

Test Condition and preliminary results

This test is done with the purpose of proof of concept, so the testing environment is not controlled. A cardboard box with holes was used as the tag holder. The prototype board is made of three sets of ports for three RF switches, and jumper wires on the back of the board form a parallel connection with the input port, which connects to the original Arduino shield Rev B. The wires connecting the prototype board with the RF switch have different lengths, so the test can show whether the length of the wire affects the RFID signature.

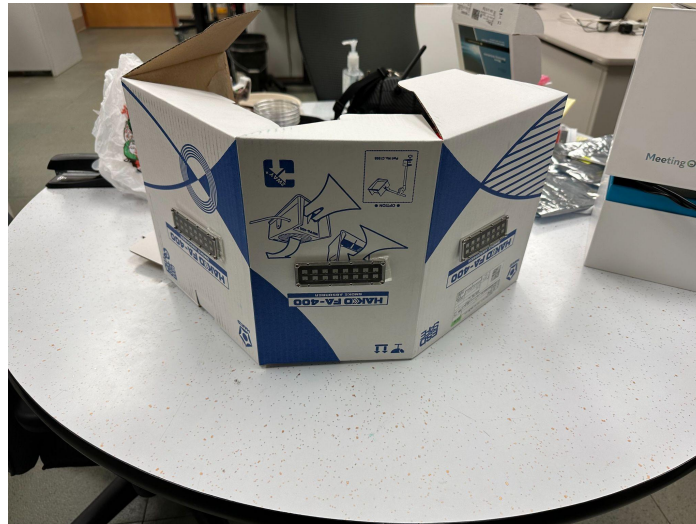


Figure 1. Tag Holder

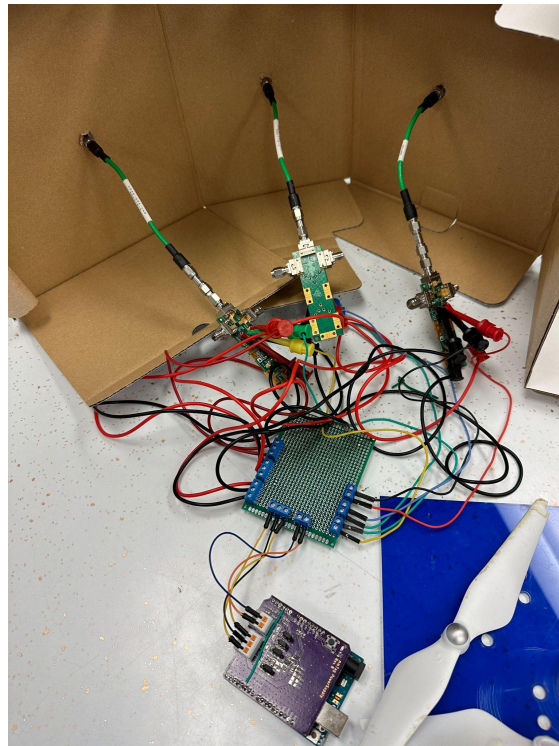


Figure 2. Connections of Three RF Switches

As the images show, the radar signature is almost identical between the three tags that are placed with approximately a 30-degree angle between them. The experiment is conducted with a person holding the 24GHZ radar moving in front of the setup, so a bit of fluctuation is expected.

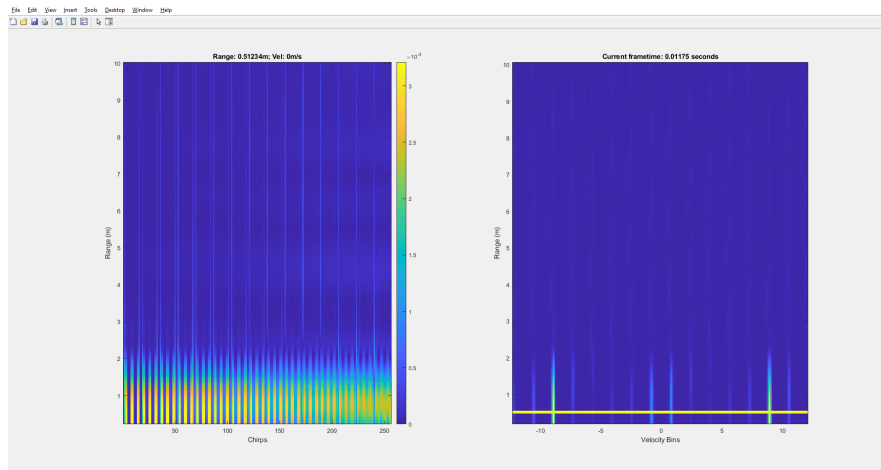


Figure 3. Left Tag

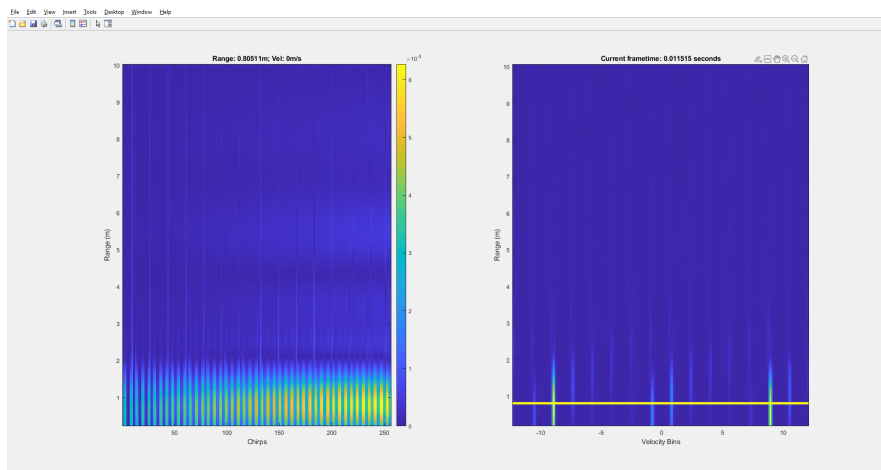


Figure 4. Middle Tag

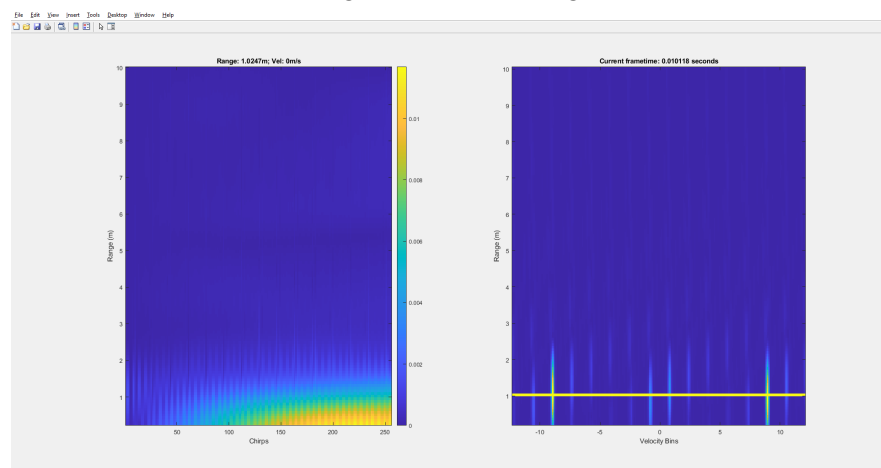


Figure 5. Right Tag

3D Holder Design

The holder should avoid using metals to reduce the possibility of disturbing the radar signal. Thus, transparent acrylic panels and hinges made of Acetal Copolymer were chosen to build the 3D holder. The hinge resistance can be changed by adjusting the screw, which makes testing the RFID tags at different angles easier.

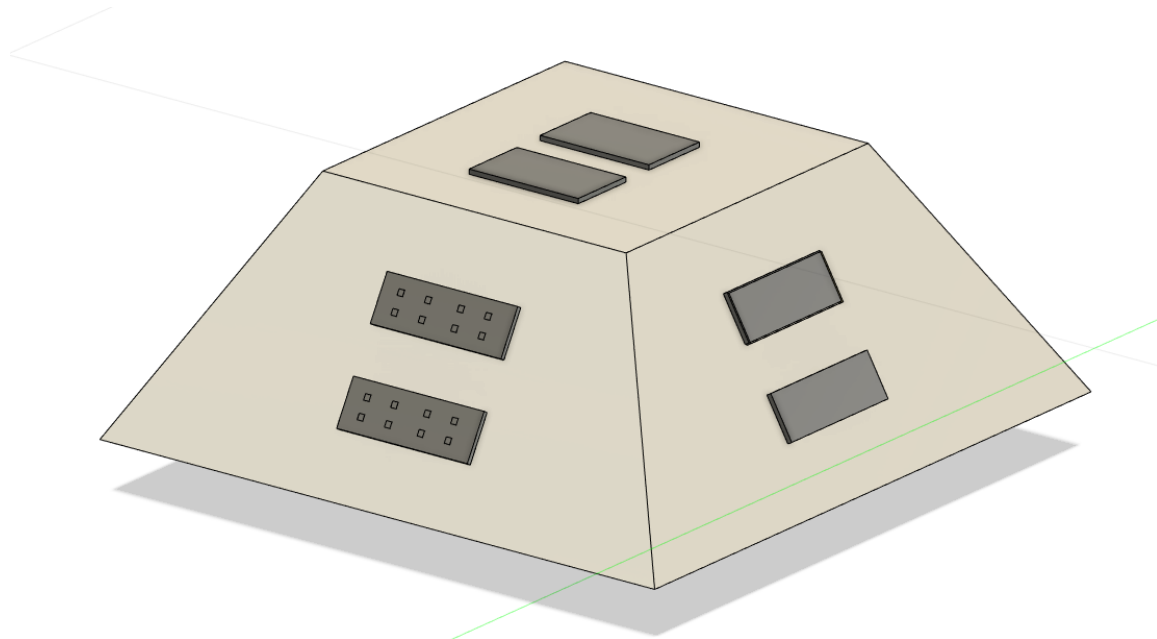


Figure 5. 3D Model of the 3D RFID tag holder

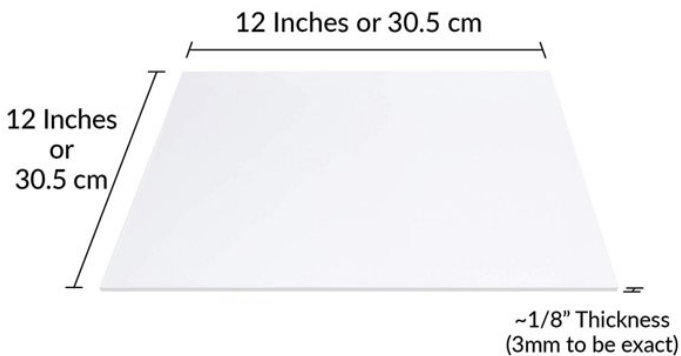


Figure 6. Acrylic Panels



Figure 7. Resistance Hinge