



Department of Electrical and Computer Engineering

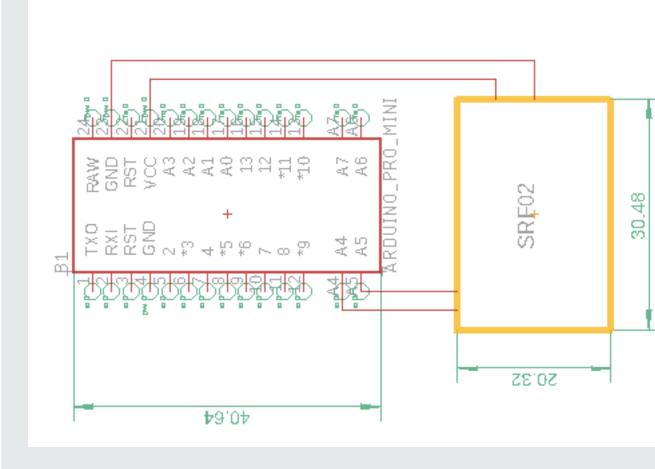
# Abstract

Sleep Apnea is a serious sleep disorder affecting many, in which breathing repeatedly stops and starts. Current continuous positive airway pressure (CPAP) machines on the market today are uncomfortable, bulky and expensive. The team has developed an ultrasonic flowmeter that will help developing more comfortable and cost effective CPAP machines

## **Project Description**

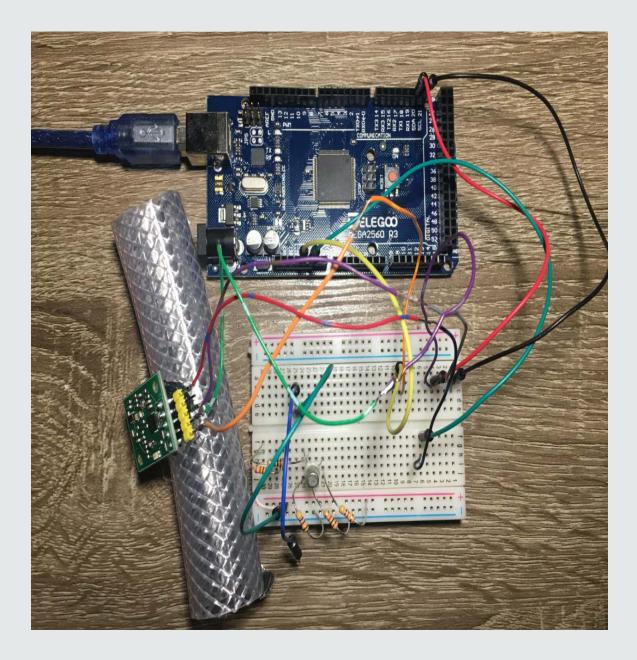
The main objective of this project is to design a working prototype that will serve as a proof of concept for Nova Resp. The end goal for the client is to develop a fully functioning micro pump CPAP machine to provide the end user with comfortability and drive the price of such a device down.

### Setup



Schematic of our airflow sensor with appropriate dimensions (mm).

Prototype for a working proof of concept of our setup.

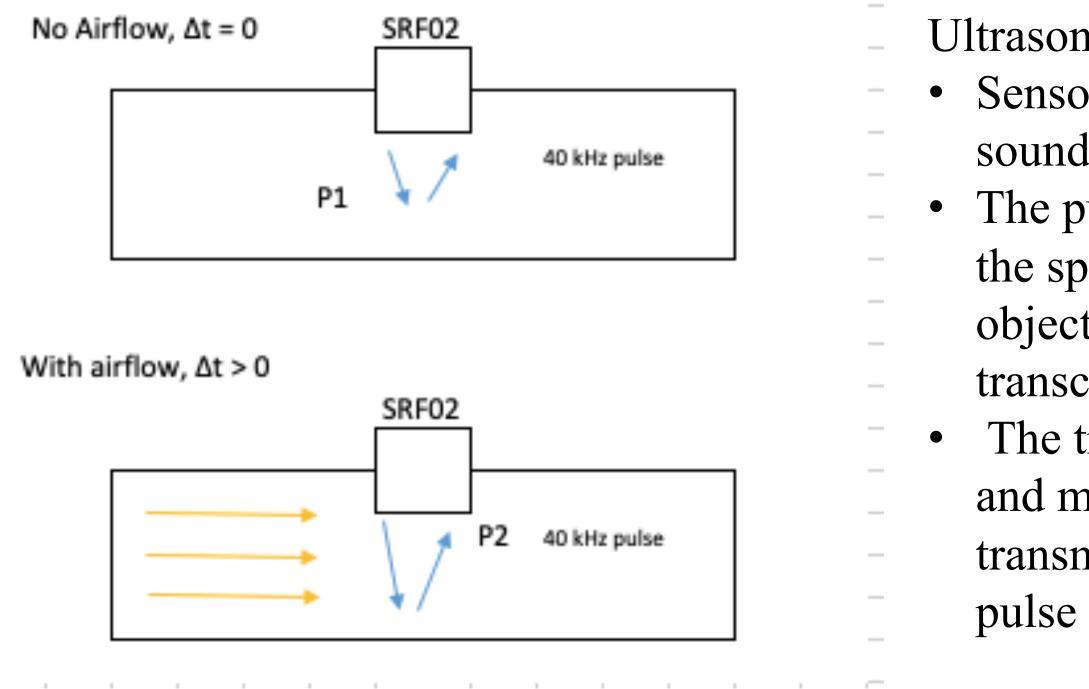




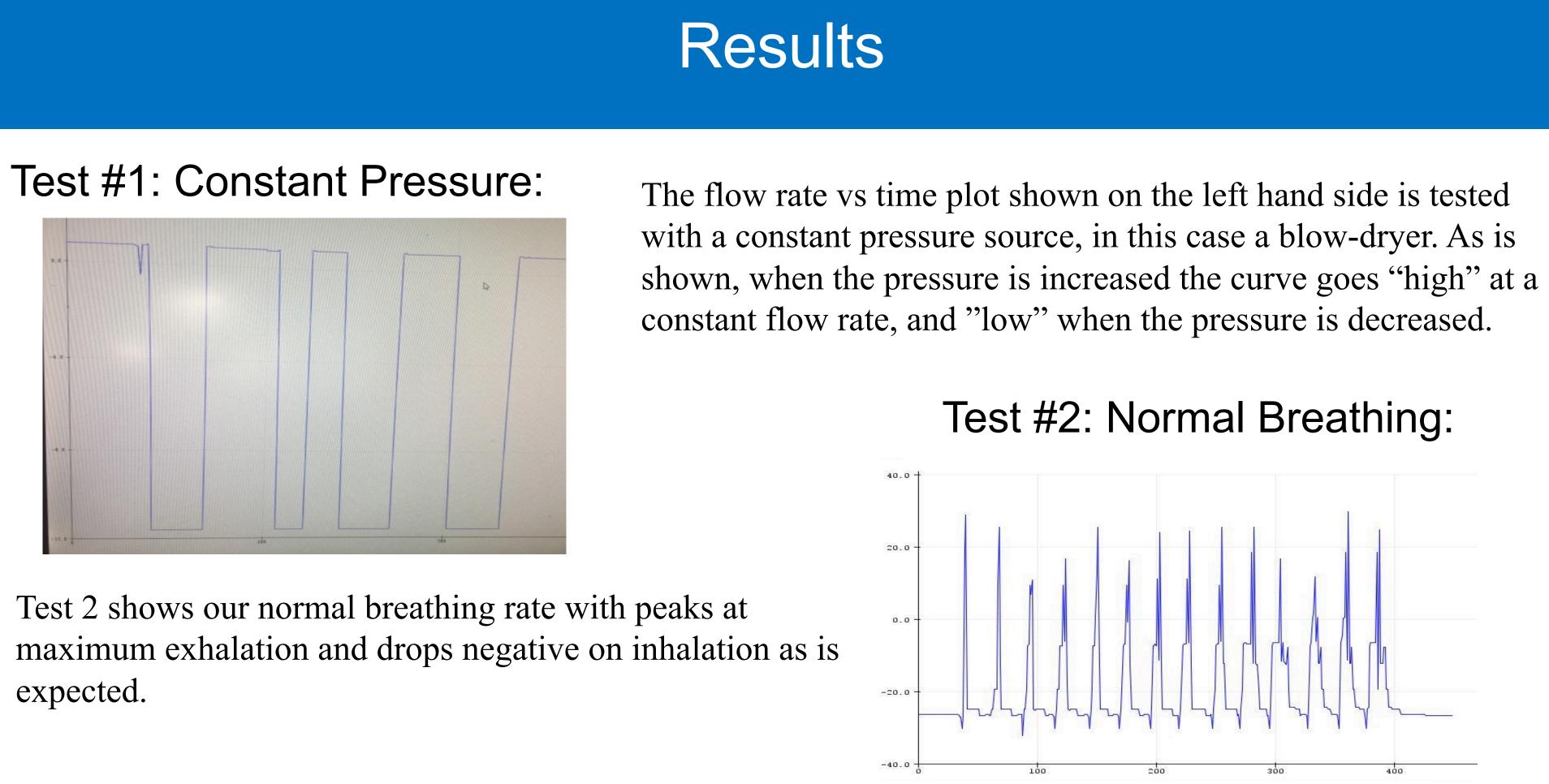
# Sensor for Sleep Apnea Treatment



The principle being used to capture the time of flight (TOF) between transmitted and received pulse from our ultrasonic sensor is the ultrasonic principle. From this we can accurately measure the airflow through the tube and display an airflow vs. time graph to monitor patient breathing rate.



The sensitivity of the SRF02 sensor that is being used as the ultrasonic transceiver is what allows us to capture minute changes in the TOF between pulses in such a simple configuration.



# Nova Resp Technologies

Ultrasonic Principle:

- Sensor emits a short high frequency sound pulse
- The pulse propagates though the air at the speed of sound and strikes an object being reflected back to the transceiver
  - The transceiver detects the echo pulse and measures the TOF between transmission and reception of the

# Conclusions

The team found that with a sensitive ultrasonic sensor, such as the SRF02, we can detect small changes of airflow within a <2.5cm diameter tube which is common for medical use. Our test results show that there is potential for a device of this size to replace current CPAP machines. Further tests need to be run to fully prove the concept but this is a good benchmark to start with.

- accurately.
- optimize the test result.

# Acknowledgements

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### Further Work

How to further improve the design: 1) Implement a more accurate shape of prototype which is able to measure air flow rate more

2) Design a signal conditioning circuit, so that it can minimize the noises and interference, and

3) Integrate a micro pump into the prototype to fully test the functionality of the final device.

# References

• https://www.dfrobot.com/wiki/index.php/SRF02\_Ultrasonic\_sensor\_(

• http://www.mantech.co.za/datasheets/products/A000047.pdf • Simon Monk.2016.Programming Arduino(Second Edition).McGraw-