

RF Exposure Evaluation declaration

Product Name : WLM54AG-23 wireless card with 2.4G
and 5G series antenna
Model No. : WPMA-2.4G19, WPMA-2.4G4.5/5G7,
WPMA-5G17, WPMA-5G23,
WPMA-2.4G14
FCC ID : TK4-WPMAANTENNA

Applicant : Compex Systems Pte Ltd.

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Singapore 368363

Date of Receipt : 2007/06/15

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Report No. : 076S041-RF-US

The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

This report must not be used to claim product endorsement by CNLA, NVLAP, NIST or any agency of the Government.

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1. RF Exposure Evaluation

1.1. Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

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)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	F/1500	6
1500-100,000	--	--	1	30

F= Frequency in MHz

Friis Formula

Friis transmission formula: $Pd = (Pout \cdot G) / (4 \cdot \pi \cdot r^2)$

Where

Pd = power density in mW/cm²

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

Pd is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

1.2. Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

The temperature and related humidity: 18°C and 78% RH.

1.3. Test Result of RF Exposure Evaluation

Product	:	WLM54AG-23 wireless card with 2.4G and 5G series antenna
Test Item	:	RF Exposure Evaluation
Test Site	:	AC-3
Test Mode	:	Mode 1: Transmitter by 802.11b (19 dBi Antenna)

Antenna Gain:

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 19 dBi or 79.43 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	RF Exposure Distance (cm)
01	2412.00	244.9063	39.35
06	2437.00	239.8833	38.94
11	2462.00	239.8833	38.94

Product	:	WLM54AG-23 wireless card with 2.4G and 5G series antenna
Test Item	:	RF Exposure Evaluation
Test Site	:	AC-3
Test Mode	:	Mode 1: Transmitter by 802.11b (14 dBi Antenna)

Antenna Gain:

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 14 dBi or 25.12 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	RF Exposure Distance (cm)
01	2412.00	244.9063	22.13
06	2437.00	239.8833	21.90
11	2462.00	239.8833	21.90

Product	:	WLM54AG-23 wireless card with 2.4G and 5G series antenna
Test Item	:	RF Exposure Evaluation
Test Site	:	AC-3
Test Mode	:	Mode 1: Transmitter by 802.11b (4.5 dBi Antenna)

Antenna Gain:

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 4.5 dBi or 2.82 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	RF Exposure Distance (cm)
01	2412.00	244.9063	7.41
06	2437.00	239.8833	7.34
11	2462.00	239.8833	7.34

Product	:	WLM54AG-23 wireless card with 2.4G and 5G series antenna
Test Item	:	RF Exposure Evaluation
Test Site	:	AC-3
Test Mode	:	Mode 2: Transmitter by 802.11g (19 dBi Antenna)

Antenna Gain:

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 19 dBi or 79.43 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	RF Exposure Distance (cm)
01	2412.00	314.7748	44.61
06	2437.00	304.7895	43.89
11	2462.00	261.8183	40.68

Product	:	WLM54AG-23 wireless card with 2.4G and 5G series antenna
Test Item	:	RF Exposure Evaluation
Test Site	:	AC-3
Test Mode	:	Mode 2: Transmitter by 802.11g (14 dBi Antenna)

Antenna Gain:

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 14 dBi or 25.12 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	RF Exposure Distance (cm)
01	2412.00	314.7748	25.08
06	2437.00	304.7895	24.68
11	2462.00	261.8183	22.88

Product	:	WLM54AG-23 wireless card with 2.4G and 5G series antenna
Test Item	:	RF Exposure Evaluation
Test Site	:	AC-3
Test Mode	:	Mode 2: Transmitter by 802.11g (4.5 dBi Antenna)

Antenna Gain:

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 4.5 dBi or 2.82 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	RF Exposure Distance (cm)
01	2412.00	314.7748	8.40
06	2437.00	304.7895	8.27
11	2462.00	261.8183	7.66

Product	:	WLM54AG-23 wireless card with 2.4G and 5G series antenna
Test Item	:	RF Exposure Evaluation
Test Site	:	AC-3
Test Mode	:	Mode 3: Transmitter by 802.11a (23 dBi Antenna)

Antenna Gain:

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 23 dBi or 199.53 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	RF Exposure Distance (cm)
01	5745.00	227.5097	60.10
03	5785.00	217.7710	58.80
05	5825.00	230.6747	60.52

Product	:	WLM54AG-23 wireless card with 2.4G and 5G series antenna
Test Item	:	RF Exposure Evaluation
Test Site	:	AC-3
Test Mode	:	Mode 3: Transmitter by 802.11a (17 dBi Antenna)

Antenna Gain:

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 17 dBi or 50.12 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	RF Exposure Distance (cm)
01	5745.00	227.5097	30.12
03	5785.00	217.7710	29.47
05	5825.00	230.6747	30.33

Product	:	WLM54AG-23 wireless card with 2.4G and 5G series antenna
Test Item	:	RF Exposure Evaluation
Test Site	:	AC-3
Test Mode	:	Mode 3: Transmitter by 802.11a (7 dBi Antenna)

Antenna Gain:

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 7 dBi or 5.01 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	RF Exposure Distance (cm)
01	5745.00	227.5097	9.53
03	5785.00	217.7710	9.32
05	5825.00	230.6747	9.59