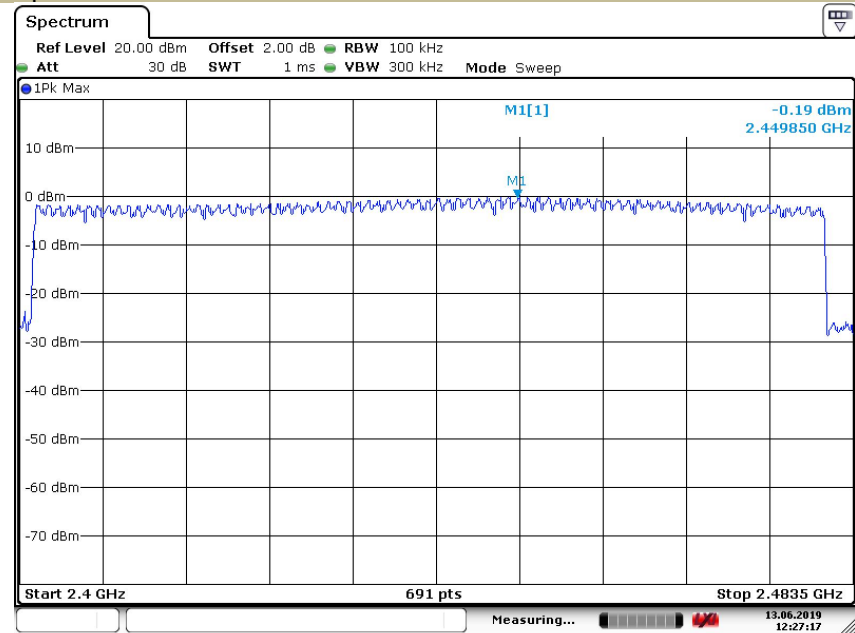


Test Model

Number Of Hopping Frequencies

Span: 2400-2483.5MHz

8DPSK Modulation



Date: 13.JUN.2019 12:27:17

9.4 AVERAGE TIME OF OCCUPANCY (DWELL TIME)

9.4.1 Applicable Standard

According to FCC Part 15.247(a)(1)(iii) and KDB 558074 D01 15.247 MEAS GUIDANCE v05r02

9.4.2 Conformance Limit

For frequency hopping systems operating in the 2400-2483.5MHz band, the average time of occupancy on any channel shall not be greater than 0.4s within a period of 0.4s multiplied by the number of hopping channels employed.

9.4.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

9.4.4 Test Procedure

■ According to FCC Part 15.247(a)(1)(iii)

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = zero span, centered on a hopping channel

RBW = 1 MHz

VBW $\geq$ RBW

Sweep = as necessary to capture the entire dwell time per hopping channel

Detector function = peak

Trace = max hold

If possible, use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section.

9.4.5 Test Results

Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

Modulation Mode	Channel Number	Packet type	Pulse width (ms)	Dwell Time (ms)	Limit (ms)	Verdict
GFSK	0	DH1	0.394	126.08	<400	PASS
	0	DH3	1.644	263.04	<400	PASS
	0	DH5	2.899	309.23	<400	PASS
Note: Dwell Time(DH1)=PW*(1600/2/79)*31.6 Dwell Time(DH3)=PW*(1600/4/79)*31.6 Dwell Time(DH5)=PW*(1600/6/79)*31.6						

Modulation Mode	Channel Number	Packet type	Pulse width (ms)	Dwell Time (ms)	Limit (ms)	Verdict
$\pi/4$ DQPSK	0	2DH1	0.412	131.84	<400	PASS
	0	2DH3	1.694	271.04	<400	PASS
	0	2DH5	2.928	312.32	<400	PASS
Note: Dwell Time(2DH1)=PW*(1600/2/79)*31.6 Dwell Time(2DH3)=PW*(1600/4/79)*31.6 Dwell Time(2DH5)=PW*(1600/6/79)*31.6						

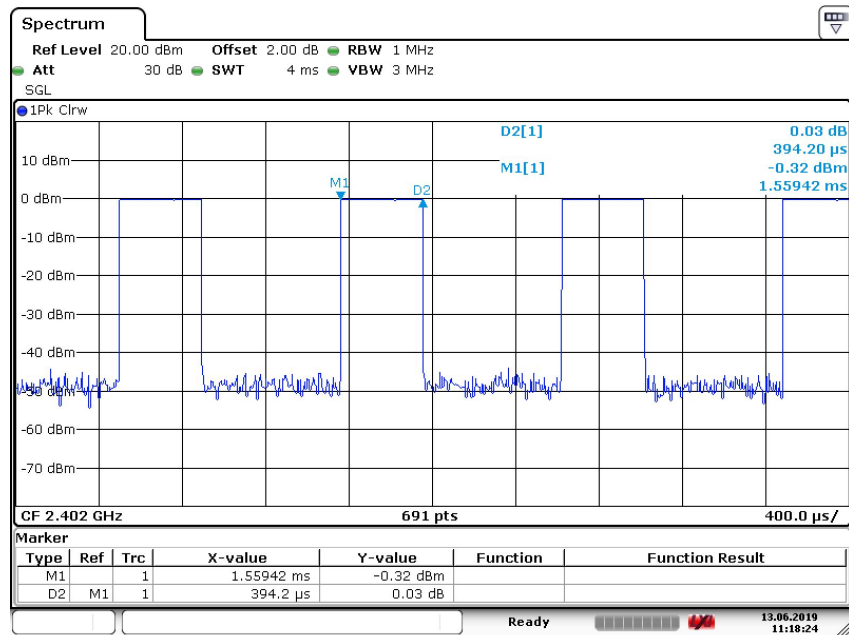
Modulation Mode	Channel Number	Packet type	Pulse width (ms)	Dwell Time (ms)	Limit (ms)	Verdict
8DPSK	0	3DH1	0.412	131.84	<400	PASS
	0	3DH3	1.654	264.64	<400	PASS
	0	3DH5	2.942	313.81	<400	PASS
Note: Dwell Time(3DH1)=PW*(1600/2/79)*31.6 Dwell Time(3DH3)=PW*(1600/4/79)*31.6 Dwell Time(3DH5)=PW*(1600/6/79)*31.6						

Test Model

Average Time Of Occupancy (Dwell Time)

CH 0: 2402MHz

GFSK DH1



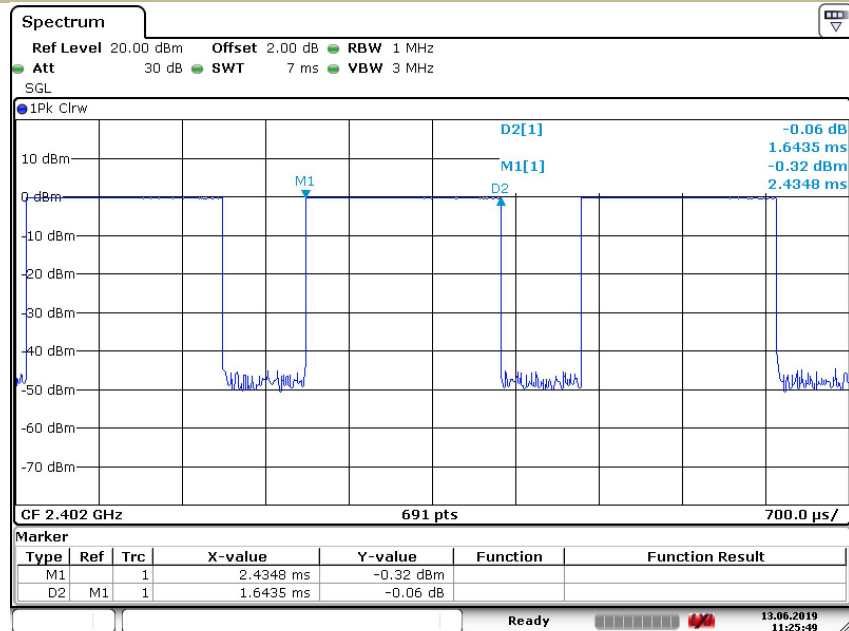
Date: 13.JUN.2019 11:18:25

Test Model

Average Time Of Occupancy (Dwell Time)

CH 0: 2402MHz

GFSK DH3



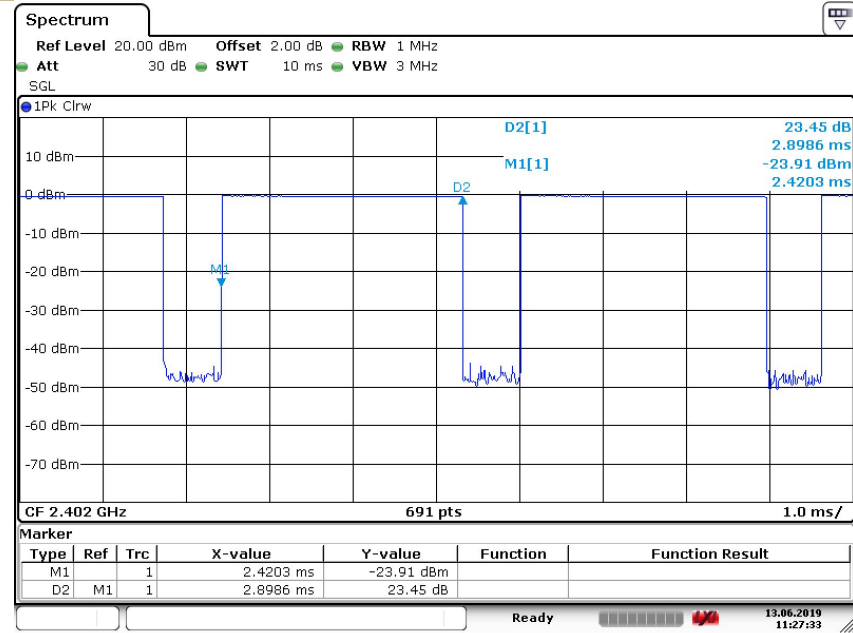
Date: 13.JUN.2019 11:25:49

Test Model

Average Time Of Occupancy (Dwell Time)

CH 0: 2402MHz

GFSK DH5



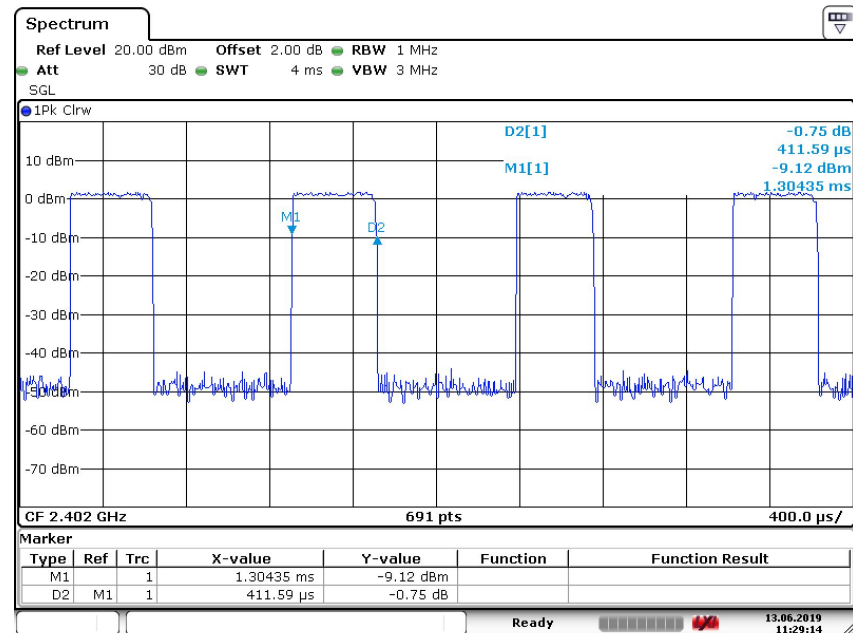
Date: 13.JUN.2019 11:27:33

Test Model

Average Time Of Occupancy (Dwell Time)

CH 0: 2402MHz

$\pi/4$ DQPSK 2DH1



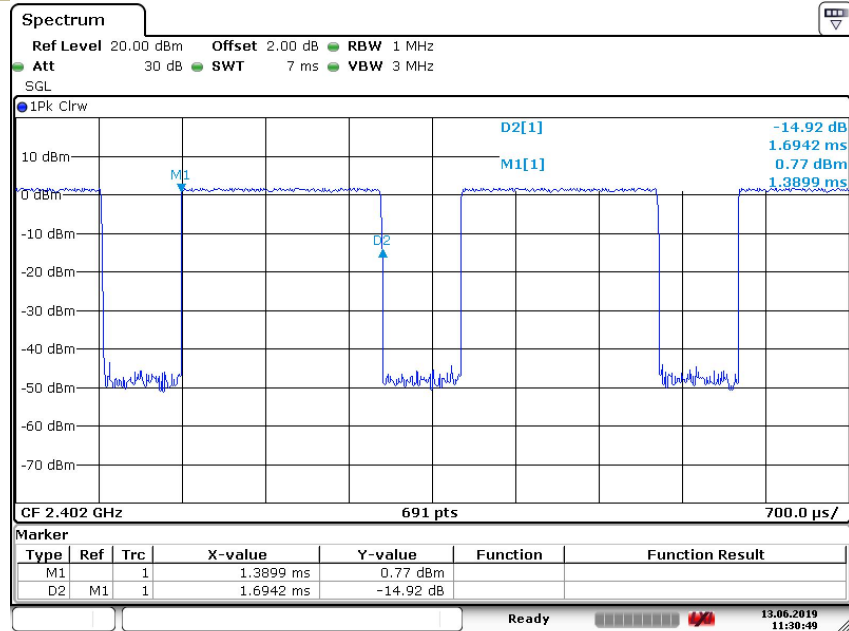
Date: 13.JUN.2019 11:29:14

Test Model

Average Time Of Occupancy (Dwell Time)

CH 0: 2402MHz

$\pi/4$ DQPSK 2DH3



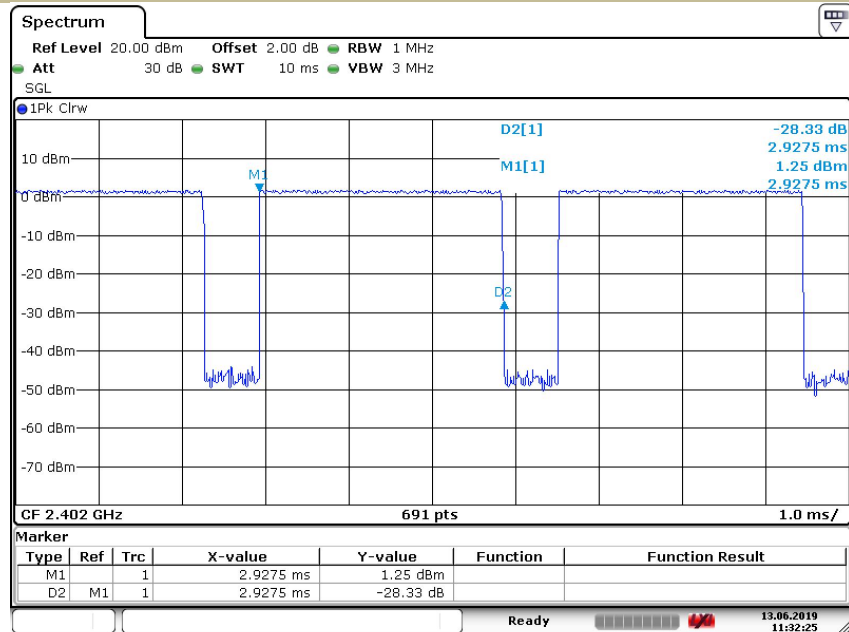
Date: 13.JUN.2019 11:30:50

Test Model

Average Time Of Occupancy (Dwell Time)

CH 0: 2402MHz

$\pi/4$ DQPSK 2DH5



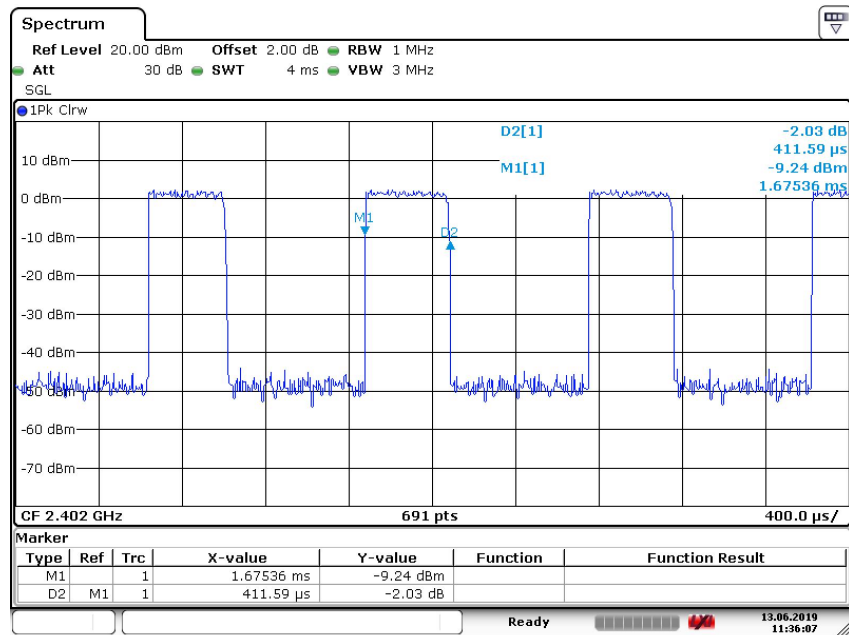
Date: 13.JUN.2019 11:32:25

Test Model

Average Time Of Occupancy (Dwell Time)

CH 0: 2402MHz

8DPSK 3DH1



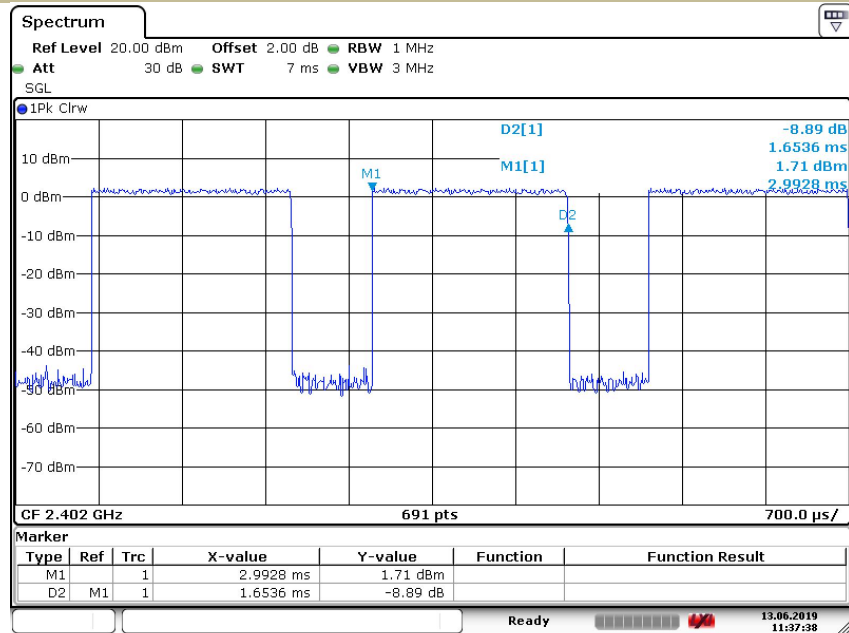
Date: 13.JUN.2019 11:36:07

Test Model

Average Time Of Occupancy (Dwell Time)

CH 0: 2402MHz

8DPSK 3DH3



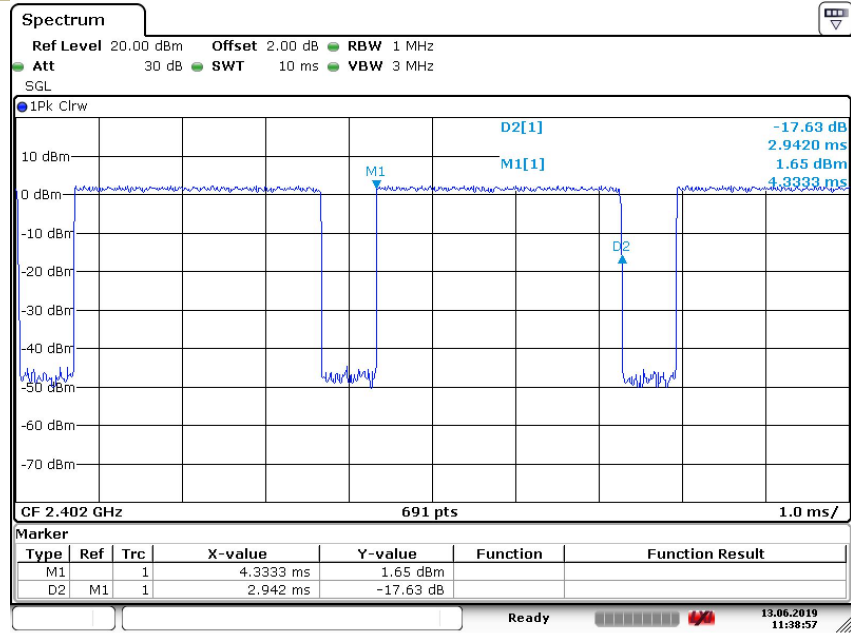
Date: 13.JUN.2019 11:37:38

Test Model

Average Time Of Occupancy (Dwell Time)

CH 0: 2402MHz

8DPSK 3DH5



Date: 13.JUN.2019 11:38:57

9.5 MAXIMUM PEAK CONDUCTED OUTPUT POWER

9.5.1 Applicable Standard

According to FCC Part 15.247(b)(1) and KDB 558074 D01 15.247 MEAS GUIDANCE v05r02

9.5.2 Conformance Limit

The max For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

9.5.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

9.5.4 Test Procedure

■ According to FCC Part 15.247(b)(1)

As an alternative to a peak power measurement, compliance with the limit can be based on a measurement of the maximum conducted output power.

Use the following spectrum analyzer settings:

Set Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel (about 10MHz)

Set RBW > the 20 dB bandwidth of the emission being measured (about 3MHz)

Set VBW $\geq$ RBW

Set Sweep = auto

Set Detector function = peak

Set Trace = max hold

Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission to determine the peak amplitude level.

Test Results

Temperature:	26°C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

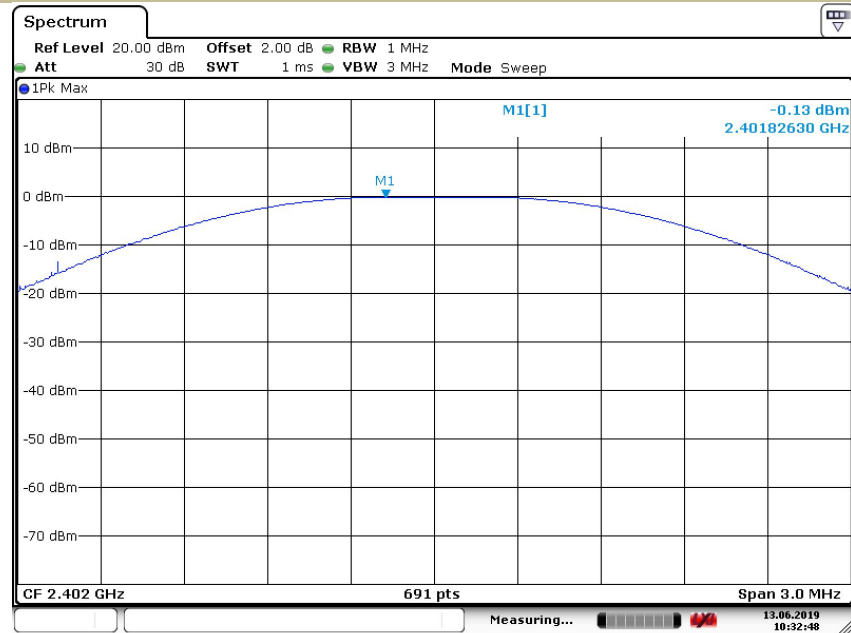
Operation Mode	Channel Number	Channel Frequency (MHz)	Measurement Level (dBm)	Limit (dBm)	Verdict
GFSK	0	2402	-0.13	30	PASS
	39	2441	0.98	30	PASS
	78	2480	-0.54	30	PASS
$\pi/4$ -DQPSK	0	2402	2.00	30	PASS
	39	2441	3.23	30	PASS
	78	2480	1.81	30	PASS
8DPSK	0	2402	2.33	30	PASS
	39	2441	3.57	30	PASS
	78	2480	2.16	30	PASS
Note:					

Test Model

Maximum Peak Conducted Output Power

Channel 0: 2402MHz

GFSK



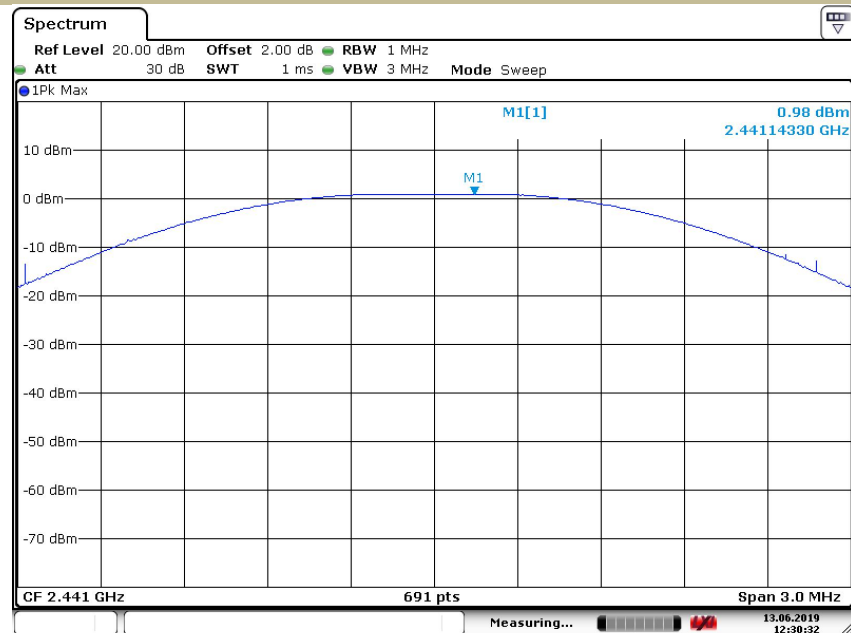
Date: 13.JUN.2019 10:32:48

Test Model

Maximum Peak Conducted Output Power

Channel 39: 2441MHz

GFSK



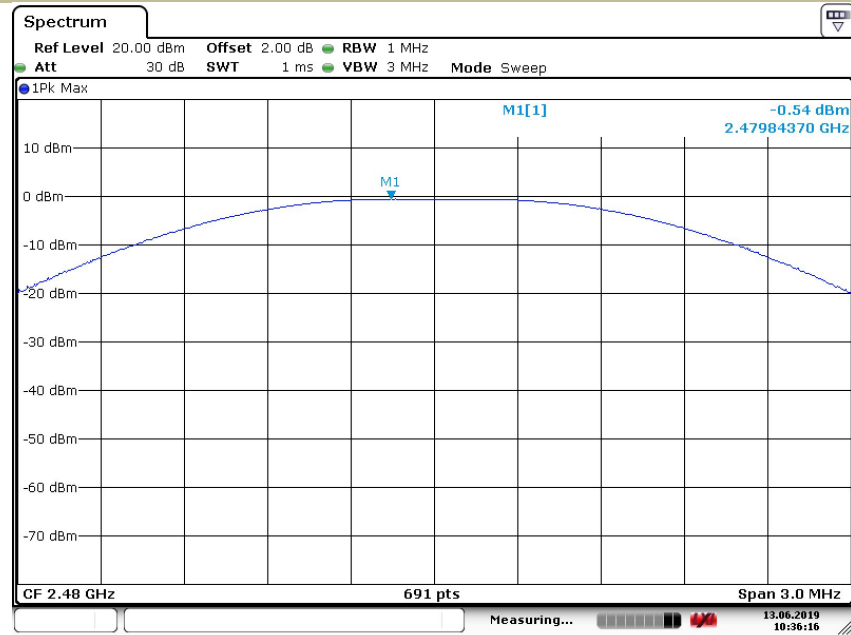
Date: 13.JUN.2019 12:30:32

Test Model

Maximum Peak Conducted Output Power

Channel 78: 2480MHz

GFSK



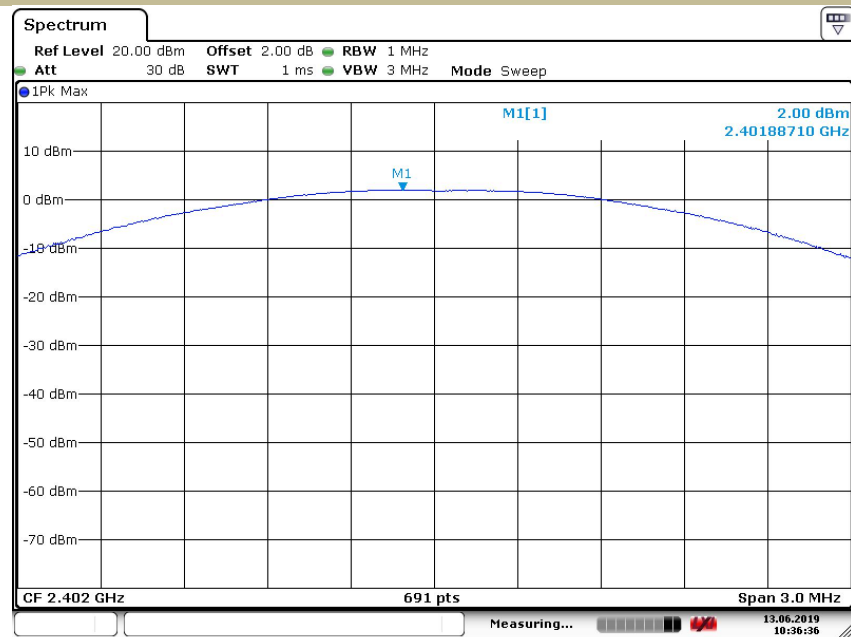
Date: 13.JUN.2019 10:36:17

Test Model

Maximum Peak Conducted Output Power

Channel 0: 2402MHz

π /4DQPSK



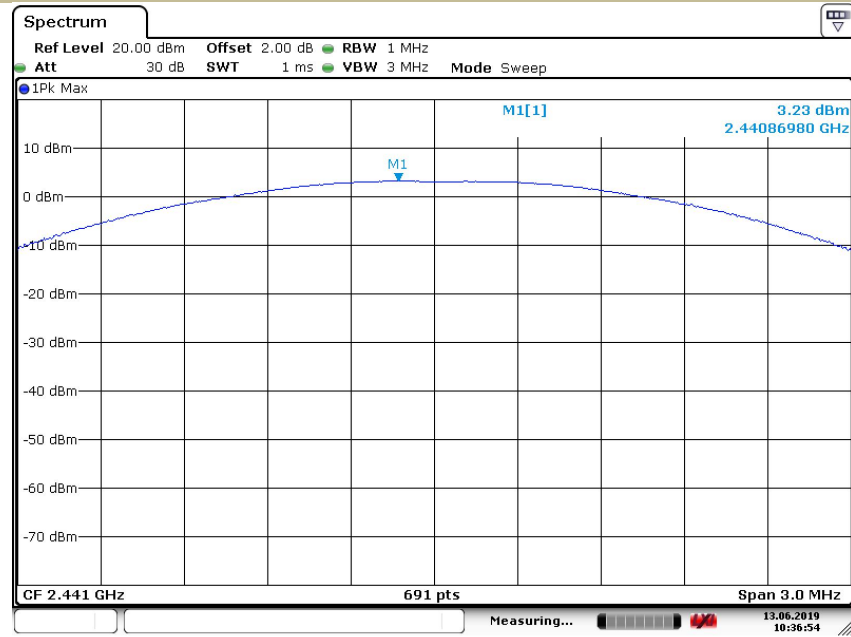
Date: 13.JUN.2019 10:36:37

Test Model

Maximum Peak Conducted Output Power

Channel 39: 2441MHz

π /4DQPSK



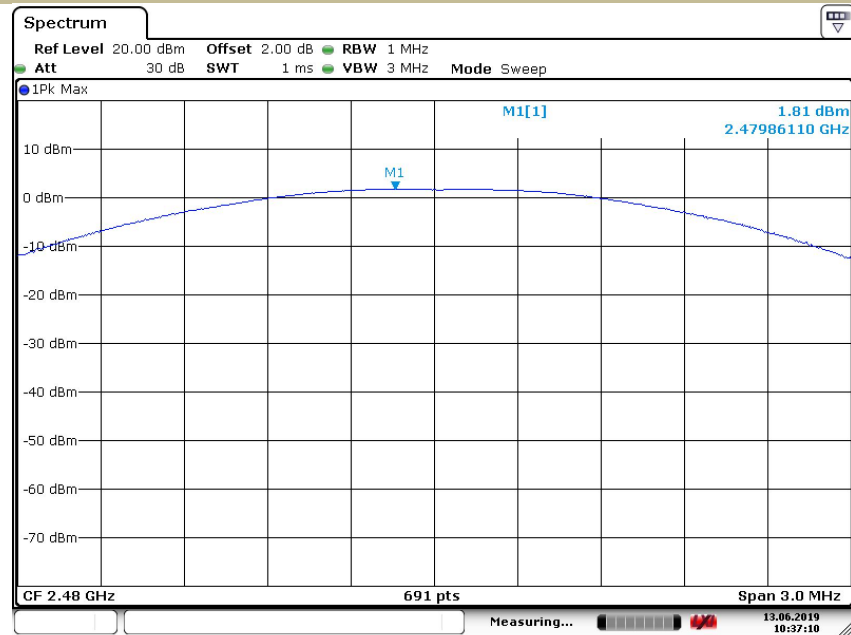
Date: 13.JUN.2019 10:36:55

Test Model

Maximum Peak Conducted Output Power

Channel 78: 2480MHz

π /4DQPSK



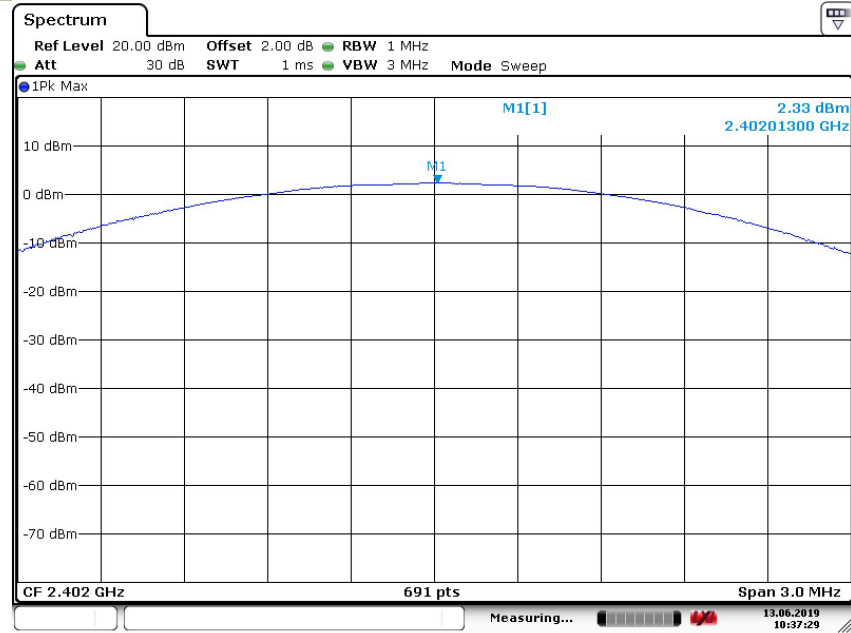
Date: 13.JUN.2019 10:37:10

Test Model

Maximum Peak Conducted Output Power

Channel 0: 2402MHz

8DPSK



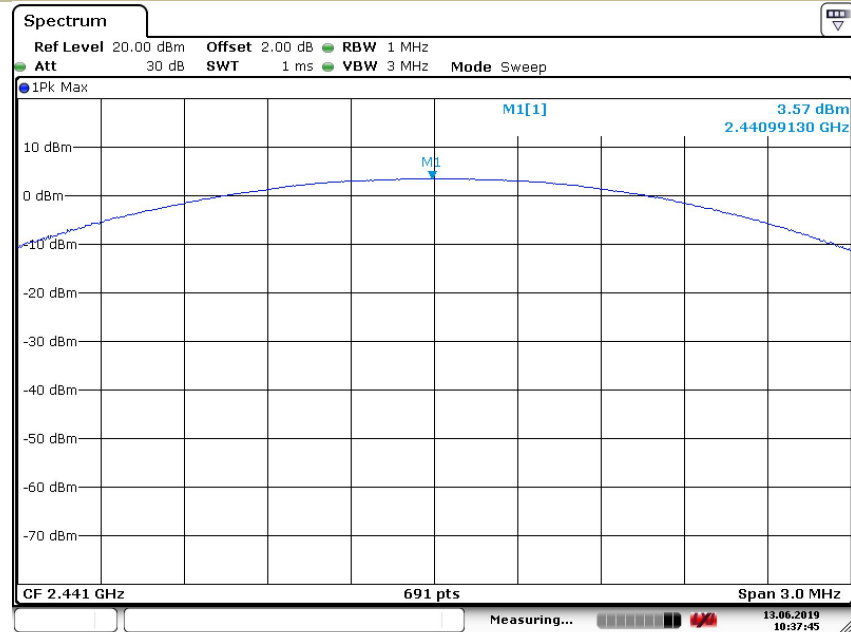
Date: 13.JUN.2019 10:37:29

Test Model

Maximum Peak Conducted Output Power

Channel 39: 2441MHz

8DPSK



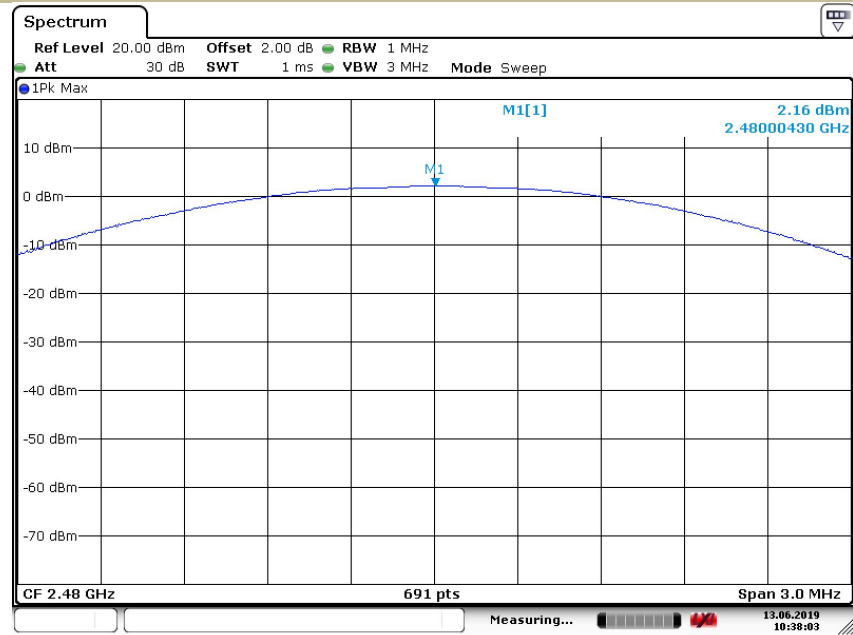
Date: 13.JUN.2019 10:37:45

Test Model

Maximum Peak Conducted Output Power

Channel 78: 2480MHz

8DPSK



Date: 13.JUN.2019 10:38:03

9.6 CONDUCTED SUPRIIOUS EMISSION

9.6.1 Applicable Standard

According to FCC Part 15.247(d) and KDB 558074 D01 15.247 MEAS GUIDANCE v05r02

9.6.2 Conformance Limit

According to FCC Part 15.247(d):

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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, provided the transmitter demonstrates compliance with the peak conducted power limits.

9.6.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

9.6.4 Test Procedure

The transmitter output (antenna port) was connected to the spectrum analyzer

■ Reference level measurement

Establish a reference level by using the following procedure:

Set instrument center frequency to DSS channel center frequency.

Set Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel.

Set the RBW = 100 kHz. Set the VBW $\geq 3 \times$ RBW.

Set Detector = peak. Set Sweep time = auto couple.

Set Trace mode = max hold. Allow trace to fully stabilize.

Use the peak marker function to determine the maximum Maximum conduceted level.

Note that the channel found to contain the maximum conduceted level can be used to establish the reference level.

■ Band-edge Compliance of RF Conducted Emissions

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products which fall outside of the authorized band of operation

Set RBW $\geq 1\%$ of the span=100kHz Set VBW $\geq$ RBW

Set Sweep = auto Set Detector function = peak Set Trace = max hold

Allow the trace to stabilize. Set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission.

The marker-delta value now displayed must comply with the limit specified in this Section.

Now, using the same instrument settings, enable the hopping function of the EUT. Allow the trace to stabilize. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit.

■ Conduceted Spurious RF Conducted Emission

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic.(30MHz to 25GHz). Set RBW = 100 kHz Set VBW $\geq$ RBW

Set Sweep = auto Set Detector function = peak Set Trace = max hold

Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded. The level displayed must comply with the limit specified in this Section.

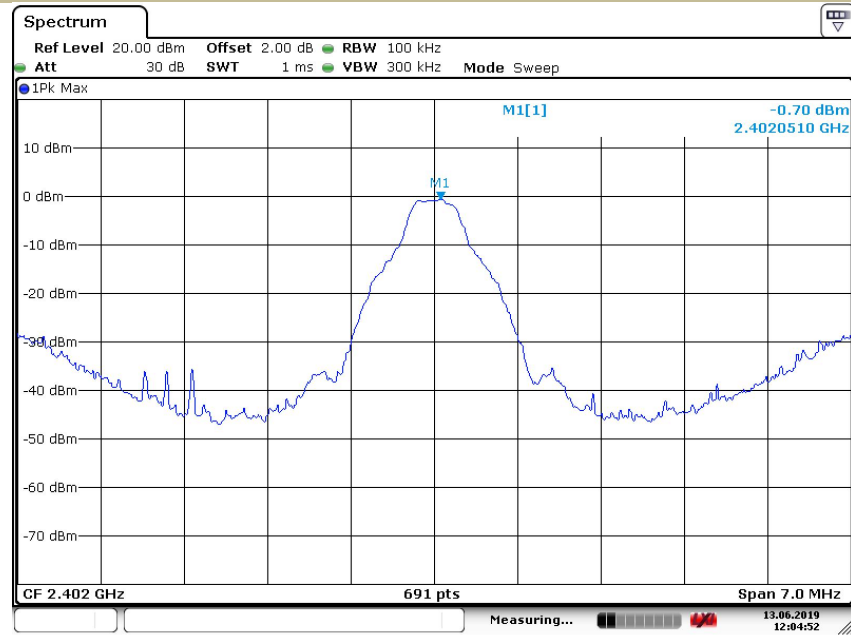
9.6.5 Test Results

Test Model

Maximum Conduced Level RBW=100kHz

Channel 0: 2402MHz

GFSK



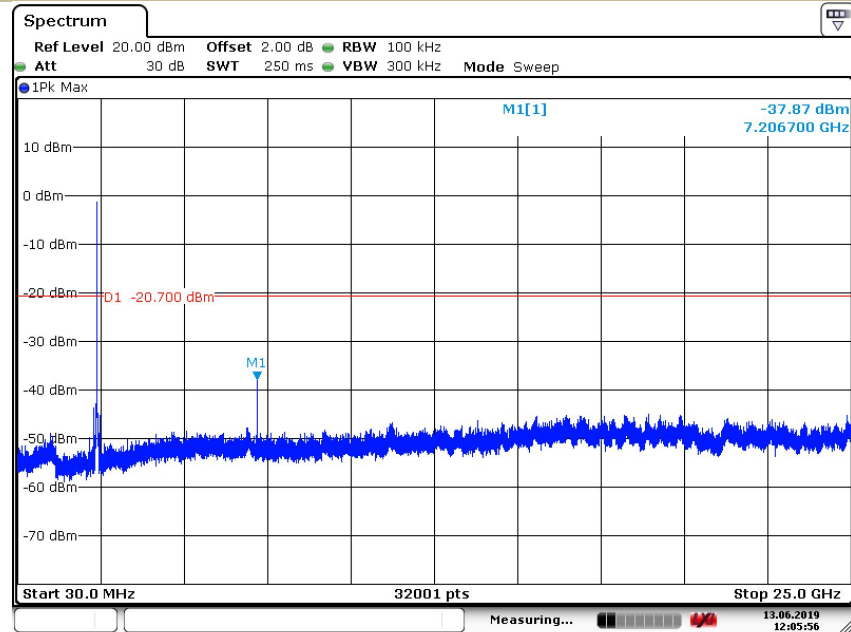
Date: 13.JUN.2019 12:04:53

Test Model

Conduced Spurious RF Conducted Emission

Channel 0: 2402MHz

GFSK



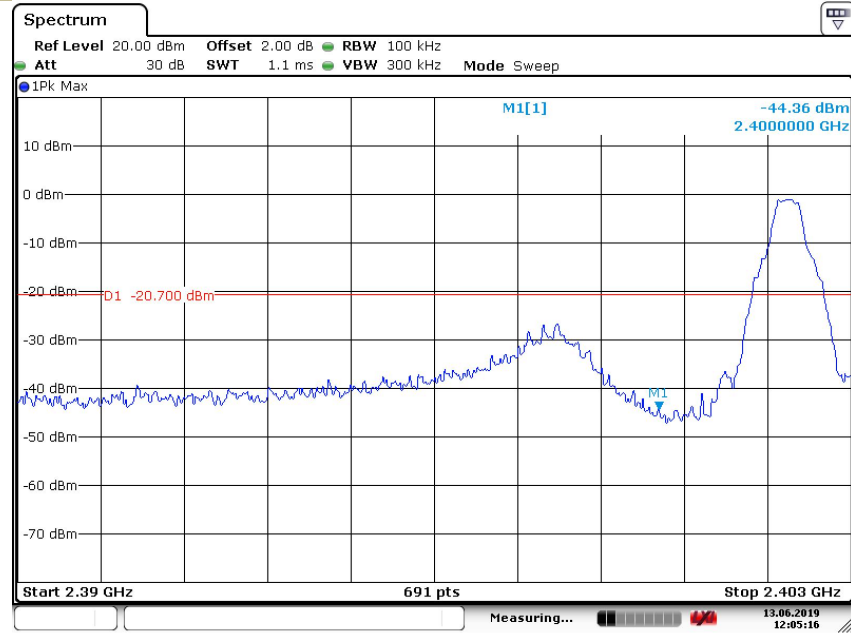
Date: 13.JUN.2019 12:05:56

Test Model

Band-edge Conducted Emissions

Channel 0: 2402MHz

GFSK



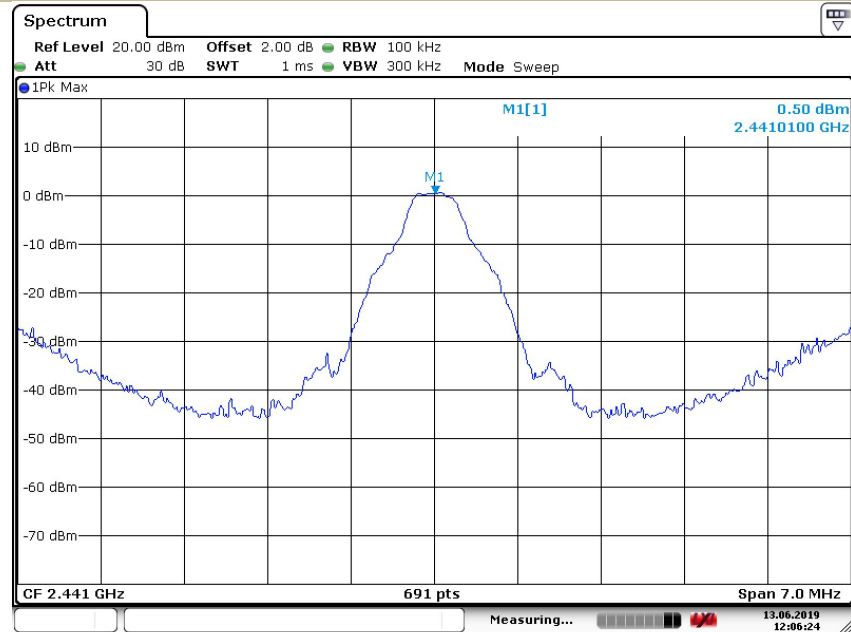
Date: 13.JUN.2019 12:05:17

Test Model

Maximum Conducted Level RBW=100kHz

Channel 39: 2441MHz

GFSK



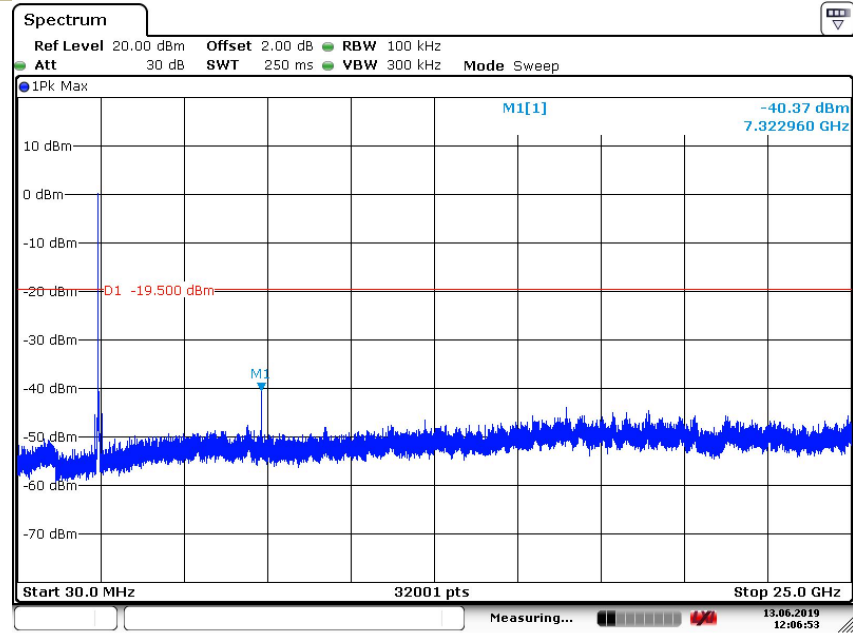
Date: 13.JUN.2019 12:06:25

Test Model

Conducted Spurious RF Conducted Emission

Channel 39: 2441MHz

GFSK



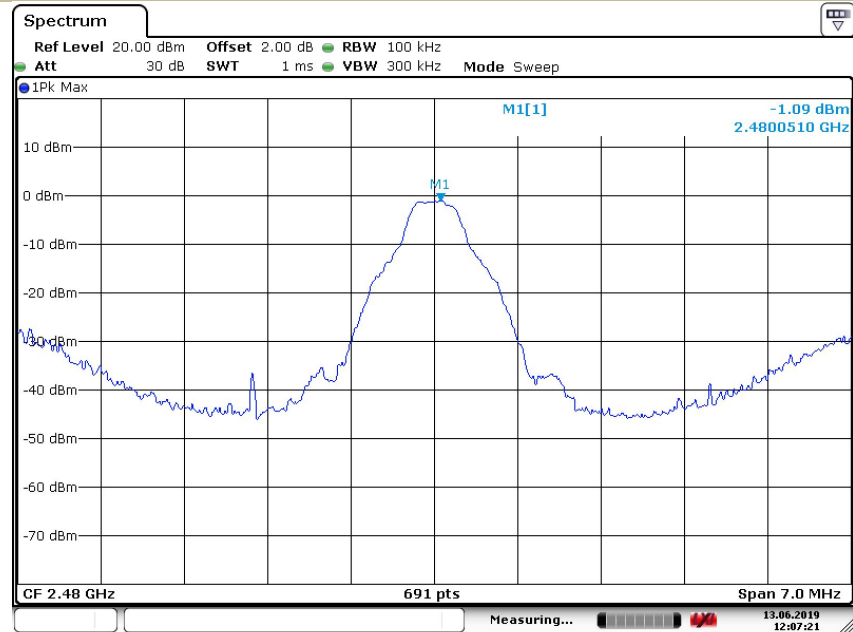
Date: 13.JUN.2019 12:06:53

Test Model

Maximum Conducted Level RBW=100kHz

Channel 78: 2480MHz

GFSK



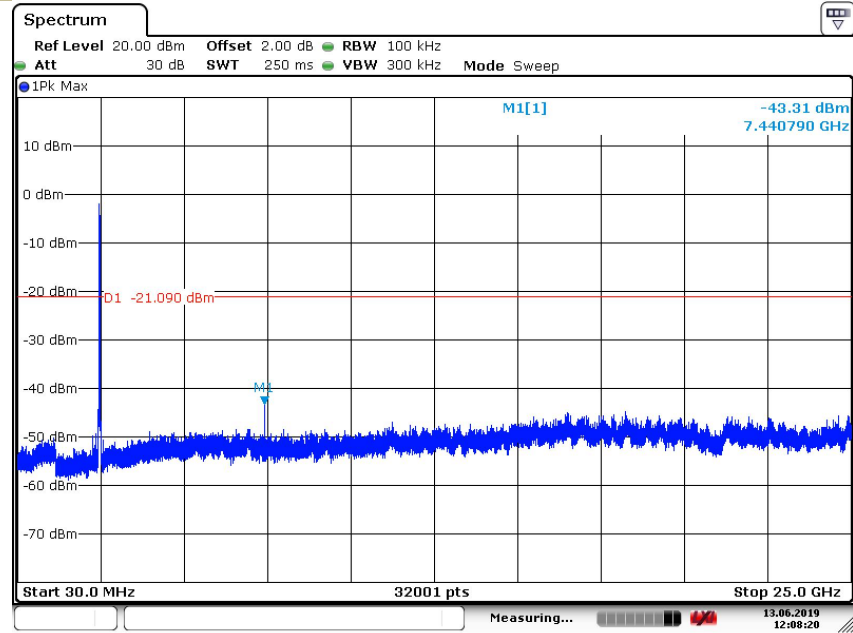
Date: 13.JUN.2019 12:07:21

Test Model

Conducted Spurious RF Conducted Emission

Channel 78: 2480MHz

GFSK



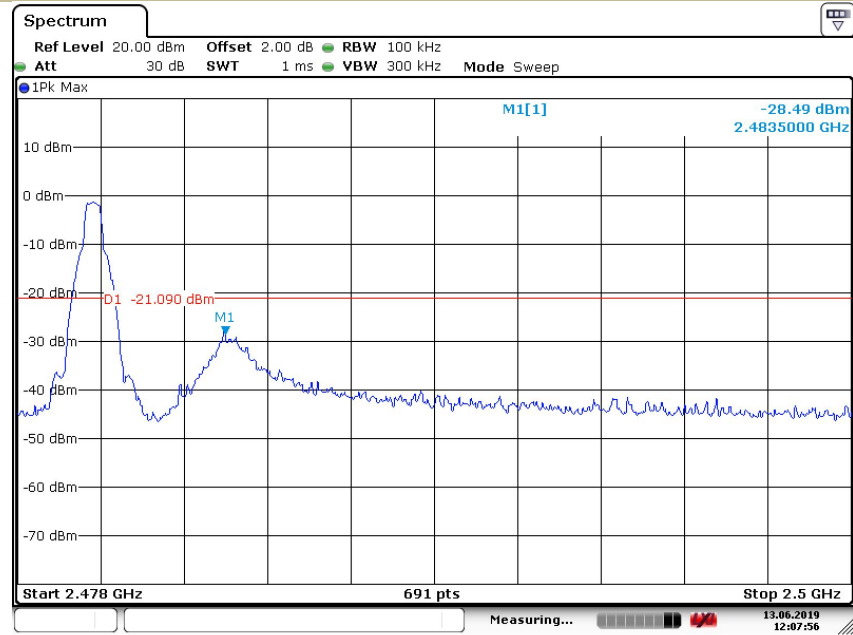
Date: 13.JUN.2019 12:08:20

Test Model

Band-edge Conducted Emissions

Channel 78: 2480MHz

GFSK



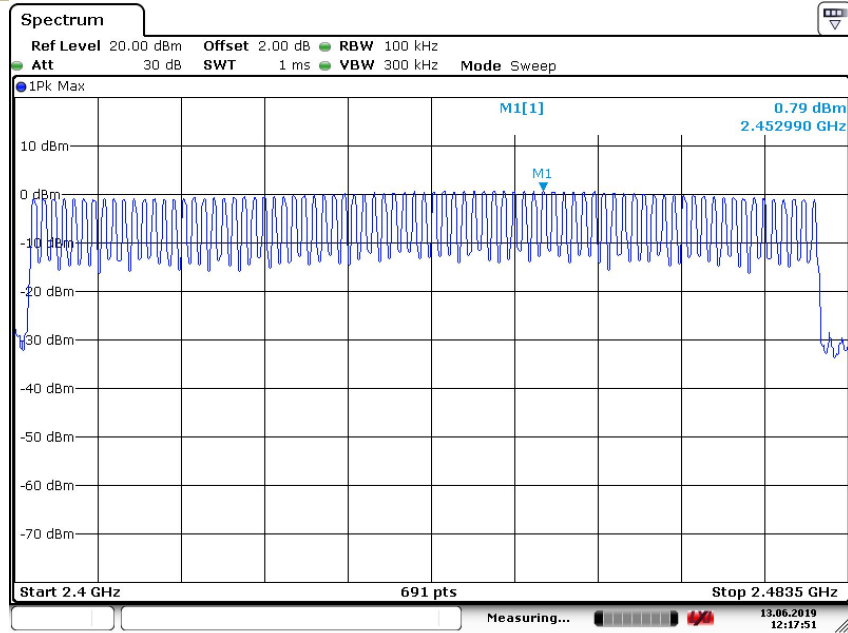
Date: 13.JUN.2019 12:07:56

Test Model

Maximum Conducted Level RBW=100kHz

Hopping

GFSK



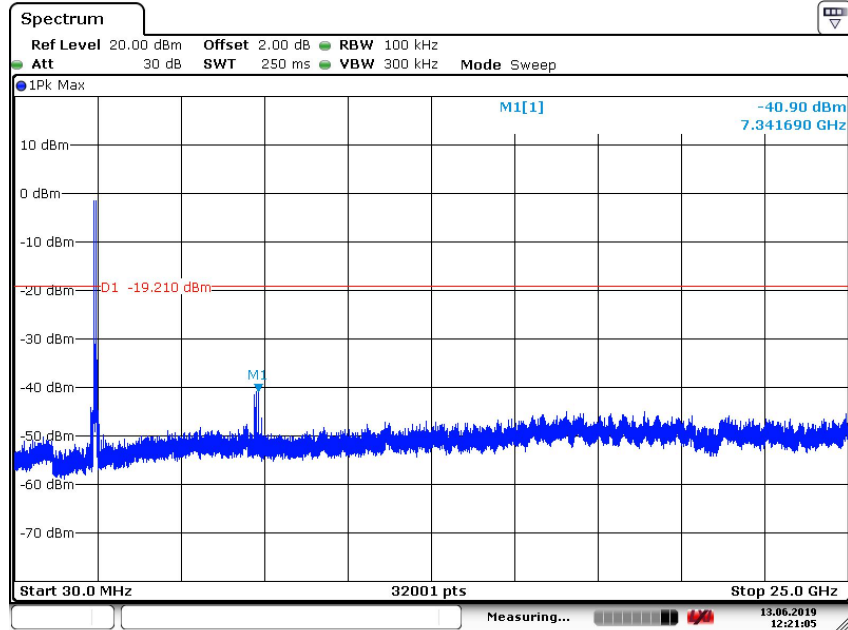
Date: 13.JUN.2019 12:17:52

Test Model

Conducted Spurious RF Conducted Emission

Hopping

GFSK



Date: 13.JUN.2019 12:21:05