

## Radio Test Report (BT-EDR)

**Report No.:** RJ200814E08-2

**Test Model:** MT7921K

**Received Date:** Mar. 17, 2020

**Test Date:** July 31, 2020 ; Sep. 22, 2020

**Issued Date:** Sep. 30, 2020

**Applicant:** MediaTek Inc.

**Address:** No. 1, Duxing 1st Rd., East District, Hsinchu City 300 Taiwan

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
Hsin Chu Laboratory

**Lab Address:** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
Taiwan

**Test Location:** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
Taiwan



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**Release Control Record**

Issue No.	Description	Date Issued
RJ200814E08-2	Original release.	Sep. 30, 2020

## 1 Certificate of Conformity

**Product:** 2TX 11ax (WiFi6E) + BT/BLE Combo Card

**Brand:** MediaTek

**Test Model:** MT7921K

**Sample Status:** ENGINEERING SAMPLE

**Applicant:** MediaTek Inc.

**Test Date:** July 31, 2020 ; Sep. 22, 2020

**Standards:** ARIB STD-T66 (V3.7), MIC notice 88 Appendix 43  
Article 2 Paragraph 1 of Item 19

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**Prepared by :** Vivian Huang , **Date:** Sep. 30, 2020  
Vivian Huang / Specialist

**Approved by :** Clark Lin , **Date:** Sep. 30, 2020  
Clark Lin / Technical Manager

## 2 Summary of Test Results

The EUT has been tested according to the following specifications:

Notice 88 Appendix 43 Reference	ARIB STD-T66 Ref.	Report Reference	Parameter	Test Results (Note)
<b>General Provisions</b>				
C	3.2 (4)	4.1	Frequency tolerance	C
D	3.2 (7)	4.2	Occupied bandwidth	C
E	3.2 (6)	4.4	Spurious emissions	C
<b>Transmitting Equipment</b>				
F	--	4.5	Antenna power	C
--	--	--	SAR	NA
<b>Transmitting Antenna</b>				
--	--	3.5	Type, configuration, etc. of transmitting antenna	C
--	--	3.5	Direction pattern of transmitting antenna	C
<b>Receiving Equipment</b>				
G	3.3 (1)	4.6	Spurious emissions of receiver	C
--	--	3.5	Refer to all articles for transmitting antenna	C
<b>Operating Frequency 2400 to 2483.5MHz</b>				
--	3.7 (1)	3.4	High Frequency/modulation section cannot be opened easily	C
--	3.1 (1)	3.1	Communication method	C
--	3.2 (1)a	3.1	Modulation method	C
--	3.2 (1)a	3.1	Spread spectrum method	C
--	3.2 (2)	4.5	Antenna power	C
--	3.6 (2)	4.5	Absolute gain of transmitting antenna	C
--	3.6 (2)	--	Angular width of principal radiation (AWPR)	NA
--	3.2 (10)	--	Number of carriers within 1 MHz bandwidth in OFDM	NA
--	3.2 (8)	4.3	Spreading bandwidth	C
--	3.2 (9)	4.3	Spreading factor	C
--	3.2 (11)	4.7	Frequency retention time (FH employed)	C
--	3.4.1(1)	4.8	Interference Prevention Function	C
--	3.4.1(3)	--	Carrier Sense Capability	NA
Note: 1. C = Conform      NC = Not Conform    NT = Not Tested    NA = Not Applicable 2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.				

## 2.1 Test Instruments

Description & Manufacturer	Model no.	Serial No.	Calibrated Date	Calibrated Until	Calibration Authority	Calibration Method
Spectrum Analyzer R&S	FSV40	100964	May 29, 2020	May 28, 2021	ETC	(c)
ESG Vector signal generator Agilent	E4438C	MY45094468	Nov. 14, 2019	Nov. 13, 2020	ETC	(c)
Detector Narda	4503A	0306	NA	NA	NA	NA
Power Meter Anritsu	ML2495A	1529002	July 22, 2020	July 21, 2021	ETC	(c)
Power Sensor Anritsu	MA2411B	1339443	July 22, 2020	July 21, 2021	ETC	(c)
4CH Infiniivision Oscilloscope Keysight	DSOX6004A	MY55190202	July 03, 2020	July 02, 2021	ETC	(c)
DC Power Supply Topward	6603D	795558	NA	NA	NA	NA
AC Power Source Extech Electronics	6205	1440452	NA	NA	NA	NA
Voltage Meter FLUKE	179	89610322	Sep. 25, 2019	Sep. 24, 2020	ETC	(c)

- NOTE:**
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
  2. Calibration method :
    - a) : Calibration conducted by the National Institute of Information and Communications Technology (NICT) or a designated calibration agency under Article 102-18 paragraph (1).
    - b) : Calibration conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992) Japan Calibration Service System.
    - c) : Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1).
    - d) : Calibration conducted by using other equipment that listed above from a) to c).
  3. The power supply no evaluation calibrated, which used the digital multimeter to verify.
  4. Tested Date: July 31 to Sep. 22, 2020

## 2.2 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in TR 100 028-1.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .

Parameter	Uncertainty
Occupied Bandwidth	703.56 Hz
Spurious emissions	2.52 dB
Output power density	1.37 dB
Out of band radiated power	2.52 dB
Frequency Tolerance	703.56 Hz

## 2.3 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

Product	2TX 11ax (WiFi6E) + BT/BLE Combo Card
Brand	MediaTek
Test Model	MT7921K
Status of EUT	ENGINEERING SAMPLE
Nominal Voltage	DC 3.3V from host equipment
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK
Modulation Technology	FHSS
Transfer Rate	Up to 3Mbps
Operating Frequency Band	2402MHz ~ 2480MHz
Number of Channel	79
Rated RF Output Power Density	Refer to Note
Conducted RF Output Power Density	Refer to Note
Radiated RF Output Power Density	Refer to Note
Antenna Type	Refer to section 3.5
Antenna Connector	Refer to section 3.5
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. Based on engineering judgment of the device design, test data were copied from the test report (Report No.: RJ200317E01-2) except RF output power. And all data were verified to meet the requirements.
2. The test data are copied which have obtained authorization from applicant and brand company both of the test report (Report No.: RJ200317E01-2).
3. Simultaneously transmission condition.

Condition	Technology	
1	WLAN (2.4GHz)	Bluetooth
2	WLAN (5GHz)	Bluetooth

4. The power table as below table:

	Rated output power density (mW/MHz)	Conducted RF output power density (mW/MHz)	Radiated RF output power density (mW/MHz)
<b>Normal mode</b>			
<b>GFSK</b>	0.2	0.173876	0.361609
<b><math>\pi/4</math>-DQPSK</b>	0.2	0.092019	0.191372
<b>8DPSK</b>	0.2	0.88283	0.183602
<b>Enable AFH function</b>			
<b>GFSK</b>	0.8	0.702753	1.461513
<b><math>\pi/4</math>-DQPSK</b>	0.8	0.361827	0.75249
<b>8DPSK</b>	0.8	0.347137	0.72194

5. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

### 3.2 Description of Test Modes

79 channels are provided for BT-EDR mode:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
<b>0</b>	<b>2402</b>	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	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	<b>78</b>	<b>2480</b>
19	2421	<b>39</b>	<b>2441</b>	59	2461		

Note: The channels which were indicated in bold type of the above channel list were selected as representative test channel. Therefore only the data of the test channels were recorded in this report.

**NOTE 1:** By means of test software (WCN combo tool(W2004)) provided by manufacturer, the power levels during the tests were set according to the following codes:

Modulation type: GFSK		Modulation type: $\pi/4$ -DQPSK		Modulation type: 8DPSK	
Channel	Power setting	Channel	Power setting	Channel	Power setting
<b>0</b>	5	<b>0</b>	4	<b>0</b>	4
<b>39</b>	5	<b>39</b>	4	<b>39</b>	4
<b>78</b>	5	<b>78</b>	4	<b>78</b>	4

**NOTE 2:** The EUT was tested under following test modes, and the test data was recorded in this report:

Normal mode	Enable AFH function
GFSK	GFSK
$\pi/4$ -DQPSK	$\pi/4$ -DQPSK
8DPSK	8DPSK

\* For AFH function only tested occupied bandwidth, spreading bandwidth, Antenna power and dwell time.

### 3.3 Test Conditions

Test Conditions		Voltage (Vdc)
$V_{normal}$		3.3
$V_{max.}$	+10%	3.63
$V_{min.}$	-10%	2.97

### 3.4 Assembly

The EUT is constructed as a 2TX 11ax (WiFi6E) + BT/BLE Combo Card. The RF circuit was covered by metal shielding case, and the metal shielding case was soldered on PCB.

### 3.5 Antenna Specifications

#### 3.5.1 Antenna Gain

Antenna Set	RF Chain No.	Brand	Model	Antenna Net Gain (dBi)	Frequency range (GHz)	Antenna Type	Connector Type	Cable Length (mm)	Cable Loss (dB)	excluding cable loss Antenna Gain (dBi)
1	Chain0	Cortec	AN2450-4902BRS	2.42 3.87	2.4~2.4835 5.15~5.85	Dipole	R-SMA	150	2.4~2.4835GHz : 0.5dB 5.15~5.85GHz : 0.8dB	2.92 4.67
	Chain1	Cortec	AN2450-4902BRS	2.42 3.87	2.4~2.4835 5.15~5.85	Dipole	R-SMA	150	2.4~2.4835GHz : 0.5dB 5.15~5.85GHz : 0.8dB	2.92 4.67
2	Chain0	PSA	RFMTA340718EMLB302	3.18 4.92	2.4~2.4835 5.15~5.85	PIFA	i-pex(MHF)	200	included Cable loss	-
	Chain1	PSA	RFMTA340718EMLB302	3.18 4.92	2.4~2.4835 5.15~5.85	PIFA	i-pex(MHF)	200	included Cable loss	-

The above antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

#### 3.5.2 Antenna Pattern

Please refer the attach file – antenna pattern.

## 4 Test Results

### 4.1 Frequency Tolerance Measurement

#### 4.1.1 Limits of Frequency Tolerance Measurement

Tolerance of frequency shall be +/- 50ppm

#### 4.1.2 Test Setup



#### 4.1.3 Test Results

Modulation: GFSK

Environmental Conditions		25 deg.C, 60% RH					
Channel	Frequency (MHz)	Voltage <sub>normal</sub>		Voltage <sub>max.</sub>		Voltage <sub>min.</sub>	
		Carrier frequency (MHz)	Frequency tolerance (ppm)	Carrier frequency (MHz)	Frequency tolerance (ppm)	Carrier frequency (MHz)	Frequency tolerance (ppm)
0	2402	2402.000638	0.265	2401.999860	-0.058	2401.999378	-0.258
39	2441	2440.999291	-0.290	2440.998753	-0.510	2440.998260	-0.712
78	2480	2479.998347	-0.666	2479.997970	-0.818	2479.997738	-0.912

## 4.2 Occupied Bandwidth Measurement (99% power bandwidth)

### 4.2.1 Limits of Occupied Bandwidth Measurement

Item	Limit
Occupied bandwidth	<83.5 MHz

### 4.2.2 Test Setup

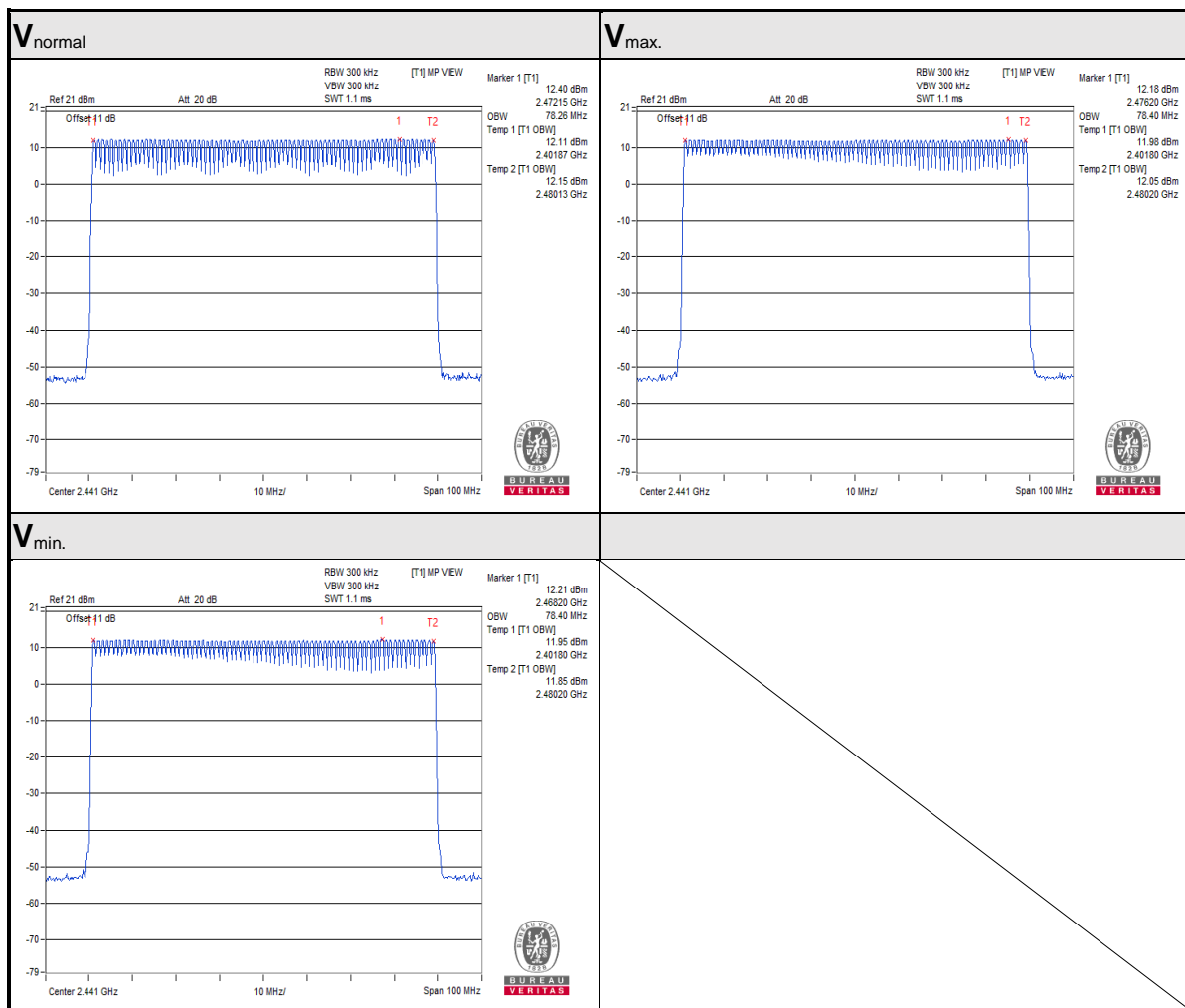


## 4.2.3 Test Results

Modulation: GFSK

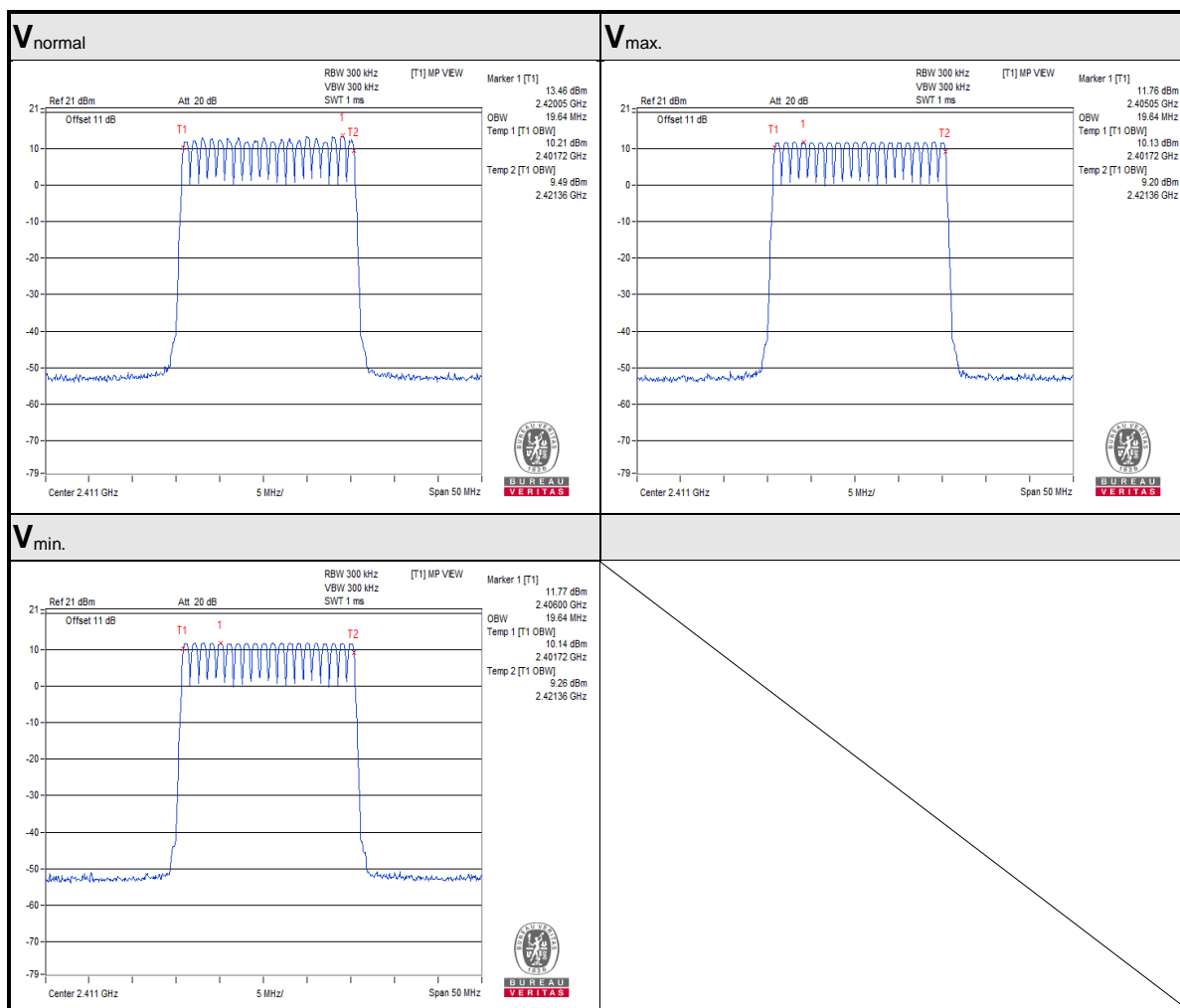
Normal Mode:

Environmental Conditions	25 deg.C, 60% RH	
$V_{normal}$	$V_{max.}$	$V_{min.}$
Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)
78.26	78.40	78.40



# AFH Mode:

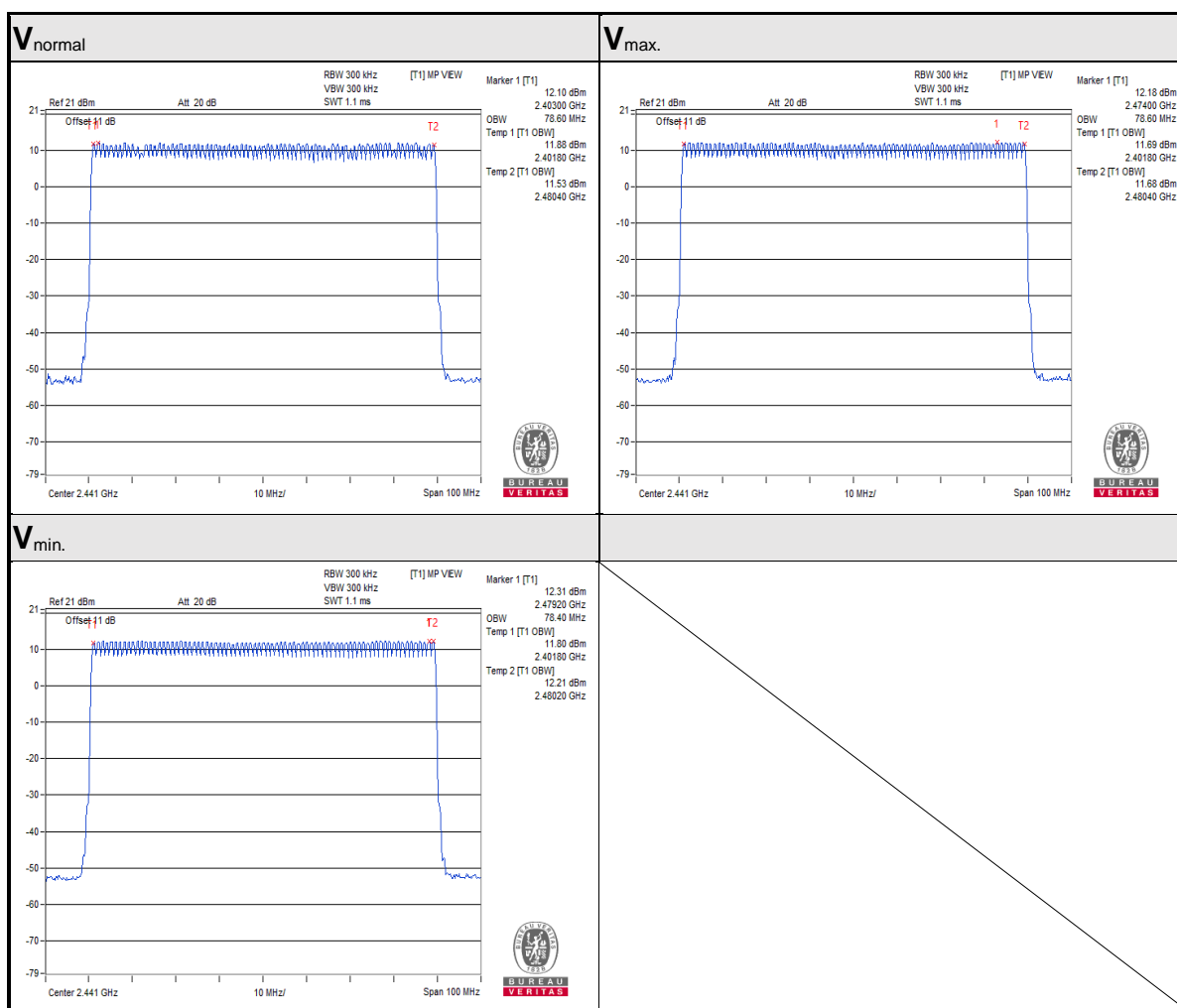
Environmental Conditions	25 deg.C, 60% RH	
$V_{normal}$	$V_{max.}$	$V_{min.}$
Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)
19.64	19.64	19.64



Modulation:  $\pi/4$ -DQPSK

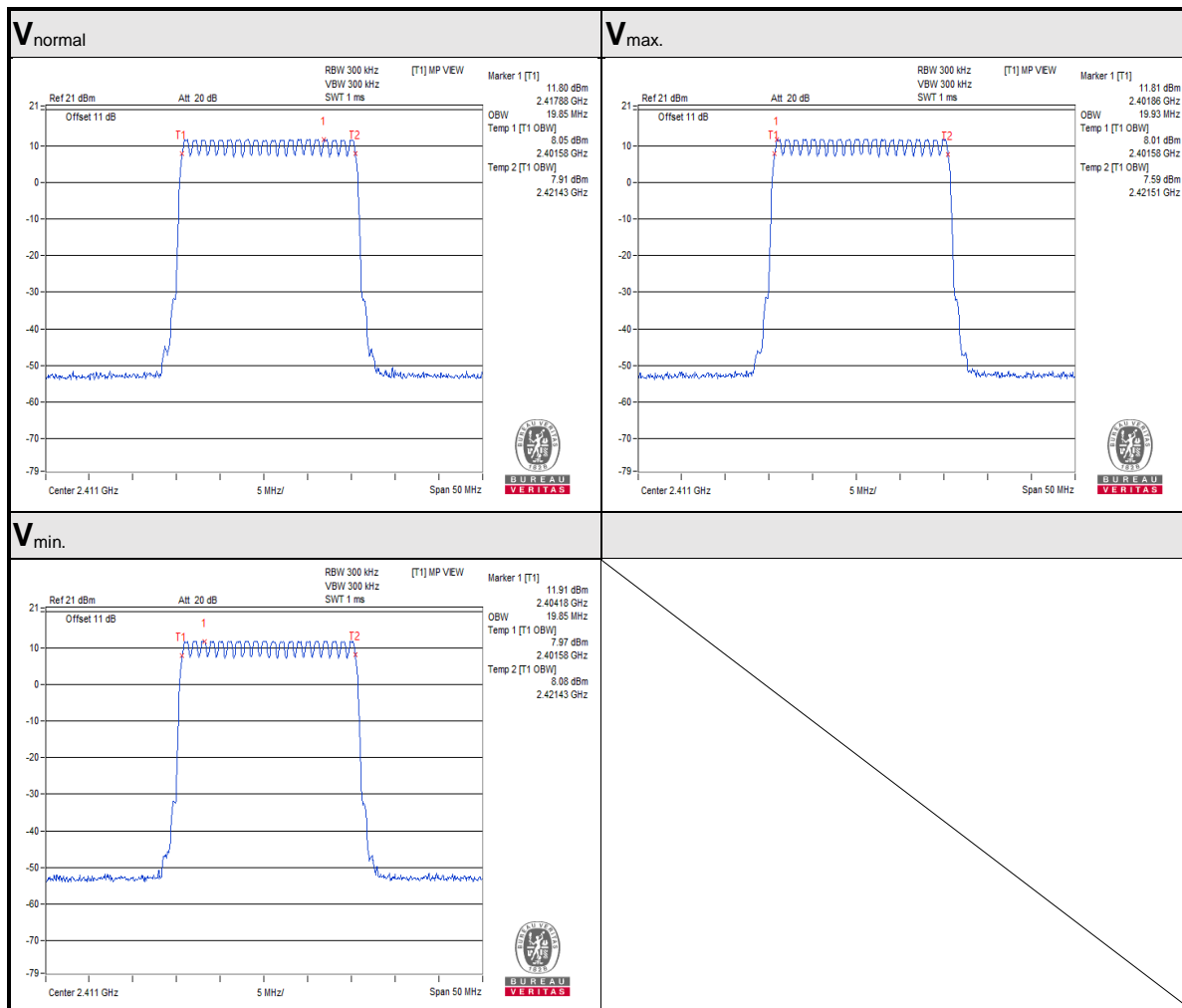
Normal Mode:

Environmental Conditions	25 deg.C, 60% RH	
$V_{normal}$	$V_{max.}$	$V_{min.}$
Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)
78.60	78.60	78.40



# AFH Mode:

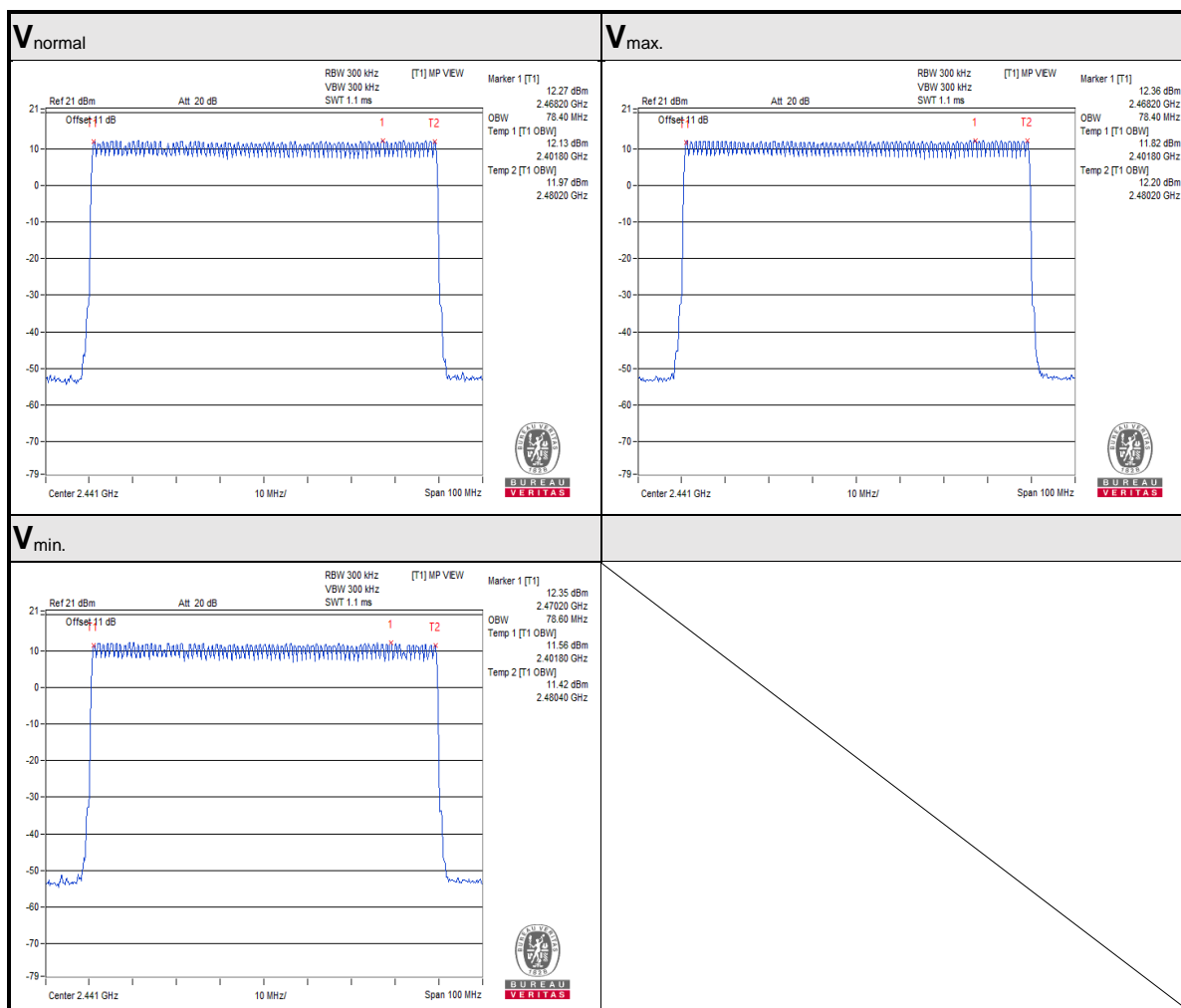
Environmental Conditions	25 deg.C, 60% RH	
$V_{normal}$	$V_{max.}$	$V_{min.}$
Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)
19.85	19.93	19.85



# Modulation: 8DPSK

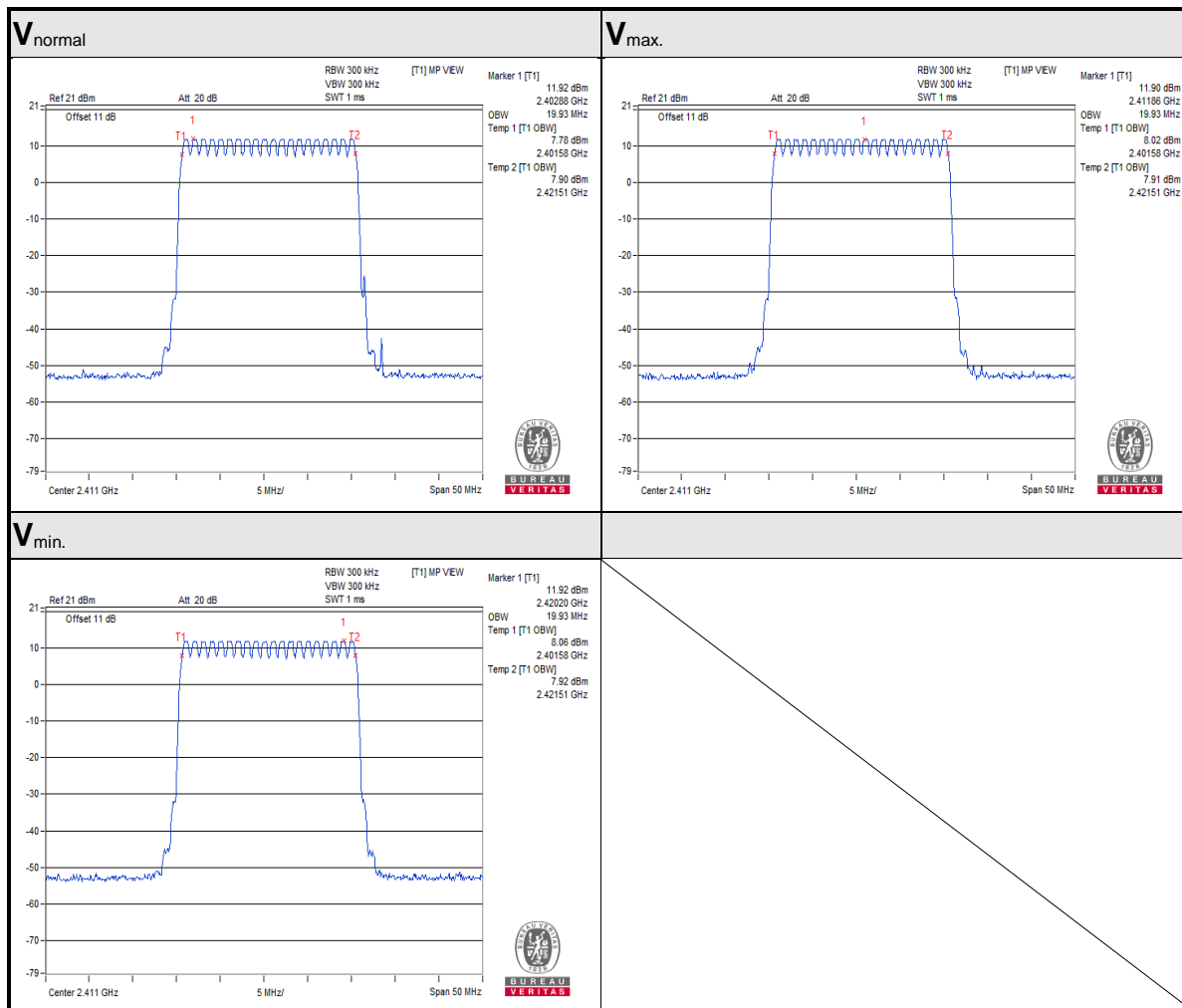
## Normal Mode:

Environmental Conditions	25 deg.C, 60% RH	
V <sub>normal</sub>	V <sub>max.</sub>	V <sub>min.</sub>
Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)
78.40	78.40	78.60



# AFH Mode:

Environmental Conditions	25 deg.C, 60% RH	
$V_{normal}$	$V_{max.}$	$V_{min.}$
Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)
19.93	19.93	19.93



### 4.3 Spreading Bandwidth Measurement (90% power bandwidth)

#### 4.3.1 Limits of Spreading Bandwidth and Spreading Factor Measurement

Item	Limit	Remark
Spreading Bandwidth	$\geq 500\text{kHz}$	(For DSSS, FHSS)
Spreading Factor	$\geq 5$	Operating frequency 2400 to 2483.5MHz

#### 4.3.2 Test Setup



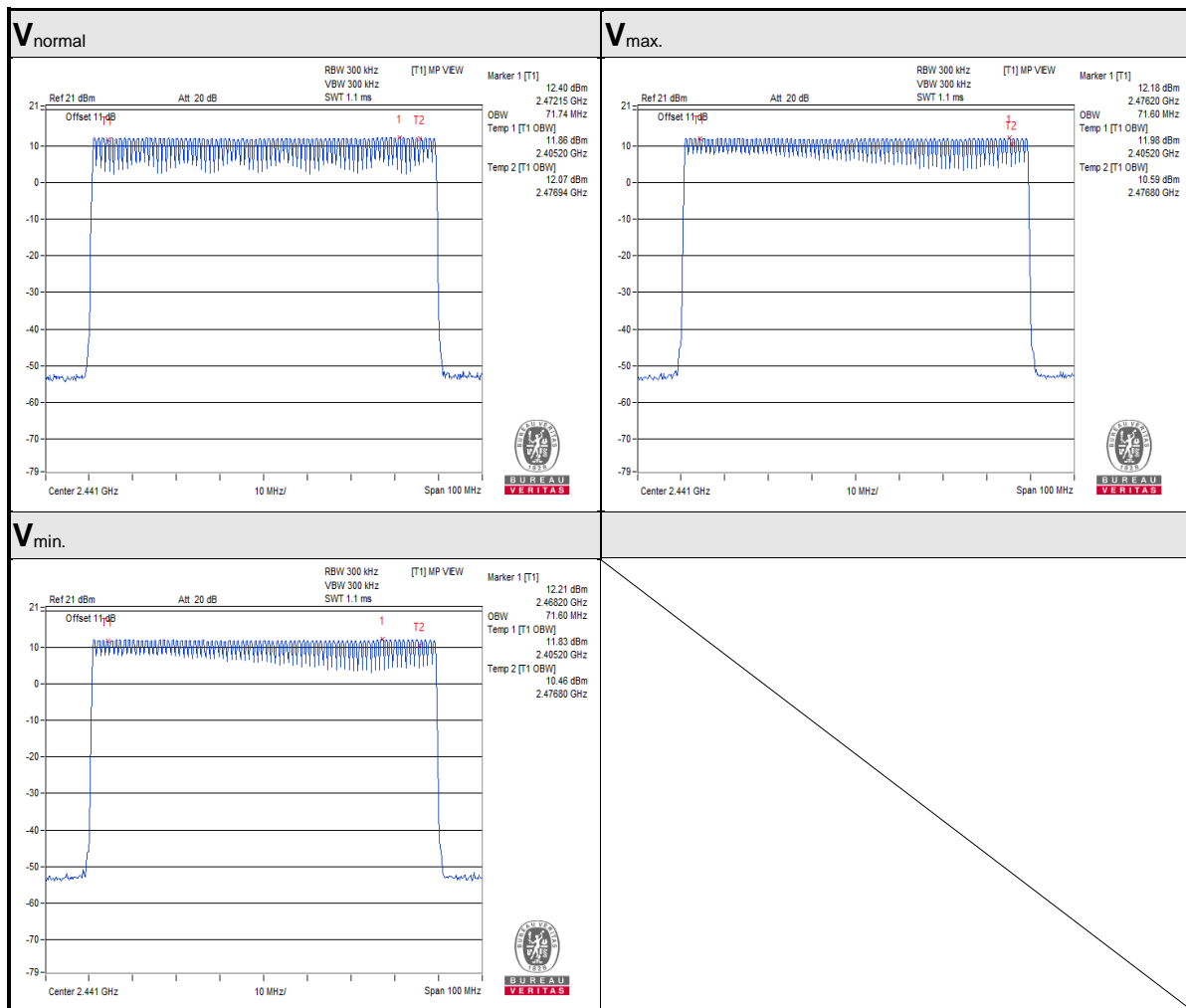
### 4.3.3 Test Results

Modulation: GFSK

Normal Mode:

Environmental Conditions		25 deg.C, 60% RH			
$V_{normal}$		$V_{max.}$		$V_{min.}$	
Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor
71.74	71.74	71.60	71.60	71.60	71.60

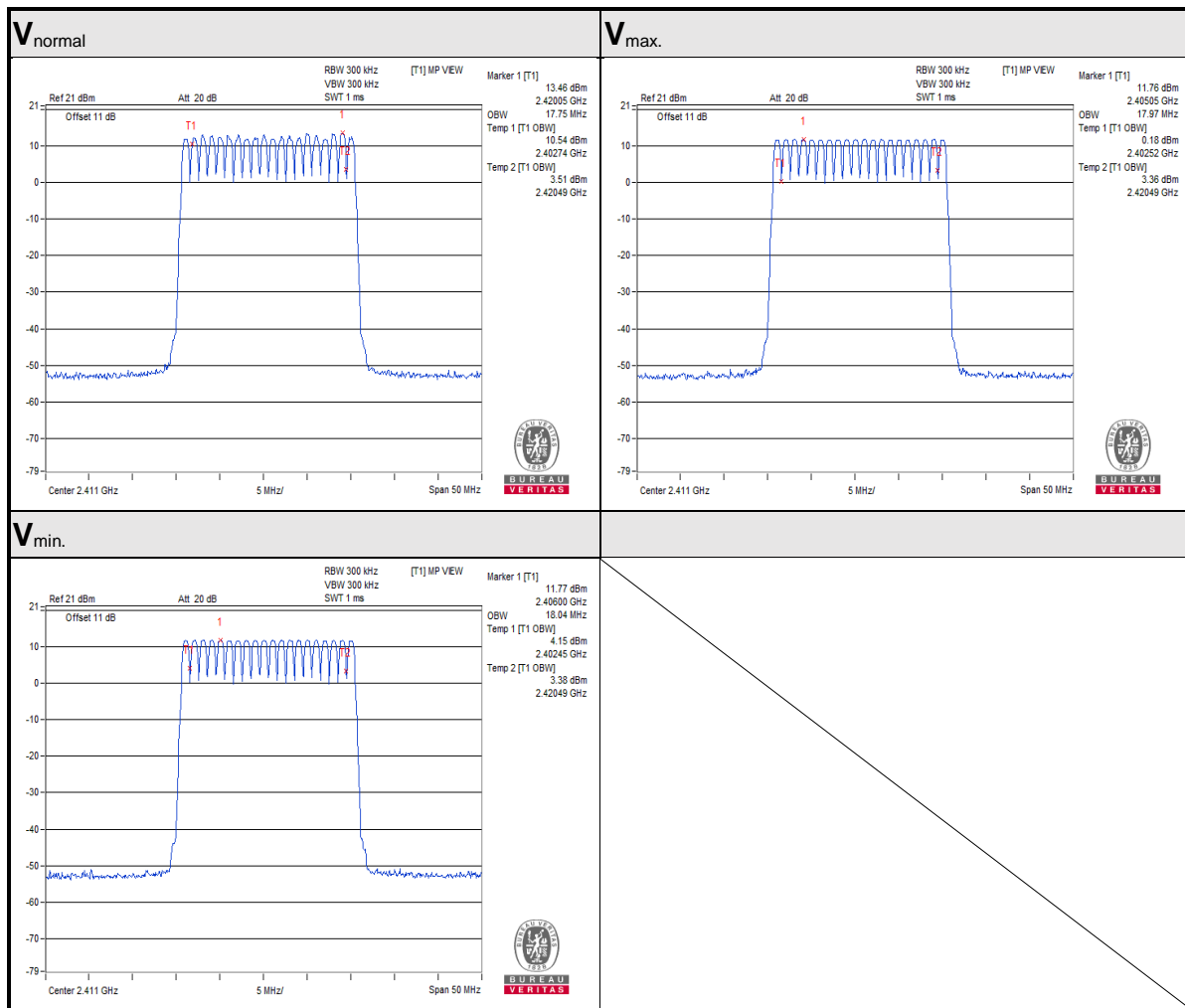
Note: 1. Spreading Factor: 90% channel power bandwidth / 1.



### AFH Mode:

Environmental Conditions		25 deg.C, 60% RH			
$V_{normal}$		$V_{max.}$		$V_{min.}$	
Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor
17.75	17.75	17.97	17.97	18.04	18.04

Note: 1. Spreading Factor: 90% channel power bandwidth / 1.

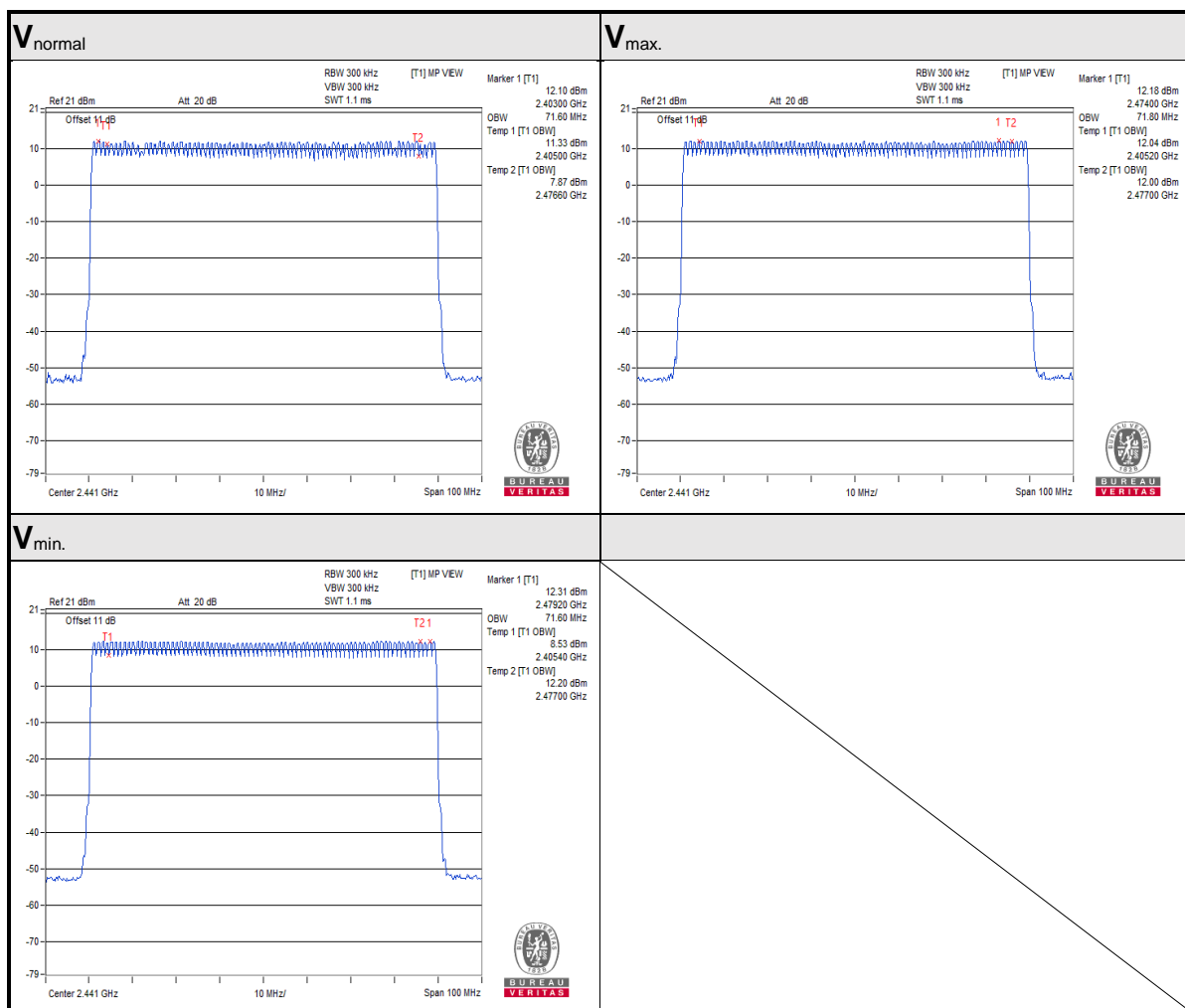


Modulation:  $\pi/4$ -DQPSK

Normal Mode:

Environmental Conditions		25 deg.C, 60% RH			
$V_{normal}$		$V_{max.}$		$V_{min.}$	
Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor
71.60	71.60	71.80	71.80	71.60	71.60

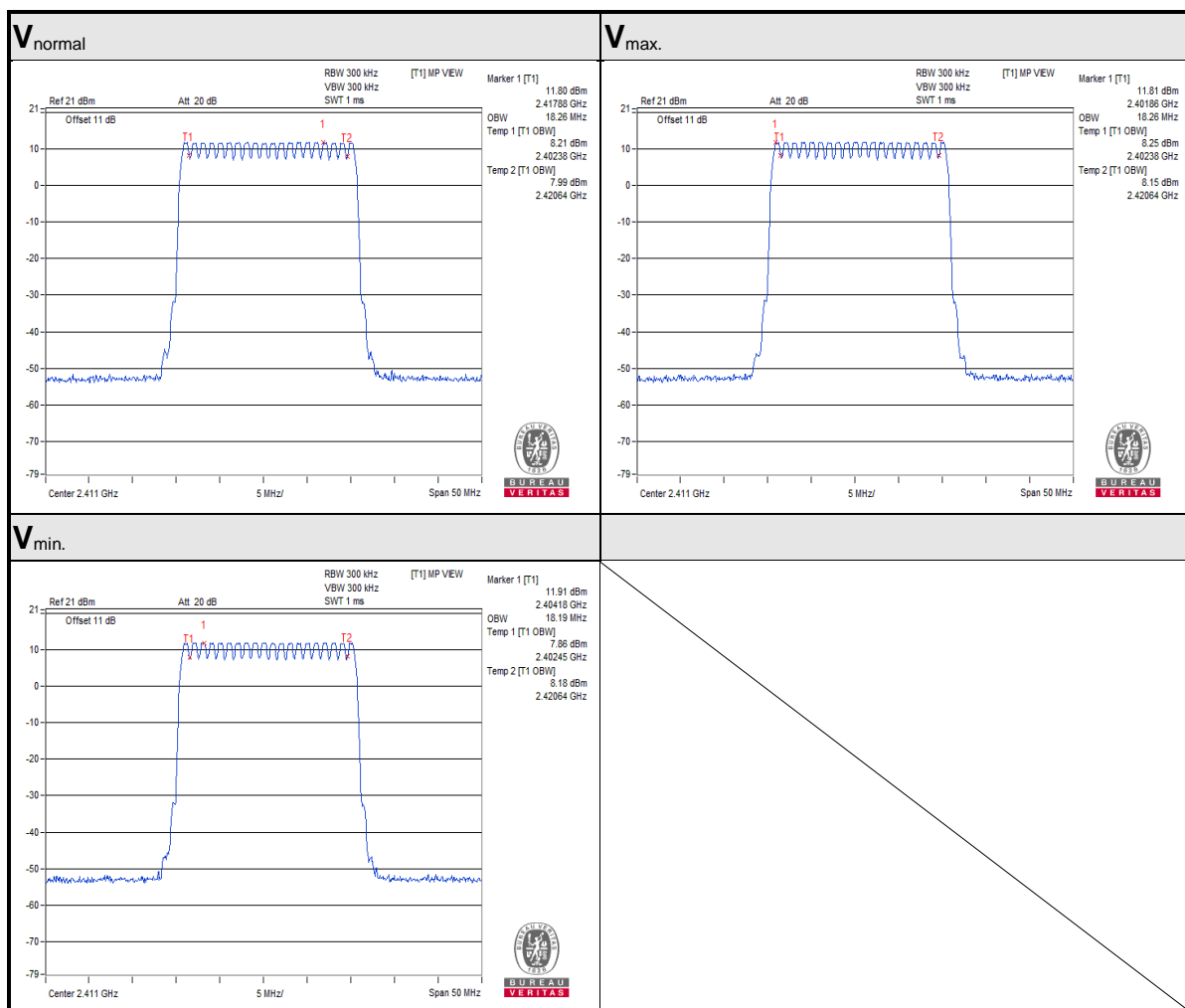
Note: 1. Spreading Factor: 90% channel power bandwidth / 1.



# AFH Mode:

Environmental Conditions		25 deg.C, 60% RH			
V <sub>normal</sub>		V <sub>max.</sub>		V <sub>min.</sub>	
Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor
18.26	18.26	18.26	18.26	18.19	18.19

Note: 1. Spreading Factor: 90% channel power bandwidth / 1.

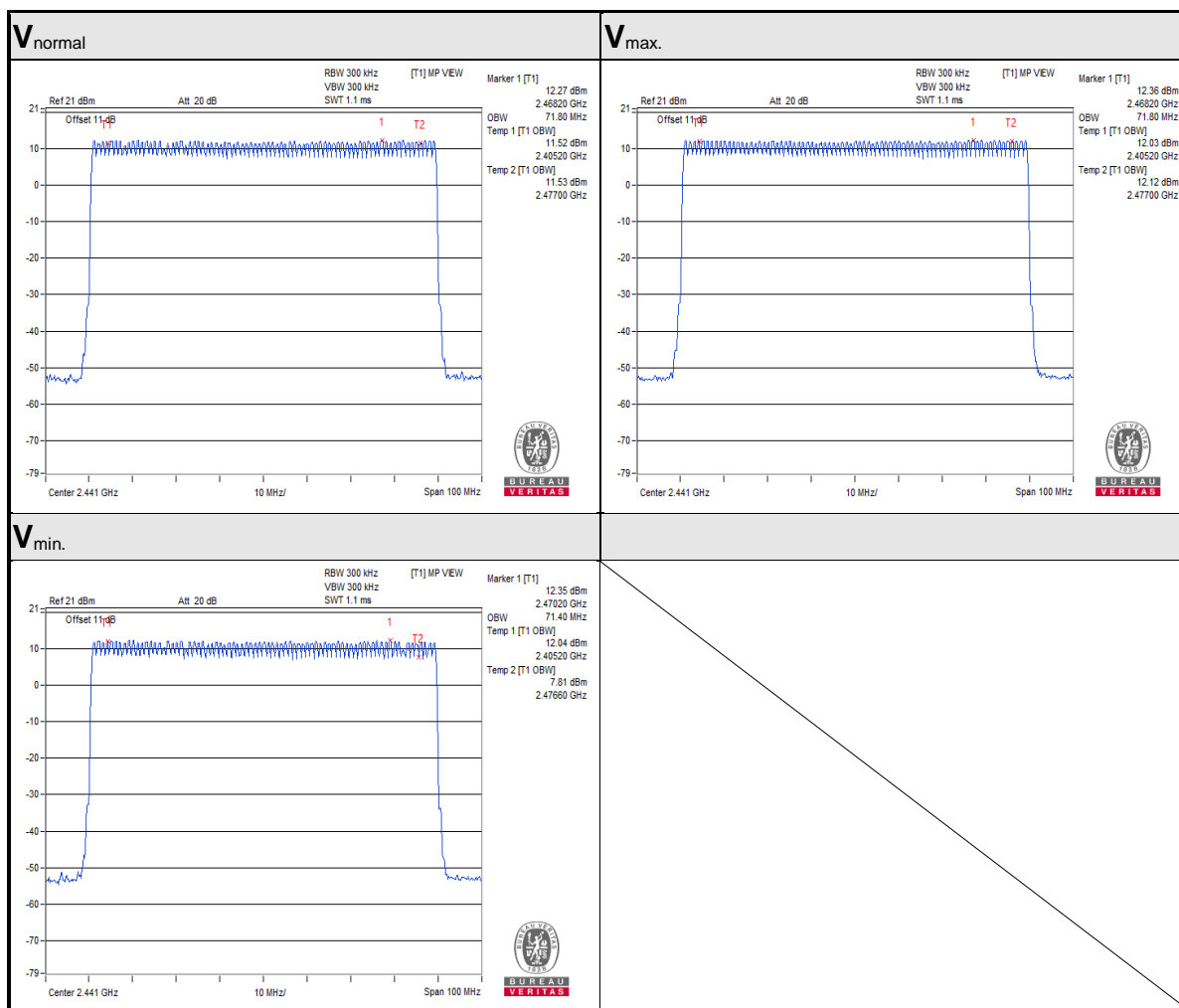


# Modulation: 8DPSK

## Normal Mode:

Environmental Conditions		25 deg.C, 60% RH			
V <sub>normal</sub>		V <sub>max.</sub>		V <sub>min.</sub>	
Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor
71.80	71.80	71.80	71.80	71.40	71.40

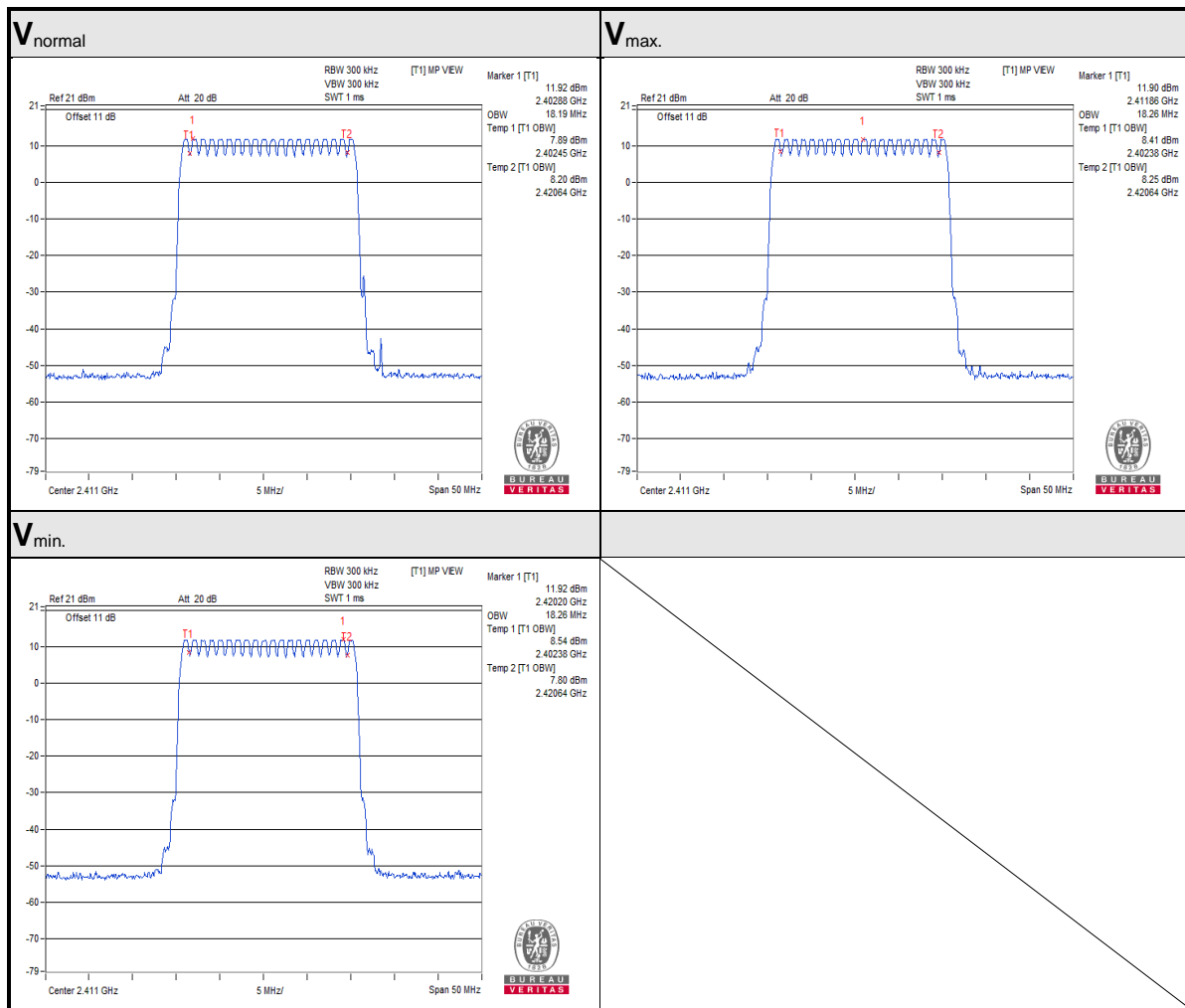
Note: 1. Spreading Factor: 90% channel power bandwidth / 1.



### AFH Mode:

Environmental Conditions		25 deg.C, 60% RH			
$V_{normal}$		$V_{max.}$		$V_{min.}$	
Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor
18.19	18.19	18.26	18.26	18.26	18.26

Note: 1. Spreading Factor: 90% channel power bandwidth / 1.



#### 4.4 Spurious Emissions for Transmitter Measurement

##### 4.4.1 Limits of Spurious Emissions

Frequencies (MHz)	Limit
Operating frequency 2400 to 2483.5MHz	
30.0MHz to 1000.0MHz	$\leq 0.25 \mu\text{W}/100\text{kHz}$
1000.0MHz to 2387MHz	$\leq 2.5 \mu\text{W}/\text{MHz}$
2387.0MHz to 2400.0MHz	$\leq 25 \mu\text{W}/\text{MHz}$
2483.5MHz to 2496.5MHz	$\leq 25 \mu\text{W}/\text{MHz}$
2496.5MHz to 12500.0MHz	$\leq 2.5 \mu\text{W}/\text{MHz}$

##### 4.4.2 Test Setup



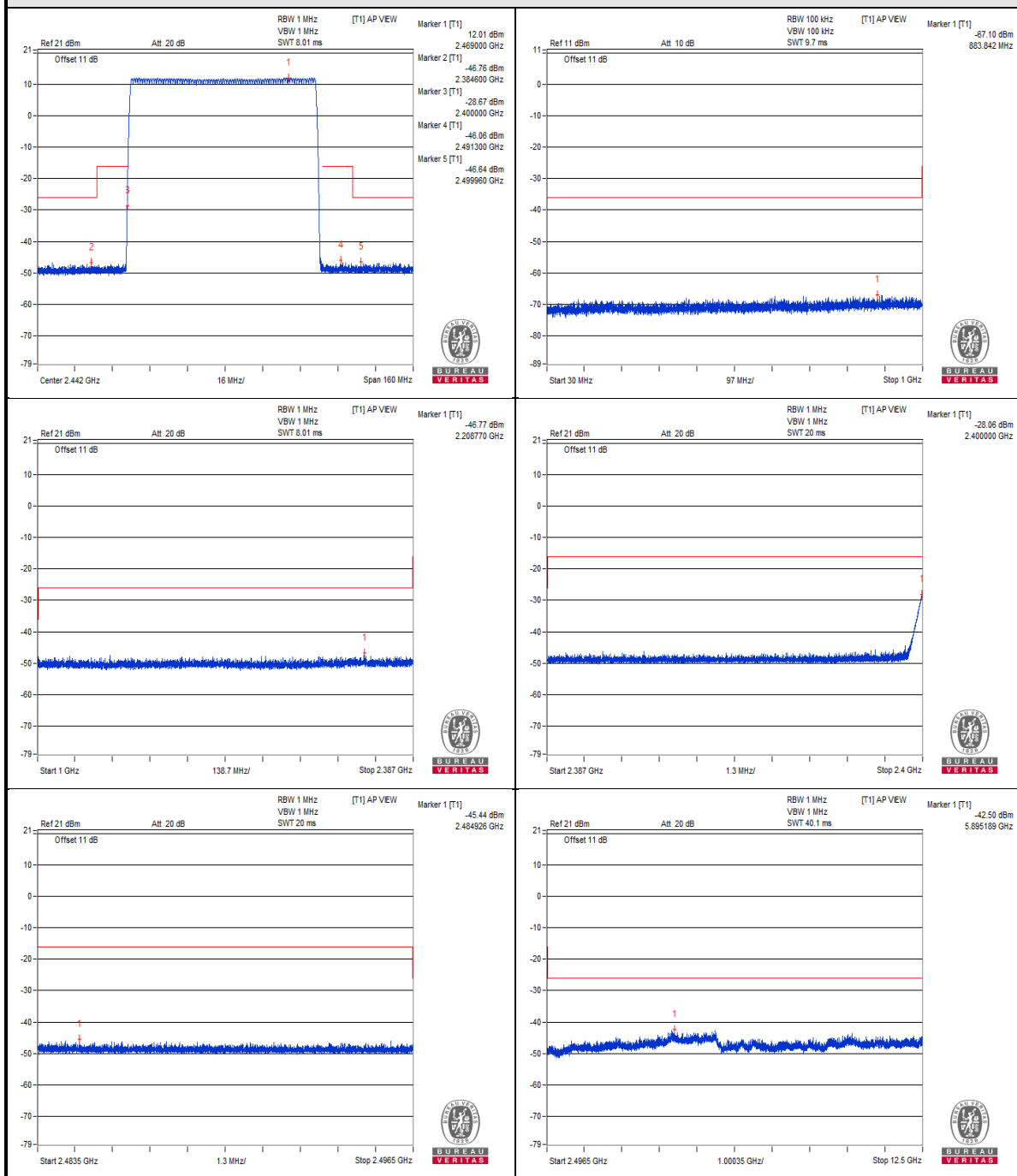
#### 4.4.3 Test Results

##### Modulation: GFSK

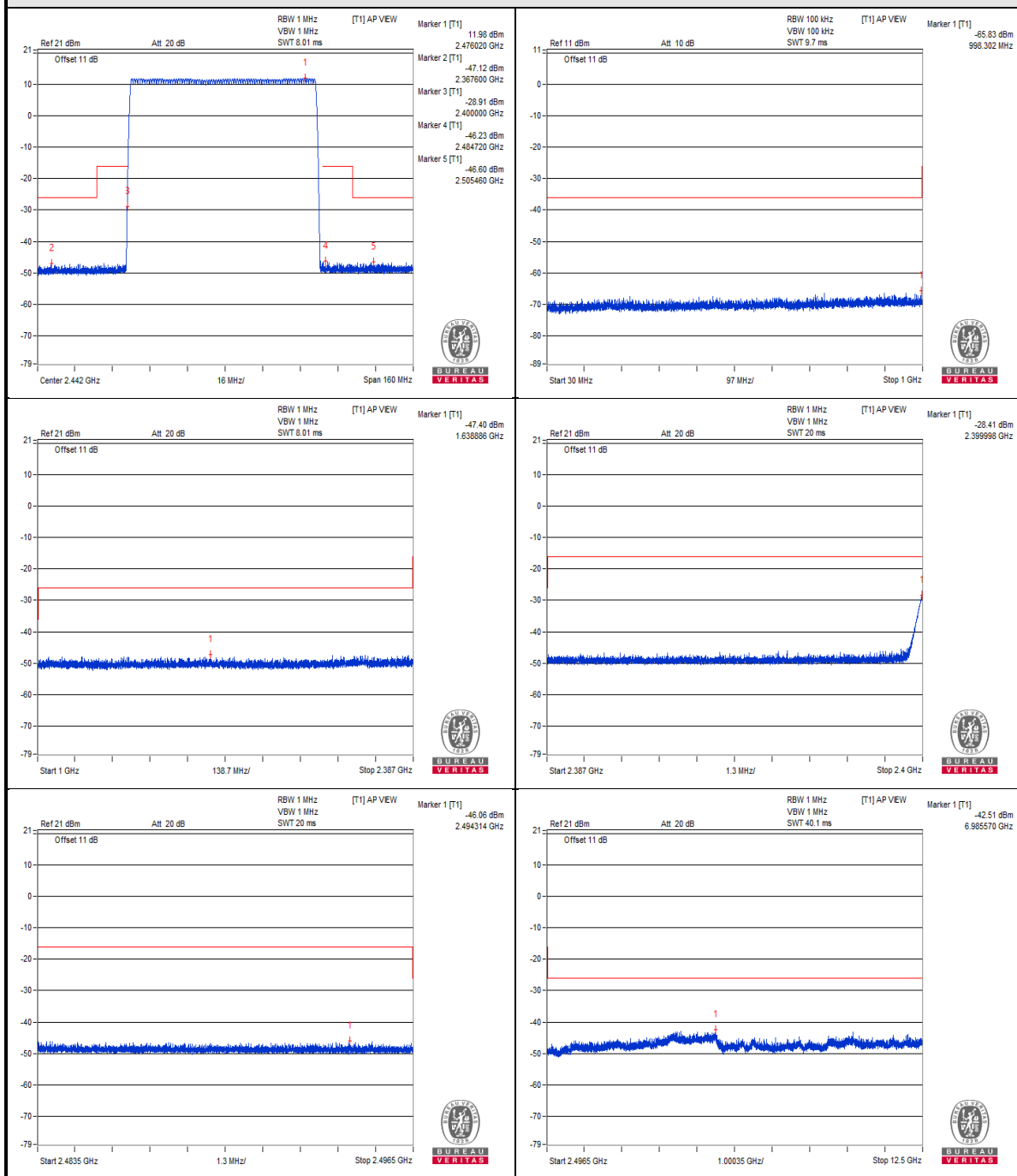
TEST CHANNEL		Hopping Mode			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
<b>V<sub>normal</sub></b>	30MHz to 1000MHz	883.842	0.000195	0.25	PASS
	1000MHz to 2387MHz	2208.770	0.021038	2.5	PASS
	2387MHz to 2400MHz	2400.000	1.563148	25	PASS
	2483.5MHz to 2496.5MHz	2484.926	0.028576	25	PASS
	2496.5MHz to 12500MHz	5895.189	0.056234	2.5	PASS
<b>V<sub>max.</sub></b>	30MHz to 1000MHz	998.302	0.000261	0.25	PASS
	1000MHz to 2387MHz	1638.886	0.018197	2.5	PASS
	2387MHz to 2400MHz	2399.998	1.442115	25	PASS
	2483.5MHz to 2496.5MHz	2494.314	0.024774	25	PASS
	2496.5MHz to 12500MHz	6985.570	0.056105	2.5	PASS
<b>V<sub>min.</sub></b>	30MHz to 1000MHz	972.112	0.000274	0.25	PASS
	1000MHz to 2387MHz	2129.711	0.019320	2.5	PASS
	2387MHz to 2400MHz	2399.996	1.517050	25	PASS
	2483.5MHz to 2496.5MHz	2486.189	0.026002	25	PASS
	2496.5MHz to 12500MHz	5786.401	0.057016	2.5	PASS

**NOTE:** 1. The spectrum plots are attached on the following pages.

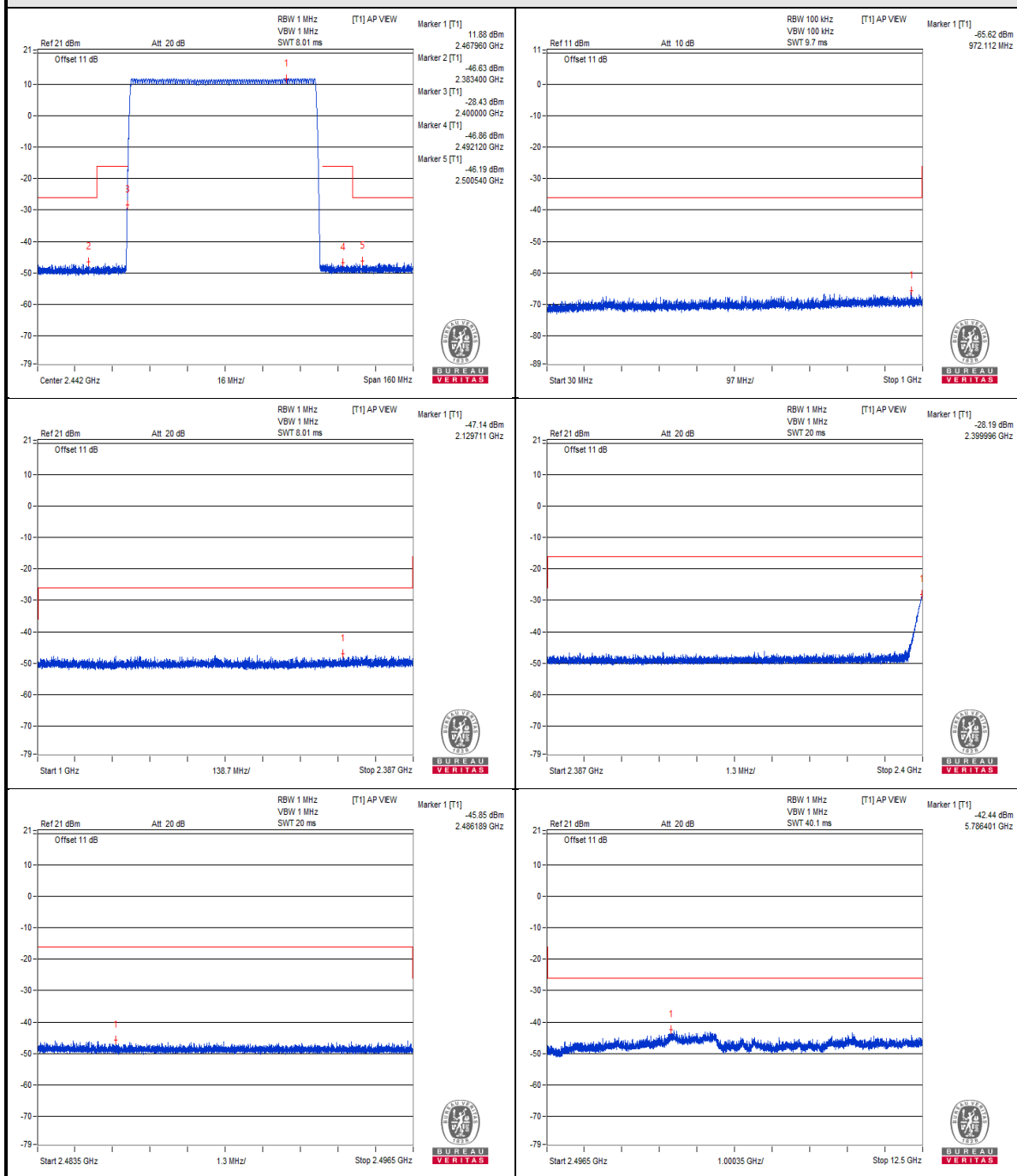
# Vnormal



V<sub>max</sub>.



V<sub>min</sub>.

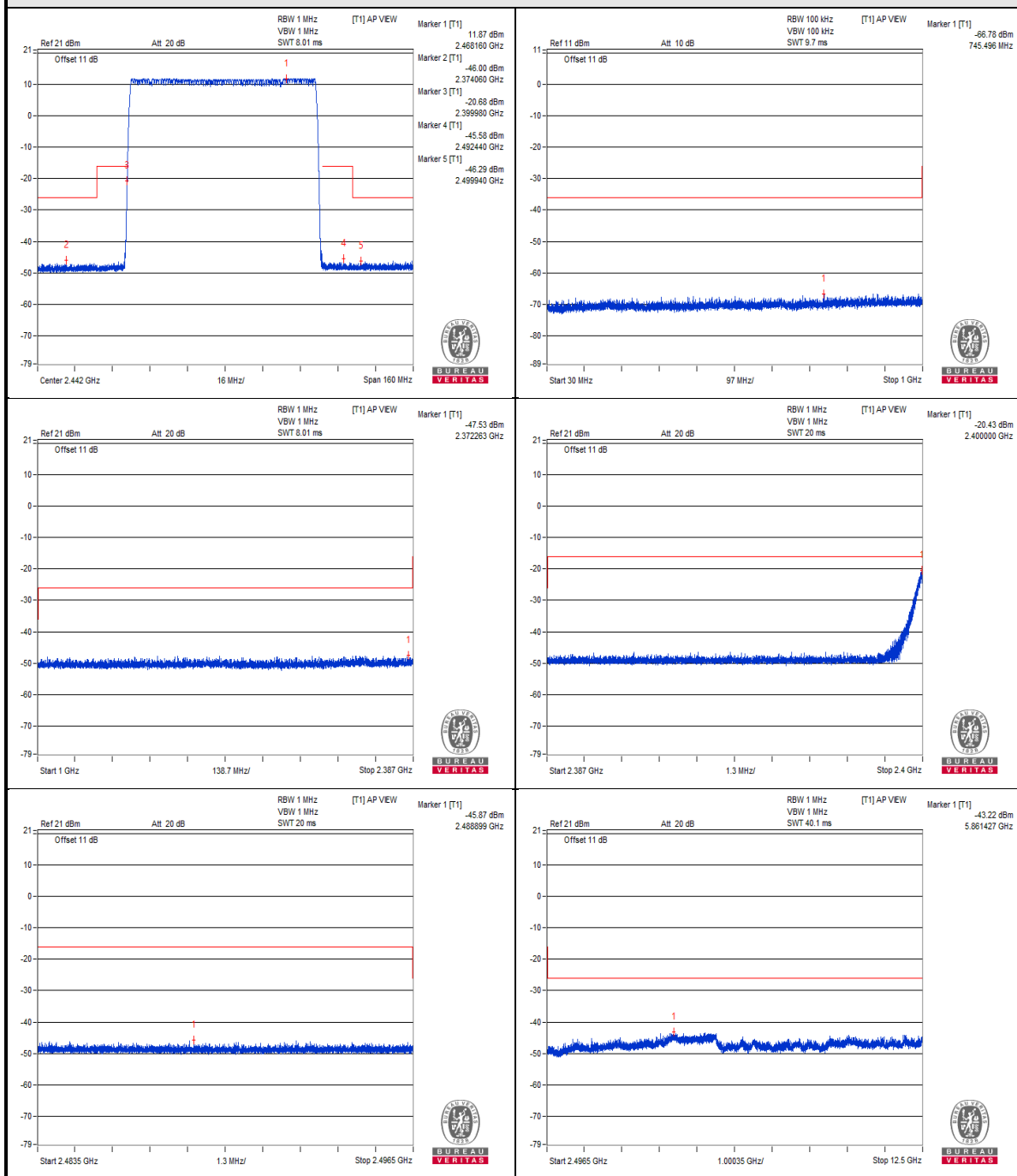


Modulation:  $\pi/4$ -DQPSK

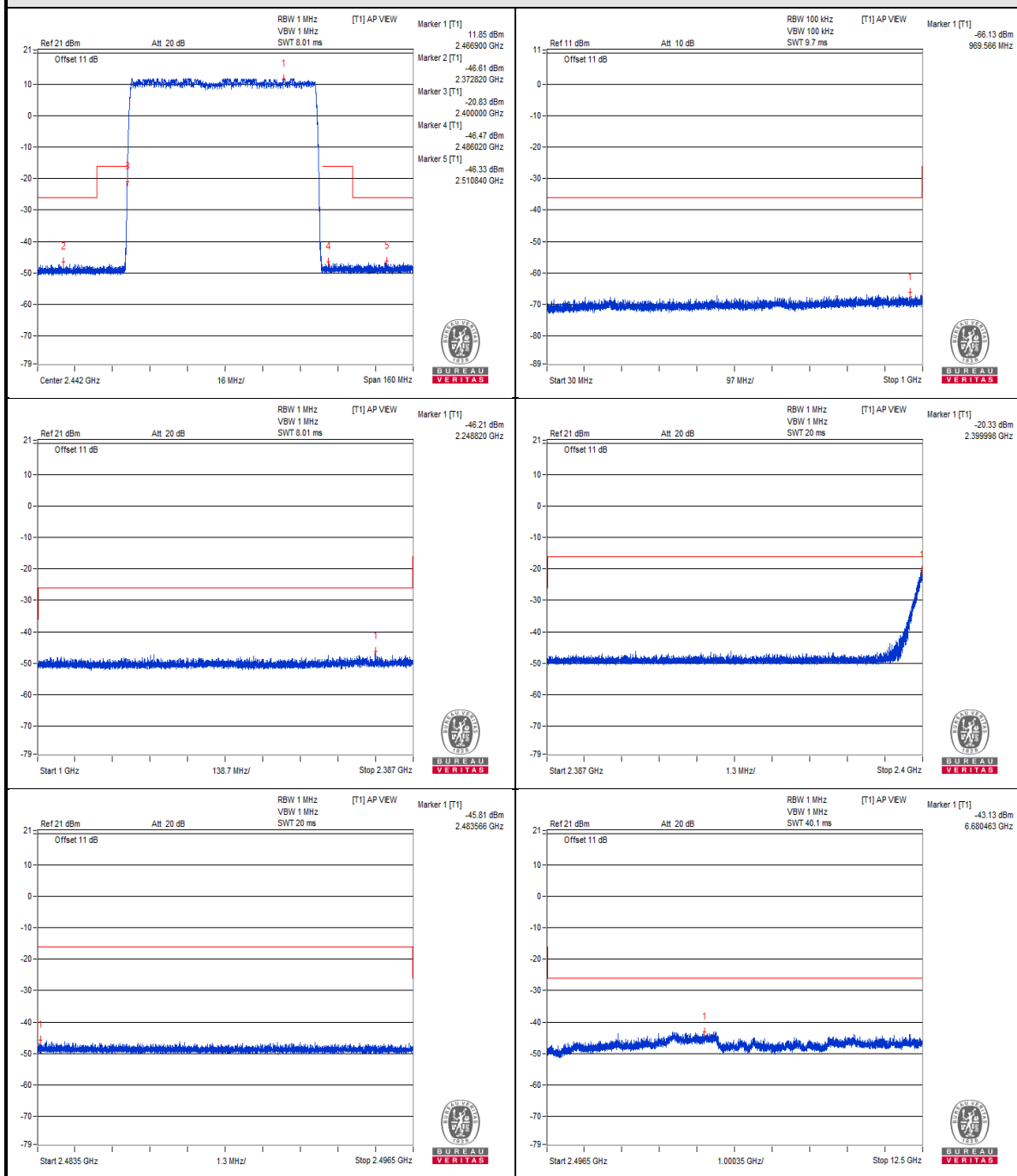
TEST CHANNEL		Hopping Mode			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
<b>V<sub>normal</sub></b>	30MHz to 1000MHz	745.496	0.000210	0.25	PASS
	1000MHz to 2387MHz	2372.263	0.017660	2.5	PASS
	2387MHz to 2400MHz	2400.000	9.057326	25	PASS
	2483.5MHz to 2496.5MHz	2488.899	0.025882	25	PASS
	2496.5MHz to 12500MHz	5861.427	0.047643	2.5	PASS
<b>V<sub>max.</sub></b>	30MHz to 1000MHz	969.566	0.000244	0.25	PASS
	1000MHz to 2387MHz	2248.820	0.023933	2.5	PASS
	2387MHz to 2400MHz	2399.998	9.268298	25	PASS
	2483.5MHz to 2496.5MHz	2483.566	0.026242	25	PASS
	2496.5MHz to 12500MHz	6680.463	0.048641	2.5	PASS
<b>V<sub>min.</sub></b>	30MHz to 1000MHz	958.653	0.000229	0.25	PASS
	1000MHz to 2387MHz	1914.899	0.019953	2.5	PASS
	2387MHz to 2400MHz	2399.998	10.162487	25	PASS
	2483.5MHz to 2496.5MHz	2490.388	0.024322	25	PASS
	2496.5MHz to 12500MHz	5893.938	0.050119	2.5	PASS

**NOTE:** 1. The spectrum plots are attached on the following pages.

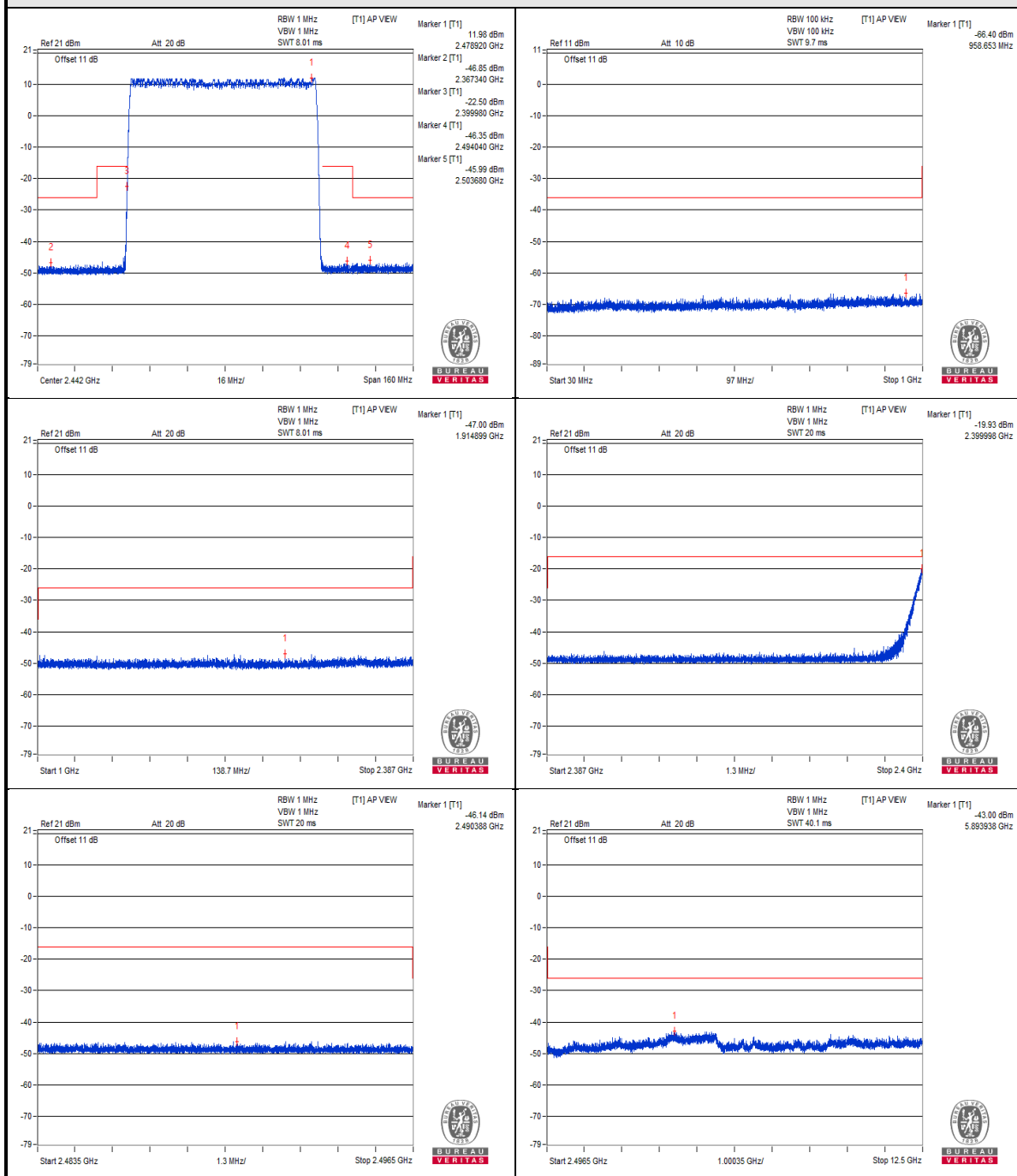
# Vnormal



V<sub>max</sub>.



V<sub>min</sub>.

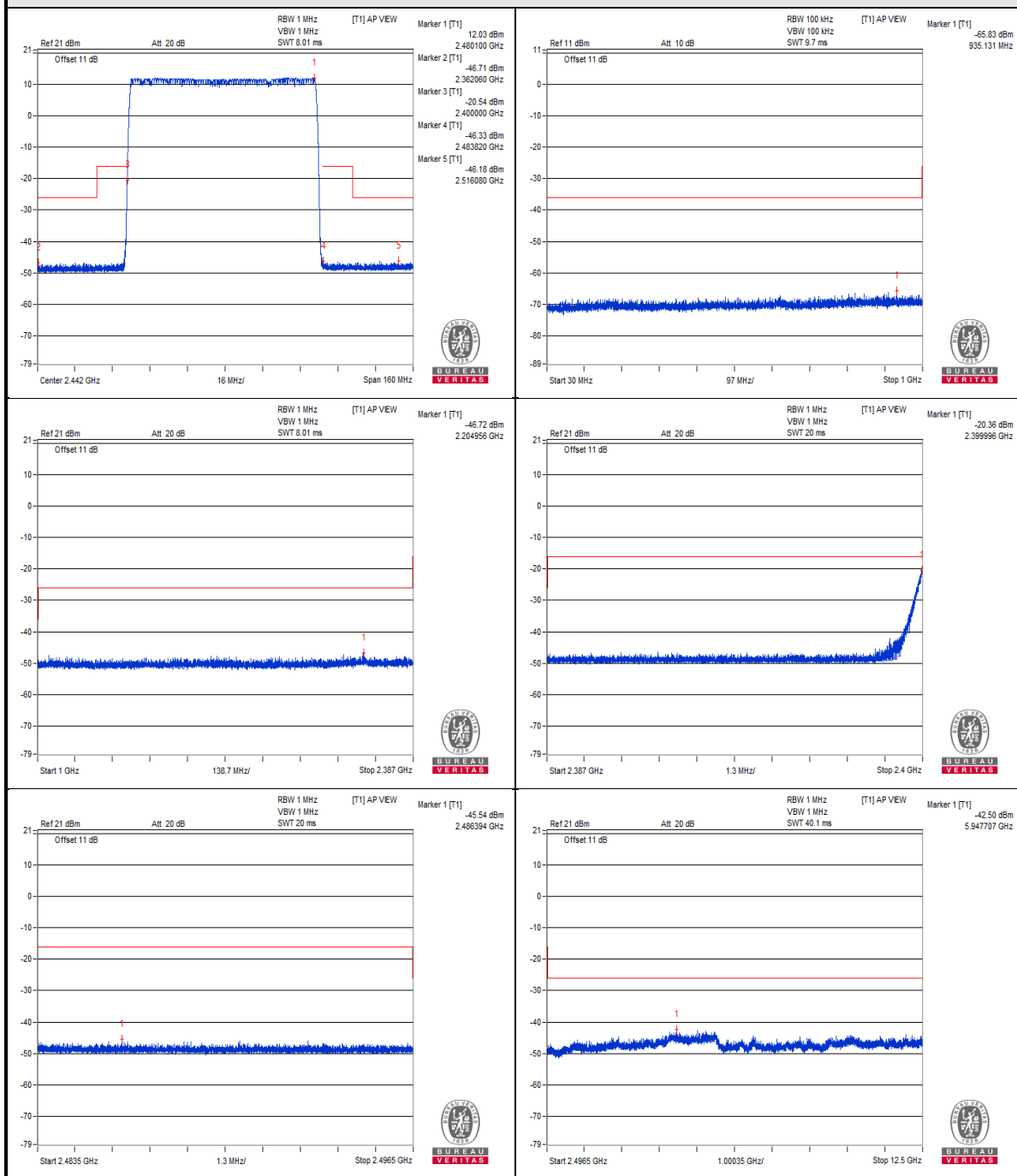


### Modulation: 8DPSK

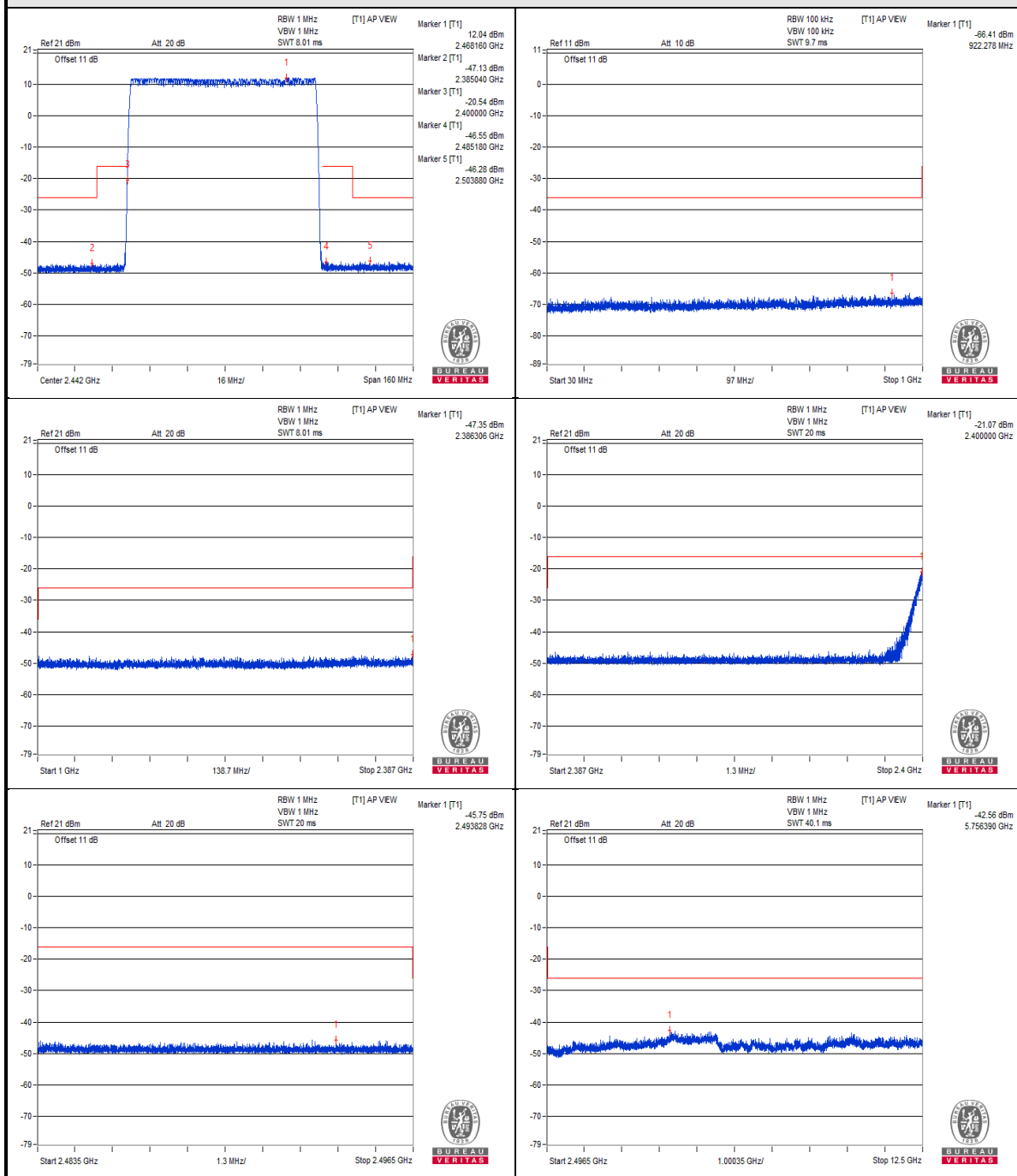
TEST CHANNEL		Hopping Mode			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
<b>V<sub>normal</sub></b>	30MHz to 1000MHz	935.131	0.000261	0.25	PASS
	1000MHz to 2387MHz	2204.956	0.021281	2.5	PASS
	2387MHz to 2400MHz	2399.996	9.204496	25	PASS
	2483.5MHz to 2496.5MHz	2486.394	0.027925	25	PASS
	2496.5MHz to 12500MHz	5947.707	0.056234	2.5	PASS
<b>V<sub>max.</sub></b>	30MHz to 1000MHz	922.278	0.000229	0.25	PASS
	1000MHz to 2387MHz	2386.306	0.018408	2.5	PASS
	2387MHz to 2400MHz	2400.000	7.816278	25	PASS
	2483.5MHz to 2496.5MHz	2493.828	0.026607	25	PASS
	2496.5MHz to 12500MHz	5756.390	0.055463	2.5	PASS
<b>V<sub>min.</sub></b>	30MHz to 1000MHz	917.307	0.000232	0.25	PASS
	1000MHz to 2387MHz	2075.098	0.022909	2.5	PASS
	2387MHz to 2400MHz	2399.998	7.870458	25	PASS
	2483.5MHz to 2496.5MHz	2483.862	0.032063	25	PASS
	2496.5MHz to 12500MHz	6934.302	0.052481	2.5	PASS

**NOTE:** 1. The spectrum plots are attached on the following pages.

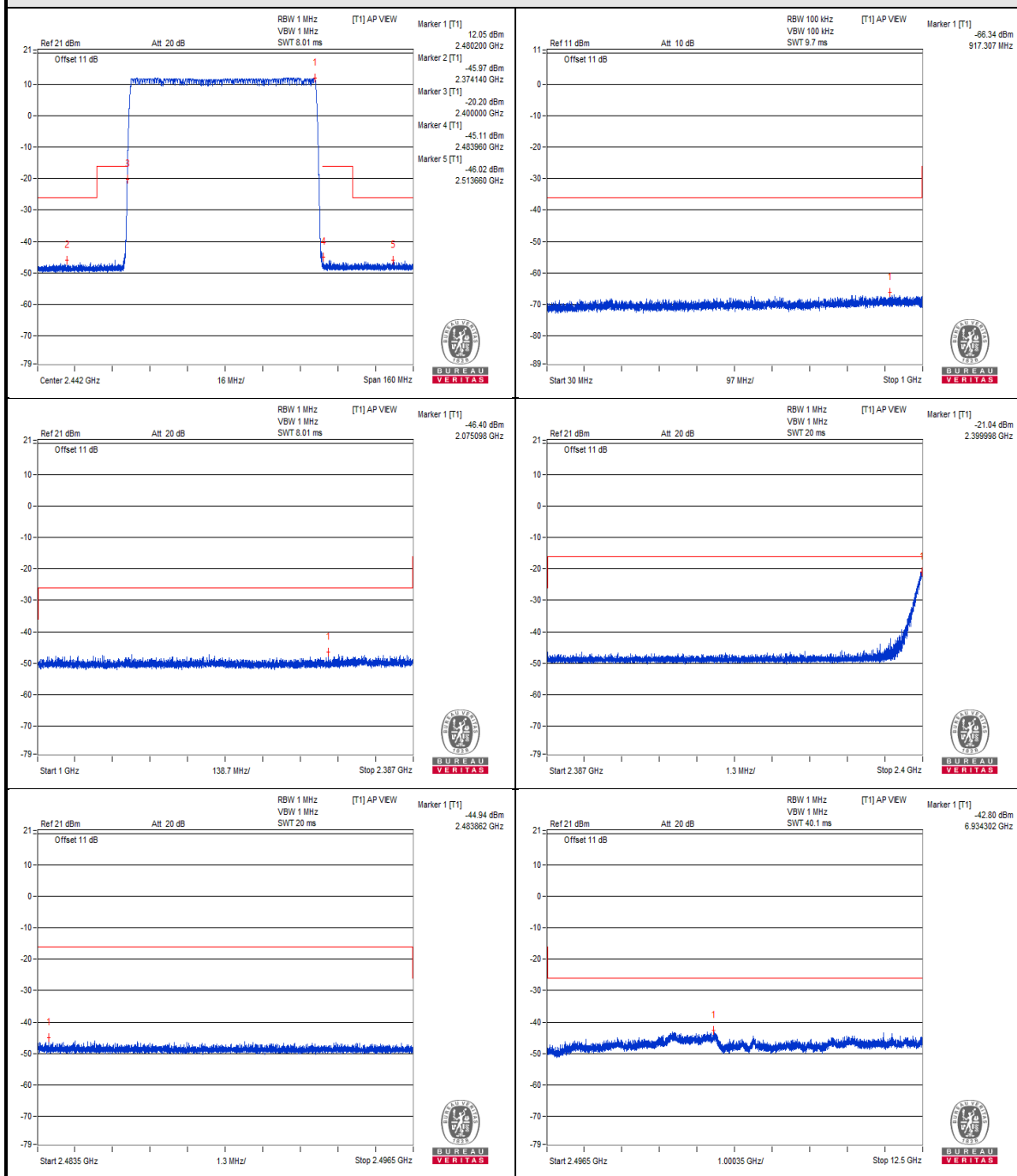
# Vnormal



V<sub>max</sub>.



V<sub>min</sub>.



## 4.5 Antenna Power Measurement

### 4.5.1 Limits of Antenna Power

Modulation System	Frequency Band Used	Antenna Power (Max.)	EIRP Limit (Note 3)
DS	2400 – 2483.5 MHz	10 mW/MHz	12.14 dBm/MHz ~ 22.14 dBm/MHz (16.368 mW/MHz ~ 163.68 mW/MHz)
OFDM (Note 1)	2400 – 2483.5 MHz	10 mW/MHz	12.14 dBm/MHz ~ 22.14 dBm/MHz (16.368 mW/MHz ~ 163.68 mW/MHz)
OFDM (Note 2)	2400 – 2483.5 MHz	5 mW/MHz	9.13 dBm/MHz ~ 19.13 dBm/MHz (8.184 mW/MHz ~ 81.84 mW/MHz)
FH	2400 – 2483.5 MHz	3 mW/MHz	6.91 dBm/MHz ~ 16.91 dBm/MHz (4.91 mW/MHz ~ 49.1 mW/MHz)

Note:

1. Occupied bandwidth is less than 26MHz
2. Occupied bandwidth is more than 26MHz and less than 38MHz
3. EIRP limit is variable by the HPBA, the HPBA (half-power beam width) of the antenna shall be 360/A degrees or less, where A = EIRP/(2.14 dBi + "Antenna Power (limit)).
4. Tolerance of antenna power shall be +20% (upper value) and -80% (lower value).

### 4.5.2 Test Setup



Output Power Density (mW/MHz) = Total Output Power (mW) / Spread Bandwidth (MHz)

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

#### 4.5.3 Test Results

##### Normal Mode:

Voltage (Vdc)	Modulation	Data Rate	Conducted RF Output Power Density (mW/MHz)	Radiated RF Output Power Density (mW/MHz)
3.3	BT GFSK	DH5	0.173876	0.361609
	BT $\pi/4$ -DQPSK	2DH5	0.088326	0.183691
	BT 8DPSK	3DH5	0.084504	0.175743
3.63	BT GFSK	DH5	0.168689	0.350822
	BT $\pi/4$ -DQPSK	2DH5	0.092019	0.191372
	BT 8DPSK	3DH5	0.088283	0.183602
2.97	BT GFSK	DH5	0.169468	0.352442
	BT $\pi/4$ -DQPSK	2DH5	0.09101	0.189273
	BT 8DPSK	3DH5	0.08134	0.169163
Max. Limit (mW/MHz):			3	-
Rated Power (mW/MHz):			0.2	-
Tolerance of Antenna Power (mW/MHz):			0.04 ~ 0.24	-
Max. EIRP Limit (mW/MHz):			-	4.91

Note: 1. Antenna gain is 3.18 dBi.

2. The radiated RF output power density is a “calculated” value derived from the conducted value.

3. Formula: Radiated RF output power density = Conducted RF output power density + Antenna gain

**AFH Mode:**

Voltage (Vdc)	Modulation	Data Rate	Conducted RF Output Power Density (mW/MHz)	Radiated RF Output Power Density (mW/MHz)
<b>3.3</b>	<b>BT GFSK</b>	<b>DH5</b>	0.702753	1.461513
	<b>BT <math>\pi/4</math>-DQPSK</b>	<b>2DH5</b>	0.346339	0.72028
	<b>BT 8DPSK</b>	<b>3DH5</b>	0.333556	0.693695
<b>3.63</b>	<b>BT GFSK</b>	<b>DH5</b>	0.672128	1.397822
	<b>BT <math>\pi/4</math>-DQPSK</b>	<b>2DH5</b>	0.361827	0.75249
	<b>BT 8DPSK</b>	<b>3DH5</b>	0.347137	0.72194
<b>2.97</b>	<b>BT GFSK</b>	<b>DH5</b>	0.672611	1.398827
	<b>BT <math>\pi/4</math>-DQPSK</b>	<b>2DH5</b>	0.358236	0.745022
	<b>BT 8DPSK</b>	<b>3DH5</b>	0.318055	0.661458
<b>Max. Limit (mW/MHz):</b>			3	-
<b>Rated Power (mW/MHz):</b>			0.8	-
<b>Tolerance of Antenna Power (mW/MHz):</b>			0.16 ~ 0.96	-
<b>Max. EIRP Limit (mW/MHz):</b>			-	4.91

Note: 1. Antenna gain is 3.18 dBi.

2. The radiated RF output power density is a “calculated” value derived from the conducted value.

3. Formula: Radiated RF output power density = Conducted RF output power density + Antenna gain

## 4.6 Spurious Emissions for Receiver

### 4.6.1 Limits of Spurious Emissions for Receiver

Frequencies (MHz)	Limit
Below 1GHz	$\leq 4\text{nW}$ (-54dBm)
Above 1GHz	$\leq 20\text{nW}$ (-47dBm)

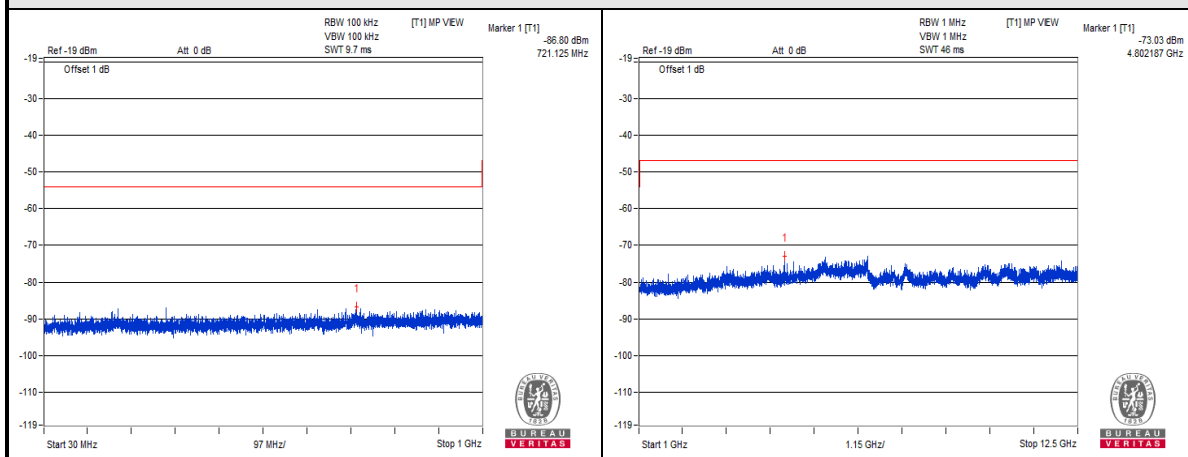
### 4.6.2 Test Setup



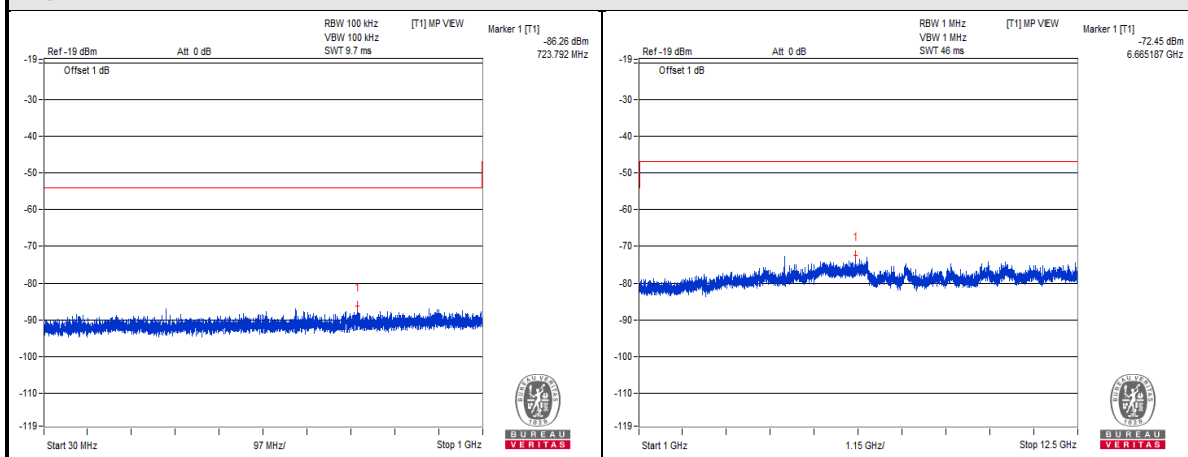
#### 4.6.3 Test Result

TEST CHANNEL		CH 0 (2402MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(nW)	LIMIT (nW)	RESULT
<b>V<sub>normal</sub></b>	30MHz to 1000MHz	721.125	0.002089	4.0	PASS
	1000MHz to 12500MHz	4802.187	0.049774	20.0	PASS
<b>V<sub>max.</sub></b>	30MHz to 1000MHz	723.792	0.002366	4.0	PASS
	1000MHz to 12500MHz	6665.187	0.056885	20.0	PASS
<b>V<sub>min.</sub></b>	30MHz to 1000MHz	697.117	0.002523	4.0	PASS
	1000MHz to 12500MHz	6458.187	0.059293	20.0	PASS
TEST CHANNEL		CH 39 (2441MHz)			
<b>V<sub>normal</sub></b>	30MHz to 1000MHz	720.882	0.002472	4.0	PASS
	1000MHz to 12500MHz	6948.375	0.060814	20.0	PASS
<b>V<sub>max.</sub></b>	30MHz to 1000MHz	492.326	0.002825	4.0	PASS
	1000MHz to 12500MHz	6991.500	0.046026	20.0	PASS
<b>V<sub>min.</sub></b>	30MHz to 1000MHz	299.296	0.002710	4.0	PASS
	1000MHz to 12500MHz	5876.000	0.054325	20.0	PASS
TEST CHANNEL		CH 78 (2480MHz)			
<b>V<sub>normal</sub></b>	30MHz to 1000MHz	698.451	0.002844	4.0	PASS
	1000MHz to 12500MHz	5812.750	0.049317	20.0	PASS
<b>V<sub>max.</sub></b>	30MHz to 1000MHz	698.451	0.002393	4.0	PASS
	1000MHz to 12500MHz	6814.687	0.051050	20.0	PASS
<b>V<sub>min.</sub></b>	30MHz to 1000MHz	735.432	0.002133	4.0	PASS
	1000MHz to 12500MHz	6918.187	0.051761	20.0	PASS

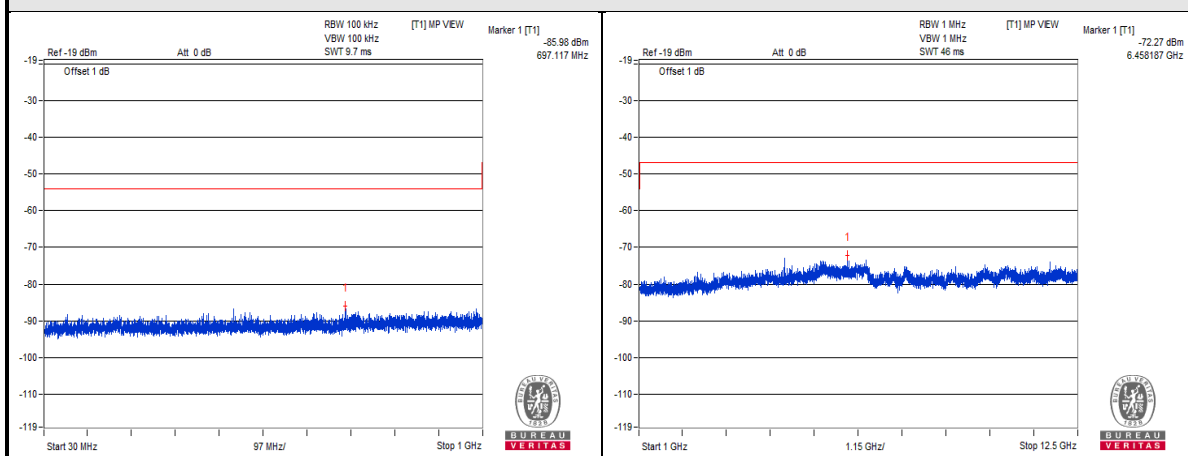
## V<sub>normal</sub>



## V<sub>max</sub>

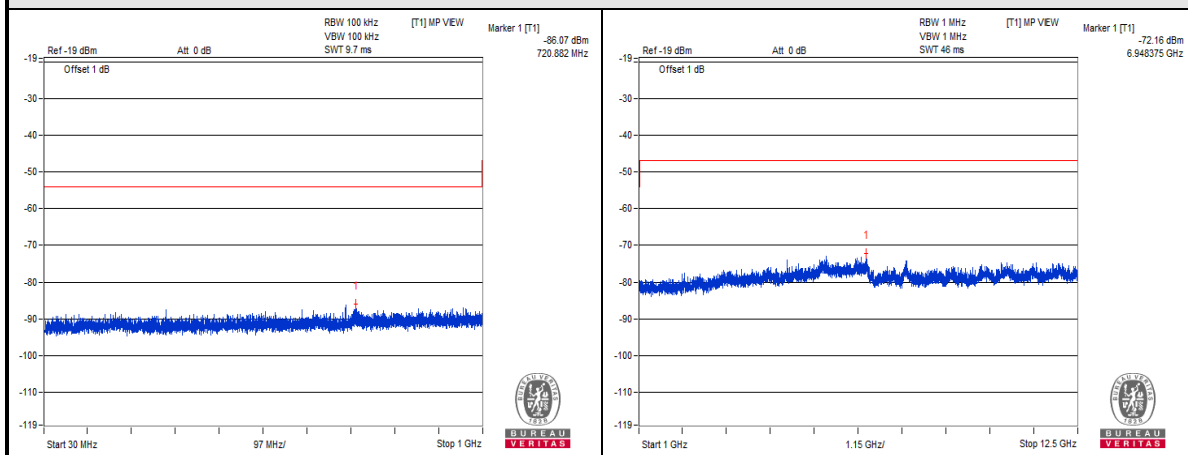


## V<sub>min</sub>

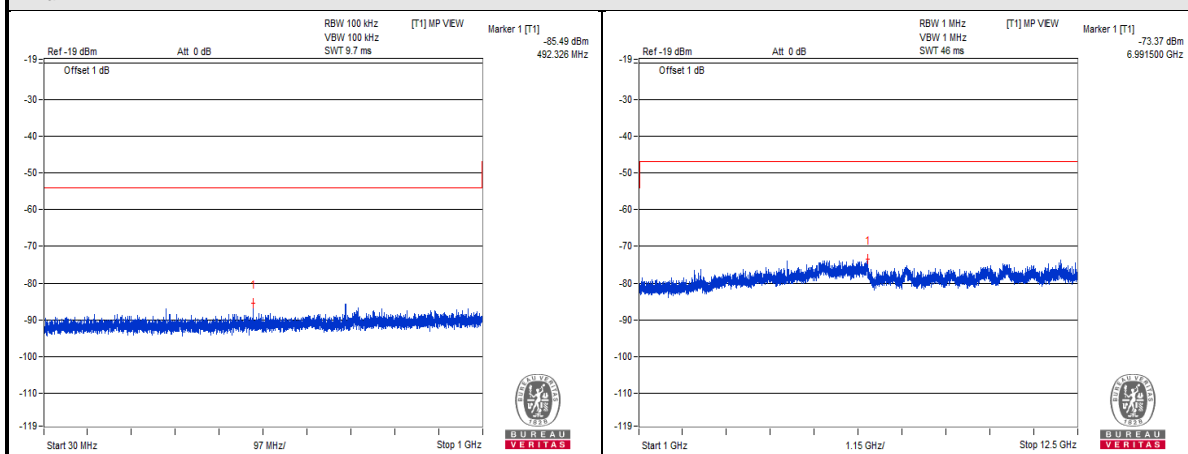


CH 0 (2402MHz)

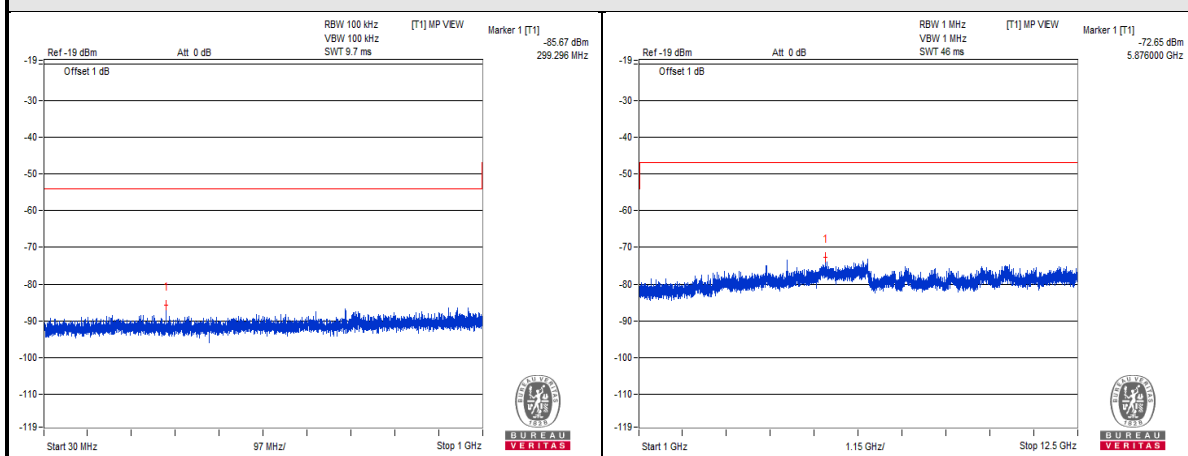
## V<sub>normal</sub>



## V<sub>max</sub>

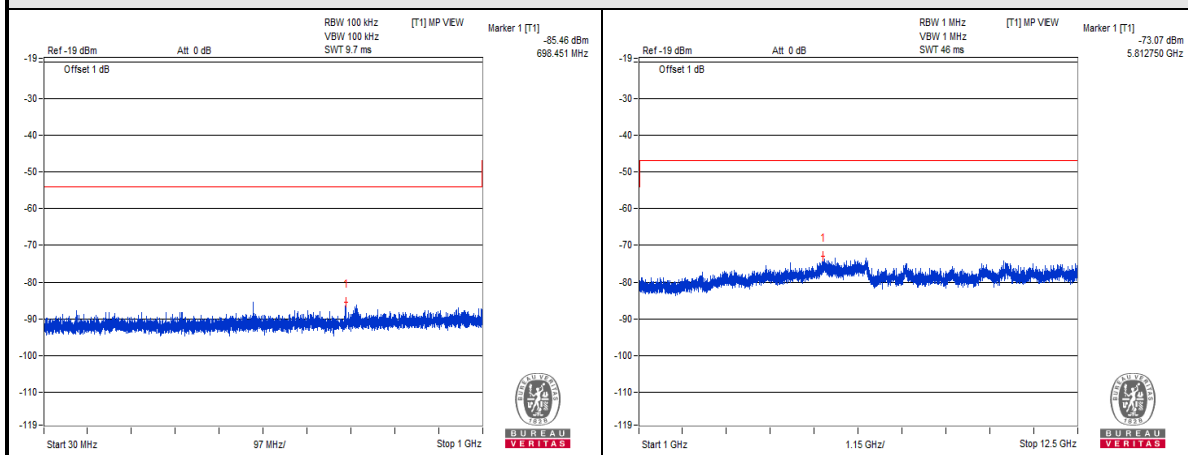


## V<sub>min</sub>

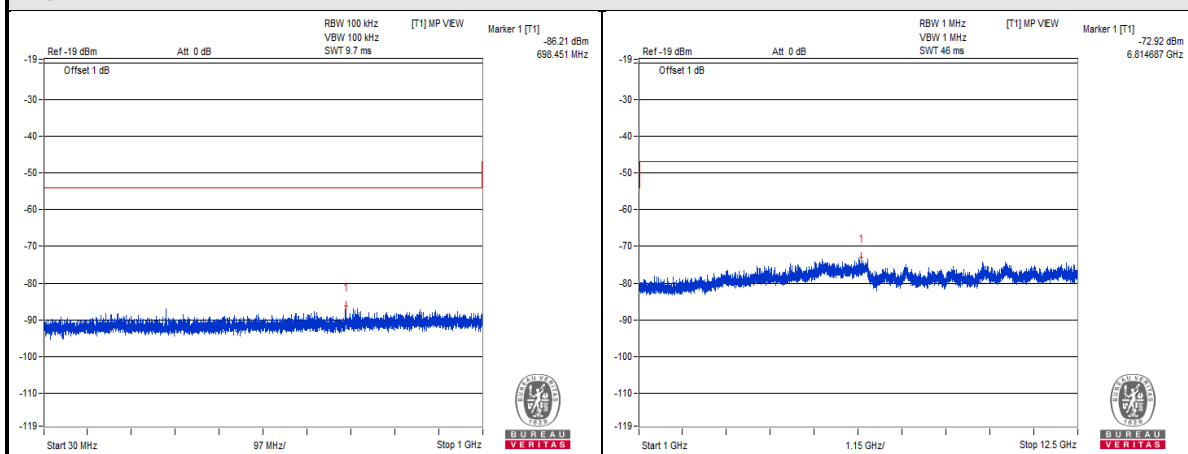


CH 39 (2441MHz)

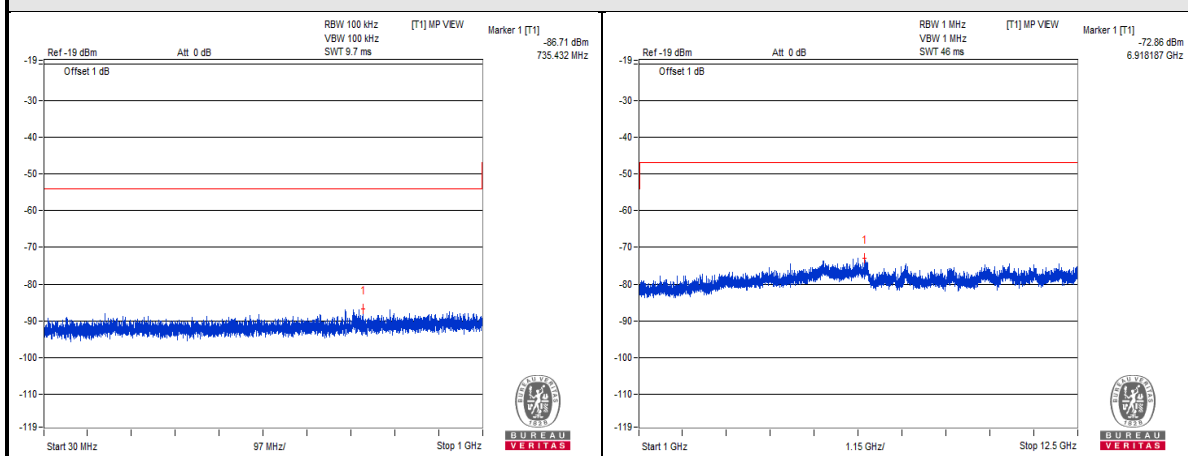
## V<sub>normal</sub>



## V<sub>max</sub>



## V<sub>min</sub>



CH 78 (2480MHz)

## 4.7 Dwell Time

### 4.7.1 Limits of Dwell Time

The frequency retention time in the frequency hopping method shall be 0.4 second or less. The total sum of the frequency retention time in any frequency within the time obtained by multiplying the diffusion rate by 0.4 second shall be 0.4 second or shorter.

Formula:

**(Normal mode)** dwell time = [diffusion rate/ 79] x duty-cycle x 0.4 seconds

**(AFH mode)** dwell time = [diffusion rate/20] x duty-cycle x 0.4 sec

### 4.7.2 Test Setup



#### 4.7.3 Test Result

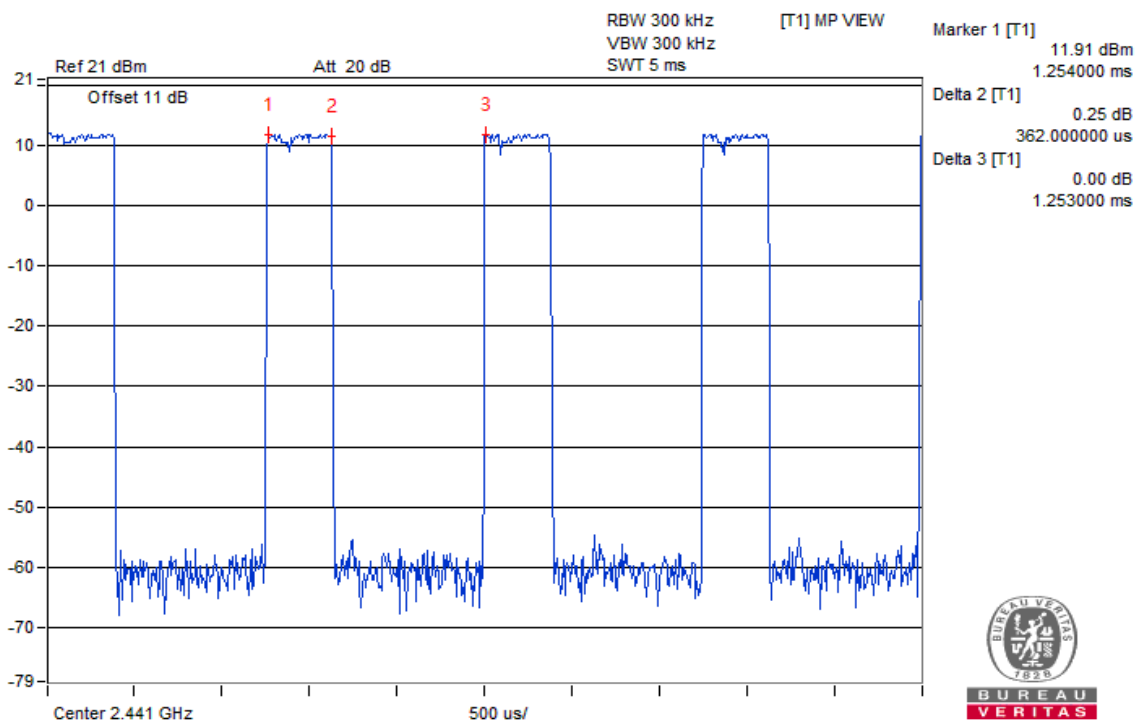
Modulation: GFSK

Normal Mode:

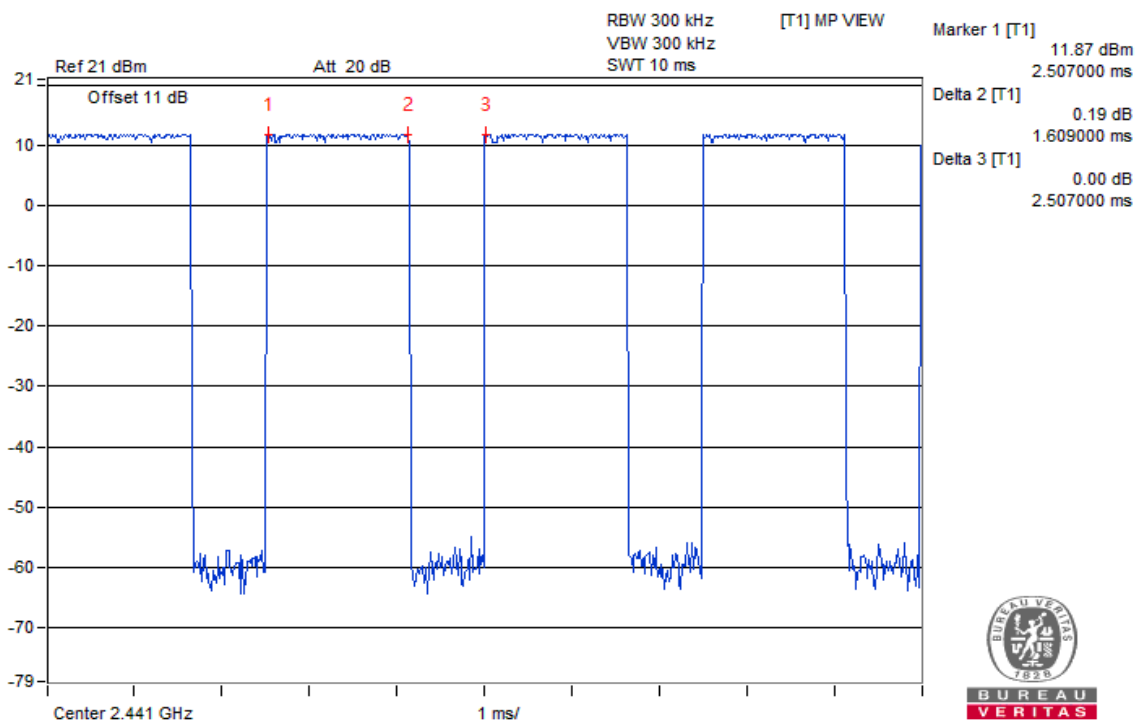
Test Condition	Mode	Spreading Rate	$(\text{Spreading Rate}/79)*0.4$	Duty Cycle (msec)	Result (msec)	Limit (msec)
$V_{\text{normal}}$	DH1	71.74	0.363	0.288	104.544	400
	DH3	71.74	0.363	0.641	232.683	400
	DH5	71.74	0.363	0.761	276.243	400
$V_{\text{max.}}$	DH1	71.60	0.362	0.288	104.256	400
	DH3	71.60	0.362	0.641	232.042	400
	DH5	71.60	0.362	0.761	275.482	400
$V_{\text{min.}}$	DH1	71.60	0.362	0.288	104.256	400
	DH3	71.60	0.362	0.641	232.042	400
	DH5	71.60	0.362	0.761	275.482	400

Note: 1. For the test plots please refer to the below pages.

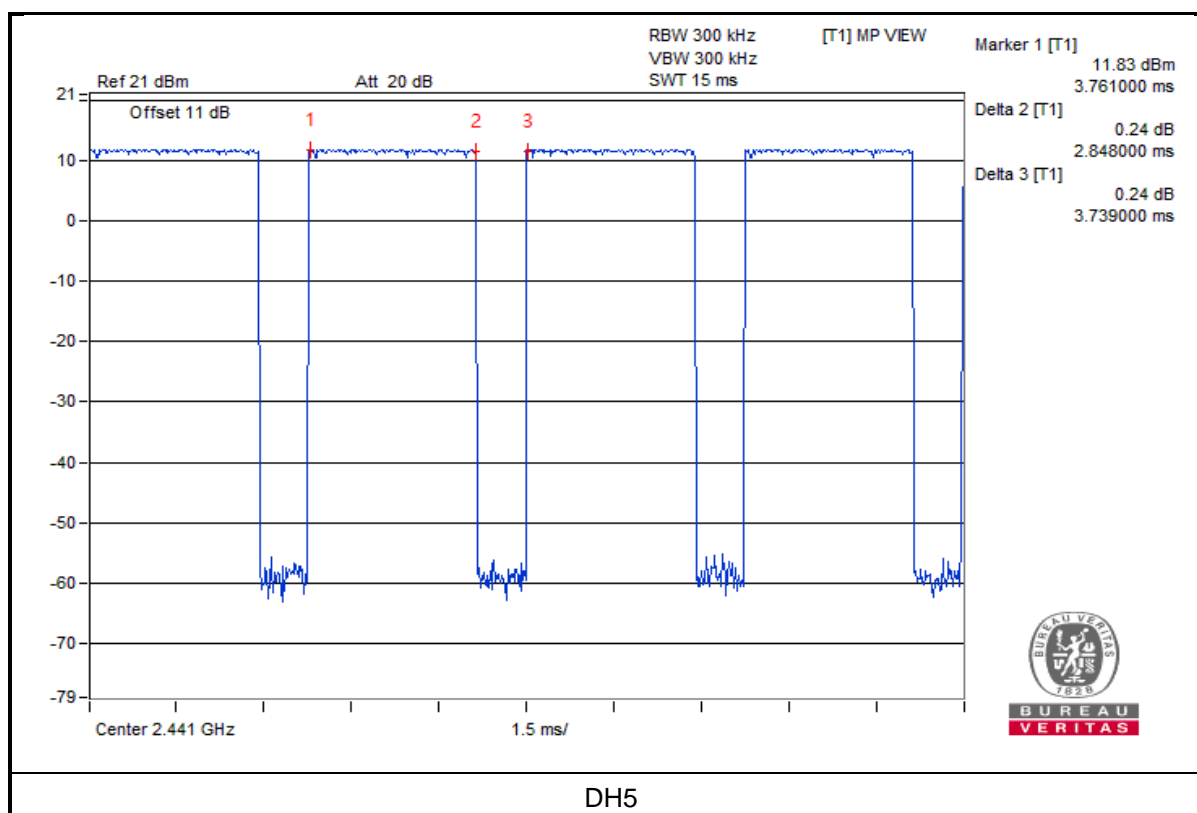
V<sub>normal</sub>



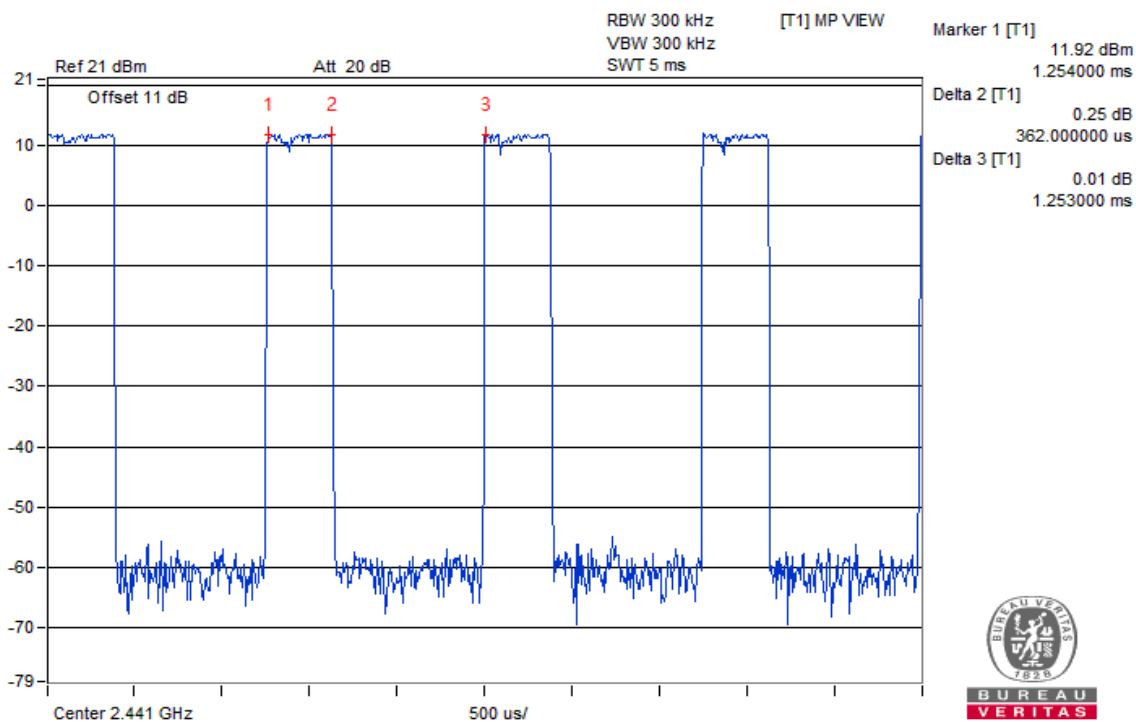
DH1



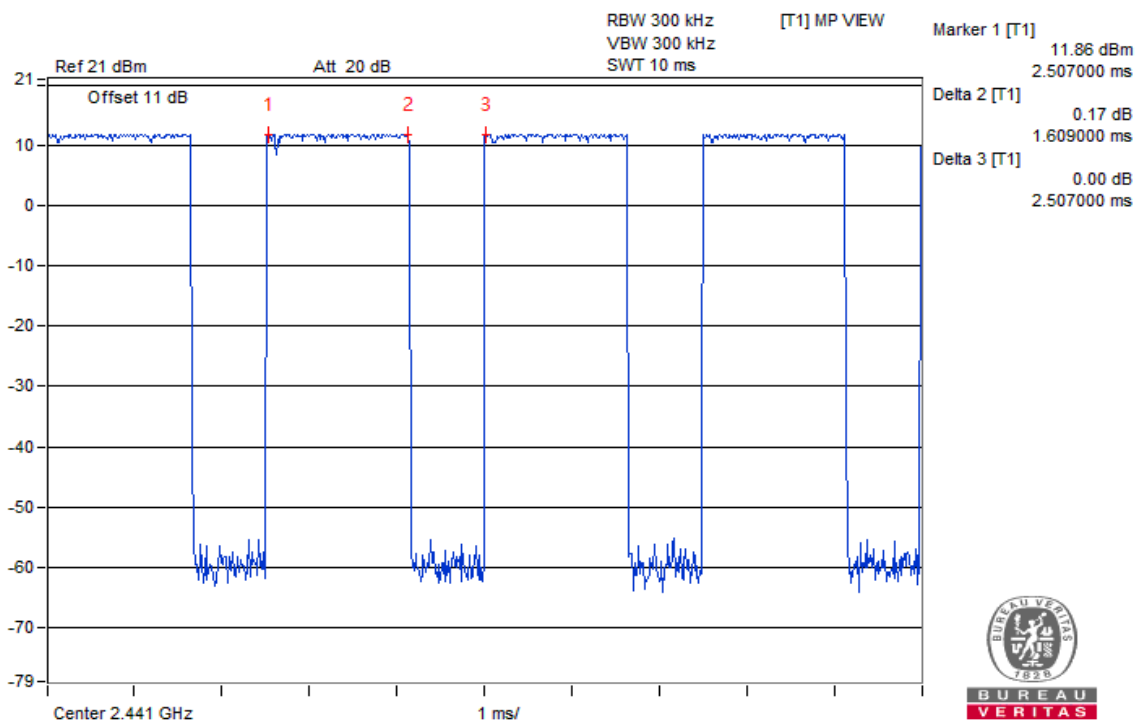
DH3



V<sub>max</sub>.



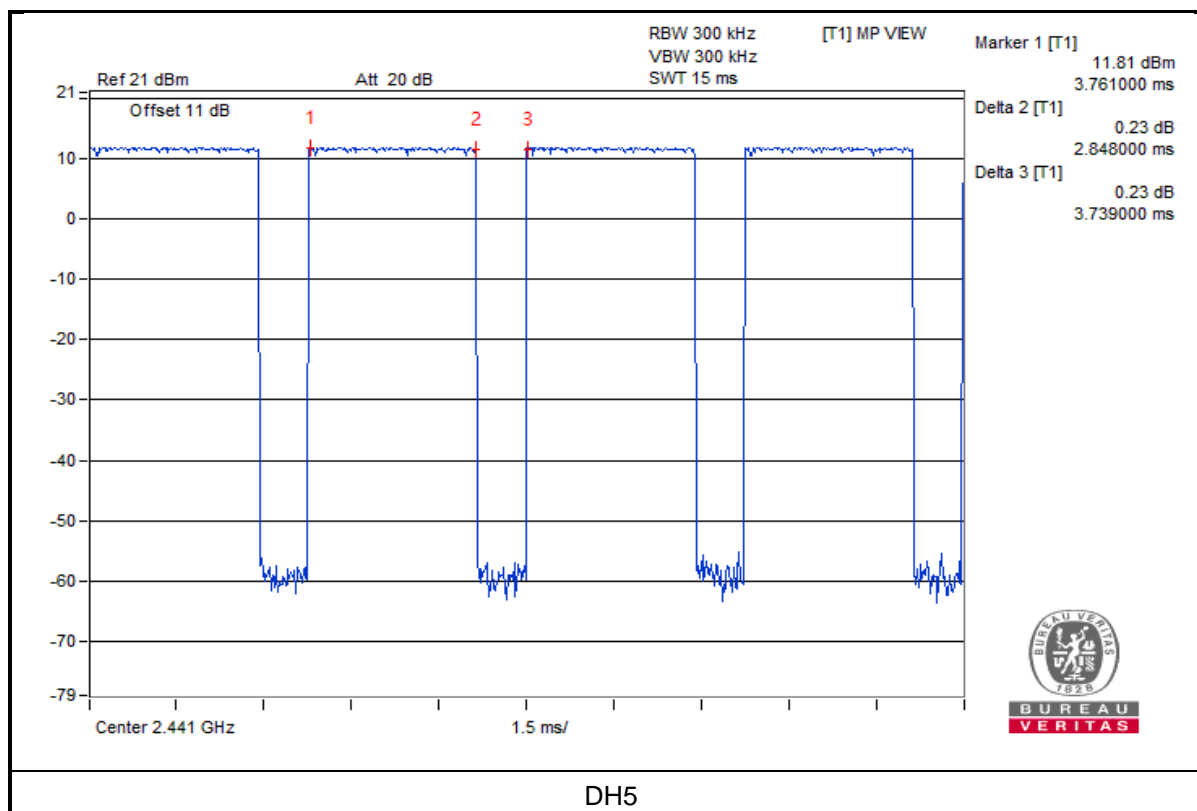
DH1



DH3

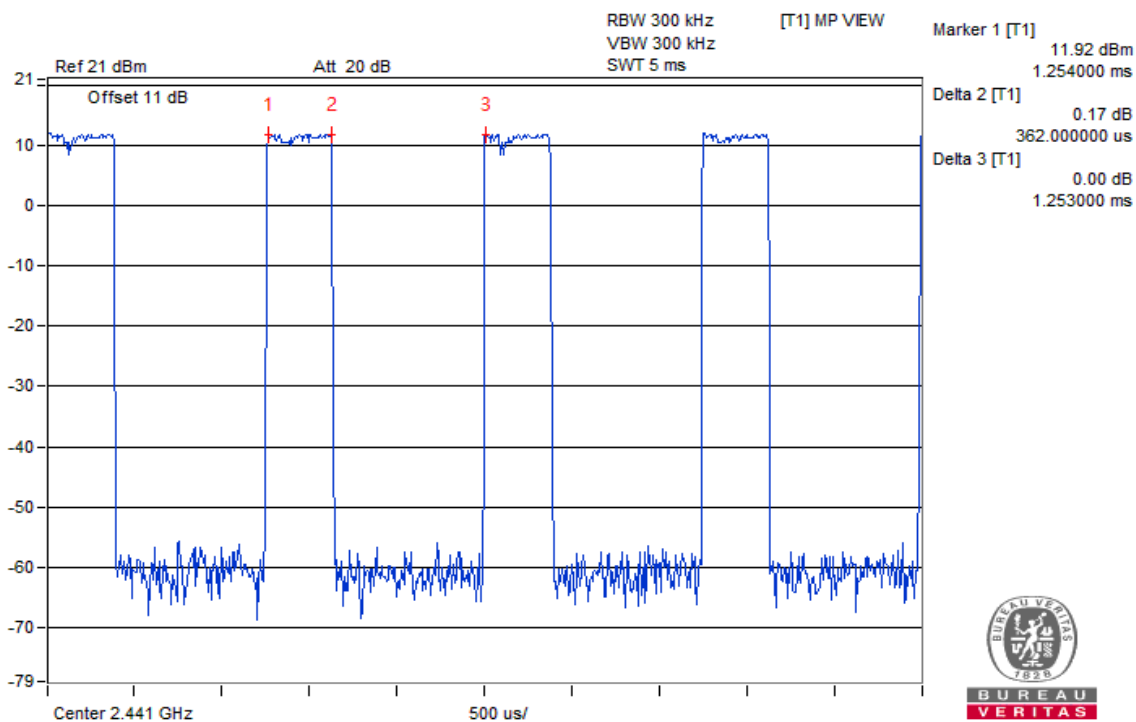


BUREAU  
VERITAS

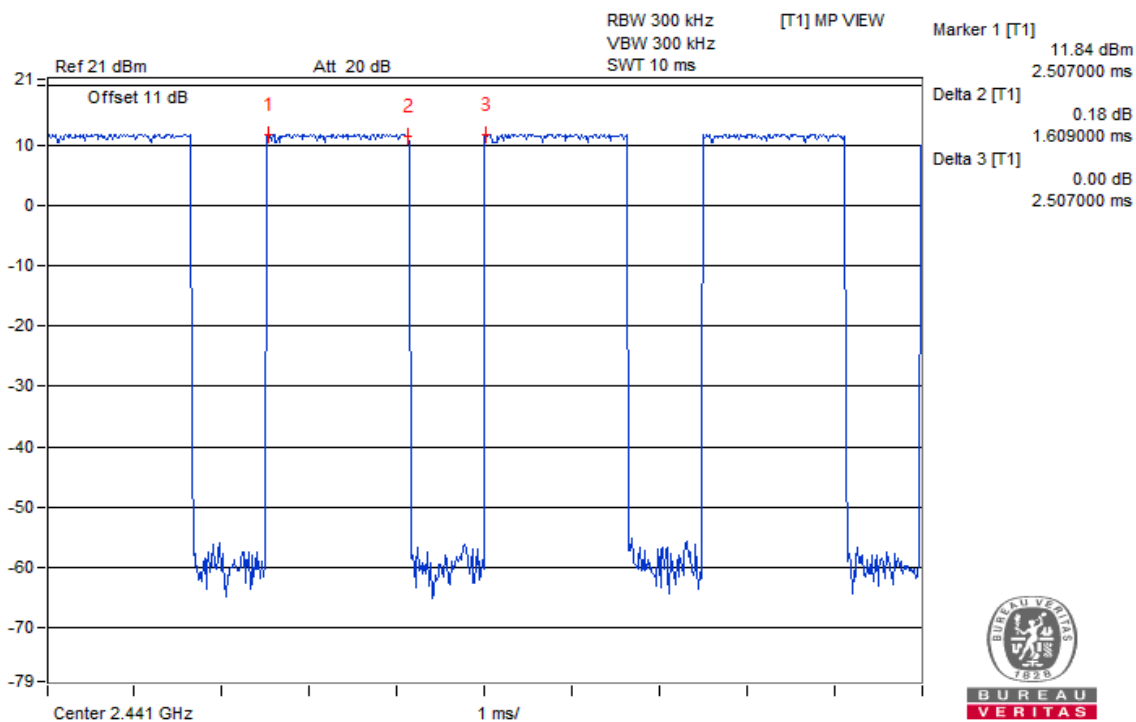


BUREAU  
VERITAS

V<sub>min</sub>.



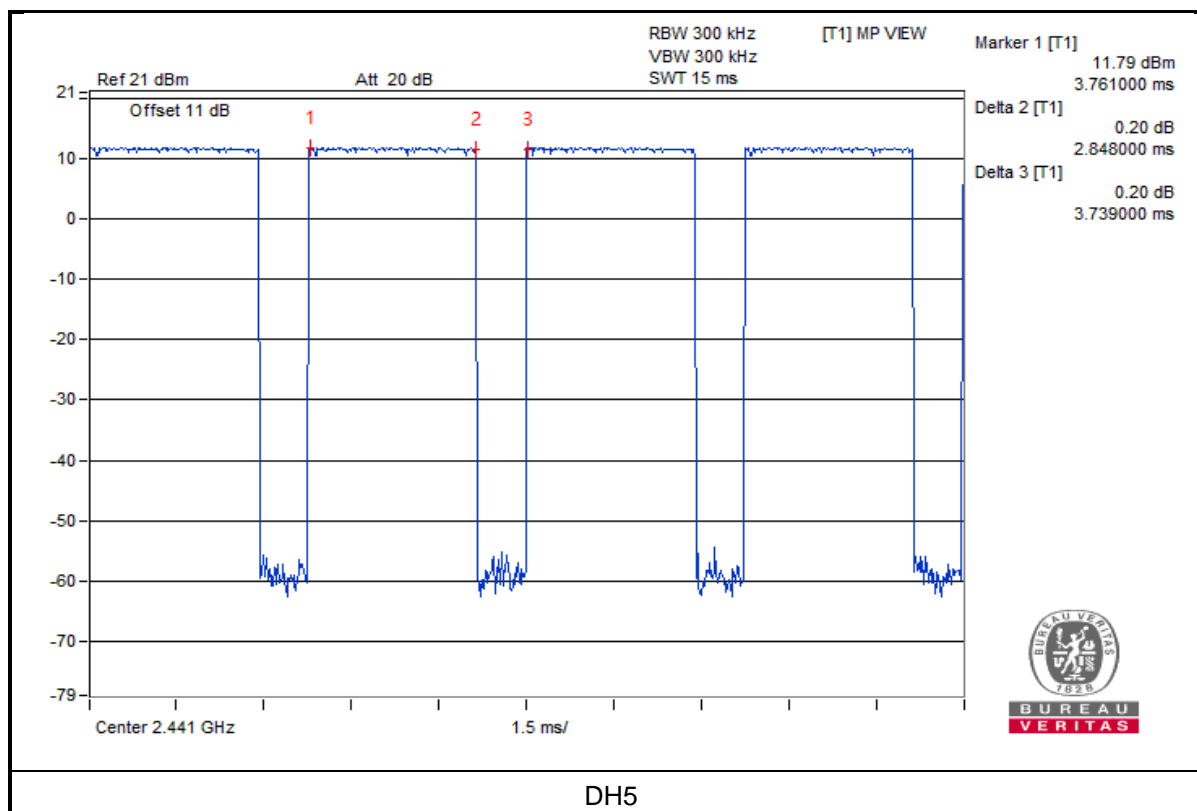
DH1



DH3



BUREAU  
VERITAS



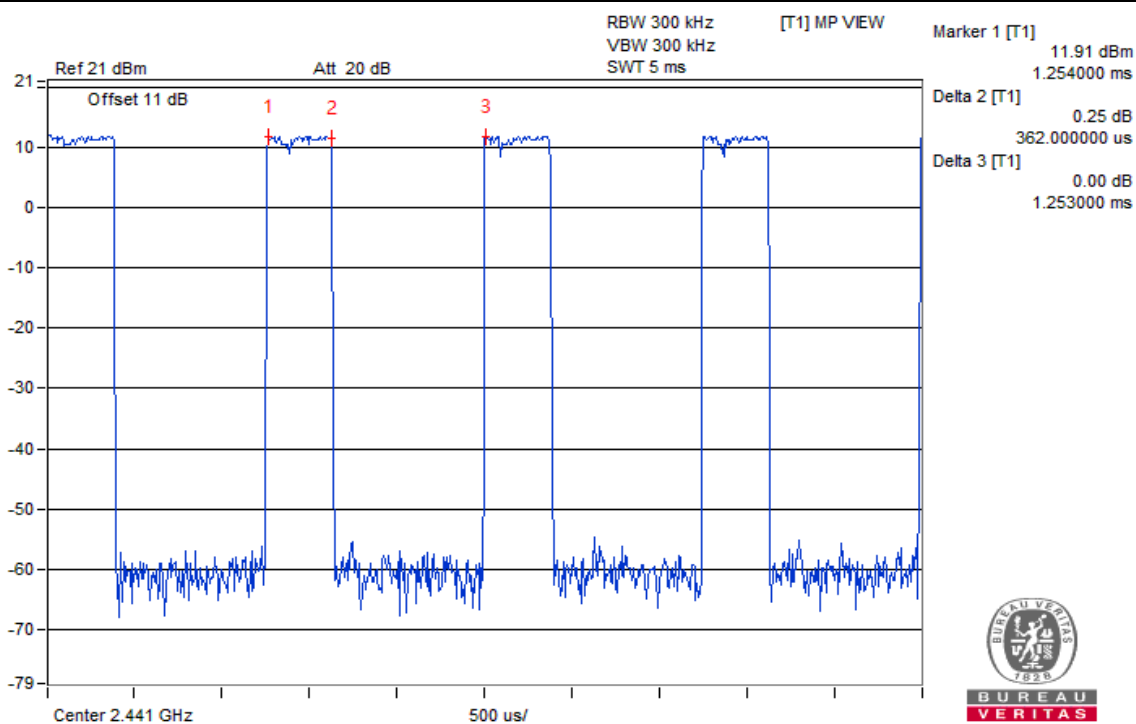
BUREAU  
VERITAS

### AFH Mode:

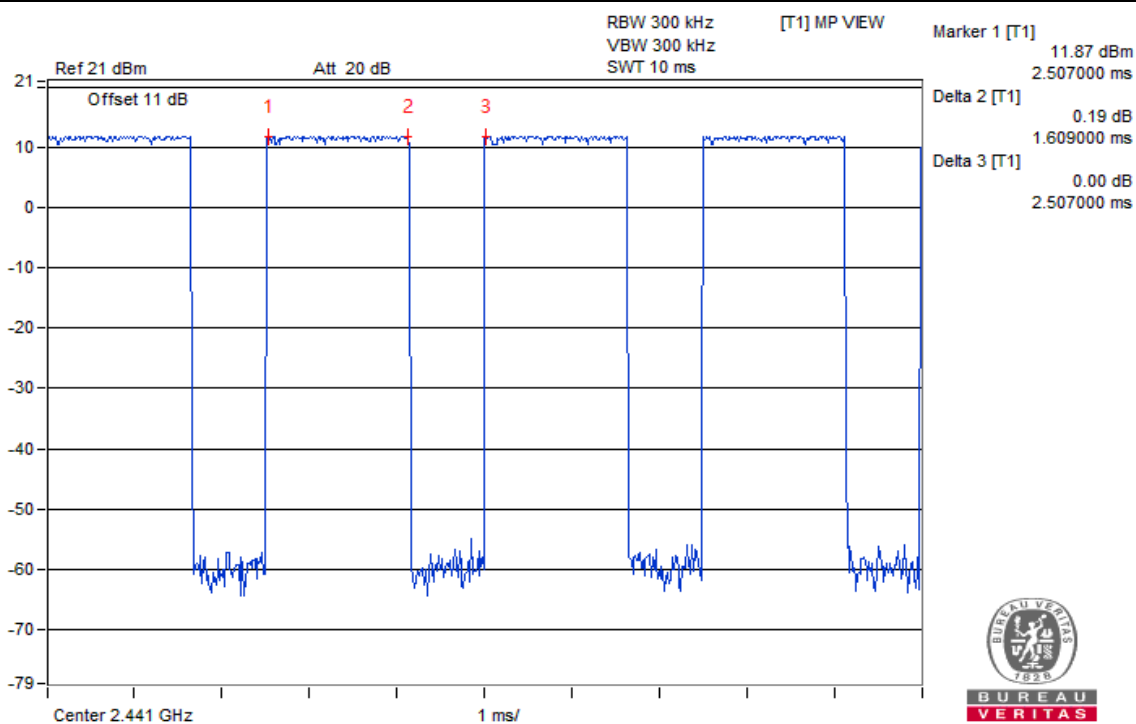
Test Condition	Mode	Spreading Rate	(Spreading Rate/20)*0.4	Duty Cycle (msec)	Result (msec)	Limit (msec)
<b>V<sub>normal</sub></b>	DH1	17.75	0.355	0.288	102.240	400
	DH3	17.75	0.355	0.641	227.555	400
	DH5	17.75	0.355	0.761	270.155	400
<b>V<sub>max.</sub></b>	DH1	17.97	0.359	0.288	103.392	400
	DH3	17.97	0.359	0.641	230.119	400
	DH5	17.97	0.359	0.761	273.199	400
<b>V<sub>min.</sub></b>	DH1	18.04	0.360	0.288	103.680	400
	DH3	18.04	0.360	0.641	230.760	400
	DH5	18.04	0.360	0.761	273.960	400

Note: 1. For the test plots please refer to the below pages.

V<sub>normal</sub>



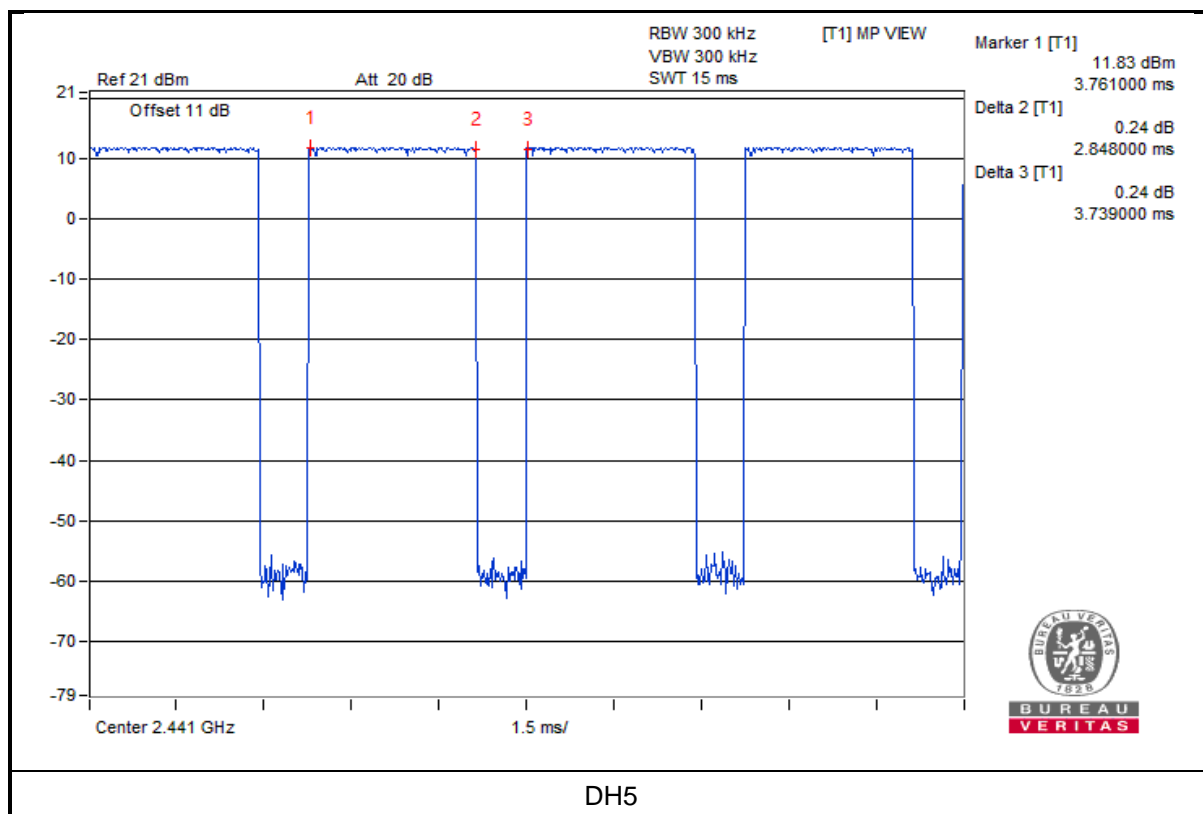
DH1



DH3

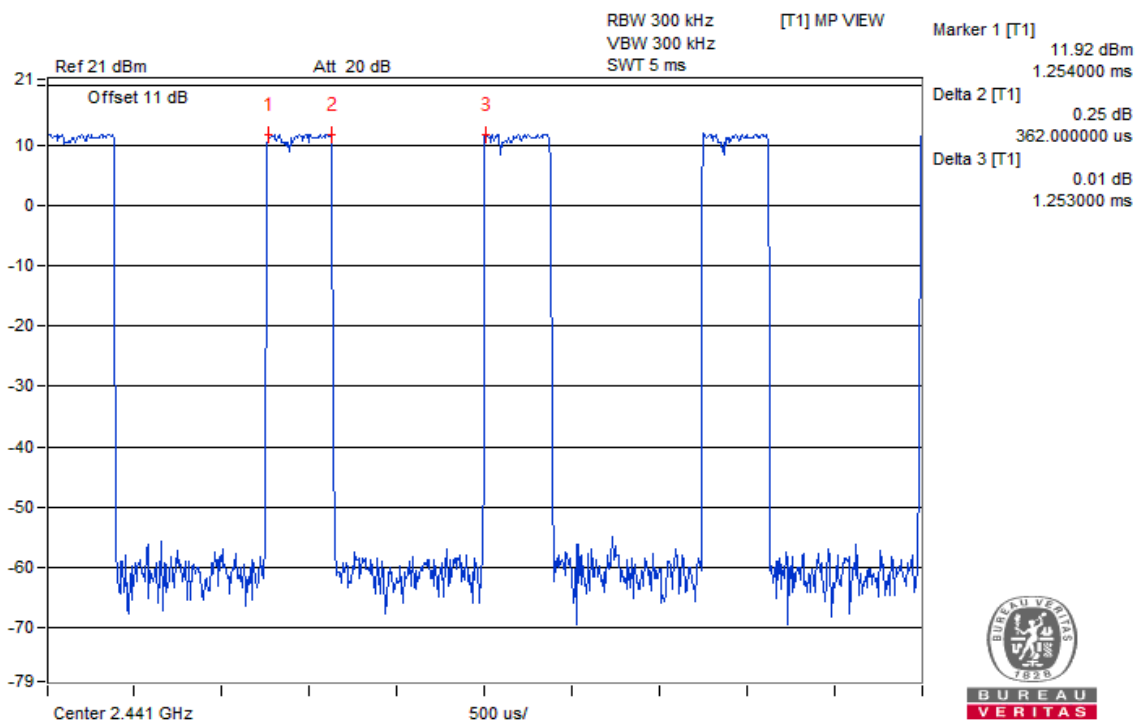


BUREAU  
VERITAS

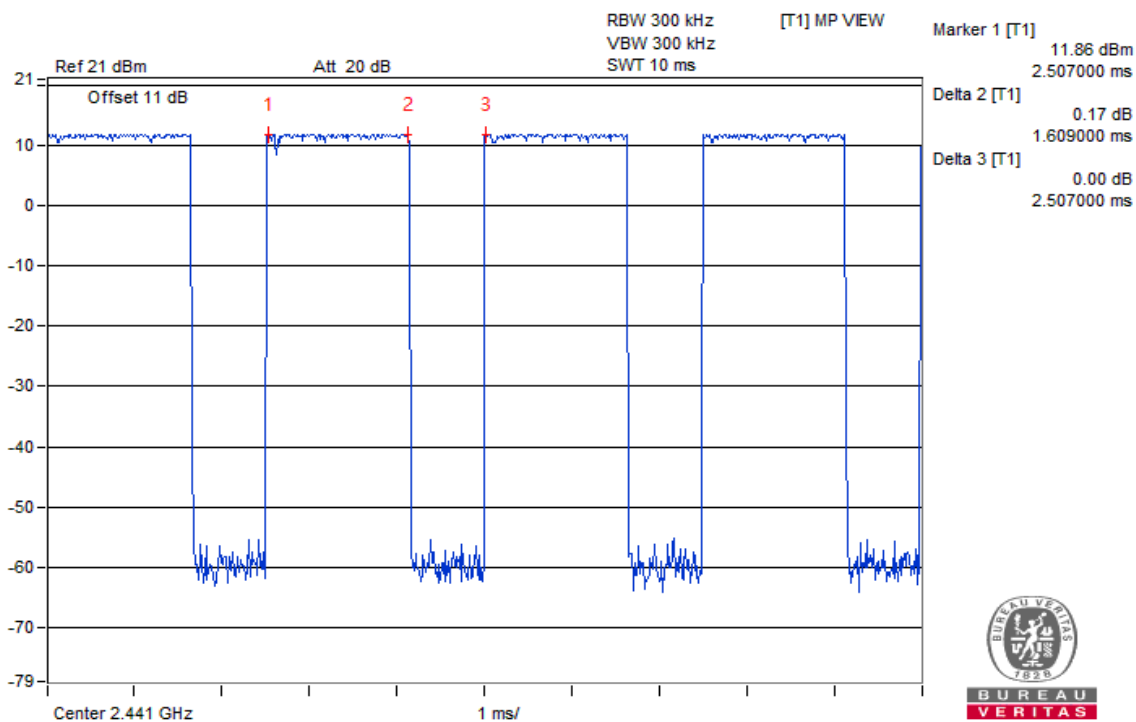


BUREAU  
VERITAS

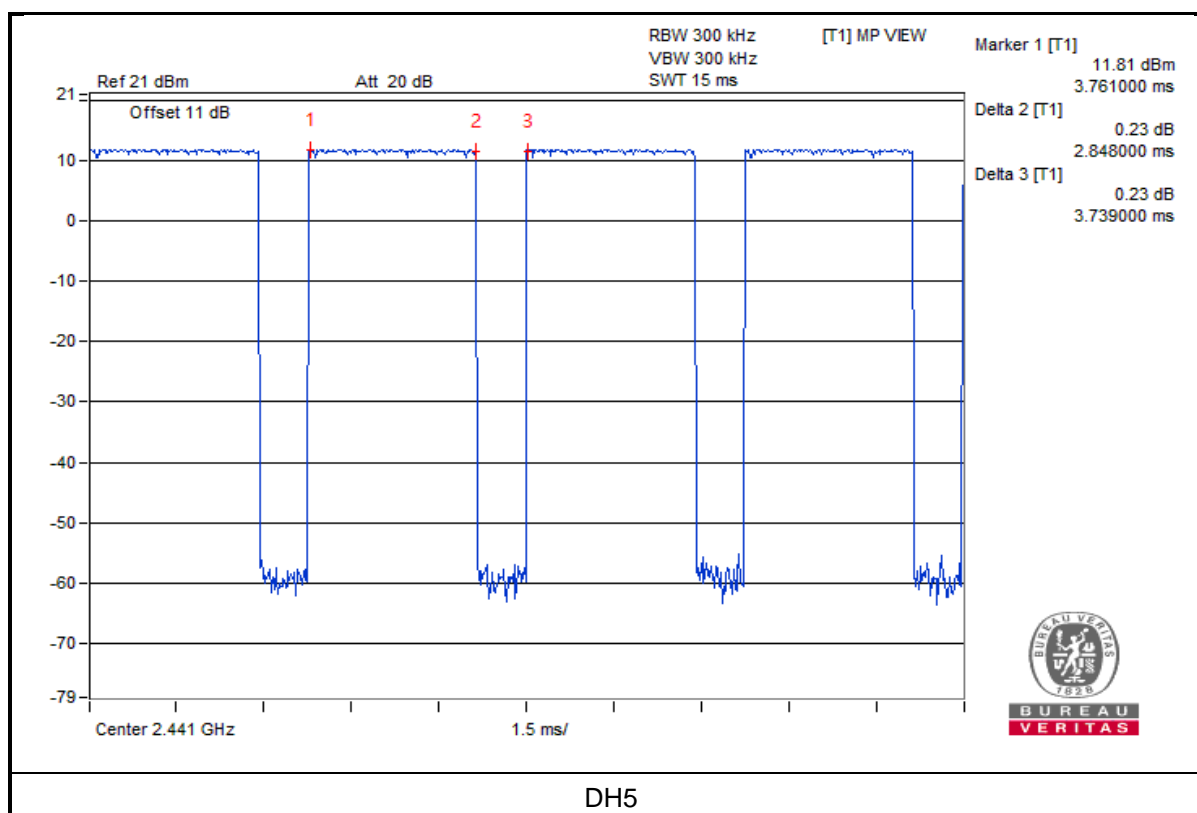
V<sub>max</sub>.



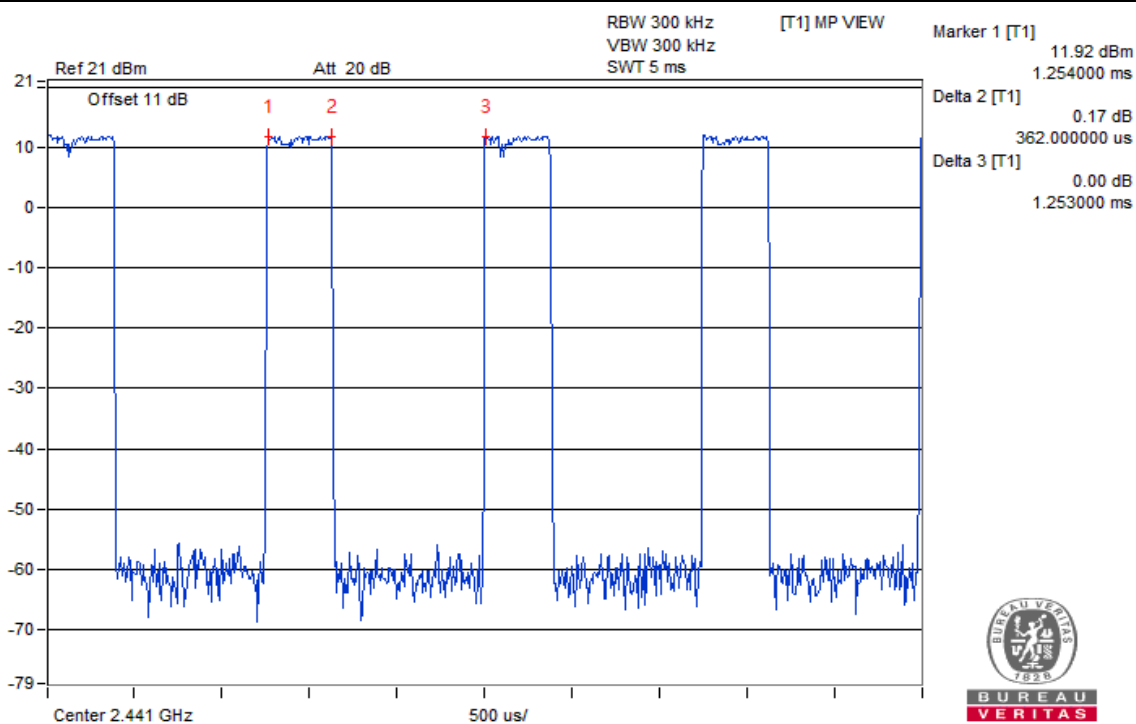
DH1



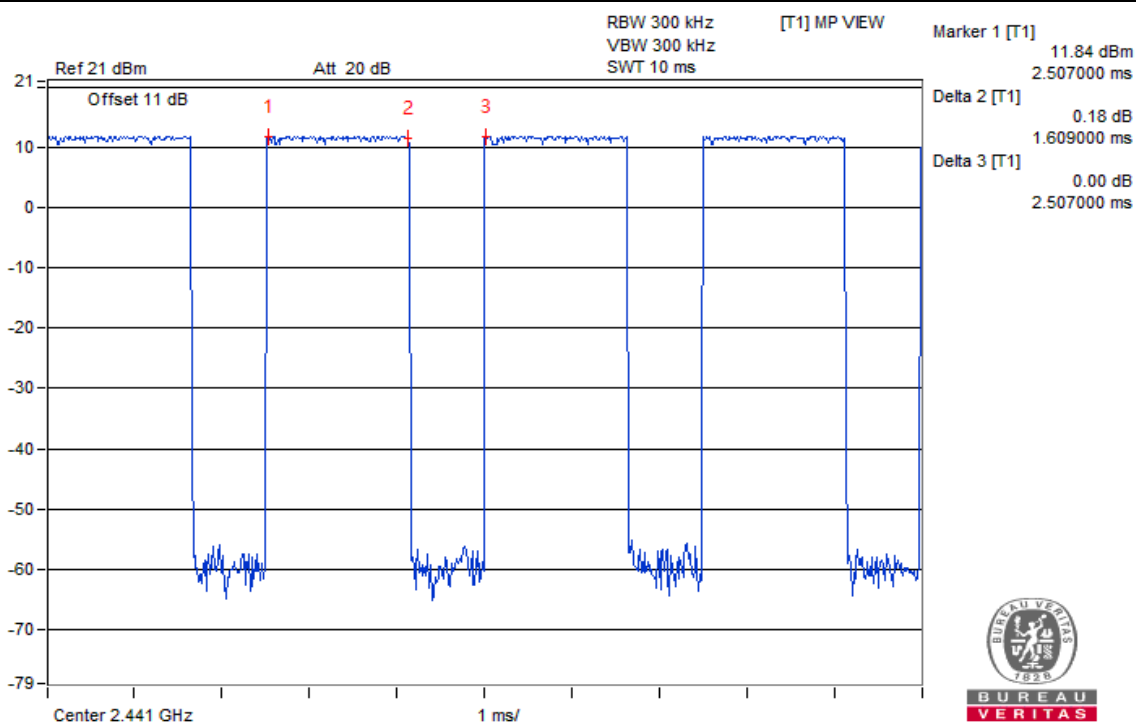
DH3



V<sub>min</sub>.



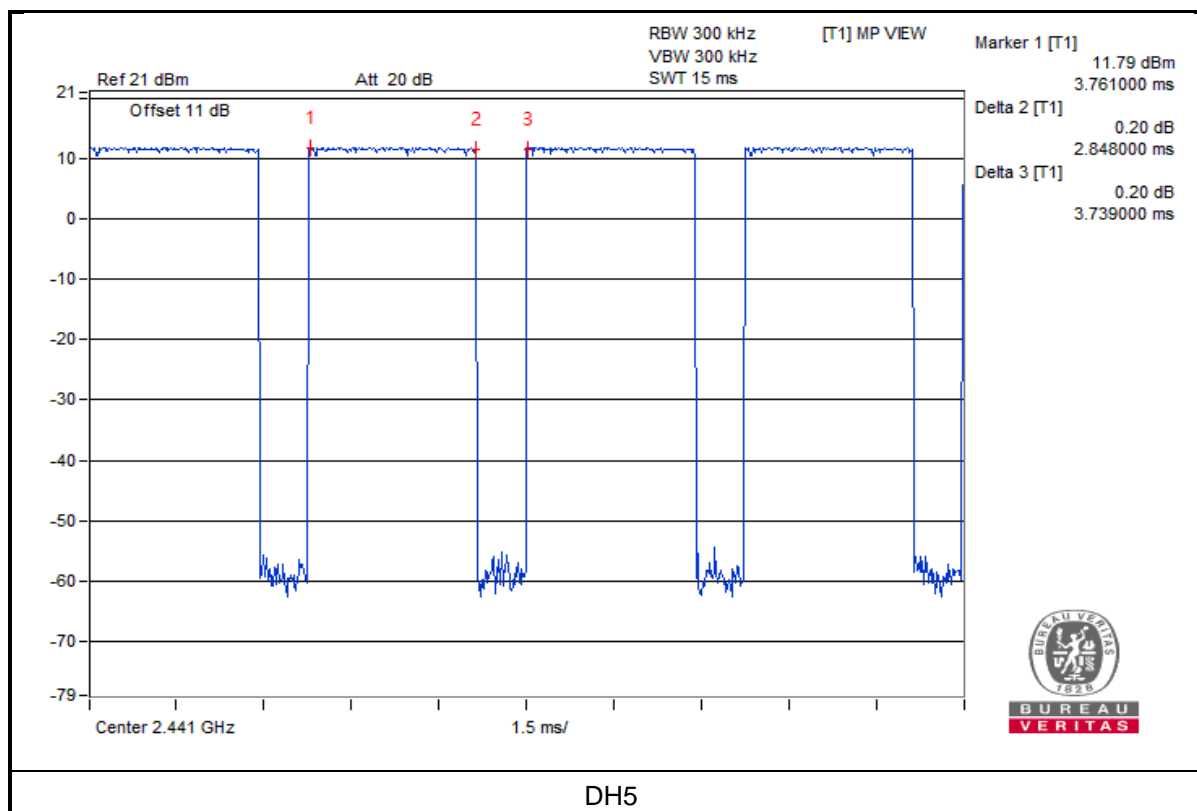
DH1



DH3



BUREAU  
VERITAS



BUREAU  
VERITAS

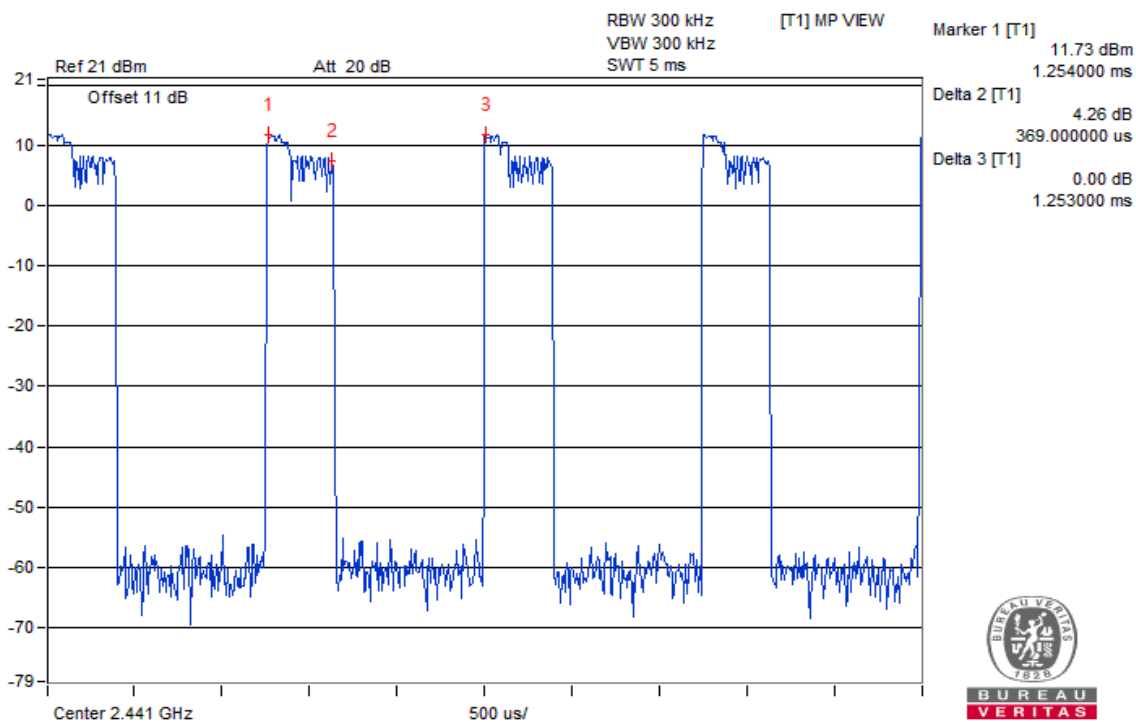
Modulation:  $\pi/4$ -DQPSK

Normal Mode:

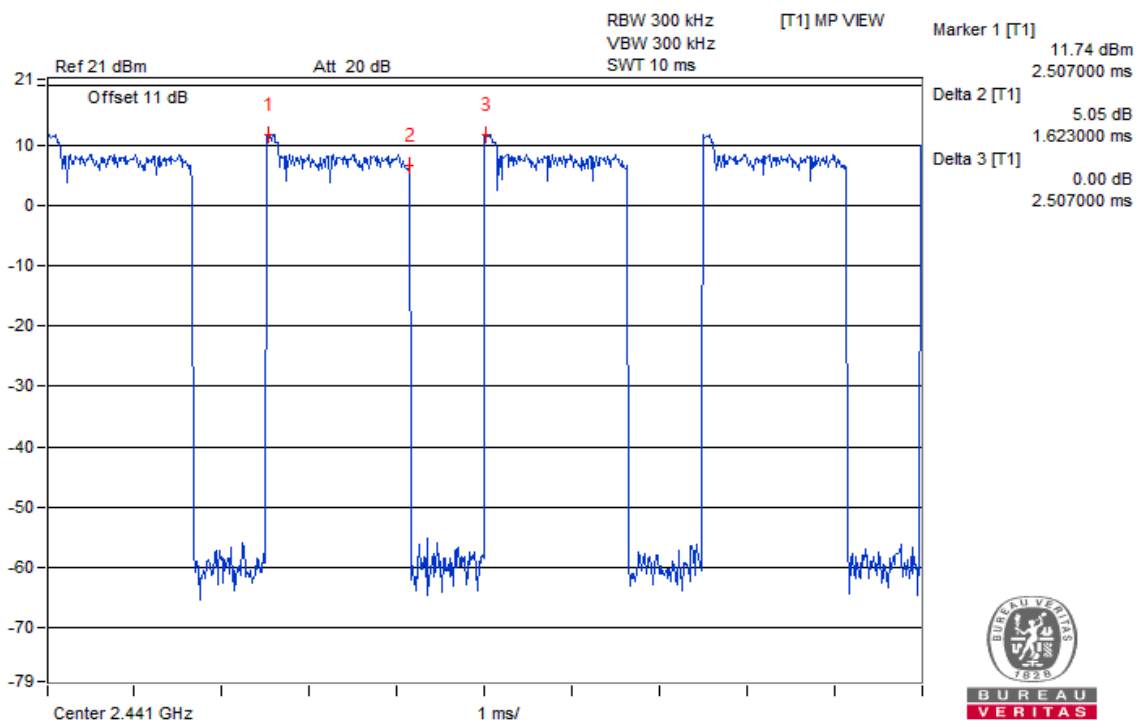
Test Condition	Mode	Spreading Rate	(Spreading Rate/79)*0.4	Duty Cycle (msec)	Result (msec)	Limit (msec)
$V_{\text{normal}}$	2DH1	71.60	0.362	0.294	106.428	400
	2DH3	71.60	0.362	0.647	234.214	400
	2DH5	71.60	0.362	0.748	270.776	400
$V_{\text{max.}}$	2DH1	71.80	0.363	0.294	106.722	400
	2DH3	71.80	0.363	0.647	234.861	400
	2DH5	71.80	0.363	0.748	271.524	400
$V_{\text{min.}}$	2DH1	71.60	0.362	0.294	106.428	400
	2DH3	71.60	0.362	0.647	234.214	400
	2DH5	71.60	0.362	0.744	269.328	400

Note: 1. For the test plots please refer to the below pages.

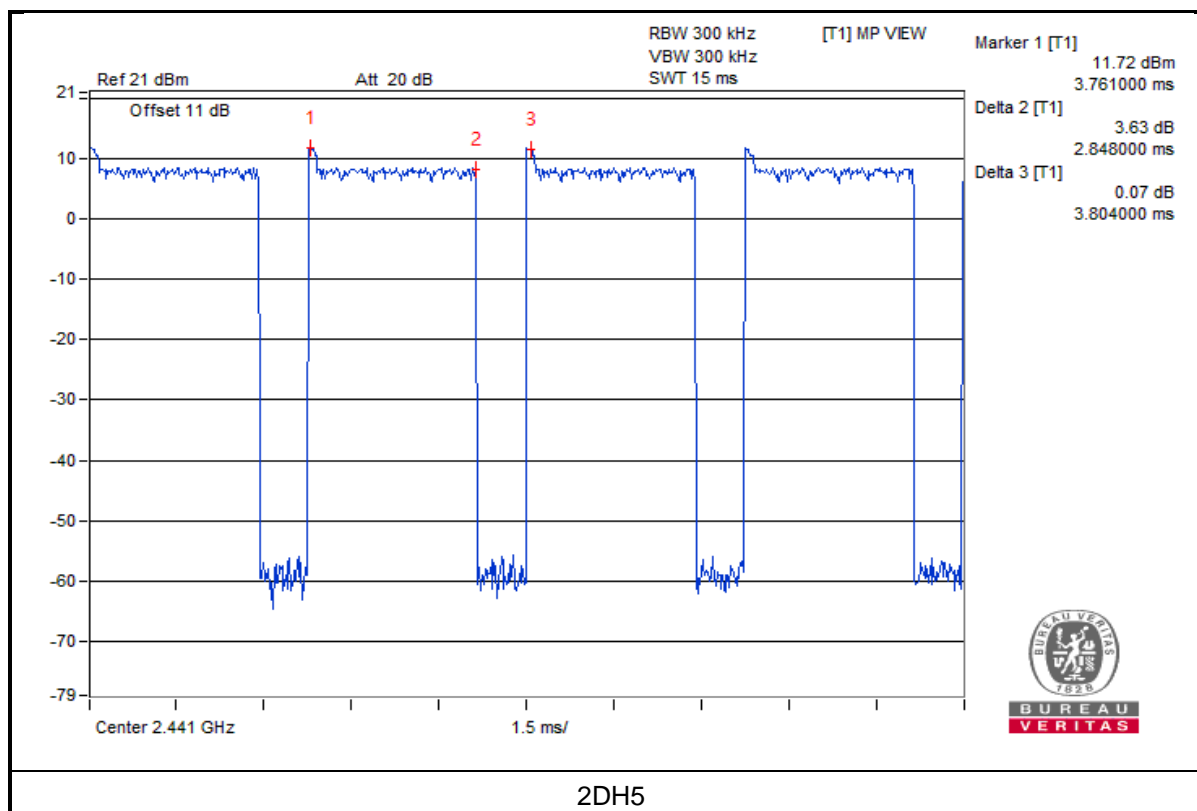
V<sub>normal</sub>



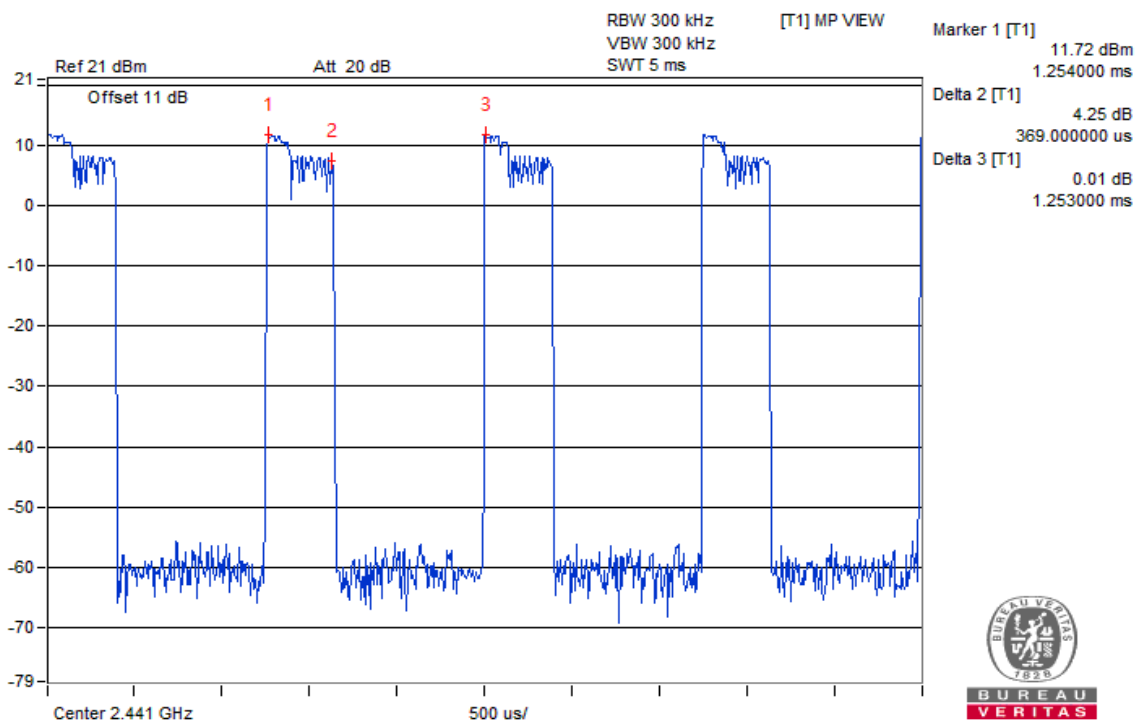
2DH1



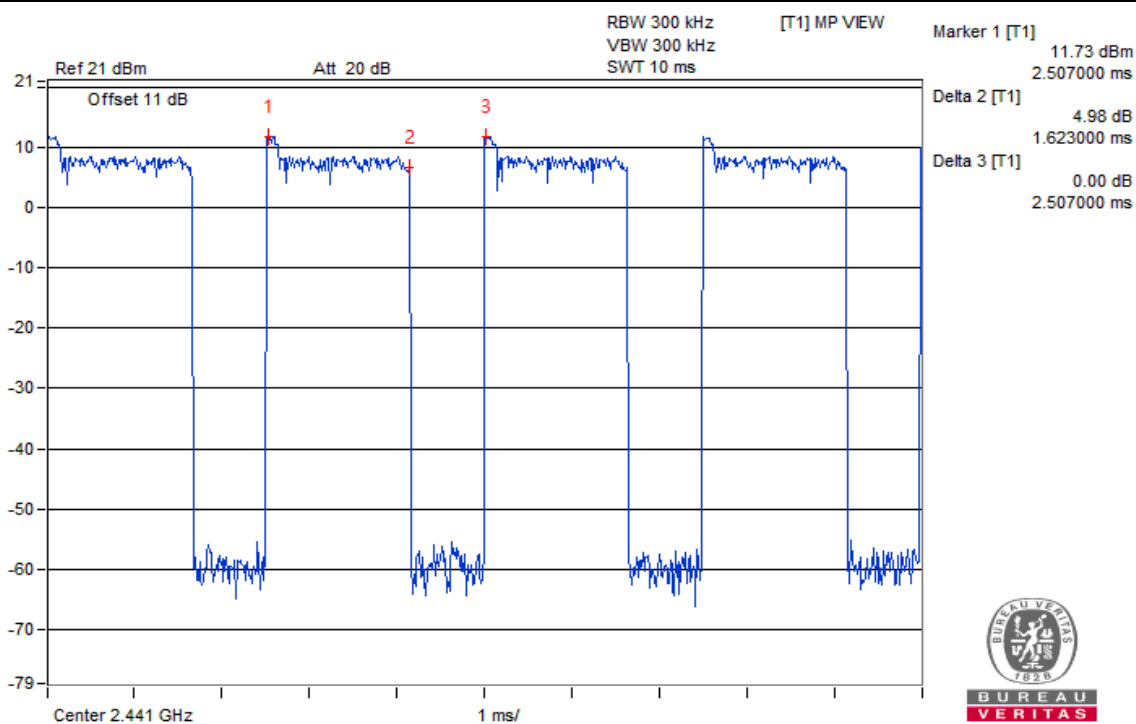
2DH3



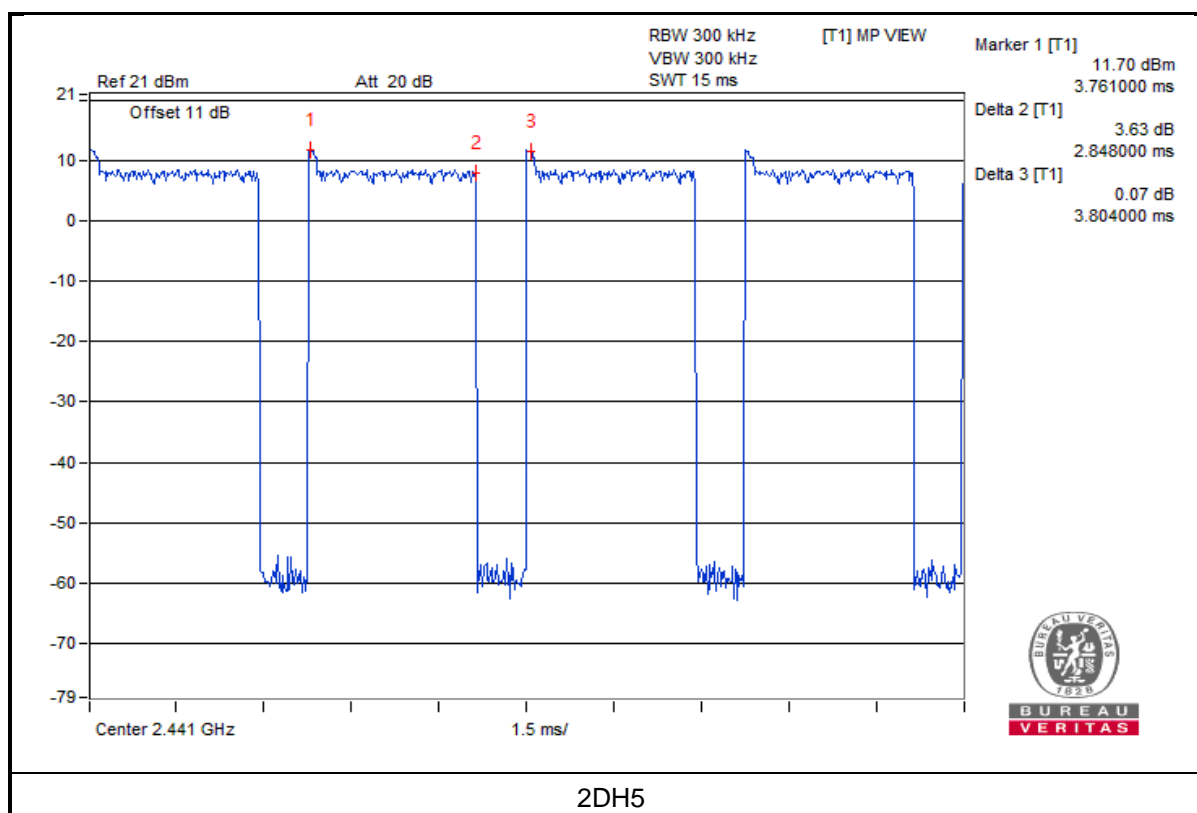
V<sub>max</sub>.



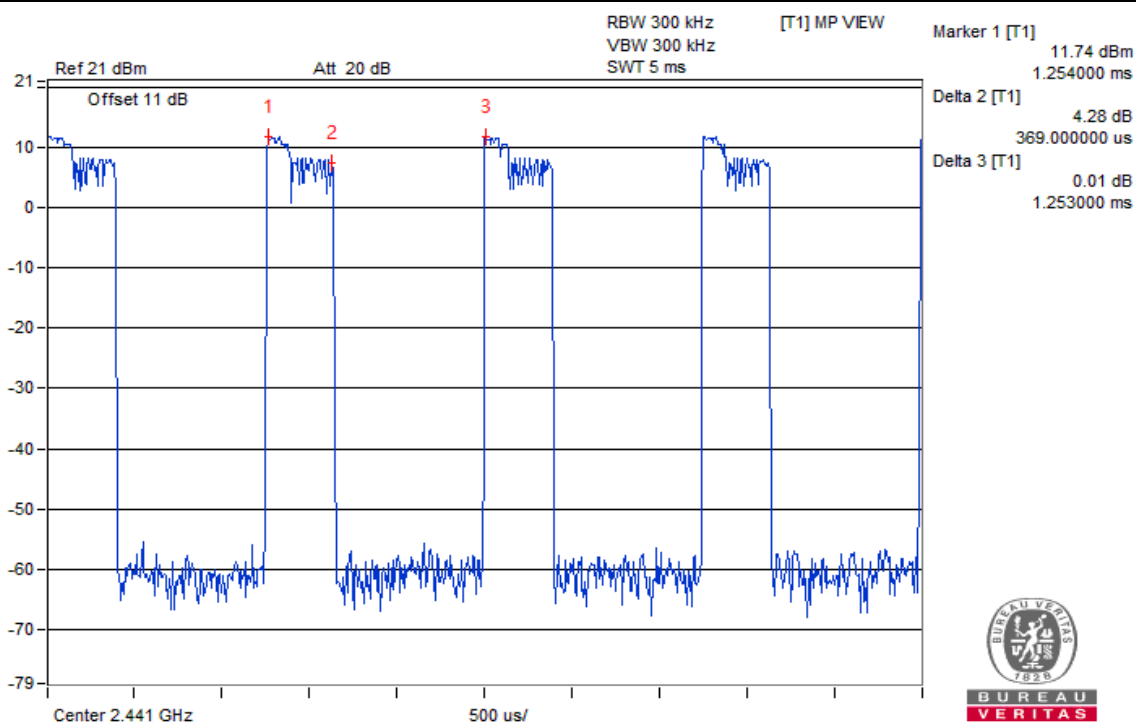
2DH1



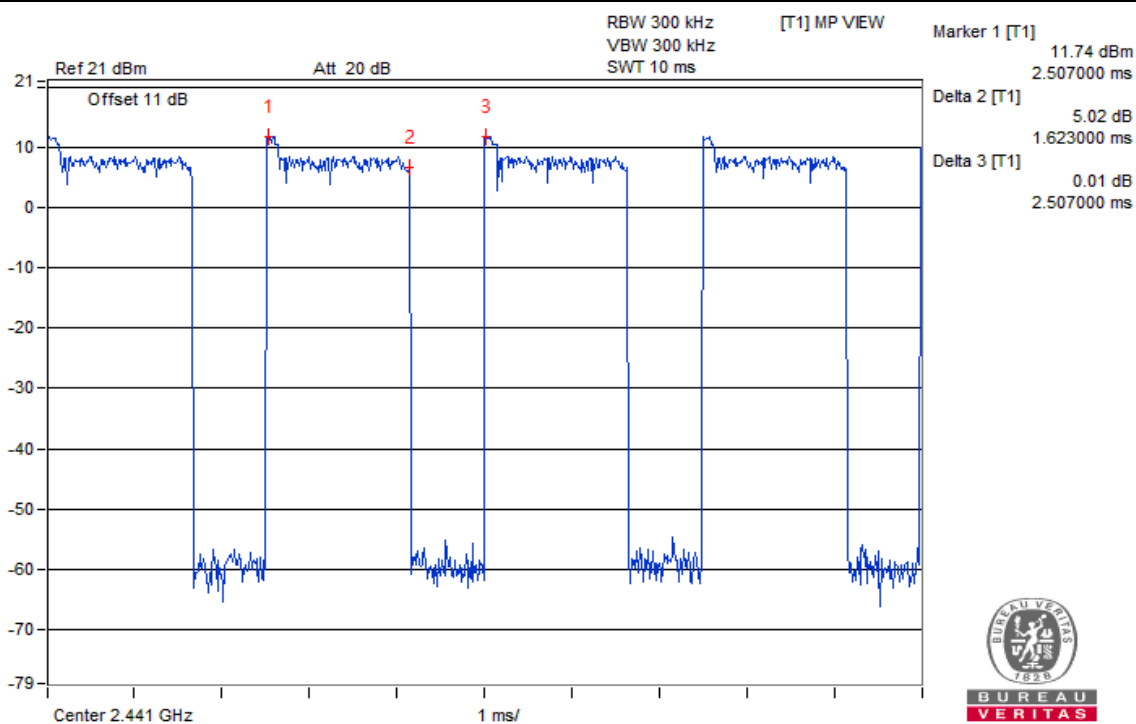
2DH3



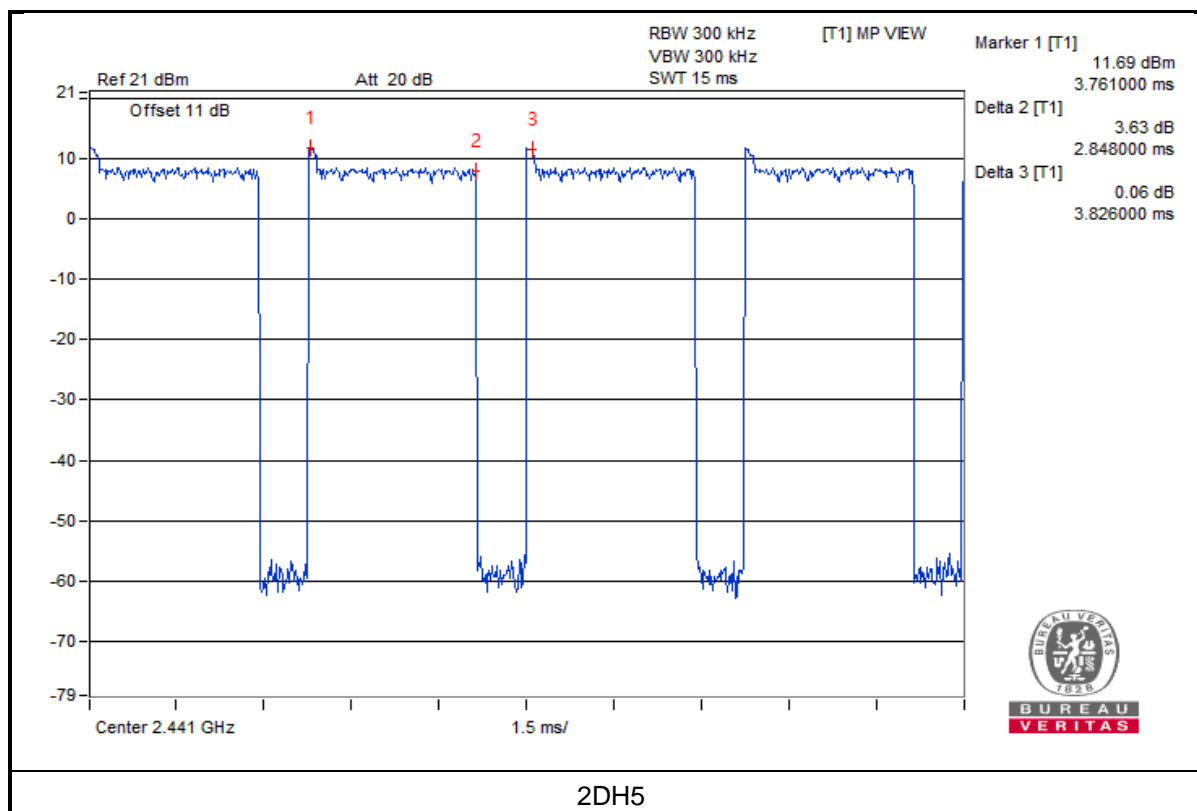
V<sub>min</sub>.



2DH1



2DH3

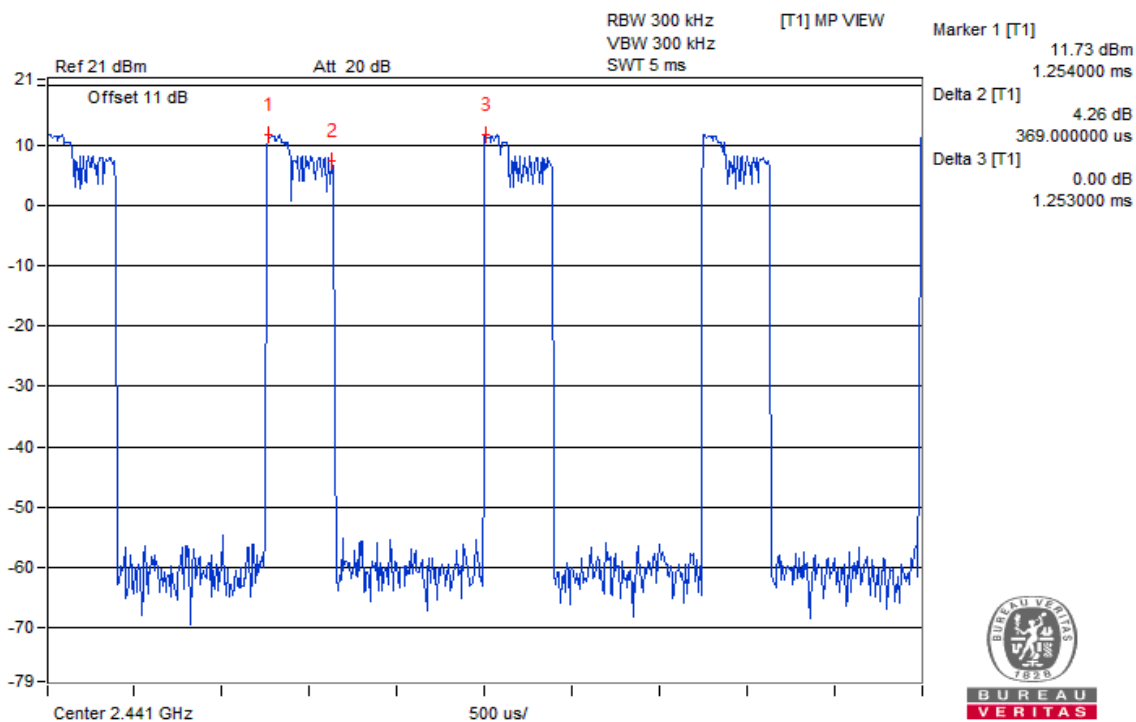


### AFH Mode:

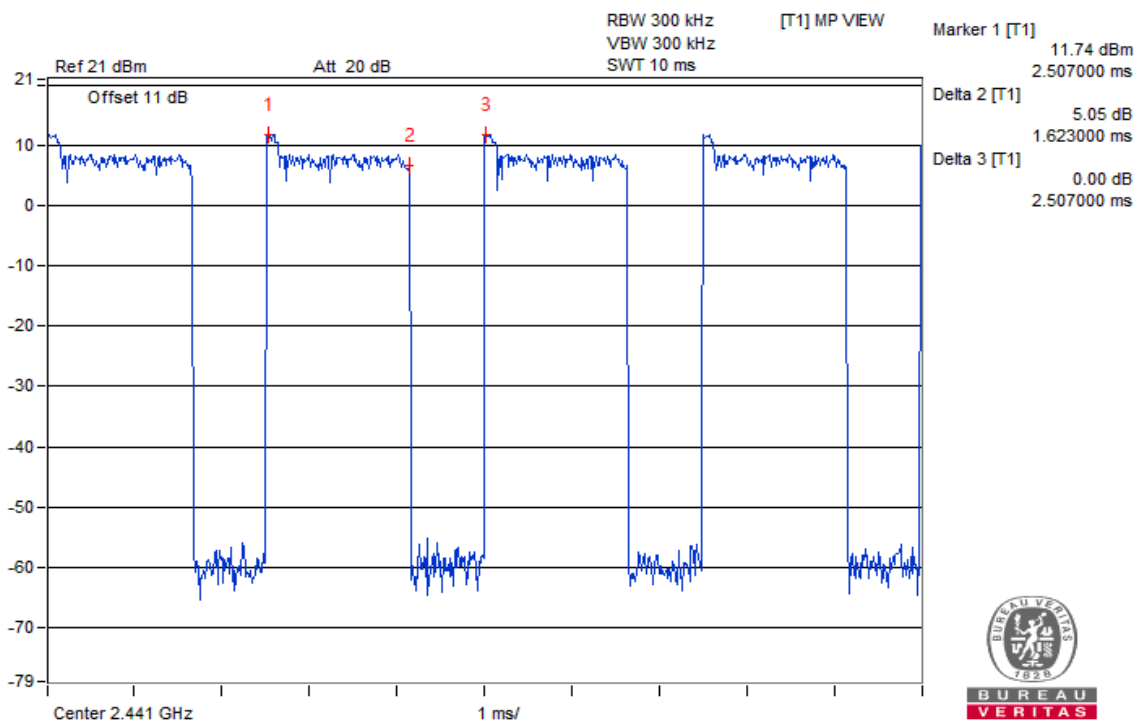
Test Condition	Mode	Spreading Rate	(Spreading Rate/20)*0.4	Duty Cycle (msec)	Result (msec)	Limit (msec)
<b>V<sub>normal</sub></b>	2DH1	18.26	0.365	0.294	107.310	400
	2DH3	18.26	0.365	0.647	236.155	400
	2DH5	18.26	0.365	0.748	273.020	400
<b>V<sub>max.</sub></b>	2DH1	18.26	0.365	0.294	107.310	400
	2DH3	18.26	0.365	0.647	236.155	400
	2DH5	18.26	0.365	0.748	273.020	400
<b>V<sub>min.</sub></b>	2DH1	18.19	0.363	0.294	106.722	400
	2DH3	18.19	0.363	0.647	234.861	400
	2DH5	18.19	0.363	0.744	270.072	400

Note: 1. For the test plots please refer to the below pages.

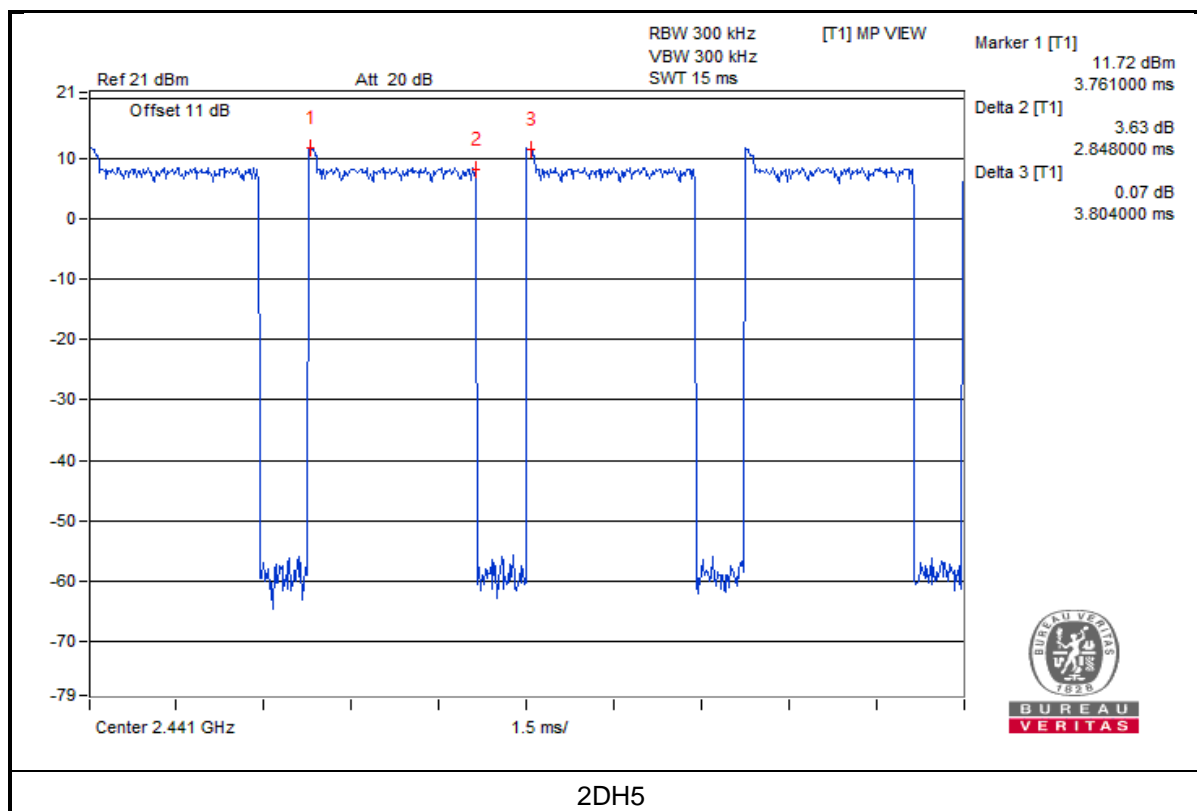
V<sub>normal</sub>



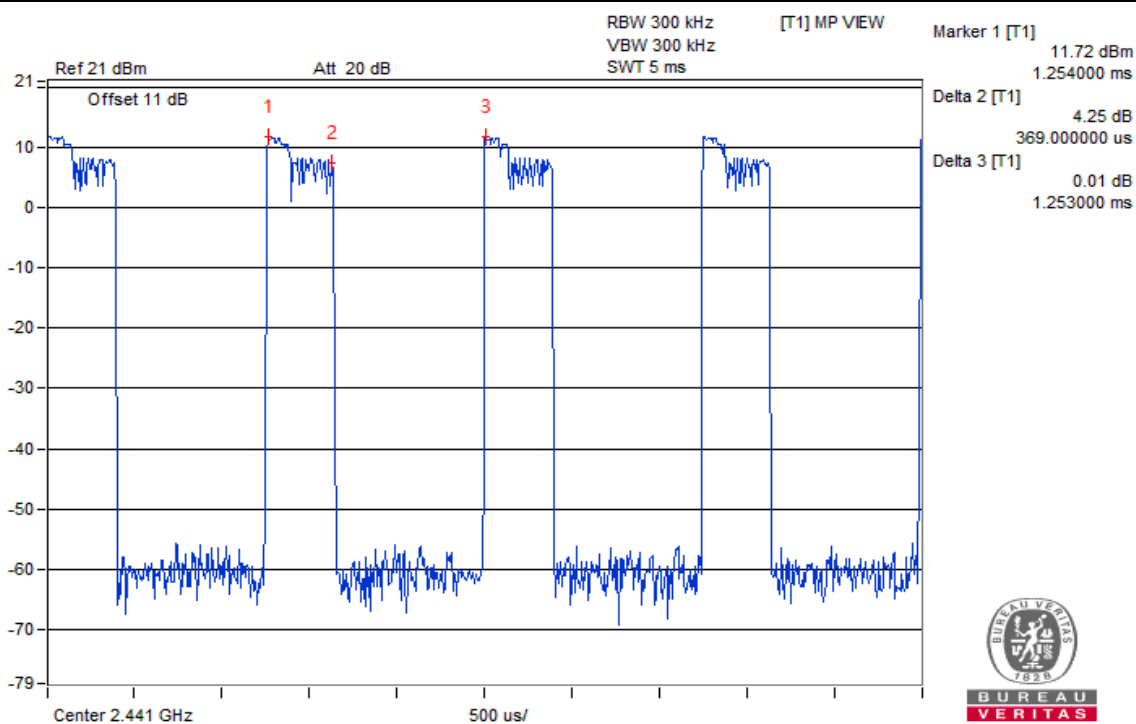
2DH1



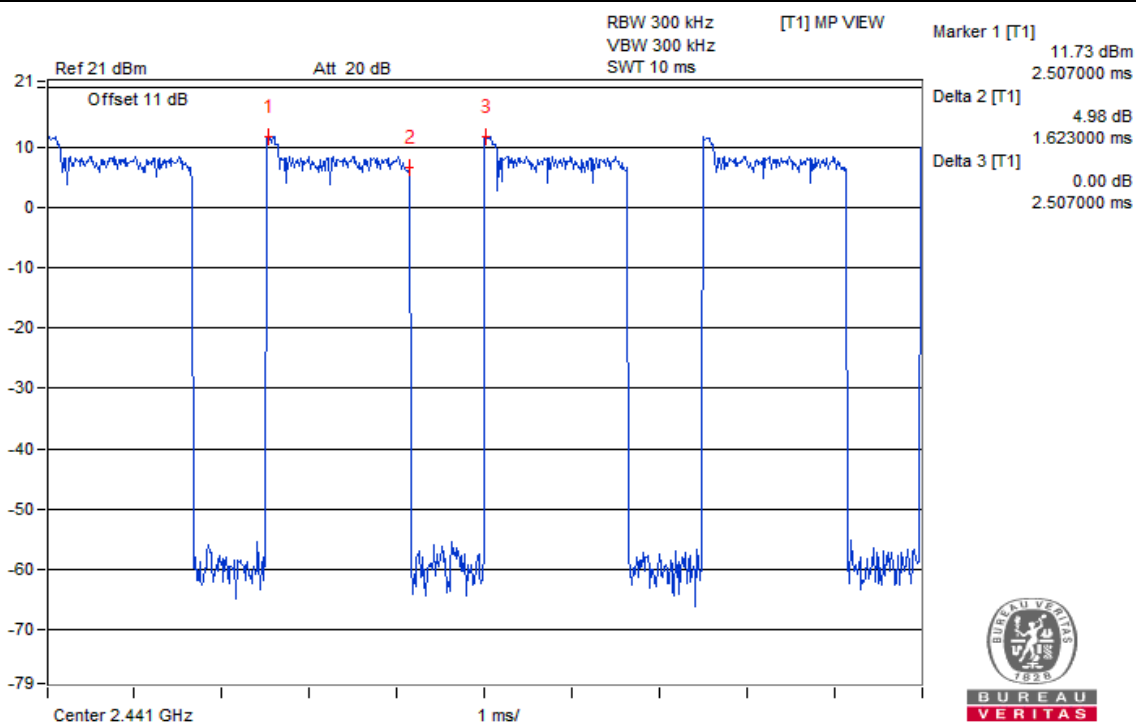
2DH3



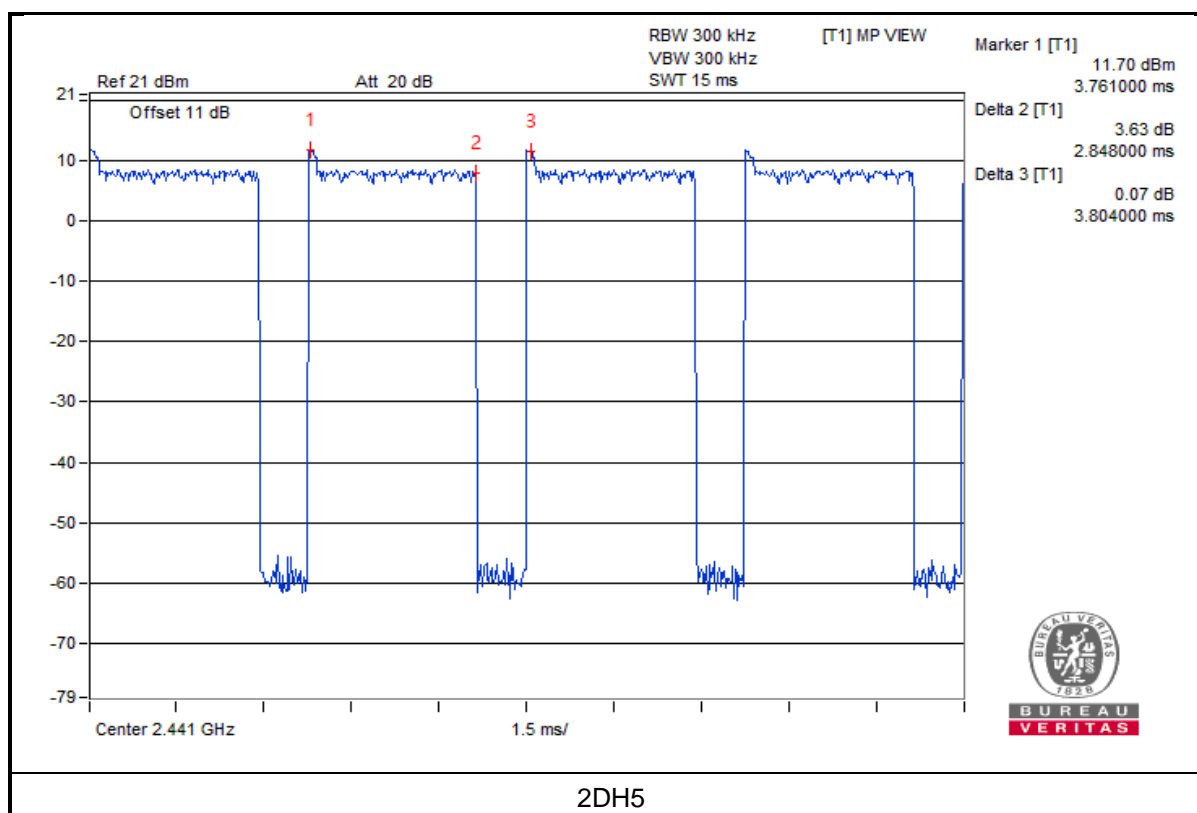
V<sub>max</sub>.



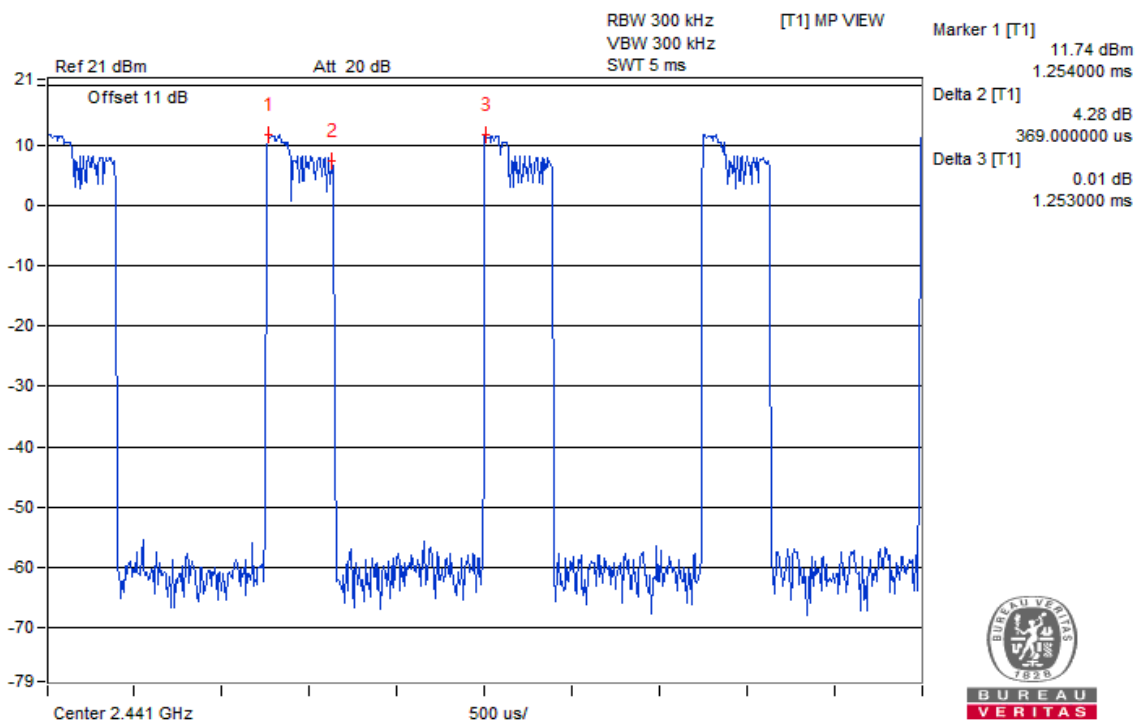
2DH1



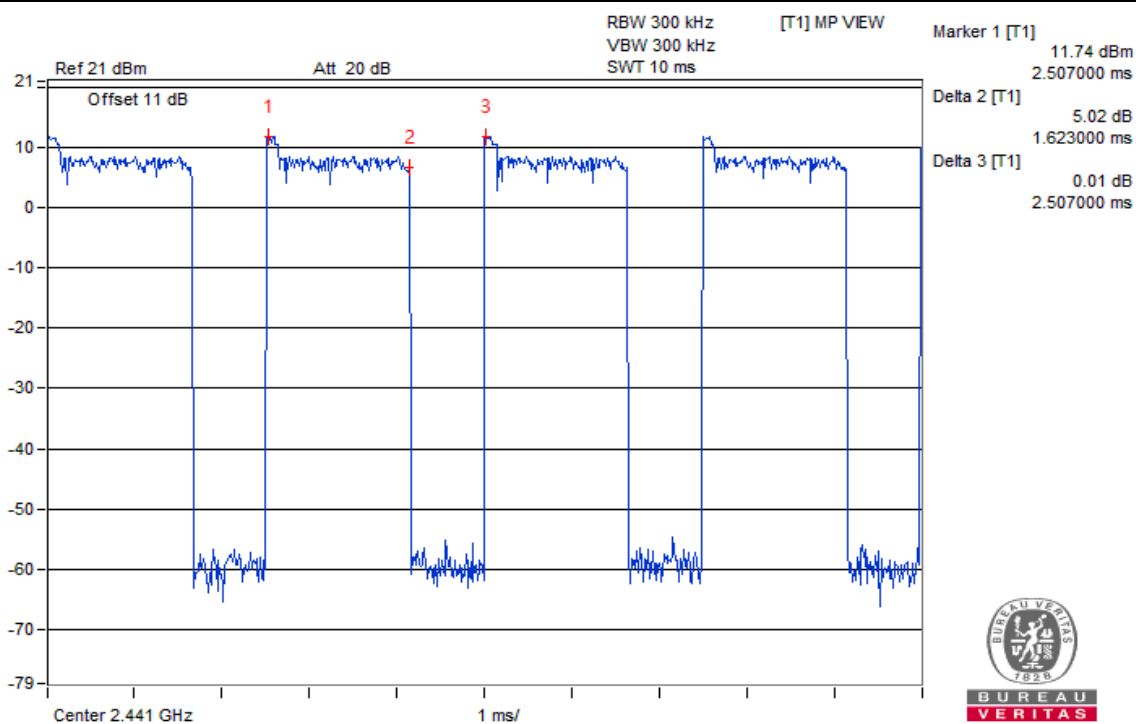
2DH3



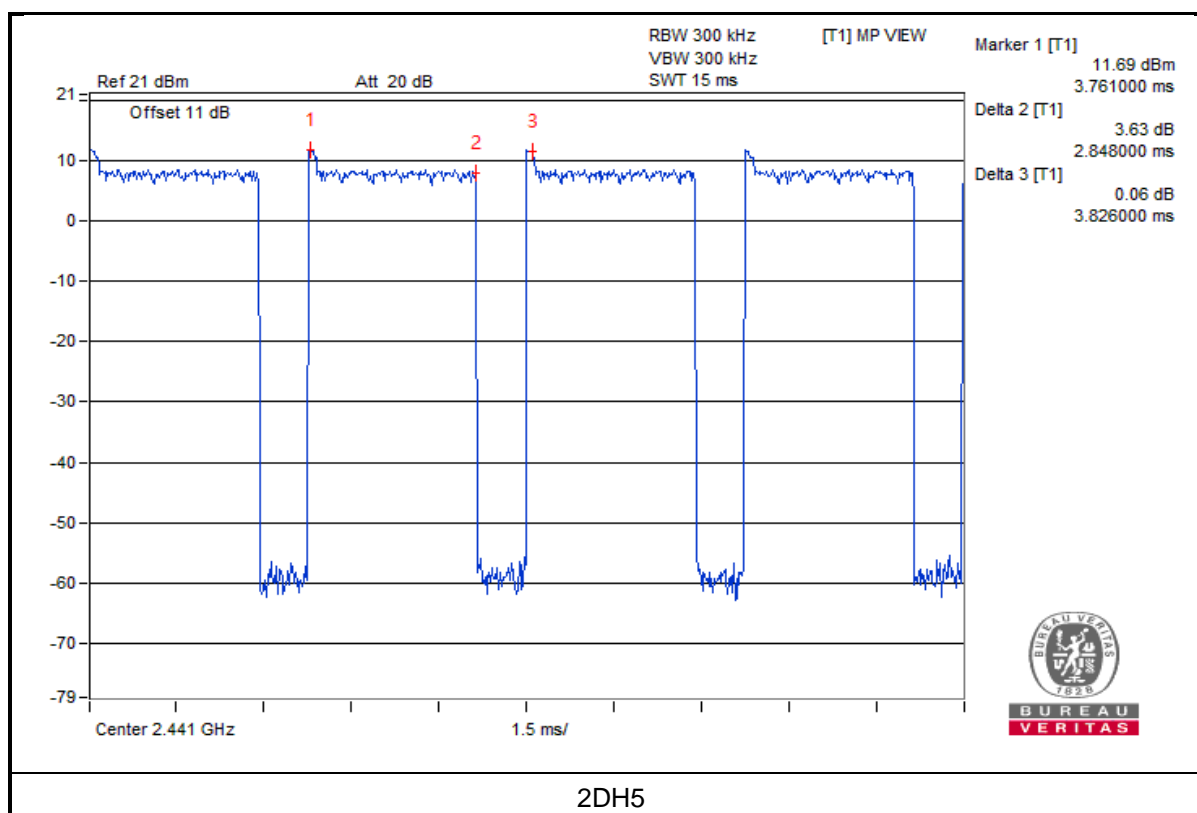
V<sub>min</sub>.



2DH1



2DH3

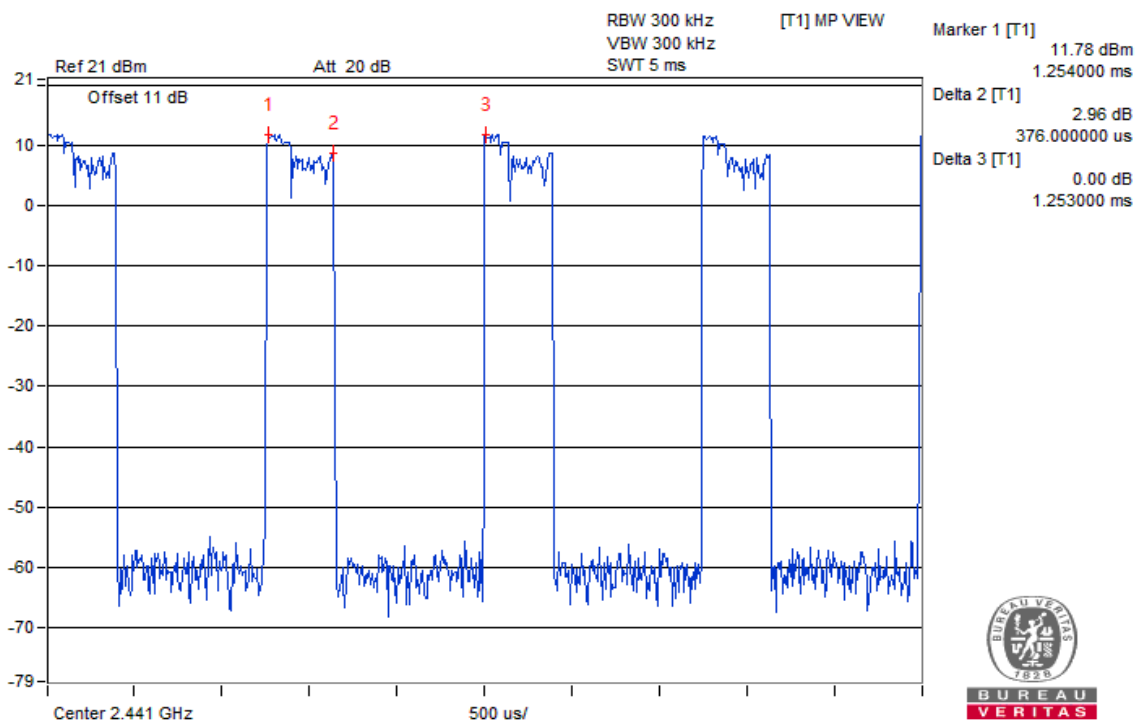


**Modulation: 8DPSK**
**Normal Mode:**

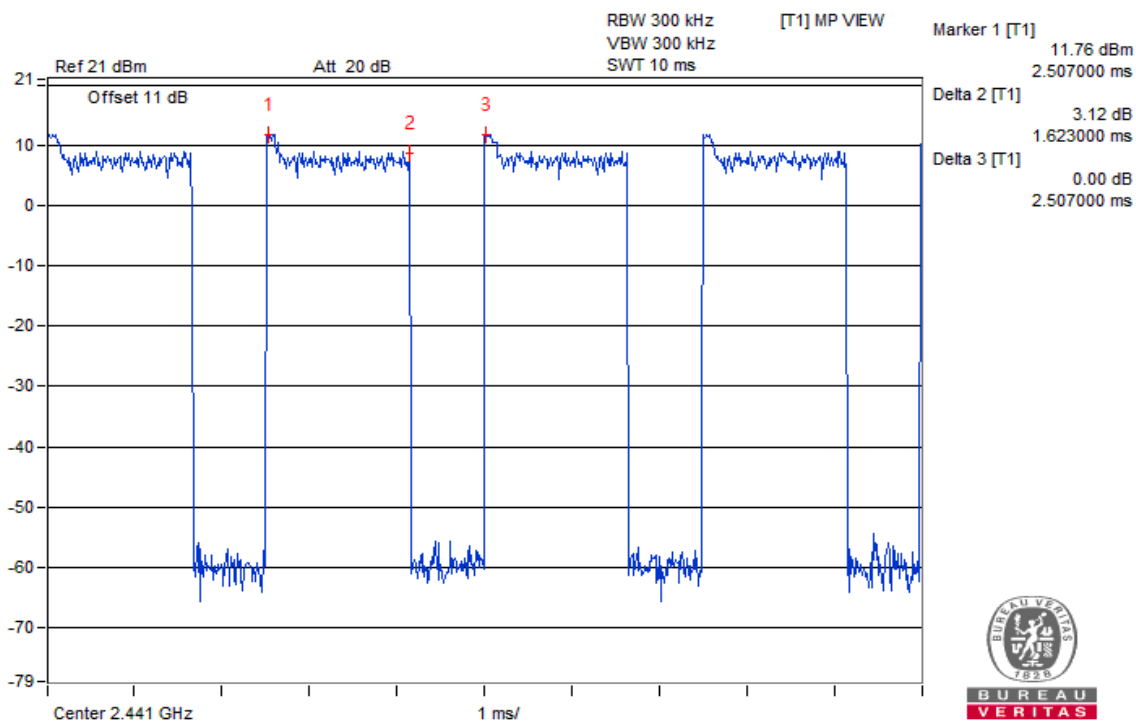
Test Condition	Mode	Spreading Rate	(Spreading Rate/79)*0.4	Duty Cycle (msec)	Result (msec)	Limit (msec)
<b>V<sub>normal</sub></b>	3DH1	71.80	0.363	0.300	108.900	400
	3DH3	71.80	0.363	0.647	234.861	400
	3DH5	71.80	0.363	0.754	273.702	400
<b>V<sub>max.</sub></b>	3DH1	71.80	0.363	0.300	108.900	400
	3DH3	71.80	0.363	0.639	231.957	400
	3DH5	71.80	0.363	0.749	271.887	400
<b>V<sub>min.</sub></b>	3DH1	71.40	0.361	0.300	108.300	400
	3DH3	71.40	0.361	0.647	233.567	400
	3DH5	71.40	0.361	0.754	272.194	400

Note: 1. For the test plots please refer to the below pages.

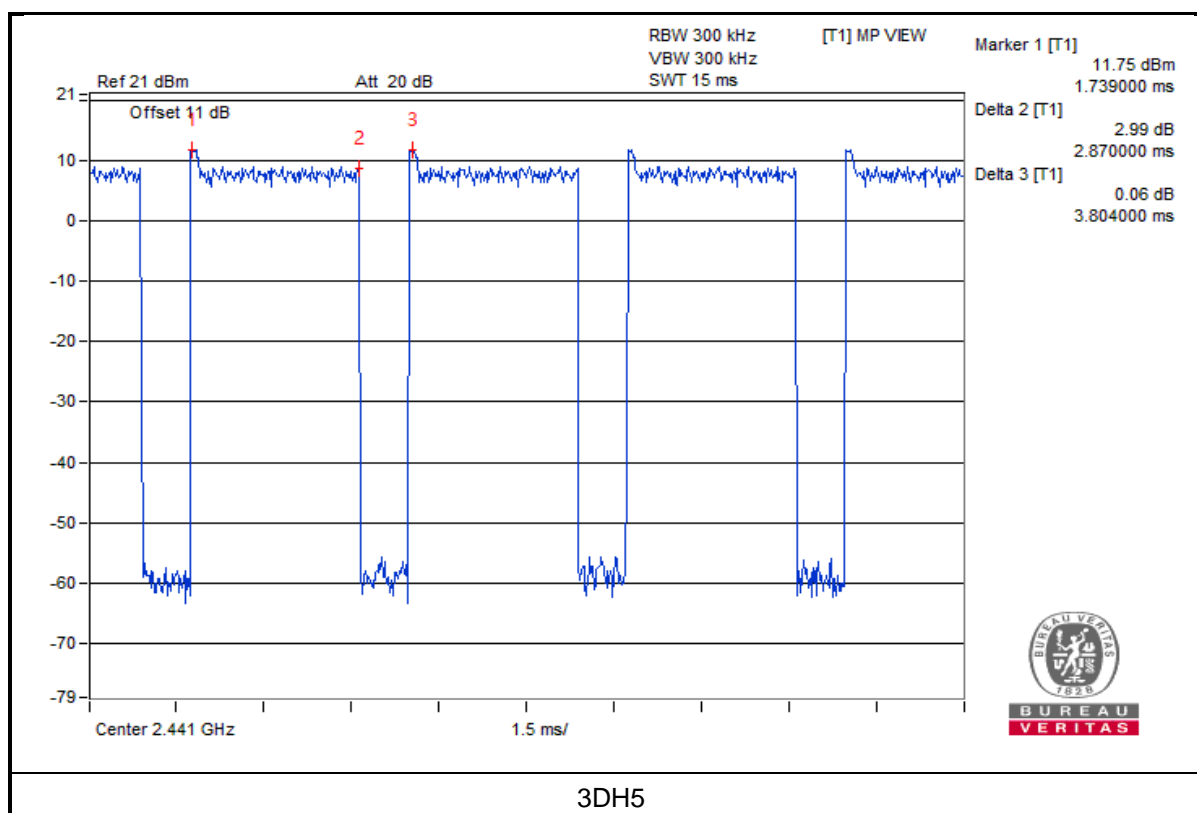
V<sub>normal</sub>



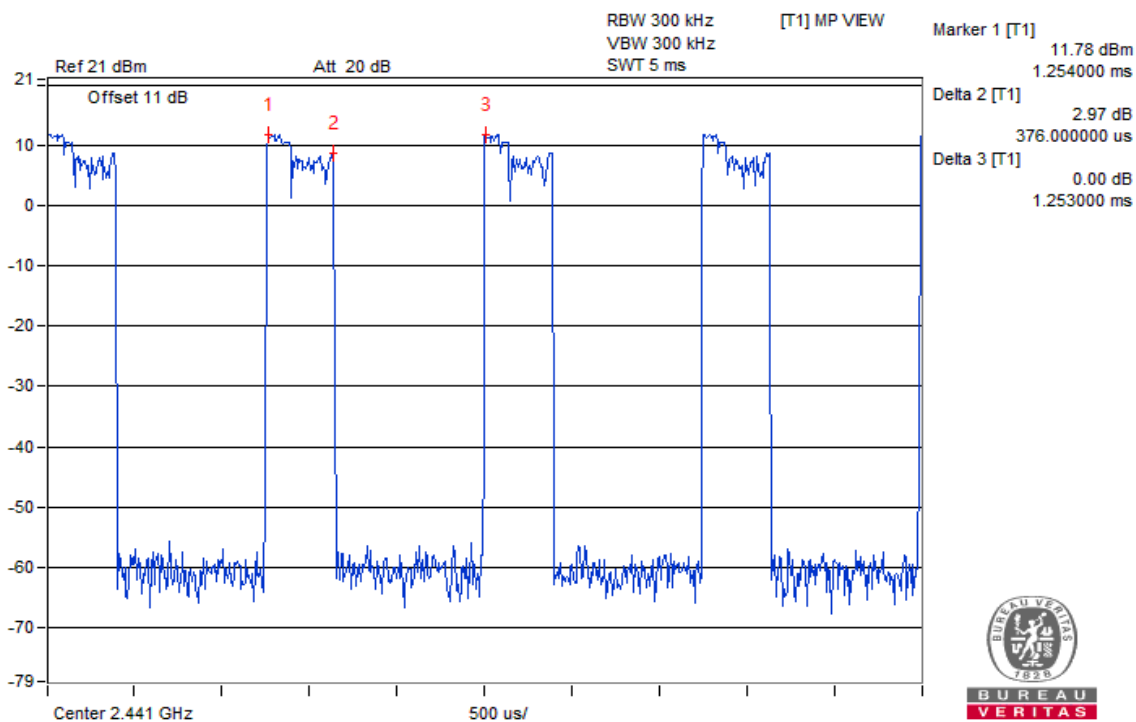
3DH1



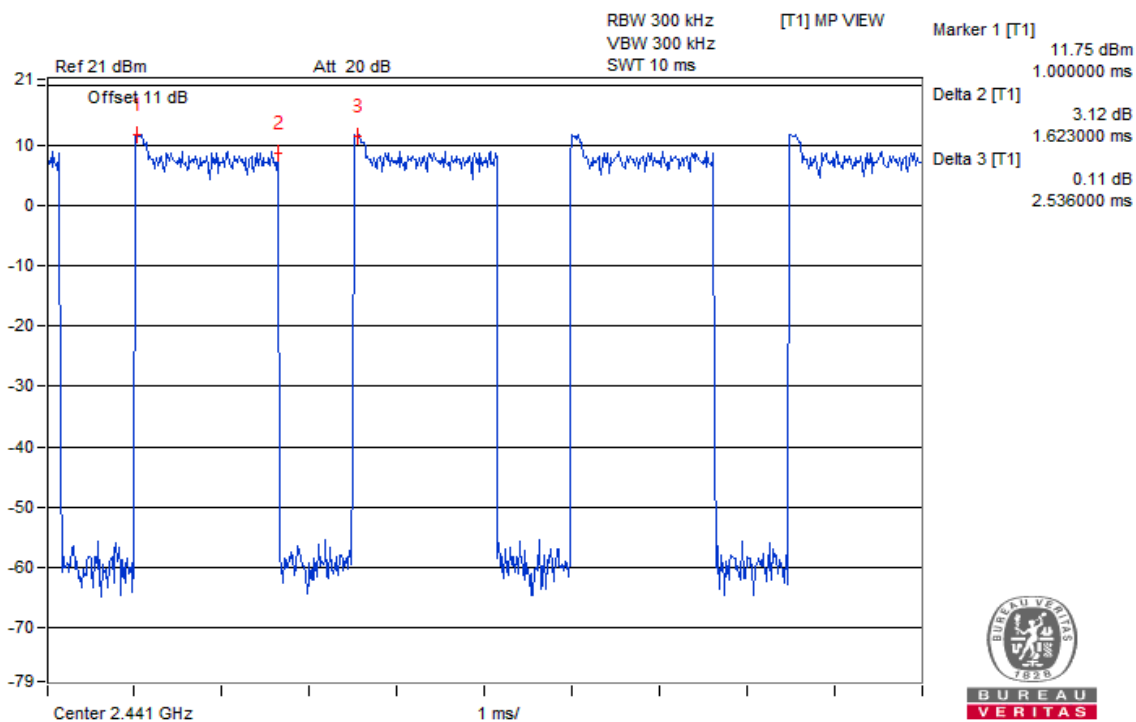
3DH3



V<sub>max</sub>.



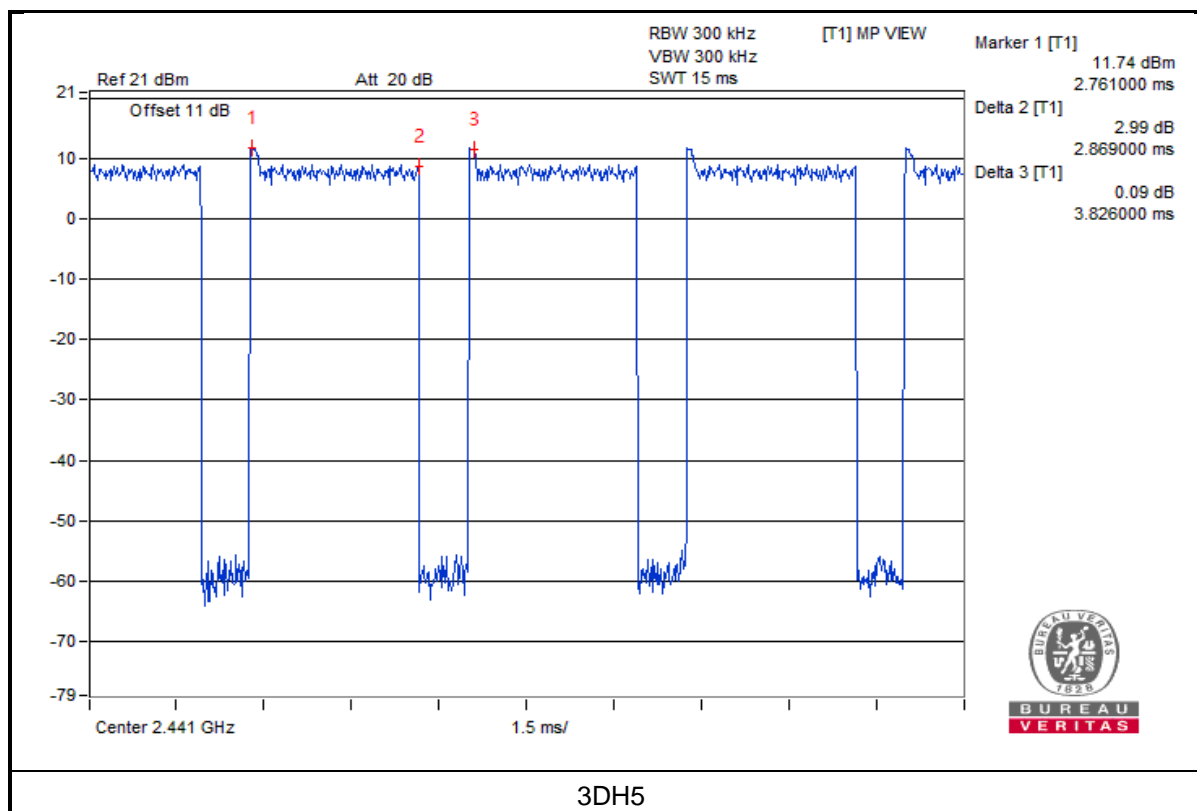
3DH1



3DH3

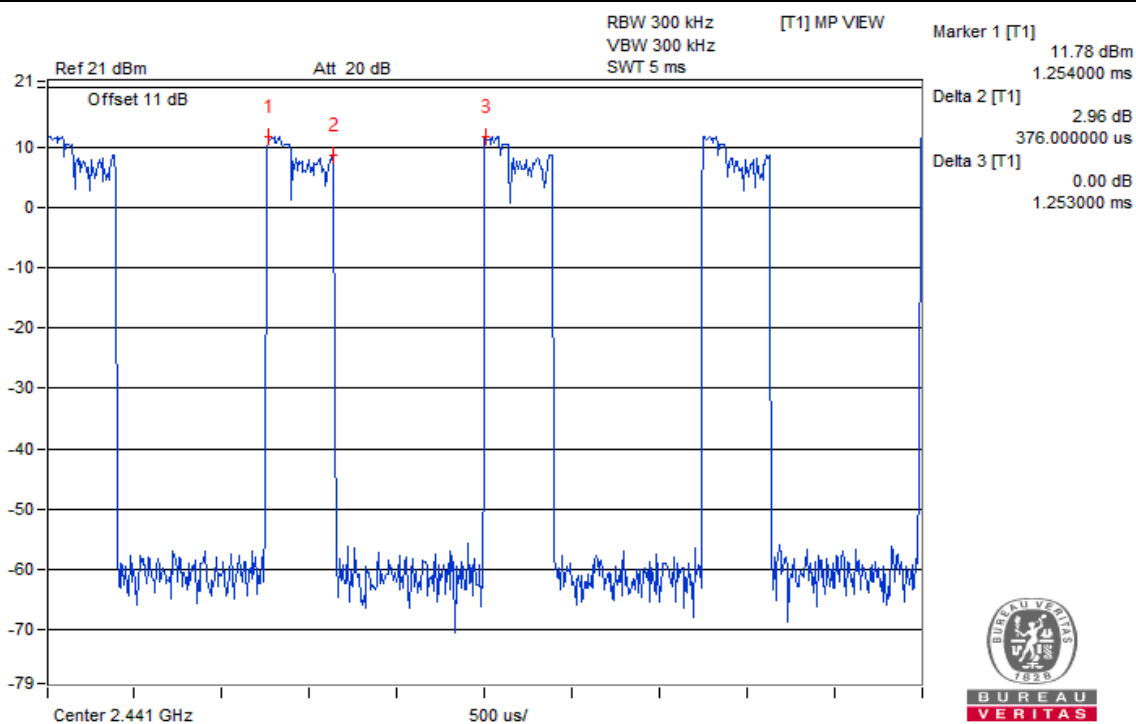


BUREAU  
VERITAS

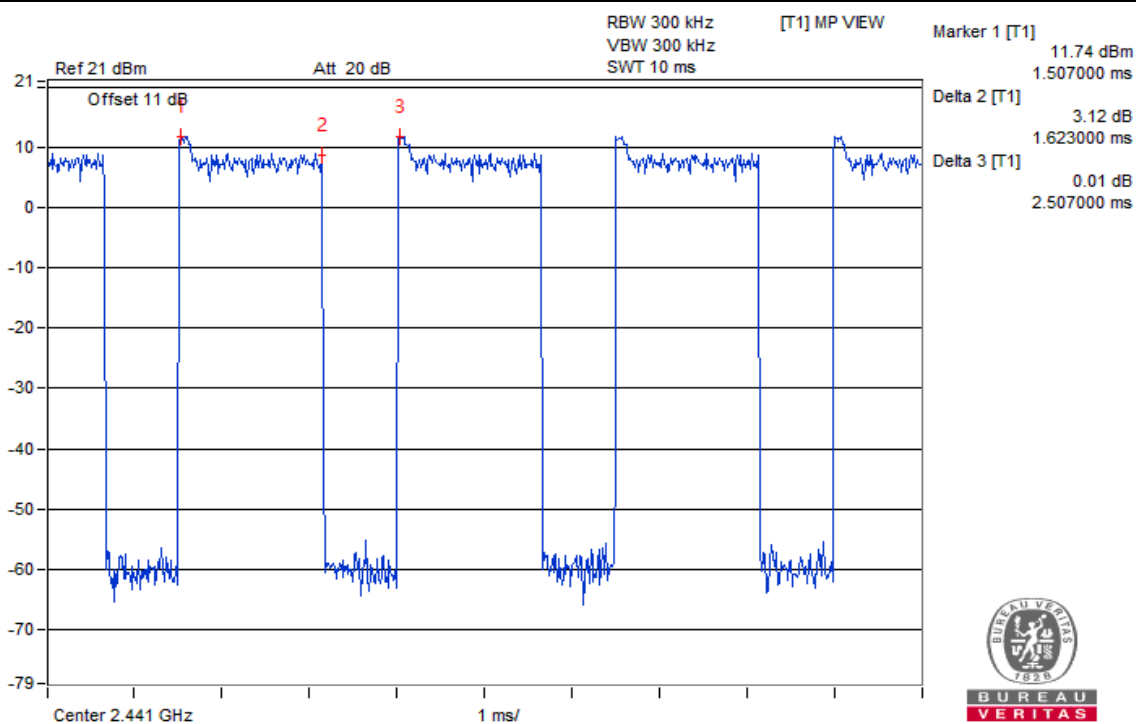


BUREAU  
VERITAS

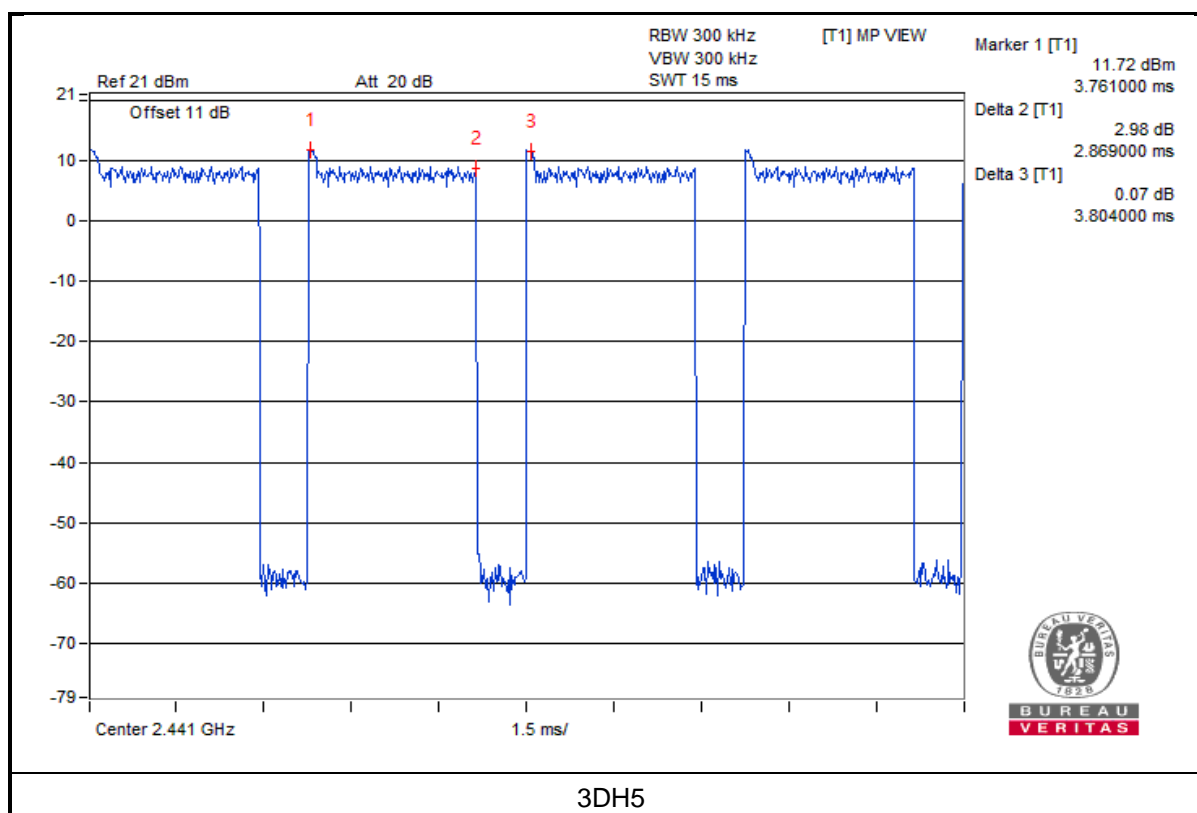
V<sub>min</sub>.



3DH1



3DH3

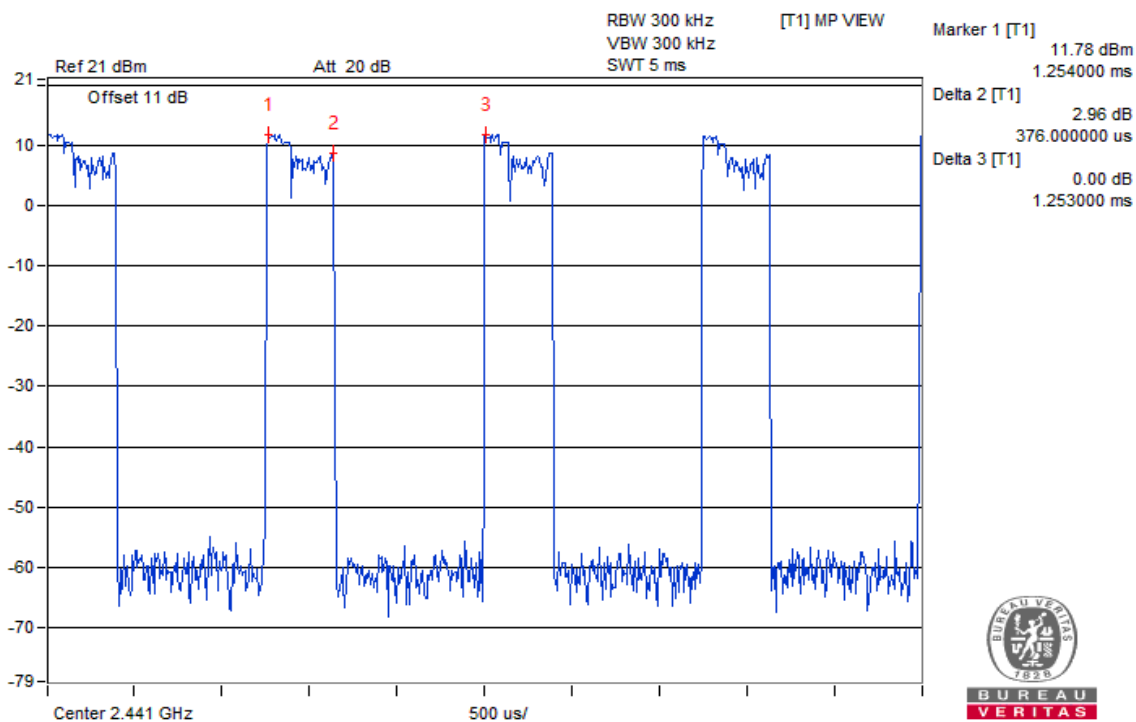


### AFH Mode:

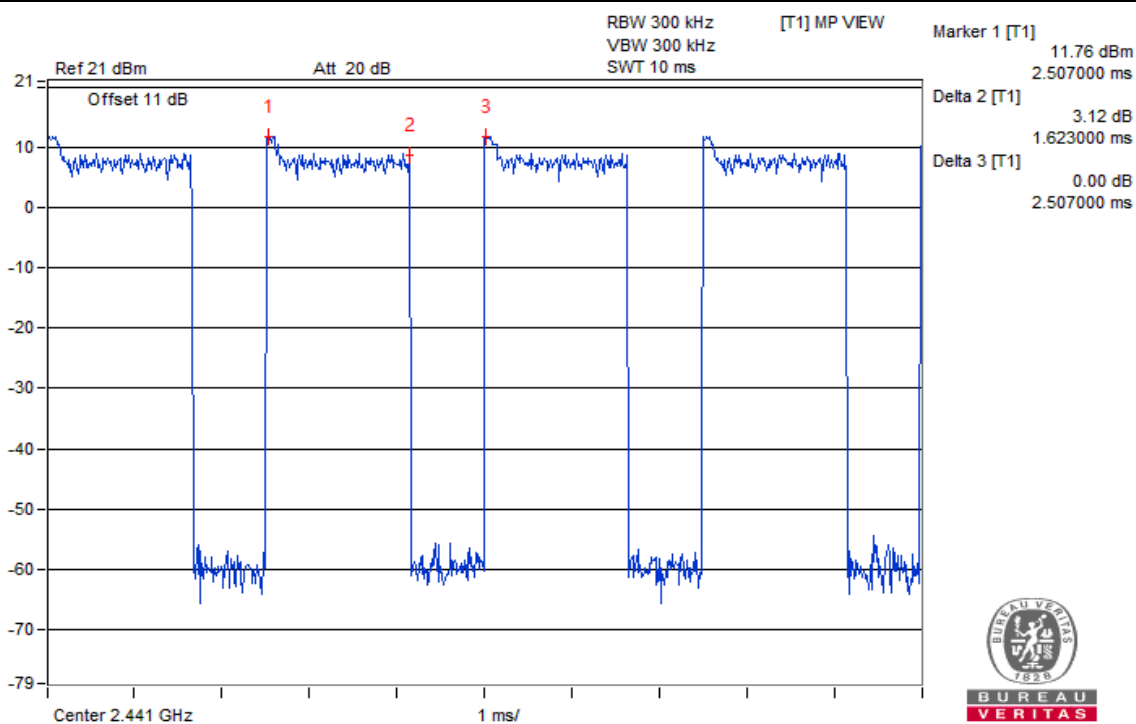
Test Condition	Mode	Spreading Rate	(Spreading Rate/20)*0.4	Duty Cycle (msec)	Result (msec)	Limit (msec)
<b>V<sub>normal</sub></b>	3DH1	18.19	0.363	0.300	108.900	400
	3DH3	18.19	0.363	0.647	234.861	400
	3DH5	18.19	0.363	0.754	273.702	400
<b>V<sub>max.</sub></b>	3DH1	18.26	0.365	0.300	109.500	400
	3DH3	18.26	0.365	0.639	233.235	400
	3DH5	18.26	0.365	0.749	273.385	400
<b>V<sub>min.</sub></b>	3DH1	18.26	0.365	0.300	109.500	400
	3DH3	18.26	0.365	0.647	236.155	400
	3DH5	18.26	0.365	0.754	275.210	400

Note: 1. For the test plots please refer to the below pages.

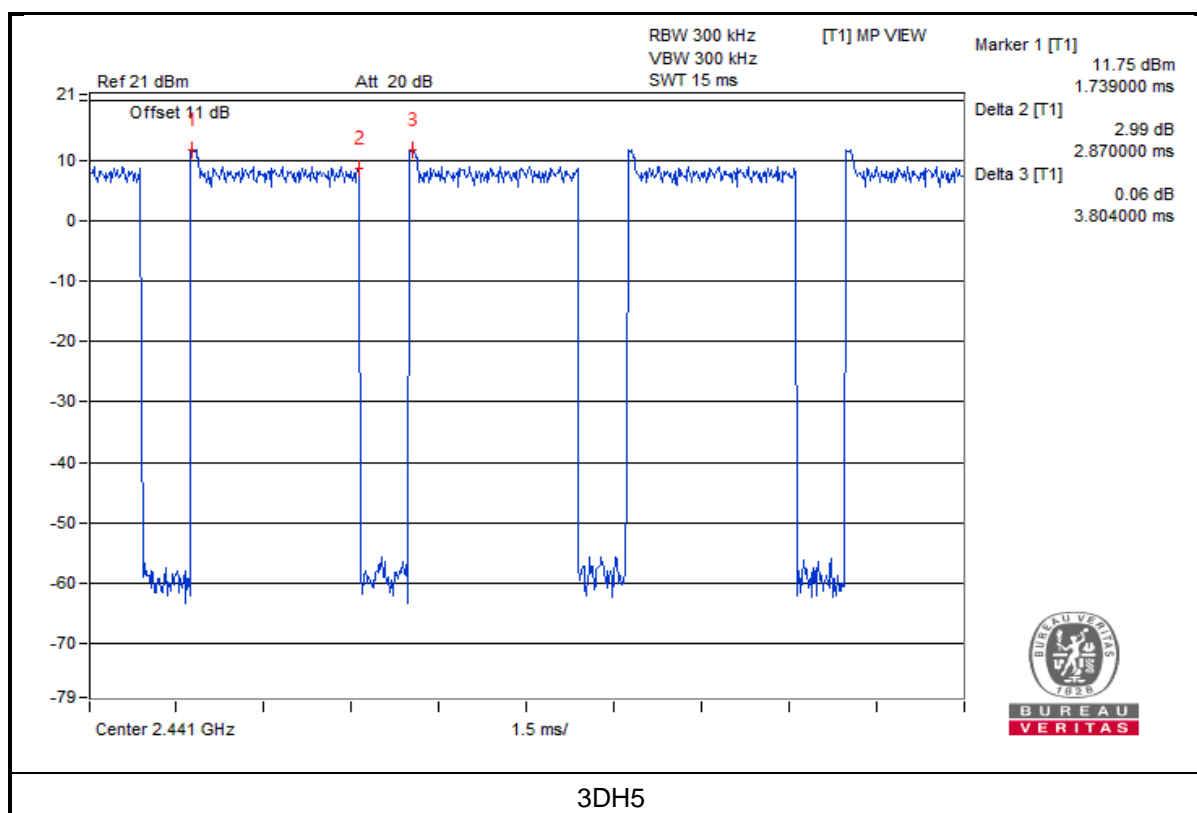
V<sub>normal</sub>



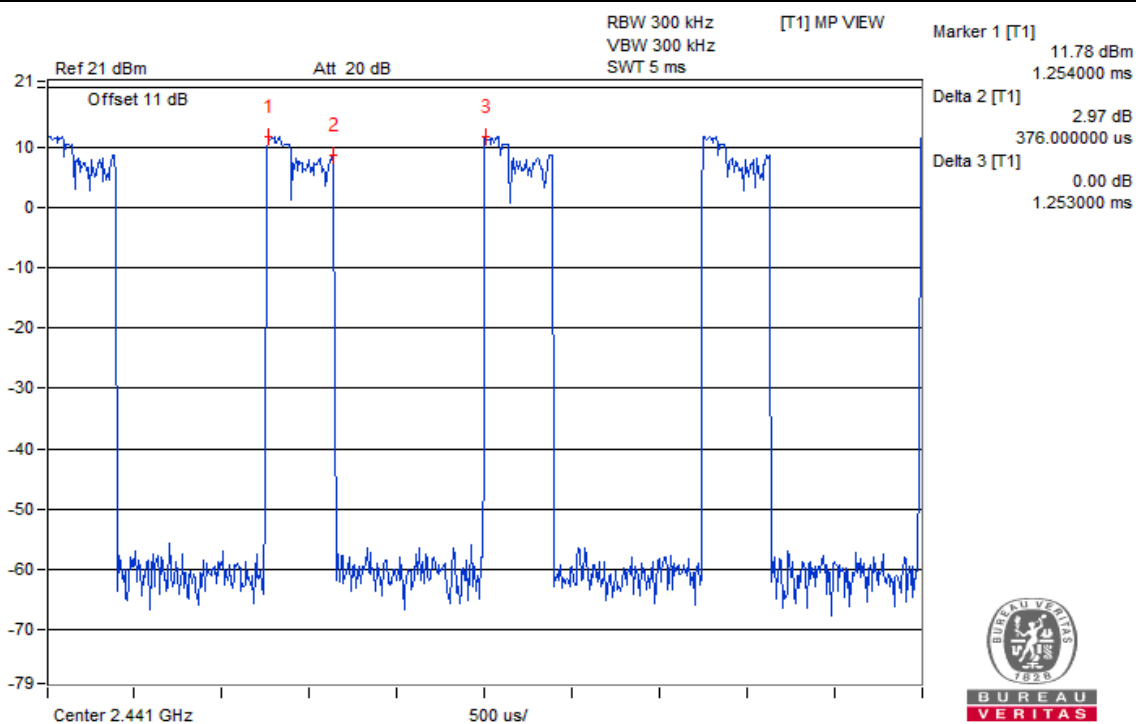
3DH1



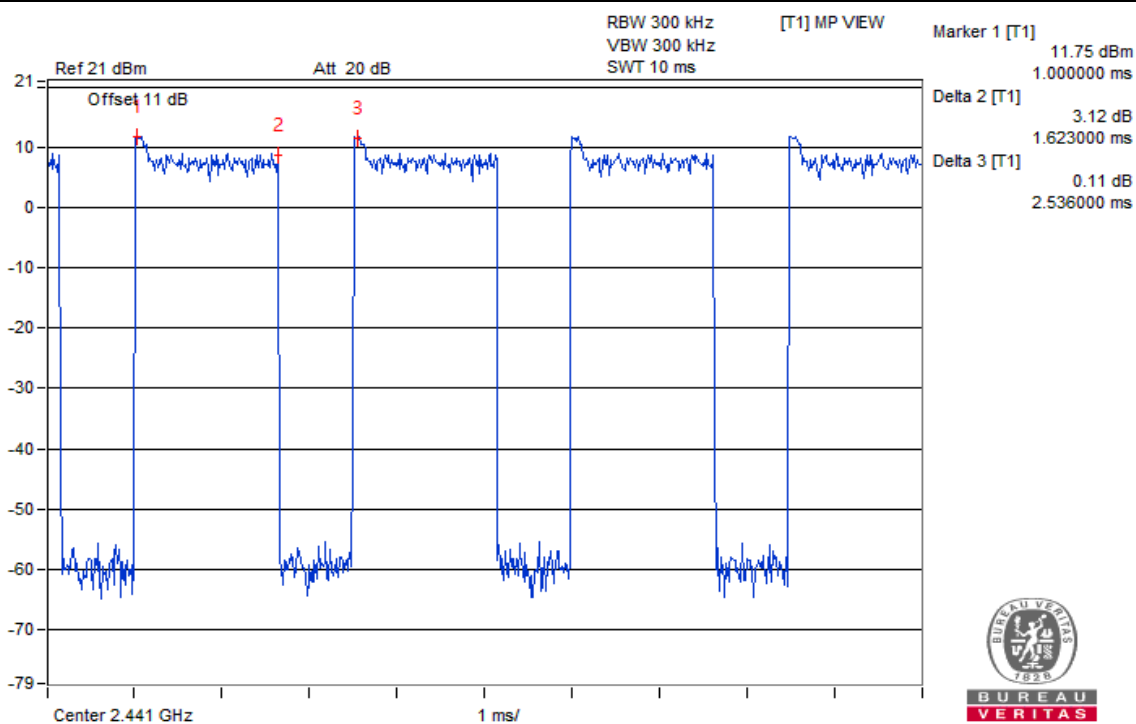
3DH3



V<sub>max</sub>.



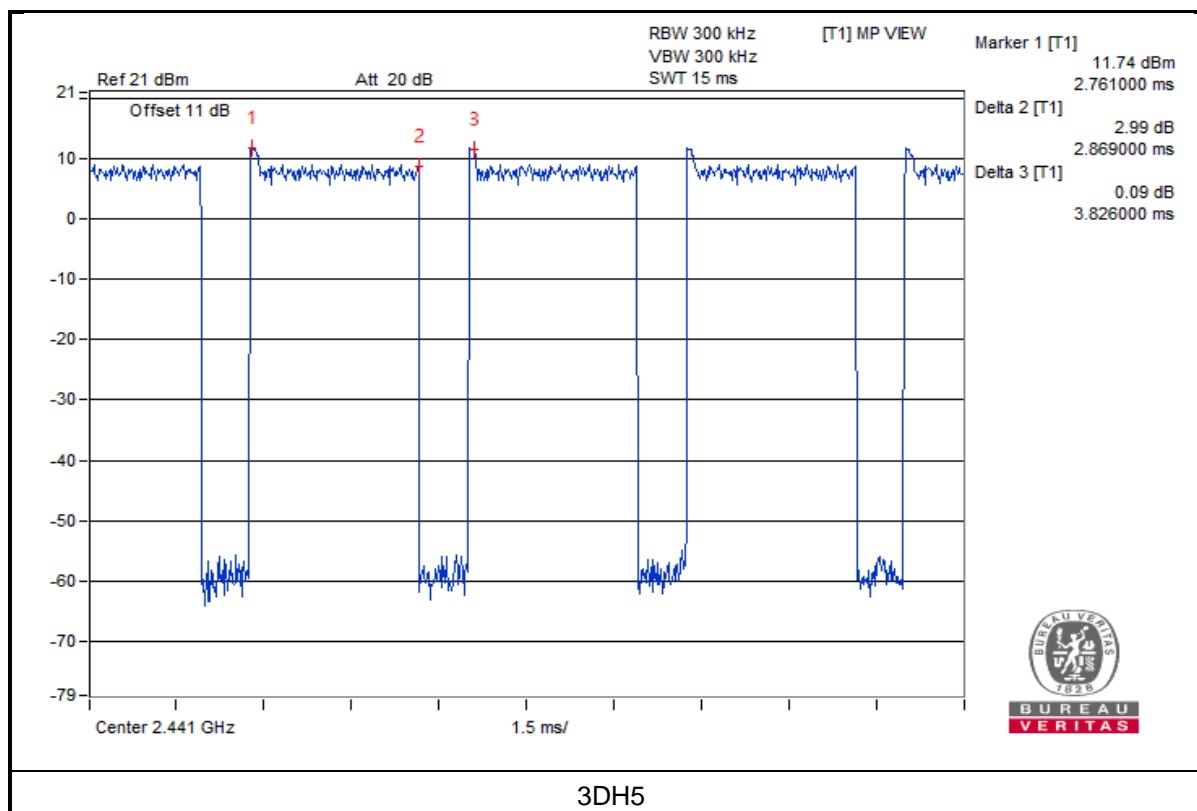
3DH1



3DH3

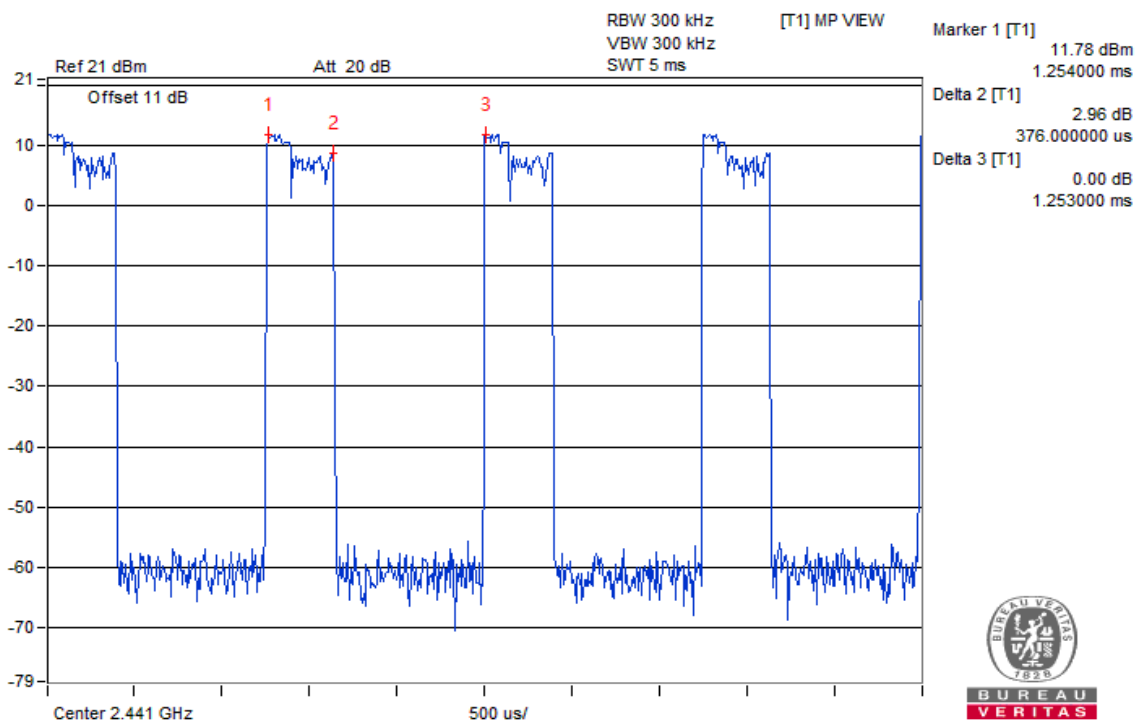


BUREAU  
VERITAS

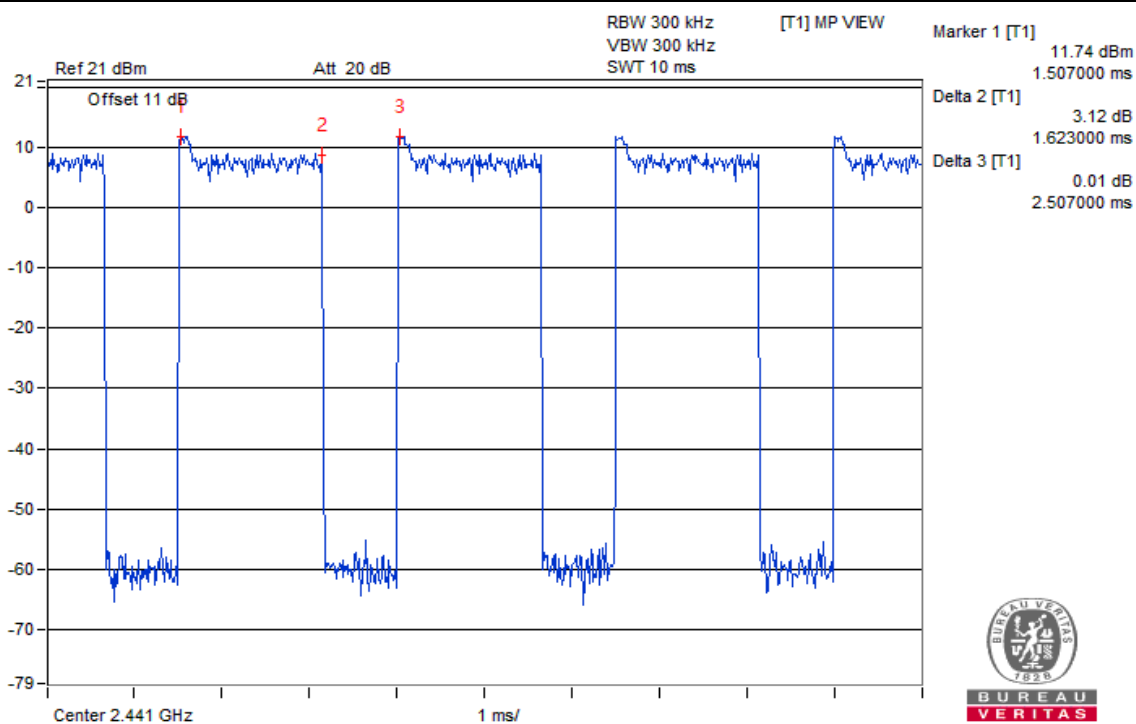


BUREAU  
VERITAS

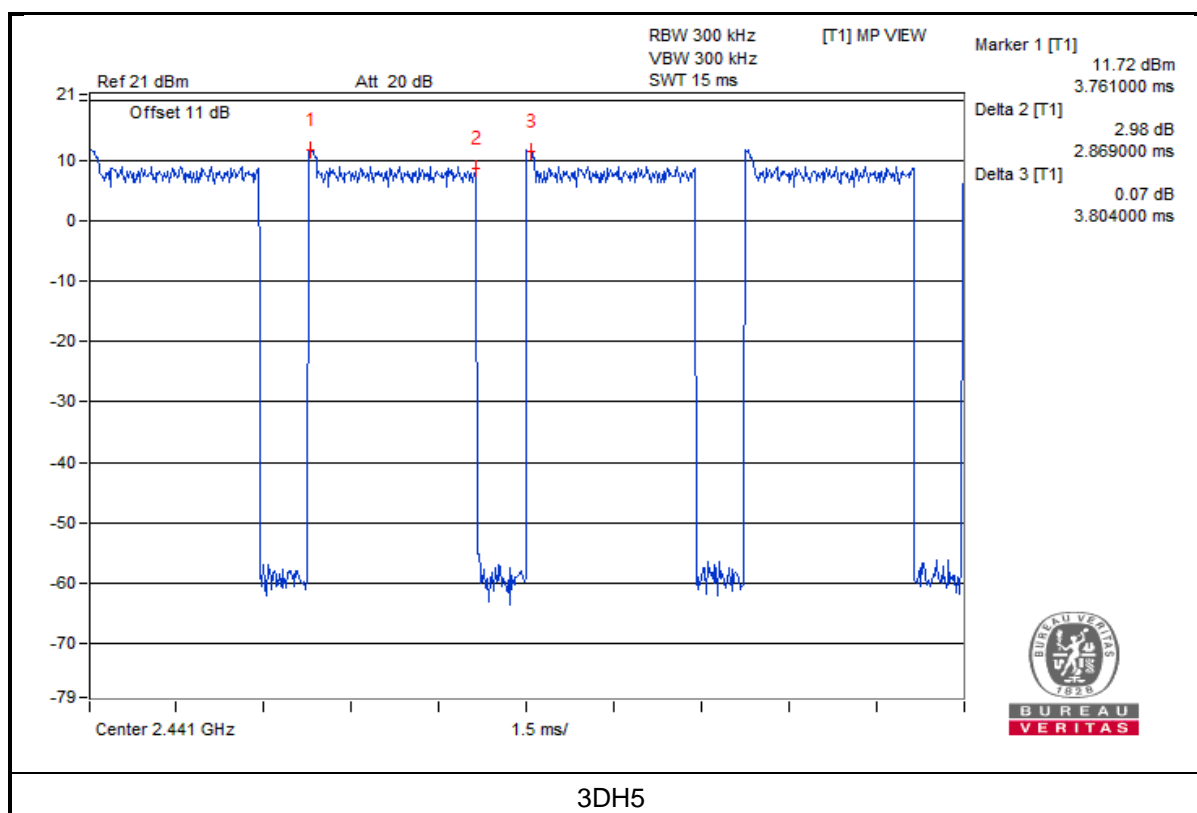
V<sub>min</sub>.



3DH1



3DH3

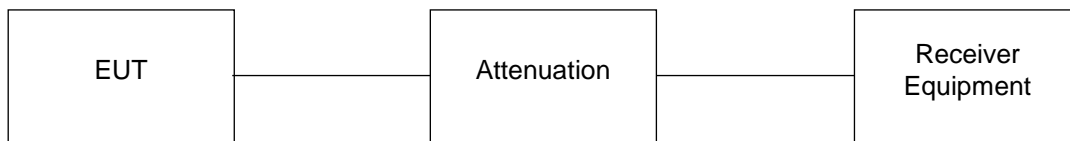


## 4.8 Interference Prevention Function

### 4.8.1 Limits of Interference Prevention Function

Radio equipment used mainly on the same premises and automatically transmits or receives identification code.

### 4.8.2 Test Setup



### 4.8.3 Test Results

Environmental Conditions	25 deg.C, 60% RH
Link Mode	Test Result
BT-EDR	Pass

## 5 Photographs of the Test Configuration



## Appendix - Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

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**Web Site:** [www.bureauveritas-adt.com](http://www.bureauveritas-adt.com)

The address and road map of all our labs can be found in our web site also.

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