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Subject: Pi Alignments compared with B4, C4 and QB3  
Posted by [Wayne\\_Parham](#) on Mon, 18 Jun 2001 05:02:36 GMT  
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I've been asked several times what Pi alignment is and how it differs from other alignments. It's essentially a simplified Thiele / Small method, setting cabinet volume directly proportional to  $V_{as}$  and  $Q_{ts}$  rather than being proportional to  $V_{as}$  and  $Q_{ts}^2$ . Box tuning is by Helmholtz resonance and is proportional to  $3F_{ts}$  and inversely proportional to  $8Q_{ts}$ . At the time I wrote the alignments, I calculated using a figure I called "Qd", which is the reciprocal of  $Q_{ts}$ .

Pi alignment for drivers with  $Q_{ts}$  under 0.35 tends to be slightly overdamped with response like large sealed cabinets. For drivers with  $Q_{ts}$  between 0.35 and 0.4, it's pretty much the same as a B4 alignment. Drivers with  $Q_{ts}$  above 0.4 are like C4 or QB3. In practice, the high efficiency woofers I favor in my designs have  $Q_{ts}$  in the 0.3 range. This tends to make a system that is slightly overdamped, which has smooth gradual rolloff. It is fairly insensitive to electro-mechanical parameter shifts from thermal compression or environmental conditions.

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