Tymphany LAT 700 - Simulated in a Transmission Line speaker

By Bjørn Johannesen, Denmark

Tympany has some very interesting drivers for their OEM market: The LAT product line.

The small outline of the LAT and the lack of vibrations is a gift to the creative designer, looking for new and exiting possibilities.

Unfortunately, I have never seen a LAT. However, I have simulated a design, suitable for the LAT 700 driver. The LAT drivers have T/S same just like any other driver, and software available for speaker design can, of course, be used as usual.

Software used for the simulation herein is the property of Marin J. King http://www.quarter-wave.com/ , and commercial use of the information in this article is not prohibited. The design proposal is owned by Bjørn Johannesen, Denmark.

The design example is based on a Quarter Wave (Transmission Line) design with a coupling changer and a tapered pipe. Please refer to AudioXpress October 2007 for more details about this type of construction. Information can also be found in my article in AudioXpress July 2006.

The design has a folded pipe with the opening next to the driver. The total external size of the cabinet will be e.g. 45 cm x 45 cm x 160 cm, depending on the actual construction.

Tymphany LAT 70 Subwoofer Data

Copied from http://www.tymphany.com/

Electrical Data

Nominal impedance	Zn	4	ohm
DC resistance	Re	3.6	ohm
Voice coil inductance	Le	4	mH

T-S Parameters

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Resonance Frequency	fs	24	Hz
Mechanical Q factor	Qms	3.5	
Electrical Q factor	Qes	0.65	
Total Q factor	Qts	0.55	
Force factor	Bl	18	Tm
Effective piston area	Sd	820	cm^2
Equivalent volume	Vas	110	ltrs

Tuning of the cabinet

The tuning frequency of the cabinet is just below 20 Hz
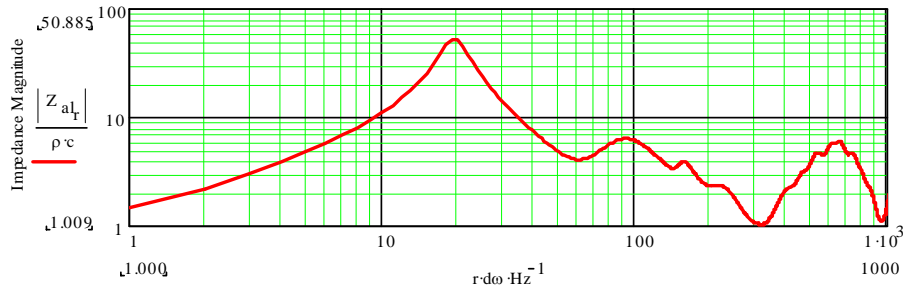
Summed SPL
The solid red line is the summed output from driver and opening. The dotted blue line is the driver in IB (Infinite Baffle). Please note the gentle roll of. A straight line down to 20 Hz is not want we want, as this would cause problems with uneven response due to room gain.

Note that the summed SPL is better than the IB, which is the contribution of the output from the opening.
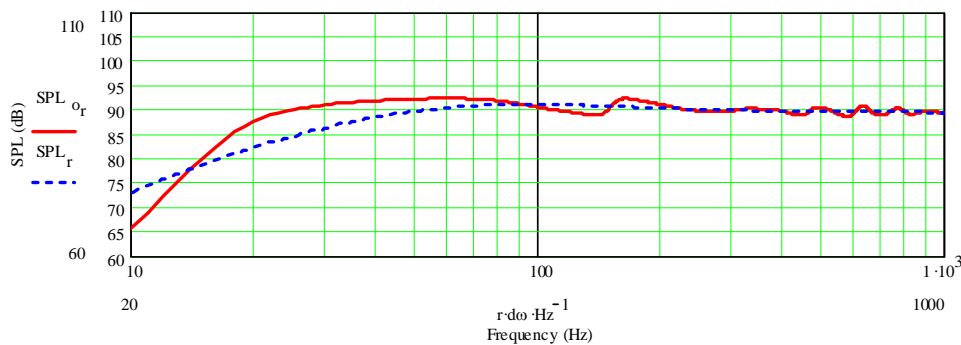

The red solid line below is the driver, and the output from the opening is shown as the blue dotted line.
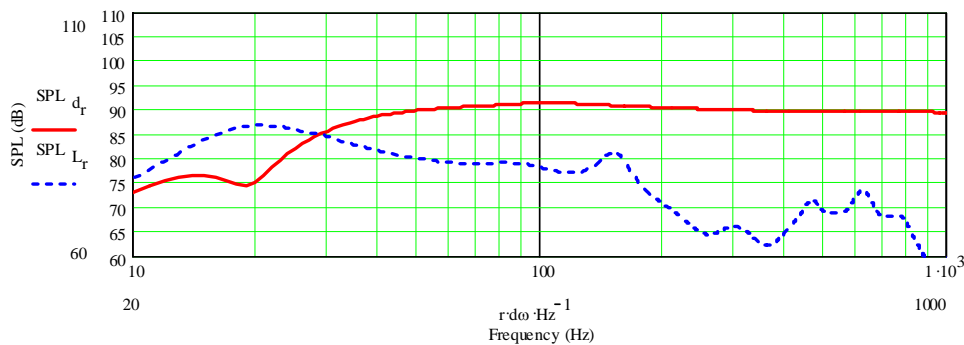
Impedance

Dotted blue line is the impedance of the driver in free air. The solid red line is the same driver in the cabinet. Note that the lower impedance peak at bout 15 Hz is almost completely damped. You don't se the double hump impedance in this Quarter Wave, like you would see in a bass reflex design.
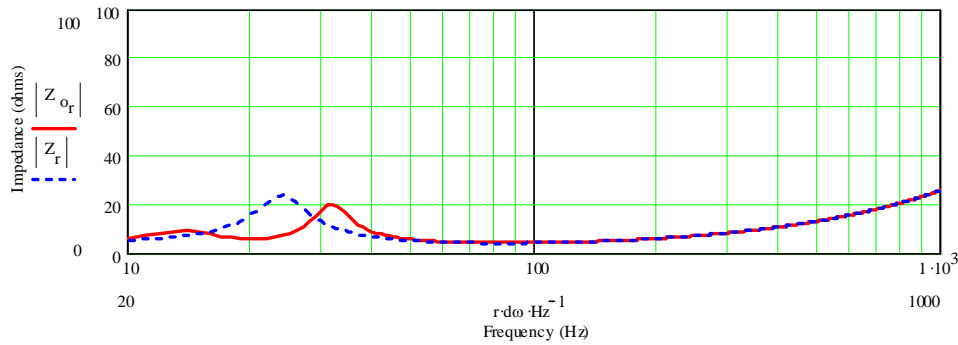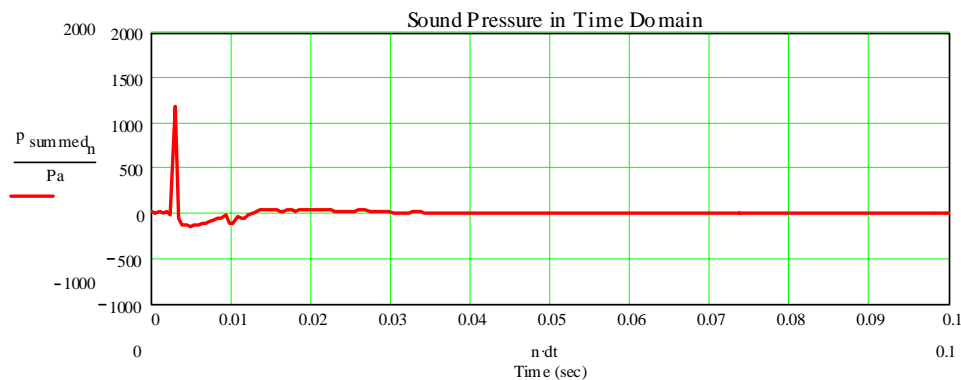

Displacement

The movement of the cone is very well controlled - better than a bass reflex, and almost as good as a closed box.
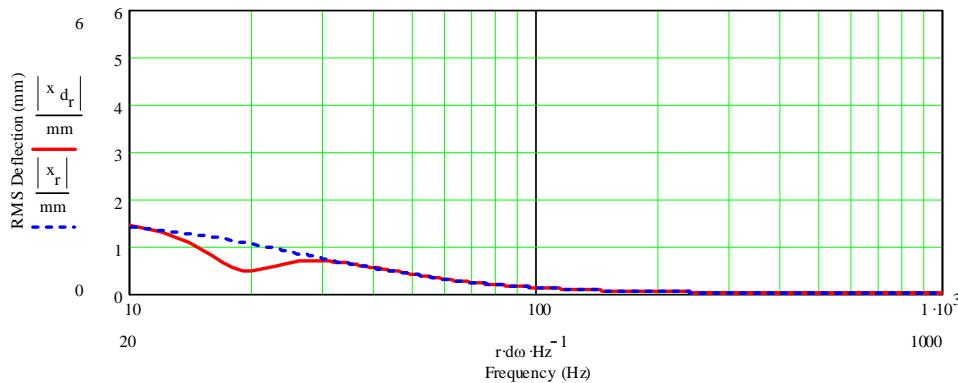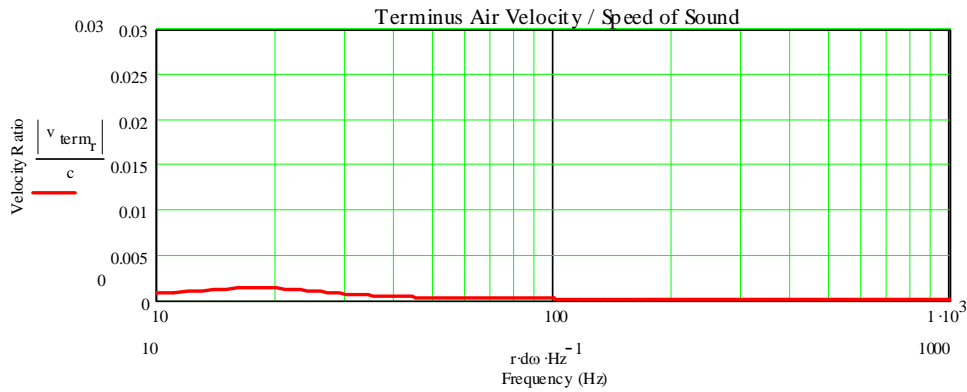

Time response

Terminus Air Velocity

Air Velocity should be lower than 0.03 (10 m/sec), and there is no danger for air turbulence in this design:


The Design of Enclosure

I have intentionally omitted detailes about the density and distribution of the stuffing as well as the size of the design. This is done since I have not actually built the loudspeaker, but the principal is as shown in AudioXpress October 2007.

The example herein is just one solution, and others might be better. This is the fun about the "noble art of designing quarter wave speakers" ☺

The overall size of the LAT Quarter Wave can be seen in this figure. When designing the enclosure, the pipe could be folded, and the opening will then end up close to the driver.
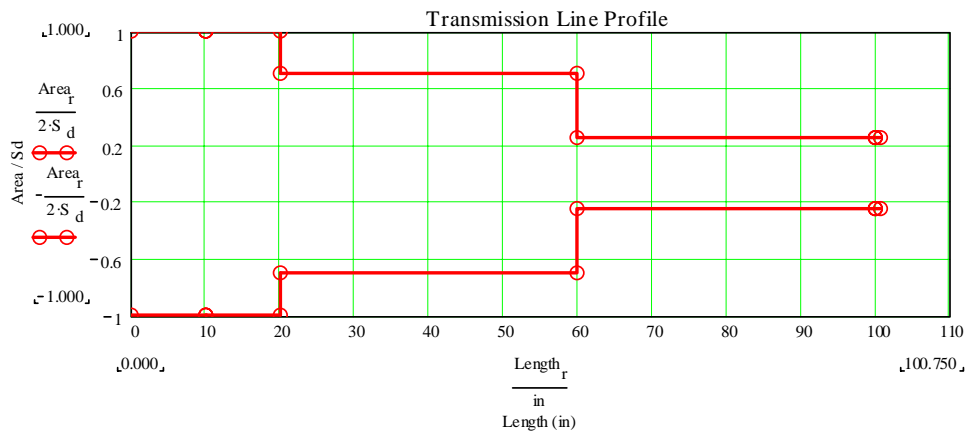
Epilogue

I hope this article has made you interested in Quarter Wave design. Please also see my article available on Internet:

http://www.t-linespeakers.org/design/MJK-for-dummies/index.html

And of course: Study Martin J. King´s work at http://www.quarter-wave.com/. On the site you can also order Martin J. King´s software usable for all kinds of enclosure design.

Have fun !

Bjørn Johannesen

Bredkær 11

2650 Hvidovre

DENMARK

bjohannesen@post.cybercity.dk