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**Loudness of impulsive sounds as a function of duration: a  
parametric study of the effect of level and frequency**

Sabine Meunier and Guy Rabau  
CNRS-LMA, 31, chemin Joseph Aiguier, 13402 Marseille, France

Loudness of brief signals increases when signal duration increases up to about 100 ms, this increase is called temporal summation. The question examined in this study is to determine how loudness change as a function of duration. Literature shows different results that lead to different conclusions: when duration increases (i) the loudness increases in direct proportion to energy (intensity x duration); (ii) the loudness increases faster than energy; (iii) the loudness increases slower than energy. We have shown, in previous experiments, that loudness change with duration can follow either (i) or (ii) depending on signal level. The present study provides a parametric examination of this question. Loudness was measured for signals whose energy was kept constant while the duration was varied. The parameters of the experiment were the signal frequency and level. The results allow to explain part of the discrepancies found in literature. Moreover, the results of this study are used into a model of impulsive sounds that calculate with a good precision the loudness of environmental short-duration sounds.