Transmission & Reception of Audio files using OFDM modulation with USRP

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Objective

- Transmit an audio file using OFDM modulation

- Build transmitter and receiver block for it

- Implement and show demo

OFDM

- a frequency multiplexing method

- data is transmitted in parallel on multiple, orthogonal subcarriers.

- Use IFFT in transmitter and FFT in the receiver

Software Defined Radio (SDR)

- radio communication signal manipulations and processing done in software

- Universal Software Radio Peripheral (USRP) is a flexible low-cost platform for SDRs.

- GNU Radio is an open source software toolkit consists of signal processing blocks library and the glue to tie these blocks together for building and deploying SDRs.
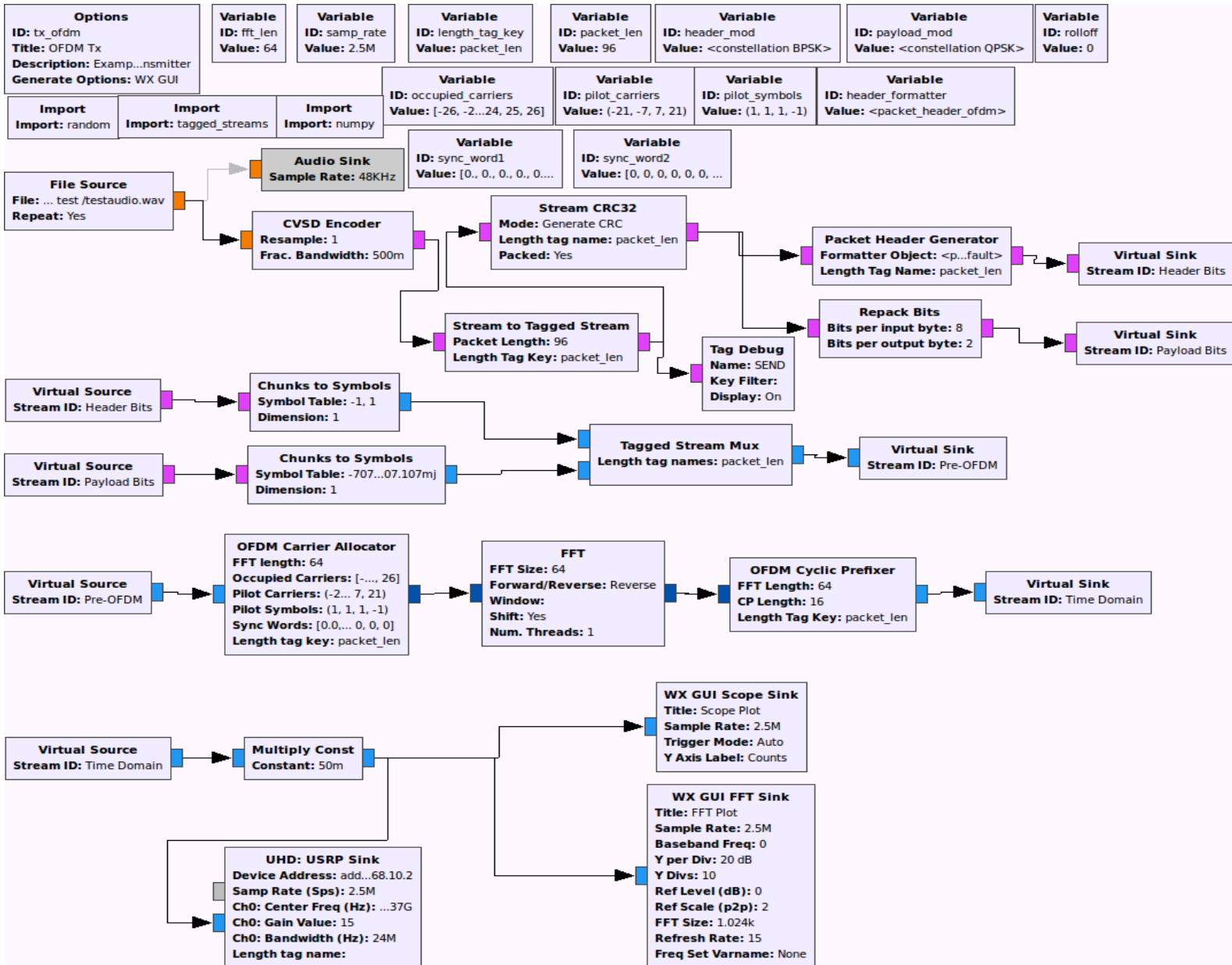
Structure

- 24 MHz wide
- FFT size of 64
  - 16 cyclic prefix
- Data= Preamble, Header ,Data
  - Preamble- detection, channel estimation and sync
  - Sample rate – 2,5MHz
  - Payload modulation scheme of QPSK
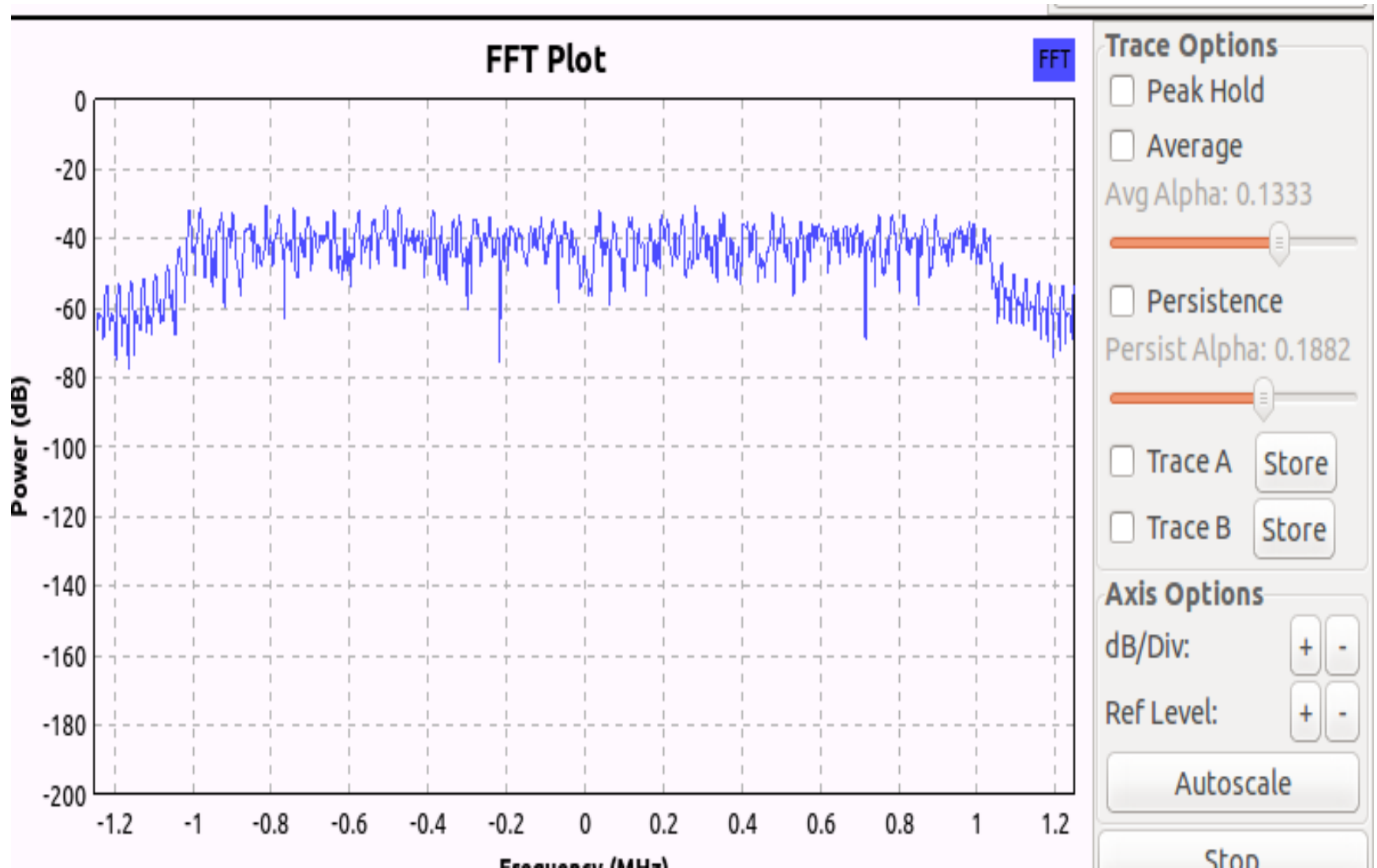 - Center frequency of 2,45

Structure

- We transmit .wav audio file a file source
- Receive , store and play the file
- Transmitter:
  - Audio encoding(CVSD)
  - CRC+Header adding
  - Bit to symbol convesion
  - iFFT+Cyclic adder
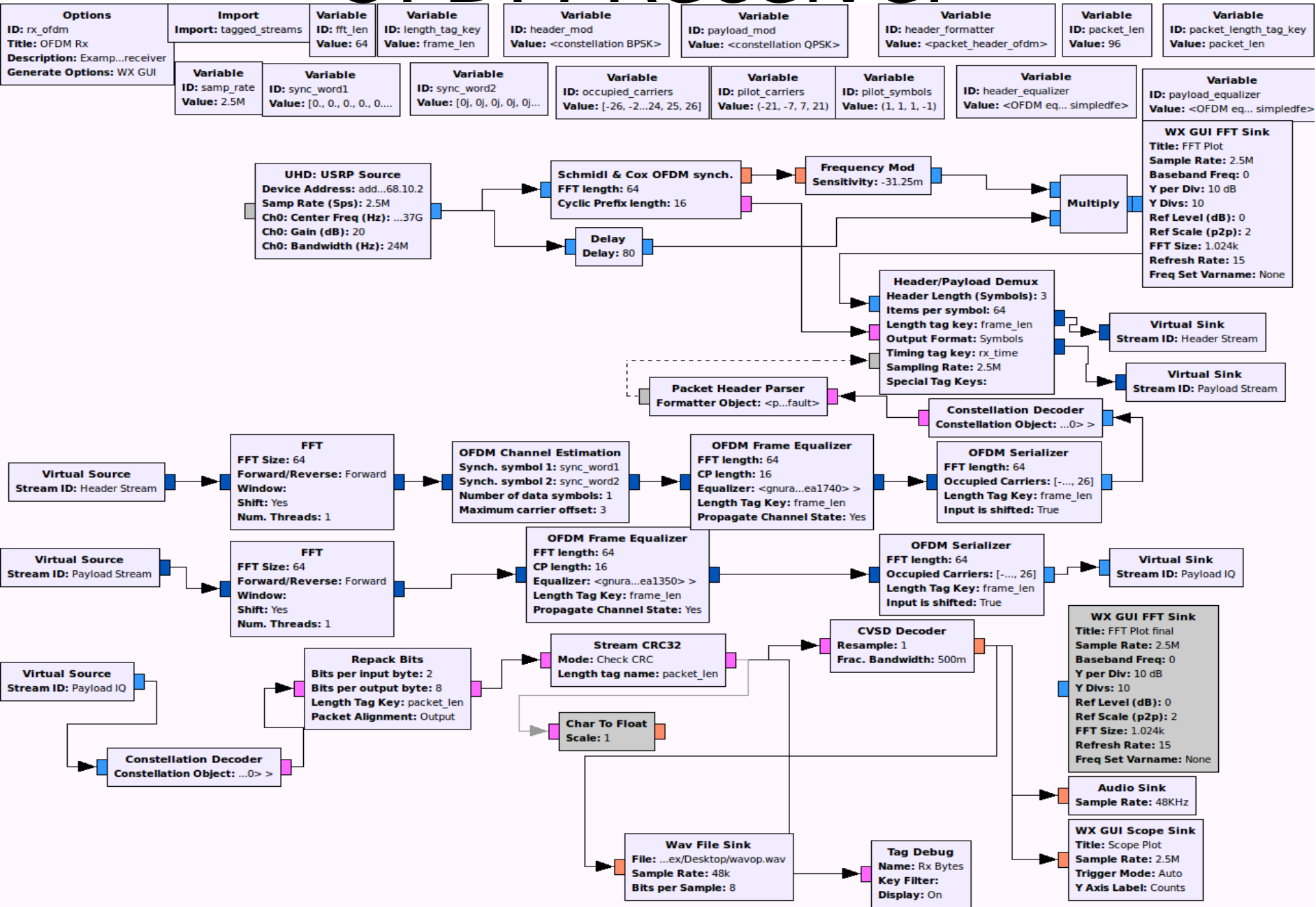 - Amplification and transmission

OFDM transmitter

Transmitted OFDM signal

Structure

- Receiver:
  - synchronization+frequency modulation
  - FFT
  - Channel estimation
  - frame equalization
  - Serialization
  - Constellation decoding
  - Repack + CRC
  - Audio de-coding(CVSD)
  - Play/store

OFDM Receiver

Received OFDM signal

THANK YOU !