

# Basic\_QPSK\_BER

## Where To Find This Example

Select **Help > Open Examples...** from the menus and type either the example name listed above or one of the keywords below.

Or in Version 13 or higher you can open the project directly from this page using this button. Make sure to select the **Enable Guided Help** before clicking this button.

Open Install Example

## Design Notes

### Basic QPSK BER

This example illustrates two different methods of creating an end-to-end QPSK system.

- The first method, in the system diagram "QPSK TX RX BER", makes use of the QPSK\_TX and General I/Q receiver blocks.
- The second method, in the system diagram "QPSK Quadrature", constructs an equivalent system using basic blocks.

The ALIGN block in "QPSK Quadrature" is used to compensate for the group delay of the pulse shape filter. The receiver blocks such as RCVR and QPSK\_RX automatically handle the group delay compensation.

The BER graph shows the simulation results of "QPSK TX RX BER" and "QPSK Quadrature". The red curve is the QPSK reference curve. The blue curve is generated from "QPSK TX RX BER" and the brown curve is generated from "QPSK Quadrature"

The eye diagram "Eye at Quadrature QPSK RX InPhase Channel" will open up as the noise level is decreased.

The eye diagram "Eye at output of QPSK Quadrature" shows the eye at the transmitter. The inter-symbol interference (ISI) is due to the root raised cosine filter (RRC).

A scatter plot at the receiver is shown as well.

Disabled measurements such as "Input Data" can be toggled on if desired.

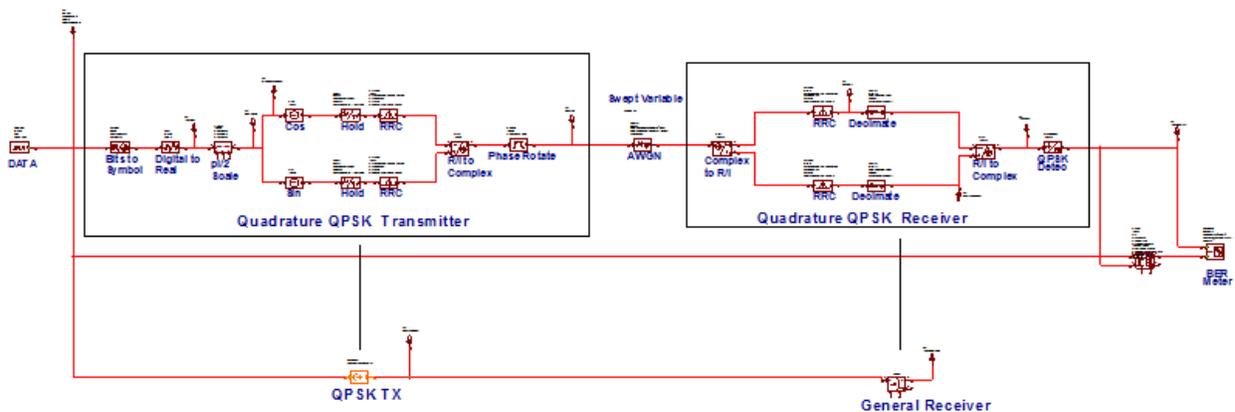
### Notes:

The additive white Gaussian noise channel block AWGN in "QPSK Quadrature" has its power type parameter, PWRTYP, set to "Avg. Power, Bit (dBW)". The value for this parameter is  $-Eb\_N0-db\_pow(2*_Z0)$ .

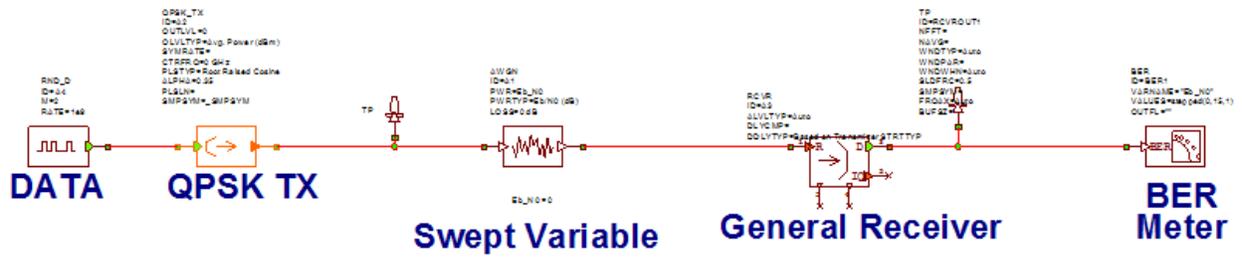
$Eb\_N0$  is a swept variable that determines the value of  $Eb/N0$ .

$_Z0$  is the characteristic impedance used in the system; the default value is 50 ohm. The correction of  $1/\sqrt{2*_Z0}$  is used to convert the voltage units used for the signal to power units used for the noise.

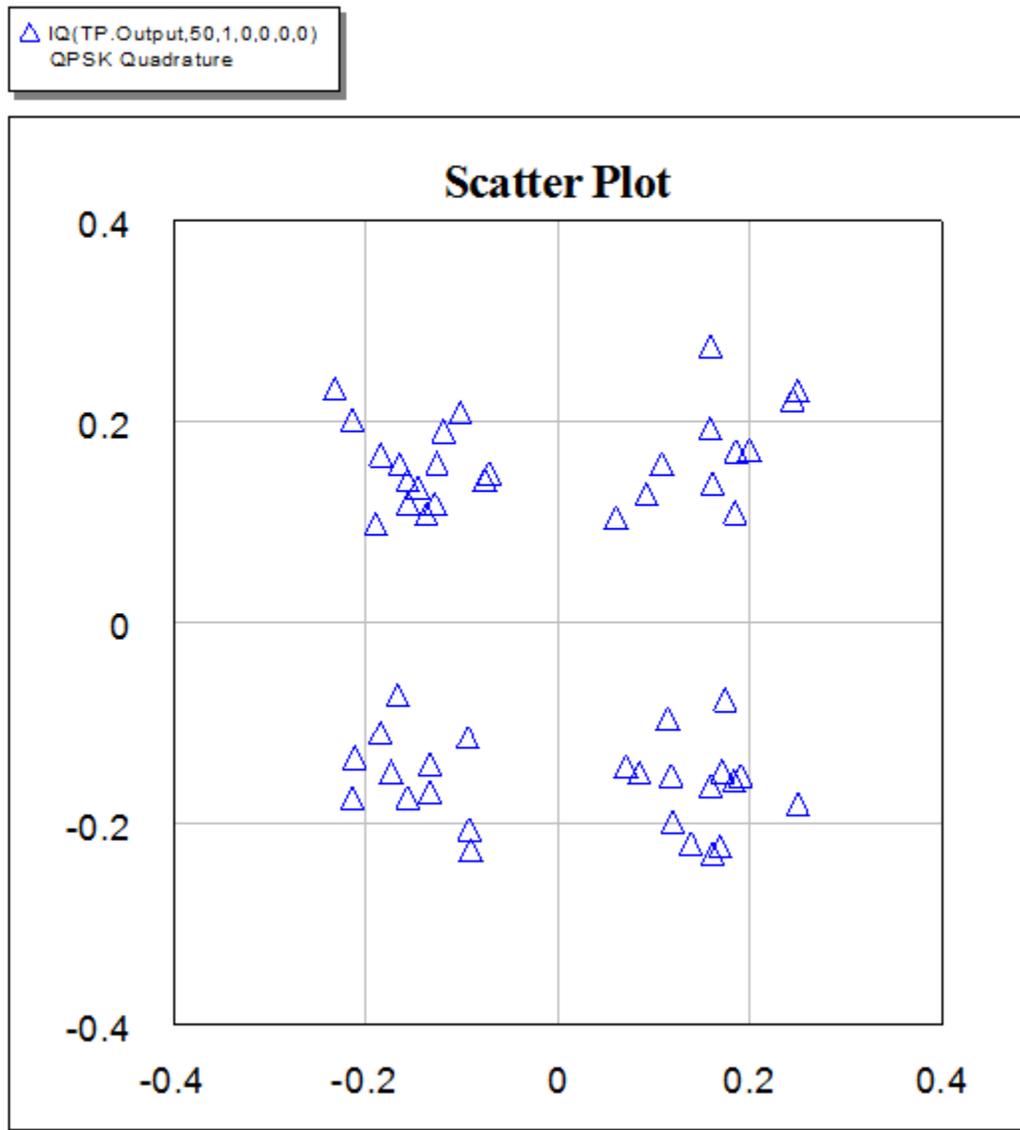
## System Diagram - QPSK Quadrature



## System Diagram - QPSK TX RX BER

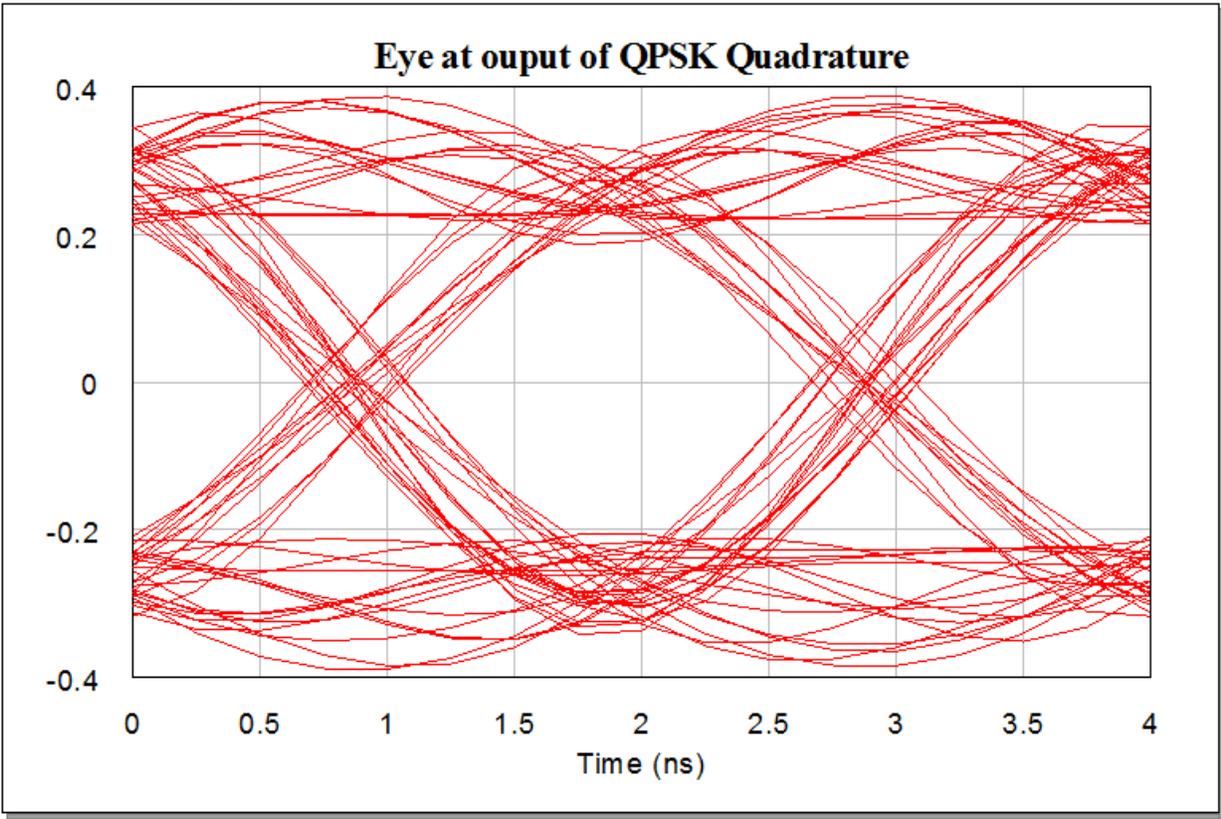


Graph - Scatter Plot

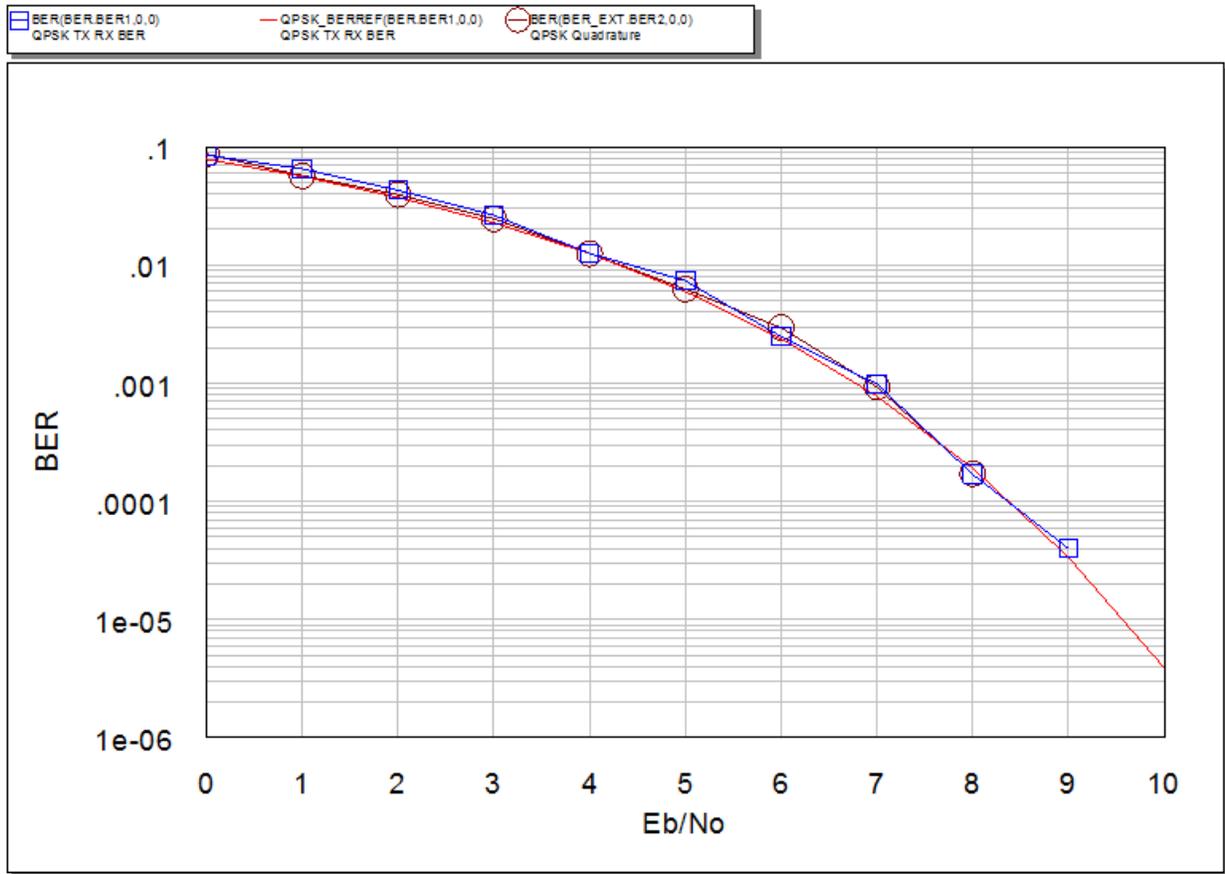


Graph - Eye at output of QPSK Quadrature

Re(EYE) (TP,OUT,4.5,60,0,1,0,0,10)  
QPSK Quadrature



Graph - BER



Graph - Eye at Quadrature QPSK RX InPhase Channel

—Re(EYE(TP\_RX\_11,4.5,60,0,1,0,0,1))  
QPSK Quadrature

### Eye at Quadrature QPSK RX InPhase Channel

