Experimental Investigation of the Transient Transfer Function of Aerosol Measurement Devices

Relevance to the Automotive Industry:	Particle emissions are of serious concern to the automotive industry. Airborne particle emissions from automotive disc brakes is one of the main sources of urban particulate matter, and it has an adverse effect on health. Field measurements of brake particles is complicated, so modeling of the emissions behavior is of interest.
Research Location:	Technische Universität Darmstadt Institute for Automotive Engineering (FDZ)
Homepage (Engl.):	http://www.fzd.tu-darmstadt.de
Faculty Mentor:	Prof. Dr.rer.nat. Hermann Winner
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Graduate Mentor:	Hartmut Niemann, M.Sc.
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Project Description: Jun 05 - Aug 10, 2018 (10 weeks, 40 h/week)	The Technische Universität Darmstadt Institute for Automotive Engineering (FZD) is cooperating with an industrial partner to study brake particle emissions of passenger car disc brakes. For the experimental modeling of the emissions behavior, it is important to identify the transient transfer function of the aerosol measurement devices used. This NSF REU project will engage three (3) NSF REU students, and it will be concerned with (A) the design, fabrication, and assembly of a test rig that generates particle step signals; and (B) with the subsequent experimental investigation of the transient transfer function for the various aerosol measurement devices used. **PHASE A** (2 weeks): During this introduction phase, the NSF REU students will familiarize themselves with particle emissions from passenger car disc brakes, aerosol measurements, and system identification with test signals; and detail and distribute project responsibilities. **PHASE B** (4 weeks): Next, the students will systematically generate, screen, and select the best solution for a test rig that generates particle step signals; develop CAD models and manufacturing documents; and then fabricate, test, and validate the individual components before assembling test rig. **PHASE C** (2 weeks): The students will then verify test rig operations and validate it using a set of appropriate test scenarios. **PHASE D** (2 weeks): Finally, the NSF REU students will document the research performed, prepare a written report, and deliver an end-of-summer presentation on the research performed.
Target publications:	• EuroBrake 2019
Necessary Skills/ Knowledge:	• Experience with MATLAB • Experience with Programming / Microcontrollers
Desirable Skills/ Knowledge:	• Experiences with measurement devices
Additional Online Resource(s):	

NSF REU Students must have completed at least two semesters of engineering studies prior to the proposed summer research, and they must have at least one semester remaining before they can earn their BS in Engineering.