MICROHARD SYSTEMS INC.

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Leaders in Wireless Telecom

RF Exposure / RF Technical Brief

Ultratech Group of Labs

3000 Bristol Circle
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ATTN: Reviewing Engineer

RF exposure information for the equipment VIP4Gb (FCC ID: NS9VIP4GABGN20)

1. Introduction:

The device **VIP4Gb** (FCC ID: **NS9VIP4GABGN20**, IC: **3143A-VIP4GABGN20**) is designed to be used only for fixed and mobile applications.

This product integrates a **Telit LN930 Data card** (FCC ID: **RI7LN930**, IC: **5131A-LN930**). The Telit LN930 Data card is granted with a modular approval for mobile applications and the highest antenna gains allowed for use with this module for mobile RF exposure conditions are 3.5 dBi (850 MHz), 5.0 dBi (700 MHz), 5.0 dBi (1700 MHz), and 3.0 dBi (1900 MHz).

The antenna(s) used for **VIP4Gb** transmitter and the antenna used for **Telit LN930 Data card** are co-located and can transmit simultaneously.

All the antennas must be installed to provide a separation distance of at least 20 cm from all the persons.

2. MPE limits:

The table below is excerpted from Table 1B of 47 CFR 1.1310 titled Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure:

Frequency Range (MHz)	Power density (mW/cm^2)	Averaging time (minutes)
300 – 1500	f (MHz) /1500	30
1500 – 100.000	1.0	30

3. Compliance criteria:

Power density of individual transmitters is calculated using the equation:

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units, e.g., mW)

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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 (appropriate units, e.g., cm)

3.1. Standalone compliance criteria:

Power density must be lower than the MPE limits stated in item 2.

3.2. Simultaneous transmission compliance criteria

The sum of the MPE ratios (Power density/MPE limit) for all simultaneous transmitting antennas incorporated in the device based on the calculated power density is ≤ 1.0.

4. Compliance calculations:

4.1. Standalone transmission – Telit LN930 data card

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum ERP/EIRP (W)	Maximum ERP/EIRP Limit (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm2)	Limit (mW/cm2)
GPRS 850 (1 Tx slot)	824.2	5.0	33.0	3.85	7.0	794.33	0.16	0.55
GPRS 850 (2 Tx slots)	824.2	5.0	33.0	3.85	7.0	1584.89	0.32	0.55
GPRS 850 (3 Tx slots)	824.2	5.0	33.0	3.85	7.0	2365.92	0.47	0.55
GPRS 850 (4 Tx slots)	824.2	5.0	32.0	3.05	7.0	2511.89	0.50	0.55
EGPRS 850 (1 Tx slot)	824.2	5.0	28.0	1.22	7.0	251.19	0.05	0.55
EGPRS 850 (2 Tx slots)	824.2	5.0	28.0	1.22	7.0	251.19	0.05	0.55
EGPRS 850 (3 Tx slots)	824.2	5.0	27.0	0.97	7.0	594.29	0.12	0.55
EGPRS 850 (4 Tx slots)	824.2	5.0	26.0	0.77	7.0	630.96	0.13	0.55
GPRS 1900 (1 Tx slot)	1850.2	3.0	30.0	2.00	2.0	251.19	0.05	1.00
GPRS 1900 (2 Tx slots)	1850.2	3.0	30.0	2.00	2.0	501.19	0.10	1.00
GPRS 1900 (3 Tx slots)	1850.2	3.0	30.0	2.00	2.0	748.17	0.15	1.00
GPRS 1900 (4 Tx slots)	1850.2	3.0	29.0	1.58	2.0	794.33	0.16	1.00
EGPRS 1900 (1 Tx slot)	1850.2	3.0	27.0	1.00	2.0	125.89	0.03	1.00
EGPRS 1900 (2 Tx slots)	1850.2	3.0	27.0	1.00	2.0	251.19	0.05	1.00
EGPRS 1900 (3 Tx slots)	1850.2	3.0	26.0	0.79	2.0	297.85	0.06	1.00
EGPRS 1900 (4 Tx slots)	1850.2	3.0	25.0	0.63	2.0	316.23	0.06	1.00
WCDMA Band 5	826.4	5.0	24.5	0.54	7.0	891.25	0.18	0.55
WCDMA Band 4	1712.4	5.5	24.5	1.00	1.0	1000.00	0.20	1.00
WCDMA Band 2	1852.4	3.0	24.5	0.56	2.0	562.34	0.11	1.00
LTE Band 17	706.5	5.0	24.0	0.48	3.0	794.33	0.16	0.47
LTE Band 13	779.5	5.0	24.0	0.48	3.0	794.33	0.16	0.52
LTE Band 5	824.7	5.0	24.0	0.48	7.0	794.33	0.16	0.55
LTE Band 4	1710.7	5.5	24.0	0.89	1.0	891.25	0.18	1.00
LTE Band 2	1850.7	3.0	24.0	0.50	2.0	501.19	0.10	1.00
LTE Band 7	2504.0	5.0	24.0	0.79	2.0	794.33	0.16	1.00

Maximum MPE ratio: 0.5/.55 = 0.909

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4.2. Standalone transmission - VIP4Gb

Frequency band	Frequency range (MHz)	Mode	Average power (dBm)	Antenna gain (dBi)	Total power (W)	Duty Cycle (%)	Evaluation distance (cm)	Power Density (mW/cm^2)	FCC MPE limit (mW/cm^2)	MPE ratio (Power Density / FCC MPE limit)
2,4 GHz	2412 - 2462	802.11b	15,91	2	0,06	100%	20	0,012	1,00	0,01
2,4 GHz	2412 - 2462	802.11g	14,51	2	0,04	100%	20	0,009	1,00	0,01
2,4 GHz	2412 - 2462	802.11n - 20 MHz	15,31	2	0,05	100%	20	0,011	1,00	0,01
2,4 GHz	2422 - 2452	802.11n - 40 MHz	13,28	2	0,03	100%	20	0,007	1,00	0,01
5,75 GHz	5745 - 5825	802.11a	16,61	2	0,07	100%	20	0,014	1,00	0,01
5,75 GHz	5745 - 5825	802.11n - 20 MHz	18,41	2	0,11	100%	20	0,022	1,00	0,02
5,75 GHz	5755 - 5795	802.11n - 40 MHz	16,61	2	0,07	100%	20	0,014	1,00	0,01

Maximum MPE ratio: 0,02

4.3. Simultaneous transmission

Maximum MPE ratio of Telit LN930 data card: 0.909

+

Maximum MPE ratio of VIP4GB: 0,02

= 0.911 ≤ 1

Signed on behalf of **Microhard Systems Inc** in **Calgary** on **July 15, 2016**

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