

Maximum Permissible Exposure Evaluation

FCC ID: 2APBP-CM30

1. Client Information

Applicant	:	Ciontek Technology Corp.
Address	:	B501, Chanxueyan Building Wuhan University, No.6 Of Yuexing 2nd Road, Yuehai Street, Nanshan District, Shenzhen, China
Manufacturer	:	Ciontek Technology Corp.
Address	:	B501, Chanxueyan Building Wuhan University, No.6 Of Yuexing 2nd Road, Yuehai Street, Nanshan District, Shenzhen, China

2. General Description of EUT

EUT Name	:	Smart POS Payment Terminal
Model(s) No.	:	CM30, CM30P, CM30L, CM30S, CM30M, CM30C, CM30A, CM30V, CM30X, CM30G
Model Difference	:	All PCB boards and circuit diagrams are the same, the only difference is that colors.
Product Description	:	Operation Frequency: Bluetooth: 2402MHz~2480MHz 802.11b/g/n(HT20): 2412MHz~2462MHz 802.11n(HT40): 2422MHz~2452MHz U-NII-1: 5180MHz~5240MHz U-NII-3: 5745MHz~5825MHz NFC: 13.56MHz GSM 850: 824.20MHz-848.80MHz PCS1900: 1850.20MHz-1909.80MHz UMTS Band II: 1852.40MHz-1907.60MHz UMTS Band IV: TX:1712.4MHz-1752.6MHz UMTS Band V:826.40MHz-846.60MHz LTE Band 2/4/5/7/12/17/38/41
Power Supply	:	Input: AC 100-240V Output: DC 24V, 1A
Software Version	:	a62_v0.08_20231110g
Hardware Version	:	CM30HWV2.0
Remark: The antenna gain and the adapter provided by the applicant, 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.

MPE Calculations for WIFI

1. Antenna Gain:

Band	Antenna Type	Antenna Gain(dBi)	
		Internal antenna	External antenna
Bluetooth	PIFA/Probe	1.55	0.98
2.4G Wi-Fi	PIFA/Probe	1.55	0.98
U-NII-1		1.71	0.16
U-NII-3		-0.97	-1.51
NFC	PIFA	0.5	/
GSM 850	PIFA/Probe	0.49	0.91
PCS1900	PIFA/Probe	1.07	1.72
UMTS Band II	PIFA/Probe	1.07	0.99
UMTS Band IV	PIFA/Probe	2.33	1.6
UMTS Band V	PIFA/Probe	0.49	1.72
LTE Band 2	PIFA/Probe	1.07	1.72
LTE Band 4	PIFA/Probe	2.33	1.6
LTE Band 5	PIFA/Probe	0.49	0.91
LTE Band 7	PIFA/Probe	-0.98	0.78
LTE Band 12	PIFA/Probe	-3.03	0.73
LTE Band 17	PIFA/Probe	-3.03	0.73
LTE Band 38	PIFA/Probe	-1.37	1.26
LTE Band 41	PIFA/Probe	0.13	1.26

2. EUT Operation Condition:

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

3. Exposure Evaluation:

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S=(PG)/4\pi R^2$$

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

4. Test Result:

Internal antenna

Bluetooth MPE Result									
Mode	N _{TX}	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]	limit (mW/cm2)
GFSK	1	2402	5.603	6±1	7	1.55	20	0.0014	1
		2441	6.294	6±1	7	1.55	20	0.0014	1
		2480	8.324	8±1	9	1.55	20	0.0023	1
π/4-DQPSK	1	2402	5.246	5±1	6	1.55	20	0.0011	1
		2441	5.208	5±1	6	1.55	20	0.0011	1
		2480	7.433	7±1	8	1.55	20	0.0018	1
8-DPSK	1	2402	5.297	5±1	6	1.55	20	0.0011	1
		2441	5.221	5±1	6	1.55	20	0.0011	1
		2480	7.339	7±1	8	1.55	20	0.0018	1

Note:
N_{TX}= Number of Transmit Antennas
RF Output power specifies that Maximum Conducted Peak Output Power.

BLE MPE Result									
Mode	N _{TX}	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]	limit (mW/cm2)
BLE (1Mbps)	1	2402	-6.987	-7±1	-6	1.55	20	0.00007	1
		2440	-4.639	-5±1	-4	1.55	20	0.00011	1
		2480	-4.493	-4±1	-3	1.55	20	0.00014	1
BLE (2Mbps)	1	2402	-6.939	-7±1	-6	1.55	20	0.00007	1
		2440	-4.654	-5±1	-4	1.55	20	0.00011	1
		2480	-4.464	-4±1	-3	1.55	20	0.00014	1

Note:
N_{TX}= Number of Transmit Antennas
RF Output power specifies that Maximum Conducted Peak Output Power.

2.4G Wi-Fi MPE Result									
Mode	N _{TX}	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/cm ²) [S]	limit (mW/cm ²)
802.11b	1	2412	17.34	17±1	18	1.55	20	0.0179	1
		2437	17.01	17±1	18	1.55	20	0.0179	1
		2462	16.03	16±1	17	1.55	20	0.0142	1
802.11g	1	2412	15.3	15±1	16	1.55	20	0.0113	1
		2437	15.26	15±1	16	1.55	20	0.0113	1
		2462	13.52	14±1	15	1.55	20	0.0090	1
802.11n20	1	2412	14.15	14±1	15	1.55	20	0.0090	1
		2437	14.05	14±1	15	1.55	20	0.0090	1
		2462	13.46	13±1	14	1.55	20	0.0071	1
802.11n40	1	2422	14.61	15±1	16	1.55	20	0.0113	1
	1	2437	13.88	14±1	15	1.55	20	0.0090	1
	1	2452	11.13	11±1	12	1.55	20	0.0045	1
Note: N _{TX} = Number of Transmit Antennas RF Output power specifies that Maximum Conducted Peak Output Power.									

5.2G Wi-Fi MPE Result									
Mode	N _{TX}	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]	limit (mW/cm2)
802.11a	1	5180	14.17	14±1	15	1.71	20	0.0093	1
		5200	14.32	14±1	15	1.71	20	0.0093	1
		5240	14.43	14±1	15	1.71	20	0.0093	1
802.11n20	1	5180	14.27	14±1	15	1.71	20	0.0093	1
		5200	14.05	14±1	15	1.71	20	0.0093	1
		5240	14.11	14±1	15	1.71	20	0.0093	1
802.11n40	1	5190	14.13	14±1	15	1.71	20	0.0093	1
		5230	14.14	14±1	15	1.71	20	0.0093	1
802.11ac20	1	5180	14.16	14±1	15	1.71	20	0.0093	1
		5200	14.23	14±1	15	1.71	20	0.0093	1
		5240	14.14	14±1	15	1.71	20	0.0093	1
802.11ac40	1	5190	14.17	14±1	15	1.71	20	0.0093	1
		5230	14.21	14±1	15	1.71	20	0.0093	1
Note: N _{TX} = Number of Transmit Antennas RF Output power specifies that Maximum Conducted average Output Power.									

5.8G Wi-Fi MPE Result									
Mode	N _{TX}	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/cm ²) [S]	limit (mW/cm ²)
802.11a	1	5745	17.40	17±1	18	-0.97	20	0.0100	1
		5785	16.80	17±1	18	-0.97	20	0.0100	1
		5825	16.73	17±1	18	-0.97	20	0.0100	1
802.11n20	1	5745	16.64	17±1	18	-0.97	20	0.0100	1
		5785	17.19	17±1	18	-0.97	20	0.0100	1
		5825	17.85	18±1	19	-0.97	20	0.0126	1
802.11n40	1	5755	17.73	18±1	19	-0.97	20	0.0126	1
		5795	17.94	18±1	19	-0.97	20	0.0126	1
802.11ac20	1	5745	17.65	18±1	19	-0.97	20	0.0126	1
		5785	17.84	18±1	19	-0.97	20	0.0126	1
		5825	16.68	17±1	18	-0.97	20	0.0100	1
802.11ac40	1	5755	16.80	17±1	18	-0.97	20	0.0100	1
		5795	16.97	17±1	18	-0.97	20	0.0100	1
Note: N _{TX} = Number of Transmit Antennas RF Output power specifies that Maximum Conducted average Output Power.									

Mode	N _{TX}	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]	limit (mW/cm2)
NFC	1	24.44	24±1	25	0.5	20	0.1989	1
GSM	1	32.17	32±1	33	0.49	20	0.4444	0.55
WCDMA	1	24.46	24±1	25	0.49	20	0.0704	0.55
LTE Band 2	1	23.86	24±1	25	1.07	20	0.0805	1
LTE Band 4	1	23.47	23±1	24	2.33	20	0.0855	1
LTE Band 5	1	23.59	24±1	25	0.49	20	0.0704	0.55
LTE Band 7	1	23.56	24±1	25	-0.98	20	0.0502	1
LTE Band 12	1	23.35	23±1	24	-3.03	20	0.0249	0.47
LTE Band 17	1	24.03	24±1	25	-3.03	20	0.0313	0.47
LTE Band 38	1	23.42	23±1	24	-1.37	20	0.0365	1
LTE Band 41	1	24.1	24±1	25	0.13	20	0.0648	1
Note: RF Output power specifies that Maximum Conducted Peak Output Power.								

External antenna

Bluetooth MPE Result									
Mode	N _{TX}	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]	limit (mW/cm2)
GFSK	1	2402	0.513	1±1	2	0.98	20	0.0004	1
		2441	4.23	4±1	5	0.98	20	0.0008	1
		2480	3.591	4±1	5	0.98	20	0.0008	1
π/4-DQPSK	1	2402	0.565	1±1	2	0.98	20	0.0004	1
		2441	4.431	4±1	5	0.98	20	0.0008	1
		2480	3.736	4±1	5	0.98	20	0.0008	1
8-DPSK	1	2402	0.642	1±1	2	0.98	20	0.0004	1
		2441	4.359	4±1	5	0.98	20	0.0008	1
		2480	3.652	4±1	5	0.98	20	0.0008	1

Note:

N_{TX}= Number of Transmit Antennas

RF Output power specifies that Maximum Conducted Peak Output Power.

BLE MPE Result									
Mode	N _{TX}	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]	limit (mW/cm2)
BLE (1Mbps)	1	2402	-8.917	-9±1	-8	0.98	20	0.000040	1
		2440	-5.666	-6±1	-5	0.98	20	0.000079	1
		2480	-5.852	-6±1	-5	0.98	20	0.000079	1
BLE (2Mbps)	1	2402	-9.139	-9±1	-8	0.98	20	0.000040	1
		2440	-5.702	-6±1	-5	0.98	20	0.000079	1
		2480	-5.796	-6±1	-5	0.98	20	0.000079	1

Note:

N_{TX}= Number of Transmit Antennas

RF Output power specifies that Maximum Conducted Peak Output Power.

2.4G Wi-Fi MPE Result									
Mode	N _{TX}	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/cm ²) [S]	limit (mW/cm ²)
802.11b	1	2412	15.48	15±1	16	0.98	20	0.0099	1
		2437	15.48	15±1	16	0.98	20	0.0099	1
		2462	13.16	13±1	14	0.98	20	0.0063	1
802.11g	1	2412	12.09	12±1	13	0.98	20	0.0050	1
		2437	13.54	14±1	15	0.98	20	0.0079	1
		2462	12.01	12±1	13	0.98	20	0.0050	1
802.11n20	1	2412	12.5	13±1	14	0.98	20	0.0063	1
		2437	13.55	14±1	15	0.98	20	0.0079	1
		2462	12.06	12±1	13	0.98	20	0.0050	1
802.11n40	1	2422	12.05	12±1	13	0.98	20	0.0050	1
	1	2437	12.7	13±1	14	0.98	20	0.0063	1
	1	2452	10.24	10±1	11	0.98	20	0.0031	1
Note: N _{TX} = Number of Transmit Antennas RF Output power specifies that Maximum Conducted Peak Output Power.									

5.2G Wi-Fi MPE Result									
Mode	N _{TX}	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]	limit (mW/cm2)
802.11a	1	5180	14.87	15±1	16	0.16	20	0.0082	1
		5200	14.29	14±1	15	0.16	20	0.0065	1
		5240	14.70	15±1	16	0.16	20	0.0082	1
802.11n20	1	5180	15.23	15±1	16	0.16	20	0.0082	1
		5200	14.35	14±1	15	0.16	20	0.0065	1
		5240	14.71	15±1	16	0.16	20	0.0082	1
802.11n40	1	5190	13.40	13±1	14	0.16	20	0.0052	1
		5230	14.63	15±1	16	0.16	20	0.0082	1
802.11ac20	1	5180	14.74	15±1	16	0.16	20	0.0082	1
		5200	14.77	15±1	16	0.16	20	0.0082	1
		5240	15.20	15±1	16	0.16	20	0.0082	1
802.11ac40	1	5190	13.87	14±1	15	0.16	20	0.0065	1
		5230	15.06	15±1	16	0.16	20	0.0082	1
Note: N _{TX} = Number of Transmit Antennas RF Output power specifies that Maximum Conducted average Output Power.									

5.8G Wi-Fi MPE Result									
Mode	N _{TX}	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]	limit (mW/cm2)
802.11a	1	5745	15.18	15±1	16	-1.51	20	0.0056	1
		5785	15.06	15±1	16	-1.51	20	0.0056	1
		5825	15.29	15±1	16	-1.51	20	0.0056	1
802.11n20	1	5745	15.20	15±1	16	-1.51	20	0.0056	1
		5785	15.61	16±1	17	-1.51	20	0.0070	1
		5825	15.67	16±1	17	-1.51	20	0.0070	1
802.11n40	1	5755	15.34	15±1	16	-1.51	20	0.0056	1
		5795	15.34	15±1	16	-1.51	20	0.0056	1
802.11ac20	1	5745	15.56	16±1	17	-1.51	20	0.0070	1
		5785	15.56	16±1	17	-1.51	20	0.0070	1
		5825	16.25	16±1	17	-1.51	20	0.0070	1
802.11ac40	1	5755	15.85	16±1	17	-1.51	20	0.0070	1
		5795	15.39	15±1	16	-1.51	20	0.0056	1
Note: N _{TX} = Number of Transmit Antennas RF Output power specifies that Maximum Conducted average Output Power.									

Mode	N _{TX}	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]	limit (mW/cm2)
GSM	1	32.21	32±1	33	0.91	20	0.4895	0.55
WCDMA	1	24.56	25±1	26	1.72	20	0.1177	0.55
LTE Band 2	1	22.9	23±1	24	1.72	20	0.0743	1
LTE Band 4	1	23.18	23±1	24	1.6	20	0.0722	1
LTE Band 5	1	23.67	24±1	25	0.91	20	0.0776	0.55
LTE Band 7	1	22.63	23±1	24	0.78	20	0.0598	1
LTE Band 12	1	23.9	24±1	25	0.73	20	0.0744	0.47
LTE Band 17	1	22.14	22±1	23	0.73	20	0.0470	0.47
LTE Band 38	1	22.97	23±1	24	1.26	20	0.0668	1
LTE Band 41	1	22.96	23±1	24	1.26	20	0.0668	1
Note: RF Output power specifies that Maximum Conducted Peak Output Power.								

5. Conclusion:

As specified in Table 1B of 47 CFR 1.1310- Limits for Maximum Permissible Exposure (MPE),

Limits for General Population/ Uncontrolled Exposure

Frequency Range (MHz)	Power density (mW/ cm ²)
300-1,500	F/1500
1,500-100,000	1.0

6. Summary simultaneous transmission results

Internal antenna

GSM and 2.4G Wi-Fi support simultaneous transmit the

GSM MPE (Ratio)	2.4GWi-Fi MPE (Ratio)	NFC MPE (Ratio)	simultaneous MPE (Ratio)	MPE Limits (Ratio)
0.4444	0.0179	0.1989	0.6608	1.0000

External antenna

GSM and 2.4G Wi-Fi support simultaneous transmit the

GSM MPE (Ratio)	2.4GWi-Fi MPE (Ratio)	simultaneous MPE (Ratio)	MPE Limits (Ratio)
0.4895	0.0099	0.4994	1.0000

So, RF exposure limit warning or SAR test are not required.

The EUT will only be used with a separation of 20cm or greater between the antenna and nearby persons and can therefore be considered a mobile transmitter per 47 CFR2.1091 (b). The RF Exposure Information page from the manual is included here for reference.

-----END OF REPORT-----