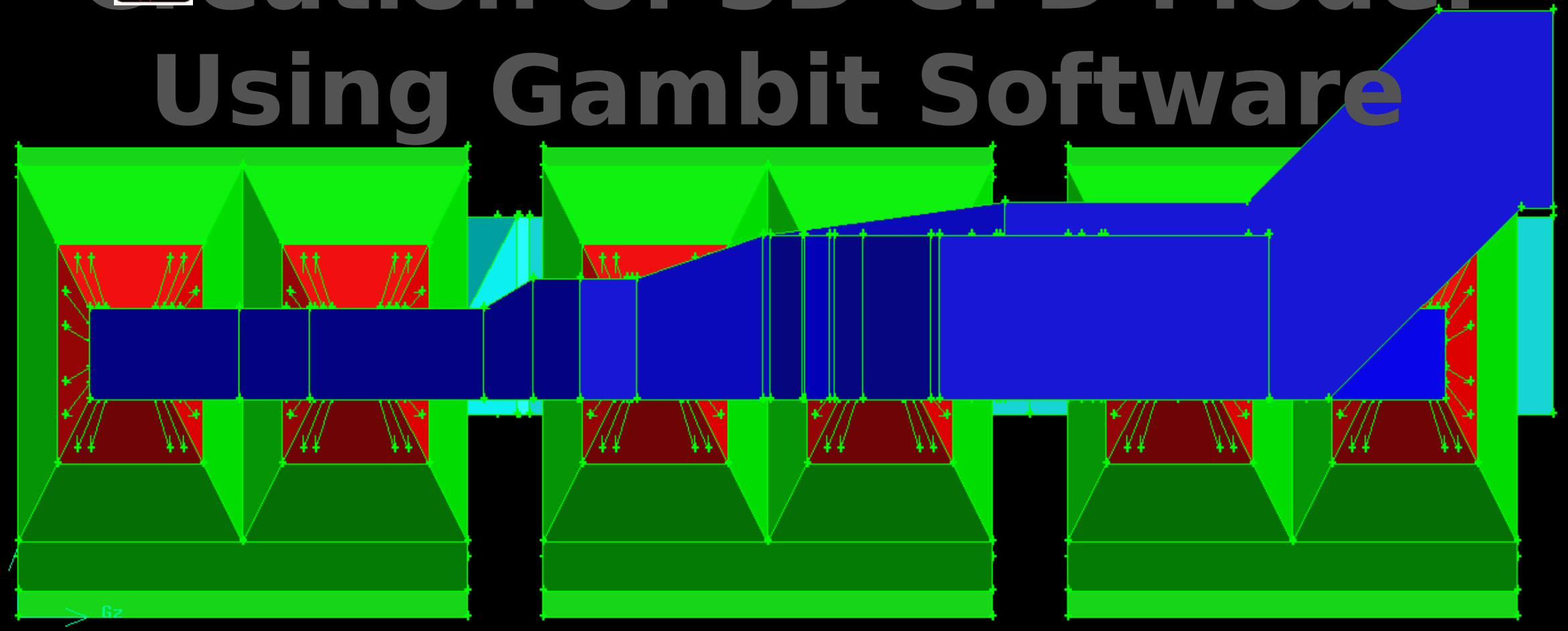
CFD for Equal Flow distribution Among ESP with small duct Modification

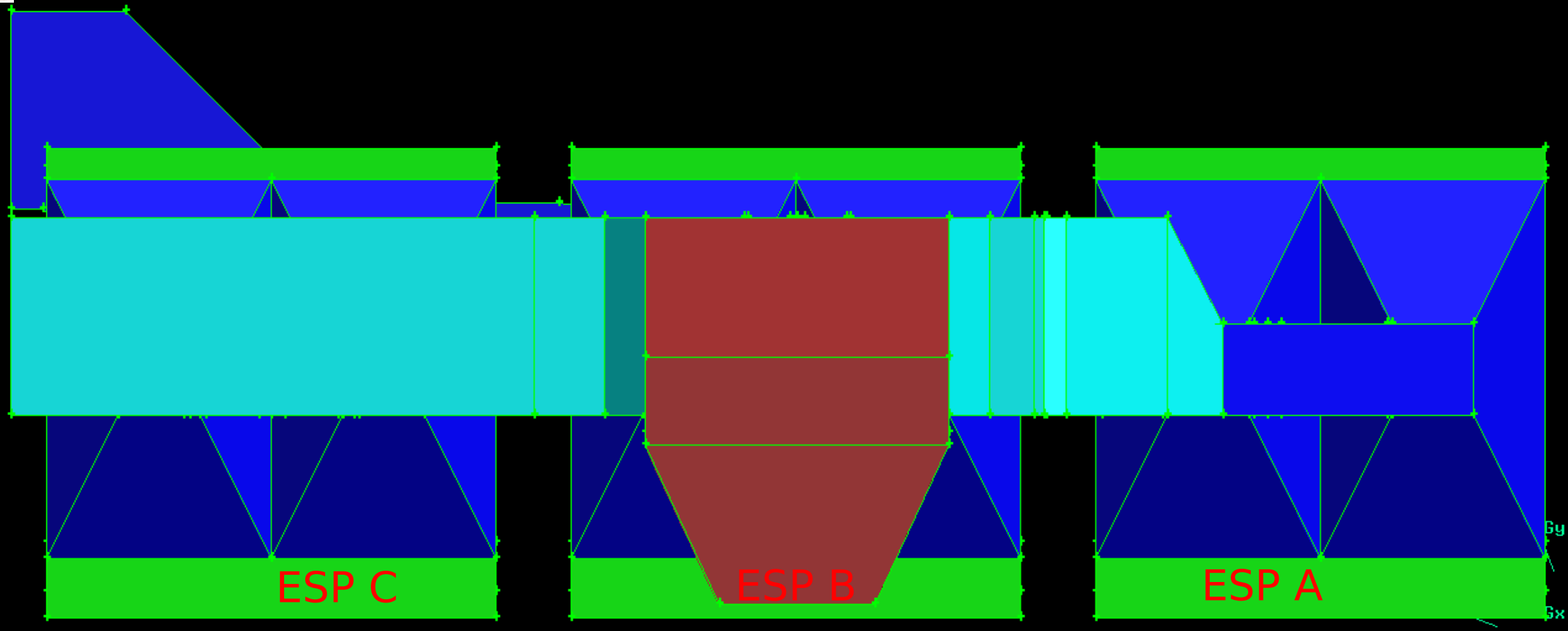
For

(800 MW)

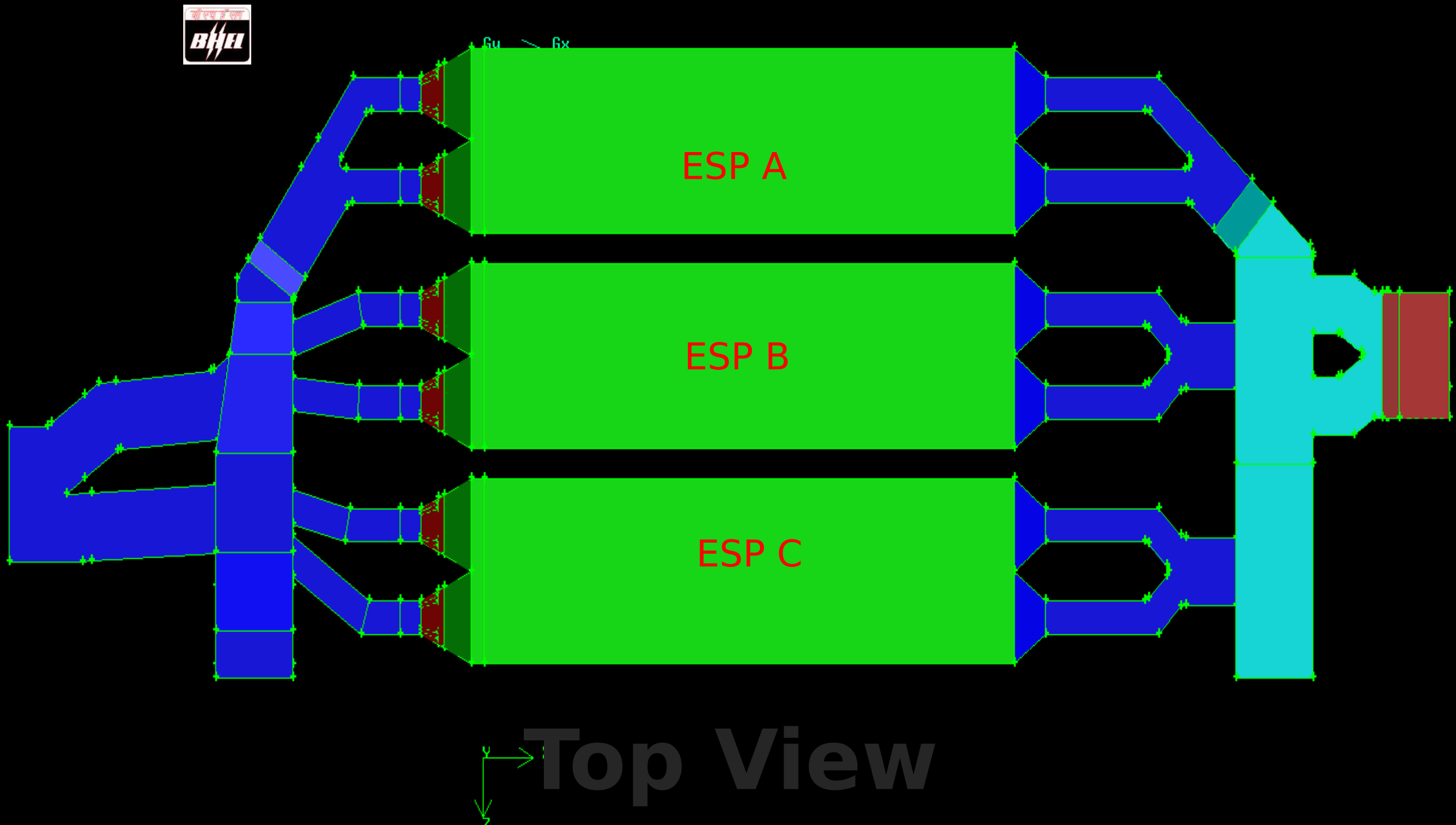
Creation of 3D CFD Model Using Gambit Software



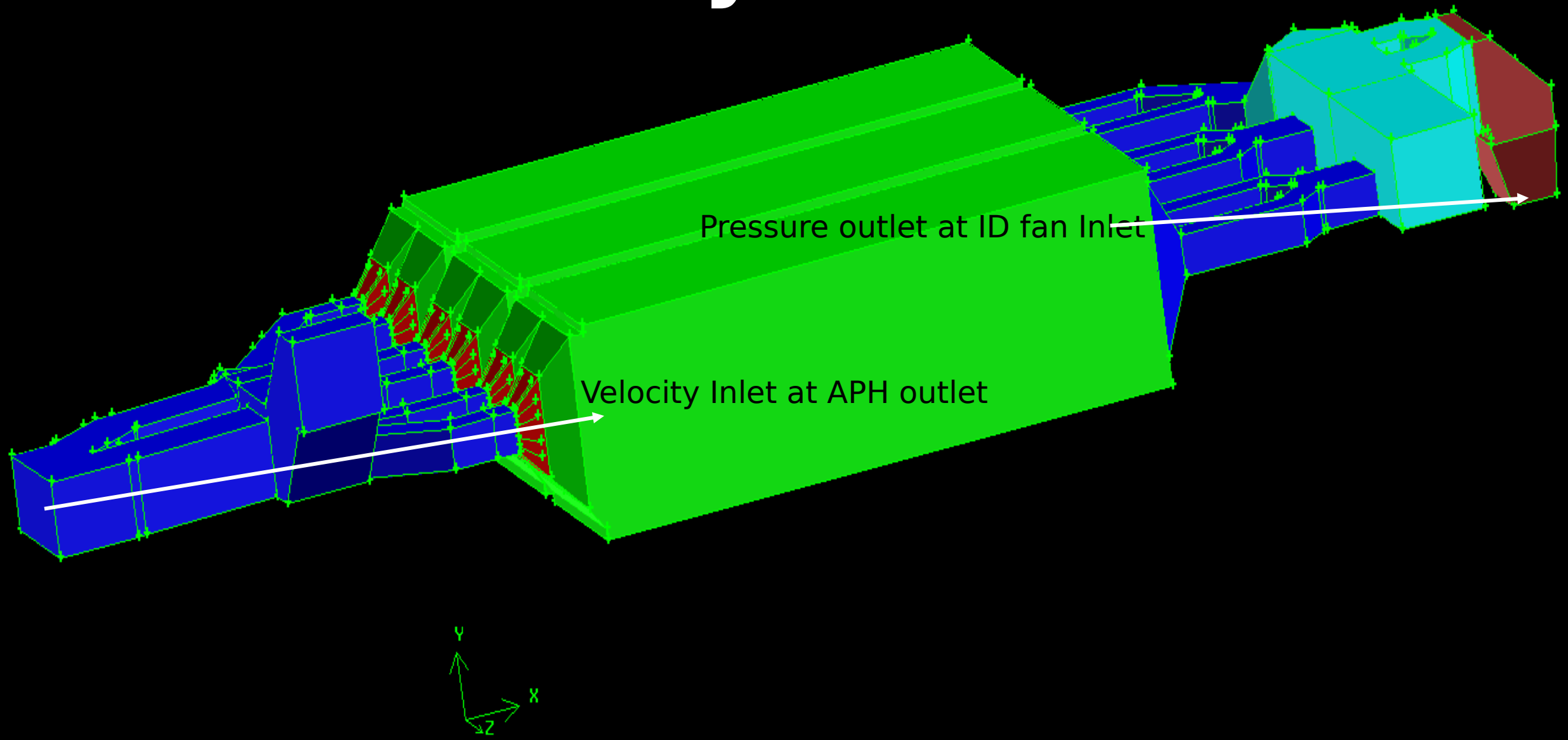
Front View



Back View


ESP A
ESP B
ESP C
Top View

Boundary Conditions



Results of ESP

Flow Distribution Among ESP passes (with No guide plate)

B:Fluent Parallel Fluent@IC-80056.bapecs.co.in [3d, pbns, sstkw] [ANSYS FLUENT]

File | Setting Up Domain | Setting Up Physics | User Defined | Solving | Postprocessing | Viewing | Parallel | Design

Surface
Create
Manage...

Graphics
Mesh
Contours
Vectors
Pathlines
Particle Tracks
HSF File...

Plots | Reports | Animation | Model Specific

Tree

Filter Text

- Electric Potential (Off)
- Materials
  - Fluid
    - air
  - Solid
- Cell Zone Conditions
  - fluid (fluid, id=2)
- Boundary Conditions
  - default-interior (interior, id=14)
  - inlet (velocity-inlet, id=6)
  - outlet (pressure-outlet, id=5)
  - pass_a1 (interior, id=12)
  - pass_a2 (interior, id=11)
  - pass_b1 (interior, id=10)
  - pass_b2 (interior, id=9)
  - pass_c1 (interior, id=8)
  - pass_c2 (interior, id=7)
  - symmetry (symmetry, id=4)
  - wall (wall, id=3)
  - wall-shadow (wall, id=15)
  - wall:013 (wall, id=13)
- Dynamic Mesh
- Reference Values
- Solution
  - Methods
  - Controls
  - Report Definitions
  - Monitors
    - Residual
    - Report Files
    - Report Plots
    - Convergence Conditions
  - Cell Registers
  - Initialization
  - Calculation Activities
  - Run Calculation
- Results
  - Graphics
    - Mesh
    - Contours
    - Vectors
    - Pathlines
    - Particle Tracks
  - Plots
  - Scene
  - Animations
  - Reports
- Parameters & Customization

Task Page

Run Calculation

Check Case... | Update Dynamic Mesh...

Number of Iterations: 434545
Reporting Interval: 1
Profile Update Interval: 1

Data File Quantities... | Acoustic Signals... | Acoustic Sources FFT...

Calculate

Help

Console

```
Parallel variables...
Done.


  iter  continuity  x-velocity  y-velocity  z-velocity           k       omega
 22897  1.4906e-03  2.0655e-03  1.5380e-03  1.7517e-03  4.4220e-03  2.2120e-03  0:
 22898  1.4905e-03  2.0671e-03  1.5383e-03  1.7527e-03  4.4224e-03  2.2120e-03 241
Done.

Calculation complete.

            Volumetric Flow Rate                (m3/s)
------------------------------- --------------------
                         pass_a1           -85.511328
                         pass_a2           -89.052901
                         pass_b1           -88.442549
                         pass_b2           -76.245102
                         pass_c1           -97.263885
                         pass_c2           -84.522255
                ---------------- --------------------
                             Net           -521.03802
```

Surface Integrals

Report Type: Volume Flow Rate
Field Variable: Pressure... / Static Pressure

Custom Vectors
Vectors of
Custom Vectors...

Save Output Parameter...

Surfaces: Filter Text

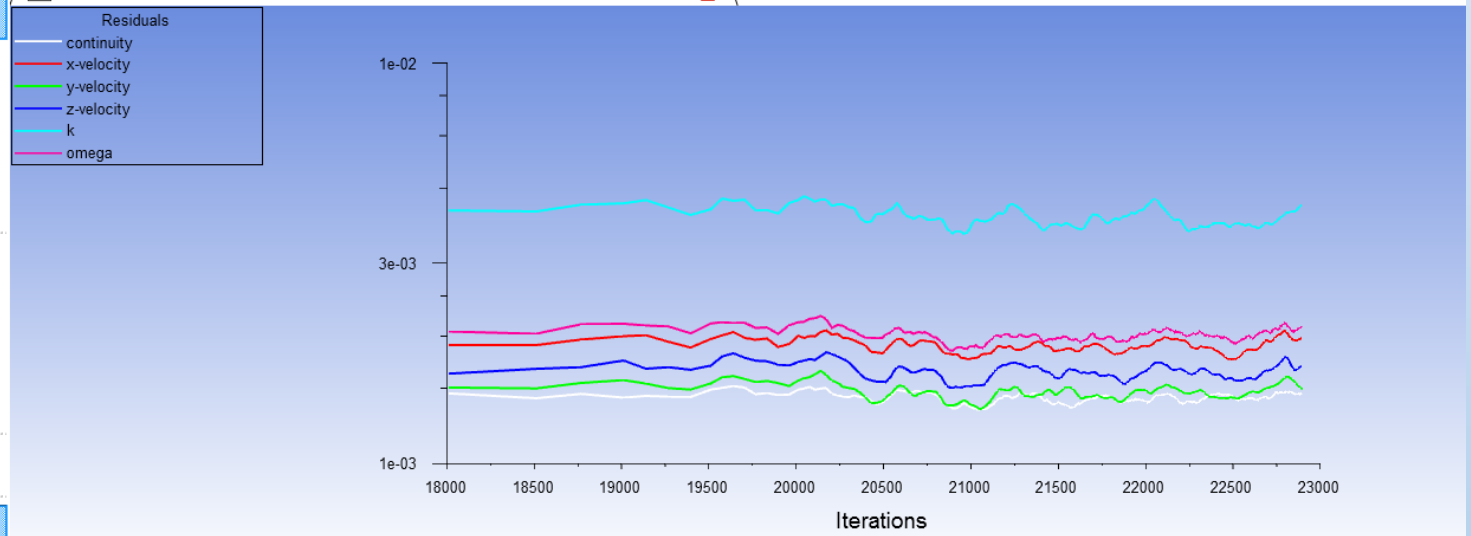
- Inlet
  - inlet
- Internal
  - default-interior
  - pass_a1
  - pass_a2
  - pass_b1
  - pass_b2
  - pass_c1
  - pass_c2
- Outlet
  - outlet

Highlight Surfaces

Volumetric Flow Rate (m3/s): -521.038

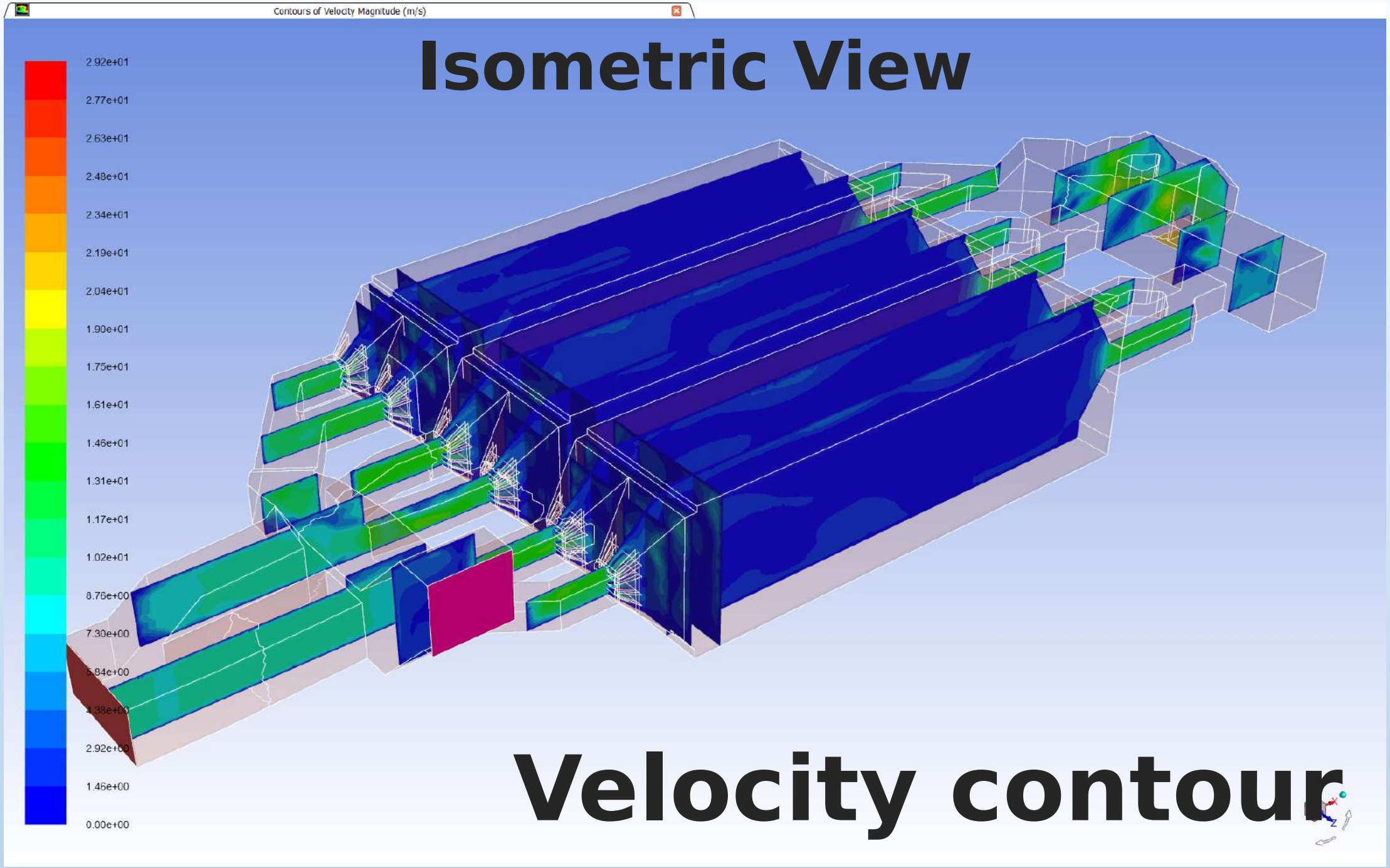
Compute | Write... | Close | Help

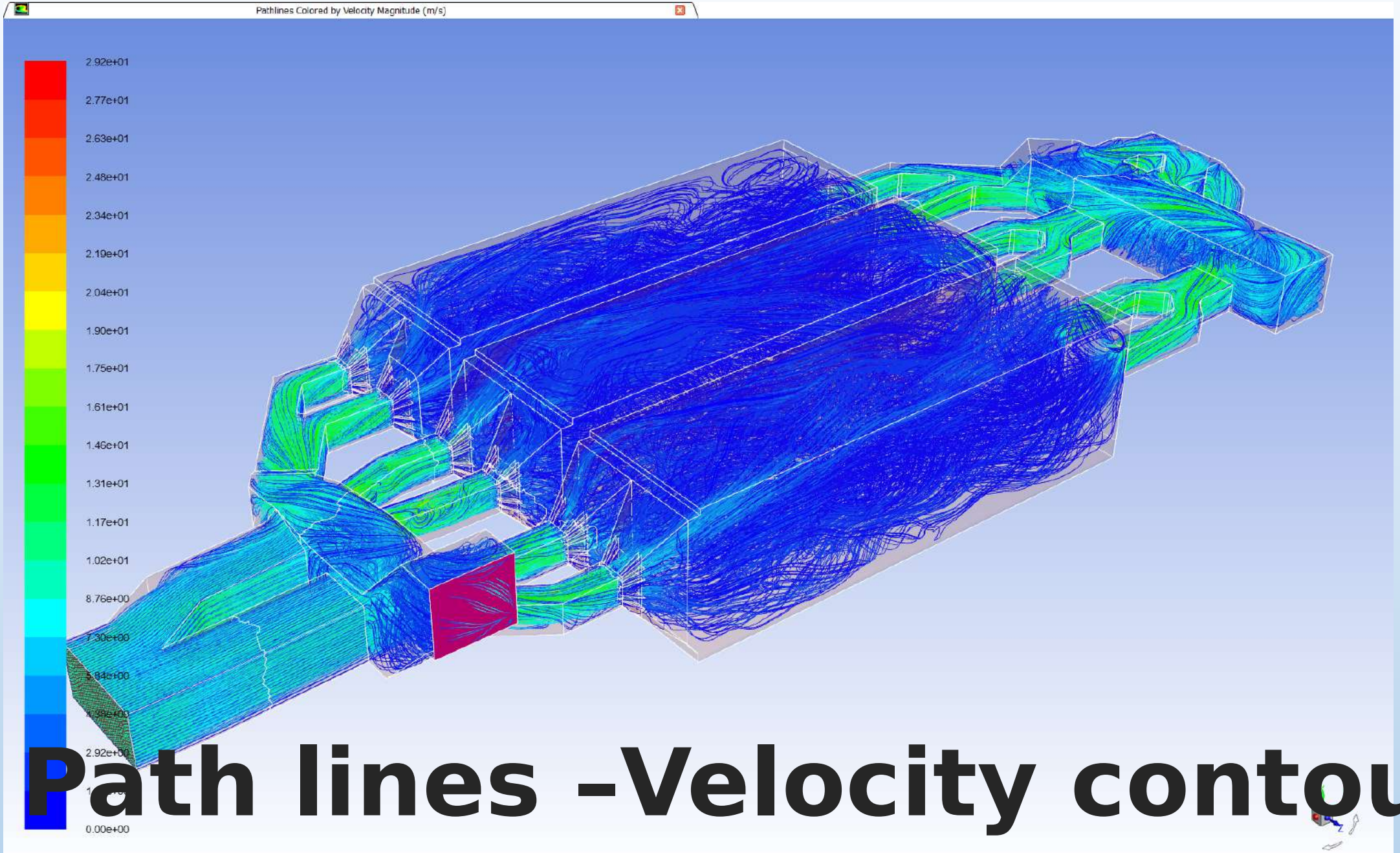
Scaled Residuals



Flow Distribution Pattern

	Location	Flow Required	Flow Achieved	% of Deviation
Pass – A1	Inlet	86.91	85.51	-01.61
Pass – A2	Inlet	86.91	89.05	+02.46
Pass – B1	Inlet	86.91	88.44	+01.76
Pass – B2	Inlet	86.91	76.25	-12.27
Pass – C1	Inlet	86.91	97.26	+11.91
Pass – C2	Inlet	86.91	84.52	-02.75


Contours of Velocity Magnitude (m/s)
2.92e+01
2.77e+01
2.63e+01
2.48e+01
2.34e+01
2.19e+01
2.04e+01
1.90e+01
1.75e+01
1.61e+01
1.46e+01
1.31e+01
1.17e+01
1.02e+01
8.76e+00
7.30e+00
5.84e+00
4.38e+00
2.92e+00
1.46e+00
0.00e+00
Isometric View
Velocity contour

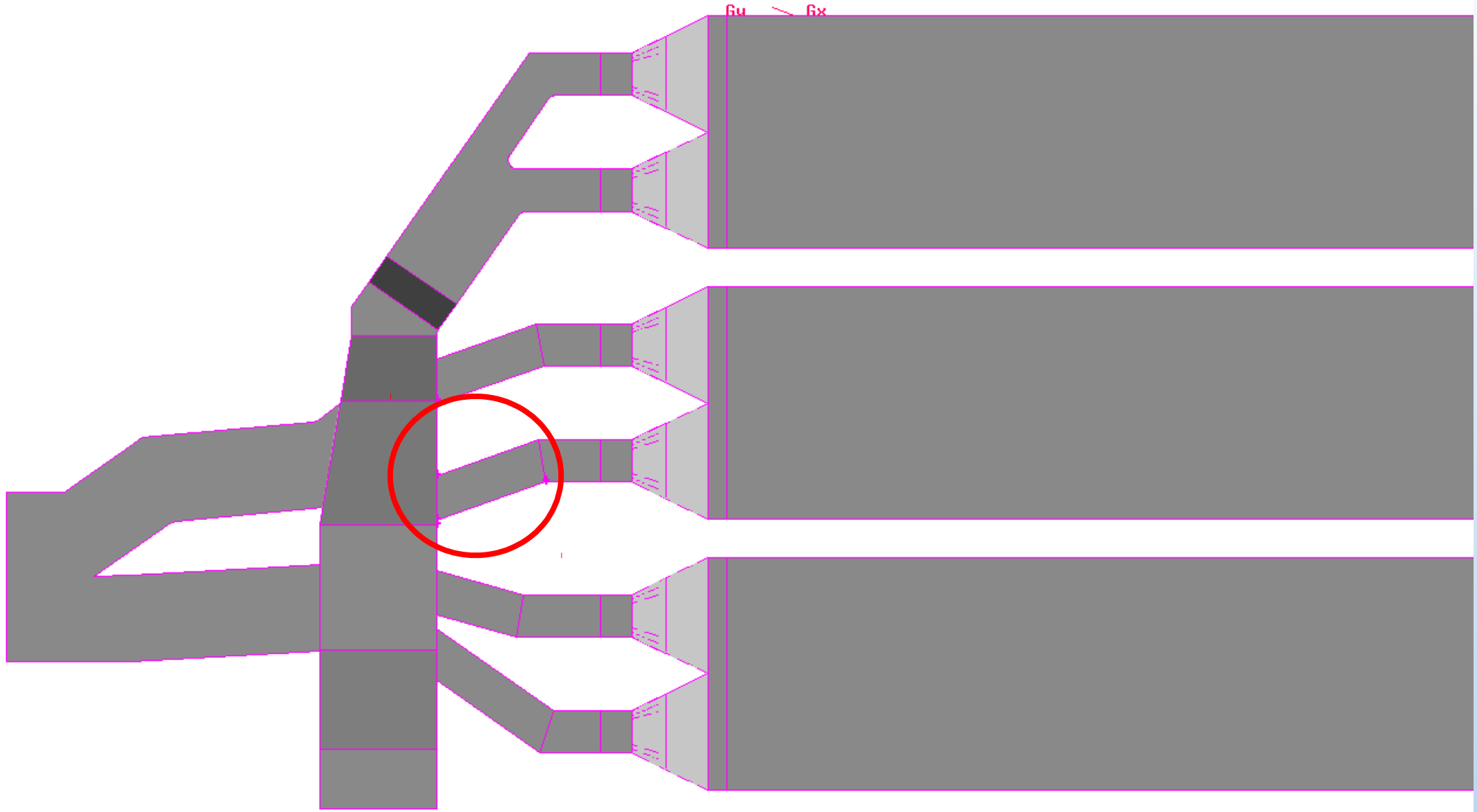


Path lines –Velocity contour

all Duct modification is carried o

y changing the direction of the l

necting B2 duct to the common o


Gy
Gx

Graphics

Mesh | Pathlines | Plots | Reports | Animation | Model Specific

Contours | Particle Tracks

Vectors | HSF File...

Task Page

Run Calculation

Check Case... | Update Dynamic Mesh...

Number of Iterations: 54545

Reporting Interval: 1

Profile Update Interval: 1

Data File Quantities... | Acoustic Signals... | Acoustic Sources FFT...

Calculate

Help

Console

```
     206 triangular interior faces, zone  8, binary.
     246 triangular interior faces, zone  9, binary.
     206 triangular interior faces, zone 10, binary.
     246 triangular interior faces, zone 11, binary.
     246 triangular interior faces, zone 12, binary.
 5168710 triangular interior faces, zone 14, binary.
    9840 shadow face pairs, binary.
  505313 nodes, binary.
  505313 node flags, binary.
Done.

Writing "D:/R&D/                                  duct modif
Done.


                Volumetric Flow Rate                (m3/s)
-------------------------------- --------------------
                           pass_a1           -83.801408
                           pass_a2           -89.330324
                           pass_b1           -81.255973
                           pass_b2           -85.708532
                           pass_c1           -93.341108
                           pass_c2           -88.182074
                  ---------------- --------------------
                               Net           -521.61942
```

Vectors of

Custom Vectors...

Save Output Parameter...

Surfaces | Filter Text

- Inlet
  - inlet
- Internal
  - default-interior
  - pass_a1
  - pass_a2
  - pass_b1
  - pass_b2
  - pass_c1
  - pass_c2
- Outlet
  - outlet

Highlight Surfaces

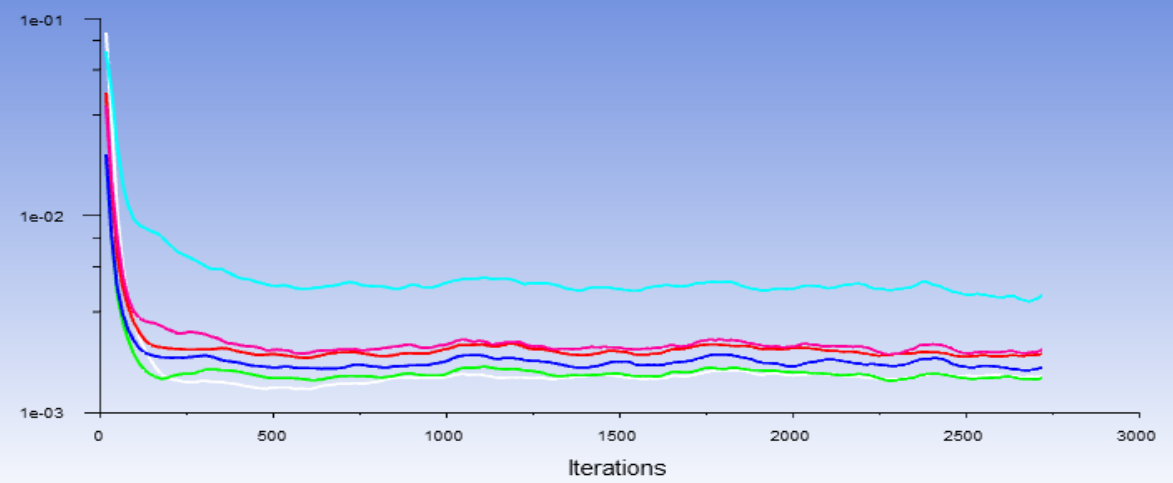
Volumetric Flow Rate (m3/s)

-521.6194

Compute | Write... | Close | Help

Scaled Residuals

Residuals
- continuity
- x-velocity
- y-velocity
- z-velocity
- k
- omega

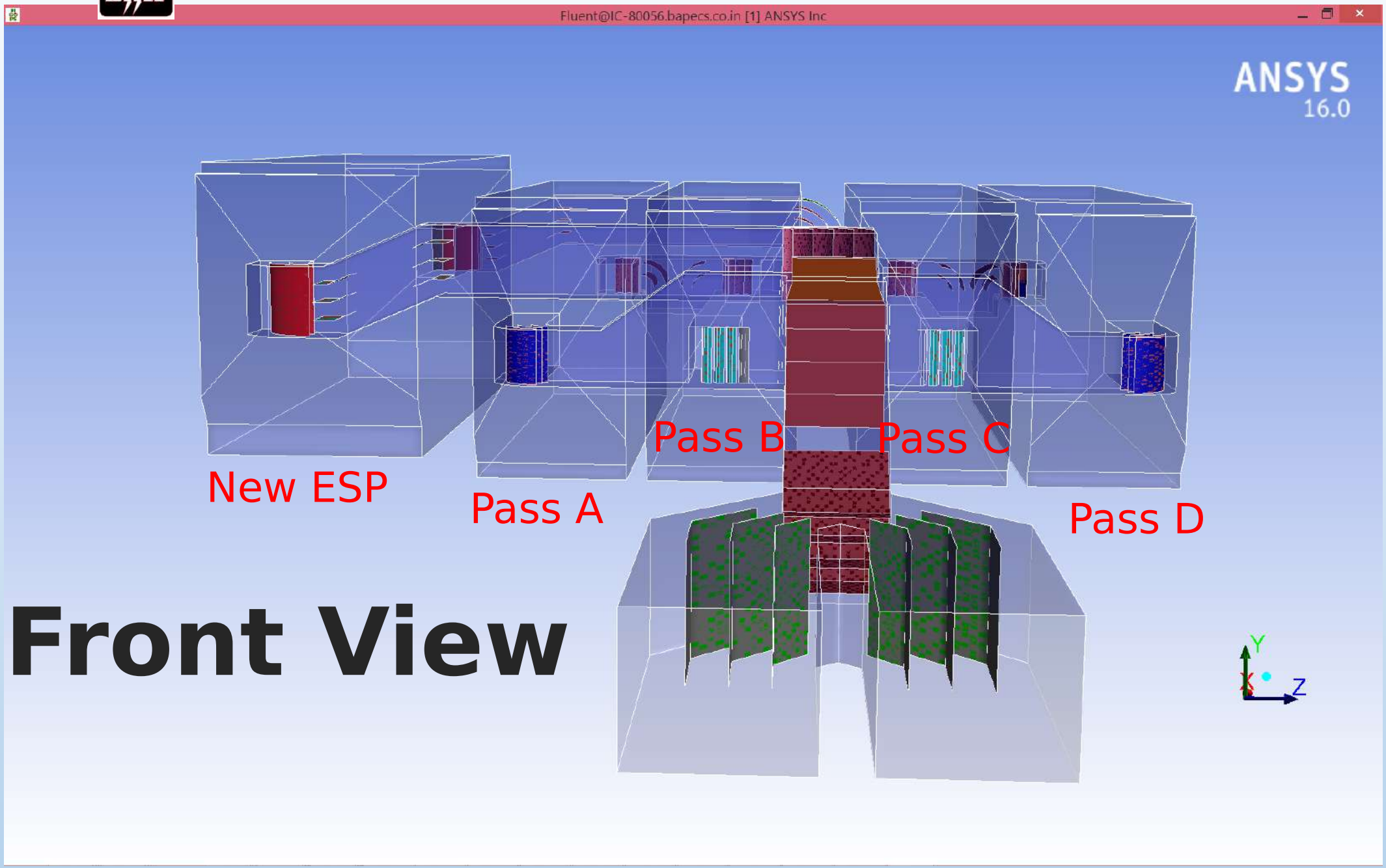


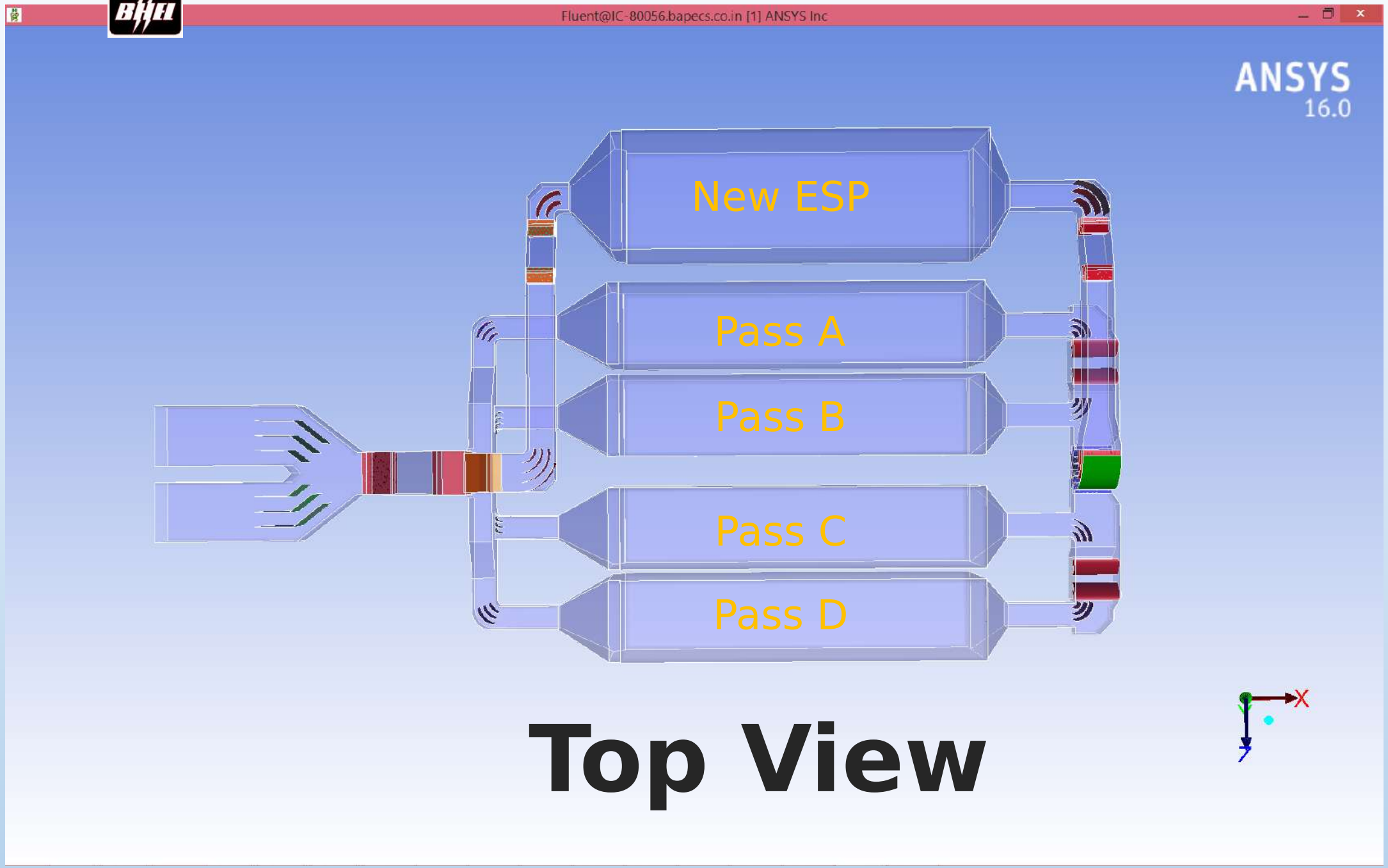
Flow Distribution Pattern

	Location	Flow Required	Flow Achieved	% of Deviation
Pass – A1	Inlet	86.91	83.8	-03.58
Pass – A2	Inlet	86.91	89.33	+02.78
Pass – B1	Inlet	86.91	81.26	-06.50
Pass – B2	Inlet	86.91	85.71	-01.38
Pass – C1	Inlet	86.91	93.34	+07.40
Pass – C2	Inlet	86.91	88.18	+01.46

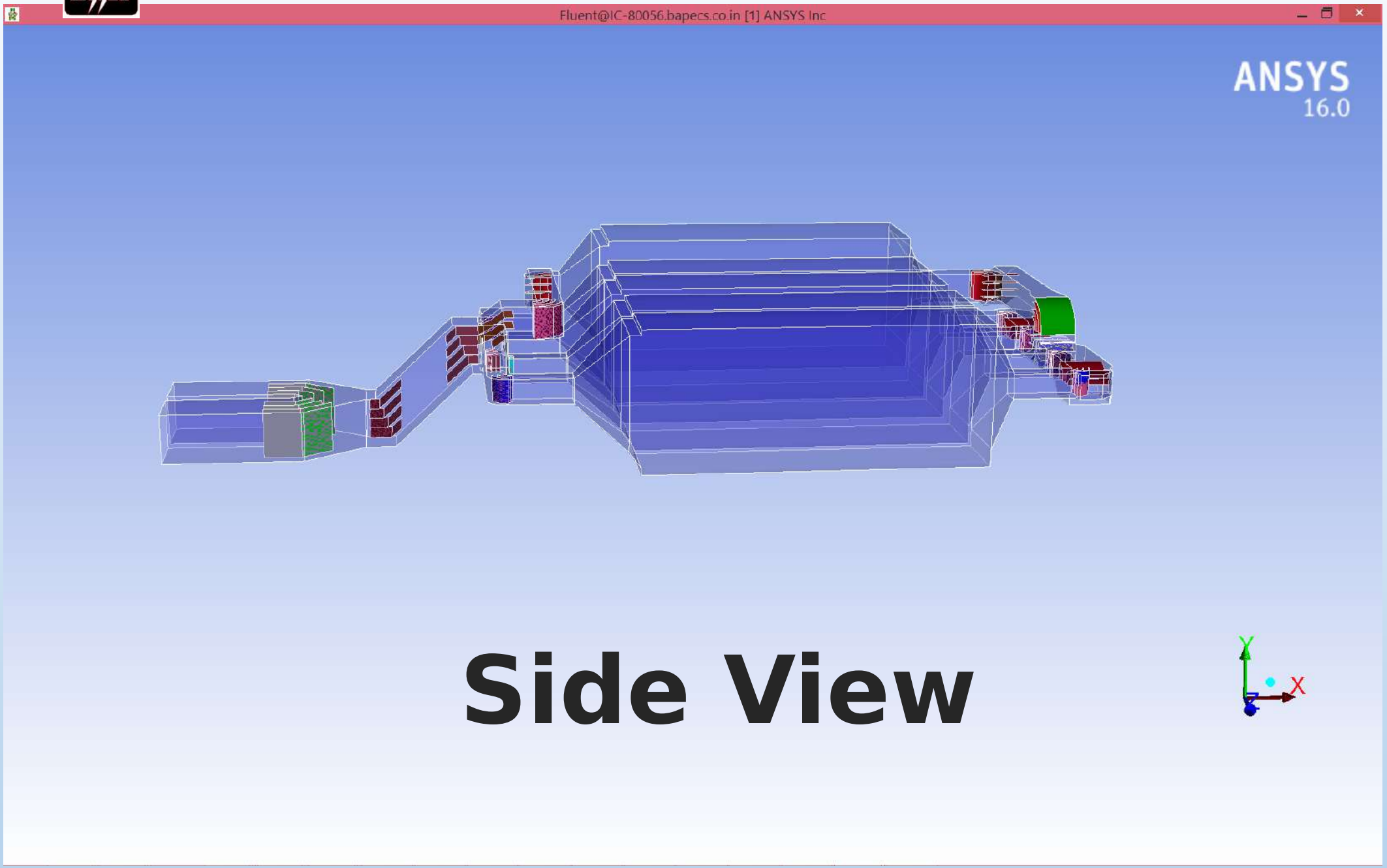
CFD for Pressure drop reduction

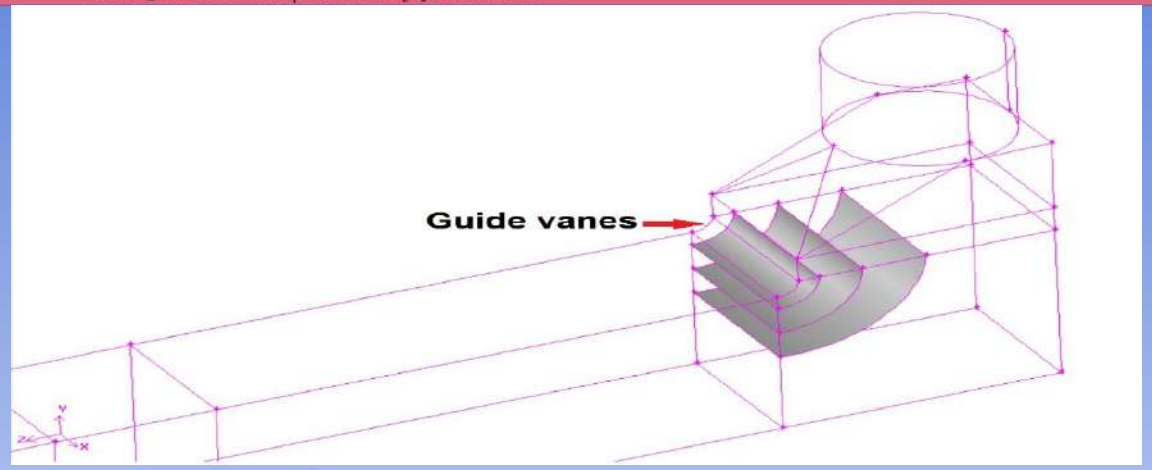
R&M 210 MW


Fluent@IC-80056.bapecs.co.in [1] ANSYS Inc
ANSYS
16.0
New ESP
Pass A
Pass B
Pass C
Pass D
Front View
Y
X
Z

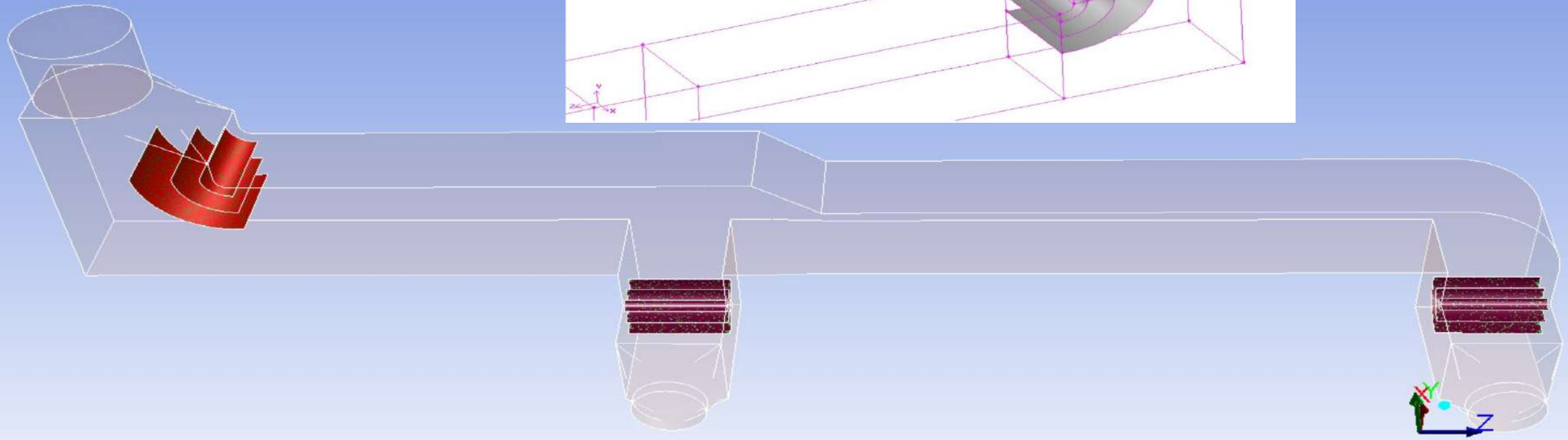

Fluent@IC-80056.bapecs.co.in [1] ANSYS Inc
ANSYS
16.0
New ESP
Pass A
Pass B
Pass C
Pass D
X

Top View

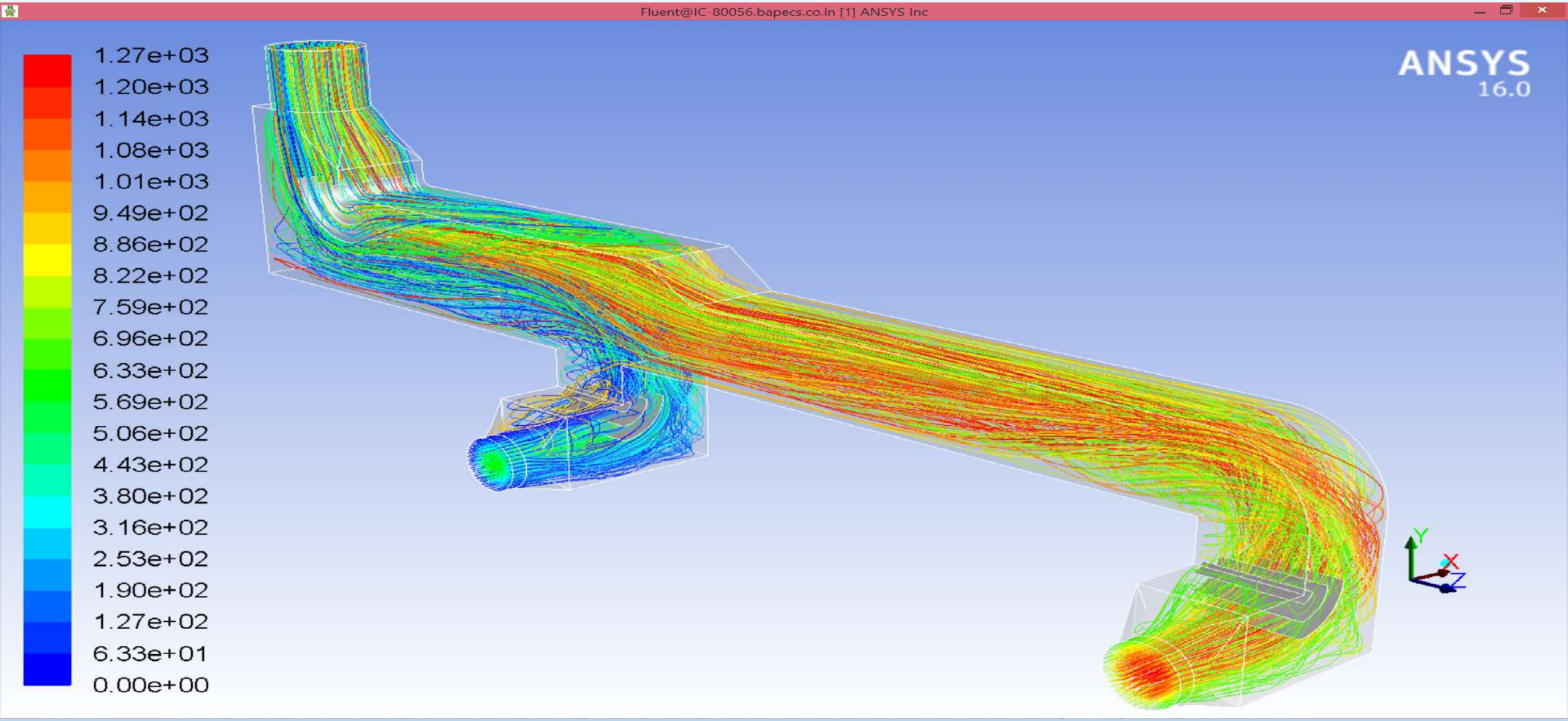

Fluent@IC-80056.bapecs.co.in [1] ANSYS Inc
ANSYS
16.0
Y
X
Side View



ANSYS
16.0



PATHLINES (Particle ID)



Velocity Contours