

Problem Definition

- Speaker cabinets have a fixed frequency range they can reproduce, and different designs are appropriate in different contexts
 - Low-frequency (10-60Hz) reproduction comes at the cost of high-frequency amplitude
- A new box must be designed for each new context

Our Mission: To provide personalized audio systems with unprecedented levels of acoustic flexibility through expert mechanical design

Benchmarks

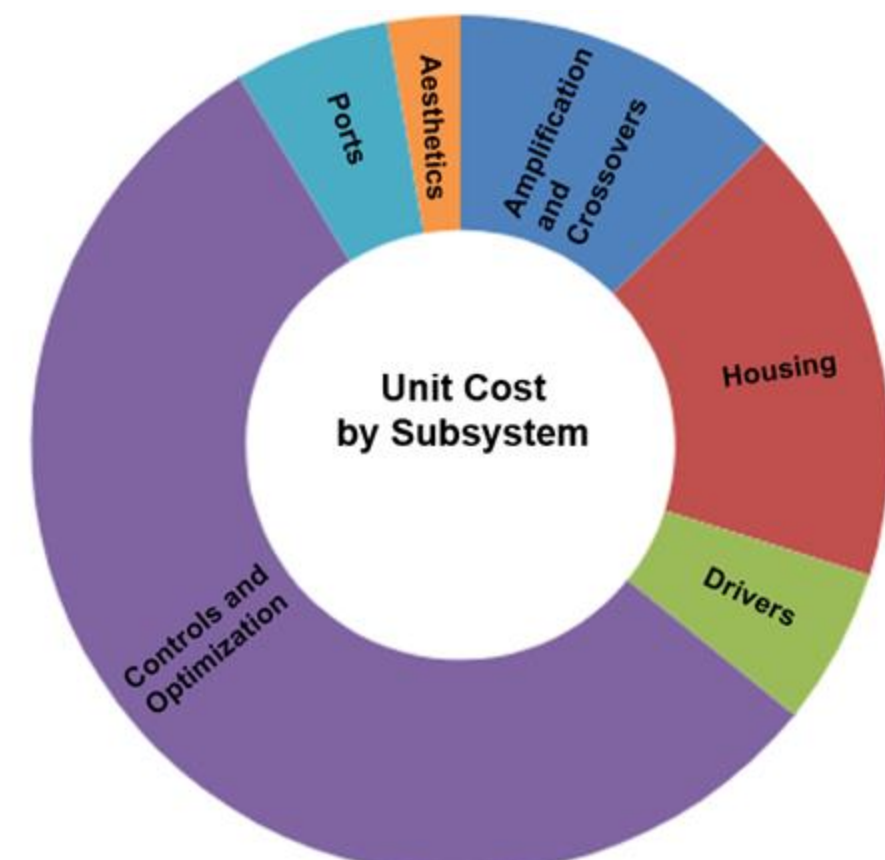
- SVS PB 16 - "Tunable" Mechanical Coupling (\$2,499, at right)
- Custom Builds (\$2,000-\$5,000)
- Legacy Audio Whisper XDS (\$20,000-\$30,000)



Three tunings are available:
 Standard Tune = All ports open (highest maximum output)
 Extended tune = One port plugged (deeper extension, slightly less maximum output)
 Sealed tune = All ports plugged (best transient response)

Business Case

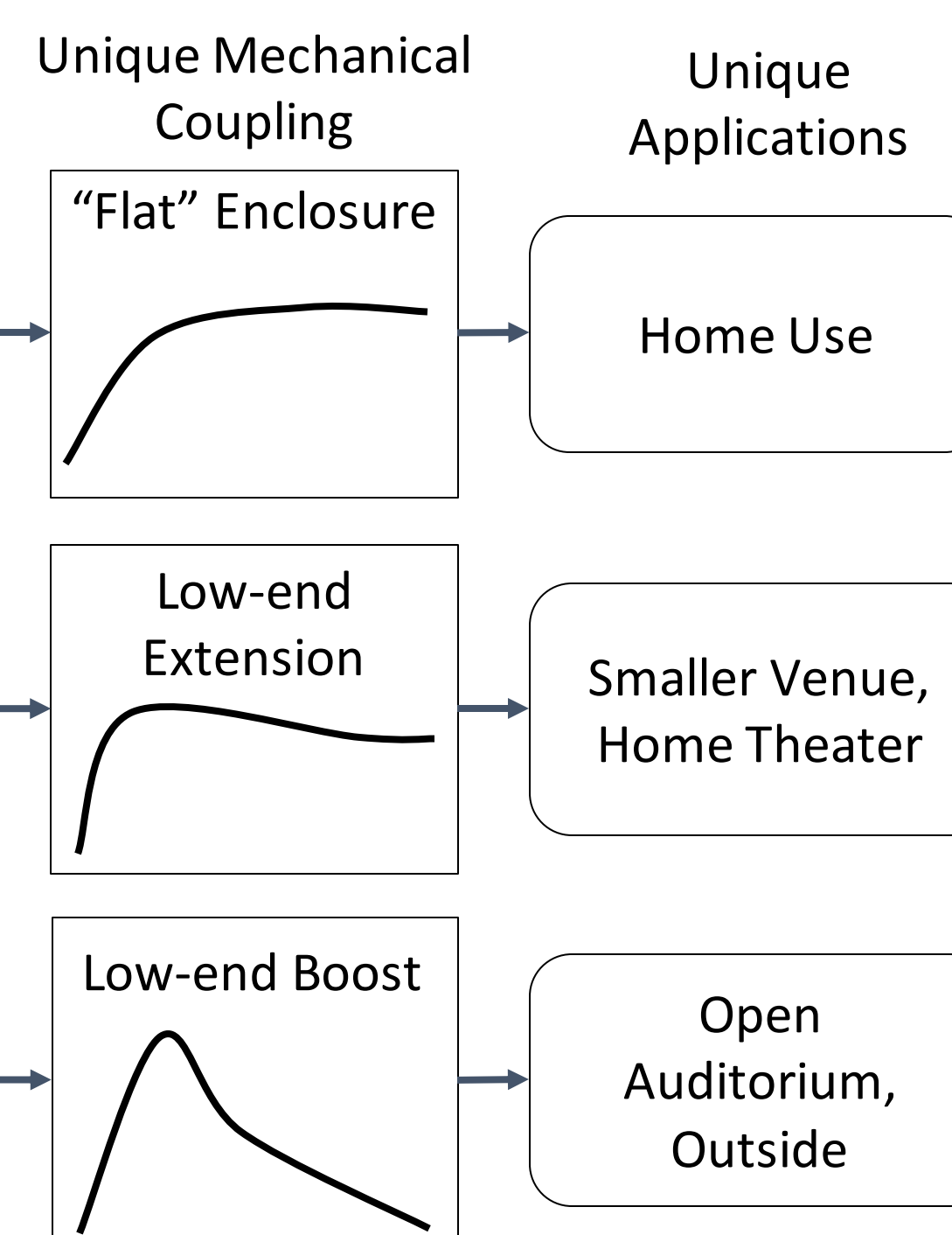
- Expected Audio Equipment Industry Revenue in 2019 of ~\$23 billion
- Steady market growth of 3.1% from 2014-2019



Unit Cost	Sales Price	Annual Sales	Annual Revenue
\$1,240	\$5,000	150	\$750,000

Our Innovation

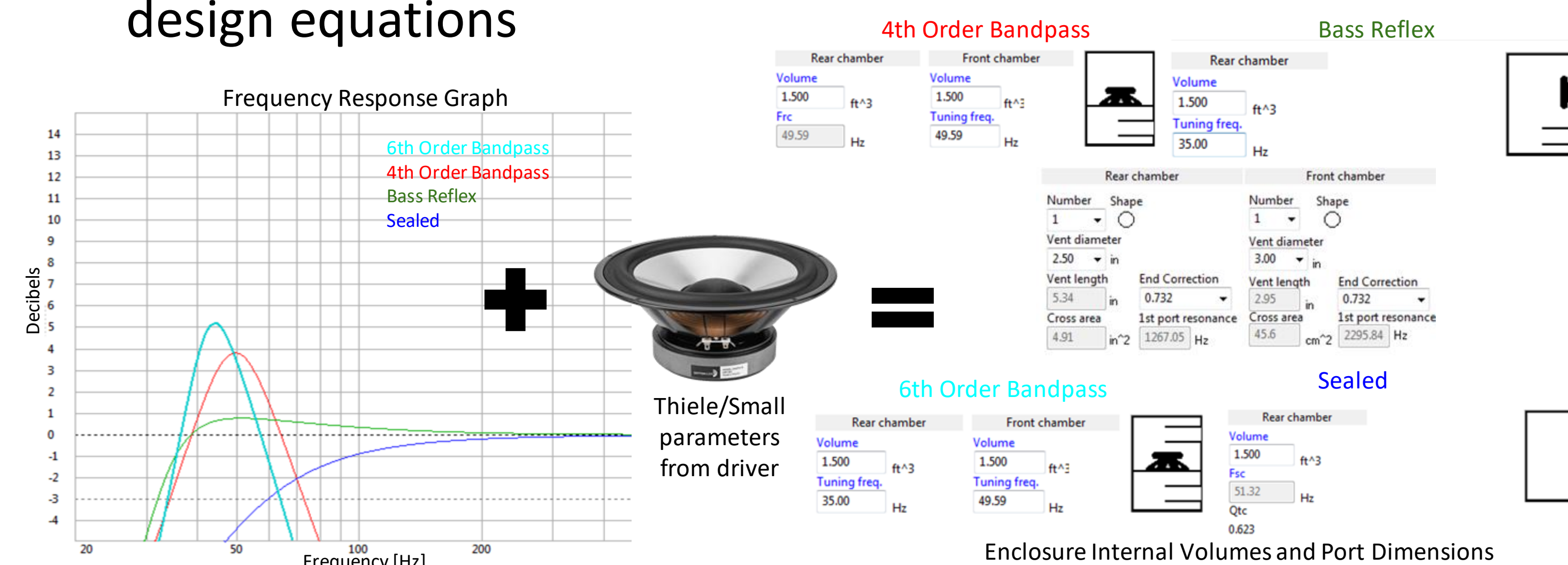
Through mechanical design, a single enclosure can behave as several unique enclosures:



Our parametric model allows for flexibility and scalability.

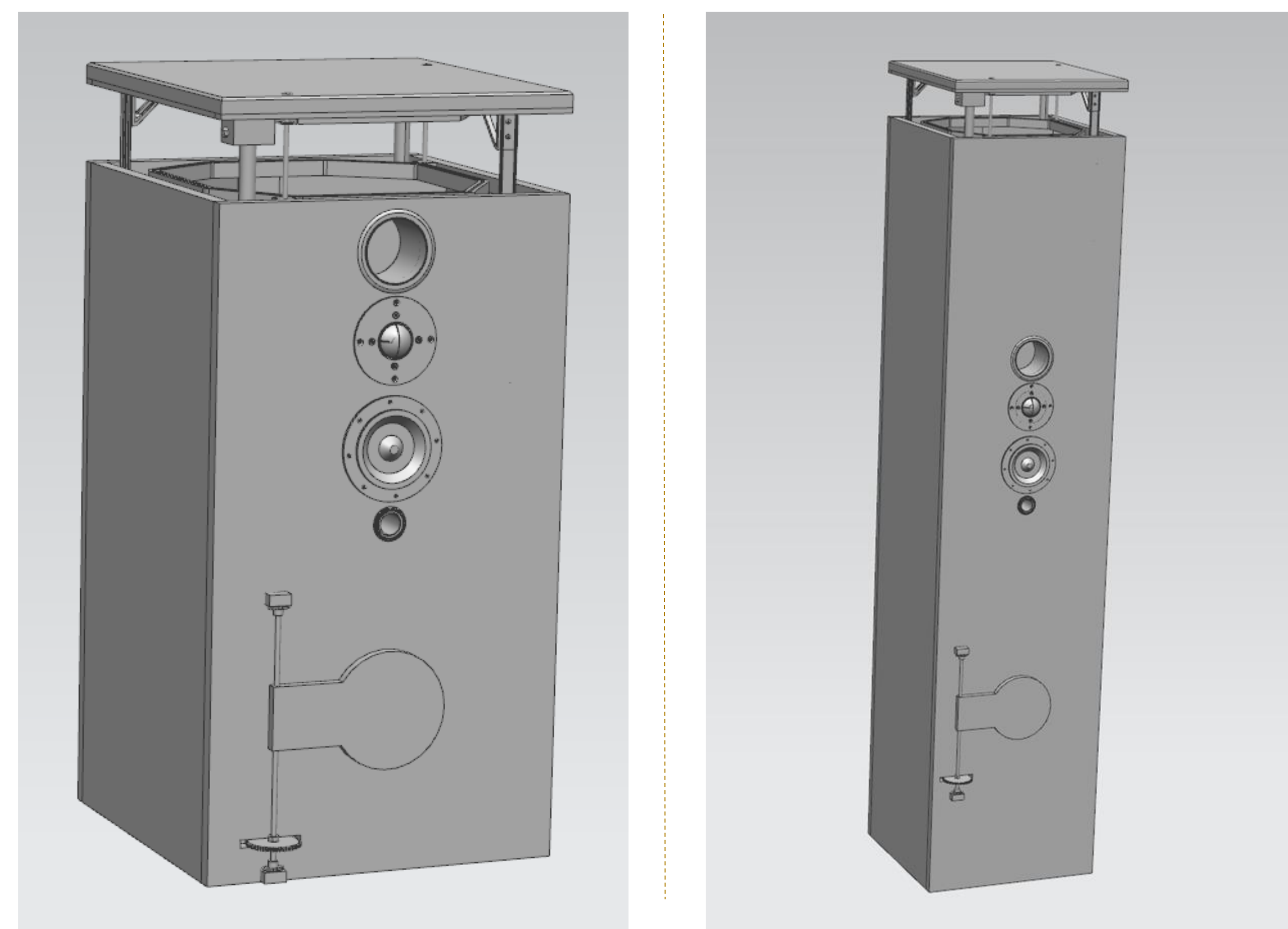
Acoustic Modeling

- Desired frequency response drives enclosure dimensions
- Model uses Thiele/Small parameters from driver in enclosure design equations



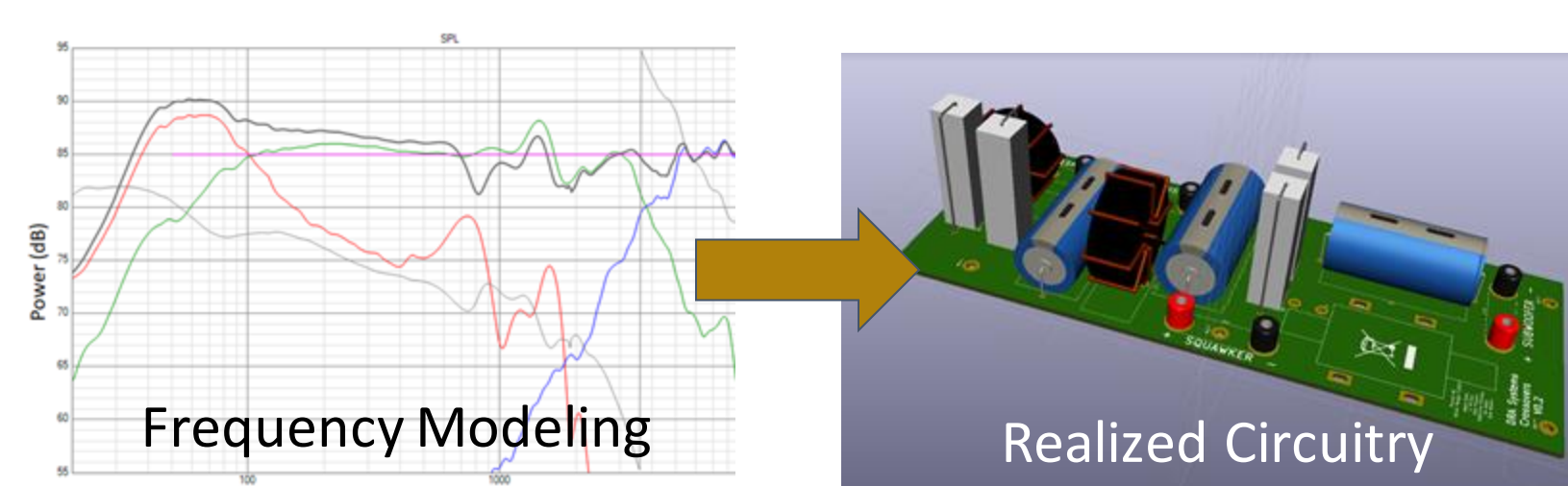
Enclosure Modeling

- Parametric modeling of the speaker enclosure allows for automatic modeling of a personalized enclosure in minutes

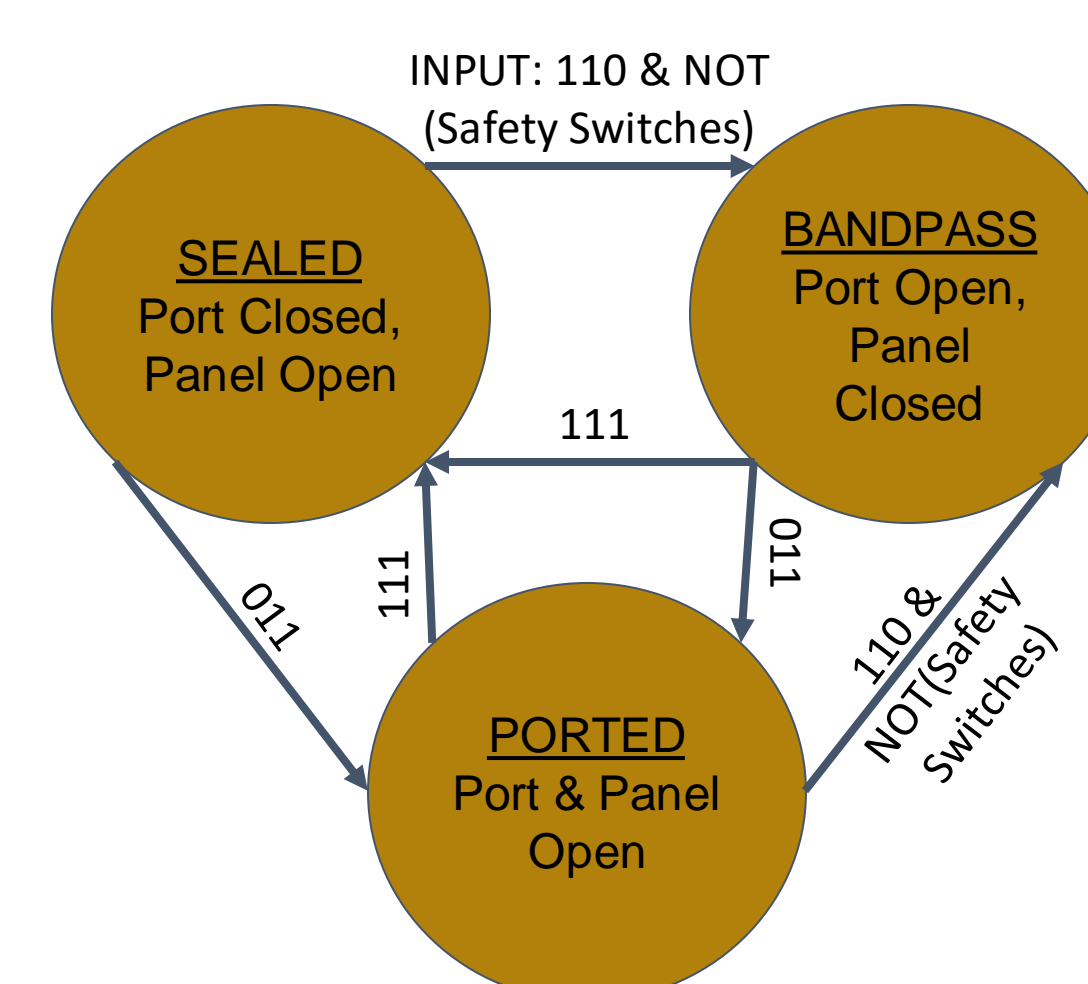


Left Enclosure: 16" footprint, 45 Hz design frequency
 Right Enclosure: 14" footprint, 70 Hz design frequency

Electronics and Controls

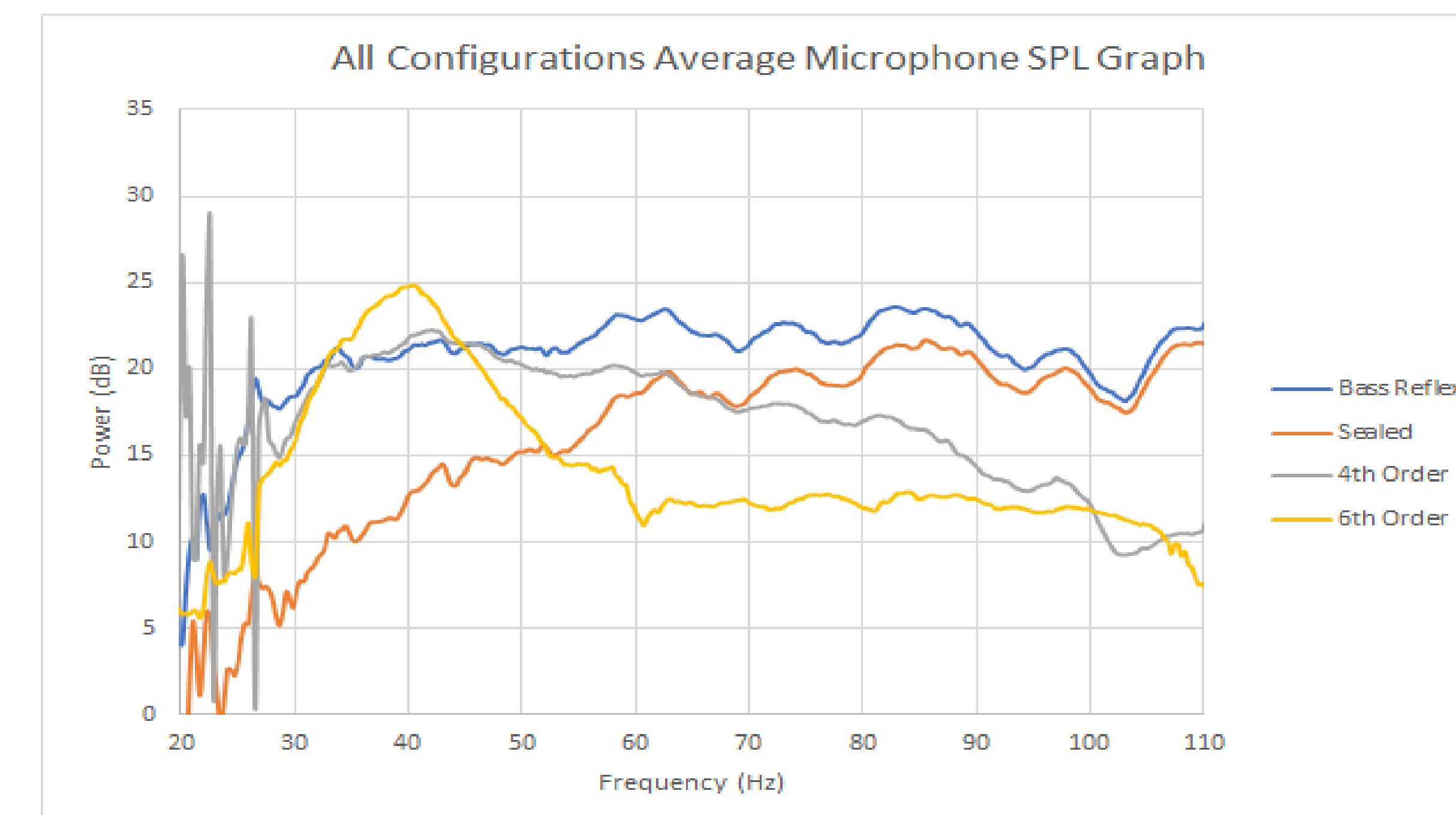


- eCAD used to create electrical crossover, simulating the equalization a user might provide
- Enclosure type set by state machine controlled by user switch and safety switches



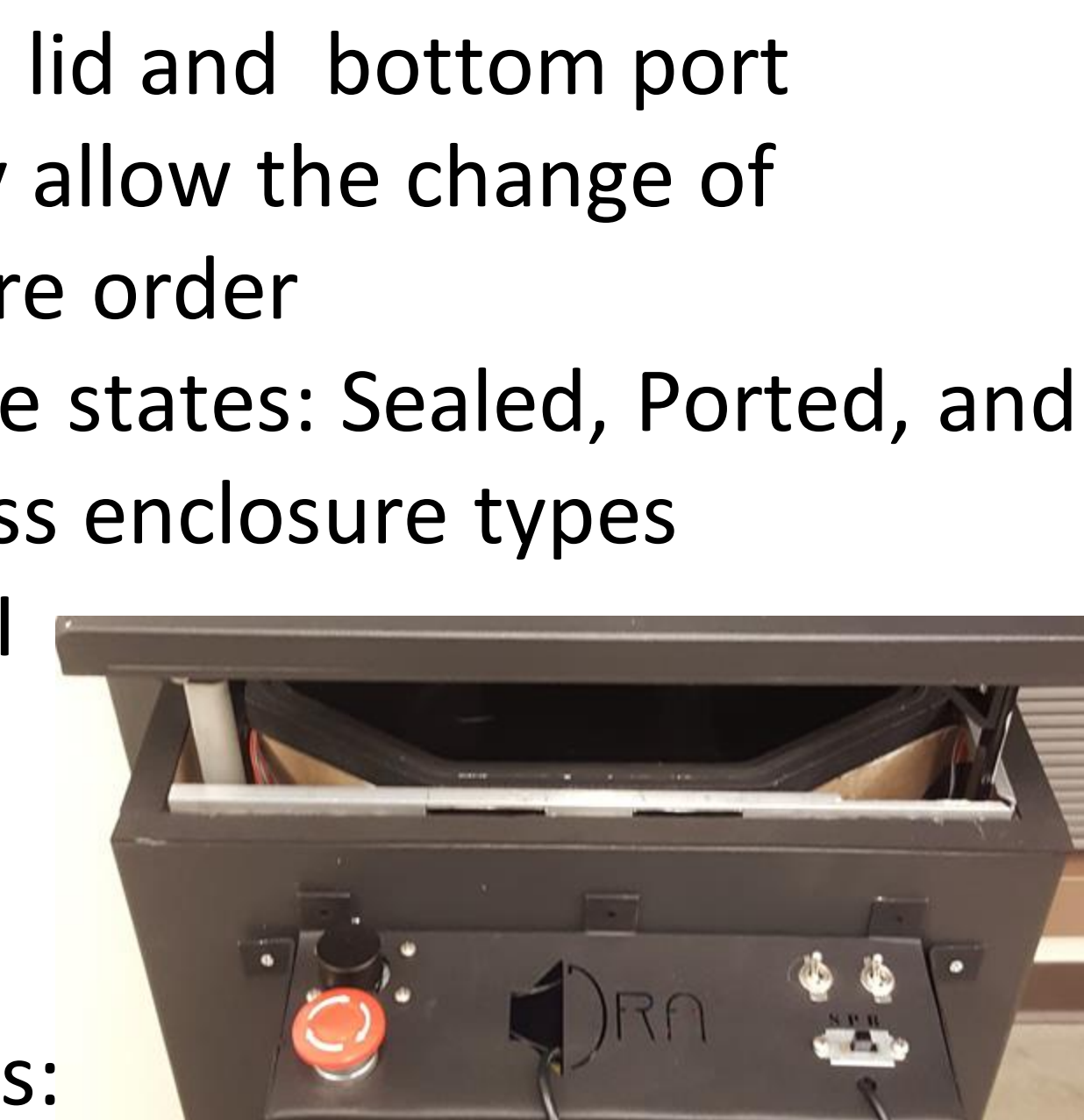
Test Results

- Bass Reflex and Sealed match design frequency response
- 4th order peaked at 42 Hz, designed frequency of 50 Hz
- 6th order peaked at 43 Hz, designed frequency of 45 Hz



Final Prototype

- Speaker lid and bottom port mobility allow the change of enclosure order
- Available states: Sealed, Ported, and Bandpass enclosure types
- Clean UI with built-in safety switches:



Moving Forward

- Apply our design flow for fully-automated custom speaker system generation
- Focus on only subwoofer enclosures to reduce complexity and emphasize our competitive advantage

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