NVH POSTPROCESSING AUTOMATION
QUICK CURVE POSTPROCESSING WITH THE 2DPOST TOOLBAR

OV/ENG/CAE/CAE/DPS/VDNV

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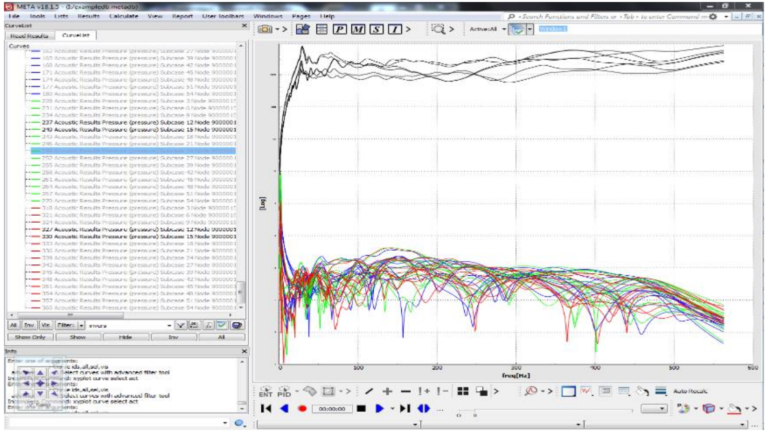
Initial Situation – Identification of the need

- Switch from a different postprocessor to MetaPost
- Consolidation of PSA / Opel-Vauxhall postprocessing approaches
- Current postprocessors need quite some manual work to yield ‘report-ready’ plot formats

- Goal of the Toolbar: Quick and Easy curve processing for the standard NVH assessments
- Goal of todays Talk: To show the benefit of custom python scripts in Meta to reduce postprocessing time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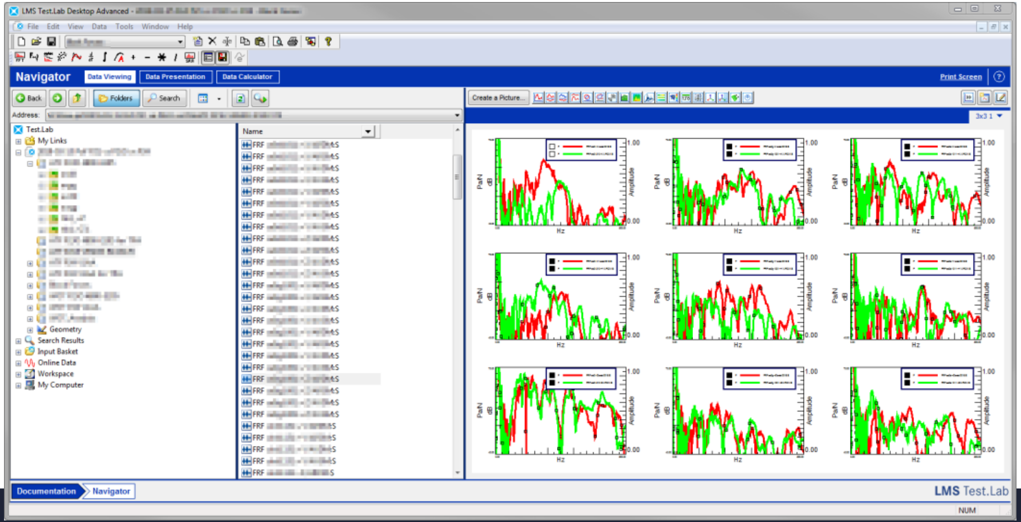
LMS Test.Lab Desktop Advanced
File Edit View Data Tools Window Help
Navigator
Data Viewing
Data Presentation
Data Calculator
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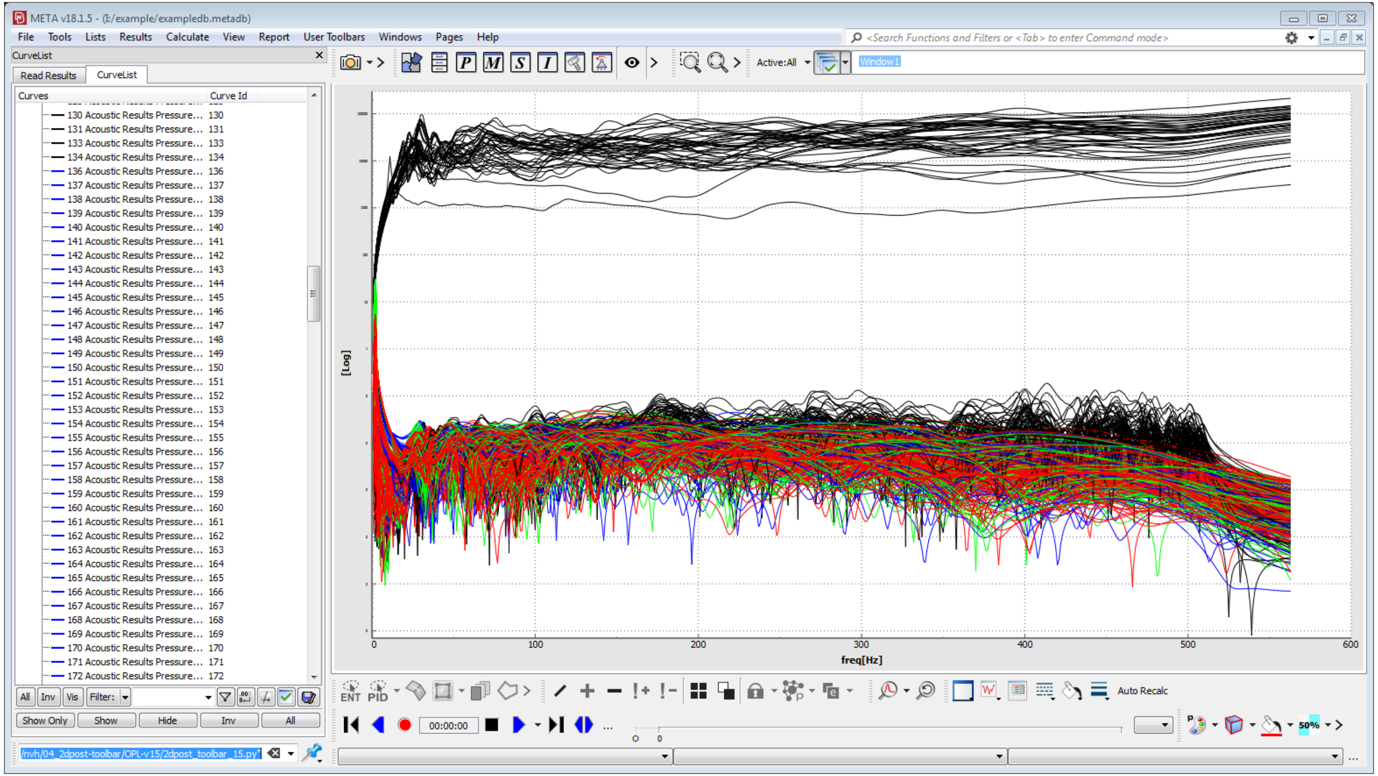
Initial Situation – MetaPost and the building bricks of the 2dPost Toolbar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META v18.1.5 - (I:/example/exampledb.metadb)

Curves	Curve Id
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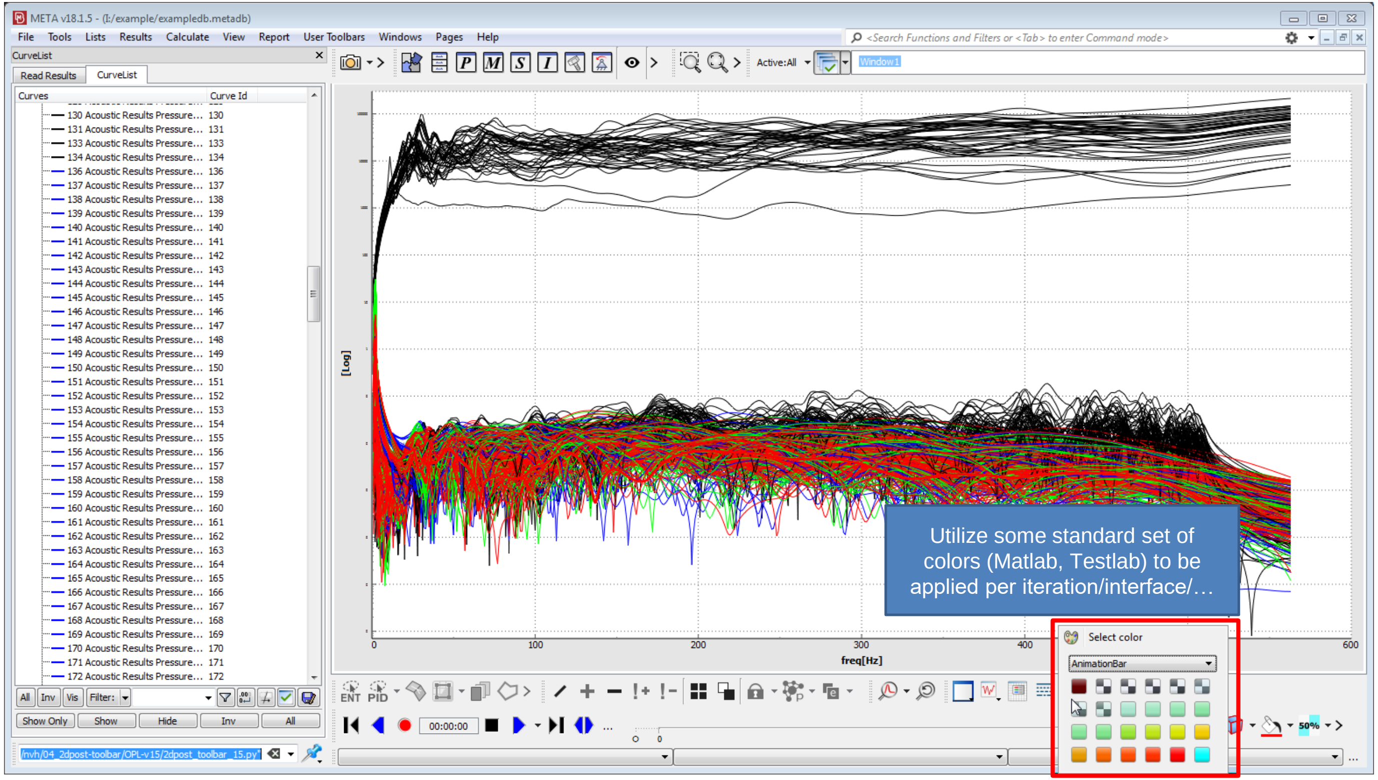
171 Acoustic Results Pressure…	171
172 Acoustic Results Pressure…	172

```
/nvh/04_2dpost-toolbar/OPL-v15/2dpost_toolbar_15.py"
```

Initial Situation – MetaPost and the building bricks of the 2dPost Toolbar

Curve coloring


META v18.1.5 - (I:/example/exampledb.metadb)
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Curves	Curve Id
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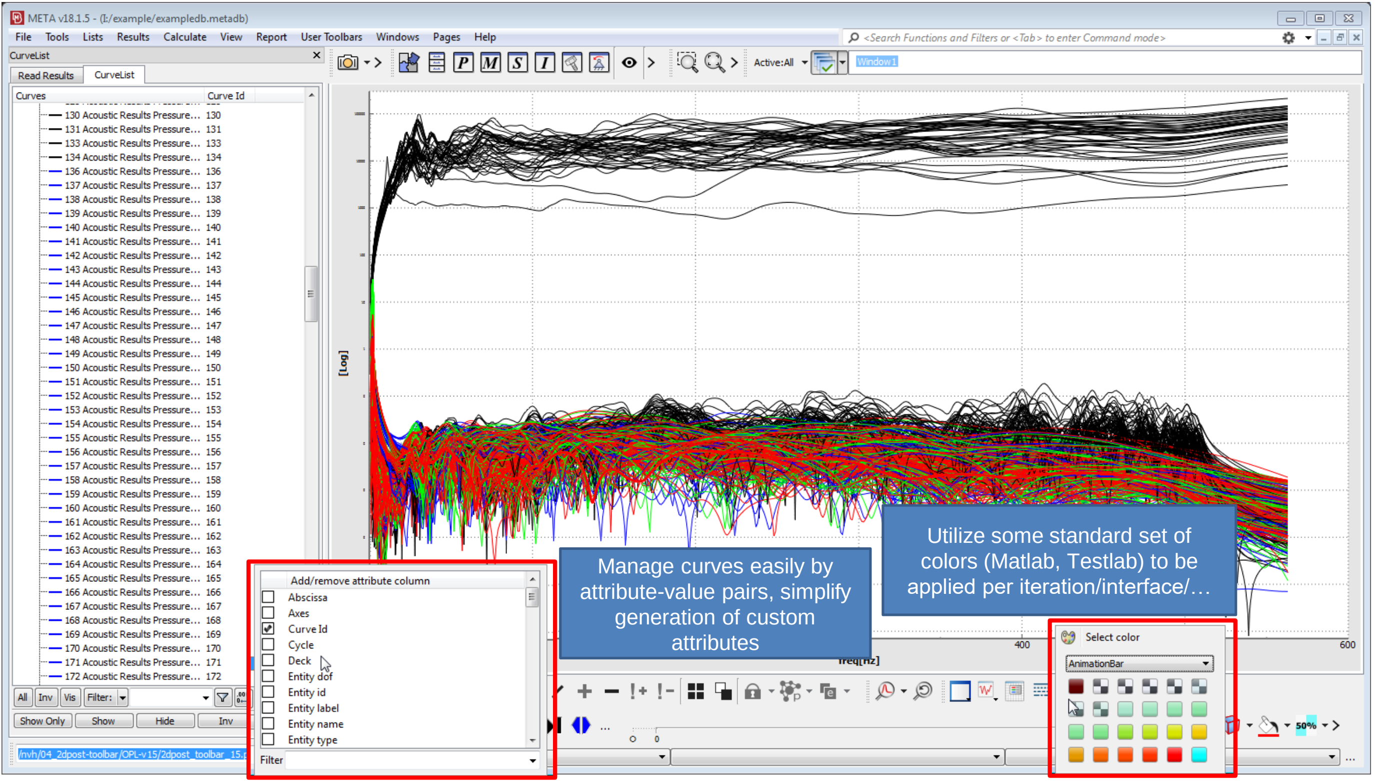
172 Acoustic Results Pressure...	172

/nvh/04_2dpost-toolbar/OPL-v15/2dpost_toolbar_15.py

Utilize some standard set of colors (Matlab, Testlab) to be applied per iteration/interface/…

Initial Situation – MetaPost and the building bricks of the 2dPost Toolbar

Curve management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Add/remove attribute column
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Curves	Curve Id
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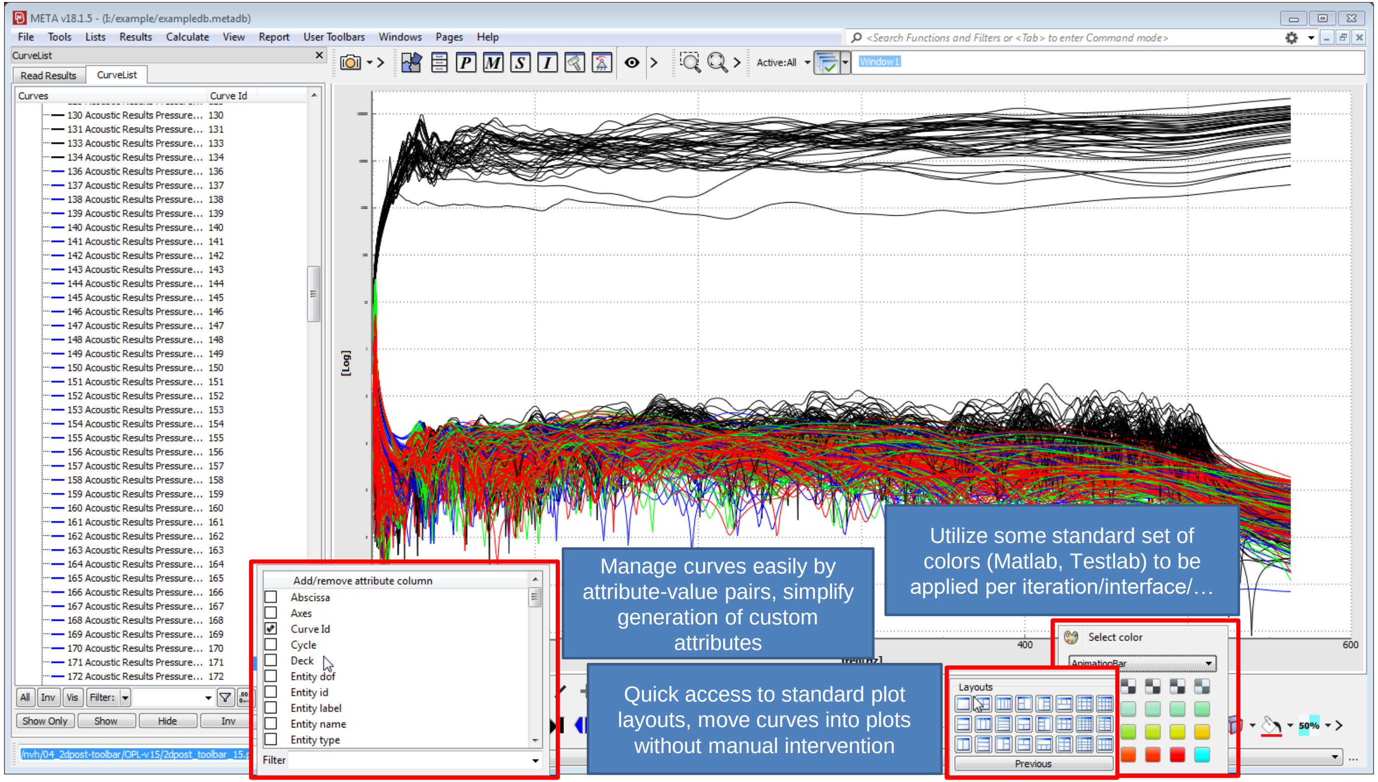
172 Acoustic Results Pressure...	172

Manage curves easily by attribute-value pairs, simplify generation of custom attributes

Utilize some standard set of colors (Matlab, Testlab) to be applied per iteration/interface/…

Initial Situation – MetaPost and the building bricks of the 2dPost Toolbar

Plot Layout


META v18.1.5 - (I:/example/exampledb.metadb)
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Curves	Curve Id
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172 Acoustic Results Pressure...	172

/nvh/04_2dpost-toolbar/OPL-v15/2dpost_toolbar_15.

Add/remove attribute column
- ☐ Abscissa
- ☐ Axes
- ☑ Curve Id
- ☐ Cycle
- ☐ Deck
- ☐ Entity dof
- ☐ Entity id
- ☐ Entity label
- ☐ Entity name
- ☐ Entity type

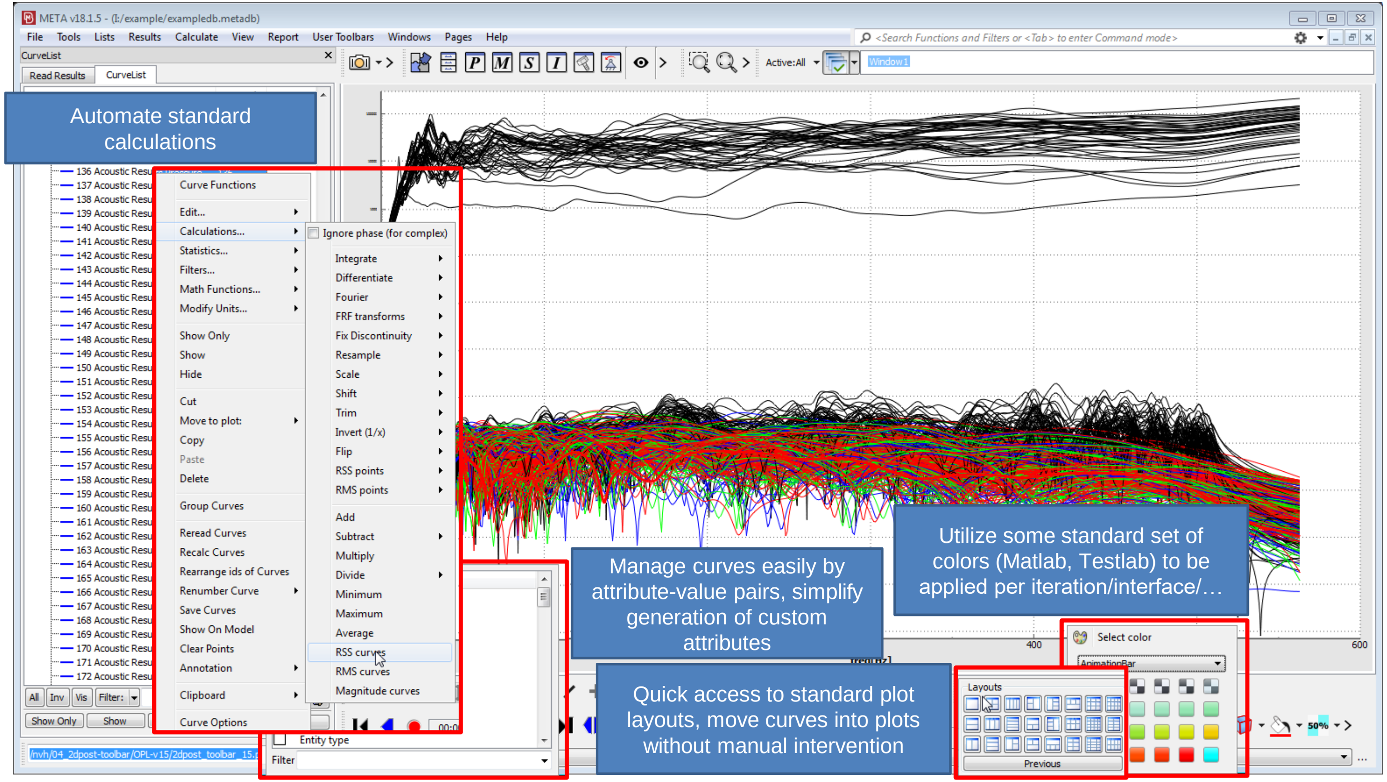
Manage curves easily by attribute-value pairs, simplify generation of custom attributes

Utilize some standard set of colors (Matlab, Testlab) to be applied per iteration/interface/…

Quick access to standard plot layouts, move curves into plots without manual intervention

Initial Situation – MetaPost and the building bricks of the 2dPost ToolbarCalculations

Standard Calculations


META v18.1.5 - (I:/example/exampledb.metadb)
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User Toolbars
Windows
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/nvh/04_2dpost-toolbar/OPL-v15/2dpost_toolbar_15.
Curve Functions
Edit...
Calculations...
Statistics...
Filters...
Math Functions...
Modify Units...
Show Only
Show
Hide
Cut
Move to plot:
Copy
Paste
Delete
Group Curves
Reread Curves
Recalc Curves
Rearrange ids of Curves
Renumber Curve
Save Curves
Show On Model
Clear Points
Annotation
Clipboard
Curve Options
☐ Ignore phase (for complex)
Integrate
Differentiate
Fourier
FRF transforms
Fix Discontinuity
Resample
Scale
Shift
Trim
Invert (1/x)
Flip
RSS points
RMS points
Add
Subtract
Multiply
Divide
Minimum
Maximum
Average
RSS curves
RMS curves
Magnitude curves
☐ Entity type
Filter
400
600
Select color
AnimationBar
Layouts
Previous
50%

Automate standard calculations

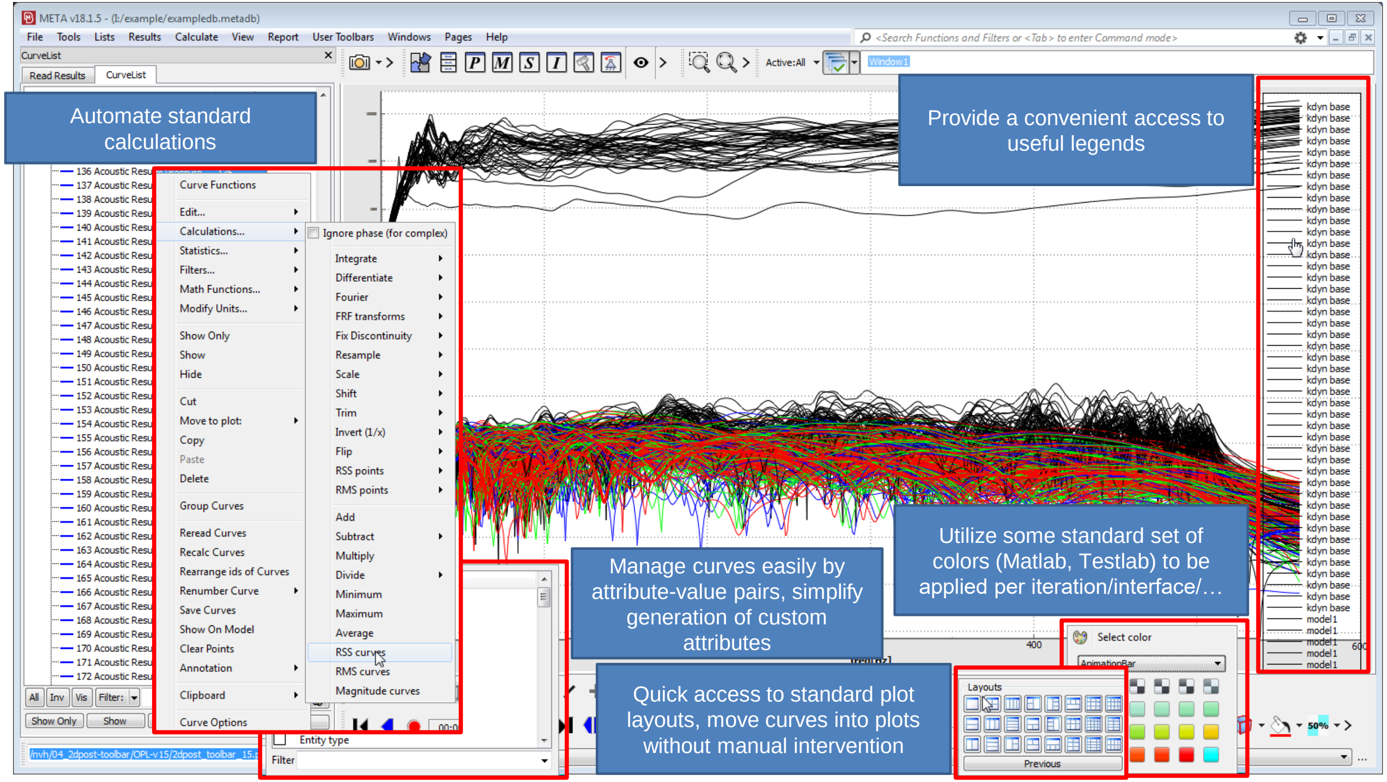
Manage curves easily by attribute-value pairs, simplify generation of custom attributes

Utilize some standard set of colors (Matlab, Testlab) to be applied per iteration/interface/…

Quick access to standard plot layouts, move curves into plots without manual intervention

Initial Situation – MetaPost and the building bricks of the 2dPost Toolbar

Quick Legend


META v18.1.5 - (I:/example/exampledb.metadb)
File Tools Lists Results Calculate View Report User Toolbars Windows Pages Help
<Search Functions and Filters or <Tab> to enter Command mode>
CurveList
Read Results
CurveList
Active:All
Window1
Curve Functions
Edit...
Calculations...
Statistics...
Filters...
Math Functions...
Modify Units...
Show Only
Show
Hide
Cut
Move to plot:
Copy
Paste
Delete
Group Curves
Reread Curves
Recalc Curves
Rearrange ids of Curves
Renumber Curve
Save Curves
Show On Model
Clear Points
Annotation
Clipboard
Curve Options
Ignore phase (for complex)
Integrate
Differentiate
Fourier
FRF transforms
Fix Discontinuity
Resample
Scale
Shift
Trim
Invert (1/x)
Flip
RSS points
RMS points
Add
Subtract
Multiply
Divide
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RSS curves
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Entity type
Filter
kdyn base
model1
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Select color
AnimationBar
Layouts
Previous
50%

Automate standard calculations

Provide a convenient access to useful legends

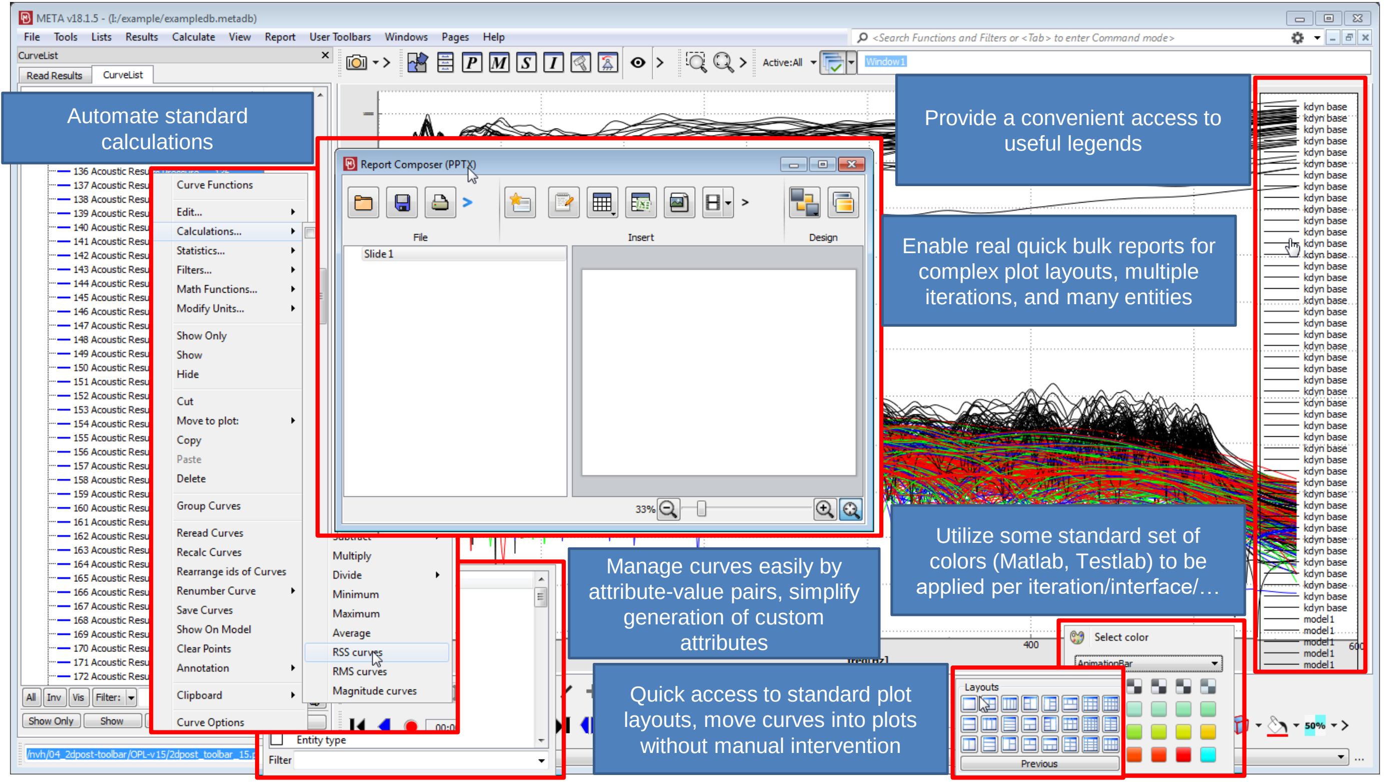
Manage curves easily by attribute-value pairs, simplify generation of custom attributes

Utilize some standard set of colors (Matlab, Testlab) to be applied per iteration/interface/…

Quick access to standard plot layouts, move curves into plots without manual intervention

Initial Situation – MetaPost and the building bricks of the 2dPost Toolbar

Really Quick Report Generation


META v18.1.5 - (I:/example/exampledb.metadb)
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Windows
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CurveList
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138 Acoustic Resu
172 Acoustic Resu
Curve Functions
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Calculations...
Statistics...
Filters...
Math Functions...
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Copy
Paste
Delete
Group Curves
Reread Curves
Recalc Curves
Rearrange ids of Curves
Renumber Curve
Save Curves
Show On Model
Clear Points
Annotation
Clipboard
Curve Options
Multiply
Divide
Minimum
Maximum
Average
RSS curves
RMS curves
Magnitude curves
Report Composer (PPTX)
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Show Only
Show
Entity type
Filter
kdyn base
model1
400
600
Select color
AnimationBar
Layouts
Previous
50%

Automate standard calculations

Provide a convenient access to useful legends

Enable real quick bulk reports for complex plot layouts, multiple iterations, and many entities

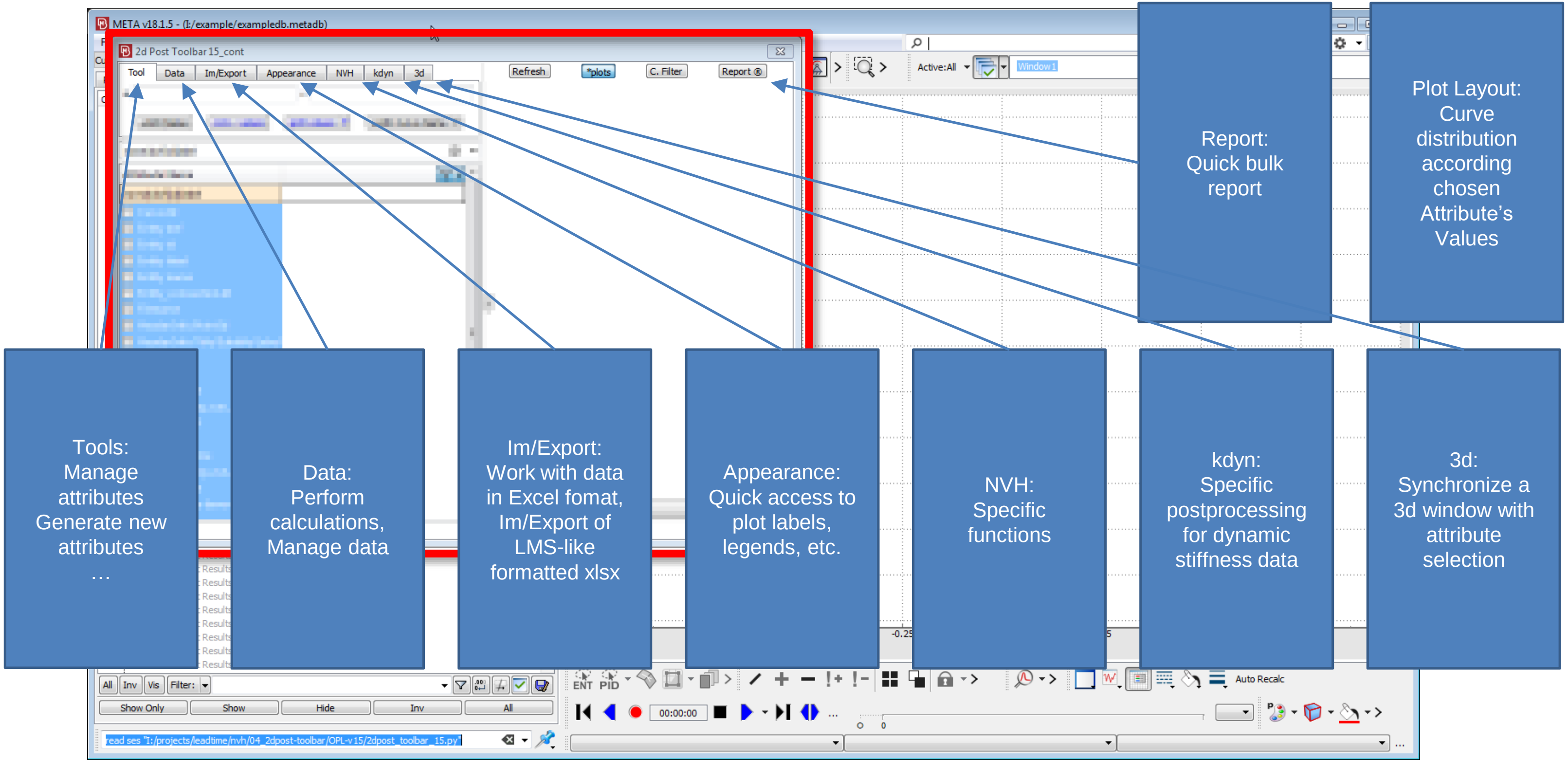
Utilize some standard set of colors (Matlab, Testlab) to be applied per iteration/interface/…

Manage curves easily by attribute-value pairs, simplify generation of custom attributes

Quick access to standard plot layouts, move curves into plots without manual intervention

The fun stuff!

2dPost Toolbar


META v18.1.5 - (I:/example/exampledb.metadb)
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```
read ses "I:/projects/leadtime/nvh/04_2dpost-toolbar/OPL-v15/2dpost_toolbar_15.py"
```

Report:
Quick bulk
report

Plot Layout:
Curve
distribution
according
chosen
Attribute's
Values

Tools:
Manage
attributes
Generate new
attributes
…

Data:
Perform
calculations,
Manage data

Im/Export:
Work with data
in Excel fomat,
Im/Export of
LMS-like
formatted xlsx

Appearance:
Quick access to
plot labels,
legends, etc.

NVH:
Specific
functions

kdyn:
Specific
postprocessing
for dynamic
stiffness data

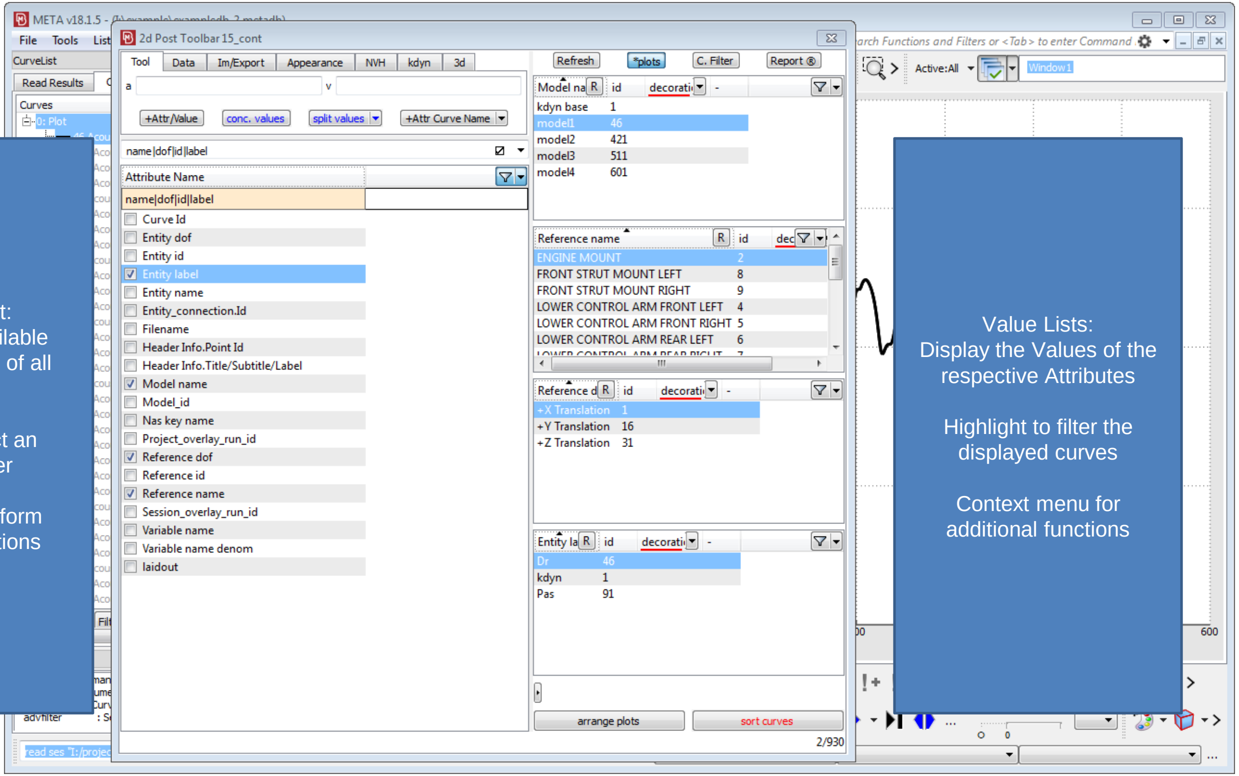
3d:
Synchronize a
3d window with
attribute
selection

Main Interface

Attribute List:
Displays all available Attribute Names of all curves

Check to select an Attribute filter

Highlight to perform additional functions


META v18.1.5
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CurveList
Read Results
Curves
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2d Post Toolbar 15_cont
Tool
Data
Im/Export
Appearance
NVH
kdyn
3d
+Attr/Value
conc. values
split values
+Attr Curve Name
Refresh
*plots
C. Filter
Report ®
arch Functions and Filters or <Tab> to enter Command
Active:All
Window1
arrange plots
sort curves
2/930
600

name|dof|id|label

Attribute Name
name|dof|id|label

☐ Curve Id
☐ Entity dof
☐ Entity id
☑ Entity label
☐ Entity name
☐ Entity_connection.Id
☐ Filename
☐ Header Info.Point Id
☐ Header Info.Title/Subtitle/Label
☑ Model name
☐ Model_id
☐ Nas key name
☐ Project_overlay_run_id
☑ Reference dof
☐ Reference id
☑ Reference name
☐ Session_overlay_run_id
☐ Variable name
☐ Variable name denom
☐ laidout

Model na	id	decorati	-
kdyn base	1		
model1	46		
model2	421		
model3	511		
model4	601		

Reference name	id	dec
ENGINE MOUNT	2	
FRONT STRUT MOUNT LEFT	8	
FRONT STRUT MOUNT RIGHT	9	
LOWER CONTROL ARM FRONT LEFT	4	
LOWER CONTROL ARM FRONT RIGHT	5	
LOWER CONTROL ARM REAR LEFT	6	

Reference d	id	decorati	-
+X Translation	1		
+Y Translation	16		
+Z Translation	31		

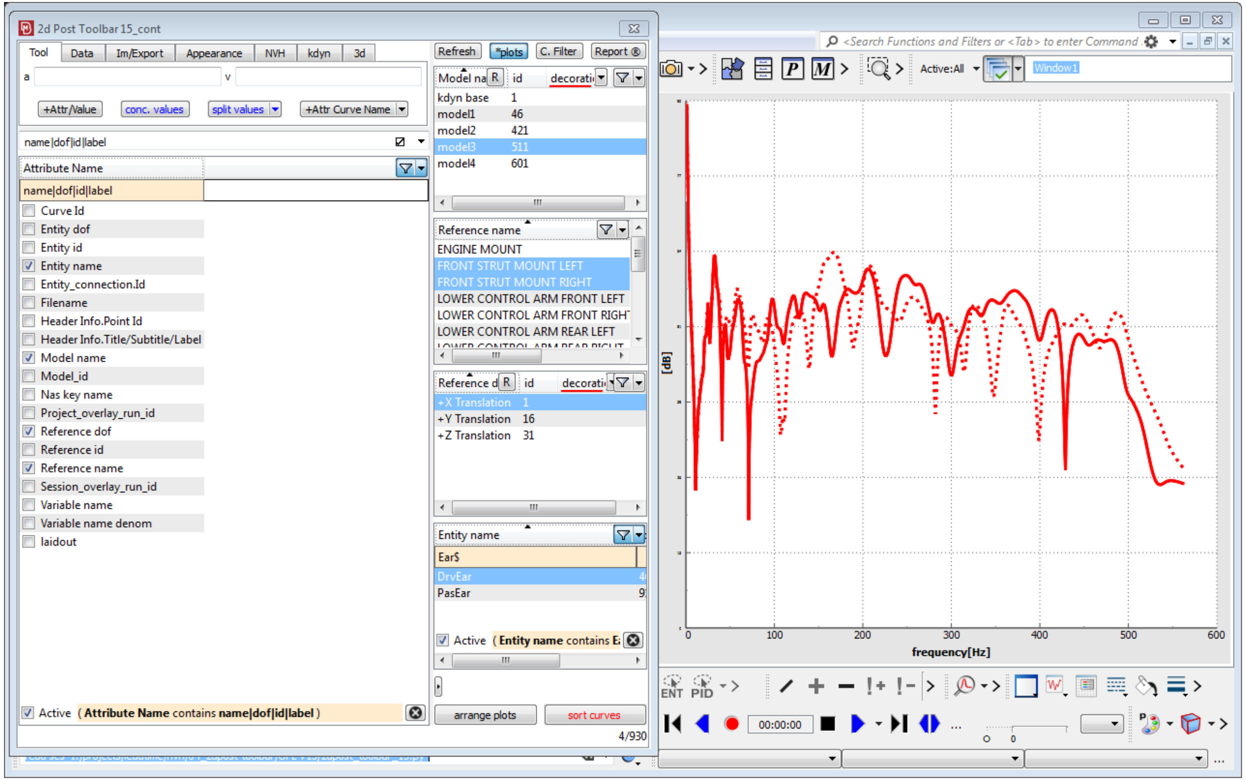
Entity la	id	decorati	-
Dr	46		
kdyn	1		
Pas	91		

Value Lists:
Display the Values of the respective Attributes

Highlight to filter the displayed curves

Context menu for additional functions

Review Data


2d Post Toolbar 15_cont
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Data
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Attribute Name	
name|dof|id|label	

☐ Curve Id
☐ Entity dof
☐ Entity id
☑ Entity name
☐ Entity_connection.Id
☐ Filename
☐ Header Info.Point Id
☐ Header Info.Title/Subtitle/Label
☑ Model name
☐ Model_id
☐ Nas key name
☐ Project_overlay_run_id
☑ Reference dof
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☑ Reference name
☐ Session_overlay_run_id
☐ Variable name
☐ Variable name denom
☐ laidout

☑ Active (**Attribute Name** contains **name|dof|id|label**)

Model na	id	decorati
kdyn base	1	
model1	46	
model2	421	
model3	511	
model4	601	

Reference name
ENGINE MOUNT
FRONT STRUT MOUNT LEFT
FRONT STRUT MOUNT RIGHT
LOWER CONTROL ARM FRONT LEFT
LOWER CONTROL ARM FRONT RIGH
LOWER CONTROL ARM REAR LEFT

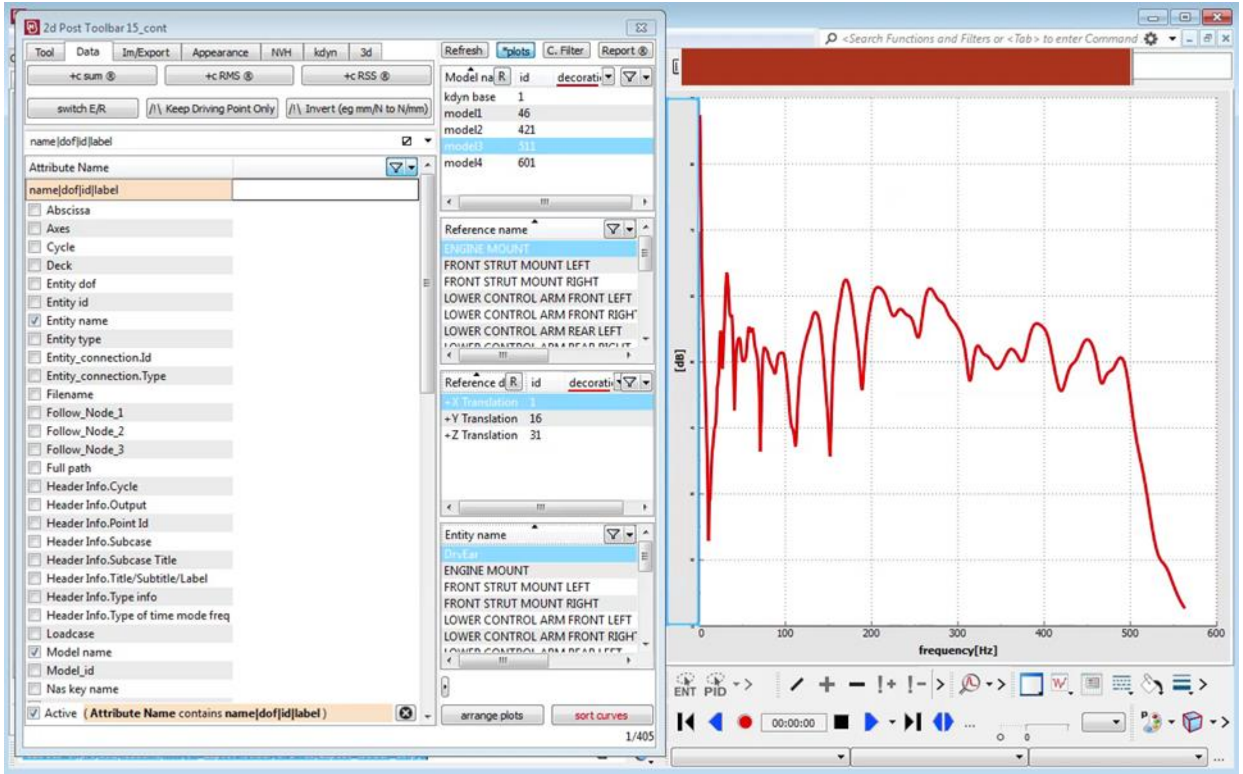
Reference d	id	decorati
+X Translation	1	
+Y Translation	16	
+Z Translation	31	

Entity name
Ear$
DrvEar
PasEar

☑ Active (**Entity name** contains E

4/930

Calculation with curves


2d Post Toolbar 15_cont
Tool
Data
Im/Export
Appearance
NVH
kdyn
3d
+c sum ®
+c RMS ®
+c RSS ®
switch E/R
/!\ Keep Driving Point Only
/!\ Invert (eg mm/N to N/mm)
Refresh
*plots
C. Filter
Report ®
arrange plots
sort curves
1/405
<Search Functions and Filters or <Tab> to enter Command
[dB]
0
100
200
300
400
500
600
frequency[Hz]
ENT
PID
00:00:00

name|dof|id|label

Attribute Name	
name|dof|id|label	

- ☐ Abscissa
- ☐ Axes
- ☐ Cycle
- ☐ Deck
- ☐ Entity dof
- ☐ Entity id
- ☑ Entity name
- ☐ Entity type
- ☐ Entity_connection.Id
- ☐ Entity_connection.Type
- ☐ Filename
- ☐ Follow_Node_1
- ☐ Follow_Node_2
- ☐ Follow_Node_3
- ☐ Full path
- ☐ Header Info.Cycle
- ☐ Header Info.Output
- ☐ Header Info.Point Id
- ☐ Header Info.Subcase
- ☐ Header Info.Subcase Title
- ☐ Header Info.Title/Subtitle/Label
- ☐ Header Info.Type info
- ☐ Header Info.Type of time mode freq
- ☐ Loadcase
- ☑ Model name
- ☐ Model_id
- ☐ Nas key name

☑ Active (**Attribute Name** contains **name|dof|id|label**)

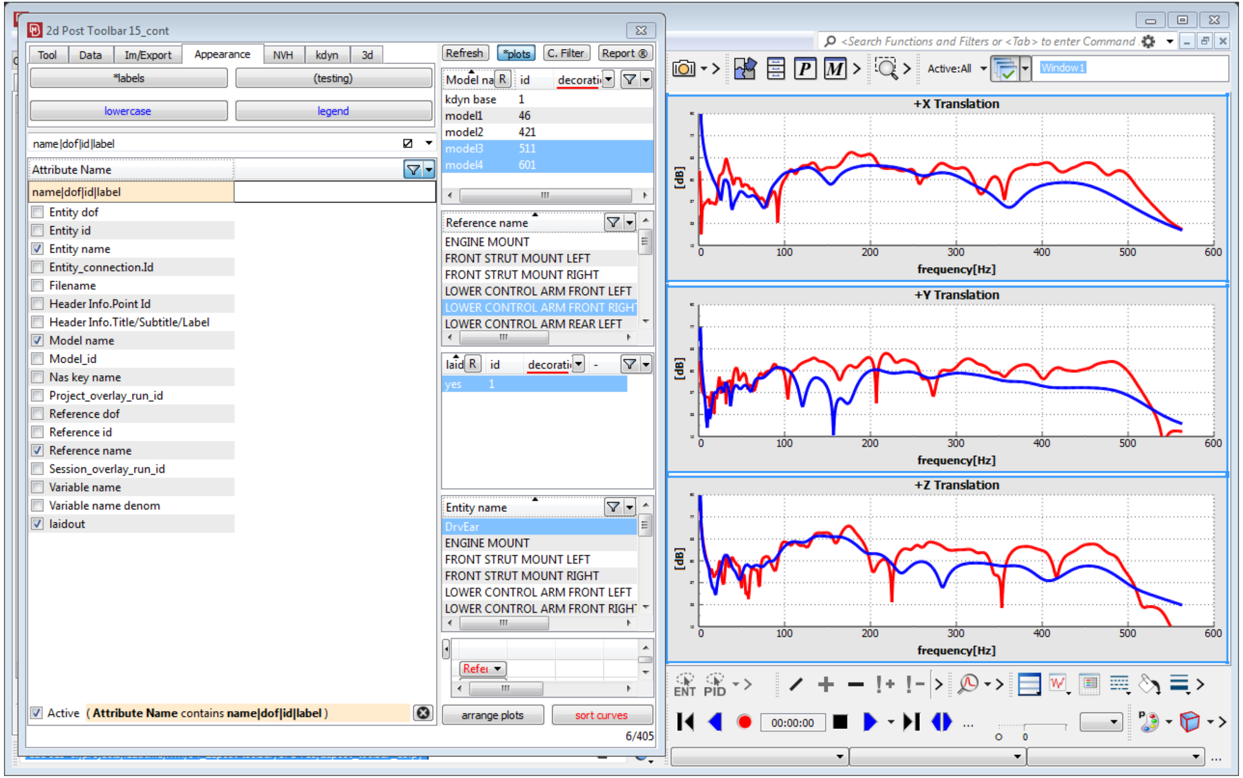
Model na	id	decorati
kdyn base	1	
model1	46	
model2	421	
model3	511	
model4	601	

Reference name
- ENGINE MOUNT
- FRONT STRUT MOUNT LEFT
- FRONT STRUT MOUNT RIGHT
- LOWER CONTROL ARM FRONT LEFT
- LOWER CONTROL ARM FRONT RIGH
- LOWER CONTROL ARM REAR LEFT

Reference d	id	decorati
+X Translation	1	
+Y Translation	16	
+Z Translation	31	

Entity name
- DrvEar
- ENGINE MOUNT
- FRONT STRUT MOUNT LEFT
- FRONT STRUT MOUNT RIGHT
- LOWER CONTROL ARM FRONT LEFT
- LOWER CONTROL ARM FRONT RIGH

Advanced plot layout


2d Post Toolbar 15_cont
Tool
Data
Im/Export
Appearance
NVH
kdyn
3d
*labels
(testing)
lowercase
legend
Refresh
*plots
C. Filter
Report
Active:All
Window1
<Search Functions and Filters or <Tab> to enter Command
+X Translation
+Y Translation
+Z Translation
[dB]
frequency[Hz]
0
100
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600
ENT
PID
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arrange plots
sort curves
Refe
6/405

name|dof|id|label ☑

Attribute Name	
name|dof|id|label	

☐ Entity dof
☐ Entity id
☑ Entity name
☐ Entity_connection.Id
☐ Filename
☐ Header Info.Point Id
☐ Header Info.Title/Subtitle/Label
☑ Model name
☐ Model_id
☐ Nas key name
☐ Project_overlay_run_id
☐ Reference dof
☐ Reference id
☑ Reference name
☐ Session_overlay_run_id
☐ Variable name
☐ Variable name denom
☑ laidout

☑ Active **(Attribute Name** contains **name|dof|id|label)**

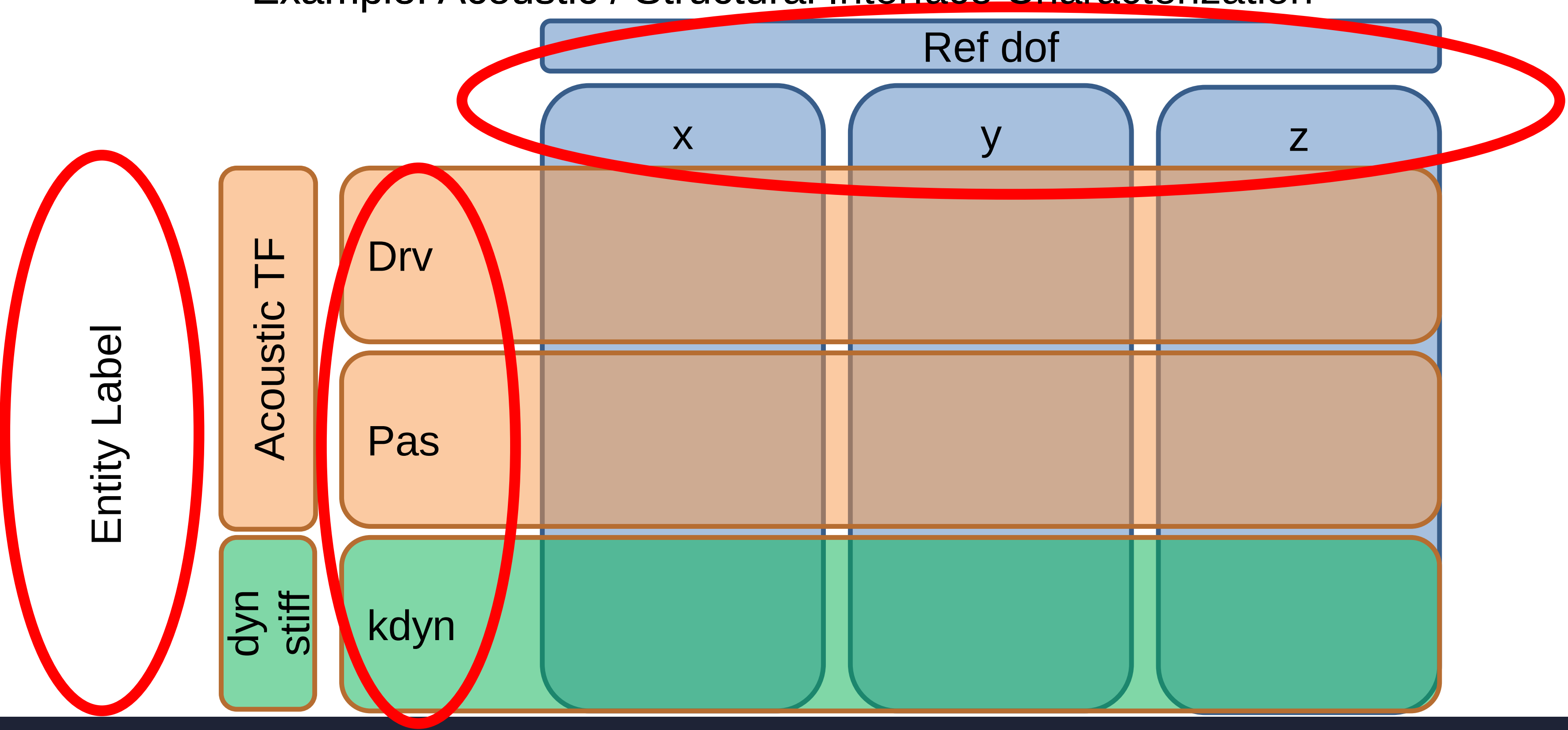
Model na	id	decorati
kdyn base	1	
model1	46	
model2	421	
model3	511	
model4	601	

Reference name
ENGINE MOUNT
FRONT STRUT MOUNT LEFT
FRONT STRUT MOUNT RIGHT
LOWER CONTROL ARM FRONT LEFT
LOWER CONTROL ARM FRONT RIGHT
LOWER CONTROL ARM REAR LEFT

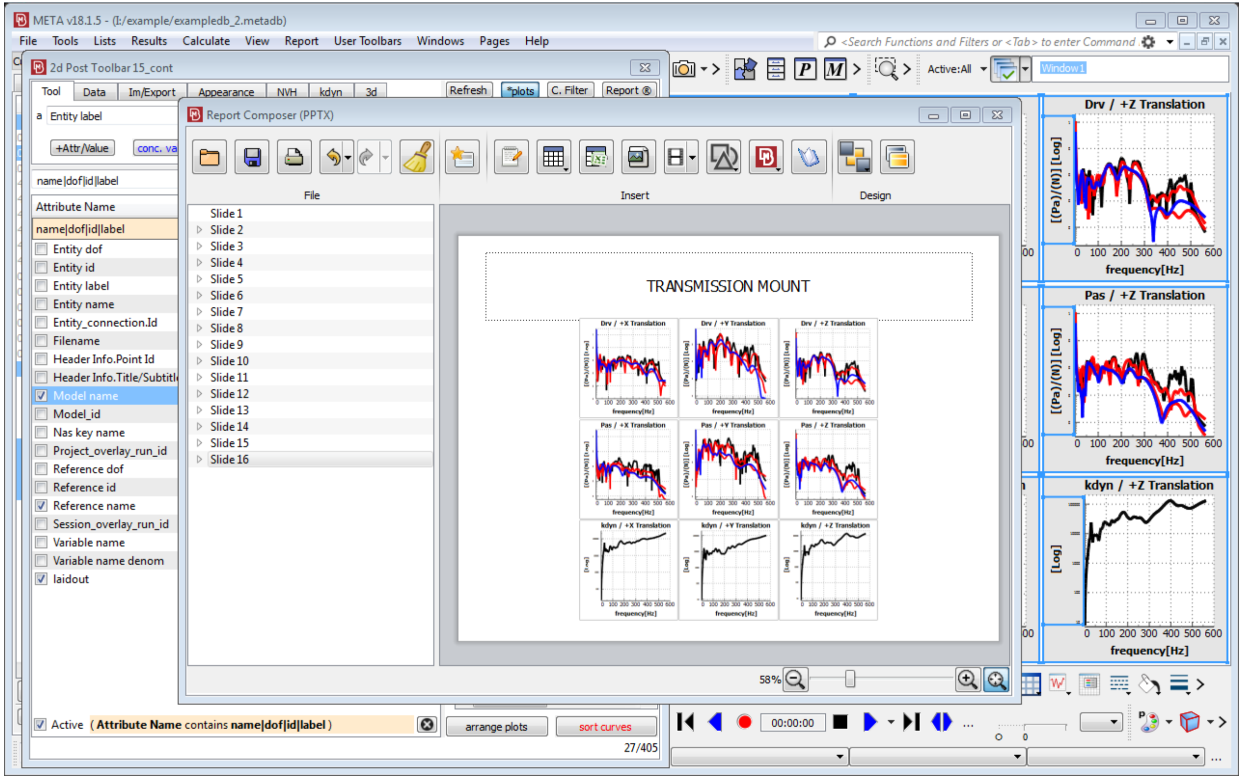
laid	id	decorati	-
yes	1		

Entity name
DrvEar
ENGINE MOUNT
FRONT STRUT MOUNT LEFT
FRONT STRUT MOUNT RIGHT
LOWER CONTROL ARM FRONT LEFT
LOWER CONTROL ARM FRONT RIGHT

Example: Acoustic / Structural Interface Characterization


Ref dof
x
y
z
Entity Label
Acoustic TF
Drv
Pas
dyn stiff
kdyn

Complex Plot Layout and Bulk Reporting



META v18.1.5 - (I:/example/exampledb_2.metadb)

2d Post Toolbar 15_cont

a Entity label

name|dof|id|label

Attribute Name

name|dof|id|label

- ☐ Entity dof
- ☐ Entity id
- ☐ Entity label
- ☐ Entity name
- ☐ Entity_connection.Id
- ☐ Filename
- ☐ Header Info.Point Id
- ☐ Header Info.Title/Subtitl
- ☑ Model name
- ☐ Model_id
- ☐ Nas key name
- ☐ Project_overlay_run_id
- ☐ Reference dof
- ☐ Reference id
- ☑ Reference name
- ☐ Session_overlay_run_id
- ☐ Variable name
- ☐ Variable name denom
- ☑ laidout

☑ Active (**Attribute Name** contains **name|dof|id|label**)

27/405

Report Composer (PPTX)

- Slide 1
- Slide 2
- Slide 3
- Slide 4
- Slide 5
- Slide 6
- Slide 7
- Slide 8
- Slide 9
- Slide 10
- Slide 11
- Slide 12
- Slide 13
- Slide 14
- Slide 15
- Slide 16

TRANSMISSION MOUNT

58%

File
Tools
Lists
Results
Calculate
View
Report
User Toolbars
Windows
Pages
Help
<Search Functions and Filters or <Tab> to enter Command
Tool
Data
Im/Export
Appearance
NVH
kdyn
3d
Refresh
*plots
C. Filter
Report
+Attr/Value
conc. va
Active:All
Window1
File
Insert
Design
arrange plots
sort curves
00:00:00
Drv / +X Translation
Drv / +Y Translation
Drv / +Z Translation
Pas / +X Translation
Pas / +Y Translation
Pas / +Z Translation
kdyn / +X Translation
kdyn / +Y Translation
kdyn / +Z Translation
[(Pa)/(N)] [Log]
[Log]
0
100
200
300
400
500
600
frequency[Hz]

Difficulties

- Limited Excel support
  - using the internal spreadsheet editor:
  - some formatting not supported
  - usage of heavy formula is time-consuming

  - external library more difficult to deploy

Assets

- Attribute values turned out as an excellent means to manage even vast amount of curves
- Python functions and MetaCommands provide a large tool chest to deal with plots and curves

- guitk library offers a wide variety of options to design a GUI
- Scripting help in general explains very well the usage of the functions, including example applications
- Excellent support by the Beta CAE support team, very fast and concise answers to any question