A.7 – Orthogonal Frequency Division Multiplexing

7.1 Experimental Setup for OFDM

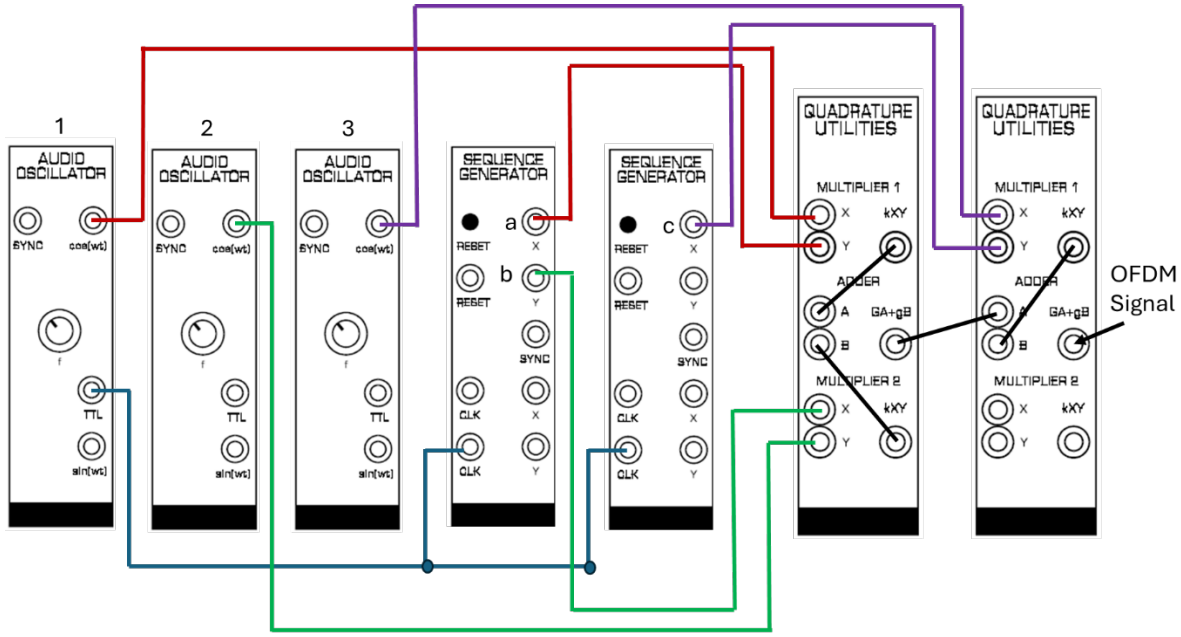

Figure A.7.1: OFDM setup.

7.2 Laboratory Exercise for OFDM

- **i.** Make the OFDM setup as shown in Figure A.7.1.
- **ii.** Tune each AUDIO OSC as close as possible to 1 kHz, 2 kHz and 3 kHz using the built in FREQ. COUNTER module. Verify the output of each oscillator; provide a screen shot of the spectrum of each oscillator output.
- **iii.** Let the output of the Sequence Generator labeled "a" be the signal a(t). Find the signal $a(t)\cos(2\pi 1000t)$ and provide a screen shot of the spectrum of $a(t)\cos(2\pi 1000t)$.
- **iv.** Repeat iii. For "b" and "c".
- **v.** Write an expression for the ODFM output signal.
- **vi.** Provide a screen shot of the spectrum of ODFM output.
- **vii.** Provide a screen shot of the time domain ODFM output signal.
- **viii.** Measure the true power (P_{ave}) of the time domain ODFM output signal.
- **ix.** Measure the peak-to-peak value ($A_{peak\text{-}to\text{-}peak}$) of the time domain ODFM output signal.
- **x.** Let the peak value = A_{peak}= ($A_{peak\text{-}to\text{-}peak}$)/2
- **xi.** Find the PAPR where the Peak-to-Average Ratio = PAPR = $(A_{peak})^2/(P_{ave})$.
- **xii.** Why is a large PAPR detrimental to power-efficient transmission of ODFM signals.
- **xiii.** Explain why the sequencies a, b, and c cannot be simultaneously recovered from the ODFM output signal in the OFDM system given above.