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## **From the Vault**

### **Beyond Thiele/Small DUMAX and Klippel Driver Measurement Systems**

*By Thomas Perazella*

Anyone who is serious about designing a loudspeaker using dynamic drivers is either familiar with, or has used, Thiele/Small parameters to model those drivers. They are generally accepted as ways to predict driver behavior in different enclosures. One factor that is often overlooked when working with T/S parameters is that they are small-signal parameters. All is then well with the world until the first time you use the resulting speaker to reproduce music at any level above a whisper. Then, the demons of driver nonlinearity rear their ugly heads. The good news is that there are measurement methods we can use to determine and quantify nonlinearities. Two methods that have reached the practical stage are the DUMAX system (Drive Unit Measurements At eXcursion) produced by DLC Design of Wixom, MI, and the Klippel Analyzer System by Klippel GmbH of Dresden, Germany. They use very different approaches to measure the nonlinearities. However, both have produced results that successfully model driver behavior under large signal conditions.

The work for this article involved extensive correspondence with both David Clark, the inventor of DUMAX and Wolfgang Klippel. In reaction to its publication, Dr. Stefan Irrgang (Klippel GmbH) found it to be "a very valuable article because it "transforms" the complicated nonlinear behavior to a very reasonable level without simplifying too much." Dr. Wolfgang Klippel said of this article: "I like very much the good humor in your introduction and I am also impressed about the transformation of this difficult subject on the right level for your readers. I also appreciate that you are trying to be very precise at the same time." *audioXpress* worked with Thomas Perazella and Klippel to recover some of the material used in this article, originally printed in black and white, allowing us to publish the photos now in color. This article was originally published in *audioXpress*, March 2003. [Read the Article Now Available Here](#)



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