



## 60GHz Baseboard I/Q Module

### 60 GHz Accessories Technical Data Sheet

PEM004

#### Description

The PEM004 is a 500 MHz quadrature signal source for use with the PEM003-KIT 60 GHz waveguide development system transmitter. The transmitter provides for baseband signal inputs in the form of Inphase (I) and Quadrature-phase (Q) waveforms, also called vector waveforms. The vector waveforms are often created by digital to analog (D/A) converters that are part of a digital modulation system for wireless communications. However, there may be situations where that kind of modulation system has yet to be developed, or a simple continuous wave (CW) carrier is desired from the 60 GHz transmitter for testing purposes.

Any vector modulated transmitter can produce a simple CW carrier if a sine wave is fed into the I and Q baseband inputs with a phase delay of 90° between them. If the Q input signal is delayed relative to the I input signal by 90°, the 60 GHz output will be as an upper sideband CW signal with the carrier frequency and the lower sideband signal suppressed. Mathematically, the I-input signal is the cosine, and the Qinput signal is the sine, at a frequency of 500 MHz. The 60 GHz frequency of the upper sideband signal will simply be the baseband signal frequency added to the carrier frequency. In the case of the PEM004, the frequency is set at 500 MHz. Therefore the resulting upper sideband frequency at 60 GHz will be the 60 GHz transmitter carrier frequency setting plus 500 MHz. As an example, if the PEM003-KIT transmitter carrier is set at 58.32 GHz, and the PEM004 is connected to the I and Q baseband inputs, the resulting frequency at the transmitter output will be 58.32 GHz + 500 MHz = 58.82 GHz. The original carrier frequency at 58.32 GHz will be suppressed, as well as the lower sideband frequency at 58.32 - 500 MHz = 57.82 GHz. The PEM004 provides a stable, clean 500 MHz waveform with tightly controlled phase between the I and Q outputs.

The PEM004 comes with all cables necessary for connecting to the PEM003-KIT transmitter board. The power cable plugs directly into J1 on the front of transmitter board (lower right) which provides 3.3VDC to the PEM004. The I and Q baseband signals are connected via their marked coaxial cables to the coaxial expansion board on the rear side of the transmitter assembly.

Click the following link (or enter part number in "SEARCH" on website) to obtain additional part information including price, inventory and certifications: [60GHz Baseboard I/Q Module PEM004](#)



## 60GHz Baseboard I/Q Module

### 60 GHz Accessories Technical Data Sheet

PEM004



Figure 1 Transmitter Board J1 Connection



Figure 2 Transmitter Baseband Inputs

The coaxial expansion board uses type MCX connectors. The power cable uses a Samtec 10-pin connector. Figure 1 shows the power connector, and Figure 2 shows the baseband I and Q signal inputs. Note that the I and Q signals are differential, and two cables ( $\pm$ ) are used for the I-input and two cables ( $\pm$ ) are used for the Q-input. Figure 3 below shows how the power and baseband cables are connected to the PEM003-KIT Transmitter (TX) assembly. Figure 4 below shows the Block Diagram logic to Figure 3. Figure 5 below illustrates the phase relationship between the I and Q signals.

Click the following link (or enter part number in "SEARCH" on website) to obtain additional part information including price, inventory and certifications: [60GHz Baseboard I/Q Module PEM004](#)



60GHz Baseboard I/Q Module

60 GHz Accessories Technical Data Sheet

PEM004

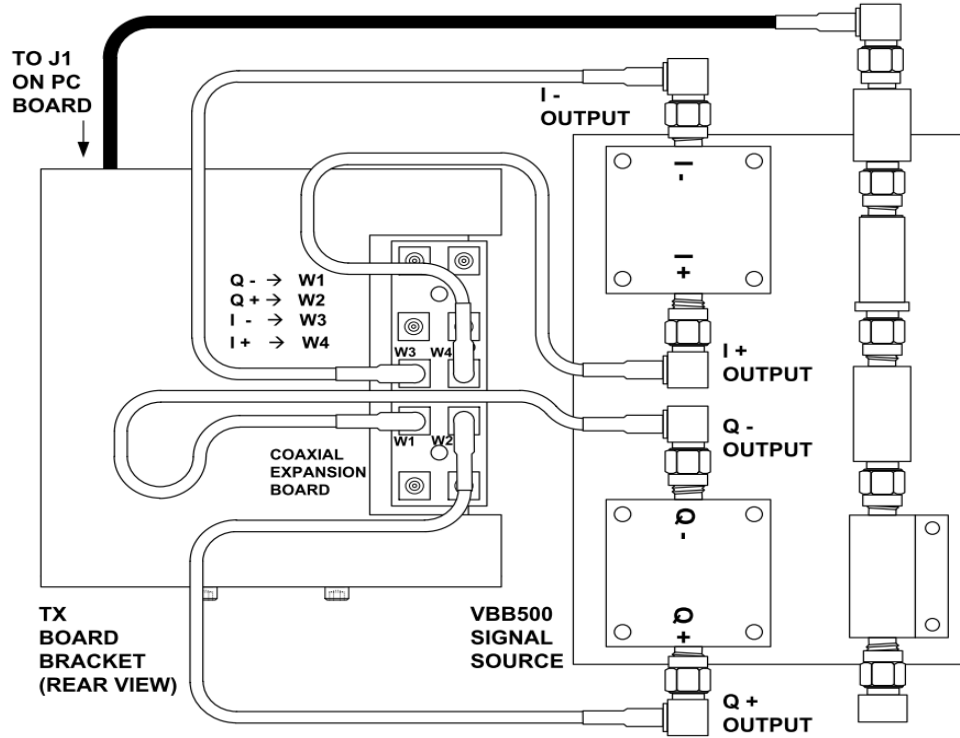


Figure 3 PEM004 Interconnections to the PEM003-KIT Transmitter Assembly

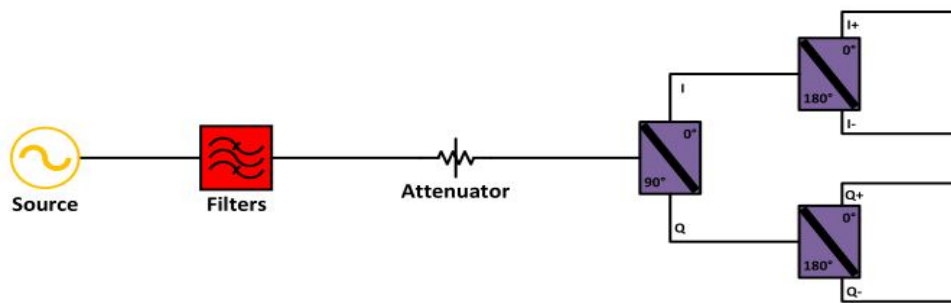


Figure 4 PEM004 Block Diagram

Click the following link (or enter part number in "SEARCH" on website) to obtain additional part information including price, inventory and certifications: [60GHz Baseboard I/Q Module PEM004](#)



60GHz Baseboard I/Q Module

60 GHz Accessories Technical Data Sheet

PEM004

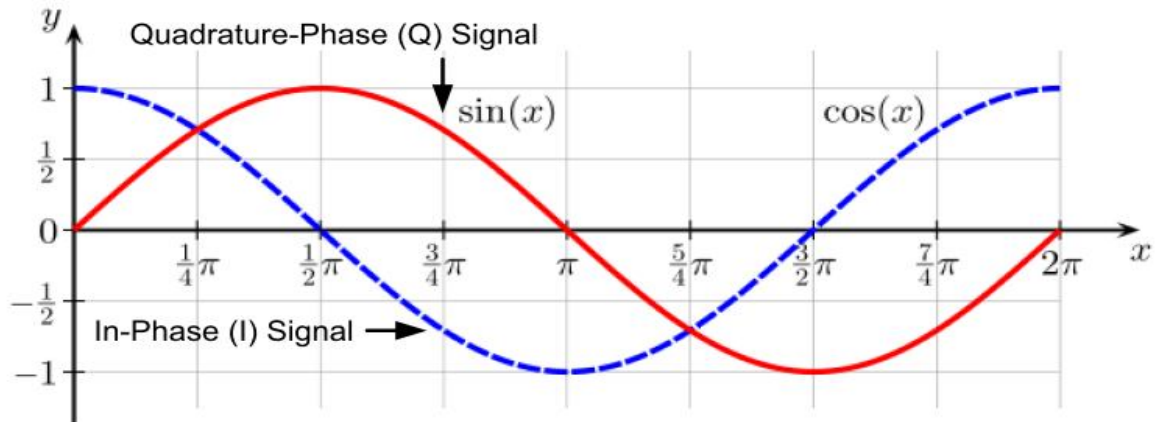


Figure 5 Phase relationship between I and Q Signals

Click the following link (or enter part number in "SEARCH" on website) to obtain additional part information including price, inventory and certifications: [60GHz Baseboard I/Q Module PEM004](#)



60GHz Baseboard I/Q Module

60 GHz Accessories Technical Data Sheet

PEM004

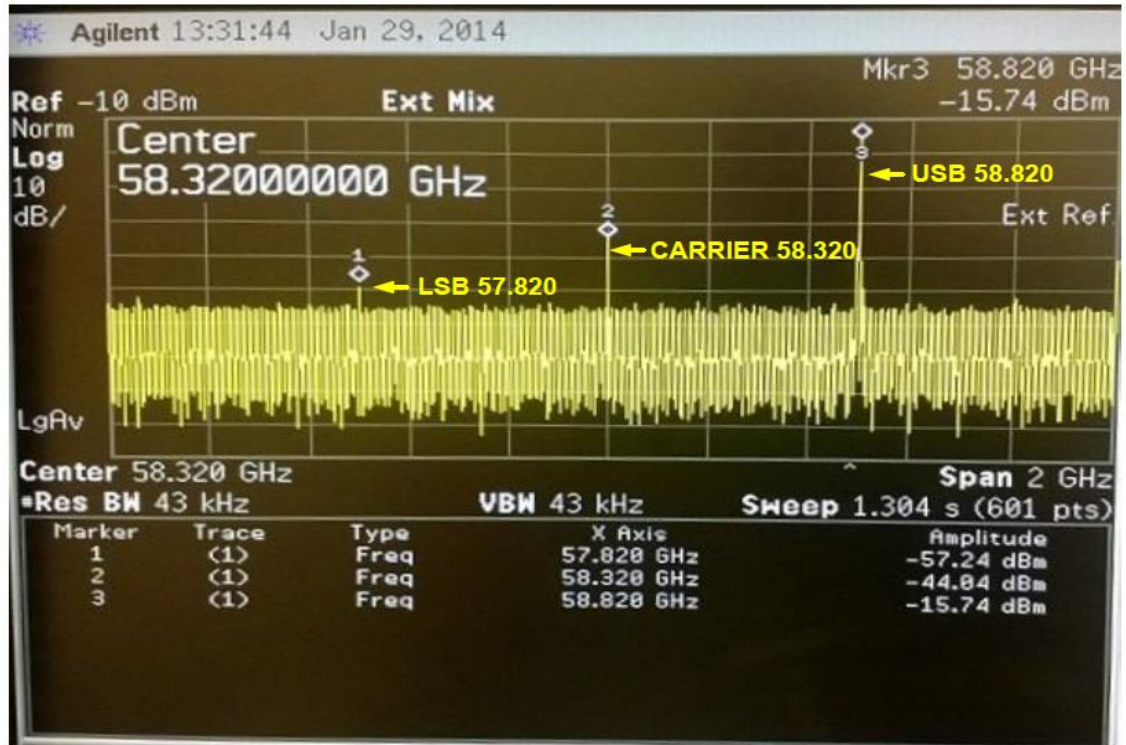


Figure 5 Spectrum Analyzer Display of PEM003-KIT Transmitter with PEM004 Connected to I/Q Inputs

The image above in Figure 5 spectrum analyzer display of a PEM003-KIT transmitter with the PEM004 connected to the I and Q inputs. The transmitter synthesizer is set to a carrier frequency of 58.32 GHz. Note the resulting spectrum with the highest level signal at the upper sideband (USB) frequency at 58.82 GHz (58.32 GHz + 500 MHz), suppressed carrier at 58.32 GHz, and the suppressed lower sideband frequency at 57.82 GHz (58.32 GHz - 500 MHz).

Click the following link (or enter part number in "SEARCH" on website) to obtain additional part information including price, inventory and certifications: [60GHz Baseboard I/Q Module PEM004](#)



## 60GHz Baseboard I/Q Module

### 60 GHz Accessories Technical Data Sheet

PEM004

#### **Compliance Certifications** (see [product page](#) for current document)

60GHz Baseboard I/Q Module from Pasternack Enterprises has same day shipment for domestic and International orders. Our RF, microwave and millimeter wave products maintain a 99.4% availability and are part of the broadest selection in the industry.

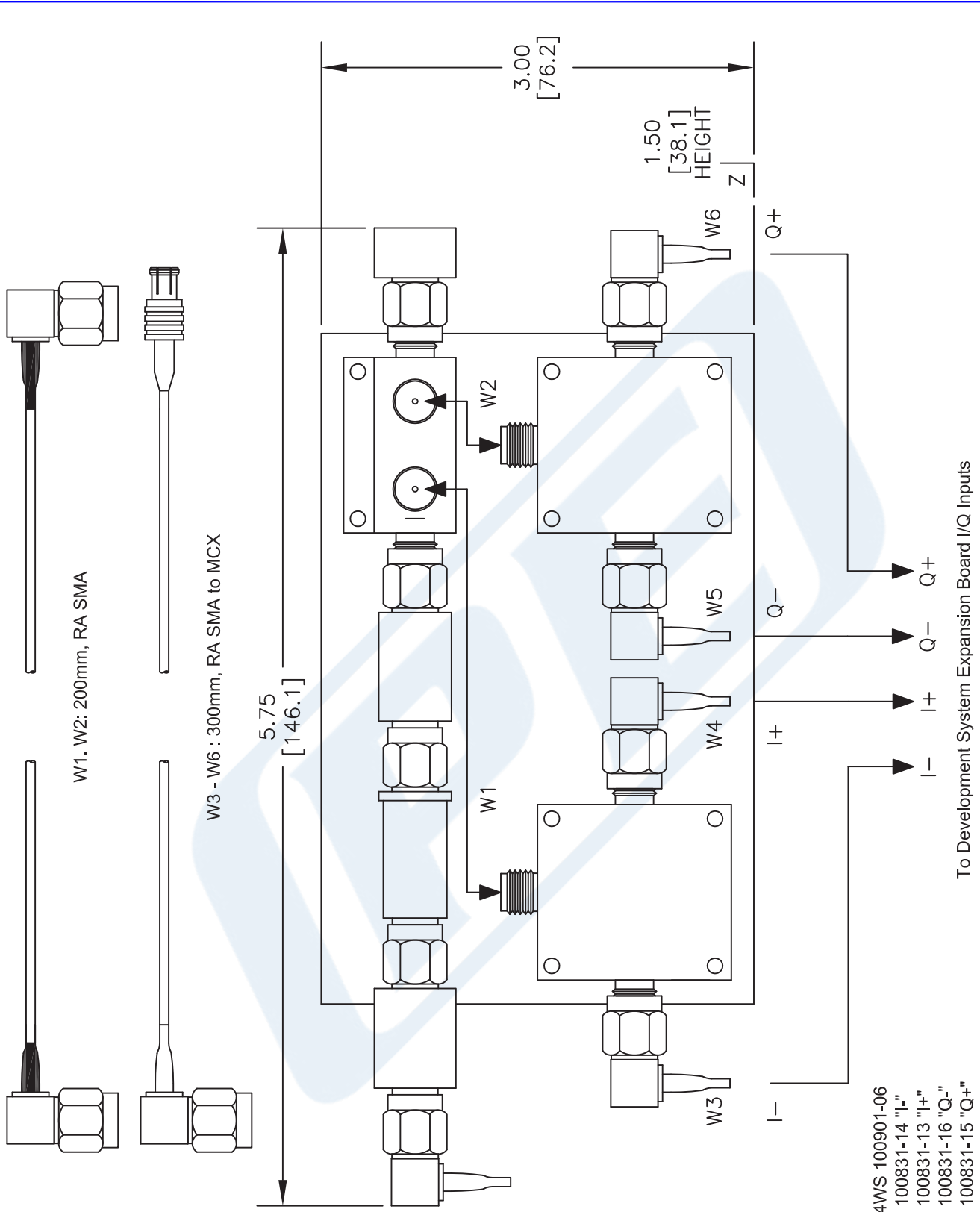
Click the following link (or enter part number in "SEARCH" on website) to obtain additional part information including price, inventory and certifications: [60GHz Baseboard I/Q Module PEM004](#)

URL: <https://www.pasternack.com/60-ghz-baseboard-i-q-module-pem004-p.aspx>

The information contained in this document is accurate to the best of our knowledge and representative of the part described herein. It may be necessary to make modifications to the part and/or the documentation of the part, in order to implement improvements. Pasternack reserves the right to make such changes as required. Unless otherwise stated, all specifications are nominal. Pasternack does not make any representation or warranty regarding the suitability of the part described herein for any particular purpose, and Pasternack does not assume any liability arising out of the use of any part or documentation.

# PEM004 CAD Drawing

## 60GHz Baseboard I/Q Module



NOTES:  
 1. UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE NOMINAL.  
 2. ALL SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE AT ANY TIME.  
 3. DIMENSIONS ARE IN INCHES [mm].  
 4. FITS MIL-C-17 AND EQUIVALENT CABLES.

DWG TITLE  
**PEM004**

**PE PASTERNAK®**  
 Pasternack Enterprises, Inc.  
 P.O. Box 16759 | Irvine | CA | 92623  
 Phone: (949) 261-1920 | Fax: (949) 261-7451  
 Website: www.pasternack.com | E-Mail: sales@pasternack.com

CAD FILE 092613 SCALE N/A SIZE A 150

FSCM NO. 53919

To Development System Expansion Board I/Q Inputs

- W1: Wellshow BD154WS 100901-06
- W2: Wellshow BD154WS 100831-14 "I"
- W3: Wellshow BD154WS 100831-13 "I"
- W4: Wellshow BD154WS 100831-13 "I"
- W5: Wellshow BD154WS 100831-16 "Q"
- W6: Wellshow BD154WS 100831-15 "Q"