Subject: Breakup modes and crossover points
Posted by Wayne Parham on Thu, 08 May 2003 17:59:05 GMT
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About crossover points, I want to point out that all speakers using cones or domes (including compression drivers) are operated through much of their range in a mode that introduces cone flex. This has been called breakup mode operation, and no speakers are immune. While most designers attempt to suppress this mode of operation, many have designed features that take this behavior into consideration, some taking advantage of it to extend response. An example is whizzer cones, which are designed to move independently of the rest of the cone at high frequencies. The fact is that it is difficult - bordering on the impossible - to create a speaker using current technologies that doesn't enter this mode of operation.Over the years, I've crossed large-format midwoofers a variety of crossover points from 100Hz to 3kHz. Usually in a three-way system, I'm using the LF driver as a woofer and crossing between 200Hz and 500Hz. That tends to keep the woofer in its pistonic range, or within an octave of it. I tend to expect 250Hz is pistonic range and 500Hz is the first breakup mode.In a two-way system, I'm usually crossing over much higher, in the octave where midwoofer DI and compression horn DI match - between 800Hz and 1.6kHz. In this regard, my designs are much like JBL's two-way monitor speakers that are almost always crossed over above 1kHz. The JBL 68881 is a 1.5kHz passive two-way crossover and it is a good example, being used with a 15" midwoofer and a 1" exit compression horn tweeter on a radial horn flare.But whether a person uses two-way or three-way configurations, the drivers are going to be used in their breakup modes over a large part of the audio band. I think its important to consider all things, and drivers that are designed to be used at high frequencies usually have well-behaved cone flex patterns and don't become excessively anomalous. Lots of high-efficiency drivers are made this way, especially compression drivers and high-efficiency large format cone midrange and midwoofer drivers. I find that a well-designed midwoofer operates pretty well in the vocal range, provided its breakup modes are well damped, which is something that is easy to determine from its response graph.