

Thought the Homebrew crowd would like my little article... so here it is:

Good Day QRP-1'ers!

Well, haven't seen a bunch of formulas so I've gotta come clean with the information I promised!

So for morse code it is desireable to have a speaker with improved response at a certain frequency, hopefully the audible frequency matching a fixed offset RX. Or well within a rig's particular RIT range.

The following was extracted from a April 1983, QST article.

"Electro-Acoustic CW Filter", Adapted from a similar article appearing in Oct. 1980, "Radio Communication (RSGB).

Please look for these for more complete information.

The following is my verbage, and is not intended to be a transcript of aforementioned articles. Rather it is representative of general knowledge obtained from said articles and Radio reference material. Including information used by me, to design resonant mufflers for performance motorcycles. (A past life of mine :).)

Concept:A speaker, mounted to radiate into a closed cylinder of certain dimensions will have improved response at audio frequencies associated with the audio 1/4 wave-length resonance of said closed tube. Peaks will occur at ODD multiples of the First harmonic, or fundamental.

Although I have built and designed an open tubed audio "shotgun Microphone", I will detail only "closed end" resonance formulae.

General formula for the resonator:

$$F = (V / (4 * (\text{length} + .3 * \text{Diameter}))) * \text{SQRT}(1 + \text{Temp_kelvin} / 273)$$

F=1/4 wave audio frequency

V=330 Meters/Second Speed of Sound

length=Tube Length in Meters

Diameter=Tube inner diameter in Meters

Temp_Kelvin= Temperature in units Kelvin.

Simplifying at Temp_kelvin=293 we get:

$$F = 122.4 / (\text{length} + (.3 * \text{Diameter})) \quad \text{Parenthesis for Clarity.}$$

! EXAMPLE 1

So..... I have an empty can of Bugler (tm) tobacco lying around the garage, my speaker fits right on top and can be taped on.

What is the Resonant Frequency?

Measurements of Can:

length= 140 mm or .14 Meters

Diameter= 95 mm or .095 Meters

Note: If you measure in Inches convert directly
to meters: I.E. 3.75 inches * .0254 (Meters/Inch)= .095 Meters.

$$122.4/((.14 + (.3 * .095))) = 726 \text{ Hz} \text{ !!!!!}$$

Success! Just for kicks, take a 3-1/2 inch speaker
and set it in a tube with these dimensions and
you'll notice SIGNIFICANT improvement around 700 Hz.

! EXAMPLE 2

You have a speaker and a Tube. They fit together nicely but
you need to shorten the tube for resonance at 800 Hz.
The Tupe and speaker are 2 inches in Diameter.
What length should the tube be?

Formula: $\text{Freq} = 122.4 / (\text{Length} + (.3 * \text{Diameter}))$

Transposing: $\text{Length} = 122.4 / \text{Freq} - (.3 * \text{Diameter})$

We know that $\text{Freq} = 800$

$\text{Diameter} = 2 \text{ inches} = 2 * .0254 = .0508 \text{ Meters}$

$\text{Length} = 122.4 / 800 - (.3 * .0508)$

ANSWER: .13776 Meters

Converted to inches .13776 / .0254 = 5.42 Inches length of tube.

To go ALL the way: Build a harmonic audio filter
that removes the 3rd and 5th etc. odd harmonics.

The passive harmonic filter design is contained in the article.

Very Important Note:

FINALLY: For real good performance, substitute a
glass or very stiff metal tube. There are a lot
of losses in the flexible sidewall of the Bugler (tm)
can -- which broadens the frequency response too
much.

You can put little holes in the tube near the speaker
end without affecting the performance significantly.

My daily contribution.

Enjoy!!!

-Ed Loranger

--

72/73 de we6w qrp es cw ONLY (From non-ham to extra in one day!)

HW-8;OHR-100, Pixie2, Johnson Viking II w/VFO.

QRP-L#1068/Norcal#2227/ARS#275/ARCI#9397 grid CM88ok

mailto:we6w@qsl.net <http://www.qsl.net/we6w>