Paper No.19-0296-O

VEHICLE INTEGRATED NON-DISPERSIVE INFRARED SENSOR SYSTEM FOR PASSIVE BREATH ALCOHOL DETERMINATION

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Abstract

The objective of the present investigation performed within the Driver Alcohol Detection System for Safety (DADSS) program is to demonstrate the effect of further recent improvements of the breath-based nondispersive infrared sensor technology in realistic settings. More specifically, sensor systems installed in vehicles have been tested by: a) exposing them to a controlled, realistic breathing pattern from artificially generated gas pulses mimicking that of an intoxicated driver and b) human subjects entering a test vehicle and performing a simulated drive while under the influence of alcohol. The tests with artificial gas pulses correspond to human directed forced exhalation from positions up 70 cm from the sensor. The tests provide experimental evidence that in-vehicle, driver breath alcohol determination is feasible with a single sensor positioned at the top of the steering column. The human subject study was designed to test both active and passive detection modes. Good correlation to the breath alcohol reference instrument was found in both cases over the full range of alcohol intoxication exceeding 0.08 percent (the legal limit in most U.S. states). Time to detection is a remaining challenge of the passive mode but is manageable by requesting an active breath in the absence of reliable data. The results illustrate the feasibility of using breath-based NDIR based sensors in different operational modes. In the active mode, a simple exhalation directed towards the sensor is enough for a test to be approved and the alcohol content quantified. In the passive mode, the operator does not actively interact with the sensor. In a real-world scenario, sensors set to a passive mode could be used for driver monitoring and to assist the driver to choose a smarter option when alcohol is detected. The overall conclusion from the present investigation is that in-vehicle breath-based alcohol determination is feasible with the current state of the art sensor technology.