GNU-Radio

Presentasjon/demo for LA7M, Modum-gruppen

LB4PK, Paul de Vries, 2 Februar 2026

Hva og Hvordan

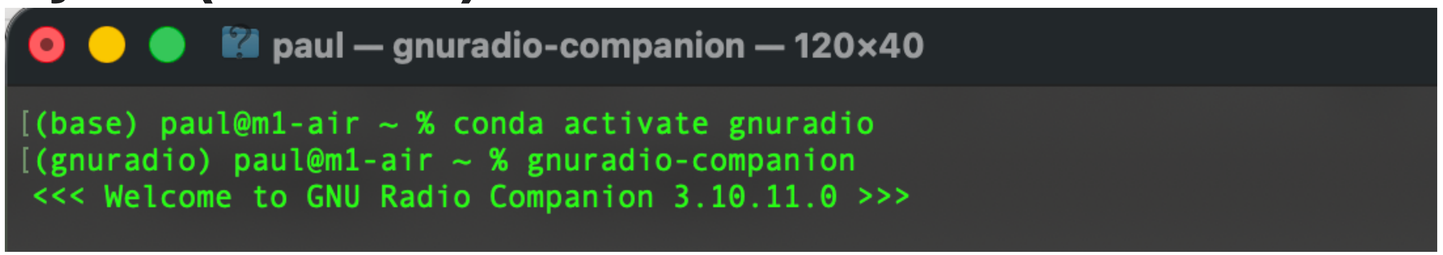
GNU Radio (https://www.gnuradio.org) er et gratis og åpen kildekode-programvarerammeverk for programvare definert radio (SDR) og digital signalbehandling.

Det lar deg bygge radiosystemer ved å koble sammen ferdige "blokker" i en grafisk eller programmatisk arbeidsflyt (flytgraf), slik at du raskt kan prototype, eksperimentere og til og med utvikle systemer som kan kjøres i produksjon.

Installere

Instruksjoner for installasjon av GNU-Radio: https://wiki.gnuradio.org/index.php/InstallingGR
Bruk RadioConda for Mac OS og Windows: https://github.com/radioconda/radioconda-installer

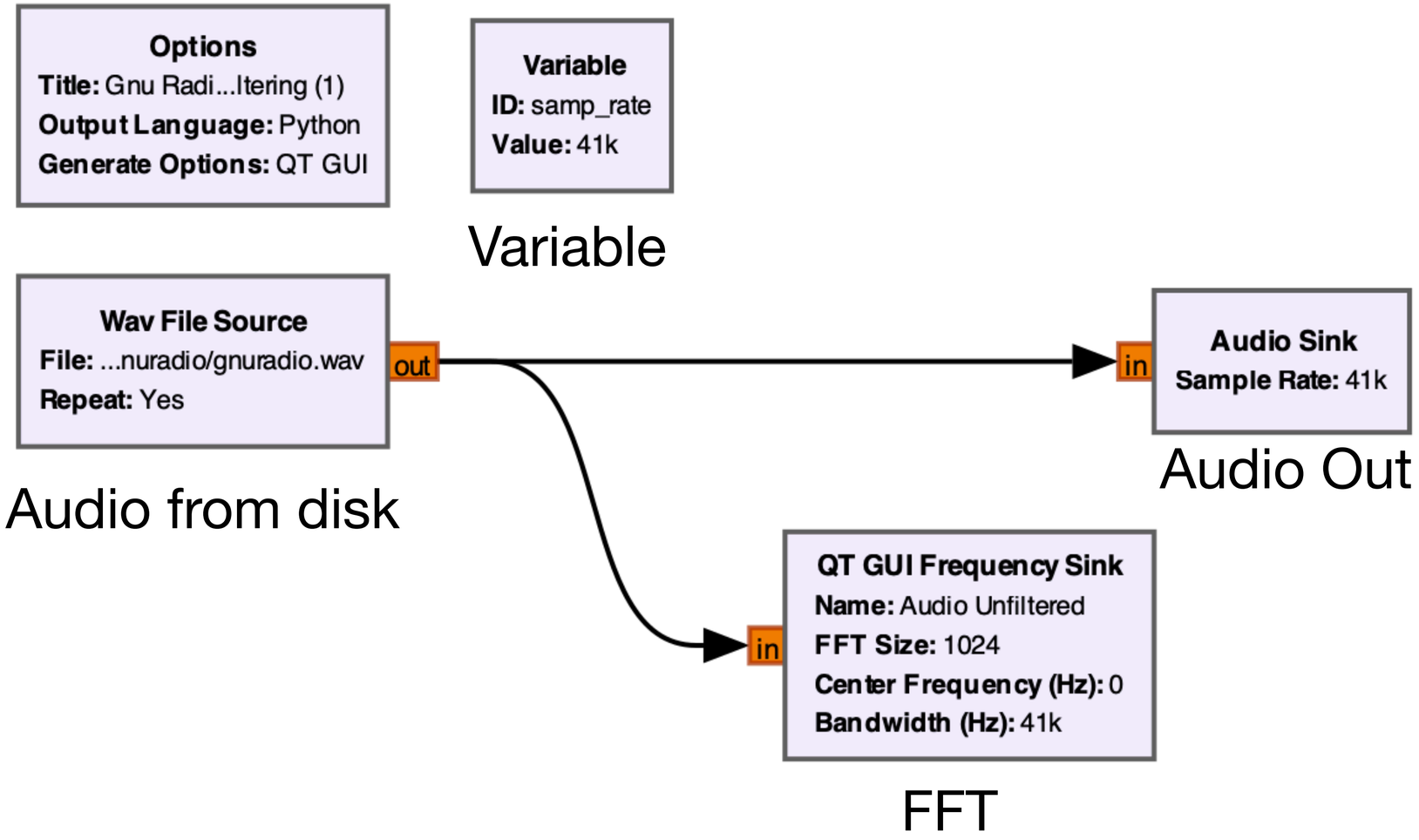
Kjøre (Mac OS)



Merk: Nyeste versjon er GR4 (desember 2025). Jeg kommer fortsatt til å bruke versjon 3.10 i dag.

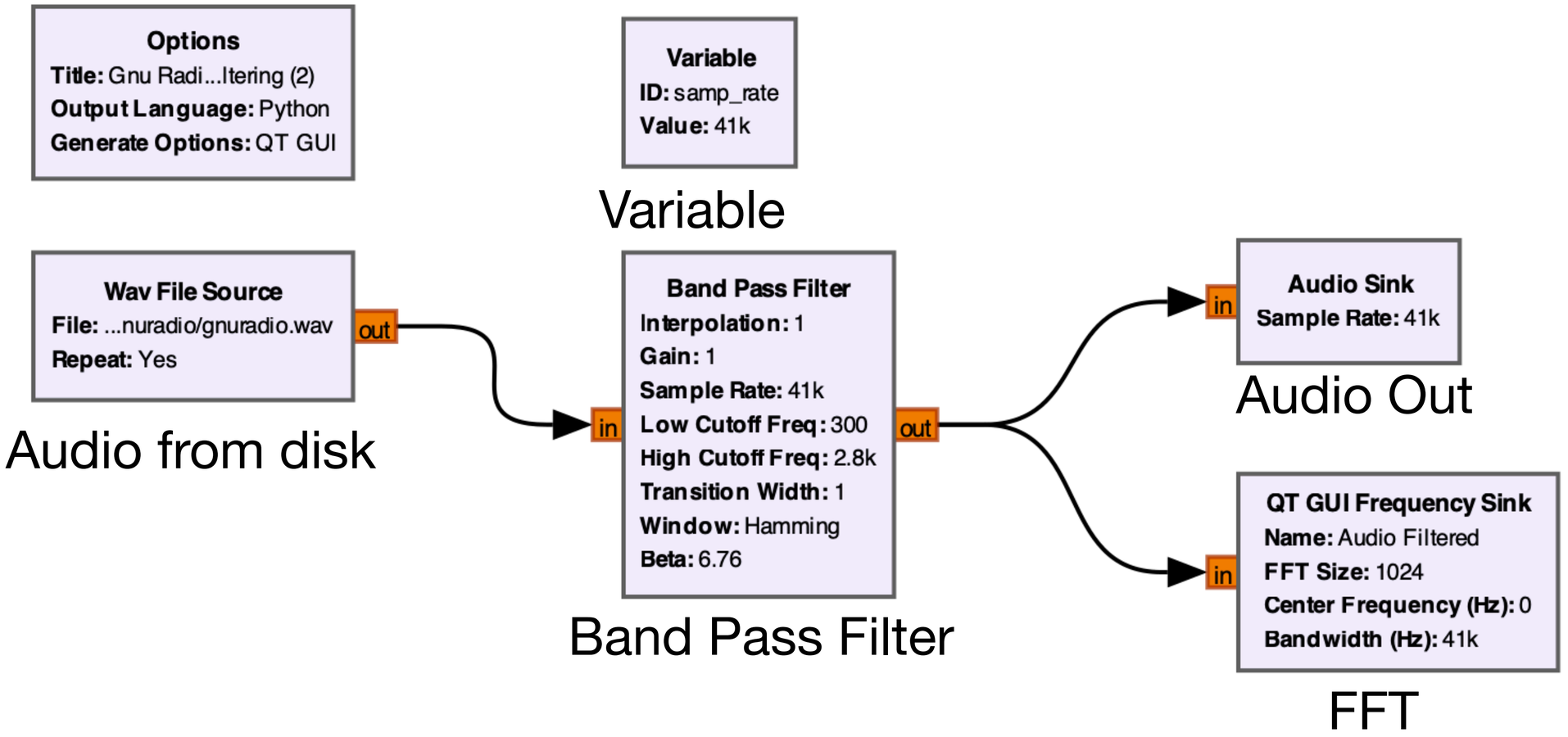
Audio (1)

Simple Audio player with Frequency Diagram (FFT)



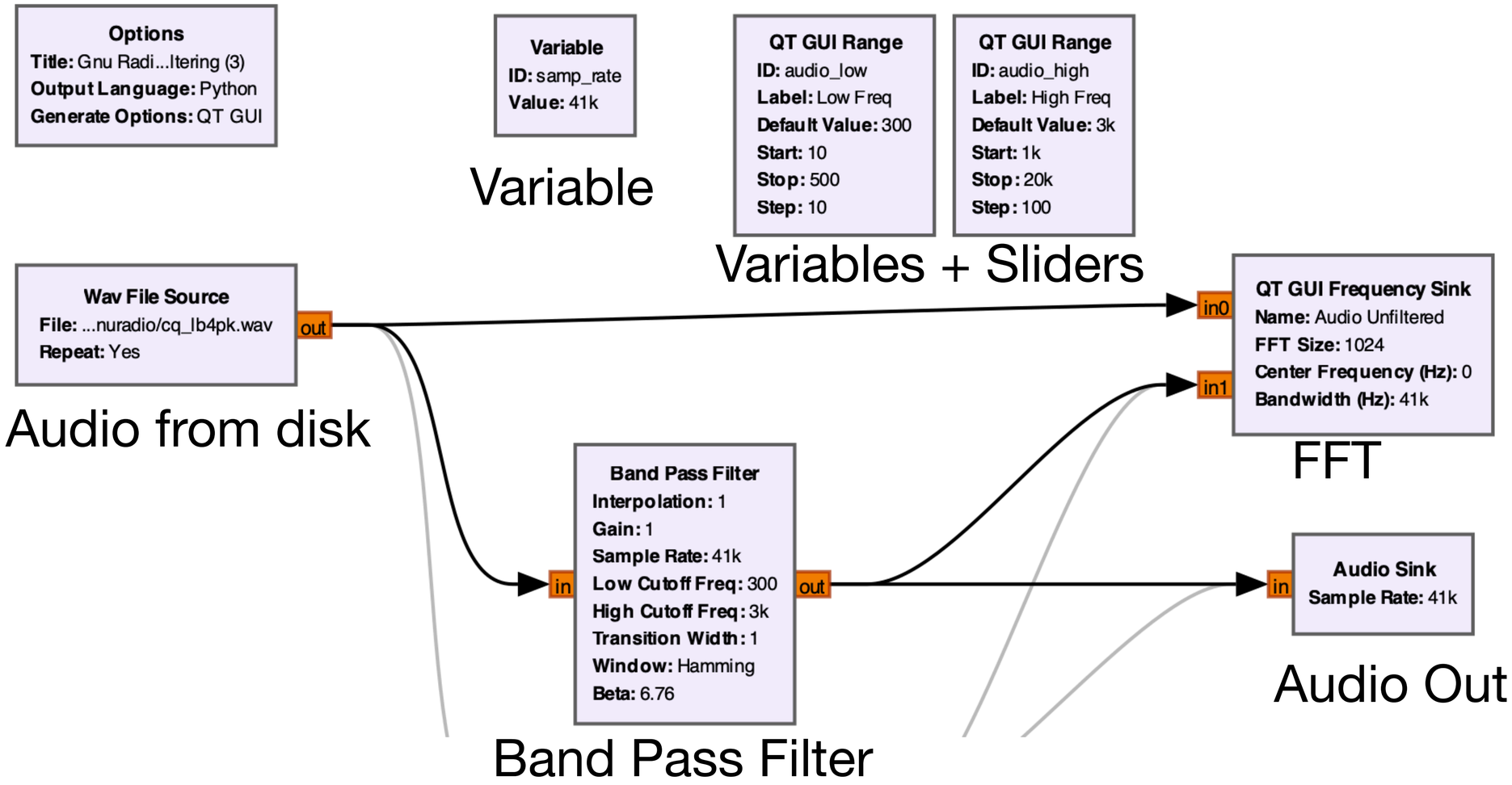
Audio (2)

Simple Audio player adding a Filter



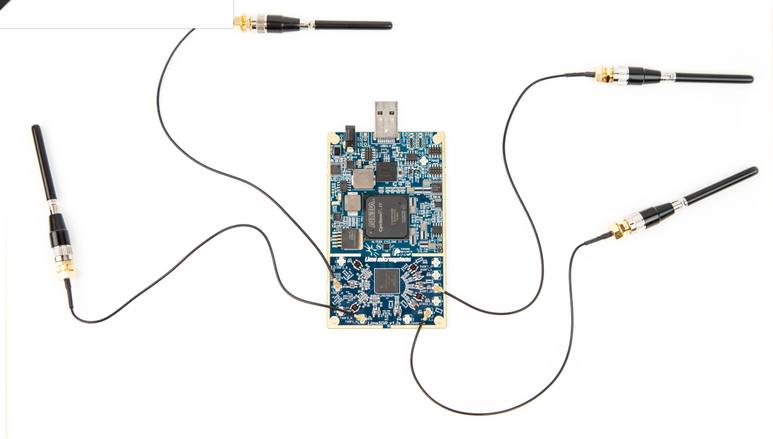
Audio (3)

Simple Audio player with Adjustable Filter



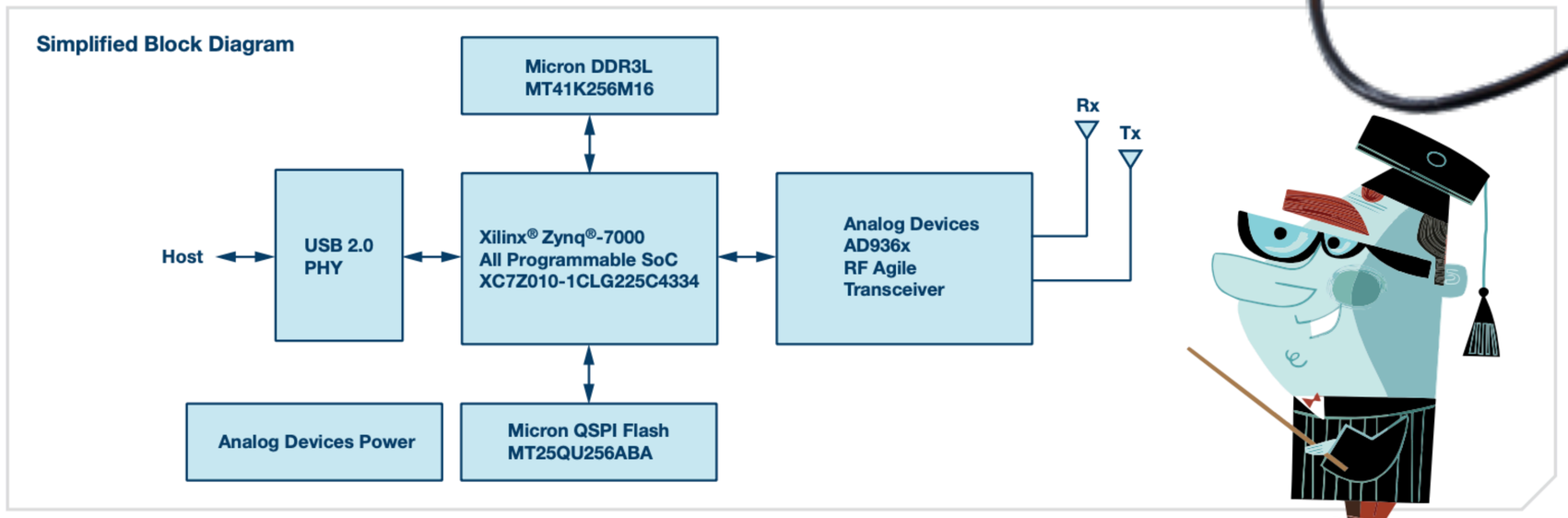
Støtter radioer i GNU-Radio

- Analog Device ADALM-PLUTO
- Ettus Research USRP™ Devices
- Fairwaves XTRX
- Fairwaves UmTRX
- Funcube Pro+ Dongle
- KerberosSDR
- Great Scott Gadgets HackRF
- Lime SDR
- Microtelecom Perseus
- New Horizons NH7020
- Novena + Myriad-RF module
- Nuand BladeRF
- Nuand BladeRF 2.0
- rtl-sdr TV tuners
- SDRplay RSP family of SDR receivers
- Softrock-like Radio frequency interfaces



ADALM-PLUTO

The ADALM-PLUTO **Active Learning Module (**PlutoSDR) is an easy to use tool available from Analog Devices Inc. (ADI) that can be used **to introduce fundamentals of Software Defined Radio (SDR)**



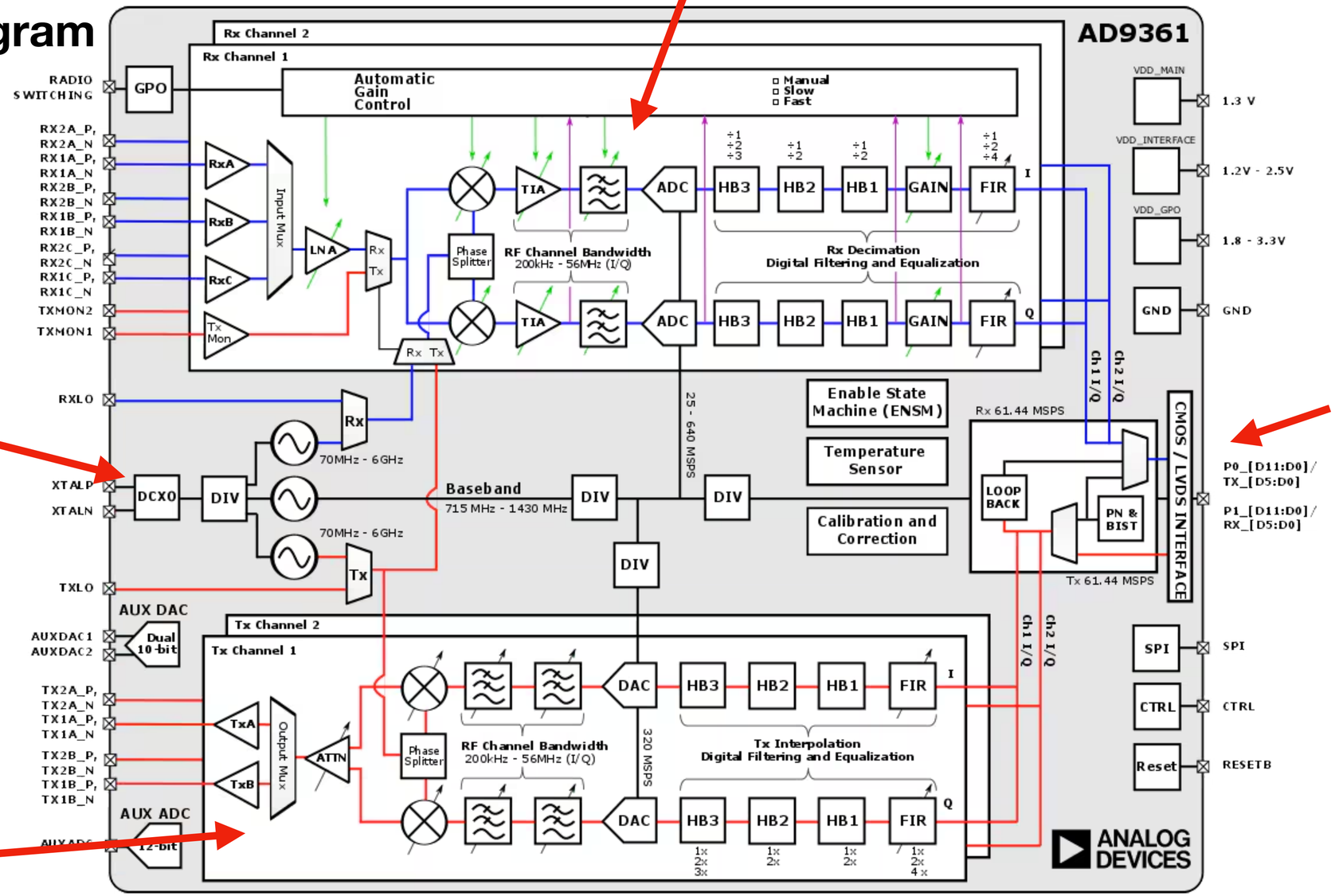
325 MHz to 3.8 GHz
12-bit ADC and DAC

Modified :

- 70M to 6GHz
- 2Rx, 2Tx

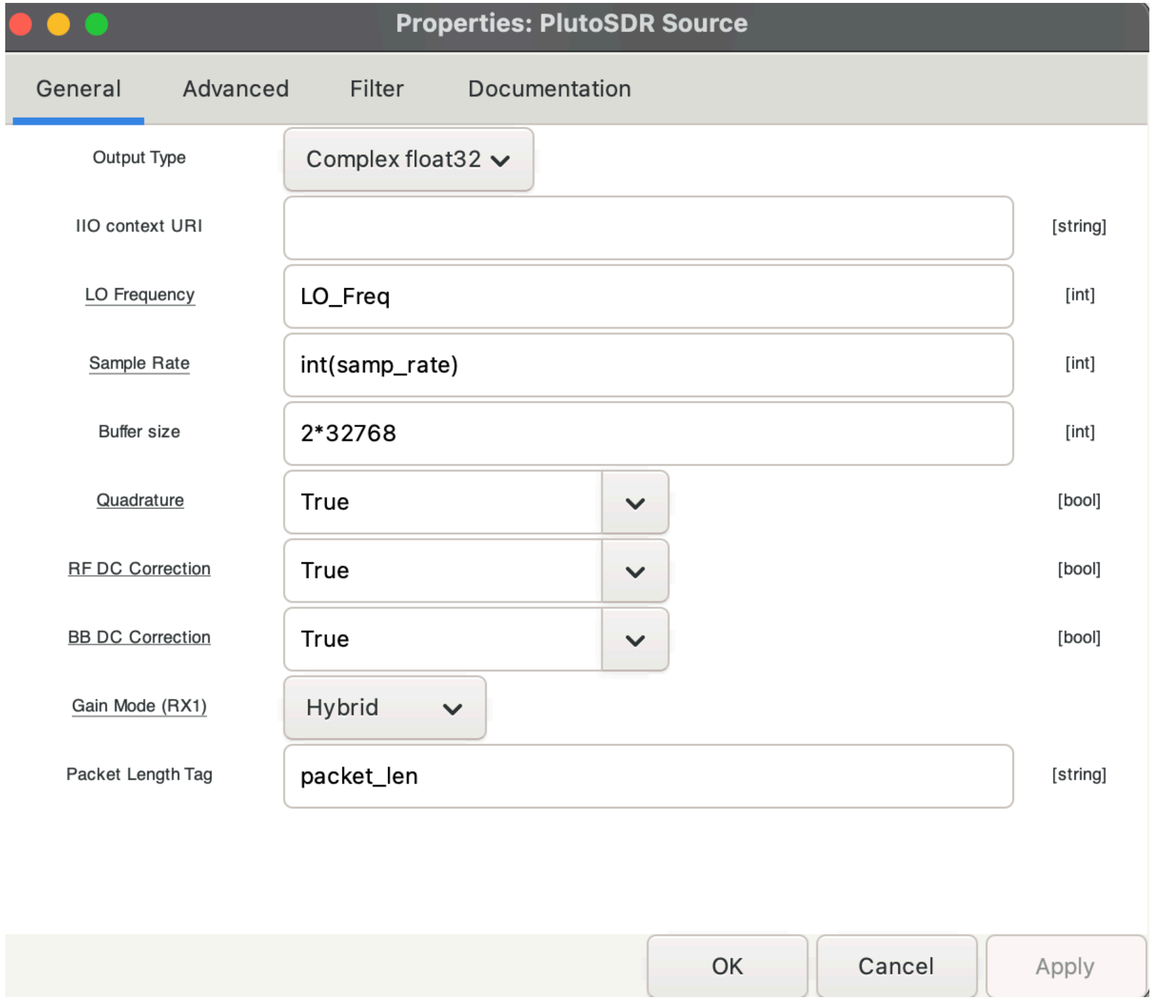
ADALM-PLUTO

AD9361 Block Diagram



ADALM-PLUTO in GnuRadio

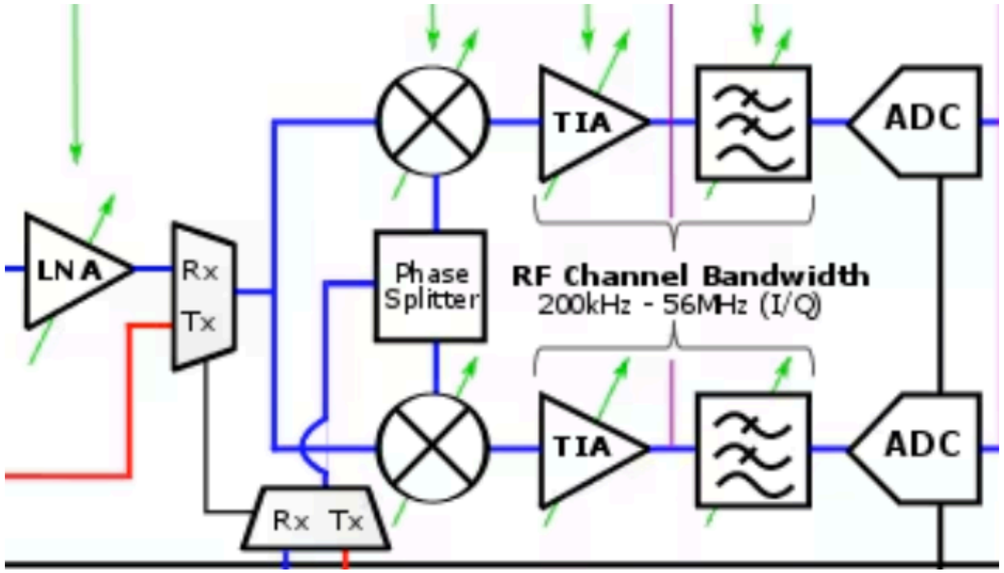
Enkel å bruke



Quadrature Receiver

What is a Quadrature Receiver?

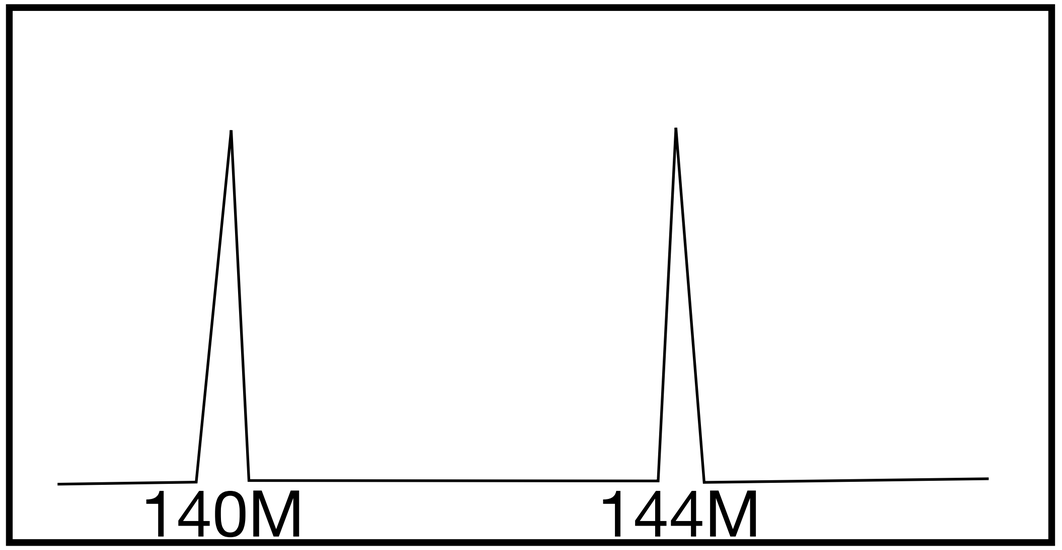
- 1x RF input
- 2x mixers and 2x ADC
  - 90 degrees phase shift
- 2x data out
  - I and Q
  - Magnitude and Phase
  - Complex number



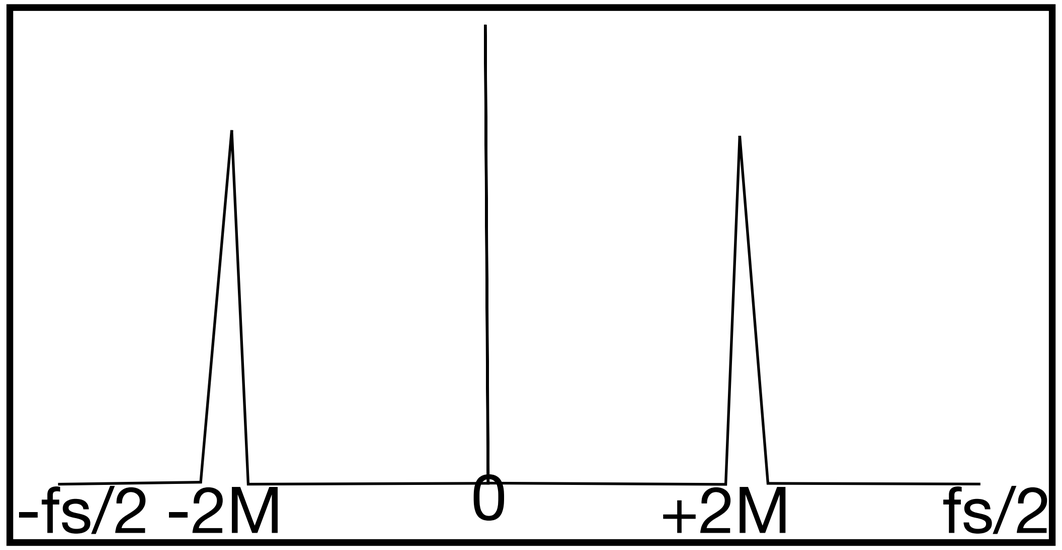
- 8 hours of video course: https://www.greatscottgadgets.com/sdr/
- Important: Frequency can be positive and negative! Because we have the phase information

Example negative frequencies

RF in



Pluto out (complex)



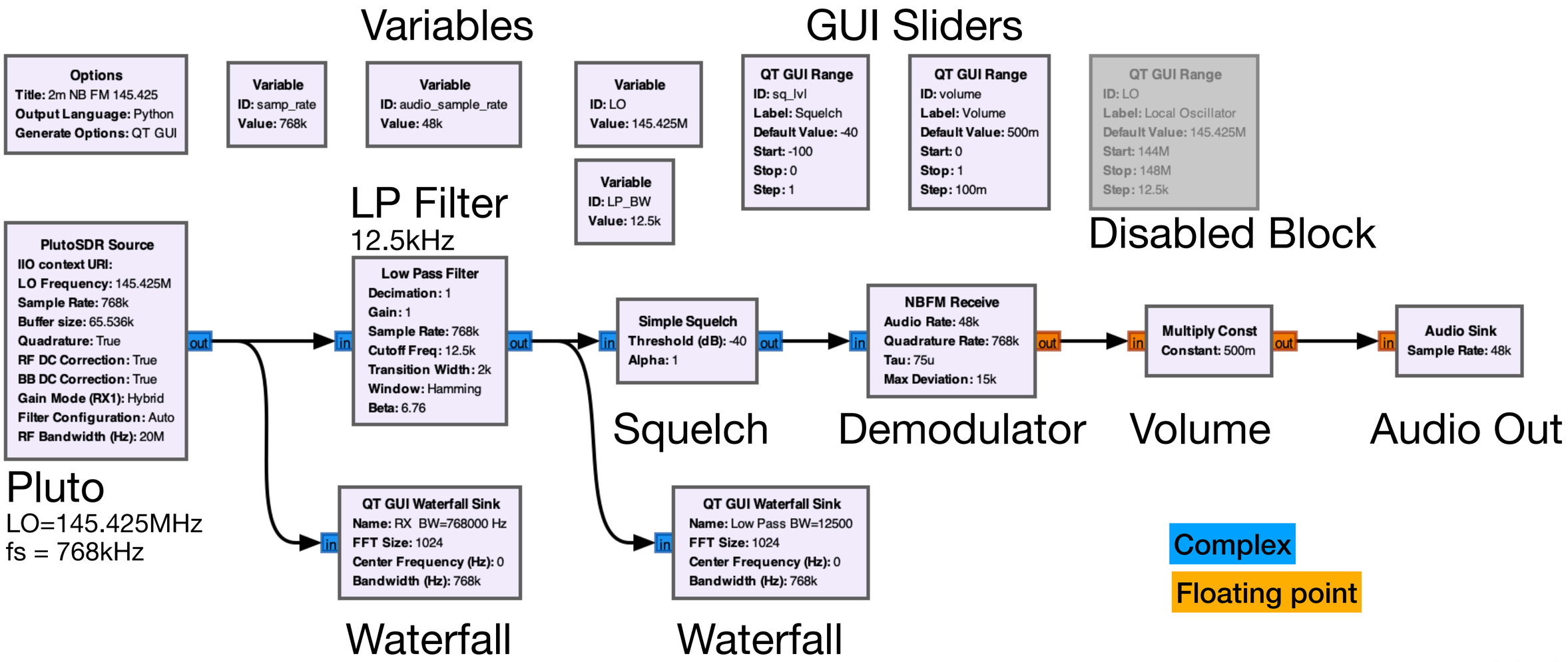
fs = sample frequency (6M)

LO = 142 MHz

Sample rate = 6MHz

FM Receiver

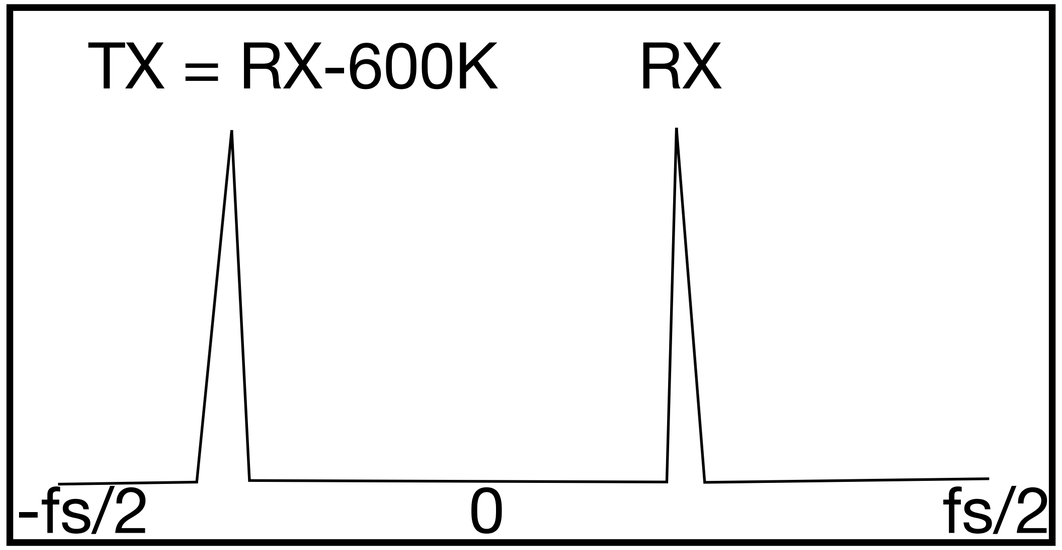
12.5kHz BW, Local Oscillator (LO) = 145.425 MHz



Frequency Offset

Repeater example

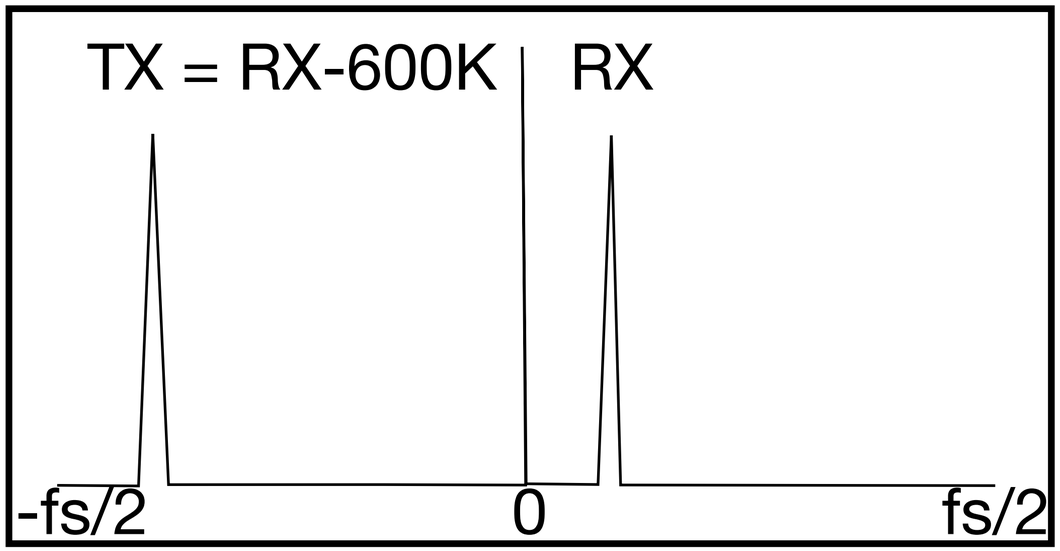
- We do not have to put LO of SDR at exact frequency!
  There can be a shift or offset!
- Set LO=145.4875 MHz (100k below RX)
- RX = 145.5875 MHz
- TX = RX - 600k = 144.9875 Hz
- Now need 100kHz down conversion to get RX
- We use a mixer and 100kHz oscillator to do that.

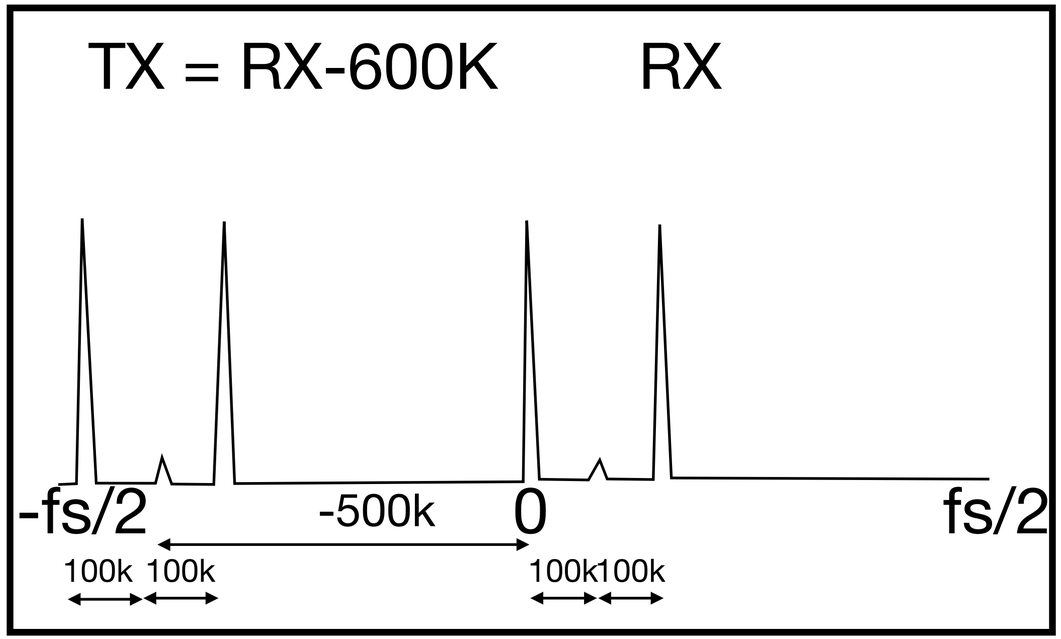


Repeater

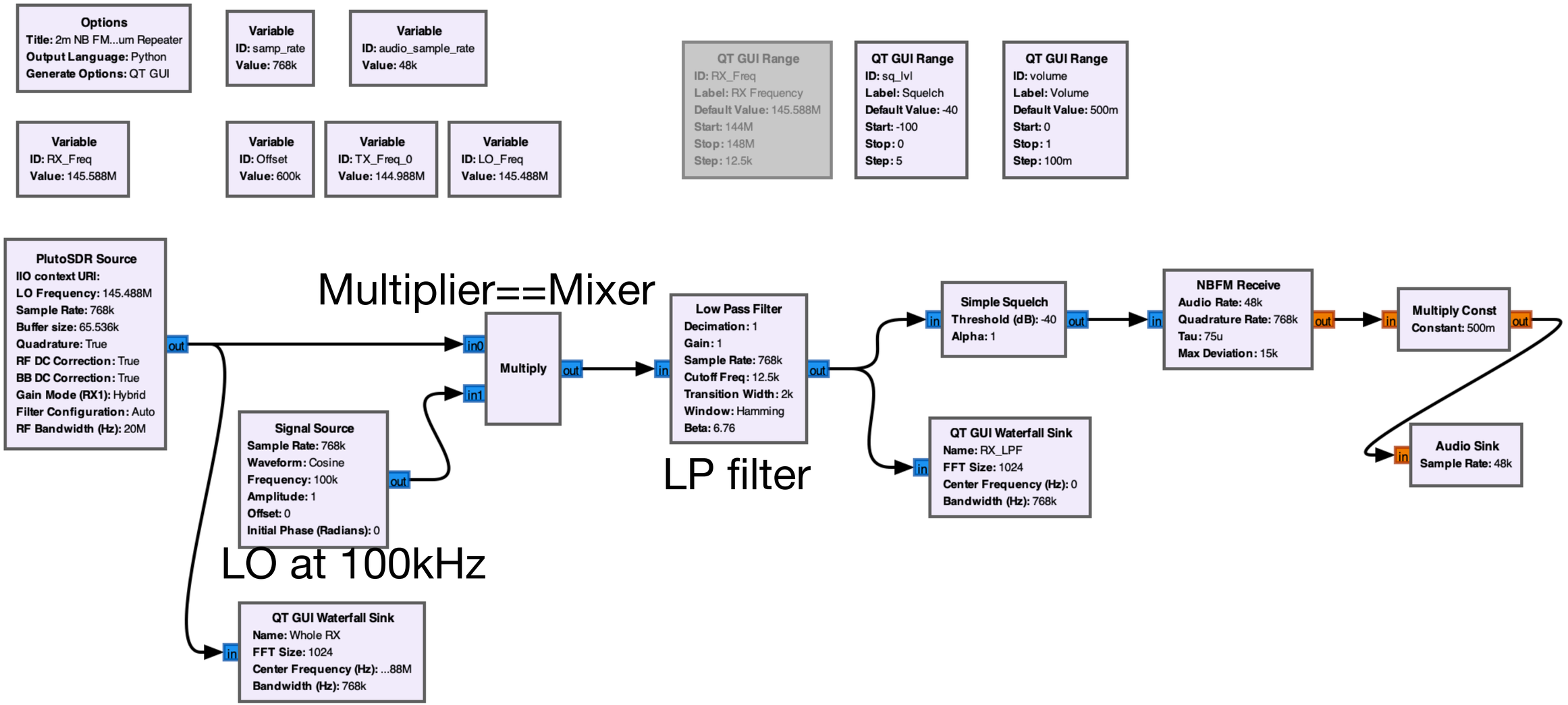
RX - 600kHz = TX

- For example set Oscillator for mixer at 100kHz
  - Rx - 100k = 0 Hz
  - Rx + 100k = 200 kHz
  - TX - 100k = -500k - 100k = -600 kHz
  - TX + 100k = -500k +100k= -400 kHz
- After LowPass -> only RX
- Low pass filters between +12.5k & -12.5kHz!





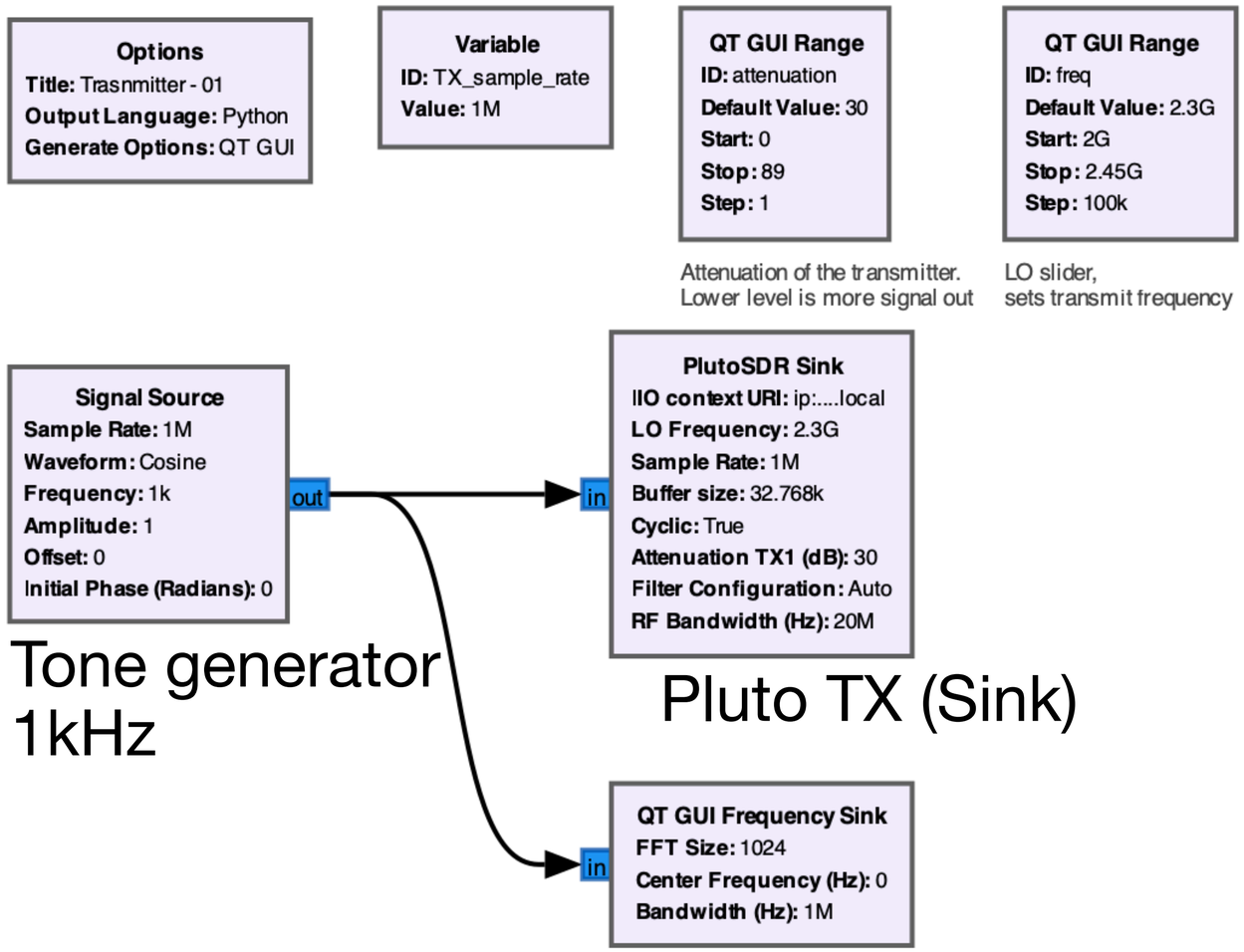
RX with offset



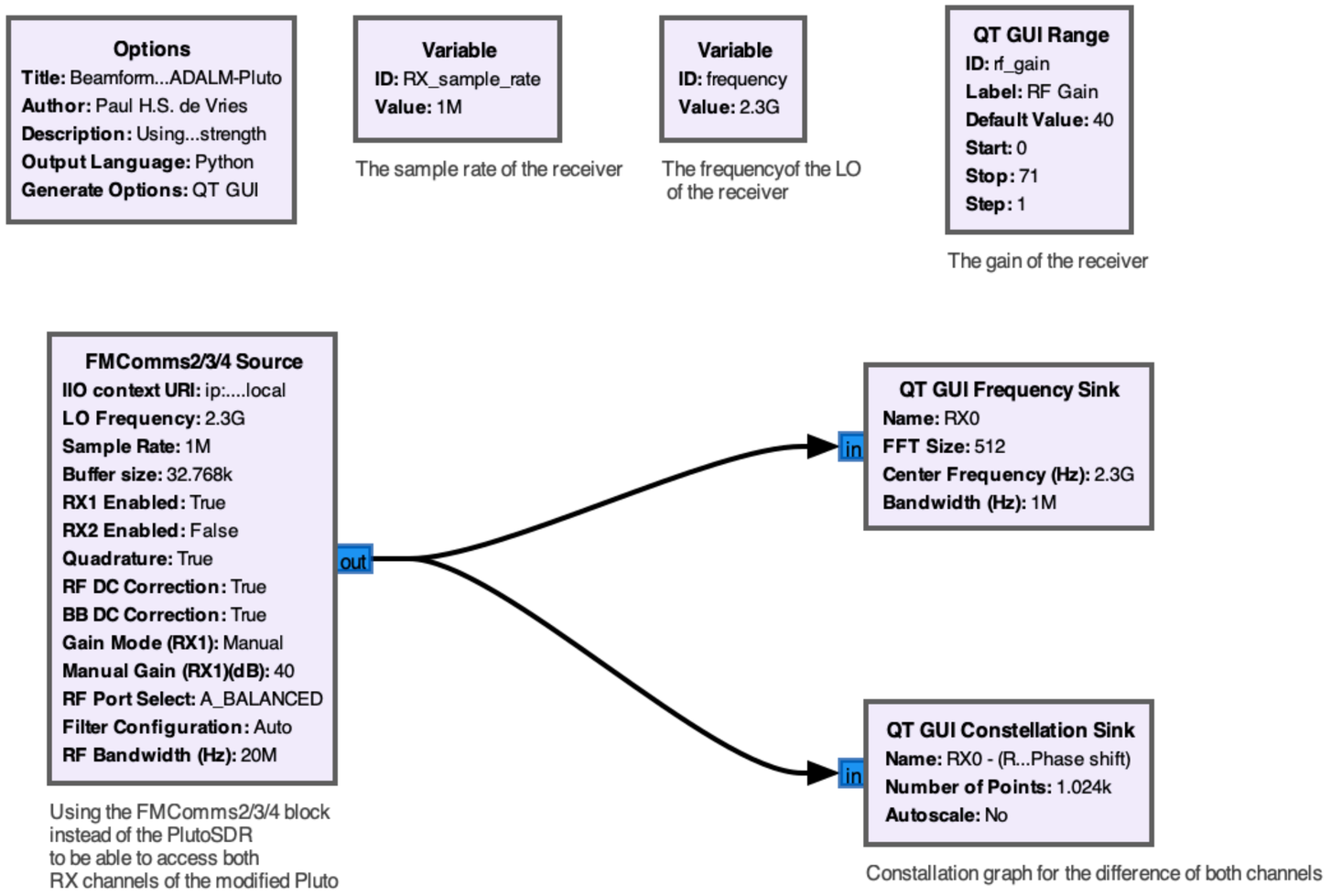
- LB4PK

Sende på 13cm bandet

Ekte CW :-) eller ‘Single Tone’

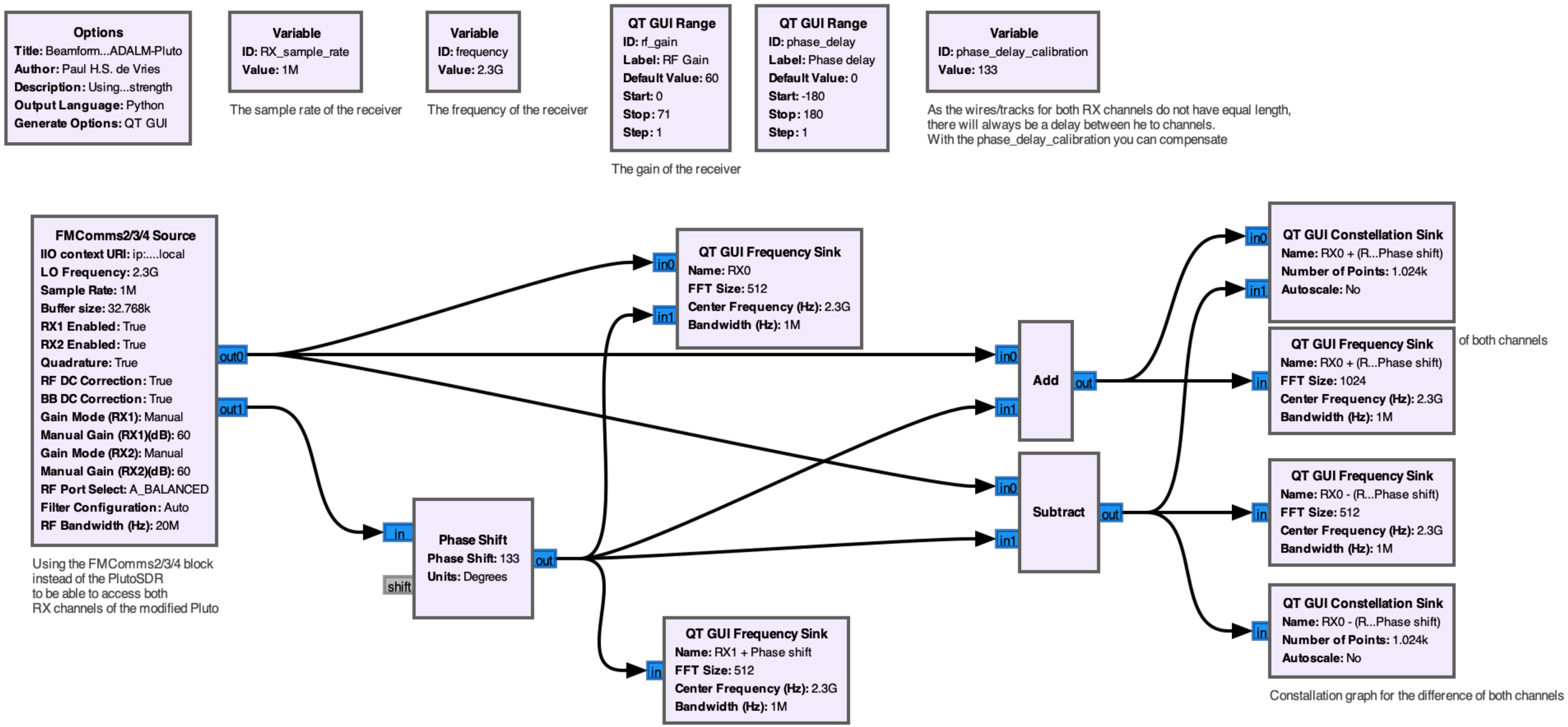


Motta på 13cm bandet



Dual Receiver 13cm

For beam forming experiments



Questions?