

Test Results

Time of occupancy on the TX channel in 31.6 sec = time domain slot length \times hop rate \div number of hop per channel \times 31.6

Test mode : GFSK

Channel		i i	Test Results			
Frequency (MHz)	Packet Type	Dwell Time (ms)	Time of occupancy on the TX channel in 31.6sec (ms)	Result		
	DH 1	0.399	126.40	Complies		
2441	DH 3	1.654	264.00	Complies		
	DH 5	2.910	309.33	Complies		
DH1 Dwell time = $0.399 \text{ ms} \times (1600 \div 2) \div 79 \times 31.6 = 127.68 \text{ ms}$						
DH3 D	DH3 Dwell time = 1.654 ms \times (1600 \div 4) \div 79 \times 31.6 = 264.64 ms					
DH5 D	well time = 2.91	L0 ms × (1600÷0	6) ÷ 79 × 31.6 = 310.3	39 ms		

Test mode : 8-DPSK

Channel			Test Results		
Frequency (MHz)	Packet Type	Dwell Time (ms)	Time of occupancy on the TX channel in 31.6sec (ms)	Result	
2441	3DH 1	0.414	129.60	Complies	
	3DH 3	1.672	265.60	Complies	
	3DH 5	2.911	309.33	Complies	

3DH1 Dwell time = $0.414 \text{ ms} \times (1600 \div 2) \div 79 \times 31.6 = 132.48 \text{ ms}$ 3DH3 Dwell time = $1.672 \text{ ms} \times (1600 \div 4) \div 79 \times 31.6 = 267.52 \text{ ms}$ 3DH5 Dwell time = $2.911 \text{ ms} \times (1600 \div 6) \div 79 \times 31.6 = 310.50 \text{ ms}$

See next pages for actual measured spectrum plots.





Time of Occupancy for PACKET Type DH1(GFSK)

Time of Occupancy for PACKET Type DH3(GFSK)



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Time of Occupancy for PACKET Type DH5(GFSK)

Time of Occupancy for PACKET Type 3DH1(8-DPSK)

Time of Occupancy for PACKET Type 3DH3(8-DPSK)

Test Report No.: 2011070024 P. Date: July 11, 2011 This Report shall not be reproduced except in full without the written approval of CTM

Page 23 of 44

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Time of Occupancy for PACKET Type 3DH5(8-DPSK)

2.1.5 Maximum peak Conducted Output Power

Test Location

RF Test Room

Test Procedures

The maximum peak conducted output power was measured with a spectrum analyzer connected to the antenna terminal, while EUT has its hopping function disabled at the highest, middle and the lowest available channels.

The spectrum analyzer is set to:Center frequency = the highest, middle, and the lowest channelsSpan = 5 MHz (approximately 5 times of the 20 dB bandwidth)RBW = 1 MHz (greater than the 20 dB bandwidth of the emission being measured)VBW = 1 MHz (\geq RBW)Detector function = peakTrace = max holdSpectrum Analyzer

Limit

§5.247(b)(1) The Maximum Peak Output Power Measurement is 0.125 Watts for frequency hopping system operating in 2400-2483.5 MHz employing at least 15 Hopping channels.

Test Results

Test mode : GPSK, CFG PKT Packet Type : 15 Packet Size : 339(DH5)

Frequency (MHz)	Channel No.	Peak output power(dBm)	Peak output power(mW)	Result
2402	0	4.882	3.077	Complies
2441	39	5.083	3.223	Complies
2480	78	5.899	3.890	Complies

Test mode : 8-D	DPSK, CFG PK	T Packet Type :	31 Packet Size :	1021(3DH5)

Frequency (MHz)	Channel No.	Peak output power(dBm)	Peak output power(mW)	Result
2402	0	3.512	2.245	Complies
2441	39	3.560	2.270	Complies
2480	78	4.154	2.602	Complies

See next pages for actual measured spectrum plots.

Form No.: CTK-RF-EF-Part15 SubpartC(Rev.2)

	ctrum Anatyzer -	Swept SA		16 - L.				
rker 1	50 Ω 2.4019650 In	000000 G put: RF P	AC HZ NO: Fast C Tri Gain: Low At	g: Free Run ten: 20 dB	Avg Type Avg Hold:	ALIGNAUTO : Log-Pwr > 100/100	12:15:25 PM Jul 05, 2 TRACE 1 2 3 4 TYPE M WWW DET P N N N	011 5 6 NNN
B/div	Ref Offset 2.3 Ref 12.30	3 dB dBm	SumLow		- V. 72	Mkr1	2.401 965 GH 4.882 dB	iz NextPea m
				1				Next Rig
								Next Le
- Annormality								Marker De
								Mkr⊸0
								Mkr→RefL
nter 2.4	402000 GHz 1.0 MHz		VBW 50 M	1H7		Sween 1	Span 5.000 M	Hz 1 o

Maximum peak Conducted Output Power – GFSK

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Dask Carry	12:20:03 PM Jul 05, 2011	ALIGNAUTO		SENSE:INT	AC		50 Q	
Peak Search	TRACE 123456 TYPE MWWWWW DET PNNNNN	e: Log-Pwr I:>100/100	Avg T Avg Ho	rig: Free Run Atten: 20 dB	PNO: Fast IFGain:Low	5000000 Input: RF	2.402015	ker 1
NextPe	2.402 015 GHz 3.512 dBm	Mkr1 2				2.3 dB) dBm	Ref Offset 2 Ref 12.30	B/div
Next Rig				1				
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1.0	Span 5.000 MHz	Sween 1			VBW 50	Z	02000 GH:	e BM

Maximum peak Conducted Output Power - 8-DPSK

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rker 1	50 Ω 2.4800050000 Input: F	AC 000 GHz RF PNO: Fast C	SENSE:INT	ALIGNAU Avg Type: Log-Py Avg Hold:>100/100	TO 12:18:41 PM Julo5, 2011 Nr TRACE 123456 0 TYPE MWWWWW DET P. N.N.N.N	Peak Search
B/div	Ref Offset 2.3 dB Ref 12.30 dBn	IFGain:Low	Atten: 20 dB	Mk	r1 2.480 005 GHz 4.154 dBm	NextPe
,			1			Next Rig
j						Next L
						Marker D
						Mkr⊣
						Mkr→Ref
nter 2.4	80000 GHz	\/B)4(5(Swee	Span 5.000 MHz	M 1 -

2.1.6 Band-edge

Test Location

RF Test Room

Test Procedures

The bandwidth at 20 dB down from the highest inband spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT has its hopping function disabled at the highest, middle and the lowest available channels.

```
The spectrum analyzer is set to:Center frequency = the highest, middle, and the lowest channelsRBW = 100 \text{ kHz}VBW = 100 \text{ kHz}VBW = 100 \text{ kHz}(\geq RBW)Span = 10 MHzDetector function = peakTrace = max holdSweep = autoEUTSpectrum Analyzer
```

Limit

> 20 dBc

Test Results

All conducted emission in any 100 kHz bandwidth outside of the spectrum band was at least 20 dB lower than the highest level of the inband spectral density. Therefore the applying equipment meets the requirement.

See next pages for actual measured spectrum plots.

01:30:47 PM Jul 05, 2011 Display Avg Type: Log-Pwi Avg|Hold:>100/100 TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P N N N N N -14.27 dBm **Display Line** PNO: Far 🖵 Trig: Free Run IFGain:Low Atten: 30 dB Annotation Mkr1 2.404 98 GHz Ref Offset 2.3 dB Ref 22.30 dBm 5.270 dBm 10 dB/div Log Title Graticule <u>On</u> Off **Display Line** -14.27 dBm On Off N whom System Display Settings Man n.A Center 2.400000 GHz Span 10.00 MHz VBW 1.0 MHz #Res BW 100 kHz Sweep 1.00 ms (1001 pts) STATUS

Band – edge (with Hopping) – GFSK

Test Report No.: 2011070024 Page 31 of 44
Date: July 11, 2011
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Form No.: CTK-RF-EF-Part15 SubpartC(Rev.2)

:45 PM Jul 05, 2011 Display Avg Type: Log-Pwi Avg|Hold:>100/100 TRACE 123456 TYPE MWWWWW DET P N N N N N -17.20 dBm **Display Line** PNO: Far 🖵 Trig: Free Run IFGain:Low Atten: 30 dB Annotation Mkr1 2.405 00 GHz Ref Offset 2.3 dB Ref 22.30 dBm 2.801 dBm 10 dB/div Log Title Graticule ho m <u>On</u> Off **Display Line** -17.20 dBm On Off lowon A www System Display Settings Center 2.400000 GHz Span 10.00 MHz VBW 1.0 MHz #Res BW 100 kHz Sweep 1.00 ms (1001 pts) STATUS

Band – edge (with Hopping) - 8-DPSK

Test Report No.: 2011070024 Page 32 of 44 Date: July 11, 2011 This Report shall not be reproduced except in full without the written approval of CTK Form No.: CTK-RF-EF-Part15 SubpartC(Rev.2)

01:40:04 PM Jul 05, 2011 Display Avg Type: Log-Pwi Avg|Hold:>100/100 TRACE 123456 TYPE MWWWWW DET P N N N N N -14.98 dBm **Display Line** PNO: Far 🖵 Trig: Free Run IFGain:Low Atten: 30 dB **Annotation** Mkr1 2.401 99 GHz 5.023 dBm Ref Offset 2.3 dB Ref 22.30 dBm 10 dB/div Log Title► 0 Graticule On Off -14.98 dE Display Line -14.98 dBm On Off System Display Settings Center 2.400000 GHz Span 10.00 MHz #Res BW 100 kHz VBW 1.0 MHz Sweep 1.00 ms (1001 pts) STATUS

Band – edge (without Hopping) – GFSK

Test Report No.: 2011070024 Page 33 of 44 Date: July 11, 2011 This Report shall not be reproduced except in full without the written approval of CTK Form No.: CTK-RF-EF-Part15 SubpartC(Rev.2)

01:42:11 PM Jul 05, 2011 TYPE MWWWWW DET P N N N N Display Avg Type: Log-Pwi Avg|Hold:>100/100 **Display Line** -17.18 dBm PNO: Far 🖵 Trig: Free Run IFGain:Low Atten: 30 dB **Annotation** Mkr1 2.402 00 GHz 2.828 dBm Ref Offset 2.3 dB Ref 22.30 dBm 10 dB/div Log Title 1 Graticule On Off **Display Line** -17.18 dBm On Off System Display Settings Center 2.400000 GHz Span 10.00 MHz VBW 1.0 MHz #Res BW 100 kHz Sweep 1.00 ms (1001 pts) STATUS

Band – edge (without Hopping) - 8-DPSK

Test Report No.: 2011070024 Page 34 of 44
Date: July 11, 2011
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Form No.: CTK-RF-EF-Part15 SubpartC(Rev.2)

Band – edge (at 20 dB blow) – Low channel Frequency Range = 30 MHz ~ 10th harmonic (GFSK : Worst-Case)

Test Report No.: 2011070024 Date: July 11, 2011 This Report shall not be reproduced except in full without the written approval of Page 35 of 44

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Band – edge (at 20 dB blow) – Mid channel Frequency Range = 30 MHz ~ 10th harmonic (GFSK : Worst-Case)

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Page 36 of 44

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Band – edge (at 20 dB blow) – High channel Frequency Range = 30 MHz ~ 10th harmonic (GFSK : Worst-Case)

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Page 37 of 44

2.1.7 Field Strength of Emissions

Test Location

Testing was performed at a test distance of 3 meter Open Area Test Site

Test Procedures

The height of the measuring antenna was varied between 1 to 4 m and the table was rotated a full revolution in order to obtain maximum values of the electric field intensity. The measurement was made in both the vertical and horizontal polarization, and the maximum value is presented in the report.

 $\begin{array}{ll} \hline \mbox{The spectrum analyzer is set to:} \\ \hline \mbox{Center frequency} = the worst channel \\ \hline \mbox{Frequency Range} = 30 \ \mbox{MHz} \sim 10^{th} \ \mbox{harmonic} \\ \hline \mbox{RBW} = 120 \ \mbox{kHz} \ (30 \ \mbox{MHz} \sim 1 \ \mbox{GHz}) \quad \ \mbox{VBW} \geq \mbox{RBW} \\ = 1 \ \mbox{MHz} \ \mbox{(1 GHz} \sim 10^{th} \ \mbox{harmonic}) \\ \hline \mbox{Span} = 100 \ \mbox{MHz} \qquad \ \mbox{Detector function} = \ \mbox{Quasi-peak} \\ \hline \mbox{Trace} = \ \mbox{max hold} \end{array}$

Limit

- 15.209(a)

Frequency(MHz)	Field Strength uV/m@3m	Field Strength dBuV/m@3m
30-88	100**	40
88-216	150**	43.5
216-960	200**	46
Above 960	500	54

** Except as provided in 15.209(g).fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88MHz, 174-216MHz, 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g.15.231 and 15.241.

Test Results

Test mode : Hopping(GFSK), CFG PKT Packet Type : 15 Packet Size : 339(DH5)

EUT	Mobile Printer	Measurement Detail	
Model	PS20BT	Frequency Range	Below 1000MHz
Test mode	GFSK (Worst case)	Detector function	Quasi-Peak

The requirements are:

🛛 Complies			
Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
_	-	-	Ouasi-peak

Remark :

1. The field strength of spurious emission was measured in the following position: EUT standup position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.

Test Results

Test mode : GFSK, CFG PKT Packet Type : 15 Packet Size : 339(DH5)

		/ •	
EUT	Mobile Printer	Measurement Detail	
Model	PS20BT	Frequency Range	1-25GHz
Channel	Channel 0	Detector function	Peak
Test Mode	GFSK (Worst case)		

Remarks

We have tested three mode (X, Y, Z). The worst mode (X axis) for final test.

The requirements are:

🛛 Complies			
Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
4804.00	51.0 / 56.7	3.0 / 17.3	Average / Peak

Test Data

Frequency	Reading [dBuV/m]	Pol.	Pol. Height		Correction Limits Factor [dBuV/m]			Limits [dBuV/m]		Result m] [dBuV/m]		ʻgin B]
[MHz]	AV / Peak		[m]	Antenna	Amp. Gain	Cable	AV ,	/ Peak	AV / Peak		AV /	Peak
4804.00	41.8 47.5	V	1.0	32.7	34.9	11.4	54.0	74.0	51.0	56.7	3.0	17.3

Restricted band edge test data

Eroguongy	Reading		Hoight		Correction			Limits		sult	Margin	
rrequency	[dBuV/m] Pol.		пеідпі		Factor		[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	AV / Peak		[m]	Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
2389.00	36.1 42.0	V	1.0	28.2	35.3	7.4	54.0	74.0	36.4	42.3	17.6 31.7	

Test Results

Test mode : GFSK, CFG PKT Packet Type : 15 Packet Size : 339(DH5)

EUT	Mobile Printer	Measurement Detail	
Model	PS20BT	Frequency Range	1-25GHz
Channel	Channel 39	Detector function	Peak
Test Mode	GFSK (Worst case)		

Remarks

We have tested three mode (X, Y, Z). The worst mode (X axis) for final test.

The requirements are:

Complies			
Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
4882.00	48.0 / 53.6	6.0 / 20.4	Average / Peak

Test Data

Frequency	Rea [dBu	ding V/m]	Pol.	Height		Correction Limit Factor [dBuV/		Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
[MHz]	AV	/ Peak		[m]	Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
4882.00	38.8	44.4	V	1.0	32.7	34.9	11.4	54.0	74.0	48.0	53.6	6.0	20.4

Restricted band edge test data

Measured frequency range : 2310-2390 MHz, 2483.5-2500 MHz

Frequency	Reading	Pol.	Height		Correction Factor		Limits	Result	Margin		
[MHz]	[dBuV/m]		[m]	Antenna	Amp. Gain	Cable	[dBuV/m]	[dBuV/m]	[dB]		
No emissions were detected at a level greater than 20dB below limit.											

Test Results

Test mode : GFSK, CFG PKT Packet Type : 15 Packet Size : 339(DH5)

EUT	Mobile Printer	Measurement Detail	
Model	PS20BT	Frequency Range	1-25GHz
Channel	Channel 78	Detector function	Peak
Test Mode	GFSK (Worst case)		

Remarks

We have tested three mode (X, Y, Z). The worst mode (X axis) for final test.

The requirements are:

Complies

Frequency (MHz)	Frequency Measured Data (MHz) (dBuV/m)		Remark
4960.00	43.0 / 51.0	11.0 / 23.0	Average / Peak

Test Data

Frequency	Reading [dBuV/m]	Pol.	Height	Correction Factor		Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
[MHz]	AV / Pea	c	[m]	Antenna	Amp. Gain	Cable	AV /	/ Peak	AV / Peak		AV / Peak
4960.00	33.8 41.8	V	1.0	32.7	34.9	11.4	54.0	74.0	43.0	51.0	11.0 23.0

Restricted band edge test data

Measured frequency range : 2310-2390 MHz, 2483.5-2500 MHz

Frequency	Rea [dBu	ding V/m]	Pol.	Height		Correction Factor		Limits [dBuV/m]		Result [dBuV/m]		Limits Result [dBuV/m] [dBuV/m]		Mar [d	rgin IB]
[MHz]	AV	/ Peak		[m]	Antenna	Amp. Gain	Cable	AV /	/ Peak	AV / Peak		AV / Peak			
2483.50	25.2	36.5	V	1.0	28.2	35.3	7.4	54.0	74.0	25.5	36.8	28.5	37.2		

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2.1.8 AC Conducted Emissions

Test Location

Shielded Room

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Procedures

The EUT was placed on a non-metallic table 0.8m above the metallic, grounded floor and 0.4m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8m.

Amplitude measurements were performed with a quasi-peak detector and an average detector.

Limit

- 15.207(a)

Frequency (MHz)	Conducted Limit (dBuV)		
	Quasi-peak	Average	
0.15 ~ 0.5	66 to 56*	56 to 46*	
0.5 ~ 5	56	46	
5 ~ 30	60	50	

* Decreases with the logarithm of the frequency.

Test Results

The requirements are:

Not Applicable

Test mode : -

Frequency	Measured Data	Margin	Remark
(MHz)	(dBuV/m)	(dB)	
-	-	-	-

APPENDIX A – Test Equipment Used For Tests

	Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
1	Signal Analyzer	Agilent	N9020A	MY48011598	2011-11-12
2	Spectrum Analyzer	Rohde & Schwarz	FSP-30	100994	2011-11-12
3	EMI Test Receiver	Rohde & Schwarz	ESVS30	826638/008	2012-07-07
4	ULTRA Broadband Antenna	Rohde & Schwarz	HL562	361324/014	2011-11-18
5	LOOP ANTENNA	EMCO	6502	9107-2652	2012-10-29
6	Attenuator	HP	8498A	1801A06913	2011-11-15
7	EPM Series Power Meter	HP	E4418A	GB38272734	2011-11-12
8	Power Sensor	HP	8487A	3318A03524	2012-07-07
9	Audio Analyzer	HP	8903B	2747A03432	2011-11-12
10	ESG-D Series Signal Generator	Agilent	E4432B	US40054094	2011-11-12
11	SYNTHESIZED SWEEPER	HP	8341B	2819A01563	2011-11-12
12	Modulation Analyzer	HP	8901B	3438A05228	2011-11-16
13	Attenuator	HP	8494A	3308A33351	2011-11-15
14	Temp&Humi Chamber	Kunpoong	JT-TH-556-1	9QE5-002	2012-11-14
15	DC POWER SUPPLY	Agilent	E3632A	MY40011638	2011-11-12
16	EMC Analyzer	Agilent	E7405A	MY45110859	2012-02-11
17	Horn Antenna	ETS-Lindgren	3115	00078894	2013-03-22
18	Horn Antenna	ETS-Lindgren	3115	00078895	2013-03-22
19	Dipole Antenna	SCHWARZBECK	VHA 9103	VHA91032557	2011-09-18
20	Dipole Antenna	SCHWARZBECK	UHA 9105	UHA91052417	2011-09-18
21	OPT H64 AMPLIFIER	HP	8447F	3113A06814	2012-03-31
22	PREAMPLIFIER	Agilent	8449B	3008A02307	2011-11-16
23	Radio Communication Tester	Rohde & Schwarz	CMU200	106765	2012-02-09
24	LISN	Rohde & Schwarz	ESH3-Z5	100207	2011-11-15
25	LISN	Rohde & Schwarz	ENV216	101151	2012-03-09
26	DC POWER SUPPLY	Agilent	E3632A	MY40011638	2011-11-12
27	EMI Test Receiver	Rohde & Schwarz	ESCI3	100032	2012-02-09