

TEST REPORT

CERTIFICATE OF CONFORMITY

Standard: Certification Ordinance Article 2-1-19

Report No.: RJBEMI-WTW-P23040655

Product: Electronic Display Device

Brand: Rakuten kobo

Model No.: N428

Received Date: 2023/5/4

Test Date: 2023/6/1 ~ 2023/6/10

Issued Date: 2023/10/6

Applicant: NETRONIX, INC.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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Approved by: Jeremy Lin, Date: 2023/10/6
Jeremy Lin / Project Engineer

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Prepared by : Vera Huang / Specialist



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Table of Contents

Release Control Record	3
1 Certificate.....	4
2 Summary of Test Results	5
2.1 Measurement Uncertainty	5
2.2 Supplementary Information	5
3 General Information	6
3.1 General Description	6
3.2 Output Power Description of EUT	7
3.3 Antenna Description of EUT	7
3.4 Channel List.....	7
3.5 Power Setting	8
3.6 Test Mode Applicability and Tested Channel Detail.....	8
4 Test Instruments	9
4.1 Frequency Tolerance	9
4.2 Occupied Bandwidth.....	9
4.3 Spreading Bandwidth and Spreading Factor	10
4.4 Spurious Emissions	10
4.5 Spurious Emissions of Receiver	10
4.6 Antenna Power	10
4.7 Dwell Time	10
4.8 Interference Prevention Function	11
5 Limits of Test Items.....	12
5.1 Frequency Tolerance	12
5.2 Occupied Bandwidth.....	12
5.3 Spreading Bandwidth and Spreading Factor	12
5.4 Spurious Emissions	12
5.5 Spurious Emissions of Receiver	12
5.6 Antenna Power	13
5.7 Dwell Time	13
5.8 Interference Prevention Function	13
6 Test Arrangements.....	14
6.1 Frequency Tolerance	14
6.2 Occupied Bandwidth.....	14
6.3 Spreading Bandwidth and Spreading Factor	14
6.4 Spurious Emissions	14
6.5 Spurious Emissions of Receiver	14
6.6 Antenna Power	15
6.7 Dwell Time	15
6.8 Interference Prevention Function	15
7 Test Results of Test Item	16
7.1 Frequency Tolerance	16
7.2 Occupied Bandwidth.....	17
7.3 Spreading Bandwidth and Spreading Factor	23
7.4 Spurious Emissions	29
7.5 Spurious Emissions of Receiver	41
7.6 Antenna Power	45
7.7 Dwell Time	47
7.8 Interference Prevention Function	89
8 Pictures of Test Arrangements	90
9 Information of the Testing Laboratories	91

Release Control Record

Issue No.	Description	Date Issued
RJBEMI-WTW-P23040655	Original Release	2023/10/6

1 Certificate

Product: Electronic Display Device

Brand: Rakuten kobo

Test Model: N428

Sample Status: Engineering Sample

Applicant: NETRONIX, INC.

Test Date: 2023/6/1 ~ 2023/6/10

Standard: Certification Ordinance Article 2-1-19

Measurement procedure: MIC notice 88 Appendix 43

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 RF characteristics under the conditions specified in this report.

2 Summary of Test Results

Certification Ordinance Article 2-1-19		
Clause	Test Item	Result
OR: Article 5 OR: Annex 1 table 7-8	Frequency Tolerance	Pass
OR: Article 6 Annex 2.30	Occupied Bandwidth	Pass
OR: Article 7. Annex 3.26	Spurious Emissions	Pass
OR: Article 49-20	Antenna Specifications	Pass
OR: Article 24.2	Spurious Emissions of Receiver	Pass
OR: Article 49-20	Housing Requirements	Pass (Refer to Note 3)
OR: Article 49-20	Communication Method	Pass (Refer to Note 3)
OR: Article 49-20	Modulation Method	Pass (Refer to Note 3)
OR: Article 49-20	Antenna Power	Pass
OR: Article 49-20	Absolute Gain of Transmitting Antenna	Pass
OR: Article 49-20	Angular Width of Principal Radiation (AWPR)	N/A
OR: Article 49-20	Number of Carriers within 1 MHz Bandwidth in OFDM	N/A
OR: Article 49-20	Spreading Bandwidth and Spreading Factor	Pass
OR: Article 49-20	Dwell Time (FH employed)	Pass
OR: Article 9-4.8	Interference Prevention Function	Pass
OR: Article 49-20	Carrier Sense Capability	N/A

Notes:

1. OR: Ordinance Regulating Radio Equipment.
2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
3. The relative information refer section 3.1 of this report

2.1 Measurement Uncertainty

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

Parameter	Uncertainty (±)
Occupied Bandwidth	491.896 Hz
Spurious Emissions	2.208 dB
Output Power Density	2.889 dB
Out of Band Radiated Power	3.93 dB
Frequency Tolerance	6805.18 Hz

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

2.2 Supplementary Information

There is not any deviation from the test standards for the test method, and no modifications required for compliance.

3 General Information

3.1 General Description

Product	Electronic Display Device
Brand	Rakuten kobo
Test Model	N428
Test Software Version	Tera Term Version 4.106
Status of EUT	Engineering Sample
Power Supply Rating	3.87Vdc from Battery or 5Vdc from USB port
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK
Modulation Technology	FHSS
Transfer Rate	Up to 3 Mbps
Operating Frequency	2.402 GHz ~ 2.48 GHz
Number of Channel	79
Assembly	The EUT is constructed as an Electronic Display Device. The housing consists of two parts, and the plastic enclosure was assembled with glue and covered by rubbers, separating the two parts was only possible by means of brute force.

Note:

1. The EUT has black & white, which are electrically identical to each other except for exterior color.
2. The EUT must be supplied with a battery as the following table:

Brand	Model	Spec.
EVE Energy Co., Ltd.	EVE188595QH	3.87Vdc, 2050mAh

3. The EUT could be supplied with USB cable and different models could be chosen:

Brand	Model	Material	Color	Specification
LUXSHARE-ICT	LB93US002-1R	PVC	Black	Shielded : Y, 1M, Core: N/A
	LB93US003-1R		White	
Yih Fone	SH-0422		Black	
	SH-0424		White	

4. The EUT could be supplied with eMMC as below following:

No.	Model	Remark
1	PTE7A0YJ-32GE	1 st source eMMC
2	MKEMF032GT1E-C	2 nd source eMMC

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

3.2 Output Power Description of EUT

Operation Mode	Rated Output Power Density (mW/MHz)	Conducted RF Output Power Density (mW/MHz)	Radiated RF Output Power Density (mW/MHz)
BT EDR	0.04	0.032382	0.079672
BT EDR AFH function	0.13	0.127106	0.312727

3.3 Antenna Description of EUT

1. The antenna information is listed as below.

Antenna No.	Gain (dBi)	Antenna Type	Connector Type
	2400~2483.5 MHz		
1	3.91	Chip	N/A

* Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

2. Antenna Pattern:

Please refer to the attached file (Antenna pattern).

3.4 Channel List

79 channels are provided for BT-EDR:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	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	78	2480
19	2421	39	2441	59	2461		

3.5 Power Setting

Power Setting	
Modulation	BT EDR
GFSK	6
$\pi/4$ -DQPSK	7
8DPSK	7

3.6 Test Mode Applicability and Tested Channel Detail

Test Conditions	Voltage (Vdc)
V_{normal}	3.87
$V_{max. (+10\%)}$	4.257
$V_{min. (-10\%)}$	3.483

Following channel(s) was (were) selected for the final test as listed below:

Test Item	Tested Channel	Modulation	Data Rate Parameter
Frequency Tolerance	0, 39, 78	un-modulation	-
Occupied Bandwidth / Spreading Bandwidth and Spreading Factor / Spurious Emissions	Hopping Channel	GFSK	DH5
		$\pi/4$ -DQPSK	2DH5
		8DPSK	3DH5
Spurious Emissions of Receiver	0, 39, 78	-	-
Antenna Power	Hopping Channel	GFSK	DH5
		$\pi/4$ -DQPSK	2DH5
		8DPSK	3DH5
Dwell Time	Hopping Channel	GFSK	DH1, DH3, DH5
		$\pi/4$ -DQPSK	2DH1, 2DH3, 2DH5
		8DPSK	3DH1, 3DH3, 3DH5
Interference Prevention Function	Normal Operation		
Note: For AFH function only tested occupied bandwidth, spreading bandwidth, Antenna power and dwell time.			

4 Test Instruments

The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.1 Frequency Tolerance

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until	Calibration Authority	Calibration Method
3-channel DC power supply JIN YIH Technology	ODP3033	ODP30332128138	Note 2	Note 2	BV CPS E&E	(d)
Digital Multimeter Fluke	87-III	70360742	2022/6/23	2023/6/22	OCL	(c)
PXA Signal Analyzer Keysight	N9030B	MY57140488	2023/3/6	2024/3/5	ETC	(c)
Signal Analyzer R&S	FSV40	100980	2023/5/3	2024/5/2	ETC	(c)
Software BV	ADT_RF Test Software V6.6.5.4	N/A	N/A	N/A	N/A	N/A

Notes:

- Calibration method:
 - Calibration conducted by the National Institute of Information and Communications Technology (NICT) or a designated calibration agency under Article 102-18 paragraph (1).
 - 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.
 - 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).
 - Calibration conducted by using other equipment that listed above from a) to c).
- The power supply no evaluation calibrated, which used the RMS clamp meter to verify before each testing.
- The test was performed in Oven room.
- Tested Date: 2023/6/1

4.2 Occupied Bandwidth

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until	Calibration Authority	Calibration Method
3-channel DC power supply JIN YIH Technology	ODP3033	ODP30332128138	Note 2	Note 2	BV CPS E&E	(d)
Digital Multimeter Fluke	87-III	70360742	2022/6/23	2023/6/22	OCL	(c)
Signal Analyzer R&S	FSV40	100980	2023/5/3	2024/5/2	ETC	(c)
Software BV	ADT_RF Test Software V6.6.5.4	N/A	N/A	N/A	N/A	N/A

Notes:

- Calibration method:
 - Calibration conducted by the National Institute of Information and Communications Technology (NICT) or a designated calibration agency under Article 102-18 paragraph (1).
 - 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.
 - 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).
 - Calibration conducted by using other equipment that listed above from a) to c).
- The power supply no evaluation calibrated, which used the RMS clamp meter to verify before each testing.
- The test was performed in Oven room.
- Tested Date: 2023/6/1

4.3 Spreading Bandwidth and Spreading Factor

Refer to section 4.2 to get information of the instruments.

4.4 Spurious Emissions

Refer to section 4.2 to get information of the instruments.

4.5 Spurious Emissions of Receiver

Refer to section 4.2 to get information of the instruments.

4.6 Antenna Power

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until	Calibration Authority	Calibration Method
3-channel DC power supply JIN YIH Technology	ODP3033	ODP30332128138	Note 2	Note 2	BV CPS E&E	(d)
Digital Multimeter Fluke	87-III	70360742	2022/6/23	2023/6/22	OCL	(c)
USB Wideband Power Sensor Keysight	U2021XA	MY55050005/MY55190004/ MY55190007/MY55210005	2022/7/13	2023/7/12	ETC	(c)

Notes:

- Calibration method:
 - Calibration conducted by the National Institute of Information and Communications Technology (NICT) or a designated calibration agency under Article 102-18 paragraph (1).
 - 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.
 - 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).
 - Calibration conducted by using other equipment that listed above from a) to c).
- The power supply no evaluation calibrated, which used the RMS clamp meter to verify before each testing.
- The test was performed in Oven room.
- Tested Date: 2023/6/2

4.7 Dwell Time

Refer to section 4.2 to get information of the instruments.

4.8 Interference Prevention Function

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until	Calibration Authority	Calibration Method
3-channel DC power supply JIN YIH Technology	ODP3033	ODP30332128138	Note 2	Note 2	BV CPS E&E	(d)
Bluetooth Simulator Anritsu	MT8852B	1218002	2023/5/21	2024/5/20	ETC	(c)
Digital Multimeter Fluke	87-III	70360742	2022/6/23	2023/6/22	OCL	(c)

Notes:

1. 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).
2. The power supply no evaluation calibrated, which used the RMS clamp meter to verify before each testing.
3. The test was performed in Oven room.
4. Tested Date: 2023/6/10

5 Limits of Test Items

5.1 Frequency Tolerance

Tolerance of frequency shall be +/- 50ppm.

5.2 Occupied Bandwidth

Modulation Method	Limit	Remark
DSSS	<26 MHz	
OFDM	<26 MHz	Antenna power limitation is 10 mW/MHz
	26 – 40 MHz	Antenna power limitation is 5 mW/MHz
FHSS	<83.5 MHz	
Other Digital	<26 MHz	

5.3 Spreading Bandwidth and Spreading Factor

Item	Limit	Remark
Spreading Bandwidth	≥ 500 kHz	(For DSSS, FHSS)
Spreading Factor	≥ 5	Operating frequency 2400 to 2483.5 MHz

5.4 Spurious Emissions

Frequencies	Limit
Operating frequency 2400 to 2483.5 MHz	
30.0 MHz to 1000.0 MHz	≤ 0.25 uW/100 kHz
1000.0 MHz to 2387 MHz	≤ 2.5 uW/MHz
2387.0 MHz to 2400.0 MHz	≤ 25 uW/MHz
2483.5 MHz to 2496.5 MHz	≤ 25 uW/MHz
2496.5 MHz to 12500.0 MHz	≤ 2.5 uW/MHz

5.5 Spurious Emissions of Receiver

Frequencies	Limit
Below 1 GHz	≤ 4 nW
Above 1 GHz	≤ 20 nW

5.6 Antenna Power

Modulation System	Frequency Band Used	Antenna Power (Max.)	EIRP Limit (Note 3)
DSSS	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)
FHSS	2400 – 2483.5 MHz	3 mW/MHz	6.91 dBm/MHz ~ 16.91 dBm/MHz (4.91 mW/MHz ~ 49.10 mW/MHz)
Other Digital	2400 – 2483.5 MHz	10 mW	12.14 dBm ~ 22.14 dBm (16.368 mW ~ 163.68 mW)

Notes:

1. Occupied bandwidth is less than 26MHz
2. Occupied bandwidth is more than 26MHz and less than 40MHz
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).

5.7 Dwell Time

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

Formula:

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

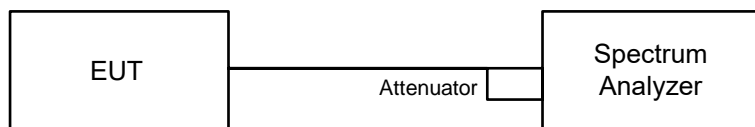
(AFH mode) dwell time = [diffusion rate/20] x duty-cycle x 0.4 sec

5.8 Interference Prevention Function

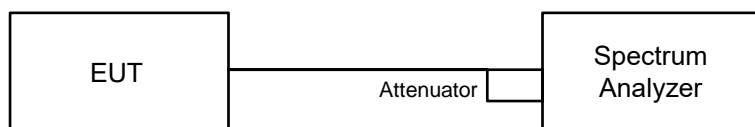
Radio equipment used mainly on the same premises and automatically transmits or receives identification code.

6 Test Arrangements

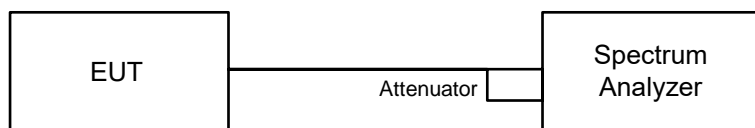
6.1 Frequency Tolerance



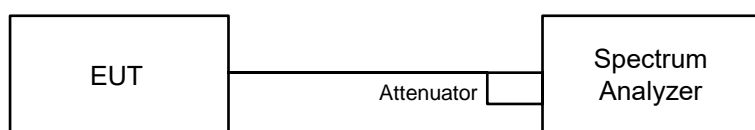
6.2 Occupied Bandwidth



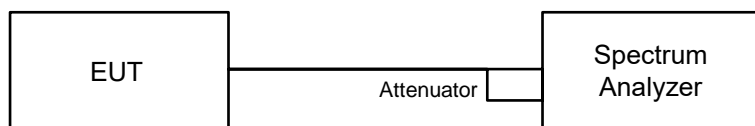
6.3 Spreading Bandwidth and Spreading Factor



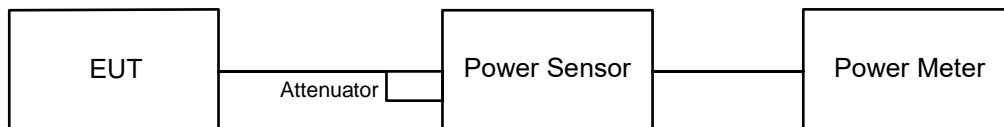
6.4 Spurious Emissions



6.5 Spurious Emissions of Receiver



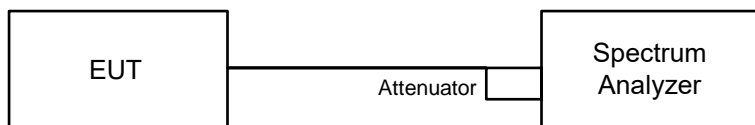
6.6 Antenna Power



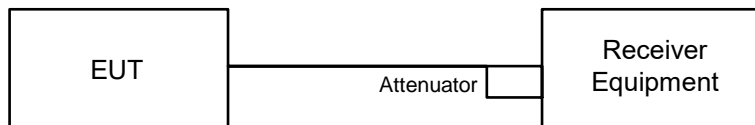
Output Power Density (mW/MHz) = Total Output Power (mW) / Spread Bandwidth (MHz)

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.

6.7 Dwell Time



6.8 Interference Prevention Function



7 Test Results of Test Item

7.1 Frequency Tolerance

Environmental Conditions:	24°C, 61% RH	Tested By:	Gary Lin
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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	2401.999934	-0.027	2401.999934	-0.027	2401.999934	-0.027
39	2441	2440.999928	-0.029	2440.999934	-0.027	2440.999934	-0.027
78	2480	2479.999870	-0.052	2479.999905	-0.038	2479.999934	-0.026

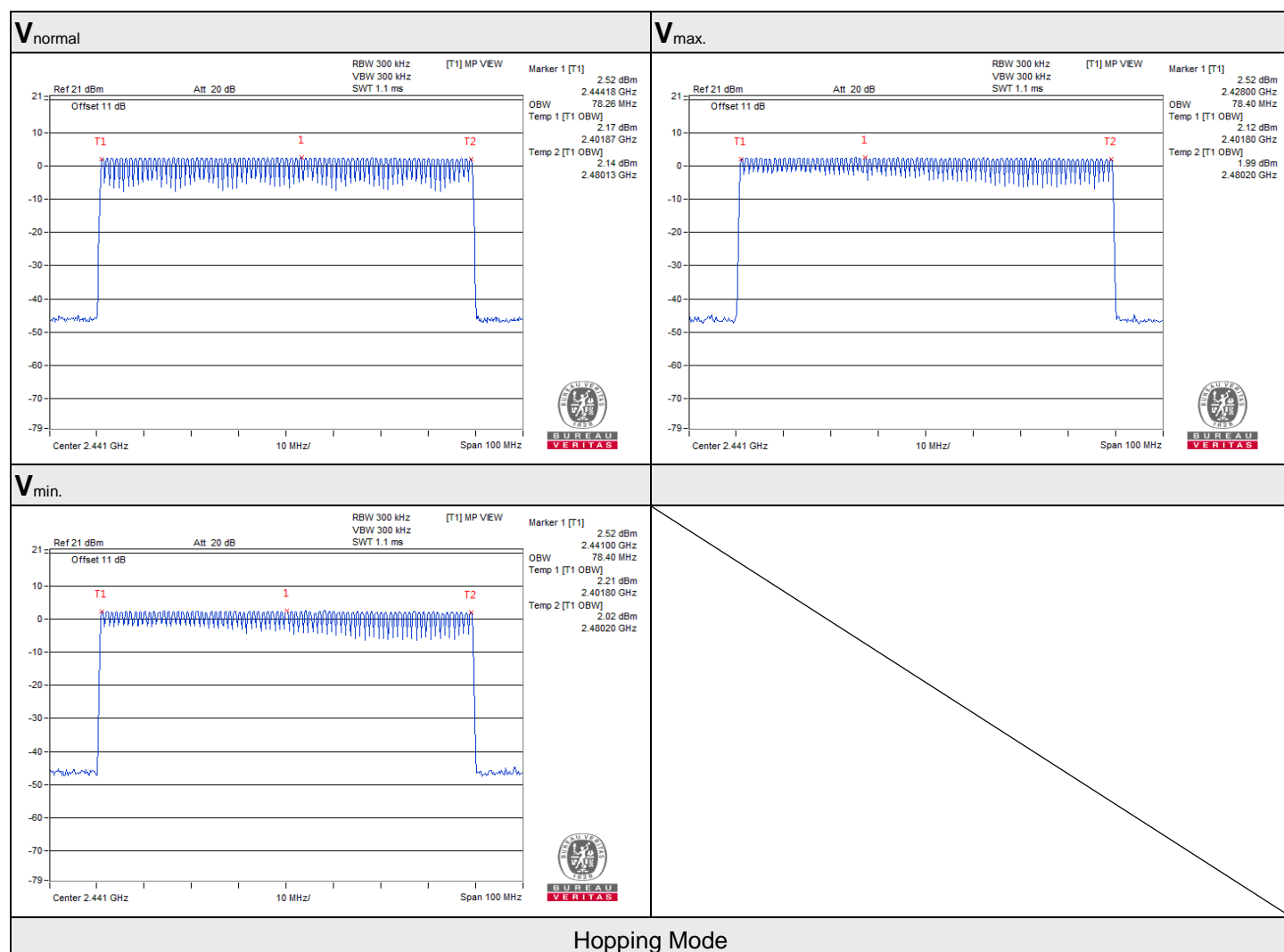
7.2 Occupied Bandwidth

Environmental Conditions:	23°C, 61% RH	Tested By:	Gary Lin
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GFSK Normal Mode

V_{normal}	$V_{\text{max.}}$	$V_{\text{min.}}$
Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)
78.26	78.40	78.40

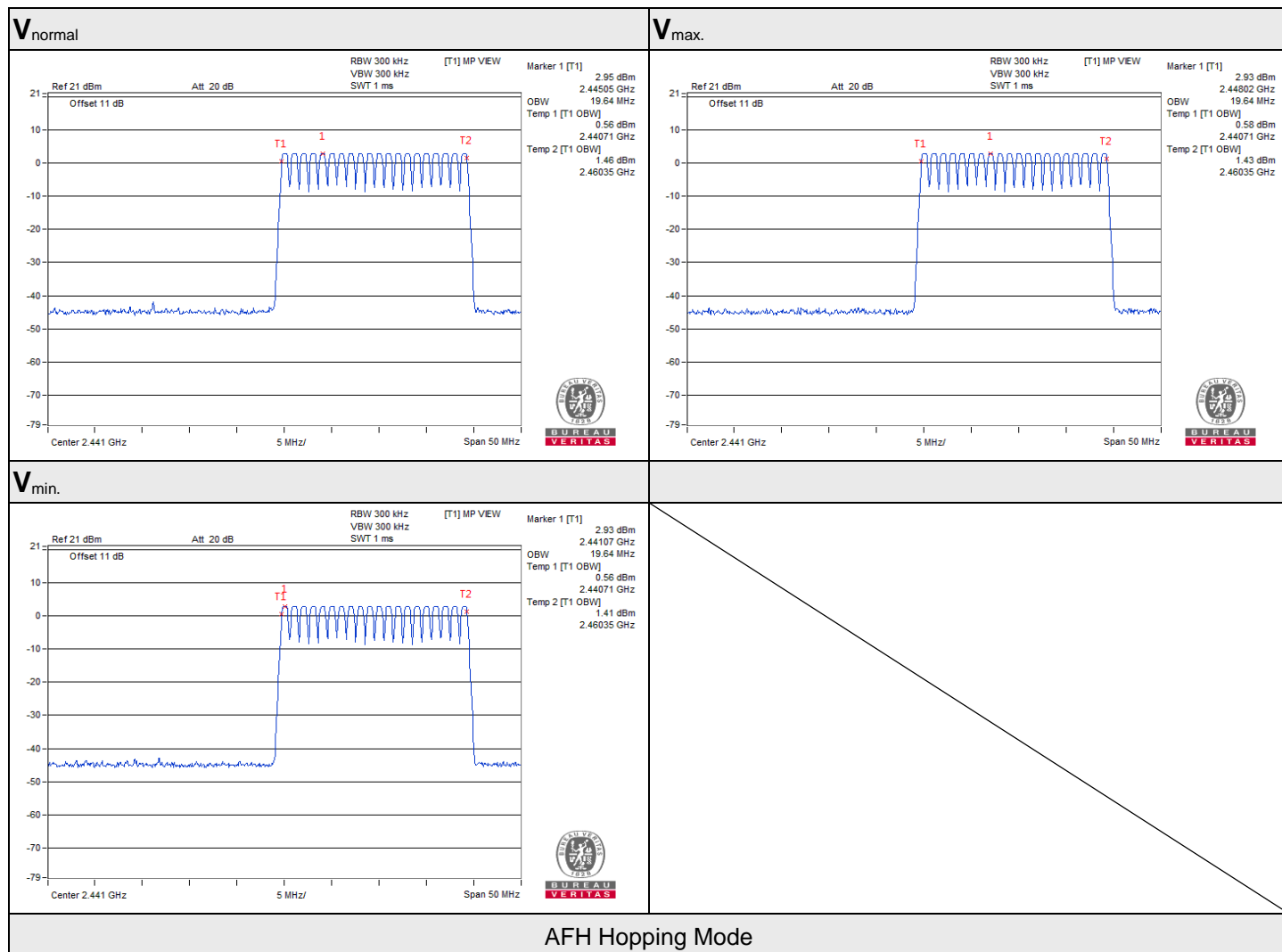
NOTE: For the test plots please refer to below.



GFSK AFH Mode

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

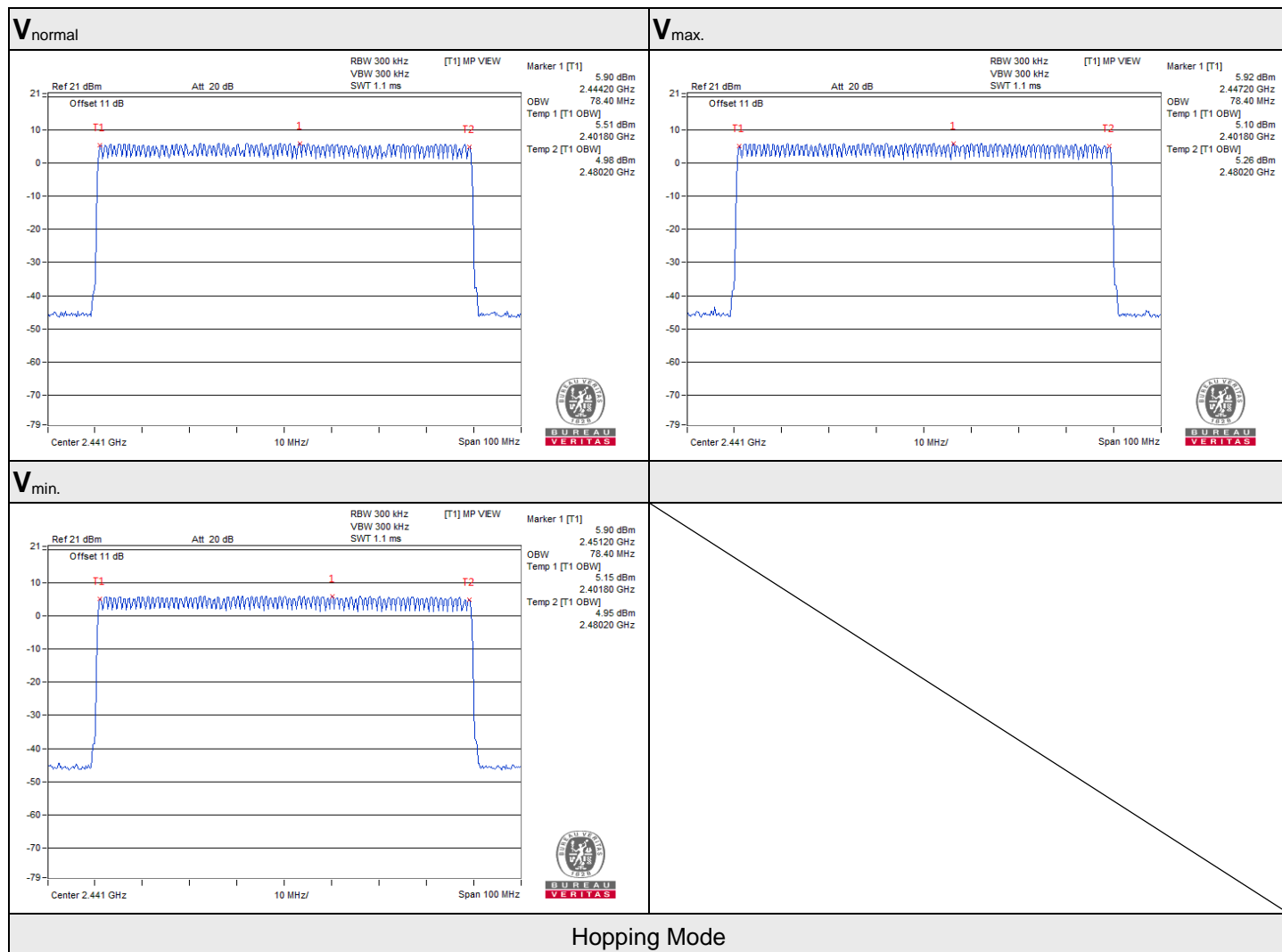
NOTE: For the test plots please refer to below.



$\pi/4$ -DQPSK Normal Mode

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

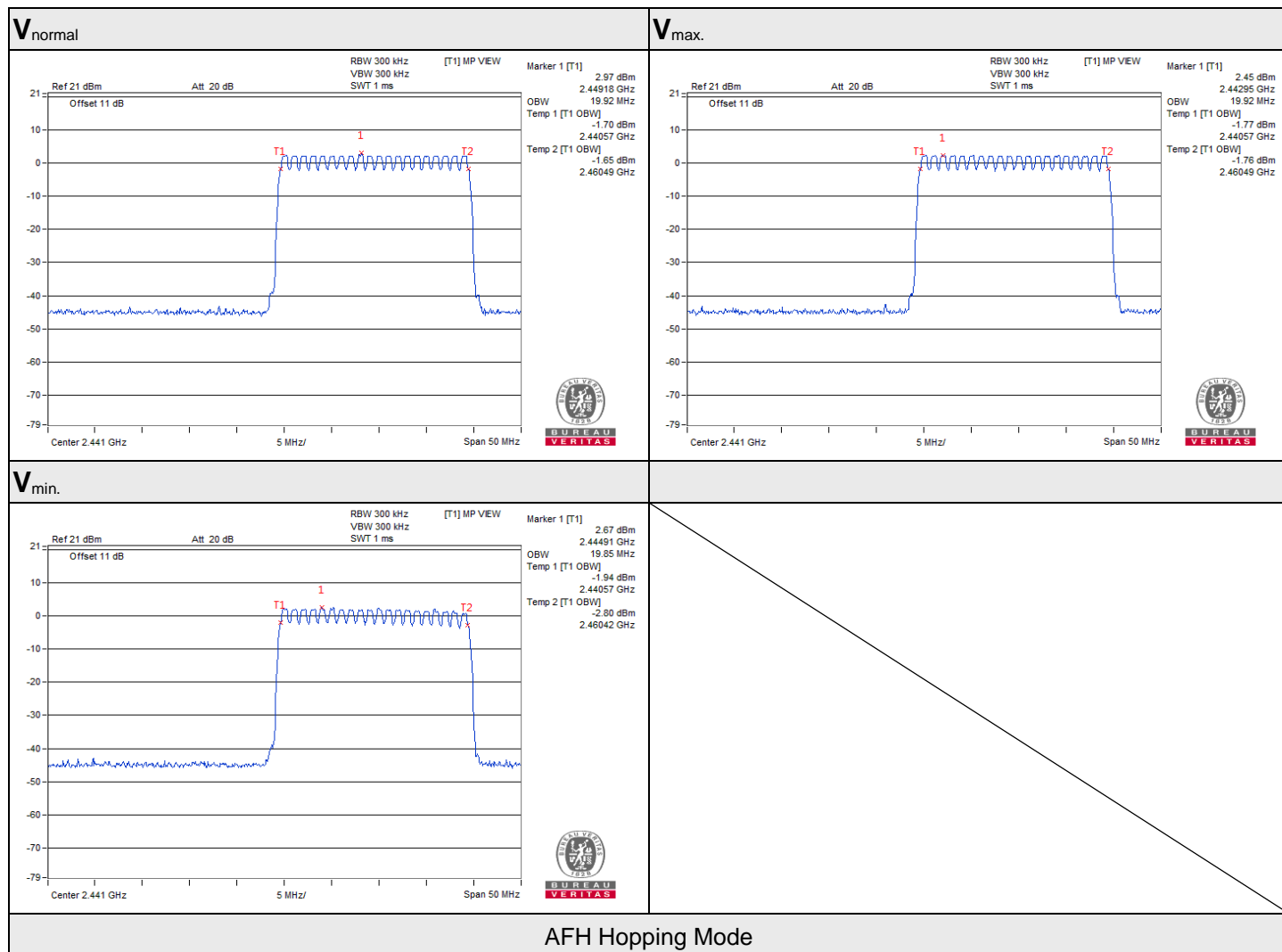
NOTE: For the test plots please refer to below.



$\pi/4$ -DQPSK AFH Mode

V_{normal}	$V_{max.}$	$V_{min.}$
Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)
19.92	19.92	19.85

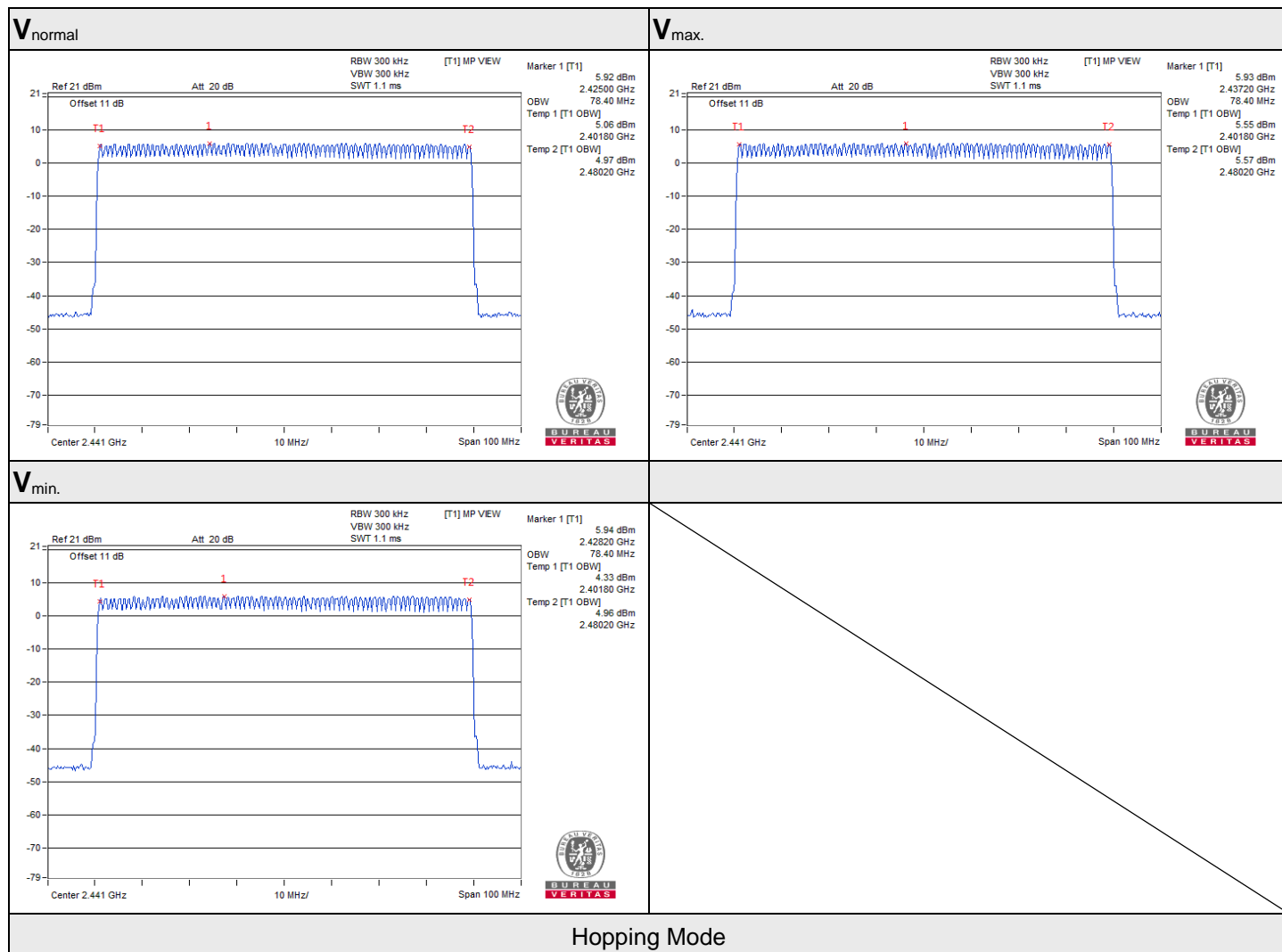
NOTE: For the test plots please refer to below.



8DPSK Normal Mode

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

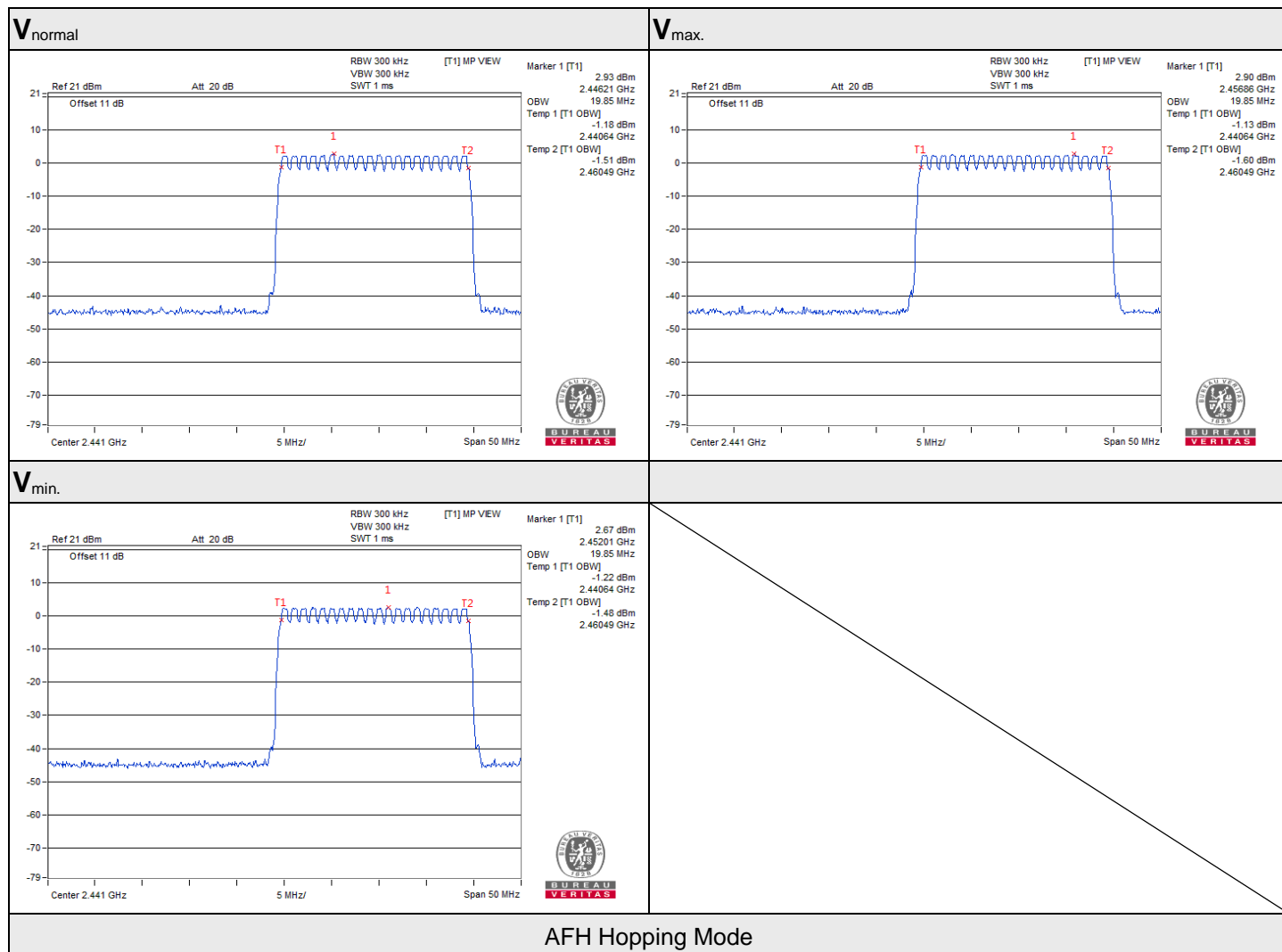
NOTE: For the test plots please refer to below.



8DPSK AFH Mode

V_{normal}	$V_{max.}$	$V_{min.}$
Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)
19.85	19.85	19.85

NOTE: For the test plots please refer to below.



7.3 Spreading Bandwidth and Spreading Factor

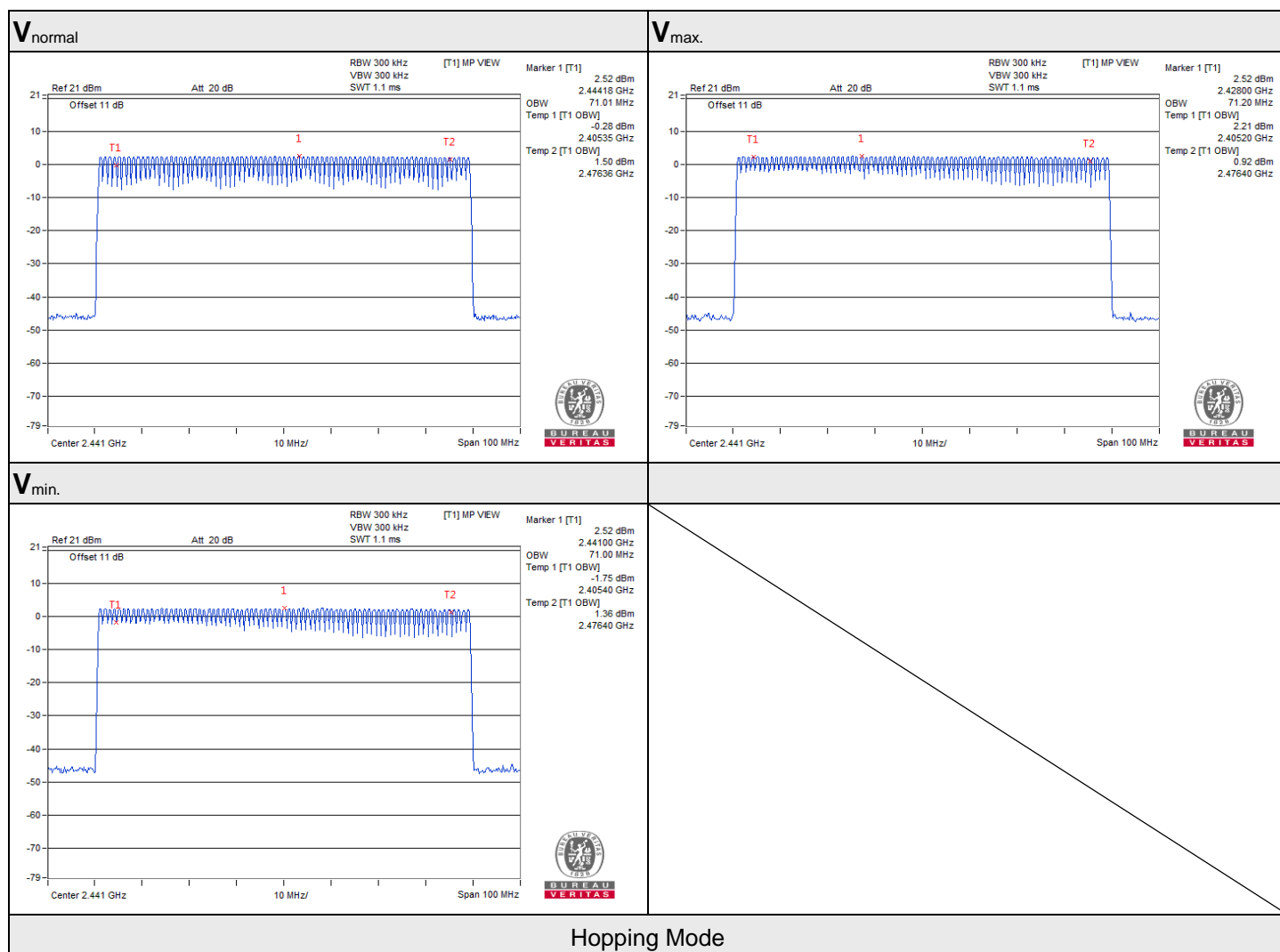
Environmental Conditions:	23°C, 61% RH	Tested By:	Gary Lin
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GFSK Normal Mode

V _{normal}		V _{max.}		V _{min.}	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
71.01	71.01	71.20	71.20	71.00	71.00

NOTE: For the test plots please refer to below.

Spreading Factor: 90% channel power bandwidth / 1

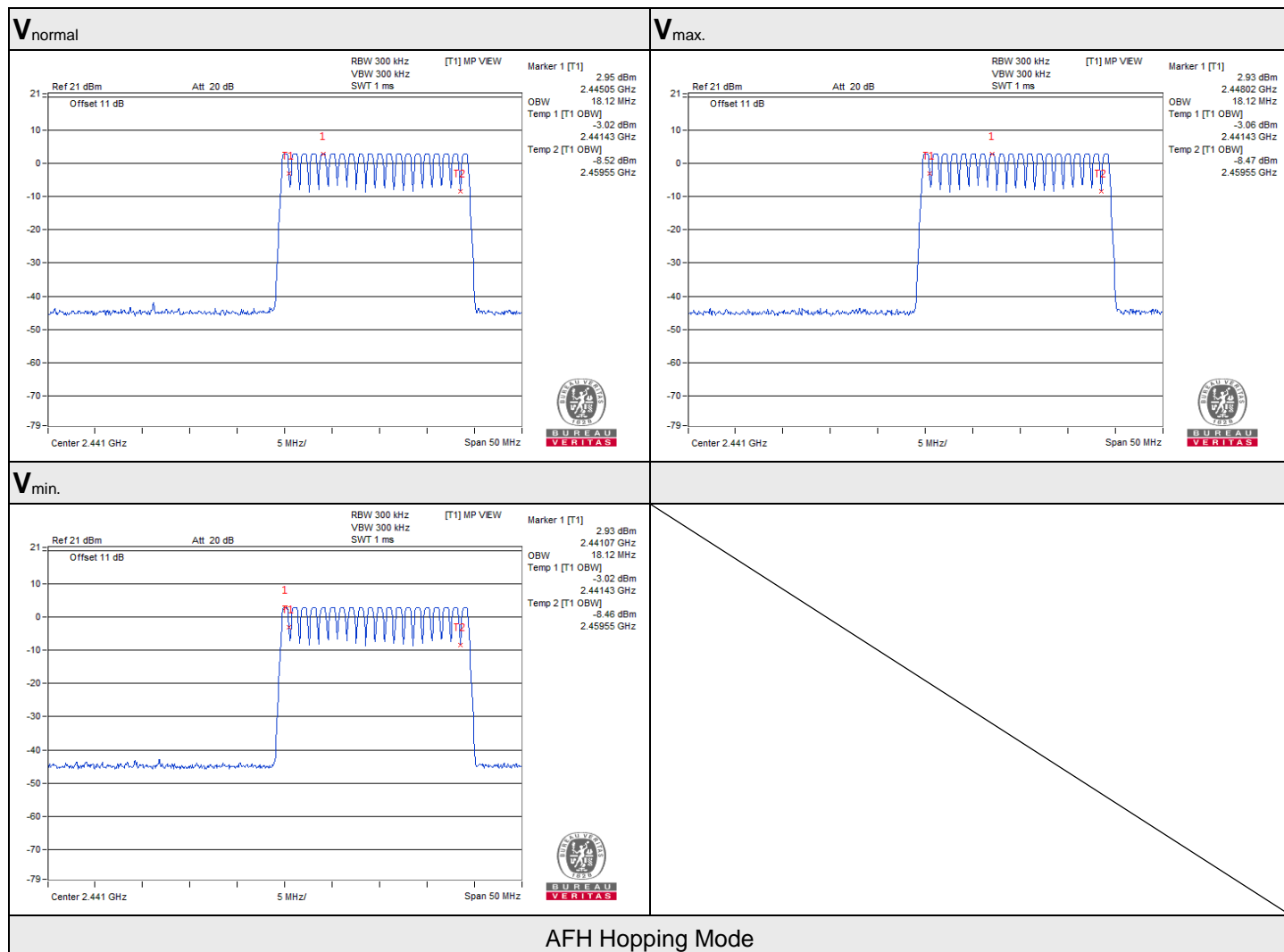


GFSK AFH Mode

V_{normal}		V_{max.}		V_{min.}	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
18.12	18.12	18.12	18.12	18.12	18.12

NOTE: For the test plots please refer to below.

Spreading Factor: 90% channel power bandwidth / 1

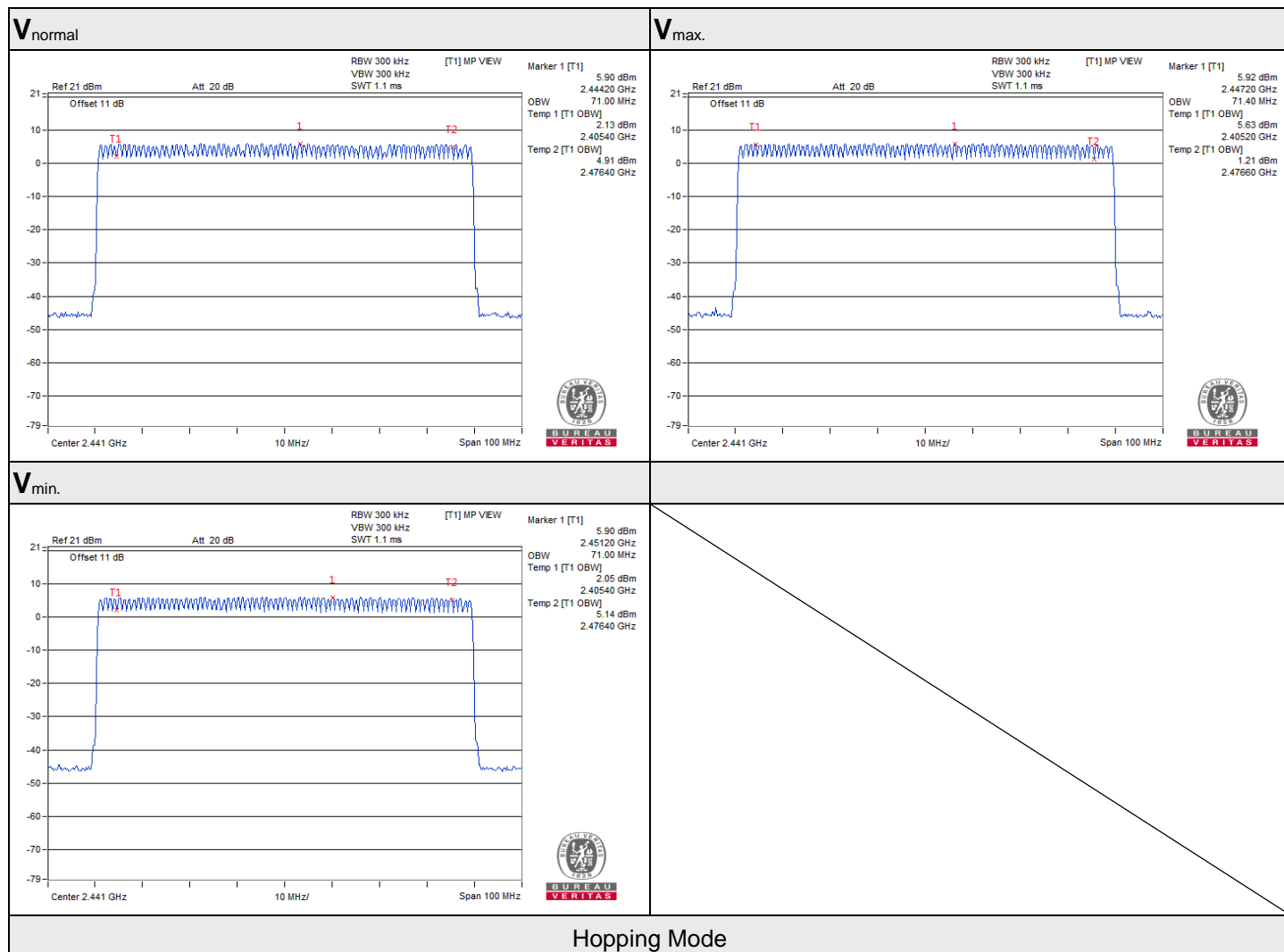


$\pi/4$ -DQPSK Normal Mode

V_{normal}		$V_{max.}$		$V_{min.}$	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
71.00	71.00	71.40	71.40	71.00	71.00

NOTE: For the test plots please refer to below.

Spreading Factor: 90% channel power bandwidth / 1

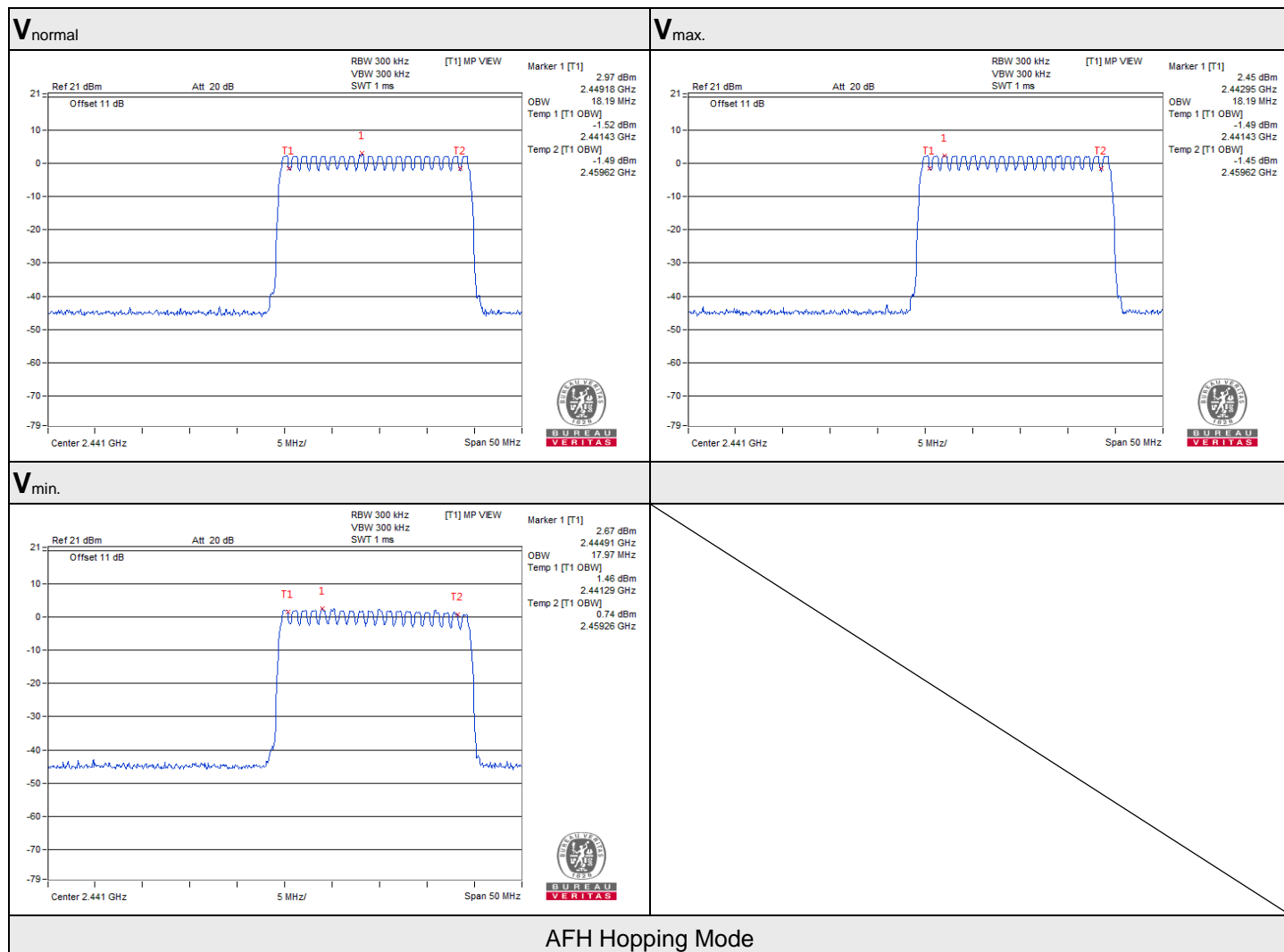


$\pi/4$ -DQPSK AFH Mode

V_{normal}		$V_{max.}$		$V_{min.}$	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
18.19	18.19	18.19	18.19	17.97	17.97

NOTE: For the test plots please refer to below.

Spreading Factor: 90% channel power bandwidth / 1

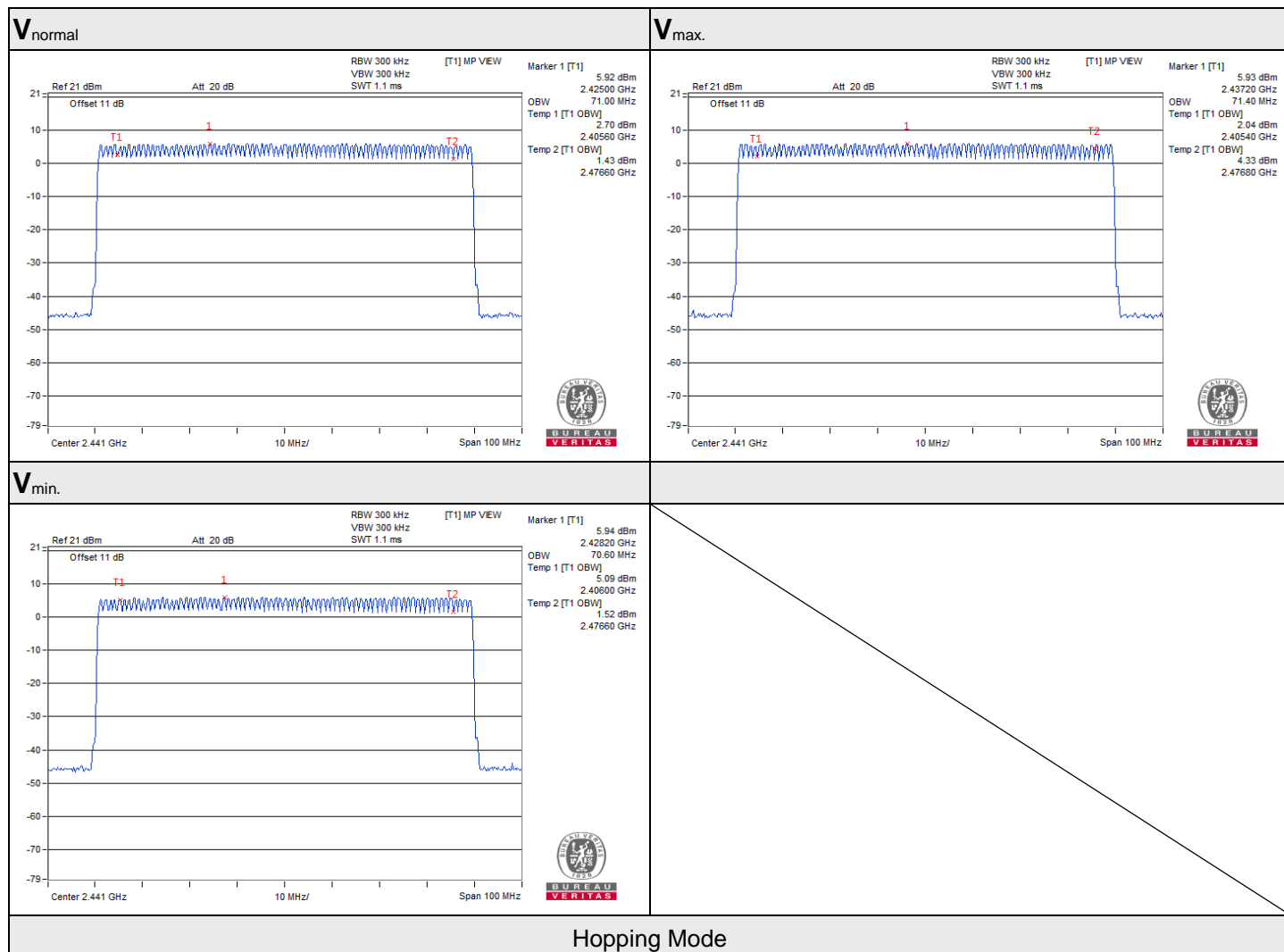


8DPSK Normal Mode

V_{normal}		V_{max.}		V_{min.}	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
71.00	71.00	71.40	71.40	70.60	70.60

NOTE: For the test plots please refer to below.

Spreading Factor: 90% channel power bandwidth / 1

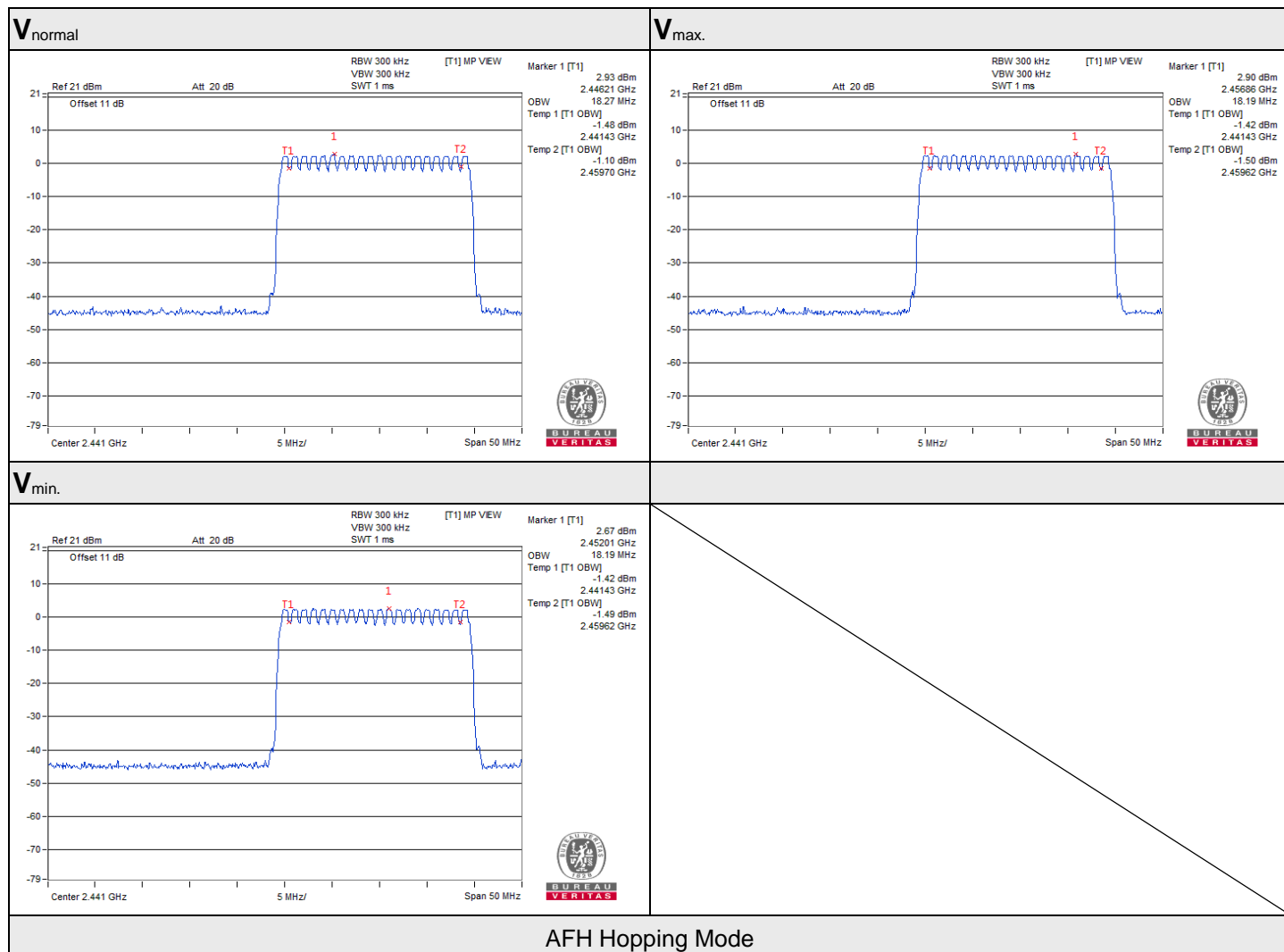


8DPSK AFH Mode

V_{normal}		$V_{max.}$		$V_{min.}$	
Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
18.27	18.27	18.19	18.19	18.19	18.19

NOTE: For the test plots please refer to below.

Spreading Factor: 90% channel power bandwidth / 1



7.4 Spurious Emissions

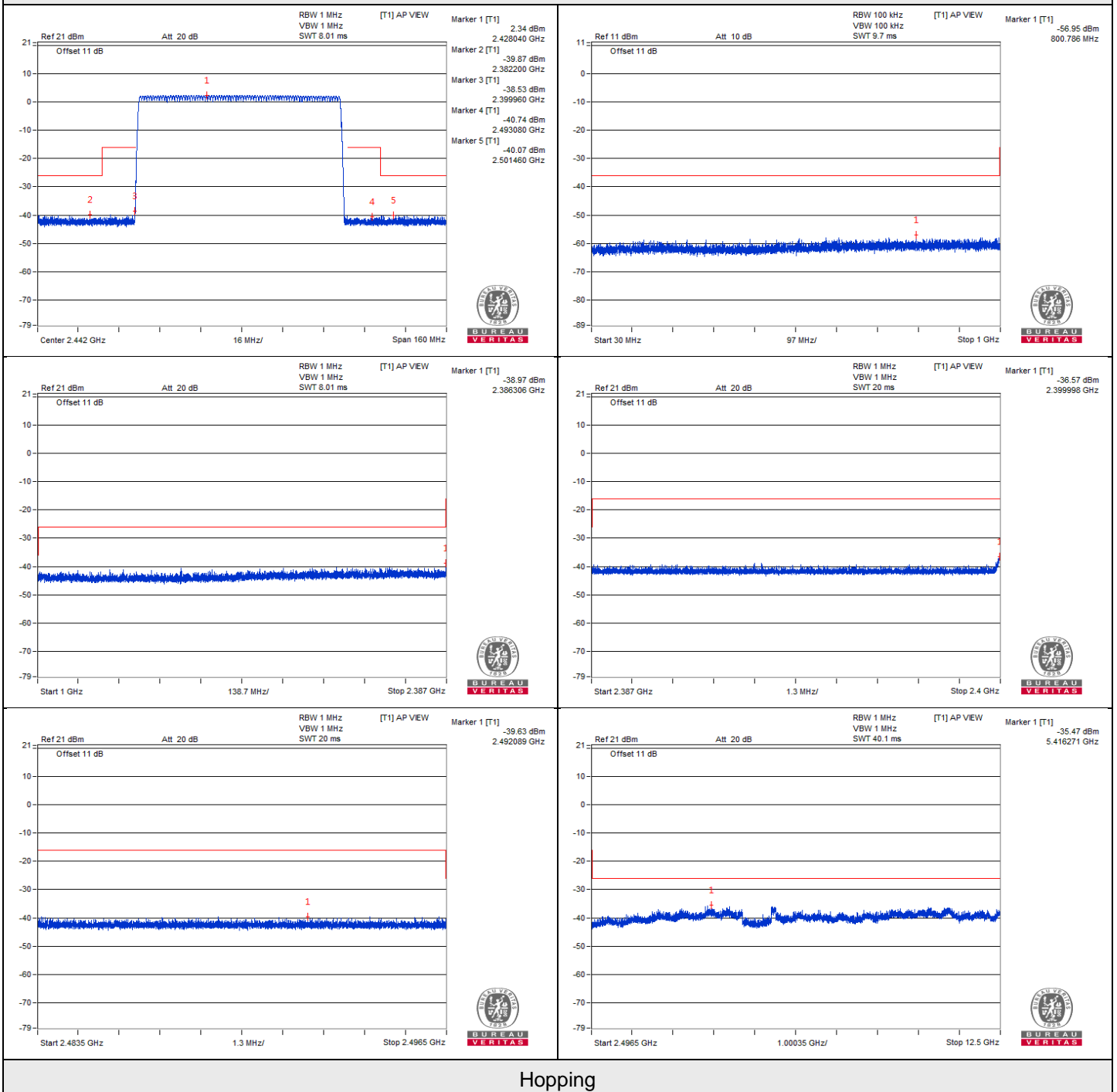
Environmental Conditions:	23°C, 61% RH	Tested By:	Gary Lin
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GFSK

TEST CHANNEL		Hopping			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASUREMENT VALUE	LIMIT	RESULT
V_{normal}	30.0 to 1000.0	800.786	0.002018 uW/100kHz	0.25 uW/100kHz	PASS
	1000.0 to 2387.0	2386.306	0.126765 uW/MHz	2.5 uW/MHz	PASS
	2387.0 to 2400.0	2399.998	0.220293 uW/MHz	25 uW/MHz	PASS
	2483.5 to 2496.5	2492.089	0.108893 uW/MHz	25 uW/MHz	PASS
	2496.5 to 12500.0	5416.271	0.283792 uW/MHz	2.5 uW/MHz	PASS
V_{max.}	30.0 to 1000.0	991.148	0.002178 uW/100kHz	0.25 uW/100kHz	PASS
	1000.0 to 2387.0	2312.102	0.103753 uW/MHz	2.5 uW/MHz	PASS
	2387.0 to 2400.0	2399.998	0.232809 uW/MHz	25 uW/MHz	PASS
	2483.5 to 2496.5	2494.473	0.121339 uW/MHz	25 uW/MHz	PASS
	2496.5 to 12500.0	6925.549	0.224388 uW/MHz	2.5 uW/MHz	PASS
V_{min.}	30.0 to 1000.0	963.018	0.002118 uW/100kHz	0.25 uW/100kHz	PASS
	1000.0 to 2387.0	2172.708	0.107895 uW/MHz	2.5 uW/MHz	PASS
	2387.0 to 2400.0	2400.000	0.231206 uW/MHz	25 uW/MHz	PASS
	2483.5 to 2496.5	2492.047	0.111944 uW/MHz	25 uW/MHz	PASS
	2496.5 to 12500.0	6891.787	0.279254 uW/MHz	2.5 uW/MHz	PASS

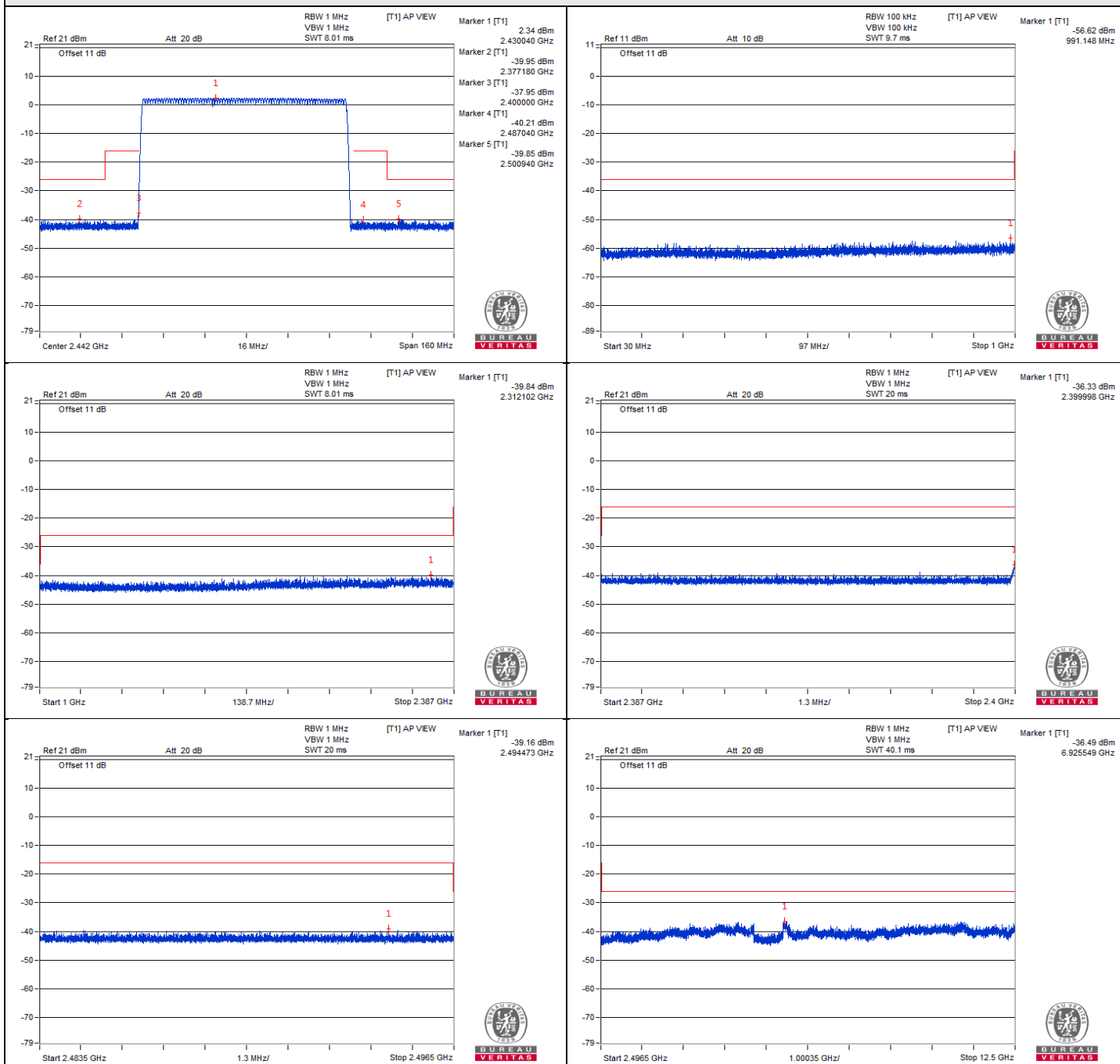
NOTE: 1. The spectrum plots are attached on the following pages.

Vnormal



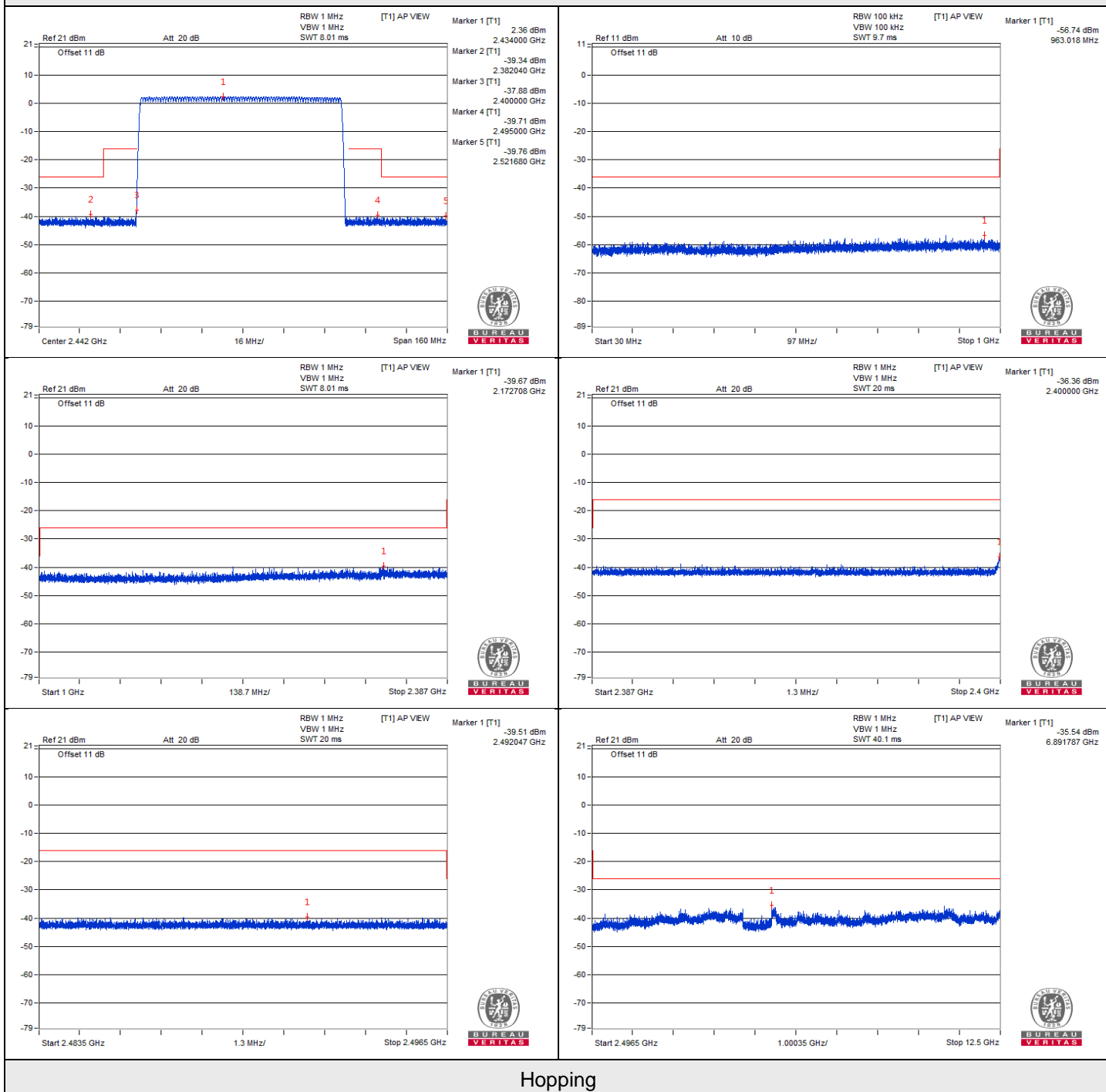
Hopping

V max.



Hopping

V_{min}.



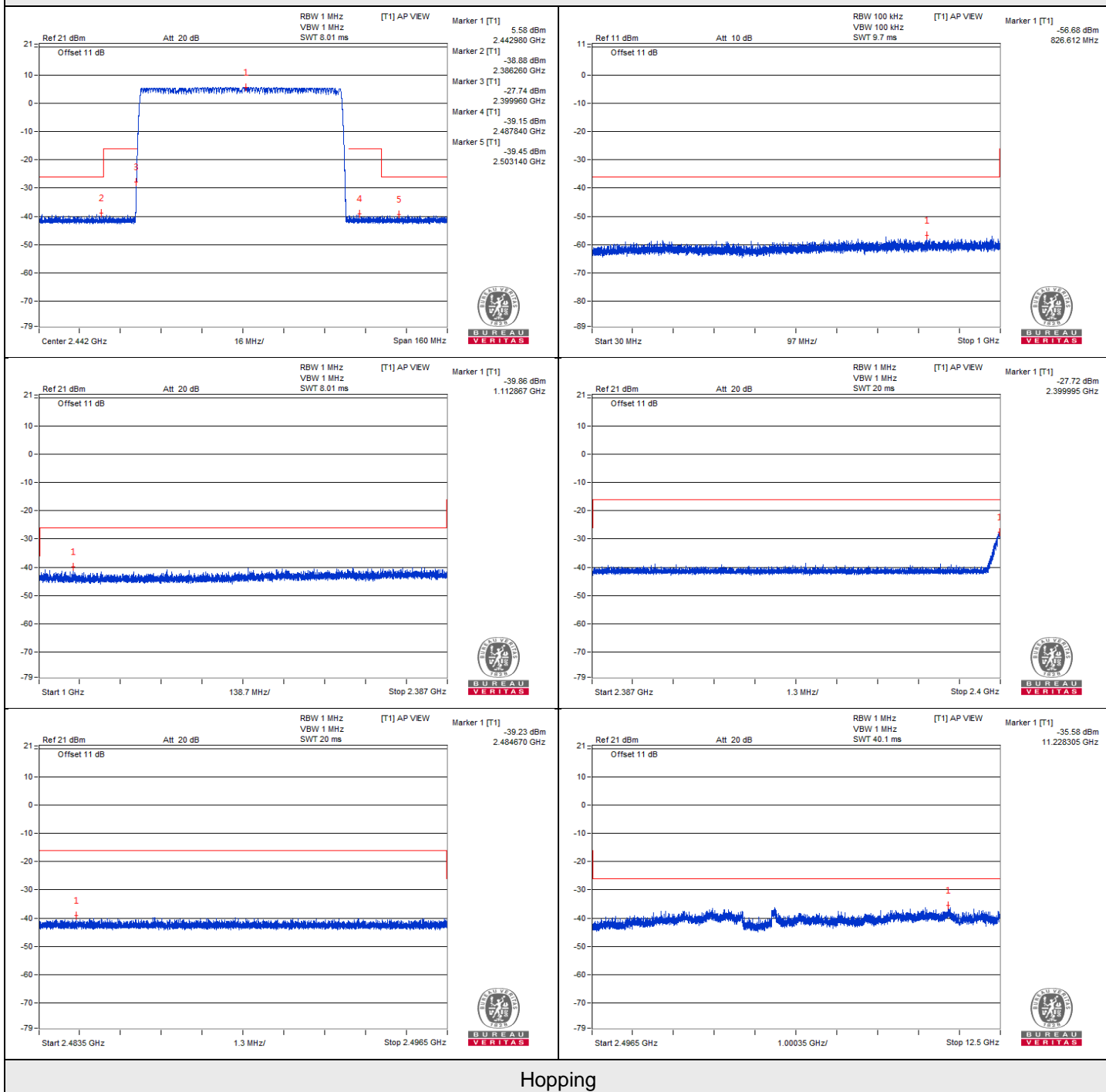
Hopping

$\pi/4$ -DQPSK

TEST CHANNEL		Hopping			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASUREMENT VALUE	LIMIT	RESULT
V_{normal}	30.0 to 1000.0	826.612	0.002148 μ W/100kHz	0.25 μ W/100kHz	PASS
	1000.0 to 2387.0	1112.867	0.103276 μ W/MHz	2.5 μ W/MHz	PASS
	2387.0 to 2400.0	2399.995	1.690441 μ W/MHz	25 μ W/MHz	PASS
	2483.5 to 2496.5	2484.670	0.119399 μ W/MHz	25 μ W/MHz	PASS
	2496.5 to 12500.0	11228.305	0.276694 μ W/MHz	2.5 μ W/MHz	PASS
V_{max.}	30.0 to 1000.0	877.537	0.001884 μ W/100kHz	0.25 μ W/100kHz	PASS
	1000.0 to 2387.0	2256.968	0.112202 μ W/MHz	2.5 μ W/MHz	PASS
	2387.0 to 2400.0	2399.993	1.954339 μ W/MHz	25 μ W/MHz	PASS
	2483.5 to 2496.5	2493.310	0.114815 μ W/MHz	25 μ W/MHz	PASS
	2496.5 to 12500.0	6980.568	0.277971 μ W/MHz	2.5 μ W/MHz	PASS
V_{min.}	30.0 to 1000.0	729.612	0.002042 μ W/100kHz	0.25 μ W/100kHz	PASS
	1000.0 to 2387.0	2026.900	0.103992 μ W/MHz	2.5 μ W/MHz	PASS
	2387.0 to 2400.0	2399.988	1.958845 μ W/MHz	25 μ W/MHz	PASS
	2483.5 to 2496.5	2492.645	0.116413 μ W/MHz	25 μ W/MHz	PASS
	2496.5 to 12500.0	5382.509	0.271644 μ W/MHz	2.5 μ W/MHz	PASS

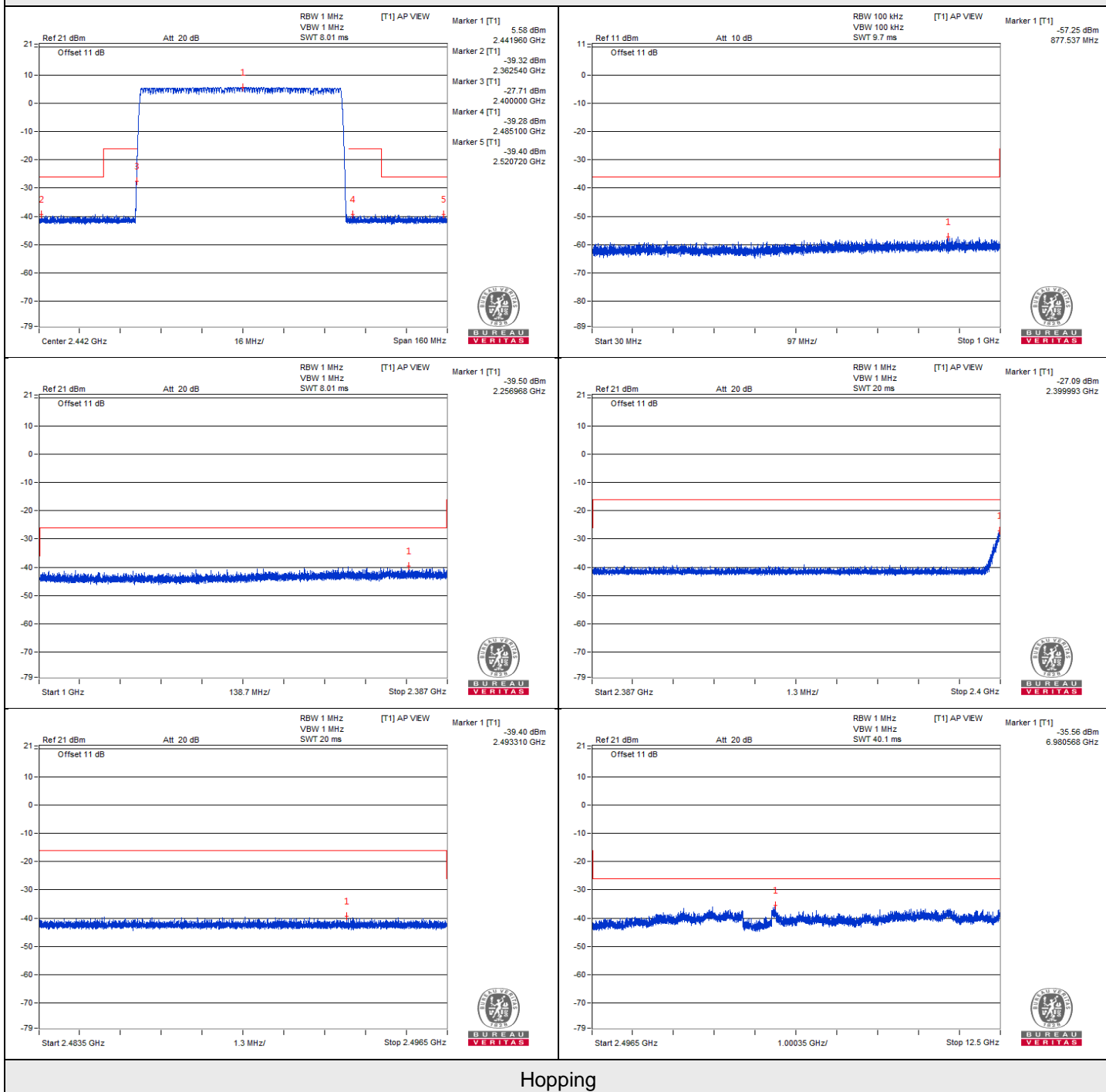
NOTE: 1. The spectrum plots are attached on the following pages.

Vnormal

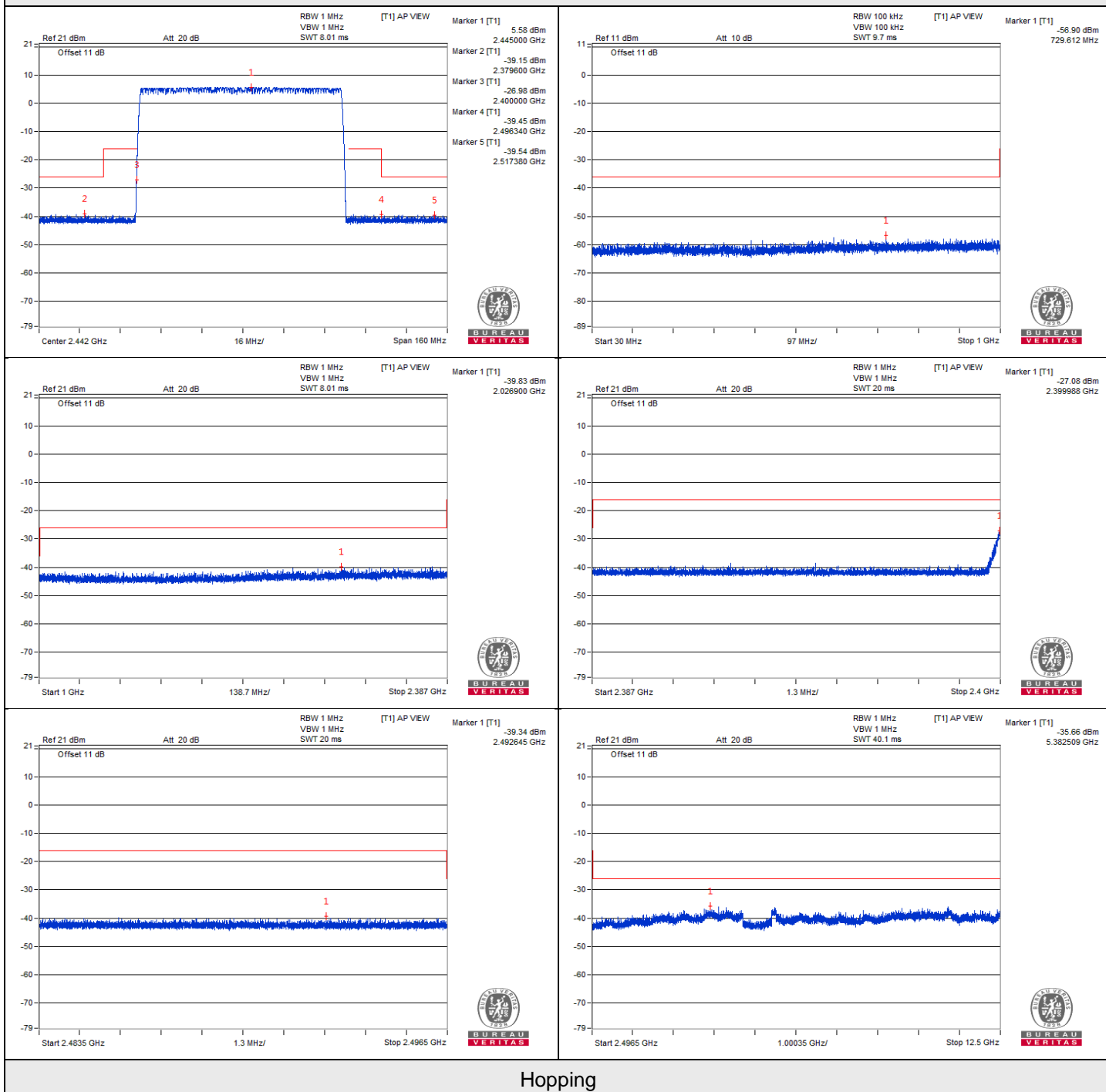


Hopping

V_{max}.



V_{min}.



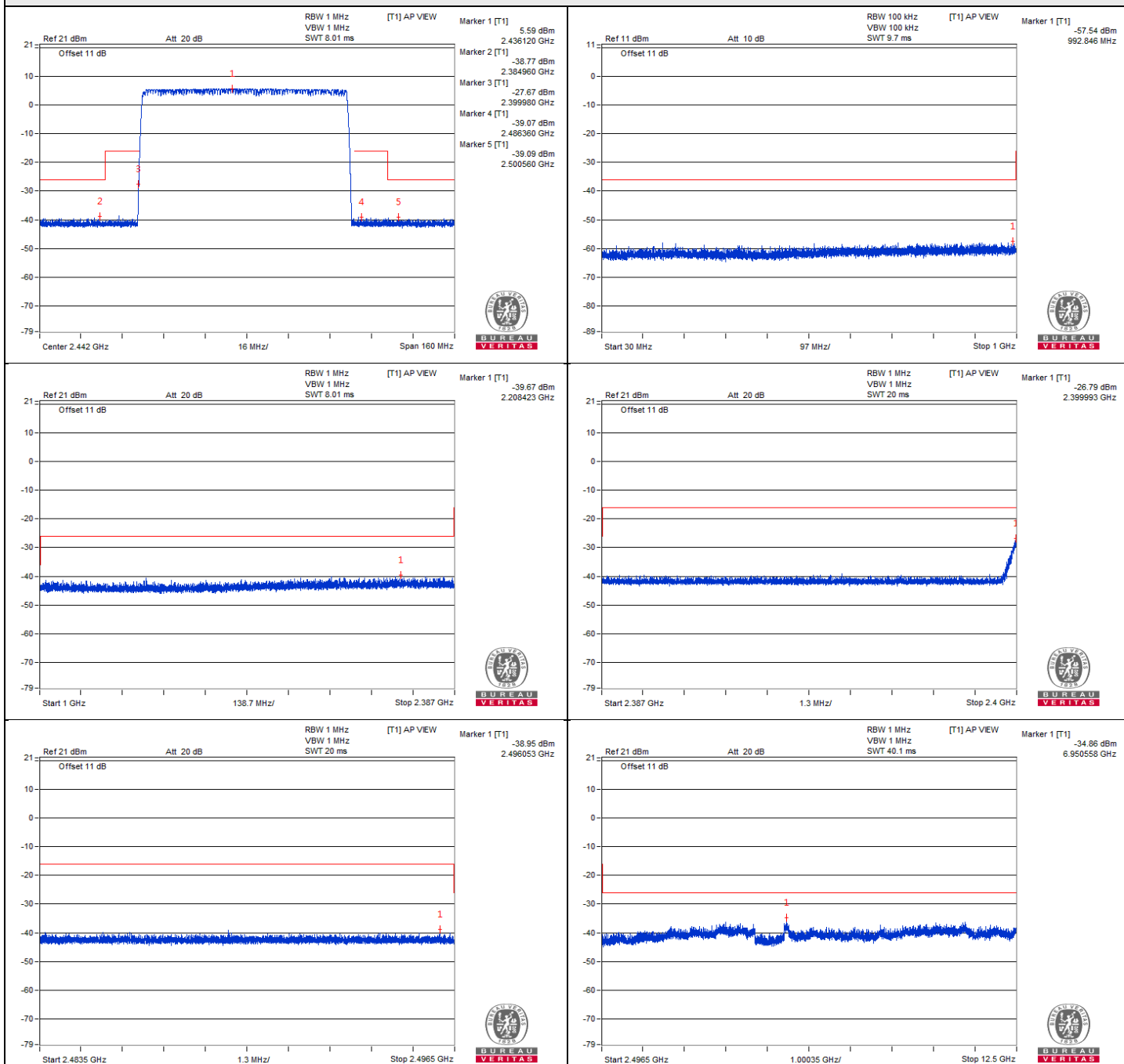
Hopping

8DPSK

TEST CHANNEL		Hopping			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASUREMENT VALUE	LIMIT	RESULT
V_{normal}	30.0 to 1000.0	992.846	0.001762 μ W/100kHz	0.25 μ W/100kHz	PASS
	1000.0 to 2387.0	2208.423	0.107895 μ W/MHz	2.5 μ W/MHz	PASS
	2387.0 to 2400.0	2399.993	2.094112 μ W/MHz	25 μ W/MHz	PASS
	2483.5 to 2496.5	2496.053	0.12735 μ W/MHz	25 μ W/MHz	PASS
	2496.5 to 12500.0	6950.558	0.326588 μ W/MHz	2.5 μ W/MHz	PASS
V_{max.}	30.0 to 1000.0	898.028	0.001734 μ W/100kHz	0.25 μ W/100kHz	PASS
	1000.0 to 2387.0	2216.572	0.114551 μ W/MHz	2.5 μ W/MHz	PASS
	2387.0 to 2400.0	2399.998	1.870682 μ W/MHz	25 μ W/MHz	PASS
	2483.5 to 2496.5	2488.311	0.119674 μ W/MHz	25 μ W/MHz	PASS
	2496.5 to 12500.0	11257.065	0.244906 μ W/MHz	2.5 μ W/MHz	PASS
V_{min.}	30.0 to 1000.0	930.523	0.001954 μ W/100kHz	0.25 μ W/100kHz	PASS
	1000.0 to 2387.0	2298.058	0.101158 μ W/MHz	2.5 μ W/MHz	PASS
	2387.0 to 2400.0	2399.991	1.870682 μ W/MHz	25 μ W/MHz	PASS
	2483.5 to 2496.5	2486.941	0.11885 μ W/MHz	25 μ W/MHz	PASS
	2496.5 to 12500.0	6933.052	0.268534 μ W/MHz	2.5 μ W/MHz	PASS

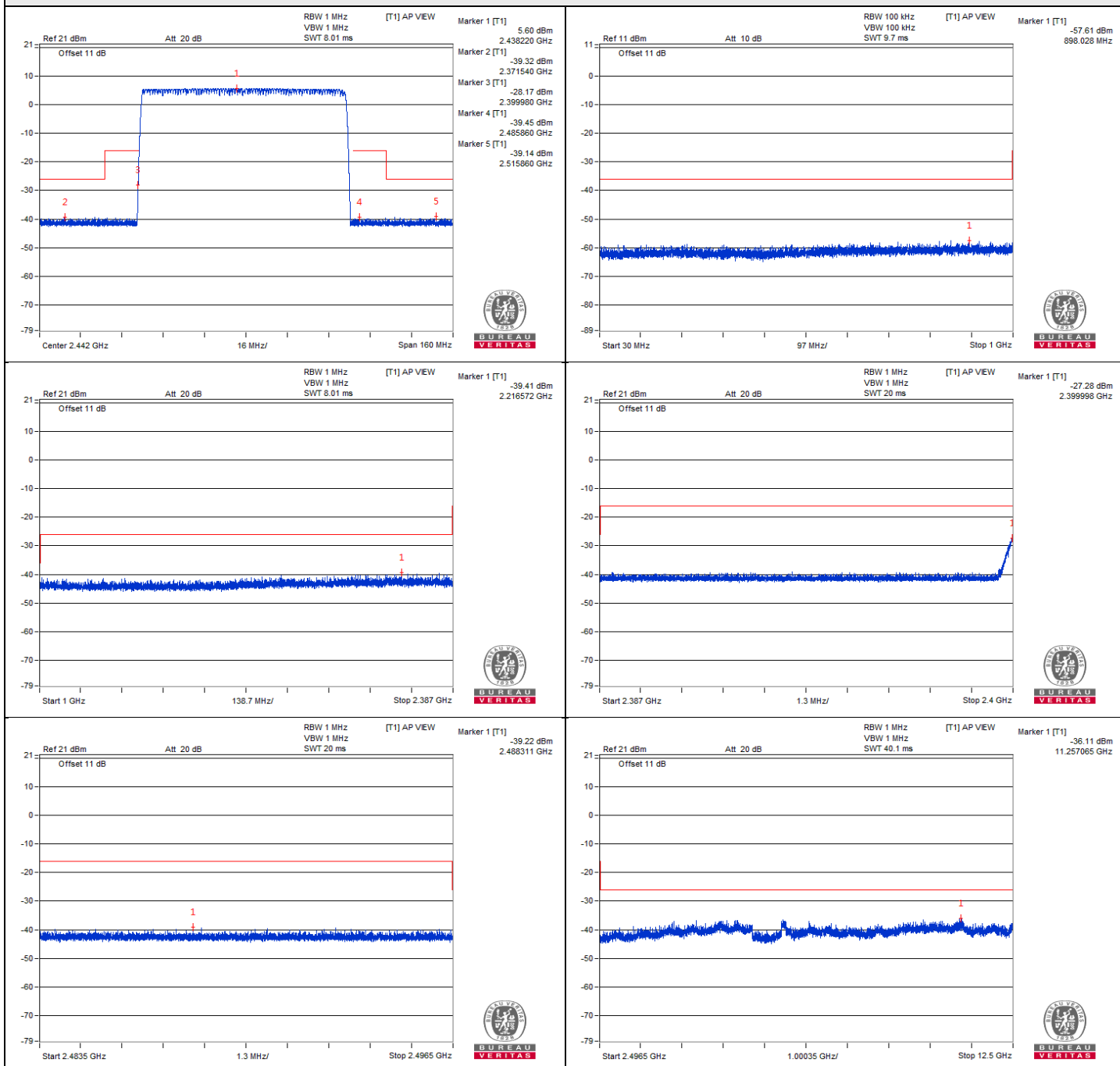
NOTE: 1. The spectrum plots are attached on the following pages.

Vnormal



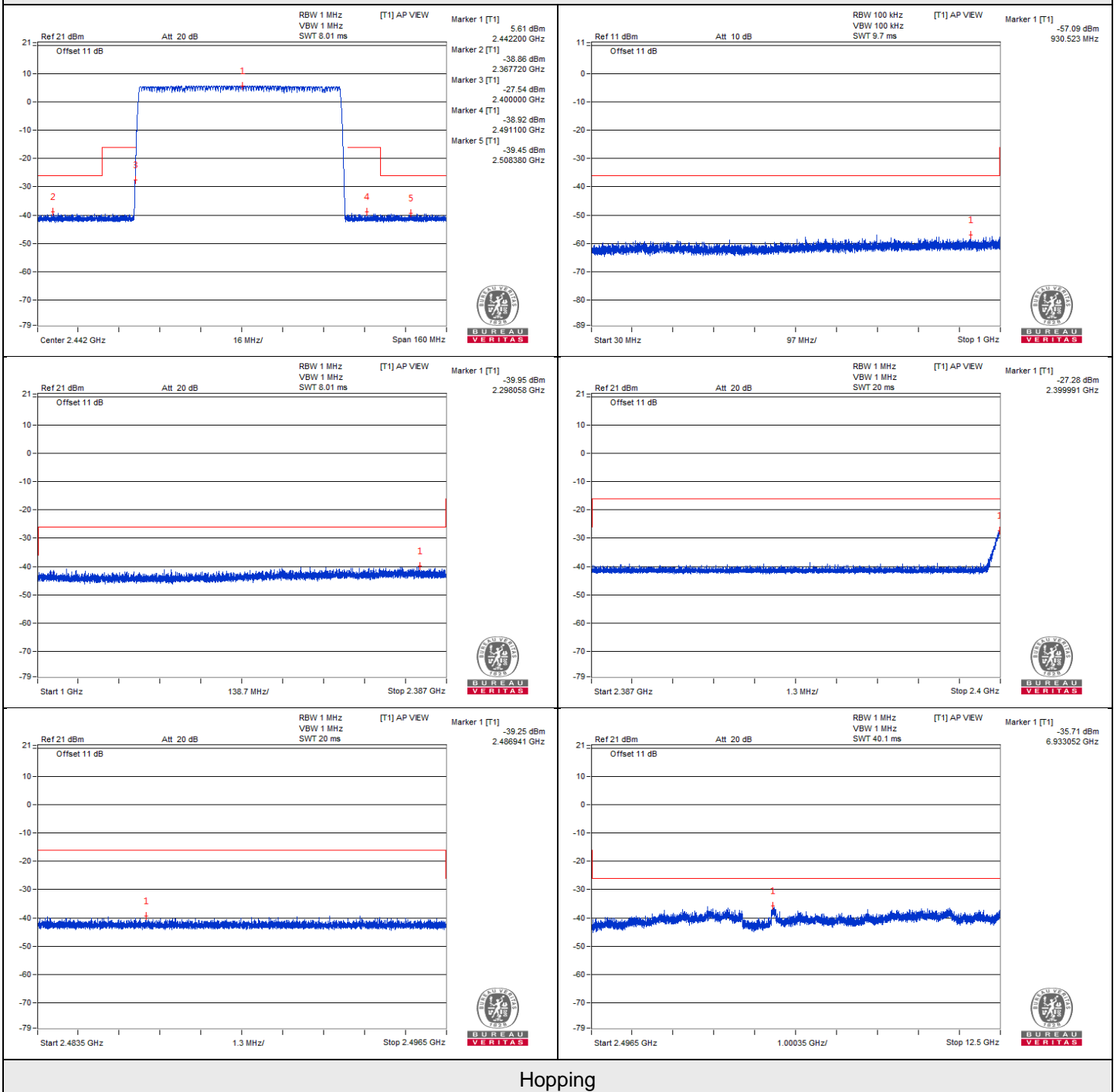
Hopping

V_{max}.



Hopping

V_{min}.

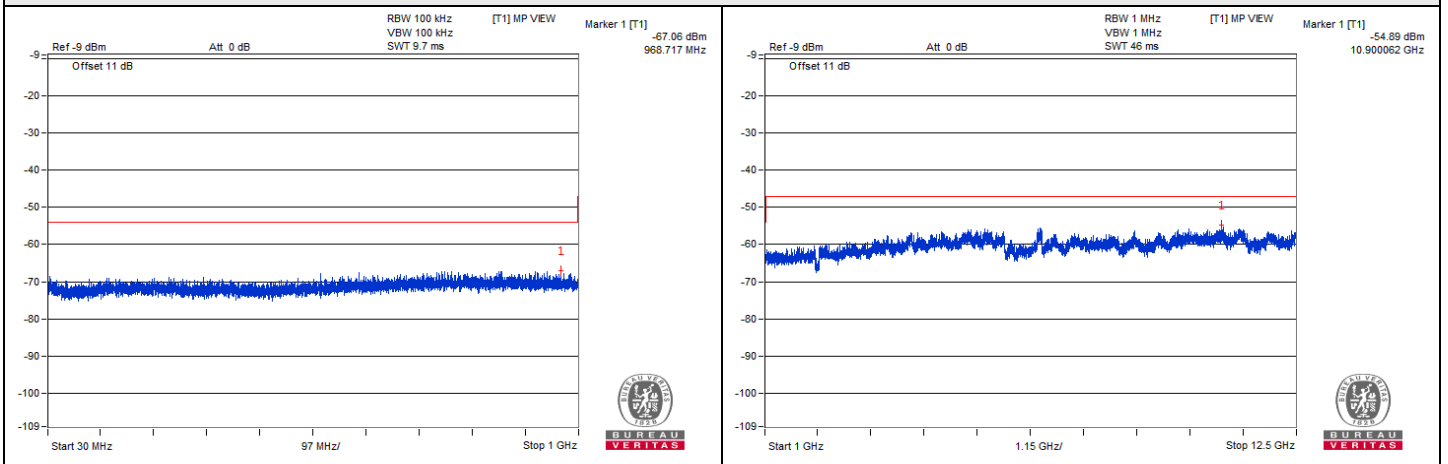


7.5 Spurious Emissions of Receiver

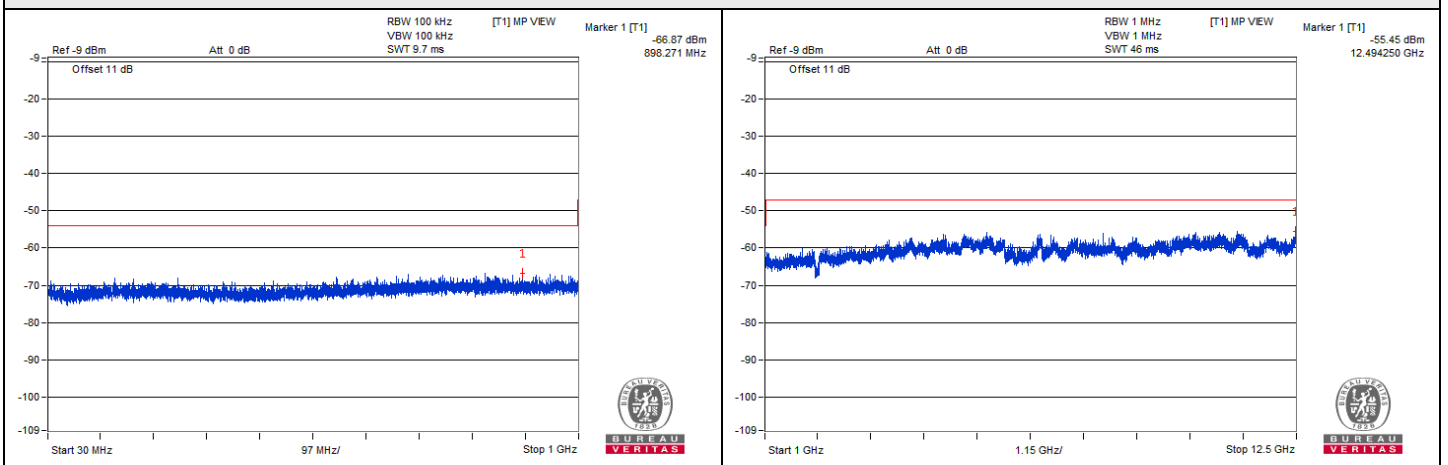
Environmental Conditions:	24°C, 61% RH	Tested By:	Gary Lin
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TEST CHANNEL		CH 0 (2402 MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASUREMENT VALUE(nW)	LIMIT (nW)	RESULT
V_{normal}	30.0 to 1000.0	968.717	0.196789	4	PASS
	1000.0 to 12500.0	10900.062	3.243396	20	PASS
V_{max.}	30.0 to 1000.0	898.271	0.205589	4	PASS
	1000.0 to 12500.0	12494.250	2.851018	20	PASS
V_{min.}	30.0 to 1000.0	818.246	0.205116	4	PASS
	1000.0 to 12500.0	11903.437	3.597493	20	PASS
TEST CHANNEL		CH 39 (2441 MHz)			
V_{normal}	30.0 to 1000.0	938.162	0.205589	4	PASS
	1000.0 to 12500.0	6994.375	3.999447	20	PASS
V_{max.}	30.0 to 1000.0	746.345	0.197697	4	PASS
	1000.0 to 12500.0	10754.875	3.380648	20	PASS
V_{min.}	30.0 to 1000.0	792.541	0.243781	4	PASS
	1000.0 to 12500.0	6988.625	3.597493	20	PASS
TEST CHANNEL		CH 78 (2480 MHz)			
V_{normal}	30.0 to 1000.0	782.356	0.197242	4	PASS
	1000.0 to 12500.0	10875.625	3.411929	20	PASS
V_{max.}	30.0 to 1000.0	809.880	0.225944	4	PASS
	1000.0 to 12500.0	5446.187	2.992265	20	PASS
V_{min.}	30.0 to 1000.0	789.267	0.218273	4	PASS
	1000.0 to 12500.0	11240.750	3.531832	20	PASS

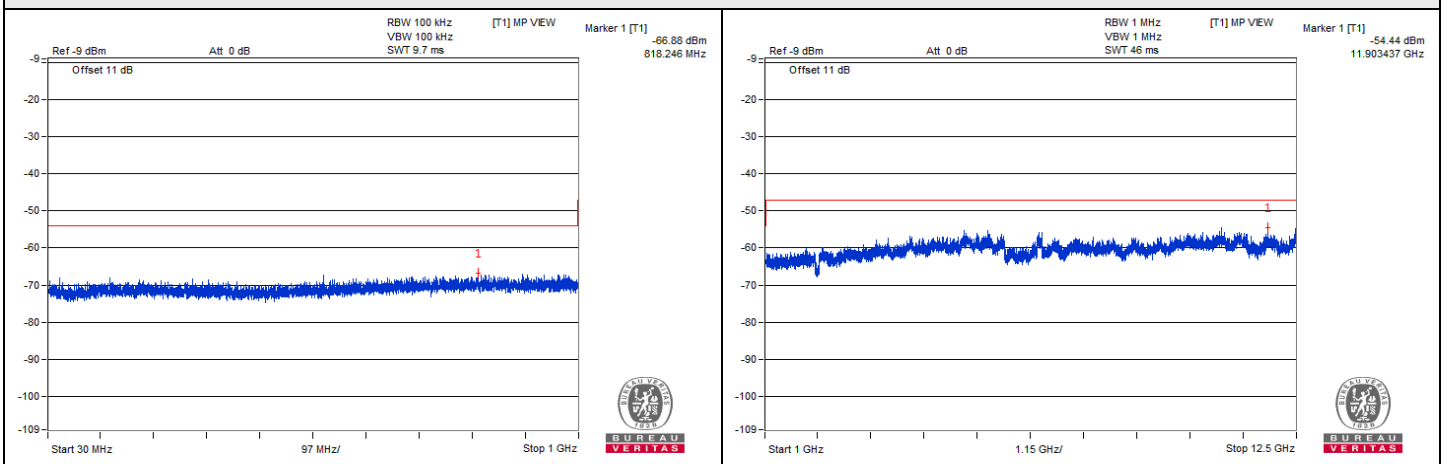
V_{normal}



V_{max.}

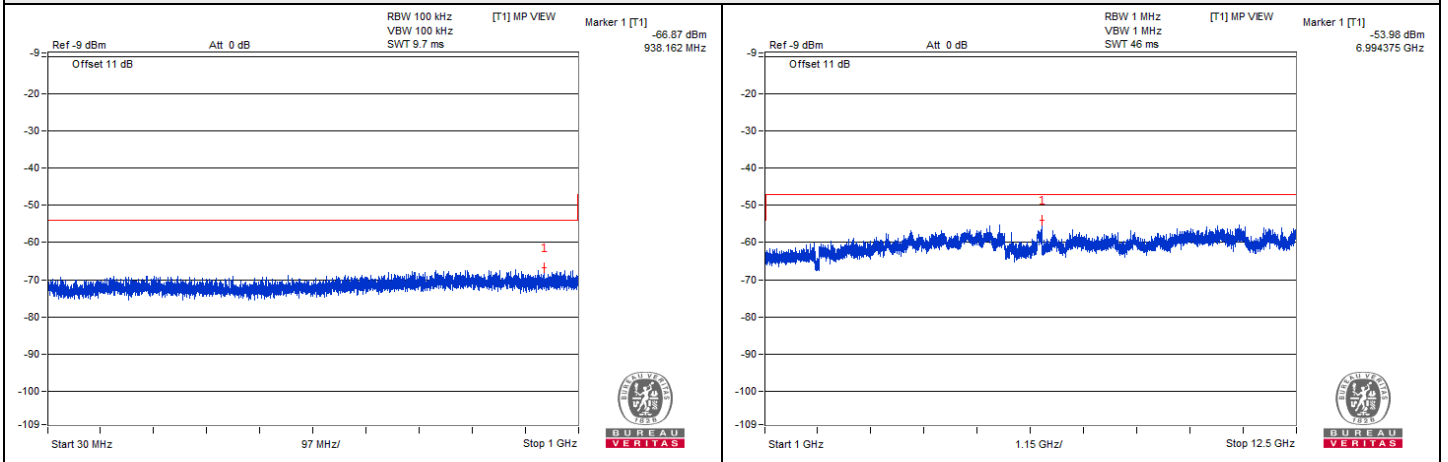


V_{min.}

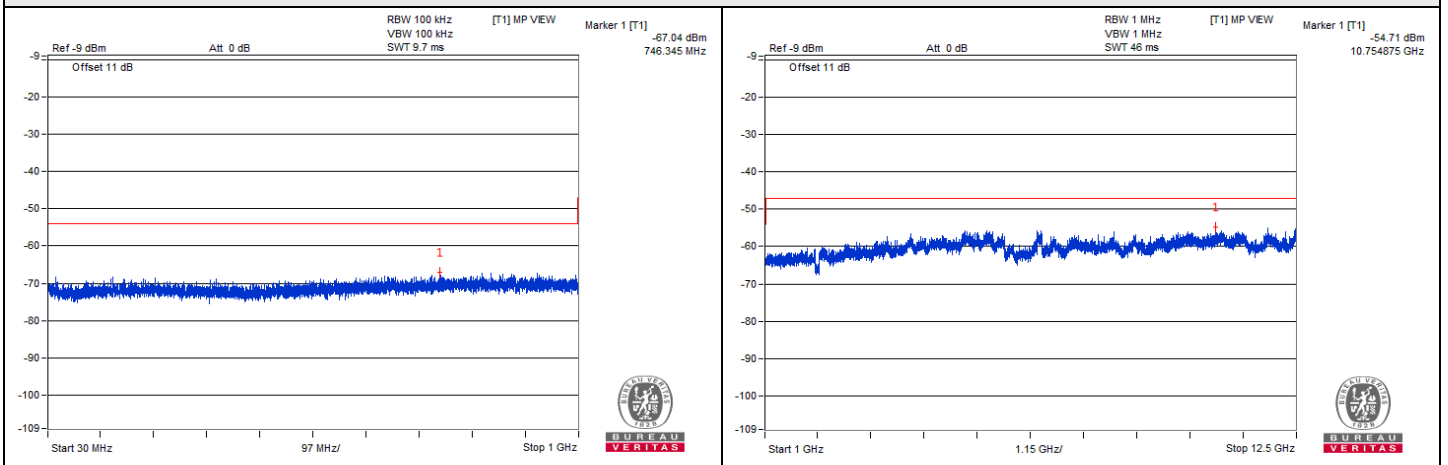


CH 0 (2402 MHz)

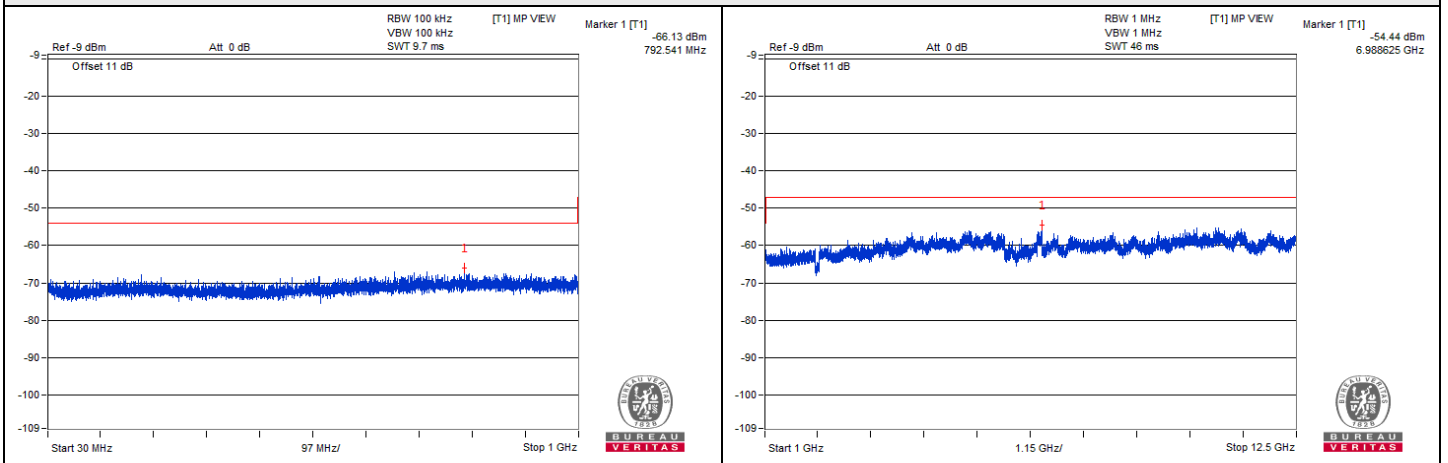
V_{normal}



V_{max.}

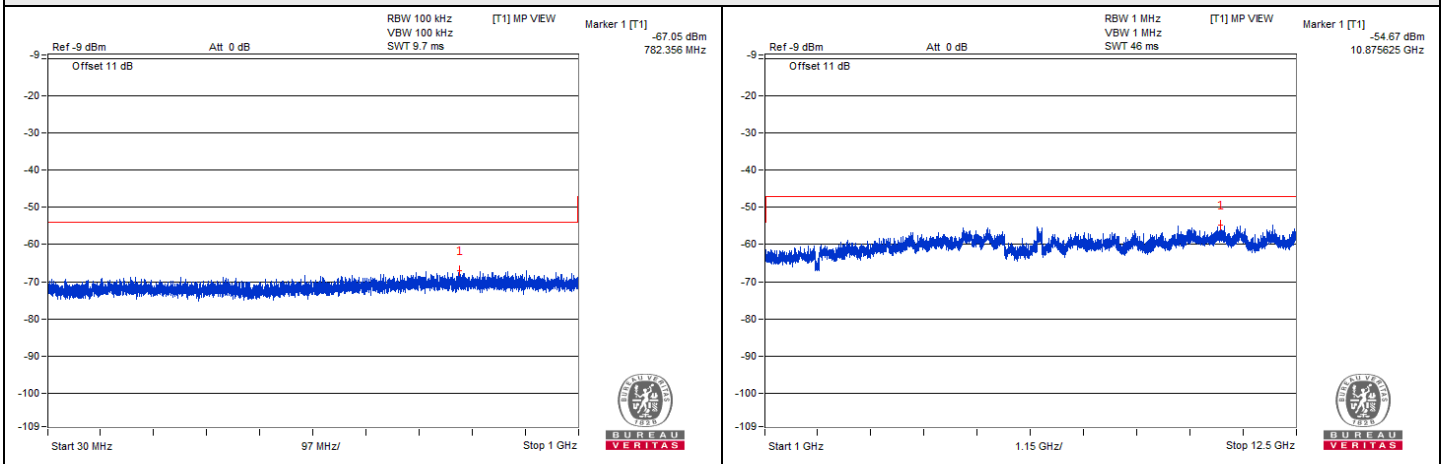


V_{min.}

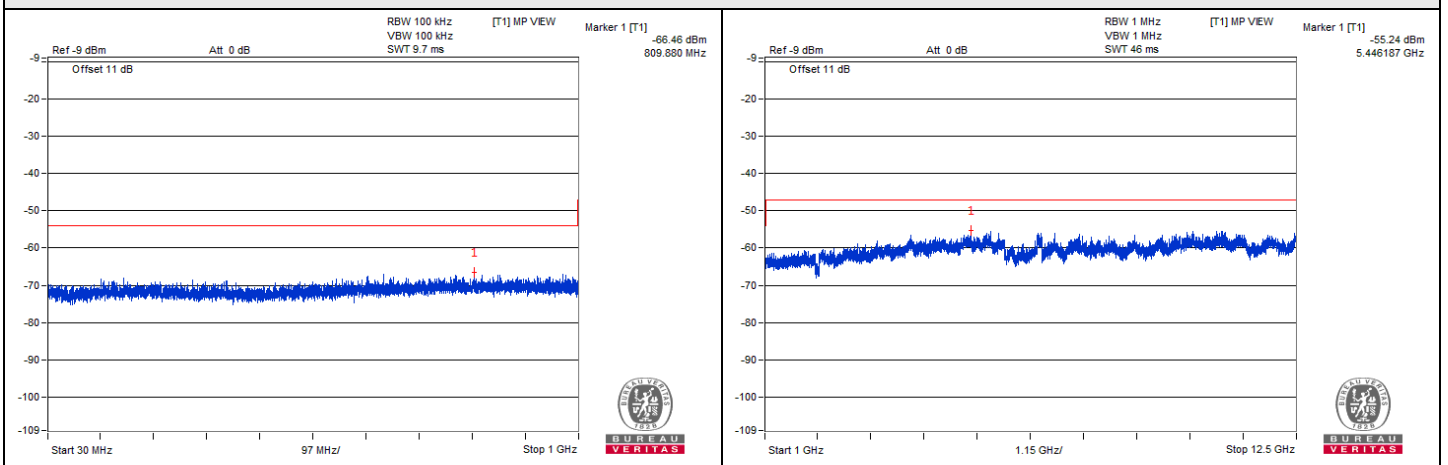


CH 39 (2441 MHz)

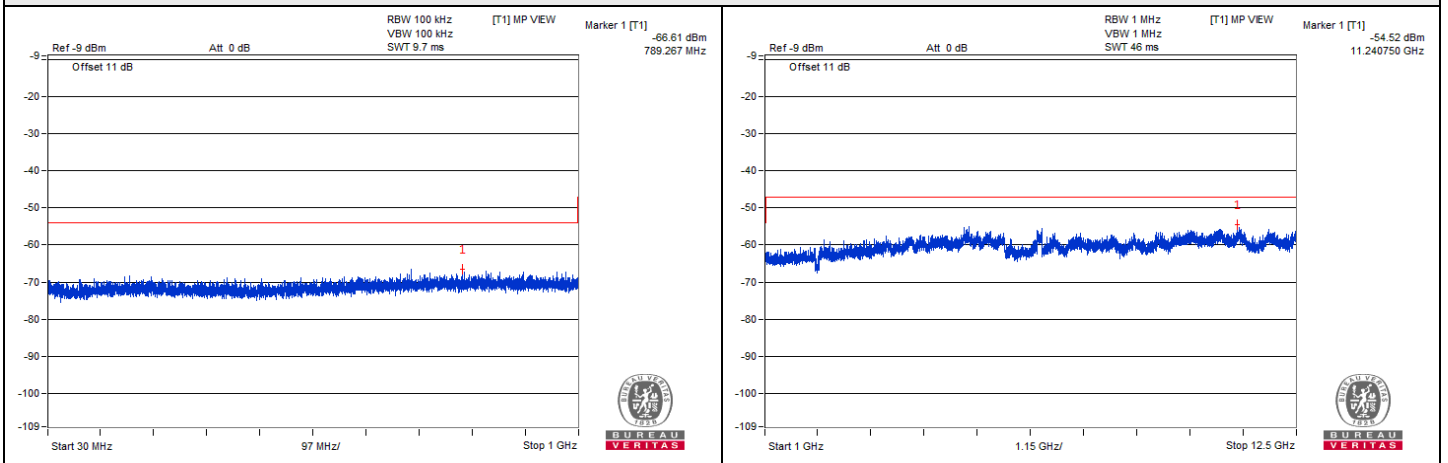
V_{normal}



V_{max.}



V_{min.}



CH 78 (2480 MHz)

7.6 Antenna Power

Environmental Conditions:	25°C, 60% RH	Tested By:	Gary Lin
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For Normal Mode

Voltage (Vdc)	Modulation	Data Rate	Conducted RF Output Power Density (mW/MHz)	Radiated RF Output Power Density (mW/MHz)
3.87	GFSK	DH5	0.025982	0.063925
	$\pi/4$ -DQPSK	2DH5	0.031386	0.077221
	8DPSK	3DH5	0.031459	0.077401
4.257	GFSK	DH5	0.025265	0.062161
	$\pi/4$ -DQPSK	2DH5	0.032382	0.079672
	8DPSK	3DH5	0.030430	0.074869
3.483	GFSK	DH5	0.027024	0.066489
	$\pi/4$ -DQPSK	2DH5	0.031459	0.077401
	8DPSK	3DH5	0.031710	0.078018
Maximum Limit (mW/MHz):			3	-
Rated Power (mW/MHz):			0.04	-
Tolerance of Antenna Power (mW/MHz):			0.008 ~ 0.048	-
Maximum EIRP Limit (mW/MHz):			-	4.91

Notes:

1. Antenna gain is 3.91 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

For AFH Mode

Voltage (Vdc)	Modulation	Data Rate	Conducted RF Output Power Density (mW/MHz)	Radiated RF Output Power Density (mW/MHz)
3.87	GFSK	DH5	0.101822	0.250520
	$\pi/4$ -DQPSK	2DH5	0.122509	0.301417
	8DPSK	3DH5	0.122254	0.300790
4.257	GFSK	DH5	0.099275	0.244253
	$\pi/4$ -DQPSK	2DH5	0.127106	0.312727
	8DPSK	3DH5	0.119445	0.293879
3.483	GFSK	DH5	0.105887	0.260521
	$\pi/4$ -DQPSK	2DH5	0.124295	0.305811
	8DPSK	3DH5	0.123074	0.302807
Maximum Limit (mW/MHz):			3	-
Rated Power (mW/MHz):			0.13	-
Tolerance of Antenna Power (mW/MHz):			0.026 ~ 0.156	-
Maximum EIRP Limit (mW/MHz):			-	4.91

Notes:

1. Antenna gain is 3.91 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

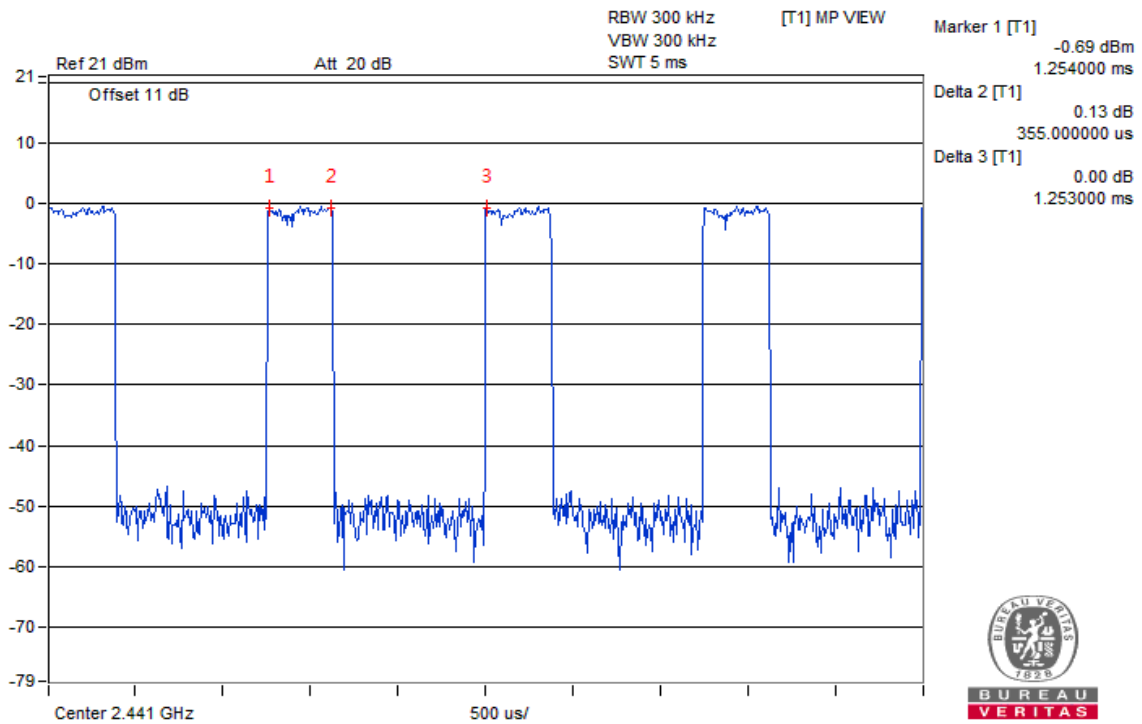
7.7 Dwell Time

Environmental Conditions:	24°C, 61% RH	Tested By:	Gary Lin
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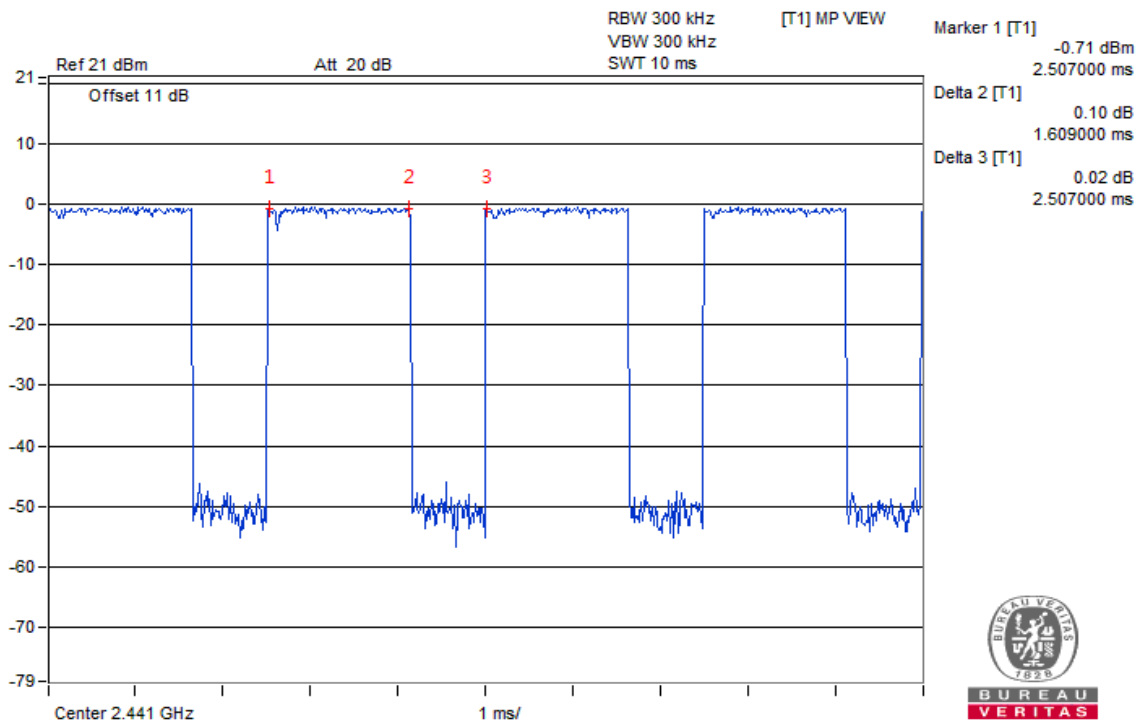
GFSK Normal Mode

Test Condition	Mode	Diffusion Rate	(Diffusion Rate/79)*0.4 sec	Duty Cycle	Result (msec)	Limit (msec)
V _{normal}	DH1	71.01	0.359	0.283	101.597	400
	DH3	71.01	0.359	0.641	230.119	400
	DH5	71.01	0.359	0.761	273.199	400
V _{max.}	DH1	71.20	0.360	0.283	101.880	400
	DH3	71.20	0.360	0.641	230.760	400
	DH5	71.20	0.360	0.761	273.960	400
V _{min.}	DH1	71.00	0.359	0.283	101.597	400
	DH3	71.00	0.359	0.641	230.119	400
	DH5	71.00	0.359	0.761	273.199	400

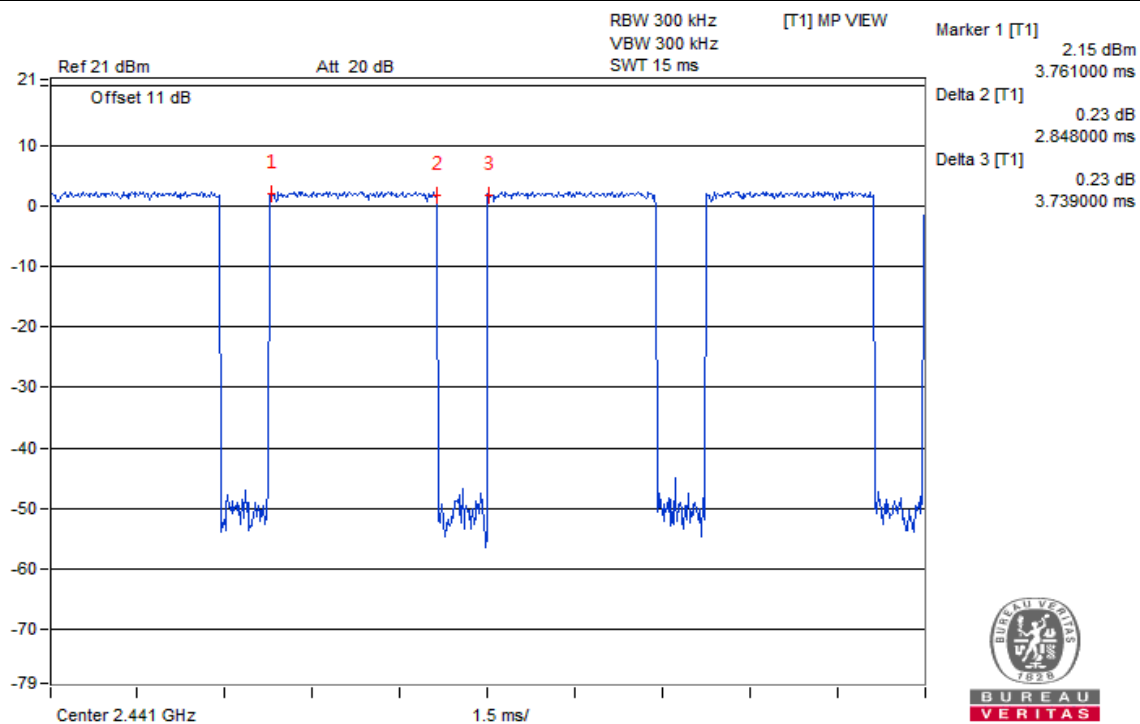
Vnormal



DH1

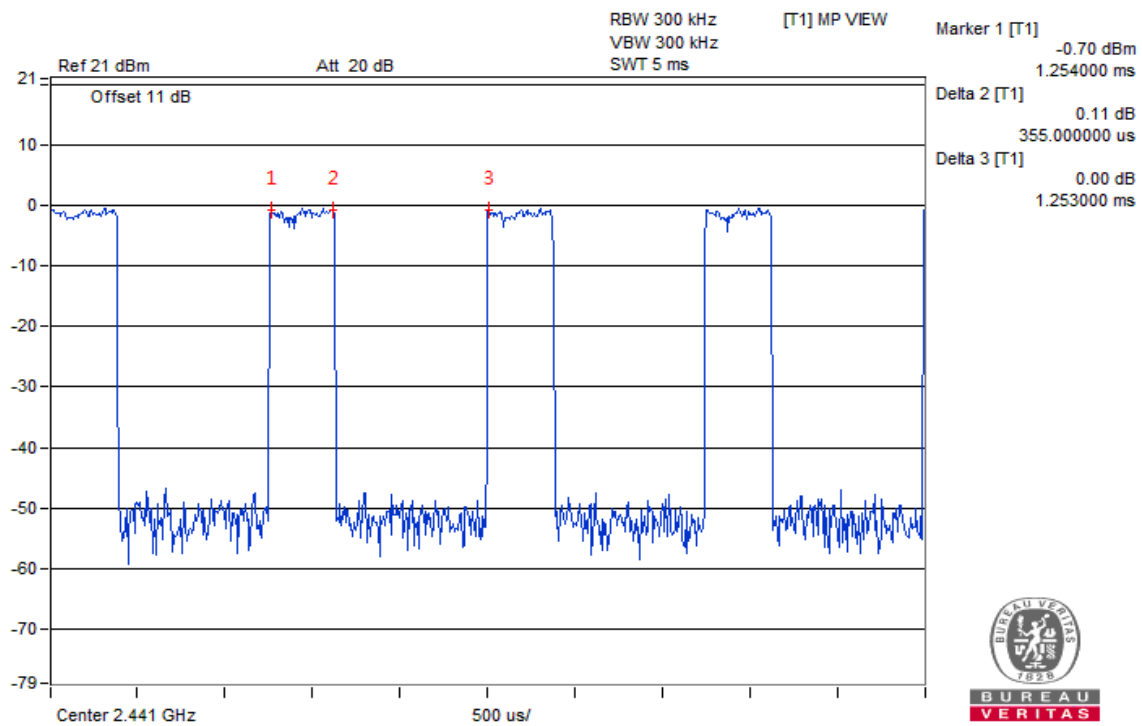


DH3

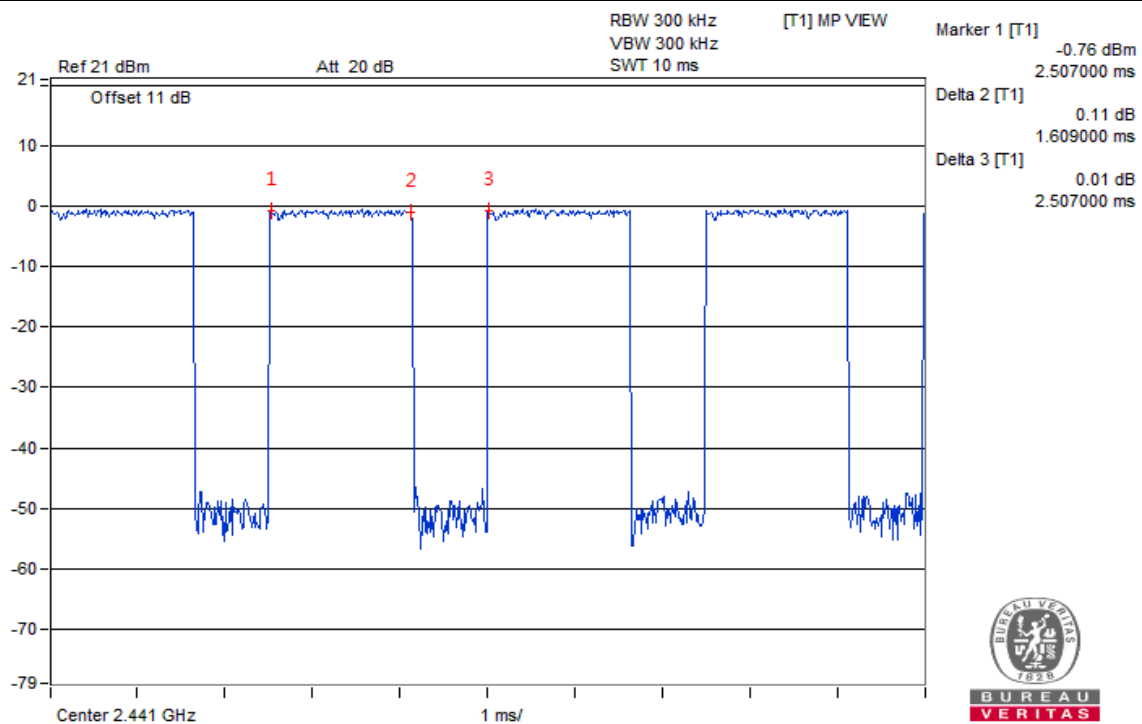


DH5

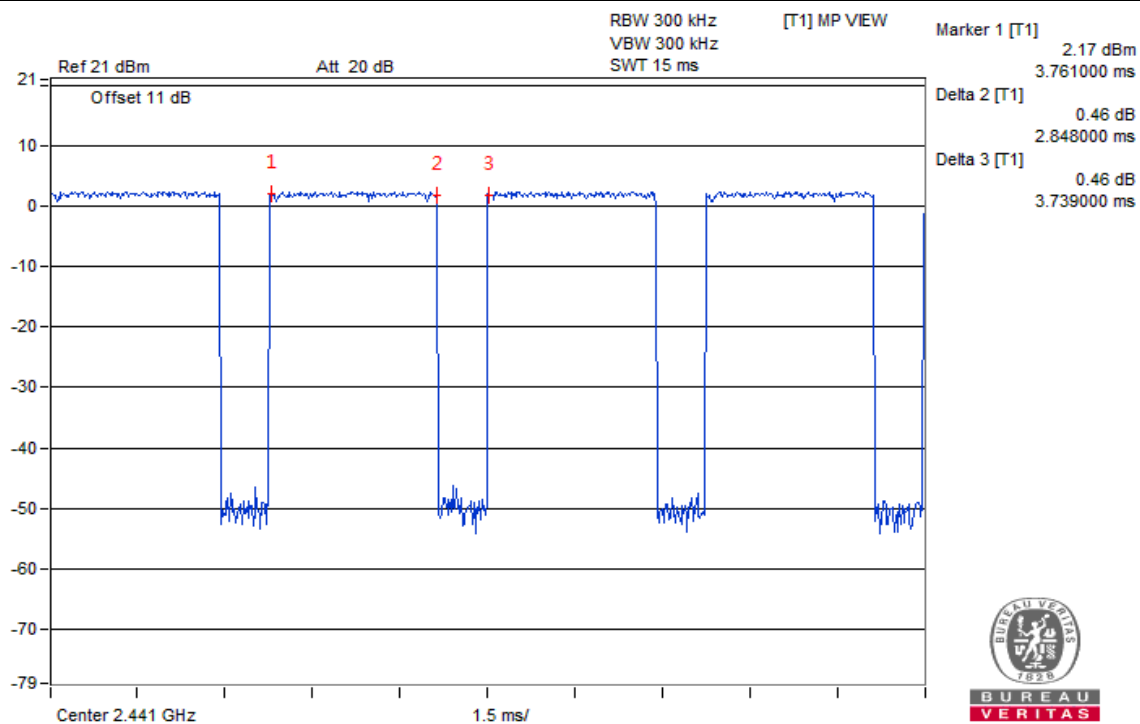
V_{max}.



DH1

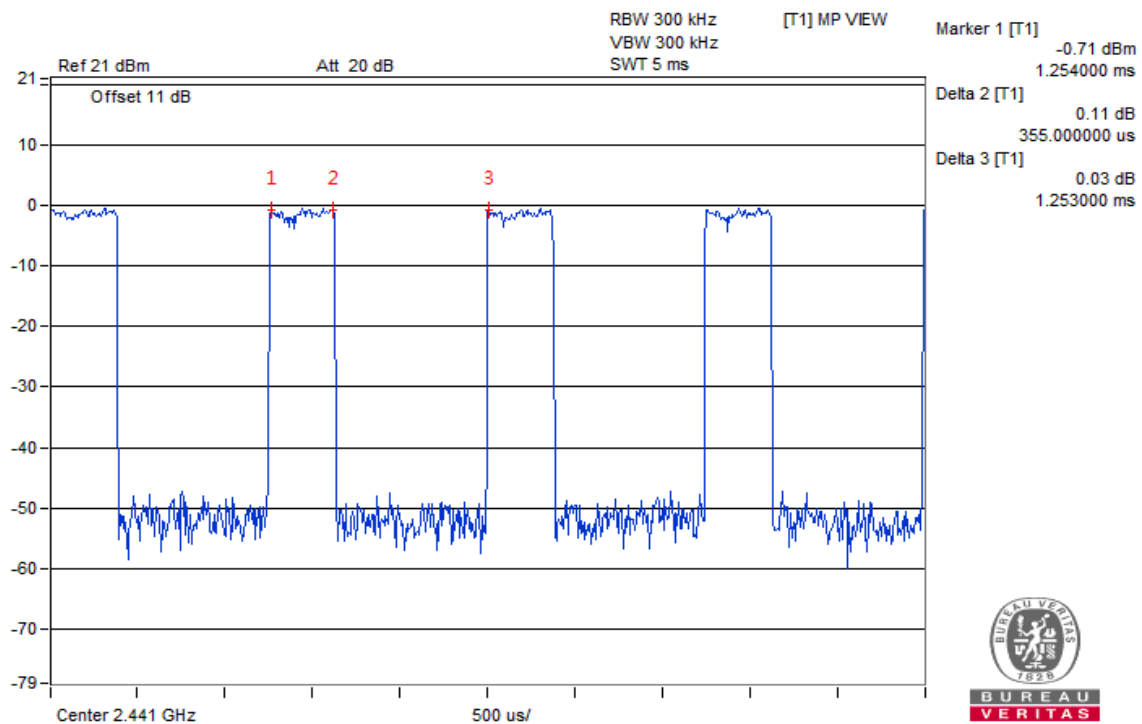


DH3

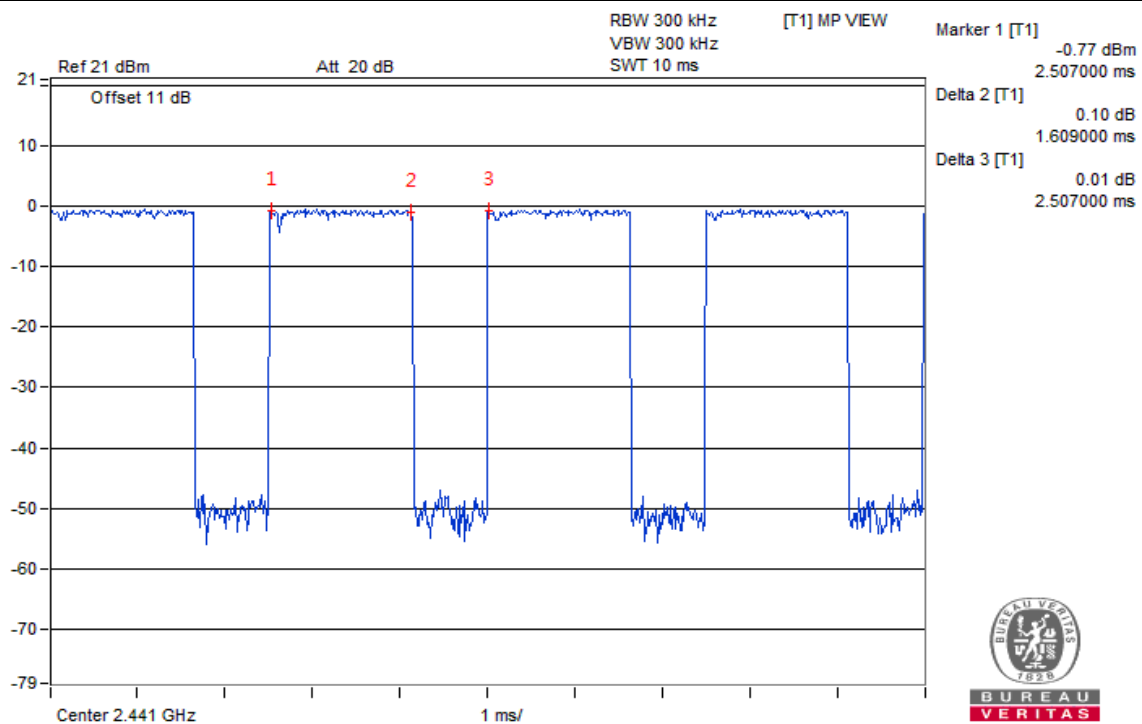


DH5

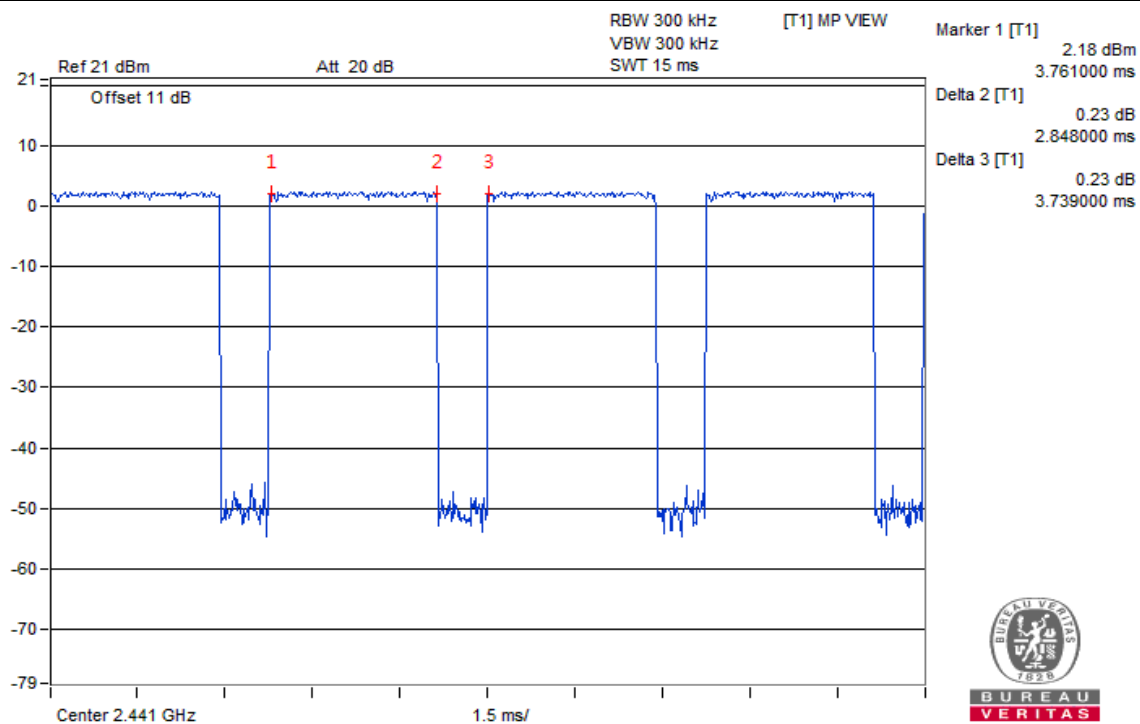
V_{min}.



DH1



DH3

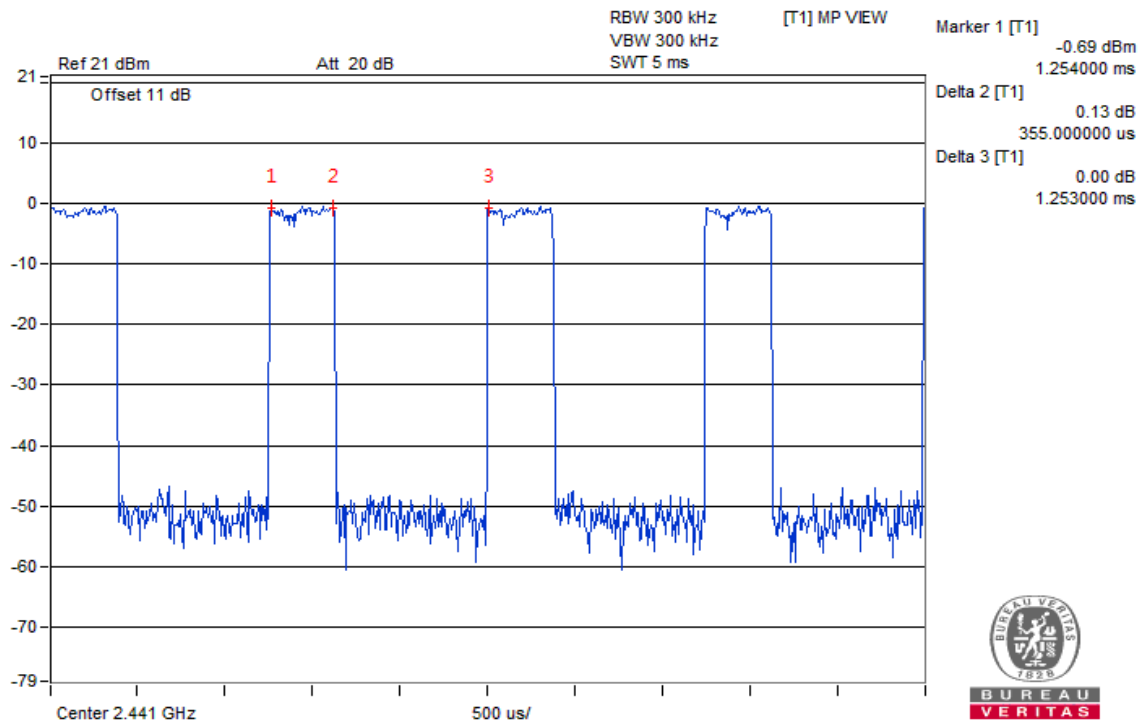


DH5

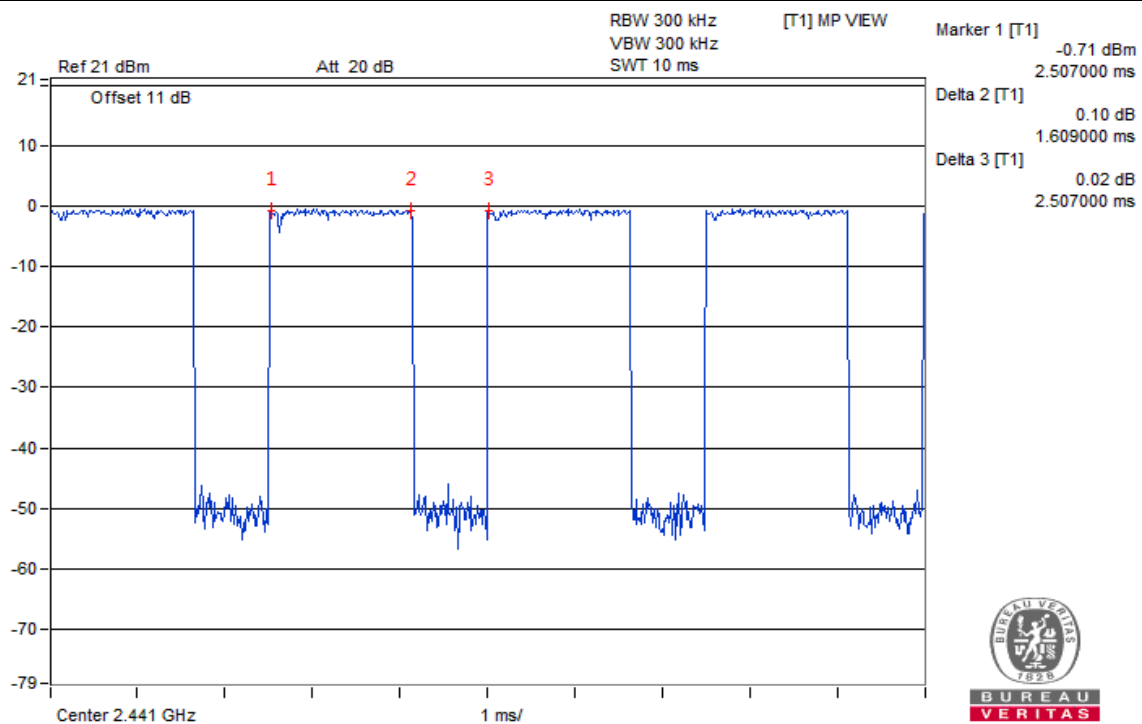
GFSK AFH Mode

Test Condition	Mode	Diffusion Rate	(Diffusion Rate/20)*0.4 sec	Duty Cycle	Result (msec)	Limit (msec)
V _{normal}	DH1	18.12	0.362	0.283	102.446	400
	DH3	18.12	0.362	0.641	232.042	400
	DH5	18.12	0.362	0.761	275.482	400
V _{max.}	DH1	18.12	0.362	0.283	102.446	400
	DH3	18.12	0.362	0.641	232.042	400
	DH5	18.12	0.362	0.761	275.482	400
V _{min.}	DH1	18.12	0.362	0.283	102.446	400
	DH3	18.12	0.362	0.641	232.042	400
	DH5	18.12	0.362	0.761	275.482	400

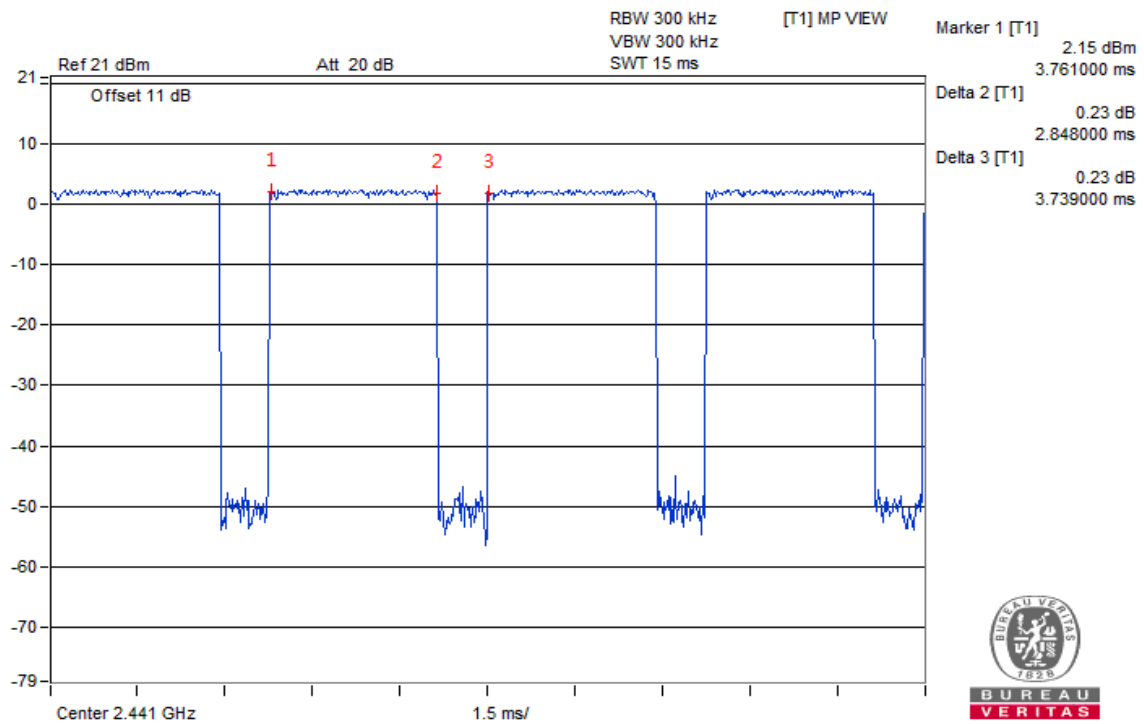
Vnormal



DH1

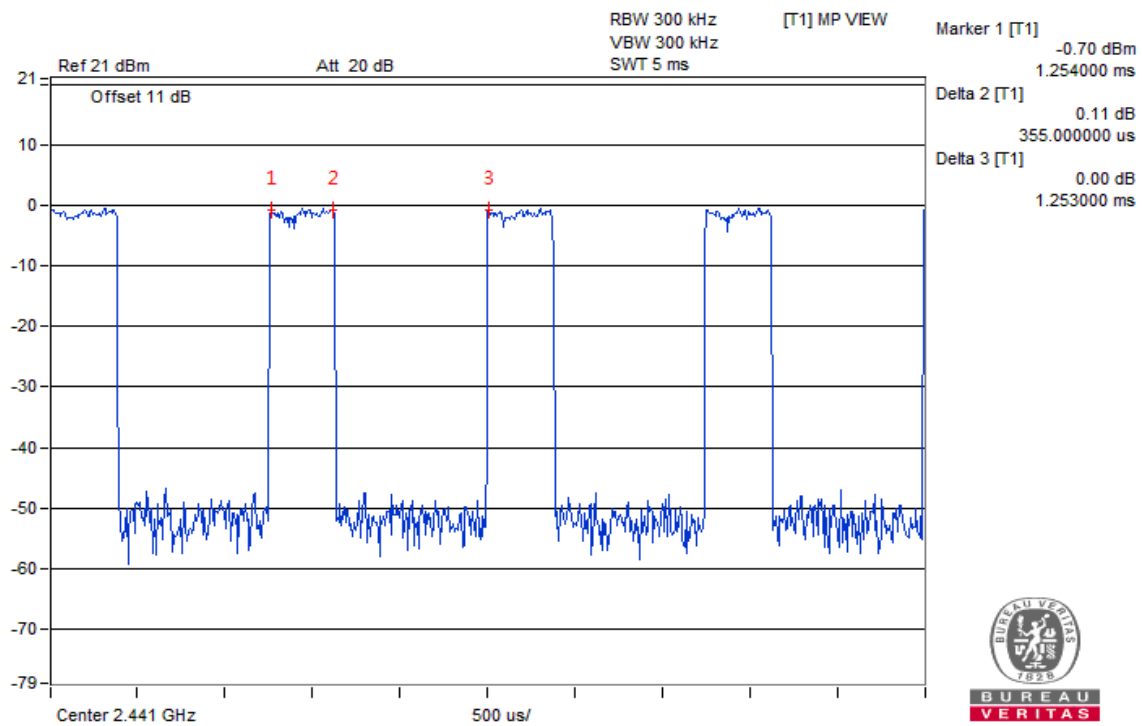


DH3

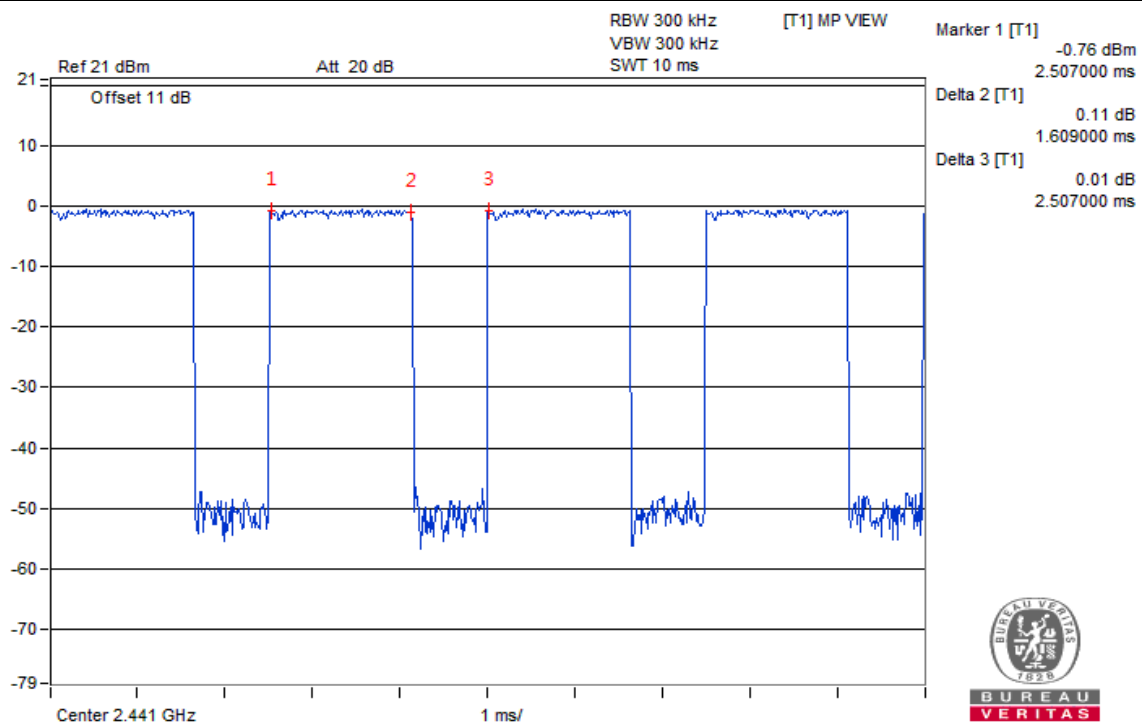


DH5

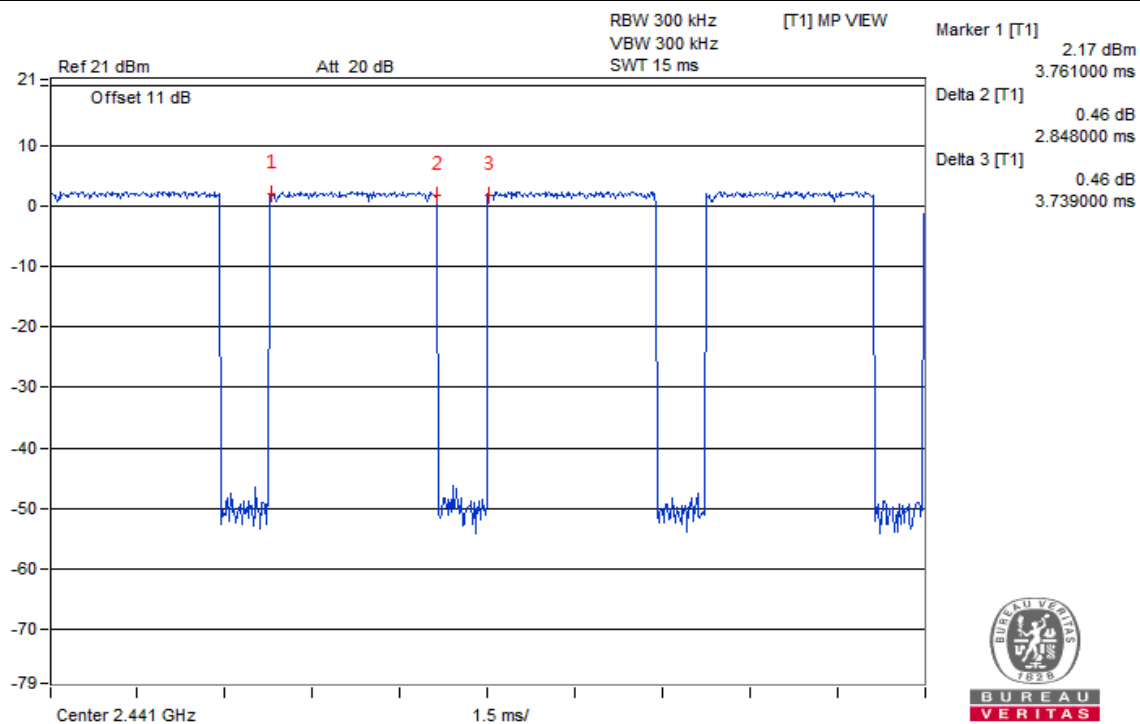
V_{max}.



DH1

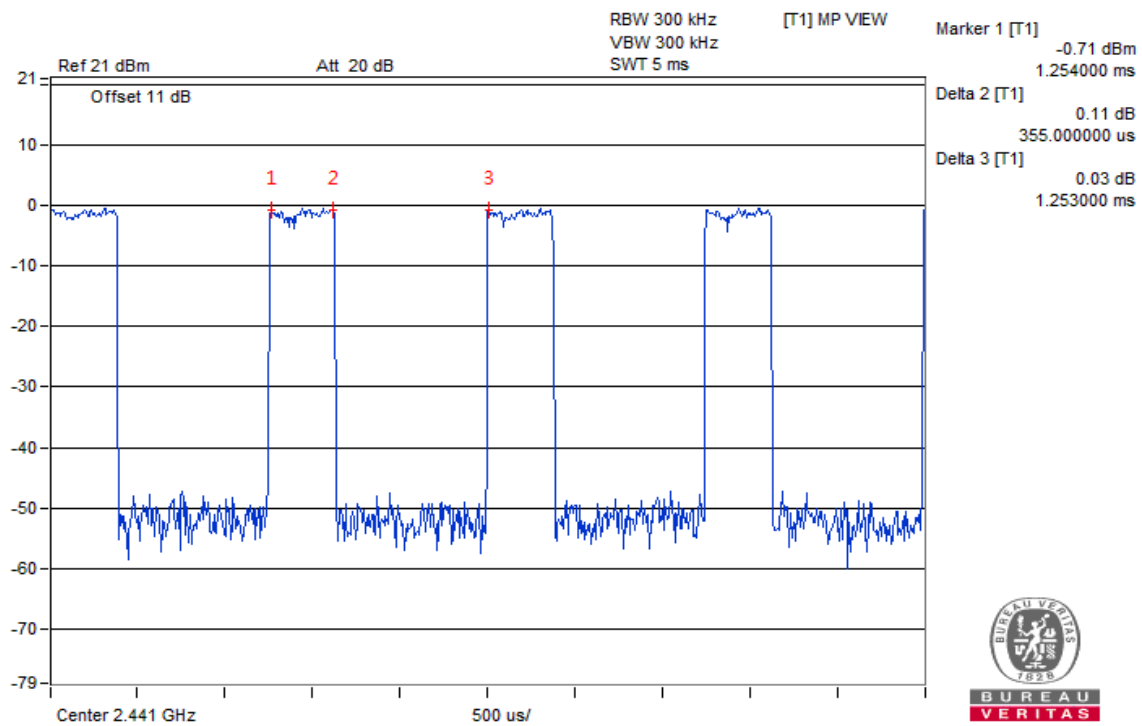


DH3

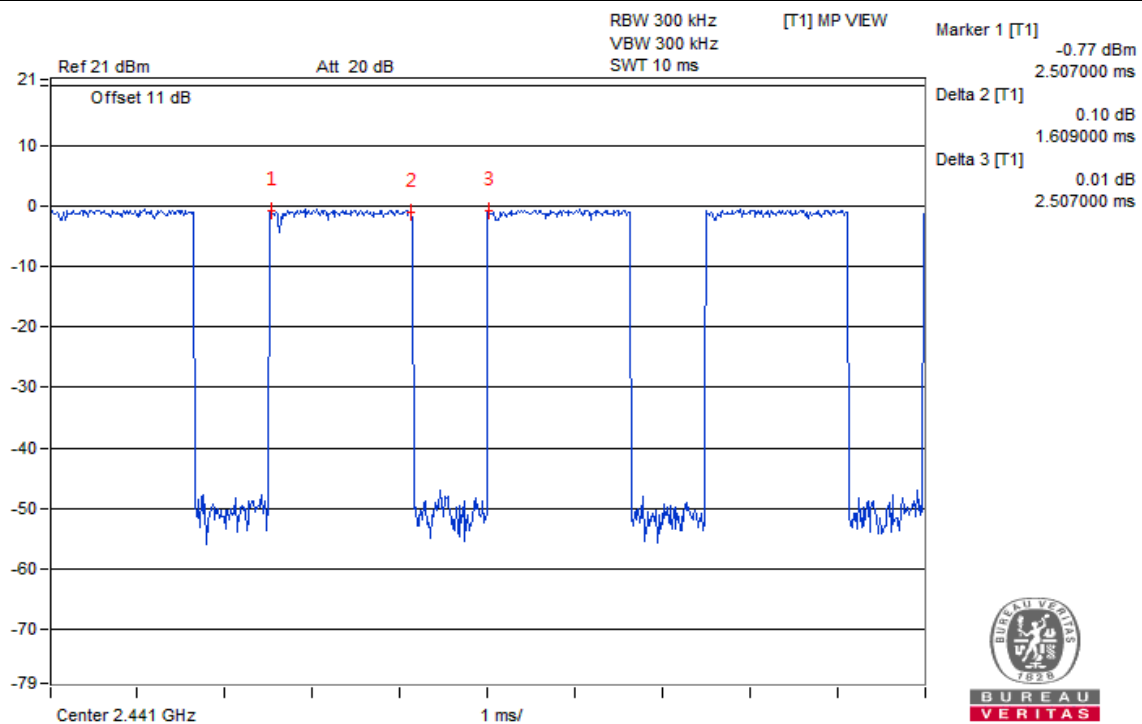


DH5

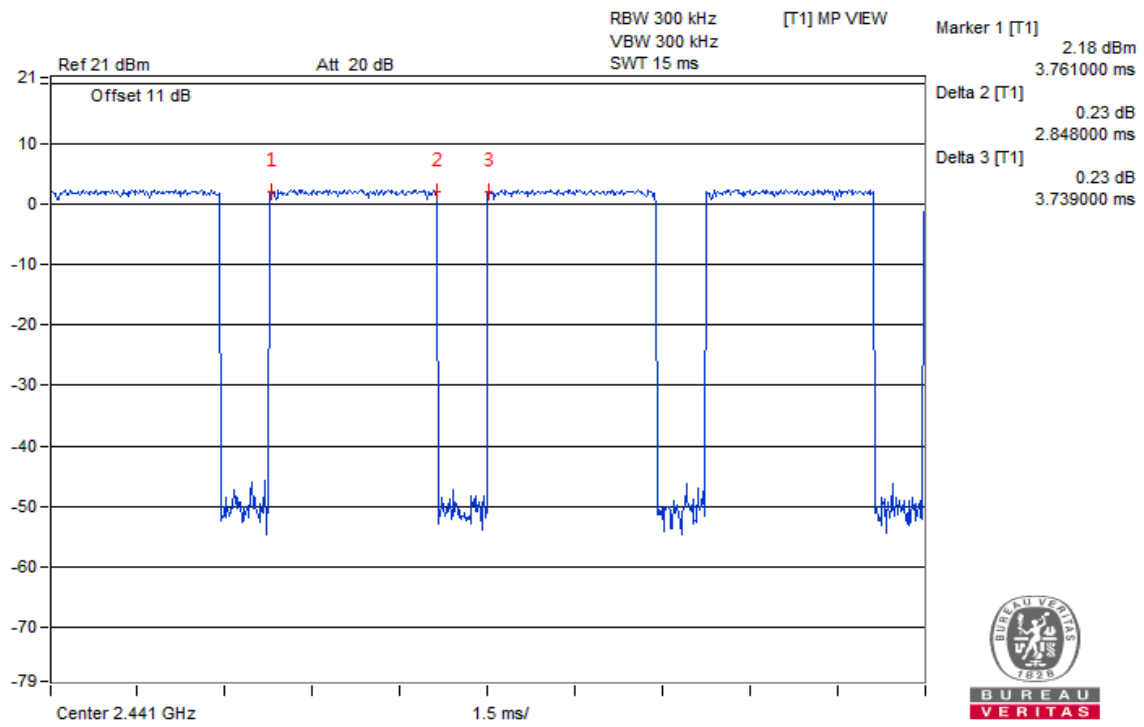
V_{min}.



DH1



DH3

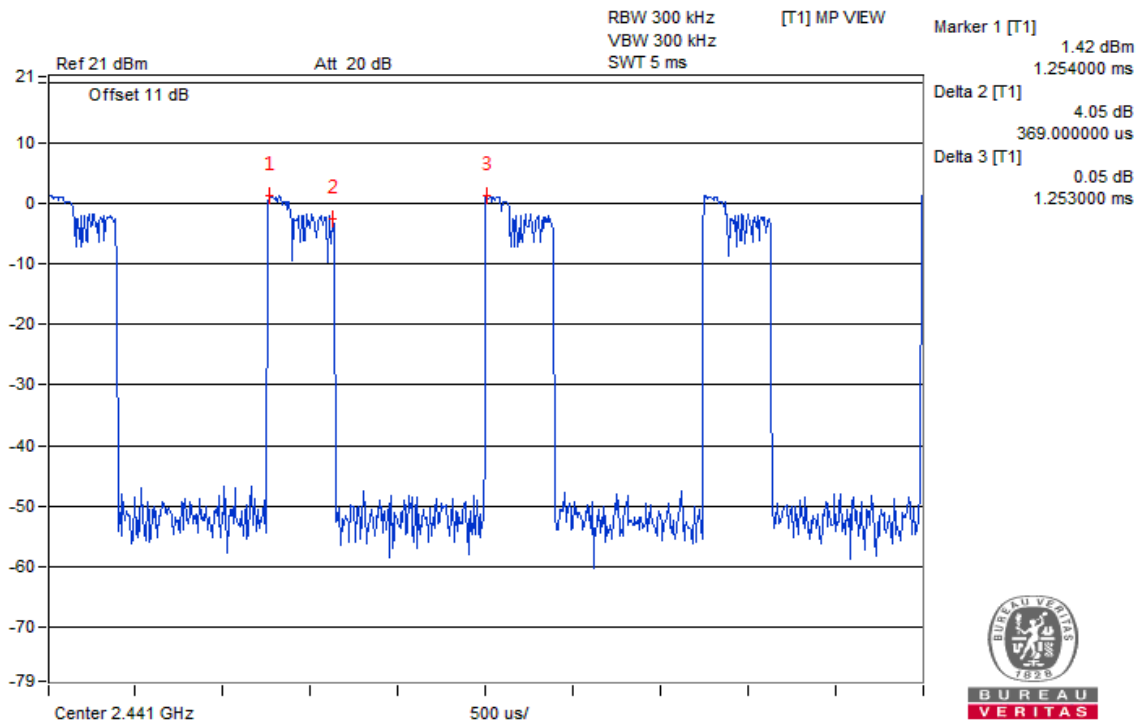


DH5

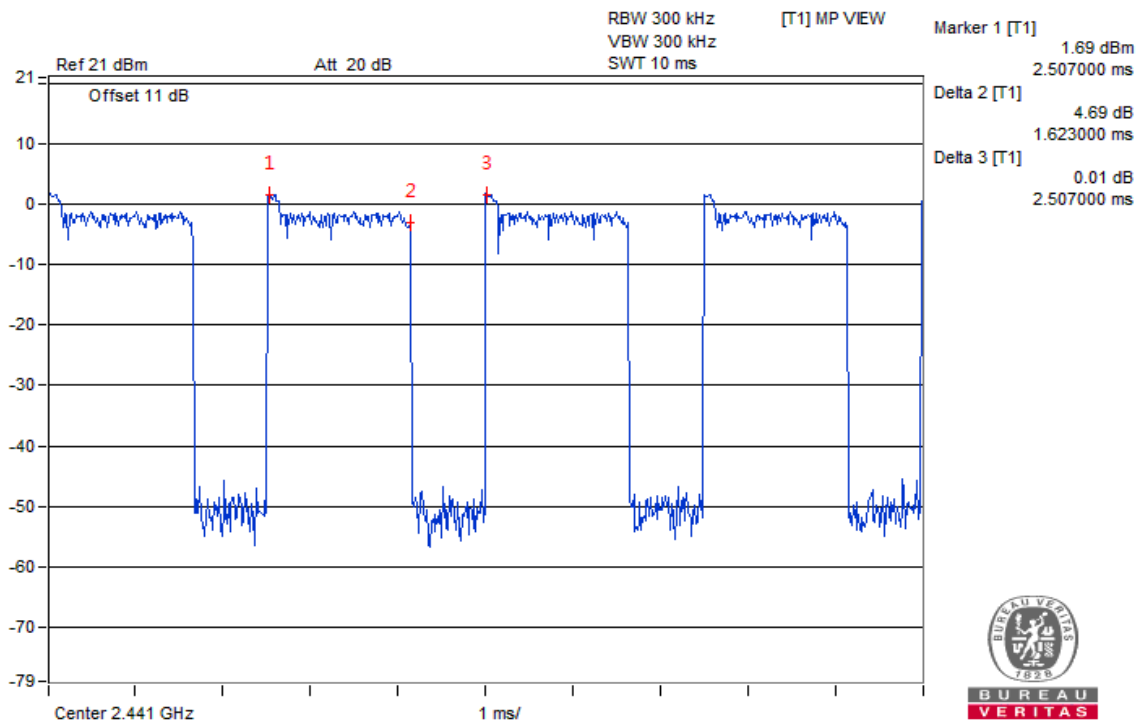
$\pi/4$ -DQPSK Normal Mode

Test Condition	Mode	Diffusion Rate	(Diffusion Rate/79)*0.4 sec	Duty Cycle	Result (msec)	Limit (msec)
V _{normal}	2DH1	71.00	0.359	0.294	105.546	400
	2DH3	71.00	0.359	0.647	232.273	400
	2DH5	71.00	0.359	0.748	268.532	400
V _{max.}	2DH1	71.40	0.361	0.294	106.134	400
	2DH3	71.40	0.361	0.647	233.567	400
	2DH5	71.40	0.361	0.744	268.584	400
V _{min.}	2DH1	71.00	0.359	0.294	105.546	400
	2DH3	71.00	0.359	0.647	232.273	400
	2DH5	71.00	0.359	0.744	267.096	400

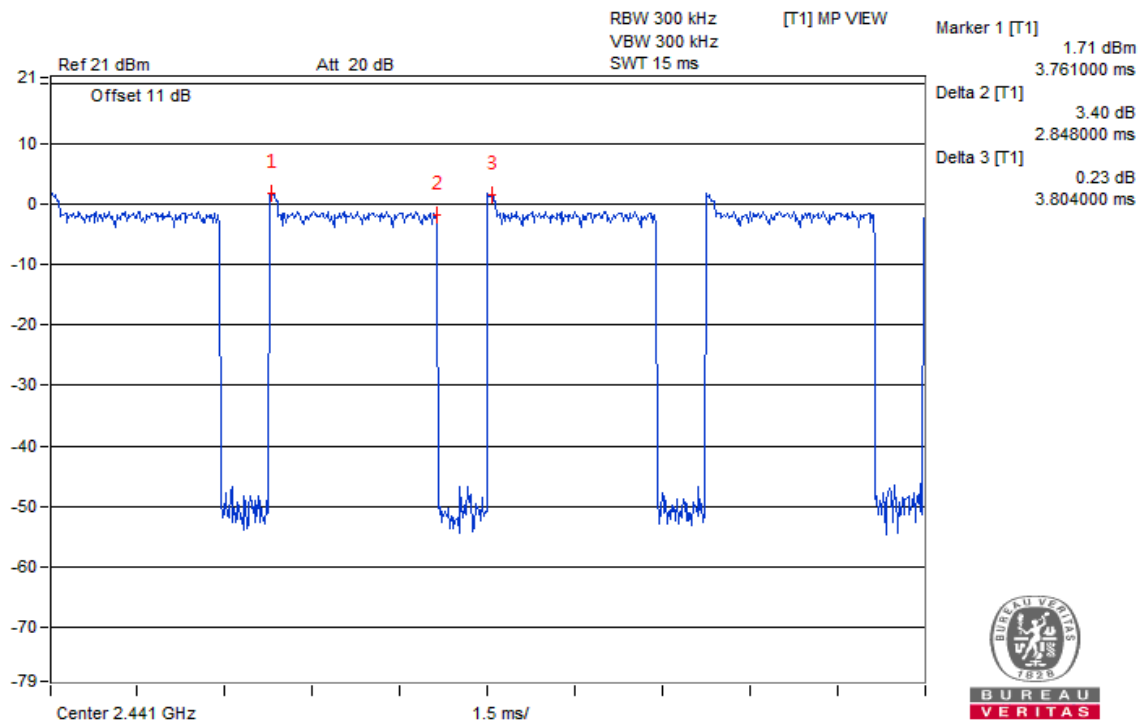
Vnormal



2DH1

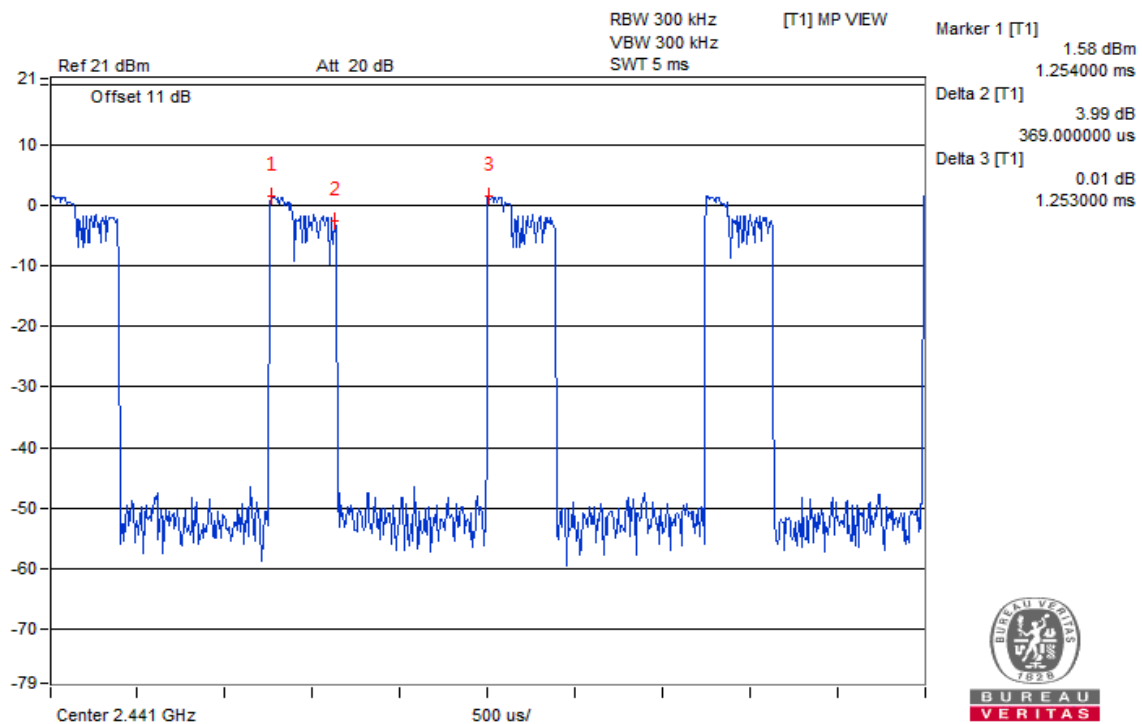


2DH3

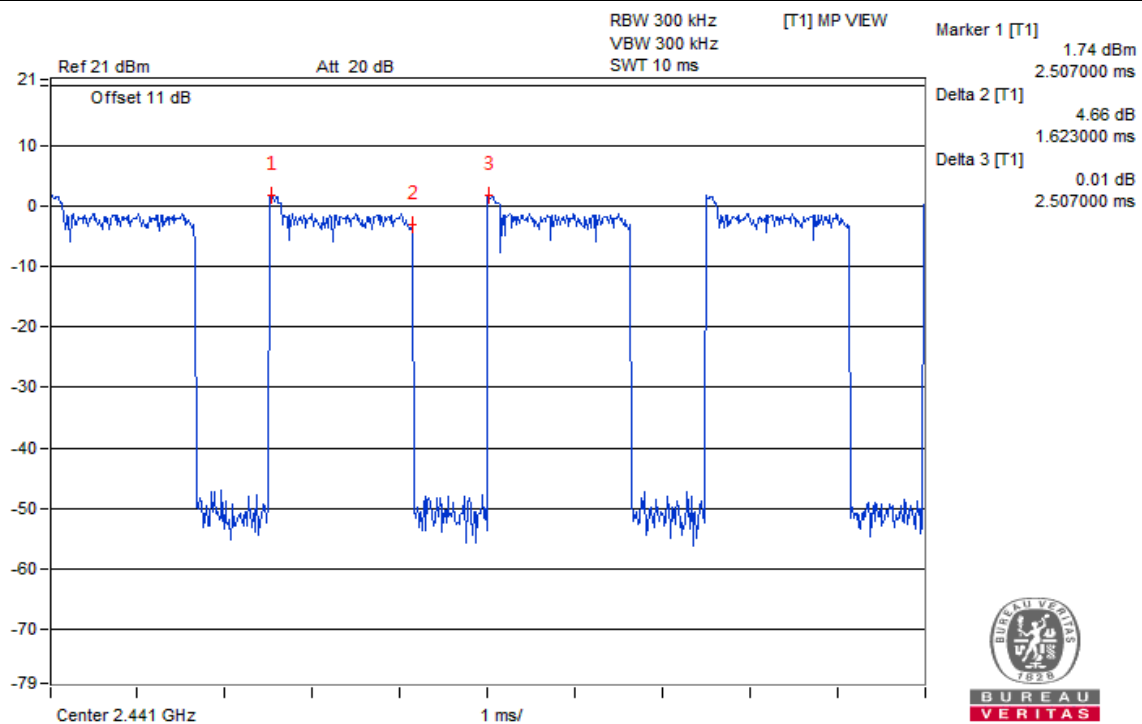


2DH5

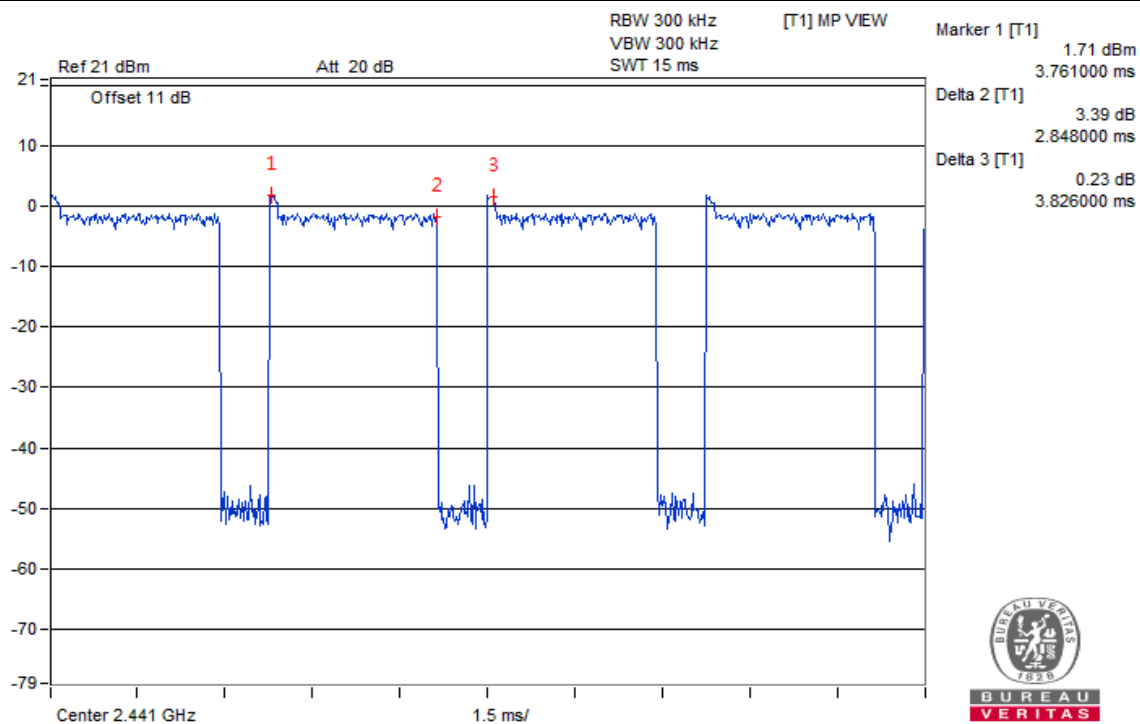
V_{max}.



2DH1

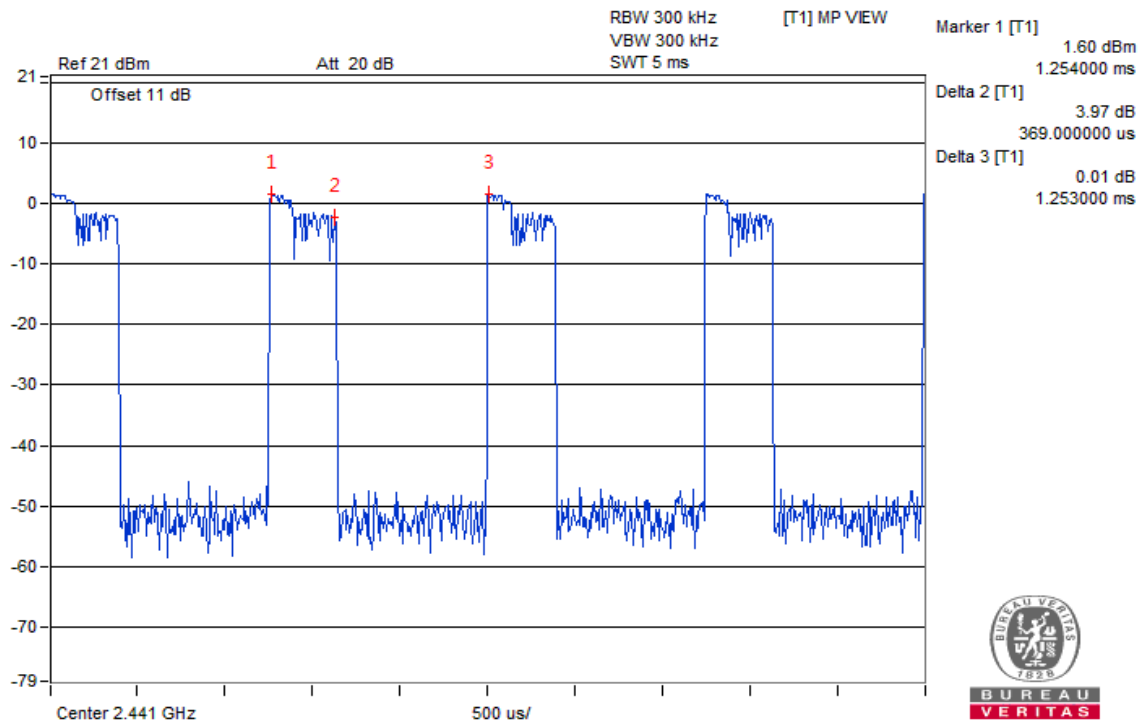


2DH3

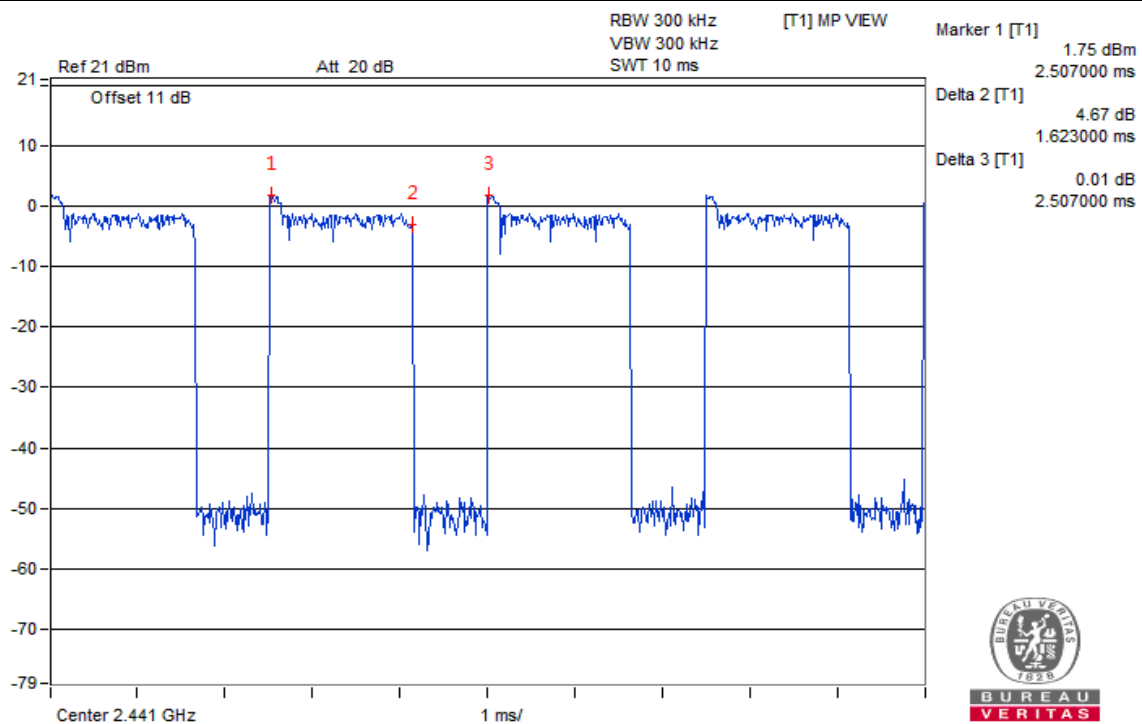


2DH5

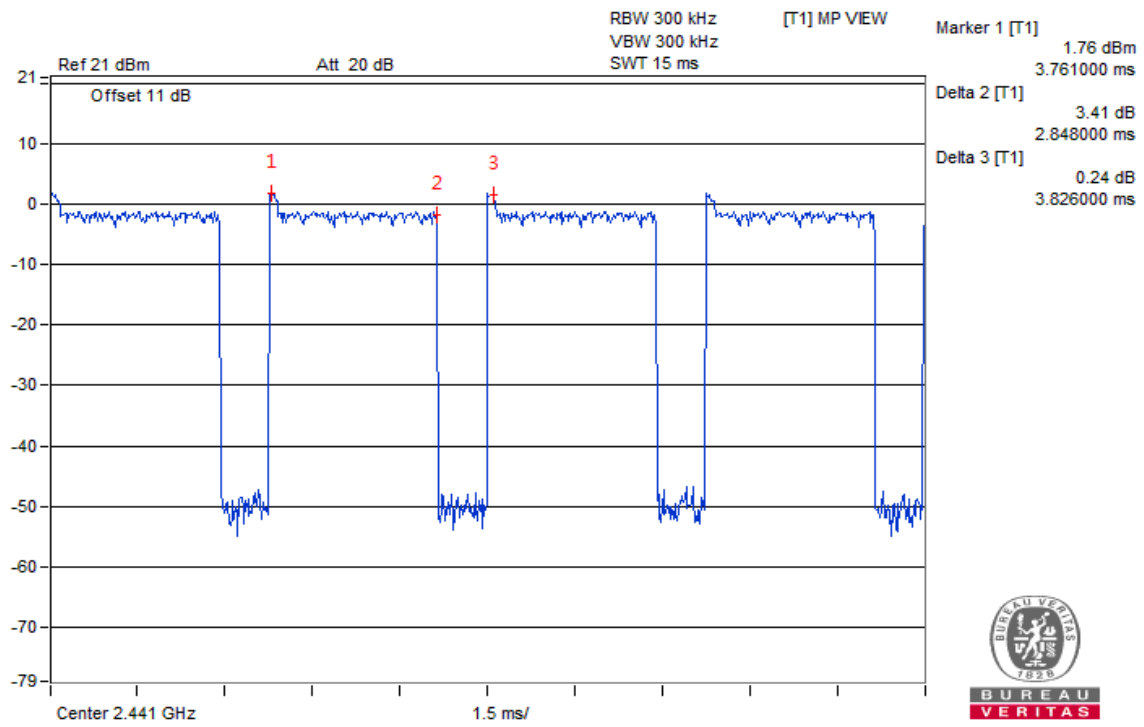
V_{min}.



2DH1



2DH3

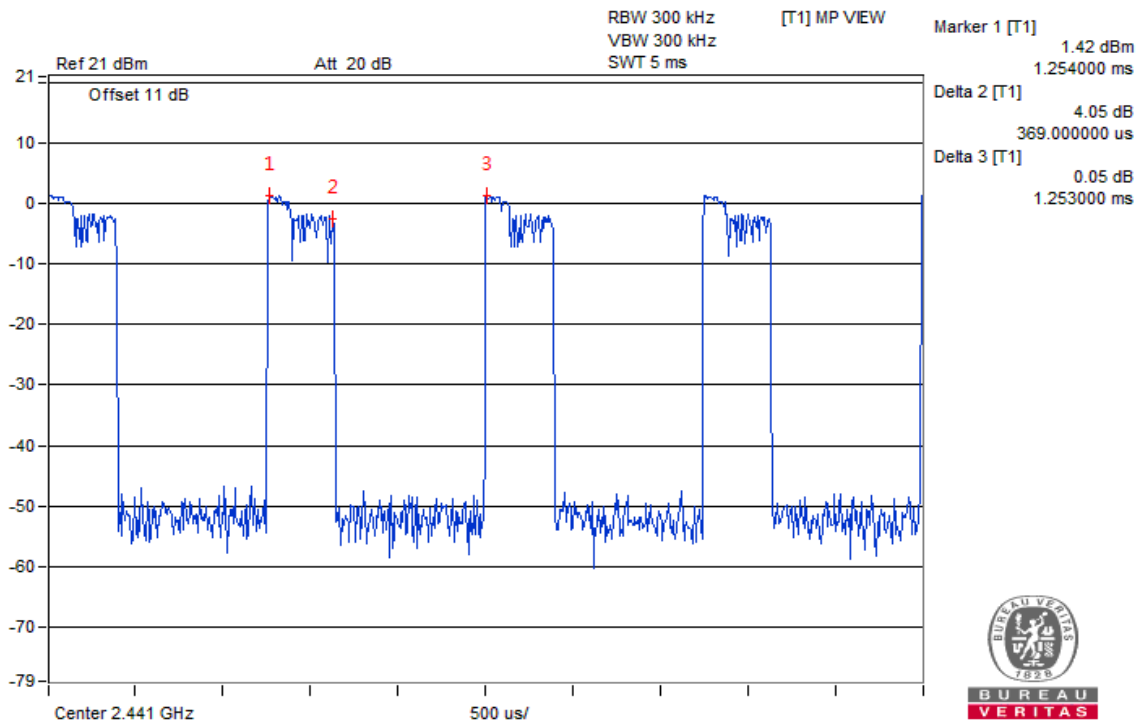


2DH5

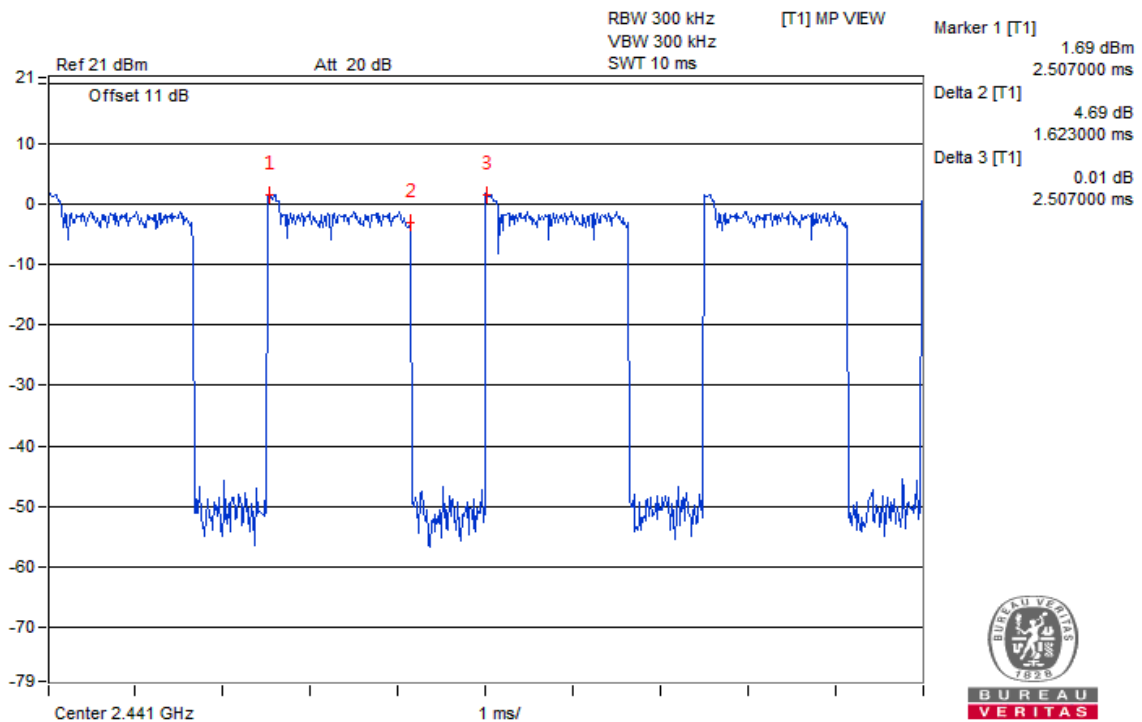
$\pi/4$ -DQPSK AFH Mode

Test Condition	Mode	Diffusion Rate	(Diffusion Rate/20)*0.4 sec	Duty Cycle	Result (msec)	Limit (msec)
V _{normal}	2DH1	18.19	0.363	0.294	106.722	400
	2DH3	18.19	0.363	0.647	234.861	400
	2DH5	18.19	0.363	0.748	271.524	400
V _{max.}	2DH1	18.19	0.363	0.294	106.722	400
	2DH3	18.19	0.363	0.647	234.861	400
	2DH5	18.19	0.363	0.744	270.072	400
V _{min.}	2DH1	17.97	0.359	0.294	105.546	400
	2DH3	17.97	0.359	0.647	232.273	400
	2DH5	17.97	0.359	0.744	267.096	400

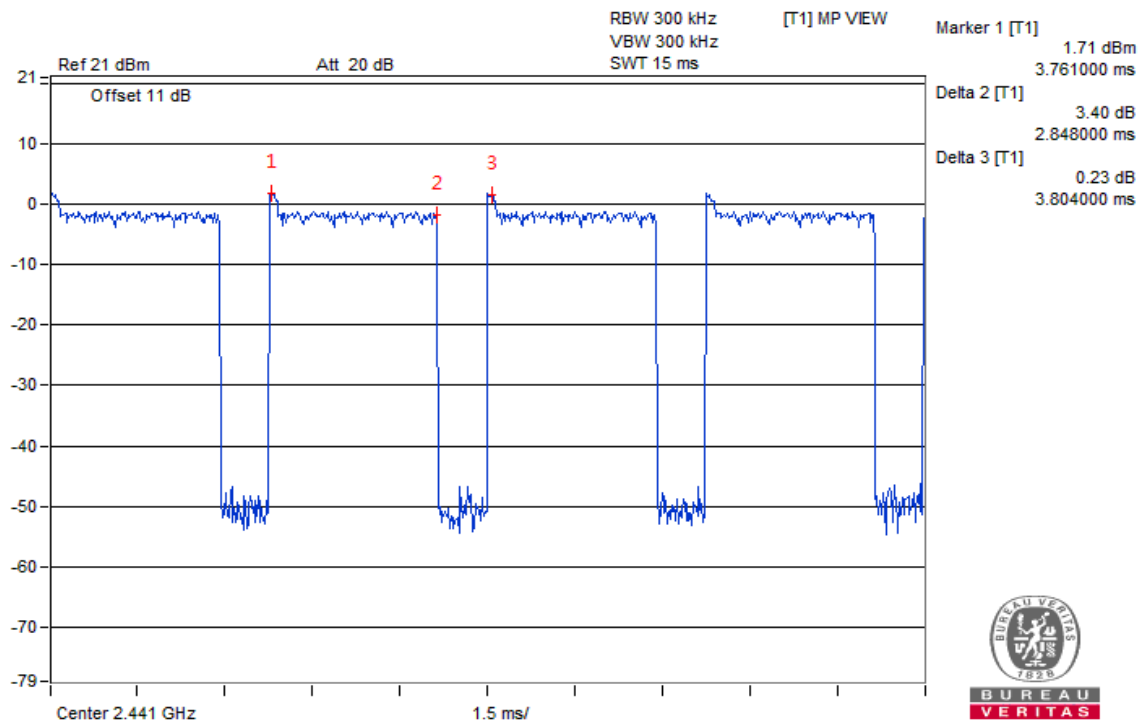
Vnormal



2DH1

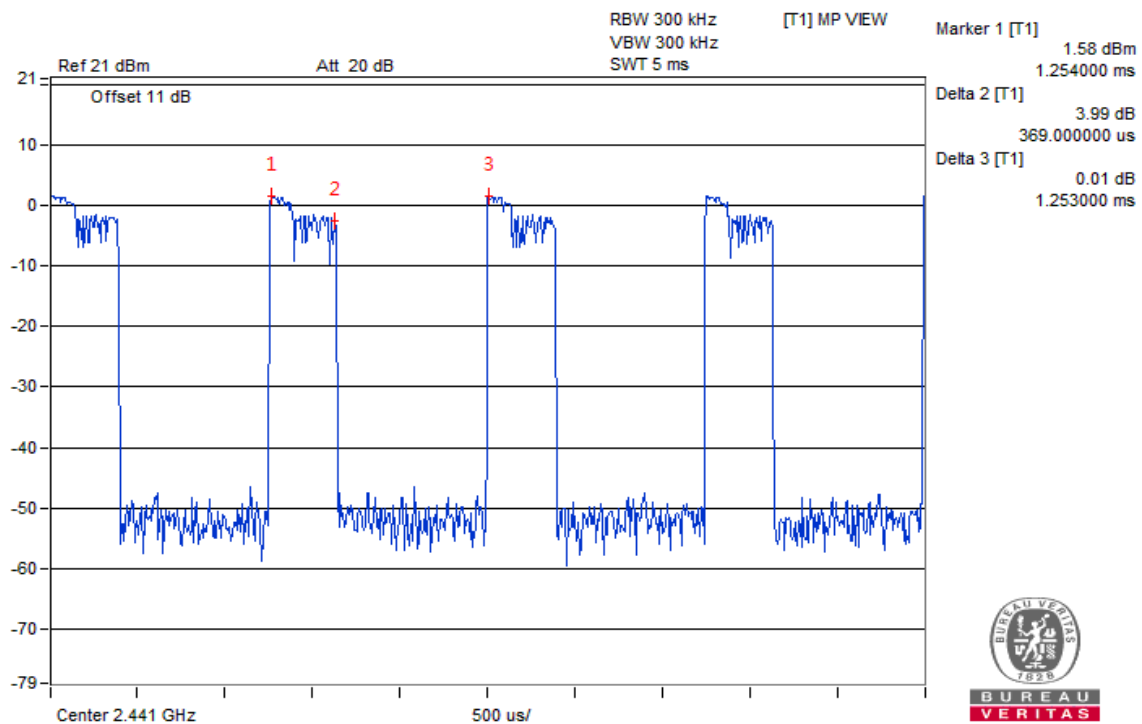


2DH3

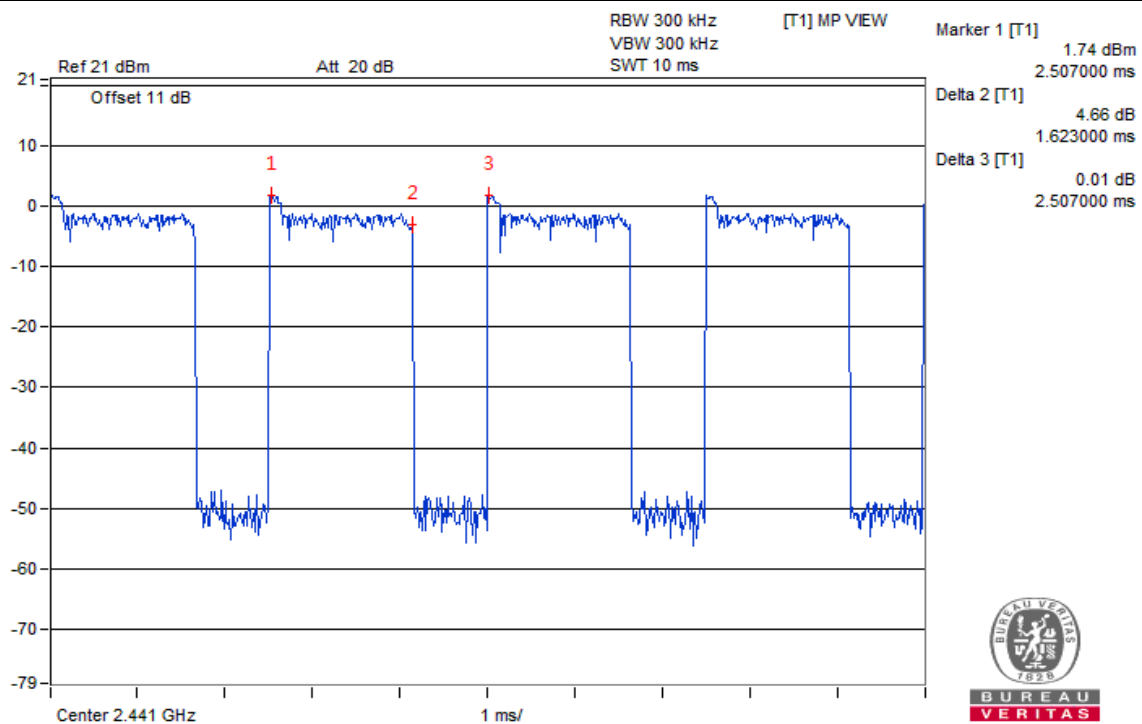


2DH5

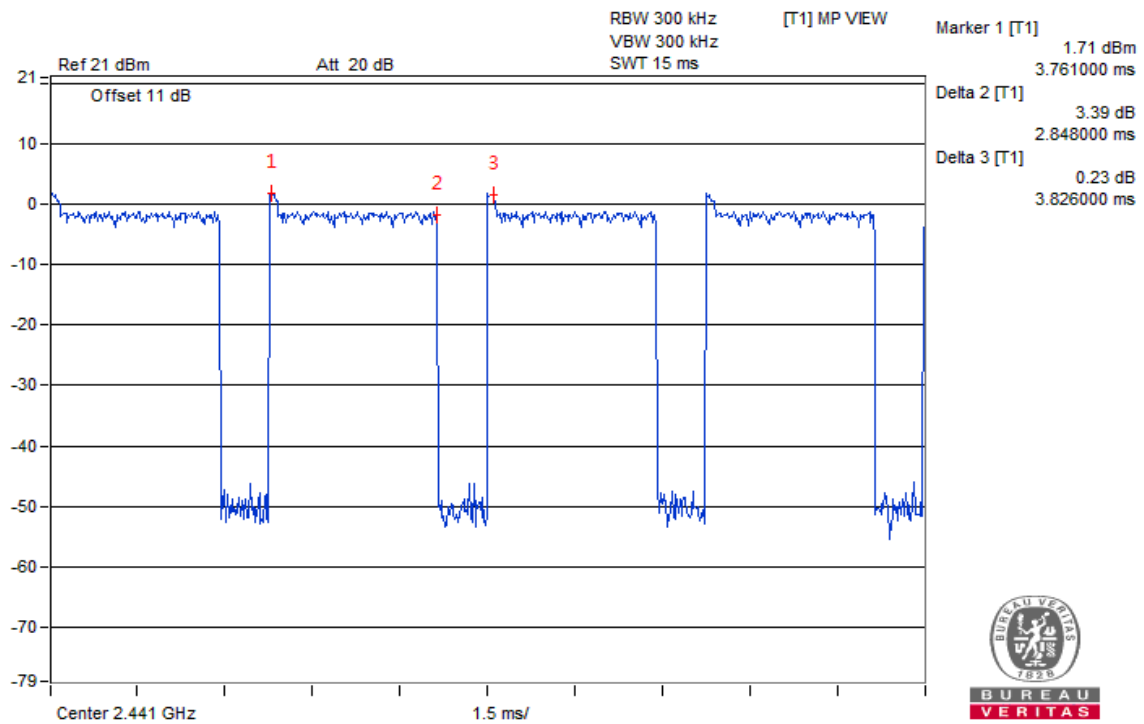
V_{max}.



2DH1

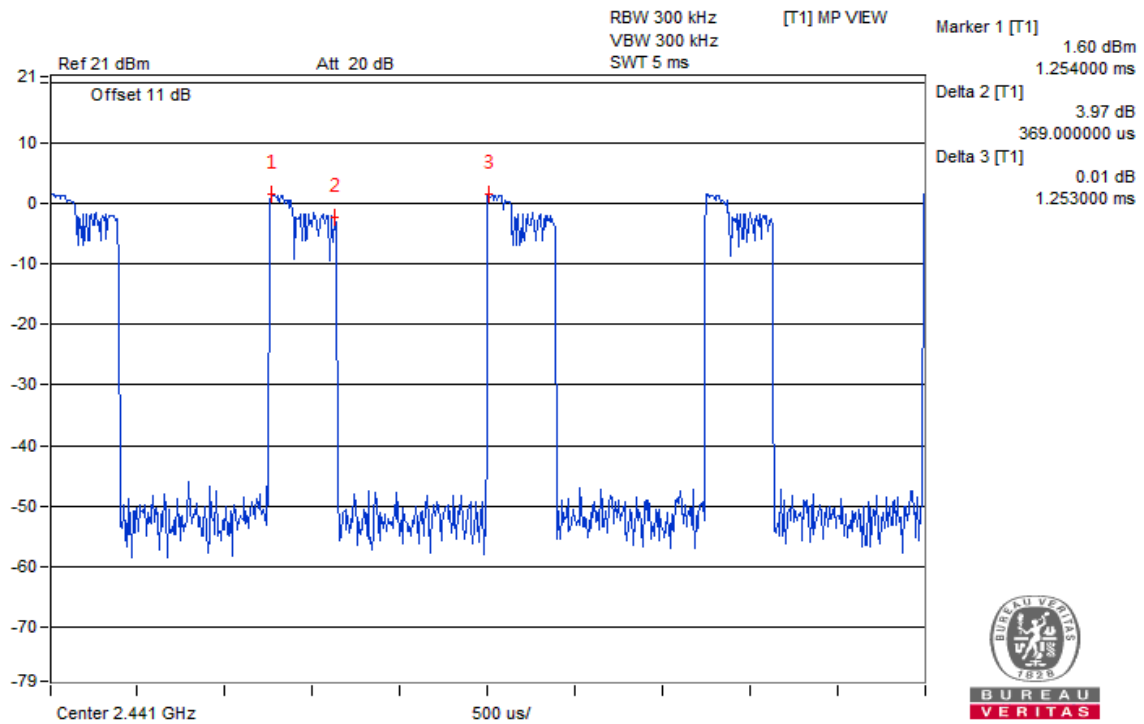


2DH3

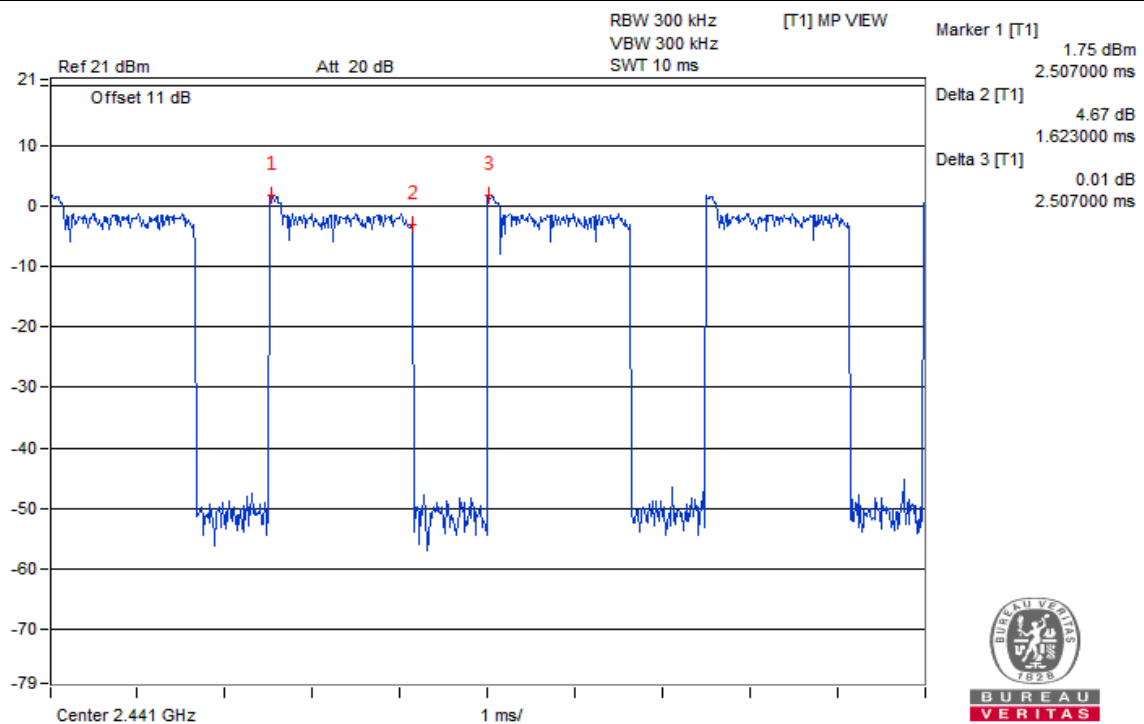


2DH5

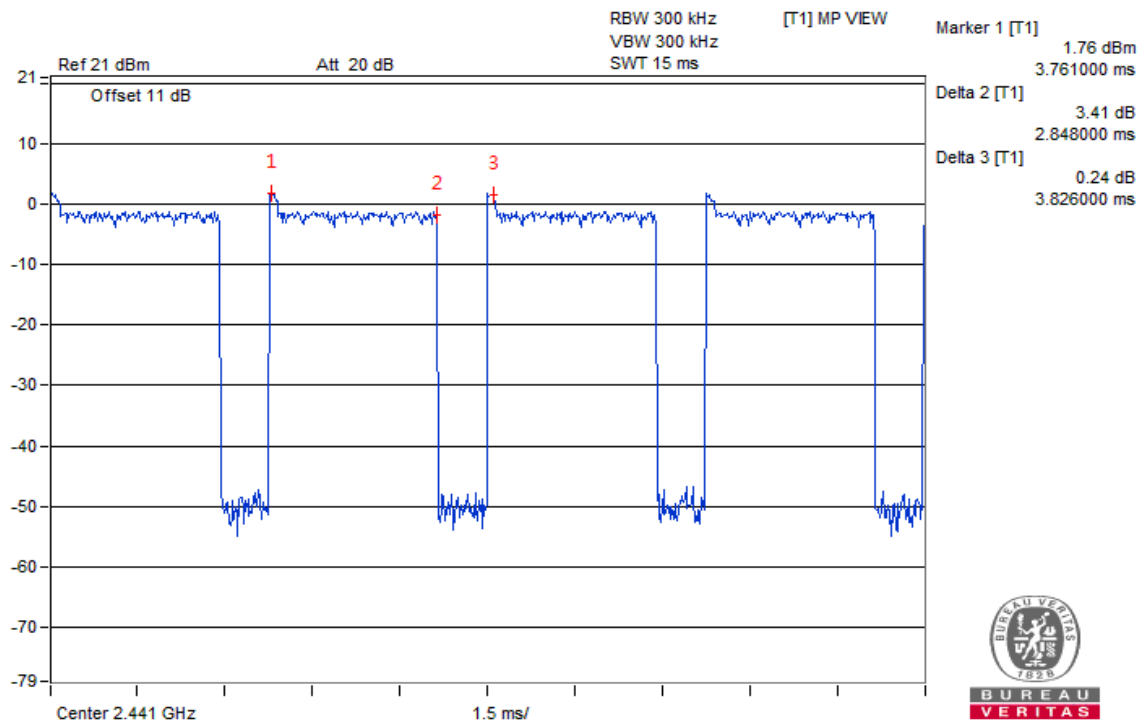
V_{min}.



2DH1



2DH3

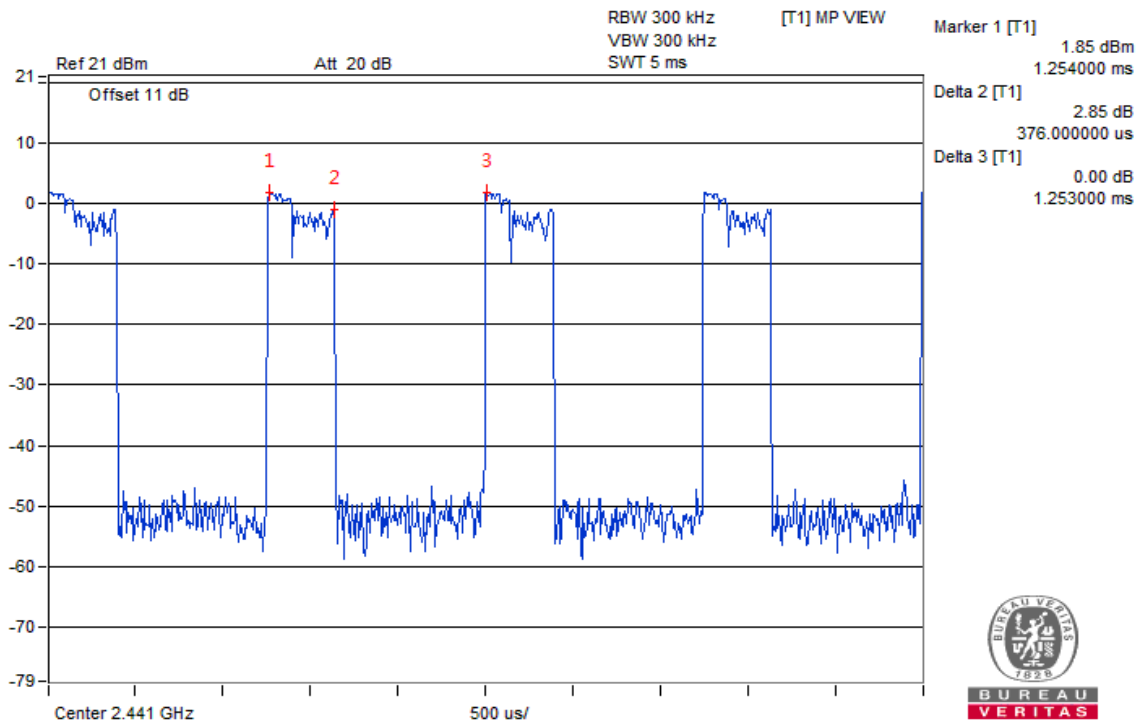


2DH5

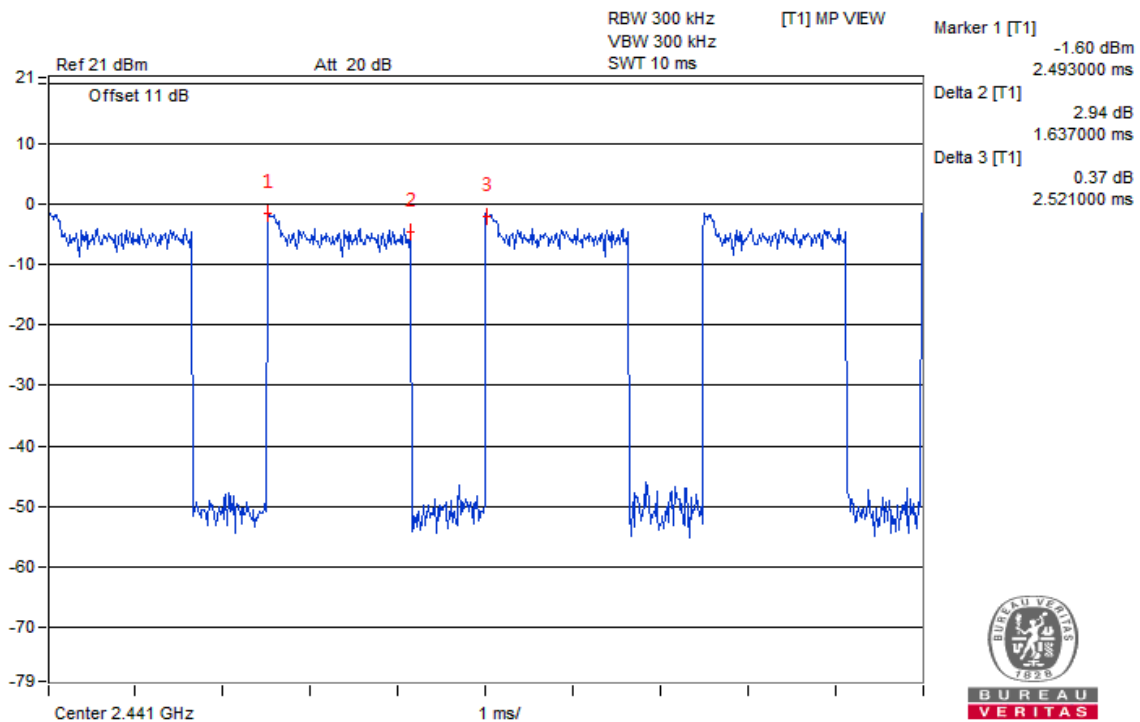
8DPSK Normal Mode

Test Condition	Mode	Diffusion Rate	(Diffusion Rate/79)*0.4 sec	Duty Cycle	Result (msec)	Limit (msec)
V _{normal}	3DH1	71.00	0.359	0.300	107.700	400
	3DH3	71.00	0.359	0.649	232.991	400
	3DH5	71.00	0.359	0.755	271.045	400
V _{max.}	3DH1	71.40	0.361	0.300	108.300	400
	3DH3	71.40	0.361	0.647	233.567	400
	3DH5	71.40	0.361	0.755	272.555	400
V _{min.}	3DH1	70.60	0.357	0.300	107.100	400
	3DH3	70.60	0.357	0.647	230.979	400
	3DH5	70.60	0.357	0.754	269.178	400

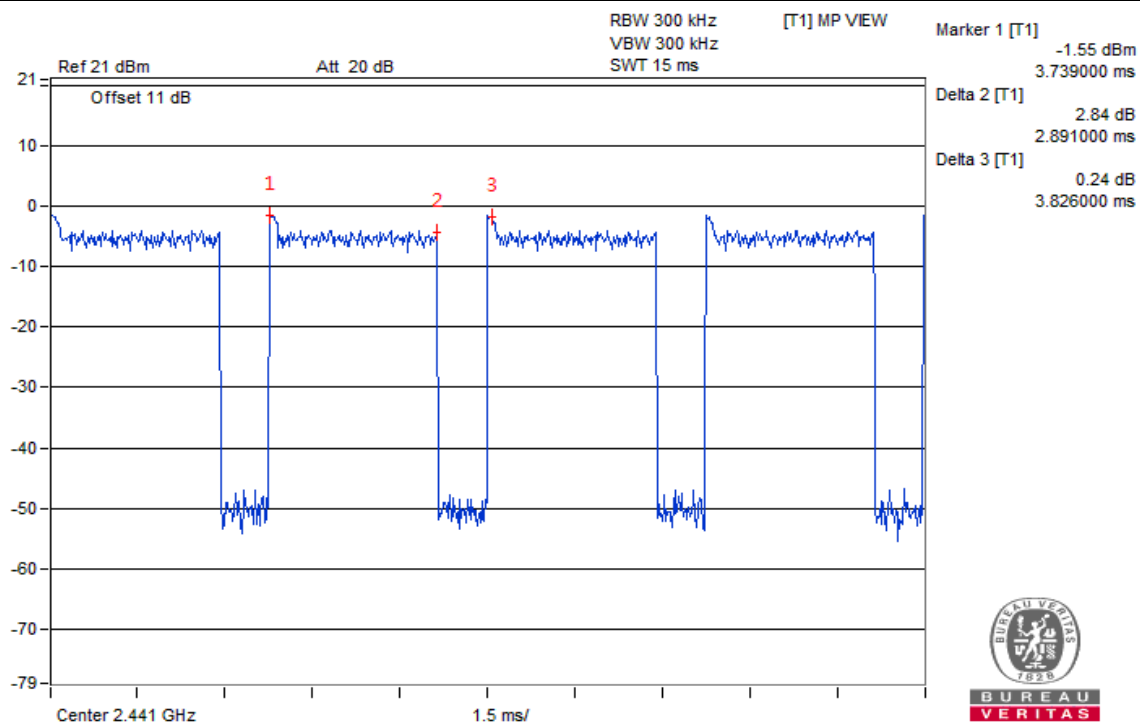
Vnormal



3DH1

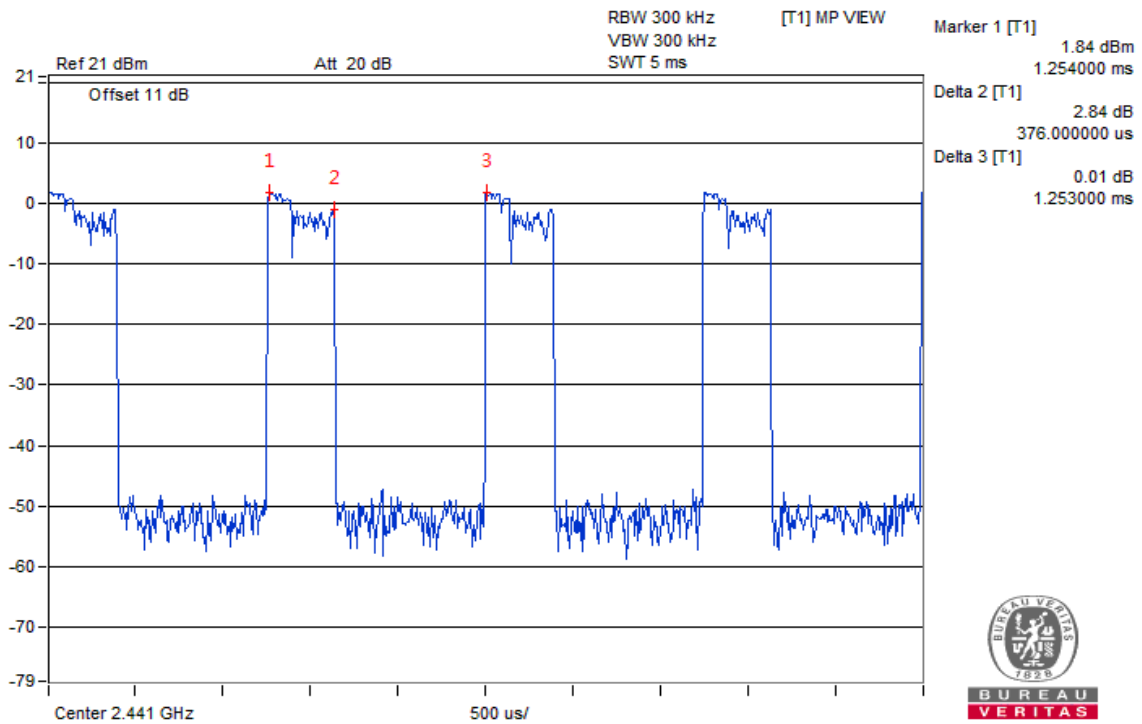


3DH3

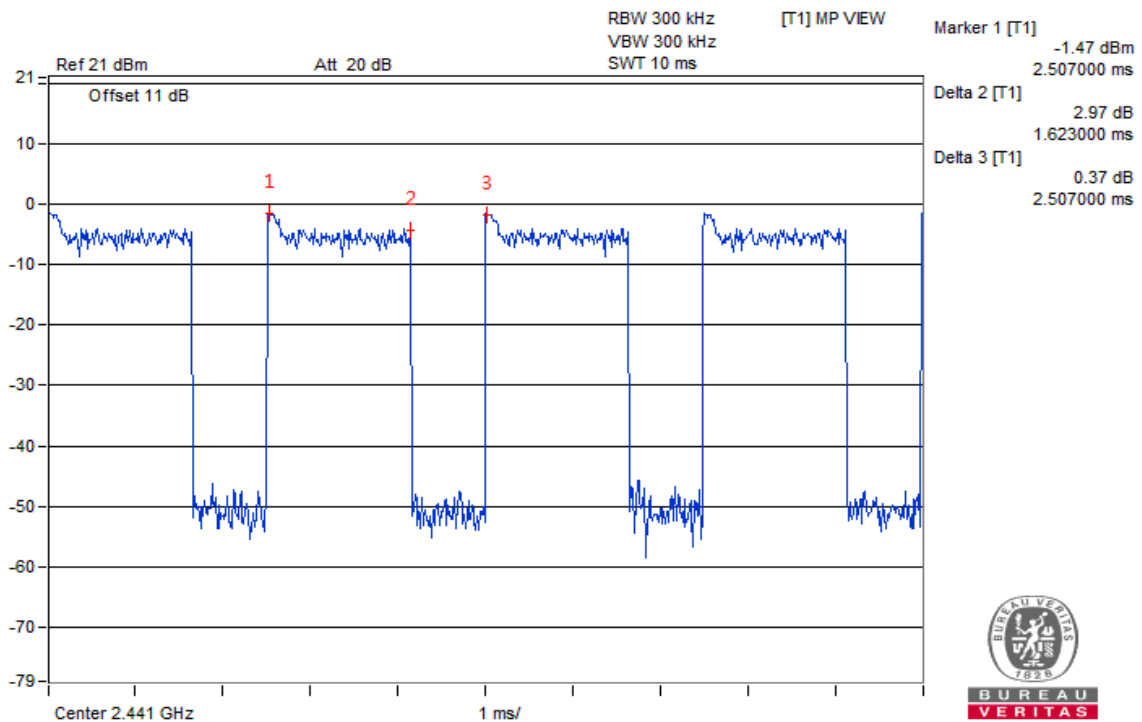


3DH5

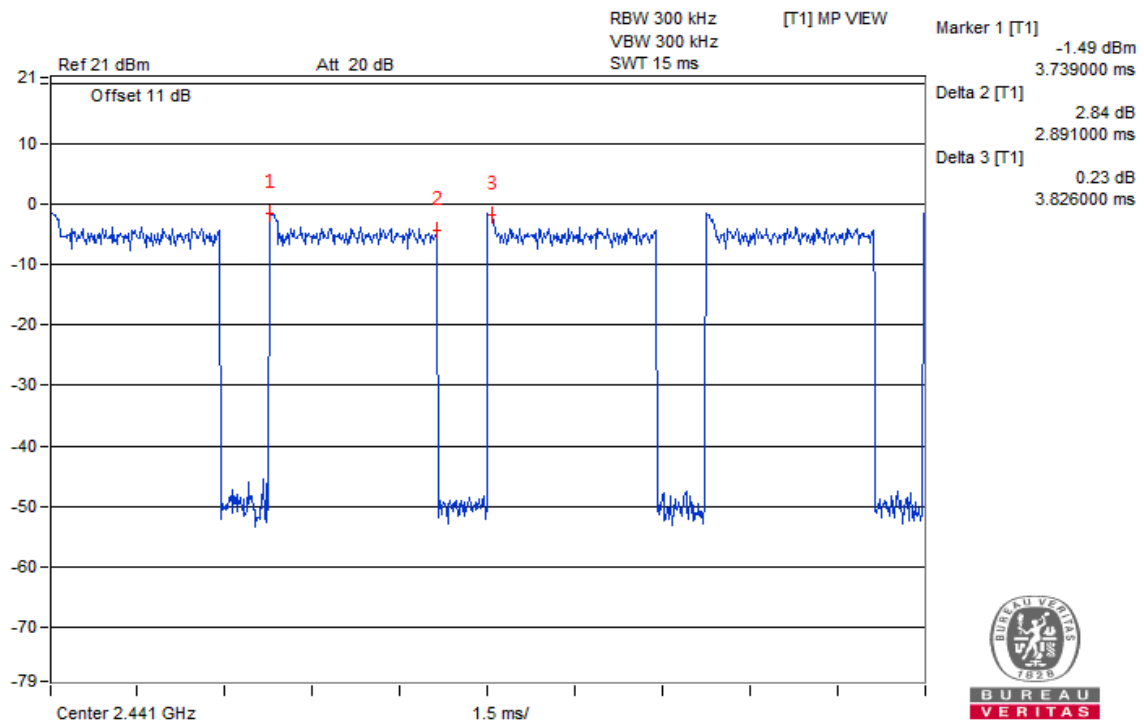
V_{max}



3DH1

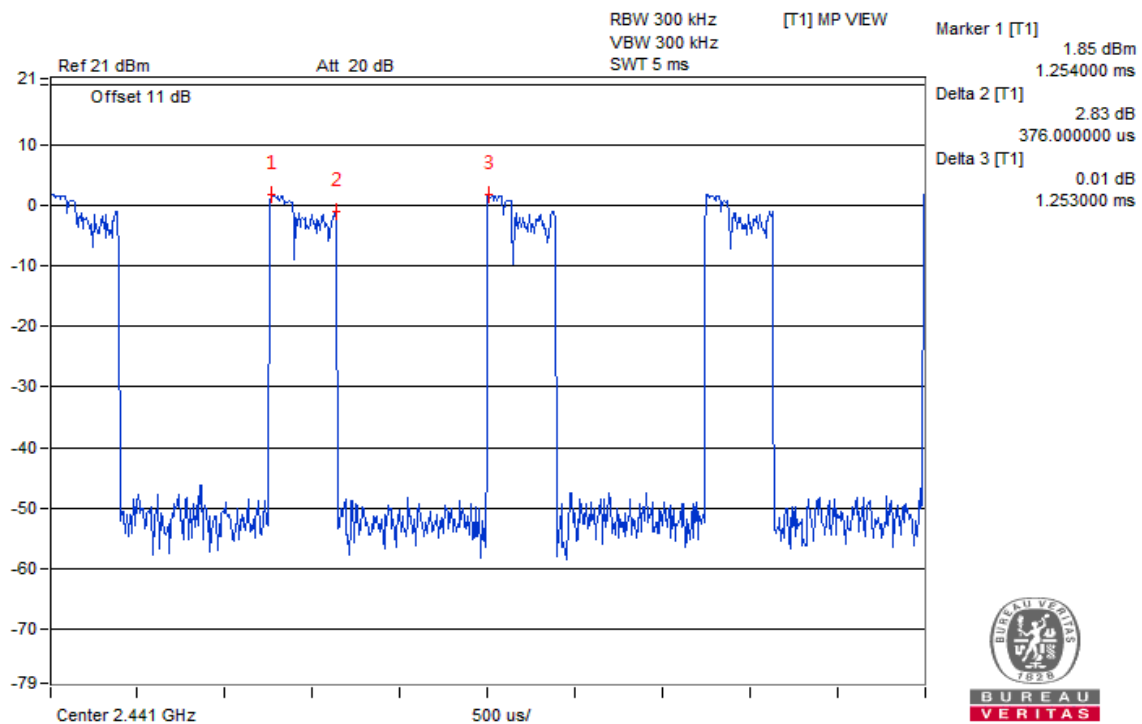


3DH3

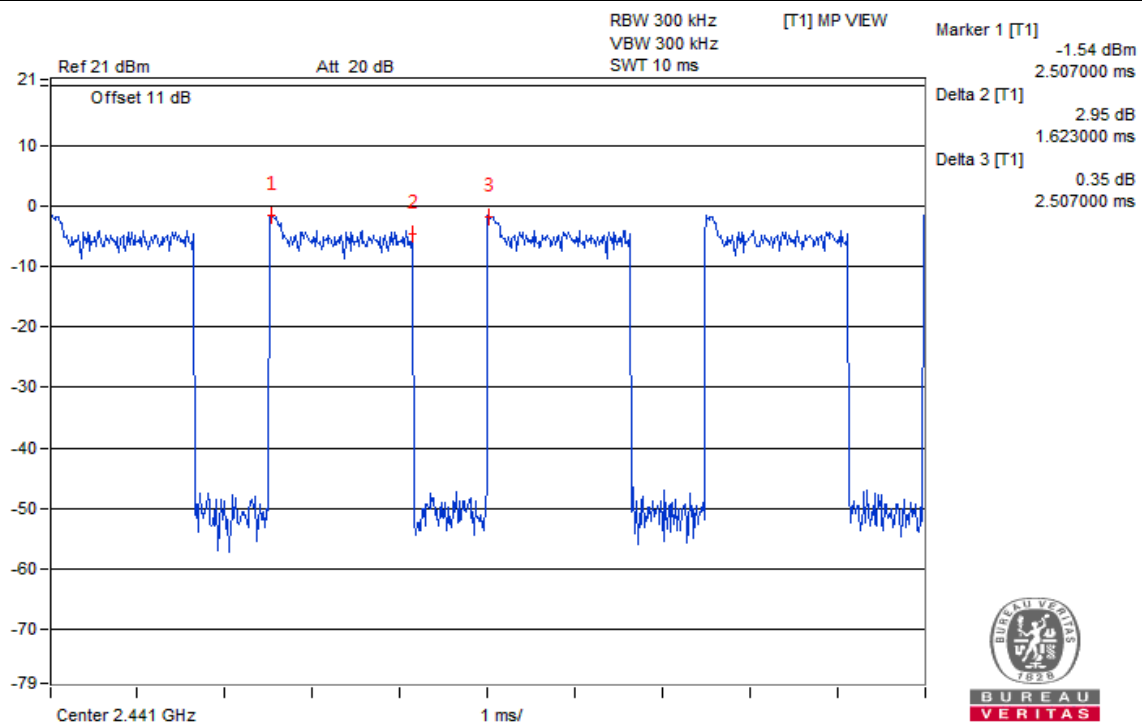


3DH5

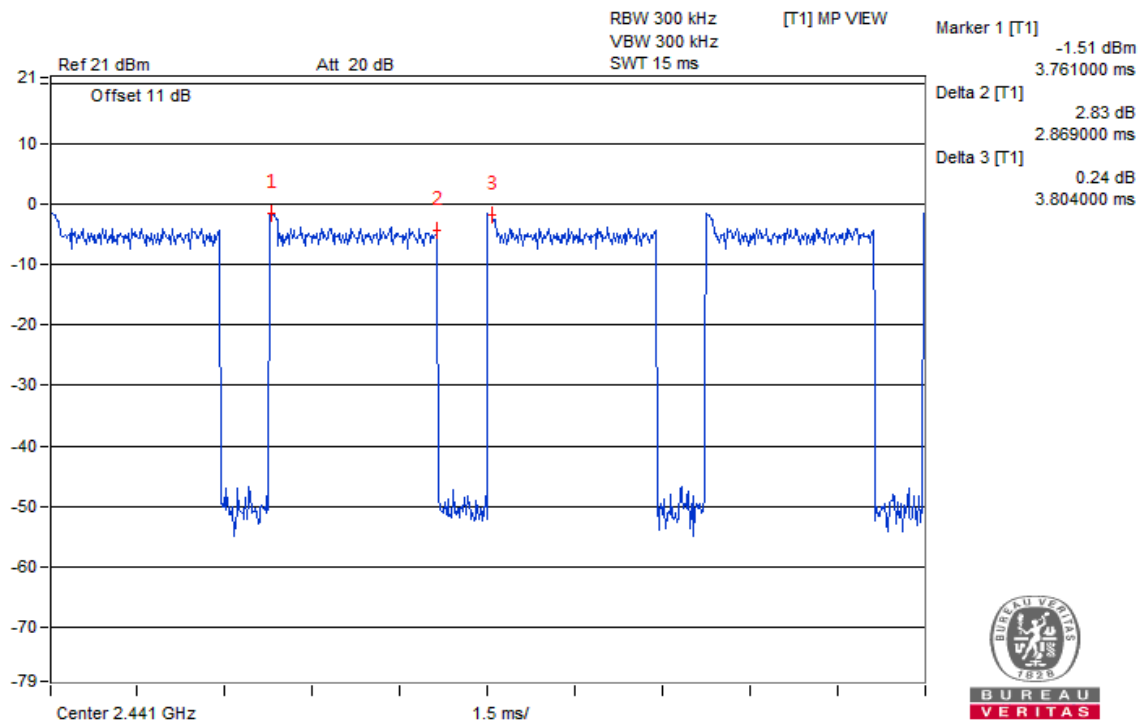
V_{min}.



3DH1



3DH3

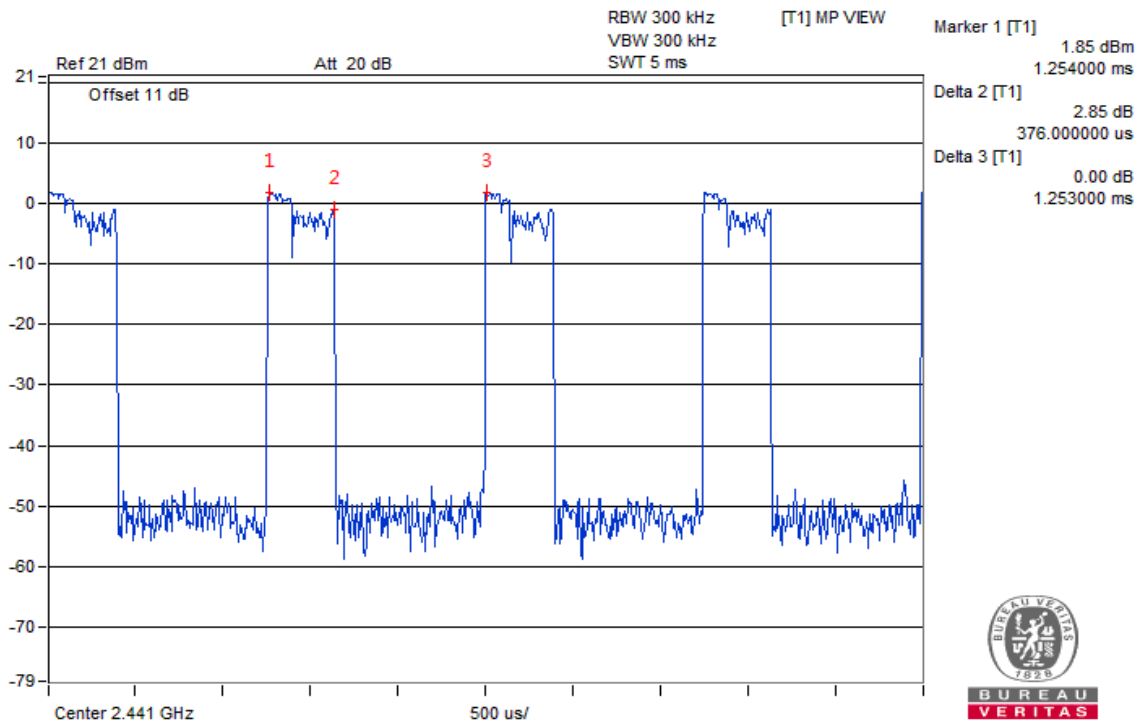


3DH5

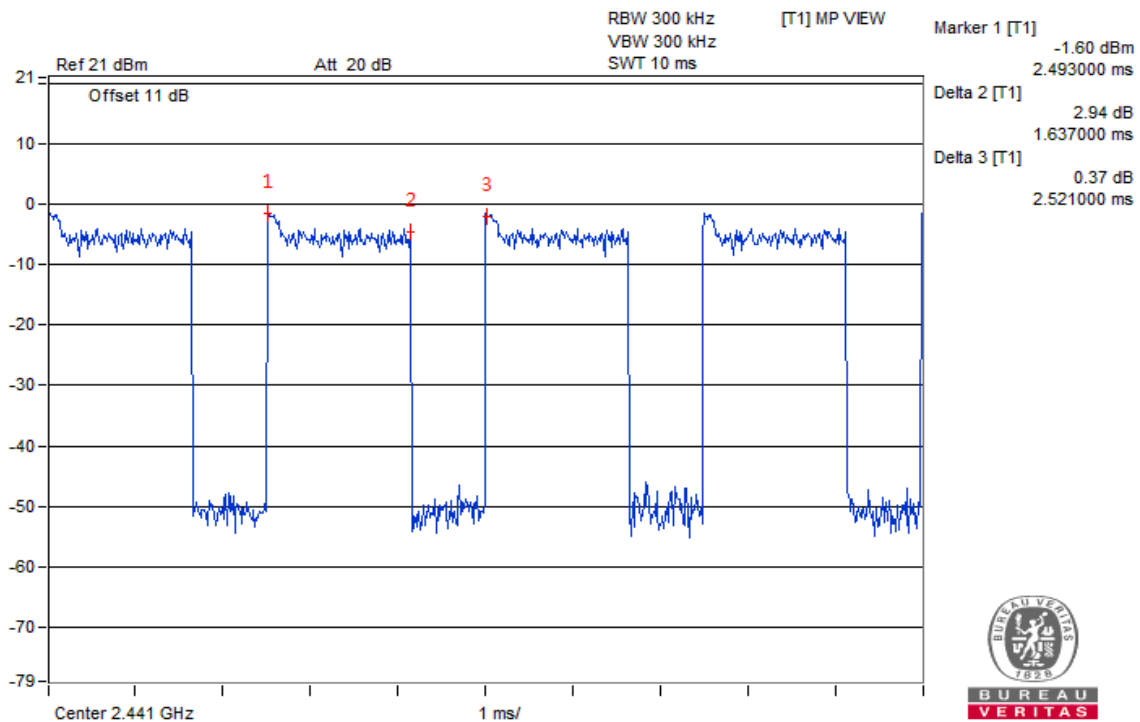
8DPSK AFH Mode

Test Condition	Mode	Diffusion Rate	(Diffusion Rate/20)*0.4 sec	Duty Cycle	Result (msec)	Limit (msec)
V _{normal}	3DH1	18.27	0.365	0.300	109.500	400
	3DH3	18.27	0.365	0.649	236.885	400
	3DH5	18.27	0.365	0.755	275.575	400
V _{max.}	3DH1	18.19	0.363	0.300	108.900	400
	3DH3	18.19	0.363	0.647	234.861	400
	3DH5	18.19	0.363	0.755	274.065	400
V _{min.}	3DH1	18.19	0.363	0.300	108.900	400
	3DH3	18.19	0.363	0.647	234.861	400
	3DH5	18.19	0.363	0.754	273.702	400

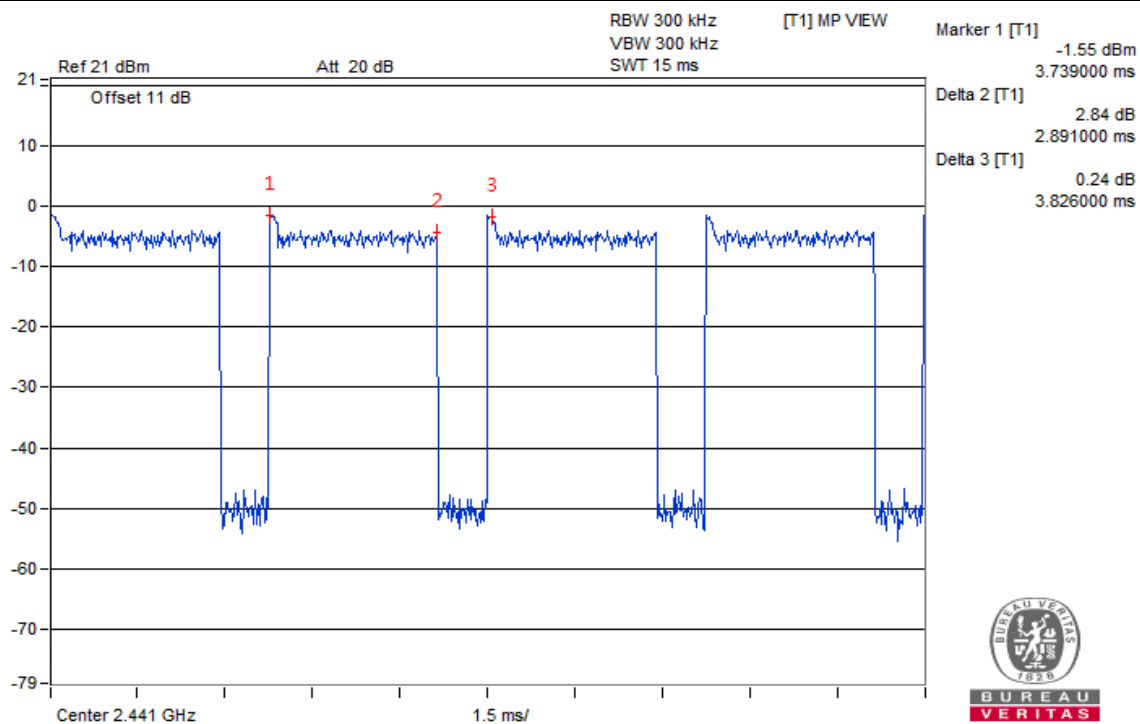
Vnormal



3DH1

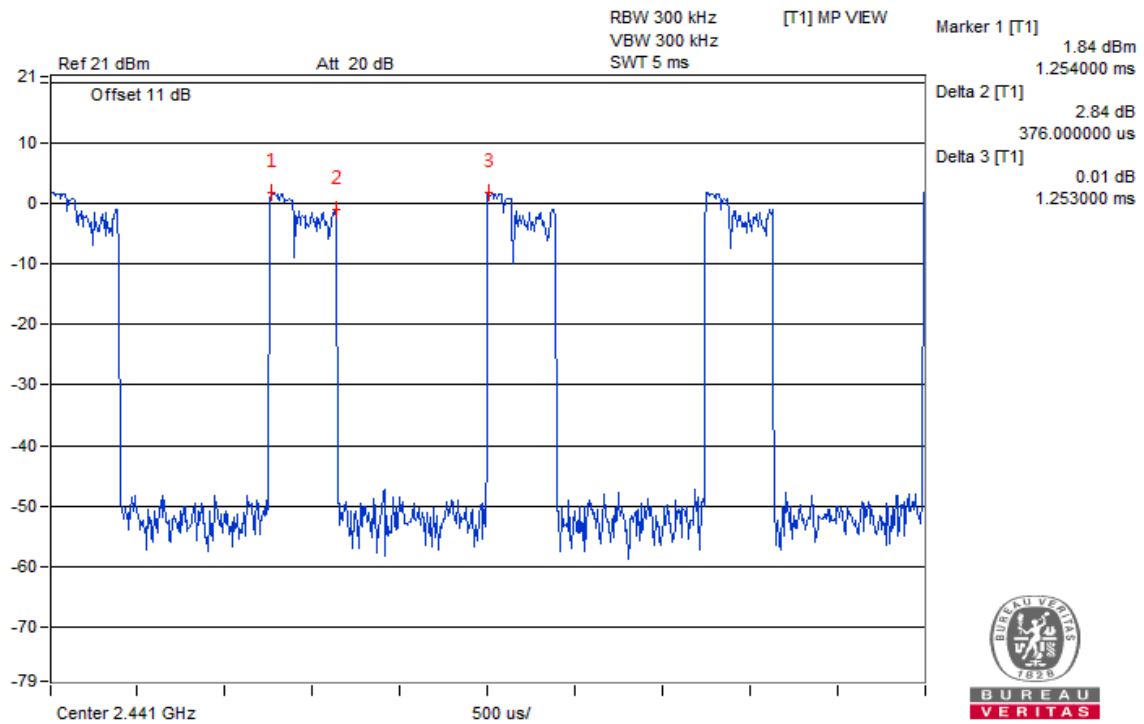


3DH3

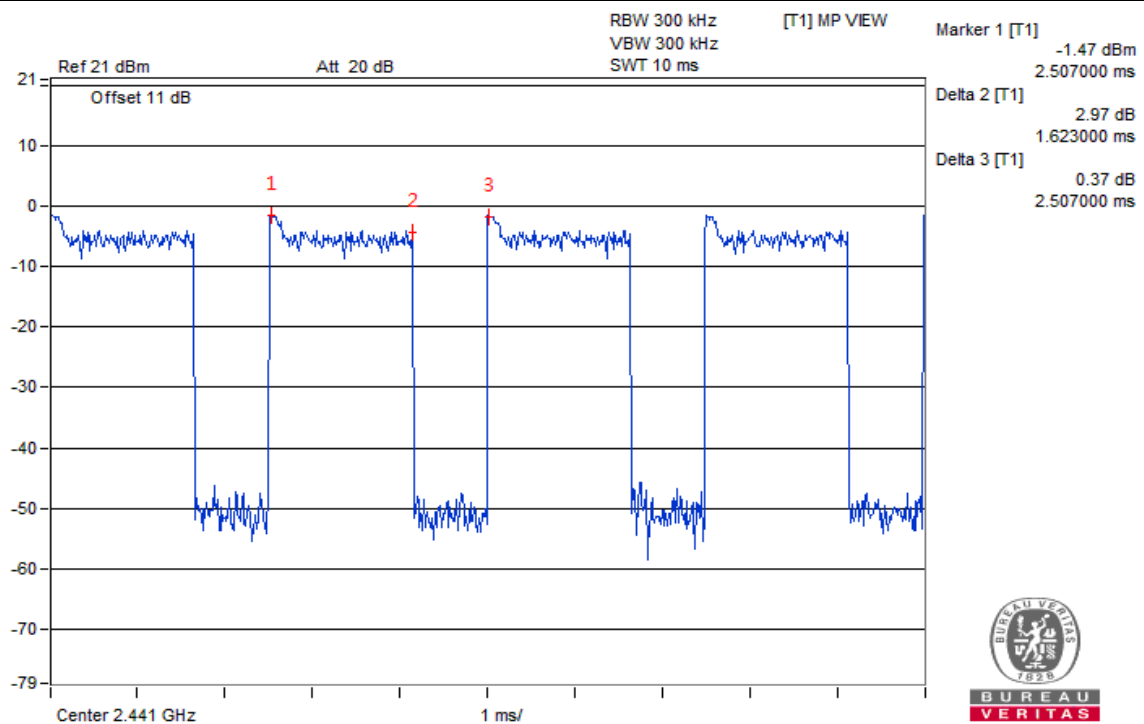


3DH5

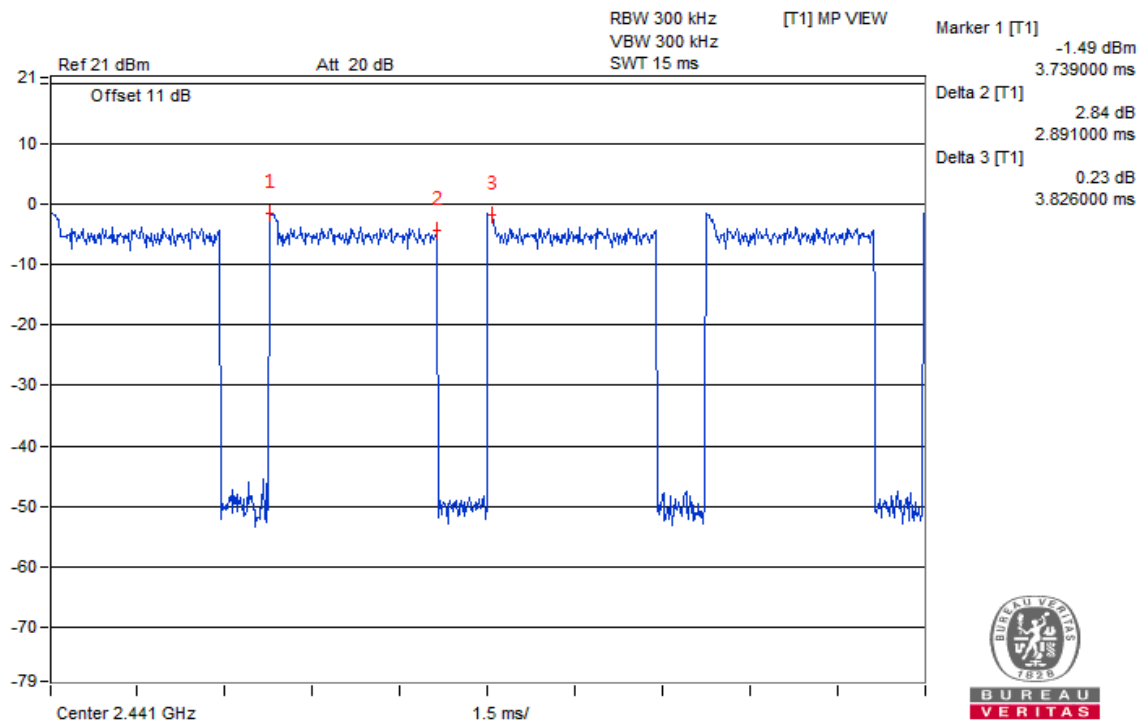
V_{max}.



3DH1

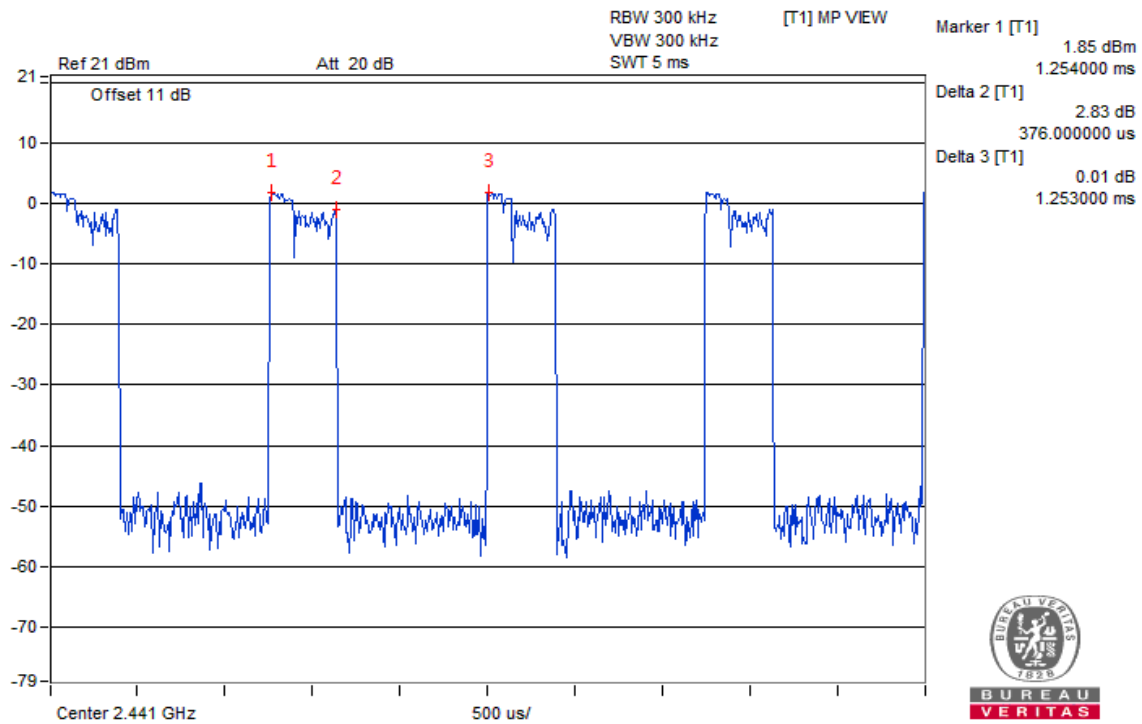


3DH3

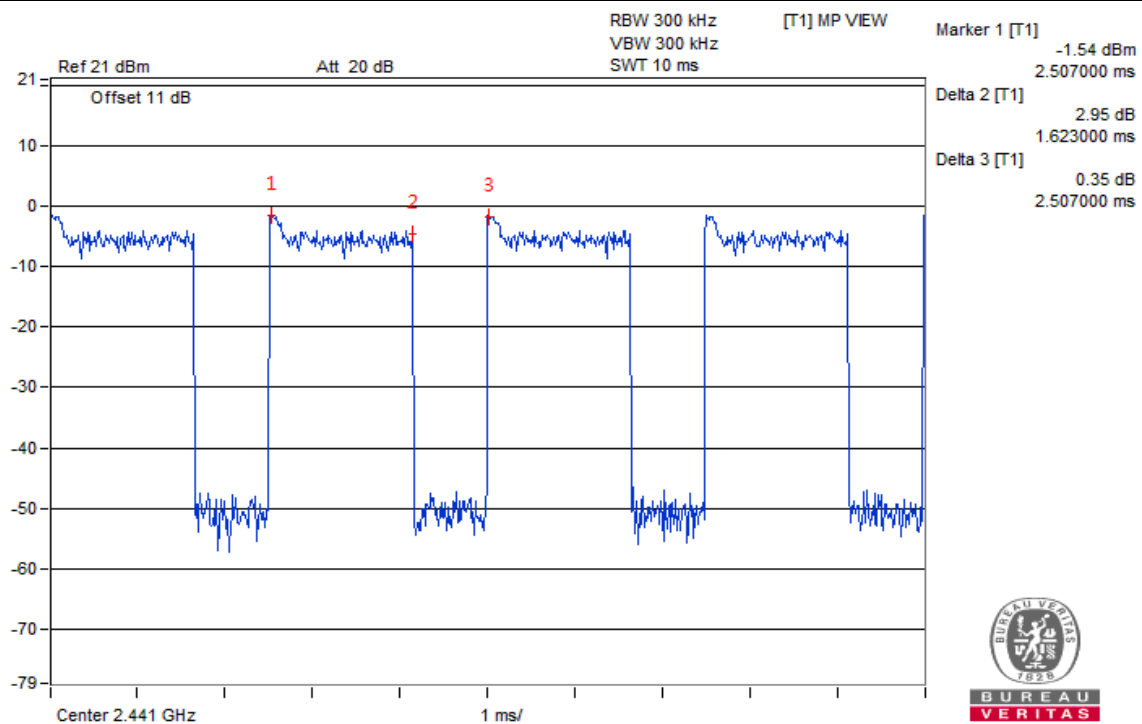


3DH5

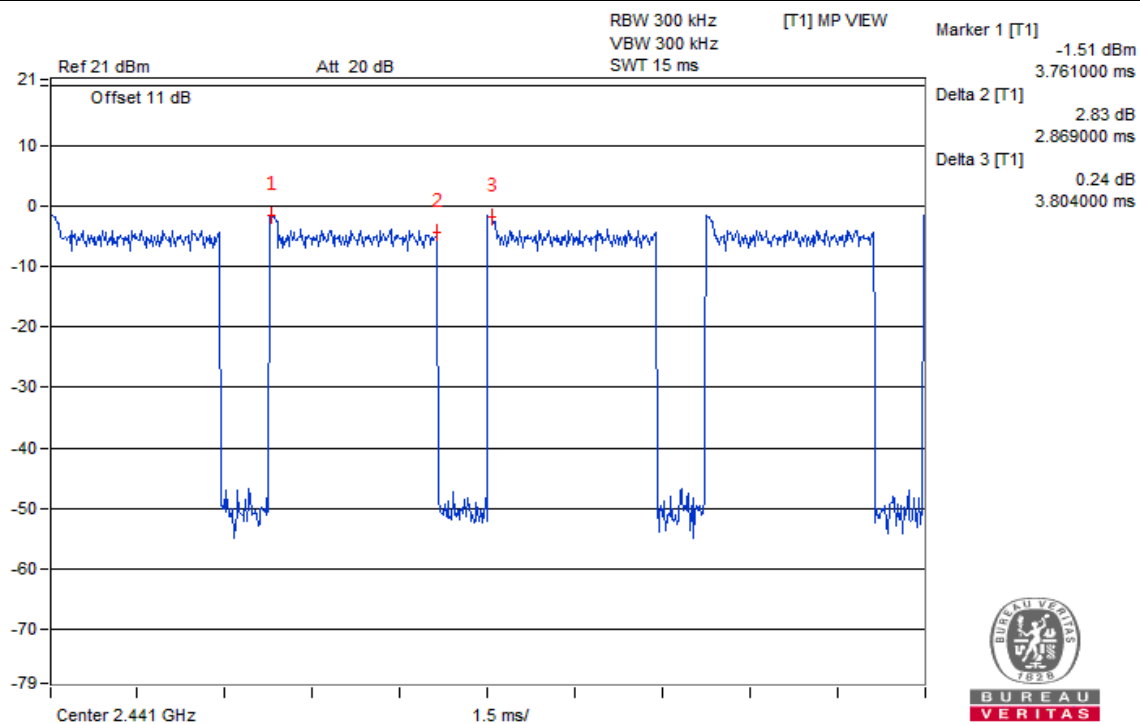
V_{min}.



3DH1



3DH3

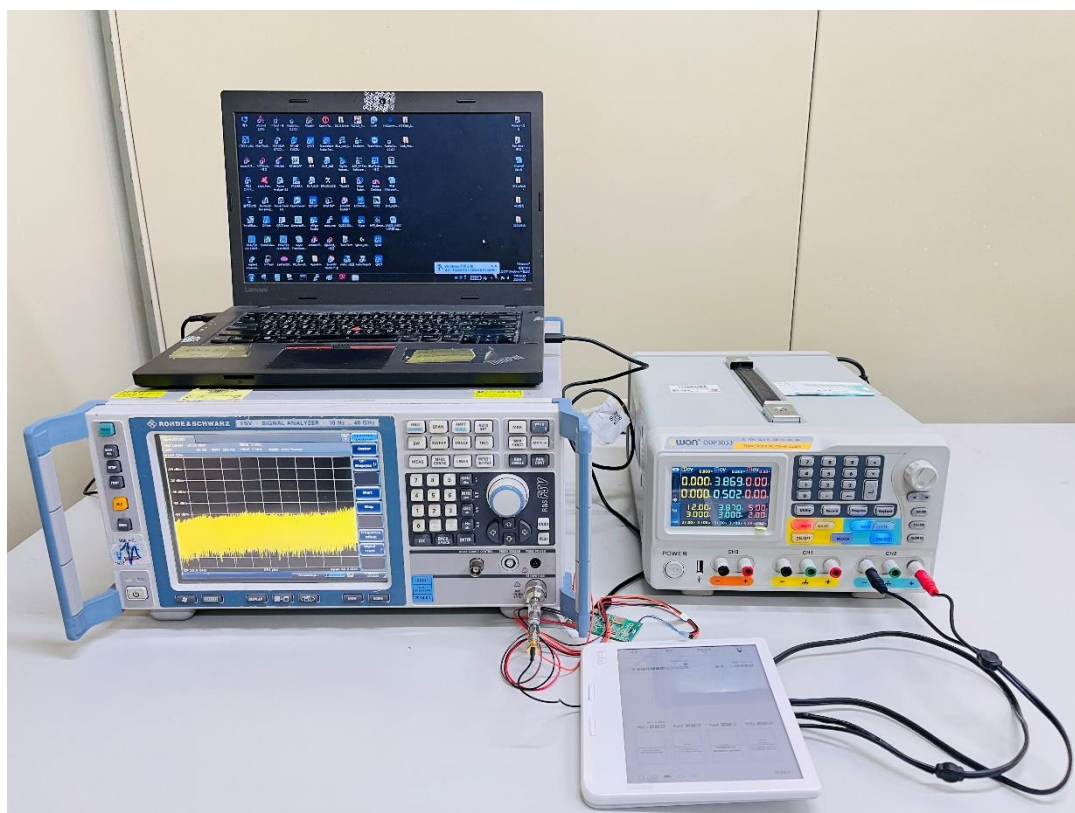


3DH5

7.8 Interference Prevention Function

Environmental Conditions:	24°C, 61% RH	Tested By:	Gary Lin
Link Mode		Test Result	
BT-EDR		Pass	

8 Pictures of Test Arrangements



9 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 FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

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

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

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