> Report No.: HR/2019/4000806 Page: 32 of 81



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Report No.: HR/2019/4000806 Page: 33 of 81

Test Requirement: 47 CFR Part 15C Section 15.247 (a)(1) Test Method: ANSI C63.10:2013 Section 7.8.2 Spectrum Analyzer E.U.T Test Setup: Non-Conducted Table Ground Reference Plane 2/3 of the 20dB bandwidth Limit: Remark: the transmission power is less than 0.125W. Exploratory Test Mode: Hopping transmitting with all kind of modulation and all kind of data type. Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, Final Test Mode: 2-DH5 of data type is the worst case of π /4DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type. Instruments Used: Refer to section 5.10 for details Test Results: Pass

4.6 Carrier Frequencies Separation



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Report No.: HR/2019/4000806 Page: 34 of 81

4.6.1 Test Results

GFSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Middle	1001	573.4	Pass
π/4DQPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Middle	1001	793.2	Pass
8DPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Middle	1001	799.2	Pass

Remark: According to section 6.4,

Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
GFSK	875.1	583.4
π/4DQPSK	1183.8	789.2
8DPSK	11862.8	791.2

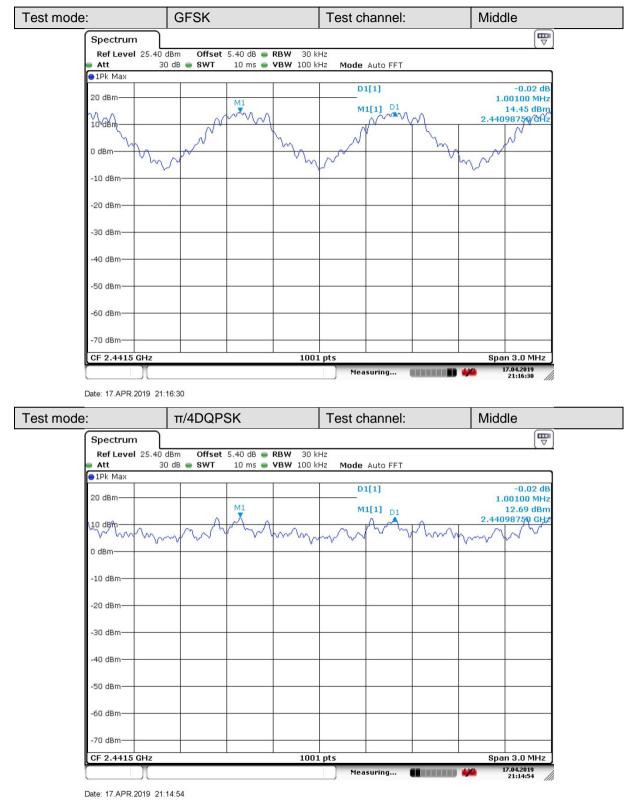


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Report No.: HR/2019/4000806 Page: 35 of 81

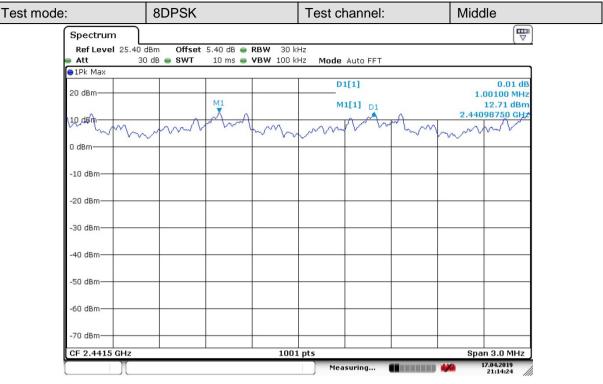
4.6.2 **Test plots:**





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Report No.: HR/2019/4000806 Page: 36 of 81



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Report No.: HR/2019/4000806 Page: 37 of 81

Test Requirement: 47 CFR Part 15C Section 15.247 (a)(1) Test Method: ANSI C63.10:2013 Section 7.8.3 Spectrum Analyzer E.U.T 6 Test Setup: Non-Conducted Table **Ground Reference Plane** Limit: At least 15 channels Test Mode: Hopping transmitting with all kind of modulation Instruments Used: Refer to section 5.10 for details **Test Results:** Pass

4.7 Hopping Channel Number

4.7.1 Test Results

Mode	Hopping channel numbers	Limit
GFSK	79	≥15
π/4DQPSK	79	≥15
8DPSK	79	≥15

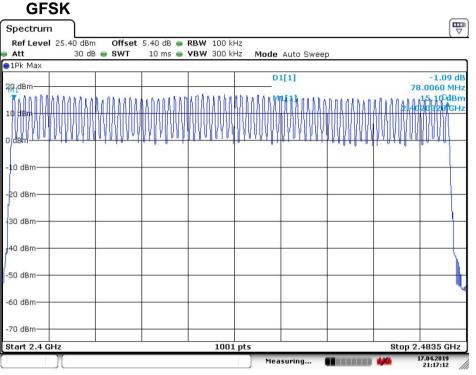


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Report No.: HR/2019/4000806 Page: 38 of 81

4.7.2 Test plots

4.7.2.1

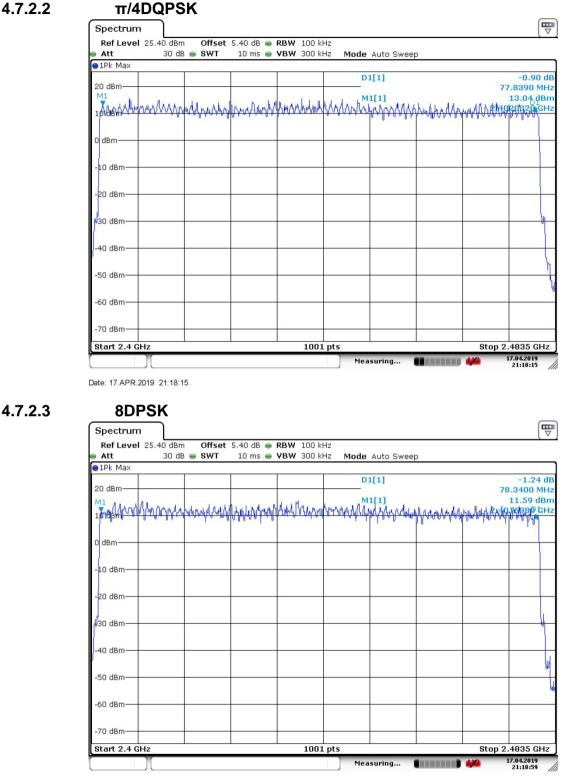


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Report No.: HR/2019/4000806 Page: 40 of 81

4.8 Dwell Time

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)	
Test Method:	ANSI C63.10:2013 Section 7.8.4	
Test Setup:	Spectrum Analyzer E.U.T Non-Conducted Table Ground Reference Plane	
Instruments Used:	Refer to section 5.10 for details	
Test Mode:	Hopping transmitting with all kind of modulation and all kind of data type.	
Limit:	0.4 Second	
Test Results:	Pass	



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Report No.: HR/2019/4000806 Page: 41 of 81

4.8.1 Test Results

Operation Modes	On time (ms) on one channel
DH1	0.390
DH3	1.651
DH5	2.901
2-DH1	0.401
2-DH3	1.657
2-DH5	2.906
3-DH1	0.400
3-DH3	1.654
3-DH5	2.911

Bluetooth Time of Occupancy Calculation

Typically, Bluetooth 1x/EDR mode has a channel hopping rate of 1600 hops/s, since 1x/EDR modes use 5 transmit and 1 receive slot, for a total of 6 slots, the Bluetooth transmitter is actually hopping at a rate of 1600/6=266.67 hops/slot

400ms x 79 Channel = 31.6 s (Time of Occupancy Limit)

Worst case BT has 266.67 hops/second (for 1x/EDR modes with 3-DH5 operation)

266.67 hops/second/79 channels=3.38 hops/second (# of hops/second on one channel)

3.38 hops/second/channel*31.6seconds=106.67 hops (#hops over a 31.6 second period)

106.67 hops *2.911 ms/channel =310.52 ms(worst case dwell time for one channel in 1x/EDR

modes)

With AFH, the number of channels is reduced to a minimum of 20 channels and the channel hopping rate is reduced by 50% to 800hops/s, AFH mode also uses 6 slots so the Bluetooth transmitter hops at a rate of 800/6=133.3 hops/s/slot

400ms x 20 Channel = 8 s (Time of Occupancy Limit)

Worst case BT has 133.3 hops/second/slot (for AFH mode with 3-DH5 operation)

133.3 hops/second/20 channels=6.67 hops/second (#hops/second on one channel)

6.67 hops/second *8seconds=53.34 hops (#hops over a 8 seconds period)

53.34 hops x2.911 ms/channel=155.27 ms(worst case dwell time for one channel in AFH mode)



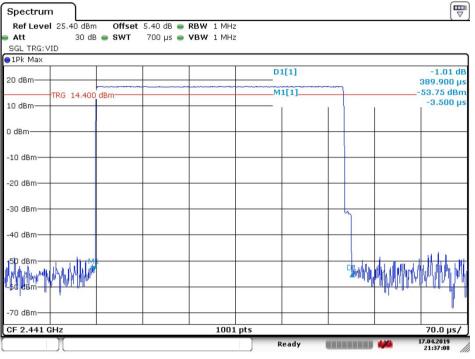
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Report No.: HR/2019/4000806 Page: 42 of 81

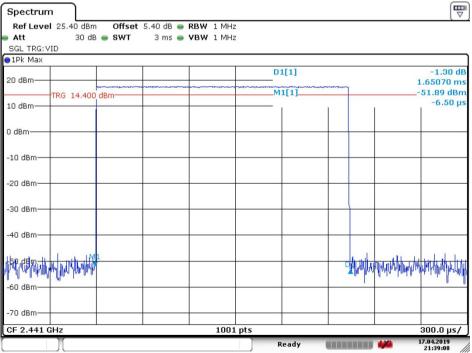
4.8.2 Test plots

4.8.2.1 DH1 _Middle Channel



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4.8.2.2 DH3 _ Middle Channel



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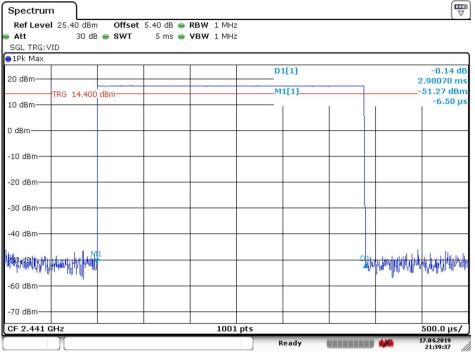


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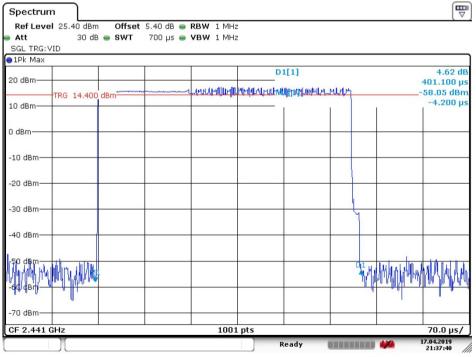
Report No.: HR/2019/4000806 Page: 43 of 81

4.8.2.3 DH5 _ Middle Channel



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4.8.2.4 2DH1 _Middle Channel



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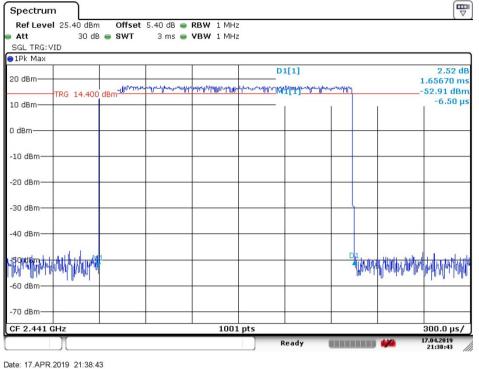


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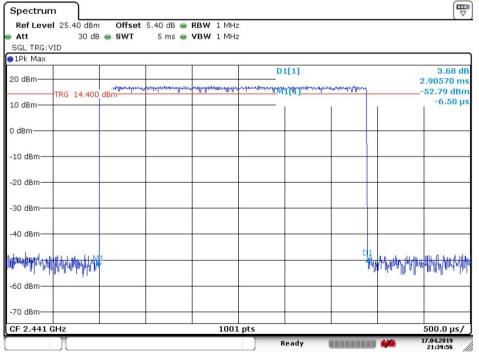


Report No.: HR/2019/4000806 Page: 44 of 81

4.8.2.5 2DH3 _ Middle Channel



4.8.2.6 2DH5 _ Middle Channel



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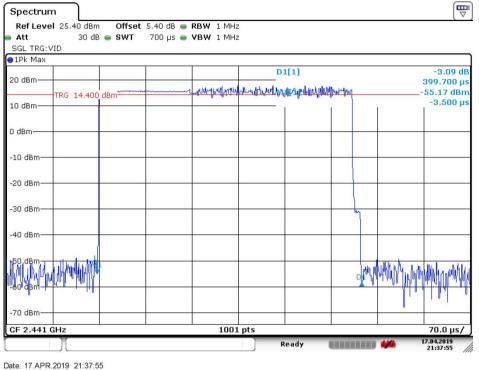


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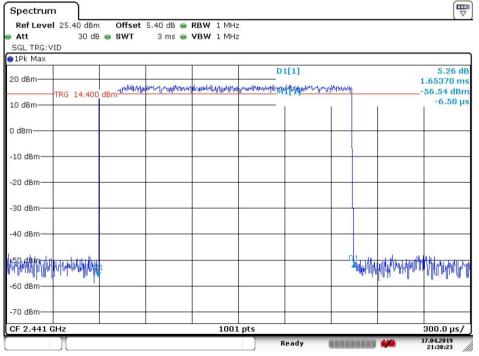


Report No.: HR/2019/4000806 Page: 45 of 81

4.8.2.7 3DH1 _Middle Channel



4.8.2.8 3DH3 _ Middle Channel



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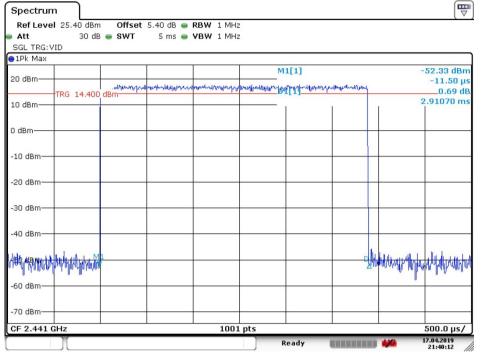


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Report No.: HR/2019/4000806 Page: 46 of 81

4.8.2.9 3DH5 _ Middle Channel



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Report No.: HR/2019/4000806 Page: 47 of 81

Test Requirement:	47 CFR Part 15C Section 15.247 (d)	
Test Method:	ANSI C63.10:2013 Section 7.8.6	
Test Setup:	Spectrum Analyzer E.U.T Non-Conducted Table Ground Reference Plane	
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.	
Exploratory Test Mode:	Hopping and Non-hopping transmitting with all kind of modulation and all kind of data type	
Final Test Mode:	 Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of π/4DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type. 	
Instruments Used:	Refer to section 5.10 for details	
Test Results:	Pass	

4.9 Band-edge for RF Conducted Emissions



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Report No.: HR/2019/4000806 Page: 48 of 81

4.9.1 Test plots



 Spectrum Ref Level 25.40 dBm Offset 5.40 dB 👄 RBW 100 kHz Att 30 dB 👄 SWT 10 ms 👄 **VBW** 300 kHz Mode Auto Sweep ●1Pk View D1[1] -59.05 dE 20 dBm--5.14500 MH 16.24 dBn M1[1] 2 4 499500 GH: 10 dBm 0 dBm-D1 -3.760 dBm -10 dBm -20 dBm -30 dBm--40 dBm Link المراجع المراجع -50 dBm مطروالالمالي Allowerly Uperportral -60 dBm -70 dBm 1001 pts CF 2.4 GHz Span 10.0 MHz 7.04.2019 21:26:02 Measuring...

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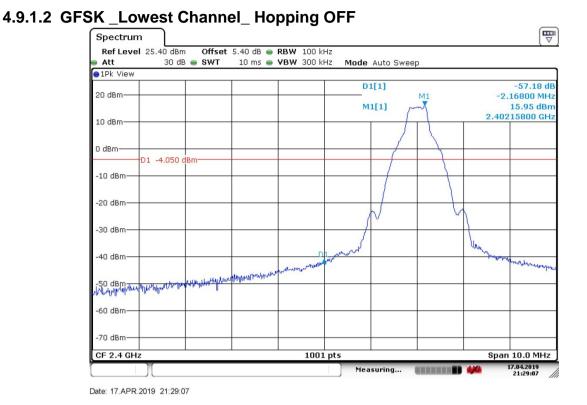


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> Report No.: HR/2019/4000806 Page: 49 of 81



4.9.1.3 GFSK _Highest Channel_ Hopping ON

T Spectrum Ref Level 25.40 dBm Offset 5.40 dB 👄 RBW 100 kHz 30 dB 👄 SWT 10 ms 👄 **VBW** 300 kHz Mode Auto Sweep Att ●1Pk View D1[1] -63.06 dE 20 dB 4.53500 MHz M1[1] 14.46 dBm 2.47904400 GHz 10 dBr dBm 01 -5.540 dB -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm al makerin appropriate to be a superior of the second s unter market the work of the light -60 dBm -70 dBm 1001 pts CF 2.4835 GHz Span 10.0 MHz 17.04.2019 21:27:18 Measuring... CONTRACTOR OF T

Date: 17.APR.2019 21:27:19

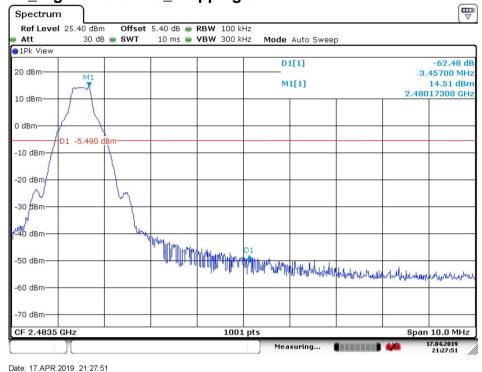


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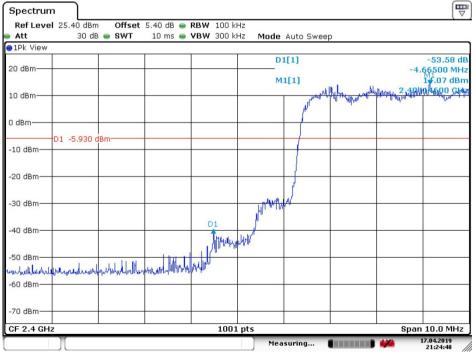
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Report No.: HR/2019/4000806 Page: 50 of 81



4.9.1.4 GFSK _Highest Channel_ Hopping OFF

4.9.1.5 π/4DQPSK _Lowest Channel_ Hopping ON



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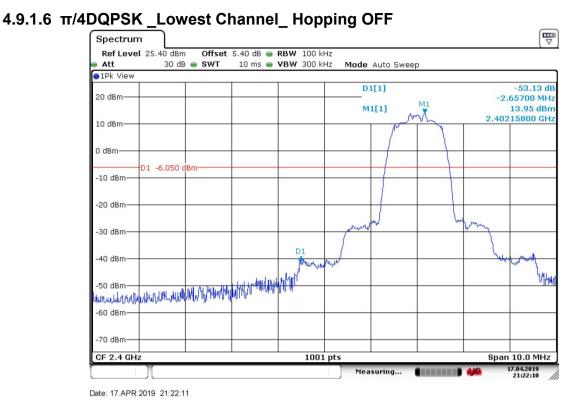


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> Report No.: HR/2019/4000806 Page: 51 of 81



4.9.1.7 π /4DQPSK _Highest Channel_ Hopping ON

T Spectrum Ref Level 25.40 dBm Offset 5.40 dB 👄 RBW 100 kHz 30 dB 👄 SWT 10 ms 👄 **VBW** 300 kHz Att Mode Auto Sweep 1Pk View D1[1] -63.92 dE 20 dBn 4.91500 MHz M1[1] 13.25 dBm 2.47884500 GH 10 Hapming 10 0 dBm D1 -6.750 dE -10 dBm -20 dBm -30 dBm -40 dBm WHAL MU -50 dBm henrichall without when her the marken 4 Martin Bala Astheba here allowers in the -60 dBm -70 dBm 1001 pts CF 2.4835 GHz Span 10.0 MHz 17.04.2019 21:23:47 Measuring... CONTRACTOR OF STREET, STREET,

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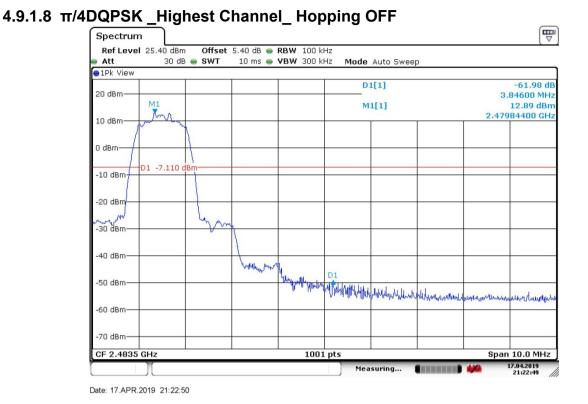


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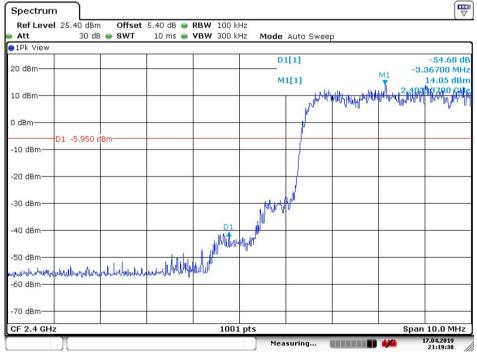
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Report No.: HR/2019/4000806 Page: 52 of 81



4.9.1.9 8DPSK _Lowest Channel_ Hopping ON



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