

Re: The sound of a laser.

Source: <http://sci.tech-archive.net/Archive/sci.optics/2004-08/0356.html>

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Date: 08/20/04

Date: Fri, 20 Aug 2004 01:42:07 -0400

"David Prokopetz" <sirbob@penguinking.com> wrote in message
news:2ol510Fbmdq4U1@uni-berlin.de...

> *Hi.*

>

> *Physics newbie question here: what does a laser sound like?*

It sounds like Zen to me...

:-P

> *Some sources*

> *I've read claim that a sufficiently powerful laser would ionise the air*

> *along its path*

True. If the electrons in the "air" atoms are able to absorb light energy of the particular wavelength, the atoms/molecules can ionize. If enough of them do it, then the gas in the path of the laser will expand thermally and produce a pressure wave (a "pop") as the system of light-atoms/molecules-ions-electrons approaches thermal equilibrium.

> *and produce a "crackle" or "pop" noise, while others claim*

> *that regardless of power, a laser has to be of a particular colour to ionise*

> *the air and thus produce a sound*

Also true. Each type of atoms/molecule (nitrogen, oxygen, argon, carbon dioxide, etc) absorbs different wavelength. A vacuum absorbs nothing at all.

Unfiltered air can also contain dust particles of indeterminate composition which may absorb or scatter the light as they drift into a continuous beam. This *could* give rise to a crackling sound.

> *- but fail to mention what that colour is.*

Sort of depends on what the exact composition of your "air" is, doesn't it. Unlike natural air, synthetic air contains no argon, water vapor, carbon dioxide, methane, helium, or trace gases. The wavelengths absorbed by these

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species are less likely to be absorbed in synthetic air.

> *Is any of this information accurate?*

In the sense of being qualitatively correct, yes.

"Accurate" is a term usually reserved in the empirical sciences for measurements/predictions that are within predetermined limits of precision established by analysis of the data and techniques used to perform measurements.

> *As a follow-up question, if a laser actually can make noise, is there an
> easy way to derive an approximate relationship between how powerful the
> laser is and how loud it is?*

Yes. Empirically would be easiest and most reliable.

Make repeatable measurements under the actual operational parameters of interest. Control the power/time curve of the laser, the composition and temperature and pressure of the gas, the environmental noise, and the distance/sensitivity of the audio transducers ("microphones") from the beam.

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