

Lumped Loudspeaker Driver Transient Analysis with Nonlinear Large-Signal Parameters

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Introduction

This model shows how to include the nonlinear (large signal) behavior of certain lumped components in a simplified loudspeaker analysis in the time domain. The mechanical and electrical system is modeled using an equivalent electrical circuit (a Thiele-Small representation). The large signal compliance $C_{MS}(x)$ and force factor BL(x) are here nonlinear functions of the speaker location. Moreover, the mechanical damping $R_{MS}(v)$ is a function of the speaker velocity.

The nonlinear effects associated with the compliance and BL factor are especially important at lower frequencies. This is also where a lumped modeling approach of the electro-mechanical system has its main application. At higher frequencies the piston assumption, of the lumped model, is no longer valid and breakup can occur in the membrane and other mechanical components. The approach is in particular relevant for microtransducer modeling (and their implementation in larger system designs) as the lumped representation is valid in a larger frequency range, due to the small size.

The model uses the built-in coupling between the **Interior Lumped Speaker Boundary** (or **Lumped Speaker Boundary**, if the back volume is also lumped) feature in the **Pressure Acoustics, Transient** interface and an **Electrical Circuit** interface. The axial speaker location x and speaker membrane velocity v exist as predefined built-in variables.

Model Definition

The model definitions, geometry, and most details of the lumped model follow the setup in the frequency domain variant; the Lumped Loudspeaker Driver also found in the Acoustics Module Application Library. In the present model, only the open back volume configuration is modeled.

This model is solved in the time domain which changes the allowed structure of the circuit. All values of the components need to be real valued and cannot be a function of frequency. This limits the possibility to, for example, use frequency dependent component values to model certain loss types. The components values can, on the other hand, be given by time dependent quantities which allows the introduction of the large signal values: compliance $C_{MS}(x)$, force factor BL(x), and the mechanical damping $R_{MS}(v)$, where the time dependency is through x = x(t) and v = v(t). The axial location of the diaphragm (the mechanical system) x is defined through a predefined (global) variable actd.ilsb1.x_ax and the diaphragm velocity v is defined through a predefined (global) variable actd.ilsb1.v_ax. When using these, add the appropriate physics and feature tags. The large signal parameters are depicted in Figure 1. The values of the curves are taken to roughly correspond to properties extracted from the Loudspeaker Driver — Frequency-Domain Analysis and the Loudspeaker Driver — Transient Analysis tutorial models. The data is just an example for the purpose of demonstration in this model.



Figure 1: Large signal parameters used in the model, $C_{MS}(x)$, BL(x), and $R_{MS}(v)$.

In this model, the applied voltage (to the Voltage Source in the Electrical Circuit model) is a single frequency harmonic signal of the type

$$V(t) = V_0 \sin(2\pi f_0 t)$$

where the frequency f_0 is set to 50 Hz and the signal amplitude V_0 is 15 V. Both values can be found in the Parameters list and modified as necessary. The current input signal will allow for the evaluation of the total harmonic distortion (THD); the signal can be modified to any desired signal, for example, if inter modulation distortion (IMD) is of interest. Note that in the model a ramp is added to the signal to increase it smoothly over the first period. In the analysis of the results, the first two periods are skipped in order to avoid inclusion of any transients.

Results and Discussion

The model contains several plots that analyze the response of the speaker as well as the behavior and contribution of the large signal parameters. The contribution of each large signal parameter, to the overall nonlinear behavior of the speaker, can of course be studied by setting one or more of the parameters to constants.

The pressure is evaluated in a point 20 cm in front of the speaker. The time signal is depicted in Figure 2. The frequency spectrum of the nonlinear periodic part of the signal (skipping the first two periods) is depicted in Figure 3. The peak values of the generated harmonics are also depicted. These can be used to evaluate the THD.

The speaker axial position and velocity as function of time are depicted in Figure 4. Finally, the variation of the large signal parameters over time is depicted in Figure 5.



Figure 2: Pressure as function of time.



Figure 3: Frequency spectrum of the nonlinear periodic part of the signal. Peak values shown for the generated harmonics.



Figure 4: Axial position and velocity as function of time.



Figure 5: The variation of the large signal parameters as function of time.

Application Library path: Acoustics_Module/Electroacoustic_Transducers/ lumped_loudspeaker_driver_transient

Modeling Instructions

From the **File** menu, choose **New**.

NEW

In the New window, click 🔗 Model Wizard.

MODEL WIZARD

I In the Model Wizard window, click 🚈 2D Axisymmetric.

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- 2 In the Select Physics tree, select Acoustics>Pressure Acoustics>Pressure Acoustics, Transient (actd).
- 3 Click Add.
- 4 Click \bigcirc Study.
- 5 In the Select Study tree, select General Studies>Time Dependent.
- 6 Click 🗹 Done.

GLOBAL DEFINITIONS

Parameters 1

- I In the Model Builder window, under Global Definitions click Parameters I.
- 2 In the Settings window for Parameters, locate the Parameters section.
- 3 Click 📂 Load from File.
- 4 Browse to the model's Application Libraries folder and double-click the file lumped_loudspeaker_driver_transient_parameters.txt.

Interpolation 1 (int1)

- I In the Home toolbar, click f(X) Functions and choose Global>Interpolation.
- 2 In the Settings window for Interpolation, locate the Definition section.
- 3 From the Data source list, choose File.
- 4 Click **Browse**.
- 5 Browse to the model's Application Libraries folder and double-click the file lumped_loudspeaker_driver_transient_bl.txt.
- 6 Click 🔃 Import.
- 7 In the Function name text field, type BL.
- 8 Locate the Interpolation and Extrapolation section. From the Interpolation list, choose Piecewise cubic.
- 9 From the Extrapolation list, choose Linear.
- **IO** Locate the **Units** section. In the **Function** table, enter the following settings:

Function	Unit
BL	Wb/m

II In the **Argument** table, enter the following settings:

Argument	Unit
t	mm

Interpolation 2 (int2)

- I In the Home toolbar, click f(X) Functions and choose Global>Interpolation.
- 2 In the Settings window for Interpolation, locate the Definition section.
- 3 From the Data source list, choose File.
- 4 Click 📂 Browse.
- 5 Browse to the model's Application Libraries folder and double-click the file lumped_loudspeaker_driver_transient_c_ms.txt.
- 6 Click **[I-]** Import.
- 7 In the Function name text field, type C_MS.
- 8 Locate the Interpolation and Extrapolation section. From the Extrapolation list, choose Linear.
- 9 Locate the Units section. In the Function table, enter the following settings:

Function	Unit
C_MS	mm/N

IO In the **Argument** table, enter the following settings:

Argument	Unit
t	mm

Interpolation 3 (int3)

- I In the Home toolbar, click f(X) Functions and choose Global>Interpolation.
- 2 In the Settings window for Interpolation, locate the Definition section.
- 3 From the Data source list, choose File.
- 4 Click **Browse**.
- 5 Browse to the model's Application Libraries folder and double-click the file lumped_loudspeaker_driver_transient_r_ms.txt.
- 6 Click **[I** Import.
- 7 In the Function name text field, type R_MS.

- 8 Locate the Interpolation and Extrapolation section. From the Interpolation list, choose Cubic spline.
- 9 Locate the Units section. In the Function table, enter the following settings:

Function	Unit
R_MS	N*s/m

IO In the **Argument** table, enter the following settings:

Argument	Unit
t	m/s

DEFINITIONS

Ramp I (rm I)

- I In the Home toolbar, click f(X) Functions and choose Local>Ramp.
- 2 In the Settings window for Ramp, locate the Parameters section.
- **3** In the **Location** text field, type **0.1***T0.
- **4** In the **Slope** text field, type 1/T0.
- **5** Select the **Cutoff** check box.
- 6 Click to expand the **Smoothing** section.
- **7** Select the **Size of transition zone at start** check box. In the associated text field, type 0.2*T0.
- **8** Select the **Size of transition zone at cutoff** check box. In the associated text field, type 0.2*T0.

GEOMETRY I

Circle 1 (c1)

- I In the **Geometry** toolbar, click 🕑 **Circle**.
- 2 In the Settings window for Circle, locate the Size and Shape section.
- 3 In the Radius text field, type 1[cm].
- 4 In the Sector angle text field, type 180.
- **5** Locate the **Position** section. In the **r** text field, type **a**.

Circle 2 (c2)

I In the **Geometry** toolbar, click (•) **Circle**.

- 2 In the Settings window for Circle, locate the Size and Shape section.
- 3 In the Radius text field, type Rair+Rpml.
- 4 In the Sector angle text field, type 180.
- 5 Locate the Rotation Angle section. In the Rotation text field, type -90.
- 6 Click to expand the Layers section. In the table, enter the following settings:

Layer name	Thickness (m)
Layer 1	Rpml

Polygon I (poll)

- I In the Geometry toolbar, click / Polygon.
- 2 In the Settings window for Polygon, locate the Object Type section.
- **3** From the **Type** list, choose **Open curve**.
- 4 Locate the **Coordinates** section. In the table, enter the following settings:

r (m)	z (m)
3[cm]	-4[cm]
a-1[cm]	0

Polygon 2 (pol2)

- I In the Geometry toolbar, click / Polygon.
- 2 In the Settings window for Polygon, locate the Object Type section.
- **3** From the **Type** list, choose **Open curve**.
- **4** Locate the **Coordinates** section. In the table, enter the following settings:

r (m)	z (m)
a+1[cm]	0
Rair	0

- 5 Click 📑 Build All Objects.
- 6 Click the **F** Zoom Extents button in the **Graphics** toolbar.

Quadratic Bézier I (qbI)

- I In the Geometry toolbar, click 🗱 More Primitives and choose Quadratic Bézier.
- 2 In the Settings window for Quadratic Bézier, locate the Control Points section.
- 3 In row 2, set r to 1.8[cm].
- 4 In row 3, set r to 3[cm].

- **5** In row **I**, set **z** to -3[cm].
- 6 In row 2, set z to -3.1[cm].
- 7 In row 3, set z to -4[cm].
- 8 Locate the Weights section. In the 2 text field, type 1.5.
- 9 Click 🏢 Build All Objects.

Delete Entities I (dell)

- I In the Model Builder window, right-click Geometry I and choose Delete Entities.
- **2** On the object **cl**, select Boundaries **3** and **4** only.
- 3 In the Settings window for Delete Entities, click 틤 Build Selected.

Polygon 3 (pol3)

- I In the Geometry toolbar, click / Polygon.
- 2 In the Settings window for Polygon, locate the Object Type section.
- **3** From the **Type** list, choose **Open curve**.
- 4 Locate the **Coordinates** section. In the table, enter the following settings:

r (m)	z (m)
0.15	0
0.15	-0.1
0	-0.1

5 Click 🟢 Build All Objects.

DEFINITIONS

Perfectly Matched Layer I (pml1)

- I In the Definitions toolbar, click M Perfectly Matched Layer.
- 2 Select Domains 1 and 5 only.
- 3 In the Settings window for Perfectly Matched Layer, locate the Scaling section.
- 4 In the PML scaling curvature parameter text field, type 3.

DEFINITIONS

Baffle (interior wall)

- I In the Definitions toolbar, click 🛯 🐜 Explicit.
- **2** In the **Settings** window for **Explicit**, type Baffle (interior wall) in the **Label** text field.

- **3** Locate the **Input Entities** section. From the **Geometric entity level** list, choose **Boundary**.
- 4 Select Boundaries 9, 11, 12, and 19 only.

Speaker

- I In the **Definitions** toolbar, click **here Explicit**.
- 2 In the Settings window for Explicit, type Speaker in the Label text field.
- 3 Locate the Input Entities section. From the Geometric entity level list, choose Boundary.
- 4 Select Boundaries 8, 15, and 18 only.

PRESSURE ACOUSTICS, TRANSIENT (ACTD)

Interior Sound Hard Boundary (Wall) I

- I In the Model Builder window, under Component I (compl) right-click Pressure Acoustics, Transient (actd) and choose Interior Conditions>Interior Sound Hard Boundary (Wall).
- 2 In the Settings window for Interior Sound Hard Boundary (Wall), locate the Boundary Selection section.
- 3 From the Selection list, choose Baffle (interior wall).

Interior Lumped Speaker Boundary I

- I In the Physics toolbar, click Boundaries and choose Interior Lumped Speaker Boundary.
- 2 In the Settings window for Interior Lumped Speaker Boundary, locate the Boundary Selection section.
- 3 From the Selection list, choose Speaker.

Proceed and add the electric circuit model for the speaker (the Thiele-Small representation). For the lumped mechanical part of the model, the units will be transformed from mechanical to electric; this is only to avoid the unit warning, the model solves nicely without the unit transform.

It is in the lumped model that the nonlinear parameters are used. The **Interior Lumped Speaker Boundary** defines variables for the axial position and the axial velocity; they are actd.ilsb1.x_ax and actd.ilsb1.v_ax, respectively.

ADD PHYSICS

- I In the Physics toolbar, click 🙀 Add Physics to open the Add Physics window.
- 2 Go to the Add Physics window.
- 3 In the tree, select AC/DC>Electrical Circuit (cir).
- 4 Click Add to Component I in the window toolbar.

5 In the Home toolbar, click 🙀 Add Physics to close the Add Physics window.

ELECTRICAL CIRCUIT (CIR)

Voltage Source 1 (V1)

- I Right-click Component I (compl)>Electrical Circuit (cir) and choose Voltage Source.
- 2 In the Settings window for Voltage Source, locate the Node Connections section.
- **3** In the table, enter the following settings:

Label	Node names
n	0

4 Locate the Device Parameters section. In the v_{src} text field, type V0*sin(2*pi*f0*t)* nojac(rm1(t)).

Resistor I (RI)

- I In the Electrical Circuit toolbar, click Resistor.
- 2 In the Settings window for Resistor, locate the Node Connections section.
- **3** In the table, enter the following settings:

Label	Node names
Р	1
n	2

4 Locate the **Device Parameters** section. In the R text field, type R_E.

Inductor I (LI)

- 2 In the Settings window for Inductor, locate the Node Connections section.
- **3** In the table, enter the following settings:

Label	Node names
Р	2
n	3

4 Locate the **Device Parameters** section. In the *L* text field, type L_E.

Current-Controlled Voltage Source 1 (H1)

I In the Electrical Circuit toolbar, click 💠 Current-Controlled Voltage Source.

2 In the Settings window for Current-Controlled Voltage Source, locate the Node Connections section.

3 In the table, enter the following settings:

Label	Node names	
Ρ	3	
n	0	

4 Locate the **Device Parameters** section. In the **Gain** text field, type BL(actd.ilsb1.x_ax)[m/Wb*ohm].

Current-Controlled Voltage Source 2 (H2)

- I In the Electrical Circuit toolbar, click 🔄 Current-Controlled Voltage Source.
- **2** In the Settings window for Current-Controlled Voltage Source, locate the Node Connections section.
- **3** In the table, enter the following settings:

Label	Node names
n	0

- 4 Locate the Current Measurement section. From the Measure current for device list, choose Resistor I (RI).
- 5 Locate the Device Parameters section. In the Gain text field, type BL(actd.ilsb1.x_ax)[m/Wb*ohm].

Inductor 2 (L2)

- I In the **Electrical Circuit** toolbar, click **OOO** Inductor.
- 2 In the Settings window for Inductor, locate the Node Connections section.
- **3** In the table, enter the following settings:

Label	Node names
Р	4
n	5

4 Locate the **Device Parameters** section. In the *L* text field, type M_MD[H/kg].

Current-Controlled Voltage Source 1 (H1)

I In the Model Builder window, click Current-Controlled Voltage Source I (HI).

- 2 In the Settings window for Current-Controlled Voltage Source, locate the Current Measurement section.
- **3** From the Measure current for device list, choose Inductor **2** (L2).

Resistor 2 (R2)

- I In the Electrical Circuit toolbar, click Resistor.
- 2 In the Settings window for Resistor, locate the Node Connections section.
- **3** In the table, enter the following settings:

Label	Node names
Р	5
n	6

4 Locate the **Device Parameters** section. In the *R* text field, type R_MS(actd.ilsb1.v_ax)[ohm/kg*s].

Capacitor 1 (C1)

- I In the **Electrical Circuit** toolbar, click **Capacitor**.
- 2 In the Settings window for Capacitor, locate the Node Connections section.
- **3** In the table, enter the following settings:

Label	Node names	
Ρ	6	
n	7	

4 Locate the **Device Parameters** section. In the *C* text field, type C_MS(actd.ilsb1.x_ax)[F*N/m].

External I vs. U I (IvsUI)

- I In the Electrical Circuit toolbar, click External I vs. U.
- 2 In the Settings window for External I vs. U, locate the Node Connections section.
- **3** In the table, enter the following settings:

Label	Node names
Р	7
n	0

4 Locate the External Device section. From the V list, choose Voltage from lumped speaker boundary (actd/ilsb1).

PRESSURE ACOUSTICS, TRANSIENT (ACTD)

- I In the Model Builder window, under Component I (compl) click Pressure Acoustics, Transient (actd).
- 2 In the Settings window for Pressure Acoustics, Transient, locate the Transient Solver and Mesh Settings section.
- 3 In the f_{max} text field, type N0*f0.

ADD MATERIAL

- I In the Home toolbar, click 🙀 Add Material to open the Add Material window.
- 2 Go to the Add Material window.
- 3 In the tree, select Built-in>Air.
- 4 Click Add to Component in the window toolbar.
- 5 In the Home toolbar, click 🙀 Add Material to close the Add Material window.

MESH I

- I In the Model Builder window, under Component I (compl) click Mesh I.
- 2 In the Settings window for Mesh, locate the Physics-Controlled Mesh section.
- 3 In the table, clear the Use check box for Electrical Circuit (cir).
- 4 Click 📗 Build All.
- **5** Click the 4 **Zoom Extents** button in the **Graphics** toolbar.

STUDY I

Step 1: Time Dependent

- I In the Model Builder window, under Study I click Step I: Time Dependent.
- 2 In the Settings window for Time Dependent, locate the Study Settings section.
- 3 In the **Output times** text field, type range(0,T0/30,10*T0).
- **4** In the **Home** toolbar, click **= Compute**.

RESULTS

Pressure On-Axis

- I In the Home toolbar, click 🔎 Add Plot Group and choose ID Plot Group.
- 2 In the Settings window for ID Plot Group, type Pressure On-Axis in the Label text field.
- 3 Click to expand the Title section. From the Title type list, choose Label.

Point Graph 1

- I Right-click Pressure On-Axis and choose Point Graph.
- **2** Select Point 6 only.
- **3** In the **Pressure On-Axis** toolbar, click **O Plot**.



Pressure On-Axis FFT

- I In the Home toolbar, click 🚛 Add Plot Group and choose ID Plot Group.
- 2 In the Settings window for ID Plot Group, type Pressure On-Axis FFT in the Label text field.
- 3 Locate the Data section. From the Time selection list, choose Interpolated.
- 4 In the Times (s) text field, type range(2*T0, T0/100, 10*T0).

The interpolation option is used to only use the solution after the initial transient ramp behavior. The sampling is also increased to get a higher frequency resolution in the FFT.

- 5 Locate the Title section. From the Title type list, choose Label.
- 6 Locate the Plot Settings section.
- 7 Select the y-axis label check box. In the associated text field, type Fourier coefficient (dB SPL).

Point Graph 1

- I Right-click Pressure On-Axis FFT and choose Point Graph.
- 2 Select Point 6 only.
- 3 In the Settings window for Point Graph, locate the x-Axis Data section.
- 4 From the Parameter list, choose Discrete Fourier transform.
- 5 From the Show list, choose Frequency spectrum.
- 6 From the Scale list, choose Multiply by sampling period.
- 7 Select the Frequency range check box.
- 8 In the Maximum text field, type (N0+1.5)*f0.
- 9 Select the In dB check box.
- **IO** From the **dB type** list, choose **20log**.
- II From the **dB reference** list, choose **Manual**.
- 12 In the Reference value text field, type 20e-6.
- **I3** In the **Pressure On-Axis FFT** toolbar, click **ID Plot**.

Graph Marker I

- I In the Model Builder window, right-click Point Graph I and choose Graph Marker.
- 2 In the Settings window for Graph Marker, locate the Display section.
- 3 From the Display list, choose Max.
- **4** From the **Scope** list, choose **Local**.
- 5 Locate the Text Format section. In the Display precision text field, type 3.
- 6 In the Suffix text field, type dB.

7 In the Pressure On-Axis FFT toolbar, click **O** Plot.



Speaker Position x(t)

- I In the Home toolbar, click 🚛 Add Plot Group and choose ID Plot Group.
- 2 In the Settings window for ID Plot Group, type Speaker Position x(t) in the Label text field.
- 3 Locate the Title section. From the Title type list, choose Label.

- I Right-click Speaker Position x(t) and choose Global.
- In the Settings window for Global, click Replace Expression in the upper-right corner of the y-Axis Data section. From the menu, choose Component I (compl)>
 Pressure Acoustics, Transient>Interior Lumped Speaker Boundary I>actd.ilsbl.x_ax Speaker axial position m.
- 3 Locate the y-Axis Data section. In the table, enter the following settings:

Expression	Unit	Description
actd.ilsb1.x_ax	mm	Speaker axial position

4 In the Speaker Position x(t) toolbar, click **O** Plot.



Speaker Velocity v(t)

- I In the Home toolbar, click 📠 Add Plot Group and choose ID Plot Group.
- 2 In the Settings window for ID Plot Group, type Speaker Velocity v(t) in the Label text field.
- 3 Locate the Title section. From the Title type list, choose Label.

- I Right-click Speaker Velocity v(t) and choose Global.
- In the Settings window for Global, click Replace Expression in the upper-right corner of the y-Axis Data section. From the menu, choose Component I (compl)>
 Pressure Acoustics, Transient>Interior Lumped Speaker Boundary l>actd.ilsbl.v_ax Speaker axial velocity m/s.

3 In the Speaker Velocity v(t) toolbar, click **I** Plot.



$C_MS(x(t))$

- I In the Home toolbar, click 🚛 Add Plot Group and choose ID Plot Group.
- 2 In the Settings window for ID Plot Group, type C_MS(x(t)) in the Label text field.
- 3 Locate the Data section. From the Time selection list, choose Interpolated.
- **4** In the **Times (s)** text field, type range(5*T0, T0/60, 10*T0).

- I Right-click **C_MS(x(t))** and choose **Global**.
- 2 In the Settings window for Global, locate the y-Axis Data section.
- **3** In the table, enter the following settings:

Expression	Unit	Description
C_MS(actd.ilsb1.x_ax)	s^2/kg	$C_MS(x(t))$

4 In the C_MS(x(t)) toolbar, click **O** Plot.



BL(x(t))

- I In the Home toolbar, click 🚛 Add Plot Group and choose ID Plot Group.
- 2 In the Settings window for ID Plot Group, type BL(x(t)) in the Label text field.
- 3 Locate the Data section. From the Time selection list, choose Interpolated.
- 4 In the Times (s) text field, type range (5*T0, T0/60, 10*T0).

- I Right-click **BL(x(t))** and choose **Global**.
- 2 In the Settings window for Global, locate the y-Axis Data section.
- **3** In the table, enter the following settings:

Expression	Unit	Description
BL(actd.ilsb1.x_ax)	Wb/m	BL(x(t))

4 In the **BL(x(t))** toolbar, click **I** Plot.



$R_MS(v(t))$

- I In the Home toolbar, click 🚛 Add Plot Group and choose ID Plot Group.
- 2 In the Settings window for ID Plot Group, type R_MS(v(t)) in the Label text field.
- 3 Locate the Data section. From the Time selection list, choose Interpolated.
- **4** In the **Times (s)** text field, type range(5*T0, T0/60, 10*T0).

- I Right-click **R_MS(v(t))** and choose **Global**.
- 2 In the Settings window for Global, locate the y-Axis Data section.
- **3** In the table, enter the following settings:

Expression	Unit	Description
R_MS(actd.ilsb1.v_ax)	N*s/m	R_MS(v(t))

4 In the R_MS(v(t)) toolbar, click I Plot.



GLOBAL DEFINITIONS

Interpolation I (BL)

- I In the Model Builder window, under Global Definitions click Interpolation I (BL).
- 2 In the Settings window for Interpolation, click 🐻 Create Plot.

RESULTS

Interpolation Data: BL(x)

I In the Settings window for ID Plot Group, type Interpolation Data: BL(x) in the Label text field.

2 In the Interpolation Data: BL(x) toolbar, click **O** Plot.



GLOBAL DEFINITIONS

Interpolation 2 (C_MS)

- I In the Model Builder window, under Global Definitions click Interpolation 2 (C_MS).
- 2 In the Settings window for Interpolation, click 🐻 Create Plot.

RESULTS

Interpolation Data: $C_MS(x)$

I In the Settings window for ID Plot Group, type Interpolation Data: C_MS(x) in the Label text field.

2 In the Interpolation Data: C_MS(x) toolbar, click 🗿 Plot.



GLOBAL DEFINITIONS

Interpolation 3 (R_MS)

- I In the Model Builder window, under Global Definitions click Interpolation 3 (R_MS).
- 2 In the Settings window for Interpolation, click 🐻 Create Plot.

RESULTS

Interpolation Data: R_MS(v)

I In the Settings window for ID Plot Group, type Interpolation Data: R_MS(v) in the Label text field.



2 In the Interpolation Data: R_MS(v) toolbar, click 🗿 Plot.

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