Grey blocks are stimulus

Ch2 is the frequency shifted version of Ch1.

The IF power levels are fixed by the system
AGC so I won't test at different Ch1/Ch2 ratios.

The counter is a continuously variable channel ratio for test.
Connect ROM to slice above for normal use. I noticed the
output IF noise floor drops 50dB between the two modes.

In order to add the two IFs and maintain the
same relative amplitude, divide them both by
two then add them together.
For instance if DiffDb is 0 (both AGCs are
equal) then GainSlave will be 0.5.GainMaster =
1.0-GainSlave, so GainMaster is also 0.5.

The raw AGC input is ±2V at 20dB/V for 80dB range.

The A/D is 12 bits covering 3.3V. The AGC is gained
to cover 3.6V of that range with 0V input equals
midscale. Since the A/D only uses 3.0V of its 3.3V
range, the total range of the A/D represents 88dB
(80dB * 3.3V / 3.0V = 88 dB)

The combiner is only viable over a 10dB range
before turning into a best source selector. If we only
use an eighth of the full range gives us 11dB.

Random
Integer
Random Integer
Generator

Rate Transition

Scope7

QPSK
Modulator
Baseband

AWGN
Channel1

Gain5

Lowpass Filter1
Ch1

Spectrum
Analyzer

Real-Imag to
Complex1

Freq Offset NCO

ExtOffset
Mixer

AWGN
Channel2

Gain6

Lowpass Filter2
Ch2

Inc NCO
NCO1

Real-Imag to
Complex

IntOffset
Mixer

Data Type Conversion

Delay

Sine Wave

PhaseDetect

Complex to
Magnitude-Angle

Conjugate

AD9957-2

Spectrum
Analyzer2

Delay5

Delay6

Complex to
Real-Imag5

Delay3

Delay4

Lag Out 2

Ctrl Out

Loop Filter Scope

K Ts
Discrete-Time
Integrator

Gain1

Complex to
Real-Imag

Ch1Real
Ch1Imag
Ch2Real
Ch2Imag

Complex to
Real-Imag1

ChanSwapper

Delay2

Delay1

Phase_Detect

CordicATan

Phase Detect

Bipolar
NCO

Convert

Convert1

Int Q fixed bf user

Negate1

AddSub

AddSub2

Lag Coef
Constant11

Lead Coef
Constant12

AGC Diff

Display5

AGC Diff Times 8
Display6

Abs AGC Diff
Display2

Sine Wave1

Gain

Constant7

Gain2

Constant8

Gain3

Gain4

Ch1AGC

Ch2AGC

DiffDB

CMult

Absolute

Slice

CMult2

Slice6

Inverter

Counter

ROM

GainSlave

CMult1

AGC ROM Add1
Display1

From3

Constant2

Constant3

Manual Switch1

MuxControl

Goto

AGC1 GT AGC2
Display3

Constant10

Gain_Master

Constant9

Constant5

Constant6

Mux6

Mux7

AddSub1

AddSub3

Real Lock
Display

Imag Lock
Display4

Logical2

Locked
Display7

Goto1

Slice6

Slice7

Slice2

Slice3

Slice4

Logical

Logical1

Gateway Out

Gateway Out 1

Ch1RealOut

Ch2RealOut

Ch1ImagOut

Ch2ImagOut

Mult2

Mult3

Mult4

Mult5

AddReals

AddImag

RealOut

ImagOut

Scope1

Real-Imag to
Complex2

AD9957

Scope5

Spectrum
Analyzer1

Scope3

Sample Times for 'ComplexPhaseDetector'

Color	Annotation	Description	Value
	FiM	Fixed in Minor Step	[0,1]
	D1	Discrete 1	1.3393e-09
	D2	Discrete 2	1.0714e-08
	D3	Discrete 3	1.0714e-07
	D4	Discrete 4	0.010714
	V1	Variable 1	Continuous Source
	Inf	Constant	Inf
	H	Hybrid	N/A