TC	通测检测 TESTING CENTRE TECHNOLOGY	Report No.: TCT180827E036
	GFSK	
	Aglendt Spectrum Analyzer / Swept SA.         SPECIAL         SPECIAL         ALIMAUTO         (McG247PH Acg29, 2013)         Frequency           Start Freq 2.4000000000Hz         PI0: Fast         Trig: Free Run         Avg1Hold>         Avg1Hold>         Pi0: Fast         Pi0	
	Start 2.40000 GHz         Stop 2.48350 GHz           #Res BW 100 kHz         #VBW 300 kHz         Sweep 8.000 ms (1001 pts)           WR1 MORE TRC SCI         X         Y         Runction         Runction wouth         Runction wouth         Runction wouth         Runction wouth         Runction wouth         CF Step 8.350000 MHz         Auto         Auto         Man           1         Y         2.473 9930 GHz         2.2473 9930 GHz         2.248 dBm         Freq Offset         0 Hz         Gr Step 9.488 dBm         Gr Step 9.488 dBm         Freq Offset         0 Hz         0 Hz         Gr Step 9.488 dBm         Freq Offset         0 Hz         Gr Step 9.488 dBm         Gr St	
	Pi/4DQPSK	
	Agine         Spectrum Adaptive Swept SA         Spectrum Adaptive Swept SA         ALIGNAUTO         (Mod 2014 Aug 20 2018)         Frequency           Start Freq 2.400000000 GHz         PN0: Fast         Trig: Free Run BrGallat.ow         Avg Type: Leg-Pwr Avg Hold>100100         PN0: Fast         Frequency         Auto Tune           100         B         Mkr2 2.479 993 0 GHz         Center Freq 2.438 dBm         Center Freq 2.441750000 GHz         Center Freq 2.441750000 GHz           000         1         Center Freq 2.400000000 GHz         2         Center Freq 2.400000000 GHz         Start Freq 2.400000000 GHz	
	Stop Freq         Stop Freq         2.48350000 GHz           Start 2.40000 GHz         CF Stop         CF Stop	
	Here Note Field         Yes         Sweep 8.000 ms (1001 pts)         Basenoon M+z           MEN Note Field         Y         Flanction         Panction         Panction         Panction Value         Auto         Man           2         N         1         7         2.401 837 0 0Hz         -3.620 dBm         Auto         Man           3         1         7         2.401 837 0 0Hz         -3.620 dBm         Freq Offset         0 Hz           4         -	
	8DPSK	
	Ref Offset 0.5 dB         ML/SAUTO         005790FM Aug 20, 2019         Frequency           Vid         Frequency         PROC Flast         Trig: Free Run         Avg Type: Log-Run         Trig: Start Freq         Auto Tune           Vid         Box         Frequency         Ref offset 0.5 dB         Mkr2 2.479 993 0 GHz         Auto Tune           Vid         Box         Center Freq         2.4175 GBm         Center Freq         2.441750000 GHz           Vid         MMMUM MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM	
	Kong         Kong <th< td=""><td></td></th<>	
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	Spectrum Analyzer EUT			
Test Mode:	Hopping mode			
Test Procedure:	<ol> <li>The testing follows ANSI C63.10:2013 Measurement Guidelines.</li> <li>The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>Enable the EUT hopping function.</li> <li>Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW shall be ≤ channel spacing and where possible RBW should be set &gt;&gt; 1 / T, where T is the expected dwell time per channel; VBW≥RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.</li> <li>Measure and record the results in the test report.</li> </ol>			
Test Result:	PASS			

FCC Part15 C Section 15.247 (a)(1)

The average time of occupancy on any channel shall not

seconds multiplied by the number of hopping channels

-0

be greater than 0.4 seconds within a period of 0.4

ANSI C63.10:2013

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employed.

## 6.7.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Aug. 27, 2019
RF Cable (9KHz-26.5GHz)	тст	RE-06	N/A	Aug. 27, 2019
Antenna Connector	тст	RFC-01	N/A	Aug. 27, 2019

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

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6.7.1. Test Specification

**Test Requirement:** 

6.7. Dwell Time

**Test Method:** 

**Test Setup:** 

Limit:

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## 6.7.3. Test Data

Mode	Packet	Hops Over Occupancy Time (hops)	Package Transfer Time (ms)	Dwell time (second)	Limit (second)	Result
GFSK	DH1	320	0.420	0.134	0.4	PASS
GFSK	DH3	160	1.683	0.269	0.4	PASS
GFSK	DH5	106.67	2.932	0.313	0.4	PASS
Pi/4 DQPSK	2-DH1	320	0.429	0.137	0.4	PASS
Pi/4 DQPSK	2-DH3	160	1.680	0.269	0.4	PASS
Pi/4 DQPSK	2-DH5	106.67	2.944	0.314	0.4	PASS
8DPSK	3-DH1	320	0.433	0.139	0.4	PASS
8DPSK	3-DH3	160	1.686	0.270	0.4	PASS
8DPSK	3-DH5	106.67	2.944	0.314	0.4	PASS

Note: 1. In normal mode, hopping rate is 1600 hops/s with 6 slots in 79 hopping channels.

For DH1, With channel hopping rate (1600 / 2 / 79) in Occupancy Time Limit  $(0.4 \times 79)$  (s), Hops Over Occupancy Time comes to  $(1600 / 2 / 79) \times (0.4 \times 79) = 320$  hops

For DH3, With channel hopping rate (1600 / 6 / 79) in Occupancy Time Limit (0.4 x 79) (s), Hops Over Occupancy Time comes to  $(1600 / 4 / 79) \times (0.4 \times 79) = 160$  hops

For DH5, With channel hopping rate (1600 / 6 / 79) in Occupancy Time Limit (0.4 x 79) (s), Hops Over Occupancy Time comes to (1600 / 6 / 79) x (0.4 x 79) = 106.67 hops

2. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

#### Test plots as follows:







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## 6.9. Conducted Band Edge Measurement

## 6.9.1. Test Specification

FCC Part15 C Section 15.247 (d)			
ANSI C63.10:2013			
In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.			
Spectrum Analyzer EUT			
Transmitting mode with modulation			
<ol> <li>The testing follows the guidelines in Band-edge Compliance of RF Conducted Emissions of ANSI C63.10:2013 Measurement Guidelines.</li> <li>Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>Set RBW = 100 kHz (≥1% span=10MHz), VBW = 300 kHz (≥RBW). Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.</li> <li>Enable hopping function of the EUT and then repeat step 2 and 3.</li> <li>Measure and record the results in the test report.</li> </ol>			
Test Result: PASS			

## 6.9.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Aug. 27, 2019
RF Cable (9KHz-26.5GHz)	тст	RE-06	N/A	Aug. 27, 2019
Antenna Connector	тст	RFC-01	N/A	Aug. 27, 2019

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

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## 6.9.3. Test Data

**GFSK Modulation** 



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#### **Pi/4DQPSK Modulation**



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### 8DPSK Modulation



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# 6.10. Conducted Spurious Emission Measurement

## 6.10.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (d)		
Test Method:	ANSI C63.10:2013		
Limit:	In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.		
Test Setup:	Spectrum Analyzer EUT		
Test Mode:	Transmitting mode with modulation		
Test Procedure:	<ol> <li>The testing follows the guidelines in Spurious RF Conducted Emissions of ANSI C63.10:2013 Measurement Guidelines</li> <li>The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>Set RBW = 100 kHz, VBW = 300kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.</li> <li>Measure and record the results in the test report.</li> <li>The RF fundamental frequency should be excluded against the limit line in the operating frequency band.</li> </ol>		
Test Result:	PASS		

## 6.10.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Aug. 27, 2019
RF Cable (9KHz-26.5GHz)	тст	RE-06	N/A	Aug. 27, 2019
Antenna Connector	тст	RFC-01	N/A	Aug. 27, 2019

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

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