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Analyzing a loudspeaker's voice coil response to a signal

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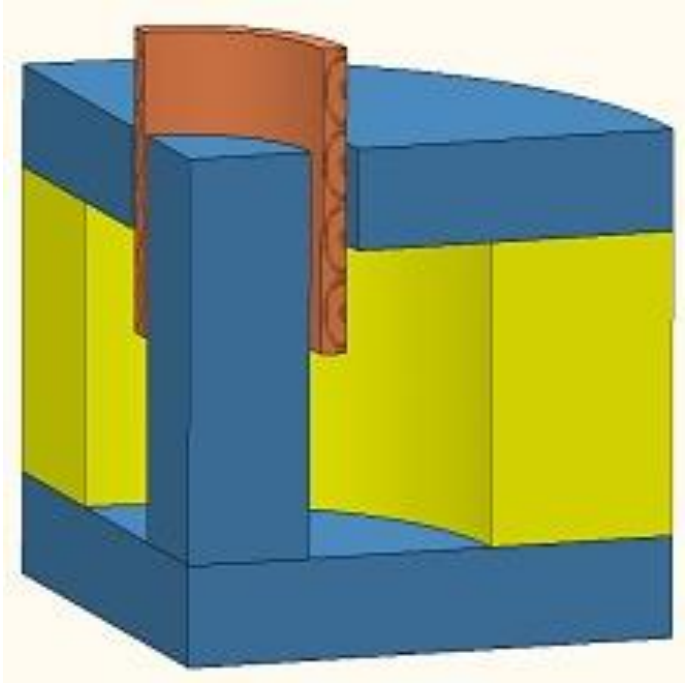
In this example, we have analyzed the voice coil response to a signal by using Simcenter MAGNET's 2D Transient with motion solver. The solver includes coupling to the mechanical equations of motion, so that the movement of a component of a device (for example, the movement of the voice coil) is accurately simulated. The mechanical effects can include friction, inertia, mass, springs, gravitation, etc.



NOTE The initial transients are evident for the first 2 cycles in all of the graphs listed below. Also, the nonlinearity in the response of the voice coil due to the nonlinearity in the gap field is very evident.

COMPLIANCE OF THE SPEAKER CONE

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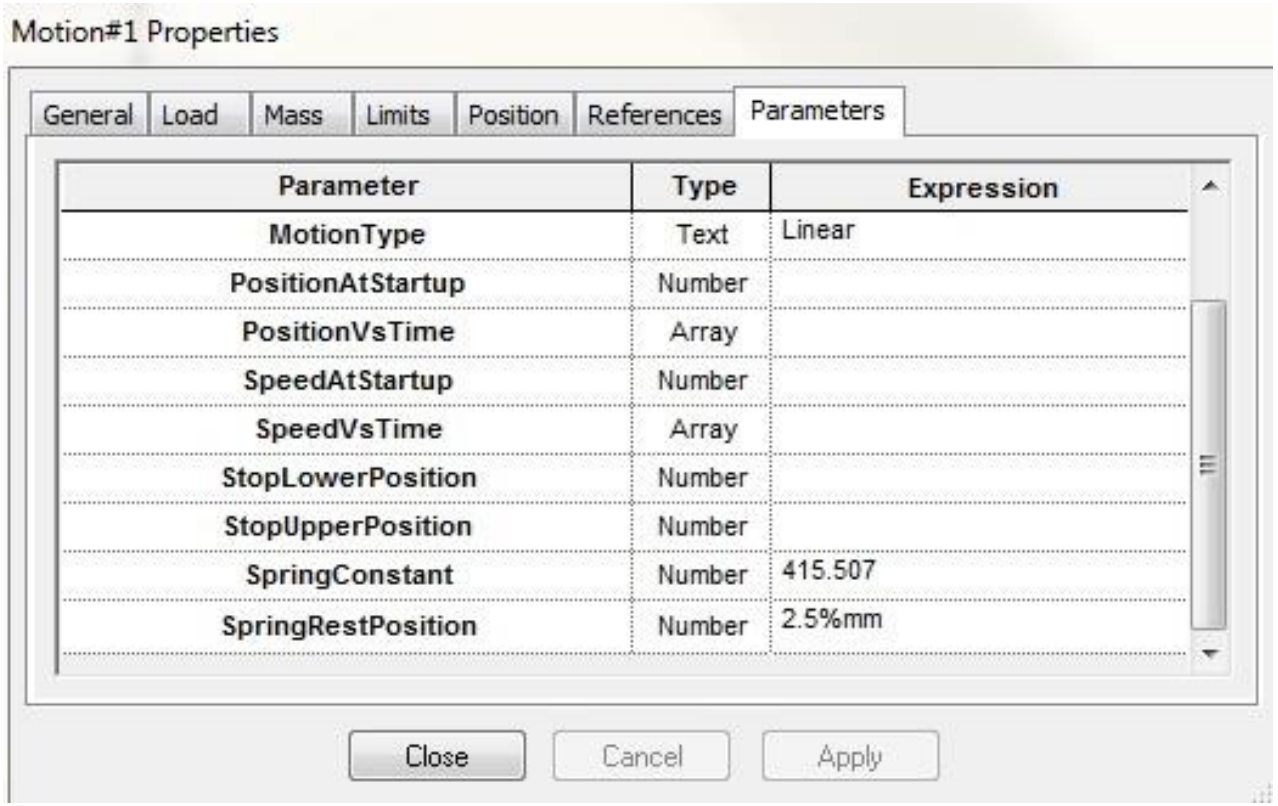
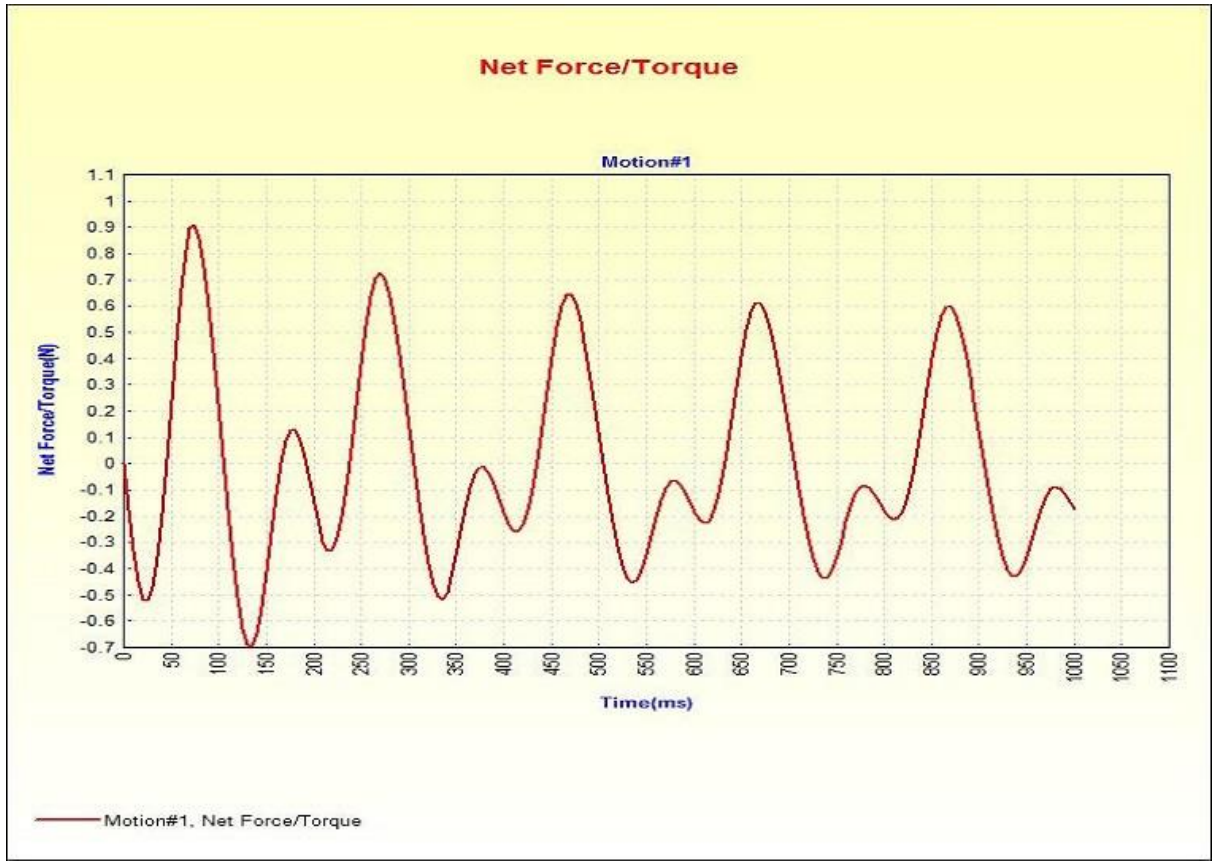


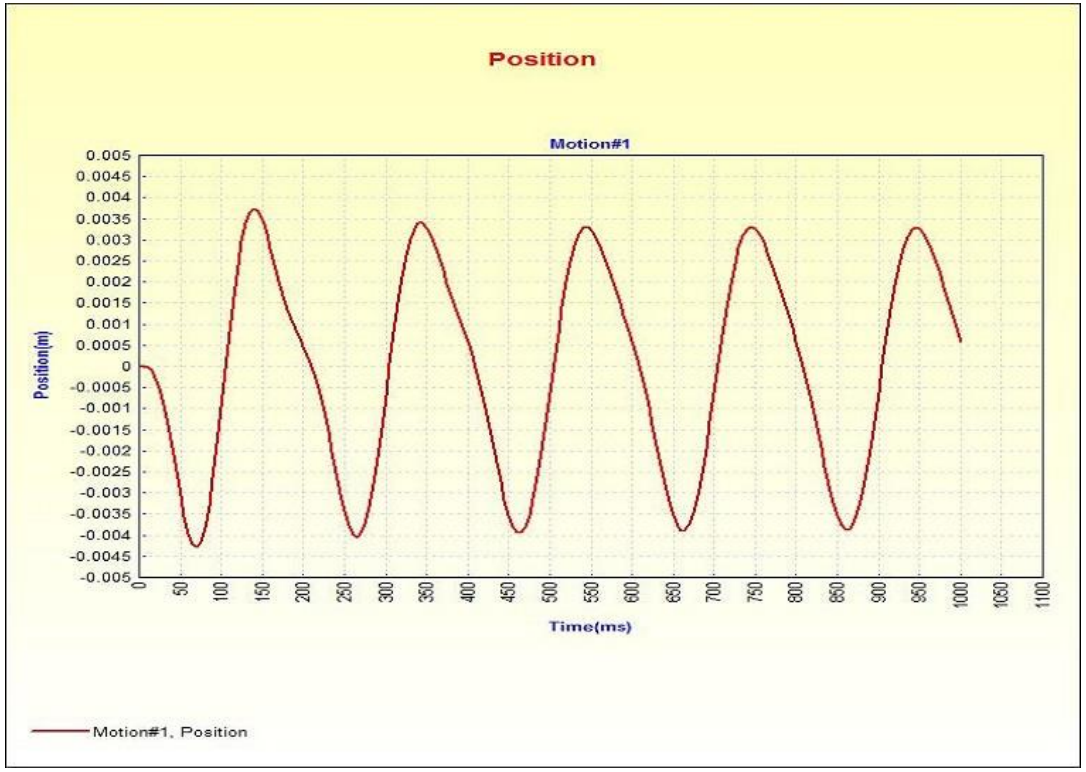
We define how the voice coil is suspended by defining a spring with a coefficient corresponding to the compliance of the speaker cone. In the illustration to the left, we show the spring coefficients used in the analysis.

FORCE IN THE LOUDSPEAKER



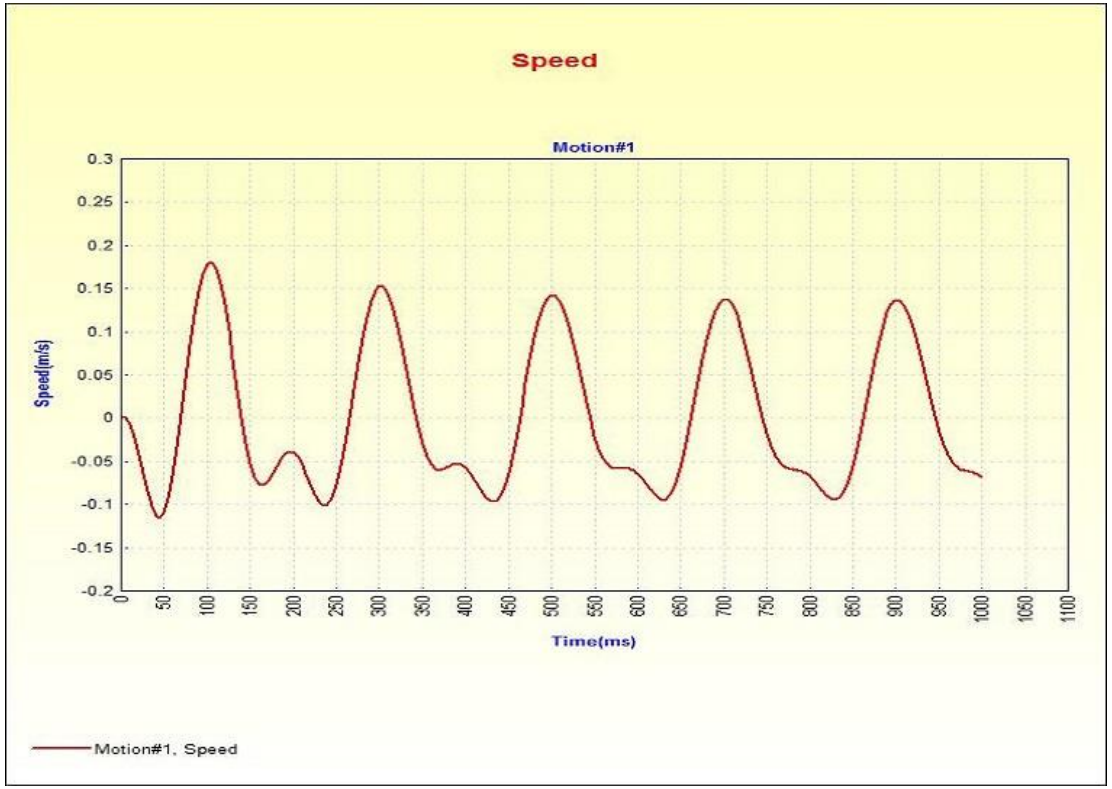
This graph shows the force for a sinusoidal current input, as a function of time.

POSITION OF THE VOICE COIL IN THE LOUDSPEAKER



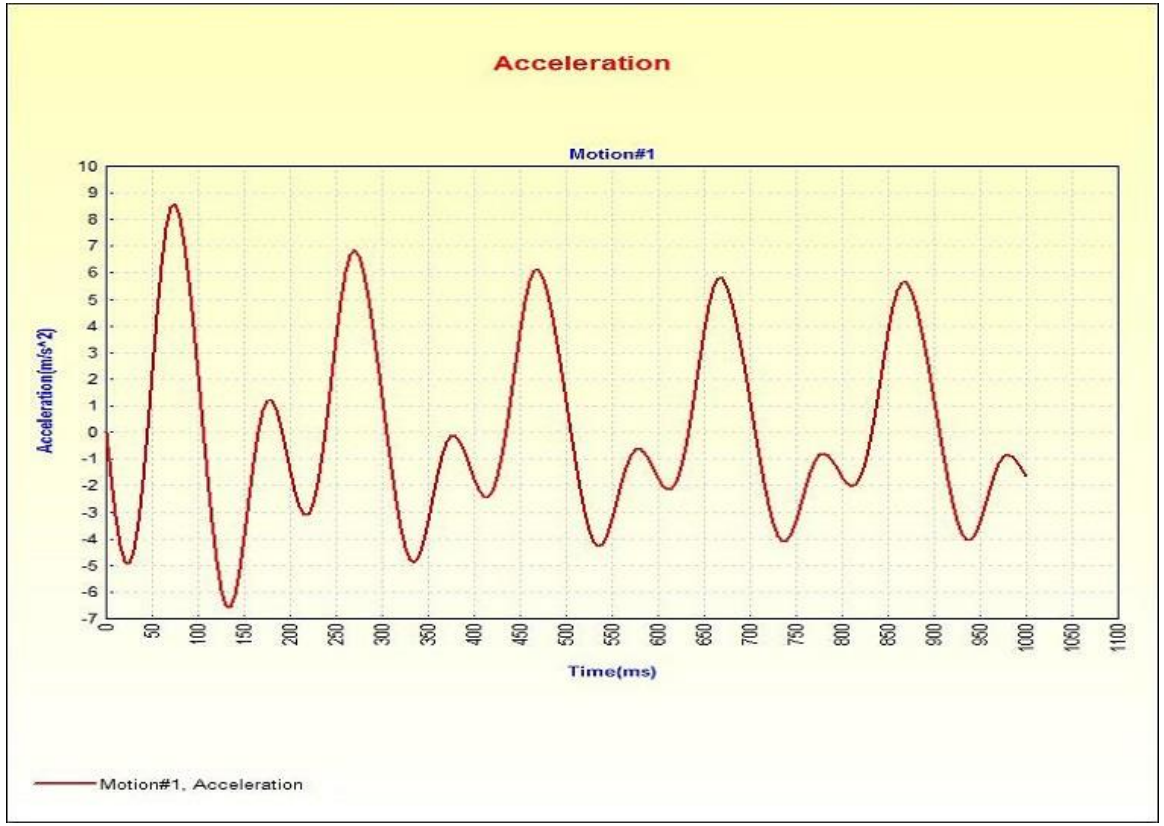
This graph shows the position of the voice coil, as a function of time.

SPEED OF THE VOICE COIL



This graph shows the speed of the voice coil, as a function of time.

VOICE COIL ACCELERATION



The Magnet OR (magnet outer radius) parameter is changed.