

# VisSim/Comm™ 4.5

## Communication System Design Software



VisSim/Comm is a Windows-based simulation environment for modeling end-to-end communication systems at the signal or physical level. With its full complement of communication blocks and powerful, time-domain simulation engine, VisSim/Comm provides fast and accurate solutions for analog, digital, and mixed-mode communication systems.

### Integrated development environment

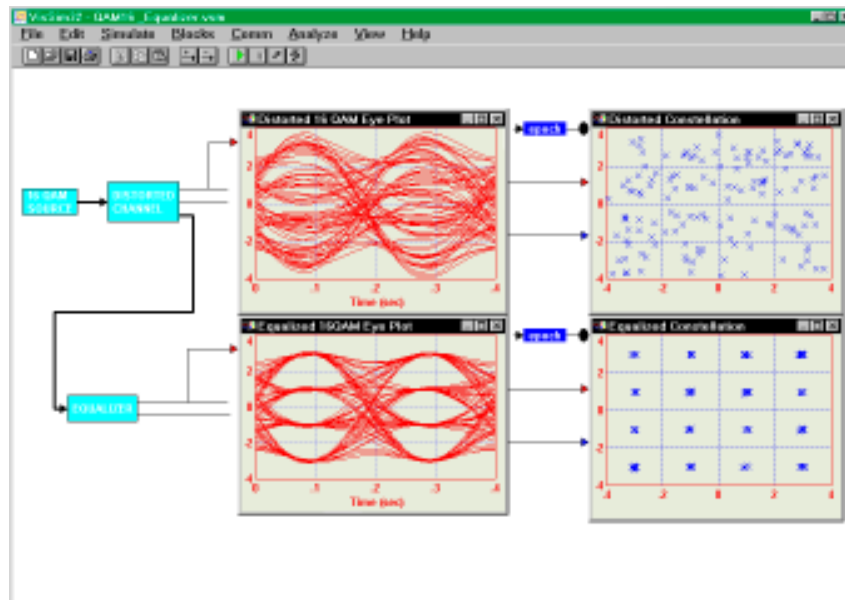
Using VisSim/Comm, you can seamlessly move among the stages of model construction, simulation, optimization, and validation. This means that you can simulate and view signal waveforms at any phase of the communication system chain.

### Intuitive block diagram interface

VisSim/Comm's intuitive block diagram interface makes it easy to build, modify, and maintain even the most complex system models. Simply drag blocks off the Blocks and Comm menus and wire them together with the mouse. This means that all your modeling and simulation tasks can be completed without writing a line of code.

### Integrated VisSim Viewer

VisSim/Comm includes the VisSim Viewer, a run-time, view-only version of VisSim. The Viewer allows you to share your models with individuals not licensed to use VisSim. The Viewer preserves model integrity by prohibiting recipients from changing wiring and block diagram structure. The Viewer does provide the flexibility for recipients to change block and simulation parameters to test different design scenarios.



Use of adaptive equalization to compensate for channel distortions in a 16-QAM communications link.

### Modeling Highlights

- Drag-and-drop block diagram construction
- 200+ communication and mathematical blocks
- Analog, digital, and mixed-mode communication system design
- Large model development
  - Explorer window for easy navigation
  - Hierarchical design with password protection
  - Embedded diagrams
  - Wire checking
  - Connector labels
  - Global, local, and scoped variables
  - Search utility
- Analog and digital modulators and demodulators
- Adaptive equalizers
- Encoders and decoders
- Vector and matrix operations
- Gaussian noise, fading, and multipath channels
- Filter design wizard and viewer
  - FIR (lowpass, highpass, bandpass, bandstop, Gaussian, Hilbert, and user-defined)
  - IIR (Bessel, Chebyshev, Butterworth, inverse Chebyshev, and elliptic)
  - Raised cosine and root raised cosine
  - Arbitrary magnitude and phase
  - Filter response viewer
  - Decimating FIR filters
- Phase-locked loops
- Distortion true RF elements
- Complex math operators
- Complex envelope representation
- Data I/O in ASCII, .M, .MAT, .WAV formats
- DLL interface to create custom blocks in C, C++, Fortran, or Pascal
- DDE with Copy Link and Paste Link
- Windows Clipboard support

### Simulation Highlights

- Continuous-time, discrete-time, and hybrid simulation
- Interactive, batch, auto-restart, and single step execution modes
- Euler, trapezoidal, and Runge Kutta 2nd integration algorithms
- Error highlighting
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## Simulation Highlights

- Range checking on communication blocks
- Estimation functions for BER, average power, mean, variance, correlation, and delay
- Automated BER generation
- MatLab interface for .MAT and .M files
- Look-up table wizard
- Global variables **NEW**
- Signal probes
- Pushbutton conversion of s- and z-domain transfer functions
- Parameter optimization
- Implicit system solvers

## Visualization Highlights

- Interactive plots
  - Basic time domain, XY, frequency, and discrete plots
  - Phase scatter plots
  - Eye plots
  - BER curves
  - Complex FFT plots with averaging
  - External hold capacity
  - Multi XY traces
  - Log, semi-log, dB, and linear scales
  - Automatic Y scaling and selectable time axis scaling
  - Full control of X and Y axis ranges
  - Over plotting and zooming
  - Read coordinates mode
  - Data I/O in ASCII, .M, and .MAT formats
- Filter Response Viewer
- Graphic and line animation
- Dynamic strip charts, bar graphs, needle meters, and histograms

## General Highlights

- Integrated VisSim Viewer
- String processing
- WMF format support
- Global, local, and nested path aliases
- Mathcad 2000 integration **NEW**

## Comm and Standard Block Sets

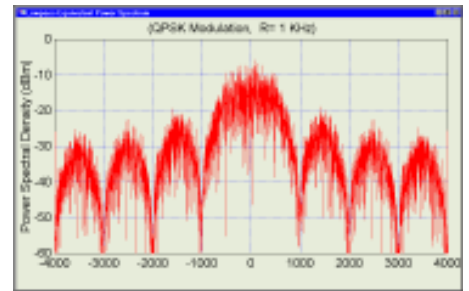
The Comm block set includes over 100 blocks in the following categories:

- Channels
- Complex Math
- Decoders
- Demodulators
- Digital Elements
- Encoders
- Estimators
- Filters
- Modulators
- Operators
- Phase-Locked Loops
- RF Components
- Signal Sources

In addition to the Comm blocks, VisSim/Comm also offers over 100 mathematical, engineering, and scientific blocks for linear, nonlinear, continuous, discrete, multi-rate, SISO, MIMO, and hybrid system design.

These blocks are in the following categories:

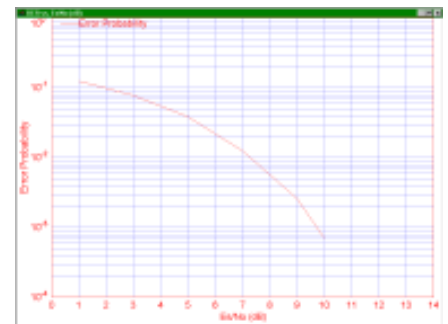
- Animation
- Annotation
- Arithmetic
- Boolean
- DDE
- Integration
- Linear Systems
- MatLab Interface
- Matrix Operations
- Nonlinear
- Optimization
- Random Generator
- Real Time
- Signal Consumer
- Signal Producer
- Time Delay
- Transcendental



Lowpass equivalent power spectrum of a 2 kbps QPSK modulated signal.



Chebyshev bandpass filter response obtained by computing the FFT of its impulse response.



BER curve.

## VisSim/Comm Options

Extend VisSim/Comm's power with application-specific software

### Add-Ons

**VisSim/C-Code** Translates VisSim models into highly optimized, ANSI C code that can be immediately put to use in a variety of applications or customized to meet specific design requirements.

**VisSim/Comm DSP** Rapidly prototypes communication systems to DSPs or embedded systems.

### Stand-Alone Products

**VisSim/Comm Personal Edition** Entry-level version of VisSim/Comm offering much of the functionality of VisSim/Comm, with these limitations: no userFunction or embed block, some restrictions on Comm blocks, and limited to 100 blocks per diagram.

## Communications Block Library

### Channels

Add. White Gaussian Noise (Complex & Real)  
Binary Symmetric Channel  
Jakes Mobile\*  
Multipath  
Propagation Loss\*  
Rice/Rayleigh Fading  
Rummler Multipath  
TWTA\*

### Complex Math

Addition  
Conjugate  
Conversions (Complex & Real)  
Division  
Inverse  
Multiplication  
Power\*  
Square Root

### Demodulators

DQPSK\*  
pi/4-DQPSK Dectector\*  
FM Demodulator  
PPM Demodulator  
PSK Detector (2,4, 8\*, 16\*)  
PAM Detector (2,4,8,16)  
QAM Detector (16,32,64\*,256\*)

### Digital Elements

Binary Counter  
Bits to Symbol  
Divide by N  
D Flip Flop  
JK Flip Flop  
Mux/Demux\*  
Parallel to Serial  
Queue\*  
Serial to Parallel  
Symbol to Bits

### Encoders and Decoders

Block Interleaver  
Convolutional Encoder  
Convolutional Interleaver\*  
Gray Decoder  
Gray Encoder,  
Trellis Decoder\*  
Trellis Encoder\*  
Viterbi Decoder (Hard & Soft\*)

### Estimators

Average Power (Complex & Real)  
BER Curve Control  
Bit/Symbol Error Rate  
Correlation\*  
Delay Estimator  
Event Time  
Mean  
Median\*  
Variance  
Weighted Mean\*

### Filters

Adaptive Equalizer (Complex & Real)  
File FIR  
FIR  
IIR  
MagPhase\*  
Sampled File FIR\*  
Sampled FIR

### Modulators

AM, DQPSK\*  
pi/4-DQPSK\*  
FM  
FSK,  
I/Q\*,  
MSK\*  
PM  
PAM (4,8)  
PPM  
PSK (2,4,8\*,16\*)  
QAM (16,32,64\*,256\*)  
SQPSK

### Operators

A/D Converter  
Compander  
Complex Exponential  
Complex FFT IFFT  
Conversions  
Decimation  
Delay (Complex & Real)  
Gain (dB)  
Integrate & Dump (Complex & Real)  
I/Q Mapper\*  
Max Index  
Modulo  
Phase Rotate  
Phase Unwrap\*  
Polynomial  
Spectrum Analyzer

### Phase-Locked Loops

Charge Pump  
PLL Loop Filters (2nd & 3rd\* order)  
Type 2 Phase Detector  
Type 3 Phase/Frequency Detector  
Type 4 Phase/Frequency Detector\*

### RF Components

Amplifier  
Attenuator  
Coupler\*  
Double Balanced Mixer\*  
Splitter/Combiner  
Switch  
Variable Attenuator\*

### Signal Sources

Complex Tone  
File Data  
Frequency Sweep  
Impulse  
Impulse Train  
Noise  
PN Sequence  
Random Seed  
Random Symbol  
Rectangular Pulses  
Sinusoid  
VCO (Complex & Real)  
Walsh Sequence\*  
Walsh Sequence Generator

\* Not included with VisSim/Comm PE

## Technical Specification

Visual and interactive environment for modeling end-to-end communication systems at the signal or physical level

### Types of Systems

- Analog
- Digital
- Mixed-mode communication systems

### Operating Systems

- Windows 95
- Windows 98
- Windows NT 4+

### System Requirements

- 4MB RAM
- 4 MB hard disk space
- Math co-processor

### Technical Specifications

Max. blocks	500MB*
Max. plots	500MB*
Max. integrators	500MB*
Max. data points	200MB
Integration methods	3
Numeric precision	IEEE 64-bit
Data file form	ASCII, .M, .MAT, .WAV
ABCD state-space form	.MAT, .M

\* Max blocks, plots, and integrators is 100 in VisSim/Comm PE