TEST REPORT

CERTIFICATE OF CONFORMITY

Standard:	**EN 300 328 V2.2.2 (2019-07)**
Report No.:	REBBUI-WTW-P22100653-4
Product:	11ax RTL8851BE Combo module
Brand:	REALTEK
Model No.:	RTL8851BE
Received Date:	2022/10/25
Test Date:	2022/12/14 ~ 2023/3/24
Issued Date:	2023/4/28
Applicant:	Realtek Semiconductor Corp.
Address:	No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
Test Location:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan

Approved by: _____ , **Date:** **2023/4/28**

May Chen / Manager

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Prepared by : Vito Lung / Specialist

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
REBBUI-WTW-P22100653-4	Original release.	2023/4/28

1 Certificate

Product:	11ax RTL8851BE Combo module
Brand:	REALTEK
Test Model:	RTL8851BE
Sample Status:	Engineering sample
Applicant:	Realtek Semiconductor Corp.
Test Date:	2022/12/14 ~ 2023/3/24
Standard:	EN 300 328 V2.2.2 (2019-07)

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

EN 300 328 V2.2.2		
Clause	Test Item	Result
4.3.1.2	RF Output Power	Pass
4.3.1.3	Duty cycle, Tx-sequence, Tx-gap	Not Applicable
4.3.1.4	Accumulated Transmit Time, Frequency Occupation and Hopping Sequence	Pass
4.3.1.5	Hopping Frequency Separation	Pass
4.3.1.6	Medium Utilization (MU) Factor	Not Applicable
4.3.1.7	Adaptivity	Pass
4.3.1.8	Occupied Channel Bandwidth	Pass
4.3.1.9	Transmitter Unwanted Emissions in the out-of-band Domain	Pass
4.3.1.10	Transmitter Unwanted Emissions in the Spurious Domain up to 1 GHz	Pass
4.3.1.10	Transmitter Unwanted Emissions in the Spurious Domain above 1 GHz	Pass
4.3.1.11	Receiver Spurious Emissions up to 1 GHz	Pass
4.3.1.11	Receiver Spurious Emissions above 1 GHz	Pass
4.3.1.12	Receiver Blocking	Pass
4.3.1.13	Geo-location capability	Not Applicable

Notes:

1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

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 Channel Bandwidth	1.132×10^{-4} %
RF output power, conducted	1.371 dB
Power Spectral Density, conducted	1.371 dB
Unwanted Emissions, conducted	2.5 dB
All emissions, radiated	4.9 dB
Temperature	0.12 °C
Supply voltages	0.3%
Time	2.53%

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	11ax RTL8851BE Combo module
Brand	REALTEK
Test Model	RTL8851BE
Status of EUT	Engineering sample
Power Supply Rating	3.3 Vdc from host equipment
Temperature Operating Range	-20 °C ~ 70 °C
Modulation Type	GFSK, π/4-DQPSK, 8DPSK
Modulation Technology	FHSS
Transfer Rate	Up to 3 Mbps
Operating Frequency	2.402 GHz ~ 2.48 GHz
Number of Channel	79
Output Power (e.i.r.p.)	16.55 dBm
EUT Category	Adaptive Equipment without the possibility to switch to a non-adaptive mode
Receiver Category	Category 1

Note:

1. The EUT has below HW SKU configuration, as below table:

SKU No.	Product name	HW Configuration
1	11ax RTL8851BE Combo module	PCIe + USB interface + Dual antenna port
2		PCIe + USB interface + Single antenna port
Note: For spurious emissions: From the above HW SKUs, the worse case was found in **SKU No.: 2**. Therefore only the test data of the SKU was recorded in this report.		

2. There are Bluetooth and WLAN (2.4 GHz & 5 GHz) technology used for the EUT.

3. Simultaneously transmission condition.

Condition	Technology	
1	WLAN (5 GHz)	Bluetooth
2	WLAN(2.4 GHz)	Bluetooth
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.		

3.2 Antenna Description of EUT

1. The antenna information is listed as below.

Antenna NO.	Chain NO.	Brand	Model	Antenna Net Gain(dBi)	Frequency range	Antenna Type	Connector Type	Cable Length
1	Chain 1	REALTEK	RTK-ANT-0022	3.4	2.4~2.4835GHz	PIFA	IPEX4	300mm
				5	5.15~5.85GHz			
	Chain 2	REALTEK	RTK-ANT-0022	3.4	2.4~2.4835GHz	PIFA	IPEX4	300mm
				5	5.15~5.85GHz			
2	Chain 1	Aristotle	RFA-27-C38H1-MHF4300	3	2.4~2.4835GHz	Dipole	IPEX4	300mm
				5	5.15~5.85GHz			
	Chain 2	Aristotle	RFA-27-C38H1-MHF4300	3	2.4~2.4835GHz	Dipole	IPEX4	300mm
				5	5.15~5.85GHz			
3	Chain 1	LYNwave	ALX22F-120AA0-00	3.2	2.4~2.4835GHz	Monopole	IPEX4	200mm
				4	5.15~5.85GHz			
	Chain 2	LYNwave	ALX22F-120AA0-00	3.2	2.4~2.4835GHz	Monopole	IPEX4	200mm
				4	5.15~5.85GHz			

Note:
1. Max. gain was selected for the final test, except for Spurious Emissions & Adaptivity test.

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

3.3 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		

3.4 Test Mode Applicability and Tested Channel Detail

Pre-Scan:	1. PIFA/Monopole ANT can be used in the following ways: X / Y / Z axis. Pre-scan in these ways and find the worst case as a representative test condition. 2. EUT has two types of patterns. dual port sampling(1Tx Diversity)/single port sampling(Fixed Chain1). Pre-scan in these ways to find the worst case as a representative test condition. 3. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates.
Worst Case:	1. PIFA/Monopole ANT the worst case was found when positioned on (X / Y / Z axis): Transmitter Unwanted Emissions in the Spurious Domain up to 1 GHz Z axis worst ; Transmitter Unwanted Emissions in the Spurious Domain above 1 GHz Z axis worst. 2. dual port sampling/single port sampling types Worst Condition: Single port sampling

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

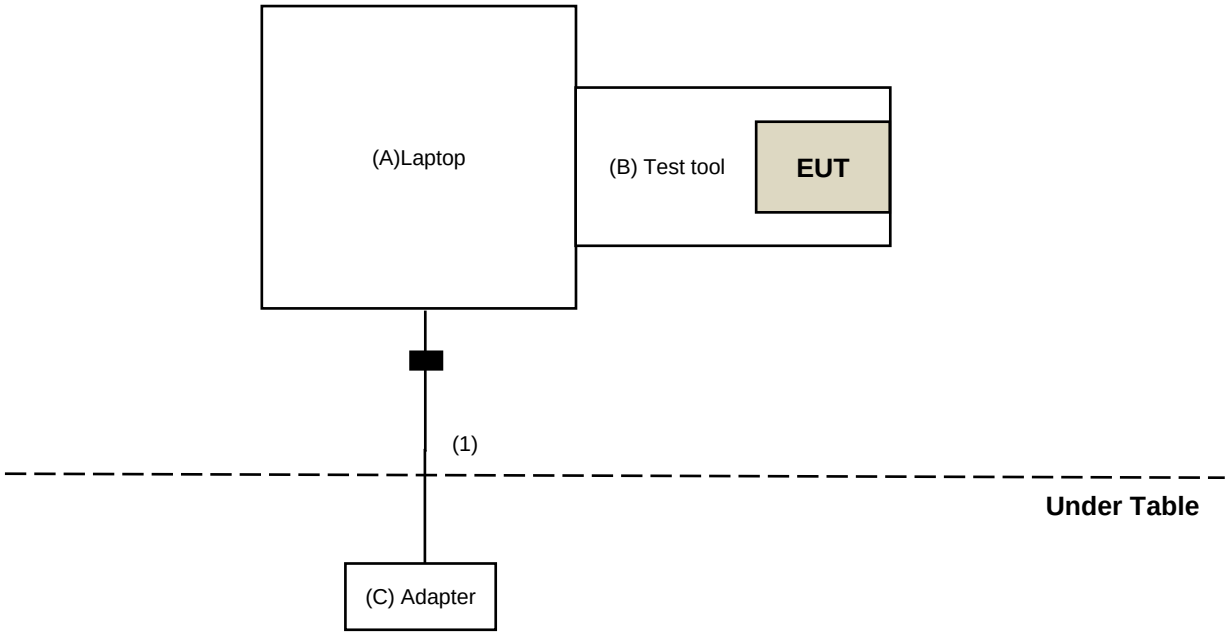
Test Item	EUT Configure Mode	Power Profile	Tested Channel	Modulation	Data Rate Parameter	Special requirements
RF Output Power	-	Low Power	Hopping mode	GFSK	DH5	-
				8DPSK	3DH5	
		High Power		GFSK	DH5	
				8DPSK	3DH5	
Accumulated Transmit Time, Frequency Occupation and Hopping Sequence	-	Low Power	Hopping mode	GFSK	DH5	-
				8DPSK	3DH5	
		High Power		GFSK	DH5	
				8DPSK	3DH5	
Hopping Frequency Separation	-	Low Power	Hopping mode	GFSK	DH5	-
				8DPSK	3DH5	
		High Power		GFSK	DH5	
				8DPSK	3DH5	
Adaptivity	-	-	0, 78	-	-	-
						Add Test low antenna gain
Occupied Channel Bandwidth / Transmitter Unwanted Emissions in the out-of-band Domain	-	Low Power	0, 78	GFSK	DH5	-
				8DPSK	3DH5	
		High Power		GFSK	DH5	
				8DPSK	3DH5	
Transmitter Unwanted Emissions in the Spurious Domain up to 1 GHz	A	High Power	78	GFSK	DH5	-
	B					
	C					
Transmitter Unwanted Emissions in the Spurious Domain above 1 GHz	A	High Power	0, 78	GFSK	DH5	-
	B					
	C					
Receiver Spurious Emissions up to 1 GHz	A	Receiver	78	-	-	-
	B					
	C					
Receiver Spurious Emissions above 1 GHz	A	Receiver	0, 78	-	-	-
	B		0, 78			
	C		0, 78			
Receiver Blocking	-	-	0, 78	-	DH5	-
						Worst Pmin

Test Item	EUT Configure Mode	Power Profile	Tested Channel	Modulation	Data Rate Parameter	Special requirements
EUT Configure Mode:	A	with Dipole Antenna				
	B	with PIFA Antenna				
	C	with Monopole Antenna				
Note: Bluetooth output power is divided into Low Power(6dBm) and High Power(12dBm), both need to be tested.						

3.5 Test Program Used and Operation Descriptions

Controlling software (Bluetooth RF test tool (5.3.2.49)) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

3.6 Connection Diagram of EUT and Peripheral Devices



3.7 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Laptop	Dell	Latitude 7430	8C19NN3	N/A	Provided by Lab
B	Test tool	Realtek	N/A	N/A	N/A	Supplied by applicant
C	Adapter	DELL	LA90PM111	N/A	N/A	Provided by Lab

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	DC Cable	1	1.8	NO	1	Provided by Lab

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 RF Output Power

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
MXG X-Series RF Vector Signal Generator Keysight	N5182B	MY53052700	2022/7/18	2023/7/17
Power Meter Anritsu	ML2495A	1529002	2022/6/22	2023/6/21
PSG analog signal generator (from 250 kHz to 50 GHz) Keysight	E8257D	MY53401987	2022/6/21	2023/6/20
PXA Signal Analyzer(3 Hz to 50 GHz) Keysight	N9030A	MY54490570	2022/6/20	2023/6/19
Software	ADT_RF Test Software V6.6.5.4	N/A	N/A	N/A
Temperature & Humidity Chamber TERCHY	MHU-225AU	911033	2022/11/18	2023/11/17

Notes:

1. The test was performed in Oven room 1.
2. Tested Date: 2022/12/14

4.2 Accumulated Transmit Time, Frequency Occupation and Hopping Sequence

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
MXG X-Series RF Vector Signal Generator Keysight	N5182B	MY53052700	2022/7/18	2023/7/17
PSG analog signal generator (from 250 kHz to 50 GHz) Keysight	E8257D	MY53401987	2022/6/21	2023/6/20
PXA Signal Analyzer(3 Hz to 50 GHz) Keysight	N9030A	MY54490570	2022/6/20	2023/6/19
Software	ADT_RF Test Software V6.6.5.4	N/A	N/A	N/A

Notes:

1. The test was performed in Oven room 1.
2. Tested Date: 2022/12/14

4.3 Hopping Frequency Separation

Refer to section 4.2 to get information of the instruments.

4.4 Adaptivity

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Direct Coupler EMCI	CS20-18-436/16	1139	2022/12/28	2023/12/27
MXG X-Series RF Vector Signal Generator Keysight	N5182B	MY53052647	2022/11/8	2023/11/7
Power Splitter/combiner Mini-Circuits	ZN4PD-642W-S+	408501327_01	2022/4/5	2023/4/4
		408501327_02	2022/9/14	2023/9/13
PSG analog signal generator (from 250 kHz to 50 GHz) Keysight	E8257D	MY53401987	2022/6/21	2023/6/20
Spectrum Analyzer Keysight	N9030A	MY55410176	2022/6/21	2023/6/20

Notes:

1. The test was performed in Adaptivity room.
2. Tested Date: 2023/3/24

4.5 Occupied Channel Bandwidth

Refer to section 4.2 to get information of the instruments.

4.6 Transmitter Unwanted Emissions in the out-of-band Domain

Refer to section 4.2 to get information of the instruments.

4.7 Transmitter Unwanted Emissions in the Spurious Domain up to 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208411	N/A	N/A
Power Meter Anritsu	ML2495A	0824006	2022/5/9	2023/5/8
		1529002	2022/6/22	2023/6/21
Preamplifier Agilent	8447D	2944A10663	2022/4/25	2023/4/24
PSG analog signal generator (from 250 kHz to 50 GHz) Keysight	E8257D	MY53401987	2022/6/21	2023/6/20
Pulse Power Sensor Anritsu	MA2411B	1339443	2022/5/29	2023/5/28
		1726432	2022/5/29	2023/5/28
PXA Signal Analyzer(3 Hz to 50 GHz) Keysight	N9030A	MY54490570	2022/6/20	2023/6/19
Software	ADT_Radiated_V7.6.15.9.5	N/A	N/A	N/A
Trilog Broadband Antenna Schwarzbeck	VULB 9168	9168-162	2022/10/20	2023/10/19

Notes:

1. The test was performed in RF Fully Chamber No. 1.
2. Tested Date: 2022/12/30

4.8 Transmitter Unwanted Emissions in the Spurious Domain above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208542	N/A	N/A
Horn Antenna Schwarzbeck	BBHA 9120 D	9120D-1479	2022/11/13	2023/11/12
Power Meter Anritsu	ML2495A	1529002	2022/6/22	2023/6/21
	ML2496A	1529003	2022/8/8	2023/8/7
Pre-Amplifier Agilent 8449B (1 to 26.5GHz) Agilent	8449B	3008A01922	2022/8/15	2023/8/14
PSG analog signal generator (from 250 kHz to 50 GHz) Keysight	E8257D	MY53401987	2022/6/21	2023/6/20
Pulse Power Sensor Anritsu	MA2411B	1339443	2022/5/29	2023/5/28
		1726432	2022/5/29	2023/5/28
Software	ADT_Radiated_V7.6.15.9.5	N/A	N/A	N/A
Spectrum Analyzer Keysight	N9030A	MY54490520	2022/8/5	2023/8/4

Notes:

1. The test was performed in RF Fully Chamber No. 2.
2. Tested Date: 2022/12/19 ~ 2022/12/20

4.9 Receiver Spurious Emissions up to 1 GHz

Refer to section 4.7 to get information of the instruments.

4.10 Receiver Spurious Emissions above 1 GHz

Refer to section 4.8 to get information of the instruments.

4.11 Receiver Blocking

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Bluetooth Simulator (up to Version 4.0) Anritsu	MT8852B	1218002	2022/5/24	2023/5/23
Combiner / Splitter (Model:ZN2PD-9G) Mini-Circuits	ZN2PD-9G	ZN2PD-9G	2022/6/9	2023/6/8
MXG -X Vector Signal Generator KEYSIGHT	N5182B	MY57301272	2022/3/13	2023/3/12
N9030B - PXA Signal Analyzer KEYSIGHT	N9030B	MY57140938	2022/3/15	2023/3/14
Signal Analyzer R&S	FSV7	104056	2022/5/20	2023/5/19
Spectrum Analyzer R&S	FSV40	100979	2022/3/25	2023/3/24

Notes:

1. The test was performed in Adaptivity room.
2. Tested Date: 2023/1/17

5 Limits of Test Items

5.1 RF Output Power

Condition	Frequency Band	Limit (e.i.r.p.)
Under all test conditions	2400 ~ 2483.5 MHz	20 dBm

5.2 Accumulated Transmit Time, Frequency Occupation and Hopping Sequence

Accumulated Transmit Time	
Condition	**Limit**
Adaptive frequency hopping systems	≤ 400 ms

Frequency Occupation	
Condition	**Limit**
Adaptive frequency hopping systems	Option 1: Each hopping frequency of the hopping sequence shall be occupied at least once within a period not exceeding four times the product of the dwell time and the number of hopping frequencies in use.

Hopping Sequence(s)	
Condition	**Limit**
Adaptive frequency hopping systems	Operating frequency band ≥58.45 MHz (Operating over a minimum of 70 % of the operating in the band 2,4 GHz to 2,4835 GHz)
	≥15 hopping frequencies or 15 MHz/minimum Hopping Frequency Separation in MHz, whichever is the greater.

5.3 Hopping Frequency Separation

Condition	Limit
Adaptive frequency hopping systems	The minimum Hopping Frequency Separation shall be 100 kHz.

5.4 Adaptivity

Applicability of adaptive requirements and limit for frequency hopping equipment

Requirement	Operational Mode	
	LBT based DAA	Other forms of DAA (non-LBT based)
Minimum Clear Channel Assessment (CCA) Time	18 us (see note 1)	NA
Maximum Channel Occupancy (COT) Time	60 ms (see note2)	40 ms (see note5)
Minimum Idle Period	100 us (see note3)	100 us (see note5)
Extended CCA check	see note4	NA
Minimum time for unavailable	NA	see note6
Short Control Signalling Transmissions	Maximum duty cycle of 10 % within an observation period of 50 ms (see note 7)	

NOTE 1: The CCA observation time shall be not less than 0,2 % of the Channel Occupancy Time with a minimum of 18 µs
NOTE 2: For LBT based frequency hopping equipment with a dwell time < 60 ms, the maximum Channel Occupancy Time is limited by the dwell time.
NOTE 3: Minimum 5 % of the Channel Occupancy Time with a minimum of 100 µs.
NOTE 4: Extended CCA check is observed for a random duration between the value defined for the CCA observation time and 5 % of the Channel Occupancy Time.
NOTE 5: For equipment using a dwell time > 40 ms that want to have other transmissions during the same hop (dwell time) an Idle Period (no transmissions) of minimum 5 % of the Channel Occupancy Period with a minimum of 100 µs shall be implemented.
NOTE 6: The frequency shall remain unavailable for a minimum time equal to 1 second or 5 times the actual number of hopping frequencies multiplied with the Channel Occupancy Time whichever is the longest.
NOTE 7: Adaptive equipment may or may not have Short Control Signaling Transmissions.

Interference threshold level

Maximum transmit power (P_H) EIRP dBm	Threshold level (TL) (see notes 1 and 2)
20	-70 dBm / MHz

NOTE 1: For a 20 dBm e.i.r.p. transmitter the detection threshold level (TL) shall be equal or less than -70 dBm/MHz at the input to the receiver (assuming a 0 dBi receive antenna)
NOTE 2: For power levels below 20 dBm e.i.r.p., the detection threshold level may be relaxed to TL = -70 dBm/MHz + 10 × $\log_{10}$ (100 mW / P_{out}) (P_{out} in mW e.i.r.p.)
NOTE3: Pout is EIRP Limit 20dBm and antenna gain is -2dBi specified by applicant.

Unwanted signal parameters for LBT based DAA		
Wanted signal mean power from companion device	**Unwanted signal frequency (MHz)**	**Unwanted CW signal power (dBm)**
sufficient to maintain the link (see note 2)	2 395 or 2 488.5 (see note 1)	-35 (see note 3)

NOTE 1: The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483.5 MHz.
NOTE 2: A typical value which can be used in most cases is -50dBm/MHz.
NOTE 3: The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain.

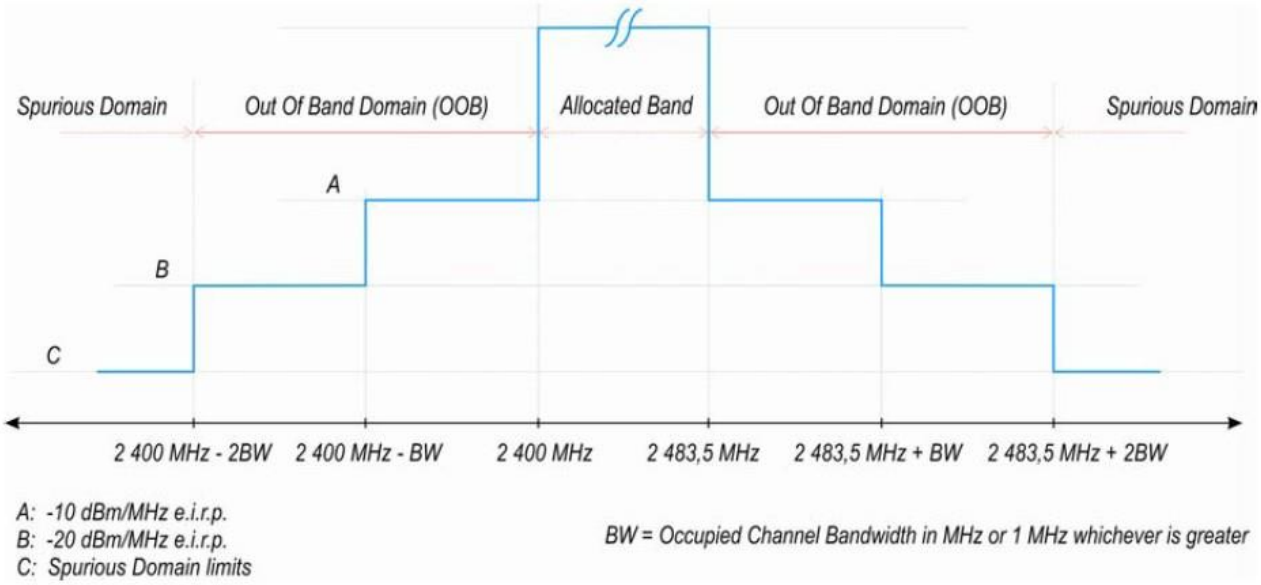
Unwanted signal parameters for non-LBT Based		
Wanted signal mean power from companion device (dBm)	**Unwanted signal frequency (MHz)**	**Unwanted CW signal power (dBm)**
-30	2 395 or 2 488.5 (see note 1)	-35 (see note 2)
NOTE 1: The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz.		
NOTE 2: The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain.		

5.5 Occupied Channel Bandwidth

Condition		Limit
All types of equipment		Shall fall completely within the band 2400 to 2483.5 MHz.
Additional requirement	For non-adaptive non-FHSS system and e.i.r.p >10 dBm.	Less than 20 MHz
	For non-adaptive Frequency Hopping system and e.i.r.p >10 dBm.	Less than 5 MHz

5.6 Transmitter Unwanted Emissions in the out-of-band Domain

Condition	Limit
Under normal conditions	The transmitter unwanted emissions in the out-of-band domain shall not exceed the values provided by the mask in below figure.



5.7 Transmitter Unwanted Emissions in the Spurious Domain up to 1 GHz

Frequency Range	Maximum Power Limit	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87.5 MHz	-36 dBm	100 kHz
87.5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 694 MHz	-54 dBm	100 kHz
694 MHz to 1 GHz	-36 dBm	100 kHz

Note: These limits are e.r.p. for emissions up to 1 GHz.

5.8 Transmitter Unwanted Emissions in the Spurious Domain above 1 GHz

Frequency Range	Maximum Power Limit	Bandwidth
1 GHz to 12.75 GHz	-30 dBm	1 MHz

Note: These limits are e.i.r.p. for emissions above 1 GHz.

5.9 Receiver Spurious Emissions up to 1 GHz

Frequency Range	Maximum Power Limit	Bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz

Note: These limits are e.r.p. for emissions up to 1 GHz.

5.10 Receiver Spurious Emissions above 1 GHz

Frequency Range	Maximum Power Limit	Bandwidth
1 GHz to 12.75 GHz	-47 dBm	1 MHz

Note: These limits are e.i.r.p. for emissions above 1 GHz.

5.11 Receiver Blocking

Receiver Category 1 Equipment			
Wanted signal mean power from companion device (dBm) (see notes 1 to 4)	**Blocking Signal Frequency (MHz)**	**Blocking Signal Power (dBm) (see note 4)**	**Type of blocking signal**
(-133 dBm + 10 × $\log_{10}$(OCBW)) or -68 dBm whichever is less (see note 2)	2 380 2 504	-34	CW
(-139 dBm + 10 × $\log_{10}$(OCBW)) or -74 dBm whichever is less (see note 3)	2 300 2 330 2 360 2 524 2 584 2 674		

NOTE 1: OCBW is in Hz.
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 20 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured / positioned as recorded in clause 5.4.3.2.2.

6 Test Arrangements

6.1 RF Output Power

Test procedure refer to chapter 5.4.2 of EN 300 328 V2.2.2.

Measurement Method	Conducted measurement

6.2 Accumulated Transmit Time, Frequency Occupation and Hopping Sequence

Test procedure refer to chapter 5.4.4 of EN 300 328 V2.2.2.

Measurement Method	Conducted measurement

6.3 Hopping Frequency Separation

Test procedure refer to chapter 5.4.5 of EN 300 328 V2.2.2.

Measurement Method	Conducted measurement

6.4 Adaptivity

Refer to chapter 5.4.6 of EN 300 328 V2.2.2.

Measurement Method	
☒ Conducted measurement	☐ Radiated measurement

6.5 Occupied Channel Bandwidth

Test procedure refer to chapter 5.4.7 of EN 300 328 V2.2.2.

Measurement Method	Conducted measurement

6.6 Transmitter Unwanted Emissions in the out-of-band Domain

Test procedure refer to chapter 5.4.8 of EN 300 328 V2.2.2.

Measurement Method	Conducted measurement

6.7 Transmitter Unwanted Emissions in the Spurious Domain up to 1 GHz

Test procedure refer to chapter 5.4.9 of EN 300 328 V2.2.2.

Measurement Method	Radiated measurement

6.8 Transmitter Unwanted Emissions in the Spurious Domain above 1 GHz

Test procedure refer to chapter 5.4.9 of EN 300 328 V2.2.2.

Measurement Method	Radiated measurement

6.9 Receiver Spurious Emissions up to 1 GHz

Test procedure refer to chapter 5.4.10 of EN 300 328 V2.2.2.

Measurement Method	Radiated measurement

6.10 Receiver Spurious Emissions above 1 GHz

Test procedure refer to chapter 5.4.10 of EN 300 328 V2.2.2.

Measurement Method	Radiated measurement

6.11 Receiver Blocking

Test procedure refer to chapter 5.4.11 of EN 300 328 V2.2.2.

Measurement Method	Conducted measurement

7 Test Results of Test Item

7.1 RF Output Power

Input Power:	3.3 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Dolly Chung

GFSK Low Power

EIRP (dBm)			Limit (dBm)	Test Result
Extreme test conditions				
25 ℃	-20 ℃	70 ℃		
9.68	9.98	9.38	20	Pass

8DPSK Low Power

EIRP (dBm)			Limit (dBm)	Test Result
Extreme test conditions				
25 ℃	-20 ℃	70 ℃		
9.55	9.87	9.25	20	Pass

GFSK High Power

EIRP (dBm)			Limit (dBm)	Test Result
Extreme test conditions				
25 ℃	-20 ℃	70 ℃		
16.25	16.55	15.95	20	Pass

8DPSK High Power

EIRP (dBm)			Limit (dBm)	Test Result
Extreme test conditions				
25 ℃	-20 ℃	70 ℃		
13.38	13.70	13.08	20	Pass

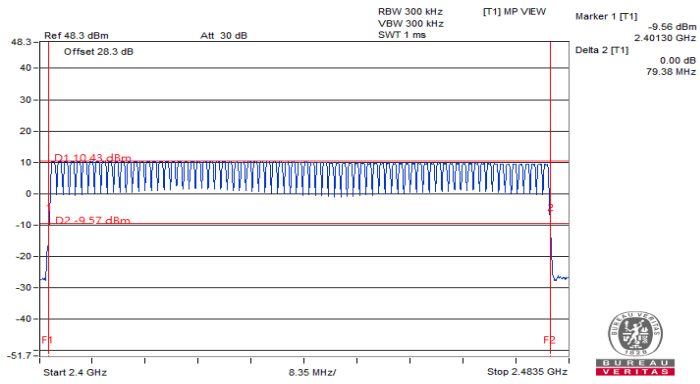
7.2 Accumulated Transmit Time, Frequency Occupation and Hopping Sequence

Input Power:	3.3 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Dolly Chung

GFSK Low Power

Hopping Sequence				
Amount of Hopping frequency	Limit	Operating Frequency Band	Limit	Test Result
79	≥ 16 Hopping frequencies	79.38 MHz	≥ 58.45 MHz	Pass

Spectrum plots of Hopping Sequence

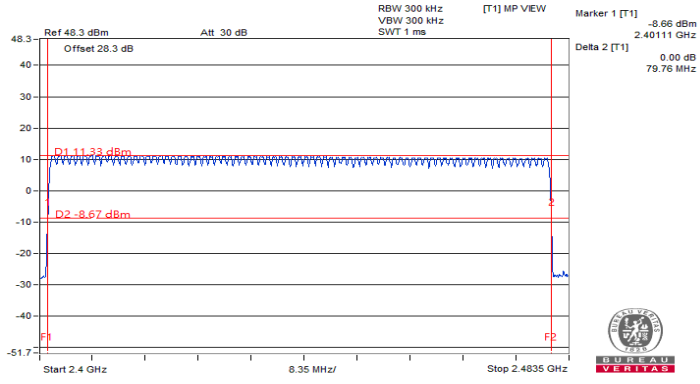


GFSK Low Power

8DPSK Low Power

Hopping Sequence				
Amount of Hopping frequency	Limit	Operating Frequency Band	Limit	Test Result
79	≥ 15 Hopping frequencies	79.76 MHz	≥ 58.45 MHz	Pass

Spectrum plots of Hopping Sequence

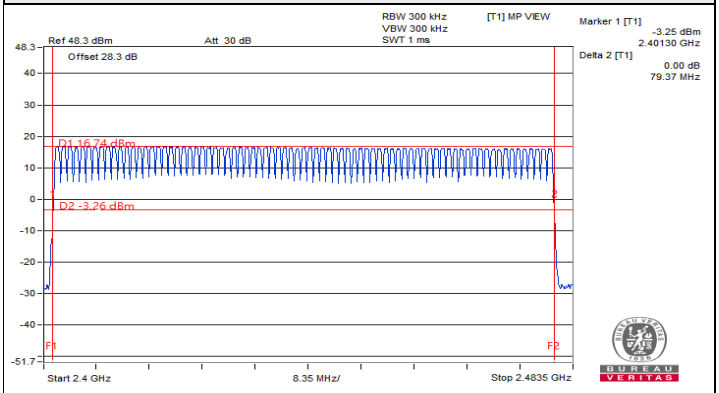


8DPSK Low Power

GFSK High Power

Hopping Sequence				
Amount of Hopping frequency	Limit	Operating Frequency Band	Limit	Test Result
79	≥ 15 Hopping frequencies	79.37 MHz	≥ 58.45 MHz	Pass

Spectrum plots of Hopping Sequence

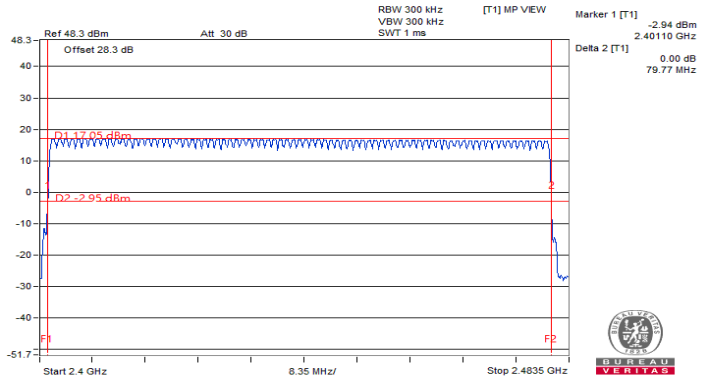


GFSK High Power

8DPSK High Power

Hopping Sequence				
Amount of Hopping frequency	Limit	Operating Frequency Band	Limit	Test Result
79	≥ 15 Hopping frequencies	79.77 MHz	≥ 58.45 MHz	Pass

Spectrum plots of Hopping Sequence



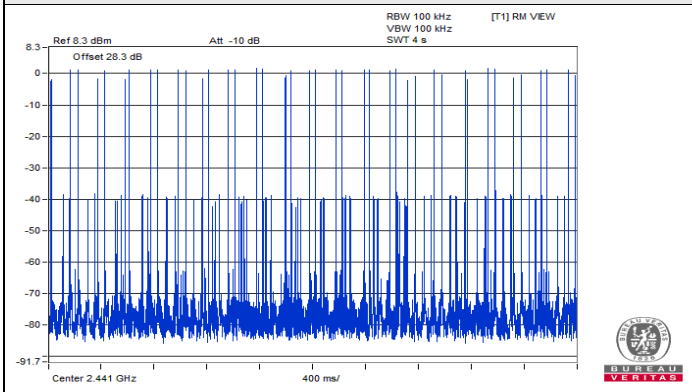
8DPSK High Power

GFSK Low Power

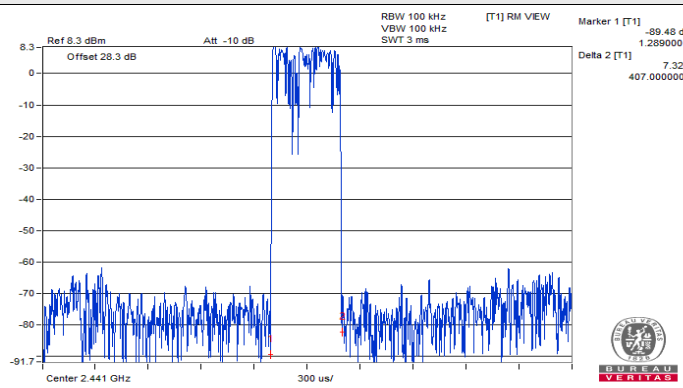
Accumulated Transmit Time							
Mode	Minimum Number of Hopping Channel	NTP* (Sec)	Number of Hop in NTP*	Dwell Time per Hop (msec)	Dwell Time in NTP* (msec)	Limit (msec)	Test Result
DH1	79	31.6	323.9	0.407	131.8273	400	Pass
DH3	79	31.6	173.8	1.676	291.2888	400	Pass
DH5	79	31.6	86.9	2.934	254.9646	400	Pass

Note: NTP*** is** Number of transmission in a period (channel number x 0.4 sec)

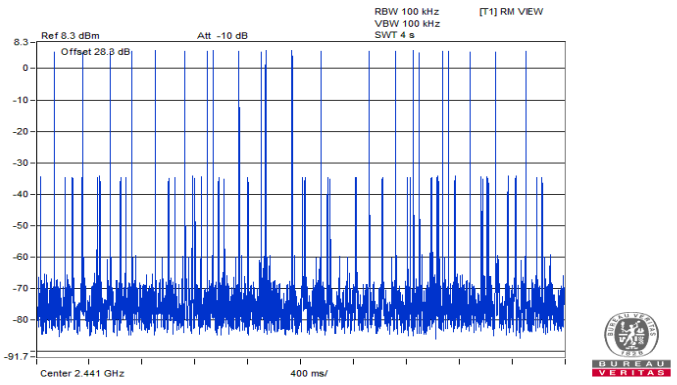
Spectrum plots of Accumulated Transmit Time



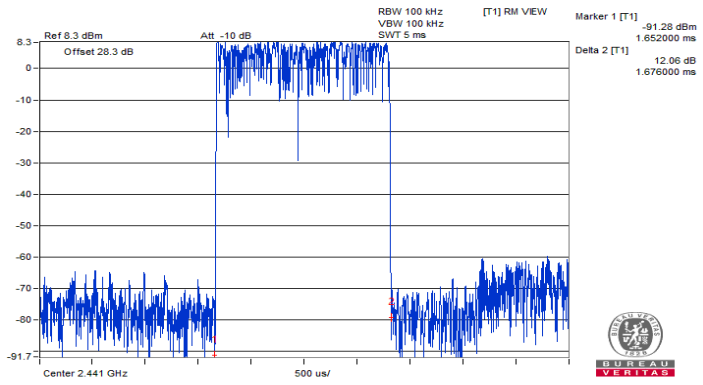
GFSK Low Power DH1



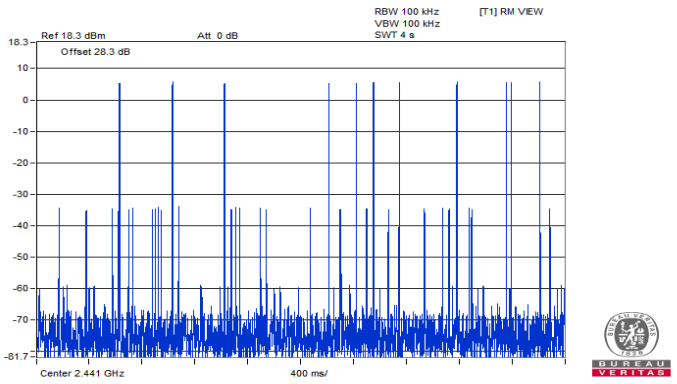
GFSK Low Power DH1



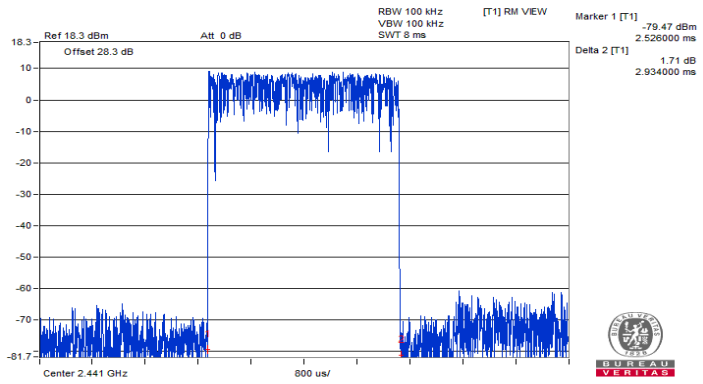
GFSK Low Power DH3



GFSK Low Power DH3



GFSK Low Power DH5



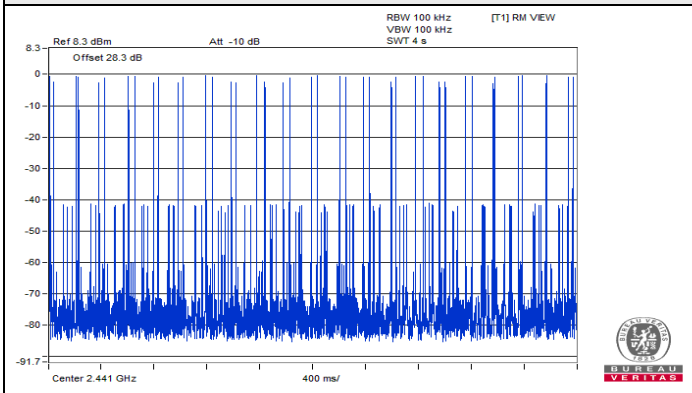
GFSK Low Power DH5

8DPSK Low Power

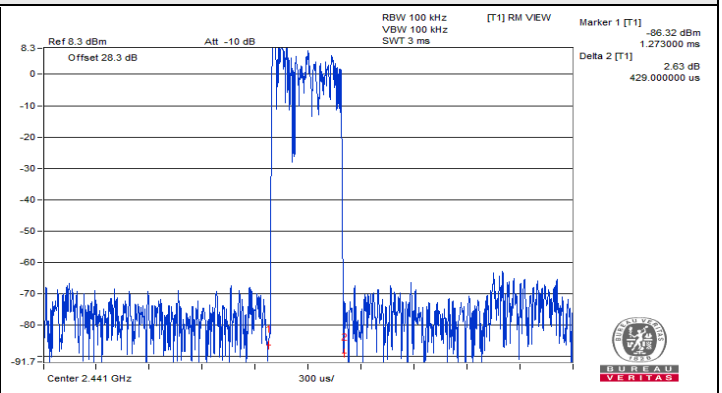
Accumulated Transmit Time							
Mode	Minimum Number of Hopping Channel	NTP* (Sec)	Number of Hop in NTP*	Dwell Time per Hop (msec)	Dwell Time in NTP* (msec)	Limit (msec)	Test Result
3DH1	79	31.6	316	0.429	135.564	400	Pass
3DH3	79	31.6	158	1.702	268.916	400	Pass
3DH5	79	31.6	110.6	2.934	324.5004	400	Pass

Note: NTP*** is** Number of transmission in a period (channel number x 0.4 sec)

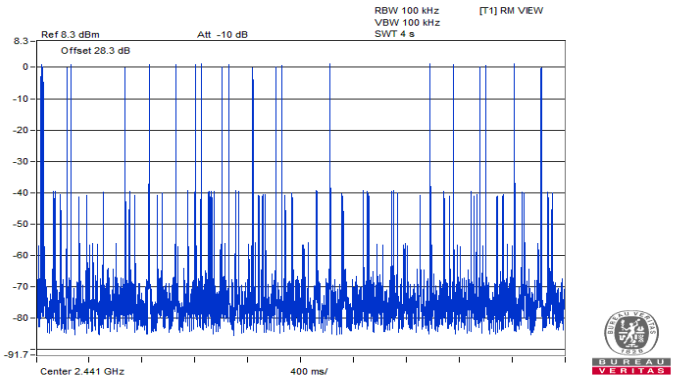
Spectrum plots of Accumulated Transmit Time



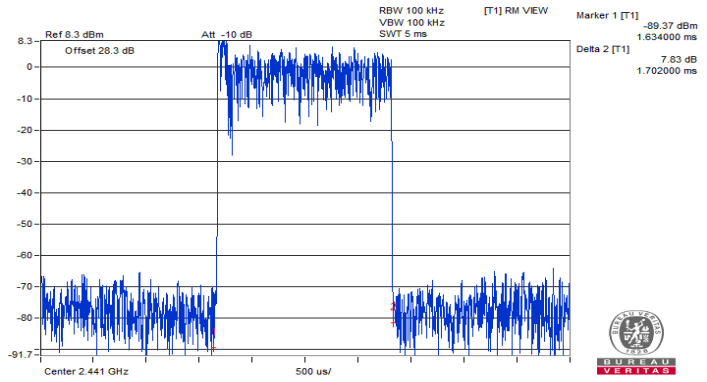
8DPSK Low Power 3DH1



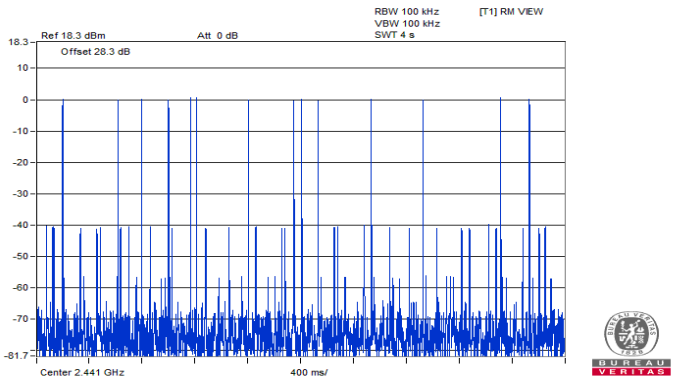
8DPSK Low Power 3DH1



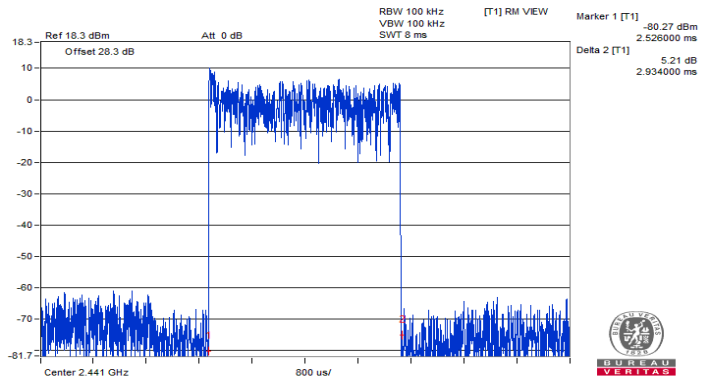
8DPSK Low Power 3DH3



8DPSK Low Power 3DH3



8DPSK Low Power 3DH5



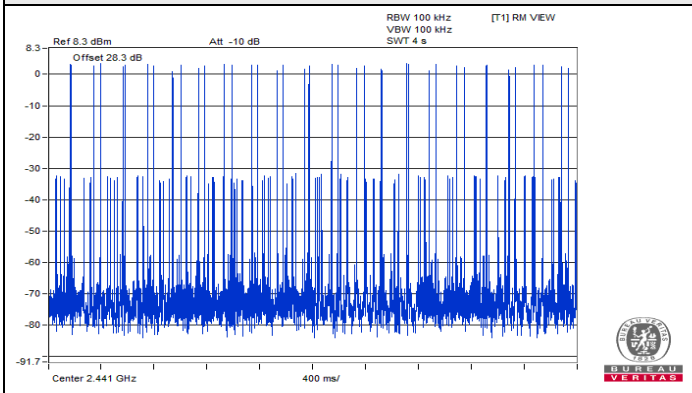
8DPSK Low Power 3DH5

GFSK High Power

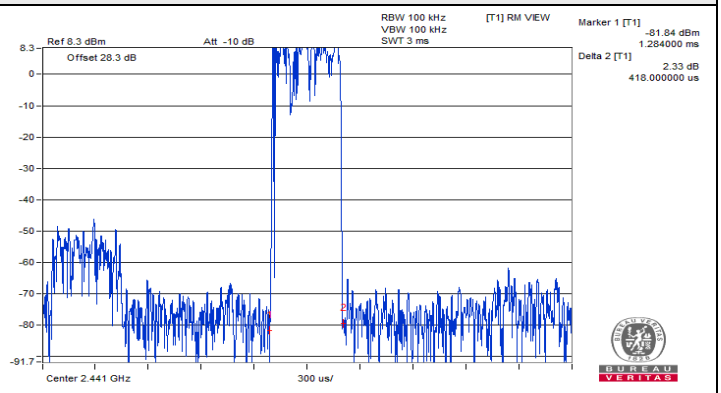
Accumulated Transmit Time							
Mode	Minimum Number of Hopping Channel	NTP* (Sec)	Number of Hop in NTP*	Dwell Time per Hop (msec)	Dwell Time in NTP* (msec)	Limit (msec)	Test Result
DH1	79	31.6	292.3	0.418	122.1814	400	Pass
DH3	79	31.6	158	1.677	264.966	400	Pass
DH5	79	31.6	94.8	2.936	278.3328	400	Pass

Note: NTP*** is** Number of transmission in a period (channel number x 0.4 sec)

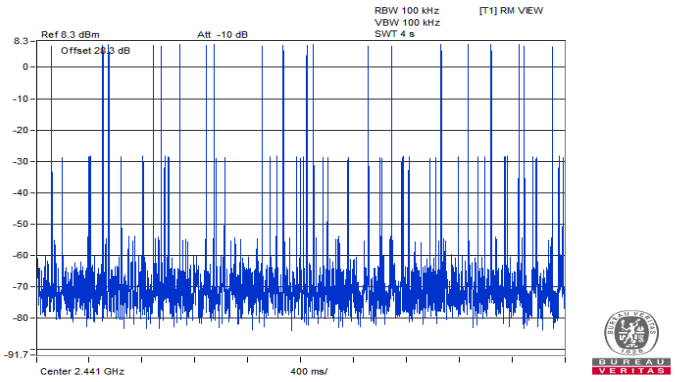
Spectrum plots of Accumulated Transmit Time



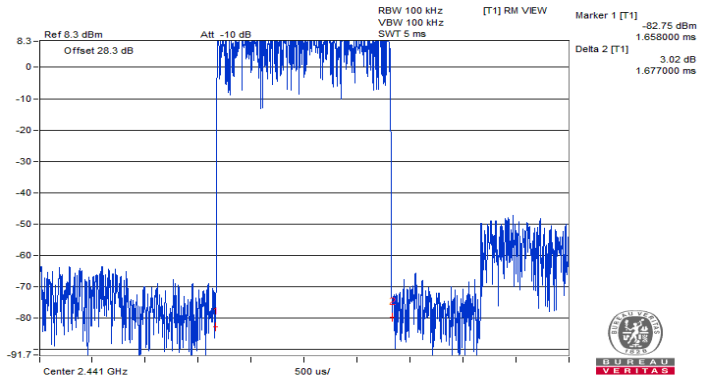
GFSK High Power DH1



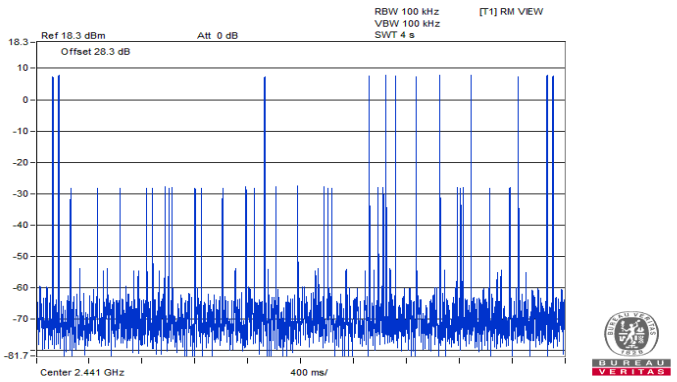
GFSK High Power DH1



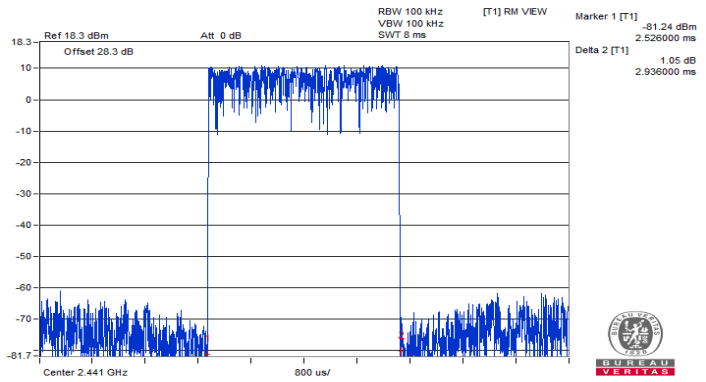
GFSK High Power DH3



GFSK High Power DH3



GFSK High Power DH5



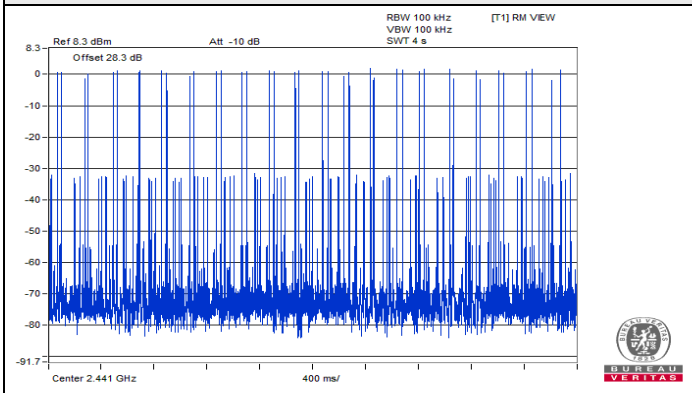
GFSK High Power DH5

8DPSK High Power

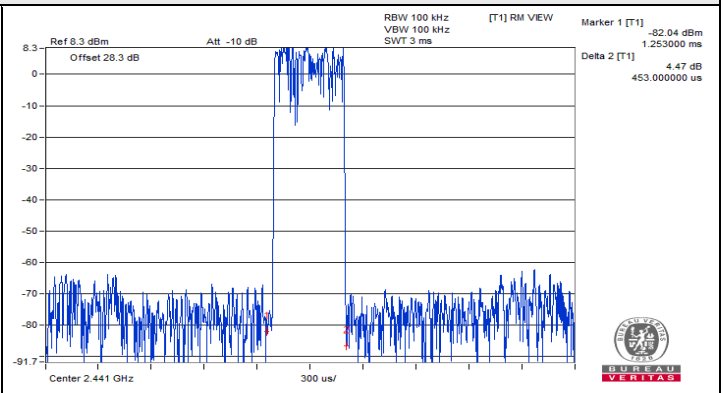
Accumulated Transmit Time							
Mode	Minimum Number of Hopping Channel	NTP* (Sec)	Number of Hop in NTP*	Dwell Time per Hop (msec)	Dwell Time in NTP* (msec)	Limit (msec)	Test Result
3DH1	79	31.6	308.1	0.453	139.5693	400	Pass
3DH3	79	31.6	158	1.68	265.44	400	Pass
3DH5	79	31.6	94.8	2.934	278.1432	400	Pass

Note: NTP*** is** Number of transmission in a period (channel number x 0.4 sec)

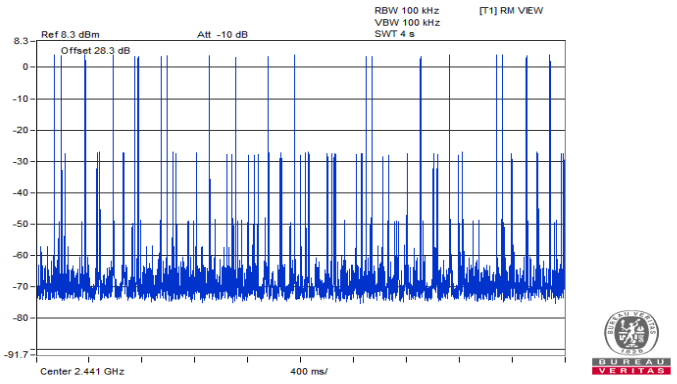
Spectrum plots of Accumulated Transmit Time



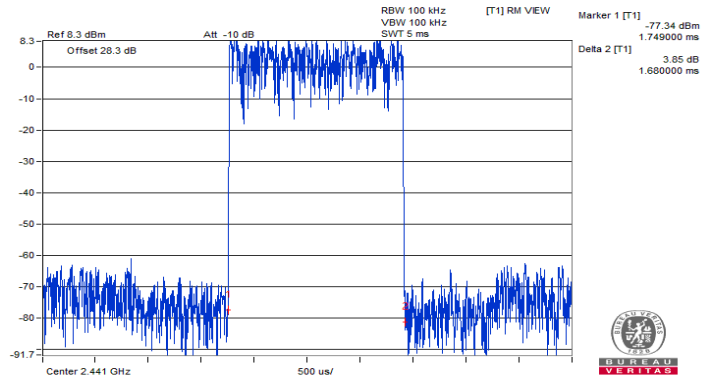
8DPSK High Power 3DH1



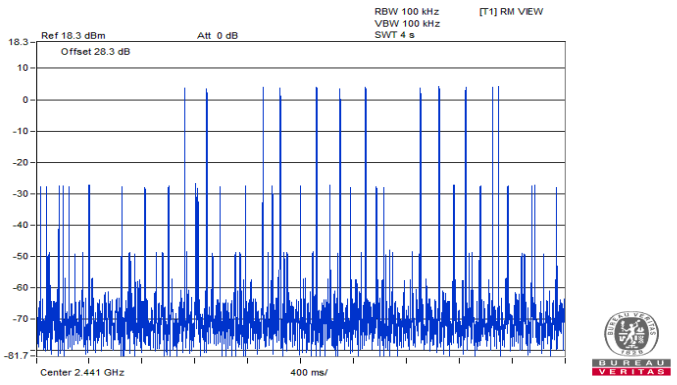
8DPSK High Power 3DH1



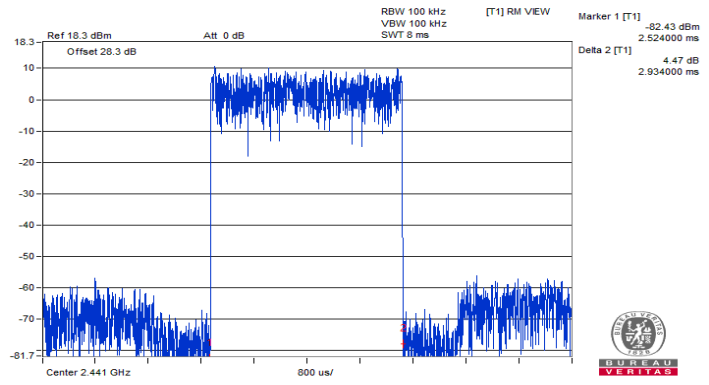
8DPSK High Power 3DH3



8DPSK High Power 3DH3



8DPSK High Power 3DH5



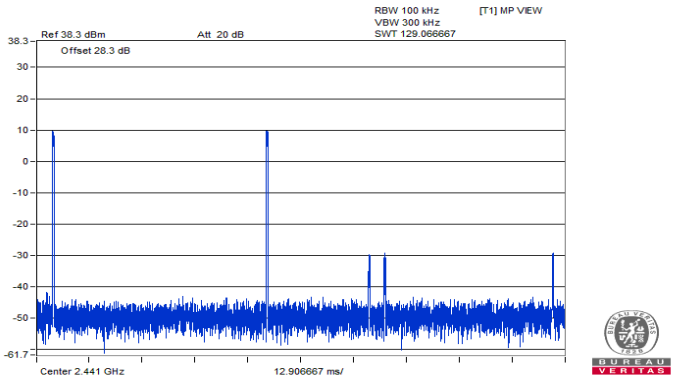
8DPSK High Power 3DH5

GFSK Low Power

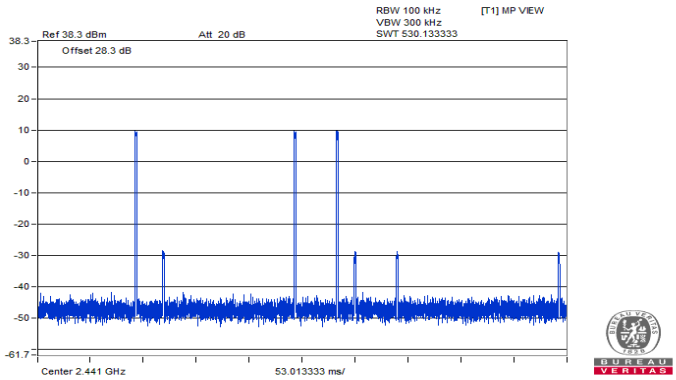
Frequency Occupation							
Mode	Actual Number of Hopping Channel	Dwell Time per Hop (msec)	T_{FO}* (msec)	Number of Hop in T_{FO}*	Dwell Time in T_{FO}*	Limit-Minimum number of Hopping in T_{FO}*	Test Result
DH1	79	0.407	128.612	2	0.814	1	Pass
DH3	79	1.676	529.616	3	5.028	1	Pass
DH5	79	2.934	927.144	3	8.802	1	Pass

Note: T_{FO}* is 4 × Dwell Time × Actual number of hopping frequencies in use

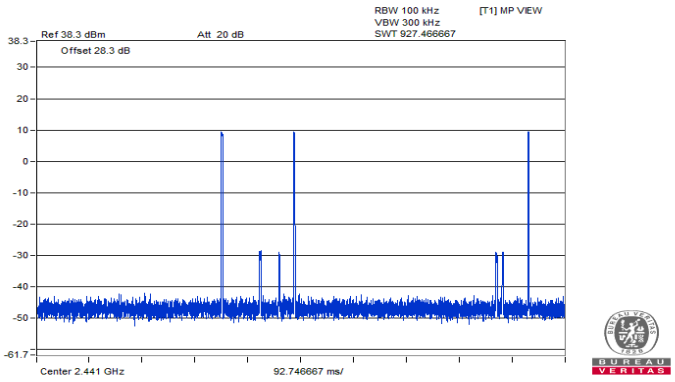
Spectrum plots of Frequency Occupation



GFSK Low Power DH1



GFSK Low Power DH3



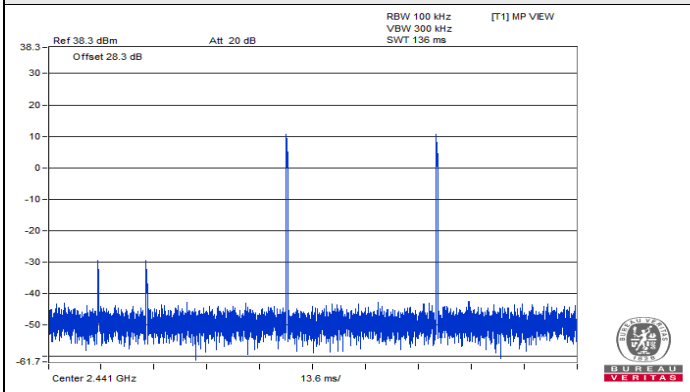
GFSK Low Power DH5

8DPSK Low Power

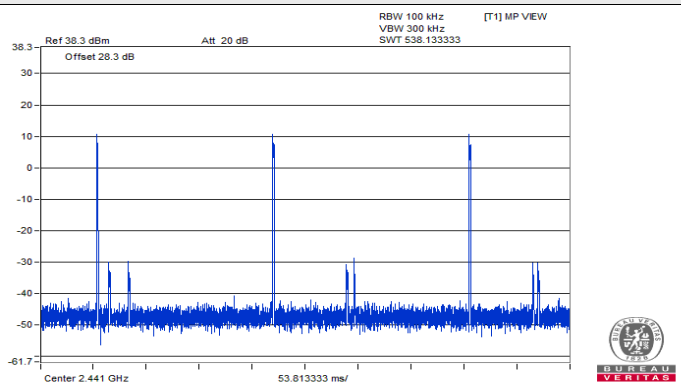
Frequency Occupation							
Mode	Actual Number of Hopping Channel	Dwell Time per Hop (msec)	T_{FO}* (msec)	Number of Hop in T_{FO}*	Dwell Time in T_{FO}*	Limit-Minimum number of Hopping in T_{FO}*	Test Result
3DH1	79	0.429	135.564	2	0.858	1	Pass
3DH3	79	1.702	537.832	3	5.106	1	Pass
3DH5	79	2.934	927.144	2	5.868	1	Pass

Note: T_{FO}* is 4 × Dwell Time × Actual number of hopping frequencies in use

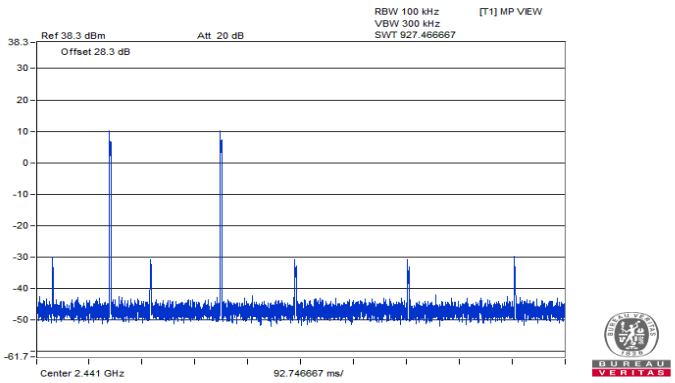
Spectrum plots of Frequency Occupation



8DPSK Low Power 3DH1



8DPSK Low Power 3DH3



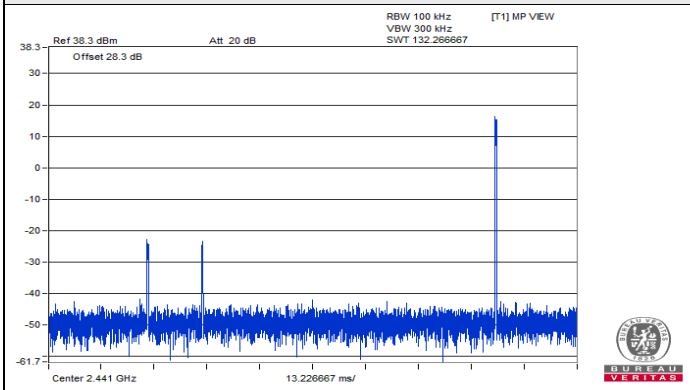
8DPSK Low Power 3DH5

GFSK High Power

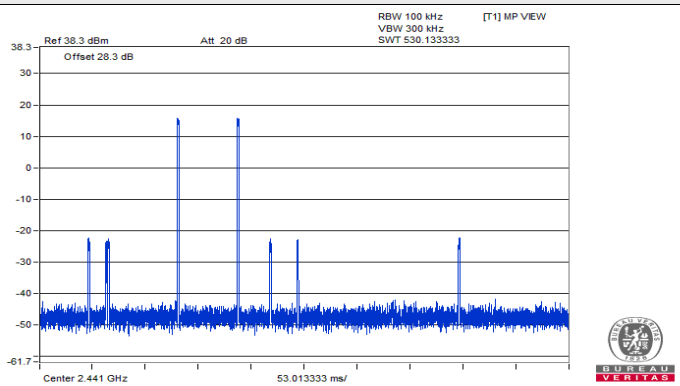
Frequency Occupation							
Mode	Actual Number of Hopping Channel	Dwell Time per Hop (msec)	T_{FO}* (msec)	Number of Hop in T_{FO}*	Dwell Time in T_{FO}*	Limit-Minimum number of Hopping in T_{FO}*	Test Result
DH1	79	0.418	132.088	1	0.418	1	Pass
DH3	79	1.677	529.932	2	3.354	1	Pass
DH5	79	2.936	927.776	3	8.808	1	Pass

Note: T_{FO}* is 4 × Dwell Time × Actual number of hopping frequencies in use

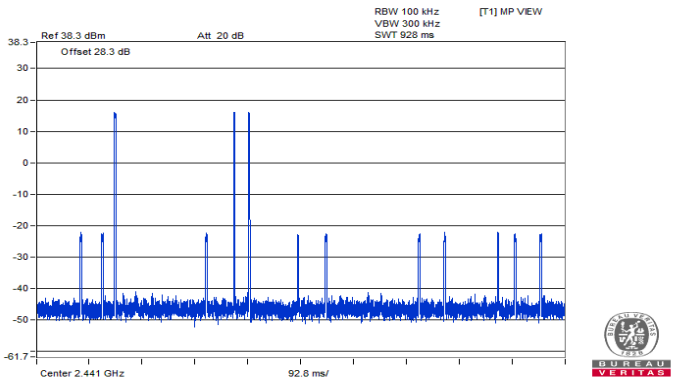
Spectrum plots of Frequency Occupation



GFSK High Power DH1



GFSK High Power DH3



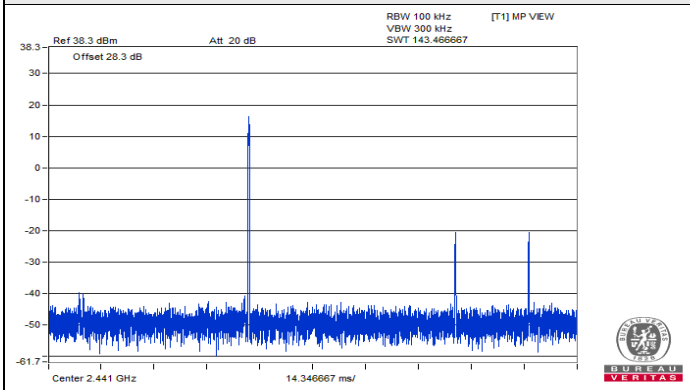
GFSK High Power DH5

8DPSK High Power

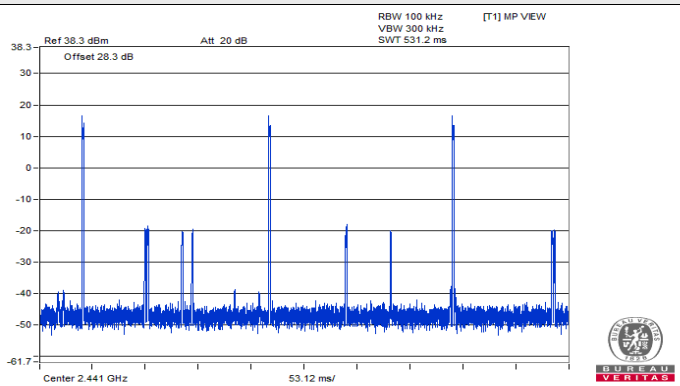
Frequency Occupation							
Mode	Actual Number of Hopping Channel	Dwell Time per Hop (msec)	T_{FO}* (msec)	Number of Hop in T_{FO}*	Dwell Time in T_{FO}*	Limit-Minimum number of Hopping in T_{FO}*	Test Result
3DH1	79	0.453	143.148	1	0.453	1	Pass
3DH3	79	1.68	530.88	3	5.04	1	Pass
3DH5	79	2.934	927.144	1	2.934	1	Pass

Note: T_{FO}* is 4 × Dwell Time × Actual number of hopping frequencies in use

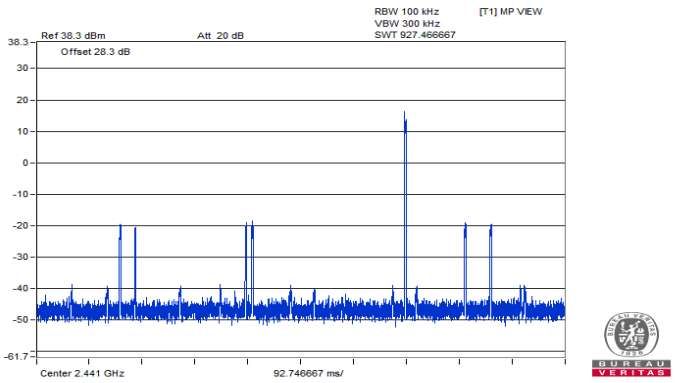
Spectrum plots of Frequency Occupation



8DPSK High Power 3DH1



8DPSK High Power 3DH3



8DPSK High Power 3DH5

7.3 Hopping Frequency Separation

Input Power:	3.3 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Dolly Chung

GFSK Low Power

Channel	Channel Frequency (MHz)	Frequency Separation (MHz)	Minimum Limit (MHz)	Test Result
0	2402	1.00	0.1	Pass
78	2480	0.99	0.1	Pass

8DPSK Low Power

Channel	Channel Frequency (MHz)	Frequency Separation (MHz)	Minimum Limit (MHz)	Test Result
0	2402	1.00	0.1	Pass
78	2480	1.00	0.1	Pass

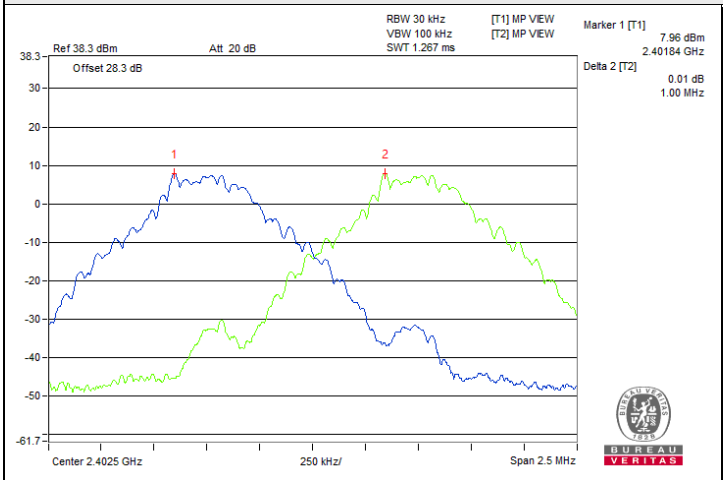
GFSK High Power

Channel	Channel Frequency (MHz)	Frequency Separation (MHz)	Minimum Limit (MHz)	Test Result
0	2402	1.00	0.1	Pass
78	2480	1.00	0.1	Pass

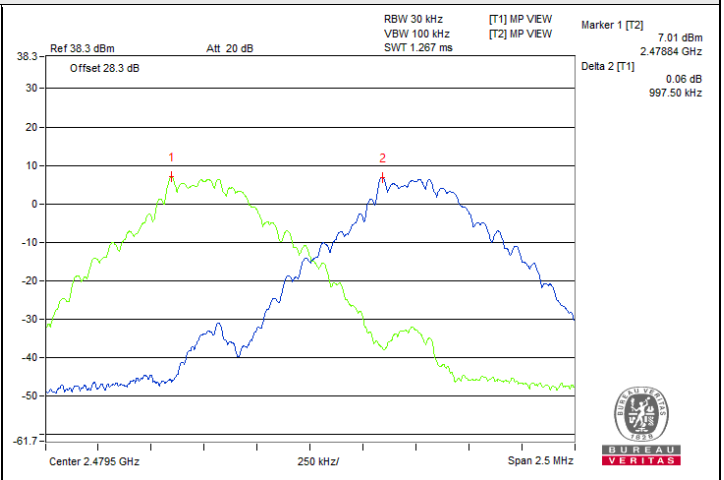
8DPSK High Power

Channel	Channel Frequency (MHz)	Frequency Separation (MHz)	Minimum Limit (MHz)	Test Result
0	2402	1.00	0.1	Pass
78	2480	1.00	0.1	Pass

Spectrum Plot

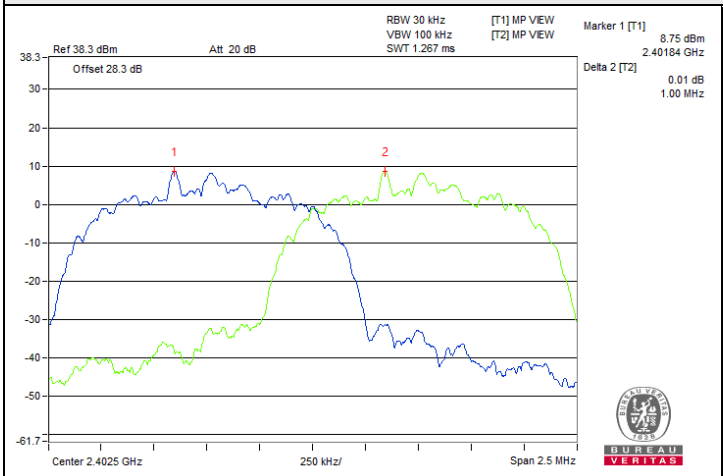


GFSK Low Power : CH 0

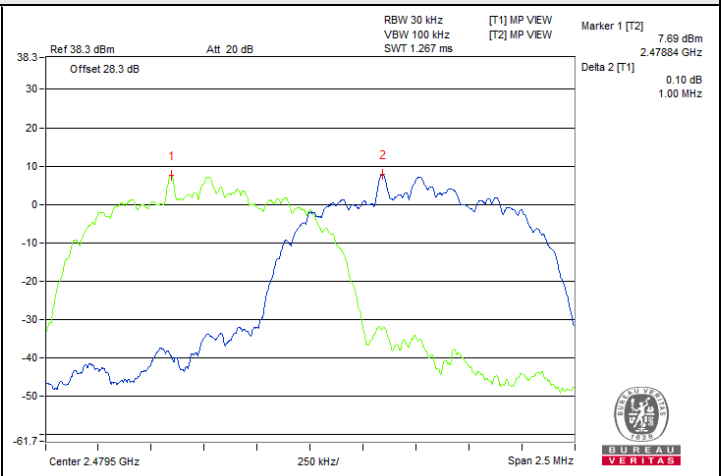


GFSK Low Power : CH 78

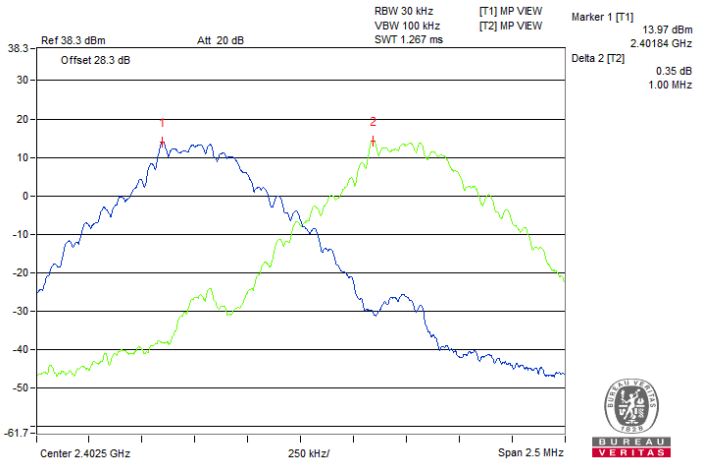
Spectrum Plot



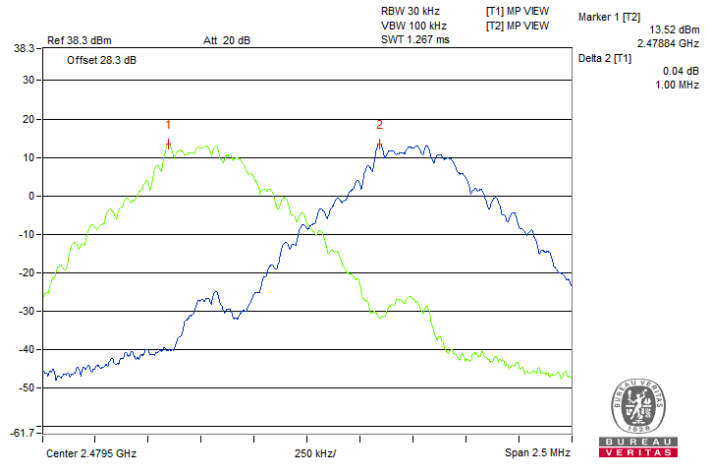
8DPSK Low Power : CH 0



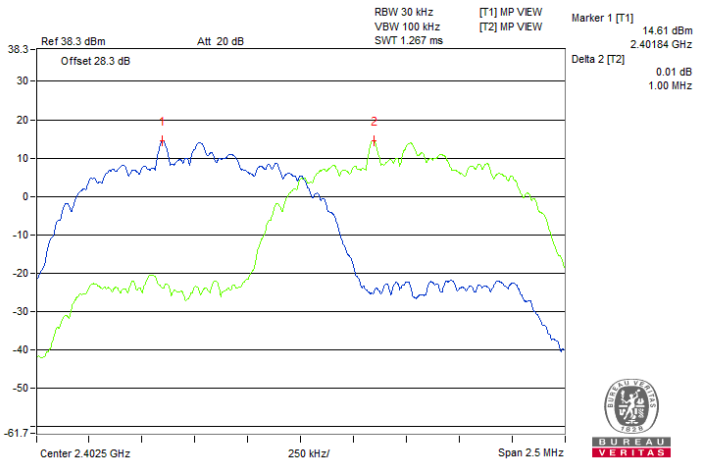
8DPSK Low Power : CH 78



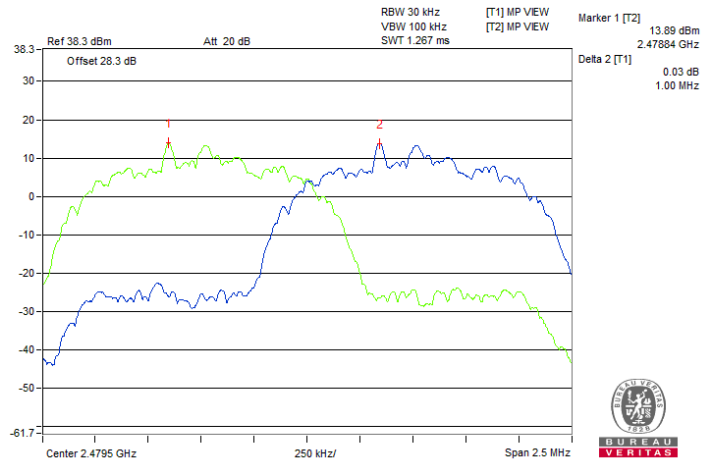
GFSK High Power : CH 0



GFSK High Power: CH 78



8DPSK High Power : CH 0



8DPSK High Power : CH 78

7.4 Adaptivity

UUT SOFTWARE VERSION

Product	Model No.	Software Version
11ax RTL8851BE Combo module	RTL8851BE	8664.1.1005.2022

Companion Device information

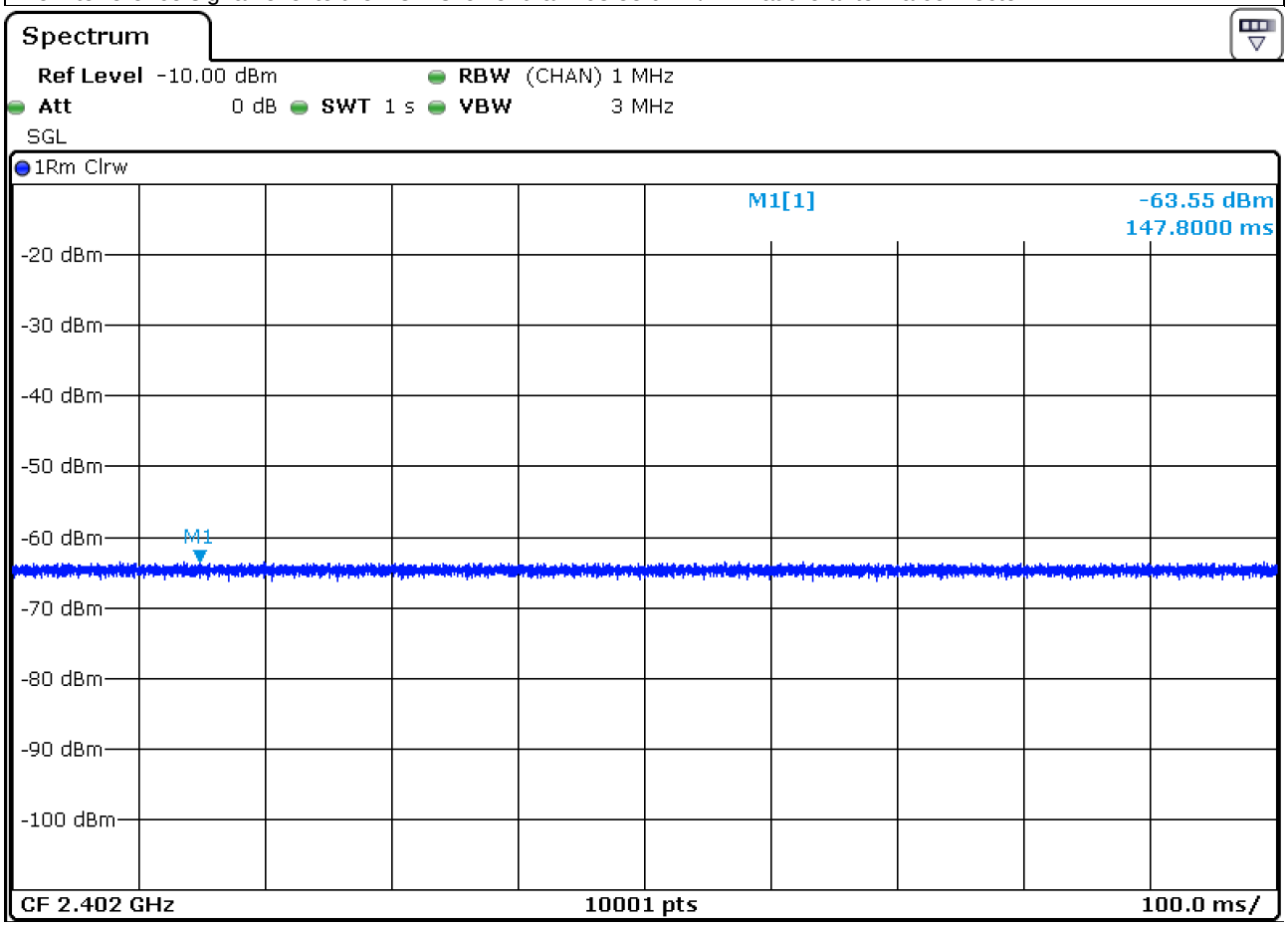
PRODUCT	BRAND	MODEL NO.
Bluetooth Test Set	Anritsu	MT8852b

List of Measurements

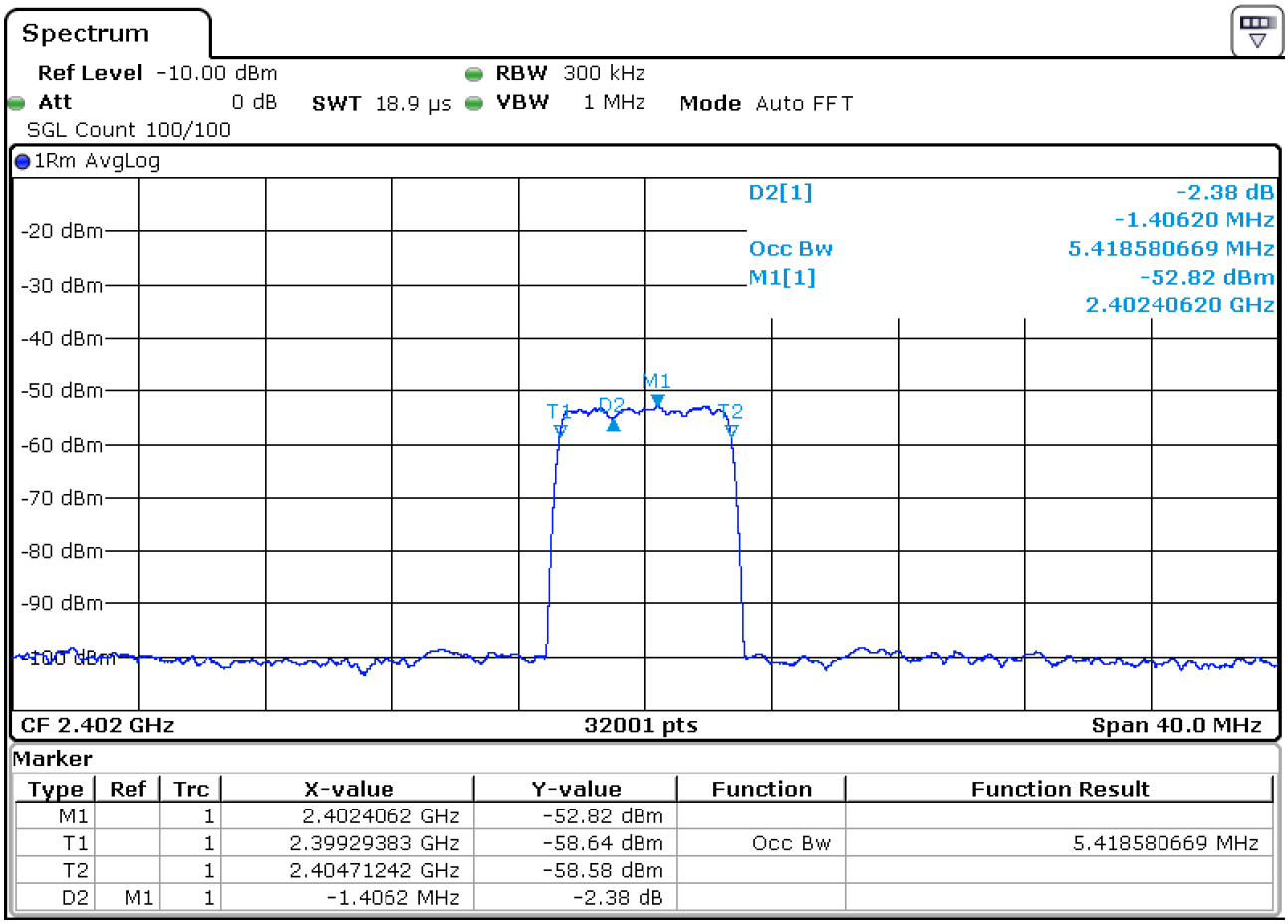
UUT Operational Mode	Applicable	Limit	
		The Maximum Channel Occupancy Time	The Minimum idle Period
FHSS using others form of DAA (non-LBT based)	v	40 ms	5% of COT
FHSS using LBT based		60ms	5% of COT

Clause	Test Parameter	Remarks	Pass/Fail
4.3.1.7.2	Adaptive FHSS using LBT Based DAA	Not Applicable	NA
4.3.1.7.3	Adaptive FHSS using others form of DAA (non-LBT based)	Applicable	PASS
4.3.1.7.4	Short Control Signalling Transmissions	Applicable	PASS
4.3.1.7.3.2.6	Unwanted signal test	Applicable	PASS

Detection Threshold Level
The maximum EIRP is 16.55 dBm (45.19 mW) and antenna gain is 3 dBi. Detection Threshold level= -70 dBm/MHz + 10×log(100 mW / Pout (45.19 mW)) + G (3 dBi) = -63.55 dBm/MHz The interference signal level to the EUT is lower than -63.55 dBm/MHz at the antenna connector.

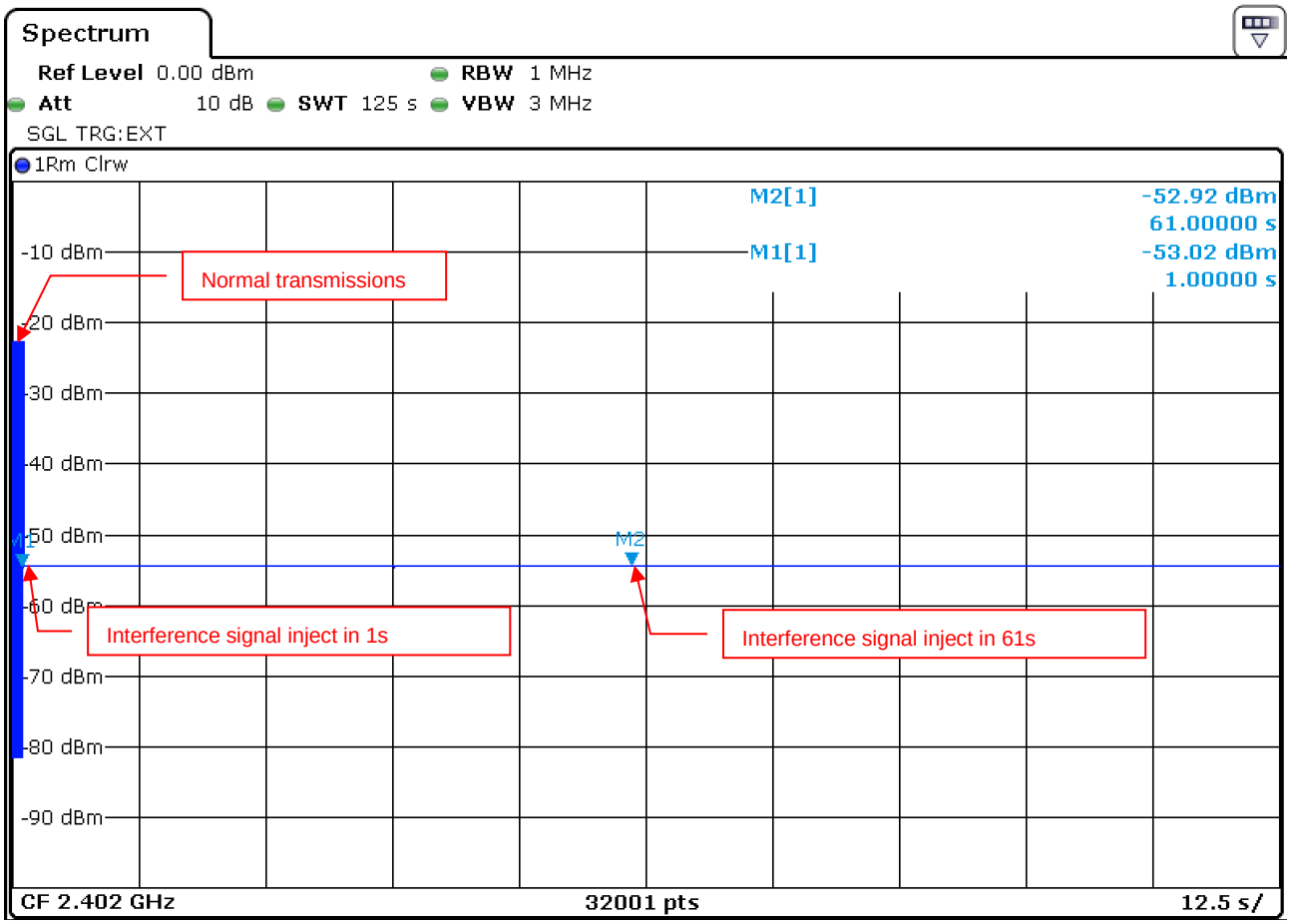


Detection Threshold Level

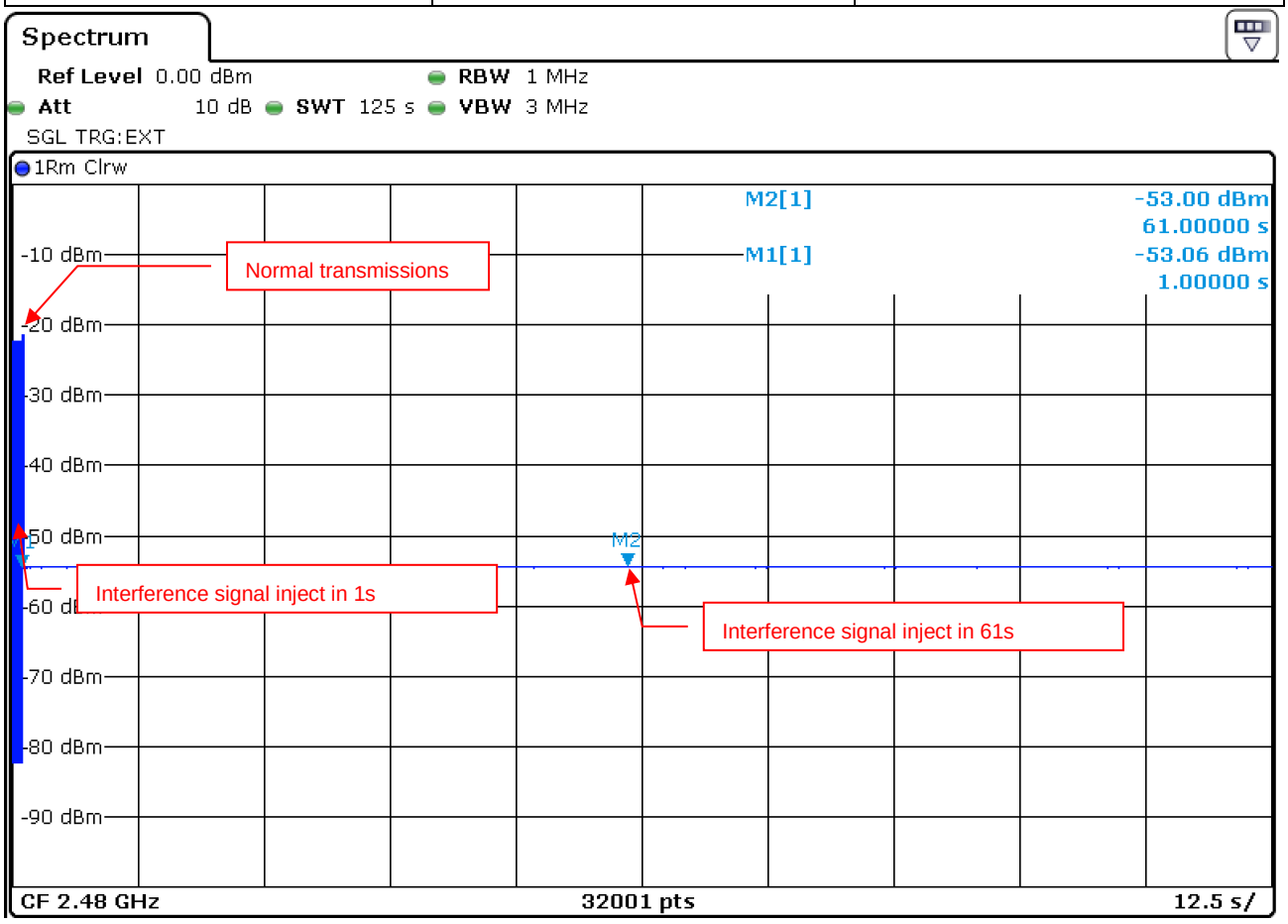


Flatness and Bandwidth

Operational Mode	Operating Frequency (MHz)	Test Result
GFSK	2402	PASS

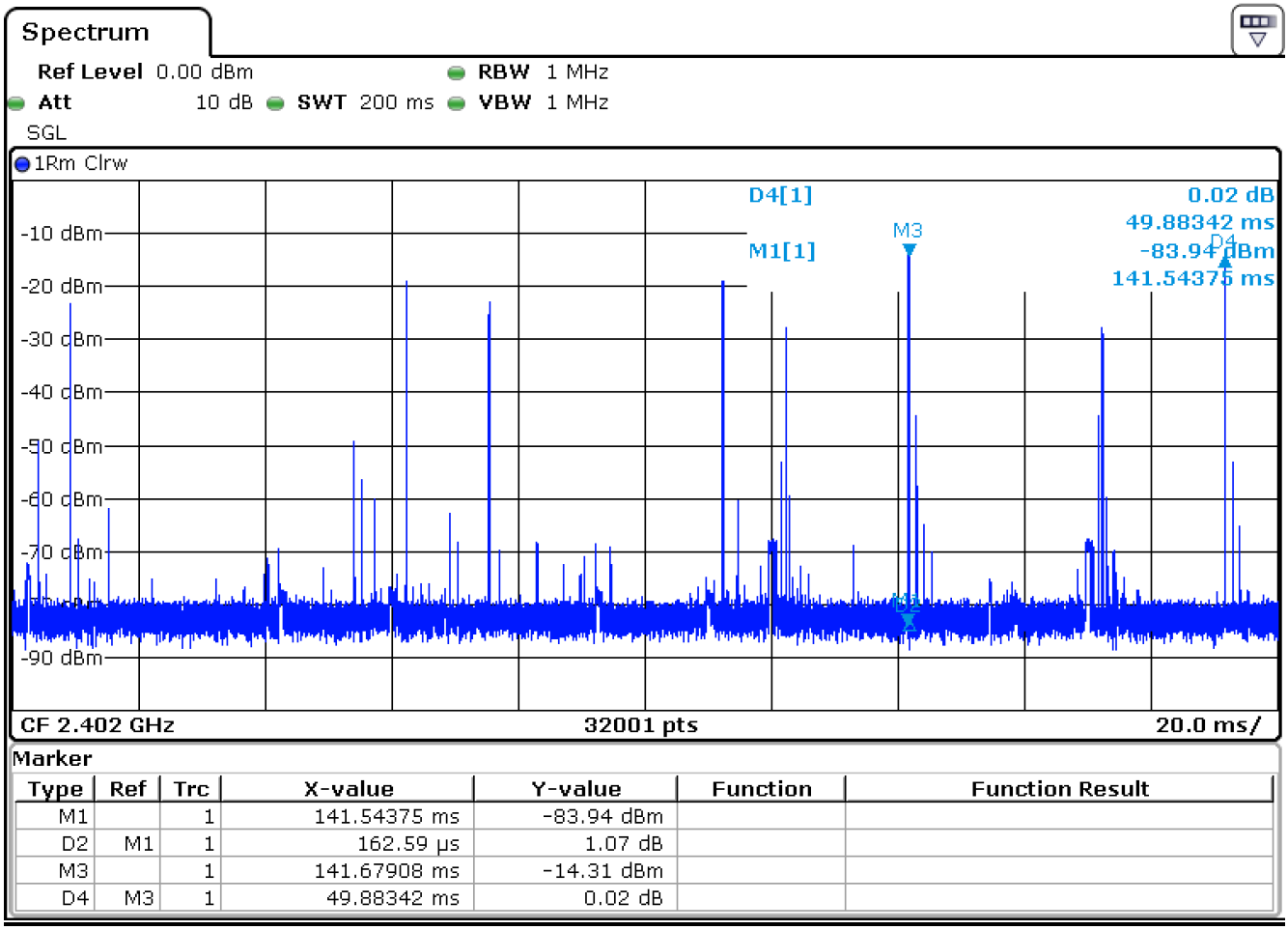

Spectrum
Ref Level 0.00 dBm
RBW 1 MHz
Att 10 dB
SWT 125 s
VBW 3 MHz
SGL TRG:EXT
1Rm Clrw
M2[1]
-52.92 dBm
61.00000 s
M1[1]
-53.02 dBm
1.00000 s
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
M1
M2
Normal transmissions
Interference signal inject in 1s
Interference signal inject in 61s
CF 2.402 GHz
32001 pts
12.5 s/

Operational Mode	Operating Frequency (MHz)	Test Result
GFSK	2480	PASS



Operating Frequency Bands and Mode of EUT

Operational Mode	Operating Frequency (MHz)	The Channel Occupancy Time (ms)	Minimum Idle Period (ms)	Test Result
GFSK	2402	0.16	49.88	PASS



Marker

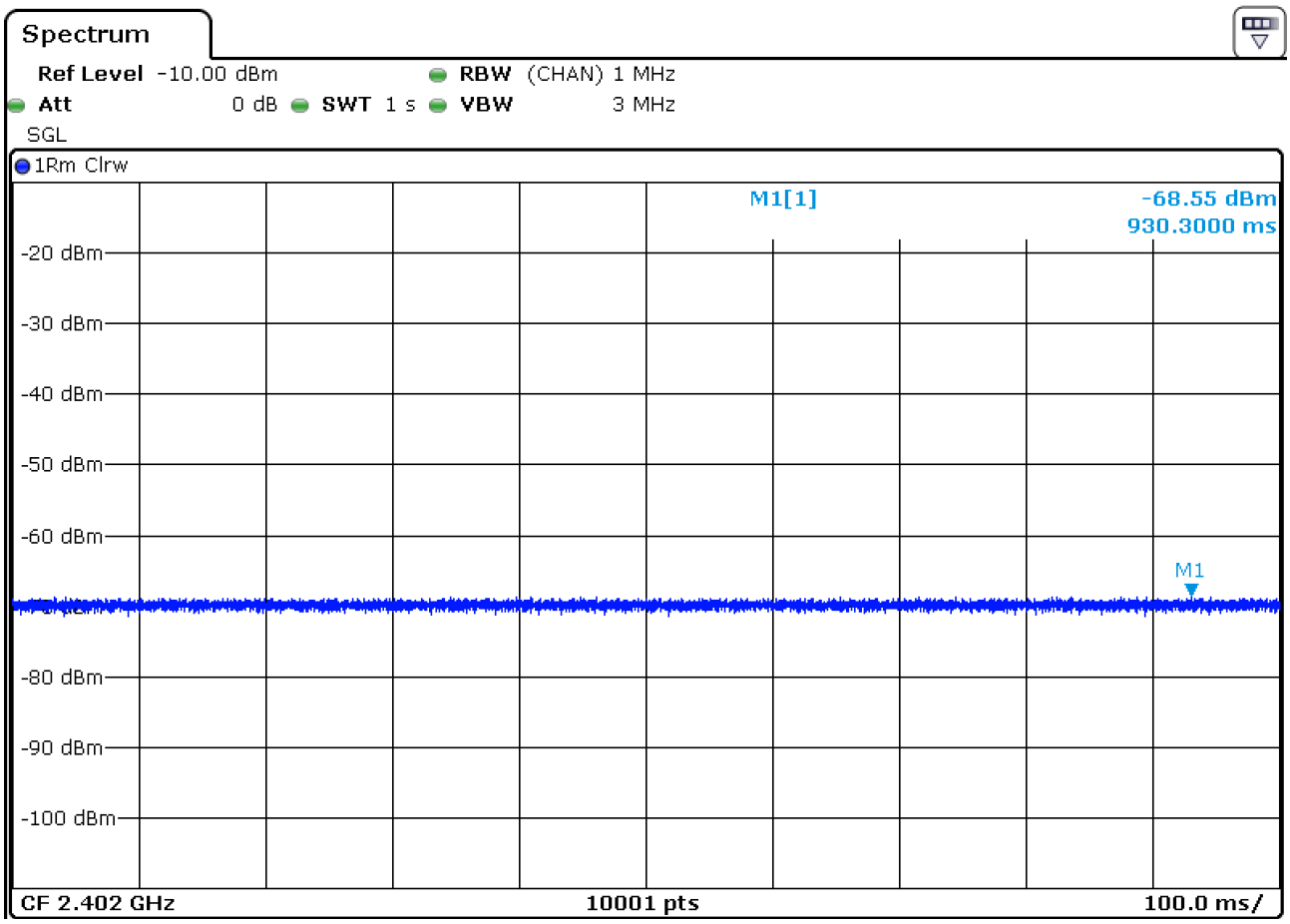
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	141.54375 ms	-83.94 dBm		
D2	M1	1	162.59 µs	1.07 dB		
M3		1	141.67908 ms	-14.31 dBm		
D4	M3	1	49.88342 ms	0.02 dB		

Unwanted Signal Interference Test Results

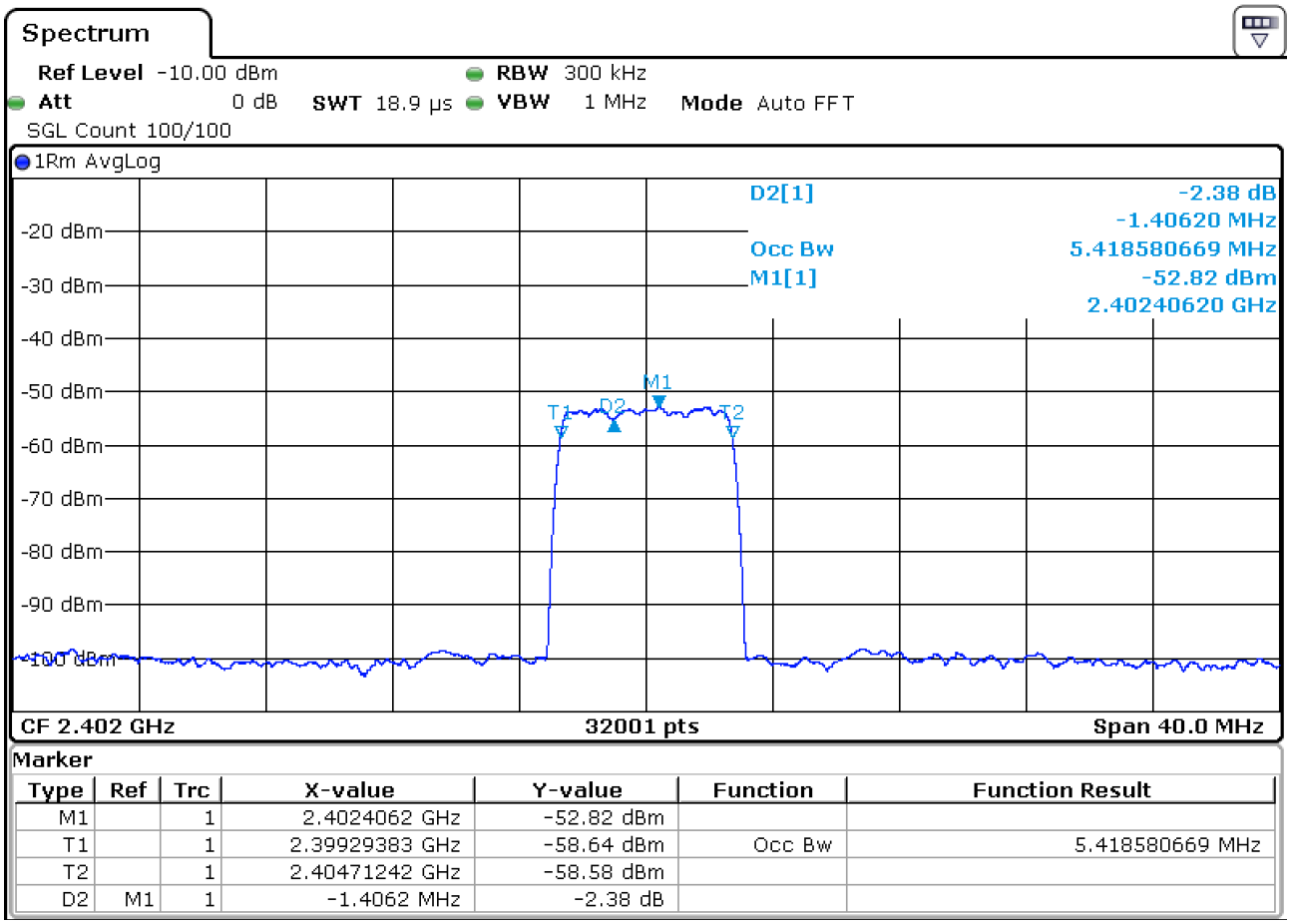
Channel	Channel Frequency (MHz)	Wanted Signal Mean Power from Companion Device (dBm/MHz)	Wanted Signal Frequency (MHz)	Unwanted Signal Power (dBm)	Pass/Fail
0	2402	-50	2488.5	-31.6	Pass
78	2480	-50	2395	-31.6	Pass

Test Results for reference by client's requirement

Detection Threshold Level
The maximum EIRP is 16.55 dBm (45.19 mW) and antenna gain is -2 dBi. Detection Threshold level= -70 dBm/MHz + 10×log(100 mW / Pout (45.19 mW)) + G (-2 dBi) = -68.55 dBm/MHz The interference signal level to the EUT is lower than -68.55 dBm/MHz at the antenna connector.

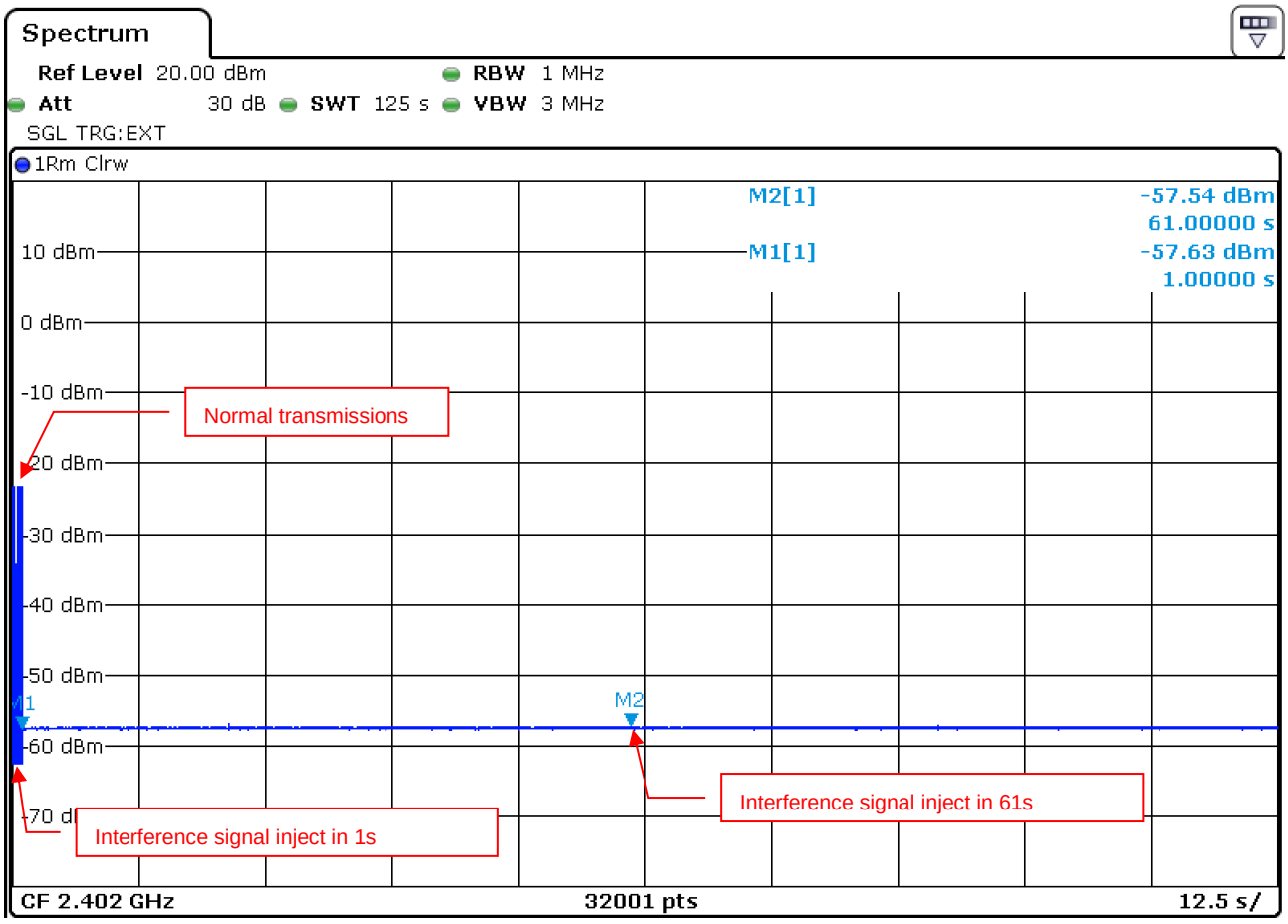


Detection Threshold Level

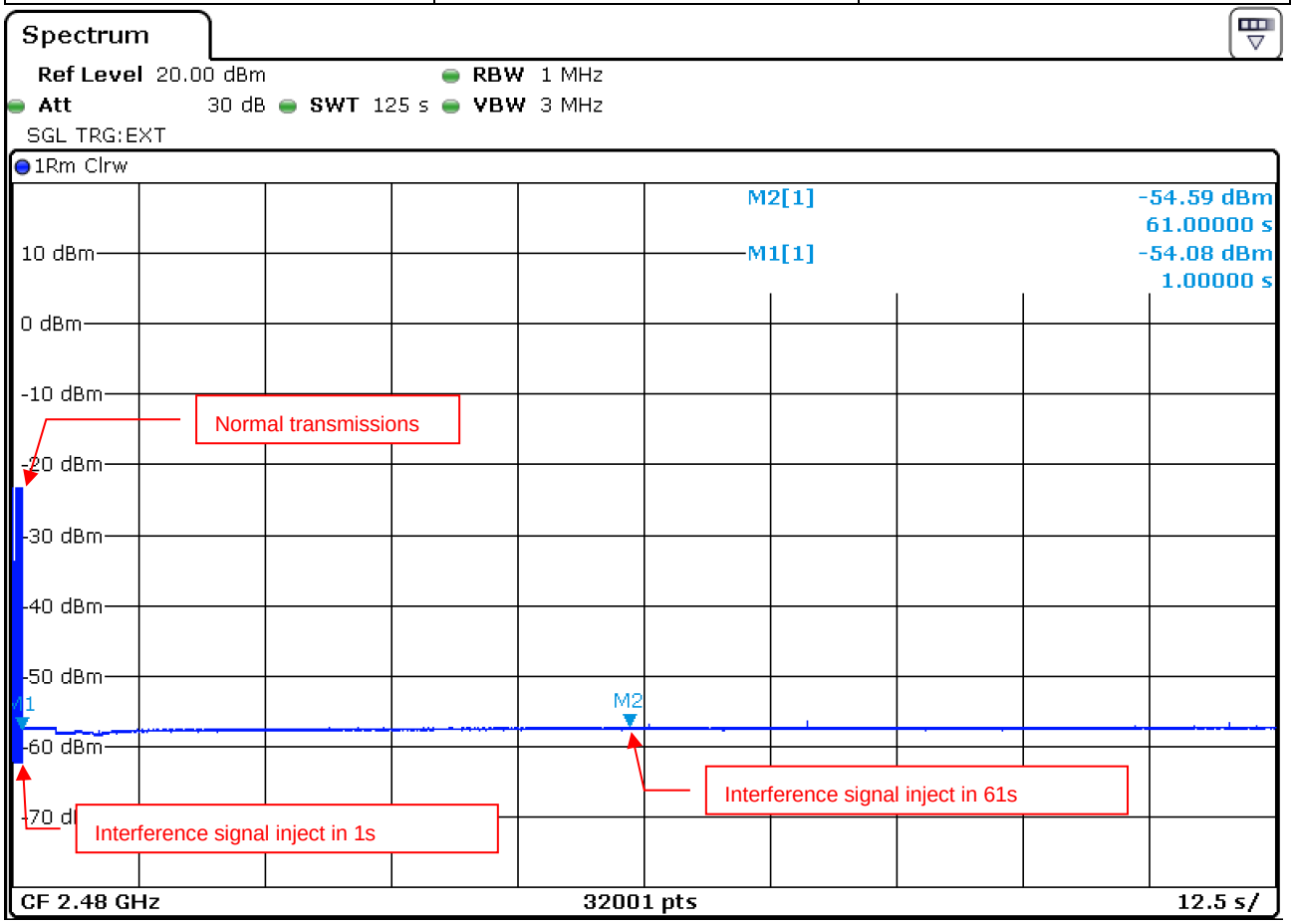


Flatness and Bandwidth

Operational Mode	Hopping Frequency (MHz)	Test Result
Hopping @ GFSK	2402	PASS

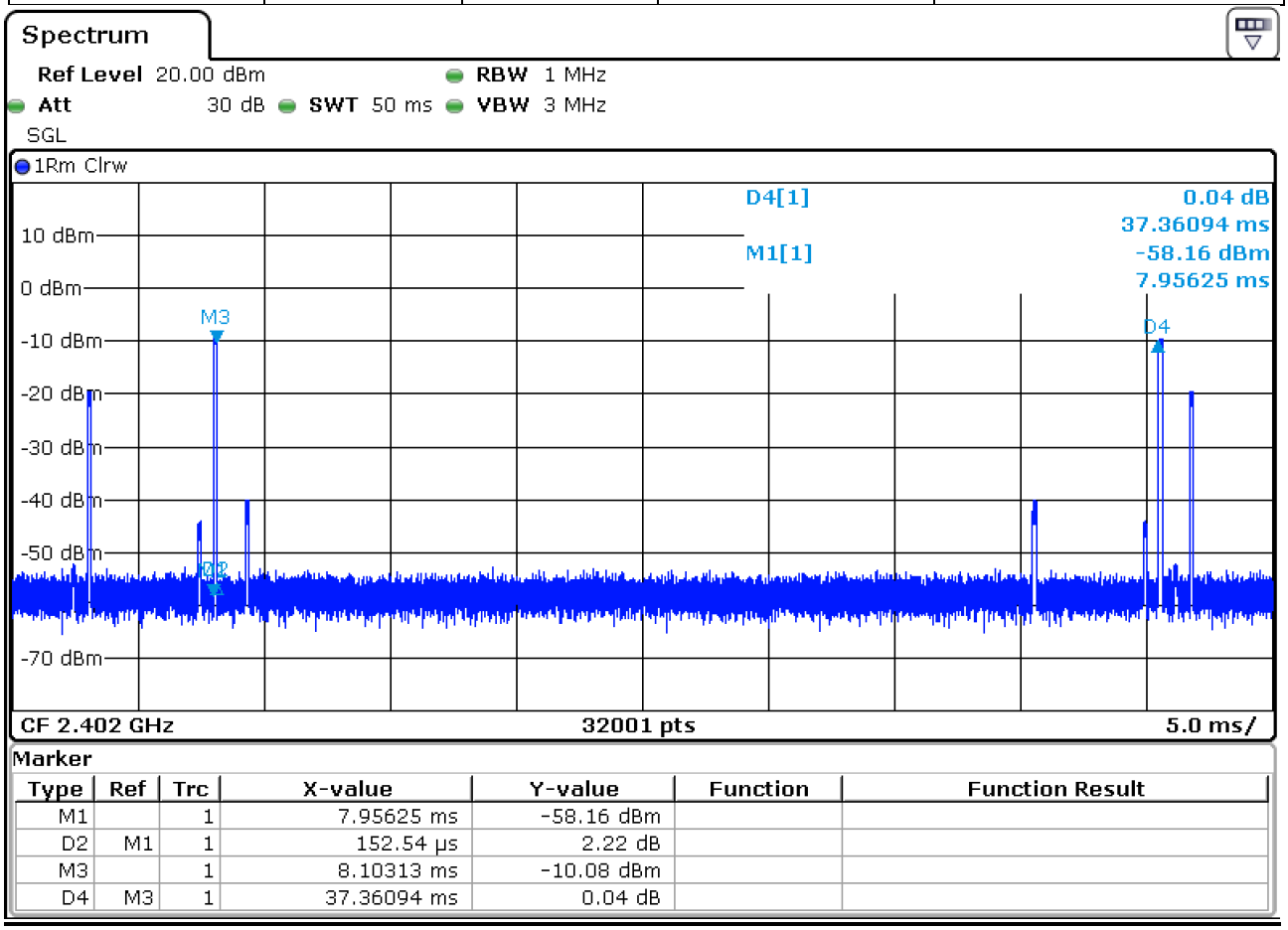

Spectrum
Ref Level 20.00 dBm
RBW 1 MHz
Att 30 dB
SWT 125 s
VBW 3 MHz
SGL TRG:EXT
1Rm Clrw
M2[1]
-57.54 dBm
61.00000 s
M1[1]
-57.63 dBm
1.00000 s
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
M2
Normal transmissions
Interference signal inject in 1s
Interference signal inject in 61s
CF 2.402 GHz
32001 pts
12.5 s/

Operational Mode	Operating Frequency (MHz)	Test Result
GFSK	2480	PASS



Operating Frequency Bands and Mode of EUT

Operational Mode	Hopping Frequency (MHz)	The Channel Occupancy Time (ms)	Minimum Idle Period (ms)	Test Result
GFSK	2402	0.15	37.36	PASS



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	7.95625 ms	-58.16 dBm		
D2	M1	1	152.54 µs	2.22 dB		
M3		1	8.10313 ms	-10.08 dBm		
D4	M3	1	37.36094 ms	0.04 dB		

Unwanted Signal Interference Test Results

Channel	Channel Frequency (MHz)	Wanted Signal Mean Power from Companion Device (dBm/MHz)	Wanted Signal Frequency (MHz)	Unwanted Signal Power (dBm)	Pass/Fail
0	2402	-50	2488.5	-31.6	Pass
78	2480	-50	2395	-31.6	Pass

7.5 Occupied Channel Bandwidth

Input Power:	3.3 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Dolly Chung

GFSK Low Power

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	Measured Frequencies		Limit	Test Result
			FL (MHz)	FH (MHz)		
0	2402	0.89	2401.56	2402.45	FL > 2400 MHz and FH < 2483.5 MHz	Pass
78	2480	0.89	2479.56	2480.45		Pass

Notes:

1. FL is the lowest frequency of the 99% occupied bandwidth of power envelope.
2. FH is the highest frequency of the 99% occupied bandwidth of power envelope.

8DPSK Low Power

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	Measured Frequencies		Limit	Test Result
			FL (MHz)	FH (MHz)		
0	2402	1.20	2401.41	2402.61	FL > 2400 MHz and FH < 2483.5 MHz	Pass
78	2480	1.20	2479.41	2480.61		Pass

Notes:

1. FL is the lowest frequency of the 99% occupied bandwidth of power envelope.
2. FH is the highest frequency of the 99% occupied bandwidth of power envelope.

GFSK High Power

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	Measured Frequencies		Limit	Test Result
			FL (MHz)	FH (MHz)		
0	2402	0.88	2401.57	2402.45	FL > 2400 MHz and FH < 2483.5 MHz	Pass
78	2480	0.89	2479.56	2480.45		Pass

Notes:

1. FL is the lowest frequency of the 99% occupied bandwidth of power envelope.
2. FH is the highest frequency of the 99% occupied bandwidth of power envelope.

8DPSK High Power

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	Measured Frequencies		Limit	Test Result
			FL (MHz)	FH (MHz)		
0	2402	1.21	2401.40	2402.61	FL > 2400 MHz and FH < 2483.5 MHz	Pass
78	2480	1.21	2479.40	2480.61		Pass

Notes:

1. FL is the lowest frequency of the 99% occupied bandwidth of power envelope.
2. FH is the highest frequency of the 99% occupied bandwidth of power envelope.

7.6 Transmitter Unwanted Emissions in the out-of-band Domain

Input Power:	3.3 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Dolly Chung

GFSK Low Power

Channel	Frequency (MHz)	Out-Of-Band Domain			Limit (dBm/MHz)	Test Result
		Frequency Range (MHz)	Worst Frequency (MHz)	Emission Level (dBm/MHz)		
0	2402	2398 ~ 2399	2398.50	-40.14	-20	Pass
		2399 ~ 2400	2399.50	-37.70	-10	Pass
78	2480	2483.5 ~ 2484.5	2484.00	-48.27	-10	Pass
		2484.5 ~ 2485.5	2485.00	-49.14	-20	Pass

8DPSK Low Power

Channel	Frequency (MHz)	Out-Of-Band Domain			Limit (dBm/MHz)	Test Result
		Frequency Range (MHz)	Worst Frequency (MHz)	Emission Level (dBm/MHz)		
0	2402	2397.6 ~ 2398.8	2398.30	-40.22	-20	Pass
		2398.8 ~ 2400	2399.50	-33.03	-10	Pass
78	2480	2483.5 ~ 2484.7	2484.00	-48.19	-10	Pass
		2484.7 ~ 2485.9	2485.20	-49.26	-20	Pass

GFSK High Power

Channel	Frequency (MHz)	Out-Of-Band Domain			Limit (dBm/MHz)	Test Result
		Frequency Range (MHz)	Worst Frequency (MHz)	Emission Level (dBm/MHz)		
0	2402	2398 ~ 2399	2398.50	-39.58	-20	Pass
		2399 ~ 2400	2399.50	-34.47	-10	Pass
78	2480	2483.5 ~ 2484.5	2484.00	-45.51	-10	Pass
		2484.5 ~ 2485.5	2485.00	-46.81	-20	Pass

8DPSK High Power

Channel	Frequency (MHz)	Out-Of-Band Domain			Limit (dBm/MHz)	Test Result
		Frequency Range (MHz)	Worst Frequency (MHz)	Emission Level (dBm/MHz)		
0	2402	2397.58 ~ 2398.79	2398.29	-39.21	-20	Pass
		2398.79 ~ 2400	2399.50	-21.56	-10	Pass
78	2480	2483.5 ~ 2484.71	2484.00	-44.38	-10	Pass
		2484.71 ~ 2485.92	2485.21	-47.15	-20	Pass

7.7 Transmitter Unwanted Emissions in the Spurious Domain up to 1 GHz

Mode A

BT GFSK

Spurious Emission Frequency Range	30 MHz ~ 1 GHz	**Operating Channel**	78
Input Power (System)	230 Vac, 50 Hz	**Environmental Conditions**	23°C, 67% RH
Tested By	Jeff Hsieh		

Spurious Emission Level				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
49.40	H	-63.48	-54.00	-9.48
49.40	V	-62.44	-54.00	-8.44
63.48	V	-74.61	-54.00	-20.61
63.53	H	-71.20	-54.00	-17.20
99.89	H	-71.89	-54.00	-17.89
210.07	H	-67.36	-54.00	-13.36
214.00	V	-72.16	-54.00	-18.16
224.05	V	-66.68	-54.00	-12.68
499.83	H	-71.59	-54.00	-17.59
499.83	V	-73.84	-54.00	-19.84
543.50	V	-74.33	-54.00	-20.33
543.55	H	-71.75	-54.00	-17.75
566.63	H	-74.71	-54.00	-20.71
566.68	V	-73.54	-54.00	-19.54
589.81	H	-75.04	-54.00	-21.04
589.81	V	-73.90	-54.00	-19.90
612.95	V	-72.77	-54.00	-18.77
636.08	H	-75.06	-54.00	-21.06
666.62	H	-74.83	-54.00	-20.83
676.17	V	-74.33	-54.00	-20.33

Mode B

BT GFSK

Spurious Emission Frequency Range	30 MHz ~ 1 GHz	Operating Channel	78
Input Power (System)	230 Vac, 50 Hz	Environmental Conditions	24°C, 69% RH
Tested By	Ethan Hsu		

Spurious Emission Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
49.40	H	-66.80	-54.00	-12.80
49.40	V	-63.28	-54.00	-9.28
63.53	V	-76.32	-54.00	-22.32
99.94	V	-79.91	-54.00	-25.91
196.09	V	-74.13	-54.00	-20.13
214.20	H	-74.78	-54.00	-20.78
474.16	V	-80.40	-54.00	-26.40
497.79	V	-79.45	-54.00	-25.45
498.68	H	-80.07	-54.00	-26.07
525.99	H	-80.79	-54.00	-26.79
543.55	H	-78.54	-54.00	-24.54
543.55	V	-79.40	-54.00	-25.40
566.63	H	-77.40	-54.00	-23.40
583.15	V	-76.84	-54.00	-22.84
593.35	H	-80.08	-54.00	-26.08
612.85	V	-77.43	-54.00	-23.43
636.08	H	-77.17	-54.00	-23.17
659.16	V	-77.28	-54.00	-23.28
659.21	H	-77.36	-54.00	-23.36
678.31	H	-76.95	-54.00	-22.95

Mode C

BT GFSK

Spurious Emission Frequency Range	30 MHz ~ 1 GHz	**Operating Channel**	78
Input Power (System)	230 Vac, 50 Hz	**Environmental Conditions**	24°C, 69% RH
Tested By	Ethan Hsu		

Spurious Emission Level				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
49.09	V	-63.50	-54.00	-9.50
49.40	H	-66.80	-54.00	-12.80
63.31	V	-76.54	-54.00	-22.54
99.72	V	-80.23	-54.00	-26.23
195.88	V	-74.35	-54.00	-20.35
214.20	H	-74.78	-54.00	-20.78
473.85	V	-80.62	-54.00	-26.62
497.57	V	-79.67	-54.00	-25.67
498.57	H	-80.28	-54.00	-26.28
525.77	H	-81.22	-54.00	-27.22
543.23	V	-79.62	-54.00	-25.62
543.43	H	-78.66	-54.00	-24.66
566.52	H	-77.52	-54.00	-23.52
582.94	V	-77.05	-54.00	-23.05
593.23	H	-80.30	-54.00	-26.30
612.63	V	-77.65	-54.00	-23.65
635.87	H	-77.39	-54.00	-23.39
659.02	H	-77.57	-54.00	-23.57
659.16	V	-77.28	-54.00	-23.28
678.09	H	-77.17	-54.00	-23.17

7.8 Transmitter Unwanted Emissions in the Spurious Domain above 1 GHz

Mode A

BT GFSK

Spurious Emission Frequency Range	1 GHz ~ 12.75 GHz	**Operating Channel**	0, 78
Input Power (System)	230 Vac, 50 Hz	**Environmental Conditions**	22°C, 62% RH
Tested By	Spencer Liao		

Spurious Emission Level					
Channel	**Frequency (MHz)**	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
0	7205.60	H	-44.32	-30.00	-14.32
	7205.65	V	-38.90	-30.00	-8.90
	9608.00	H	-48.93	-30.00	-18.93
	9609.26	V	-48.03	-30.00	-18.03
78	7439.60	H	-43.70	-30.00	-13.70
	7440.40	V	-38.76	-30.00	-8.76
	9920.00	H	-48.25	-30.00	-18.25
	9920.00	V	-48.13	-30.00	-18.13

Mode B

BT GFSK

Spurious Emission Frequency Range	1 GHz ~ 12.75 GHz	Operating Channel	0, 78
Input Power (System)	230 Vac, 50 Hz	Environmental Conditions	25°C, 64% RH
Tested By	Ethan Hsu		

Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
0	7206.00	H	-45.85	-30.00	-15.85
	7206.00	V	-45.73	-30.00	-15.73
	9608.00	H	-50.59	-30.00	-20.59
	9608.00	V	-49.62	-30.00	-19.62
78	7439.50	H	-39.45	-30.00	-9.45
	7439.50	V	-40.19	-30.00	-10.19
	9919.50	H	-51.30	-30.00	-21.30
	9919.50	V	-51.63	-30.00	-21.63

Mode C

BT GFSK

Spurious Emission Frequency Range	1 GHz ~ 12.75 GHz	Operating Channel	0, 78
Input Power (System)	230 Vac, 50 Hz	Environmental Conditions	25°C, 64% RH
Tested By	Ethan Hsu		

Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
0	7206.00	H	-42.87	-30.00	-12.87
	7206.00	V	-43.42	-30.00	-13.42
	9608.00	H	-52.46	-30.00	-22.46
	9608.00	V	-52.23	-30.00	-22.23
78	7440.00	H	-43.64	-30.00	-13.64
	7440.00	V	-42.83	-30.00	-12.83
	9920.00	H	-51.64	-30.00	-21.64
	9920.00	V	-51.54	-30.00	-21.54

7.9 Receiver Spurious Emissions up to 1 GHz

Mode A

Spurious Emission Frequency Range	30 MHz ~ 1 GHz	**Operating Channel**	78
Input Power (System)	230 Vac, 50 Hz	**Environmental Conditions**	23°C, 67% RH
Tested By	Jeff Hsieh		

Spurious Emission Level				
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
49.40	H	-63.46	-57.00	-6.46
49.40	V	-63.66	-57.00	-6.66
125.86	V	-69.03	-57.00	-12.03
148.19	H	-66.07	-57.00	-9.07
150.38	V	-67.26	-57.00	-10.26
166.60	H	-63.16	-57.00	-6.16
166.60	V	-63.95	-57.00	-6.95
208.08	H	-67.01	-57.00	-10.01
222.91	V	-65.03	-57.00	-8.03
233.20	H	-66.41	-57.00	-9.41
248.97	V	-66.97	-57.00	-9.97
270.41	V	-69.84	-57.00	-12.84
299.86	H	-62.78	-57.00	-5.78
466.50	H	-69.47	-57.00	-12.47
499.38	H	-70.65	-57.00	-13.65
543.55	H	-71.99	-57.00	-14.99
824.90	V	-68.62	-57.00	-11.62
840.97	H	-69.44	-57.00	-12.44
858.13	V	-69.05	-57.00	-12.05
995.72	V	-69.74	-57.00	-12.74

Mode B

Spurious Emission Frequency Range	30 MHz ~ 1 GHz	Operating Channel	78
Input Power (System)	230 Vac, 50 Hz	Environmental Conditions	24°C, 69% RH
Tested By	Ethan Hsu		

Spurious Emission Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
49.40	H	-67.44	-57.00	-10.44
49.40	V	-63.57	-57.00	-6.57
77.60	H	-74.68	-57.00	-17.68
148.19	H	-73.91	-57.00	-16.91
166.00	H	-65.20	-57.00	-8.20
173.46	V	-74.84	-57.00	-17.84
200.07	V	-75.45	-57.00	-18.45
202.11	H	-73.29	-57.00	-16.29
232.41	H	-68.64	-57.00	-11.64
748.60	V	-75.47	-57.00	-18.47
813.96	V	-75.70	-57.00	-18.70
815.60	H	-74.89	-57.00	-17.89
856.19	V	-74.14	-57.00	-17.14
897.38	V	-74.14	-57.00	-17.14
932.00	H	-74.91	-57.00	-17.91
932.40	V	-74.41	-57.00	-17.41
961.90	V	-74.10	-57.00	-17.10
965.68	H	-74.58	-57.00	-17.58
969.16	V	-73.78	-57.00	-16.78
997.96	H	-74.76	-57.00	-17.76

Mode C

Spurious Emission Frequency Range	30 MHz ~ 1 GHz	Operating Channel	78
Input Power (System)	230 Vac, 50 Hz	Environmental Conditions	24°C, 69% RH
Tested By	Ethan Hsu		

Spurious Emission Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
49.08	V	-63.79	-57.00	-6.79
49.17	H	-67.76	-57.00	-10.76
77.48	H	-74.90	-57.00	-17.90
147.98	H	-74.23	-57.00	-17.23
165.79	H	-65.41	-57.00	-8.41
173.24	V	-75.06	-57.00	-18.06
199.85	V	-75.67	-57.00	-18.67
201.89	H	-73.50	-57.00	-16.50
232.19	H	-68.86	-57.00	-11.86
748.38	V	-75.69	-57.00	-18.69
813.74	V	-76.02	-57.00	-19.02
815.38	H	-75.11	-57.00	-18.11
855.97	V	-74.36	-57.00	-17.36
897.16	V	-74.36	-57.00	-17.36
931.78	H	-75.13	-57.00	-18.13
932.19	V	-74.63	-57.00	-17.63
961.69	V	-74.32	-57.00	-17.32
965.46	H	-74.90	-57.00	-17.90
968.94	V	-74.10	-57.00	-17.10
997.84	H	-74.98	-57.00	-17.98

7.10 Receiver Spurious Emissions above 1 GHz

Mode A

Spurious Emission Frequency Range	1 GHz ~ 12.75 GHz	**Operating Channel**	0, 78
Input Power (System)	230 Vac, 50 Hz	**Environmental Conditions**	22°C, 62% RH
Tested By	Spencer Liao		

Spurious Emission Level					
Channel	**Frequency (MHz)**	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
0	6405.33	H	-55.23	-47.00	-8.23
	6405.33	V	-55.10	-47.00	-8.10
78	6613.33	H	-53.89	-47.00	-6.89
	6613.33	V	-53.97	-47.00	-6.97

Mode B

Spurious Emission Frequency Range	1 GHz ~ 12.75 GHz	**Operating Channel**	0, 78
Input Power (System)	230 Vac, 50 Hz	**Environmental Conditions**	25°C, 64% RH
Tested By	Ethan Hsu		

Spurious Emission Level					
Channel	**Frequency (MHz)**	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
0	6405.00	H	-57.96	-47.00	-10.96
	6405.00	V	-57.15	-47.00	-10.15
78	6613.00	H	-57.88	-47.00	-10.88
	6613.00	V	-57.34	-47.00	-10.34

Mode C

Spurious Emission Frequency Range	1 GHz ~ 12.75 GHz	**Operating Channel**	0, 78
Input Power (System)	230 Vac, 50 Hz	**Environmental Conditions**	25°C, 64% RH
Tested By	Ethan Hsu		

Spurious Emission Level					
Channel	**Frequency (MHz)**	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
0	6405.00	H	-57.99	-47.00	-10.99
	6405.00	V	-57.18	-47.00	-10.18
78	6613.00	H	-57.73	-47.00	-10.73
	6613.00	V	-57.41	-47.00	-10.41

7.11 Receiver Blocking

Input Power:	3.3 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Thomas Liao

Receiver Category 1 Equipment	
Minimum Performance Criterion:	PER or FER ≦10%

Receiver Blocking Measure Of The Capability							
Operation Mode	**Operating Frequency (MHz)**	**Wanted Signal Mean Power From Companion Device (dBm) (Note 1 & 2)**	**Blocking Signal Frequency (MHz)**	**Blocking Signal Frequency Shift (MHz) (Note 3)**	**Blocking Signal Power (dBm) (Note 2)**	**PER(%)**	**Test Result**
BT GFSK	2402	-70.16	2380	-	-30.6	2.8	Pass
		-76.16	2300	-	-30.6	2.7	Pass
			2330	-	-30.6	3.1	Pass
			2360	-	-30.6	2.7	Pass
	2480	-70.11	2504	-	-30.6	2.3	Pass
		-76.11	2524	-	-30.6	2.3	Pass
			2584	-	-30.6	2.6	Pass
			2674	-	-30.6	2.2	Pass

Notes:

1. Wanted signal level was calculated based on the formula, which corresponds to OCBW. OCBW at 2402 MHz is 0.88 MHz and at 2480 MHz is 0.89 MHz.
2. In conducted measurements, the blocking signal power level has to be corrected for the (in-band) antenna assembly gain (G) at the antenna connector. The antenna gain is 3.4 dBi.
3. If the performance criteria is not met, those frequencies of the blocking signal has been increased/decreased with a value equal to the Occupied Channel Bandwidth except the blocking frequencies 2380, 2504MHz shall be increased/decreased with a value equal to 10MHz also if the frequency offset is more than 7MHz, the level of the wanted signal shall be increased by 3dB.

Input Power:	3.3 Vdc	Environmental Conditions:	25°C, 60% RH	Tested By:	Thomas Liao

Worst Gain

Receiver Category 1 Equipment	
Minimum Performance Criterion:	PER or FER ≦10%

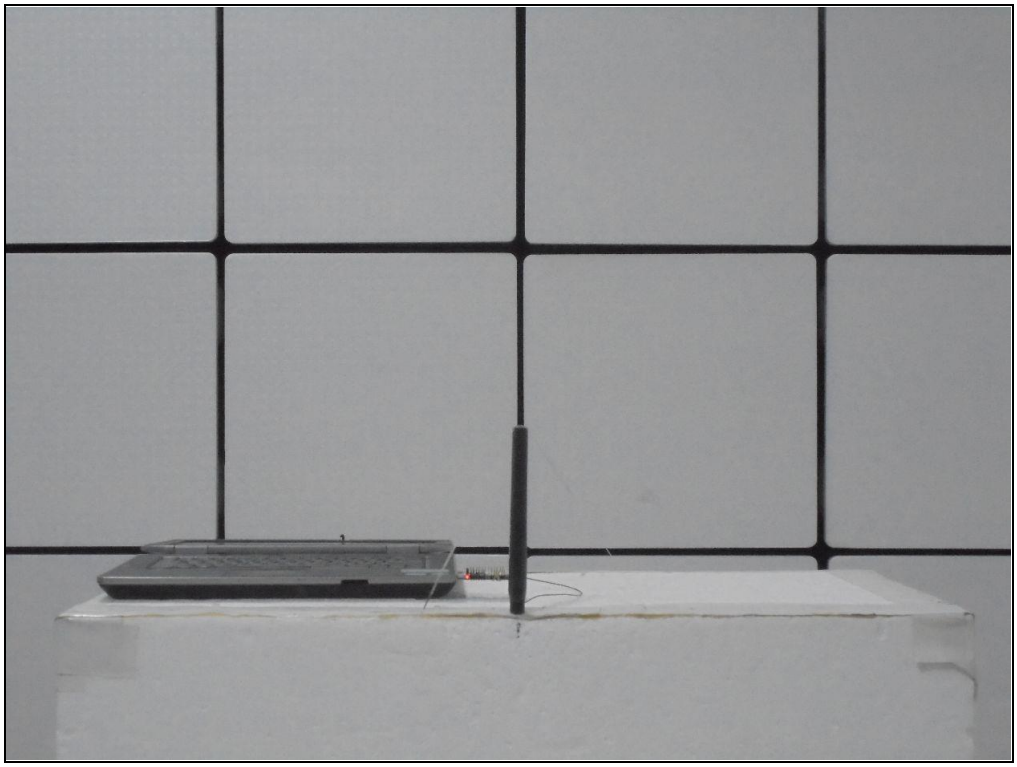
Receiver Blocking Measure Of The Capability							
Operation Mode	**Operating Frequency (MHz)**	**Wanted Signal Mean Power From Companion Device (dBm) (Note 1 & 2)**	**Blocking Signal Frequency (MHz)**	**Blocking Signal Frequency Shift (MHz) (Note 3)**	**Blocking Signal Power (dBm) (Note 2)**	**PER(%)**	**Test Result**
BT GFSK	2402	-92	2380	-	-30.6	2.5	Pass
		-91	2300	-	-30.6	3.6	Pass
			2330	-	-30.6	2.3	Pass
			2360	-	-30.6	2.3	Pass
	2480	-91	2504	-	-30.6	2.8	Pass
		-91	2524	-	-30.6	2.4	Pass
			2584	-	-30.6	3.1	Pass
			2674	-	-30.6	2.9	Pass

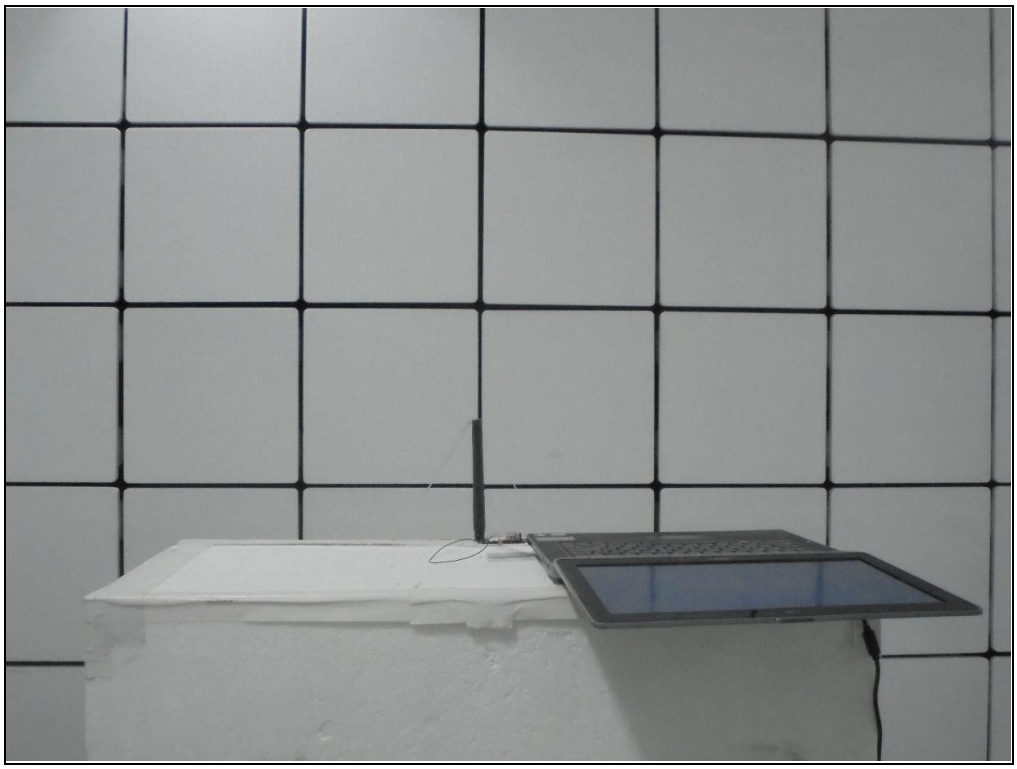
Notes:

1. Wanted signal level was calculated based on the formula, which corresponds to OCBW. OCBW at 2402 MHz is 0.88 MHz and at 2480 MHz is 0.89 MHz.
2. In conducted measurements, the blocking signal power level has to be corrected for the (in-band) antenna assembly gain (G) at the antenna connector. The antenna gain is 3.4 dBi.
3. If the performance criteria is not met, those frequencies of the blocking signal has been increased/decreased with a value equal to the Occupied Channel Bandwidth except the blocking frequencies 2380, 2504MHz shall be increased/decreased with a value equal to 10MHz also if the frequency offset is more than 7MHz, the level of the wanted signal shall be increased by 3dB.

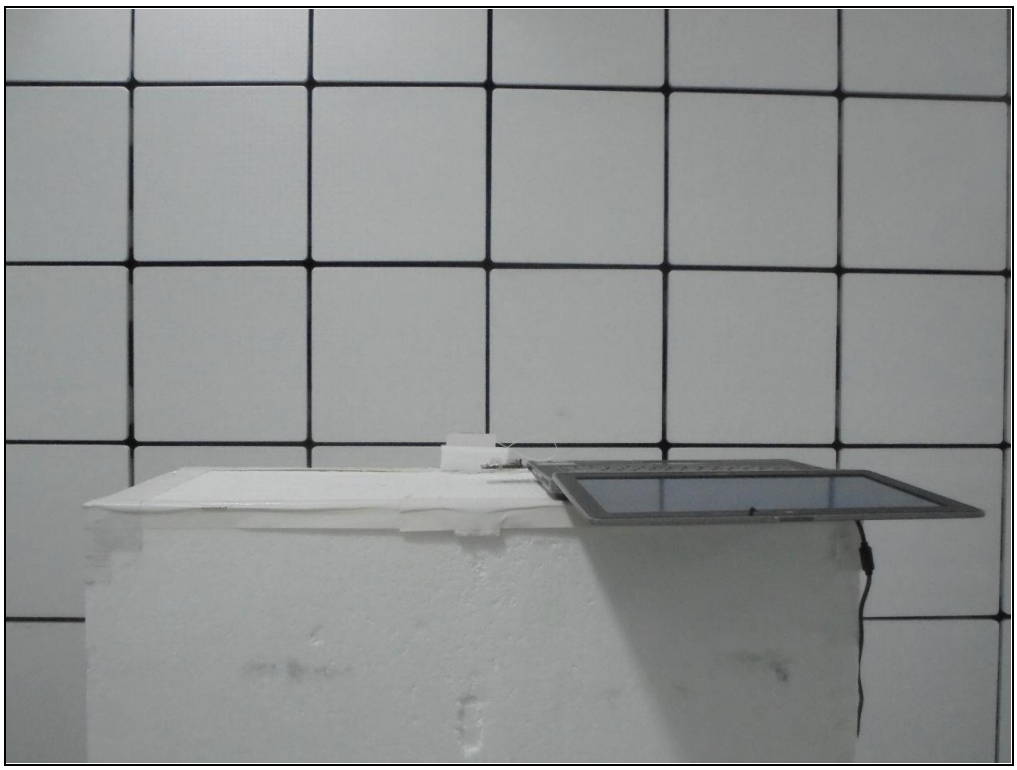
8 Pictures of Test Arrangements

Mode A

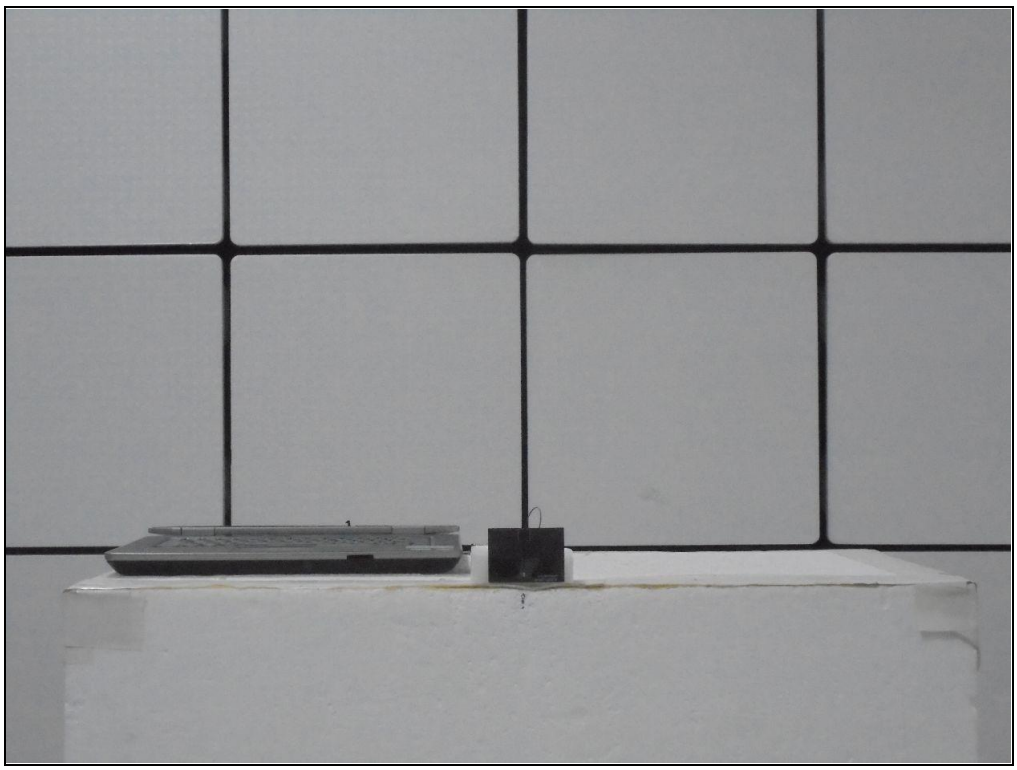




Mode B



Mode C



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.

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