



EMC Test Data

Client:	Hexagon Mining	PR Number:	PR113292
Model:	HxGN MineProtect OAS-LV	T-Log Number:	TL113292
Contact:	Marco Carvalho	Project Manager:	Christine Krebill
Standard:	FCC 15B, CISPR 32, EN 301 489	Project Engineer:	Deniz Demirci
		Class:	N/A

Maximum Permissible Exposure

Specific Details

Objective: Evaluate the RF Exposure requirements per FCC 1.1310, 2.1091, 2.1093 and RSS-102.

Date of Test: 3/11/2020

Test Engineer: Deniz Demirci

General Test Configuration

Calculation uses the free space transmission formula:

$$S = (PG)/(4 \pi d^2)$$

Where: S is power density (W/m^2), P is output power (W), G is antenna gain relative to isotropic, d is separation distance from the transmitting antenna (m).

Summary of Results

Device complies with Power Density requirements at 20 cm separation:	Yes
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Deviations From The Standard

No deviations were made from the requirements of the standard.



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FCC MPE Calculation

Use: General

Antenna: Ethertronics_LTE_AVX-E_1002289 and Larid_Wi-Fi and Bluetooth_330-0156-R1_9

For 300-1500 MHz single transmitters (General use)

Freq. MHz	EUT Power		Cable Loss Loss dB	Ant Gain dBi	Power at Ant dBm	EIRP mW	Power Density (S) at 20 cm mW/cm^2	MPE Limit at 20 cm mW/cm^2
707.5	dBm	mW*						
707.5	24.5	281.8	0	2.9	24.5	549.5	0.109	0.472
782.0	24.5	281.8	0	2.9	24.5	549.5	0.109	0.521
836.5	24.5	281.8	0	2.9	24.5	549.5	0.109	0.558

For 1.5-15 GHz single transmitters (General use)

Freq. MHz	EUT Power		Cable Loss Loss dB	Ant Gain dBi	Power at Ant dBm	EIRP mW	Power Density (S) at 20 cm mW/cm^2	MPE Limit at 20 cm mW/cm^2
	dBm	mW*						
1732.5	24.5	281.8	0	4.3	24.5	758.6	0.151	1.000
1732.5*	24.5	281.8	0	4.3	24.5	758.6	0.151	1.000
1880.0	24.5	281.8	0	4.3	24.5	758.6	0.151	1.000
2412.0	23.5	221.9	0	2.5	23.5	394.6	0.078	1.000
2462.0	23.5	221.9	0	2.5	23.5	394.6	0.078	1.000
5180.0	17.8	60.2	0	3.0	17.8	120.2	0.024	1.000
5230.0	17.8	60.2	0	3.0	17.8	120.2	0.024	1.000
5260.0	15.8	38.0	0	3.0	15.8	75.9	0.015	1.000
5320.0	15.8	38.0	0	3.0	15.8	75.9	0.015	1.000
5500.0	21.1	130.0	0	3.0	21.1	259.3	0.052	1.000
5720.0	21.1	130.0	0	3.0	21.1	259.3	0.052	1.000
5745.0	17.8	60.2	0	3.0	17.8	120.2	0.024	1.000
5825.0	17.8	60.2	0	3.0	17.8	120.2	0.024	1.000

* Verizon

Note 1:	Cell modem RF power information was derived from the test Report: MDE_UBLOX_1712_MPEb provided by 7 Layers (UMTS as worst case, including tune-up tolerances)
Note 2:	Tune up tolerance of +2 dB applied to Wi-Fi RF power per the test Report: TR 315356 E (RFx) provided by Laird



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Standard:	FCC 15B, CISPR 32, EN 301 489	Project Engineer:	Deniz Demirci
		Class:	N/A

FCC MPE Calculation

Combined exposure from all 2 radios (highest contribution from each radio) as a percentage of the corresponding limit

Freq. MHz	Power Density (S) at 20 cm mW/cm ²	MPE Limit at 20 cm mW/cm ²	% of the limit	Total
707.5	0.109	0.472	23	23
782.0	0.109	0.521	21	-
836.5	0.109	0.558	20	-
1732.5	0.151	1.000	15	-
1732.5*	0.151	1.000	15	-
1880.0	0.151	1.000	15	-
2412.0	0.078	1.000	8	8
2462.0	0.078	1.000	8	-
5180.0	0.024	1.000	2	-
5230.0	0.024	1.000	2	-
5260.0	0.015	1.000	2	-
5320.0	0.015	1.000	2	-
5500.0	0.052	1.000	5	-
5720.0	0.052	1.000	5	-
5745.0	0.024	1.000	2	-
5825.0	0.024	1.000	2	-

31%

Result: **Pass**



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Standard:	FCC 15B, CISPR 32, EN 301 489	Project Engineer:	Deniz Demirci
		Class:	N/A

ISED Canada MPE Calculation

Use: General

Antenna: Ethertronics_LTE_AVX-E_1002289 and Larid_Wi-Fi and Bluetooth_330-0156-R1_9

For 300-6000 MHz single transmitters (General use)

Freq. MHz	EUT Power		Cable Loss Loss dB	Ant Gain dBi	Power at Ant dBm	EIRP mW	Power Density (S) at 20 cm W/m^2	MPE Limit at 20 cm W/m^2
707.5	dBm	mW*						
707.5	24.5	281.8	0	2.9	24.5	549.54	1.093	2.321
782.0	24.5	281.8	0	2.9	24.5	549.54	1.093	2.485
836.5	24.5	281.8	0	2.9	24.5	549.54	1.093	2.602
1732.5	24.5	281.8	0	4.3	24.5	758.58	1.509	4.280
1732.5	24.5	281.8	0	4.3	24.5	758.58	1.509	4.280
1880.0	24.5	281.8	0	4.3	24.5	758.58	1.509	4.526
2412.0	23.5	221.9	0	2.5	23.5	394.57	0.785	5.366
2462.0	23.5	221.9	0	2.5	23.5	394.57	0.785	5.442
5180.0	17.8	60.2	0	3.0	17.8	120.17	0.239	9.047
5230.0	17.8	60.2	0	3.0	17.8	120.17	0.239	9.107
5260.0	15.8	38.0	0	3.0	15.8	75.89	0.151	9.142
5320.0	15.8	38.0	0	3.0	15.8	75.89	0.151	9.213
5500.0	21.1	130.0	0	3.0	21.1	259.31	0.516	9.425
5720.0	21.1	130.0	0	3.0	21.1	259.31	0.516	9.681
5745.0	17.8	60.2	0	3.0	17.8	120.17	0.239	9.710
5825.0	17.8	60.2	0	3.0	17.8	120.17	0.239	9.803

Note 1: Cell modem RF power information was derived from the test Report: MDE_UBLOX_1712_MPEb provided by 7 Layers (UMTS as worst case, including tune-up tolerances)

Note 2: Tune up tolerance of +2 dB applied to Wi-Fi RF power per the test Report: TR 315356 E (RFx) provided by Laird



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		Class:	N/A

ISED Canada MPE Calculation

Combined exposure from all 2 radios (highest contribution from each radio) as a percentage of the corresponding limit

Freq. MHz	Power Density (S) at 20 cm W/m ²	MPE Limit at 20 cm W/m ²	% of the limit	Total
707.5	1.093	2.321	47	47
782.0	1.093	2.485	44	
836.5	1.093	2.602	42	-
1732.5	1.509	4.280	35	-
1732.5	1.509	4.280	35	-
1880.0	1.509	4.526	33	-
2412.0	0.785	5.366	15	15
2462.0	0.785	5.442	14	-
5180.0	0.239	9.047	3	-
5230.0	0.239	9.107	3	-
5260.0	0.151	9.142	2	-
5320.0	0.151	9.213	2	-
5500.0	0.516	9.425	5	-
5720.0	0.516	9.681	5	-
5745.0	0.239	9.710	2	-
5825.0	0.239	9.803	2	-

62%

Result: **Pass**