

Background

- 52% of thoracic injuries result in tension pneumothorax (TPX)
- TPX is the third most common preventable cause of death in recent military conflicts
- Needle decompression is the recommended treatment, but problems include misdiagnosis and insertion of the needle at an inappropriate location

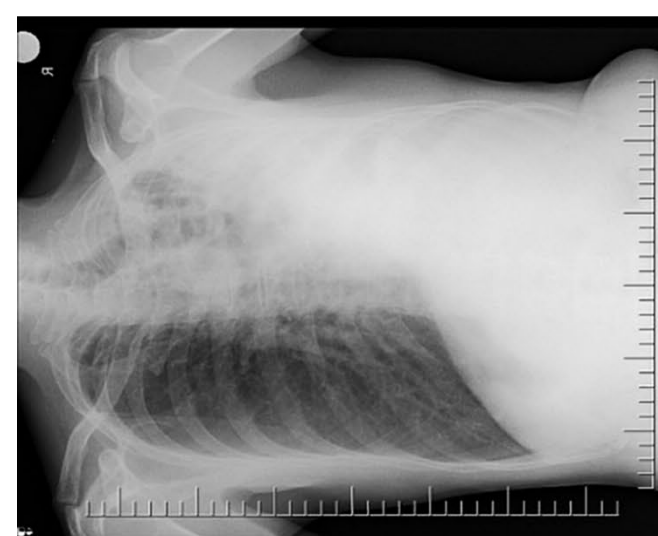
Approach

Locating the insertion site (right): Intercostal space (1) vs. rib (2)

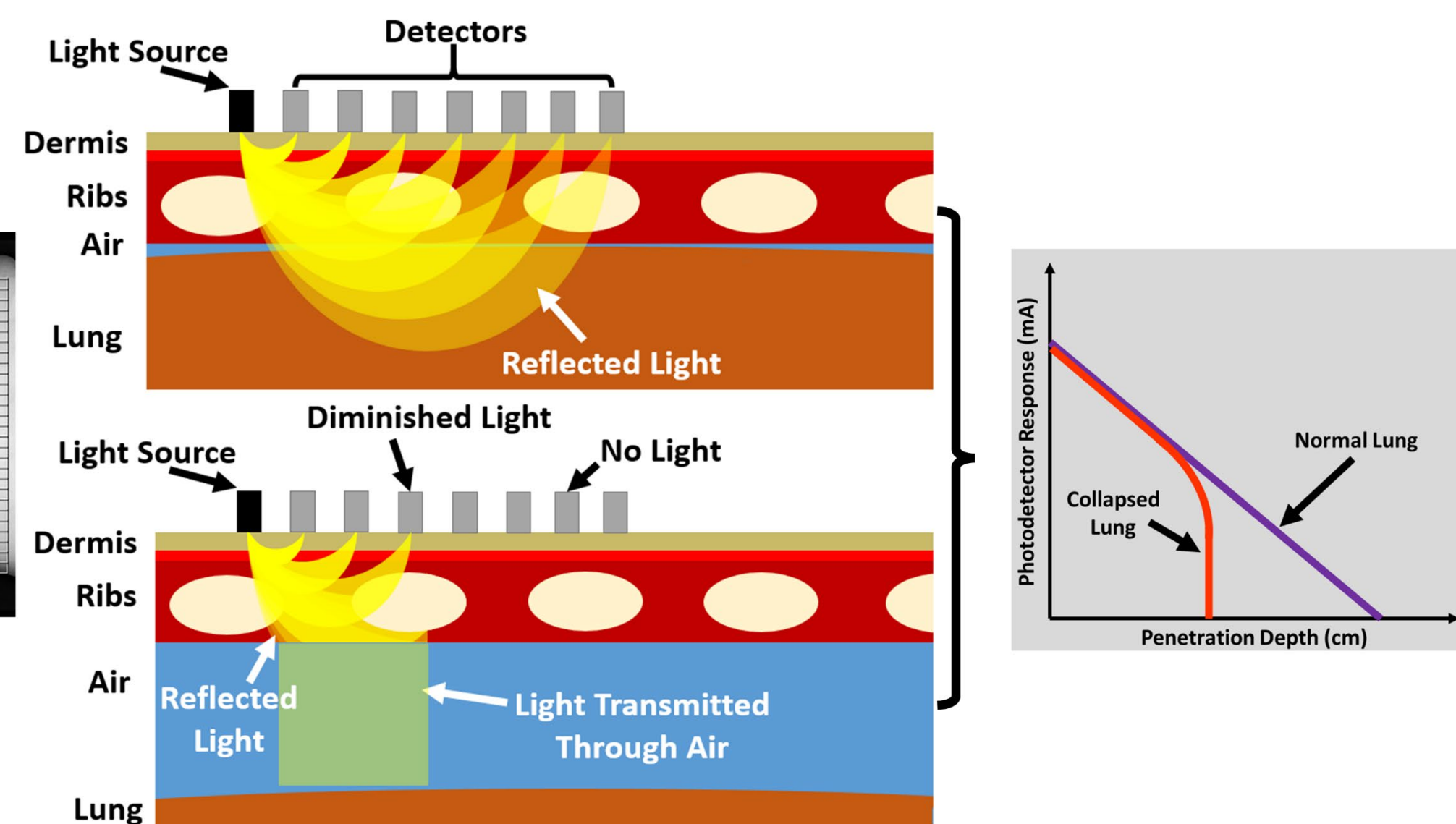
Diagnosing TPX (below): Normal lung vs. collapsed lung



Normal Lung



Collapsed Lung

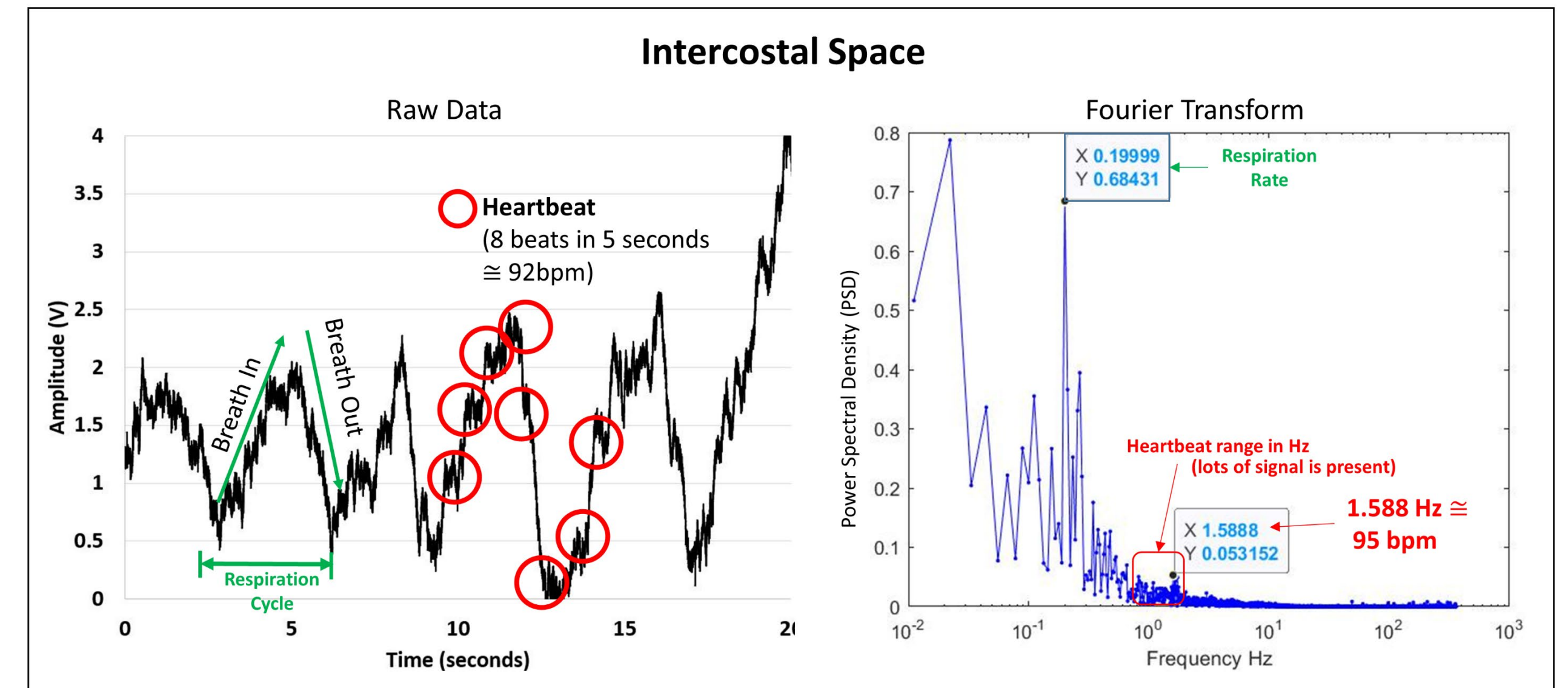


Solution for both: near-infrared (NIR) light-based monitoring

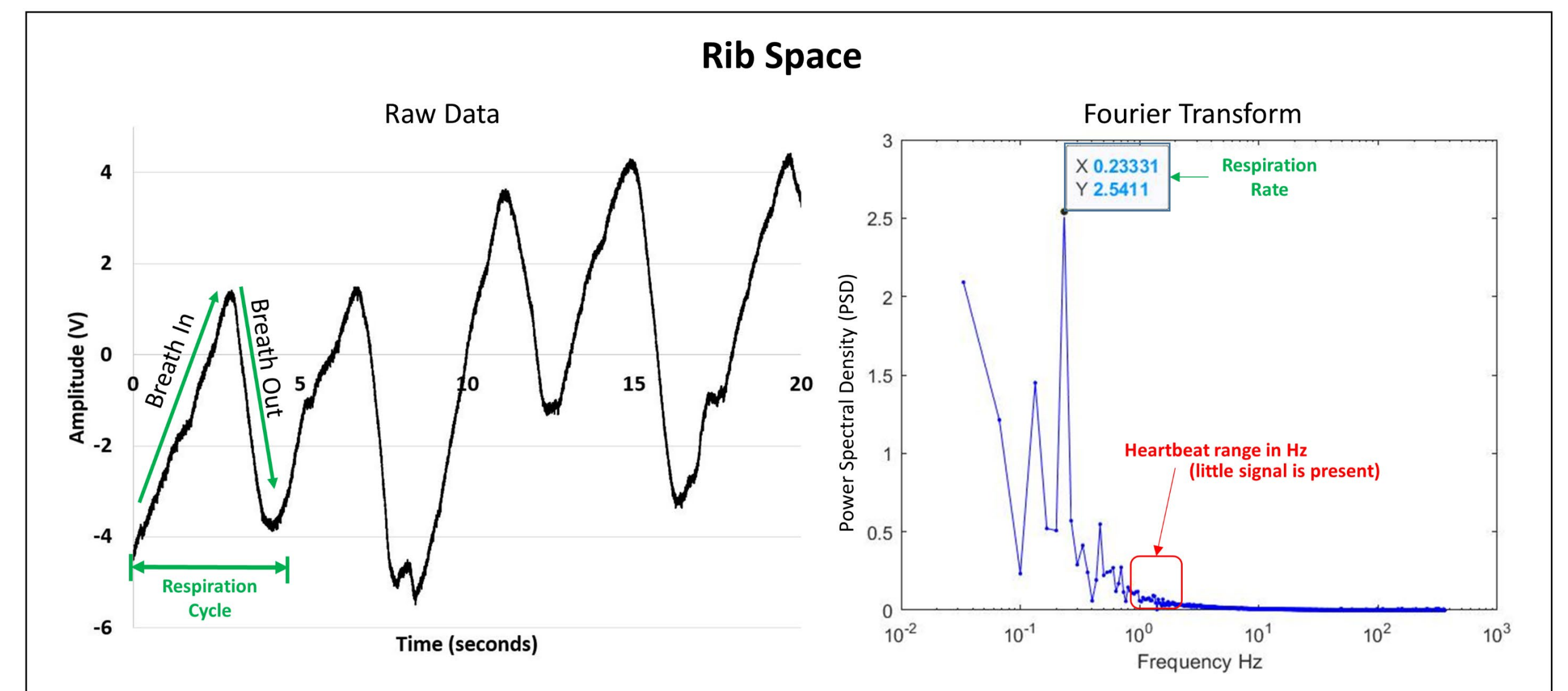
Results

Intercostal space: NIR monitor on a healthy human subject (PI) shows strong signals from respiration cycle and heartbeat.

With collapsed lung/TPX, signal from respiration cycle will not exist.



Rib space: NIR monitor on a healthy human subject (PI) shows respiration cycle, little to no signal from heartbeat.



Future Directions

- Develop detector response curves based on penetration depth to detect presence of air in pleural cavity
- Create a selective and sensitive algorithm to diagnose TPX from NIR data

Acknowledgements

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