Nemko Test Report:	3L0117RUS1
Applicant:	Sychip, Inc 2805 North Dallas Parkway Suite 400 Plano, TX 75093
Equipment Under Test: (E.U.T.)	WLAN 6060 BGAEVK
In Accordance With:	FCC Part 15, Subpart C, 15.247 Direct Sequence Spread Spectrum Transmitters
Tested By:	Nemko Dallas Inc. 802 N. Kealy Lewisville, Texas 75057-3136
Authorized By:	David Light, Resource Manager
Date:	April 3, 2003
Total Number of Pages:	42

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EQUIPMENT: WLAN 6060 BGAEVK

PROJECT NO.: 3L0117RUS1

Section 1. Summary of Test Results

Manufacturer: Sychip, Inc.

Model No.: WLAN 6060 BGAEVK

Serial No.: None

General: All measurements are traceable to national standards.

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C, Paragraph 15.247 for Direct Sequence Spread Spectrum devices. Radiated tests were conducted is accordance with ANSI C63.4-1992. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

	New Submission		Production Unit
\square	Class II Permissive Change	\square	Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.



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EQUIPMENT: WLAN 6060 BGAEVK

PROJECT NO.: 3L0117RUS1

Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
Powerline Conducted Emissions	15.207(a)	Complies
Minimum 6 dB Bandwidth	15.247(a)(2)	Complies
Maximum Peak Power Output	15.247(b)(1)	Complies
Spurious Emissions (Antenna Conducted)	15.247(c)	Complies
Spurious Emissions (Restricted Bands)	15.247(c)	Complies
Peak Power Spectral Density	15.247(d)	Complies

Footnotes:

PROJECT NO.: 3L0117RUS1

Section 2. Equipment Under Test (E.U.T.)

General Equipment Information

 Tuning Range:
 2412 – 2462 MHz

Channel Spacing: 5 MHz

User Frequency Adjustment: Software controlled

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Description of EUT

WLAN6060 EVK from SyChip Inc provides a platform for testing SyChip WLAN embedded modules (WLAN6060BB for BGA version and WLAN6060EB for 60-pin connector version).

Changes to the EUT

Transmitter chip U206 was changed from BiCMOS to SiGe. The part number of the new chip is ISL3684A. The part number of the old chip is ISL3684.

System Diagram

Refer to separate exhibit.

EQUIPMENT: WLAN 6060 BGAEVK PROJECT NO.: 3L0117RUS1

Section 3. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
TESTED BY: Art Ruvalcaba	DATE: 3/25/03

Test Results: Complies.

Measurement Data: See attached plots.

Measurement Uncertainty: +/- 1.7 dB

EQUIPMENT: WLAN 6060 BGAEVK

PROJECT NO.: 3L0117RUS1

Test Data – Powerline Conducted Emissions

Complete Preliminary					Powerlin	ne Voltage	Measure	ment				
Preliminar		Х				le renage	mououro	Job # :	3L0117	E	Test # :	CEPV-01
	у								Page	1	of	1
Client Nam	ne :	Sychip Inc										
EUT Name	e:	WLAN Eva	al Kit									
EUT Mode	91#: #.	WLAN 600	60 BGA	EVK								
EUT Part #	#: 	N/A										
EUT Sena	11 # : ia :	IN/A	ato DCM	CIA port	oflantor	<u></u>						
EUT COIII	iy	Installed li)						
Specificati	on :	CFR 47, F	Part 15, S	Subpart I	В			Refe	rence :			
Transduce	er # :	1188		Temp. (deg. C):	27				Date :	3/25/03	
HP Filter #	ŧ:	1433		Humidit	y (%) :	36				Time :	16:00	
Cable 1 #	:	1976		EUT Vo	Itage :	115 VAC				Staff :	Art Ruvalcat	a
Cable 2 #	:	1534		EUT Fre	equency :	60Hz			Lo	cation :	Lab 5	
Detector 1	#:	785		Peak Ba	andwidth:	10kHz			Ph	oto ID:	3L0117E CE	PV-01
Detector 2	:#:	N/A		QP Ban	dwidth	10kHz						
Limiter # :		N/A		Avg. Ba	ndwidth	10kHz						
Meas	FUT	Detector	Limit	Meter	Path	Transducer	Corrected	Sne	c limit	CR/SI	Pass	
Freq.	Test	Type	Type	Reading	Loss	Factor	Reading	(dF	RuV)	Diff	Fail	
(MHz)	Point	(P.QP. A)	(QP, A)	(dBuV)	(dB)	(dB)	(dBuV)	Q.P.	Ava.	(dB)	Unc.	Comment
0.194	N	P	A	35.7	0	0	35.7	63.86	53.864	-18.2	Pass	
0.293	Ν	Р	Α	38.7	0	0	38.7	60.44	50.439	-11.7	Pass	
0.389	Ν	Р	Α	35.2	0	0	35.2	58.09	48.085	-12.8	Pass	
0.442	Ν	Р	А	38.2	0	0	38.2	57.02	47.024	-8.8	Pass	
2.6	Ν	Р	Α	39.6	0	0	39.6	56	46	-6.4	Pass	
5.95	Ν	Р	Α	36.9	0	0	36.9	60	50	-13.1	Pass	
0.192	Н	Р	Α	34.8	0	0	34.8	63.95	53.95	-19.1	Pass	
0.294	Н	Р	Α	37.0	0	0	37.0	60.41	50.411	-13.4	Pass	
0.392	H	P	Α	34.9	0	0	34.9	58.02	48.021	-13.1	Pass	
0.445	H	Р	A	37.0	0	0	37.0	56.97	46.968	-10.0	Pass	
2.6	H	P	A	38.1	0	0	38.1	56	46	-7.9	Pass	
6	Н	Р	A	37.5	0	0	37.5	60	50	-12.5	Pass	
\vdash												
 +												
											Scanned .15	0-30 MHz
\vdash												
\vdash												
\vdash												
\vdash												ļ
\vdash												
\FMC.Shc	are\All')ATASH	TS\CEP	Voltage	Rev C vis	Documen	t Contro	H#FMC	DS FM		Г

EQUIPMENT: WLAN 6060 BGAEVK

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Photos – Powerline Conducted Emissions

Front



Side



PROJECT NO.: 3L0117RUS1

Section 4. Minimum 6 dB Bandwidth

NAME OF TEST: Minimum 6 dB Bandwidth	PARA. NO.: 15.247(a)(2)
TESTED BY: Tom Tidwell	DATE: 3/24/03

Test Results: Complies.

Measurement Data: See 6 dB BW plot

Measured 6 dB bandwidth:	12.3 MHz
Channel Separation:	5 MHz

FCC PART 15, SUBPART C DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

EQUIPMENT: WLAN 6060 BGAEVK

Data Plot			Oce	cupied Ba	andwidth					
Page <u>1</u> o	f <u>3</u>		_				Comple	te X		
Job No.:	3L0117R		Date:	3/24/2003			Preliminary	/:		
Specification:	15.247(2)	Temp	erature(°C):	24						
Tested By:	Tom Tidwell	Relative H	umidity(%)	50						
E.U.T.:	802.11b Radio									
Configuration:	Tx full power									
Sample Number:	1									
Location:	Lab 1			RBW:	100 kHz		Measuremen	nt		
Detector Type:	Peak			VBW:	100 kHz		Distanc	e: <u>NA</u>	m	
Test Equipm	ent Used									
Antenna:			Directi	ional Coupler:						
Pre-Amp:				Cable #1:	1046					
Filter:				Cable #2:						
Receiver:	1036			Cable #3:						
Attenuator #1	1477			Cable #4:						
Attenuator #2:				Mixer:						
Additional equip	ment used:									
Measurement Un	certainty: +/-1.7	dB								
		Delta 1			кви	100	RHZ F	RE Att	10 dB	
Ref	Lvl		1	.01 dB	νвы	100	кНz			
10	dBm	1 1	27254	509 MHZ	SWI	19	ms l	lo i t	dBm	
10						·	-			
21	dB Offset									A
				1. 100	VMm 1					
				L AL						
- 10				<u>r</u>	· · · · · ·	\		_		
			1	'		λ				
			[[1				
-20	F 11					1				
1 V 1	EW									164
-30					_			_		
			man			1 m	Vin			
						Low	way.			EXT
-40		r.					4			
		ſ					L L			
-50										
~ ·	and	and					y.	harnely		
VI.	huberton	~							wwww	
-60										
- 70										
-80					-			-		
-90										
Cen	ter 2.412 E	iHz		7.5	MHz/			Spar	n 75 MHz	
Date:	24.MAR.:	<u>2003 16</u>	:35:14							
Notes:	Channel 1 - CF 2.4	12 GHz								
L										

FCC PART 15, SUBPART C DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

EQUIPMENT: WLAN 6060 BGAEVK



FCC PART 15, SUBPART C DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

EQUIPMENT: WLAN 6060 BGAEVK



EQUIPMENT: WLAN 6060 BGAEVK PROJEC

PROJECT NO.: 3L0117RUS1

Section 5. Maximum Peak Output Power

NAME OF TEST: Maximum Peak Output power	PARA. NO.: 15.247(b)(1)
TESTED BY: Tom Tidwell	DATE: 3/24/03

Test Results: Complies.

Measurement Data:

Antennas: 2.45 GHz Chip Antenna

Center Frequency (GHz)	Conducted Power (dBm)	Conducted Power (mW)	Gain (dBi)	E.I.R.P. (dBm)
2.412 (Vnom)	15.6	36.3	3	18.6
2.437 (Vnom)	16.1	40.7	3	19.1
2.462 (Vnom)	16.1	40.7	3	19.1

Equipment Used: 1029-1030

Measurement Uncertainty: +/- 0.7 dB

Temperature: 24 °C

Relative Humidity: 50 %

PROJECT NO.: 3L0117RUS1

Section 6. **RF Exposure**

NAME OF TEST: RF Exposure

PARA. NO.: 15.247(b)(4)

PREPARED BY: Tom Tidwell

DATE: 3/24/03

Test Results: Complies.

Measurement Data: See attached data.

PROJECT NO.: 3L0117RUS1

Nemko

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radi

R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	<u> </u>
Maximum peak output power at antenna input terminal:	40.73802778 (mW)
Antenna gain(typical):	<u>3</u> (dBi)
Maximum antenna gain:	1.995262315 (numeric)
Prediction distance:	<u>20</u> (cm)
Prediction frequency:	2400 (MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1 (mW/cm^2)

```
Power density at prediction frequency: 0.016171 (mW/cm^2)
```

Margin of compliance: -17.9 (dB)

Average RF Power Output:

2412 MHz: 13.7 dBm 2437 MHz: 14.0 dBm 2462 MHz: 13.8 dBm EQUIPMENT: WLAN 6060 BGAEVK PROJECT NO.: 3L0117RUS1

Section 7. Spurious Emissions (conducted)

NAME OF TEST: Spurious Emissions (conducted)	PARA. NO.: 15.247(c)
TESTED BY: Tom Tidwell	DATE: 3/24/03

Test Results: Complies.

Measurement Data: See attached plots.

FCC PART 15, SUBPART C DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

EQUIPMENT: WLAN 6060 BGAEVK

Data Plot		Spurious Emi	ssions at	Antenna T	<u>[erminals]</u>				
Page <u>1</u> o Job No.: Specification: Tested By: E.U.T.: Configuration:	f <u>4</u> 3L0117R 15.247(c) <u>Tom Tidwell</u> 802.11b Radio Tx full power	Date:	3/24/2003 24 50		I	Complete Preliminary:	X		
Sample Number: Location: Detector Type:	1 Lab 1 Peak		RBW: VBW:	100 kHz 100 kHz		Measurement Distance:	<u>NA</u> n	1	
Test Equipm Antenna: Pre-Amp: Filter: Receiver: Attenuator #1 Attenuator #2:	ent Used	Directi	conal Coupler: Cable #1: Cable #2: Cable #3: Cable #4: Mixer:	1045					
Additional equip Measurement Ur	ment used: acertainty: +/-1.7	d <u>B</u> Deita 1 []]] -36	.07 dB	KBM VBM	100 KH 100 KH	1z RF 1z	- Att	1U dB	
	I dB Offset			All All					•
-20 1 V I -30 -40	ЕМ		puller white				a Marine		1MA EXT
-50 ////	numerica	mondallander						y	
-80									
Date:	24.MAR.2	2003 16:46:12	7.5	MHZ/			Span	75 MHz	
NOTES:	Lower bandedge	H2 GHZ							

FCC PART 15, SUBPART C DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

EQUIPMENT: WLAN 6060 BGAEVK

Data Plot			<u>Spur</u>	ious Emis	sions at A	Antenna T	<u>erminals</u>				
Page <u>2</u> c Job No.: Specification: Tested By: E.U.T.:	f 4 3L011 15.247 Tom T 802.11	7R (c) idwell b Radio	Temp Relative F	Date: $\frac{3/2}{24}$ erature(°C): $\frac{24}{50}$	4/2003						
Configuration:	Tx full	power									
Ref	Lvl dBm		Deita 1 4	-53. -53.	05 dB 47 GHz	RBW VBW SWT	100 k 100 k 6.4	Hz Ri Hz s Ur	- Att nit	<u>10 dB</u> dBm	1
0 2	1 dB	Offset									A
- 10	_										
-20	_										
-30 1 1	EW										1MA
-40											ЕХТ
-50	world	hurm	1 por Martin	mman	mohener	mm	ulpour	marcend	monumber	menno	
-70											
-80											
-90											
-95 - Sta Sta Date:	nt 3 2	0 MHz 24.MAR.2	003 16	:51:52	2.497	GHz/	1	1	Stop) 25 GHz	
Notes:	Chan	nel 1 - 2.412 G	GHz								

FCC PART 15, SUBPART C DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

EQUIPMENT: WLAN 6060 BGAEVK

Data	l Plot			Spur	ious Emis	sions at A	ntenna T	<u>erminals</u>				
Pa Lab Na	age <u>3</u> of	4	70		D. t. 2/2	4/2002						
JOD NO.: Specificz	ation.	15 247	/K /(c)	Temn	erature(°C): $\frac{3/2}{24}$	4/2003						
Tested B	y:	Tom 1	Tidwell	Relative H	Iumidity(%) 50							
E.U.T.:		802.11	b Radio									
Configur	ration:	Tx ful	l power									
				Delta 1	. [1]		кви	1UU K	HZ RI	- Att	10 dB	
$\langle \! \! \rangle $	Ref	Lv1			-54.	50 dB	VBW	100 k	Hz			
	5 c	IBm 1	l	4	.170916	683 GHz	SWT	6.4	s Ur	пit	dBm	ı
5	21	dB	Offset									
U												-
-10												
-20												
	1 V I	EМ										1100
-30												
-4U												EXT
				1								
-50				M.			MAM	b . b		Mar	han I I	
	wh	لمعهد	merthose	var ha	wellow	manne	0V - ~ ~	minund	Marghen	www.	* while	
-60	A											
-70												
-80												
-90												
-95	Star	t 3	0 MHz			2.497	GHz/			Stor) 25 GHz	
Date		2	24.MAR.2	003 16	54:44							
Not	tes:	Chan	nel 6 - 2.437 (Hz								
1												

FCC PART 15, SUBPART C DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

EQUIPMENT: WLAN 6060 BGAEVK

Test Plot	<u>.</u>		Spur	ious Emis	sions at A	ntenna T	erminals				
Page <u>4</u> o Job No.: Specification: Tested By: E.U.T.:	f 4 3L011 15.247 Tom T 802.11	7R (c) Tidwell b Radio	Temp Relative H	Date: 3/2 erature(°C): 24 lumidity(%) 50	4/2003						
Configuration:	Tx full	power									
Ref	Delta 1 [1]] ef Lvl -55.55 dB 5 dBm 4.52119739 GHz						100 k 100 k 6.4	Hz RF Hz s Ur	- Att nit	1U dB dBm	
-10 -20 -30 $1 \vee I$ -40 -50 -60	E W		1 rhmme		whankan	, ler	humu			Muntu	1MA EXT
-70 -80 -90 -95 Star Date:	rt 3 2 Chan	0 MHz 24.MAR.2 nel 11-CF 2,4	003 16 62 GHz	:56:30	2.497	GHz/			Stop	25 GHz	

PROJECT NO.: 3L0117RUS1

Section 8. Spurious Emissions (radiated)

NAME OF TEST: Radiated Spurious Emissions	PARA. NO.: 15.247 (c)
TESTED BY:	DATE: 3/25/03

Test Results: Complies.

Measurement Data: See attached table.

Note: The frequency spectrum was searched from the lowest frequency in the device up to the 10th harmonic of the fundamental transmission.

EQUIPMENT: WLAN 6060 BGAEVK

	Radiated Emissions										
Page <u>1</u> of	2										
Job No.:	3L0117R			Date:	3/25/2003						
Specification:	15.247		Temp	oerature(°C):	22						
Tested By:	Art Ruvalca	ba 💌	Relative I	Humidity(%)	55						
E.U.T.:	802.11b Rac	lio									
Configuration:	Tabletop in	laptop host									
Sample Number:	1										
Location:	AC 3				RBW:	1 MHz					
Detector Type:	Peak				VBW:	1 MHz					
			<u>Test Equip</u>	<u>oment Used</u>							
Antenna:	993			Direct	tional Coupler:						
Pre-Amp:	1016				Cable #1:	1484					
Filter:	1482				Cable #2:	1485					
Receiver:	1464	-			Cable #3:		-				
Attenuator #1		<u> </u>			Cable #4:		_				
Attenuator #2:		<u> </u>			Mixer:						
Note:	If PEAK me	asurement m	et theAVE	RAGE limit,	then an AVER	AGE measurem	ent was no	t made.			
Measurement											
Uncertainty:	+/-3./ dB										
Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Comment			
								Channel 11 - CF 2.437			
2.4835	34.2	29.0	3.1	0.0	66.3	74	-7.7	H - PEAK			
2.4835	20.3	29.0	3.1	0.0	52.4	54	-1.6	H - AVERAGE			
4.9240	42.3	33.5	4.3	29.7	50.4	54	-3.6	H - PEAK			
7.3860	41.5	35.9	5.2	34.1	48.5	54	-5.5	H - PEAK			
12.3100	41.7	40.0	7.3	32.8	56.2	74	-17.8	H - PEAK			
12.3100	30.3	40.0	7.3	32.8	44.8	54	-9.2	H - AVERAGE			
2.4835	33.0	29.0	3.1	0.0	65.1	74	-8.9	V - PEAK			
2.4835	20.5	29.0	3.1	0.0	52.6	54	-1.4	V - AVERAGE			
4.9240	45.8	33.5	4.3	29.7	53.9	74	-20.1	V - PEAK			
4.9240	32.2	33.5	4.3	29.7	40.3	54	-13.7	V - AVERAGE			
7.3860	41.7	35.9	5.2	34.1	48.7	54	-5.3	V - PEAK			
12.3100	42.8	40.0	7.3	32.8	57.3	74	-16.7	V - PEAK			
12.3100	30.3	40.0	7.3	32.8	44.8	54	-9.2	V - AVERAGE			
Notes:	Poak mos	s uro monte	ara 1 N			¥/					
	I Cak Inca	is ure ments		INZ KD W	T MHZ VBV	/ V					

EQUIPMENT: WLAN 6060 BGAEVK

	Radiated Spurious Emissions											
Page <u>2</u> of	2			Continu	ation Page							
Job No.:	3L0117R			Date:	4/3/2003							
Specification:	CFR 47, Par	t 15	Tem	perature(°F):	72							
Tested By:	Art Ruvalca	ba 💌	Relative I	Humidity(%)	50							
E.U.T.:	802.11b Rac	lio										
Configuration:	Tabletop in	laptop host										
Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Comment				
								Channel 1				
4.824	47.2	33.2	4.2	30.1	54.5	74	-19.5	V - PEAK				
4.824	38.7	33.2	4.2	30.1	46.0	54	-8.0	V - AVERAGE				
7.236	46.7	35.8	5.1	34	53.6	74	-20.4	V - PEAK				
7.236	33.5	35.8	5.1	34	40.4	54	-13.6	V - AVERAGE				
12.06	45.5	39.7	7.3	33.4	59.1	74	-14.9	V - PEAK				
4.824	44.5	33.2	4.2	30.1	51.8	54	-2.2	H - PEAK				
7.236	45.0	35.8	5.1	34	51.9	54	-2.1	H - PEAK				
12.06	45.0	39.7	7.3	33.4	58.6	74	-15.4	H - PEAK				
								Channel 6				
4.874	43.8	33.2	4.2	30.1	51.1	54	-2.9	H - PEAK				
7.311	44.3	35.8	5.1	34	51.2	54	-2.8	H - PEAK				
12.185	45.8	39.7	7.3	33.4	59.4	74	-14.6	H - PEAK				
12.185	33.7	39.7	7.3	33.4	47.3	54	-6.7	H - AVERAGE				
4.874	46.8	33.2	4.2	30.1	54.1	74	-19.9	V - PEAK				
4.874	41.0	33.2	4.2	30.1	48.3	54	-5.7	V - AVERAGE				
7.311	45.2	35.8	5.1	34	52.1	54	-1.9	V - PEAK				
12.185	45.5	39.7	7.3	33.4	59.1	74	-14.9	V - PEAK				
12.185	33.5	39.7	7.3	33.4	47.1	54	-6.9	V - AVERAGE				
Notes:	Searched All emiss	spectrum ions within	from low 1 20 dB o	est freque	ncy in devic limit were 1	e to the 10t reported	h harmor	ic of carrier frequency.				

EQUIPMENT: WLAN 6060 BGAEVK

PROJECT NO.: 3L0117RUS1

Radiated Photographs (Worst Case Configuration)





PROJECT NO.: 3L0117RUS1

Section 9. Peak Power Spectral Density

NAME OF TEST: Peak Power Spectral Density	PARA. NO.: 15.247(d)
TESTED BY: Tom Tidwell	DATE: 3/24/03

Test Results: Complies.

Measurement Data: See attached plots.

FCC PART 15, SUBPART C DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

EQUIPMENT: WLAN 6060 BGAEVK

Data Plot				Peak Po	wer Spec	tral Dens	ity				
Page <u>1</u> o	f <u>3</u>							Complete	X		
Job No.:	3L0117	R		Date:	3/24/2003			Preliminary:			
Specification:	15.247(d)	Tem	perature(°C):	24						
Tested By:	Tom Tie	dwell	Relative l	Humidity(%)	50						
E.U.T.:	802.11b	Radio									
Configuration:	Tx full p	power									
Sample Number:	: 1										
Location:	Lab	1			RBW: 3	kHz		Measurement			
Detector Type:	Pea	k			VBW: 3	kHz		Distance:	NA n	1	
Test Equipm Antenna	ent Use	<u>d</u>		Directi	onal Coupler:						
Pre-Amp					Cable #1	1046					
Filter:					Cable #2:	1040					
Receiver:	103	6			Cable #3:						
Attenuetor #1	147	7			Cable #4:						
Attenuator #1	14/	/			Cable #4.	<u> </u>					
Attenuator #2:		1.			Mixer:						
Additional equip	ment used	1:	ID.								
Measurement Ur	icertainty:	+/-1./ 0	18								
K A			Marker	1 [[1]]		КВМ	З К	Hz RI	- Att	20 dB	
Ref	Lvl			-7.	97 dBm	νвы	ЗК	Hz			
20	dBm		2	2.410391	178 GHz	SWT	1700	s Ur	nit	dBm	
20 21	1 dB	Offset		1		r –	Γ				
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10 01	0 4	2 m									
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U											
		1									
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16 M 7	14 M	utathily.	A MALAM A	Au 6 / Au 6 / Yu		h h M \ L AW L J	il MM		Adda to a state of the	1. M. 194	1MA
	- 141 V	ant lanera /	M M 100				M A M	N ~ I /°₩ ~	Mand the Mill	rimi wy	
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											ЕХТ
-30											
-40											
-50											
-60											
-70											
						1					
-80	<u> </u>	440 0		I	L	L	1	I			
L'en	ter 2	2.412 G 4 Mar 3	HZ 2003 15		500	KHZ/			ъра	n 5 MHz	
Notos:	Charr		12 CH-								
Notes:	Cnann	ei i - CF 2.4	12 GHZ								
	-										

FCC PART 15, SUBPART C DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

EQUIPMENT: WLAN 6060 BGAEVK



FCC PART 15, SUBPART C DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

EQUIPMENT: WLAN 6060 BGAEVK



EQUIPMENT: WLAN 6060 BGAEVK

Section	10.	Test E	quipment	List
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Nemko ID	Description	Manufacturer	Serial Number	Calibration	Calibration
		Model Number		Date	Due
1464	Spectrum analyzer	Hewlett Packard	3551A04428	02/11/03	02/11/05
		8563E			
1016	Pre-Amp	HEWLETT PACKARD	2749A00159	07/15/02	07/15/03
		8449A			
1482	Band Pass Filter	K & L	2	Cal B4 Use	N/A
		11SH10-4000/T12000-0/0			
1484	Cable 2.0-18.0 GHz	Storm	N/A	07/15/02	07/15/03
		PR90-010-072			
1485	Cable 2.0-18.0 GHz	Storm	N/A	07/15/02	07/15/03
		PR90-010-216			
993	Horn Antenna	A.H. Systems	XXX	01/08/02	01/09/04
		SAS-200/571			
1547	CABLE .6m	KTL	N/A	08/06/02	08/06/03
		RG223			
1030	PEAK POWER SENSOR	HP	2539A03573	08/13/02	08/13/03
		84811A			
1029	PEAK POWER METER	HP	3303U0012	08/13/02	08/13/03
		8900D			
1045	CABLE 2m	Astrolab Inc.	N/A	CBU	N/A
		32027-2-29094-72TC			
1988	CABLE, 6.8m	KTL	N/A	10/01/02	10/01/03
		RG223			
1478	20db Attenuator DC 18 GHz	MCL Inc.	NONE	CBU	N/A
		BW-S20W6			
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ	830844/006	12/18/01	12/19/03
		FSEK30			
1555	Filter high pass 5 kHz	Solar Electronics	933125	06/06/02	06/06/03
		7930-5.0			
1258	LISN .15MHz-30MHz	EMCO	1305	07/09/02	07/09/03
		0			

EQUIPMENT: WLAN 6060 BGAEVK

PROJECT NO.: 3L0117RUS1

ANNEX A - TEST DETAILS

EQUIPMENT: WLAN 6060 BGAEVK

PROJECT NO.: 3L0117RUS1

NAME OF TEST: Powerline Conducted Emissions PARA. NO.: 15.207(a)

Minimum Standard: The R.F. that is conducted back onto the AC power line on any frequency within the band 0.45 to 30 MHz shall not exceed $250\mu V$ (48 dB μV) across 50 ohms.

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PROJECT NO.: 3L0117RUS1

NAME OF TEST: Minimum 6 dB bandwidth PARA. NO.: 15.247(a)(2)

Minimum Standard: kHz. The minimum 6 dB bandwidth shall be at least 500

EQUIPMENT: WLAN 6060 BGAEVK

PROJECT NO.: 3L0117RUS1

NAME OF TEST: Maximum Peak Output Power PARA. NO.: 15.247(b)(1)

Minimum Standard: The maximum peak output power shall not exceed 1 watt.

If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point to point operation may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceed 6 dBi.

Systems operating in the 5725 – 5850 MHz band that are used exclusively for fixed, point-to-point operation may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

Direct Measurement Method For Detachable Antennas:

If the antenna is detachable, a peak power meter is used to measure the power output with the transmitter operating into a 50 ohm load. The dBi gain of the antenna(s) employed shall be reported.

Calculation Of EIRP For Integral Antenna:

If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation $GP/4\pi R^2 = E^2/120\pi$ and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts

E = the maximum measured field strength in V/m

R = the measurement range (3 meters)

G = the numeric gain of the transmit antenna in relation to an isotropic radiator

PROJECT NO.: 3L0117RUS1

The RBW of the spectrum analyzer shall be set to a value greater than the measured 6 dB occupied bandwidth of the E.U.T.

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

EQUIPMENT: WLAN 6060 BGAEVK

PROJECT NO.: 3L0117RUS1

NAME OF TEST: RF Exposure	PARA. NO.: 15.247(b)(4)
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Minimum Standard: Systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines stipulated in 1.1307(b)(1) of CFR 47.

EQUIPMENT: WLAN 6060 BGAEVK

PROJECT NO.: 3L0117RUS1

NAME OF TEST: Spurious Emissions(conducted) PARA. NO.: 15.247(c)

Minimum Standard: In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits. Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength (μV/m @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

THE SPECTRUM IS SEARCHED TO THE 10th HARMONIC OF THE HIGHEST FREQUENCY GENERATED IN THE EUT.

Method Of Measurement:

30 MHz - 10th harmonic plot RBW: 100 kHz VBW: 300 kHz Sweep: Auto Display line: -20 dBc

Lower Band Edge RBW: At least 1% of span/div. VBW: >RBW Span: As necessary to display any spurious at band edge. Sweep: Auto Center Frequency: 902 MHz, 2400 MHz, or 5725 MHz Marker: Peak of fundamental emission Marker ∆: Peak of highest spurious level below center frequency.

 Upper Band Edge

 RBW: At least 1% of span/div.

 VBW: >RBW

 Span: As necessary to display any spurious at band edge.

 Sweep: Auto

 Center Frequency: 928 MHz, 2483.5 MHz, or 5850 MHz

 Marker: Peak of fundamental emission

 Marker ∆: Peak of highest spurious level above center frequency.

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

EQUIPMENT: WLAN 6060 BGAEVK

PROJECT NO.: 3L0117RUS1

Minimum Standard: In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits:

Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength (μV/m @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

THE SPECTRUM WAS SEARCHED TO THE 10th HARMONIC

13:203 Nestricted Dailds			
MHz	MHz	MHz	GHz
0.09-0.11	16.42-16.423	399.9-410	4.5-5.25
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.125-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41	1718		

15.205 Restricted Bands

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

EQUIPMENT: WLAN 6060 BGAEVK

PROJECT NO.: 3L0117RUS1

NAME OF TEST. Transmitter Power Densit	v PARA NO 15 247(d)

Minimum Standard: The transmitted power density averaged over any 1 second interval shall not be greater than +8 dBm in any 3 kHz bandwidth.

Method Of Measurement: The spectrum analyzer is set as follows:

RBW: 3 kHz VBW: >3 kHz Span: => measured 6 dB bandwidth Sweep: Span(kHz)/3 (i.e. for a span of 1.5 MHz the sweep rate is 1500/3 = 500 sec. LOG dB/div.: 2 dB

Note: For devices with spectrum line spacing =< 3 kHz, the RBW of the analyzer is reduced until the spectral lines are resolved. The measurement data is normalized to 3 kHz by summing the power of all the individual spectral lines within a 3 kHz band in linear power units.

For Devices With Integral Antenna:

For devices with non-detachable antennas, the received field strength is peaked and the spectrum analyzer is set as above. The peak emission level is then measured and converted to a field strength by adding the appropriate antenna factor and cable loss. This field strength is then converted to an equivalent isotropic radiated power using the same method as described for Peak Power output.

Tuning Range	Number Of Channels Tested	Channel Location In Band
1 MHz or Less	1	Middle
1 to 10 MHz	2	Top And Bottom
More Than 10 MHz	3	Top, Middle, Bottom

EQUIPMENT: WLAN 6060 BGAEVK

PROJECT NO.: 3L0117RUS1

ANNEX B - TEST DIAGRAMS

PROJECT NO.: 3L0117RUS1

Test Site For Radiated Emissions



TO TEST RECEIVER/SPECTRUM ANALYZER. A high-pass filter and LNA is necessary to measure to the limits of 15.209.

Conducted Emissions



PROJECT NO.: 3L0117RUS1

Peak Power At Antenna Terminals



Minimum 6 dB Bandwidth Peak Power Spectral Density Spurious Emissions (conducted)

