

# **The Rough Wall High Reynolds Number Turbulent Boundary Layer Surface Pressure Spectrum**

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Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University in  
partial fulfillment of the requirements for the degree of

Master of Science  
in  
Aerospace Engineering

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Blacksburg, Virginia

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fluctuations

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**Figure 4:** The Virginia Tech Stability Wind Tunnel (figure courtesy of AOE Department) shown with the full anechoic configuration, and its modification to the hemi-anechoic test section used for this investigation.

Figure adapted from facility website, courtesy of AOE department:

<http://www.aoe.vt.edu/research/facilities/stabilitytunnel/description-stabilitytunnel.html>

Figure also adapted from Figure 1 in:

Devenport, W. J., R. Burdisso, A. Borgoltz, R. Patricio, and M. Barone. "Aerodynamic and Acoustic Corrections for a Kevlar-Walled Anechoic Wind Tunnel." 16<sup>th</sup> AIAA/CEAS Aeroacoustics Conference. Stockholm, Sweden, June 7 - 9, 2010. AIAA - 2010 - 3749

and from Figure 2.2 in:

Forest, J., 2012, "The Wall Pressure Spectrum of High Reynolds Number Rough-Wall Turbulent Boundary Layer", M.S. Thesis, Aerospace and Ocean Engineering Department, Virginia Tech.

**Figure 7:** General test section configuration and coordinate system where the  $x$ ,  $y$ , and  $z$  coordinates correspond to the streamwise, spanwise, and wall normal coordinate. The origin of which is located at the primary trip at the centerline and flush with the testing surface.

Figure adapted from Figure 2.7 in:

Forest, J., 2012, "The Wall Pressure Spectrum of High Reynolds Number Rough-Wall Turbulent Boundary Layer", M.S. Thesis, Aerospace and Ocean Engineering Department, Virginia Tech.

## Written permission documentation for Figure 4:

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Dr. Devenport,

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<http://www.aoe.vt.edu/research/facilities/stabilitytunnel/description-stabilitytunnel.html>

-Acoustic test section schematic from Figure 1 in Devenport, W. J., R. Burdisso, A. Borgoltz, R. Patricio, and M. Barone. "Aerodynamic and Acoustic Corrections for a Kevlar-Walled Anechoic Wind Tunnel." 16th AIAA/CEAS Aeroacoustics Conference. Stockholm, Sweden, June 7-9, 2010. AIAA-2010-3749.

Thanks,  
-Tim

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May I have permission to use an adapted version of the following figures in my thesis?

- Figure 2.2: Schematic of Virginia Tech Stability Tunnel Anechoic test section with adjoining anechoic chambers. (Left) Typical anechoic test section setup (Right) Modifications made to accommodate false wall. Figure adapted from Devenport et al (2010)  
from Forest, J., 2012, "The Wall Pressure Spectrum of High Reynolds Number Rough-Wall Turbulent Boundary Layer", M.S. Thesis, Aerospace and Ocean Engineering Department, Virginia Tech.

- Figure 2.7. General tunnel setup diagram from Forest, J., 2012, "The Wall Pressure Spectrum of High Reynolds Number Rough-Wall Turbulent Boundary Layer", M.S. Thesis, Aerospace and Ocean Engineering Department, Virginia Tech.

Thanks,  
Tim Meyers

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