

Boston University
Electrical & Computer Engineering

Final Prototype Testing Plan

Better Bots

by

Team #15

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Required Materials:

1. Spectrum Analyzer
2. Oscilloscope
3. Function Generator
4. Power Supply
5. Active Antenna
6. Isolation Amplifier
7. Tracking Filter
8. Triode Mixer
9. Varactor

Setup:

For the final prototype testing, we will combine and test the four circuits we have made. The circuits that are being tested are Active Antenna, Isolation Amplifier, Tracking Filter, and Triode Mixer. The schematic of the combined system is in Fig.1. The required hardware is a spectrum analyzer, function generator, power supply, and oscilloscope. First, we will power up the active antenna and hook it with up to 10 ft 28 gauge wire to the input of the active antenna, then connect 3.3V DC voltage to power up the antenna. The isolation amplifier's input will then be connected to the output of the active antenna and powered up by a 3.3V DC power supply, the isolation amplifier should be able to amplify the input signals. Then the input of the tracking filter will be connected to the output of the isolation amplifier, and the output of the tracking filter will serve as an input for the triode mixer.

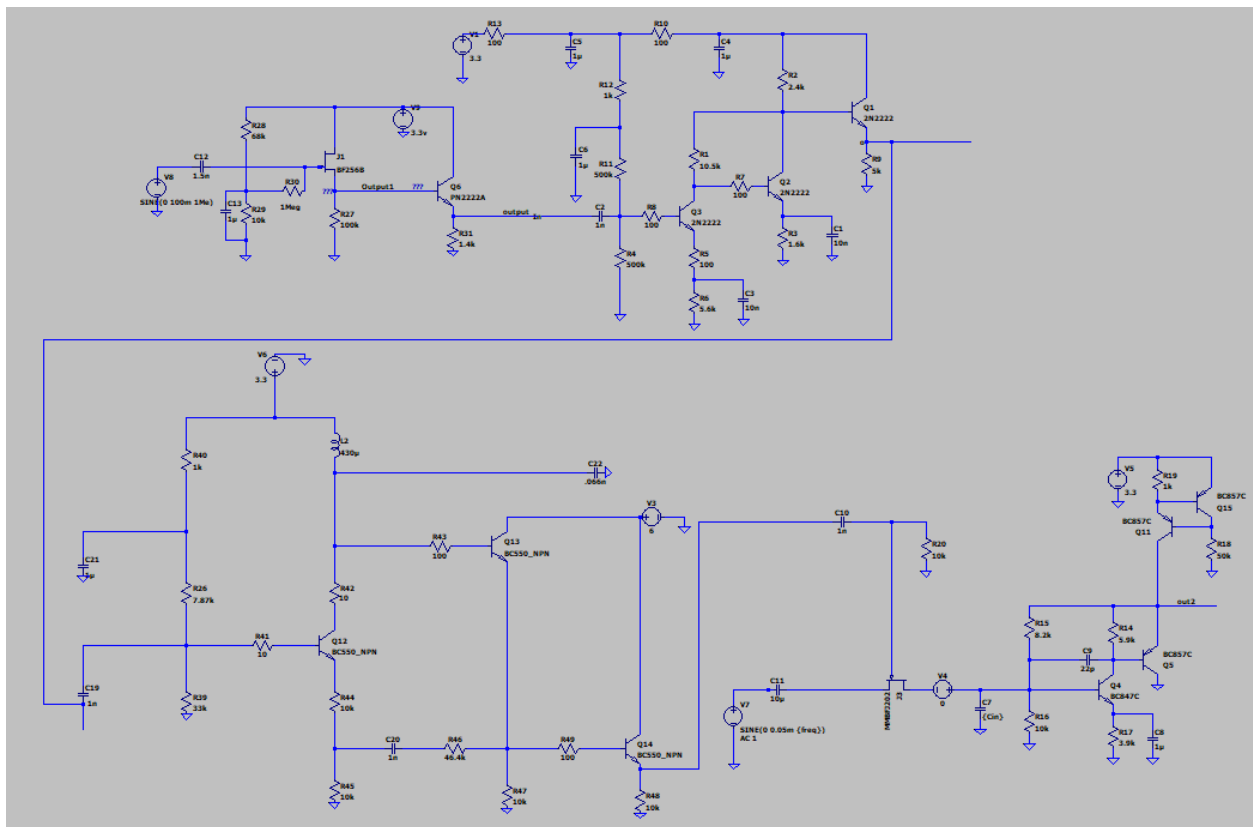


Fig. 1 Overview of the system schematic

Procedure:

1) Active Antenna

- a) Power up the active antenna with a 3.3 V dc voltage
- b) Connect a 10 ft 28 gauge wire to the input of the active antenna
- c) Set the frequency range of the spectrum analyzer to be 500kHz to 1.8MHz
- d) Set the resolution bandwidth (RBW) to be 1kHz and video bandwidth (vbw) to be 300Hz
- e) Observe the spectrum analyzer

2) Isolation Amplifier

- a) Connect the DC 3.3V
- b) Connect input to the output of the active antenna

3) Tracking Filter

- a) Set variable capacitor to desired frequency's capacitance (0.075 nF for 850.1KHz signal).
- b) Connect Orange cable to 3.3V DC power supply.
- c) Connect Black cable to GND.
- d) Connect Red cable to 6V DC power supply.
- e) Connect Green cables across the desired feedback resistor.
- f) Connect white cables across variable capacitor.
- g) Connect purple cable to oscilloscope input.
- h) Use naked wire as tracking filter input.

4) Triode Mixer

- a) Connect the 3.3V voltage supply to the current source part of the circuit
- b) Connect the RF radio output from the Tracking filter to the RF input portal
- c) Connect the function generator which generates a sine wave with a frequency 5 kHz higher than RF signal to the LO (Local Oscillator) portal
- d) Connect the oscilloscope and observe the output 5 kHz IF (intermediate frequency) signal.

Measuring Criteria:

1. The Active antenna is able to detect the surrounding AM radio by showing peaks on the spectrum analyzer
2. The isolation Amplifier should amplify the useful signal by a range of 15-20
3. Tracking filter:
 - a. Clearance around target frequency.
 - b. Amplification of the isolated signal.
4. Triode Mixer.
 - a. Output intermediate low-frequency signal (LO-RF)
 - b. Outstanding IF signal intensity peak observed on oscilloscope FFT

Scoring Sheet:

Test Case	Pass/Fail
Tracking filter: Clearance around target frequency, a signal 10KHz away from target should have an amplitude $\leq \frac{1}{\sqrt{2}}$ * amplitude of target frequency.	
Tracking filter: Amplification of isolated signal the isolated signal should have an amplification between 5-25x.	
The isolation Amplifier amplifies the input signal by a factor range of 15-20	
Triode mixer output intermediate low-frequency signal	
IF frequency peak is observed in FFT	
All four circuits connect and work as expected	