RF EXPOSURE REPORT

REPORT NO.:	SA130221E04B
MODEL NO.:	CUS227
FCC ID:	PPD-CUS227
IC:	4104A-CUS227
RECEIVED:	Dec. 25, 2013
TESTED:	Jan. 10 and Feb. 06, 2014
ISSUED:	Feb. 06, 2014

APPLICANT:	Qualcomm Atheros, Inc.
ADDRESS:	1700 Technology Drive, San Jose, CA 95110

ISSUED BY:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
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This report should not be used by the client to claim product certification, approval, or endorsement by any government agencies.

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
SA130221E04B	Original release	Feb. 06, 2014

1. CERTIFICATION

PRODUCT:	802.11a/b/g/n 2x2 WLAN card
BRAND NAME:	Qualcomm Atheros
MODEL NO.:	CUS227
TEST SAMPLE:	ENGINEERING SAMPLE
APPLICANT:	Qualcomm Atheros, Inc.
STANDARDS:	FCC Part 2 (Section 2.1091)
	FCC OET Bulletin 65, Supplement C (01-01)
	IEEE C95.1

The above equipment (Model: CUS227) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : _____ , **DATE:** *Feb. 06, 2014*
(Lori Chung, Specialist)

APPROVED BY : _____ , **DATE:** *Feb. 06, 2014*
(May Chen, Manager)

2. RF EXPOSURE LIMIT

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

FREQUENCY RANGE (MHz)	ELECTRIC FIELD STRENGTH (V/m)	MAGNETIC FIELD STRENGTH (A/m)	POWER DENSITY (mW/cm^2)	AVERAGE TIME (minutes)
LIMITS FOR GENERAL POPULATION / UNCONTROLLED EXPOSURE				
300-1500	…	…	F/1500	30
1500-100,000	…	…	1.0	30

F = Frequency in MHz

3. MPE CALCULATION FORMULA

$Pd = (Pout*G) / (4*pi*r^2)$

where

Pd = power density in mW/cm^2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

pi = 3.1416

r = distance between observation point and center of the radiator in cm

4. CLASSIFICATION

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user. So, this device is classified as **Mobile Device**.

5. ANTENNA GAIN

The antennas provided to the EUT, please refer to the following table:

Internal antenna								
No.	Brand	Model	Antenna Type	Connecter Type	Cable Loss (dB)	Antenna gain 2.4G(dBi)	Antenna gain 5G(dBi)	Cable Length (mm)
1	Qualcomm	CUS227 V03-2	Integrated PCB antenna	NA	NA	2	3	NA
External antenna								
No.	Brand	Model	Antenna Type	Connecter Type	Freq. Range (MHz to MHz)	Cable Loss (dB)	Net Gain (dBi)	Cable Length (mm)
2	WNC	81EAAY15.G05	PIFA	IPEX	2400~2483.5	-0.20	3.25	100
					5150~5250	-0.28	4.42	
					5250~5350	-0.28	4.27	
					5470~5725	-0.28	4.50	
					5725~5850	-0.28	4.59	
3	WNC	81EAAY15.G06	MONOPOLE	IPEX	2400~2483.5	-0.20	3.15	100
					5150~5250	-0.28	2.89	
					5250~5350	-0.28	3.46	
					5470~5725	-0.28	3.79	
					5725~5850	-0.28	3.50	
4	WNC	81EAAY15.G07	DIPOLE	IPEX	2400~2483.5	-0.20	3.14	100
					5150~5250	-0.28	3.95	
					5250~5350	-0.28	4.51	
					5470~5725	-0.28	4.98	
					5725~5850	-0.28	4.78	

Note: 1. The EUT incorporates beam forming function

6. CALCULATION RESULT OF MAXIMUM CONDUCTED POWER

For 2.4GHz:

With Internal antenna:

802.11b

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
2412-2462	100.237	5.01	20	0.06321	1.00

NOTE: 1. Directional gain = 2dBi + 10log(2) = 5.01dBi

2. This power include tune-up tolerance range that specified in QCA CUS227 Tune Up power table

802.11g

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
2412-2462	89.337	5.01	20	0.05633	1.00

NOTE: 1. Directional gain = 2dBi + 10log(2) = 5.01dBi

2. This power include tune-up tolerance range that specified in QCA CUS227 Tune Up power table

802.11n (HT20)

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
2412-2462	89.337	5.01	20	0.05633	1.00

NOTE: 1. Directional gain = 2dBi + 10log(2) = 5.01dBi

2. This power include tune-up tolerance range that specified in QCA CUS227 Tune Up power table

802.11n (HT40)

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
2422-2452	44.774	5.01	20	0.02823	1.00

NOTE: 1. Directional gain = 2dBi + 10log(2) = 5.01dBi

2. This power include tune-up tolerance range that specified in QCA CUS227 Tune Up power table

With External antenna:

802.11b

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
2412-2462	100.237	6.26	20	0.08429	1.00

NOTE: 1. Directional gain = 3.25dBi + 10log(2) = 6.26dBi

2. This power include tune-up tolerance range that specified in QCA CUS227 Tune Up power table

802.11g

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
2412-2462	89.337	6.26	20	0.07512	1.00

NOTE: 1. Directional gain = 3.25dBi + 10log(2) = 6.26dBi

2. This power include tune-up tolerance range that specified in QCA CUS227 Tune Up power table

802.11n (HT20)

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
2412-2462	89.337	6.26	20	0.07512	1.00

NOTE: 1. Directional gain = 3.25dBi + 10log(2) = 6.26dBi

2. This power include tune-up tolerance range that specified in QCA CUS227 Tune Up power table

802.11n (HT40)

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
2422-2452	44.774	6.26	20	0.03765	1.00

NOTE: 1. Directional gain = 3.25dBi + 10log(2) = 6.26dBi

2. This power include tune-up tolerance range that specified in QCA CUS227 Tune Up power table

For 15.247(5GHz):

With Internal antenna:

802.11a

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
5745 ~ 5825	251.785	6.01	20	0.19988	1.00

NOTE: 1. Directional gain = 3dBi + 10log(2) = 6.01dBi

2. This power include tune-up tolerance range that specified in QCA CUS227 Tune Up power table

802.11n(HT20)

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
5745 ~ 5825	251.785	6.01	20	0.19988	1.00

NOTE: 1. Directional gain = 3dBi + 10log(2) = 6.01dBi

2. This power include tune-up tolerance range that specified in QCA CUS227 Tune Up power table

802.11n(HT40)

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
5755 ~ 5795	141.589	6.01	20	0.11240	1.00

NOTE: 1. Directional gain = 3dBi + 10log(2) = 6.01dBi

2. This power include tune-up tolerance range that specified in QCA CUS227 Tune Up power table

With External antenna:

802.11a

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
5745 ~ 5825	224.404	7.79	20	0.26839	1.00

NOTE: 1. Directional gain = 4.78dBi + 10log(2) = 7.79dBi

2. This power include tune-up tolerance range that specified in QCA CUS227 Tune Up power table

802.11n(HT20)

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
5745 ~ 5825	224.404	7.79	20	0.26839	1.00

NOTE: 1. Directional gain = 4.78dBi + 10log(2) = 7.79dBi

2. This power include tune-up tolerance range that specified in QCA CUS227 Tune Up power table

802.11n(HT40)

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
5755 ~ 5795	141.589	7.79	20	0.16934	1.00

NOTE: 1. Directional gain = 4.78dBi + 10log(2) = 7.79dBi

2. This power include tune-up tolerance range that specified in QCA CUS227 Tune Up power table

For 15.407(5GHz):

With Internal antenna:

802.11a

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
5180-5240 5260-5320 5500-5580 & 5660-5700	282.508	6.01	20	0.22426	1.00

NOTE: 1. Directional gain = 3dBi + 10log(2) = 6.01dBi

2. This power include tune-up tolerance range that specified in QCA CUS227 Tune Up power table

802.11n(HT20)

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
5180-5240 5260-5320 5500-5580 & 5660-5700	251.785	6.01	20	0.19988	1.00

NOTE: 1. Directional gain = 3dBi + 10log(2) = 6.01dBi

2. This power include tune-up tolerance range that specified in QCA CUS227 Tune Up power table

802.11n(HT40)

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
5190-5230 5270-5310 5510-5550 & 5670	158.866	6.01	20	0.12611	1.00

NOTE: 1. Directional gain = 3dBi + 10log(2) = 6.01dBi

2. This power include tune-up tolerance range that specified in QCA CUS227 Tune Up power table

With External antenna:

802.11a

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
5180-5240 5260-5320 5500-5580 & 5660-5700	224.404	7.99	20	0.28103	1.00

NOTE: 1. Directional gain = 4.98dBi + 10log(2) = 7.99dB

2. This power include tune-up tolerance range that specified in QCA CUS227 Tune Up power table

802.11n(HT20)

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
5180-5240 5260-5320 5500-5580 & 5660-5700	224.404	7.52	20	0.28103	1.00

NOTE: 1. Directional gain = 4.98dBi + 10log(2) = 7.99dB

2. This power include tune-up tolerance range that specified in QCA CUS227 Tune Up power table

802.11n(HT40)

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
5190-5230 5270-5310 5510-5550 & 5670	141.589	7.99	20	0.17732	1.00

NOTE: 1. Directional gain = 4.98dBi + 10log(2) = 7.99dB

2. This power include tune-up tolerance range that specified in QCA CUS227 Tune Up power table

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