

Design Engineering Department Tour

The following demonstrates typical Misco capabilities by using examples from various speaker designs

Engineering

- **Misco Engineering has been designing high quality loudspeakers for over 60 years**
 - Loudspeaker drivers
 - Crossovers
 - Enclosures
 - Complete loudspeaker systems
 - Design and manufacturing of amplifiers, utilizing analog and digital signal processing
- **Our engineering staff can work with you in several ways:**
 - Modify an existing MISCO product to meet your specifications
 - Reverse engineer unique or discontinued drivers
 - Do a ground-up design based on your requirements and specifications

Engineering Tools

Or we can start with this

- 8" round cast basket
- Poly cone with rubber surround
- Frequency response $\approx 35\text{Hz}-3.5\text{kHz}$
- 91 dB SPL 1W/1m
- DC 5.7, Fs 31Hz, Qts 0.24, Vas 66liter

Engineering Tools

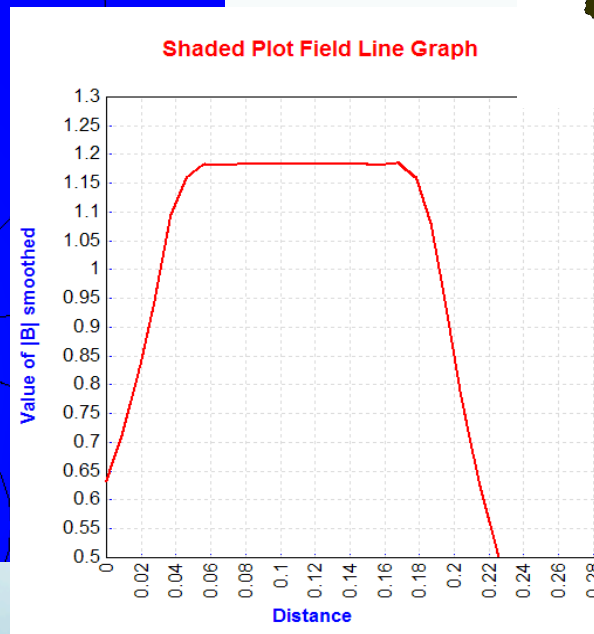
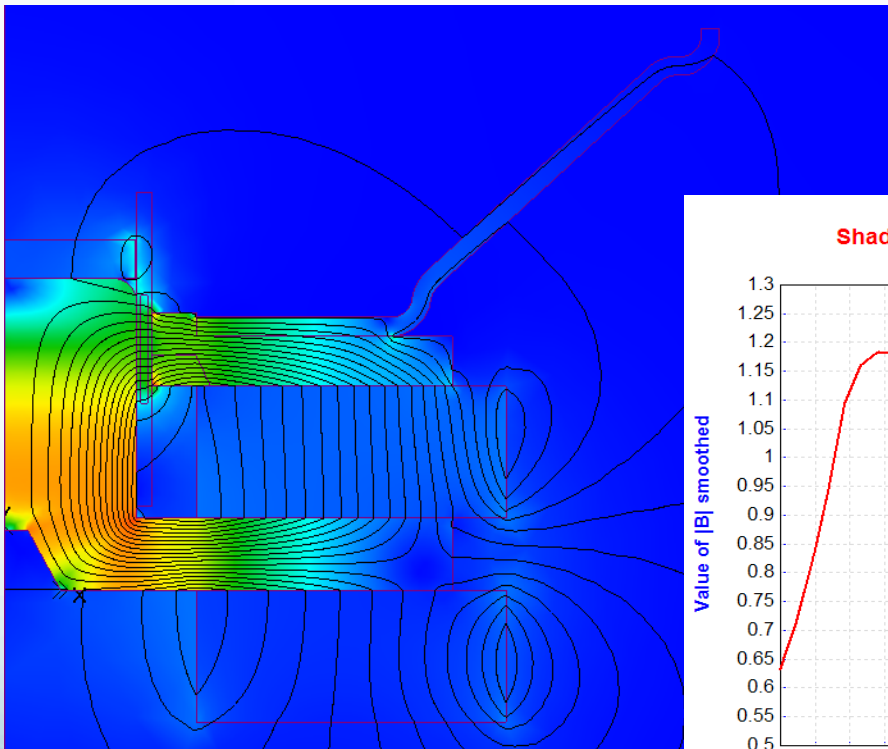
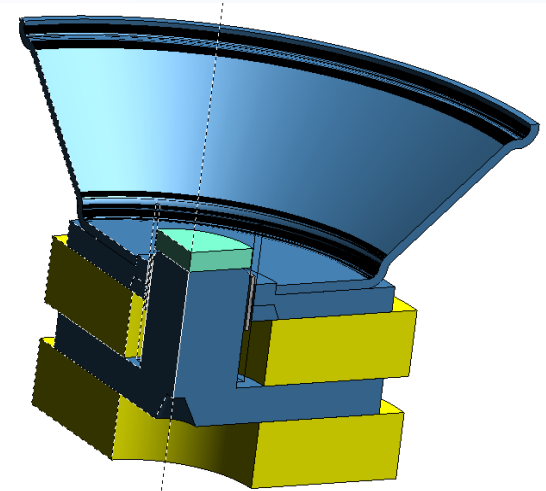
Or we can start with this

1. 2 way system vented box
2. 10 liters or less
3. 5.25" woofer & 1" tweeter
4. 88 dB SPL 1W/1M
5. 50Hz - 20kHz

Engineering Tools

Magnetic Finite Elemental Analysis

- Infolytica MagNet™
- FEMM



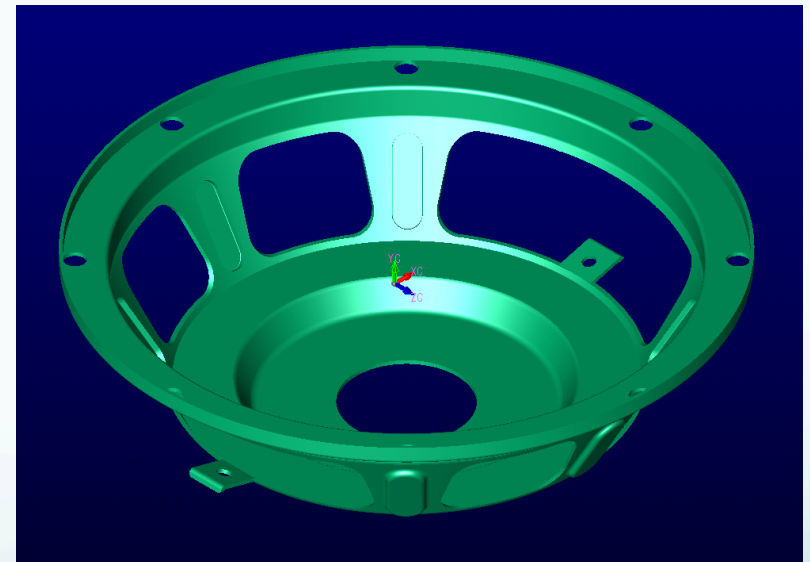
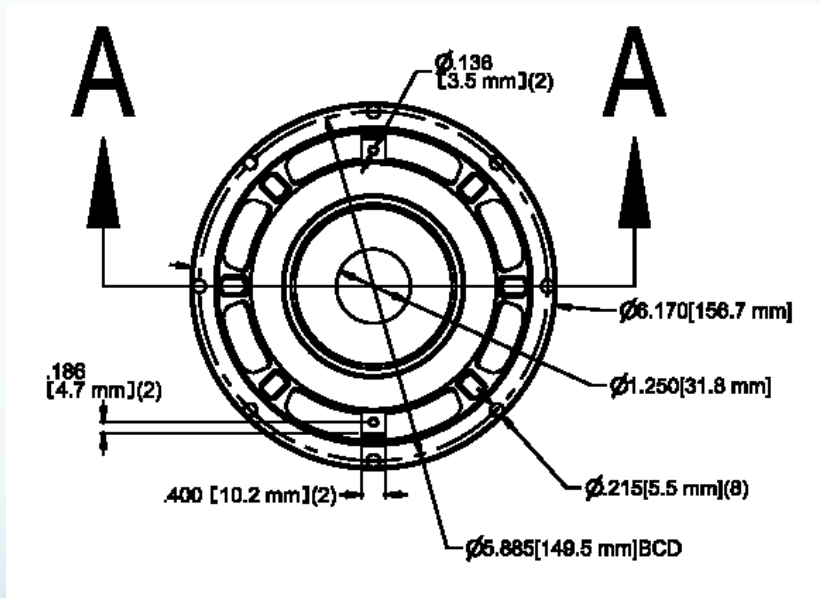
Design Group Engineering

MISCO
Minneapolis Speaker Company

Engineering Tools

Solid Modeling & Rapid Prototyping

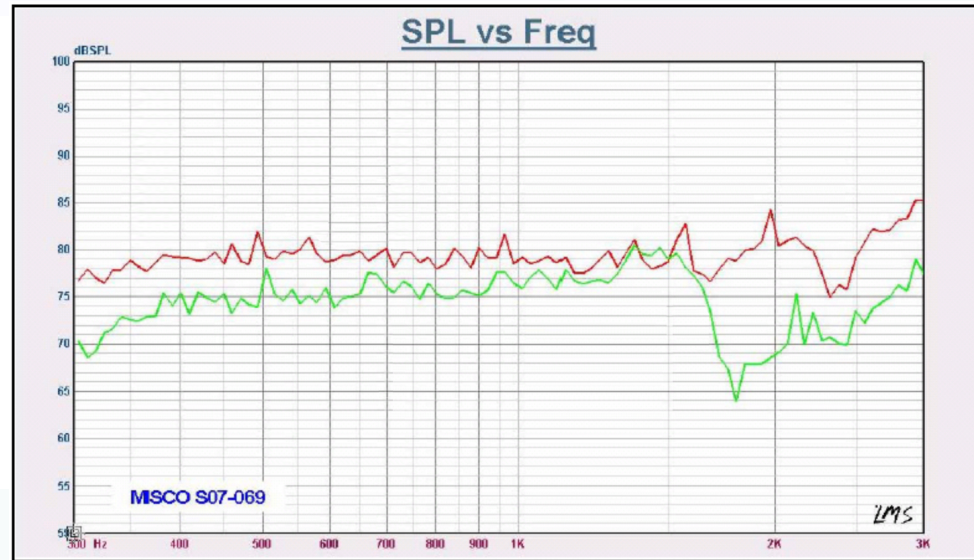
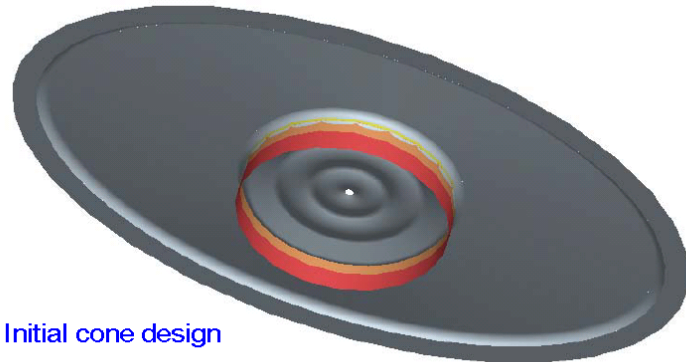
- SolidWorks & CadKey 2D and 3D drawing capabilities
- Produce DXF, DWG, IGES, STL files (and many more)
- Rapid prototyping SLA and 3D printing



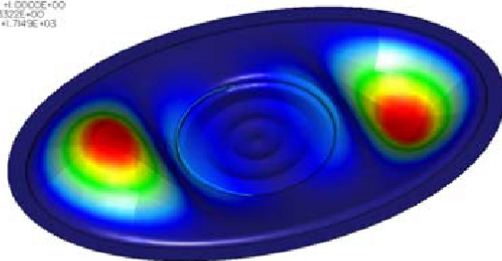
Solid model data is used to create STL files for rapid prototyping...

Engineering Tools

Modal analysis of soft parts



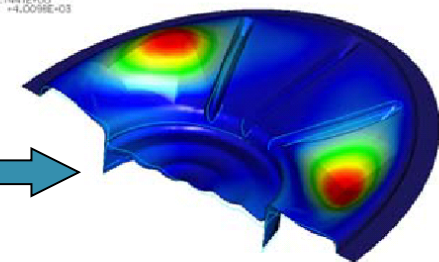
Displacement Mag (WCS1)
(mm)
Deformed
Max Disp: +1.0000E+00
Scale: 4.3322E+00
Mode: 5: +1.743E+03



Mode 5, Long axis rocking breakup

Adding body ribs
pushes destructive
bending mode up
above 3kHz limit

Displacement Mag (WCS1)
(mm)
Deformed
Max Disp: +1.0000E+00
Scale: 2.7441E+00
Mode: 5: +4.0098E+03



Mode 5

Engineering Tools

Misco custom designs all voice coils in house to meet performance goals



Round Wire Voice Coil Design		Input Parameters		Wire Diameters	
				AWG	Cond. Insul.
				26.0	0.0157 0.0174
(units are in ohms, inches and grams)		Wire Condition	MINIMUM		
DC Resistance@25C	= 3.20 ohms	Conductor OD	0.0157		
Conductor Length	= 619.7 in	Insulated Wire OD	0.0174		
V C Section Width	= 0.0937 in	Bobbin Glue Thick	0.0010		
Voice Coil Outside Dia	= 1.2085 in	Bobbin Thick	0.0030		
Voice Coil Avg. Dia	= 1.1157 in	Packing Factor	0.952		
Wind Inside Diameter	= 1.0230 in	DC Resistance@25C	3.20		
Number of Turns	= 176.8	No. of Layers	6		
Turns on 1st Layer	= 32.0	Voice Coil ID	1.0150		
Stacking Factor	= 0.678				
Inner Wind Height	= 0.584 in				
Outer Wind Height	= 0.493 in				
Average Wind Height	= 0.539 in				
Total Wire Mass	= 6.55 g				
Adhesive Mass	= 0.49 g				
Total Mass w/o Bobbin	= 7.04 g				
		TYPE	RHO		
		Round Wire	CC AI 9.9960 E-7		

Engineering Tools

Small Signal Simulations

— SpeaD & RevSpeaD

SpeaD
File Edit Motor DataBase Design Tools Help
File: Capilano Audio S07-042-V1

Voice Coil
2 SVC Layers
2.020 VCID (in)
AL.10 Former
A_Copper1 Wire (AWG)
Optimizer
29.5 Wire
.931 WHgt (in)
7.453 DCR Ω

Motor Parts
Frontplate (in)
5 Outside Dia.
0.312 Thickness
2.100 Inside Dia.
Magnet (in)
5.24 Outside Dia.
0.75 Thickness
2.32 Inside Dia.
Backplate / Pole (in)
5 Outside Dia.
0.312 Thickness
1.996 Pole Dia.
Pole Extension
0 Vent Hole Dia.

Soft Parts
Cone
15 Size (in)
.0876 Sd (M²)
25. Cone Fo
25. Cone + 1/2 edge Wght
Spider / Misc.
1.45 Spider
50 Defl. Wght.
8. Misc. Wght.
Qms
12. Qms
Bg Adjust
100 %

Parameters
7.45 Re
25.9 Fo Hz
0.533 Qts
642.37 Vas (L)
0.5577 Qes
12 Qms
11.74 BL (T/M)
7.85 Xmax mm
48.71 Mmd g
63.36 Mms g
596 Cms $\mu\text{M/N}$
95.24 SPL 2.83V

SpeaD Reverse Synthesis
File Enclosure Design Tools Help
File: [] [2] [3] [4] [5] [6]

Targets Sealed
7.4 Re (Ohms)
15 Cone Size (in)
.087616 Sd (M²)
13 Qms
25 Total Volume ft³
.66 Qtc
50 Mmd (g)
6 Xmax (mm)
35 F3 Low (Hz.)

Parameters
7.4 Re
23.54 Fo (Hz.)
0.5562 Qts
0.5811 Qes
13 Qms
621.6 Vas (L)
12.22 BL (T/M)
6 Xmax (mm)
20.18 BL²/Re
79.31 Mms (g)
576.6 Cms $\mu\text{M/N}$
93.71 SPL 2.83V

Enclosure
0.8786 Alpha
9.261 Pemax

Input Voltage: 2.83 ON

Frequency Response
Impedance Response
Max Power (Watts)

Curve Info

Curve: 10 SpkrModel: S07-042 V1 W/ET

Data:
Horz Range: 10.0...20.0KHz
Left Vert: Imp
Right Vert: Phase
Polar Freq (Hz): 1.0000

Info:
S07-042 V1 W/ET Revc=7.400 Ohm Fo=25.825 Hz Sd=87.616m M² Md=100.600 g
BL=11.436 T-M Qms=12.698 Qes=0.587 Qts=0.561 No=1.836 % SPLo= 94.7 dB
Vas=647.295m M³ Cms=593.809u M/N Krm=3.534m Ohm Erm=0.838
Mms=63.962 g Mmd=49.050 g Kxm=41.362m H Exm=0.630

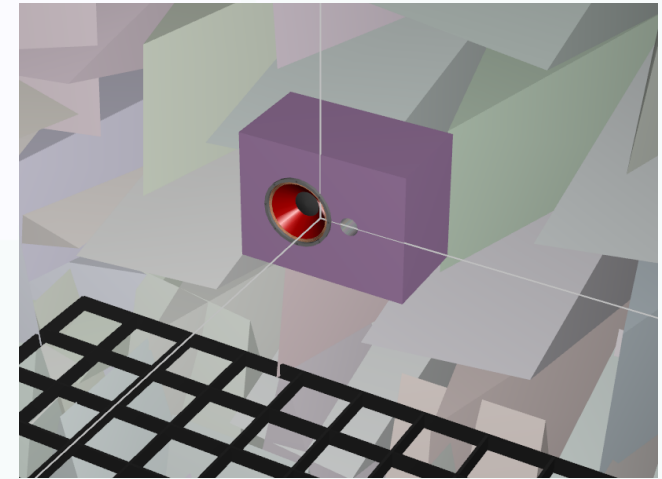
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 Copy Info Text to Left Graph Notes Copy Info Text to Right Graph Notes Auto Copy

Ok Cancel

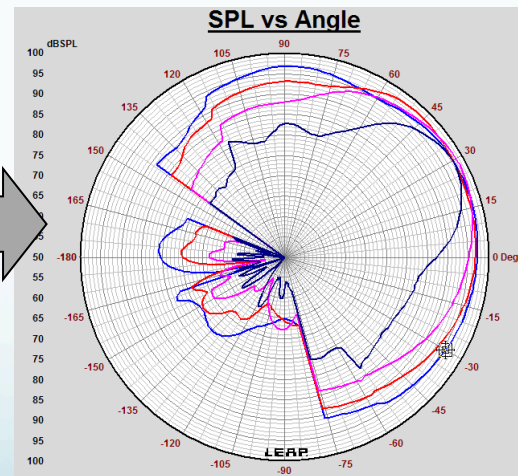
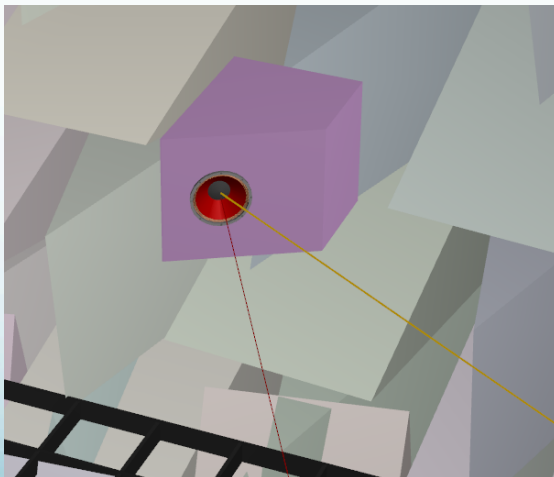
Loudspeaker Enclosure Analysis Program



- Accurately design and analyze system performance using test data from LMS
- Calculates on and off-axis frequency response
- Impedance curves
- Excursion levels



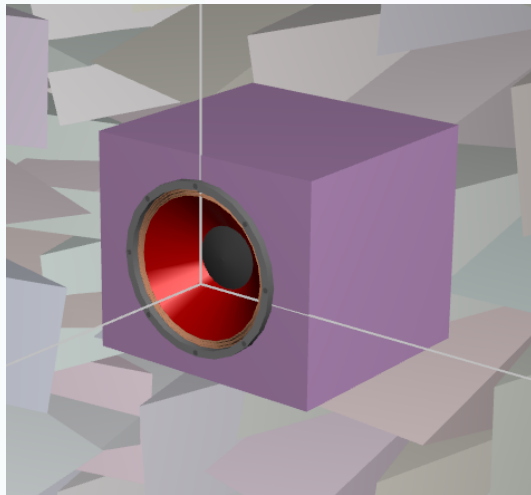
4" vented system



2-1/2" full-range

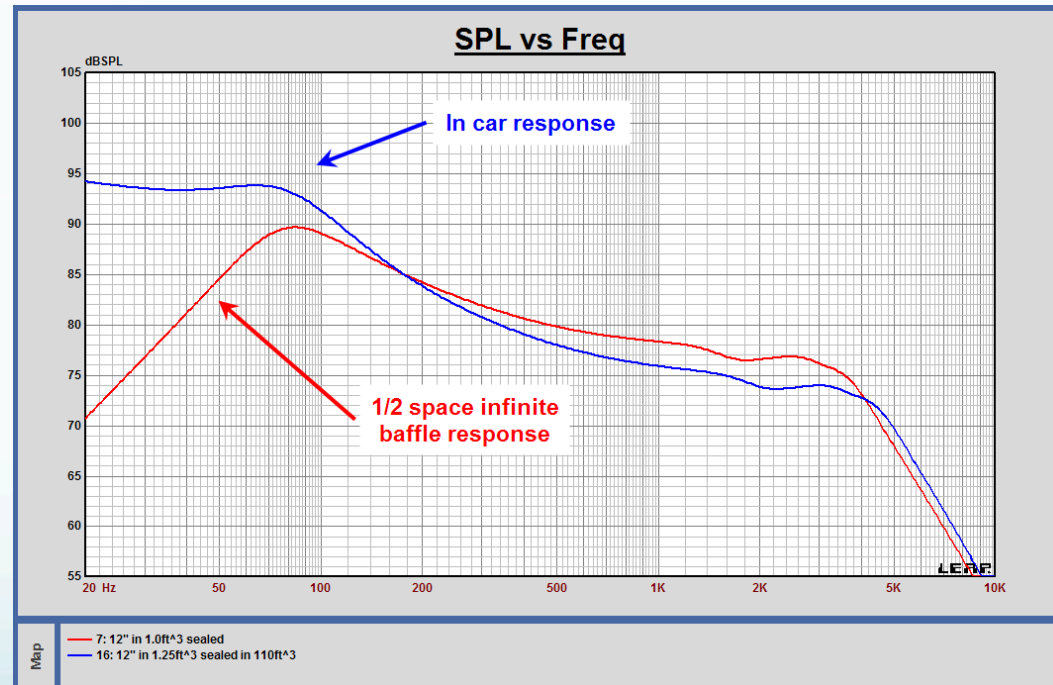
Design Group Engineering

Loudspeaker Enclosure Analysis Program



High performance 12" car audio subwoofer in 1ft³ sealed enclosure

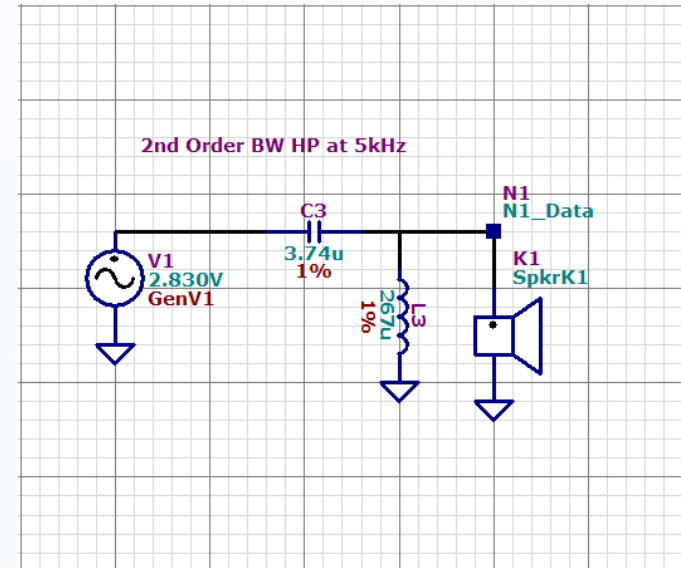
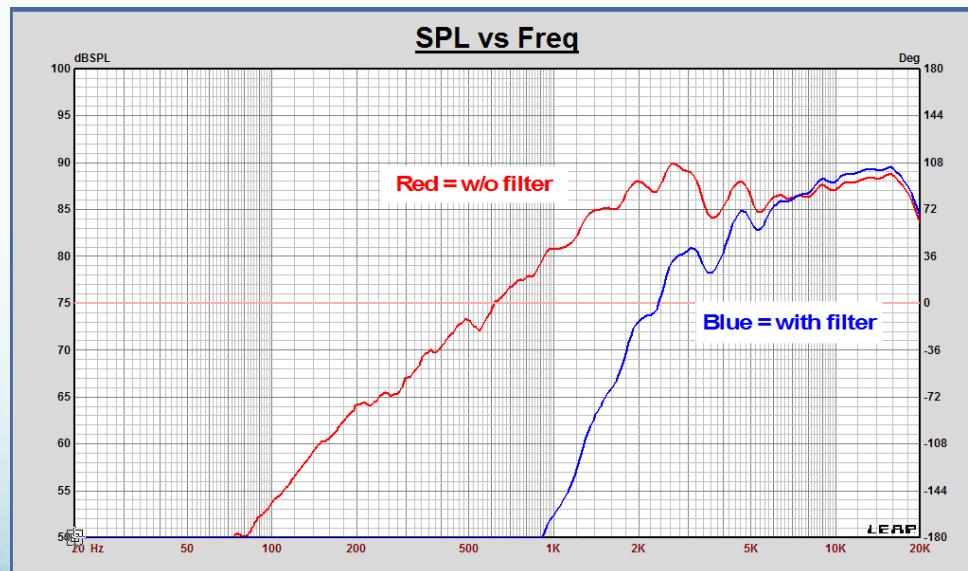
Software will also simulate changes in the model's domain shape and volume...



Crossover shop



- Design and analyze active and passive crossover circuits
- Uses actual speaker frequency and impedance response data from LMS

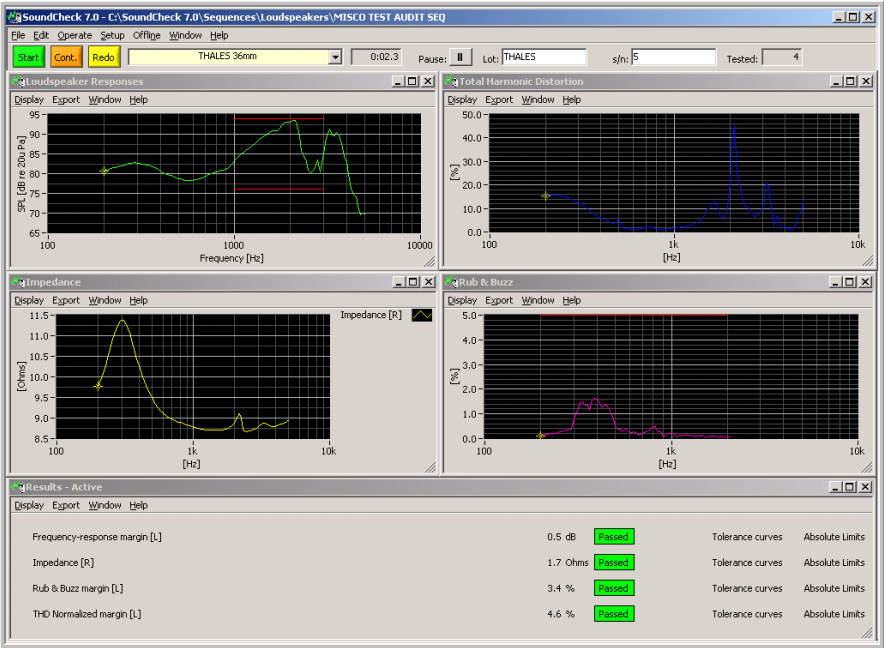
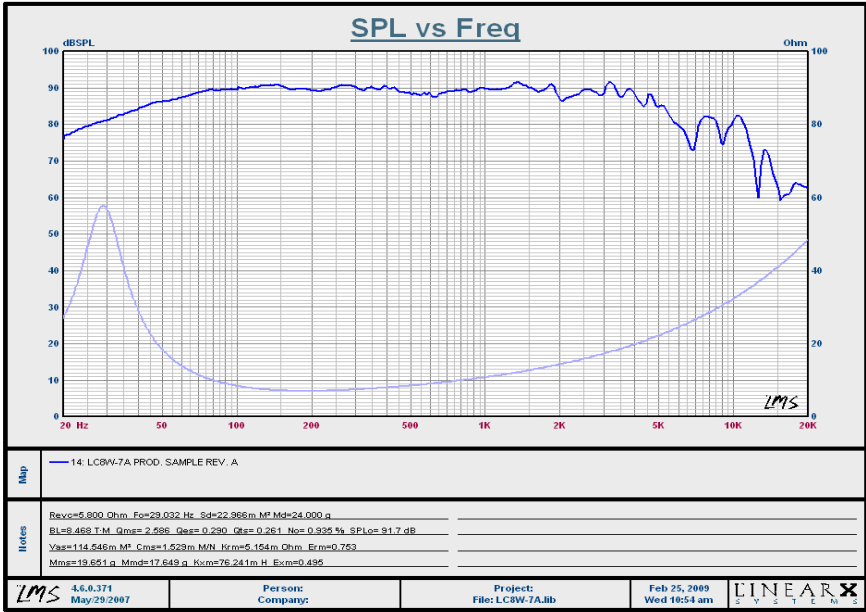


MDT-025A Tweeter
25mm soft dome

Engineering Tools

Testing equipment

- LMS analyzer
- TEF analyzer
- SoundCheck Analyzer

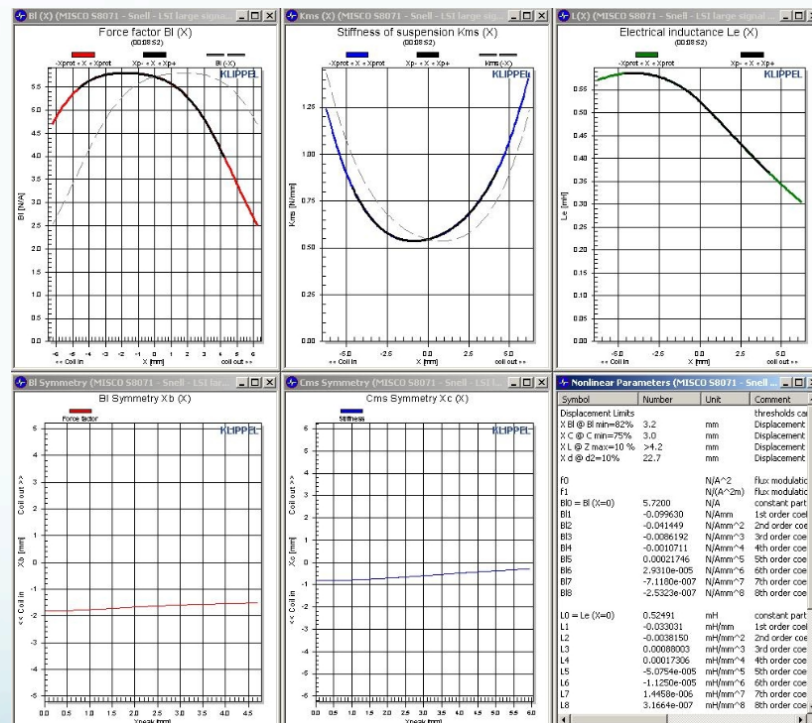


Engineering Tools

Testing Equipment

We can provide:

- Frequency response, distortion, impedance and small signal measurements
- Klippel Analysis of motor and suspension linearity
- 3D polar response
- EASE data



Engineering Tools

Other services we supply

- We have capability to provide full FEA analysis on motor and suspension components maximizing linearity
- Access to anechoic and reverb chambers

Engineering Tools

Quality Control

- Utilize SoundCheck for end of line testing
- 100% testing or batch audits
- Batch reports and statistics available on request

FC46MB-8A			Total Speakers Ran Total Speakers Passing		
	dB	Resonant Frequency Hz.	Qts		
UPPER LIMIT	102	130	1.6	109	109 100.00%
LOWER LIMIT	96	79.6	1.25		
MEAN VALUE	98.57981651	107.6788991	1.405779817		
MODE VALUE	98.7	111	1.44		
MEDIAN VALUE	98.6	109	1.41		
DEVIATION	0.262933283	4.579332778	0.052676851		
CPK USL	4.335933242	1.624770973	1.229004017		
CPK LSL	3.270559087	2.043885754	0.985757592		
CPK	3.270559087	1.624770973	0.985757592		
Batch measured on 11-4-2009 by C.V.					
<small>Note: All data collected in production environment per Misco test procedure TP-926. Data is meant to be used as a relative gauge of performance and quality. Printed values may differ from approved engineering specifications.</small>					
			Time To Complete		
			7:06:30	start	
			9:59:05	end	
			2:52:35	total time	
			0:01:35	ave. time per speaker	
			Individual Test Passing Rate		
			Frequency Response Margin		
			109	100.00%	
			THD Margin		
			109	100.00%	
			Rub and Buzz		
			109	100.00%	
			Impedance Margin		
			109	100.00%	
			Ave. Sensitivity		
			109	100.00%	
			Resonant Frequency		
			109	100.00%	
			Qts		
			109	100.00%	
			Polarity		
			109	100.00%	



Return to Website

<http://miscospeakers.com/support/tour>