

## Appendix A

### RF Test Data for BT V5.0(BDR/EDR) (Conducted Measurement)

Product Name: Music hat  
Trade Mark: N/A  
Test Model: Music hat 1902

#### Environmental Conditions

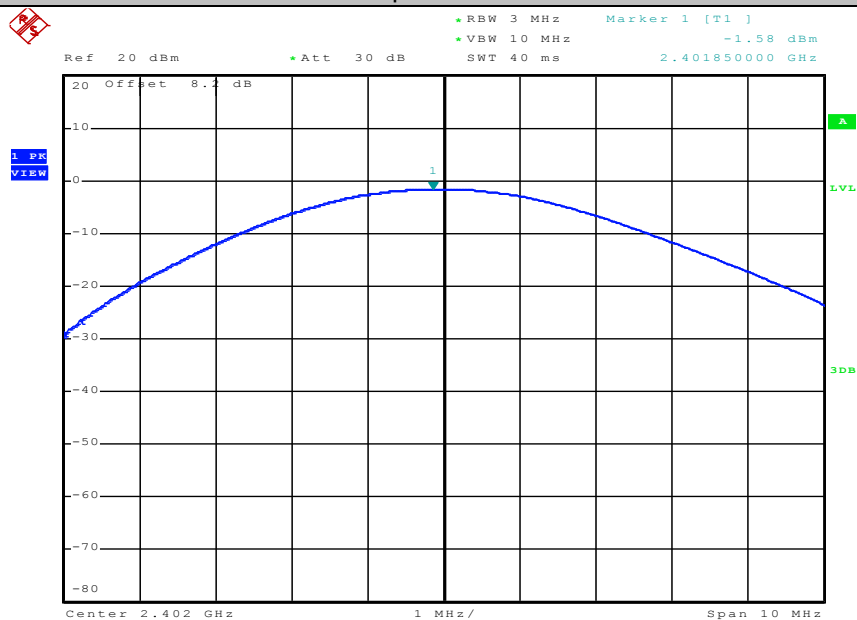
|                    |             |
|--------------------|-------------|
| Temperature:       | 24.1°C      |
| Relative Humidity: | 53.6%       |
| ATM Pressure:      | 100.0 kPa   |
| Test Engineer:     | David Luo   |
| Supervised by:     | Wang.Chuang |

#### A.1 Maximum Conducted Peak Output Power

| Mode          | Channel. | Maximum Peak Output Power [dBm] | Limit [dBm] | Verdict |
|---------------|----------|---------------------------------|-------------|---------|
| GFSK          | LCH      | -1.580                          | 21          | PASS    |
|               | MCH      | -2.550                          | 21          | PASS    |
|               | HCH      | -4.080                          | 21          | PASS    |
| $\pi/4$ DQPSK | LCH      | 0.650                           | 21          | PASS    |
|               | MCH      | -0.420                          | 21          | PASS    |
|               | HCH      | -2.040                          | 21          | PASS    |

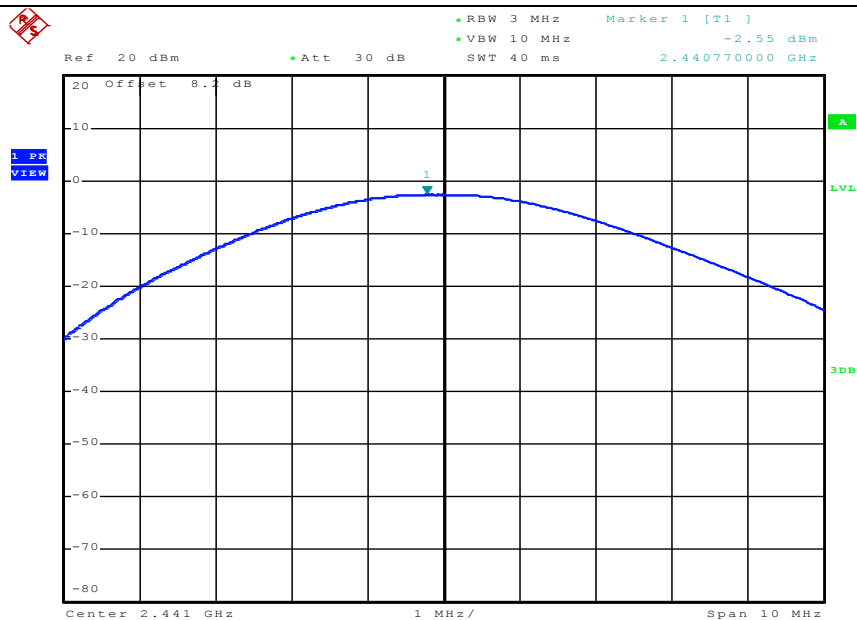
## Test Graphs

GFSK/LCH



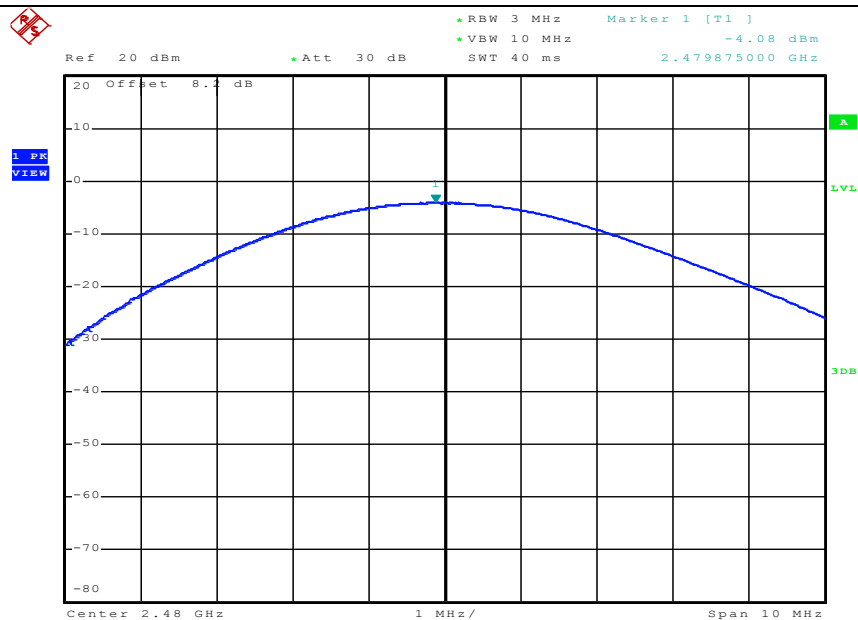
Date: 3.SEP.2019 18:36:05

GFSK/MCH



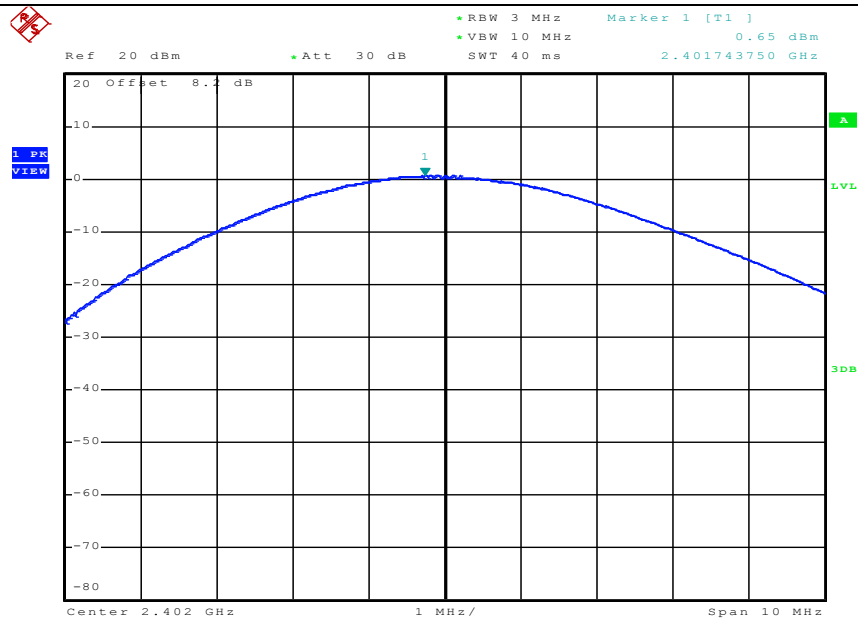
Date: 3.SEP.2019 18:39:27

GFSK/HCH



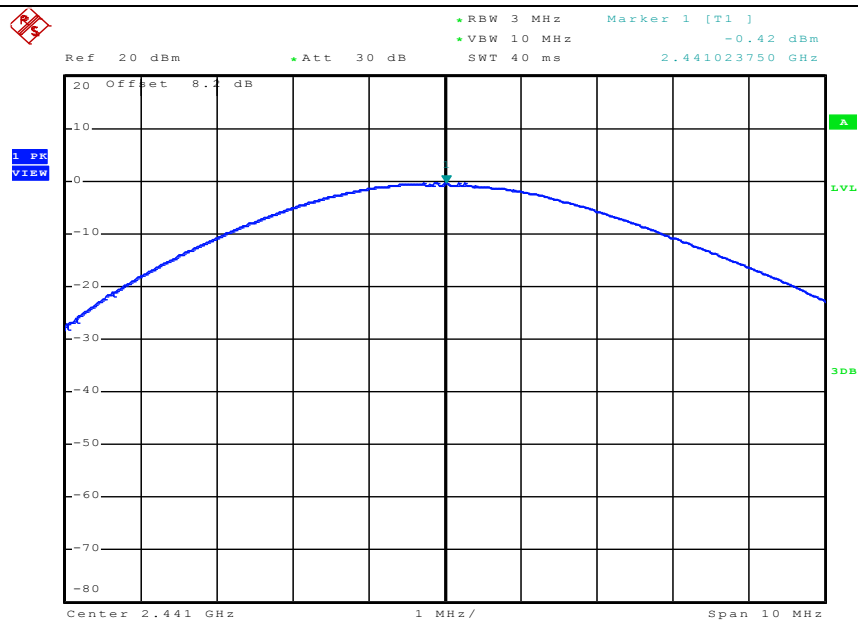
Date: 3.SEP.2019 18:42:00

$\pi/4$ DQPSK/LCH



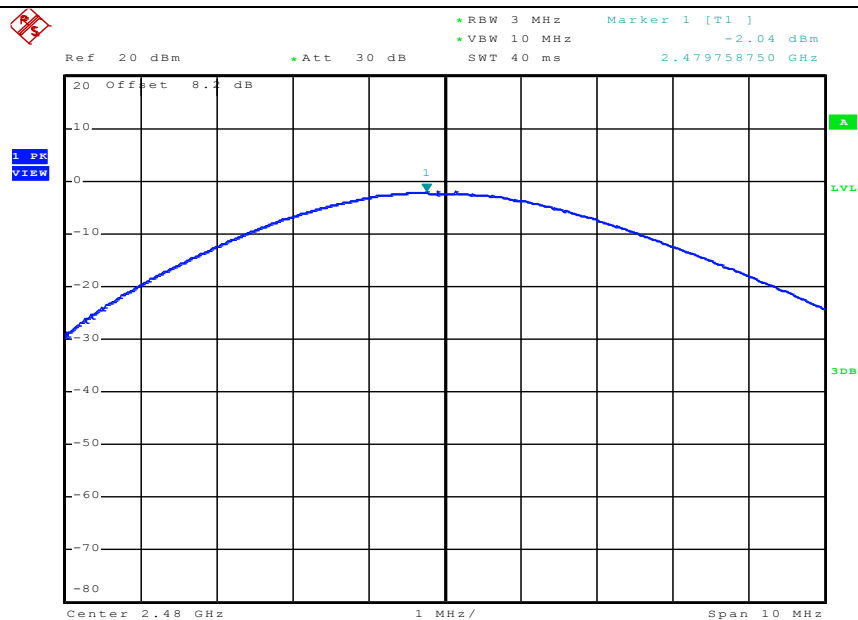
Date: 3.SEP.2019 18:44:41

$\pi/4$ DQPSK/MCH



Date: 3.SEP.2019 18:48:46

$\pi/4$ DQPSK/HCH



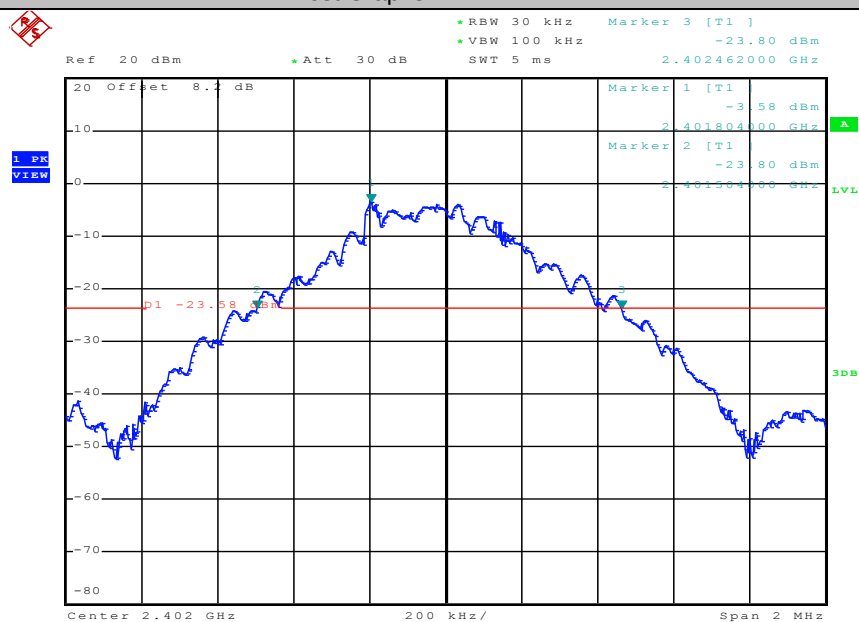
Date: 3.SEP.2019 18:50:30

## A.2 20dB Bandwidth

| Mode          | Channel. | 20dB Bandwidth [MHz] | Limit [MHz]   | Verdict |
|---------------|----------|----------------------|---------------|---------|
| GFSK          | LCH      | 0.958                | Not Specified | PASS    |
|               | MCH      | 0.956                | Not Specified | PASS    |
|               | HCH      | 0.958                | Not Specified | PASS    |
| $\pi/4$ DQPSK | LCH      | 1.284                | Not Specified | PASS    |
|               | MCH      | 1.282                | Not Specified | PASS    |
|               | HCH      | 1.282                | Not Specified | PASS    |

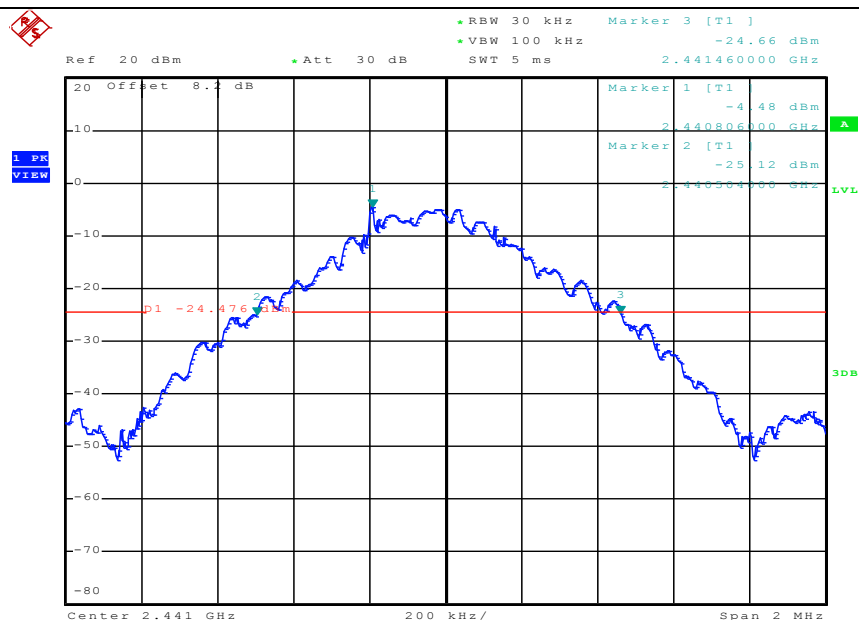
Test Graphs

GFSK/LCH



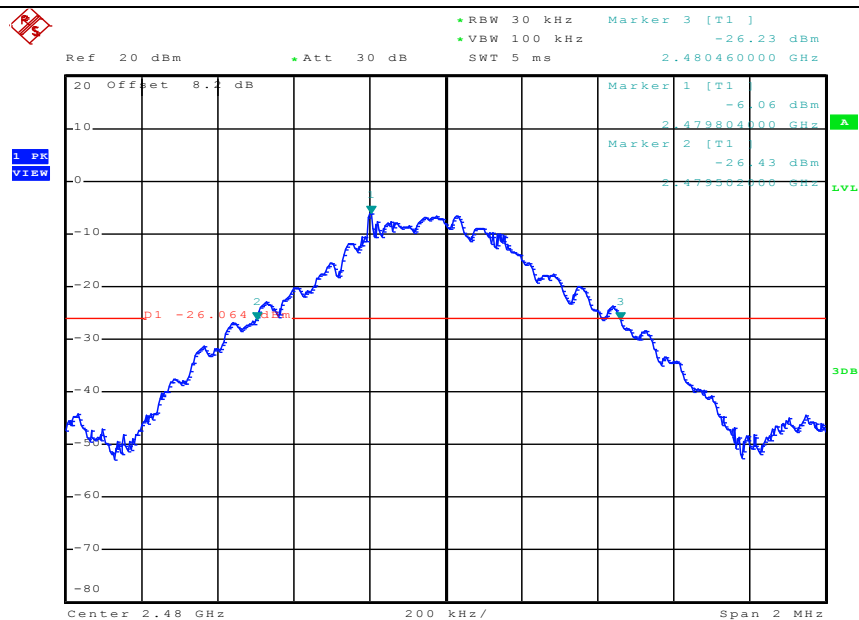
Date: 3.SEP.2019 18:35:28

GFSK/MCH

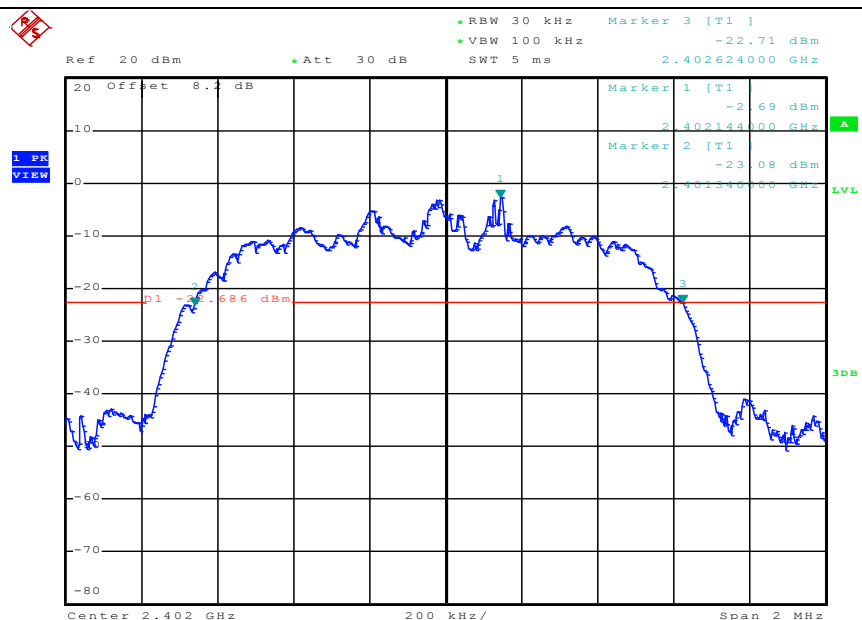


Date: 3.SEP.2019 18:38:50

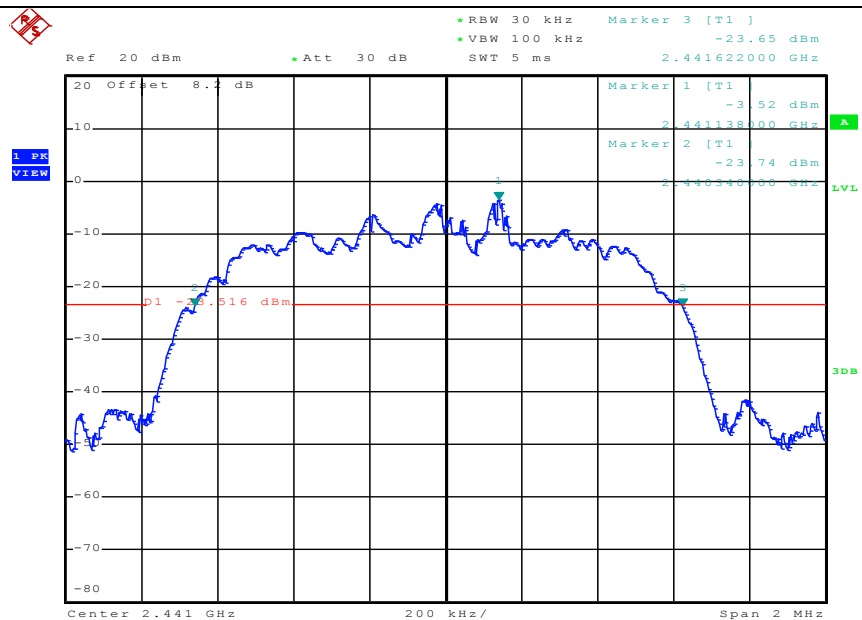
GFSK/HCH



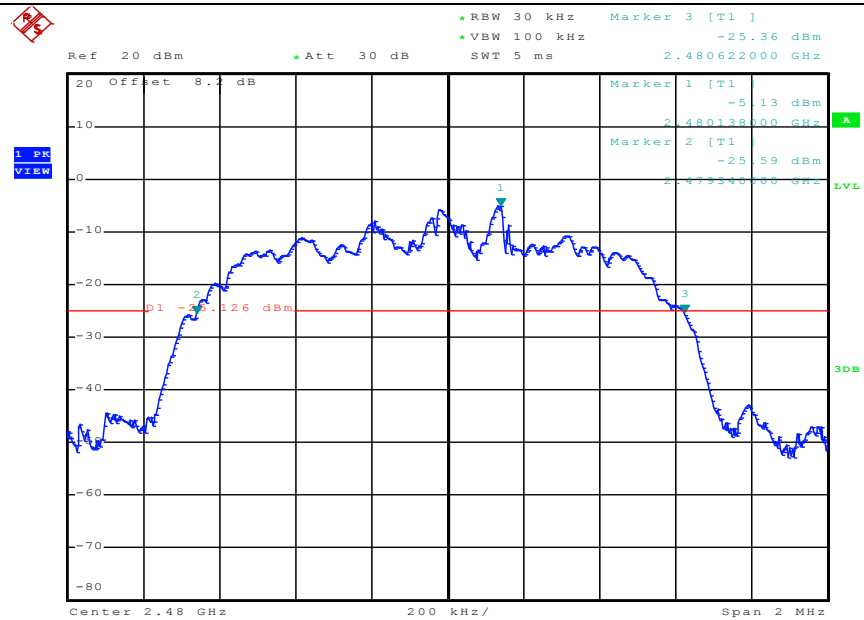
Date: 3.SEP.2019 18:41:24

$\pi/4$ DQPSK/LCH

Date: 3.SEP.2019 18:44:04

 $\pi/4$ DQPSK/MCH

Date: 3.SEP.2019 18:48:09

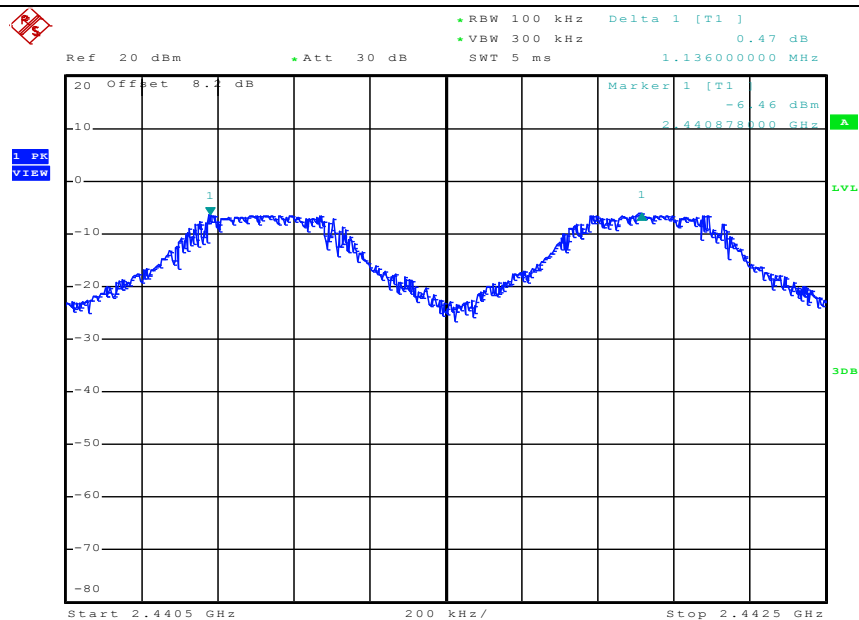
$\pi/4$ DQPSK/HCH

Date: 3.SEP.2019 18:49:53

| Mode          | Channel. | Carrier Frequency Separation [MHz] | Limit [MHz] | Verdict |
|---------------|----------|------------------------------------|-------------|---------|
| GFSK          | LCH      | 1.005                              | 0.639       | PASS    |
|               | MCH      | 1.136                              | 0.613       | PASS    |
|               | HCH      | 1.152                              | 0.613       | PASS    |
| $\pi/4$ DQPSK | LCH      | 1.208                              | 0.819       | PASS    |
|               | MCH      | 1.032                              | 0.819       | PASS    |
|               | HCH      | 0.986                              | 0.819       | PASS    |

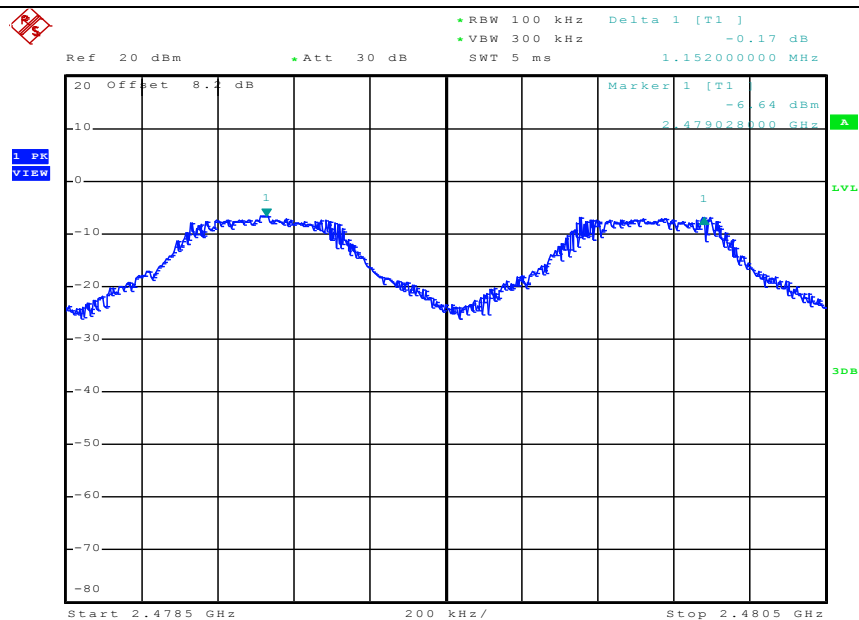


GFSK/MCH

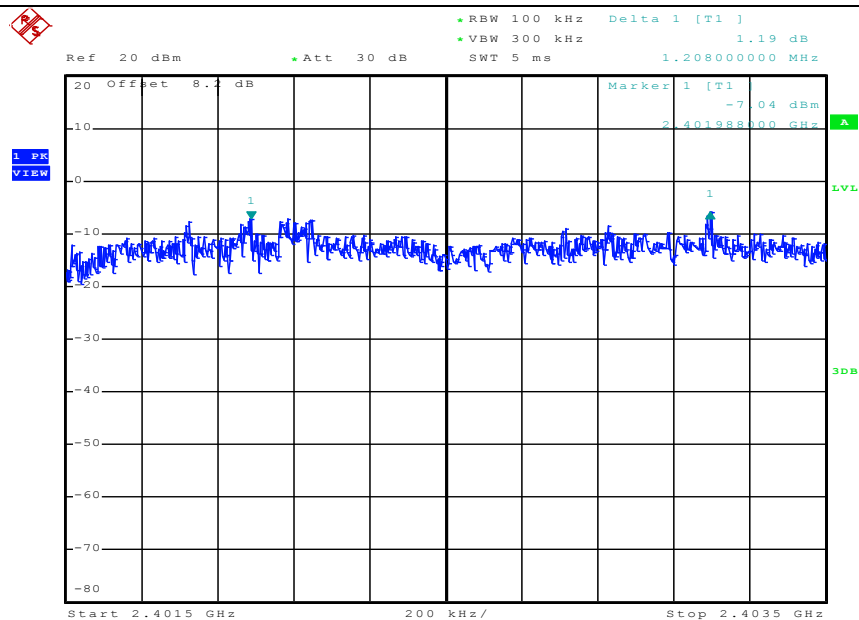


Date: 3.SEP.2019 17:07:44

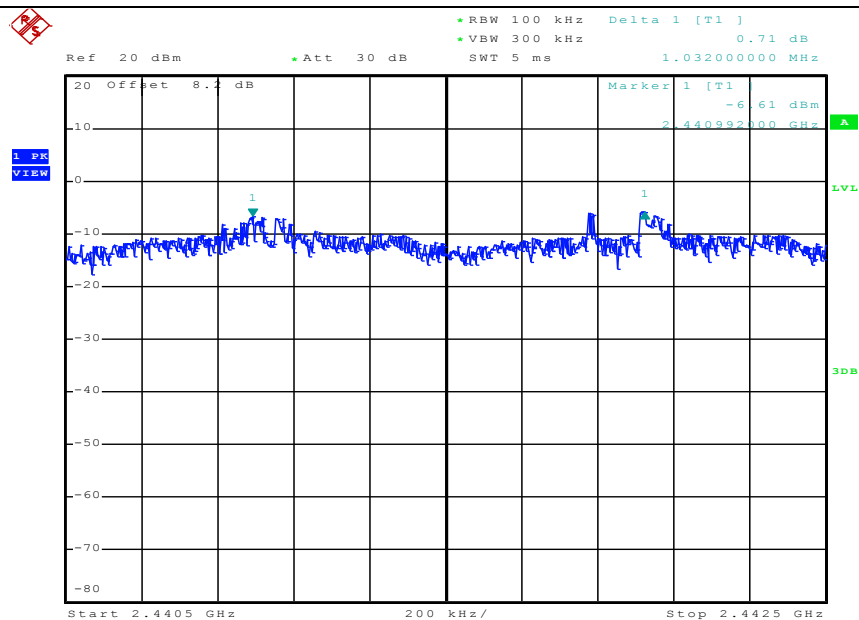
GFSK/HCH



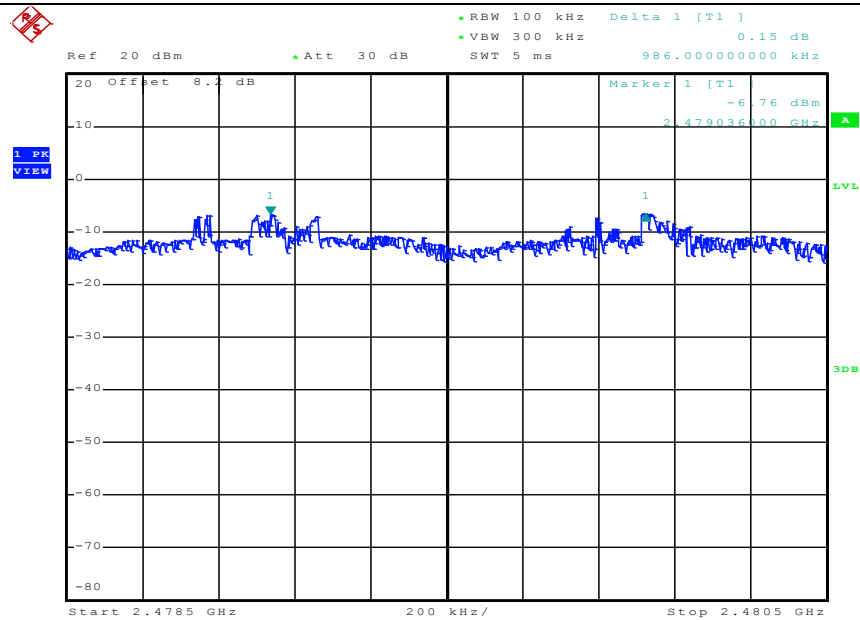
Date: 3.SEP.2019 17:08:46

$\pi/4$ DQPSK/LCH

Date: 3.SEP.2019 17:15:25

 $\pi/4$ DQPSK/MCH

Date: 3.SEP.2019 17:19:00

$\pi/4$ DQPSK/HCH

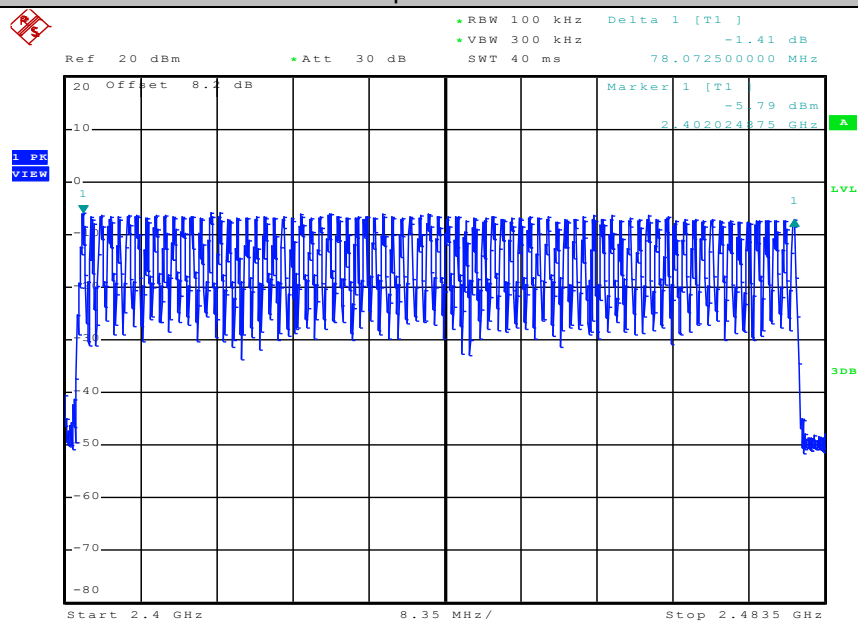
Date: 3.SEP.2019 17:20:09

#### A.4 Hopping Channel Number

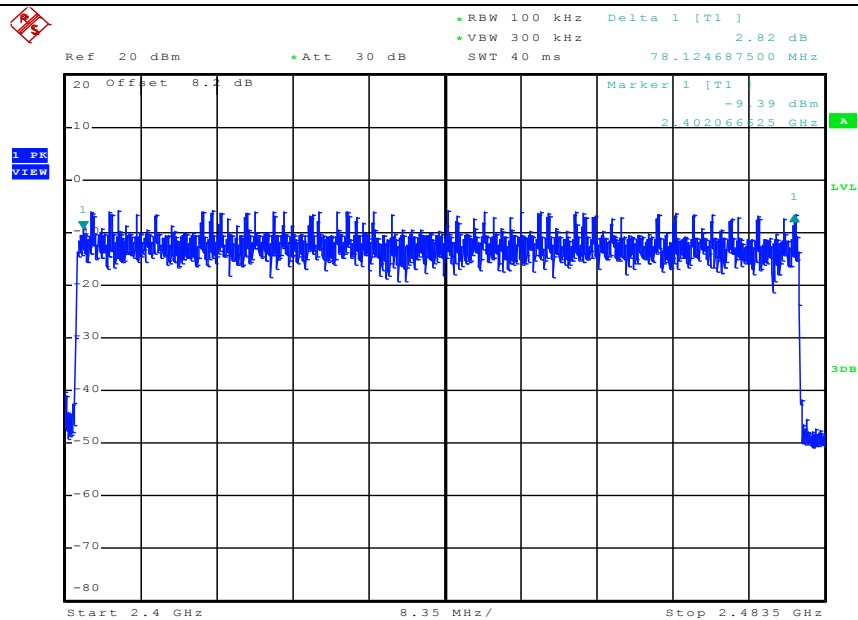
| Mode          | Channel. | Number of Hopping Channel [N] | Limit [N] | Verdict |
|---------------|----------|-------------------------------|-----------|---------|
| GFSK          | Hop      | 79                            | $\geq 15$ | PASS    |
| $\pi/4$ DQPSK | Hop      | 79                            | $\geq 15$ | PASS    |

## Test Graphs

GFSK/Hop



Date: 3.SEP.2019 17:14:38

 $\pi$ /4DQPSK/Hop

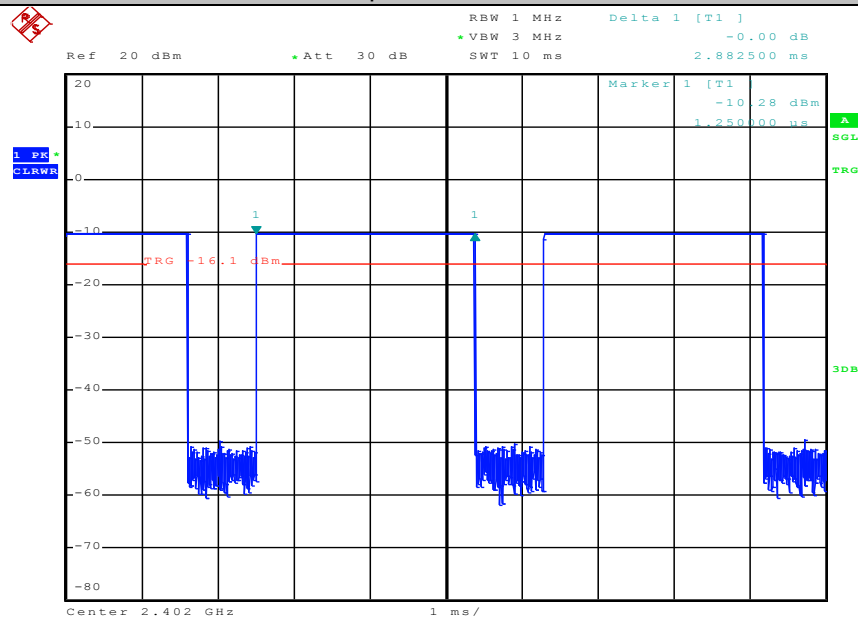
Date: 3.SEP.2019 17:25:07

## A.5 Dwell Time

| Mode          | Packet | Channel | Burst Width<br>[ms/hop/ch] | Total<br>Hops[hop*ch] | Dwell Time[s] | Limit [s] | Verdict |
|---------------|--------|---------|----------------------------|-----------------------|---------------|-----------|---------|
| GFSK          | DH5    | LCH     | 2.88                       | 106.7                 | 0.307         | 0.4       | PASS    |
|               | DH5    | MCH     | 2.88                       | 106.7                 | 0.307         | 0.4       | PASS    |
|               | DH5    | HCH     | 2.88                       | 106.7                 | 0.307         | 0.4       | PASS    |
| $\pi/4$ DQPSK | 2DH5   | LCH     | 2.88                       | 106.7                 | 0.308         | 0.4       | PASS    |
|               | 2DH5   | MCH     | 2.88                       | 106.7                 | 0.308         | 0.4       | PASS    |
|               | 2DH5   | HCH     | 2.88                       | 106.7                 | 0.308         | 0.4       | PASS    |

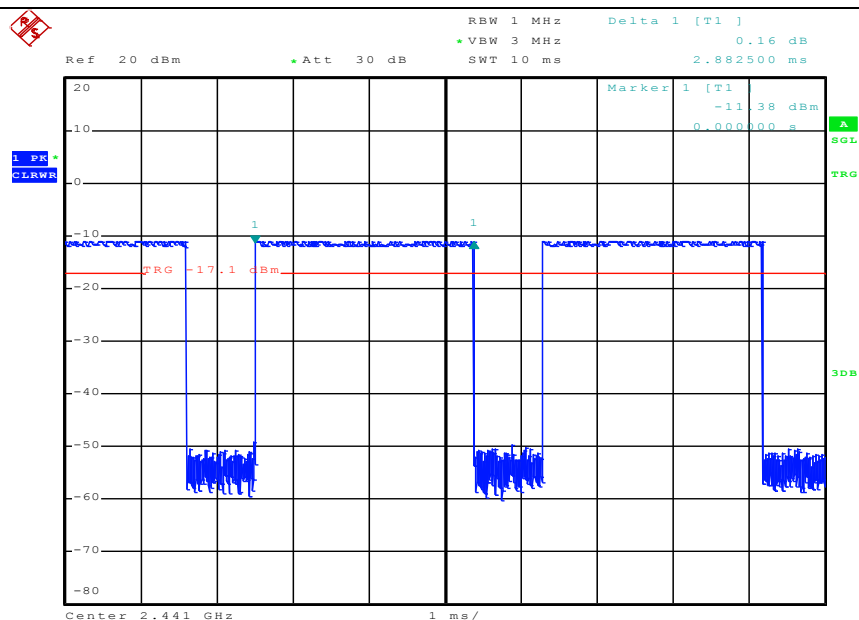
Test Graphs

GFSK\_DH5/LCH



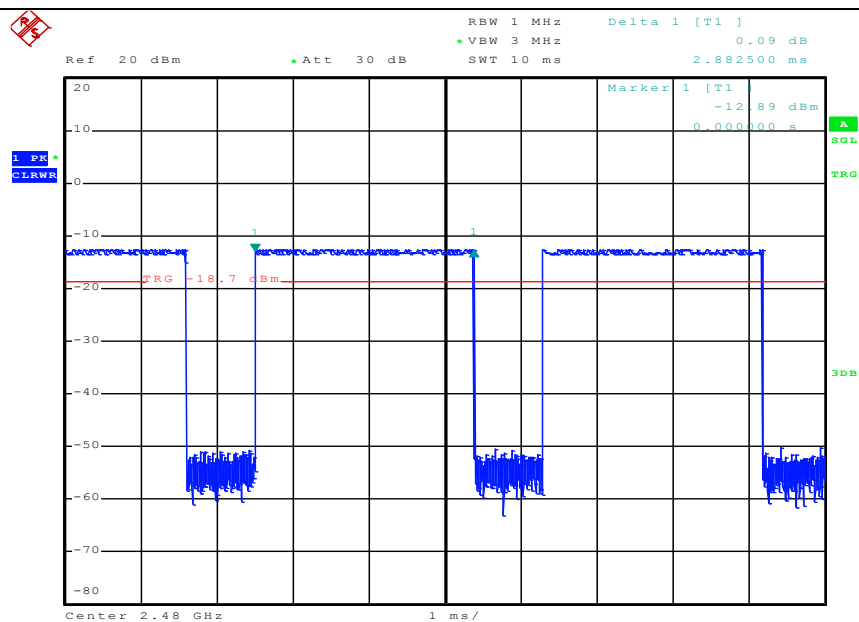
Date: 3.SEP.2019 18:35:50

GFSK\_DH5/MCH



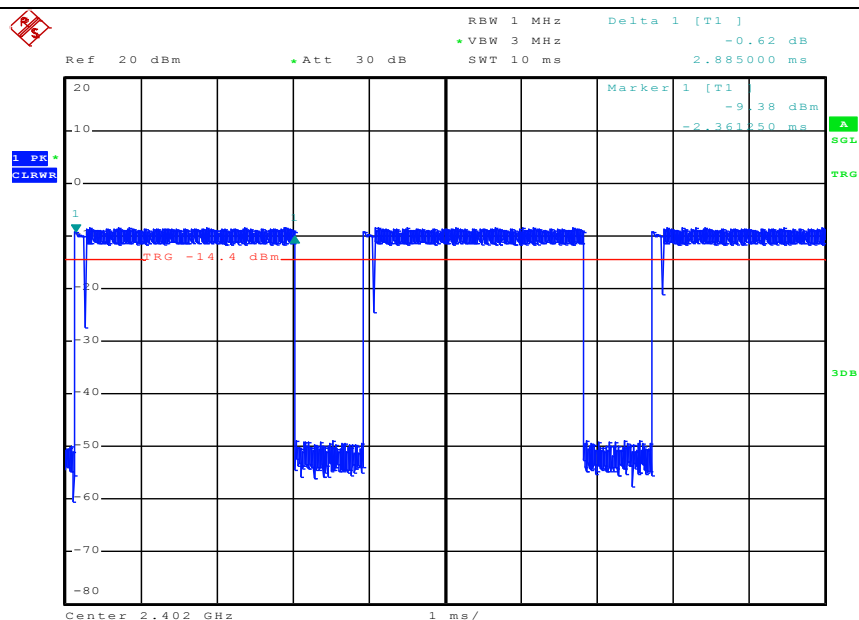
Date: 3.SEP.2019 18:39:12

GFSK\_DH5/HCH



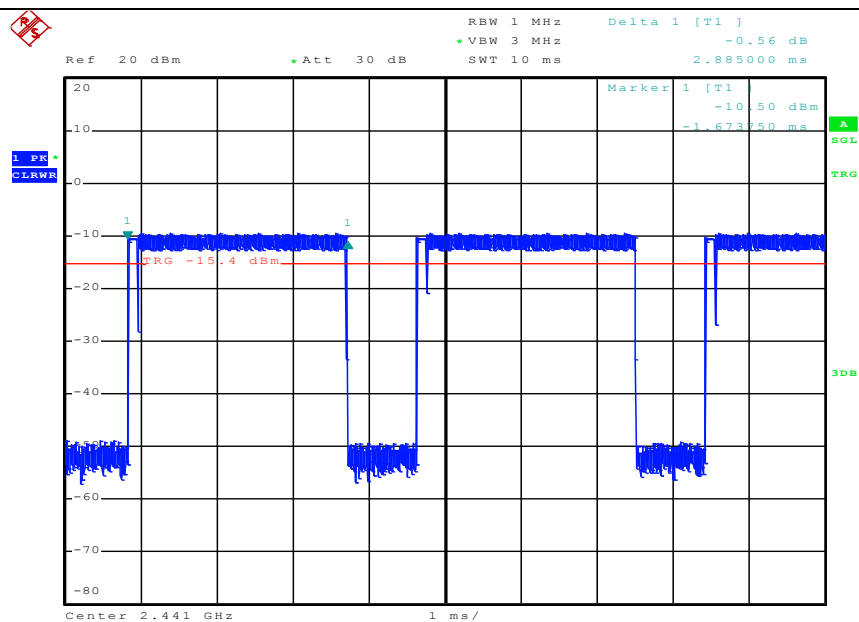
Date: 3.SEP.2019 18:41:45

$\pi/4$ DQPSK  
\_2DH5/LCH



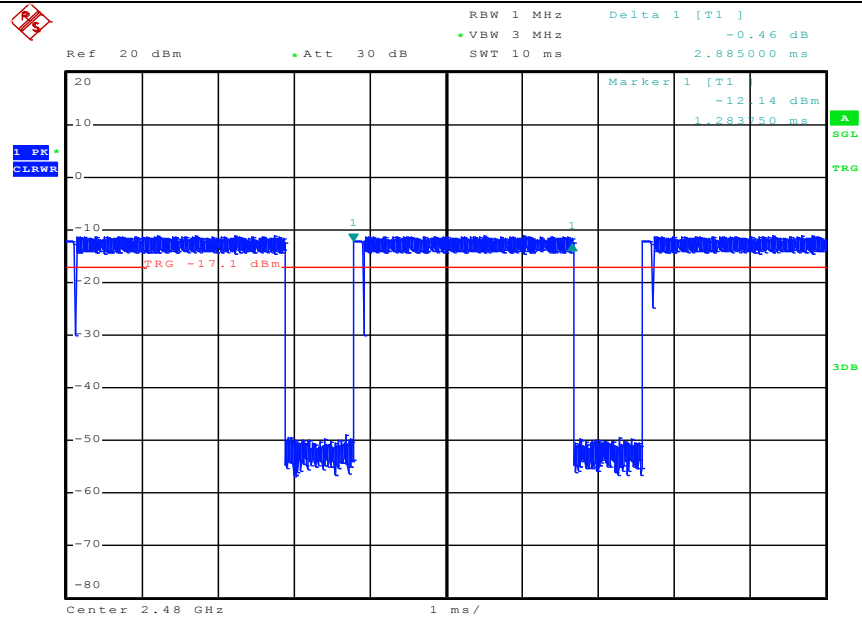
Date: 3.SEP.2019 18:44:26

$\pi/4$ DQPSK  
\_2DH5/MCH



Date: 3.SEP.2019 18:48:31

$\pi/4$ DQPSK  
\_2DH5/HCH



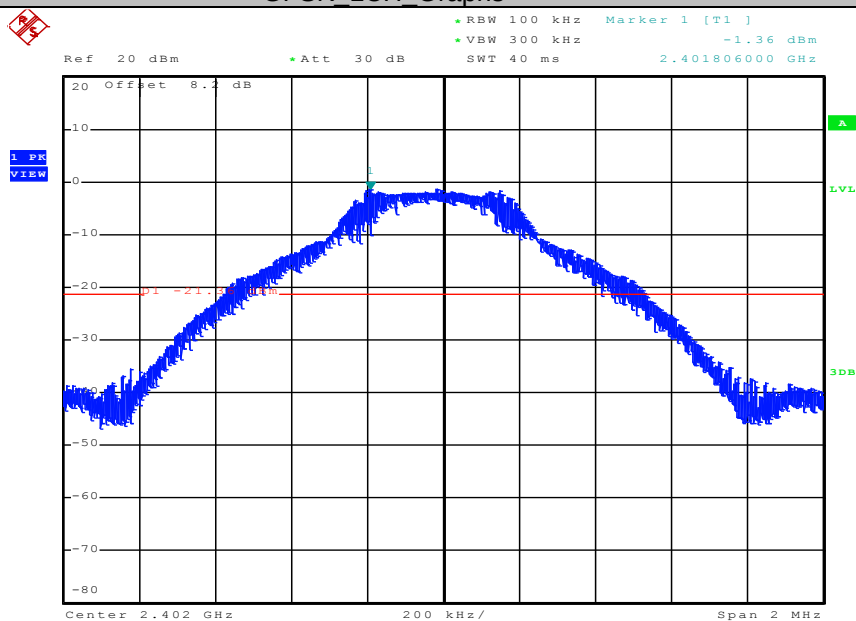
Date: 3.SEP.2019 18:50:15

## A.6 RF Conducted Spurious Emissions

| Mode          | Channel | Pref [dBm] | Max. Level [dBm] | Limit [dBm] | Verdict |
|---------------|---------|------------|------------------|-------------|---------|
| GFSK          | LCH     | -1.36      | -32.150          | -21.360     | PASS    |
|               | MCH     | -2.32      | -32.690          | -22.320     | PASS    |
|               | HCH     | -3.9       | -31.430          | -23.900     | PASS    |
| $\pi/4$ DQPSK | LCH     | -0.51      | -32.230          | -20.510     | PASS    |
|               | MCH     | -1.71      | -31.230          | -21.710     | PASS    |
|               | HCH     | -3.26      | -32.640          | -23.260     | PASS    |

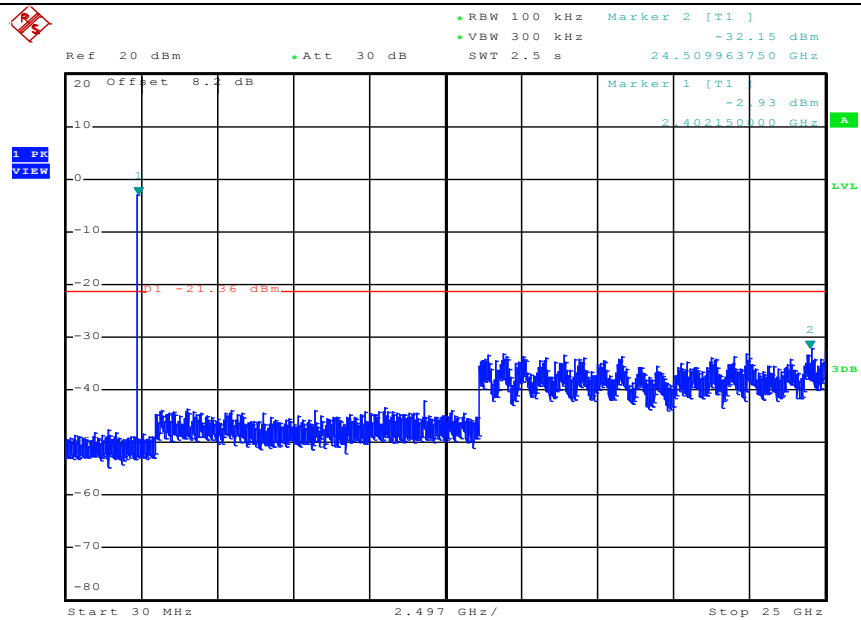
GFSK LCH Graphs

Pref



Date: 3.SEP.2019 18:37:18

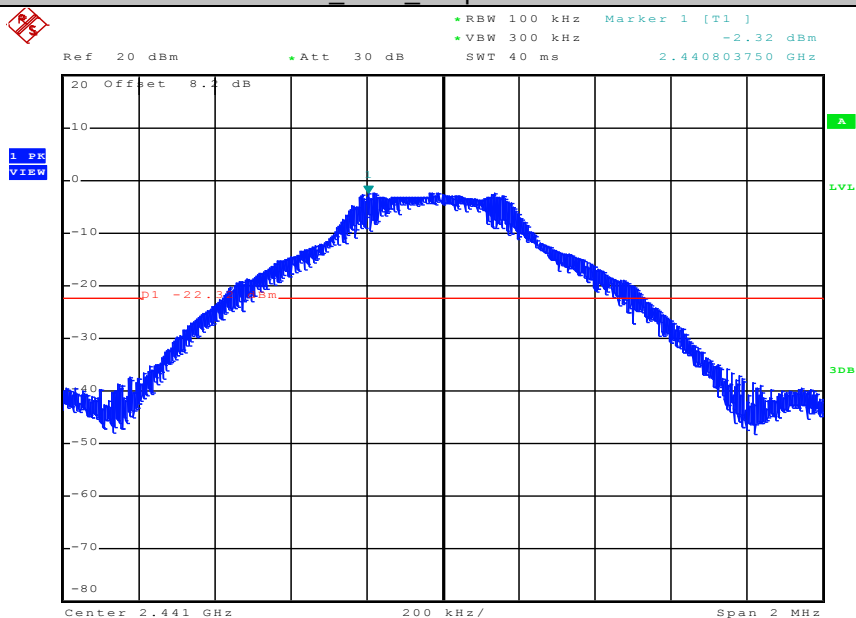
P<sub>uw</sub>



Date: 3.SEP.2019 18:37:33

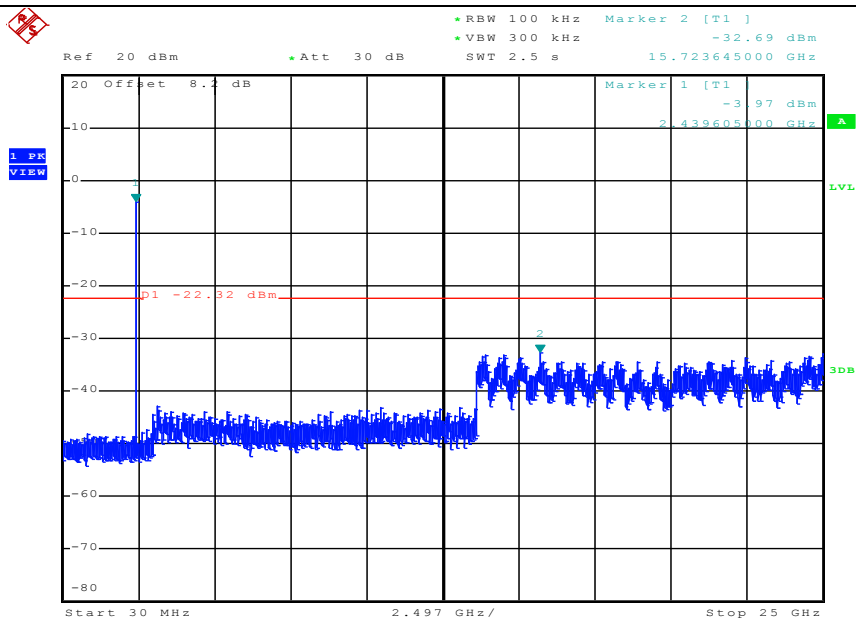
# GFSK MCH\_Graphs

Pref



Date: 3.SEP.2019 18:40:31

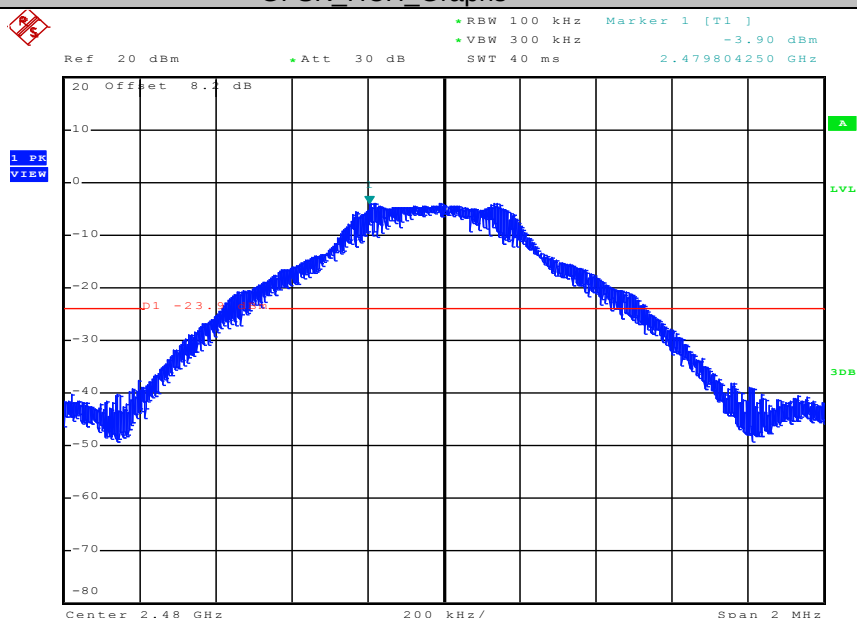
Puw



Date: 3.SEP.2019 18:40:45

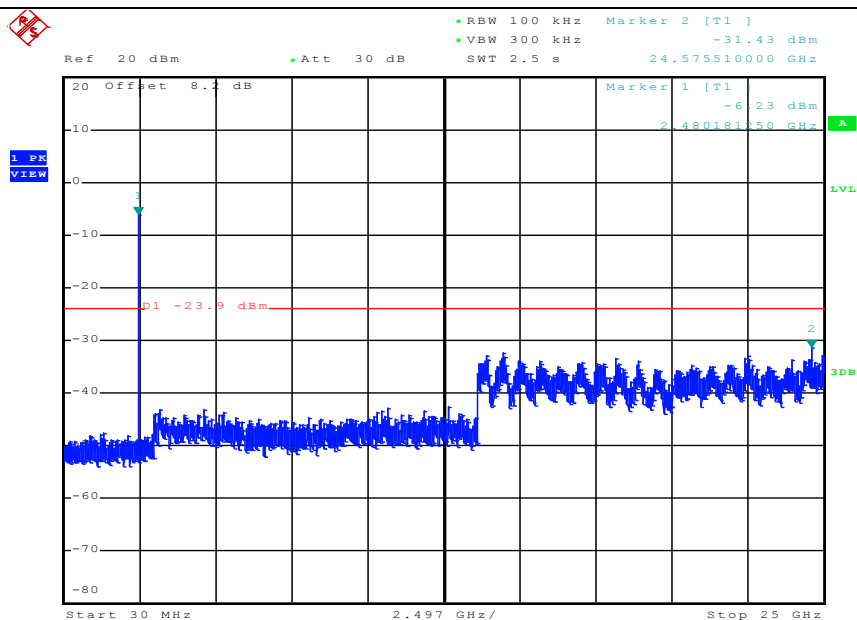
# GFSK HCH Graphs

Pref



Date: 3.SEP.2019 18:42:30

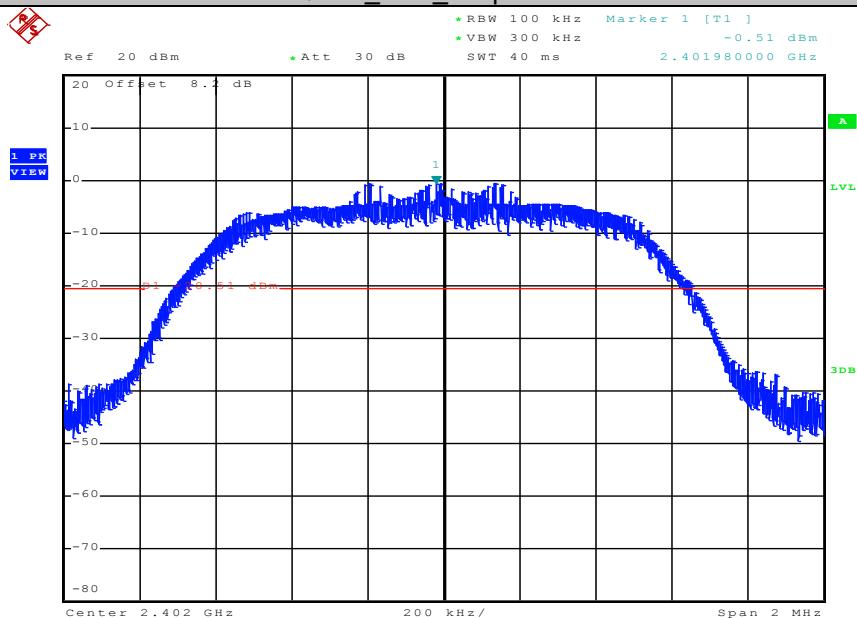
Puw



Date: 3.SEP.2019 18:42:45

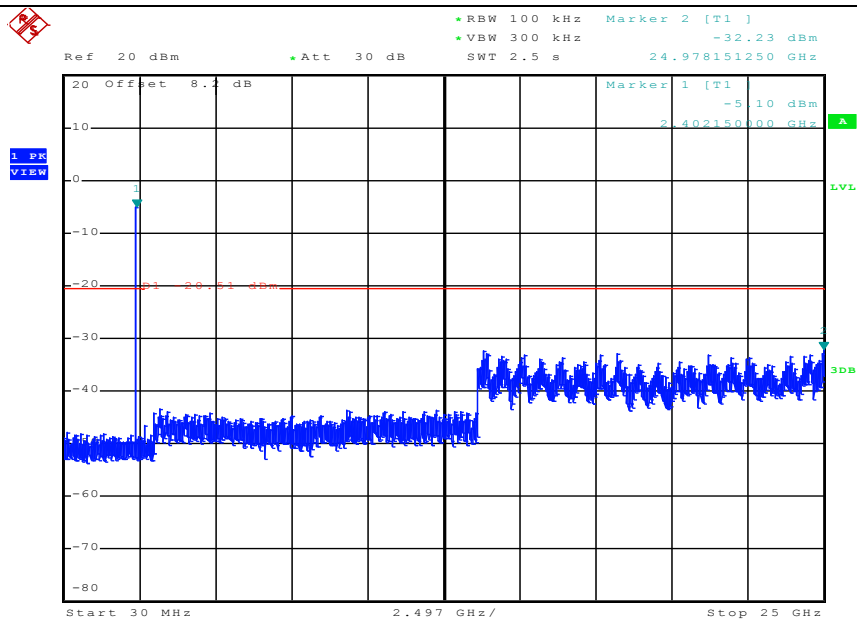
$\pi/4$ DQPSK LCH\_Graphs

Pref



Date: 3.SEP.2019 18:45:10

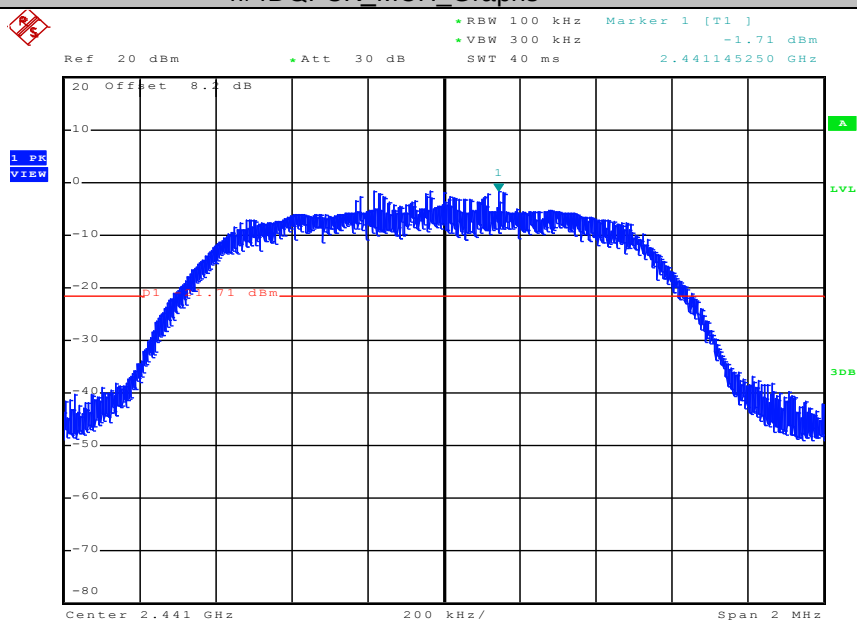
Puw



Date: 3.SEP.2019 18:45:25

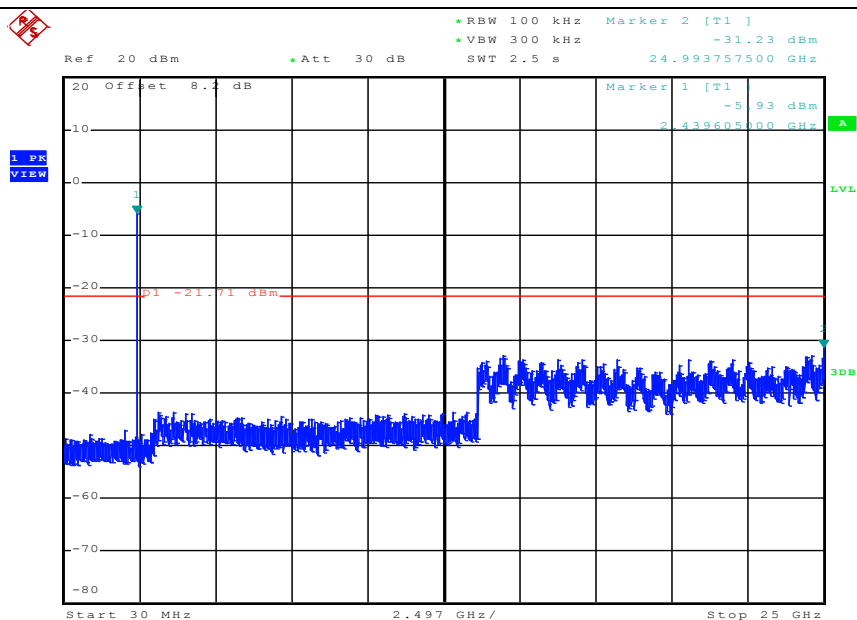
$\pi/4$ DQPSK\_MCH\_Graphs

Pref



Date: 3.SEP.2019 18:48:59

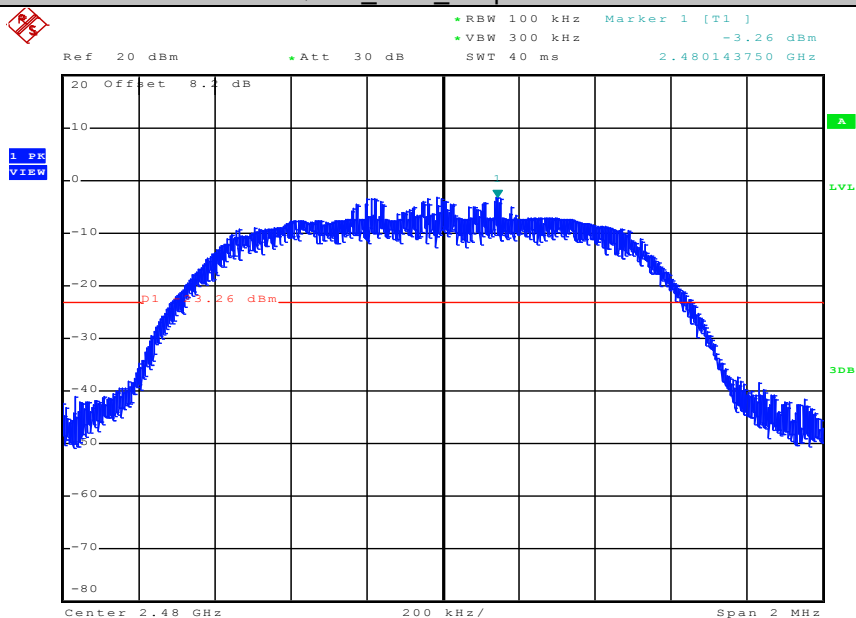
Puw



Date: 3.SEP.2019 18:49:13

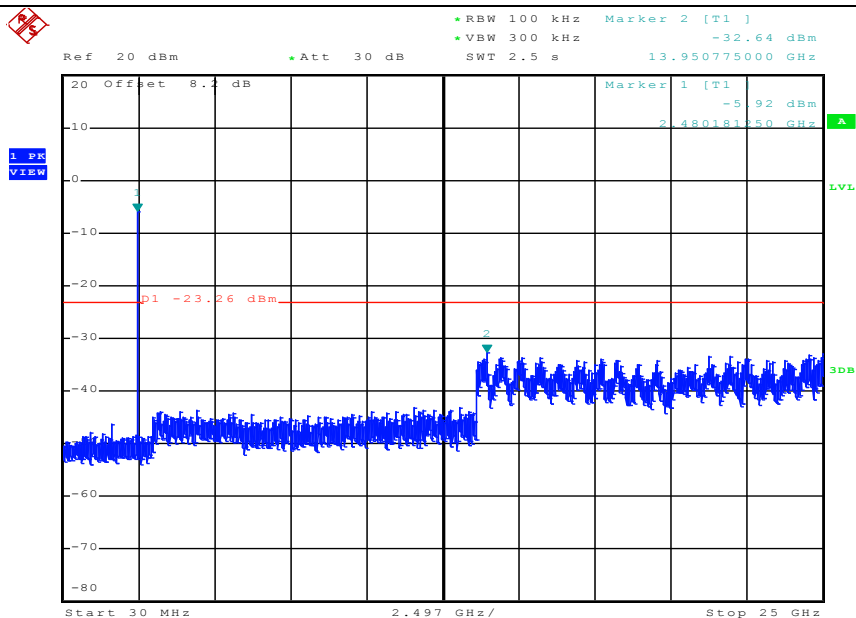
# $\pi/4$ DQPSK\_HCH\_Graphs

Pref



Date: 3.SEP.2019 18:50:59

Puw



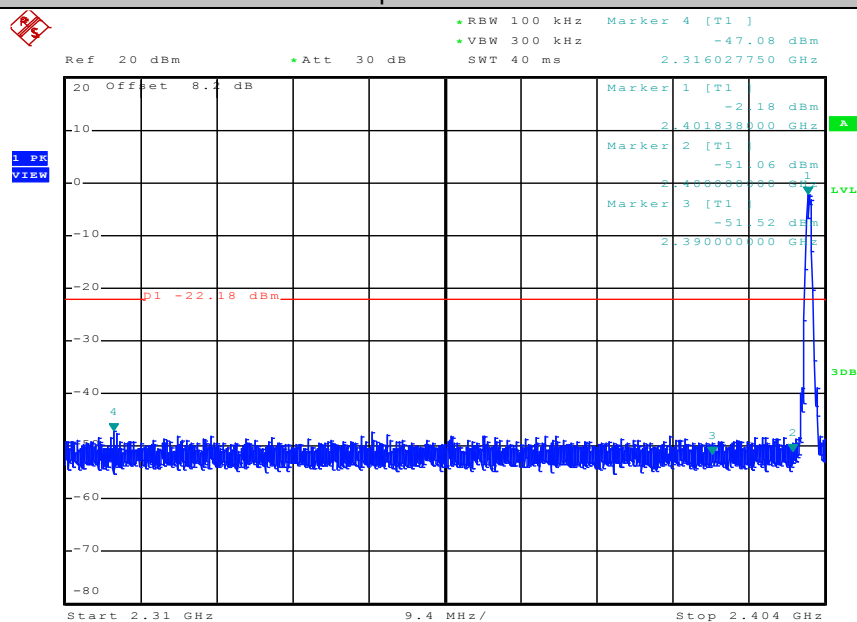
Date: 3.SEP.2019 18:51:14

## A.7 Band-edge for RF Conducted Emissions

| Mode          | Channel | Carrier Frequency [MHz] | Carrier Power [dBm] | Frequency Hopping | Max Spurious Level [dBm] | Limit [dBm] | Verdict |
|---------------|---------|-------------------------|---------------------|-------------------|--------------------------|-------------|---------|
| GFSK          | LCH     | 2402                    | -2.180              | Off               | -47.075                  | -22.18      | PASS    |
|               |         |                         | -5.910              | On                | -45.734                  | -25.91      | PASS    |
|               | HCH     | 2480                    | -3.910              | Off               | -46.947                  | -23.91      | PASS    |
|               |         |                         | -6.230              | On                | -46.573                  | -26.23      | PASS    |
| $\pi$ /4DQPSK | LCH     | 2402                    | -0.990              | Off               | -47.159                  | -20.99      | PASS    |
|               |         |                         | -5.800              | On                | -46.813                  | -25.8       | PASS    |
|               | HCH     | 2480                    | -3.290              | Off               | -47.101                  | -23.29      | PASS    |
|               |         |                         | -6.540              | On                | -46.890                  | -26.54      | PASS    |

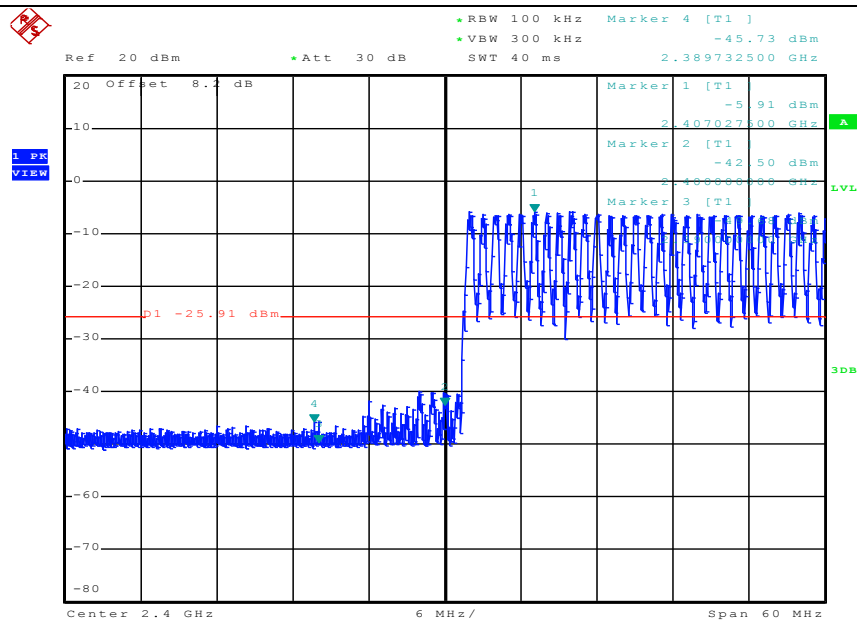
## Test Graphs

GFSK/LCH/No Hop



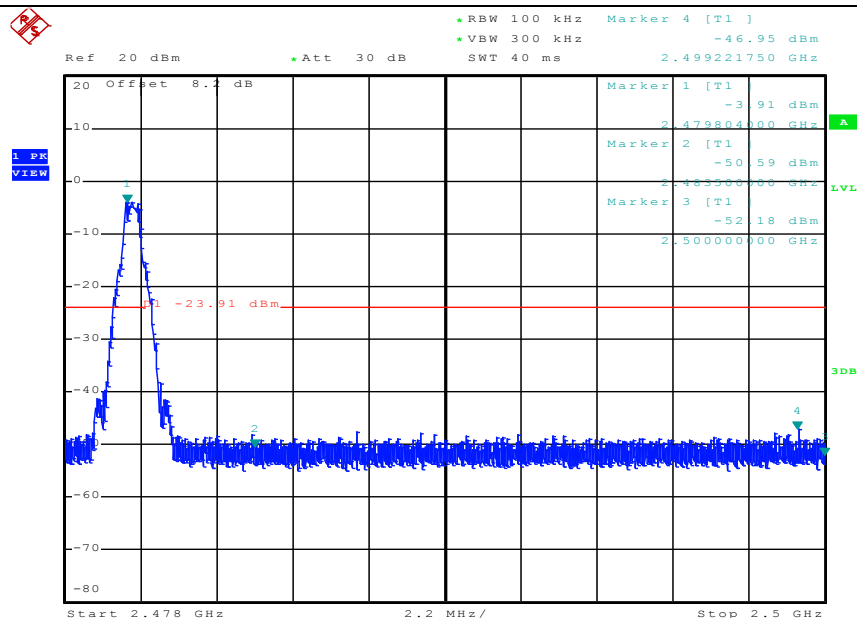
Date: 3.SEP.2019 18:36:21

GFSK/LCH/Hop



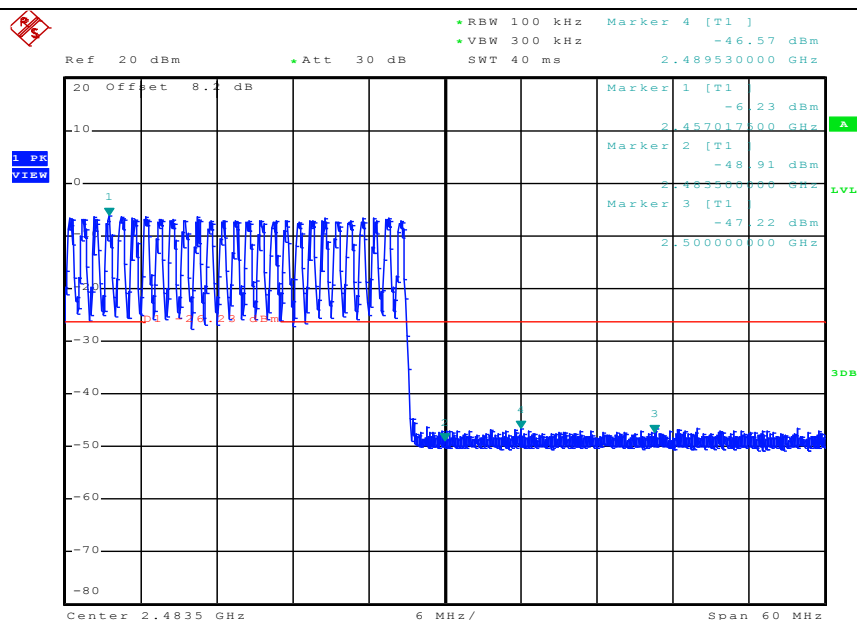
Date: 3.SEP.2019 17:06:52

GFSK/HCH/No Hop



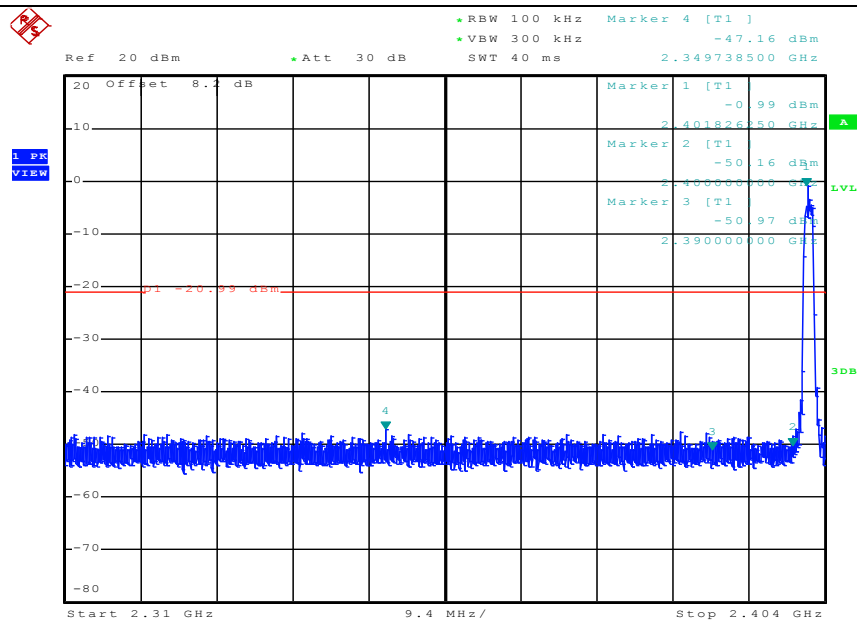
Date: 3.SEP.2019 18:42:17

GFSK/HCH/Hop

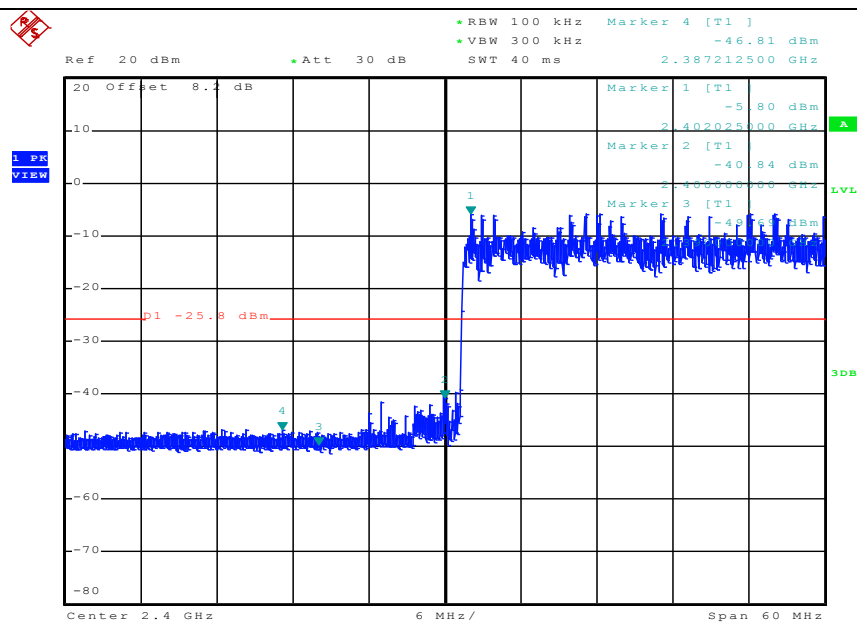


Date: 3.SEP.2019 17:13:19

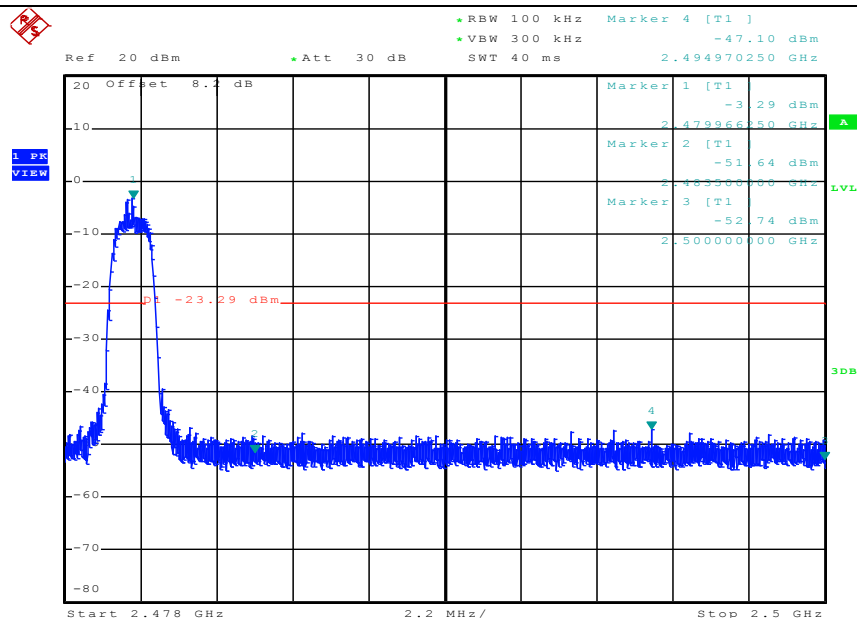
$\pi/4$ DQPSK/LCH/No  
Hop



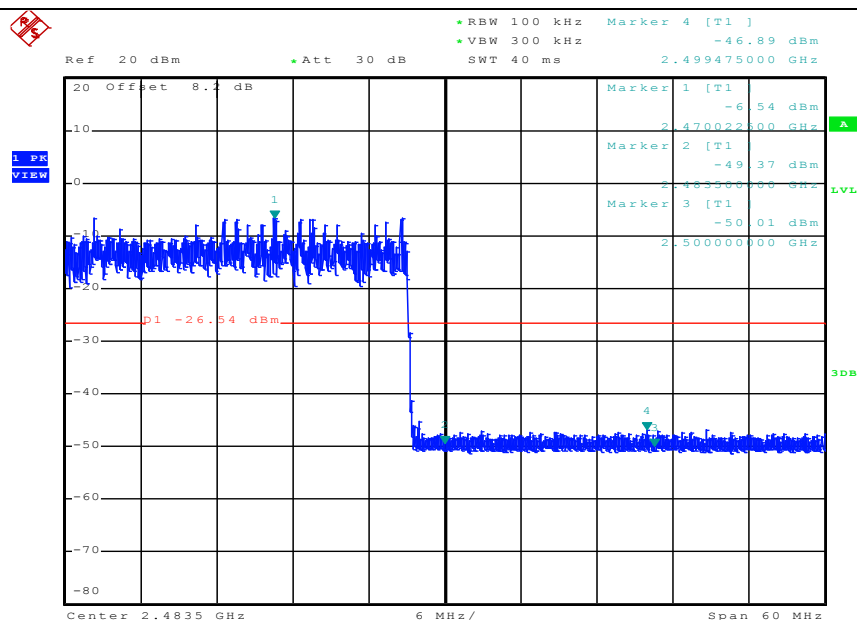
$\pi/4$ DQPSK/LCH/Hop



$\pi/4$ DQPSK/HCH/No  
Hop



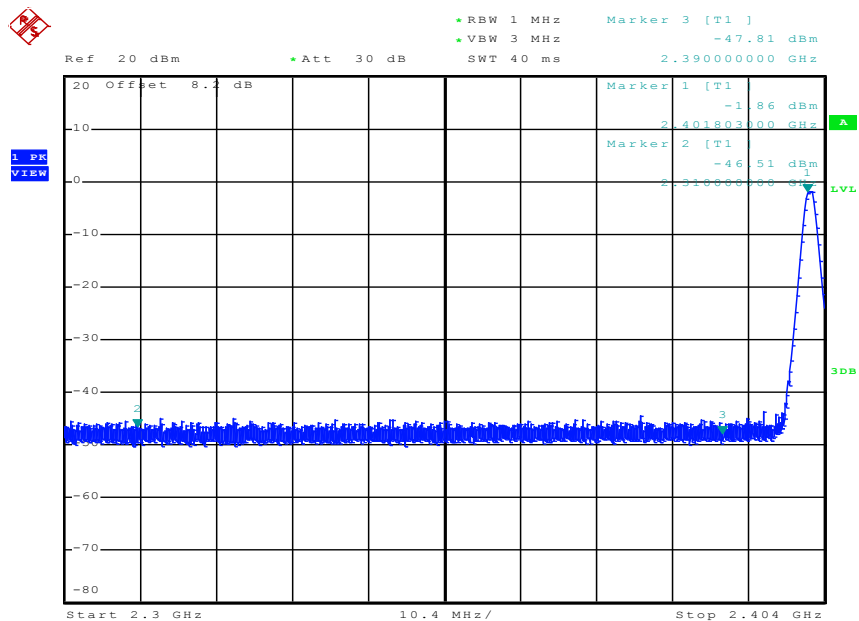
$\pi/4$ DQPSK/HCH/Hop



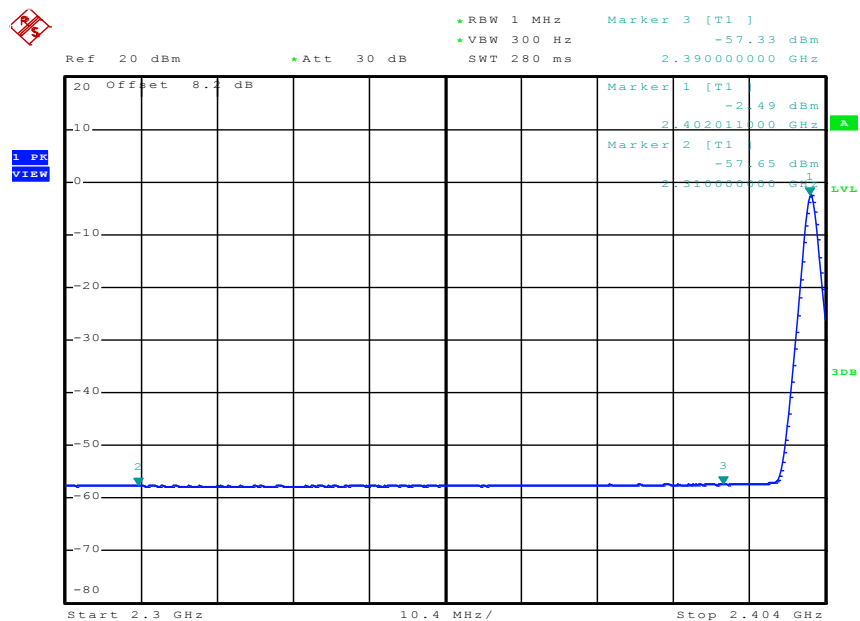
## A.8 Restrict-band band-edge measurements

| Test Mode     | Hopping | Freq.  | Power [dBm] | Gain | Ground Factor | E [dBuV/m] | Detector | Limit [dBuV/m] | Verdict |
|---------------|---------|--------|-------------|------|---------------|------------|----------|----------------|---------|
| GFSK          | Off     | 2310.0 | -46.51      | 2.0  | 0             | 50.75      | PEAK     | 74             | PASS    |
|               | Off     | 2310.0 | -57.65      | 2.0  | 0             | 39.61      | AV       | 54             | PASS    |
|               | Off     | 2390.0 | -47.81      | 2.0  | 0             | 49.45      | PEAK     | 74             | PASS    |
|               | Off     | 2390.0 | -57.33      | 2.0  | 0             | 39.93      | AV       | 54             | PASS    |
|               | Off     | 2483.5 | -42.35      | 2.0  | 0             | 54.91      | PEAK     | 74             | PASS    |
|               | Off     | 2483.5 | -47.38      | 2.0  | 0             | 49.88      | AV       | 54             | PASS    |
|               | Off     | 2500.0 | -48.10      | 2.0  | 0             | 49.16      | PEAK     | 74             | PASS    |
|               | Off     | 2500.0 | -58.04      | 2.0  | 0             | 39.22      | AV       | 54             | PASS    |
| $\pi/4$ DQPSK | Off     | 2310.0 | -48.12      | 2.0  | 0             | 49.14      | PEAK     | 74             | PASS    |
|               | Off     | 2310.0 | -57.71      | 2.0  | 0             | 39.55      | AV       | 54             | PASS    |
|               | Off     | 2390.0 | -47.36      | 2.0  | 0             | 49.90      | PEAK     | 74             | PASS    |
|               | Off     | 2390.0 | -57.40      | 2.0  | 0             | 39.86      | AV       | 54             | PASS    |
|               | Off     | 2483.5 | -41.44      | 2.0  | 0             | 55.82      | PEAK     | 74             | PASS    |
|               | Off     | 2483.5 | -47.31      | 2.0  | 0             | 49.95      | AV       | 54             | PASS    |
|               | Off     | 2500.0 | -49.00      | 2.0  | 0             | 48.26      | PEAK     | 74             | PASS    |
|               | Off     | 2500.0 | -58.05      | 2.0  | 0             | 39.21      | AV       | 54             | PASS    |

## Restrict-band band-edge measurements\_Hopping Off\_GFSK\_PEAK (Low Channel)



## Restrict-band band-edge measurements\_Hopping Off\_GFSK\_Average (Low Channel)



Ref 20 dBm Att 30 dB RBW 1 MHz VBW 3 MHz SWT 40 ms

Marker 3 [T1] 2.500000000 GHz -48.10 dBm

Marker 1 [T1] 2.479787800 GHz -4.39 dBm

Marker 2 [T1] 2.483500000 GHz -42.35 dBm

1 PR VIEW

Start 2.478 GHz Stop 2.5 GHz

Date: 3.SEP.2019 18:43:04

1 PK VIEW

Ref 20 dBm Att 30 dB RBW 1 MHz VBW 300 Hz SWT 170 ms

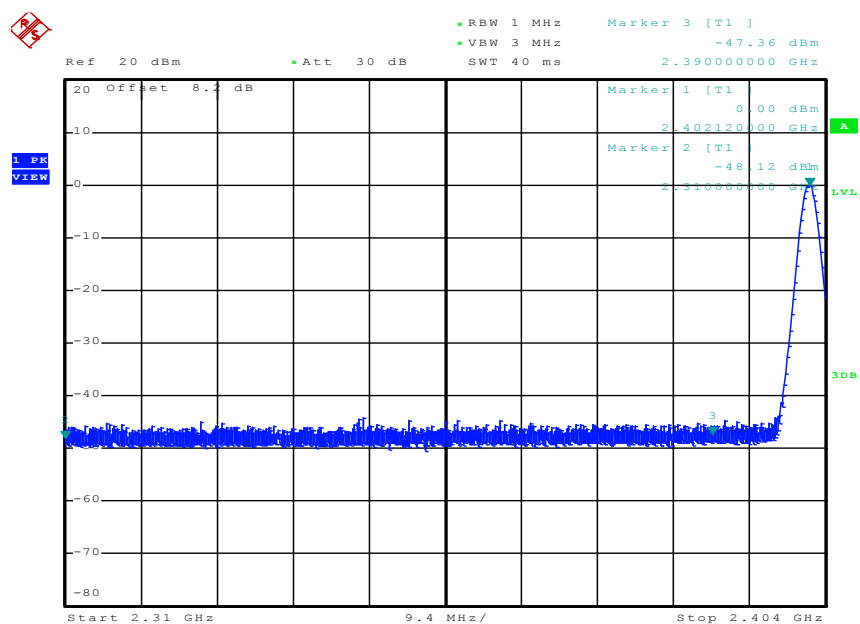
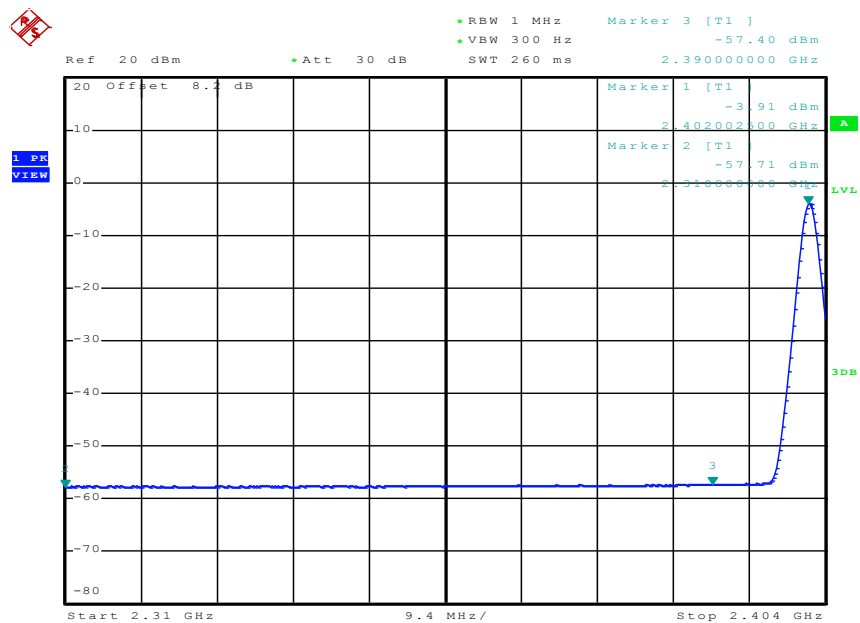
Marker 3 [T1] -58.04 dBm 2.500000000 GHz

Marker 1 [T1] -4.99 dBm 2.47998850 GHz

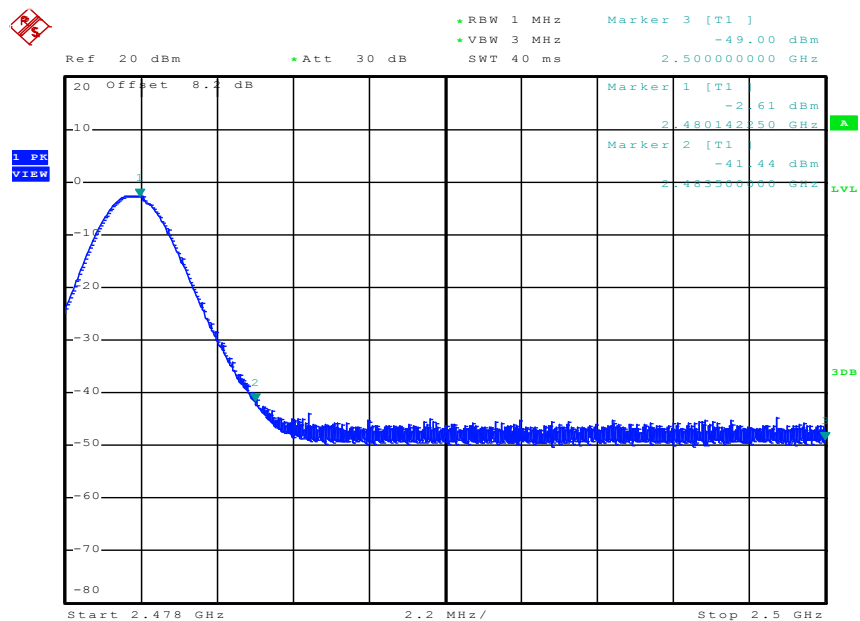
Marker 2 [T1] -47.38 dBm 2.493333333 GHz

Start 2.478 GHz Stop 2.5 GHz

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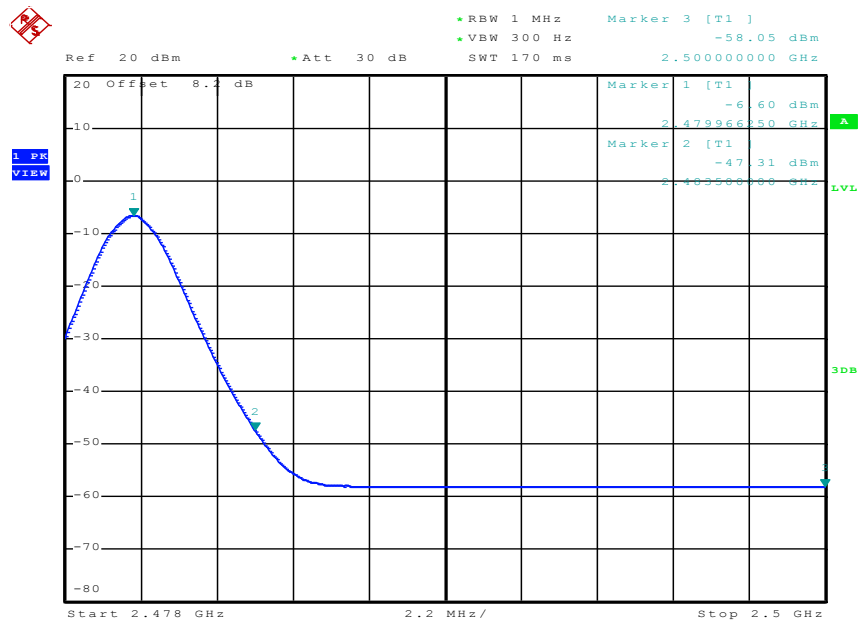
Restrict-band band-edge measurements\_Hopping Off  $\pi/4$ -DQPSK\_PEAK (Low Channel)Restrict-band band-edge measurements\_Hopping Off  $\pi/4$ -DQPSK\_Average (Low Channel)

## Restrict-band band-edge measurements\_Hopping Off\_π/4-DQPSK\_PEAK (High Channel)



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## Restrict-band band-edge measurements\_Hopping Off\_π/4-DQPSK\_Average (High Channel)



Date: 3.SEP.2019 18:51:46

