**Flow Measurement Capabilities of NIST’s**

**Scale Model Smokestack Simulator (SMSS)**

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Abstract

NIST designed and built a Scale-Model Smokestack Simulator (SMSS) to quantify the uncertainty of industrial-scale smokestack flow measurements, and to establish a calibration platform to tie power plant emissions to the SI unit of flow. The SMSS establishes smokestack-like flow conditions (i.e., swirling asymmetric flow) in a downstream 1.2 m (4 ft) test section. These adverse flow conditions exist in power plant smokestacks where they degrade the ability to accurately measure the flow rate of hazardous emissions. We will use the SMSS 1) to compare the performance of single path and dual crossing path ultrasonic flow monitors commonly used to report stack emissions and 2) to assess the accuracy of the S-probe pitot traverse methods used to calibrate these meters. We evaluate the performance of 1) and 2) against an SI traceable reference standard installed upstream where the flow profile is symmetric and swirl is negligible. This manuscript describes the SMSS design, documents the prominent flow features (turbulence intensity, flow profile, swirl levels, etc.) in the test section, and gives the uncertainty of the SMSS facility.