PHYSICS

What is the relationship between the velocity of an object and its Sound Intensity Level in an inelastic collision?

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Assuming the mass, acceleration, and height of the dropped object are constant and the area of the measured sound wave is constant, would the relation be linear, exponential, logarithmic, square root or other?

I'm going into year 2 physics in high school so I have yet to learn anything about any wave energy. While I will be conducting an experiment like this in a month or so by essentially dropping a steel ball onto a steel plate from various heights and measuring the SIL using a sound level meter, I also need to validate or disprove my results logically beforehand for a paper.

I know that if you say doubled the velocity, the resulting kinetic energy would quadruple; would that apply to the amplitude/sound energy as well? From what I have researched, the intensity of a sound wave is measured by power/ area or energy/ (time* area) whereby you can calculate the SIL in decibels by 10* log(I/ 10^-12 Watts/Meters^2); so if the sound intensity would as a result be squared due to the velocity say doubling, when inputted in the log, would the SIL appear as a linear relation to the velocity of the object?

I don't know how to proceed or if I'm leaving any major factors out when thinking about this (like if the material of the object and/or the ground is also relevant when thinking about this), but I thought I would turn here for any help.

[energy]   [waves]   [acoustics]   [velocity]

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asked Aug 15, 2015 at 1:08

Winston
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Bear in mind that not all kinetic energy from the falling ball will be converted to sound energy because your ball is likely to rebound when hitting the plate. For example, if the ball bounces back to, say 50 %, of the height from which it was dropped then the ball has only lost 50 % of its Kinetic Energy during the collision with the plate. You need to construct an energy conservation equation to try and estimate how much of the ball's Kinetic Energy will be converted to sound energy. – Gert Aug 15, 2015 at 2:11

I see your question actually specifies an 'inelastic collision' but a collision between a steel ball and a steel plate will always be elastic to some extent. – Gert Aug 15, 2015 at 2:20