# ACOUSTICS2008/383
# Absorption and dispersion of acoustical waves in synthetic and natural compressed fibrous materials

Bernard Castagnede, Bruno Brouard, Claude Depollier, Olivier Dazel and Denis Lafarge
Laboratoire d'Acoustique de l'Université du Maine, Avenue Olivier Messiaen, 72085 Le Mans, France

When a fibrous slab is compressed along its thickness, there are some changes in the basic physical parameters which describe the propagation of sound waves. For instance during compression, the acoustical resistivity and the tortuosity increase, while at the same time the porosity as well as the viscous and thermal characteristic lengths diminish. For a 1-D compression along the thickness of the porous layer, these changes are decribed by straightforward linear equations, as long as the compression ratio is kept small (e.g. between 1 and 5). Such simple expressions are derived theoretically on the base of conservation principles relying on some fundamental metrology indicators. Next, the influence of these changes on the 5 fundamental physical properties of any porous networks are studied numerically on the dispersion and attenuation curves versus frequency, in the frame of the "equivalent-fluid" model [4]. Finally, experiments are performed in order to check some of these predictions on various felt fibrous materials having different compression ratio.