

DEVELOPMENT OF REMOTE SENSING INSTRUMENTATION FOR NO_x AND PM EMISSIONS FROM HEAVY-DUTY TRUCKS

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Researchers at Oak Ridge National Laboratory (ORNL) are developing prototype instruments to remotely and non-intrusively measure the NO_x and particulate matter (PM) emissions from heavy trucks. An ultraviolet (UV) absorption method and a modified LIDAR method are being employed to measure NO_x and PM concentrations, respectively, in the exhaust plumes of moving trucks.

To couple the concentration measurements to the truck on a gram-per-mile basis, an innovative approach to determining engine operating conditions with remote sensing is being employed. This is accomplished by using sensitive listening equipment to acquire acoustic signatures as the truck passes.

Acoustic signature analysis will devolve data about the truck's operating parameters, such as engine speed, turbine speed, and number of cylinders. The combined results will be used to make estimates of the instantaneous exhaust flow rate, which, when coupled with the emission concentration measurements, vehicle speed, acceleration, and load, lead to emissions data in terms of grams per mile. These three technologies represent extensions and modifications of existing measurement sciences into this new application, and much of the challenge is the development of algorithms for interpreting data from each.

This effort is part of a larger project concept dealing with truck emissions and their impacts on local air quality. The Watt Road Environmental Laboratory Initiative is a joint effort between ORNL and the University of Tennessee, Knoxville, to develop a field laboratory for comprehensive studies of truck emissions in a 2.5-mile corridor along Interstate 40 in Knox County, Tennessee.