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Subject: sensitivity: conversion of units

Posted by [Floyd Andrews](#) on Wed, 08 Jun 2005 16:32:25 GMT

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Can anyone tell me how to convert the sensitivity of a speaker that is expressed as a percentage to db/watt or db/2.83volts?

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Subject: Re: sensitivity: conversion of units

Posted by [Earl Geddes](#) on Wed, 08 Jun 2005 16:49:52 GMT

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I can tell you how, but I don't have time to work out the details. The % times the input watts tells you the watts radiated as sound. At one meter these watts would cover an area of  $4/3 \pi R^3$ . The radiated watts are "proportional to"  $\text{Pressure}^2/\text{unit area}$ , with the area of the sphere as noted. So multiply the radiated watts by the area of a sphere at 1 meter and you have  $\text{pressure}^2$  (within some constants). From this you can get the dB with a log and some more constants. You can look up the constants.

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Subject: Re: sensitivity: conversion of units

Posted by [GM](#) on Wed, 08 Jun 2005 18:31:18 GMT

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Greetings! I've seen various values used for half space pressure, from 112 -112.2 dB/m, though 112 seems to be the most common. FWIW, I calc'd it at 112.018, so rounding it off to 112 and 1 % eff.....  $\text{dBv} = \sim 112 + 10 * (\log_{10}(0.01)) = \sim 92 \text{ dB} / \sim 2.828 \text{ V/m}$  Since  $1 \text{ W} = E^2/R = \sim 2.828^2/8 = 1$ , then  $\text{dBa} = \sim 92 \text{ dB/W/m}$  for 8 ohm nominal loads. To convert other nominal resistances (R) to dBa, add  $10 * \log_{10}(R/8)$  to the dBv, so if the above is a nominal 4 or 16 ohms, then  $\text{dBa} = \sim 89$  or  $95 \text{ dB/W/m}$ . GM

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Subject: Re: sensitivity: conversion of units

Posted by [Earl Geddes](#) on Thu, 09 Jun 2005 19:34:35 GMT

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How did you get the 112 dB? That's nice to know. I think that 1/2 space is incorrect since sensitivity is usually an anechoic measurement which is full space. The correction for speaker impedance is hardly ever used.

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Subject: Re: sensitivity: conversion of units  
Posted by [GM](#) on Fri, 10 Jun 2005 13:44:50 GMT  
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Greetings!??  $120 + (10 * \text{LOG}_{10}(1/\text{'space'}))$ , where 'space' in this case is  $(2 * \pi)$ , or half space. GM

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Subject: Re: sensitivity: conversion of units  
Posted by [Earl Geddes](#) on Fri, 10 Jun 2005 17:48:44 GMT  
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Ok So where does the 120 come from? This seems too simple to me to be correct. Could you fill in the details?

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Subject: Re: sensitivity: conversion of units  
Posted by [GM](#) on Fri, 10 Jun 2005 21:32:35 GMT  
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Greetings! Fairly simple, or I wouldn't understand it:  $L_w = 10 * \log_{10}(1 W_a / 10^{-12} W) = 120$  where:  $L_w$  = sound power level in dB  $W_a$  = one acoustic watt  $10^{-12} W$  = sound power standard reference for the threshold of hearing GM

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Subject: Re: sensitivity: conversion of units  
Posted by [Earl Geddes](#) on Mon, 13 Jun 2005 16:08:20 GMT  
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I guess it is simpler than I thought at first, but quite obvious now. Thanks

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Subject: Re: sensitivity: conversion of units  
Posted by [Walt](#) on Thu, 23 Jun 2005 19:46:26 GMT  
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Maximum efficiency is 109db fullspace, which translates to 112db halfspace. Best regards, Walt

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