1. No.
   2024G040

2. Title
   Dynamic Risk Analysis of Passive Smoking Based on Particle Odor and Human Behavior Monitoring

3. Period
   2024-2025

4. Summary

   The objective of this research was to capture passive smoking risk not as a static average exposure but as a time-varying phenomenon influenced by human presence and staying behavior, and to establish the measurement technologies and analytical framework required for such dynamic evaluation.

   In the first year, foundational work was conducted through the development and basic characterization of first-generation human dynamic sensors that do not acquire personal information, together with a quasi-nanoparticle sensor. Field observations at smoking areas demonstrated the feasibility of simultaneously acquiring human dynamic information and environmental data. However, the results also revealed clear limitations of approaches based solely on signal strength or packet counts in semi-open spaces, identifying the enhancement of human dynamic sensing as a critical technical challenge.

   In the second year, addressing this challenge, a second-generation human dynamic sensing approach based on Channel State Information (CSI) from WiFi communication was investigated. Experimental measurements conducted at smoking areas and in indoor environments confirmed that temporal variations in CSI responded systematically to human presence and absence. These results indicated that human dynamics can be captured using a new physical quantity related to wireless propagation, beyond conventional indicators.

   Through the entire grant period, this research established a measurement and analysis foundation for integrating particles, odor, and human dynamics in the evaluation of time-varying passive smoking risk, and prepared the basis for advancing to the next stage of quantitative assessment.