FCC 47 CFR PART 15 SUBPART C
ISED RSS 247 ISSUE 2
CERTIFICATION TEST REPORT

For

SMART VACUUM CLEANER

MODEL NUMBER: VS12210AUS

ADDITIONAL MODEL NUMBER: VS12240AUS, VS12250AUS

PROJECT NUMBER: 4789392958

REPORT NUMBER: 4789392958-2

FCC ID: 2ASWB-S12VP

IC: 24918-S12VP

ISSUE DATE: Apr. 03, 2020

Prepared for

Ecovacs Robotics Co Ltd

Prepared by

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Revision History

Rev.	Issue Date	Revisions	Revised By
V0	04/03/2020	Initial Issue	

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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name:	Ecovacs Robotics Co Ltd
Address:	No. 108 Shihu Road West, Wuzhong Zone,Suzhou, 215128 P.R.China

Manufacturer Information

Company Name:	Ecovacs Robotics Co Ltd
Address:	No. 108 Shihu Road West, Wuzhong Zone,Suzhou, 215128 P.R.China

Factory Information

Company Name:	Ecovacs Robotics Co Ltd
Address:	No. 108 Shihu Road West, Wuzhong Zone,Suzhou, 215128 P.R.China

EUT Description

Product Name	SMART VACUUM CLEANER
Model Name	VS12210AUS
Additional No.	VS12240AUS, VS12250AUS
Sample Number	2936358
Date of Receipt Sample	Mar. 09, 2020
Date Tested	Mar. 13, 2020~ Apr.01, 2020

APPLICABLE STANDARDS

STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	PASS
ISED RSS-247 Issue 2	PASS
ISED RSS-GEN Issue 5	PASS

Summary of Test Results			
Clause	**Test Items**	**FCC /ISED Rules**	**Test Results**
1	20dB Bandwidth And 99% Bandwidth	FCC 15.247 (a) (1) RSS-247 Clause 5.1 (a)	Complied
2	Peak Conducted Output Power	FCC 15.247 (b) (1) RSS-247 Clause 5.1 (b)	Complied
3	Carrier Hopping Channel Separation	FCC 15.247 (a) (1) RSS-247 Clause 5.1 (b)	Complied
4	Number of Hopping Frequency	15.247 (a) (1) III RSS-247 Clause 5.1 (d)	Complied
5	Time of Occupancy (Dwell Time)	15.247 (a) (1) III RSS-247 Clause 5.1 (d)	Complied
6	Conducted Bandedge	FCC 15.247 (d) RSS-247 Clause 5.5	Complied
7	Radiated Bandedge and Spurious	FCC 15.247 (d) FCC 15.209 FCC 15.205 RSS-247 Clause 5.5 RSS-GEN Clause 8.9 RSS-GEN Clause 8.10	Complied
8	Conducted Emission Test for AC Power Port	FCC 15.207 RSS-GEN Clause 8.8	Complied
9	Antenna Requirement	FCC 15.203 RSS-GEN Clause 6.8	Complied
Remark: 1) The measurement result for the sample received is <Pass> according to < ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15C, ISED RSS-GEN Issue5, ISED RSS-247 Issue2> > when <Accuracy Method> decision rule is applied.			

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Laboratory Leader

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01, ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15 ISED RSS-GEN ISSUE 5 and ISED RSS-247 ISSUE 2.

3. FACILITIES AND ACCREDITATION

Test Location	**UL-CCIC Company Limited, EMC&RF Lab**
Address	**No. 2, Chengwan Road, Suzhou Industrial Park, Suzhou 215122 ,China**
Accreditation Certificate	**CNAS (Certificate No.: L2065)** **The Laboratory has been assessed and proved to be in compliance with CNAS, The Certificate Registration Number is L2065.** **A2LA (Certificate No.: 4829.01)** **UL-CCIC COMPANY LIMITED has been assessed and proved to be in compliance with A2LA.** **FCC (FCC Designation No.: CN1247)** **UL-CCIC COMPANY LIMITED has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules.** **IC (IC Designation No.: 25056)** **UL-CCIC COMPANY LIMITED has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules.**

Note 1: All tests measurement facilities use to collect the measurement data are located at No. 2, Chengwan Road, Suzhou Industrial Park, Suzhou 215122, People's Republic of China

Note 2: For below 30MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. These measurements below 30MHz had been correlated to measurements performed on an OFS.

Note 3: The test anechoic chamber in UL-CCIC COMPANY LIMITED had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. MEASUREMENT UNCERTAINTY

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

Test Item	Uncertainty
Conduction emission	3.00dB
Radiation Emission test(include Fundamental emission) (9KHz-30MHz)	3.32dB
Radiation Emission test(include Fundamental emission) (30MHz-1GHz)	3.27dB
Radiation Emission test (1GHz to 26GHz)(include Fundamental emission)	3.80dB (1GHz-18Gz)
	4.11dB (18GHz-26.5Gz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

Product Name:	SMART VACUUM CLEANER	
Model No.:	VS12210AUS	
Product Description (Bluetooth)	Operation Frequency	2402 MHz ~ 2480 MHz
	Modulation Type	Data Rate
	GFSK	1Mbps
	∏/4-DQPSK	2Mbps
	8DPSK	3Mbps
Test software of EUT:	EspRFtestTool_2.0 (manufacturer declare)	
Antenna Type:	Meandered printed inverted-F antenna	
Antenna Gain:	3.0 dBi	
	Remark: This data is provided by customer and our lab isn't responsible for this data	
Battery	NAME: Rechargeable Li-ion Battery MODEL:A12NA-02 OUTPUT: 21.6V 2500mAh 54Wh	
Adapter	MODEL:YLS0241A-T260070 INPUT:100-240V~50/60Hz 0.8A Max OUTPUT:26V ⎓ 700 mA	

Model No.:

Number:	Name:	Number:	Name:	Number:	Name:
1	VS12210AUS	2	VS12240AUS	3	VS12250AUS

Remark: Only the main model **VS12210AUS** was tested and only the data of this model is shown in this test report. Since Their electrical circuit design, layout, components used and internal wiring are identical, only the model name, product color, marketing channel and sale contury.

5.2. MAXIMUM OUTPUT POWER

Bluetooth Mode	Frequency(MHz)	Channel Number	Max Output Power (dBm)
GFSK	2402-2480	0-78[79]	-1.19
8DPSK	2402-2480	0-78[79]	-4.20

5.3. PACKET TYPE CONFIGURATION

Test Mode	Packet Type	Setting(Packet Length)
GFSK	DH1	27
	DH3	183
	DH5	339
∏/4-DQPSK	2-DH1	54
	2-DH3	367
	2-DH5	679
8DPSK	3-DH1	83
	3-DH3	552
	3-DH5	1021

5.4. CHANNEL LIST

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	20	2422	40	2442	60	2462
01	2403	21	2423	41	2443	61	2463
02	2404	22	2424	42	2444	62	2464
03	2405	23	2425	43	2445	63	2465
04	2406	24	2426	44	2446	64	2466
05	2407	25	2427	45	2447	65	2467
06	2408	26	2428	46	2448	66	2468
07	2409	27	2429	47	2449	67	2469
08	2410	28	2430	48	2450	68	2470
09	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

5.5. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel Number	Test Channel
GFSK	CH 00, CH 39, CH 78	Low, Middle, High
8DPSK	CH 00, CH 39, CH 78	Low, Middle, High

5.6. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter under 2400 ~ 2483.5MHz Band				
Test Software		FCCTool		
Modulation Type	Transmit Antenna Number	Test Channel		
		CH 00	CH 39	CH 78
GFSK	1	2	2	2
8DPSK	1	2	2	2

5.7. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2402-2480	Meandered printed inverted-F antenna	3.0

Test Mode	Transmit and Receive Mode	Description
GFSK	1TX, 1RX	Chain 1 can be used as transmitting/receiving antenna.
8DPSK	1TX, 1RX	Chain 1 can be used as transmitting/receiving antenna.

5.8. WORST-CASE CONFIGURATIONS

Bluetooth Mode	Modulation Technology	Modulation Type	Data Rate (Mbps)
BR	FHSS	GFSK	1Mbit/s
EDR	FHSS	8DPSK	3Mbit/s

Note: Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates.

5.9. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	55 ~ 65%	
Atmospheric Pressure:	101kPa	
Temperature	TN	23 ~ 28°C
Voltage	VL	N/A
	VN	DC 21.6V
	VH	N/A

Note: VL= Lower Extreme Test Voltage
VN= Nominal Voltage.
VH= Upper Extreme Test Voltage
TN= Normal Temperature

5.10. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	Description
1	Laptop	ThinkPad	E550c	N/A
2	Fixed Frequency Board	N/A	N/A	Supply by Customer
3	USB Cable	N/A	N/A	Supply by UL Lab(100cm length)

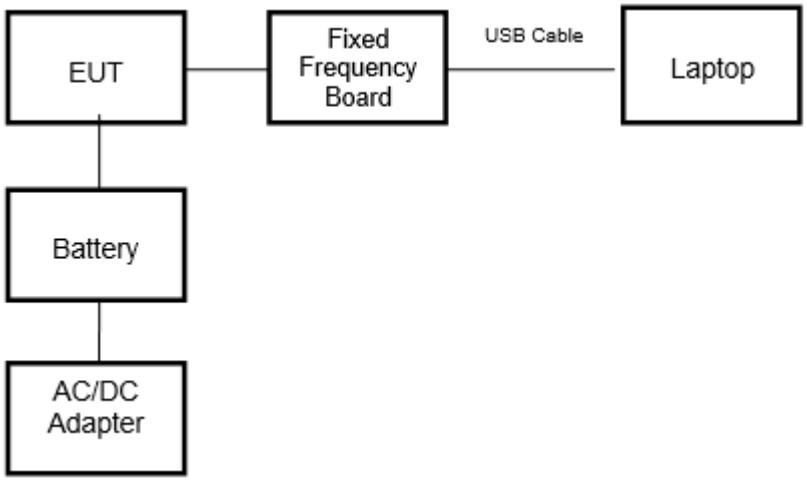
ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
1	Battery	Rechargeable Li-ion Battery	A12NA-02	OUTPUT: 21.6V 2500mAh 54Wh
2	Adapter	N1A	YLS0241A-T260070	INPUT:100-240V~50/60Hz 0.8A Max OUTPUT:26V ⎓ 700 mA

TEST SETUP

The EUT can work in an engineer mode with a software through a PC.

SETUP DIAGRAM FOR TESTS



5.11. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions (Instrument**)**							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
☑	EMI Test Receiver	R&S	ESR3	126700	2018-12-13	2019-12-12	2020-12-11
☑	Two-Line V-Network	R&S	ENV216	126701	2018-12-13	2019-12-12	2020-12-11
☑	Artificial Mains Networks	R&S	ENY81	126711	2018-12-13	2019-12-12	2020-12-11
Software							
Used	Description		Manufacturer	Name	Version		
☑	Test Software for Conducted disturbance		R&S	EMC32	Ver. 9.25		
Radiated Emissions (Instrument**)**							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
☑	Spectrum Analyzer	Keysight	N9010B	MY57110128	2018-05-30	2019-05-29	2020-05-28
☑	EMI test receiver	R&S	ESR26	1267603	2018-12-13	2019-12-12	2020-12-11
☑	Receiver Antenna (9kHz-30MHz)	Schwarzbeck	FMZB 1513	513-265	2018-06-17	2019-06-16	2020-06-15
☑	Receiver Antenna (30MHz-1GHz)	SunAR RF Motion	JB1	126704	N/A	2019-01-28	2022-01-27
☑	Receiver Antenna (1GHz-18GHz)	R&S	HF907	126705	2019-01-26	2020-01-25	2021-01-24
☑	Receiver Antenna (18GHz-26.5GHz)	Schwarzbeck	BBHA9170	126706	2019-02-06	2020-02-05	2021-02-04
☑	Pre-amplification (To 18GHz)	Compliance Direction System Inc.	PAP-1G18-50	14140-13467	2019-02-06	2020-02-05	2021-02-04
☑	Pre-amplification (To 26.5GHz)	R&S	SCU-26D	134668	2019-03-18	2020-03-17	2021-03-16
☑	Band Reject Filter	Wainwright	WRCJV8-2350-2400-2483.5-2533.5-40SS	1	2019-02-06	2020-01-23	2021-01-22
☑	Highpass Filter	Wainwright	WHKX10-2700-3000-18000-40SS	2	2019-05-29	2020-01-23	2021-01-22
Software							
Used	Description		Manufacturer	Name	Version		
☑	Test Software for Radiated disturbance		Tonscend	JS32	V1.0		
Other instruments							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
☑	Spectrum Analyzer	Keysight	N9010B	MY57110128	2018-05-30	2019-05-29	2020-05-28

6. ANTENNA PORT TEST RESULTS

6.1. ON TIME AND DUTY CYCLE

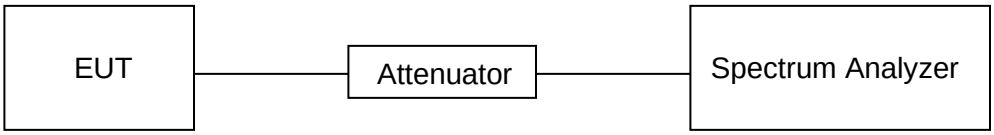
LIMITS

None; for reporting purposes only

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method

TEST SETUP

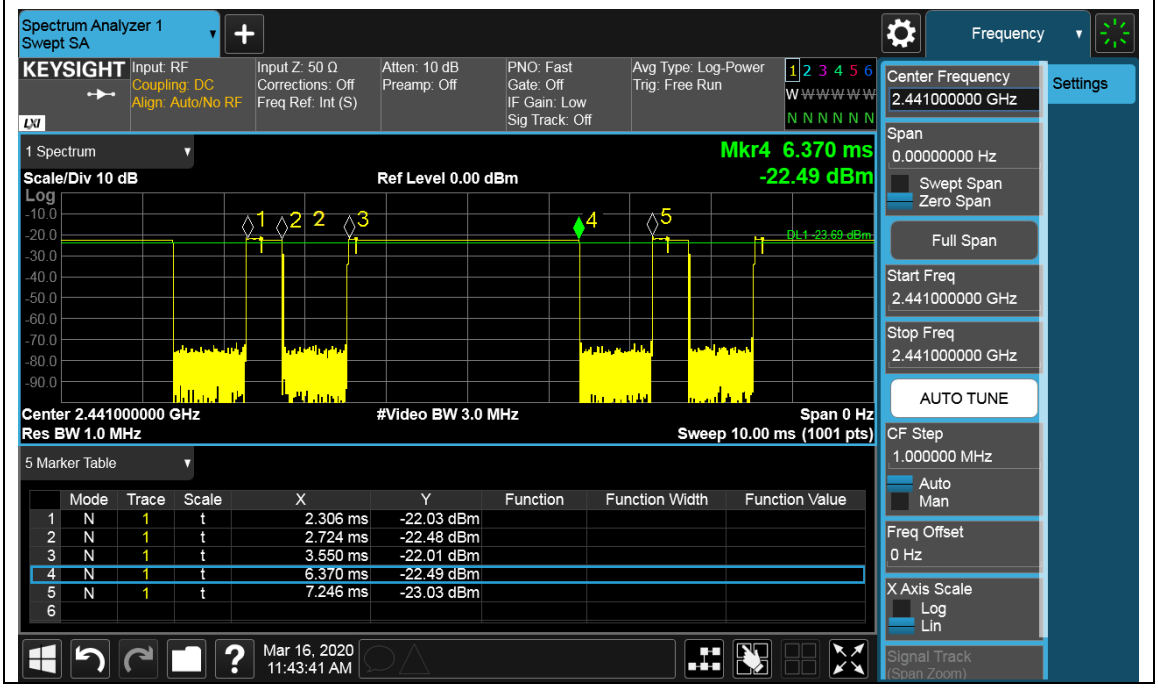


RESULTS

Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (db)	1/T Minimum VBW (KHz)	Final VBW(kHz)
GFSK	3.238	4.940	0.655	65.5	1.84	0.31	1
8DPSK	2.948	3.744	0.787	78.7	1.04	0.34	1

Note: Duty Cycle Correction Factor=10log(1/x).
Where: x is Duty Cycle (Linear)
Where: T is On Time (transmit duration)

DH5 ON TIME AND DUTY CYCLE MID CH



3DH5 ON TIME AND DUTY CYCLE MID CH

6.2. 20 dB BANDWIDTH

LIMITS

FCC Part15 (15.247) Subpart C RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
RSS-247 Clause 5.1 (a)	20dB Bandwidth	500KHz	2400-2483.5
RSS-Gen Clause 6.6	99% Bandwidth	N/A	2400-2483.5

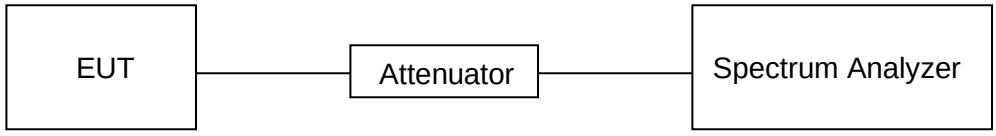
TEST PROCEDURE

Connect the UUT to the spectrum Analyzer and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	For 20dB Bandwidth:1% of the 20 dB bandwidth For 99% Bandwidth: 1% to 5% of the occupied bandwidth
VBW	For 20dB Bandwidth: ≥ RBW For 99% Bandwidth: approximately 3×RBW
Span	approximately 2 to 5 times the 20 dB bandwidth
Trace	Max hold
Sweep	Auto couple

Allow the trace to stabilize and measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

TEST SETUP



RESULTS TABLE

Test Mode	Test Channel	20dB bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Result
GFSK	LCH	0.759	0.791	Pass
	MCH	0.756	0.790	Pass
	HCH	0.756	0.794	Pass
8DPSK	LCH	1.243	1.157	Pass
	MCH	1.244	1.158	Pass
	HCH	1.243	1.157	Pass

Test Graphs

BANDWIDTH LOW CH_DH5

BANDWIDTH MID CH_DH5

BANDWIDTH HIGH CH_DH5

BANDWIDTH LOW CH_3DH5

BANDWIDTH MID CH_3DH5

BANDWIDTH HIGH CH_3DH5

6.3. PEAK CONDUCTED OUTPUT POWER

LIMITS

FCC Part15 (15.247) , Subpart C RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247 (b) (1), RSS-247 Clause 5.4 (b)	Peak Conducted Output Power	Hopping channel carrier frequencies separated by a minimum of 25KHz or the 20dB bandwidth of the hopping channel: 1 watt or 30dBm; Hopping channel carrier frequencies that are separated by 25KHz or two-thirds of the 20 dB bandwidth of hopping channel: 125mW or 21dBm	2400-2483.5

TEST PROCEDURE

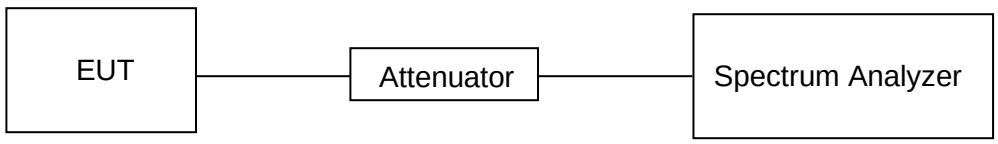
Disable the hopping function, connect the UUT to the spectrum Analyzer and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	≥ 20 dB bandwidth of the emission being measured
VBW	≥RBW
Span	Approximately five times the 20 dB bandwidth
Trace	Max hold
Sweep time	Auto couple

Allow trace to fully stabilize and use peak marker function to determine the peak amplitude level.

TEST SETUP

for peak power measurement:

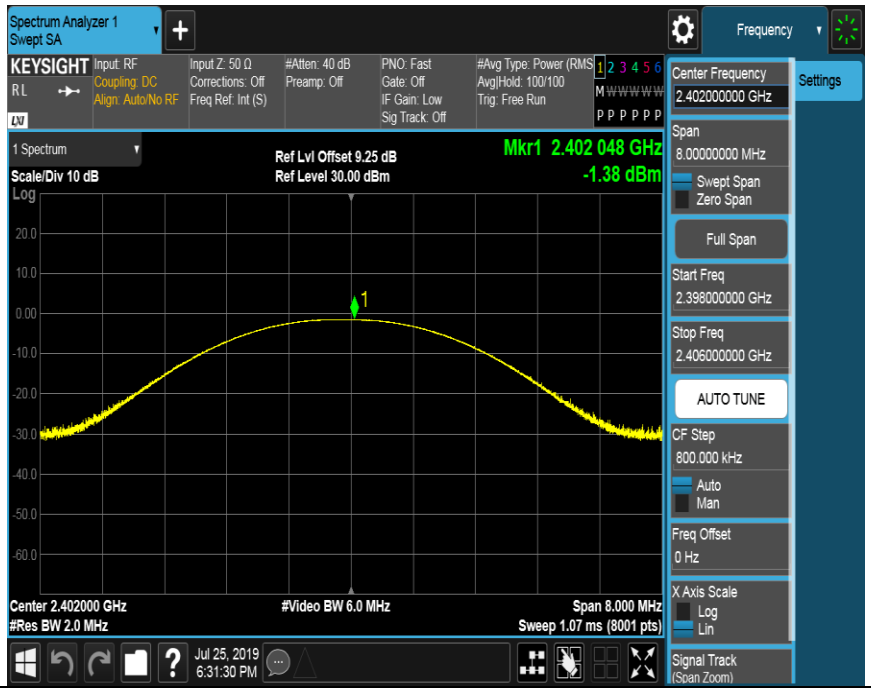


RESULTS

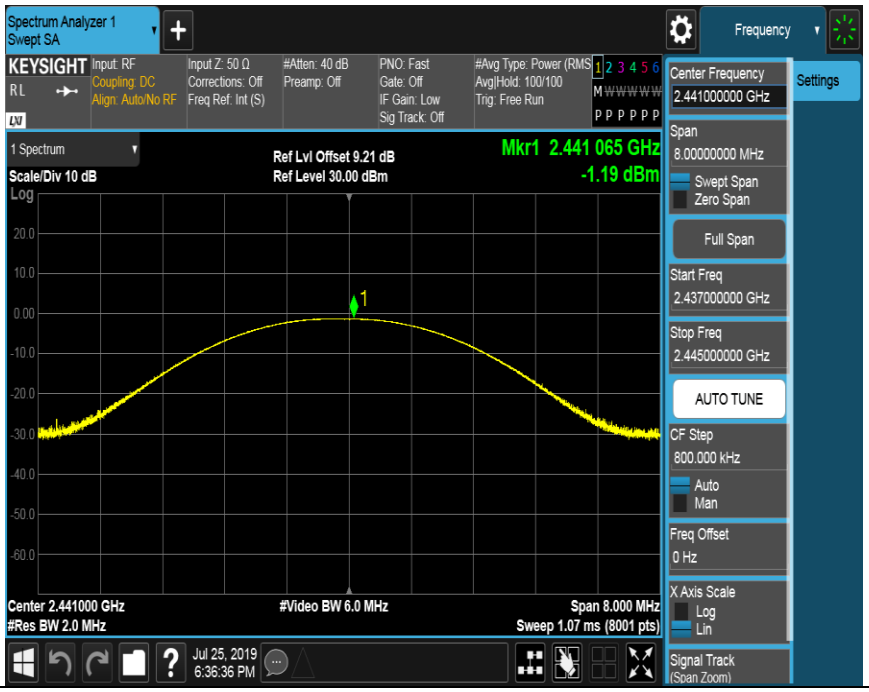
6.3.1. GFSK MODE

Channel	Frequency	Maximum PK Conducted Output Power	Result
	(MHz)	(dBm)	
Low	2402	-1.38	Pass
Middle	2441	-1.19	Pass
High	2480	-2.07	Pass

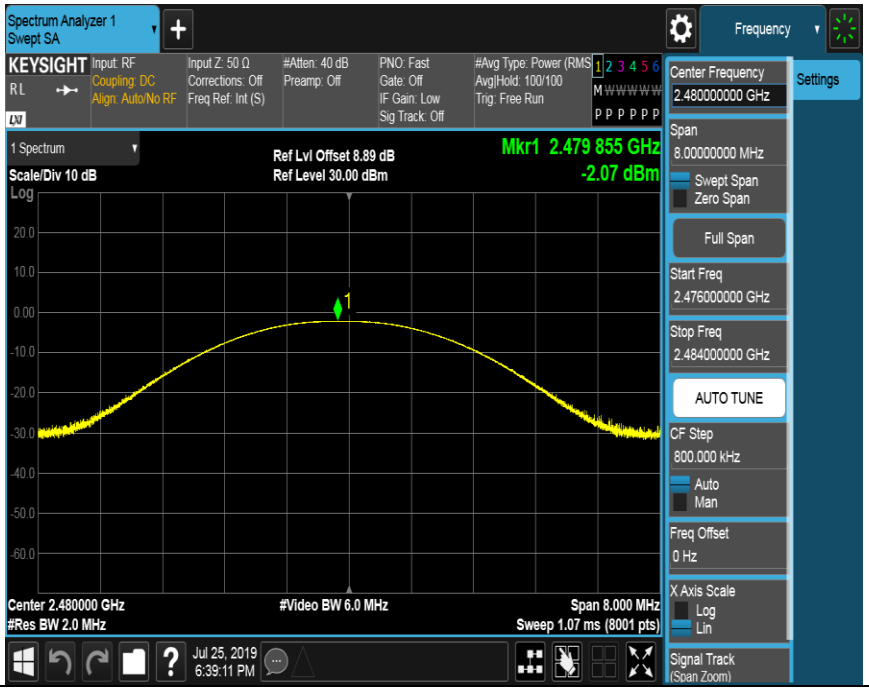
OUTPUT POWER LOW CH



OUTPUT POWER MID CH



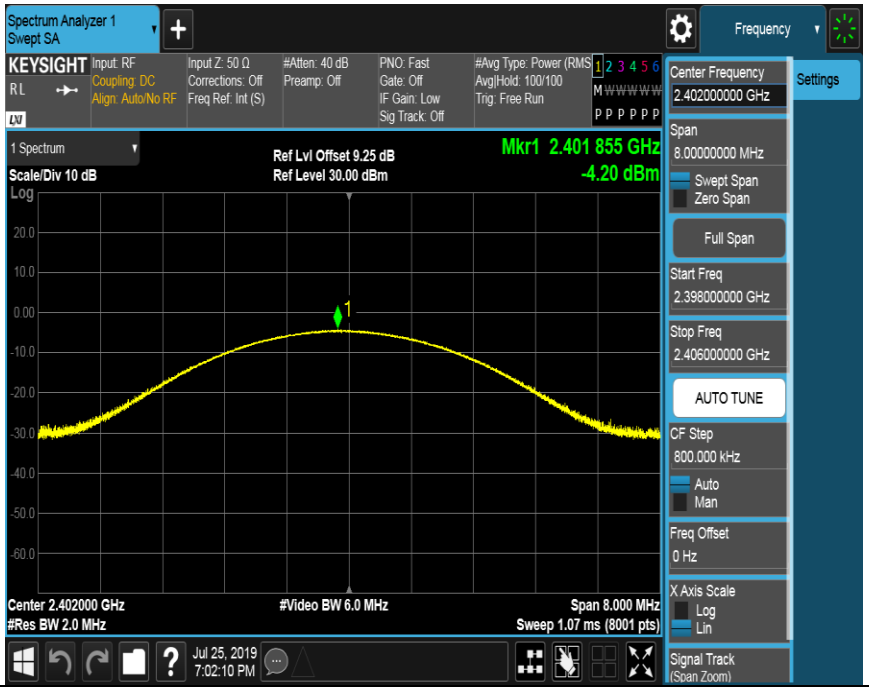
OUTPUT POWER HIGH CH



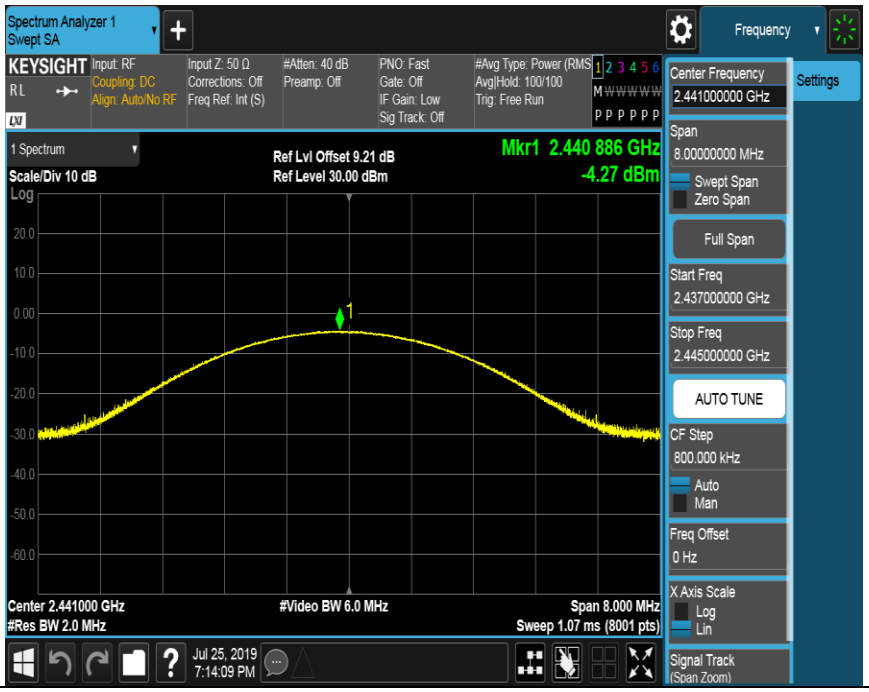
6.3.2. 8DPSK MODE

Channel	Frequency	Maximum PK Conducted Output Power	Result
	(MHz)	(dBm)	
Low	2402	-4.20	Pass
Middle	2441	-4.27	Pass
High	2480	-4.48	Pass

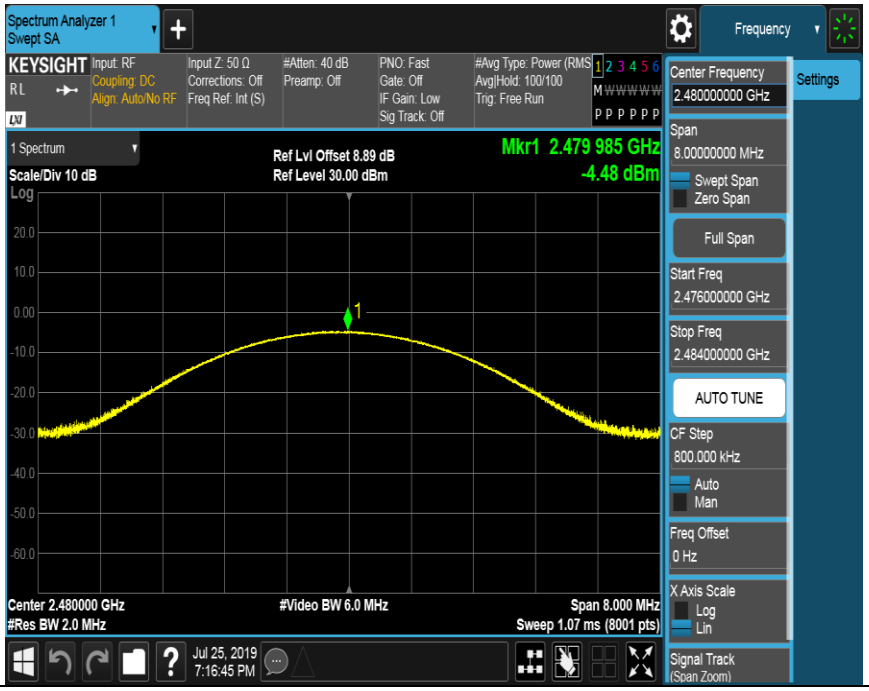
OUTPUT POWER LOW CH



OUTPUT POWER MID CH



OUTPUT POWER HIGH CH



6.4. CARRIER HOPPING CHANNEL SEPARATION

LIMITS

FCC Part15 (15.247) , Subpart C RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247 (a) (1), RSS-247 Clause 5.1 (b)	Carrier Hopping Channel Separation	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25KHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5MHz band may have hopping channel carrier frequencies that are separated by 25KHz or two-thirds of the 20 dB bandwidth of the hopping channel.	2400-2483.5

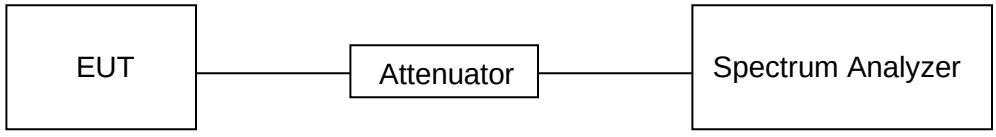
TEST PROCEDURE

Connect the UUT to the spectrum Analyzer and use the following settings:

Center Frequency	The center frequency of the channel under test
Span	wide enough to capture the peaks of two adjacent channels
Detector	Peak
RBW	Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel
VBW	≥RBW
Trace	Max hold
Sweep time	Auto couple

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section. Submit this plot.

TEST SETUP

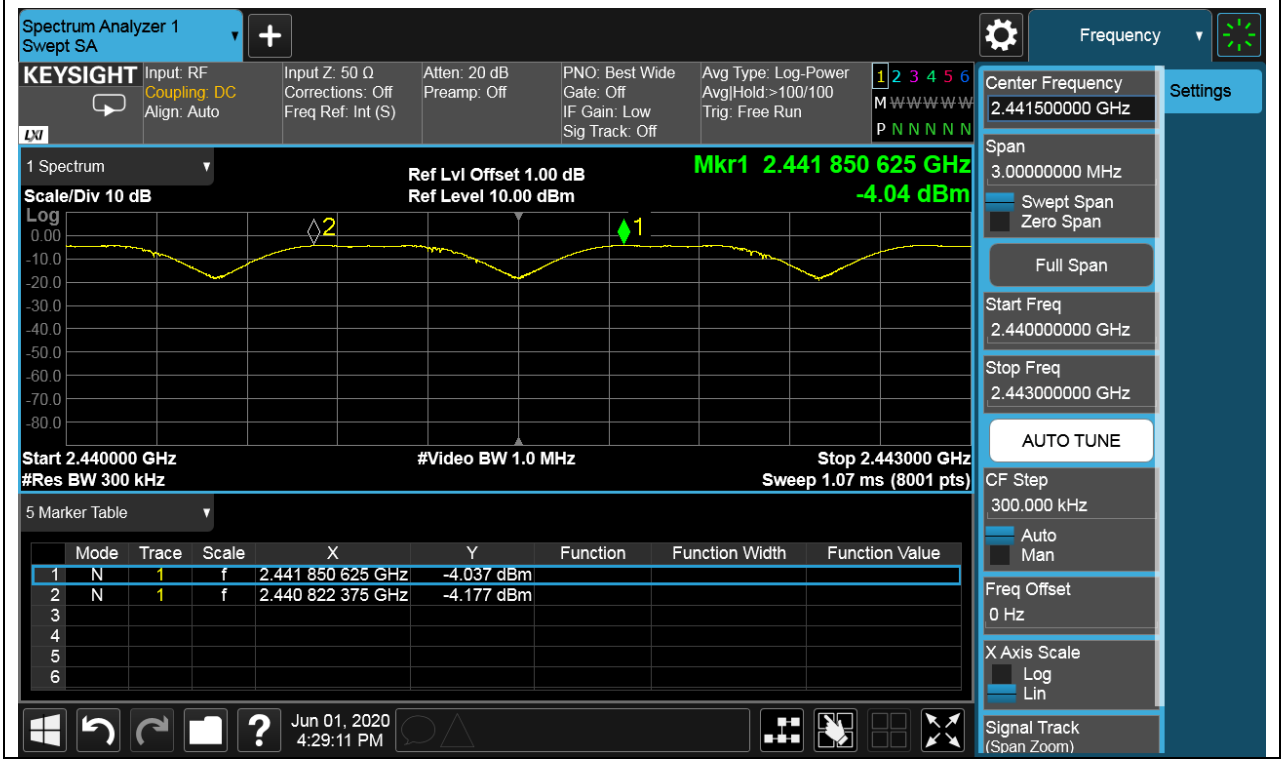


RESULTS

6.4.1. GFSK MODE

Channel	Carrier Hopping Channel Separation (MHz)	Result
Middle	1.028	PASS

Channel Separation MID CH

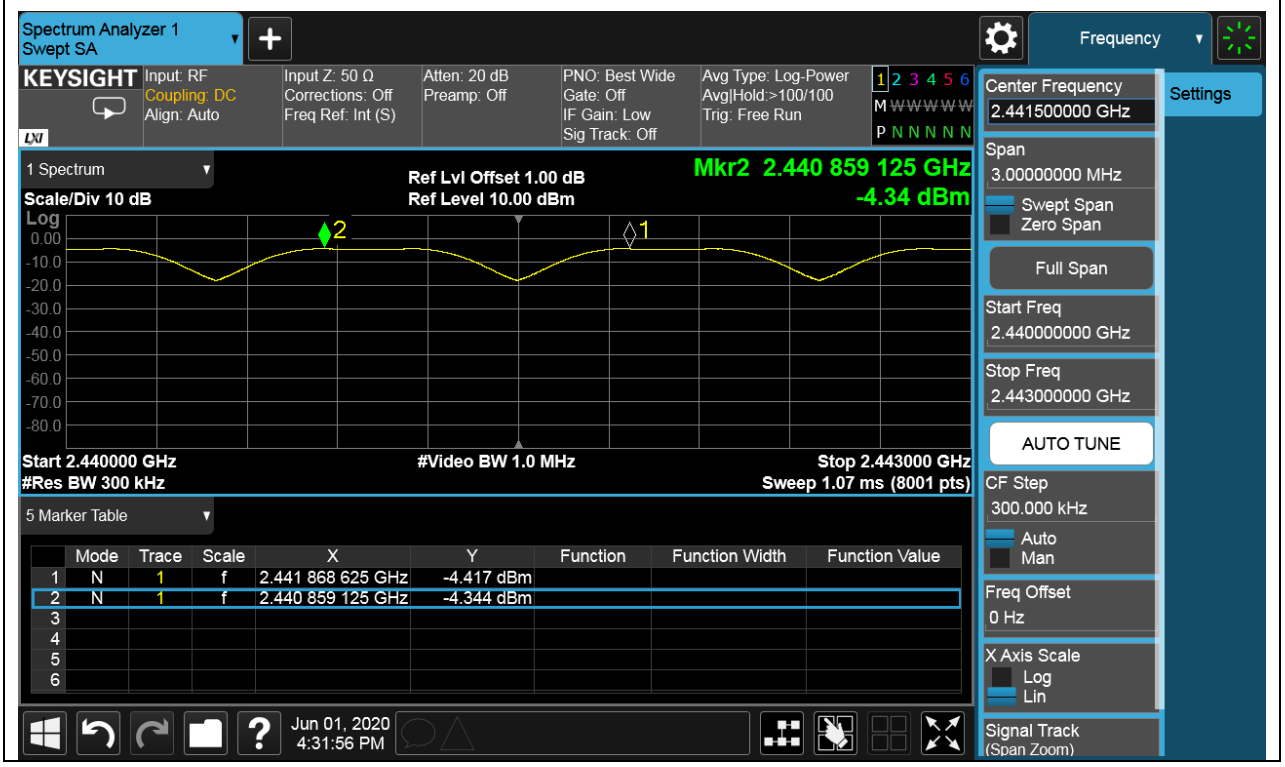


Note: For 20 dB Bandwidth of The Hopping Channel, please refer to clause 6.2.

6.4.2. 8DPSK MODE

Channel	Carrier Hopping Channel Separation (MHz)	Result
Middle	1.010	PASS

Channel Separation MID CH



Note: For 20 dB Bandwidth of The Hopping Channel, please refer to clause 6.2.

6.5. NUMBER OF HOPPING FREQUENCY

LIMITS

FCC Part15 (15.247) , Subpart C RSS-247 ISSUE 2		
Section	Test Item	Limit
15.247 (a) (1) III	Number of Hopping Frequency	at least 15 hopping channels
RSS-247 Clause 5.1 (d)	Number of Hopping Frequency	at least 15 hopping channels

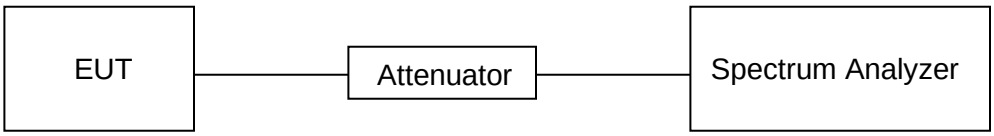
TEST PROCEDURE

Connect the EUT to the spectrum Analyzer and use the following settings:

Detector	Peak
RBW	To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller
VBW	≥RBW
Span	The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen
Trace	Max hold
Sweep time	Auto couple

Set EUT to transmit maximum output power and switch on frequency hopping function. then set enough count time (larger than 5000 times) to get all the hopping frequency channel displayed on the screen of spectrum analyzer.
Count the quantity of peaks to get the number of hopping channels.
Normal Mode: 79 Channels observed.
AFH Mode: 20 Channels declared.

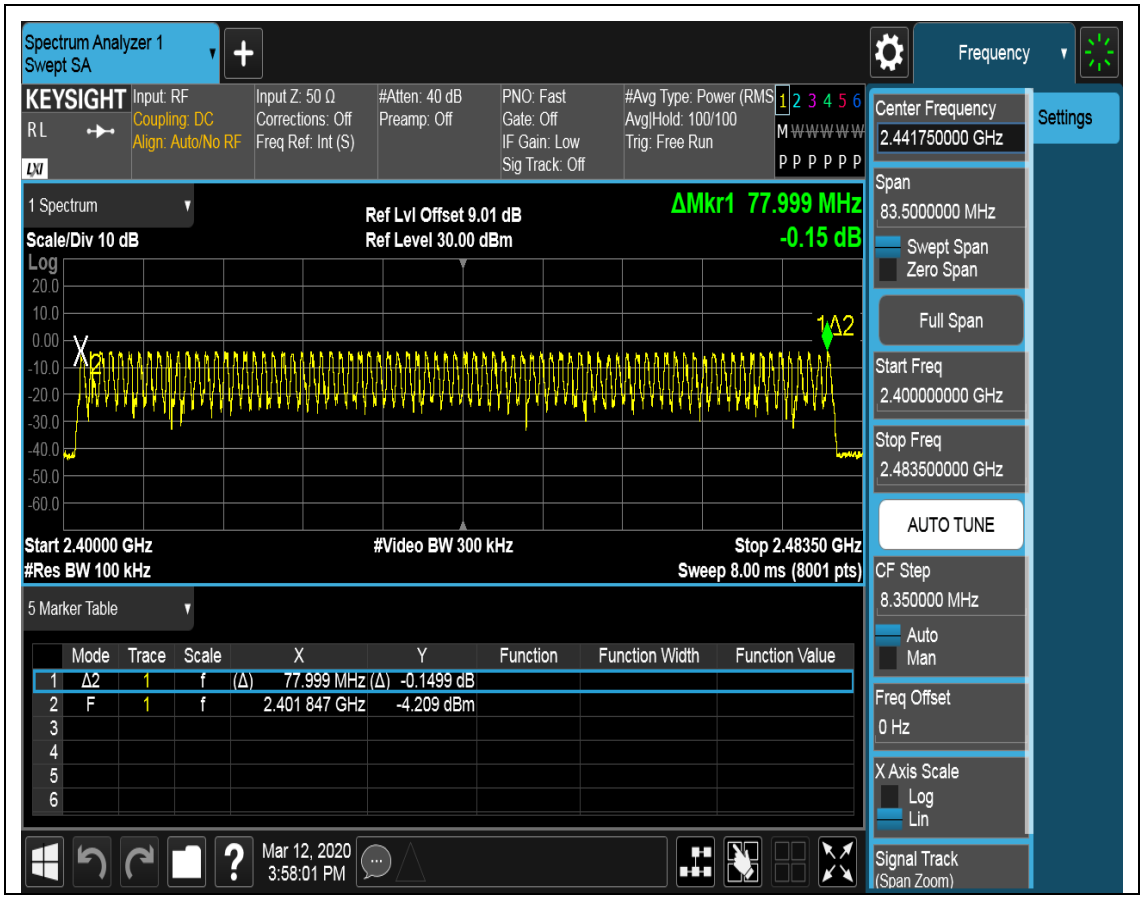
TEST SETUP



RESULTS

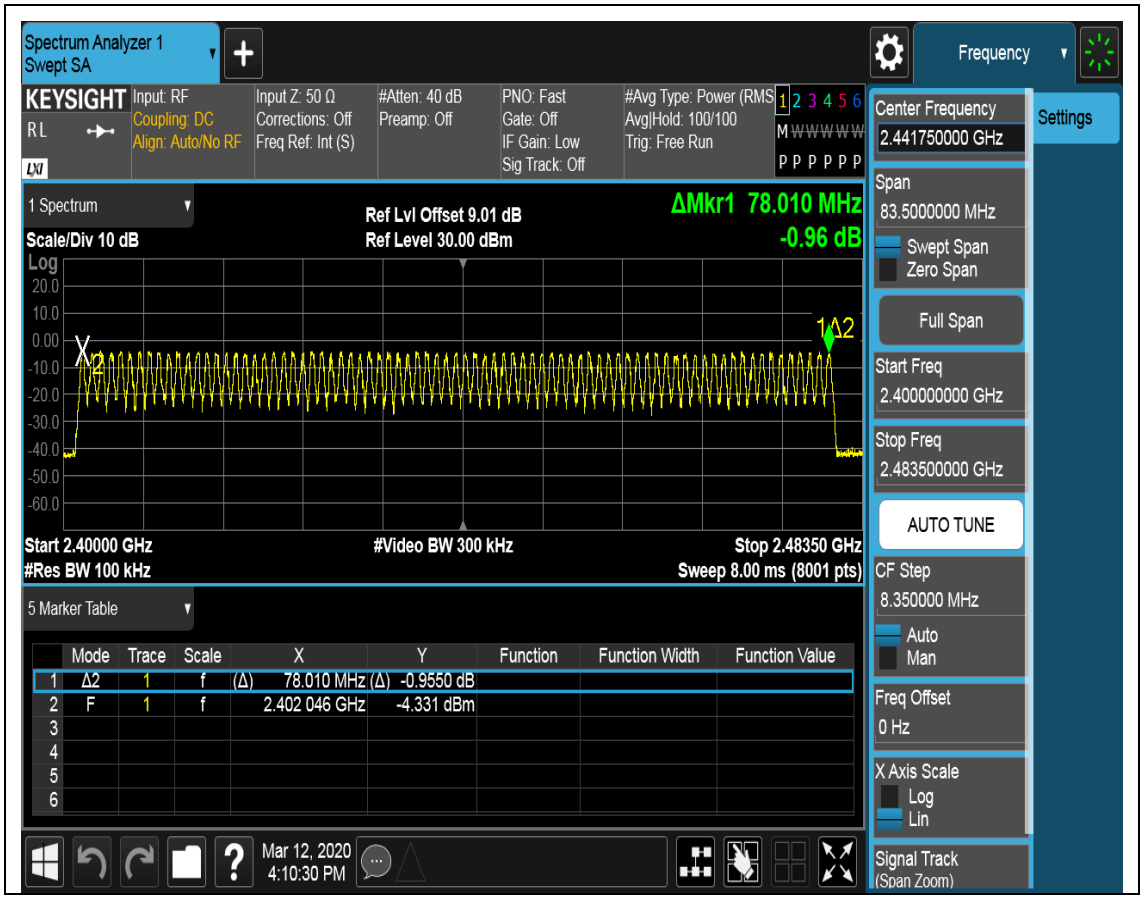
6.5.1. GFSK MODE

Hopping numbers	Limit	Results
79	>15	Pass



6.5.2. 8DPSK MODE

Hopping numbers	Limit	Results
79	>15	Pass



6.6. TIME OF OCCUPANCY (DWELL TIME)

LIMITS

FCC Part15 (15.247) , Subpart C		
Section	Test Item	Limit
15.247 (a) (1) III	Time of Occupancy (Dwell Time)	The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds, multiplied by the number of hopping channels employed.

TEST PROCEDURE

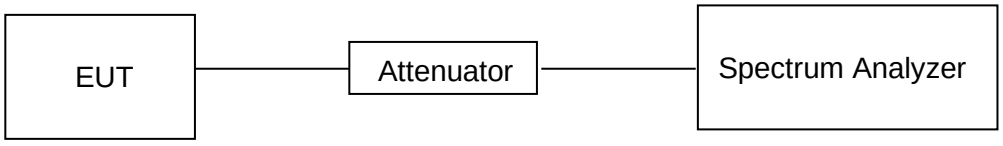
Connect the UUT to the spectrum Analyzer and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	1 MHz
VBW	≥RBW
Span	zero span
Trace	Max hold
Sweep time	As necessary to capture the entire dwell time per hopping channel

a. The transmitter output (antenna port) was connected to the spectrum analyzer
b. Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz.
c. Use a video trigger with the trigger level set to enable triggering only on full pulses.
d. Sweep Time is more than once pulse time.
e. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
f. Measure the maximum time duration of one single pulse.
g. Set the EUT for DH5, DH3 and DH1 packet transmitting.
h. Measure the maximum time duration of one single pulse.
A Period Time = (channel number)*0.4

For Normal Mode (79 Channel):
DH1 Time Slot: Reading * (1600/2)*31.6/(channel number)
DH3 Time Slot: Reading * (1600/4)*31.6/(channel number)
DH5 Time Slot: Reading * (1600/6)*31.6/(channel number)
For AFH Mode (20 Channel):
DH1 Time Slot: Reading * (800/2)*8/(channel number)
DH3 Time Slot: Reading * (800/4)*8/(channel number)
DH5 Time Slot: Reading * (800/6)*8/(channel number)

TEST SETUP



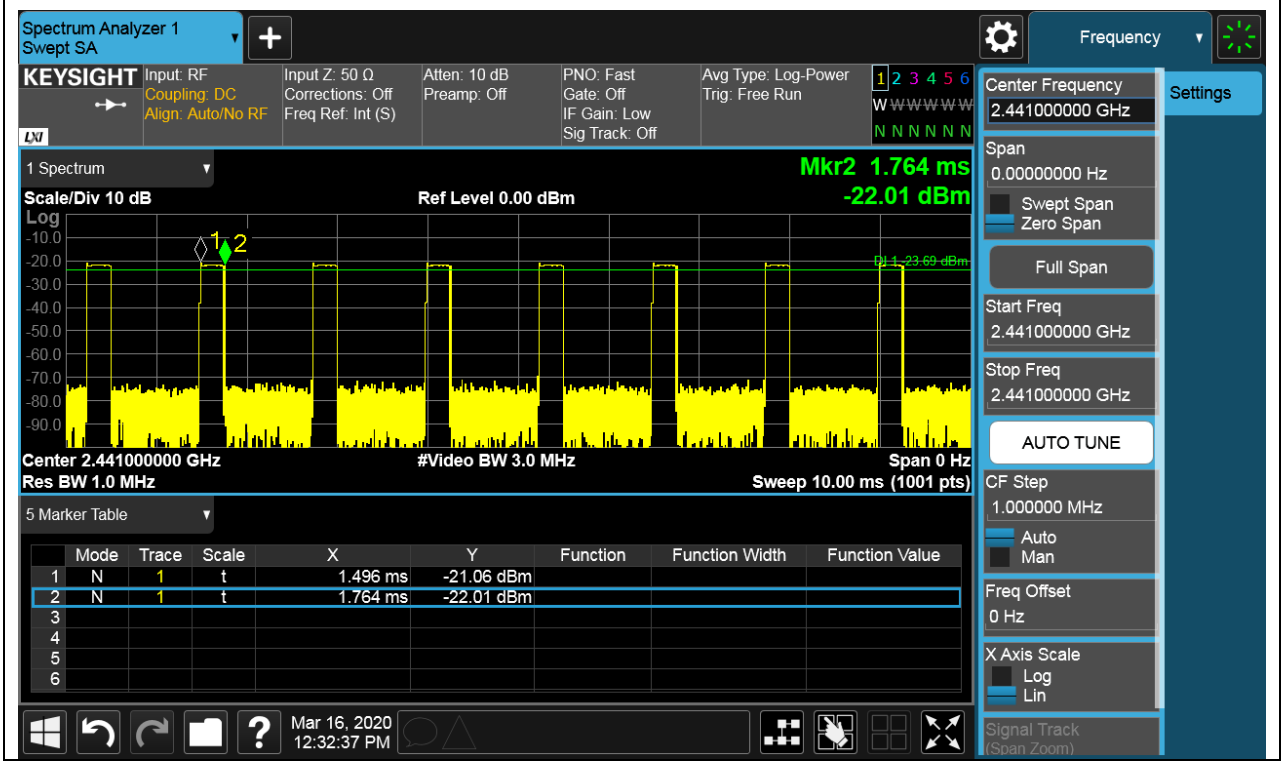
RESULTS

6.6.1. GFSK MODE

Normal Mode				
Packet	**Channel**	**Burst Width [ms/hop/ch]**	**Dwell Time [s]**	**Results**
DH1	MCH	0.268	0.086	PASS
DH3	MCH	0.408	0.065	PASS
DH5	MCH	3.238	0.345	PASS
AFH Mode				
DH1	MCH	0.268	0.043	PASS
DH3	MCH	0.408	0.033	PASS
DH5	MCH	3.238	0.173	PASS

Test Graph

TIME OF SINGLE SLOT (DH1)



TIME OF SINGLE SLOT (DH3)

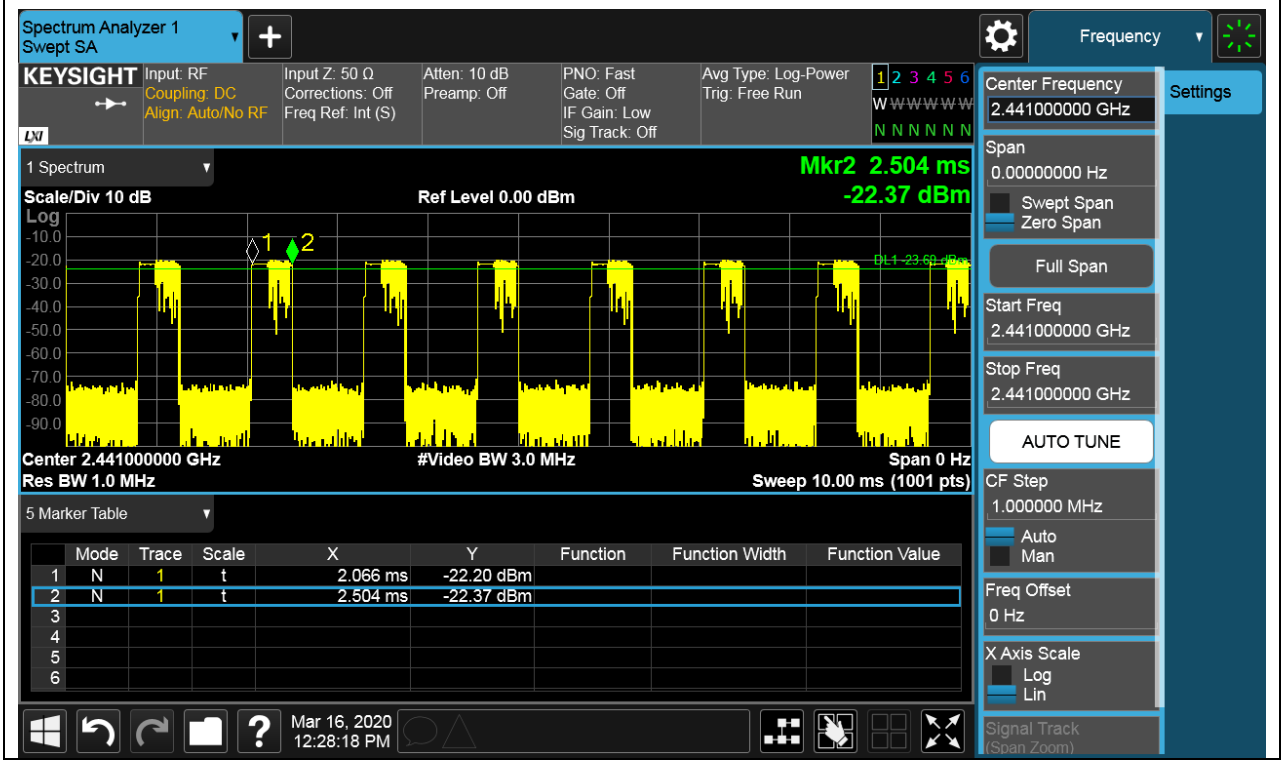
TIME OF SINGLE SLOT (DH5)

6.6.2. 8DPSK MODE

Normal Mode				
Packet	**Channel**	**Burst Width [ms/hop/ch]**	**Dwell Time [s]**	**Results**
3DH1	MCH	0.438	0.140	PASS
3DH3	MCH	1.678	0.268	PASS
3DH5	MCH	2.948	0.314	PASS
AFH Mode				
3DH1	MCH	0.438	0.07	PASS
3DH3	MCH	1.678	0.134	PASS
3DH5	MCH	2.948	0.157	PASS

Test Graph

TIME OF SINGLE SLOT (3DH1)



TIME OF SINGLE SLOT (3DH3)

TIME OF SINGLE SLOT (3DH5)

6.7. CONDUCTED SPURIOUS EMISSION

LIMITS

FCC Part15 (15.247) , Subpart C RSS-247 ISSUE 2		
Section	Test Item	Limit
FCC §15.247 (d)	Conducted Spurious Emission	at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power
RSS-247 5.5	Conducted Spurious Emission	at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

TEST PROCEDURE

For Band-edge use the following settings:

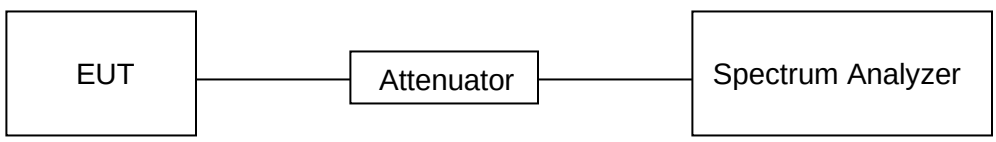
Detector	Peak
RBW	1 MHz
VBW	3 × RBW
Span	Wide enough to capture the peak level of the emission operating on the channel closest to the band edge
Trace	Max hold
Sweep time	Couple

For Spurious Emission use the following settings:

Detector	Peak
RBW	100 kHz
VBW	300 kHz
Span	Wide enough to capture the peak level of the emission operating on the channel closest to the band edge
Trace	Max hold
Sweep time	Couple

Use the peak marker function to determine the maximum amplitude level**.**

TEST SETUP



6.7.1. GFSK MODE

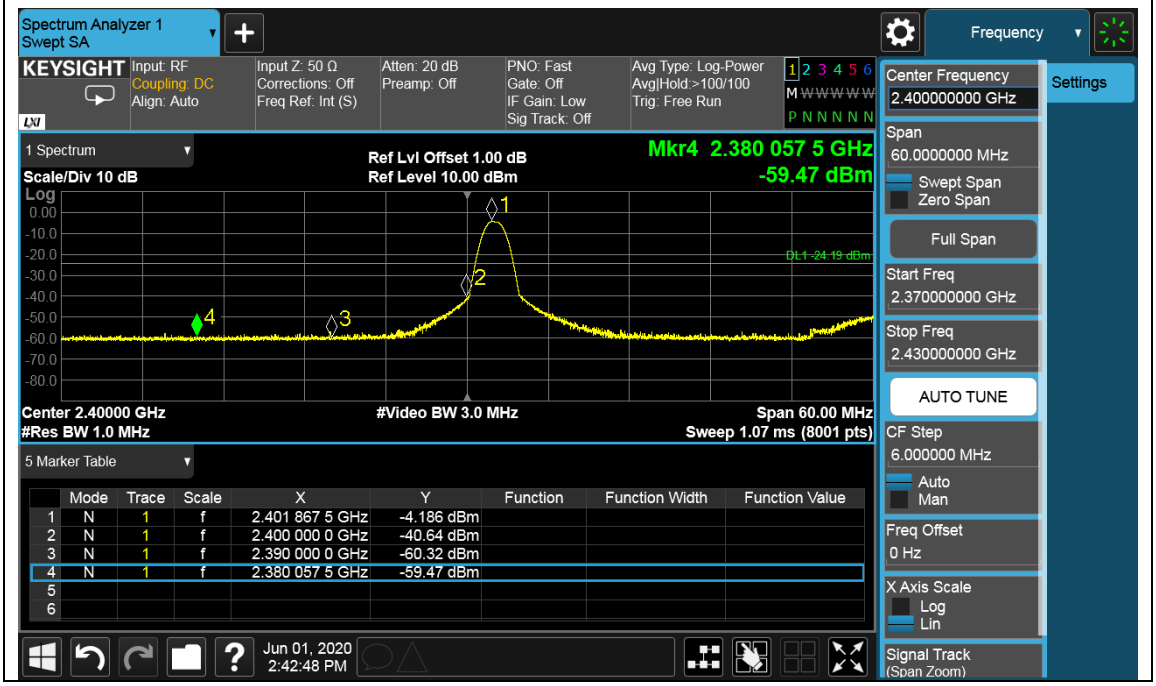
Part I: CONDUCTED BANDEDGE

RESULTS TABLE

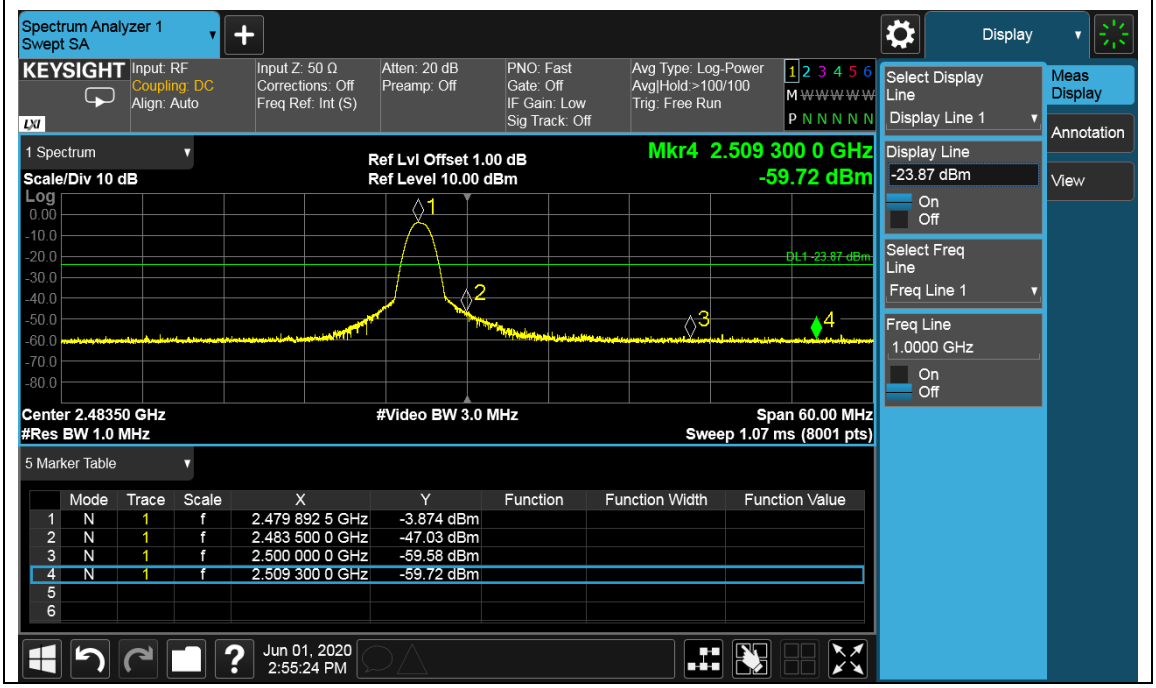
Test Mode	Test Channel	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-4.186	-40.64	-24.19	PASS
	HCH	-3.874	-47.03	-23.87	PASS

TEST GRAPHS

LOW CH BANDEDGE



HIGH CH BANDEDGE



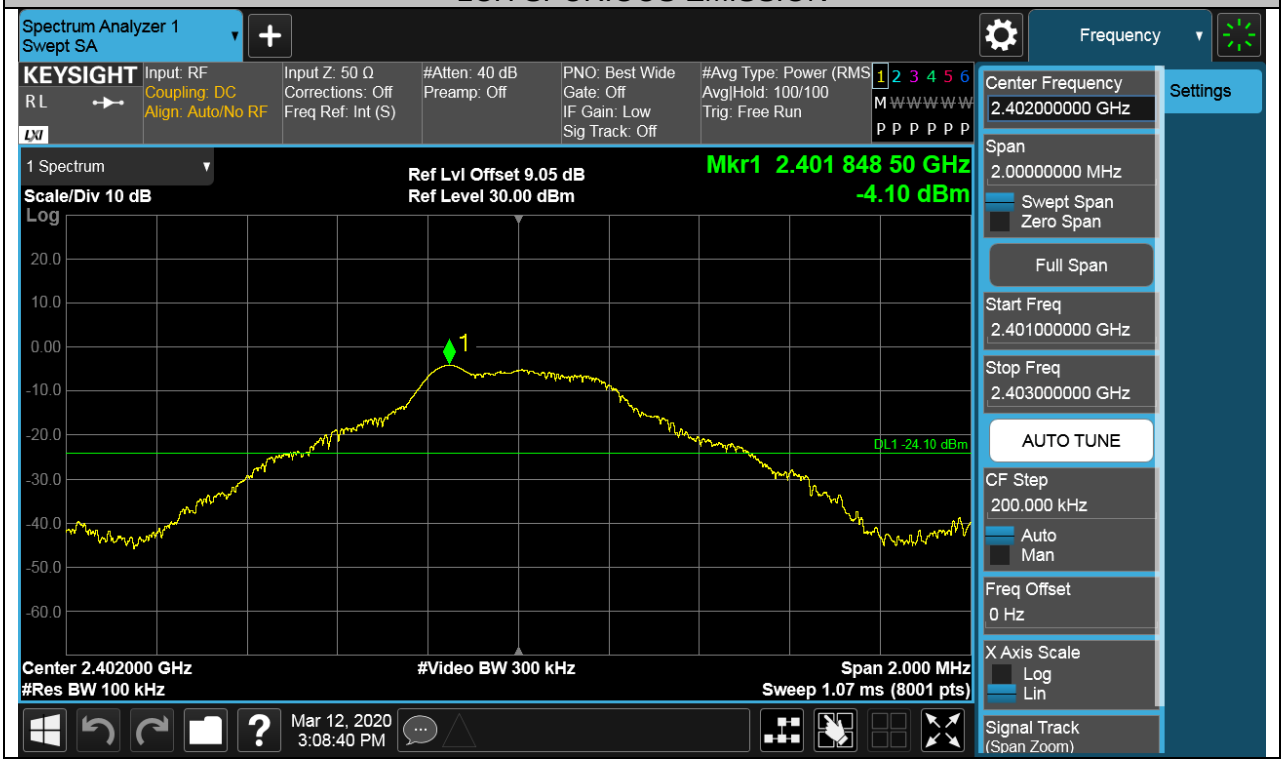
Part II: CONDUCTED SPURIOUS EMISSIONS

RESULTS TABLE

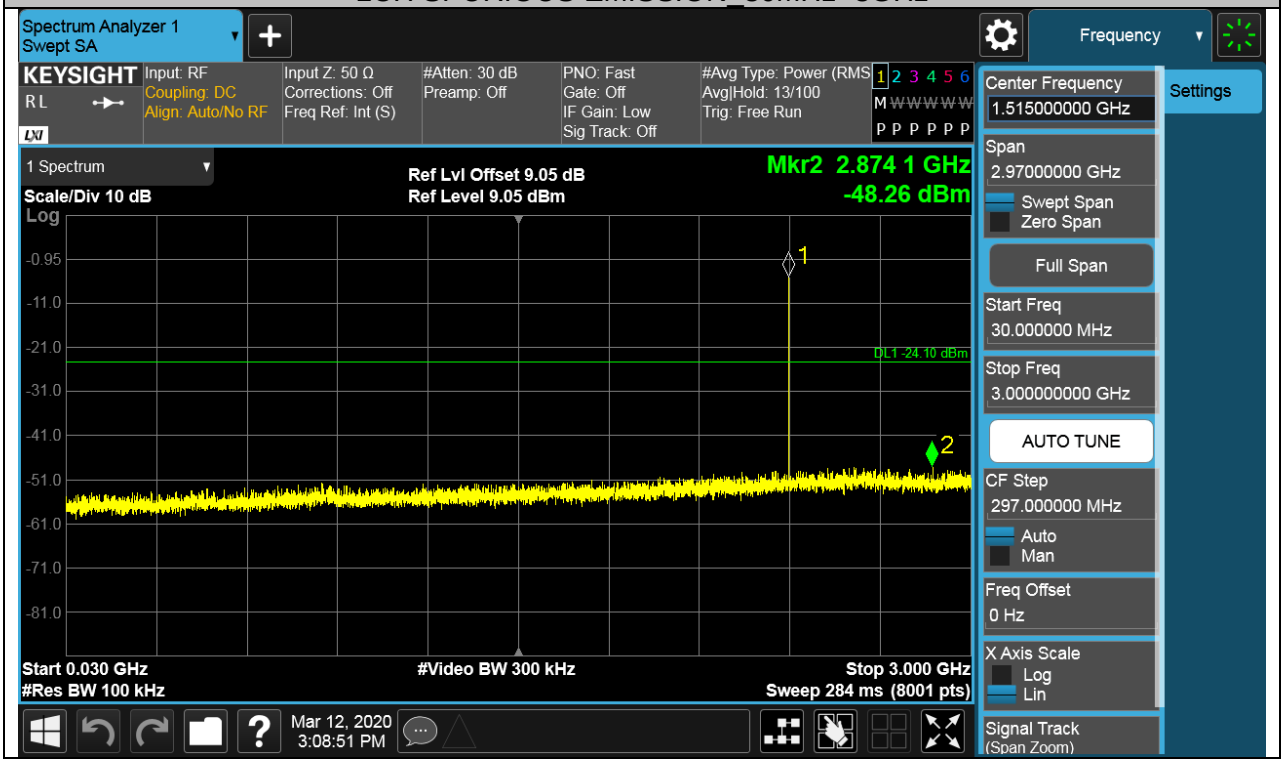
Test Mode	Channel	Pref(dBm)	Puw(dBm)	Verdict
GFSK	LCH	-4.10	<Limit	PASS
	MCH	-4.33	<Limit	PASS
	HCH	-4.65	<Limit	PASS

SPURIOUS EMISSIONS, LOW CHANNEL

LCH SPURIOUS EMISSION

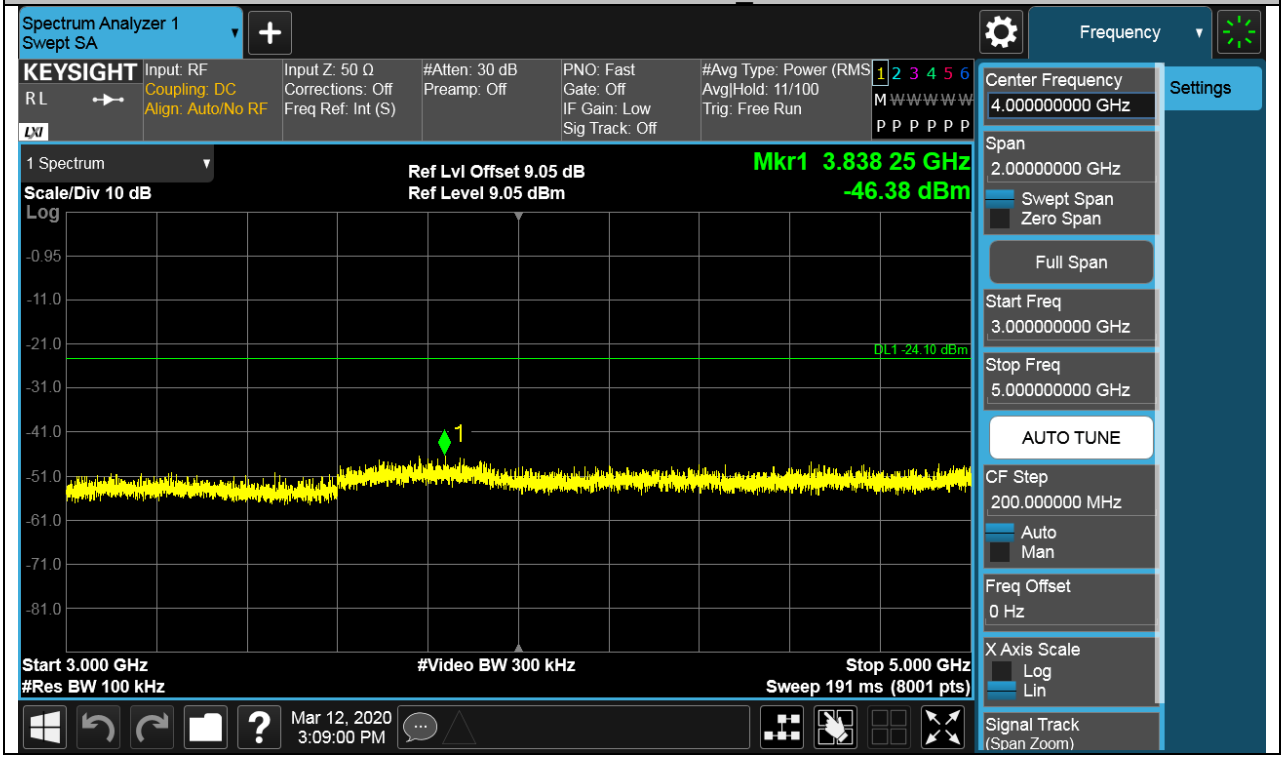


LCH SPURIOUS EMISSION_30MHz~3GHz

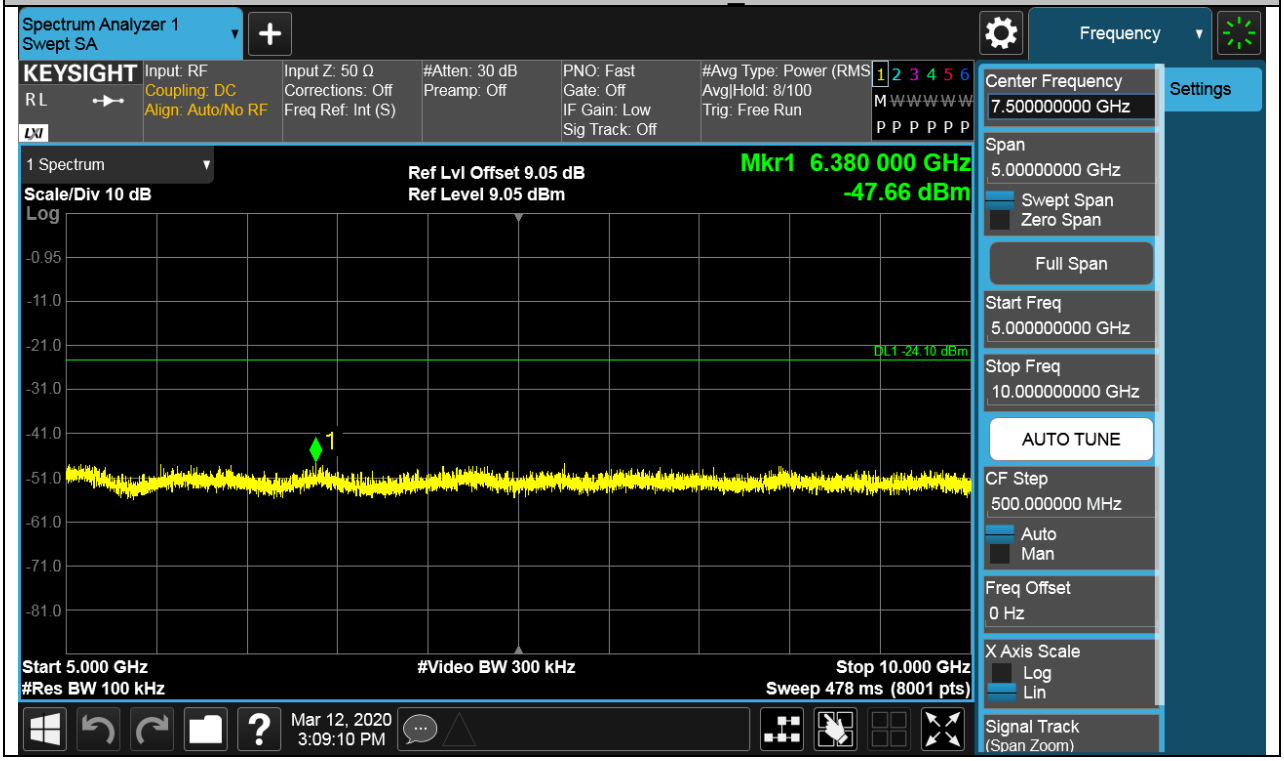


Note: The point 1 which exceeds the limit is 2.4G main carrier.

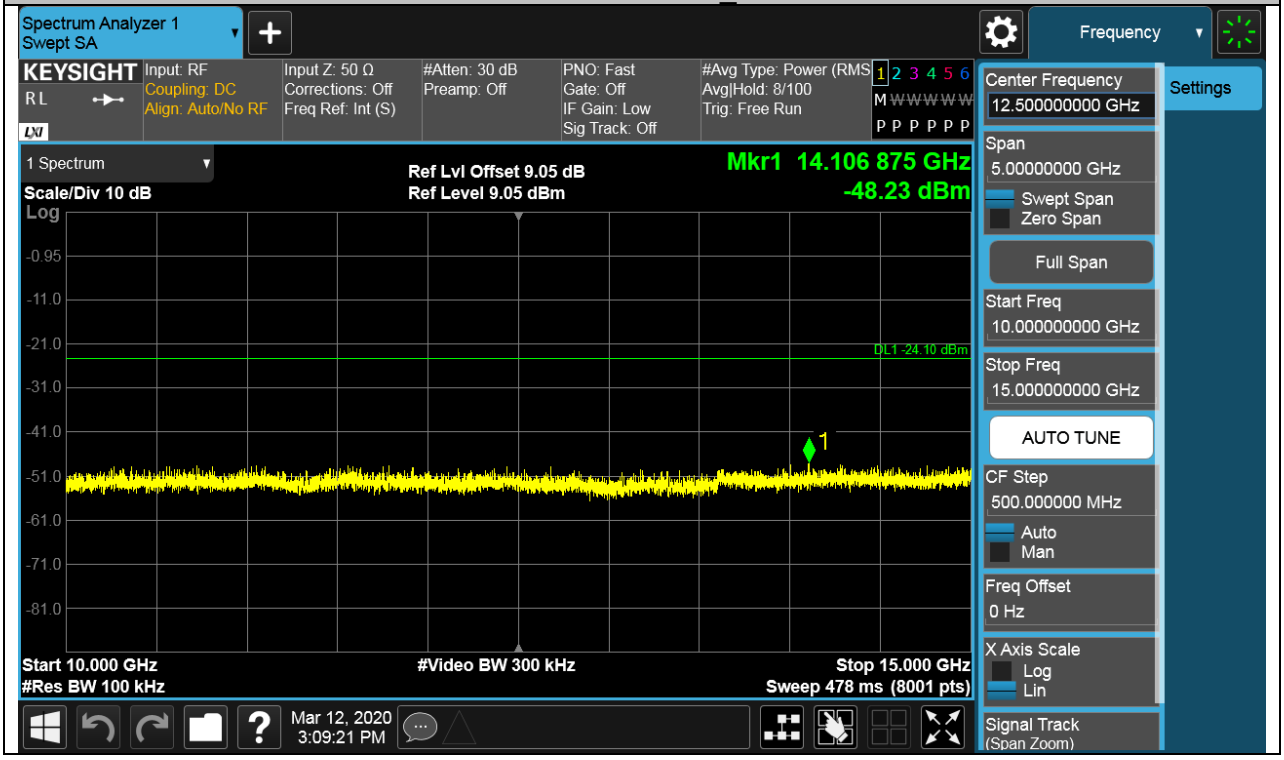
LCH SPURIOUS EMISSION_3GHz~5GHz



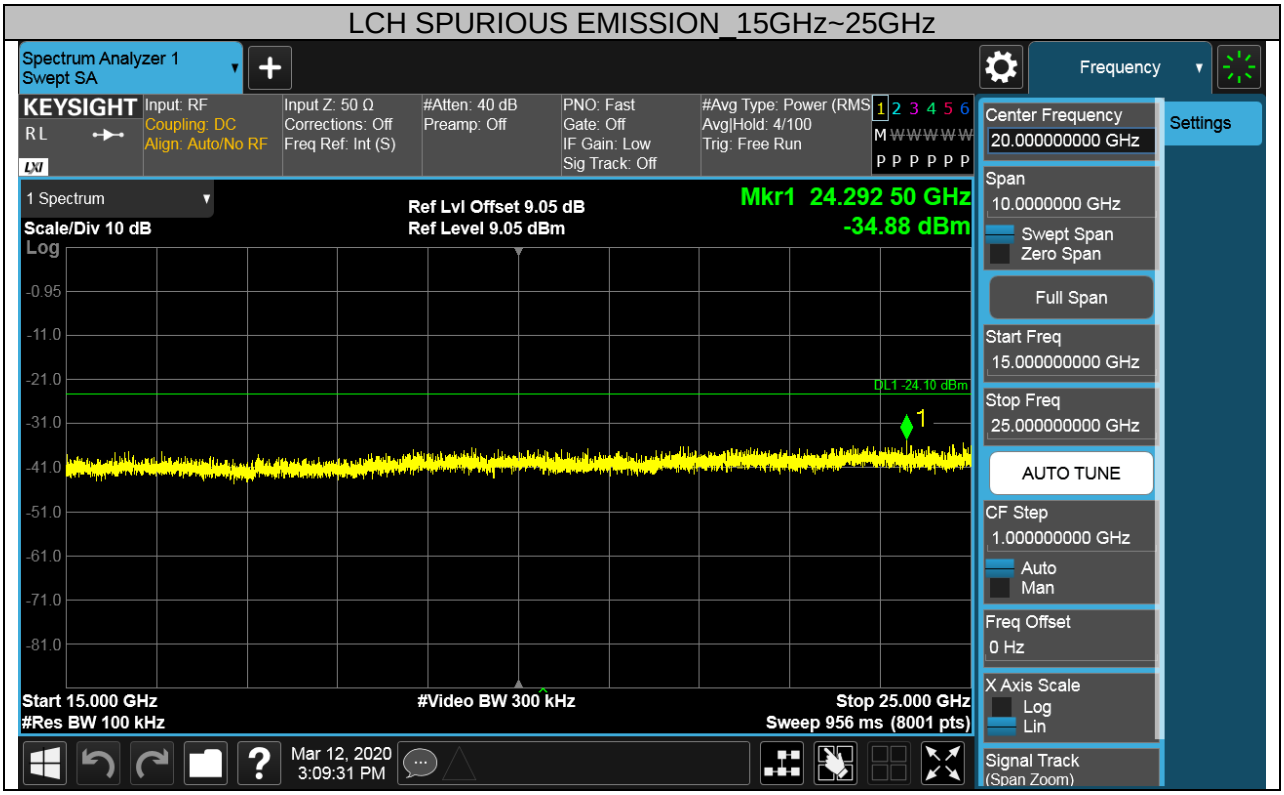
LCH SPURIOUS EMISSION_5GHz~10GHz



LCH SPURIOUS EMISSION_10GHz~15GHz

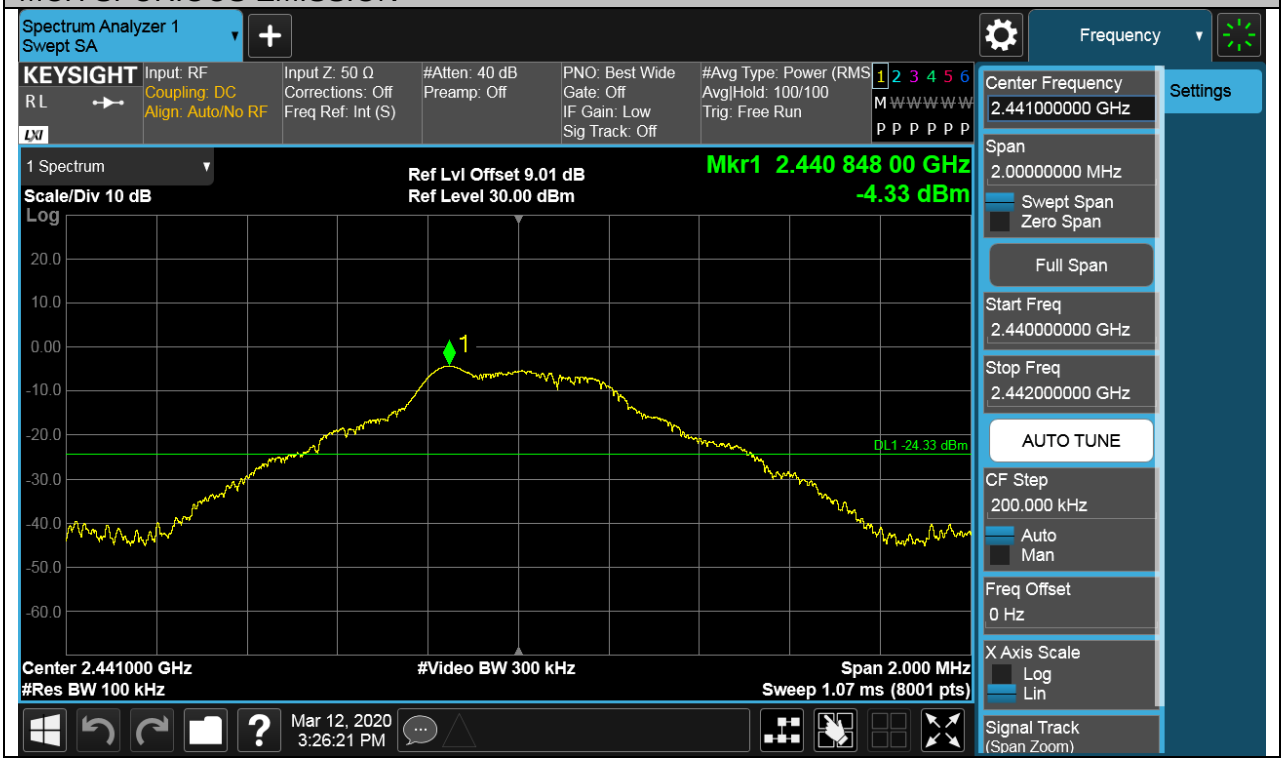


LCH SPURIOUS EMISSION_15GHz~25GHz

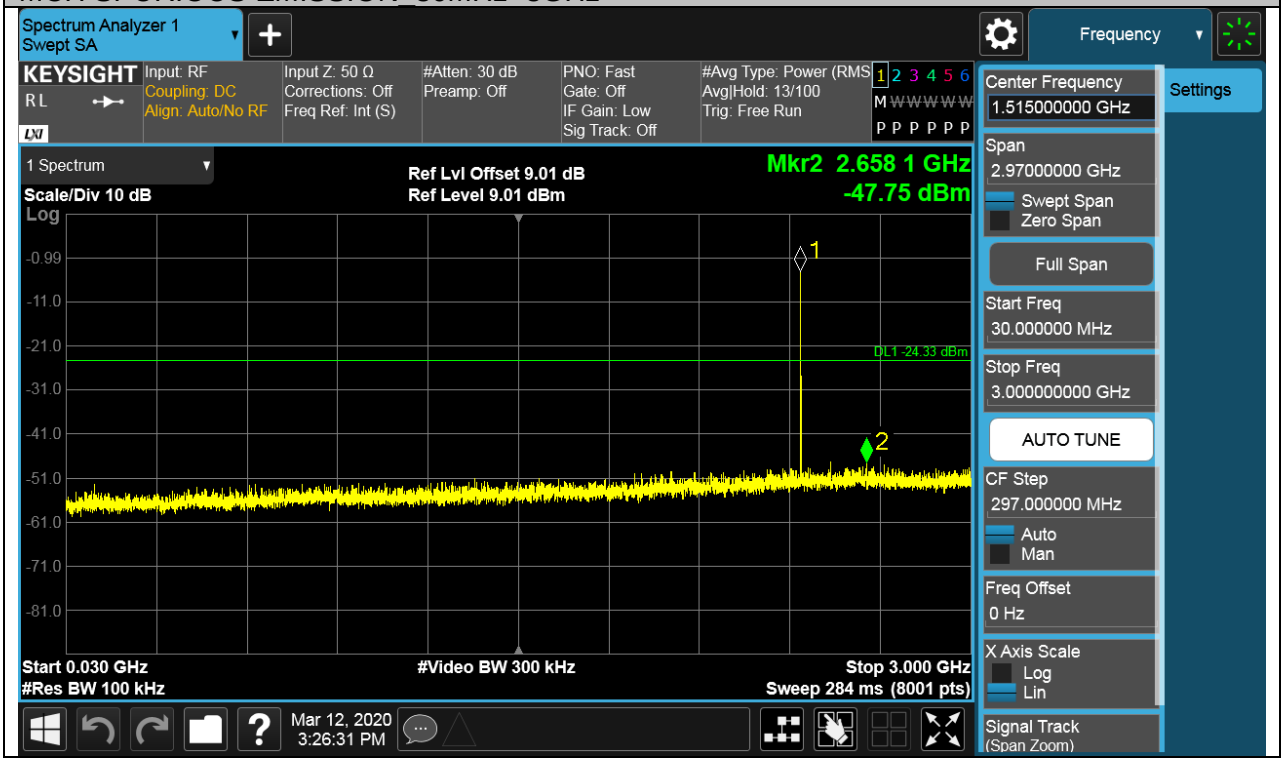


SPURIOUS EMISSIONS, MID CHANNEL

MCH SPURIOUS EMISSION

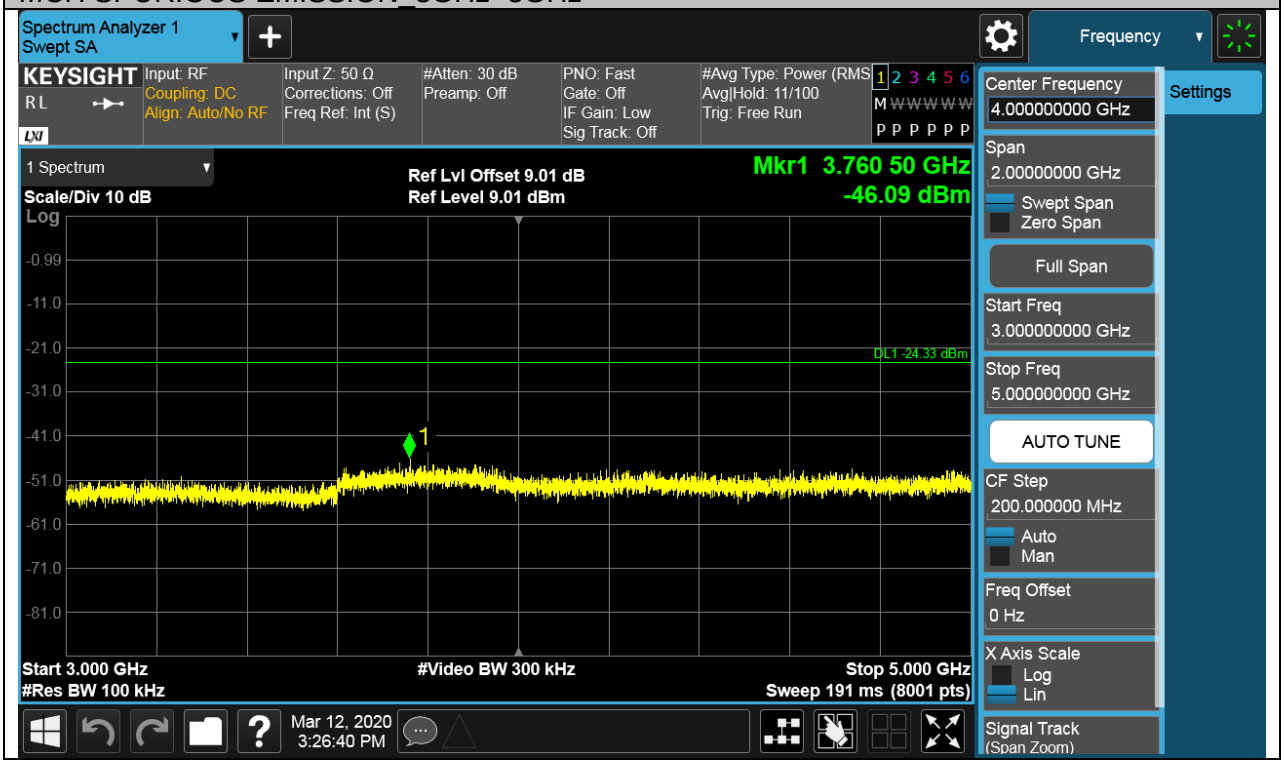


MCH SPURIOUS EMISSION_30MHz~3GHz

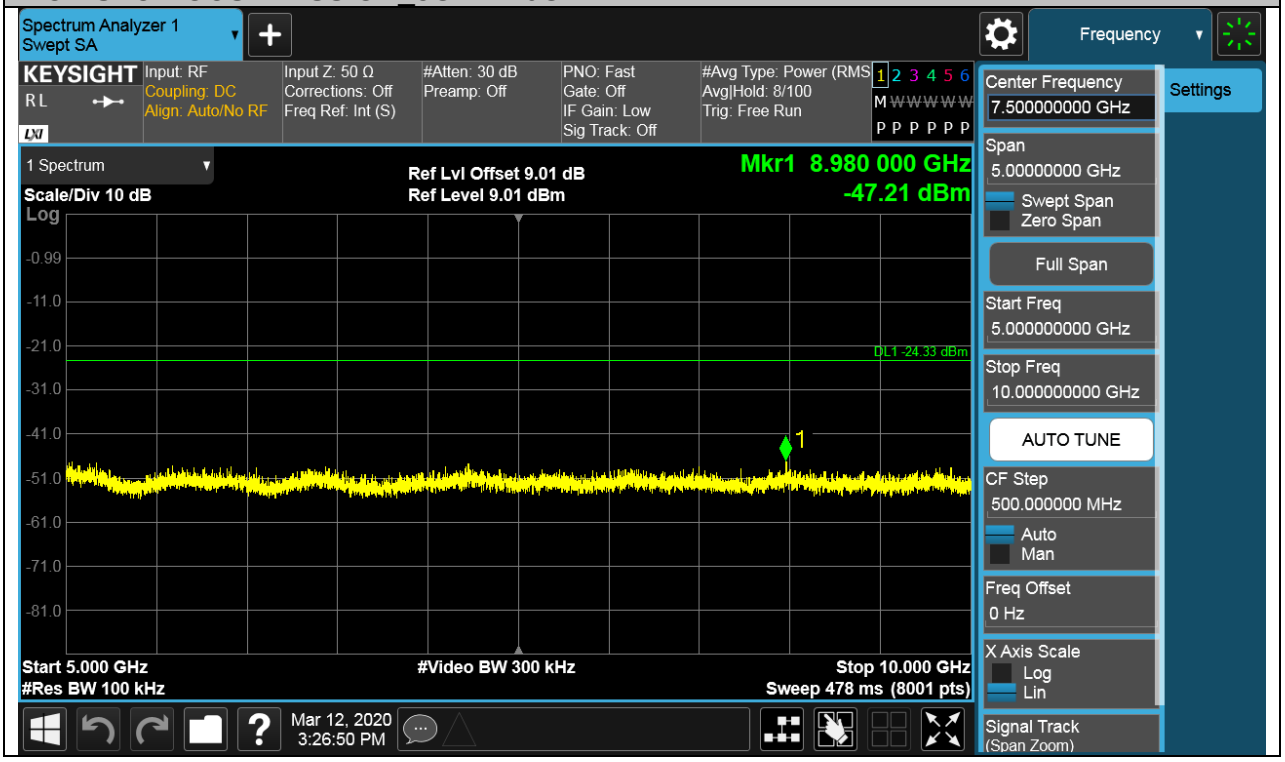


Note: The point 1 which exceeds the limit is 2.4G main carrier.

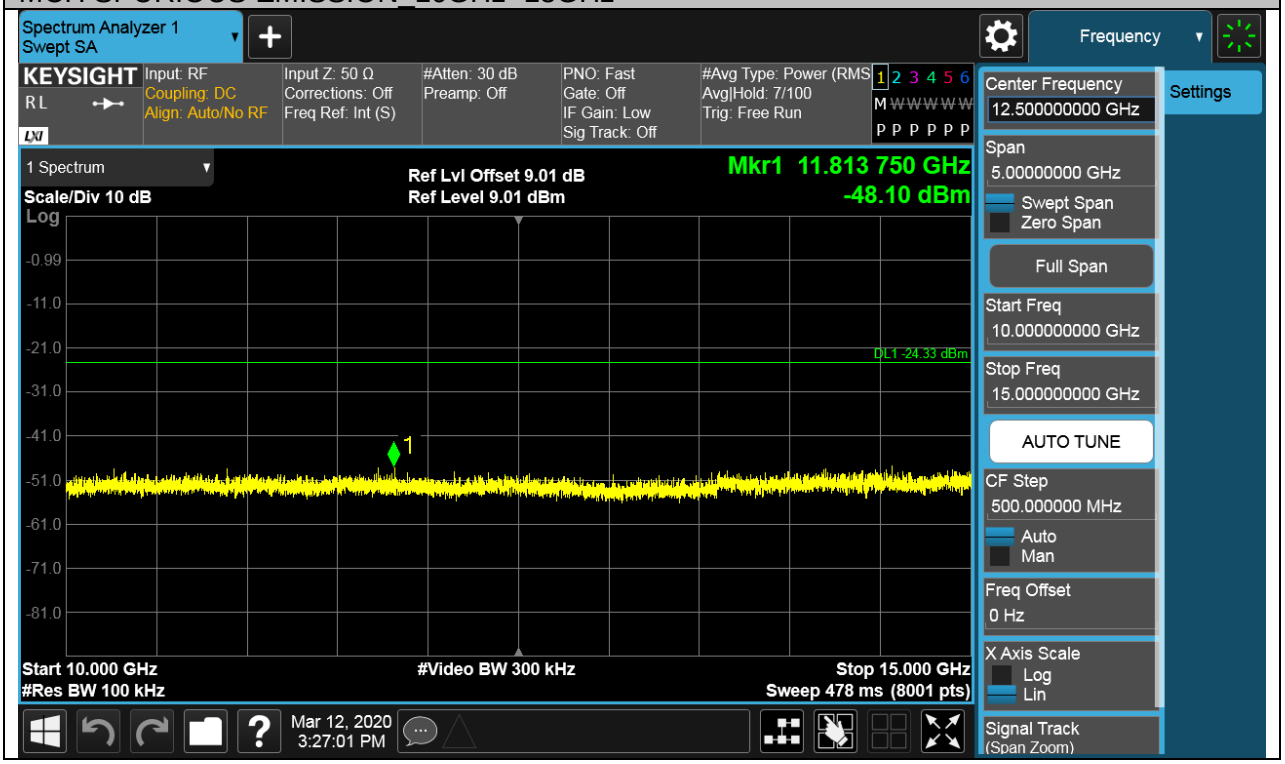
MCH SPURIOUS EMISSION_3GHz~5GHz



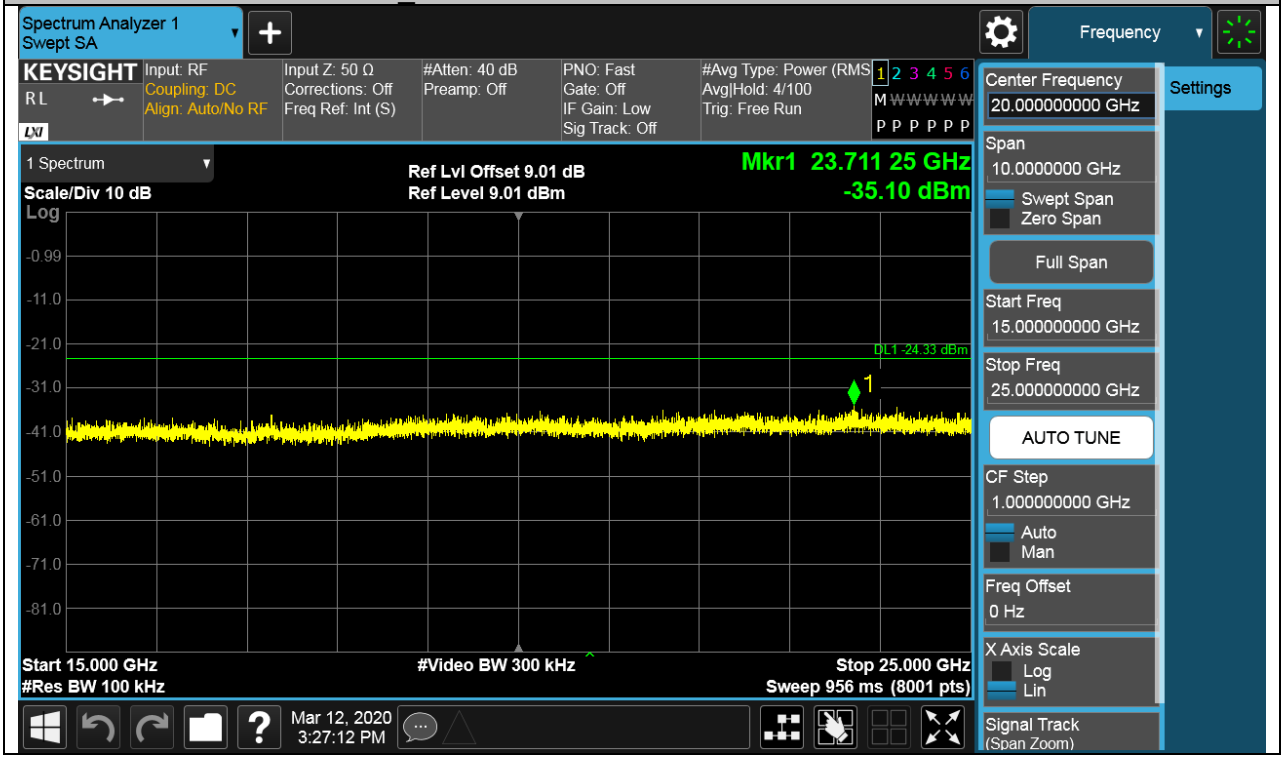
MCH SPURIOUS EMISSION_5GHz~10GHz



MCH SPURIOUS EMISSION_10GHz~15GHz

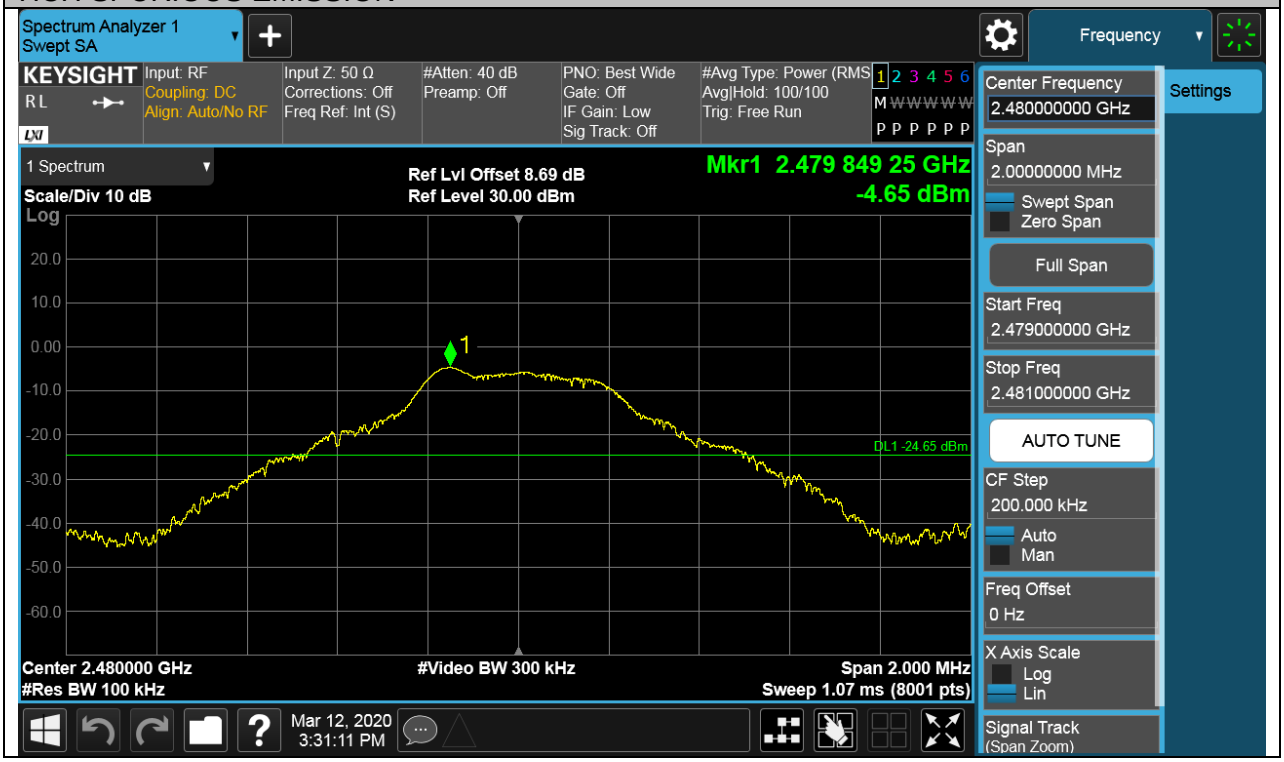


MCH SPURIOUS EMISSION_15GHz~25GHz

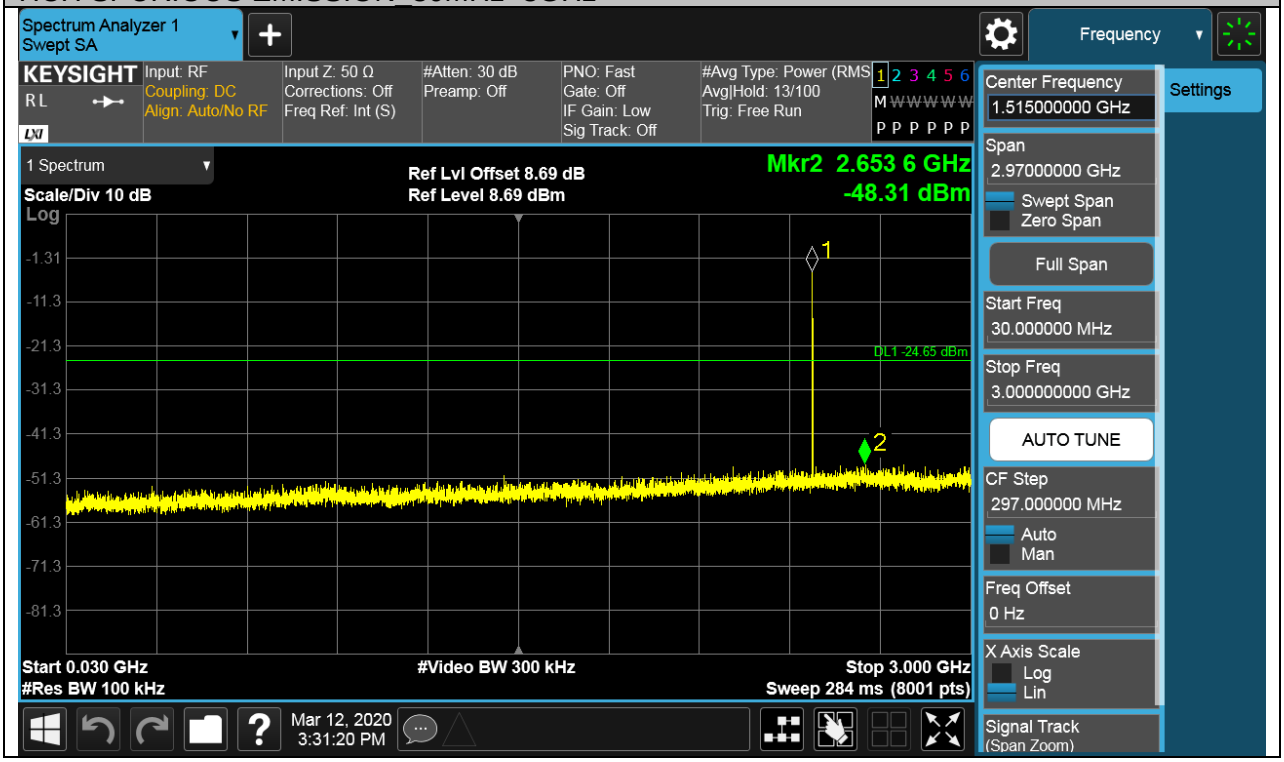


SPURIOUS EMISSIONS, HIGH CHANNEL

HCH SPURIOUS EMISSION

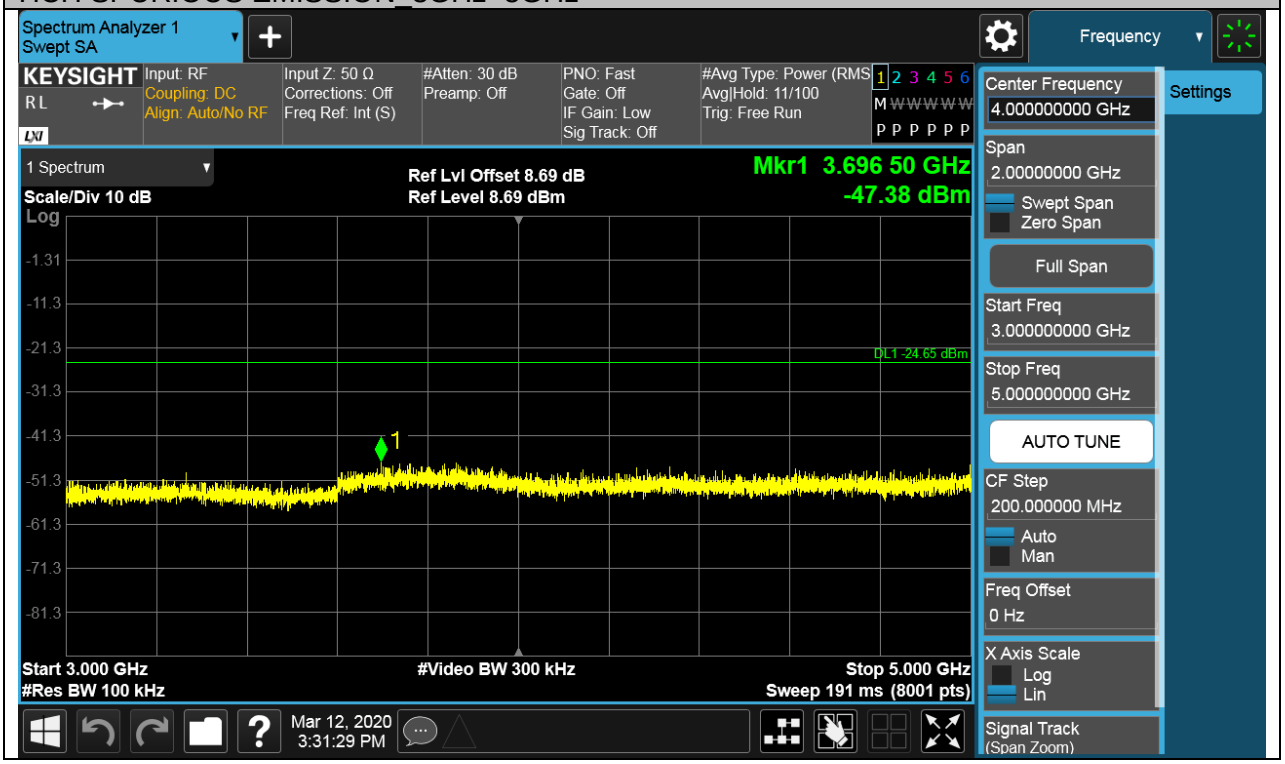


HCH SPURIOUS EMISSION_30MHz~3GHz

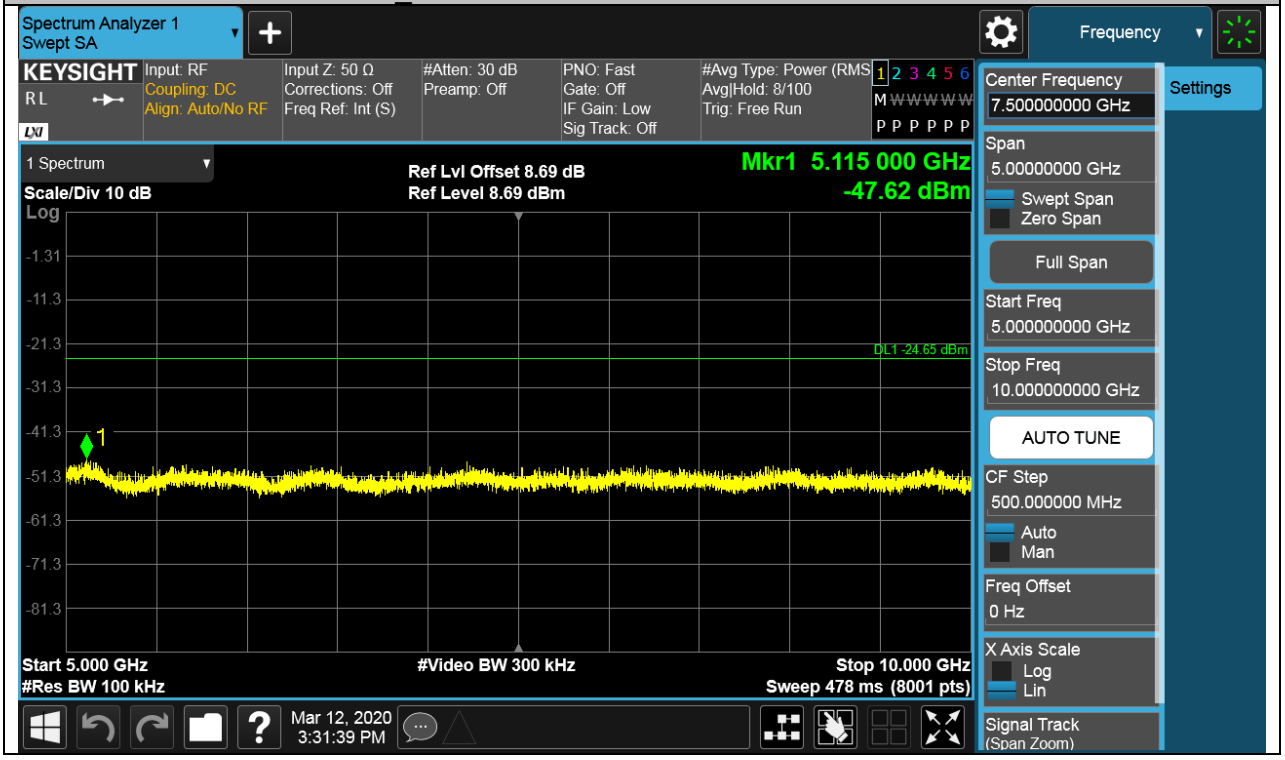


Note: The point 1 which exceeds the limit is 2.4G main carrier.

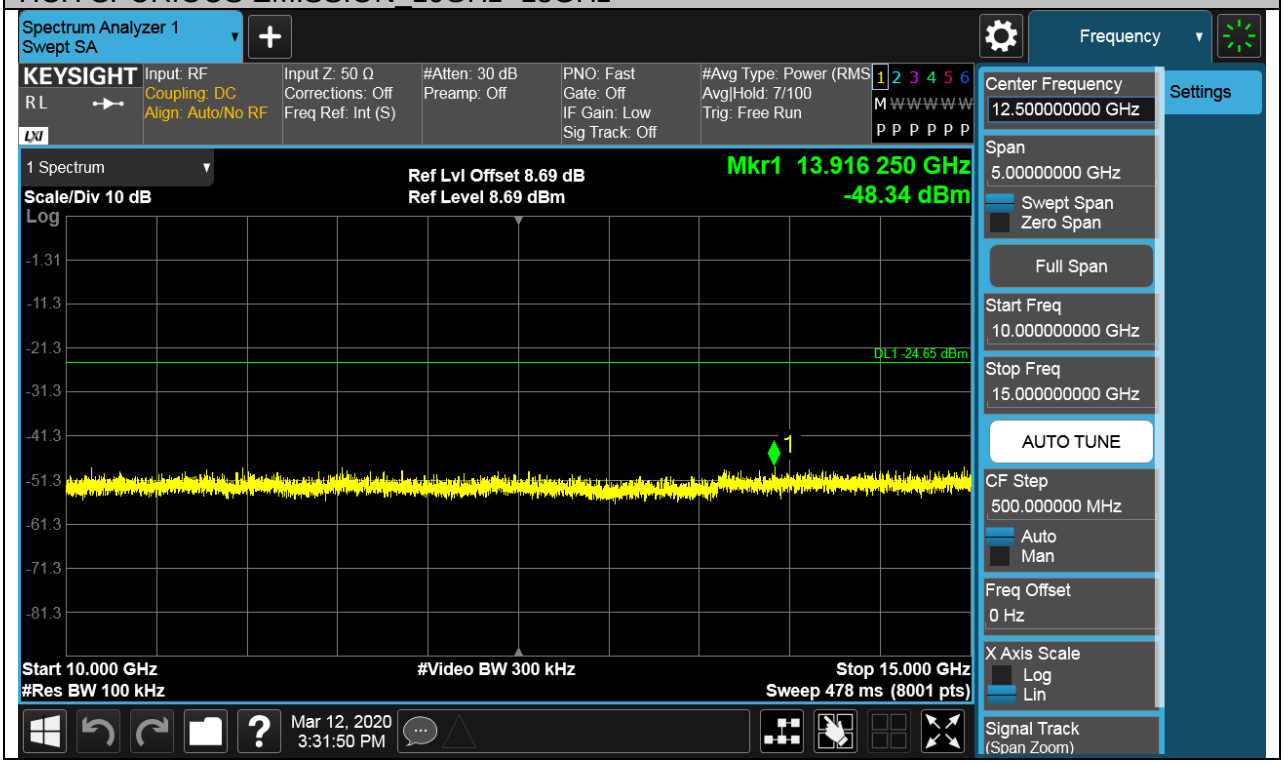
HCH SPURIOUS EMISSION_3GHz~5GHz



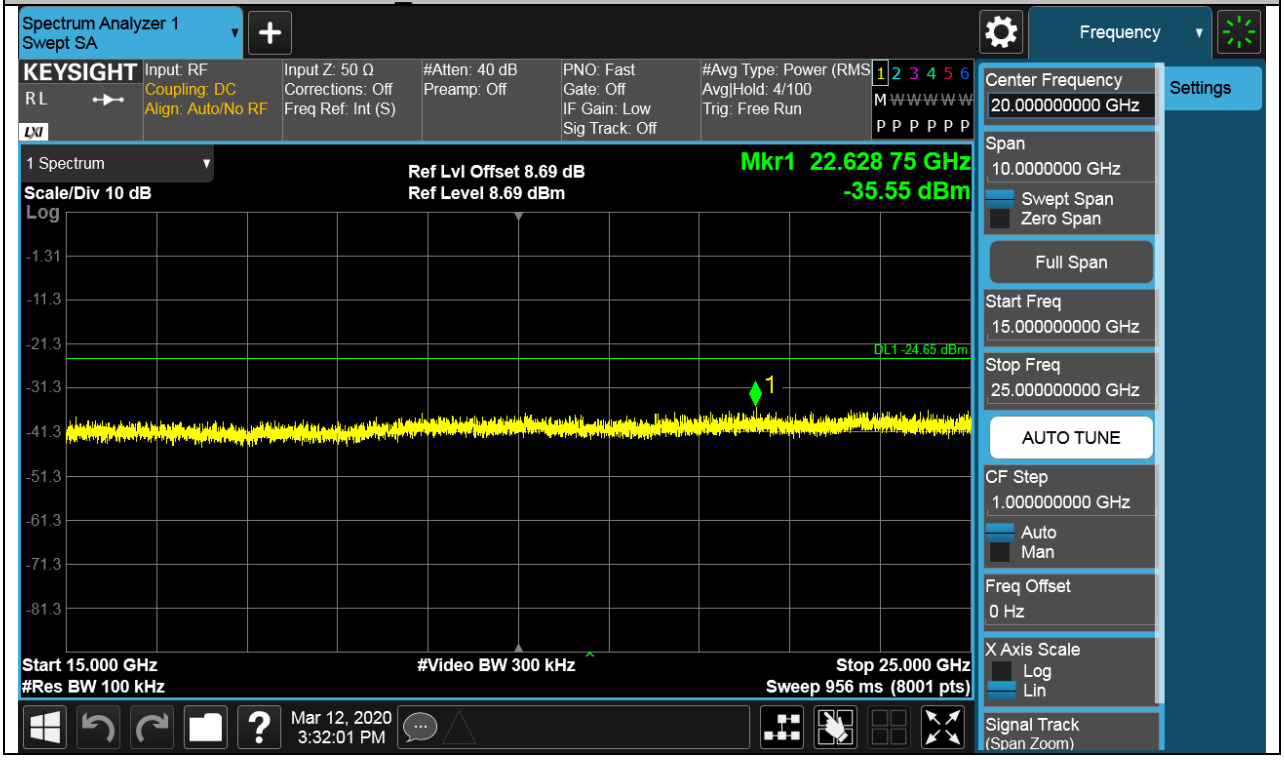
HCH SPURIOUS EMISSION_5GHz~10GHz



HCH SPURIOUS EMISSION_10GHz~15GHz

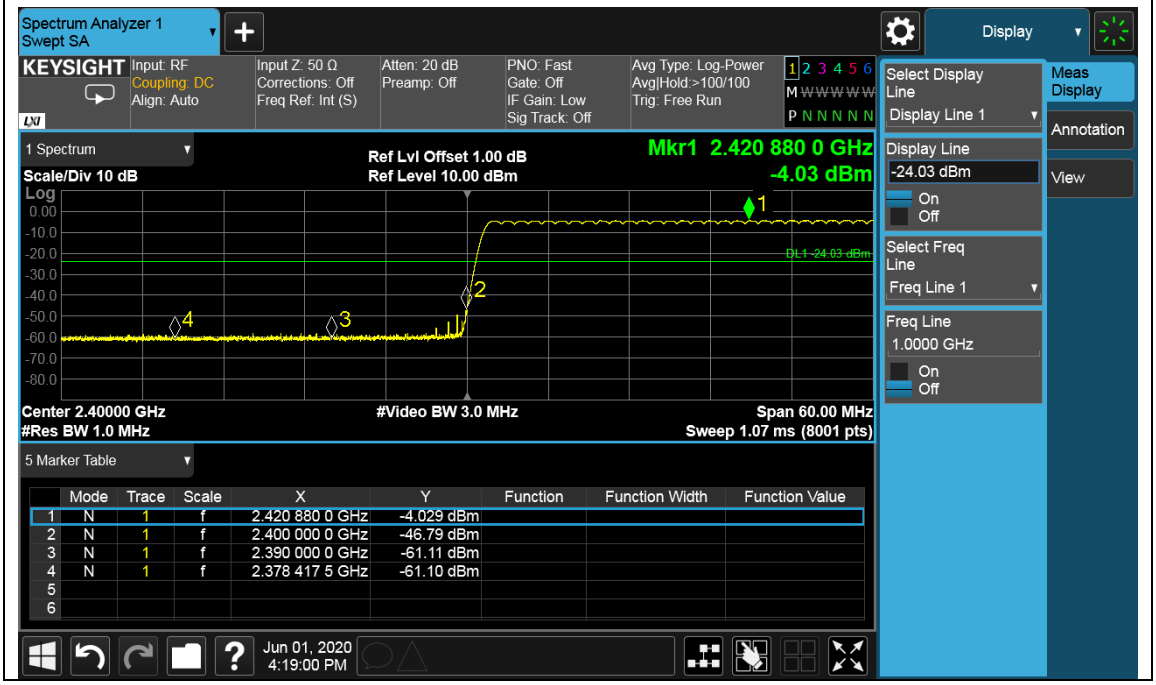


HCH SPURIOUS EMISSION_15GHz~25GHz

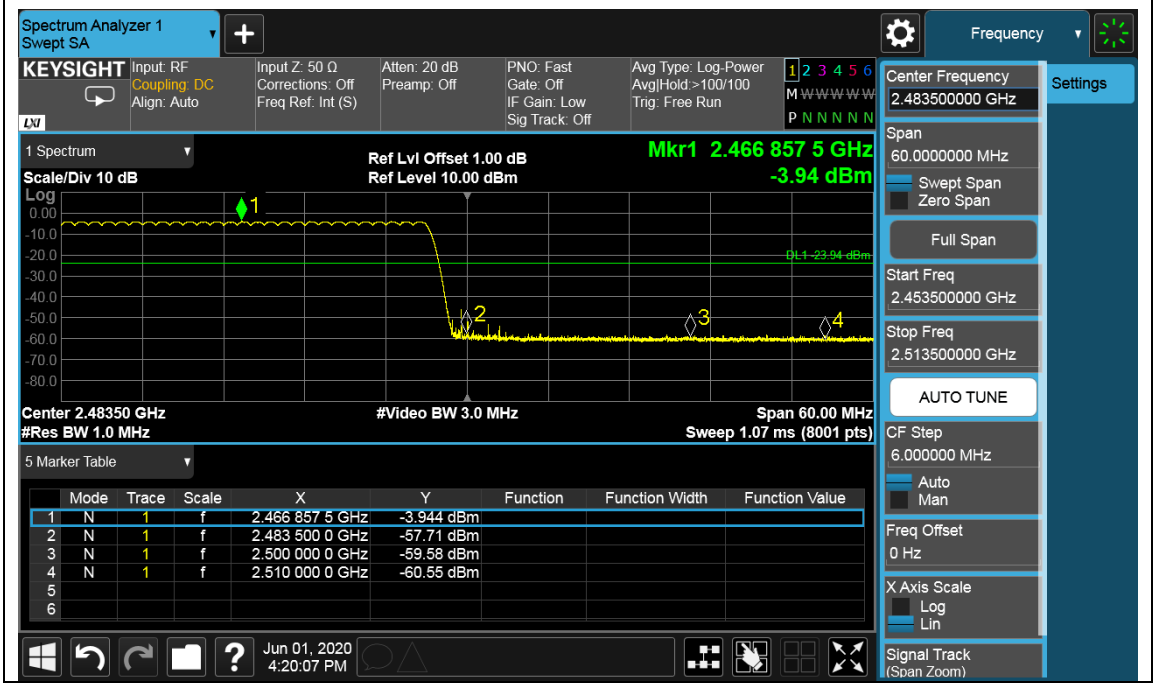


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW CH BANDEDGE WITH HOPPING ON



HIGH CH BANDEDGE WITH HOPPING ON



6.7.2. 8DPSK MODE

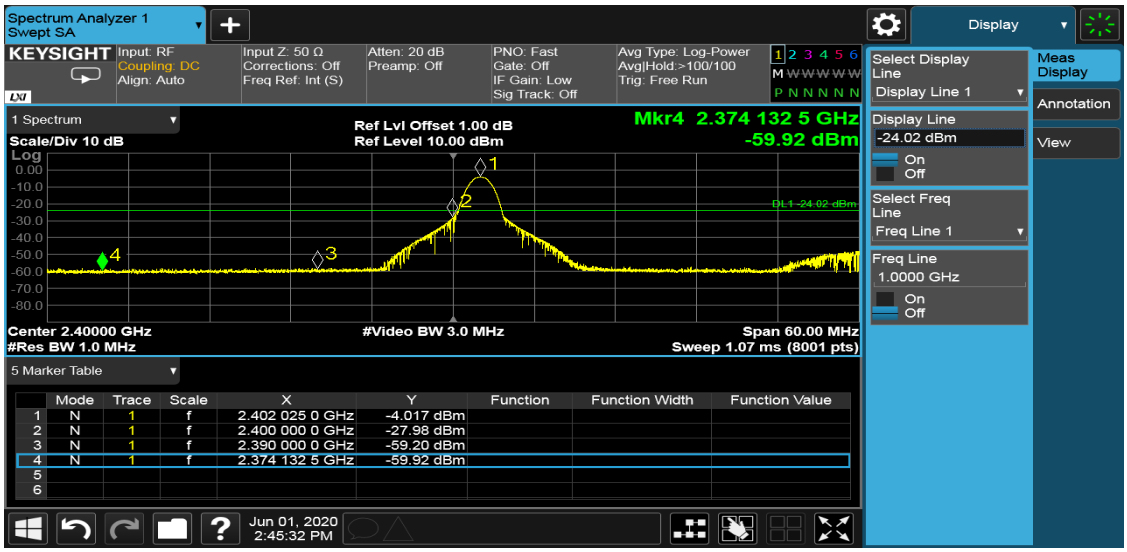
Part I: CONDUCTED BANDEDGE

RESULTS TABLE

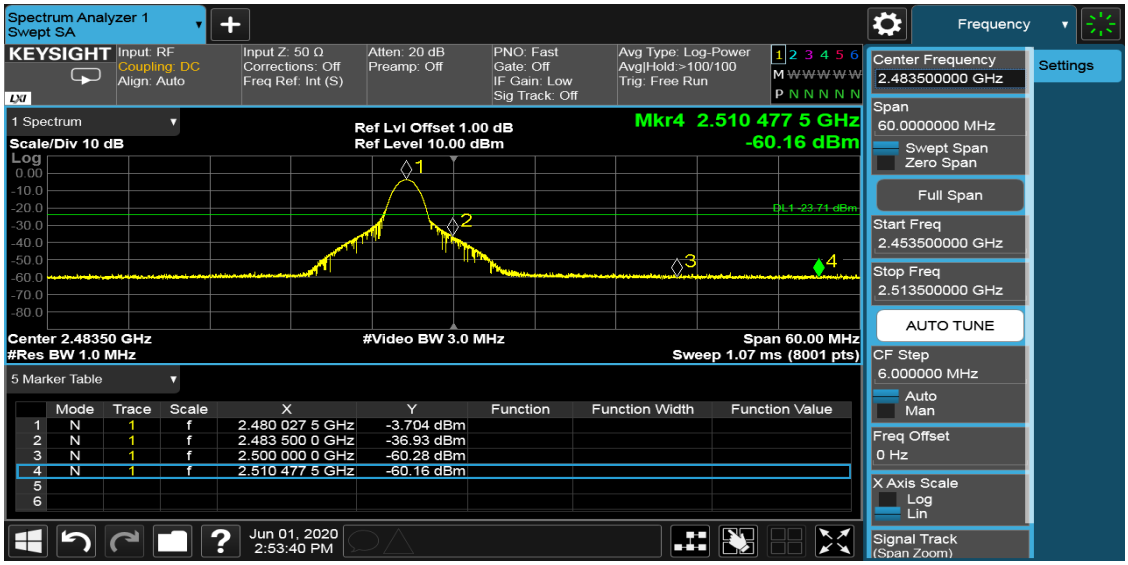
Test Mode	Test Channel	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit [dBm]	Verdict
8DPSK	LCH	-4.017	-27.98	-24.02	PASS
	HCH	-3.704	-36.93	-23.71	PASS

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CH BANDEDGE



HIGH CH BANDEDGE



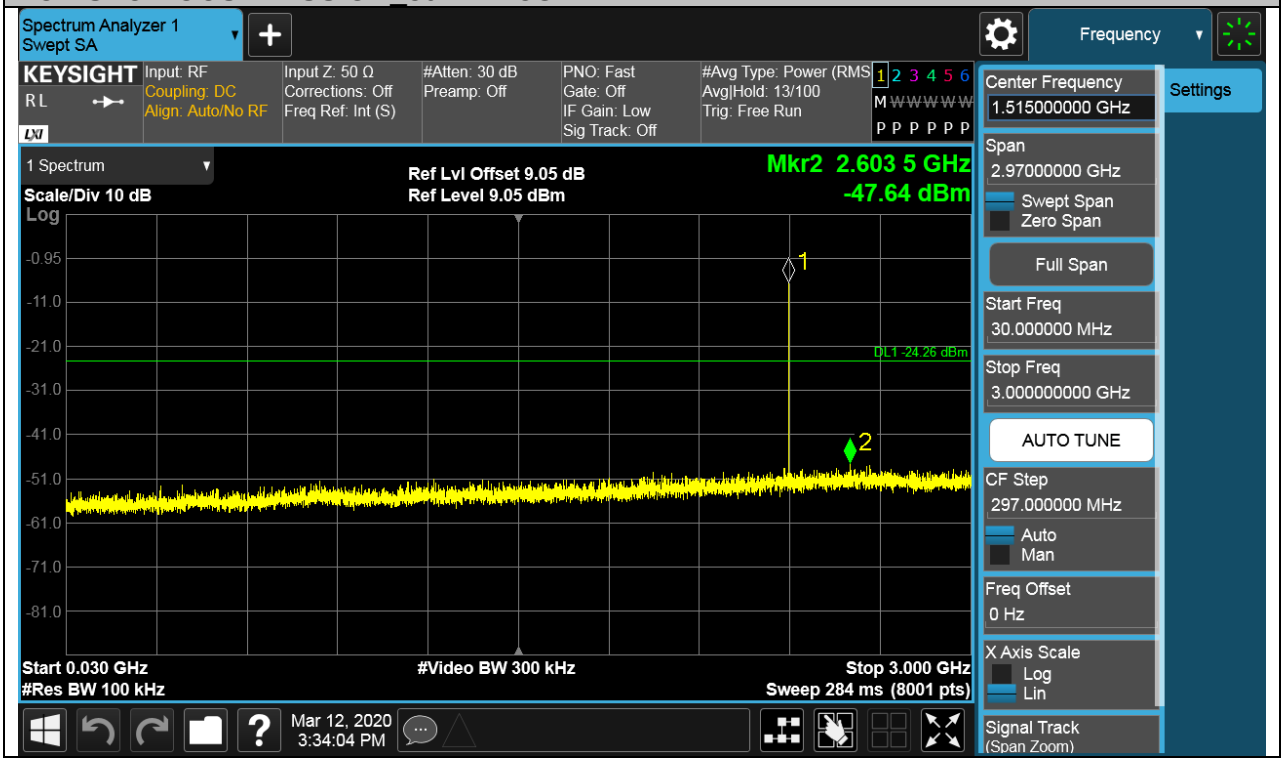
Part II: CONDUCTED SPURIOUS EMISSIONS

RESULTS TABLE

Test Mode	Channel	Pref(dBm)	Puw(dBm)	Verdict
8DPSK	LCH	-4.26	<Limit	PASS
	MCH	-4.47	<Limit	PASS
	HCH	-4.81	<Limit	PASS

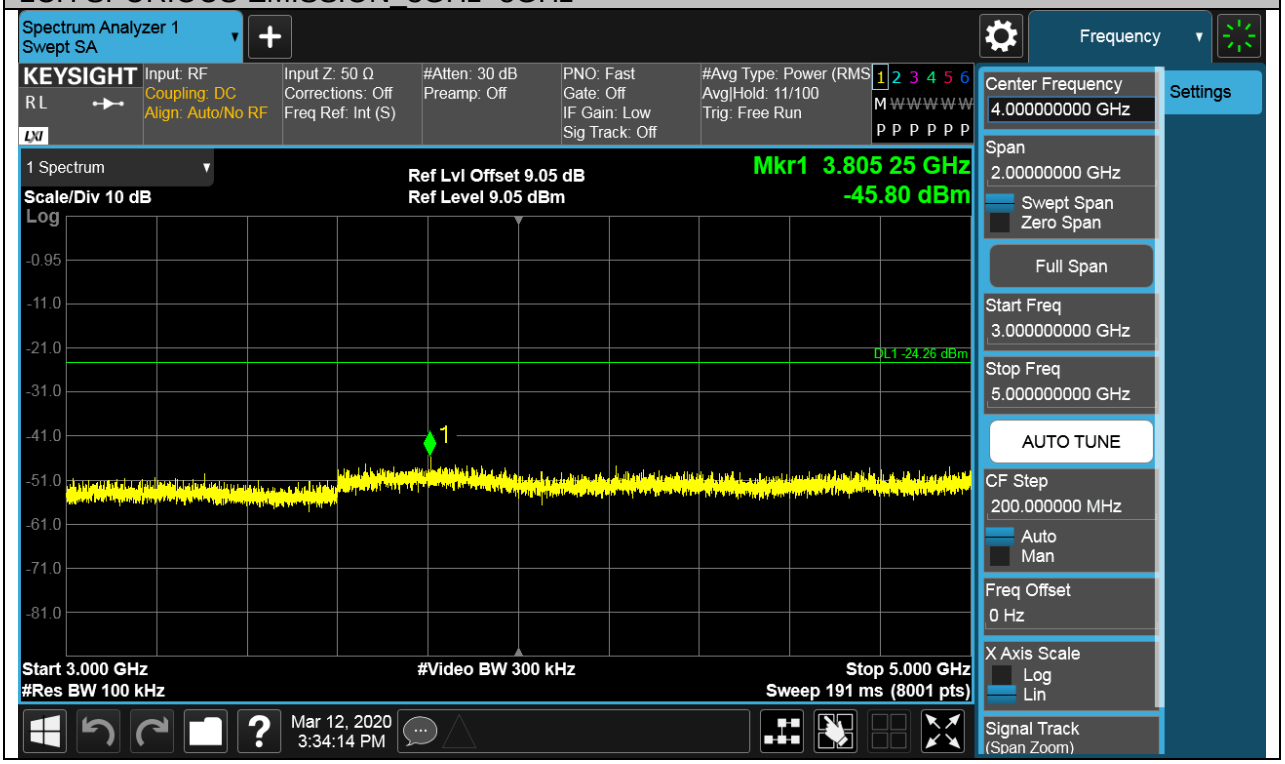
LCH SPURIOUS EMISSION

LCH SPURIOUS EMISSION_30MHz~3GHz

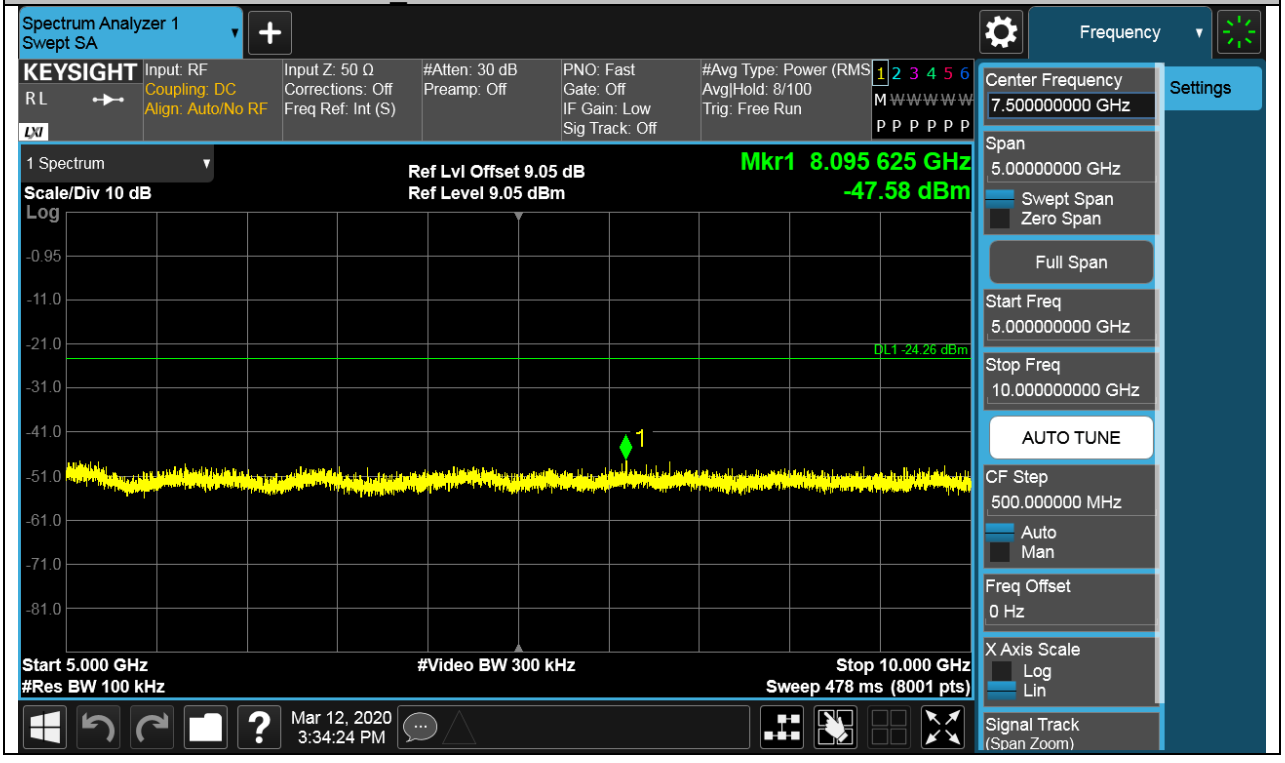


Note: The point 1 which exceeds the limit is 2.4G main carrier.

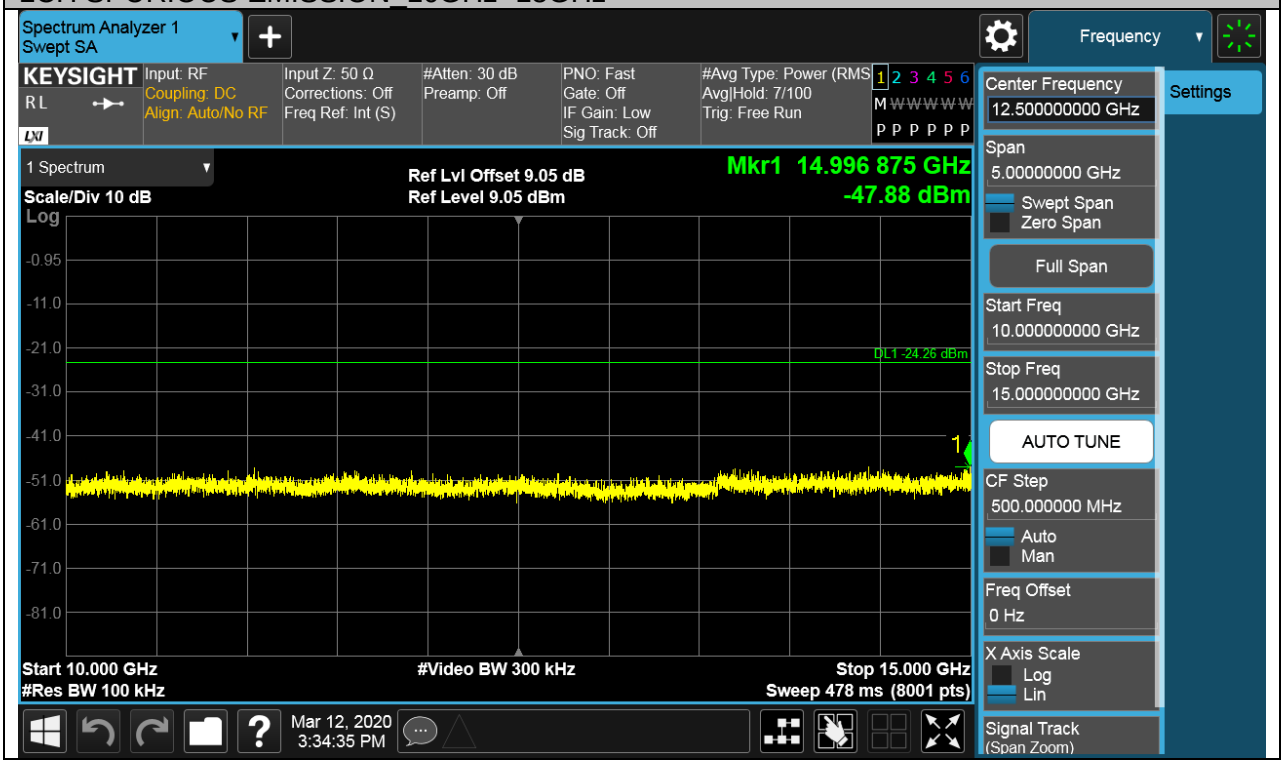
LCH SPURIOUS EMISSION_3GHz~5GHz



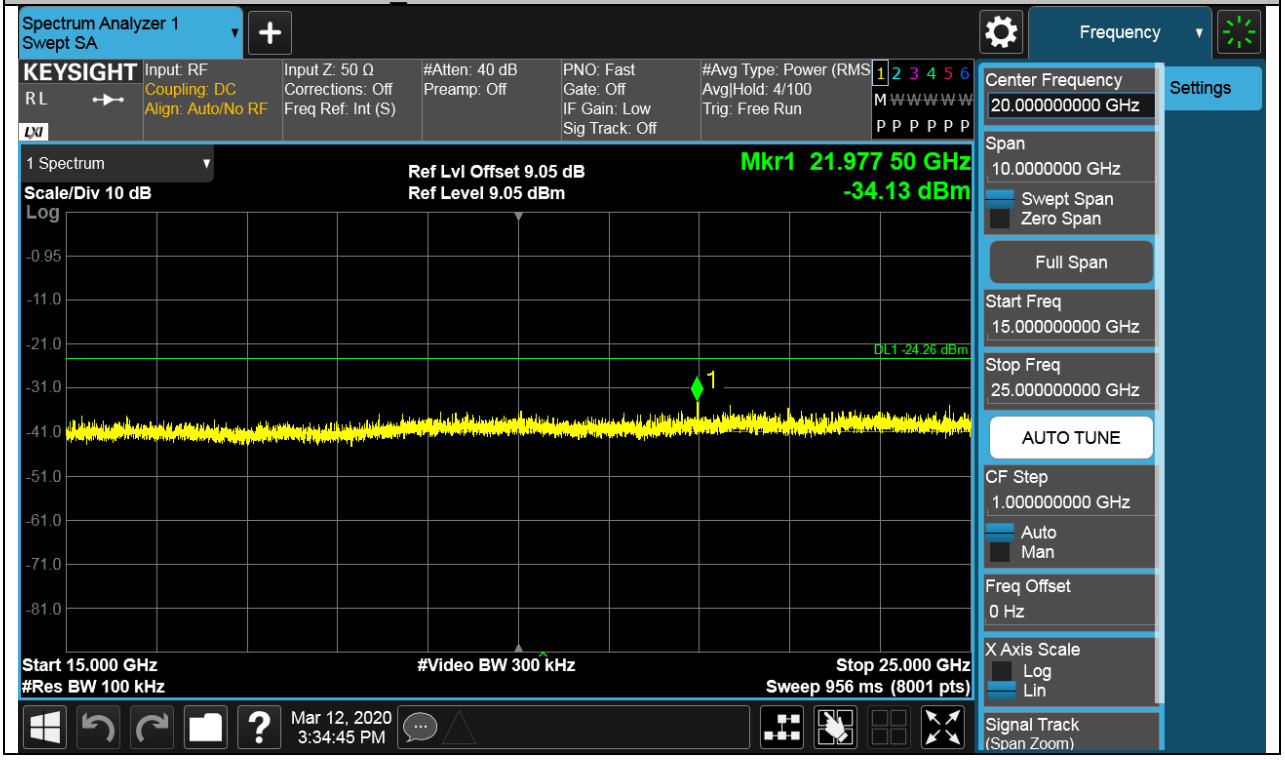
LCH SPURIOUS EMISSION_5GHz~10GHz



LCH SPURIOUS EMISSION_10GHz~15GHz



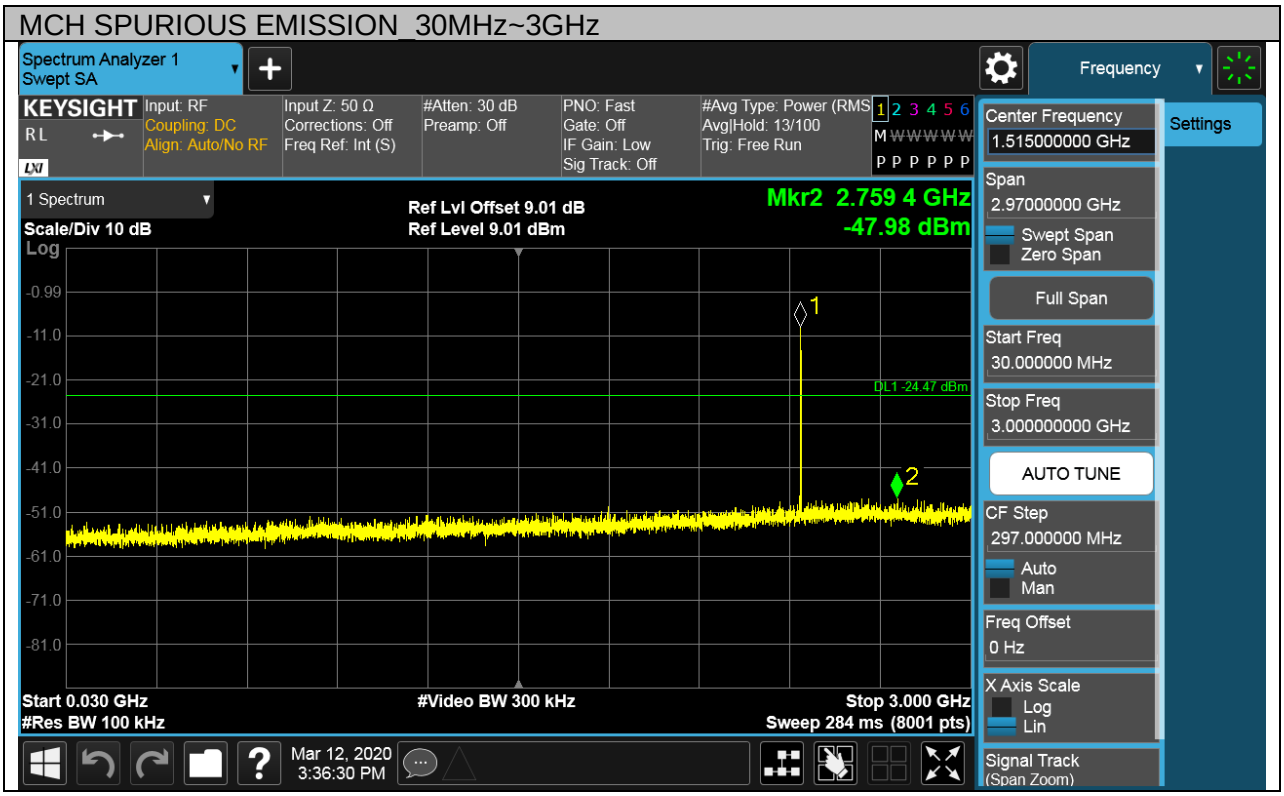
LCH SPURIOUS EMISSION_15GHz~25GHz



SPURIOUS EMISSIONS, MID CHANNEL

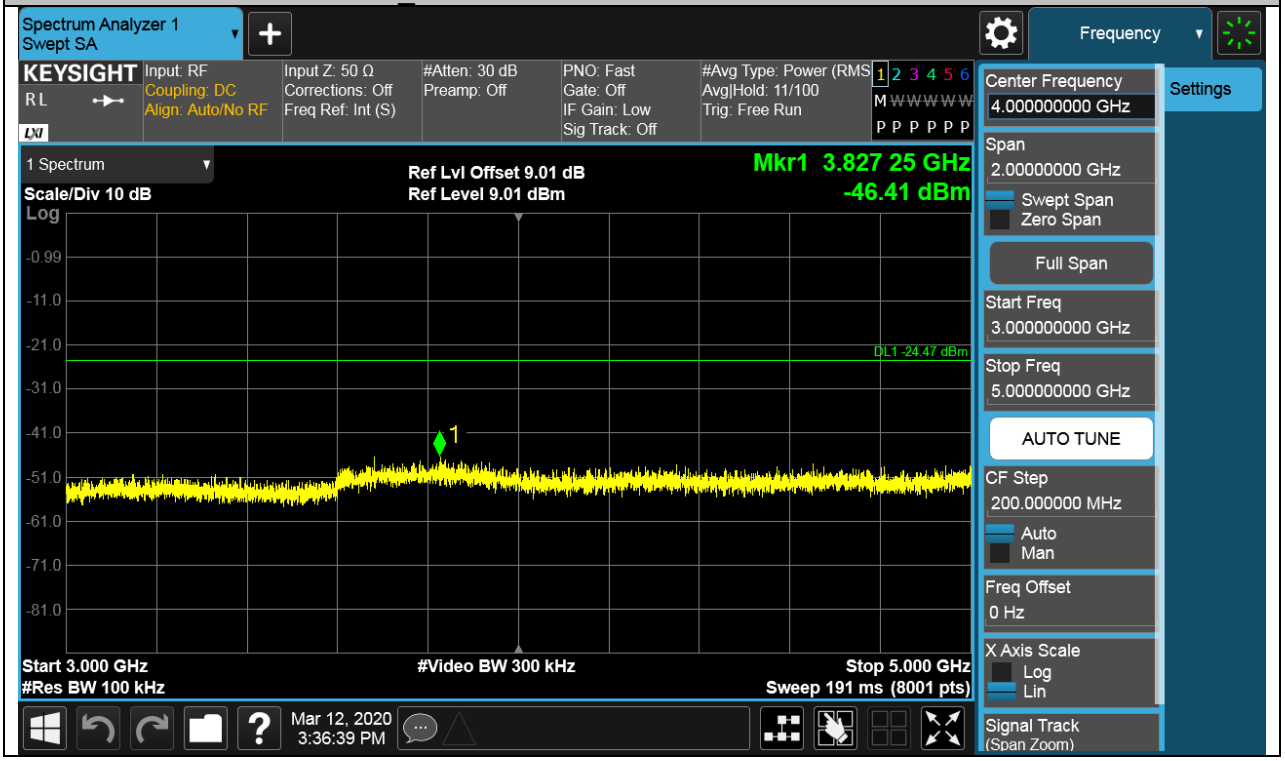
MCH SPURIOUS EMISSION

MCH SPURIOUS EMISSION_30MHz~3GHz



Note: The point 1 which exceeds the limit is 2.4G main carrier.

MCH SPURIOUS EMISSION_3GHz~5GHz



MCH SPURIOUS EMISSION_5GHz~10GHz