

Abstract Submitted
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Investigation of Turbulent Wall Pressure Fluctuations over a wide Reynolds Number Range of Turbulent Pipe Flows¹ IAN COOK, Cornell Univ, WILLIAM KEITH, ALIA FOLEY, KIMBERLY CIPOLLA, NAVSEA Newport — The flow noise induced by turbulent wall pressure fluctuations under a moderate to high Reynolds number turbulent boundary layer constitutes a primary limitation on acoustic array performance. The widest and highest ranges of the Reynolds numbers of interest are most easily achieved in pipe flow configurations. It is therefore of interest to investigate the turbulent boundary layers which are generated on a pipe wall to assess if this class of flows can sufficiently replicate the turbulent boundary layers to which an acoustic array is exposed. Turbulent wall pressure fluctuations were measured under the aqueous turbulent boundary layer in a 3.5-inch diameter circular pipe. A linear array of small diameter wall pressure sensors flush mounted in the pipe wall recorded wall pressure fluctuations for a range of centerline flow velocities. These data were used to perform spectral analysis of the turbulent energy in the flow. Reynolds number effects were explored and comparisons were made with wall pressure fluctuations under flat plate turbulent boundary layers.

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