Maximum Permissible Exposure Evaluation

FCC ID: 2BEY4-M92

Report No.	:	TBR-C-202412-0146-3
Applicant	:	Kontron, d. o. o.
Equipment Under Test (EUT)		
EUT Name	:	Innbox M92
Model No.	:	Innbox M92
Series Model No.	:	Planet M92
Brand Name	:	Innbox
Sample ID	:	HC-C-202412-0146-01-01&HC-C-202412-0146-01-02
Receipt Date	:	2024-12-26
Test Date	:	2024-12-27 to 2025-01-21
Issue Date	:	2025-01-21
Standards	:	FCC Part 2.1091
Test Method	:	KDB 447498 D01 General RF Exposure Guidance v06
Conclusions	:	**PASS**
		In the configuration tested, the EUT complied with the standards specified above.
Test By	:	Rick Chen
Reviewed By	:	Wade Lv
Approved By	:	Ivan Su

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

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Revision History

Report No.	Version	Description	Issued Date
TBR-C-202412-0146-3	Rev.01	Initial issue of report	2025-01-21

1. General Information about EUT

1.1 Client Information

Applicant	:	Kontron, d. o. o.
Address	:	Ljubljanska cesta 24a, 4000 Kranj, Slovenia
Manufacturer	:	Kontron, d. o. o.
Address	:	Ljubljanska cesta 24a, 4000 Kranj, Slovenia

1.2 General Description of EUT (Equipment Under Test)

EUT Name	:	Innbox M92
Models No.	:	Innbox M92, Planet M92
Model Different	:	All these models are identical in the same PCB, layout and electrical circuit, The only difference is model name.
Operation Frequency	:	U-NII-1: 5180MHz~5240MHz; U-NII-2A: 5260MHz~5320MHz U-NII-2C: 5500MHz~5720MHz; U-NII-3: 5745MHz~5825MHz 2.4G Wi-Fi: 2412MHz~2462MHz
Modulation Type:	:	802.11a: OFDM (QPSK, BPSK, 16QAM, 64QAM) 802.11b: DSSS (DQPSK, DBPSK, CCK) 802.11g: OFDM (BPSK, QPSK,16QAM, 64QAM) 802.11n: OFDM (QPSK, BPSK, 16QAM, 64QAM) 802.11ac: OFDM (QPSK, BPSK, 16QAM, 64QAM, 256QAM) 802.11ax: OFDMA (QPSK, BPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
Power Rating	:	AC Adapter (Model: RD1201000-225MG): Input: 100-240V~, 50/60Hz, 0.6A Output: 12V⎓1.0A
Software Version	:	N/A
Hardware Version	:	V1.1(InnboxM92)

Remark:
(1)The antenna gain and adapter provided by the applicant, the verified for the RF conduction test provided by TOBY test lab.
(2)For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

1.3 Antenna Information

Band	Max. Antenna Gain(dBi)	
	Ant. 1(PCB)	Ant. 2(PCB)
2.4G Wi-Fi	3.58	4.05
5G U-NII-1	4.80	5.08
5G U-NII-2A	4.80	5.08
5G U-NII-2C	4.80	5.08
5G U-NII-3	4.80	5.08
Note: The above antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible		

2. Measurement Uncertainty

The reported uncertainty of measurement y±U，where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2，providing a level of confidence of approximately 95 %.

Test Item	Parameters	Expanded Uncertainty (U_{Lab})
Conducted Emission	Level Accuracy: 9kHz~150kHz 150kHz to 30MHz	±3.50 dB ±3.10 dB
Radiated Emission	Level Accuracy: 9kHz to 30 MHz	±4.60 dB
Radiated Emission	Level Accuracy: 30MHz to 1000 MHz	±4.50 dB
Radiated Emission	Level Accuracy: Above 1000MHz	±4.20 dB
RF Power-Conducted	/	±0.95 dB
Power Spectral Density-Conducted	/	±3dB
Occupied Bandwidth	/	±3.8%
Unwanted Emission-Conducted	/	±2.72 dB

3. Test Facility

The testing report were performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at 1/F., Building 6, Rundongsheng Industrial Zone, Longzhu, Xixiang, Bao'an District, Shenzhen, Guangdong, China. At the time of testing, the following bodies accredited the Laboratory:

CNAS (L5813)

The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

A2LA Certificate No.: 4750.01

The laboratory has been accredited by American Association for Laboratory Accreditation(A2LA) to ISO/IEC 17025：2017 General Requirements for the Competence of Testing and Calibration Laboratories for the technical competence in the field of Electrical Testing. And the A2LA Certificate No.: 4750.01.FCC Accredited Test Site Number: 854351. Designation Number: CN1223.

IC Registration No.: (11950A)

The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A. CAB identifier: CN0056.

4. Method of Measurement for FCC

4.1 EUT Operation Condition:

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

4.2 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

4.3 Simultaneous transmission MPE Considerations

According to KDB447498 D01v06: All transmitters and antennas in the host must be either evaluated for MPE compliance, by measurement or computational modeling, or qualify for the standalone MPE test exclusion in section 7.1. Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0.
This means that:

∑ of MPE ratios ≤ 1.0

5. Test Result

2.4G Wi-Fi MPE Result									
Test Mode	Ant.	Channel	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)
11B-SISO	Ant1	2412	19.90	20±1	21	3.58	20	0.0571	1
	Ant2	2412	19.92	20±1	21	4.05	20	0.0636	1
	Ant1	2437	20.21	20±1	21	3.58	20	0.0571	1
	Ant2	2437	20.80	20±1	21	4.05	20	0.0636	1
	Ant1	2462	19.23	20±1	21	3.58	20	0.0571	1
	Ant2	2462	20.09	20±1	21	4.05	20	0.0636	1
11G-SISO	Ant1	2412	18.19	18±1	19	3.58	20	0.0360	1
	Ant2	2412	18.62	18±1	19	4.05	20	0.0402	1
	Ant1	2437	18.83	18±1	19	3.58	20	0.0360	1
	Ant2	2437	18.66	18±1	19	4.05	20	0.0402	1
	Ant1	2462	18.01	18±1	19	3.58	20	0.0360	1
	Ant2	2462	18.18	18±1	19	4.05	20	0.0402	1
11N20-CDD	Ant1	2412	17.56	18±1	19	3.58	20	0.0360	1
	Ant2	2412	18.07	18±1	19	4.05	20	0.0402	1
	Ant1	2437	17.51	18±1	19	3.58	20	0.0360	1
	Ant2	2437	17.64	18±1	19	4.05	20	0.0402	1
	Ant1	2462	17.48	18±1	19	3.58	20	0.0360	1
	Ant2	2462	17.75	18±1	19	4.05	20	0.0402	1
11N40-CDD	Ant1	2422	16.15	17±1	18	3.58	20	0.0286	1
	Ant2	2422	16.55	17±1	18	4.05	20	0.0319	1
	Ant1	2437	17.27	17±1	18	3.58	20	0.0286	1
	Ant2	2437	17.57	17±1	18	4.05	20	0.0319	1
	Ant1	2452	17.48	17±1	18	3.58	20	0.0286	1
	Ant2	2452	17.54	17±1	18	4.05	20	0.0319	1
11AX20-CDD	Ant1	2412	16.83	17±1	18	3.58	20	0.0286	1
	Ant2	2412	17.30	18±1	19	4.05	20	0.0402	1
	Ant1	2437	18.20	18±1	19	3.58	20	0.0360	1
	Ant2	2437	18.29	18±1	19	4.05	20	0.0402	1
	Ant1	2462	17.80	18±1	19	3.58	20	0.0360	1
	Ant2	2462	18.11	18±1	19	4.05	20	0.0402	1
11AX40-CDD	Ant1	2422	16.24	17±1	18	3.58	20	0.0286	1
	Ant2	2422	16.71	17±1	18	4.05	20	0.0319	1
	Ant1	2437	16.14	17±1	18	3.58	20	0.0286	1
	Ant2	2437	16.24	17±1	18	4.05	20	0.0319	1
	Ant1	2452	16.07	17±1	18	3.58	20	0.0286	1
	Ant2	2452	16.26	17±1	18	4.05	20	0.0319	1

5G Wi-Fi Worst MPE Result								
Test Mode	Ant.	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm)[P]	Max. ANT Gain (dBi)[G]	Distance (cm) [R]	Power Density (mW/ cm^2) [S]	Limit (mW/ cm^2)
5G a-SISO	Ant1	20.81	20±1	21	4.80	20	0.0765	1
	Ant2	20.65	20±1	21	5.08	20	0.0807	1
5G n20-CDD	Ant1	20.21	20±1	21	4.80	20	0.0765	1
	Ant2	19.21	20±1	21	5.08	20	0.0807	1
5G n40-CDD	Ant1	20.32	20±1	21	4.80	20	0.0765	1
	Ant2	19.02	20±1	21	5.08	20	0.0807	1
5G ac20-CDD	Ant1	20.21	20±1	21	4.80	20	0.0765	1
	Ant2	19.23	20±1	21	5.08	20	0.0807	1
5G ac40-CDD	Ant1	20.10	20±1	21	4.80	20	0.0765	1
	Ant2	19.42	20±1	21	5.08	20	0.0807	1
5G ac80-CDD	Ant1	20.10	20±1	21	4.80	20	0.0765	1
	Ant2	19.42	20±1	21	5.08	20	0.0807	1
5G ax20-CDD	Ant1	20.67	20±1	21	4.80	20	0.0765	1
	Ant2	19.29	20±1	21	5.08	20	0.0807	1
5G ax40-CDD	Ant1	20.17	20±1	21	4.80	20	0.0765	1
	Ant2	19.68	20±1	21	5.08	20	0.0807	1
5G ax80-CDD	Ant1	20.07	20±1	21	4.80	20	0.0765	1
	Ant2	19.07	20±1	21	5.08	20	0.0807	1

1. 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

For: 2.4G&5G
MPE limit S: 1mW/cm^2
The worst MPE is calculated as ***0.0807mW / cm^2 < limit 1mW / cm^2***.

2. Summary simultaneous transmission information

Modulation Type	Work Frequency Band	Transmit Antenna		Antenna 1&2 Synchronization Transmit
		Ant. 1	Ant.2	
IEEE 802.11b	2.4GHz	Yes	Yes	No
IEEE 802.11g	2.4GHz	Yes	Yes	No
IEEE 802.11n HT20	2.4GHz	Yes	Yes	Yes
IEEE 802.11n HT40	2.4GHz	Yes	Yes	Yes
IEEE 802.11ax HE20	2.4GHz	Yes	Yes	Yes
IEEE 802.11ax HE40	2.4GHz	Yes	Yes	Yes
IEEE 802.11a	U-NII-1/ U-NII-2A U-NII-2C/ U-NII-3	Yes	Yes	No
IEEE 802.11n HT20	U-NII-1/ U-NII-2A U-NII-2C/ U-NII-3	Yes	Yes	Yes
IEEE 802.11n HT40	U-NII-1/ U-NII-2A U-NII-2C/ U-NII-3	Yes	Yes	Yes
IEEE 802.11ac VHT20	U-NII-1/ U-NII-2A U-NII-2C/ U-NII-3	Yes	Yes	Yes
IEEE 802.11ac VHT40	U-NII-1/ U-NII-2A U-NII-2C/ U-NII-3	Yes	Yes	Yes
IEEE 802.11ac VHT80	U-NII-1/ U-NII-2A U-NII-2C/ U-NII-3	Yes	Yes	Yes
IEEE 802.11ax HE20	U-NII-1/ U-NII-2A U-NII-2C/ U-NII-3	Yes	Yes	Yes
IEEE 802.11ax HE40	U-NII-1/ U-NII-2A U-NII-2C/ U-NII-3	Yes	Yes	Yes
IEEE 802.11ax HE80	U-NII-1/ U-NII-2A U-NII-2C/ U-NII-3	Yes	Yes	Yes

3. Summary simultaneous transmission results

Band	MPE Antenna 1 (mW/cm^2)	MPE Antenna 2 (mW/cm^2)	∑MPE ratios	Limit	Results
2.4G	0.0360	0.0402	0.0762	1.0	PASS
5G	0.0765	0.0807	0.1572	1.0	PASS

Wi-Fi support Synchronization transmission

Maximum MPE ratio 2.4GWiFi	Maximum MPE ratio 5GWiFi	∑MPE ratios	Limit	Results
0.0762	0.1572	0.2334	1	PASS

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 CFR 2.1091 (b). The RF Exposure Information page from the manual is included here for reference.

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