# Developing and testing a software defined radio telemetry system for wildlife tracking


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# Background

- Current methods
  - Human-based tracking
    - Costly and time intensive
    - Risk to human safety
    - Small sample sizes

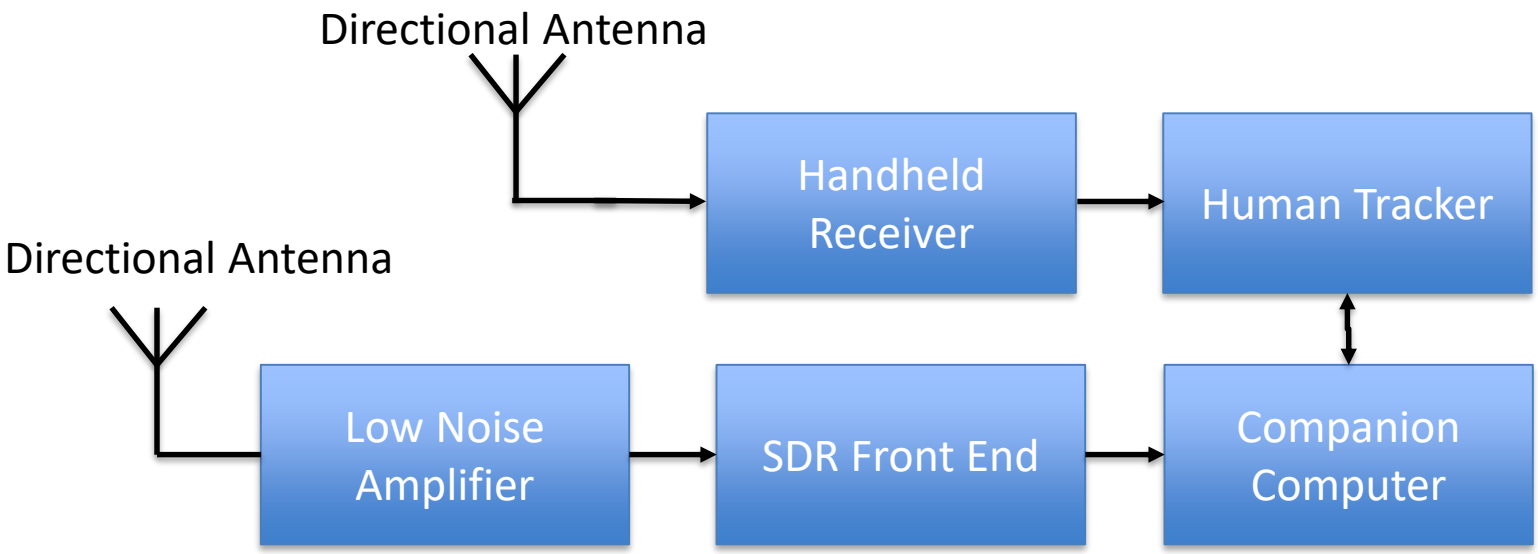
- A leading manufacturer of wildlife telemetry equipment summarized the distinct benefits and risks of manned aircraft-based radio wildlife tracking:

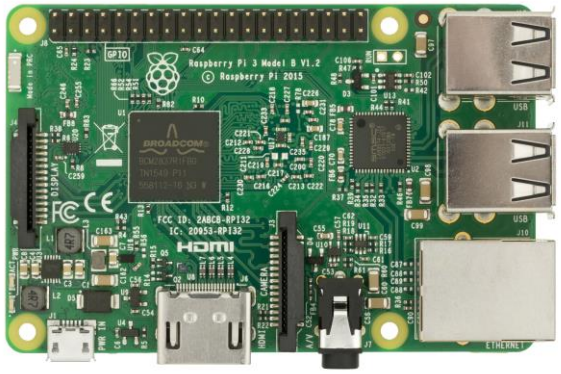
*If you're ground tracking a medium-sized animal wearing a collar with a state-of-the-art telemetry receiver...the range performance on level ground can be anywhere from 2 to 5 miles. By getting up on a hill and overlooking the animal, ranges can be extended to 5 to 10 miles. However, if it is possible to take your telemetry receiver up in an aircraft, the range is extended even further—typically from 10 to 30 miles. For many studies, regular aircraft tracking...extends the line-of-sight range and reduces signal attenuation due to vegetation. These two factors, combined with aircraft speed and mobility, provide significant advantages…Conducting research from aircraft is recognized in our field as a dangerous operation. Over the years far too many friends and colleagues have been injured or lost in aircraft accidents.* ***Therefore anything that increases efficiency, and reduces the time spent conducting low level flights, should have a positive influence on our actuarial statistics.*** (Beaty 1997)

# Introduction

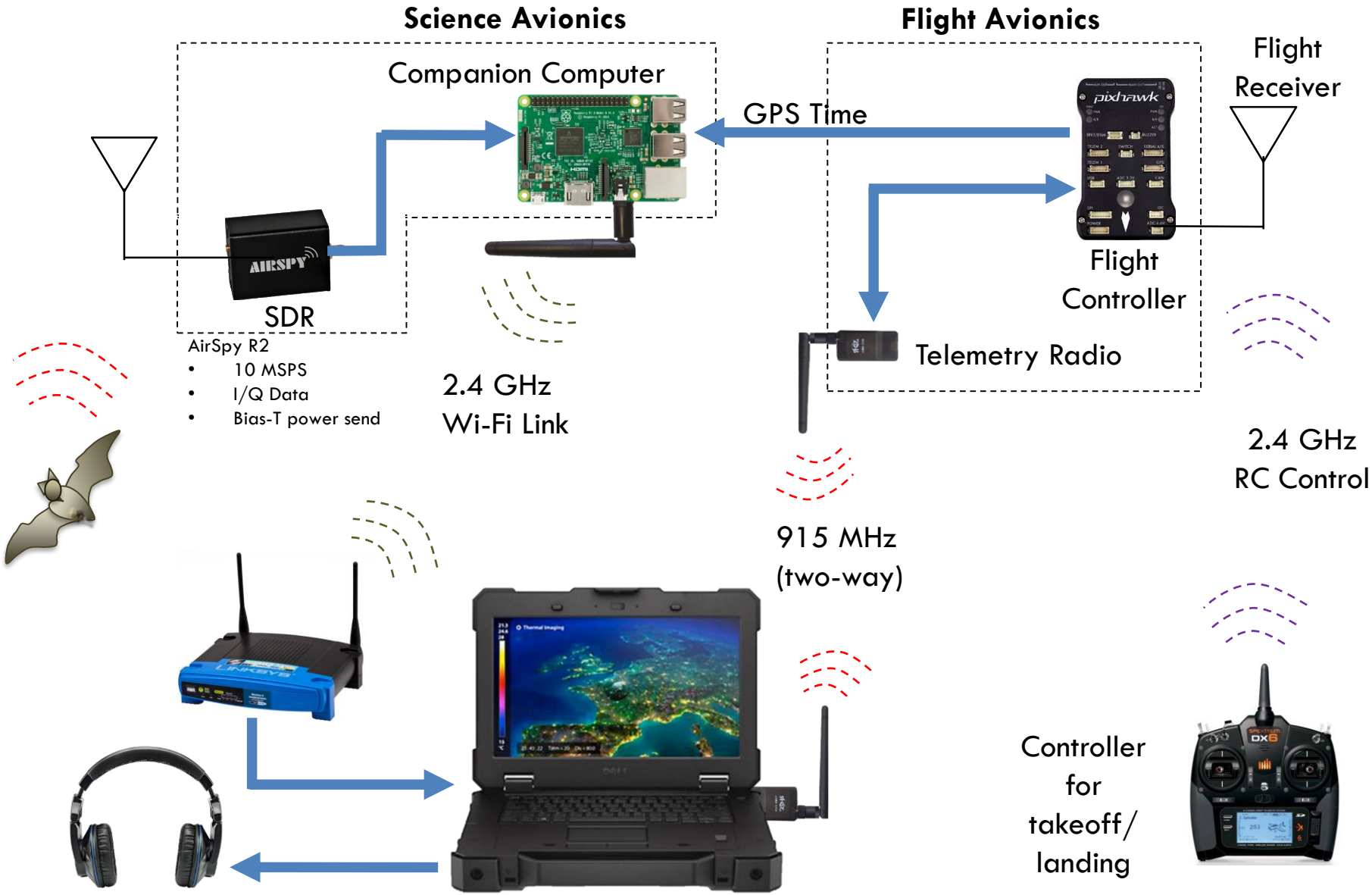
- Unmanned Aerial System
  - Science avionics (this talk)
    - Improving detection and localization of wildlife tags
    - Radio telemetry
    - Data processing
  - UAV platform
    - Tuesday at 11:10AM
      - New Technology II
      - Room 27, 29, and 31
      - Session number 66

# System: Functional Block Diagram

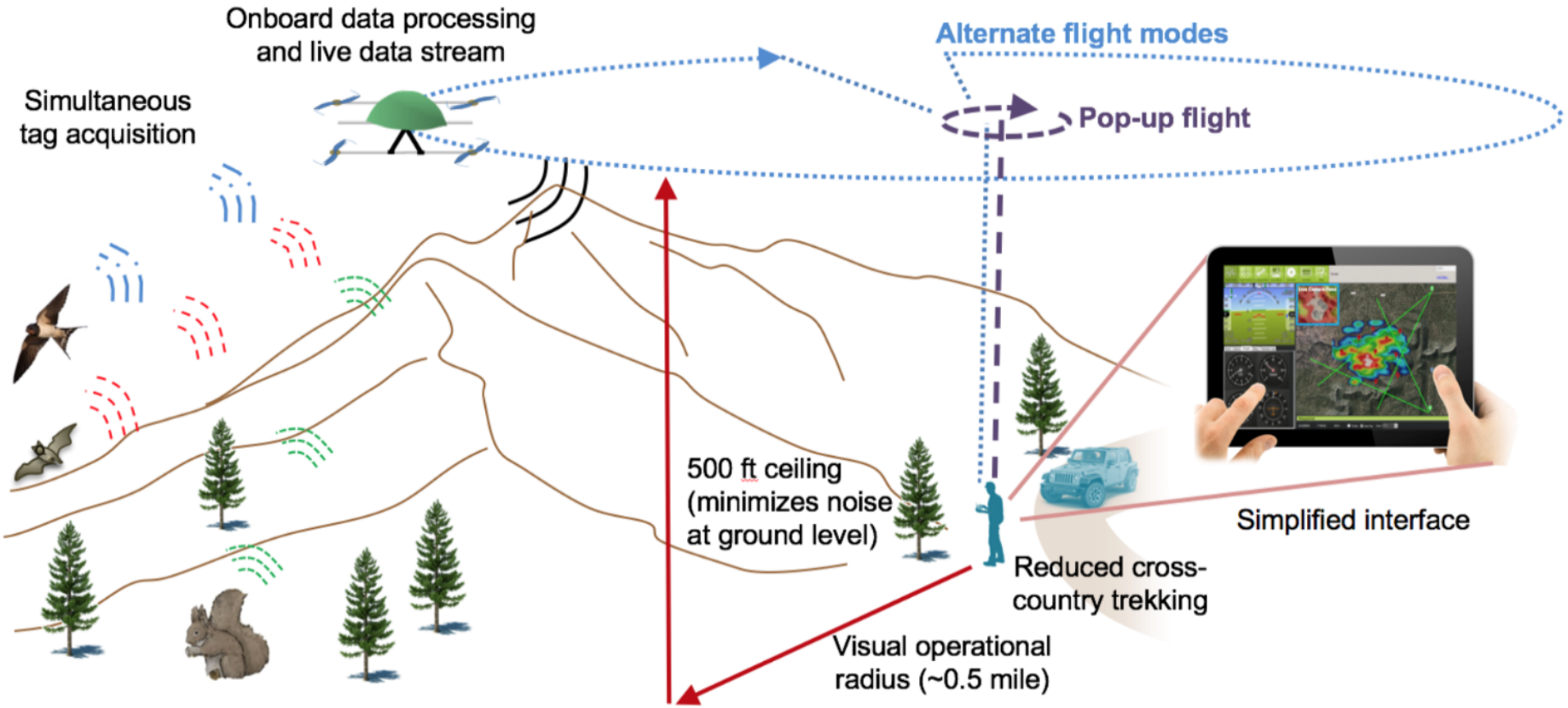




# System: Function Block Diagram cont.



# System: Virtual Pole



# System: Hardware Performance

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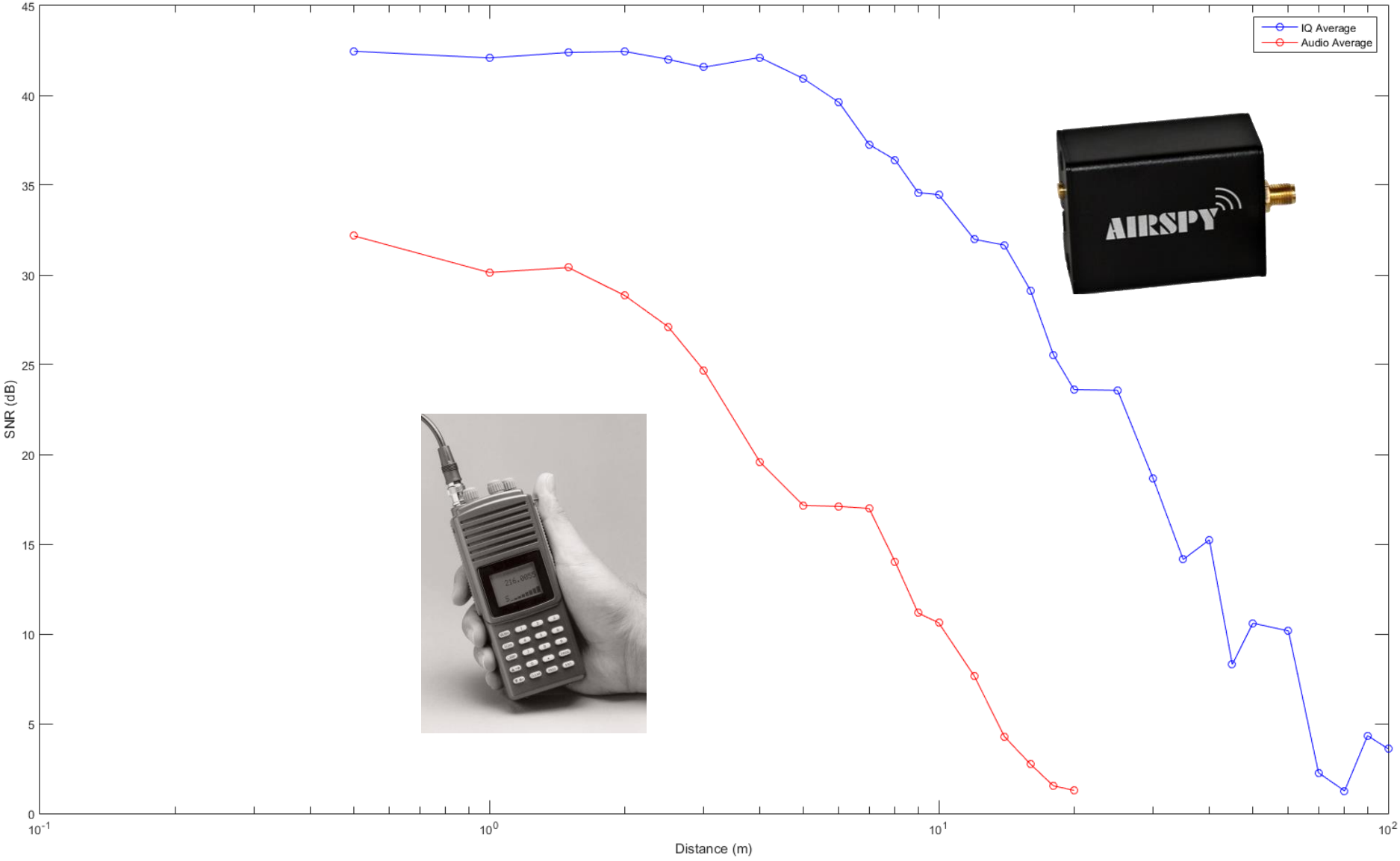
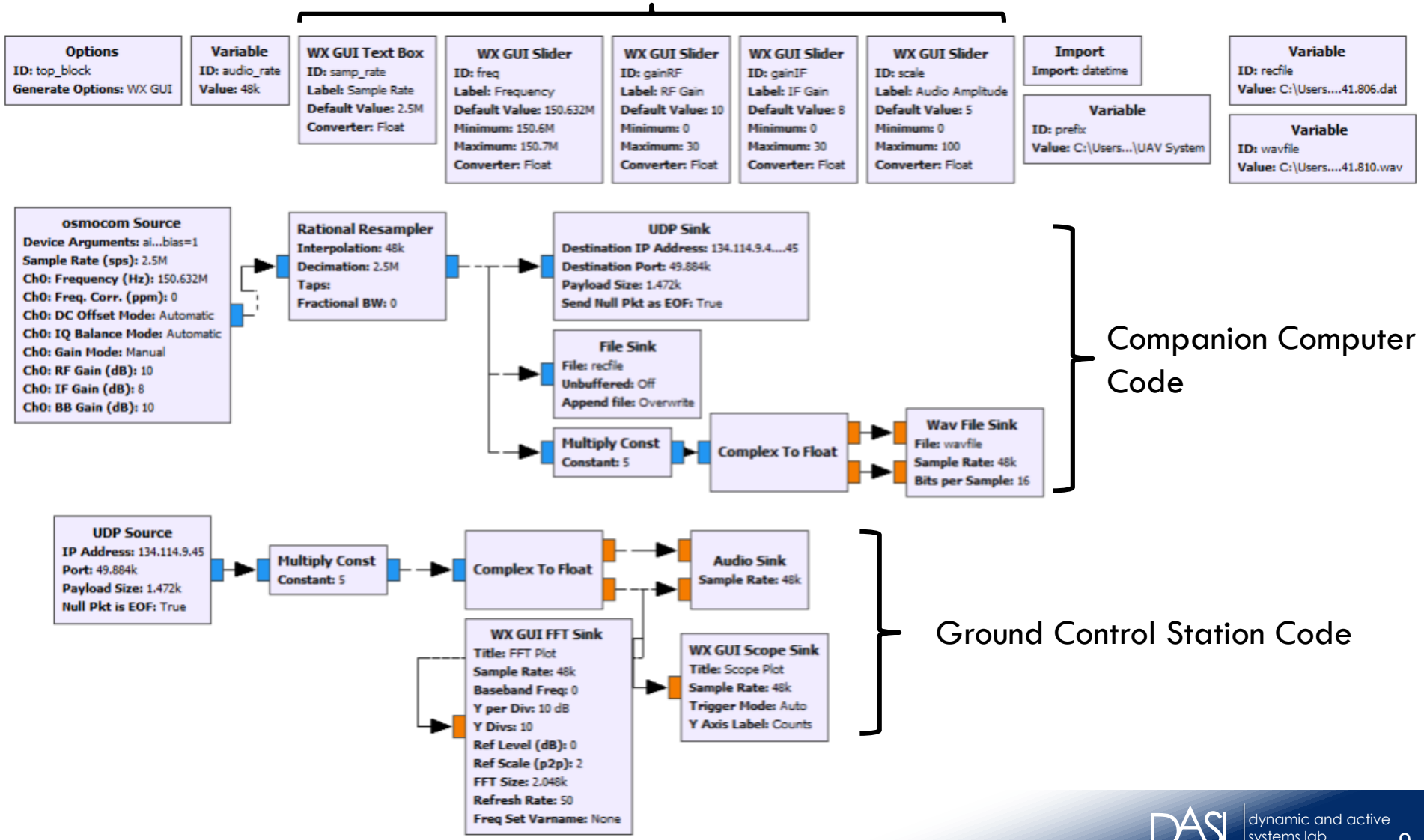
## I/Q and Audio Data vs. Distance

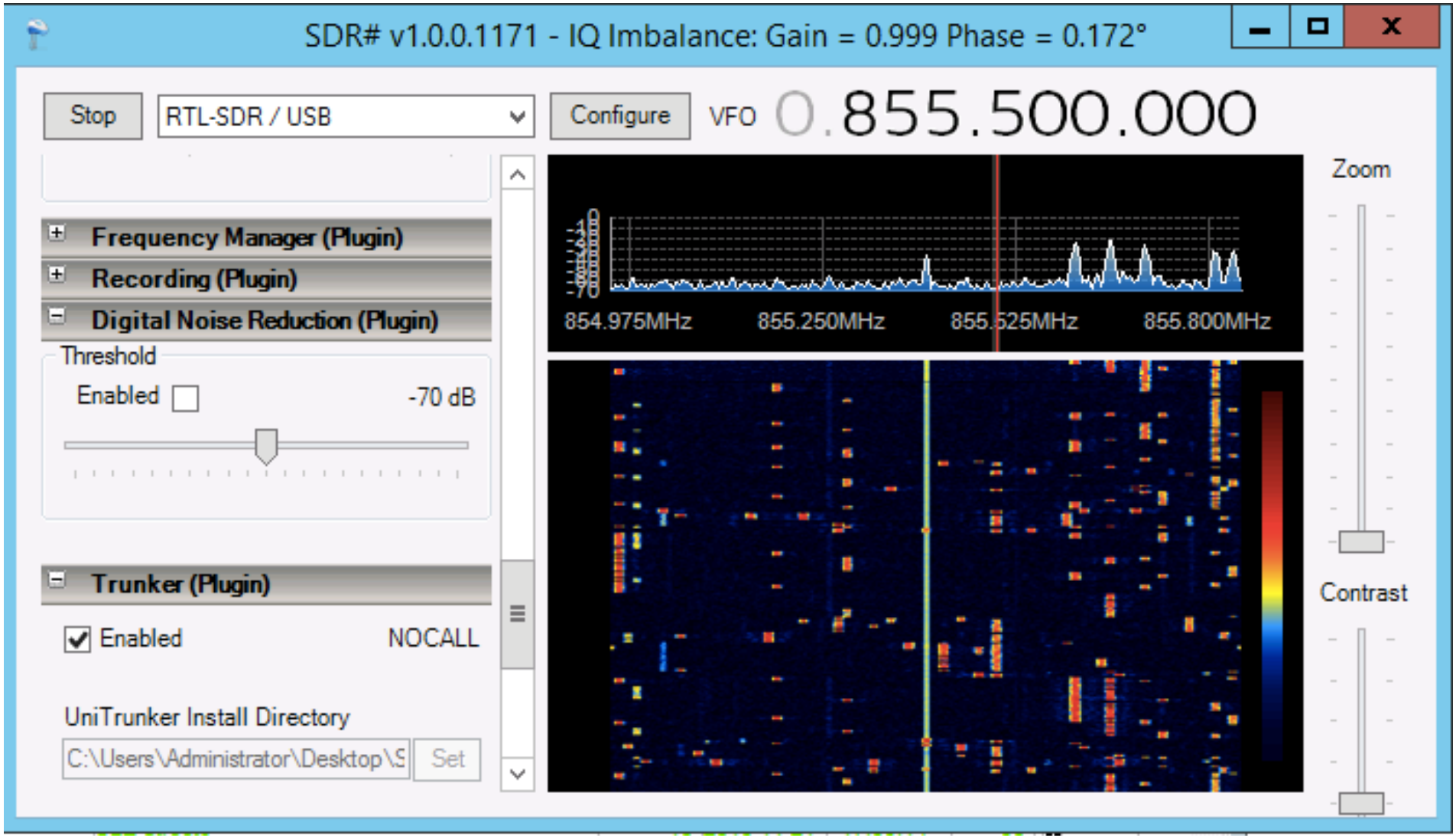


# System: Software, GNURadio

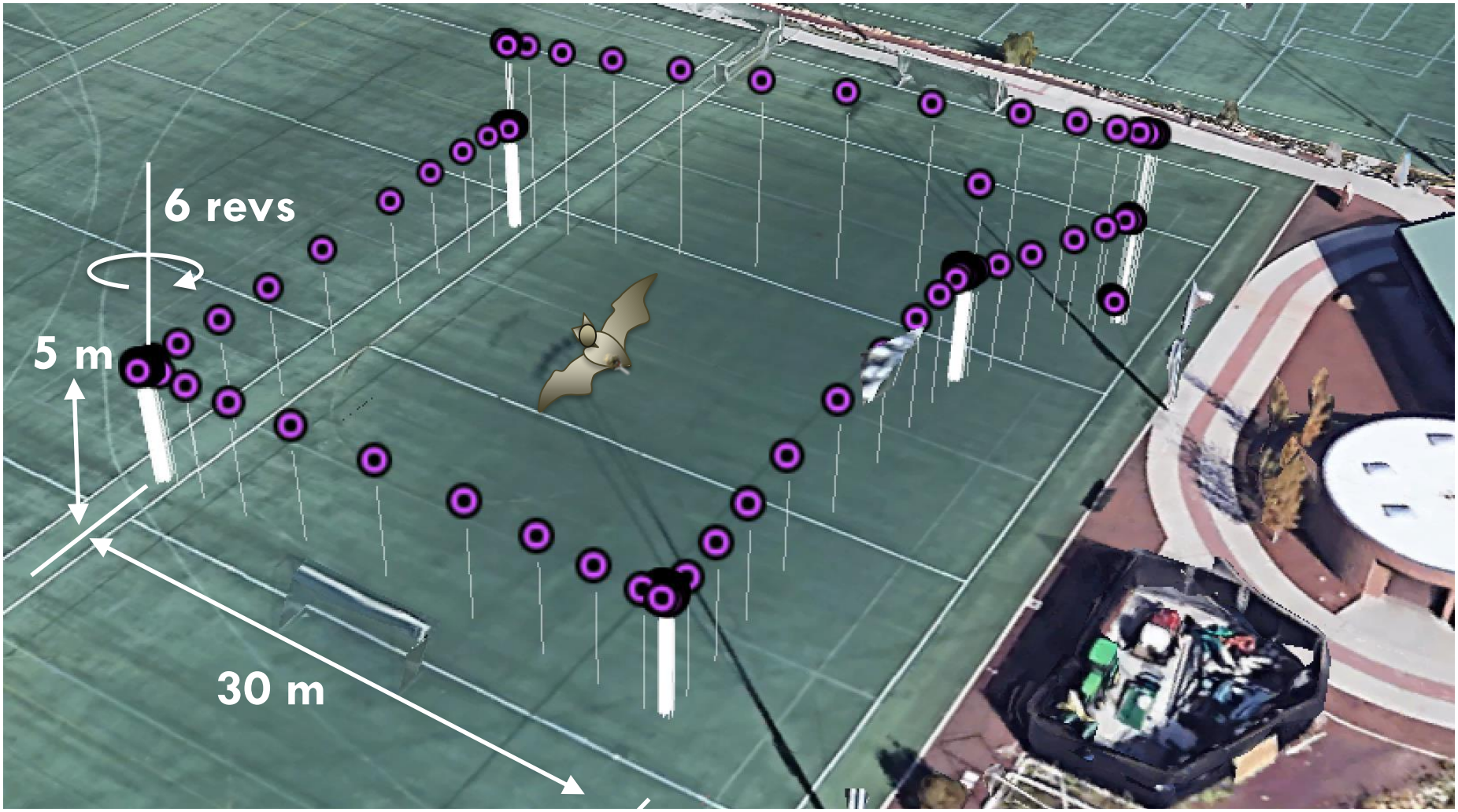
Real time control from ground control station



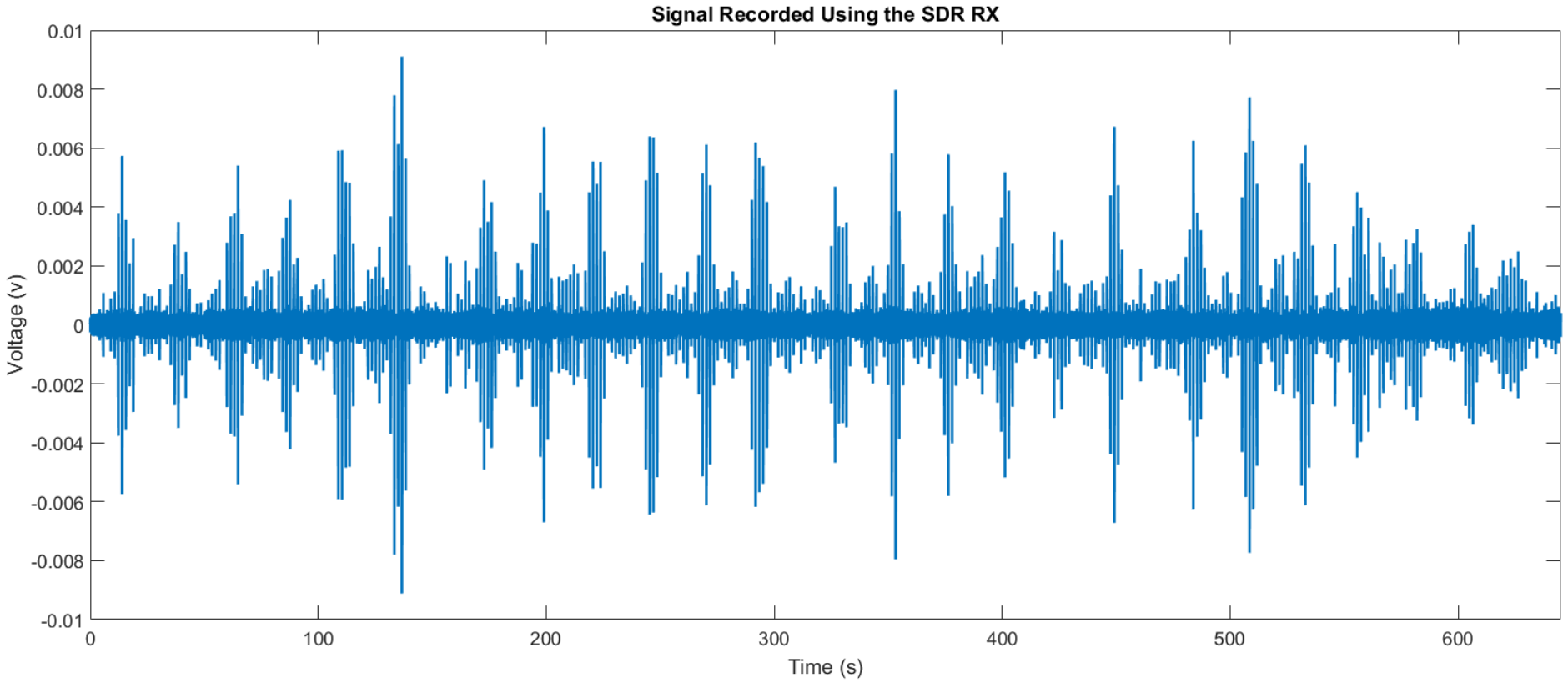
# System: Software, R&D



# Preliminary direction of arrival test



# Received signal by SDR system



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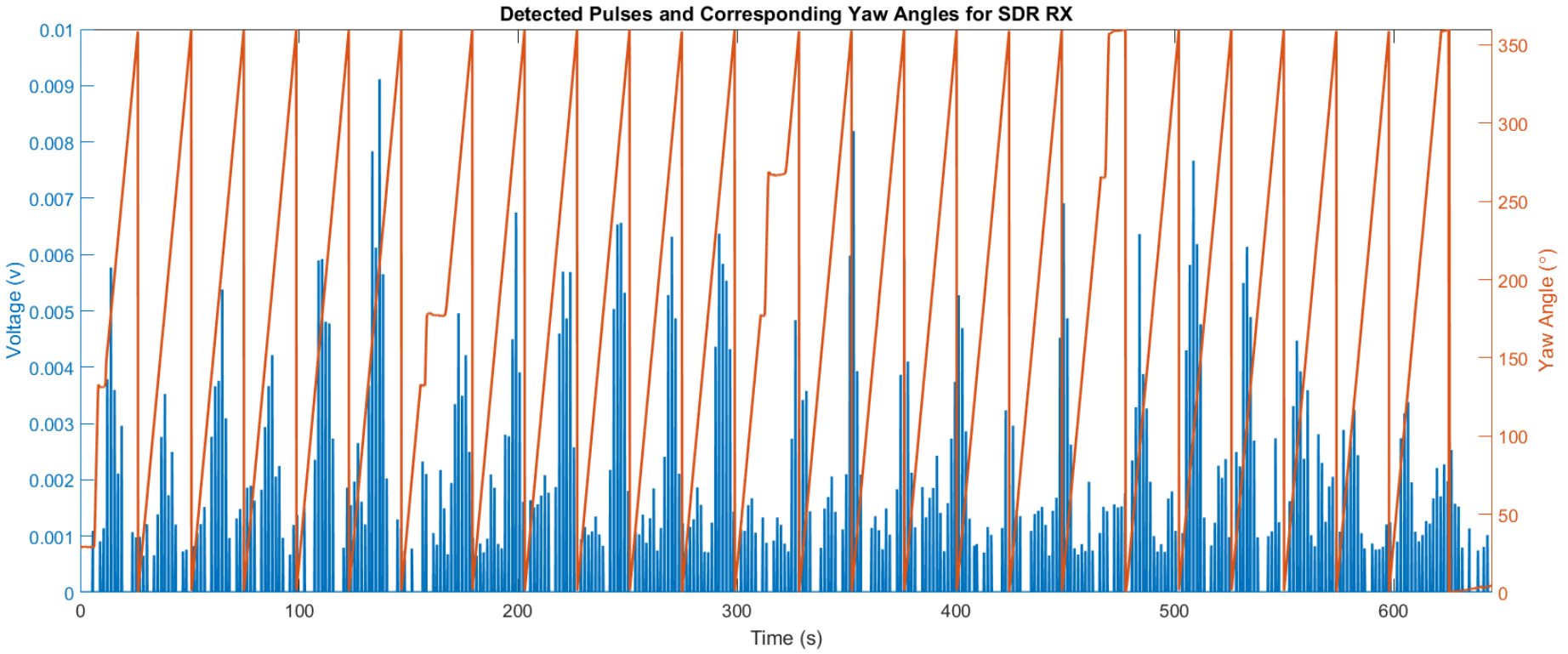
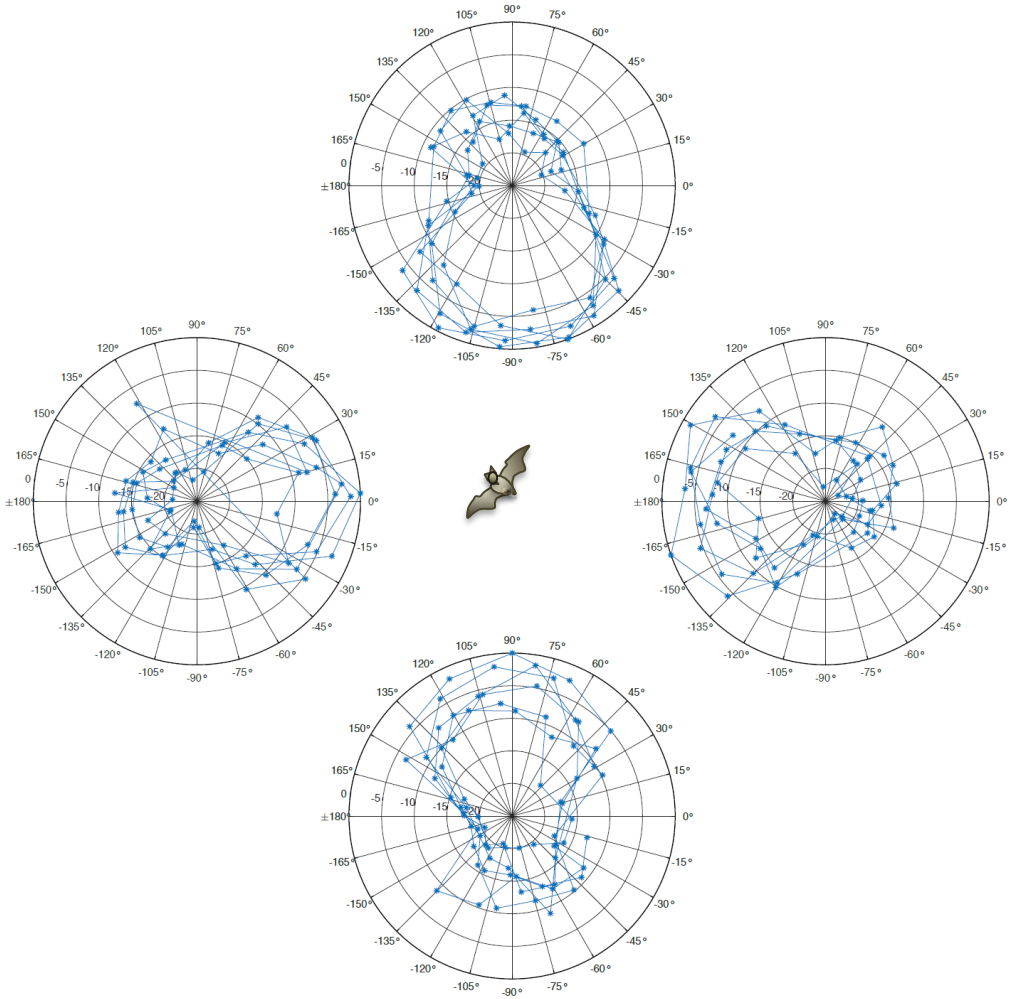
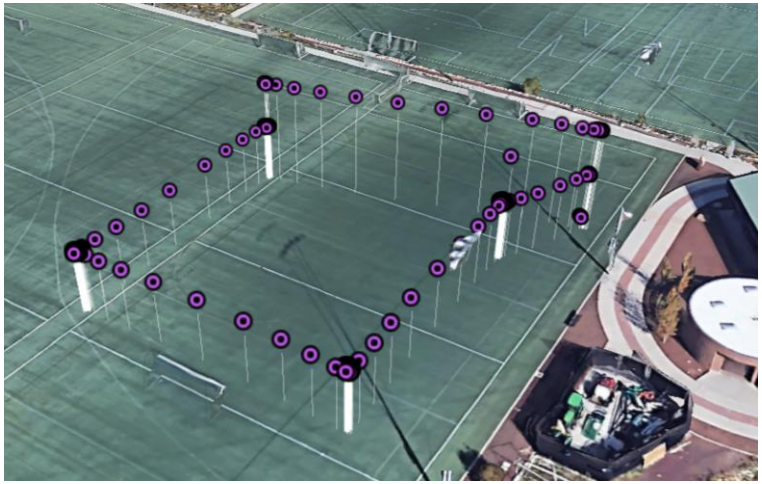
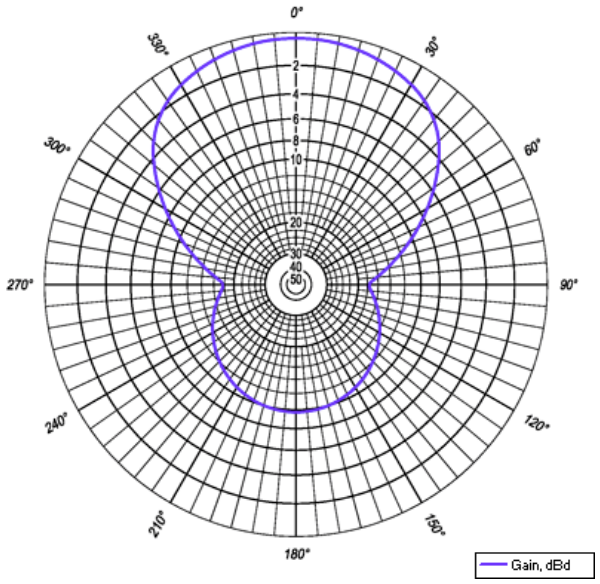


# Post processing results

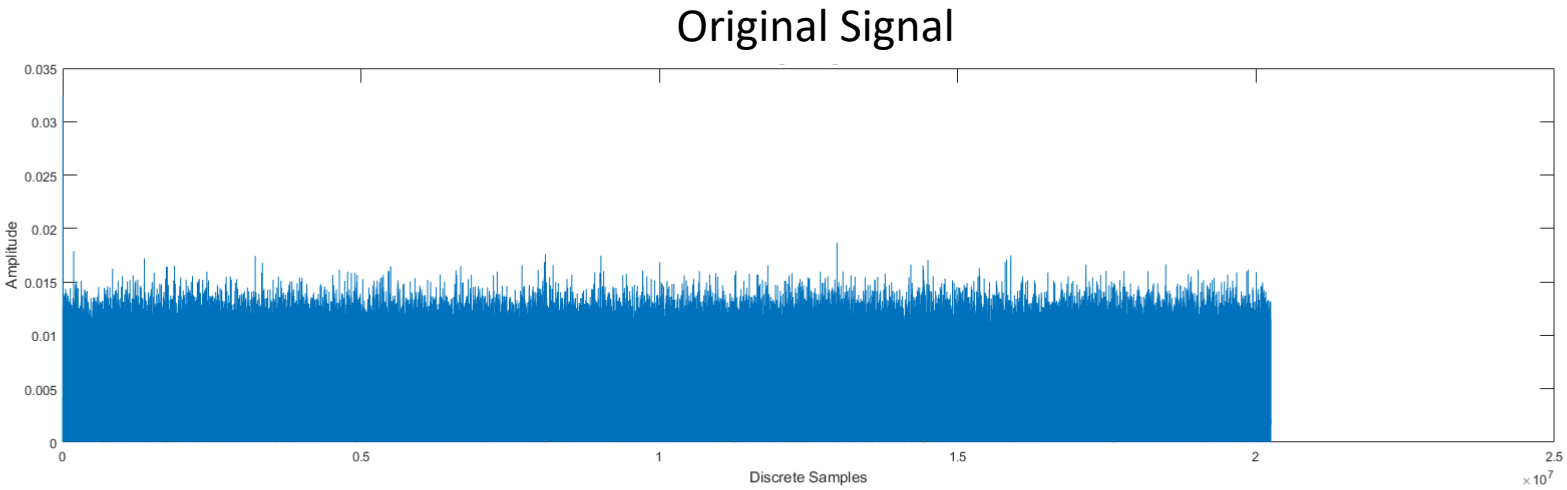




Telonics RA-23K Gain Pattern



# Recovery of Signal Below Noise Floor



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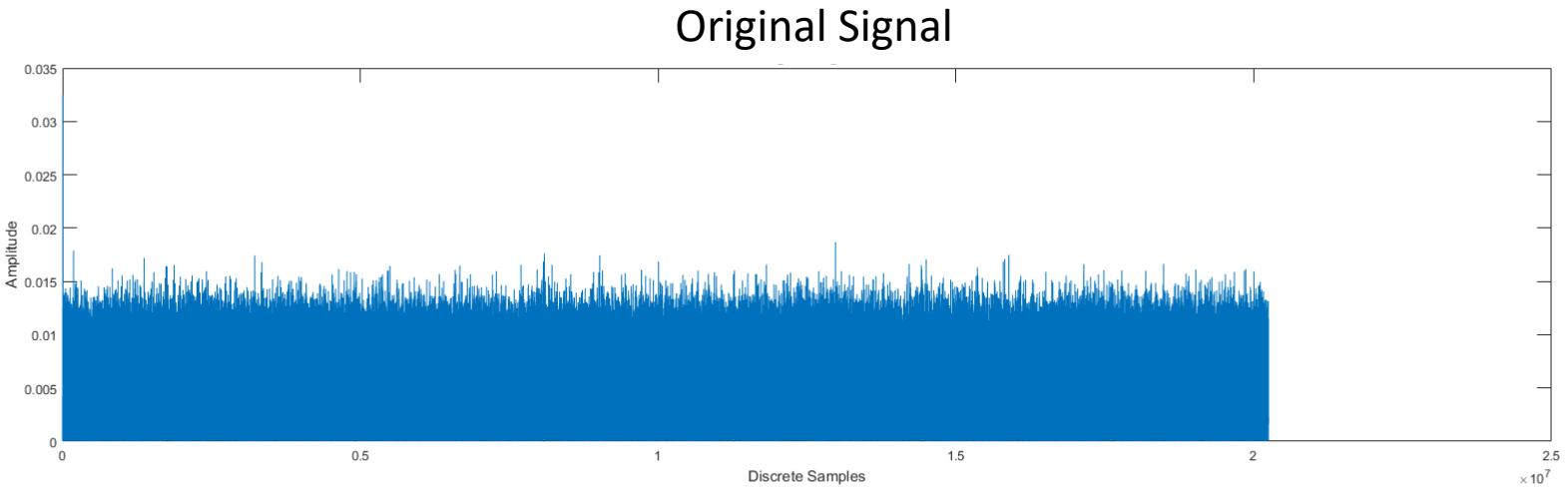


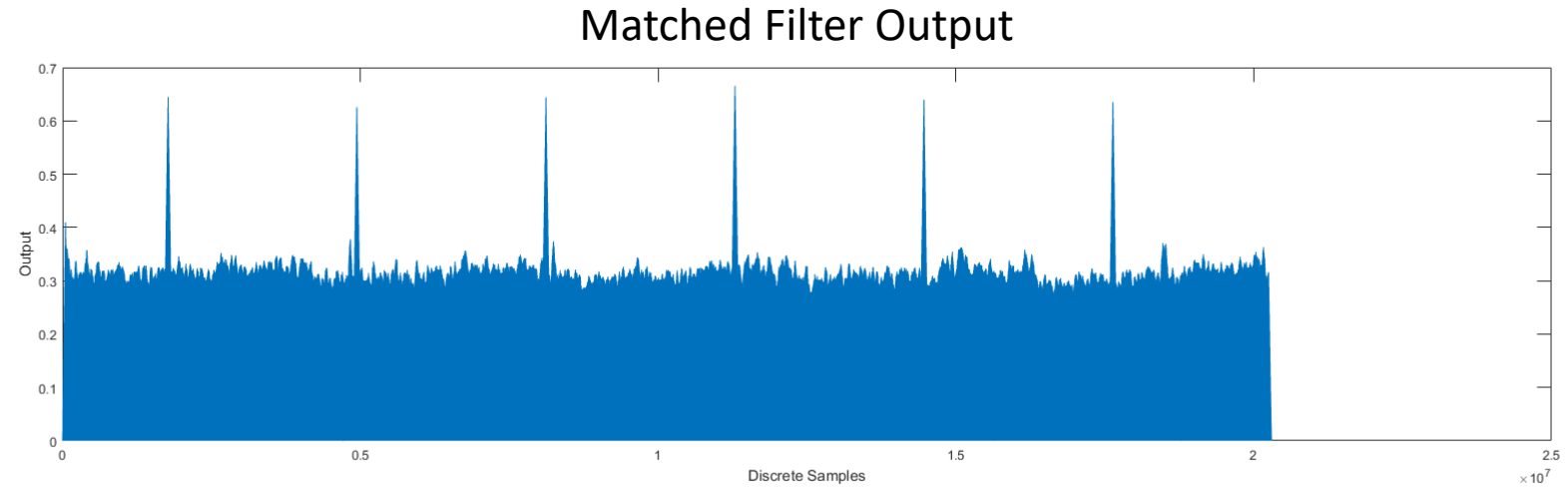

# Conclusion

- Augmentation to established method
  - Skilled human trackers
  - Modern radar signal processing
- Benefits
  - Improved human safety
  - Time efficiency
  - Increased sample size

# Future Work

- Increased detection and localization range
- Increased localization accuracy

# Acknowledgements


- This work was supported by NSF Award 1556417
- Collaborators Michael Shafer, Paul Flikkema and Carol Chambers

- Thank you!

# Questions?