Patent (583651): A FOLDED BROADBAND OPTICAL RESONATOR SPECTROMETER FOR TRACE GAS DETECTION WITH HIGH SENSITIVITY AND METHOD THEREOF

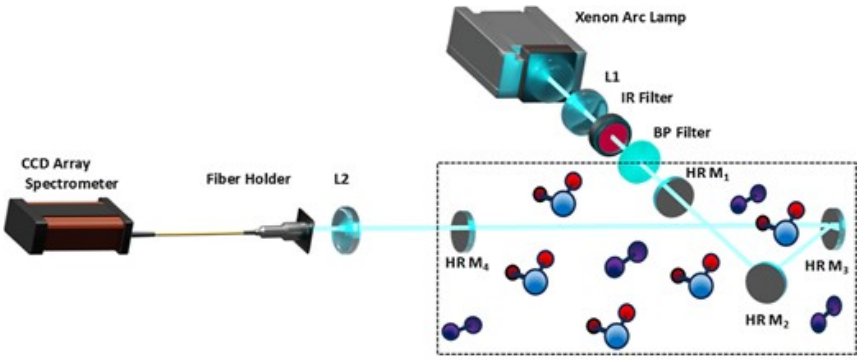
Inventors: Dr. M. K. Ravi Varma, Salma Jose, Keerthana V. A, Adithya Danaj

Also published as:

Salma Jose, *Adithya Danaj*, *Keerthana Varada Anilkumar*, *Ravi Varma* (2026): "A Four-Mirror Incoherent Broadband Cavity-Enhanced Absorption Spectrometer for Trace Gas Detection". *ACS Omega*, 6 October 2026; 11 (39): 59240–59250. https://doi.org/10.1021/acsomega.6c04683

Abstract:

A four-mirror resonator-based incoherent broadband cavity-enhanced absorption spectrometer (IBBCEAS) was demonstrated for the first time for sensitive trace gas detection. The proposed geometry addresses limitations of conventional linear cavities by enabling enhanced alignment flexibility and multiplexed detection through multiple output ports, allowing selective sensitivity optimization for simultaneous multispecies measurements. The optical stability of the cavity is evaluated theoretically based on cavity length and mirror radius of curvature. Owing to its flexibility, stability, and capability for selective sensitivity enhancement, the proposed system is well suited for identifying wide range of gas detection in space-constrained environments. The invention has high commercial potential



Four- Mirror Incoherent Broadband Cavity Enhanced Spectrometer