



Indoor Aerosol Characterization on a Shoestring – Recent Insights from the EDIAQI Project

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Poor indoor air quality (IAQ) poses significant health risks to all, as people spend up to 90% of their time indoors, particularly affecting vulnerable groups such as children. Within the EDIAQI (Evidence Driven Air Quality Improvement) project, exposure to indoor air pollution in households with asthmatic children is being investigated through non-invasive, low-cost sensing approaches. To meet these requirements, TROPOS developed the AQBIE (Air Quality Beacon and Immission Evaluator), a compact, robust, and silent monitoring device designed to unobtrusively integrate into children's bedrooms.

In contrast to commercial air quality monitors, AQBIE integrates three distinct particulate matter (PM) sensors, allowing for improved source classification and size differentiation. With a 10-second time resolution, the system provides detailed insights into dynamic indoor pollution events. Active user interaction supports event labeling, adding valuable context to the sensor data.

During a three-month field campaign in the city of Zagreb (Croatia), 15 AQBIE units operated continuously across households, covering the transition from late summer to the onset of the heating season. Real-time data transmission via a robust and redundant MQTT-based infrastructure enabled permanent monitoring and remote control without on-site intervention, proving to be highly reliable with data coverage vastly exceeding 99%.

AQBIE shows how open-source IoT technologies can serve scientific research while engaging stakeholders and building IAQ awareness in a playful, accessible way. Here we present the device design, data acquisition and data transmission architecture, and preliminary field campaign results. This positions AQBIE as a flexible, low-cost platform for scalable IAQ networks. Ultimately, the collected data will support lung deposition modeling and contribute to the development of health-relevant exposure metrics.

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