

# Xeta2m-T

## User Manual

February 5, 2016



XETAUJAVE

C U S T O M   R F   S O L U T I O N S

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## Warranty

XetaWave LLC warrants your XetaWave wireless data transceiver against defects in materials and manufacturing for a period of two years from the date of purchase. In the event of a product failure due to materials or workmanship, XetaWave will, at its discretion, repair or replace the product.

In no event will XetaWave LLC, its suppliers or its licensors, be liable for any damages arising from the use of or the inability to use this product. This includes business interruption, loss of business information, or other loss which may arise from the use of this product. XetaWave LLC transceivers should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. XetaWave LLC accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the XetaWave transceiver, or for the failure of such transceiver to transmit or receive such data.

Warranty policy may not apply:

- 1) If product repair, adjustments, or parts replacements is required due to accident, neglect or unusual physical, electrical or electromagnetic stress.
- 2) If product is used outside of XetaWave specifications.
- 3) If product has been modified, repaired or altered by Customer unless XetaWave specifically authorized such alterations in each instance in writing.

The warranty period begins from the date of shipment and is defined per the standard warranty policy stated above.

Information in this document is subject to change without notice. The information contained in this document is proprietary and confidential to XetaWave LLC. This manual is for use by purchasers and other authorized users of the XetaWave wireless data transceiver only.

No part of this document may be reproduced or transmitted in any form or by any means, electronic or mechanical, or for any purpose without the express written permission of XetaWave LLC.

This product is licensed by the United States. Diversion contrary to U.S. law is prohibited. Shipment or re-export of this product outside of the United States may require authorization by the U.S. Bureau of Export Administration. Please contact XetaWave LLC for assistance and further information.

## FCC Notifications

### Federal Communications Commission

This device complies with Title 47 CFR § Parts 1, 15, 80, and 90 of the federal code. Specifically, 47CFR § 1.1310, Table 1, Limits for General Population/Uncontrolled Exposure.

This device must be operated as supplied by XetaWave LLC. Any changes or modifications made to the device without the express written approval of XetaWave LLC may void the user's authority to operate the device, pose violations and liabilities.

### Caution

The Xeta2m-T has a nominal (rated) transmitter output power of:

- All modulations and bandwidths in the 217-220 MHz band: 2 Watts
- MSK, 15 KHz, 220-222 MHz: 3 Watts
- MSK, 50 KHz, 220-222 MHz: 2 Watts
- All other modulations and bandwidths, 220-222 MHz: 5 Watts

The transmit antenna shall be kept at least 61.65cm from physical space where humans may exist.

Additional details may be found in the "RF Exposure Calculations" at the end of this section.

### Integration FCC ID:

When the module is installed inside of another device, then the outside of the device into which the module is installed must display a label referring to the enclosed module.

The exterior label will use the wording: 'Contains FCC ID: PEJ-XETA2'

Serial # X00000000 1234 1234

Model # XETA2-E

Contains FCC ID: PEJ-XETA2

Input Voltage: 12 VDC

This device complies with Part 80 and Part 90 of the FCC rules.

Made in the USA by Xetawave, LLC  
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## **WARNING**

These radio systems shall be installed by a RF/radio professional familiar with the applicable rules. Installation of all antennas shall be performed in a manner that will provide at least the MPE Distance from the direction of maximum radiation, to any user or member of the public and consistent with the settings in the applicable antenna installation compliance section below.

### FCC antenna compliance

Since professional installation is required, standard RF connectors are used. Adapters or custom coaxial cables may be required to connect the radio output connector to the desired antenna.

Any antenna from a reputable manufacturer with desired bandwidth, gain/pattern coverage, and have an input impedance of approximately 50 ohms can be used.

### **Exposure Compliance**

**FCC ID:** PEJ-XETA2

It is the responsibility of the licensee or user to guarantee compliance with the appropriate MPE regulations when operating this device in a way other than described herein. The installer of this equipment must ensure the antenna is located or oriented such that it does not emit an RF field in excess guidelines as posted in the 47 CFR Bulletin 65/47CFR § 1.1310 of the Federal Communications Commission.

The XetaWave XETA2 uses a low power radio frequency transmitter. The concentrated energy from an antenna may also pose a health hazard in the near field. People should not be near the antenna when the radio link is operating as general practice and maintain a safe distance as calculated below.

The following calculations are based off the Maximum Permissible Exposure requirements as outlined by the FCC.

The MPED (Maximum Permissible Exposure Distance) is calculated based on the limits for a General Population/Uncontrolled Exposure in the 30 -300 MHz frequency band using the stated MPE power density limit of  $0.2 \text{ mW/cm}^2$ . The following table provides safe distance for several power levels and antennas besides the worst case for convenience.

To calculate safe distance:

**Equation 2:** 
$$MPED = \sqrt{\frac{(ConductedPower(mW))(DutyCycle)(AntennaGain)}{(4\pi)(ExposureLimit(mW/cm^2))}}$$

Where: MPED is Maximum Permissible Exposure Distance or safe distance.

All quantities are calculated in linear or numeric quantities.

The exposure limit, MPED, and conducted power units must be consistent, mW and cm for this case.

Duty cycle is set using packet sizes for master and slave. Packet sizes are set in the radio Network Configuration Menu. At Power up and with no data transmitting, the radios will transmit or beacon with a duty cycle of 6 to 10% depending upon modulation setting. The maximum Duty Cycle is 100%.

Table of MPE Safe Distance vs. Antenna Gain and Power Output Setting					
Power Out Setting (mW)*	Duty Cycle (linear)	Antenna Gain (dBi)	Antenna Gain (linear)	FCC MPE Limit (mW/cm <sup>2</sup> )	Safe Distance (cm)
5890	1.00	2.1	1.622	0.2	61.65
*The worst case is 5890 mW with a 2.1dBi gain antenna at 61.65cm					

## Specifications

### 1.1 Performance

#### Transmitter

Frequency Range:	217-222 MHz
Output Power:	2 Watts, all 217-220 MHz modulations 3 Watts, MSK, 15 KHz, 220-222 MHz 2 Watts, MSK, 50 KHz, 220-222 MHz 5 Watts, all 220-222 MHz modulations except MSK
Range (Line of Sight):	70+ miles
Modulation (Part 90):	MSK, QPSK, 8PSK, 16PSK, 32PSK
Modulation (Part 80):	MSK, QPSK, 8PSK, 16QAM, 32QAM
RF Data Rate:	8.75 Kbps to 800 Kbps
Occupied Bandwidth:	9.2 KHz to 176 KHz
Frequency Stability:	Better than 1.0 ppm
Duty Cycle:	Continuous
Output Impedance:	50 Ohms

## Receiver

### Modulation Type/Data Rate (Kbps)/Sensitivity (dBm)

	Modulation Type	Channel Spacing		
		12.5 KHz	25 KHz	50 KHz
217-220 MHz (Part 90)	MSK	9.6 Kbps/-115	18 Kbps/-114	43 Kbps/-109
	QPSK	17 Kbps/-113	29 Kbps/-112	72 Kbps/-106
	8PSK	26 Kbps/-107	44 Kbps/-106	105 Kbps/-103
	16PSK	36 Kbps/-104	59 Kbps/-103	144 Kbps/-100
	32PSK	45 Kbps/-102	76 Kbps/-100	180 Kbps/-97

	Modulation Type	Channel Spacing	
		15 KHz	50 KHz
220-222 MHz (Part 90)	MSK	8.75 Kbps/-115	36 Kbps/-105
	QPSK	19 Kbps/-100	59 Kbps/-101
	8PSK	28 Kbps/-95	88 Kbps/-95
	16PSK	37 Kbps/-90	117 Kbps/-88
	32PSK	47 Kbps/-88	146 Kbps/-85

	Modulation Type	Channel Spacing	
		250 KHz	500 KHz
217-218 MHz,	MSK	194 Kbps/-102	-----
219-220 MHz	QPSK	-----	320 Kbps/-100
(Part 80)	8PSK	-----	480 Kbps/-89
	16QAM	-----	640 Kbps/-88
	32QAM	-----	800 Kbps/-86

## Data Transmission

Error Detection: Up to 32-bit CRC, X<sup>2</sup> ECC, Retransmit on error

## Power / Physical

Operating Voltage: 12 VDC

Transmit Current: 925 mA @ 12V for 1W

## 1.2 Environmental

- -30°C to +50°C operating temperature range.
- 95% operating humidity @ 40°C non-condensing.

## 1.3 Security & Certifications

- FCC, UL Class 1 Div 2

## 1.4 Mechanical / Physical Design





## **1.5 Configuration**

The following parameters are available for selection by the installer at the end-product level for all products that incorporate the Xeta2m-T:

- Frequency (Master and Slave)
- Modulation Type

The installer shall set the frequency (or pair of frequencies) according to the requirements of the user's license. There are different modulations and bandwidths available. The available modulations are limited to those listed in paragraph 1.1, and further limited by frequency selection. A modulation shall be selected according to the bandwidth (channel size and number of channels) that is specified in the user's license. Lower speeds have generally better sensitivity and longer range, while higher speeds offer greater data throughput.

## **1.6 Password**

The installer shall set a password for the end-product to prevent alteration of the radio parameters by unauthorized parties. The procedure for setting the password is described in the user manual for the end-product that incorporates the Xeta2m-T.