

MPE Calculations

The WLAN module E2K512ANHMW is designed to be installed into laptop host systems with a minimum separation distance of at least 20cm from the antennas to persons. The maximum power spectral density 20cm from the antenna is highlighted in the table and is 0.04 mW/cm², 4% of the allowed limit.

Frequency	MPE Limit (mW/cm ²)	Output Power (mW)	Max. Antenna Gain (dBi) ¹	EIRP (mW)	Pd at 20cm (mW/cm ²)	Distance where Pd = limit (cm)
2412 to 2462 MHz	1.00	72.4	3.2	151.4	0.03	3.5
5180 to 5320 MHz	1.00	45.7	5.0	144.5	0.03	3.4
5500 to 5700 MHz	1.00	70.8	5.0	223.9	0.04	4.2
5745 to 5825 MHz	1.00	61.7	5.0	195.0	0.04	3.9

The WWAN module VV7-MBMF3507G is also designed to be installed into laptop hosts. The installation of this module by Dell will use the Amphenol Hepburn antenna that has a maximum gain of 2.1dBi in the 800MHz band and 1.2dBi in the 1.9GHz band. Using the output powers listed in the RF exposure calculations for the various operating modes, and the appropriate protocol-limited (source-based) duty cycle the power density 20cm from the device for each operating mode is shown in the table below.

Modulation	MPE Limit (mW/cm ²)	Output Power (mW)	Duty Cycle (%)	Output Power (mW)	Antenna Gain (dBi) ²	EIRP (mW)	Pd at 20cm (mW/cm ²)	% of limit
824.2 – 848.8 MHz Band								
GPRS	0.55	1995.3	25	498.82	2.1	809.0	0.20	36.4%
EDGE	0.55	741.3	25	314.73	2.1	510.4	0.10	18.2%
WCDMA	0.55	190.6	100	230.14	2.1	373.2	0.07	12.7%
HSDPA	0.55	199.5	100	223.36	2.1	362.3	0.07	12.7%
HSUPA	0.55	190.6	100	203.24	2.1	329.6	0.07	12.7%
1850.2 – 1909.8 MHz Band								
GPRS	1	851.1	25	212.78	1.2	278.6	0.06	6.0%
EDGE	1	741.3	25	185.33	1.2	242.6	0.05	5.0%
WCDMA	1	190.6	100	190.55	1.2	249.5	0.05	5.0%
HSDPA	1	199.5	100	199.53	1.2	261.2	0.05	5.0%
HSUPA	1	190.6	100	190.55	1.2	249.5	0.05	5.0%

¹ Antenna gain is the highest antenna gain in each band for the antennas covered by this application.

² Antenna gain is the highest antenna gain in each band for the antennas covered by this application.

The maximum power spectral density 20cm from the antenna relative to the limit is the highlighted row and the power density is 36.4% of the limit.

When the two devices are co-located the total power density 20cm from both antennas, expressed as a ratio of the allowable rf exposure, is the sum of the individual percentages of the limits for each module. This sum is 40.4%. As this value is below 100% of the limit the two devices may be collocated and used in applications with a separation distance of at least 20cm from persons.

Antenna Specification for WWAN Module
Amphenol Hepburn Antenna

Antenna Specifications

Antenna Type (Material, Technology)	IFA
Antenna Model Number	Hepburn
Operating Frequency Range(s)	824MHz ~ 960MHz and 1710MHz ~ 2170MHz
Peak Gain (Low Band) (dBi)	Main 2.09 / Aux 1.17
Peak Gain (High Band) (dBi)	Main 1.55 / Aux 0.7
Radio Connector Type	IPEX 20278-111R-13 / IPEX 20531-111R-37
Mid-Line Connector Type (If Applicable)	N/A

Remark: Peak Gains include all system losses (connector, cable, etc)