Shashank Sharma
Phone no- +91-8085154358
E-Mail- sshell2u@gmail.com, shashank09111@iiitdmj.in

Altair

ASHOK LEYLAND

Student Details

Name	
Department / Year of Study	Mechanical, Final Year
College Address	PDPM Indian Institute of Information Technology Design and Manufacturing, Dumna road, Jabalpur, M.P.
Email	sshell2u@gmail.com, shashank09111@iiitdmj.ac.in
Phone	+91 8085154358
HOD name + contact details	Dr. Sunil Agrawal Email- sa@iiitdmj.ac.in Phone- +91 761 2633955
Reference Professor	Dr. Prashant Kumar Jain (preferred) Email- pkjain@iiitdmj.ac.in Phone- +91 761 2632664

Student Comments

Problems Attempted	
Part A	Problem No 1 : Pressure Tank Problem No 2 - Control Arm
Part B	Problem No 1 - Clutch Pedal Problem No 3 - Aircraft Wing Rib
Part C	Not Attempted
Comments	The reason for my participation was to gather valuable experience in the field of Optimization. This contest really helped he to enhance my skills. I had a very pleasant and enjoyable experience. The training program was very helpful.

Altair

Innovation Intelligence®

Part A : Problem 1- Pressure Tank

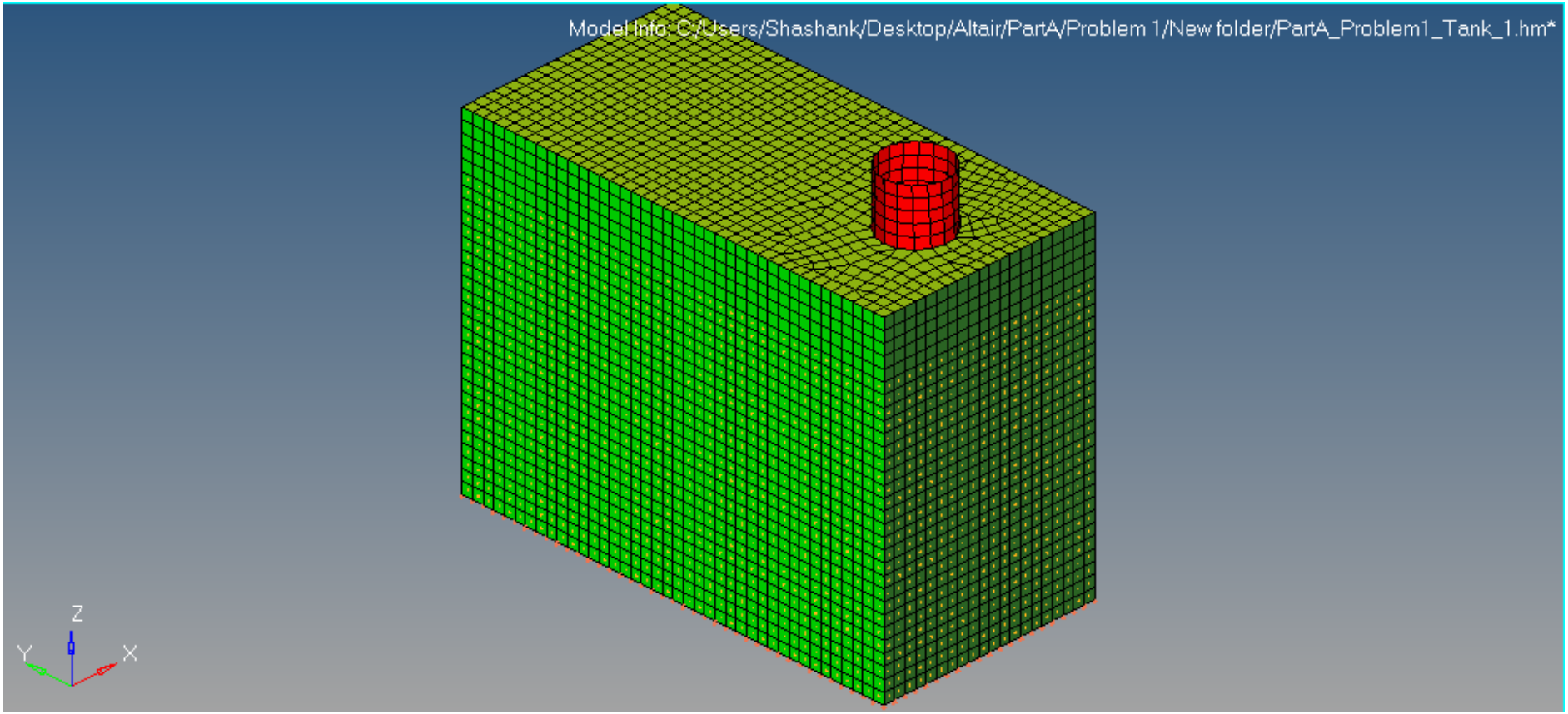
Problem Overview and Assumptions

Altair

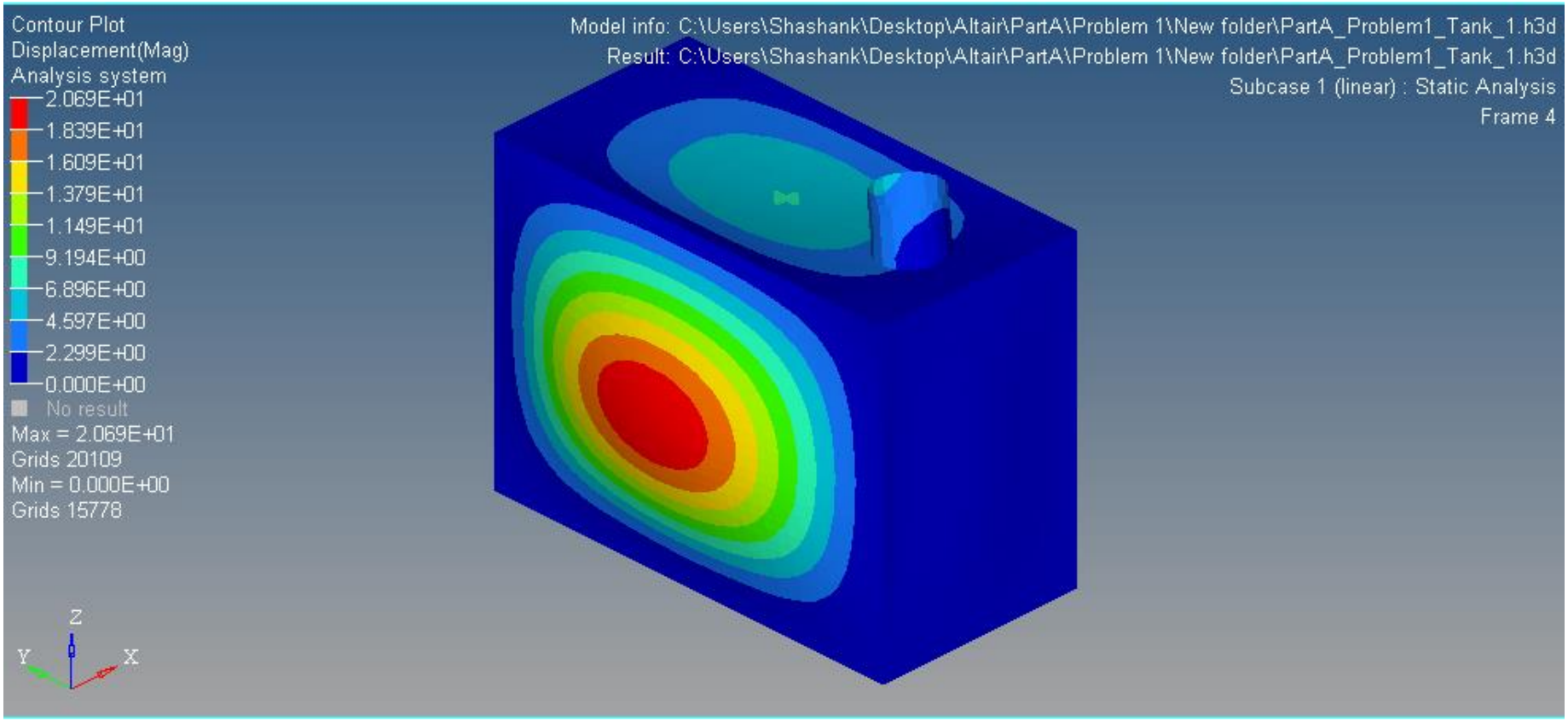
- The problem was optimization of a pressure tank model for internal pressure conditions so as to minimize the maximum displacement on the walls of the tank.
- The model has been meshed with an element size of ‘5’ with mixed element type (both tria and quad).
- A material has been defined whose ‘E’ and ‘nu’ has been specified according to problem statement.
- Properties for both ‘Design’ and ‘Non-Design’ region has been specified with thickness ‘2’.
- A Topographic design variable is specified in Design region. A 2-plane symmetry is specified. Optimum bead params are set.
- A static displacement response is set.
- An objective of minimizing the response is established.

Model and Result Pictures

- Model setup-

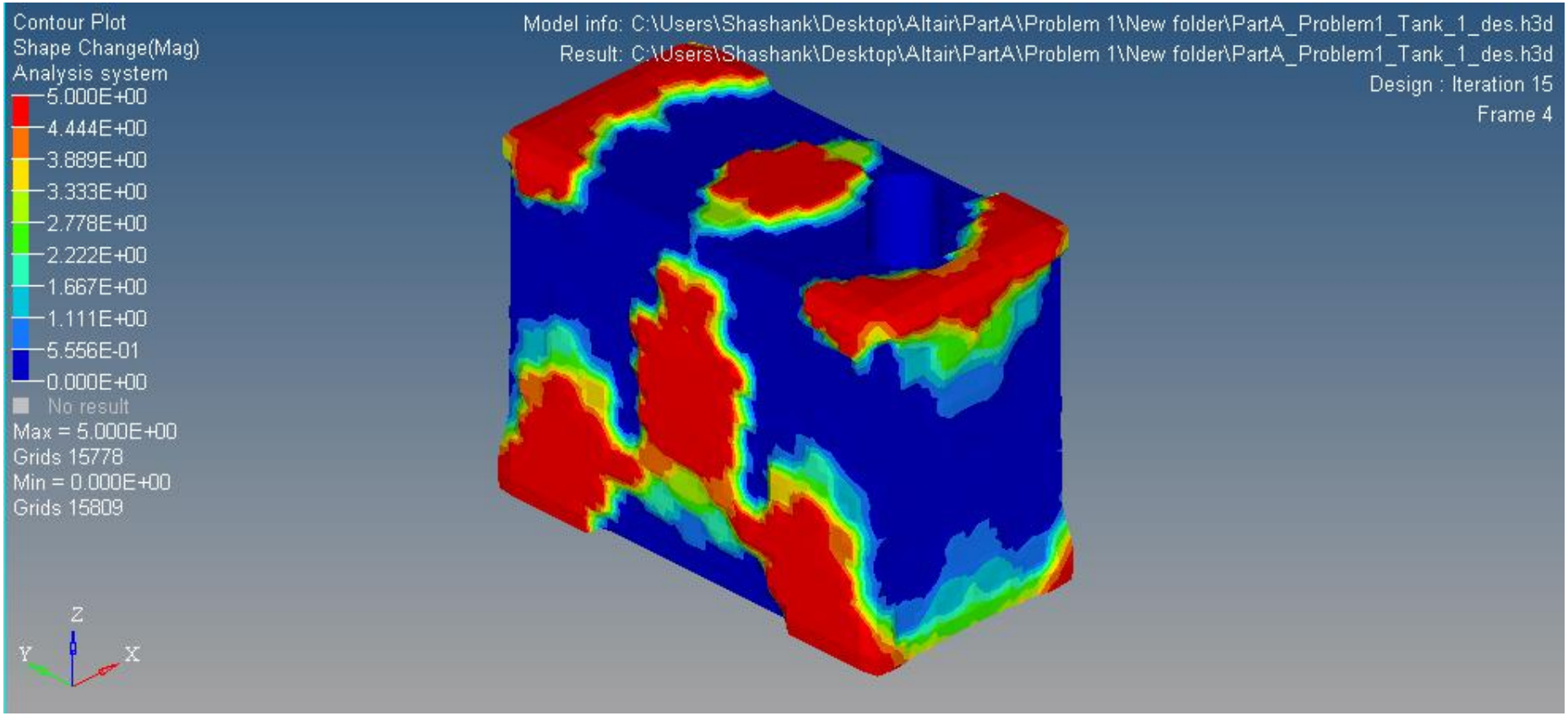


- *Baseline Analysis (MaxDisp=20.687)*



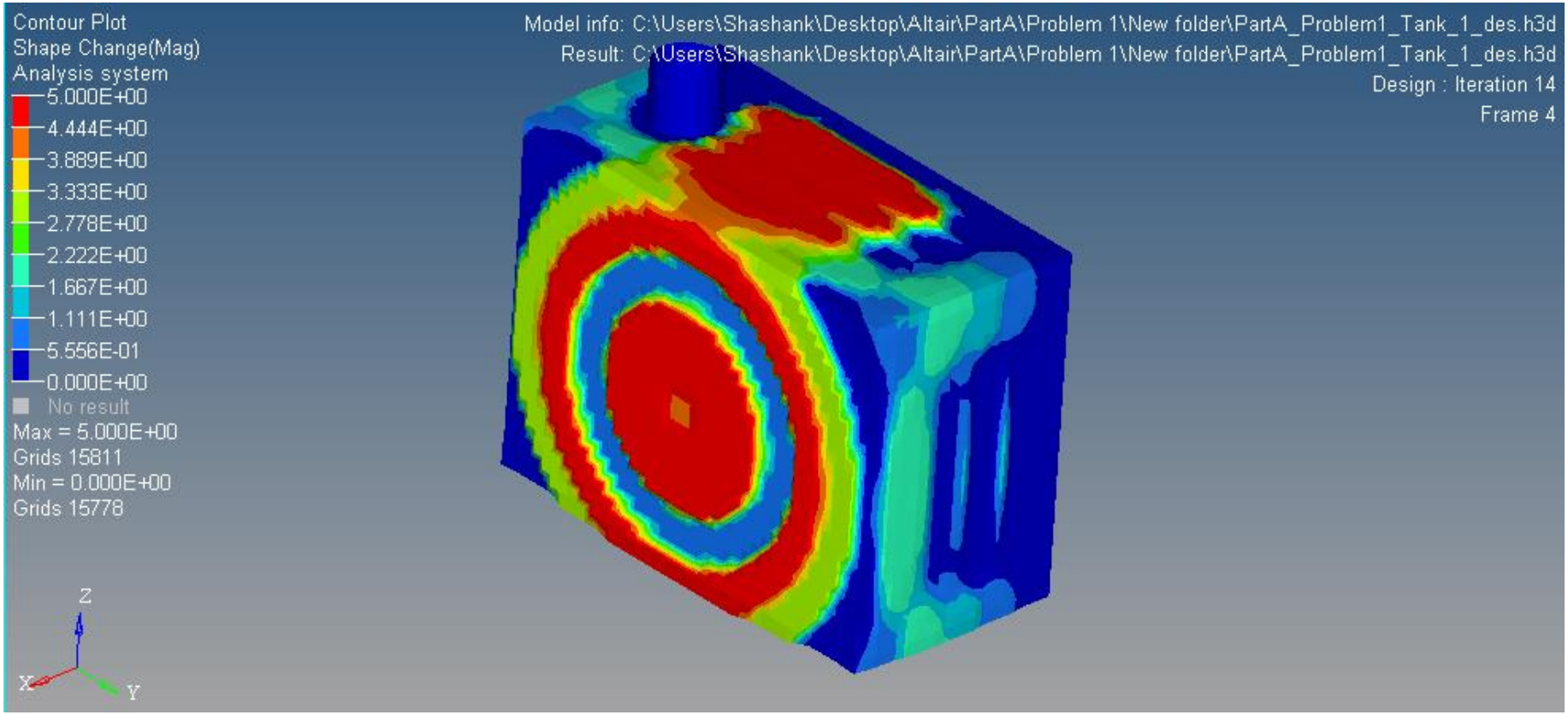
Altair

- *Optimization (MaxDisp=3.487)*



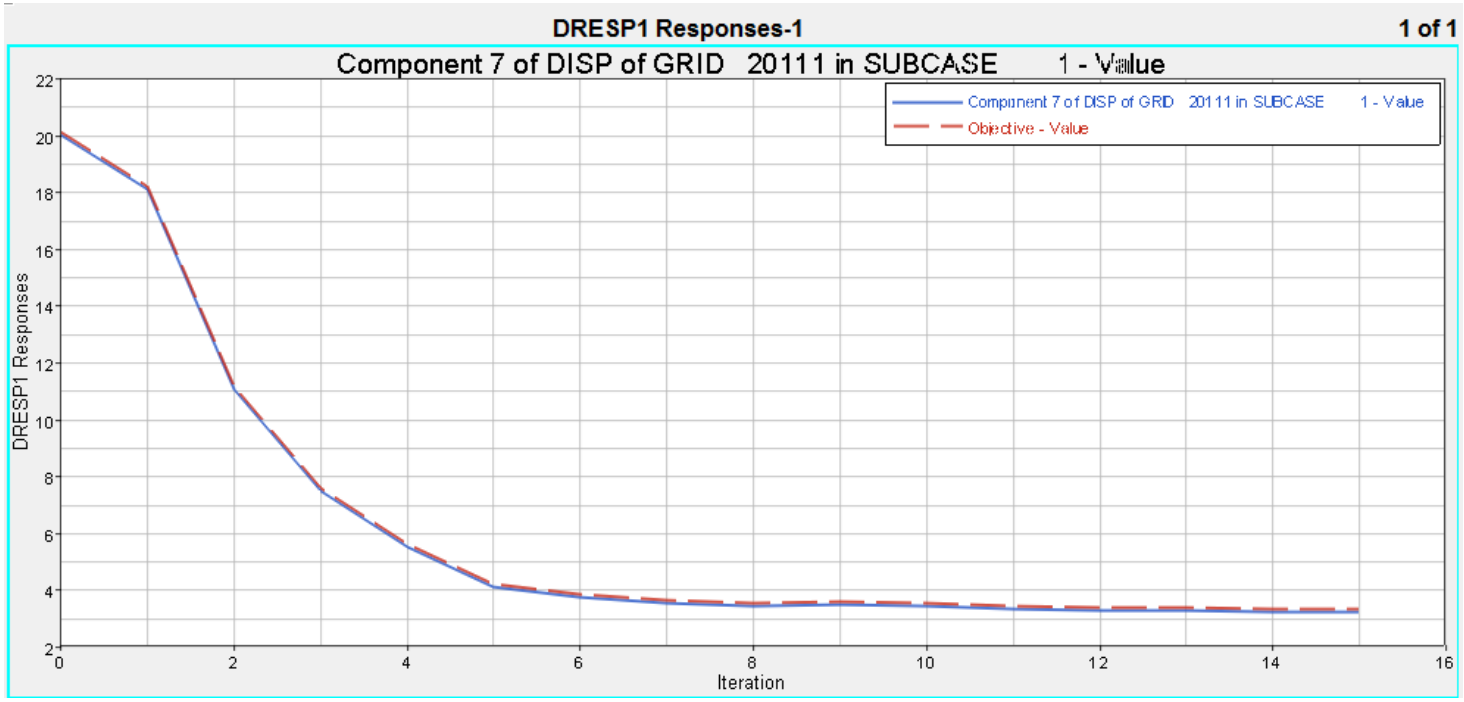
Altair

- *Optimization (MaxDisp=7.467)*



Result Observations

- *Thus it can be observed that the first optimization result is better than the second.*
- *Plot of .hgdata file for first optimization*



Summary

	No of Iterations	Solver Time Taken (Attach Out Files)	Mass Savings %	Final Stress /Displacement %
Run 1 (Topography)	15	00:00:35	NA	Max Displacement=*3.487*
Run 2 (Topography)	14	00:00:34	NA	Max Displacement=*7.467*

Altair

Innovation Intelligence®

Part A : Problem 2- Control Arm

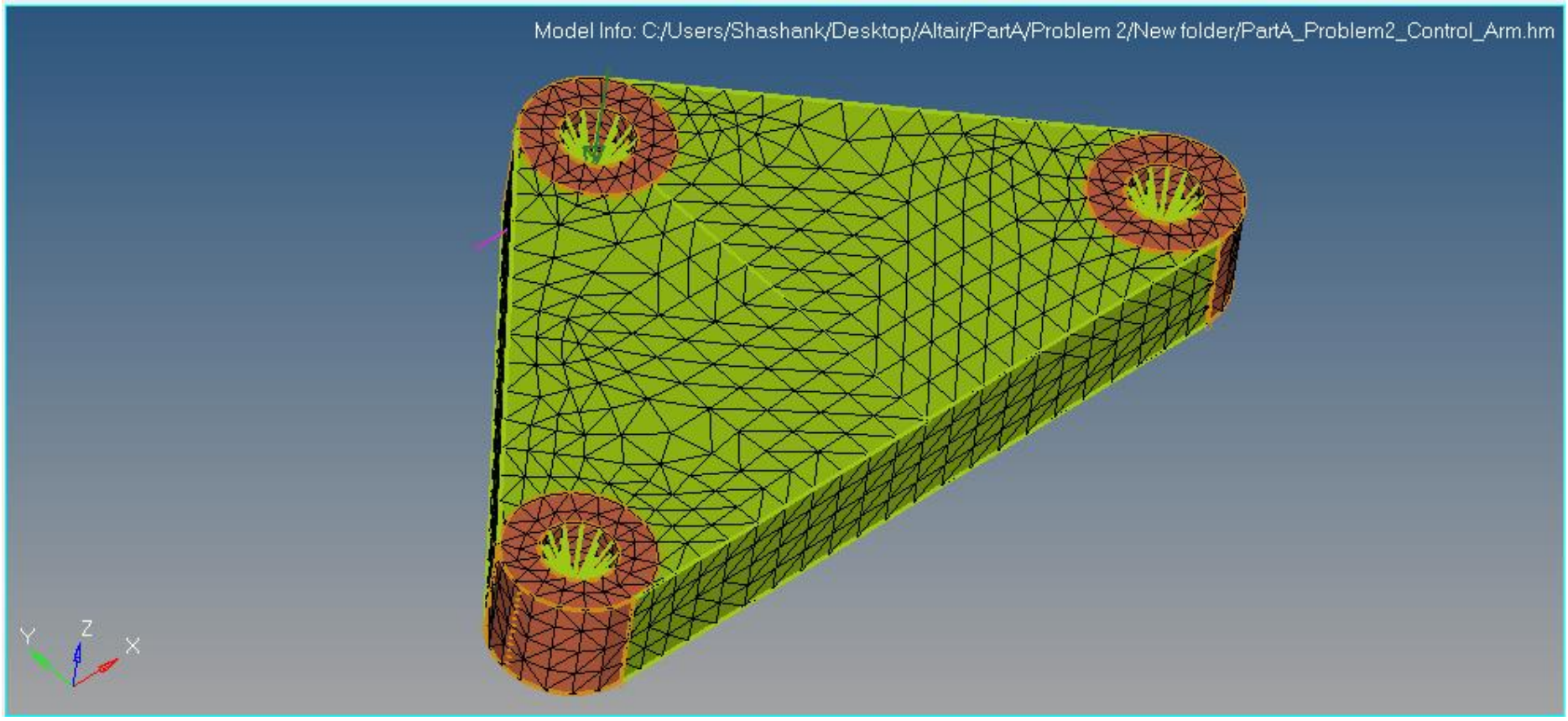
Problem Overview and Assumptions

Altair

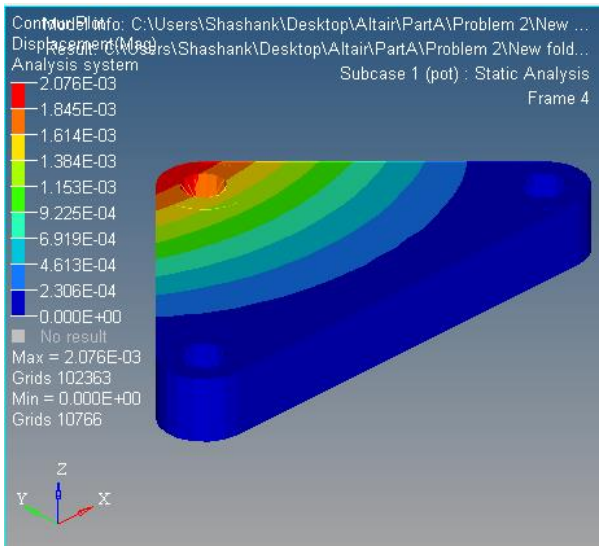
- The problem was optimization of a Automotive control arm model for given loading conditions so as to minimize the maximum displacement on the point of action of forces.
- The model geometry was cleaned and a faulty edge was corrected.
- The model was tetra meshed using Volume tetra method.
- Properties for both ‘Design’ and ‘Non-Design’ region has been specified.
- A Topology design variable is specified in Design region.
- Two response is set-
  - Mass- Response Type mass.
  - Disp- Response Type static displacement at force application node.
- A constraint of disp of upper bound=‘.005’. (Value estimated through baserun)
- An objective of minimizing the mass response is established.

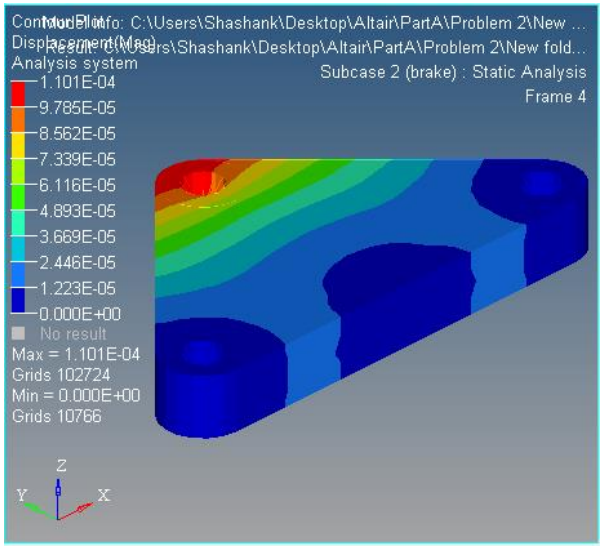
Model and Result Pictures

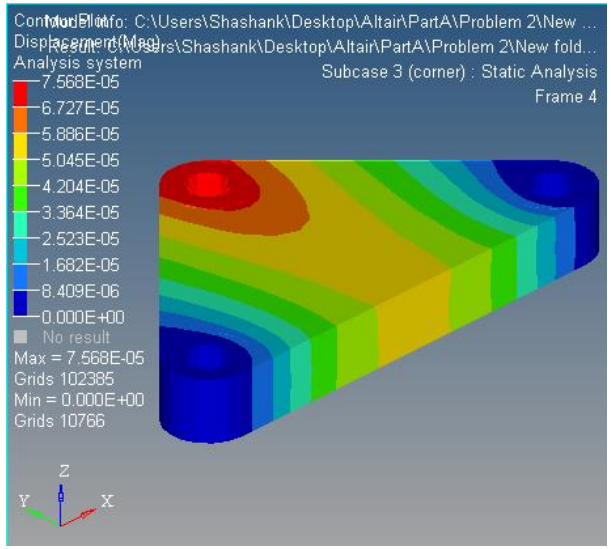
- Model setup



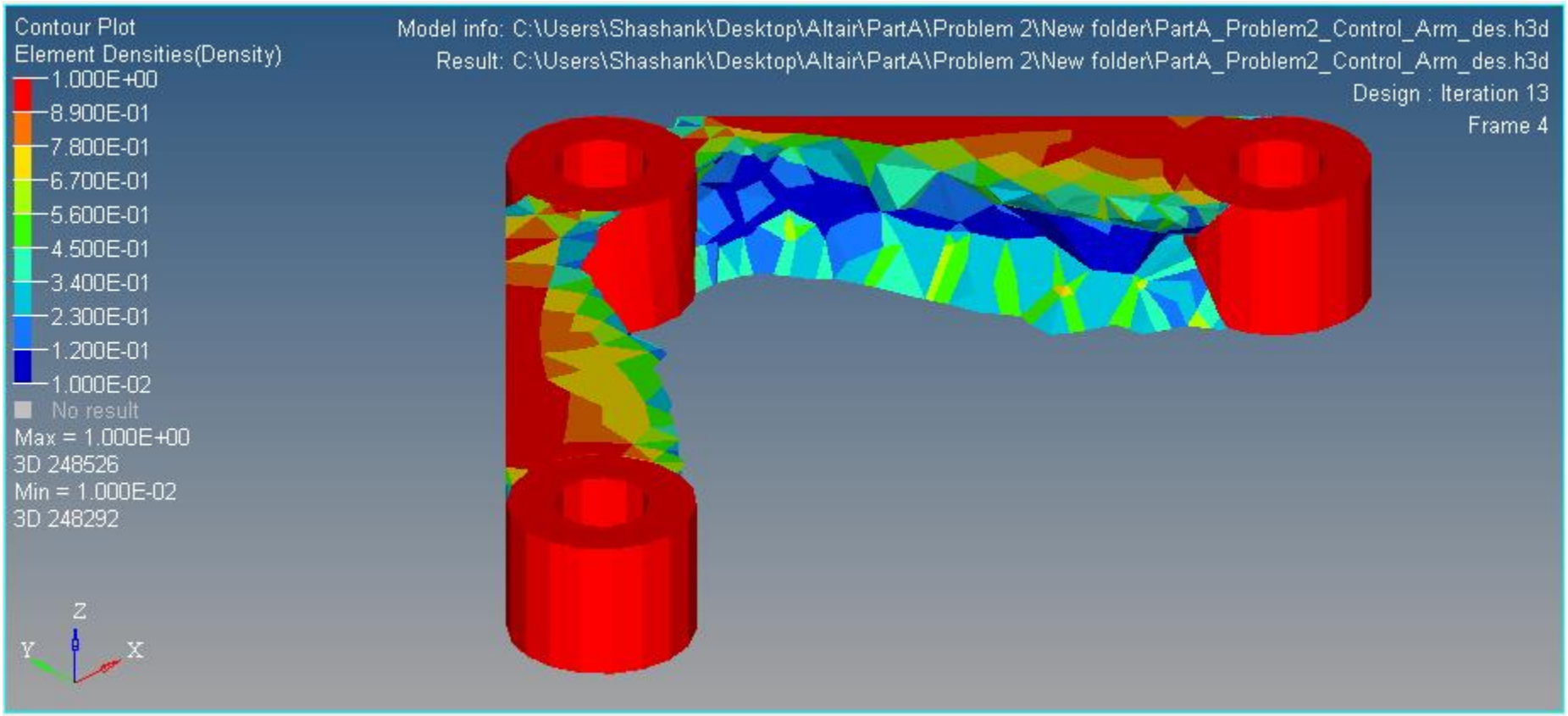
- Baseline Analysis (Load steps -Pot-hole, Brake, Corner)





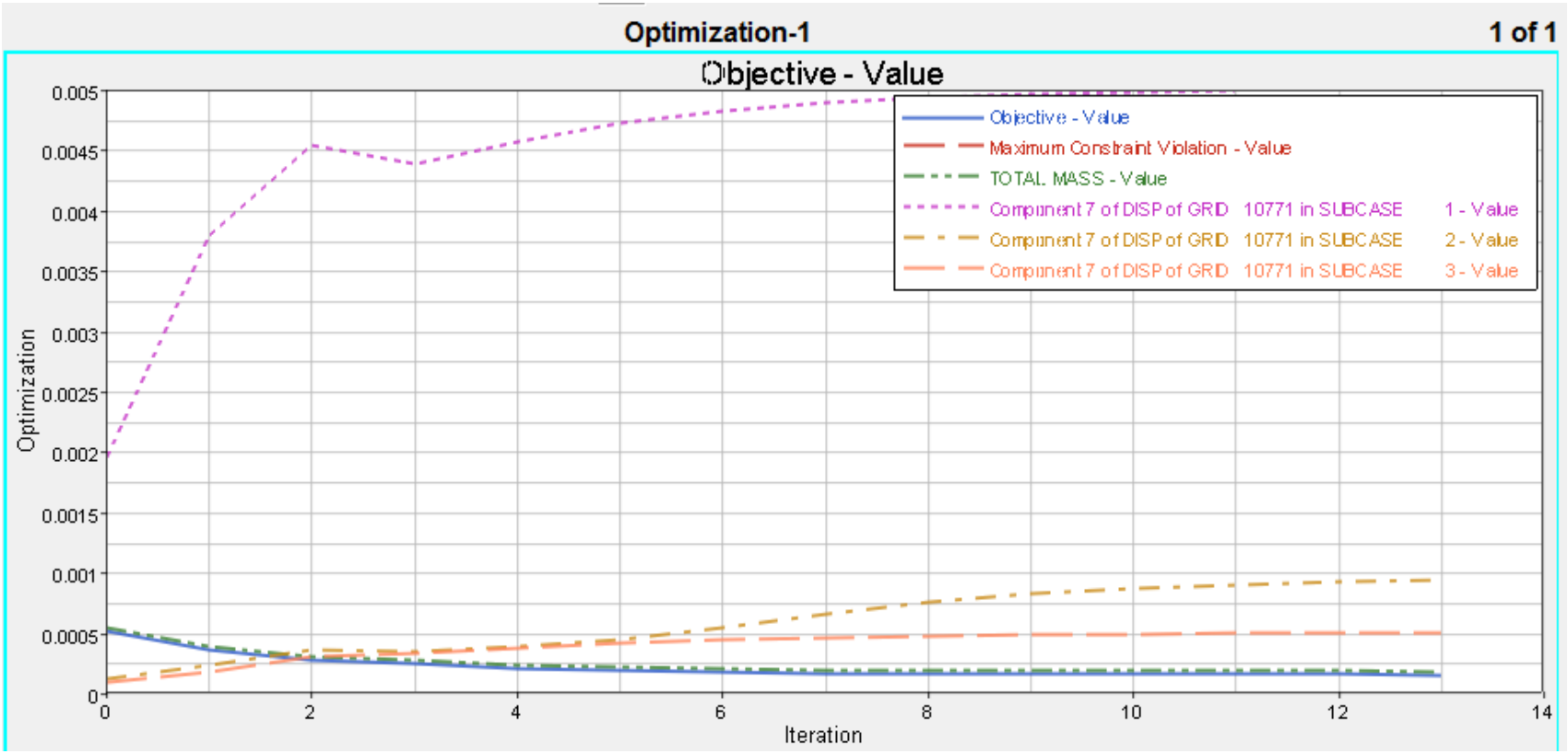


- Topology Optimization (element density>.3)



Result Observations

- It has been observed that the displacements observed due to pot-forces is the maximum. This is basically due to lack of stiffness in the z direction.
- *Plot of .hgdata fill.*



Summary

	No of Iterations	Solver Time Taken (Attach Out Files)	Mass Savings %	Final Stress /Displacement %
Run 1 (Topology)	13	00:00:10	60%	Volume fraction Constraint 0.3 % satisfied

Altair

Innovation Intelligence®

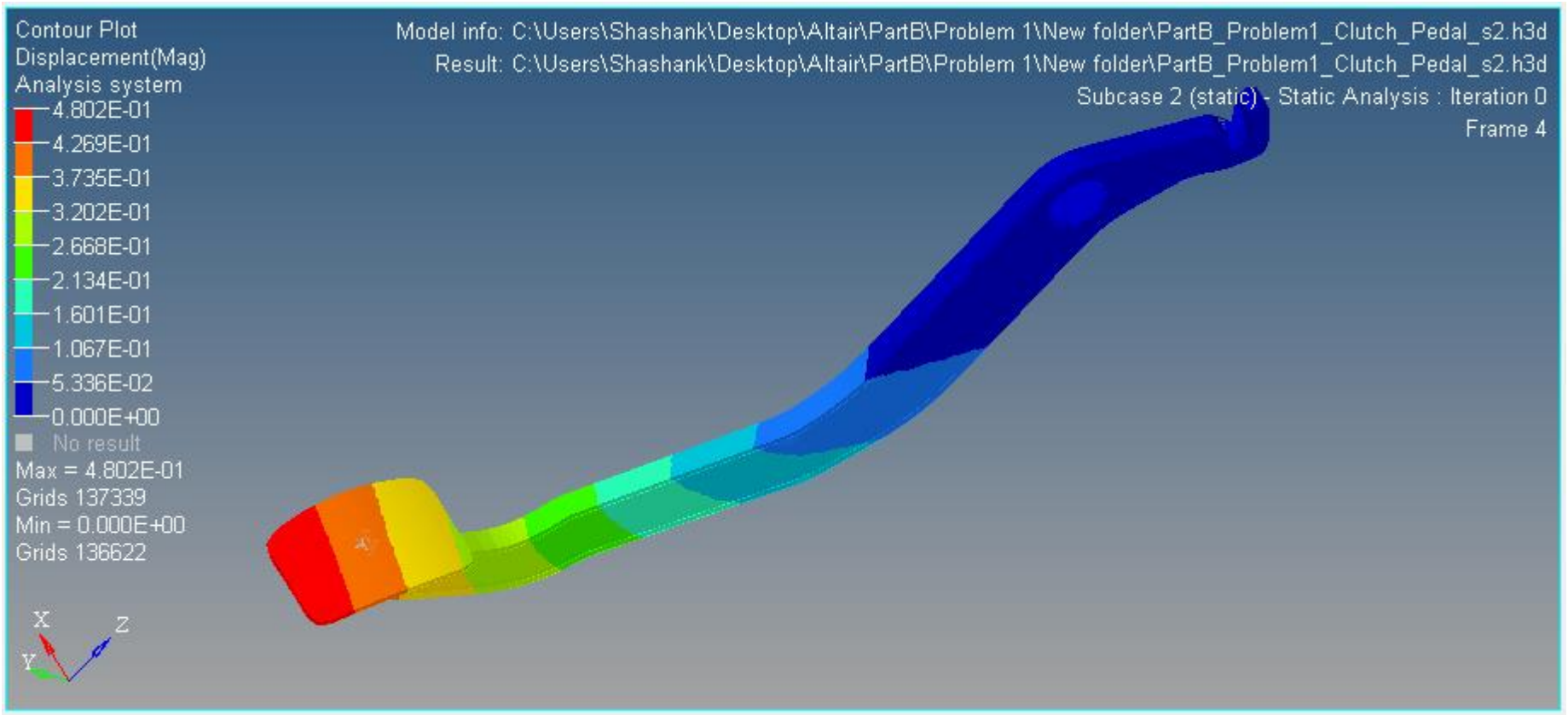
Part B : Problem No 1 - Clutch Pedal

Problem Overview and Assumptions

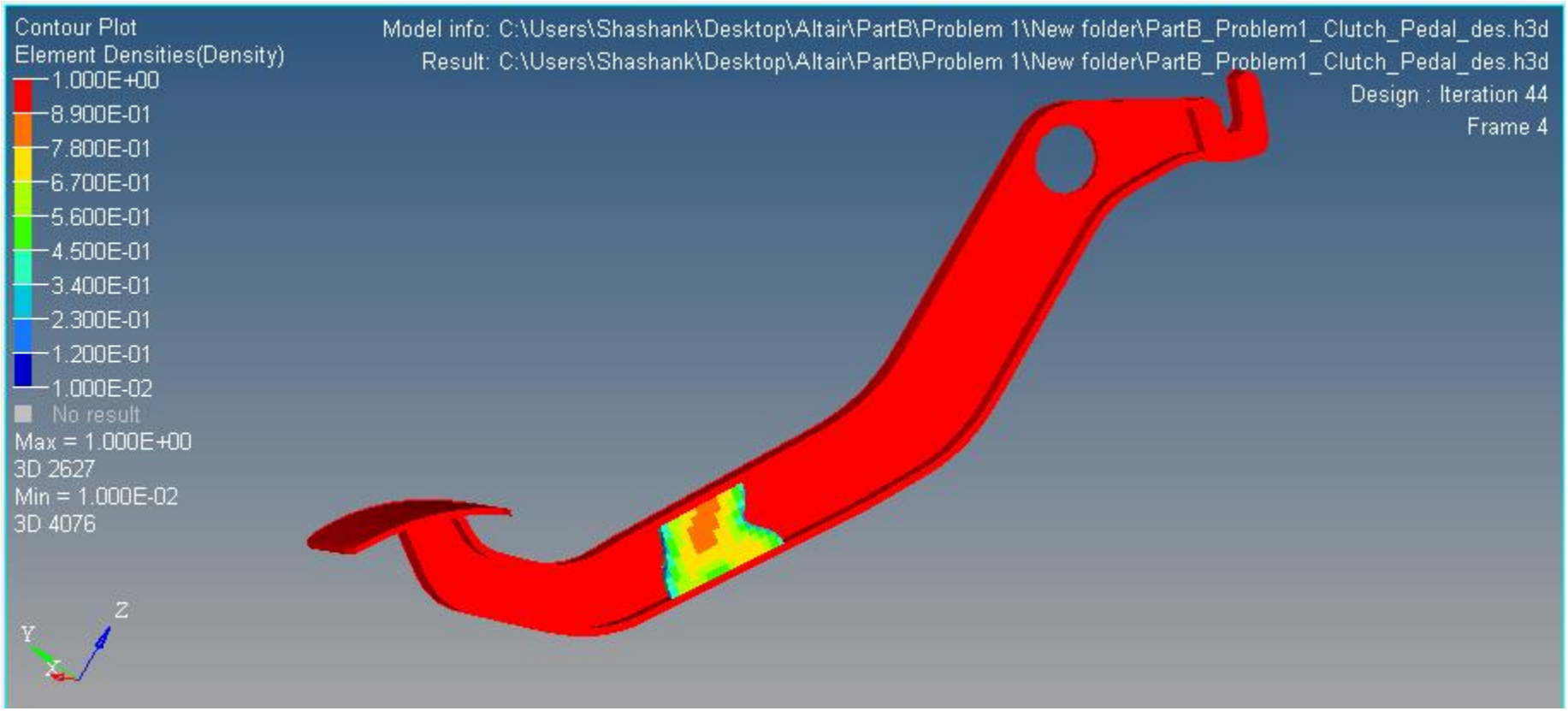
- The problem was optimization of a Clutch pedal for given loading conditions so as to minimize the weight of the part.
- A Topology design variable is specified in Design region. Also the draw type is set to single with the obstacle set to non design region.
- Two response is set-
  - Mass- Response Type mass.
  - Disp- Response Type static displacement at force application node.
- A constraint of disp of upper bound=‘.8’.
- An objective of minimizing the mass response is established.

Model and Result Pictures

- Baseline analysis

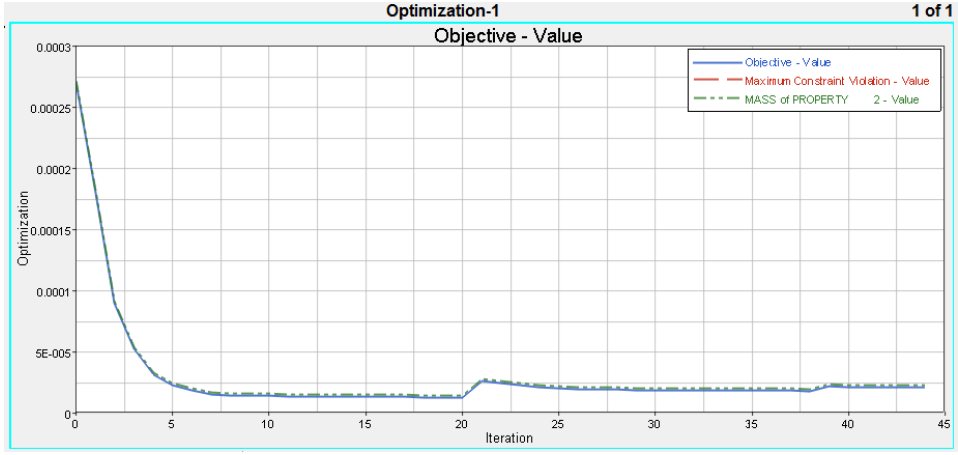


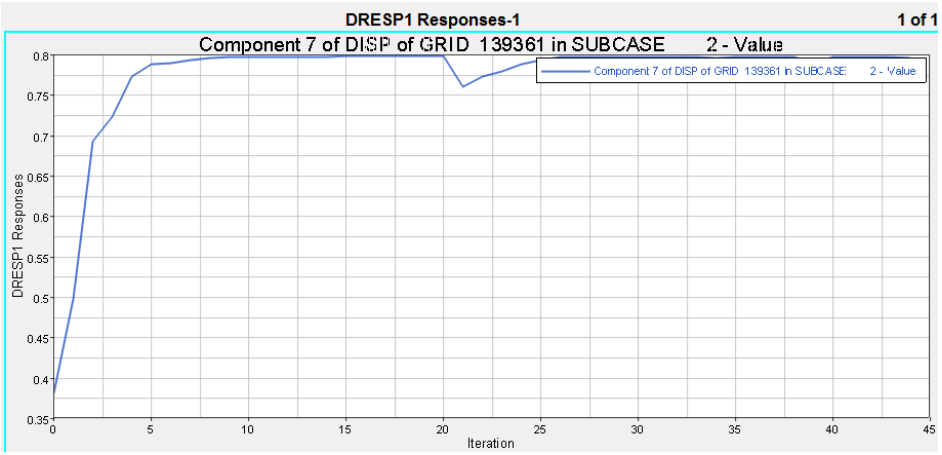
- Topology optimization



Result Observations

- It is observed that 90% of the mass is reduced in the design domain keeping in accordance with the constraints.





Summary

	No of Iterations	Solver Time Taken (Attach Out Files)	Mass Savings %	Final Stress /Displacement %
Run 1 (Topology)	44	00:01:17	90 % (of the design domain)	Max displacement of .8 satisfied

Altair

Innovation Intelligence®

Part B : Problem No 3 - Aircraft Wing Rib

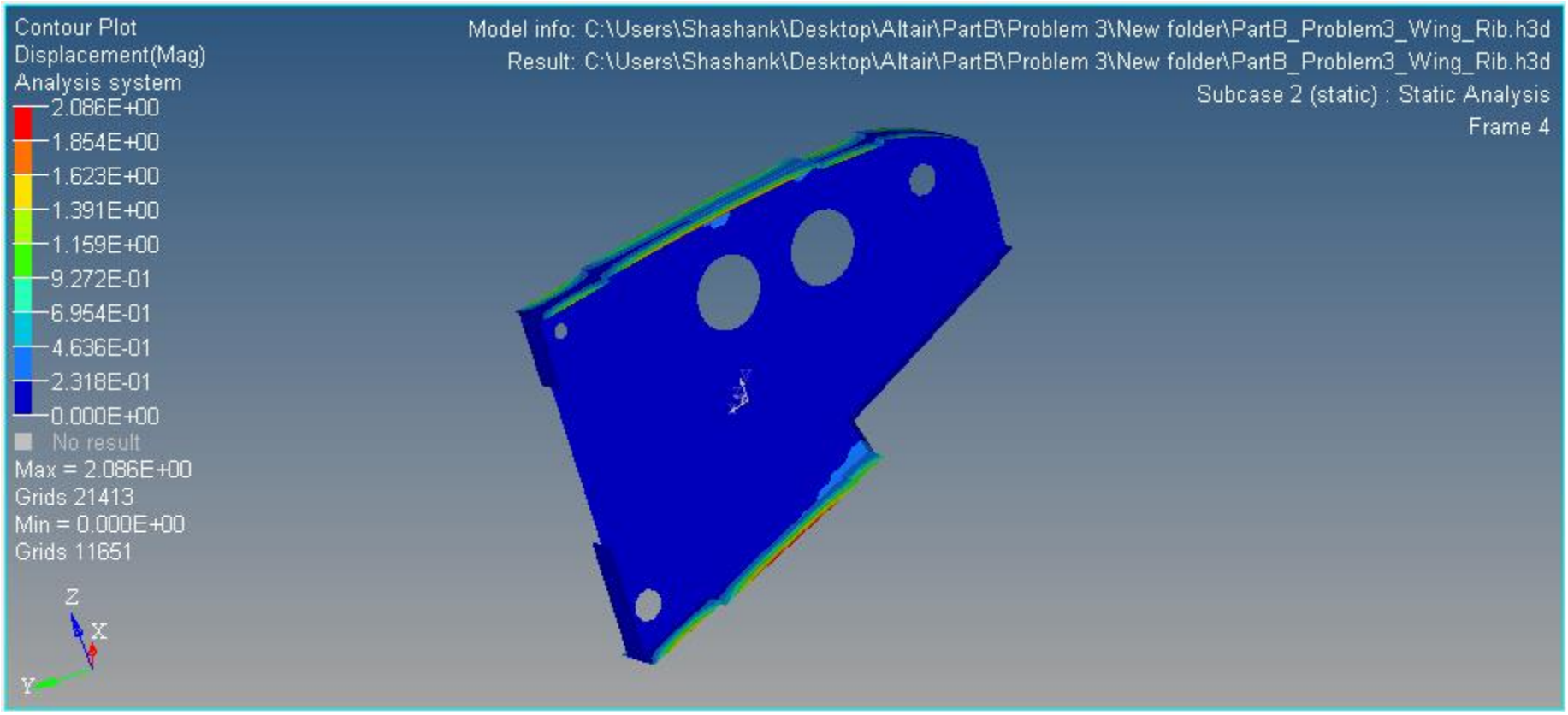
Problem Overview and Assumptions

Altair

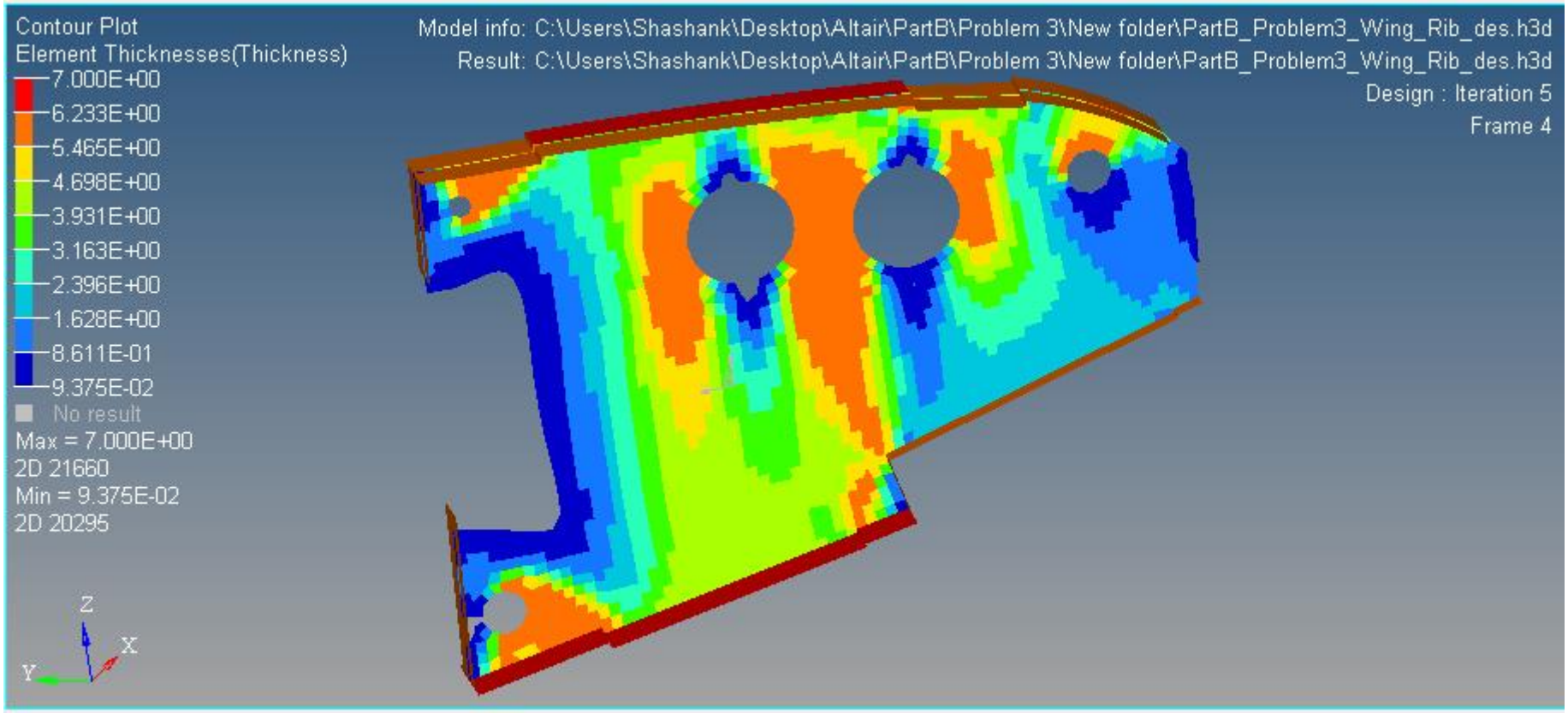
- The problem was optimization of a Aircraft Wing Rib for given loading conditions so as to minimize the weight of the part with maximum stiffness.
- A Free size design variable is specified in Design region. Also the mindim has been set to ‘4’.
- Two response is set-
  - Volf - Response Type volume fraction.
  - wcomp- Response Type weighted compliances.
- A constraint of minvf of upper bound=‘.5’.
- An objective of minimizing the wcomp response is established.

Model and Result Pictures

- Baseline analysis

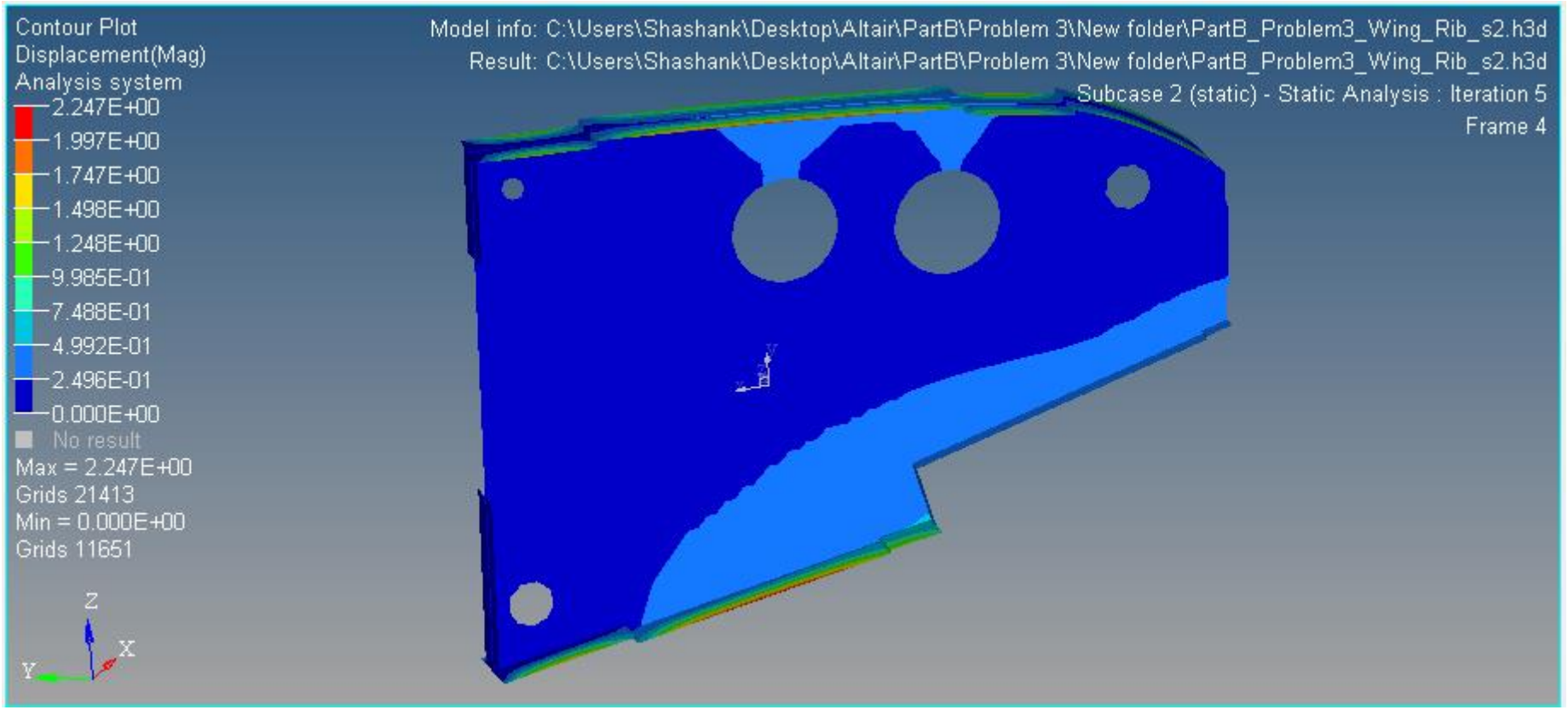


- Free Size optimization



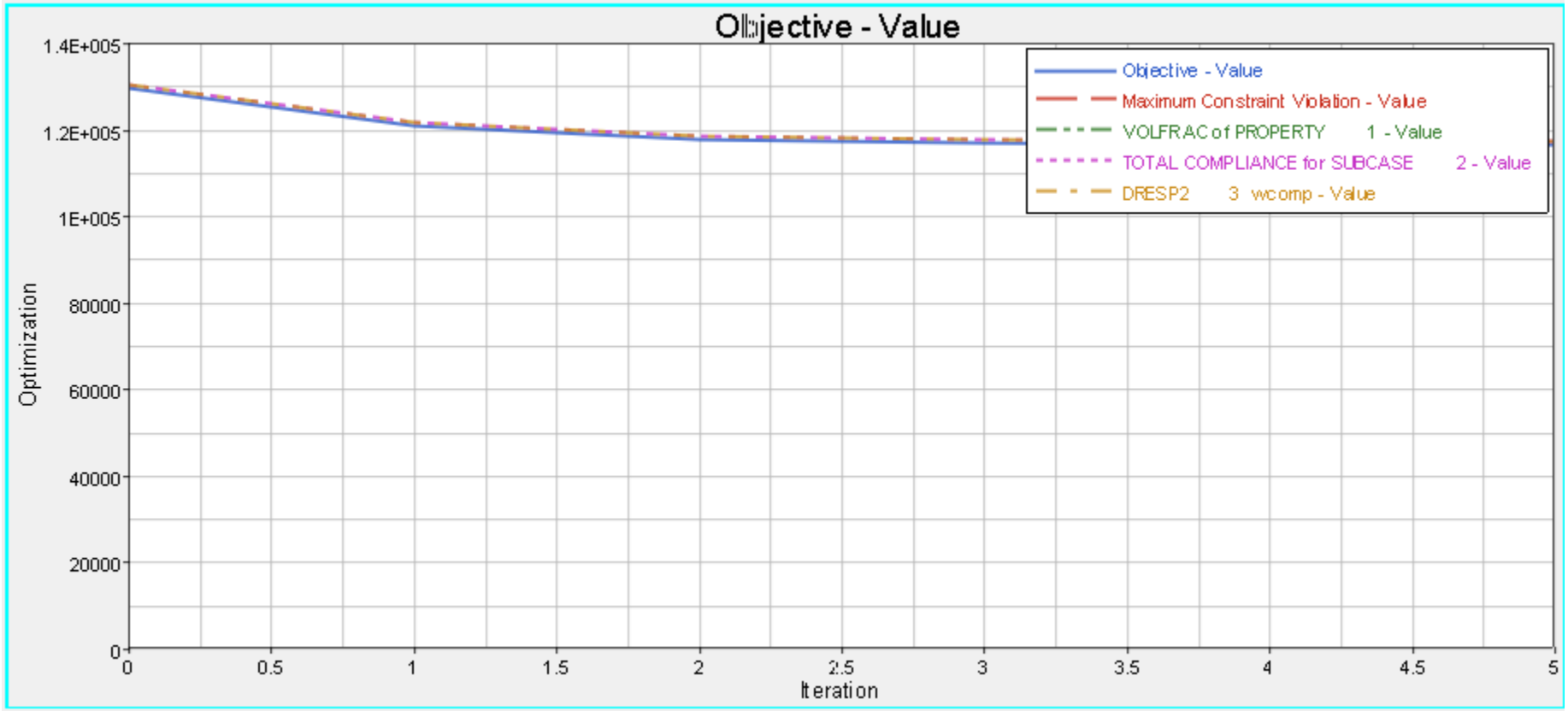
Altair

- Static analysis after optimization



Result Observations

- *Thus the volume has been decreased by half, keeping the stiffness of the wing rib intact.*



Summary

	No of Iterations	Solver Time Taken (Attach Out Files)	Mass Savings %	Final Stress /Displacement %
Run 1 (Free Size)	5	00:00:10	50%	Max displacement is .75 (aprox.)

Altair

Innovation Intelligence®

Part C : Problem unattempted:

(because of an accident suffered)

Innovation Intelligence®

THANK YOU