3		TY	PE M WWW	<del>ww</del>			_
					FGain:Low	* #/	Atten: 30	dB					٥	ET PPPP	P P		_	_
10 dB/div		Ref Offse Ref 20.(									Mkı	5 2.		055 GH 06 dBi			Auto	Tune
							ľ								Ŷ	~	onto	Erog
														A	ah.			r Freq
0.00														-9.14 d		2.352	250000	0 GHz
-10.0																		
-20.0																	Star	Freq
-30.0																2.300		0 GHz
-40.0												5_	_ <u>^3</u>					
-50.0		() <sup>4</sup> .										Υ.	Ŷ.					
1000	al as and	3940 mary 10	(illetter and all and a second se	and a state of the second		w and a second	enternet, A. Arek	an the the second s	Ro. Alexand	olihino		~~~~~	and here a line	the state.			Stop	Freq
-60.0																2.405	500000	0 GHz
-70.0																		
Start 2.3	000											C+	on 24	0500 GH	17		05	044
#Res BV					#VI	BW 30	0 kHz			ş	Sweep			(1001 pt	S)			Step 0 MHz
MKR MODE	TRC	SCL		х			Y	FL	JNCTION	FUN	CTION WID	TH	FUNCT	ION VALUE	<u> </u>	Auto		Man
		f			60 GHz		0.86 dBr											
2 N 3 N		f f			00 GHz 00 GHz		9.90 dBr 8.49 dBr									I	rea C	Offset
4 N	1	f	2.	310 0	00 GHz	-5	1.68 dBr	m										0 Hz
5 N	1	f	2.	383 0	55 GHz	-4	7.06 dBr	m				_			E			
7																		
8																:	Scale	Туре
9															ш,	.og		Lin
11															-	Jug		Lin
•														+				
MSG											STA	TUS						

	ctrum Analyzer - !											
enter Fr	RF 50 eq 2.5100			Tria	SENSE:IN	#Av		ALIGN AUTO B: RMS	TRAC	M Feb 17, 2022	F	requency
) dB/div	Ref Offset		PNO: Fast IFGain:Low	· •	n: 30 dB			Mkr	4 2.532	16 GHz 18 dBm		Auto Tur
										-7.69 dBm		Center Fre
		2						<b>4</b>			2.47	<b>Start Fre</b> 70000000 G⊦
jis <sup>1</sup> registan			and a second and a s	alegaditarian da series de la constante de la	10-194 <sub>8</sub> -15 <sub>0</sub> 07.	Antonio y positivo Antonio y pos	10-11-1-V	annon an Arab	<del>ران این رید در این ایر</del> مراجع این		2.55	<b>Stop Fre</b> 50000000 GH
	000 GHz 100 kHz		#V	BW 300 k	Hz		5			5000 GHz 1001 pts)		CF Ste 8.000000 MH
MODE TR	C SCL	X	80 00 GHz	Y 40.2	1 dBm	FUNCTION	FUN	CTION WIDTH	FUNCTI	ON VALUE	<u>Auto</u>	Ma
N 1 N 1 N 1	f f f	2.4	80 00 GH2 83 50 GHz 00 00 GHz 32 16 GHz	-50.1 -51.1	0 dBm 7 dBm 8 dBm							Freq Offs 0 F
												Scale Typ
											Log	L
				III				STATUS		•		

# CH High (2.47GHz ~ 2.55GHz)

	Analyzer - Swept SA F 50 Ω AC		SENSE:INT	#Avg Typ	ALIGN AUTO	03:24:46 PM Feb 1 TRACE 1 2		Frequency
enter Freq	2.510000000	PNO: Fast G IFGain:Low	Trig: Free Run #Atten: 30 dB	#AV8 19P	E. KWIJ	TYPE MW DET P P	wwww	
0 dB/div Re	ef Offset 8.23 dB ef 20.00 dBm				Mkr4	2.528 00 ( -46.04 c		Auto Tu
°g	htm 					4	3.19 dBm	Center Fr 2.510000000 G
20.0 30.0 40.0	A2		3		4			Start F 2.470000000 (
50.0 50.0 70.0	- Winner and the	en and the second	an derend and georgia the the state	nagenge Asthering and a	t-Athone and		ال جانيونيو 	Stop F 2.550000000
tart 2.47000 Res BW 100		#VB\	N 300 kHz			Stop 2.55000 000 ms (1001	pts)	CF S 8.000000 I
IKR MODE TRC SC		476 00 GHz	۲ 11.81 dBm	FUNCTION FUN	ICTION WIDTH	FUNCTION VALU	JE A	l <u>uto</u> I
	2.4	476 00 GHZ 483 50 GHZ 500 00 GHZ 528 00 GHZ	11.81 dBm -49.58 dBm -50.59 dBm -46.04 dBm					Freq Off
3 N 1 f 4 N 1 f 5	<b>2.</b>							
3 N 1 f 4 N 1 f								Scale T

	w (2.30GHz ectrum Analyzer - Swept SA	2.102	0112 )					-	- 6 ×
X RL	RF 50 Ω AC req 2.352500000	GHz PNO: Fast	SENSE:IN Trig: Free Rur #Atten: 30 dB	#Avg	ALIGN AUTO 3 Type: RMS	TRAC	M Feb 17, 2022 CE <b>1 2 3 4 5 6</b> PE M WWWWW ET <b>P P P P P P</b>	Fre	quency
10 dB/div	Ref Offset 8.23 dB Ref 20.00 dBm				Mkr5		85 GHz 40 dBm		Auto Tune
10.0 0.00							_8.39 dBm		enter Freq 500000 GHz
-20.0	<b>4</b>		<b>5</b>				<u></u>		Start Freq 000000 GHz
-50.0 <b></b> -60.0	and for the second second second second	hallower and a share	weethin	an construction of the state of	zansishi yiki yekonsiki yekonsiki yekonsiki yekonsiki yekonsiki yekonsiki yekonsiki yekonsiki yekonsiki yekonsi	hertransk dreaste	A Marine A		Stop Freq
Start 2.30 #Res BW		#VBW	300 kHz		Sweep 3		0500 GHz 1001 pts)		CF Step
MKR MODE TH	f 2.40	2 060 GHz 0 000 GHz	Y 11.61 dBm -49.03 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION	ALUE A	<u>Auto</u>	Man req Offsel
3 N 4 N 5 N 6	f 2.31	0 000 GHz 0 000 GHz 0 085 GHz	-51.05 dBm -51.81 dBm -45.40 dBm				E		0 Hz
7 8 9 10									cale Type
11			m					Log	Lin
//SG					STATUS	6			

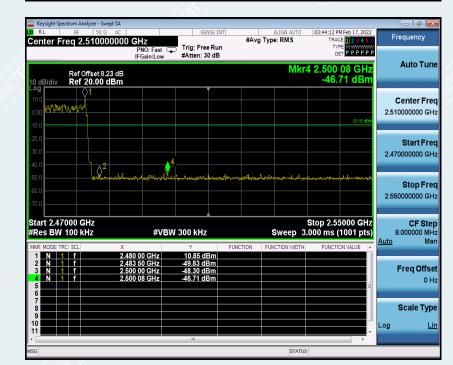
# 3DH5 CH Low (2.30GHz ~2.405GHz )

Keysight Spectrum Analyzer - Swept SA							
Center Freq 2.352500000		SENSE:IN	#Avg	ALIGN AUTO Type: RMS		Feb 17, 2022	Frequency
	PNO: Fast G IFGain:Low	#Atten: 30 dB			DET	P	Auto Tune
Ref Offset 8.13 dB 10 dB/div Ref 20.00 dBm				Mkr5	2.381 16 -47.4	65 GHz 4 dBm	Auto Tune
Log 10.0		l í				<b>⊘1</b>	Center Freq
0.00						, Anto	2.352500000 GHz
-10.0						-9.40 dBm	
-20.0							Start Freq
-30.0				r			2.30000000 GHz
-40.0				, <b>\$</b>	() <sup>3</sup>	, Ø <sup>2</sup>	
-50.0	สระบุๆๆของจองสุดกลรู้ใด	Street Martinet	farnyn filmeddor yw	tuntur graven Alure	elember of a state of a second se	ntreak	Stop Freq
-70.0							2.405000000 GHz
Start 2.30000 GHz					Stop 2.40		05.04
#Res BW 100 kHz	#VBV	/ 300 kHz		Sweep 3.			CF Step 10.500000 MHz
MKR MODE TRC SCL X		Y	FUNCTION	FUNCTION WIDTH	FUNCTION	VALUE 🔺	<u>Auto</u> Man
	2 165 GHz 0 000 GHz	10.60 dBm -50.98 dBm					
3 N 1 f 2.39	0 000 GHz	-50.97 dBm					Freq Offset
	0 000 GHz 1 165 GHz	-51.83 dBm -47.44 dBm					0 Hz
6	1 165 GHZ	-47.44 dBm					
7							Scale Type
9							Log <u>Lin</u>
						-	
MSG				STATUS			

Page 41 of 84

	ectrum Analyzer - Swept SA	,					-	a x
Center F	RF 50 Ω AC req 2.5100000	00 GHz	SENSE:II	#Avg	ALIGN AUTO g Type: RMS	02:54:24 PM Feb 17, 2022 TRACE 1 2 3 4 5 6 TYPE	Frequ	ency
10 dB/div	Ref Offset 8.23 dE Ref 20.00 dBn		#Atten: 30 dB		Mkr	4 2.532 16 GHz -45.52 dBm	A	ito Tune
Log 10.0 0.00						-7.59 dBn	Cent 2.510000	<b>ter Freq</b> 0000 GHz
-20.0 -30.0 -40.0			3		4		Sta 2.470000	<b>art Freq</b> 0000 GHz
-50.0		annin san ann ann ann ann ann ann ann ann an	a 1920-re- of the of th	ğılı-dişs yq <b>turi</b> y]tury <u>şı</u>	have he have the	ter hierenist oweelter fan sterrer wiede	St 2.550000	o <b>p Freq</b> 0000 GHz
Start 2.47 #Res BW	7000 GHz 100 kHz	#VB	W 300 kHz			Stop 2.55000 GHz .000 ms (1001 pts)	8.000	CF Step 0000 MHz Mar
MKR MODE TH		X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Auto	war
1 N 1 2 N 1 3 N 1 4 N 1 5 6	1 f 1 f	2.480 00 GHz 2.483 50 GHz 2.500 00 GHz 2.532 16 GHz	12.41 dBm -49.83 dBm -50.16 dBm -45.52 dBm			E	Free	<b>q Offsel</b> 0 Hz
7 8 9 10							Sca Log	ale Type <u>Lir</u>
11 MSG					STATUS		LUg	<u>L11</u>

# CH High (2.47GHz ~ 2.55GHz)





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Spurious Emissions DH5 CH Low

Keysight Spectrum Analyzer - Swept SA           R L         RF         50 Ω         AC		SENSE:INT	ALIGN AUT		Frequency
enter Freq 2.4020000	OGHZ PNO: Wide ⊂ IFGain:Low	Trig: Free Run #Atten: 30 dB	#Avg Type: RMS	TRACE 1 2 3 4 5 TYPE M DET P P P P P	
Ref Offset 8.23 dB dB/div Ref 28.23 dBm			Mkr1	2.402 009 0 GHz 11.76 dBm	Auto Tur
		l l			Center Fre
8.2		1			2.402000000 GH
3.23					Start Fre
.17					2.401250000 GH
1.8				Market Contraction	<b>Stop Fre</b> 2.402750000 GH
					CF Ste
1.8					150.000 ki Auto M
					Freq Offs
11.8					01
1.8					Scale Typ
enter 2.4020000 GHz	40 (B14)	200 1/11-	0	Span 1.500 MHz	Log <u>L</u>
Res BW 100 kHz	#VBW	300 kHz	Sweep	1.000 ms (1001 pts	

Keysight S	pectrum Analyzer - Swe	pt SA		<u> </u>							
XI RL	RF 50 Ω			SEI	NSE:INT		ALIGN AUTO		4 Feb 17, 2022	Erog	uency
Center F	req 515.000			Trig: Fre	Dun	#Avg Typ	e:RMS	TRAC	E 123456 E MWWWW	Fieq	uency
			NO:Fast 🖵 Gain:Low	#Atten: 2				DE	PPPPP		
			Gameon				M		31 MHz	A	uto Tune
	Ref Offset 8.2						IVI		87 dBm		
10 dB/div Log	Ref 18.23 d	вm						-00.			
					Í					Car	nter Fre
8.23											
0.23										515.00	0000 MH
-1.77										e	tart Fre
									-8.24 dBm		10000 MH
-11.8										30.00	
-21.8										9	top Fre
											00000 GH
-31.8										1.00000	0000 GF
-41.8											<b>CF</b> Ste
-41.0											0000 MH
										<u>Auto</u>	Ma
-51.8								<u>^1</u>			
								🔶 '		Ere	eq Offse
-61.8	والمحرب الطريف وألزجه	i condition di accessore	Latin man	Long to a later of the	A DE LE MARKEN & S AND B	ور فراند الله وجو	and the second secon	in the party of the party of	ipipy test day		0 H
ير سور ا	والمتعاومين والمتعاولة	والطبر ويتماد ويتم المقاطع	ى. ئانىۋىزالىرۇرىدىيىرى	الحرر يتأسب أحق	Line and such as a	والعلى فتروقا ليأس	وأنزر ومعدا والأخروا	داسينانيج يبوأه عجيب	(Illianthanddan)		01
-71.8											
										Sc	ale Typ
Start 0.0									0000 GHz	Log	Li
#Res BW	100 kHz		#VBN	/ 300 kHz		S	weep 36	.00 ms (3	0001 pts)		
MSG							STATUS				

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		Spect		nalyzer - !	Swept	SA			_				_						
<mark>LXI</mark> F			RF	50 3.75		AC		4-7			SENS	SE:INT	#4		ALIGN AUTO e: RMS		M Feb 17, 2022 CE 1 2 3 4 5		Frequency
Cer	nter	Fre	iq i	3.75	000	000	PN	O: Fas	st 🖵		: Free			9 199	e. 14115	TΥ		₩	
							IFG	ain:Lo	w	#Att	en: 20	dB							Auto Tune
				Offset											Mkr2	26.388	65 GH2 30 dBm		Auto Func
10 c Log	IB/div	/ ()1	Ret	18.23	3 a.	sm_					Y					-42.			
8.2	-	Y 1																	Center Fred
-1.73	-																-8.24 dBr		13.750000000 GHz
-11.8																	-0.24 0.0		
-21.8																			Start Fred
-31.8																	2		1.000000000 GHz
-41.8	-																	1	
-51.8											_	are an order		1999 F.11		de la parte	and the second		
-61.8					ann a										Party of the local division of the local div				Stop Fred
-71.8	3																		26.50000000 GHz
	rt 1. s Bi							#	VRM	300	kH7			0	ween 03	Stop 2 8.0 ms (3	6.50 GHz		CF Step 2.55000000 GHz
				MIIZ				"	V 1.5 WY		AHZ				-				Auto Mar
MKR	MODE	TRC 1	SCL			× 2.4	01 65	GHz		۲ 10.	70 dB		NCTION	FUN	ICTION WIDTH	FUNCT	ON VALUE		
2	Ň	1	f				88 65				30 dB								Freq Offse
4																			0 Hz
5			-														-		
7																			Scale Type
9																			ocure rype
10			_															. L	_og <u>Lir</u>
•			_							n							+		
MSG															STATU:	5			

## CH Mid



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3)

RL	RF 50	Ω AC		CEI	NSE:INT		ALIGN AUTO	01-57-00 Pt	1 Feb 17, 2022		
	reg 515.00		lz			#Avg Typ		TRAC	E 1 2 3 4 5 6	Fred	quency
			PNO: Fast 🕞 IFGain:Low	Trig: Free #Atten: 2				TYP			
0 dB/div	Ref Offset 8 Ref 18.23						Μ	kr1 756. -59.9	82 MHz 92 dBm	A	uto Tui
<sup>og</sup>					Í					60	nter Fre
3.23											00000 M
										01010	
.77											
									-7.89 dBm		Start Fr
1.8										30.0	00000 M
1.8										ş	Stop Fr
										1.0000	00000 G
1.8											
1.8											CF Ste
1.0											00000 M M
1.8										<u>Auto</u>	IVI
							1				
51.8		. a ht at ta	-tourse, like loke steal	de Universite II	land U. ber and	الالمعالية العمادية		and the second state of the	Mininger der der	Fr	eq Offs 0 I
utities at	g 17 ang siya ng mga ng Milang si ng katalong ng mga ng Milan.	ande in aderse daere beste Ander in aderse daere beste	in a substantia de la compañía de la Compañía de la compañía de la compañí	and a subsection of the section of t	ىرى مەربا دۆر مۇرىيا مەربار بىشىغار بىر قارم	and the state of the second state of the secon	(proverside location)	and the second second	un patriat pravilà,		0
1.8											
										S	cale Ty
tart 0.0	300 GHz							Stop 1.0	000 GHz	Log	L
	100 kHz		#VBW	300 kHz		S	weep <u>36</u>		0001 pts)		

Keysight S RL	pectrum. RF	Analyzer - Swep 50 Ω			SENS	CANT		ALIGN AUTO	01/67/26.0	M Feb 17, 2022	_	
			00000 GH	:Fast 🔾	Trig: Free F	Run	#Avg Ty		TRA			equency
0 dB/div	Ref Re	Offset 8.23 f 18.23 d	3 dB	in:Low	#Atten: 20	dB		Mkr2	25.538	65 GHz 58 dBm		Auto Tui
.og 8.23 1.77 11.8	♥1									-7.89 dBm		enter Fre
21.8 31.8 41.8										2	1.000	<b>Start Fr</b> 0000000 G
51.8 61.8 ///// 71.8 ////	<b>.</b>										26.500	<b>Stop Fr</b> 0000000 G
Start 1.0 Res BV	V 100	kHz		#VBV	/ 300 kHz			weep 93	8.0 ms (3		2.550 Auto	<b>CF St</b> 0000000 G M
2 N 3 4	TRC SCL 1 f 1 f		× 2.440 75 ( 25.538 65 (	GHz GHz	Y 11.66 dBr -42.58 dBr	n	CTION FU	NCTION WIDTH	FUNCTI	ON VALUE		Freq Offs 0
5 6 7 8 9												Scale Ty
10										-	Log	l







			zer - Swept											
IXI RI		RF		AC			SEI	NSE:INT	#Avg Typ	ALIGN AUT		M Feb 17, 2022 CE 1 2 3 4 5 6	Fre	equency
Cen	ter Fr	eq 51	5.0000	00 M		ast 🖵 .ow	Trig: Fre #Atten: 2		#Avg Typ	e. RIVIS	TY D			
10 dE Log	3/div		set 8.23 3 <b>.23 dB</b>								Mkr1 854 -60	.31 MHz .22 dBm		Auto Tune
8.23														<b>enter Freq</b> .000000 MHz
-1.77 -11.8												-7.80 dBm	30	Start Freq .000000 MHz
-21.8 -31.8													1.000	<b>Stop Freq</b> 0000000 GHz
-41.8 -51.8													97 <u>Auto</u>	<b>CF Step</b> .000000 MHz Man
-61.8											alariyin ana arafar		F	F <b>req Offset</b> 0 Hz
-71.8														Scale Type
		00 GHz 100 kH			#	¢VBW	300 kHz		s	weep	Stop 1. 36.00 ms (3	0000 GHz 30001 pts)	Log	<u>Lin</u>
MSG										ST/	ATUS			



# 2DH5

Keysight Spectrum Analyzer - Swept SA	SENSE:INT	ALIGN AUTO	02:03:17 PM Feb 17, 2022	
enter Freq 2.402000000		#Avg Type: RMS	TRACE 1 2 3 4 5 6 TYPE M	Frequency
Ref Offset 8.23 dB dB/div Ref 28.23 dBm		Mkr1 2	.401 998 5 GHz 11.73 dBm	Auto Tur
.2				Center Fre 2.402000000 GH
23 77	- Arr	- Mr		<b>Start Fr</b> 2.401250000 G
.8				<b>Stop Fr</b> 2.402750000 G
.8				<b>CF St</b> e 150.000 k <u>Auto</u> M
.8				Freq Offs 0
.8				Scale Ty
enter 2.4020000 GHz tes BW 100 kHz	#VBW 300 kHz	Sweep	Span 1.500 MHz I.000 ms (1001 pts)	Log <u>l</u>

	pectrum Analyzer - Sv									-0	
<mark>(/</mark> RL		2 AC	11-	SEI	NSE:INT	#Avg Typ	ALIGN AUTO		OM Feb 17, 2022	Frequ	ency
ienter i	req 515.00	0000 M	PNO: Fast IFGain:Low	Trig: Free #Atten: 2		#Avg typ	e. Rivis	TΥ			
0 dB/div	Ref Offset 8. Ref 18.23						N		.84 MHz .60 dBm	Au	to Tun
										Cen	ter Fre
3.23										515.000	
L.77											
									-8.27 dBm		art Fre
11.8										30.000	000 MH
21.8										St	op Fre
31.8										1.000000	
											CF Ste
11.8										97.000	OF Ste 0000 MF Ma
51.8										<u>Auto</u>	IVIC
									<b>1</b>	Fre	q Offs
51.8 <mark>(71/1</mark> 7)		a Pillipheren	in statements in the second second	من الدرانية معد شور ا	ه بالطريب بطري هم يد.	a producer of the second s	I (PETRO I AND	and a state of the second s	a naja sasara sa kara t		0 H
1.8	and the second second	ter for entry	Referiti Arteria secola		Contract Contract	allo o Al Ababaa					
										Sca	ale Typ
	300 GHz 100 kHz		#\/B\A	/ 300 kHz			ween 3	Stop 1.	0000 GHz 30001 pts)	Log	L
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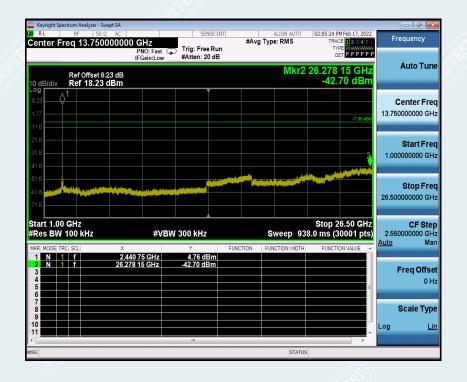
	ectrum Analyzer - S						
Center F		000000 GHz	Fast Trig: Free	Run	ALIGN AUTO	02:03:46 PM Feb 17, 2022 TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P P P P P P	Frequency
10 dB/div	Ref Offset 8 Ref 18.23		Low #Atten: 2	0 dB	Mkr2	25.638 10 GHz -42.71 dBm	Auto Tur
- <b>09</b> 8.23 -1.77 -11.8	<sup>2</sup> 1					-8.27 dBm	Center Fre 13.750000000 GH
21.8 31.8 41.8						2	Start Fr 1.000000000 G
51.8 61.8 71.8							<b>Stop Fr</b> 26.500000000 G
Start 1.00 Res BW	100 kHz	X	#VBW 300 kHz	FUNCTION	Sweep 93	Stop 26.50 GHz 8.0 ms (30001 pts)	CF Ste 2.55000000 G Auto M
	f	2.401 65 G 25.638 10 G		3m		E	Freq Offs 0 I
7 8 9 9 10 11 11 11 11 11 11 11 11 11 11 11 11							Scale Ty Log L
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M         RE         S0.0         AC         SENSE:INT         ALIGN AUTO         02:05:00 PMFeb 17,2022         Frequency           Center Freq 515.000000 MHz IFGain:Low         Trig: Free Run IFGain:Low         Trig: Free Run #Atten: 20 dB         #Avg Type: RMS         Trace IP P P P P Def P P P P P         Auto Tu           10 dB/div         Ref Offset 8.23 dB											
Ref Offset 8.23 dB         Mikr1 928.93 MHz         Center Freq 4.5000000 MHz         Frequency           10 dB/div         Ref 18.23 dB         Mkr1 928.93 MHz         -59.97 dB         Auto Tu           10 dB/div         Ref 18.23 dB         -59.97 dB         -59.97 dB         -515.000000 MHz         -515.00000 MHz           10 dB/div         Ref 18.23 dB         -59.97 dB         -59.97 dB         -515.00000 MHz         -515.000000 MHz											
IFGain:Low       #Atten: 20 dB       Der Machana         10 dB/div       Ref Offset 8.23 dB       Mkr1 928.93 MHz       Auto Tu         0.0			MHz	Trig: Free	Run			TRAC	E 1 2 3 4 5 6	F	requency
823       Center FI         1477       Start Fr         1478       Start Fr         148       Start Fr			IFGain:Low	#Atten: 20	0 dB		٨	/kr1 928	.93 MHz		Auto Tune
Image: start Fr         Start Fr           -118											Center Freq 5.000000 MHz
									-7.96 dBm	30	Start Freq 0.000000 MHz
97.00000 M										1.00	Stop Freq
-51.8										9 <u>Auto</u>	<b>CF Step</b> 7.000000 MHz Man
618	-61.8	ng di kalaran kuntuk serengkatan panasa katalah kutu Manang di katalah katalah kutuk serengkatan katalah kutuk	and a second second second second second	ing an ing an ing an	angang sangaran ini Mganaliki palamatiki	t og	a de la desta de la de la de la de la de la de la d Nota de la desta de la desta de la desta de la desta de la	ana patria di speli patri Mana patria di speli patri	1 Shire (space in such Shire (space in such		Freq Offset 0 Hz
Scale Ty											Scale Type
Start 0.0300 GHz Stop 1.0000 GHz #VBW 300 kHz Sweep 36.00 ms (30001 pts)	#Res BW		#VBW	300 kHz		s	weep 3	Stop 1.0 6.00 ms (3	0000 GHz 0001 pts)	Log	Lin

CH Mid



# CH High

Keysight Spectrum Analyzer - Swept SA				- 2 <b>×</b>
KL RF 50 Ω AC     Center Freq 2.480000000	SENSE:INT	ALIGN AUTO #Avg Type: RMS	02:06:38 PM Feb 17, 2022 TRACE 1 2 3 4 5 6	Frequency
	PNO: Wide Trig: Free Run IFGain:Low #Atten: 30 dB		TYPE M WWWWW DET PPPPP	
Ref Offset 8.23 dB 10 dB/div Ref 28.23 dBm		Mkr1 2	.479 995 5 GHz 12.31 dBm	Auto Tune
18.2				Center Freq 2.480000000 GHz
8.23 -1.77			m-Norra a	<b>Start Freq</b> 2.479250000 GHz
-11.8				<b>Stop Freq</b> 2.480750000 GHz
-31.8				<b>CF Step</b> 150.000 kHz <u>Auto</u> Man
-51.8				<b>Freq Offset</b> 0 Hz
-61.8				Scale Type
Center 2.4800000 GHz #Res BW 100 kHz	#VBW 300 kHz	Sweep 1	Span 1.500 MHz .000 ms (1001 pts)	Log <u>Lin</u>
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enter Fr	RF 50 Ω req 515.0000	AC			NSE:INT		ALIGN AUTO	02:06:44.01	4 Feb 17, 2022		_
	104 0 10.0000	000 MHz	z			#Avg Typ		TRAC	E 1 2 3 4 5 6	Frequ	lency
			NO: Fast Ģ Gain:Low	Trig: Free #Atten: 2				DE			
0 dB/div	Ref Offset 8.23 <b>Ref 18.23 di</b>						Μ	kr1 753. -59.	39 MHz 87 dBm	Au	ito Tur
<sup>og</sup>				,,							
3.23											nter Fre 0000 Mi
										515.00	0000 141
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Res BW	100 KHZ		#VBW	300 kHz		s	status	i.00 ms (3	0001 pts)		

RL	ctrum Analyzer - Sv RF 50 S req 13.750	2 AC 000000 GHz	SENSE:I	#Avg	ALIGN AUTO Type: RMS	02:07:08 PM Feb 17, 2022 TRACE 1 2 3 4 5 6 TYPE M	Frequency
10 dB/div	Ref Offset 8 Ref 18.23				Mkr2	25.575 20 GHz -42.05 dBm	Auto Tur
- <b>og</b> 8.23	,1 					-7.69 dBm	Center Fro 13.750000000 Gi
21.8 31.8 41.8						<sup>2</sup>	<b>Start Fr</b> 1.000000000 G
51.8 61.8 71.8							<b>Stop Fr</b> 26.50000000 G
tart 1.00 Res BW	100 kHz	#V	BW 300 kHz	FUNCTION	Sweep 93	Stop 26.50 GHz 8.0 ms (30001 pts)	CF St 2.550000000 G <u>Auto</u> M
1 N 1 2 N 1 3 4 5 6	f	2.480 70 GHz 25.575 20 GHz	6.20 dBm -42.05 dBm				Freq Offs 0
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	.44 MH2 79 dBm		<b>"</b>					⊠dB IBm	of Offset 8.2 of 18.23	3/div	10 dE _og
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515.000000 MH											8.23
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	30001 pts)	36.00 ms (3	Sweep 3		z	300 kHz	#VBW			s BW 1	
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# CH Mid

🔤 Keysight Spectrum Analyzer - Swept SA					- ¢ ×
K RL RF 50 Ω AC     Center Freq 2.441000000		SE:INT A #Avg Type		MFeb 17, 2022	Frequency
	PNO: Wide Trig: Free IFGain:Low #Atten: 30	Run	TYF		
Ref Offset 8.23 dB 10 dB/div Ref 28.23 dBm			Mkr1 2.441 00 12.	1 5 GHz 21 dBm	Auto Tune
18.2				2	Center Freq 441000000 GHz
8.23 -1.77			-ward with	2	Start Freq 440250000 GHz
-11.8				2	<b>Stop Freq</b> 441750000 GHz
-31.8				Aut	<b>CF Step</b> 150.000 kHz <u>o</u> Man
-51.8					<b>Freq Offset</b> 0 Hz
-61.8					Scale Type
Center 2.4410000 GHz #Res BW 100 kHz	#VBW 300 kHz	S	Span 1 weep 1.000 ms (	.500 MHz <sup>Log</sup> 1001 pts)	ı <u>Lin</u>
MSG			STATUS		

C

Keysight Sp	RF 50 Ω AC			uce and		ALIGN AUTO	02-45-14-0	45-h 17 0000	-	
	req 515.000000			NSE:INT	#Avg Typ		TRAC	M Feb 17, 2022 E 1 2 3 4 5 6 E M WWWWWW	Freq	uency
		PNO: Fast G IFGain:Low	#Atten: 2				DE	PPPPP		
0 dB/div	Ref Offset 8.23 dB Ref 18.23 dBm					М	kr1 727. -60.3	33 MHz 36 dBm	A	uto Tur
<sup>og</sup>									Ce	nter Fre
3.23										00000 MI
.77								-7.79 dBm	S	tart Fr
1.8									30.00	0000 MI
:1.8									S	top Fr
31.8									1.00000	00000 GI
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	300 GHz 100 kHz	#VBW	/ 300 kHz		s	weep 36	Stop 1.0 3.00 ms_3	0000 GHz 0001 pts)	LUg	<u> </u>
NG SI						STATU	<u>`</u>			_

Keysight Spectrum Analyzer - Swep					- 2
RL RF 50 Ω Center Freq 13.75000	PNO: Fast	Trig: Free Run	#Avg Type: RMS	02:45:39 PM Feb 17, 2022 TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P P P P P P	Frequency
Ref Offset 8.23 0 dB/div Ref 18.23 dl		#Atten: 20 dB	Mkr2	25.891 40 GHz -42.44 dBm	Auto Tur
•99 8.23 1.77 11.8				-7.79 dBm	Center Fre 13.750000000 GH
21.8 31.8 41.8				2	<b>Start Fr</b> 1.000000000 GI
51.8 61.8 71.8					<b>Stop Fr</b> 26.50000000 G
start 1.00 GHz Res BW 100 kHz		V 300 kHz	-	Stop 26.50 GHz 38.0 ms (30001 pts)	CF Sto 2.55000000 G Auto M
MODE         TRC         SCL           1         N         1         f           2         N         1         f           3	× 2.440 75 GHz 25.891 40 GHz	Y 8.27 dBm -42.44 dBm	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	Freq Offs 0
7 8 9 10					Scale Ty
11					







	eysight Spe													
t <mark>x/</mark> ⊪ Cer	nter Fr	<sup>RF</sup> eq 51		AC	PNO: Fr		Trig: Free #Atten: 2		#Avg Typ	ALIGN AUTO e: RMS	TRAC	M Feb 17, 2022 E 1 2 3 4 5 6 PE M 7 P P P P P	Fre	equency
10 d Log	B/div		fset 8.2 8.23 (		IFGain:L	.0W	#Atten: 2	Udb			Mkr1 958			Auto Tune
8.23														enter Freq .000000 MHz
-1.77 -11.8												-7.68 dBm	30	Start Freq .000000 MHz
-21.8 -31.8													1.000	<b>Stop Freq</b> 0000000 GHz
-41.8													97 <u>Auto</u>	<b>CF Step</b> .000000 MHz Man
-51.8 -61.8	<u>क्षण महाक</u>	PO <mark>TE PICC</mark>	ollahteral			भूष् <sup>र्ण</sup> वि के में र	ماله مقررة و مقراة إفضاء م	al tanyajip	A state of the second	l Manager and a second s	n terret a terret de la constant de la		F	F <b>req Offset</b> 0 Hz
-71.8			i di setti della	unter anna de la competencia d	in Lection - Robbi M	ini jedi de siddi	in (an indana)	iliinini, dierna	ey di kanta-de Alexiedea		Alle for all for a feature of the second			Scale Type
	rt 0.03 s BW				#	¢VBW	300 kHz		s	weep :	Stop 1.0 36.00 ms (3	0000 GHz 0001 pts)	Log	<u>Lin</u>
MSG										STAT	rus			

Keysight Spectru	m Analyzer - Swept SA							
	RF 50 Ω AC 13.75000000		SENSE		ALIGN AUTO Type: RMS	02:55:00 PM Feb 17 TRACE 128		Frequency
Center Fred	15.75000000	PNO: Fast IFGain:Low	Trig: Free R #Atten: 20 d	un	g type: time	DET P P	WWWWW	
10 dB/div	tef Offset 8.23 dB Ref 18.23 dBm				Mkr2	25.127 25 0 -41.75 d		Auto Tune
Log 8.23 -1.77 -11.8						-7.	68 dBm	Center Freq 13.75000000 GHz
-21.8 -31.8 -41.8							2-	<b>Start Freq</b> 1.00000000 GHz
-51.8 -61.8			Land and Constitution of					<b>Stop Freq</b> 26.50000000 GHz
Start 1.00 G #Res BW 10	0 kHz	#VBW	300 kHz	51005100		Stop 26.50 8.0 ms (30001	pts)	<b>CF Step</b> 2.55000000 GHz <u>Auto</u> Man
	f 2.4	79 85 GHz 27 25 GHz	<sup>Y</sup> <u>5.70 dBm</u> -41.75 dBm		FUNCTION WIDTH	FUNCTION VALU		<b>Freq Offset</b> 0 Hz
7 8 9 10 11							-	Scale Type Log <u>Lin</u>
MSG					STATUS			

The unit does meet the FCC requirements.

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#### 12. RADIATED SPURIOUS EMISSIONS

## 12.1 LIMITS

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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

Frequency (MHz)	Quasi-peak(µV/m)	Measurement distance(m)	Quasi-peak(dBµV/m)@distance 3m
0.009-0.490	2400/F(kHz)	300	128.5-93.8
0.490-1.705	24000/F(kHz)	30	73.8-63
1.705-30.0	30	30	69.5
30 ~ 88	100	3	40
88~216	150	3	43.5
216 ~ 960	200	3	46
Above 960	500	3	54

NOTE:

- (1) The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.
- (2) The lower limit shall apply at the transition frequencies.

# **12.2 TEST PROCEDURES**

## 1) Sequence of testing 9 kHz to 30 MHz

#### Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

- --- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
- --- If the EUT is a floor standing device, it is placed on the ground.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions.
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 3 meter.
- --- The EUT was set into operation.

#### Pre measurement:

- --- The turntable rotates from 0 ° to 360 °.
- --- The antenna height is 1.0 meter.
- --- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

#### **Final measurement:**

--- Identified emissions during the pre measurement the software maximizes by rotating the turntable position (0 ° to 360 °) and by rotating the elevation axes (0 ° to 360 °).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QP detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement and the limit will be stored.

#### 2) Sequence of testing 30 MHz to 1 GHz

#### Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

- --- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- --- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 3 meter.

--- The EUT was set into operation.

#### Pre measurement:

- --- The turntable rotates from 0 ° to 360 °.
- --- The antenna is polarized vertical and horizontal.
- --- The antenna height changes from 1 to 4 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

#### **Final measurement:**

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable rotates from  $0^{\circ}$  to 360 and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

#### 3) Sequence of testing 1 GHz to 18 GHz

#### Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

- --- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- --- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 3 meter.

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--- The EUT was set into operation.

#### **Pre measurement:**

- --- The turntable rotates from 0 ° to 360 °.
- --- The antenna is polarized vertical and horizontal.
- --- The antenna height scan range is 1 meter to 4 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

#### **Final measurement:**

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable rotates from  $0^{\circ}$  to  $360^{\circ}$  and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement with marked maximum final measurements and the limit will be stored.

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3Y

# 4) Sequence of testing above 18 GHz Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

- --- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- --- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 1 meter.
- --- The EUT was set into operation.

#### **Pre measurement:**

--- The antenna is moved spherical over the EUT in different polarisations of the antenna.

#### **Final measurement:**

--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector. --- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

#### NOTE:

(a).The frequency from 9kHz to 150kHz, Set RBW=300Hz(for Peak & AVG), VBW=300Hz(for Peak & AVG). The frequency from 150kHz to 30MHz, Set RBW=9kHz, VBW=9kHz, (for QP Detector).
(b).The frequency from 30MHz to 1GHz, Set RBW=120kHz, VBW=300kHz, (for QP Detector).
(c).The frequency above 1GHz, for Peak detector: Set RBW=1MHz,VBW=3MHz.

(d). The frequency above 1GHz, for Avg detector: Set RBW=1MHz, if the EUT is configured to transmit with duty cycle  $\geq$ 98%, set VBW $\leq$ RBW/100 (i.e.,10kHz) but not less than 10 Hz. If the EUT duty cycle is <98%, set VBW $\geq$ 1/T, Where T is defined in section 2.8.

(e). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X plane) were recorded in this report.

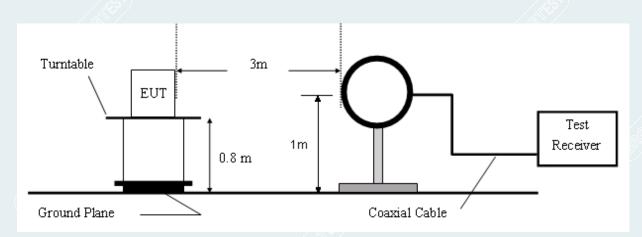
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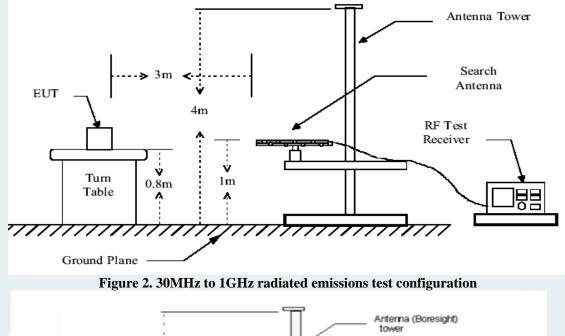
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3)

## 12.3 TEST SETUP







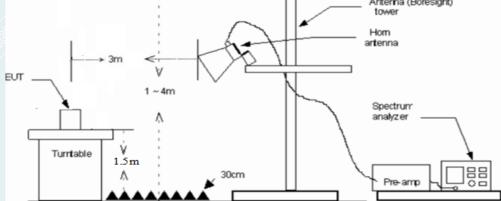


Figure 3. 1GH to 18GHz radiated emissions test configuration

Report No.: E20220126055701-2

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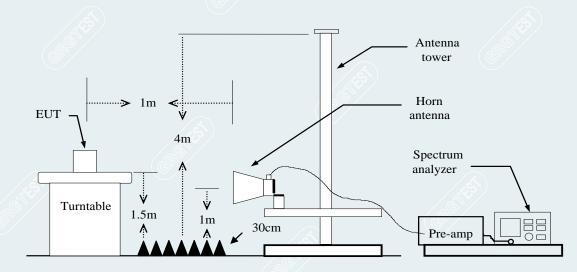


Figure 4. 18GHz to 26.5GHz radiated emissions test configuration

# 12.4 DATA SAMPLE

# **30MHz to 1GHz**

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark	Pole
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	( <b>dB</b> )		
XXX	XXX	37.06	-15.48	21.58	40.00	-18.42	QP	Vertical

## 1GHz to 18GHz

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark	Pole
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	( <b>dB</b> )		
XXX	XXX	65.45	-11.12	54.33	74.00	-19.67	peak	Vertical
XXX	XXX	63.00	-11.12	51.88	54.00	-2.12	AVG	Vertical

# Above 18GHz

No.	Frequency	Reading	Factor	Level	Limit	Margin	Remark	Pole
	(MHz)	(dBuV/m)	( <b>dB</b> )	(dBuV/m)	(dBuV/m)	( <b>dB</b> )		
XXX	XXX	68.86	57.66	-11.20	83.54	25.88	peak	Vertical
XXX	XXX	68.89	9/-11.20	57.69	63.54	5.85	AVG	Vertical

Frequency (MHz)	= Emission frequency in MHz
Ant.Pol. (H/V)	= Antenna polarization
Reading (dBuV)	= Uncorrected Analyzer / Receiver reading
Correction Factor (dB/m)	= Antenna factor + Cable loss – Amplifier gain
Result (dBuV/m)	= Reading (dBuV) + Correction Factor (dB/m)
Limit (dBuV/m)	= Limit stated in standard
Margin (dB)	= Remark Result (dBuV/m) – Limit (dBuV/m)
Peak	= Peak Reading
QP	= Quasi-peak Reading
AVG	= Average Reading

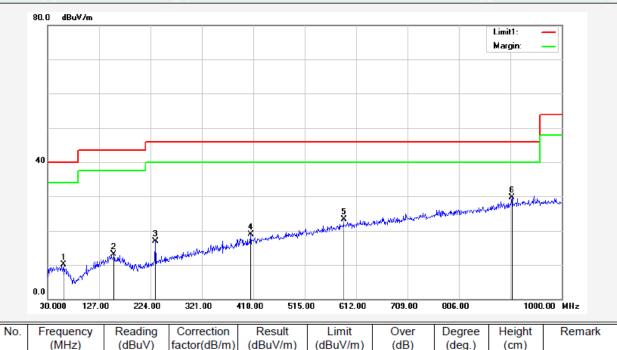
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## 12.5 TEST RESULTS

# **30MHz to 1GHz:**

Mode: DH5 Low Frequency (2402MHz) Test Engineer: Test Voltage: Polarity:

Date: 2022/02/22 Tang Shenghui DC 3.8V Horizontal



	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(deg.)	(cm)	
1	60.0700	37.31	-27.30	10.01	40.00	-29.99	14	200	QP
2	155.1300	37.56	-24.45	13.11	43.50	-30.39	135	100	QP
3	233.7000	42.71	-25.72	16.99	46.00	-29.01	201	100	QP
4	413.1500	38.42	-19.50	18.92	46.00	-27.08	205	100	QP
5	588.7200	38.08	-14.80	23.28	46.00	-22.72	356	100	QP
6*	905.9100	39.06	-9.36	29.70	46.00	-16.30	137	300	QP

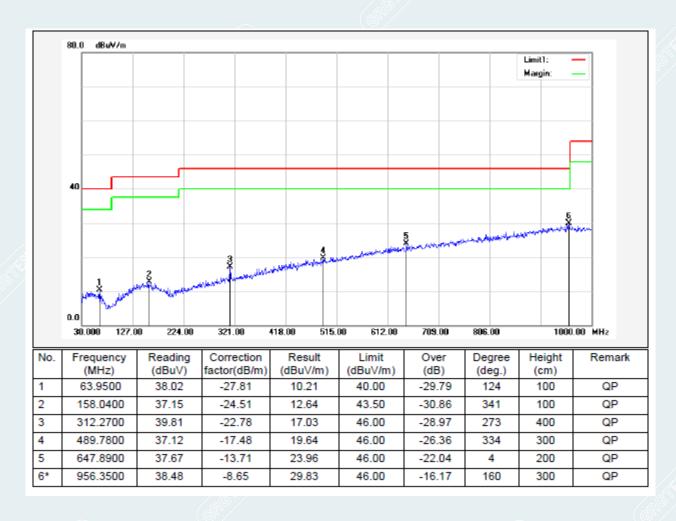
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Report No.: E20220126055701-2

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Mode: DH5 Low Frequency (2402MHz) Test Engineer: Test Voltage: Polarity:

Date: 2022/02/22 Tang Shenghui DC 3.8V Vertical



(&

38.39

38.80

5

6\*

692.5100

946.6500

-12.86

-8.77

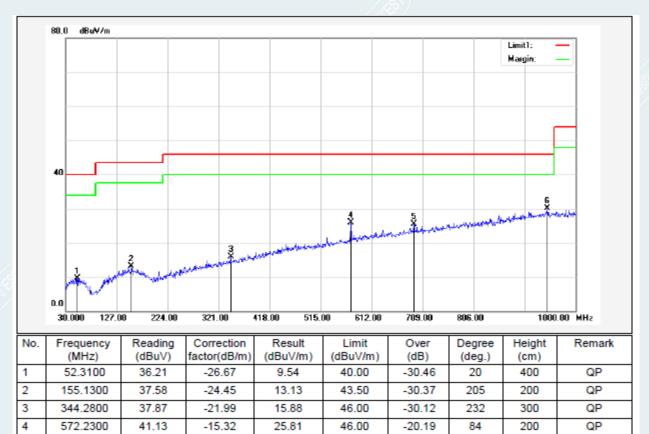
25.53

30.03

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Mode: DH5 Low Frequency (2441MHz) Test Engineer: Test Voltage: Polarity:

Date: 2022/02/22 Tang Shenghui DC 3.8V Horizontal



-20.47

-15.97

50

216

200

100

QP

QP

46.00

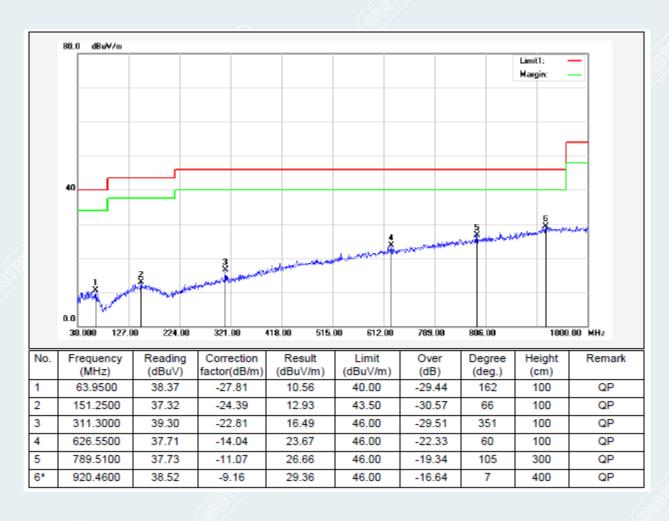
46.00

Report No.: E20220126055701-2

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Mode: DH5 Low Frequency (2441MHz) Test Engineer: Test Voltage: Polarity:

Date: 2022/02/22 Tang Shenghui DC 3.8V Vertical

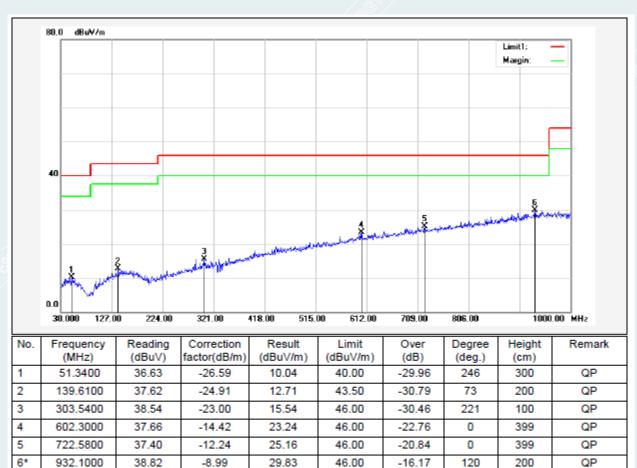


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Mode: DH5 Low Frequency (2480MHz) Test Engineer: Test Voltage: Polarity:

Date: 2022/02/22 Tang Shenghui DC 3.8V Horizontal

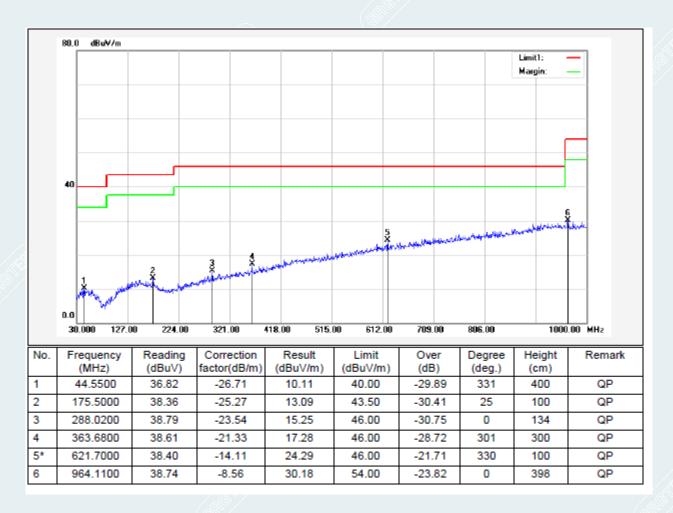


Report No.: E20220126055701-2

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Mode: DH5 Low Frequency (2480MHz) Test Engineer: Test Voltage: Polarity:

Date: 2022/02/22 Tang Shenghui DC 3.8V Vertical



## Remark:

- 1 No emission found between lowest internal used/generated frequency to 30MHz.
- 2 Pre-scan all mode and recorded the worst case results in this report (DH5)
- 3 Measuring frequencies from 9kHz to the 1GHz.
- 4 Radiated emissions measured in frequency range from 30MHz to 1GHz were made with an instrument using Peak/Quasi-peak detector mode.
- 5 Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 6 The IF bandwidth of SPA between 30MHz to 1GHz was 120kHz.

# Above 1GHz:

Mode: DH5 Lowest Frequency (2402MHz) Test Engineer: Test Voltage:

Date: 2022/03/01
Lu Qiang
DC 3.8V

Suspect	ed Data List								
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [ ]	Polarity
1	1077.0096	56.93	31.96	-24.97	74.00	42.04	200	122	Horizontal
2	1506.0633	56.50	33.61	-22.89	74.00	40.39	200	182	Horizontal
3	3230.6538	54.29	37.98	-16.31	74.00	36.02	100	201	Horizontal
4	3620.7026	54.59	40.14	-14.45	74.00	33.86	100	138	Horizontal
5	4803.9755	57.05	47.27	-9.78	74.00	26.73	100	89	Horizontal
6	7204.2755	48.11	44.94	-3.17	74.00	29.06	200	95	Horizontal

Suspect	ted Data List								
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [ ]	Polarity
1	1165.0206	57.20	32.63	-24.57	74.00	41.37	100	224	Vertical
2	1850.1063	58.40	36.53	-21.87	74.00	37.47	100	217	Vertical
3	3573.8217	52.90	37.70	-15.20	74.00	36.30	200	298	Vertical
4	4803.9755	55.32	45.54	-9.78	74.00	28.46	200	141	Vertical
5	7189.2737	48.62	45.47	-3.15	74.00	28.53	200	39	Vertical
6	9949.6187	45.03	46.79	1.76	74.00	27.21	200	6	Vertical

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Mode: DH5 Middle Frequency (2441MHz) Test Engineer: Test Voltage:

Date: 2022/03/01 Lu Qiang DC 3.8V

Suspect	Suspected Data List											
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [ ]	Polarity			
1	1166.7708	57.37	32.80	-24.57	74.00	41.20	100	132	Horizontal			
2	1779.0974	58.57	36.35	-22.22	74.00	37.65	200	96	Horizontal			
3	4128.8911	52.58	38.95	-13.63	74.00	35.05	100	61	Horizontal			
4	4880.8601	58.16	48.27	-9.89	74.00	25.73	200	101	Horizontal			
5	7716.2145	47.72	45.17	-2.55	74.00	28.83	200	156	Horizontal			
6	8951.9940	46.45	46.47	0.02	74.00	27.53	200	312	Horizontal			
					× /							

AV Fina	al Data List								
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBµV/m]	AV Value [dBµV/m ]	AV Limit [dBµV/m]	AV Margin [dB]	Height [cm]	Angle [ ]	Polarity
1	4879.8351	-9.90	52.31	42.41	54.00	11.59	138	101	Horizontal

Suspect	Suspected Data List												
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [ ]	Polarity				
1	1114.0143	57.37	32.57	-24.80	74.00	41.43	200	48	Vertical				
2	1950.1188	58.39	36.45	-21.94	74.00	37.55	100	48	Vertical				
3	3498.8124	53.78	38.41	-15.37	74.00	35.59	100	272	Vertical				
4	3804.4756	53.63	39.33	-14.30	74.00	34.67	200	54	Vertical				
5	4878.9849	55.32	45.44	-9.88	74.00	28.56	200	115	Vertical				
6	7969.3712	47.43	45.71	-1.72	74.00	28.29	100	156	Vertical				



Mode: DH5 Highest Frequency (2480MHz) Test Engineer: Test Voltage:

Date: 2022/03/01 Lu Qiang DC 3.8V

Suspected Data List											
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [ ]	Polarity		
1	1000.0000	66.45	41.29	-25.16	74.00	32.71	200	163	Horizontal		
2	1659.5824	56.29	33.79	-22.50	74.00	40.21	100	356	Horizontal		
3	3721.9652	53.65	38.92	-14.73	74.00	35.08	200	176	Horizontal		
4	4959.6200	58.87	48.86	-10.01	74.00	25.14	100	121	Horizontal		
5	7718.0898	48.28	45.76	-2.52	74.00	28.24	200	102	Horizontal		
6	11502.3128	44.18	48.50	4.32	74.00	25.50	200	1	Horizontal		
					S /						

AV Fina	al Data List								
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBµV/m]	AV Value [dBµV/m ]	AV Limit [dBµV/m]	AV Margin [dB]	Height [cm]	Angle [ ]	Polarity
1	4959.9176	-10.01	52.80	42.79	54.00	11.21	145	114	Horizontal

Suspect	Suspected Data List												
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [ ]	Polarity				
1	1081.0101	57.35	32.40	-24.95	74.00	41.60	100	327	Vertical				
2	1416.3020	57.00	33.62	-23.38	74.00	40.38	200	210	Vertical				
3	1849.8562	57.94	36.07	-21.87	74.00	37.93	100	32	Vertical				
4	3720.0900	54.34	39.60	-14.74	74.00	34.40	100	357	Vertical				
5	4959.6200	56.23	46.22	-10.01	74.00	27.78	100	48	Vertical				
6	8575.0719	46.45	45.78	-0.67	74.00	28.22	100	75	Vertical				

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Mode: 3DH5 Lowest Frequency (2402MHz) Test Engineer: Test Voltage:

Date: 2022/03/02 Zhang Qiang DC 3.8V

Suspect	ed Data List					_			
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [ ]	Polarity
1	1543.5679	56.53	33.67	-22.86	74.00	40.33	200	33	Horizontal
2	3210.0263	53.65	37.66	-15.99	74.00	36.34	100	142	Horizontal
3	4803.9755	57.14	47.36	-9.78	74.00	26.64	100	169	Horizontal
4	7206.1508	47.35	44.16	-3.19	74.00	29.84	100	156	Horizontal
5	9375.7970	44.86	46.27	1.41	74.00	27.73	200	177	Horizontal
6	13460.0575	40.44	48.17	7.73	74.00	25.83	200	177	Horizontal
				/					

Suspect	ed Data List	-					-	-	
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [ ]	Polarity
1	1541.3177	56.91	34.05	-22.86	74.00	39.95	200	34	Vertical
2	2401.9252	59.28	39.38	-19.90	74.00	34.62	200	359	Vertical
3.0	4350.1688	52.20	39.89	-12.31	74.00	34.11	100	14	Vertical
4	4803.9755	52.13	42.35	-9.78	74.00	31.65	200	96	Vertical
5	9235.1544	46.61	47.31	0.70	74.00	26.69	200	211	Vertical
6	14093.8867	39.74	49.25	9.51	74.00	24.75	200	217	Vertical



Mode: 3DH5 Middle Frequency (2441MHz) Test Engineer: Test Voltage:

Date: 2022/03/02 Zhang Qiang DC 3.8V

Suspect	Suspected Data List											
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [ ]	Polarity			
1	1768.0960	60.30	38.00	-22.30	74.00	36.00	200	292	Horizontal			
2	2440.9301	63.95	44.27	-19.68	74.00	29.73	< 100	217	Horizontal			
3	4880.8601	56.06	46.17	-9.89	74.00	27.83	200	116	Horizontal			
4	7738.7173	46.25	44.10	-2.15	74.00	29.90	100	359	Horizontal			
5	10776.5971	43.99	47.67	3.68	74.00	26.33	100	360	Horizontal			
6	13343.7930	40.40	48.38	7.98	74.00	25.62	200	75	Horizontal			

Suspect	ed Data List								
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [ ]	Polarity
1	1736.8421	56.71	34.29	-22.42	74.00	39.71	200	292	Vertical
<b>2</b> 6	3196.8996	52.89	36.99	-15.90	74.00	37.01	100	285	Vertical
3	4880.8601	51.85	41.96	-9.89	74.00	32.04	200	347	Vertical
4	7196.7746	47.49	44.36	-3.13	74.00	29.64	100	34	Vertical
5	8741.9677	46.10	45.30	-0.80	74.00	28.70	100	48	Vertical
6	12531.8165	42.21	47.21	5.00	74.00	26.79	200	68	Vertical



Mode: 3DH5 Highest Frequency (2480MHz) Test Engineer: Test Voltage:

Date: 2022/03/02 Zhang Qiang DC 3.8V

Suspect	Suspected Data List												
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [ ]	Polarity				
1	1508.8136	56.16	33.28	-22.88	74.00	40.72	100	88	Horizontal				
2	1900.8626	56.93	35.05	-21.88	74.00	38.95	100	1	Horizontal				
3	4353.9192	52.93	40.58	-12.35	74.00	33.42	200	101	Horizontal				
4	4959.6200	58.34	48.33	-10.01	74.00	25.67	100	88	Horizontal				
5	6802.9754	47.17	42.96	-4.21	74.00	31.04	100	299	Horizontal				
6	9135.7670	45.05	45.49	0.44	74.00	28.51	100	258	Horizontal				

Suspect	ed Data List								
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [ ]	Polarity
1	1778.5973	58.27	36.05	-22.22	74.00	37.95	200	360	Vertical
2	3706.9634	53.47	38.66	-14.81	74.00	35.34	200	40	Vertical
3	4959.6200	55.00	44.99	-10.01	74.00	29.01	100	326	Vertical
4	6405.4257	48.71	42.49	-6.22	74.00	31.51	100	210	Vertical
5	7748.0935	46.65	44.67	-1.98	74.00	29.33	200	80	Vertical
6	11149.7687	42.42	46.89	4.47	74.00	27.11	100	0	Vertical

## Remark:

- 1 Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2 The amplitude of 18GHz to 26.5GHz spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.
- 3 Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- 4 Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- 5 Spectrum setting:

a. Peak Setting 1GHz – 26.5GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = auto.

- b. AV Setting 1GH z- 26.5GHz, RBW = 1MHz, VBW = 10Hz (if the EUT duty cycle is < 98% , set VBW $\ge$ 1/T),Sweep time = auto.
- 6 As the Transmit Power of GFSK and 8DPSK is larger than  $\pi/4$ -DQPSK, Therefore, radiated spurious emissions recorded the worst case results in this report.

Test result: The unit does meet the requirements.

## 13. RESTRICTED BANDS OF OPERATION

# 13.1 LIMITS

Section 15.247(d) In addition, Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

MHz	MHz	MHz	GHz	
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15	
10.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46	
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75	
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5	
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2	
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5	
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7	
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4	
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5	
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2	
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4	
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12	
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0	
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8	
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5	
12.57675 - 12.57725	322 - 335.4	3600 - 4400		
13.36 - 13.41				

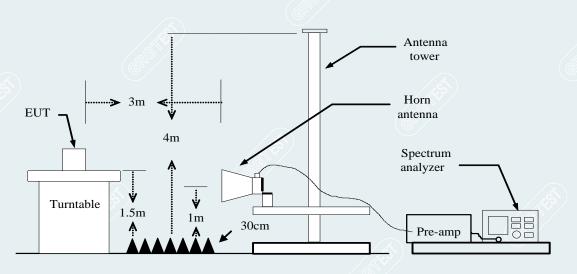
Frequency (MHz)	Quasi-peak(µV/m)	Measurement distance(m)	Quasi-peak(dBµV/m)@distance 3m
0.009-0.490	2400/F(kHz)	300	128.5-93.8
0.490-1.705	24000/F(kHz)	30	73.8-63
1.705-30.0	30	30	69.5
30 ~ 88	100	3	40
88~216	150	3	43.5
216 ~ 960	200	3	46
Above 960	500	3	54

#### **13.2 TEST PROCEDURES**

- 1) The EUT is placed on a turntable, which is 1.5m above the ground plane.
- 2) The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 3) EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
- 4) Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
  - a) PEAK: RBW=1MHz / VBW=1MHz / Sweep=AUTO
  - b) AVERAGE: RBW=1MHz / VBW=1/T / Sweep=AUTO
- 5) Repeat the procedures until all the PEAK and AVERAGE versus polarization are measured.

**Note**: For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X plane) were recorded in this report

## **13.3 TEST SETUP**



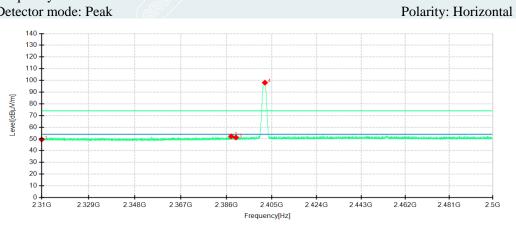
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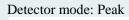
# 13.4 TEST RESULTS

Equipment:	Wireless earphones	Test Date	2022/03/03	
Model No.:	E505A	Test Engineer:	Zhang Zishan	
Test Voltage:	DC 3.8V	1 / 20	/	

# DH5

**Lowest Channel** Frequency 2402MHz Detector mode: Peak



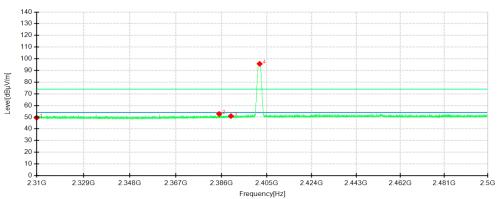


Polarity: Vertical

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No.	Frequency	Reading	Level	Factor	Limit	Margin	Height	Angle	Pole	Remark
	MHz	$dB\mu V/m$	dBµV/m	dB	dBuV/m	dB	cm	0		
1	2310.0000	46.05	49.53	3.48	74.00	24.47	200	149	Horizontal	/
2	2387.9950	48.42	52.20	3.78	74.00	21.80	200	142	Horizontal	$\langle \rangle$ /
3	2390.0000	47.44	51.25	3.81	74.00	22.75	100	218	Horizontal	/
4	2402.1500	94.06	98.05	3.99	74.00	-24.05	200	142	Horizontal	No limit
1	2310.0000	46.03	49.51	3.48	74.00	24.49	200	121	Vertical	/
2	2385.0690	49.04	52.77	3.73	74.00	21.23	100	142	Vertical	/
3	2390.0000	47.11	50.92	3.81	74.00	23.08	100	246	Vertical	/
4	2402.0550	91.68	95.67	3.99	74.00	-21.67	100	204	Vertical	No limit