AES MEASUREMENT WORKSHOP

2-19-2011/Atlanta GA

SYSTEM ALIGNMENT BASICS

Ivan Beaver dB Audio&Video/Danley Sound Labs

MAIN PURPOSE

What are we here to do?

Why am I doing this?

Sound system-Instrument or Tool?

Linear Transfer Input=Output

All a matter of compromise

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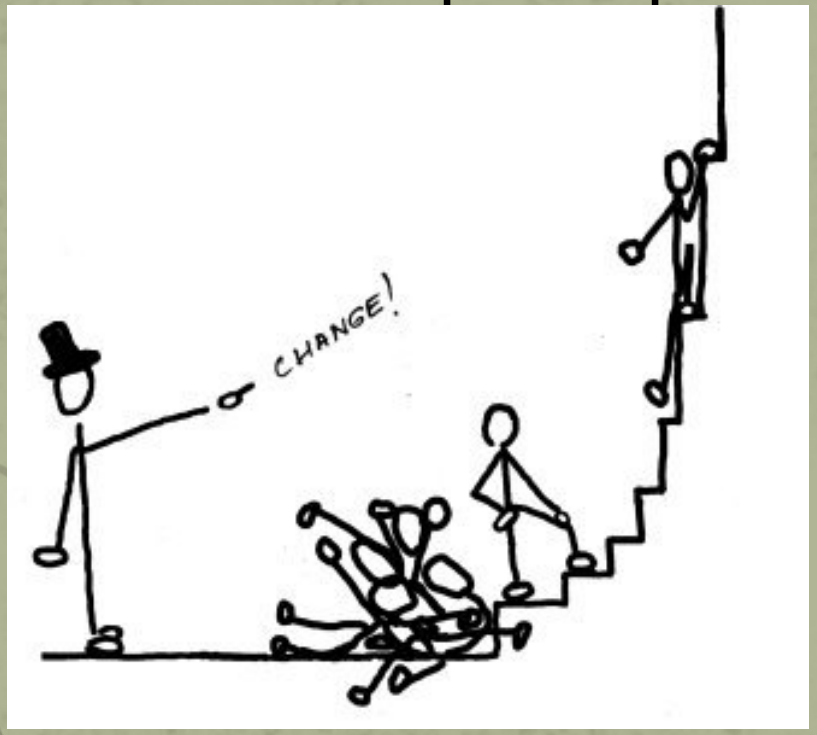
CURVES-Good or Bad?

High freq rolloff?

House curve, X Curve etc.

Low freq “bump”?



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INSTALLED vs PORTABLE Sound systems

Differences
Time & material

DESIGN Time

LOUDSPEAKER options

HANG Time

ALIGNMENT Time

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EXPECTATIONS

Consistencies

+ or – a certain SPL dB is not good enough-

Freq blind

Portable system more tolerant of level variances

FOH usually most important

Installed systems need more consistent coverage

Every seat should be roughly the same response and level

Target +/- 3dB across the freq response band

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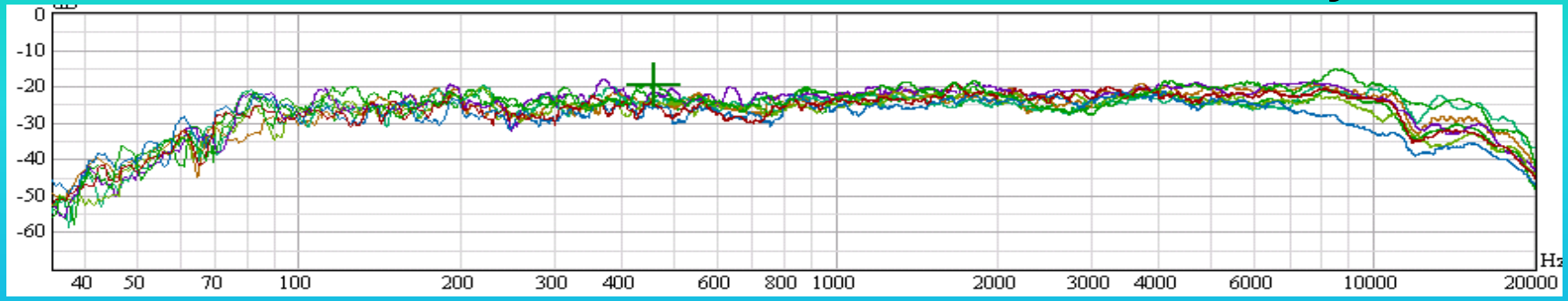
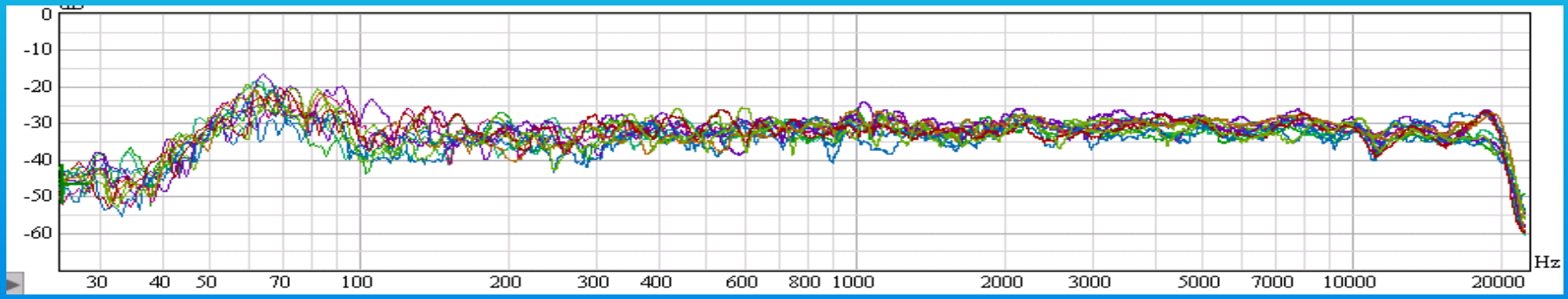
ACTUAL MEASURED EXAMPLES

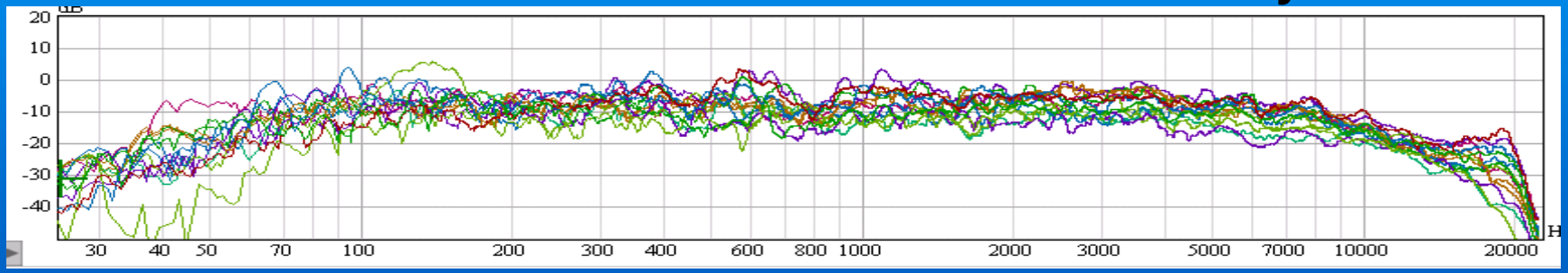
Reverberant mostly speech Church **Line source system**



Contemporary “rockin” Church (Subs off) **Center cluster/exploded/delays**



50,000 seat baseball stadium-Turner field **Distributed system**



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Target of alignment

Determine “Zero” point for alignment

Delay to back line?

Portable-FOH

Install-Main cluster coverage

Mono-center(ish) of room/main cluster

Stereo-center(ish) of each cluster

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Mic placement

On stand or ground plane?

Seating conditions-diffusion or smooth

Not about getting a “pretty” measurement

Is about getting useful information

Avoid nearby reflections-balcony faces-walls-pillars etc

Try to avoid on axis measurements

Measure in bad spots-overlaps-edge of coverage etc

Check non coverage areas-such as stage

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STEPS IN THE PROCESS

1: Verify everything is working properly

Correct freq response

Proper polarity

Proper aiming/coverage

2: Calibrate microphones &
Determine meaningful microphone positions

Edges and main coverage areas

Overlap areas

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STEPS IN THE PROCESS-cont

3: Measure system using measurement tools-get as technically close as you can

Determine Zero/reference point

Work outwards and backwards/forwards

Recheck early measurement positions

4: Polarity pulses-listening for alignments

Where is sound coming from?

Are there bad reflections?

Can you do anything about them?

STEPS IN THE PROCESS-cont

5: LISTEN and walk the audience area

Various types of music/speech

Level and timbre differences

Check non-coverage areas-stage

-for problems

Reflections/echos

Muddiness/buildup

Adjust as needed/desired

6: Recheck with analyzer

Anything “out of whack?”

Redo #5 & 6

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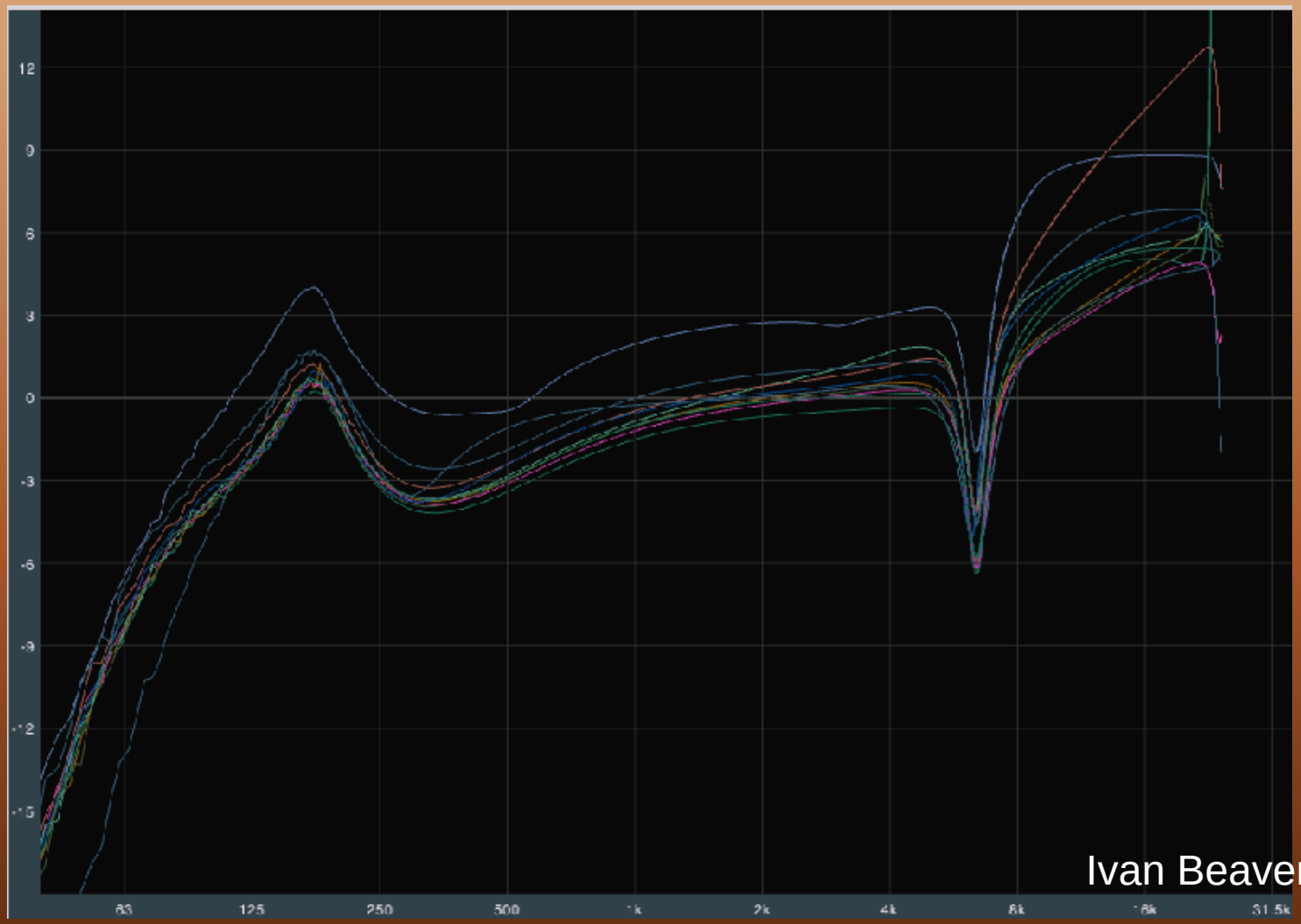
CLUSTER ALIGNMENT

1: Start w/manufacturer recommended DSP settings

Be aware that the numbers don't translate properly



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2: Start with single box in middle of coverage

3: Add boxes adjacent to middle & work outwards

Look closely at overlap area for interference

4: Be aware of freq buildup due to lack of pattern control

5: Cluster size/output issues

Physically large results in narrowing of pattern
-varies with freq

A: Reduce buildup freq with EQ-but pattern won't change

B: Use only center elements for low (below pattern control)

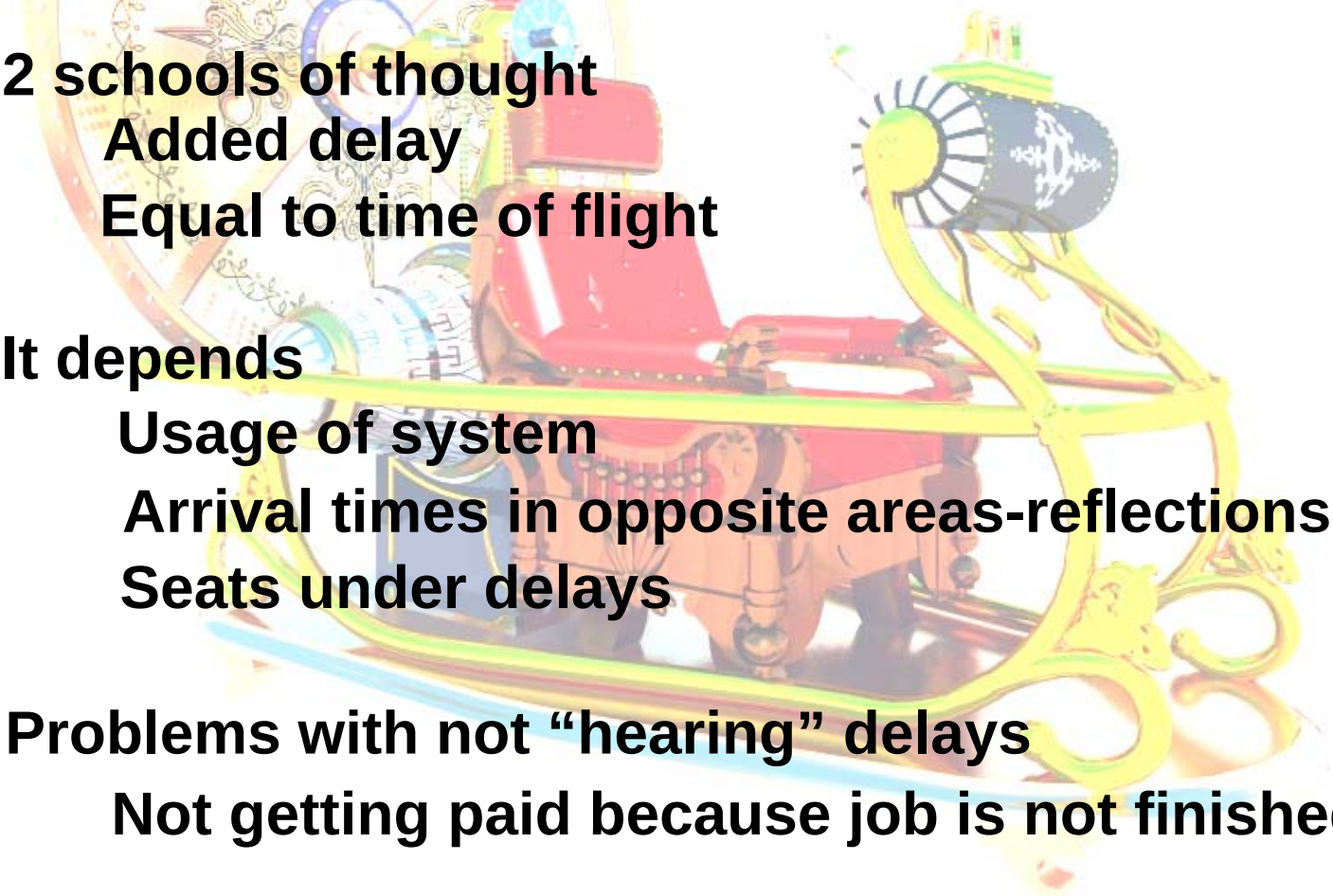
Output capability will suffer

C: Use progressive HP filters

Beware of phase response changes and cancellations

DELAY LOUDSPEAKERS

HAAS Effect
Localization



2 schools of thought
- **Added delay**
- **Equal to time of flight**

It depends
- **Usage of system**
- **Arrival times in opposite areas-reflections**
- **Seats under delays**

Problems with not “hearing” delays
- **Not getting paid because job is not finished**

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TOOLS

(For tweaking delay loudspeakers)

Signal delay

Freq. response

Highpass filters

Level

Effects of delay to other non-coverage areas

Stage, areas under delays

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SUBS

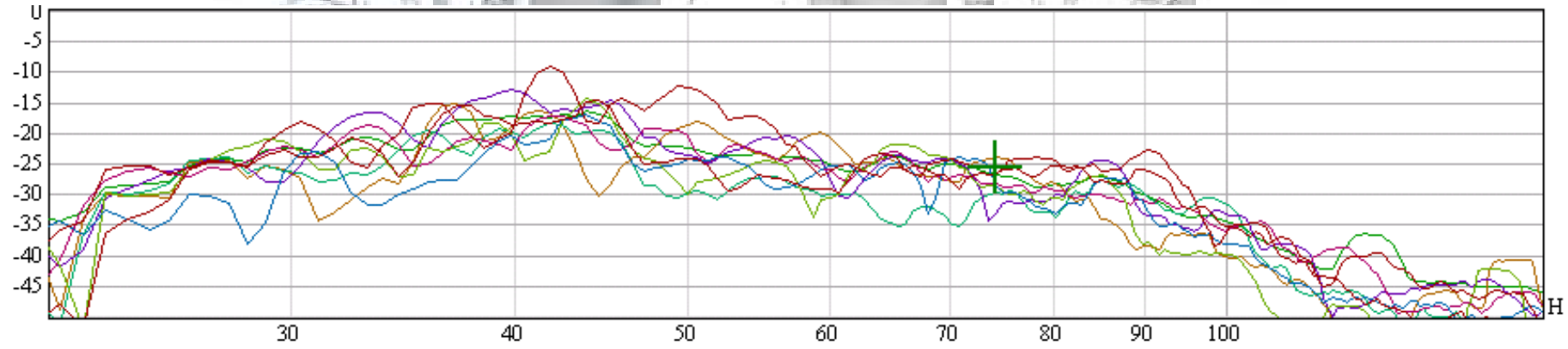
Room modes/mic positions

Alignment to full range boxes

Together or separated (floor subs)?

1 listening position-or many?

Averages



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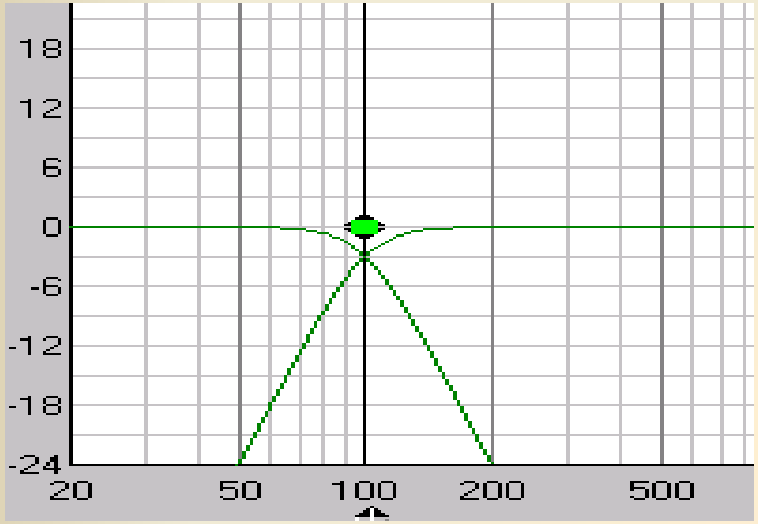
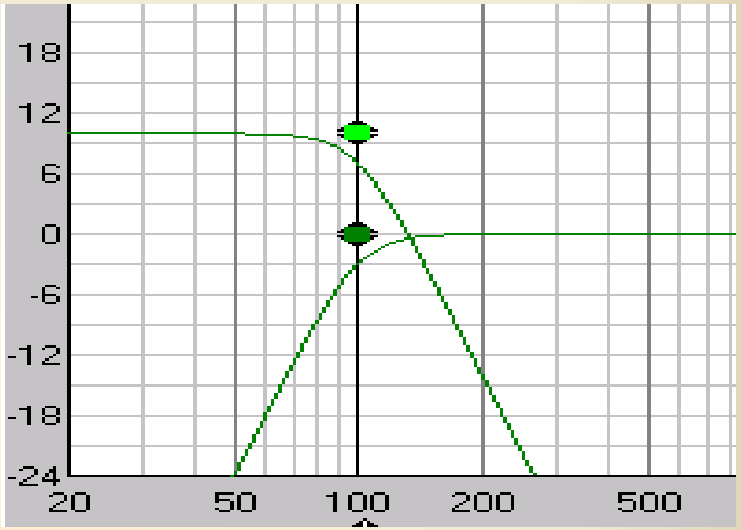
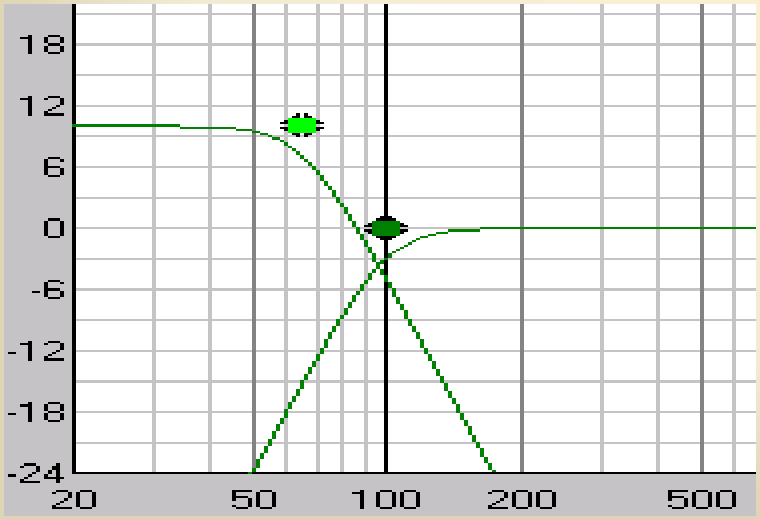
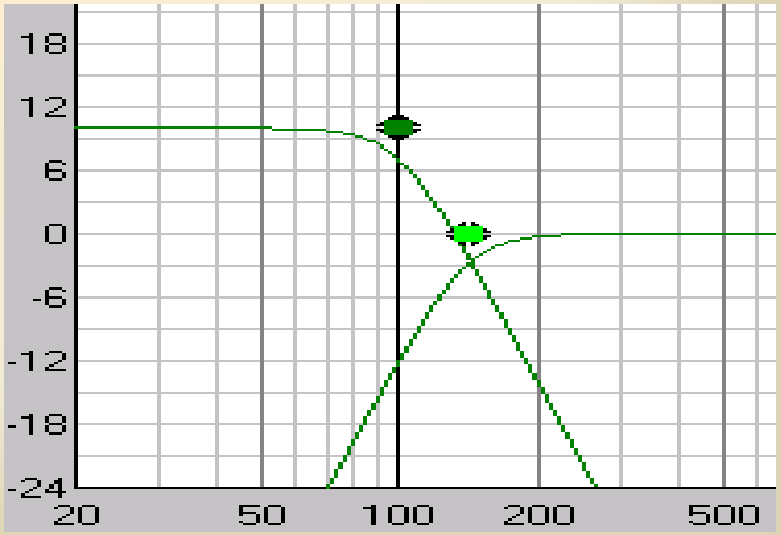
Acoustical vs electrical crossovers









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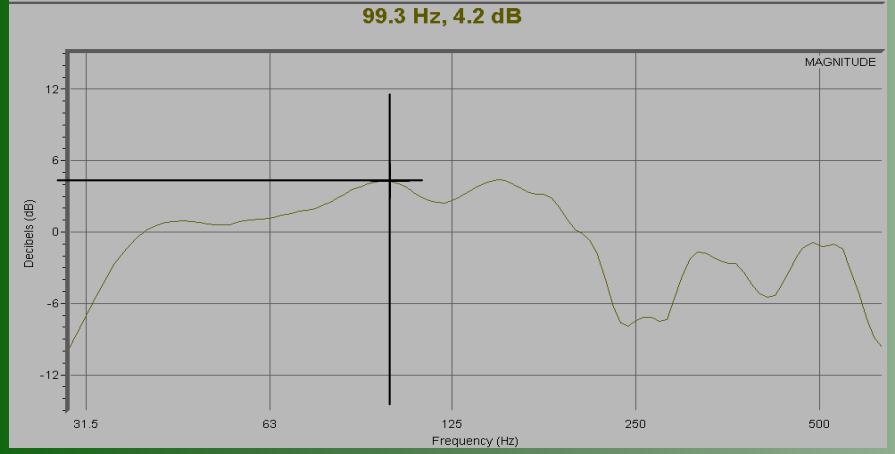
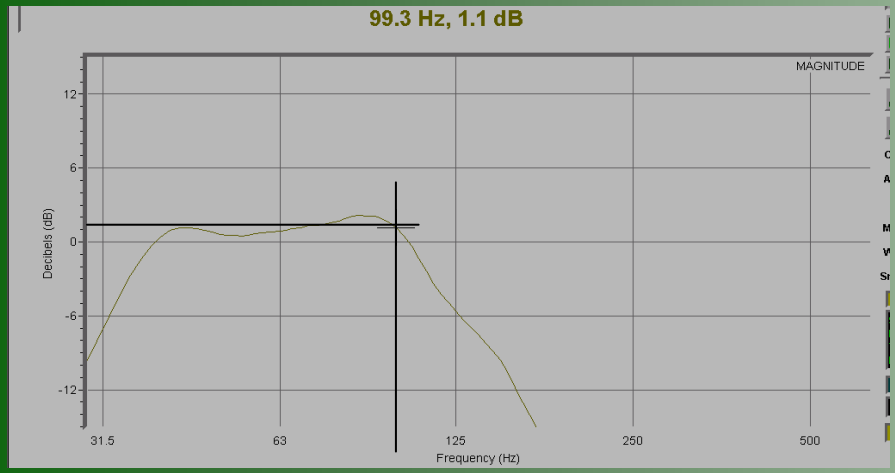
Real world

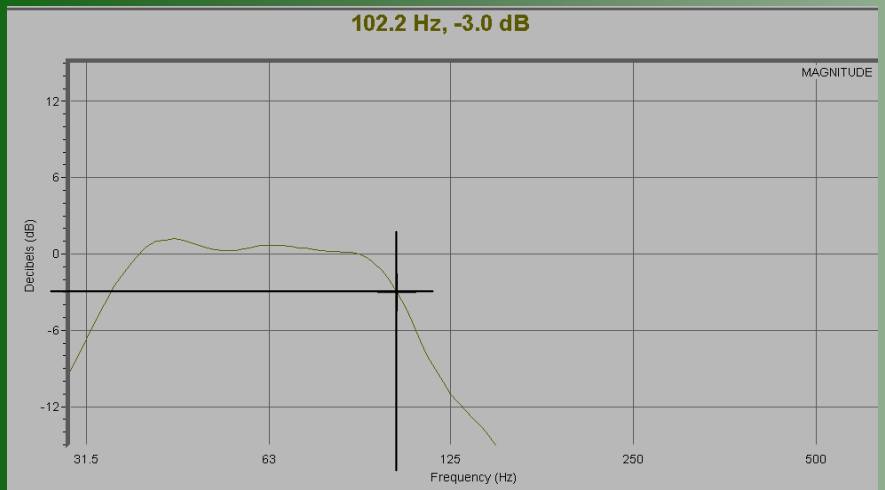
100Hz Low Pass required



No crossover



100Hz 24dB Butterworth LP



85Hz 24dB Butterworth LP

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When all else fails