LTM & LLP Series
Multiband Antennas

The LTM & LLP Series Antennas is designed for secure communication and enables MiMo and diveristy applications with excellent RF performance.

Modular built and can contain up to 7 antennas in the same housing.

All antennas in LTM and LLP series are built and tested according to industrial and military standards.

support multi system solutions for

- Heavy vehicles
- Public safety
- Construction machinery
- Industrial machinery
- Forestry
- Buses
- Internet On Board services

Ultimate MIMO mobile antennas

- Compact radome
- Small size
- Rugged
- Heavy duty construction
- Broadband global LTE coverage
- Configurable for different systems
- Field proven design, dependable link
- Tested to industry & military specs
- * Avaliable with LMR195-FR cables

* LMR-195FR is a non-halogen (non-toxic), low smoke, fire retardant cable.and has the same cable loss as RF195

MobileMark
antenna solutions

LTM502 5-cable: Global LTE MIMO, WiFi MIMO & GPS

- 5-cables: two for Global Cellular/LTE, two for WiFi, and one for GPS
- Covers all Cellular & LTE frequencies worldwide, from 694 MHz to 3700 MHz
- WiFi elements can be used for WiFi MIMO or for separate WiFi modems
- Single mounting hole; easier installation

Mobile Mark's LTM502 Series Multiband Diversity/MIMO antenna contains five separate antennas, all in one compact antenna housing: two broadband LTE/Cellular antennas, two dual-band WiFi antennas, and one GPS antenna. The LTM502 differs from the LTM501 in that the broadband LTE/Cellular element covers all LTE frequencies worldwide, from 694-3700 MHz.

Both WiFi and LTE MIMO (multiple-input-multiple-output) modems offer greater speed and capacity than earlier generations of modems. To ensure optimum performance, the systems need multiple antennas on both the transmission and receive ends.

With 5-elements, the new LTM502 antenna is ideal for fleet management systems that combine GPS with both any Global LTE MIMO modem as well as WiFi MIMO modem.

Measuring 5.5" (140mm) in diameter with a low profile of 2.38", the LTM series antennas take up significantly less space than multiple antennas and cut down on installation time and costs by offering a single mounting hole. The antennas are available in either surface-mount or mag-mount and can also be configured for combined GPS & Glonass use.

Model Configurator

LTM502-□□□□□□□□□□-□□□-□

- Cable/Connector 1
- Cable/Connector 2
- Cable/Connector 3
- Cable/Connector 4
- Cable/Connector 5
- Color
- Cable Length in Inches (eg. 12 or 180)

Example: LTM502-3C3C3C3C2C-WHT-180
MLTM502-3C3C3C3C2C-BLK-180 (mag-mount option)

Specify "LTMG" or "MLTMG" instead of "LTM" or "MLTM" for GPS/Glonass combination antenna.

Cable Options:		Connector Options:		Color Options:	
Code	Cable	Code	Connector	Code	Color
1	RG-58	A	TNC	WHT	White
2	RG-174	C	SMA	BLK	Black
3	RF-195	J	RP SMA		

(Other Configurations available.)

Specifications

Frequency & Gain (peak)*:	
Cable 1 & 2 (Global LTE)	694-960 MHz, 3 dBi & 1710-3700 MHz, 4 dBi
Cable 3 & 4 (WiFi)	2.4-2.5 & 4.9-6.0 GHz, 5 dBi
Cable 5 (GPS)	1575.42 +/- 2 MHz, 26 dB, 5 dBi
VSWR*:	2:1 VSWR over Range
Impedance:	50 Ohm Nominal
Maximum Power:	10 Watts
Case size:	
Surface Mount	5.50" Dia. x 2.38" High (140mm x 60.4mm)
Magnet Mount	5.50" Dia. x 2.78" High (140mm x 70.6mm)
Radome Material:	ASA UV-Stable Plastic
Operating Temperature:	-40° to +80° C
Connectors:	SMA Plugs standard
Cable:	
Cable 1-4	Separate RF-195,15 ft (4.5m)
Cable 5 (GPS)	RG-174, 15 ft (4.5 meters)
LTM Mounting:	7/8" (22mm) Dia. Feed through 3/4"(19mm)Long Thread for up to 1/2" (13mm)thick surface
MLTM Mounting:	Magnet mount
Shock & Vibration:	IEEE1478, EN61373, MIL-810G, TIA 329.2-C
Water Ingress:	IP67

*Measured on 1' ground with 1' cable

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MobileMark
antenna solutions

LLP502 Low Profile, multi-band 5-cable LTE, WIFI & GPS

LLP502
Antenna

- 5-cables: two for Cellular & LTE, two for WiFi, and one for GPS
- WiFi elements can be used for WiFi MIMO or for separate WiFi modems
- Avaliable with GPS or with combination GPS/Glonass

Mobile Mark's LLP502 Series Multiband Diversity/MIMO antenna contains five separate antenna elements, all in one compact antenna housing: two broadband LTE/Cellular antennas, two dual-band WiFi antennas, and one GPS antenna. The LLP502 covers Cellular LTE frequencies from 694-3700 MHz.

MIMO (multiple-input-multiple-output) modems for both WiFi and LTE/Cellular offer greater speed and capacity than earlier generations of modems. They achieve this by sending RF signals on multiple antenna elements to maximize the amount of information transmitted and received. To ensure optimum performance, the systems need multiple antennas on both the transmission and receive ends.

With 5-elements, the new LLP502 antenna is ideal for fleet management systems that combine GPS with both any Global LTE MIMO modem as well as WiFi MIMO modem

Measuring 9.00" (22.8cm) x 3.50" (8.9cm) in diameter with a low profile of 1.25" (31.8mm), the LLP502 series antennas take up significantly less space than multiple antennas. The radome is available in black and white . The antennas can also be configured for combined GPS & Glonass use.

This antenna is not avaliable as a mag-mount.

Model Configurator

LLP502 - □□□□□□□□□□□-□□□ □□□□

Cable/Conn 1
Cable/Conn 2
Cable/Conn 3
Cable/Conn 4
Cable/Conn 5
Color
Cable Length in Inches (eg. 12 or 180)

Example: LLP502-3C3C3C2C-BLK-180

Specify "G" instead of LLP502G
for GPS/Glonass combination antenna.

Cable Options:		Connector Options:		Color Options:	
Code	Cable	Code	Connector	Code	Color
2	RG-174	C	SMA	BLK	Black
3	RF-195	J	RP SMA	WHT	White

Specifications

Frequency & Gain (peak)*:	
Cable 1 & 2 (Cellular)	694-960 MHz, 0-3 dBi 1710-3700 MHz, 4 dBi
Cable 3 & 4 (WiFi)	2.4-2.5 & 4.9-6.0 GHz, 4 & 5 dBi
Cable 5 (GPS)	1575 MHz, 26 dB, 5 dBi
GPS & Glonass option	1575 MHz & 1612 MHz
VSWR*:	2:1 VSWR over Range
Impedance:	50 Ohm Nominal
Maximum Power:	10 Watts
GPS	
Amplifier Bias:	2.7 to 5 VDC
Noise Figure:	2.0 dB max, 1.7 dB typical
Current:	20 mA max, 10 mA typical
Case size:	9.00"x 3.50" x 1.25" 22.8cm x 8.9cm x 31.8mm
Radome Material:	ASA UV-Stable Plastic
Operating Temperature:	-40° to +80° C
Connectors, standard:	SMA Plugs
Cable:	
Cable 1-4	Separate RF-195, 15 ft (4.5m)
Cable 5 (GPS and GPS/Glonass)	RG-174, 15 ft (4.5 meters)
Mounting:	Through hole, ground plane dependent
Shock & Vibration:	IEEE1478, EN61373, MIL-801G, TIA 329.2-C
Water Ingress:	IP67,

*Measured on 1' ground with 1' cable

Specifications subject to change without notice (03/2017)

LTM & LLP VS Other brand

	Other brand	LTM	LLPG		Other brand Claimed dBi	LTM	LLPG
Cellular	**1 meter GP**	**0,33 Meter GP**	**0,33 meter GP**	**Cellular**	**1 meter GP**	**0,3 meter GP**	**0,3 meter GP**
VSWR				**Gain**			
698 – 730	< 3 : 1	Max 2:1	Max 2:1		4,5dBi	3dBi	0dBi
730 – 960	< 2.7 : 1	Max 2:1	Max 2:1		5,5dBi	3dBi	3dBi
1710 – 2170	< 2.1 : 1	Max 2:1	Max 2:1		6,5dBi	4dBi	4dBi
2500 – 2700	< 1.9 : 1	Max 2:1	Max 2:1		6,5dBi	4dBi	4dBi
2700-3700	NA	Max 2:1	Max 2:1		NA	4dBi	4dBi

Note about VSWR

VSWR	Reflected Power (%)	Reflected Power (dB)
1.0	0.00	-Infinity
1.5	4.0	-14.0
2.0	11.1	-9.55
2.5	18.4	-7.36
3.0	25.0	-6.00

Impedance	50 Ohm	50 Ohm	50 Ohm				
Max Power	10 Watt	10 Watt	10 Watt				
WiFi	**1 meter GP**	**0,33 Meter GP**	**0,33 meter GP**	**WiFi**			
VSWR				**Gain**			
2400-2485	1:5	Max 2:1	Max 2:1		2.15dBi	5dBi	4dBi
4915-5875	1:5	Max 2:1	Max 2:1		2.15dBi	5dBi	5dBi
Max Power	10 Watt	10 Watt	10 Watt				

Note on WiFi freq coverage
LTM and LLP covers Wifi, ITS and DSRC freq 4900-6000 MHz

GPS / GNSS							
VSWR	< 2:1	Max 2:1	Max 2:1	**Gain**	-3,5dBic / 30dB + - 2dB	5dBi / 26dB	5dBi / 26dB
NF	1.2dB	Max 2,0 dB (1.7)	Max 2,0 dB (1.7)				
Voltage	2.5-6	2.7-5	2.7-5				
Current	15-25 mA	10-20 mA	10-20 mA				
MiMo							
Cellular	Yes	Yes	Yes				
WiFi	Yes	Yes	Yes				
Diversity							
Cellular	Unknown	Yes	Yes				
WiFi	Yes	Yes	Yes				
Dimensions	280 x 120 x 50mm	140 x 60.4mm	228 x 89 x 31.8mm				
Cable lenght							
Cellular	215mm	250-7000mm	250-7000mm				
GPS	265mm	250-7000mm	250-7000mm				
WiFi	165mm	250-7000mm	250-7000mm				
Connector							
Cellular	FAKRA Code D	Customer defind	Customer defind				
GPS	FAKRA Code C	Customer defind	Customer defind				
WiFi	FAKRA Code I	Customer defind	Customer defind				
Cable							
Cellular	RG316	RF195/195FR	RF195/195FR				
GPS	RG316	RG174/195FR	RG174/195FR				
WiFi	RG316	RG195/195FR	RG195/195FR				
IP Class	IP67	IP67	IP67				
RoHS compliant	Yes	Yes	Yes				
MIL-810G	Unknown	Yes	Yes				
IEEE1478	Unknown	Yes	Yes				
EN61373	Unknown	Yes	Yes				
TIA 329.2-C	Unknown	Yes	Yes				
Proven design	New	Yes	Yes				

Our Conclusion
LTM and LLP are mesaured and tested to spec with a much smaller groundplane 0,33 Meters VS 1 Meter
LTM and LLP covers ITS and DSRC freq 5900-6000 MHz
LTM and LLPhas lower VSWR figures on 694-960 MHz (GSM, 3G, 4G, LTE)
LTM and LLP covers Cellular freq 694-3700 MHz (Global Cell)
LTM and LLP requires less installation space
LTM and LLP are built and tested according to military and industrial standards
LTM avaliable in magnetic mount version
LTM well proven World Wide for many years
LTM and LLP avaliable in versions from 2 to 7 elements (example 2 x Global Cell , 2 x Global Cell - 4 x WiFi/ ITS DSRC - 1 x GPS/GNSS, 6 x WiFi / ITS DSRC)

Comparsion of cable losses and connector limitations

Attenuation RG316 VS RF195

RG316	26dB at 1000MHz	100 feet	dB / Meter	0,85
RG316	42dB at 2500MHz	100 feet	dB / Meter	1,38
RF195	12dB at 1000MHz	100 feet	dB / Meter	0,39
RF195	19dB at 2500MHz	100 feet	dB / Meter	0,62

FAKRA connectors spec according to Amphenol :

Optimized for DC-4GHz

V.S.W.R: 1.40 max DC-2GHz / 1.50 max 2GHZ-4GHz

Insertion Loss: <0.3dB max from DC-3GHz

SMA connectors spec according to Amphenol :

Optimized for DC-12,4GHz (Flexible coax)

V.S.W.R: 1.15 - 1.25 from DC- 6GHz

Insertion Loss: 0.12dB at 4GHz

Cables and connectors

Cable and connectors are an important parameter and there are big gains to make.
A poor quality cable may in the worst case diminish more or even as much as the gain of the antenna gain.

The higher the band you will use, the more important the cable is. Unfortunately, it is not always easy to determine the quality of the cable. For instance there are a number of models of RG58 and all have different characteristics. Consult and ask to see the attenuation of the cable for the bands or frequencies you intend to use.

There is no shortcut here, and this is one of the most important components of the chain. It is not always that a coarser cable has less losses than a thin cable. Much depends on the structure and materials that the manufacturer has used.

Antenna VSWR

VSWR (voltage-standing-wave-ratio) represents the degree with which an antenna is "matched" to the system impedance. Most modern antennas do not require any tuning for optimum performance. VSWR is one of the easiest parameters to measure and VSWR meters are becoming very popular antenna installation tools.

Most modern antennas, receivers and transmitters are designed for peak performance when operating into a 50 Ohm transmission line. If the VSWR is too high, the transmitter power may be reduced as well as the strength of the received signal.

The typical commercial standard for maximum allowable VSWR across the entire bandwidth of a system is 2:1. You should specify the maximum VSWR and the operating frequency bandwidth when specifying your antenna. A VSWR of greater than 2:1 usually is considered unacceptable (or for receiving purposes only) since it increases losses in the transmission line. Incidentally, decreasing the VSWR below 1.5:1 will often be expensive.

Is a High Gain Antenna always a better choice?

Often manufacturers of antennas (cellular, wifi, gps antennas) specify the antenna gain. For instance, manufacturers of wifi antennas may market the wifi antenna as a "high gain antenna", which is more expensive than a similar low gain antenna.

The question is: Do we want high gain?

It depends. If you know exactly where your desired signal is coming from, you probably would like to have maximum possible gain towards the desired direction. However, if you don't know where the desired signal will be coming from, it is often better to have a low gain antenna.

A couple examples will make this clear.

1 - TV Antennas. If you mount a TV antenna on your roof, and know the tv broadcast antennas are to the south (for example, on some hill south of the city), then it is preferred to have a high gain antenna. Antennas with gain of at least 12-15 dB are often preferred.

2 - GPS (Global Positioning System). GPS antennas for mobile devices are receive only. The job of the gps antenna is to triangulate your position by measuring the received signal from multiple gps satellites, which are all in different directions relative to the receive antenna. For this case, a very highly directional antenna would not be preferred.

3 - Mobile Cellular Antennas. The cellular antenna on your vehicle communicates with a single cellular network tower. However, the cellular antenna can be in any orientation depending on if the vehicle is leaning to either side or moving uphill or downhill, and can be in any position relative to the network tower. Also difficult terrain like in the forest or deep valleys in a moving vehicle makes a directional or high gain antenna less effective. Your mobile device could dramaticly benefit from a antenna with less gain.

Questions to answer before making final antenna selection

Frequency range (MHz): .....

Center freguency: .....

Bandwith: .....

Radiation pattern (Omni or Directional): .....

Polarization (Vertical, Horizontal or Elliptical): .....

Minimum Gain: (dBd or dBi) .....

Max allowable VSWR (typical 2:1 or less): .....

Power rating of antenna (Milliwatts / Watts): .....

Connector type (SMA, FME, N,TNC etc): .....

Connector type (Male, Female or RP): .....

Pigtail feed (Yes, No, Lenght): .....

Maximum size of antenna: .....

Environment (Indoor or Outdoor): .....

Where will the antenna be mounted: .....

Windspeeds at location: .....

Temperaturs at location: .....

Is a radome required (Yes, No, Color): .....

Expected lifetime of the antenna: .....

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