

RF Exposure Report

Report No.: SA161129C10

FCC ID: G95-DWA1230

Equipment Name: Wireless .11ac Smart Ultra Broadband Gateway

Trade Name: technicolor

Model Number: DWA1230

Product Code: DSLYBA123GP, DSLYBA123WA

Received Date: Nov. 29, 2016

Test Date: Feb. 03 ~ Mar. 01, 2017

Issued Date: Mar. 29, 2017

Applicant: Technicolor Connected Home USA LLC

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

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(R.O.C.)

Test Location: No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City
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Release Control Record

Issue No.	Description	Date Issued
SA161129C10	Original release.	Mar. 29, 2017

1 Certificate of Conformity

Equipment Name: Wireless .11ac Smart Ultra Broadband Gateway

Trade Name: technicolor

Test Model: DWA1230

Product Code: DSLYBA123GP, DSLYBA123WA

Sample Status: Product Unit

Applicant: Technicolor Connected Home USA LLC

Test Date: Feb. 03 ~ Mar. 01, 2017

Standards: FCC Part 2 (Section 2.1091)
KDB 447498 D01 General RF Exposure Guidance v06
IEEE C95.1

The above equipment 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:

Mar. 29, 2017

Polly Chien / Specialist

Approved by :



Date:

Mar. 29, 2017

Ken Liu / Senior Manager

2 RF Exposure

2.1 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

2.2 MPE Calculation Formula

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

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

2.3 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**.

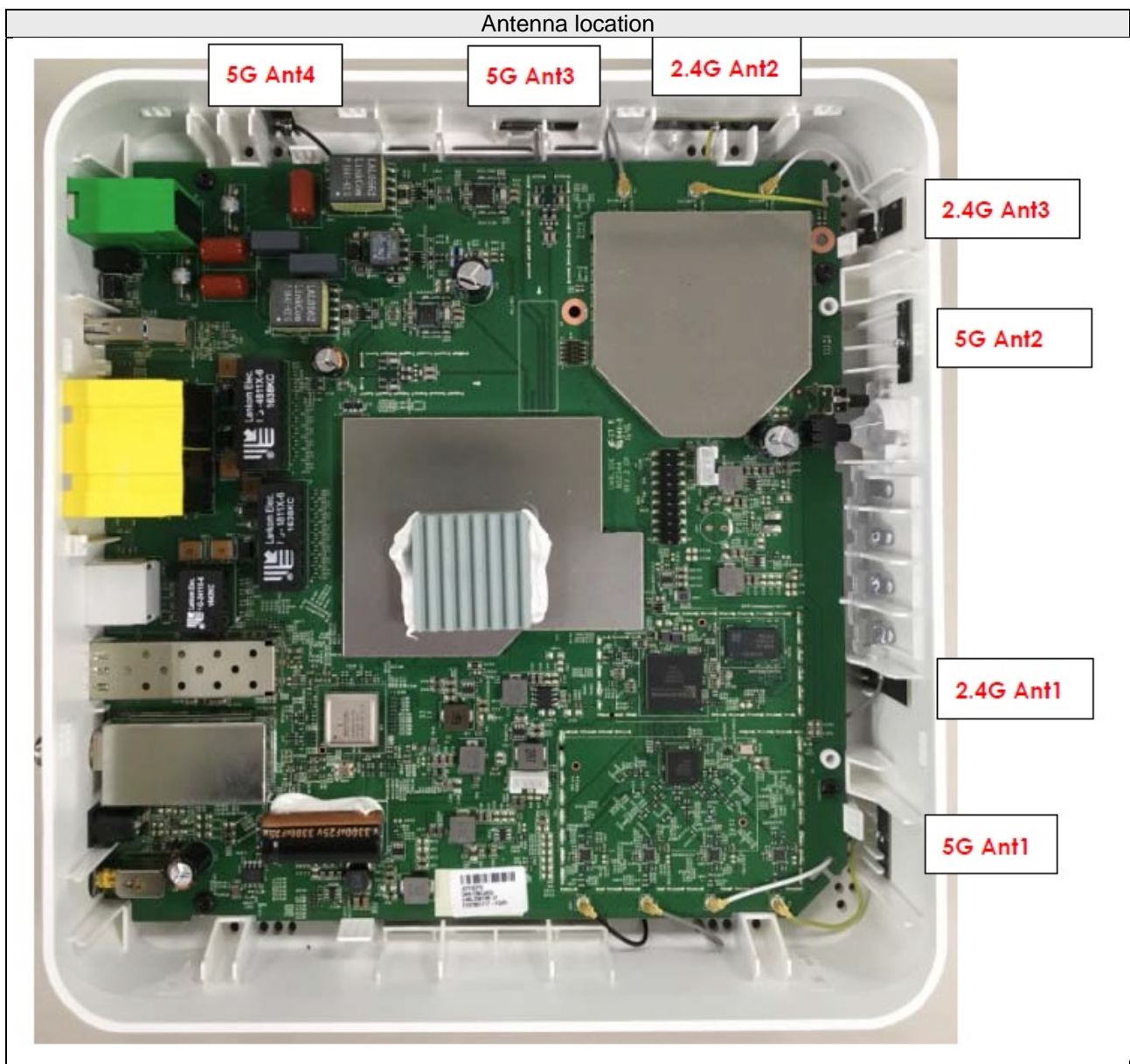
2.4 Antenna Gain

For WLAN – 2.4GHz:

Ant.	Brand	Model Name	Antenna Type	Connector
1	WHAYU	C107-511315-A	PCB	I-Pex
2	WHAYU	C107-511314-A	PCB	I-Pex
3	WHAYU	C107-511316-A	PCB	I-Pex

Antenna & Bandwidth for 2400~2483.5MHz

Antenna	1st (TX)		2nd (TX)		3rd (TX)	
	20 MHz	40 MHz	20 MHz	40 MHz	20 MHz	40 MHz
802.11b	V	X	X	X	X	X
802.11g	V	X	X	X	X	X
802.11n	V	V	V	V	V	V



For 2400~2483.5MHz

Frequency	Antenna Gain (dBi)					
	Ant. 1 (WJ1)		Ant. 2 (WJ2)		Ant. 3 (WJ3)	
	20 MHz	40 MHz	20 MHz	40 MHz	20 MHz	40 MHz
2412MHz	2.11	-	2.81	-	3.37	-
2422MHz	-	2.08	-	2.94	-	3.30
2437MHz	2.23	2.23	2.73	2.73	3.16	3.16
2452MHz	-	2.58	-	3.12	-	3.29
2462MHz	2.93	-	3.30	-	2.98	-

Frequency	Maximum Gain (dBi) for SDM mode			
	SDM mode (2 Stream 2 TX) for Power & PSD Gain (KDB 662911 Option 2)		SDM mode (3 Stream 3 TX) for Power & PSD Gain (KDB 662911 Option 2)	
	20 MHz	40 MHz	20 MHz	40 MHz
2412MHz	1.88	-	1.86	-
2422MHz	-	1.86	-	1.74
2437MHz	1.39	1.39	1.38	1.38
2452MHz	-	1.41	-	1.65
2462MHz	1.79	-	1.90	-

Note:

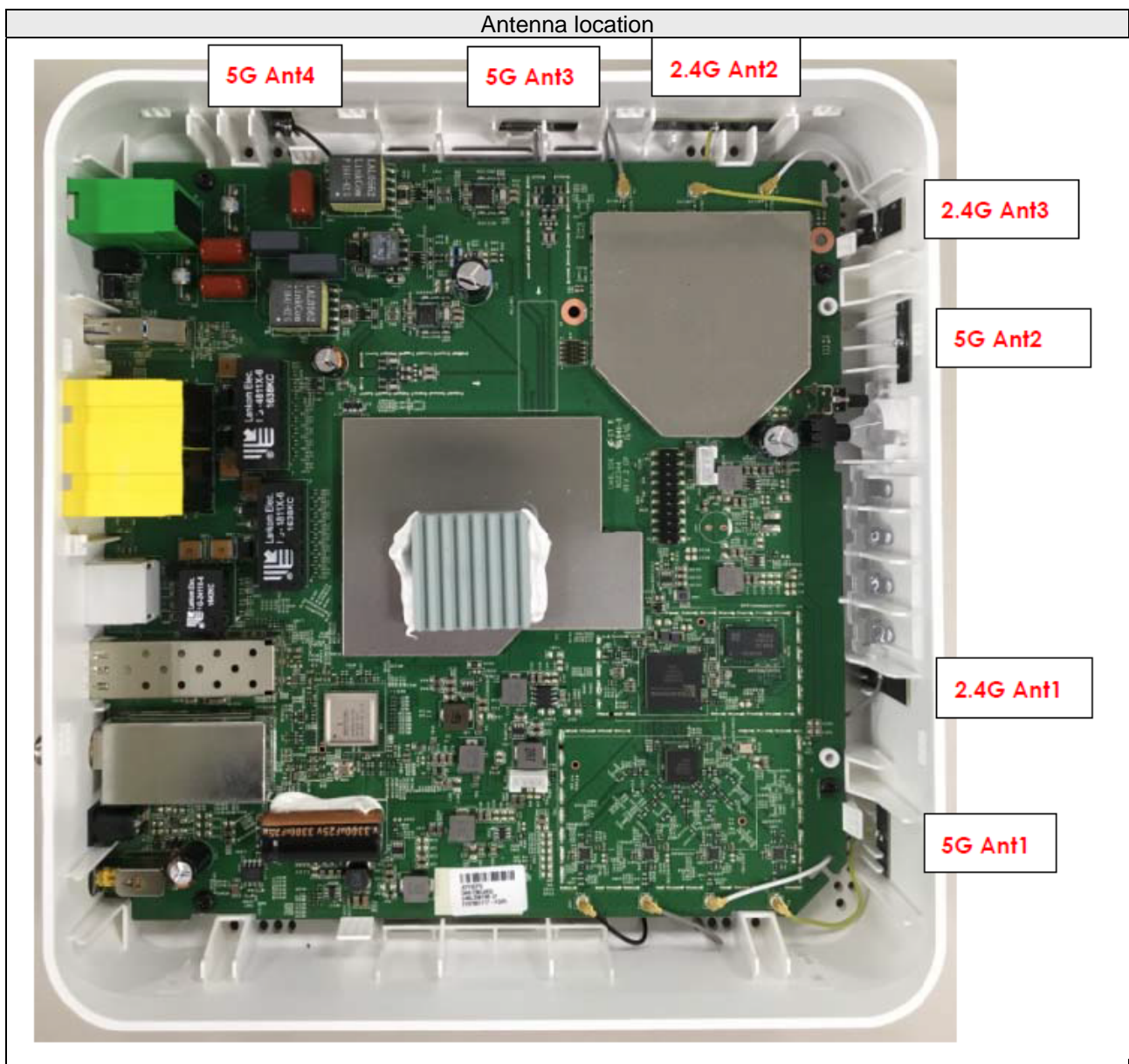
1. Antenna Gain refer to "DWA1230 antenna table_V1.08.xlsx" files
2. Maximum Uncorrelated Directional Gain = $10 \log\left[\frac{10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20}}{N_{ANT}}\right]^2$ dBi
3. Maximum Uncorrelated Directional Gain = $10 \log\left[\frac{10^{G1/10} + 10^{G2/10} + \dots + 10^{GN/10}}{N_{ANT}}\right]$ dBi

For WLAN – 5GHz:

Ant.	Brand	Model Name	Antenna Type	Connector
1	WHAYU	C107-511313-A	PCB	I-Pex
2	WHAYU	C107-511312-A	PCB	I-Pex
3	WHAYU	C107-511311-A	PCB	I-Pex
4	WHAYU	C107-511310-A	PCB	I-Pex

Antenna & Bandwidth

Antenna Bandwidth Mode	1st (TX)			2nd (TX)			3rd (TX)			4th (TX)		
	20 MHz	40 MHz	80 MHz	20 MHz	40 MHz	80 MHz	20 MHz	40 MHz	80 MHz	20 MHz	40 MHz	80 MHz
802.11a	V	X	X	V	X	X	V	X	X	V	X	X
802.11n	V	V	X	V	V	X	V	V	X	V	V	X
802.11ac	V	V	V	V	V	V	V	V	V	V	V	V



Frequency	Maximum Gain (dBi) for CDD mode					
	CDD mode (1 Stream 4 TX) for Power Gain			CDD mode (1 Stream 4 TX) for PSD Gain		
	20 MHz	40 MHz	80MHz	20 MHz	40 MHz	80MHz
5180MHz	3.27			6.89		
5190MHz		3.37			6.99	
5200MHz	3.34			6.94		
5210MHz			3.47			6.73
5230MHz		3.09			6.25	
5240MHz	3.07			6.38		
5260MHz	3.21			6.44		
5270MHz		4.14			6.61	
5290MHz			3.52			6.65
5300MHz	3.64			6.44		
5310MHz		3.94			6.48	
5320MHz	3.48			6.28		
5500MHz	2.98			6.13		
5510MHz		3.35			6.29	
5530MHz			3.71			6.71
5550MHz		3.43			6.33	
5580MHz	3.62			6.56		
5610MHz			3.50			6.13
5620MHz	4.02			6.63		
5630MHz		3.87			6.09	
5670MHz		3.37			6.06	
5690MHz			4.21			6.58
5700MHz	3.41			6.29		
5710MHz		3.85			6.18	
5720MHz	4.01			6.25		
5745MHz	4.02			6.31		
5755MHz		4.96			7.08	
5775MHz			4.34			6.49
5785MHz	3.64			5.92		
5795MHz		3.47			5.89	
5825MHz	3.90			6.22		

Note:

1. Antenna Gain refer to "DWA1230 antenna table_V1.08.xlsx" files
2. Maximum Correlated Directional Gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}]$ dBi
3. Maximum Uncorrelated Directional Gain = $10 \log[(10^{G1/10} + 10^{G2/10} + \dots + 10^{GN/10}) / N_{ANT}]$ dBi

Frequency	Maximum Gain (dBi) for TXBF mode					
	TXBF mode (1 Stream 4 TX) for Power Gain			TXBF mode (1 Stream 4 TX) for PSD Gain		
	20 MHz	40 MHz	80MHz	20 MHz	40 MHz	80MHz
5180MHz	6.89			6.89		
5190MHz		6.99			6.99	
5200MHz	6.94			6.94		
5210MHz			6.73			6.73
5230MHz		6.25			6.25	
5240MHz	6.38			6.38		
5260MHz	6.44			6.44		
5270MHz		6.61			6.61	
5290MHz			6.65			6.65
5300MHz	6.44			6.44		
5310MHz		6.48			6.48	
5320MHz	6.28			6.28		
5500MHz	6.13			6.13		
5510MHz		6.29			6.29	
5530MHz			6.71			6.71
5550MHz		6.33			6.33	
5580MHz	6.56			6.56		
5610MHz			6.13			6.13
5620MHz	6.63			6.63		
5630MHz		6.09			6.09	
5670MHz		6.06			6.06	
5690MHz			6.58			6.58
5700MHz	6.29			6.29		
5710MHz		6.18			6.18	
5720MHz	6.25			6.25		
5745MHz	6.31			6.31		
5755MHz		7.08			7.08	
5775MHz			6.49			6.49
5785MHz	5.92			5.92		
5795MHz		5.89			5.89	
5825MHz	6.22			6.22		

Note:

1. Antenna Gain refer to "DWA1230 antenna table_V1.08.xlsx" files
2. Maximum Correlated Directional Gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}]$ dBi
3. Maximum Uncorrelated Directional Gain = $10 \log[(10^{G1/10} + 10^{G2/10} + \dots + 10^{GN/10}) / N_{ANT}]$ dBi

3 Calculation Result of Maximum Conducted Power

For WLAN – 2.4GHz: 11n 40 MHz MCS16, 3S3T SDM, Ant. 1+2+3

Frequency (MHz)	Max Conducted Power (mW)	Directional Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
2437	548.277	1.38	20	0.14987	1

Note:

1. $P_{out} * G = \text{EIRP Power} = \text{Max Conducted Power(mW)} * \text{Gain(numeric)}$
2. $\text{Gain(dBi)} \text{ to } \text{Gain(numeric)} = 10^{(1.38/10)} = 1.3740$
3. $\text{Distance (cm)} = r = \text{declare by manufacture} = 20 \text{ cm}$
4. $P_d = (P_{out} * G) / (4 * \pi * r^2) = (548.277 * 1.3740) / (4 * 3.1416 * 20^2) = 0.14987 \text{ (mW/cm}^2\text{)}$

For WLAN – 5GHz_U_NII 1: 11ac 20MHz MCS0, 1S4T TxBF, Ant. 1+2+3+4

Frequency (MHz)	Max Conducted Power (mW)	Directional Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
5180	466.659	6.89	20	0.45366	1

Note:

1. $P_{out} * G = \text{EIRP Power} = \text{Max Conducted Power(mW)} * \text{Gain(numeric)}$
2. $\text{Gain(dBi)} \text{ to } \text{Gain(numeric)} = 10^{(6.89/10)} = 4.8865$
3. $\text{Distance (cm)} = r = \text{declare by manufacture} = 20 \text{ cm}$
4. $P_d = (P_{out} * G) / (4 * \pi * r^2) = (466.659 * 4.8865) / (4 * 3.1416 * 20^2) = 0.45366 \text{ (mW/cm}^2\text{)}$

For WLAN – 5GHz_U_NII 3: 11ac 40MHz MCS0, 1S4T TxBF, Ant. 1+2+3+4

Frequency (MHz)	Max Conducted Power (mW)	Directional Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
5755	468.813	7.08	20	0.47613	1

Note:

1. $P_{out} * G = \text{EIRP Power} = \text{Max Conducted Power(mW)} * \text{Gain(numeric)}$
2. $\text{Gain(dBi)} \text{ to } \text{Gain(numeric)} = 10^{(7.08/10)} = 5.1051$
3. $\text{Distance (cm)} = r = \text{declare by manufacture} = 20 \text{ cm}$
4. $P_d = (P_{out} * G) / (4 * \pi * r^2) = (468.813 * 5.1051) / (4 * 3.1416 * 20^2) = 0.47613 \text{ (mW/cm}^2\text{)}$

Conclusion:

The formula of calculated the MPE is:

$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$

CPD = Calculation power density

LPD = Limit of power density

$\text{WLAN 2.4GHz} + \text{WLAN 5GHz} = 0.14987 / 1 + 0.47613 / 1 = 0.62600$

Therefore all the maximum calculations of above situations are less than the "1" limit.

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