

Altair HVVH Tutorials 2019

HVVH-6000: Solution Tab

altairhyperworks.com

In this tutorial, you will learn how to:

- Check run a solver deck (Altair Radioss or Altair OptiStruct).
- After a check run, compare OUT files of Altair OptiStruct-written result files.

Three options are available for the solver Check Run.

- 1. Two OUT files generated from the solver run (Altair Radioss or Altair OptiStruct) can be compared.
- 2. The current solver run OUT file can be compared with the reference OUT file.
- 3. Two OUT files generated from the same solver deck using two different solver versions can be compared.

Step 1: Check run solver data for an Altair Radioss deck.

- 1. From the **Solution** tab, select the **Check run** tab.
- 2. Activate the *Check run* option.

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rent Solver Path : C:/Altair/14.0_Mainline_inspire/hwsolvers/scripts/radioss.bat	
pleted check run.	

- 3. For File type, select RADIOSS(Block).
- 4. For *Current version*, select 2017.



- 5. Under Input file, use the file browser icon, it is select and open the following file: ...\tutorials\hvvh\Solution\Radioss\Checkrun\BOXBEAM\BOXBEAM 0000.rad
- 6. For the **Output directory** field, use the open file icon, $\stackrel{\smile}{\rightarrowtail}$, to select an output directory.
- 7. Click Check Run.

After the check run is complete, the status of the run is displayed in the **Messages** window.

- 8. In the **Messages** window, the run details are displayed along with the log file location.
- 9. Errors are indicated with the label **Fail**, otherwise, they are labeled **Pass**.
- 10. Click HTML Report to view the HTML report.

HyperWorks Verification and Validation Harness

Solution - Check Run Report

olver Type : RADIOSS(Block)	Current Version : 2017	Reference Version : 13.0
	Result file	Run status
C:/HVVH/OutDir/Solution_CheckRun_7/Current_BOXBEAM_0000.out		M 0000.out

Step 2: Using the Out Compare option.

OUT files generated from the Altair Radioss solver check run can be directly compared.

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			*	Out compare	C Out file comparison	
	Solver version:	Solver version:				
Input OUT file :						
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Output directory :						
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- 1. From the **Solution** tab, select **Check Run**.
- 2. Activate the **Out Compare** option.
- 3. For File type, select RADIOSS(Block).
- 4. Under **Input OUT file**, use the file browser icon, $\stackrel{\frown}{\rightarrowtail}$, to select and open the following file:

..\tutorials\hvvh\Solution\Radioss\Checkrun\Current BOXBEAM 0000.out

5. Under **Reference OUT file**, use the file browser icon, $\stackrel{\frown}{\vdash}$, to select and open the following file:

..\tutorials\hvvh\Solution\Radioss\Checkrun\Reference_BOXBEAM_0000.out

- 6. For the **Output directory** field, use the open file icon, $\stackrel{\frown}{\rightarrowtail}$, to select an output directory.
- 7. Click Check Run.



The OUT files selected are compared, including some of the important blocks in the OUT files. More blocks will be added in later versions of HVVH.

After the *Check run* (OUT file comparison), the status of the comparison is displayed in the Messages window.

- 8. In the **Messages** window, the run details are displayed along with the log file location.
- 9. Differences are indicated with the label **Fail**, otherwise, they are labeled **Pass**.
- 10. Click **HTML Report** to view the HTML report. The comparison of different blocks of results are shown line-by-line. Warnings are in light orange and errors are in dark orange.

HyperWorks Verification and Validation Harness				
Solution - Check Run Report				
Solver Type : RADIOSS(Block) Current Version : 2017 Re	eference Version : 13.0			
Result file	Run status OUT comparison			
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Step 3: Use the Out Ref. Compare option.

Out files generated from the solver check run can be compared with the reference OUT file.



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File type : RADIOSS(Block)	Current Version : 2017	Reference Version : 13.0	Check run Out compare	 Out Ref. compare Out file comparison
input me (solver deck) :	to Parts days (Particus) (Phanh and Part 1974)	PERSONAL AND and		2
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Reference OUT file :				
C:/Altair/2017.0.0.14/demos/hvvl	n/Solution/Radioss/Check run-Run/Refe	rence_BOXBEAM_0000.out		5
Dutput directory :				
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C/HYVH/OUDH				
				Check Run
	Result file		Run statu	s OUT comparison
CUHY	VVH/Outbit/solution_checklun_s/kere	rence_BGXBEAM_0000.out	Page	P495
		Html Report		
Messages 🥖	Utair/2017.0.0.14/demos/bash/Col	ution/Radious/Chark run.8/BOVB	EAM/BOXBEAM 0000 red	

- 1. From the **Solution > Check run** tab, activate the **Out Ref. compare** option.
- 2. For File type, select **RADIOSS(Block)**.
- 3. For *Current version*, select 2017.
- 4. Under Input file, use the file browser icon, it is select and open the following file: ...\tutorials\hvvh\Solution\Radioss\Checkrun\BOXBEAM\BOXBEAM_0000.rad

This file is used for the solver run in the background.

5. Under **Reference OUT file**, use the file browser icon, $\stackrel{\frown}{\vdash}$, to select and open the following file:

..\tutorials\hvvh\Solution\Radioss\Checkrun\Reference_BOXBEAM_0000.out

This file is used to compare the first generated OUT file.

6. For the **Output directory** field, use the open file icon, it is select an output directory.



7. Click Check Run.

The generated OUT file and reference OUT files are compared, including some of the important blocks in the OUT files are compared. More blocks will be added in later versions.

- 8. After the Check run (OUT file comparison) is complete, the status of the comparison is displayed in the **Messages** window.
- 9. In the **Messages** window, the run details are displayed along with the log file location.
- 10. Differences are indicated with the label **Fail;** otherwise, they are labeled **Pass**.
- 11. Click **HTML Report** to view the HTML report. The comparison of different blocks of results are shown line-by-line. Warnings are in light orange and errors are in dark orange.

HyperWorks Verification and Validation Harness

Solution - Check Run Report

Solver Type : RADIOSS(Block) Current Version : 2017 Reference Version : 13.0

Result file	Run status	OUT comparison
C:/HVVH/OutDir/Solution_CheckRun_9/Reference_BOXBEAM_0000.out	Pass	Pass

Step 4: Using the Out file comparison option.

Out files generated from different solver versions can be directly compared.

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rsign CAD FE Model Solution	Result Manufacturing solution	m				
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File type : RADIOSS(Block) •	Current Version : 20	17 • Refere	nce Version : 1	4.130	C Check run	C Out Ref. compare
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	and the second sec	n 10/Reference BOXBE	AM_0000.out		Pass	Pass
C;/HV	VH/OutDir/Solution_CheckRu					
C;/HV	VH/OutDir/Solution_CheckRu	Htm	l Report			
C;/W	VN/OutDir/Solution_CheckRu	Htm	l Report			
C;/W	VW/DutDir/Solution_CheckRu	Htm	i Report			
C/M	VW/DutDir/Solution_CheckRu	Htm	i Report			
C;/HV	VW/DutDir/Solution_CheckRu	Htm	i Report			
C;/HV	VW/DutDir/Solution_CheckRu	Htm	i Report			
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Messages	17.0.0.16-udayshw2017Bu	gFix_BW-dev1/hwsol s/radioss.bat	i Report	ss.bat		

- 1. From the **Solution > Check run** tab, activate the **Out file comparison** option.
- 2. For File type, select **RADIOSS(Block)**.
- 3. For Current version, select 2017.
- 4. For Reference version, select 14.130.
- 5. Under Input file, use the file browser icon, $\stackrel{\bigcirc}{\vdash}$, to select and open the following file: ...\tutorials\hvvh\Solution\Radioss\Checkrun\BOXBEAM\BOXBEAM_0000.rad

This is the solver file that will be used to run the solver for the check run. The OUT file is created in the output directory.

- 6. For the **Output directory** field, use the open file icon, it is select an output directory.
- 7. Click Check Run.

The generated OUT files are compared, including some of the important blocks in the OUT files. More blocks will be added in later versions.





- 8. After the check run (OUT file comparison) is complete, the status of the comparison is displayed in the **Messages** window.
- 9. In the **Messages** window, the run details are displayed along with the log file location.
- 10. Differences are indicated with the label **Fail**; otherwise, they are labeled **Pass**.
- 11. Click *HTML Report* to view the HTML report. The comparison of different blocks of results are shown line-by-line. Warnings are in light orange and errors are in dark orange.

HyperWorks Verification and Validation Harness			
Solution - Check Run Repo	<u>rt</u>		
Solver Type : RADIOSS(Block) Current Version : 2017 H	Reference Version : 14.130		
Result file	Run status OUT comparison		
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Step 5: Solver run.

After a complete solver run, you can compare OUT files for solver-written result files.

Three options are available for the OUT file comparison under the **Run** option of the solver.

- 1. Two OUT files generated from the solver run can be compared.
- 2. The current solver run OUT file can be compared with the reference OUT file.
- 3. Two OUT files generated from the same solver deck using two different solver versions can be compared.



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Check run F	un Solver version res	ult comparison Solver	version result co	moarison HG Sensitivity	Analysis Compa	re Sensitivity Analysis	
File type :	RADIOSS(Block)	Current Version :	2017 •	Reference Version : Solver version:	14.130 •	G Complete runC Out compare	 ○ Out Ref. compare ○ Out file comparison
Reference	OUT file :						
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Output dir			Resu	Itfile			Run Run status

Begin the tutorial:

- 1. From the **Solution > Run** tab, activate the **Complete run** option.
- 2. For File type, select RADIOSS(Block).
- 3. For *Current version*, select 2017.
- 4. Under Input file, use the file browser icon, it is select and open the following file: ...\tutorials\hvvh\Solution\Radioss\Run\BOXBEAM\BOXBEAM_0000.rad

This file is used for the solver run in the background.

- 5. For the **Output directory** field, use the open file icon, $\stackrel{\frown}{\vdash}$, to select an output directory.
- 6. Click *Run*.

After the run is complete, the status of the comparison is displayed in the **Messages** window.

- 7. In the **Messages** window, the run details are displayed along with the log file location.
- 8. Errors are indicated with the label **Fail**; otherwise, they are labeled **Pass**.
- 9. Click *HTML Report* to view the HTML report.



HyperWorks Verification and Validation Harness

Solution - Run Report

Solver Type : RADIOSS(Block) Current Version : 2017 Reference Version : 13.0

Result file	Run status
C:/HVVH/OutDir/Solution_CompleteRun_2/Current_BOXBEAM_0000.out	Pass

- 10. The following three options on the Run tab work as they do on the Check run tab (see Steps 2-4 above).
 - Out compare (out files comparison)
 - Out Ref. compare (out files comparison)
 - Out file comparison from solver check runs

For Altair Radioss, both the Starter OUT file and Engine OUT files are compared.

For Altair OptiStruct, the OUT files are compared.

Step 6: Solver version result comparison (Altair Radioss or Altair OptiStruct)

In this section, you will use the Solver version result comparison option for a given model. If the result files are not available, the Solver Run can be done in the background and the result generated are used in the result comparison.

1. From the **Solution** tab, select the **Solver version result comparison** tab.



1 HVVH - HyperWorks Verification	n and Validation Harness (v2017) 🛛 🚽 🗖 💌
File Edit Help	
Design CAD FE Model Solution Result Manufacturing solution	
Check run Run Solver version result comparison Solver version result comparison	HG Sensitivity Analysis Compare Sensitivity Analysis
Solver Type : RADIOSS Tolerance : default	1e-6 Apply Result: A001 THTML Report \$
Current	Reference
Version 2017 Run solver Solver ver.	Version 14.130 Run solver Solver ver.
Load Model	Load Model
Load Result	Load Result
Output directory :	3
Acceptance Generation MAC HyperView	Run Solver MAC only Apply
Subcase Simulation	Result type
^ ·	^
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	L All
	Tolerance Apply

- 2. For Solver type, select RADIOSS.
- 3. For **Tolerance**, select the default (1e-06). You can set any tolerance for Scalar, Vector, or Tensor data types.
- 4. For **Result**, select **A001**.
- 5. Click *HTML Report*.
- 6. Under **Current**, for *Load Model*, use the file browser icon, it is select and open the following file:

..\tutorials\hvvh\Solution\Radioss\Solver-versions-resultcomparison\Current\BOXBEAM 0000.rad file.

7. Under **Reference**, for *Load Model*, use the file browser icon, $\stackrel{\smile}{\rightarrowtail}$, to select and open the following file:

..\tutorials\hvvh\Solution\Radioss\Solver-versions-resultcomparison\Reference\BOXBEAM 0000.rad file.

8. For the **Output directory** field, use the open file icon, $\stackrel{\frown}{=}$, to select an output directory.





Edit Help	
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eck run Run Solver version result comparison Solver version result comparison HG	G Sensitivity Analysis Compare Sensitivity Analysis
Solver Type : RADIOSS Tolerance : default	1e-5 Apply Result: A001 * HTML Report +
Current	Reference
Version 2017 💌 🗷 Run solver 🗆 Solver ver. 💌	Version 14.330 🝸 🗷 Run solver 🗆 Solver ver. 🇨
Load Model ss/Solver versions result comparison/Current/BOX8EAM_0000.rad 🐸	Load Model C:/Altair/2017.0.0.34/demos/hvvh/Solution/Radioss/Solver versio
Load Result	Load Result
Output directory :	3
Acceptance	Bus Solver MAC coly Aroly

9. Activate the *Run solver* options.

10. Click *Run Solver*.

After the solver run, the A001 results are loaded in the *Load Result* option.

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File Edit Help	
Design CAD FE Model Solution Result Manufacturing solution	
Check run Run Solver version result comparison Solver version result comparison HG	Sensitivity Analysis Compare Sensitivity Analysis
Solver Type : RADIOSS Tolerance : default	1e-6 Apply Result: A001 • HTMLReport 0
Current	Reference
Version 2017 Version 2017 Run solver Solver ver.	Version 14.130 V Run solver Solver ver.
Load Model ss/Solver versions result comparison/Current/BOX8EAM_0000.rad	Load Model C:/Altair/2017.0.0.14/demos/hwh/Solution/Radioss/Solver versio
Load Result C:/HVVH/OutDir/Solution_RunSolver_1/Current/BOX8EAMA001	Load Result C:/WVVH/OutDir/Solution_RunSolver_1/Reference/BOX8EAMA00
Output directory: C:/HVVH/OutDir	ě
Acceptance and Acceptance Accepta	Run Solver MAC only Apply

11. Click Apply.

The results available (Subcase, Simulation, and Result type) in the current result file are loaded in the three windows.

Subcase	Simulation	Result type	
Loadcase 1	Time = 0.0000e+000 Time = 1.0006e-001 Time = 2.0018e-001 Time = 3.0035e-001 Time = 4.0012e-001	Displacement Contact Forces Velocity Plastic Strain Von Mises	į
All	E All	E All	

12. Select each *All* under each of the windows and click the second *Apply* button.Any combination of Subcase, Simulation, and Datatype can be selected for comparison.Results comparison of the current and reference results are generated.



- 13. In the **Messages** window, the run details are displayed along with the log file location.
- 14. If any difference is greater than the tolerance, it is indicated with the label **Fail**, otherwise, they are labeled **Pass**.

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	point ventor must compared into	sentinely search compa	e search search	
Solver Type : AADIOSS	* Tolerance default	14-6 Apply	Actual Actual	HTMLReport 1
Current		Reference		
Version 2017 . IC R	un solver 🗉 Solver ver. 🔹	Version 14.130	🗵 Run solver 🛛 🖂 Solve	er ver.
Load Model us/Solver versions re	sult comparison/Current/BCXIBIAM 0000.rad	Load Model C:/Altar/2017	0.0.34/demos/hwth/Solution	/katioo/Solver versio
Load Result C/HVVH/OutDe/Sol	ition_RunSolver_1/Current/BOXBEAMADD1	Load Result C./HVVH/Out	0k/Solution_RunSoliver_1/Re	herence/BCX86AMA00
Output directory : C:/HVVH/Dutbe				8
Acceptance Criteria :	MAC Hype/View	Run Solver	MAC only	Αφρίγ
fubcase	Simulation		Result type	
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	Plane Pe	904L		
Messages 🥖				

15. Click *HTML Report* to view the HTML report. Comparisons between different data types are available.

For example, for a vector (Displacement), the components Magnitude, X-displacement, Y-displacement, and Z-displacement are compared for the entire model and results are displayed.



HyperWorks Veri	fication and Validation Harness
Solution - Solver	Version Result Comparison Report
Solver Type : RADIOSS	Current Version: 2017 Reference Version: 14.330
Current file	Reference file [Report]Launch HV]
C. NVVH OutDa Solution_SolverVerCompare_1 Current_SOXEEAMADOL_ContactForces_	1 C. HVVH OutDo Solution, SolverVerCompare, 1 Reference, 50038.43(4001_ContactForces, 1 1000_10700_1000_10700_1000_10700_1000_10700_10700_10700_10700_10700_10700_10700_10700_10700_10700_10700_10700_10700_10700_10700_10700_10700_10000_1000_1000_1000_1000_1000_1000_10000_1000_1000_10000_10000_10000_1000000
C. HVVH OutDe Solution_SolverVerCompare_1 Current_BOXBEAMA001_Velocity_1	C. HVVH OutDa Solution, Solver VerCompare, 1 Reference, BOXBEAMAND1, Velocity, 1
C-HVVH OutDe Solution_SolverVerCompare_1 Current_BOXBEAMA001_VonMose_1	C:HVVH OutDe Solution, SolverVerCompare, 1 Reference, BOUBEAMANI, VonMass, 1
C SIVH OutDr Solution_SolverVerCompare_1Current_BOXBEAMAN()_FunderStrain_1	I C. HVVH OutDe Solution, SolverVeCompare, LReference, BOXSEAMA001, Flantsfitters, I
Min-M	ax values across loadcase
Data Tra	ar Load CaueNamber of Simultion
Dislaren	est [Loadcase 1] 41
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16. Click **Pass/Fail** in the HTML report to open a detailed comparison report.

The second column in the table, **Launch HV**, opens Altair HyperView. Depending on the data type, different windows are opened with the respective diff results.

For example, for vector results (Displacement), four windows open with the Magnitude, Displacement -X, Displacement -Y, and Displacement -Z loaded in the different windows. In each window, further details can be viewed.

17. Click the first column of the table to open a new graphics window.





In the image above, the left window shows a diff contour (Current-Reference) and the right window shows a diff plot in Altair HyperGraph.

- 18. In case any difference is greater than the tolerance, it is indicated with the label **Fail**, otherwise, it is labeled **Pass**.
- 19. Click the left window to open the diff-values H3D in HyperView Player. You can view the difference in the contour and view the area where there is a difference in case of a failure.
- 20. Click the right window to maximize/minimize the plot. The difference values for each step are calculated and the min and max values of the difference are plotted.

If all the values match and no difference is seen, the curve is a flat line and the diff contours have values less than the tolerance.

Step 7: Solver version result comparison (Altair HyperView option -Altair HyperView interactive)

1. From the **Solution** tab, select the **Solver version result comparison** tab.

Solver Type : RADIOSS Tolerance : default	10-5 Apply Result: ADD1 MTMLReport o
Current	
Version 2017 • Z Run solver Solver ver.	Reference Version 14.130 V Run solver Solver ver.
Load Model ss/Solver versions result comparison/Current/BOXBEAM_0000.rad	Load Model C:/Altair/2017.0.0.14/demos/hwh/Solution/Radioss/Solver versio
Load Result	Load Result



- 2. For the Solver Type, select RADIOSS.
- 3. For *Tolerance*, select the default (1e-06). You can set any tolerance for the Scalar, Vector or Tensor data types
- 4. For **Result**, select **A001**.
- 5. Click HTML Report.
- 6. For Current Version, select 2017.
- 7. For Reference Version, select 14.130.
- 8. Under **Current**, for **Load Model**, use the file browser icon, \smile , to select and open the following file:

```
..\tutorials\hvvh\Solution\Radioss\Solver-versions-result-
comparison\Current\BOXBEAM 0000.rad
```

9. Under **Reference**, for **Load Model**, use the file browser icon, it is select and open the following file:

```
..\tutorials\hvvh\Solution\Radioss\Solver-versions-result-
comparison\Reference\BOXBEAM_0000.rad
```

- 10. For the **Output directory** field, use the open file icon, it is select an output directory.
- 11. Activate the *Run solver* options.
- 12. Click Run Solver.]

After the solver run, the A001 results are loaded in the *Load Result* option.

🖒 HVVH - HyperWorks Verification and Validation Harness (v2017)
File Edit Help
Design CAD FE Model Solution Result Manufacturing solution
Check run Run Solver version result comparison Solver version result comparison HG Sensitivity Analysis Compare Sensitivity Analysis
Solver Type : RADIOSS * Tolerance : default * 10-6 Apply Result: A001 * HTML Report +
Current Reference
Version 2017 Run solver Solver ver. Version 14.130 Run solver Solver ver.
Load Model ss/Solver versions result comparison/Current/BOX8EAM_0000.rad 🐸 Load Model C:/Altair/2017.0.0.34/demos/hvvh/Solution/Radioss/Solver versio
Load Result C:/HVVH/OutDir/Solution_RunSolver_1/Current/BOXBEAMA001 🗳 Load Result C:/HVVH/OutDir/Solution_RunSolver_1/Reference/BOXBEAMA001
Output directory:
Acceptance MAC HyperView Run Solver MAC only Apply

13. Click HyperView.

Altair Hyperview opens the current results and reference results and loads them into two windows.

- 14. Model and results are pre-loaded for both the current and reference models in Altair HyperView. From the Contour panel, select data type and data component.
- 15. Control is active for first window.

- Select a region of interest (element, node, component level) and create a contour.
- Run the command ::Displaycontour (reference result contour is also loaded for the selected region).
- Run a command to apply a user-defined tolerance for the data type selected **::Applytolerance** (otherwise, use the default tolerance).
- Run the command **::Diffcontour**. Difference contour result are displayed in another window for the selected data types only and are also plotted.



- 16. The first window displays the current model and result, and the second window displays reference model and result.
- 17. The third window displays the difference in the contour values. If the difference is greater than the tolerance, it is indicated as **Fail**, otherwise its displayed as **Pass**.
- 18. The fourth window displays the actual diff plots in HyperGraph.

The data type can be changed and any individual component result can be compared. Tolerance values can be reset to any value and result comparison.

Comparison for region of interest:

• Part of the model (by window, by component, set of elements, and so on) can be selected in the first window. Using APIs as mentioned above, results can be compared ONLY for the selected region.

Step 8: Solver version result comparison HG

In this step, you will compare results from different solver versions (Altair Radioss or Altair OptiStruct) using Altair HyperGraph.

1. From the Solution tab, select Solver version result comparison HG.



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lel Solution Result	Manufacturing s	olution					
ver version result co	mparison Solver	version result	comparison HG	Sensitivity A	nalysis C	ompare Sensitivity Analy	sis
ADIOSS	Percentage Tolerance :	default	<u> </u>		10-6	Apply	HTML Report
				Reference			
Altair/2017.0.0.14/der	mos/hvvh/Solutio	n/Radioss/Solve	r-versions	Data File	C:/Altai	r/2017.0.0.14/demos/hvvh	/Solution/Radioss/Solver-versions
(VVH)/OutDir							uš -
	el Solution Result ver version result co ADIOSS 7	el Solution Result Manufacturing s er version result comparison Solver ADROSS Percentage 7 1 Itair/2017.0.0.14/demos/hvvh/Solution	el Solution Result Manufacturing solution er version result comparison Solver version result ADROSS Percentage default Tolerance : default tair/2017.0.0.14/demos/hvvh/Solution/Radioss/Solve	el Solution Result Manufacturing solution er version result comparison Solver version result comparison HG ADROSS Percentage default ADROSS ADROSS ADROSS ADROSS ADROSS ADROSS ADROSS ADROSS ADROSS	el Solution Result Manufacturing solution er version result comparison HG Sensitivity A ADIOSS Percentage default Folerance: Reference Utair/2017.0.0.14/demos/hvvh/Solution/Radioss/Solver-versions Reference Data File VVH/OutDir	el Solution Result Manufacturing solution er version result comparison HG Sensitivity Analysis C ADIOSS Percentage default Internet: left left left left left left left left	el Solution Result Manufacturing solution er version result comparison HG Sensitivity Analysis Compare Sensitivity Analy ADROSS Percentage default In-6 Apply 7 Tolerance Reference Itair/2017.0.0.14/demos/hvvh/Solution/Radioss/Solver-versions

- 2. For Solver Type, select RADIOSS.
- 3. Click *HTML Report*.
- 4. For **Version**, select **2017**.
- 5. Under **Current**, for **Data File**, use the file browser icon, $\stackrel{\smile}{\rightarrowtail}$, to select and open the following file:

```
..\tutorials\hvvh\Solution\Radioss\Solver-versions-result-comparison-
HG\Current BOXBEAMT01
```

6. Under **Reference**, for **Data File**, use the file browser icon, rightarrow, to select and open the following file:

..\tutorials\hvvh\Solution\Radioss\Solver-versions-result-comparison-HG\Reference BOXBEAMT01

- 7. For the **Output directory** field, use the open file icon, it is select an output directory.
- 8. Click Apply.

Subcase X Ty	pe Time Plot only faile	
Y Туре	Y Request	Y Component
Global Variables Part Material Property Node/Impactors displacement	I edge to edge	FNX-X NORMAL FORCE FNY-Y NORMAL FORCE FNZ-Z NORMAL FORCE FTX-X TANGENT FORCE FTY-Y TANGENT FORCE
Z All	Z All	IIA 🗵

9. Select each **All** and click the second **Apply**.

Any combination of the Y-Type, Y Request, and Y Component can be selected for comparison.

10. In this example, the solver result for the same model with *slightly different* Boundary conditions are picked to show the difference in the results so that they are visible in the graphs of the report.

Results comparison of the current results and reference plot results are generated.



11. In the **Messages** window, the run details are displayed along with the log file location.

ck run Run Solver version result como	arison Solver version result comparison HG	ensitivity Analysis Compare Sensitivity Analysis	
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Solver Type : RADIOSS	Percentage default *	1e-6 Apply	HTML Report
Version 2017			
Current		Reference	
Data File dioss/Solver-versions-result	-comparison-HG/Current_BOX8EAMT01	Data File ss/Solver-versions-result-comparison-H0	Beference_BOX8EAMT01
Output directory :	11		2
			Annix
Subcase *	x Type Time 💌 🗹 Plot	only failed	1447
туре	Y Request	Y Component	
Slobal Variables Part Material Property	2 edge to edge	FINE-X NORMAL FORCE FINE-Y NORMAL FORCE FINE-Z NORMAL FORCE FINE-X TANGENT FORCE FINE-X TANGENT FORCE	
		2 PTI-TTANGENT FORCE	
Node/Impactors displacement	IZ AB		
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Node/impactors displacement 2 All Impare result : Current file	i 2 Ali	Reference file	Apply Report
Node/impactors displacement All Impare result : Current file sn_SolverVerHScompare/Current, Current ion_SolverVerHScompare/Current, Current	All BOXBEAMTEL_(Rigid wallMovin)_SolverVenHGo BOXBEAMTEL_(Rigid wallMovin)_SolverVenHGo BOXBEAMTEL_(Rigid wallMovin)_SolverVenHGo	Reference file ompare/Reference_BOXII(AMT01_(Rigid v compare/Reference_Reference_BOXII(AMT01_(Rigid v	Report allMo Fail wallfo Fail
Node/Impactors displacement Z All mpare result : Current file on_SolverVerHScompare/Current_Current ton_SolverVerHScompare/Current_Current	Z All C All C BOXBEANTOL_Rigid wallMovin_SolverVerHGo N_BOXBEANTOL_Rigid wallFixe(on_SolverVerHGo	Reference file ompare/Reference_Reference_BOX8EAMT01_(Rigid compare/Reference_Reference_BOX8EAMT01_(Rigid	Report allMo Fail vallFc Fail
Node/Impactors displacement R All propare result : Current file on_SolverVerHGcompare/Current_Current Ison_SolverVerHGcompare/Current_Current	E All B BOXBEAMTEL_(Rigid wallMovin)_SolverVerHGo nt_BOXBEAMTEL_(Rigid wallFixe(on_SolverVerHG Html Repo	Reference file ompare/Reference_Reference_BOXBEAMT01_[Rigid compare/Reference_Reference_BOXBEAMT01_[Rigid ort	Apply Report allMo Fail wallFo Fail
Node/impactors displacement R All ompare result : Current file on_SolverVerHGcompare/Current_Current tion_SolverVerHGcompare/Current_Current	E All E BOXEEAATTOL_(Rigid wallMovin)_SolverVerHGo nt_BOXEEAATTOL_(Rigid wallFixedon_SolverVerHG Html Rep	Reference file ompare/Reference_Reference_BOXBEAMT01_[Rigid compare/Reference_Reference_BOXBEAMT01_[Rigid ort	Apply Report allMo Fail Fail

12. Click *HTML Report* to open the report. Comparison of different Types, Requests, and Components (TRC) are available.

HyperWorks Verification and Validation Harness

Solution - Solver Version HG Comparison

Current Ble	Reference file	Report
HVVH OutDar Solution_SolverVerHOcompare Current_Current_BOXDRAMT01_(Rapid wallMoving Rapid wall)_second	[C MVVH OutDe Solution_SolverVeHOcompare Reference_Reference_BOXREAMT01_(Repid wallMoving Repid wall)_session	
C HVVH OutDe Solution_SolverVielHCompare Current_Current_BC008EAMT11_[Rigid wallFixed rigid wall]_session1	C-HVVH OutDe Solution_SolverVerHCcompare Reference_Reference_BOODEAMT11_(Rapid wallFand rapid wall_session)	1.00
C: HVV16 OutDir Solution_SolverVir16Gcompare Current_Current_BOXDEAMT01_Property_session1	C.HVVH OnDie Solution_SolverVerHOcompare/Reference_Reference_BOXBEAMT01_Property_session1	
C: HVVH OutDe Solution_SolverVetHOcompart Current_DOXIBLAMTH_Part_assocn1	C. HVVH OutDut Solution, SolverVerHOcompare Reference, Reference, BOXBEAMTH, Part, sessionT	
C. HVVH OutDa Solution_SolverVielHCompare Current_Current_BOXBEAMT91_(Interfacetype 7)_session1	C HVVH OutDat Solution_SolverVerH0compare Reference_Reference_B020BEAMT01_(Interfacetype 7)_ieroion1	
C. HVVH OutDer Solution_SolverVerH0compare Carrent_D0XDEAMT01_(Olobal Variables)_session1	C.HVVH OutDe Solution_SolverVerHOcompare Reference_BOXBEAMT01_(Olobal Variables)_session1	
C. HVVH OutDe Solution_SolverVerHOcompare Current_DOXBEAMT01_(Olobal Variables)_ansion2	C. HVVH OutDie Solution, SolverVerHOcompare Reference, Reference, BOXBEAMT01_(Olobal Variables)_session2	1.00
C:HVVH OutDe Solution_SolverVerHGcompare Current_DOXBEAMT01_(Interfacetype 11)_session3	C 30VV91 OutDr Solution_Solution_Solution_Solution_Reference_BOX88LAMT01_(Interfacetype 11)_assessed	
C HVVH OutDa Solution SolverVerHOcompare Current Current BOXBEAMT01 Material session)	C HVVH OutDa Solution SolverVerHGcompare Reference Reference BOXBEAMT01 Material session1	





- 13. Click the *Fail in HTML* report to open a detailed comparison report.
 - Here, the boundary conditions are different and there is a difference in results.
- 14. Click on the plots to maximize/minimize the images.
- 15. Graphs display the current and reference curves along with the difference curve.

- 16. The diff curve shows differences in current/reference curves. Any non-zero diff value is a failure.
- 17. All statistical details of the difference curve is also shown in the graph table.

Step 9: Sensitivity Analysis.

Compare results from different solver versions (Altair Radioss or Altair Optistruct) using Sensitivity Analysis. Sensitivity analysis of the model is carried out for different seed values.

1. From the **Solution** tab, select the **Sensitivity Analysis** tab.

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a Edit Halo	Horks Perincatori and Pandatori Harries (12017)					
e cuit neip	And a Californ Burnel Manufacture Internation					
esign CAD FE	Model solution Result Manufacturing solution					
Check run Run	Solver version result comparison Solver version result comparison HG Sensitivity Analysis Compare Sensitivity Analysis					
Solver Type	RADIOSS	HTML Report				
Current						
Version	Version 2017 Run solver Solver ver. Use existing results					
Result directory	Result C:/Altair/2017.0.0.14/demos/hvvh/Solution/Radioss/Sensitivity-Analysis					
Config File	Config File C:/Altair/2017.0.0.14/demos/hvvh/Solution/Radioss/Sensitivity-Analysis/config_thickness_0.txt					
Output directory :	C:/HVVH/OutDir	2				
unectory.	Generate Decks	Apply				
Subcase	× X Type ×					
Response Para	meters :					
Y Туре	Y Request Y Component					
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		Apply				
Sensitivity Re	ort:					
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		Report				
	Html Report					
Messages 🤞						

- 2. For Solver Type, select RADIOSS.
- 3. Click *HTML Report*.
- 4. For Version, select 2017.
- 5. Activate the **Use existing results** option.

The results of from a previously run solver analysis is used.



6. For **Result directory**, use the file browser icon, $\stackrel{\frown}{\rightarrowtail}$, to browse here:

..\tutorials\hvvh\Solution\Radioss\Sensitivity-Analysis

7. For Config File, use the file browser icon, it is select and open the following file: ..\tutorials\hvvh\Solution\Radioss\Sensitivity-

Analysis\config_thickness_0.txt

This file is used to set different seed values for the sensitivity analysis.

- 8. For the **Output directory** field, use the open file icon, it is select an output directory.
- 9. Click Apply.

Response Parameters :		
Y Туре	YRequest	Y Component
Global Variables Part Material Property Interface/NULL	1 self contact 2 wall	FNX-X NORMAL FORCE FNY-Y NORMAL FORCE FNZ-Z NORMAL FORCE FTX-X TANGENT FORCE FTY-Y TANGENT FORCE
		I All

- 10. Under **Response Parameters**, select TRCs for the sensitivity study and click **Apply**. The sensitivity report is generated.
- 11. In the **Messages** window, the run details are displayed along with the log file location.



eck run Run Solver version re	sult comparison Solv	er version result comparison HG	Sensitivity Analysis Comp	are Sensitivity Analysis	
Solver Type : RADIOSS					HTMLReport 4
Current					
Version 2017	3 Run solver 🛛 🕀 S	olver ver. • 🗵 U	re existing results		
Result directory	.14/demos/hvvh/Solut	or/Radioss/Sensitivity-Analysis			<u>8</u>
Config File C:/Altair/2017.0.0	.14/demos/hwh/Soluti	on/Radioss/Sensitivity-Analysis/co	nfig_thickness_0.txt		2
Output C/HVVH/Outpir					3
directory :				Generate Decks	Apply
Subcase lesponse Parameters :	•	Type Time	2		
Y Туре		Y Request		Y Component	
Global Variables Part Material Property Interface/NULL		1 self contact 2 wall	į	FNX-X NORMAL FORCE FNY-Y NORMAL FORCE FNZ-Z NORMAL FORCE FTX-X TANGENT FORCE FTY-Y TANGENT FORCE	
				🖾 All	
				E	Apply
iensitivity Report:					
cilumatious	Mensilivity Analysis/	Current file iensitivity-Analysis Seedfulinteefer	ettt (Iselfpootact) ETV.	KTANGENTFORCE	Report .
C:/HVVH/OutD	it/Sensitivity-Analysis/	iensitivity-Analysis_TimeVsInterfac	eULL_[Iselfcontact]_FTX-	XTANGENTFORCE	Report
		Html Re	not		
35 - 1 2					

12. Click HTML Report to open the sensitivity report.

13. In the HTML report for one TRC, there will be two reports.

1.Seed Vs TRC.

This is a scattered plot, showing sensitivity for each seed value. This creates a sensitivity corridor that can be used to study the variation or sensitivity of the result for the given model.

2. Time Vs TRC.

This shows:

- All Time History (TH) plots across the seed values.
- Envelope cures (Max, Min, Mean, SD, Mean+SD, and Mean-SD).
- Statistical curves (Max, Min, Mean, SD, Mean+SD, and Mean-SD).

The detailed report points to different sets of information to help you further assess the results and perform the sensitivity study, and if this model can be used further for solver version result comparisons.



Step 10: Compare results from different Solver versions (Altair Radioss or Altair OptiStruct) using Sensitivity analysis.

Actual solver version result comparison for solver plot results using this sensitivity analysis, carried out using different solver versions for the same model.

1. From the Solution tab, select the Compare Sensitivity Analysis tab.

VHVH - HyperWorks Verification and Validation Harness (v2017)	
File Edit Help	
Design CAD FE Model Solution Result Manufacturing solution	
Check run Run Solver version result comparison Solver version result comparison HG Sensitivity Analysis Compare Sensi	tivity Analysis
Solver Type : RADIOSS 💌 🗹 Use existing results	HTML Report \$
Current Reference Version 2017 Current Solver ver. Current Version 14.130 Current	n solver 🗌 Solver ver. 🕎
Curr Result directory 17.0.0.14/demos/hvvh/Solution/Radioss/Compare-Sensitivity-Analysis Ref Result directory	olution/Radioss/Compare-Sensitivity-Analysis
Config File C:/Altair/2017.0.0.14/demos/hvvh/Solution/Radioss/Compare-Sensitivity-Analysis/config_thickness_0.txt	2
Output C:\HVVH\OutDie	ë
	Run Solver Apply

- 2. For Solver Type, select RADIOSS.
- 3. Activate the **Use existing results** option.
- 4. Click HTML Report.
- 5. For Current Version, select 2017.
- 6. For Reference Version, select 14.130.
- 7. For **Current Result directory**, use the file browser icon, it is browse to the following location:

.. \tutorials \hvvh \Solution \Radioss \Compare-Sensitivity-Analysis

8. For **Reference Result directory**, use the file browser icon, it is browse to the following location:

.. \tutorials \hvvh \Solution \Radioss \Compare - Sensitivity - Analysis

- 9. For Config File, use the file browser icon, ..tutorials\hvvh\Solution\Radioss\Compare-Sensitivity-Analysis\config thickness 0.txt
- 10. For the **Output directory** field, use the open file icon, <a>> , to select an output directory.
- 11. Click **Apply**.

Response Parameters :			
Y Type Global Variables Part Material Property Interface/NULL	Y Request 1 tube 2 Schlitten	Y Component E-Internal Energy KE-Kinetic Energy XE-MOM-X Momentum YMOM-Y Momentum ZMOM-Z Momentum	
		🗆 All	

12. Select each **All** under the Type, Request, and Component (TRC) windows and click the second **Apply** button.

The sensitivity report is generated for comparison across two versions.

13. In the **Messages** window, the run details are displayed along with the log file location.

	_		
Solver Type : RADIOSS	Use existing results	нт	ML Report \$
Current Version 2017	solver 🗆 Solver ver.	teference fersion 14.130 Run solver Solver ver.	*
Curr Result 17.0.0.14/demos/hvvh/S directory	olution/Radioss/Compare-Sensitivity-Analysis 🚔 Ref di	Result 17.0.0.14/demos/hvvh/Solution/Radioss/Compare-Sensit rectory	ivity-Analysis 🗳
Config File C:/Altair/2017.0.0.14/de	mos/hwh/Solution/Radioss/Compare-Sensitivity-Analy	sis/config_thickness_0.txt	2
Output directory :			2
Response Parameters :		Run Solver	Apply
Y Туре	YRequest	YComponent	
Global Variables Part Material Property Interface/NULL	1 self contact 2 wall	FNX-X NORMAL FORCE FNY-Y NORMAL FORCE FNZ-Z NORMAL FORCE FTX-X TANGENT FORCE FTY-Y TANGENT FORCE	
		- All	_
			Apply
Sensitivity Report:			_
Curre	nt file	Reference file sitivity Analysis/Reference, Seed/statesface(III) /tselfe	Report
ort/Compare_Sensitivity_Analysis/Cu	rrent_TimeVsInterfaceULL_{lselfcoirt/Compare_Ser	sitivity_Analysis/Reference_TimeVsInterfaceULL_{1selfor	Report
Compare_Sensitivity_Analysis/Current	t_CurveStatistics_InterfaceULL_{1se.ompare_Sensitiv	ity_Analysis/ReferenceCurveStatistics_InterfaceULL_{1s	Report
	Html Repo	nt	

14. Click *HTML Report* to open the sensitivity report.



HyperWorks Verification and Validation Harness Solution - Compare Sensitivity Analysis						
Solver Type : RADIOSS	Current HW Version : 3	1017 Refer	ence HW Version : 14.130	Current Solver Ve	rsion 13.0	Reference Solver Version : 13.0
	Type	Request	Component	PlotName	Report	
	InterfaceULL	{1selfcontact}	FNY-YNORMALFORCE	SeedVs InterfaceULL	Report	
	InterfaceULL	{1selfcontact}	FNY-YNORMALFORCE	TimeVs InterfaceULL	Report	
	InterfaceULL	(1selfcontact)	FNY-YNORMALFORCE	CurveStatistics	Report	
	InterfaceULL	(1selfcontact)	FNZ-ZNORMALFORCE	SeedVs InterfaceULL	Report	
	InterfaceULL	(1selfcontact)	FNZ-ZNORMALFORCE	TimeVs InterfaceULL	Report	
	InterfaceULL	{1selfcontact}	FNZ-ZNORMALFORCE	CurveStatistics	Report	
	InterfaceULL	(1selfcontact)	FNX-XNORMALFORCE	SeedVs InterfaceULL	Report	
	InterfaceULL	(1selfcontact)	FNX-XNORMALFORCE	TimeVs InterfaceULL	Report	
	InterfaceULL	(1selfcontact)	FNX-XNORMALFORCE	CurveStatistics	Report	
	InterfaceULL	(2wall)	FNY-YNORMALFORCE	SeedVs InterfaceULL	Report	
	InterfaceULL	{2wall}	FNY-YNORMALFORCE	TimeVs InterfaceULL	Report	
	InterfaceULL	{2wall}	FNY-YNORMALFORCE	CurveStatistics	Report	
	InterfaceULL	{2wall}	FNZ-ZNORMALFORCE	SeedVs InterfaceULL	Report	
	InterfaceULL	(2wall)	FNZ-ZNORMALFORCE	TimeVs InterfaceULL	Report	
	InterfaceULL	{2wall}	FNZ-ZNORMALFORCE	CurveStatistics	Report	
	InterfaceULL	{2wall}	FNX-XNORMALFORCE	SeedVs InterfaceULL	Report	
	InterfaceULL	(2wall)	FNX-XNORMALFORCE	TimeVs InterfaceULL	Report	
	InterfaceULL	(2wall)	FNX-XNORMALFORCE	CurveStatistics	Report	

15. In the HTML report for one TRC, there will be two reports. For each of the solver results from different solver versions, the results are extracted and plotted for comparison.

1.Seed Vs TRC.

This is a scatter plot, showing sensitivity for each seed value. Using this sensitivity corridor, the variations across different seed vales for results from two solver versions can be determined.

2. Time Vs TRC.

This shows Time History (TH) plots for the current and reference files and their diff curve.

3. Curve Statistic

- Envelop of all cures (Max, Min, Mean, SD, Mean+SD, and Mean-SD).
- Statistical curves (Max, Min, Mean, SD, Mean+SD, and Mean-SD).







