Dear Troels,

Thank you for generously sharing your valuable experience and knowledge on your eminent web pages. I would like to express my gratitude through this letter by contributing with a suggestion on an alternative transmission line cabinet for the TJL3W.

After having finished a Lenco L75 turntable project I was considering upgrading my sound system with a pair of new speakers. Especially transmission line speakers seemed appealing to me, but the pricetag on such readymade speakers (e.g., PMC FB1) no doubt helped me to decide turning into the present diy-project. Besides it is fun and instructive to design and build your own speakers. I got acquainted with Martin J Kings MathCad worksheets for transmission line design and found that the Seas W18E001 seemed most appropriate among your speaker projects for a middle sized transmission line floorstander design. Choosing between TJL 2-way and 3-way I went for the latter with its potential for a more uniform power response (See Figures 1 and 2). The cabinet design is shown in Figure 3. It is tested in MJ Kings MathCad program and the theoretical frequency response is shown in Figure 4. As shown, it predicts -3dB a little below 40 Hz. I measured the free air resonance (Fs) for the W18 speakers to be about 33 Hz. The acoustic length of the transmission line is about 1.9 m which is what is required to match that Fs when the line is tapered according to the design in Figure 3.

I started up building my TJL3W speakers during the summer vacation. After a month and a lot of work they were ready to play. The backsides of the cabinets are mounted with screws (and sealed with window sealing strips) to allow adjustment of the stuffing. Figure 3 shows the green felt damping and rough amount of sheep wool damping material to get subjectively optimal bass reproduction in my listening room.

The clarity of the sound immediately impressed when I first listened to the speakers and it was easy to get optimal bass level by adjusting the stuffing. However, solo instruments and voices tended to dominate the sound stage a little bit too much causing me listening fatigue. It may be that I've been accustomed to the BBC dip from former ls3/5a-alike speakers. Note that also the mid elements in the present design are inserted in small tapered transmission line cabinets with closed end. Simulation in MJ Kings MathCad showed the fundamental pipe resonance at about 730 Hz at zero stuffing. According to the model, it is easily suppressed (together with its harmonics) by some lightly stuffing, so I stuffed the mid cabinet lightly with sheep wool.

Following your advice on how to lower the level of the midband (1 ohm before the mid crossover and 47 ohm across its terminals) I must say the sonic result fulfills all my expectations. The treble, mid and bass are now wonderfully smooth integrated. The bass is clean and fast, articulate and deep. Overall, the sound is transparent and convincing. Ben Webster's tenor sax has never sounded warmer and more full-bodied to me from a pair of loudspeakers and I have never heard any loudspeaker reproduction of classical music more sweet and seductive. So thank you for inspiring me to build these wonderfully sounding speakers.

Kind Regards

Ingvar Bergman/Stockholm

Email: ingvar[dot}bergman [at}yahoo[dot]se

Figure 1. The speakers ready to play. Between them, my Lenco L75 with solid plinth in birch plywood, matching the speakers also in birch plywood.

Figure 2. A closer look at one of the speakers. Behind, my class A solid state power amp with no global feedback, meaning full control over reproduced frequency spectrum.

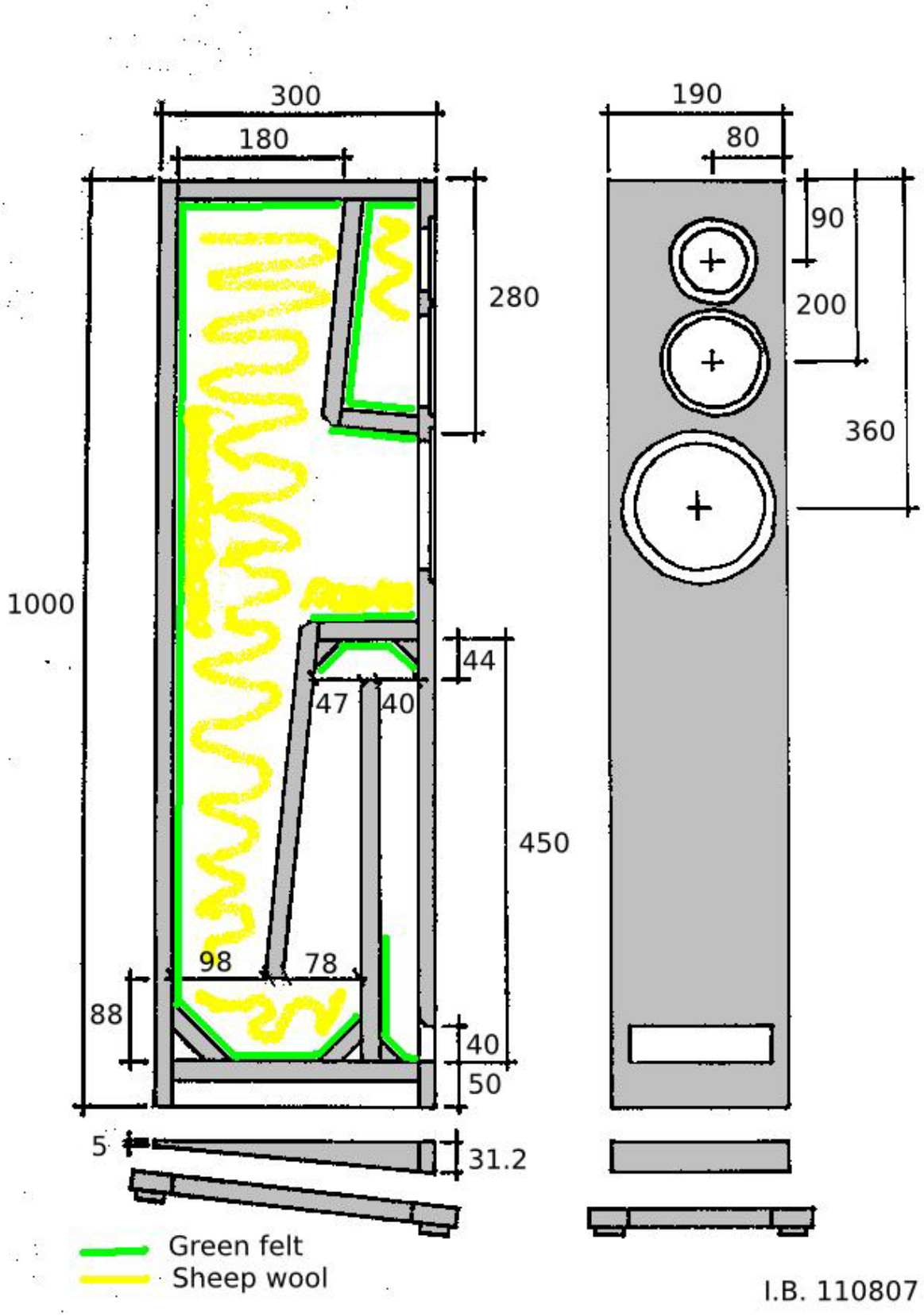

Figure 3. Cabinet in 21 mm birch plywood. In addition to the showed (~10 mm thick) green felt locations, both side panels were internally covered entirely with green felt. The sheep wool was fluffed up and very lightly stuffed (except for the sheets at the backside and below the W18E001 that was aimed to reduce direct reflections). All measures are in mm.

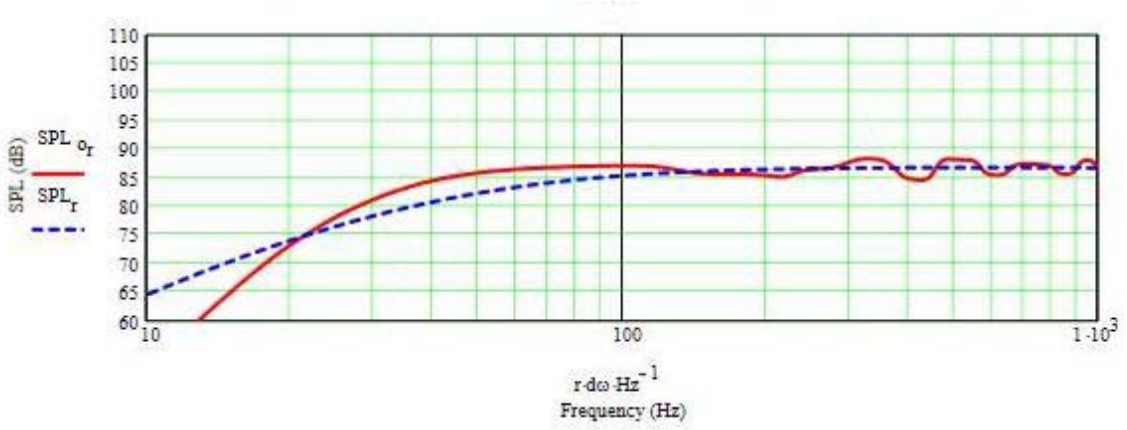

Figure 4. Theoretical Far Field Transmission Line System Sound Pressure Level Responses (red) at about optimal stuffing (i.e., close to the amount of damping shown in Figure 3) and for Infinite Baffle (blue).

Addendum

Dear Troels

After listening a few weeks to my TJL3W speakers I changed back to your suggested mid driver standard level and realized that it sounds best after all. Several factors may have contributed to the initial listening fatigue of which there is non whatsoever anymore. The sound is now incredible pleasant and realistic and I can listen and enjoy for as long as ever. One contributing factor may have been the new drivers needing to play some time to loosen up rubber surrounds and materials so as to reach intended working state. Another factor may have been back reflections from the mid driver cabinets that are not according to your original design in my TL-version. To suppress potential back reflections I added a sheet of sheep wool behind the mid driver, but I can't really say whether it made a difference or whether there was any problem with back reflection to begin with. A third factor contributing to too much accentuation on the midrange definitely was a too tame bass due to slightly too much sheep wool stuffing. I realized that when close to optimal stuffing, very small changes of the amount of stuffing makes big difference in perceived sound balance. When I reduced the amount of stuffing to fill only 3/4 of the volume in the first bend of the pipe (instead of the whole volume as shown in Figure 3), the bass notes came through at just the right level giving a marked and solid bottom without being obtrusive. My listening room is about 20m^2 and I have found that placing the TL-speakers so their pipe openings are 60-65 cm from the back wall gives to my taste a proper amount of room support for the lowest bass notes. When I am now more settled with my TJL3W speakers I have to say that the level of transparency these speakers can reproduce bear witness of an outstanding skill and care in crossover and loudspeaker design. So thank you again for so generously sharing it.

Kind regards

Ingvar

Dear Troels,

Here are some further experiences from my speaker building journey. Experimenting with felt on the baffle has revealed to me even more of the potential of the TJL3W. The felt I tried is wool felt of type F-10 (a grading according to the Society of Automotive Engineering in the US). The idea is to absorb cabinet edge diffraction (Ralph, D.L., 2005, Diffraction doesn't have to be a problem. *AudioXpress,* 36(6), see http://www.speakerdesign.net/audioXpress/diffraction/diffraction.html). For each speaker I used 1/2" thick felt with cut outs for the tweeter- and mid drivers, and two 1/4" thick strips on the tweeter face (see the picture).

With felt on the baffles, I find the details in the sound stage more precisely located and recorded depth more precisely reproduced. The recorded depth is also more evident on mono recordings, helping e.g. old 78s to sound surprisingly good if played through good gear. For some records, however, the precise sound stage is almost disturbing, jumping from one instrument to another in a synthetic sound stage rather than a natural one. On the other hand, for recordings produced with good microphone and recording techniques, as is the case for many classical music recordings, the felt helps the stereo image to come through just beautifully.

The felt thus seems to help the speakers to attain more of an ideal monitor character, but it should also be said that it may not be everyone's cup of tea. It may be that the felt somewhat alter the frequency balance in the middle- and treble regions, although it still sounds correct to me. It may also be that the absorbing felt ruins the power distribution of the drivers to a degree, because I have noticed that the sound stage collapses sooner when moving out of the hot spot.

An unexpected effect of the felt (applied according to the picture) was that it somewhat attenuated the bass, or rather some baffle - room reflection in the lower frequencies. It meant that I could restore the bass level by further reducing the sheep wool damping slightly in the first bend of the TL. With this last adjustment, there is an amazing power and authority in the lower bass, critically contributing to very much of concert room feeling to classical music. The bass is really deep and clean, not earth shaking with the relatively small cone area of the bass driver, but it goes down to the realm where feeling starts to take over from hearing and with power and authority all the way down to the real low notes and thunders. All kinds of music benefit, but especially listening to classical music now is great drama and lots of surprises and I enjoy every moment of it.

Best regards
Ingvar