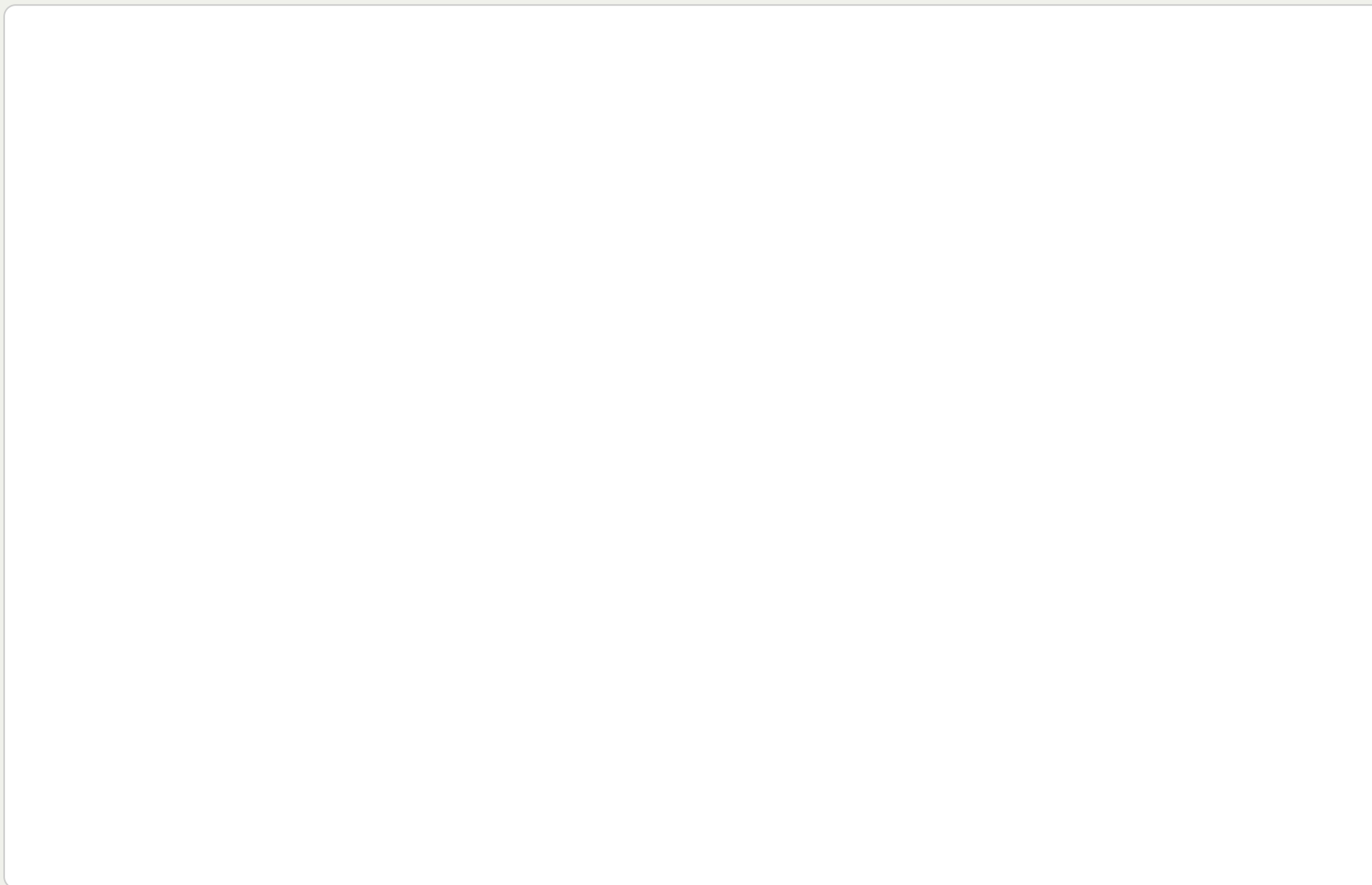


Multichamber Muffler System

Michael Raba, MSc Candidate at University of Kentucky

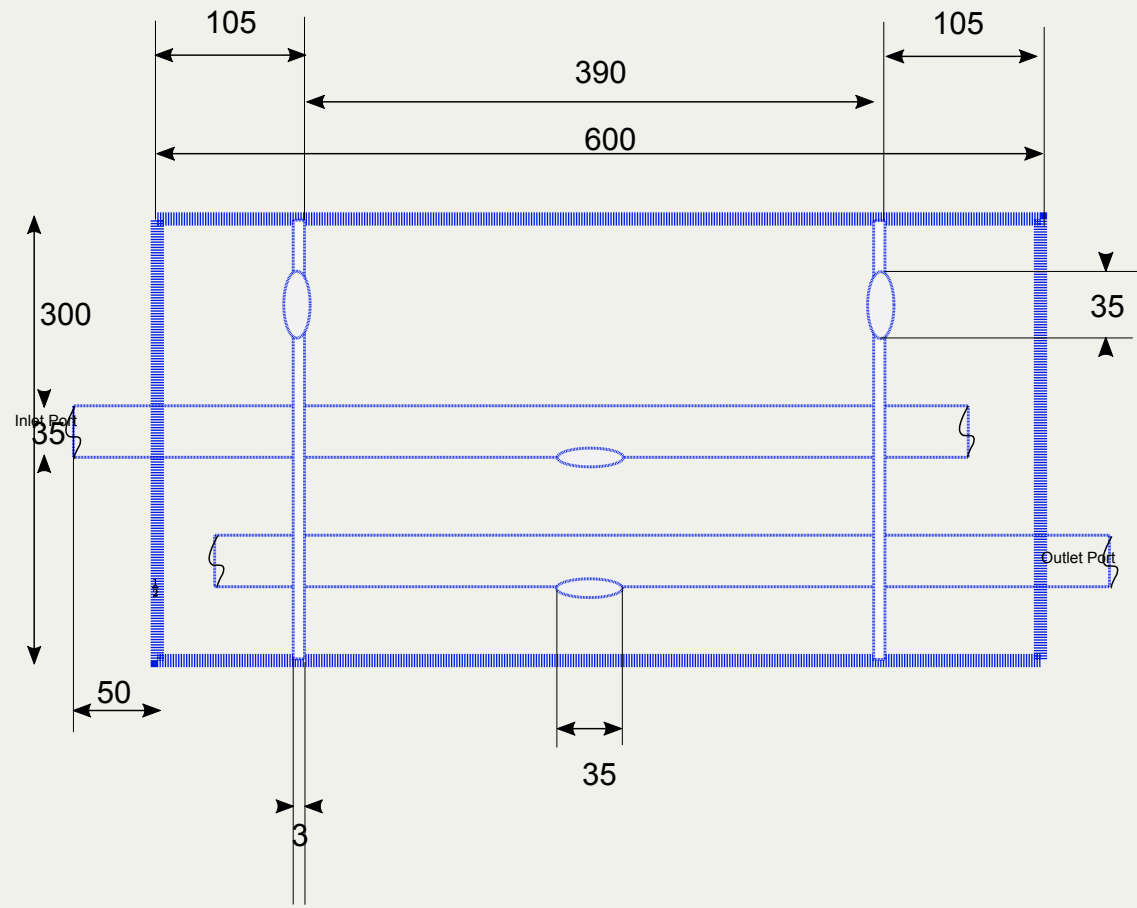
Created: 2025-09-15 Mon 14:27

Multicomponent Muffler Internal Geometry

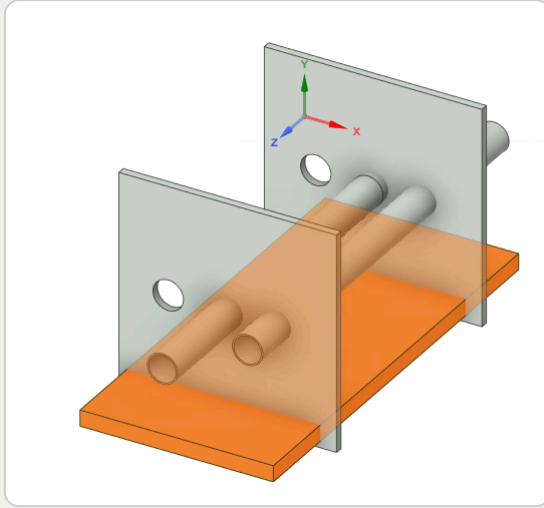


Dimensions

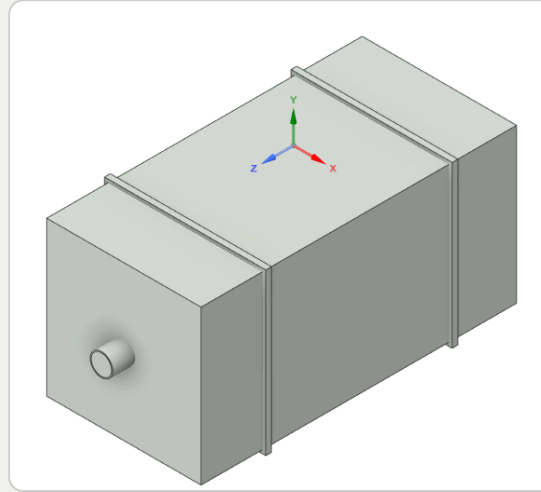
dimensional units in mm



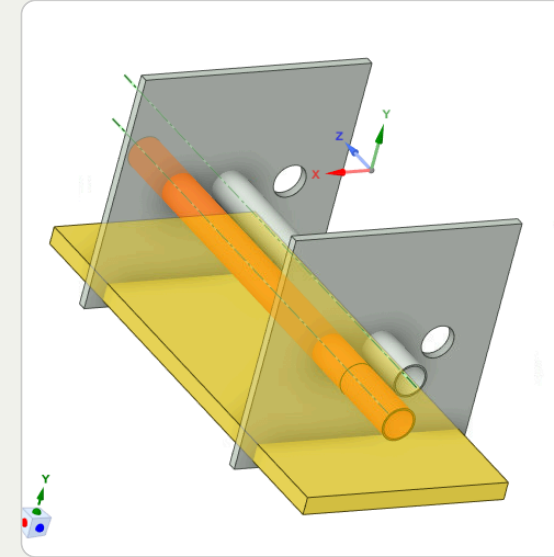
Schematic Variants for Muffler Subcomponents



Part 1 — Chamber and Baffle

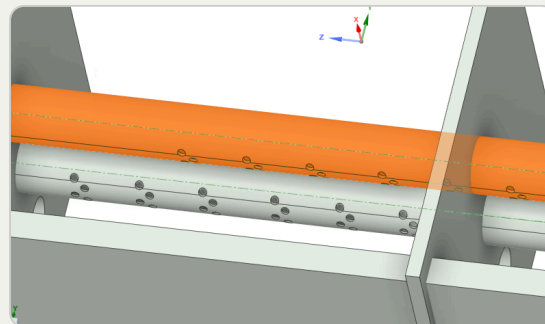


Part 2 — Fluid domain

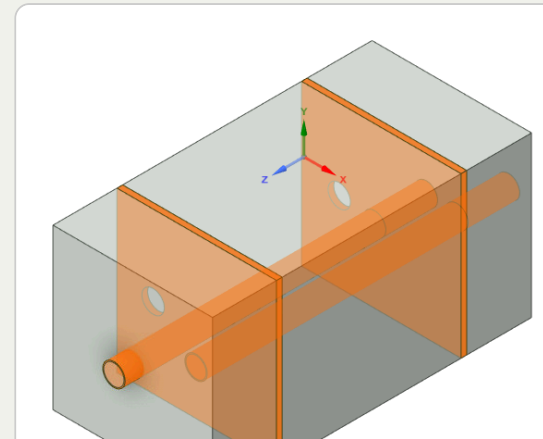


Part 3 — Fiberglass Absorbant (gold)

Part 4 — Showing perforates (aimed at fiberglass)



Part 5 — Final Assembly View



Ansys Simulation

Simulated Transmission Loss (0–1000 Hz) by approximating muffler walls as fluid at 20 deg C

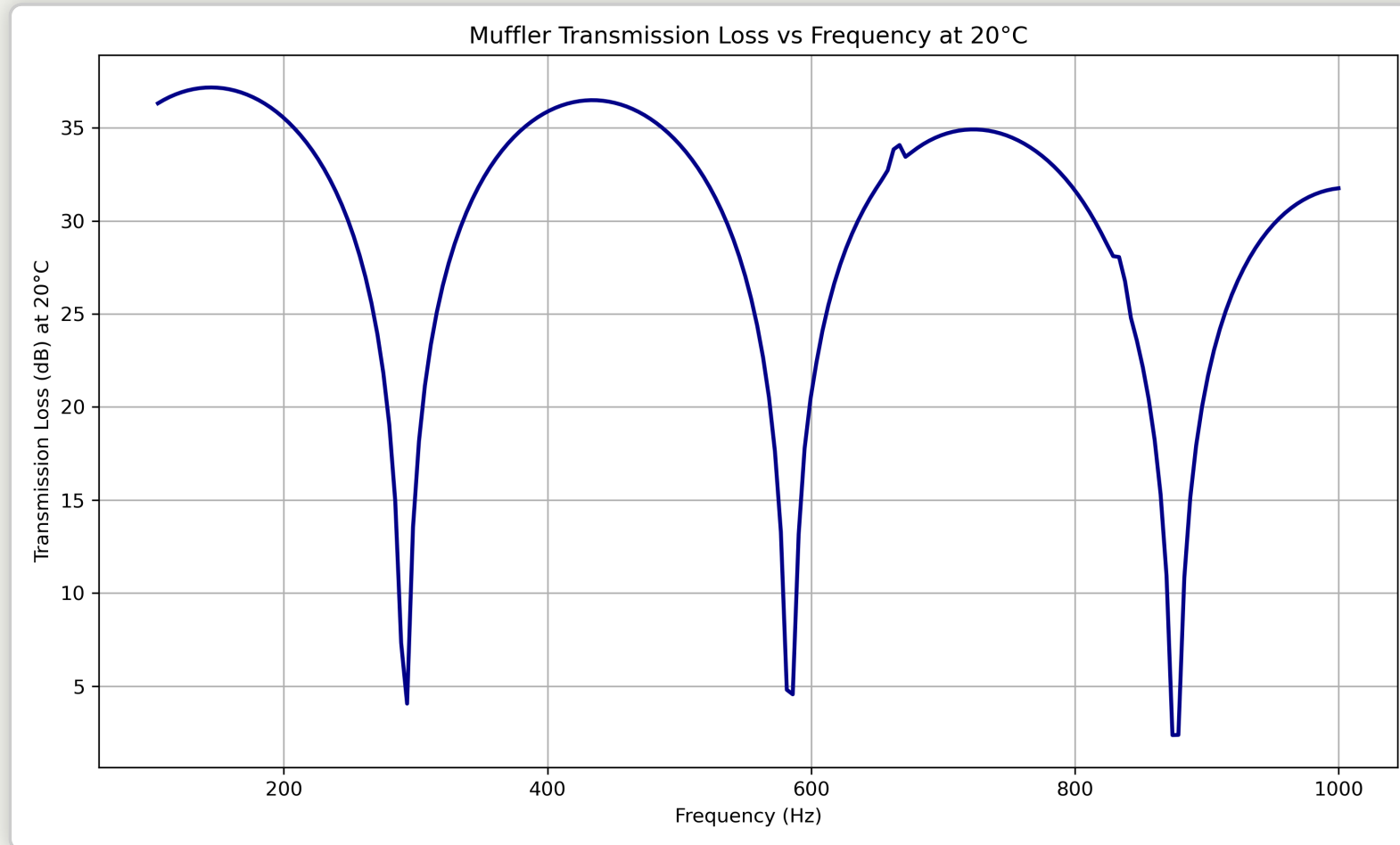
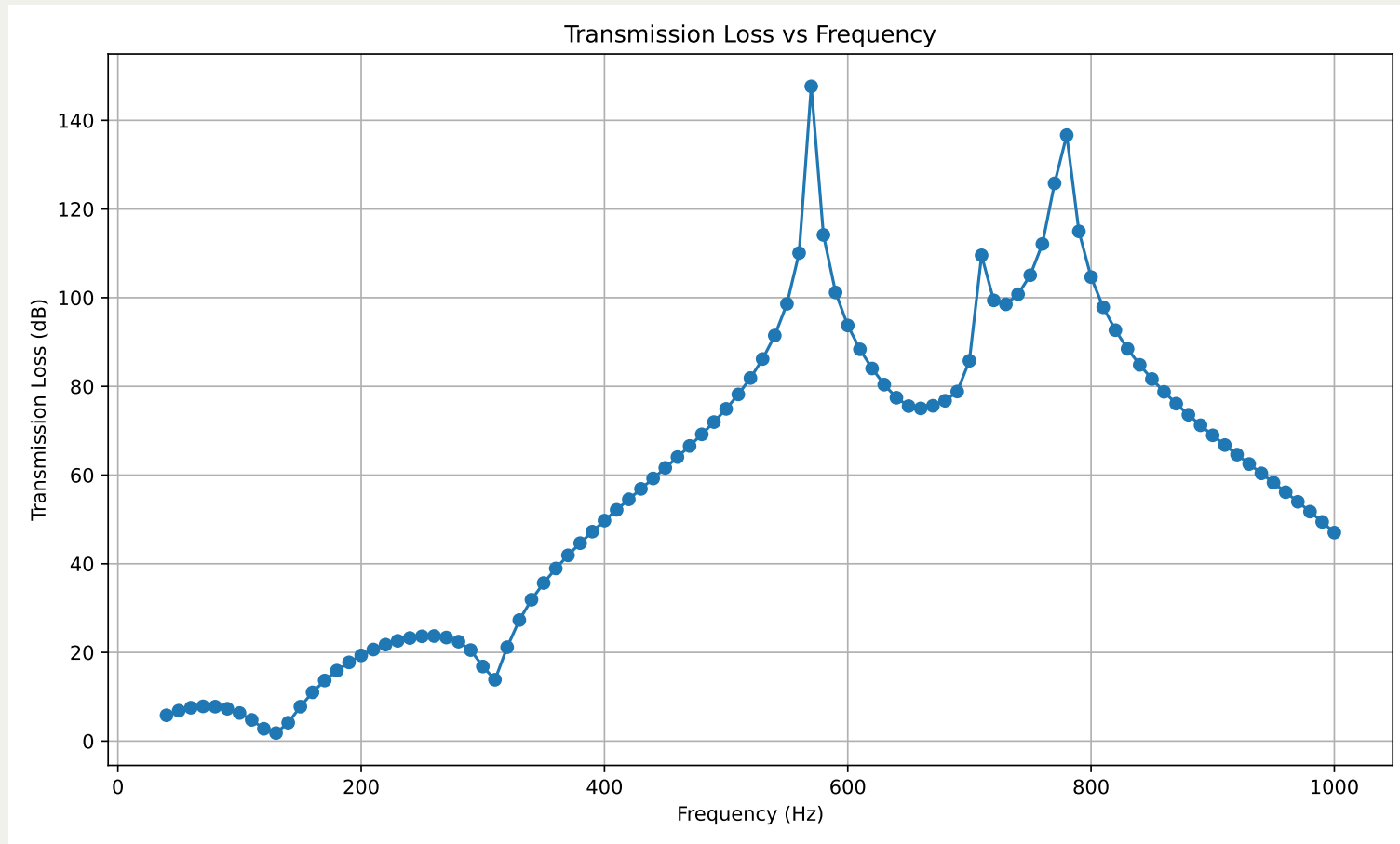


Figure: Transmission Loss curve of the muffler between 5 Hz and 1000 Hz at 20°C.

Simlab Simulation

Simulated Transmission Loss (0–1000 Hz) Simlab model



Sidlab and Ansys File Download Center

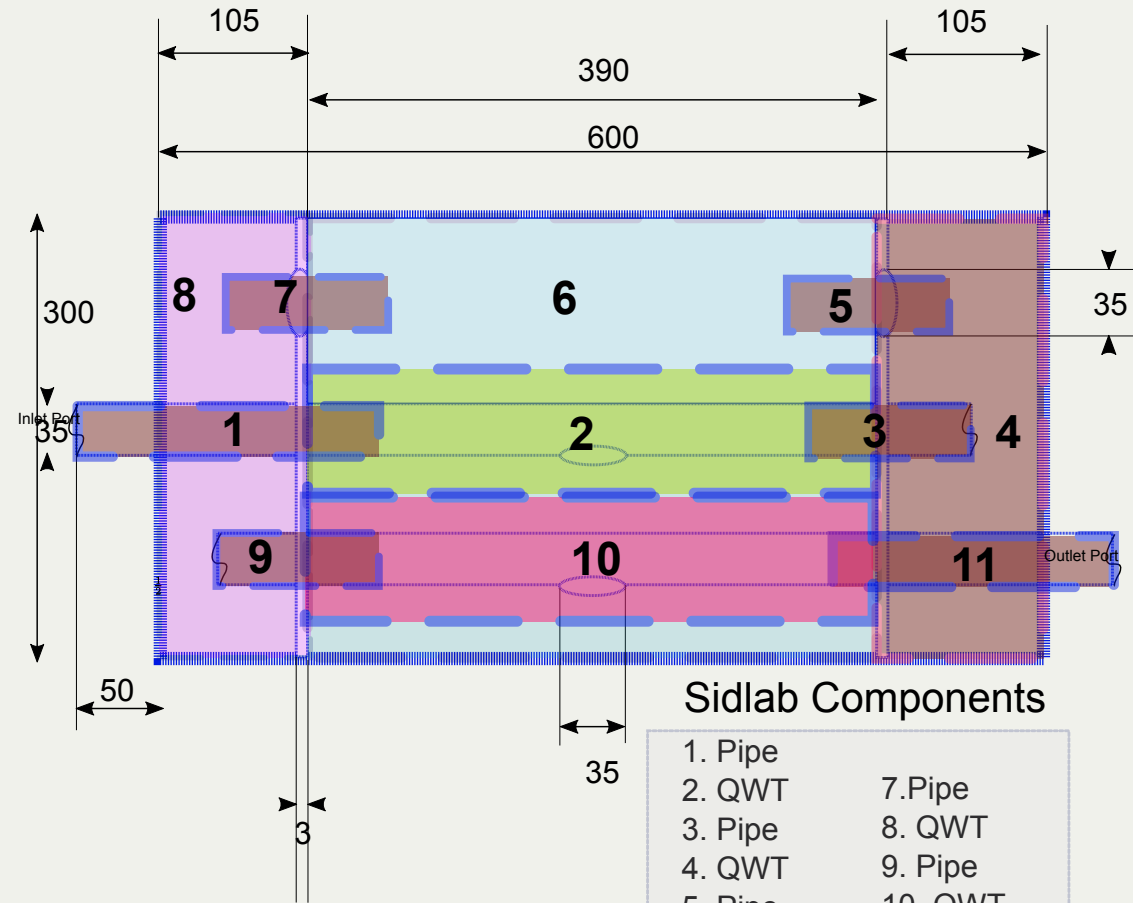
SIDLAB Model

- **File:** Mark3Sid.zip
- **Created with:** SIDLAB 5.1
- [↓ Download SIDLAB File](#)

ANSYS Simulation

- **File:** Mark-I-MDF-cleared-data.wbpz
- **Created with:** ANSYS 2023 R2
- [↓ Download ANSYS File](#)

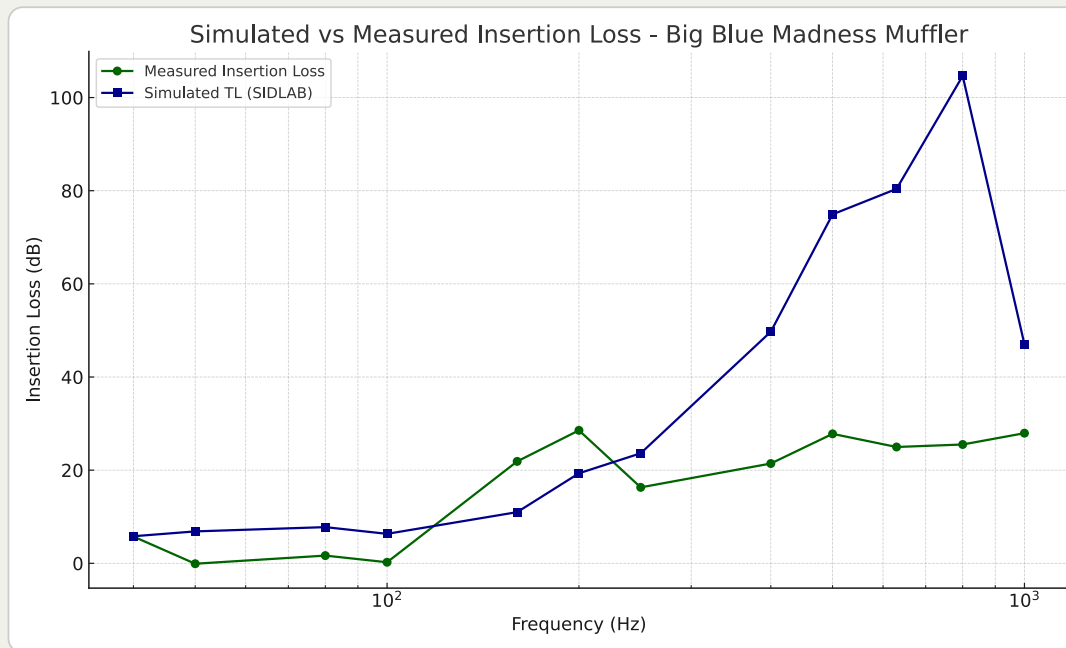
dimensional units in mm



Sidlab Components

Simulated vs Measured Insertion Loss

Measured vs Simulated TL



Insertion Loss Explanation

Insertion Loss (IL) quantifies how much sound is attenuated when a muffler is added to the system.

General formula:

$$IL = 10 \log_{10} \left(\frac{P_{\text{baseline}}}{P_{\text{muffler}}} \right)$$

Because our data is already in decibels (dB), this simplifies to:

$$IL = \text{Power}_{\text{baseline}} (\text{dB}) - \text{Power}_{\text{muffler}} (\text{dB})$$

References

Cited Works

1. Munjal ML. *Acoustics of Ducts and Mufflers*. 2nd ed. Wiley; 2014. ISBN: 9781118443125.
<https://doi.org/10.1002/9781118443125>
2. Dokumacı E. *Duct Acoustics: Fundamentals and Applications to Mufflers and Silencers*. Cambridge University Press; 2021. ISBN: 9781108840750. <https://doi.org/10.1017/9781108840750>

Note: These references are foundational texts in muffler and duct acoustics and were consulted for system modeling, schematic development, and transmission loss analysis.