## 9. Dwell Time

## 9.1. Test Equipment

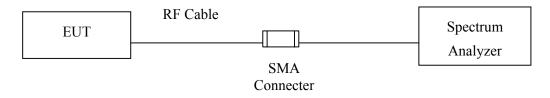
The following test equipments are used during the radiated emission tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100339	Jun, 2009
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2009
Х	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2009

Note: 1. All equipments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

## 9.2. Test Setup



## **9.3.** Limit

The dwell time shall be the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

## 9.4. Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

## 9.5. Uncertainty

± 25msec

#### 9.6. **Test Result of Dwell Time**

Product	:	Smart Handheld
Test Item	:	Dwell Time
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK) (Channel 00,39,78 –DH5)

Channel No.	Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Duty cycle	Dwell Time (Sec)	Limit (Sec)	Result
00	2402	2.880	13	50	0.75	0.300	0.4	Pass
39	2441	2.880	13	50	0.75	0.300	0.4	Pass
78	2480	2.880	13	50	0.75	0.300	0.4	Pass

Note: Duty cycle =((Time slot length (ms)\*Hopping of Number) / Sweep time (ms)

Dwell time = (Duty cycle /79) \* (79\*0.4)

#### CH 00 2402MHz Dwell Time

Transmission Time Marker Avg Type: Log-Pw Sweep/Control 000 ms Avg Type: Log-Pw 50.00 ms TYPE WWW DET P N N Trig Select Mar Ext Gain: -10.00 dE Sweep Tim 50.00 m Ext Gain: -10.00 dE ∆Mkr1 2.880 ms -0.30 dE Ref 20.00 dBm Ref 20.00 dBm Nor Delf I, ſ ULſ Fixe nter 2.402000000 GHz s BW 1.0 MHz Span 0 H Sweep 50.00 ms (1001 pts Span 0 H Sweep 15.00 ms (1001 pts nter 2.402000000 GHz 5 BW 1.0 MHz #VBW 1.0 MHz #VBW 1.0 MHz of -0.30 dB 5.08 dBm -0.02 dB 1 t (Δ) 1 t 1 t (Δ) 2.990 ms (Δ) 4.200 ms 3.760 ms (Δ) Gate [Off,LO] Properties Poin 10 More 1 of 2

CH 39 2441MHz Dwell Time

#### Transmission Time

III Agilent Speetrum Analyzer - Swept SA			🔀 ≢ Agjilent Spectrum Analyzer - Swept SA	
M         S0.0         AC         CHEVENIT         A1000           Center Freq         2.441000000 GHz         Trig Delay: 0.000 s         Avg Type: Log-	Pwr 1000 123150	Frequency		requency
Input II ITIO: Last Trig: Video IFGain:Low #Atten: 30 dB Ext Gain: -10.00	dB CELPNNNNN	Auto Tune	Inguist II IFGaint.com #Atten: 30 dB Ext Gain: -10.00 dB	Auto Tune
10 dB/div Ref 20.00 dBm			10 dB/div Ref 20.00 dBm -0.40 dB	
		Center Freq 2.441000000 GHz		Center Freq 1000000 GHz
-2010	тясси	Start Freq 2.441000000 GHz	eq :000 1900 1900 100 2.44	Start Freq 1000000 GHz
-200	n tá h vi	Stop Freq 2.441000000 GHz		Stop Freq
<u>.</u>	Span 0 Hz p 50.00 ms (1001 pts)	CF Step 1.000000 MHz		CF Step 1.000000 MHz
VKD WARD THE SS X Y DIRETION FUNCTION	WIDTH FUNCTION VALUE	<u>Auto</u> Man	1 Δ2 1 t (Δ) 2.880 ms (Δ) -0.40 dB	Man
2 3 4 6 6		Freq Offset 0 Hz	set 3 Δ2 1 t (Δ) 3.750 ms (Δ) -0.23 dB	Freq Offset 0 Hz
7			7 7 9 10 11	
12	SIAIUS		12 status	

#### CH 78 2480MHz Dwell Time

Transmission Time

💷 Agilent																💷 Agi																
Center			00000	n GH		Trig	Delay:	0.000 s	Avg		Log-Pwr		40 /M Dec 16, 20 INACE 1 2 3 4 5	۵L	Frequency	Cen				00000	00.01	lz 0:1aar –	Trie	Delay: -			e: Log-Pw		INACE	Der 16,2009	Fr	equency
			Input: RI	IFGui	:last⊶ n:Luw	#Att	en: 30 d	18	Ext C	3ain: -1	Bb 00.01		DCT I'NNNN	N	Auto Tune					Input: R	I IN IFG	l0:last ⊶ ⊎in:Luw	#Att	ten: 30 d	9	Ext Gain	: -10.00 dB		DCT	PNNNN		Auto Tune
10 dB/di	v Re	ef 20.00	dBm											L	Auto Tune		B/div	Re	ef 20.0	00 dBm	1							ΔMk	r1 2.8 -0	380 ms 9.91 dB		Auto Tune
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-/111															2.480000000 GHz	~~~~															2.480	0000000 GHz
Center Res BV			GHZ		#VBV	N 1.0 I	MHz			8	weep 5	0.00 m	Span 0 H Is (1001 pts	z ;)	CF Step 1.000000 MHz	Cen Res	ter 2 BW	.480 1.0 N	00000 1Hz	0 GHz		#VB	W 1.0	MHz			Sweep	15.00		oan 0 Hz 001 pts)	1	CF Step .000000 MHz
MKR MADE	TRC SI		Х			۲		PI	INCTION	FIIN	TION WOTH	E II	ICTION VALUE		<u>uto</u> Man	1	Δ2	1 t 1 t	(A)	;		30 ms (A 0 ms		-0.91 dE	si -	TINN	INCTION W/D	TH.	FUNCTION	I VAJ I IF	Auto	Man
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MEC											STATUS					MSC											STAT	rus				

Note: The dwell times of the packet type of DH1, DH3, and DH5 are tested. Only the worst case is shown on the report.

Product	:	Smart Handheld
Test Item	:	Dwell Time
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK) (Channel 00,39,78 –DH5)

Channel No.	Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Duty cycle	Dwell Time (Sec)	Limit (Sec)	Result
00	2402	2.895	8	50	0.46	0.185	0.4	Pass
39	2441	2.895	8	50	0.46	0.185	0.4	Pass
78	2480	2.895	8	50	0.46	0.185	0.4	Pass

Note: Duty cycle =((Time slot length(ms)\*Hopping of Number) / Sweep time (ms)

Dwell time = (Duty cycle /79) \* (79\*0.4)

#### CH 00 2402MHz Dwell Time

🛙 Agilent 1			iyzer - 1	Swept SJ	A																		D As	tlent S	pectru	m Ar	nalyzer -	- Swep	it SA														
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#### CH 39 2441MHz Dwell Time

#### Transmission Time

Transmission Time

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#### CH 78 2480MHz Dwell Time

Transmission Time

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Note: The dwell times of the packet type of DH1, DH3, and DH5 are tested. Only the worst case is shown on the report.

# 10. Occupied Bandwidth

#### **10.1.** Test Equipment

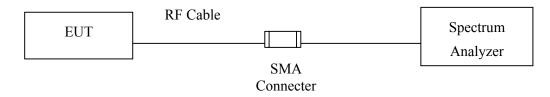
The following test equipments are used during the radiated emission tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100339	Jun, 2009
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2009
Х	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2009

Note: 1. All equipments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

## 10.2. Test Setup



## 10.3. Limits

N/A

## **10.4.** Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

## 10.5. Uncertainty

± 150Hz

# 10.6. Test Result of Occupied Bandwidth

Product	:	Smart Handheld
Test Item	:	Occupied Bandwidth Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK)(2402MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	1120		NA

# Figure Channel 00:

Peak Search	10:31:38 AM Dec 16, 2009 TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P N N N N N	Log-Pwr 0/100	Avg Type Avg Hold: Ext Gain:		C SER Trig: Free #Atten: 30	NO: Far 😱			arker 1
NextPe	2.402 15 GHz 4.707 dBm		Ext Gain.	ab	#Atten. St	Gain:Low		Ref 20.00	dB/div
Next Rig				<b>↓</b> 1					
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<b>М</b> а 1 о	Span 10.00 MHz 500 ms (1001 pts)				100 kHz	#VBW	lz	02000 GH 100 kHz	

Product	:	Smart Handheld
Test Item	:	Occupied Bandwidth Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK)(2441MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
39	2441	1120		NA

## Figure Channel 39:

Agilent Spectrum Analyzer - Swept S/ 50 Ω	AC	SENSE:INT		ALIGN AUTO	10:32:09 AM Dec 16, 2009	Peak Search
arker 1 2.44098000000 Input: RF	PNO: Ear	Trig: Free Run #Atten: 30 dB	Avg Hold	e: Log-Pwr : 16/100 : -10.00 dB	TRACE 1 2 3 4 5 6 TYPE MWWWWWW DET P N N N N N	
dB/div Ref 20.00 dBm				Mkr	1 2.440 98 GHz 4.150 dBm	NextPea
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0.0						Mkr→Refl
.0						
enter 2.441000 GHz Res BW 100 kHz	#VBW 1	00 kHz		#Sweep	Span 10.00 MHz 500 ms (1001 pts)	Мо 1 о

Product	:	Smart Handheld
Test Item	:	Occupied Bandwidth Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK)(2480MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
78	2480	1130		NA

# Figure Channel 78:

50 Ω arker 1 2.48013000000		C   SEF ] Trig: Free	NSE:INT	Avg Type Avg Hold	ALIGNAUTO	10:32:43 AM Dec 16, 2009 TRACE 1 2 3 4 5 6	Peak Search
Input: RF	PNO: Far 😱 IFGain:Low	#Atten: 30		Ext Gain:	-10.00 dB	TYPE MWWWWW DET P N N N N N 1 2.480 13 GHz	Next Pe
dB/div Ref 20.00 dBm					IVINI	4.022 dBm	
.0			<b>●</b> <sup>1</sup>				Next Rig
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							Mkr→Ref
0							M
enter 2.480000 GHz Res BW 100 kHz	#VBW	100 kHz			#Sweep	Span 10.00 MHz 500 ms (1001 pts)	1 0

Product	:	Smart Handheld
Test Item	:	Occupied Bandwidth Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK) (2402MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	1400		NA

# Figure Channel 00:

arker 1 2.402130000000 Input: RF		Avg Type: Log	00 TYPE MWWWWW	Peak Search
) dB/div Ref 20.00 dBm	IFGain:Low #Atten: 30		Mkr1 2.402 13 GHz 4.729 dBm	Next Pea
0.0		• <sup>1</sup>		Next Rig
00	- Maran			Next L
0.0	physic			Marker De
).0 Janon contraction of the state of the state of the	mand	hur	My house and an and the second	Mkr→
0.0				Mkr→Ref
enter 2.402000 GHz Res BW 100 KHz	#VBW 100 kHz	#91	Span 10.00 MHz veep 500 ms (1001 pts)	<b>М</b> с 1 с

Product	:	Smart Handheld
Test Item	:	Occupied Bandwidth Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Cł	hannel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
	39	2441	1390		NA

## Figure Channel 39:

Res BW 100 kHz	#VBW	100 kHz			#Sweep	500 ms (1001 pt	s)
enter 2.441000 GHz						Span 10.00 MH	Mo Iz 1 o
1.0							Mkr→RefL
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0.0	March		į	m			Marker De
	×-	→		0.00 dB .39 MHz			
0.0		ĺ					Next L
00		N	AL HAN				
.0			1				Next Rig
dB/div Ref 20.00 dBn	•				Mkr	1 2.440 98 GH 4.151 dBi	
Input: F		Trig: Free #Atten: 30		Avg Hold Ext Gain:	: 15/100	TYPE MWWW DET P N N N N	WW N
<sup>50 Ω</sup> arker 1 2.4409800000		IC SEN	ISE:INT	Ava Tvpe	ALIGNAUTO : Log-Pwr	10:33:45 AM Dec 16, 20 TRACE 1 2 3 4 5	

Product	:	Smart Handheld
Test Item	:	Occupied Bandwidth Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK)(2480MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
78	2480	1390		NA

# Figure Channel 78:

50 Ω		ENSE:INT	ALIGN AUTO	10:34:10 AM Dec 16, 2009	Peak Search
arker 1 2.48013000000 Input: RF	D GHz PNO: Far IFGain:Low Trig: Fro #Atten: 3	ee Run Av	rg Type: Log-Pwr g Hold: 19/100 t Gain: -10.00 dB	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P N N N N N	
dB/div Ref 20.00 dBm			Mkr	1 2.480 13 GHz 4.038 dBm	Next Peal
<b>D</b> 0.0		<b>●</b> <sup>1</sup>			Next Rig
.0		-20.0	0 48		Next L
0.0	Alparter	-			Marker De
2.0 2.0 200211011111111111111111111111111111	www.		had had her have	Hundreven and the second second	Mkr→C
			etado.		Mkr→RefL
enter 2.480000 GHz Res BW 100 kHz	#VBW 100 kH	7	#Sween	Span 10.00 MHz 500 ms (1001 pts)	<b>М</b> а 1 о

## 11. Duty Cycle

## **11.1.** Test Equipment

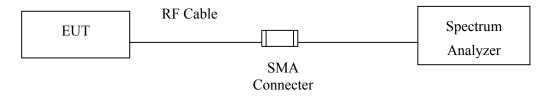
The following test equipments are used during the band edge tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100339	Jun, 2009
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2009
Х	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2009

Note: 1. All equipments are calibrated every one year.

2. The test equipments marked by "X" are used to measure the final test results.

# 11.2. Test Setup



## 11.3. Uncertainty

 $\pm$  150Hz

## **11.4.** Test Result of Duty Cycle

Product	:	Smart Handheld
Test Item	:	Duty Cycle Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK)

	1	As		CTRAMES IN	18:12:44.4MDer 16, 2009	Sweep/Control
weep Time 50.1	input RF Pt	i0: Fast ` • ' ain:Low	Trig Delay: 0.000 s Trig: Video #Atten: 30 dB	Avg Type: Log-Pwr Ext Gain: -10.00 dB	TRACE 1 2 3 4 5 5 TYPE WANNAN DE3 P N N N N N	Sweep Time 50.00 ms
0 dB/div Ref 20. 0 dB/div Ref	00 dBm					50,00 r
enter 2.4020000 es BW 1.0 MHz	00 GHz	#VBW	1.0 MHz	Sweep 5	Span 0 Hz 0.00 ms (1001 pts)	
2 3 4 5 6						Gat [0#,L0
7			į			

	10:19:17 AM Oec 16, 2009	ALCONALTO	1	NSEINTÍ	- 1	L A	r - omept of	trum Analyze 50 Q	ment oper
Marker Select Mark	DETECTION OF DUALS	ype: Log-Pwr iin: -10.00 dB	-	y: -500.0 µs io	Trig Dela	0: Fast 🔸	input RF Pt	Δ 2.880	rker 1
	Mkr1 2.880 ms -0.30 dB	ΔΙ					0 dBm	Ref 20.0	IB/div
				42 342	<b>▲</b> <sup>1,</sup>				
Not		+		+	_		+ *	-	
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0	1781G L VL								<u>ال</u>
_									<u> </u>
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Fix							-	-	
									-
	Span 0 Hz						) GHz	0200000	
	5.00 ms (1001 pts)				1.0 MHz	#VBW			8W 1.
	FUNCTION VALUE	FUNCTION WIDTH	310N		-0.30	30 ms (∆)	× 2.8	so. t (Δ)	Δ2 1
					5.08 d -0.02	00 ms (Δ)	4.2	t t (Δ)	F 1 Δ2 1
Properti			_				•//		
M									
1									
		STATUS							

Time on of 100ms= 2.88ms\*26= 74.880ms Duty Cycle= 74.88ms / 100ms= 0.7488 Duty Cycle correction factor= 20 LOG 0.7488= -2.513 dB

	Duty Cycle correction factor	-2.513	dB
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Remark:

1. If Duty Cycle is smaller than -20dB,based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.

Product	:	Smart Handheld
Test Item	:	Duty Cycle Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK)

 Image: Section Alloyed Source
 Allowed Source

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Fixe												333
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						4.52 d	) ms			1 t	F	2
Bernet					dB	0.55	5 ms (Δ)	6.3	(Δ)	1 t	<u>02</u>	3 4
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										+	-+	8
预												9
1					-					+	-+	0
					1		1			1		

Time on of 100ms= 2.895ms\*16== 46.320ms Duty Cycle= 46.320ms / 100ms= 0.4632 Duty Cycle correction factor= 20 LOG 0.4632= -6.685 dB

Duty Cycle correction factor	-6.685	dB

Remark:

1. If Duty Cycle is smaller than -20dB,based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.

# 12. EMI Reduction Method During Compliance Testing

No modification was made during testing.

Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs