

FCC RF Exposure Evaluation

1. Product Information

FCC ID:	2ASRT-NPX640
Product name	Multi Function Projector
Model number	NeoPix Ultra, NPX640/INT, NeoPix ACE
Model Declaration	PCB board, structure and internal of these model(s) are the same, So no additional models were tested.
Test Model	NeoPix Ultra
Power supply	Input: 100-240V~, 50/60Hz, 2.5A Max Output: 19V 7A
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK for Bluetooth V5.0 (BDR/EDR) 802.11b: DSSS; 802.11g/n: OFDM
Antenna Type	PCB antenna
Antenna Gain	0dBi (maximum)
Hardware version	/
Software version	/
Operation frequency	2402MHz-2480MHz IEEE 802.11b:2412-2462MHz IEEE 802.11g:2412-2462MHz IEEE 802.11n HT20:2412-2462MHz IEEE 802.11n HT40:2422-2452MHz
Bluetooth Version	V5.0
Exposure category	General population/uncontrolled environment
EUT Type	Production Unit
Device Type	Portable Device

2. Evaluation Method

According to KDB447498 D01 General RF Exposure Guidance v06Section 4.3.1 Standalone SAR test exclusion considerations: "Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition, listed below, is satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions. The minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander (see 5) of section 4.1). To qualify for SAR test exclusion, the test separation distances applied must be fully explained and justified by the operating configurations and exposure conditions of the transmitter and applicable host platform requirements, typically in the SAR measurement or SAR analysis report, according to the required published RF exposure KDB procedures. When no other RF exposure testing or reporting is required, a statement of justification and compliance must be included in the equipment approval, in lieu of the SAR report, to qualify for the SAR test exclusion. When required, the device specific conditions described in the other published RF exposure KDB procedures must be satisfied before applying these SAR test exclusion provisions; for example, handheld PTT two-way radios, handsets, laptops & tablets etc."

$$\left[\frac{\text{(max. power of channel, including tune-up tolerance, mW)}}{\text{(min. test separation distance, mm)}} \right] \cdot [\sqrt{f} \text{ (GHz)}] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where:}$$

- f (GHz) is the RF channel transmit frequency in GHz
 - Power and distance are rounded to the nearest mW and mm before calculation
 - The result is rounded to one decimal place for comparison
 - 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below
- The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is

< 5 mm, a distance of 5 mm according to f) in section 4.1 is applied to determine SAR test exclusion.

When one of the following test exclusion conditions is satisfied for all combinations of simultaneous transmission configurations, further equipment approval is not required to incorporate transmitter modules in host devices that operate in the mixed mobile and portable host platform exposure conditions. The grantee is responsible for documenting this according to Class I permissive change requirements. Antennas that qualify for standalone SAR test exclusion must apply the estimated standalone SAR to determine simultaneous transmission test exclusion.

- a) The $[\sum \text{of (the highest measured or estimated SAR for each standalone antenna configuration, adjusted for maximum tune-up tolerance)} / 1.6 \text{ W/kg}] + [\sum \text{of MPE ratios}] \leq 1.0$.
- b) The SAR to peak location separation ratios of all simultaneously transmitting antenna pairs operating in portable device exposure conditions are all ≤ 0.04 , and the $[\sum \text{of MPE ratios}] \leq 1.0$.

3. Refer Evaluation Method

[ANSI C95.1-1999](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

[FCC KDB publication 447498 D01 General RF Exposure Guidance v06](#): Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

[FCC CFR 47 part1 1.1310](#): Radiofrequency radiation exposure limits.

[FCC CFR 47 part2 2.1093](#): Radiofrequency radiation exposure evaluation: portable devices

4. Conducted Power Results

[BT Classics]

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
GFSK	0	2402	3.336
	39	2441	3.512
	78	2480	4.123
$\pi/4$ DQPSK	0	2402	2.545
	39	2441	2.730
	78	2480	3.310
8DPSK	0	2402	2.596
	39	2440	2.812
	78	2480	3.430

<2.4GWLAN>

Mode	Channel	Frequency(MHz)	Average Conducted Output Power (dBm)
IEEE 802.11b	LCH	2412	10.00
	MCH	2437	9.83
	HCH	2462	9.41
IEEE 802.11g	LCH	2412	14.11
	MCH	2437	14.51
	HCH	2462	13.68
IEEE 802.11n HT20	LCH	2412	14.03
	MCH	2437	14.63
	HCH	2462	13.81
IEEE 802.11n HT40	LCH	2422	14.36
	MCH	2437	14.54
	HCH	2452	11.11

5. Manufacturing Tolerance

[BT Classics]			
GFSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	4	4	4
Tolerance \pm (dB)	1.0	1.0	1.0
π /4DQPSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	3	3	3
Tolerance \pm (dB)	1.0	1.0	1.0
8DPSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	3	3	3
Tolerance \pm (dB)	1.0	1.0	1.0

<2.4GWLAN>			
IEEE 802.11b (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	10.0	10.0	10.0
Tolerance \pm (dB)	1.0	1.0	1.0
IEEE 802.11g (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	14.0	14.0	14.0
Tolerance \pm (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	14.0	14.0	14.0
Tolerance \pm (dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	14.0	14.0	11.0
Tolerance \pm (dB)	1.0	1.0	1.0

6. Evaluation Results

6.1 Standalone Evaluation

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
IEEE 802.11b	10.00	10.0000	0	1.0000	0.0020	1.0000
IEEE 802.11g	14.51	28.2488	0	1.0000	0.0056	1.0000
IEEE 802.11n HT20	14.63	29.0402	0	1.0000	0.0058	1.0000
IEEE 802.11n HT40	14.54	28.4446	0	1.0000	0.0057	1.0000
GFSK	4.123	2.5840	0	1.0000	0.0005	1.0000
π /4DQPSK	3.310	2.1429	0	1.0000	0.0004	1.0000
8DPSK	3.430	2.2029	0	1.0000	0.0004	1.0000

Remark:

1. Output power including turn-up tolerance;
2. Output power is burst average power;
3. MPE evaluate distance is 20cm from user manual provide by manufacturer;
4. MPE values = $PG/4\pi R^2$

6.1 Simultaneous Transmission for SAR Exclusion

The sample support one antenna, no need consider simultaneous transmission

7. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

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