RF Exposure Exemption Report

MPI Holdings FZE

ISS (Intelligent Safety System)
In accordance with FCC CFR 47 Part 1.1307

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Prepared for: MPI Holdings FZE
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NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
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Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD document control rules.

FCC Accreditation
294497/UK2010 Octagon House, Fareham Test Laboratory

EXECUTIVE SUMMARY
The wireless devices described within this report are compliant with the exemption criteria related to human exposure to electromagnetic fields laid out in FCC CFR Title 47 Part 1.1307.

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1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	14-May-2024

Table 1

1.2 Introduction

Applicant	MPI Holdings FZE
Manufacturer	MPI Holdings FZE
Model Number(s)	GDU (Graphical Display Unit) – 641-9400 (With LTE) Power Hub CCU (Central Control Unit) – 641-9399 White RCM (Radio Communication Module) – 641-9389 RTD (Real Time Detection) Unit – 641-9404 E6 Handset – 641-9403
Manufacturers Declared Variant(s)	GDU (Graphical Display Unit) - 641-9401 (no LTE) GDU (Graphical Display Unit) - 641-9395
Serial Number(s)	Power Hub CCU (Central Control Unit) – S/N: 251684 White RCM (Radio Communication Module) - S/N: 253990 GDU (Graphical Display Unit) – S/N: 250240 RTD (Real Time Detection) Unit – S/N: 249477 E6 Handset – S/N: 254506
Hardware Version(s)	GDU-1V6 CCU-1V4 RCM-2V2 E6-1V3 RTD+-1V2
Specification/Issue/Date	FCC 47 CFR Part 1.1307: 2022
Order Number	003752
Date	09 April 2024
Related Document(s)	• KDB 447498 D04 v01 • FCC 47 CFR Part 2.1091: 2022

1.3 Brief Summary of Results

The wireless devices described within this report are compliant with the exemption criteria related to human exposure to electromagnetic fields laid out in FCC CFR Title 47 Part 1.1307.

The calculations shown in this report were made in accordance with the procedures specified in the applied test specification(s).

Application Form

1.4 Product Information

1.4.1 Technical Description

Vehicle mounted collision avoidance equipment.

1.4.2 Transmitter Description

The following radio access technologies and frequency bands are supported by the equipment under test.

Radio Access Technology	Frequency Band (MHz)	Minimum Frequency (MHz)	Output Power (dBm)	Duty Cycle (%)
WLAN	2400-2483.5	2412	19.5	100
ISM	915-928	915	12.0	3.5
BT	2400-2483.5	2402	9.0	100
UWB	6240-6739.2	6240	10.0	0.7
LTE B2	1850-1910	1850	21.0	100
LTE B4	1710-1755	1710	21.0	100
LTE B5	824-849	824	21.0	100
LTE B12	698-716	699	21.0	100
LTE B13	776-788	777	21.0	100
LTE B25	1850-1915	1850	21.0	100
LTE B26	814-849	814	21.0	100
LTE B66	1710-1780	1710	21.0	100
LTE B71	663-698	663	21.0	100

Table 2 – Transmitter Description- FCC

Note: Transmitter power includes upper bounds of uncertainty therefore maximum values are used.

1.4.3 Antenna Description

The following antennas are supported by the equipment under test.

Radio Access Technology	Antenna Model	Gain (dBi)	Antenna length (cm)	Minimum Separation Distance (mm)
WLAN	Module integrated antenna	3.7	Onboard inlaid PCB antenna	200
ISM	Ignion NN02	2.1	1.2	200
BT	Module integrated antenna	3.7	Onboard inlaid PCB antenna	200
UWB	Module integrated antenna on the DWM1000 module	4.2	0.8	200
LTE	Ignion NN03	2.4	3	200

Table 3 – Antenna description

In the case of more than one type of antenna being supported by the equipment, the calculation is based on the maximum of the antenna gains. If other antennas can be used that have greater gains, the minimum separation distances will need to be recalculated.

Note: Antenna gain includes upper bounds of uncertainty therefore maximum values are used.

1.4.4 Equipment Configuration

Simultaneous transmission for the following configurations;

Combination 1 - 2.4 GHz WLAN, ISM 915 MHz, 6 GHz UWB and LTE Band 2

Combination 2 - 2.4 GHz WLAN, ISM 915 MHz, 6 GHz UWB and LTE Band 4

Combination 3 – 2.4 GHz WLAN, ISM 915 MHz, 6 GHz UWB and LTE Band 4

Combination 4 – 2.4 GHz WLAN, ISM 915 MHz, 6 GHz UWB and LTE Band 5

Combination 5 – 2.4 GHz WLAN, ISM 915 MHz, 6 GHz UWB and LTE Band 12

Combination 6 – 2.4 GHz WLAN, ISM 915 MHz, 6 GHz UWB and LTE Band 13

Combination 7 – 2.4 GHz WLAN, ISM 915 MHz, 6 GHz UWB and LTE Band 25

Combination 8 – 2.4 GHz WLAN, ISM 915 MHz, 6 GHz UWB and LTE Band 66

Combination 9 – 2.4 GHz WLAN, ISM 915 MHz, 6 GHz UWB and LTE Band 71

Notes: Please note that as per customer specification, either WIFI or Bluetooth can transmit at one time and not simultaneously. Therefore, for Simultaneous transmission testing, the WIFI Mode was configured as the worst-case.

2 Assessment Details

2.1 Single RF Source options for determination of exemption.

<table>
<tr><th>Option</th><th>Reference</th><th>RF Exposure Test Exemptions for Single Source</th></tr>
<tr><td>A
(1-mW Test Exemption)</td><td>FCC
1.1307(b)(3)(i)(A)</td><td>The available maximum time averaged power is no more than 1 mW, regardless of separation distance.</td></tr>
<tr><td>B
(SAR-Based Exemption)</td><td>FCC
1.1307(b)(3)(i)(B)</td><td>The available maximum timeaveraged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold Pth (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). Pth is given by:
$$P_{th}\ (\text{mW}) = \begin{cases} ERP_{20\ cm}(d/20\ \text{cm})^x & d \le 20\ \text{cm} \\ ERP_{20\ cm} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases}$$
Where
$$x = -\log_{10}\left(\frac{60}{ERP_{20\ cm}\sqrt{f}}\right)$$ and f is in GHz;
and
$$ERP_{20\ cm}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases}$$
d = the separation distance (cm);</td></tr>
<tr><td>C
(MPE-Based Exemption)</td><td>FCC
1.1307(b)(3)(i)(C)</td><td>Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least λ/2π, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed
the electrical length of λ/4 or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).
TABLE 1 TO § 1.1307(b)(3)(i)(C)—SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION
<table>
<tr><th>RF Source frequency (MHz)</th><th>Threshold ERP (watts)</th></tr>
<tr><td>0.3–1.34</td><td>1,920 R^2.</td></tr>
<tr><td>1.34–30</td><td>3,450 R^2/f^2.</td></tr>
<tr><td>30–300</td><td>3.83 R^2.</td></tr>
<tr><td>300–1,500</td><td>0.0128 R^2f.</td></tr>
<tr><td>1,500–100,000</td><td>19.2R^2.</td></tr>
</table></td></tr>
</table>

2.2 Multiple RF Sources options for determination of exemption.

Option	Reference	
A 1-mW Test Exemption for Multiple Sources	FCC 1.1307(b)(3)(ii)(A)	The available maximum time averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those is paragraph (b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(i)(A).
B Simultaneous Transmission with both SAR-based and MPE-Based Test Exemptions	FCC 1.1307(b)(3)(ii)(B)	in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation. $\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$

3 Individual Antenna Port Exposure Results

3.1.1 Single Source Calculation of Exposure at Specified Separation Distance FCC 1.1307(b)(3)(i)(C) 'Option C' (MPE Based Exemption)

RAT	Frequency (MHz)	Conducted Power Output (mW)	Duty Cycle %	Time Average Conducted Power Output (mW)	Antenna Gain Ratio	Maximum Power (EIRP) mW	Maximum Power (ERP) mW	Minimum separation distance for MPE evaluation λ/2 π mm	Actual Distance (mm)	Threshold ERP (mW)	1.1307(b)(3)(i)(C) Exemption (Yes/No) (300 kHz to 100 GHz)
WLAN	2412	89.125	100	89.125	2.344	208.9090	127.38	19.8	200	768.0	Yes
ISM	915	15.849	3.5	0.555	1.622	0.8998	0.55	52.2	200	468.5	Yes
BT	2402	89.125	100	7.943	2.344	208.9090	127.38	19.9	200	768.0	Yes
UWB	6240	10.000	0.7	0.07	2.63	0.1841	0.11	7.7	200	768.0	Yes
LTE B2	1850	125.893	100	125.893	1.862	234.4128	142.93	25.8	200	768.0	Yes
LTE B4	1710	125.893	100	125.893	1.862	234.4128	142.93	27.9	200	768.0	Yes
LTE B5	824	125.893	100	125.893	1.413	177.8868	108.47	57.9	200	421.9	Yes
LTE B12	699	125.893	100	125.893	1.413	177.8868	108.47	68.3	200	357.9	Yes
LTE B13	777	125.893	100	125.893	1.413	177.8868	108.47	61.4	200	397.8	Yes
LTE B25	1850	125.893	100	125.893	1.862	234.4128	142.93	25.8	200	768.0	Yes
LTE B26	814	125.893	100	125.893	1.413	177.8868	108.47	58.7	200	416.8	Yes
LTE B66	1710	125.893	100	125.893	1.413	177.8868	108.47	27.9	200	768.0	Yes
LTE B71	663	125.893	100	125.893	1.413	177.8868	108.47	72.0	200	339.5	Yes

Table 4 –Transmitter Result

The calculations show that the individual transmitters comply with FCC 1.1307(b)(3)(i)(C) MPE-based exception at a minimum distance of 200 mm.

3.2 Combined Antenna Port RF Exposure Results FCC 1.1307(b)(3)(ii)(B)

3.2.1 Combination 1 – Option B or Option C Summation

RAT	Frequency (MHz)	Conducted Power Output mW	Duty Cycle %	Time Average Conducted Power Output mW	Antenna Gain Ratio	Maximum Power (EIRP) mW	Maximum Power (ERP) mW	Test Separation Distance (mm)	ERPj / ERPth,j <or> Pi / Pth	Sum of the fractional contributions to the applicable thresholds is less than or equal to 1. Compliant? (Yes/No)
WLAN	2412	89.125	100	89.125	2.344	208.9090	127.38	200	0.16586	-
ISM	915	15.849	3.5	0.555	1.622	0.8998	0.55	200	0.00117	-
UWB	6240	10	0.7	0.07	2.63	0.1841	0.11	200	0.00015	-
LTE B2	1850	125.893	100	125.893	1.862	234.4128	142.93	200	0.18611	-
Calculated RF exposure level at minimum compliance boundary of 200 mm as a fraction of the limit									0.35329	Yes

Table 5 –Transmitter Result

The calculations show that the multiple transmitters comply with FCC 1.1307(b)(3)(ii)(B) summation-based exemption.

3.2.2 Combination 2 - Option B or Option C Summation

RAT	Frequency (MHz)	Conducted Power Output mW	Duty Cycle %	Time Average Conducted Power Output mW	Antenna Gain Ratio	Maximum Power (EIRP) mW	Maximum Power (ERP) mW	Test Separation Distance (mm)	ERPj / ERPth,j <or> Pi / Pth	Sum of the fractional contributions to the applicable thresholds is less than or equal to 1. Compliant? (Yes/No)
WLAN	2412	89.125	100	89.125	2.344	208.9090	127.38	200	0.16586	-
ISM	915	15.849	3.5	0.555	1.622	0.8998	0.55	200	0.00117	-
UWB	6240	10	0.7	0.07	2.63	0.1841	0.11	200	0.00015	-
LTE B4	1710	125.893	100	125.893	1.862	234.4128	142.93	200	0.18611	-
Calculated RF exposure level at minimum compliance boundary of 200 mm as a fraction of the limit									0.35329	Yes

Table 6 –Transmitter Result

The calculations show that the multiple transmitters comply with FCC 1.1307(b)(3)(ii)(B) summation-based exemption

3.2.3 Combination 3 - Option B or Option C Summation

RAT	Frequency (MHz)	Conducted Power Output mW	Duty Cycle %	Time Average Conducted Power Output mW	Antenna Gain Ratio	Maximum Power (EIRP) mW	Maximum Power (ERP) mW	Test Separation Distance (mm)	ERPj / ERPth,j <or> Pi / Pth	Sum of the fractional contributions to the applicable thresholds is less than or equal to 1. Compliant? (Yes/No)
WLAN	2412	89.125	100	89.125	2.344	208.9090	127.38	200	0.16586	-
ISM	915	15.849	3.5	0.555	1.622	0.8998	0.55	200	0.00117	-
UWB	6240	10	0.7	0.07	2.63	0.1841	0.11	200	0.00015	-
LTE B5	824	125.893	100	125.893	1.413	177.8868	108.47	200	0.25710	-
Calculated RF exposure level at minimum compliance boundary of 200 mm as a fraction of the limit									0.42428	Yes

Table 7 –Transmitter Result

The calculations show that the multiple transmitters comply with FCC 1.1307(b)(3)(ii)(B) summation-based exemption

3.2.4 Combination 4 - Option B or Option C Summation

RAT	Frequency (MHz)	Conducted Power Output mW	Duty Cycle %	Time Average Conducted Power Output mW	Antenna Gain Ratio	Maximum Power (EIRP) mW	Maximum Power (ERP) mW	Test Separation Distance (mm)	ERPj / ERPth,j <or> Pi / Pth	Sum of the fractional contributions to the applicable thresholds is less than or equal to 1. Compliant? (Yes/No)
WLAN	2412	89.125	100	89.125	2.344	208.9090	127.38	200	0.16586	-
ISM	915	15.849	3.5	0.555	1.622	0.8998	0.55	200	0.00117	-
UWB	6240	10	0.7	0.07	2.63	0.1841	0.11	200	0.00015	-
LTE B12	699	125.893	100	125.893	1.413	177.8868	108.47	200	0.30308	-
Calculated RF exposure level at minimum compliance boundary of 200 mm as a fraction of the limit									0.47026	Yes

Table 8 –Transmitter Result

The calculations show that the multiple transmitters comply with FCC 1.1307(b)(3)(ii)(B) summation-based exemption

3.2.5 Combination 5 - Option B or Option C Summation

RAT	Frequency (MHz)	Conducted Power Output mW	Duty Cycle %	Time Average Conducted Power Output mW	Antenna Gain Ratio	Maximum Power (EIRP) mW	Maximum Power (ERP) mW	Test Separation Distance (mm)	ERPj / ERPth,j <or> Pi / Pth	Sum of the fractional contributions to the applicable thresholds is less than or equal to 1. Compliant? (Yes/No)
WLAN	2412	89.125	100	89.125	2.344	208.9090	127.38	200	0.16586	-
ISM	915	15.849	3.5	0.555	1.622	0.8998	0.55	200	0.00117	-
UWB	6240	10	0.7	0.07	2.63	0.1841	0.11	200	0.00015	-
LTE B13	777	125.893	100	125.893	1.413	177.8868	108.47	200	0.03978	-
Calculated RF exposure level at minimum compliance boundary of 200 mm as a fraction of the limit									0.56498	Yes

Table 9 –Transmitter Result

The calculations show that the multiple transmitters comply with FCC 1.1307(b)(3)(ii)(B) summation-based exemption

3.2.6 Combination 6 - Option B or Option C Summation

RAT	Frequency (MHz)	Conducted Power Output mW	Duty Cycle %	Time Average Conducted Power Output mW	Antenna Gain Ratio	Maximum Power (EIRP) mW	Maximum Power (ERP) mW	Test Separation Distance (mm)	ERPj / ERPth,j <or> Pi / Pth	Sum of the fractional contributions to the applicable thresholds is less than or equal to 1. Compliant? (Yes/No)
WLAN	2412	89.125	100	89.125	2.344	208.9090	127.38	200	0.16586	-
ISM	915	15.849	3.5	0.555	1.622	0.8998	0.55	200	0.00117	-
UWB	6240	10	0.7	0.07	2.63	0.1841	0.11	200	0.00015	-
LTE B25	1850	125.893	100	125.893	1.862	234.4128	142.93	200	0.18611	-
Calculated RF exposure level at minimum compliance boundary of 200 mm as a fraction of the limit									0.35329	Yes

Table 10 –Transmitter Result

The calculations show that the multiple transmitters comply with FCC 1.1307(b)(3)(ii)(B) summation-based exemption

3.2.7 Combination 7 - Option B or Option C Summation

RAT	Frequency (MHz)	Conducted Power Output mW	Duty Cycle %	Time Average Conducted Power Output mW	Antenna Gain Ratio	Maximum Power (EIRP) mW	Maximum Power (ERP) mW	Test Separation Distance (mm)	ERPj / ERPth,j <or> Pi / Pth	Sum of the fractional contributions to the applicable thresholds is less than or equal to 1. Compliant? (Yes/No)
WLAN	2412	89.125	100	89.125	2.344	208.9090	127.38	200	0.16586	-
ISM	915	15.849	3.5	0.555	1.622	0.8998	0.55	200	0.00117	-
UWB	6240	10	0.7	0.07	2.63	0.1841	0.11	200	0.00015	-
LTE B26	814	125.893	100	125.893	1.413	177.8868	108.47	200	0.26026	-
Calculated RF exposure level at minimum compliance boundary of 200 mm as a fraction of the limit									0.42744	Yes

Table 11 –Transmitter Result

The calculations show that the multiple transmitters comply with FCC 1.1307(b)(3)(ii)(B) summation-based exemption

3.2.8 Combination 8 - Option B or Option C Summation

RAT	Frequency (MHz)	Conducted Power Output mW	Duty Cycle %	Time Average Conducted Power Output mW	Antenna Gain Ratio	Maximum Power (EIRP) mW	Maximum Power (ERP) mW	Test Separation Distance (mm)	ERPj / ERPth,j <or> Pi / Pth	Sum of the fractional contributions to the applicable thresholds is less than or equal to 1. Compliant? (Yes/No)
WLAN	2412	89.125	100	89.125	2.344	208.9090	127.38	200	0.16586	-
ISM	915	15.849	3.5	0.555	1.622	0.8998	0.55	200	0.00117	-
UWB	6240	10	0.7	0.07	2.63	0.1841	0.11	200	0.00015	-
LTE B66	1710	125.893	100	125.893	1.413	177.8868	108.47	200	0.14123	-
Calculated RF exposure level at minimum compliance boundary of 200 mm as a fraction of the limit									0.30841	Yes

Table 12 –Transmitter Result

The calculations show that the multiple transmitters comply with FCC 1.1307(b)(3)(ii)(B) summation-based exemption

3.2.9 Combination 9 - Option B or Option C Summation

RAT	Frequency (MHz)	Conducted Power Output mW	Duty Cycle %	Time Average Conducted Power Output mW	Antenna Gain Ratio	Maximum Power (EIRP) mW	Maximum Power (ERP) mW	Test Separation Distance (mm)	ERPj / ERPth,j <or> Pi / Pth	Sum of the fractional contributions to the applicable thresholds is less than or equal to 1. Compliant? (Yes/No)
WLAN	2412	89.125	100	89.125	2.344	208.9090	127.38	200	0.16586	-
ISM	915	15.849	3.5	0.555	1.622	0.8998	0.55	200	0.00117	-
UWB	6240	10	0.7	0.07	2.63	0.1841	0.11	200	0.00015	-
LTE B71	663	125.893	100	125.893	1.413	177.8868	108.47	200	0.31953	-
Calculated RF exposure level at minimum compliance boundary of 200 mm as a fraction of the limit									0.48671	Yes

Table 13 –Transmitter Result

The calculations show that the multiple transmitters comply with FCC 1.1307(b)(3)(ii)(B) summation-based exemption