

Radio Test Report

Report No.: RJ200422C32

Test Model: BMD0010

Received Date: Apr. 22, 2020

Test Date: May 17, 2020

Issued Date: Jun. 01, 2020

Applicant: Bose Corporation

Address: The Mountain, Framingham, MA 01701 USA

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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Release Control Record

Issue No.	Description	Date Issued
RJ200422C32	Original Release	Jun. 01, 2020

1 Certificate of Conformity

Product: Audio Sunglasses

Brand: Bose

Test Model: BMD0010

Sample Status: Engineering Sample

Applicant: Bose Corporation

Test Date: May 17, 2020

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 RF characteristics under the conditions specified in this report.

Prepared by : Gina Liu, **Date:** Jun. 01, 2020
Gina Liu / Specialist

Approved by : Dylan Chiou, **Date:** Jun. 01, 2020
Dylan Chiou / Senior Project Engineer

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)
General Provisions				
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
Transmitting Equipment				
F	3.2 (2)	4.5	Antenna Power	C
--	--	--	SAR	NA
Transmitting Antenna				
--	--	3.5	Type, Configuration, etc. of Transmitting Antenna	C
--	--	3.5	Direction Pattern of Transmitting Antenna	C
Receiving Equipment				
G	3.3 (1)	4.6	Spurious Emissions of Receiver	C
--	--	3.5	Refer to All Articles for Transmitting Antenna	C
Operating Frequency 2400 to 2483.5 MHz				
--	3.7 (1)a	3.4	Radio Frequency / Modulation Section cannot be opened easily	C
--	3.1 (1)	3.1	Communication Method	C
--	3.2 (1)	3.1	Modulation Method	C
--	3.2 (1)	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)	--	Frequency Retention Time (FH Employed)	NA
--	3.4.1(1)	4.8	Interference Prevention Function	C
--	3.4.1(3)	--	Carrier Sense Capability	NA
Note: 1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty. 2. C = Conform NC = Not Conform NT = Not Tested NA = Not Applicable				

2.1 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	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

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Audio Sunglasses
Brand	Bose
Test Model	BMD0010
Status of EUT	Engineering Sample
Nominal Voltage	5.0 Vdc (Host equipment) 3.8 Vdc (Li-ion battery)
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK
Transfer Rate	1/2/3 Mbps
Operating Frequency	2402 ~ 2480 MHz
Number of Channel	79
Rated RF Output Power / Power Density	Refer to Note
Conducted RF Output Power / Power Density	Refer to Note
Radiated RF Output Power / Power Density	Refer to Note
Antenna Type	Refer to Note

Note:

- The EUT contains following accessory devices.

Product	Brand	Model	Description
Charging Cable	BOSE	849761	--

- The power table as below:

	Rated Power (mW/MHz)	Total Conducted RF Output Power Density (mW/MHz)	Radiated RF Output Power Density (mW/MHz)
Bluetooth EDR			
Normal mode	0.2	0.110831	0.08216
AFH mode	1.0	0.431522	0.319892

- The antenna used in this EUT is listed as below table:

Item	Type	Gain(dBi)
Frequency		2400 ~ 2480 MHz
2.4 GHz	PCB	-1.3

- 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

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (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		

NOTE 1: By means of test software provided by manufacture, the power levels during the tests were set according to the following codes:

NOTE 2: Pre-Scan has been conducted to determine the worst-case mode from packet type; we found the DH5 was the worst case, and chosen for final test. Following test items were selected for the final test as listed below.

Test Items
Spurious emissions
Power density (Antenna power)
Occupied / spreading bandwidth

Modulation type: GFSK		Modulation type: $\pi/4$ -DQPSK		Modulation type: 8DPSK	
Channel	Power Setting	Channel	Power Setting	Channel	Power Setting
0	Default	0	Default	0	Default
39	Default	39	Default	39	Default
78	Default	78	Default	78	Default

3.3 Test Conditions

Test Conditions	Voltage (Vdc)
V_{normal}	5.0
$V_{max.}$	5.5
$V_{min.}$	4.5

3.4 Assembly

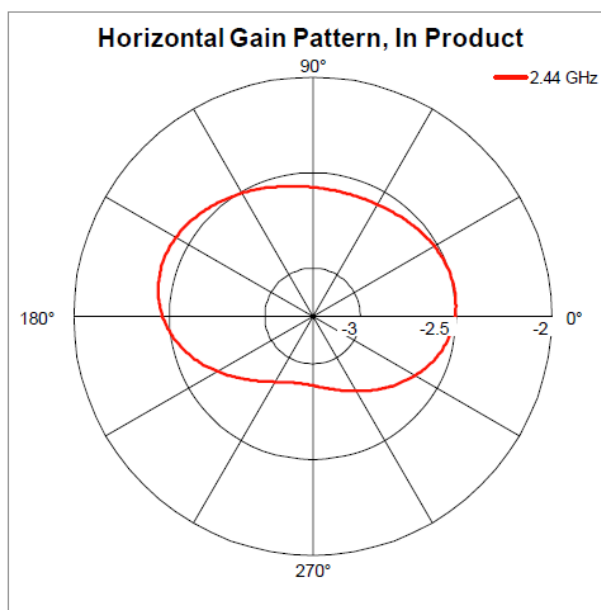
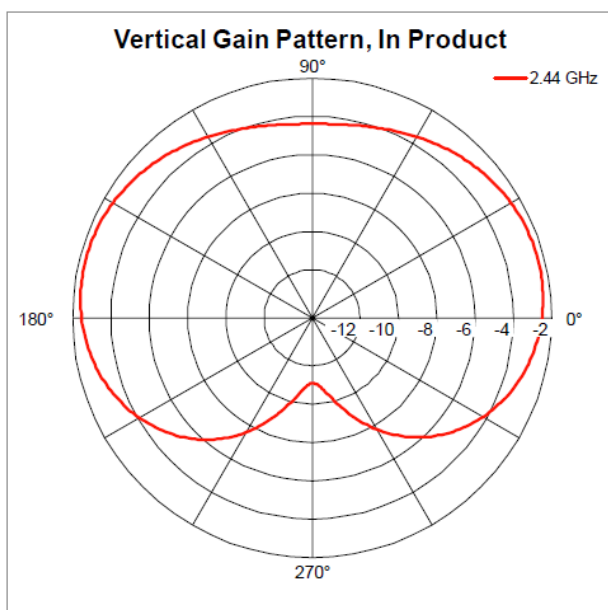
The RF areas for BMD0010 are covered by shielding frames.

3.5 Antenna Specifications

3.5.1 Antenna Gain

	Antenna type	Gain (dBi)
Bluetooth	PCB	-1.3

3.5.2 Antenna Pattern



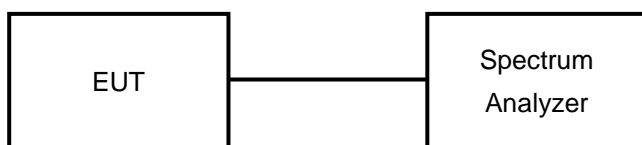
4 Test Results

4.1 Frequency Tolerance Measurement

4.1.1 Limits of Frequency Tolerance Measurement

Tolerance of frequency shall be +/- 50 ppm.

4.1.2 Test Setup



4.1.3 Test Results

Modulation: GFSK

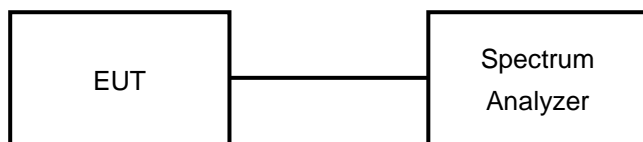
Environmental Conditions		25 deg.C, 60 % RH					
Channel	Frequency (MHz)	Voltage _{normal}		Voltage _{max.}		Voltage _{min.}	
		Carrier Frequency (MHz)	Frequency Tolerance (ppm)	Carrier Frequency (MHz)	Frequency Tolerance (ppm)	Carrier Frequency (MHz)	Frequency Tolerance (ppm)
0	2402	2402.000160	0.066	2401.999679	-0.133	2401.999038	-0.400
39	2441	2440.998237	-0.722	2440.997917	-0.853	2440.997756	-0.919
78	2480	2479.997756	-0.904	2479.997756	-0.904	2479.997756	-0.904

4.2 Occupied Bandwidth Measurement (99 % Power Bandwidth)

4.2.1 Limits of Occupied Bandwidth Measurement

Item	Limit
Occupied Bandwidth	< 83.5 MHz

4.2.2 Test Setup



4.2.3 Test Results

Modulation: GFSK

Normal Mode:

Environmental Conditions	25 deg.C, 60 % RH	
V _{normal}	V _{max.}	V _{min.}
Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)
78.20	78.20	78.20

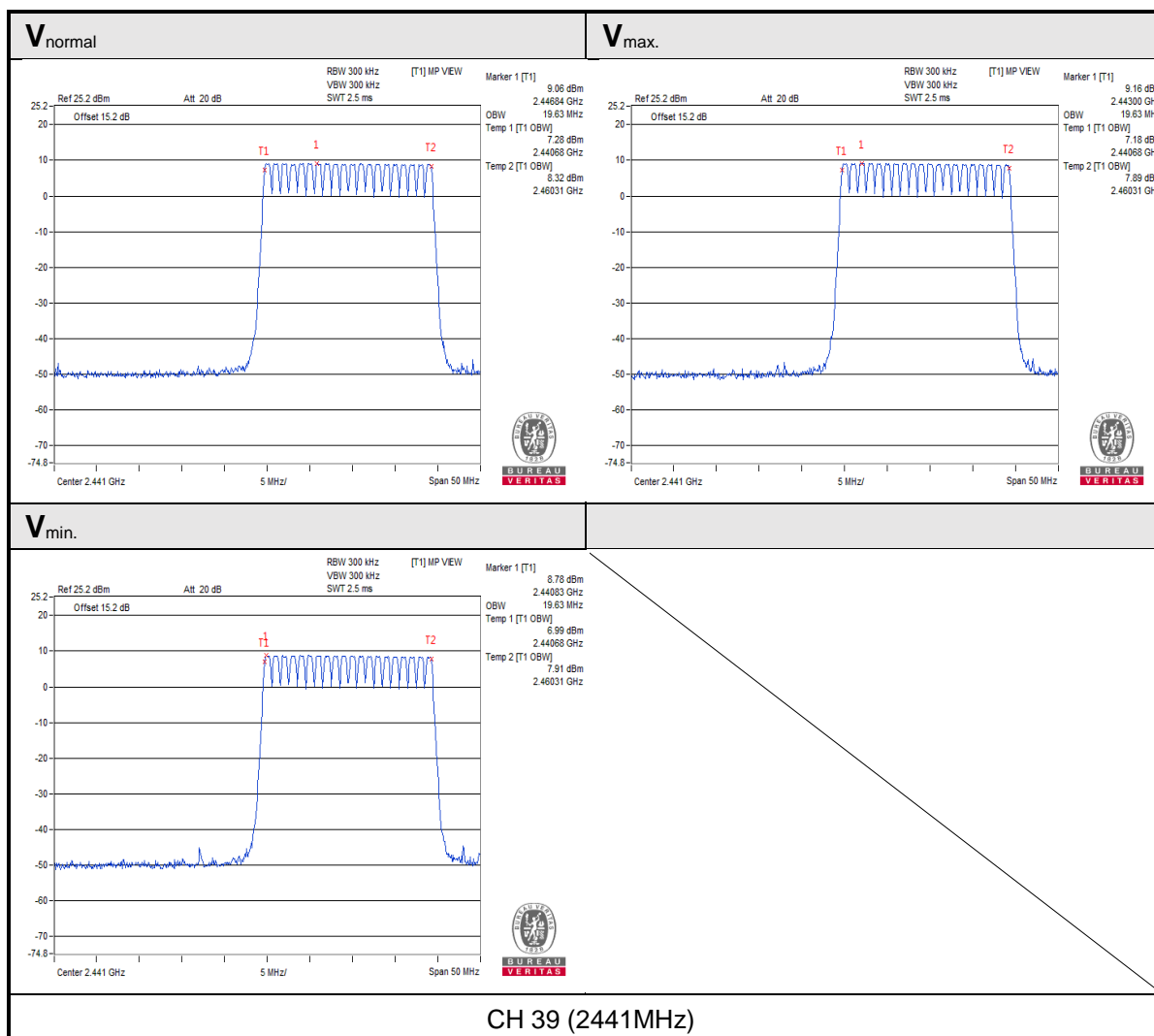
Note: 1. For the test plots please refer to the below pages.



AFH Mode:

Environmental Conditions	25 deg.C, 60 % RH	
V_{normal}	$V_{max.}$	$V_{min.}$
Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)
19.63	19.63	19.63

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

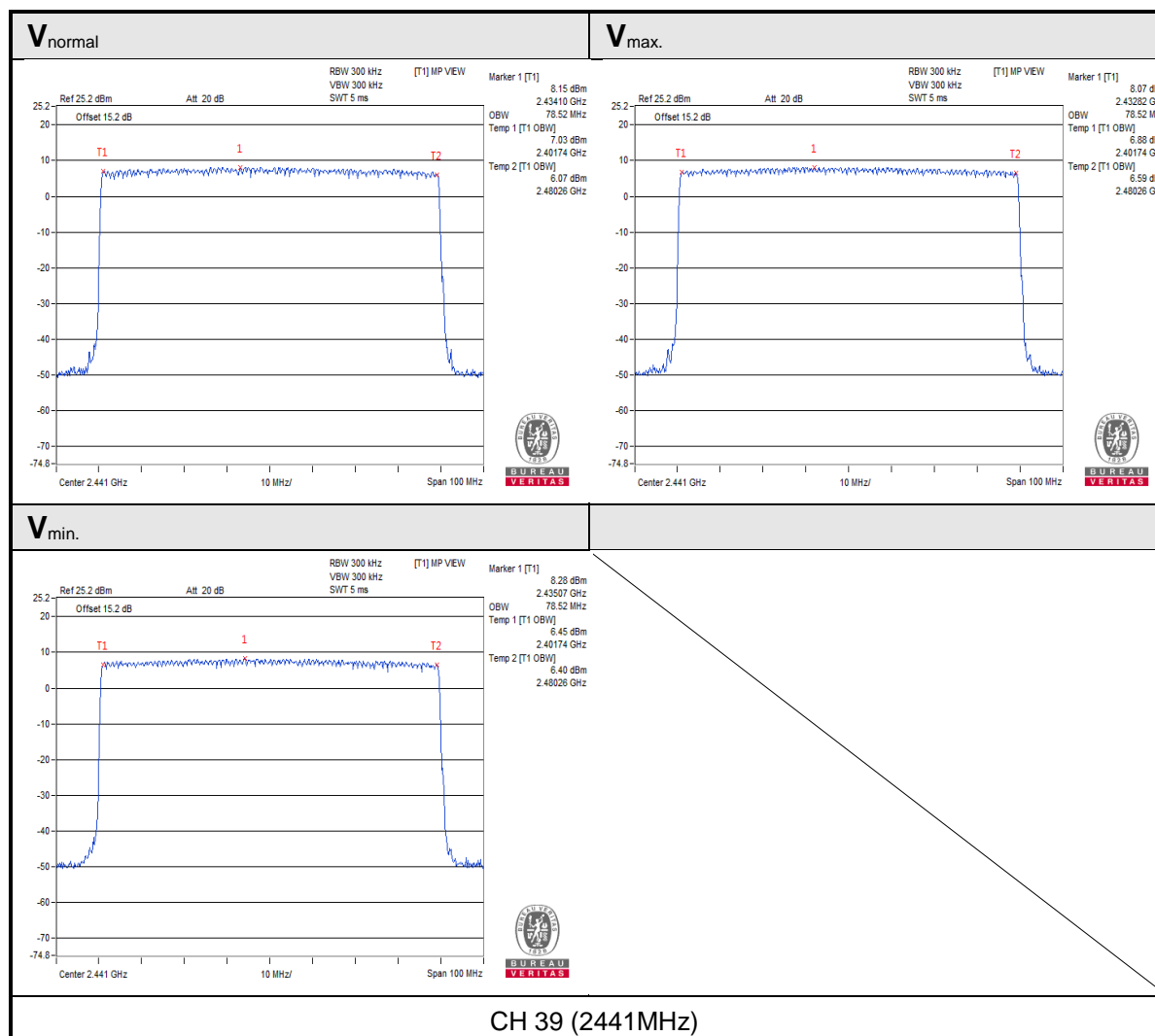


Modulation: $\pi/4$ -DQPSK

Normal Mode:

Environmental Conditions	25 deg.C, 60 % RH	
V _{normal}	V _{max.}	V _{min.}
Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)
78.52	78.52	78.52

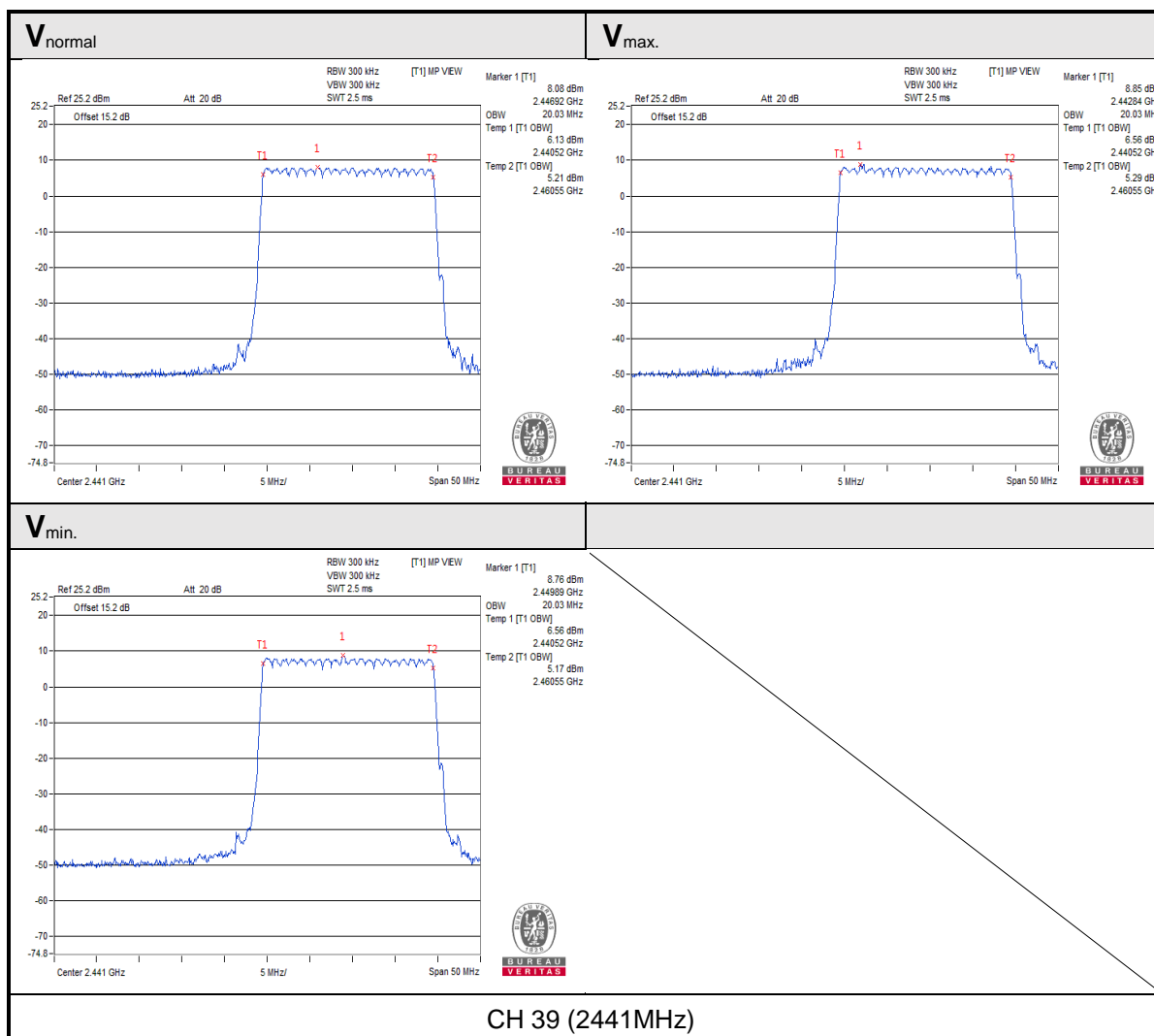
Note: 1. For the test plots please refer to the below pages.



AFH Mode:

Environmental Conditions	25 deg.C, 60 % RH	
V _{normal}	V _{max.}	V _{min.}
Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)
20.03	20.03	20.03

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

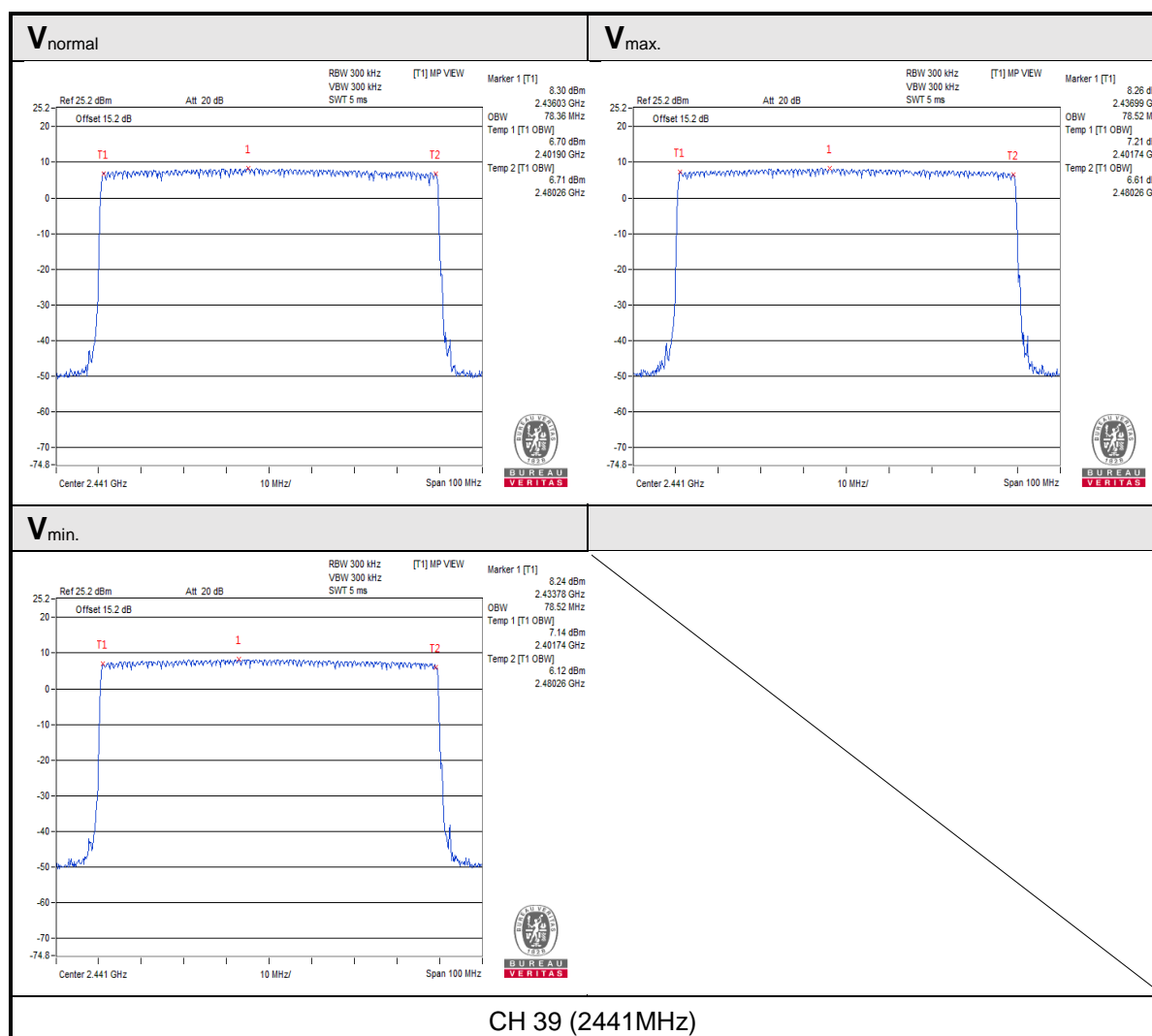


Modulation: 8DPSK

Normal Mode:

Environmental Conditions	25 deg.C, 60 % RH	
V _{normal}	V _{max.}	V _{min.}
Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)
78.36	78.52	78.52

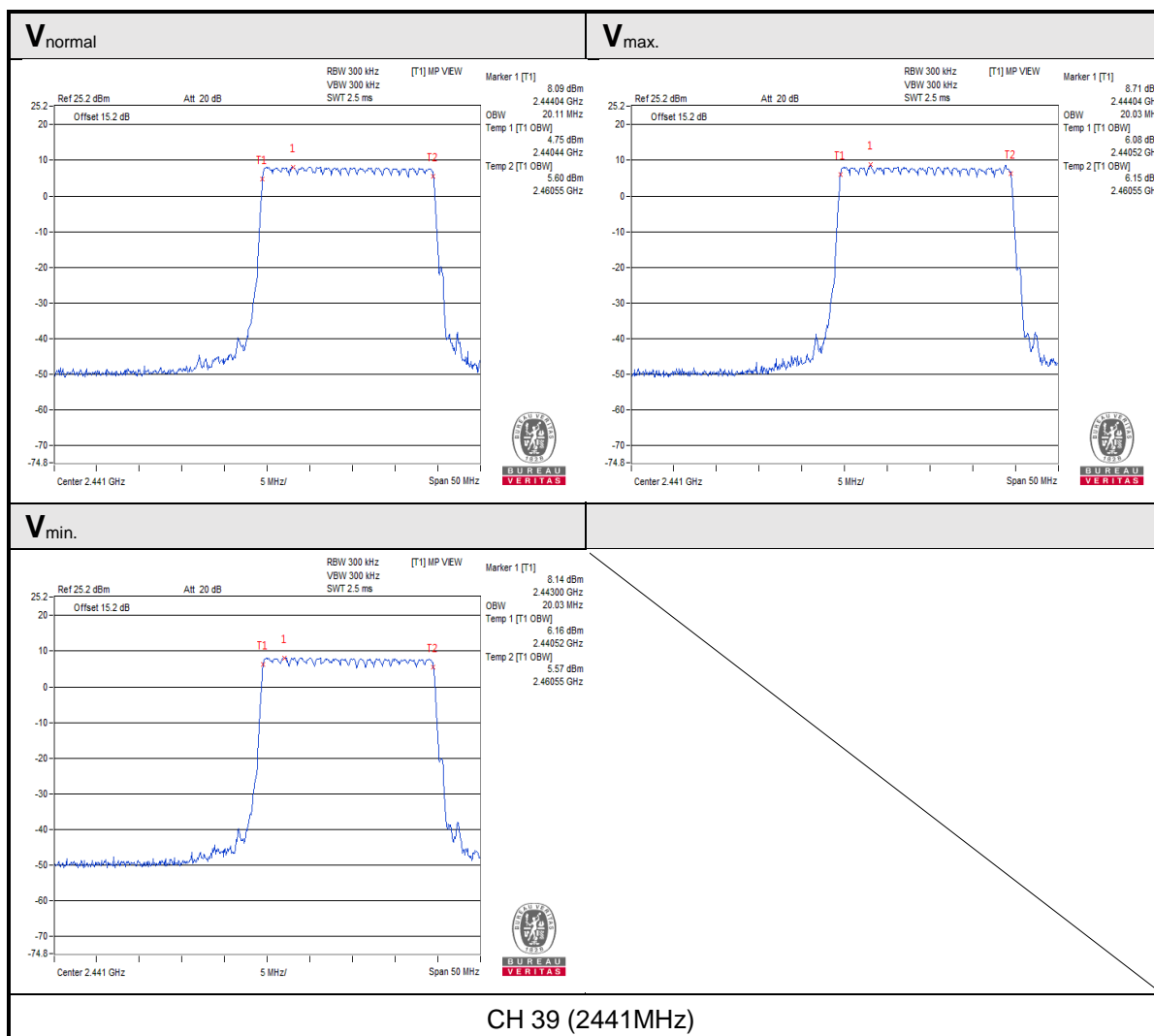
Note: 1. For the test plots please refer to the below pages.



AFH Mode:

Environmental Conditions	25 deg.C, 60 % RH	
V_{normal}	$V_{max.}$	$V_{min.}$
Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)	Occupied Bandwidth (MHz)
20.11	20.03	20.03

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

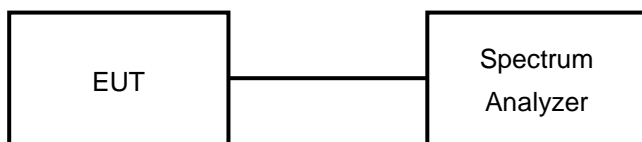


4.3 Spreading Bandwidth Measurement (90 % Power Bandwidth)

4.3.1 Limits of Spreading Bandwidth and Spreading Factor Measurement

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

4.3.2 Test Setup



4.3.3 Test Results

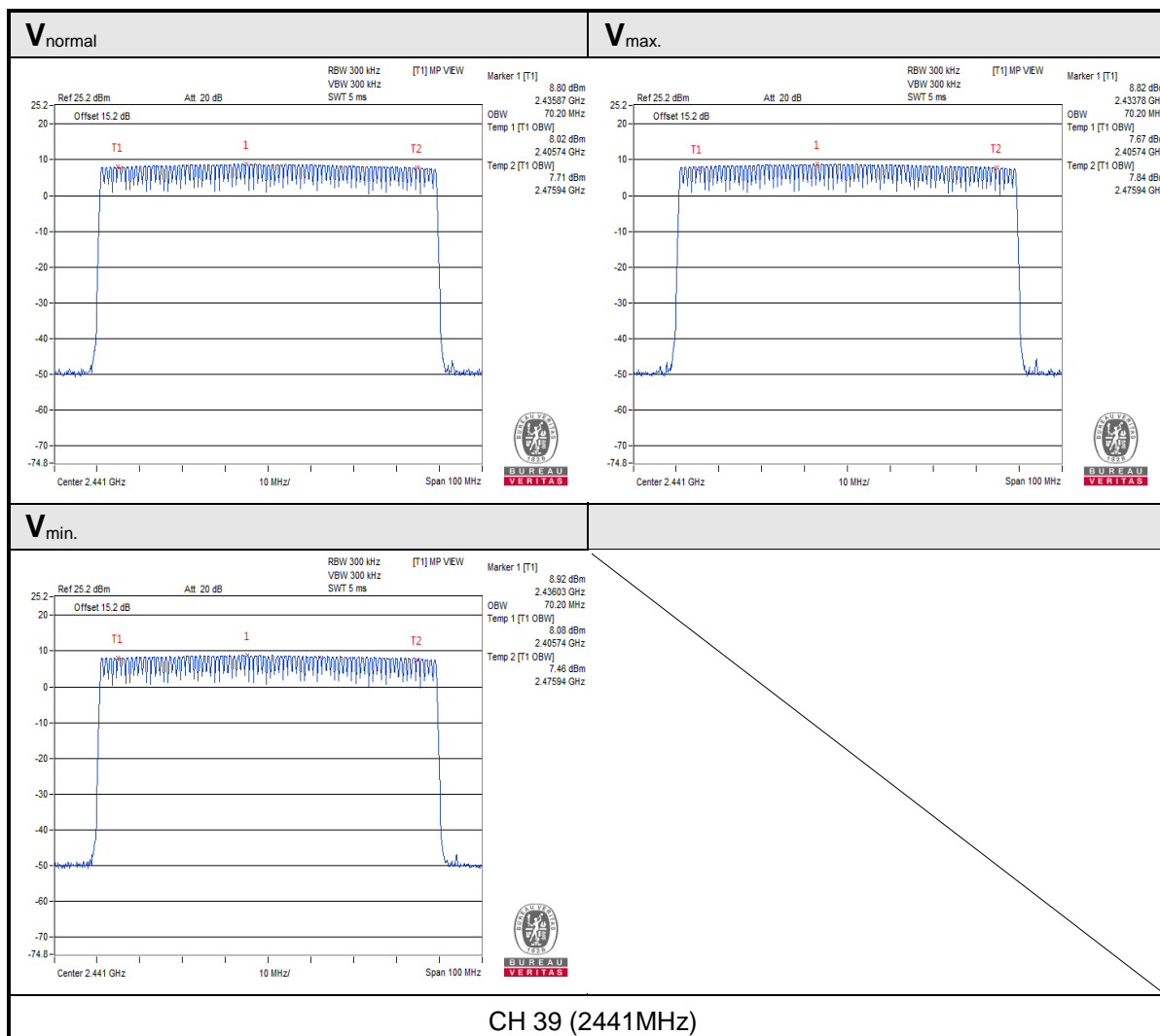
Modulation: GFSK

Normal Mode:

Environmental Conditions		25 deg.C, 60 % RH			
V _{normal}		V _{max.}		V _{min.}	
Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor
70.20	70.20	70.20	70.20	70.20	70.20

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

2. For the test plots please refer to the below pages.

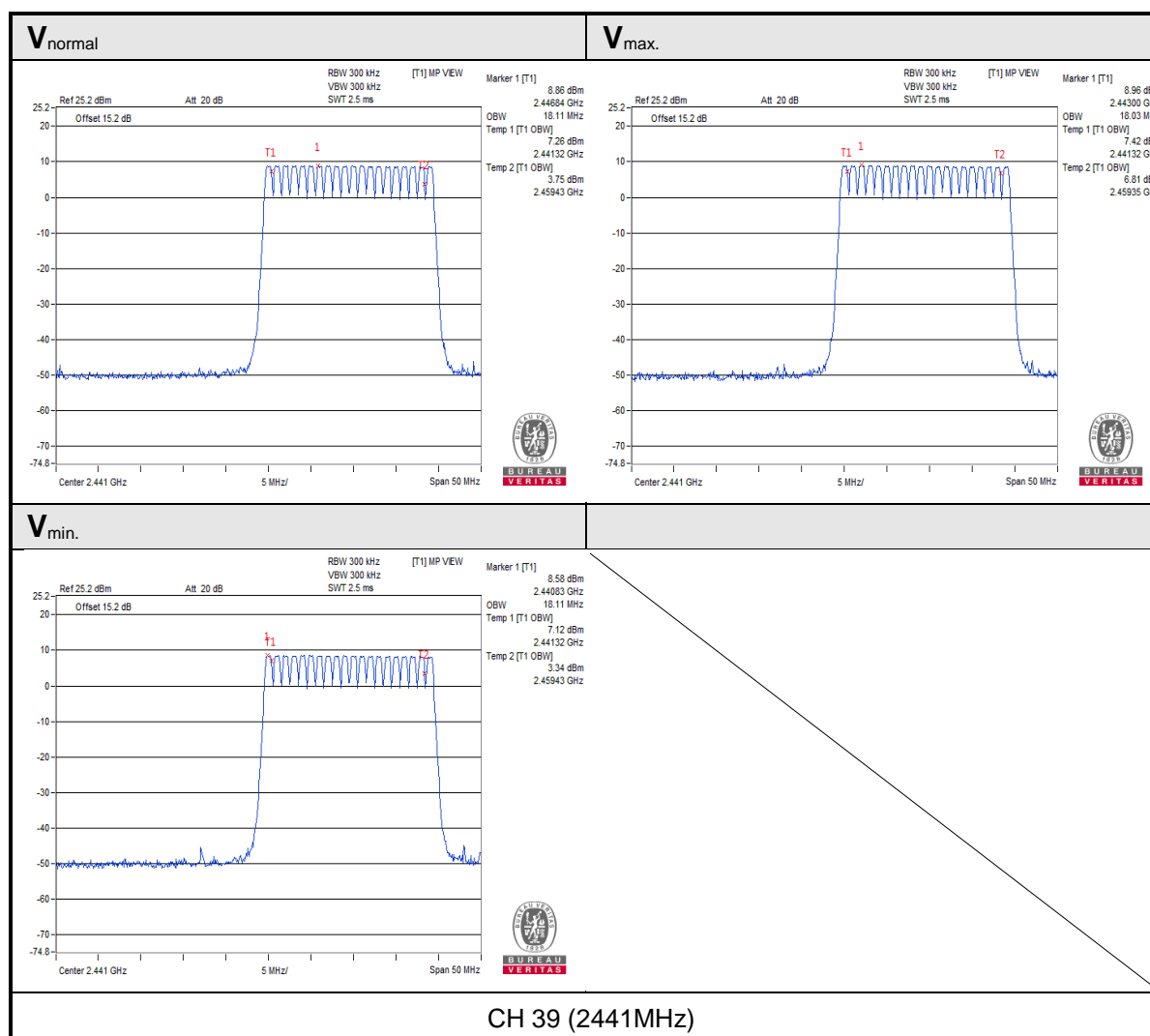


AFH Mode:

Environmental Conditions		25 deg.C, 60 % RH			
V _{normal}		V _{max.}		V _{min.}	
Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor
18.11	18.11	18.03	18.03	18.11	18.11

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

2. For the test plots please refer to the below pages.



Modulation: $\pi/4$ -DQPSK

Normal Mode:

Environmental Conditions		25 deg.C, 60 % RH			
V_{normal}		$V_{max.}$		$V_{min.}$	
Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor
70.20	70.20	70.20	70.20	70.36	70.36

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

2. For the test plots please refer to the below pages.

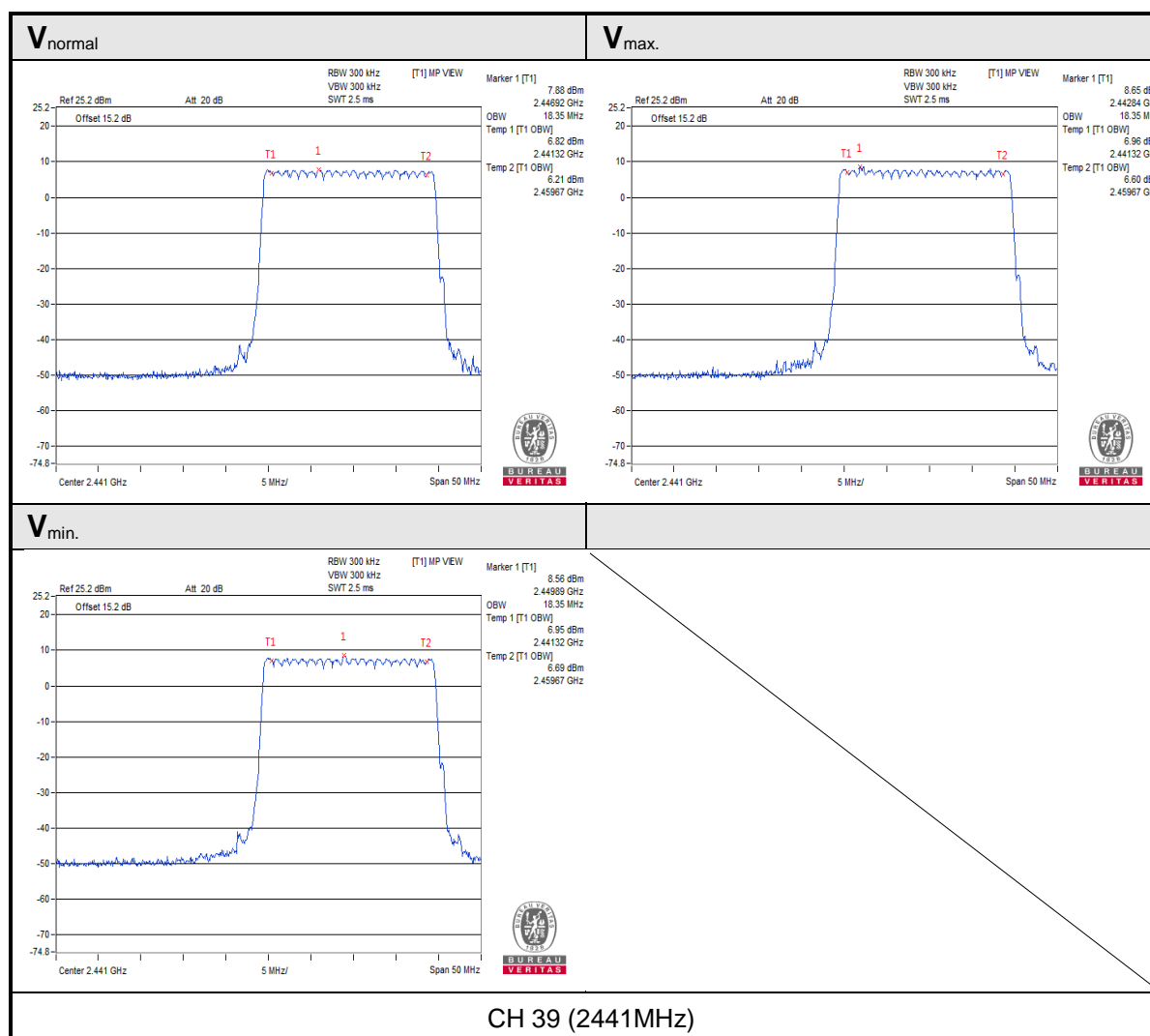


AFH Mode:

Environmental Conditions		25 deg.C, 60 % RH			
V _{normal}		V _{max.}		V _{min.}	
Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor
18.35	18.35	18.35	18.35	18.35	18.35

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

2. For the test plots please refer to the below pages.



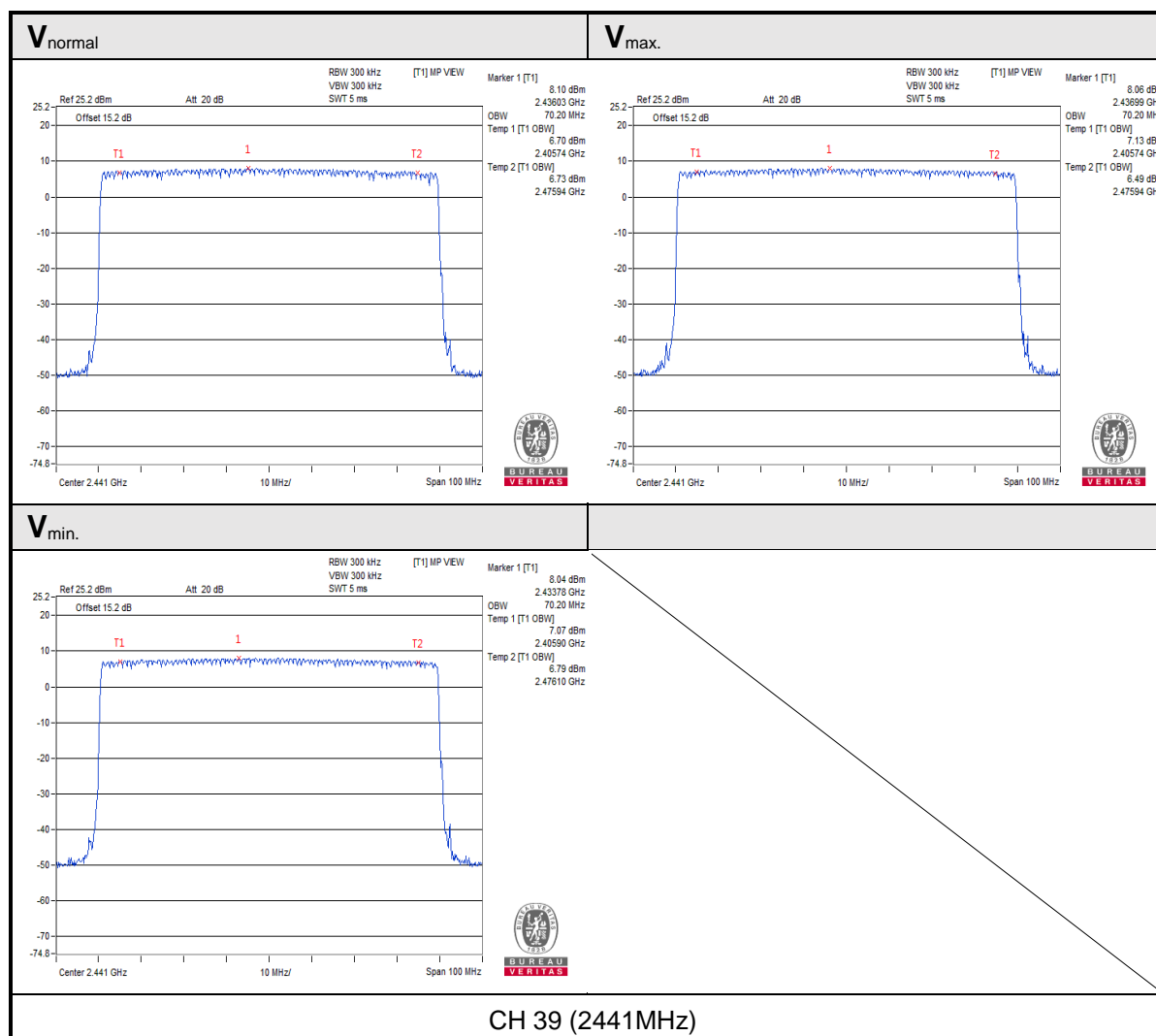
Modulation: 8DPSK

Normal Mode:

Environmental Conditions		25 deg.C, 60 % RH			
V _{normal}		V _{max.}		V _{min.}	
Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor
70.20	70.20	70.20	70.20	70.20	70.20

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

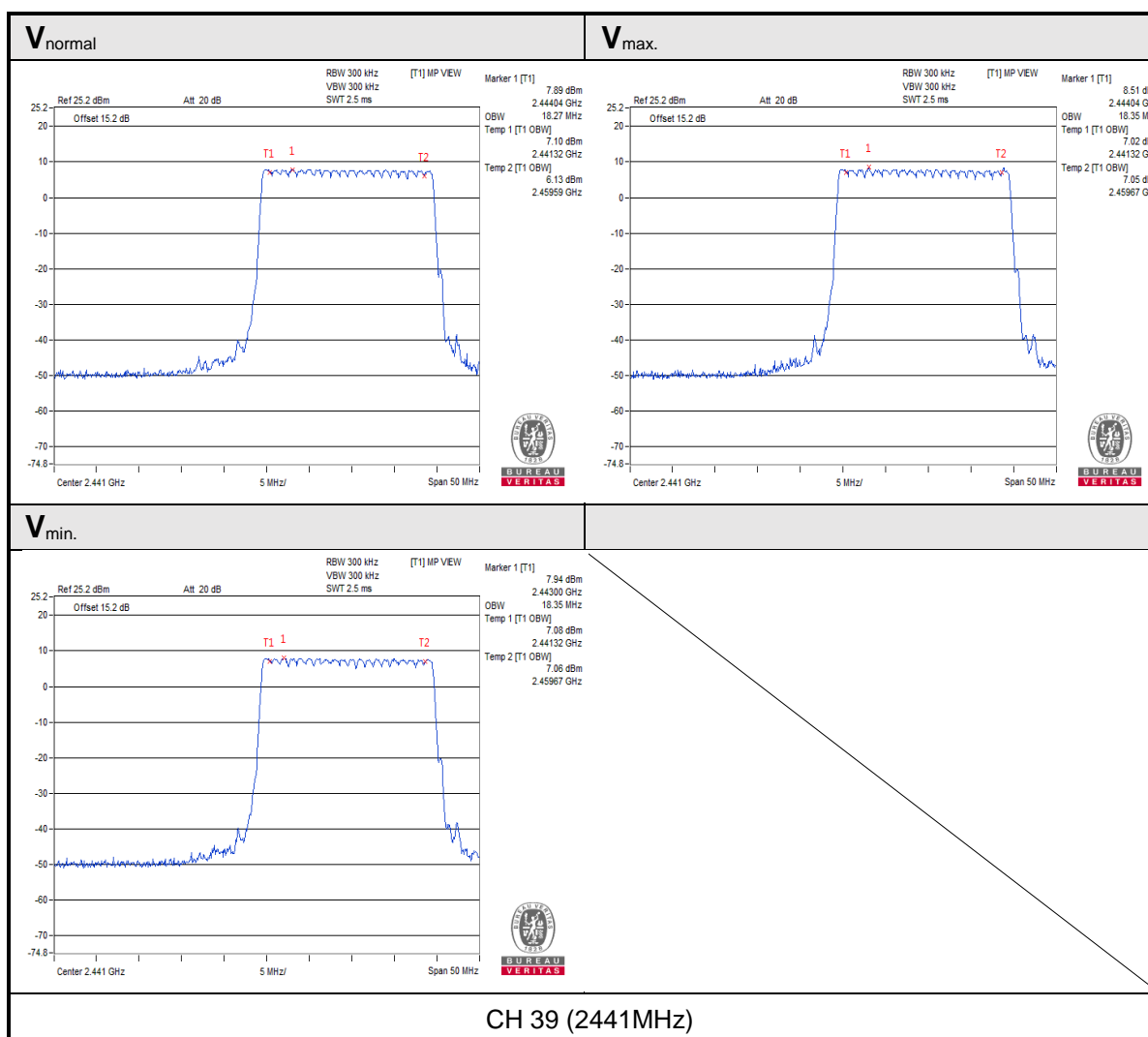
2. For the test plots please refer to the below pages.



AFH Mode:

Environmental Conditions		25 deg.C, 60 % RH			
V _{normal}		V _{max.}		V _{min.}	
Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor	Occupied Bandwidth (MHz)	Spreading Factor
18.27	18.27	18.35	18.35	18.35	18.35

- Note: 1. Spreading Factor: 90 % channel power bandwidth / 1.
2. For the test plots please refer to the below pages.

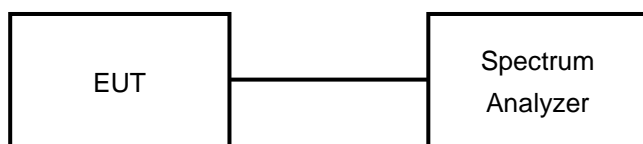


4.4 Spurious Emissions for Transmitter Measurement

4.4.1 Limits of Spurious Emissions

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

4.4.2 Test Setup



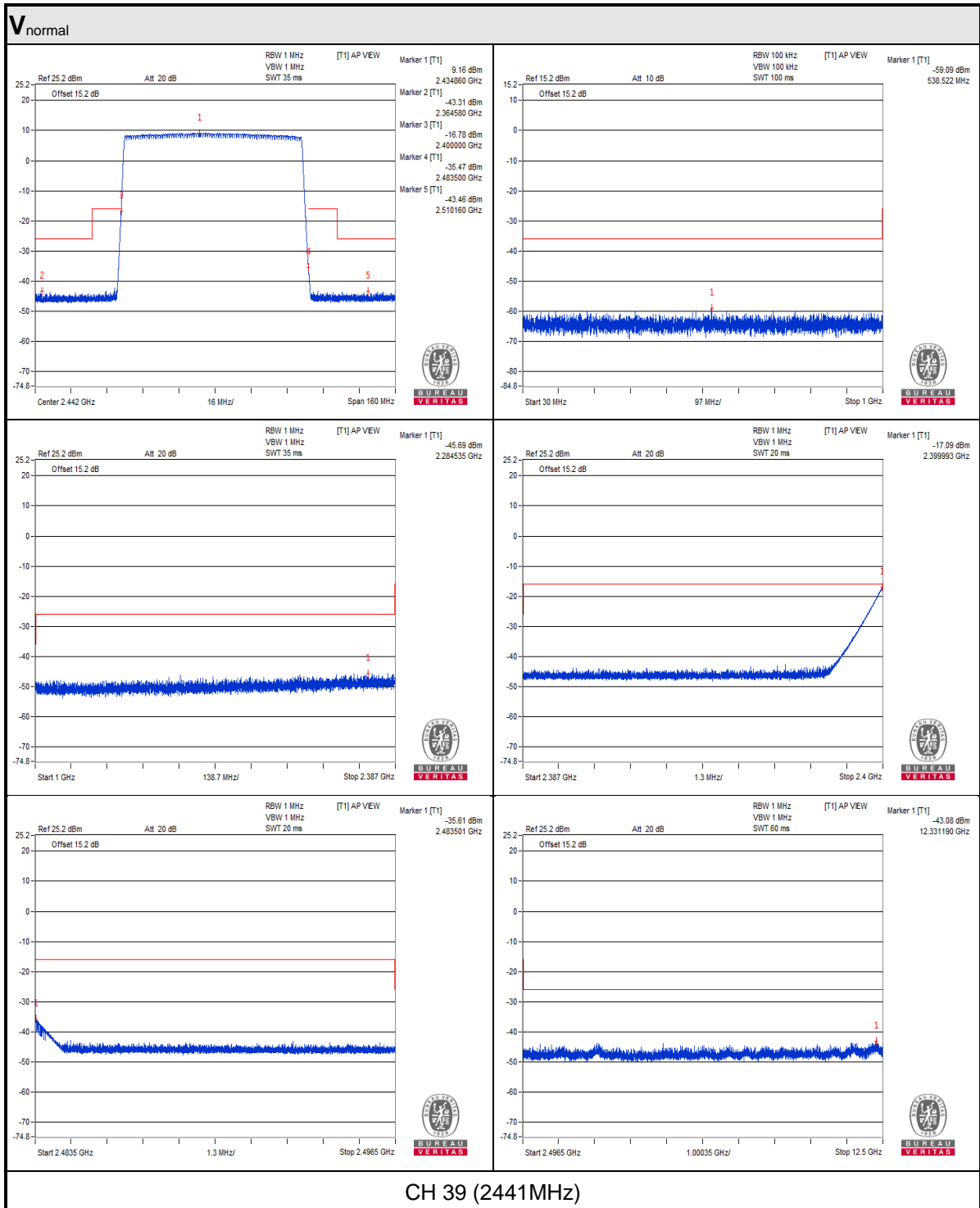
4.4.3 Test Results

Modulation: GFSK

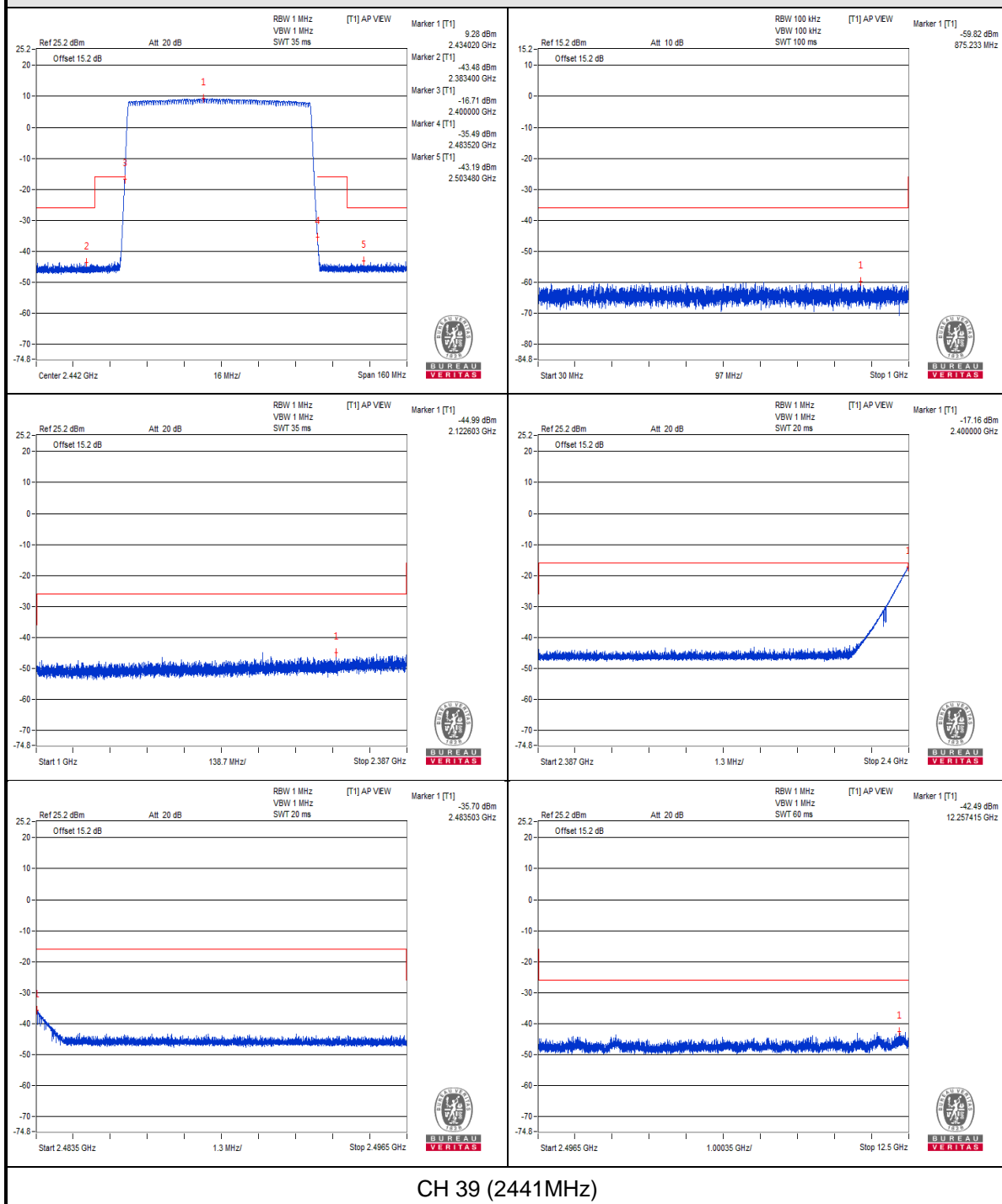
Environmental Conditions		25 deg.C, 60 % RH			
Test Channel		Hopping Mode		Limit (uW)	Result
Test Condition	Frequency Range	Frequency (MHz)	Measured Value (uW)		
V _{normal}	30.0 MHz to 1000.0 MHz	538.522	0.001233	0.25	Pass
	1000.0 MHz to 2387.0 MHz	2284.535	0.026977	2.5	Pass
	2387.0 MHz to 2400.0 MHz	2399.993	19.543395	25	Pass
	2483.5 MHz to 2496.5 MHz	2483.501	0.274789	25	Pass
	2496.5 MHz to 12500.0 MHz	12331.190	0.049204	2.5	Pass
V _{max.}	30.0 MHz to 1000.0 MHz	875.233	0.001042	0.25	Pass
	1000.0 MHz to 2387.0 MHz	2122.603	0.031696	2.5	Pass
	2387.0 MHz to 2400.0 MHz	2400.000	19.230917	25	Pass
	2483.5 MHz to 2496.5 MHz	2483.503	0.269153	25	Pass
	2496.5 MHz to 12500.0 MHz	12257.415	0.056364	2.5	Pass
V _{min.}	30.0 MHz to 1000.0 MHz	695.905	0.001127	0.25	Pass
	1000.0 MHz to 2387.0 MHz	2354.752	0.038815	2.5	Pass
	2387.0 MHz to 2400.0 MHz	2400.000	19.230917	25	Pass
	2483.5 MHz to 2496.5 MHz	2483.508	0.248313	25	Pass
	2496.5 MHz to 12500.0 MHz	2561.522	1.009253	2.5	Pass

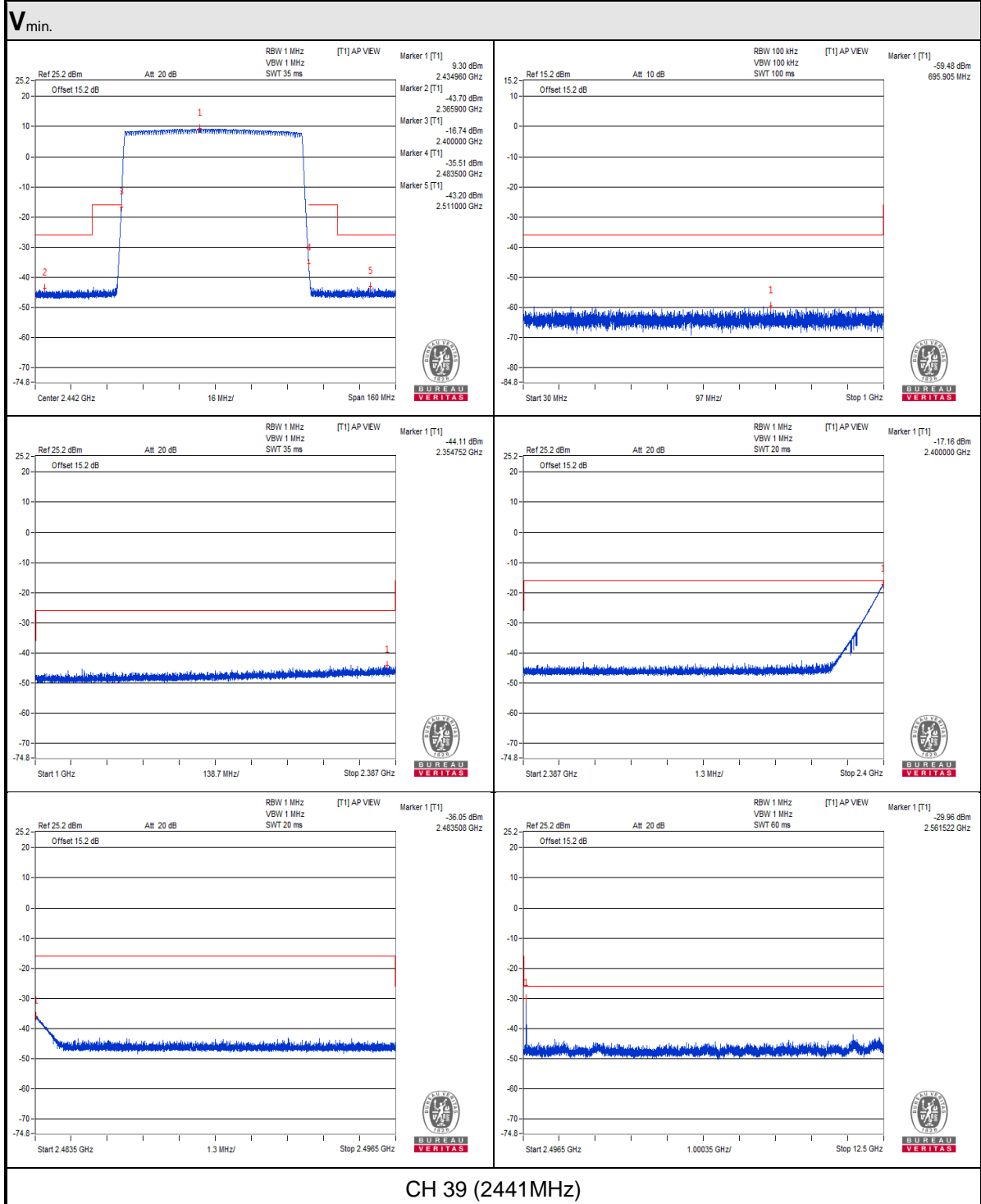
Note:

1. The spectrum plots are attached on the following pages.
2. (No.): The value was tested under Measuring Mode *Zero Span.



V_{max}.



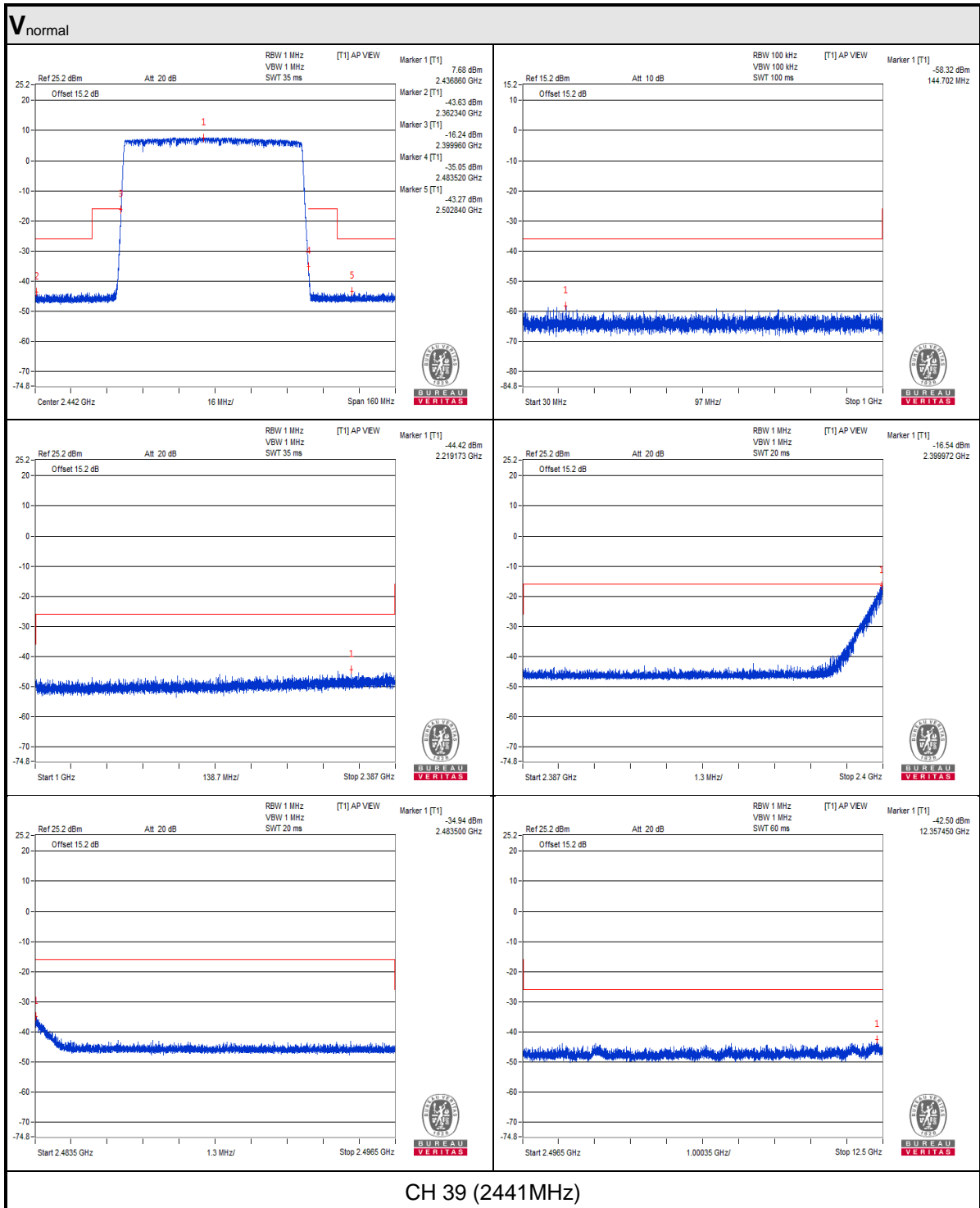


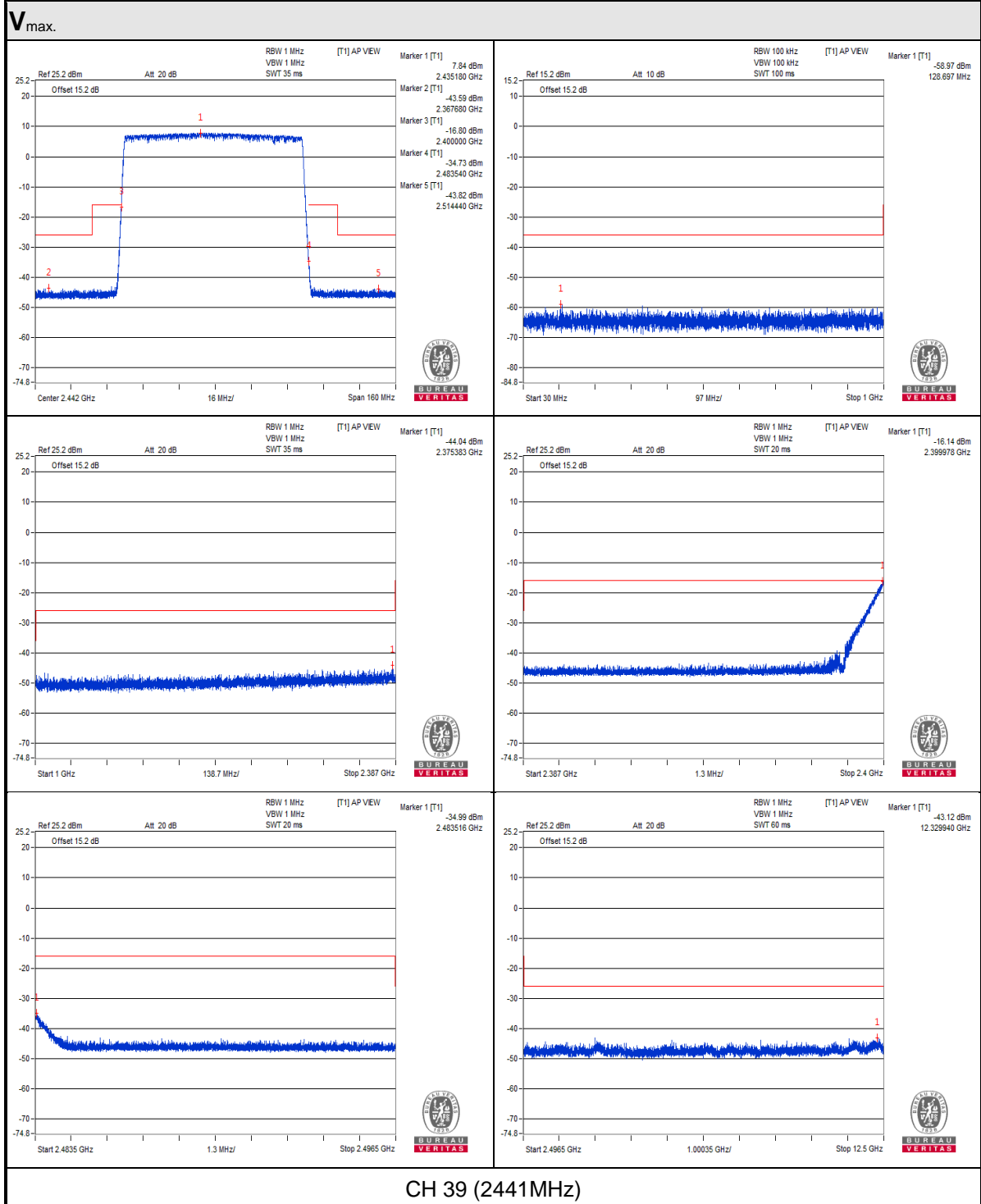
Modulation: $\pi/4$ -DQPSK

Environmental Conditions		25 deg.C, 60 % RH			
Test Channel		Hopping Mode		Limit (uW)	Result
Test Condition	Frequency Range	Frequency (MHz)	Measured Value (uW)		
V_{normal}	30.0 MHz to 1000.0 MHz	144.702	0.001472	0.25	Pass
	1000.0 MHz to 2387.0 MHz	2219.173	0.036141	2.5	Pass
	2387.0 MHz to 2400.0 MHz	2399.972	22.181964	25	Pass
	2483.5 MHz to 2496.5 MHz	2483.500	0.320627	25	Pass
	2496.5 MHz to 12500.0 MHz	12357.450	0.056234	2.5	Pass
V_{max.}	30.0 MHz to 1000.0 MHz	128.697	0.001268	0.25	Pass
	1000.0 MHz to 2387.0 MHz	2375.383	0.039446	2.5	Pass
	2387.0 MHz to 2400.0 MHz	2399.978	24.322040	25	Pass
	2483.5 MHz to 2496.5 MHz	2483.516	0.316957	25	Pass
	2496.5 MHz to 12500.0 MHz	12329.940	0.048753	2.5	Pass
V_{min.}	30.0 MHz to 1000.0 MHz	115.723	0.002265	0.25	Pass
	1000.0 MHz to 2387.0 MHz	2362.554	0.029512	2.5	Pass
	2387.0 MHz to 2400.0 MHz	2399.965	23.173946	25	Pass
	2483.5 MHz to 2496.5 MHz	2483.501	0.323594	25	Pass
	2496.5 MHz to 12500.0 MHz	12253.663	0.050816	2.5	Pass

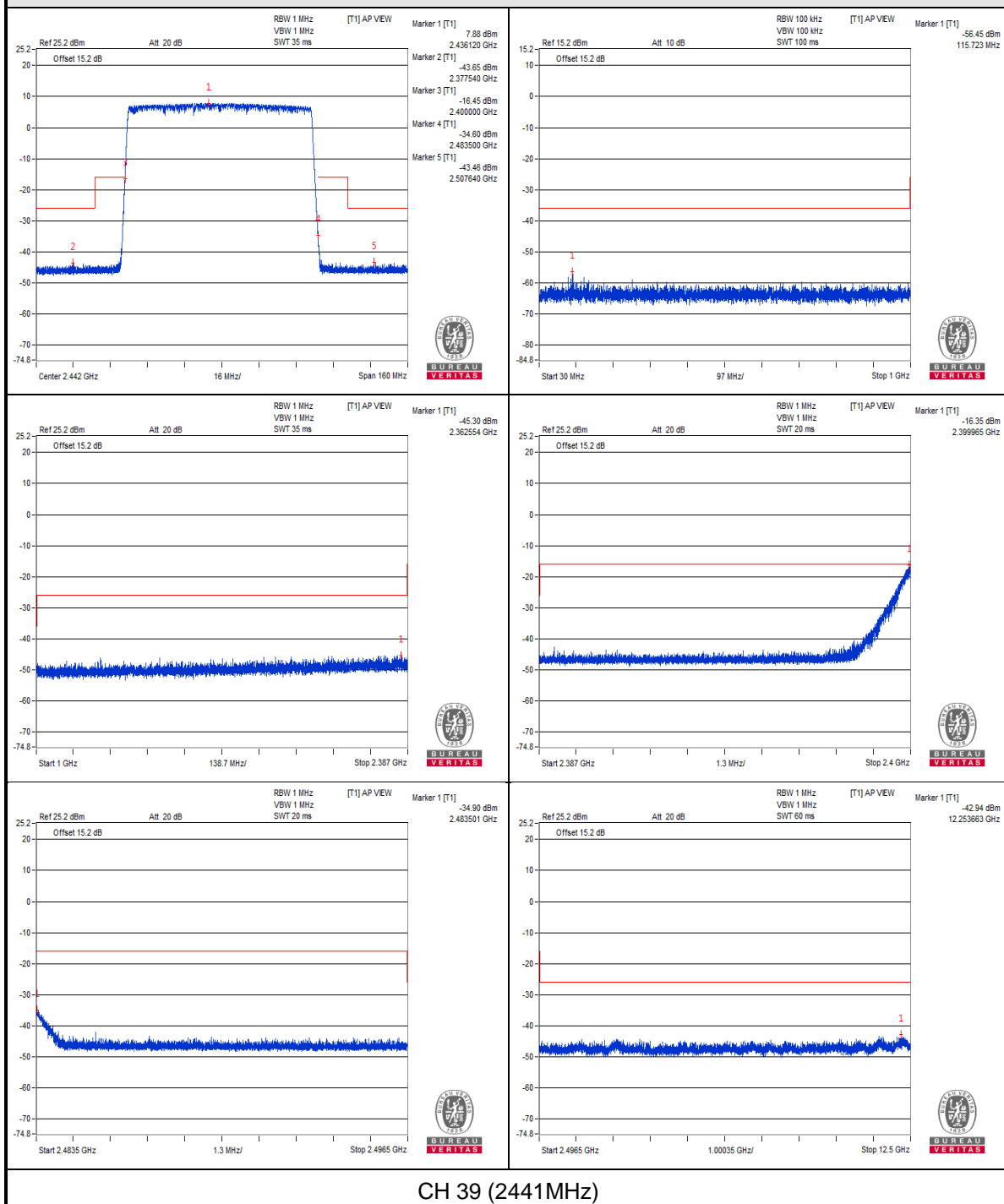
Note:

1. The spectrum plots are attached on the following pages.
2. (No.): The value was tested under Measuring Mode *Zero Span.





V_{min}.

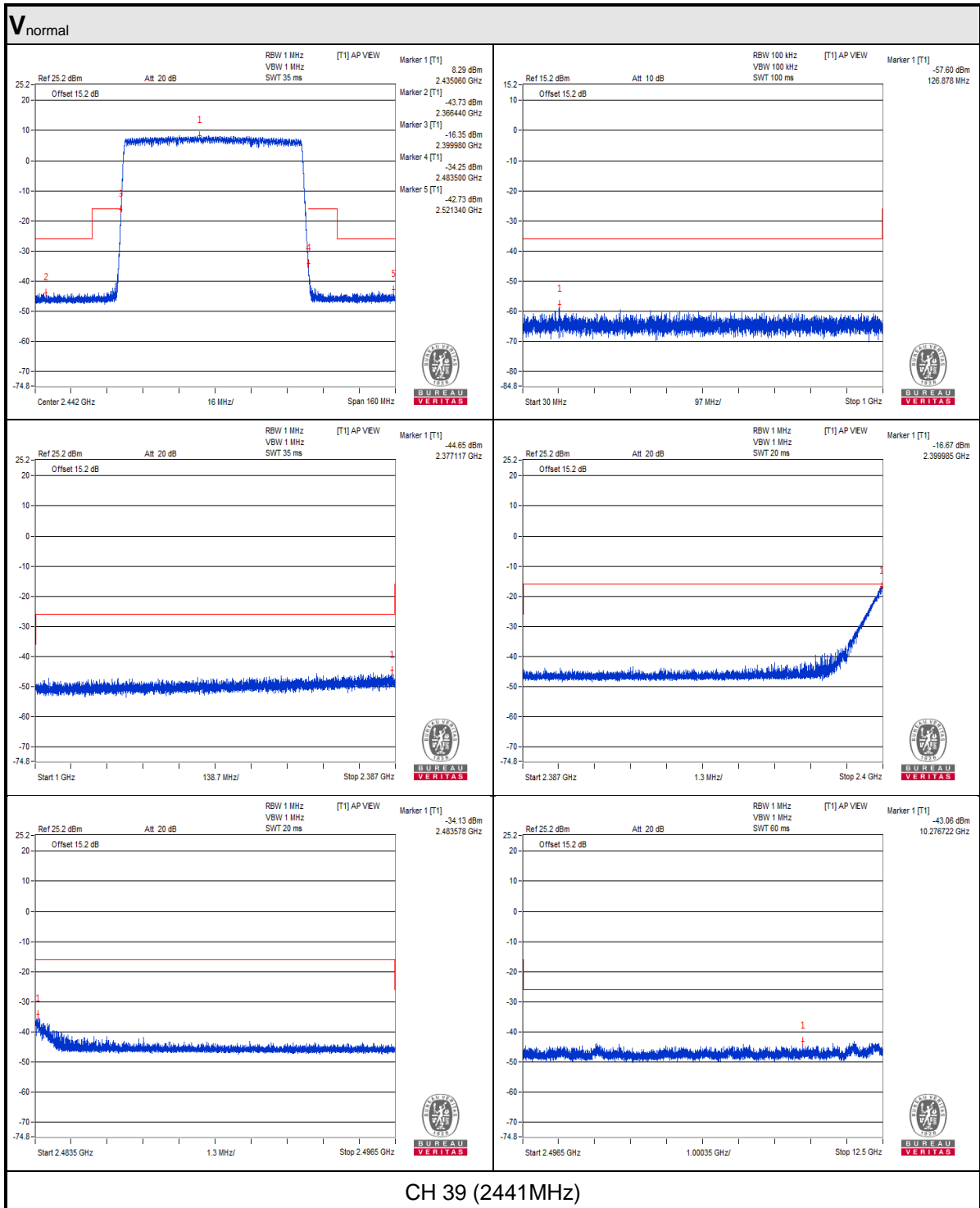


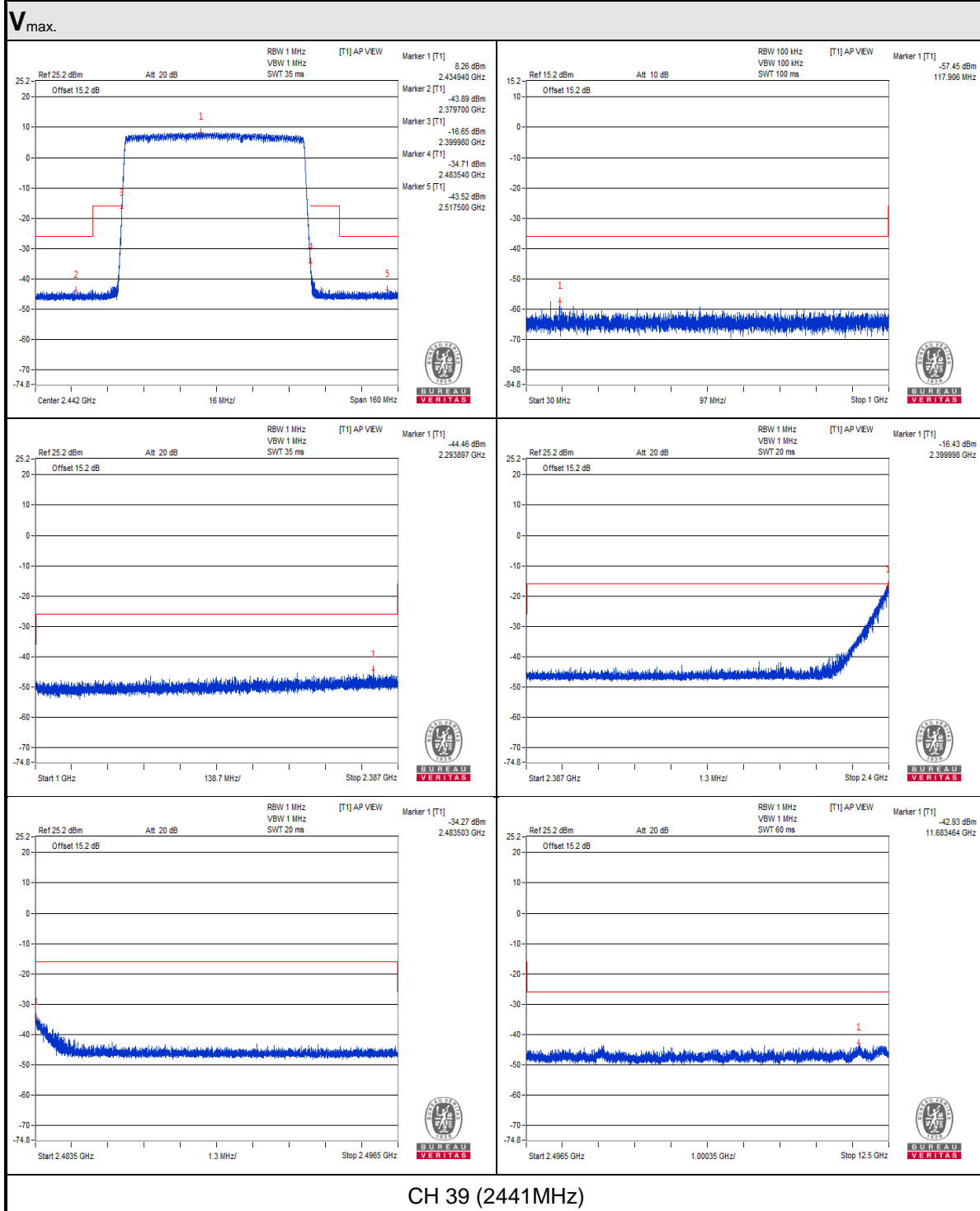
Modulation: 8DPSK

Environmental Conditions		25 deg.C, 60 % RH			
Test Channel		Hopping Mode		Limit (uW)	Result
Test Condition	Frequency Range	Frequency (MHz)	Measured Value (uW)		
V_{normal}	30.0 MHz to 1000.0 MHz	126.878	0.001738	0.25	Pass
	1000.0 MHz to 2387.0 MHz	2377.117	0.034277	2.5	Pass
	2387.0 MHz to 2400.0 MHz	2399.985	21.527817	25	Pass
	2483.5 MHz to 2496.5 MHz	2483.578	0.386367	25	Pass
	2496.5 MHz to 12500.0 MHz	10276.722	0.049431	2.5	Pass
V_{max.}	30.0 MHz to 1000.0 MHz	117.906	0.001799	0.25	Pass
	1000.0 MHz to 2387.0 MHz	2293.897	0.035810	2.5	Pass
	2387.0 MHz to 2400.0 MHz	2399.998	22.750974	25	Pass
	2483.5 MHz to 2496.5 MHz	2483.503	0.374111	25	Pass
	2496.5 MHz to 12500.0 MHz	11683.464	0.050933	2.5	Pass
V_{min.}	30.0 MHz to 1000.0 MHz	131.728	0.001875	0.25	Pass
	1000.0 MHz to 2387.0 MHz	2378.157	0.041783	2.5	Pass
	2387.0 MHz to 2400.0 MHz	2400.000	24.322040	25	Pass
	2483.5 MHz to 2496.5 MHz	2483.503	0.404576	25	Pass
	2496.5 MHz to 12500.0 MHz	4599.735	0.061802	2.5	Pass

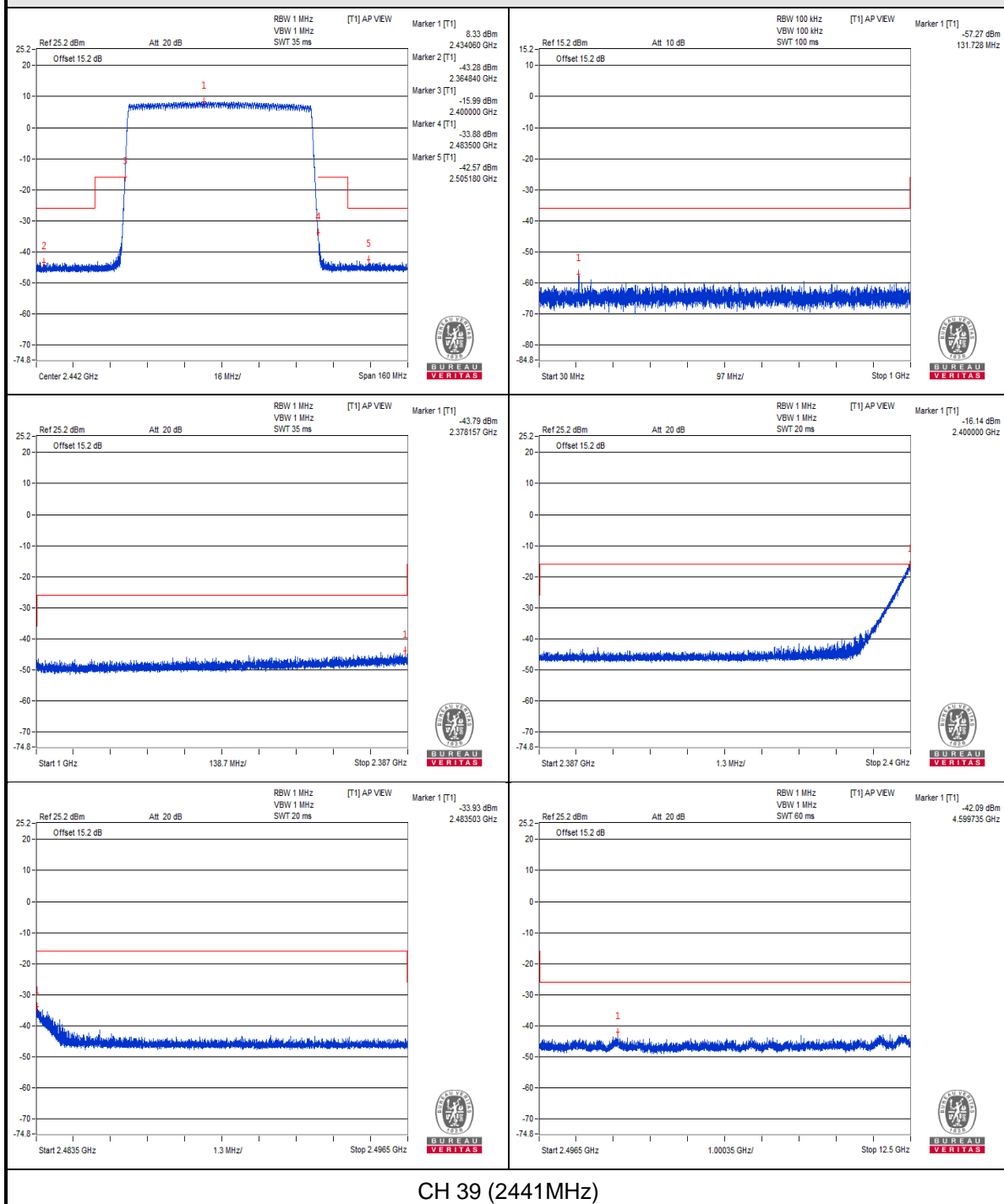
Note:

3. The spectrum plots are attached on the following pages.
4. (No.): The value was tested under Measuring Mode *Zero Span.





V_{min}.



4.5 Antenna Power Measurement

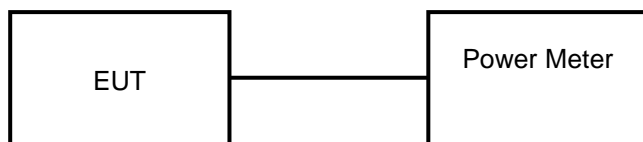
4.5.1 Limits of Antenna Power

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 (8.203 mW/MHz ~ 82.03 mW/MHz)
FH	2400 – 2483.5 MHz	3 mW/MHz	6.91 dBm/MHz ~ 16.91 dBm/MHz (4.9 mW/MHz ~ 49.09 mW/MHz)

Note:

1. Occupied bandwidth is less than 26 MHz
2. Occupied bandwidth is more than 26 MHz and less than 38 MHz
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 $A = \text{EIRP} / (2.14 \text{ dBi} + \text{Antenna Power (limit)})$.
4. Tolerance of antenna power shall be +20 % (upper value) and –80 % (lower value).

4.5.2 Test Setup



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

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

4.5.3 Test Results

Normal Mode:

Environmental Conditions		26 deg.C, 60 % RH			
Modulation Type	Data Rate Type	Conducted RF Output Power Density (mW/MHz)			
		V _{normal}	V _{max.}	V _{min.}	Max. Limit (mW/MHz)
GFSK	DH5	0.108059	0.110831	0.109815	3
$\pi/4$ -DQPSK	2DH5	0.090503	0.091974	0.093686	3
8DPSK	3DH5	0.091974	0.095425	0.089467	3
Rated Power		0.2 mW			
Tolerance of Antenna Power		0.04 ~ 0.24 mW			

PCB Antenna with -1.3 dBi gain

Environmental Conditions		26 deg.C, 60 % RH			
Modulation Type	Data Rate Type	Radiated RF Output Power Density (mW/MHz)			
		V _{normal}	V _{max.}	V _{min.}	Max. Limit (mW/MHz)
GFSK	DH5	0.080105	0.08216	0.081407	4.909
$\pi/4$ -DQPSK	2DH5	0.067091	0.068181	0.06945	4.909
8DPSK	3DH5	0.068181	0.07074	0.066323	4.909

- Note: 1. The radiated RF output power density is a “calculated” value derived from the conducted value.
2. Formula: Radiated RF output power density = Conducted RF output power density + Antenna Gain.

AFH Mode:

Environmental Conditions		26 deg.C, 60 % RH			
Modulation Tpe	Data Rate Type	Conducted RF Output Power Density (mW)			
		V _{normal}	V _{max.}	V _{min.}	Max. Limit (mW/MHz)
GFSK	DH5	0.41887	0.431522	0.425677	3
$\pi/4$ -DQPSK	2DH5	0.346229	0.351857	0.359223	3
8DPSK	3DH5	0.353398	0.365059	0.342266	3
Rated Power		1.0 mW			
Tolerance of Antenna Power		0.2 ~ 1.2 mW			

PCB Antenna with -1.3 dBi gain

Environmental Conditions		26 deg.C, 60 % RH			
Modulation Tpe	Data Rate Type	Radiated RF Output Power Density (mW)			
		V _{normal}	V _{max.}	V _{min.}	Max. Limit (mW/MHz)
GFSK	DH5	0.310513	0.319892	0.315559	4.909
$\pi/4$ -DQPSK	2DH5	0.256663	0.260835	0.266296	4.909
8DPSK	3DH5	0.261978	0.270622	0.253725	4.909

Note: 1. The radiated RF output power density is a “calculated” value derived from the conducted value.

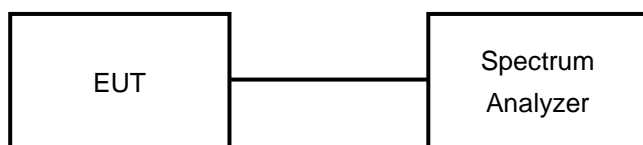
2. Formula: Radiated RF output power density = Conducted RF output power density + Antenna Gain.

4.6 Spurious Emissions for Receiver

4.6.1 Limits of Spurious Emissions for Receiver

Frequencies (MHz)	Limit
Below 1 GHz	≤ 4 nW (-54 dBm)
Above 1 GHz	≤ 20 nW (-47 dBm)

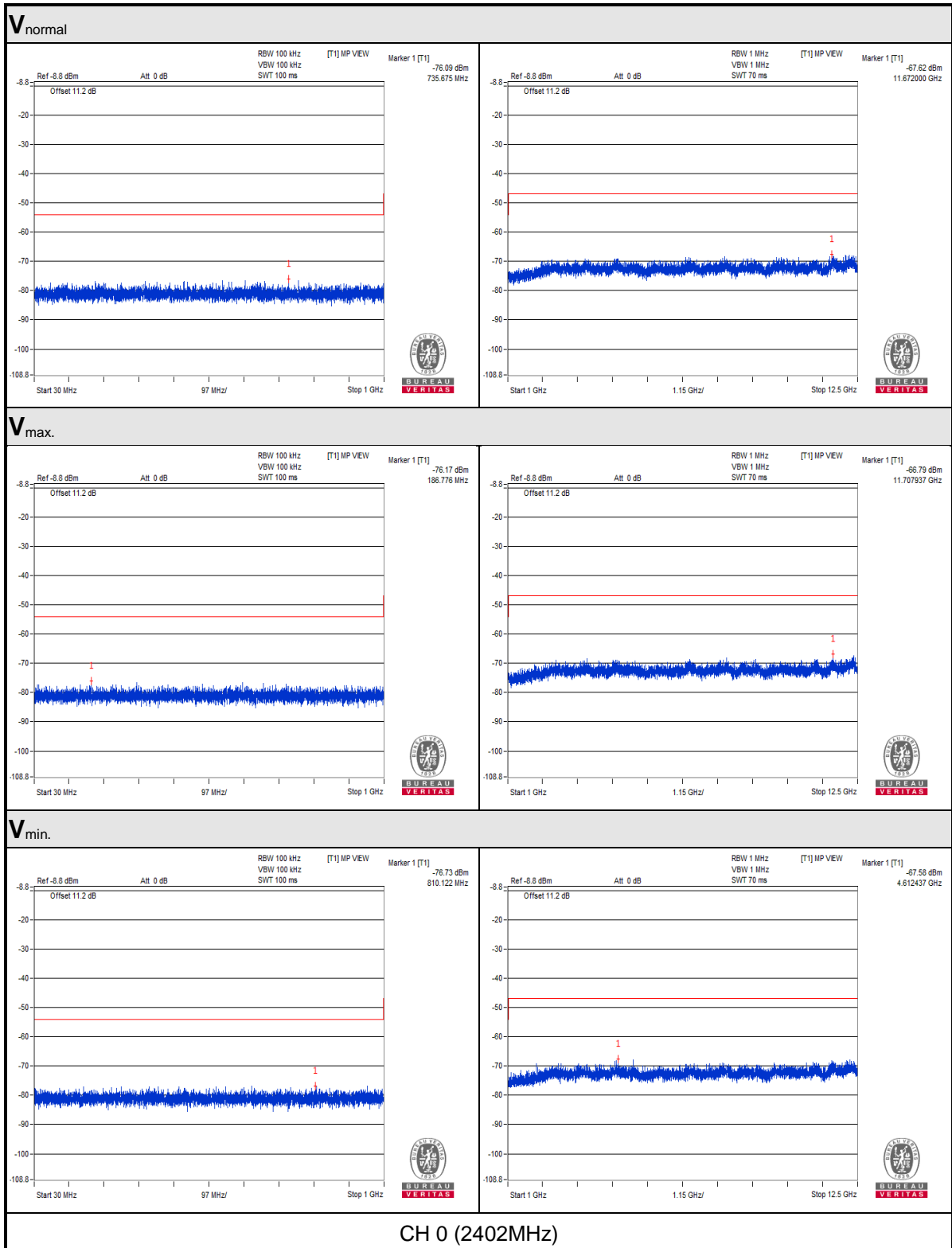
4.6.2 Test Setup



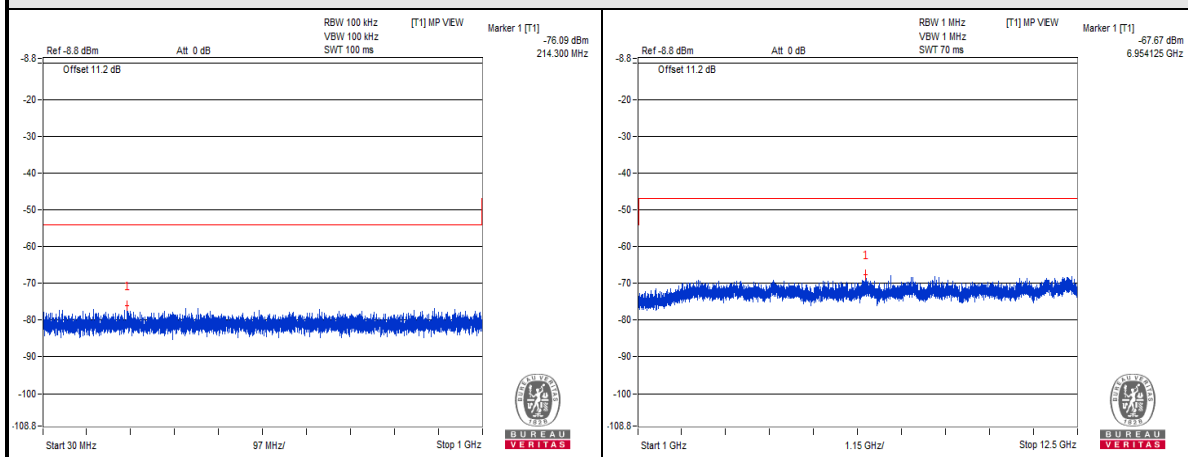
4.6.3 Test Result

Environmental Conditions		25 deg.C, 60 % RH					
Test Channel		Channel 0 (2402 MHz)		Channel 39 (2441 MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measured Value (nW)	Frequency (MHz)	Measured Value (nW)		
V _{normal}	Below 1 GHz	735.675	0.024604	214.300	0.024604	4 nW	Pass
	Above 1 GHz	11672.000	0.172982	6954.125	0.171002	20 nW	Pass
V _{max.}	Below 1 GHz	186.776	0.024155	862.381	0.021281	4 nW	Pass
	Above 1 GHz	11707.937	0.209411	12318.875	0.180302	20 nW	Pass
V _{min.}	Below 1 GHz	810.122	0.021232	961.321	0.031333	4 nW	Pass
	Above 1 GHz	4612.437	0.174582	12088.875	0.207014	20 nW	Pass
Test Channel		Channel 78 (2480 MHz)				Limit	Result
Test Condition	Frequency Range	Frequency (MHz)		Measured Value (nW)			
V _{normal}	Below 1 GHz	143.611		0.023014		4 nW	Pass
	Above 1 GHz	12173.687		0.184077		20 nW	Pass
V _{max.}	Below 1 GHz	146.763		0.021979		4 nW	Pass
	Above 1 GHz	12192.375		0.201837		20 nW	Pass
V _{min.}	Below 1 GHz	866.867		0.026242		4 nW	Pass
	Above 1 GHz	12130.562		0.196789		20 nW	Pass

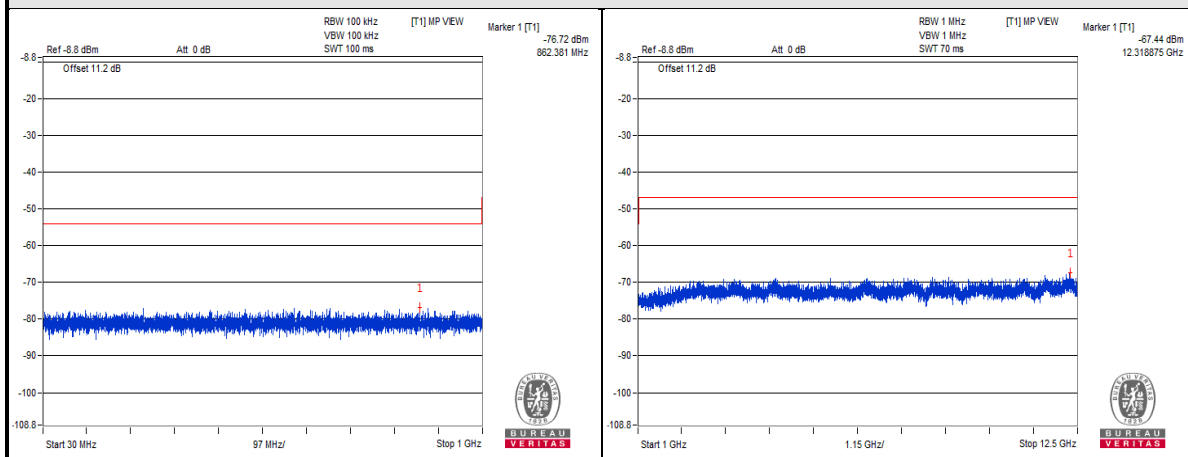
Note: 1. The worst value in each frequency range v.s. each channel has been marked by boldface.
2. The spectrum plots are attached on the following pages.



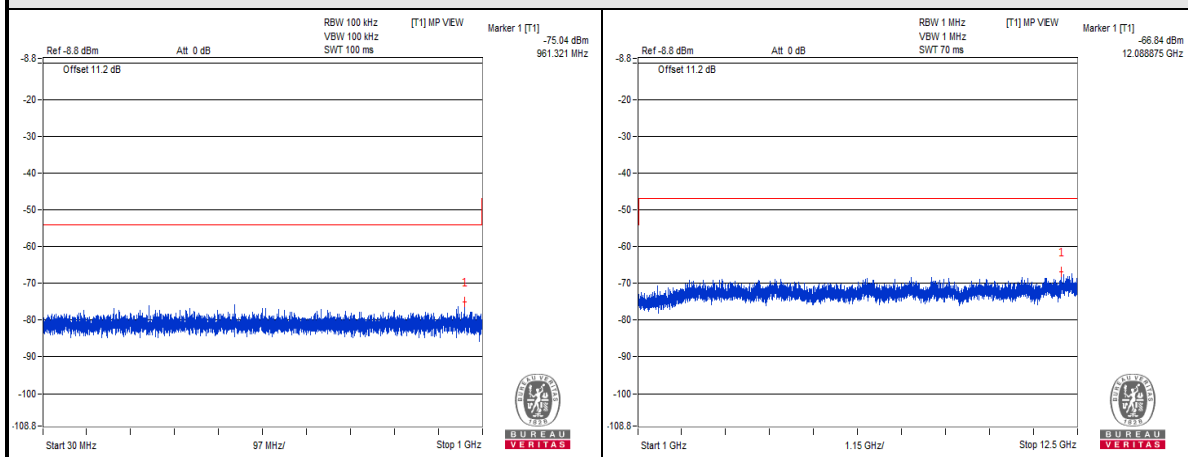
V_{normal}



V_{max}

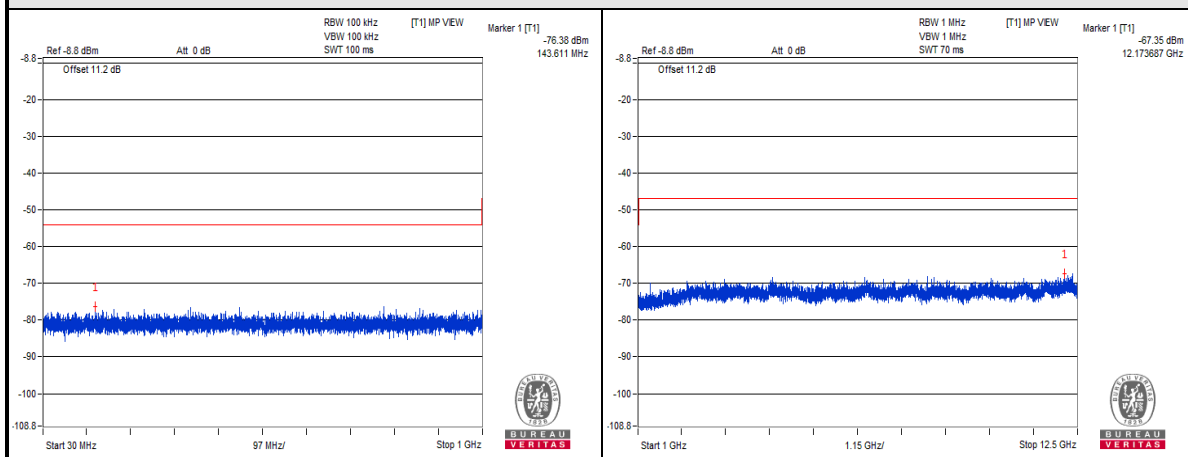


V_{min}

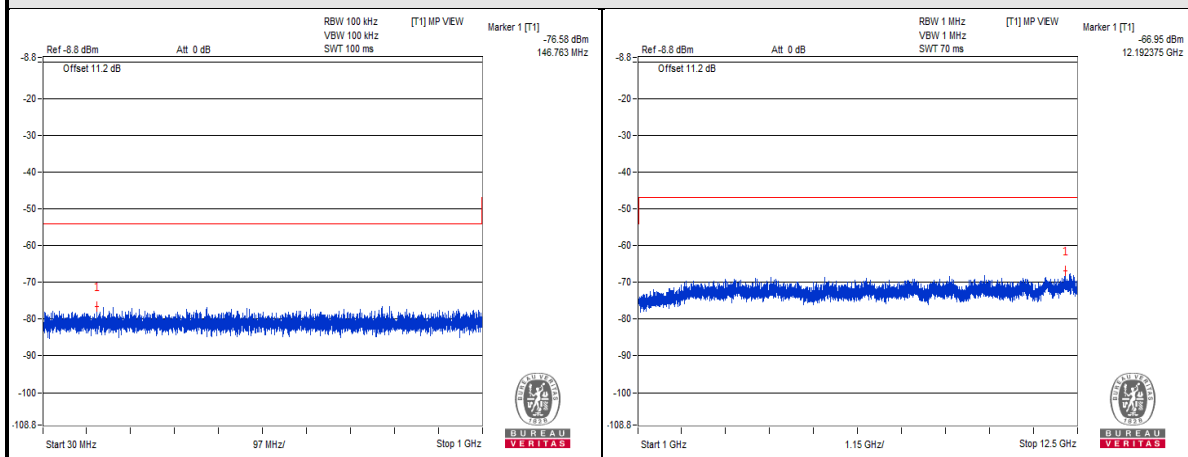


CH 39 (2441MHz)

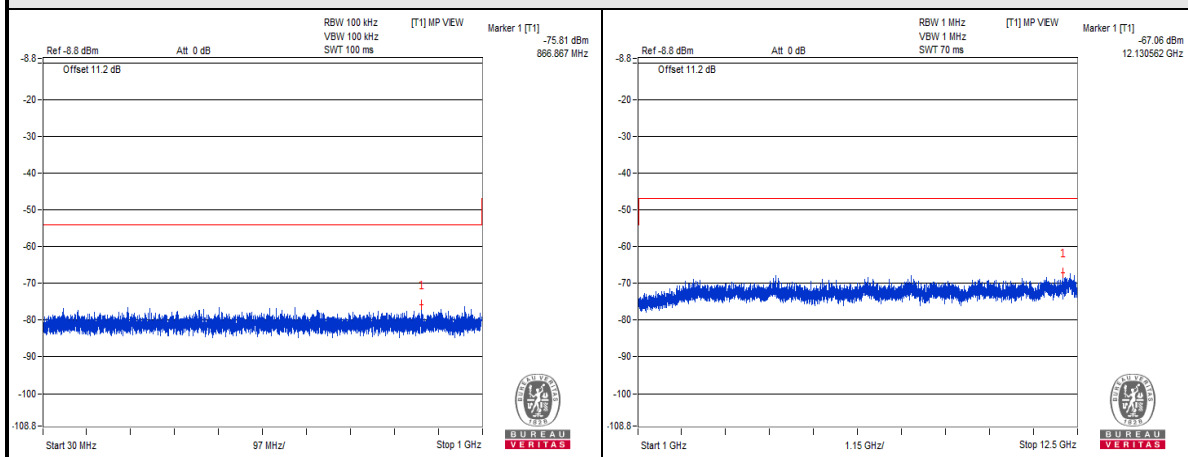
V_{normal}



V_{max}



V_{min}



CH 78 (2480MHz)

4.7 Dwell Time

4.7.1 Limits of Dwell Time

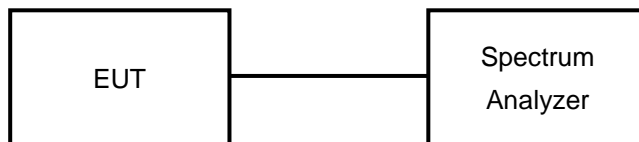
The frequency retention time in the frequency hopping method shall be 0.4 seconds or less. The total sum of the frequency retention time in any frequency within the time obtained by multiplying the diffusion rate by 0.4 second shall be 0.4 second or shorter.

Formula:

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

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

4.7.2 Test Setup



4.7.3 Test Result

Modulation: GFSK

Normal Mode:

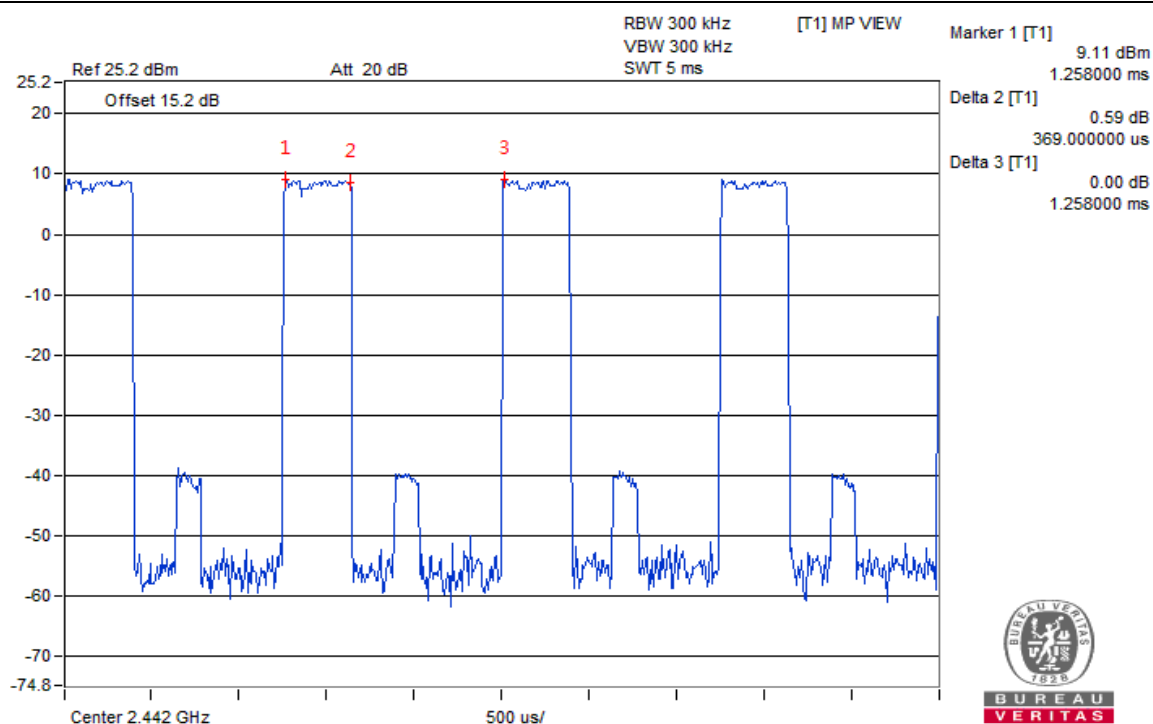
Test Condition	Mode	Spreading Rate	[Spreading Rate/79]*0.4	Duty Cycle	Result (msec)	Limit (msec)
V _{normal}	DH1	70.20	0.355	0.293	104.015	400
	DH3	70.20	0.355	0.641	227.555	400
	DH5	70.20	0.355	0.764	271.220	400
V _{max.}	DH1	70.20	0.355	0.293	104.015	400
	DH3	70.20	0.355	0.647	229.685	400
	DH5	70.20	0.355	0.764	271.220	400
V _{min.}	DH1	70.20	0.355	0.293	104.015	400
	DH3	70.20	0.355	0.641	227.555	400
	DH5	70.20	0.355	0.764	271.220	400

AFH Mode:

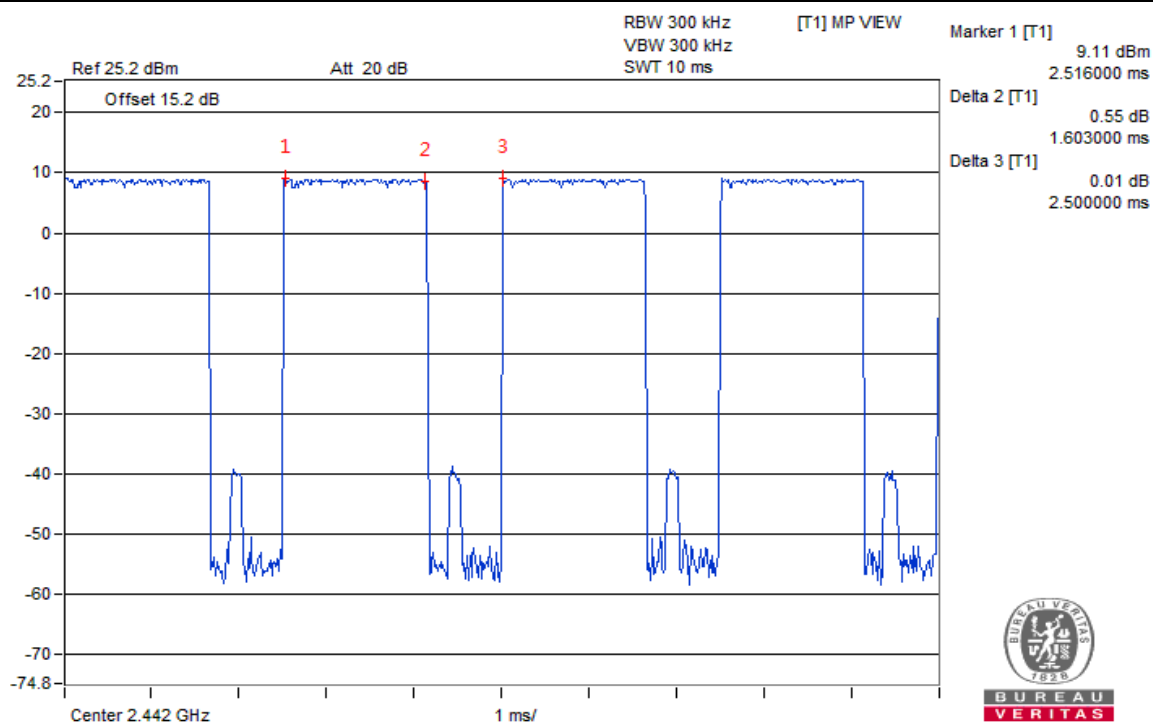
Test Condition	Mode	Spreading Rate	[Spreading Rate/20]*0.4	Duty Cycle	Result (msec)	Limit (msec)
V _{normal}	DH1	18.11	0.362	0.293	106.066	400
	DH3	18.11	0.362	0.641	232.042	400
	DH5	18.11	0.362	0.764	276.568	400
V _{max.}	DH1	18.03	0.360	0.293	105.480	400
	DH3	18.03	0.360	0.647	232.920	400
	DH5	18.03	0.360	0.764	275.040	400
V _{min.}	DH1	18.11	0.362	0.293	106.066	400
	DH3	18.11	0.362	0.641	232.042	400
	DH5	18.11	0.362	0.764	276.568	400

NOTE: Test plots of the transmitting time slot are shown on following pages.

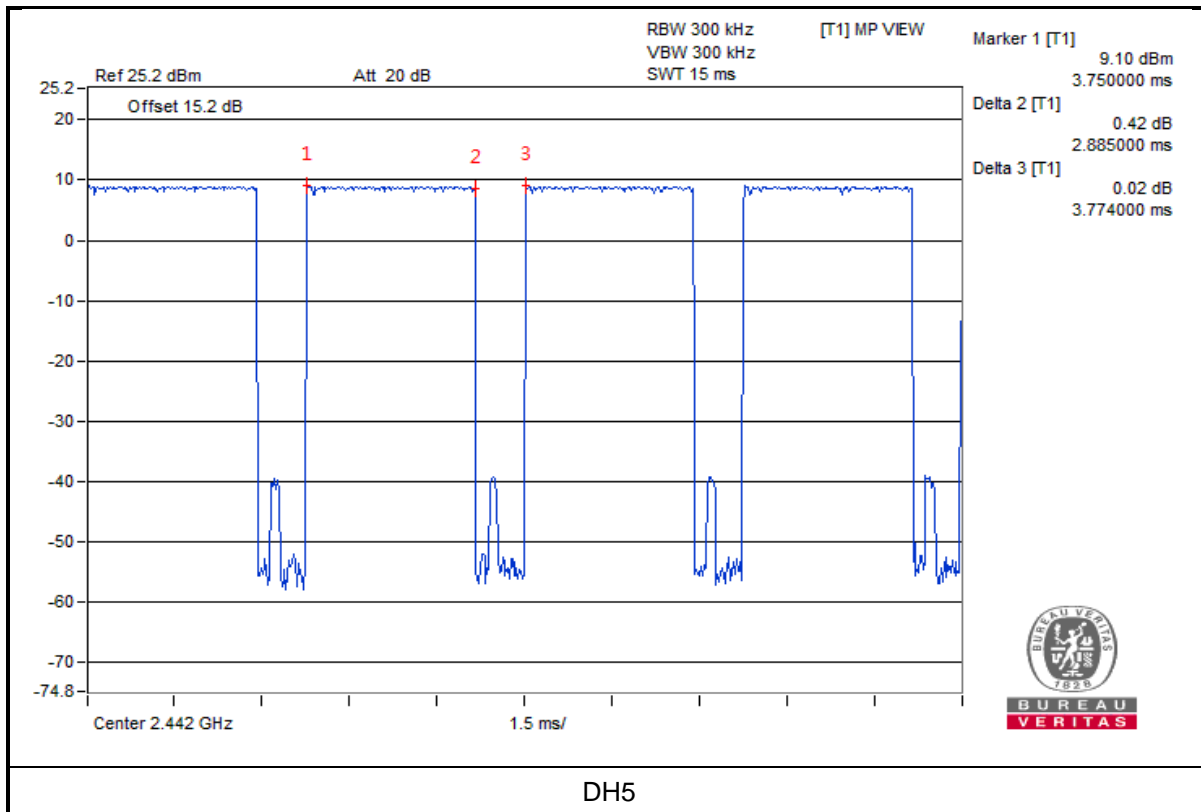
V_{normal}



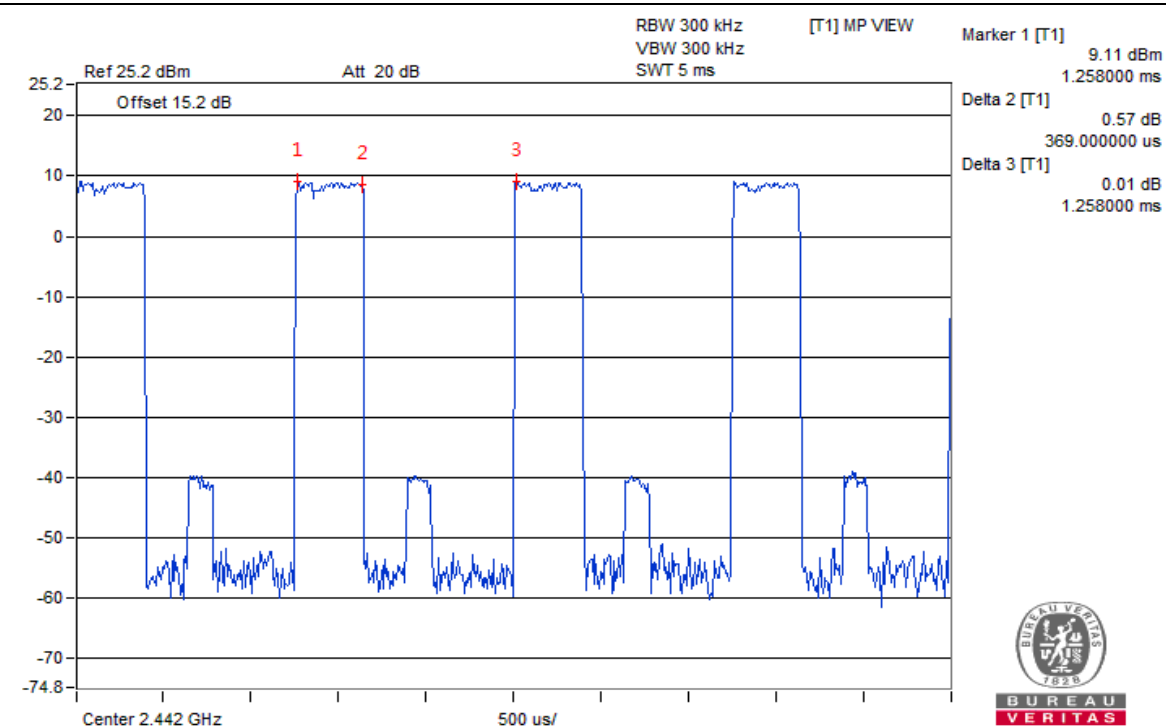
DH1



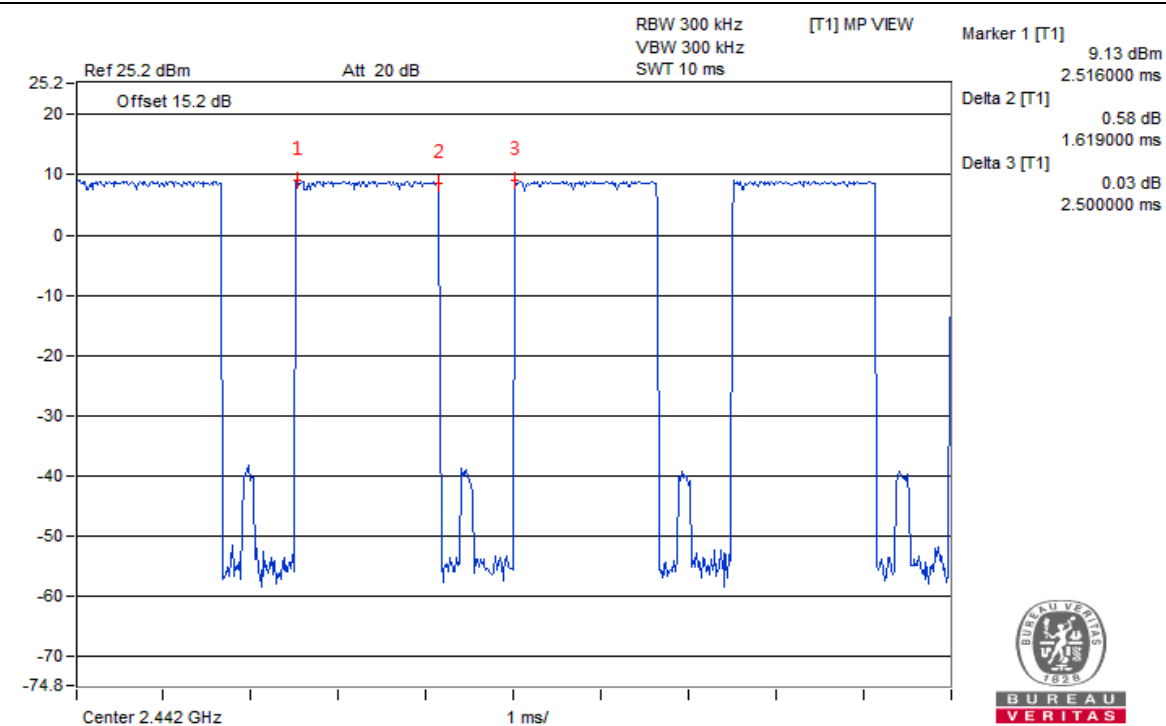
DH3



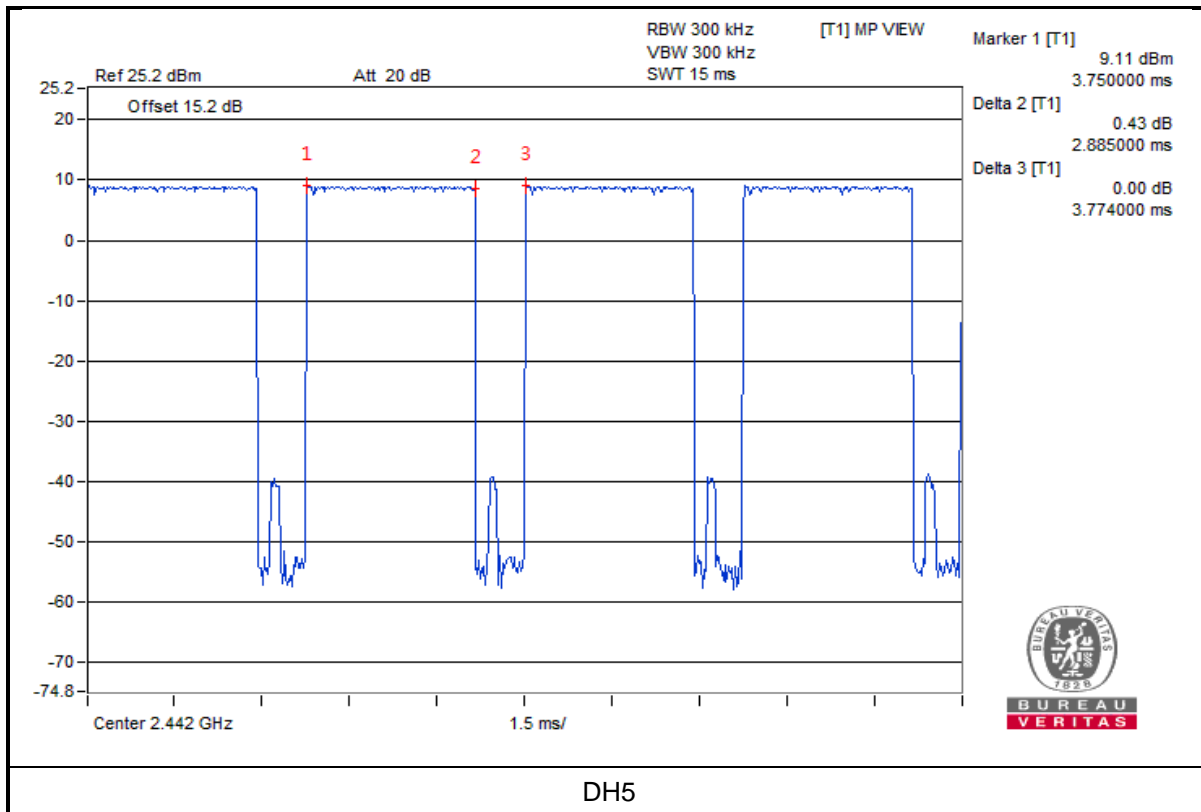
V_{max}.



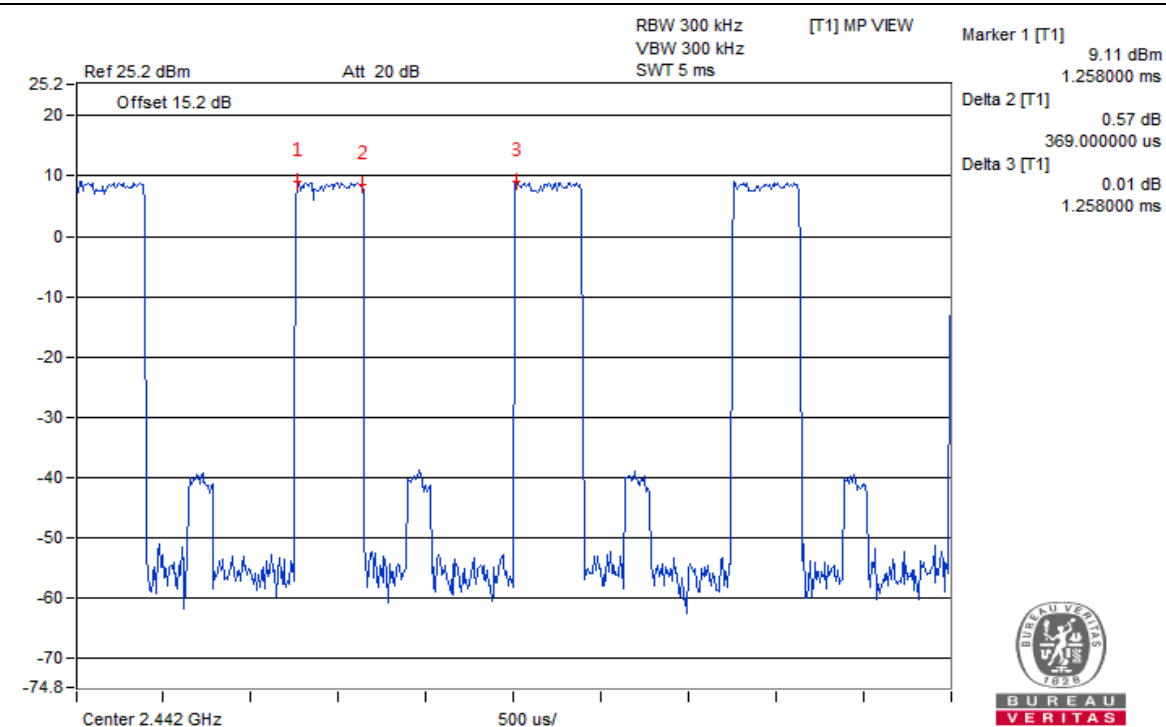
DH1



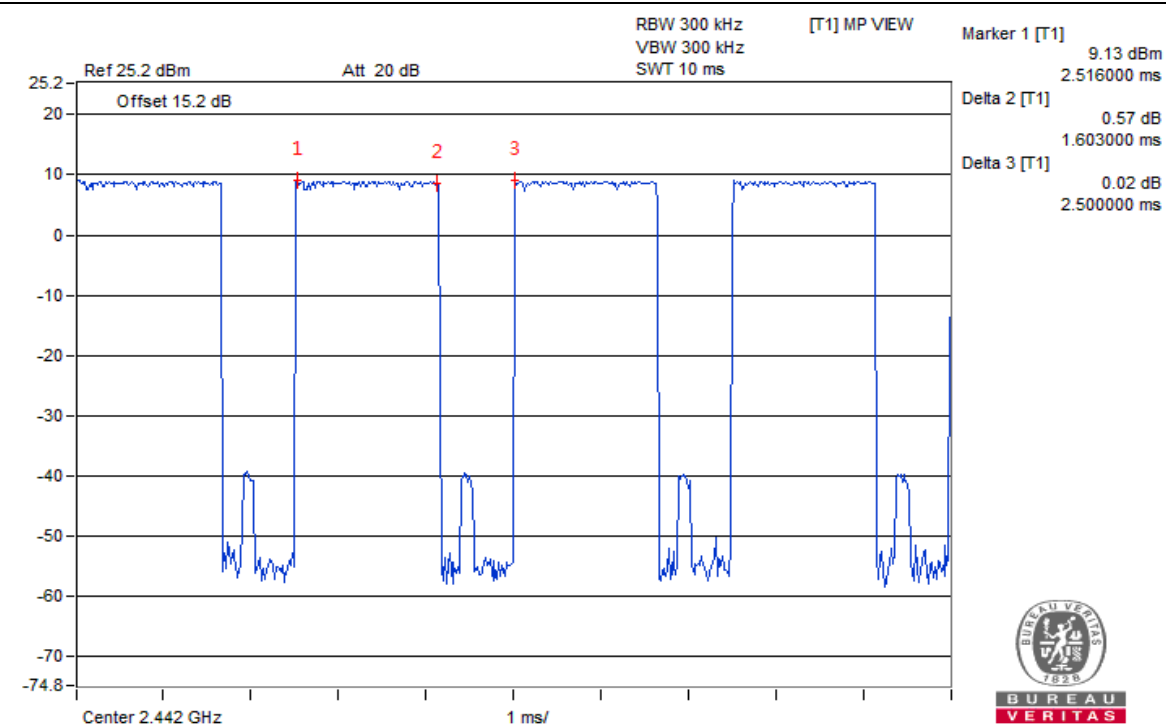
DH3



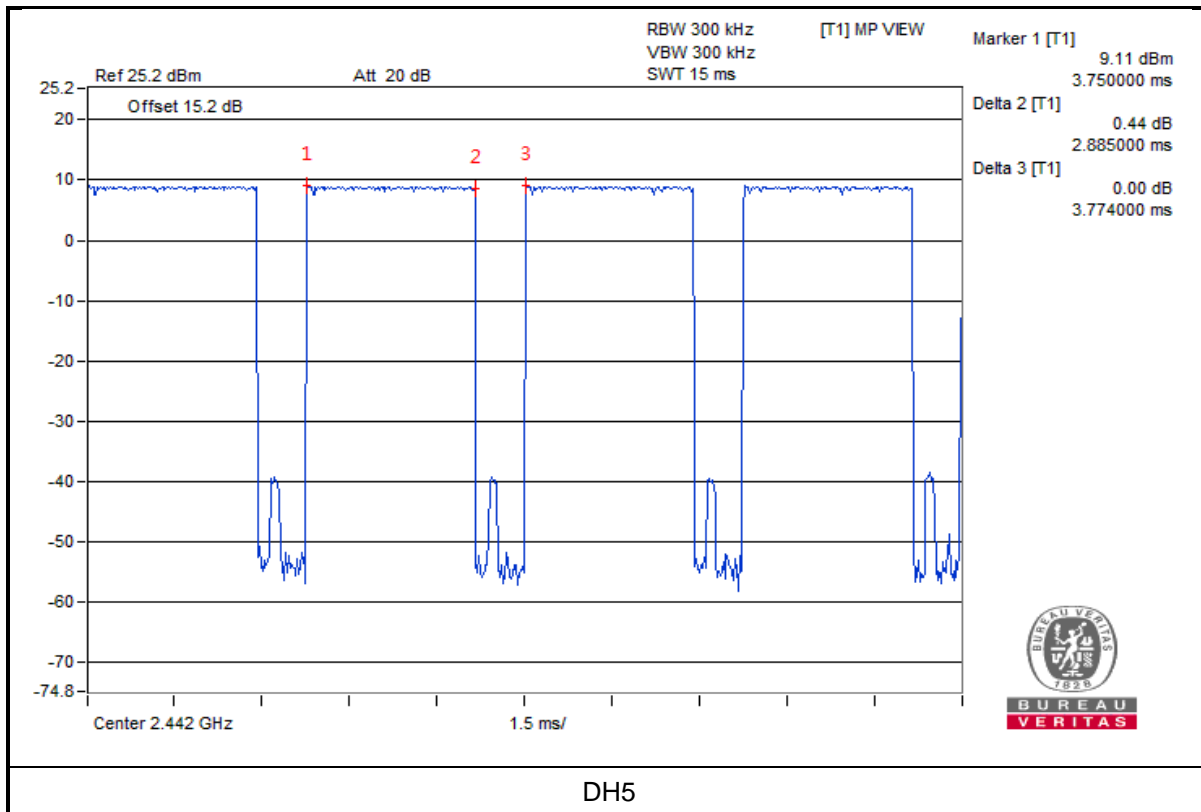
V_{min}.



DH1



DH3



Modulation: $\pi/4$ -DQPSK

Normal Mode:

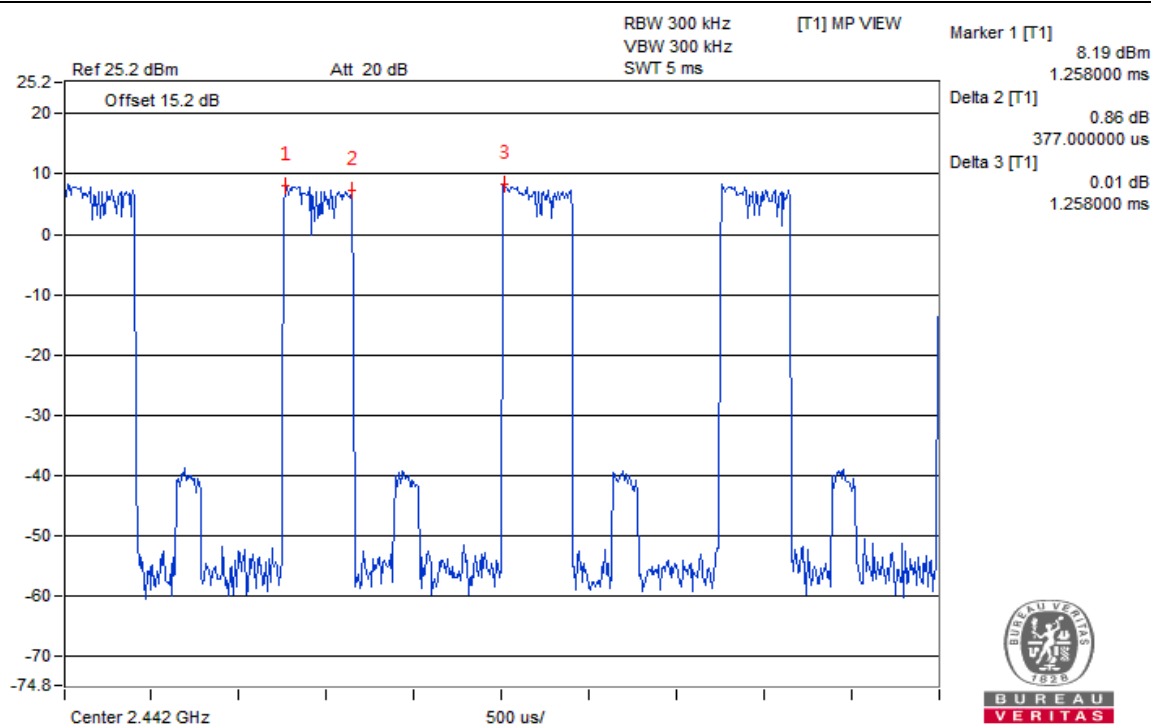
Test Condition	Mode	Spreading Rate	[Spreading Rate/79]*0.4	Duty Cycle	Result (msec)	Limit (msec)
V_{normal}	2DH1	70.20	0.355	0.299	106.145	400
	2DH3	70.20	0.355	0.647	229.685	400
	2DH5	70.20	0.355	0.758	269.090	400
$V_{max.}$	2DH1	70.20	0.355	0.299	106.145	400
	2DH3	70.20	0.355	0.647	229.685	400
	2DH5	70.20	0.355	0.758	269.090	400
$V_{min.}$	2DH1	70.36	0.356	0.299	106.444	400
	2DH3	70.36	0.356	0.651	231.756	400
	2DH5	70.36	0.356	0.758	269.848	400

AFH Mode:

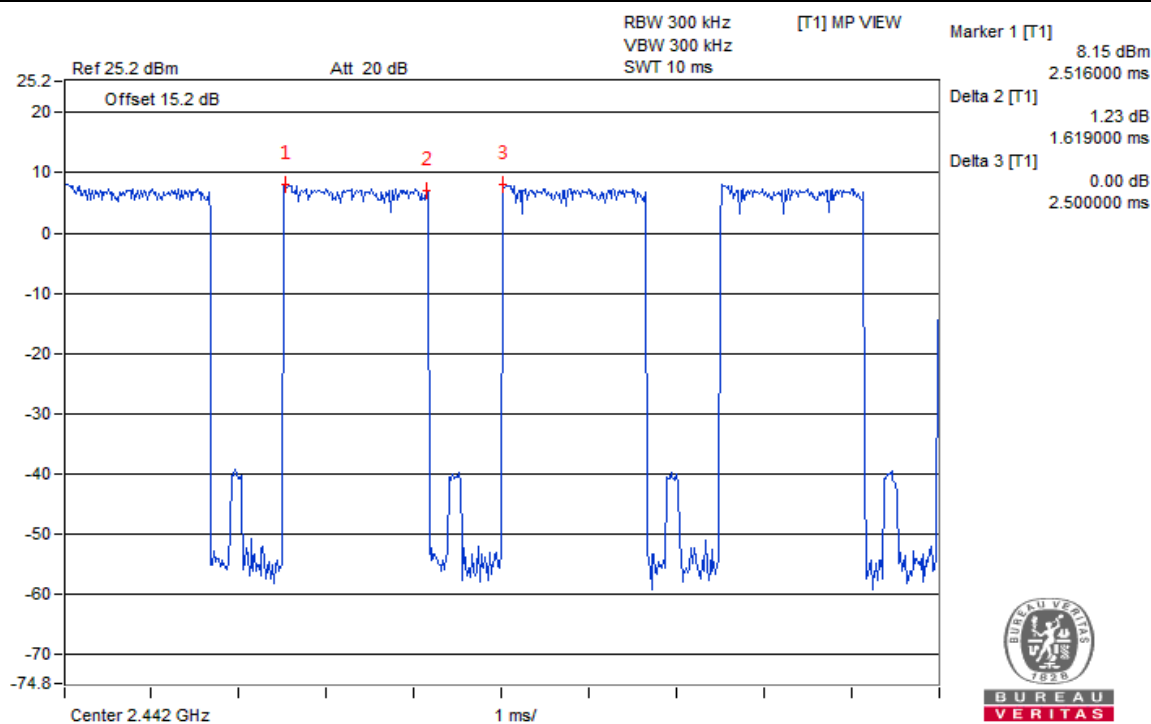
Test Condition	Mode	Spreading Rate	[Spreading Rate/20]*0.4	Duty Cycle	Result (msec)	Limit (msec)
V_{normal}	2DH1	18.35	0.367	0.299	109.733	400
	2DH3	18.35	0.367	0.647	237.449	400
	2DH5	18.35	0.367	0.758	278.186	400
$V_{max.}$	2DH1	18.35	0.367	0.299	109.733	400
	2DH3	18.35	0.367	0.647	237.449	400
	2DH5	18.35	0.367	0.758	278.186	400
$V_{min.}$	2DH1	18.35	0.367	0.299	109.733	400
	2DH3	18.35	0.367	0.651	238.917	400
	2DH5	18.35	0.367	0.758	278.186	400

NOTE: Test plots of the transmitting time slot are shown on following pages.

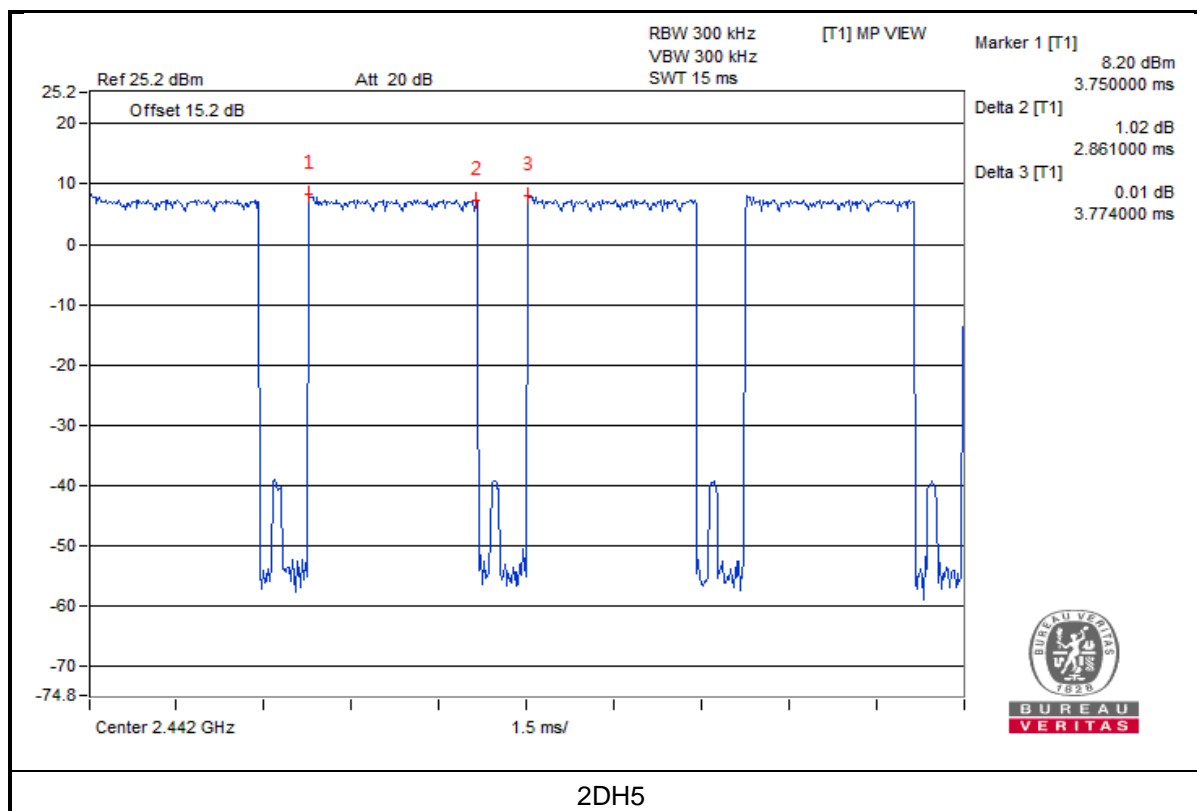
V_{normal}



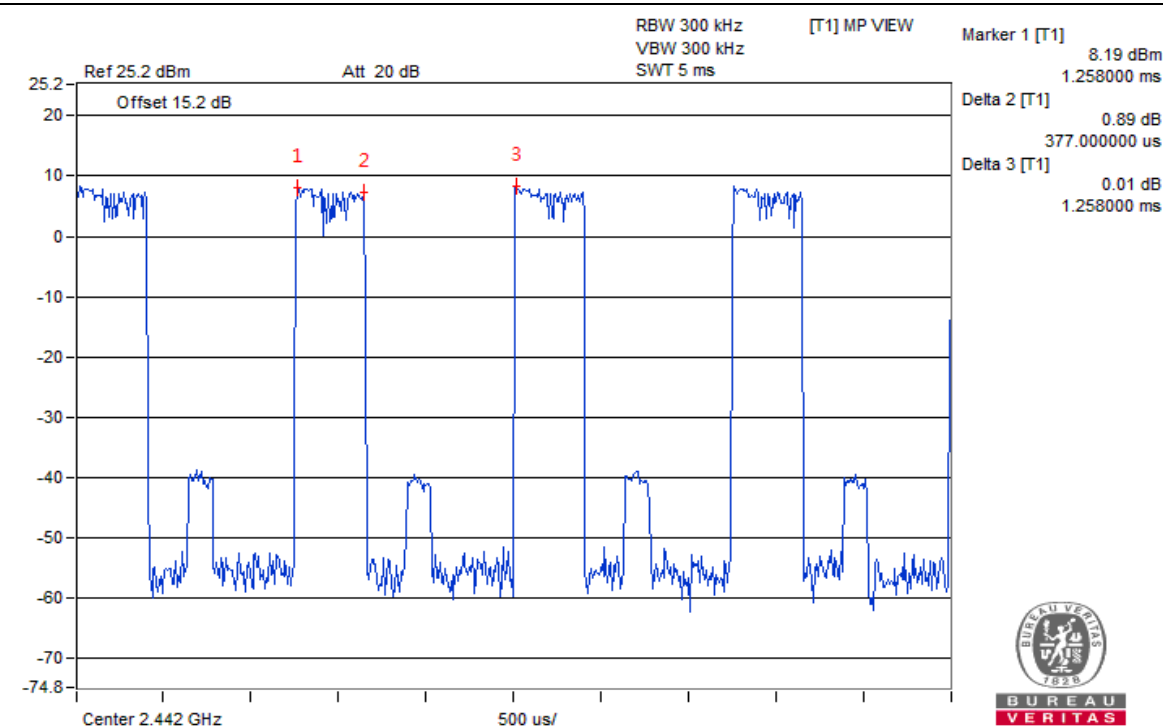
2DH1



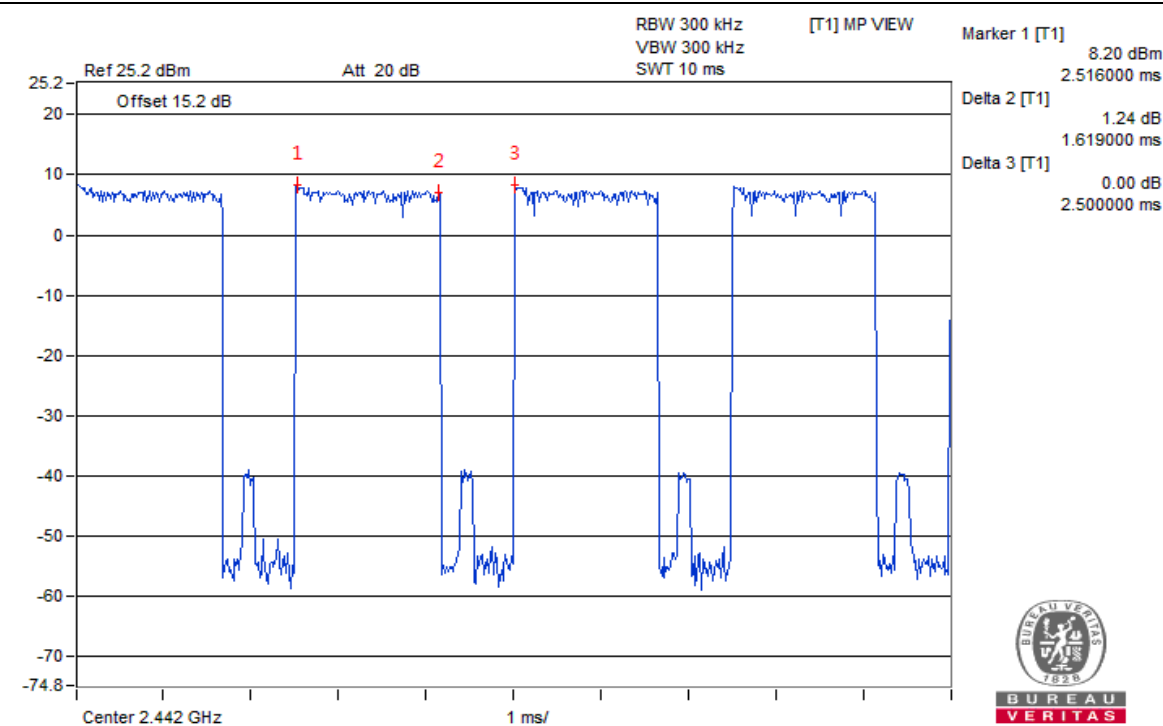
2DH3



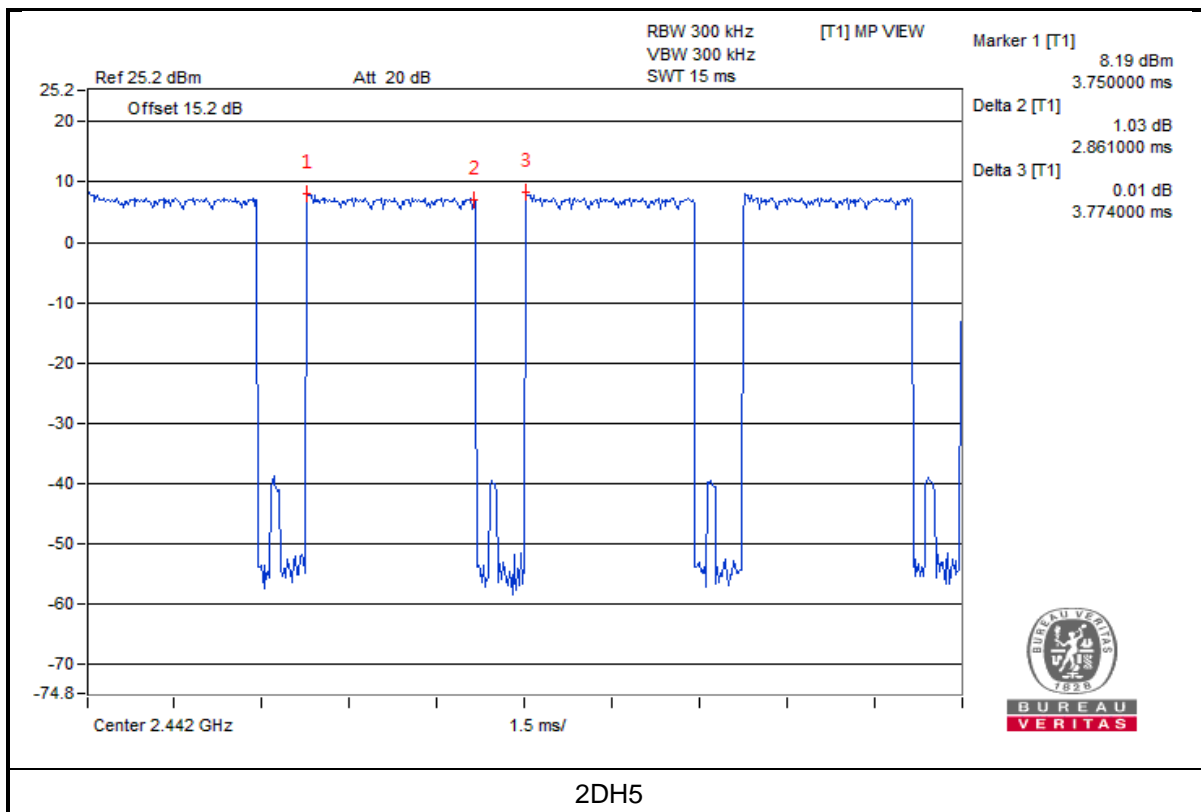
V_{max}.



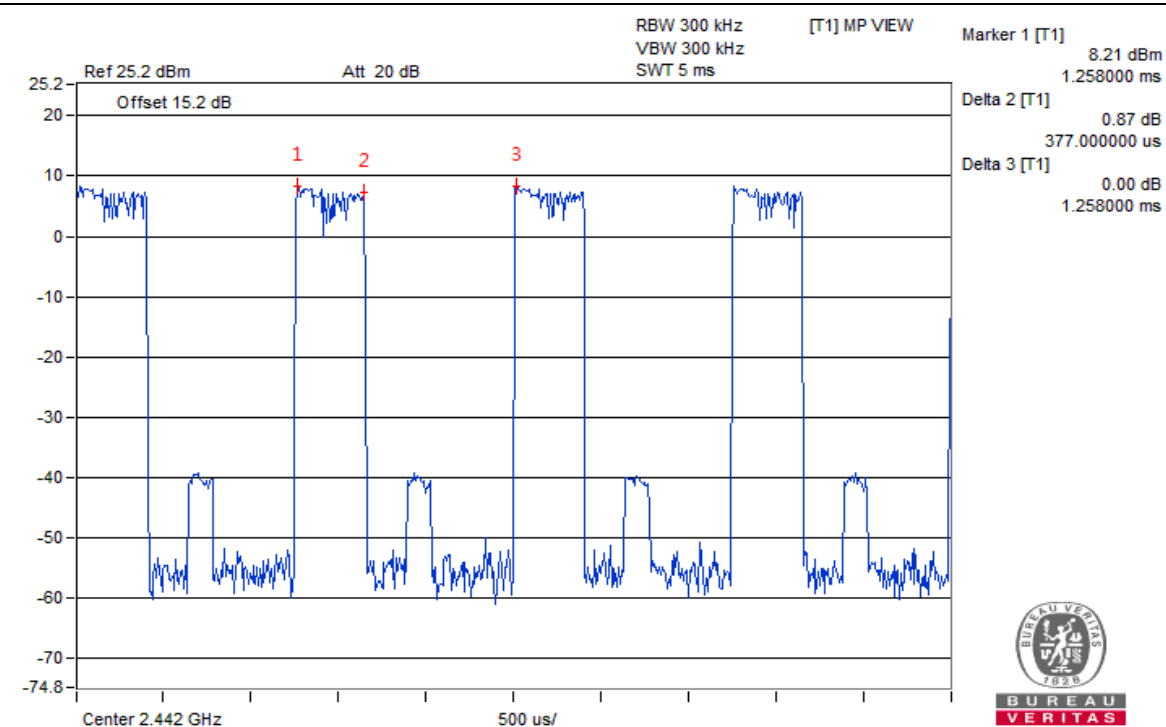
2DH1



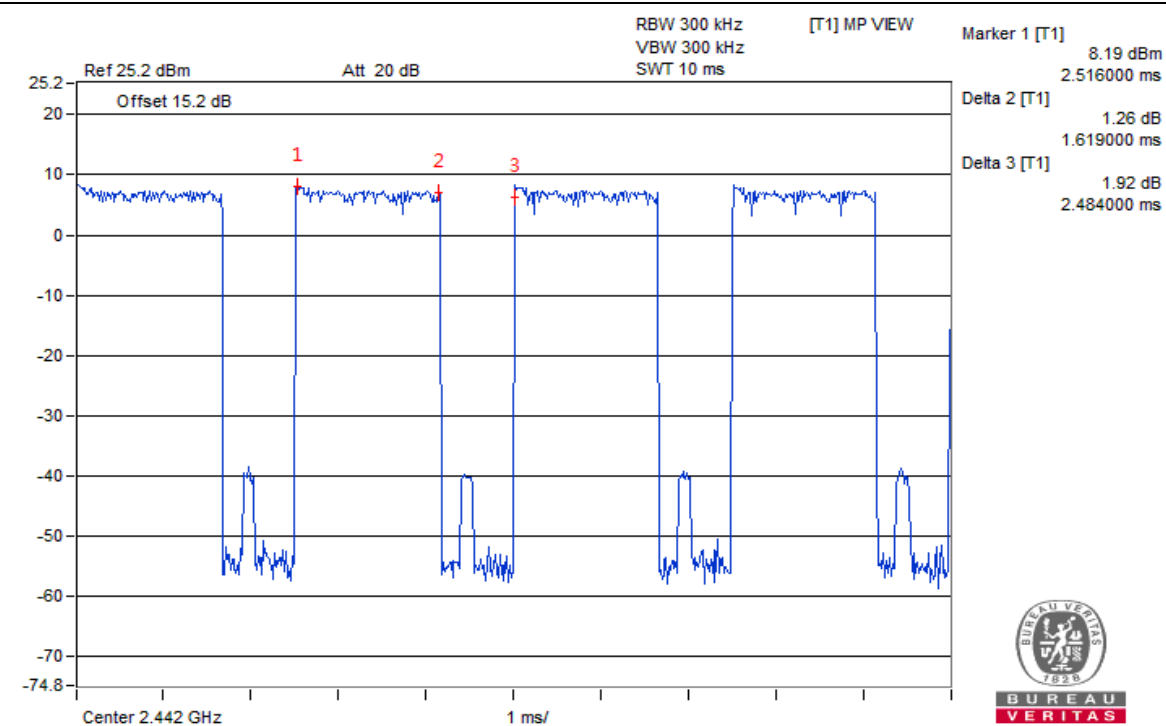
2DH3



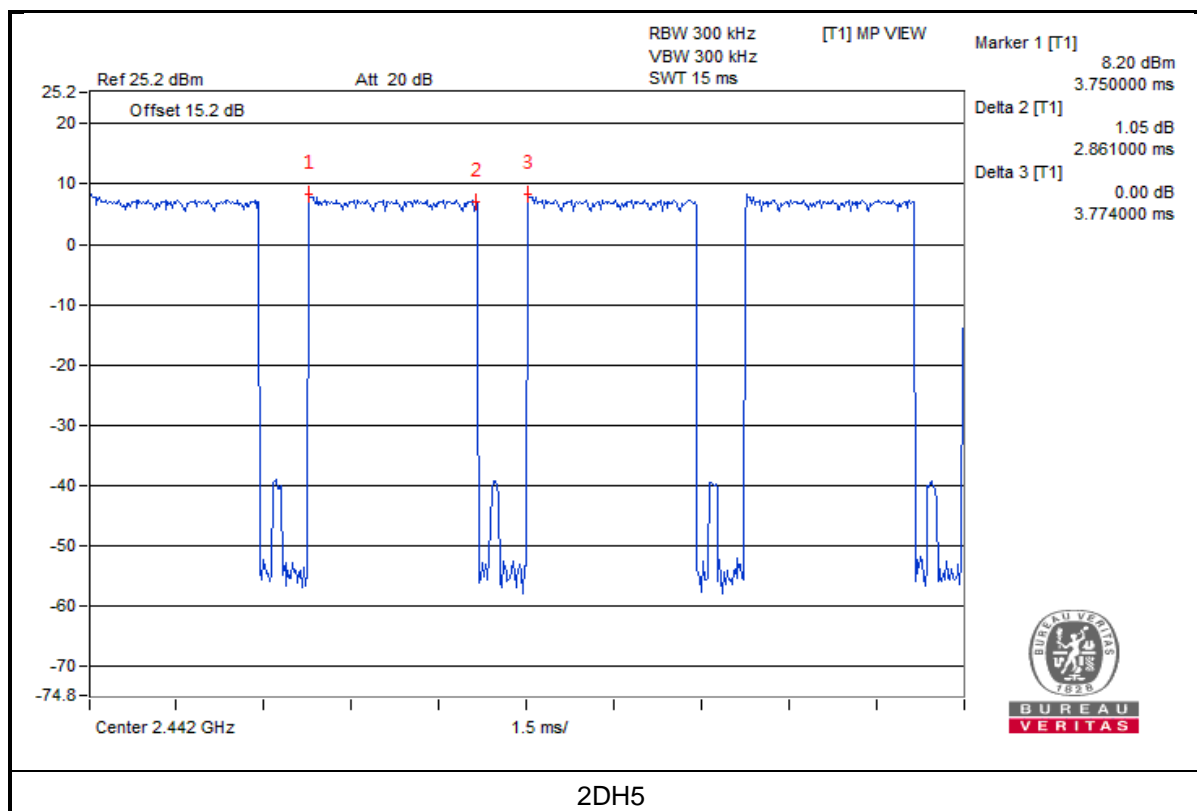
V_{min}.



2DH1



2DH3



Modulation: 8DPSK

Normal Mode:

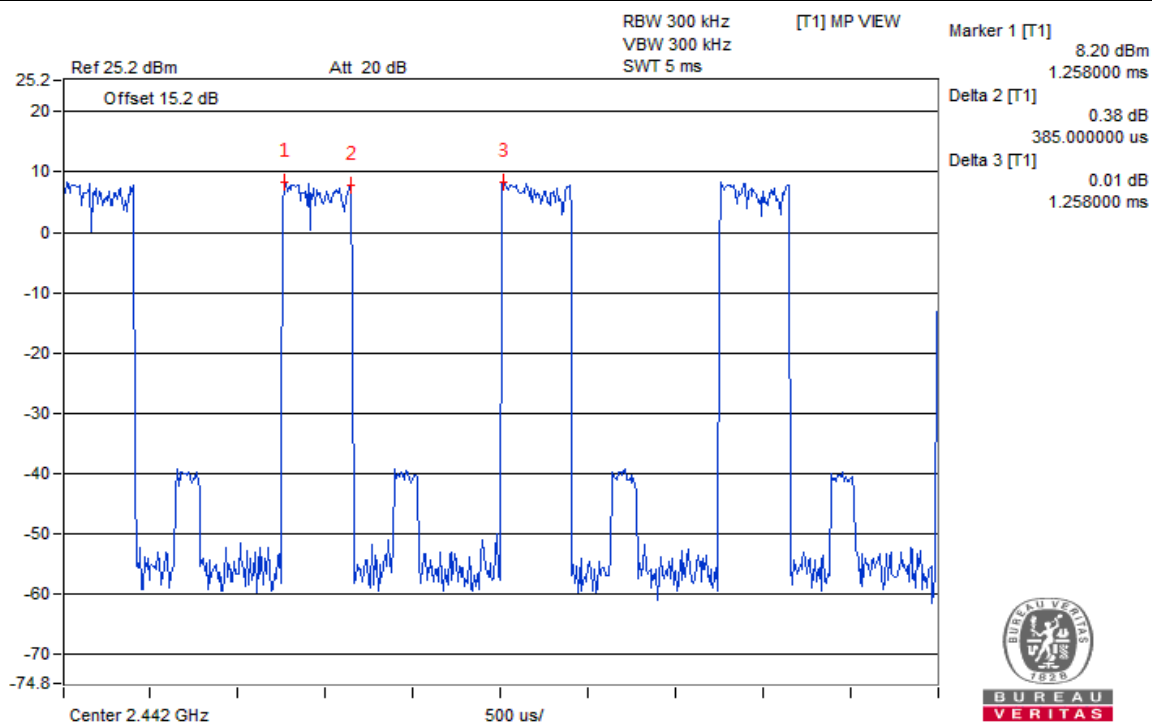
Test Condition	Mode	Spreading Rate	[Spreading Rate/79]*0.4	Duty Cycle	Result (msec)	Limit (msec)
V _{normal}	3DH1	70.20	0.355	0.306	108.630	400
	3DH3	70.20	0.355	0.654	232.170	400
	3DH5	70.20	0.355	0.764	271.220	400
V _{max.}	3DH1	70.20	0.355	0.306	108.630	400
	3DH3	70.20	0.355	0.647	229.685	400
	3DH5	70.20	0.355	0.764	271.220	400
V _{min.}	3DH1	70.20	0.355	0.306	108.630	400
	3DH3	70.20	0.355	0.647	229.685	400
	3DH5	70.20	0.355	0.764	271.220	400

AFH Mode:

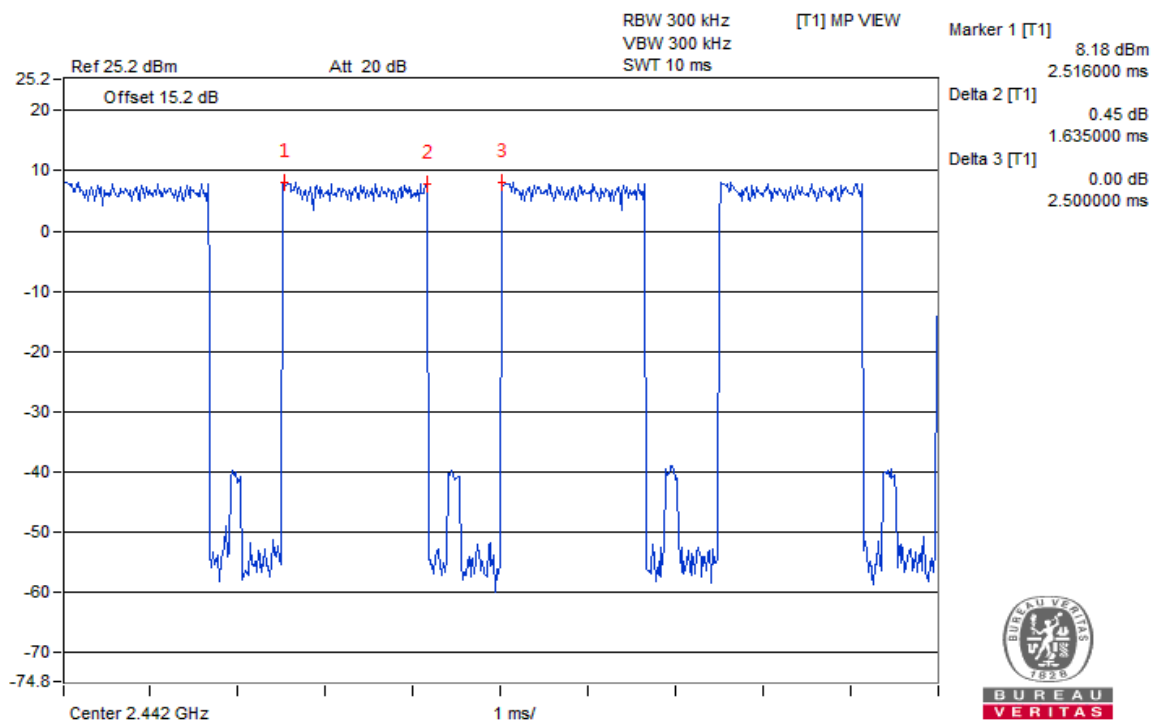
Test Condition	Mode	Spreading Rate	[Spreading Rate/20]*0.4	Duty Cycle	Result (msec)	Limit (msec)
V _{normal}	3DH1	18.27	0.365	0.306	111.690	400
	3DH3	18.27	0.365	0.654	238.710	400
	3DH5	18.27	0.365	0.764	278.860	400
V _{max.}	3DH1	18.35	0.367	0.306	112.302	400
	3DH3	18.35	0.367	0.647	237.449	400
	3DH5	18.35	0.367	0.764	280.388	400
V _{min.}	3DH1	18.35	0.367	0.306	112.302	400
	3DH3	18.35	0.367	0.647	237.449	400
	3DH5	18.35	0.367	0.764	280.388	400

NOTE: Test plots of the transmitting time slot are shown on following pages.

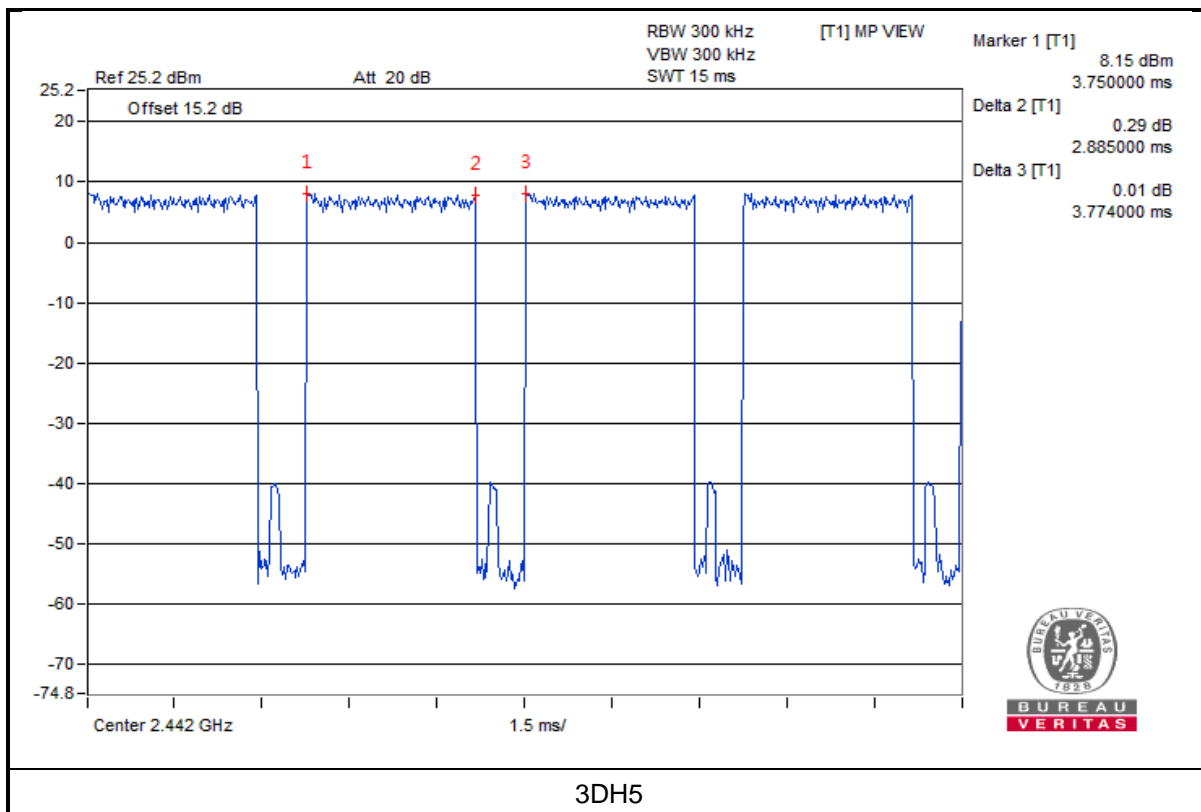
V_{normal}



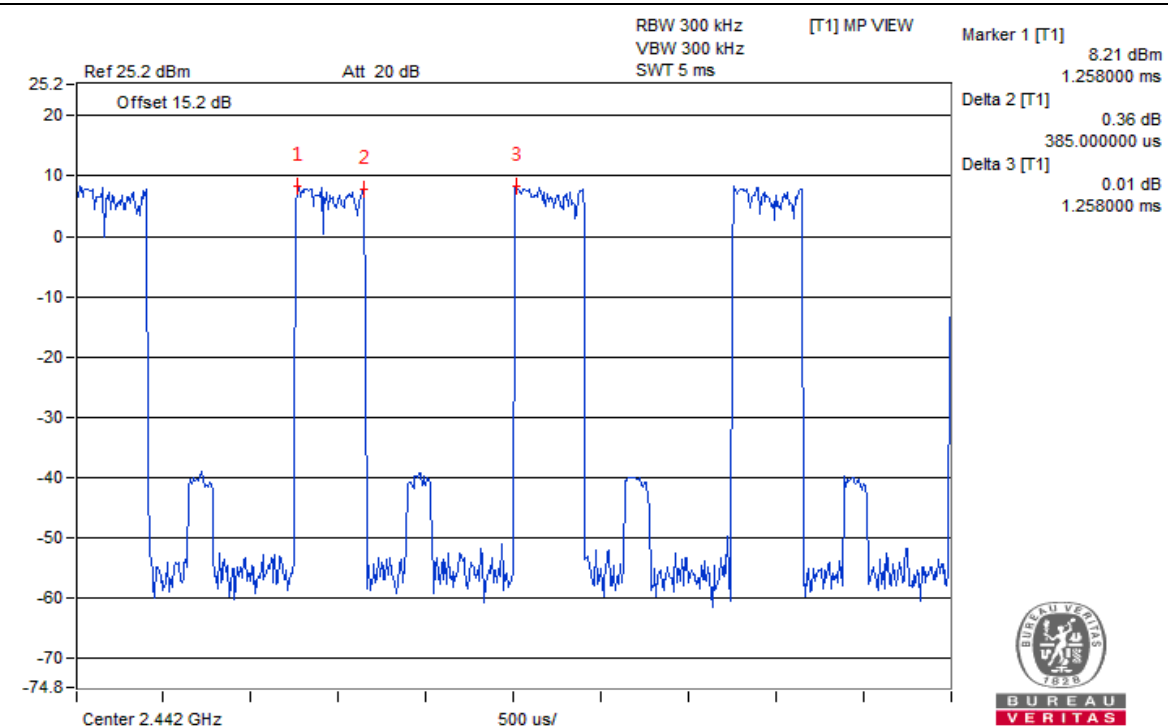
3DH1



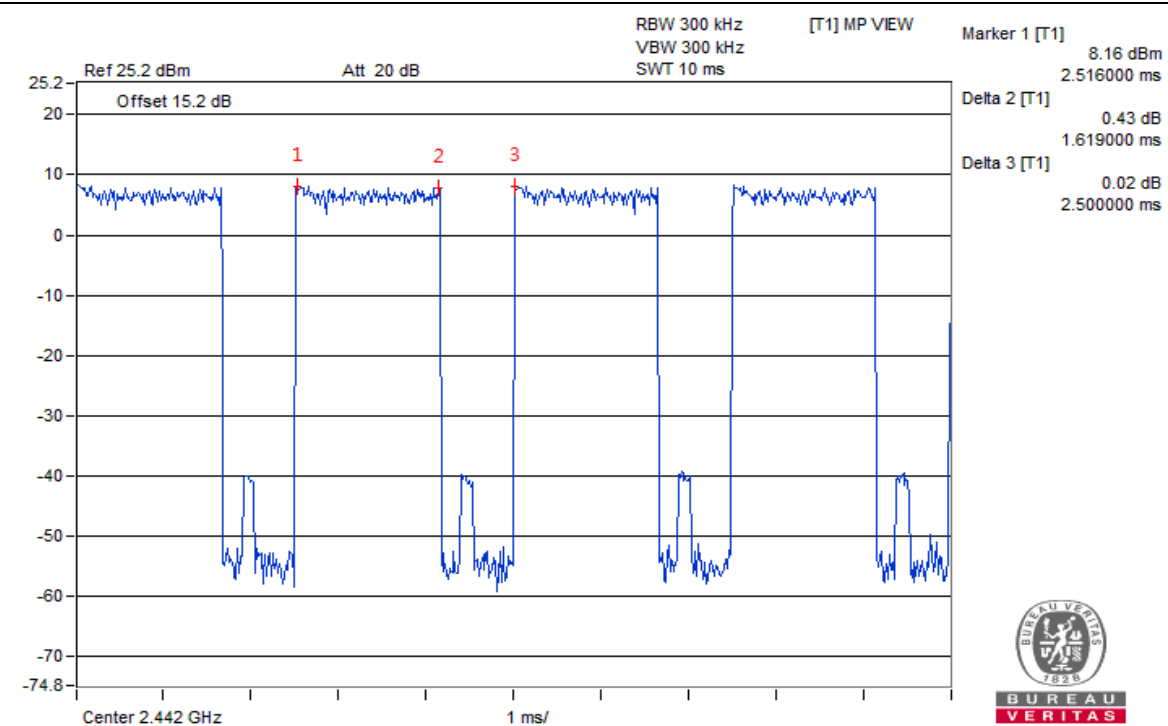
3DH3



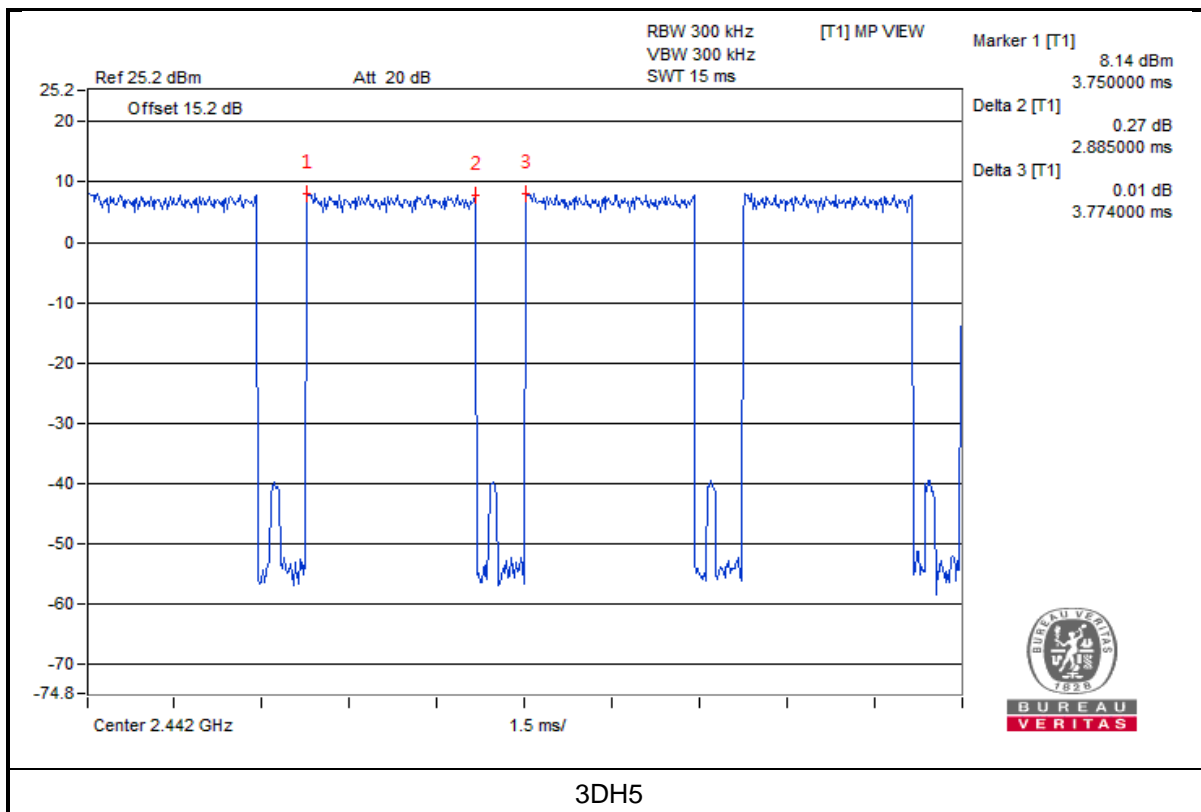
V_{max}.



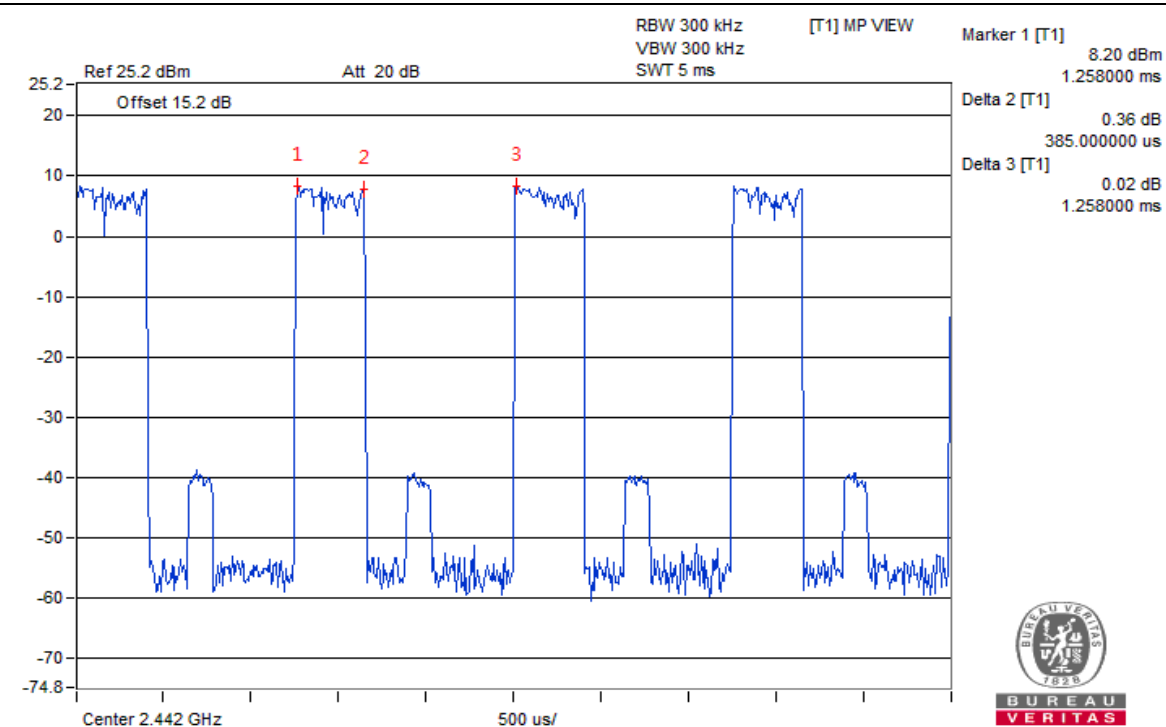
3DH1



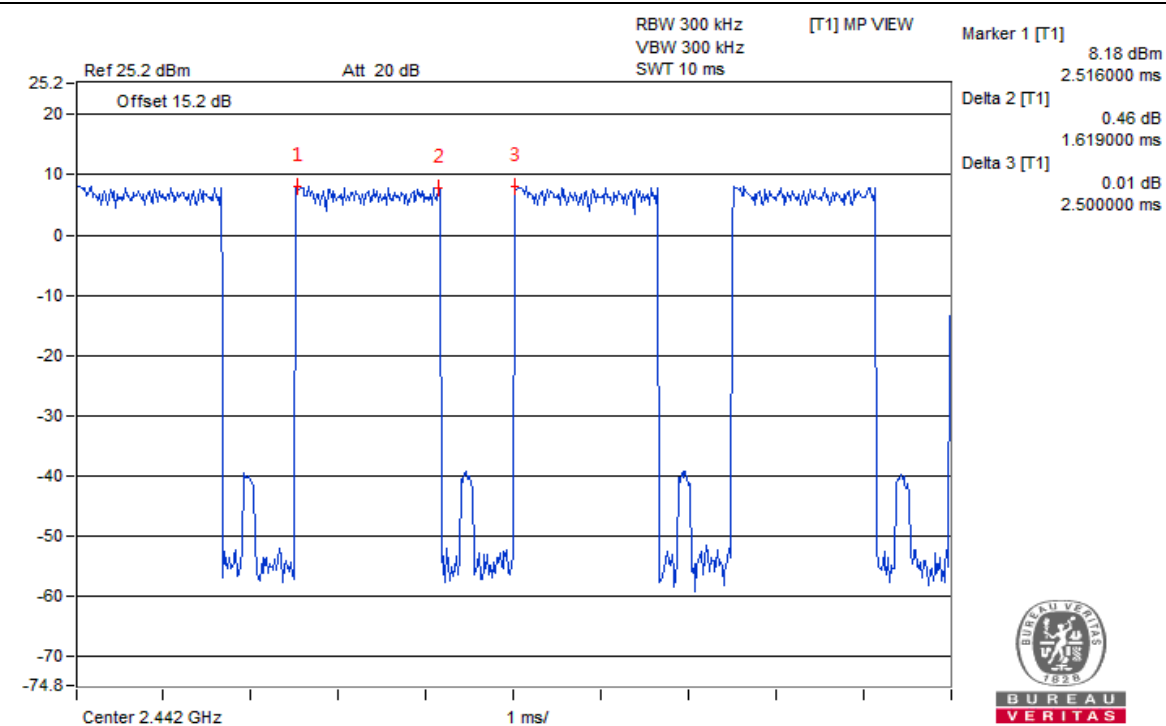
3DH3



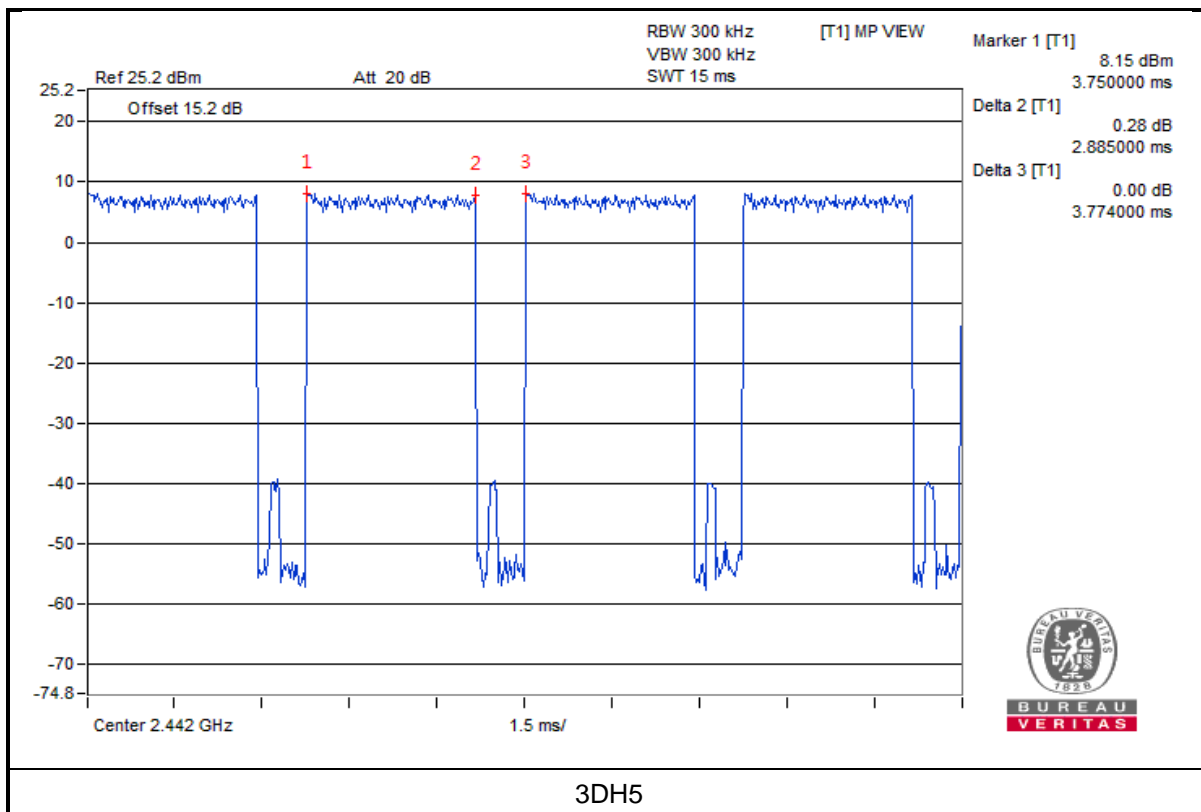
V_{min}.



3DH1



3DH3

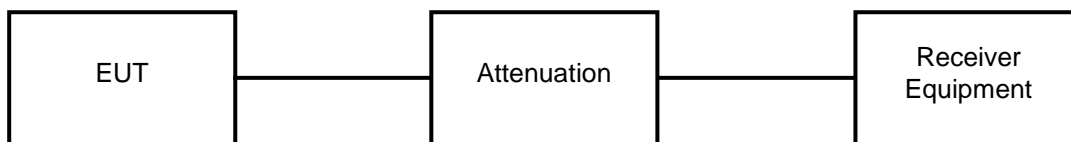


4.8 Interference Prevention Function

4.8.1 Limits of Interference Prevention Function

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

4.8.2 Test Setup



4.8.3 Test Results

Environmental Conditions	25 deg.C, 68 % RH
Link Mode	Test Result
Bluetooth EDR	Pass

5 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration	Calibration Authority	Cal. Method
SPECTRUM ANALYZER / ROHDE & SCHWARZ	FSU43	101261	Apr. 16, 2020	Apr. 15, 2021	ETC	c)
SIGNAL GENERATOR / AGILENT	N5182B	MY53050430	Nov. 25, 2019	Nov. 24, 2020	ETC	c)
POWER METER / ANRITSU	ML2495A	1145013	May 28, 2019	May 27, 2020	ETC	c)
POWER SENSOR / ANRITSU	MA2411B	1126085	May 28, 2019	May 27, 2020	ETC	c)
2WAY DIV / WOKEN	2Way SMA Fwd.:30W/Rev.:2W Isolated Powe	COM412W5E3	Jan. 21, 2020	Jan. 20, 2021	BV CPS E&E	d)
BLUETOOTH TESTER / ROHDE & SCHWARZ	CBT	100980	Jul. 18, 2019	Jul. 17, 2020	ETC	c)
DC POWER SUPPLY / TWINTEX	TP-3305D	11T35D0801027	NA	NA	BV CPS E&E	d)
TRUE RMS CLAMP METER	325	31130711WS	May 21, 2019	May 20, 2020	ETC	c)

NOTE:

- The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
- 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) ~ TELEC EngineeringCenter, Intertek Japan K.K., Keysight Technologies, Inc ~.
 - b) : Correction conducted pursuant to the provisions of Article 135 or Article 144 of the MeasurementLaw (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) ~ TELEC EngineeringCenter, Intertek Japan K.K., Keysight Technologies, Inc ~.
 - d) : Calibration conducted by using other equipment that listed above from a) to c)

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

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