

## 0.5x0.5x0.5m subwoofer using two Pyle plpw15d drivers

### Introduction:

The drivers have two 4 ohm voice coils each. It is assumed that each drivers voice coils are connected in series and the drivers are wired in parallel. It is recommend to put the drivers on opposing faces of the box to cancel the moving mass of the cones effects on the box (box walk etc.). You may want to consider a push pull slot loaded baffle design (PPSL) to halve box heat load and to protect the drivers from knocks, however this will use some box volume. In the calculations I assumed that there are 25L of driver, braces and box wall in the enclosure, some of this may be recoverable with fibre glass fill that can increase the effective volume if applied with the correct density through conversion of the acoustical energy to heat (damping is also recommended to reduce the box resonance around 380Hz). Increases in box volume will increase the efficiency below the resonant frequency of the system (<57Hz). The system will require extensive parametric equalisation to achieve flat frequency response or a Linkwitz transform circuit.

**Hornresp - Input Parameters**

File Tools Window Help

Ang	2.0 x Pi	Eg	2.00	Rg	0.00	Cir	0.00
S1	0.00	S2	0.00	L12	0.00	F12	0.00
S2	0.00	S3	0.00	L23	0.00	F23	0.00
S3	0.00	S4	0.00	L34	0.00	F34	0.00
S4	0.00	S5	0.00	L45	0.00	F45	0.00

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Sd	820.00	Cms	2.05E-04	Mmd	146.79	Re	6.80
Bl	19.91	Rms	6.79	Le	0.71	Nd	2P
Vrc	100.00	Fr	40.00	Vtc	0.00		
Lrc	46.00	Tal	4.00	Atc	0.00		

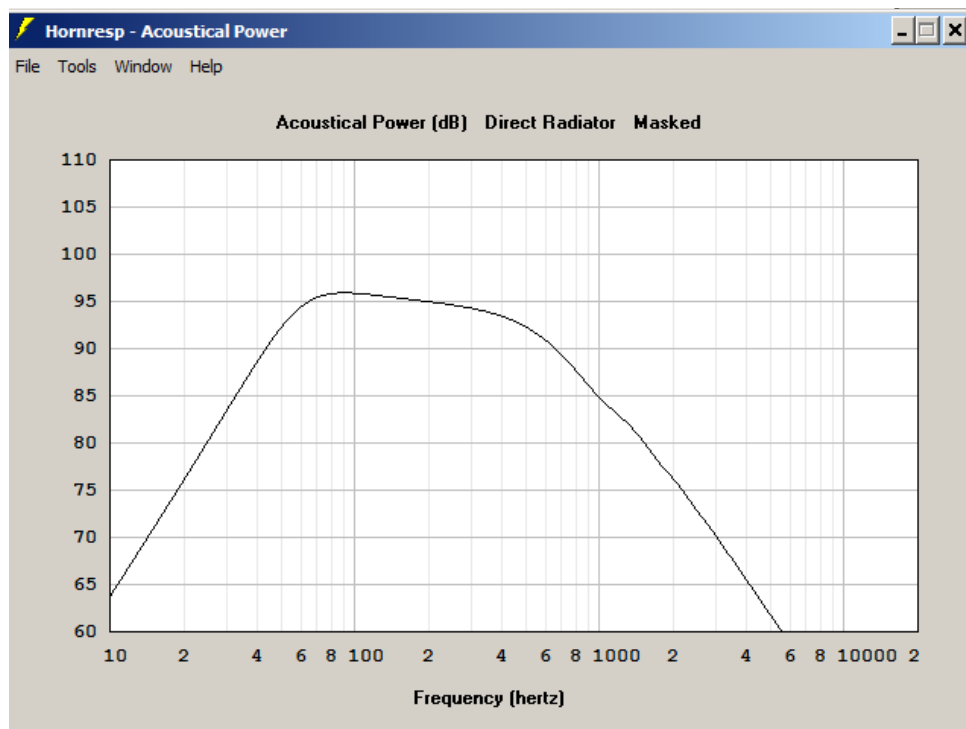
Comment: 100L 2\*pyle plpw15d in 500mm^3 (25L assumed occupied)

Previous Next Edit Add Delete Record 15 of 15 Calculate

Illustration 1: Thile Small parameters

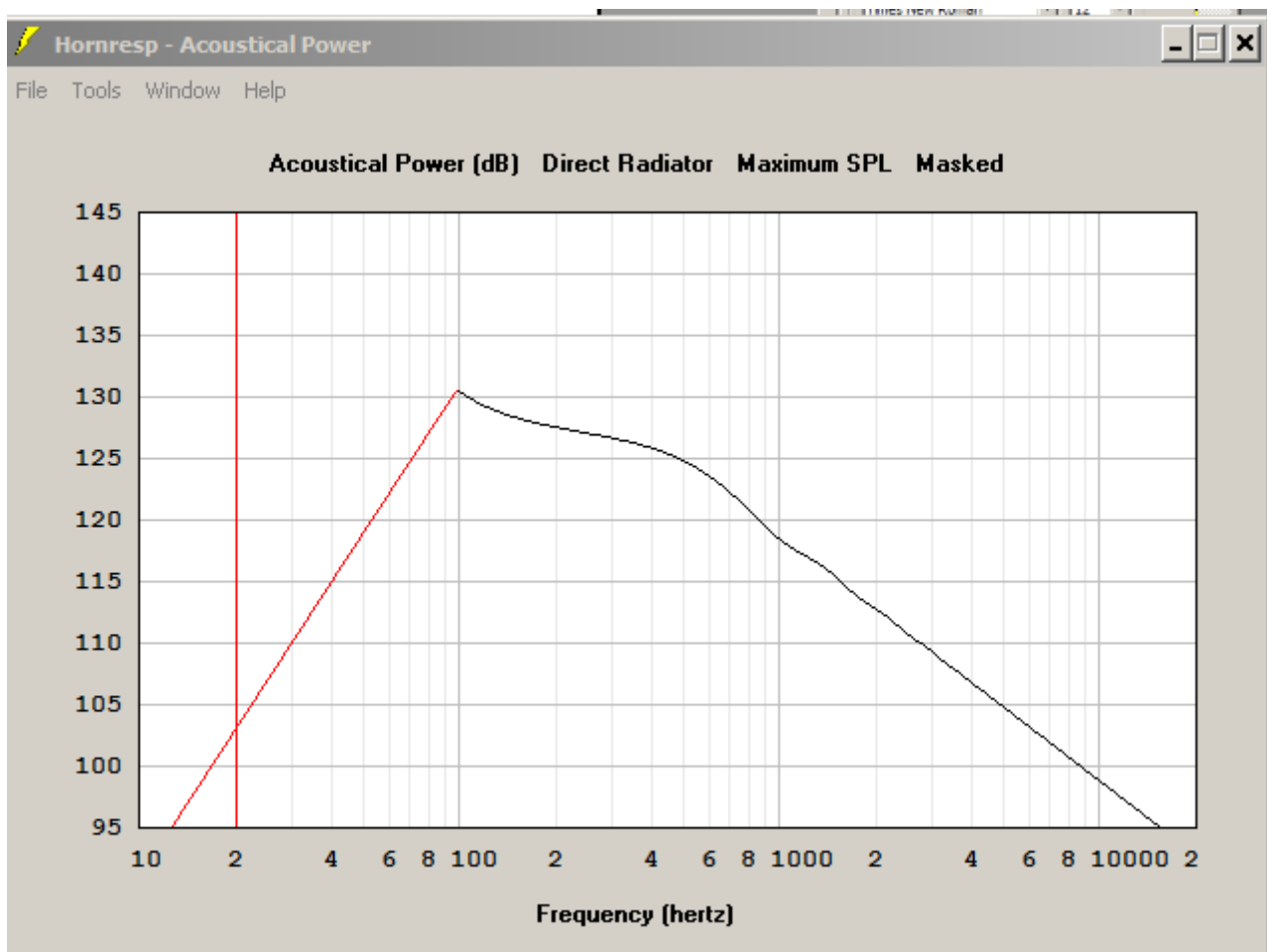
### 2π 1W/1m SPL:

Note this is a constant voltage excitation of 2 Vrms in an acoustic environment similar to placing the subwoofer in the middle of a flat field with no nearby boundaries.



*Illustration 2: 1W SPL*

**Maximum SPL in a  $2\pi$  environment:**



Sample ✕

Frequency 20 hertz

At 20 hertz,

Sound pressure level = 102.9473 dB.

Driver input power = 256.0957 watts.

Driver diaphragm displacement =  $\pm 8.0000$  mm.

LIMITED BY DIAPHRAGM DISPLACEMENT

Close

Sample ✕

Frequency 30 hertz

At 30 hertz,

Sound pressure level = 109.9846 dB.

Driver input power = 190.0364 watts.

Driver diaphragm displacement =  $\pm 8.0000$  mm.

LIMITED BY DIAPHRAGM DISPLACEMENT

Close

Sample ✕

Frequency 40 hertz

At 40 hertz,

Sound pressure level = 114.9733 dB.

Driver input power = 117.7500 watts.

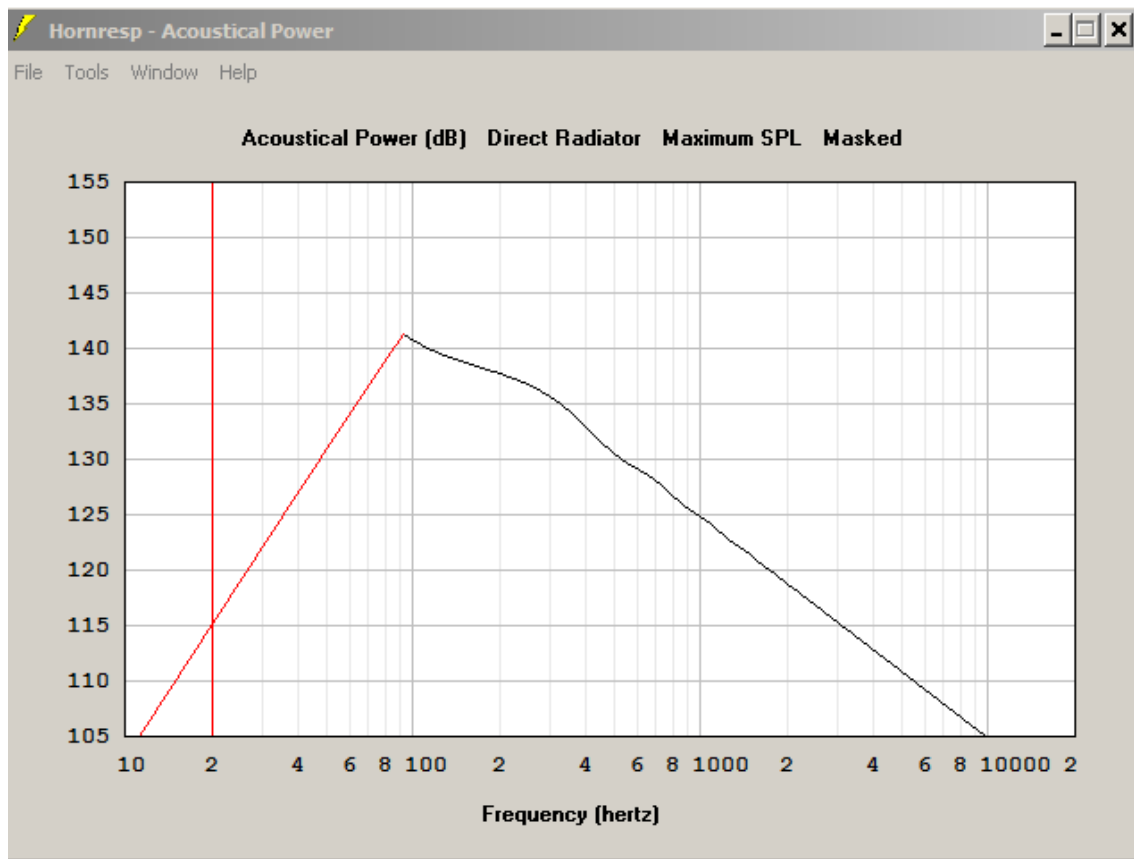
Driver diaphragm displacement =  $\pm 8.0000$  mm.

LIMITED BY DIAPHRAGM DISPLACEMENT

Close

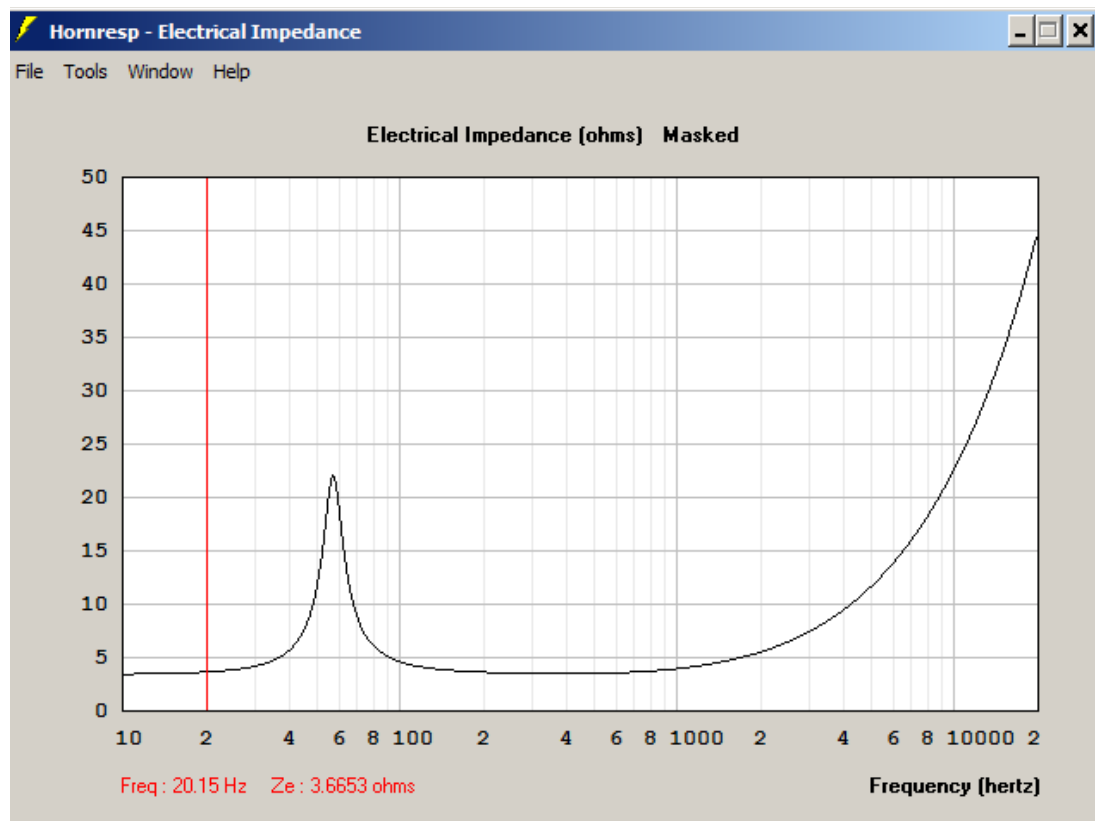
The maximum SPL at 20Hz is 102dB/1m with a total input power of 512W. This corresponds to 45Vrms. Each additional subwoofer driven with 512W will add an additional 6dB (+3dB for power doubling and +3dB for acoustical efficiency gain of a larger radiating surface).

### ***Maximum SPL in $0.5\pi$ environment (corner of a room):***



As expected this is +12dB (115dB/1m @20Hz) as the acoustic source is double mirrored with respect to the  $2\pi$  case.

## Electrical impedance magnitude:



Quite ideal for extracting maximum power from a modern PA amplifier. One channel of an inuke6000 can drive 1642W sustained into 4ohm@20Hz so would be suitable if limited. Usually a driver can withstand +50% excursion from  $x_{max}$  which is 12mm so I would recommend setting limiting to 750W into 4ohm (magnetic force decreases beyond  $x_{max}$  so this should be pretty safe).

## Appendix 1: PPSL



Ported box shown. The idea is to have a slot where one driver is in loaded in backwards. The drivers are then wired in anti-phase such that the box is pressurised at the same time by both drivers but one is moving forwards and the other backwards. This cancels differences between the forward stroke and backwards stroke reducing distortion. As one driver is facing out of the box the heat load on the box is reduced as one driver can be cooled by the ambient air. If it is possible to make a box to tight tolerance the magnet in driver could be heatsinked to the box wall and or its pole vent, vented out of the box. The drivers can also more easily be protected from damage in this configuration.