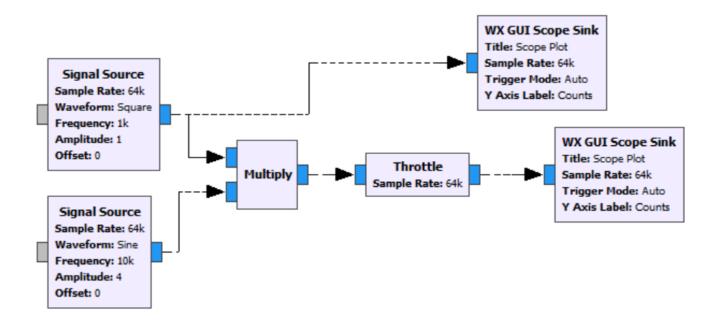**Options**
ID: top_block
Generate Options: WX GUI

Variable
ID: samp_rate
Value: 64k

Signal Source
Sample Rate: 64k
Waveform: Square
Frequency: 1k
Amplitude: 1
Offset: 0

Signal Source
Sample Rate: 64k
Waveform: Sine
Frequency: 10k
Amplitude: 4
Offset: 0

Multiply

Throttle
Sample Rate: 64k

WX GUI Scope Sink
Title: Scope Plot
Sample Rate: 64k
Trigger Mode: Auto
Y Axis Label: Counts

WX GUI Scope Sink
Title: Scope Plot
Sample Rate: 64k
Trigger Mode: Auto
Y Axis Label: Counts

Options
ID: ber_simulation
Title: BER Simulation
Author: Example
Description: Adjus...happens!
Generate Options: WX GUI

Error Rate
Type: Bit Error Rate
Window Size: 1k
Bits per Symbol: 16

WX GUI Number Sink
Title: BER
Units: %
Sample Rate: 100k
Min Value: 0
Max Value: 1
Factor: 100
Decimal Places: 4
Reference Level: 0
Number Rate: 15
Show Gauge: Hide
Grid Position: 4, 0, 4, 1

Random Source
Minimum: 0
Maximum: 4
Num Samples: 1k
Repeat: Yes

Throttle
Sample Rate: 100k

Chunks to Symbols
Symbol Table: -707...07.107mj
Dimension: 1

Constellation Decoder
Constellation Object: ...0> >

Noise Source
Noise Type: Gaussian
Amplitude: 158.114m
Seed: 42

Add

Variable
ID: samp_rate
Value: 100k

Variable
ID: const
Value: <constel...ation 8PSK>

Import
Import: math

WX GUI Slider
ID: EbN0
Label: Eb/N0 (dB)
Default Value: 10
Minimum: -10
Maximum: 200
Converter: Float

Variable
ID: const_type
Value: 1

WX GUI Scope Sink
Title: Constellation: 4-PSK
Sample Rate: 100k
XY Mode: On
Grid Position: 0, 0, 1, 1
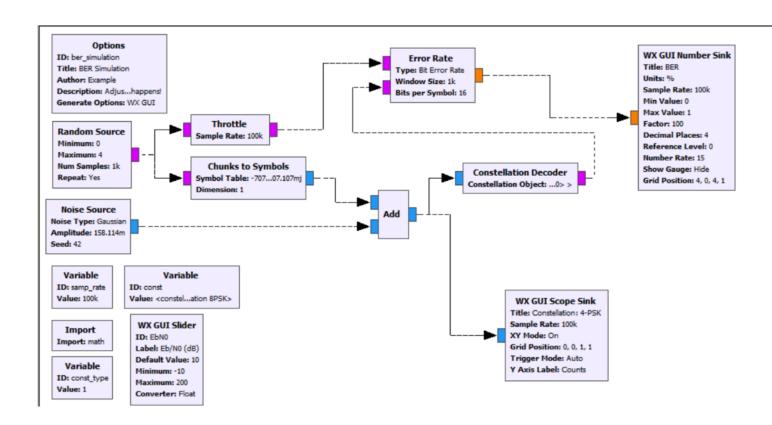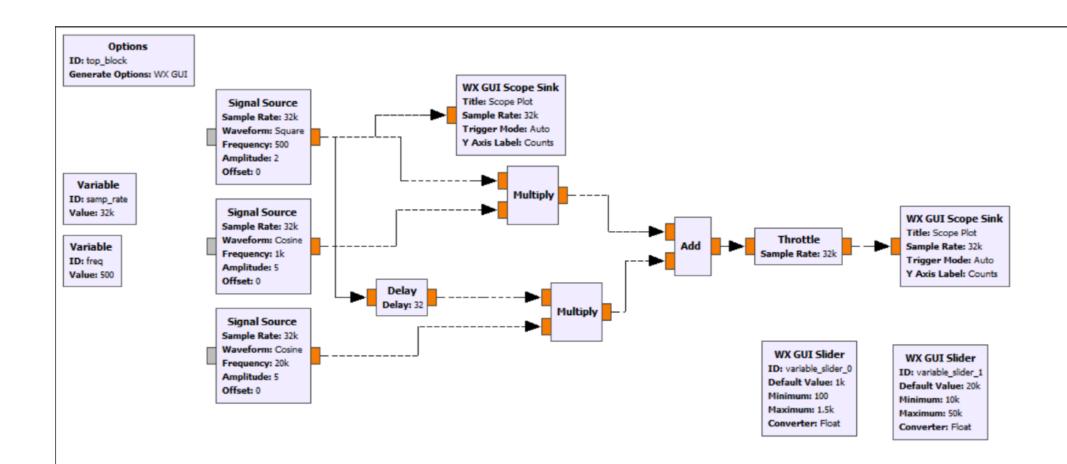Trigger Mode: Auto
Y Axis Label: Counts

Options
ID: top_block
Generate Options: WX GUI

Variable
ID: samp_rate
Value: 32k

Variable
ID: freq
Value: 500

Signal Source
Sample Rate: 32k
Waveform: Square
Frequency: 500
Amplitude: 2
Offset: 0

Signal Source
Sample Rate: 32k
Waveform: Cosine
Frequency: 1k
Amplitude: 5
Offset: 0

Signal Source
Sample Rate: 32k
Waveform: Cosine
Frequency: 20k
Amplitude: 5
Offset: 0

WX GUI Scope Sink
Title: Scope Plot
Sample Rate: 32k
Trigger Mode: Auto
Y Axis Label: Counts

Multiply

Delay
Delay: 32

Multiply

Add

Throttle
Sample Rate: 32k

WX GUI Scope Sink
Title: Scope Plot
Sample Rate: 32k
Trigger Mode: Auto
Y Axis Label: Counts

WX GUI Slider
ID: variable_slider_0
Default Value: 1k
Minimum: 100
Maximum: 1.5k
Converter: Float

WX GUI Slider
ID: variable_slider_1
Default Value: 20k
Minimum: 10k
Maximum: 50k
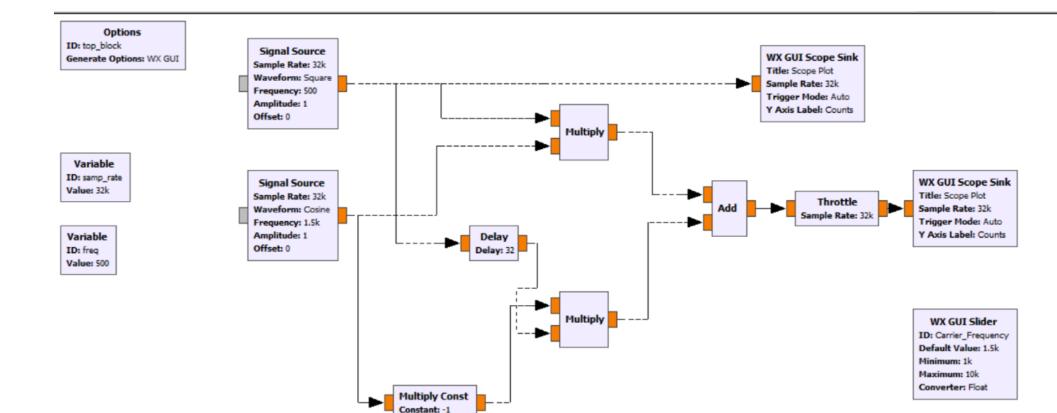Converter: Float

Options
ID: top_block
Generate Options: WX GUI

Signal Source
Sample Rate: 32k
Waveform: Square
Frequency: 500
Amplitude: 1
Offset: 0

WX GUI Scope Sink
Title: Scope Plot
Sample Rate: 32k
Trigger Mode: Auto
Y Axis Label: Counts

Variable
ID: samp_rate
Value: 32k

Multiply

Variable
ID: freq
Value: 500

Signal Source
Sample Rate: 32k
Waveform: Cosine
Frequency: 1.5k
Amplitude: 1
Offset: 0

Add

Throttle
Sample Rate: 32k

WX GUI Scope Sink
Title: Scope Plot
Sample Rate: 32k
Trigger Mode: Auto
Y Axis Label: Counts

Delay
Delay: 32

Multiply

WX GUI Slider
ID: Carrier_Frequency
Default Value: 1.5k
Minimum: 1k
Maximum: 10k
Converter: Float

Multiply Const
Constant: -1

Options
ID: eyeplot
Generate Options: Hier Block (QT GUI)
Category: custom

Pad Source
Label: in

Variable
ID: samp_rate
Value: 100k

Delay
Delay: 1

Delay
Delay: 2

Delay
Delay: 3

Delay
Delay: 4

Delay
Delay: 5

Delay
Delay: 6

Delay
Delay: 7

Delay
Delay: 8

Delay
Delay: 9

QT GUI Time Sink
Number of Points: 3
Sample Rate: 100k
Autoscale: No

Options
ID: top_block
Generate Options: QT GUI

Variable
ID: numpoints
Value: 400

QT GUI Range
ID: cutoff
Default Value: 50k
Start: 10k
Stop: 80k
Step: 1k

QT GUI Time Sink
Name: in
Number of Points: 400
Sample Rate: 100k
Autoscale: No

Variable
ID: samp_rate
Value: 100k

QT GUI Eyeplot

QT GUI Time Sink
Number of Points: 40
Sample Rate: 100k
Autoscale: No

Low Pass Filter
Decimation: 1
Gain: 1
Sample Rate: 100k
Cutoff Freq: 50k
Transition Width: 100
Window: Hamming
Beta: 6.76

Throttle
Sample Rate: 100k

Random Source
Minimum: 0
Maximum: 2
Num Samples: 400
Repeat: Yes

Chunks to Symbols
Symbol Table: -2, 2
Dimension: 1

QT GUI Eyeplot

Options
ID: top_block
Generate Options: QT GUI

Variable
ID: excess_bw
Value: 350m

Variable
ID: samp_rate
Value: 32k

Variable
ID: sps
Value: 4

Variable
ID: numpoints
Value: 10k

Variable
ID: nfilts
Value: 32

Variable
ID: arity
Value: 4

Variable
ID: rrc_taps
Value: firdes.root_raised_...

Constellation Rect. Object
ID: qpsk
Symbol Map: 0, 1, 2, 3
Constellation Points: ...07mj
Rotational Symmetry: 4
Real Sectors: 2
Imaginary Sectors: 2
Width Real Sectors: 1
Width Imaginary Sectors: 1

Random Source
Minimum: 0
Maximum: 256
Num Samples: 10k
Repeat: Yes

QT GUI Range
ID: k
Default Value: 0
Start: 0
Stop: 100
Step: 1

Complex To Float

QT GUI Histogram
Number of Points: 1.0
Number of Bins: 100
Autoscale: Yes
Accumulate: Yes
Min x-axis: -1
Max x-axis: 1

Constellation Modulator
Constellation: <con... (m=4)>
Differential Encoding: Yes
Samples/Symbol: 4
Excess BW: 350m

Fading Model
Num Sinusoids (SoS model): 8
Normalized Max Doppler (fD*Ts): 312....5u
LOS Model: Rician/LOS
Rician factor (K): 0
Seed: 0

QT GUI Co
Name: rece
Number of
Autoscale:

Throttle
Sample Rate: 32k

Polyphase Clock Sync
Samples/Symbol: 4
Loop Bandwidth: 62.8m
Taps: rrc_taps
Filter Size: 32
Initial Phase: 16
Maximum Rate Deviation: 1.5
Output SPS: 1

Costas Loop
Loop Bandwidth: 62.8m
Order: 4

Throttle
Sample Rate: 32k

QT GUI Constellation Sink
Name: o/p afte... correction
Number of Points: 10k
Autoscale: Yes

CMA Equalizer
Num. Taps: 6
Modulus: 1
Gain: 10m
Samples per Symbol: 2

Throttle
Sample Rate: 32k

QT GUI Constellatio
Name: receiver...equaliz
Number of Points: 10k
Autoscale: Yes

Variable
ID: excess_bw
Value: 350m

Variable
ID: samp_rate
Value: 32k

Variable
ID: sps
Value: 4

Variable
ID: numpoints
Value: 10k

Variable
ID: nfilts
Value: 32

Variable
ID: arity
Value: 4

Variable
ID: rrc_taps
Value: firdes.root_raised_...

Random Source
Minimum: 0
Maximum: 256
Num Samples: 10k
Repeat: Yes

QT GUI Range
ID: k
Default Value: 0
Start: 0
Stop: 100
Step: 1

Complex To Float

QT GUI Histogram Sink
Number of Points: 1.024k
Number of Bins: 100
Autoscale: Yes
Accumulate: Yes
Min x-axis: -1
Max x-axis: 1

Constellation Modulator
Constellation: <con... (m=4)>
Differential Encoding: Yes
Samples/Symbol: 4
Excess BW: 350m

Fading Model
Num Sinusoids (SoS model): 8
Normalized Max Doppler (fD*Ts): 312....5u
LOS Model: Rician/LOS
Rician factor (K): 0
Seed: 0

QT GUI Constellation Sink
Name: received
Number of Points: 10k
Autoscale: Yes

Throttle
Sample Rate: 32k

Costas Loop
Loop Bandwidth: 62.8m
Order: 4

Throttle
Sample Rate: 32k

QT GUI Constellation Sink
Name: o/p afte... correction
Number of Points: 10k
Autoscale: Yes

CMA Equalizer
Num. Taps: 6
Modulus: 1
Gain: 10m
Samples per Symbol: 2

Throttle
Sample Rate: 32k

QT GUI Constellation Sink
Name: receiver...equalization
Number of Points: 10k
Autoscale: Yes

Options
D: top_block
Generate Options: QT GUI

Variable
ID: samp_rate
Value: 32k

Variable
ID: excess_bw
Value: 350m

Variable
ID: sps
Value: 4

Variable
ID: numpoints
Value: 10k

Variable
ID: nfilts
Value: 32

Variable
ID: arity
Value: 4

Variable
ID: rrc_taps
Value: firdes.root_raised_...

QT GUI Range
ID: d
Default Value: 2
Start: 0
Stop: 10
Step: 1

Constellation Rect. Object
ID: qpsk
Symbol Map: 0, 1, 2, 3
Constellation Points: ...07mj
Rotational Symmetry: 4
Real Sectors: 2
Imaginary Sectors: 2
Width Real Sectors: 1
Width Imaginary Sectors: 1

Random Source
Minimum: 0
Maximum: 256
Num Samples: 32k
Repeat: Yes

Constellation Modulator
Constellation: <con... (m=4)>
Differential Encoding: Yes
Samples/Symbol: 4
Excess BW: 350m

QT GUI Range
ID: k
Default Value: 20
Start: 0
Stop: 100
Step: 1

QT GUI Constellation Sink
Name: received
Number of Points: 10k
Autoscale: Yes

Frequency Selective Fading Model
Num Sinusoids (SoS model): 8
Normalized Max Doppler (fD*Ts): 0
LOS Model: Rician/LOS
Rician factor (K): 20
Seed: 0
PDP Delays (samp): 0,...m, 20
PDP Magnitudes: 1, 800m, 60m
Num Taps: 8

Throttle
Sample Rate: 32k

QT GUI Frequency Sink
Name: before equalization
FFT Size: 1.024k
Center Frequency (Hz): 0
Bandwidth (Hz): 32k

Polyphase Clock Sync
Samples/Symbol: 4
Loop Bandwidth: 62.8m
Taps: rrc_taps
Filter Size: 32
Initial Phase: 16
Maximum Rate Deviation: 1.5
Output SPS: 1

Costas Loop
Loop Bandwidth: 62.8m
Order: 4

CMA Equalizer
Num. Taps: 2
Modulus: 1
Gain: 10m
Samples per Symbol: 2

Throttle
Sample Rate: 32k

QT GUI Frequency Sink
Name: after equalization
FFT Size: 1.024k
Center Frequency (Hz): 0
Bandwidth (Hz): 32k

QT GUI Constellation Sink
Name: CMA
Number of Points: 10k
Autoscale: Yes

Options
ID: top_block
Generate Options: QT GUI

Variable
ID: samp_rate
Value: 32k

Tag Object
ID: vec_end
Offset: 4
Key: sync
Value: true
Source ID: src

Tag Object
ID: vector_start
Offset: 4
Key: sync
Value: False
Source ID: src

QT GUI Vector Sink
Name: ch in
Vector Size: 4
X-Axis Start Value: 0
X-Axis Step Value: 1
X-Axis Label: x-Axis
Y-Axis Label: y-Axis
X-Axis Units:
Y-Axis Units:
Ref Level: 0

Vector Source
Vector: -4, 8, 4, 8
Tags: False, true
Repeat: Yes
Vec Length: 4

Multiply Const
Constant: 1, 1, -1, 1
Vec Length: 4

Vector Source
Vector: -4, 8, 4, 8
Tags: False, true
Repeat: Yes
Vec Length: 4

Multiply Const
Constant: -1, 1, 1, 1
Vec Length: 4

Add
Vec Length: 4

Vector Source
Vector: 0, 0, 0, 0
Tags: False, true
Repeat: Yes
Vec Length: 4

Float To Complex
Vec Length: 4

Noise Source
Noise Type: Gaussian
Amplitude: 1
Seed: 0

Vector to Stream
Num Items: 4

Add

Virtual Sink
Stream ID:

Options
ID: top_block
Generate Options: QT GUI

Variable
ID: samp_rate
Value: 1.536M

QT GUI Range
ID: fm_station
Default Value: 90M
Start: 85M
Stop: 105M
Step: 100

Wav File Source
File: ...48000Hz_8bit_PCM.wav
Repeat: Yes

Add

WBFM Transmit
Audio Rate: 48k
Quadrature Rate: 192k
Tau: 75u
Max Deviation: 75k
Preemphasis High Corner Freq: -1

Multiply Const
Constant: 511

Rational Resampler
Interpolation: 8
Decimation: 1
Taps:
Fractional BW: 0

UHD: USRP Sink
Samp Rate (Sps): 1.536M
Ch0: Center Freq (Hz): 90M
Ch0: Gain Value: 60
Ch0: Antenna: Tx/Rx
Ch0: Bandwidth (Hz): 1.536M
TSB tag name:

QT GUI Frequency Sink
FFT Size: 1.024k
Center Frequency (Hz): 90M
Bandwidth (Hz): 1.536M

Options
ID: top_block
Generate Options: WX GUI

WX GUI Slider
ID: fm_station
Default Value: 95M
Minimum: 91M
Maximum: 105M
Converter: Float

WX GUI FFT Sink
Title: FFT Plot
Sample Rate: 1.536M
Baseband Freq: 95M
Y per Div: 10 dB
Y Divs: 10
Ref Level (dB): 0
Ref Scale (p2p): 2
FFT Size: 1.024k
Refresh Rate: 15
Freq Set Varname: None

Variable
ID: samp_rate
Value: 1.536M

UHD: USRP Source
Samp Rate (Sps): 1.536M
Ch0: Center Freq (Hz): 95M
Ch0: Gain Value: 40
Ch0: Antenna: TX/RX
Ch0: Bandwidth (Hz): 200k

Low Pass Filter
Decimation: 4
Gain: 1
Sample Rate: 1.536M
Cutoff Freq: 96k
Transition Width: 15k
Window: Blackman
Beta: 6.76

WBFM Receive
Quadrature Rate: 384k
Audio Decimation: 8

Audio Sink
Sample Rate: 48KHz

Options
ID: top_block
Generate Options: QT GUI

Variable
ID: samp_rate
Value: 7.68M

Variable
ID: packet_len
Value: 50

Variable
ID: len_tag_key
Value: packet_len

Variable
ID: fft_len
Value: 128

Variable
ID: occ_carriers
Value: [-50, -4...47, 48, 49]

Variable
ID: pilot_carriers
Value: [-40, 40]

Variable
ID: pilot_syms
Value: (1, 1)

Random Source
Minimum: 0
Maximum: 256
Num Samples: 1k
Repeat: Yes

Stream to Tagged Stream
Packet Length: 50
Length Tag Key: packet_len

OFDM Transmitter
FFT Length: 128
Cyclic Prefix Length: 32
Length Tag Name: packet_len
Occupied Carriers: [-..., 49]
Pilot Carriers: [-40, 40]
Pilot Symbols: (1, 1)
Header Modulation: BPSK
Payload Modulation: QPSK
Rolloff length (samples): 0
Log Debug Info: No

Throttle
Sample Rate: 7.68M

Channel Model
Noise Voltage: 1.2
Frequency Offset: 10m
Epsilon: 1
Taps: 1
Seed: 0

QT GUI Range
ID: noise
Label: Noise Voltage
Default Value: 1.2
Start: 0
Stop: 2
Step: 10m

QT GUI Sink
FFT Size: 1.024k
Center Frequency (Hz): 0
Bandwidth (Hz): 7.68M
Update Rate: 10

QT GUI Range
ID: timing
Label: Timing_Offset
Default Value: 1
Start: 999m
Stop: 1.001
Step: 100u

QT GUI Range
ID: freq
Label: Frequency_Offset
Default Value: 10m
Start: -1
Stop: 1
Step: 10m

OFDM Receiver
FFT Length: 128
Cyclic Prefix Length: 32
Packet Length Tag Key: rx_len
Occupied Carriers: [-..., 49]
Pilot Carriers: [-40, 40]
Pilot Symbols: (1, 1)
Header Modulation: BPSK
Payload Modulation: QPSK
Log Debug Info: No

Tag Debug
Name:
Key Filter: packet_num
Display: On