



Maximum Permissible Exposure Report

1. Product Information

EUT	: GNSS RECEIVER
Test Model	: INNO8
Additional Model No.	: ALPS1, ALPS2, ALPS3, ALPS4, ALPS5, ALPS6, INNO9, INNO6, INNO5, INNO3, INNO8 Pro, K60 Pro, K60, K2, KR1, KR2, KR3, T7, T7 Pro, T6, T6 Pro, T5, T5 Pro, RENO2S, RENO1 Pro, ROVA3, RAMA1, RAMA2, RAMA3, RAMA4, K50, K9S, T14, T15, RENO2, RENO3, ROVA2, Insight V3, V1
Model Declaration	: PCB board, structure and internal of these model(s) are the same, So no additional models were tested
Ratings	: For AC Adapter Input: 100-240V~, 50/60Hz, 1.4A MAX Adapter Output: PD3.0: 5V=3A/9V=3A/15V=3A/20V=2.25A PPS: 3.3-11.0V=3A QC: 5V=3A/9V=3A/12V=3A DC 7.4V by Rechargeable Li-ion Battery, 10000mAh
Hardware Version	: H0X0DY0N0210008063135G048C12
Software Version	: PurpleCowY_RTK-V20231019
Bluetooth	:
Frequency Range	: 2402MHz~2480MHz
Channel Number	: 79 channels for Bluetooth V4.2 (DSS) 40 channels for Bluetooth V4.2 (DTS)
Channel Spacing	: 1MHz for Bluetooth V4.2 (DSS) 2MHz for Bluetooth V4.2 (DTS)
Modulation Type	: GFSK, $\pi/4$ -DQPSK, 8-DPSK for Bluetooth V4.2 (DSS) GFSK for Bluetooth V4.2 (DTS)
Bluetooth Version	: V4.2
Antenna Description	: Internal Antenna, 2.70dBi(Max.)
WIFI(2.4G Band)	:
Frequency Range	: 2412MHz~2462MHz
Channel Spacing	: 5MHz
Channel Number	: 11 Channels for 20MHz bandwidth (2412~2462MHz) 7 Channels for 40MHz bandwidth (2422~2452MHz)
Modulation Type	: IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description	: Internal Antenna, 2.70dBi(Max.)
WIFI(5.2G Band)	:
Frequency Range	: 5180MHz~5240MHz
Channel Number	: 4 Channels for 20MHz bandwidth(5180MHz~5240MHz)





2 channels for 40MHz bandwidth(5190MHz~5230MHz)
Modulation Type : IEEE 802.11a/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description : Internal Antenna, 8.07dBi(Max.)

WIFI(5.3G Band)

Frequency Range : 5260MHz~5320MHz
Channel Number : 4 Channels for 20MHz bandwidth(5260MHz~5320MHz)
2 channels for 40MHz bandwidth(5270MHz~5310MHz)
Modulation Type : IEEE 802.11a/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description : Internal Antenna, 6.95dBi(Max.)

WIFI(5.5G Band)

Frequency Range : 5500MHz~5700MHz
Channel Number : 11 Channels for 20MHz bandwidth(5500MHz~5700MHz)
5 Channels for 40MHz bandwidth(5510MHz~5670MHz)
Modulation Type : IEEE 802.11a/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description : Internal Antenna, 6.95dBi(Max.)

2G

Support Band : ☒ GSM 850 (U.S.-Band)
☒ PCS 1900 (U.S.-Band)
Release Version : R99
GPRS Class : Class 12
EGPRS Class : Class 12
Type Of Modulation : GMSK for GSM/GPRS; GMSK/8PSK for EGPRS
Antenna Description : Internal Antenna
0.63dBi (max.) For GSM 850
1.54dBi (max.) For PCS 1900

3G

Support Band : ☒ WCDMA Band V (U.S.-Band)
Release Version : R9
Type Of Modulation : QPSK,16QAM
Antenna Description : Internal Antenna
0.63dBi (max.) For WCDMA Band V

LTE

Support Band : ☒ E-UTRA Band 5(U.S.-Band)
☒ E-UTRA Band 7(U.S.-Band)
☒ E-UTRA Band 41(U.S.-Band)
LTE Release Version : R9
Type Of Modulation : QPSK/16QAM
Antenna Description : Internal Antenna
0.63dBi (max.) For E-UTRA Band 5





1.78dBi (max.) For E-UTRA Band 7
2.55dBi (max.) For E-UTRA Band 41

Power Class : Class 3

NFC :

Frequency Range : 13.56MHz

Modulation Type : ASK

Antenna Description : Internal Antenna, 0dBi(Max.)

PMR :

Operating Frequency : 410MHz~470MHz

Channel Separation : 12.5KHz

Modulation Type : GMSK

rated power : 3W

Antenna Description : External Antenna, 2.14dBi(Max.)

Extreme temp. : -30°C to +50°C

Tolerance

Extreme vol. Limits : 6.7VDC to 8.4VDC (nominal: 7.4VDC)

EUT Type : Production Unit

Device Type : Mobile Devices





2. Evaluation Method

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498D01 for 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 modelled or measured field strengths or power density, is ≤ 1.0 . The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

3. Limit

3. 1 Refer Evaluation Method

[ANSI C95.1-2019](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz

[FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v06](#): Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

[FCC CFR 47 part1 1.1310](#): Radiofrequency radiation exposure limits.

[FCC CFR 47 part2 2.1091](#): Radiofrequency radiation exposure evaluation: mobile devices.



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3.2 Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
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 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Uncontrolled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 30	824/f	2.19/f	(180/f ²)*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	/	/	f/1500	30
1500 – 100,000	/	/	1.0	30

F=frequency in MHz

*=Plane-wave equivalent power density

4. MPE Calculation Method

Predication of MPE limit at a given distance

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 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



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**6. Conducted Power****[BT Max Peak Power]**

Mode	Channel	Frequency (MHz)	Max Conducted Power(dBm)	ANT Max. Tune Up Power (dBm)
GFSK	00	2402	-0.61	0±1.0
	39	2441	-0.01	0±1.0
	79	2480	0.29	0±1.0
$\pi/4$ -DQPSK	00	2402	-0.84	0±1.0
	39	2441	-0.33	0±1.0
	79	2480	0.03	0±1.0
8-DPSK	00	2402	-0.83	0±1.0
	39	2441	-0.25	0±1.0
	79	2480	0.07	0±1.0

[BT LE Max Peak Power]

Mode	Channel	Frequency (MHz)	Max Conducted Power(dBm)	ANT Max. Tune Up Power (dBm)
GFSK	0	2402	-0.5	0±1.0
	19	2440	-0.34	0±1.0
	39	2480	-1.11	-1.0±1.0

[2.4G WIFI Max Peak Power]

Mode	Channel	Frequency (MHz)	Max Conducted Power(dBm)	ANT Max. Tune Up Power (dBm)
IEEE 802.11b	1	2412	15.20	15.0±1.0
	6	2437	15.54	15.0±1.0
	11	2462	15.64	15.0±1.0
IEEE 802.11g	1	2412	14.82	14.0±1.0
	6	2437	14.09	14.0±1.0
	11	2462	14.33	14.0±1.0
IEEE 802.11n HT20	1	2412	13.24	13.0±1.0
	6	2437	13.63	13.0±1.0
	11	2462	13.61	13.0±1.0
IEEE 802.11n HT40	3	2422	12.63	12.0±1.0
	6	2437	12.24	12.0±1.0
	9	2452	11.9	11.0±1.0





[5.2G WIFI Max Average Power]

Mode	Channel	Frequency (MHz)	Max Conducted Power(dBm)	ANT Max. Tune Up Power (dBm)
IEEE 802.11a	36	5180	12.34	12.0±1.0
	40	5200	13.13	13.0±1.0
	48	5240	12.78	12.0±1.0
IEEE 802.11n HT20	36	5180	12.25	12.0±1.0
	40	5200	11.71	11.0±1.0
	48	5240	11.8	11.0±1.0
IEEE 802.11n HT40	38	5190	10.96	10.0±1.0
	46	5230	11.24	11.0±1.0

[5.3G WIFI Max Average Power]

Mode	Channel	Frequency (MHz)	Max Conducted Power(dBm)	ANT Max. Tune Up Power (dBm)
IEEE 802.11a	52	5260	12.47	12.0±1.0
	60	5300	12.81	12.0±1.0
	64	5320	12.41	12.0±1.0
IEEE 802.11n HT20	52	5260	11.86	11.0±1.0
	60	5300	11.58	11.0±1.0
	64	5320	11.79	11.0±1.0
IEEE 802.11n HT40	54	5270	11.06	11.0±1.0
	62	5310	11.39	11.0±1.0

[5.5G WIFI]

Mode	Channel	Frequency (MHz)	Max Conducted Power(dBm)	ANT Max. Tune Up Power (dBm)
IEEE 802.11a	100	5500	12.66	12.0±1.0
	116	5580	12.97	12.0±1.0
	140	5700	12.91	12.0±1.0
IEEE 802.11n HT20	100	5500	11.81	11.0±1.0
	116	5580	11.47	11.0±1.0
	140	5700	11.97	11.0±1.0
IEEE 802.11n HT40	102	5510	11.31	11.0±1.0
	110	5550	10.54	10.0±1.0
	134	5670	10.83	10.0±1.0

[GSM Max Average Power]

Test Mode	Channel	Frequency (MHz)	Max Average Power (dBm)	ANT Max. Tune Up Power (dBm)
GSM 850	Low	824.2	30.67	30.0±1.0
	Middle	836.6	30.69	30.0±1.0
	High	848.8	30.63	30.0±1.0
GSM 1900	Low	1850.2	29.67	29.0±1.0
	Middle	1880.0	29.67	29.0±1.0
	High	1909.8	29.66	29.0±1.0





[WCDMA Max Average Power]

Test Mode	Channel	Frequency (MHz)	Max Average Power (dBm)	ANT Max. Tune Up Power (dBm)
WCDMA Band V	Low	826.4	23.06	23.0±1.0
	Middle	836.4	23.23	23.0±1.0
	High	846.6	23.11	23.0±1.0

[LTE Max Average Power]

Test Mode		Channel	Max Average Power (dBm)	ANT Max. Tune Up Power (dBm)
LTE	Band 5	LCH	23.40	23.0±1.0
		MCH	23.31	23.0±1.0
		HCH	23.20	23.0±1.0
	Band 7	LCH	21.57	21.0±1.0
		MCH	21.80	21.0±1.0
		HCH	21.40	21.0±1.0
	Band 41	LCH	24.72	24.0±1.0
		MCH	25.01	25.0±1.0
		HCH	25.25	25.0±1.0

NFC:

TX frequency range: 13.56MHz

Max. Field Strength: 43.08dBuV/m @3m

 $EIRP = E - 104.8 + 20 \log D = 43.08 - 104.8 + 20 \log 3 = -52.18 \text{ dBm}$

Maximum Conducted Output Power: -52.18dBm

Turn-up: -52±1dBm

<PMR>

Test Mode		Frequency(MHz)	Max Conducted Peak Power (dBm)	Tune Up Power (dBm)
GMSK	12.5KHz	410.125	33.888	33±1.0
		439.625	33.836	33±1.0
		469.625	33.883	33±1.0





7. Measurement Results

7.1 Standalone MPE Evaluation

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 50 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, $r=50\text{cm}$, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

[BT]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)	MPE ratios
	dBm	mW					
GFSK	1.0	1.2589	2.43	1.7498	0.00007	1.0000	0.00007
$\pi/4$ -DQPSK	1.0	1.2589	2.43	1.7498	0.00007	1.0000	0.00007
8-DPSK	1.0	1.2589	2.43	1.7498	0.00007	1.0000	0.00007

[BT LE]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)	MPE ratios
	dBm	mW					
GFSK	1.0	1.2589	2.43	1.7498	0.00007	1.0000	0.00007

[2.4G WLAN]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)	MPE ratios
	dBm	mW					
IEEE 802.11b	16.0	39.8107	2.43	1.7498	0.00222	1.0000	0.00222
IEEE 802.11g	15.0	31.6228	2.43	1.7498	0.00176	1.0000	0.00176
IEEE 802.11n HT20	14.0	25.1189	2.43	1.7498	0.00140	1.0000	0.00140
IEEE 802.11n HT40	13.0	19.9526	2.43	1.7498	0.00111	1.0000	0.00111

[5.2G WLAN]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)	MPE ratios
	dBm	mW					
IEEE 802.11a	14.0	25.1189	8.07	6.4121	0.00513	1.0000	0.00513
IEEE 802.11n HT20	13.0	19.9526	8.07	6.4121	0.00407	1.0000	0.00407
IEEE 802.11n HT40	12.0	15.8489	8.07	6.4121	0.00323	1.0000	0.00323



**[5.3G WLAN]**

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)	MPE ratios
	dBm	mW					
IEEE 802.11a	13.0	19.9526	6.95	4.9545	0.00315	1.0000	0.00315
IEEE 802.11n HT20	12.0	15.8489	6.95	4.9545	0.00250	1.0000	0.00250
IEEE 802.11n HT40	12.0	15.8489	6.95	4.9545	0.00250	1.0000	0.00250

[5.5G WLAN]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)	MPE ratios
	dBm	mW					
IEEE 802.11a	13.0	19.9526	6.95	4.9545	0.00315	1.0000	0.00315
IEEE 802.11n HT20	12.0	15.8489	6.95	4.9545	0.00250	1.0000	0.00250
IEEE 802.11n HT40	12.0	15.8489	6.95	4.9545	0.00250	1.0000	0.00250

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)	MPE ratios
	dBm	mW					
GSM 850	31.0	1258.9254	0.63	1.1561	0.04633	0.5493	0.08434
GSM 1900	30.0	1000.0000	1.54	1.4256	0.04538	1.0000	0.04538
WCDMA Band V	24.0	251.1886	0.63	1.1561	0.00924	0.4660	0.01983
LTE Band 5	24.0	251.1886	0.63	1.1561	0.00924	0.5667	0.01630
LTE Band 7	22.0	158.4893	1.78	1.5066	0.00760	1.0000	0.00760
LTE Band 41	26.0	398.1072	2.55	1.7989	0.02280	1.0000	0.02280

<NFC>

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)	MPE ratios
	dBm	mW					
ASK	-51.0	0.0000	0	1.0000	0.0000	1.0000	0.0000

[PMR]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)	MPE ratios
	dBm	mW					
GMSK 410 ~ 470MHz	34	2511.89	2.14	1.6368	0.1309	0.2733	0.4790

Remark:

1. Output power including turn-up tolerance;
2. Output power was adjust to duty cycle at 100% if measured duty cycle less than 98%;
3. MPE evaluate distance is 50cm from user manual provide by manufacturer.





8.2 Simultaneous Transmission MPE Evaluation

The sample support one BT&BLE&2.4GWLAN&5.2GWLAN&5.3GWLAN&5.5GWLAN(MPE1), another one GSM&WCDMA<E(MPE2), another one NFC(MPE3) transmit antenna and another one PMR (MPE4)transmit antenna, so need consider simultaneous transmission;

Simultaneous transmission MPE

According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;

$\sum \sum$ of MPE ratios ≤ 1.0

Mode	MPE1 Max.	MPE2 Max.	MPE3 Max	MPE4 Max	$\sum$ MPE ratios	Limit	Results
WIFI+LTE+NFC+PMR	0.00513	0.08434	0.000	0.4790	0.56847	1.000	Pass

9. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

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



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