

# TEST REPORT

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**Applicant** : Leica Geosystems AG  
**Address of Applicant** : Heinrich-Wild-Strasse, CH-9435 Heerbrugg

**Product Name** : Rugged Windows Field Controller  
**Model No.** : CS30 LTE LRBT  
**Sample No.** : E21040013-01 #05  
E21040013-01 #01  
**FCC ID** : RFD-CS30LRBT  
**ISED Number** : 3177A-CS30LRBT

**Standards** : FCC CFR47 Part 15, Subpart C  
RSS-Gen (Issue 5, March 2019)  
RSS-247 (Issue 2, February 2017)

**Date of Receipt** : 2021-04-25  
**Date of Test** : 2021-04-25 ~ 2021-06-07  
**Date of Issue** : 2021-06-07

**Remark:**

*This report details the results of the testing carried out on one sample, the results contained in this report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.*

Prepared by:

Jennifer Zhou  
(Jennifer Zhou)

Reviewed by:

Oliver Xiang  
(Oliver Xiang)

Approved by:

Guoyou Chi  
(Authorized signatory: Guoyou Chi)

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## 1 General Information

### 1.1 Testing Laboratory

<b>Company Name</b>	ICAS Testing Technology Service (Shanghai) Co., Ltd.
<b>Address</b>	No.1298 Pingan Rd, Minhang District, Shanghai, China
<b>Telephone</b>	0086 21-51682999
<b>Fax</b>	0086 21-54711112
<b>Homepage</b>	www.icasiso.com

### 1.2 Details of Application

<b>Applicant Company Name</b>	Leica Geosystems AG
<b>Address</b>	Heinrich-Wild-Strasse, CH-9435 Heerbrugg
<b>Contact Person</b>	Patrick Rayero
<b>Telephone</b>	+4171 727 4664
<b>Email</b>	patrick.rayero@leica-geosystems.com
<b>Manufacturer Company Name</b>	Leica Geosystems AG
<b>Address</b>	Heinrich-Wild-Strasse, CH-9435 Heerbrugg
<b>Factory Company Name</b>	Shenzhen UniStrong Science & Technology Co.,Ltd.
<b>Address</b>	B,4-4Factory, Zhengcheng Road, Fuyong Baoan District, Shenzhen, China

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## 1.3 Details of EUT

Product Name	Rugged Windows Field Controller
Brand Name	Leica
Test Model No.	CS30 LTE LRBT
FCC ID	RFD-CS30LRBT
ISED Number	3177A-CS30LRBT

## Technical Information

Mode of Operation	Bluetooth BR/EDR
Frequency Range	2400MHz ~ 2483.5MHz
Number of Channels	79 (at intervals of 1 MHz)
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8-DPSK
Antenna Type	Internal Antenna and External Antenna
Antenna Gain	1.97 dBi (for internal antenna) 2.00 dBi (for external antenna)
Extreme Temperature Range	-20°C ~ +60°C
Test Voltage	DC 11.1V
Hardware version	PCB V0.4
Software version	R.ED.00.02.03
RF power setting in TEST SW	DRTU and Serial Port Adapter Toolbox

## 1.4 Test Methodology

47 CFR Part 15, Subpart C (10-1-16 Edition)	Miscellaneous Wireless Communications Services
KDB Publication 558074 D01 v05r02	15.247 Meas Guidance
RSS-Gen (Issue 5, March 2019)	General Requirements for Compliance of Radio Apparatus
RSS-247 (Issue 2, February 2017)	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

### Note(s):

All test items were verified and recorded according to the standards and without any addition/deviation/exclusion during the test.

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## 1.5 Test Summary

Test Item	FCC Rules	ISED RULES	Result
Antenna Requirement	FCC Part 15.247(b)(4), Part 15.203	RSS-247 5.4(6)	PASS
Maximum Conducted Output Power and E.I.R.P	FCC Part 15.247(b)(1)	RSS-247 5.4(2)	PASS
20dB Bandwidth and 99% Bandwidth	FCC Part 15.247(a)(1)	RSS-247 5.1(1) RSS-Gen 6.7	PASS
Conducted Spurious Emission & Authorized-band band-edge	FCC Part 15.247(d)	RSS-247 5.5	PASS
Radiated Spurious Emission	FCC Part 15.247(d), 15.205, 15.209	RSS-247 5.5	PASS
Band Edge (Restricted-band band-edge)	FCC Part 15.247(d), 15.205, 15.209	RSS-247 5.5	PASS
Hopping Frequency Separation	FCC Part 15.247(a)(1)	RSS-247 5.1(2)	PASS
Number of Hopping Frequency	FCC Part 15.247(a)(1)(iii)	RSS-247 5.1(4)	PASS
Time of Occupancy	FCC Part 15.247(a)(1)(iii)	RSS-247 5.1(4)	PASS
Conducted Emission on AC Mains	FCC Part 15.207(a)	RSS-Gen 8.8	PASS

### Note(s):

$\pi/4$ -DQPSK is the EDR 2M rate mode, 8-DPSK is the EDR 3M rate mode. The consistency of test results in  $\pi/4$ -DQPSK and 8-DPSK is very high. So we chose 8-DPSK as a typical representative to appear on the report. Another we will show all the modes on the RF output power test item.

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## 2 Test Condition

### 2.1 Environmental conditions

Temperature (°C)	18-25
Humidity (%RH)	40-65
Barometric Pressure (mbar)	960-1060

### 2.2 Equipment List

Name of Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Keysight	N9020B	MY59260184	2020-08-19	2021-08-18
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2020-06-09	2021-06-08
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2020-06-09	2021-06-08
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2020-06-09	2021-06-08
V-network	SCHWARZBECK	NSLK 8127	8127-902	2020-07-29	2021-07-28
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	100687	2020-08-19	2021-08-18
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2020-06-09	2021-06-08
Horn Antenna-18G	SCHWARZBECK	BBHA9120 D	9120D-1775	2020-07-29	2021-07-28
Loop Antenna	SCHWARZBECK	FMZB 1513	N/A	2020-11-23	2021-11-22
Horn Antenna-40G	YINGLIAN	LB-180400-KF	N/A	2020-07-27	2021-07-26
EMC chamber 9*6*6 (L*W*H)	CHANGNING	966	N/A	2020-06-09	2023-06-08
Shielded Enclosure 8*5*4 (L*W*H)	CHANGNING	854	N/A	2020-06-09	2021-06-08
Test Software	BL	BL410_E	N/A	N/A	N/A
Test Software	BL	BL410_R	N/A	N/A	N/A

### 2.3 Measurement Uncertainty

Parameter	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	± 1.5 dB
	> 1GHz	± 1.5 dB
Radiated Emission	30 MHz – 1 GHz	± 3 dB
	> 1GHz	± 3 dB
Conducted Emission on AC Mains	9KHz-30MHz	± 1.96 dB

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## 3 Test Set-up and Operation Modes

### 3.1 Details of Test Mode

Using test software was control EUT work in continuous transmitter and receiver mode. Select test channel as below:

Channel	Frequency
The lowest channel(CH0)	2402MHz
The middle channel(CH39)	2441MHz
The Highest channel(CH78)	2480MHz

The basic operation modes are:

- A. On
  - 1. BR/EDR mode
    - a. Transmitting
      - i. Low Channel
      - ii. Middle Channel
      - iii. High Channel
      - iv. Hopping mode
    - b. Receiving
  - 2. Normal working with Bluetooth on
- B. Standby
- C. Off

### 3.2 Special Accessories and Auxiliary Equipment

Description	Manufacturer	Model No.	Serial No.
Laptop	Lenovo	TP00083A	N/A

### 3.3 Support Software

Description	Manufacturer	Software Name
Software	N/A	Serial Port Adapter Toolbox and DRTU

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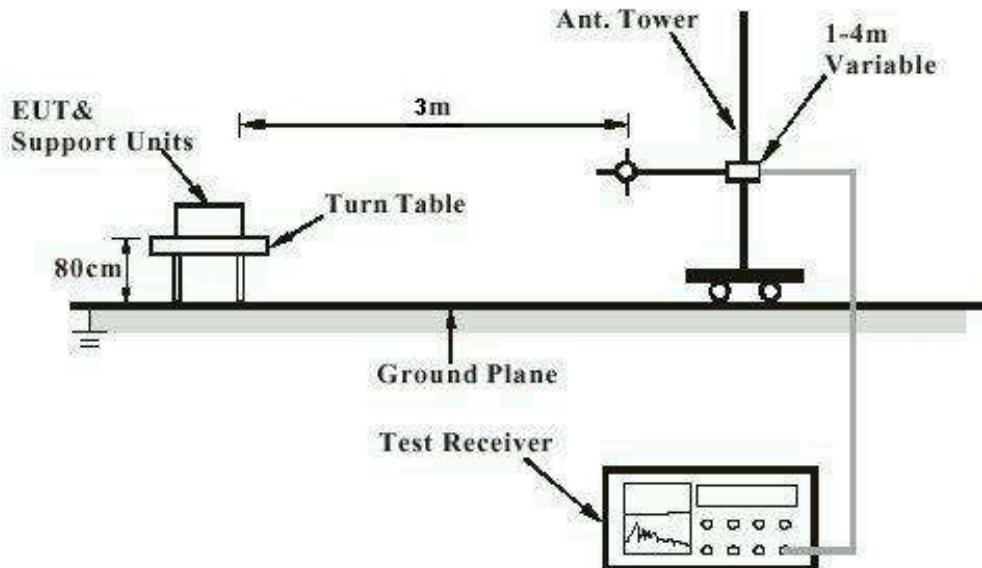
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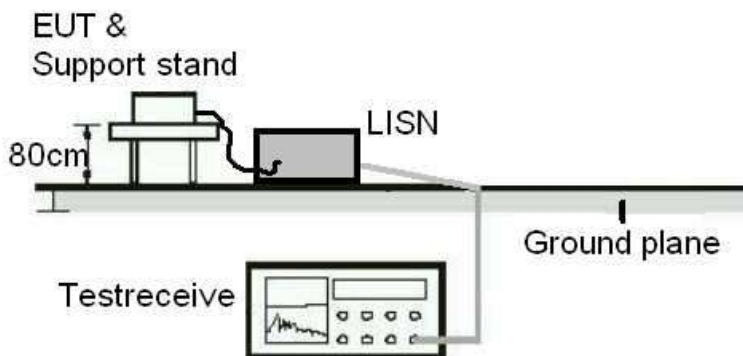
## 3.4 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Equipment Configuration for Conduction Measurement





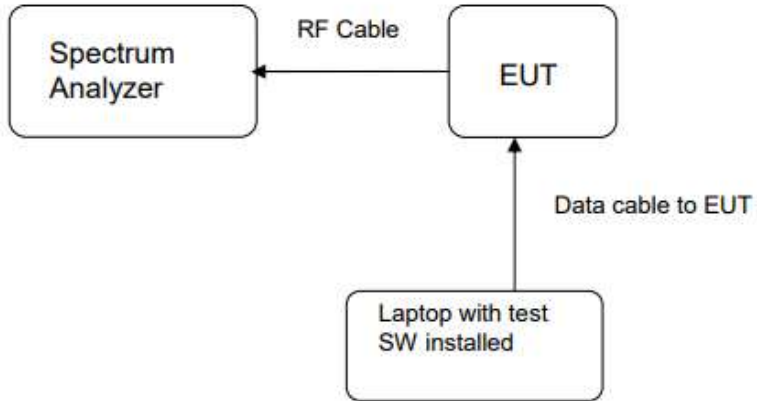
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## Diagram of Measurement Equipment Configuration for Transmitter Measurement



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## 4 Test Results

### 4.1 Transmitter Requirement & Test Suites

#### 4.1.1 Antenna Requirement

**RESULT:** **PASS**

Test standard : FCC Part 15.247(b)(4), Part 15.203  
RSS-247 5.4(6)

Requirement : The use of approved antennas only with directional gains that do not exceed 6dBi

According to the manufacturer declaration, the EUT has an antenna with a directional gain of 2.00 dBi. The antenna is an external antenna with no possibility of replacement with a non-approved antenna by the end-user.

Therefore, the EUT is considered to comply with this provision.

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## 4.1.2 Maximum Conducted Output Power and E.I.R.P

RESULT:

PASS

Test standard : FCC Part 15.247(b)(1)  
 RSS-247 5.4(2)  
 Requirement : ANSI C63.10-2013  
 Kind of test site : Shielded room

### Test setup

Test Channel : Low/Middle/High  
 Operation Mode : A.1.a  
 Ambient temperature : 23°C  
 Relative humidity : 52%

Internal Module (Contain Table 1, Table 2 and Figure 1)

Table 1: Maximum Conducted Output Power

Test Mode	Test Channel (MHz)	Measured Peak Power		Limit (W)
		(dBm)	(mW)	
GFSK	2402	3.62	2.30	≤ 1
	2441	3.76	2.38	
	2480	3.62	2.30	
π/4-DQPSK	2402	0.81	1.21	≤ 0.125
	2441	1.32	1.36	
	2480	1.53	1.42	
8-DPSK	2402	-0.24	0.95	≤ 0.125
	2441	0.32	1.08	
	2480	0.54	1.13	

Table 2: E.I.R.P

Test Mode	Test Channel (MHz)	E.I.R.P		Limit (W)
		(dBm)	(mW)	
GFSK	2402	5.59	3.62	≤ 4
	2441	5.73	3.74	
	2480	5.59	3.62	
π/4-DQPSK	2402	2.78	1.90	
	2441	3.29	2.13	
	2480	3.50	2.24	
8-DPSK	2402	1.73	1.49	
	2441	2.29	1.69	
	2480	2.51	1.78	

Note: The antenna gain is 1.97dBi

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External Module (Contain Table 3, Table 4 and Figure 2)

**Table 3: Maximum Conducted Output Power**

Test Mode	Test Channel (MHz)	Measured Peak Power		Limit (W)
		(dBm)	(mW)	
GFSK	2402	7.62	5.78	≤ 1
	2441	7.17	5.21	
	2480	5.27	3.37	
π/4-DQPSK	2402	6.84	4.83	≤ 0.125
	2441	6.31	4.28	
	2480	4.07	2.55	
8-DPSK	2402	6.82	4.81	≤ 0.125
	2441	6.41	4.38	
	2480	4.23	2.65	

**Table 4: E.I.R.P**

Test Mode	Test Channel (MHz)	E.I.R.P		Limit (W)
		(dBm)	(mW)	
GFSK	2402	9.62	9.16	≤ 4
	2441	9.17	8.26	
	2480	7.27	5.33	
π/4-DQPSK	2402	8.84	7.66	
	2441	8.31	6.78	
	2480	6.07	4.05	
8-DPSK	2402	8.82	7.62	
	2441	8.41	6.93	
	2480	6.23	4.20	

Note: The antenna gain is 2.00dBi

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Figure 1: Internal Module-Maximum Conducted Output Power, 2402MHz, GFSK



Internal Module-Maximum Conducted Output Power, 2441MHz, GFSK



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## Internal Module-Maximum Conducted Output Power, 2480MHz, GFSK



## Internal Module-Maximum Conducted Output Power, 2402MHz, $\pi/4$ -DQPSK



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## Internal Module-Maximum Conducted Output Power, 2441MHz, $\pi/4$ -DQPSK



## Internal Module-Maximum Conducted Output Power, 2480MHz, $\pi/4$ -DQPSK



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## Internal Module-Maximum Conducted Output Power, 2402MHz, 8-DPSK



## Internal Module-Maximum Conducted Output Power, 2441MHz, 8-DPSK





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## Internal Module-Maximum Conducted Output Power, 2480MHz, 8-DPSK



Figure 2: External Module-Maximum Conducted Output Power, 2402MHz, GFSK



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## External Module-Maximum Conducted Output Power, 2441MHz, GFSK



## External Module -Maximum Conducted Output Power, 2480MHz, GFSK



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## External Module-Maximum Conducted Output Power, 2402MHz, $\pi/4$ -DQPSK



## External Module-Maximum Conducted Output Power, 2441MHz, $\pi/4$ -DQPSK



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## External Module-Maximum Conducted Output Power, 2480MHz, $\pi/4$ -DQPSK



## External Module-Maximum Conducted Output Power, 2402MHz, 8-DPSK



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## External Module-Maximum Conducted Output Power, 2441MHz, 8-DPSK



## External Module-Maximum Conducted Output Power, 2480MHz, 8-DPSK



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## 4.1.3 20dB Bandwidth and 99% Bandwidth

RESULT:

PASS

Test standard : FCC Part 15.247(a)(1)  
RSS-247 5.1(1)  
RSS-Gen 6.7  
Requirement : ANSI C63.10-2013  
Kind of test site : Shielded room

### Test setup

Test Channel : Low/Middle/High  
Operation Mode : A.1.a  
Ambient temperature : 23°C  
Relative humidity : 52%

### Internal Module (Contain Table 5 and Figure 3)

Table 5: 20dB Bandwidth and 99% Bandwidth

Test Mode	Test Channel (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
GFSK	2402	0.9474	0.8682
	2441	0.9486	0.8683
	2480	0.9514	0.8727
8-DPSK	2402	1.482	1.3494
	2441	1.477	1.3465
	2480	1.480	1.3488

### External Module (Contain Table 6 and Figure 4)

Table 6: 20dB Bandwidth and 99% Bandwidth

Test Mode	Test Channel (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
GFSK	2402	0.9473	0.8390
	2441	0.9474	0.8470
	2480	0.9472	0.8438
8-DPSK	2402	1.317	1.2069
	2441	1.319	1.2068
	2480	1.317	1.2088

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Figure 3: Internal Module-20dB Bandwidth and 99% Bandwidth, 2402MHz, GFSK



Internal Module-20dB Bandwidth and 99% Bandwidth, 2441MHz, GFSK



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## Internal Module-20dB Bandwidth and 99% Bandwidth, 2480MHz, GFSK



## Internal Module-20dB Bandwidth and 99% Bandwidth, 2402MHz, 8-DPSK





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## Internal Module-20dB Bandwidth and 99% Bandwidth, 2441MHz, 8-DPSK



## Internal Module-20dB Bandwidth and 99% Bandwidth, 2480MHz, 8-DPSK



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Figure 4: External Module-20dB Bandwidth and 99% Bandwidth, 2402MHz, GFSK



External Module-20dB Bandwidth and 99% Bandwidth, 2441MHz, GFSK



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## External Module-20dB Bandwidth and 99% Bandwidth, 2480MHz, GFSK



## External Module-20dB Bandwidth and 99% Bandwidth, 2402MHz, 8-DPSK



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## External Module-20dB Bandwidth and 99% Bandwidth, 2441MHz, 8-DPSK



## External Module-20dB Bandwidth and 99% Bandwidth, 2480MHz, 8-DPSK



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## 4.1.4 Conducted Spurious Emission & Authorized-band band-edge

RESULT:

**PASS**

Test standard : FCC Part 15.247(d)  
RSS-247 5.5  
Requirement : ANSI C63.10-2013  
Kind of test site : Shielded room

### Test setup

Test Channel : Low/Middle/High for spurious, Low/High for Band  
Edge  
Operation Mode : A.1.a  
Ambient temperature : 23°C  
Relative humidity : 52%

For details refer to following test plot.

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Figure 5: Internal Module-Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, GFSK Carrier Level



## Band Edge



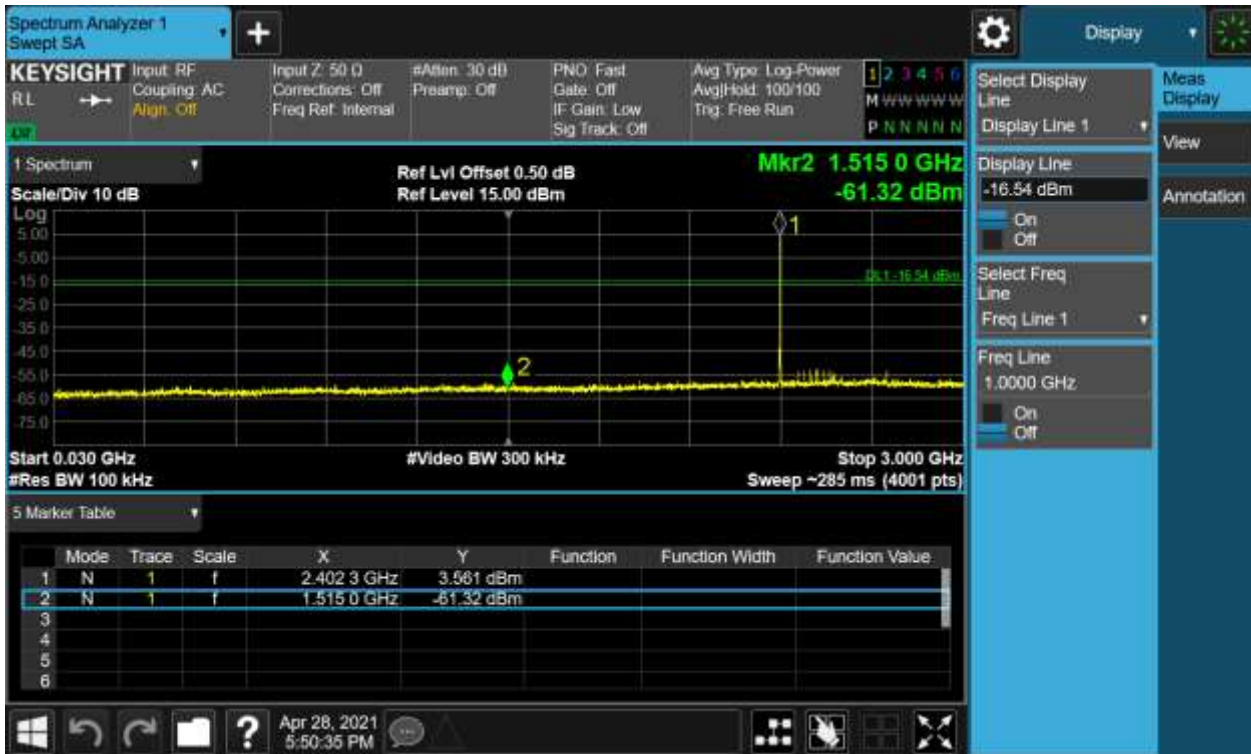
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## Conducted spurious emissions 30MHz-25GHz



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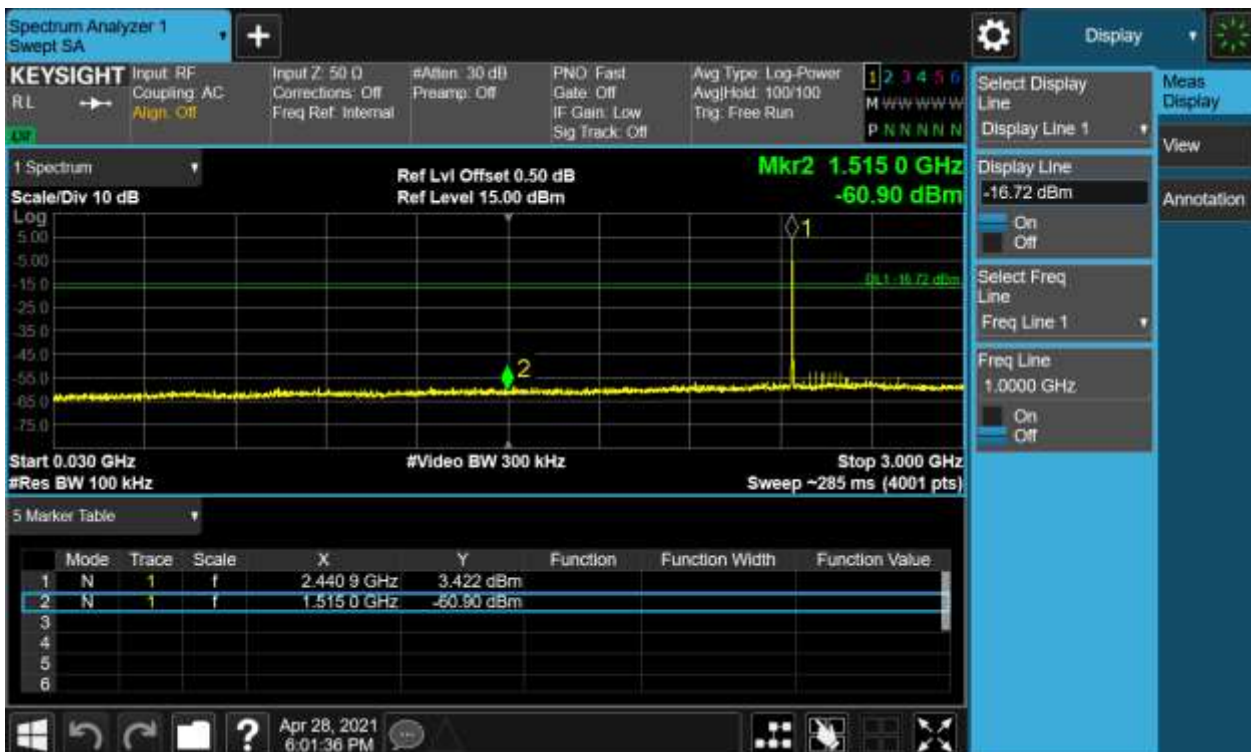
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Figure 6: Internal Module-Conducted Spurious Emission & Authorized-band band-edge, 2441MHz, GFSK Carrier Level



Conducted spurious emissions 30MHz-25GHz





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Figure 7: Internal Module-Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, GFSK Carrier Level



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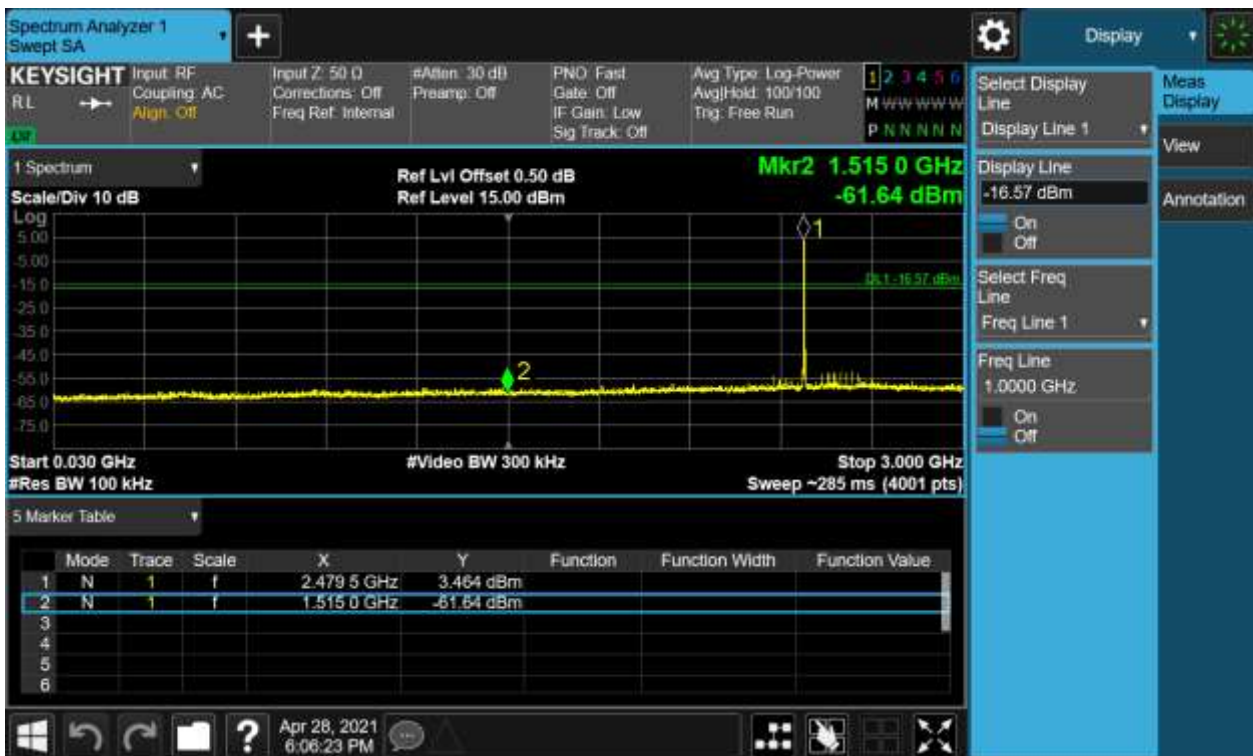
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## Band Edge



## Conducted spurious emissions 30MHz-25GHz



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Figure 8: Internal Module-Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, 8-DPSK Carrier Level



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## Band Edge



## Conducted spurious emissions 30MHz-25GHz



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Figure 9: Internal Module-Conducted Spurious Emission & Authorized-band band-edge, 2441MHz, 8-DPSK Carrier Level



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## Conducted spurious emissions 30MHz-25GHz



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Figure 10: Internal Module-Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, 8-DPSK Carrier Level



## Band Edge



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## Conducted spurious emissions 30MHz-25GHz





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Figure 11: Internal Module-Conducted Spurious Emission & Authorized-band band-edge, Hopping Mode, GFSK

## Carrier Level



## Band Edge(Low)



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## Band Edge(High)



## Conducted spurious emissions 30MHz-25GHz



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Figure 12: Internal Module-Conducted Spurious Emission & Authorized-band band-edge, Hopping Mode, 8-DPSK Carrier Level



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## Band Edge(Low)



## Band Edge(High)



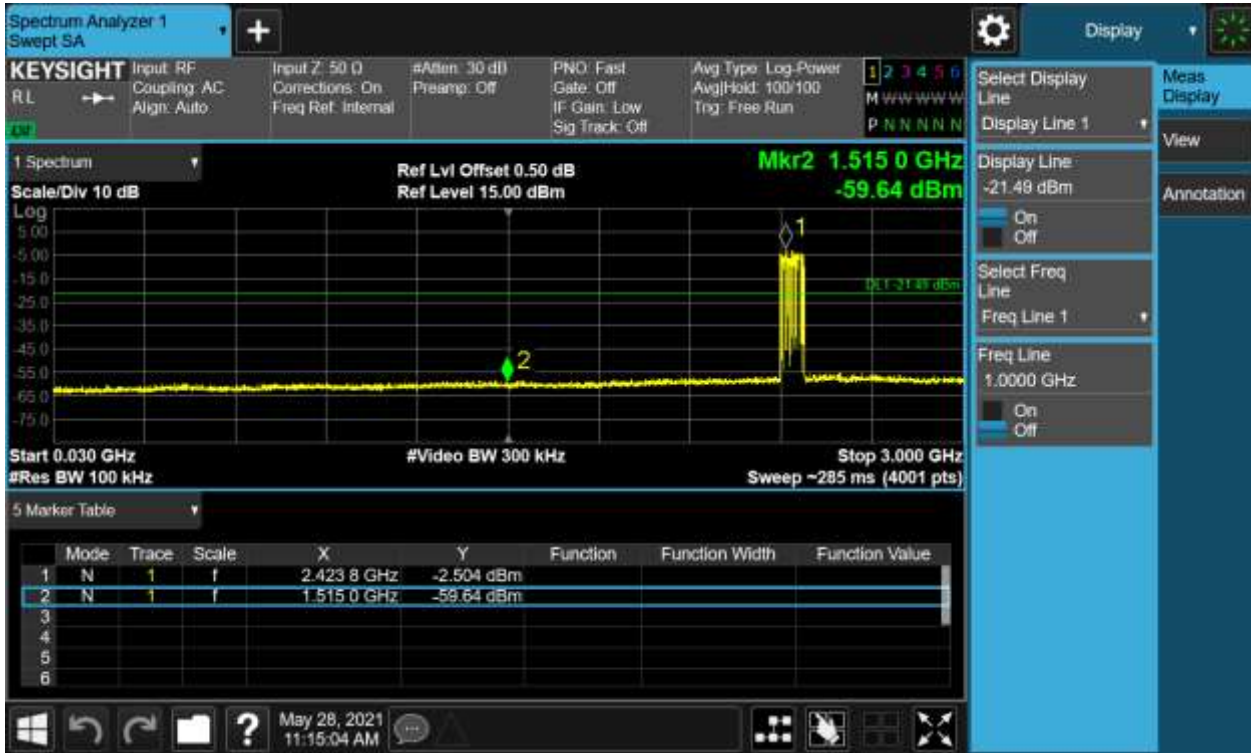
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## Conducted spurious emissions 30MHz-25GHz



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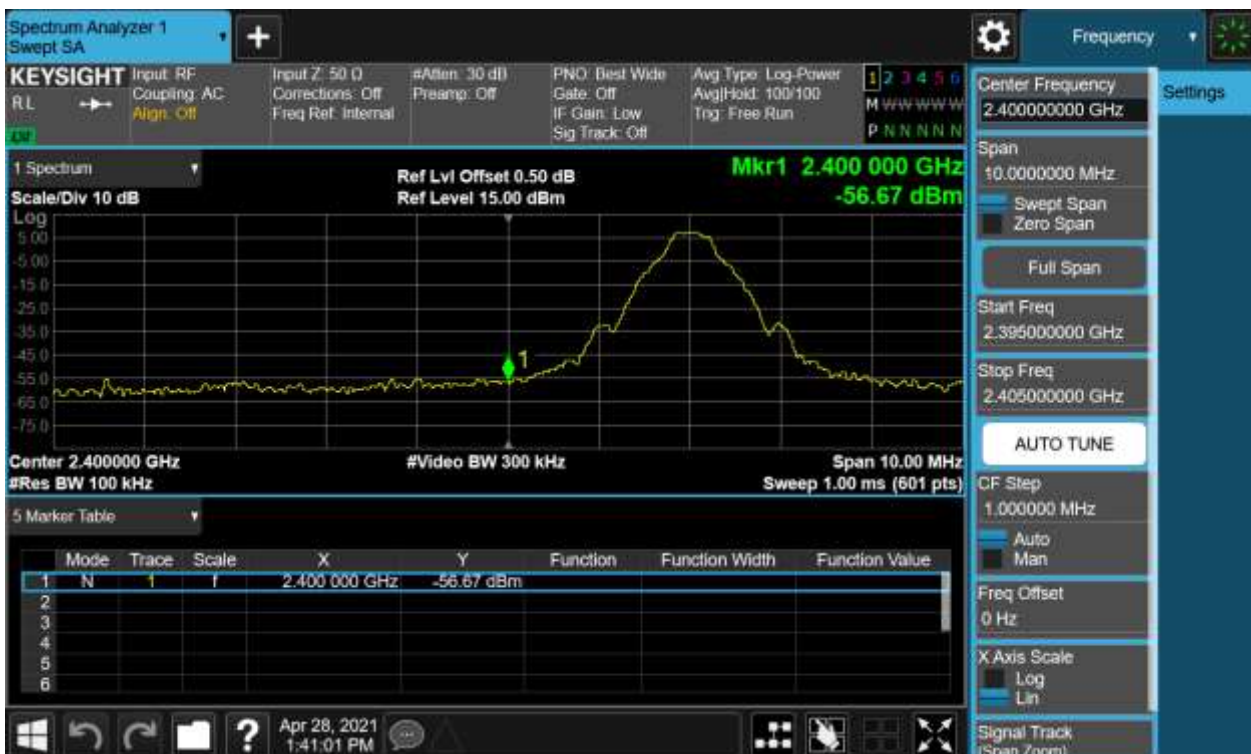
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Figure 13: External Module -Conducted Spurious Emission & Authorized-band band-edge, 2402, GFSK Carrier Level



## Band Edge



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## Conducted spurious emissions 30MHz-25GHz



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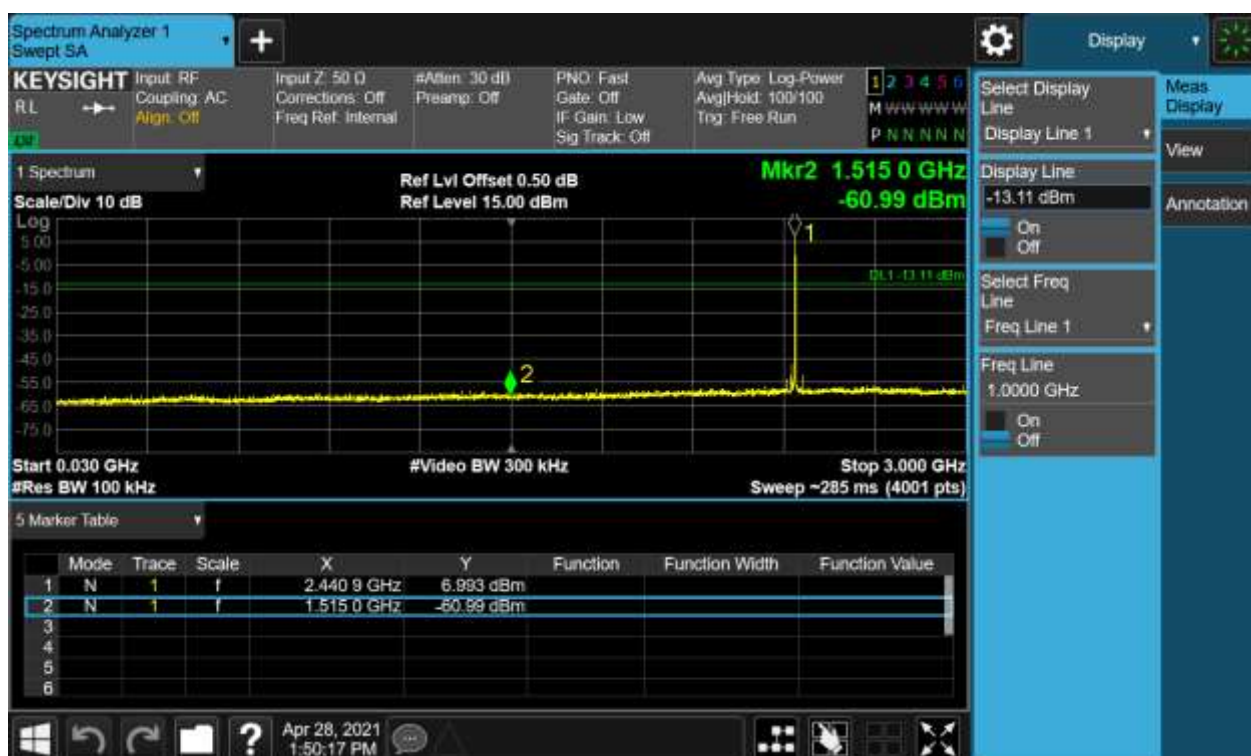
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Figure 14: External Module -Conducted Spurious Emission & Authorized-band band-edge, 2441, GFSK Carrier Level



## Conducted spurious emissions 30MHz-25GHz





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Figure 15: External Module -Conducted Spurious Emission & Authorized-band band-edge, 2480, GFSK Carrier Level



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## Band Edge



## Conducted spurious emissions 30MHz-25GHz



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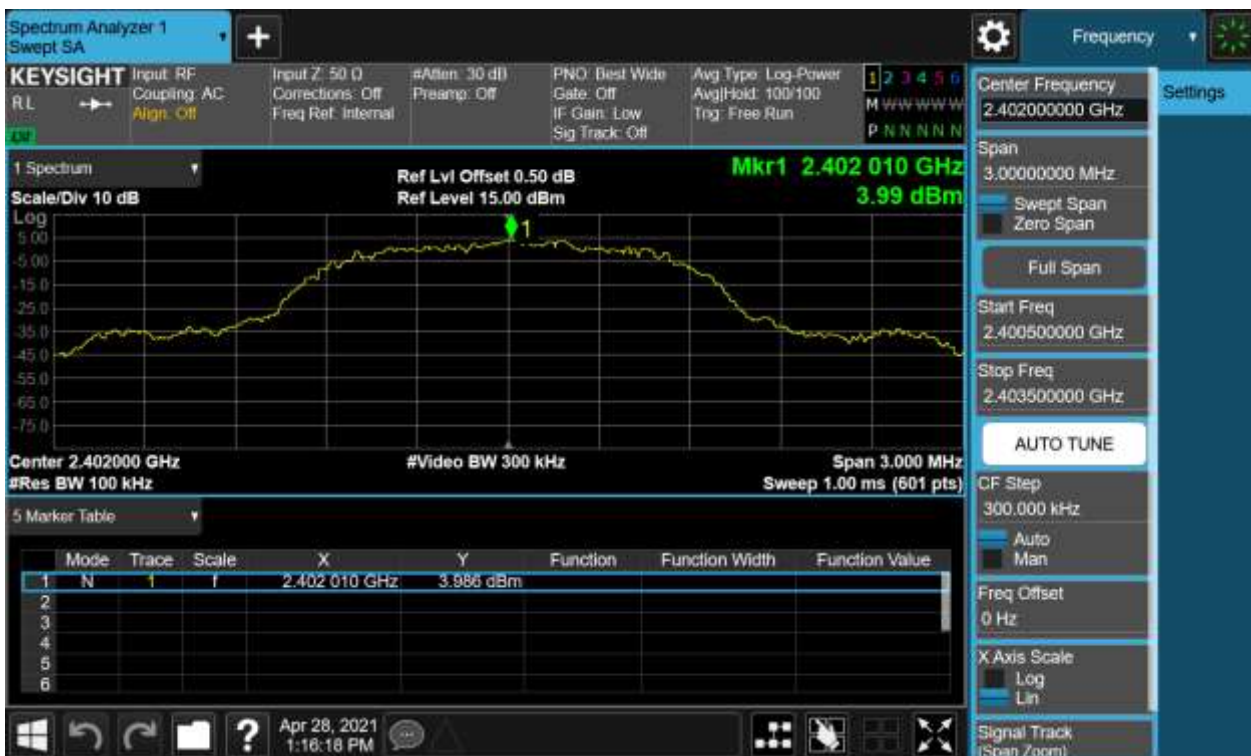
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Figure 16: External Module -Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, 8-DPSK Carrier Level



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## Band Edge



## Conducted spurious emissions 30MHz-25GHz



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Figure 17: External Module -Conducted Spurious Emission & Authorized-band band-edge, 2441MHz, 8-DPSK Carrier Level



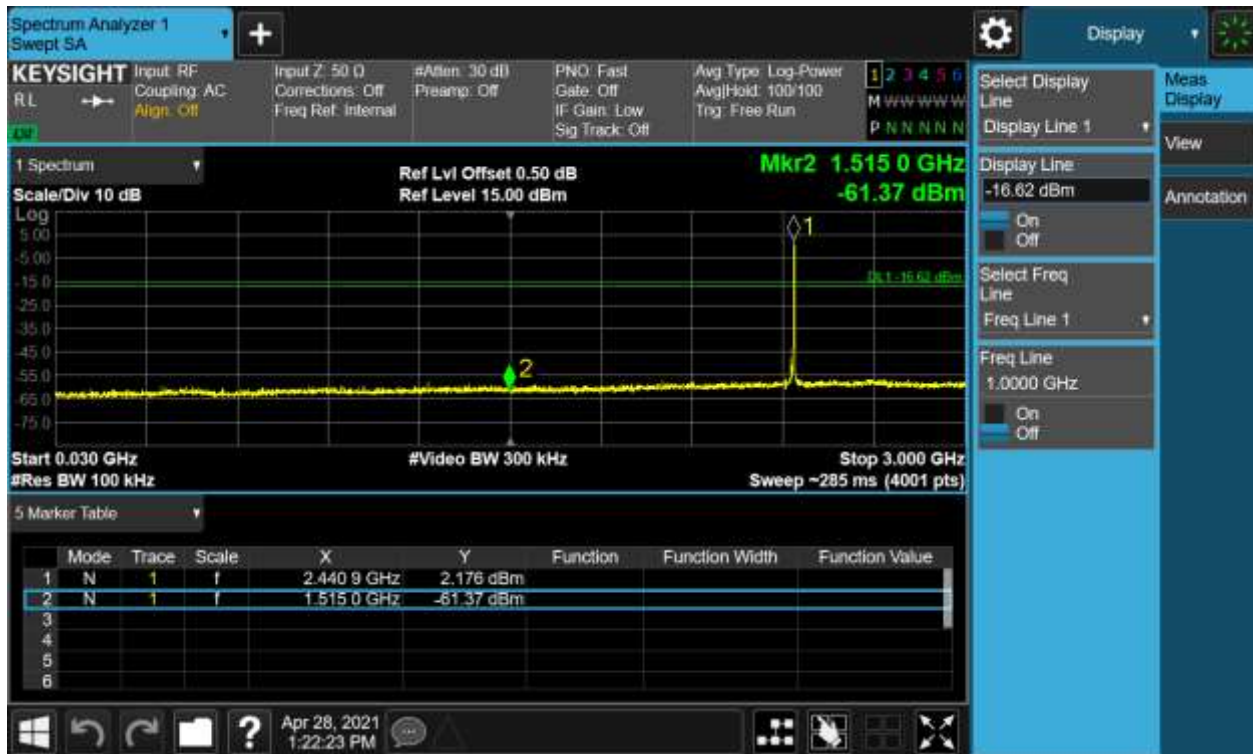
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## Conducted spurious emissions 30MHz-25GHz



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Figure 18: External Module -Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, 8-DPSK Carrier Level



## Band Edge



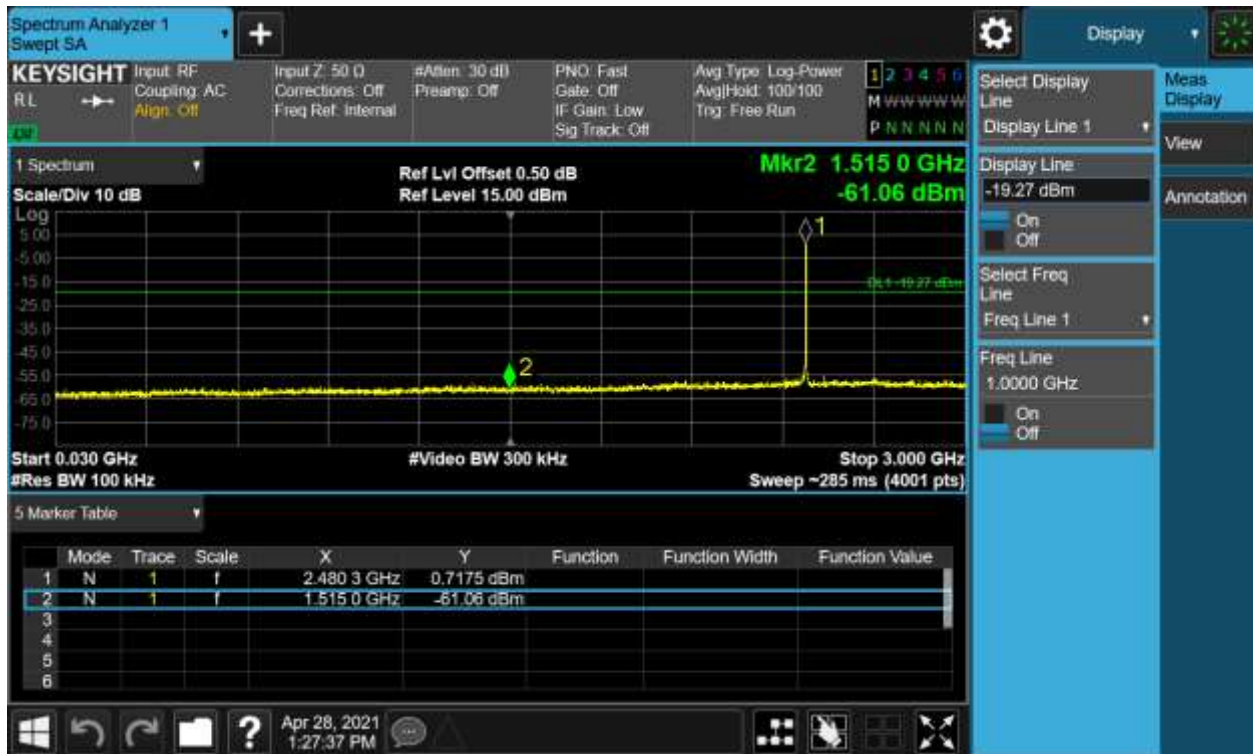
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## Conducted spurious emissions 30MHz-25GHz





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Figure 19: External Module -Conducted Spurious Emission & Authorized-band band-edge, Hopping mode, GFSK

## Carrier Level



## Band Edge(Low)



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## Band Edge(High)



## Conducted spurious emissions 30MHz-25GHz



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Figure 19: External Module -Conducted Spurious Emission & Authorized-band band-edge, Hopping mode, 8-DPSK Carrier Level



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## Band Edge(Low)



## Band Edge(High)



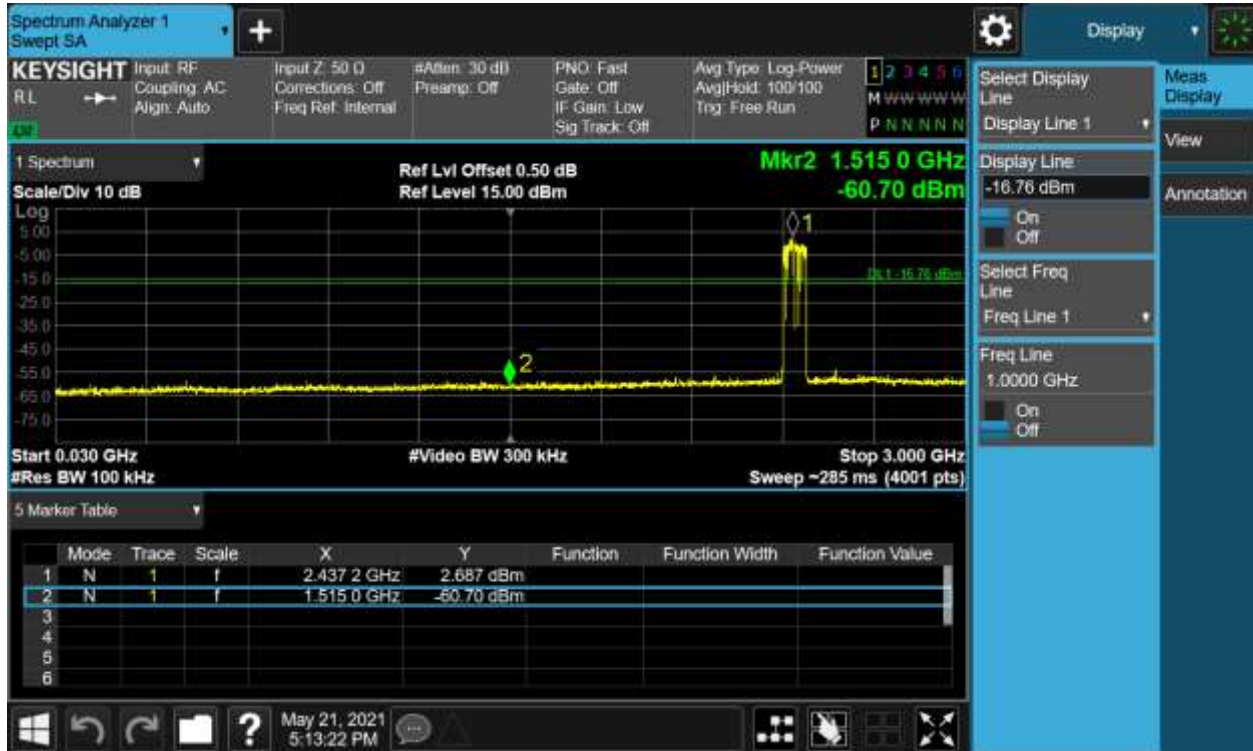
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## Conducted spurious emissions 30MHz-25GHz



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## 4.1.5 Radiated Spurious Emission

RESULT:

**PASS**

Test standard : FCC Part 15.247(d), 15.205, 15.209  
RSS-247 5.5  
Requirement : ANSI C63.10-2013  
Kind of test site : 3m Semi-Anechoic Chamber

### Test setup

Test Channel : Low/Middle/High  
Operation Mode : A  
Ambient temperature : 23°C  
Relative humidity : 52%

### Notes

*Test plots please refer to the annex document "SHE21040013-02HE Internal Module DATA BDED-R-TX EXHIBIT A and SHE21040013-02HE External Module DATA BDED-R-TX EXHIBIT B".*

1. For 9 kHz ~ 30 MHz, the amplitude of spurious emissions that are attenuated by more than 20dB below the permissible. The value has no need to be reported.
2. The spurious above 18GHz is noise only and 20dB below the limit. The value has no need to be reported.
3. The EUT is working in the Normal link mode below 1 GHz.
4. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement -X, Y, and Z-plane. The X-plane results were found as the worst case and were shown in this report.

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## 4.1.6 Band Edge (Restricted-band band-edge)

RESULT:

**PASS**

Test standard : FCC Part 15.247(d), 15.205, 15.209  
RSS-247 5.5  
Requirement : ANSI C63.10-2013  
Kind of test site : 3m Semi-Anechoic Chamber

### Test setup

Test Channel : Low/Middle/High  
Operation Mode : A.1  
Ambient temperature : 23°C  
Relative humidity : 52%

### Notes

*Test plots please refer to the annex document "SHE21040013-02HE Internal Module DATA BDED-R-TX EXHIBIT A and SHE21040013-02HE External Module DATA BDED-R-TX EXHIBIT B".*

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## 4.1.7 Hopping Frequency Separation

RESULT:

PASS

Test standard : FCC Part 15.247(a)(1)  
RSS-247 5.1(2)  
Requirement : ANSI C63.10-2013  
Kind of test site : Shielded room

### Test setup

Test Channel : Hopping  
Operation Mode : A.1.a.iv  
Ambient temperature : 23°C  
Relative humidity : 52%

### Internal Module (Contain Table 7 and Figure 20)

Table 7: Hopping Frequency Separation

Mode	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
GFSK	2441	0.98	≥ 25kHz or two-thirds of 20dB bandwidth
8-DPSK	2441	1.05	

\*Note: The systems operate with an output power no greater than 125mW.

### External Module (Contain Table 8 and Figure 21)

Table 8: Hopping Frequency Separation

Mode	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
GFSK	2441	1.08	≥ 25kHz or two-thirds of 20dB bandwidth
8-DPSK	2441	1.01	

\*Note: The systems operate with an output power no greater than 125mW.



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Figure 20: Internal Module-Hopping Frequency Separation, Hopping Mode, GFSK



Internal Module-Hopping Frequency Separation, Hopping Mode, 8DPSK



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Figure 31: External Module-Hopping Frequency Separation, Hopping Mode, GFSK



External Module-Hopping Frequency Separation, Hopping Mode, 8DPSK



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## 4.1.8 Number of Hopping Frequency

RESULT:

PASS

Test standard : FCC Part 15.247(a)(1)(iii)  
RSS-247 5.1(4)  
Requirement : ANSI C63.10-2013  
Kind of test site : Shielded room

### Test setup

Test Channel : Hopping  
Operation Mode : A.1.a.iv  
Ambient temperature : 23°C  
Relative humidity : 52%

### Internal Module (Contain Table 9 and Figure 22)

Table 9: Number of Hopping Frequency

Mode	Frequency Range	Measured Quantity of Hopping Channel	Limit
GFSK	2400 – 2483.5	79	≥15
8-DPSK	2400 – 2483.5	79	≥15

### External Module (Contain Table 10 and Figure 23)

Table 10: Number of Hopping Frequency

Mode	Frequency Range	Measured Quantity of Hopping Channel	Limit
GFSK	2400 – 2483.5	79	≥15
8-DPSK	2400 – 2483.5	79	≥15

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Figure 22: Internal Module-Number of Hopping Frequency, Hopping Mode, GFSK



Internal Module-Number of Hopping Frequency, Hopping Mode, 8-DPSK



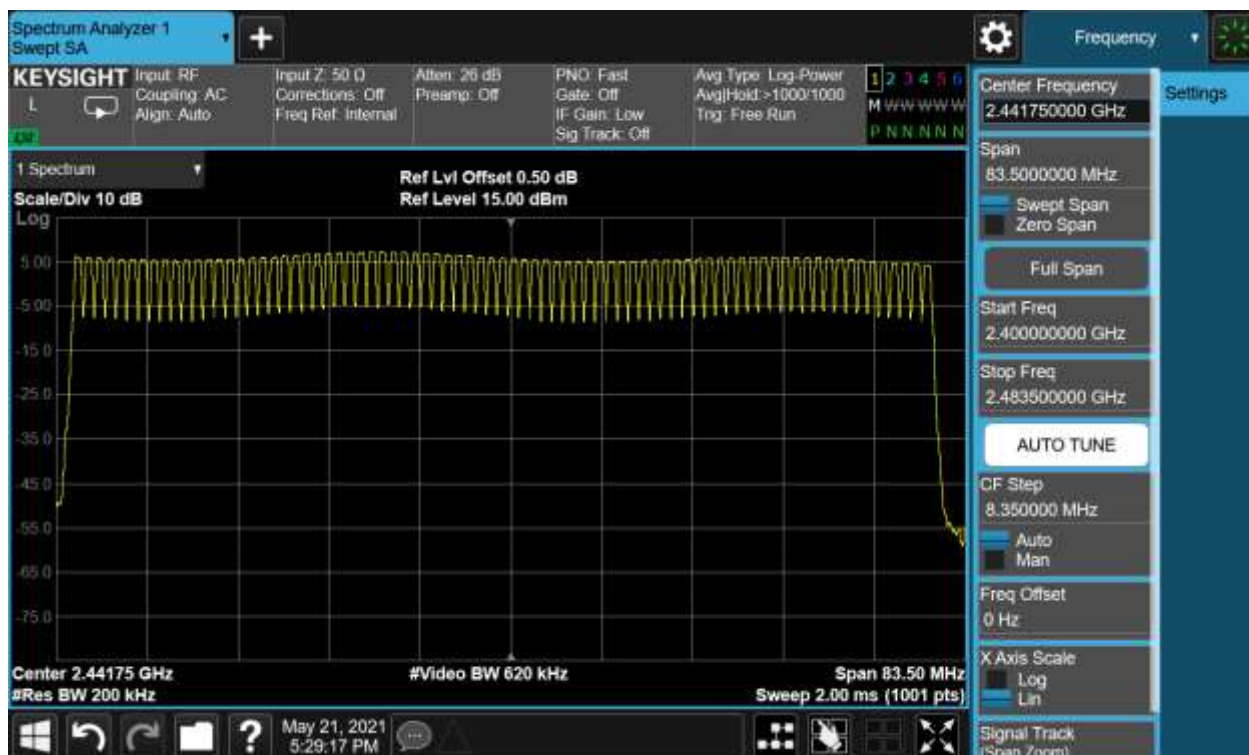
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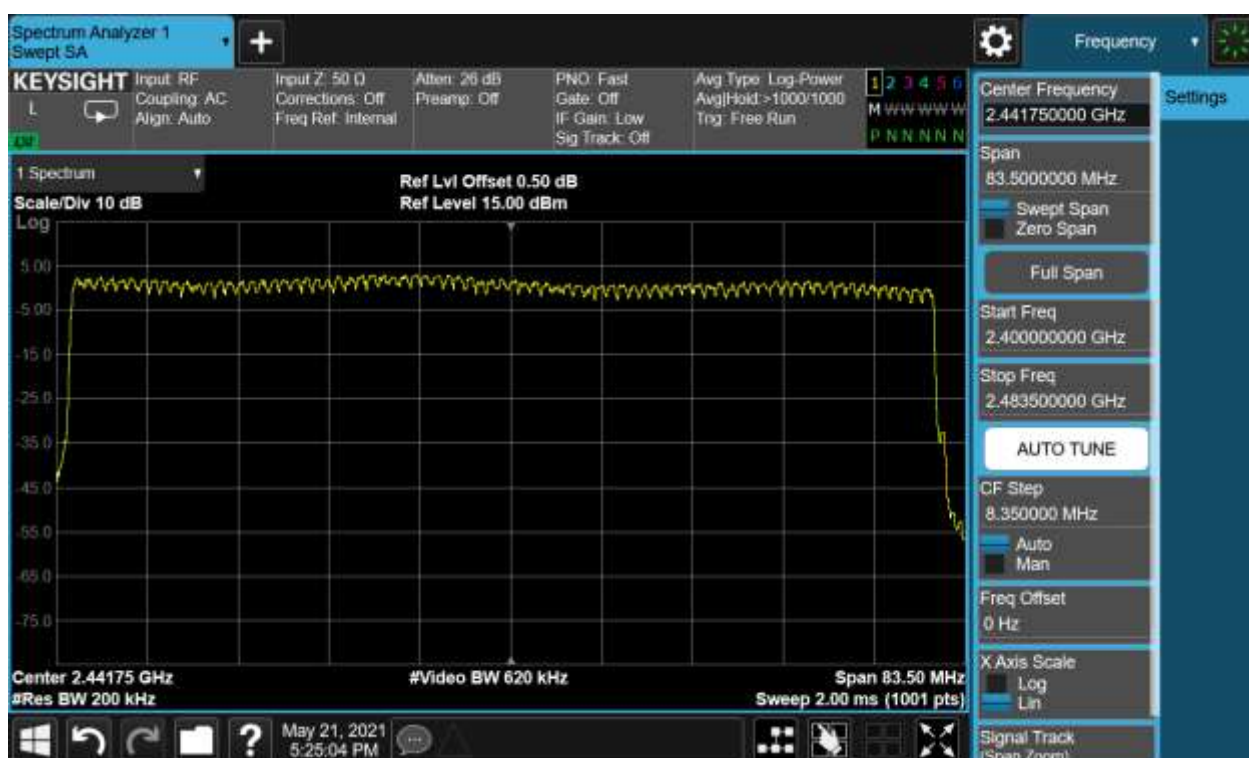
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Figure 23: External Module-Number of Hopping Frequency, Hopping Mode, GFSK



External Module-Number of Hopping Frequency, Hopping Mode, 8-DPSK



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## 4.1.9 Time of Occupancy

RESULT:

**PASS**

Test standard : FCC Part 15.247(a)(1)(iii)  
RSS-247 5.1(4)  
Requirement : ANSI C63.10-2013  
Kind of test site : Shielded room

### Test setup

Test Channel : Middle  
Operation Mode : A.1.a  
Ambient temperature : 23°C  
Relative humidity : 52%

### Internal Module (Contain Table 11 and Figure 24)

Table 11: Time of Occupancy

Mode	Packet Type	Pulse Time (ms)	Total of Dwell (ms)	Limit (s)
GFSK	DH1	0.3967	126.944	0.4
	DH3	1.6550	264.800	0.4
	DH5	2.9070	310.080	0.4
8-DPSK	DH1	0.4033	129.056	0.4
	DH3	1.6700	267.200	0.4
	DH5	2.9130	310.720	0.4

### External Module (Contain Table 12 and Figure 25)

Table 12: Time of Occupancy

Mode	Packet Type	Pulse Time (ms)	Total of Dwell (ms)	Limit (s)
GFSK	DH1	0.4250	136.000	0.4
	DH3	1.6900	270.400	0.4
	DH5	2.9330	312.853	0.4
8-DPSK	DH1	0.4300	137.600	0.4
	DH3	1.7000	272.000	0.4
	DH5	2.9400	313.600	0.4

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Note:

For DH1 package type:

Total of Dwell = Pulse Time\*(1600/2)/Number of Hopping Frequency\*Period

Period = 0.4\* Number of Hopping Frequency

For DH3 package type:

Total of Dwell = Pulse Time\*(1600/4)/Number of Hopping Frequency\*Period

Period = 0.4\* Number of Hopping Frequency

For DH5 package type:

Total of Dwell = Pulse Time\*(1600/6)/Number of Hopping Frequency\*Period

Period = 0.4\* Number of Hopping Frequency

Figure 24: Internal Module-Time of Occupancy, 2441MHz, GFSK DH1



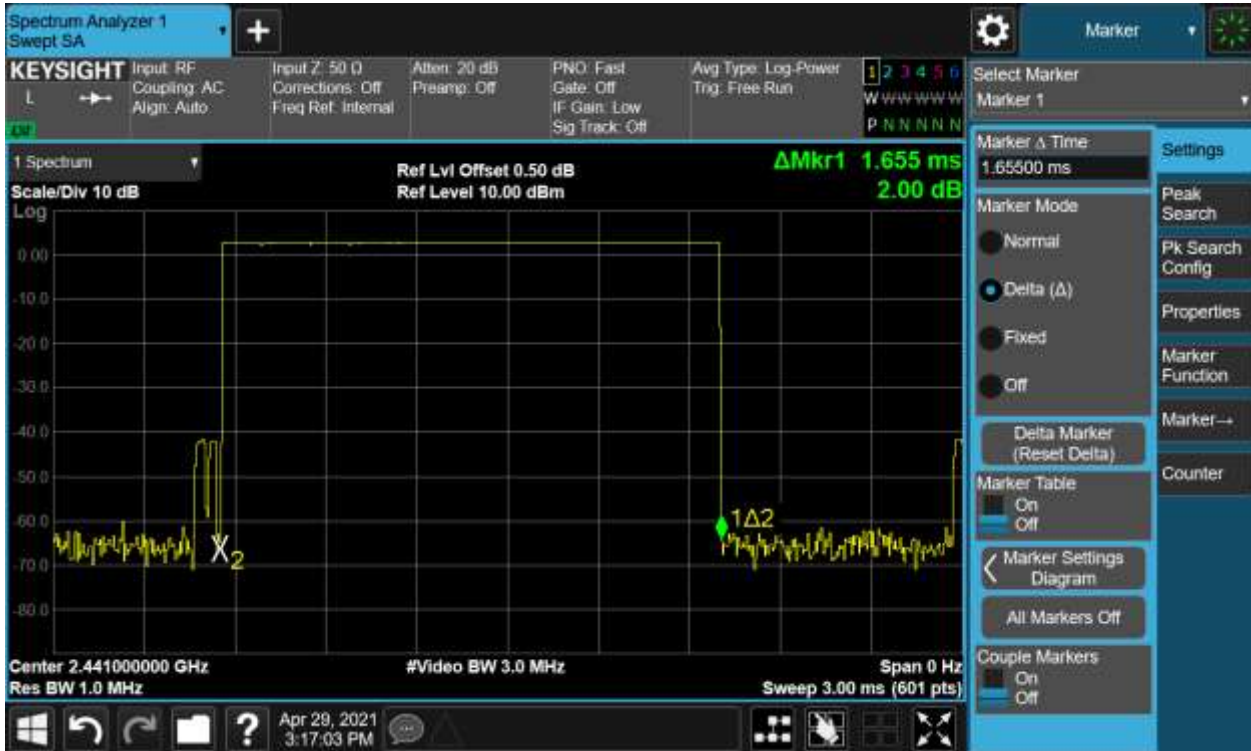
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## Internal Module-Time of Occupancy, 2441MHz, GFSK DH3



## Internal Module-Time of Occupancy, 2441MHz, GFSK DH5





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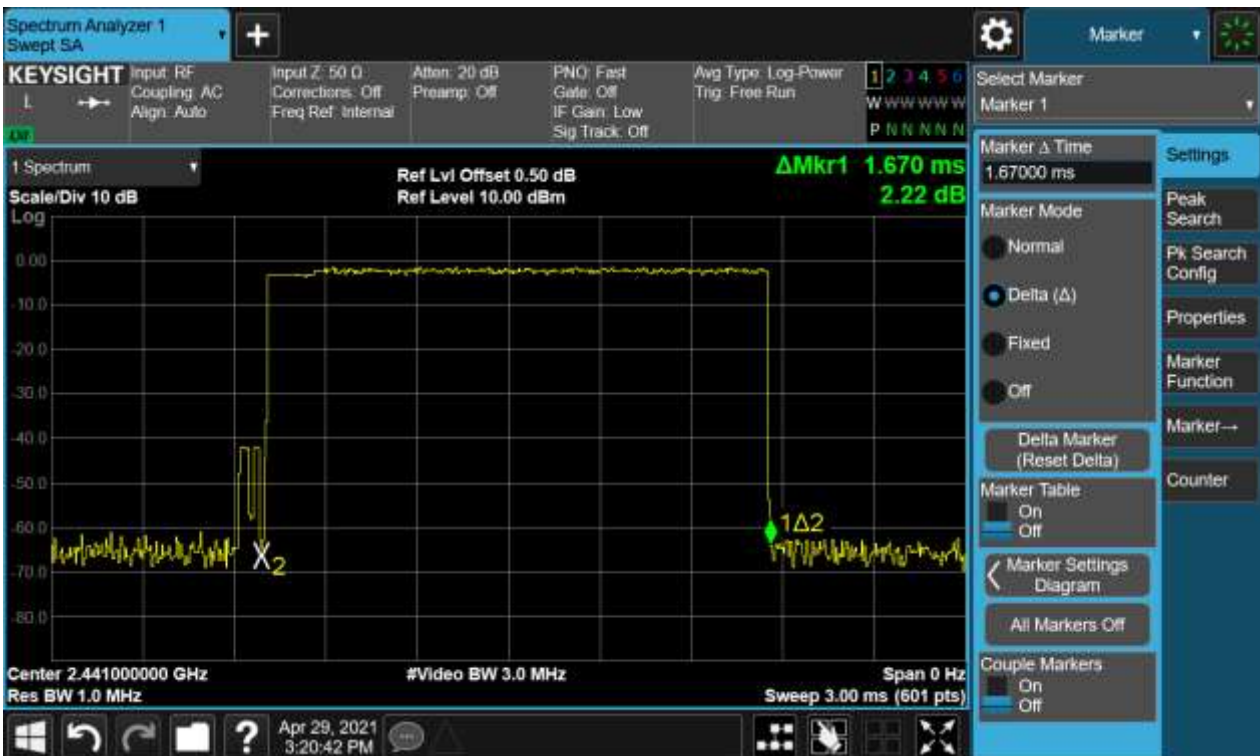
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## Internal Module-Time of Occupancy, 2441MHz, 8-DPSK DH1



## Internal Module-Time of Occupancy, 2441MHz, 8-DPSK DH3



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## Internal Module-Time of Occupancy, 2441MHz, 8-DPSK DH5

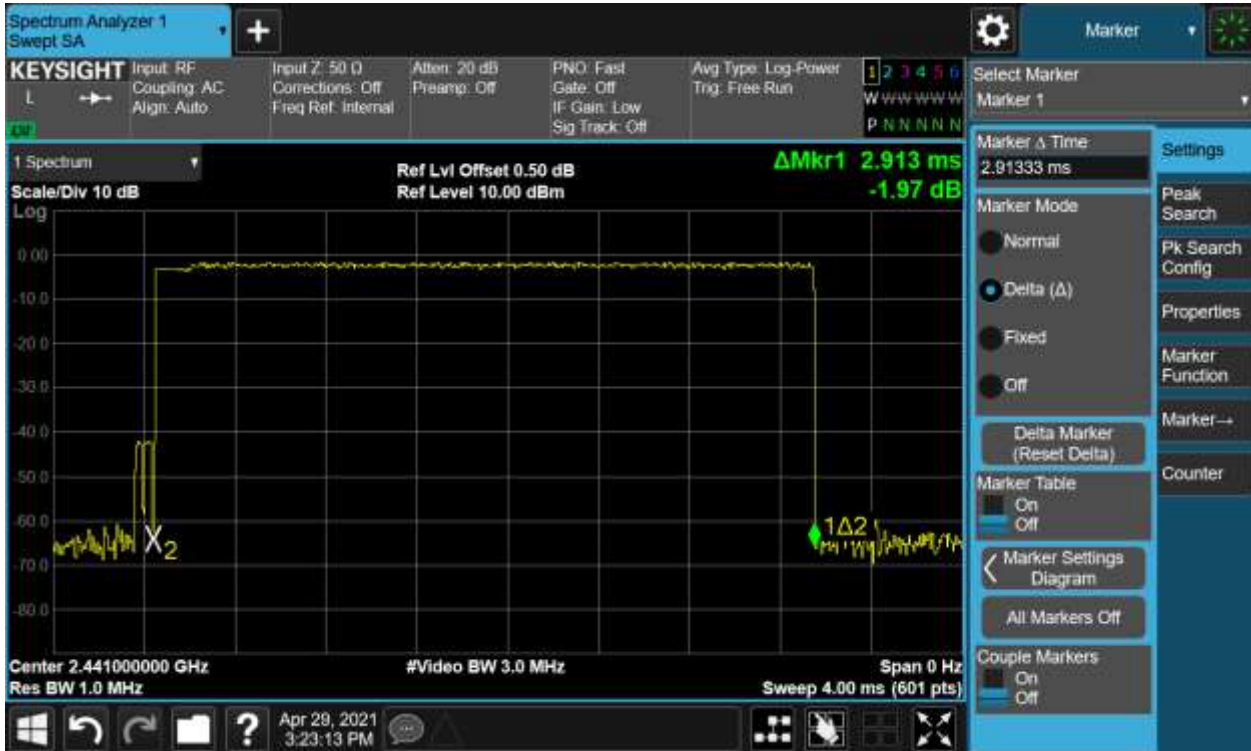
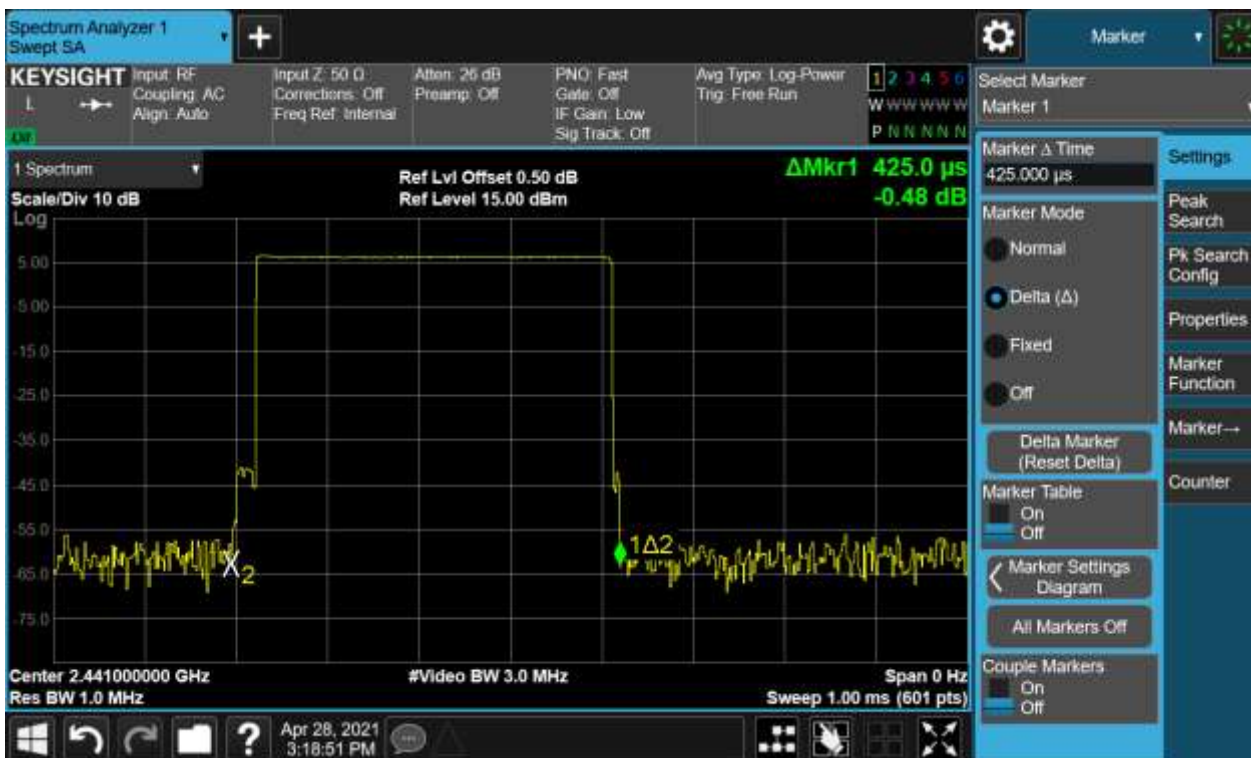


Figure 25: External Module-Time of Occupancy, 2441MHz, GFSK DH1



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## External Module-Time of Occupancy, 2441MHz, GFSK DH3



## External Module-Time of Occupancy, 2441MHz, GFSK DH5



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## External Module-Time of Occupancy, 2441MHz, 8-DPSK DH1



## External Module-Time of Occupancy, 2441MHz, 8-DPSK DH3



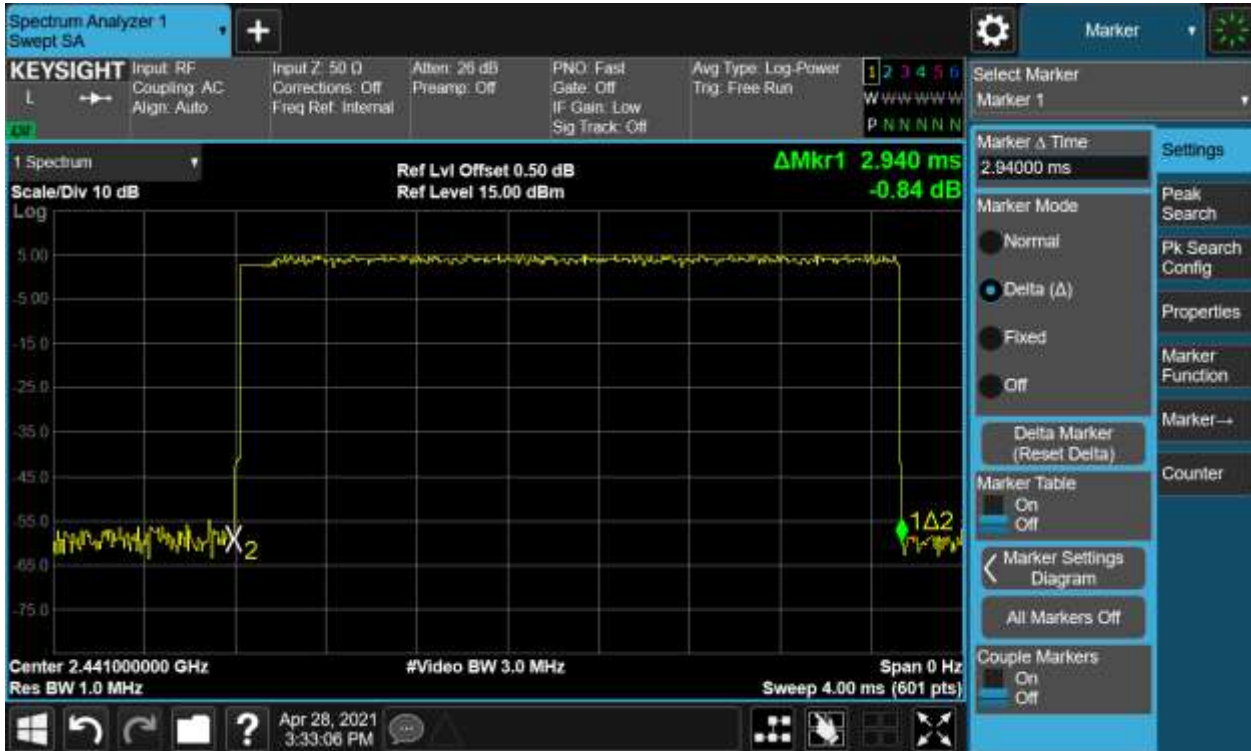
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## External Module-Time of Occupancy, 2441MHz, 8-DPSK DH5



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## 4.2 Mains Emissions

### 4.2.1 Conducted Emission on AC Mains

RESULT:

**PASS**

Test standard : FCC Part 15.207(a)  
RSS-Gen 8.8  
Requirement : ANSI C63.10-2013  
Kind of test site : Shielded room

#### Test setup

Input Voltage : AC 120V, 60Hz  
Operation Mode : A.1.a  
Earthing : Not Connected  
Ambient temperature : 23°C  
Relative humidity : 52%

For details refer to following test plot.

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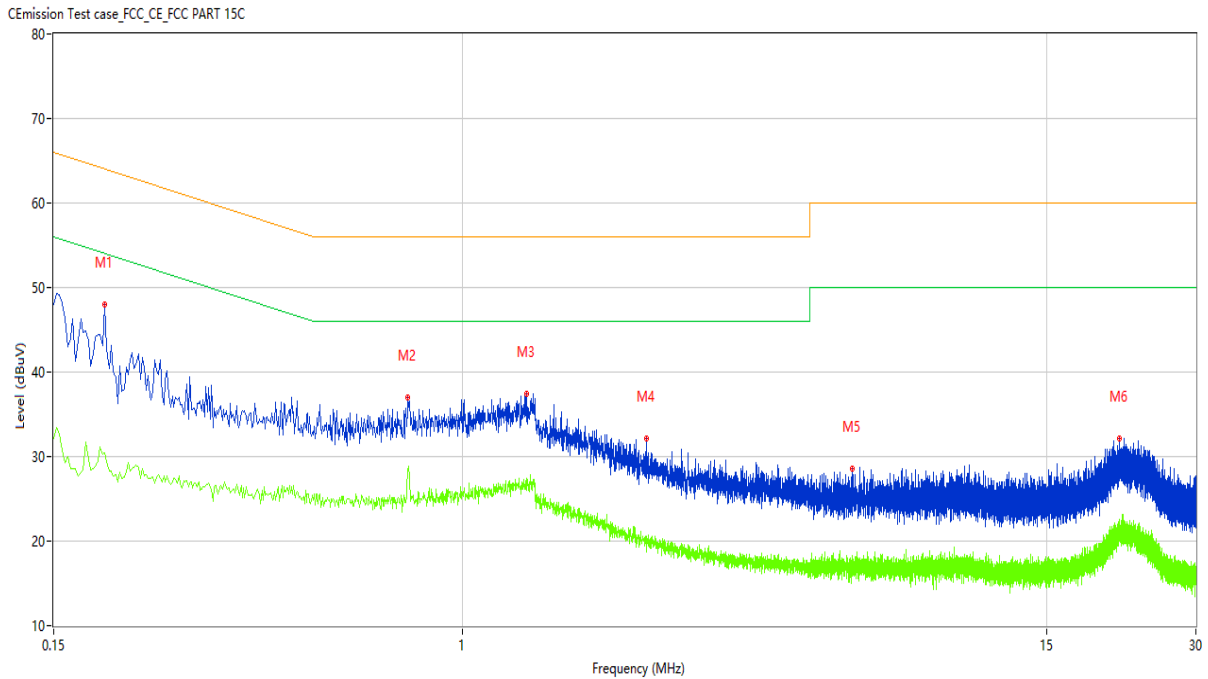
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**Note:**

The all configurations were tested respectively, but only the worst configuration shown here.

**Figure 34: Conducted Emission on AC Mains, L Phase**



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.190	48.45	9.65	64.04	-15.59	Peak	L	Pass
1*	0.190	40.45	9.65	64.04	-23.59	QP	L	Pass
1**	0.190	30.50	9.65	54.04	-23.54	AV	L	Pass
2	0.776	32.76	9.75	56.00	-23.24	Peak	L	Pass
2*	0.776	25.86	9.75	56.00	-30.14	QP	L	Pass
2**	0.776	28.41	9.75	46.00	-17.59	AV	L	Pass
3	1.348	30.93	9.67	56.00	-25.07	Peak	L	Pass
3*	1.348	23.25	9.67	56.00	-32.75	QP	L	Pass
3**	1.348	27.38	9.67	46.00	-18.62	AV	L	Pass
4	2.346	24.97	9.68	56.00	-31.03	Peak	L	Pass
4*	2.346	17.33	9.68	56.00	-38.67	QP	L	Pass
4**	2.346	20.58	9.68	46.00	-25.42	AV	L	Pass
5	6.104	21.79	9.69	60.00	-38.21	Peak	L	Pass
5*	6.104	14.48	9.69	60.00	-45.52	QP	L	Pass
5**	6.104	18.24	9.69	50.00	-31.76	AV	L	Pass
6	21.038	30.46	9.45	60.00	-29.54	Peak	L	Pass
6*	21.038	25.20	9.45	60.00	-34.80	QP	L	Pass
6**	21.038	21.65	9.45	50.00	-28.35	AV	L	Pass

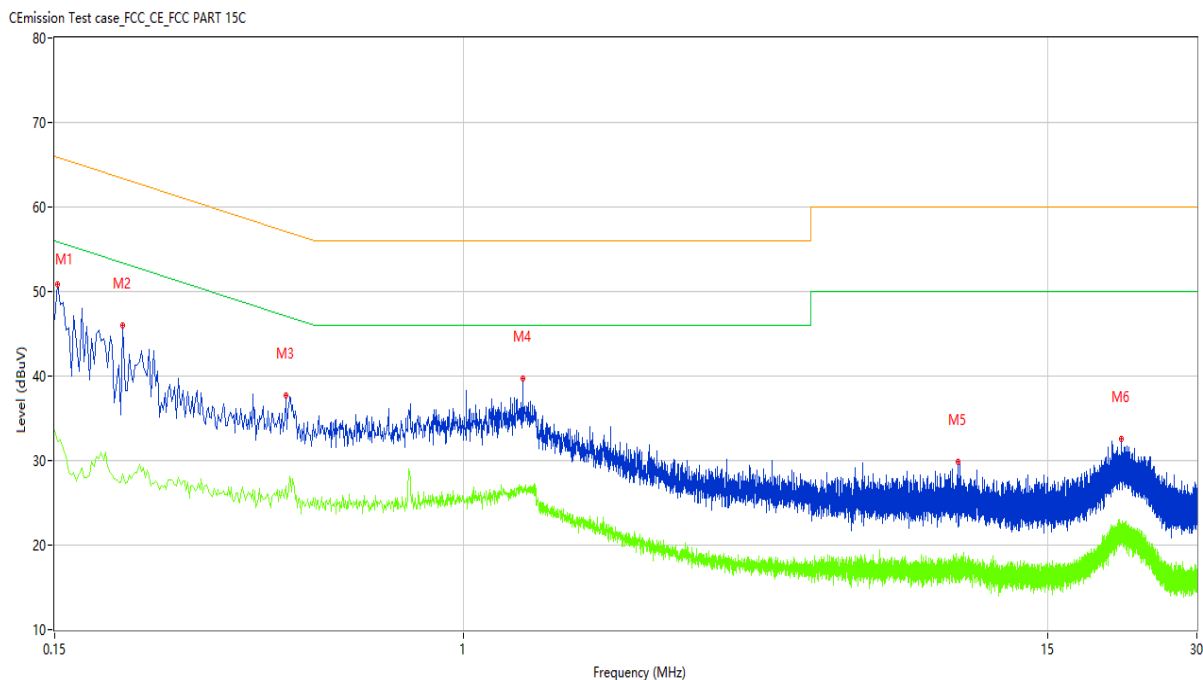
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**Figure 35: Conducted Emission on AC Mains, N Phase**



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.150	52.58	9.67	66.00	-13.42	Peak	N	Pass
1*	0.150	45.75	9.67	66.00	-20.25	QP	N	Pass
1**	0.150	33.64	9.67	56.00	-22.36	AV	N	Pass
2	0.206	45.30	9.66	63.37	-18.07	Peak	N	Pass
2*	0.206	35.96	9.66	63.37	-27.41	QP	N	Pass
2**	0.206	28.40	9.66	53.37	-24.97	AV	N	Pass
3	0.438	36.49	9.74	57.10	-20.61	Peak	N	Pass
3*	0.438	30.63	9.74	57.10	-26.47	QP	N	Pass
3**	0.438	27.05	9.74	47.10	-20.05	AV	N	Pass
4	1.316	29.28	9.67	56.00	-26.72	Peak	N	Pass
4*	1.316	22.54	9.67	56.00	-33.46	QP	N	Pass
4**	1.316	26.56	9.67	46.00	-19.44	AV	N	Pass
5	9.916	23.34	9.65	60.00	-36.66	Peak	N	Pass
5*	9.916	16.35	9.65	60.00	-43.65	QP	N	Pass
5**	9.916	17.89	9.65	50.00	-32.11	AV	N	Pass
6	21.144	30.19	9.45	60.00	-29.81	Peak	N	Pass
6*	21.144	25.17	9.45	60.00	-34.83	QP	N	Pass
6**	21.144	21.29	9.45	50.00	-28.71	AV	N	Pass



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## 5 Appendixes

### 5.1 Photographs of the Sample



Front of the sample



Rear of the sample

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## 5.2 Set-up for Conducted Emissions



## 5.3 Set-up for Conducted RF test at Antenna Port



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## 5.4 Set-up for Spurious Emissions below 1GHz



## 5.5 Set-up for Spurious Emissions above 1GHz



\*\*\*End of the report\*\*\*