DIY Coaxial Stage Wedge

Michael Smithers, 23 February 2012

In 2011 I was reading over the Coaxial Wedge Collaboration thread on www.soundforums.net and got interested in making a high quality 12" coaxial wedge for myself that could run passive and bi-amped. I decided on the BMS 12CN680 driver, since I could get a passive crossover – designed by Curtist List - from www.assistanceaudio.com.

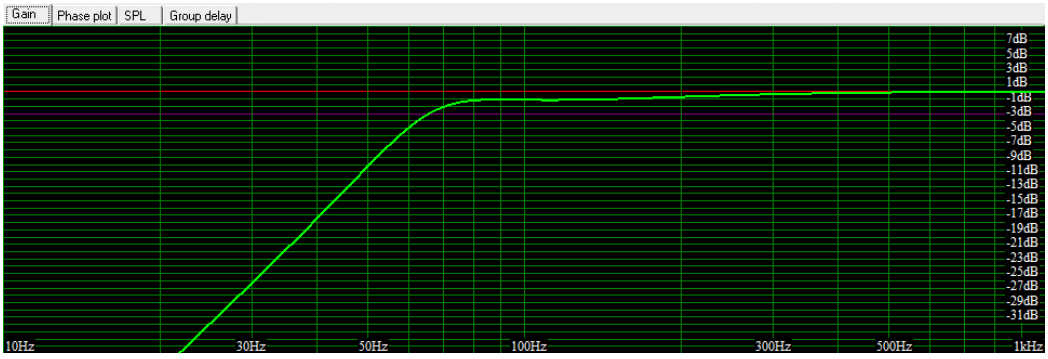
This document shows the design and construction of the wedge using 18mm marine plywood and pieces of 70x35mm pine (cut to the various batten shapes). CAD drawings follow at the end. These should work with thinner plywood.

Design

For the 12CN680, BMS recommends a 24 litre bass reflex enclosure tuned for 57 Hz.

The basic design was first created in CAD. A spread sheet was created to calculate the internal volume, taking into account all battens, the driver volume and the ports. The driver parameters and online bass reflex / vented calculators were used to determine the port sizes. Since the port size impacted internal volume, the design took a few iterations. Owing to a mistake in the spread sheet, the design ended up at 27 litres and with shorter ports. More details follow in the construction.

Following is a WinISD simulation of the 12" driver in 27 litres vented and with the size of the ports used in this design.



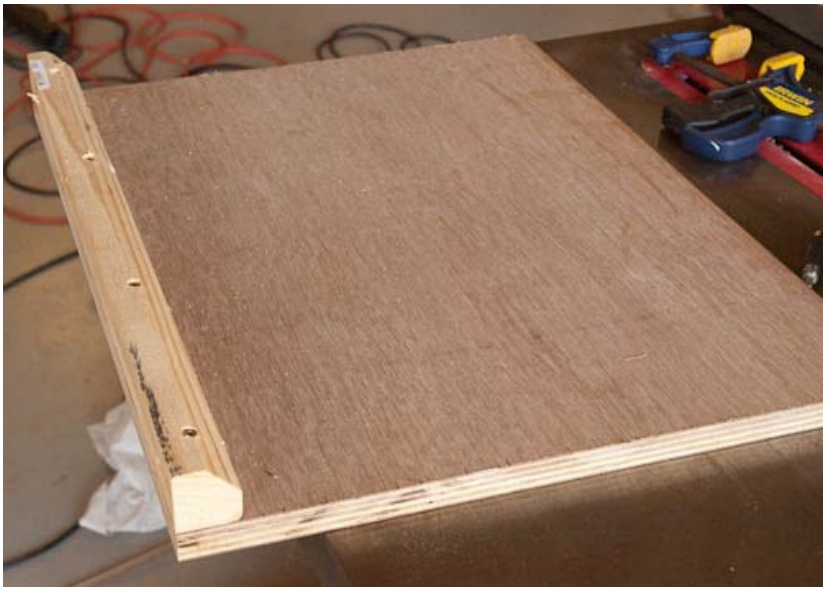
Other 12" coaxial drivers, like the B&C 12HCX76 and B&C 12CXN76, could be used. The volume and port sizes would need to be adjusted using bass reflex calculators and/or WinISD.

Construction

Bottom panel and rear batten.

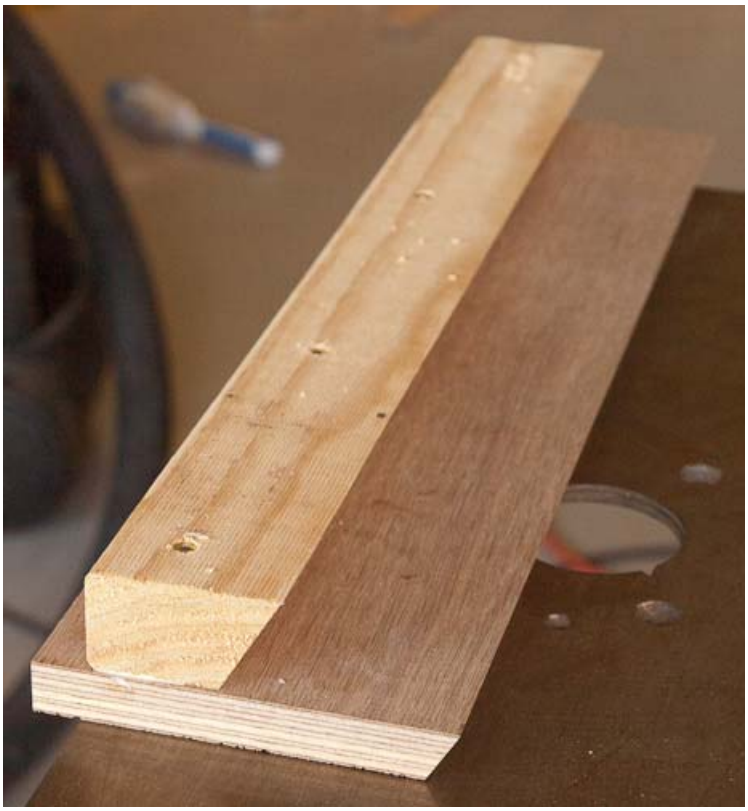
Batten is 70x35mm cut in half and chamfered.

The screws are kept far enough away from the edge that they won't get in the way of the rear round-over cut.

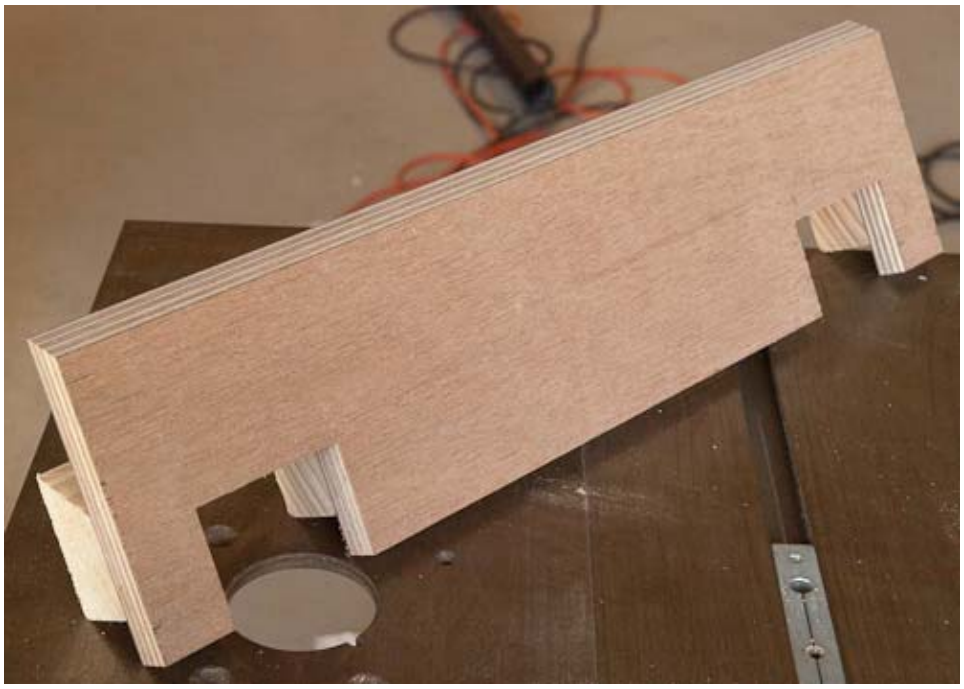


Front panel and batten (which supports the top panel/speaker baffle).

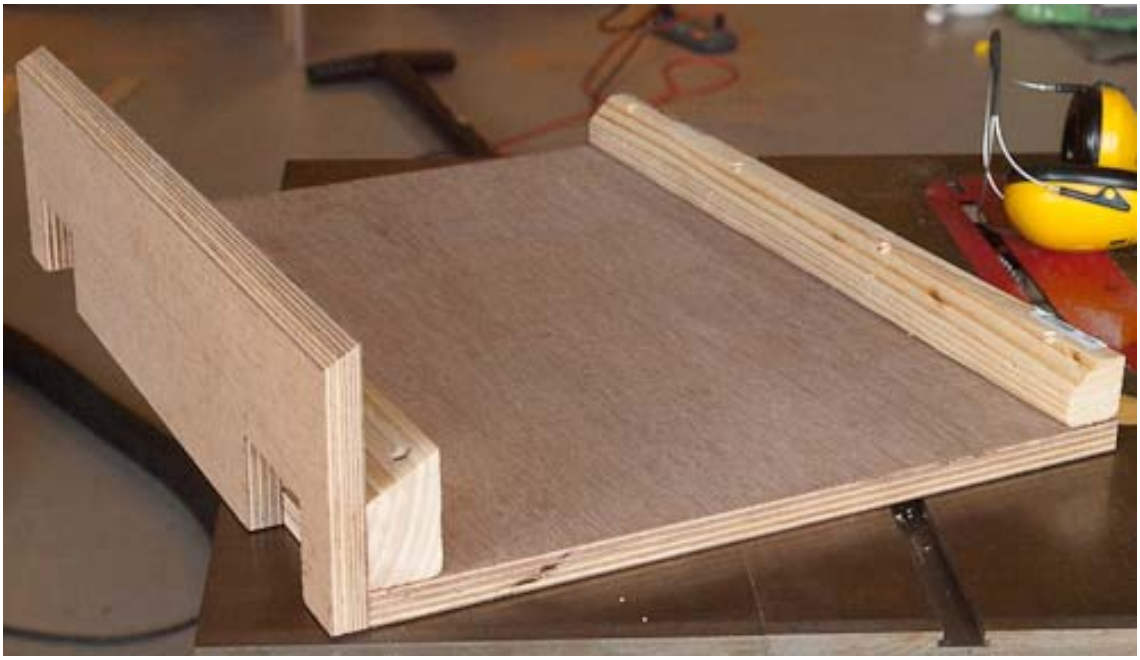
The screws are placed so that they're not in the way of the port hole cuts. (See next page.)



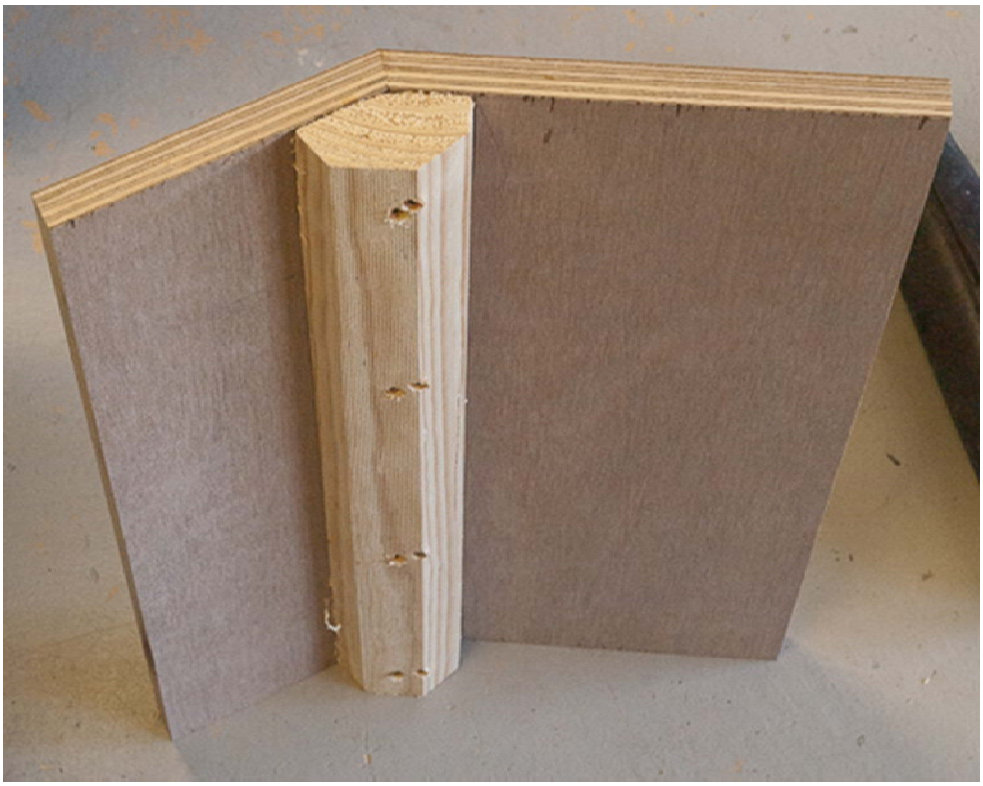
Port holes cut into the front panel.



Front panel fixed to bottom panel.



Back panels and batten



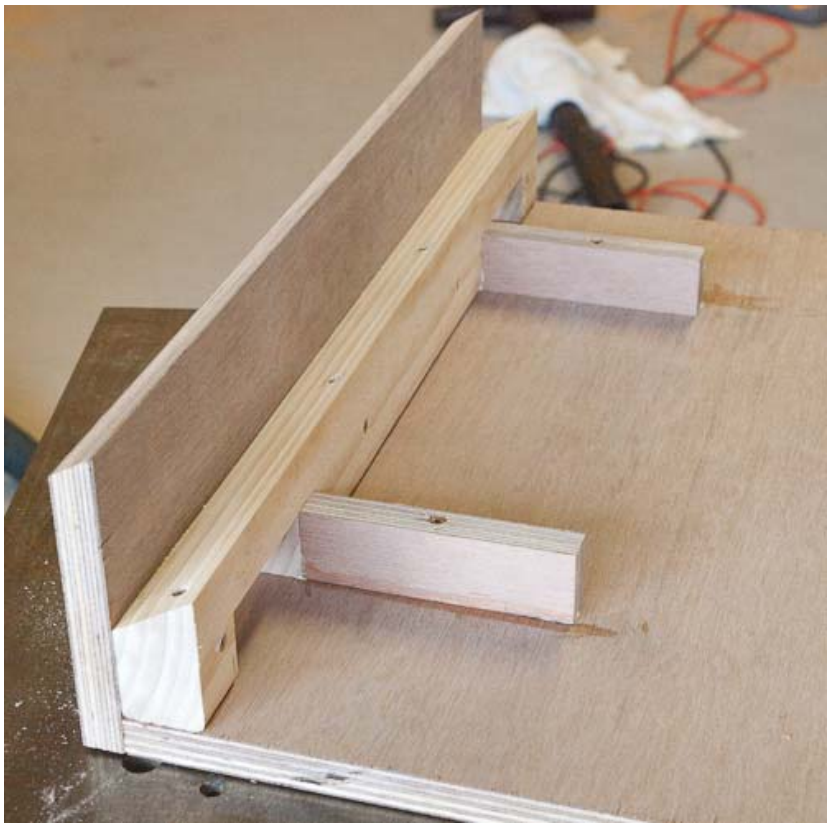
Back panels fixed to bottom panel.

Note: the screws are kept far enough away from the corner that they won't get in the way of the rear round-over cut.

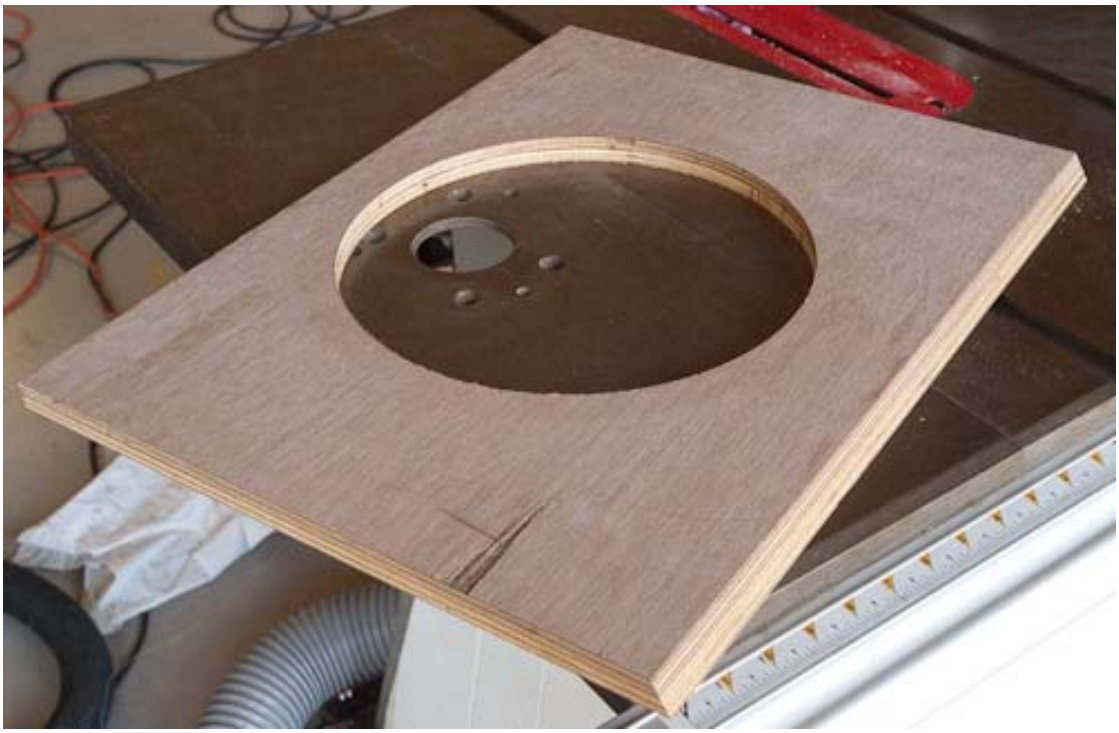
Port tunnel walls

When tuning the ports, I found these were not necessary. The tunnels through the front batten were enough.

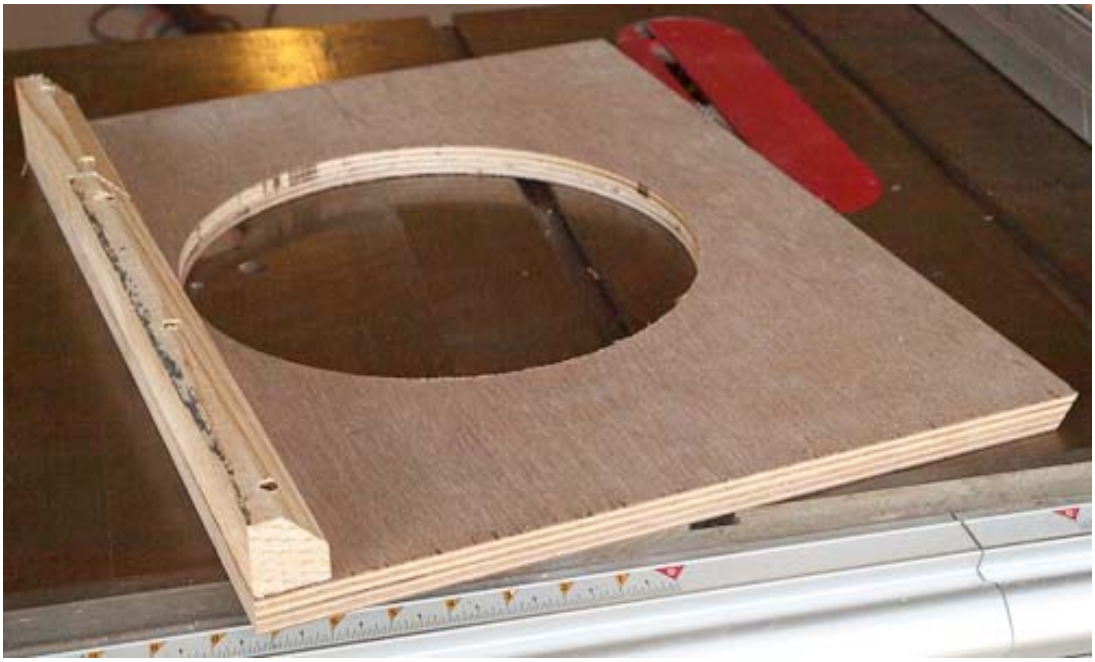
[BMS recommends an internal volume (not including ports and the driver) of 24 litres. I accidentally designed this a little larger at 27 litres.]



Top panel/baffle routed.



Top panel/baffle routed and attached to rear batten.



Top panel/baffle in place

Side battens added.

The lower battens form the side walls of the port tunnels. Note that the upper battens leave enough room to slide in thin pieces of plywood what form the roof of the port tunnels. [As mentioned above, in the final design, the internal port walls and roof weren't necessary.]

Routed side panels in place.

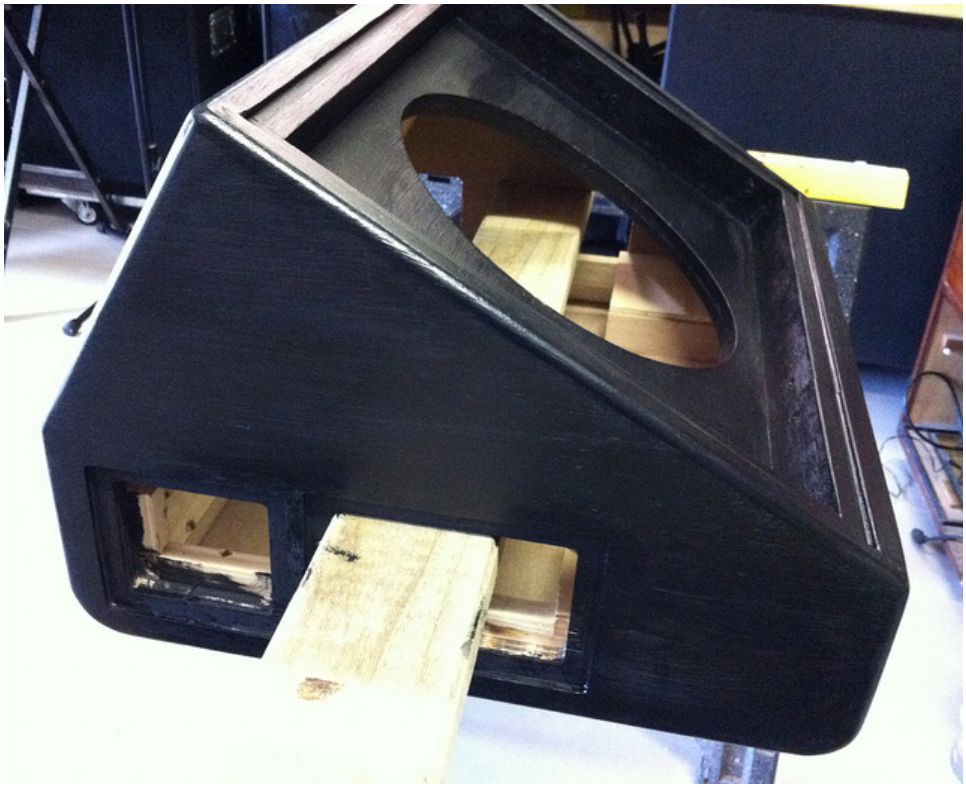
Generously glued and screwed from the inside. Additional pieces of ply added to support the grill.

Once dry, cut the lower front and back large round-overs with a few passes on the table saw, then sand. Route all outside edges and port edges with a round-over bit, sand and paint.

After routing and sanding

Painting

For the 1st wedge I used semi-gloss enamel (shown). For the 2nd one I used Rockard Texture Coat. www.rockardpaint.com.



Components installed.

The internals included padding to reduce internal resonances, and wiring between the boards and Speakon's (on each side). On the front I added foam to reduce reflections and diffraction from the sidewalls on the front baffle.

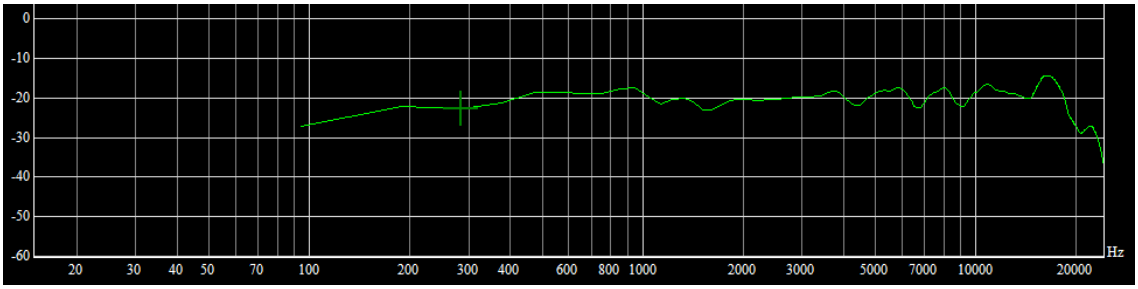
Grill installed

The grill I had custom made – hex punched and powder coated 1.6mm mild steel.

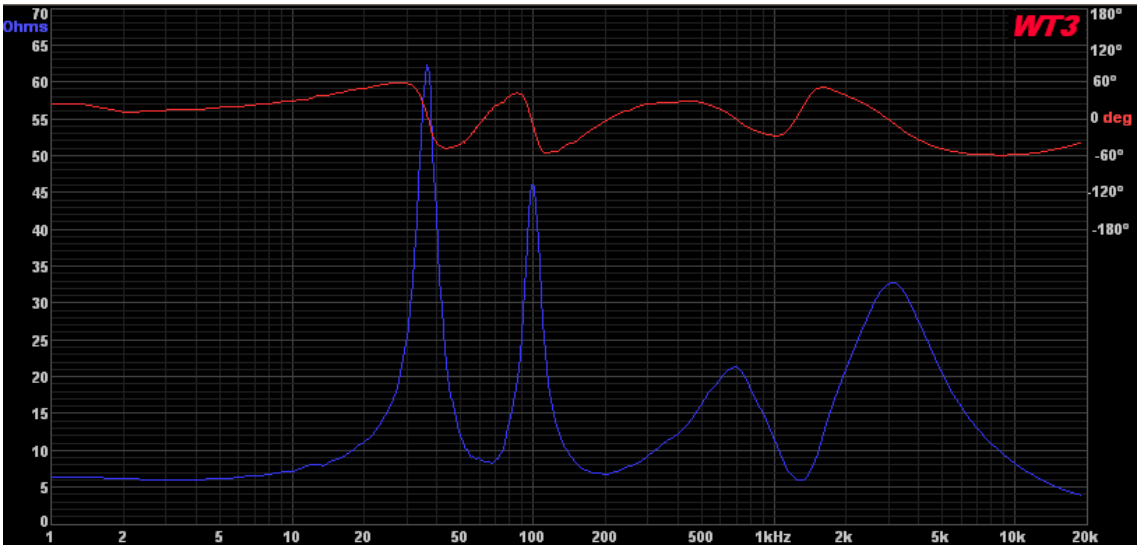
As a slightly cheaper alternative, Penn Elcom make circular perforated grill sheets that can be cut to size.

Verification

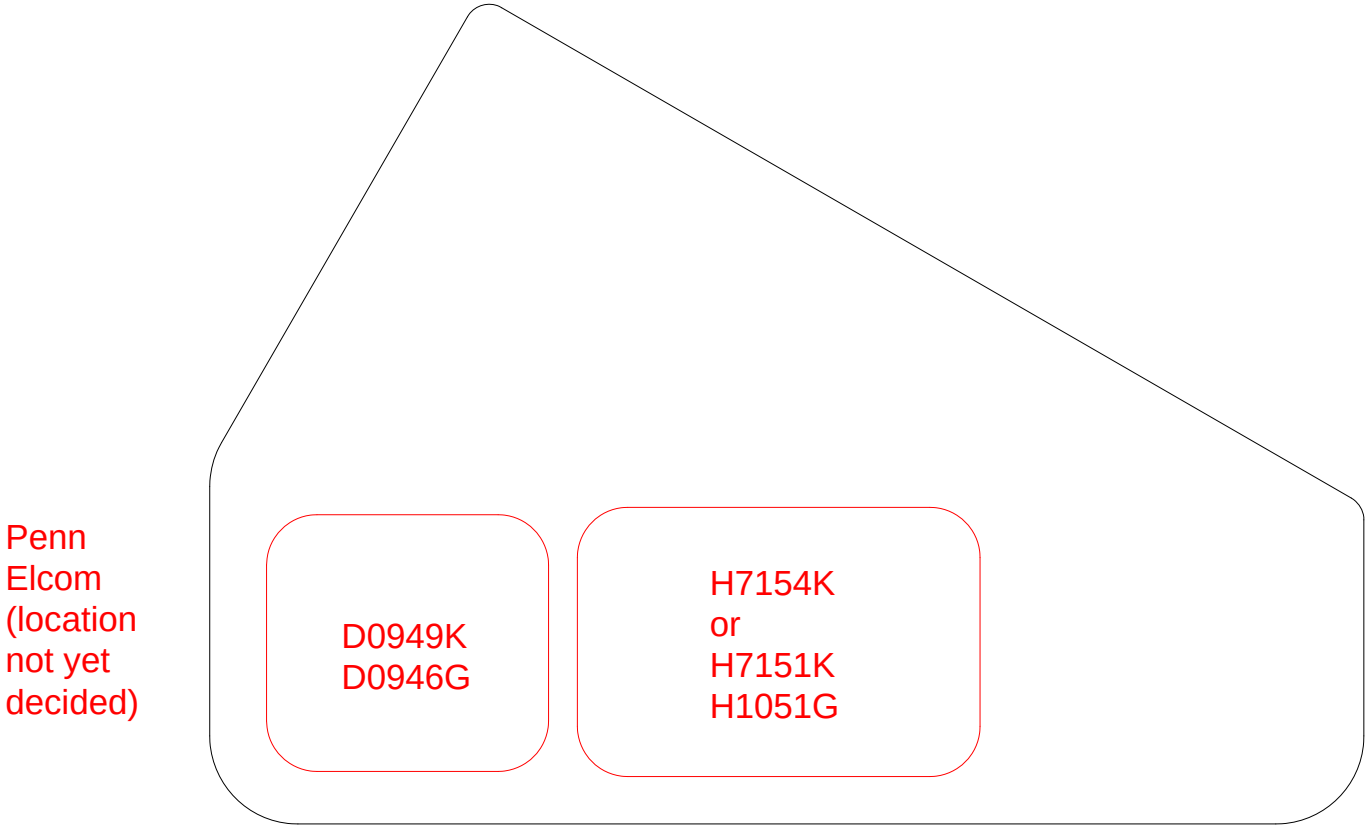
Following is a quick frequency response measurement taken about 5’ above the wedge and on axis. SysTune (5.46s pink noise, approx. 6ms window – due to the low ceiling in my garage – with Turkey 50% window both ends, 1/12th octave smoothing) and a Behringer ECM8000 mic – not ideal.



Following is an impedance trace, measured using a WT3. The port tuning looks to be about 62 Hz.



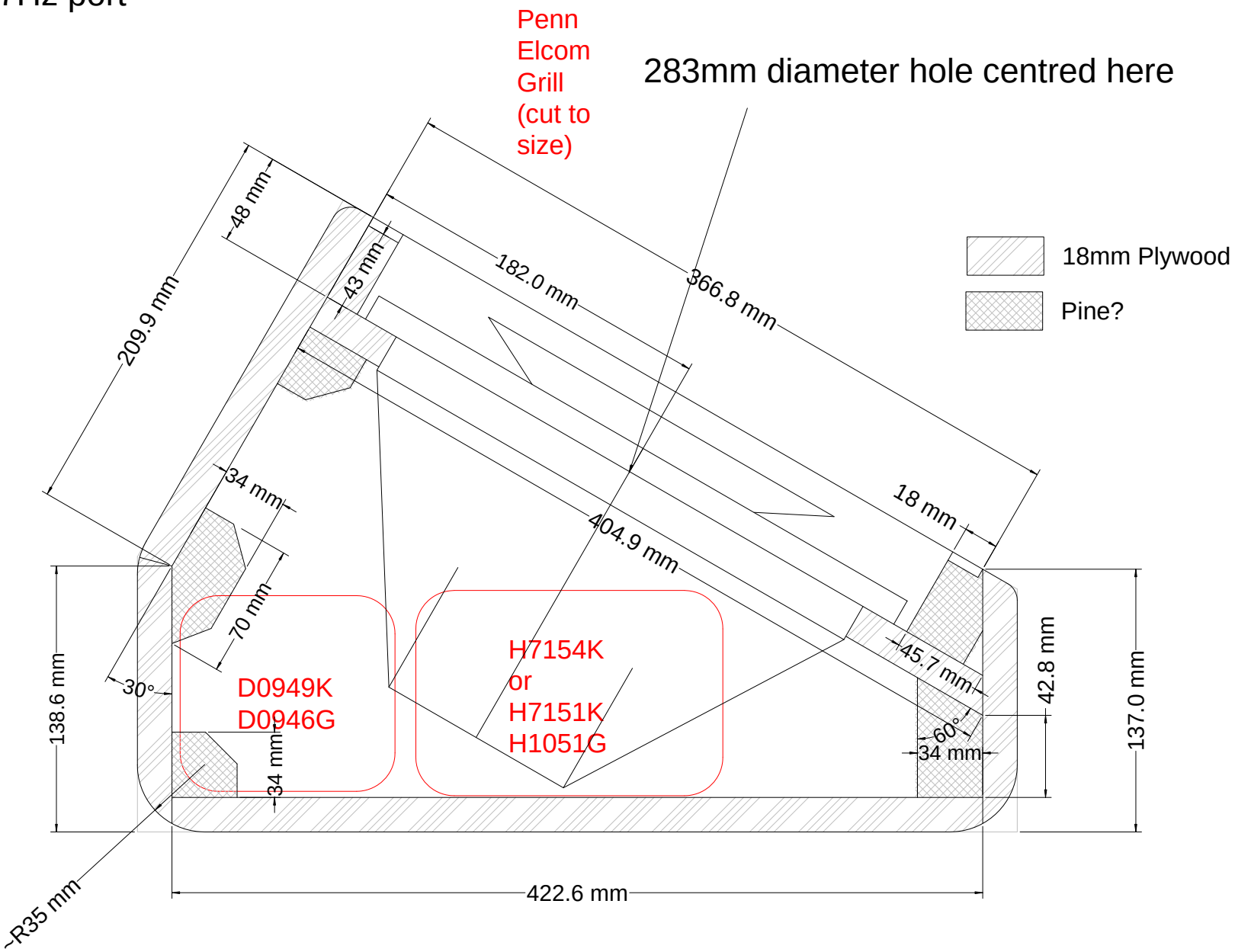
Driver: BMS 12CN680
Cabinet: ~27L, ~57Hz port
M Smithers



End View

A4 Scale 1:3

Driver: BMS 12CN680
Cabinet: ~27L, ~57Hz port
M Smithers

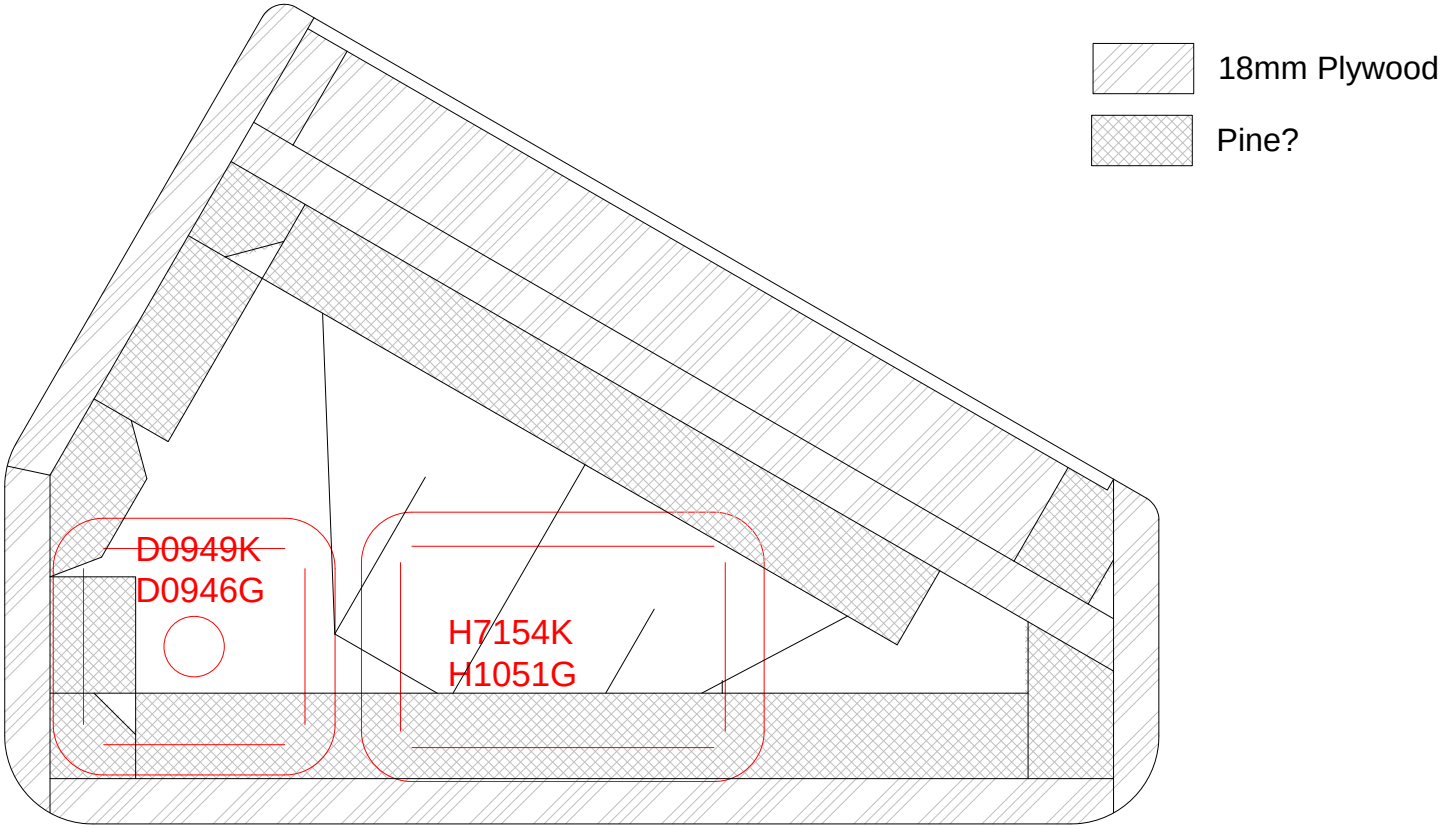


Chamfers are part of maximising internal volume (for correct tuning of the speaker ports).

A4 Scale 1:3

Front/back centre section

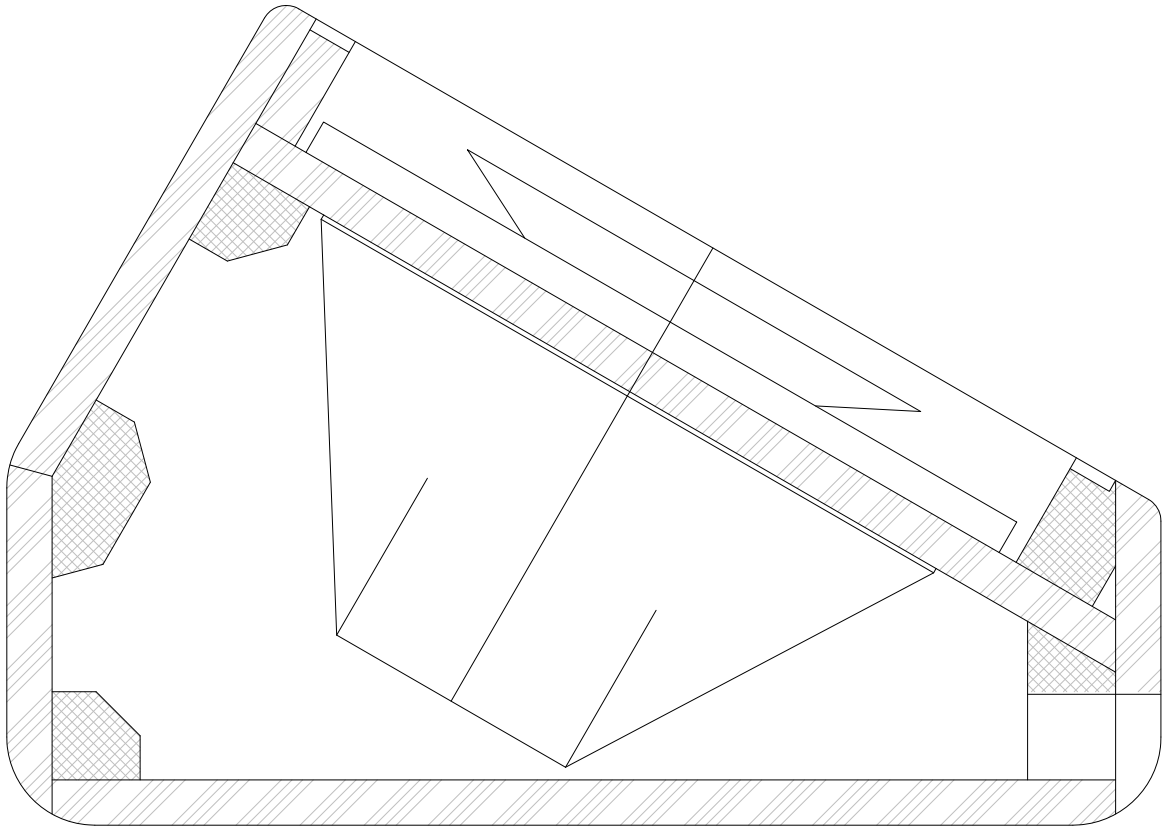
Driver: BMS 12CN680
Cabinet: ~27L, ~57Hz port
M Smithers



Front/back edge section

A4 Scale 1:3

Driver: BMS 12CN680
Cabinet: ~27L, ~57Hz port
M Smithers



18mm Plywood

Pine?

Chamfers are part of maximising internal volume (for correct tuning of the speaker ports).

A4 Scale 1:3

Front/back port section

Driver: BMS 12CN680
Cabinet: ~27L, ~57Hz port
M Smithers

18mm Plywood
Pine?

2 ports. Overall tuning is for ~57 Hz (as per BMS recommendation).

Front view with port detail

A4 Scale 1:3