

FCC RF EXPOSURE REPORT

FCC ID: VOB-P2897

Project No. : 1602C038
Equipment : SHIELD Android TV Game Console
Model : P2897
Applicant : NVIDIA Corporation
Address : 2701 San Tomas Expressway, Santa Clara, CA, 95050, USA

According to : FCC Guidelines for Human Exposure IEEE C95.1

B T L I N C .

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MPE CALCULATION METHOD:

Calculation Method of RF Safety Distance:

$$S = \frac{PG}{4\pi^2} = \frac{EIRP}{4\pi^2}$$

where:

S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

Table for Filed Antenna

BT+ LE:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain(dBi)
1	NVIDIA Corporation	N/A	Monopole Antenna	N/A	3.88

2.4G WIFI:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain(dBi)
1	NVIDIA Corporation	N/A	Monopole Antenna	N/A	3.88
2	NVIDIA Corporation	N/A	Monopole Antenna	N/A	2.80

Note:

- The EUT incorporates a MIMO function. Physically, the EUT provides two completed two transmitters and two receivers (2T2R). all transmit signals are completely correlated, then, Direction gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2/N]$, that is
Directional gain = $10 \log[(10^{3.88/20} + 10^{2.80/20})^2/2] = 6.37\text{dBi}$
- The Output Power limit is $30 - 6.37 + 6 = 29.63 \text{ dBm}$
- The PSD limit is $8 - 6.37 + 6 = 7.63 \text{ dBm}$

Operating Mode	1TX	2TX
	TX Mode	
802.11b	V (ANT 1 or ANT 2)	-
802.11g	V (ANT 1 or ANT 2)	-
802.11n(20MHz)	-	V (ANT 1 + ANT 2)

5G:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain(dBi)	Note
1	NVIDIA Corporation	N/A	Monopole Antenna	N/A	4.55	UNII-1 UNII-2A
2	NVIDIA Corporation	N/A	Monopole Antenna	N/A	4.43	UNII-1 UNII-2A

Ant.	Brand	Model Name	Antenna Type	Connector	Gain(dBi)	Note
1	NVIDIA Corporation	N/A	Monopole Antenna	N/A	5.32	UNII-2C
2	NVIDIA Corporation	N/A	Monopole Antenna	N/A	6.57	UNII-2C

Ant.	Brand	Model Name	Antenna Type	Connector	Gain(dBi)	Note
1	NVIDIA Corporation	N/A	Monopole Antenna	N/A	5.22	UNII-3
2	NVIDIA Corporation	N/A	Monopole Antenna	N/A	6.75	UNII-3

Note:

- The EUT incorporates a MIMO function. Physically, the EUT provides two completed two transmitters and two receivers (2T2R). all transmit signals are correlated, then, Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2/N]$, that are
 UNII-1, UNII-2A Directional gain= $10 \log[(10^{4.55/20} + 10^{4.43/20})^2/2] = 7.50$ dBi
 UNII-2C Directional gain= $10 \log[(10^{5.32/20} + 10^{6.57/20})^2/2] = 8.98$ dBi
 UNII-3 Directional gain= $10 \log[(10^{5.22/20} + 10^{6.75/20})^2/2] = 9.03$ dBi
- The UNII-1 and UNII-2A Output Power limit is $24-7.50+6=22.50$ dBm
 The UNII-2C Output Power limit is $24-8.98+6=21.02$ dBm
 The UNII-3 Output Power limit is $30-9.03+6=26.97$ dBm
- The UNII-1 and UNII-2A PSD limit is $11-7.50+6=9.50$ dBm/MHz
 The UNII-2C PSD limit is $11-8.98+6=8.02$ dBm/MHz
 The UNII-3 PSD limit is $30-9.03+6=26.97$ dBm/500kHz.

Operating Mode	1TX	2TX
TX Mode		
802.11a	V (ANT 1 or ANT 2)	-
802.11n (20MHz)	-	V (ANT 1+ANT 2)
802.11n (40MHz)	-	V (ANT 1+ANT 2)
802.11ac (20MHz)	-	V (ANT 1+ANT 2)
802.11ac (40MHz)	-	V (ANT 1+ANT 2)
802.11ac (80MHz)	-	V (ANT 1+ANT 2)

TEST RESULTS

BT

EUT :	SHIELD Android TV Game Console	Model Name :	P2897
Temperature :	25 °C	Relative Humidity:	55 %
Test Voltage :	AC 120V/60Hz		
Test Mode :	TX Mode _1Mbps		

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
3.88	2.4434	11.43	13.8995	0.00676006	1	Complies
3.88	2.4434	11.15	13.0317	0.00633797	1	Complies
3.88	2.4434	11.14	13.0017	0.00632340	1	Complies

EUT :	SHIELD Android TV Game Console	Model Name :	P2897
Temperature :	25 °C	Relative Humidity:	55 %
Test Voltage :	AC 120V/60Hz		
Test Mode :	TX Mode _1Mbps		

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
3.88	2.4434	9.11	8.1470	0.00396233	1	Complies
3.88	2.4434	10.61	11.5080	0.00559694	1	Complies
3.88	2.4434	10.9	12.3027	0.00598343	1	Complies

BLE:

EUT :	SHIELD Android TV Game Console	Model Name :	P2897
Temperature:	25 °C	Relative Humidity:	55 %
Test Voltage :	AC 120V/60Hz		
Test Mode :	CH00, CH19 , CH39		

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
3.88	2.4434	8.00	6.3096	0.00306867	1	Complies
3.88	2.4434	9	7.9433	0.00386323	1	Complies
3.88	2.4434	10	10.0000	0.00486352	1	Complies

2.4G WIFI:

EUT :	SHIELD Android TV Game Console	Model Name :	P2897
Temperature:	25 °C	Relative Humidity:	55 %
Test Voltage :	AC 120V/60Hz		
Test Mode :	TX N-40M MODE_Total /CH03, CH06, CH09		

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
3.88	2.4434	26.22	418.7936	0.20368093	1	Complies
3.88	2.4434	28.45	699.8420	0.34036929	1	Complies
3.88	2.4434	26.83	481.9478	0.23439609	1	Complies

UNII-1

EUT :	SHIELD Android TV Game Console	Model Name :	P2897
Temperature:	25 °C	Relative Humidity:	55 %
Test Voltage :	AC 120V/60Hz		
Test Mode :	UNII-1/TX A Mode_ANT1		

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
4.55	2.8510	21.05	127.3503	0.07226872	1	Complies
4.55	2.8510	22.22	166.7247	0.09461290	1	Complies
4.55	2.8510	22.13	163.3052	0.09267239	1	Complies

UNII-2A

EUT :	SHIELD Android TV Game Console	Model Name :	P2897
Temperature:	25 °C	Relative Humidity:	55 %
Test Voltage :	AC 120V/60Hz		
Test Mode :	UNII-2A/TX N20 Mode_Total		

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
4.55	2.8510	21.46	139.9587	0.07942375	1	Complies
4.55	2.8510	21.39	137.7209	0.07815385	1	Complies
4.55	2.8510	21.38	137.4042	0.07797410	1	Complies

UNII-2C

EUT :	SHIELD Android TV Game Console	Model Name :	P2897
Temperature:	25 °C	Relative Humidity:	55 %
Test Voltage :	AC 120V/60Hz		
Test Mode :	UNII-2C/TX A Mode_ANT1		

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
6.57	4.5394	19.09	81.0961	0.07327408	1	Complies
6.57	4.5394	21.8	151.3561	0.13675725	1	Complies
6.57	4.5394	17.37	54.5758	0.04931174	1	Complies

UNII-3

EUT :	SHIELD Android TV Game Console	Model Name :	P2897
Temperature:	25 °C	Relative Humidity:	55 %
Test Voltage :	AC 120V/60Hz		
Test Mode :	UNII-3/TX N20 Mode_Total		

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
6.75	4.7315	25.99	397.1915	0.37406784	1	Complies
6.75	4.7315	25.87	386.3670	0.36387345	1	Complies
6.75	4.7315	25.51	355.6313	0.33492716	1	Complies

Note: the calculated distance is 20 cm.