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# The intensity in a reverberant field as an acoustic energy-density gradient

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The classical assumption for diffuse reverberant sound fields is that the acoustic energy flow at any location in a room – i.e., the acoustic intensity – is null. For rooms with disproportionate dimensions and/or uneven absorption distributions, this assumption no longer holds. Over the past few years, a room-acoustic diffusion model has been developed that can be seen as an extension of the statistical theory to non-diffuse sound fields. This work investigates the basic gradient-equation underlying this diffusion theory: it states that the energy-flow vector is proportional to both the gradient of the acoustic energy density, and to the room diffusion constant. The gradient equation for the acoustic intensity is confirmed numerically by comparison with calculations of the intensity vector using a particle-tracing model and a ray-tracing model. Examples are presented for a room with a diffuse sound field, and for elongated rooms where the sound field is strongly non-diffuse, in the case of both diffuse and specular reflections.