

JAPAN MIC TEST REPORT

For

MPOW TECHNOLOGY CO.,LIMITED

FLAT/RM 605 6/F FA YUEN COMMERCIAL BUILDING 75-77 FA YUEN STREET MONGKOK KL
HONG KONG

Model: BH437A


This Report Concerns: <input checked="" type="checkbox"/> Original Report		Equipment Type: TRUE WIRELESS EARBUDS
Report Number:	RDG200714012-07A	
Report Date:	2020-07-23	
Reviewed By:	Ivan Cao Assistant Manager 	
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn	

TABLE OF CONTENTS

GENERAL INFORMATION.....	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
OBJECTIVE	3
TEST METHODOLOGY	3
MEASUREMENT UNCERTAINTY.....	3
DECLARATIONS.....	4
EUT TEST CONFIGURATION	5
DESCRIPTION OF TEST CONFIGURATION	5
EUT EXERCISE SOFTWARE	5
EQUIPMENT MODIFICATIONS	5
SUPPORT EQUIPMENT LIST AND DETAILS	5
CONFIGURATION OF TEST SETUP	5
TEST EQUIPMENT LIST AND DETAILS.....	6
TEST ENVIRONMENTAL CONDITIONS	6
SUMMARY OF TEST RESULTS	7
FREQUENCY ERROR	8
LIMIT	8
TEST PROCEDURE	8
TEST DATA	8
OCCUPIED BANDWIDTH AND SPREADING BANDWIDTH	10
LIMIT	10
TEST PROCEDURE	10
TEST DATA	10
TRANSMITTER SPURIOUS EMISSION STRENGTH AND UNWANTED EMISSION INTENSITY.....	12
LIMIT	12
TEST PROCEDURE	12
TEST DATA	12
ANTENNA OUTPUT POWER AND ANTENNA POWER TOLERANCE.....	23
LIMIT	23
TEST PROCEDURE	23
TEST DATA	23
RECEIVER SPURIOUS EMISSION AND UNWANTED EMISSION INTENSITY	25
LIMIT	25
TEST PROCEDURE	25
TEST DATA	25
FREQUENCY HOPPING DWELL TIME	30
APPLICABLE STANDARD	30
TEST PROCEDURE	30
TEST DATA	30
INTERFERENCE PREVENTION FUNCTION.....	36
REQUIREMENT	36
TEST PROCEDURE	36
MEASUREMENT RESULT	36
CONSTRUCTION PROTECTION CONFIRMATION	37
LIMIT	37
CONFIRMATION METHOD.....	37

GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

EUT Name:	TRUE WIRELESS EARBUDS
EUT Model:	BH437A
Modulation Type	GFSK, $\pi/4$ DQPSK, 8DPSK
Emission Type	F1D
Frequency Range	2402-2480MHz
Output Power	0.02mW/MHz
Antenna Gain	-4.5 dBi
Rated Input Voltage:	DC 3.7V from battery or charged by charger base
Serial Number:	RDG200714012-RF -S1
EUT Received Date:	2020.07.17
EUT Received Status:	Good

Objective

The objective of the manufacturer is to demonstrate compliance with Radio Law of Japan item 19 of Article 2 Paragraph 1.

Test Methodology

All measurements contained in this report were conducted with technical regulations of the Radio Law of Japan.

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	$\pm 5\%$
RF output power, conducted	$\pm 0.61\text{dB}$
Unwanted Emissions, conducted	$\pm 1.5\text{dB}$
Temperature	$\pm 1^\circ\text{C}$
Humidity	$\pm 5\%$
DC and low frequency voltages	$\pm 0.4\%$
Duty Cycle	1%

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Declarations

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol “Δ”. Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

This report cannot be reproduced except in full, without prior written approval of the Company.

This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

This report may contain data that are not covered by the accreditation scope and shall be marked with an asterisk “★”.

EUT TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in engineering mode which provide by manufacturer. For Bluetooth, EUT was tested with Channel 2402MHz, 2441MHz, 2480MHz.

The extreme voltage test conditions which were declared by the manufacturer and the normal conditions are as below:

NV: Normal Voltage 3.7V_{DC}

LV: Low Voltage 3.3V_{DC}

HV: High Voltage 4.2V_{DC}

EUT Exercise Software

The 'Airoha.Tool.Kit' command was used during test, which was provided by manufacturer. The maximum power level was configured by the software as below table:

Mode	Channel	Frequency (MHz)	Power Level Setting
GFSK	Low	2402	63
	Middle	2441	63
	High	2480	63
$\pi/4$ -DQPSK	Low	2402	63
	Middle	2441	63
	High	2480	63
8DPSK	Low	2402	63
	Middle	2441	63
	High	2480	63

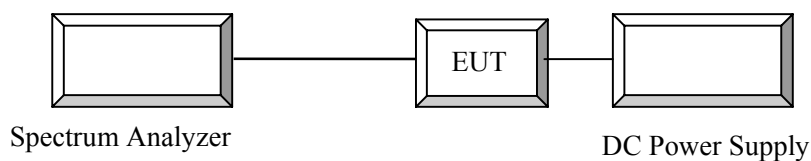
Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Pro instrument	DC Power Supply	pps3300	3300012

Configuration of Test Setup



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU 26	200256	2020-07-07	2021-07-07
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each time	N/A
Agilent	USB Wideband Power Sensor	U2022XA	MY5417006	2019-09-23	2020-09-23
UNI-T	Multimeter	UT39A	M130199938	2019-07-23	2020-07-23
Agilent	Signal Generator	E8247C	MY43321350	2019-12-10	2020-12-10
Pro instrument	DC Power Supply	pps3300	3300012	N/A	N/A

** Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to requirements, traceable to National Primary Standards and International System of Units (SI).*

Test Environmental Conditions

Temperature:	28.8 ~ 30°C
Relative Humidity:	50~57 %
ATM Pressure:	99.9~100.6kPa
Tester:	Rita Huang
Test Date:	2020.07.17~2020.07.20

SUMMARY OF TEST RESULTS

MIC Notice No.88 Appendix No.43 Article 2, Paragraph 1, Item 19 Rules Section	Description of Test	Result
3	Frequency Error	Compliance
4	Occupied Bandwidth and Spreading Bandwidth	Compliance
5	Transmitter Spurious Emission and Unwanted Emission Intensity	Compliance
6	Antenna Output Power and Output Power Tolerance	Compliance
7	Receiver Spurious Emission and Unwanted Emission Intensity	Compliance
10	Transmission Antenna Gain	Not Applicable
11	Transmission Radiation Angle Width	Not Applicable
12	Interference Prevention Function	Compliance
13	Frequency Hopping Dwell Time	Compliance
Note 1	Construction Protection Confirmation	Compliance

Not Applicable: this item not applicable for the EIRP less than 6.91dBm/MHz.

FREQUENCY ERROR

Limit

50ppm or below

Test Procedure

Set the EUT to the measurement frequency without modulation.
Setting of SA is following as: Sweep time: Auto / Sweep Mode: Continuous sweep / Detect mode: Positive peak / Trace mode: Max hold.
Record the peak spot frequency.

If the EUT can't set at un-modulation mode, measure the 10dBc center frequency.

Test Data

Test Result: Compliant

Test Mode: Transmitting

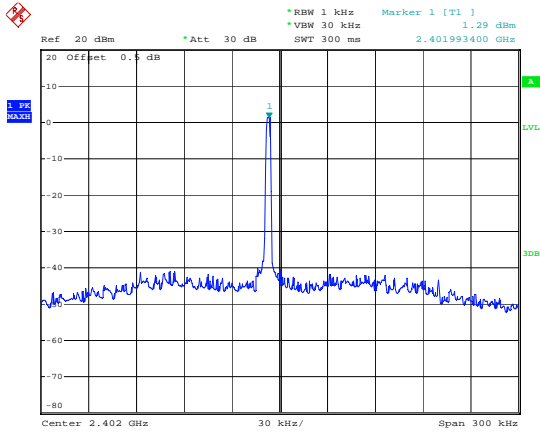
Test Frequency (MHz)	Voltage	Measured Frequency (MHz)	Tolerance (ppm)	Limit
2402	LV	2401.9962	-1.58	≤50ppm
	NV	2401.9934	-2.75	
	HV	2401.9923	-3.21	
2441	LV	2440.9901	-4.06	
	NV	2440.9910	-3.69	
	HV	2440.9990	-0.41	
2480	LV	2479.9913	-3.51	
	NV	2479.9904	-3.87	
	HV	2479.9901	-3.99	

Note:

$$\text{Tolerance} = (\text{Measured Frequency} - \text{Test Frequency}) / \text{Test Frequency} * 10^6$$

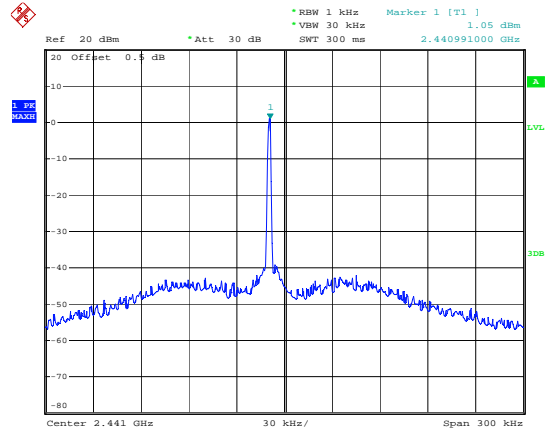
Please refer to the plots for normal voltage test:

Low Channel



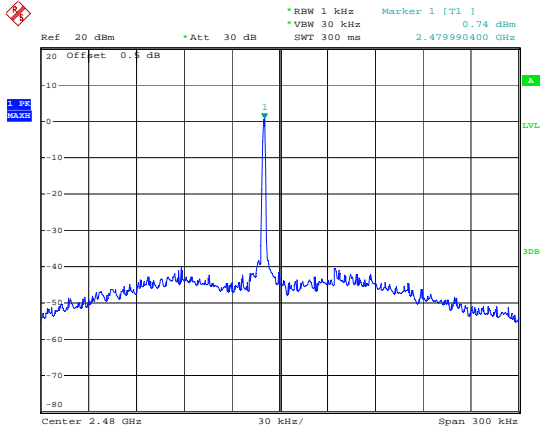
Date: 17.JUL.2020 15:37:50

Middle Channel



Date: 17.JUL.2020 15:38:55

High Channel



Date: 17.JUL.2020 15:39:56

OCCUPIED BANDWIDTH AND SPREADING BANDWIDTH

Limit

- Occupied bandwidth: $FH \leq 83.5$ MHz
- Spread Bandwidth: ≥ 500 kHz, Spread factor ≥ 5 .

Test Procedure

- ❖ Conditions of Application Equipment (EUT)
 - The modulation state shall be “continuous frequency-hopping mode” by spread spectrum.
- ❖ Spectrum Analyzer Conditions
 - RBW: 300 kHz
 - VBW: 300 kHz
 - Sweep time: Auto, Marker: Marker Off
 - Log scale : 10dB/Div, Data points : 501points (400 points or more)
 - Detection: Positive Peak, Sweep mode: Continuous

Test Data

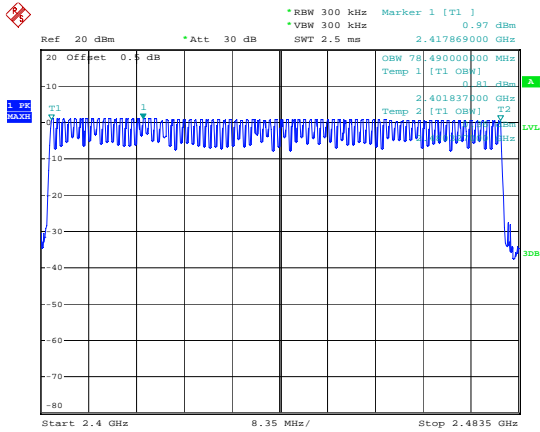
Test Result: Compliance

Test Mode: Transmitting

Mode	Voltage	LV	NV	HV	Limit
GFSK	Occupied Bandwidth (MHz)	78.507	78.490	78.474	≤ 83.5 MHz
	Spread Bandwidth (MHz)	71.327	71.600	71.310	≥ 500 kHz
	Spread Factor	71.327	71.600	71.310	≥ 5
$\pi/4$ -DQPSK	Occupied Bandwidth (MHz)	78.641	78.657	78.643	≤ 83.5 MHz
	Spread Bandwidth (MHz)	71.484	71.600	71.456	≥ 500 kHz
	Spread Factor	71.484	71.600	71.456	≥ 5
8DPSK	Occupied Bandwidth (MHz)	78.471	78.490	78.509	≤ 83.5 MHz
	Spread Bandwidth (MHz)	71.473	71.600	71.456	≥ 500 kHz
	Spread Factor	71.473	71.600	71.456	≥ 5

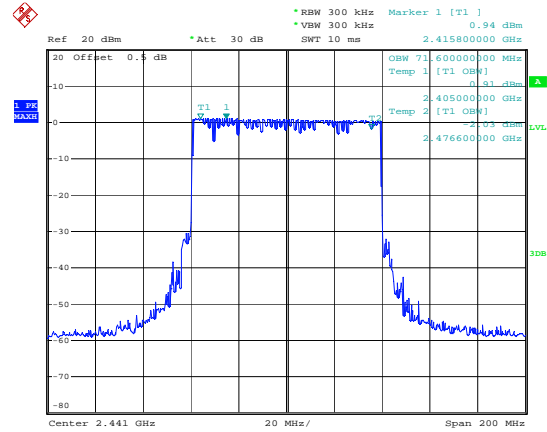
Spread Factor=Spread Bandwidth/modulation rate. The modulation rate: MR=1.
Please refer to the below plots for normal voltage test.

GFSK Occupied Bandwidth



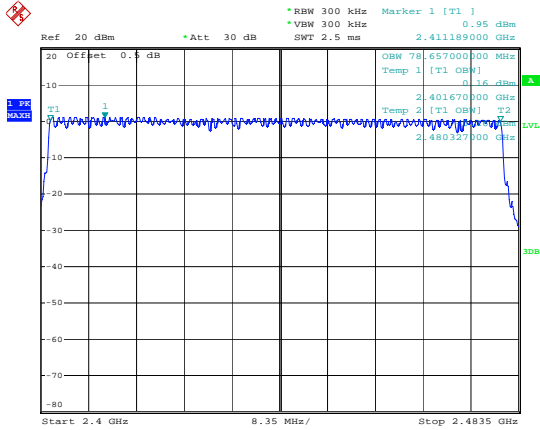
Date: 17.JUL.2020 15:36:38

GFSK Spread Bandwidth



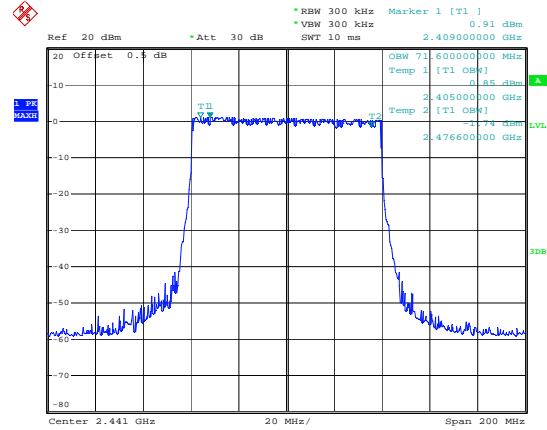
Date: 17.JUL.2020 14:50:43

$\pi/4$ -DQPSK Occupied Bandwidth



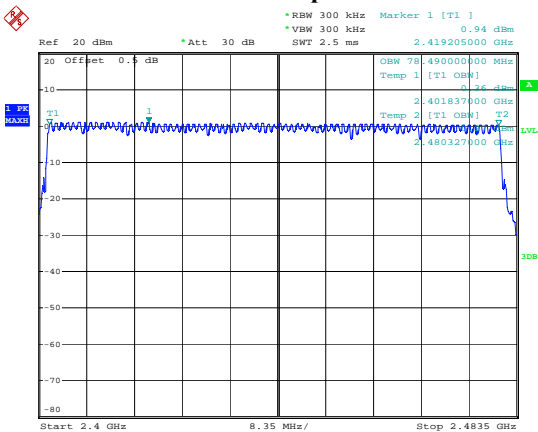
Date: 17.JUL.2020 15:33:46

$\pi/4$ -DQPSK Spread Bandwidth



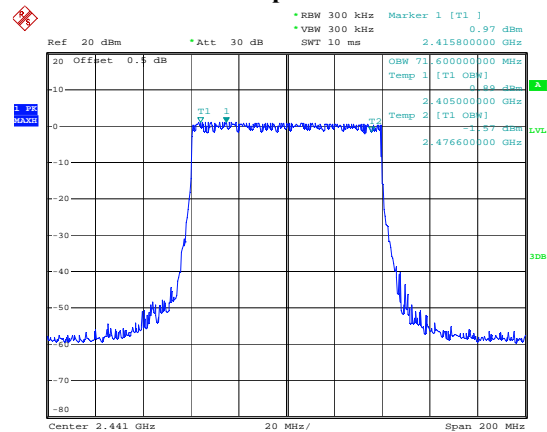
Date: 17.JUL.2020 15:09:19

8DPSK Occupied Bandwidth



Date: 17.JUL.2020 15:30:40

8DPSK Spread Bandwidth



Date: 17.JUL.2020 15:12:42

TRANSMITTER SPURIOUS EMISSION STRENGTH AND UNWANTED EMISSION INTENSITY

Limit

- $f < 1000 \text{ MHz}$: $\leq 0.25 \mu\text{W}/100\text{kHz}$
- $f < 2387 \text{ MHz}$, $f > 2496.5 \text{ MHz}$: $\leq 2.5 \mu\text{W}/\text{MHz}$
- $2387 \text{ MHz} \leq f \leq 2400 \text{ MHz}$; $2483.5 \text{ MHz} < f \leq 2496.5 \text{ MHz}$: $\leq 25 \mu\text{W}/\text{MHz}$

Test Procedure

❖ Conditions of Application Equipment (EUT)

- The modulation state shall be in continuously transmitting mode.

❖ Spectrum Analyzer Conditions

Step1:

- Setting of SA start 30MHz and stop frequency 1000MHz, RB:100kHz/VB:100kHz, Sweep time: Auto. Sweep mode: continuous sweep .Detect mode: Positive peak/Trace mode: max hold. Then to mark peak. reading value + cable loss shall be less than $0.25 \mu\text{W}/100\text{kHz}$.
- Setting of SA start 1000MHz and stop frequency 2387MHz, RBW: 1MHz/VBW: 1MHz, Sweep time: Auto. Sweep mode: continuous sweep .Detect mode: Positive peak/Trace mode: max hold. Then to mark peak. Reading value + cable loss shall be less than $2.5 \mu\text{W}/\text{MHz}$.
- Setting of SA start 2387MHz and stop frequency 2400MHz, RBW: 1MHz/VBW: 1MHz, Sweep time: Auto. Sweep mode: continuous sweep .Detect mode: Positive peak/Trace mode: max hold. Then to mark peak. Reading value + cable loss shall be less than $25 \mu\text{W}/\text{MHz}$.
- Setting of SA start 2483.5MHz and stop frequency 2496.5MHz, RBW: 1MHz/VBW: 1MHz, Sweep time: Auto. Sweep mode: continuous sweep .Detect mode: Positive peak/Trace mode: max hold. Then to mark peak. Reading value + cable loss shall be less than $25 \mu\text{W}/\text{MHz}$.
- Setting of SA start 2496.5MHz and stop frequency 12500MHz, RBW: 1MHz/VBW: 1MHz, Sweep time: Auto. Sweep mode: continuous sweep .Detect mode: Positive peak/Trace mode: max hold. Then to mark peak. Reading value + cable loss shall be less than $2.5 \mu\text{W}/\text{MHz}$.

Step 2:

Center frequency: Searched Frequency

Span: 0Hz

RBW:1MHz(Above 1GHz), 100 kHz(30MHz-1GHz). VBW: Same as RBW.

Sweep time: Auto(Minimum time to ensure measurement accuracy. *In case of burst wave, one burst shall be included per data point) Data points: 400 points or more. Sweep mode: Single Sweep.

Detection Mode: Sample

Test Data

Test Result: Compliance

Test Mode: Transmitting

GFSK:

Frequency Band	Low Channel			Middle Channel			High Channel			Limit
	LV	NV	HV	LV	NV	HV	LV	NV	HV	
Band I (dBm/100kHz)	-62.48	-61.94	-60.98	-61.97	-62.39	-62.63	-61.13	-61.19	-61.49	-36dBm/100kHz (0.25μW/100kHz)
Band II (dBm/MHz)	-41.27	-42.11	-42.41	-44.86	-45.76	-44.68	-49.37	-48.95	-49.91	-26dBm/MHz (2.5μW/MHz)
Band III (dBm/MHz)	-19.08	-18.06	-18.60	-47.16	-46.38	-46.86	-44.55	-45.15	-44.73	-16dBm/MHz (25μW/MHz)
Band IV (dBm/MHz)	-43.95	-42.81	-43.23	-42.23	-42.53	-41.21	-23.22	-22.68	-21.96	-16dBm/MHz (25μW/MHz)
Band V (dBm/MHz)	-39.26	-40.34	-39.80	-41.75	-41.39	-40.49	-42.01	-41.23	-41.83	-26dBm/MHz (2.5μW/MHz)

 $\pi/4$ -DQPSK:

Frequency Band	Low Channel			Middle Channel			High Channel			Limit
	LV	NV	HV	LV	NV	HV	LV	NV	HV	
Band I (dBm/100kHz)	-62.81	-62.09	-62.57	-61.33	-61.51	-60.31	-61.26	-62.46	-63.06	-36dBm/100kHz (0.25μW/100kHz)
Band II (dBm/MHz)	-49.30	-48.94	-48.40	-49.77	-50.43	-51.63	-50.45	-51.65	-50.63	-26dBm/MHz (2.5μW/MHz)
Band III (dBm/MHz)	-25.12	-25.30	-25.78	-45.49	-46.45	-45.25	-41.11	-40.93	-39.79	-16dBm/MHz (25μW/MHz)
Band IV (dBm/MHz)	-44.24	-43.04	-43.58	-43.09	-43.15	-43.09	-18.47	-18.71	-17.51	-16dBm/MHz (25μW/MHz)
Band V (dBm/MHz)	-42.17	-41.99	-41.33	-41.07	-41.01	-41.85	-42.92	-41.60	-41.48	-26dBm/MHz (2.5μW/MHz)

8DPSK:

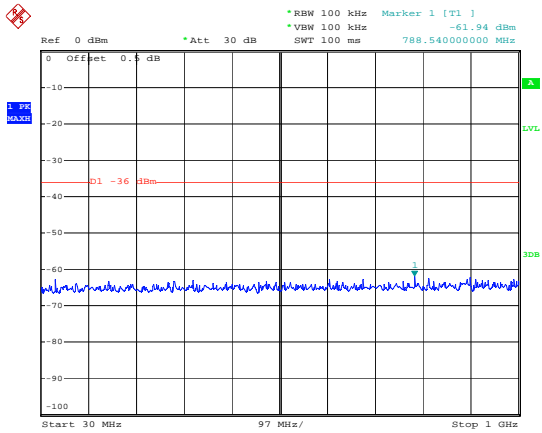
Frequency Band	Low Channel			Middle Channel			High Channel			Limit
	LV	NV	HV	LV	NV	HV	LV	NV	HV	
Band I (dBm/100kHz)	-61.96	-62.08	-62.92	-62.95	-62.11	-60.79	-62.20	-60.88	-59.74	-36dBm/100kHz (0.25μW/100kHz)
Band II (dBm/MHz)	-36.54	-37.44	-38.04	-52.03	-51.31	-51.37	-50.09	-48.89	-50.09	-26dBm/MHz (2.5μW/MHz)
Band III (dBm/MHz)	-24.93	-24.15	-23.67	-44.79	-45.21	-44.61	-43.55	-43.49	-43.55	-16dBm/MHz (25μW/MHz)
Band IV (dBm/MHz)	-44.13	-43.53	-43.41	-41.74	-42.58	-42.46	-18.80	-18.38	-17.60	-16dBm/MHz (25μW/MHz)
Band V (dBm/MHz)	-41.92	-41.14	-40.54	-41.36	-41.18	-40.16	-41.46	-41.76	-41.34	-26dBm/MHz (2.5μW/MHz)

Note: Band I: 30MHz~1000MHz
 Band II: 1000MHz~2387MHz
 Band III: 2387MHz~2400MHz
 Band IV: 2483.5MHz~2496.5MHz
 Band V: 2496.5MHz~12500MHz

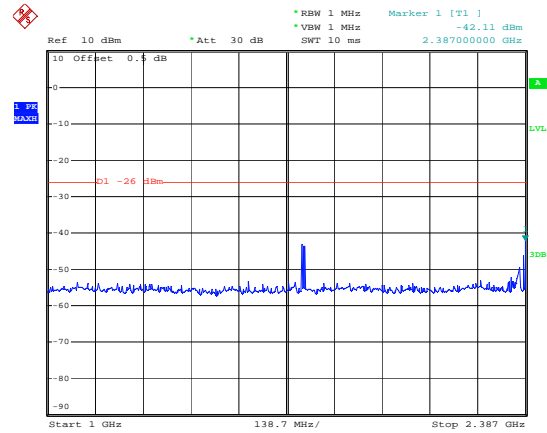
Please refer to the below plots for normal voltage test.

GFSK:

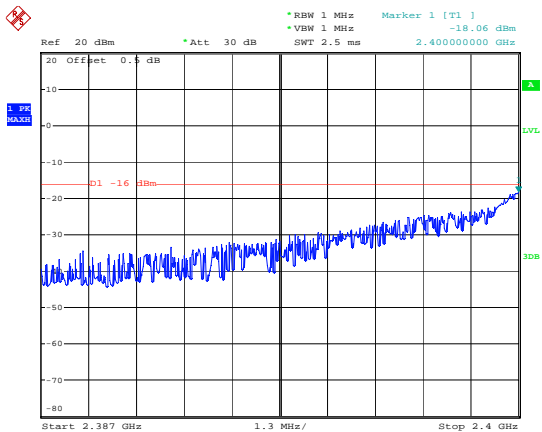
Low Channel



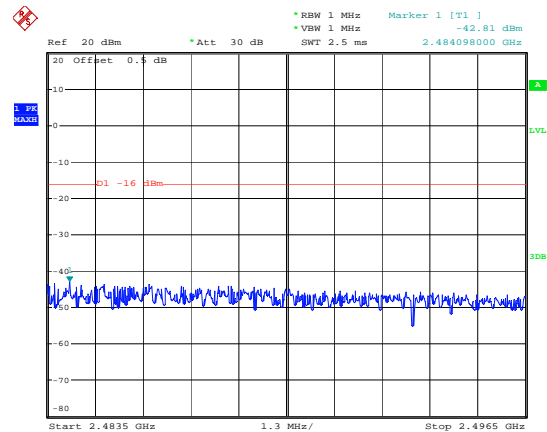
Date: 17.JUL.2020 13:47:54



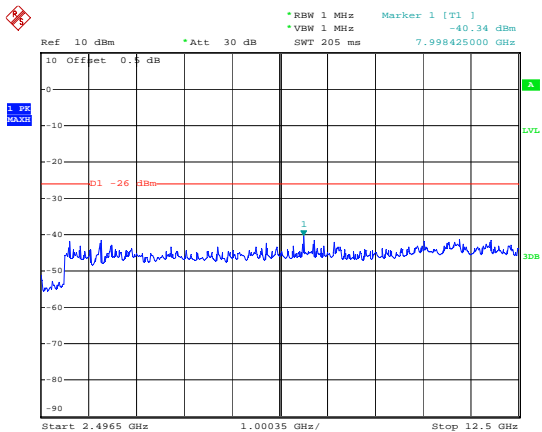
Date: 17.JUL.2020 13:48:10



Date: 17.JUL.2020 13:48:38

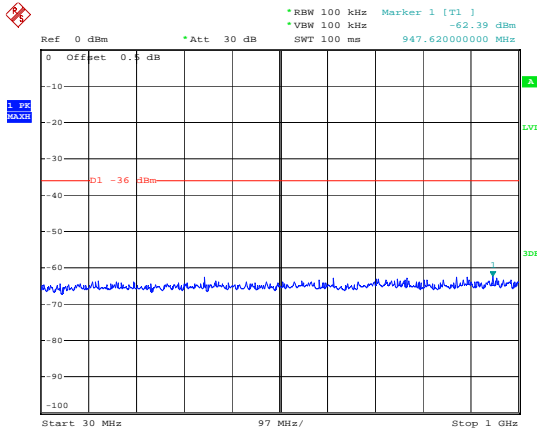


Date: 17.JUL.2020 13:49:00

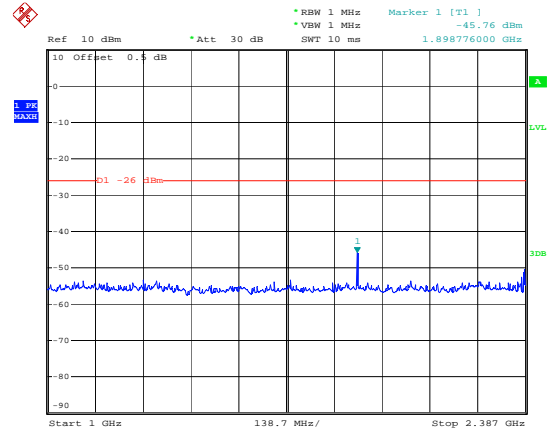


Date: 17.JUL.2020 13:49:12

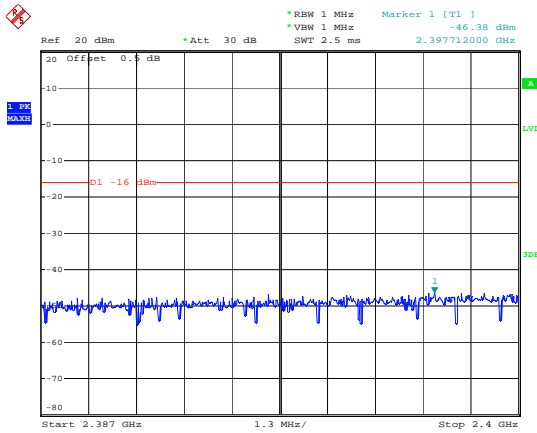
Middle Channel



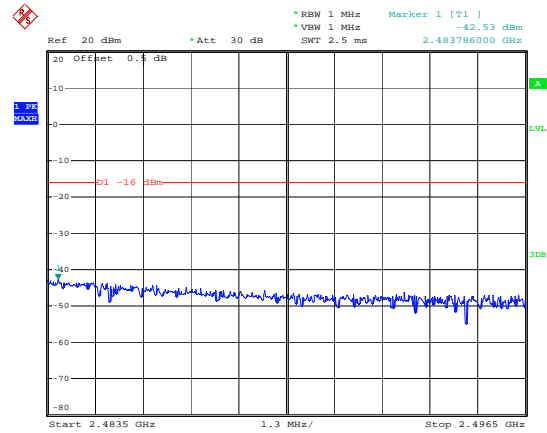
Date: 17.JUL.2020 13:49:40



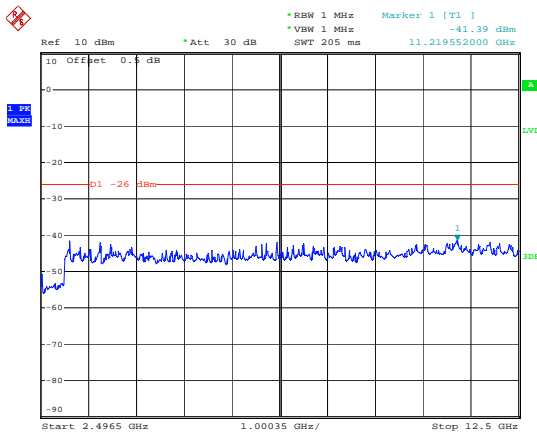
Date: 17.JUL.2020 13:49:52



Date: 17.JUL.2020 13:50:14

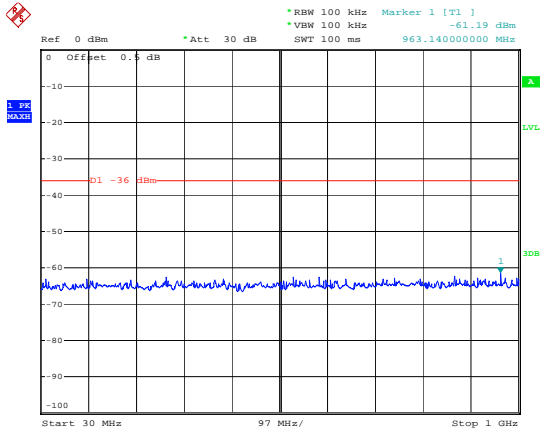


Date: 17.JUL.2020 13:50:33

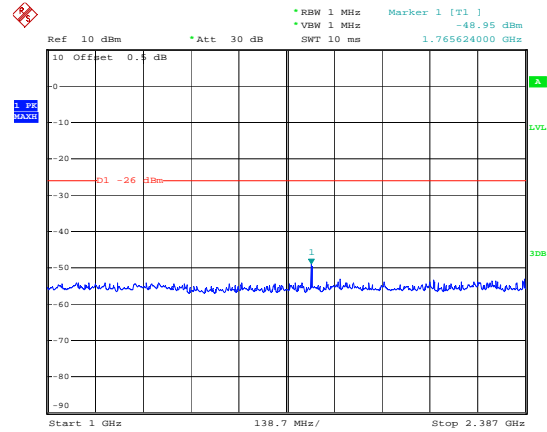


Date: 17.JUL.2020 13:50:45

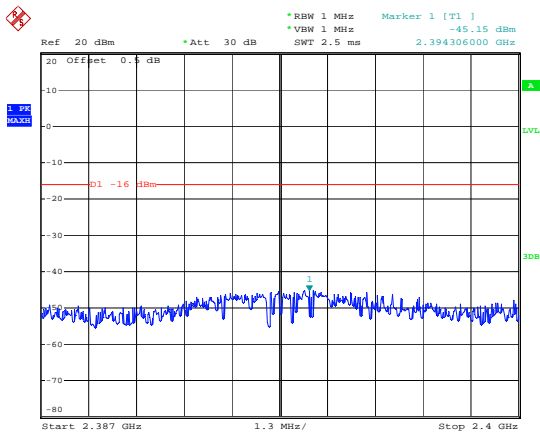
High Channel



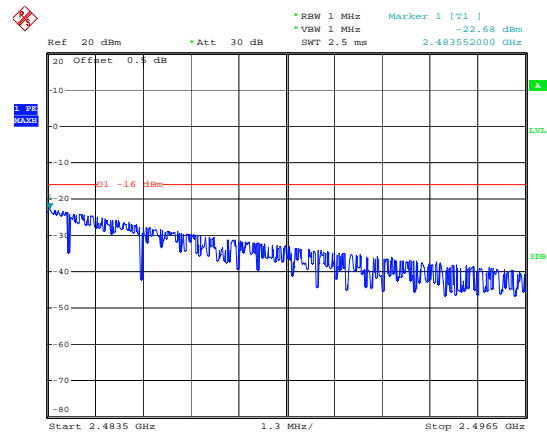
Date: 17.JUL.2020 13:51:16



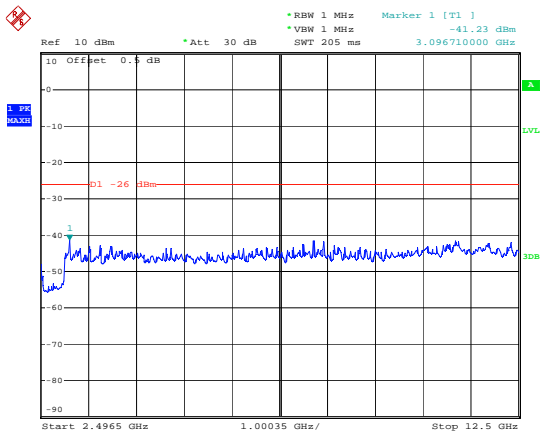
Date: 17.JUL.2020 13:51:32



Date: 17.JUL.2020 13:51:51



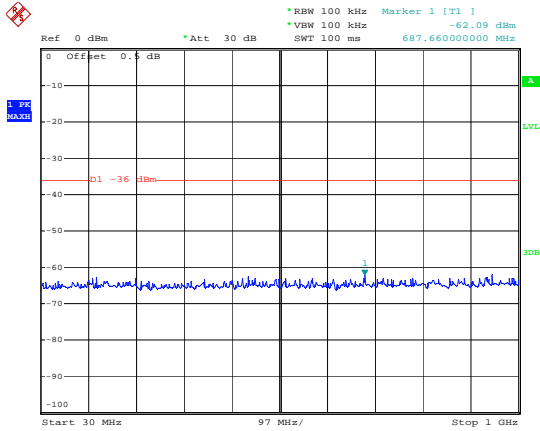
Date: 17.JUL.2020 13:52:16



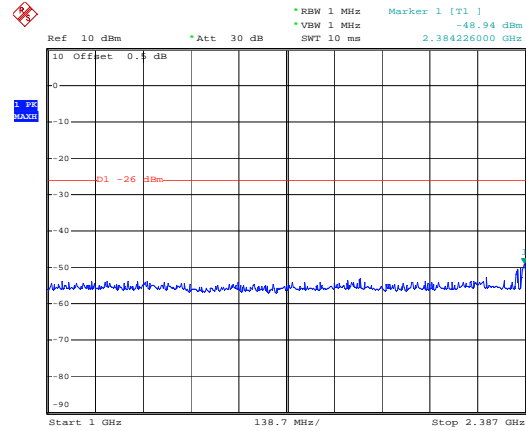
Date: 17.JUL.2020 13:52:28

$\pi/4$ -DQPSK:

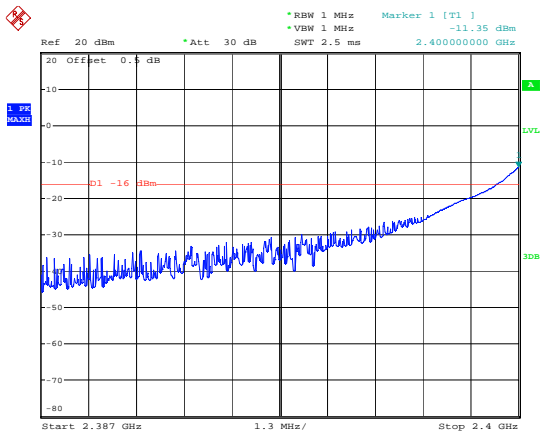
Low Channel



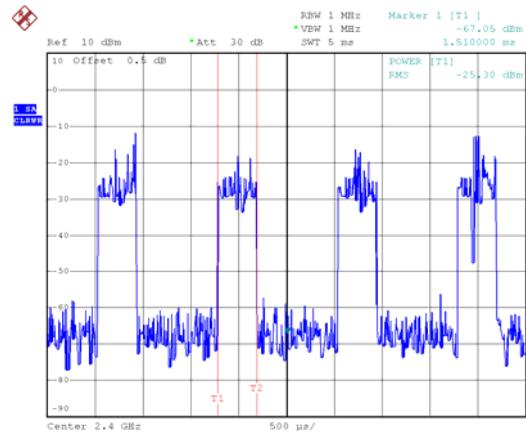
Date: 17.JUL.2020 13:55:57



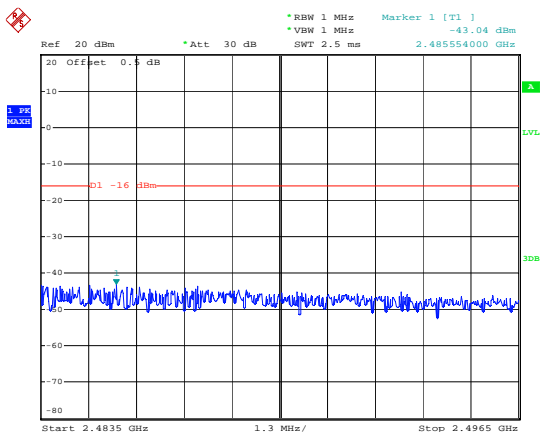
Date: 17.JUL.2020 13:56:13



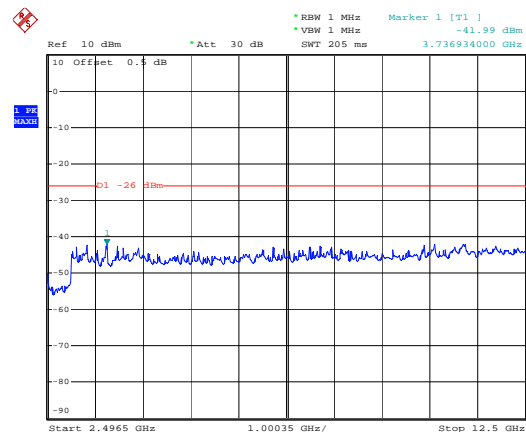
Date: 17.JUL.2020 13:56:35



Date: 17.JUL.2020 14:23:22

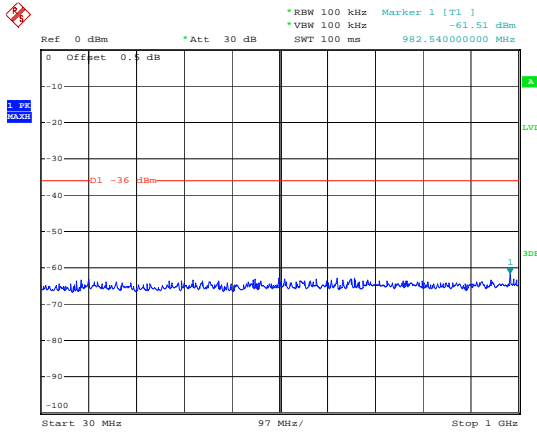


Date: 17.JUL.2020 13:56:56

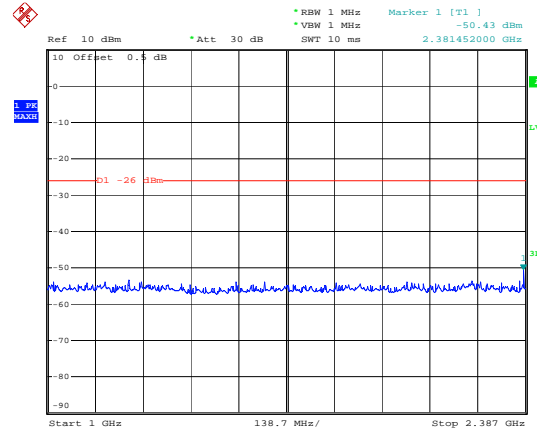


Date: 17.JUL.2020 13:57:09

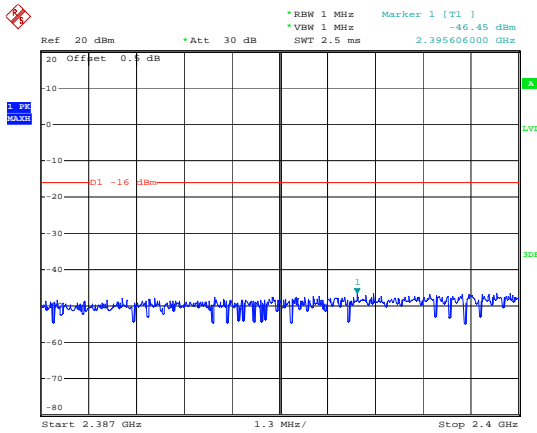
Middle Channel



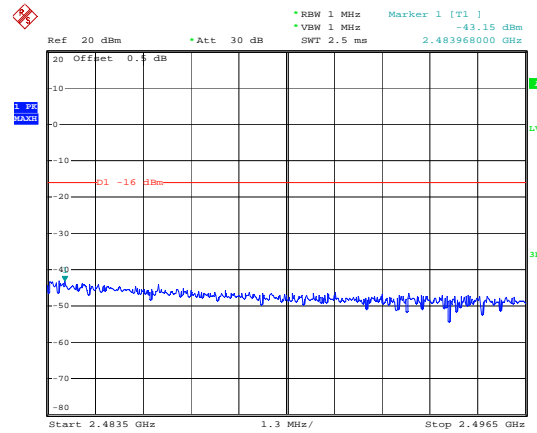
Date: 17.JUL.2020 13:54:21



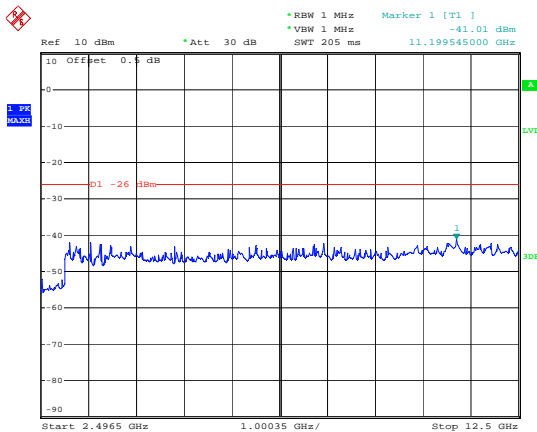
Date: 17.JUL.2020 13:54:33



Date: 17.JUL.2020 13:54:55

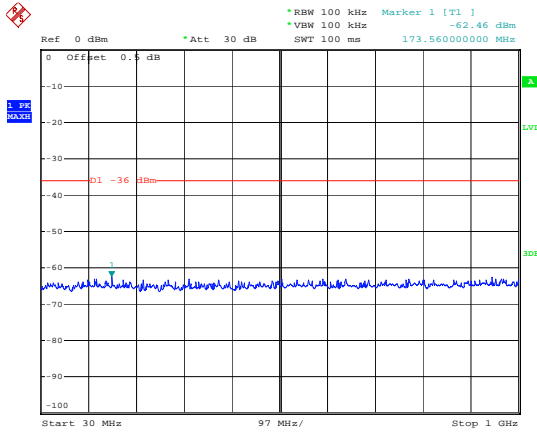


Date: 17.JUL.2020 13:55:13

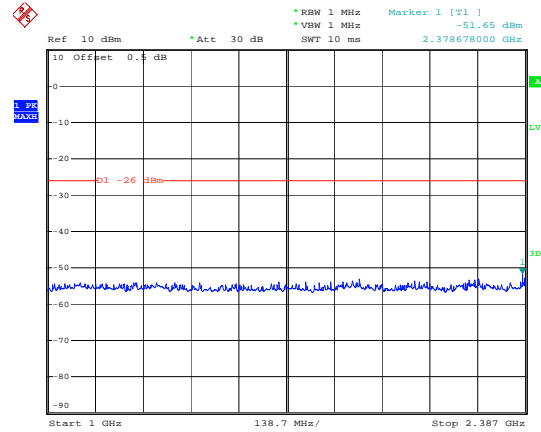


Date: 17.JUL.2020 13:55:26

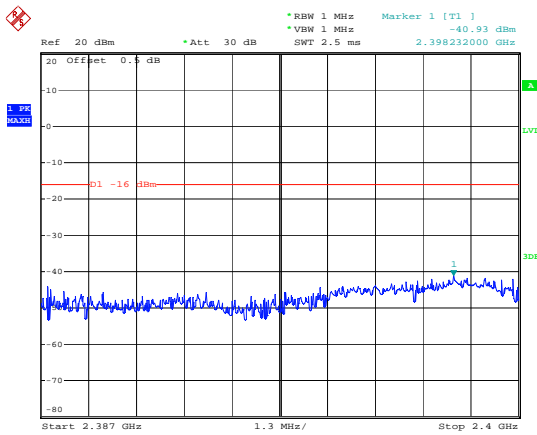
High Channel



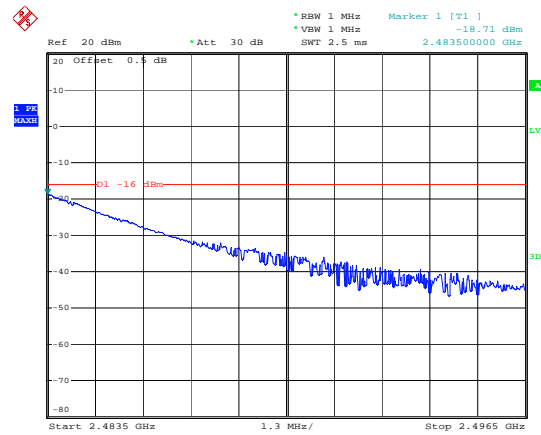
Date: 17.JUL.2020 13:52:53



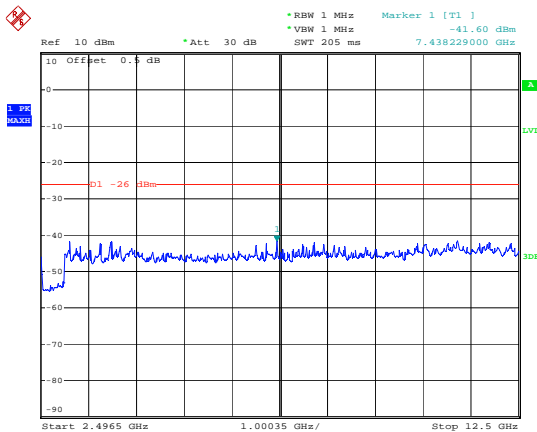
Date: 17.JUL.2020 13:53:09



Date: 17.JUL.2020 13:53:28

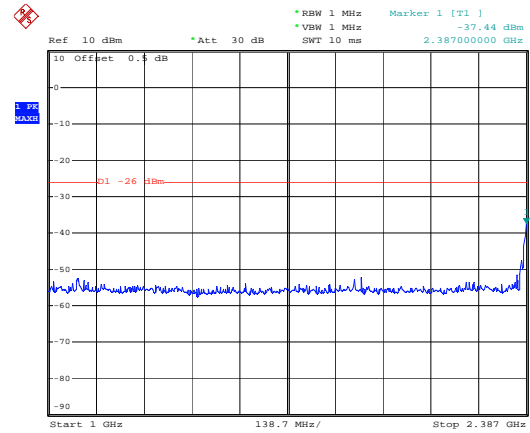


Date: 17.JUL.2020 13:53:46

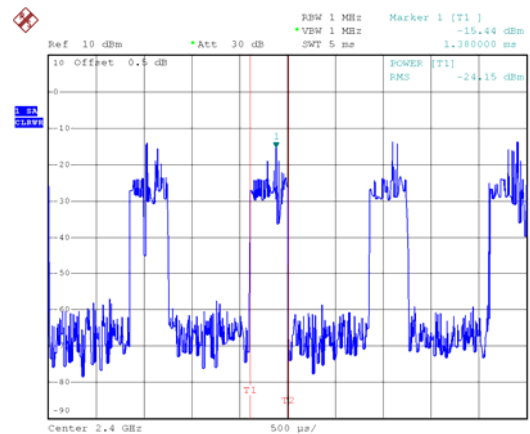


Date: 17.JUL.2020 13:53:59

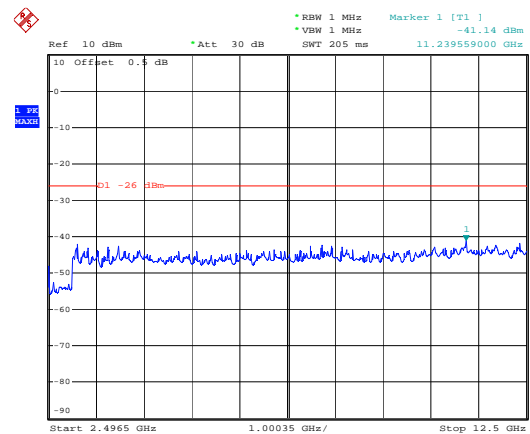
Low Channel



Date: 17.JUL.2020 14:16:22

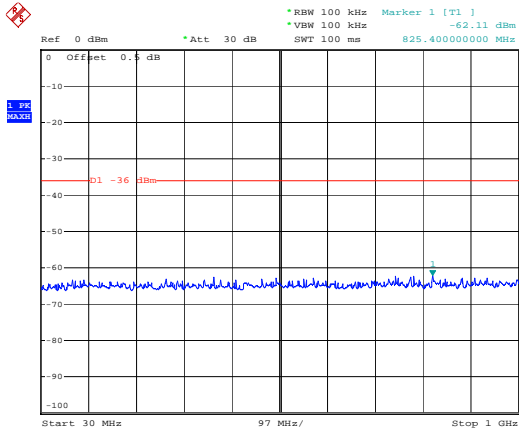


Date: 17.JUL.2020 14:25:43

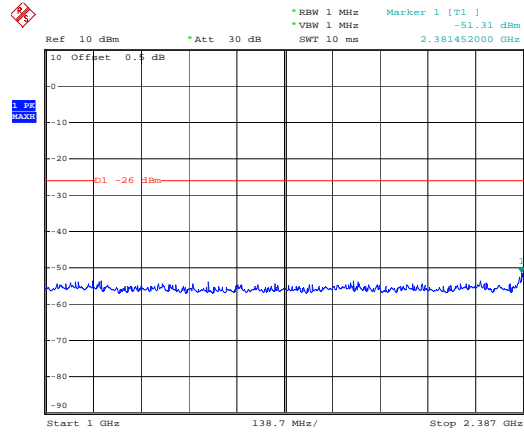


Date: 17.JUL.2020 14:17:09

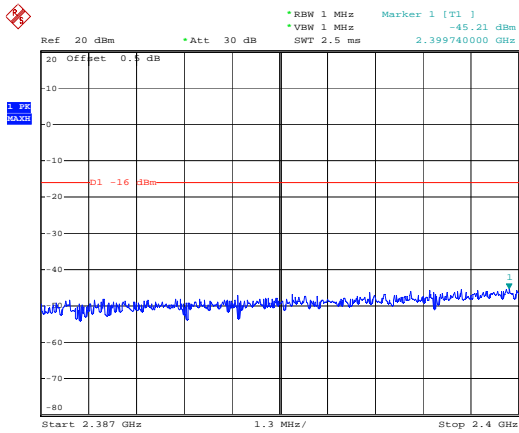
Middle Channel



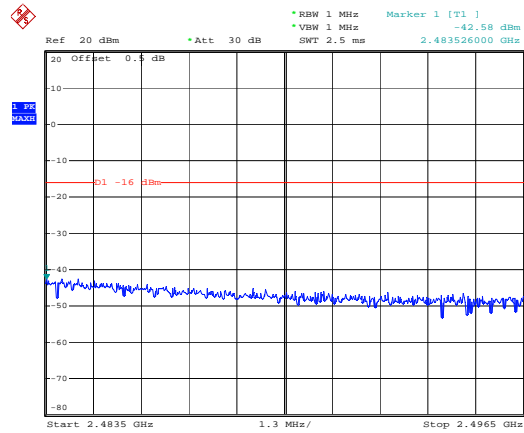
Date: 17.JUL.2020 13:59:33



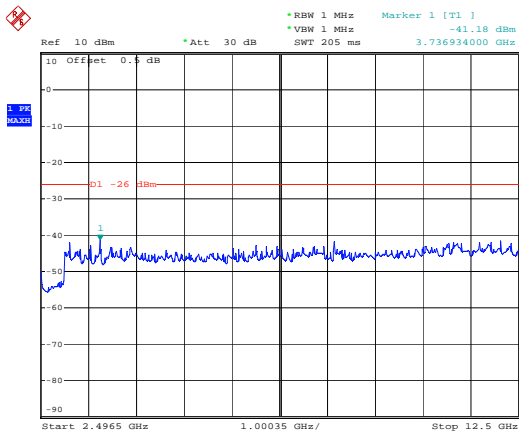
Date: 17.JUL.2020 13:59:45



Date: 17.JUL.2020 14:00:01

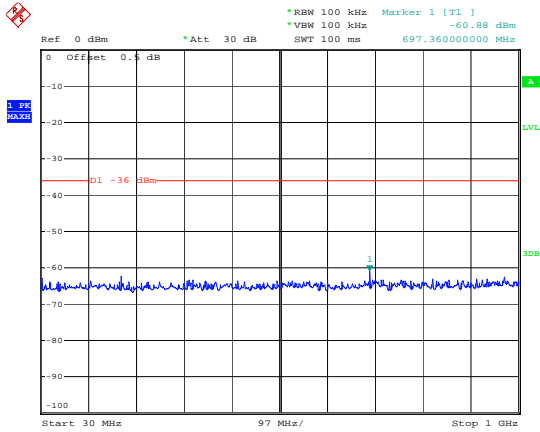


Date: 17.JUL.2020 14:00:19

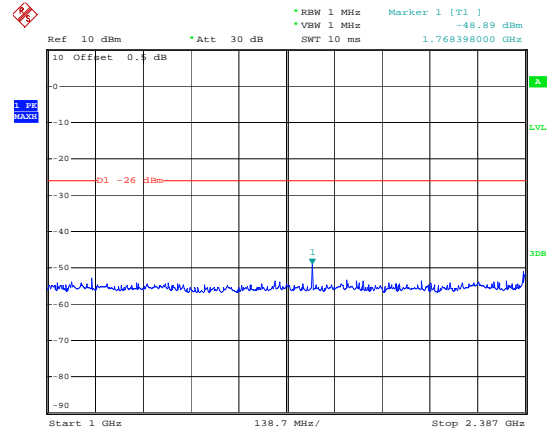


Date: 17.JUL.2020 14:00:32

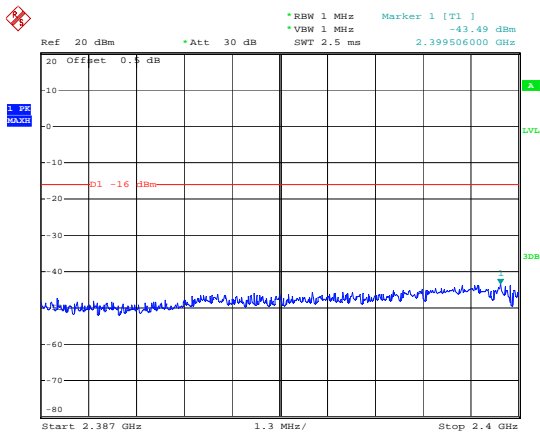
High Channel



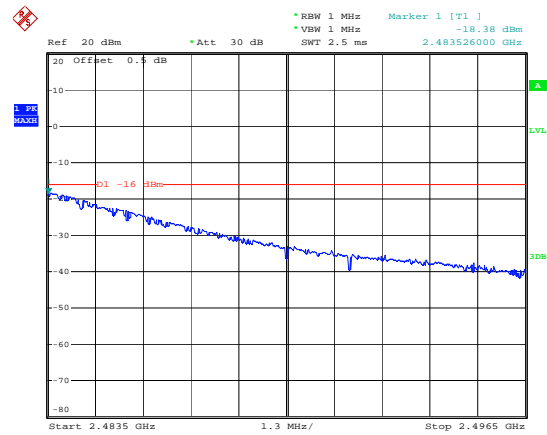
Date: 17.JUL.2020 14:17:41



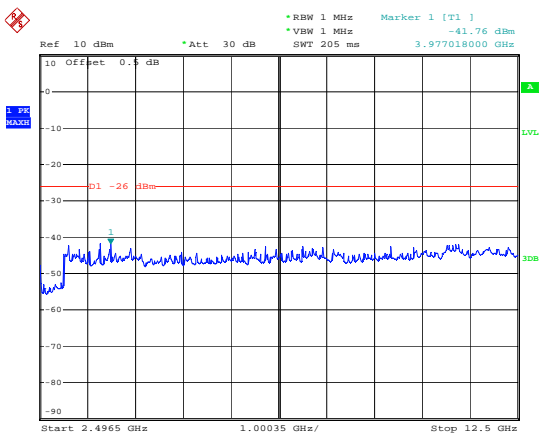
Date: 17.JUL.2020 14:17:57



Date: 17.JUL.2020 14:18:16



Date: 17.JUL.2020 14:18:28



Date: 17.JUL.2020 14:18:41

ANTENNA OUTPUT POWER AND ANTENNA POWER TOLERANCE

Limit

- $\leq 3 \text{ mW /MHz}$

The Output Power Tolerance must be within +20%, -80%.

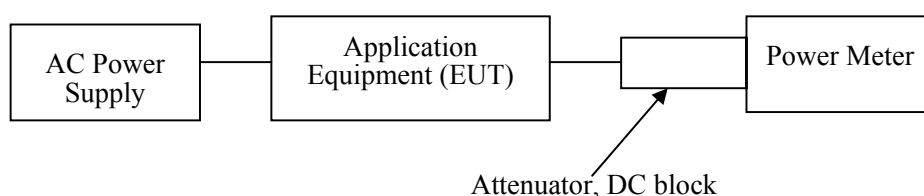
- $\text{EIRP} \leq 6.91 \text{ dBm/MHz}$

Test Procedure

For FHSS UUT:

Connect the UUT to the power meter in a state of hopping mode.

Test Setup Block diagram



Test Data

Test Result: Compliance

Test Mode: Transmitting

Mode	Test Condition	Reading (dBm)	Spread bandwidth (MHz)	Duty cycle (%)	Antenna output power (mW/MHz)		Antenna power tolerance (%)		EIRP (dBm/MHz)	
					Result	Limit	Result	Limit	Result	Limit
GFSK	LV	-3.31	71.327	35.43	0.01847	3	-7.67	-80~+20	-21.84	6.91
	NV	-3.29	71.6	35.43	0.01848		-7.60		-21.83	
	HV	-3.25	71.31	35.43	0.01873		-6.36		-21.78	
$\pi/4$ DQPSK	LV	-3.61	71.484	37.3	0.0163		-18.33		-22.37	
	NV	-3.66	71.6	37.3	0.0161		-19.40		-22.43	
	HV	-3.72	71.456	37.3	0.0159		-20.34		-22.48	
8DPSK	LV	-3.29	71.473	36	0.0182		-8.90		-21.89	
	NV	-3.34	71.6	36	0.0180		-10.10		-21.95	
	HV	-3.39	71.456	36	0.0178		-10.95		-21.99	

Note:

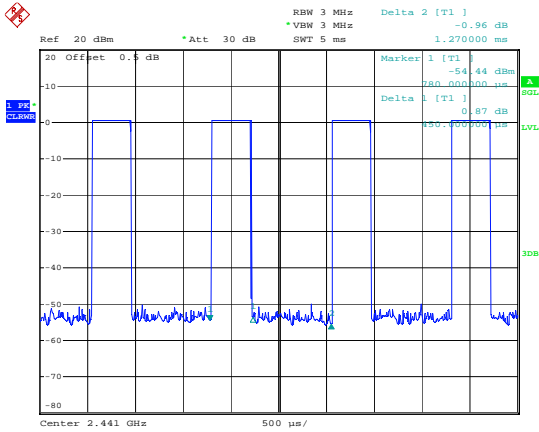
1) Antenna Output power (mW/MHz) = Reading(mW)/Duty cycle (%) / Spread Bandwidth (MHz)

2) Antenna Output Power Tolerance = (Antenna Output power - Declared Power) / Declared Power * 100%

3) Declared Power: 0.02mW/MHz, the antenna gain is -4.5dBi.

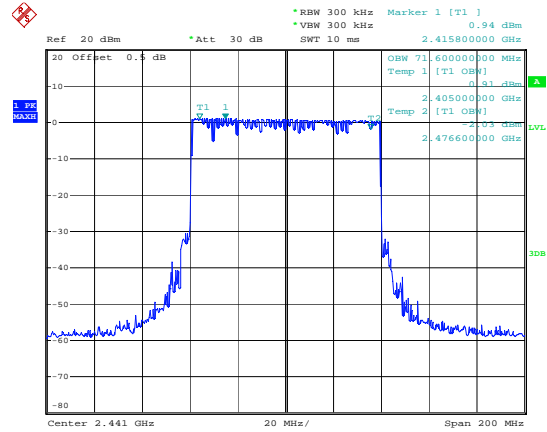
4) Transmission Antenna Gain and Transmission Radiation Angle Width are not required since EIRP less than 6.91dBm/MHz.

GFSK Duty cycle=0.45/1.27=35.43%



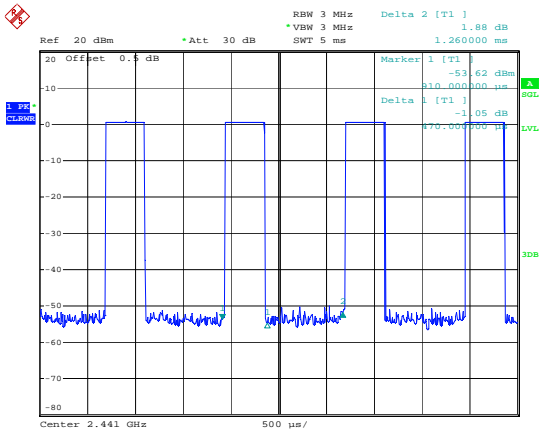
Date: 17.JUL.2020 14:51:34

GFSK Spread Bandwidth



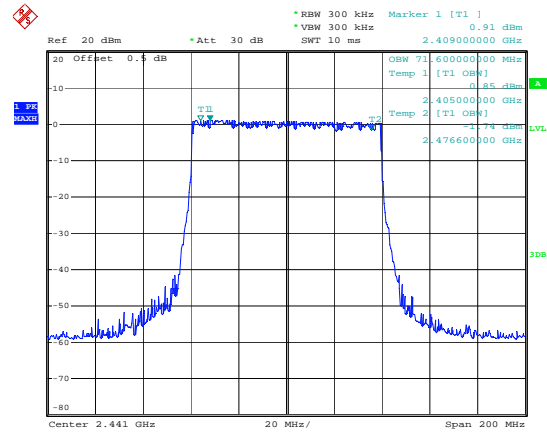
Date: 17.JUL.2020 14:50:43

$\pi/4$ -DQPSK Duty cycle=0.47/1.26=37.3%



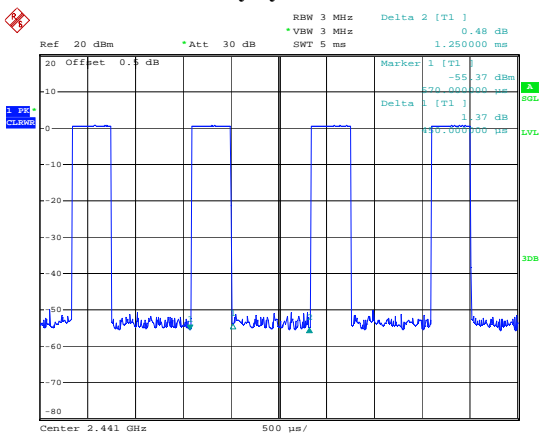
Date: 17.JUL.2020 15:10:09

$\pi/4$ -DQPSK Spread Bandwidth



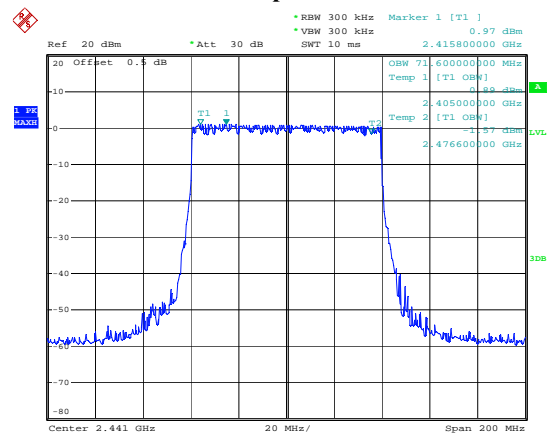
Date: 17.JUL.2020 15:09:19

8DPSK Duty cycle=0.45/1.25=36.0%



Date: 17.JUL.2020 15:13:22

8DPSK Spread Bandwidth



Date: 17.JUL.2020 15:12:42

RECEIVER SPURIOUS EMISSION AND UNWANTED EMISSION INTENSITY

Limit

- $\leq 4 \text{ nW}$ ($30 \text{ MHz} \leq f \leq 1000 \text{ MHz}$)
- $\leq 20 \text{ nW}$ ($1 \text{ GHz} \leq f \leq 12.5 \text{ GHz}$)

Test Procedure

❖ Conditions of Application Equipment (EUT)

- The modulation state shall be “continuous receiving mode”.

❖ Spectrum Analyzer Conditions

- Start Frequency: Start Frequency of frequency range to measure (30MHz or 1GHz)
- Stop Frequency: Stop Frequency of frequency range to measure (1GHz or 12.5GHz)
- Span: AUTO (Measurement Range)
- RBW: 100 kHz, VBW: 100 kHz for Frequency $< 1 \text{ GHz}$
- RBW: 1MHz, VBW: 1MHz for Frequency $> 1 \text{ GHz}$
- Sweep time: AUTO or more
- Sweep mode: Auto Sweep
- Detection: Positive Peak
- Reference Level: Enough level for maximum dynamic range

Test Data

Test Result: Compliance, please see the below tables and plots

Test Mode: Receiving. Please refer to following table:

Mode	Channel	Test Band	Result (dBm)			Limit (dBm)	Limit (nW)
			LV	NV	HV		
GFSK	Low	BandVI (100kHz)	-63.65	-62.81	-64.07	-54	4
		BandVII (1MHz)	-51.29	-50.63	-50.81	-47	20
	Middle	BandVI (100kHz)	-72.54	-72.42	-73.26	-54	4
		BandVII (1MHz)	-52.05	-51.69	-50.37	-47	20
	High	BandVI (100kHz)	-73.53	-72.27	-72.09	-54	4
		BandVII (1MHz)	-51.13	-50.47	-50.89	-47	20
$\pi/4$ -DQPSK	Low	BandVI (100kHz)	-71.45	-72.17	-72.59	-54	4
		BandVII (1MHz)	-52.43	-52.01	-50.93	-47	20
	Middle	BandVI (100kHz)	-71.11	-71.83	-70.99	-54	4
		BandVII (1MHz)	-50.48	-51.68	-51.20	-47	20
	High	BandVI (100kHz)	-69.94	-71.26	-71.74	-54	4
		BandVII (1MHz)	-50.10	-50.52	-50.70	-47	20
8DPSK	Low	BandVI (100kHz)	-73.72	-72.88	-71.62	-54	4
		BandVII (1MHz)	-50.79	-51.81	-50.97	-47	20
	Middle	BandVI (100kHz)	-72.48	-72.24	-72.30	-54	4
		BandVII (1MHz)	-52.50	-51.36	-51.90	-47	20
	High	BandVI (100kHz)	-72.44	-71.96	-70.82	-54	4
		BandVII (1MHz)	-51.81	-52.29	-52.47	-47	20

Note:

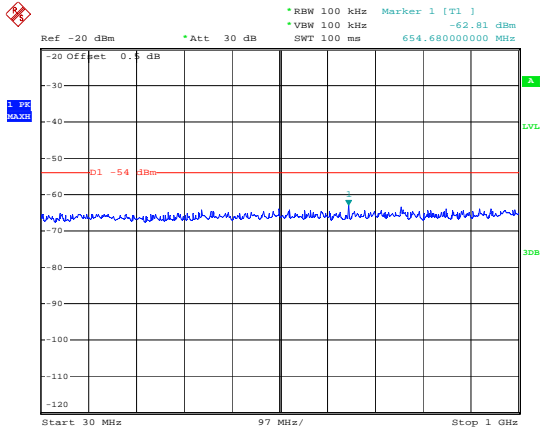
Band VI: 30MHz~1000MHz

Band VII: 1000MHz~12500MHz

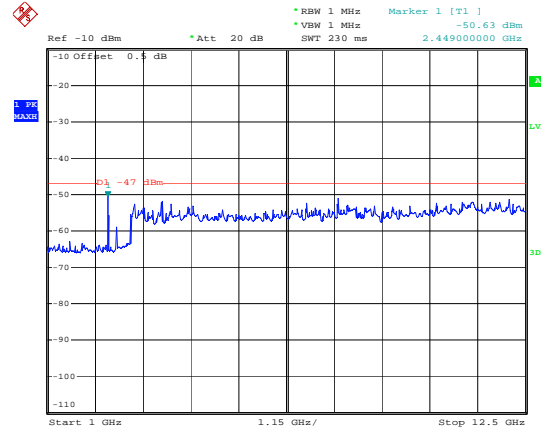
Please refer to the below plots for normal voltage test.

GFSK:

Low Channel

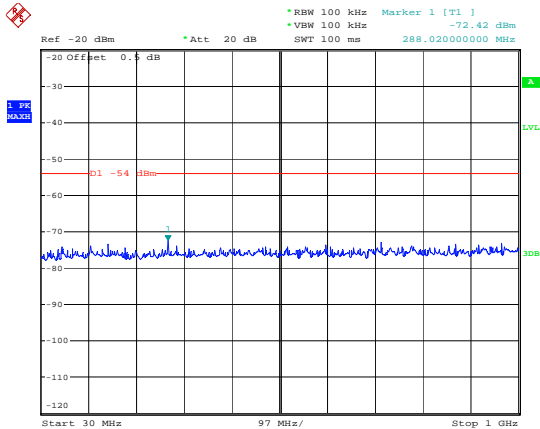


Date: 17.JUL.2020 14:27:12

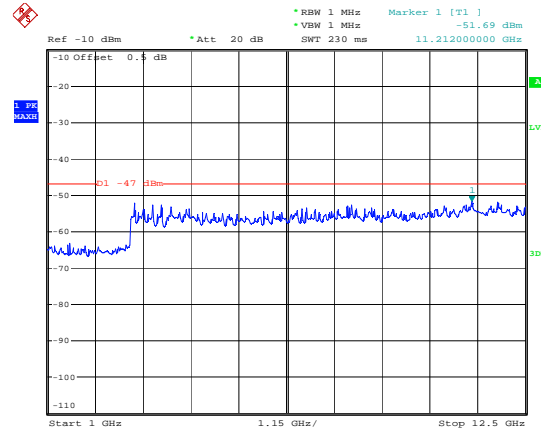


Date: 17.JUL.2020 14:28:27

Middle Channel

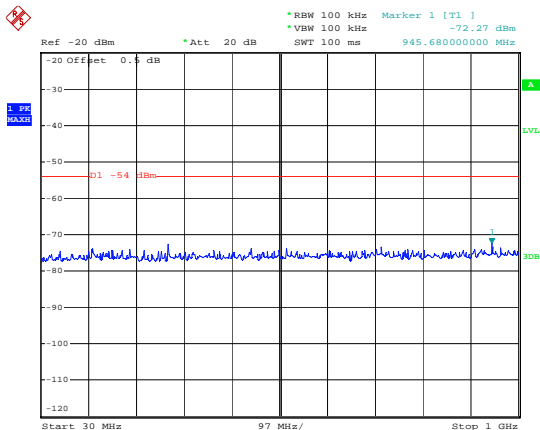


Date: 17.JUL.2020 14:31:04

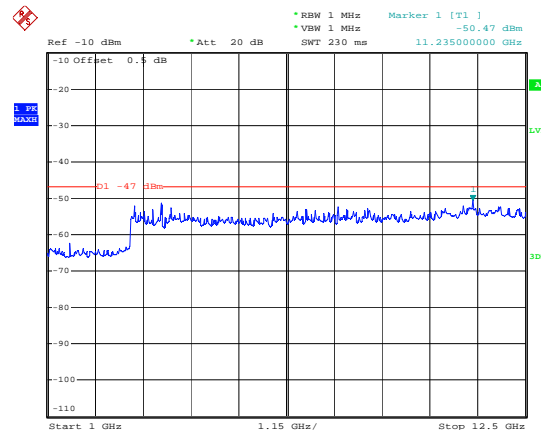


Date: 17.JUL.2020 14:31:17

High Channel



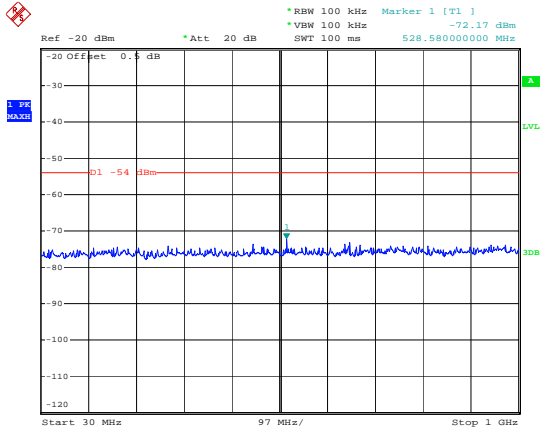
Date: 17.JUL.2020 14:32:24



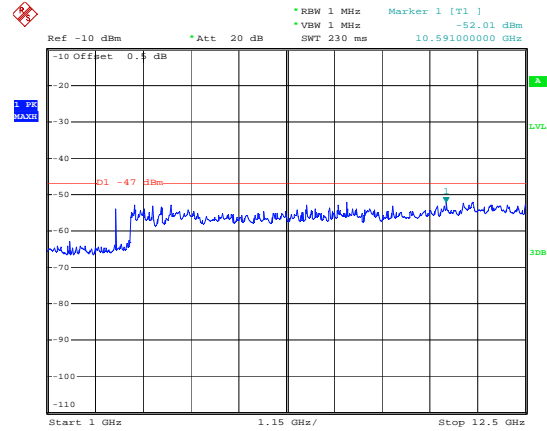
Date: 17.JUL.2020 14:33:26

$\pi/4$ -DQPSK:

Low Channel

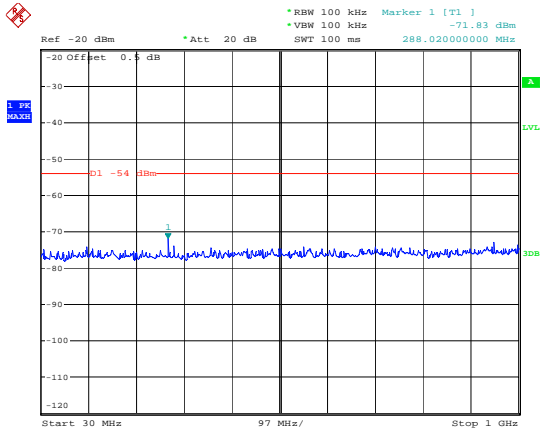


Date: 17.JUL.2020 14:28:46

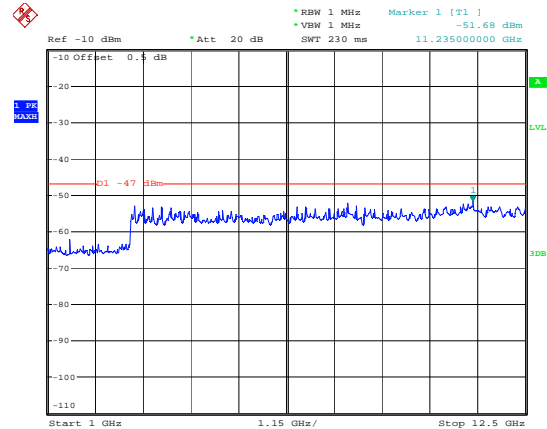


Date: 17.JUL.2020 14:28:58

Middle Channel

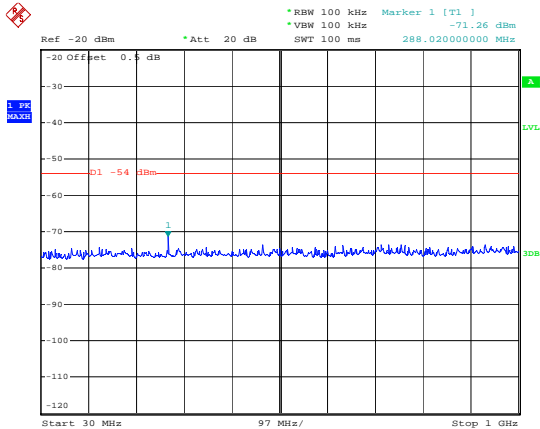


Date: 17.JUL.2020 14:30:33

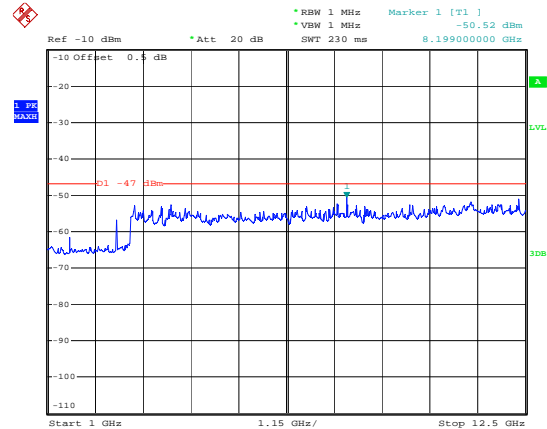


Date: 17.JUL.2020 14:30:46

High Channel



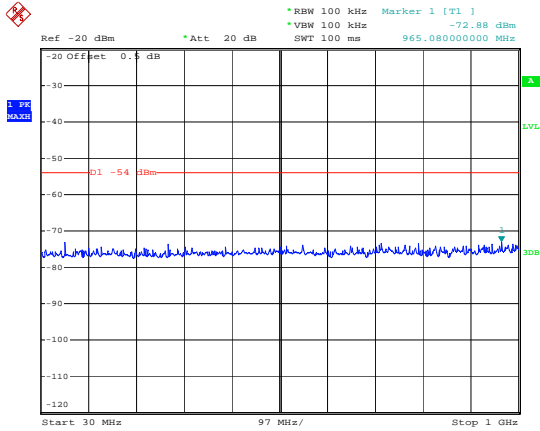
Date: 17.JUL.2020 14:34:16



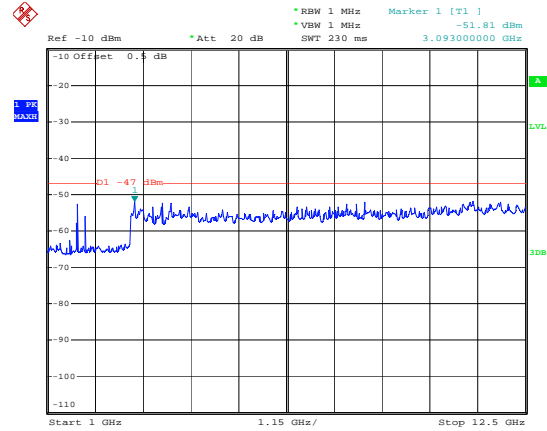
Date: 17.JUL.2020 14:34:48

8DPSK:

Low Channel

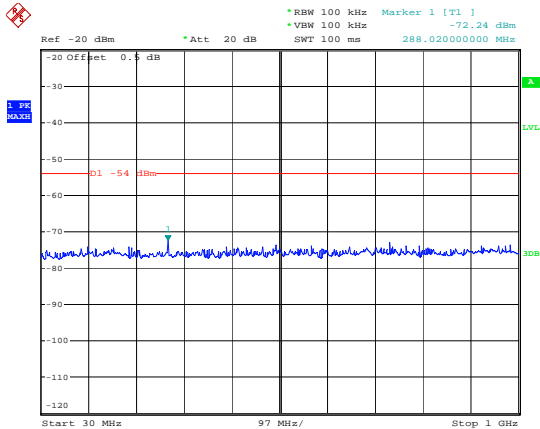


Date: 17.JUL.2020 14:29:18

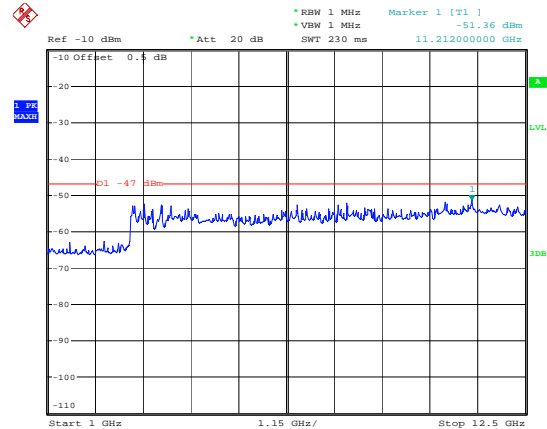


Date: 17.JUL.2020 14:29:34

Middle Channel

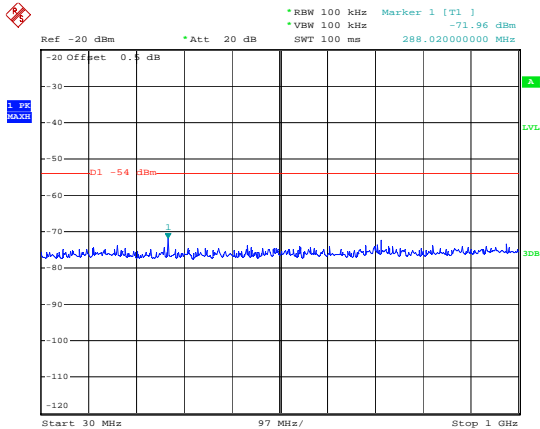


Date: 17.JUL.2020 14:30:05

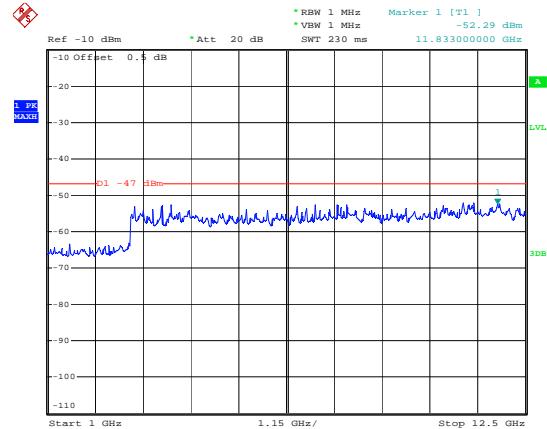


Date: 17.JUL.2020 14:30:17

High Channel



Date: 17.JUL.2020 14:35:15



Date: 17.JUL.2020 14:36:05

FREQUENCY HOPPING DWELL TIME

Applicable Standard

According to Radio Law Radio Equipment Regulations Article 49-20, frequency dwell time is 0.4 seconds or below.

Test Procedure

❖ Conditions of Application Equipment (EUT)

- Set the application equipment (EUT) to the measurement frequency.
- The modulation state shall be “continuous (burst) transmission mode”. If impossible, it shall be “continuous frequency-hopping mode”.

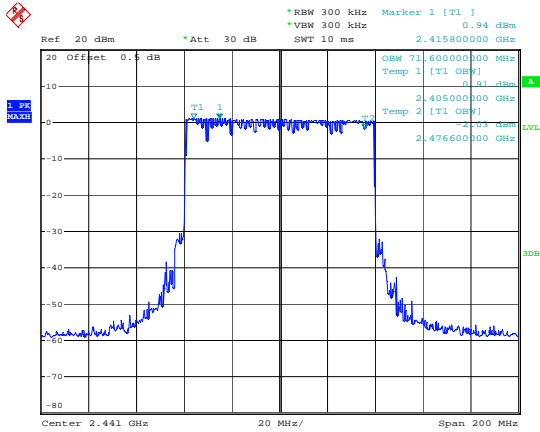
Test Data

Test Result: Compliance

Mode	Packet Type	Spreading bandwidth (MHz)	Ton (ms)	Hopping Number In Observed Period	Result (s)	Limit (s)
GFSK	DH1	71.600	0.450	282	0.358	0.4
	DH3	71.600	1.780	159	0.398	
	DH5	71.600	3.000	103	0.388	
$\pi/4$ -DQPSK	DH1	71.600	0.470	296	0.373	
	DH3	71.600	1.800	148	0.376	
	DH5	71.600	3.060	105	0.390	
8DPSK	DH1	71.600	0.450	287	0.359	
	DH3	71.600	1.720	152	0.383	
	DH5	71.600	3.060	105	0.396	

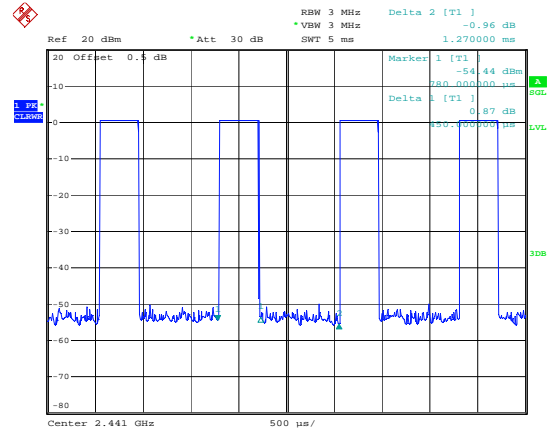
Note: Dwell time = Time per one hopping (On time) * hopping number (within the time obtained by multiplying the spread rate by 0.4s)
For Bluetooth device, spread rate equal to spread bandwidth.

GFSK DH1 Spread Bandwidth



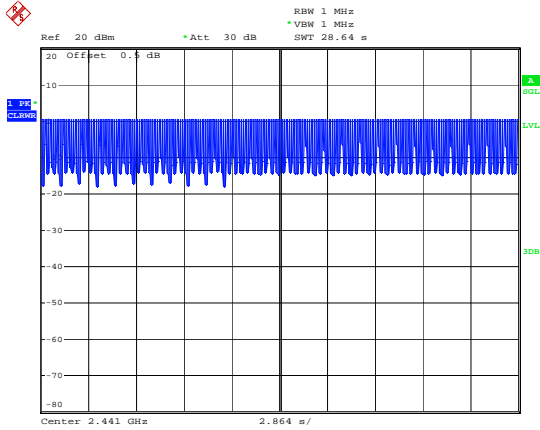
Date: 17.JUL.2020 14:50:43

GFSK DH1 Ton



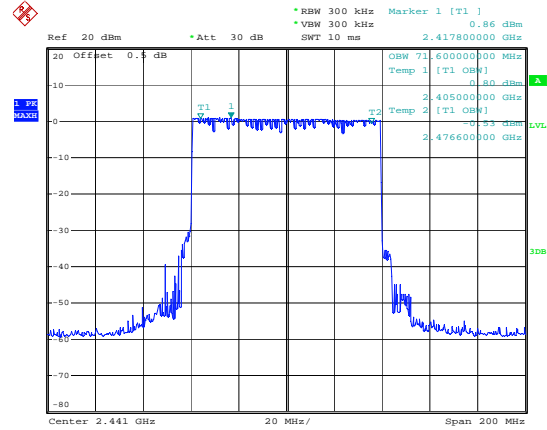
Date: 17.JUL.2020 14:51:34

GFSK DH1 Hopping Number In Observed Period



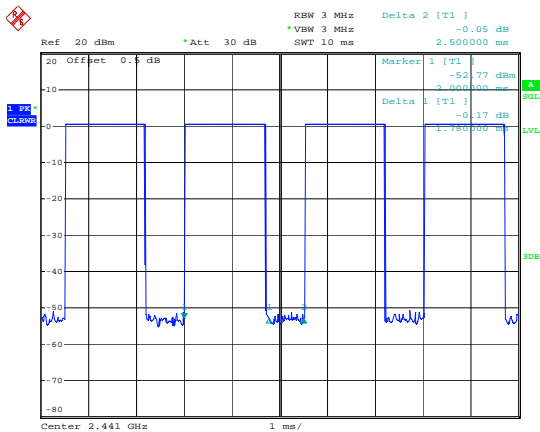
Date: 17.JUL.2020 14:55:47

GFSK DH3 Spread Bandwidth



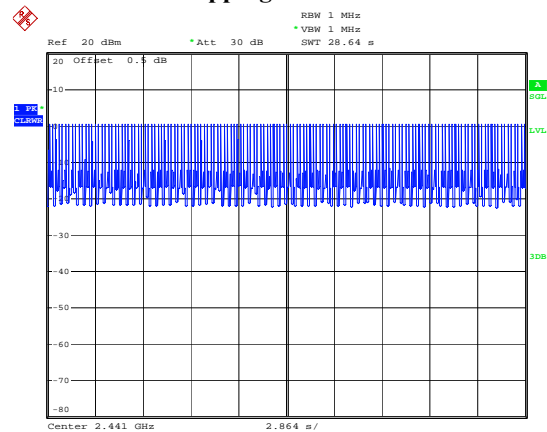
Date: 17.JUL.2020 14:57:35

GFSK DH3 Ton



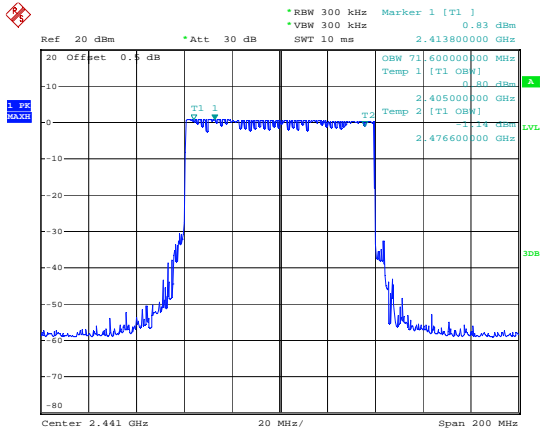
Date: 17.JUL.2020 14:58:19

GFSK DH3 Hopping Number In Observed Period



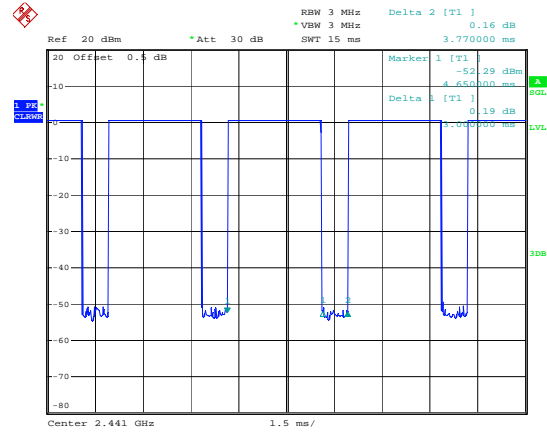
Date: 17.JUL.2020 14:59:04

GFSK DH5 Spread Bandwidth



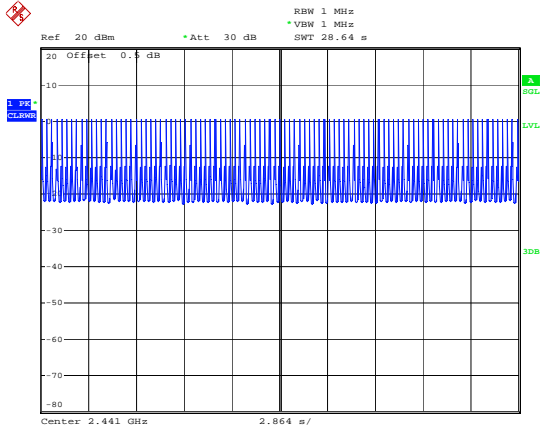
Date: 17.JUL.2020 15:01:08

GFSK DH5 Ton



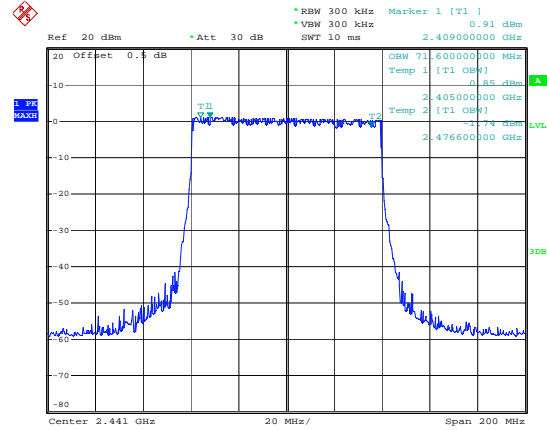
Date: 17.JUL.2020 15:01:48

GFSK DH5 Hopping Number In Observed Period



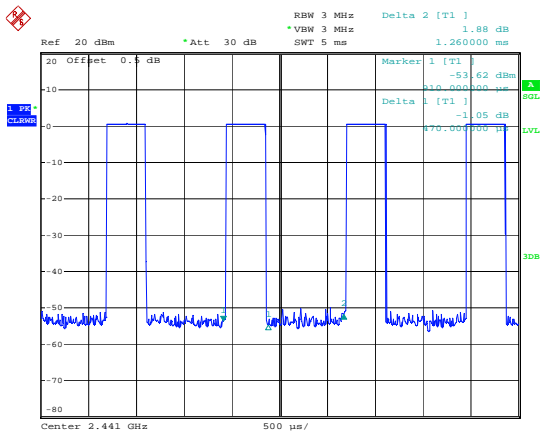
Date: 17.JUL.2020 15:02:32

$\pi/4$ -DQPSK DH1 Spread Bandwidth



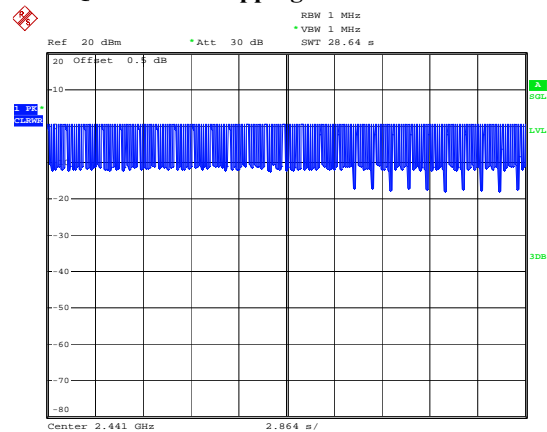
Date: 17.JUL.2020 15:09:19

$\pi/4$ -DQPSK DH1 Ton



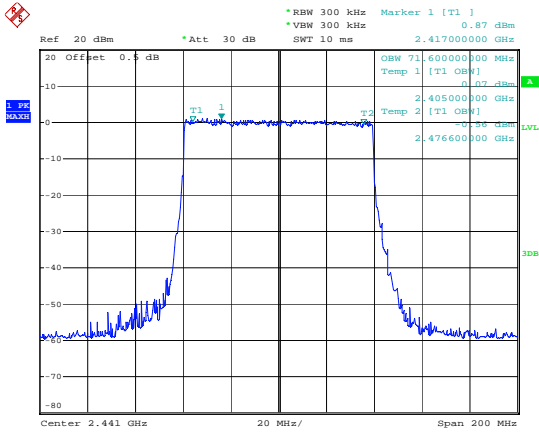
Date: 17.JUL.2020 15:10:09

$\pi/4$ -DQPSK DH1 Hopping Number In Observed Period



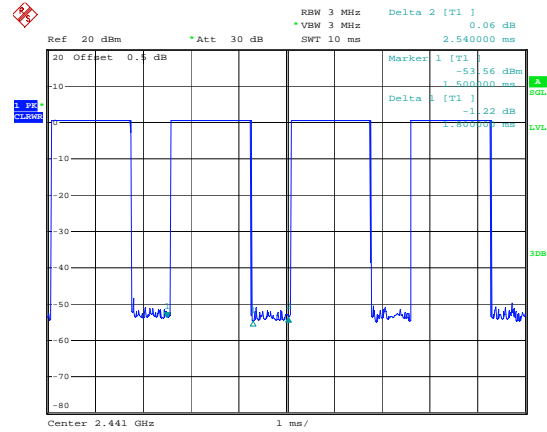
Date: 17.JUL.2020 15:10:57

$\pi/4$ -DQPSK DH3 Spread Bandwidth



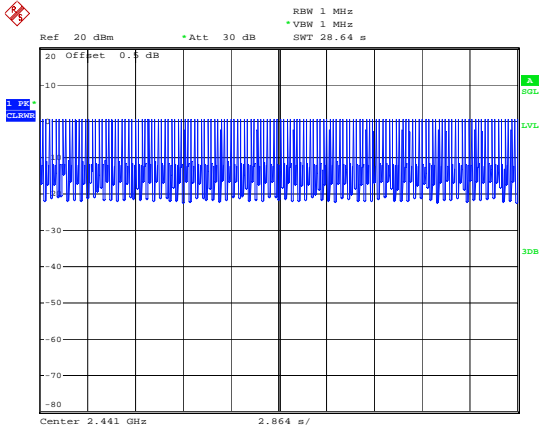
Date: 17.JUL.2020 15:06:04

$\pi/4$ -DQPSK DH3 Ton



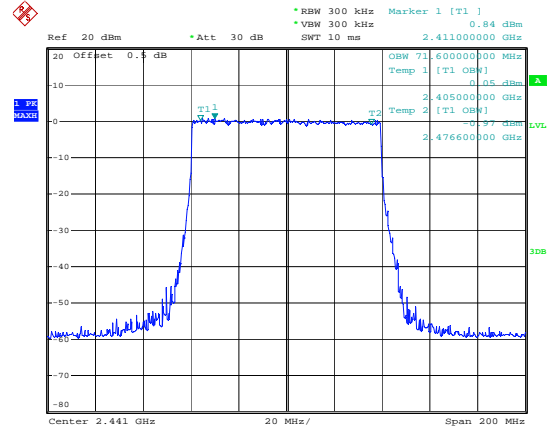
Date: 17.JUL.2020 15:06:50

$\pi/4$ -DQPSK DH3 Hopping Number In Observed Period



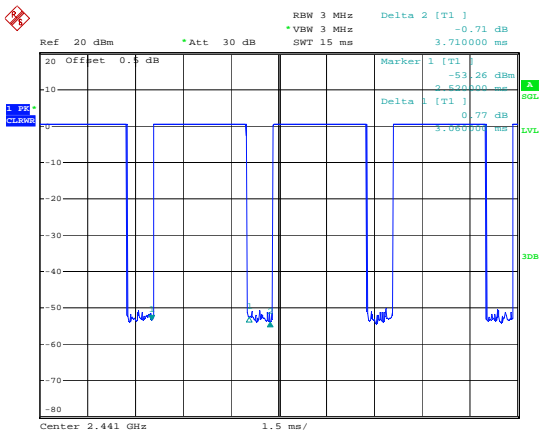
Date: 17.JUL.2020 15:07:40

$\pi/4$ -DQPSK DH5 Spread Bandwidth



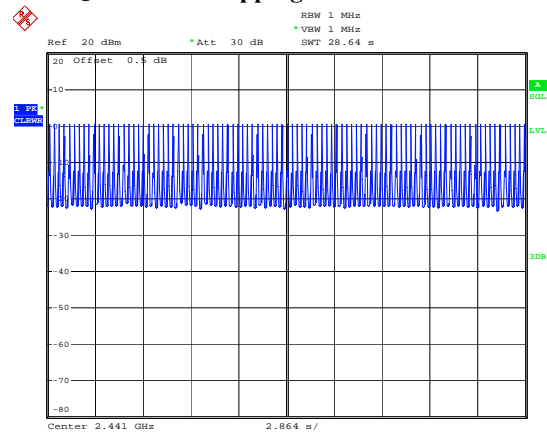
Date: 17.JUL.2020 15:03:35

$\pi/4$ -DQPSK DH5 Ton



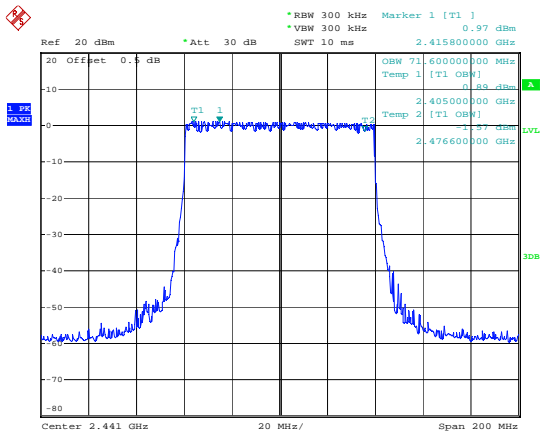
Date: 17.JUL.2020 15:04:16

$\pi/4$ -DQPSK DH5 Hopping Number In Observed Period



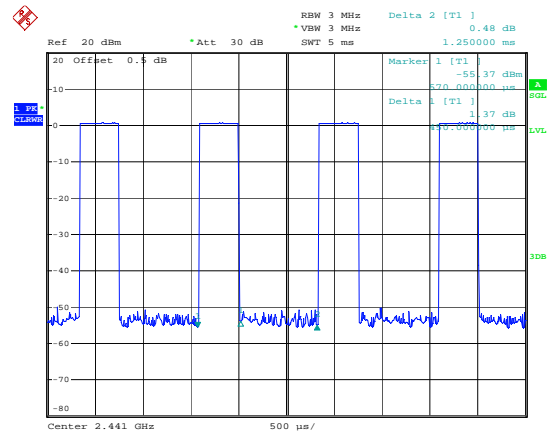
Date: 17.JUL.2020 15:05:03

8DPSK DH1 Spread Bandwidth



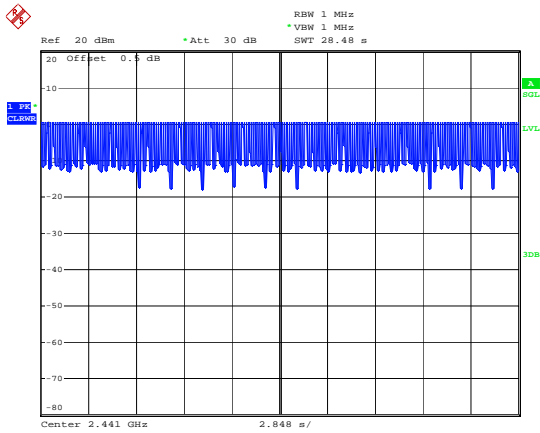
Date: 17.JUL.2020 15:12:42

8DPSK DH1 Ton



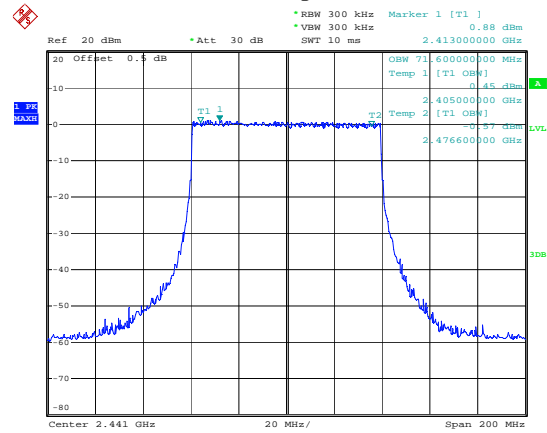
Date: 17.JUL.2020 15:13:22

8DPSK DH1 Hopping Number In Observed Period



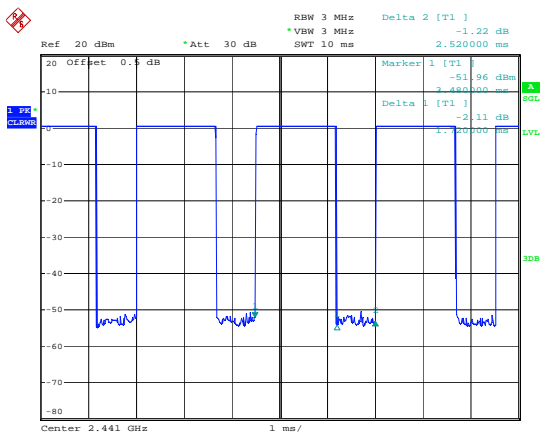
Date: 17.JUL.2020 15:16:26

8DPSK DH3 Spread Bandwidth



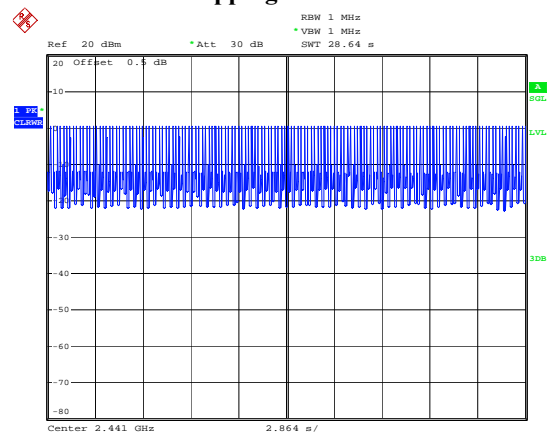
Date: 17.JUL.2020 15:19:33

8DPSK DH3 Ton



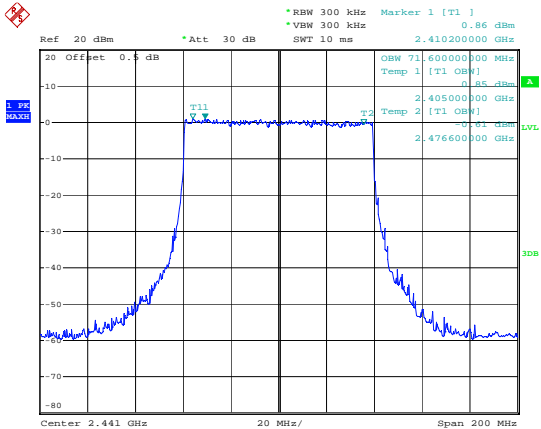
Date: 17.JUL.2020 15:20:17

8DPSK DH3 Hopping Number In Observed Period

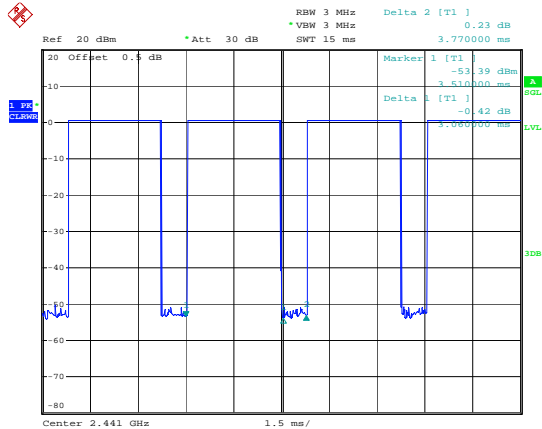


Date: 17.JUL.2020 15:21:03

8DPSK DH5 Spread Bandwidth



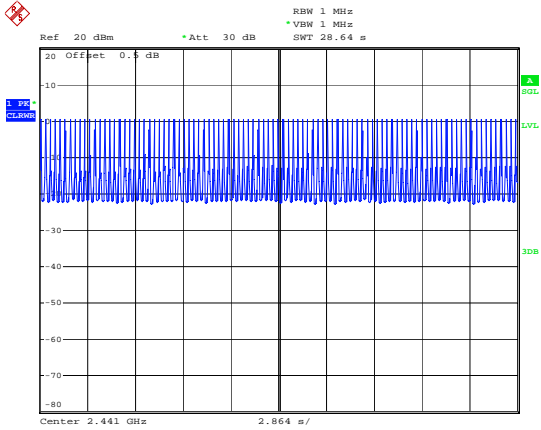
8DPSK DH5 Ton



Date: 17.JUL.2020 15:22:02

Date: 17.JUL.2020 15:22:48

8DPSK DH5 Hopping Number In Observed Period



Date: 17.JUL.2020 15:23:33

INTERFERENCE PREVENTION FUNCTION

Requirement

The EUT shall have the interference prevention capability to transmit or to receive the identification automatically, so that sender and receiver shall exclude other equipment.

Test Procedure

In the case that the EUT has the function of automatically transmitting the identification code:

1. Transmit the predetermined identification codes from EUT
2. Check the transmitted identification codes with the demodulator.

In the case of receiving the identification codes:

1. Transmit the predetermined identification codes from the counterpart.
2. Check if communication is normal
3. Transmit the signal other than predetermined ID codes from the counterpart.
4. Check if the EUT stops the transmission, or if it displays that identification codes are different from the predetermined ones.

Measurement Result

Test Result: Good

CONSTRUCTION PROTECTION CONFIRMATION

Limit

The high-frequency section and modulation section of the radio equipment except for the antenna system shall not be capable of being opened easily.

Confirmation Method

The house of EUT was locked by Super glue, can't be opened easily. Please refer the EUT photo.

******END OF REPORT******