Sadra:

The design of the mixer began with researching various architectures that can be implemented for the mixer. The first type was the Diode Ring mixer, however, despite being a simple design, there were 3 issues with it:

1. Diodes are temperature dependant
2. Diodes can also leak current in the opposite direction, making them unreliable
3. Will not be turned on if the voltage across them is too low

Then I decided on the Gilbert Cell implementation which utilizes N-channel MOSFETs and allows current to flow to the output when any of the input signals are either low or high. This process multiplies the two signals together. Like the previous design, the Gilbert Cell was also a simple implementation but it does not have the drawbacks that the diode ring mixer has. This design is highly accurate, temperature effects are negligible, and the transistors are chosen to conduct at low voltages, which is suitable for the weak RF signals picked up by the antenna.

NMOS - chosen as it requires a low voltage to turn on, to start conducting.

Resistor - resistors chosen at a lower value to put

Transformer - this is used to create a differential signal so a + and a - signal (180 phase difference) to power the different transistors. It is used to turn one signal into 2 signals of opposite sign.

IC - used for fail safe, if any part of the design fails the IC can be connected using the connector.

Next steps:  
1. Build a model of each device on the breadboard when the digikey order arrives. Then connect all of the devices together and test their outputs.

* Expected challenge if the correct signal is not outputted, make the appropriate changes to the schematics.

3. Make an organized layout while taking into consideration EMI and debugging procedures.

4. Make a testing procedure on how to solder the board and how to test once it is manufactured.

* Expected challenge for this are

Junyi Liu:

I’ll be guiding you through the intricacies of our Low Pass Filter (LPF) and its integrated amplifier stage. Initially, drawing parallels with Bandpass Filters (BPF), our design approach considered utilizing an RLC circuit complemented by an operational amplifier. This traditional path seemed promising, aiming to leverage the similarities in design principles and execution. However, an insightful lecture highlighted a pivotal strategy: the utilization of an active low pass filter could elegantly fulfill both the roles of LPF and amplifier.

(showing the schematics of active LPF without DC offset)

It takes inputs from the mixer and goes to subsystem B, demodulation.

…

(showing the simulation)

As you can see, our design fulfills the requirement by having a cutoff frequency at 96kHz and a gain of 30dB.