

## Radio Test Report (BT-EDR)

**Report No.:** RJBUI-WTW-P21040655-2

**Test Model:** RTL8852BE

**Received Date:** Apr. 20, 2021

**Test Date:** May 06, 2021

**Issued Date:** July 15, 2021

**Applicant:** Realtek Semiconductor Corp.

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**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
RJBBUI-WTW-P21040655-2	Original release.	July 15, 2021

## 1 Certificate of Conformity

**Product:** 11ax RTL8852BE Combo module

**Brand:** REALTEK

**Test Model:** RTL8852BE

**Sample Status:** Engineering sample

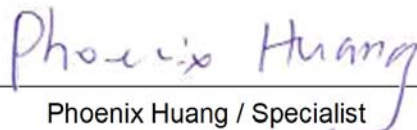
**Applicant:** Realtek Semiconductor Corp.

**Test Date:** May 06, 2021

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

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 :**

  
Phoenix Huang / Specialist

**Date:**

July 15, 2021

**Approved by :**



Clark Lin / Technical Manager

**Date:**

July 15, 2021

## 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. 18, 2020	Nov. 17, 2021	ETC	(c)
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)
DC Power Supply Topward	6603D	795558	NA	NA	NA	NA
AC Power Source Extech Electronics	6905S	1991551	NA	NA	NA	NA
True RMS Clamp Meter FLUKE	325	31130711WS	June 06, 2020	June 05, 2021	ETC	(c)
Power Combiner Mini-circuits	ZFRSC-123-S+	F698501347_02	Dec. 23, 2020	Dec. 22, 2021	BV CPS E&E	(d)
Power Divide Warison	WDIV-4R4029	0001	Jan. 11, 2021	Jan. 10, 2022	BV CPS E&E	(d)

- 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: May 06, 2021

## 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	$\pm 960$ Hz
Spurious emissions	$\pm 2.5$ dB
Output power density	$\pm 1.2$ dB
Out of band radiated power	$\pm 2.5$ dB
Frequency Tolerance	$\pm 960$ Hz

## 2.3 Modification Record

There were no modifications required for compliance.



### 3 General Information

#### 3.1 General Description of EUT (BT-EDR)

Product	11ax RTL8852BE Combo module
Brand	REALTEK
Test Model	RTL8852BE
Status of EUT	Engineering sample
Nominal Voltage	3.3 Vdc from host equipment
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK
Modulation Technology	FHSS
Transfer Rate	Up to 3 Mbps
Operating Frequency	2.402 ~ 2.480 GHz
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. The EUT has below HW SKU configuration, as below table:

SKU No.	Interface	Description
1	PCIe + USB	Single antenna port
2	PCIe + USB	Dual antenna port
3	PCIe + UART	Dual antenna port

Note: From the above HW SKUs, the worse case was found in **SKU No.: 2**. Therefore only the test data of the SKU was recorded in this report.

2. Simultaneously transmission condition.

Condition	Technology	
1	WLAN 5GHz	Bluetooth

3. The power table as below table:

<b>High Power</b>							
Modulation Mode	Rated output power density (mW/MHz)	Conducted RF output power density (mW/MHz)	Radiated RF output power density (mW/MHz)	Modulation Mode	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>Enable AFH function</b>			
<b>GFSK</b>	0.3	0.256679	0.574633	<b>GFSK</b>	1	0.985919	2.207198
<b><math>\pi/4</math>-DQPSK</b>	0.3	0.142689	0.319441	<b><math>\pi/4</math>-DQPSK</b>	1	0.543875	1.217584
<b>8DPSK</b>	0.3	0.142033	0.317972	<b>8DPSK</b>	1	0.541374	1.211985
<b>Low Power</b>							
Modulation Mode	Rated output power density (mW/MHz)	Conducted RF output power density (mW/MHz)	Radiated RF output power density (mW/MHz)	Modulation Mode	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>Enable AFH function</b>			
<b>GFSK</b>	0.1	0.06405	0.14339	<b>GFSK</b>	0.3	0.252792	0.565931
<b><math>\pi/4</math>-DQPSK</b>	0.1	0.064166	0.14365	<b><math>\pi/4</math>-DQPSK</b>	0.3	0.250901	0.561697
<b>8DPSK</b>	0.1	0.064313	0.143979	<b>8DPSK</b>	0.3	0.253419	0.567334

4. 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 (Bluetooth RF test tool (5.2.3.1)) provided by manufacturer, the power levels during the tests were set according to the following codes:

<b>High power</b>					
<b>Modulation type: GFSK</b>		<b>Modulation type: <math>\pi/4</math>-DQPSK</b>		<b>Modulation type: 8DPSK</b>	
Channel	Power setting	Channel	Power setting	Channel	Power setting
0	0x08	0	0x03	0	0x03
39	0x08	39	0x03	39	0x03
78	0x08	78	0x03	78	0x03
<b>Low power</b>					
<b>Modulation type: GFSK</b>		<b>Modulation type: <math>\pi/4</math>-DQPSK</b>		<b>Modulation type: 8DPSK</b>	
Channel	Power setting	Channel	Power setting	Channel	Power setting
0	0x08	0	0x08	0	0x08
39	0x08	39	0x08	39	0x08
78	0x08	78	0x08	78	0x08

**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

Test mode is presented in the report as below:

Test Item	Test Conditions	Environmental Conditions
Frequency Tolerance	Mode 1: High Power Mode 2: Low Power	25 deg.C, 60 % RH
Occupied Bandwidth / Spreading Bandwidth	Mode 1: High Power Mode 2: Low Power	25 deg.C, 60 % RH
Spurious Emissions for Transmitter	Mode 1: High Power Mode 2: Low Power	25 deg.C, 60 % RH
Antenna Power	Mode 1: High Power Mode 2: Low Power	25 deg.C, 60 % RH
Spurious Emissions for Receiver	Mode 1: High Power Mode 2: Low Power	25 deg.C, 60 % RH
Dwell Time	Mode 1: High Power Mode 2: Low Power	25 deg.C, 60 % RH

### 3.4 Assembly

The EUT is constructed as an 11ax RTL8852BE Combo module. The RF circuit was covered by metal shielding case, and the metal shielding case won't be easy to be opened.

### 3.5 Antenna Specifications

#### 3.5.1 Antenna Gain

Ant. Set	RF Chain No.	Brand	Model	Ant. Net Gain (dBi)	Frequency Range (GHz)	Ant. Type	Connector Type	Cable Length (mm)
1	Chain 0	ARISTOTLE	RFA-27-JP326-MHF4300	3.5	2.4~2.4835	PIFA	i-pex(MHF)	300
				5	5.15~5.85			
				5	5.875~7.125			
	Chain 1	ARISTOTLE	RFA-27-JP326-MHF4300	3.5	2.4~2.4835	PIFA	i-pex(MHF)	300
				5	5.15~5.85			
				5	5.875~7.125			
2	Chain 0	ARISTOTLE	RFA-27-C38H1-MHF4300	3	2.4~2.4835	Dipole	i-pex(MHF)	300
				5	5.15~5.85			
				5	5.875~7.125			
	Chain 1	ARISTOTLE	RFA-27-C38H1-MHF4300	3	2.4~2.4835	Dipole	i-pex(MHF)	300
				5	5.15~5.85			
				5	5.875~7.125			

Note: 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 to the attached 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 (Mode 1)

Modulation: GFSK

Channel	Frequency (MHz)	$V_{normal}$		$V_{max.}$		$V_{min.}$	
		Carrier frequency (MHz)	Frequency tolerance (ppm)	Carrier frequency (MHz)	Frequency tolerance (ppm)	Carrier frequency (MHz)	Frequency tolerance (ppm)
0	2402	2402.002792	1.162	2402.002501	1.041	2402.002178	0.906
39	2441	2441.001996	0.817	2441.001827	0.748	2441.001652	0.676
78	2480	2480.001391	0.560	2480.001305	0.526	2480.001217	0.490

#### 4.1.4 Test Results (Mode 2)

Modulation: GFSK

Channel	Frequency (MHz)	$V_{normal}$		$V_{max.}$		$V_{min.}$	
		Carrier frequency (MHz)	Frequency tolerance (ppm)	Carrier frequency (MHz)	Frequency tolerance (ppm)	Carrier frequency (MHz)	Frequency tolerance (ppm)
0	2402	2402.005049	2.101	2402.004874	2.029	2402.004729	1.968
39	2441	2441.004363	1.787	2441.004270	1.749	2441.004241	1.737
78	2480	2480.004031	1.625	2480.003939	1.588	2480.003910	1.576

## 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 (Mode 1)

Modulation: GFSK

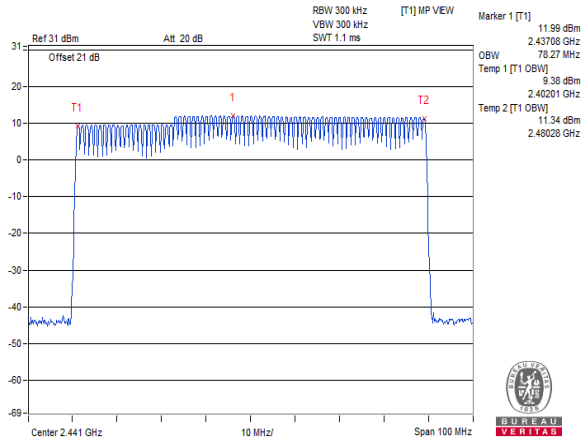
Normal Mode:

$V_{\text{normal}}$	$V_{\text{max.}}$	$V_{\text{min.}}$
Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
78.27	78.20	78.20

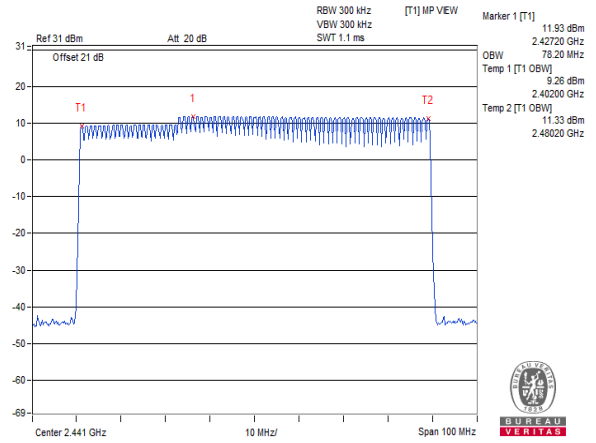
**NOTE:** For the test plots please refer to the below pages.



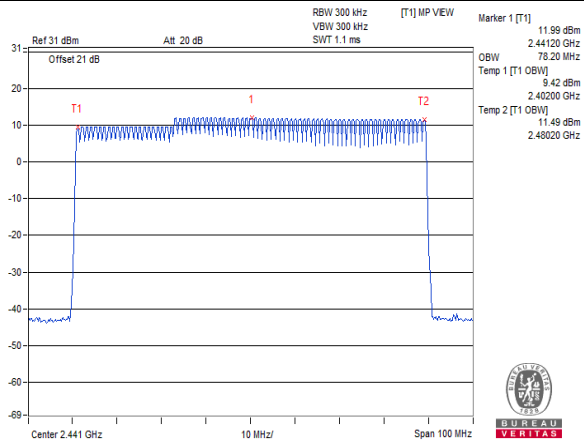
### V<sub>normal</sub>



### V<sub>max.</sub>

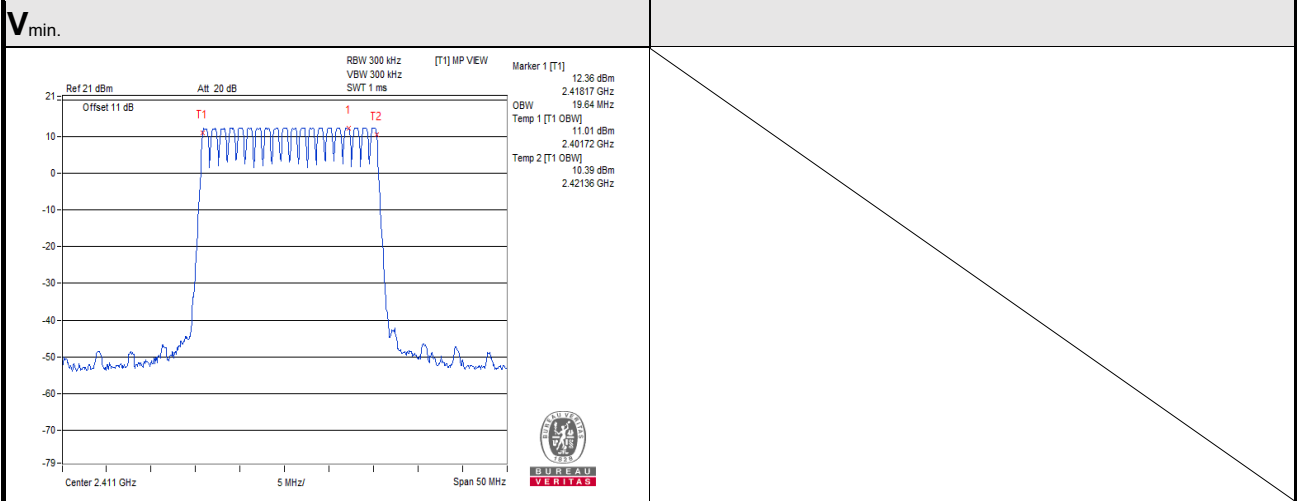
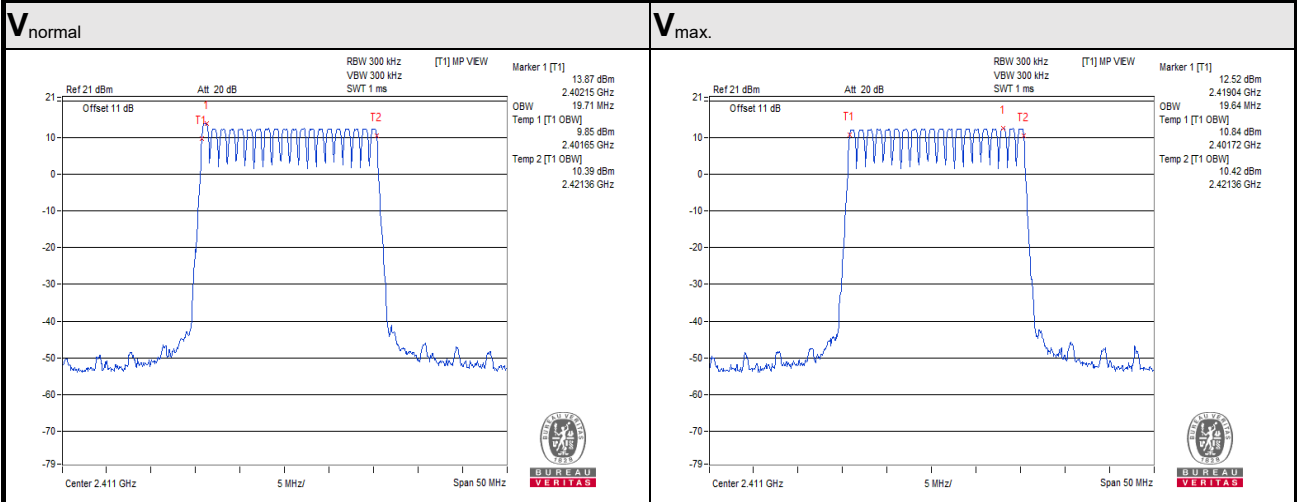


### V<sub>min.</sub>



**AFH Mode:**

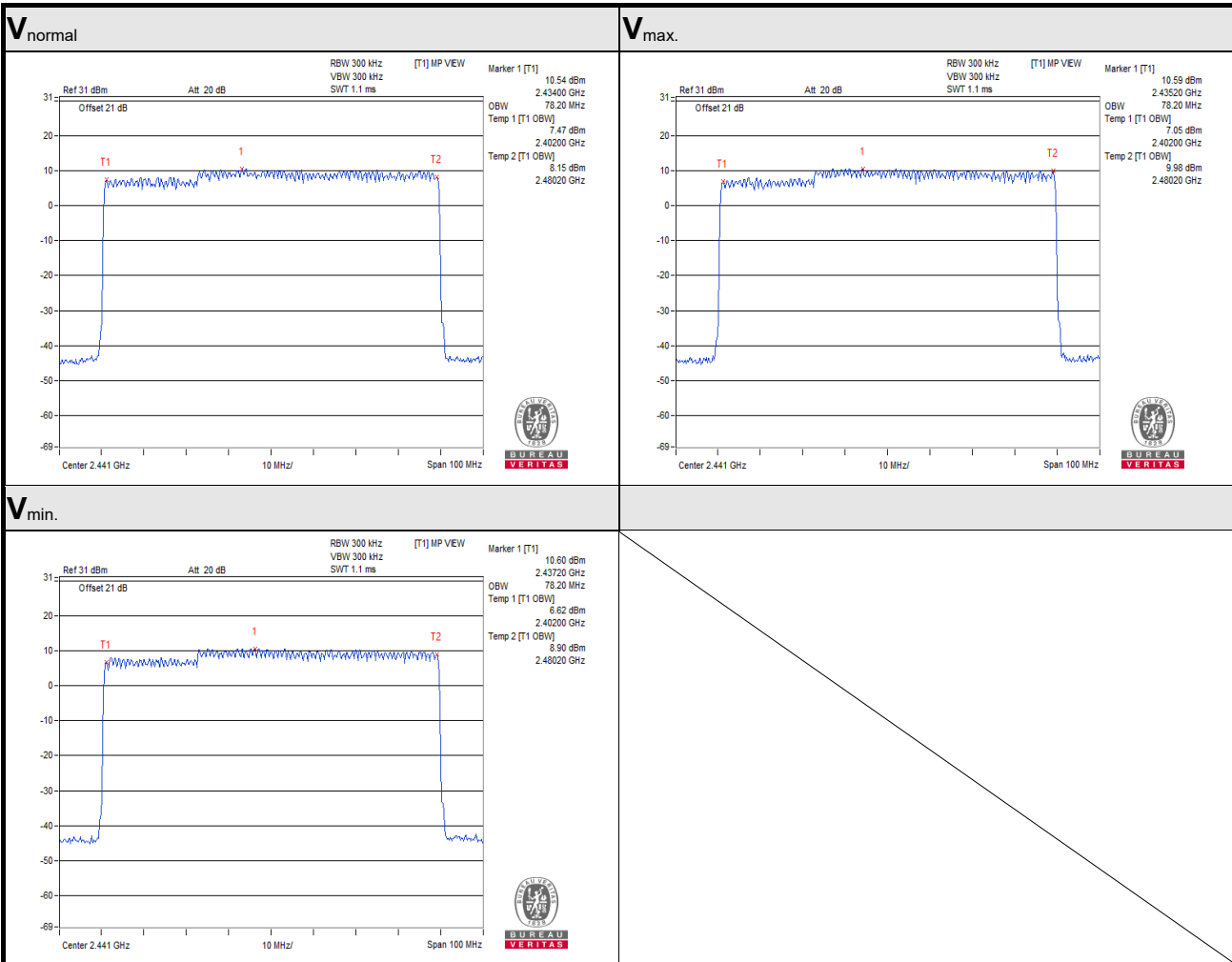
$V_{normal}$	$V_{max.}$	$V_{min.}$
Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
19.71	19.64	19.64



Modulation:  $\pi/4$ -DQPSK

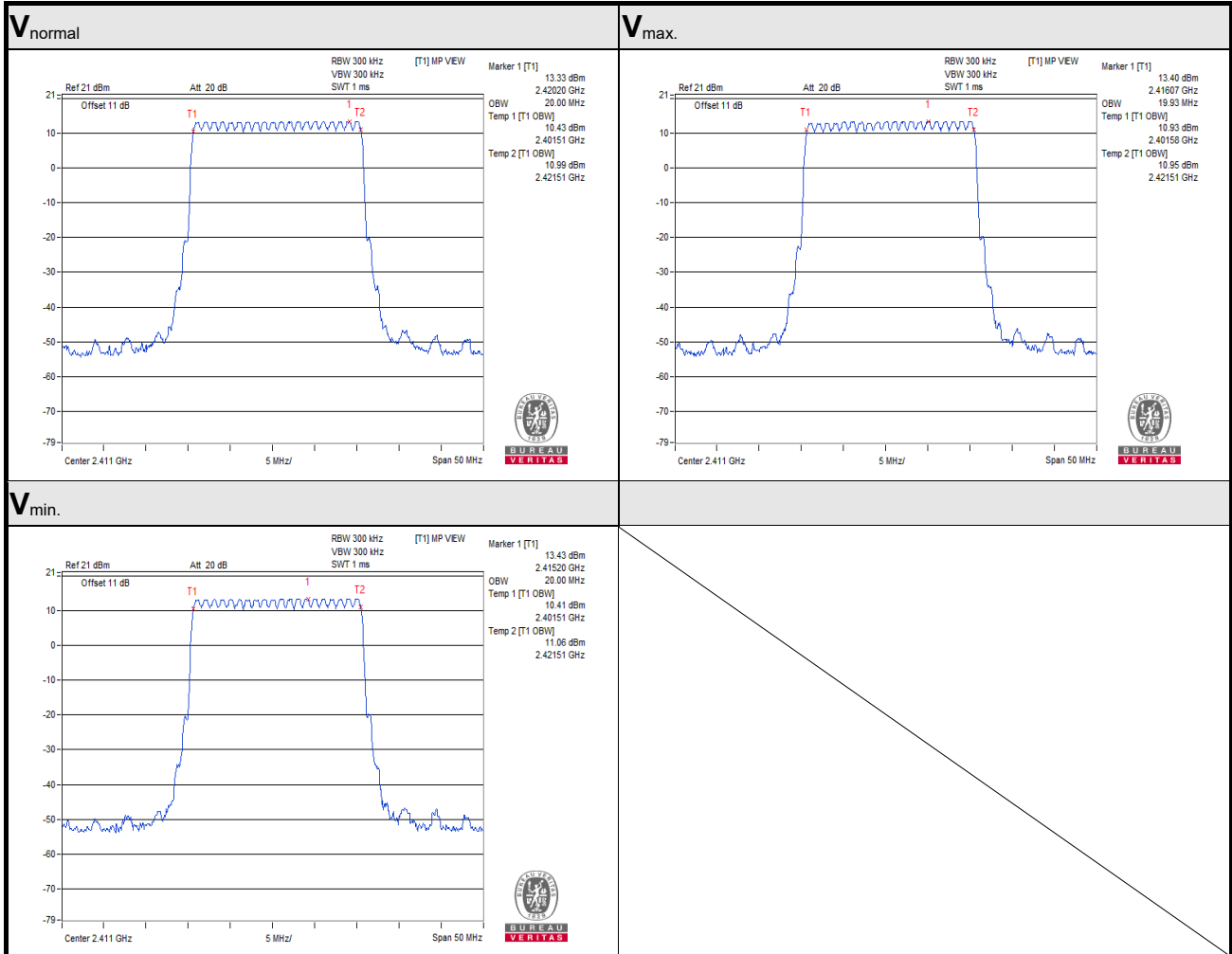
Normal Mode:

$V_{normal}$	$V_{max.}$	$V_{min.}$
Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
78.20	78.20	78.20



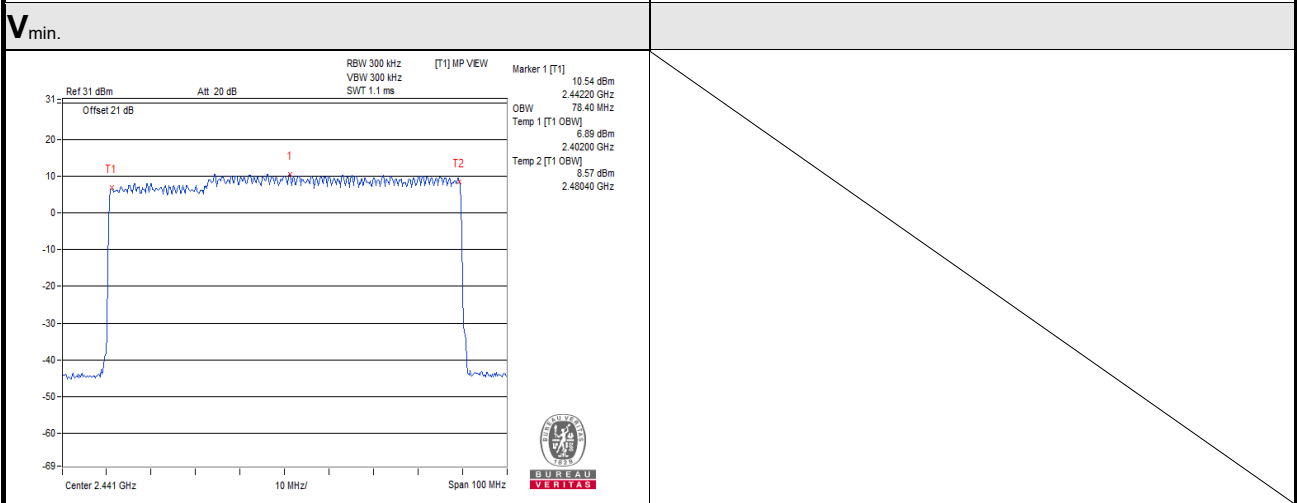
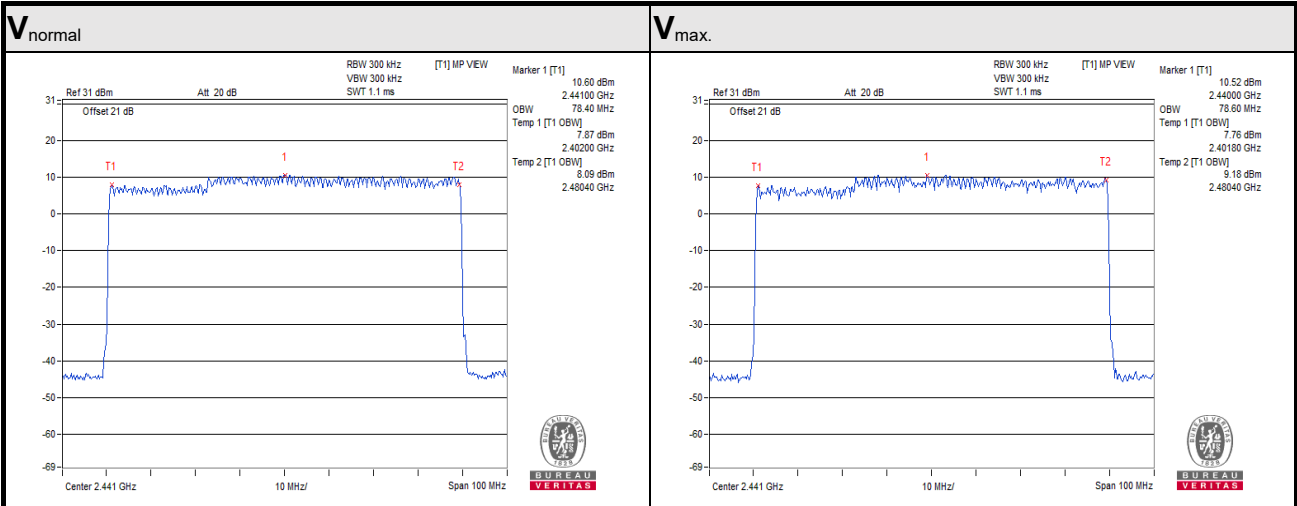
**AFH Mode:**

$V_{normal}$	$V_{max.}$	$V_{min.}$
Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
20.00	19.93	20.00



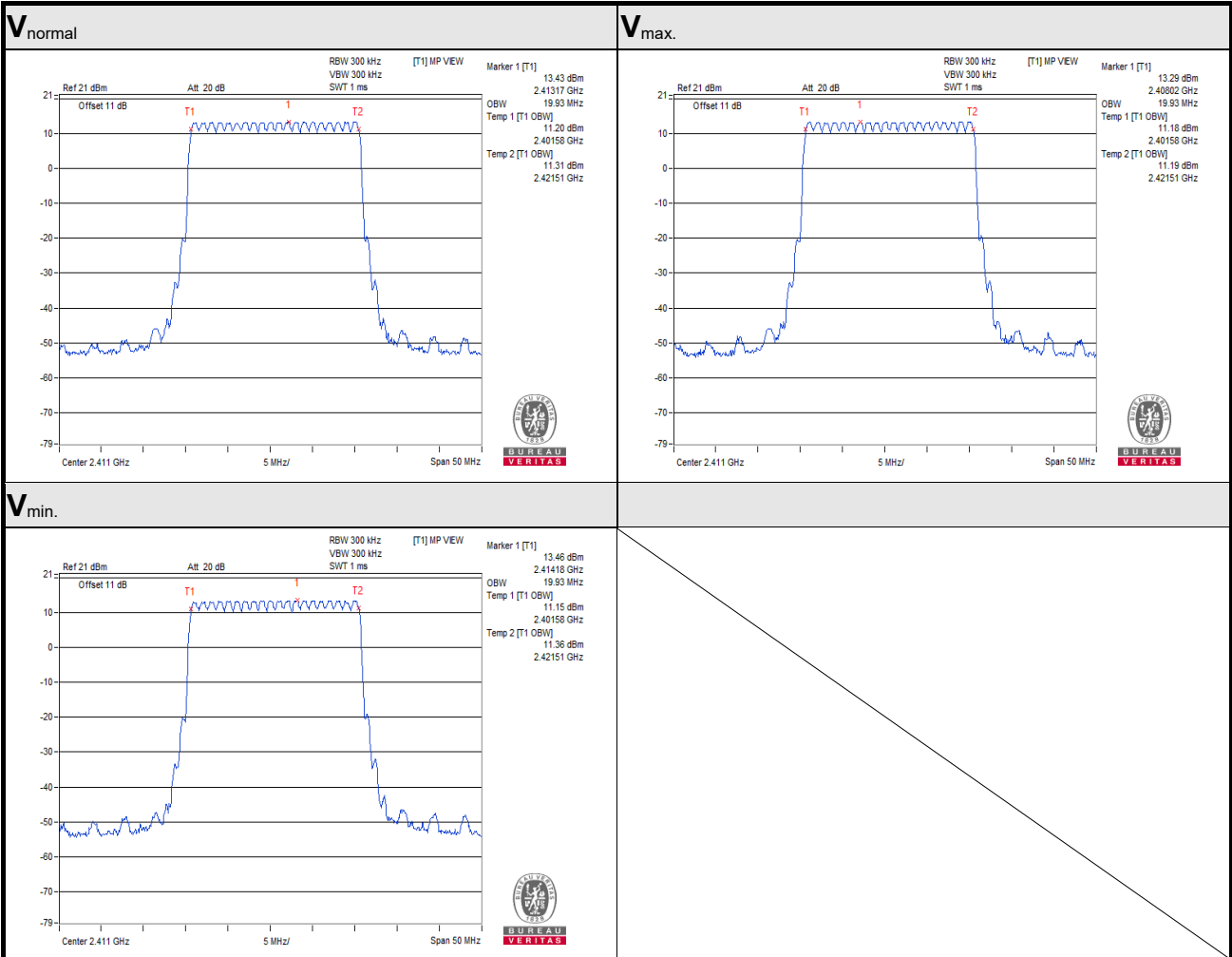
**Modulation: 8DPSK**  
**Normal Mode:**

$V_{normal}$	$V_{max.}$	$V_{min.}$
Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
78.40	78.60	78.40



**AFH Mode:**

$V_{normal}$	$V_{max.}$	$V_{min.}$
Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
19.93	19.93	19.93

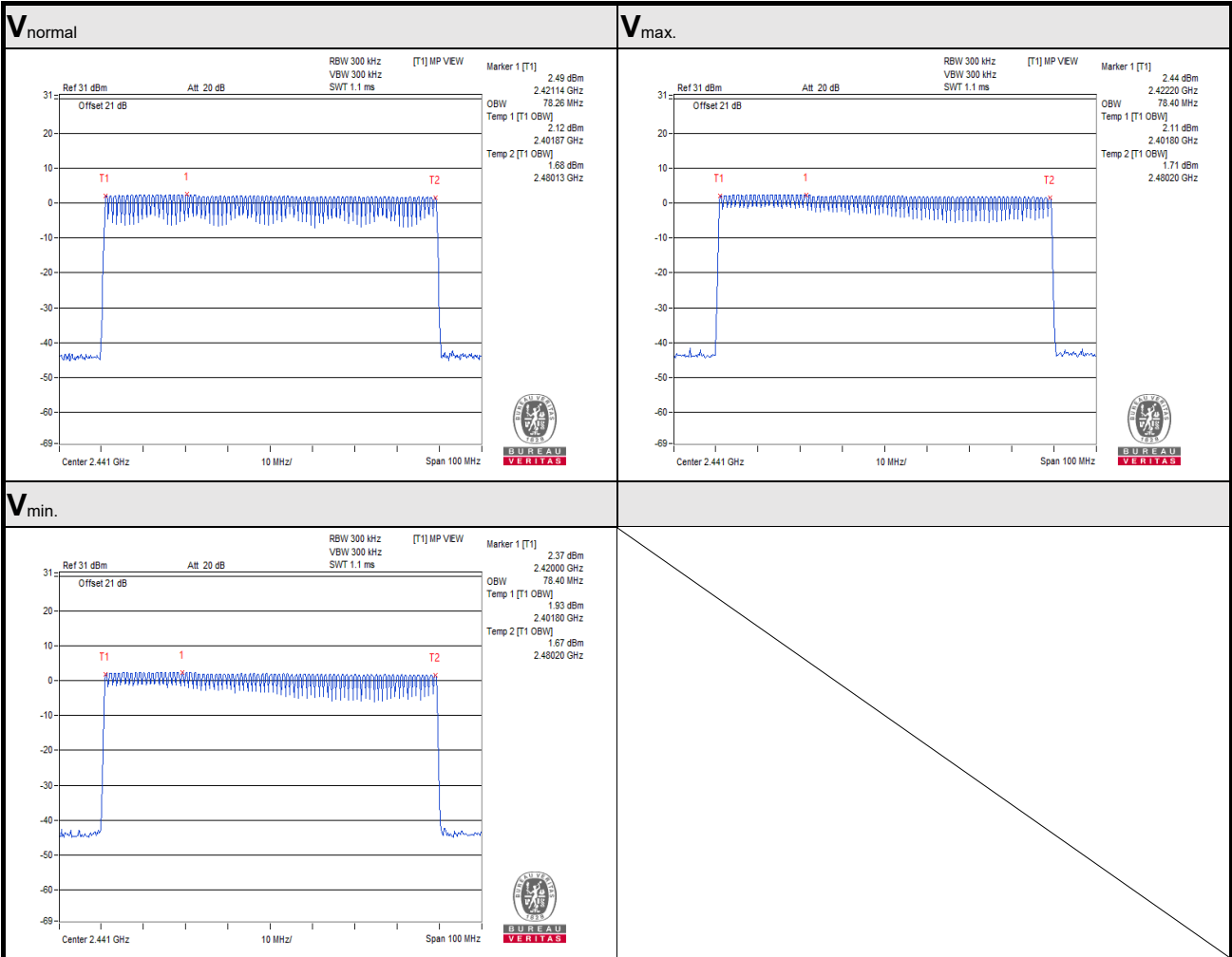


### 4.2.4 Test Results (Mode 2)

Modulation: GFSK

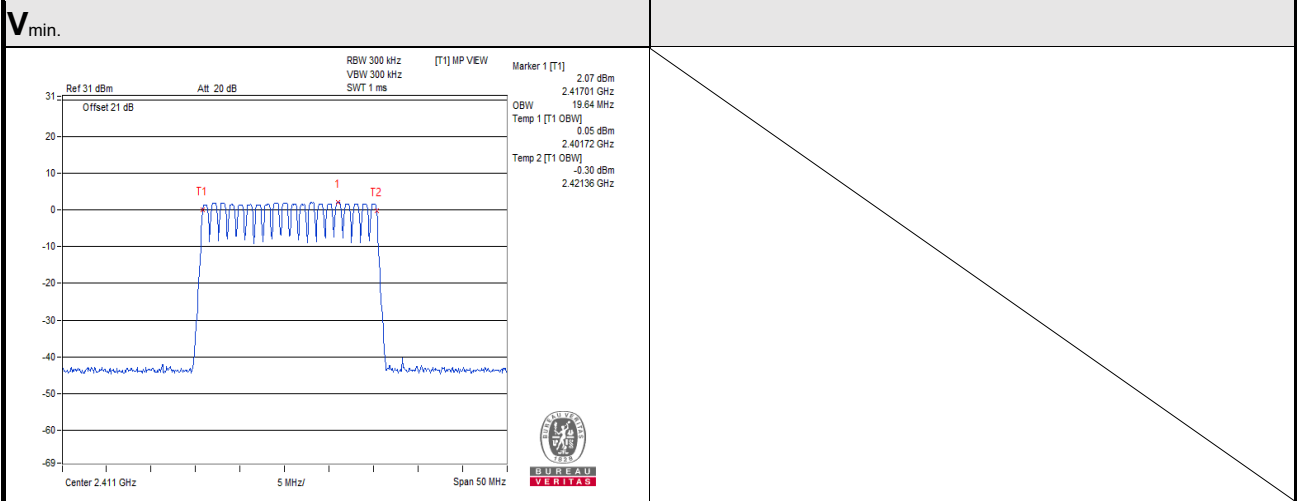
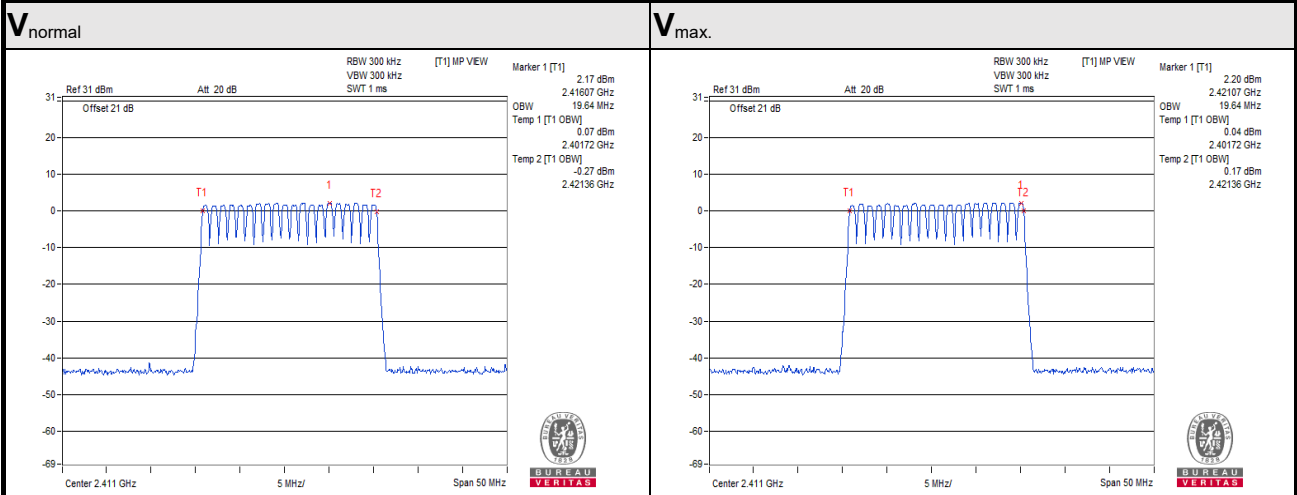
Normal Mode:

$V_{normal}$	$V_{max.}$	$V_{min.}$
Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
78.26	78.40	78.40



**AFH Mode:**

$V_{normal}$	$V_{max.}$	$V_{min.}$
Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
19.64	19.64	19.64

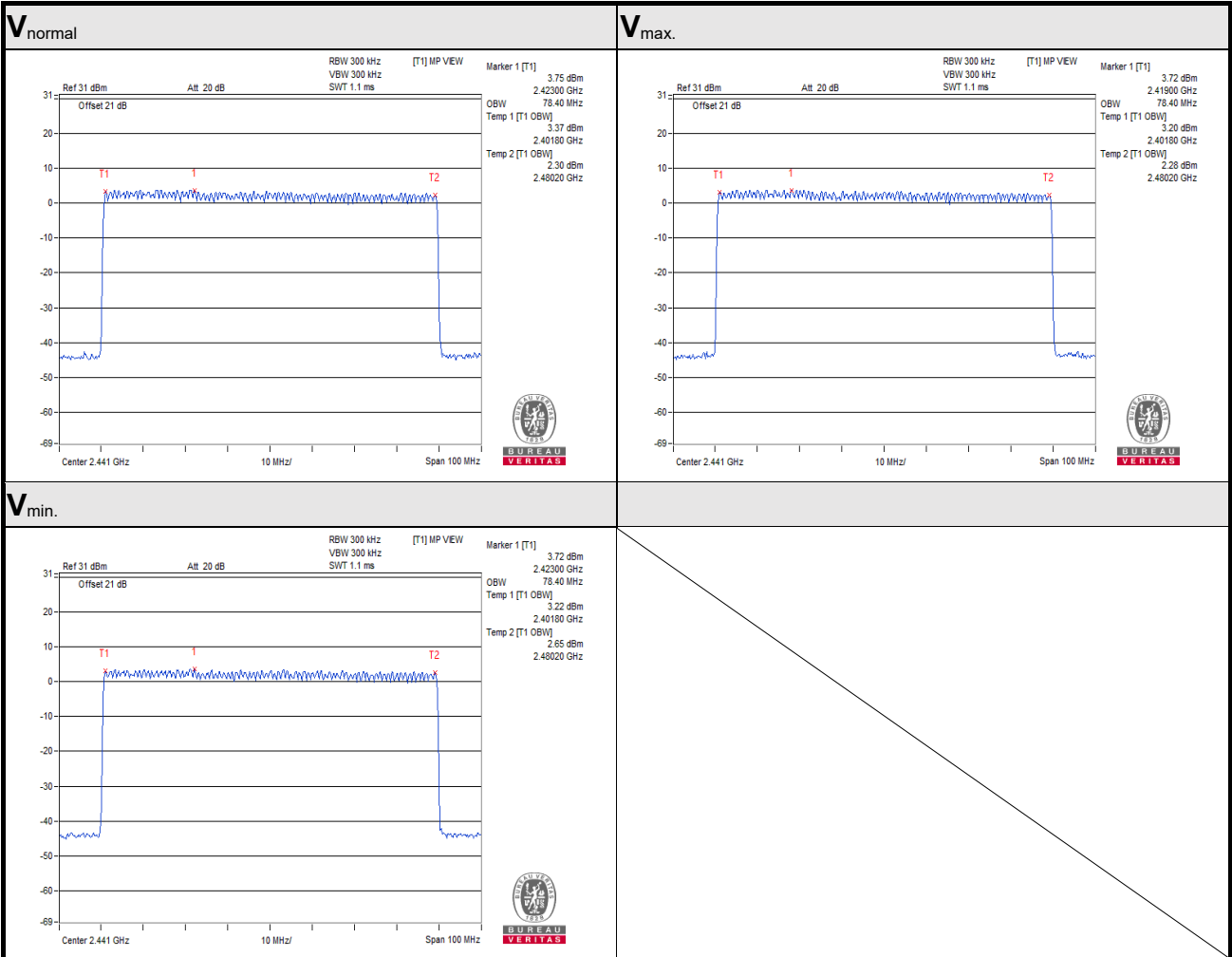




Modulation:  $\pi/4$ -DQPSK

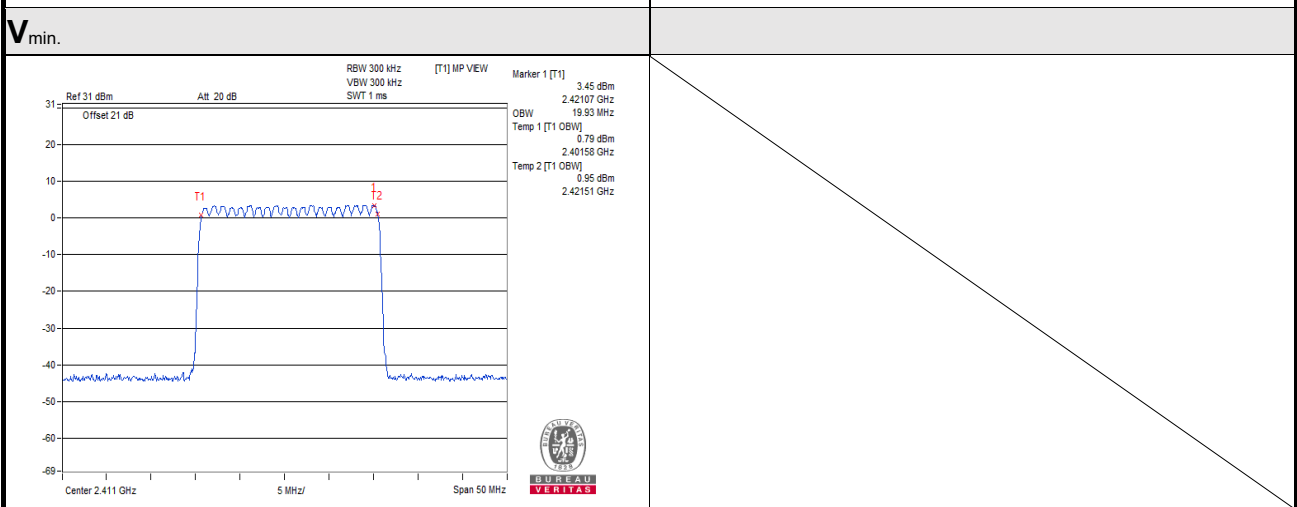
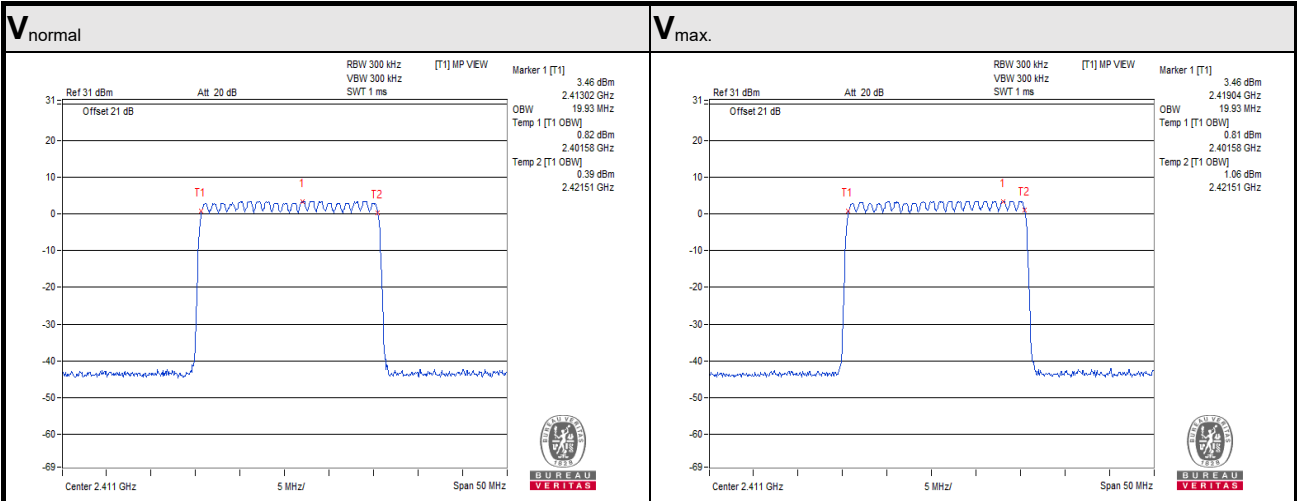
Normal Mode:

$V_{normal}$	$V_{max.}$	$V_{min.}$
Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
78.40	78.40	78.40



**AFH Mode:**

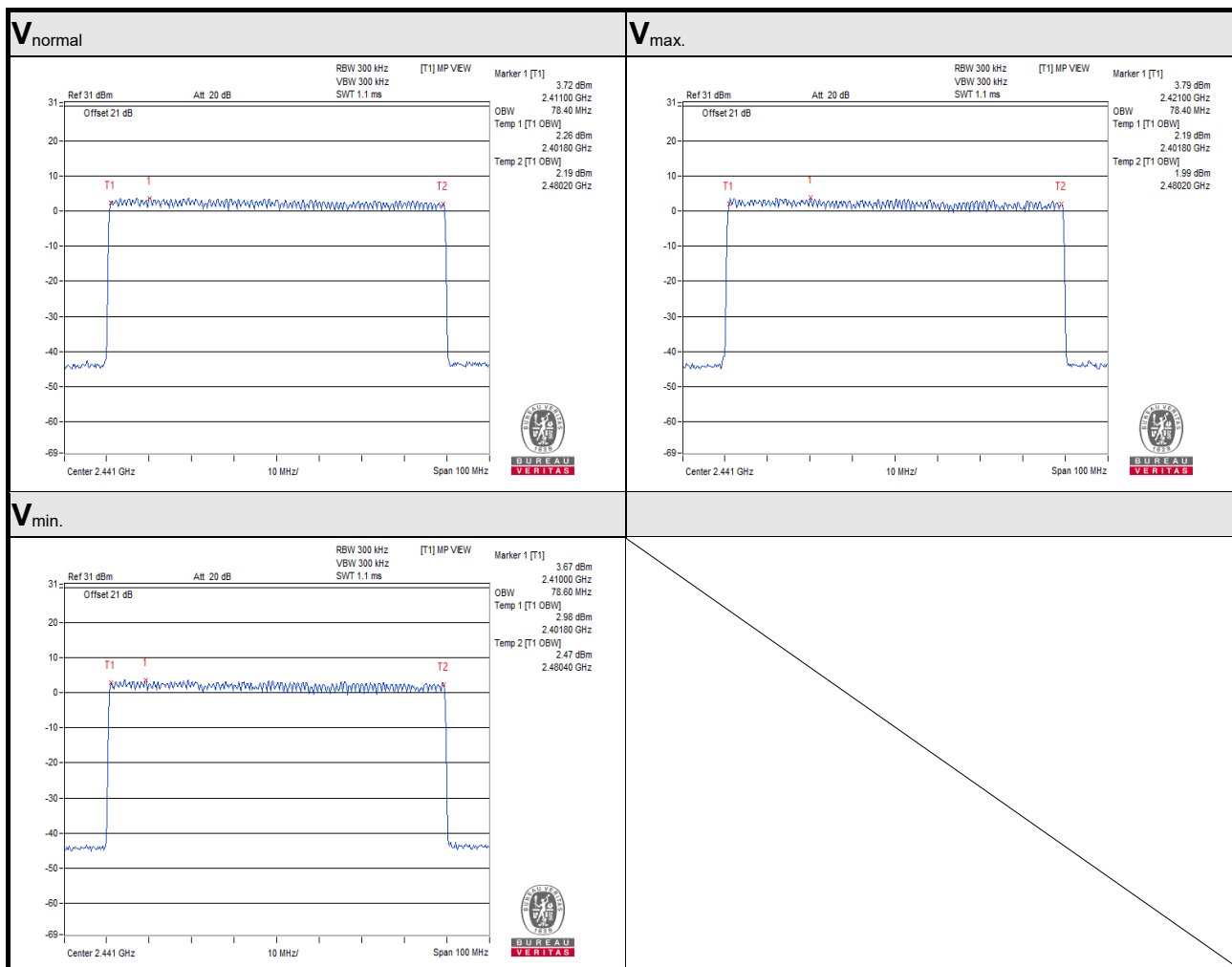
$V_{normal}$	$V_{max.}$	$V_{min.}$
Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
19.93	19.93	19.93



**Modulation: 8DPSK**

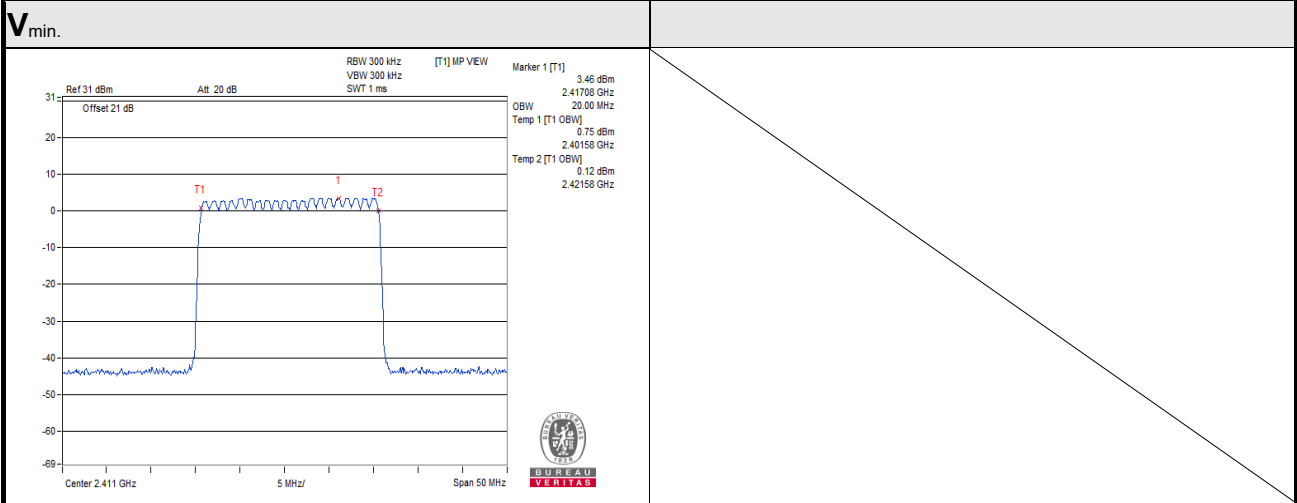
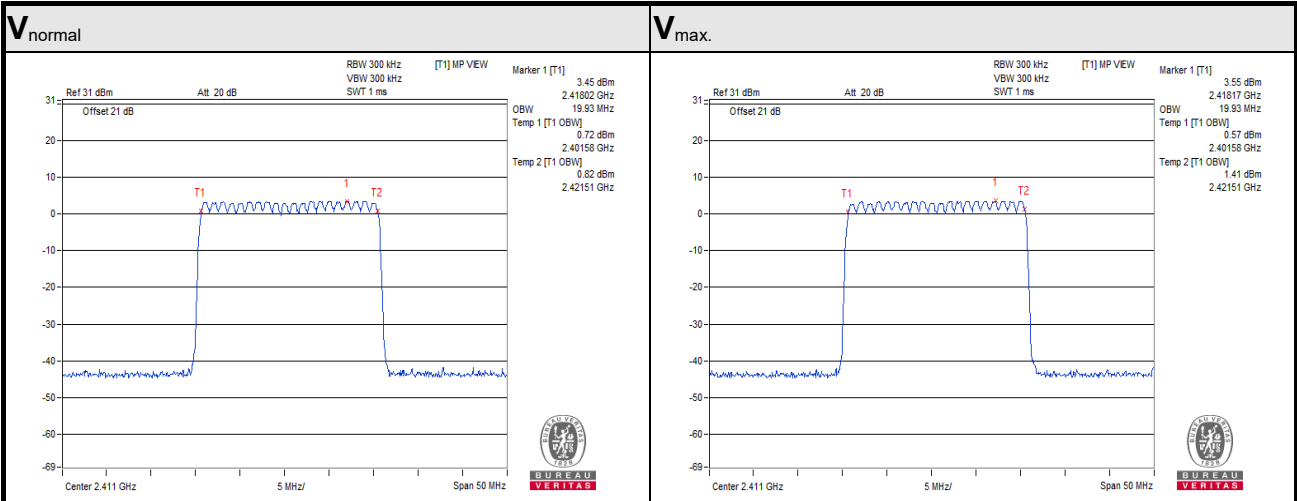
**Normal Mode:**

$V_{normal}$	$V_{max.}$	$V_{min.}$
Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
78.40	78.40	78.60



**AFH Mode:**

$V_{normal}$	$V_{max.}$	$V_{min.}$
Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
19.93	19.93	20.00



### 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 (Mode 1)

**Modulation: GFSK**

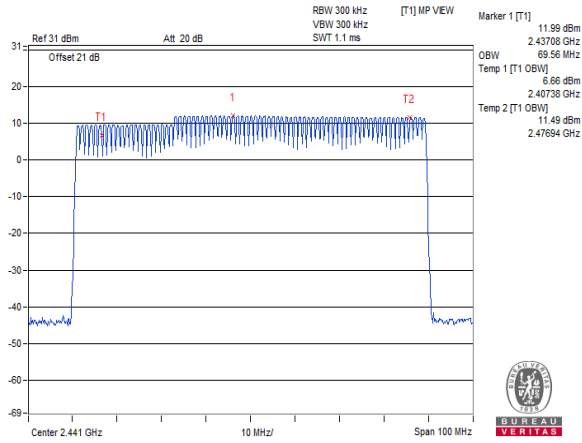
**Normal Mode:**

$V_{\text{normal}}$		$V_{\text{max.}}$		$V_{\text{min.}}$	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
69.56	69.56	69.60	69.60	69.80	69.80

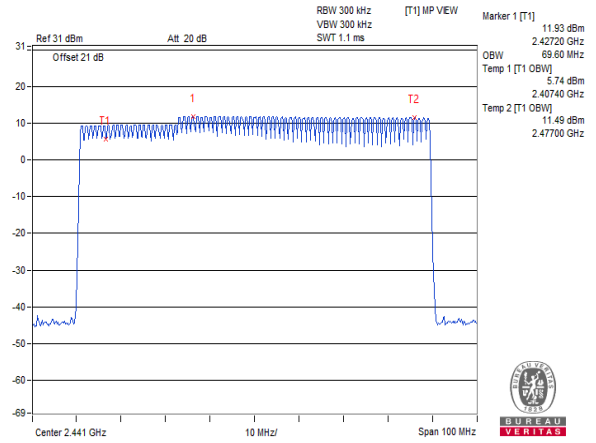
**NOTE:** For the test plots please refer to the below pages.

Spreading Factor: 90% channel power bandwidth / 1

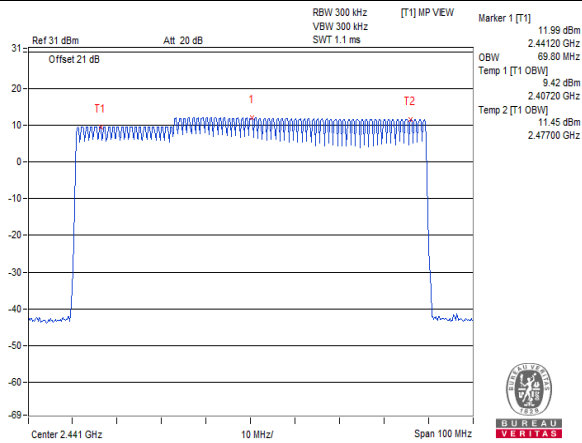
### V<sub>normal</sub>



### V<sub>max.</sub>



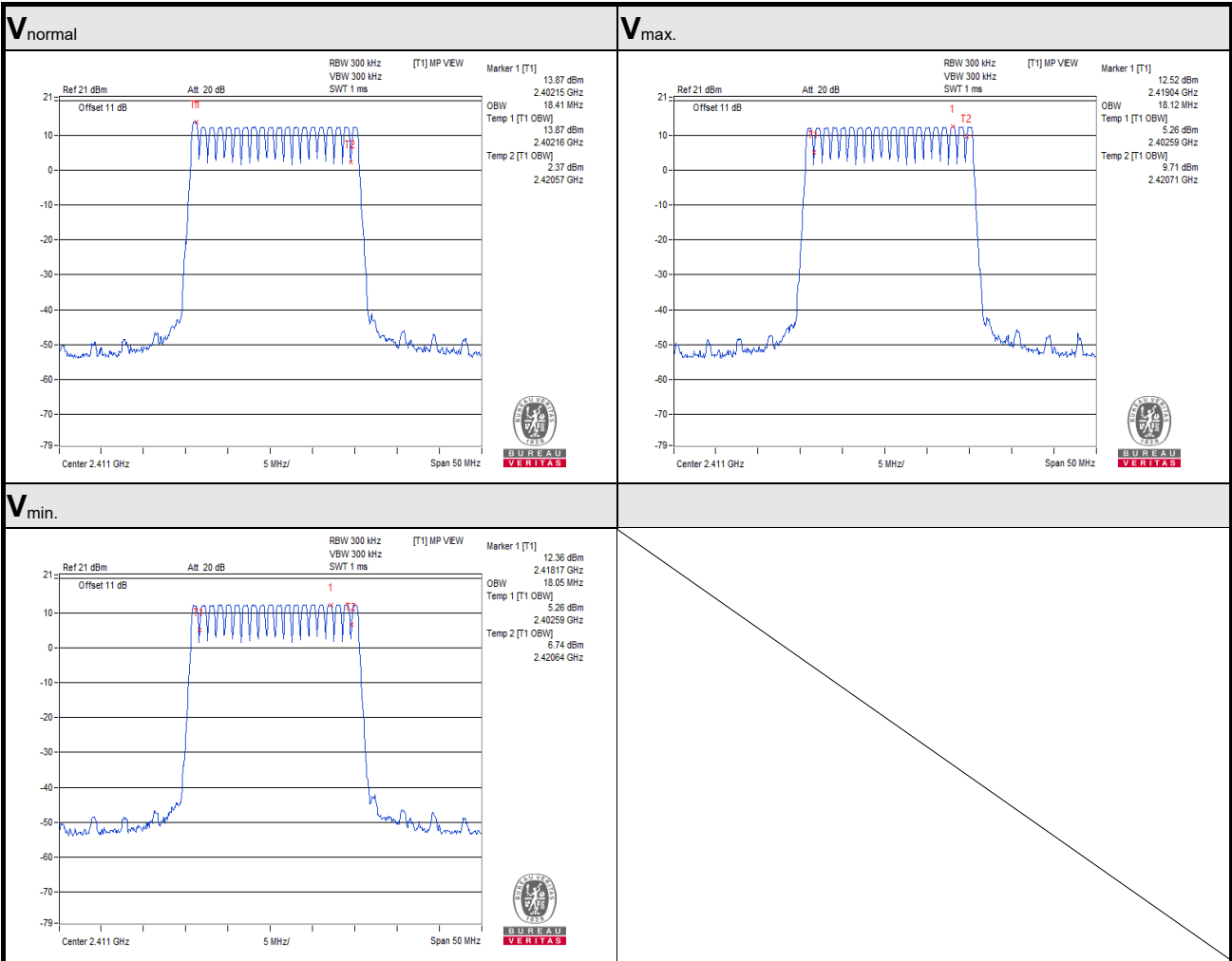
### V<sub>min.</sub>



**AFH Mode:**

<b>V<sub>normal</sub></b>		<b>V<sub>max.</sub></b>		<b>V<sub>min.</sub></b>	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
18.41	18.41	18.12	18.12	18.05	18.05

**NOTE:** Spreading Factor: 90% channel power bandwidth / 1

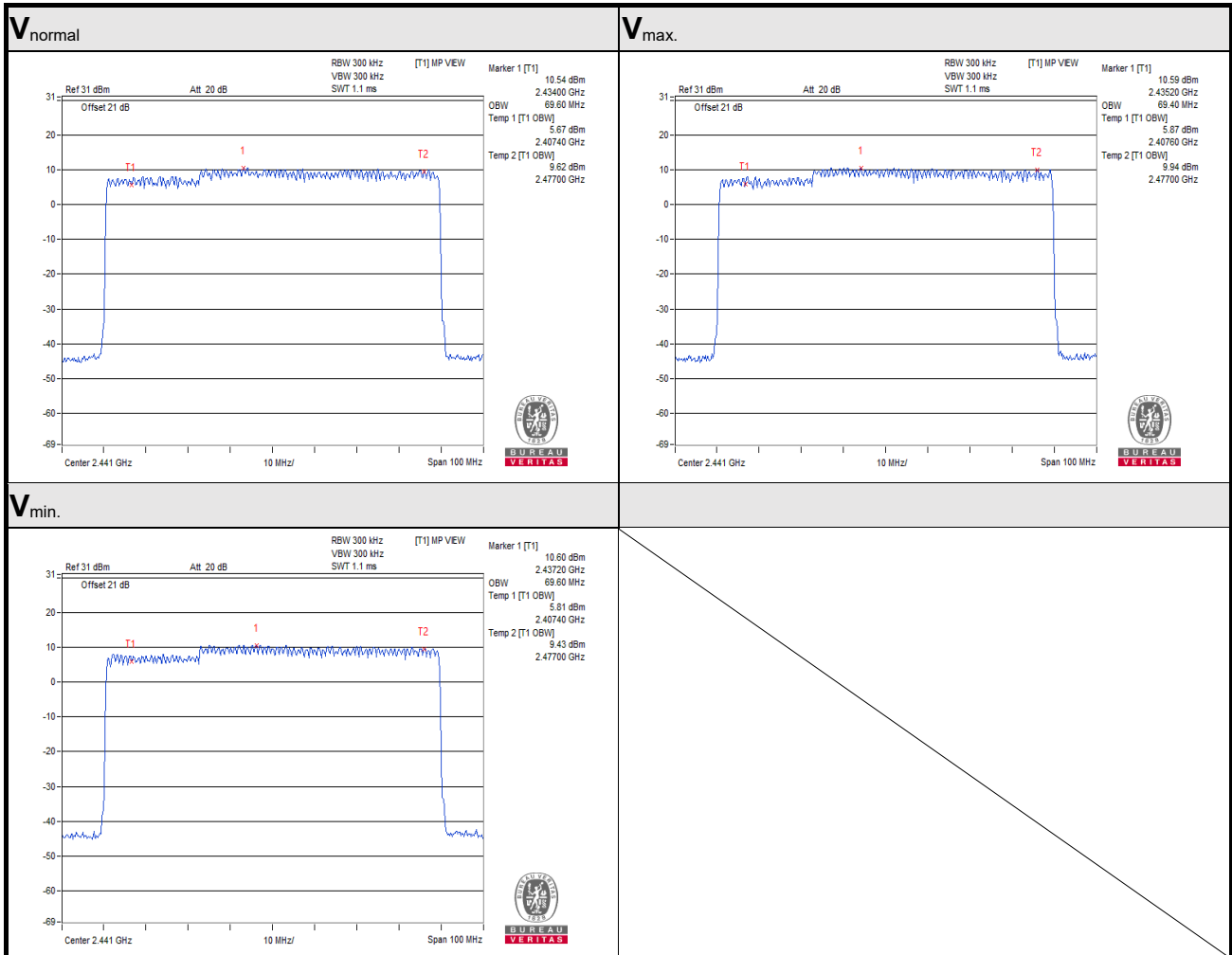


**Modulation:  $\pi/4$ -DQPSK**

**Normal Mode:**

<b>V<sub>normal</sub></b>		<b>V<sub>max.</sub></b>		<b>V<sub>min.</sub></b>	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
69.60	69.60	69.40	69.40	69.60	69.60

**NOTE:** Spreading Factor: 90% channel power bandwidth / 1

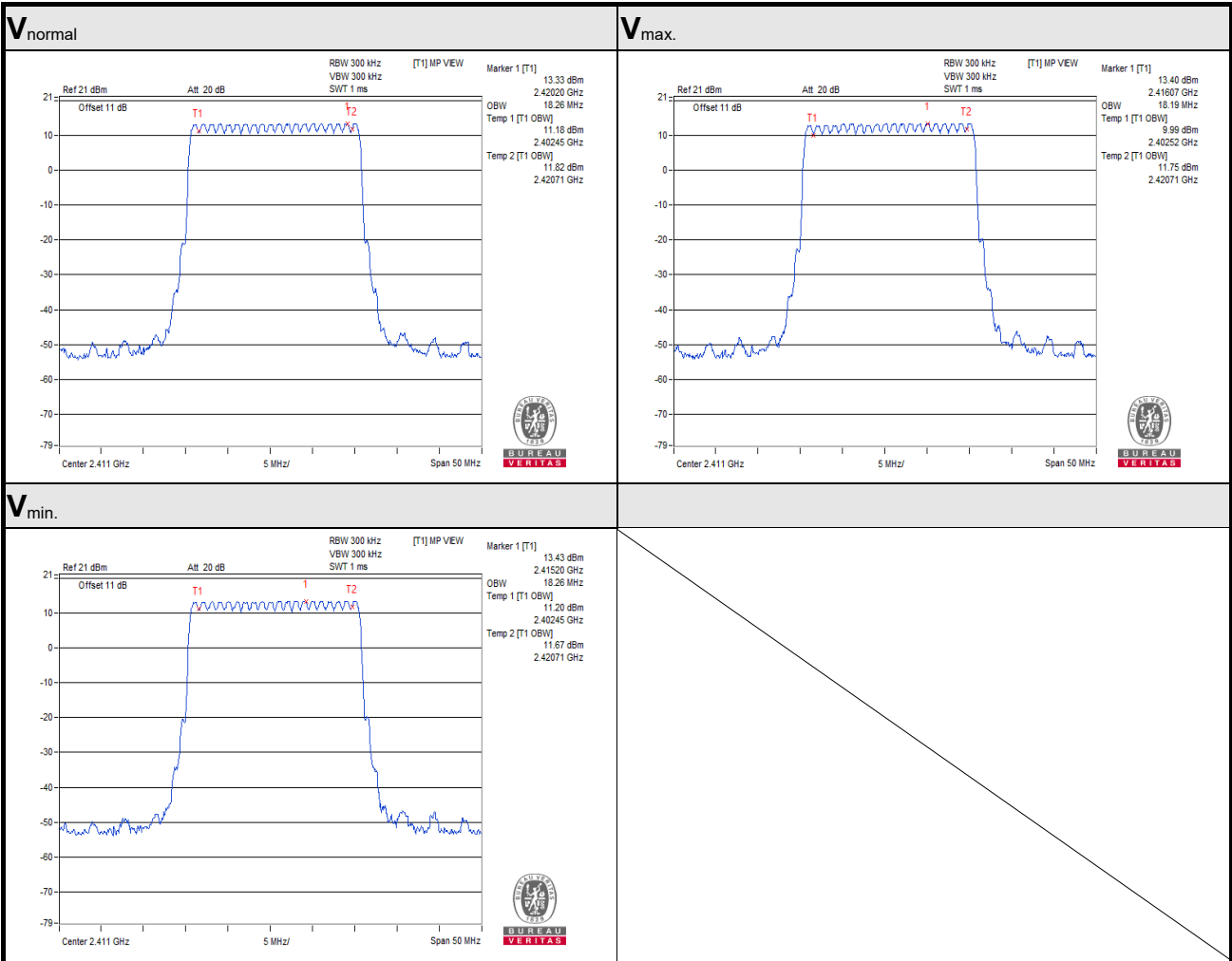




**AFH Mode:**

<b>V<sub>normal</sub></b>		<b>V<sub>max.</sub></b>		<b>V<sub>min.</sub></b>	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
18.26	18.26	18.19	18.19	18.26	18.26

**NOTE:** Spreading Factor: 90% channel power bandwidth / 1

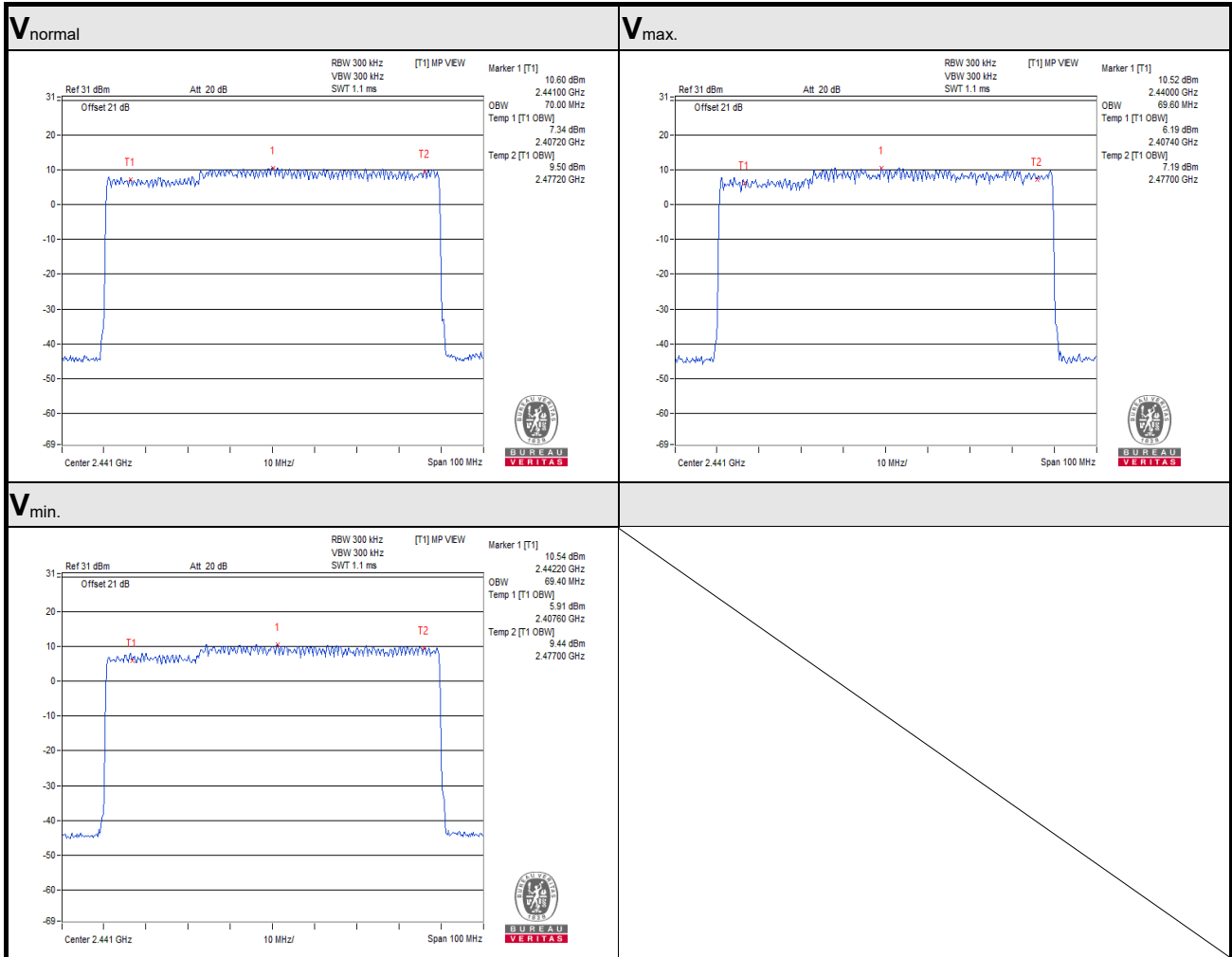


**Modulation: 8DPSK**

**Normal Mode:**

<b>V<sub>normal</sub></b>		<b>V<sub>max.</sub></b>		<b>V<sub>min.</sub></b>	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
70.00	70.00	69.60	69.60	69.40	69.40

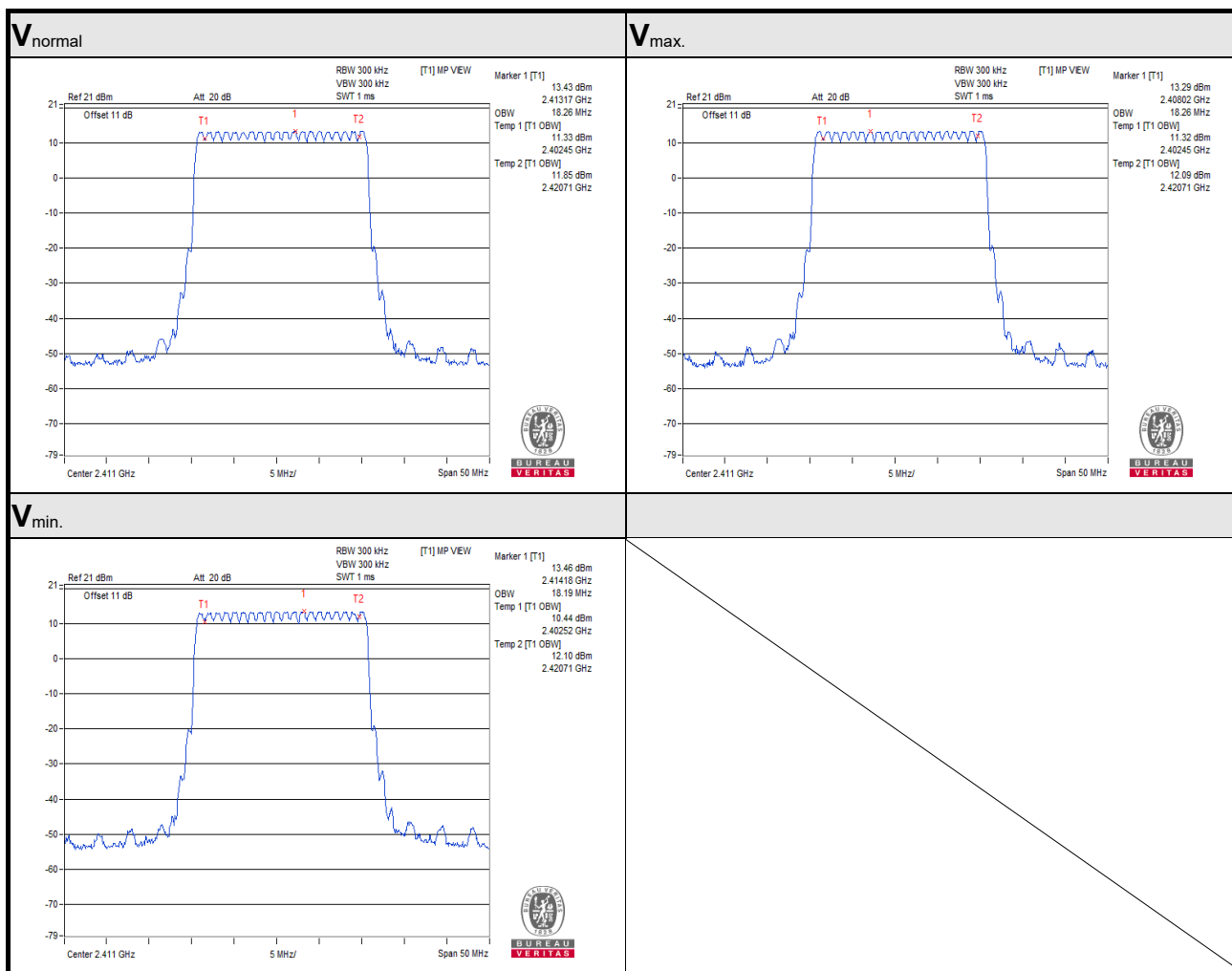
**NOTE:** Spreading Factor: 90% channel power bandwidth / 1



**AFH Mode:**

<b>V<sub>normal</sub></b>		<b>V<sub>max.</sub></b>		<b>V<sub>min.</sub></b>	
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:** Spreading Factor: 90% channel power bandwidth / 1



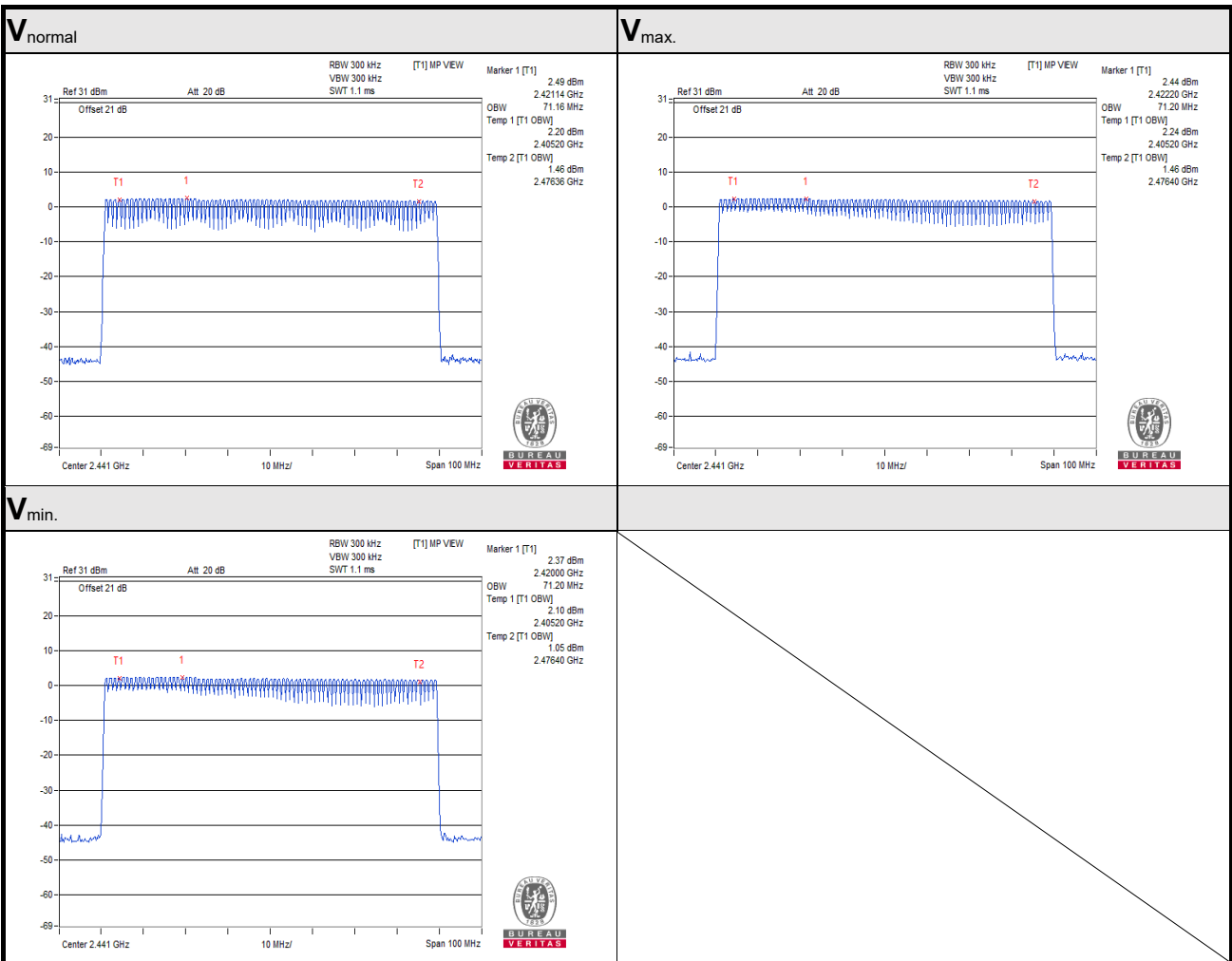
### 4.3.4 Test Results (Mode 2)

Modulation: GFSK

Normal Mode:

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
71.16	71.16	71.20	71.20	71.20	71.20

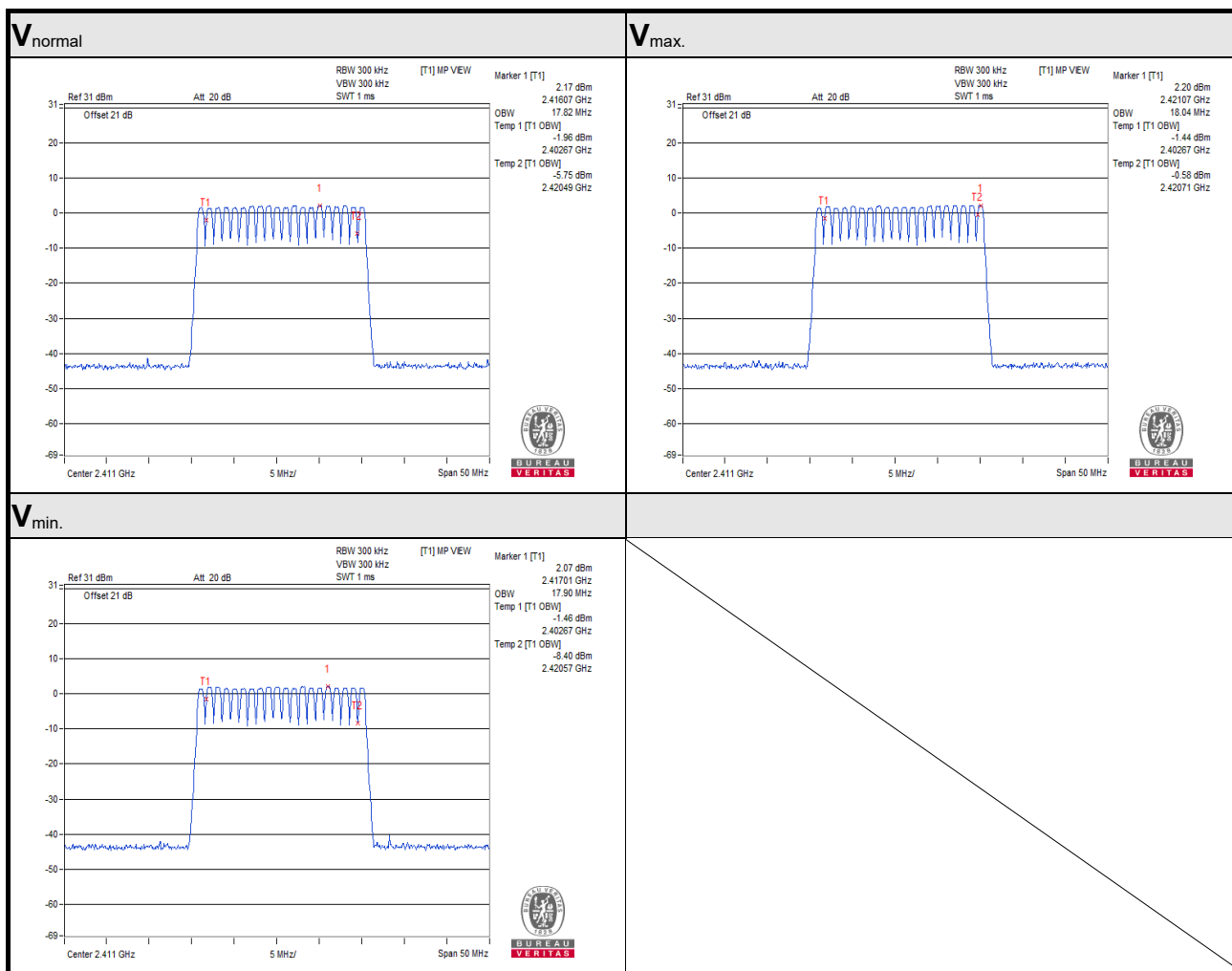
**NOTE:** Spreading Factor: 90% channel power bandwidth / 1



**AFH Mode:**

<b>V<sub>normal</sub></b>		<b>V<sub>max.</sub></b>		<b>V<sub>min.</sub></b>	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
17.82	17.82	18.04	18.04	17.90	17.90

**NOTE:** Spreading Factor: 90% channel power bandwidth / 1

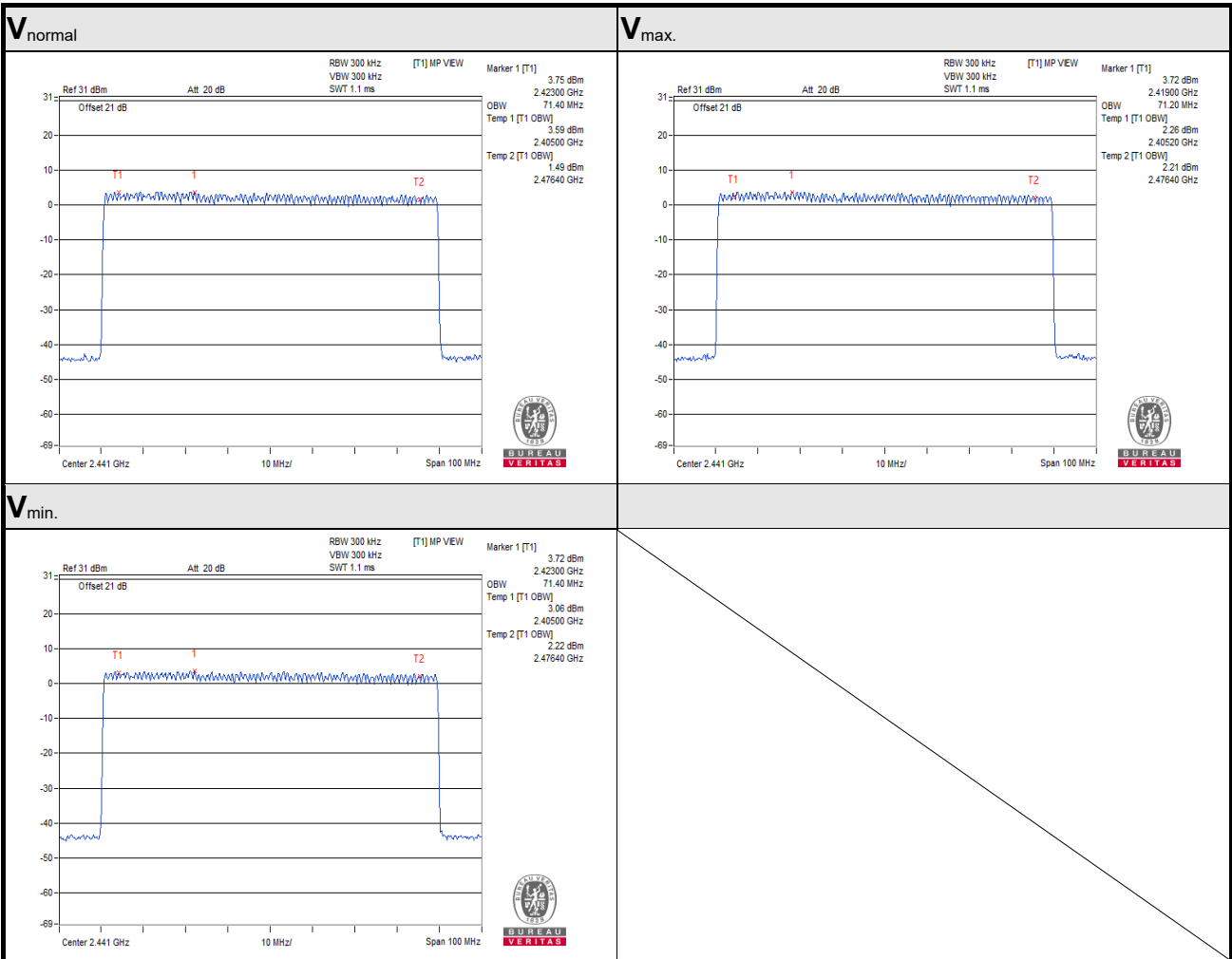


**Modulation:  $\pi/4$ -DQPSK**

**Normal Mode:**

<b>V<sub>normal</sub></b>		<b>V<sub>max.</sub></b>		<b>V<sub>min.</sub></b>	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
71.40	71.40	71.20	71.20	71.40	71.40

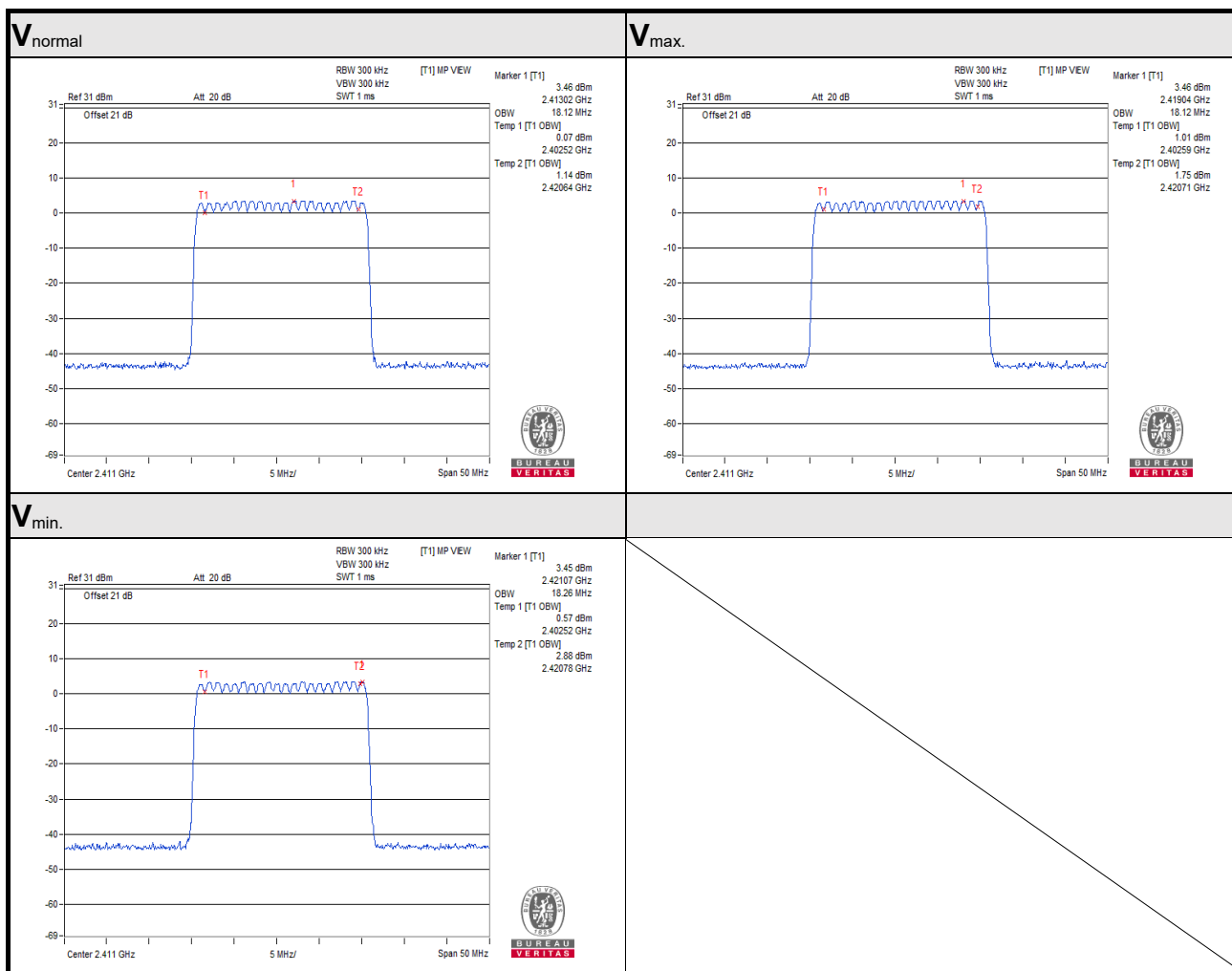
**NOTE:** Spreading Factor: 90% channel power bandwidth / 1



**AFH Mode:**

<b>V<sub>normal</sub></b>		<b>V<sub>max.</sub></b>		<b>V<sub>min.</sub></b>	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
18.12	18.12	18.12	18.12	18.26	18.26

**NOTE:** Spreading Factor: 90% channel power bandwidth / 1

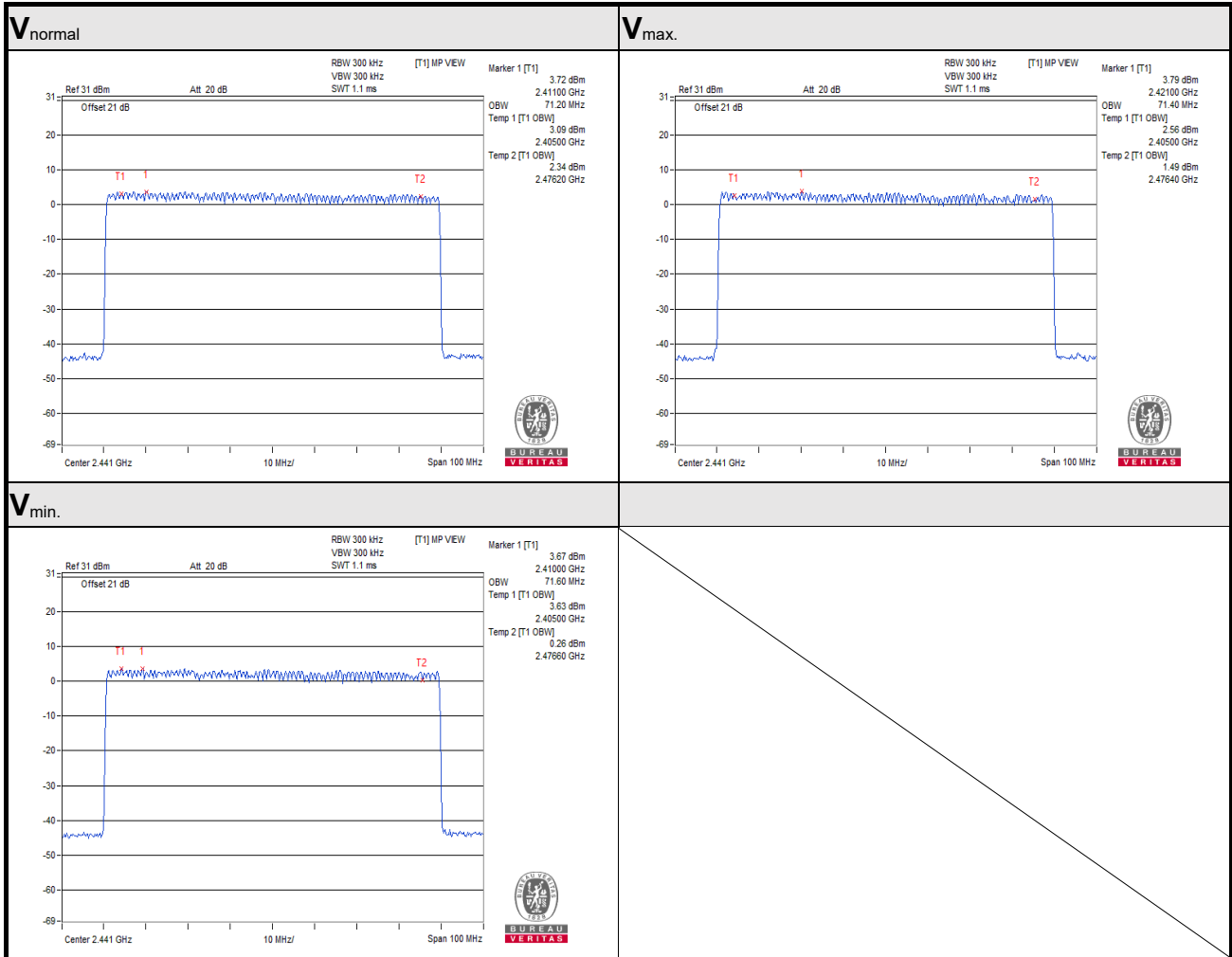


**Modulation: 8DPSK**

**Normal Mode:**

<b>V<sub>normal</sub></b>		<b>V<sub>max.</sub></b>		<b>V<sub>min.</sub></b>	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
71.20	71.20	71.40	71.40	71.60	71.60

**NOTE:** Spreading Factor: 90% channel power bandwidth / 1

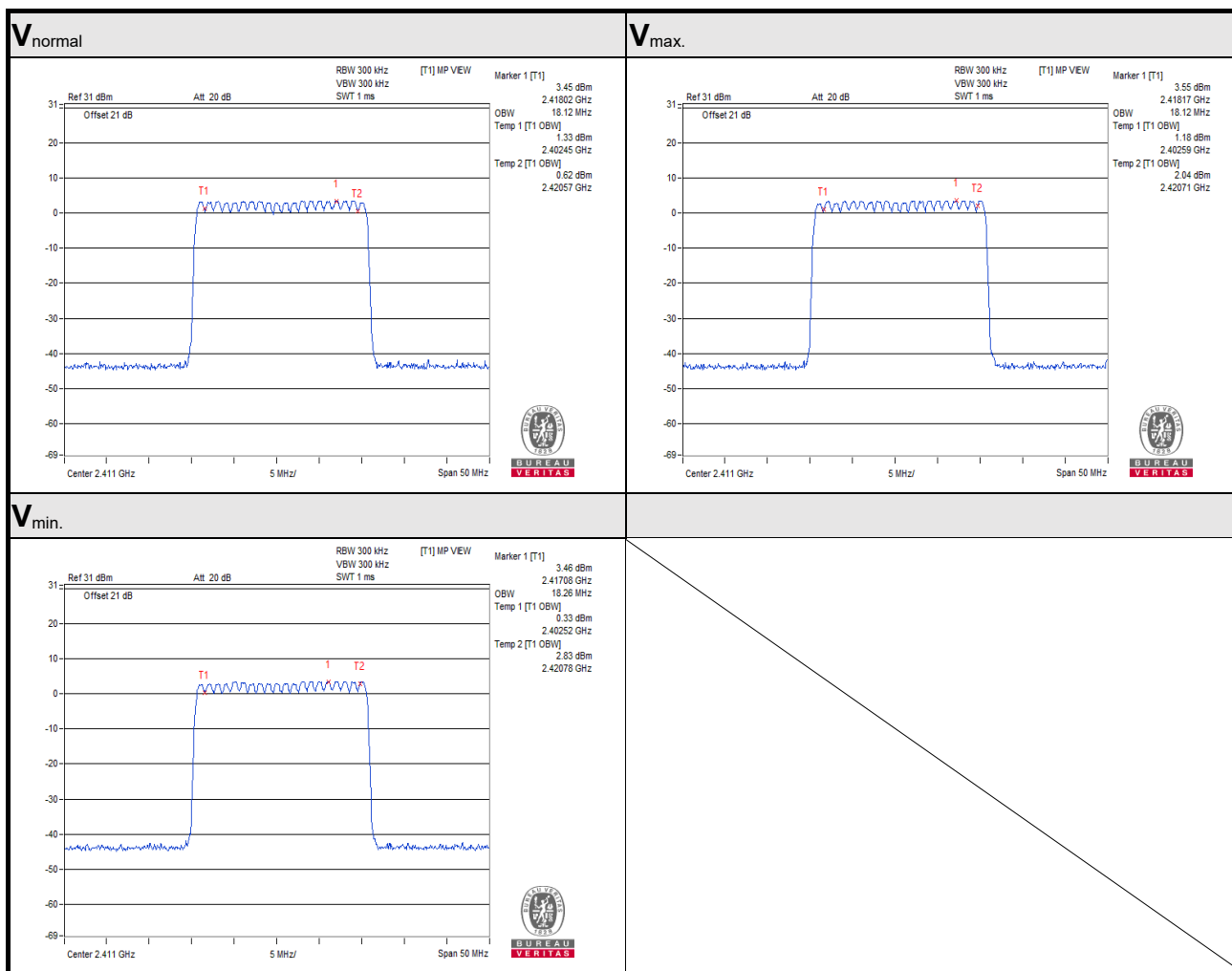




**AFH Mode:**

<b>V<sub>normal</sub></b>		<b>V<sub>max.</sub></b>		<b>V<sub>min.</sub></b>	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
18.12	18.12	18.12	18.12	18.26	18.26

**NOTE:** 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



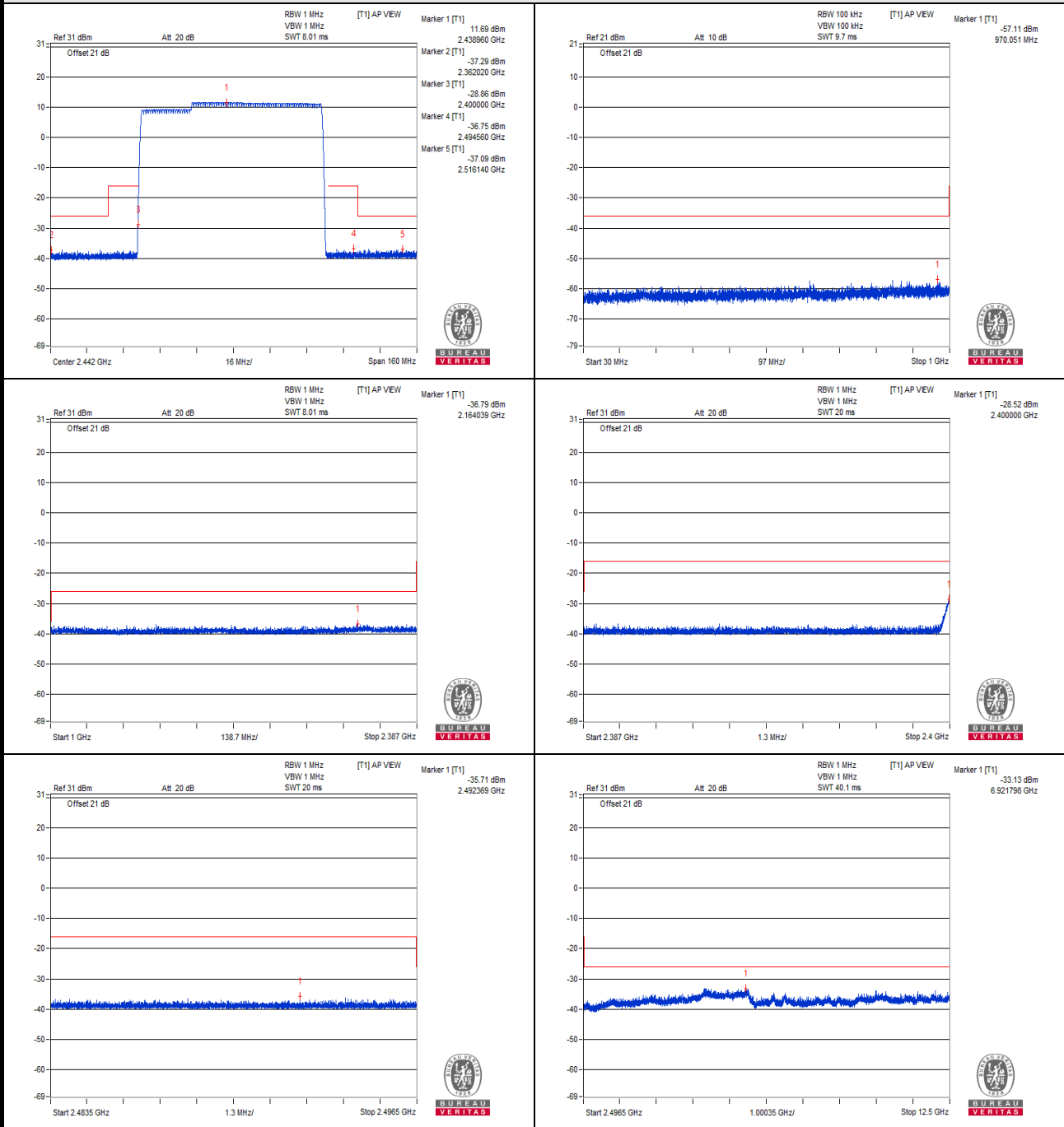
#### 4.4.3 Test Results (Mode 1)

Modulation: GFSK

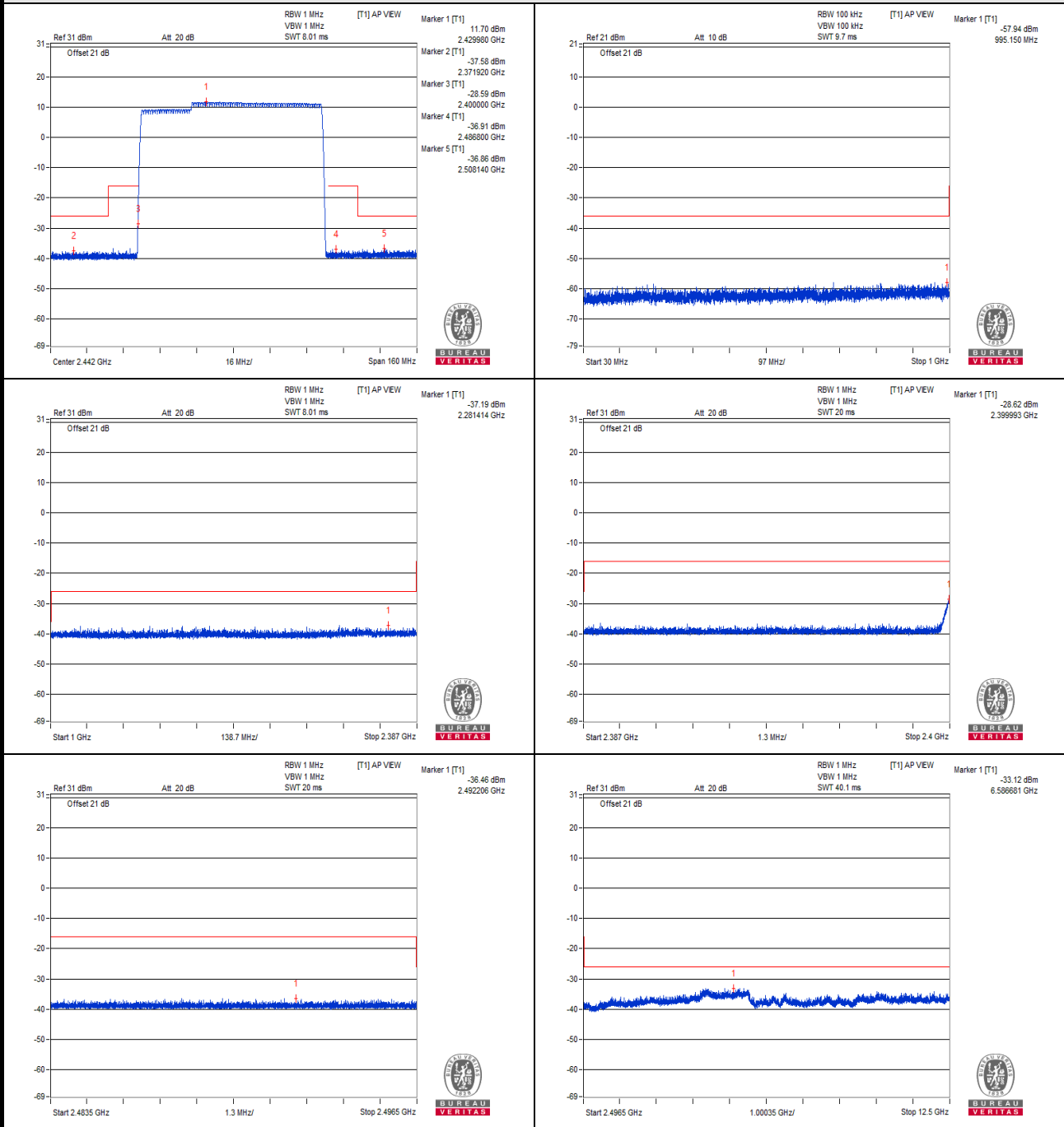
Test Channel		Hopping Mode			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE( $\mu$ W)	LIMIT ( $\mu$ W)	RESULT
<b>V<sub>normal</sub></b>	30MHz to 1000MHz	970.051	0.001945	0.25	PASS
	1000MHz to 2387MHz	2164.039	0.209411	2.5	PASS
	2387MHz to 2400MHz	2400.000	1.406048	25	PASS
	2483.5MHz to 2496.5MHz	2492.369	0.268534	25	PASS
	2496.5MHz to 12500MHz	6921.798	0.486407	2.5	PASS
<b>V<sub>max.</sub></b>	30MHz to 1000MHz	995.150	0.001607	0.25	PASS
	1000MHz to 2387MHz	2281.414	0.190985	2.5	PASS
	2387MHz to 2400MHz	2399.993	1.374042	25	PASS
	2483.5MHz to 2496.5MHz	2492.206	0.225944	25	PASS
	2496.5MHz to 12500MHz	6586.681	0.487528	2.5	PASS
<b>V<sub>min.</sub></b>	30MHz to 1000MHz	614.910	0.002178	0.25	PASS
	1000MHz to 2387MHz	1969.166	0.190108	2.5	PASS
	2387MHz to 2400MHz	2399.998	1.399587	25	PASS
	2483.5MHz to 2496.5MHz	2484.125	0.236048	25	PASS
	2496.5MHz to 12500MHz	5773.896	0.500035	2.5	PASS

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

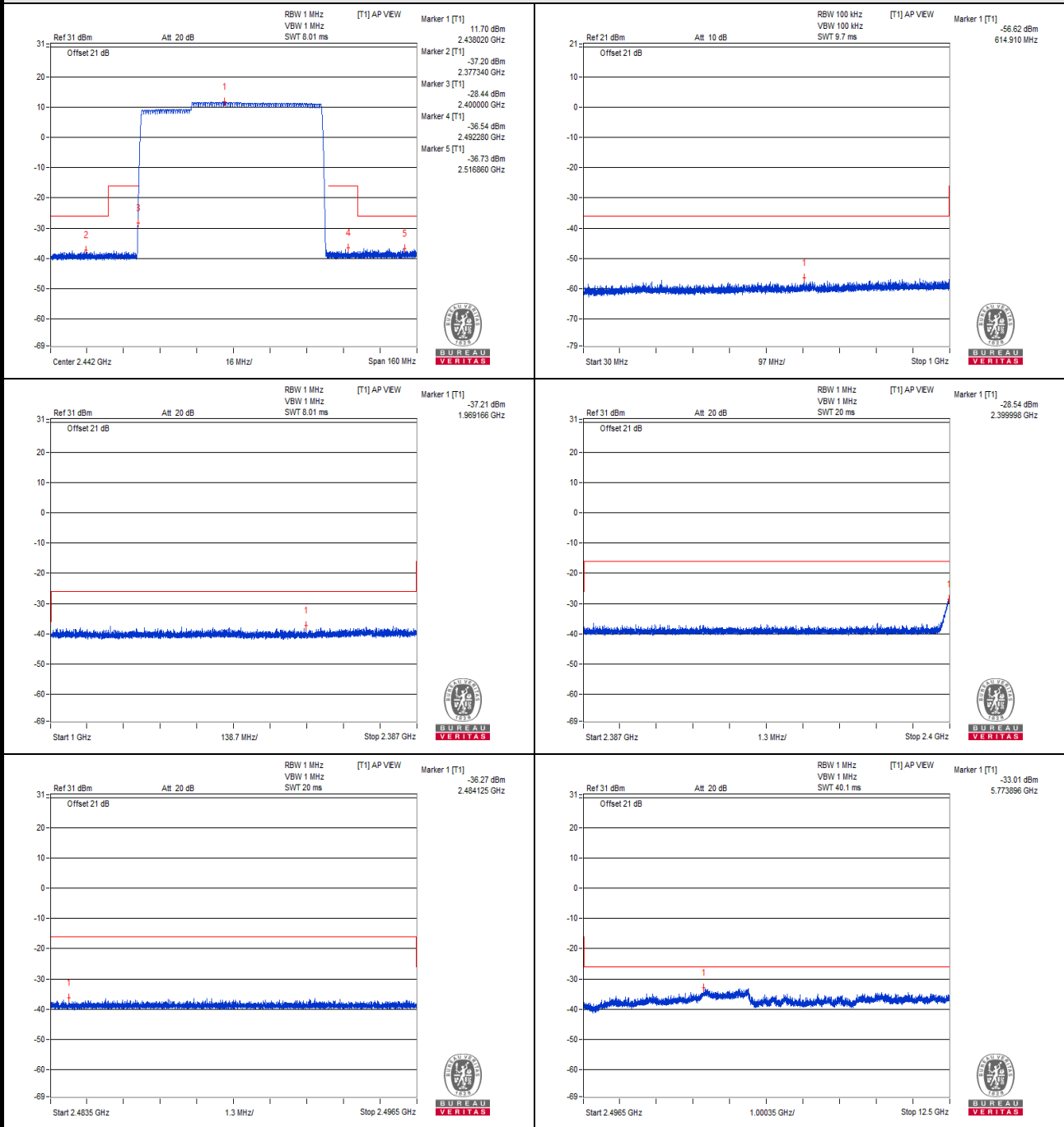
# Vnormal



# V<sub>max</sub>



V min.

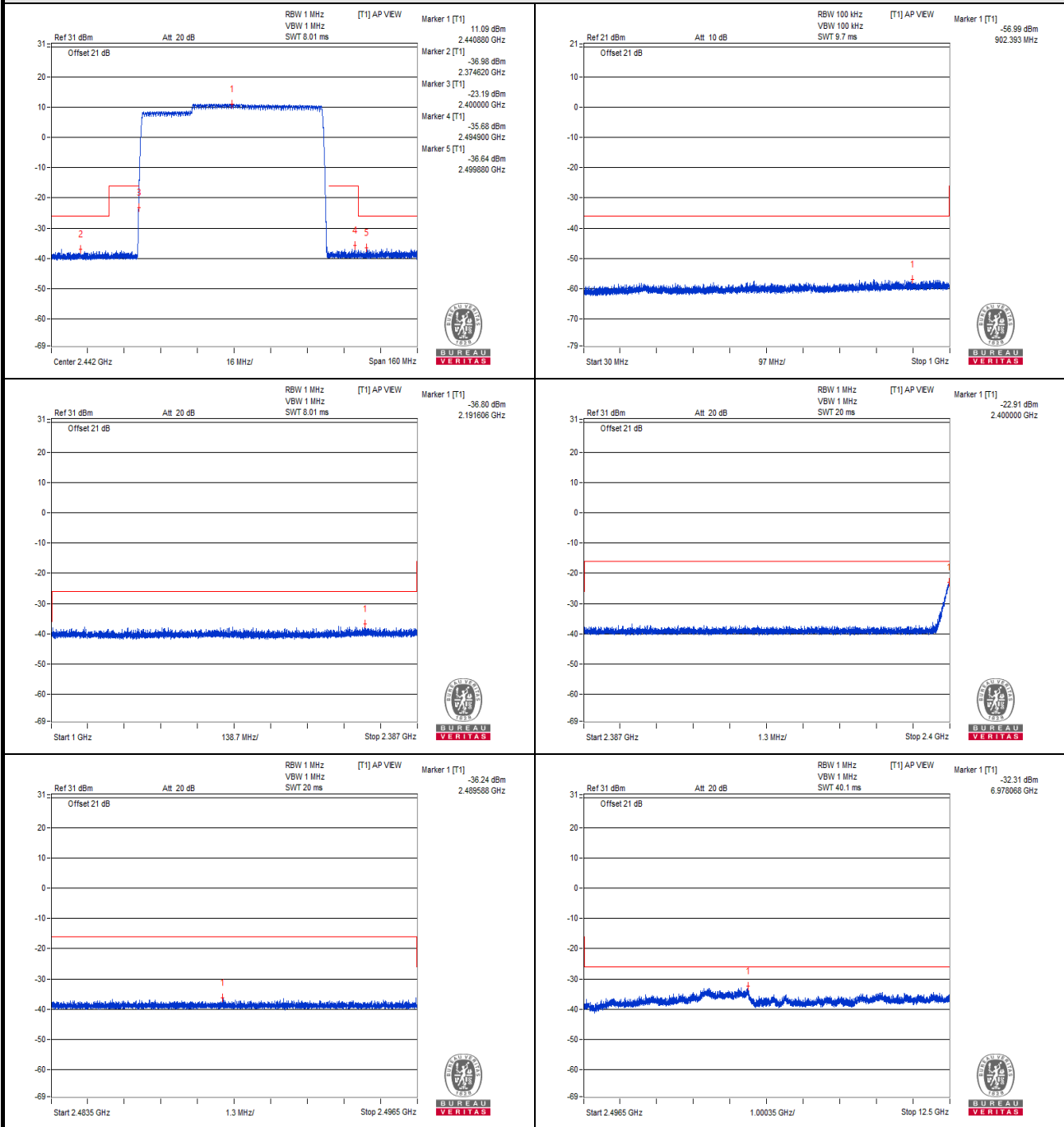


Modulation:  $\pi/4$ -DQPSK

Test Channel		Hopping Mode			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE( $\mu$ W)	LIMIT ( $\mu$ W)	RESULT
<b>V<sub>normal</sub></b>	30MHz to 1000MHz	902.393	0.002000	0.25	PASS
	1000MHz to 2387MHz	2191.606	0.208930	2.5	PASS
	2387MHz to 2400MHz	2400.000	5.116818	25	PASS
	2483.5MHz to 2496.5MHz	2489.588	0.237684	25	PASS
	2496.5MHz to 12500MHz	6978.068	0.587489	2.5	PASS
<b>V<sub>max.</sub></b>	30MHz to 1000MHz	765.260	0.002339	0.25	PASS
	1000MHz to 2387MHz	2145.141	0.198153	2.5	PASS
	2387MHz to 2400MHz	2400.000	5.248075	25	PASS
	2483.5MHz to 2496.5MHz	2495.317	0.233884	25	PASS
	2496.5MHz to 12500MHz	5885.185	0.526017	2.5	PASS
<b>V<sub>min.</sub></b>	30MHz to 1000MHz	861.896	0.002028	0.25	PASS
	1000MHz to 2387MHz	2151.210	0.186638	2.5	PASS
	2387MHz to 2400MHz	2399.996	5.395106	25	PASS
	2483.5MHz to 2496.5MHz	2488.578	0.228560	25	PASS
	2496.5MHz to 12500MHz	6717.977	0.522396	2.5	PASS

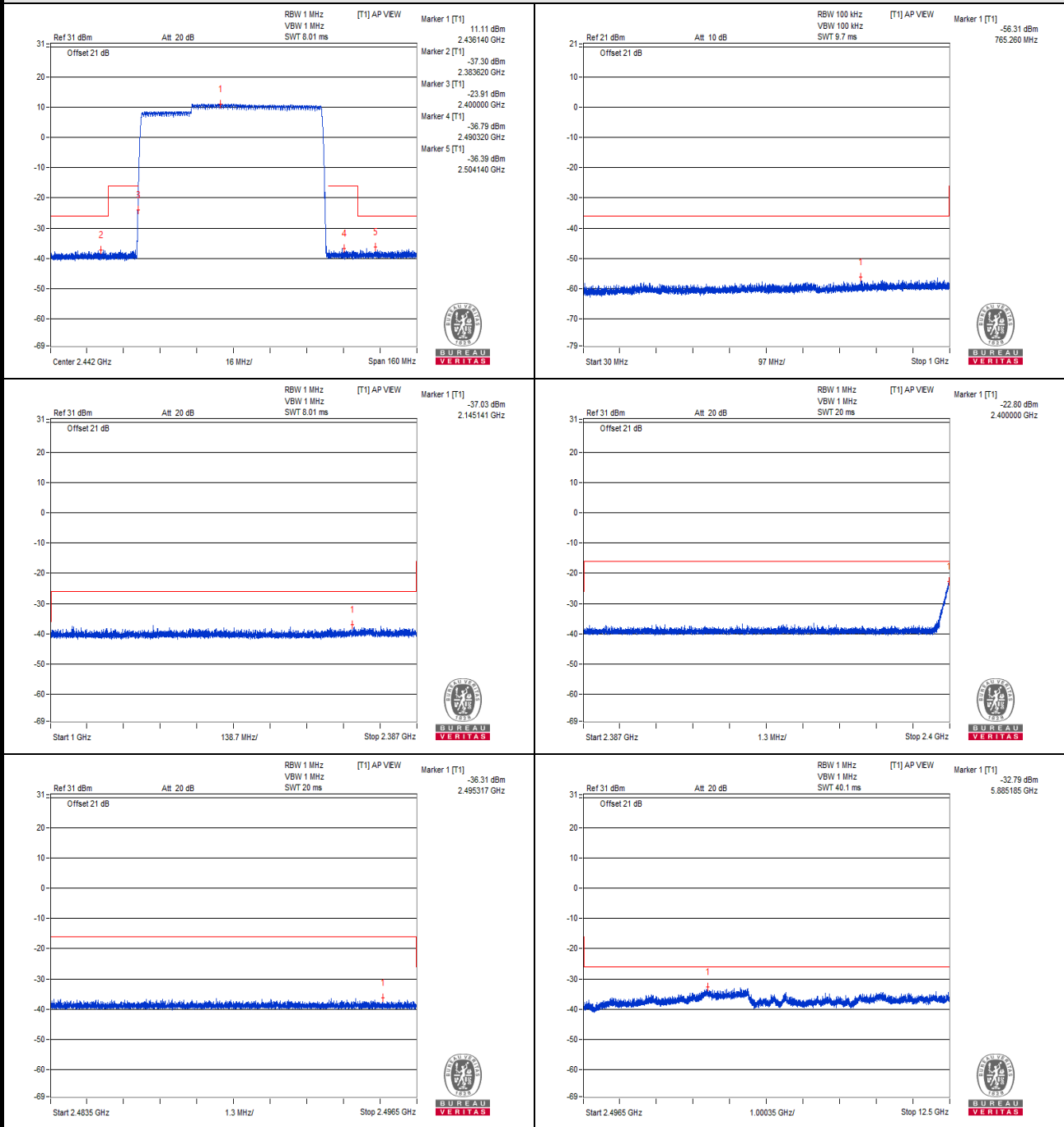
**NOTE:** The spectrum plots are attached on the following pages.

# Vnormal

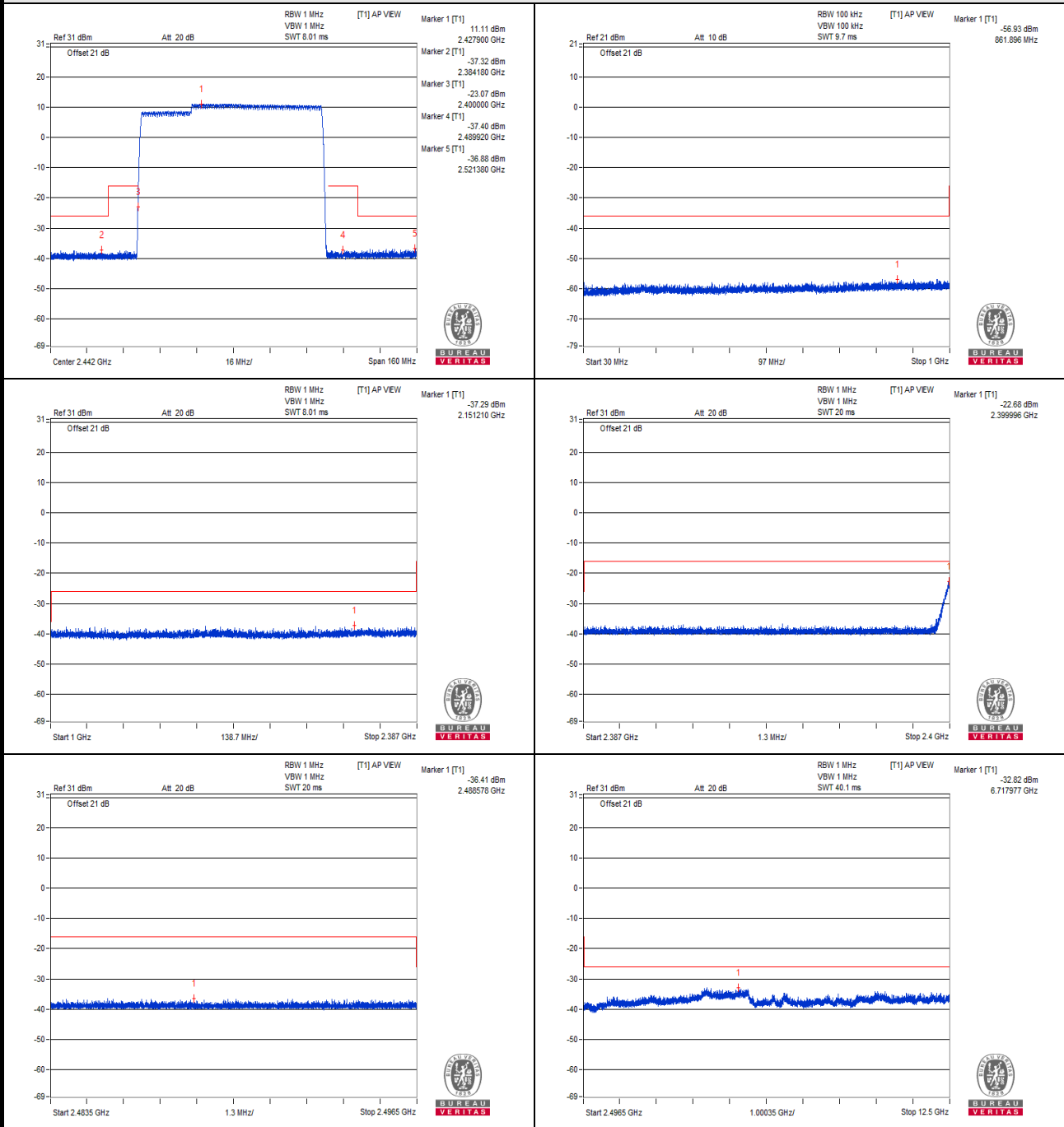




# V<sub>max</sub>



V min.

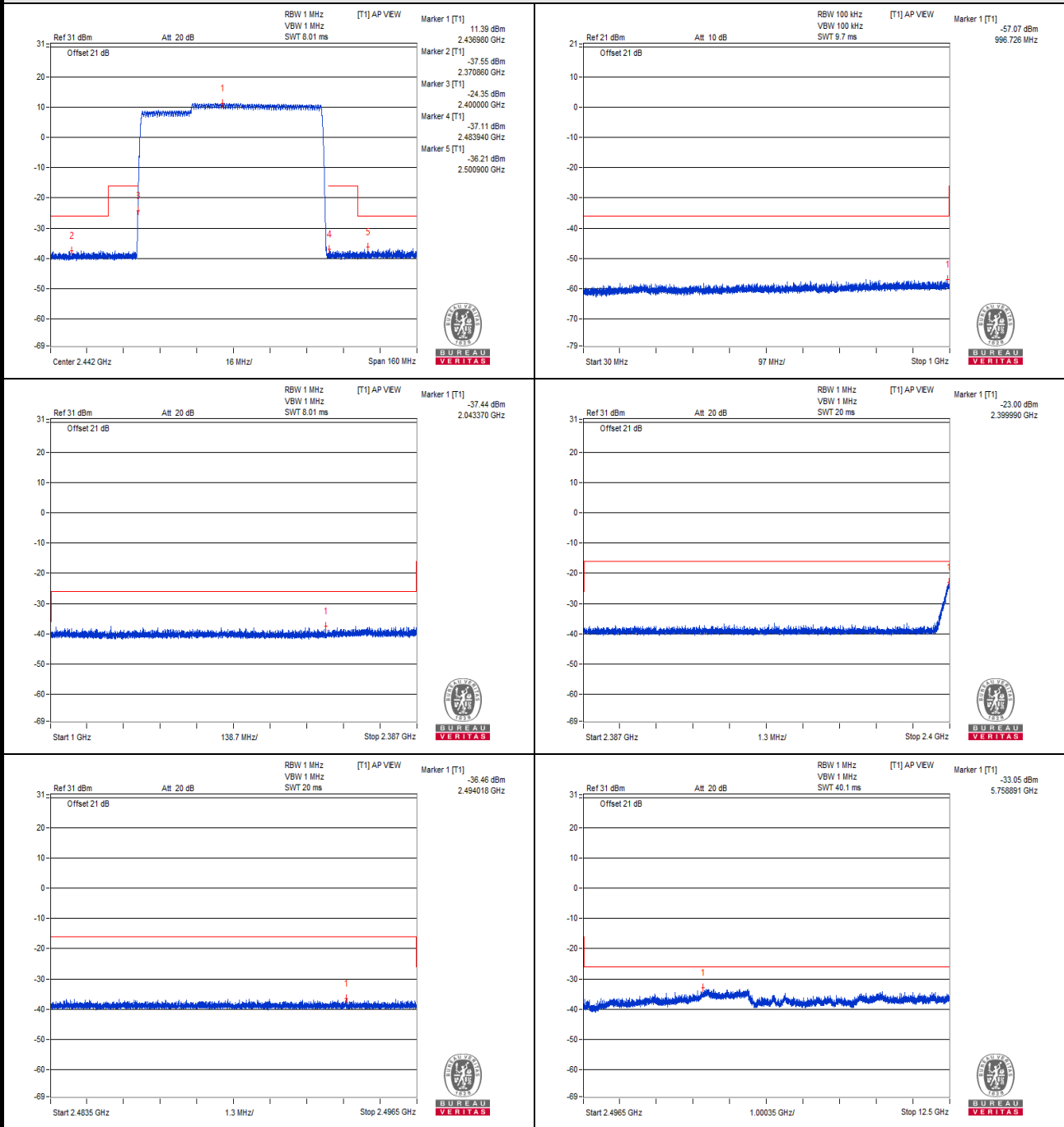


**Modulation: 8DPSK**

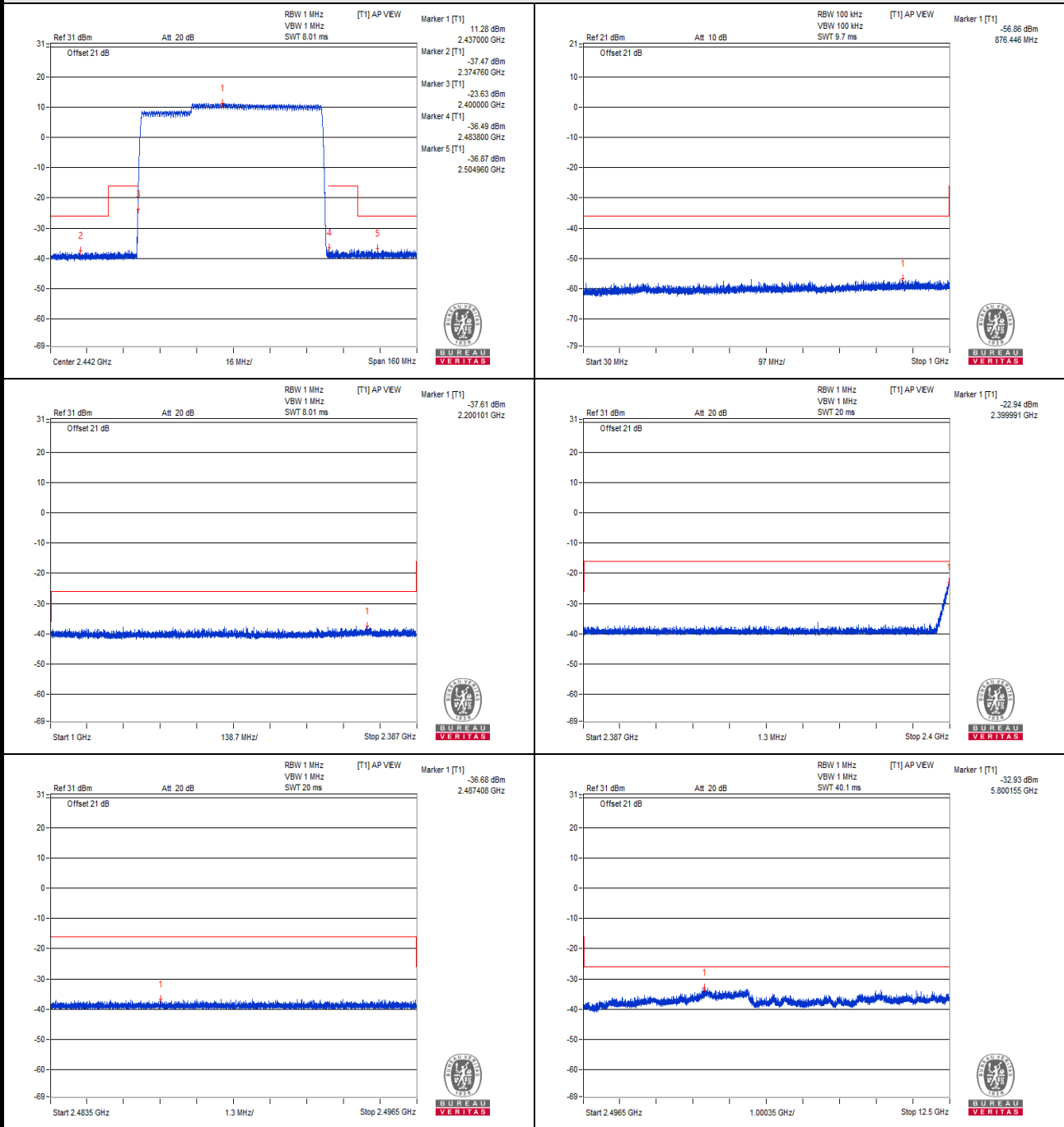
Test Channel		Hopping Mode			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE( $\mu$ W)	LIMIT ( $\mu$ W)	RESULT
<b>V<sub>normal</sub></b>	30MHz to 1000MHz	996.726	0.001963	0.25	PASS
	1000MHz to 2387MHz	2043.370	0.180302	2.5	PASS
	2387MHz to 2400MHz	2399.990	5.011872	25	PASS
	2483.5MHz to 2496.5MHz	2494.018	0.225944	25	PASS
	2496.5MHz to 12500MHz	5758.891	0.495450	2.5	PASS
<b>V<sub>max.</sub></b>	30MHz to 1000MHz	876.446	0.002061	0.25	PASS
	1000MHz to 2387MHz	2200.101	0.173380	2.5	PASS
	2387MHz to 2400MHz	2399.991	5.081594	25	PASS
	2483.5MHz to 2496.5MHz	2487.408	0.214783	25	PASS
	2496.5MHz to 12500MHz	5800.155	0.509331	2.5	PASS
<b>V<sub>min.</sub></b>	30MHz to 1000MHz	873.900	0.002070	0.25	PASS
	1000MHz to 2387MHz	2183.804	0.193642	2.5	PASS
	2387MHz to 2400MHz	2399.975	4.487454	25	PASS
	2483.5MHz to 2496.5MHz	2489.169	0.239332	25	PASS
	2496.5MHz to 12500MHz	5792.653	0.485289	2.5	PASS

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

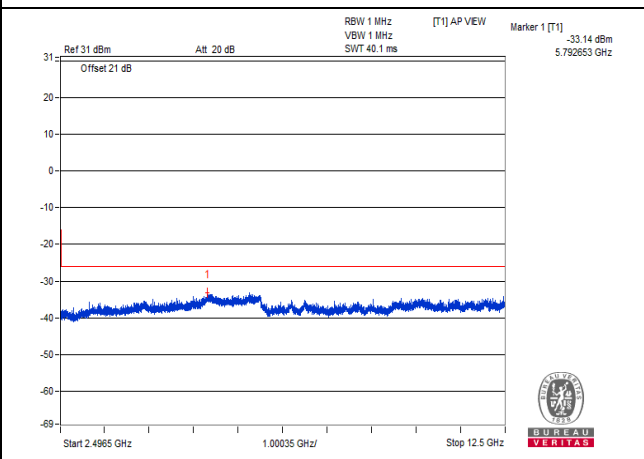
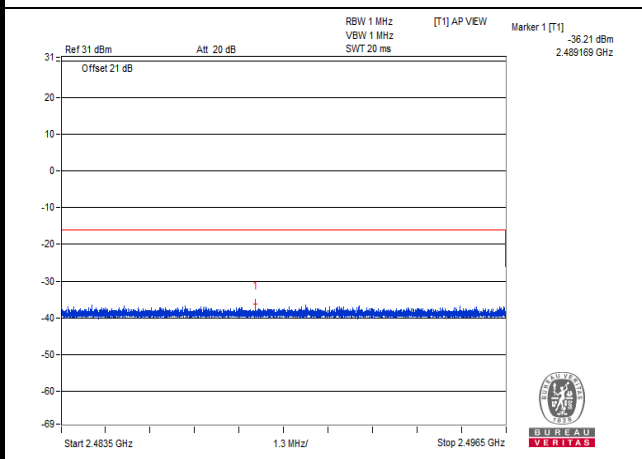
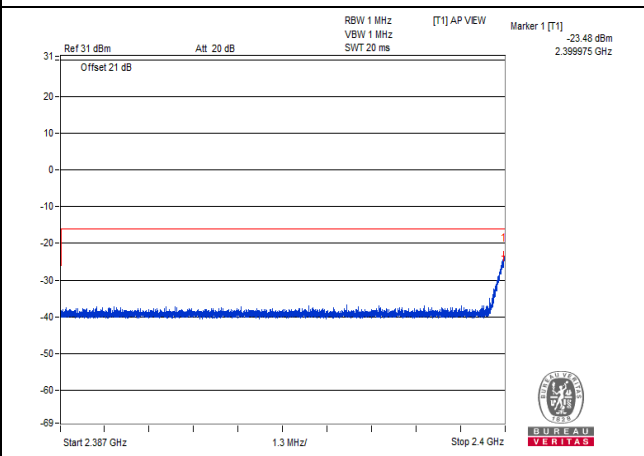
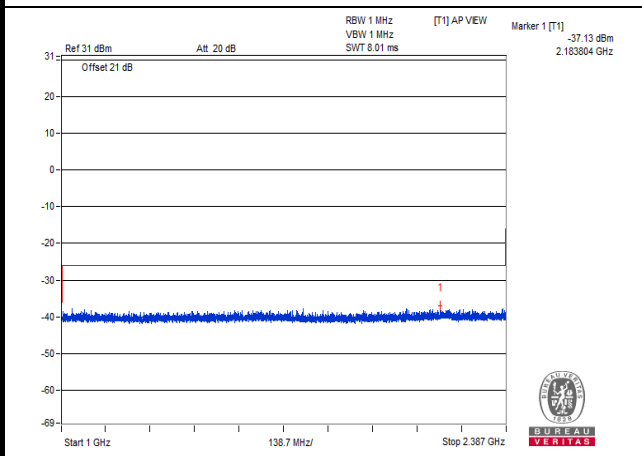
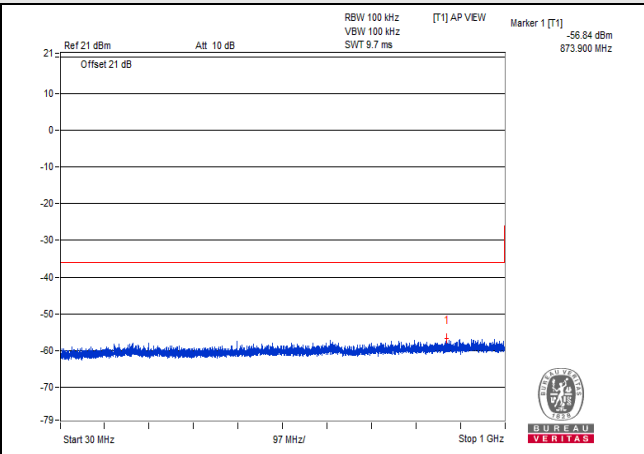
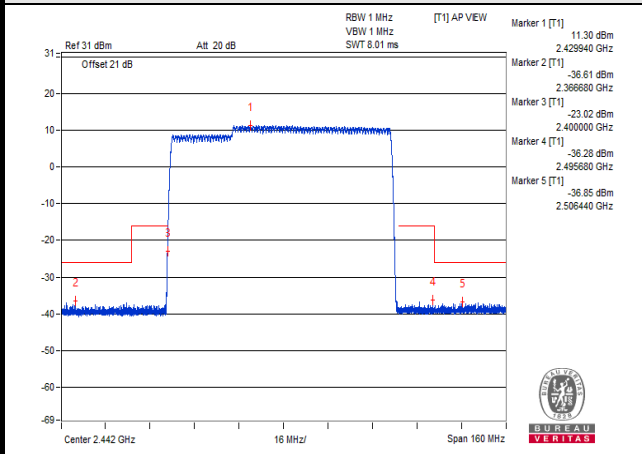
# Vnormal



# V<sub>max</sub>



V min.



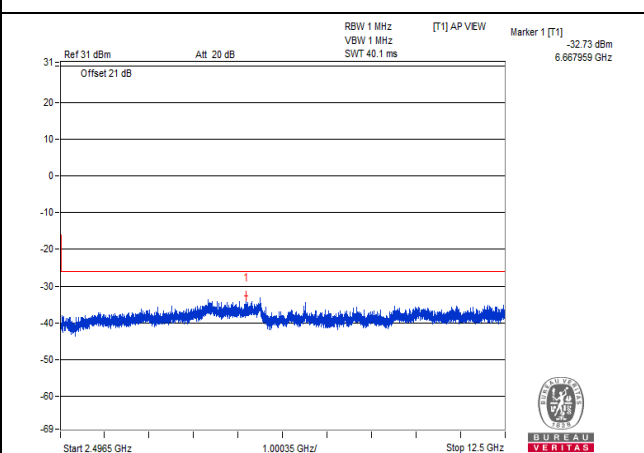
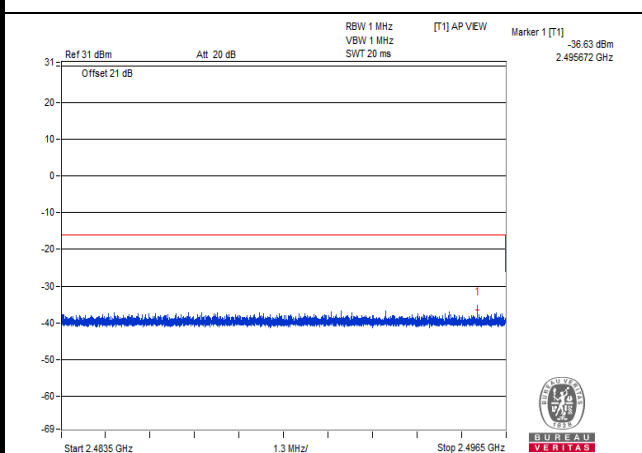
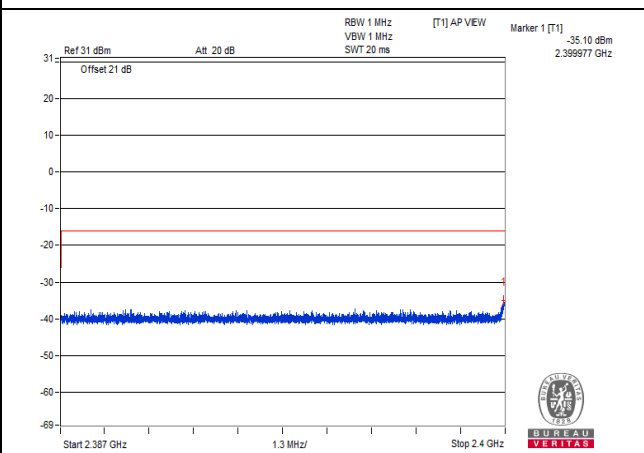
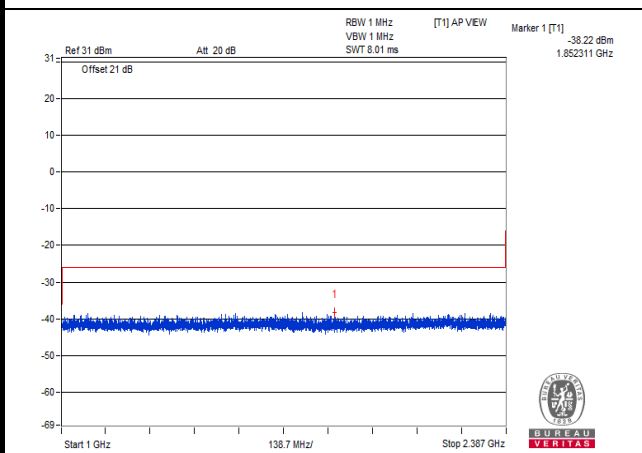
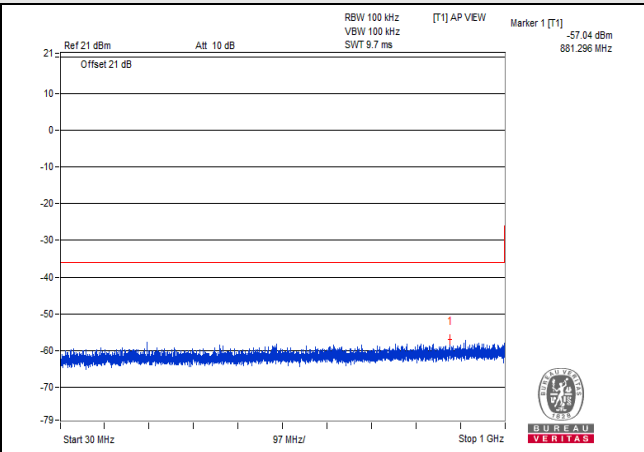
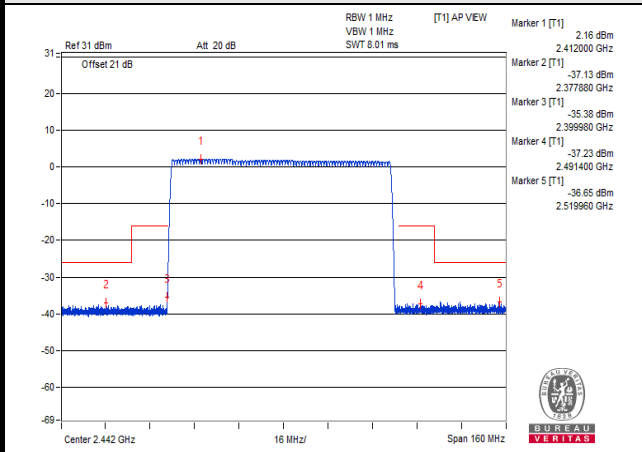
#### 4.4.4 Test Results (Mode 2)

Modulation: GFSK

Test Channel		Hopping Mode			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE( $\mu$ W)	LIMIT ( $\mu$ W)	RESULT
<b>V<sub>normal</sub></b>	30MHz to 1000MHz	881.296	0.001977	0.25	PASS
	1000MHz to 2387MHz	1852.311	0.150661	2.5	PASS
	2387MHz to 2400MHz	2399.977	0.309030	25	PASS
	2483.5MHz to 2496.5MHz	2495.672	0.217270	25	PASS
	2496.5MHz to 12500MHz	6667.959	0.533335	2.5	PASS
<b>V<sub>max.</sub></b>	30MHz to 1000MHz	985.692	0.001782	0.25	PASS
	1000MHz to 2387MHz	2116.014	0.165196	2.5	PASS
	2387MHz to 2400MHz	2399.991	0.301301	25	PASS
	2483.5MHz to 2496.5MHz	2483.659	0.199067	25	PASS
	2496.5MHz to 12500MHz	6684.215	0.449780	2.5	PASS
<b>V<sub>min.</sub></b>	30MHz to 1000MHz	973.931	0.001762	0.25	PASS
	1000MHz to 2387MHz	2307.247	0.141906	2.5	PASS
	2387MHz to 2400MHz	2399.991	0.288403	25	PASS
	2483.5MHz to 2496.5MHz	2492.383	0.209411	25	PASS
	2496.5MHz to 12500MHz	6880.533	0.460257	2.5	PASS

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

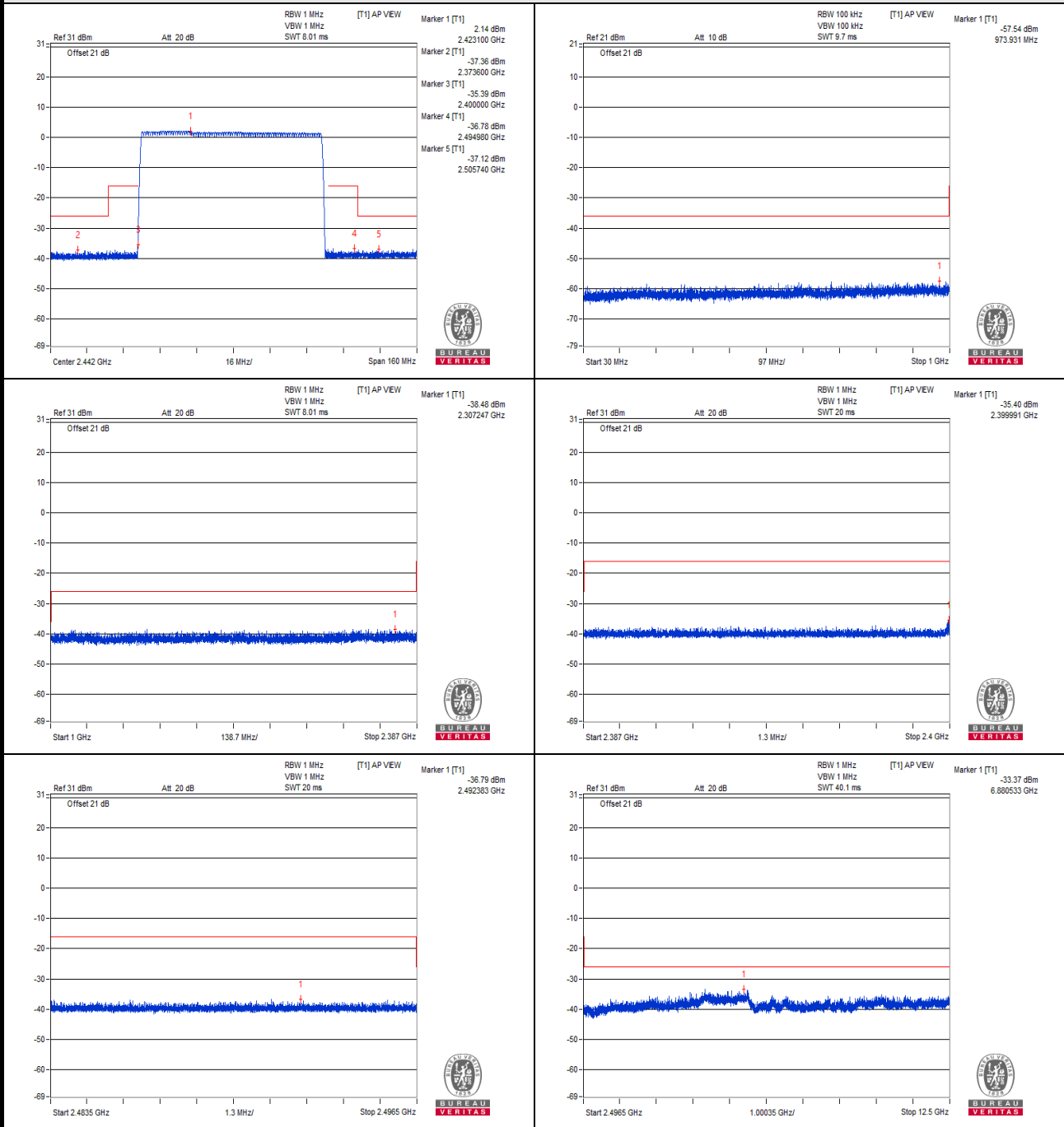
# Vnormal







V min.

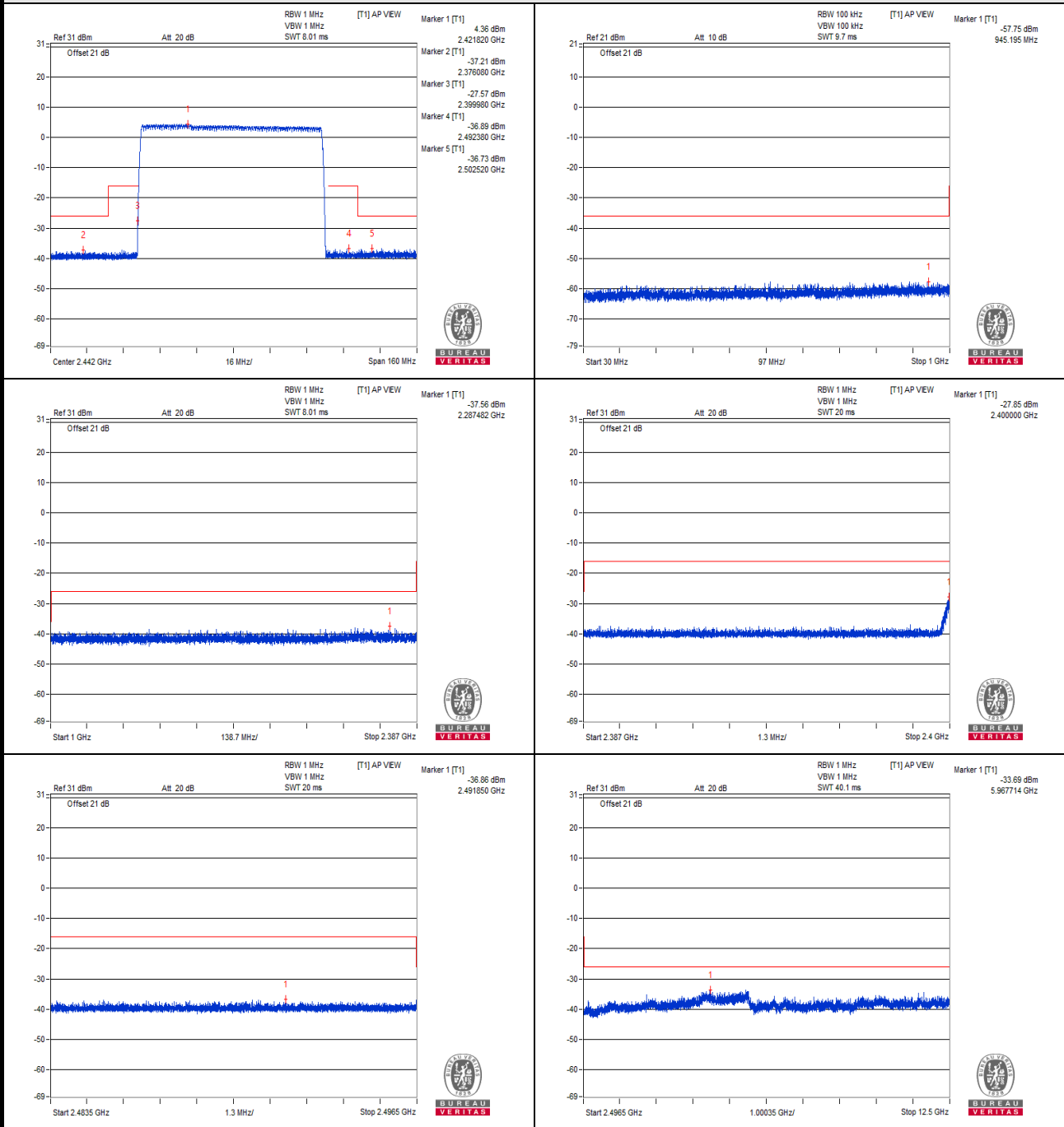


Modulation:  $\pi/4$ -DQPSK

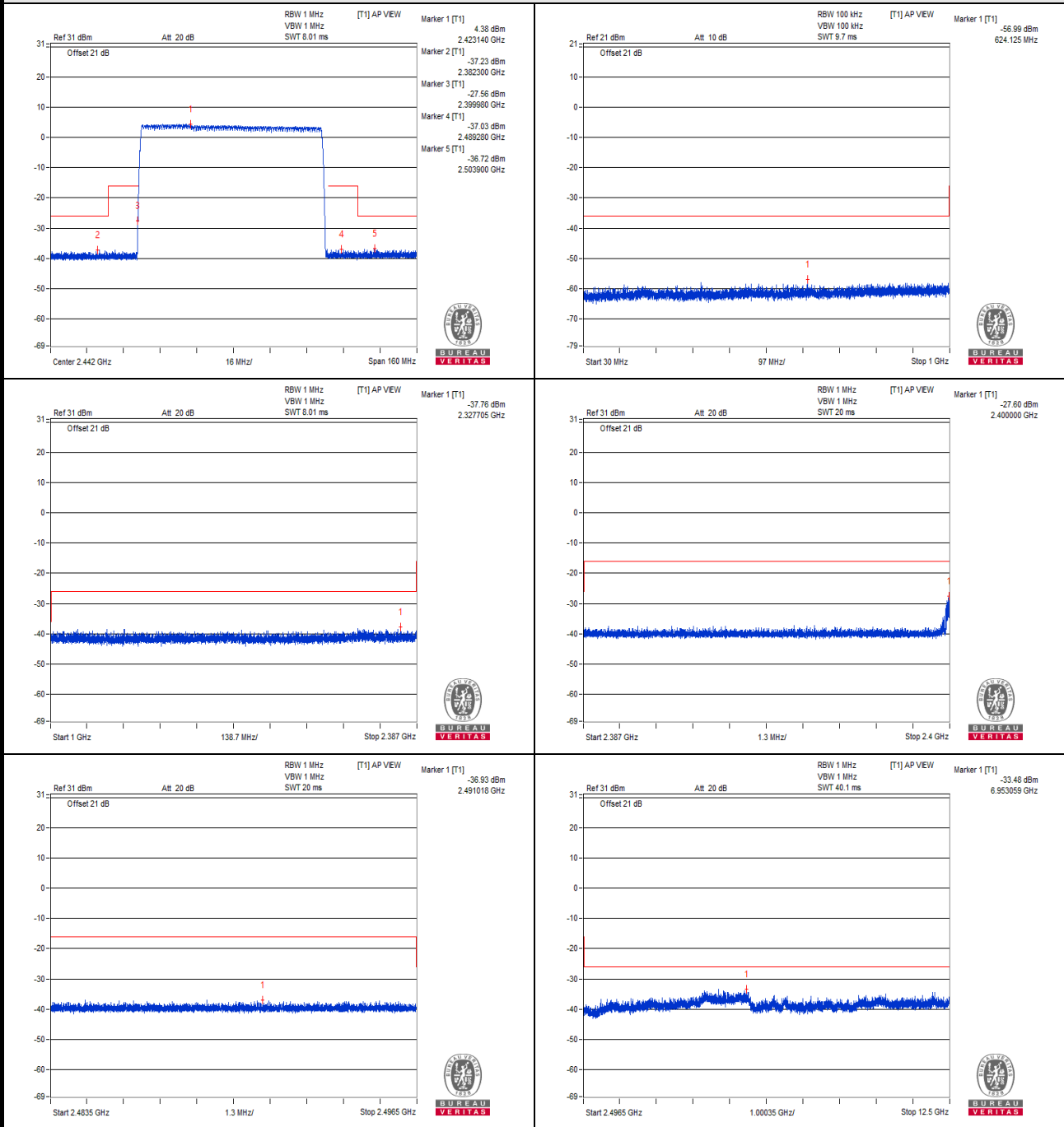
Test Channel		Hopping Mode			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE( $\mu$ W)	LIMIT ( $\mu$ W)	RESULT
<b>V<sub>normal</sub></b>	30MHz to 1000MHz	945.195	0.001679	0.25	PASS
	1000MHz to 2387MHz	2287.482	0.175388	2.5	PASS
	2387MHz to 2400MHz	2400.000	1.640590	25	PASS
	2483.5MHz to 2496.5MHz	2491.850	0.206063	25	PASS
	2496.5MHz to 12500MHz	5967.714	0.427563	2.5	PASS
<b>V<sub>max.</sub></b>	30MHz to 1000MHz	624.125	0.002000	0.25	PASS
	1000MHz to 2387MHz	2327.705	0.167494	2.5	PASS
	2387MHz to 2400MHz	2400.000	1.737801	25	PASS
	2483.5MHz to 2496.5MHz	2491.018	0.202768	25	PASS
	2496.5MHz to 12500MHz	6953.059	0.448745	2.5	PASS
<b>V<sub>min.</sub></b>	30MHz to 1000MHz	432.671	0.001807	0.25	PASS
	1000MHz to 2387MHz	2034.875	0.183231	2.5	PASS
	2387MHz to 2400MHz	2400.000	1.770109	25	PASS
	2483.5MHz to 2496.5MHz	2490.654	0.210863	25	PASS
	2496.5MHz to 12500MHz	5876.432	0.442588	2.5	PASS

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

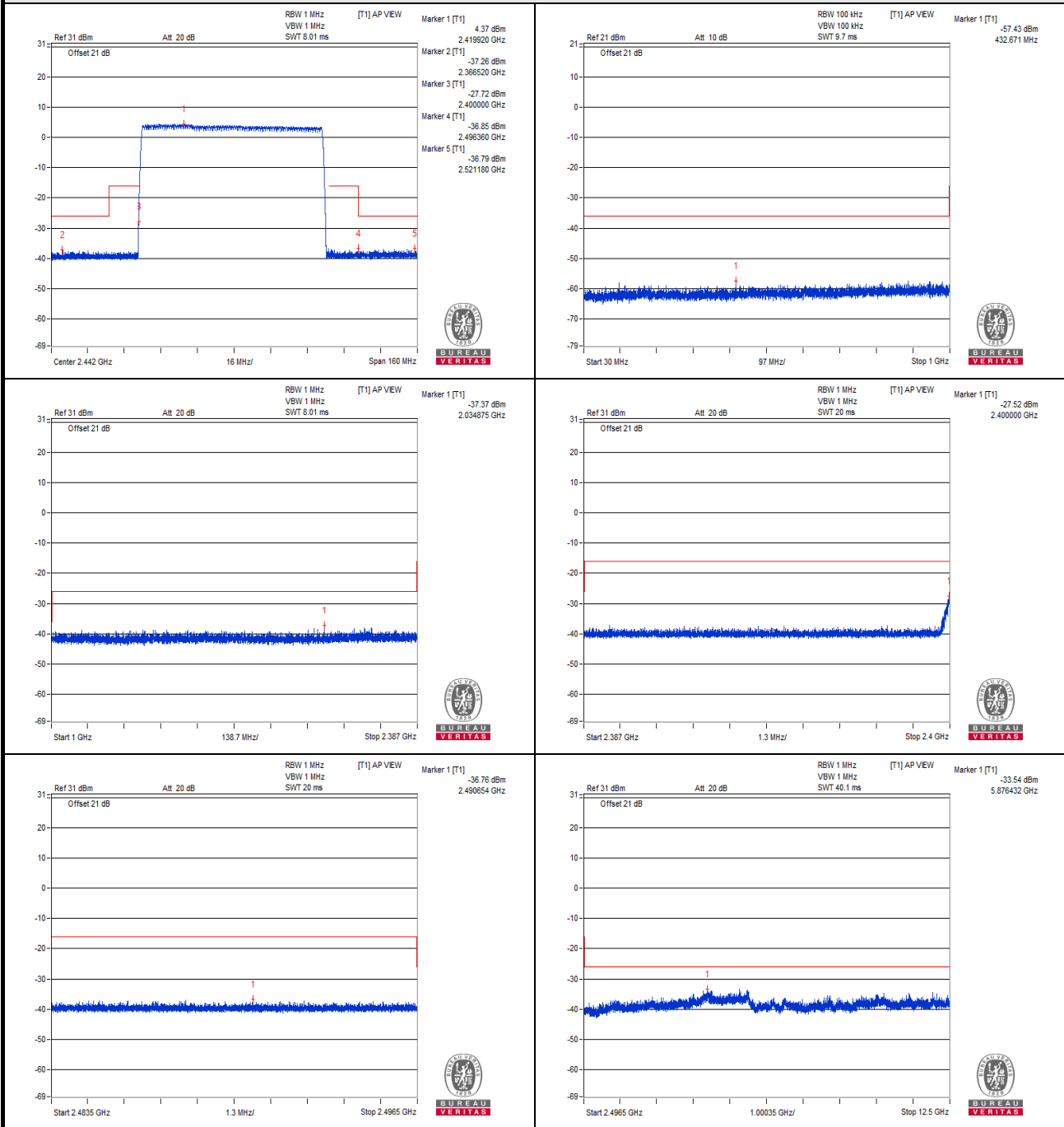
# Vnormal



V<sub>max</sub>.



V min.

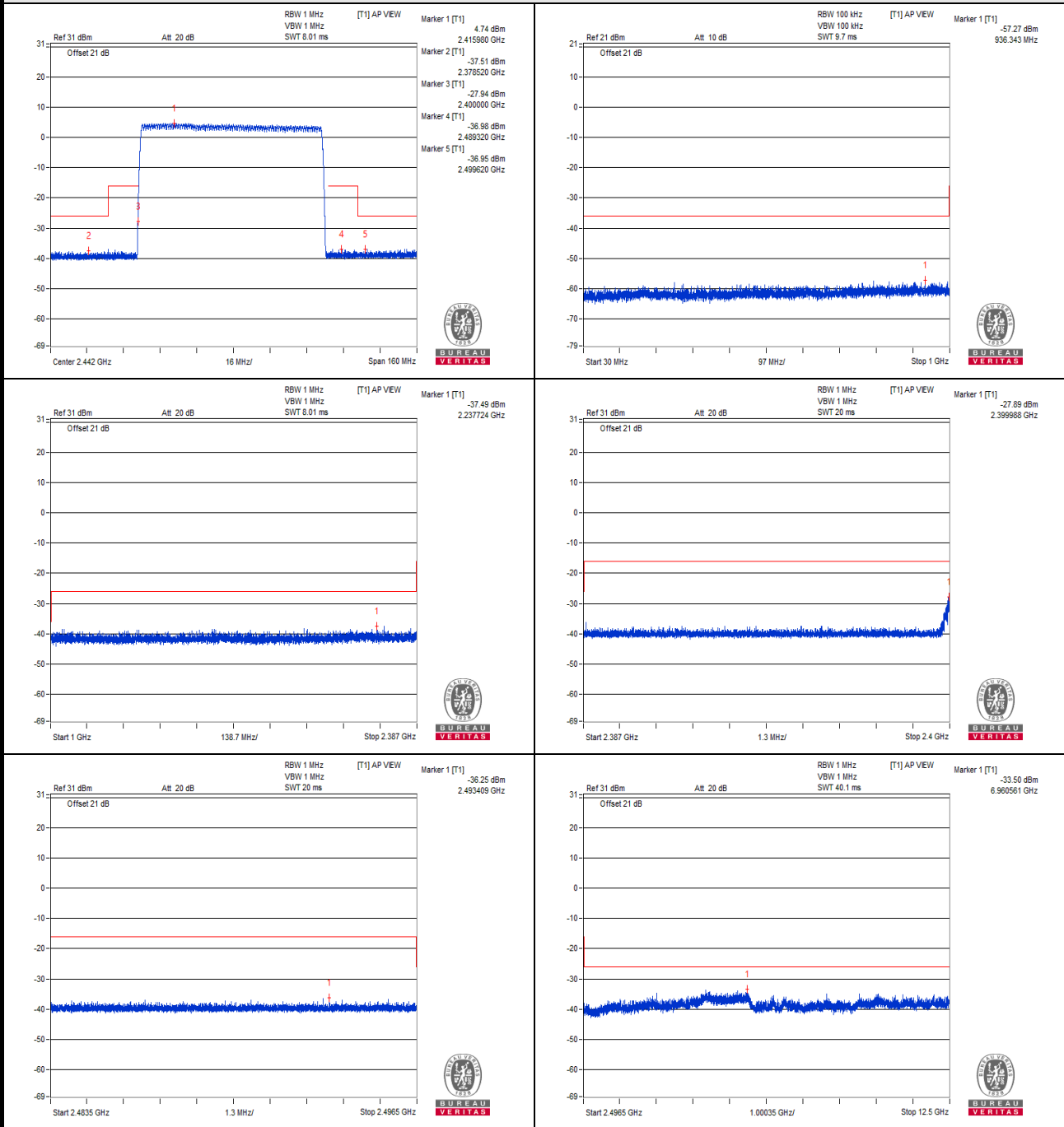


**Modulation: 8DPSK**

Test Channel		Hopping Mode			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE( $\mu$ W)	LIMIT ( $\mu$ W)	RESULT
<b>V<sub>normal</sub></b>	30MHz to 1000MHz	936.343	0.001875	0.25	PASS
	1000MHz to 2387MHz	2237.724	0.178238	2.5	PASS
	2387MHz to 2400MHz	2399.988	1.625549	25	PASS
	2483.5MHz to 2496.5MHz	2493.409	0.237137	25	PASS
	2496.5MHz to 12500MHz	6960.561	0.446684	2.5	PASS
<b>V<sub>max.</sub></b>	30MHz to 1000MHz	881.660	0.001811	0.25	PASS
	1000MHz to 2387MHz	2241.018	0.177419	2.5	PASS
	2387MHz to 2400MHz	2399.998	1.905461	25	PASS
	2483.5MHz to 2496.5MHz	2495.291	0.205116	25	PASS
	2496.5MHz to 12500MHz	6988.071	0.450817	2.5	PASS
<b>V<sub>min.</sub></b>	30MHz to 1000MHz	955.501	0.001982	0.25	PASS
	1000MHz to 2387MHz	2352.498	0.156675	2.5	PASS
	2387MHz to 2400MHz	2400.000	1.534617	25	PASS
	2483.5MHz to 2496.5MHz	2495.261	0.197697	25	PASS
	2496.5MHz to 12500MHz	6692.968	0.469894	2.5	PASS

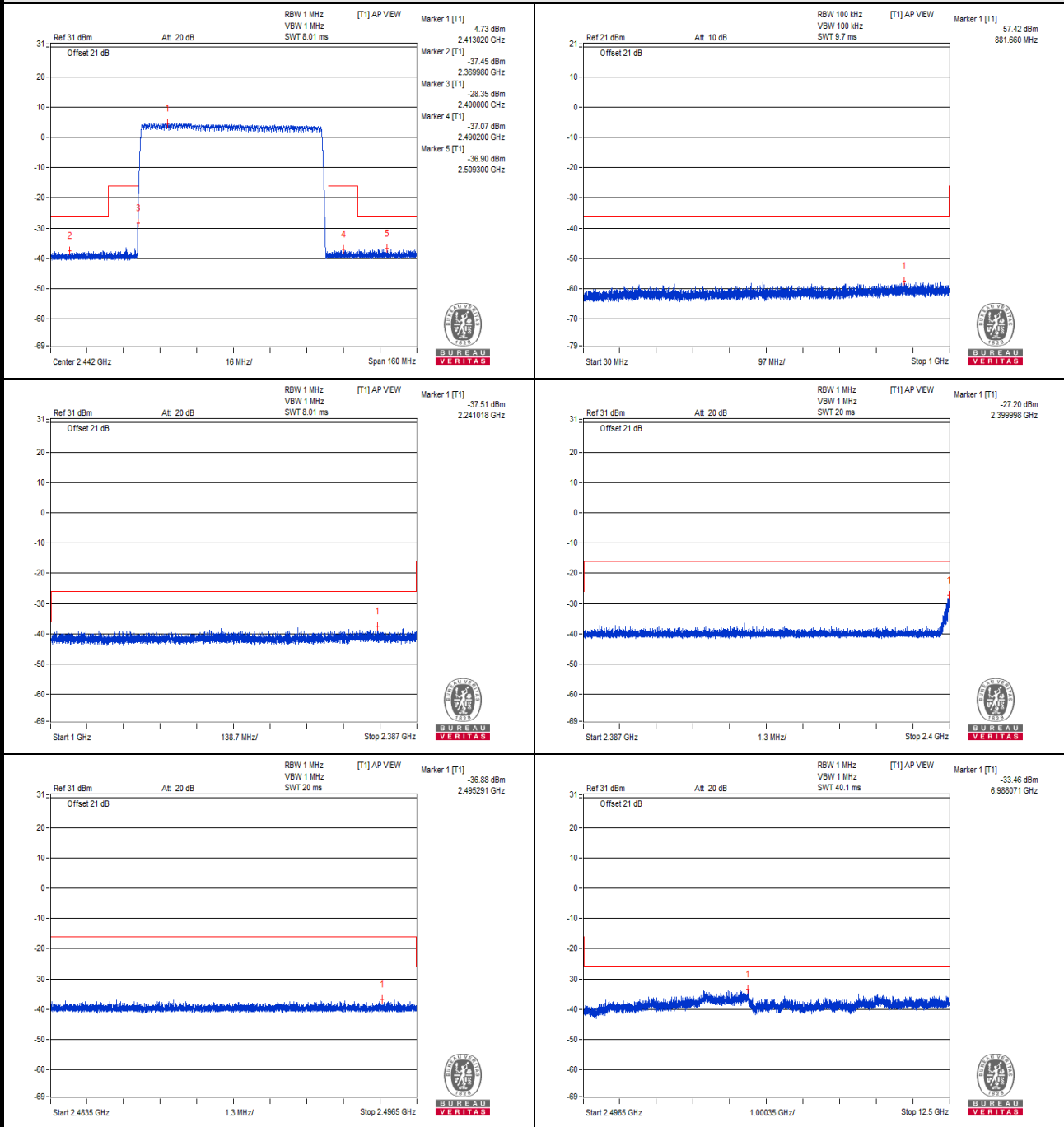
**NOTE:** 1. The spectrum plots are attached on the following pages.

# Vnormal

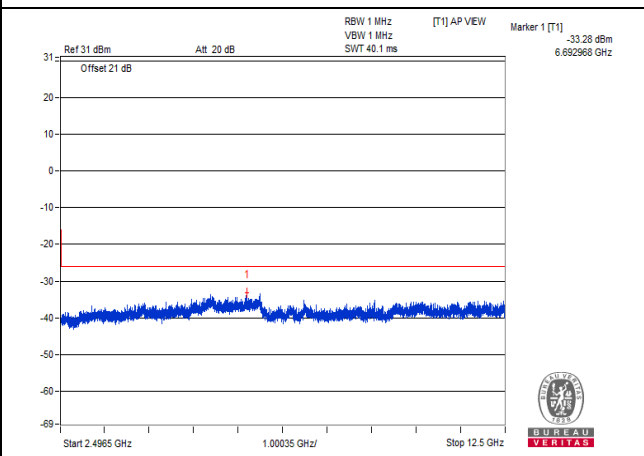
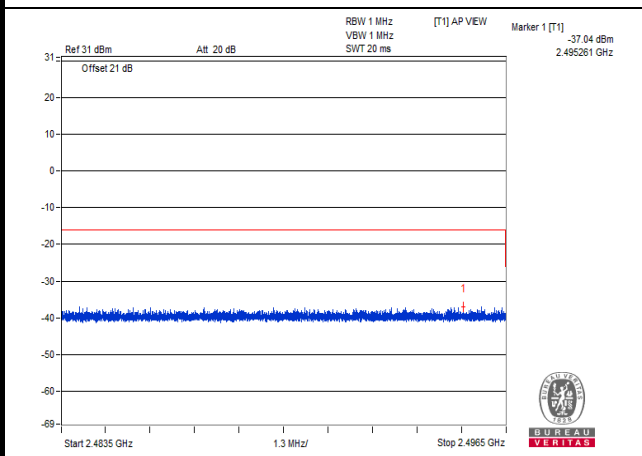
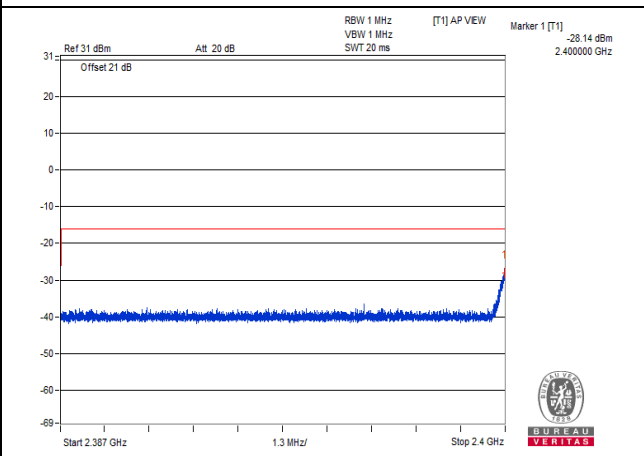
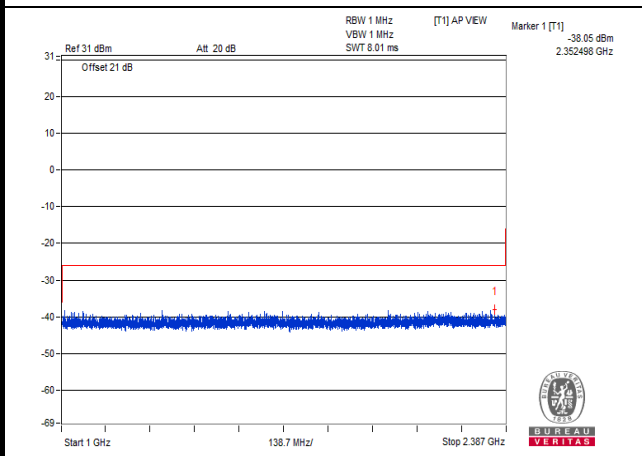
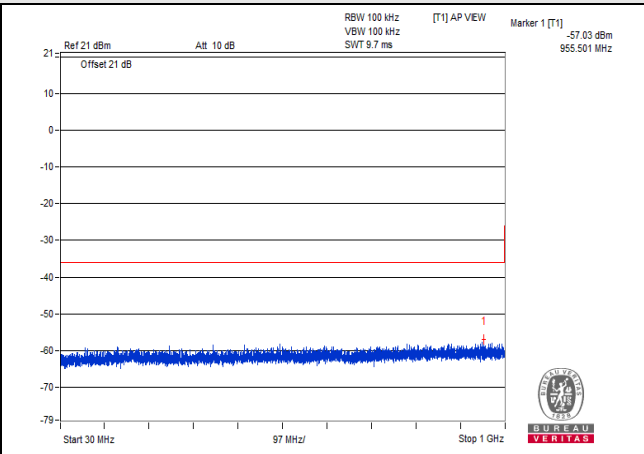
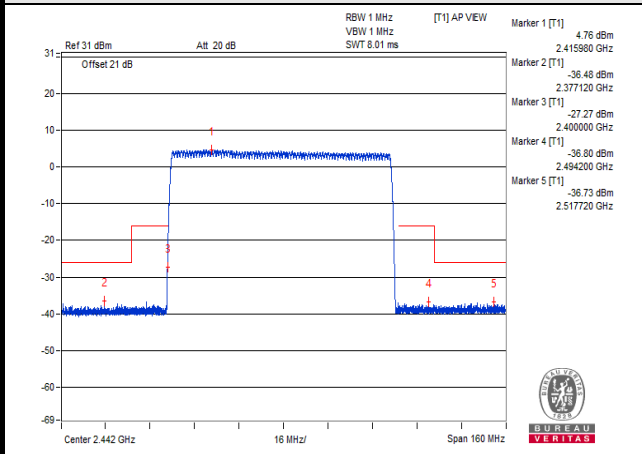




# V<sub>max</sub>



V min.



## 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 ~ 49.10 mW/MHz)

Note:

1. Occupied bandwidth is less than 26MHz
2. Occupied bandwidth is more that 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 (Mode 1)

#### Normal Mode:

Voltage (Vdc)	Modulation	Data Rate	Conducted RF Output Power Density (mW/MHz)	Radiated RF Output Power Density (mW/MHz)
3.3	GFSK	DH5	0.250404	0.560585
	$\pi/4$ -DQPSK	2DH5	0.137528	0.307887
	8DPSK	3DH5	0.136114	0.304721
3.63	GFSK	DH5	0.256679	0.574633
	$\pi/4$ -DQPSK	2DH5	0.140165	0.31379
	8DPSK	3DH5	0.142033	0.317972
2.97	GFSK	DH5	0.253597	0.567733
	$\pi/4$ -DQPSK	2DH5	0.142689	0.319441
	8DPSK	3DH5	0.133549	0.298979
Max. Limit (mW/MHz):			3	-
Rated Power (mW/MHz):			0.3	-
Tolerance of Antenna Power (mW/MHz):			0.06 ~ 0.36	-
Max. EIRP Limit (mW/MHz):			-	4.91

Note: 1. Antenna gain is 3.5 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)
3.3	GFSK	DH5	0.946122	2.118103
	$\pi/4$ -DQPSK	2DH5	0.524203	1.173544
	8DPSK	3DH5	0.521795	1.168153
3.63	GFSK	DH5	0.985919	2.207198
	$\pi/4$ -DQPSK	2DH5	0.534769	1.197199
	8DPSK	3DH5	0.541374	1.211985
2.97	GFSK	DH5	0.980669	2.195444
	$\pi/4$ -DQPSK	2DH5	0.543875	1.217584
	8DPSK	3DH5	0.509527	1.140689
Max. Limit (mW/MHz):			3	-
Rated Power (mW/MHz):			1	-
Tolerance of Antenna Power (mW/MHz):			0.2 ~ 1.2	-
Max. EIRP Limit (mW/MHz):			-	4.91

Note: 1. Antenna gain is 3.5 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

#### 4.5.4 Test Results (Mode 2)

##### Normal Mode:

Voltage (Vdc)	Modulation	Data Rate	Conducted RF Output Power Density (mW/MHz)	Radiated RF Output Power Density (mW/MHz)
3.3	GFSK	DH5	0.062483	0.139882
	$\pi/4$ -DQPSK	2DH5	0.061845	0.138454
	8DPSK	3DH5	0.062161	0.139161
3.63	GFSK	DH5	0.06405	0.14339
	$\pi/4$ -DQPSK	2DH5	0.063026	0.141098
	8DPSK	3DH5	0.064313	0.143979
2.97	GFSK	DH5	0.063463	0.142076
	$\pi/4$ -DQPSK	2DH5	0.064166	0.14365
	8DPSK	3DH5	0.060129	0.134612
Max. Limit (mW/MHz):			3	-
Rated Power (mW/MHz):			0.1	-
Tolerance of Antenna Power (mW/MHz):			0.02 ~ 0.12	-
Max. EIRP Limit (mW/MHz):			-	4.91

Note: 1. Antenna gain is 3.5 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)
3.3	GFSK	DH5	0.249511	0.558586
	$\pi/4$ -DQPSK	2DH5	0.243694	0.545563
	8DPSK	3DH5	0.244253	0.546814
3.63	GFSK	DH5	0.252792	0.565931
	$\pi/4$ -DQPSK	2DH5	0.247652	0.554424
	8DPSK	3DH5	0.253419	0.567334
2.97	GFSK	DH5	0.252434	0.565129
	$\pi/4$ -DQPSK	2DH5	0.250901	0.561697
	8DPSK	3DH5	0.235774	0.527832
Max. Limit (mW/MHz):			3	-
Rated Power (mW/MHz):			0.3	-
Tolerance of Antenna Power (mW/MHz):			0.06 ~ 0.36	-
Max. EIRP Limit (mW/MHz):			-	4.91

Note: 1. Antenna gain is 3.5 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	$\leq 4\text{nW}/100\text{kHz}$ (-54dBm)
Above 1GHz	$\leq 20\text{nW}/\text{MHz}$ (-47dBm)

### 4.6.2 Test Setup

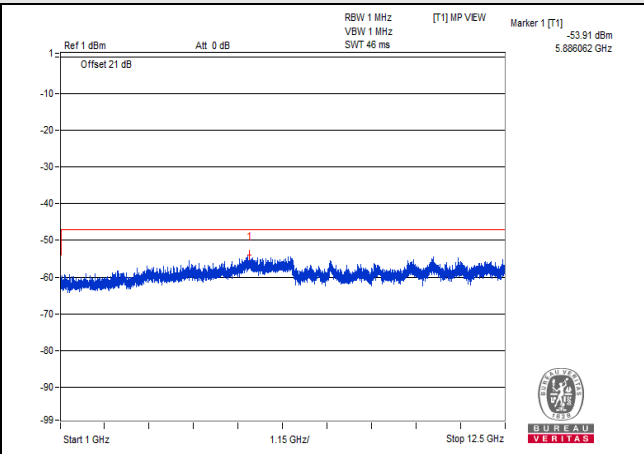
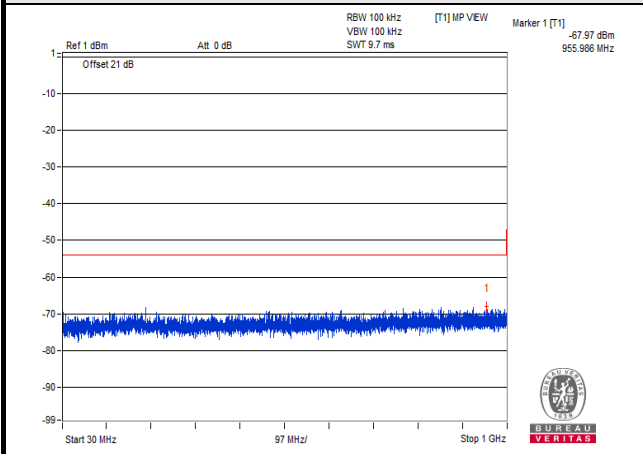


#### 4.6.3 Test Results (Mode 1)

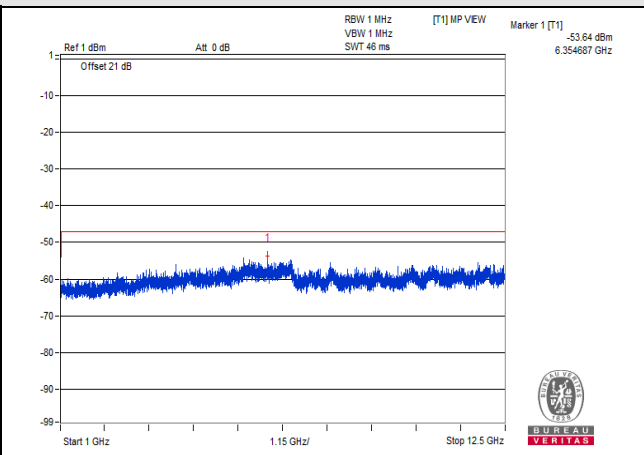
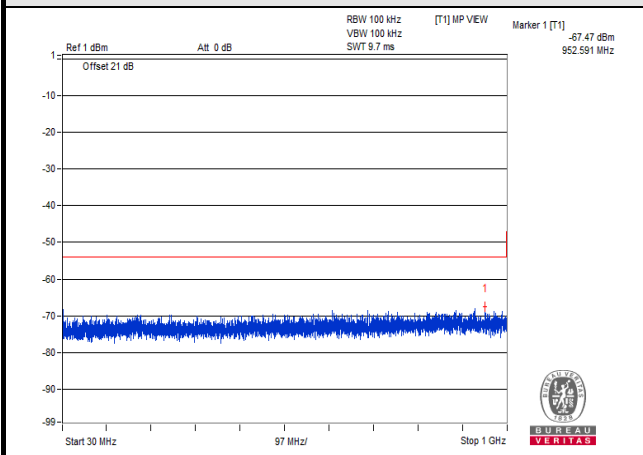
TEST CHANNEL		CH 0 (2402MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(nW)	LIMIT (nW)	RESULT
<b>V<sub>normal</sub></b>	30MHz to 1000MHz	955.986	0.159588	4.0	PASS
	1000MHz to 12500MHz	5886.062	4.064433	20.0	PASS
<b>V<sub>max.</sub></b>	30MHz to 1000MHz	952.591	0.179061	4.0	PASS
	1000MHz to 12500MHz	6354.687	4.325138	20.0	PASS
<b>V<sub>min.</sub></b>	30MHz to 1000MHz	832.311	0.177828	4.0	PASS
	1000MHz to 12500MHz	6808.937	4.425884	20.0	PASS
TEST CHANNEL		CH 39 (2441MHz)			
<b>V<sub>normal</sub></b>	30MHz to 1000MHz	965.928	0.179473	4.0	PASS
	1000MHz to 12500MHz	6709.750	4.570882	20.0	PASS
<b>V<sub>max.</sub></b>	30MHz to 1000MHz	973.810	0.173380	4.0	PASS
	1000MHz to 12500MHz	5922.000	3.303695	20.0	PASS
<b>V<sub>min.</sub></b>	30MHz to 1000MHz	956.107	0.165196	4.0	PASS
	1000MHz to 12500MHz	6085.875	3.908409	20.0	PASS
TEST CHANNEL		CH 78 (2480MHz)			
<b>V<sub>normal</sub></b>	30MHz to 1000MHz	867.716	0.210378	4.0	PASS
	1000MHz to 12500MHz	6994.375	4.149540	20.0	PASS
<b>V<sub>max.</sub></b>	30MHz to 1000MHz	980.721	0.206063	4.0	PASS
	1000MHz to 12500MHz	10660.000	4.017908	20.0	PASS
<b>V<sub>min.</sub></b>	30MHz to 1000MHz	927.250	0.171791	4.0	PASS
	1000MHz to 12500MHz	5804.125	4.178304	20.0	PASS

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

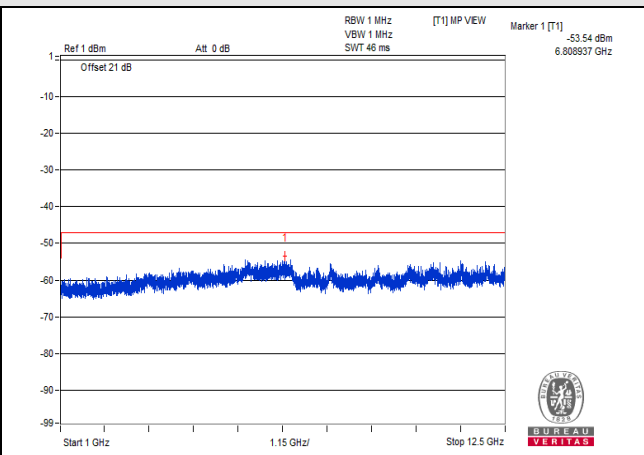
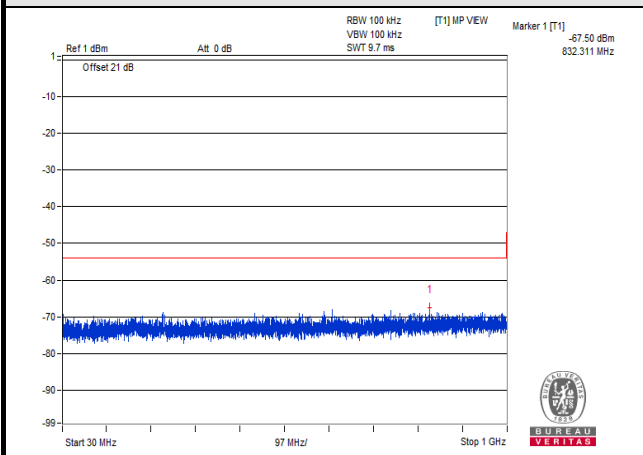
### V<sub>normal</sub>



### V<sub>max</sub>



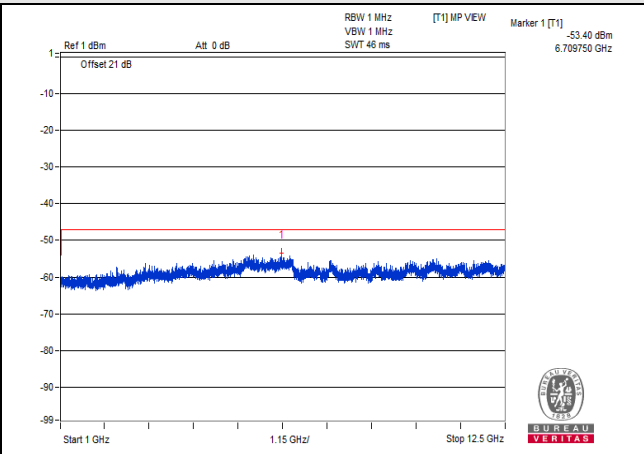
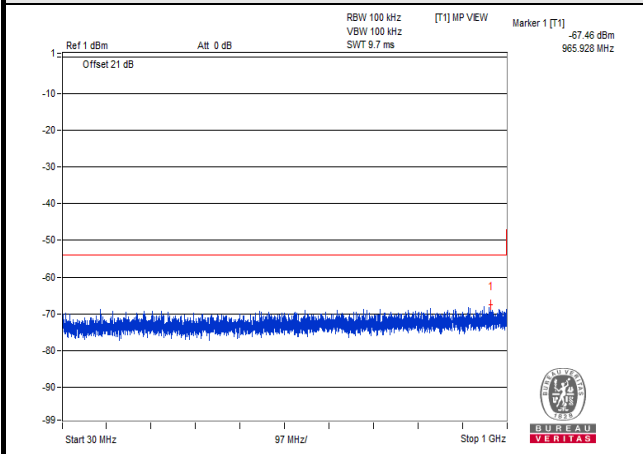
### V<sub>min</sub>



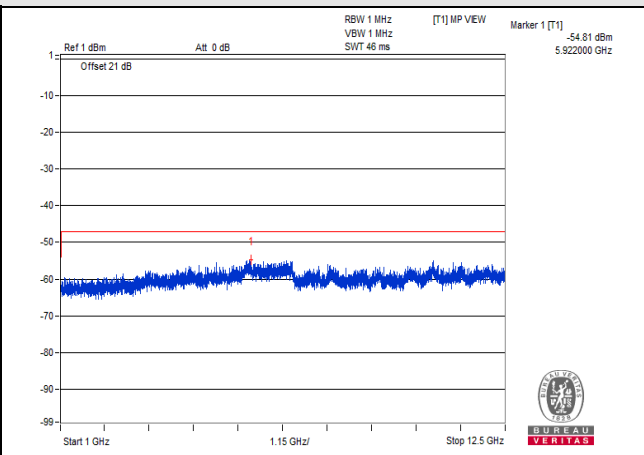
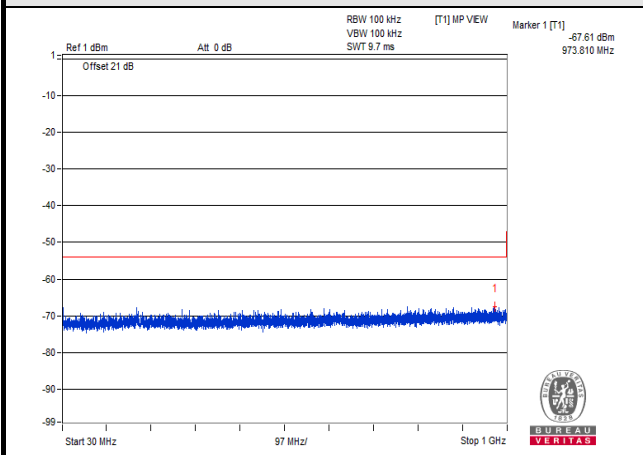
CH 0 (2402MHz)



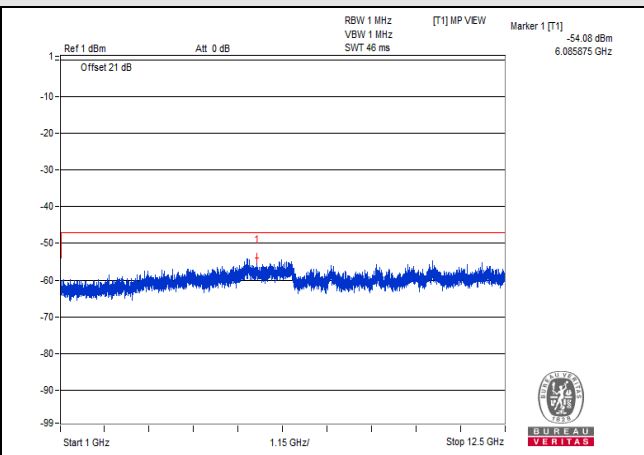
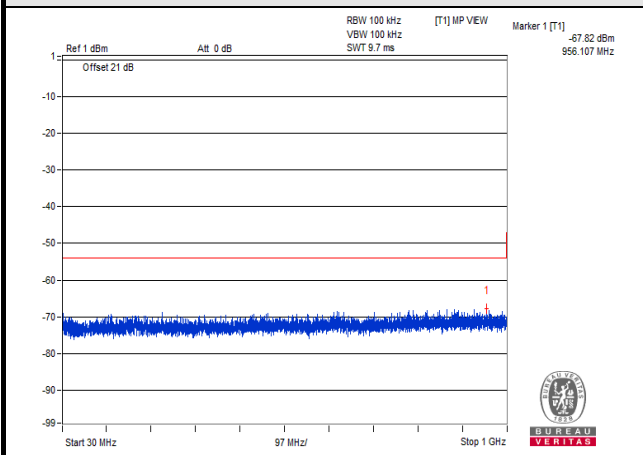
### V<sub>normal</sub>



### V<sub>max.</sub>

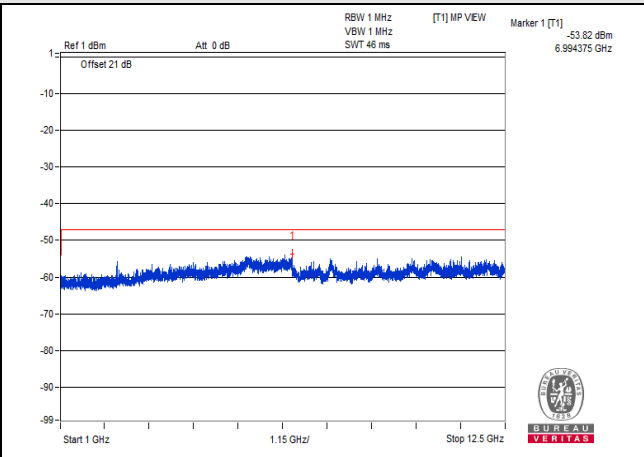
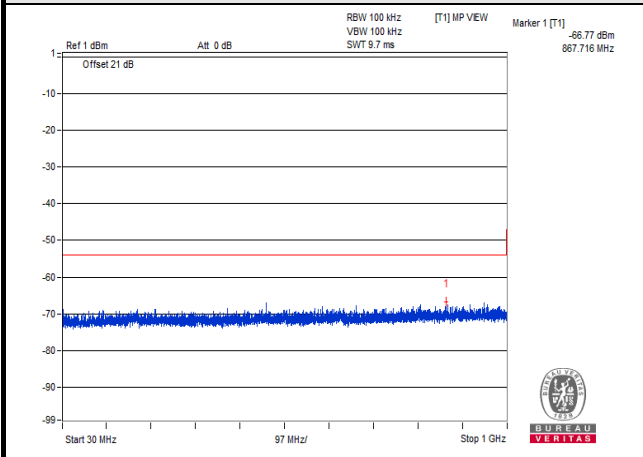


### V<sub>min.</sub>

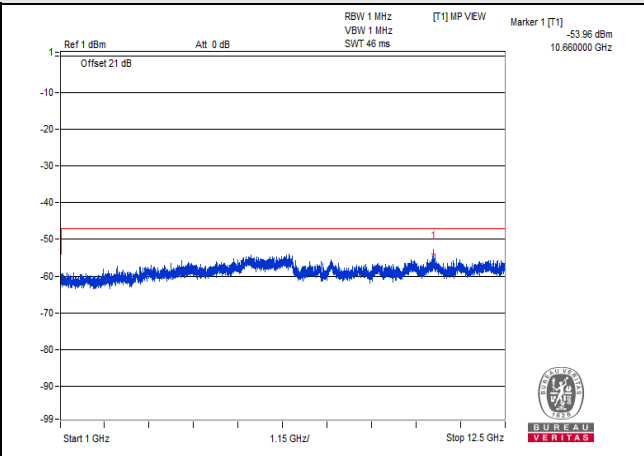
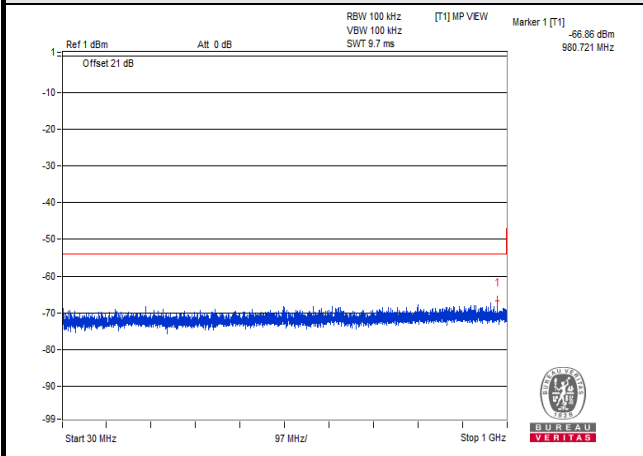


CH 39 (2441MHz)

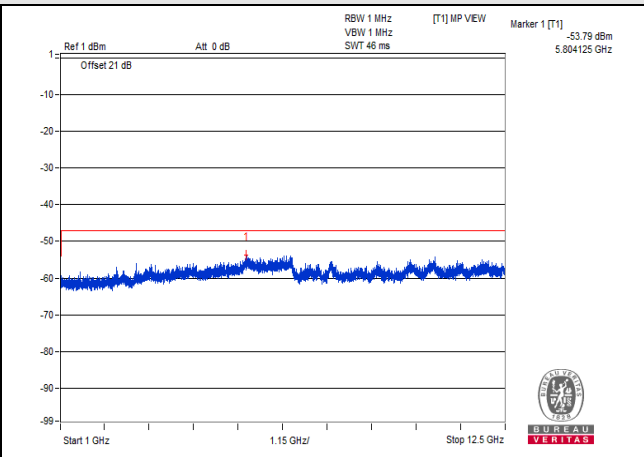
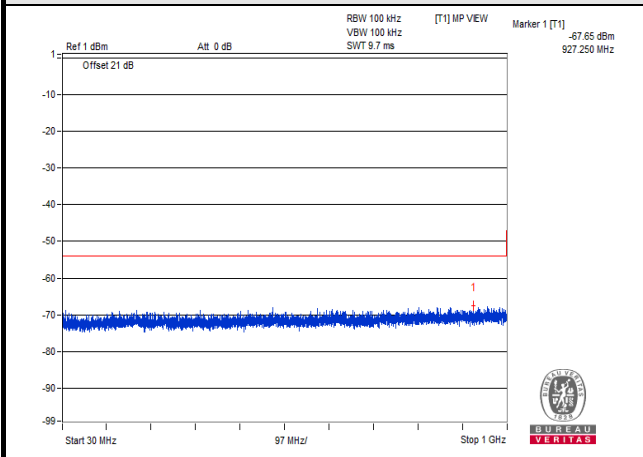
### V<sub>normal</sub>



### V<sub>max.</sub>



### V<sub>min.</sub>



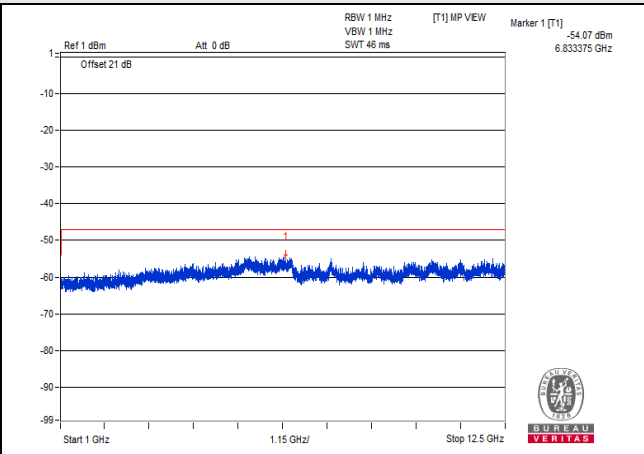
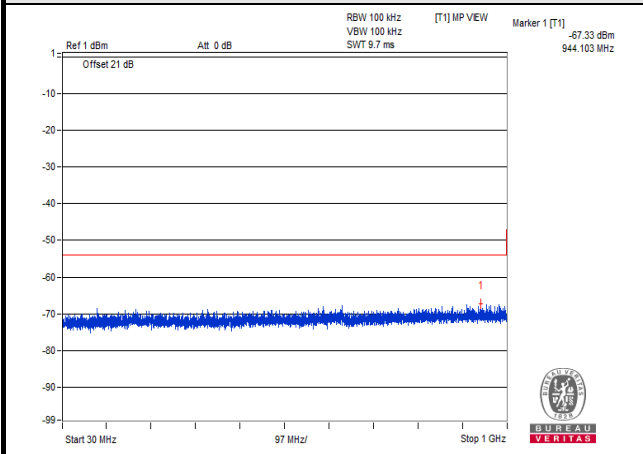
CH 78 (2480MHz)

#### 4.6.4 Test Results (Mode 2)

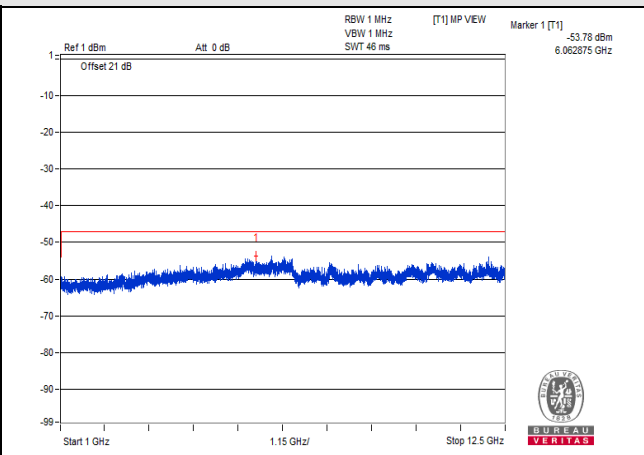
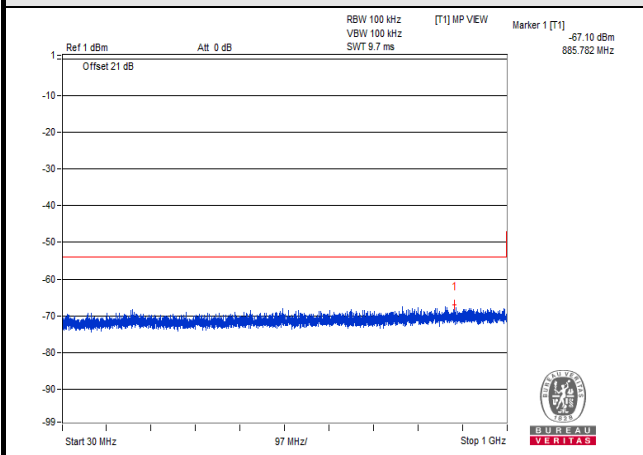
TEST CHANNEL		CH 0 (2402MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(nW)	LIMIT (nW)	RESULT
<b>V<sub>normal</sub></b>	30MHz to 1000MHz	944.103	0.184927	4.0	PASS
	1000MHz to 12500MHz	6833.375	3.917419	20.0	PASS
<b>V<sub>max.</sub></b>	30MHz to 1000MHz	885.782	0.194984	4.0	PASS
	1000MHz to 12500MHz	6062.875	4.187936	20.0	PASS
<b>V<sub>min.</sub></b>	30MHz to 1000MHz	988.360	0.185780	4.0	PASS
	1000MHz to 12500MHz	6432.312	4.508167	20.0	PASS
TEST CHANNEL		CH 39 (2441MHz)			
<b>V<sub>normal</sub></b>	30MHz to 1000MHz	962.897	0.189671	4.0	PASS
	1000MHz to 12500MHz	5861.625	4.497799	20.0	PASS
<b>V<sub>max.</sub></b>	30MHz to 1000MHz	836.433	0.189671	4.0	PASS
	1000MHz to 12500MHz	5940.687	4.149540	20.0	PASS
<b>V<sub>min.</sub></b>	30MHz to 1000MHz	902.878	0.184927	4.0	PASS
	1000MHz to 12500MHz	5904.750	4.405549	20.0	PASS
TEST CHANNEL		CH 78 (2480MHz)			
<b>V<sub>normal</sub></b>	30MHz to 1000MHz	620.366	0.154525	4.0	PASS
	1000MHz to 12500MHz	5917.687	4.508167	20.0	PASS
<b>V<sub>max.</sub></b>	30MHz to 1000MHz	854.863	0.170608	4.0	PASS
	1000MHz to 12500MHz	6773.000	4.405549	20.0	PASS
<b>V<sub>min.</sub></b>	30MHz to 1000MHz	956.350	0.187499	4.0	PASS
	1000MHz to 12500MHz	5876.000	4.159106	20.0	PASS

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

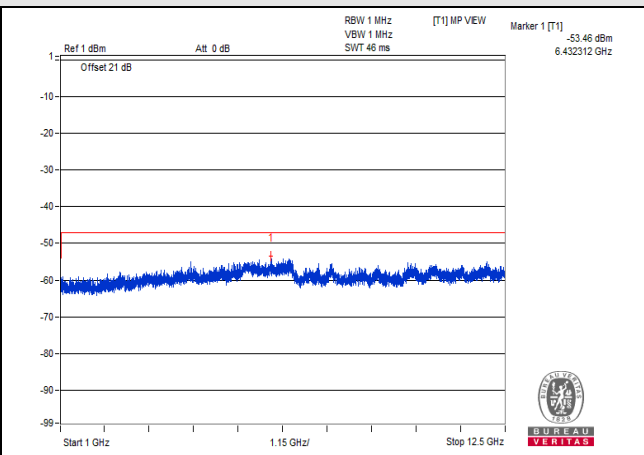
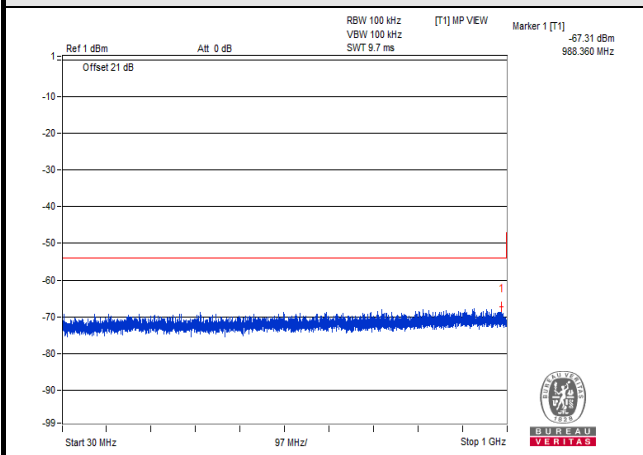
### V<sub>normal</sub>



### V<sub>max.</sub>

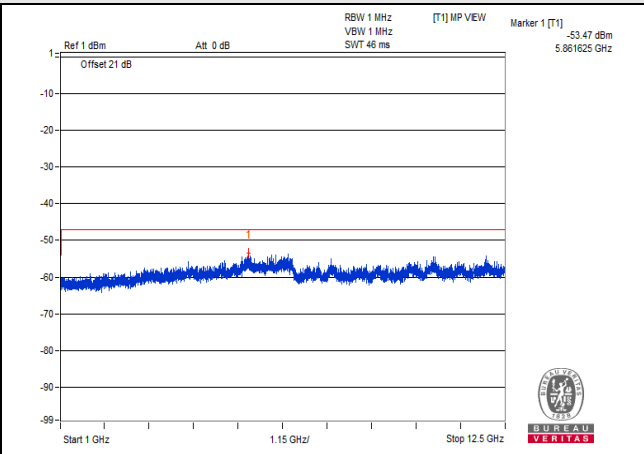
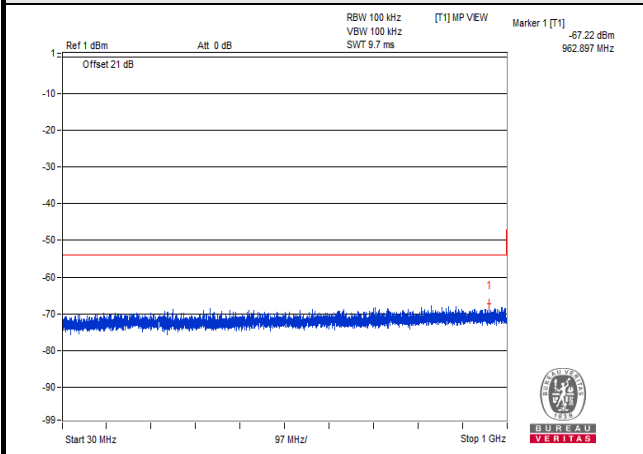


### V<sub>min.</sub>

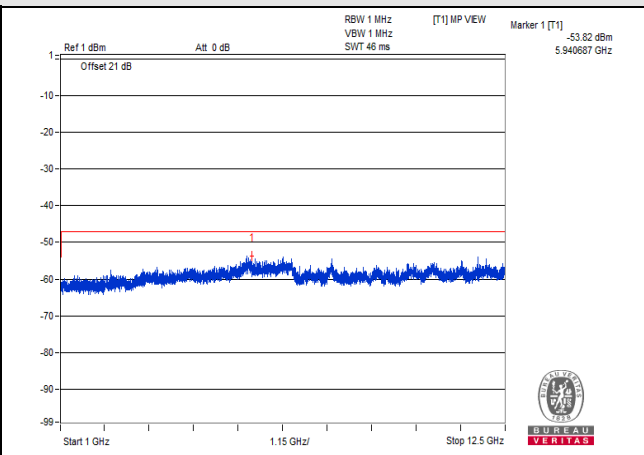
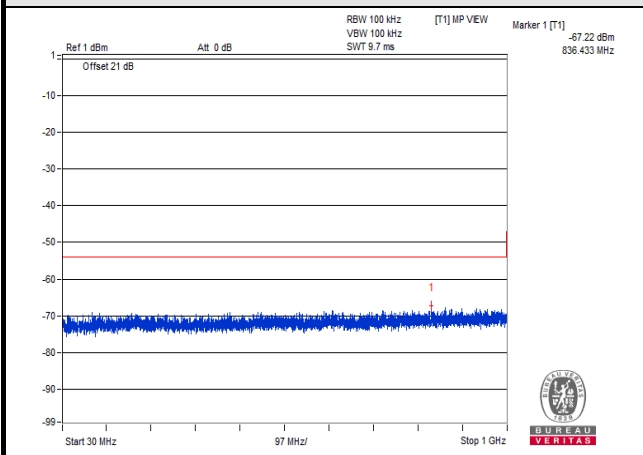


CH 0 (2402MHz)

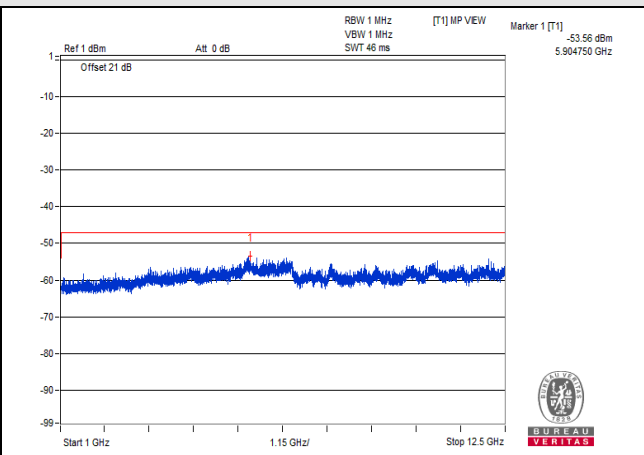
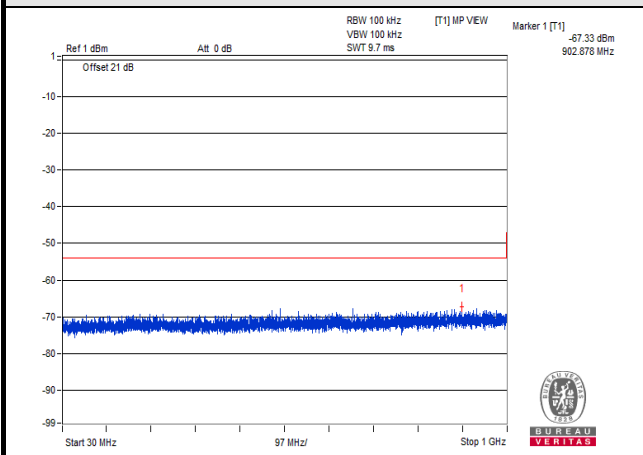
### V<sub>normal</sub>



### V<sub>max</sub>

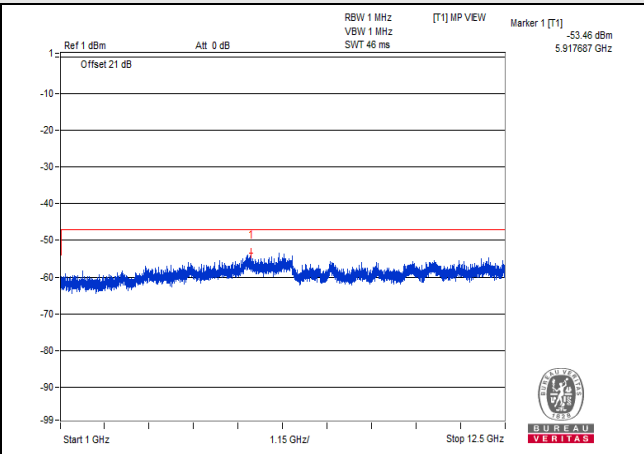
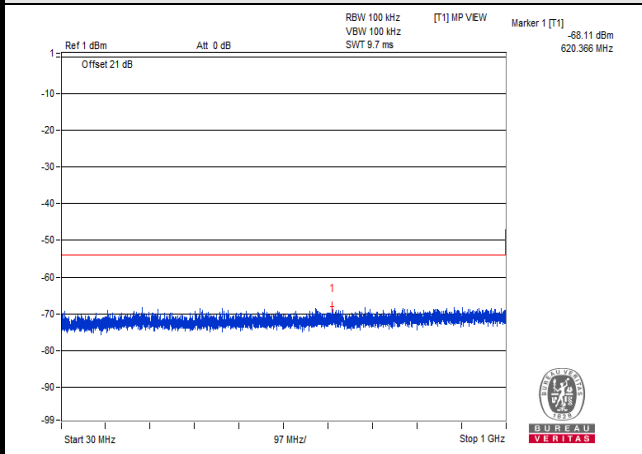


### V<sub>min</sub>

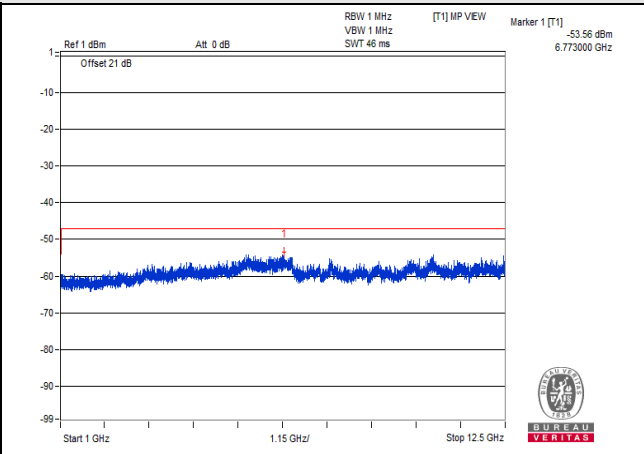
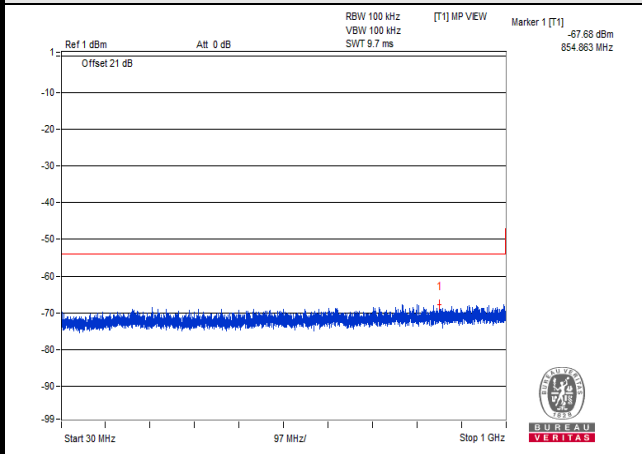


CH 39 (2441MHz)

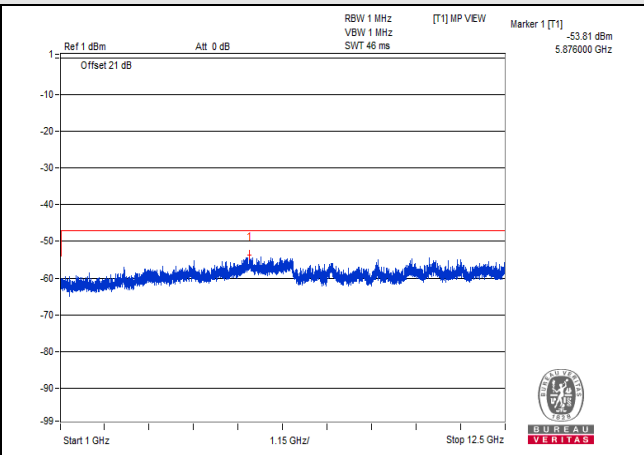
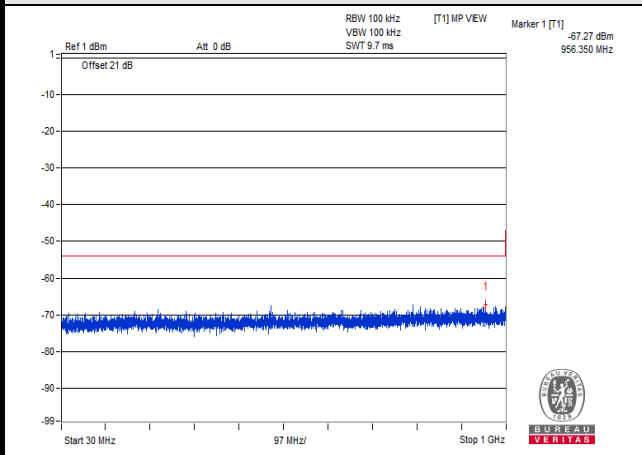
### V<sub>normal</sub>



### 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 second

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

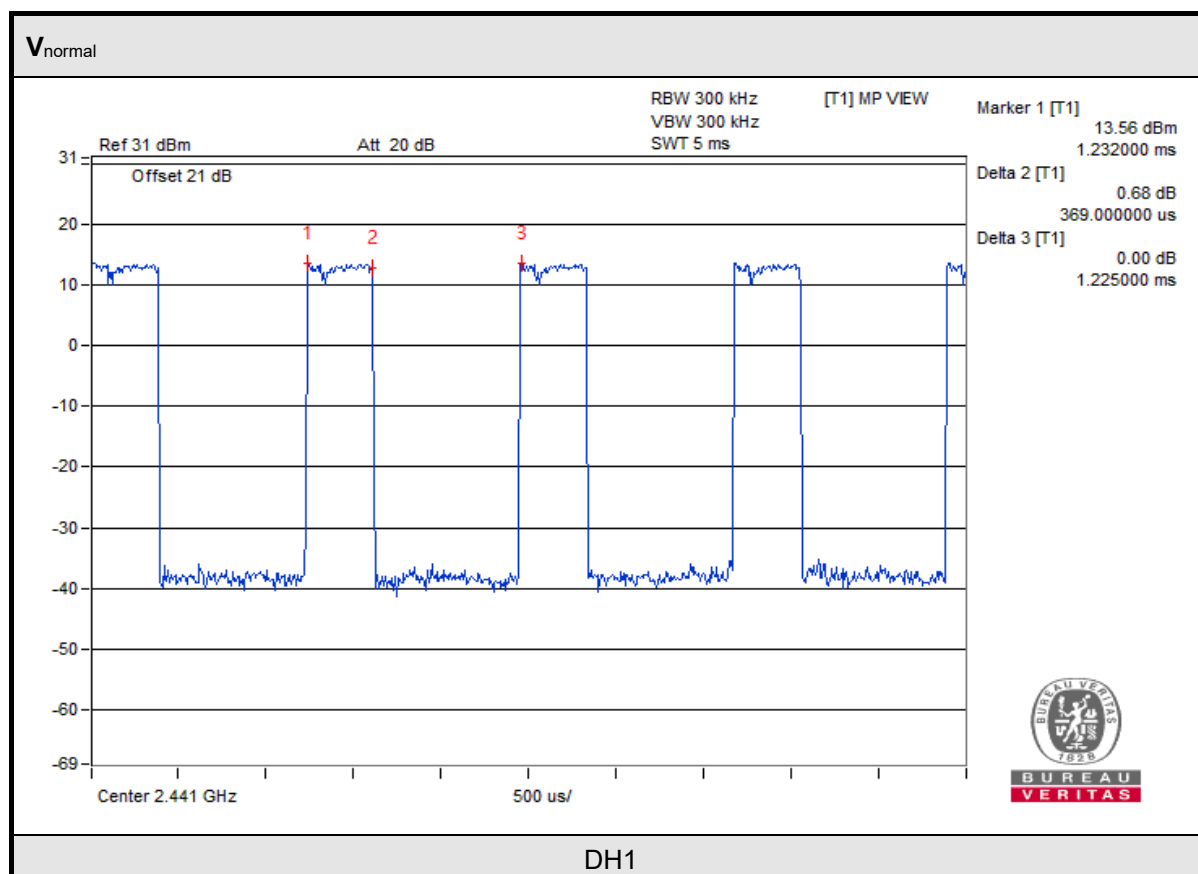
### 4.7.2 Test Setup



### 4.7.3 Test Results (Mode 1)

Modulation: GFSK  
 Normal Mode:

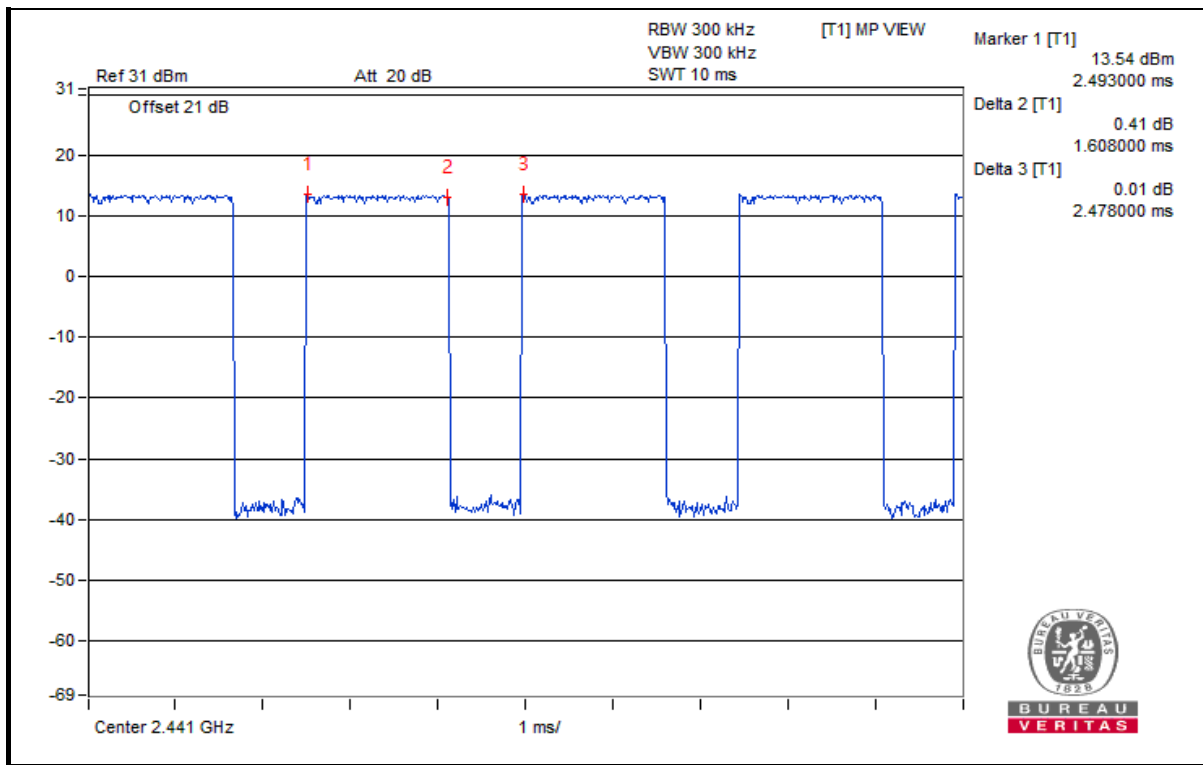
Test Condition	Mode	Diffusion Rate	[Diffusion Rate/79]*0.4 sec	Duty Cycle	Result (msec)	Limit (msec)
<b>V<sub>normal</sub></b>	DH1	69.56	0.352	0.301	105.952	400
	DH3	69.56	0.352	0.648	228.096	400
	DH5	69.56	0.352	0.761	267.872	400
<b>V<sub>max.</sub></b>	DH1	69.60	0.352	0.301	105.952	400
	DH3	69.60	0.352	0.648	228.096	400
	DH5	69.60	0.352	0.761	267.872	400
<b>V<sub>min.</sub></b>	DH1	69.80	0.353	0.301	106.253	400
	DH3	69.80	0.353	0.648	228.744	400
	DH5	69.80	0.353	0.761	268.633	400



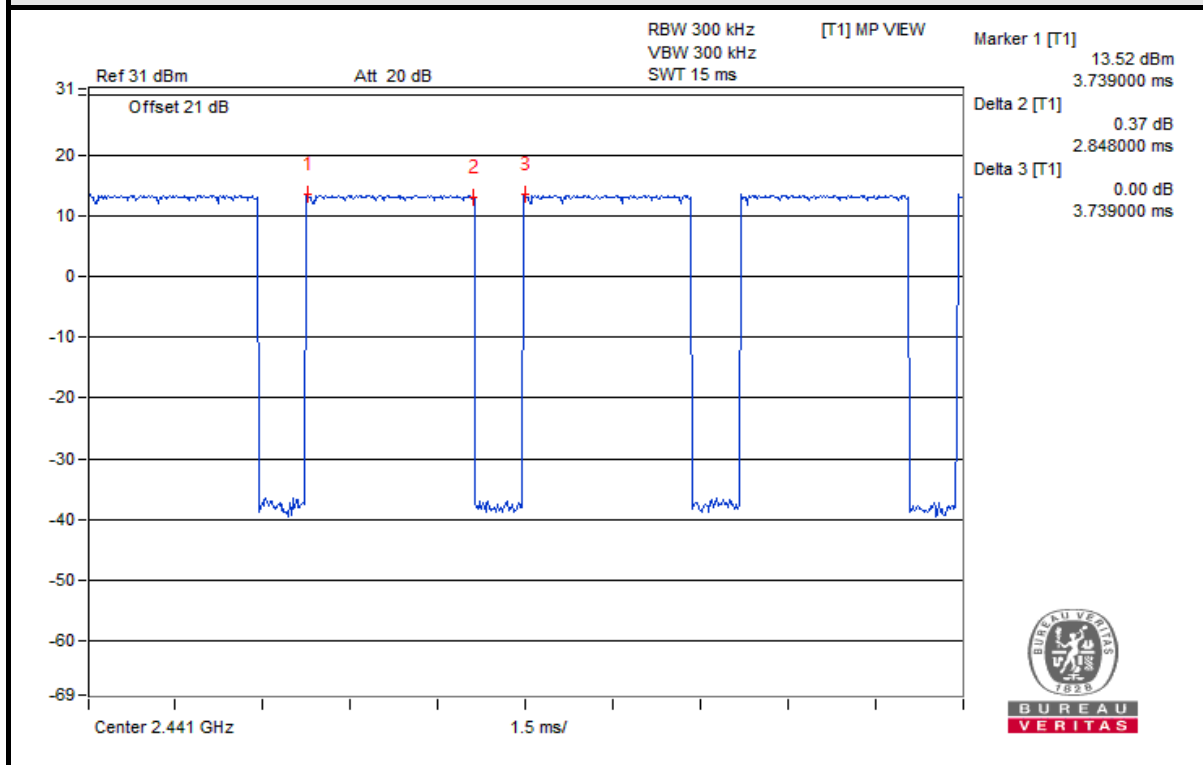




BUREAU  
VERITAS



DH3

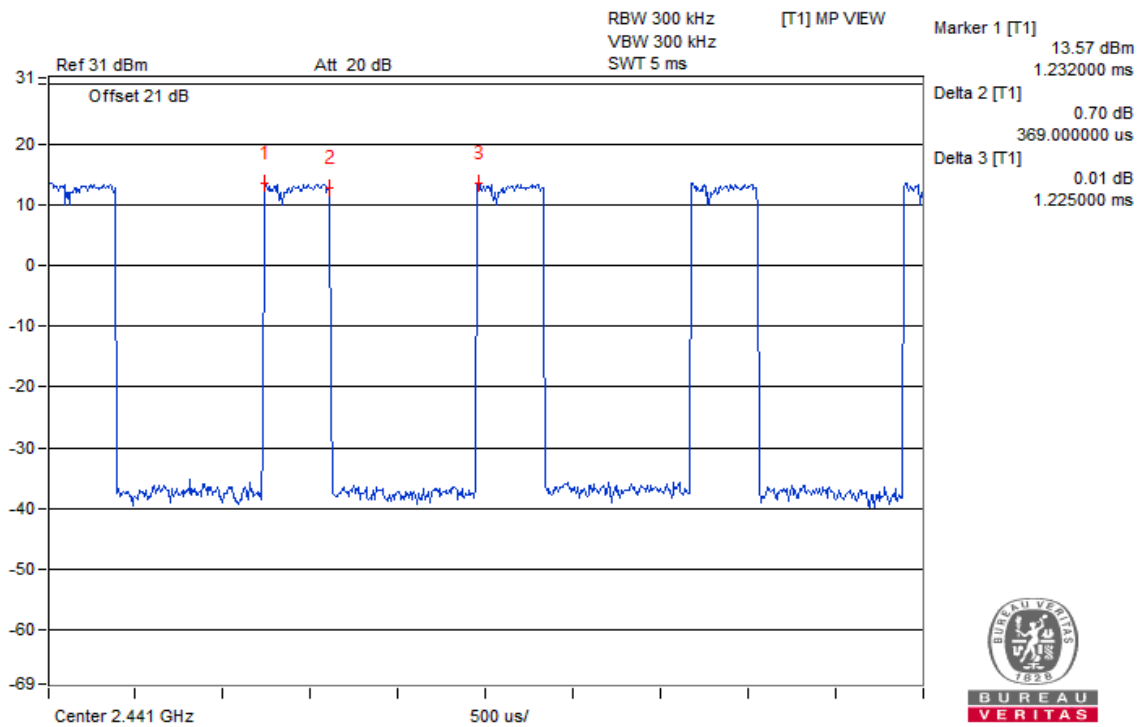


DH5

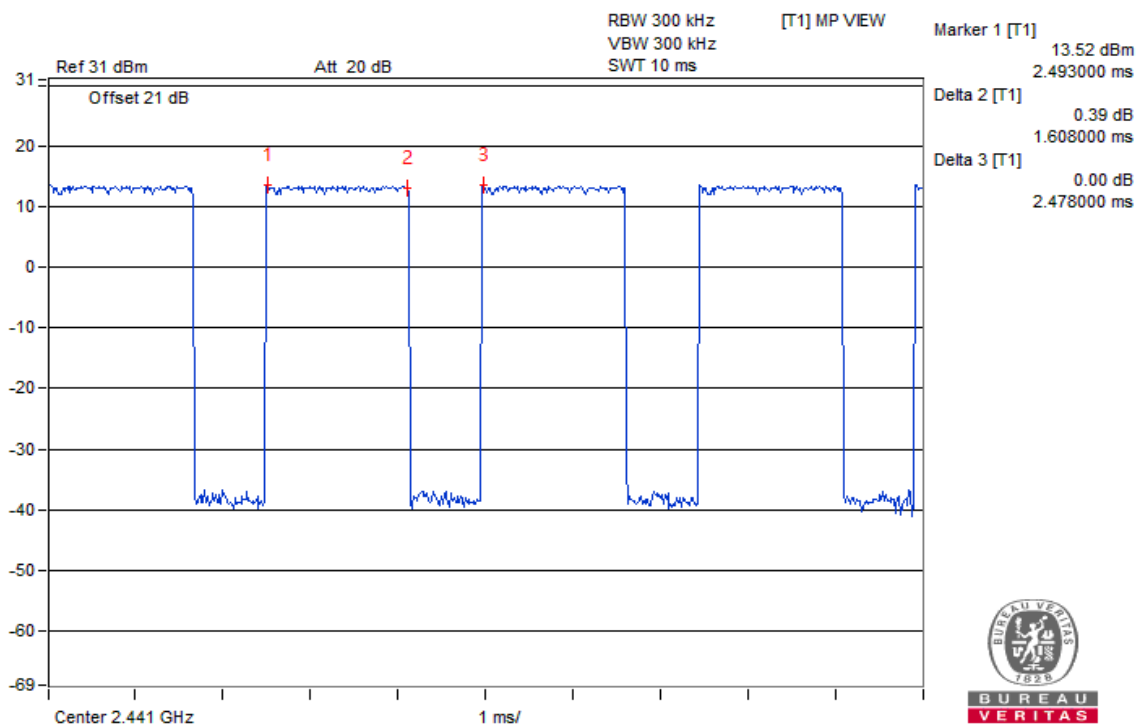


BUREAU  
VERITAS

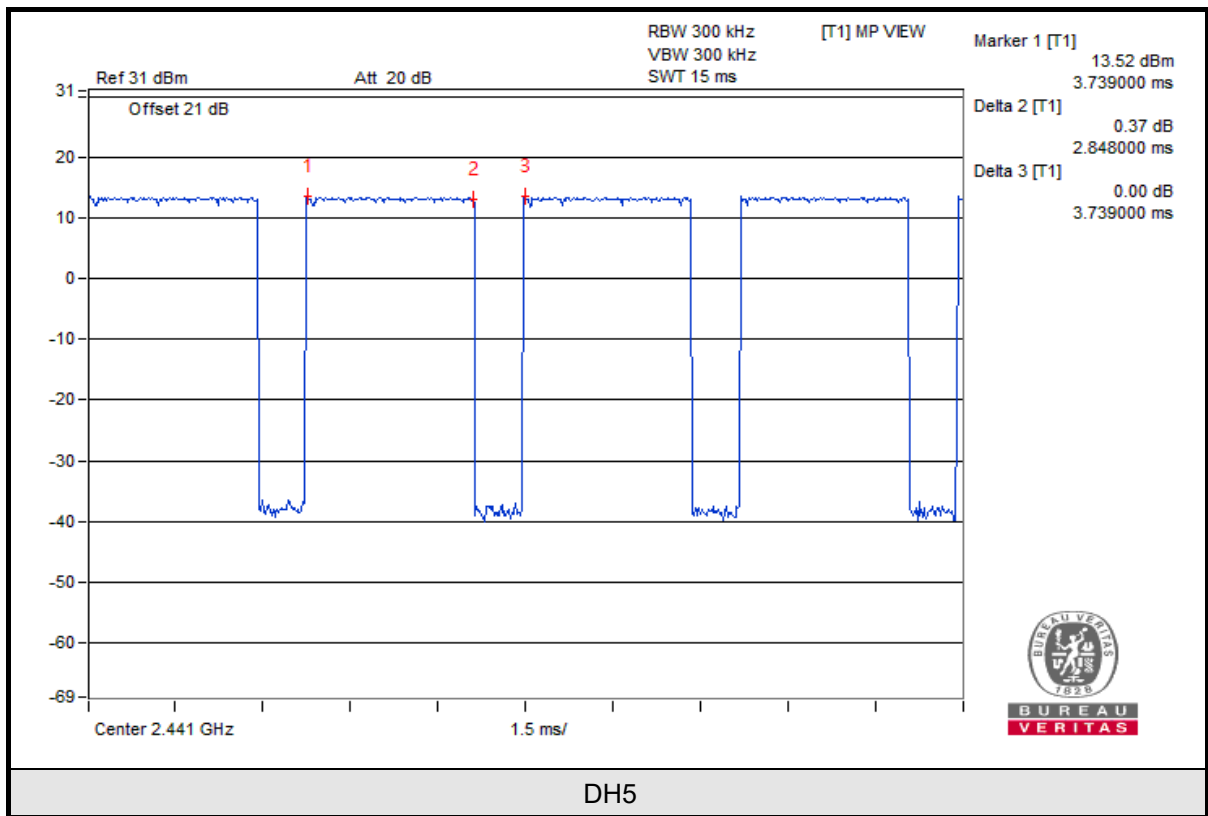
V<sub>max</sub>.



DH1



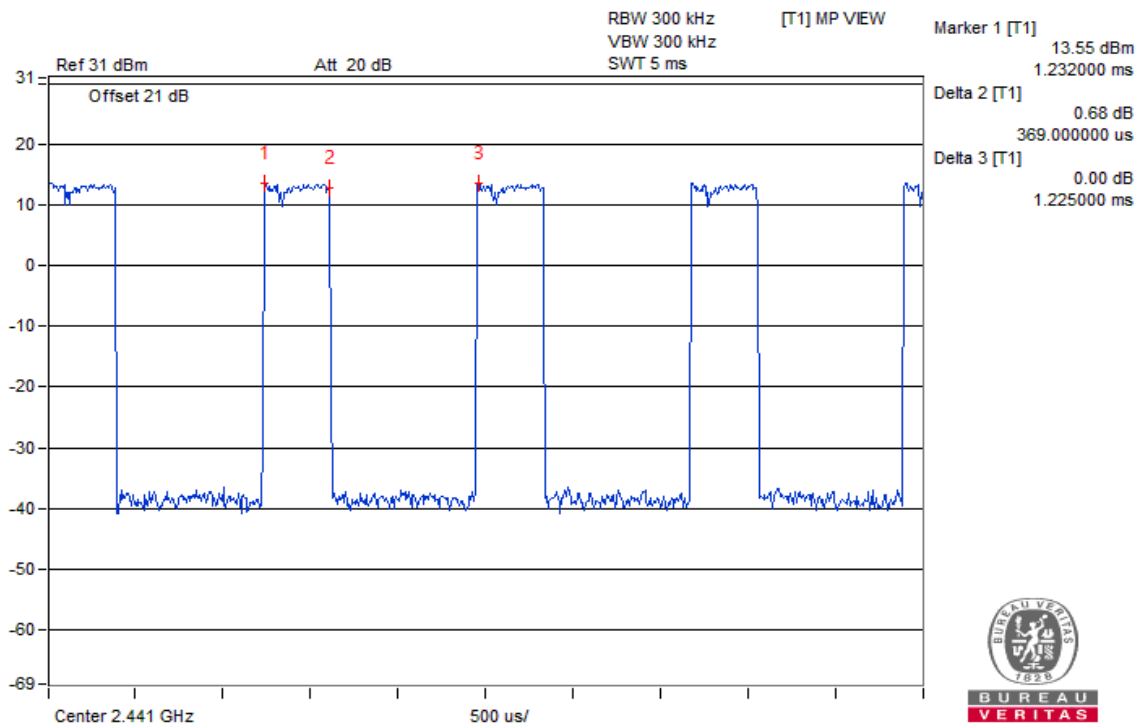
DH3



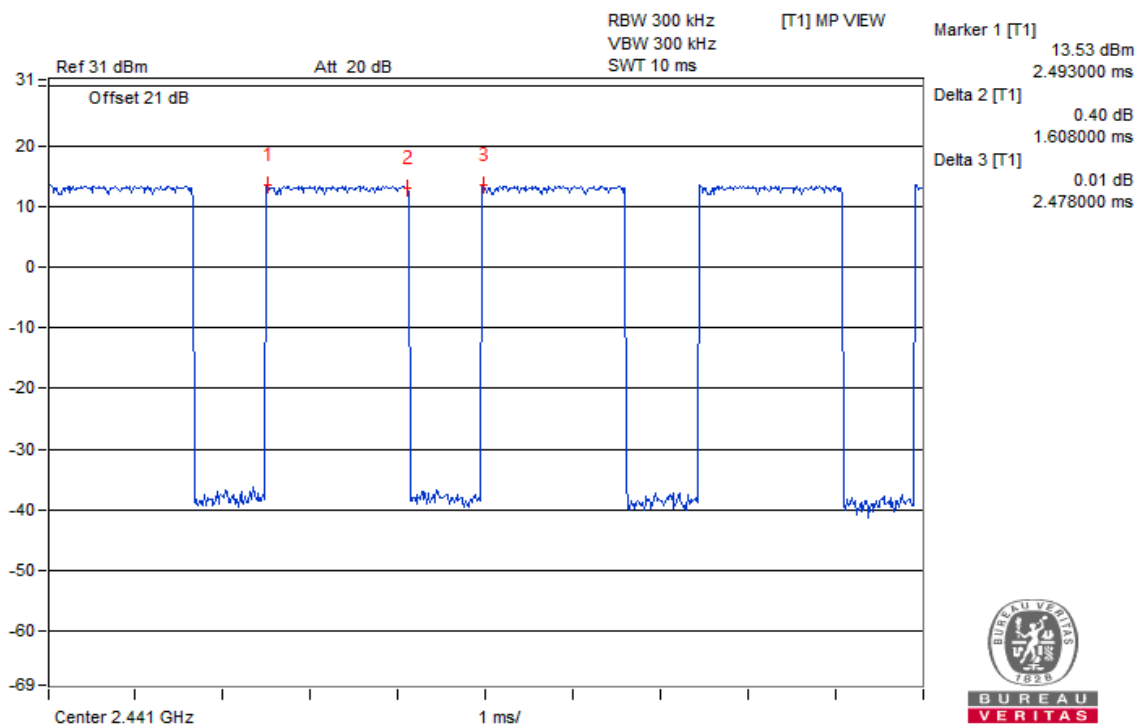


BUREAU  
VERITAS

V<sub>min</sub>.



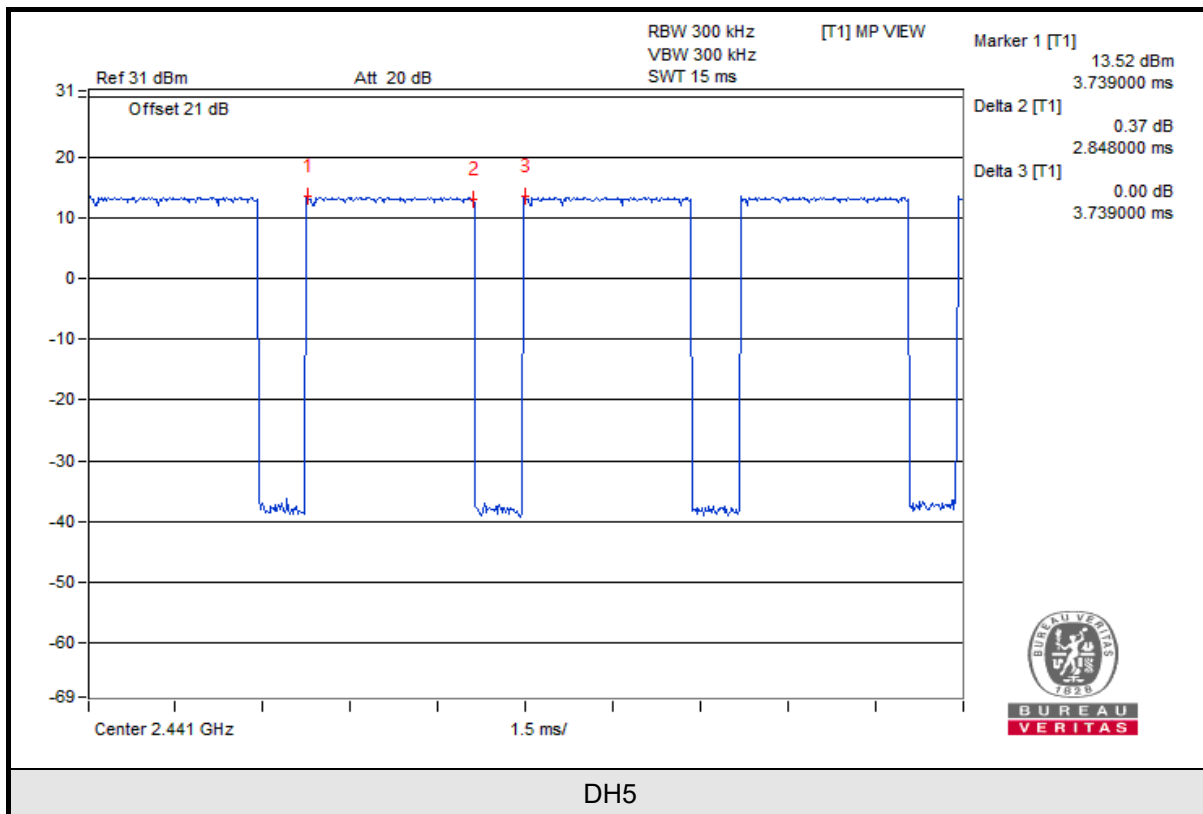
DH1



DH3

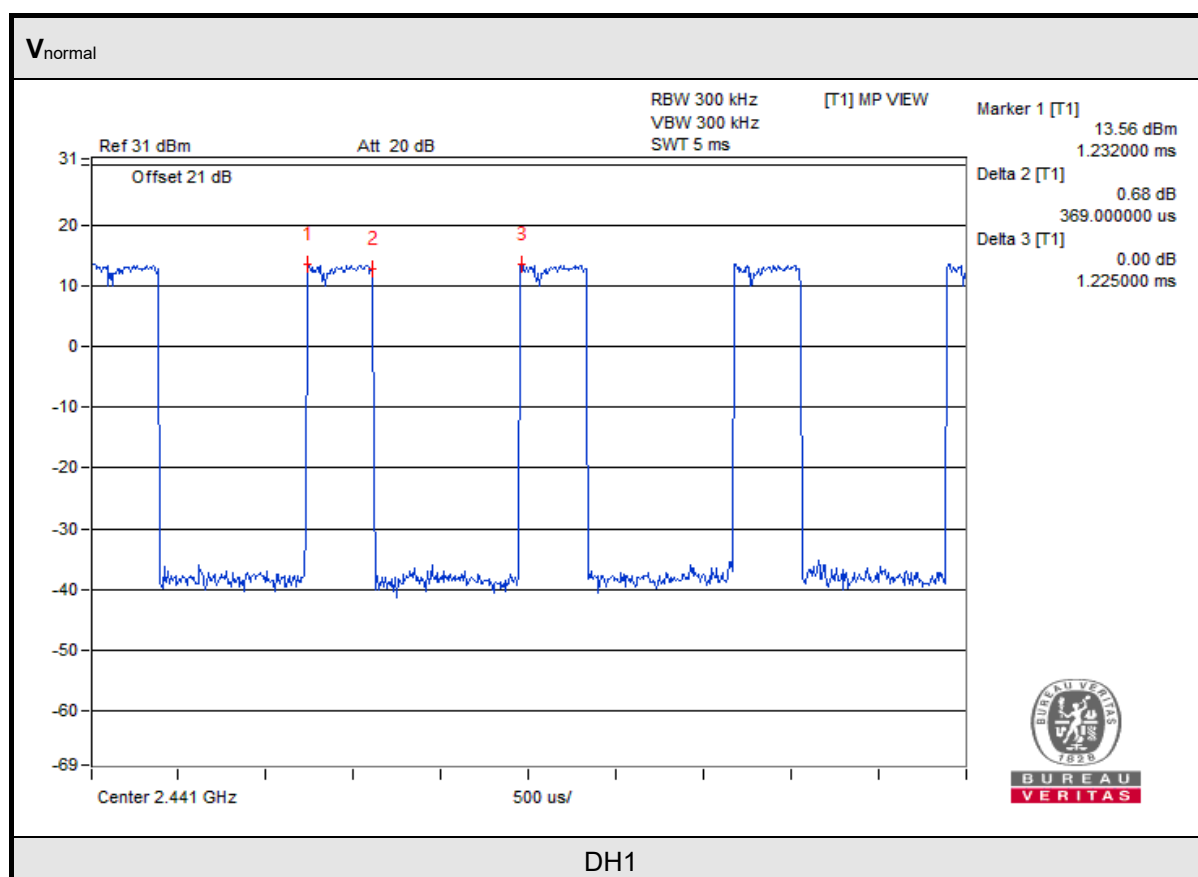


BUREAU  
VERITAS



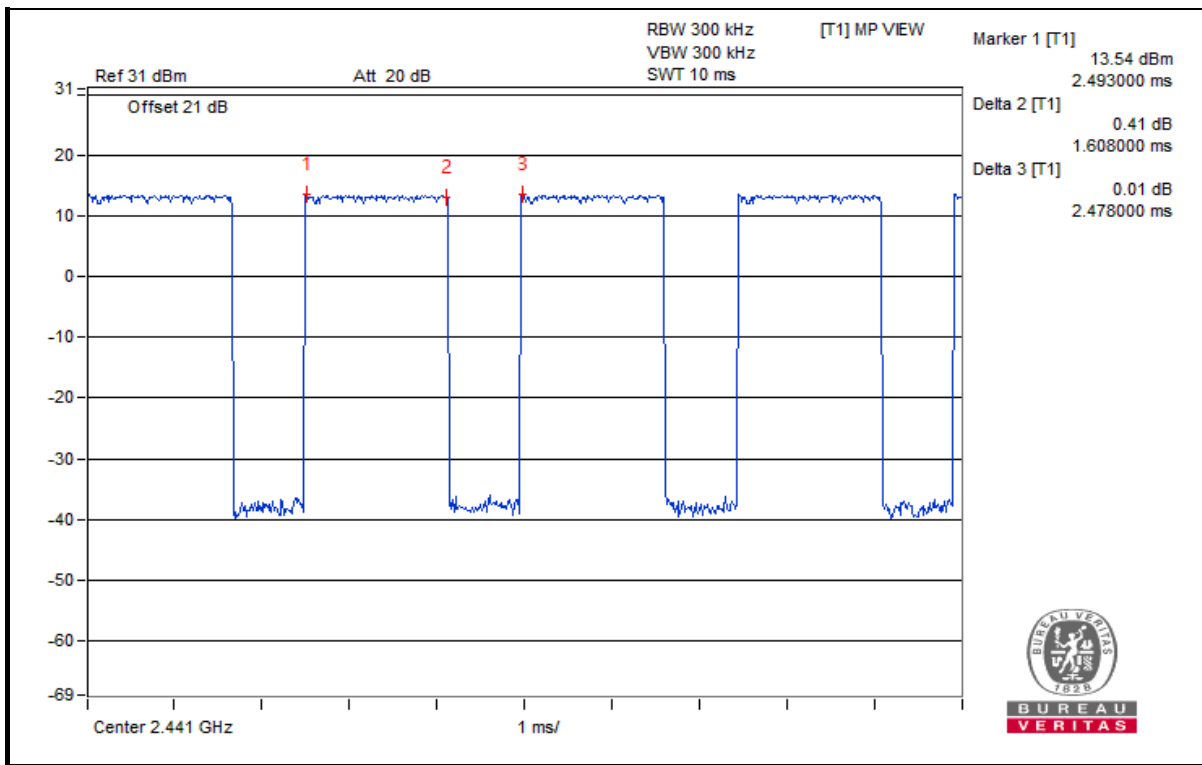
**AFH Mode:**

Test Condition	Mode	Diffusion Rate	[Diffusion Rate/20]*0.4 sec	Duty Cycle	Result (msec)	Limit (msec)
<b>V<sub>normal</sub></b>	DH1	18.41	0.368	0.301	110.768	400
	DH3	18.41	0.368	0.648	238.464	400
	DH5	18.41	0.368	0.761	280.048	400
<b>V<sub>max.</sub></b>	DH1	18.12	0.362	0.301	108.962	400
	DH3	18.12	0.362	0.648	234.576	400
	DH5	18.12	0.362	0.761	275.482	400
<b>V<sub>min.</sub></b>	DH1	18.05	0.361	0.301	108.661	400
	DH3	18.05	0.361	0.648	233.928	400
	DH5	18.05	0.361	0.761	274.721	400

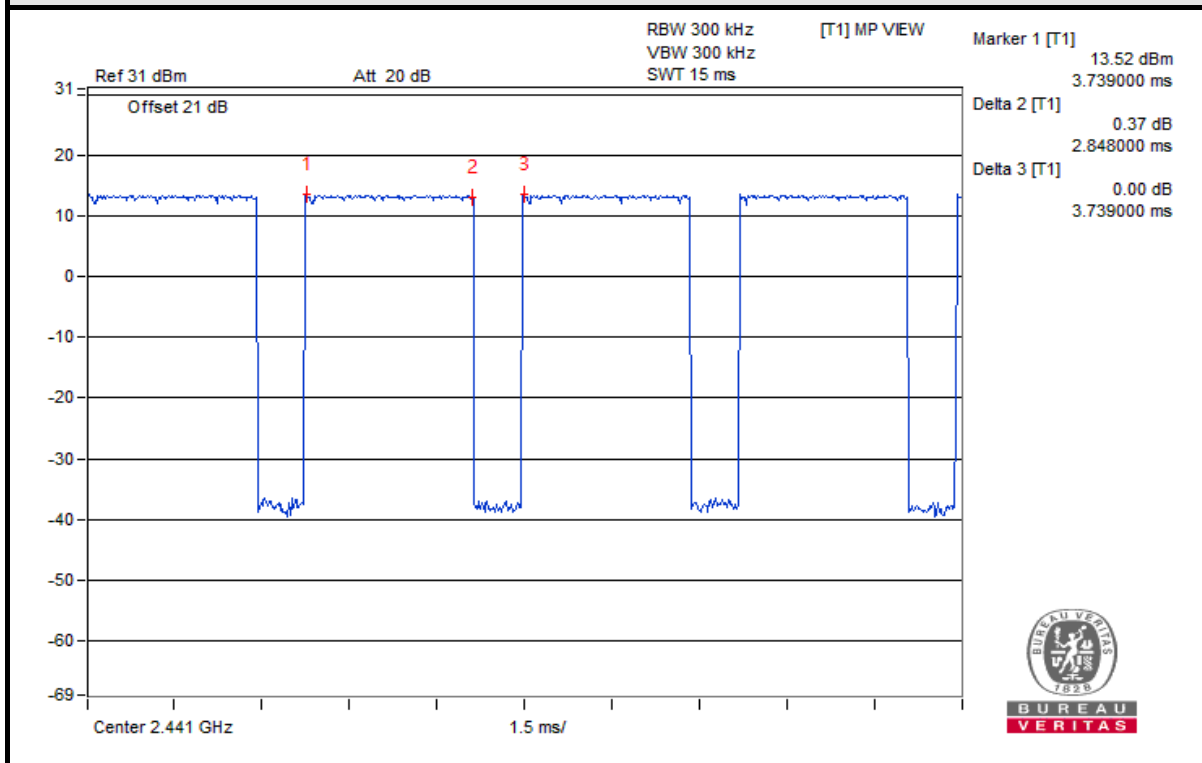




BUREAU  
VERITAS

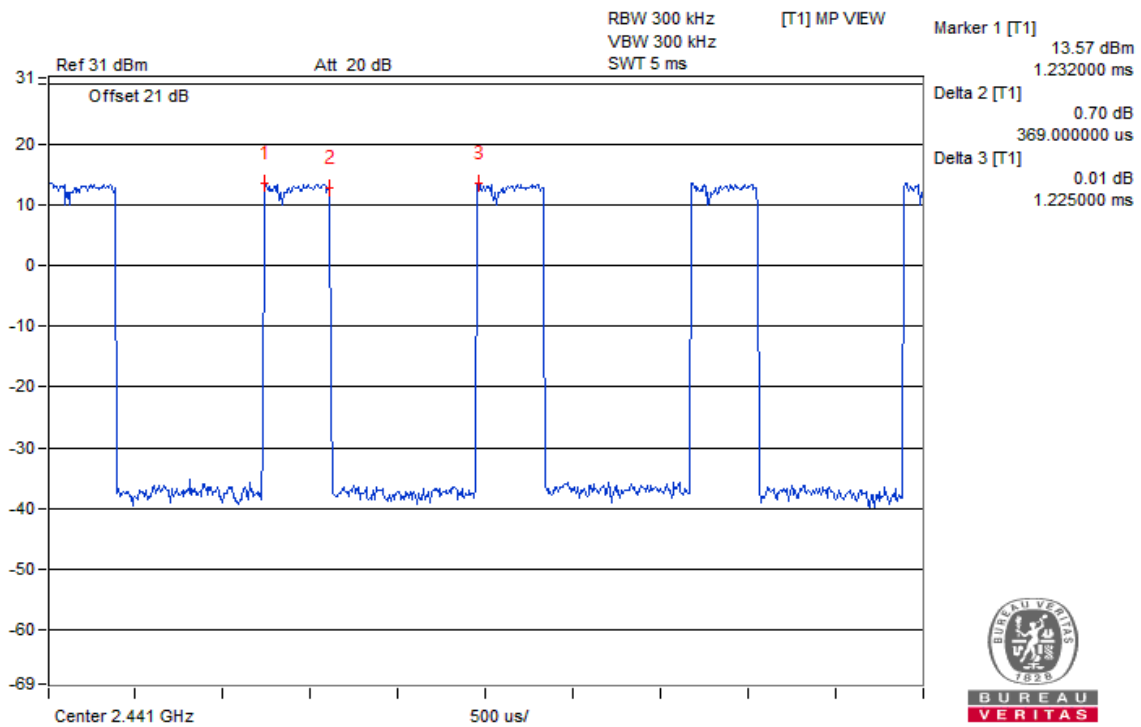


DH3

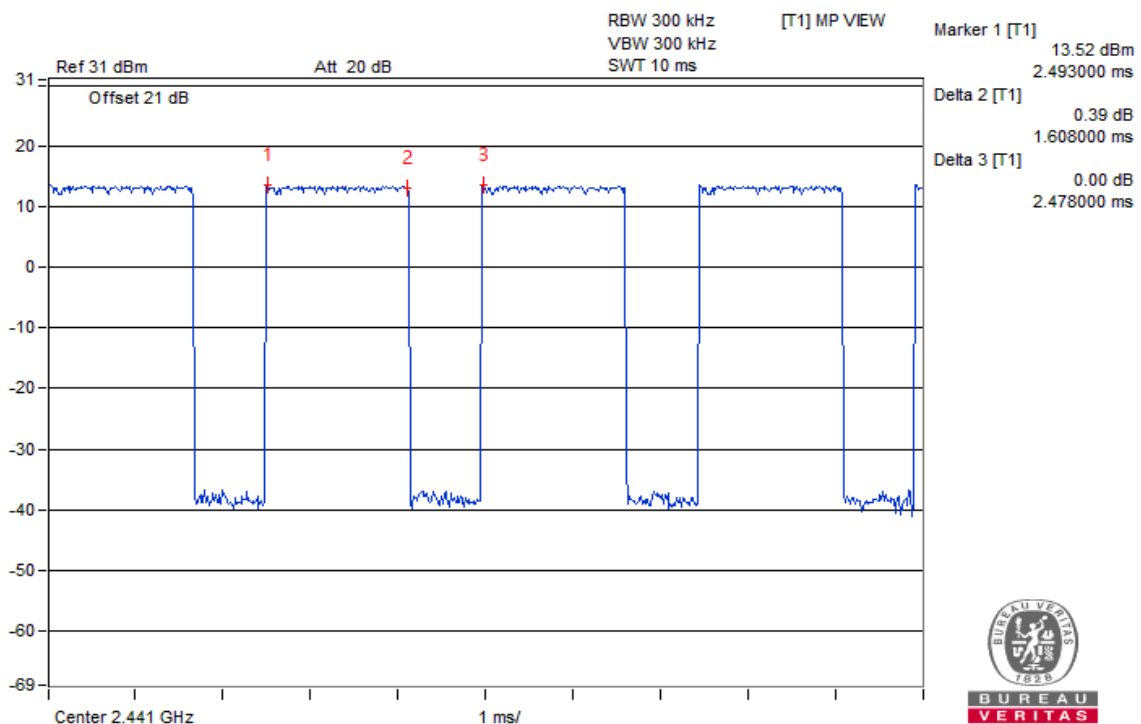


DH5

V<sub>max</sub>.

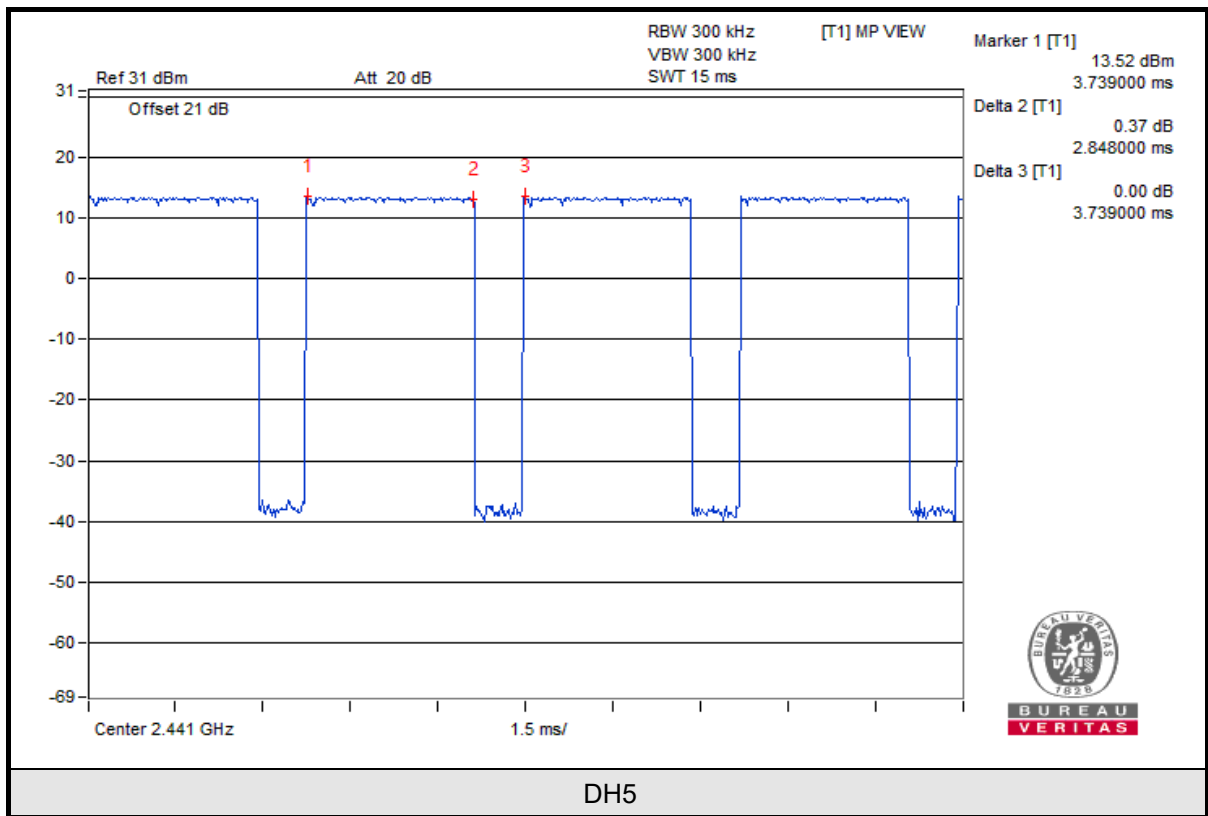


DH1



DH3

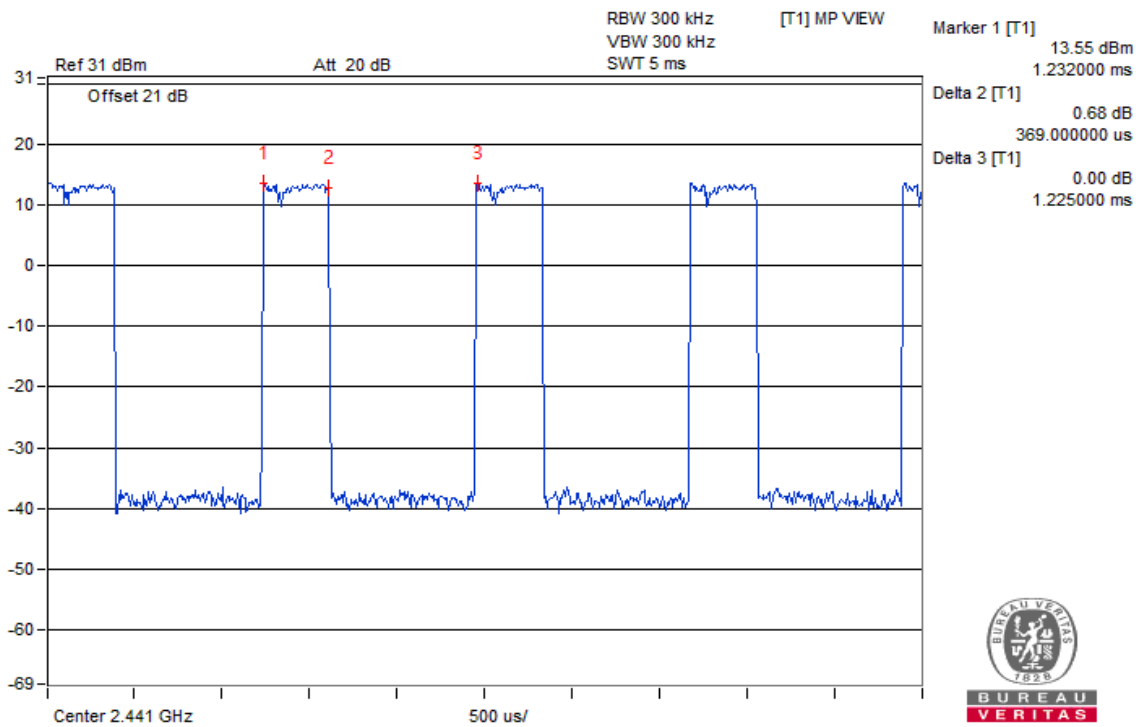




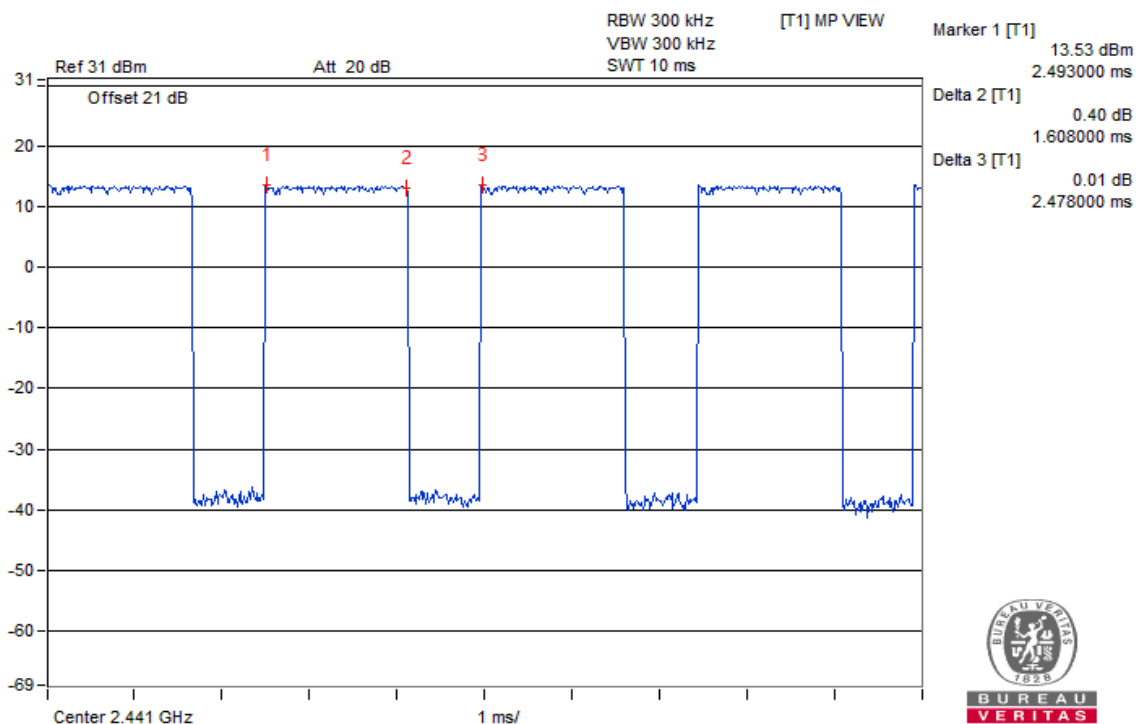


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VERITAS

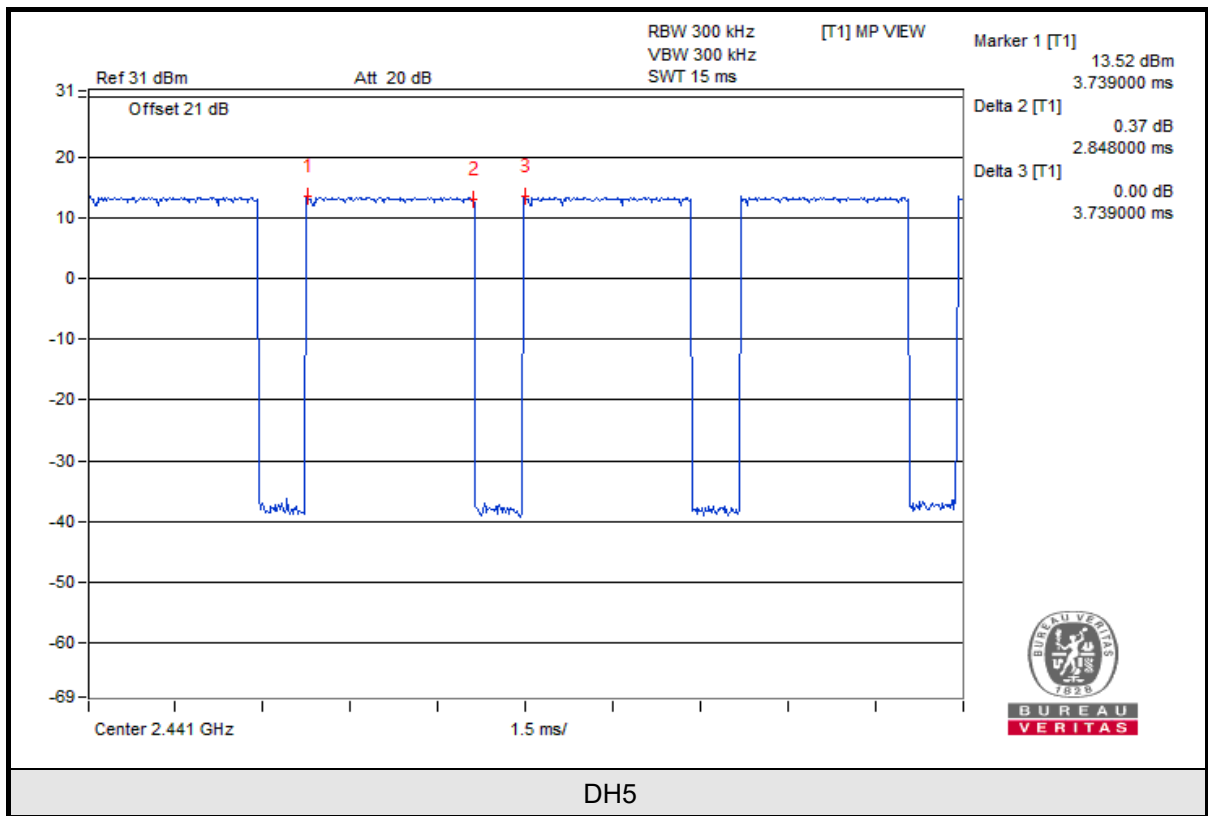
V<sub>min</sub>.



DH1



DH3

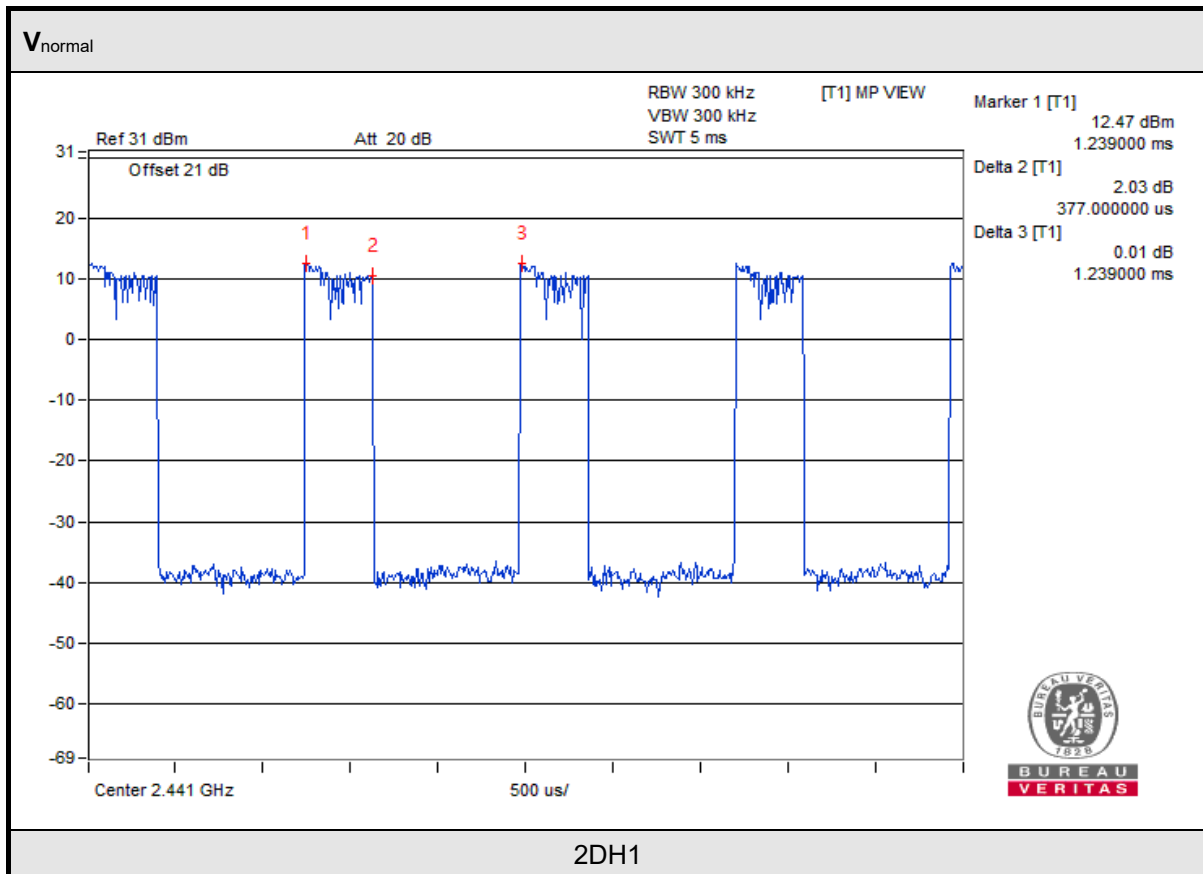




Modulation:  $\pi/4$ -DQPSK

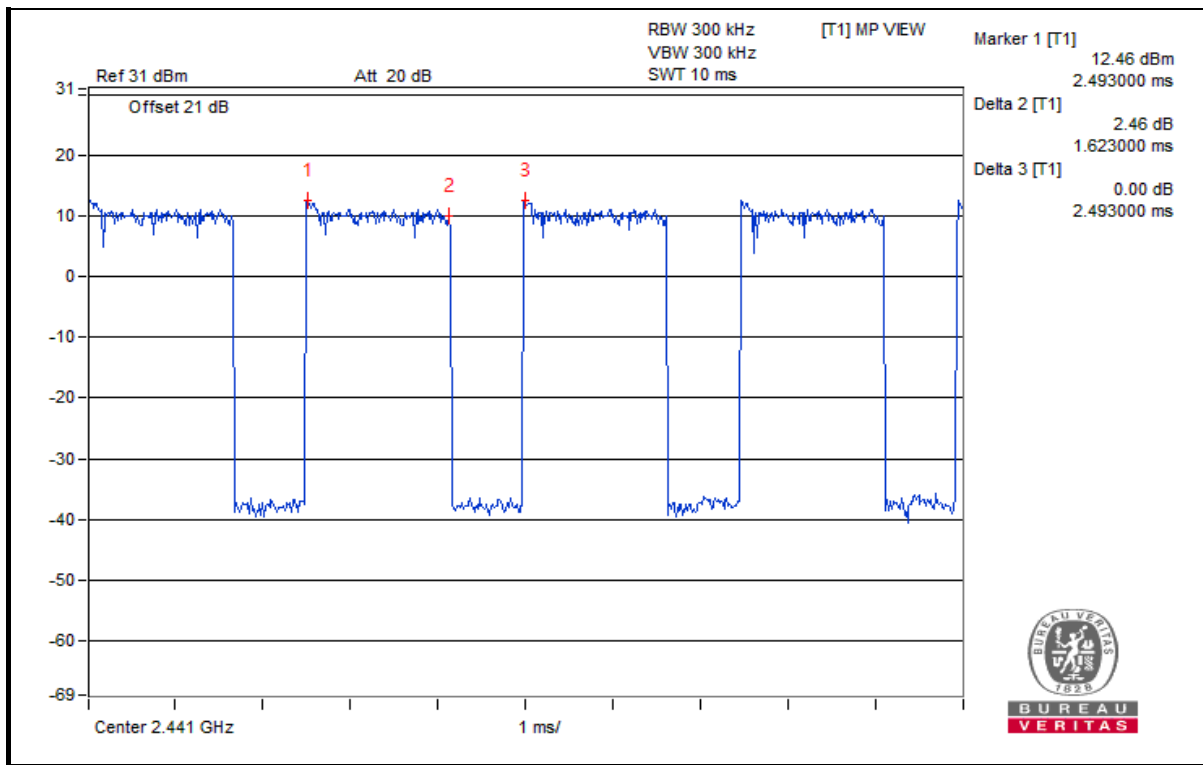
Normal Mode:

Test Condition	Mode	Diffusion Rate	[Diffusion Rate/79]*0.4 sec	Duty Cycle	Result (msec)	Limit (msec)
V <sub>normal</sub>	2DH1	69.60	0.352	0.304	107.008	400
	2DH3	69.60	0.352	0.651	229.152	400
	2DH5	69.60	0.352	0.761	267.872	400
V <sub>max.</sub>	2DH1	69.40	0.351	0.304	106.704	400
	2DH3	69.40	0.351	0.651	228.501	400
	2DH5	69.40	0.351	0.754	264.654	400
V <sub>min.</sub>	2DH1	69.60	0.352	0.304	107.008	400
	2DH3	69.60	0.352	0.651	229.152	400
	2DH5	69.60	0.352	0.754	265.408	400

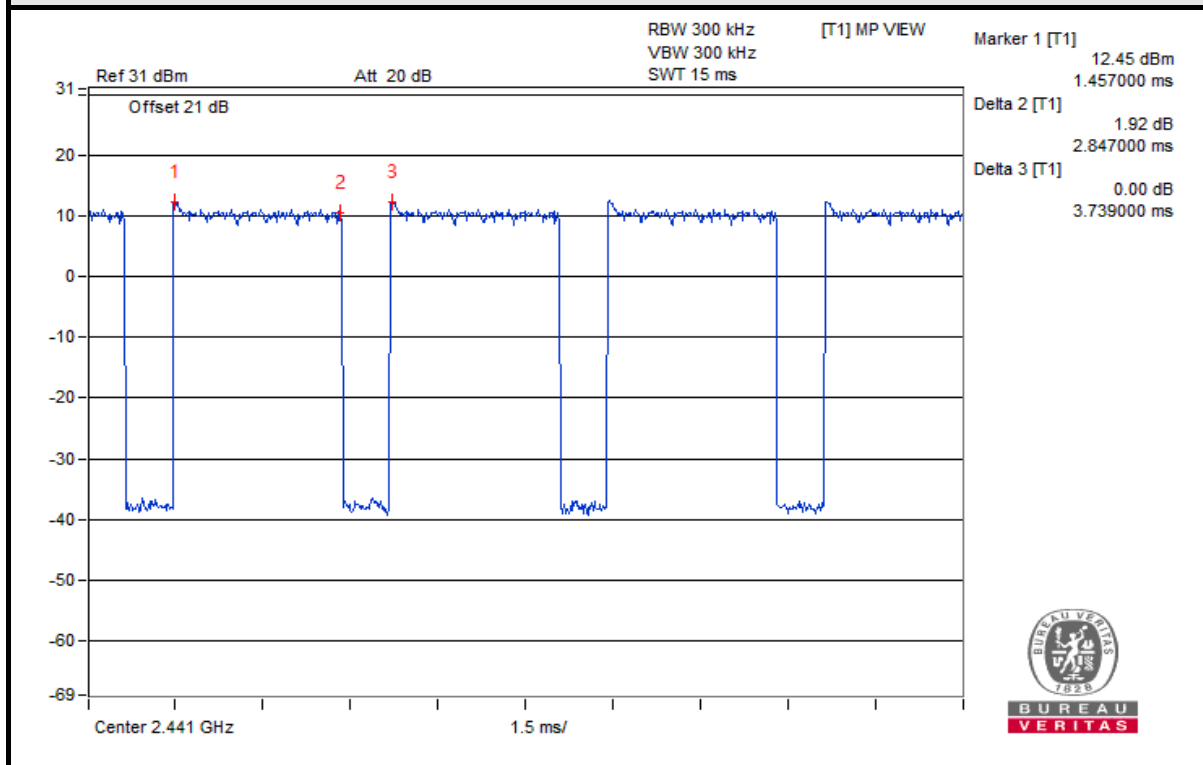




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VERITAS



2DH3

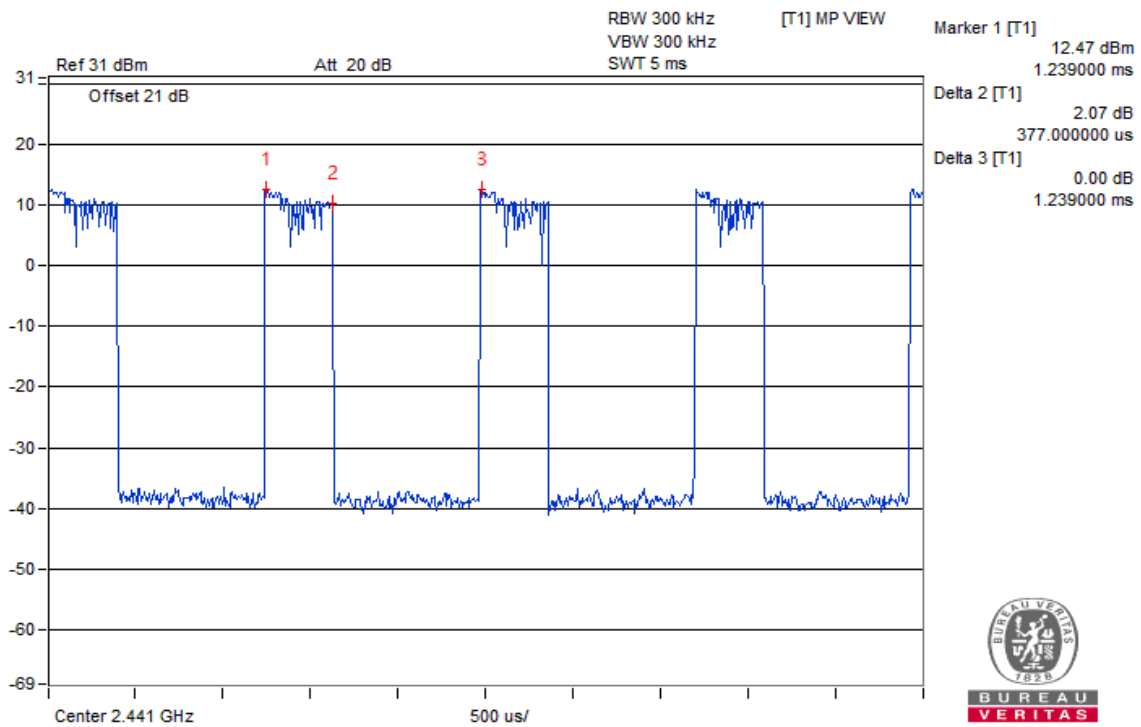


2DH5

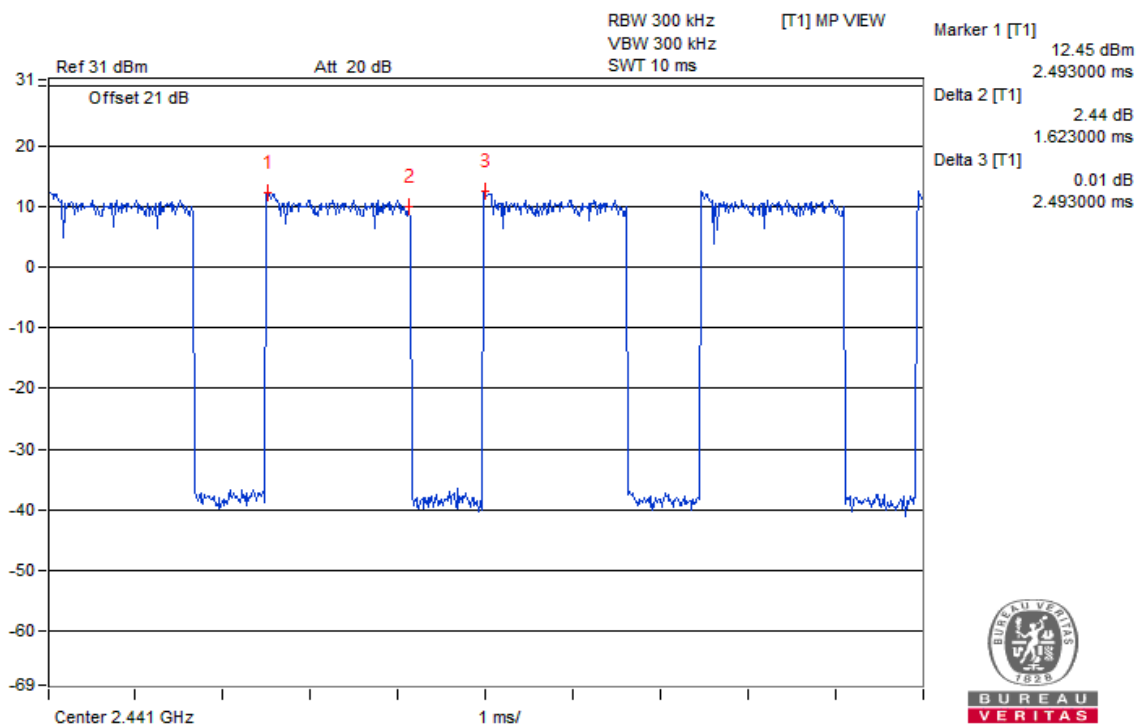


BUREAU  
VERITAS

V<sub>max</sub>.



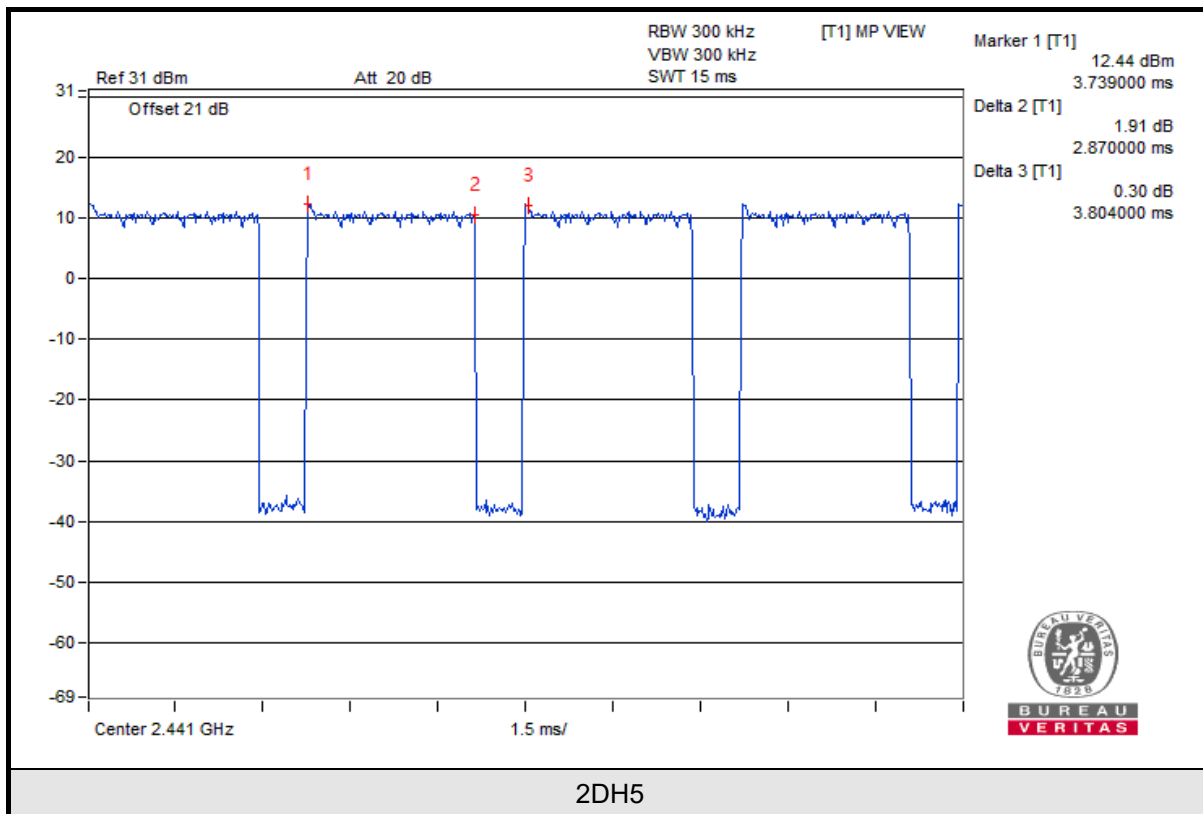
2DH1



2DH3



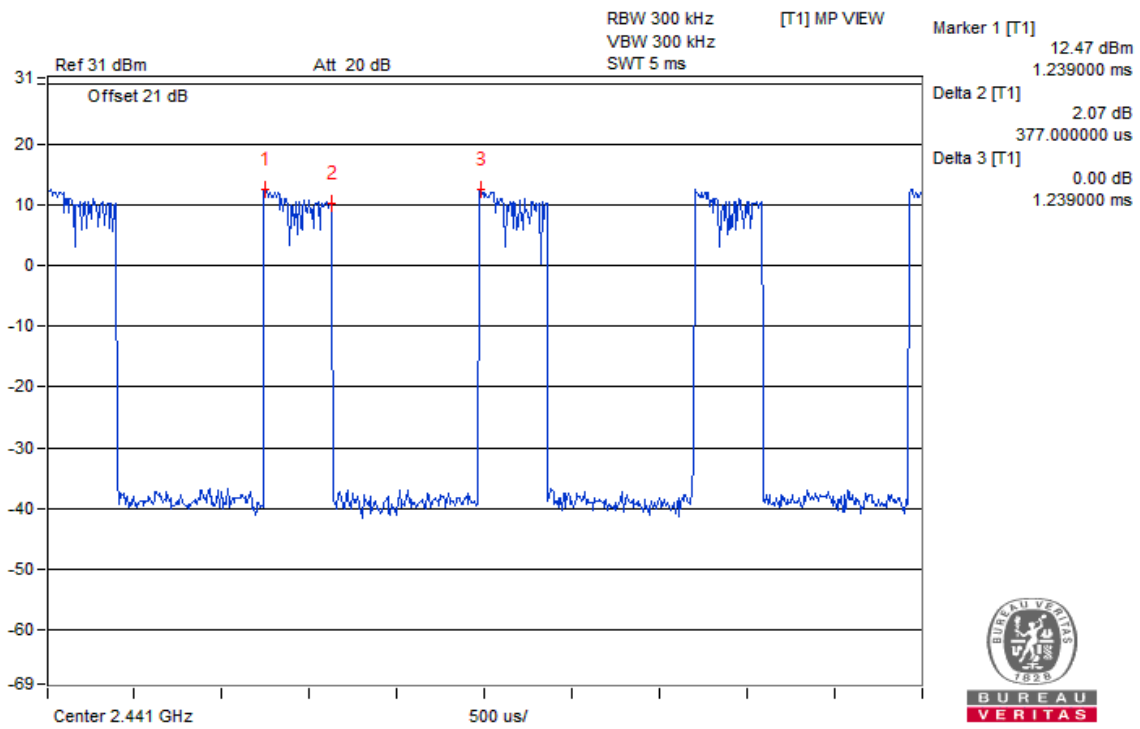
BUREAU  
VERITAS



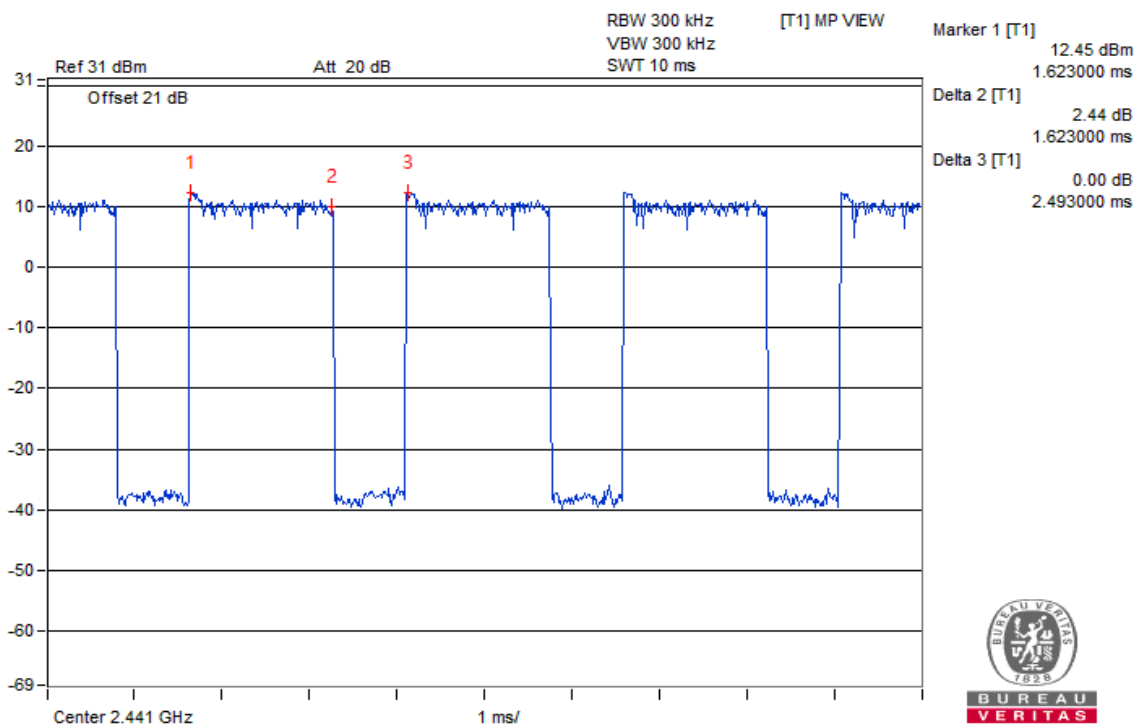


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VERITAS

V<sub>min</sub>.



2DH1

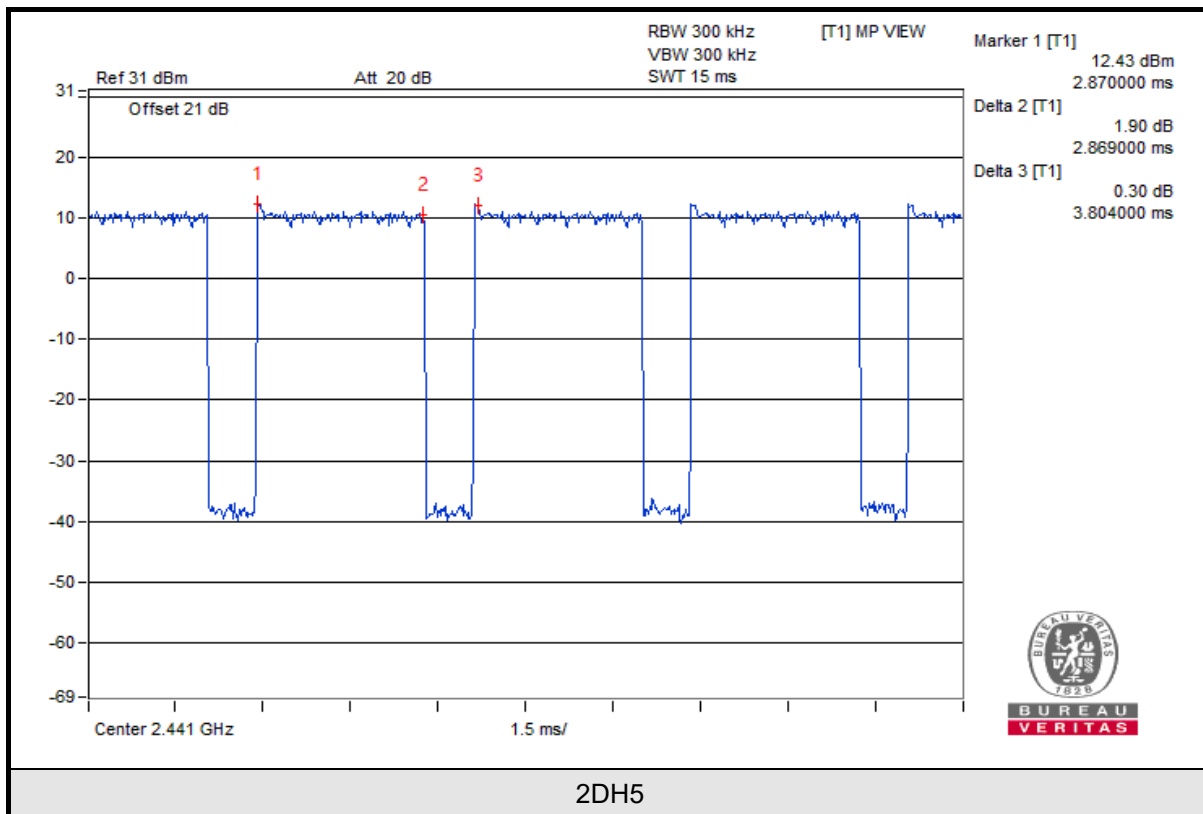


2DH3





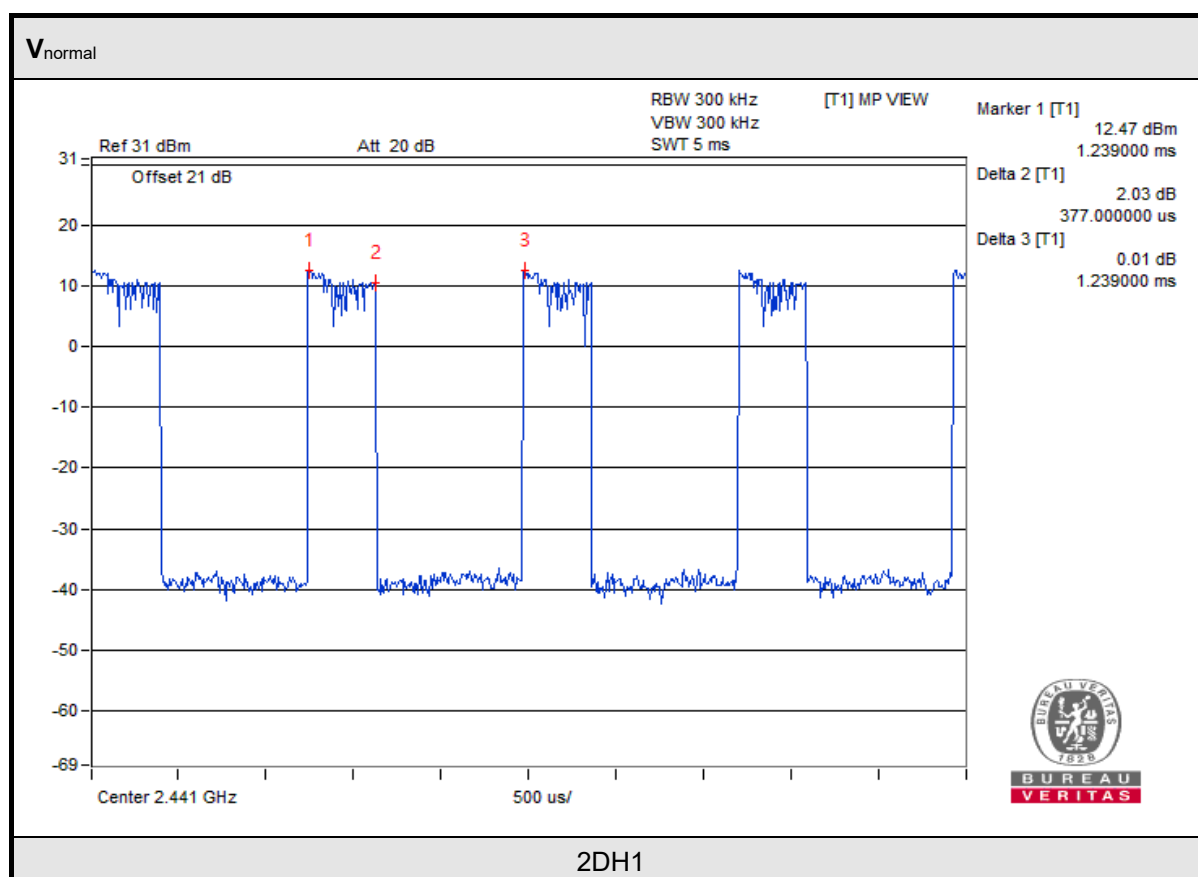
BUREAU  
VERITAS



BUREAU  
VERITAS

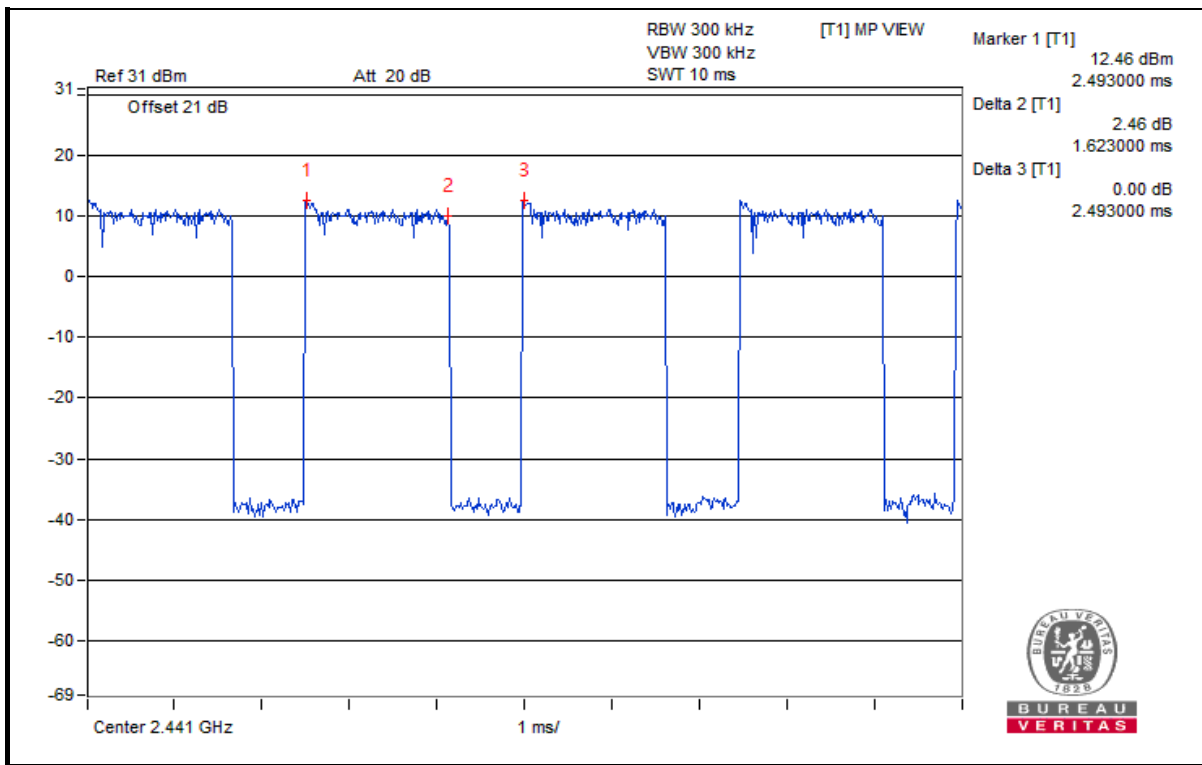
**AFH Mode:**

Test Condition	Mode	Diffusion Rate	[Diffusion Rate/20]*0.4 sec	Duty Cycle	Result (msec)	Limit (msec)
<b>V<sub>normal</sub></b>	2DH1	18.26	0.365	0.304	110.960	400
	2DH3	18.26	0.365	0.651	237.615	400
	2DH5	18.26	0.365	0.761	277.765	400
<b>V<sub>max.</sub></b>	2DH1	18.19	0.363	0.304	110.352	400
	2DH3	18.19	0.363	0.651	236.313	400
	2DH5	18.19	0.363	0.754	273.702	400
<b>V<sub>min.</sub></b>	2DH1	18.26	0.365	0.304	110.960	400
	2DH3	18.26	0.365	0.651	237.615	400
	2DH5	18.26	0.365	0.754	275.210	400

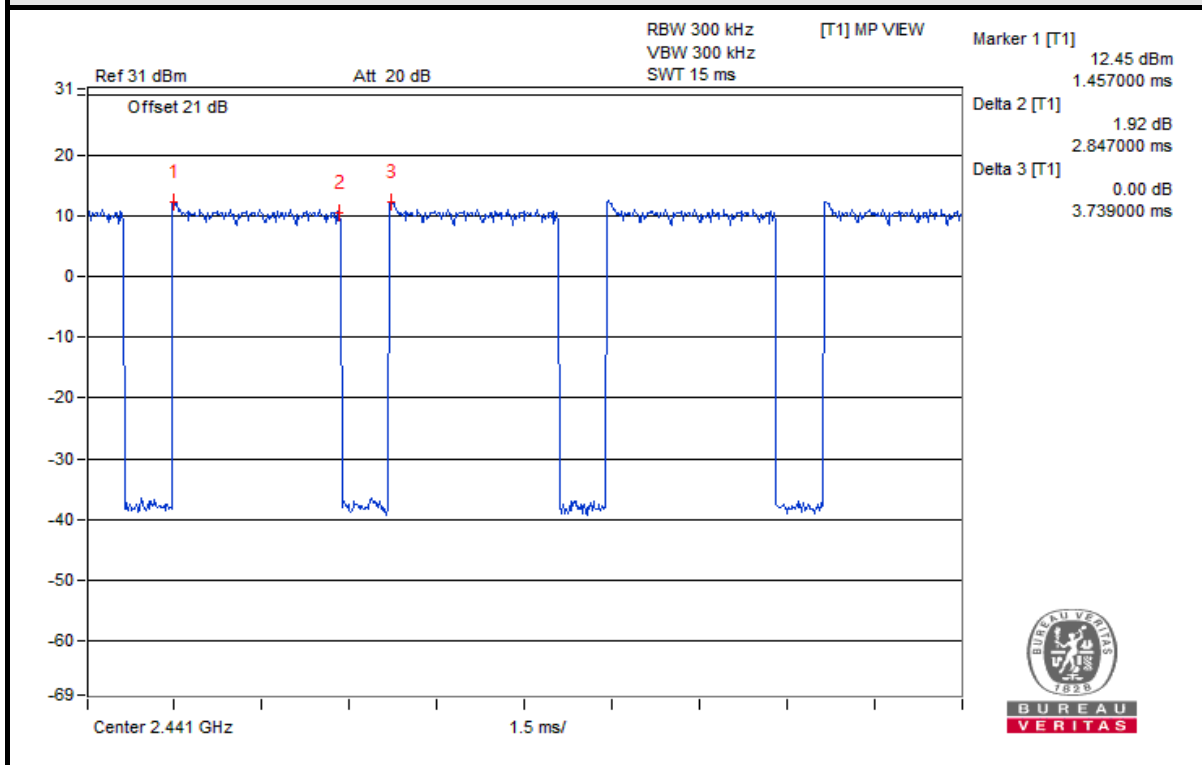




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VERITAS



2DH3

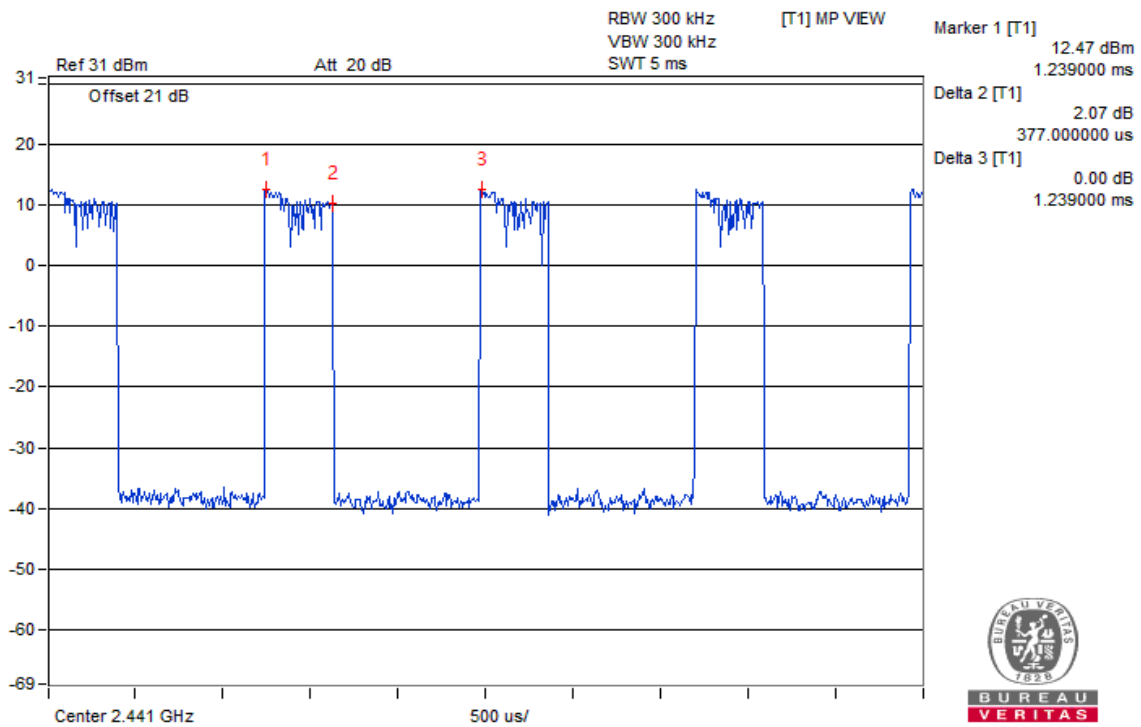


2DH5

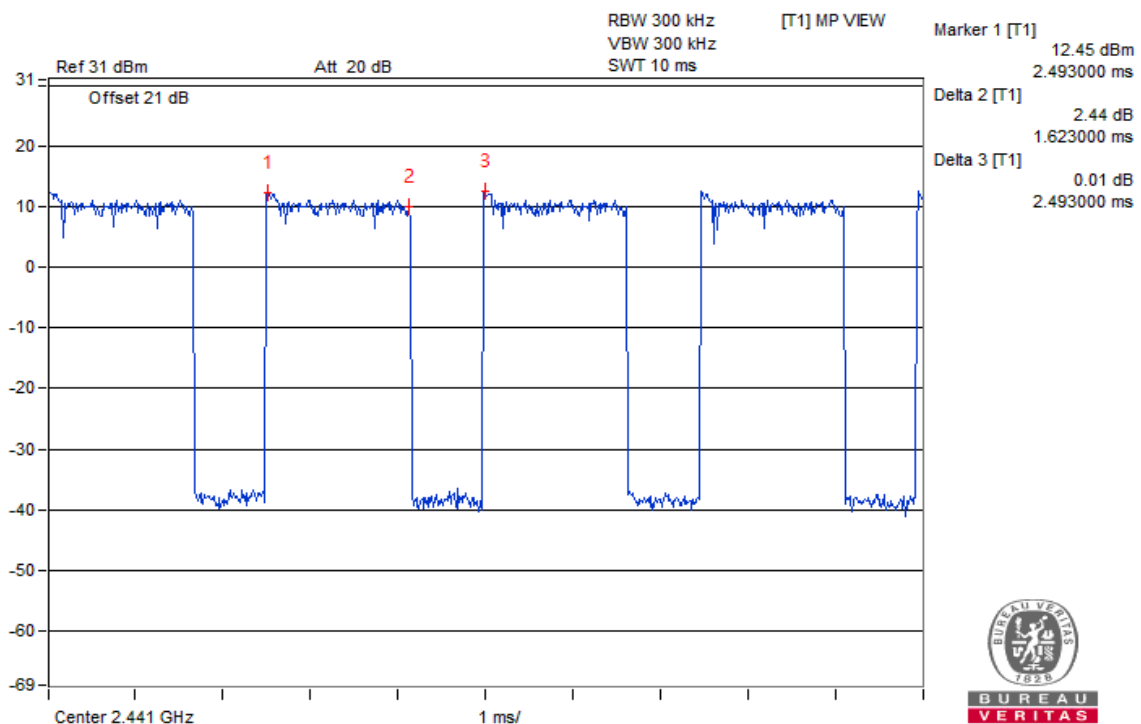


BUREAU  
VERITAS

V<sub>max</sub>.



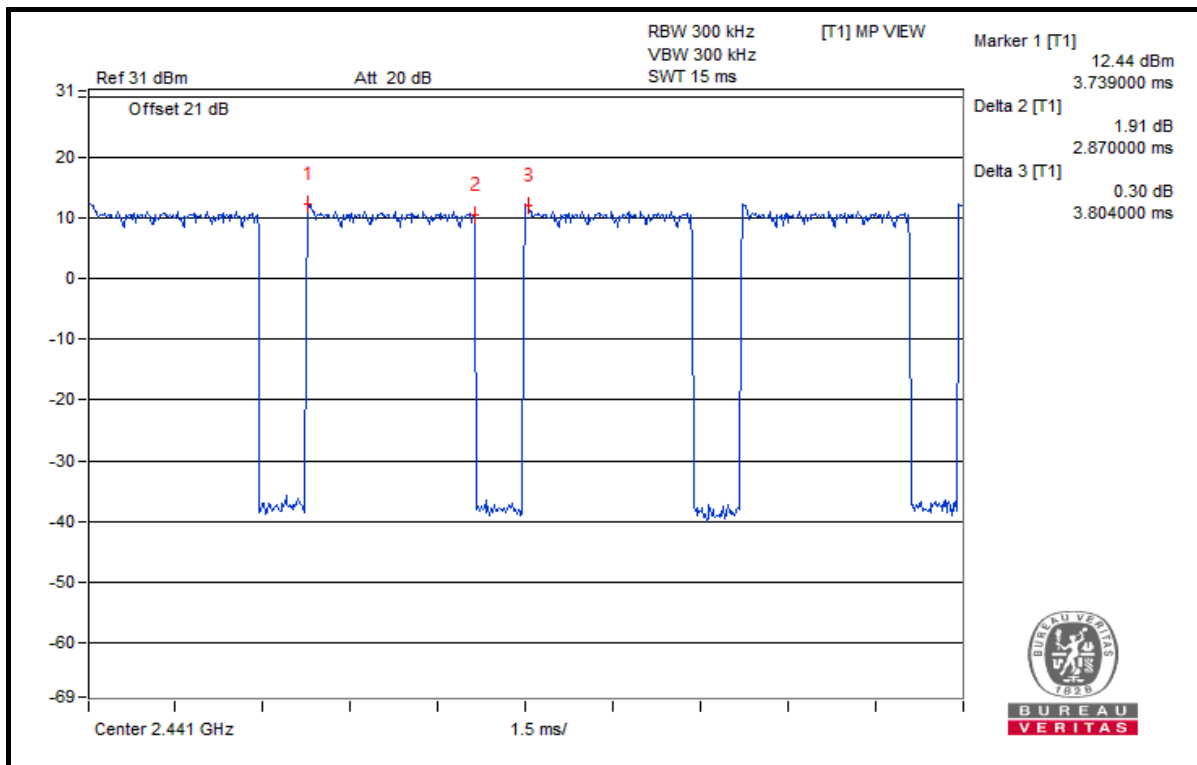
2DH1



2DH3



BUREAU  
VERITAS



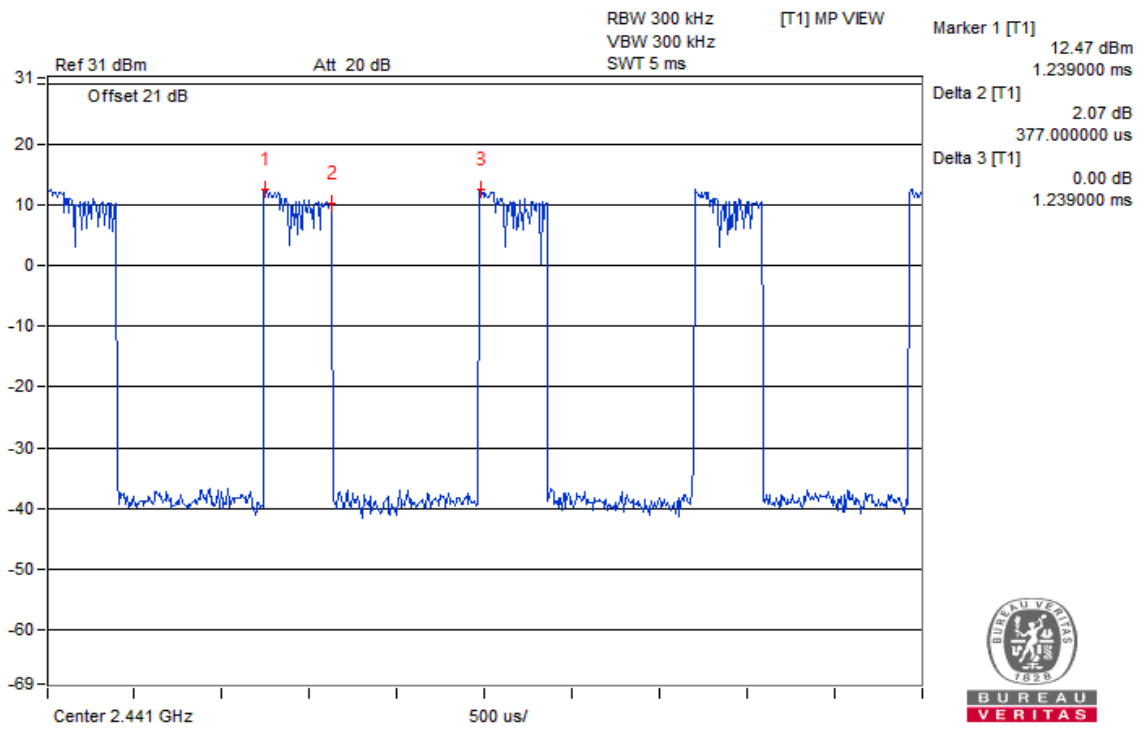
BUREAU  
VERITAS

2DH5

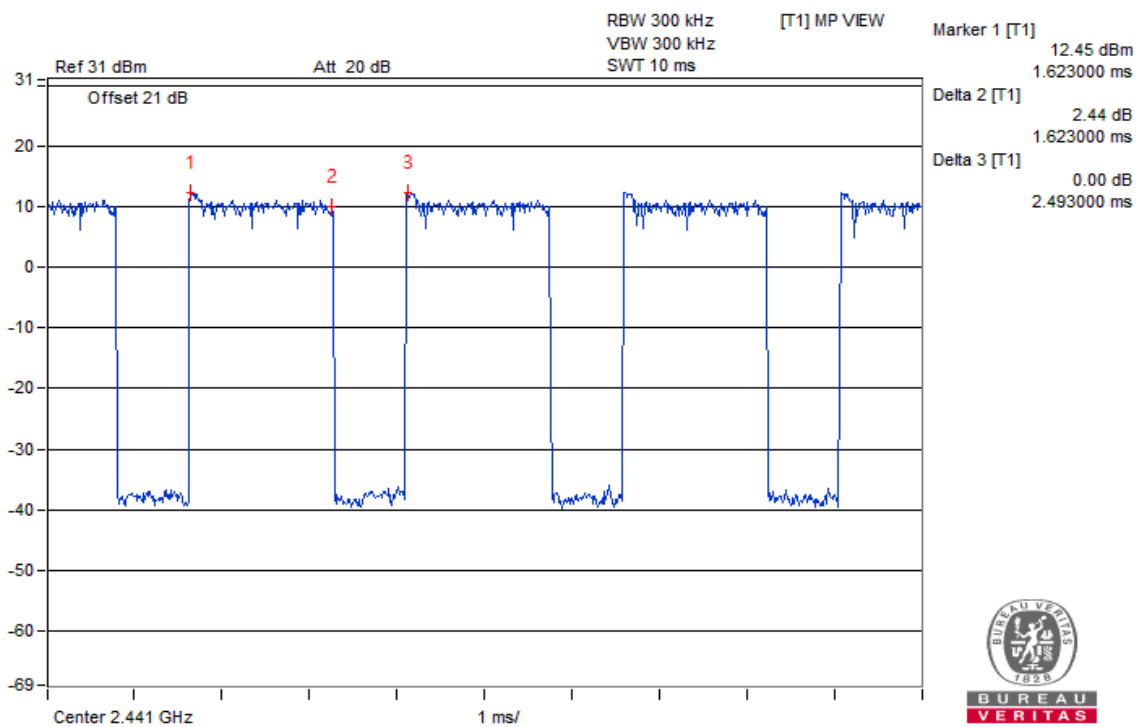


BUREAU  
VERITAS

V<sub>min</sub>.



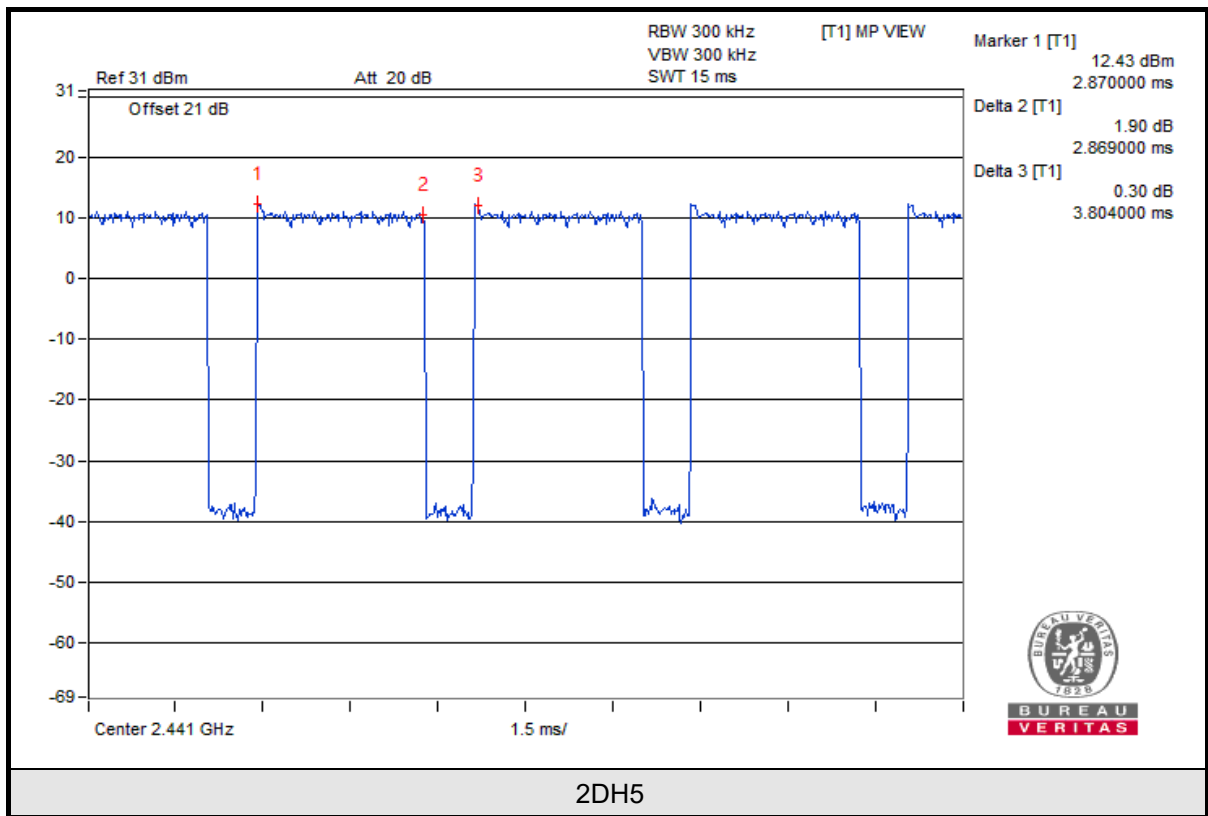
2DH1



2DH3

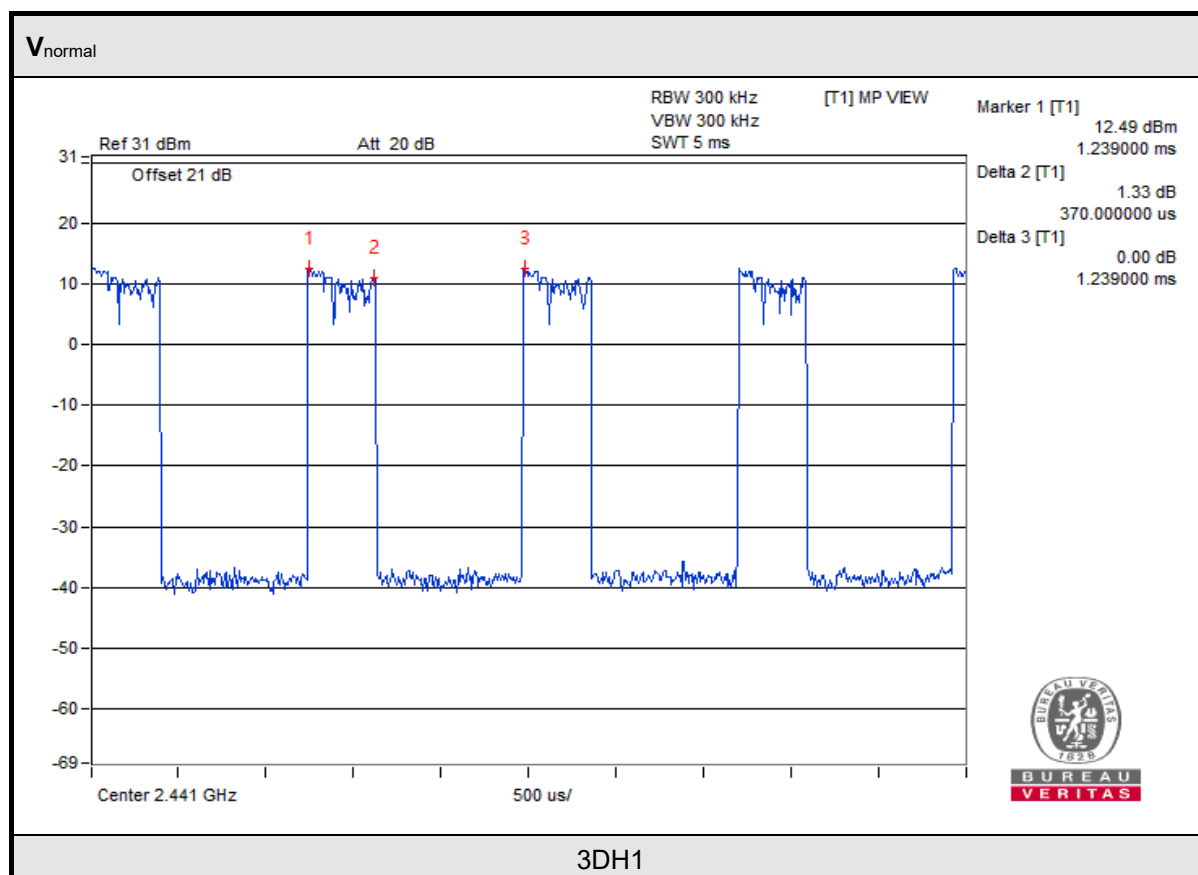


BUREAU  
VERITAS



Modulation: 8DPSK  
Normal Mode:

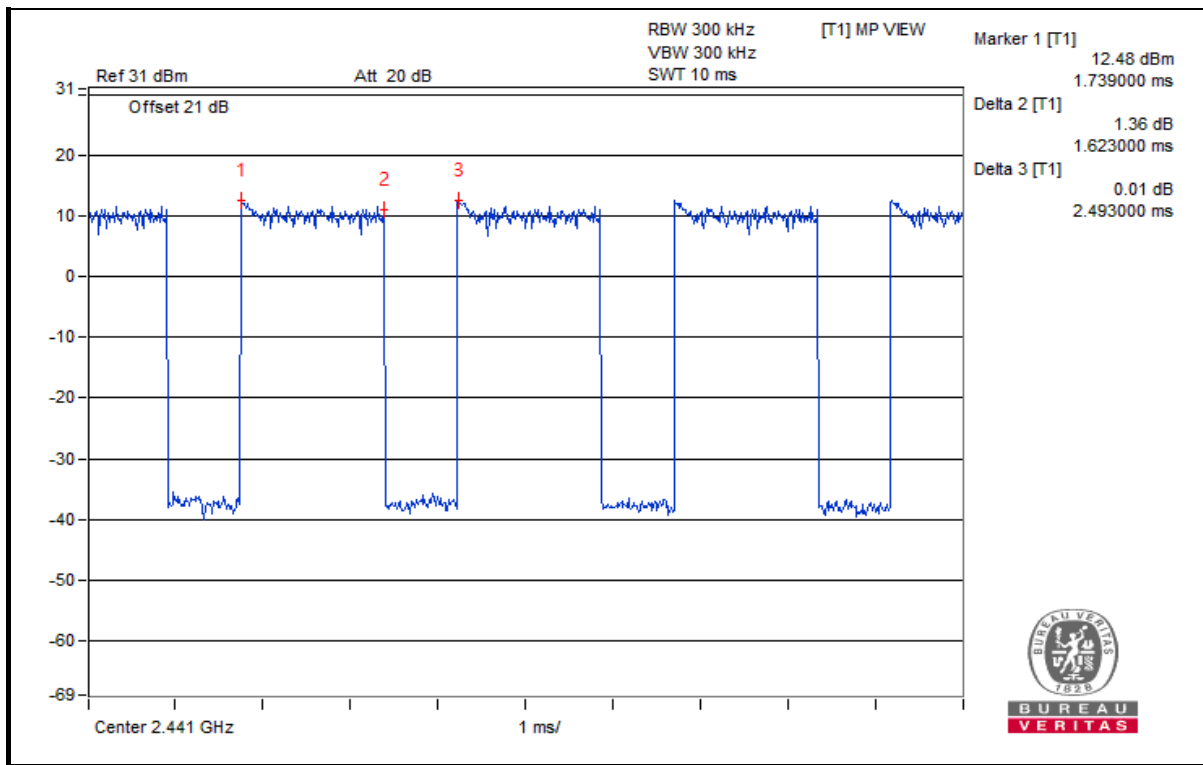
Test Condition	Mode	Diffusion Rate	[Diffusion Rate/79]*0.4 sec	Duty Cycle	Result (msec)	Limit (msec)
<b>V<sub>normal</sub></b>	3DH1	70.00	0.354	0.298	105.492	400
	3DH3	70.00	0.354	0.651	230.454	400
	3DH5	70.00	0.354	0.768	271.872	400
<b>V<sub>max.</sub></b>	3DH1	69.60	0.352	0.298	104.896	400
	3DH3	69.60	0.352	0.651	229.152	400
	3DH5	69.60	0.352	0.768	270.336	400
<b>V<sub>min.</sub></b>	3DH1	69.40	0.351	0.298	104.598	400
	3DH3	69.40	0.351	0.653	229.203	400
	3DH5	69.40	0.351	0.768	269.568	400



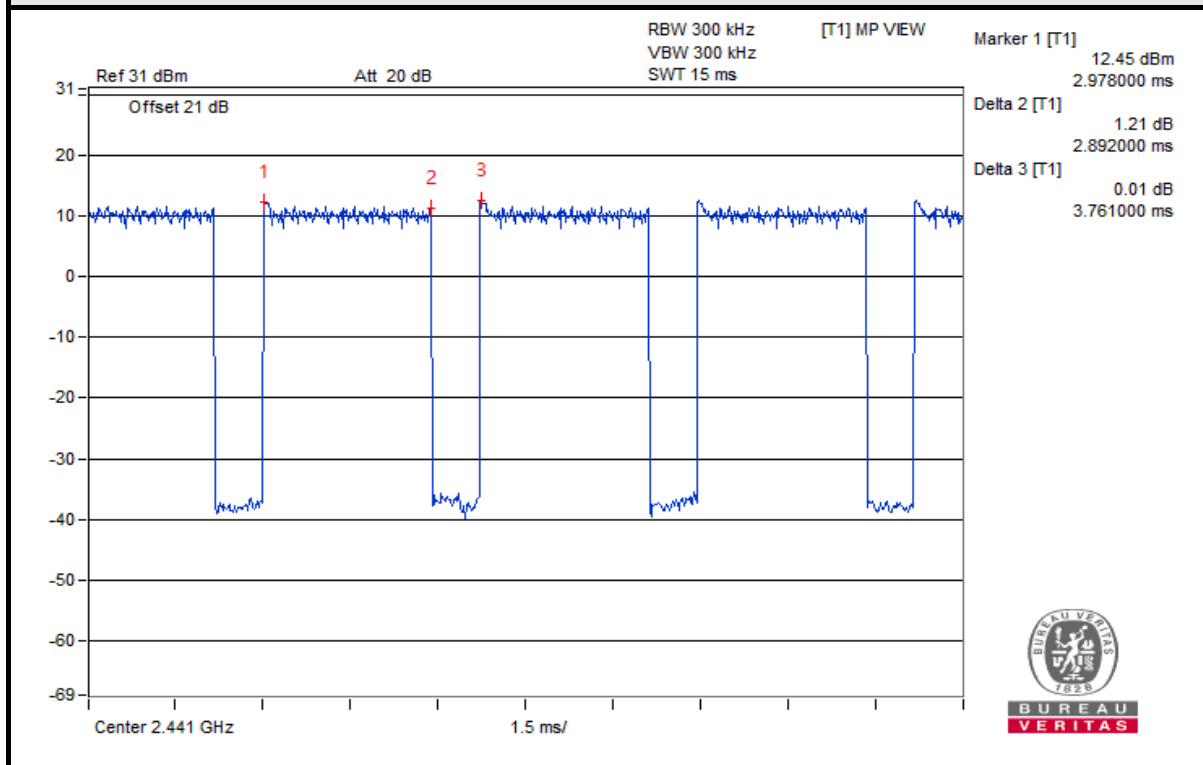




BUREAU  
VERITAS

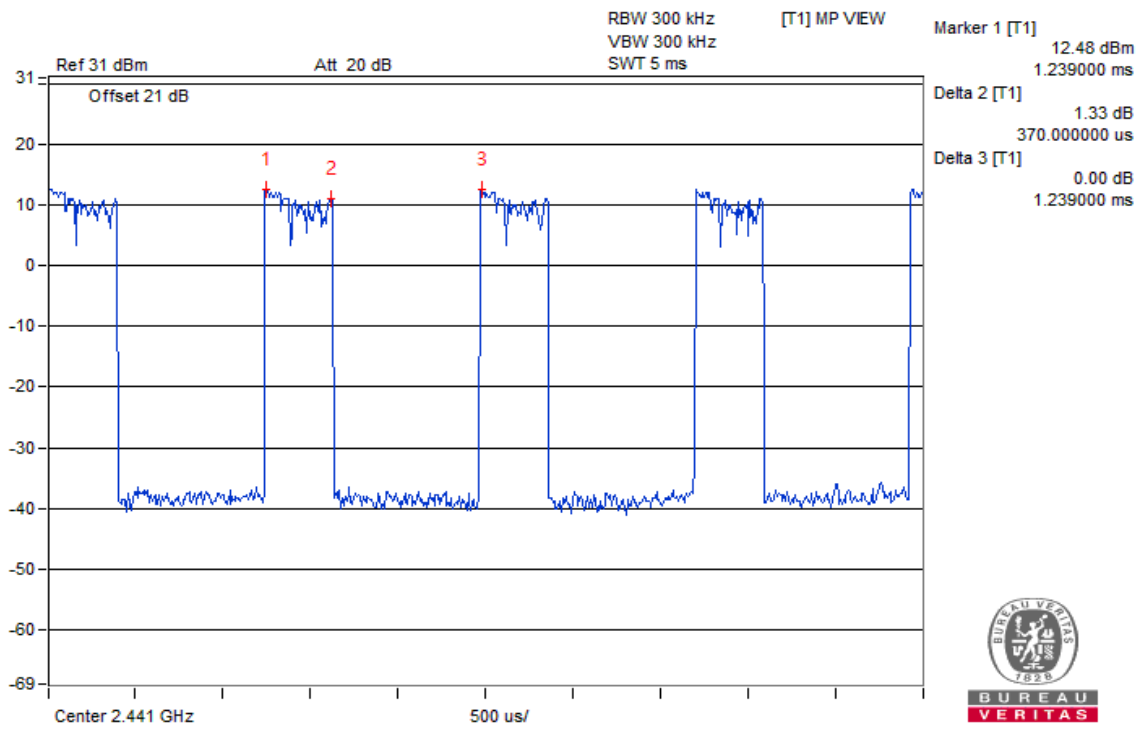


3DH3

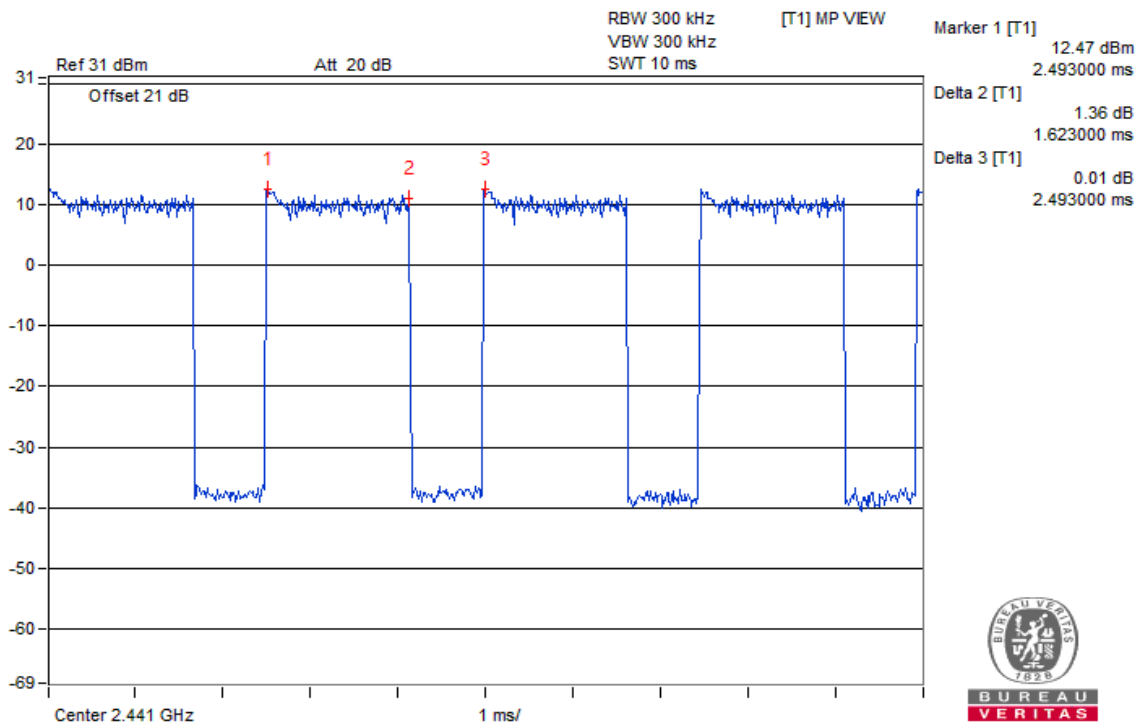


3DH5

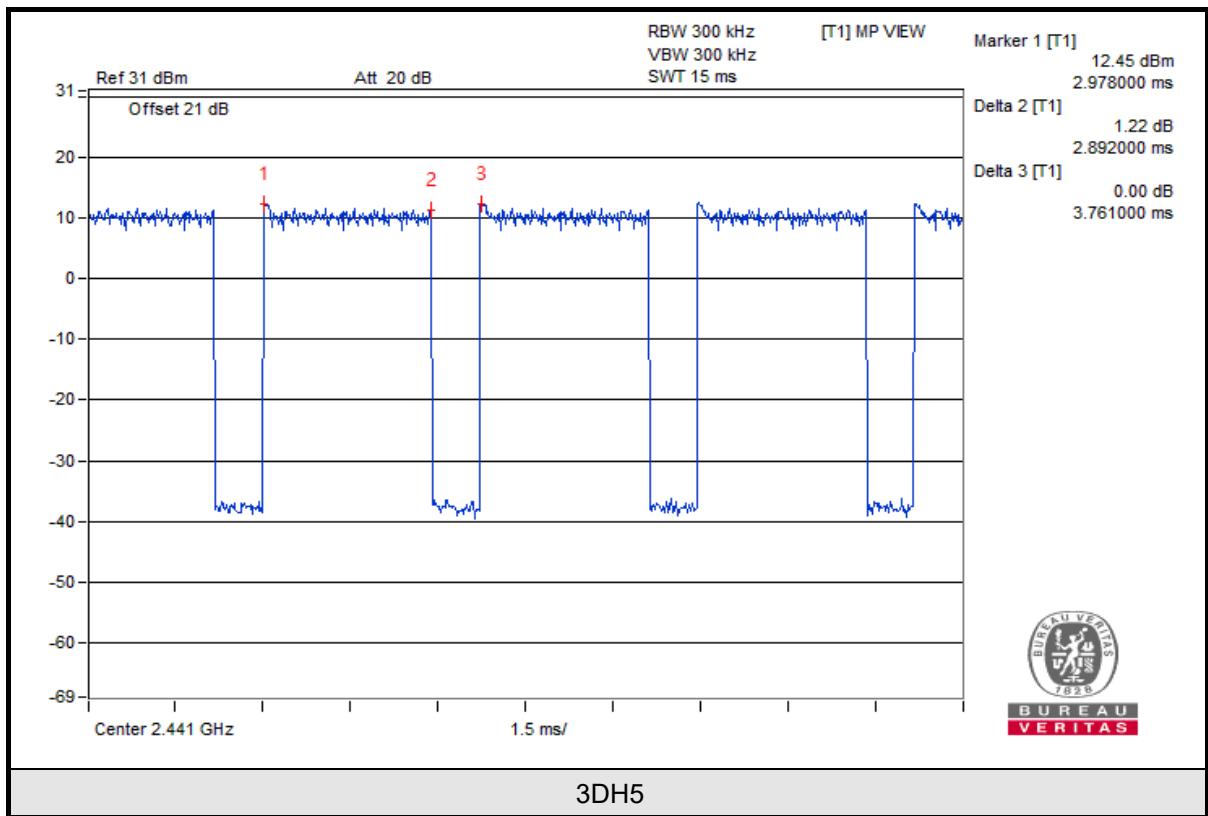
V<sub>max</sub>.



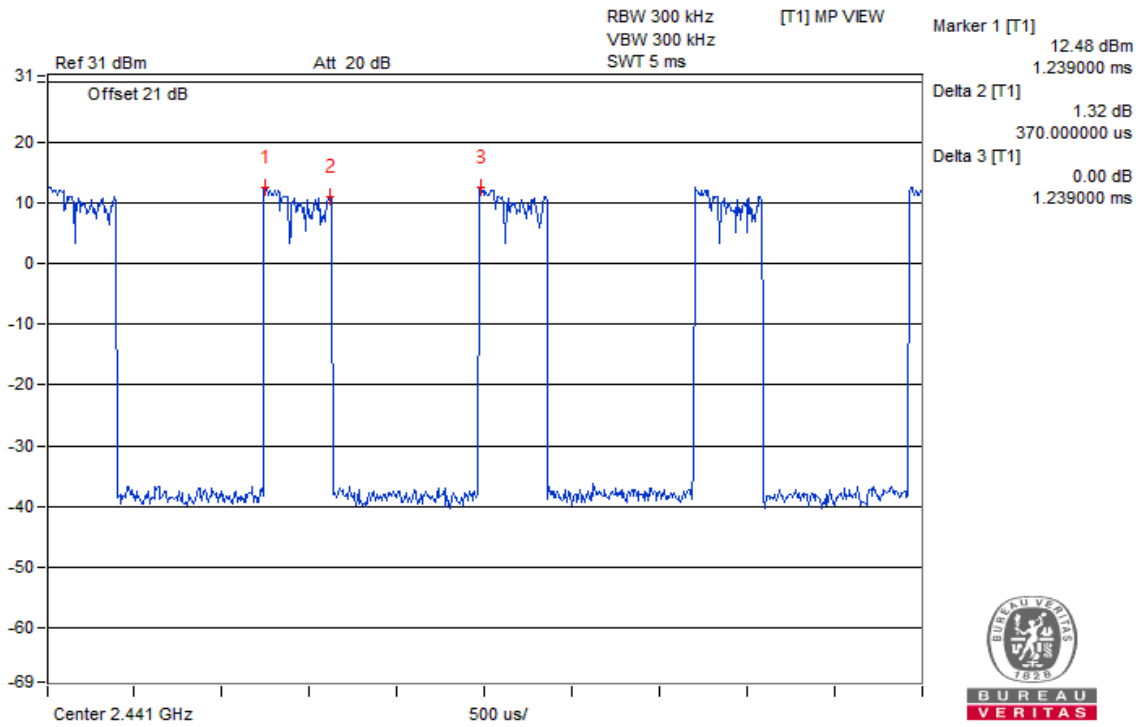
3DH1



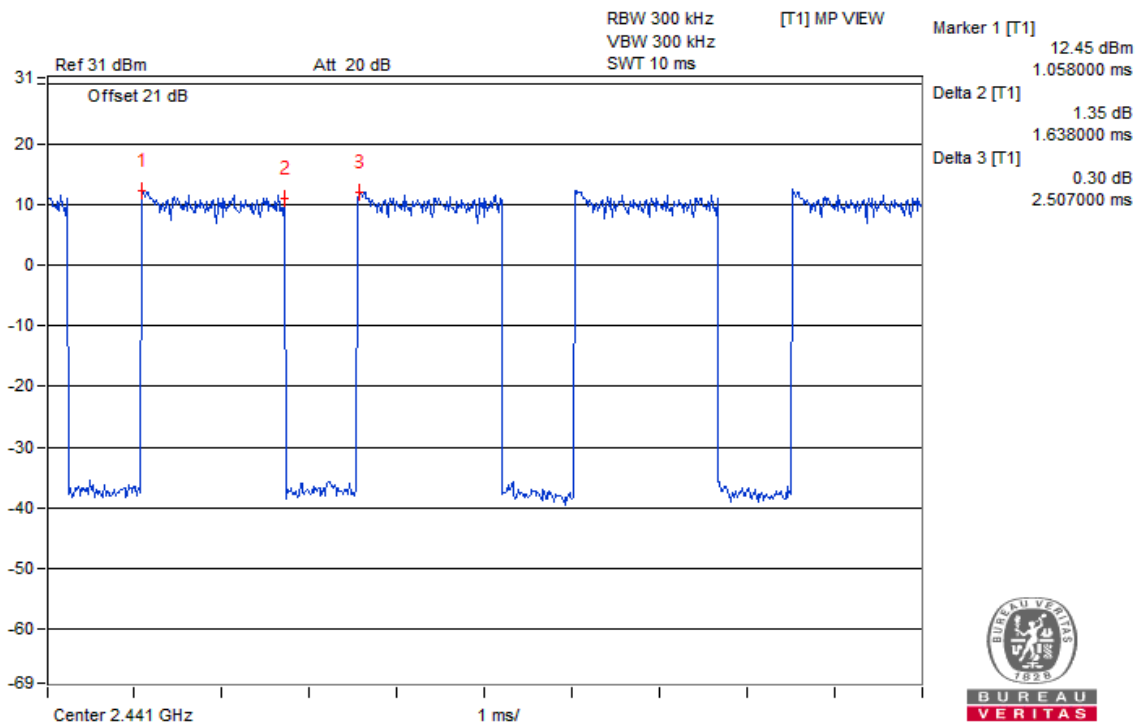
3DH3



V<sub>min</sub>.



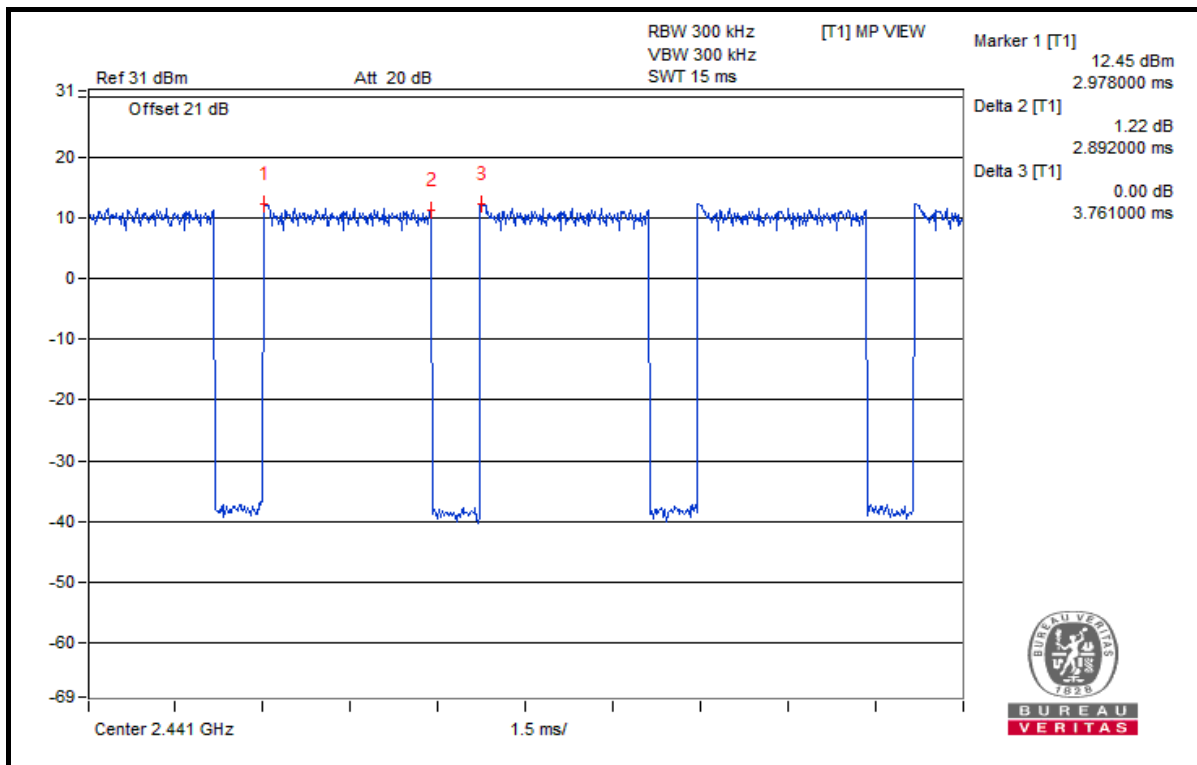
3DH1



3DH3



BUREAU  
VERITAS

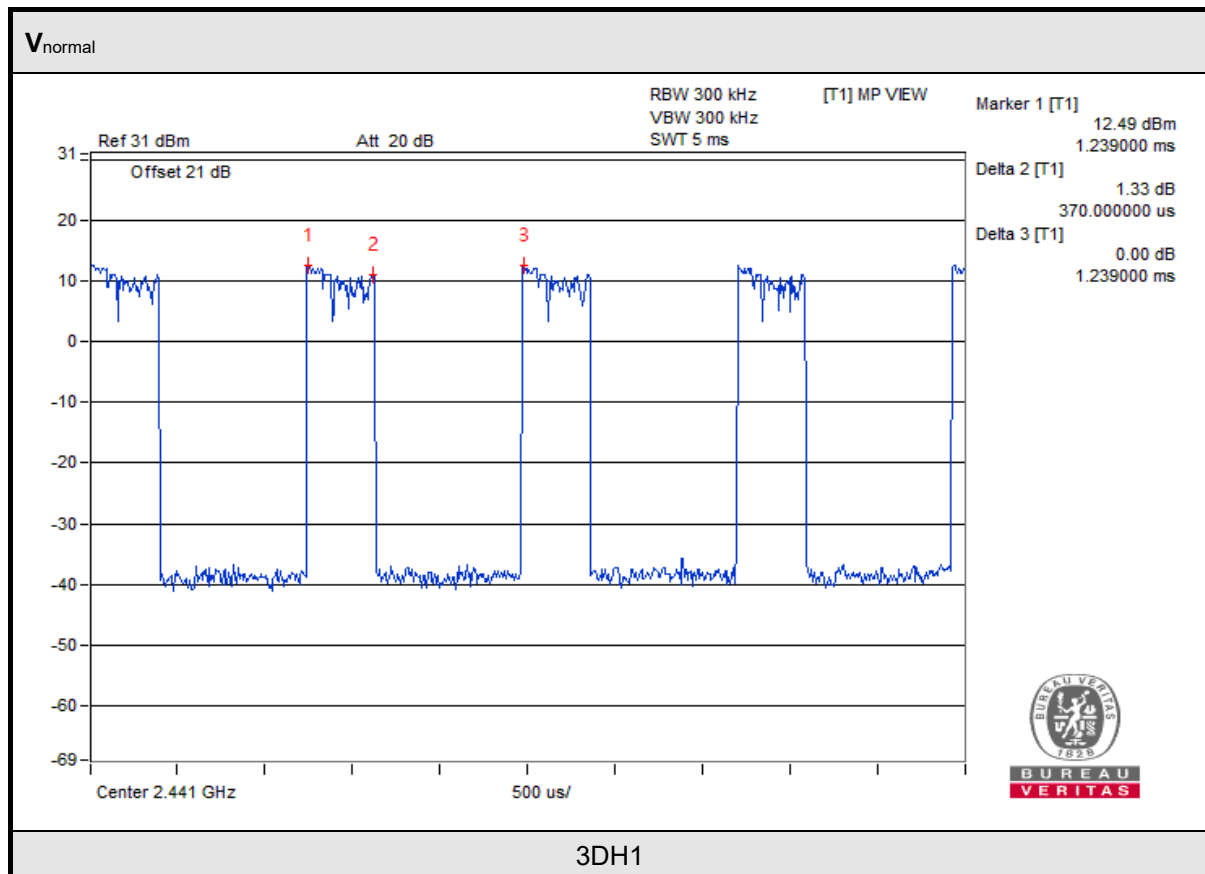


BUREAU  
VERITAS

3DH5

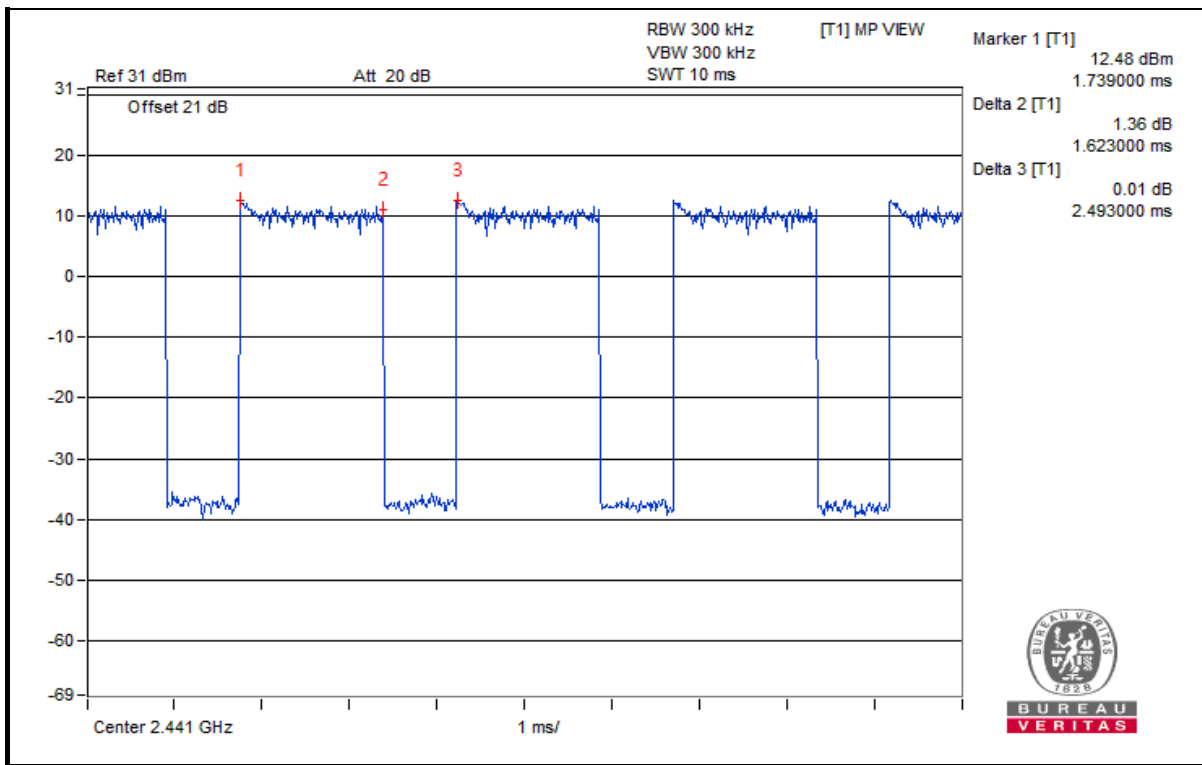
**AFH Mode:**

Test Condition	Mode	Diffusion Rate	[Diffusion Rate/20]*0.4 sec	Duty Cycle	Result (msec)	Limit (msec)
<b>V<sub>normal</sub></b>	3DH1	18.26	0.365	0.298	108.770	400
	3DH3	18.26	0.365	0.651	237.615	400
	3DH5	18.26	0.365	0.768	280.320	400
<b>V<sub>max.</sub></b>	3DH1	18.26	0.365	0.298	108.770	400
	3DH3	18.26	0.365	0.651	237.615	400
	3DH5	18.26	0.365	0.768	280.320	400
<b>V<sub>min.</sub></b>	3DH1	18.19	0.363	0.298	108.174	400
	3DH3	18.19	0.363	0.653	237.039	400
	3DH5	18.19	0.363	0.768	278.784	400

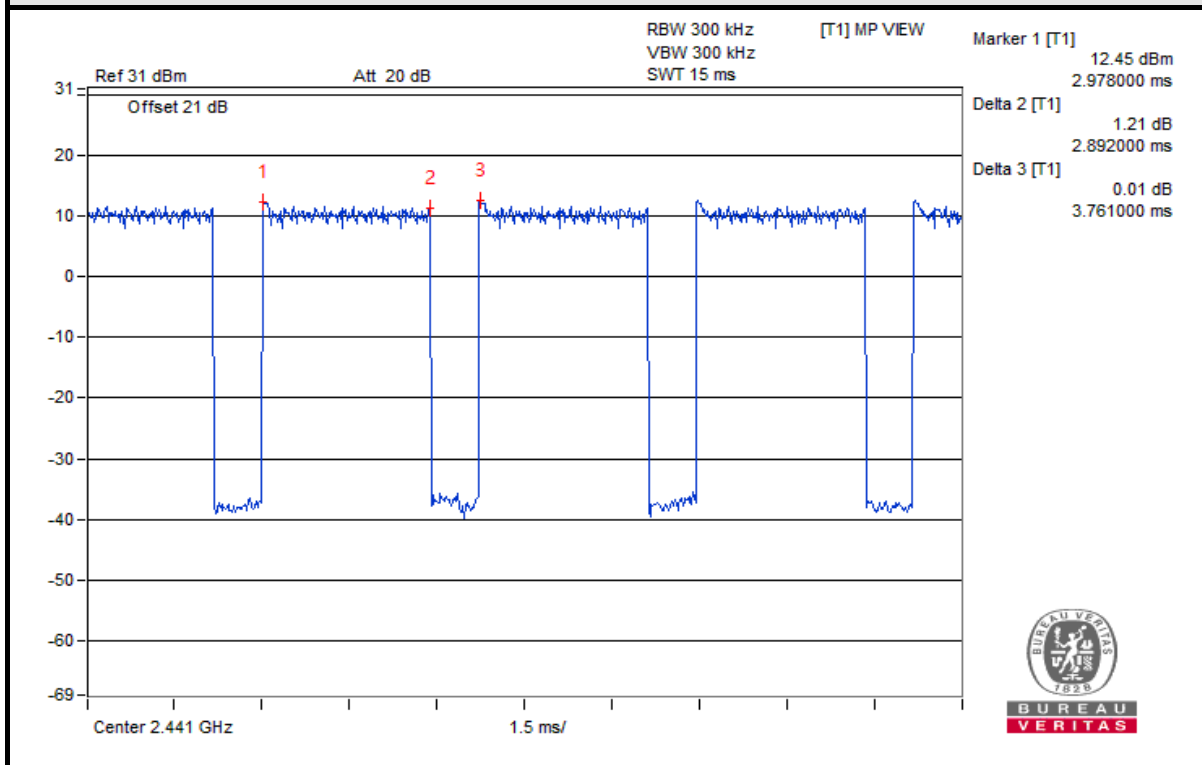




BUREAU  
VERITAS

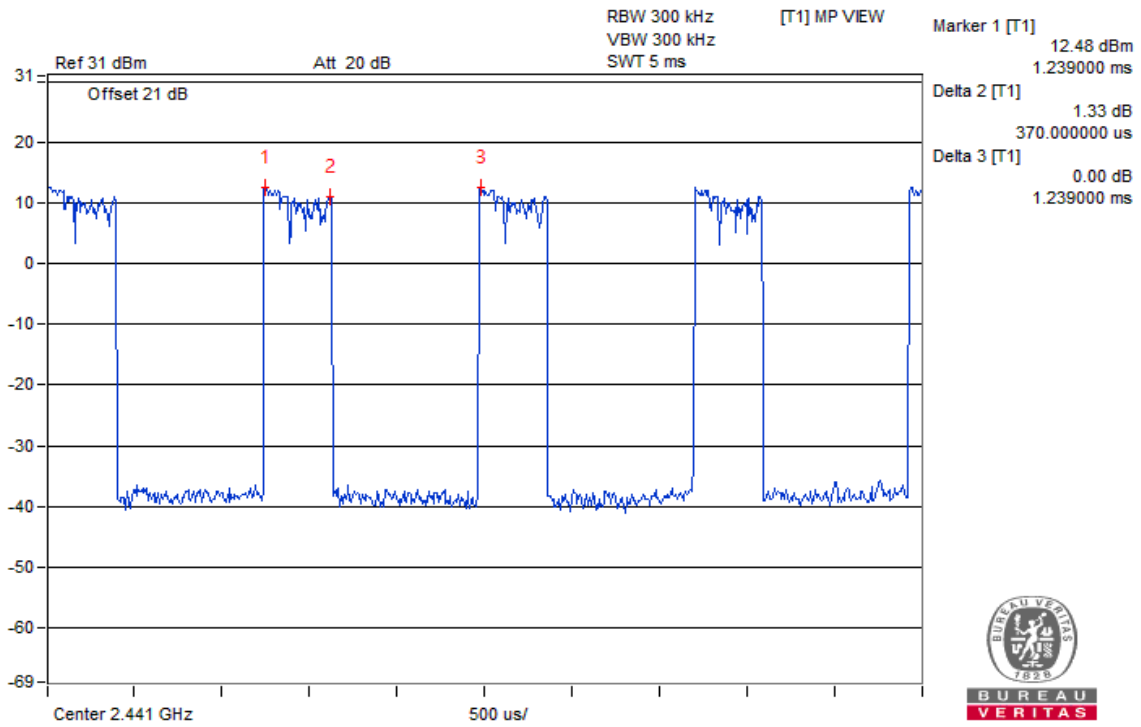


3DH3

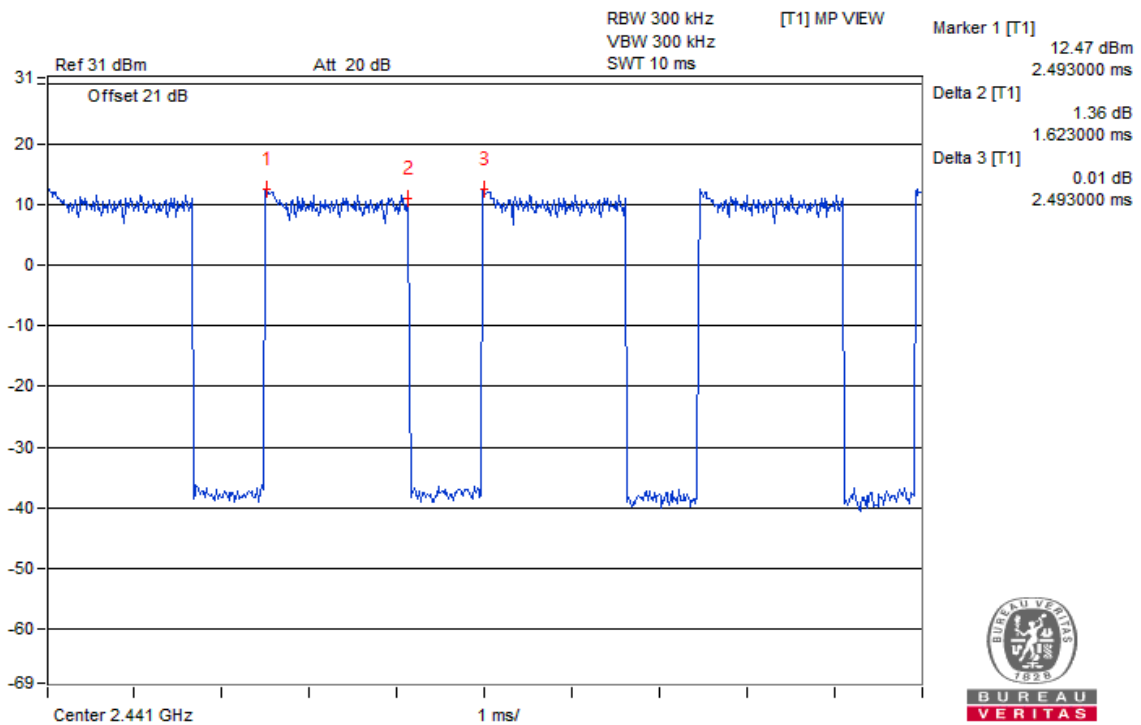


3DH5

V<sub>max</sub>.



3DH1

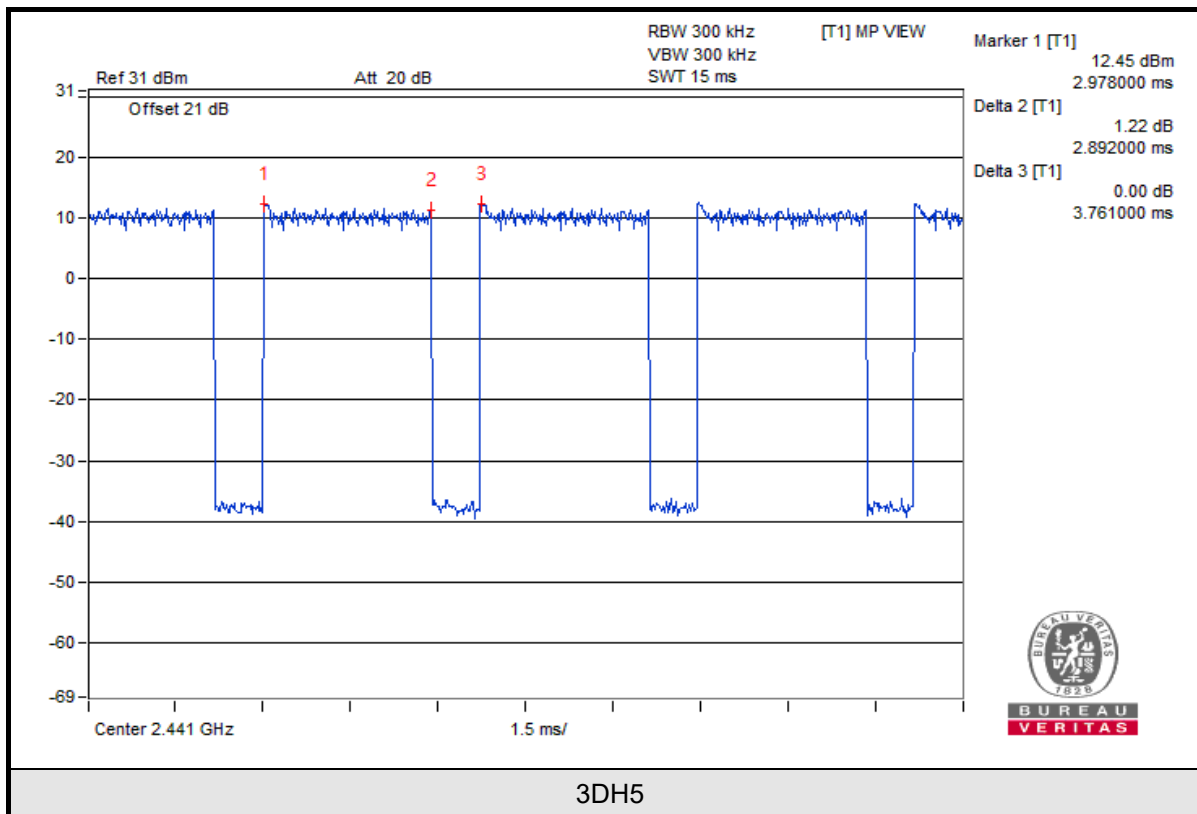


3DH3





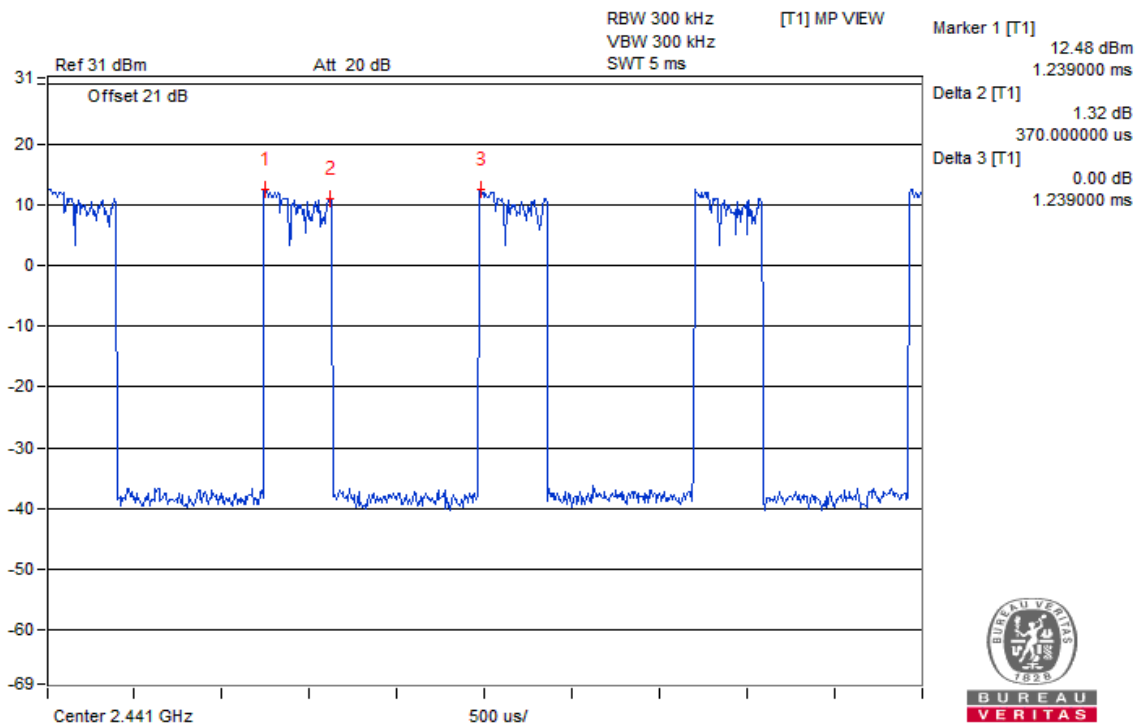
BUREAU  
VERITAS



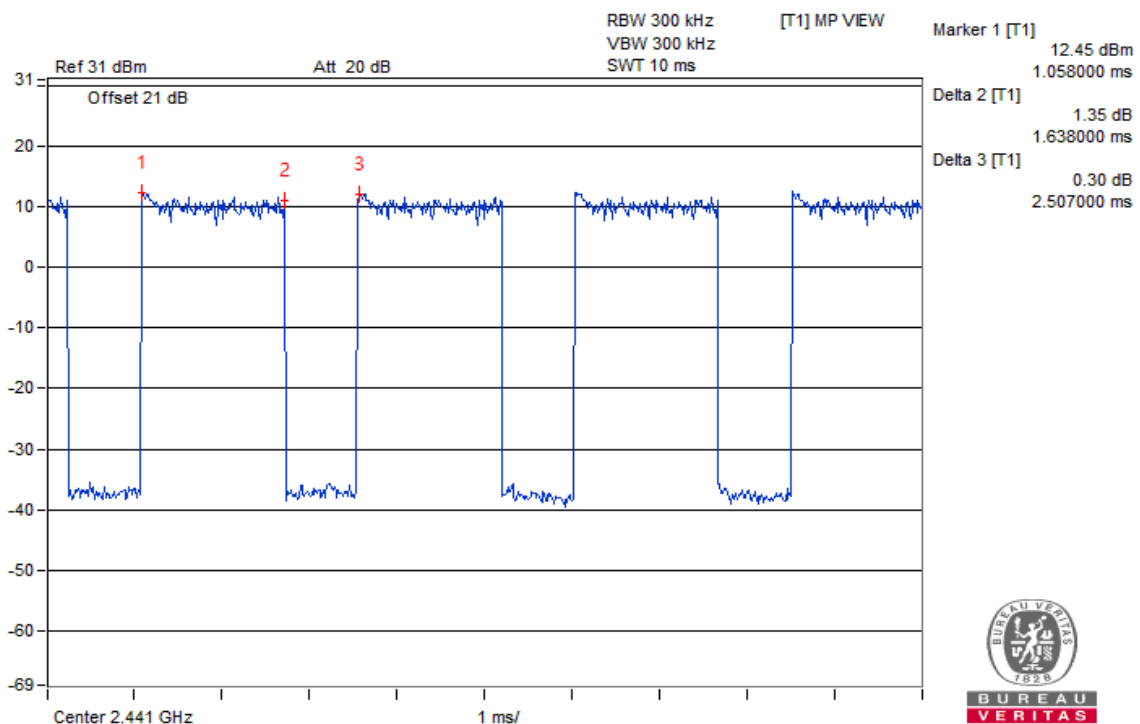


BUREAU  
VERITAS

V<sub>min</sub>.



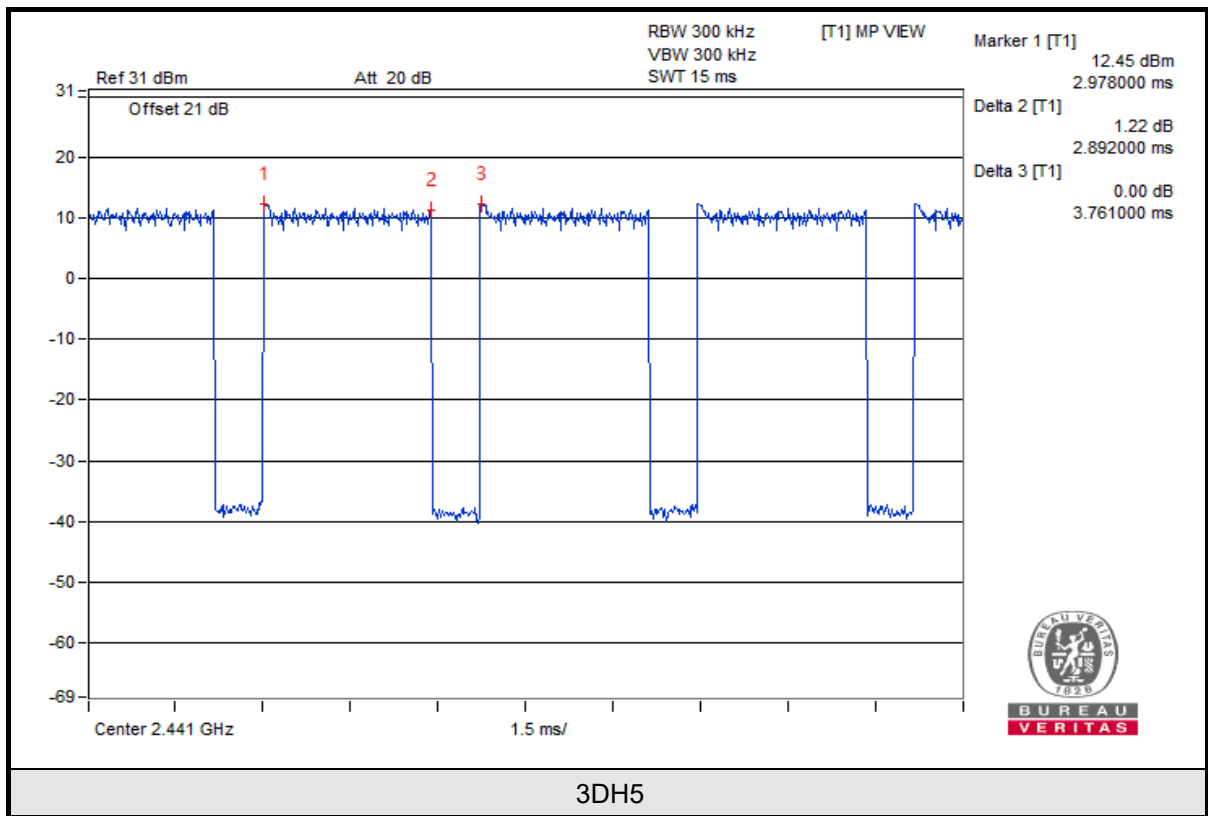
3DH1



3DH3



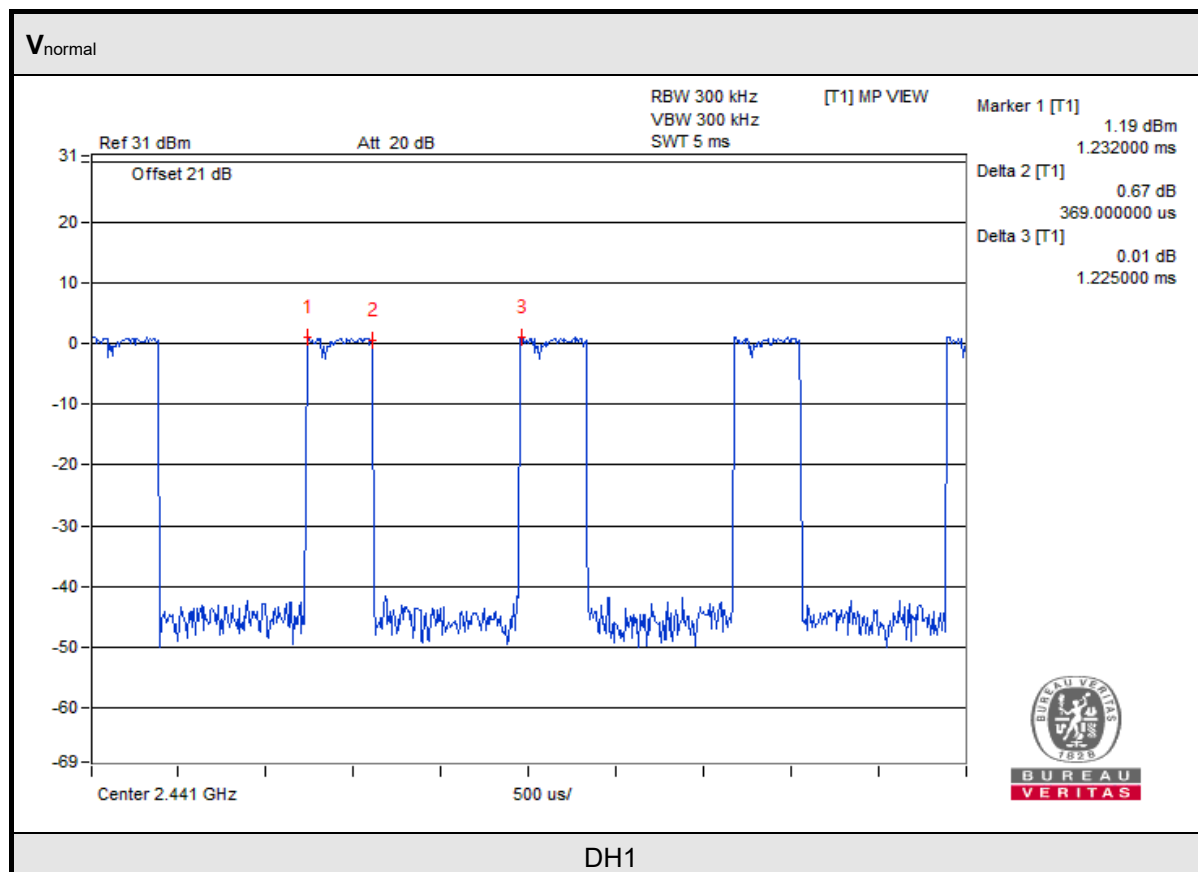
BUREAU  
VERITAS



#### 4.7.4 Test Results (Mode 2)

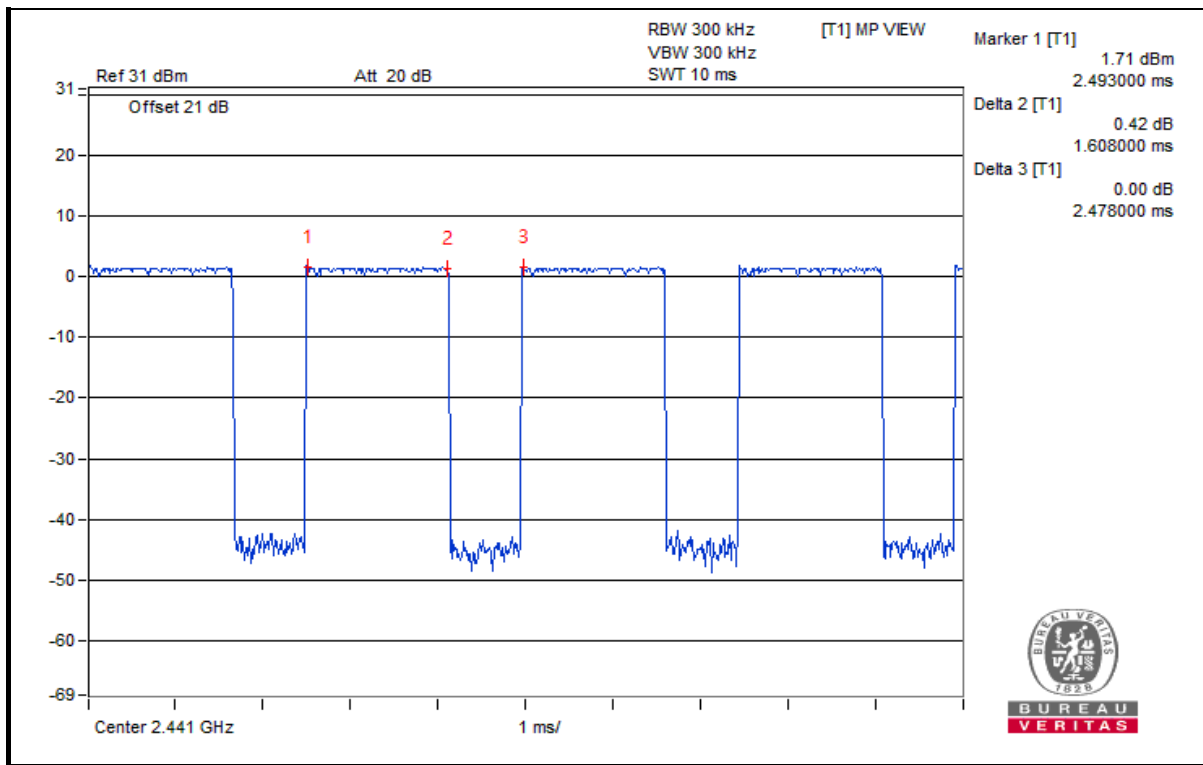
Modulation: GFSK  
Normal Mode:

Test Condition	Mode	Diffusion Rate	[Diffusion Rate/79]*0.4 sec	Duty Cycle	Result (msec)	Limit (msec)
V <sub>normal</sub>	DH1	71.16	0.360	0.301	108.360	400
	DH3	71.16	0.360	0.648	233.280	400
	DH5	71.16	0.360	0.761	273.960	400
V <sub>max.</sub>	DH1	71.20	0.360	0.305	109.800	400
	DH3	71.20	0.360	0.651	234.360	400
	DH5	71.20	0.360	0.761	273.960	400
V <sub>min.</sub>	DH1	71.20	0.360	0.301	108.360	400
	DH3	71.20	0.360	0.648	233.280	400
	DH5	71.20	0.360	0.761	273.960	400

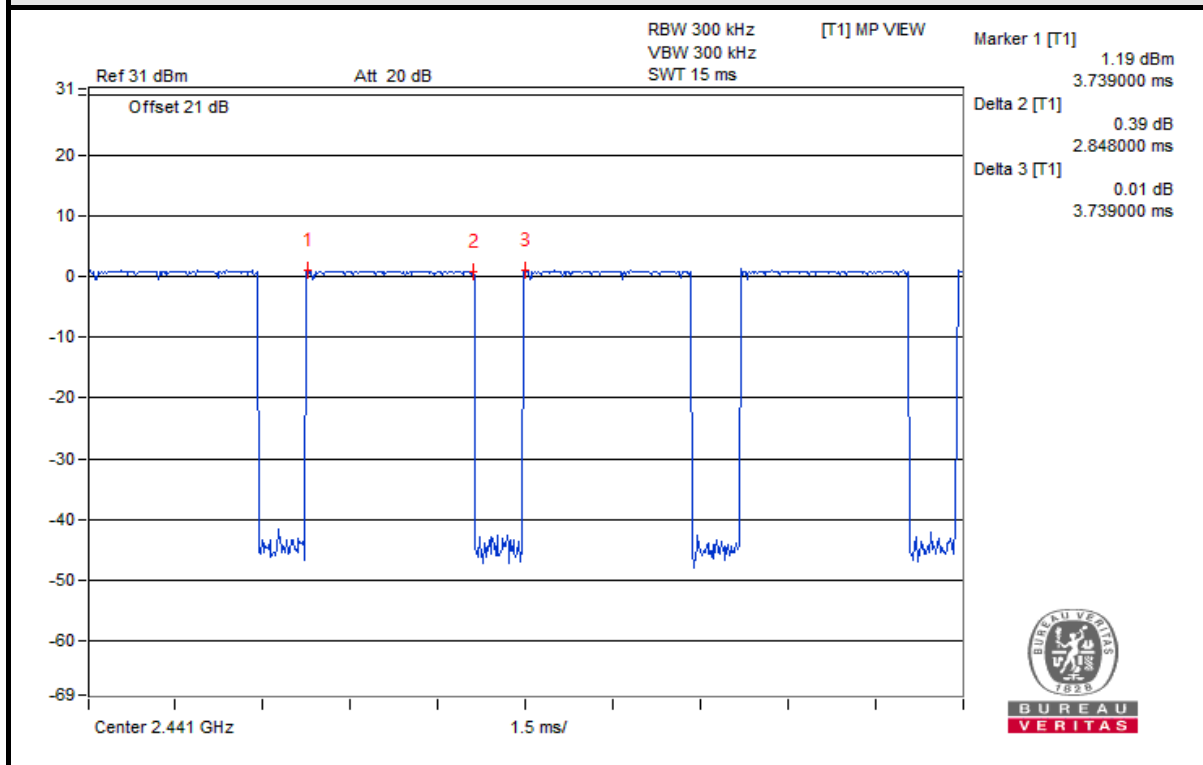




BUREAU  
VERITAS

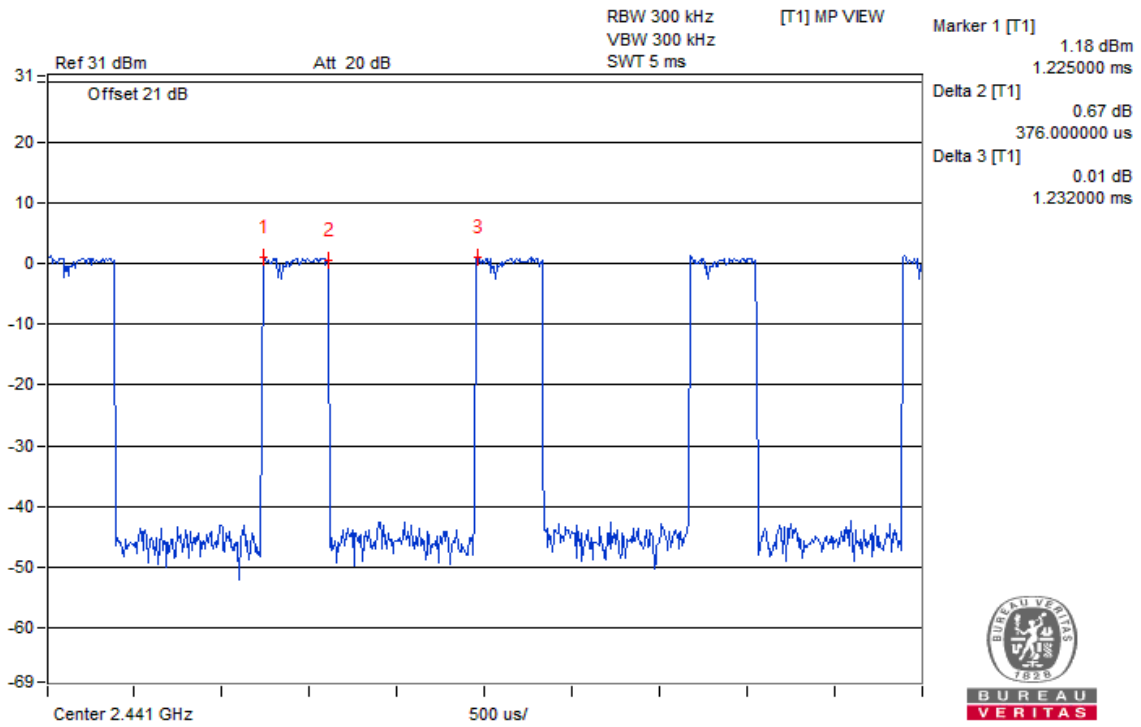


DH3

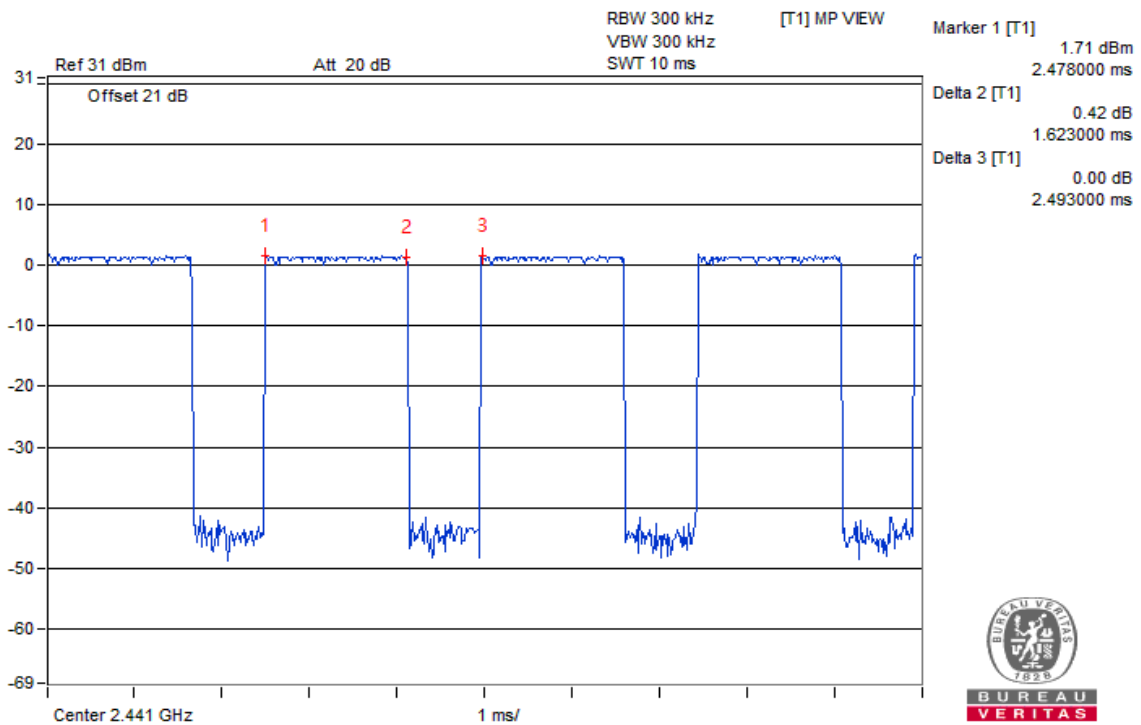


DH5

V<sub>max</sub>.



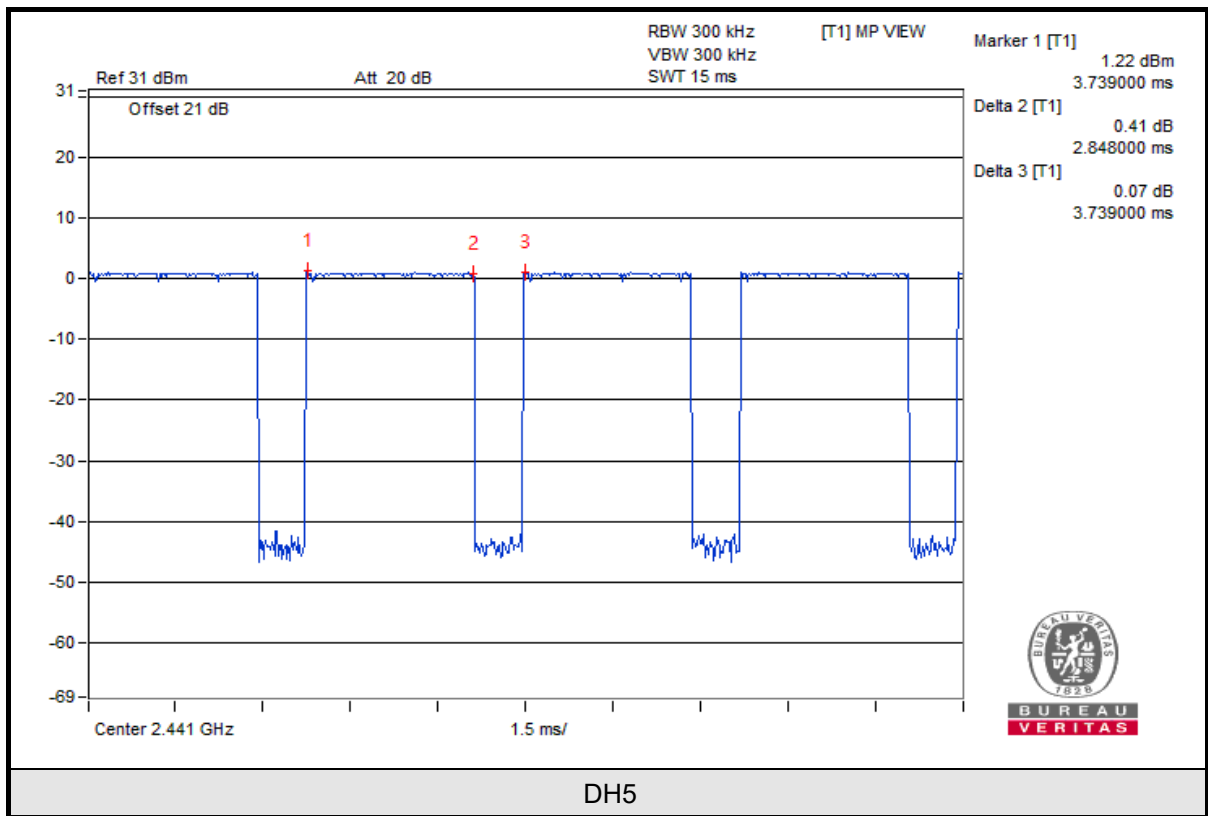
DH1



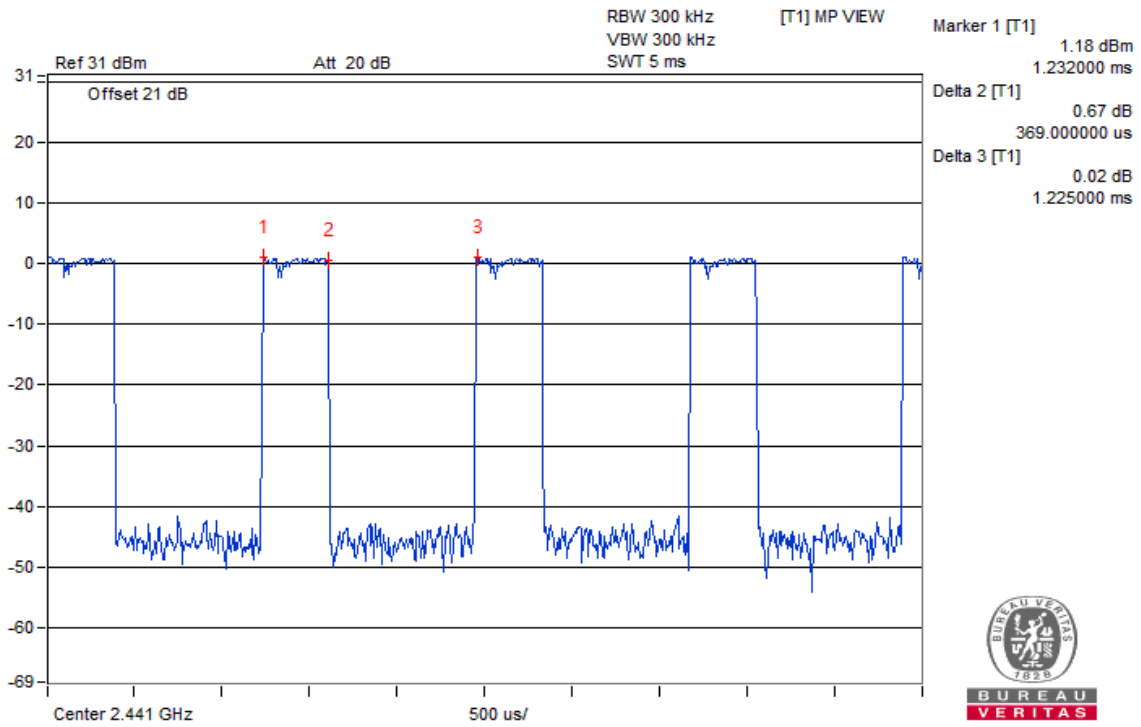
DH3



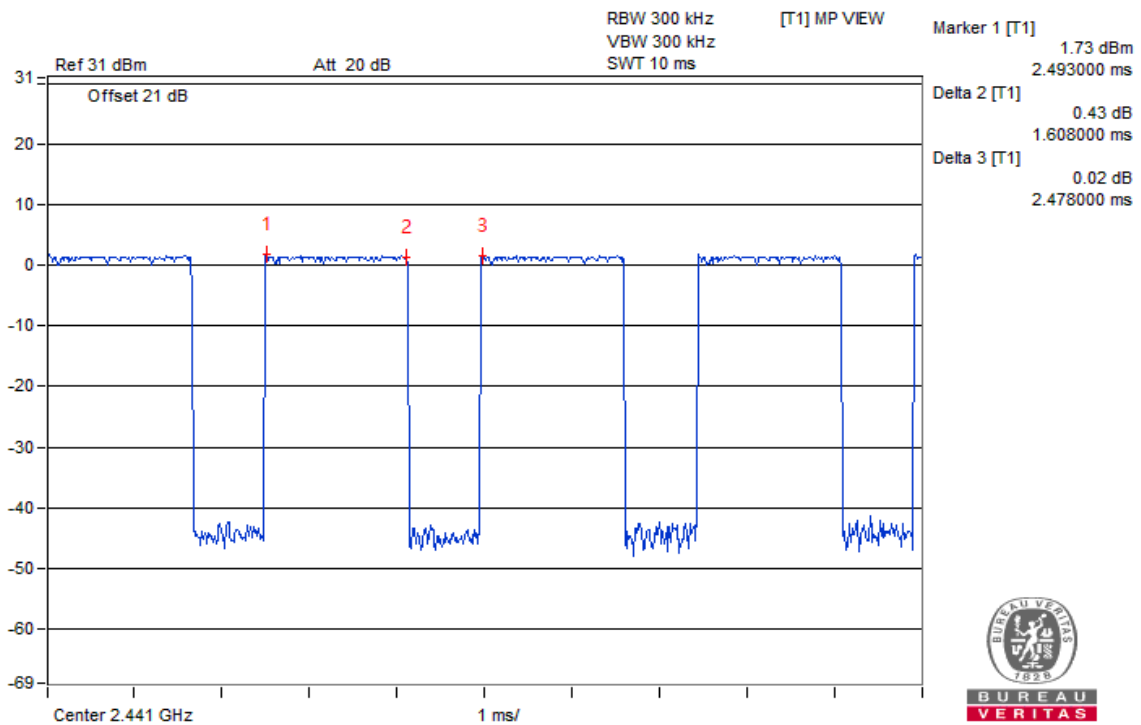
BUREAU  
VERITAS



V<sub>min</sub>.



DH1



DH3

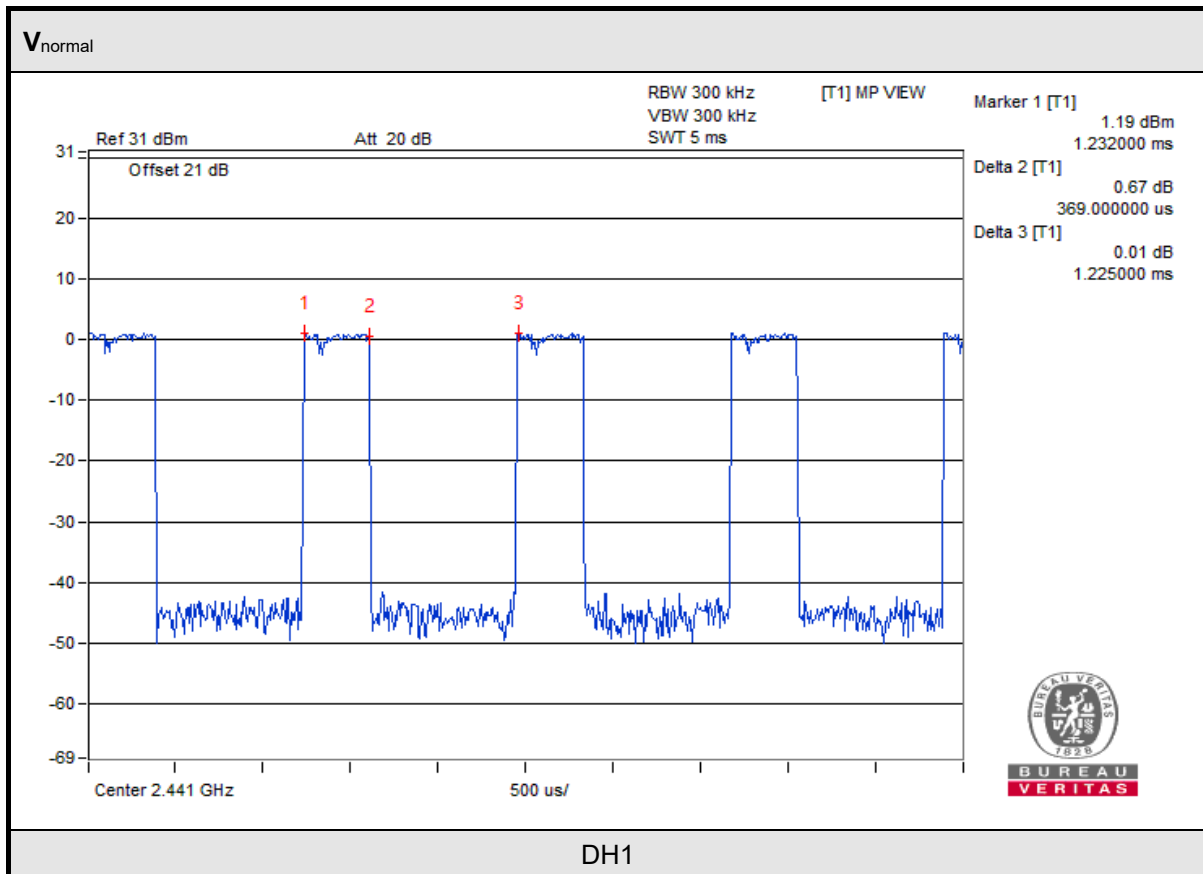






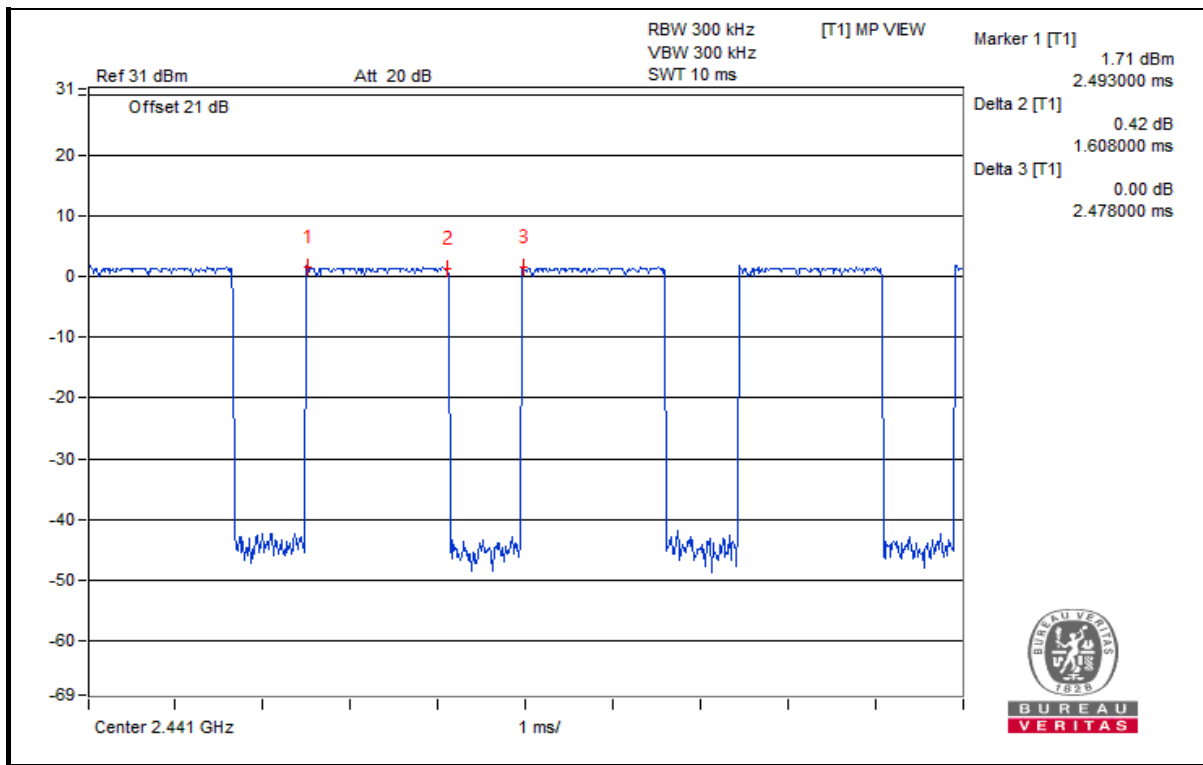
AFH Mode:

Test Condition	Mode	Diffusion Rate	[Diffusion Rate/20]*0.4 sec	Duty Cycle	Result (msec)	Limit (msec)
V <sub>normal</sub>	DH1	17.82	0.356	0.301	107.156	400
	DH3	17.82	0.356	0.648	230.688	400
	DH5	17.82	0.356	0.761	270.916	400
V <sub>max.</sub>	DH1	18.04	0.360	0.305	109.800	400
	DH3	18.04	0.360	0.651	234.360	400
	DH5	18.04	0.360	0.761	273.960	400
V <sub>min.</sub>	DH1	17.90	0.358	0.301	107.758	400
	DH3	17.90	0.358	0.648	231.984	400
	DH5	17.90	0.358	0.761	272.438	400

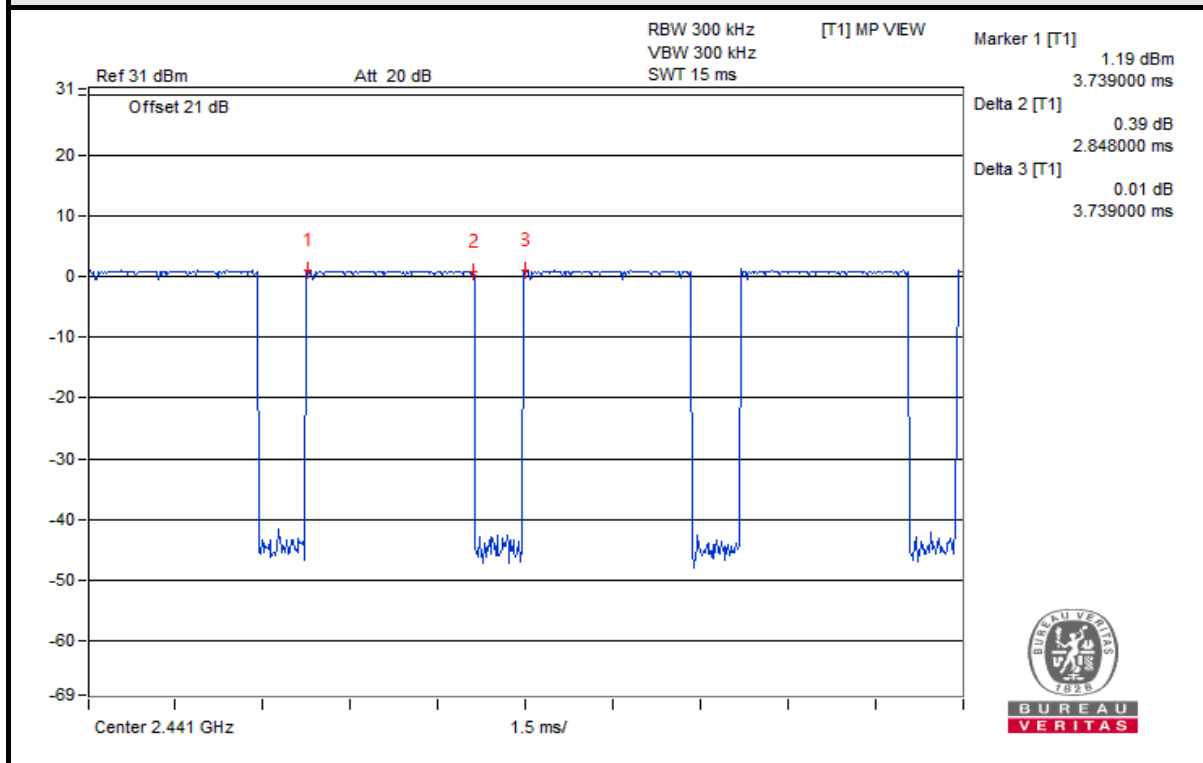




BUREAU  
VERITAS

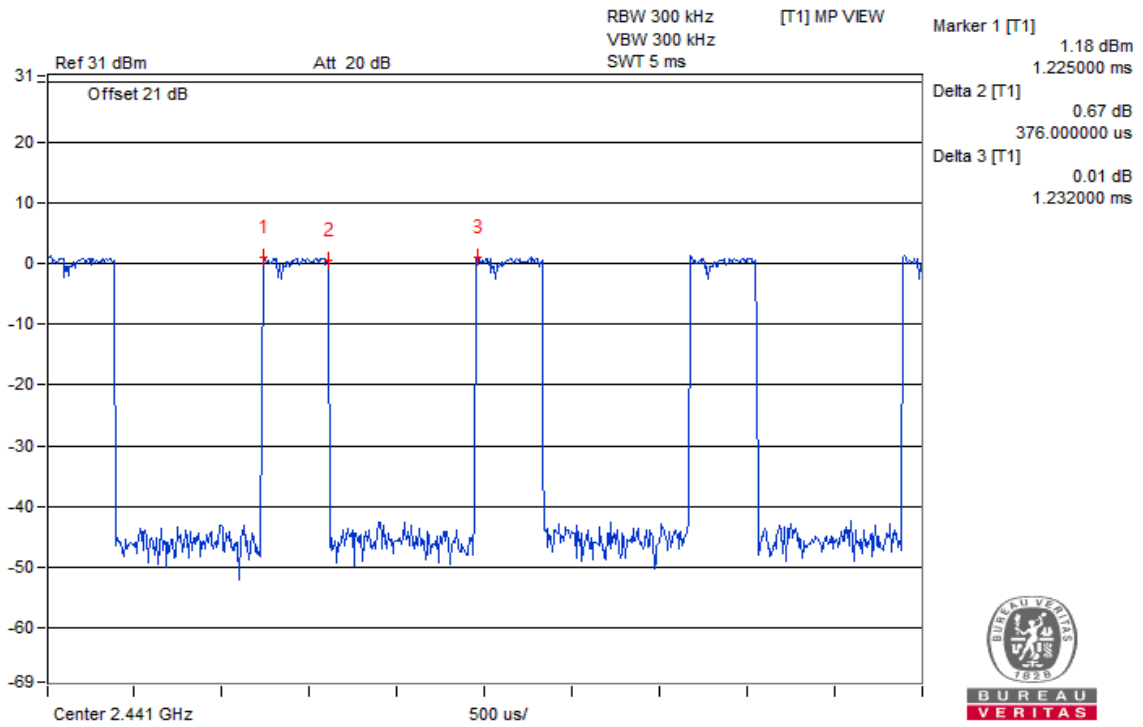


DH3

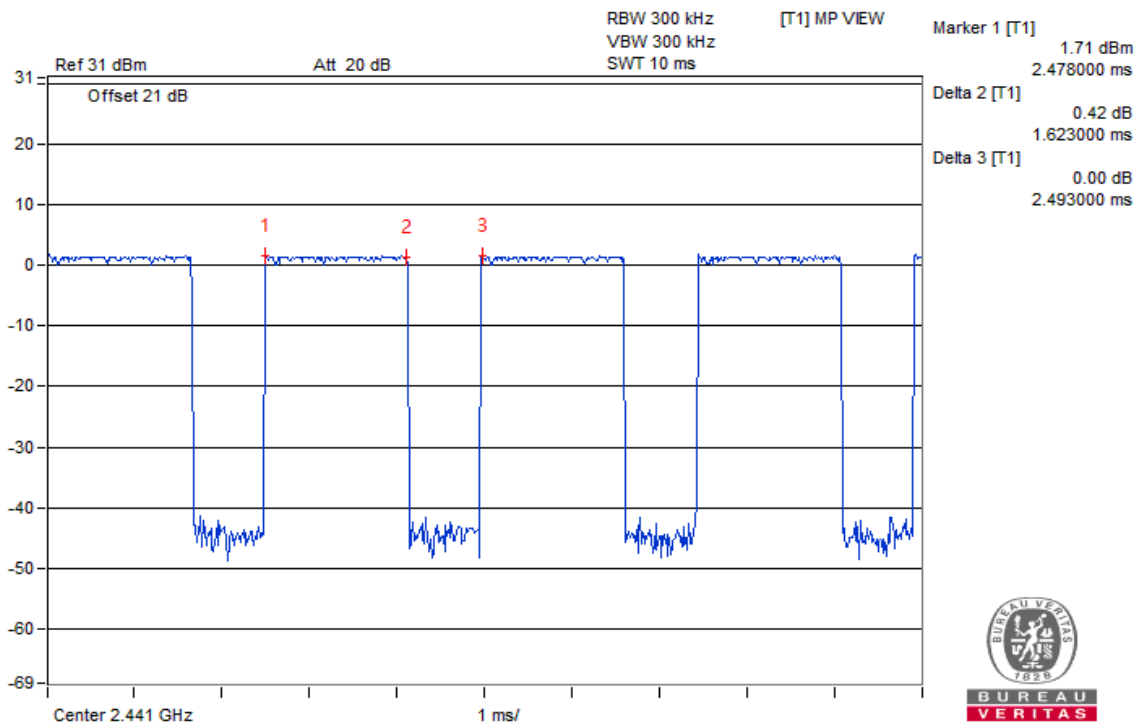


DH5

V<sub>max</sub>.



DH1



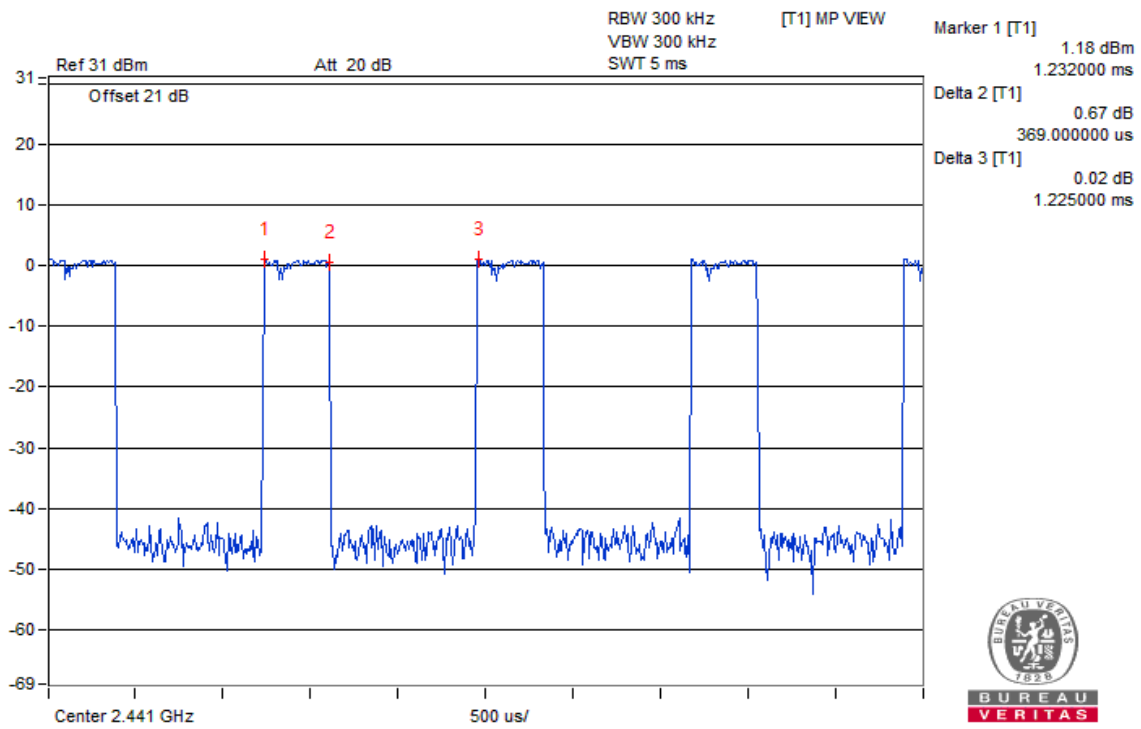
DH3



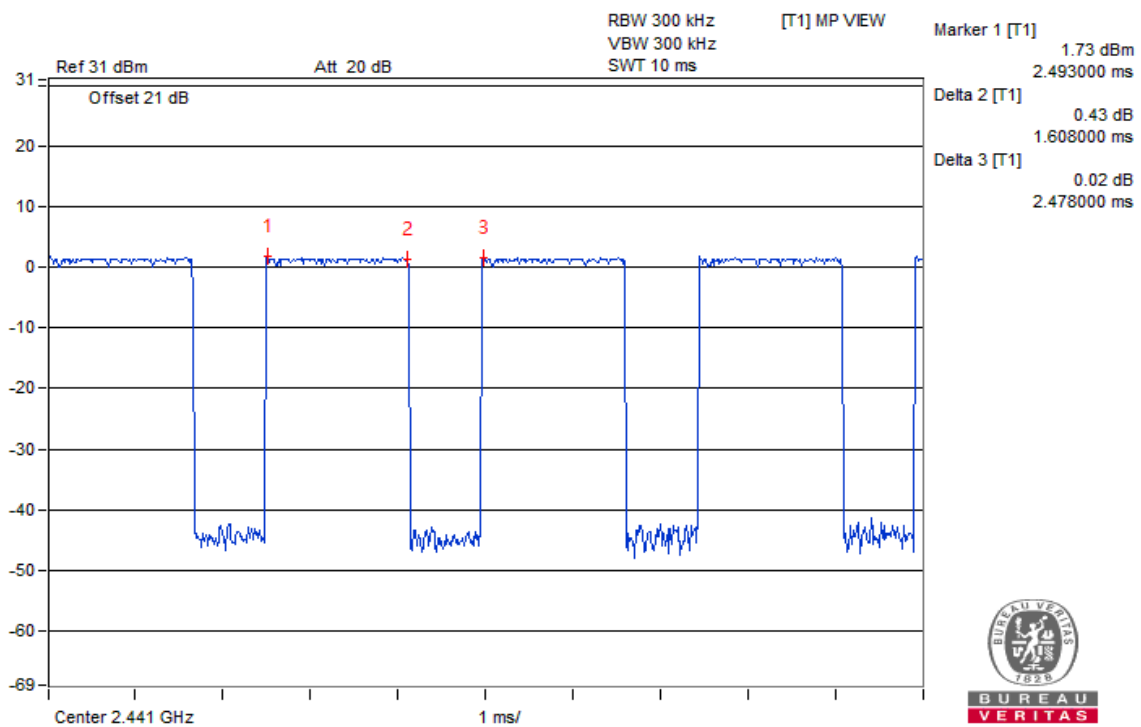


BUREAU  
VERITAS

V<sub>min</sub>.



DH1



DH3



Modulation:  $\pi/4$ -DQPSK

Normal Mode:

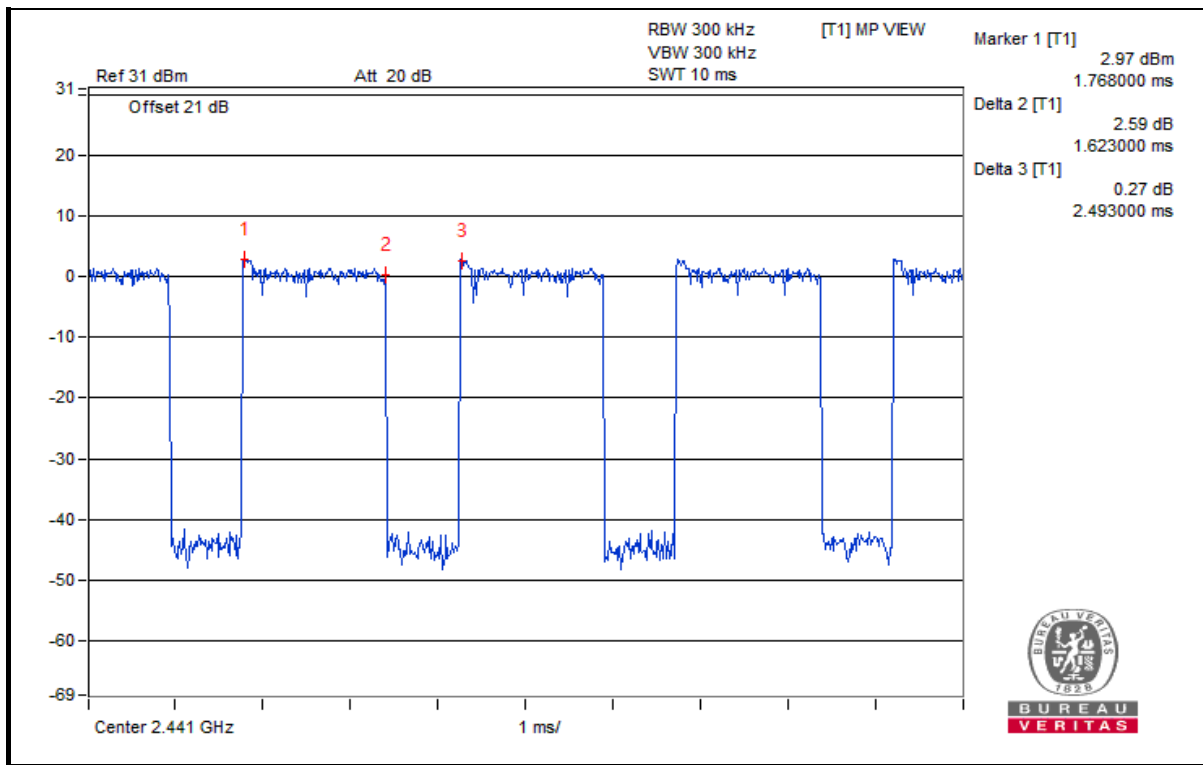
Test Condition	Mode	Diffusion Rate	[Diffusion Rate/79]*0.4 sec	Duty Cycle	Result (msec)	Limit (msec)
V <sub>normal</sub>	2DH1	71.40	0.361	0.306	110.466	400
	2DH3	71.40	0.361	0.651	235.011	400
	2DH5	71.40	0.361	0.754	272.194	400
V <sub>max.</sub>	2DH1	71.20	0.360	0.306	110.160	400
	2DH3	71.20	0.360	0.651	234.360	400
	2DH5	71.20	0.360	0.754	271.440	400
V <sub>min.</sub>	2DH1	71.40	0.361	0.306	110.466	400
	2DH3	71.40	0.361	0.651	235.011	400
	2DH5	71.40	0.361	0.761	274.721	400



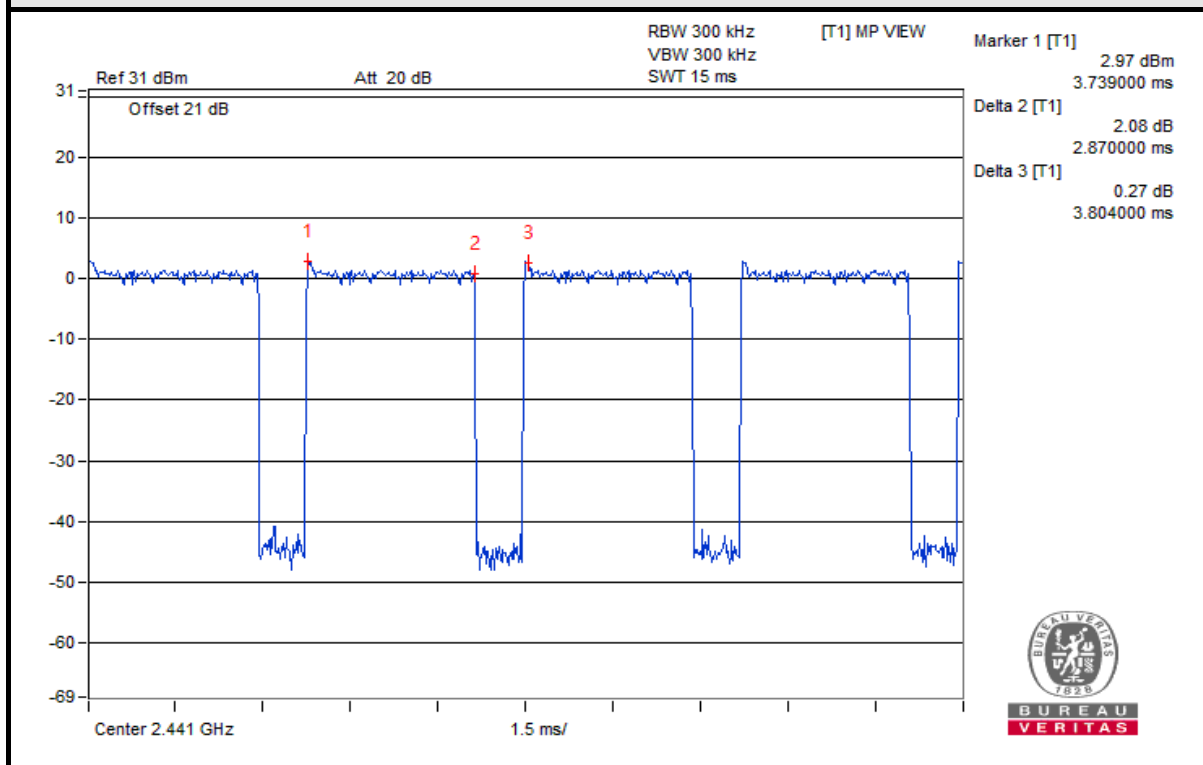




BUREAU  
VERITAS

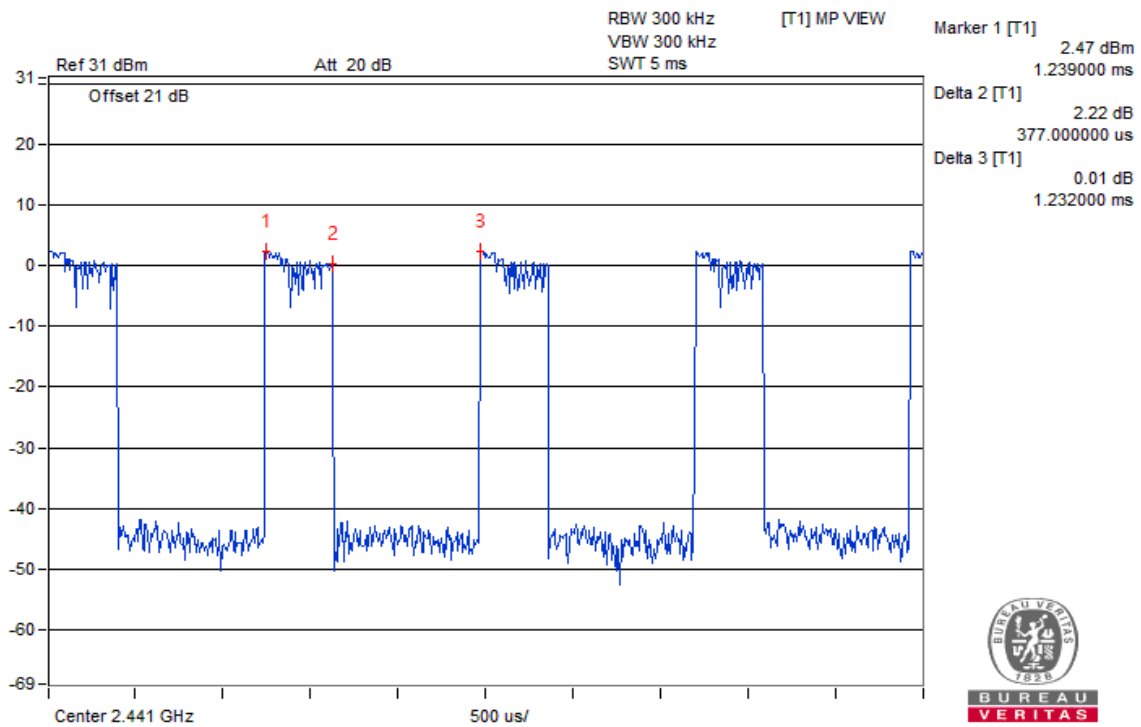


2DH3

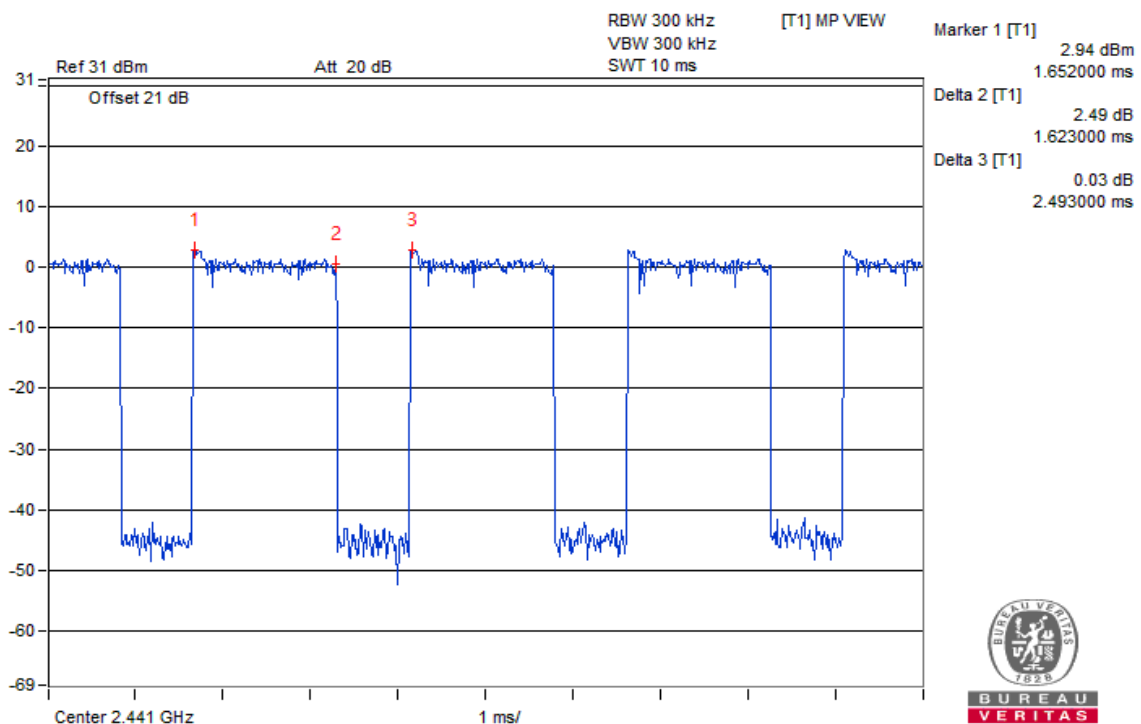


2DH5

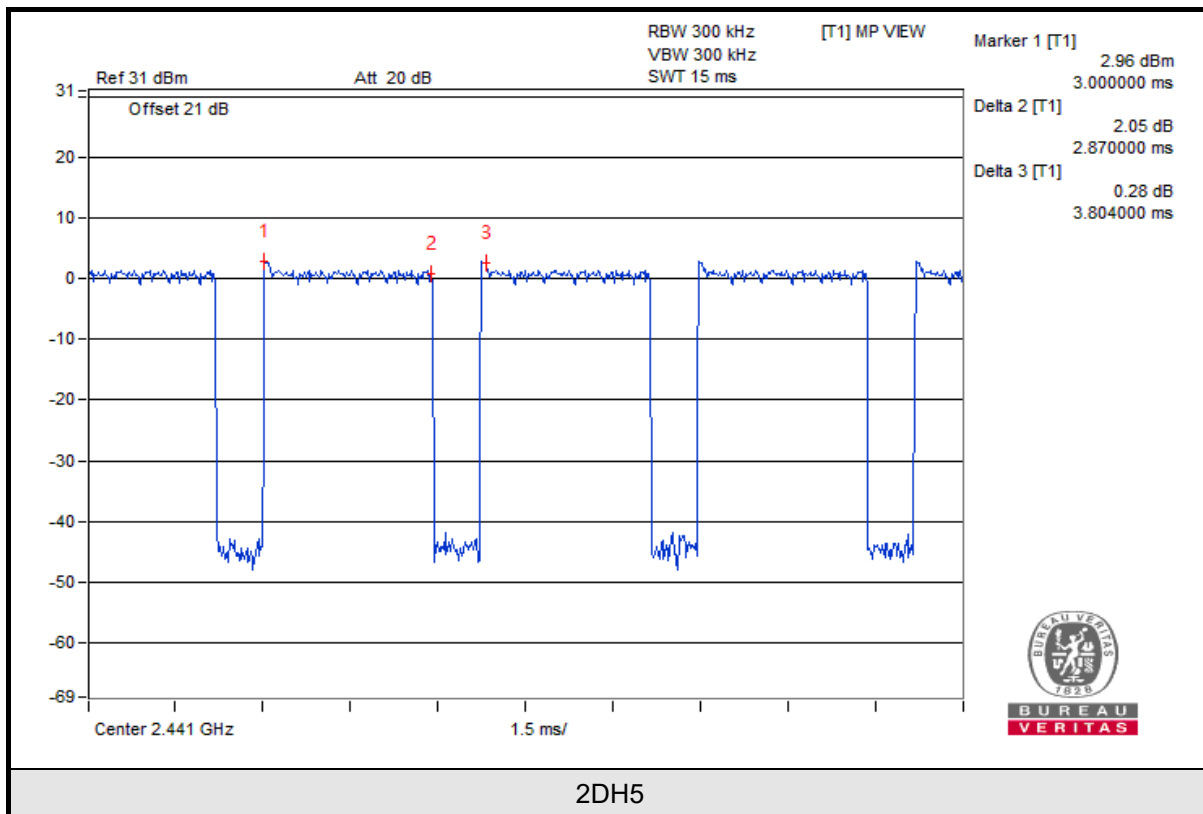
V<sub>max</sub>.



2DH1



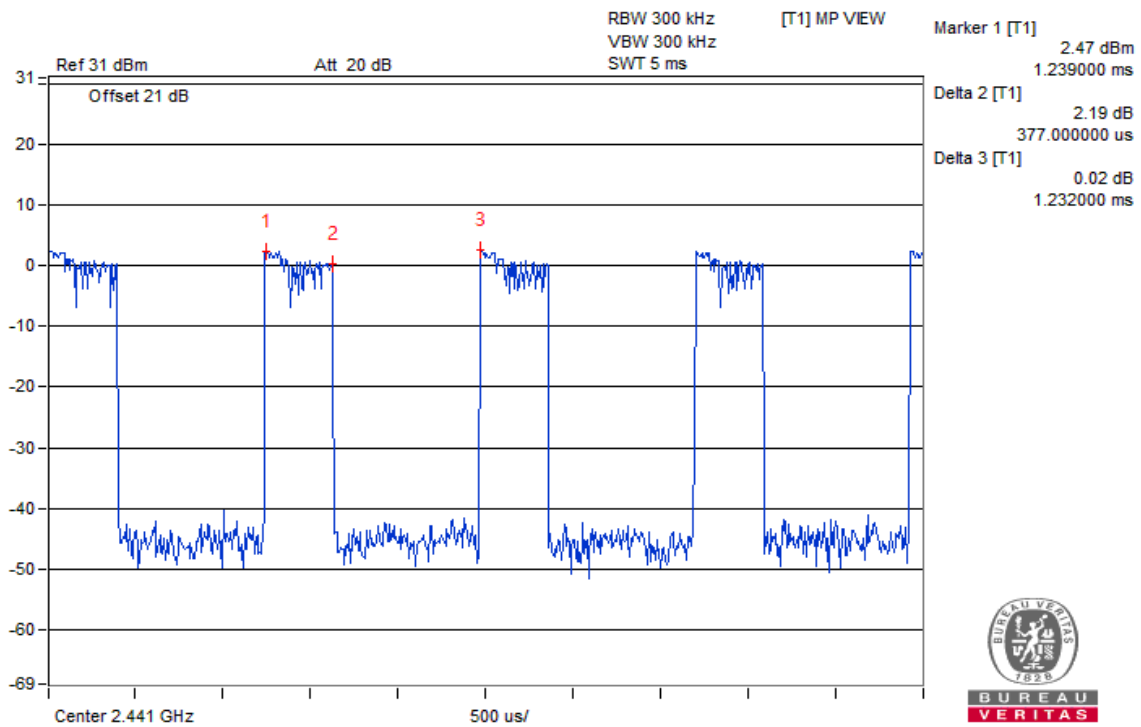
2DH3



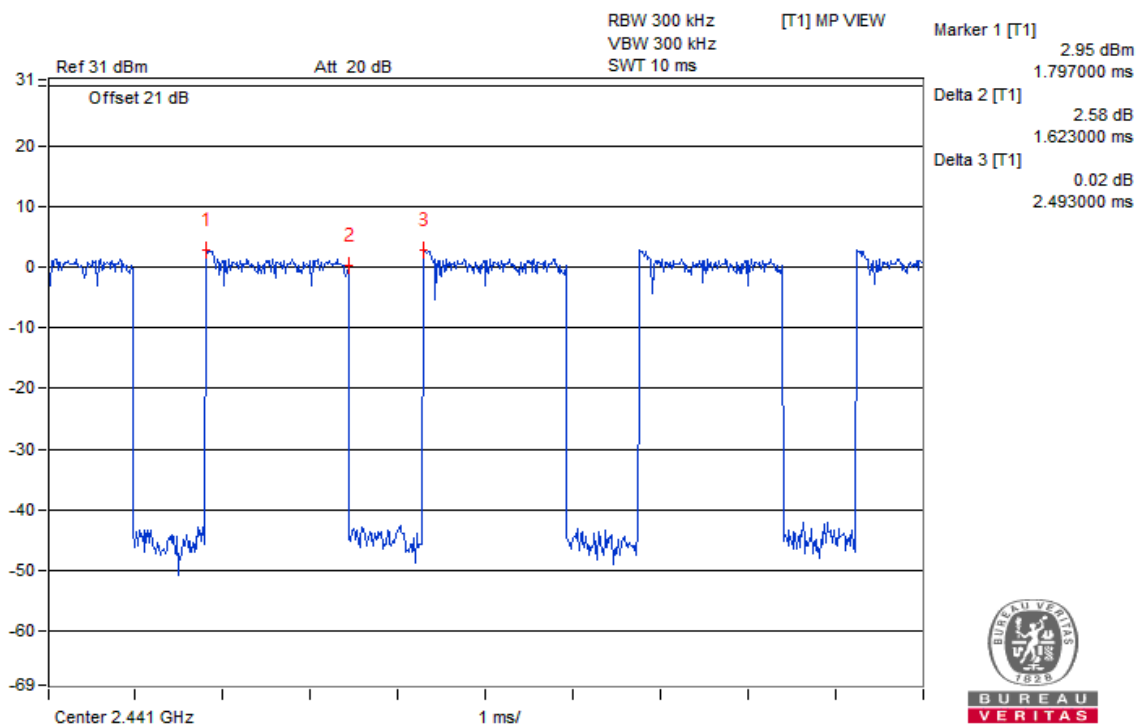


BUREAU  
VERITAS

V<sub>min</sub>.



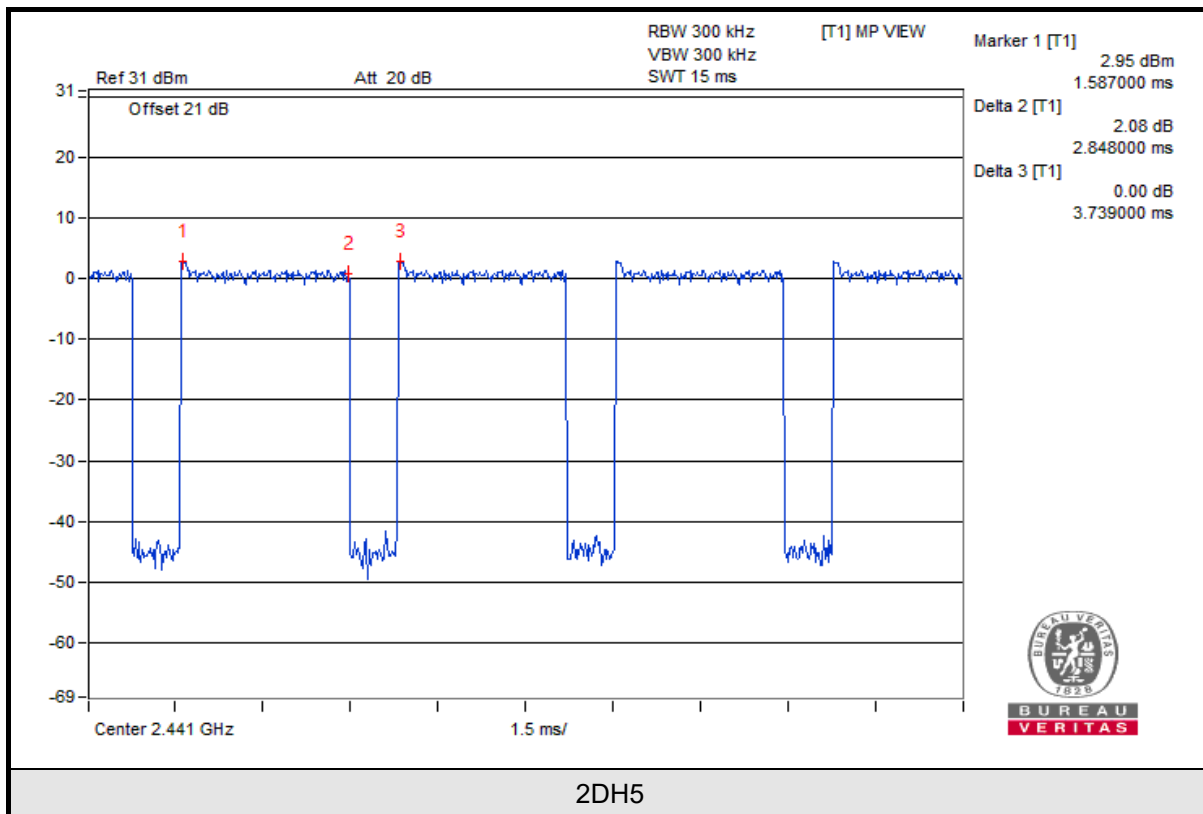
2DH1



2DH3



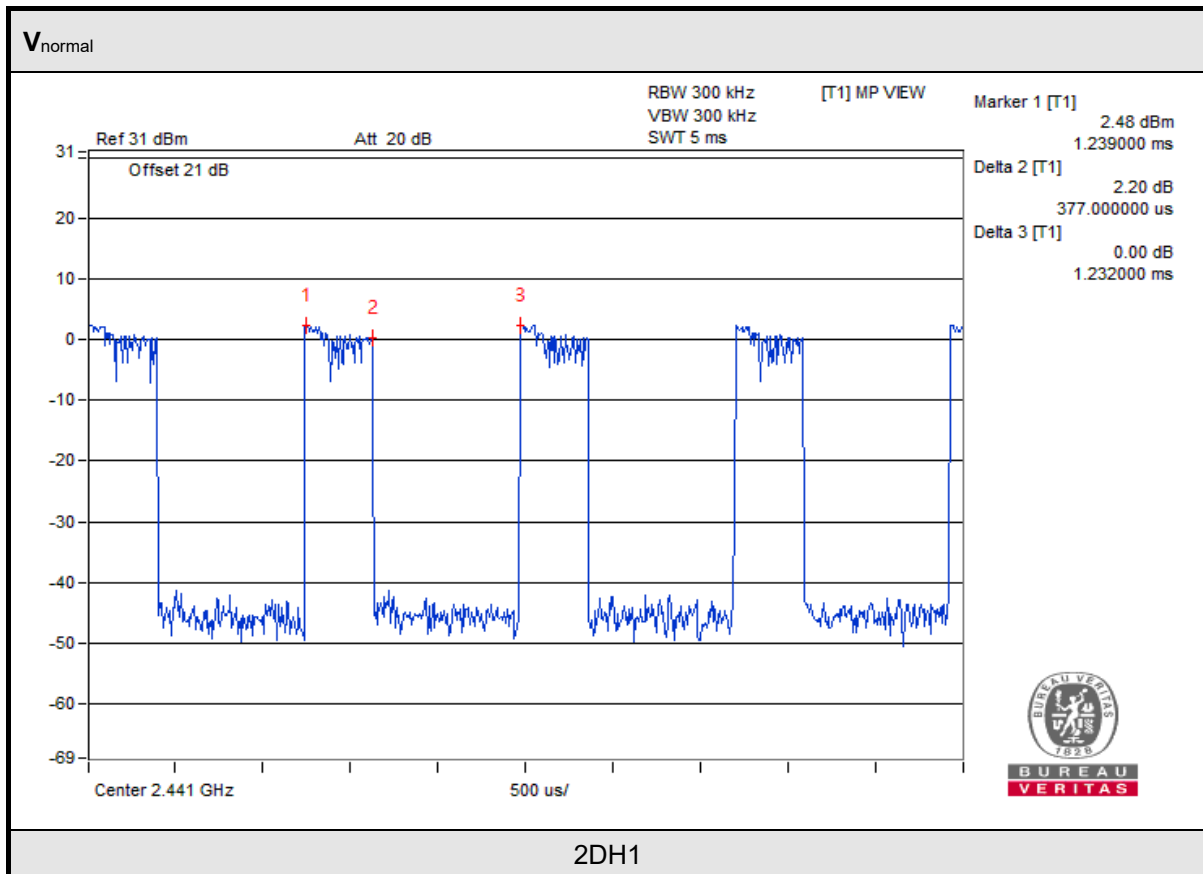
BUREAU  
VERITAS





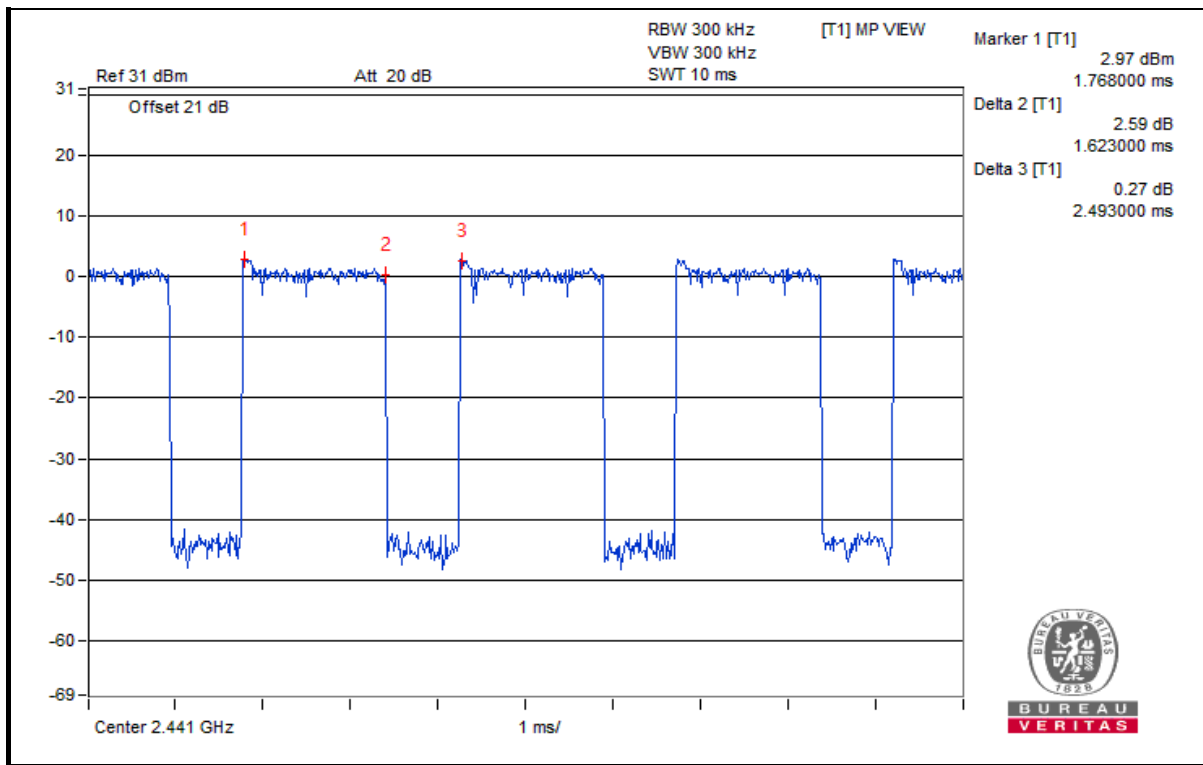
AFH Mode:

Test Condition	Mode	Diffusion Rate	[Diffusion Rate/20]*0.4 sec	Duty Cycle	Result (msec)	Limit (msec)
V <sub>normal</sub>	2DH1	18.12	0.362	0.306	110.772	400
	2DH3	18.12	0.362	0.651	235.662	400
	2DH5	18.12	0.362	0.754	272.948	400
V <sub>max.</sub>	2DH1	18.12	0.362	0.306	110.772	400
	2DH3	18.12	0.362	0.651	235.662	400
	2DH5	18.12	0.362	0.754	272.948	400
V <sub>min.</sub>	2DH1	18.26	0.365	0.306	111.690	400
	2DH3	18.26	0.365	0.651	237.615	400
	2DH5	18.26	0.365	0.761	277.765	400

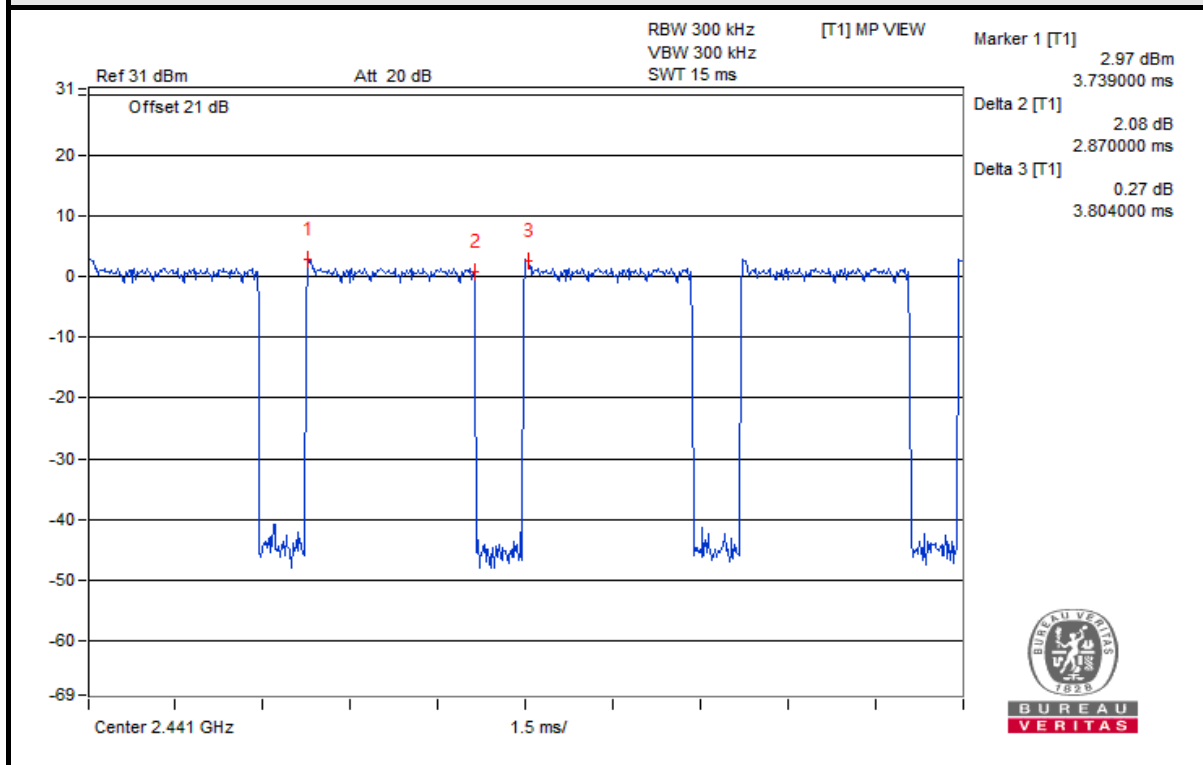




BUREAU  
VERITAS



2DH3

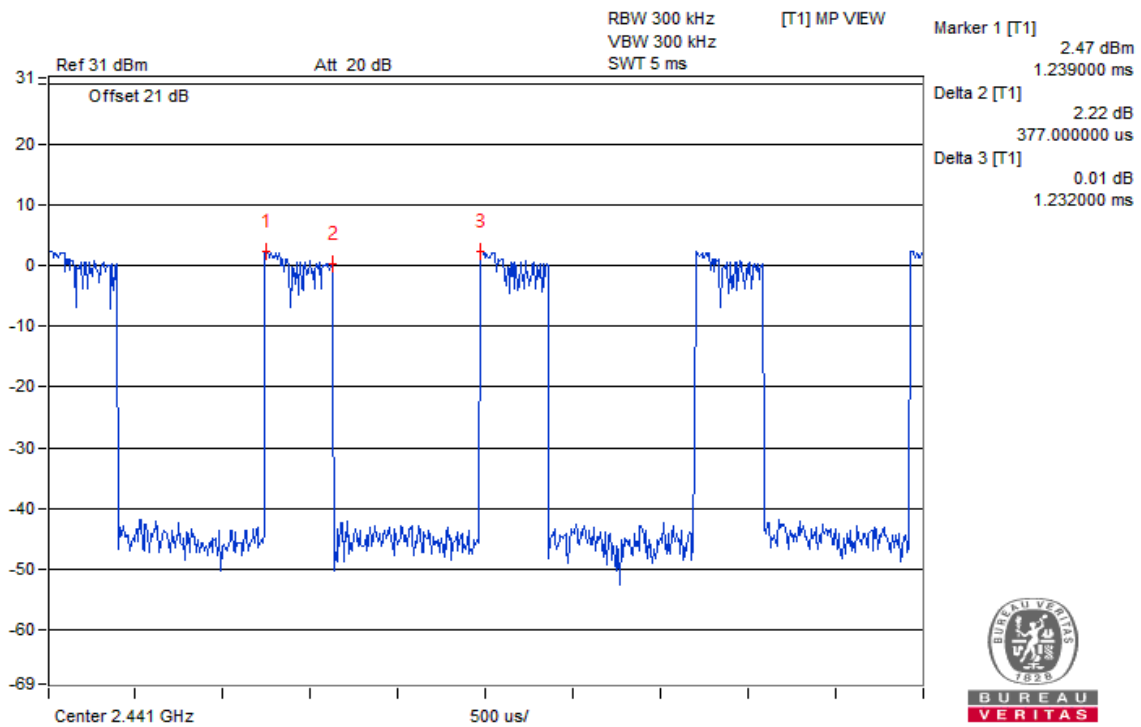


2DH5

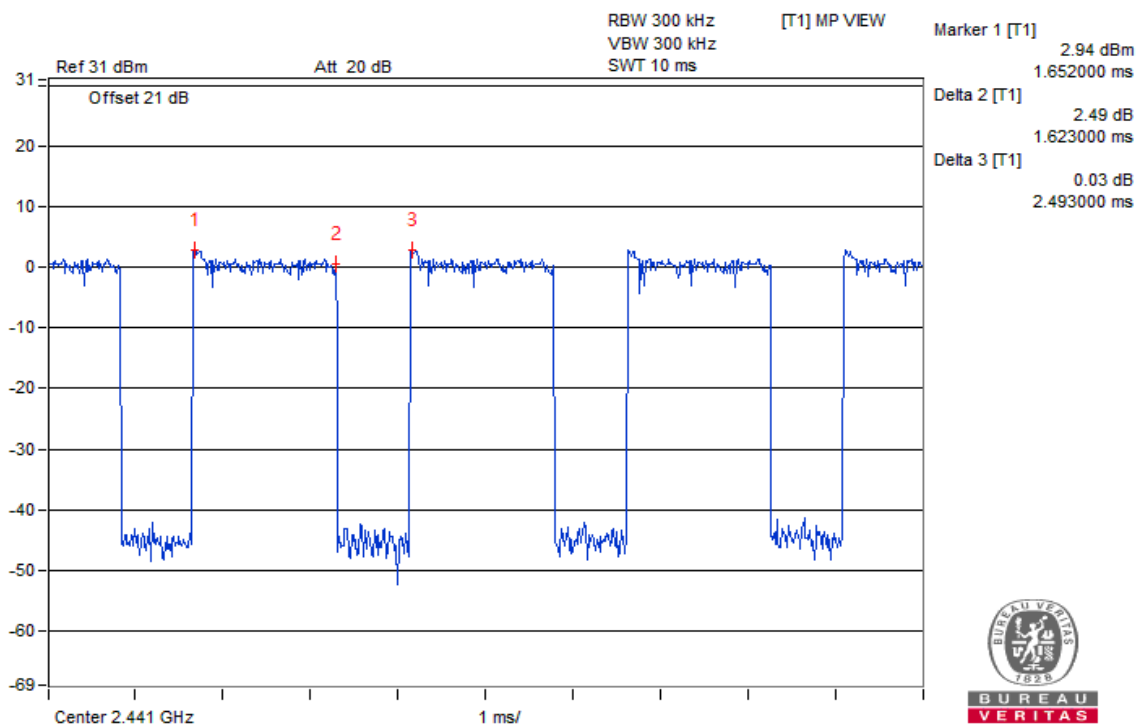


BUREAU  
VERITAS

V<sub>max</sub>.

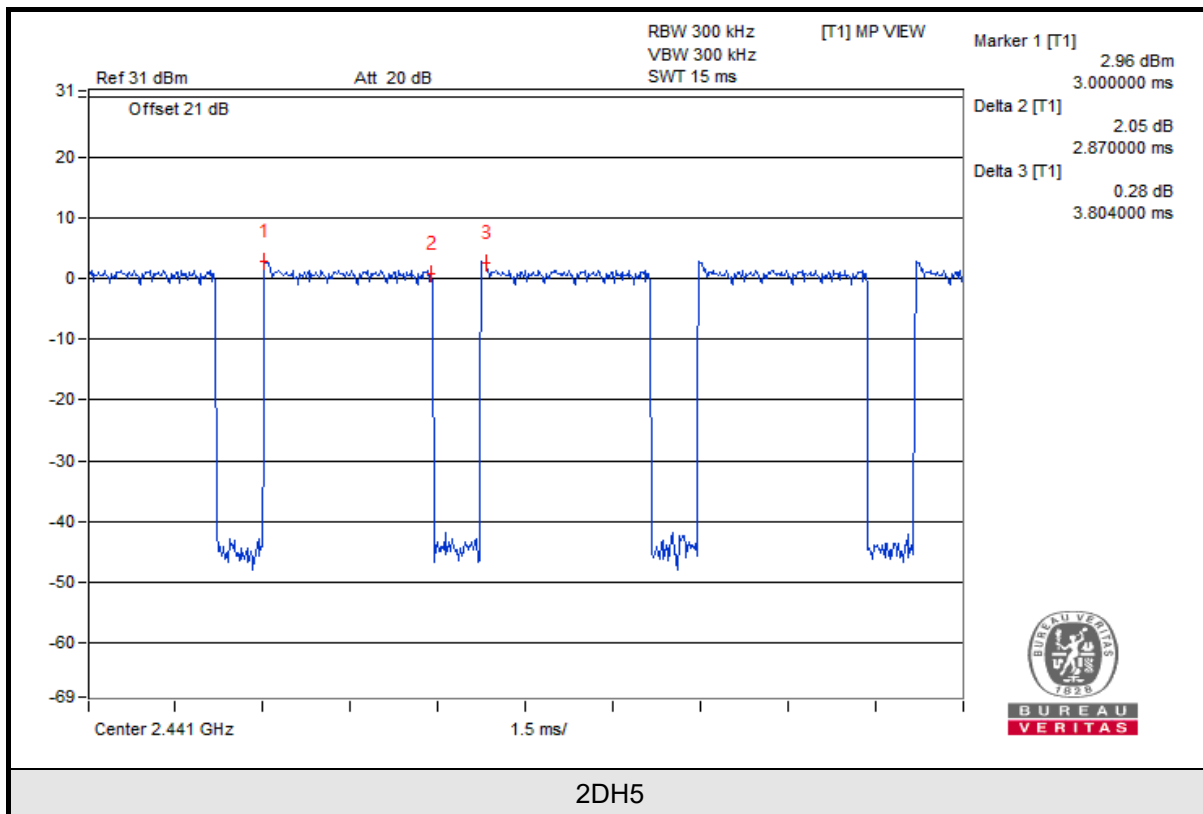


2DH1



2DH3

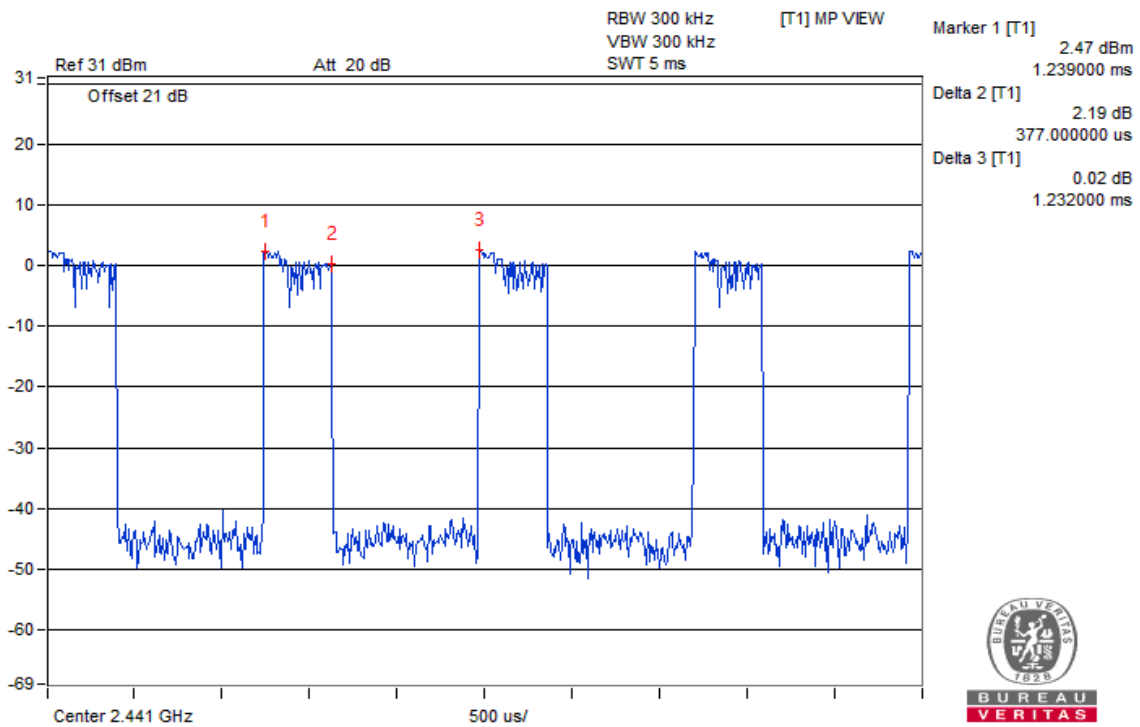




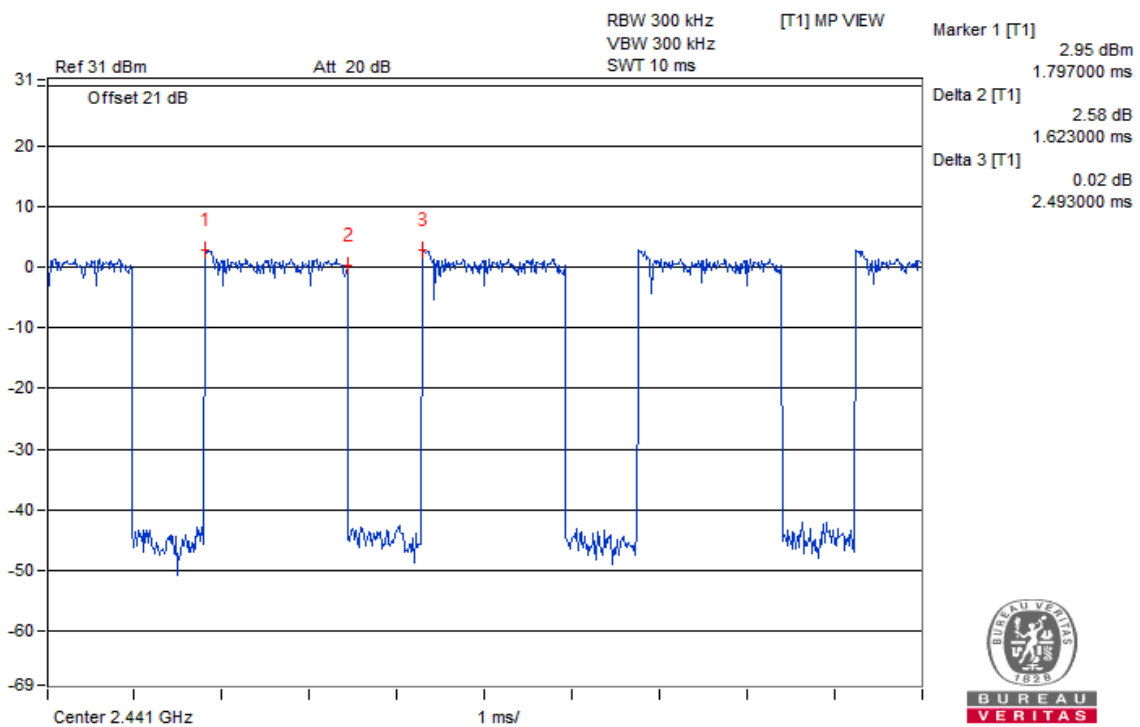


BUREAU  
VERITAS

V<sub>min</sub>.



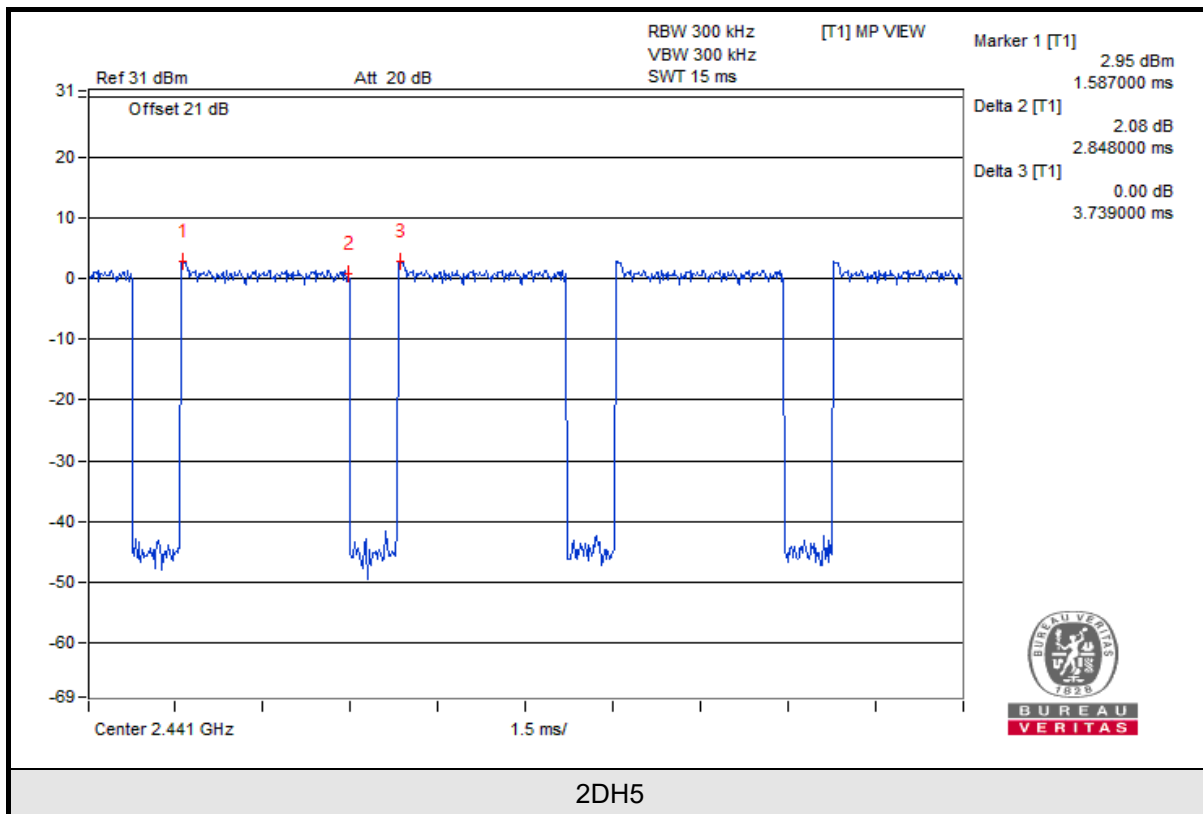
2DH1



2DH3



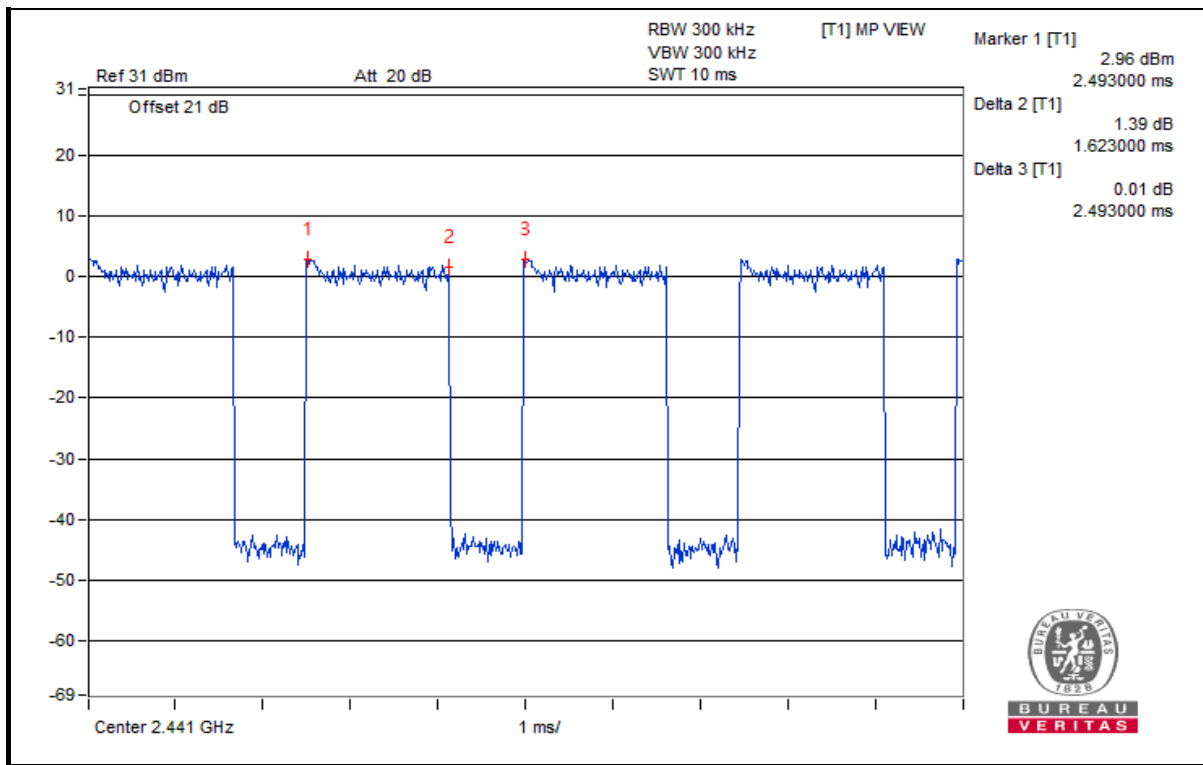
BUREAU  
VERITAS



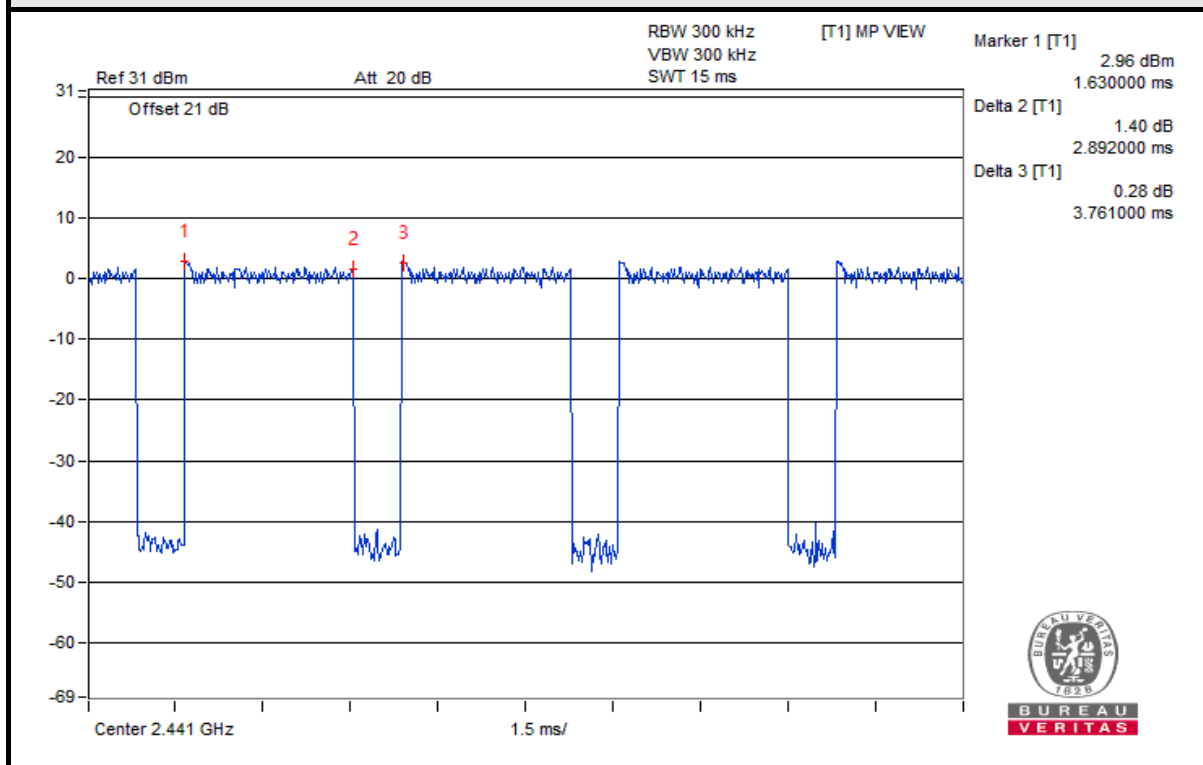




BUREAU  
VERITAS



3DH3

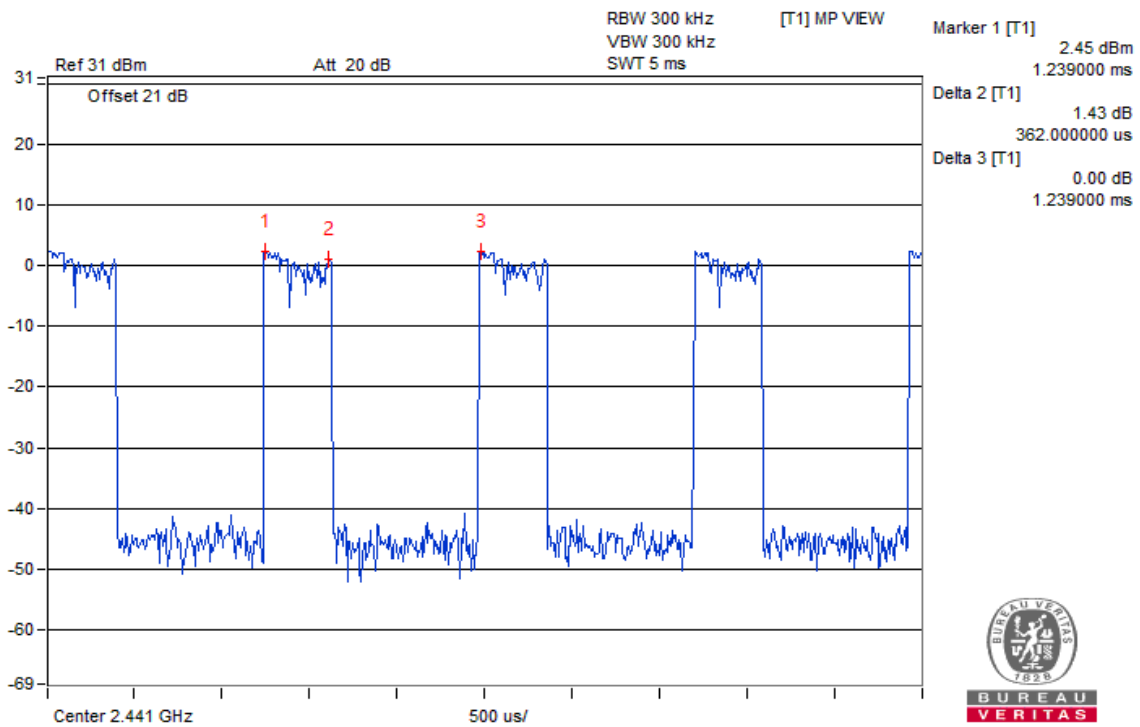


3DH5

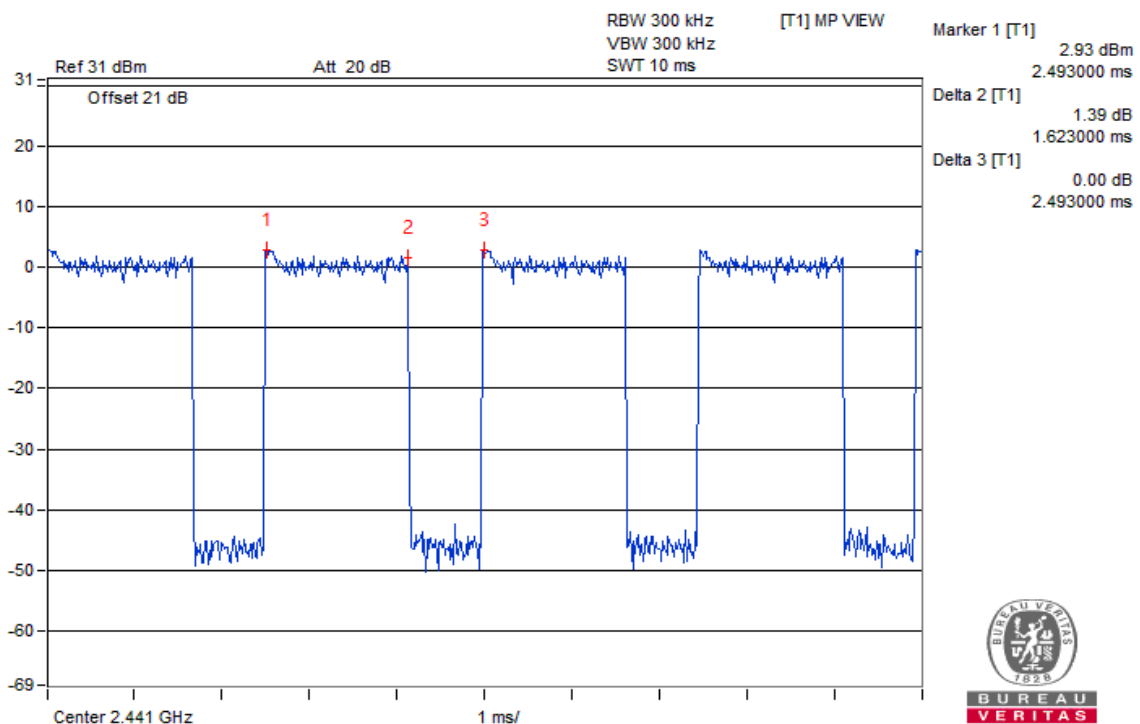


BUREAU  
VERITAS

V<sub>max</sub>.



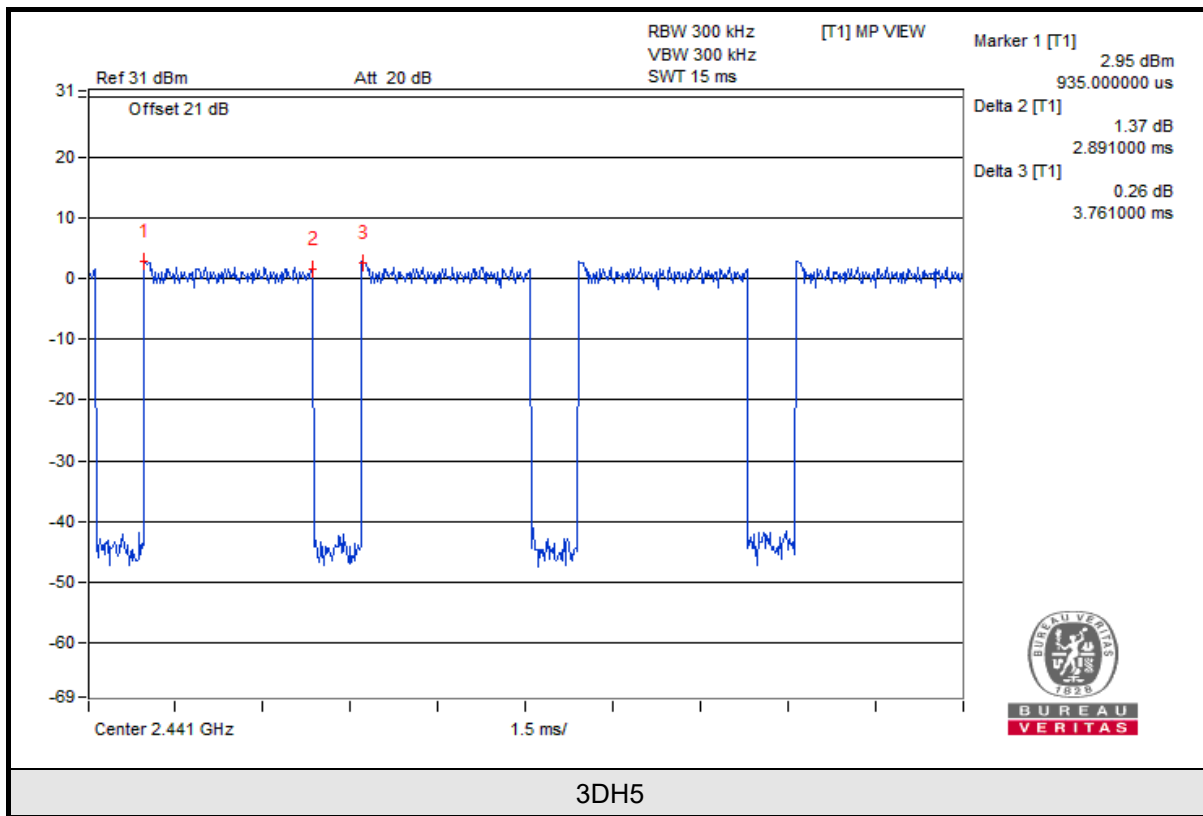
3DH1



3DH3



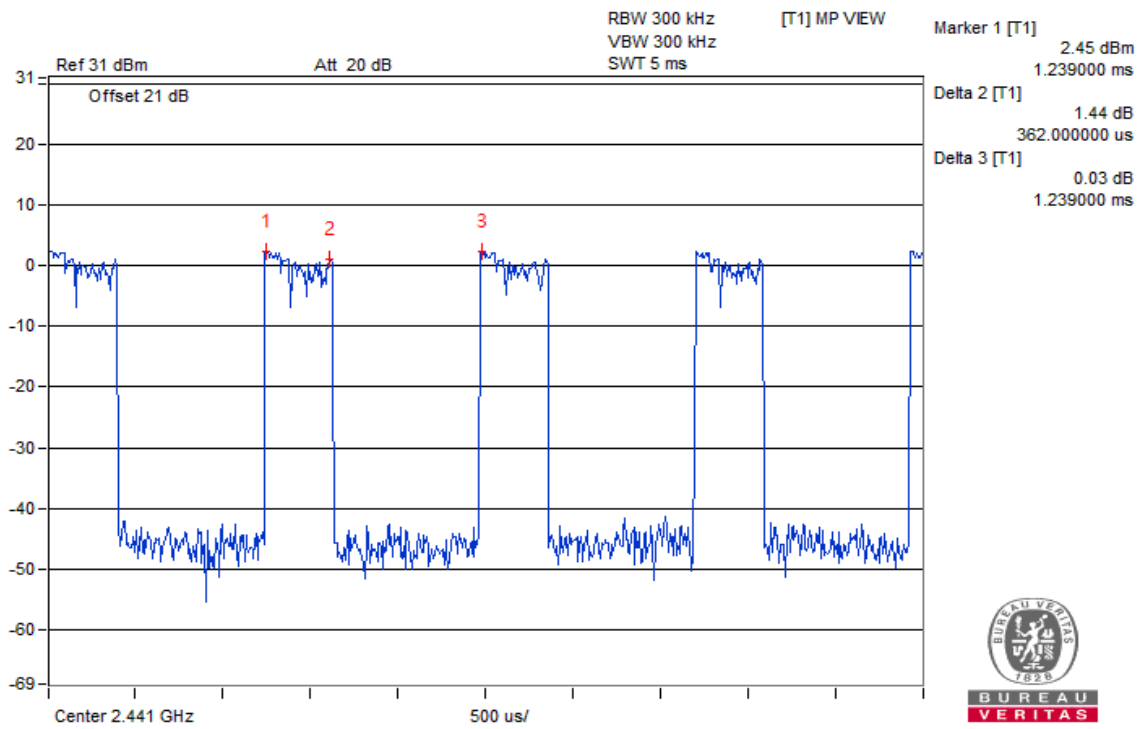
BUREAU  
VERITAS



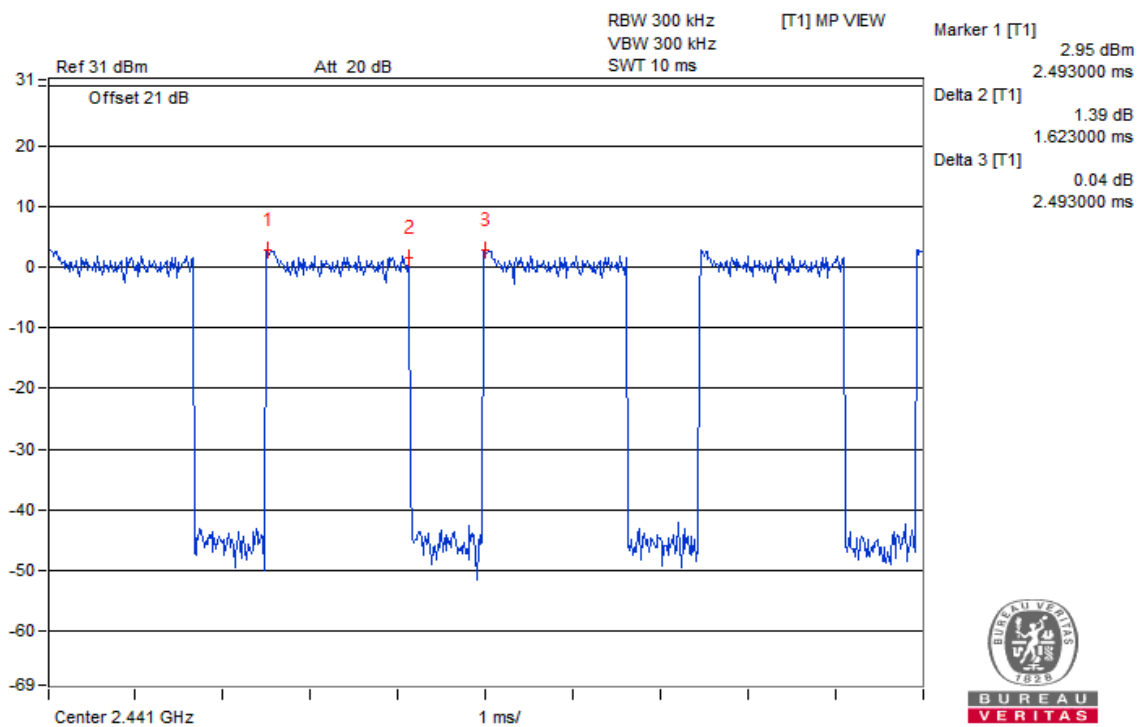


BUREAU  
VERITAS

V<sub>min</sub>.

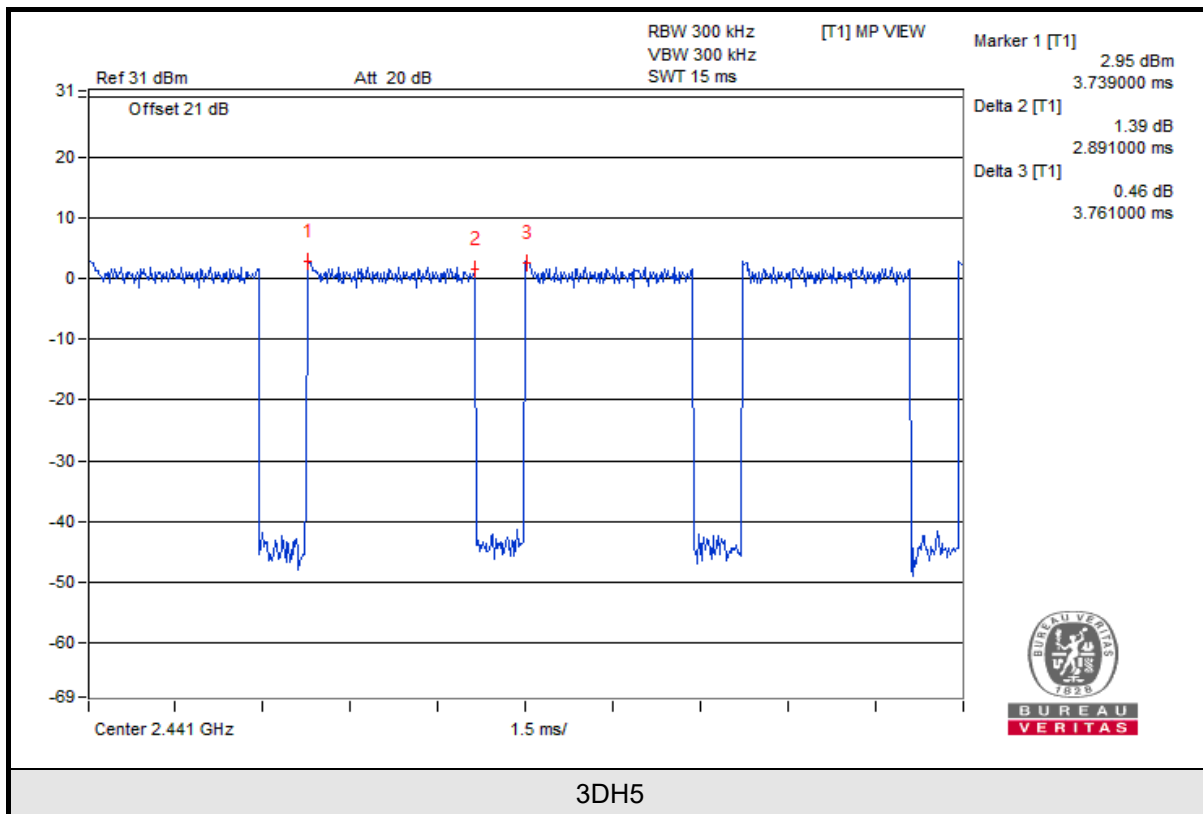


3DH1



3DH3



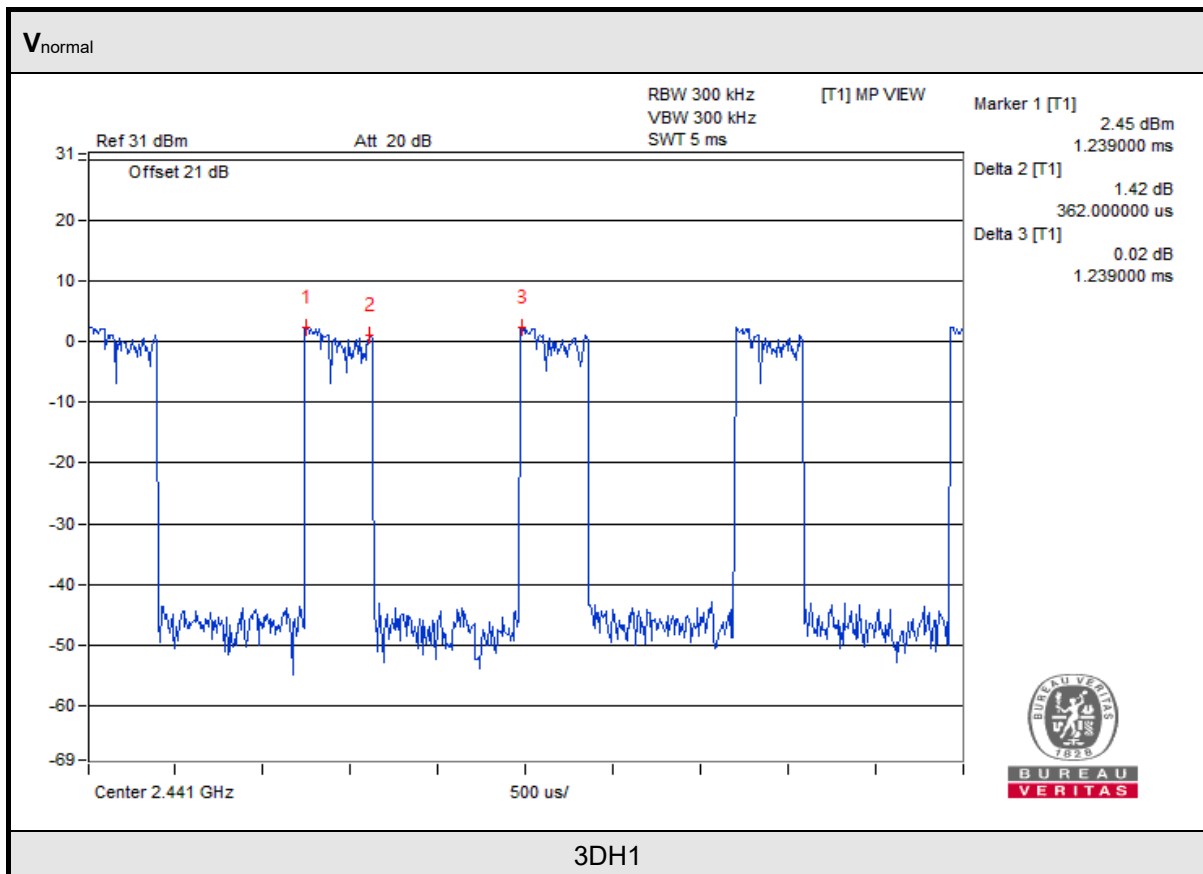




BUREAU VERITAS

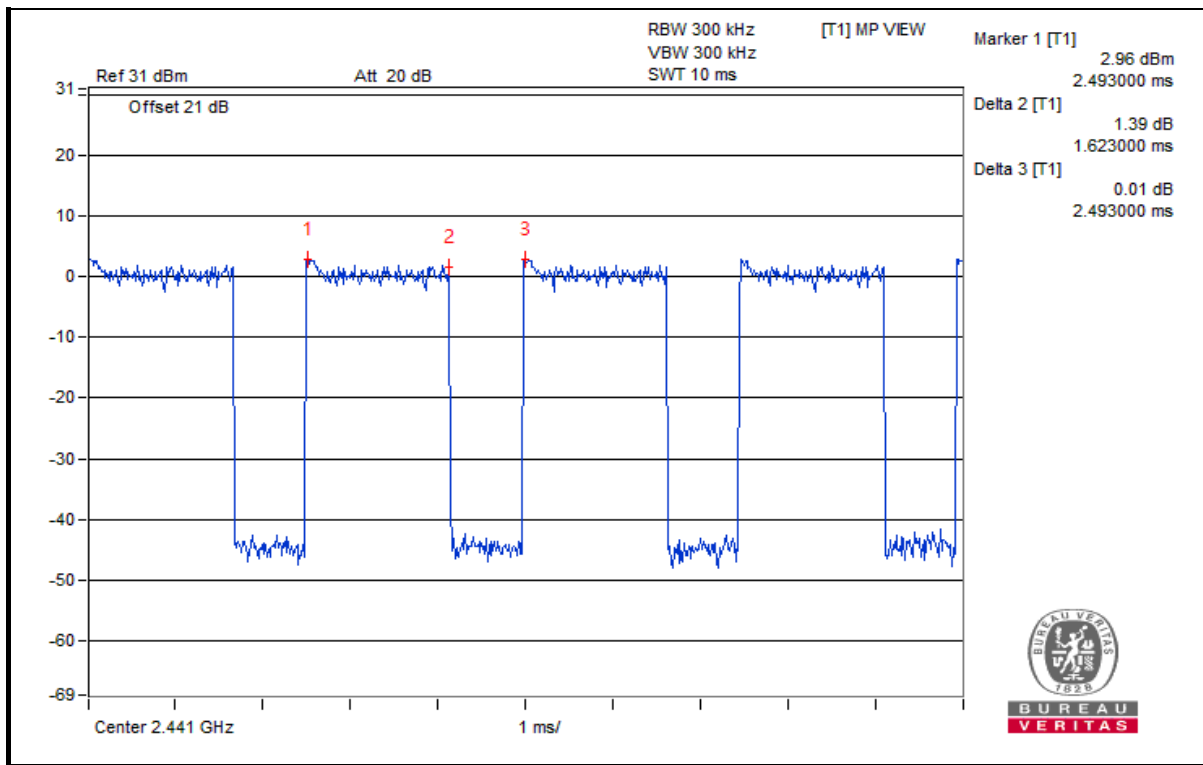
AFH Mode:

Test Condition	Mode	Diffusion Rate	[Diffusion Rate/20]*0.4 sec	Duty Cycle	Result (msec)	Limit (msec)
V <sub>normal</sub>	3DH1	18.12	0.362	0.292	105.704	400
	3DH3	18.12	0.362	0.651	235.662	400
	3DH5	18.12	0.362	0.768	278.016	400
V <sub>max.</sub>	3DH1	18.12	0.362	0.292	105.704	400
	3DH3	18.12	0.362	0.651	235.662	400
	3DH5	18.12	0.362	0.768	278.016	400
V <sub>min.</sub>	3DH1	18.26	0.365	0.292	106.580	400
	3DH3	18.26	0.365	0.651	237.615	400
	3DH5	18.26	0.365	0.768	280.320	400

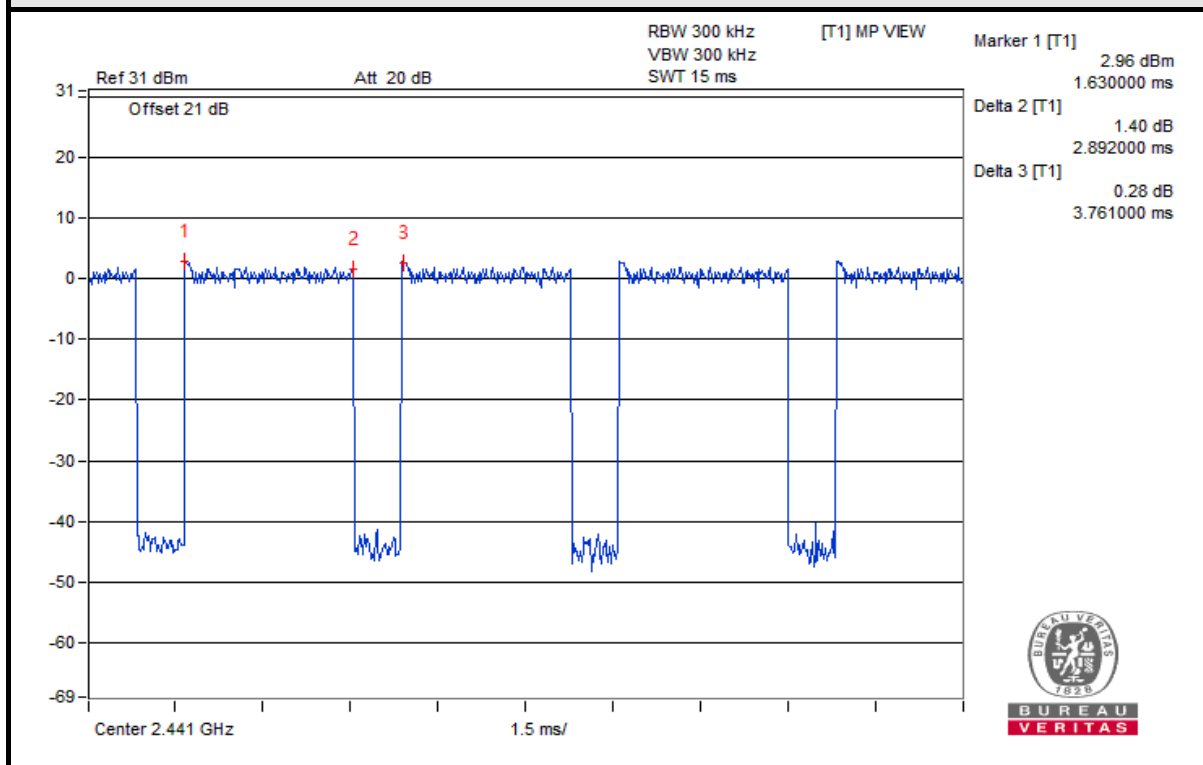




BUREAU  
VERITAS



3DH3

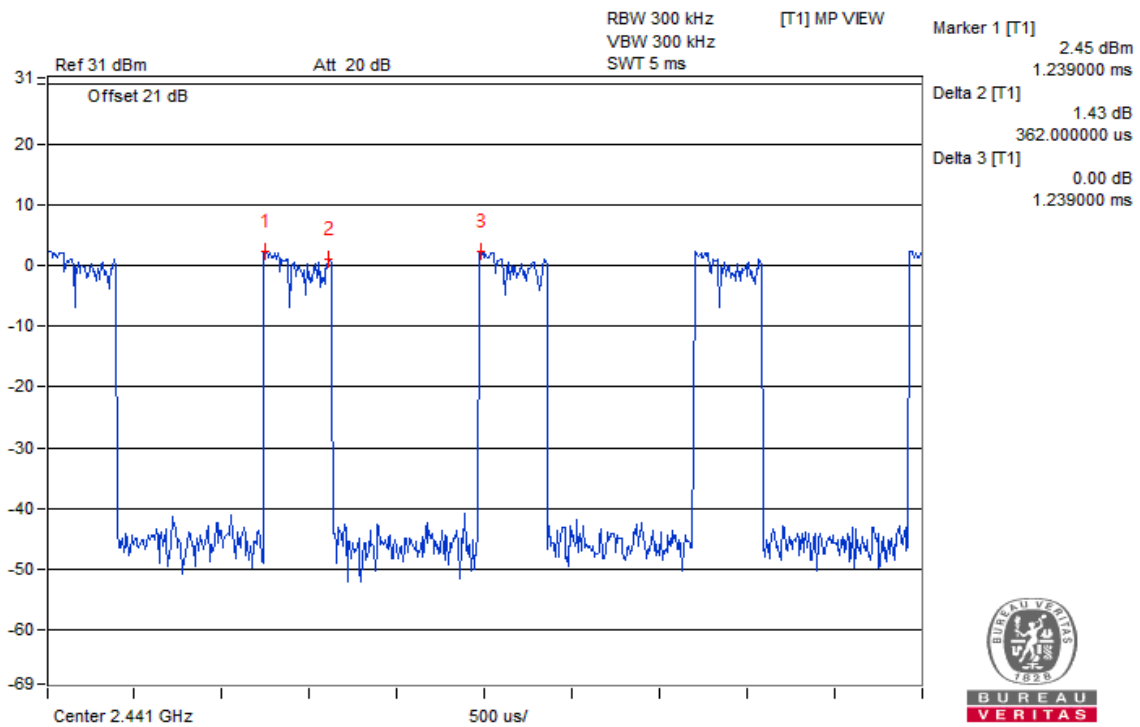


3DH5

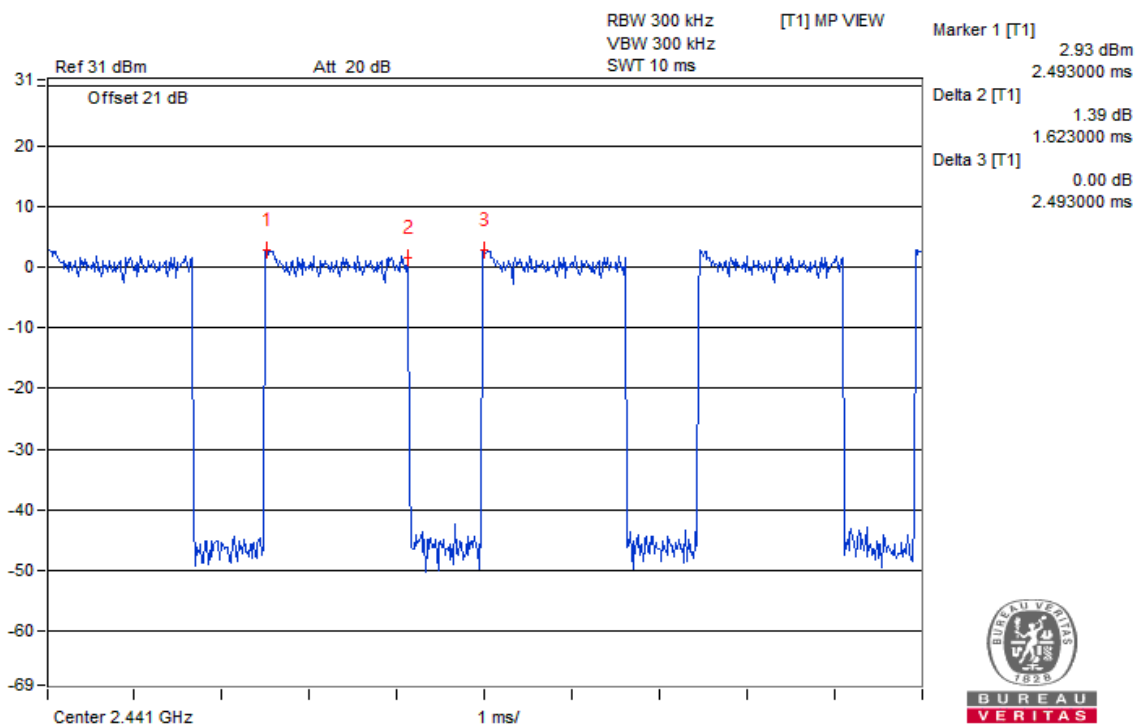


BUREAU  
VERITAS

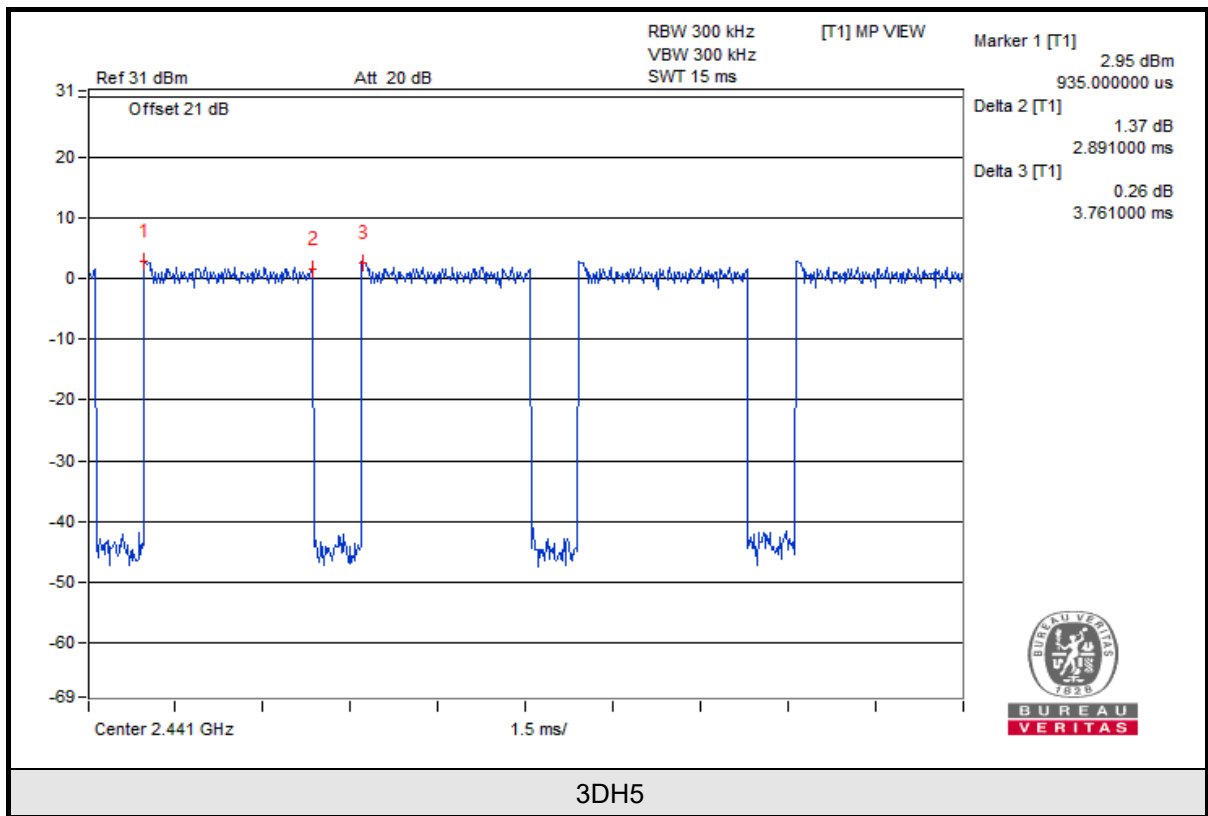
V<sub>max</sub>.



3DH1



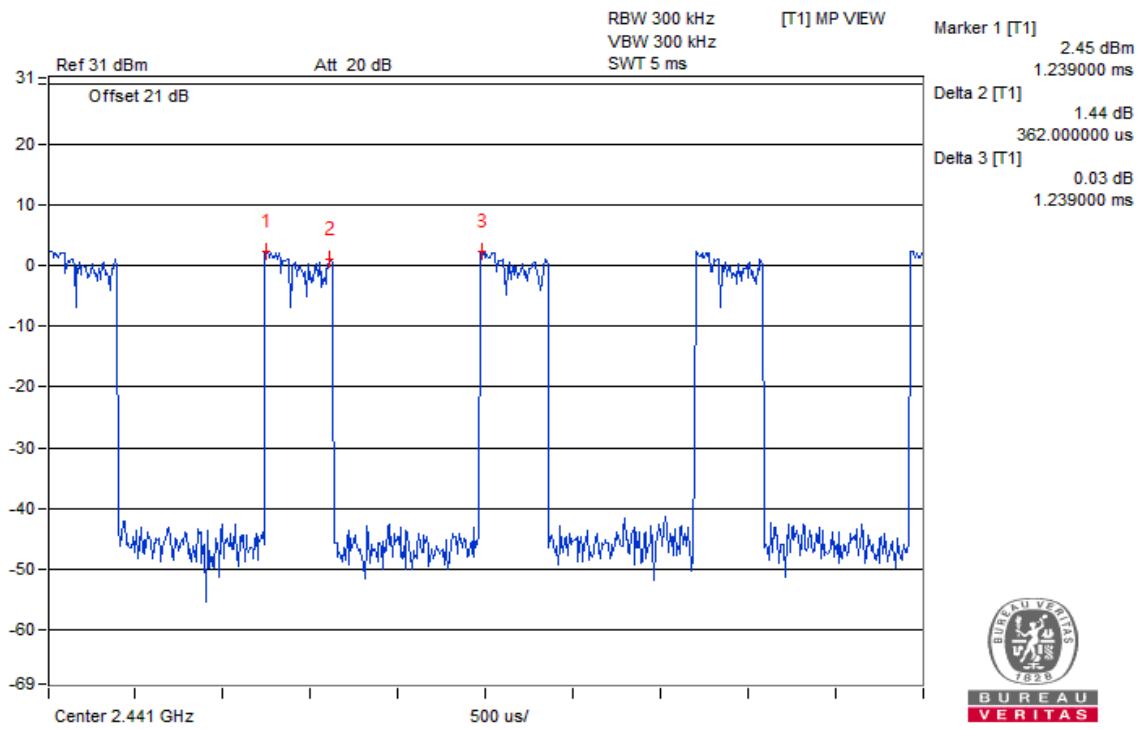
3DH3



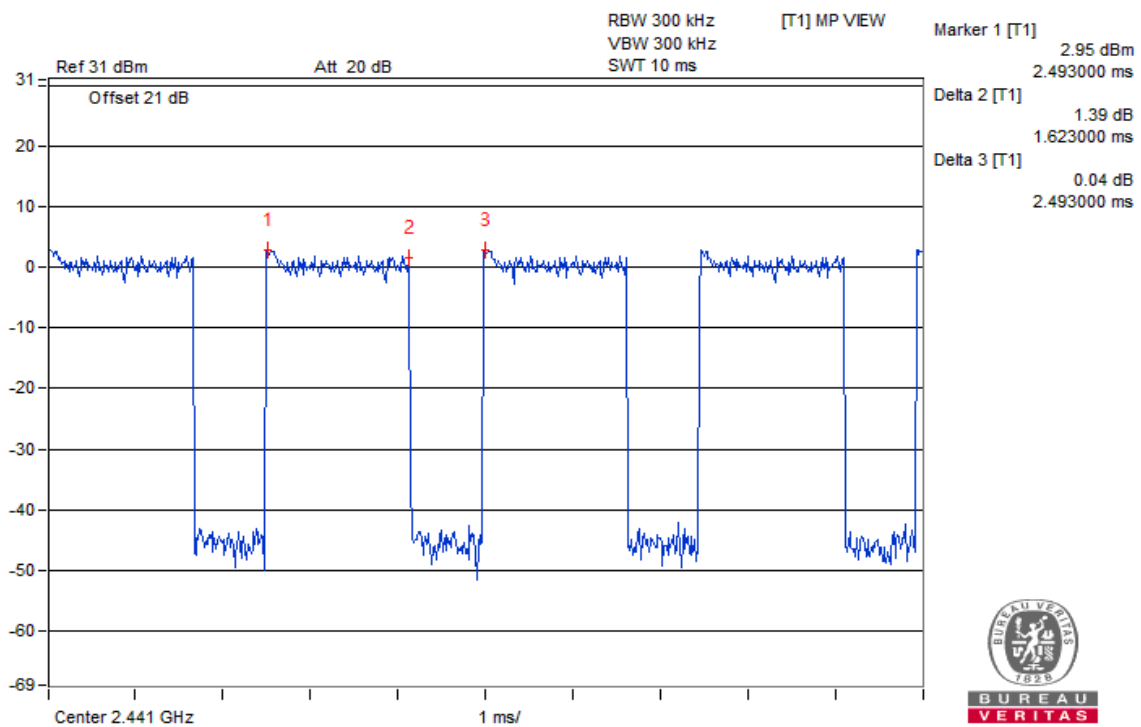


BUREAU  
VERITAS

V<sub>min</sub>.



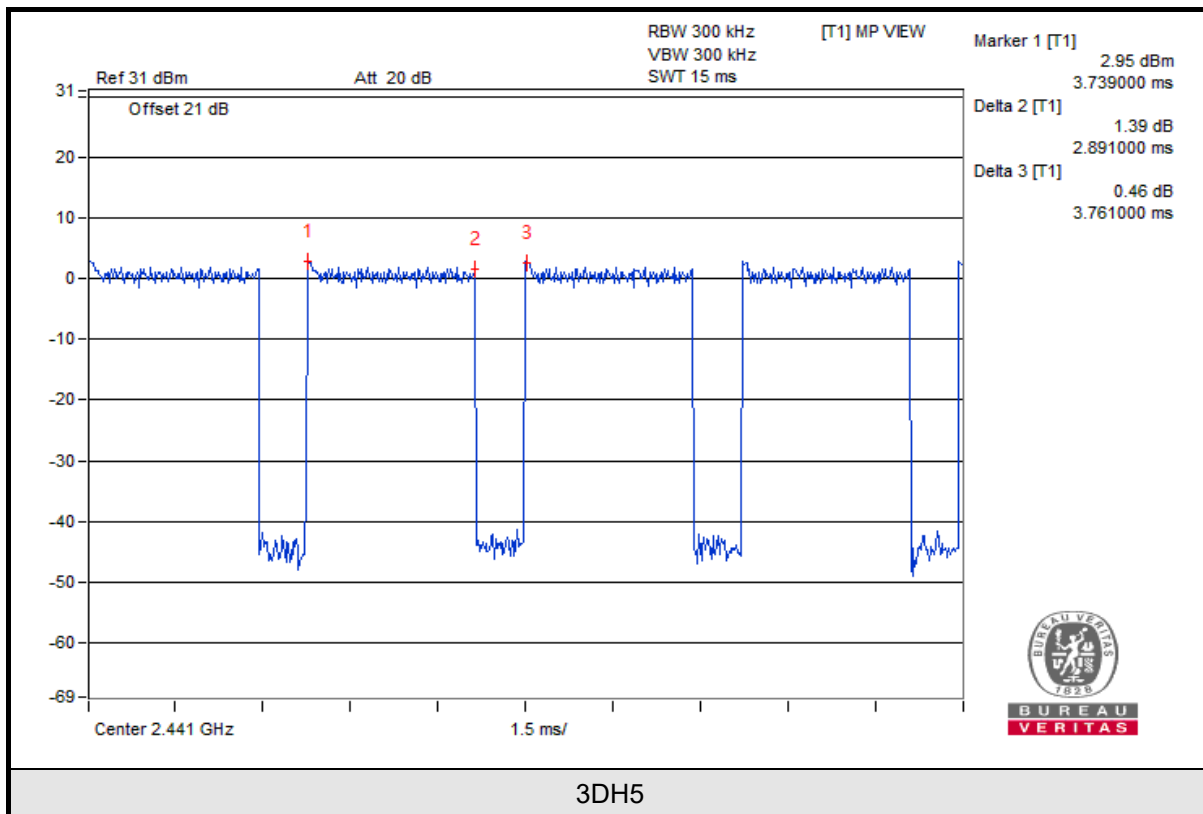
3DH1



3DH3



BUREAU  
VERITAS

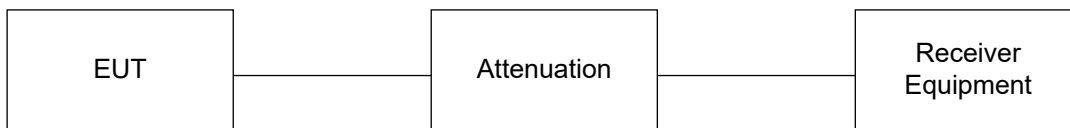


## 4.8 Interference Prevention Function

### 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

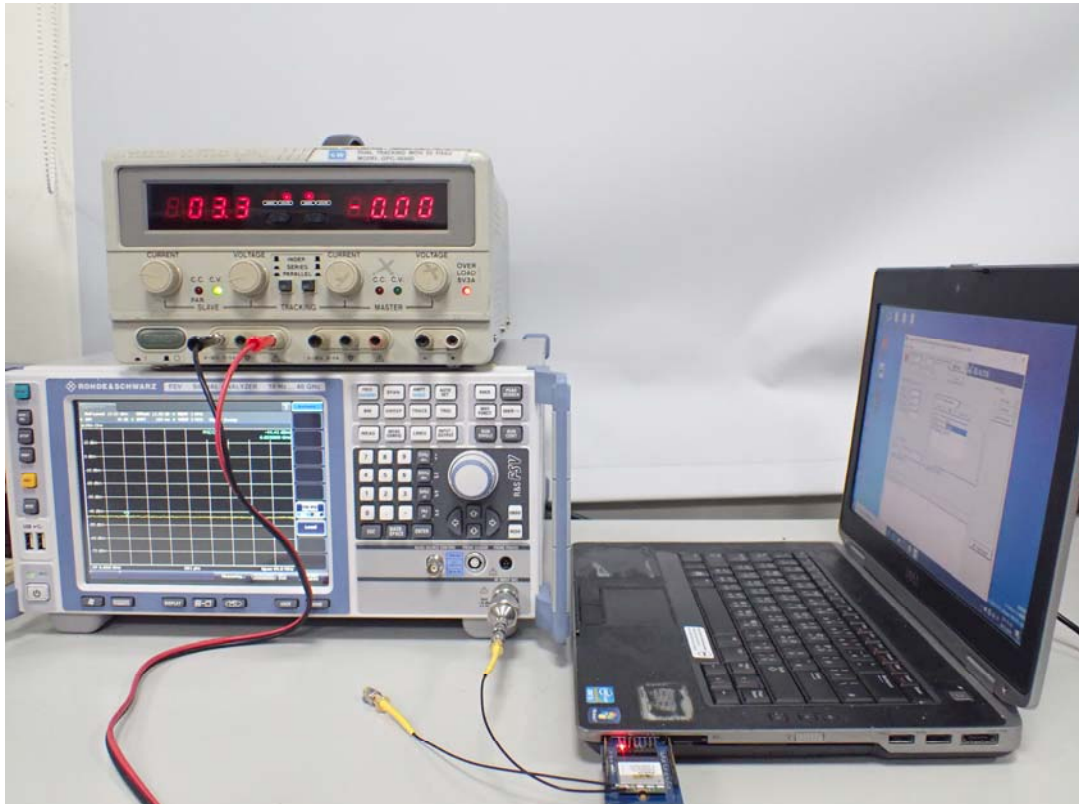


### 4.8.3 Test Results

<b>Environmental Conditions</b>	<b>25 deg.C, 60 % RH</b>
<b>Link Mode</b>	<b>Test Result</b>
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.

If you have any comments, please feel free to contact us at the following:

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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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