

# Monitoring human respiration and diagnosing sleep disorders using an infrared gas imaging camera with quantum detector

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The standard method for diagnosing obstructive sleep apnea (OSA), full-night polysomnography (PSG), requires multiple sensors attached to the body, potentially disturbing sleep. Carbon dioxide, at 4% of exhaled airflow, has a distinct infrared absorption wavelength ( $4.26 \mu\text{m}$ ), enabling clearer analysis of breathing and sleep via infrared optical gas imaging [1]. This study aimed to monitor respiration and diagnose sleep disorders using an infrared gas imaging camera with a quantum detector, assessing its suitability for OSA diagnosis. Data from PSG and infrared imaging were collected from 50 volunteers concurrently. Respiratory signals were extracted from infrared images using automated algorithms, and compared with PSG results. Respiratory events detected by infrared imaging strongly correlated with PSG findings. Receiver operating characteristic analysis supported the appropriateness of infrared imaging for OSA diagnosis. It accurately detected sleep-related respiratory events, suggesting its potential as an OSA screening tool.

- [1] Sean M Caples et al, Use of polysomnography and home sleep apnea tests for the longitudinal management of obstructive sleep apnea in adults: an American Academy of Sleep Medicine clinical guidance statement, *J Clin Sleep Med.* 17(6), 1287 (2021)
- [2] V. Romaniello et al A sensitivity study of the  $4.8 \mu\text{m}$  carbon dioxide absorption band in the mwir spectral range, *Remote Sensing.* 12(1), 172 (2020)