Dynascan Technology Corp.

TEST REPORT

SCOPE OF WORK:
FCC 1.1310 – Maximum Permissible Exposure report

Model:
FBP206

REPORT NUMBER
220500399THC-001

ISSUE DATE
Jul. 25, 2022

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GFT-OP-10h (28-Nov-2018)

Maximum Permissible Exposure (MPE) Evaluation Report

Applicant:	**Dynascan Technology Corp.** **6F., No. 88, Wenmao Rd., Guishan Dist., Taoyuan City 333001, Taiwan**
Product:	**Digital Transmission Systems**
Model No.:	**FBP206**
FCC ID:	**2AKWYFBP206**
Test Method/ Standard:	**47 CFR FCC 1.1310** **KDB 447498**
Test By:	**Intertek Testing Services Taiwan Ltd.,** **Hsinchu Laboratory** **No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,** **Shiang-Shan District, Hsinchu City, Taiwan**

Zero Chen
Engineer

Rico Deng
Reviewer

Revision History

Report No.	Issue Date	Revision Summary
220500399THC-001	Jul. 25, 2022	Original report

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Summary of Tests

MPE Evaluation meet FCC OET No. 65: 1997, IEEE C95.1-2005

Test	Reference	Results
MPE Evaluation	FCC Guidelines for Human Exposure IEEE C95.1	Complies

Note: Please note that the test results with statement of conformity, the decision rules which are based on: Safety Testing: the specification, standard or IEC Guide 115.
Other Testing: the specification, standard and not taking into account the measurement uncertainty.

1. General Information

1.1 Identification of the EUT

Product:	Digital Transmission System
Model No.:	FBP206
Operating Frequency:	1. 2412MHz ~ 2462MHz 2. 5180MHz ~ 5240MHz 3. 5745MHz ~ 5825MHz
Channel Number:	1. 11 channels for 2412MHz ~ 2462MHz 2. 7 channels for 5180MHz ~ 5240MHz 3. 8 channels for 5745MHz ~ 5825MHz
Access scheme:	DSSS, OFDM
Rated Power:	DC 3.3V
Power Cord:	N/A
Sample receiving date:	2022/05/30
Sample condition:	Workable
Test Date(s):	2022/06/14 ~ 2022/07/04

1.2 Description of the EUT

Modulation mode	Transmit path			
	Chain 0	Chain 1	Chain 2	Chain 3
802.11b	V	V	V	V
802.11g	V	V	V	V
802.11n (HT20)	V	V	V	V
802.11n (HT40)	V	V	V	V
802.11a	V	V	V	V
802.11ac (VHT20)	V	V	V	V
802.11ac (VHT40)	V	V	V	V
802.11ac (VHT80)	V	V	V	V

Item	Product name	Model No.	Rated Power
Host	Display	65512	100-240V~ 50-60Hz 4A

1.3 Antenna description

WiFi 2.4GHz

For antenna 0 (Chain 0)

Antenna Gain : -3.04 dBi
Antenna Type : PIFA antenna
Connector Type : I-pex

For antenna 1 (Chain 1)

Antenna Gain : -3.04 dBi
Antenna Type : PIFA antenna
Connector Type : I-pex

For antenna 2 (Chain 2)

Antenna Gain : -3.04 dBi
Antenna Type : PIFA antenna
Connector Type : I-pex

For antenna 3 (Chain 3)

Antenna Gain : -3.04 dBi
Antenna Type : PIFA antenna
Connector Type : I-pex

WiFi 5GHz

For antenna 0 (Chain 0)

Antenna Gain : -2.31 dBi
Antenna Type : PIFA antenna
Connector Type : I-pex

For antenna 1 (Chain 1)

Antenna Gain : -2.31 dBi
Antenna Type : PIFA antenna
Connector Type : I-pex

For antenna 2 (Chain 2)

Antenna Gain : -2.31 dBi
Antenna Type : PIFA antenna
Connector Type : I-pex

For antenna 3 (Chain 3)

Antenna Gain : -2.31 dBi
Antenna Type : PIFA antenna
Connector Type : I-pex

2. Test specifications

2.1 Introduction

The EUT operates in the 2.4 and 5 GHz band. Due to the EUT (include antenna) at its normal operation distance is at least 20 cm from the human body, the EUT was defined as a Mobile Device.

The reason to do the MPE Evaluation is to avoid the RF hazard to human body. The maximum output power and gain of the antenna were used to calculate the limited Power density (S) at 20 cm distance away from the product. The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 and Safety Code 6 are followed.

According to 1.1307 (b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission’s guideline.

2.2 RF Exposure Limit

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b) and KDB 447498 D01 General RF Exposure Guidance v06.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*(100)	≤6
3.0-30	1842/f	4.89/f	*($900/f^2$)	<6
30-300	61.4	0.163	1.0	<6
300-1,500			f/300	<6
1,500-100,000			5	<6
(ii) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*($180/f^2$)	<30
30-300	27.5	0.073	0.2	<30
300-1,500			f/1500	<30
1,500-100,000			1.0	<30

SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	SAR Test Exclusion Threshold (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

MHz	30	35	40	45	50	mm
150	232	271	310	349	387	SAR Test Exclusion Threshold (mW)
300	164	192	219	246	274	
450	134	157	179	201	224	
835	98	115	131	148	164	
900	95	111	126	142	158	
1500	73	86	98	110	122	
1900	65	76	87	98	109	
2450	57	67	77	86	96	
3600	47	55	63	71	79	
5200	39	46	53	59	66	
5400	39	45	52	58	65	
5800	37	44	50	56	62	

Note: 10-g Extremity SAR Test Exclusion Power Thresholds are 2.5 times higher than the 1-g SAR Test Exclusion Thresholds indicated above. These thresholds do not apply, by extrapolation or other means, to occupational exposure limits.

SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and > 50 mm

Approximate SAR test exclusion power thresholds at selected frequencies and test separation distances are illustrated in the following table.

MHz	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	mm
100	474	481	487	494	501	507	514	521	527	534	541	547	554	561	567	
150	387	397	407	417	427	437	447	457	467	477	487	497	507	517	527	
300	274	294	314	334	354	374	394	414	434	454	474	494	514	534	554	
450	224	254	284	314	344	374	404	434	464	494	524	554	584	614	644	
835	164	220	275	331	387	442	498	554	609	665	721	776	832	888	943	
900	158	218	278	338	398	458	518	578	638	698	758	818	878	938	998	
1500	122	222	322	422	522	622	722	822	922	1022	1122	1222	1322	1422	1522	mW
1900	109	209	309	409	509	609	709	809	909	1009	1109	1209	1309	1409	1509	
2450	96	196	296	396	496	596	696	796	896	996	1096	1196	1296	1396	1496	
3600	79	179	279	379	479	579	679	779	879	979	1079	1179	1279	1379	1479	
5200	66	166	266	366	466	566	666	766	866	966	1066	1166	1266	1366	1466	
5400	65	165	265	365	465	565	665	765	865	965	1065	1165	1265	1365	1465	
5800	62	162	262	362	462	562	662	762	862	962	1062	1162	1262	1362	1462	

SAR Test Exclusion Thresholds for < 100 MHz and < 200 mm

Approximate SAR test exclusion power thresholds at selected frequencies and test separation distances are illustrated in the following table.

MHz	< 50	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	mm
100	237	474	481	487	494	501	507	514	521	527	534	541	547	554	561	567	
50	308	617	625	634	643	651	660	669	677	686	695	703	712	721	729	738	
10	474	948	961	975	988	1001	1015	1028	1041	1055	1068	1081	1095	1108	1121	1135	
1	711	1422	1442	1462	1482	1502	1522	1542	1562	1582	1602	1622	1642	1662	1682	1702	mW
0.1	948	1896	1923	1949	1976	2003	2029	2056	2083	2109	2136	2163	2189	2216	2243	2269	
0.05	1019	2039	2067	2096	2125	2153	2182	2211	2239	2268	2297	2325	2354	2383	2411	2440	
0.01	1185	2370	2403	2437	2470	2503	2537	2570	2603	2637	2670	2703	2737	2770	2803	2837	

2.3 RF Exposure calculations

From §FCC 1.1310 table 1, the maximum permissible RF exposure for an uncontrolled environment is 1 mW/(cm^2) (or 10 W/m^2)*

Power density (S) is calculated by the following formula:

$S = (P * G)/4\pi R^2$

where, S = Power density (mW/cm^2)
P = Output power to antenna (mW)
R = Distance between radiating structure and observation point (cm)
G = Gain of antenna in numeric
π = 3.1416

Example:
Assume a mobile device operates at 2412MHz and its maximum output power is 50mW, and the maximum gain of antenna is 1 (numeric) /0dBi.

then the power density (S) = $(50 * 1)/4*\pi*20^2$ = 0.00995 (mW/cm^2) (or = 0.0995 W/m^2)

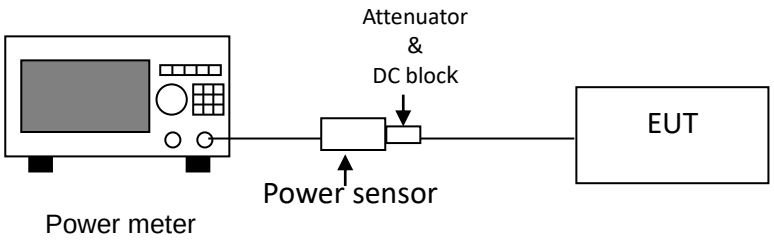
2.4 Operation mode

Power on, executing “WLAN Test Tool V2.3.0” to select different frequency and modulation.

2.5 Test equipment

Equipment	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
Power Meter	Anritsu	ML2495A	0844001	2021/10/17	2022/10/16
Power Sensor	Anritsu	MA2491A	031543	2022/03/07	2023/03/06

2.6 Test Set-up



Remark: Cable loss = 21 dB

3. Test results

Temperature (℃) :	29
Relative Humidity (%) :	55
Test date :	2022/06/23 ~ 2022/07/04

Chain 0+1+2+3

Mode	Channel	Frequency (MHz)	Output Power (dBm)				Tune-up Tolerance (dB)
			Chain 0	Chain 1	Chain 2	Chain 3	
802.11b	1	2412	20.52	19.52	20.41	19.20	2.0
	6	2437	20.19	18.34	19.58	18.52	2.0
	11	2462	20.47	18.42	20.26	18.12	2.0
802.11g	1	2412	23.24	22.41	23.11	22.36	2.0
	6	2437	22.78	21.70	22.38	21.79	2.0
	11	2462	22.89	21.36	22.37	21.20	2.0
802.11n(HT20)	1	2412	22.82	22.76	22.87	21.46	2.0
	6	2437	22.57	21.77	22.08	21.21	2.0
	11	2462	22.75	21.83	22.26	21.57	2.0
802.11n(HT40)	3	2422	22.69	21.74	23.43	22.51	2.0
	6	2437	22.96	20.99	22.19	21.21	2.0
	9	2452	23.45	21.96	22.95	22.06	2.0

Mode	Channel	Frequency (MHz)	Max Tune-up Output Power (dBm)			
			Chain 0	Chain 1	Chain 2	Chain 3
802.11b	1	2412	22.52	21.52	22.41	21.2
	6	2437	22.19	20.34	21.58	20.52
	11	2462	22.47	20.42	22.26	20.12
802.11g	1	2412	25.24	24.41	25.11	24.36
	6	2437	24.78	23.7	24.38	23.79
	11	2462	24.89	23.36	24.37	23.2
802.11n(HT20)	1	2412	24.82	24.76	24.87	23.46
	6	2437	24.57	23.77	24.08	23.21
	11	2462	24.75	23.83	24.26	23.57
802.11n(HT40)	3	2422	24.69	23.74	25.43	24.51
	6	2437	24.96	22.99	24.19	23.21
	9	2452	25.45	23.96	24.95	24.06

Mode	Channel	Frequency (MHz)	Antenna Gain (dBi)				Total Power Density (mW/cm²)	Limit (mW/cm²)
			Chain 0	Chain 1	Chain 2	Chain 3		
802.11b	1	2412	-3.04	-3.04	-3.04	-3.04	0.062	1.0
	6	2437	-3.04	-3.04	-3.04	-3.04	0.052	1.0
	11	2462	-3.04	-3.04	-3.04	-3.04	0.055	1.0
802.11g	1	2412	-3.04	-3.04	-3.04	-3.04	0.119	1.0
	6	2437	-3.04	-3.04	-3.04	-3.04	0.104	1.0
	11	2462	-3.04	-3.04	-3.04	-3.04	0.100	1.0
802.11n(HT20)	1	2412	-3.04	-3.04	-3.04	-3.04	0.112	1.0
	6	2437	-3.04	-3.04	-3.04	-3.04	0.098	1.0
	11	2462	-3.04	-3.04	-3.04	-3.04	0.102	1.0
802.11n(HT40)	3	2422	-3.04	-3.04	-3.04	-3.04	0.115	1.0
	6	2437	-3.04	-3.04	-3.04	-3.04	0.097	1.0
	9	2452	-3.04	-3.04	-3.04	-3.04	0.115	1.0

The Notice in Installation Manual has been stated as below:
While installing and operating this transmitter, the radio frequency exposure limit of 1 mW/ (cm^2) may be exceeded at distances close to the transmitter. Therefore, the user must maintain a minimum distance of 20 cm from the device at all time.

Temperature (℃) :	29
Relative Humidity (%) :	60
Test date :	2022/06/23 ~ 2022/07/04

Chain 0+1+2+3

Mode	Channel	Frequency (MHz)	Output Power (dBm)				Tune-up Tolerance (dB)
			Chain 0	Chain 1	Chain 2	Chain 3	
802.11a	36	5180	14.238	13.417	14.084	12.314	2.0
	44	5220	14.246	12.659	13.675	11.833	2.0
	48	5240	14.492	12.353	13.228	11.538	2.0
	149	5745	20.981	19.991	20.264	19.613	2.0
	157	5785	20.874	20.309	20.886	19.610	2.0
	165	5825	20.580	19.956	19.934	19.980	2.0
802.11ac (VHT20)	36	5180	14.376	12.910	13.665	12.243	2.0
	44	5220	13.958	12.647	13.522	11.915	2.0
	48	5240	14.224	12.939	13.886	12.198	2.0
	149	5745	20.912	19.752	20.212	19.426	2.0
	157	5785	20.609	19.895	19.898	19.846	2.0
	165	5825	19.821	19.801	19.607	20.085	2.0
802.11ac (VHT40)	38	5190	12.006	11.535	11.763	10.080	2.0
	46	5230	16.628	15.391	16.110	14.014	2.0
	151	5755	19.338	18.784	19.070	18.170	2.0
	159	5795	19.203	19.072	19.140	18.458	2.0
802.11ac (VHT80)	42	5210	13.337	12.449	12.642	10.692	2.0
	155	5775	18.220	17.619	17.675	17.073	2.0

Mode	Channel	Frequency (MHz)	Max Tune-up Output Power (dBm)			
			Chain 0	Chain 1	Chain 2	Chain 3
802.11a	36	5180	16.238	15.417	16.084	14.314
	44	5220	16.246	14.659	15.675	13.833
	48	5240	16.492	14.353	15.228	13.538
	149	5745	22.981	21.991	22.264	21.613
	157	5785	22.874	22.309	22.886	21.610
	165	5825	22.580	21.956	21.934	21.980
802.11ac (VHT20)	36	5180	16.376	14.910	15.665	14.243
	44	5220	15.958	14.647	15.522	13.915
	48	5240	16.224	14.939	15.886	14.198
	149	5745	22.912	21.752	22.212	21.426
	157	5785	22.609	21.895	21.898	21.846
	165	5825	21.821	21.801	21.607	22.085
802.11ac (VHT40)	38	5190	14.006	13.535	13.763	12.080
	46	5230	18.628	17.391	18.110	16.014
	151	5755	21.338	20.784	21.070	20.170
	159	5795	21.203	21.072	21.140	20.458
802.11ac (VHT80)	42	5210	15.337	14.449	14.642	12.692
	155	5775	20.220	19.619	19.675	19.073

Mode	Channel	Frequency (MHz)	Antenna Gain (dBi)				Total Power Density (mW/cm²)	Limit (mW/cm²)
			Chain 0	Chain 1	Chain 2	Chain 3		
802.11a	36	5180	-2.31	-2.31	-2.31	-2.31	0.0169	1.0
	44	5220	-2.31	-2.31	-2.31	-2.31	0.0155	1.0
	48	5240	-2.31	-2.31	-2.31	-2.31	0.0149	1.0
	149	5745	-2.31	-2.31	-2.31	-2.31	0.0783	1.0
	157	5785	-2.31	-2.31	-2.31	-2.31	0.0822	1.0
	165	5825	-2.31	-2.31	-2.31	-2.31	0.0762	1.0
802.11ac (VHT20)	36	5180	-2.31	-2.31	-2.31	-2.31	0.0161	1.0
	44	5220	-2.31	-2.31	-2.31	-2.31	0.0151	1.0
	48	5240	-2.31	-2.31	-2.31	-2.31	0.0161	1.0
	149	5745	-2.31	-2.31	-2.31	-2.31	0.0760	1.0
	157	5785	-2.31	-2.31	-2.31	-2.31	0.0754	1.0
	165	5825	-2.31	-2.31	-2.31	-2.31	0.0713	1.0
802.11ac (VHT40)	38	5190	-2.31	-2.31	-2.31	-2.31	0.0102	1.0
	46	5230	-2.31	-2.31	-2.31	-2.31	0.0272	1.0
	151	5755	-2.31	-2.31	-2.31	-2.31	0.0570	1.0
	159	5795	-2.31	-2.31	-2.31	-2.31	0.0586	1.0
802.11ac (VHT80)	42	5210	-2.31	-2.31	-2.31	-2.31	0.0128	1.0
	155	5775	-2.31	-2.31	-2.31	-2.31	0.0433	1.0

The Notice in Installation Manual has been stated as below:
While installing and operating this transmitter, the radio frequency exposure limit of 1 mW/ (cm^2) may be exceeded at distances close to the transmitter. Therefore, the user must maintain a minimum distance of 20 cm from the device at all time.

The worst value of WiFi 2.4GHz is 0.119 (mW/cm^2). The worst value of WiFi 5GHz is 0.0822 (mW/cm^2). When these are transmitting at the same time, the worst MPE value is 0.119+0.0822=0.2012 mW/cm^2. It is also met the limit.