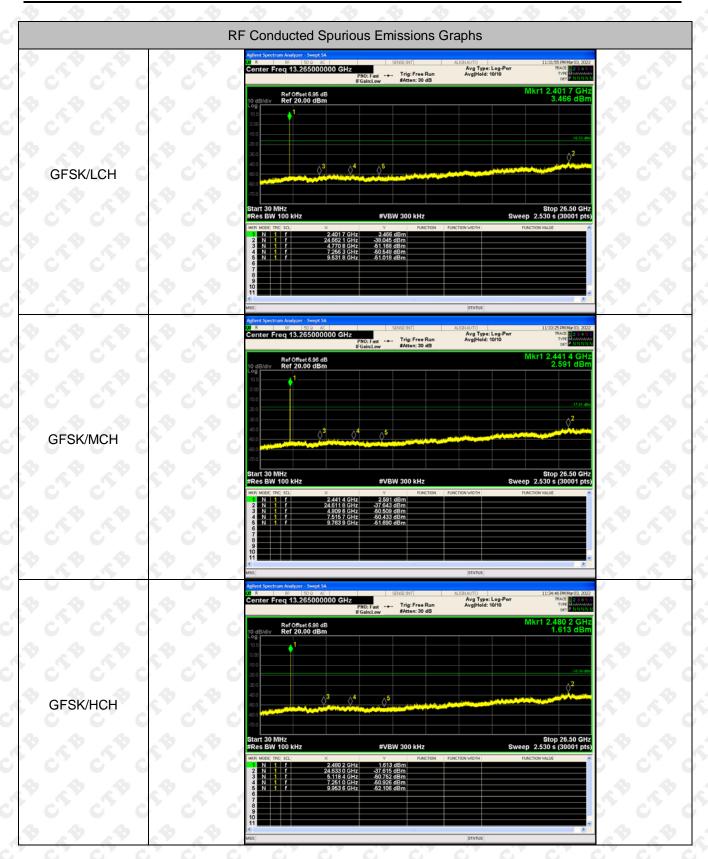


| 8DPSK /LCH/Hop | Applied Spectrum Auditation: Sweep 13 Spectrum Auditation: Sweep | |
|----------------------|--|--|
| 8DPSK /HCH/No Hop | No. Store Act Stor | |
| 8DPSK /HCH/Hop | Note Status View Bit 100 m Att Center Freq 2.468750000 GHz PHO: Fast | |







| 8 5 8 5 B | 5 8 5 8 S | Aglient Spectrum Analyzer - Swept SA 09 R BF 500 AC Center Freq 13.265000000 GHz | SENSE INT PNO: Fast Trig: Free Run IFGain:Low #Atten: 30 dB | ALIGNAUTO Avg Type: Log-Pwr Avg Hold: 10/10 | 11:45:59 PM Mar 03, 2022 TRACE 2 2 4 5 0 TYPE DET PNNNNNN | 58 58 |
|---------------|--------------------|--|--|---|--|-------|
| | \$ \$ | Ref Offset 6.95 dB 10 dB/div Ref 20.00 dBm | In Calif. Com. | Mł | r1 2.401 7 GHz -1.233 dBm | |
| | ້ ດັ ດ໌ | -10.0 | | | -21 23 @0 | |
| π/4DQPSK /LCH | Store of the state | -40.0 50.0 | , ⊘ ⁵ | | 3 | |
| | A .A | -60.0 | | | | |
| | | Start 30 MHz #Res BW 100 kHz MKR MODE TRC SCL × 1 N 1 f 24017 GH | | | Stop 26.50 GHz 2.530 s (30001 pts) | |
| | 50 50 5 | 2 N 1 f 262011 GH 3 N 1 f 4760 2 GH 4 N 1 f 7,108 3 GH 6 N 1 f 9,556 6 GH 7 | z -1.233 dBm z -37 660 dBm z -51 296 dBm z -50 696 dBm z -51 460 dBm | | | |
| | A 24 | 8 9 10 11 | | | × | |
| <u> </u> | | MSG Aglient Spectrum Analyzer - Swept SA Q8 R RF 50.9 AC | SENSE:INT | STATUS ALIGNAUTO | 11:47:16 PM Mar 03, 2022 | |
| | 5 6 6 6 | Ref Offset 6.96 dB | PNO:Fast → Trig:FreeRun IFGain:Low #Atten:30 dB | Avg Type: Log-Pwr Avg Hold: 10/10 | r1 2.440 5 GHz -0.355 dBm | |
| | 5 8 B | 10 dB/div Ref 20.00 dBm | | | | |
| | | -10.0 | | | -20 38 dbm | |
| π/4DQPSK/MCH | 5 6 6 | -800 -500 -600 | ⁴ 5 | | | |
| | 5 B 5 B 6 | Start 30 MHz #Res BW 100 kHz | #VBW 300 kHz | | Stop 26.50 GHz 2.530 s (30001 pts) | |
| | | MKR MODE: TRC: SCL X 1 N 1 f 2.440 5 GH 2 N 1 f 24.598 6 GH 3 N 1 f 6.078 7 GH 4 N 1 f 7.433 7 GH 5 N 1 f 9.759 5 GH | z -0.355 dBm z -37.603 dBm z -51.234 dBm z -50.066 dBm z -52.161 dBm | PUNCTUR VIOLA | UN VALUE | |
| | | 6 7 8 9 10 | | | | |
| V CAN CAN | SP SP S | Agilent Spectrum Analyzer - Swept SA | | STATUS | <u>×</u> | 5° 5° |
| | A 24 | 08 8 8 50 0 AC Center Freq 13.265000000 GHz | PNO: Fast Trig: Free Run IFGain:Low #Atten: 30 dB | Augrauto Avg Type: Log-Pwr Avg Hold: 10/10 | 11:49:41 PM Mar 03, 2022 TRACE 2 3 4 5 5 TVPE DET PINNINN | |
| | | Ref Offset 6.98 dB 10 dB/div Ref 20.00 dBm | | | r1 2.480 2 GHz -2.063 dBm | |
| | 5 × 5 × 5 | 10.00 -10.0 -20.0 | | | -22.06.40m | |
| π/4DQPSK/HCH | A 42 | -40.0 -50.0 | 4 | | | |
| | | 700 Start 30 MHz #Res BW 100 kHz | #VBW 300 kHz | | Stop 26.50 GHz 2.530 s (30001 pts) | |
| | ్ ర్ ర్ | MKR MODE TRC XL X 1 N 1 f 2.480.2 GH 2 N 1 f 25.023.9 GH 3 N 1 f 5.165.7 GH | Y FUNCTION | | ION VALUE | |
| | 50 50 | 4 N 1 f 7.453 1 GH 5 N 1 f 10.077 1 GH 6 7 | z -50.098 dBm z -51.946 dBm | | | |
| | \$ \$ | 9 10 11 • | | STATUS | > | |
| ີວີວີວ | 600 | 6 6 | 0'0' | 6 6 | 6 6 | 5 6 |



| | 5 P | | Aglent Spectrum Analyzer - Swigt SA 20 A 5 5 500 AC 1 SD 2 AC 1 200000 AHM2 04,2022 Center Freq 13,255000000 GHz Avg Type: Log-Pwr TRUE 1724350 PHO: Fast → Trig: Free Run Avg Hold: 10/10 Trig IFGain.tow Atten: 30 dB C | AP AP |
|-----------------------------|----------------|------|--|----------|
| | .* | | Ref Offset 6.95 dB Mkr1 2.401 7 GHz 10 dB/div Ref 20.00 dBm -0.338 dBm | A 4 |
| | c ² | | | |
| 8DPSK /LCH | C S P | | $\begin{pmatrix} 300 \\ 400 \\ 600 \end{pmatrix}$ | A B A B |
| | | | | A 4 |
| | C | | Start 30 MHz Stop 26:50 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 2.530 s (30001 pts) Mar Mode TRC SQL X Y Function Function worth Function worth N 1 f _24917 GHz -0338 dBm Function Function worth Function worth Function worth | |
| | c S | | 1 1 f 2.4017 0.338 dBm 2 N 1 f 2.4200 6.01+57 4.33 BBm 3 N 1 f 2.4200 6.01+57 4.33 BBm 3 N 1 f 7.435 G.01+57 4.56 4.65 6.67 6. | A B CAR |
| | 2 | | | 29 29 |
| | C'A | | NSG STATUS Agitent Spectrum Analyzer - Swigt SA 00 R IS SO A. A. SDISE BYT ALIGN AUTO 120125 AM Mar04, 2022 | |
| | c | | Center Freq 13.265000000 GHz Trig: Free Run IF Gainstow Avg Type: Log-Powr Avg Heid: 10/10 Trig: Pree Run Avg Heid: 10/10 Ref Offset 6.95 dB 10 gB/dlg Mkr1 2.441 4 GHz -0.048 dBm | Str of V |
| | 1 C P | | 10 dB/div Ref 20.00 dBmU.U48 dBm 100U.U48 dBm 100 | 19 19 |
| | C | | 100 | |
| 8DPSK /MCH | c | | | |
| | 5.8 | | Start 30 MHz Stop 26.50 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 2.530 s (30001 pts) | 50 50 |
| | .* | | INR MOSE TRC SU. X Y FUNCTION FUNCTION WORTH FUNCTION WALLE 1 N 1 f 2.4411.63H.2 -0.048 dBm - <t< th=""><th>A .A</th></t<> | A .A |
| | c | | | |
| 8 . <u>1</u> 8 . <u>1</u> 8 | C S S | 18 C | 11 STATUS | 50 50 |
| | | | Bit Bit Stop AC Special AUDUATIO 1200007 MMHz04,0200 Center Freq 13,2550000000 GHz Special Avg Type: Log-Pwr Nucl Type: Log-Pwr Thic Type: Log-Pwr | A .A |
| | C | | Ref Offset 6.99 dB Mkr1 2.480 2 GHz 10 dB/div Ref 20.00 dBm -1.155 dBm 100 -1.155 dBm -1.155 dBm | |
| | c | | 0.00 | Sto Cha |
| 8DPSK /HCH | ×9 | | $\begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \end{array} \\ \end{array} $ | 28 28 |
| ode Sk /Hon | C | | Start 30 MHz Stop 26.50 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 2.530 s (30001 pts) | |
| | c | | MKR MODE TRC SCL X Y FUNCTION RUNCTION VALUE | ST CT |
| | 50 | | 1 1 f 2.4802 GHz -1.155 GBm 2 N 1 f 2.4657 GHz -3.1565 GBm 3 N 1 f 2.657 GHz -5.918 GBm 3 N 1 f 5.1184 GHz -5.918 GBm 4 N 1 f 7.450 GHz -50.237 GBm 5 N 1 f 7.450 GHz -52.083 GBm 6 1 f 9.748 0.GHz -52.083 GBm 7 8 8 | 58 58 |
| | 0 | | 0 10 11 ≤ ∞ xso 3 37Ans | \$ \$ |
| 6 6 | C' | c° c | | 5 5 |



9. COUDUCTED PEAK OUTPUT POWER

9.1 Block Diagram Of Test Setup

Radio Test System



9.2 Limit

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

9.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set the spectrum analyzer: RBW = 2MHz. VBW = 6MHz. Sweep = auto; Detector Function = Peak.

3. Keep the EUT in transmitting at lowest, middle and highest channel individually. Record the max value.



9.4 Test Result

| Mode | Channel. | Maximum Peak Output Power [dBm] | Verdict |
|------------------------|----------|---------------------------------|---------|
| A | LCH | 3.698 | PASS |
| EDR mode (GFSK) | MCH | 3.649 | PASS |
| (GFSR) | НСН | 2.791 | PASS |
| Ø Ø Ø | LCH | 3.705 | PASS |
| EDR mode (π/4DQPSK) | MCH | 0 0 3.555 0 0 | PASS C |
| | нсн | 2.694 | PASS |
| 2.2. | LCH | 3.831 | PASS |
| EDR mode (8DPSK) | MCH | 3.734 | PASS |
| | НСН | 2.817 | PASS |



Graphs

R R 50 Q AC Avg Type: Log-Pwr Avg[Hold: 100/100 Ref Offset 6.95 dB Ref 20.00 dBm 402 14 G 3.698 d **♦**¹ GFSK/LCH Span 10.00 MHz Sweep 1.000 ms (1001 pts) Center 2.402000 GHz #Res BW 2.0 MHz #VBW 6.0 MHz enter Freq 2.441000000 GHz Avg Type: Log-Pwr Avg|Hold: 100/100 PNO: Fast ---- Trig: Free Run #Atten: 30 dB 2.440 84 G 3.649 dB Ref Offset 6.96 dB Ref 20.00 dBm ٠ GFSK/MCH nter 2.441000 GHz Span 10.00 MHz Sweep 1.000 ms (1001 pts) #VBW 6.0 MHz r Freq 2.480000000 GHz Avg Type: Log-Pwr Avg|Hold: 100/100 PNO: Fast ---- Trig: Free Run If Chini aw #Atten: 30 dB Ref Offset 6.98 dB Ref 20.00 dBm 2.480 08 GF 2.791 dB **↓**¹ GFSK/HCH

ter 2.480000 GHz BW 2.0 MHz

#VBW 6.0 MHz

Span 10.00 MHz Sweep 1.000 ms (1001 pts)







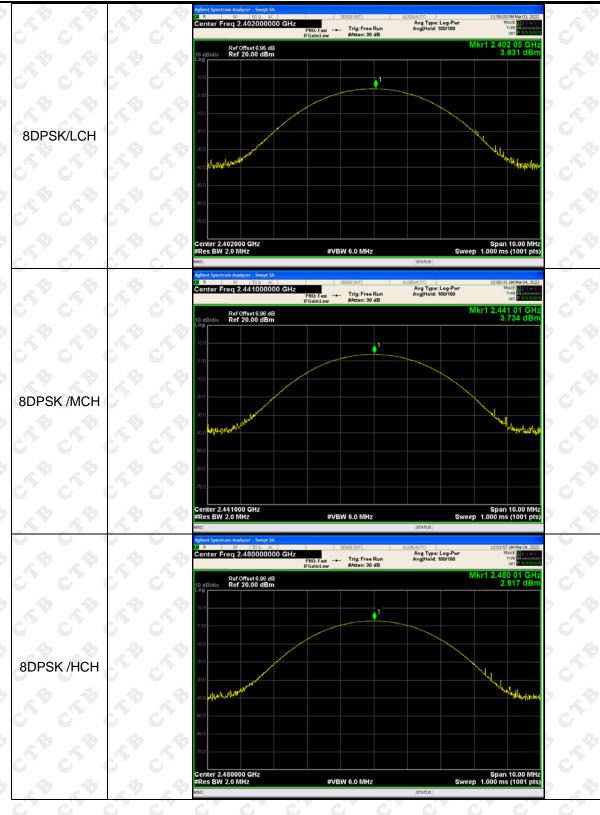


π/4DQPSK/LCH

π/4DQPSK/MCH

π/4DQPSK/HCH

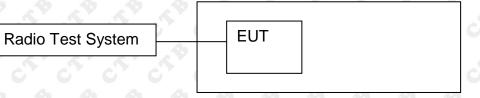






10. 20DB OCCUPIED BANDWIDTH

10.1 Block Diagram Of Test Setup



10.2 Limit

Alternatively, frequency hopping systems operating in the 2400-2483.5MHz band may have hopping channel carrier frequencies that are separated by 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125nw.

10.3 Test procedure

- 1. Rem1. Set RBW = 30 kHz.
- 2. Set the video bandwidth (VBW) \geq 3 x RBW.
- 3. Detector = Peak.
- 4. Trace mode = max hold.
- 5. Sweep = auto couple.
- 6. Allow the trace to stabilize.

7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

10.4 Test Result

| Test Mode | Frequency | 20dB Bandwidth (MHz) | Result |
|-----------|--------------|-------------------------|--------|
| 0 0 0 | Low channel | 0.945 | PASS |
| GFSK | Mid channel | 0.91 | PASS |
| | High channel | 0.932 | PASS |
| 000 | Low channel | 1.469 | PASS |
| π/4DQPSK | Mid channel | 1.444 | PASS |
| | High channel | 1.49 | PASS |
| 0 0 0 | Low channel | 1.474 | PASS |
| 8DPSK | Mid channel | 1.489 | PASS |
| | High channel | 1.489 | PASS |

Note: All modes of operation were Pre-scan and the worst-case emissions are reported.



Test Graph:







СТВ





11. CARRIERFREQUENCIES SEPARATION

11.1 Block Diagram Of Test Setup

Radio Test System



11.2 Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 0.125W.

11.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set the spectrum analyzer: RBW = 100kHz. VBW = 300kHz , Span = 3.0MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

| Mode Channel. | | Carrier Frequency Separation [MHz] | Verdict |
|---------------|-----|------------------------------------|---------|
| GFSK | LCH | 1.000 | PASS |
| GFSK | MCH | 1.000 | PASS |
| GFSK | HCH | 1.002 | PASS |
| π/4DQPSK | LCH | 1.000 | PASS |
| π/4DQPSK | MCH | 1.000 | PASS |
| π/4DQPSK | НСН | C C 1.002 C C C | O PASS |
| 8DPSK | LCH | 1.002 | PASS |
| 8DPSK | MCH | 1.000 | PASS |
| 8DPSK | HCH | 1.000 | PASS |

11.4 Test Result



Test Graph





| \$ 5\$ 5 B | 5 B 5 B | Aglient Spectrum Analyzer - Swept SA B R RF 50 Ω AC Marker 1 Δ 1.0000000000 MHz | SENSE-INT PNO: Wide Trig: Free Run IFGein:Low #Atten: 30 dB | ALIGNAUTO Avg Type: Log-Pwr Avg Hold:>100/100 | 11:49:43 PM Mar 03, 2022 TRACE 2 3:4 5 6 TYPE MUMOUND DET P NNNNN | |
|--|-----------|---|---|---|--|-------|
| | \$ \$ | Ref Offset 6.95 dB 10 dB/div Ref 20.00 dBm | IFGBINLLOW #ACCEN: 30 GD | ΔΝ | 1kr1 1.000 MHz -1.085 dB | |
| ່ວົວົວ | ້ ເຈົ້ ເ | 10.0 0.00 -10.0 | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | 1 <u>0</u> 2 | m | |
| | A 44 | -20.0 | | | | |
| π/4DQPSK/LCH | 4 4 | -50.0 -60.0 -70.0 | | | | |
| | ີ່ຕີ້ຕິ | Center 2.402500 GHz #Res BW 30 kHz MKR MODE TRC SCL X | #VBW 100 kHz | | Span 2.000 MHz .133 ms (1001 pts) | |
| | A 44 | 1 Δ2 1 f (Δ) 1.000 2 F 1 f 2.401 992 3 3 5 5 5 5 5 | MHz (Δ) -1.085 dB GHz -1.627 dBm | | | |
| | \$ \$ | 6 7 8 9 10 | | | | |
| c' c' c | C' C | K MSG Agilent Spectrum Analyzer - Swept SA | | STATUS | 2 | S. C. |
| B AB AB | 5 B 5 B 5 | DA R RF 50.Ω AC Marker 1 Δ 1.000000000 MHz | PNO: Wide IFGain:Low #Atten: 30 dB | AUGNAUTO Avg Type: Log-Pwr Avg Hold>100/100 | 11:53:17 PM Mar 03, 2022 TRACE 2 2 4 5 6 TYPE P NN NN N DET P NN NN N | |
| \$ \$ | | Ref Offset 6.96 dB 10 dB/dlv Ref 20.00 dBm 10 dB/dlv Ref 20.00 dBm | | ΔN | 1kr1 1.000 MHz -0.317 dB | |
| | ి రి ర | 10.00 -10.0 -20.0 | | | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | |
| | 5 8 5 8 C | -40.0 | | | | |
| π/4DQPSK/MCH | \$ \$ | -60 0 -70 0 Center 2.441500 GHz | | | Span 2.000 MHz | |
| ້ວ້ວັວ | ້ຕໍ່ຕັ | MRR MODE FRC SUL X 1 Δ2 1 f (Δ3) 1,000 2 F 1 f 2,440 984 | #VBW 100 kHz Y FUNCTION R MHz (Δ) -0.317 dB GHz -0.496 dBm | | Span 2.000 MHz .133 ms (1001 pts) ^{ON VALUE} | |
| B CAB CAB | SP SP S | 3 4 5 6 7 | | | | |
| \$ \$ \$ | \$ \$ | 89 10 11 | | | ~ | |
| | | MSG Applent Spectrum Analyzer - Swept SA Og R SS SO AC Marker 1 Δ 1.0020000000 MHz | SDSENT | ALIGNAUTO Avg Type: Log-Pwr | 11:55:57 PM Mar 03, 2022 TRACE 12:04:52 0 | |
| ² 5 ² 5 ² 5 | S C S C | Ref Offset 6.98 dB 10 dB/div Ref 20.00 dBm | PNO: Wide Trig: Free Run IFGain:Low #Atten: 30 dB | Avg Type: Log-Pwr Avg Hold>100/100 | 1kr1 1.002 MHz -1.348 dB | |
| \$ \$ \$ | A .A . | | | 162 | | |
| | | -10.0 | | | | |
| π/4DQPSK/HCH | ST CAT | -40.0 -50.0 | | | | |
| \$ \$ \$ | \$ \$ | Center 2.479500 GHz #Res BW 30 kHz | #VBW 100 kHz | | Span 2.000 MHz .133 ms (1001 pts) | |
| | | MKR MODE TRC SCL × 1 Δ2 1 f (Δ) 1.002 2 F 1 f 2.478 988 3 4 4 4 | Y FUNCTION R MHz (Δ) -1,348 dB GHz -1,554 dBm | UNCTION WIDTH FUNCT | ON VALUE | |
| CAT CAT C | ST CAT C | 5 6 7 8 | | | | |
| \$ \$ \$ | \$ \$ | 11 < MSG | | STATUS | > | 14 14 |
| | | | | | | |

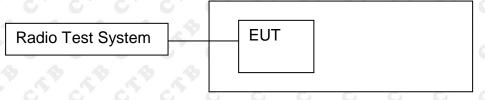


| | | \$ | Agilent Spectrum Analyzer - Swept SA Dr. R. 8F. 50 g. AC | |
|---|--|---|--|---------------------------------------|
| | ດີ ເ | ి చిచి | Marker 1 & 1.000000000 MHz PHO Wide Tris: Free Run AvgHeid> 100/100 100 If GainLaw Atten: 30 dB | 1 S 6 |
| | | \$ \$ | RefOffset695 dB ΔMkr1 1.000 MH 10 dB/dly Ref 20.00 dBm 0.318 d | 4 4 |
| | c ^s c | | | S |
| | | A A | | |
| | SY a | 5 × 5 × 5 | | S . S . |
| 8DPSk | /LCH | | | |
| | 1 N 1 | C | Center 2.402500 GHz Span 2.000 MH #Res BW 30 kHz #VBW 100 kHz Sweep 2.133 ms (1001 pt | |
| | C C | 000 | MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE | |
| | 29 | 9 L9 1 | 1 0.2 1 f (.0) 1.000 MHz (.0) 0.319 dB 3 2 F 1 f 2.401 989 GHz -1.923 dBm 3 4 | 29 L9 |
| | C' C | | | 0 0 C |
| | | \$ \$ | | |
| 6 | c' c | | ≤ > MSD STATUS | |
| | | \$ \$ | Aglend Spectrum Analyzer - Swedt SA 01 8 8 100 AAL SERVERT ALLOHANTO 120007 AMMAFOL 20 Marker 1 ∆ 1.000000000 MHz PIO: Wale Trig: Free Run Argibiolis 100100 1197 | |
| | ດີ ດ | ి చి చి | IF Gain: Low #Atten: 30 dB Contraction Con | |
| | | \$ | 10 dBldiv Ref 20.00 dBm -0.241 d | \$ \$ |
| | c' c | | 100 X2 X2 | S 8 6 |
| | - | \$ \$ | | \$ \$ |
| 8DPSK | | ST ST | 400 | ST ST |
| ODFSK | /wich | A A | 700 | |
| | S.V. | 5 4 A 4 | Center 2.441500 GHz Span 2.000 MH #Res BW 30 kHz #VBW 100 kHz Sweep 2.133 ms (1001 pt | 12 5) |
| | | | NRR MODE TRC SQL X Y FUNCTION RANCTION WIDTH FUNCTION VALUE 1 Δ2 1 f (Δ) 1,000 MHz (Δ) -0.241 dB - 2 F 1 f 2.440 978 GHz -2.028 dBm - - | |
| | | A A | 2 F I I 2.440 3/0 GFI2 -2.020 dDfn | |
| | S.V. | A 14 | 3 7 1 2 2400 ST0 ST12 32.020 Gbm 4 4 4 4 4 4 6 4 4 4 4 4 | 50 50 |
| | cr ^w c | SP CYP C | 2 P I I Z 440 310 UNIZ 2000 UDM 4 4 5 6 6 8 9 9 9 1 10 | 58 558 |
| | CT C | 5 ¹⁰ 67 ¹⁰ 67 5 ¹⁰ 67 ¹⁰ 67 | 2 7 1 1 2 440 370 0F12 2 4020 0Dm 4 4 4 6 6 7 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 1 1 1 2 440 370 0F12 2 4020 0Dm 10 11 11 11 11 11 11 11 11 11 11 11 11 1 | 5 8 5 8 5 8 5 8 |
| * C 1 * | cr ^w c | 5 ¹⁰ 05 ¹⁰ 05 | 3 4 6 6 7 1 7 1 | |
| ^{به} رم ^ی <u>به رم</u> هر ه | د ^{م ک} د در ^{م ک} د در ^م د | ^ی ^م ری ^م ر <u>ی مری می</u> رو مری می | 3 6 6 7 7 8 9 9 10 | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 |
| ^{به} در ^{به} به <u>رم ه</u> به در ه | CIT C | 5 ⁴ 05 ⁴ 0 5 ⁴ 05 ⁴ 0 5 ⁴ 05 ⁴ 0 | 3 4 6 6 7 6 7 7 8 9 10 10 11 1 <th>1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</th> | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 |
| ^{به} کې <u>په کې پې</u> په کې پې | c ^{5^w c c^{5^w c c^{5^w c}}} | ^{ین ه} ین ^ه ی د هین مین هی د هی هی | 3 6 7 5 7 6 7 7 6 7 6 7 6 7 7 6 7 7 6 7 | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 |
| ^{به} دیم <u>به دیم</u> به دیمه | CTBC | ^{ین ه} ین ^ه ی <u>به دیمه م</u> به دیمه د به دیمه د | 3 4 6 7 7 6 6 7 7 6 6 6 6 6 6 6 7 | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 |
| ^{به} یکی ^{می} مرکع می مهر می | | ^ی ن ^{می} ری ^{می} ری <u>د میری میر</u> د میری میر د میری میر د میری میر | 3 6 7 5 7 6 7 7 6 7 6 7 6 7 7 6 7 7 6 7 | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 |
| 8DPSK | | ^{ین ه} ین ^ه ی رو هین ^م ین رو هین ^م ین رو هین ^م ین رو هین رو هین | 3 4 6 7 7 6 6 7 7 6 6 6 6 6 6 6 7 | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 |
| 8DPSK | | | 3 4 4 5 | |
| 8DPSK | | ^{ین} ^{می} ری ^{می} ر <u>و می می می</u> و می می می و می می می و می می می | 3 4 4 5 2 | |
| 8DPSK | | | 3 4 6 7 6 7 | |
| 8DPSK | | | 3 4 A | |
| 8DPSK | | | 3 3 3 3 3 4 5 5 5 5 Agent System Analyzer Swept AA 5 5 6 Agent System Analyzer Swept AA 5 5 Marker 1 A 1.0000000000 MHz Trig: Free Run Analyzer Swept AA Age Type: Leg-Pwr Arg/Type: Leg-Pwr Trig: Free Run | |
| 8DPSK | | | 3 4 A | |



12. HOPPING CHANNEL NUMBER

12.1 Block Diagram Of Test Setup



12.2 Limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

12.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set the spectrum analyzer: RBW = 100kHz. VBW = 300kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.

4. Set the spectrum analyzer: Start Frequency = 2.4GHz, Stop Frequency = 2.4835GHz. Sweep=auto;

Number of Hopping Channel Verdict Mode Channel. GFSK PASS Hop 79 π/4DQPSK PASS Hop 79 8DPSK PASS Hop 79

12.4 Test Result

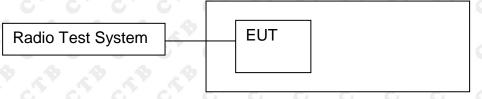


Test Graph Graphs nter Freq 2.441750000 GHz Avg Type: Log-Pwr Avg[Hold: 5000/5000 ---- Trig: Free Run Ref Offset 6.95 dB Ref 20.00 dBm GFSK/Hop Stop 2.48350 GI Sweep 8.000 ms /4001 #VBW 300 kHz 2.402 004 0 GHz 2.479 993 0 GHz 3.489 dB 3.508 dB enter Freq 2.441750000 GHz Avg Type: Log-Pwr Avg[Hold: 5000/5000 PNO: Fast ---- Trig: Free Run #Atten: 30 dB Ref Offset 6.96 dB Ref 20.00 dBm π/4DQPSK/Hop Stop 2.48350 GHz Sweep 8.000 ms (1001 pts) Start 2.40000 GHz #Res BW 100 kHz #VBW 300 kHz 2.402 004 0 GHz 2.479 993 0 GHz -0.032 dBm 0.018 dBm N 1 1 N 1 1 ter Freq 2.441750000 GHz Avg Type: Log-Pwr Avg|Hold: 5000/5000 PNO: Fast ---- Trig: Free Run IFGain:Low #Atten: 30 dB Mkr1 2.401 Ref Offset 6.95 dB Ref 20.00 dBm 8DPSK/Hop Stop 2.48350 GHz Sweep 8.000 ms (1001 pts) tart 2.40000 GHz Res BW 100 kHz #VBW 300 kHz 2.401 920 5 GHz 2.480 410 5 GHz 0.005 dBm -2.341 dBm



13. DWELL TIME

13.1 Block Diagram Of Test Setup



13.2 Limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

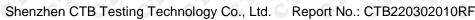
13.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set spectrum analyzer span = 0. Centred on a hopping channel;

3. Set RBW = 1MHz and VBW = 3MHz.Sweep = as necessary to capture the entire dwell time per hopping channel. Set the EUT for DH5, DH3 and DH1 packet transmitting.

4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).





13.4

СТВ

| Mode | Packet | Channel | Pulse Time (ms) | Total Dwell Time (ms) | Limit (ms) | Verdict |
|------|--------|---------|--------------------|--------------------------|------------|---------|
| A | DH1 | LCH | 0.381 | 121.92 | 400 | PASS |
| | DH1 | MCH | 0.38 | 121.6 | 400 | PASS |
| | DH1 | НСН | 0.381 | 121.92 | 400 | PASS |
| | DH3 | LCH | 1.641 | 262.56 | 400 | PASS |
| GFSK | DH3 | MCH | 1.641 | 262.56 | 400 | PASS |
| | DH3 | HCH | 1.641 | 262.56 | 400 | PASS |
| | DH5 | LCH | 2.891 | 308.373 | 400 | PASS |
| | DH5 | MCH | 2.891 | 308.373 | 400 | PASS |
| | DH5 | HCH | 2.891 | 308.373 | 400 | PASS |

Remark: DH5 Packet permit maximum 1600 / 79 / 6 hops per second in each channel (5 time slots RX, 1 time slot TX).

DH3 Packet permit maximum 1600 / 79 / 4 hops per second in each channel (3 time slots RX, 1 time slot TX).

DH1 Packet permit maximum 1600 / 79 /2 hops per second in each channel (1 time slot RX, 1 time slot TX). So, the Dwell Time can be calculated as follows:

DH5:1600/79/6*0.4*79*(MkrDelta)/1000 DH3:1600/79/4*0.4*79*(MkrDelta)/1000 DH1:1600/79/2*0.4*79*(MkrDelta)/1000 Remark: Mkr Delta is once pulse time.



Test Graph

| | Graphs | |
|--------------|--|--|
| GFSK_DH1/LCH | Addrest Spectrum Analyzer: Swept SA Spectrum Analyzer: Swept SA AUXAUTO 11:37-018MM:00.2022 Center Freq 2.402000000 GHz PR0: Fait Trig Delay-600.0 µ Avg Type: Log-Pwr Trid Delay-600.0 µ Image: Spectrum Analyzer: Swept SA Genter Freq 2.402000000 GHz PR0: Fait Trig: Video Avg Type: Log-Pwr Trid Delay-600.0 µ Image: Spectrum Analyzer: Swept SA Genter Freq 2.402000000 GHz Auxer: 30 dB Commercial for the faith of | |
| GFSK_DH1/MCH | Allers Sport num Anadyzer Sweet SA W & B S SO ALL Center Freq 2.441000000 GHz Ref Offset 6.95 dB Control Brance From the set of | |
| GFSK_DH1/HCH | Addend Speet from Analyzer 5 keyd 5A. The Bool Add Strate Trig Delay 560.0 µs Avg Type: Log-Pwr The Speet From | |



| | 1 4 A | Aglient Spectrum Analyzer - Swept SA ULR BE 50.0 AC Center Freq 2.40200000 | SE | NSE:INT AL Trig Delay-500.0 µs Trig: Video | IGNAUTO Avg Type: Log-Pwr | 11:51:34 PM Mar 03, 2022 TRACE 2 2 3 4 5 0 TYPE W | |
|--------------|---------------------------------------|--|---|---|---|--|----------|
| | | Ref Offset 6.95 dB | | #Atten: 30 dB | ΔM | kr1 1.641 ms 6.28 dB | |
| | C | 10.0 0.00 .10.0 | | | | TROLIN | |
| | 4 | -20.0 | | | | | |
| GFSK_DH3/LCH | C' C' | -40.0 -50.0 david toti autitud -60.0 autot autitud | | | | | |
| | 58.5 | Center 2.402000000 GHz Res BW 1.0 MHz | #VBW | (3.0 MHz | | Span 0 Hz 0 ms (10001 pts) | |
| | | MKR MODE TRC SCL \times 1 $\Delta 2$ 1 t (Δ) 2 F 1 t | Υ 1.641 ms (Δ) 6.28 499.5 μs -5.50 d | FUNCTION FUNCT | | | |
| | ່ດ້ຳດ້ຳ | 3 4 5 6 7 | | | | | |
| | \$ \$ 5 | 8 9 10 11 | | | | | |
| <u> </u> | 0'0' | Agilent Spectrum Analyzer - Swept SA | | | STATUS | | <u> </u> |
| | A P A | Center Freq 2.44100000 | PNO: Fast IFGain:Low | Trig Delay-500.0 µs Trig: Video #Atten: 30 dB | Avg Type: Log-Pwr | 11:55:03 PM Mar 03, 2022 TRACE 2 3 4 5 0 TYPE WWWWWWW DET PINNININI | |
| | | Ref Offset 6.96 dB 10 dB/div Ref 20.00 dBm Log | | | ΔM | kr1 1.641 ms 3.98 dB | |
| | 6° 6° | 100 X2 | | | | TROLIN | |
| | 2 2 2 | | | | anti al atte auto | ndarath dar at a | |
| GFSK_DH3/MCH | 0'0' | -60.0 Heler - Eleventer | | | | station of the state of the | |
| | 6 5 ° 6 | Center 2.441000000 GHz Res BW 1.0 MHz | #VBW | I 3.0 MHz | | Span 0 Hz 0 ms (10001 pts) | |
| | | 1 Δ2 1 t (Δ) 2 F 1 t 3 4 | 1.641 ms (Δ) 3.98 499.5 μs -2.30 d | | | | |
| | రి రి | 6 7 8 9 | | | | | |
| | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 10 11 MISG | | | STATUS | × | |
| | | Aglient Spectrum Analyzer - Swept SA UC R RF 50.0 AC Center Freq 2.48000000 | IO GHz | NSE:INT AL Trig Delay-500.0 µs Trig: Video | IGNAUTO Avg Type: Log-Pwr | 11:57:53 PM Mar 03, 2022 TRACE 2 3 4 5 0 TYPE | a a |
| | 6 6 | Ref Offset 6.98 dB | PNO: Fast IFGain:Low | #Atten: 30 dB | ΔM | kr1 1.641 ms 8.78 dB | |
| | \$ \$ \$ | 10.0 0.00 | | Hadada aya yana kapila il | | | |
| | c' c' | -10.0 2- -20.0 | | | | 1001.4 | |
| GFSK_DH3/HCH | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | -40.0 -50.0 History (algebra) -60.0 History (algebra) | | | inder dem Schwarten die ster Versiter in der Schwarten die Schwarten die Schwarten die Schwarten die Schwarten die Schwarten die Schwarten d | | |
| 6 6 6 6 | | Center 2.480000000 GHz Res BW 1.0 MHz | | | | Span 0 Hz 0 ms (10001 pts) | |
| | C | Res BW 1.0 MHz MKR MODE TRC SCL × 1 Δ2 1 t (Δ) 2 F 1 t (Δ) | #VBW 1.641 ms (Δ) 8.78 499.5 μs -6.91 d | FUNCTION FUNCT BM | ION WIDTH FUNCTION | | |
| | 2 62 | 3 4 5 6 7 | | | | | |
| | 0'0' | 8 9 10 11 | | | | | |
| V C C C | | | 67 | 67 G | STATUS | | V V |
| | | | | | | | |



| | C0 R | nt Spectrum Analyzer - Swept SA RF 50 Q AC Inter Freq 2.402000000 | GHz | SENSE:INT | ALIGNAUTO Avg Type: Log-Pwr | 12:05:54 AM Mar 04, 2022 TRACE 12:04:45 C | |
|----------------|-------------|---|------------------------------------|---|--|--|-----|
| | | | PNO: Fast +++ IFGain:Low | Trig Delay-500.0 µs Trig: Video #Atten: 30 dB | | TYPE Der PINNNIN Mkr1 2.891 ms | |
| | | Ref Offset 6.95 dB B/dly Ref 20.00 dBm | | | 102 | 5.79 dB | |
| | | X2 | | A Sheeting Had and the Construction | i fre k de se berge fan | 1790 LV4 | |
| | | | | | | | |
| GFSK_DH5/LCH | | n Herne on of a Herne And Height Maarde | | | n di ku ka | al talen al talen an talen al talen al La talen al t | |
| | Cer | nter 2.402000000 GHz | | | | | |
| | Res | BW 1.0 MHz | Y | FUNCTION FUN | | Span 0 Hz 00 ms (10001 pts) | |
| | 23345 | F 1 t | 2.891 ms (Δ) 5.7 499.5 μs -4.14 | dBm | | | |
| | | | | | | | |
| | | | | 4 | STATUS | × | |
| | LW R | nt Spectrum Analyzer - Swept SA RF 50 Q AC | | SENSE:INT | ALIGN AUTO | 12:10:14 AM Mar 04, 2022 | |
| | Cer | nter Freq 2.441000000 | PN0: Fast | Trig Delay-500.0 µs Trig: Video #Atten: 30 dB | Avg Type: Log-Pwr | TRACE 221450 TYPE DET PINNINN | |
| | 10.9 | Ref Offset 6.96 dB Bidiv Ref 20.00 dBm | | | Δ 1Δ2 | Mkr1 2.891 ms 2.72 dB | |
| | | X2 | | | | T90 LVL | |
| | | | | | | | |
| GFSK_DH5/MCH | | Manufa and Ana ang iki | | | a har h shi h shi h | | |
| 6 <u>6 6 6</u> | | ter 2 44100000 GHz | | | | | |
| | | MODE TRC SCL × | Y | FUNCTION FUN | | Span 0 Hz 00 ms (10001 pts) | |
| | 234 | $\frac{\Delta z}{F} = \frac{1}{1} t$ | 2.891 ms (Δ) 2.7 499.5 μs -0.60 | dBm | | | |
| | 67 | | | | | | |
| | | | | | | > | |
| 0 0 0 | LX 8 | nt Spectrum Analyzer - Swept SA | | SENSE:INT | STATUS ALIGN AUTO | 12:13:34 AM Mar 04, 2022 TRACE 12:0445 0 | C'Y |
| | Cer | nter Freq 2.48000000 | PNO: Fast | Trig Delay-500.0 μs Trig: Video #Atten: 30 dB | Avg Type: Log-Pwr | TYPE DET PINNINN | |
| | C C 10g | Ref Offset 6.98 dB Bidiv Ref 20.00 dBm | | | Δ | Mkr1 2.891 ms 0.22 dB | |
| | | X2 | | | | TRO LVL | |
| | | | | | | | |
| GFSK_DH5/HCH | 400 400 | at it a due no off | | | in naish all a naish ann In naishini a bhalana an | terildin or obsit indext oo teristik that date. | |
| | | ter 2 48000000 CHz | | | عليمية ببلي يتعقد | Spap 0 Hz | |
| | | MODE TRC SCL × | Y | W 3.0 MHz | | Span 0 Hz 00 ms (10001 pts) | |
| | | Δ2 1 t (Δ) F 1 t | 2.891 ms (Δ) 0.2 499.5 μs -0.78 | dBm | | | |
| | 6 7 8 | | | | | | |
| | | | | | | × | |
| | C C MSG | 6' 6' | 67 | c' c | STATUS | | C C |
| | | | | | | | |

14. PSEUDORANDOM FREQUENCY

14.1 Limit

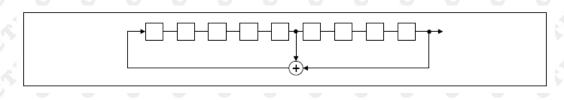
СТВ

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively. Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

14.2 Test procedure

The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.

- Number of shift register stages: 9
- Length of pseudo-random sequence: 29 -1 = 511 bits
- Longest sequence of zeros: 8 (non-inverted signal)



An example of Pseudorandom Frequency Hopping Sequence as follow:

| 0 6 2 4 | 6 77 | 7 | 64 | 8 | 73 | | 16 | 75 |
|---------|------|-------|----|---|-----------|------|----|----|
| ТТ | | T | | | TT | | | |
| | | | | | | | | |
| | | | | | | | 1 | |
| 1 1 | | 1 | | | | | ! | |

Each frequency used equally on the average by each transmitter.

The system receivers have input bandwidths that match the hopping channel bandwidths of their Corresponding transmitters and shift frequencies in synchronization with the transmitted signals.



14.3 Test Result

The device does not have the ability to be coordinated with other FHSS systems in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitters.



15. ANTENNA REQUIREMENT

15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna is PCB Antenna. The best case gain of the antenna is 1.0dBi.



16. EUT PHOTOGRAPHS

EUT Photo 1



EUT Photo 2



Report



17. EUT TEST SETUP PHOTOGRAPHS

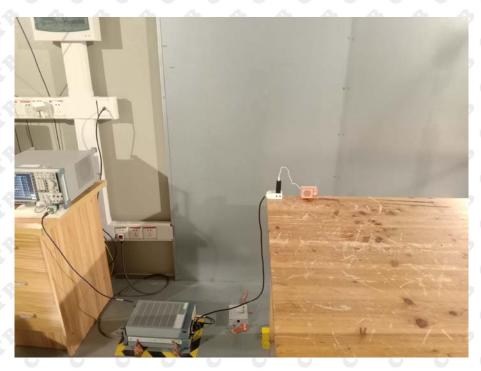
Radiated Emission







Conducted emissions



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