Reverberation Time Calculator - Room Tuning

Moderators: Hyperion, KD

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Reverberation Time Calculator - Room Tuning

by **jo2** » Fri Aug 27, 2004 9:45 am

For all interested in tuning their listening room.

Select appropriate or equivalent materials.

http://www.saecollege.de/reference_mate ... ulator.htm

http://www.mbiproducts.com/room/Calculator.aspx

ENJOY!!

jo2

Citizen

Posts: 465
Joined: Fri Apr 30, 2004 7:59 am

Location: Malapit kina Mang Enteng

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by **Hyperion** » Fri Aug 27, 2004 12:05 pm

jo2,

What would be the desirable RT60 values for a typical listening room?

Hyperion

Moderator

Posts: 1908
Joined: Thu Jan 23, 2003 11:57 pm

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by **jo2** » Fri Aug 27, 2004 2:42 pm

Hyperion

Got no idea!
Based on the table below these values for some reason do not correspond and compliment each other.

Which one is correct? No absolute answer!

But it does give you idea behaviour of materials and its properties and characteristics.

It's like asking me, "what's the best speaker int the world?"

Sorry, not helpful but it helps you get there or close enough to tune those frequencies at a given room dimensions.

RT60 using various formulae

Formula	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz
Sabine	0.45	0.64	0.43	0.32	0.34	0.38
Eyring	0.41	0.59	0.38	0.27	0.30	0.34
Fitzroy 1	0.43	0.66	0.65	0.41	0.51	0.82
Fitzroy 2	0.40	0.69	0.55	0.37	0.42	0.52
Arau	0.42	0.62	0.48	0.32	0.37	0.50
Millington	0.39	0.58	0.32	0.22	0.22	0.24

On axis RT60

using Fitzroy 1	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz
X axis	0.08	0.20	0.25	0.14	0.19	0.43
Y axis	0.11	0.22	0.29	0.19	0.23	0.30
Z axis	0.23	0.23	0.11	0.08	0.08	0.09

Basic differences between the different reverberation time formulae

Sabine Classic reverberation time formula. Assumes an average absorption for all surfaces and a perfectly diffuse sound field.

Eyring Modification to Sabine based on the mean free path and accounting for reflection attenuation within a diffuse field.

Fitzroy 1 Modification to Eyring that accounts for unequal axial absorbancy.

Fitzroy 2 Reinhard Neubauer's modification to Eyring that accounts for an "almost two dimensional" sound field.

Arau Same consideration as Fitzroy, but calculates unequal absorbancy in a different way.

Millington Same consideration as Fitzroy, but accounts for the absorbency of each surface individually

Last edited by jo2 on Sat Aug 28, 2004 4:39 am, edited 1 time in total.

jo2

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by **mozilla** » Fri Aug 27, 2004 4:52 pm

Here's a snip of an email to me by an acoustician when I was asking the same question before:

To analyze a room one must start defining the contents of the room. Some objects and materials are very reflective, like mirrors or ceramic tile. Others are broadband absorbers, like a cloth covered couch, and some are generally reflective but absorb well in a part of the band (1/2” drywall on 16” o.c. 2x4 studs is strongly reflective at middle and high frequencies but absorbs fairly well around 125 Hz). What needs to be done is to take an inventory of all the major contents of the room as planned and count up the Sabin content. Sabins are a unit of measure which expresses the amount of sound energy, for a given range of frequencies, that a material (or in some cases an object) will absorb (vs. reflect). A Sabin number of 1.00 expresses the concept that a square foot of this material is like an open window – it will reflect no sound energy, all will be absorbed. A Sabin number of 0.00 implies that a material will reflect all of the sound energy that strikes it. Sabins are however a simple way of looking at something very complicated, and are not completely accurate – for example the absorption that takes place will depend on the angle that sound wave strikes a sample of a material – take Sabin numbers as a general guide only.

Tables containing Sabin numbers for common materialscan be found on the net, and there are also links to calculator spreadsheets which when properly filled in will provide you with an estimate of the Sabine content and axial modes of any rectangular room. Knowing a room’s volume and its Sabin content it is possible to estimate the rooms reverb time. This estimate is generally expressed as a **room’s RT60 which is short hand for the time in seconds that a sound will take to decay to 60 dB below its initial impulse energy level**. A high RT60 means that sound will bounce around for a long time before it is absorbed. Dead rooms have low RT60’s.

Estimates of this sort are helpful in the design process for many purposes, but the main purpose you should concern yourself with working with these numbers is that of estimating how much absorptive treatment a room will need. Smaller rooms cannot tolerate high RT60’s (long reverb times) without introducing strong colorations to the low frequency part of the reverberant field. Even large rooms will need to limit reverb times in order to be considered good sounding rooms for various purposes. Generally the lower the low frequency energy expected, and the larger the room, the higher the RT60 can/should be.

A 5,000 cubic foot recording room for modern rhythmic music (with oodles of low frequency content) might need to be limited to an average RT60 of .6 seconds, though significantly longer RT60's for the lower end of the spectrum are common and generally considered acceptable (up to an 80% rise over the 1 kHz RT60 for sounds in the 63 Hz band are not considered objectionable by many), so a recording room with a .6 second RT60 at 1 kHz and a 1.1 second RT60 at 60 Hz would be a workable space according to many. This concept tracks the reverberations times one might find in a typical living room, where the RT60 for lower frequencies would be also be significantly greater than that for mid and high frequencies.

mozilla

Moderator

Posts: 2004

Joined: Mon Jan 20, 2003 11:54 am