Options
Title: Gnuradio... Radiometer
Author: Pierre ...ech (CCERA)
Copyright: GNU-GPL
Description: A sim...astronmy
Output Language: Python
Generate Options: QT GUI

Import
Import: math

Import
Import: time

Note
Note:
The total-power sub-graph
Compute mag^2 for both inputs
(East and West)
Provide East and West outputs
as well as sum and difference

Note
Note:
There are 32-bit-float numerical
issues when using very-small ALPHA
values in the IIR.
So, we do the integration in two stages.

Variable
ID: samp_rate
Value: 500k

Variable
ID: actual_freq
Value: 1.42041G

Variable
ID: integQty
Value: 31k

Parameter
ID: longitude
Label: Longitude
Type: Float
Value: -103.156

Variable
ID: alt
Value: 87.5

Variable
ID: amsl
Value: 1.372k

Variable
ID: decln
Value: 49.1192

Variable
ID: azimut
Value: 0

Virtual Source
Stream ID: rf1

Complex to Mag^2
A detector
Computes
(I^2)+(Q^2)

Integrate
Decimation: 100

Fast Multiply Const
Constant: 1
Integrator doesn't reduce

Keep 1 in N

BAA:Data Logger
Formatter: None
Filepat: tp-%04d%02d%02d_DSES
Extension: .csv
Logtime: 5
Fmtstr: %11.9f
Nchan: 1
Localtime: False
Longitude: -103.156
Legend: GMT,LMS...BW=5.000000

Probe Signal
ID: pacer_probe

Virtual Sink
Stream ID: rf1

Complex to Mag^2
Vector Length: 2.048k
Convert to power estimate

Virtual Source
Stream ID: rf1

Stream to Vector
FFT requires fft-sized vectors
we do that here

FFT
FFT Size: 2.048k
Forward/Reverse: Forward
Window: window.blackmanhar...
Shift: Yes
Num. Threads: 1

ezRA Vector Logger
Fftsize: 2.048k
Integqty: 31k
Prefix: DSES
Fileheader: from ...dB power
Logseconds: 10

Note
Note:
The spectral sub-graph
Compute the mag^2
Integrate
Decimate down to "data_rate"

Integrate
Decimation: 31k
Vector Length: 2.048k

Keep 1 in N
N: 24
Vector Length: 2.048k
Decimate

Strip Chart daily
Decim: 10
Daily: 86.4k

QT GUI Vector Sink
Name: Total Power (Daily)
Vector Size: 86.4k
X-Axis Start Value: 0
X-Axis Step Value: -277.778u
X-Axis Label: Drif... (Hours)
Y-Axis Label: Detector Power
Ref Level: 0

Note
Note:
In two blocks below,
in the boxes
"RSP Selector",
insert the following
numbers, one in each
block (these are same
as serial numbers
on back of devices)::
2405079A34
240507AB34

Note
Note:
Do not need serial
numbers as only
one device plugged in

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one device plugged in

SDRplay: RSPduo
RSP Selector: 2405079A34
RSPduo mode: Single Tuner
Antenna: Tuner 1 50 ohm
Sample rate (Sps): 500k
Center Freq (Hz): 1.42G
Bandwidth (Hz): AUTO

SDRplay: RSPduo
RSP Selector:
RSPduo mode: Dual Tuner (independent RX)
Antenna: Both Tuners
Sample rate (Sps): samp_rate
RX0: Center Freq (Hz): ...41G
RX1: Center Freq (Hz): ...41G
Bandwidth (Hz): AUTO

SDRplay: RSPduo
RSP Selector:
RSPduo mode: Single Tuner
Antenna: Tuner 1 50 ohm
Sample rate (Sps): 500k
Center Freq (Hz): 1.42G
Bandwidth (Hz): AUTO

SDRplay: RSPduo
RSP Selector: 240507AB34
RSPduo mode: Single Tuner
Antenna: Tuner 2 50 ohm
Sample rate (Sps): 500k
Center Freq (Hz): 1.42G
Bandwidth (Hz): AUTO

Note
Note:
Choose the one above
for one RSPduo SDR
in dual channel mode
(lower bandwidth but
only requires one
receiver)

Note
Note:
Choose the one above
for one RSPduo SDR
in single channel mode

Note
Note:
Choose the two above
to select TWO
independent RSPduo
SDRs linked by single
clock cable, each in
single channel mode
(gives greater bandwidth)

Baseline Compensator
Fftsize: 2.048k
Collect: True
Optionally apply baseline-subtraction

Integrate
Decimation: 31k
Vector Length: 2.048k

Log10
n: 10
k: -60.3401
Vector Length: 2.048k
Turn into 10Log10
Then scale appropriately

Flipper
Fftsize: 2.048k
Enabled: False
Optionally flip the spectral vector for
display--for conventional display of
redshift/blueshift

QT GUI Vector Sink
Name: Doppler Velocity
Vector Size: 2.048k
X-Axis Start Value: -52.7652
X-Axis Step Value: 51.5285m
X-Axis Label: Red shift(km/s)
Y-Axis Label: Rel power (dB)
Ref Level: 0

xval

Selector
Enabled: Enabled
Number of Inputs: 1
Number of Outputs: 3
Input Index: 0
Output Index: 0
Vector Length: 2.048k

Null Sink
Vector Length: 2.048k

Vector Logger
Fftsize: 2.048k
Formatter: None
Filepat: fft-%04...d%02d_DSES
Extension: .csv
Logtime: 15
Fmtstr: %6.2f
Localtime: False
Fftshift: False
Longitude: -103.156

Variable
ID: freqlow
Value: 1.42016k

Variable
ID: freqhigh
Value: 1.42066k

Variable
ID: freqstep
Value: 244.141u

Variable
ID: fftsize
Value: 2.048k

We make this a variable, but in reality
Embedded Python blocks
dont handle runtime vector sizing very well

Variable
ID: fftrate
Value: 244

Variable
ID: data_rate
Value: 10

The "back end" operates at this many Hz
20Hz should be more than adequate for
any data-logging requirements for this
type of observing

Variable
ID: doplow
Value: -52.7652

Variable
ID: dophigh
Value: 52.7652

Variable
ID: winpower
Value: 528.051

Variable
ID: split_ratio
Value: 100

Parameter
ID: freq
Label: RF Frequency (Hz)
Type: Float
Value: 1.42041G

Parameter
ID: srate
Label: Sample Rate (SPS)
Type: Float
Value: 5M

Parameter
ID: rfgain
Label: RF Gain (dB)
Type: Float
Value: 49

Parameter
ID: sinteg
Label: Integrat...or Spectrum
Type: Float
Value: 60

Variable
ID: prefix
Value: 49.12

Parameter
ID: logtime
Label: Logging ...rval (secs)
Type: Float
Value: 5

Parameter
ID: utc
Label: Log in UTC time
Type: Int
Value: 1

Parameter
ID: dmult
Label: Detector Multiplier
Type: Float
Value: 100

QT GUI Tab Widget
ID: Main
Num Tabs: 1
Label 0: GSR

Variable
ID: declnstr
Value: +49.12

Variable
ID: gmt
Value: time.gmtime()

Variable
ID: today
Value: 2025-10-16

Variable
ID: seconds
Value: 3.6k

Variable
ID: tiktok
Value: 0

Parameter
ID: vf
Type: Int
Value: 1

Parameter
ID: tinteg
Label: Integrat...ecs) for TP
Type: Float
Value: 60

QT GUI Label
ID: variable_qtgui_label_rf
Label: RF SDR Parameters
Default Value:

QT GUI Label
ID: variable_...abel_Location
Label: Location Parameters
Default Value:

QT GUI Label
ID: variable_qtgui_label_0
Label: Antenna Parameters
Default Value:

QT GUI Label
ID: variable_qtgui_label_3
Label: Astronomy Parameters
Default Value:

Variable
ID: ltp
Value: time.gmtime(time.ti...

Function Probe
ID: pacer
Block ID: pacer_probe
Function Name: level
Poll Rate (Hz): 1
A bit of a hack to get us an LMST
display that is updated at 1Hz

Variable
ID: prefix
Value: DSES

QT GUI Entry
ID: ifreq
Label: Tuned Frequency
Default Value: 1.42041G

QT GUI Range
ID: Longitude
Label: Longitude :
Default Value: -103.156
Start: -180
Stop: 180
Step: 100m

QT GUI Label
ID: variable_qtgui_label_1
Label: Azimut :
Default Value: 180 ...ansit)

QT GUI Label
ID: LMST
Label: LMST :
Default Value: ra_f...,":",":")

QT GUI Range
ID: irfgain
Label: RF Gain
Default Value: 49
Start: 0
Stop: 100
Step: 2.5

QT GUI Range
ID: latitude
Label: Latitude :
Default Value: 38.3808
Start: -90
Stop: 90
Step: 100m

QT GUI Range
ID: altitude
Label: Altitude :
Default Value: 87.5
Start: -180
Stop: 2k
Step: 100m

QT GUI Label
ID: idecln
Label: Declination target :
Default Value: +49.12

QT GUI Range
ID: isinteg
Label: Spectral...ration Time
Default Value: 60
Start: 1
Stop: 300
Step: 1

QT GUI Check Box
ID: correct_baseline
Label: Baseline Correction
Default Value: False
True: True
False: False

QT GUI Check Box
ID: velocity
Label: Velocity / Frequency
Default Value: 1
True: 1
False: 0

QT GUI Chooser
ID: filechoice
Label: File type choice
Num Options: 3
Default option: 0
Option 0: 0
Label 0: No file
Option 1: 1
Label 1: CSV file
Option 2: 2
Label 2: ezRA file

QT GUI Range
ID: itinteg
Label: TP Integration Time
Default Value: 60
Start: 1
Stop: 300
Step: 1

QT GUI Chooser
ID: dc_gain
Label: Detector Output Mult.
Num Options: 5
Default option: 100
Option 0: 100
Label 0: x100
Option 1: 1k
Label 1: x1000
Option 2: 10k
Label 2: x10000
Option 3: 100k
Label 3: x100000
Option 4: 1M
Label 4: x1000000