Maximum Permissible Exposure Report

FCC ID: M82-FWA1012VC

Project No.	**: 1807T071**
Equipment	**: Network Security Platform**
Test Model	**: FWA-1012VC**
Series Model	**: FWA-1012VCXXXXXXXXXXXXXXXX (where X may be any alphanumeric character , blank or "-".)**
Applicant	**: Advantech Co., Ltd.**
Address	**: No.1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei 11491, Taiwan, R.O.C.**
According:	**: FCC Guidelines for Human Exposure IEEE C95.1**

Authorized Signatory : Herbort Liu
(Herbort Liu)

BTL INC.
No.18, Ln. 171, Sec. 2, Jiuzong Rd.,
Neihu Dist., Taipei City, Taiwan (R.O.C.)
TEL:+886-2-2657-3299 FAX: +886-2-2657-3331

Testing Laboratory
0659

MPE CALCULATION METHOD:

Calculation Method of RF Safety Distance:

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

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

Table for Filed Antenna

2.4G WLAN:

Ant.	Brand	Model	Type	Connector	Gain (dBi)
1	Walsin	RFDPA131000SBLB808	Dipole	SMA	2.93
2	Invax	AN2450-92K02BRS	Dipole	SMA	2.86

NOTE:

(a) The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and receivers (2T2R). 2.4 GHz and 5GHz can't transmit simultaneously.

(b) For Power Spectral Density (CDD mode)
Directional Gain = 10log $[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{Gn/20})^2/N_{ANT}]$ = 5.91 dBi.
The Direction gain is less than 6 dBi, so conducted power limits will not be reduced.

(c) For Conducted Output Power (CDD mode)
For $N_{ANT} = 2 < 5$,
Direction gain = $G_{ANT} + 0 = 2.93 + 0 = 2.93$ dBi .
The Direction gain is less than 6 dBi, so conducted power limits will not be reduced.

5G RLAN:

UNII-1:

Ant.	Brand	Model	Type	Connector	Gain (dBi)
1	Walsin	RFDPA131000SBLB808	Dipole	SMA	3.44
2	Invax	AN2450-92K02BRS	Dipole	SMA	3.11

UNII-3:

Ant.	Brand	Model	Type	Connector	Gain (dBi)
1	Walsin	RFDPA131000SBLB808	Dipole	SMA	3.95
2	Invax	AN2450-92K02BRS	Dipole	SMA	3.79

NOTE:

(a) For Power Spectral Density(CDD mode)

Directional Gain = 10log $[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{Gn/20})^2/N_{ANT}]$ = 6.71 dBi.
The Direction gain exceeds 6 dBi, so the reduced power spectral density limits = Limit - (Directional Gain - 6 dBi) = 17 - (6.71 - 6) = 16.29 dBm/MHz.
.

(b) For Conducted Output Power (CDD mode)
For UNII-1:
For N_{ANT} = 2 < 5,
Direction gain = G_{ANT} + 0 = 3.44 + 0 = 3.44 dBi.
The Direction gain is less than 6 dBi, so conducted power limits will not be reduced.
For UNII-3:
For N_{ANT} = 2 < 5,
Direction gain = G_{ANT} + 0 = 3.95 + 0 = 3.95 dBi.
The Direction gain is less than 6 dBi, so conducted power limits will not be reduced.

Operating Mode / TX Mode	2TX
802.11a	V (ANT 1+ANT 2)
802.11b	V (ANT 1+ANT 2)
802.11g	V (ANT 1+ANT 2)
802.11n (HT20)	V (ANT 1+ANT 2)
802.11n (HT40)	V (ANT 1+ANT 2)
802.11ac (HT20)	V (ANT 1+ANT 2)
802.11ac (HT40)	V (ANT 1+ANT 2)
802.11ac (VHT80)	V (ANT 1+ANT 2)

TEST RESULTS

2.4G:

Test Mode :	TX B MODE Total / CH01, CH06, CH11

Frequency (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
2412	2.93	1.9634	22.83	191.8669	0.07498085	1	Complies
2437	2.93	1.9634	22.61	182.3896	0.07127716	1	Complies
2462	2.93	1.9634	20.83	121.0598	0.04730972	1	Complies

Test Mode :	TX G MODE Total / CH01, CH06, CH11

Frequency (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
2412	2.93	1.9634	18.49	70.6318	0.02760262	1	Complies
2437	2.93	1.9634	18.6	72.4436	0.02831068	1	Complies
2462	2.93	1.9634	16.51	44.7713	0.01749647	1	Complies

Test Mode :	TX N (HT20) Mode / CH01, CH06, CH11

Frequency (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
2412	2.93	1.9634	16.48	44.4631	0.01737602	1	Complies
2437	2.93	1.9634	17.42	55.2077	0.02157498	1	Complies
2462	2.93	1.9634	15.02	31.7687	0.01241510	1	Complies

Test Mode :	TX N (HT40) Mode Total / CH03, CH06, CH09

Frequency (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
2422	2.93	1.9634	13.09	20.3704	0.00796068	1	Complies
2437	2.93	1.9634	17.42	55.2077	0.02157498	1	Complies
2452	2.93	1.9634	10.9	12.3027	0.00480784	1	Complies

5G:

Test Mode :	UNII-1_TX A MODE Total /CH36, CH40, CH48

Frequency (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
5180	3.44	2.2080	16.32	42.8549	0.01883434	1	Complies
5200	3.44	2.2080	15.31	33.9625	0.01492624	1	Complies
5240	3.44	2.2080	16.32	42.8549	0.01883434	1	Complies

Test Mode :	UNII-1_TX N (HT20) MODE Total /CH36, CH40, CH48

Frequency (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
5180	3.44	2.2080	14.88	30.7610	0.01351918	1	Complies
5200	3.44	2.2080	15.59	36.2243	0.01592027	1	Complies
5240	3.44	2.2080	15.85	38.4592	0.01690248	1	Complies

Test Mode :	UNII-1_TX AC (HT20) MODE Total /CH36, CH40, CH48

Frequency (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
5180	3.44	2.2080	14.45	27.8612	0.01224476	1	Complies
5200	3.44	2.2080	14.87	30.6902	0.01348809	1	Complies
5240	3.44	2.2080	14.86	30.6196	0.01345707	1	Complies

Test Mode :	UNII-1_TX N (HT40) MODE / CH38, CH46

Frequency (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
5190	3.44	2.2080	13.05	20.1837	0.00887055	1	Complies
5230	3.44	2.2080	15.35	34.2768	0.01506435	1	Complies

Test Mode :	UNII-1_TX AC (HT40) MODE / CH38, CH46

Frequency (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
5190	3.44	2.2080	13.01	19.9986	0.00878922	1	Complies
5230	3.44	2.2080	14.41	27.6058	0.01213250	1	Complies

Test Mode :	UNII-1_TX AC (VHT80) MODE Total / CH42

Frequency (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
5210	3.44	2.2080	12.22	16.6725	0.00732741	1	Complies

Test Mode :	UNII-3_TX A MODE Total / CH149, CH157, CH161

Frequency (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
5745	3.95	2.4831	15.84	38.3707	0.01896489	1	Complies
5785	3.95	2.4831	16.29	42.5598	0.02103538	1	Complies
5825	3.95	2.4831	16.13	41.0204	0.02027451	1	Complies

Test Mode :	UNII-3_TX N (HT20) MODE Total / CH149, CH157, CH161

Frequency (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
5745	3.95	2.4831	15.52	35.6451	0.01761775	1	Complies
5785	3.95	2.4831	15.25	33.4965	0.01655581	1	Complies
5825	3.95	2.4831	15.51	35.5631	0.01757723	1	Complies

Test Mode :	UNII-3_TX AC (HT20) MODE Total / CH149, CH157, CH161

Frequency (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
5745	3.95	2.4831	14.32	27.0396	0.01336443	1	Complies
5785	3.95	2.4831	14.61	28.9068	0.01428731	1	Complies
5825	3.95	2.4831	14.24	26.5461	0.01312050	1	Complies

Test Mode :	UNII-3_TX N (HT40) MODE / CH151, CH159

Frequency (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
5755	3.95	2.4831	15.3	33.8844	0.01674751	1	Complies
5795	3.95	2.4831	15.33	34.1193	0.01686360	1	Complies

Test Mode :	UNII-3_TX AC (HT40) MODE / CH151, CH159

Frequency (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
5755	6.58	4.5499	14.38	27.4157	0.02482849	1	Complies
5795	6.58	4.5499	14.47	27.9898	0.02534839	1	Complies

Test Mode :	UNII-3_TX AC (VHT80) MODE Total / CH155

Frequency (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
5775	6.58	4.5499	13.89	24.4906	0.02217943	1	Complies

Note:
(1) The calculated distance is 20 cm.

WCDMA & LTE:

Mode	Band	Frequency (MHz)	Antenna Gain (dBi)	Max Tune up power (dBm)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
WCDMA	Band II	1880	2.04	23	0.0635	1.0000	Complies
WCDMA	Band IV	1732.6	1.57	23	0.0570	1.0000	Complies
WCDMA	Band V	836.4	-0.06	23	0.0372	0.5576	Complies
LTE	Band 2	1880	2.04	23.5	0.0712	1.0000	Complies
LTE	Band 4	1732.5	1.57	23.5	0.0629	1.0000	Complies
LTE	Band 5	836.5	-0.06	23	0.0372	0.5577	Complies
LTE	Band 7	2535	3.37	21.5	0.0611	1.0000	Complies
LTE	Band 12	707.5	2.05	23.5	0.0678	0.4717	Complies
LTE	Band 13	782	-0.14	23.5	0.0431	0.5213	Complies
LTE	Band 25	1882.5	2.04	23	0.0635	1.0000	Complies
LTE	Band 30	2310	-0.83	21.5	0.0232	1.0000	Complies
LTE	Band 41	2593	3.81	21.5	0.0676	1.0000	Complies

COLLOCATED POWER DENSITY CACULATIONS

So for 2.4G+WWAN simultaneous transmission:

0.074981/1+0.0712/1=0.146181<1

So for 5G+WWAN simultaneous transmission:

0.025348/1+0.0712/1=0.096548<1