

UKMMN Case Study: Acoustic metamaterials for low-frequency tonal noise reduction in aircraft cabins – Felix Langfeldt (University of Southampton)

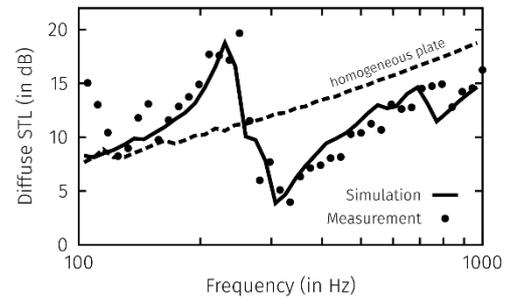
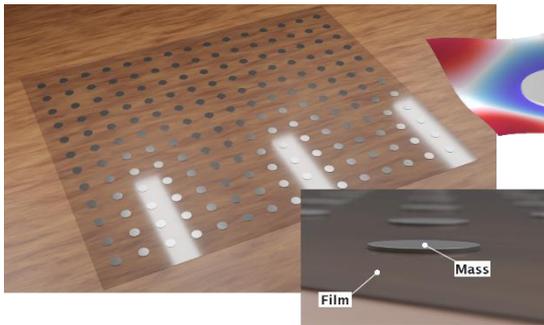
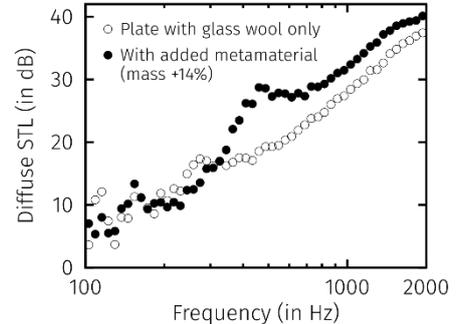
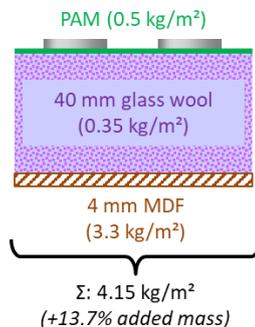
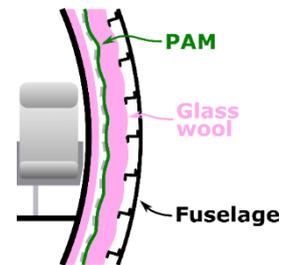


Plate-type acoustic metamaterials (PAM) consist of thin plates or films with periodically attached masses. They exhibit tuneable anti-resonance frequencies at which the sound transmission loss (STL) can be much higher than compared to a homogeneous plate with the same weight.

Low-frequency tonal noise is an issue that is becoming increasingly important in many areas, for example in future aircraft technologies that use large diameter turbofan or open rotor engines, which are more fuel-efficient but generate low-frequency tonal noise. PAM can be tuned to target the tonal frequencies and they are thin and lightweight, so they could be easily integrated into the aircraft cabin side wall to reduce the interior noise.



Diffuse STL measurements of a 1.2 m² large test sample, consisting of a MDF plate (representing the fuselage), a 40 mm thick layer of aircraft grade glass wool, and an added PAM layer were performed in the laboratory. Measurement results indicate up to almost +10 dB improvement of the STL, even though the PAM increases the total mass by less than 15%.

This work has been performed under the framework of the German-Canadian joint research project New Acoustic Insulation Metamaterial Technology for Aerospace (NAIMMTA), funded by the Federal Ministry of Education and Research (Grant No. 03INT504AB).

Relevant references:

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