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Statistical energy analysis limits for acoustic radiation car: an alternative approach

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Due to a new pass-by noise regulation, Vehicle exterior noise will have to be reduced in the fore coming years. This may be achieved by optimizing underbody and underhood absorption and screening apertures. There is then a need for numerical techniques able to predict sound reduction related to acoustic absorption and transmission loss changes. Through a work supported by ADEME and headed by PSA, energy-based predictive techniques such as Analytical Statistical Energy Analysis (ASEA) and discretized Energy Flow Analysis (DEFA) were tested against the actual physical problem to be solved through a series of benchmarks. Both theories are compared across several simple acoustic problems. It is concluded that both methods do not fit to the initial acoustic optimization requirement due to their intrinsic assumptions that restrict their applicative range. More fitted numerical techniques are now investigated: among new candidates, the Virtual SEA (VSEA) technique that allows the creation of a numerical model of coupled acoustic cavities from the finite element global modes without the serious limitations of ASEA and a matrix approach based on Craigh-Bampton substructuration of the cavities.