



RF Exposure Evaluation

FCC ID: 2APJB-NE1D

1. Client Information

Applicant	:	Netool llc
Address	:	P.O. box 2500Minden NV 89423 USA
Manufacturer	:	Shenzhen WUDOUMI Electronics technology company limited
Address	:	5th Building, Xinhui industrial zone, Bantian Street, Longgang, Shenzhen, China.

2. General Description of EUT

EUT Name	netool.io handheld network analyzer.	
Models No.	NE1D, NE1E	
Model Different	All these models are identical in the same PCB, layout and electrical circuit, The only difference is model name.	
Product Description	Operation Frequency:	802.11b/g/n(HT20): 2412MHz~2462MHz 802.11n(HT40): 2422MHz~2452MHz
	Number of Channel:	802.11b/g/n(HT20):11 channels 802.11n(HT40): 7 channels
	Antenna Gain:	2.64dBi Ceramic Antenna
	Modulation Type:	802.11b: DSSS(CCK, DQPSK, DBPSK) 802.11g/n:OFDM(BPSK,QPSK,16QAM,64QAM)
	Bit Rate of Transmitter:	802.11b:11/5.5/2/1 Mbps 802.11g:54/48/36/24/18/12/9/6 Mbps 802.11n:up to 150Mbps
Power Supply	:	Input: DC 5V/1A Output: DC 5V/0.8A DC 3.7V by 2500mAh Rechargeable Li-ion battery
Software Version	:	V2.0.9
Hardware Version	:	V1.4
Remark: The antenna gain provided by the applicant, the adapter and verified for the RF conduction test and adapter provided by TOBY test lab.		

Note: More test information about the EUT please refer the RF Test Report.

SAR Test Exclusion Calculations

1. FCC: According to KDB 447498 D01 Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies v06.

(1) Clause 4.3: General SAR test reduction and exclusion guidance

Sub clause 4.31: Standalone SAR test exclusion considerations

1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6GHz at test separation distance ≤ 5 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation, mm})] \cdot [\sqrt{f_{\text{GHz}}}] \leq 3.0$ for 1-g SAR

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation, mm})] \cdot [\sqrt{f_{\text{GHz}}}] \leq 7.5.0$ for 10-g SAR

2. Summary simultaneous transmission for SAR Exclusion

The SAR exemption limits outlined in clause 4.3.2(b) of KDB 447498 have been derived based on an approximate SAR value of 0.4 W/kg using half-wave dipole antennas Footnote 1. As such, when simultaneous transmitter SAR evaluations include transmitters that have been exempt from routine SAR evaluation, the SAR must be estimating based on the ratio between the maximum tune-up tolerance limit of the transmitter that has been exempt and the exemption limit at the specific distance and frequency for that transmitter. This ratio must be multiplied by 0.4 W/kg (2.0 W/kg for controlled use and 1.0 W/kg for limb worn devices) in order to calculate the estimated SAR level.

The estimate SAR value is calculated based the following equation:

(maximum power level including tune-up tolerance for transmitter A / maximum power level of exemption at the same frequency and distance) * 0.4W/kg

- 1) $[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{\text{GHz}}/x}]$ W/kg, for test separation distances ≤ 50 mm;

where $x = 7.5$ for 1-g SAR and $x = 18.75$ for 10-g SAR.

- 2) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distance is > 50 mm.³⁷

The $[\Sigma \text{ of (the highest measured or estimated SAR for each standalone antenna configuration, adjusted for maximum tune-up tolerance) / 1.6 W/kg} + [\Sigma \text{ of MPE ratios}]]$ is ≤ 1.0 .

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 $[\Sigma \text{ of MPE ratios}]$ is ≤ 1.0 .



3. Calculation:

TestMode	Antenna	Channel	Result[dBm]	Turn-up Power Tolerance (dB)	Max power of tune up tolerance (dBm)	Max power of tune up tolerance (mw)	Calculation Value
11B	Ant1	2412	8.08	8 ± 1	9	7.943	2.467
	Ant2	2412	8.20	8 ± 1	9	7.943	2.480
	Ant1	2437	7.90	7 ± 1	8	6.310	1.970
	Ant2	2437	8.19	8 ± 1	9	7.943	2.480
	Ant1	2462	7.94	7 ± 1	8	6.310	1.980
	Ant2	2462	7.68	7 ± 1	8	6.310	1.980
11G	Ant1	2412	7.15	7 ± 1	8	6.310	1.960
	Ant2	2412	7.70	7 ± 1	8	6.310	1.960
	Ant1	2437	7.24	7 ± 1	8	6.310	1.970
	Ant2	2437	7.61	7 ± 1	8	6.310	1.970
	Ant1	2462	7.10	7 ± 1	8	6.310	1.980
	Ant2	2462	7.56	7 ± 1	8	6.310	1.980
11N20	Ant1	2412	4.16	4 ± 1	5	3.162	0.982
	Ant2	2412	5.51	5 ± 1	6	3.981	1.237
	Ant1	2437	3.87	3 ± 1	4	2.512	0.784
	Ant2	2437	5.65	5 ± 1	6	3.981	1.243
	Ant1	2462	3.87	3 ± 1	4	2.512	0.788
	Ant2	2462	5.29	5 ± 1	6	3.981	1.249
11N40	Ant1	2422	4.83	4 ± 1	5	3.162	0.984
	Ant2	2422	5.77	5 ± 1	6	3.981	1.239
	Ant1	2437	5.22	5 ± 1	6	3.981	1.243
	Ant2	2437	6.31	6 ± 1	7	5.012	1.565
	Ant1	2452	4.90	4 ± 1	5	3.162	0.990
	Ant2	2452	5.73	5 ± 1	6	3.981	1.247

Simultaneous Transmission for SAR Exclusion			
Simultaneous Transmission for SAR Exclusion		Total Calculation Value	Limit
2.4GWiFi Ant1	2.4GWiFi Ant2		
0.335	0.335	0.41875	1.0
Note: The sample support one BT modular and BLE modular, they supports difference antenna, need consider Σ of (the highest measured or estimated $SAR_{WiFi} + SAR_{WiFi}$)/1.6 = (0.335+0.335)/1.6 = 0.41875 < 1.0;			

Conclusion:

The measurement results comply with the FCC Limit per 47 CFR 2.1093 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB 447498 v06.

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