InnoComm Mobile Technology Corp.

TEST REPORT

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191000214TWN-001

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Maximum Permissible Exposure (MPE) Evaluation Report

Applicant:	**InnoComm Mobile Technology Corp.** **3F, No.6, Hsin Ann Rd., Hsinchu Science Park, Hsinchu 30078, Taiwan**
Product:	**SOM module**
Model No.:	**SB30**
Brand Name:	**InnoComm**
FCC ID:	**YAISB30**
Test Method/ Standard:	**FCC 1.1310**
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**

Testing Laboratory
0597

Prepared and Checked by:

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Approved by:

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Engineer

Revision History

Report No.	Issue Date	Revision Summary
191000214TWN-001	Nov. 26, 2019	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:	SOM module
Model No.:	SB30
Operating Frequency:	1. 2402 MHz ~ 2480 MHz 2. 2412 MHz ~ 2462 MHz 3. 5180MHz ~ 5240MHz 4. 5260MHz ~ 5320MHz 5. 5500MHz ~ 5720MHz 6. 5745MHz ~ 5825MHz
Channel Number:	1. 79 channels for 2402 MHz ~ 2480 MHz (BT 2.1) 2. 40 channels for 2402 MHz ~ 2480 MHz (BT 4.0) 3. 11 channels for 2412 MHz ~ 2462 MHz (Wi-Fi 2.4GHz) 4. 7 channels for 5180MHz~5240MHz (Wi-Fi 5GHz) 5. 7 channels for 5260MHz~5320MHz (Wi-Fi 5GHz) 6. 18 channels for 5500MHz~5720MHz (Wi-Fi 5GHz) 7. 8 channels for 5745MHz~5825MHz (Wi-Fi 5GHz)
Access scheme:	DSSS, OFDM
Rated Power:	DC 2.7V ~ 5.5V
Power Cord:	N/A
Sample receiving date:	Oct. 16, 2019
Sample condition:	Workable
Test Date(s):	Oct. 21, 2019 ~ Nov. 12, 2019

1.2 Antenna description

Antenna 1

Antenna Gain : 5 dBi / 2dBi
Antenna Type : Dipole antenna
Connector Type : I-Pex

Antenna 2

Antenna Gain : 5 dBi / 2dBi
Antenna Type : Dipole antenna
Connector Type : I-Pex

1.3 Peripherals equipment

No.	Model no.	Specification
Adapter	EA10681G-120	I/P: 100-240V~, 2.0A, 50-60Hz O/P: 12V, 4.16A

Peripherals	Brand	Model No.	Serial No.	Data cable
Notebook PC	HP	HP ProBook 440 G3	5CD8021S9H	Micro USB Cable 0.8 meter × 1
Carrier Board	InnoComm	SB30 carrier Board	N/A	N/A

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.

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

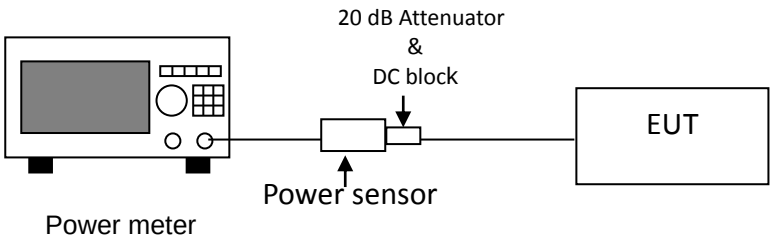
The EUT was supplied with DC 5 V from Carrier Board (Test voltage: 120Vac, 60Hz).

Connected to Notebook via USB Cable, executing “CMD” and enter command 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	2019/10/23	2020/10/21
Power Sensor	Anritsu	MA2411B	0738452	2019/10/23	2020/10/21
RF Cable	SUHNER	SUCOFLEX 102	CB0006	2019/05/02	2020/04/30

2.6 Test Set-up



Remark: Cable loss = 1.5 dB

3. Test results

Mode	Ch	Frequency (MHz)	Antenna Gain0 (numeric)	Output power to antenna 0 (dBm)	Output power to antenna 0 (mW)	Tune-up Power Tolerance (dB)	Max Tune-up Power (dBm)	Max Tune-up Power (mW)	Power density (mW/cm^2)	Limit of power density (mW/cm^2)
802.11b	1	2412	3.16	18.06	63.97	2.00	20.06	101.39	0.0402	1.0
	6	2437	3.16	18.52	71.12	2.00	20.52	112.72	0.0447	1.0
	11	2462	3.16	18.53	71.29	2.00	20.53	112.98	0.0448	1.0

Mode	Ch	Frequency (MHz)	Antenna Gain0 (numeric)	Output power to antenna 0 (dBm)	Antenna Gain1 (numeric)	Output power to antenna 1 (dBm)	Tune-up Power Tolerance (dB)	Max Tune-up Power to antenna 0 (dBm)	Max Tune-up Power to antenna 1 (dBm)
802.11g	1	2412	3.16	22.40	3.16	21.49	2.00	24.40	23.49
	6	2437	3.16	23.64	3.16	22.79	2.00	25.64	24.79
	11	2462	3.16	23.21	3.16	22.45	2.00	25.21	24.45

Mode	Ch	Frequency (MHz)	Max Tune-up Power to antenna 0 (mW)	Max Tune-up Power to antenna1 (mW)	Power density0 (mW/cm^2)	Power density1 (mW/cm^2)	Total Power density (mW/cm^2)	Limit of power density (mW/cm^2)
802.11g	1	2412	275.42	223.36	0.1733	0.1405	0.3138	1.0
	6	2437	366.44	301.30	0.2305	0.1896	0.4201	1.0
	11	2462	331.89	278.61	0.2088	0.1753	0.3841	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.

Mode	Ch	Frequency (MHz)	Antenna Gain0 (numeric)	Output power to antenna 0 (dBm)	Antenna Gain1 (numeric)	Output power to antenna 1 (dBm)	Tune-up Power Tolerance (dB)	Max Tune-up Power to antenna 0 (dBm)	Max Tune-up Power to antenna 1 (dBm)
802.11n (HT20)	1	2412	3.16	22.15	3.16	21.48	2.00	24.15	23.48
	6	2437	3.16	23.40	3.16	23.53	2.00	25.40	25.53
	11	2462	3.16	22.40	3.16	22.36	2.00	24.40	24.36

Mode	Ch	Frequency (MHz)	Max Tune-up Power to antenna 0 (mW)	Max Tune-up Power to antenna1 (mW)	Power density0 (mW/cm^2)	Power density1 (mW/cm^2)	Total Power density (mW/cm^2)	Limit of power density (mW/cm^2)
802.11n (HT20)	1	2412	260.02	222.84	0.1636	0.1402	0.3038	1.0
	6	2437	346.74	357.27	0.2181	0.2248	0.4429	1.0
	11	2462	275.42	272.90	0.1733	0.1717	0.3450	1.0

Mode	Ch	Frequency (MHz)	Antenna Gain0 (numeric)	Output power to antenna 0 (dBm)	Antenna Gain1 (numeric)	Output power to antenna 1 (dBm)	Tune-up Power Tolerance (dB)	Max Tune-up Power to antenna 0 (dBm)	Max Tune-up Power to antenna 1 (dBm)
802.11n (HT40)	3	2422	3.16	16.26	3.16	15.96	2.00	18.26	17.96
	6	2437	3.16	22.98	3.16	22.47	2.00	24.98	24.47
	9	2452	3.16	17.57	3.16	17.50	2.00	19.57	19.50

Mode	Ch	Frequency (MHz)	Max Tune-up Power to antenna 0 (mW)	Max Tune-up Power to antenna1 (mW)	Power density0 (mW/cm^2)	Power density1 (mW/cm^2)	Total Power density (mW/cm^2)	Limit of power density (mW/cm^2)
802.11n (HT40)	3	2422	66.99	62.52	0.0421	0.0393	0.0815	1.0
	6	2437	314.77	279.90	0.1980	0.1761	0.3741	1.0
	9	2452	90.57	89.13	0.0570	0.0561	0.1131	1.0

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Mode	Ch	Frequency (MHz)	Antenna0 Gain (numeric)	Output power to antenna 0 (dBm)	Antenna1 Gain (numeric)	Output power to antenna 1 (dBm)	Tune-up Power Tolerance (dB)	Max AV Tune-up Power to antenna 0 (dBm)	Max AV Tune-up Power to antenna 1 (dBm)
802.11a	36	5180	3.16	17.23	3.16	15.47	2.00	19.23	17.47
	44	5220	3.16	17.45	3.16	15.48	2.00	19.45	17.48
	48	5240	3.16	18.14	3.16	16.22	2.00	20.14	18.22
	52	5260	3.16	17.57	3.16	15.84	2.00	19.57	17.84
	60	5300	3.16	17.79	3.16	15.81	2.00	19.79	17.81
	64	5320	3.16	18.52	3.16	16.58	2.00	20.52	18.58
	100	5500	3.16	21.29	3.16	19.61	2.00	23.29	21.61
	120	5600	3.16	20.14	3.16	19.32	2.00	22.14	21.32
	140	5700	3.16	19.18	3.16	18.88	2.00	21.18	20.88
	149	5745	3.16	20.45	3.16	19.91	2.00	22.45	21.91
	157	5785	3.16	20.63	3.16	19.93	2.00	22.63	21.93
	165	5825	3.16	21.62	3.16	20.43	2.00	23.62	22.43
802.11ac (VHT20)	36	5180	3.16	17.63	3.16	16.15	2.00	19.63	18.15
	44	5220	3.16	17.42	3.16	15.76	2.00	19.42	17.76
	48	5240	3.16	18.38	3.16	16.68	2.00	20.38	18.68
	52	5260	3.16	18.29	3.16	16.72	2.00	20.29	18.72
	60	5300	3.16	19.35	3.16	18.15	2.00	21.35	20.15
	64	5320	3.16	19.31	3.16	18.06	2.00	21.31	20.06
	100	5500	3.16	22.23	3.16	20.57	2.00	24.23	22.57
	120	5600	3.16	21.12	3.16	20.37	2.00	23.12	22.37
	140	5700	3.16	20.10	3.16	19.96	2.00	22.10	21.96
	149	5745	3.16	20.71	3.16	20.46	2.00	22.71	22.46
	157	5785	3.16	21.11	3.16	20.45	2.00	23.11	22.45
	165	5825	3.16	22.27	3.16	21.01	2.00	24.27	23.01

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.

Mode	Ch	Frequency (MHz)	Antenna0 Gain (numeric)	Output power to antenna 0 (dBm)	Antenna1 Gain (numeric)	Output power to antenna 1 (dBm)	Tune-up Power Tolerance (dB)	Max AV Tune-up Power to antenna 0 (dBm)	Max AV Tune-up Power to antenna 1 (dBm)
802.11ac (VHT40)	38	5190	3.16	15.25	3.16	14.39	2.00	17.25	16.39
	46	5230	3.16	17.45	3.16	16.64	2.00	19.45	18.64
	54	5270	3.16	18.29	3.16	18.10	2.00	20.29	20.10
	62	5310	3.16	18.73	3.16	18.35	2.00	20.73	20.35
	102	5510	3.16	20.54	3.16	19.52	2.00	22.54	21.52
	118	5590	3.16	19.81	3.16	19.32	2.00	21.81	21.32
	134	5670	3.16	18.92	3.16	19.53	2.00	20.92	21.53
	151	5755	3.16	18.75	3.16	19.33	2.00	20.75	21.33
	159	5795	3.16	19.56	3.16	19.64	2.00	21.56	21.64
802.11ac (VHT80)	42	5210	3.16	12.41	3.16	10.91	2.00	14.41	12.91
	58	5290	3.16	19.06	3.16	18.91	2.00	21.06	20.91
	106	5530	3.16	20.15	3.16	18.74	2.00	22.15	20.74
	122	5610	3.16	18.91	3.16	18.27	2.00	20.91	20.27
	155	5775	3.16	18.47	3.16	18.63	2.00	20.47	20.63

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Mode	Ch	Frequency (MHz)	Max AV Tune-up Power to antenna 0 (mW)	Max AV Tune-up Power to antenna1 (mW)	Power density 0 (mW/cm^2)	Power density 1 (mW/cm^2)	Total of power density (mW/cm^2)	Limit of power density (mW/cm^2)
802.11a	36	5180	83.7529	55.8470	0.0527	0.0351	0.0878	1.0
	44	5220	88.1049	55.9758	0.0554	0.0352	0.0906	1.0
	48	5240	103.2761	66.3743	0.0650	0.0418	0.1067	1.0
	52	5260	90.5733	60.8135	0.0570	0.0383	0.0952	1.0
	60	5300	95.2796	60.3949	0.0599	0.0380	0.0979	1.0
	64	5320	112.7197	72.1107	0.0709	0.0454	0.1163	1.0
	100	5500	213.3045	144.8772	0.1342	0.0911	0.2253	1.0
	120	5600	163.6817	135.5189	0.1030	0.0853	0.1882	1.0
	140	5700	131.2200	122.4616	0.0826	0.0770	0.1596	1.0
	149	5745	175.7924	155.2387	0.1106	0.0977	0.2083	1.0
	157	5785	183.2314	155.9553	0.1153	0.0981	0.2134	1.0
	165	5825	230.1442	174.9847	0.1448	0.1101	0.2549	1.0
802.11ac (VHT20)	36	5180	91.8333	65.3131	0.0578	0.0411	0.0989	1.0
	44	5220	87.4984	59.7035	0.0550	0.0376	0.0926	1.0
	48	5240	109.1440	73.7904	0.0687	0.0464	0.1151	1.0
	52	5260	106.9055	74.4732	0.0673	0.0469	0.1141	1.0
	60	5300	136.4583	103.5142	0.0858	0.0651	0.1510	1.0
	64	5320	135.2073	101.3911	0.0851	0.0638	0.1488	1.0
	100	5500	264.8500	180.7174	0.1666	0.1137	0.2803	1.0
	120	5600	205.1162	172.5838	0.1290	0.1086	0.2376	1.0
	140	5700	162.1810	157.0363	0.1020	0.0988	0.2008	1.0
	149	5745	186.6380	176.1976	0.1174	0.1108	0.2283	1.0
	157	5785	204.6445	175.7924	0.1287	0.1106	0.2393	1.0
	165	5825	267.3006	199.9862	0.1682	0.1258	0.2940	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.

Mode	Ch	Frequency (MHz)	Max AV Tune-up Power to antenna 0 (mW)	Max AV Tune-up Power to antenna1 (mW)	Power density 0 (mW/cm^2)	Power density 1 (mW/cm^2)	Total of power density (mW/cm^2)	Limit of power density (mW/cm^2)
802.11ac (VHT40)	38	5190	53.0884	43.5512	0.0334	0.0274	0.0608	1.0
	46	5230	88.1049	73.1139	0.0554	0.0460	0.1014	1.0
	54	5270	106.9055	102.3293	0.0673	0.0644	0.1316	1.0
	62	5310	118.3042	108.3927	0.0744	0.0682	0.1426	1.0
	102	5510	179.4734	141.9058	0.1129	0.0893	0.2022	1.0
	118	5590	151.7050	135.5189	0.0954	0.0853	0.1807	1.0
	134	5670	123.5947	142.2329	0.0778	0.0895	0.1672	1.0
	151	5755	118.8502	135.8313	0.0748	0.0855	0.1602	1.0
	159	5795	143.2188	145.8814	0.0901	0.0918	0.1819	1.0
802.11ac (VHT80)	42	5210	27.6058	19.5434	0.0174	0.0123	0.0297	1.0
	58	5290	127.6439	123.3105	0.0803	0.0776	0.1579	1.0
	106	5530	164.0590	118.5769	0.1032	0.0746	0.1778	1.0
	122	5610	123.3105	106.4143	0.0776	0.0669	0.1445	1.0
	155	5775	111.4295	115.6112	0.0701	0.0727	0.1428	1.0

The worst value of WiFi 2.4GHz is 0.4429 (mW/cm^2). The worst value of WiFi 5GHz is 0.2940 (mW/cm^2). When these are transmitting at the same time, the worst MPE value is 0.4429+0.2940=0.7369 mW/ cm2. It is also met the limit.