Transfer Impedance of a Perforate:
# Solved using Domain Decomposition

Extension of the Application Library Model

Background and Motivation

- The Transfer Impedance of a Perforate model exists in its original version in the Application Library of the Acoustics Module. The model can also be downloaded here (in the Application Gallery) along with the model documentation (.pdf file).

- The version transfer_impedance_perforate_withDD. mph shows how the model can be solved using the Domain Decomposition solver. The built-in Iterative Solver Suggestion is enabled and used. The geometry is modified to model a full perforation in order to increase the model size and challenge the solvers.
    - COMSOL blog post: www.comsol.com/blogs/using-the-domain-decomposition-solver-for-thermoviscous-acoustics/

Iterative Solver Suggestions

- When generating the Default Solver for most physics interfaces of the Acoustics Module one or more Iterative Solver Suggestions are generated automatically. These can be enabled when solving large computationally intensive models.

- Expand the Solver Configuration nodes and enable one of the suggestions by clicking on it and pressing F4.
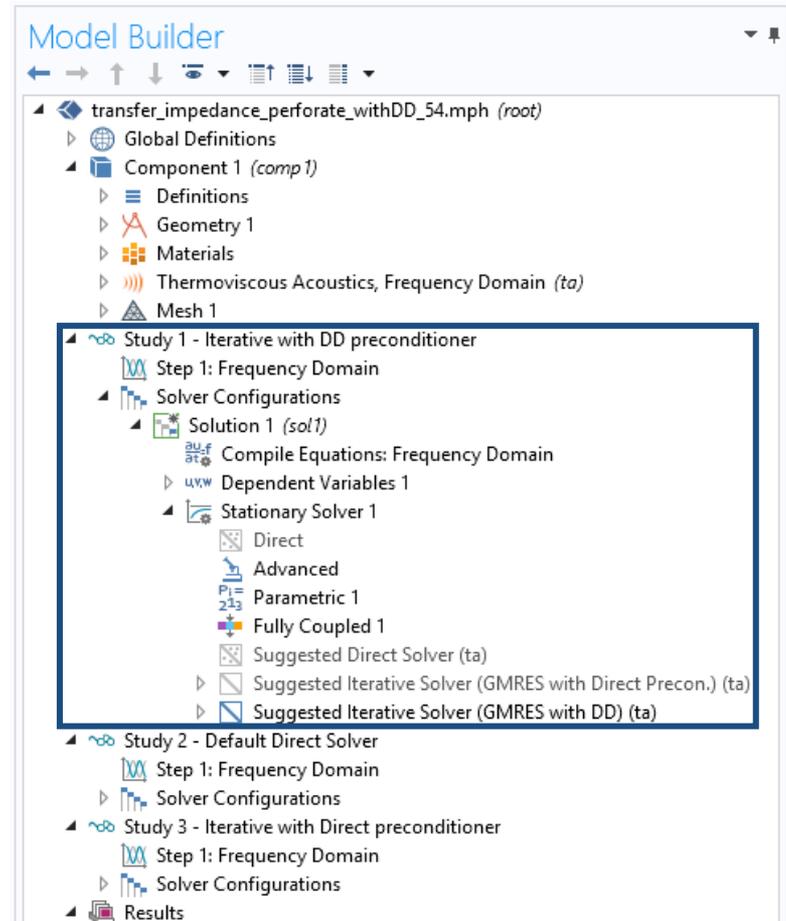
Results

- Results when running the model on a desktop PC with 4 cores and 32 GB RAM. Only solving for a single frequency.

Configuration	Memory	Time
Iterative solver suggestion: GMRES with DD: Recompute and clear subdomain data is set to On (the default). Very memory efficient but slower.	7.8 GB	26min 30s
Default direct solver	24.9 GB	4min 50s
Iterative solver suggestion: GMRES with Direct Preconditioner*	19.6 GB	3min 0s
Modified iterative solver suggestion: GMRES with DD: Recompute and clear subdomain data is set to Off	22.8 GB	2min 36s

- * This is the iterative solver suggestion used in the original Application Library model. This method is scaling less well than the DD for even larger problems.

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References

- COMSOL Multiphysics documentation
  - COMSOL Multiphysics Reference Manual, under the Studies and solvers section
  - Acoustic Modules User's Guide, under the Modeling with Thermoviscous Acoustics section

- COMSOL blog posts (www.comsol.com/blogs)
  - www.comsol.com/blogs/using-the-domain-decomposition-solver-in-comsol-multiphysics/

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