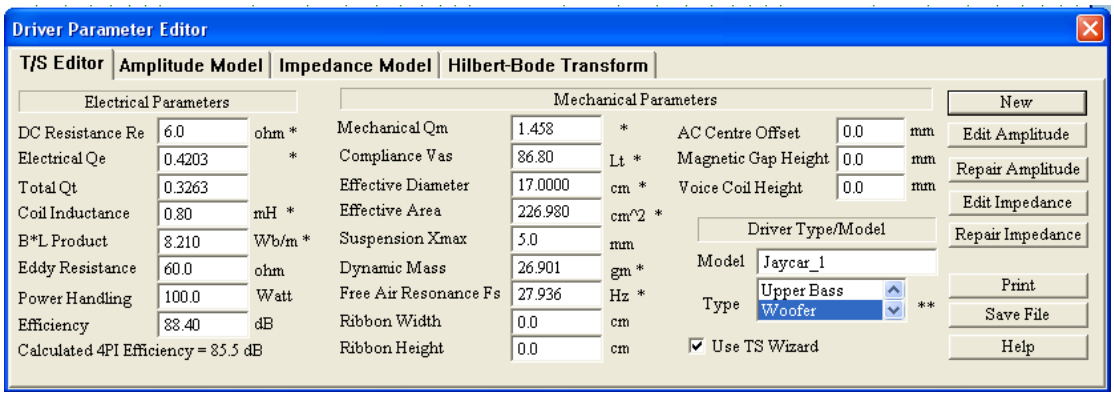
Front Loudspeakers

The two front channels (left and right) carry most significant sound information. Therefore, the design goal followed broadly the 5.1 system recommendations (Ref 1) and was to obtain maximum frequency response extension, say 40Hz-20000Hz from a medium-size box. These channels are also destined to be used as stereo channels with McCauley 18” subwoofer augmentation. Such configuration would easily provide a 3dB audio bandwidth of 16Hz-22000Hz (see subwoofer description). Aesthetically, I was able to accept a box with internal volume of about 50Lt.

Conceptually, the front loudspeaker is a 2-way, vented system with two 8”/90Wrms woofers and 1”/120Wrms soft dome Morel tweeter, shown below, and making it quite a robust, medium-size loudspeaker. The whole entertainment system setup in my AV room only allowed for 23cm of space (width) for the front loudspeakers. This restriction dictated the shape design of the enclosures.

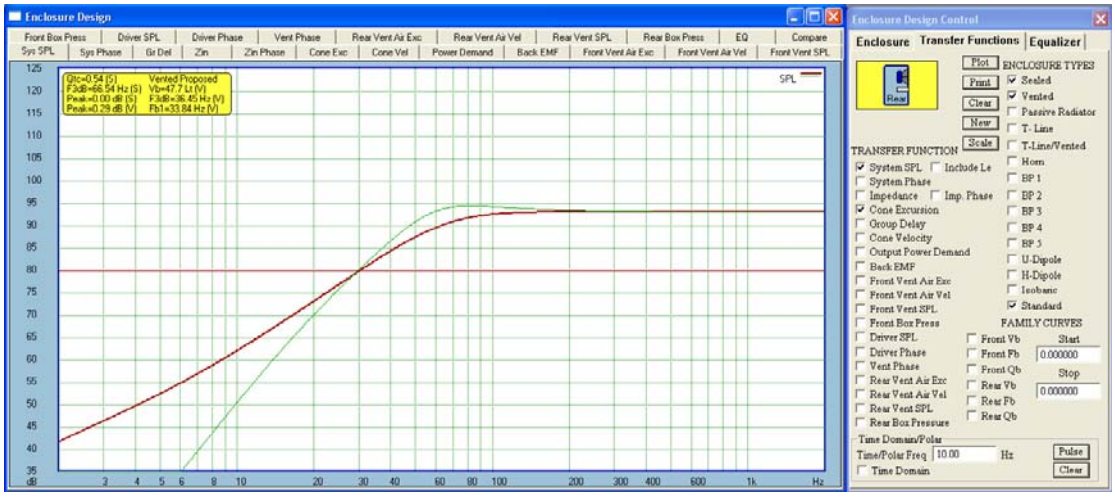
Enclosure design was carried out using SoundEasy V18. Based on TS parameters, I calculated all enclosure data, necessary to assemble the box and the measure drivers’ SPL/phase performance.

Woofer's T/S Parameters



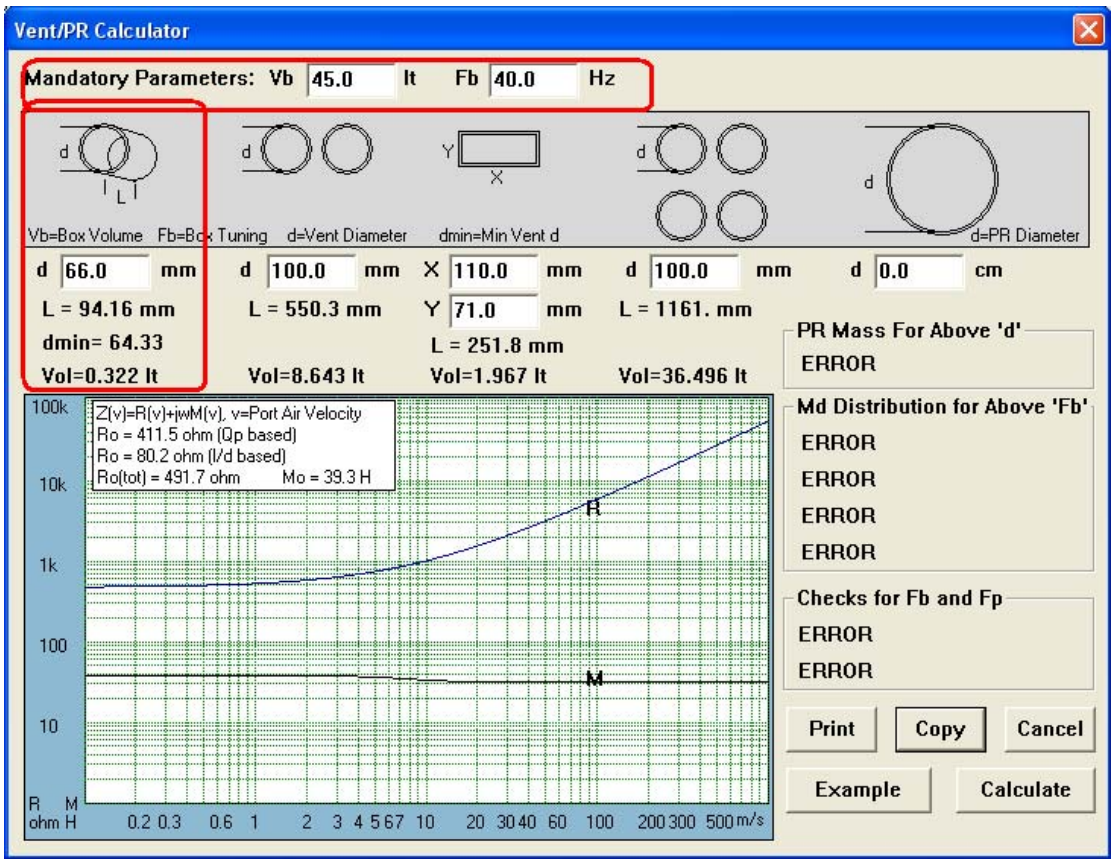
Enclosure Design

There are basically two options for the rear enclosure. I opted for vented system, because with 8dB of available equalization, I will be able to obtain -3dB cut-off frequency of 40Hz, with satisfactory cone excursions. This is quite reasonable output from such small enclosure. The same equalization for sealed enclosure would result in the -3dB cut-off frequency of around 50Hz. The box is lightly padded with enclosure filling material, resulting in estimated Qb of 10.



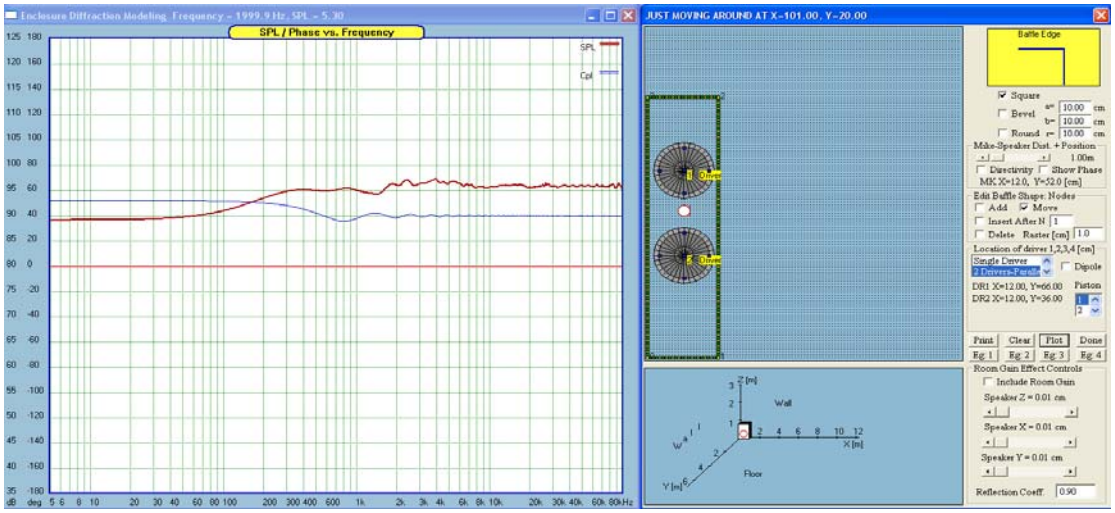
Vent Design

For the 45Lt enclosure, tuned to 40Hz, the vent must be rather small in diameter, otherwise, it's length is excessive and will not fit comfortably into the enclosure depth of 30cm. For the 65mm diameter vent, the expected length is 95mm.



Diffraction

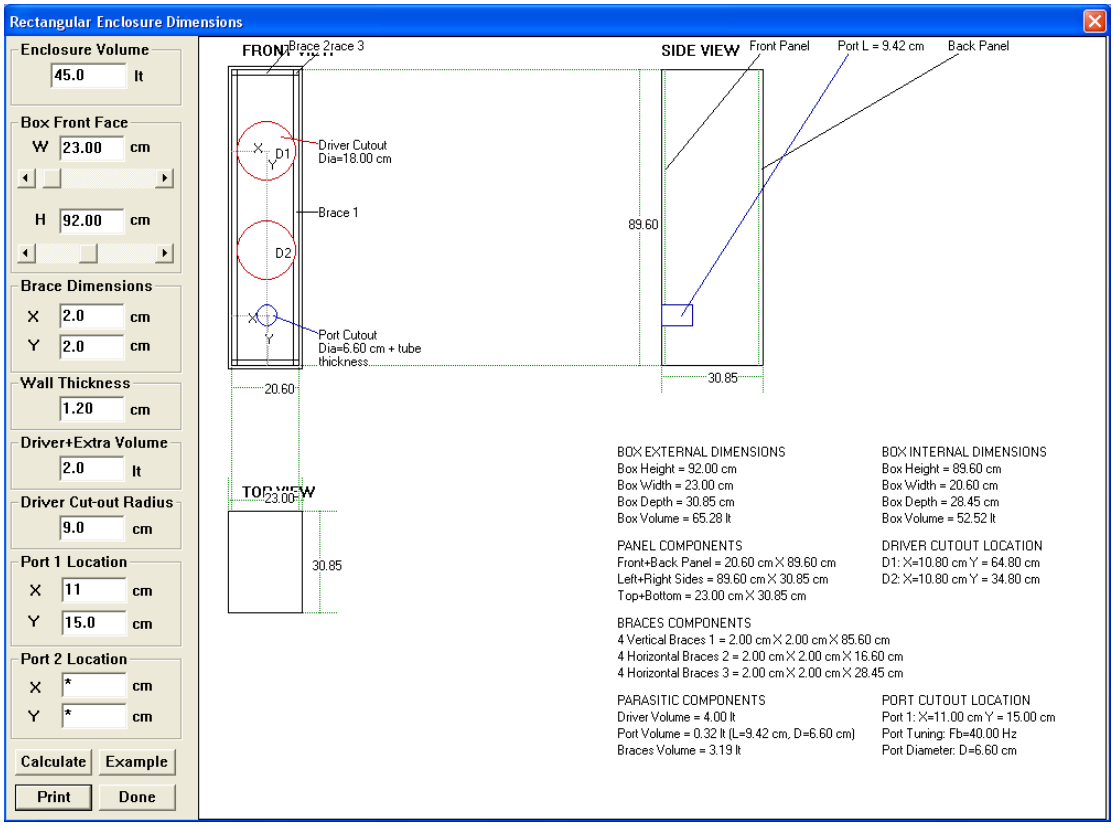
Diffraction curve for square edge type of enclosure is fairly typical. Starts rising from around 100Hz. Diffraction curve will be completely equalized using inverse HBT process.



Rectangular Box

Finally, I am able to visualize the actual box design, even though it does not show tweeter cut out. Enclosure bracing is 20mm x 20mm in cross-section.

For the construction, I use 12mm particle board. Joints are glued and all panels are crewed to the braces using suitable wood screws. Finish is very simple. Exterior is smoothed, primed and painted white, to match the rest of the loudspeakers and room décor.



At the back of the box, there are two push connector terminals, one for the woofers and one for the tweeter. The 66mm diameter front port, is shown to the right.

After assembly, all surface irregularities (screw holes, chipboard edges) are patched with wood-filler, and left to dry for 4 hours. Then the whole exterior of the box is smoothed using two grades of sandpaper.

Finally, the exterior is primed and spray-painted with 4 layers of water-based enamel paint. Total construction time was about 10 hours. Fully assembled front loudspeaker is shown below.

References

1. The Recording Academy's Producers & Engineers Wing Recommendations For Surround Sound Production.

http://www2.grammy.com/PDFs/Recording_Academy/Producers_And_Engineers/5_1_Rec.pdf