2025 IEEE RADAR CHALLENGE

BREATHING RATE ESTIMATION OF THE DETECTED INDIVIDUAL USING CN0566 10GHZ PHASED ARRAY RADAR PLATFORM

Team: Vital-CN0566

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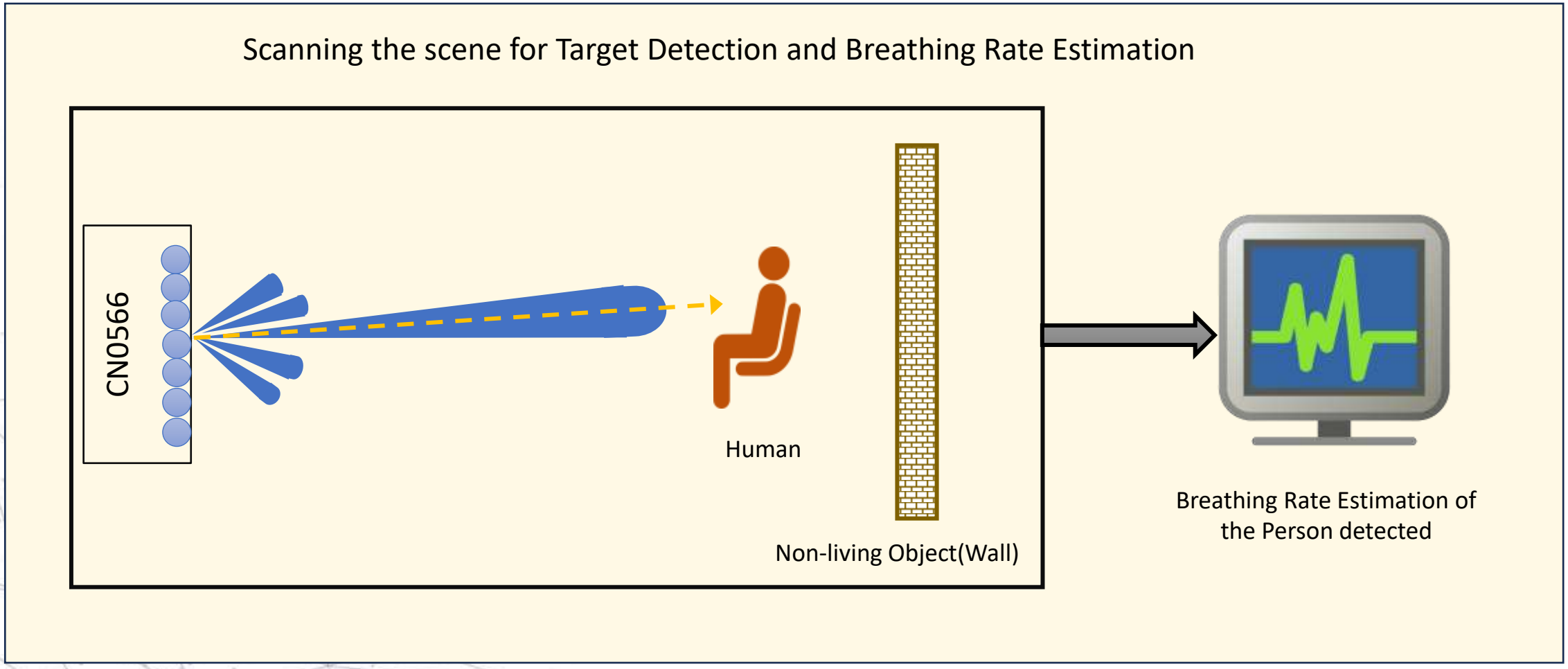
Presentation Outline

1. Objectives at a Glance
2. System and Algorithm Block Diagrams
3. Test Scenarios
4. Demonstration Video
5. Example Displays
6. Results
7. Conclusion and Future Work

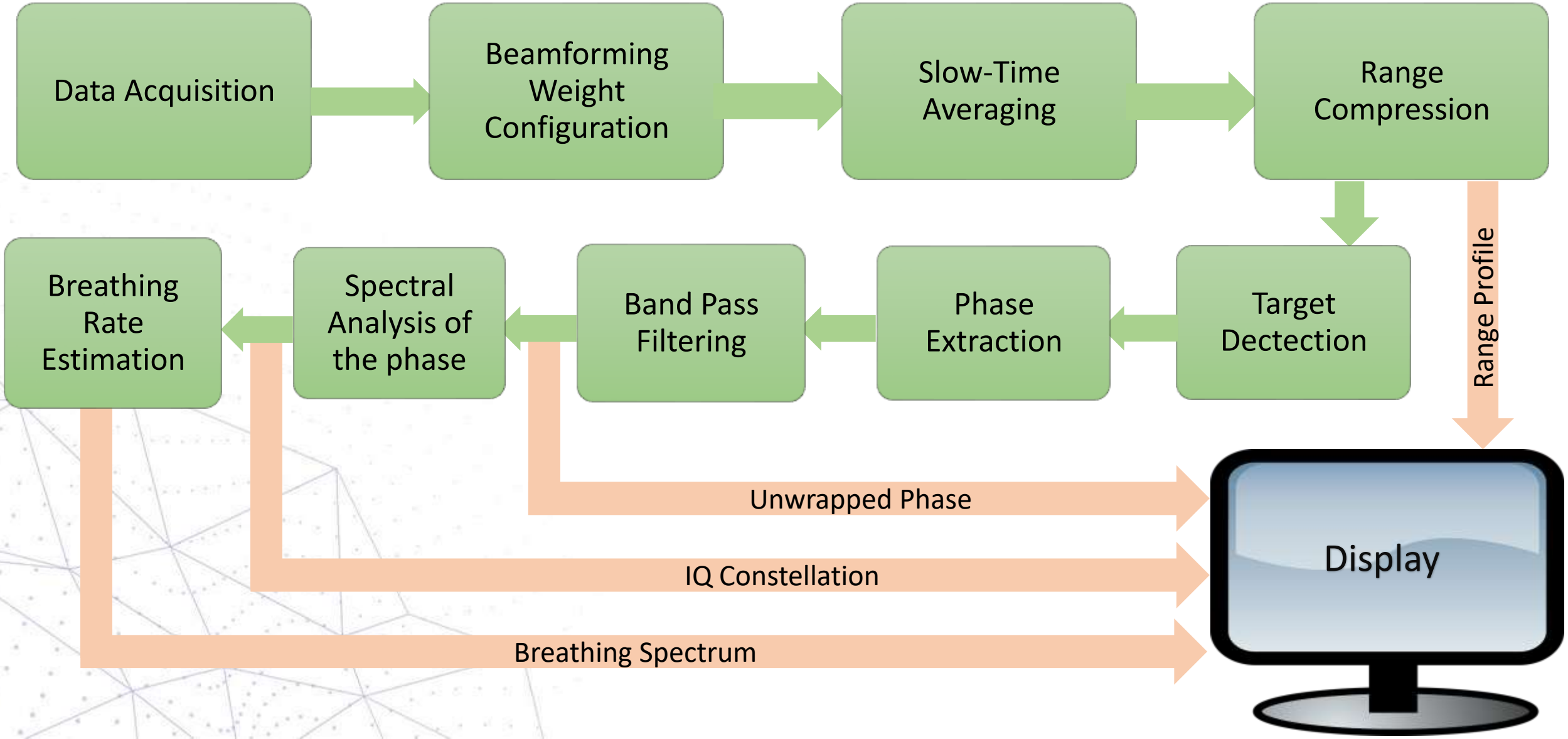
Objectives at a Glance

- Design and implement a non-contact breathing rate estimation module using the ADALM-PHASER (CN0566) Phased Array.
- Validate its performance on both controlled simulated respiration with a digital pump and real human subjects.
- Demonstrate reliable estimation of breathing rates across different ranges, showing the feasibility of phased-array radar for respiration monitoring.

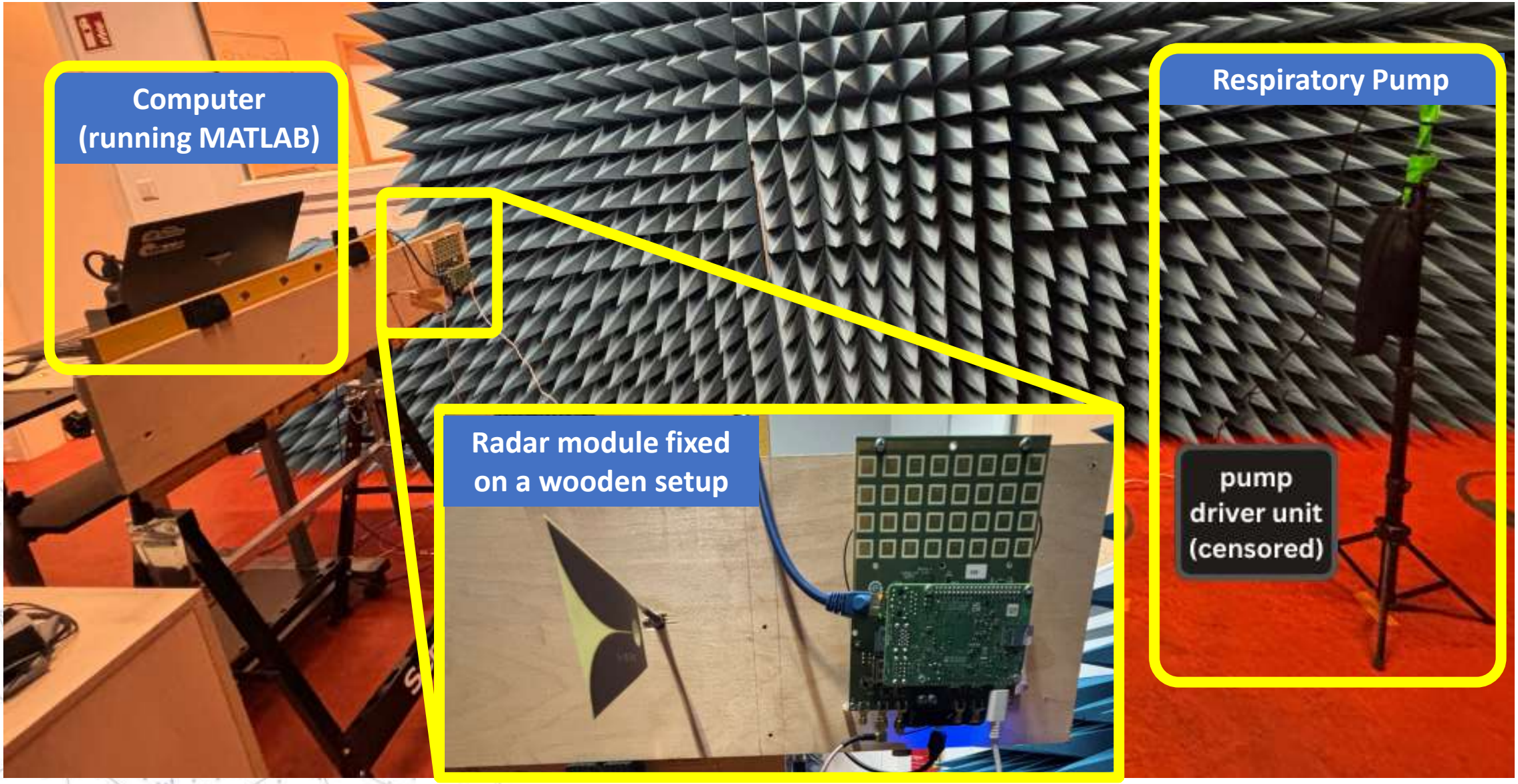
System Block Diagram



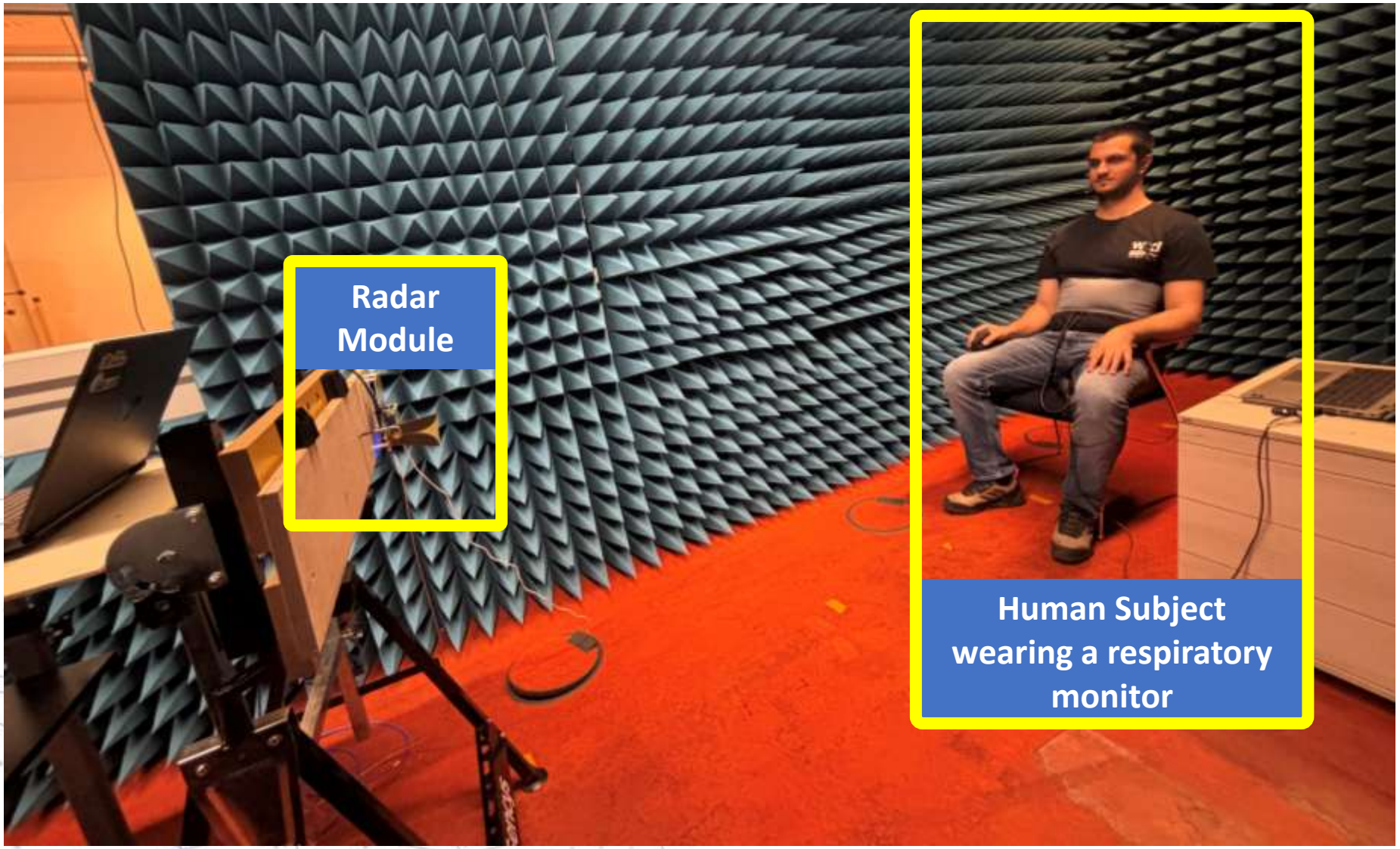
Algorithm Block Diagram



Test Scenario (Pump)



Test Scenario (Human Subject)



Radar Challenge Demonstrations

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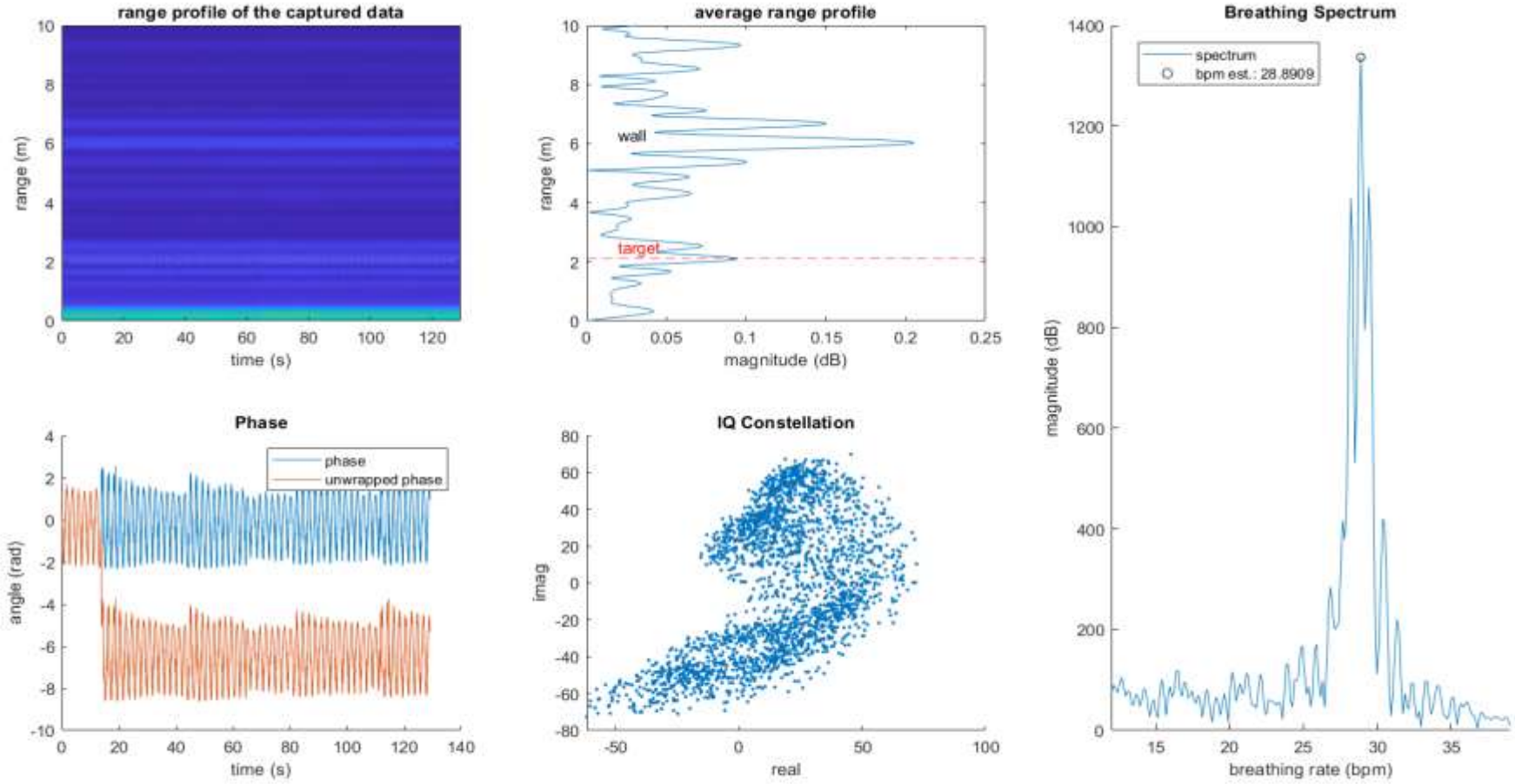
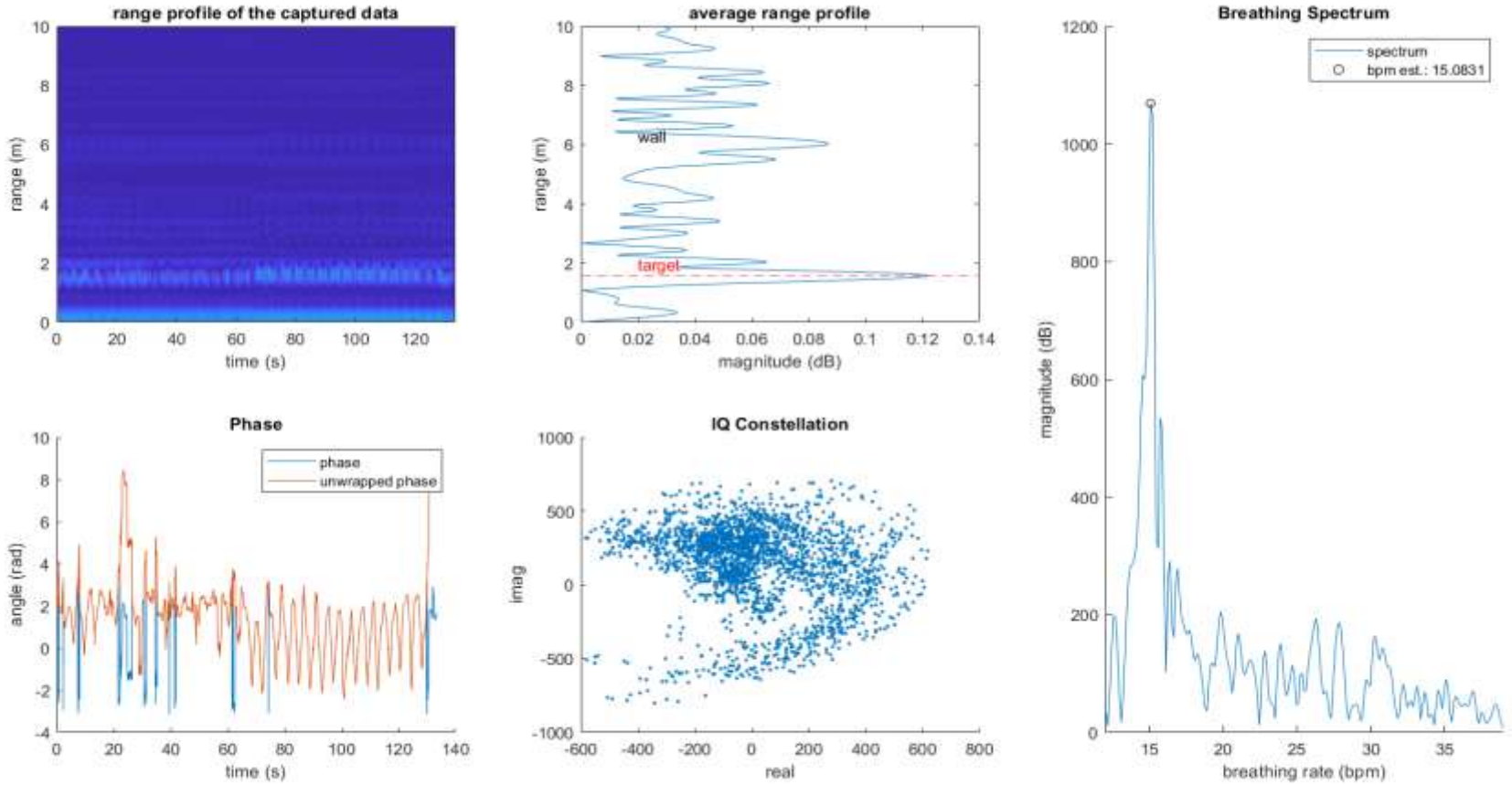
Example Display (Pump)

Actual bpm: 28 , Estimated bpm: 28.8909 (For object at distance = ~2.0 m), observation time = 120s (approx..)



Example Display (Human Subject)

Estimated bpm: 15.083 (For object at distance = ~ 1.5m), observation time = 120s (approx..)

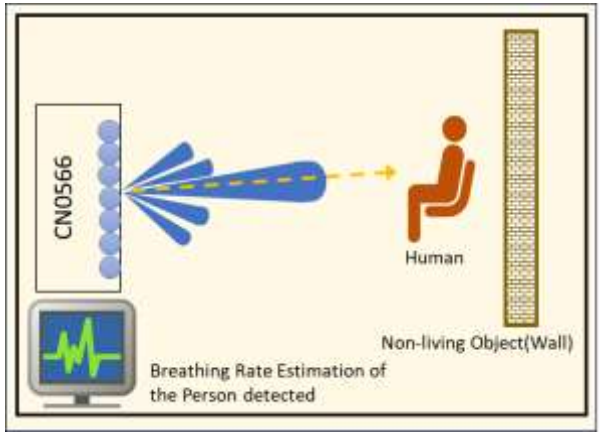


Experimental Results

Subject	Range (meters)	Breathing Rate (beats per minute)	
		Ground Truth	Estimate
Pump	1.0	34.00	33.70
	1.5	25.00	25.86
		28.00	28.04
	2.0	20.00	20.34
		28.00	28.89
	Mean Absolute Error: 0.49 BPM		
Human	2.5	12.87	13.38
		15.12	14.05
	3.0	16.62	16.75
	Mean Absolute Error: 0.57 BPM		

Conclusion & Future Work

We developed a breathing rate estimation module using the ADALM-PHASER (CN0566) Phased Array and validated its performance on both a **digital pump simulator** and **human subjects**.



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The estimated breathing rates were consistently close to the ground truth across different ranges, showing that the system provides reliable and accurate non-contact respiration monitoring.

Future work can extend this framework to enable multi-person breathing rate estimation through range–angle–Doppler processing, as well as living/non-living target classification.

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Thank You!

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Appendix