

# **TEST REPORT**

Report No.:	BCTC2106496988-2E	
Applicant:	DP AUDIO VIDEO LLC	
Product Name:	15.6 inch laptop	
Model/Type reference:	CLT1564	
Tested Date:	2021-06-11 to 2021-06-22	
Issued Date:	2021-07-02	
She	enzhen BCECTesting Co., Ltd.	
No. : BCTC/RF-EMC-007	Page: 1 of 69	Edition : A.3



## FCC ID:2AVRVCLT1564

Product Name:	15.6 inch laptop
Trademark:	CORE INNOVATIONS
Model/Type reference:	CLT1564 CLT1564BL, CLT1564SL, CLT1564RD, CLT1564TL, CLT1564PN, CLT1564PR, CLT1564BU
Prepared For:	DP AUDIO VIDEO LLC
Address:	920 Malcolm Ave Los Angeles, California, USA 90024
Manufacturer:	SHENZHEN NST INDUSTRY AND TRADE CO., LTD.
Address:	3/F, Bldg 1, Hongbang Intelligent Technology Park, No.30 Cuibao Road, Baolong Street, Longgang District, Shenzhen, China
Prepared By:	Shenzhen BCTC Testing Co., Ltd.
Address:	1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Tangwei, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China
Sample Received Date:	2021-06-11
Sample tested Date:	2021-06-11 to 2021-06-22
Issue Date:	2021-07-02
Report No.:	BCTC2106496988-2E
Test Standards	FCC Part15.247 ANSI C63.10-2013
Test Results	PASS
Remark:	This is Bluetooth Classic radio test report.
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Tested by:

kelsey Ton

Kelsey Tan/ Project Handler

Zero Zhou/Reviewer

Approved by:

The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen BCTC Testing Co., Ltd, this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client.



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(Note: N/A means not applicable)

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## 1. VERSION

Report No.	Issue Date	Description	Approved
BCTC2106496988-2E	2021-07-02	Original	Valid



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## 2. TEST SUMMARY

The Product has been tested according to the following specifications:

No.	Test Parameter	Clause No	Results
1	Conducted emission AC power port	§15.207	PASS
2	Conducted peak output power for FHSS	§15.247(b)(1)	PASS
3	20dB Occupied bandwidth	§15.247(a)(1)	PASS
4	Number of hoppingfrequencies	§15.247(a)(1)(iii)	PASS
5	Dwell Time	§15.247(a)(1)(iii)	PASS
6	Spurious RF conducted emissions	§15.247(d)	PASS
7	Band edge	§15.247(d)	PASS
8	Spurious radiated emissions for transmitter	§15.247(d) & §15.209 & §15.205	PASS
9	Antenna Requirement	15.203	PASS





## 3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Uncertainty
1	Conducted Emission (150kHz-30MHz)	U=3.2dB
2	3m camber Radiated spurious emission(9kHz-30MHz)	U=3.7dB
3	3m camber Radiated spurious emission(30MHz-1GHz)	U=4.3dB
4	3m chamber Radiated spurious emission(1GHz-18GHz)	U=4.5dB
5	3m chamber Radiated spurious emission(18GHz-40GHz)	U=3.34dB
6	Conducted Adjacent channel power	U=1.38dB
7	Conducted output power uncertainty Above 1G	U=1.576dB
8	Conducted output power uncertainty below 1G	U=1.28dB
9	humidity uncertainty	U=5.3%



## 4. PRODUCT INFORMATION AND TEST SETUP

## 4.1 Product Information

Model/Type reference:	CLT1564
	CLT1564BL, CLT1564SL, CLT1564RD, CLT1564TL, CLT1564PN, CLT1564PR, CLT1564BU
Model differences:	All the model are the same circuit and RF module, except model names.
Bluetooth Version:	BT 5.0
Hardware Version:	N/A
Software Version:	N/A
Operation Frequency:	Bluetooth: 2402-2480MHz
Type of Modulation:	Bluetooth: GFSK, Pi/4 DQPSK, 8DPSK
Number Of Channel	79CH
Antenna installation:	FPCB antenna
Antenna Gain:	3.31dBi
Ratings:	DC 12V 2A Battery:DC 7.6V
Adapter	Manufacture:Shenzhen JuZhou Power Technology Co., Ltd. Model No.:JZB024-120200UX Input: AC100-240V 50-60Hz 0.7A Output:DC 12V 2A
	$= - \left( $

## 4.2 Test Setup Configuration

See test photographs attached in *EUT TEST SETUP PHOTOGRAPHS* for the actual connections between Product and support equipment.

Cor	nducted E	mission	:			
	E-1 EUT	C-1	E-2 Adapter	AC	××××××××××××××××××××××××××××××××××××××	
Rac	diated Spu E-1 EUT	urious E	mission			
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## 4.3 Support Equipment

No.	Device Type	Brand	Model	Series No.	Note
E-1	15.6 inch laptop	CORE INNOVATI ONS	CLT1564	Ref. 4.1 Product Information	EUT
E-2	Adapter	N/A	JZB024-12020 0UX	N/A	EUT

Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	0.3M	DC cable unshielded

#### Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.

2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

## 4.4 Channel List

СН	Frequency (MHz)	СН	Frequency (MHz)	СН	Frequency (MHz)	СН	Frequency (MHz)
0	2402	1	2403	2	2404	3	2405
4	2406	5	2407	6	2408	7	2409
8	2410	9	2411	10	2412	11	2413
12	2414	13	2415	14	2416	15	2417
16	2418	17	2419	18	2420	19	2421
20	2422	21	2423	22	2424	23	2425
24	2426	25	2427	26	2428	27	2429
28	2430	29	2431	30	2432	31	2433
32	2434	33	2435	34	2436	35	2437
36	2438	37	2439	38	2440	39	2441
40	2442	41	2443	42	2444	43	2445
44	2446	45	2447	46	2448	47	2449
48	2450	49	2451	50	2452	51	2453
52	2454	53	2455	54	2456	55	2457
56	2458	57	2459	58	2460	59	2461
60	2462	61	2463	62	2464	63	2465
64	2466	65	2467	66	2468	67	2469
68	2470	69	2471	70	<u>2</u> 472	71	2473
72	2474	73	2475	74	2476	75	2477
76	2478	77	2479	78	2480	79	





## 4.5 Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Test Mode	Test mode	Low channel	Middle channel	High channel		
1	Transmitting(GFSK)	2402MHz	2441MHz	2480MHz		
2	Transmitting(Pi/4DQPSK) 2402MHz 2441MHz 2480MHz					
3	Transmitting(8DPSK) 2402MHz 2441MHz 2480					
4	Charging(Conducted emission)					
5	Transmitting (Radiated emission)					

Note:

(1) The measurements are performed at the highest, middle, lowest available channels.

(2) Fully-charged battery is used during the test

## 4.6 table of parameters of text software setting

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters

Test software VersionFrequency24Parameters						
	CMD					
Parameters	2402 MHz 2441 MHz		2480 MHz			
	DEF	DEF	DEF			
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## 5. TEST FACILITY AND TEST INSTRUMENT USED

## 5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Shenzhen BCTC Testing Co., Ltd. Address: 1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Tangwei, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

FCC Test Firm Registration Number: 712850

IC Registered No.: 23583

## 5.2 Test Instrument Used

Conducted emissions Test							
Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.		
Receiver	R&S	ESR3	102075	May 28, 2021	May 27, 2022		
LISN	R&S	ENV216	101375	May 28, 2021	May 27, 2022		
ISN	HPX	ISN T800	S1509001	May 28, 2021	May 27, 2022		
Software	Frad	EZ-EMC	EMC-CON 3A1	١	N		
					$\left  \right  / \left  \right $		

RF conducted test								
Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.			
Power Metter	Keysight	E4419B		May 28, 2021	May 27, 2022			
Power Sensor (AV)	Keysight	E9 300A		May 28, 2021	May 27, 2022			
Signal Analyzer 20kHz-26.5GHz	KEYSIGHT	N9020A	MY4910006 0	May 28, 2021	May 27, 2022			
Spectrum Analyzer 9kHz-40GHz	R&S	FSP40	100363	May 28, 2021	May 27, 2022			



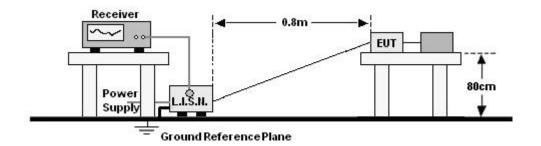
Radiated emissions Test (966 chamber)									
Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.				
966 chamber	ChengYu	966 Room	966	Jun. 06. 2020	Jun. 05, 2023				
Receiver	R&S	ESR3	102075	May 28, 2021	May 27, 2022				
Receiver	R&S	ESRP	101154	May 28, 2021	May 27, 2022				
Amplifier	SKET	LAPA_01G 18G-45dB	١	May 28, 2021	May 27, 2022				
Amplifier	Schwarzbeck	BBV9744	9744-0037	May 28, 2021	May 27, 2022				
TRILOG Broadband Antenna	schwarzbeck	VULB 9163	VULB9163- 942	Jun. 01, 2021	May 31, 2022				
Horn Antenna	SCHWARZBE CK	BBHA9120 D	1541	Jun. 02, 2021	Jun. 01, 2022				
Horn Antenna (18GHz-40 GHz)	SCHWARZBE CK	BBHA9170	822	May 28, 2021	May 27, 2022				
Amplifier (18GHz-40 GHz)	MITEQ	TTA1840-3 5-HG	2034381	May 28, 2021	May 27, 2022				
Loop Antenna (9KHz-30M Hz)	SCHWARZBE CK	FMZB1519 B	014	Jun. 02, 2021	Jun. 01, 2022				
RF cables1 (9kHz-30MH z)	Huber+Suhnar	9kHz-30M Hz	B1702988- 0008	May 28, 2021	May 27, 2022				
RF cables2 (30MHz-1G Hz)	Huber+Suhnar	30MHz-1G Hz	1486150	May 28, 2021	May 27, 2022				
RF cables3 (1GHz-40G Hz)	Huber+Suhnar	1GHz-40G Hz	1607106	May 28, 2021	May 27, 2022				
Power Metter	Keysight	E4419B		May 28, 2021	May 27, 2022				
Power Sensor (AV)	Keysight	E9 300A	l	May 28, 2021	May 27, 2022				
Signal Analyzer 20kHz-26.5 GHz	KEYSIGHT	N9020A	MY491000 60	May 28, 2021	May 27, 2022				
Spectrum Analyzer 9kHz-40G Hz	Agilent	FSP40	100363	May 28, 2021	May 27, 2022				
Software	Frad	EZ-EMC	FA-03A2 RE						

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## 6. CONDUCTED EMISSIONS

6.1 Block Diagram Of Test Setup



## 6.2 Limit

0.15 -0.5 66 - 56 * 56 - 46 *	(dBuV)
	Average
	56 - 46 *
0.50 -5.0 56.00 46.00	46.00
5.0 -30.0 60.00 50.00	50.00

Notes:

1. \*Decreasing linearly with logarithm of frequency.

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

## 6.3 Test procedure

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Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz / / / / / / / /

a. The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).

b. The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.

c. For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.



## 6.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.



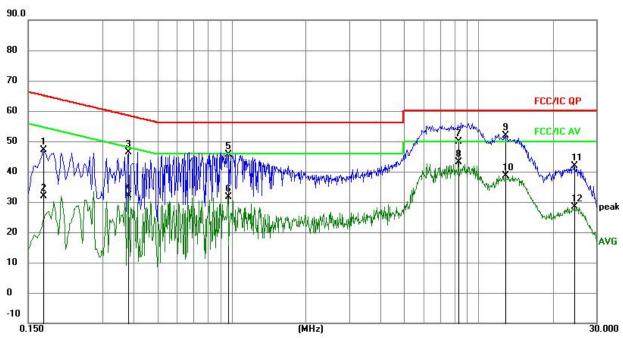
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#### Test Result 6.5

Temperature :	<b>26</b> ℃	Relative Humidity :	54%
Pressure :	101kPa	Phase :	L
Test Voltage :	AC 120V/60Hz	Test Mode :	Mode 4



#### Remark:

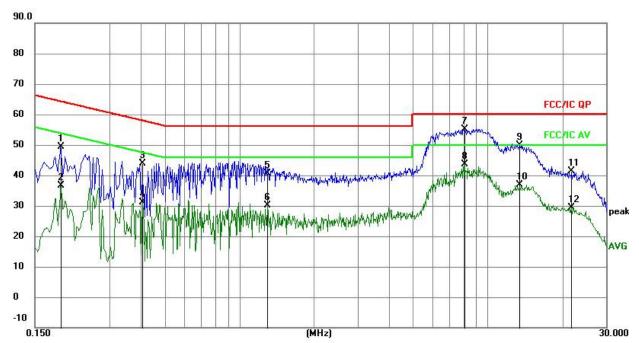
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz		dB	dBu∨	dBuV	dB	Detector
1		0.1725	37.66	9.49	47.15	64.84	-17.69	QP
2		0.1725	22.33	9.49	31.82	54.84	-23.02	AVG
3		0.3795	36.87	9.52	46.39	58.29	-11.90	QP
4		0.3795	22.63	9.52	32.15	48.29	-16.14	AVG
5		0.9644	36.10	9.58	45.68	56.00	-10.32	QP
6		0.9644	22.01	9.58	31.59	46.00	-14.41	AVG
7		8.3220	40.21	9.71	49.92	60.00	-10.08	QP
8	*	8.3220	33.33	9.71	43.04	50.00	-6.96	AVG
9		12.8220	42.27	9.70	51.97	60.00	-8.03	QP
10		12.8220	29.03	9.70	38.73	50.00	-11.27	AVG
11		24.4995	32.13	9.75	41.88	60.00	-18.12	QP
12		24.4995	18.53	9.75	28.28	50.00	-21.72	AVG

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All readings are Quasi-Peak and Average values.
 Factor = Insertion Loss + Cable Loss.



Temperature :	<b>26</b> ℃	Relative Humidity :	54%
Pressure :	101kPa	Phase :	Ν
Test Voltage :	AC 120V/60Hz	Test Mode :	Mode 4



#### Remark:

- All readings are Quasi-Peak and Average values.
   Factor = Insertion Loss + Cable Loss.

No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
	MHz		dB	dBuV	dBuV	dB	Detector
1	0.1904	39.86	9.47	49.33	64.02	-14.69	QP
2	0.1904	27.10	9.47	36.57	54.02	-17.45	AVG
3	0.4061	34.33	9.51	43.84	57.73	-13.89	QP
4	0.4061	21.64	9.51	31.15	47.73	-16.58	AVG
5	1.2960	31.05	9.58	40.63	56.00	-15.37	QP
6	1.2960	20.48	9.58	30.06	46.00	-15.94	AVG
7 *	8.0624	45.51	9.71	55.22	60.00	-4.78	QP
8	8.0624	33.93	9.71	43.64	50.00	-6.36	AVG
9	13.4792	40.18	9.70	49.88	60.00	-10.12	QP
10	13.4792	27.06	9.70	36.76	50.00	-13.24	AVG
11	21.7149	31.49	9.77	41.26	60.00	-18.74	QP
12	21.7149	19.67	9.77	29.44	50.00	-20.56	AVG

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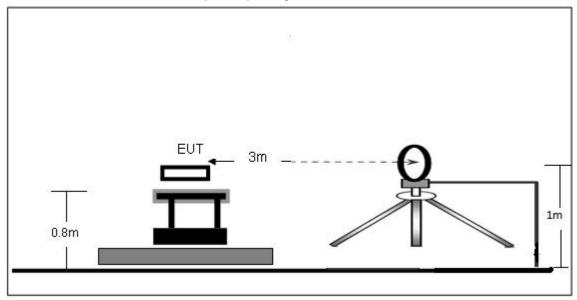
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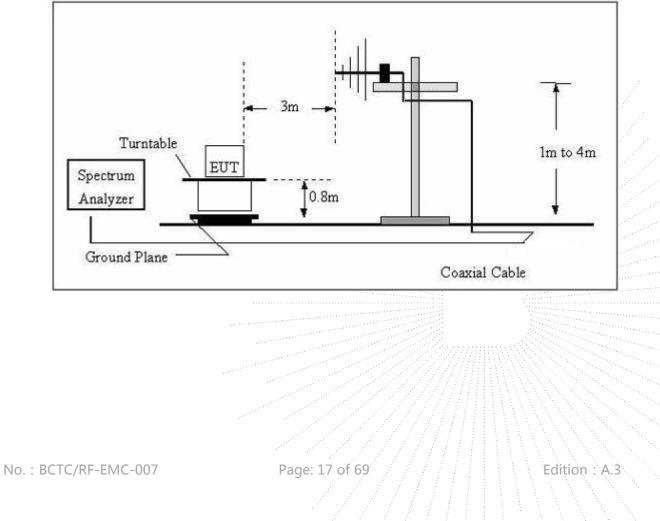


## 7. RADIATED EMISSIONS

- 7.1 Block Diagram Of Test Setup
  - (A) Radiated Emission Test-Up Frequency Below 30MHz



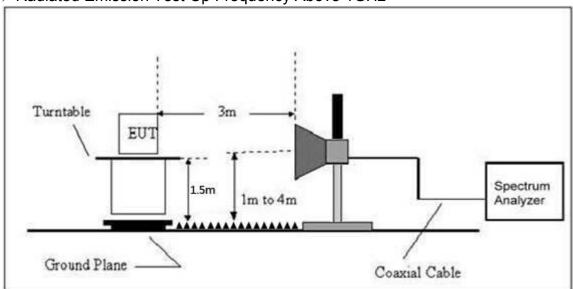
(B) Radiated Emission Test-Up Frequency 30MHz~1GHz





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## 7.2 Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequency	Field Strength	Distance	Field Strength Limit at 3m Distance				
(MHz)	uV/m	(m)	uV/m	dBuV/m			
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	20log <sup>(2400/F(kHz))</sup> + 80			
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	20log <sup>(24000/F(kHz))</sup> + 40			
1.705 ~ 30	30	30	100 * 30	20log <sup>(30)</sup> + 40			
30 ~ 88	100	3	100	20log <sup>(100)</sup>			
88 ~ 216	150	3	150	20log <sup>(150)</sup>			
216 ~ 960	200	3	200	20log <sup>(200)</sup>			
Above 960	500	3	500	20log <sup>(500)</sup>			

## LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENC	Limit (dBuV/	/m) (at 3M)	
Y (MHz)	PEAK	AVERAGE	4 
Above 1000	74	54	

Notes:

(1)The limit for radiated test was performed according to FCC PART 15C.

(2)The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).



## 7.3 Test procedure

Receiver Parameter	Setting
Attenuation	Auto
9kHz~150kHz	RBW 200Hz for QP
150kHz~30MHz	RBW 9kHz for QP
30MHz~1000MHz	RBW 120kHz for QP

Spectrum Parameter	Setting	
1-25GHz	RBW 1 MHz /VBW 1 MHz for Peak,	
1-23682	RBW 1 MHz / VBW 10Hz for Average	

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 metre to 1.5 metre( Above 18GHz the distance is 1 meter and table is 1.5 metre).

h. Test the EUT in the lowest channel ,the middle channel ,the Highest channel.

Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.





Above 1GHz test procedure as below:

a.The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b.The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c.The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d.For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.

e.The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g.Test the EUT in the lowest channel, the Highest channel.

Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

## 7.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

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## 7.5 Test Result

Below 30MHz

Temperature:	<b>26</b> ℃	Relative Humidtity:	24%
Pressure:	101 kPa	Test Voltage :	DC 7.6V
Test Mode :	Mode 5	Polarization :	

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
				PASS
				PASS

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =40 log (specific distance/test distance)(dB); Limit line = specific limits(dBuv) + distance extrapolation factor.

No.: BCTC/RF-EMC-007

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	Belween SUMINZ – TGHZ					
Temperature:	<b>26</b> ℃	Relative Humidtity:	54%			
Pressure:	101 kPa	Test Voltage :	DC 7.6V			
Test Mode :	Mode 5	Polarization :	Horizontal			





#### Remark:

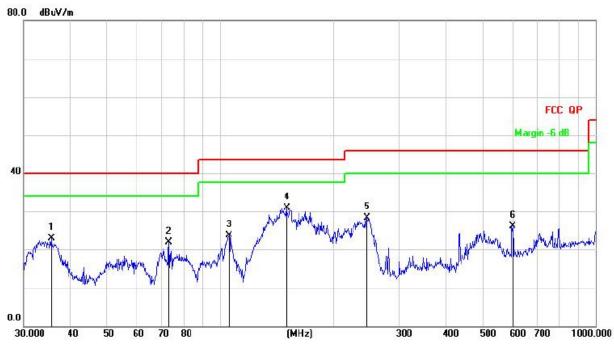
Factor = Antenna Factor + Cable Loss – Pre-amplifier.

No.	Mk	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detect
1		61.9951	33.42	-16.36	17.06	40.00	-22.94	QP
2		106.3850	41.22	-16.69	24.53	43.50	-18.97	QP
3		145.8611	49.25	-19.23	30.02	43.50	- <mark>13.4</mark> 8	QP
4		173.8135	51.44	-17.98	33.46	<b>43.50</b>	-10.04	QP
5	*	237.4760	54.86	-15.44	39.42	46.00	-6.58	QP
6		755.3873	29.84	-4.26	25.58	46.00	-20.42	QP

#### No. : BCTC/RF-EMC-007



Temperature:	<b>26</b> ℃	Relative Humidtity:	54%
Pressure:	101 kpa	Test Voltage :	DC 7.6V
Test Mode :	Mode 5	Polarization :	Vertical



#### Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

No.	Mk	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detecto
1		35.4993	39.23	-16.25	22.98	40.00	-17.02	QP
2		73.1025	40.79	- <mark>18</mark> .88	21.91	40.00	-18.09	QP
3		105.6415	40.41	- <mark>16</mark> .64	23.77	43.50	- <mark>19.7</mark> 3	QP
4	*	150.5378	50.31	-19.47	30.84	43.50	-12.66	QP
5		246.8149	43.55	-15.22	28.33	46.00	-17.67	QP
6		601.4265	32.66	-6.53	26.13	46.00	-19.87	QP



Between 1GHz – 25GHz

Polar	Frequency	Reading Level	Correct Factor	Measure- ment	Limits	Over	Detector
(H/V)	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/ m)	(dB)	Туре
		G	FSK Low cl	nannel			
V	4804.00	52.65	-0.43	52.22	74.00	-21.78	PK
V	4804.00	41.87	-0.43	41.44	54.00	-12.56	AV
V	7206.00	44.87	8.31	53.18	74.00	-20.82	PK
V	7206.00	35.77	8.31	44.08	54.00	-9.92	AV
Н	4804.00	48.78	-0.43	48.35	74.00	-25.65	PK
H	4804.00	39.54	-0.43	39.11	54.00	-14.89	AV
H	7206.00	43.50	8.31	51.81	74.00	-22.19	PK
Н	7206.00	35.48	8.31	43.79	54.00	-10.21	AV
			SK Middle o				
V	4882.00	49.14	-0.38	48.76	74.00	-25.24	PK
V	4882.00	40.51	-0.38	40.13	54.00	-13.87	AV
V	7323.00	39.59	8.83	48.42	74.00	-25.58	PK
V	7323.00	30.58	8.83	39.41	54.00	-14.59	AV
H	4882.00	45.52	-0.38	45.14	74.00	-28.86	PK
H	4882.00	35.75	-0.38	35.37	54.00	-18.63	AV
H	7323.00	38.32	8.83	47.15	74.00	-26.85	PK
H	7323.00	30.47	8.83	39.30	54.00	-14.70	AV
	-		SK High c		:		1
V	4960.00	50.84	-0.32	50.52	74.00	-23.48	PK
V	4960.00	40.72	-0.32	40.40	54.00	-13.60	AV
V	7440.00	42.83	9.35	52.18	74.00	-21.82	PK
V	7440.00	32.85	9.35	42.20	54.00	-11.80	AV
Н	4960.00	48.48	-0.32	48.16	74.00	-25.84	PK
Н	4960.00	38.86	-0.32	38.54	54.00	-15.46	AV
Н	7440.00	40.33	9.35	49.68	74.00	-24.32	PK
Н	7440.00	32.84	9.35	42.19	54.00	-11.81	AV

#### Remark:

1.Emission Level = Meter Reading + Factor,

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Over= Emission Level - Limit

2.If peak below the average limit, the average emission was no test.

3. In restricted bands of operation, The spurious emissions below the permissible value more than 20dB

4. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

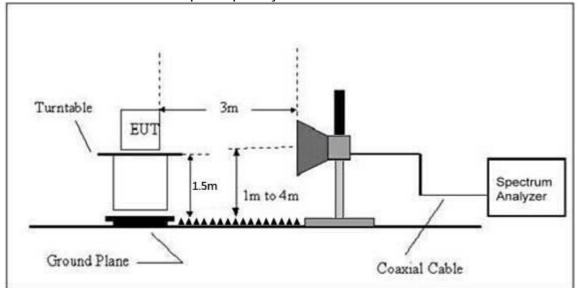
5.All the Modulation are test, the worst mode is GFSK, the data recording in the report.



## 8. RADIATED BAND EMISSION MEASUREMENT AND RESTRICTED BANDS OF OPERATION

8.1 Block Diagram Of Test Setup

Radiated Emission Test-Up Frequency Above 1GHz



## 8.2 Limit

## FCC Part15 C Section 15.209 and 15.205

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
<sup>1</sup> 0.495-0.505	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	2690-2900	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	( <sup>2</sup> )
13.36-13.41			

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENC	Limit (dBuV/	/m) (at 3M)
Y (MHz)	PEAK	AVERAGE
Above 1000	.74	54

Notes:

(1)The limit for radiated test was performed according to FCC PART 15C.

(2)The tighter limit applies at the band edges.



(3)Emission level (dBuV/m)=20log Emission level (uV/m).

## 8.3 Test procedure

Receiver Parameter	Setting
Attenuation	Auto
Start Frequency	2300MHz
Stop Frequency	2520
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Above 1GHz test procedure as below:

a.The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b.The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c.The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d.For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.

e.The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g.Test the EUT in the lowest channel, the Highest channel.

Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

## 8.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.



## 8.5 Test Result

	Polar (H/V)	Frequency (MHz)	Reading Level	Correct Factor	Measure- ment (dBuV/m)		nits V/m)	Result
	(	()	(dBuV/m)	(dB)	PK	PK	AV	
			Low	Channel 2	402MHz			
	Н	2390.00	56.66	-6.70	49.96	74.00	54.00	PASS
	Н	2400.00	48.54	-6.71	41.83	74.00	54.00	PASS
	V	2390.00	56.64	-6.70	49.94	74.00	54.00	PASS
GFSK	V	2400.00	49.30	-6.71	42.59	74.00	54.00	PASS
GFSK			High	Channel 2	480MHz	-	-	
	Н	2483.50	57.11	-6.79	50.32	74.00	54.00	PASS
	Н	2485.00	49.06	-6.81	42.25	74.00	54.00	PASS
	V	2483.50	55.82	-6.79	49.03	74.00	54.00	PASS
	V	2485.00	47.75	-6.81	40.94	74.00	54.00	PASS
				Channel 2				
	Н	2390.00	57.75	-6.70	51.05	74.00	54.00	PASS
	Н	2400.00	49.37	-6.71	42.66	74.00	54.00	PASS
	V	2390.00	57.03	-6.70	50.33	74.00	54.00	PASS
Pi/4DQPSK	V	2400.00	49.45	-6.71	42.74	74.00	54.00	PASS
			<b>_</b>	Channel 2		1		
	Н	2483.50	56.95	-6.79	50.16	74.00	54.00	PASS
	Н	2485.00	49.00	-6.81	42.19	74.00	54.00	PASS
	V	2483.50	57.44	-6.79	50.65	74.00	54.00	PASS
	V	2485.00	50.20	-6.81	43.39	74.00	54.00	PASS
				Channel 2				
	H	2390.00	56.75	-6.70	50.05	74.00	54.00	PASS
	H	2400.00	47.94	-6.71	41.23	74.00	54.00	PASS
	V	2390.00	57.52	-6.70	50.82	74.00	54.00	PASS
8DPSK	V	2400.00	50.42	-6.71	43.71	74.00	54.00	PASS
				Channel 2				
	H	2483.50	55.50	-6.79	48.71	74.00	54.00	PASS
	Н	2485.00	48.33	-6.81	41.52	74.00	54.00	PASS
	V	2483.50	57.86	-6.79	51.07	74.00	54.00	PASS
Remark:	V	2485.00	49.54	-6.81	42.73	74.00	54.00	PASS

#### Remark:

1. Emission Level = Meter Reading + Factor,

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Over= Emission Level - Limit

2. If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.

3 In restricted bands of operation, The spurious emissions below the permissible value more than 20dB

4. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.



## 9. CONDUCTED EMISSION

## 9.1 Block Diagram Of Test Setup



## 9.2 Limit

Regulation 15.247 (d), 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. 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))

## 9.3 Test procedure

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

2. Set the spectrum analyzer:

Below 30MHz:

RBW = 100kHz, VBW = 300kHz, Sweep = auto

Detector function = peak, Trace = max hold

Above 30MHz:

RBW = 100KHz, VBW = 300KHz, Sweep = auto

Detector function = peak, Trace = max hold

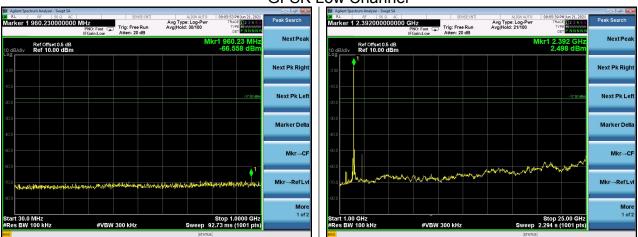
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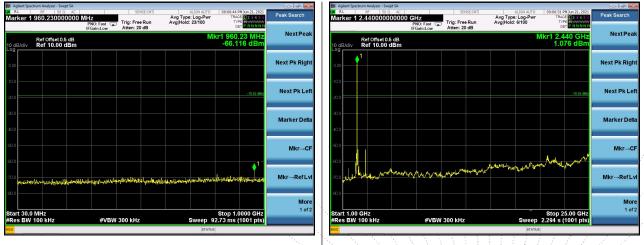
## 9.4 Test Result

Temperature :	<b>26</b> ℃	Relative Humidity :	54%
Test Voltage :	DC 7.6V	Remark:	N/A

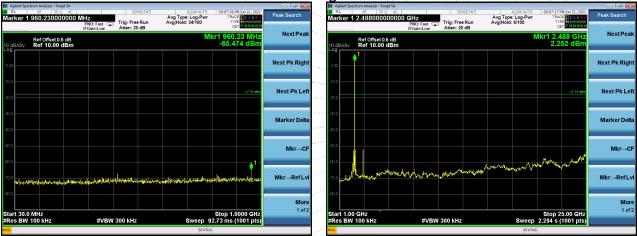
#### **30MHz – 25GHz** GFSK Low Channel



#### **GFSK Middle Channel**



## GFSK High Channel



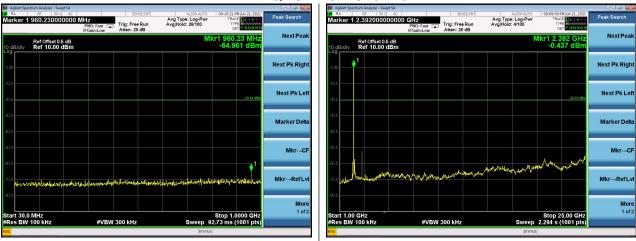
No. : BCTC/RF-EMC-007

Edition: A.3



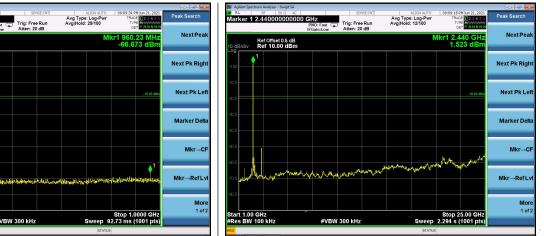
r 1 960.230000000 MHz

#### Report No.: BCTC2106496988-2E



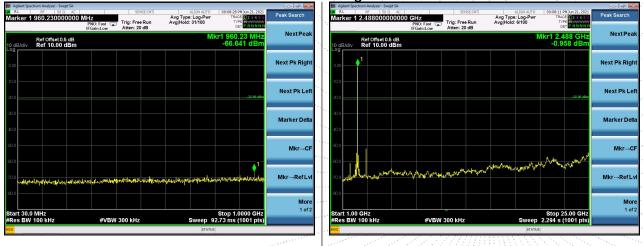
#### Pi/4 DQPSK Low Channel

## Pi/4 DQPSK Middle Channel

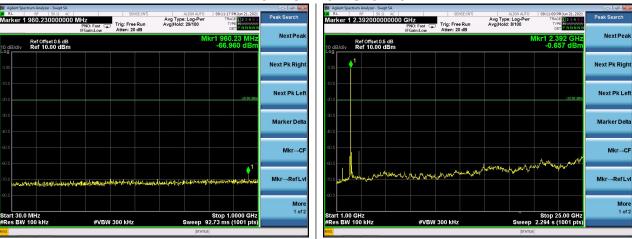


# Ref Offset 0.5 dB Ref 10.00 dBm rt 30.0 MHz s BW 100 kHz #VBW 300 kHz

## Pi/4 DQPSK High Channel

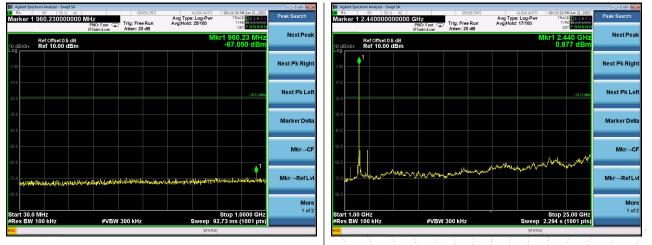




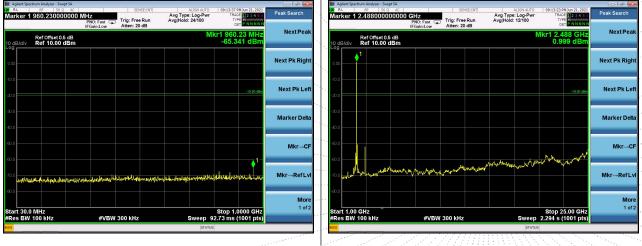


#### 8DPSK Low Channel

## 8DPSK Middle Channel



## **8DPSK High Channel**

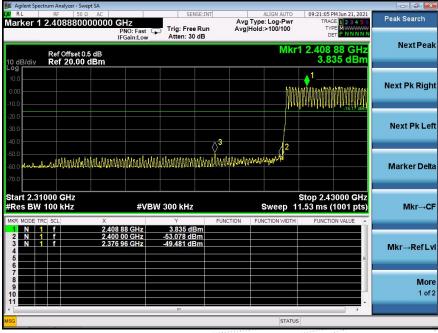




Milent Spectrum Analyzer - Swept SA			
Marker 1 2.402200000000		ALIGN AUTO 09:21:49 PM Jun 21, 202 Avg Type: Log-Pwr TRACE 2 34 5 AvglHold:>100/100 TVPE MWWWW	6 Peak Search
Ref Offset 0.5 dB 10 dB/div Ref 20.00 dBm	PNO: Fast Trig: Free Run IFGain:Low Atten: 30 dB	Avg Hold:>100/100 TYPE MUNAWAY DET P NNNN Mkr1 2.402 2 GH: 3.672 dBn	Next Peak
10.0 0.00 -10.0			Next Pk Righ
-20.0		-16.33 dB	Next Pk Lef
-50.0 -60.0	denner andre and an and den and an and an and	nunt samma na	Marker Delta
Start 2.31000 GHz #Res BW 100 kHz	#VBW 300 kHz	Stop 2.41000 GH: Sweep 9.600 ms (1001 pts	
2 N 1 f 2.4	402 2 GHz 3.672 dBm 00 00 GHz -46.888 dBm 399 3 GHz -49.132 dBm		Mkr→RefLv
7 8 9 10 11			More 1 of 2
MSG		STATUS	

## GFSK Transmitting Band edge-left side

## GFSK Hopping Band edge-left side





M Agilent Spec								
Marker 1	RF 2.4798	50 Ω AC 4800000	0 GHz	SENSE:II	Avg	ALIGN AUTO Type: Log-Pwr	09:15:34 PM Jun 21, 2 TRACE 1 2 3 4	5 6 Peak Search
	Ref Offs	et 0.5 dB	PNO: Fast IFGain:Low	Trig: Free Run Atten: 20 dB	n Avg	Hold:>100/100 Mkr1	2.479 848 GH 3.062 dB	NN NextPeak
10 dB/div 0.00		.00 dBm					-16.94 d	Next Pk Right
-30.0 -40.0 -50.0			∆ <sup>2</sup> ∆ <sup>3</sup>					Next Pk Left
-60.0 -70.0 -60.0			mandation	Muzilmiselvalum	NonenerMine	white	and the second secon	Marker Delta
Start 2.47 #Res BW	100 kHz	X		W 300 kHz Y	FUNCTION	Sweep 2.	Stop 2.50000 GF 133 ms (1001 pt FUNCTION VALUE	Hz (S) Mkr→CF
1 N 1 2 N 1 3 N 1 4 5 6	f f f	2.4	79 848 GHz 83 500 GHz 84 556 GHz	3.062 dBm -59.544 dBm -58.775 dBm				Mkr→RefLv
7 8 9 10 11				m			,	More 1 of 2
MSG						STATUS		

## GFSK Transmitting Band edge-right side

GFSK Hopping Band edge-right side

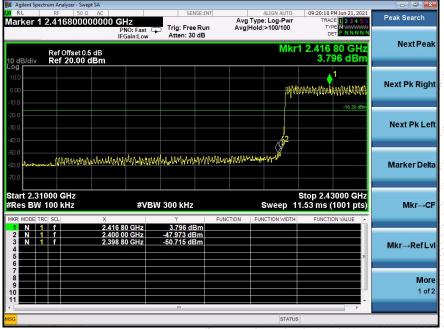




	F1/			SITTILLII	iy Danc	i euge-ieit	SILLE
	trum Analyzer - Swept S						
N RL	RF 50 Ω 2.402200000		SENSE:II		ALIGN AUTO	09:22:16 PM Jun 21, 2021 TRACE 1 2 3 4 5 6	Peak Search
Marker 1	2.402200000	PNO: Fast	Trig: Free Ru		Hold:>100/100	TYPE MWWWWW DET P NNNNN	
		IFGain:Low	Atten: 30 dB				NextPeak
	Ref Offset 0.5 d	IB			Mk	r1 2.402 2 GHz	NEXIFEAN
10 dB/div Log	Ref 20.00 dE					3.542 dBm	
10.0						<b>1</b>	
0.00							Next Pk Right
				12 6			
-10.0						-16.46 dBm	
-20.0							Next Pk Left
-30.0						61	NEXT PK LEIT
-40.0						\$ <b>\$</b> 2	
-50.0	n					<del>/</del> _ <u>h</u>	
-60.0	nume componen	were many many many many many many many many	meterneter meternet	win marine	with a war and a second	manne huse	Marker Delta
-70.0							
Start 2.31 #Res BW		#\/E	W 300 kHz		Swoon 0	Stop 2.41000 GHz 600 ms (1001 pts)	Mkr→CF
							WIKI→CF
MKR MODE TR	C SCL	× 2.402 2 GHz	Y 3.542 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	
2 N 1	f	2.400 00 GHz	-46.967 dBm				
3 N 1	f	2.399 3 GHz	-49.721 dBm				Mkr→RefLvi
5						E	
7							
8							More
10							1 of 2
11							
ISG					STATUS		
					014103		

Pi/4 DQPSK Transmitting Band edge-left side

## Pi/4 DQPSK Hopping Band edge-left side



No. : BCTC/RF-EMC-007

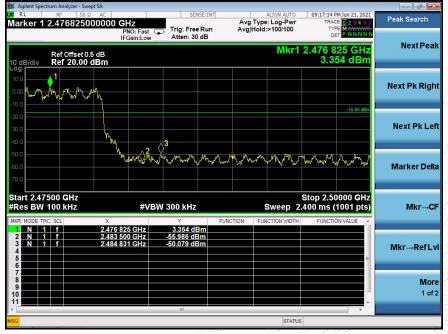




Agilent Spectrum Analyzer - Swept SA		intering Barra		
RL RF 50Ω AC larker 1 2.480178000000	BHZ PN0: Fast ↓ IFGain:Low Trig: Free Run Atten: 20 dB	ALIGN AUTO Avg Type: Log-Pwr Avg Hold:>100/100	09:14:57 PM Jun 21, 2021 TRACE 2 3 4 5 0 TYPE MWWWWW DET P N N N N N	Peak Search
Ref Offset 0.5 dB 0 dB/div Ref 10.00 dBm		Mkr1	2.480 178 GHz 3.020 dBm	NextPeak
			-16.98 dBm	Next Pk Right
	203			Next Pk Lef
0.0	m man man man	hhalin have and how for any	maladurionalophan	Marker Delta
tart 2.47800 GHz Res BW 100 kHz	#VBW 300 kHz	Sweep 2.	Stop 2.50000 GHz 133 ms (1001 pts)	Mkr→Cl
2 N 1 f 2.483 3 N 1 f 2.484 4 5 6 6	0 178 GHz 3.020 dBm 3 500 GHz -60.079 dBm 4 292 GHz -59.499 dBm	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	Mkr→RefLv
7 8 9 0 1				Mor 1 of 2
G		STATUS		

Pi/4 DQPSK Transmitting Band edge-right side

Pi/4 DQPSK Hopping Band edge-right side







Agilent Spectrum Analyzer - Swept SA						
RL RF 50 Ω AC Marker 1 2.40220000000	0 GHz	SENSE:INT	Avg Type:		09:22:50 PM Jun 21, 2021 TRACE 1 2 3 4 5 6	Peak Search
Ref Offset 0.5 dB 10 dB/div Ref 20.00 dBm	PNO: Fast IFGain:Low	Trig: Free Run Atten: 30 dB	Avg Hold:>		1 2.402 2 GHz 3.582 dBm	NextPeak
og 10.0 					1	Next Pk Right
0.0					-16.42 dBm	Next Pk Lef
0.0 .0 <del></del>	international and the services	manalet Maran	a	an the sector of	www.	Marker Delta
tart 2.31000 GHz Res BW 100 kHz	#VBW	300 kHz		weep 9.6	top 2.41000 GHz 00 ms (1001 pts)	Mkr→Cl
1         N         1         f         2           2         N         1         f         2.           3         N         1         f         2.           4         -         -         -         -           5         -         -         -         -         -           6         -         -         -         -         -         -	2.402 2 GHz 400 00 GHz 2.399 3 GHz	3.582 dBm -47.266 dBm -49.802 dBm				Mkr→RefLv
7 8 8 9 9 9 9 1 9 1						More 1 of 2
SG SG		m		STATUS	,	

## 8DPSK Transmitting Band edge-left side

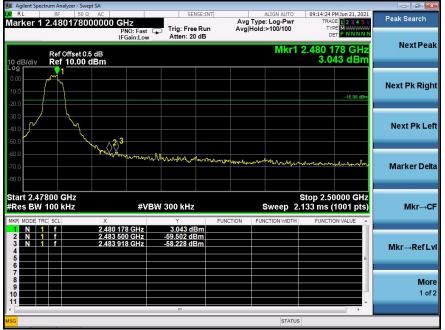
8DPSK Hopping Band edge-left side

RL	RF 50 G		SENSE:INT	ALIGN AUTO Avg Type: Log-Pwr	09:19:03 PM Jun 21, 2021 TRACE 1 2 3 4 5 6	Peak Search
arker 1	2.4048000	00000 GHz PNO: Fast	Trig: Free Run	Avg Hold:>100/100		
		IFGain:Low	Atten: 30 dB			NovtBo
dB/div	Ref Offset 0. Ref 20.00			Mkr	1 2.404 80 GHz 3.789 dBm	
-9 0.0 .00 0.0				M	1	Next Pk Ri
D.0					-16.21 dBm	Next Pk L
D.O				3222		
10						
للإسلام معد 1.0	ma Martinatural	milannihimalmi	magazinationalia	Y I		Marker D
).0 <b></b> ).0 0.1		mudaaaanahahamadaa	n againman an a	Y I	Stop 2.43000 GHz	
art 2.31			พา <i>คมุมภาพภามภามมาก</i> ปุ่ม 3W 300 kHz	witheritheries	Stop 2.43000 GHz 1.53 ms (1001 pts)	
art 2.31	000 GHz 100 kHz	#VE	3W 300 kHz Y F	witheritheries	1.53 ms (1001 pts)	
tart 2.31	000 GHz 100 kHz	#VE	3W 300 kHz 3.789 dBm -46.616 dBm	มกใหญ่ไปหมาย Sweep 1	1.53 ms (1001 pts)	
art 2.31 Res BW	000 GHz 100 kHz	#VE X 2.404 80 GHz	300 kHz 3.789 dBm	มกใหญ่ไปหมาย Sweep 1	1.53 ms (1001 pts)	Mkr⊸
tart 2.31 Res BW R MODE TR N 1 2 N 1 3 N 1 4	000 GHz 100 kHz	#VE	3W 300 kHz 3.789 dBm -46.616 dBm	มกใหญ่ไปหมาย Sweep 1	1.53 ms (1001 pts)	Mkr–
Image: constraint of the second sec	000 GHz 100 kHz	#VE	3W 300 kHz 3.789 dBm -46.616 dBm	มกใหญ่ไปหมาย Sweep 1	1.53 ms (1001 pts)	Mkr⊸
0.0 tart 2.31	000 GHz 100 kHz	#VE	3W 300 kHz 3.789 dBm -46.616 dBm	มกใหญ่ไปหมาย Sweep 1	1.53 ms (1001 pts)	Mkr⊸ Mkr⊸Ref
Res         No           Image: Second sec	000 GHz 100 kHz	#VE	3W 300 kHz 3.789 dBm -46.616 dBm	มกใหญ่ไปหมาย Sweep 1	1.53 ms (1001 pts)	Mkr⊸ Mkr⊸Ref
R MODE TF Res BW R MODE TF N 1 3 N 1 3 N 1 4 5 5 5 5 6 6 7 7 8 8	000 GHz 100 kHz	#VE	3W 300 kHz 3.789 dBm -46.616 dBm	มกใหญ่ไปหมาย Sweep 1	1.53 ms (1001 pts)	Mkr⊸ Mkr⊸Ref

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#### 8DPSK Transmitting Band edge-right side

8DPSK Hopping Band edge-right side

