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

**Variable**
**ID:** samp_rate
**Value:** 5M

**osmocom Source**
**Device Arguments:** ai...pack=0
**Sync:** Don't Sync
**Number Channels:** 1
**Sample Rate (sps):** 5M
**Ch0: Frequency (Hz):** 1.42041G
**Ch0: Frequency Correction (ppm):** 0
**Ch0: DC Offset Mode:** 0
**Ch0: IQ Balance Mode:** 0
**Ch0: Gain Mode:** False
**Ch0: RF Gain (dB):** 40
**Ch0: IF Gain (dB):** 20
**Ch0: BB Gain (dB):** 20
command
out

**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.

**Single Pole IIR Filter**
**Alpha:** ra_funcs...plit_ratio)
in
out

**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
in

**Variable**
**ID:** actual_freq
**Value:** 1.42041G

**Variable**
**ID:** freqlow
**Value:** 1.41791k

**Variable**
**ID:** freqhigh
**Value:** 1.42291k

**Variable**
**ID:** freqstep
**Value:** 2.44141m

**Variable**
**ID:** fftsize
**Value:** 2.048k

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

**osmocom Source**
**Device Arguments:** mi...pack=0
**Sync:** Don't Sync
**Number Channels:** 1
**Sample Rate (sps):** 5M
**Ch0: Frequency (Hz):** 1.42041G
**Ch0: Frequency Correction (ppm):** 0
**Ch0: DC Offset Mode:** 0
**Ch0: IQ Balance Mode:** 0
**Ch0: RF Gain (dB):** 40
**Ch0: IF Gain (dB):** 20
**Ch0: BB Gain (dB):** 20
command

**RTL-SDR Source**
**Sync:** Unknown PPS
**Number Channels:** 1
**Sample Rate (sps):** 256k
**Ch0: Frequency (Hz):** 1.4204M
**Ch0: Frequency Correction (ppm):** 0
**Ch0: DC Offset Mode:** 0
**Ch0: IQ Balance Mode:** 0
**Ch0: Gain Mode:** False
**Ch0: RF Gain (dB):** 10
**Ch0: IF Gain (dB):** 20
**Ch0: BB Gain (dB):** 20
**Ch0: Bandwidth (Hz):** 2.5k
out

**Virtual Source**
**Stream ID:** rf1
out

**Complex to Mag^2**
in
out

A detector
Computes
(I^2)+(Q^2)

**Integrate**
**Decimation:** 100
in
out

**Fast Multiply Const**
**Constant:** 1
in
out

Integrator doesn't reduce

**Keep 1 in N**
in
out

**Virtual Sink**
**Stream ID:** rf1
in

**Virtual Source**
**Stream ID:** rf1
out

**Stream to Vector**
in
out

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
in
out

**Complex to Mag^2**
**Vector Length:** 2.048k
in
out

Convert to power estimate

**Single Pole IIR Filter**
**Alpha:** ra_funcs...eg,fftrate)
**Vector Length:** 2.048k
in
out

**Probe Signal**
**ID:** pacer_probe
in

**Keep 1 in N**
**N:** 244
**Vector Length:** 2.048k
in
out

Decimate

**Strip Chart daily**
**Decim:** 10
**Daily:** 86.4k
in
out

**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
in

**Variable**
**ID:** fftrate
**Value:** 2.441k

**Variable**
**ID:** data_rate
**Value:** 10

**Variable**
**ID:** doplow
**Value:** -527.652

**Variable**
**ID:** dophigh
**Value:** 527.652

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:** winpower
**Value:** 528.051

**Variable**
**ID:** split_ratio
**Value:** 100

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

**Integrate**
**Decimation:** 31k
**Vector Length:** 2.048k
in
out

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

**Variable**
**ID:** integQty
**Value:** 31k

**Integrate**
**Decimation:** 31k
**Vector Length:** 2.048k
in
out

**Baseline Compensator**
**Fftsize:** 2.048k
**Collect:** True
in
out

Optionally apply baseline-subtraction

**Log10**
**n:** 10
**k:** -60.3401
**Vector Length:** 2.048k
in
out

Turn into 10Log10
Then scale appropriately

**Flipper**
**Fftsize:** 2.048k
**Enabled:** False
in
out

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:** -527.652
**X-Axis Step Value:** 515.285m
**X-Axis Label:** Red shift(km/s)
**Y-Axis Label:** Rel power (dB)
**Ref Level:** 0
in
xval

**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:** longitude
**Label:** Longitude
**Type:** Float
**Value:** -103.156

**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

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

**Parameter**
**ID:** vf
**Type:** Int
**Value:** 1

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

**Variable**
**ID:** alt
**Value:** 87.5

**Variable**
**ID:** amsl
**Value:** 1.372k

**Variable**
**ID:** decln
**Value:** 49.1192

**Variable**
**ID:** declnstr
**Value:** +49.12

**Variable**
**ID:** azimut
**Value:** 0

**Variable**
**ID:** gmt
**Value:** time.gmtime()

**Variable**
**ID:** today
**Value:** 2025-09-18

**Variable**
**ID:** seconds
**Value:** 3.6k

**Variable**
**ID:** tiktok
**Value:** 0

**Null Sink**
**Vector Length:** 2.048k
in

**Selector**
**Enabled:** Enabled
**Number of Inputs:** 1
**Number of Outputs:** 3
**Input Index:** 0
**Output Index:** 0
**Vector Length:** 2.048k
in
out0
out1
out2

**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
in

**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

**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

**Variable**
**ID:** prefix
**Value:** DSES

**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:** 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:** 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

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