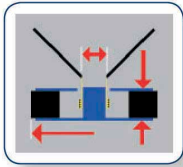




Scientific Design Software

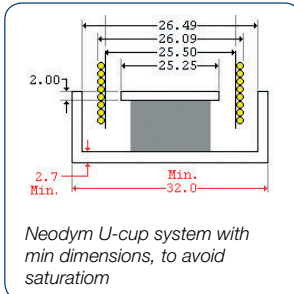
LOUDSPEAKER

– for better speaker designs



FINEMotor™

Magnet System & Voice Coil Design Program



The FINEMotor program is the unique simulation tool for prediction of SPL & T/S parameters including Xmax and wire diameter. FINEMotor is also the unique simulation tool for designing the magnet system, voice coil and spider for woofers, domes, telephone-receivers, headphones etc.

Precise and Fast

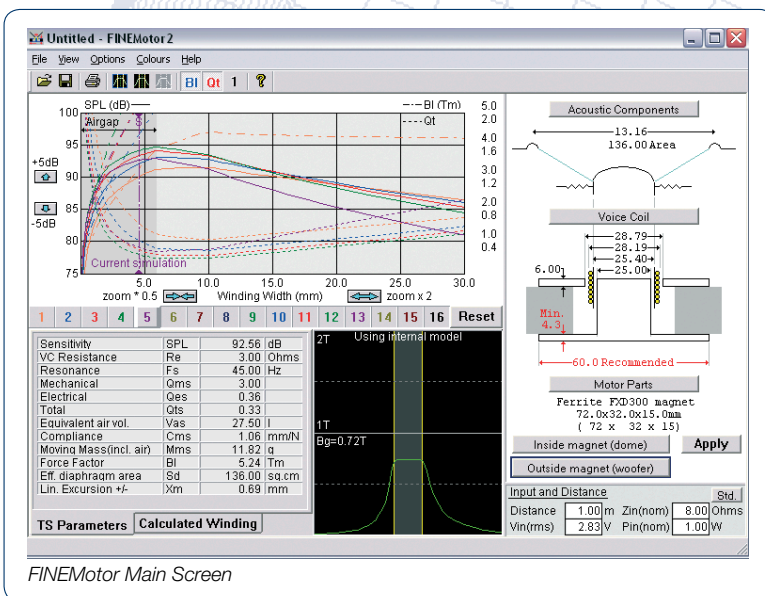
When SEAS was designing a new product line and used FINEMotor for the first time, the result was right on target and saved them a lot of time. After this first attempt SEAS now works with FINEMotor for all new motor systems.

Material database

With the latest version of FINEMotor you can add your own magnets and wires to the database, which already has a lot of standard Chinese materials to choose from.

Special Features:

- Accurate prediction of SPL, T/S parameters and winding data
- Round and edge wound copper, aluminium and CCAW wires.
- F_s is calculated from Cone F_o and spider deflection/ Resonance/ flexibility.
- Ferrite, neodymium and user specified magnetic material
- Automatic magnetic compensation of air gap for larger wires or multi-layer VC's



- Twin voice coil 2+2 layers in parallel
- Shielded/unshielded – only one button click
- Saturation shown in top plate, pole and back plate
- Q_{ms} is estimated by including VC former losses for Alu or Kapton
- Selection between steel or non-steel frame
- Updated internal flux motor models: T-Pole, extended Pole
- Up/down offset of Voice coil now standard

FINEMotor™ Examples

New designs:

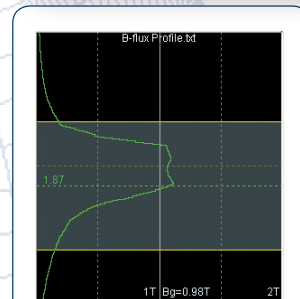
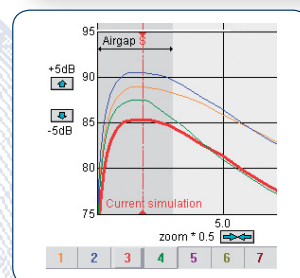
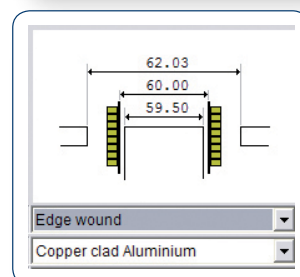
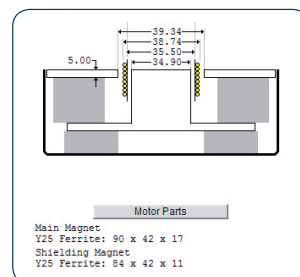
- You can design an 8 inch long throw subwoofer with shielding and for instance a $Q_{ts}=0.33$, plus calculate the spider deflection + stiffness to get $F_s=28\text{Hz}$. The program gives you all winding data for the 3.35 ohm Voice Coil.
- Design a given size motor and get maximum BL, even when using a steel frame.
- With FINEMotor you can check the symmetry of the woofer magnet gap flux and move the Voice Coil up/down to find the best position. Calculate BL(x) at for example 2 and 5mm above and below the air gap.
- Design an optimum one layer Copper Clad Aluminum Voice Coil for a compression driver

Modifications of existing designs:

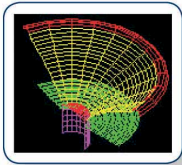
- You want to try a long 4 layer Voice Coil, but don't know how to predict the BL and Q_{ts} because the air gap is changed? Just input the 4 layers and the clearance you want between Voice Coil and top plate. FINEMotor will give you a choice of solutions with increasing X_{max} . Just pick the one you want and all winding data + motor dimensions are calculated for you.
- Add shielding cup + rear magnet to a woofer without changing the TS parameters.
- Optimize the sensitivity of a neodymium dome tweeter by using the best neodymium disk size.

Problem solving:

- Our current woofer is very good, but has too low impedance for our amplifier. Here you can modify the Voice Coil and motor, and still keep the TS parameters.

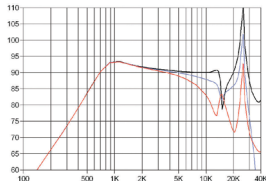


The voice coil, indicated by the yellow lines, is offset +1.87mm (down). All T/S parameters are recalculated instantly.

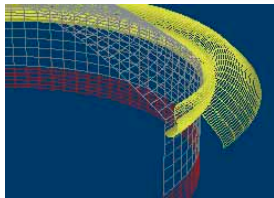


FINECone™

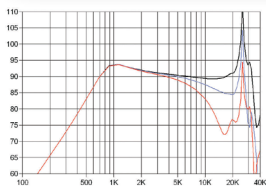
Acoustic Finite Element Dome/Cone Simulation Program



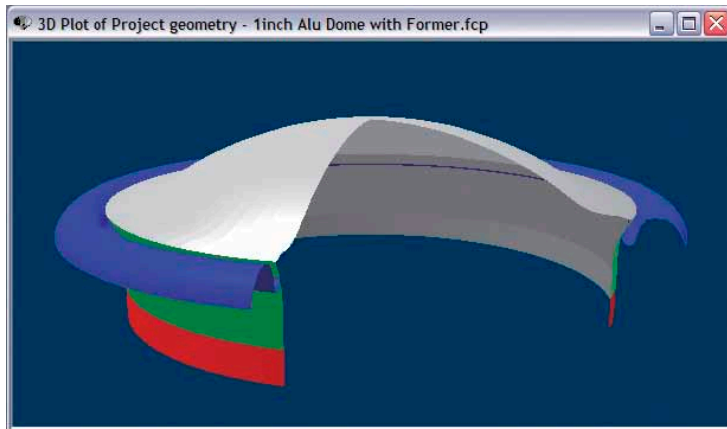
1 inch Aluminium Dome with problem at 15 kHz. Simulated response



FINECone 3D animation shows mode at 15 kHz



1 inch Aluminium dome with solved problem at 15 kHz, by adding glue joint. Simulated response



FINECone 1 inch Alu Dome Break-up mode @ 26451 Hz

The FINECone program gives you freedom to use your time and creativity to design better loudspeakers. Within seconds you can calculate the Frequency Response for a new driver or analyse your problems with an existing driver. FINECone can drastically reduce time-to-market for new products.

Save Engineering Time

High accuracy calculations in FINECone only take 5-30 seconds.

Save Tooling & Costs

FINECone predicts the performance so well that you only need to build one prototype instead of trial-and-error experiments.

Better Products

Use the Material Database to find the best driver components and optimize the cone thickness or stiffness that fits your exact demands.

Problem free production

Optimising the development process streamlines the production so you don't have to spend your time firefighting.

New Features

- DXF error tracking
- Export of response curves with phase
- Automatic air load calculation
- Frequency response over plot
- Library of DXF and FINECone models
- Import of TS parameters from FINEMotor
- Undo in 10 levels
- Improved whizzer cone calculation
- Chinese interface

FINECone™ Examples

New Designs:

In the design process for a completely new woofer the cone and surround is a big challenge, because the response is not known and no dimensions exists.

With FINECone this situation is elegantly handled and the user can quickly simulate many different cone shapes, and play with thicknesses etc. plus surround roll dimensions as well as dust caps, glue joints and even voice coil former materials.

The design of dome tweeters is even more demanding, but not with FINECone. Here you can simulate the thinnest dome diaphragm up above 50 kHz and optimize the dome and surround shape, as well as a very thin glue joint.

Modification of existing designs:

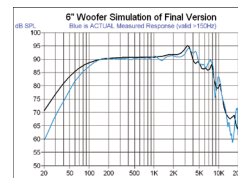
If you are not satisfied with a standard product you can simulate it in FINECone and find out what can be improved. It is very easy for example to change the cone material to Kevlar, Titanium or even more exotic materials like Beryllium.

Problem Solving

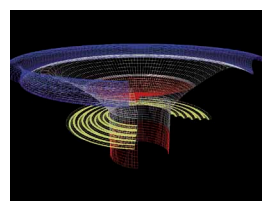
Maybe you have designed a nice looking woofer with an inverted dust cap, but unfortunately with bad response already around 1300 Hz. By exporting the response to FINE X-over we find that the x-over cannot remedy this problem. However the FINECone simulation shows that the surround is the problem. The simulated solution is found easily and corrects the problem fully.

Another example is a Chinese made Silk Dome Tweeter which has a response problem at 7 kHz. The simulation revealed that the dome edge and surround was breaking-up at this frequency.

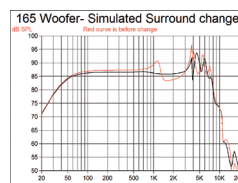
A possible solution was an additional glue joint to stiffen the edge. However that adds mass giving a lower SPL. A better solution was found by changing the bad geometry to avoid the problem without loss of efficiency.



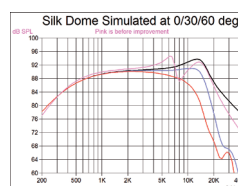
FINECone Simulated and Measured 6" Woofer



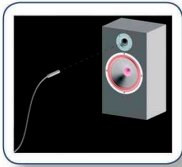
FINECone mode @ 1308Hz



Simulation of Improved woofer



Simulation of Improved Dome



FINE X-over™

X-over Simulation Program

Our customers are extremely impressed with Fine X-over 3.1. It is amazingly fast to use and has a clean uncluttered user interface. But best of all: it will cut down your development time with many hours per day.

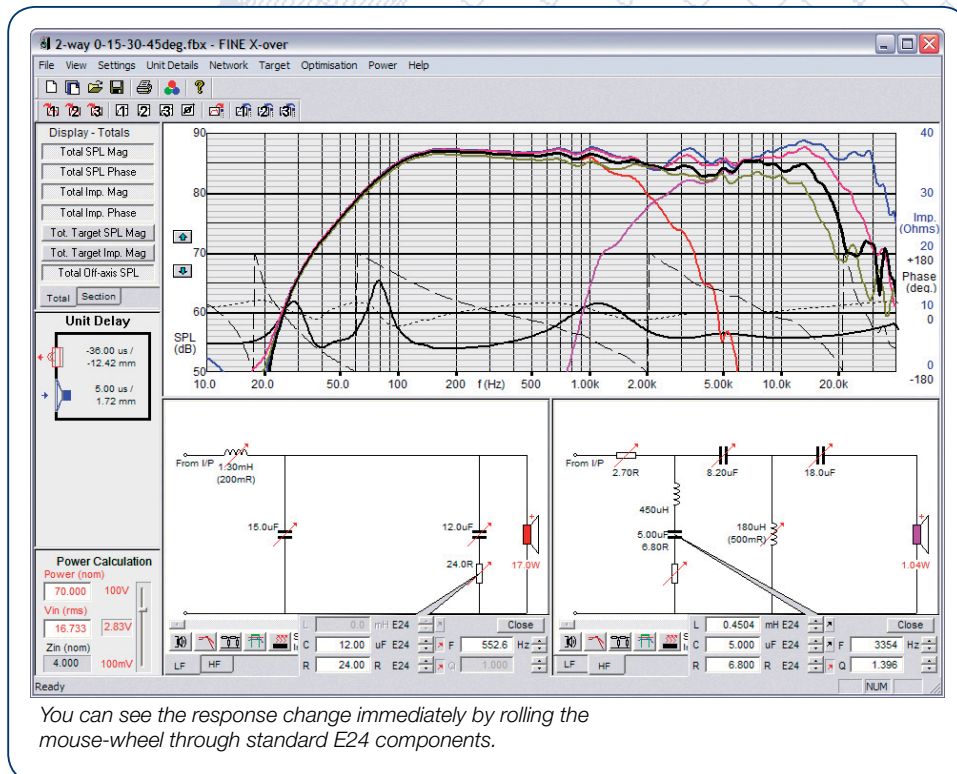
You can see the response change immediately by rolling the mouse-wheel through standard E24 components.

Or let the intelligent optimizer find the best flat response while keeping the minimum impedance and calculating the real power in all components.

Features:

- Intelligent optimizer for response and minimum impedance
- Response will change immediately when rolling the mouse-wheel through standard E24/E12... components
- Automatic power calculation of each component
- Preview of LMS, MLSSA, CALSOD, SOUNDCHECK.....driver response and impedance files
- Asymmetric LP and HP filter slopes in Band-pass
- Additional components for baffle compensation etc.

- Cascaded sections i.e. 2. woofer can be tapped from 1. woofer
- Time/distance compensation
- Variable target with slopes
- Both ON- and OFF-axis responses can be optimized at the same time
- Chinese user-interface



FINE X-over Examples

New Designs:

Simulate a completely new x-over using the real measured responses from prototypes. Or simulate the x-over with simulated responses from FINECone even BEFORE building the first prototype!

Use FINE X-over to simulate 1st/2nd or up to 4th order x-over with or without compensation networks. The program will automatically indicate which components are redundant, and thereby save component costs.

The Network Power feature is used to calculate the (IEC) power in all drivers and components in order to avoid overload in the finished x-over.

The intelligent optimizer will optimize BOTH frequency response AND minimum impedance to avoid too low impedance at any frequency, for protecting your amplifier.

Modification of existing designs:

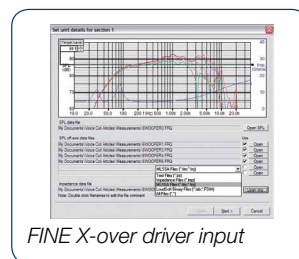
What if the production woofers or tweeters show a different average frequency curve? Import the actual driver response average from FINELab (Auto-saved in Statistics), and check the deviation from the original response in FINE X-over. Now you can optimize the x-over to give the same response with the production drivers.

You may find out that the component values in your x-over are not available in time for production? Just input the available values and re-optimize frequency response and minimum impedance once again.

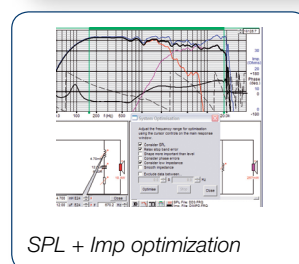
Problem Solving

Having problems in the field with burned tweeters? Redesign the x-over in minutes to lower the power in the tweeter without sacrificing the good response you had before.

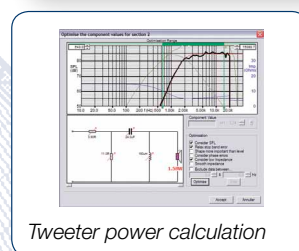
Customers complain that your loudspeaker system is causing problems with certain amplifiers? Redesign your x-over by using the button "New based on this" and optimize the system with increased (minimum) impedance.



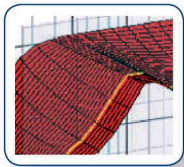
FINE X-over driver input



SPL + Imp optimization

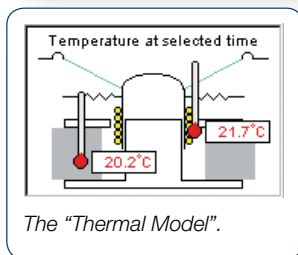
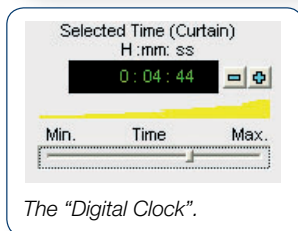
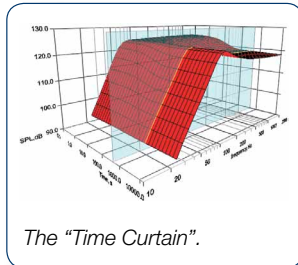


Tweeter power calculation



FINEBox™

Non-Linear High Power Enclosure Simulation Program



FINEBox is the ideal program for optimizing your loudspeaker system at high power. Use the mouse wheel to tune the Volume or Port (FB) in a bass Reflex or Band pass system.

You can even simulate the Voice Coil temperature and Compression at high power in Closed Box, ABR, Bass Reflex, Band pass and InterPort systems.

Import measured and simulated FSIM and TXT responses from most other systems including FINELab.

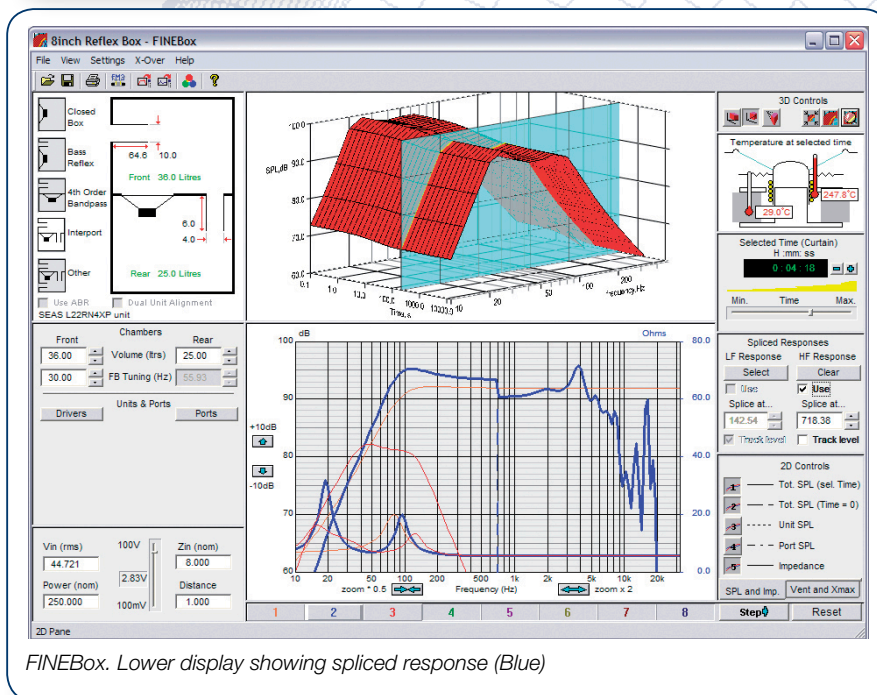
Splice imported responses with FINEBox curves and match SPL if needed.

Features

- Closed Box, ABR, Bass Reflex, Band Pass, InterPort systems are calculated
- 3D Display with "Glass" layer Time Response selection
- All Non-Linear T/S pars including thermal data can be imported from FINEMotor
- Power compression is calculated at any power level and time
- View Cone Displacement, Reflex and InterPort speeds at any power level

- Advanced Thermal model predicts heating of voice coil and motor
- Export simulated and spliced responses
- FINEBox is unique because you can input any TS parameters and directly get the bass response of a bass reflex system, ABR or Bandpass etc.
- Peter Madsen from KEF Audio UK says:

"You can change the TS parameters in FINEBox until you get the bass response you want! Then build a new woofer with these TS parameters and you have the perfect loudspeaker."





FINE QC™

Production Test System

The FINE QC test equipment is developed as a natural addition to the simulation programs from LOUDSOFT: FINEMotor, FINECone, FINEBox and FINE X-over. The FINE QC system will share data with the other FINEPrograms and works with the intuitive LOUDSOFT user interface.

The FINE QC production test system is developed to be powerful and efficient. You can use the test system for even the smallest tweeters.

Features:

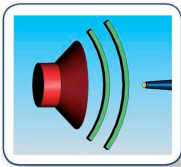
- Very fast test execution with CHIRP
- USB Interface
- Robust and reliable
- Extremely easy-to-use
- Different response limits (adaptive)
- Rub and Buzz test
- SPL, Impedance, T/S and Polarity measured at the same time
- Automatic daily average
- Automatically finding “Golden” average driver
- Available Danish electret microphone
- Files to FINECone and FINE X-over



Danish microphone



Measuring box with USB and Built-in 25W amplifier + 48V Phantom

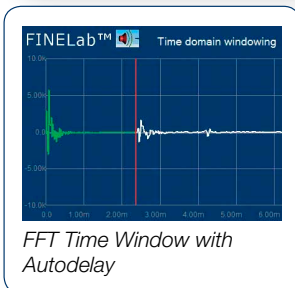


FINE QC

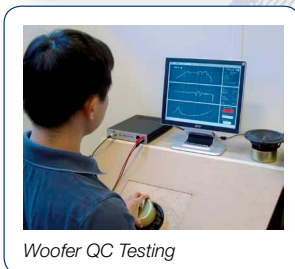
Time Domain and Tolerances



Mobile Receiver and Headphone Testing



FFT Time Window with Autodelay

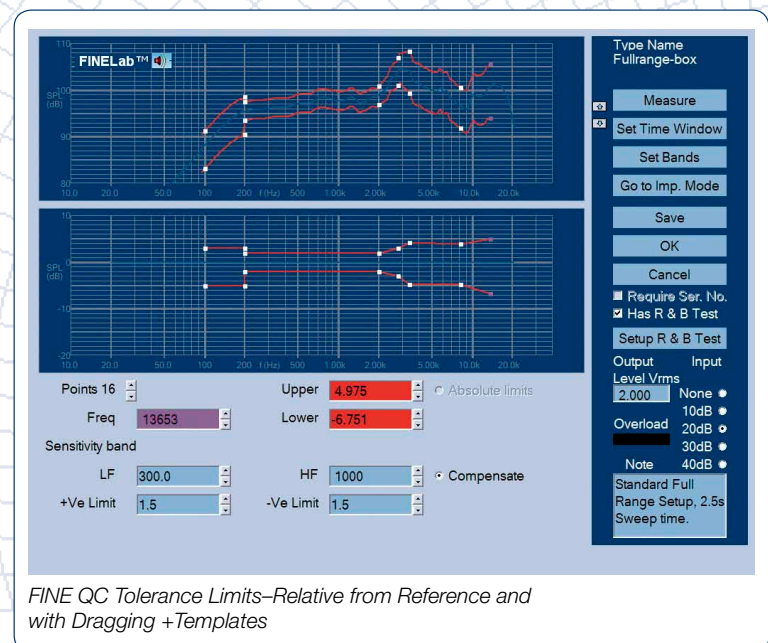


Woofer QC Testing

All Acoustic testing can be performed with FINE QC. Receivers for mobile phones, headphones, Loudspeaker Systems, Woofers and Tweeters etc. can be tested in seconds with very high accuracy.

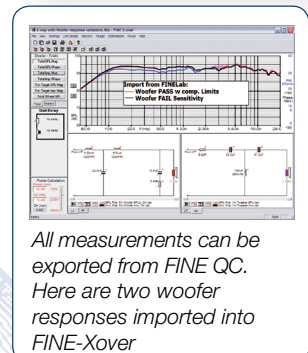
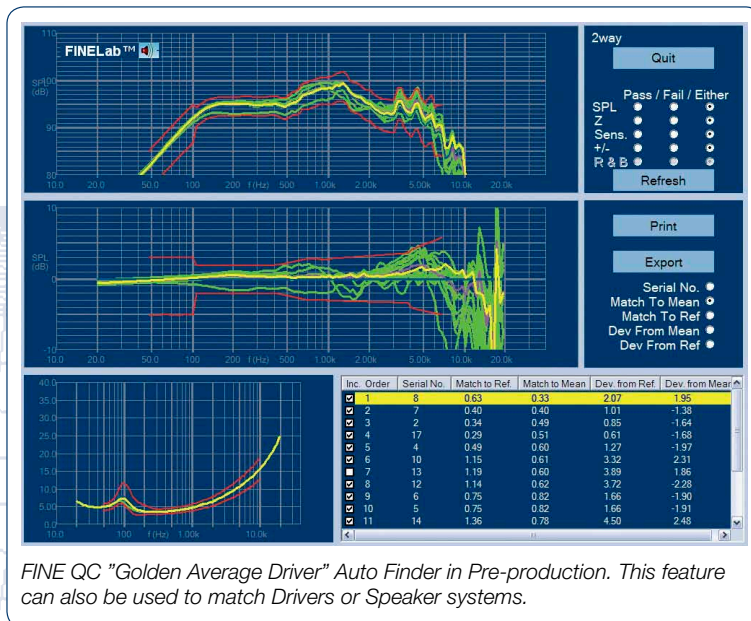
You may select a standard template with tolerances relative to your measured reference, and/or modify the limits by mouse dragging, for example to allow more space for the natural variation of a steep slope in the frequency response.

The engineer can specify an average sensitivity over a defined frequency band and Floating Frequency Limits can be controlled by the Sensitivity +/- limits.



FINE QC Tolerance Limits—Relative from Reference and with Dragging +Templates

FINE QC “Golden Average Driver”



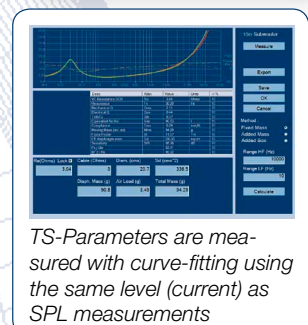
When starting a new production, the most important is to find the unit which is closest to the average of the good units, so it can be used as reference.

A pilot run consisting of 17 woofers for a 2-way system, were sorted using the automatic Preproduction Feature, see the Figure above. The highlighted driver response (yellow) is Serial No.8 in the table and is the best match to the average i.e. the Golden Average Unit.

Note that driver No. 7 was deselected in the table because that response was considered non-typical and should not disturb the average.

Should it be necessary to find a similar reference driver later, that can be found by selecting “Best Match to Reference”.

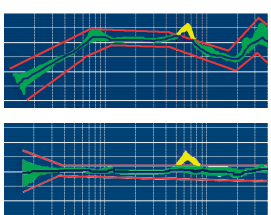
The preproduction feature can also be used for "Pair Matching" of loudspeaker systems or drivers, or sorting of units with different response variations.



FINE QC tests and statistics



Testing



Statistics

FINE QC tests

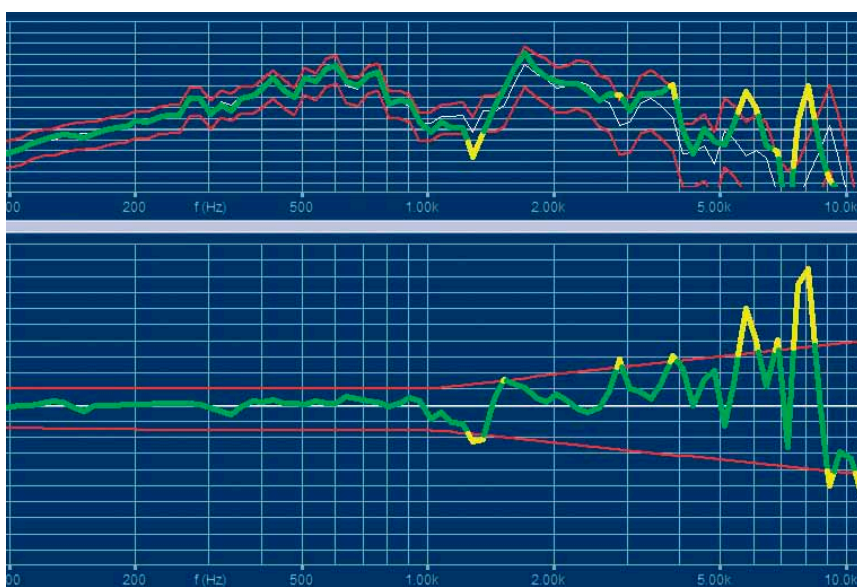
You can use your own microphone with the FINE QC system, or buy the inexpensive LOUDSOFT electret microphone. This very high quality microphone is produced in Denmark and is calibrated for the FINE QC system.

FINE QC statistics

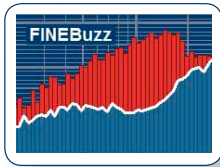
The statistics collected by the FINE QC system is designed in such a way that you automatically will get the average and deviation statistics you need, no more – no less.

FINE QC tolerances

The QC system is optimized for production testing. It is extremely fast and simple for the operator. If the tested loudspeaker is outside the tolerances, you can see it with just a quick glance.



Tolerances



FINEBuzz

The new Rub & Buzz Method in FINE QC

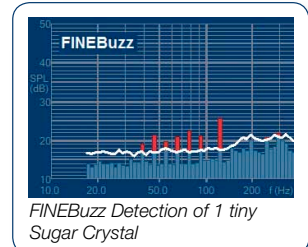
This new detection method is based on the latest Danish research on hearing mechanisms, using a completely new algorithm to find the annoying sounds, which cannot be detected with conventional methods like THD, high harmonics or IM distortion.

The signal is measured in the Time Domain, and a special algorithm is applied to find the fast low level impulses, which are normally masked by noise. Finally the result is filtered and transferred by FFT to the frequency domain, whereby the Rub & Buzz phenomena can be correlated with the actual frequencies.

The new FINEBuzz method is extremely sensitive and can detect even a small sugar crystal ticking on a loudspeaker cone.

FINEBuzz Features:

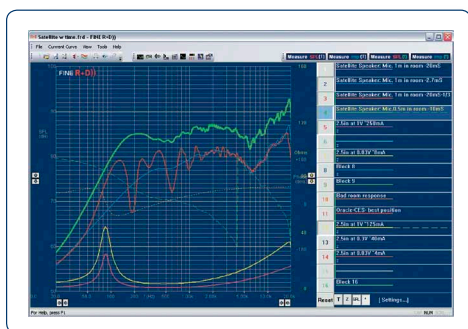
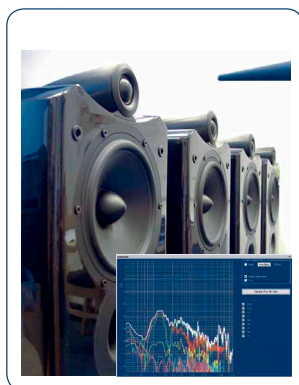
- Complete 100% End-of-Line Testing for all loudspeaker drivers and cabinets
- Very fast in production, <1-2.5s
- Integrated in FINE QC™
- Will find all rubbing Voice Coils
- Detects loose particles and even a small buzzing tinsel in a tweeter
- Detects subtle cabinet resonances and air leaks
- Uses the standard FINE QC™ hardware with built-in amplifier





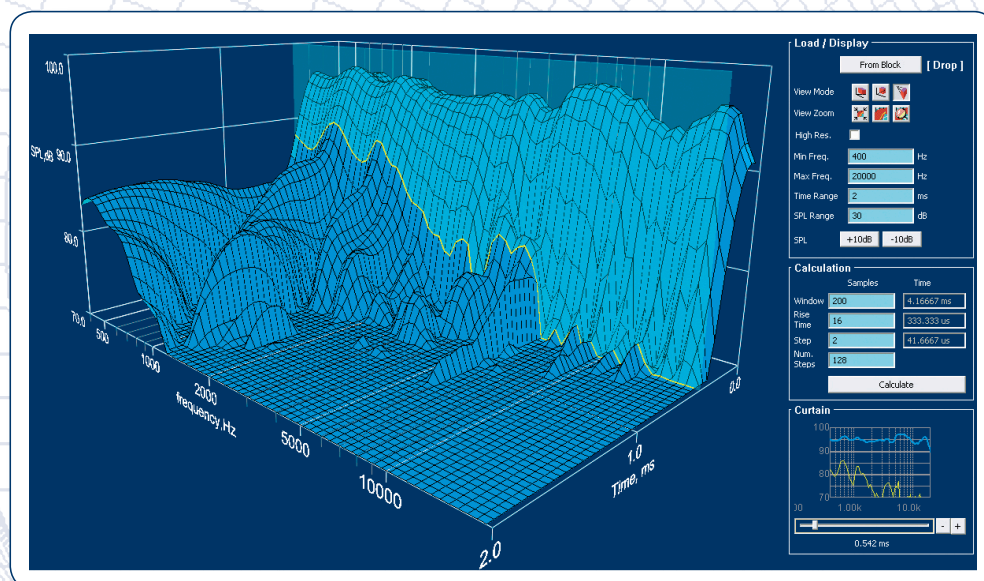
FINE R+D)))™

Acoustic Measurement System



Features:

- Anechoic FFT measurements in rooms with Acoustic Auto-delay
- SPL/Frequency and Impedance responses with phase
- Multiple Display of 16 or more responses with up/down scroll
- Drag and Drop files from VACS, MLSSA, LMS and other programs
- THD + 2 – 9th harmonics
- Cumulative Decay Spectrum “Waterfall”
- Room measurements: 1/12 - 1/6 - 1/3 - 1/2 - 1/1 octave Smoothing
- Extended Low Frequency measurements
- Export of all measurements with phase in *.lab and *.txt format (VACS / Klippel)
- Curve library of up to 50 curves/responses/TS parameters etc
- Thiele Small parameters: Fixed Mass/Delta Mass/Added Box
- Full System calibration incl. Microphone
- For Professional USB soundcards with Loudsoft/ASIO drivers



History

LOUDSOFT – *for better speaker designs*

Peter Larsen as an engineer

Peter Larsen has been working in the loudspeaker industry since 1974. He started his career with SEAS, was Chief Engineer for Vifa 1979-1987 and for Dynaudio 1987-1990. Until 1993 he worked with JBL in USA. From 1993 Peter Larsen has worked as an independent consultant for leading loudspeaker factories all over the world: Audax in France, KEF Audio in UK, Goldmax in China, Vifa-Speak in Denmark, Peerless Fabrikkerne of India, and NXT in UK.

Peter has specialized in in-depth analysis of loudspeakers and manufacturing techniques, research concerning new components and materials, advanced Acoustic Finite Element modeling, new measuring methods, novel speaker design concepts and development of several customized products (private label).



Peter Larsen as a musician

For more than 35 years Peter has been singing in choirs. At the same time he is a good piano player and he also plays the trombone. Lately he has started to arrange music for the Quintet he is playing with and he has performed on quite a few CD's during his time as a musician.

Peter has a very good ear for music and sound. That means that he also has a good ear for loudspeakers – which he has proved over the years.

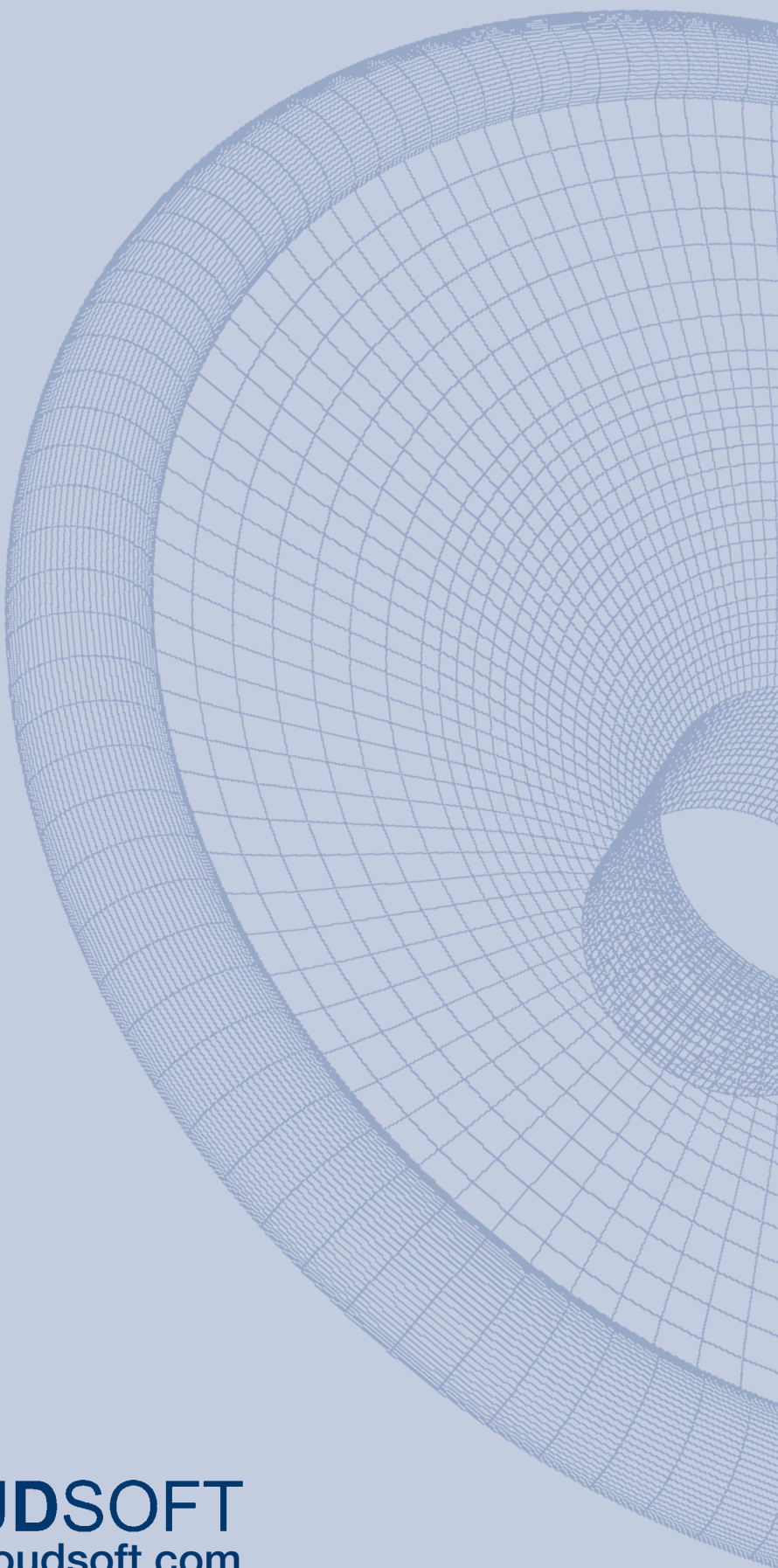
Peter Larsen as an inventor

During the last 30 years Peter has designed many new drivers for Dynaudio, JBL, KEF and other producers, but the most impressive invention was the Ring Radiator: One Friday afternoon he was working with a dome tweeter, but it had problems. As he was tired and frustrated, he took a big needle and stuck it through the dome. The dome was still able to play and the frequency response was flat as a ruler up to the limit of the B&K system. The Ring Radiator was born.

Visit
www.loudsoft.com
for more information
and download free
demos of the
programs

LOUDSOFT

– for better speaker designs



LOUDSOFT
www.loudsoft.com

Agern Alle 3 – 2970 Horsholm – Denmark
Phone +45 4582 6291 – Fax +45 4582 7242
E-mail: dl@loudsoft.com