

### 3.2 Lab 3B: OFDM Simulation with Unsynchronized Clocks

Once the synchronized clocks assumption isn't held, we need to account for carrier frequency offsets. Carrier frequency offsets are caused by differences in the local oscillators of the transmitter and receiver. These differences are due to the nature of hardware. Frequency offsets take the form of complex components as described in ???. To correct for these frequency offsets, we can use the Schmidl-Cox frequency synchronization algorithm. We do not need to account for any sampling frequency offsets, or phase offsets, in this simulation.

**Goal:** Implement the Schmidl-Cox frequency synchronization algorithm to account for frequency offsets in simulation.

1. Generate a vector of OFDM modulated data samples (including training samples).
2. Implement Schmidl-Cox frequency synchronization preamble.
3. Send the vector across a timing synchronized simulated channel.
4. Account for any captured frequency offsets.
5. Decode the received signal.
6. Recover the transmitted bits.

You are provided a MATLAB function, `nonflat_channel_timing_errors`, that simulates a channel with frequency offsets.

**Deliverables:** Please turn in your MATLAB implementation of the simulated system and a report. Make sure to refer to the technical writing expectations for this course in the appendix as you write your report.

Table 3.2: Lab 3B Rubric

	Points	Self-Assessment
<b>Introduction Section</b> <i>Introduction of the goal of the lab and any contextual information</i>	5 points	
<b>System Explanation</b> <i>Explanation of the physical system; Diagrams are well suited to this</i>	5 points	
<b>Explanation of Schmidl-Cox</b> <i>Explanation of the Schmidl-Cox algorithm and why it is being used</i>	20 points	
<b>Implementation Section</b> <i>Discussion of your particular implementation that highlights any design decisions</i>	20 points	
<b>Code Explanation</b> <i>Explanation of your code that isn't super granular; Include a flow diagram</i>	15 points	
<b>Results Section</b> <i>An overview of the results of your implementation; Include all plots that illustrate your implementation</i> <i>Include:</i> - Constellation diagrams of relevant signals - One block of sent and received data - BER	10 points	
<b>Revised Lab 3A Section</b> <i>Lab 3A technical report is included and edited where suggestions were made</i>	10 points	
<b>Technical Writing</b> <i>Refer to the technical writing guidelines</i>	10 points	
<b>Self-Assessment</b> <i>Fill out this rubric and include it in your submission.</i>	5 points	