

RF Exposure Evaluation for FCC ID: YQD-QLM100

Refer user manual this device is a QLM100 Module, and this device was designed used in Mobile devices that the minimum distance between human's body is **20cm**. Based on the 47CFR 2.1091, this device belongs to Mobile device. The definition of the category as following:

Mobile Derives:

CFR Title 47 §2.1091(b)

(b) For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.

FCC KDB 447498 D01 General RF Exposure Guidance v06 Limit

Devices operating in standalone mobile exposure conditions may contain a single transmitter or multiple transmitters that do not transmit simultaneously. A minimum test separation distance ≥ 20 cm is required between the antenna and radiating structures of the device and nearby persons to apply mobile device exposure limits. The distance must be fully supported by the operating and installation configurations of the transmitter and its antenna(s), according to the source-based time-averaged maximum power requirements of § 2.1091(d)(2). In cases where cable losses or other attenuations are applied to determine compliance, the most conservative operating configurations and exposure conditions must be evaluated. The minimum test separation distance required for a device to comply with mobile exposure conditions must be clearly identified in the installation and operating instructions, for all installation and exposure conditions, to enable users and installers to comply with RF exposure requirements. For mobile devices that have the potential to operate in portable device exposure conditions, similar to the configurations described in § 2.1091(d)(4), a KDB inquiry is required to determine the SAR test requirements for demonstrating compliance.

When the categorical exclusion provision of § 2.1091(c) applies, the minimum test separation distance may be estimated, when applicable, by simple calculations according to plane-wave equivalent conditions, to ensure the transmitter and its antenna(s) can operate in manners that meet or exceed the estimated distance. The source-based time-averaged maximum radiated power, according to the maximum antenna gain, must be applied to calculate the field strength and power density required to establish the minimum test separation distance. When the estimated test separation distance becomes overly conservative and does not support compliance, MPE measurement or computational modeling may be used to determine the required minimum separation distance.

According to FCC Part 1.1307, systems operating under the provisions of this 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.

Limits for General Population/ Uncontrolled Exposure			
Frequency Range (MHz)	Electric Field Strength(E)(V/m)	Magnetic Field Strength (H)(A/m)	Power Density (S)(mW/cm ²)
0.3-1.34	614	1.63	(100)*
1.34-30	824/f	2.19/f	(180/f ²)*
30-300	27.5	0.073	0.2
300-1500			f/1500
1500-100,000			1.0

MPE calculation formula

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

Where:

S = power density

P = output power (mW)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Separation distance between radiator and human body (cm)

Test data

GPRS			
Mode	GPRS 850		
	Low Channel	Middle Channel	High Channel
ERP (dBm)	32.95	33.30	33.14
Mode	GPRS 1900		
	Low Channel	Middle Channel	Low Channel
EIRP (dBm)	30.89	30.76	30.35
Note: This report listed the worst case ERP/EIRP value, please refer to RF test report for more details.			

EGPRS			
Mode	EGPRS 850		
	Low Channel	Middle Channel	High Channel
ERP (dBm)	27.53	27.57	27.37
Mode	GPRS 1900		
	Low Channel	Middle Channel	Low Channel
EIRP (dBm)	25.82	25.54	25.29
Note: This report listed the worst case ERP/EIRP value, please refer to RF test report for more details.			

LTE-M1						
Mode	2	4	5	12	13	25
ERP/EIRP (dBm)	21.78	21.89	19.89	17.68	19.70	21.30
Mode	66	85				
ERP/EIRP (dBm)	21.58	17.94				
Note: This report listed the worst case ERP/EIRP value, please refer to RF test report for more details.						

NB-IOT						
Mode	2	4	5	12	13	25
ERP/EIRP (dBm)	21.20	21.49	19.46	17.19	19.41	21.10
Mode	66	71	85			
ERP/EIRP (dBm)	21.41	15.63	17.74			
Note: This report listed the worst case ERP/EIRP value, please refer to RF test report for more details.						

Turn-up power

Mode		Range (dBm)
GSM	GPRS 850	30-35
	GPRS 1900	27-35
	EGPRS 850	24-30
	EGPRS 1900	24-30
LTE-M1	Band 2	15-23
	Band 4	15-23
	Band 5	15-23
	Band 12	15-23
	Band 13	15-23
	Band 25	15-23
	Band 66	15-23
	Band 85	15-23
NB-IOT	Band 2	15-23
	Band 4	15-23
	Band 5	15-23
	Band 12	15-23
	Band 13	15-23
	Band 25	15-23
	Band 66	15-23
	Band 71	15-23
	Band 85	15-23

Test result

Evolution mode		Maximum peak output power (dBm)	Antenna Gain (typical) (dBi&dBd):	Total Power (mw)	Distance (cm)	Limit of Power Density (mW/cm ²)	Power Density (mW/cm ²)	Verdict
GSM	GPRS 850	33.30	-0.76	2137.96	20	0.57	0.3570	Pass
	GPRS 1900	30.89	-1.20	931.10	20	1	0.1852	Pass
	EGPRS 850	27.57	-0.76	479.73	20	0.57	0.0954	Pass
	EGPRS 1900	25.82	-1.20	289.73	20	1	0.0576	Pass
LTE-M1	Band 2	22.98	-1.20	150.66	20	1	0.0299	Pass
	Band 4	22.79	-0.90	154.52	20	1	0.0307	Pass
	Band 5	22.80	-2.91	97.49	20	0.57	0.0193	Pass
	Band 12	22.80	-5.15	58.61	20	0.48	0.0116	Pass
	Band 13	22.66	-2.96	93.32	20	0.53	0.0185	Pass
	Band 25	22.50	-1.20	134.89	20	1	0.0268	Pass
	Band 66	22.48	-0.90	143.87	20	1	0.0286	Pass
	Band 85	22.49	-4.55	62.23	20	0.48	0.0123	Pass
NB-IOT	Band 2	22.40	-1.20	131.82	20	1	0.0262	Pass
	Band 4	22.39	-0.90	140.92	20	1	0.0280	Pass
	Band 5	22.40	-2.91	88.30	20	0.57	0.0175	Pass
	Band 12	22.34	-5.15	52.36	20	0.48	0.0104	Pass
	Band 13	22.37	-2.96	87.29	20	0.53	0.0173	Pass
	Band 25	22.30	-1.20	128.82	20	1	0.0256	Pass
	Band 66	22.31	-0.90	138.35	20	1	0.0275	Pass
	Band 71	21.88	-6.25	36.55	20	0.47	0.0073	Pass
	Band 85	22.29	-4.55	59.42	20	0.48	0.0118	Pass

Note:

1. The worst-case situation is 0.357, which is less than “0.57”. This confirmed that the device comply

with FCC 1.1310 MPE limit.

2. The QLM100 Module work frequency range used is 663 MHz ~ 716 MHz, 777 MHz ~ 787 MHz 807 MHz ~ 849 MHz 1710 MHz ~ 1780 MHz and 1850 MHz ~ 1915 MHz the result close to the limit by the above formula so, we select worst case power to calculate the exclusion power threshold.
3. More power list please refer to RF test report.

Conclusion:

RF exposure Evaluation Results: **Compliance**