Acoustic Radiation

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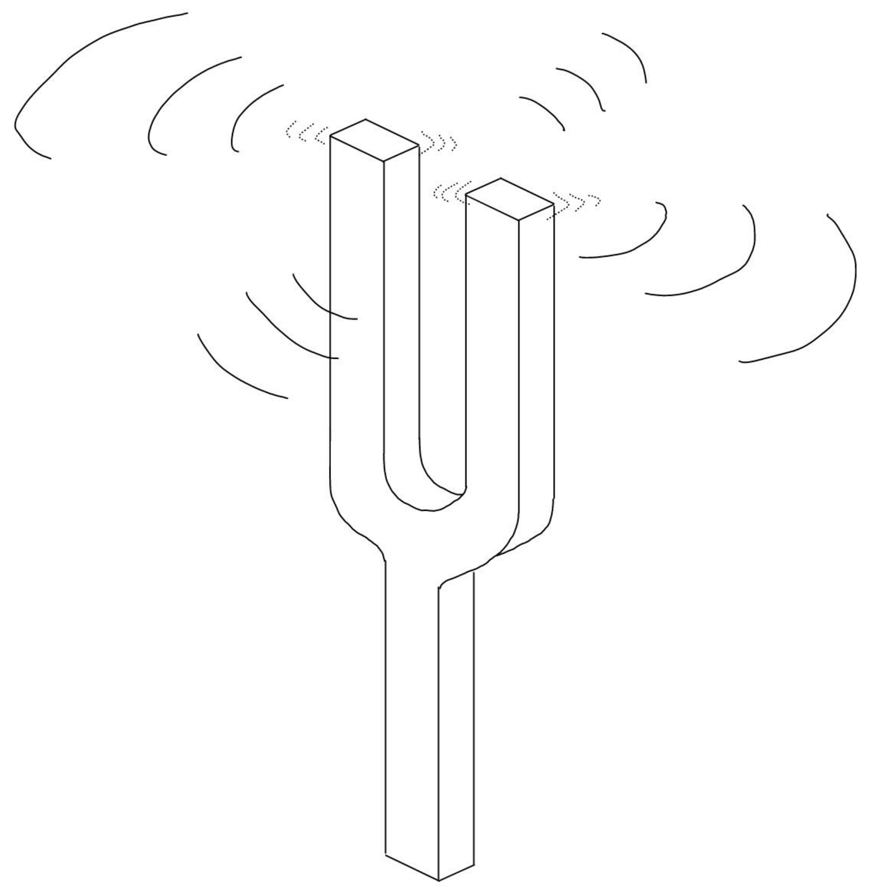
Introduction (1/2)

Tuning forks have odd sound patterns.

Nearby are four loud orientations, and four quiet orientations. Far away, only two of each appear.

Experiment goal: To characterize the acoustic radiation profile of a tuning fork.

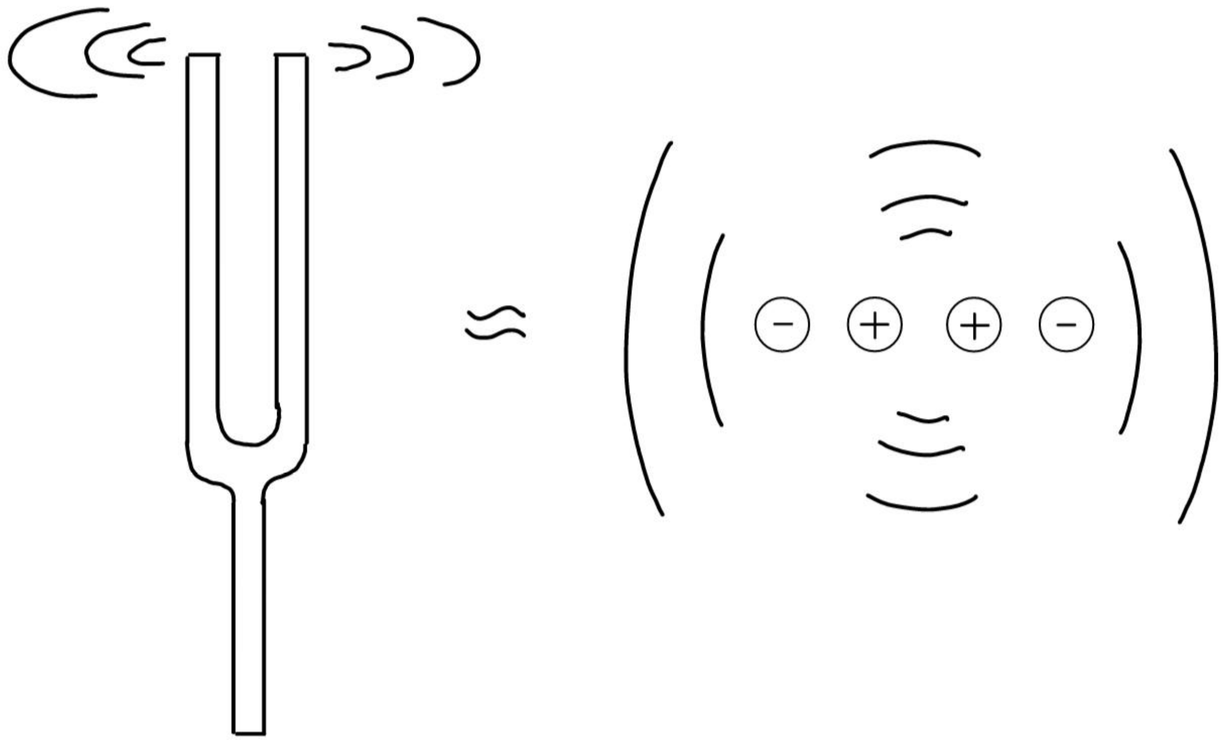


A sketch of a tuning fork vibrating and producing sound waves

Introduction (2/2)

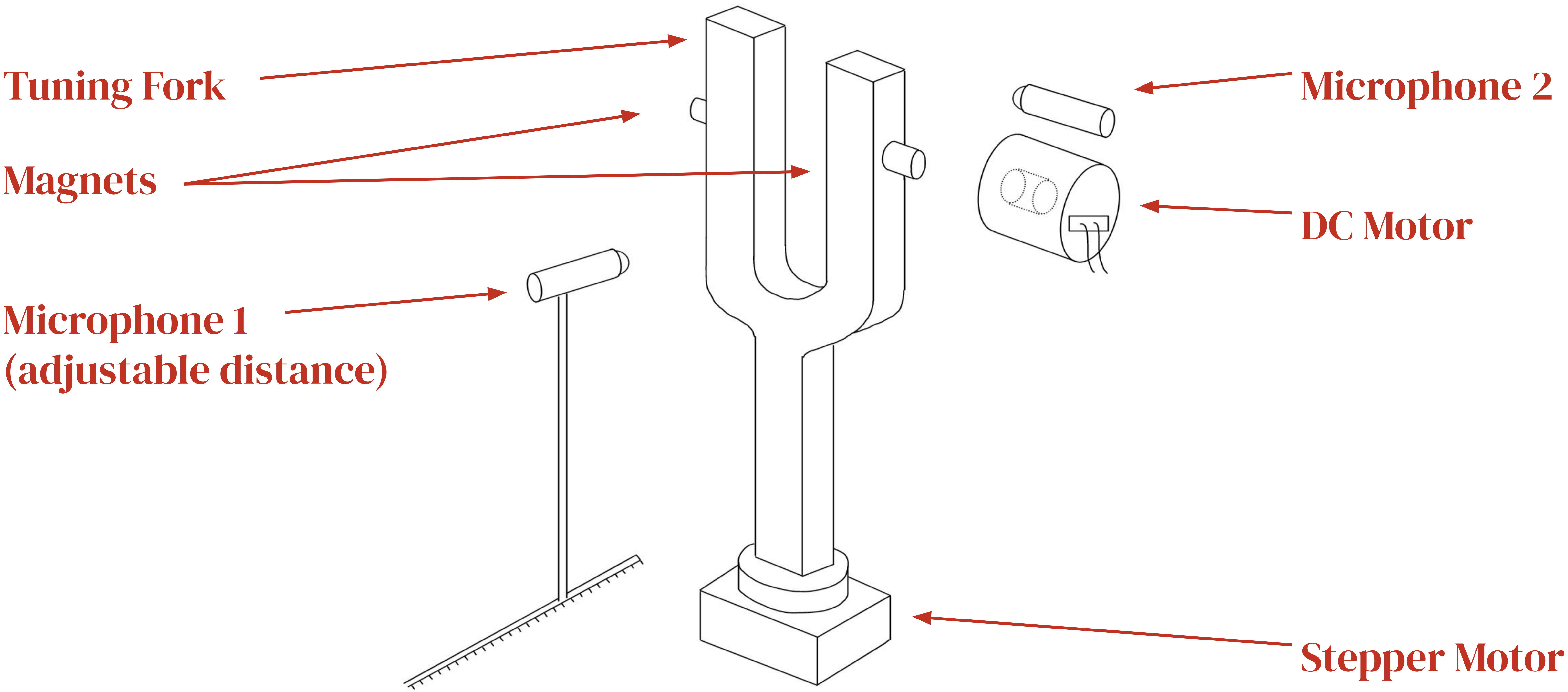
1. How does the intensity pattern of sound radiated from a tuning fork vary depending on the distance and angle of the fork?
2. Does the pattern follow trends similar to other naturally occurring phenomena?

Experimental data:
Tuning fork ≈ Linear dipole

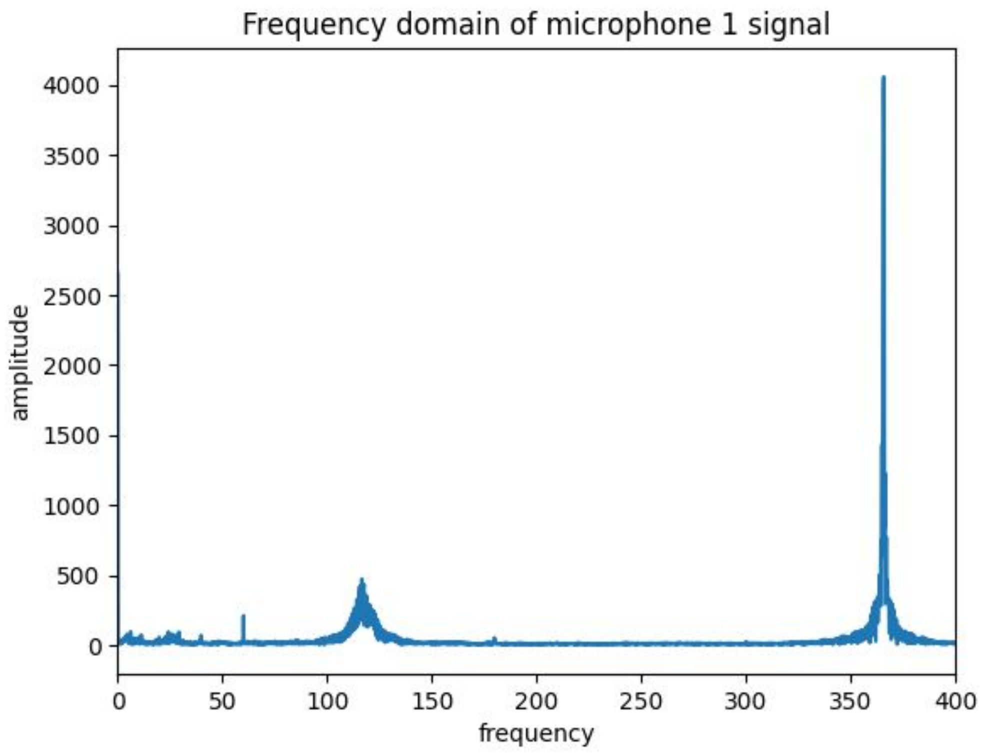


Theory of acoustic radiation impacts design and control of sound measurements, instruments, and systems.

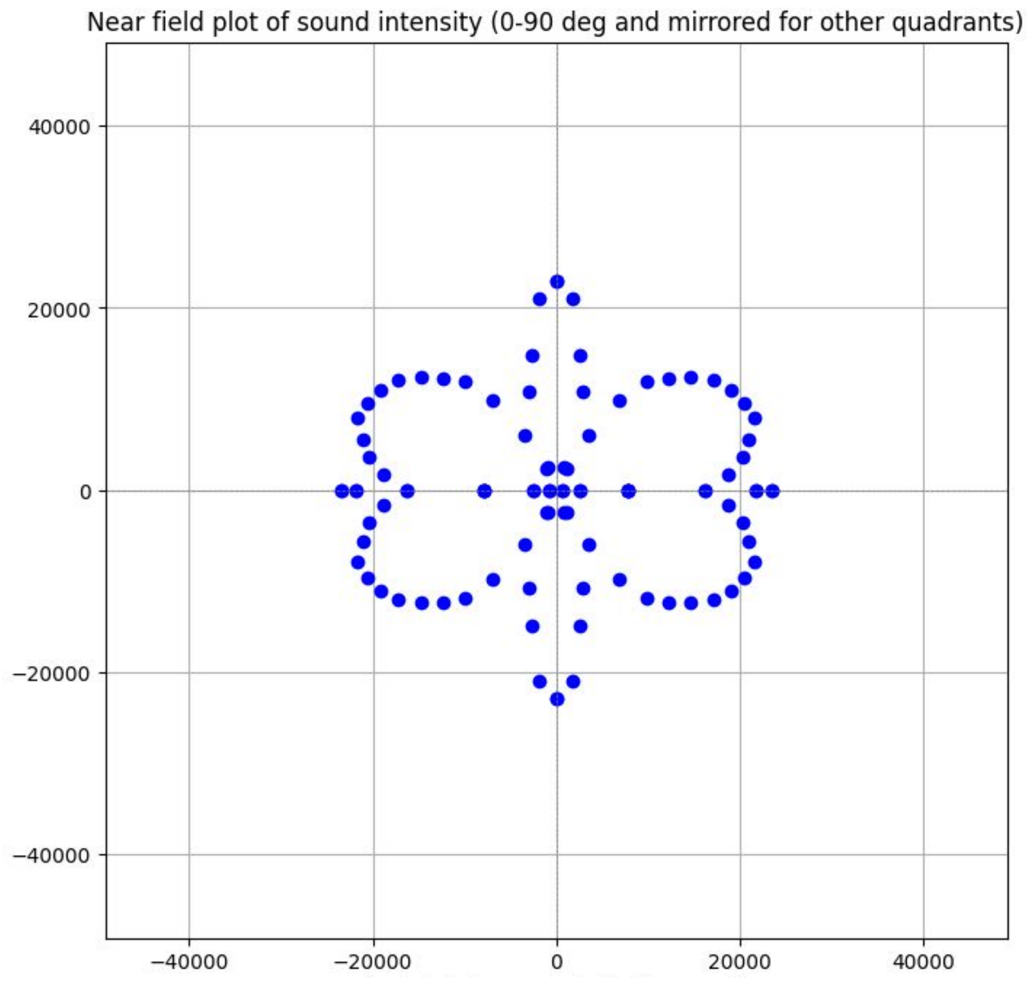
Experiment Setup



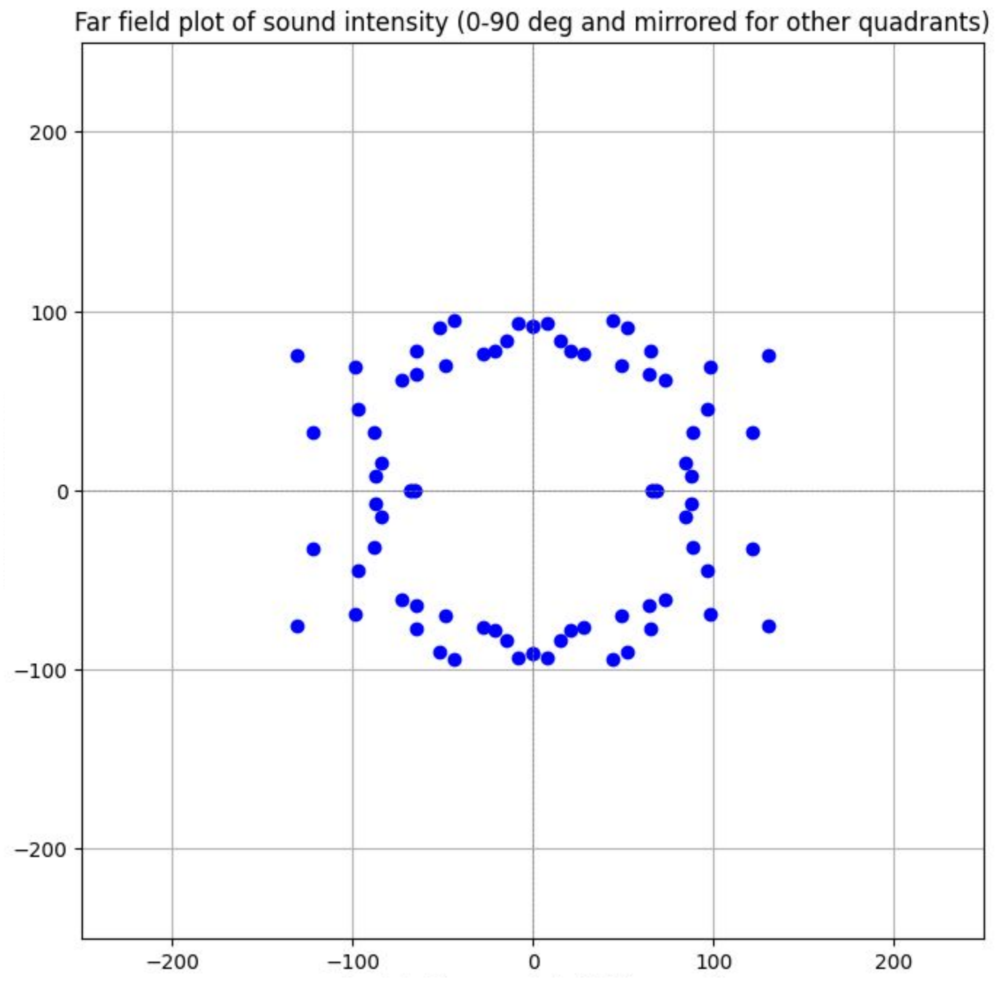
Results: Attempt 1



a) Resonant frequency = 365 Hz

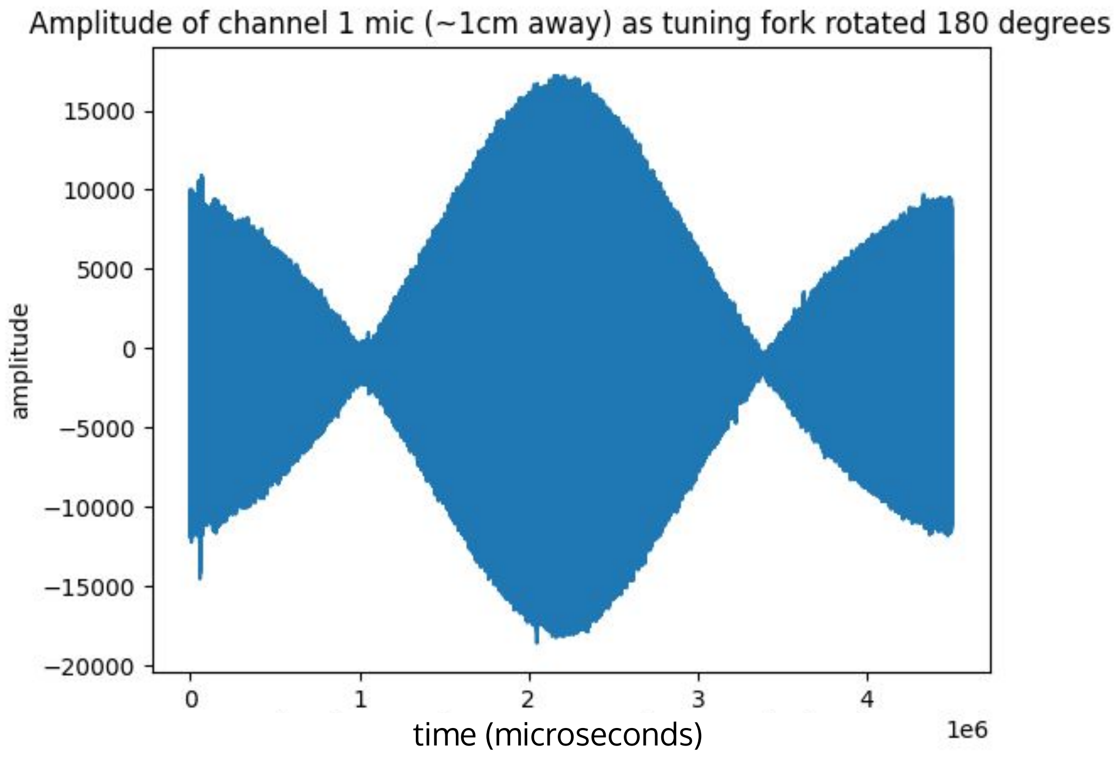


b) Near field radial plot attempt 1 (incorrect)

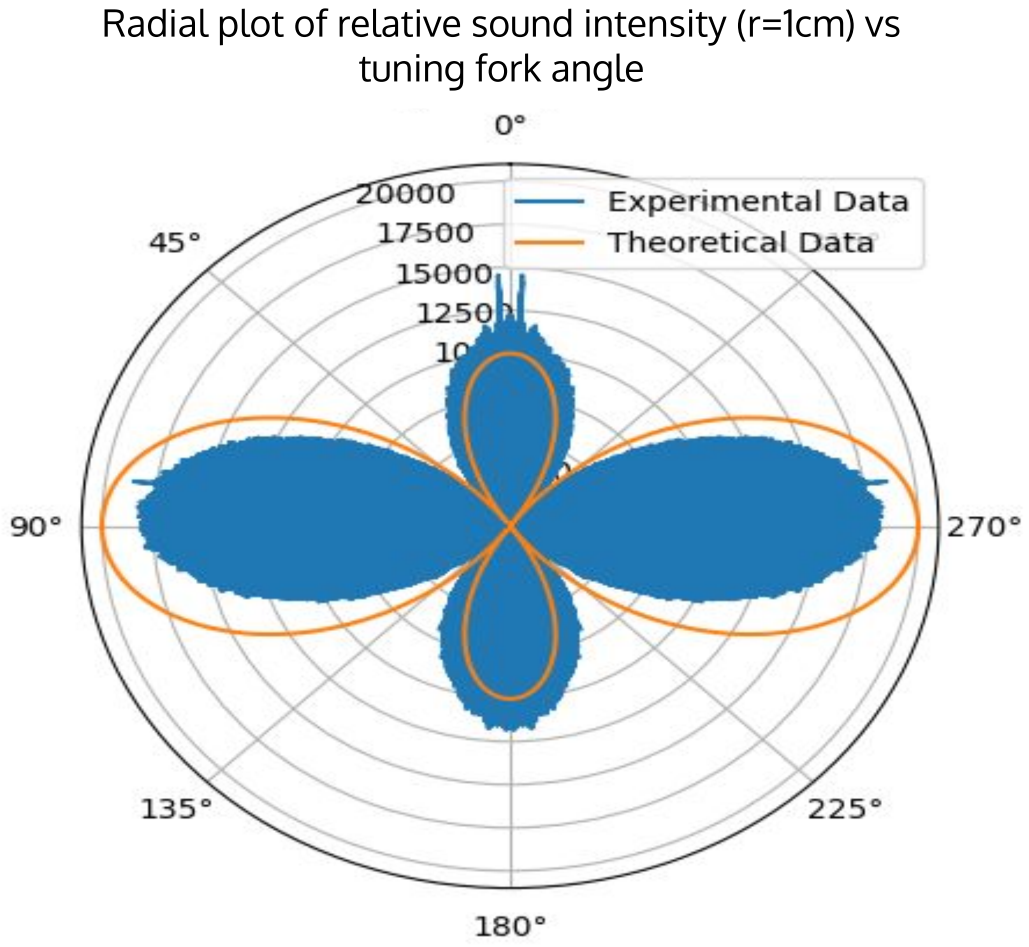


c) Far field radial plot attempt 1 (incorrect)

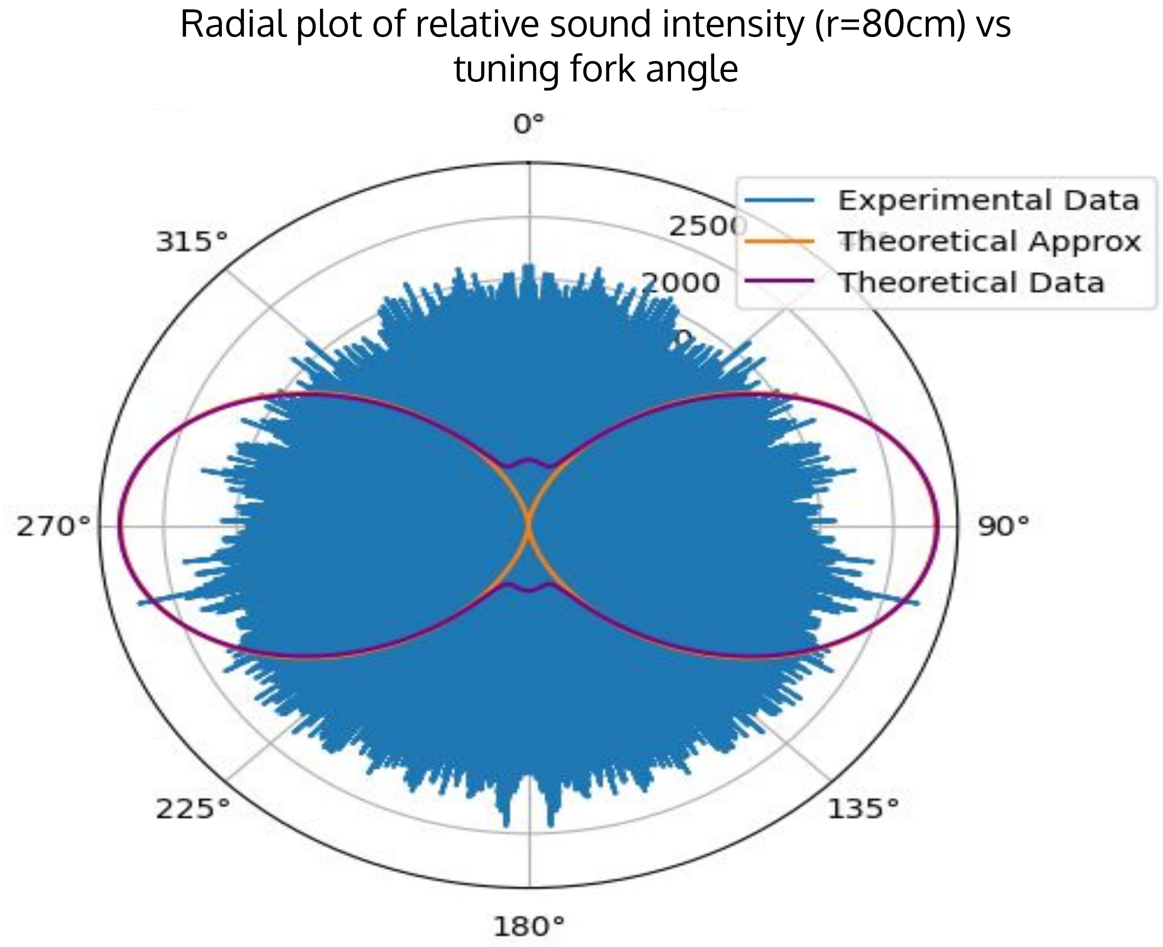
Results: Attempt 2



a) Time series data while rotating fork



b) Near field radial plot attempt 2



c) Far field radial plot attempt 2

Improvements

1. Higher precision for tuning fork driving frequency
2. Microphone specs/adjustments
3. Stepper motor not counting steps correctly

Summary & Next Steps

Summary

- Near field data approximately followed theory
- Far field data did not follow theory
- 2nd method (continuous sweep) yielded better results
- No good method to track uncertainty

Next Steps

- Investigate and test post-processing methods (i.e., data filters) for far field data
- Replicating first method with more accuracy, large range, and more points near min/max
- Downsample microphone data in sweeps