

RF Exposure Report

Report No.: SA191209E01-1

FCC ID: RSE-FGA5330

Equipment Name: Gateway

Trade Name: Technicolor

Model Number: FGA5330

Product Code: FGA5330TCH2

Received Date: Dec. 09, 2019

Test Date: Feb. 21 to 22, 2020

Issued Date: June 17, 2020

Applicant: Technicolor Delivery Technologies Belgium

Address: Prins Boudewinnlaan 47 Edegem B-2650 Belgium

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

Hsin Chu Laboratory

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Taiwan

FCC Registration /

Designation Number: 723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
SA191209E01-1	Original release.	June 17, 2020



1 Certificate of Conformity

Product: Gateway

Brand: Technicolor

Test Model: FGA5330

Product Code: FGA5330TCH2

Sample Status: LAB2A

Applicant: Technicolor Delivery Technologies Belgium

Test Date: Feb. 21 to 22, 2020

Standards: FCC Part 2 (Section 2.1091)

IEEE C95.3-2002

References Test Guidance: KDB 447498 D01 General RF Exposure Guidance v06

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: June 17, 2020

Claire Kuan / Specialist

Approved by : _______, Date: _______, June 17, 2020

Clark Lin / Technical 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/cm²)	Average Time (minutes)				
	Limits For General Population / Uncontrolled Exposure							
300-1500	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

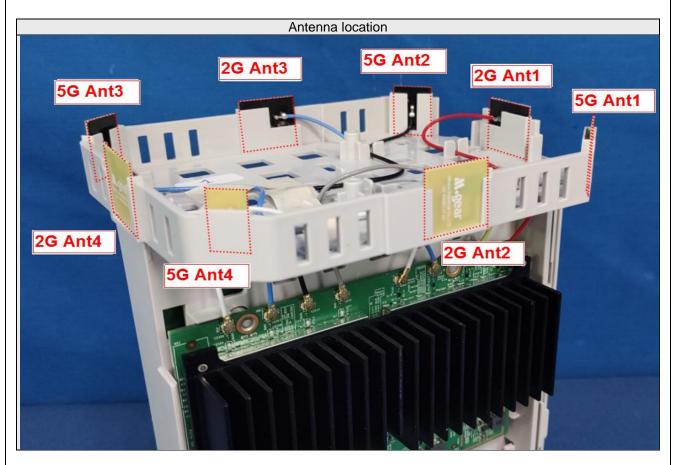
2.3 Classification

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**.

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2.4 Antenna Gain



Ant.	Brand	Model Name	Antenna Type	Connector
2G-1	WHA YU	C107-511586-A	PCB PIFA	I-pex
2G-2	WHA YU	C107-511589-A	PCB PIFA	I-pex
2G-3	WHA YU	C107-511587-A	PCB PIFA	I-pex
2G-4	WHA YU	C107-511588-A	PCB PIFA	I-pex

Antenna & Bandwidth for 2400~2483.5MHz

Number of Transmit Antennas	1TX		2TX		3TX		4TX	
Bandwidth Mode	20 MHz	40 MHz						
802.11b	V	Х	Х	Х	Х	Х	Х	Х
802.11g	V	Х	V	Х	V	Х	V	Х
802.11n	V	V	V	V	V	V	V	V
802.11ac	V	V	V	V	V	V	V	V
802.11ax	V	V	V	V	V	V	V	V

For 2400~2483.5MHz

1 01 2400~2403.3W112								
	Max Gain (dBi) For SISO mode							
Frequency	Ant. 1		Ant. 2		Ant. 3		Ant. 4	
	20 MHz	40 MHz	20 MHz	40 MHz	20 MHz	40 MHz	20 MHz	40 MHz
2412MHz	1.83	-	1.89	-	1.36	-	1.42	-
2422MHz	-	1.30	-	1.92	-	1.89	-	1.49
2437MHz	1.02	1.02	2.02	2.02	1.65	1.65	1.22	1.22
2452MHz	-	0.89	-	1.92	-	1.23	-	0.87
2462MHz	0.66	-	1.76	-	0.86	-	0.91	-



	Maximum Gain (dBi) for CDD mode						
	CDD mode (1	Stream 4 TX)	CDD mode (1	Stream 4 TX)			
Frequency	for Pow	for Power Gain		D Gain			
	(KDB 6629 ²	11 Option 2)	(KDB 6629 ⁻	11 Option 2)			
	20 MHz	40 MHz	20 MHz	40 MHz			
2412MHz	1.89	-	5.68	-			
2422MHz	-	1.92	-	5.74			
2437MHz	2.02	2.02	5.83	5.83			
2452MHz	- 1.92		-	5.53			
2462MHz	1.76	-	5.64	-			

	Maximum Gain (dBi) for TxBF mode				
	TxBF mode (1 Stream 4 TX)				
Frequency	for Power 8	R PSD Gain			
	(KDB 662911 Option 2)				
	20 MHz	40 MHz			
2412MHz	5.68	-			
2422MHz	-	5.74			
2437MHz	5.83	5.83			
2452MHz	-	5.53			
2462MHz	5.64	-			

	Maximum Gain (dBi) for TxBF mode				
		Stream 4 TX)			
Frequency	for Power & PSD Gain				
	(KDB 662911 Option 2)				
	20 MHz	40 MHz			
2412MHz	3.95	-			
2422MHz	-	4.02			
2437MHz	4.12	4.12			
2452MHz	•	3.83			
2462MHz	3.83	-			

	Maximum Gain (dBi) for TxBF mode				
	TxBF mode (3	3 Stream 4 TX)			
Frequency	for Power & PSD Gain				
	(KDB 662911 Option 2)				
	20 MHz	40 MHz			
2412MHz	1.87	-			
2422MHz	-	1.93			
2437MHz	1.83	1.83			
2452MHz	-	1.67			
2462MHz	1.62	-			

- Antenna Gain refer to "FGA5330_Antenna Test Report V1.18.pdf" files
 Maximum Correlated Directional Gain = 10 log[(10 G1/20 + 10 G2/20 + ... +10 GN/20)² / N ANT] dBi
 Maximum Uncorrelated Directional Gain = 10 log[(10 G1/10 + 10 G2/10 + ... +10 GN/10) / N ANT] dBi



Antenna & Bandwidth for 5150~5850MHz

Ant.	Brand	Model Name	Antenna Type	Connector
5G-1	WHA YU	C107-511590-A	PCB Loop	I-pex
5G-2	WHA YU	C107-511591-A	PCB Dipole	I-pex
5G-3	WHA YU	C107-511592-A	PCB Dipole	I-pex
5G-4	WHA YU	C107-511593-A	PCB Dipole	I-pex

Antenna & Bandwidth

Antenna	1st (TX)				2nd (TX)			
Bandwidth Mode	20 MHz	40 MHz	80 MHz	160 MHz	20 MHz	40 MHz	80 MHz	160 MHz
802.11a	V	Х	Χ	Х	V	Х	Х	Х
802.11n	V	V	Χ	Χ	٧	٧	Χ	X
802.11ac	V	V	V	V	V	V	V	V
802.11ax	V	V	V	V	V	V	V	V

Antenna		3rd	(TX)		4th (TX)			
Bandwidth Mode	20 MHz	40 MHz	80 MHz	160 MHz	20 MHz	40 MHz	80 MHz	160 MHz
802.11a	V	Χ	Χ	Χ	٧	Χ	Χ	Х
802.11n	V	V	Χ	Χ	٧	٧	Χ	Х
802.11ac	V	V	V	V	V	V	V	V
802.11ax	V	V	V	V	V	V	V	V



	Maximum Gain (dBi) for CDD mode								
Fraguency	CI	DD mode (1	Stream 4 T	X)	CDD mode (1 Stream 4 TX)				
Frequency		for Pow	er Gain			for PS	D Gain		
	20 MHz	40 MHz	80MHz	160MHz	20 MHz	40 MHz	80MHz	160MHz	
5180MHz	2.85	-	-	-	6.07	-	-	-	
5190MHz	-	2.83	-	-	-	6.03	-	-	
5200MHz	2.53	-	-	-	6.12	-	-	-	
5210MHz	-	-	2.64	-	-	-	5.83	-	
5230MHz	-	2.5	-	-	-	6.08	-	-	
5240MHz	2.64	-	-	-	5.83	-	-	-	
5250MHz	-	-	-	3.04	-	-	-	6.16	
5260MHz	3.04	-	-	-	5.87	-	-	-	
5270MHz	-	2.60	-	-	-	6.33	-	-	
5290MHz	-	-	2.81	-	-	-	5.98	-	
5300MHz	2.69	-	-	-	6.18	-	-	-	
5310MHz	-	2.30	-	-	-	6.01	-	-	
5320MHz	2.56	-	-	-	5.75	-	-	-	
5500MHz	2.38	-	-	-	6.08	-	-	-	
5510MHz	-	2.78	-	-	-	6.32	-	-	
5530MHz	-	-	2.97	-	-	-	6.59	-	
5550MHz	-	2.75	-	-	-	6.00	-	-	
5570MHz	-	-	-	3.45	-	-	-	5.70	
5580MHz	3.13	-	-	-	6.58	-	-	-	
5610MHz	-	-	2.92	-	-	-	5.47	-	
5670MHz	-	3.09	-	-	-	5.67	-	-	
5690MHz	-	-	3.72	-	-	-	6.63	-	
5700MHz	3.17	-	-	-	5.86	-	-	-	
5710MHz	-	3.23	-	-	-	5.96	-	-	
5720MHz	3.18	-	-	-	5.85	-	-	-	
5745MHz	3.20	-	-	-	5.91	-	-	-	
5755MHz	-	4.18	-	-	-	7.26	-	-	
5775MHz	-	-	3.62	-	-	-	6.39	-	
5785MHz	4.05	-	-	-	5.96	-	-	-	
5795MHz	-	2.94	-	-	-	6.00	-	-	
5825MHz	3.78	-	-	-	5.83	-	-	-	

Note:

- Antenna Gain refer to "FGA5330_Antenna Test Report V1.18.pdf" files
 Maximum Correlated Directional Gain = 10 log[(10 G1/20 + 10 G2/20 + ... +10 GN/20)² / N ANT] dBi
 Maximum Uncorrelated Directional Gain = 10 log[(10 G1/10 + 10 G2/10 + ... +10 GN/10) / N ANT] dBi
- 4. The Max. Power = Max. tune up power including tolerance.



	Maximum Gain (dBi) for TxBF mode									
Fraguenay	TxBF mode (1 Stream 4 TX)									
Frequency	for Power Gain & PSD Gain									
	20 MHz	40 MHz	80MHz	160MHz						
5180MHz	6.07	-	-	-						
5190MHz	-	6.03	-	-						
5200MHz	6.12	-	-	-						
5210MHz	-	-	5.83	-						
5230MHz	-	6.08	-	-						
5240MHz	5.83	-	-	-						
5250MHz	-	-	-	6.16						
5260MHz	5.87	-	-	-						
5270MHz	-	6.33	-	-						
5290MHz	-	-	5.98	-						
5300MHz	6.18	-	-	-						
5310MHz	-	6.01	-	-						
5320MHz	5.75			-						
5500MHz	6.08			-						
5510MHz	-	6.32	-	-						
5530MHz	-	-	6.59	-						
5550MHz	-	6.00	-	-						
5570MHz	-	-	-	5.70						
5580MHz	6.58	-	-	-						
5610MHz	-	-	5.47	-						
5670MHz	-	5.67	-	-						
5690MHz	-	-	6.63	-						
5700MHz	5.86	-	-	-						
5710MHz	-	5.96	-	-						
5720MHz	5.85	-	-	-						
5745MHz	5.91	-	-	-						
5755MHz	-	7.26	-	-						
5775MHz	-	-	6.39	-						
5785MHz	5.96	-	-	-						
5795MHz	-	6.00	-	-						
5825MHz	5.83	-	-	-						

Note:

- Antenna Gain refer to "FGA5330_Antenna Test Report V1.18.pdf" files
 Maximum Correlated Directional Gain = 10 log[(10 G1/20 + 10 G2/20 + ... +10 GN/20)² / N ANT] dBi
 Maximum Uncorrelated Directional Gain = 10 log[(10 G1/10 + 10 G2/10 + ... +10 GN/10) / N ANT] dBi
- 4. The Max. Power = Max. tune up power including tolerance.



		Maximum Gain (dl	Bi) for TXBF mode							
Fraguenav	TXBF mode (2 Stream 4 TX)									
Frequency	for Power Gain & PSD Gain									
	20 MHz	40 MHz	80MHz	160MHz						
5180MHz	4.44	-	-	-						
5190MHz	=	4.60	-	-						
5200MHz	4.66	-	-	-						
5210MHz	-	-	4.36	-						
5230MHz	-	4.63	-	-						
5240MHz	4.36	-	-	-						
5250MHz	-	-	-	4.64						
5260MHz	4.47	-	-	-						
5270MHz	-	4.86	-	-						
5290MHz	-	-	4.55	-						
5300MHz	4.61	-	-	-						
5310MHz	-	4.48	-	-						
5320MHz	4.25			-						
5500MHz	4.28	-	-	-						
5510MHz	-	4.56	-	-						
5530MHz	-	-	4.87	-						
5550MHz	-	4.58	-	-						
5570MHz	-	-	-	4.27						
5580MHz	4.66	-	-	-						
5610MHz	-	-	3.87	-						
5670MHz	-	4.16	-	-						
5690MHz	-	-	5.02	_						
5700MHz	4.43	_	-	-						
5710MHz	-	4.20	-	_						
5720MHz	4.32	-	-	_						
5745MHz	4.27	_	-	-						
5755MHz	-	5.7	-	-						
5775MHz	-	-	4.87	-						
5785MHz	4.40	-	-	_						
5795MHz	-	4.11	-	_						
5825MHz	4.58	-	-	_						

- Antenna Gain refer to "FGA5330_Antenna Test Report V1.18.pdf" files
 Maximum Correlated Directional Gain = 10 log[(10 G1/20 + 10 G2/20 + ... +10 GN/20)² / N ANT] dBi
 Maximum Uncorrelated Directional Gain = 10 log[(10 G1/10 + 10 G2/10 + ... +10 GN/10) / N ANT] dBi
- 4. The Max. Power = Max. tune up power including tolerance.



	Maximum Gain (dBi) for TXBF mode								
Frequency	TXBF mode (3 Stream 4 TX)								
ricquerioy	for Power Gain & PSD Gain								
	20 MHz	40 MHz	80MHz	160MHz					
5180MHz	2.51	-	-	-					
5190MHz	=	2.33	-	-					
5200MHz	2.39	-	-	-					
5210MHz	-	-	2.25	-					
5230MHz	-	2.51	-	-					
5240MHz	2.25	-	-	-					
5250MHz	-	-	-	2.40					
5260MHz	2.25	-	-	-					
5270MHz	-	2.66	-	-					
5290MHz	-	-	2.32	-					
5300MHz	2.31	-	-	-					
5310MHz	-	2.17	-	-					
5320MHz	1.94	-	-	-					
5500MHz	2.19	-	-	-					
5510MHz	-	2.58	-	-					
5530MHz	-	-	2.88	-					
5550MHz	-	2.56	-	-					
5570MHz	-	-	-	2.25					
5580MHz	2.46	-	-	-					
5610MHz	-	-	1.99	-					
5670MHz	-	2.26	-	-					
5690MHz	-	-	3.05	-					
5700MHz	2.57	-	-	-					
5710MHz	-	2.31	-	-					
5720MHz	2.48	-	-	-					
5745MHz	2.51	-	-	-					
5755MHz	-	3.42	-	-					
5775MHz	-	-	2.65	-					
5785MHz	2.50	-	-	-					
5795MHz	-	1.92	-	-					
5825MHz	2.38	-	-	-					

- Antenna Gain refer to "FGA5330_Antenna Test Report V1.18.pdf" files
 Maximum Correlated Directional Gain = 10 log[(10 G1/20 + 10 G2/20 + ... +10 GN/20)² / N ANT] dBi
 Maximum Uncorrelated Directional Gain = 10 log[(10 G1/10 + 10 G2/10 + ... +10 GN/10) / N ANT] dBi
- 4. The Max. Power = Max. tune up power including tolerance.



2.5 Calculation Result of Maximum Conducted Power

For WLAN - 2.4GHz Worst Condition: 11ax (20MHz) 1S4T TxBF

Frequency Conducted Power		Directional Gain	Distance	Power Density	Limit	
(MHz)	(dBm)	(mW)	(dBi)	(cm)	(mW/cm ²)	(mW/cm ²)
2437	27.62	578.096	5.83	30	0.19567	1

Note:

- 1. Pout*G = EIRP Power = Conducted Power(mW) * Gain(numeric)
- 2. Gain(dBi) to Gain(numeric) = $10^{(5.83/10)}$ = 3.828
- 3. Distance (cm) = r = declare by manufacture = 30 cm
- 4. Pd = (Pout*G) / (4*pi*r2) = (578.096 * 3.828) / (4 * 3.1416 * 30²) = 0.19568 (mW/cm²)

For WLAN - 5GHz U NII 1 Worst Condition: 11ax (20MHz) 1S4T TxBF

Frequency	Conducted Power (dBm) (mW)		Directional Gain	Distance	Power Density	Limit
(MHz)			(dBi)	(cm)	(mW/cm²)	(mW/cm²)
5200	29.65	922.571	6.12	30	0.33388	1

Note:

- Pout*G = EIRP Power = Conducted Power(mW) * Gain(numeric)
- 2. Gain(dBi) to Gain(numeric) = $10^{(6.12/10)} = 4.093$
- 3. Distance (cm) = r = declare by manufacture = 30 cm
- 4. $Pd = (Pout*G) / (4*pi*r^2) = (922.571 * 4.093) / (4 * 3.1416 * 30^2) = 0.33388 (mW/cm^2)$

For WLAN - 5GHz_U_NII_2A Worst Condition: 11ax (20MHz) 1S4T TxBF

Frequency	Conducted Power				Distance	Power Density	Limit
(MHz)	(dBm)	(mW)	(dBi)	(cm)	(mW/cm ²)	(mW/cm ²)	
5300	23.73	236.048	6.18	30	0.08662	1	

Note:

- 1. Pout*G = EIRP Power = Conducted Power(mW) * Gain(numeric)
- 2. Gain(dBi) to Gain(numeric) = $10^{(6.33/10)} = 4.150$
- 3. Distance (cm) = r = declare by manufacture = 30 cm
- 4. $Pd = (Pout*G) / (4*pi*r^2) = (236.048 * 4.150) / (4 * 3.1416 * 30^2) = 0.08662 (mW/cm^2)$

For WLAN – 5GHz_U_NII_2C Worst Condition: 11ax (20MHz) 1S4T TxBF

Frequency Conducted Power		Directional Gain	Distance	Power Density	Limit	
(MHz)	(dBm)	(mW)	(dBi)	(cm)	(mW/cm ²)	(mW/cm ²)
5580	23.33	215.278	6.58	30	0.08861	1

Note:

- 1. Pout*G = EIRP Power = Conducted Power(mW) * Gain(numeric)
- 2. Gain(dBi) to Gain(numeric) = $10^{(6.08/10)} = 4.550$
- 3. Distance (cm) = r = declare by manufacture = 30 cm
- 4. $Pd = (Pout*G) / (4*pi*r^2) = (215.278 * 4.550) / (4 * 3.1416 * 30^2) = 0.08861 (mW/cm^2)$



For WLAN – 5GHz_U_NII_3 Worst Condition: 11ax (40MHz) 1S4T TxBF

Frequency Conducted Power		Directional Gain	Distance	Power Density	Limit	
(MHz)	(dBm)	(mW)	(dBi)	(cm)	(mW/cm ²)	(mW/cm ²)
5755	28.65	732.825	7.26	30	0.34478	1

Note:

- 1. Pout*G = EIRP Power = Conducted Power(mW) * Gain(numeric)
- 2. Gain(dBi) to Gain(numeric) = $10^{(2.50/10)} = 5.321$
- 3. Distance (cm) = r = declare by manufacture = 30 cm
- 4. $Pd = (Pout*G) / (4*pi*r2) = (732.825*5.321) / (4*3.1416*30^2) = 0.34478 (mW/cm^2)$

Conclusion:

The formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 +etc. < 1

CPD = Calculation power density

LPD = Limit of power density

WLAN 2.4GHz + WLAN 5GHz = (0.19567 / 1) + (0.34478 / 1) = 0.54045

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

--- END ---