



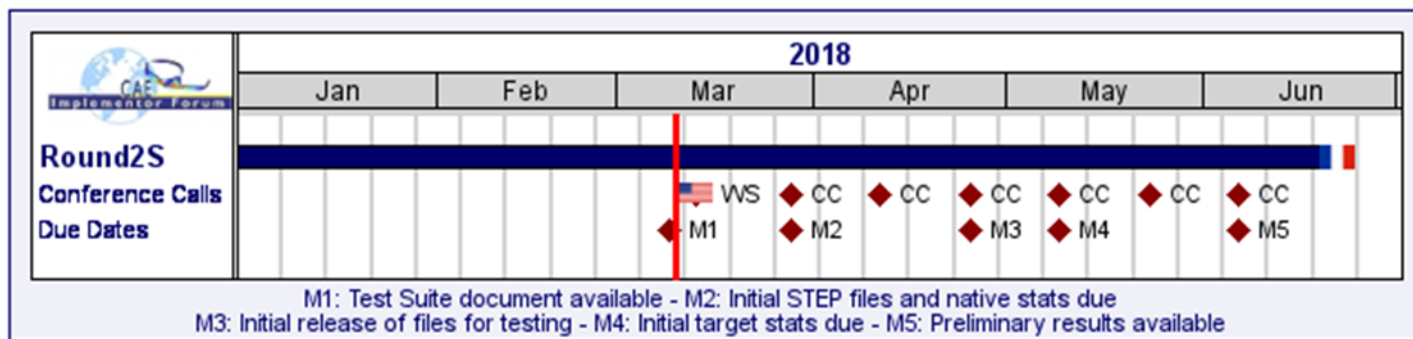
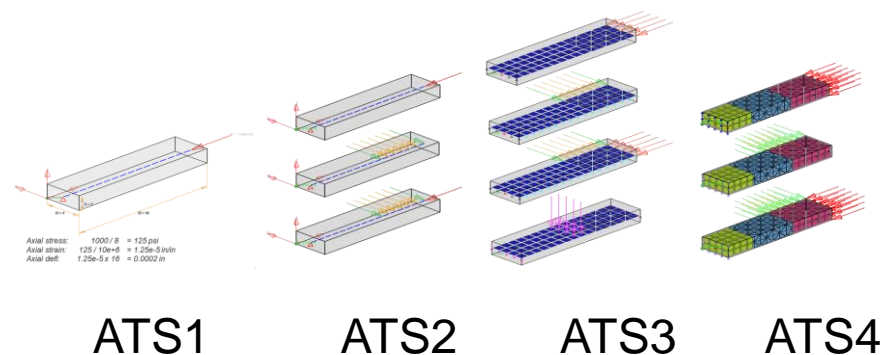
CAE-IF : R2S results summary

J.M. Crepel - Sept 26, 2018

REMINDER

CAE-IF Test Round 2S : Scope & schedule

- Same scope as pilot test #2 :
 - Beam modeled with rod, bar, shell or solid elements
 - Lumped and/or distributed applied forces
- Focused on FEA Output data :
 - Nodal displacement and rotation
 - Strain and stress tensor field
 - 1D- and 2D-element internal forces
 - Boundary condition constraint loads
 - Grid point loads
- Initial schedule
 - With bi-weekly confcalls
- R2S with figures
 - 2 participants (CT Core Technologie, Jotne EPM)
 - More than 80 new types of statistics in CAESAR
 - 60 statistics to be processed by participants



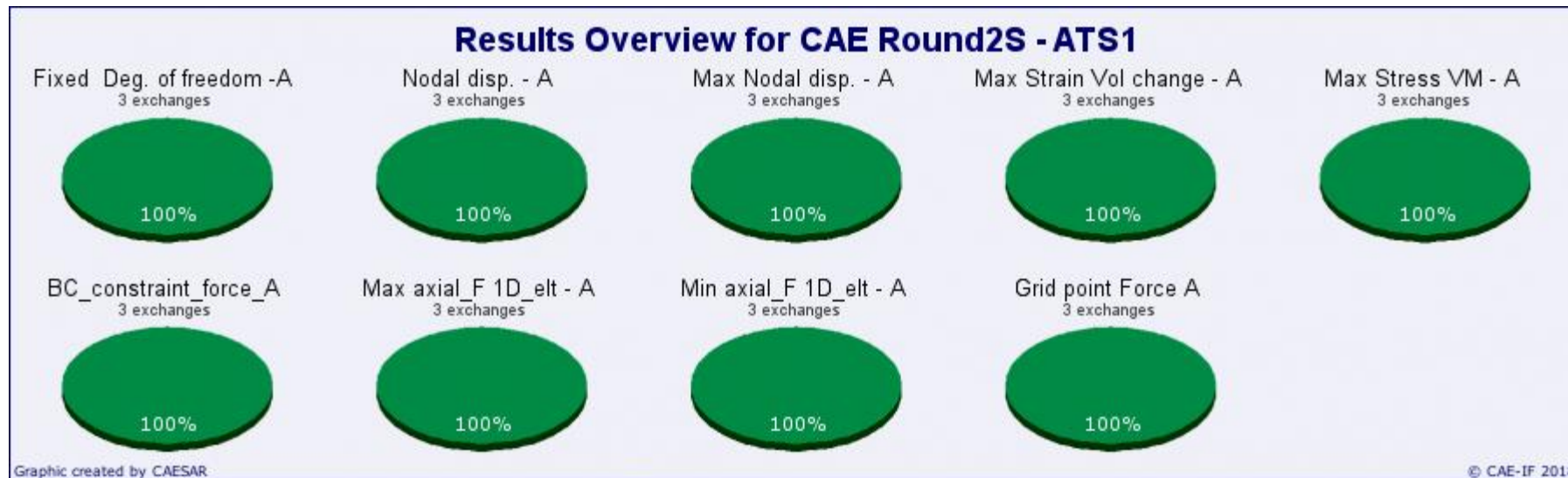
R2S new statistics (reminder)

- Nodal values /elt values :
 - Displacement, Rotation
 - Strain, stress
 - Grid point loads
 - not relevant candidates for VP as they are not “global statistics”, (but relevant for debug).
- BC loads summation :
 - no physical meaning for moments(summation \neq resultant),
 - but “global statistics”
- Min/max values are “global statistics”

Output Category	Statistics name
Displ. /rotations	Nodal vectors + max/min values
Strain tensor field	Element center value + Max/min strain volume change
Stress tensor field	Element center value + Max Von-Mises stress,
1D elements Internal forces	Max/Min axial torsion shear1 /2 bending1 /2
2D elements Internal forces	Max/Min Membrane_X /Y /XY Shear X /Y Bending X /Y /XY
Boundary Conditions constraint loads	Summation of forces/moments vectors
Grid points loads	nodal element contribution loads

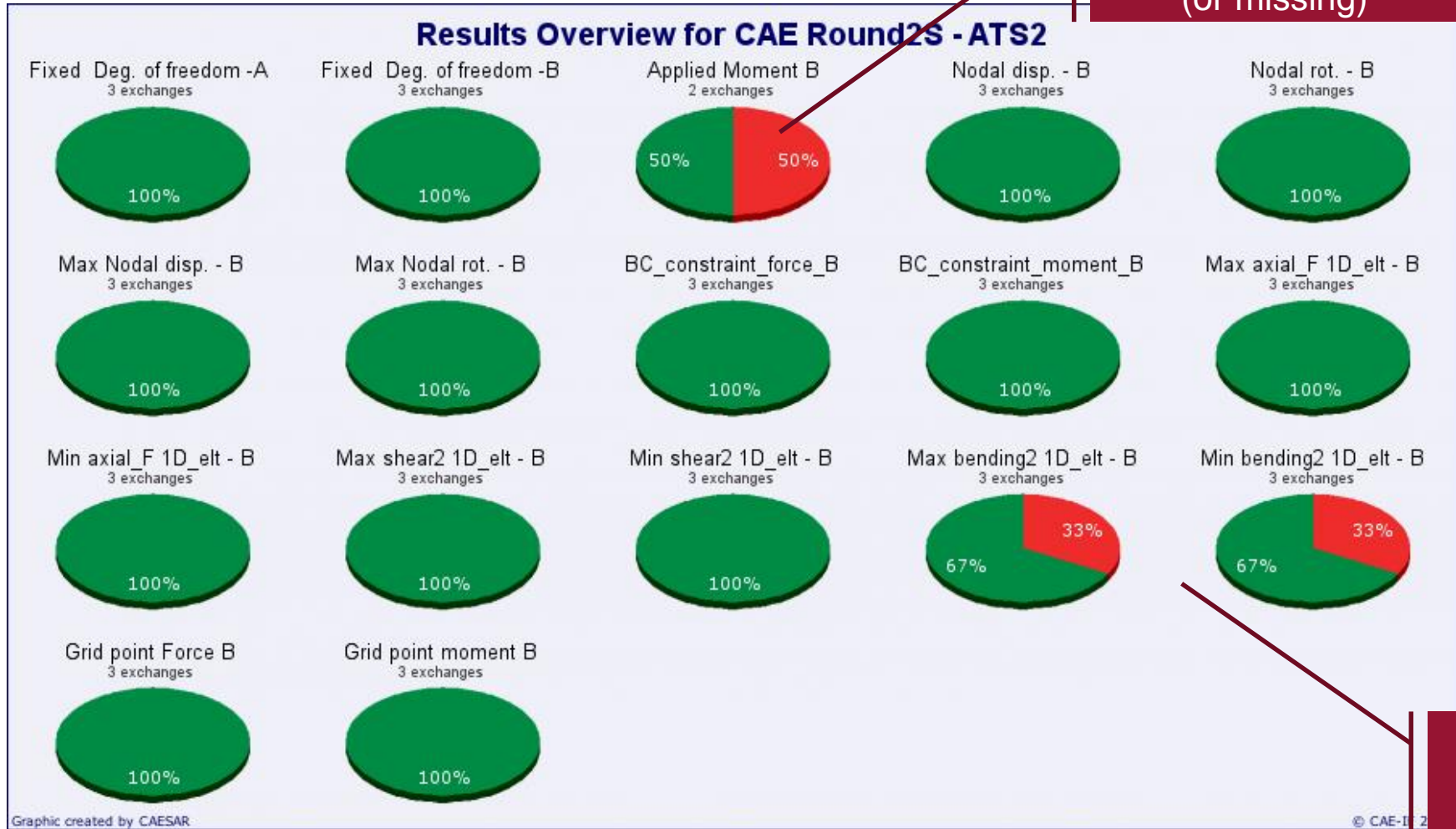
REMINDER

R2S statistics – ATS1



R2S statistics – ATS2

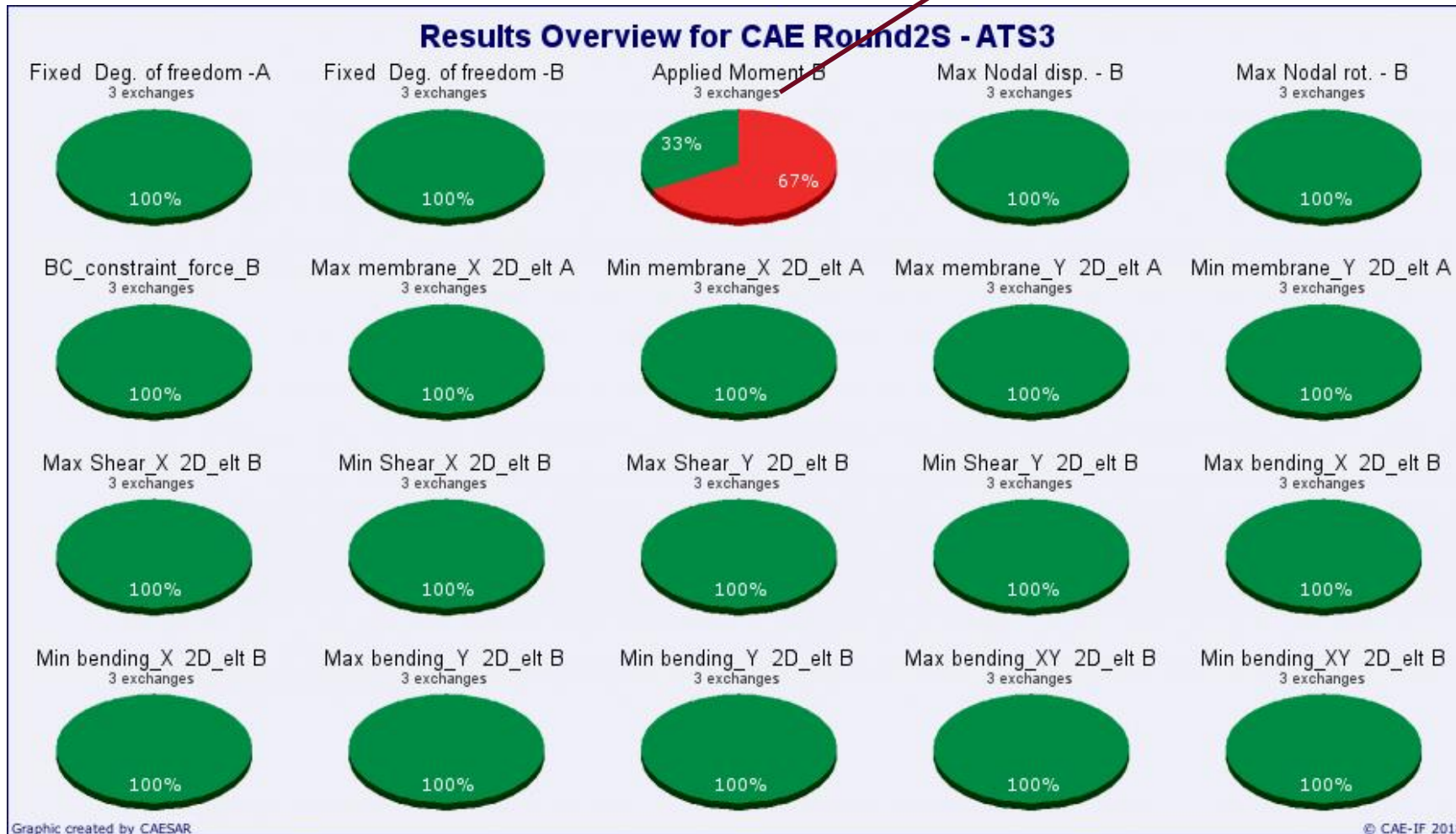
applied_moment
wrong target value
(or missing)



bending2
wrong target value

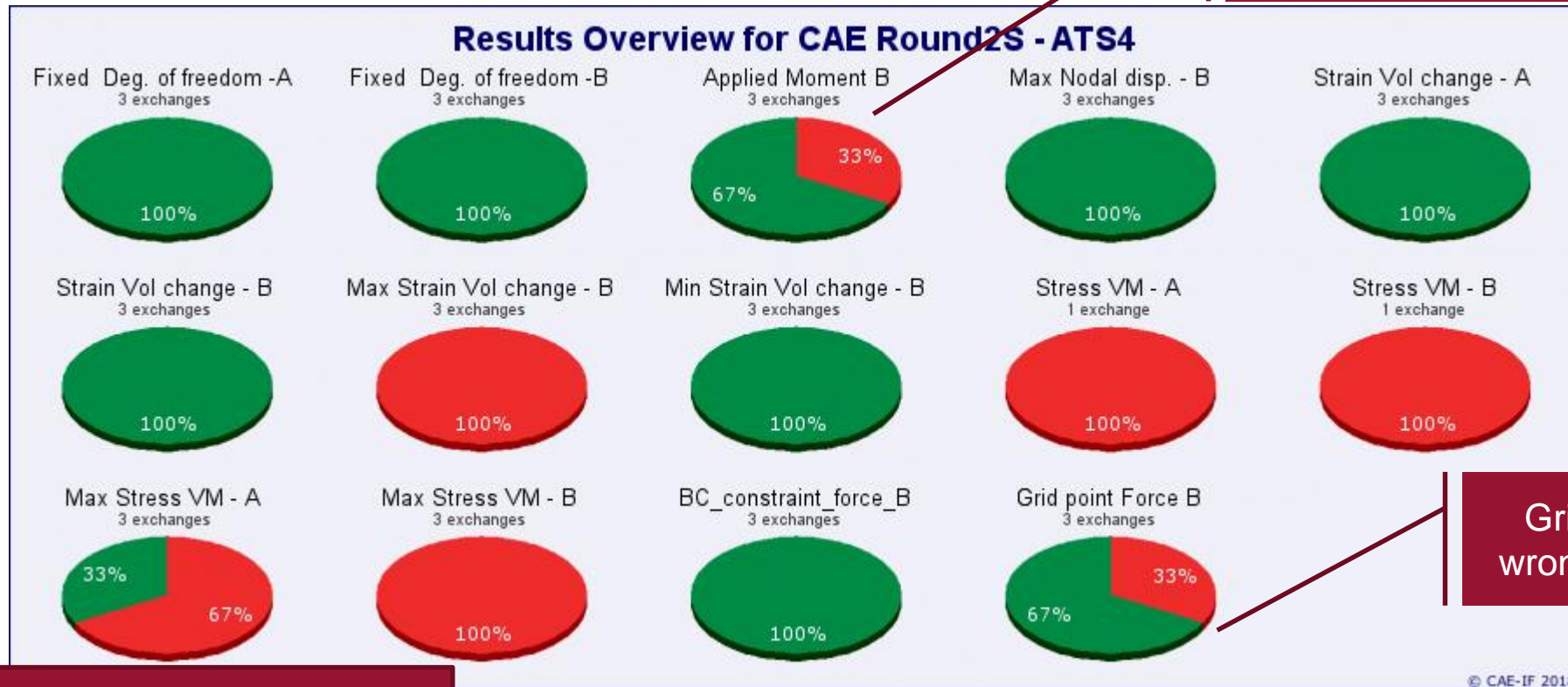
R2S statistics – ATS3

Wrong target value :
Multiple definition of
applied distributed loads



R2S statistics – ATS4

applied_moment ;
wrong target value



Grid point force
wrong target value

Stress/Strain:
wrong or missing target values,
still work to do...

CAE-IF R2S : Summary

- Conclusion
 - Huge improvement compared to June meeting
 - All ATsX files have been processed
 - All native statistics OK
 - No issue with primary results (displacements)
 - Still some remaining issues to fix regarding the translation of input data
 - More work to do regarding the translation of output data (derivative results) ...
- Next step
 - To fix the issue regarding applied loads and related resultant moment and force
 - To re-organize another test round focused on FEA output data



APPENDIX

R1S Modified statistics (reminder)

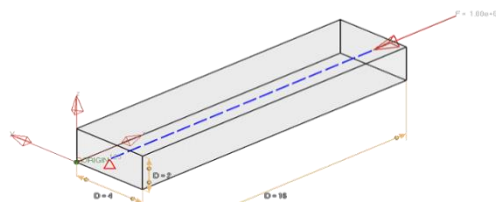
Input Category	Statistics name	Comments
Boundary conditions & Applied Loads	Number of fixed DOF	Count nb of DOF explicitly set to zero in the STEP file
	Resultant moment of applied forces at a reference point + resultant of applied moments.	Reference point to be specified in order to keep the resultant value in a reasonable range

ATS1 statistics

column name	description
fixed_dof_nb_a	Total number of fixed Degrees of freedom (DOF) - case A
nodal_disp_ax	Components of nodal displacement - case 'A'
nodal_disp_ay	
nodal_disp_az	
max_nodal_disp_a	Vector length of Max Nodal displacement - case 'A'
max_strain_vol_a	Maximum Volume change (strain at center point) - Case A
max_stress_vm_a	Maximum Von Mises stress value (center point) - Case A
bc_force_ax	Summation of boundary condition constraint forces - case 'A'
bc_force_ay	
bc_force_az	
max_axial_f_1d_elt_a	Maximum axial internal force - 1D elt (center point) -case 'A'
min_axial_f_1d_elt_a	Minimum axial internal force - 1D elt (center point) -case 'A'
grid_point_force_ax	Grid point force -- case 'A'
grid_point_force_ay	
grid_point_force_az	

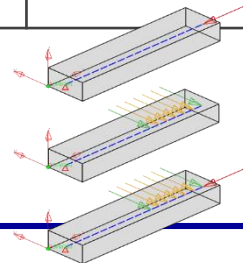
Case A/B
Additional
identifiers

Statistic	Case 'A'
Fixed DOF nb	Loadcase #1
Nodal displ.	Loadcase #1 Node #9
Max nodal displ.	Loadcase #1
Max strain	Loadcase #1
Max stress	Loadcase #1
BC force	Loadcase #1
Max/Min axial 1D_elt	Loadcase #1
Grid point force	Loadcase #1 Node #2 Element #2 contribution



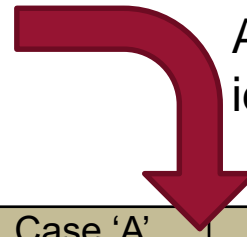
Axial stress: $1000 / 8 = 125 \text{ psi}$
 Axial strain: $125 / 10e+6 = 1.25e-5 \text{ in/in}$
 Axial defl: $1.25e-5 \times 16 = 0.0002 \text{ in}$

column name	description
fixed_dof_nb_a	Total number of fixed Degrees of freedom (DOF) - case A
fixed_dof_nb_b	Total number of fixed Degrees of freedom (DOF) - case B
applied_moment_bx	Resultant moment at origin of total applied forces + resultant of applied moments -- Load case 'B'
applied_moment_by	
applied_moment_bz	
nodal_disp_bx	Components of nodal displacement - case 'B'
nodal_disp_by	
nodal_disp_bz	
nodal_rot_bx	Components of nodal rotation - case 'B'
nodal_rot_by	
nodal_rot_bz	
max_nodal_disp_b	Vector length of Max Nodal displacement - case 'B'
max_nodal_rot_b	Vector length of Max Nodal rotation - case 'B'
bc_force_bx	Summation of boundary condition constraint forces
bc_force_by	
bc_force_bz	
bc_moment_bx	Summation of boundary condition constraint moments
bc_moment_by	
bc_moment_bz	
max_axial_f_1d_elt_b	Maximum axial internal force - 1D elt (center point)
min_axial_f_1d_elt_b	Minimum axial internal force - 1D elt (center point)
max_shear2_1d_elt_b	Maximum shear internal force /plane 2 - 1D elt (center point)
min_shear2_1d_elt_b	Minimum shear internal force /plane 2 - 1D elt (center point)
max_bending2_1d_elt_b	Maximum bending internal moment /plane 2 - 1D elt (center point)
min_bending2_1d_elt_b	Minimum bending internal moment /plane 2 - 1D elt (center point)
grid_point_force_bx	Grid point forces-- case 'B'
grid_point_force_by	
grid_point_force_bz	
grid_point_moment_bx	Grid point moment -- case 'B'
grid_point_moment_by	
grid_point_moment_bz	



ATS2 statistics

Case A/B
Additional
identifiers



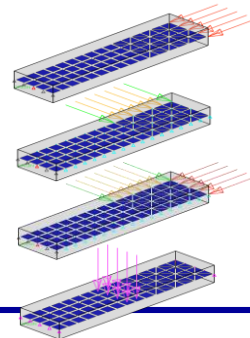
Statistic	Case 'A'	Case 'B'
Fixed DOF nb	Loadcase #1	Loadcase #3
Applied moment	--	Loadcase #3 Moment at point (16,-2,1)
Nodal displ.	--	Loadcase #3
Nodal rotation	--	Node #17
Max nodal displ.	--	Loadcase #3
Max nodal rotation	--	Loadcase #3
BC force	--	Loadcase #3
BC moment	--	Loadcase #3
Max/Min axial torsion shear1 /2 bending1 /2	--	Loadcase #3
Grid point force Grid point moment	--	Loadcase #3 Node #2 Element #2 contribution

ATS3 statistics

column name	description
fixed_dof_nb_a	Total number of fixed Degrees of freedom (DOF) - case A
fixed_dof_nb_b	Total number of fixed Degrees of freedom (DOF) - case B
applied_moment_bx	Resultant moment at origin of total applied forces + resultant of applied moments -- Load case 'B'
applied_moment_by	
applied_moment_bz	
max_nodal_disp_b	Vector length of Max Nodal displacement - case 'B'
max_nodal_rot_b	Vector length of Max Nodal rotation - case 'B'
bc_force_bx	Summation of boundary condition constraint forces - case 'B'
bc_force_by	
bc_force_bz	
max_membr_x_2d_elt_a	Maximum membrane X_face internal force - 2D elt (center point) -case 'A'
min_membr_x_2d_elt_a	Minimum membrane X_face internal force - 2D elt (center point) -case 'A'
max_membr_y_2d_elt_a	Maximum membrane Y_face internal force - 2D elt (center point) -case 'A'
min_membr_y_2d_elt_a	Minimum membrane Y_face internal force - 2D elt (center point) -case 'A'
max_shear_x_2d_elt_b	Maximum shear X_face internal force - 2D elt (center point) - case 'B'
min_shear_x_2d_elt_b	Minimum shear X_face internal force - 2D elt (center point) - case 'B'
max_shear_y_2d_elt_b	Maximum shear Y_face internal force - 2D elt (center point) - case 'B'
min_shear_y_2d_elt_b	Minimum shear Y_face internal force - 2D elt (center point) - case 'B'
max_bending_x_2d_elt_b	Maximum bending X_face internal moment - 2D elt (center point) - case 'B'
min_bending_x_2d_elt_b	Minimum bending X_face internal moment - 2D elt (center point) - case 'B'
max_bending_y_2d_elt_b	Maximum bending Y_face internal moment - 2D elt (center point) - case 'B'
min_bending_y_2d_elt_b	Minimum bending Y_face internal moment - 2D elt (center point) - case 'B'
max_bending_xy_2d_elt_b	Maximum bending XY internal moment - 2D elt (center point) - case 'B'
min_bending_xy_2d_elt_b	Minimum bending XY internal moment - 2D elt (center point) - case 'B'

Case A/B
Additional
identifiers

Statistic	Case 'A'	Case 'B'
Fixed DOF nb	Loadcase #3	Loadcase #4
Applied moment	--	Loadcase #4 Moment at point (16,-2,1)
Max nodal displ.	--	Loadcase #4
Max nodal rotation	--	Loadcase #4
BC force	--	Loadcase #4
Max/Min Membrane_X /Y /XY Shear X /Y Bending X /Y /XY	Loadcase #3	Loadcase #4

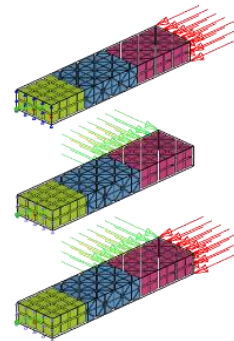


ATS4 statistics

column name	description
fixed_dof_nb_a	Total number of fixed Degrees of freedom (DOF) - case A
fixed_dof_nb_b	Total number of fixed Degrees of freedom (DOF) - case B
applied_moment_bx	Resultant moment at origin of total applied forces + resultant of applied moments -- Load case 'B'
applied_moment_by	
applied_moment_bz	
max_nodal_disp_b	Vector length of Max Nodal displacement - case 'B'
strain_vol_a	Volume change (strain at center point) - Case A
strain_vol_b	Volume change (strain at center point) - Case B
max_strain_vol_b	Maximum Volume change (strain at center point) - Case B
min_strain_vol_b	Minimum Volume change (strain at center point) - Case B
stress_vm_a	Von Mises stress value (center point) - Case A
stress_vm_b	Von Mises stress value (center point) - Case B
max_stress_vm_a	Maximum Von Mises stress value (center point) - Case A
max_stress_vm_b	Maximum Von Mises stress value (center point) - Case B

Case A/B
Additional
identifiers

		Statistic	Case 'A'	Case 'B'
bc_force_bx	Summation of boundary conditions	Fixed DOF nb	Loadcase #1	Loadcase #3
bc_force_by		Applied moment	--	Loadcase #3
bc_force_bz				Moment at point (16,-2,1)
grid_point_force_bx	Grid point forces-- case 'B'	Max nodal displ.	--	Loadcase #3
grid_point_force_by		Strain (Vol change)	Loadcase #1 Element #30	Loadcase #3 Element #30
grid_point_force_bz		Stress (Von-Mises)	Loadcase #1 Element #30	Loadcase #3 Element #30
		Max/min strain	Loadcase #1	Loadcase #3
		Max stress	Loadcase #1	Loadcase #3
		BC force	--	Loadcase #3
		Grid point force	--	Loadcase #3 Node #2 Element #2 contribution



R2S with figures

Total addressed in R2S

Test round	Test case	nb of statistics
R2S	ATS1	9
	ATS2	17
	ATS3	20
	ATS4	14
Total		60

Total in CAESAR (incl'g case A/B)

category	set name	sheet name	nb of statistics
INPUT Data	input	CAE stats - input	18
OUTPUT data	displ	CAE stats - displ	8
	strains	CAE stats - strains	6
	stresses	CAE stats - stresses	4
	1D_Elt forces	CAE stats - 1D_Elt forces	24
	2D_Elt forces	CAE stats - 2D_Elt forces	32
	BC forces	CAE stats - BC forces	4
	GP forces	CAE stats - GP forces	4
Total			100