

RF Exposure Report

Report No.: SA170724C40

FCC ID: RSE-TG389ACHP

Equipment Name: Media Access Gateway

Trade Name: technicolor

Model Number: TG389ac HP

Product Code: RGWCBA389AM

Received Date: July 24, 2017

Test Date: Aug. 09 to 31, 2017

Issued Date: Sep. 13, 2017

Applicant: Technicolor Delivery Technologies Belgium

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

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Release Control Record

Issue No.	Description	Date Issued
SA170724C40	Original release.	Sep. 13, 2017

1 Certificate of Conformity

Product: Media Access Gateway

Brand: technicolor

Test Model: TG389ac HP

Product Code: RGWCBA389AM

Sample Status: Product Unit

Applicant: Technicolor Delivery Technologies Belgium

Test Date: Aug. 09 to 31, 2017

Standards: FCC Part 2 (Section 2.1091)

KDB 447498 D01 General RF Exposure Guidance v06

IEEE C95.1-1992

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.

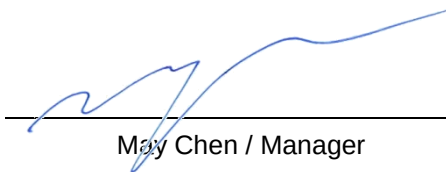
Prepared by :



Date: Sep. 13, 2017

Claire Kuan / Specialist

Approved by :



Date: Sep. 13, 2017

May Chen / 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

$$Pd = (P_{out} * G) / (4 * \pi * r^2)$$

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

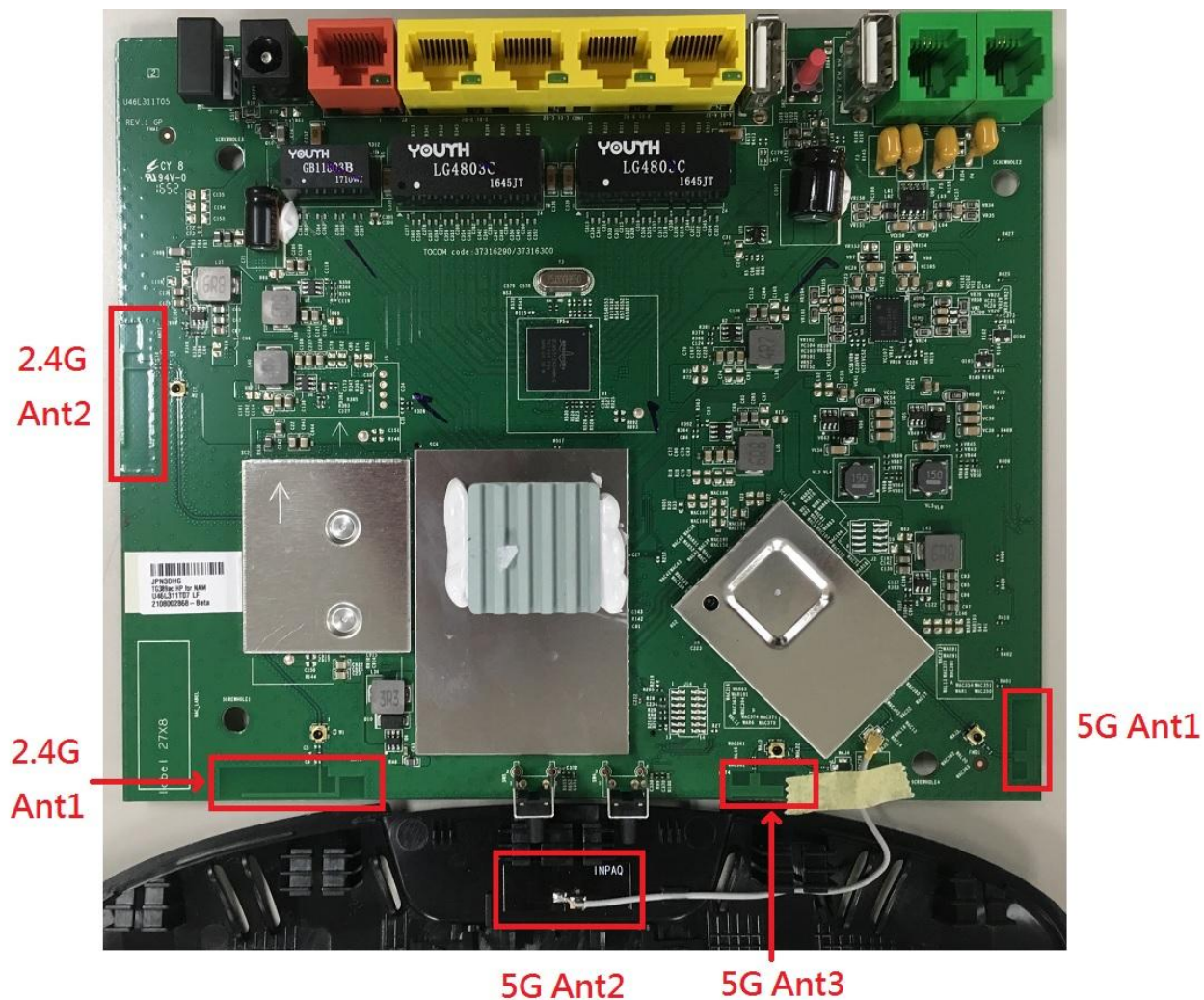
2.3 Classification

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

Antenna location



Antenna & Bandwidth for 2400~2483.5MHz

Ant.	Brand	Model Name	Antenna Type	Connector
1	-	-	Printed Antenna	Murata
2	-	-	Printed Antenna	Murata

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

For 2400~2483.5MHz

Frequency	Antenna Gain (dBi)			
	Ant. 1 (W1)		Ant. 2 (W2)	
	20 MHz	40 MHz	20 MHz	40 MHz
2412MHz	3.61	-	2.75	-
2422MHz	-	3.79	-	2.80
2437MHz	3.94	3.94	2.78	2.78
2452MHz	-	3.80	-	2.66
2462MHz	3.76	-	2.31	-

Frequency	Maximum Gain (dBi) for SDM mode	
	SDM mode (2 Stream 2 TX) for Power & PSD Gain (KDB 662911 Option 2)	
	20 MHz	40 MHz
2412MHz	2.65	-
2422MHz	-	2.70
2437MHz	3.11	3.11
2452MHz	-	3.01
2462MHz	2.61	-

Note:

1. Antenna Gain refer to "TG389ac HP with shielding antenna table_20161012.xls" 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

Antenna & Bandwidth for 5150~5850MHz

Ant.	Brand	Model Name	Antenna Type	Connector
1	-	-	Printed Antenna	Murata
2	INPAQ	WA-T-LC-03-005	PCB Antenna	I-Pex
3	-	-	Printed Antenna	Murata

Antenna	1st (TX)			2nd (TX)			3rd (TX)		
Bandwidth Mode	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
802.11n	V	V	X	V	V	X	V	V	X
802.11ac	V	V	V	V	V	V	V	V	V

Frequency	Maximum Gain (dBi) for CDD mode					
	CDD mode (1 Stream 3 TX) for Power Gain			CDD mode (1 Stream 3 TX) for PSD Gain		
	20 MHz	40 MHz	80MHz	20 MHz	40 MHz	80MHz
5180MHz	3.48	-	-	5.82	-	-
5190MHz	-	3.97	-	-	5.79	-
5200MHz	3.44	-	-	5.52	-	-
5210MHz	-	-	3.47	-	-	5.52
5230MHz	-	3.18	-	-	5.41	-
5240MHz	3.73	-	-	5.66	-	-
5260MHz	3.16	-	-	5.36	-	-
5270MHz	-	3.49	-	-	5.93	-
5290MHz	-	-	3.69	-	-	5.87
5300MHz	3.67	-	-	5.77	-	-
5310MHz	-	3.41	-	-	5.68	-
5320MHz	3.51	-	-	5.69	-	-
5500MHz	3.47	-	-	5.74	-	-
5510MHz	-	3.93	-	-	6.33	-
5530MHz	-	-	3.34	-	-	6.35
5550MHz	-	3.34	-	-	6.05	-
5580MHz	3.77	-	-	6.63	-	-
5670MHz	-	3.67	-	-	6.01	-
5700MHz	3.84	-	-	5.82	-	-
5745MHz	3.94	-	-	6.33	-	-
5755MHz	-	3.97	-	-	7.15	-
5775MHz	-	-	3.96	-	-	6.39
5785MHz	3.92	-	-	6.15	-	-
5795MHz	-	3.90	-	-	5.27	-
5825MHz	3.91	-	-	6.32	-	-

Note:

1. Antenna Gain refer to "TG389ac HP with shielding antenna table_20161012.xls" 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 SDM mode					
	SDM mode (3 Stream 3 TX) for Power Gain			SDM mode (3 Stream 3 TX) for PSD Gain		
	20 MHz	40 MHz	80MHz	20 MHz	40 MHz	80MHz
5180MHz	1.27	-	-	1.27	-	-
5190MHz	-	1.67	-	-	1.67	-
5200MHz	1.33	-	-	1.33	-	-
5210MHz	-	-	1.09	-	-	1.09
5230MHz	-	1.01	-	-	1.01	-
5240MHz	1.40	-	-	1.40	-	-
5260MHz	1.04	-	-	1.04	-	-
5270MHz	-	1.30	-	-	1.30	-
5290MHz	-	-	1.35	-	-	1.35
5300MHz	1.37	-	-	1.37	-	-
5310MHz	-	1.20	-	-	1.20	-
5320MHz	1.37	-	-	1.37	-	-
5500MHz	1.18	-	-	1.18	-	-
5510MHz	-	1.64	-	-	1.64	-
5530MHz	-	-	1.64	-	-	1.64
5550MHz	-	1.35	-	-	1.35	-
5580MHz	1.94	-	-	1.94	-	-
5670MHz	-	1.31	-	-	1.31	-
5700MHz	1.19	-	-	1.19	-	-
5745MHz	1.76	-	-	1.76	-	-
5755MHz	-	2.47	-	-	2.47	-
5775MHz	-	-	1.80	-	-	1.80
5785MHz	1.62	-	-	1.62	-	-
5795MHz	-	0.87	-	-	0.87	-
5825MHz	1.60	-	-	1.60	-	-

Note:

1. Antenna Gain refer to "TG389ac HP with shielding antenna table_20161012.xls" files
2. Maximum Correlated Directional Gain = $10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{ANT}]$ dBi
3. Maximum Uncorrelated Directional Gain = $10 \log[(10^{G_1/10} + 10^{G_2/10} + \dots + 10^{G_N/10}) / N_{ANT}]$ dBi

Frequency	Maximum Gain (dBi) for TXBF mode					
	TXBF mode (1 Stream 3 TX) for Power Gain			TXBF mode (1 Stream 3 TX) for PSD Gain		
	20 MHz	40 MHz	80MHz	20 MHz	40 MHz	80MHz
5180MHz	5.82	-	-	5.82	-	-
5190MHz	-	5.79	-	-	5.79	-
5200MHz	5.52	-	-	5.52	-	-
5210MHz	-	-	5.52	-	-	5.52
5230MHz	-	5.41	-	-	5.41	-
5240MHz	5.66	-	-	5.66	-	-
5260MHz	5.36	-	-	5.36	-	-
5270MHz	-	5.93	-	-	5.93	-
5290MHz	-	-	5.87	-	-	5.87
5300MHz	5.77	-	-	5.77	-	-
5310MHz	-	5.68	-	-	5.68	-
5320MHz	5.69	-	-	5.69	-	-
5500MHz	5.74	-	-	5.74	-	-
5510MHz	-	6.33	-	-	6.33	-
5530MHz	-	-	6.35	-	-	6.35
5550MHz	-	6.05	-	-	6.05	-
5580MHz	6.63	-	-	6.63	-	-
5670MHz	-	6.01	-	-	6.01	-
5700MHz	5.82	-	-	5.82	-	-
5745MHz	6.33	-	-	6.33	-	-
5755MHz	-	7.15	-	-	7.15	-
5775MHz	-	-	6.39	-	-	6.39
5785MHz	6.15	-	-	6.15	-	-
5795MHz	-	5.27	-	-	5.27	-
5825MHz	6.32	-	-	6.32	-	-

Note:

1. Antenna Gain refer to "TG389ac HP with shielding antenna table_20161012.xls" files
2. Maximum Correlated Directional Gain = $10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{ANT}]$ dBi
3. Maximum Uncorrelated Directional Gain = $10 \log[(10^{G_1/10} + 10^{G_2/10} + \dots + 10^{G_N/10}) / N_{ANT}]$ dBi

Frequency	Maximum Gain (dBi) for TXBF mode					
	TXBF mode (2 Stream 3 TX) for Power Gain			TXBF mode (2 Stream 3 TX) for PSD Gain		
	20 MHz	40 MHz	80MHz	20 MHz	40 MHz	80MHz
5180MHz	3.99	-	-	3.99	-	-
5190MHz	-	4.51	-	-	4.51	-
5200MHz	4.19	-	-	4.19	-	-
5210MHz	-	-	3.88	-	-	3.88
5230MHz	-	3.81	-	-	3.81	-
5240MHz	4.17	-	-	4.17	-	-
5260MHz	3.84	-	-	3.84	-	-
5270MHz	-	4.02	-	-	4.02	-
5290MHz	-	-	4.12	-	-	4.12
5300MHz	4.12	-	-	4.12	-	-
5310MHz	-	3.97	-	-	3.97	-
5320MHz	4.14	-	-	4.14	-	-
5500MHz	3.97	-	-	3.97	-	-
5510MHz	-	4.15	-	-	4.15	-
5530MHz	-	-	4.27	-	-	4.27
5550MHz	-	4.04	-	-	4.04	-
5580MHz	4.46	-	-	4.46	-	-
5670MHz	-	3.82	-	-	3.82	-
5700MHz	3.63	-	-	3.63	-	-
5745MHz	4.16	-	-	4.16	-	-
5755MHz	-	5.01	-	-	5.01	-
5775MHz	-	-	4.23	-	-	4.23
5785MHz	3.95	-	-	3.95	-	-
5795MHz	-	3.33	-	-	3.33	-
5825MHz	4.17	-	-	4.17	-	-

Note:

1. Antenna Gain refer to "TG389ac HP with shielding antenna table_20161012.xls" files
2. Maximum Correlated Directional Gain = $10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{ANT}]$ dBi
3. Maximum Uncorrelated Directional Gain = $10 \log[(10^{G_1/10} + 10^{G_2/10} + \dots + 10^{G_N/10}) / N_{ANT}]$ dBi

2.5 Calculation Result of Maximum Conducted Power

For WLAN – 2.4GHz Worst Condition: 802.11b 1Tx Chain1

Frequency (MHz)	Conducted Power		Directional Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
	(dBm)	(mW)				
2437	25.86	385.478	3.94	20	0.18996	1

Note:

1. $P_{out} * G = \text{EIRP Power} = \text{Conducted Power(mW)} * \text{Gain(numeric)}$
2. $\text{Gain(dBi)} \text{ to } \text{Gain(numeric)} = 10^{(3.94/10)} = 2.477$
3. Distance (cm) = r = declare by manufacture = 20 cm
4. $P_d = (P_{out} * G) / (4 * \pi * r^2) = (385.478 * 2.477) / (4 * 3.1416 * 20^2) = 0.18996 \text{ (mW/cm}^2\text{)}$

For WLAN – 5GHz U_NII 1 Worst Condition: 11ac (20MHz) 1S3T TxBF

Frequency (MHz)	Conducted Power		Directional Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
	(dBm)	(mW)				
5240	25.61	363.915	5.66	20	0.26650	1

Note:

1. $P_{out} * G = \text{EIRP Power} = \text{Conducted Power(mW)} * \text{Gain(numeric)}$
2. $\text{Gain(dBi)} \text{ to } \text{Gain(numeric)} = 10^{(5.66/10)} = 3.681$
3. Distance (cm) = r = declare by manufacture = 20 cm
4. $P_d = (P_{out} * G) / (4 * \pi * r^2) = (363.915 * 3.681) / (4 * 3.1416 * 20^2) = 0.22650 \text{ (mW/cm}^2\text{)}$

For WLAN – 5GHz U_NII 3 Worst Condition: 11ac (20MHz) 1S3T TxBF

Frequency (MHz)	Conducted Power		Directional Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
	(dBm)	(mW)				
5825	25.88	387.258	6.32	20	0.33013	1

Note:

1. $P_{out} * G = \text{EIRP Power} = \text{Conducted Power(mW)} * \text{Gain(numeric)}$
2. $\text{Gain(dBi)} \text{ to } \text{Gain(numeric)} = 10^{(6.32/10)} = 4.285$
3. Distance (cm) = r = declare by manufacture = 20 cm
4. $P_d = (P_{out} * G) / (4 * \pi * r^2) = (387.258 * 4.285) / (4 * 3.1416 * 20^2) = 0.33013 \text{ (mW/cm}^2\text{)}$

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

$$\text{WLAN 2.4GHz} + \text{WLAN 5GHz} = (0.18996 / 1) + (0.33013 / 1) = 0.52009$$

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

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