



ALUMINUM APERTURE PLATE

First Saved	Tuesday, March 18, 2014
Last Saved	Thursday, March 27, 2014
Product Version	14.5.7 Release
Save Project Before Solution	No
Save Project After Solution	No

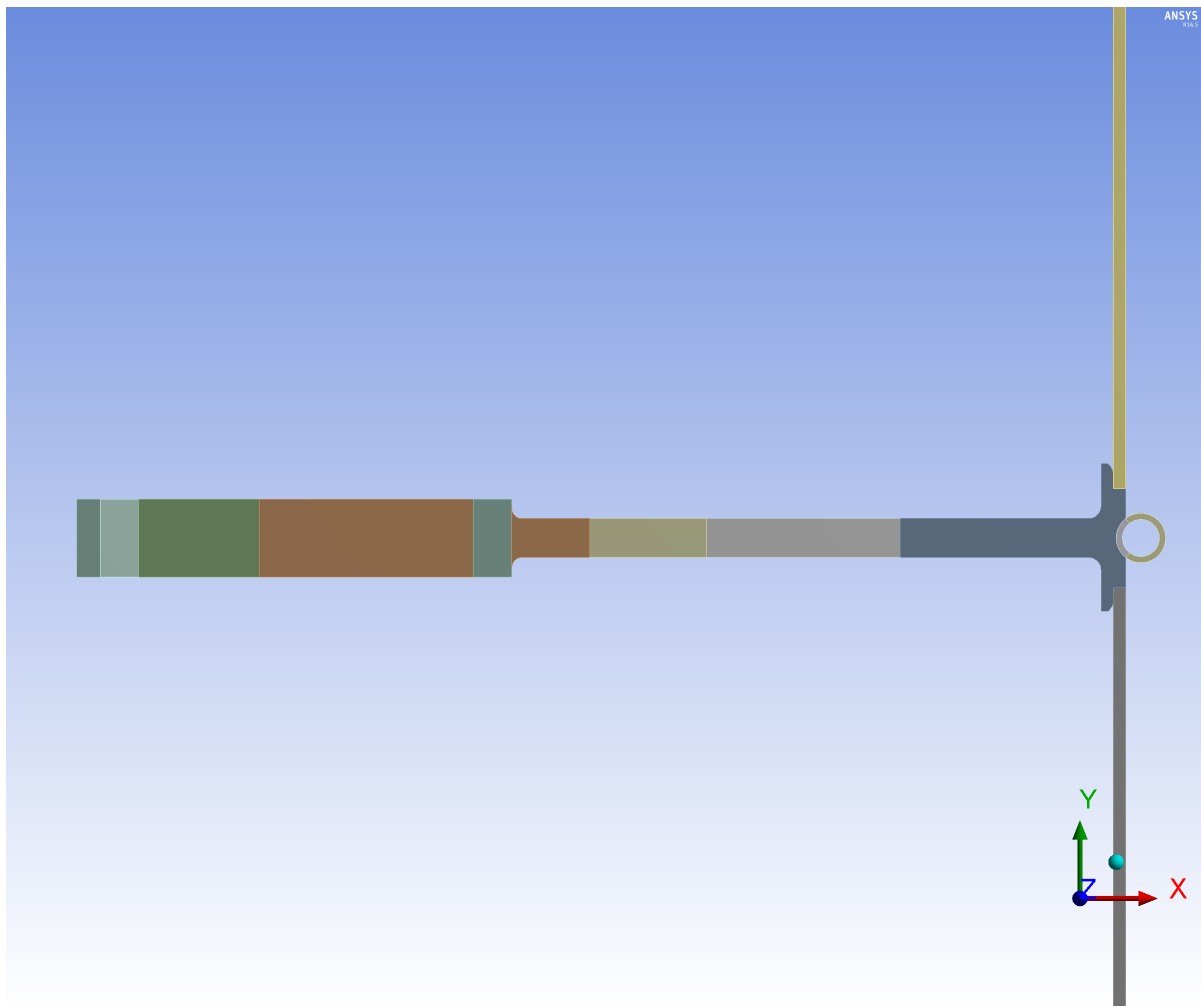


FIGURE 12
Model (A4, B4) > Steady-State Thermal (A5) > thermal loads-200microamp,5%target-1GeV

A: 2D stepped plate

Steady-State Thermal

Time: 1. s

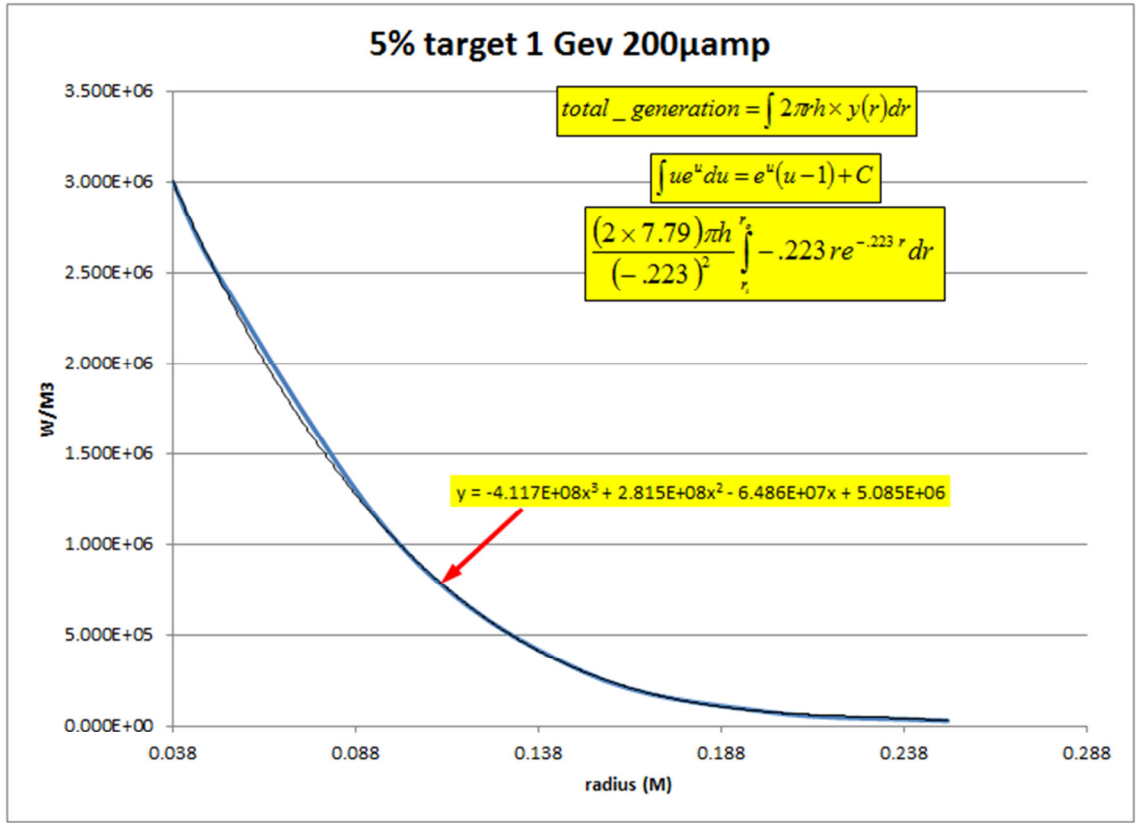
3/26/2014 3:40 PM

- A** Internal Heat Generation zone3: $6.267e+005 \text{ W/m}^3$
- B** Internal Heat Generation zone4: $1.848e+005 \text{ W/m}^3$
- C** Internal Heat Generation zone5: 54070 W/m^3
- D** Internal Heat Generation zone1: $2.739e+006 \text{ W/m}^3$
- E** Internal Heat Generation zone6: 14550 W/m^3
- F** Internal Heat Generation zone2: $1.667e+006 \text{ W/m}^3$
- H** Radiation from inner tube wall: 308. K, $9.e-002$, 1.
- I** Radiation from outer tube wall: 308. K, $9.e-002$
- J** Convection: 308. K, $6593. \text{ W/m}^2\cdot\text{K}$
- K** Radiation for non-Anodized Aluminum 2: 308. K, $9.e-002$, 1.



FIGURE 13

Model (A4, B4) > Steady-State Thermal (A5) > Example calculation for heat generation



R_i (m)	R_o (m)	thickness h (M)	q_i (w/m ³)	q_o (w/m ³)	M (w/m ⁴)	C (w/m ³)	$Q_{segment}$ (w)	volume (M ³)	q_{eq} (w/m ³)	Ansys zones
0.038	0.05	0.02	3.000E+06	2.500E+06	-4.167E+07	4.58E+06	181.71	6.635E-05	2.739E+06	1
0.05	0.1	0.02	2.500E+06	1.000E+06	-3.000E+07	4.00E+06	785.40	0.00047124	1.667E+06	2
0.1	0.15	0.02	1.000E+06	3.000E+05	-1.400E+07	2.40E+06	492.18	0.0007854	6.267E+05	3
0.15	0.2	0.008	3.000E+05	8.000E+04	-4.400E+06	9.60E+05	81.26	0.00043982	1.848E+05	4
0.2	0.25	0.008	8.000E+04	3.000E+04	-1.000E+06	2.80E+05	30.58	0.00056549	5.407E+04	5
0.25	0.3	0.008	3.000E+04	0.000E+00	-6.000E+05	1.80E+05	10.05	0.00069115	1.455E+04	6
0.3							total power (w)	1571		

FIGURE 14

Model (A4, B4) > Steady-State Thermal (A5) > curve integration of trendline fit for heat generation

integrate curve fit equation

$$q = Ar^3 + Br^2 + Cr + D$$

$$\partial Q = q \cdot 2\pi r h \partial r$$

$$\partial Q = 2\pi h (Ar^4 + Br^3 + Cr^2 + Dr) \partial r$$

$$Q = 2\pi h \left(\frac{A}{5} r^5 + \frac{B}{4} r^4 + \frac{C}{3} r^3 + \frac{D}{2} r^2 \right)_{R_i}^{R_o}$$

h	A	B	C	D	R _i (m)	R _o (m)	power (W)
0.02	-4.117E+08	2.82E+08	-6.49E+07	5.09E+06	0.038	0.15	1381
0.008	-4.117E+08	2.82E+08	-6.49E+07	5.09E+06	0.15	0.3	72
total power (W)							1452

FIGURE 15

Model (A4, B4) > Steady-State Thermal (A5) > 5052-O plastic strain data from MPDB

FIGURE 16

Model (A4, B4) > Steady-State Thermal (A5) > thermal loads for 10% target 1Gev 200 microamps

A: 2D stepped plate
Steady-State Thermal
Time: 1. s
3/27/2014 11:26 AM

ANSYS
R14.5

- A** Internal Heat Generation zone3: $6.597e+005$ W/m³
- B** Internal Heat Generation zone4: $3.572e+005$ W/m³
- C** Internal Heat Generation zone5: $1.655e+005$ W/m³
- D** Internal Heat Generation zone1: $1.383e+006$ W/m³
- E** Internal Heat Generation zone6: 48250 W/m³
- F** Internal Heat Generation zone2: $1.062e+006$ W/m³
- H** Radiation from inner tube wall: 308. K, $9.e-002$, 1.
- I** Radiation from outer tube wall: 308. K, $9.e-002$
- J** Convection: 308. K, 6593. W/m²·K
- K** Radiation for non-Anodized Aluminum 2: 308. K, $9.e-002$, 1.

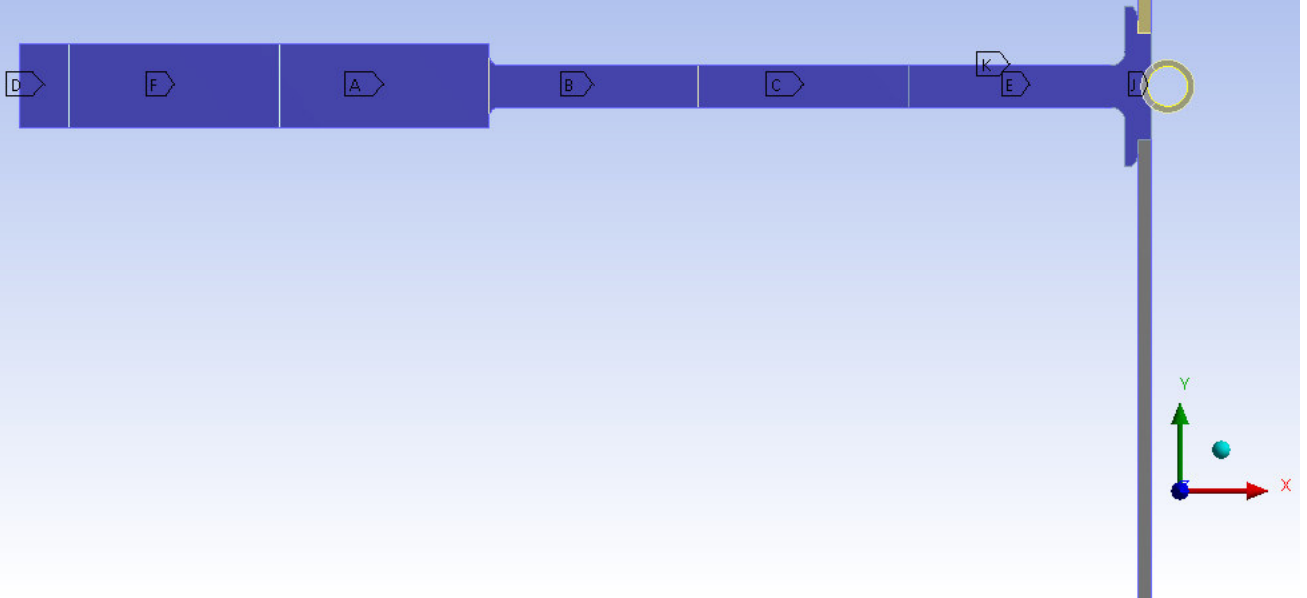


FIGURE 17

Model (A4, B4) > Steady-State Thermal (A5) > thermal loads-200microamp,0.5%target-1GeV

A: 2D stepped plate

Steady-State Thermal

Time: 1. s

3/27/2014 2:01 PM

- A** Internal Heat Generation zone1: $1.383e+006 \text{ W/m}^3$
- B** Internal Heat Generation zone2: $1.062e+006 \text{ W/m}^3$
- C** Radiation from inner tube wall: 308. K, $9.e-002$, 1.
- D** Radiation from outer tube wall: 308. K, $9.e-002$
- E** Convection: 308. K, $6593. \text{ W/m}^2\cdot\text{K}$
- F** Internal Heat Generation zone3: $6.597e+005 \text{ W/m}^3$
- G** Internal Heat Generation zone4: $3.572e+005 \text{ W/m}^3$
- H** Internal Heat Generation zone5: $1.655e+005 \text{ W/m}^3$
- I** Internal Heat Generation zone6: 48250 W/m^3
- J** Radiation for non-Anodized Aluminum 2: 308. K, $9.e-002$, 1.

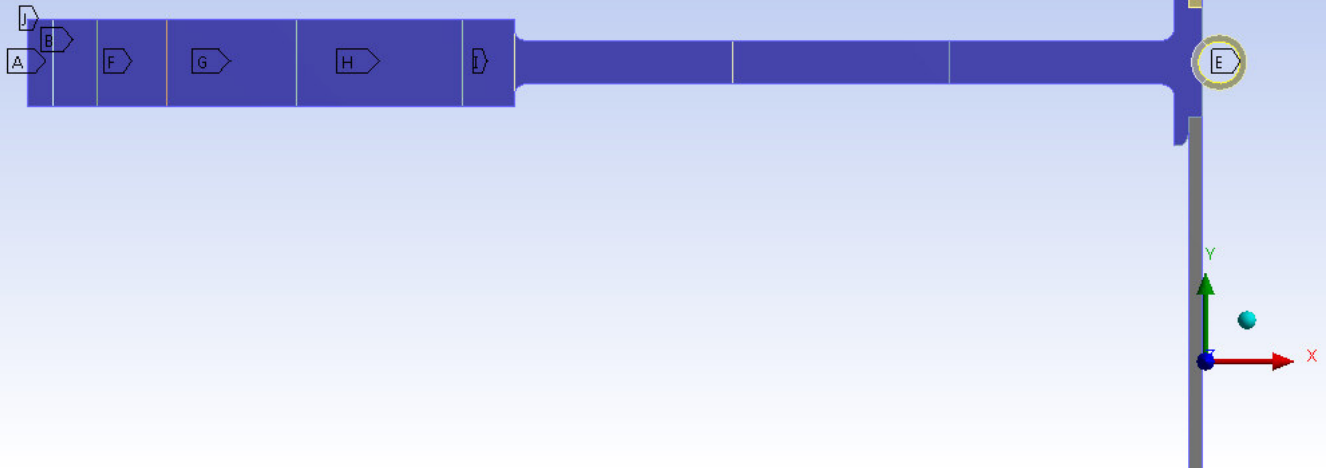


FIGURE 18

Model (A4, B4) > Steady-State Thermal (A5) > thermal loads-200microamp,1%target-1GeV

A: 2D stepped plate

Steady-State Thermal

Time: 1 s

3/27/2014 3:33 PM

- A** Internal Heat Generation zone5: 21500 W/m²
- B** Internal Heat Generation zone1: 5.858e+006 W/m²
- C** Internal Heat Generation zone6: 8909. W/m²
- D** Internal Heat Generation zone2: 1.062e+006 W/m²
- E** Radiation from inner tube wall: 308. K, 9.e-002 , 1.
- F** Radiation from outer tube wall: 308. K, 9.e-002
- G** Convection: 308. K, 6593. W/m²K
- H** Internal Heat Generation zone3: 1.471e+006 W/m²
- I** Internal Heat Generation zone4: 1.68e+005 W/m²
- J** Radiation for non-Anodized Aluminum 2: 308. K, 9.e-002 , 1.

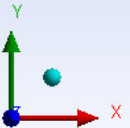
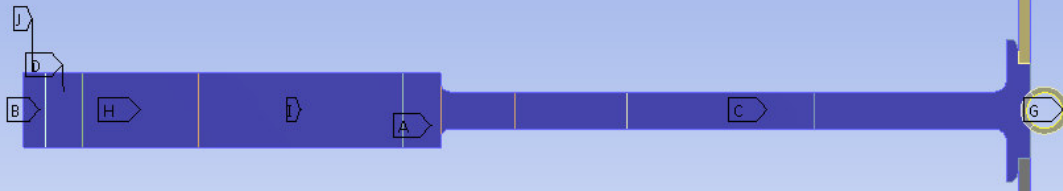


FIGURE 19

Model (A4, B4) > Steady-State Thermal (A5) > Solution (A6) > Temperature > 5052-O multilinear- no anodize water cool-5%-1GeV-200micro

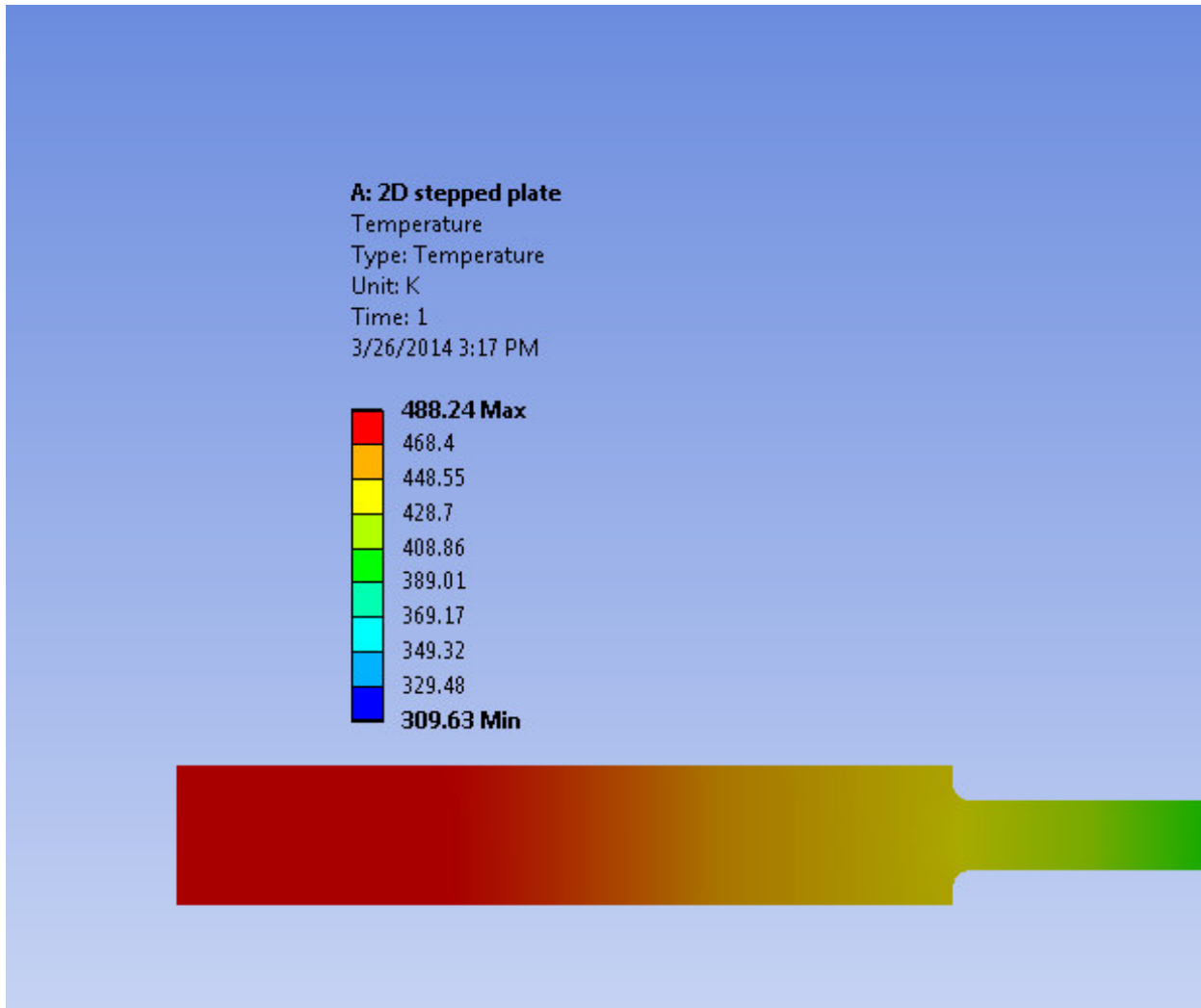


FIGURE 20

Model (A4, B4) > Steady-State Thermal (A5) > Solution (A6) > Temperature > 5052-O multilinear- no anodize water cool-10%-1GeV-200micro

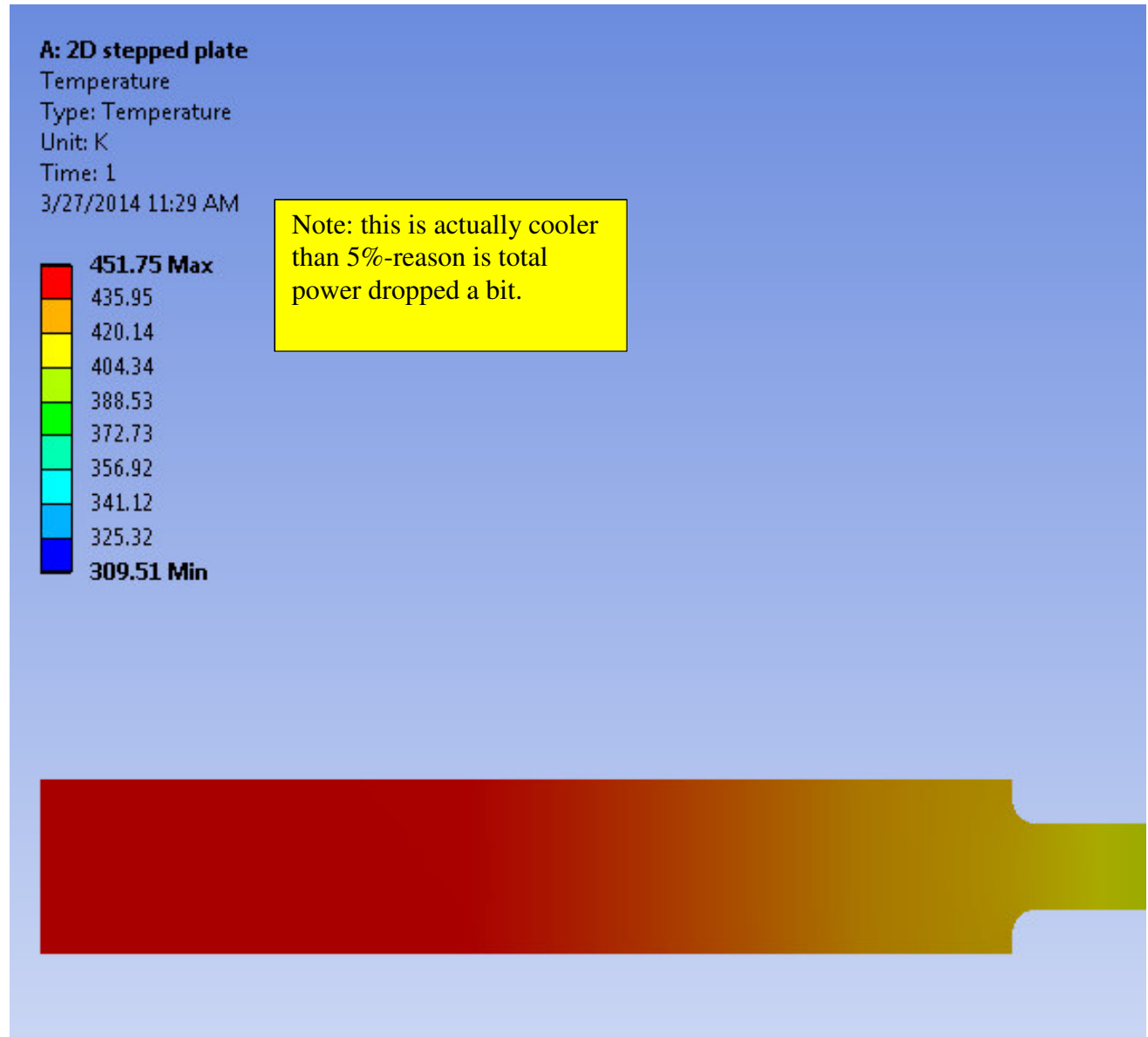


FIGURE 21

Model (A4, B4) > Steady-State Thermal (A5) > Solution (A6) > Temperature > 5052-O multilinear- no anodize water cool-0.5%-1GeV-200micro

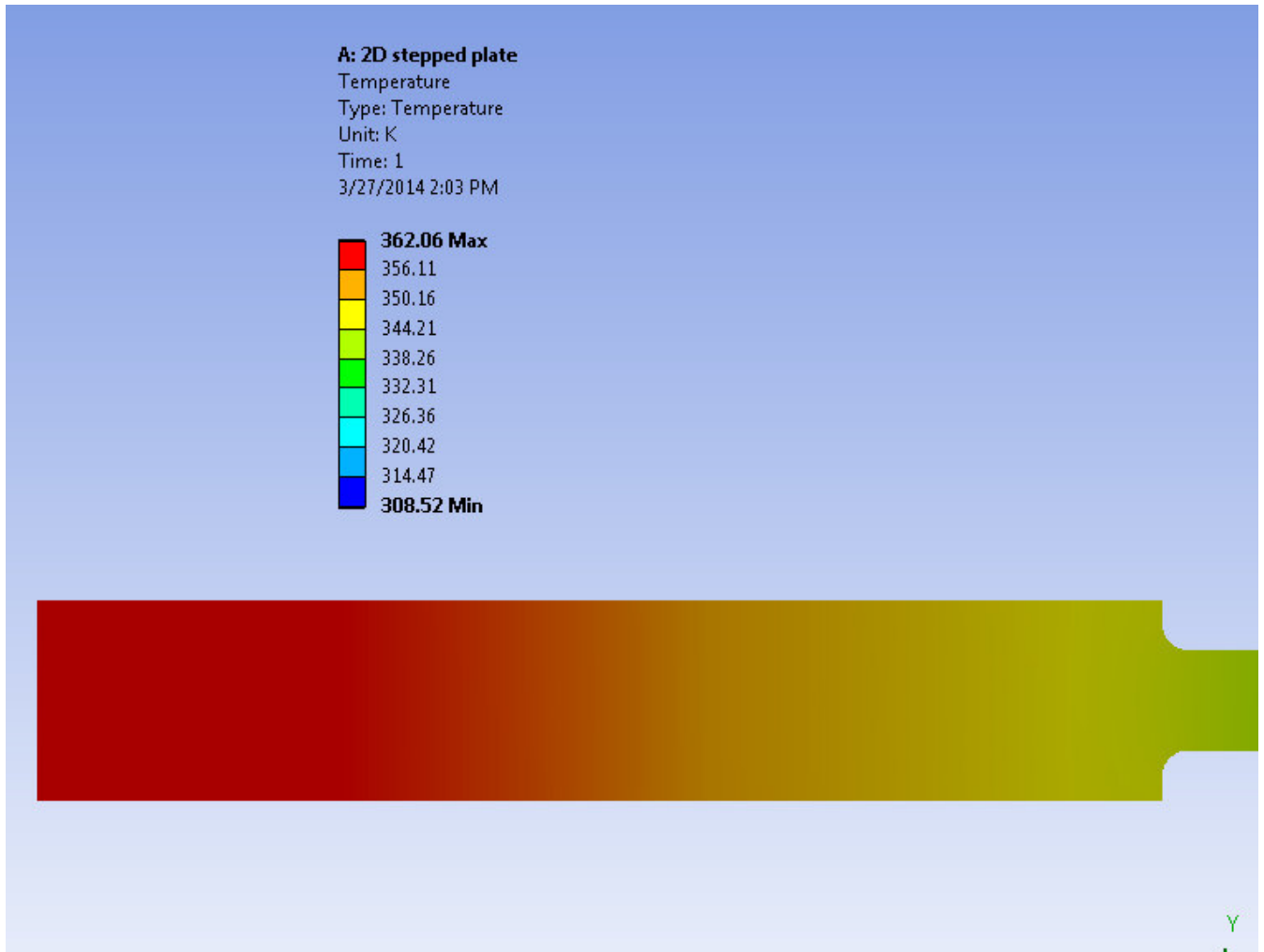


FIGURE 22

Model (A4, B4) > Steady-State Thermal (A5) > Solution (A6) > Temperature > 5052-O multilinear- no anodize water cool-1%-1GeV-200micro

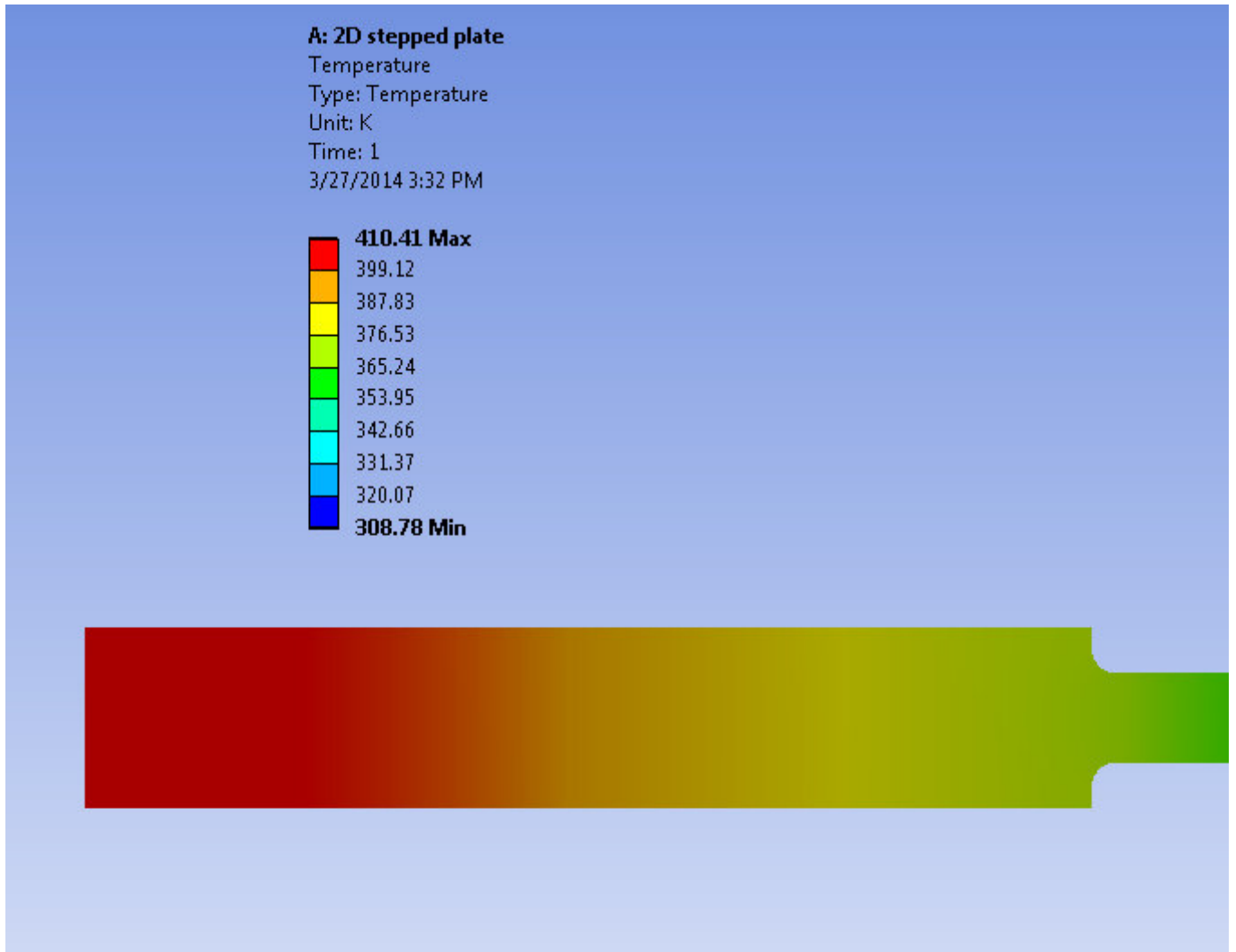


FIGURE 23

Model (A4, B4) > Steady-State Thermal (A5) > Solution (A6) > Temperature 2 > 5052-O multilinear-no anodize water cool-5%-1GeV-200micro

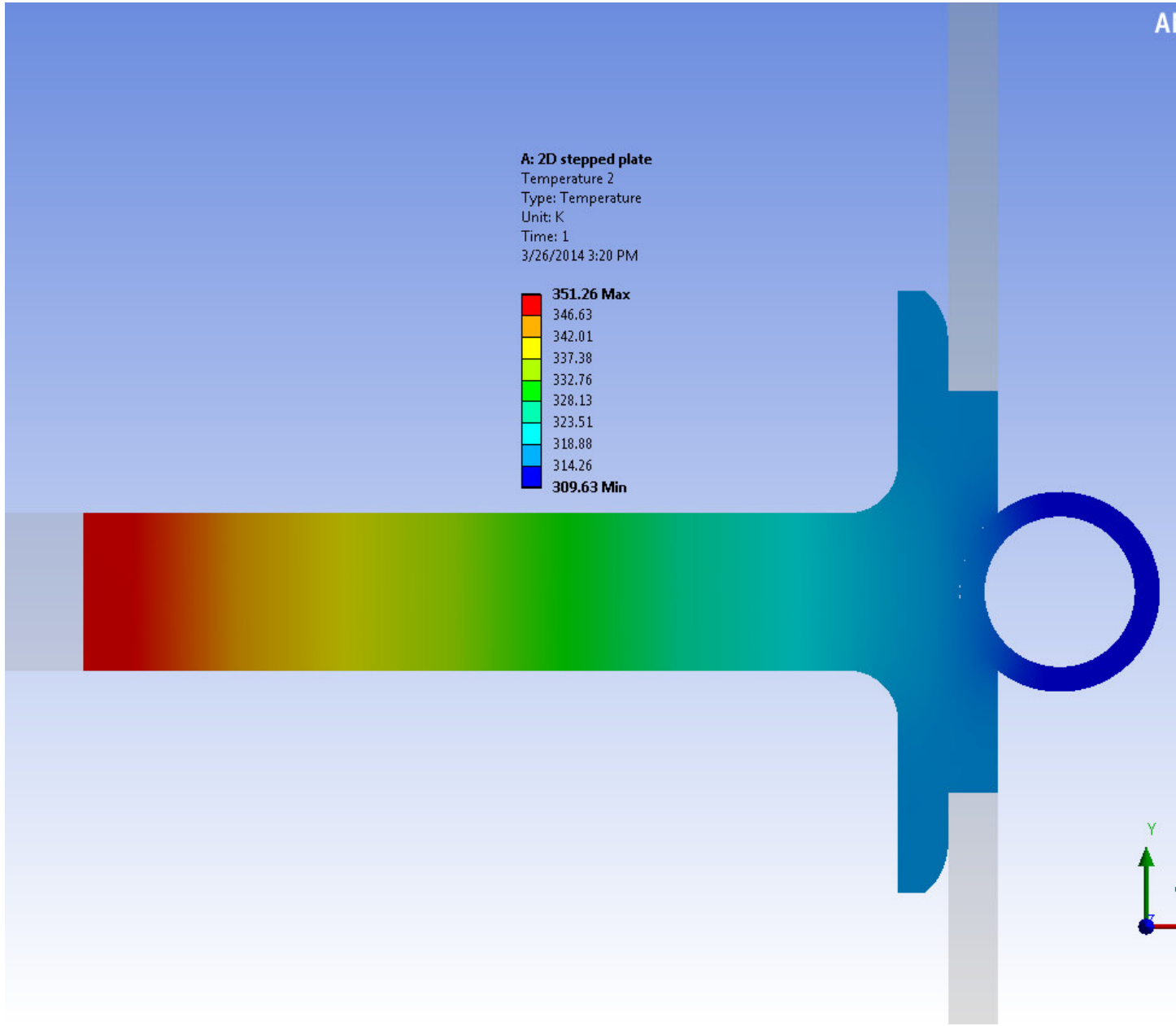


FIGURE 24

Model (A4, B4) > Steady-State Thermal (A5) > Solution (A6) > Temperature 2 > 5052-O multilinear-no anodize water cool-10%-1GeV-200micro

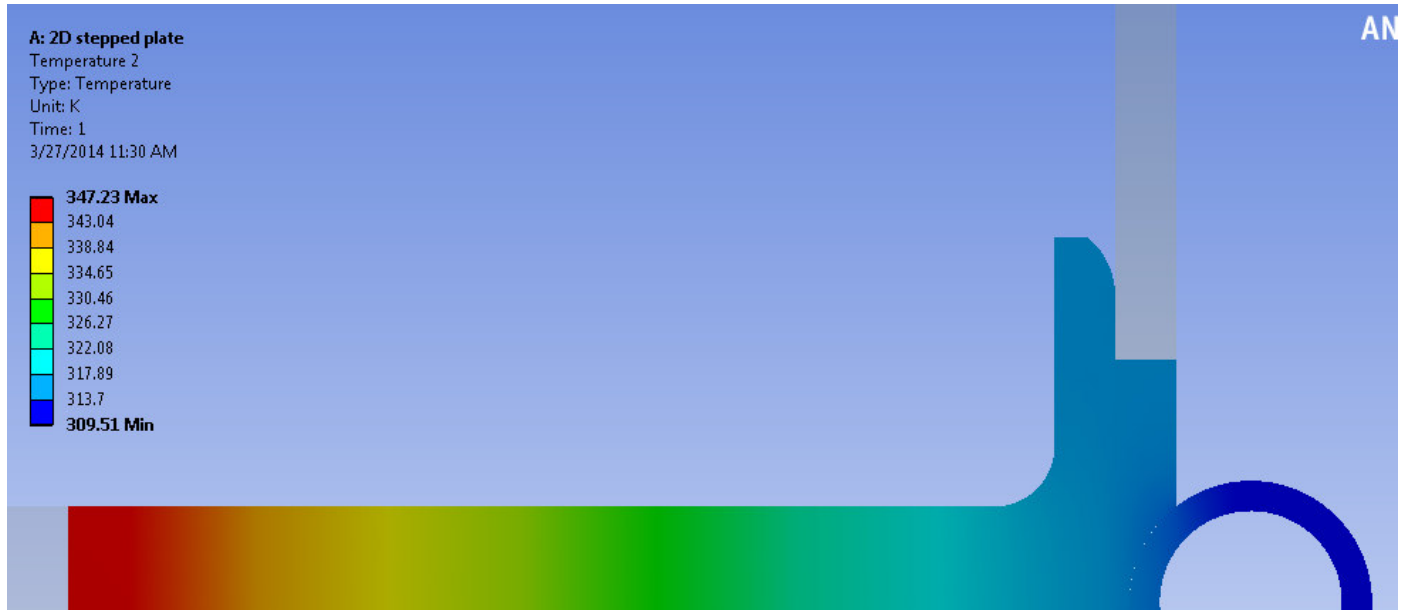


FIGURE 25

Model (A4, B4) > Steady-State Thermal (A5) > Solution (A6) > Temperature 2 > 5052-O multilinear-no anodize water cool-0.5%-1GeV-200micro

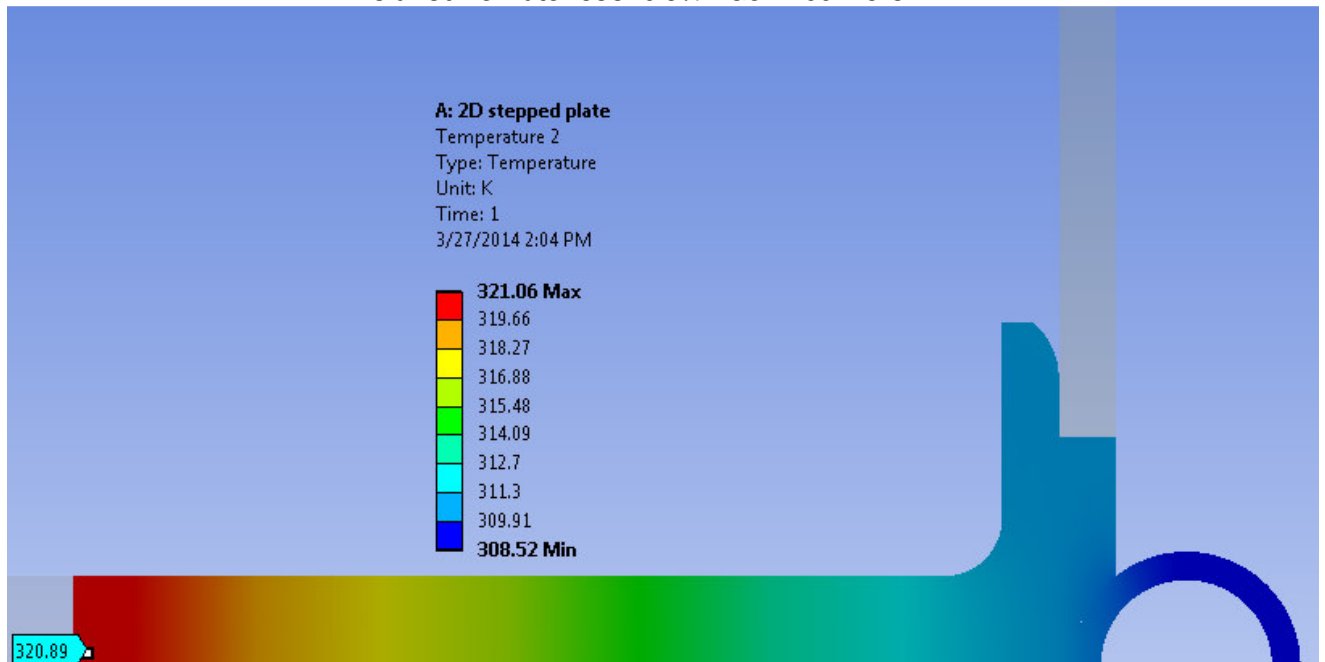


FIGURE 26

Model (A4, B4) > Steady-State Thermal (A5) > Solution (A6) > Temperature 2 > 5052-O multilinear-no anodize water cool-1%-1GeV-200micro

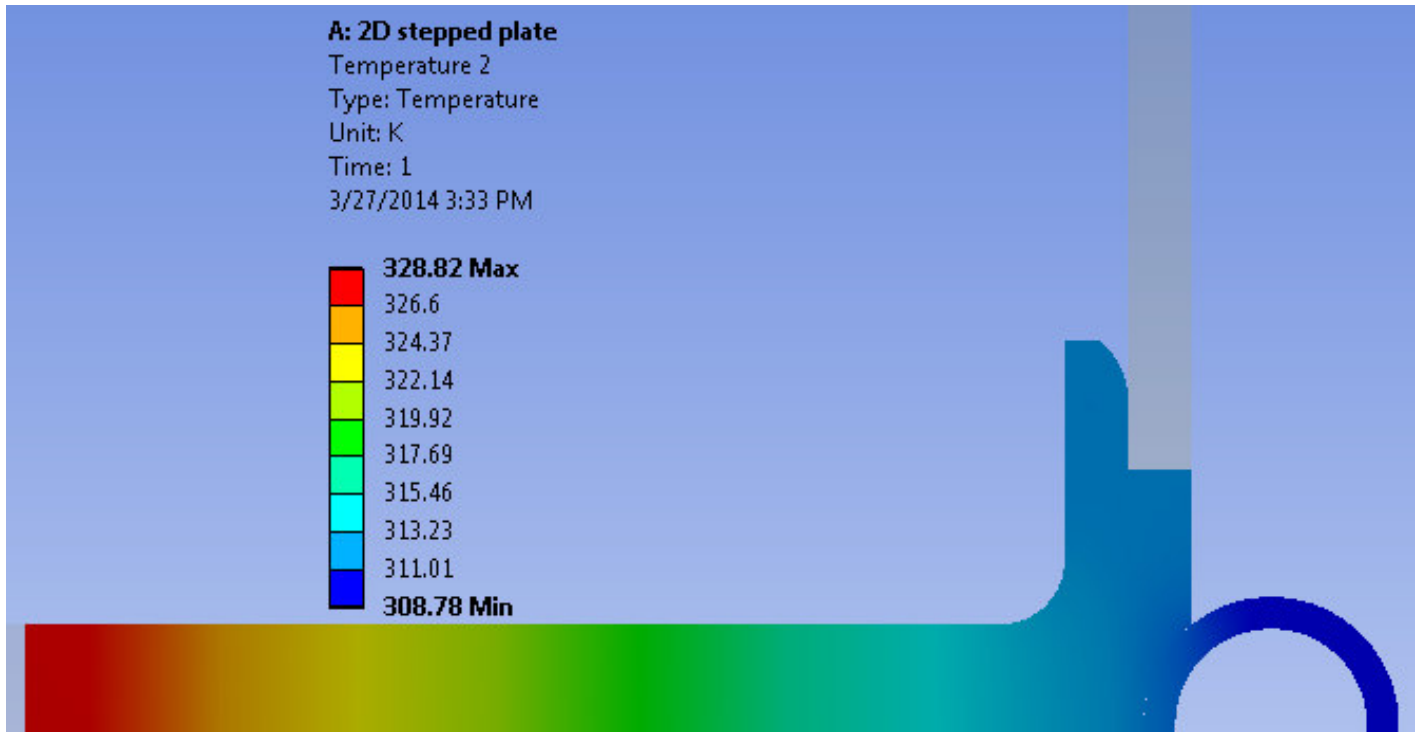


FIGURE 35

Model (A4, B4) > Static Structural (B5) > Solution (B6) > Equivalent Stress > 5052-O multilinear- no anodize water cool-5%-1GeV-200micro

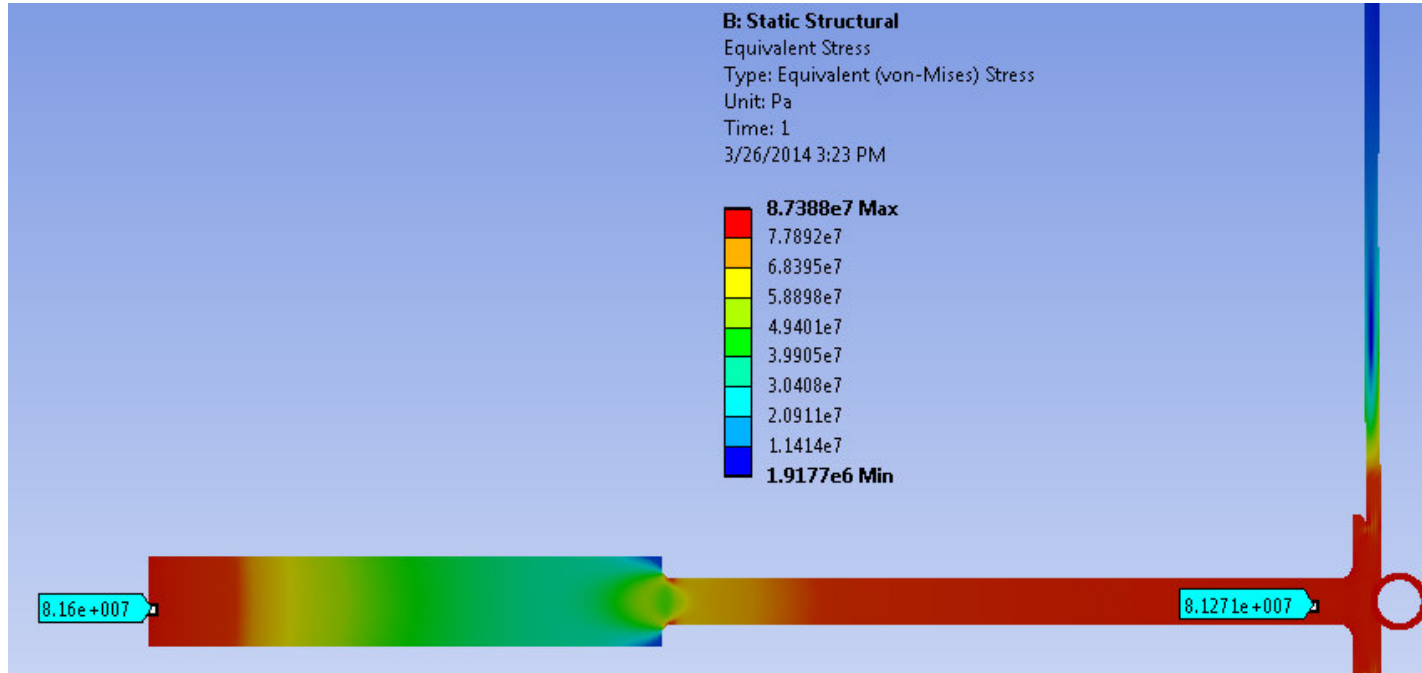


FIGURE 36

Model (A4, B4) > Static Structural (B5) > Solution (B6) > Equivalent Stress > 5052-O multilinear- no anodize water cool-10%-1GeV-200micro

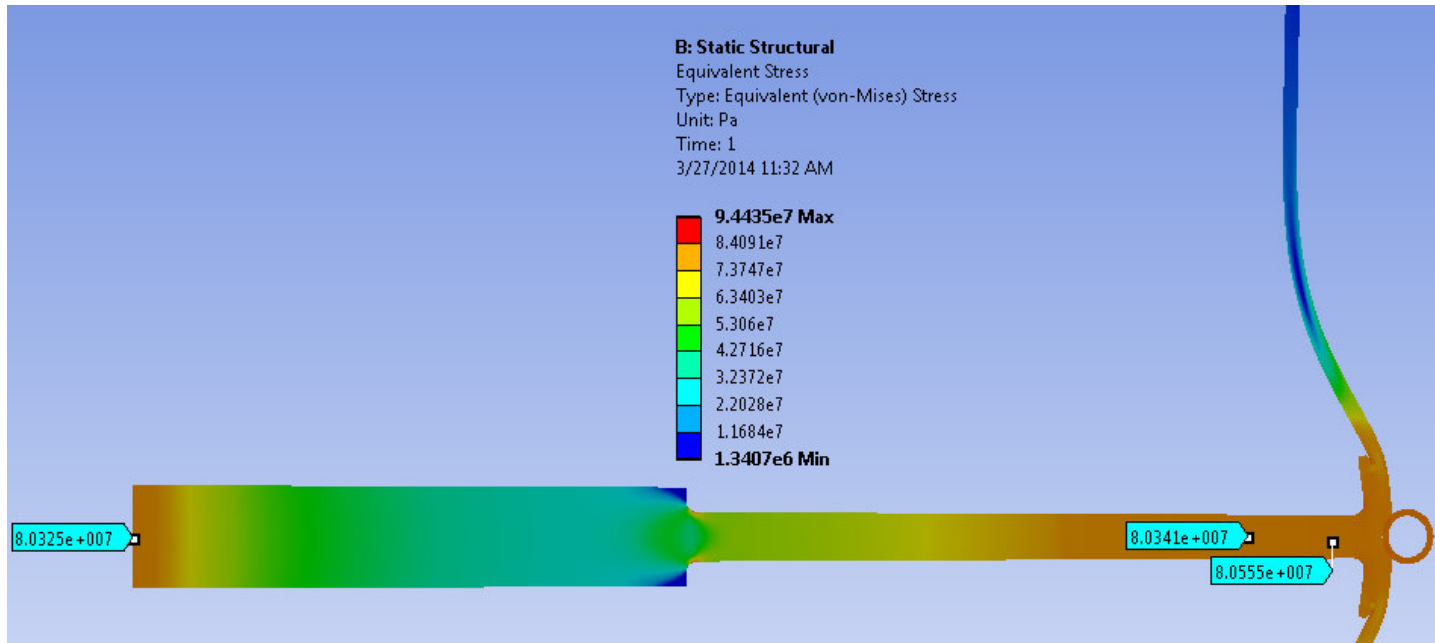


FIGURE 37

Model (A4, B4) > Static Structural (B5) > Solution (B6) > Equivalent Stress > 5052-O multilinear- no anodize water cool-0.5%-1GeV-200micro

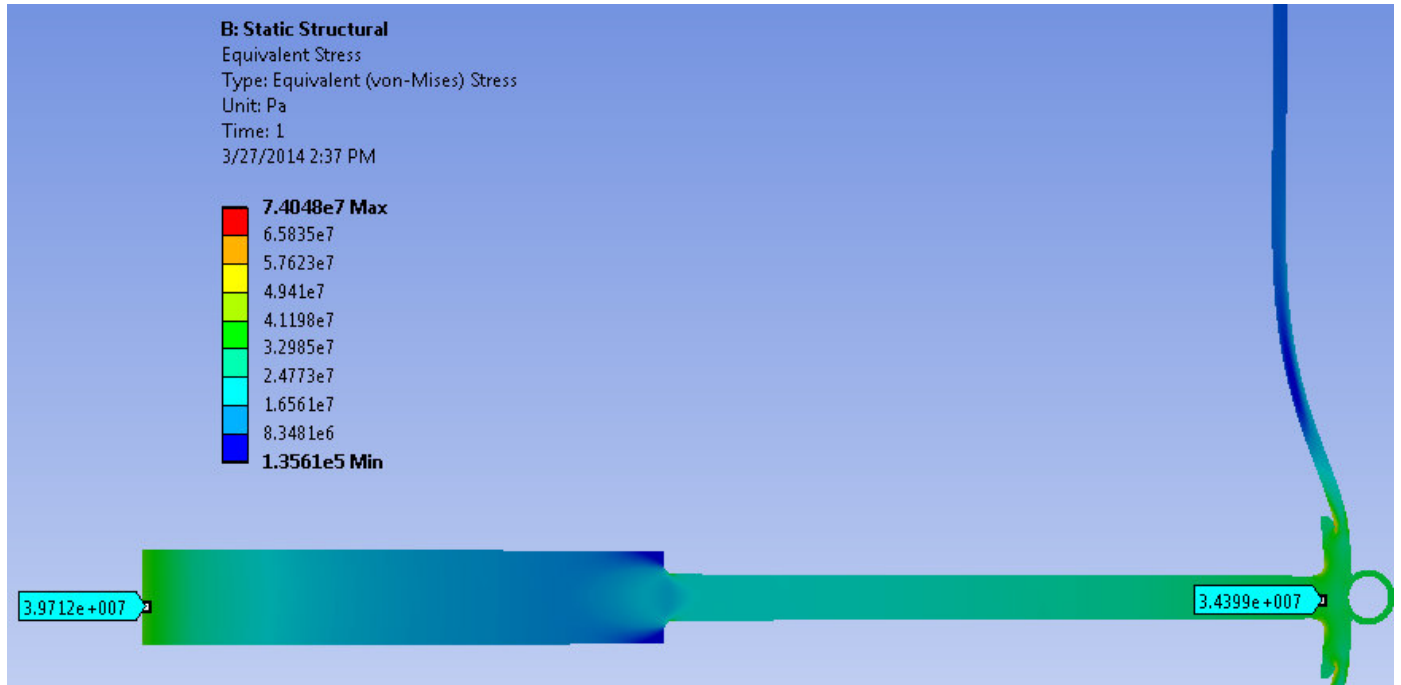


FIGURE 38

Model (A4, B4) > Static Structural (B5) > Solution (B6) > Equivalent Stress > 5052-O multilinear- no anodize water cool-1%-1GeV-200micro

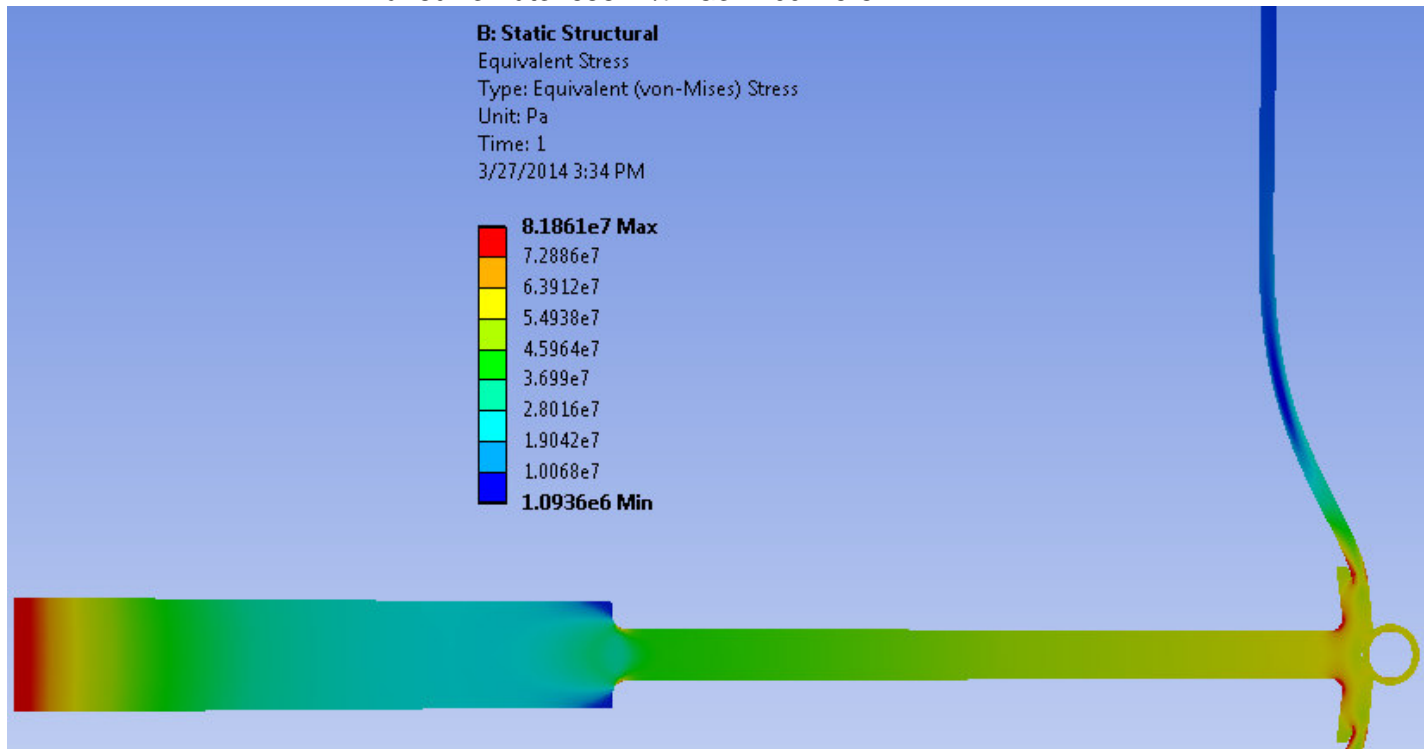


FIGURE 40

**Model (A4, B4) > Static Structural (B5) > Solution (B6) > Directional Deformation > 5052-O
multilinear- no anodize water cool-5%-1GeV-200micro**

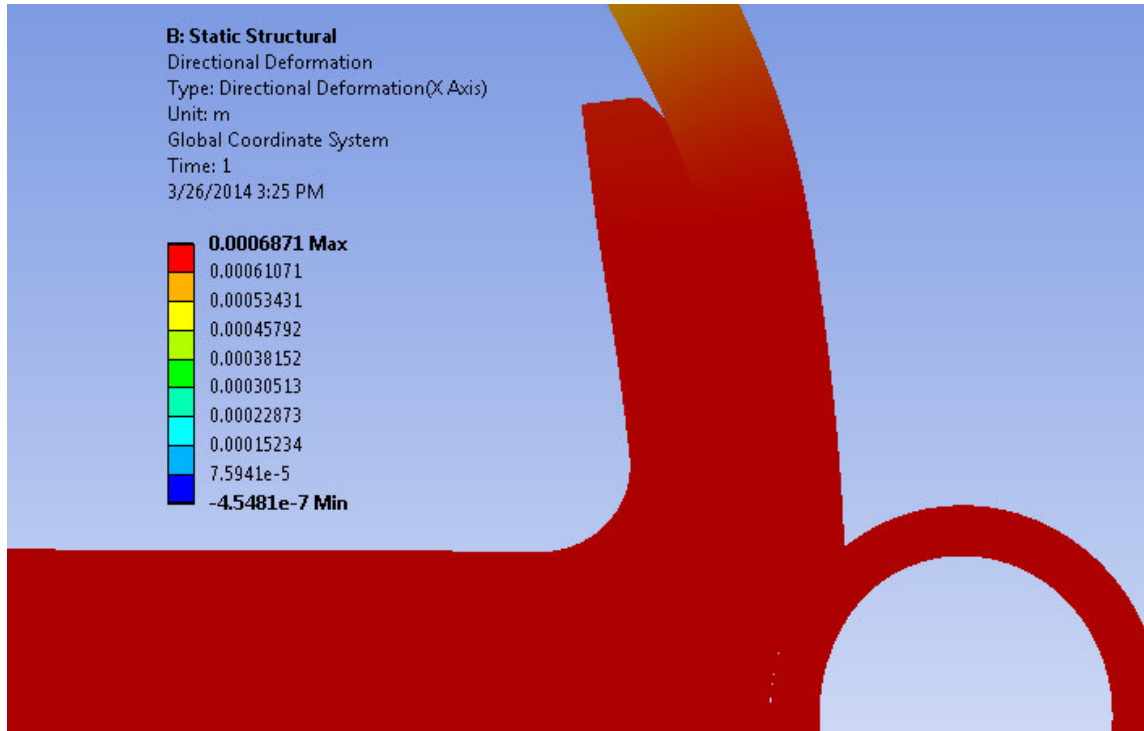


FIGURE 41

**Model (A4, B4) > Static Structural (B5) > Solution (B6) > Directional Deformation > 5052-O
multilinear- no anodize water cool-10%-1GeV-200micro**

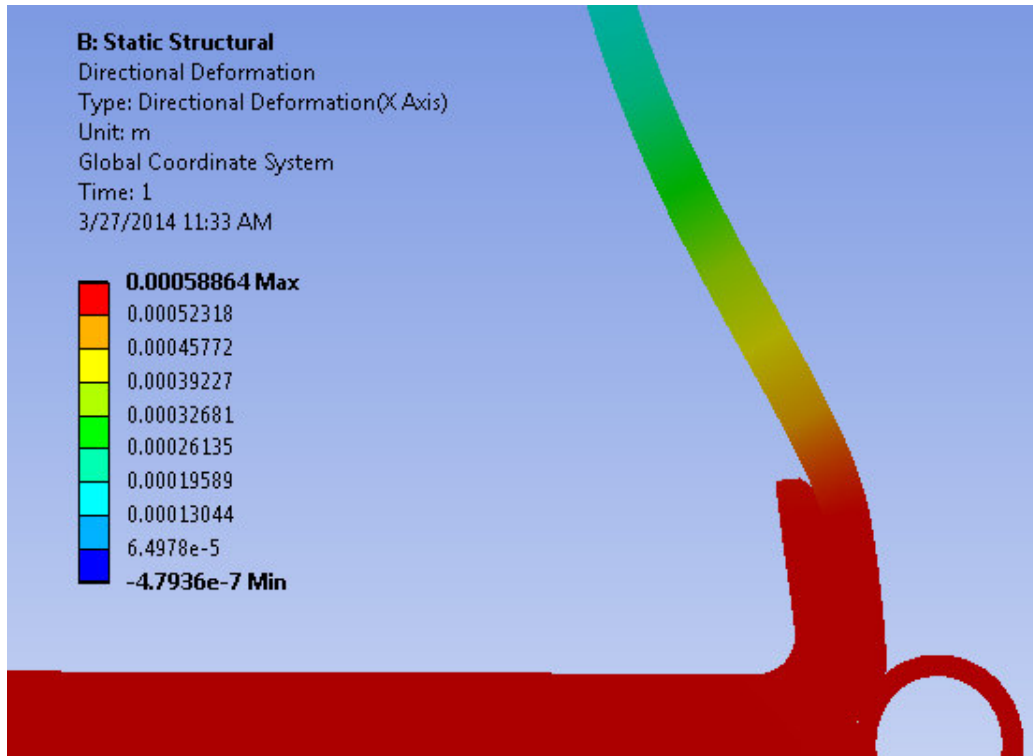


FIGURE 45

Model (A4, B4) > Static Structural (B5) > Solution (B6) > Equivalent Plastic Strain 2 > 5052-O multilinear- no anodize water cool-5%-1GeV-200micro

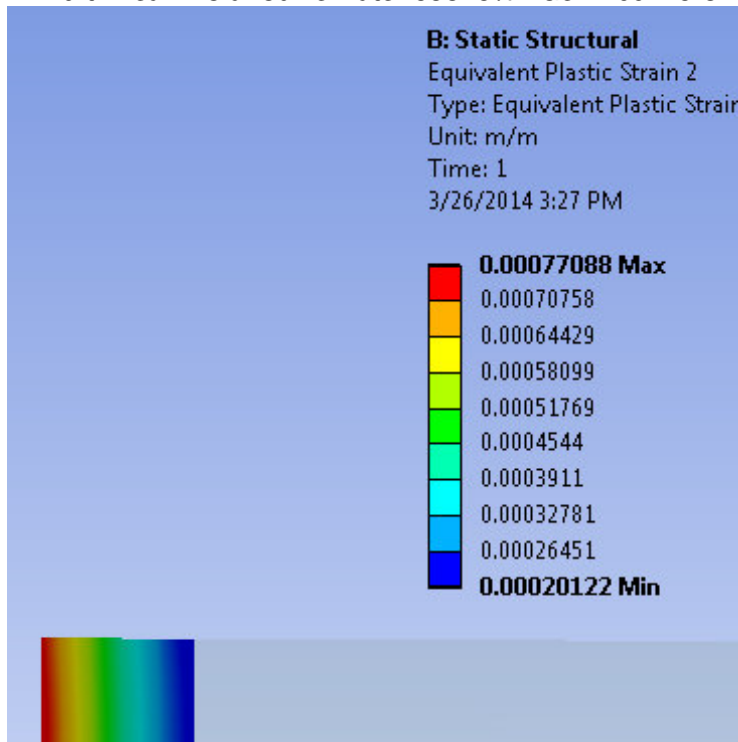


FIGURE 46

Model (A4, B4) > Static Structural (B5) > Solution (B6) > Equivalent Plastic Strain 2 > 5052-O multilinear- no anodize water cool-10%-1GeV-200micro

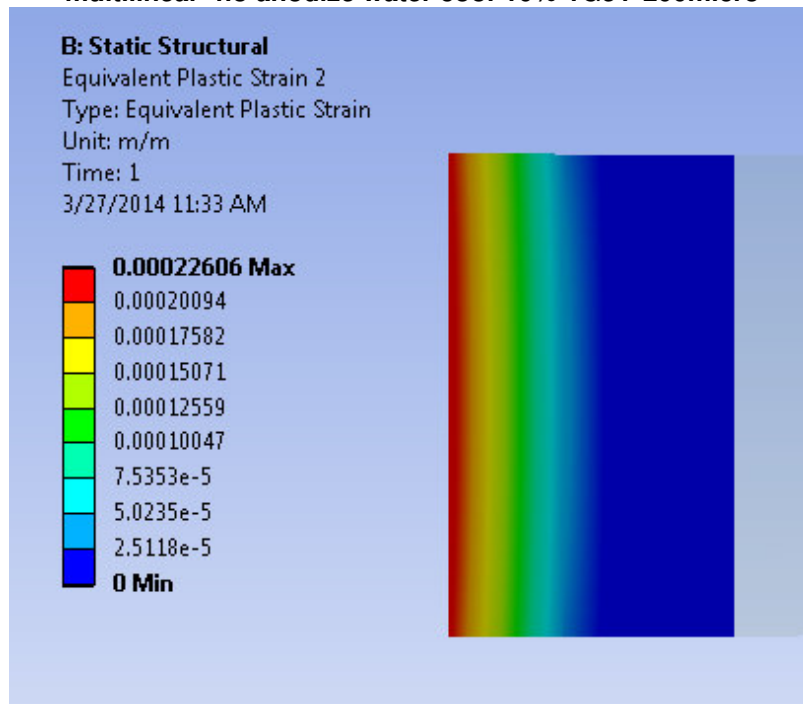


FIGURE 47

**Model (A4, B4) > Static Structural (B5) > Solution (B6) > Equivalent Plastic Strain 2 > 5052-O
multilinear- no anodize water cool-0.5%-1GeV-200micro**

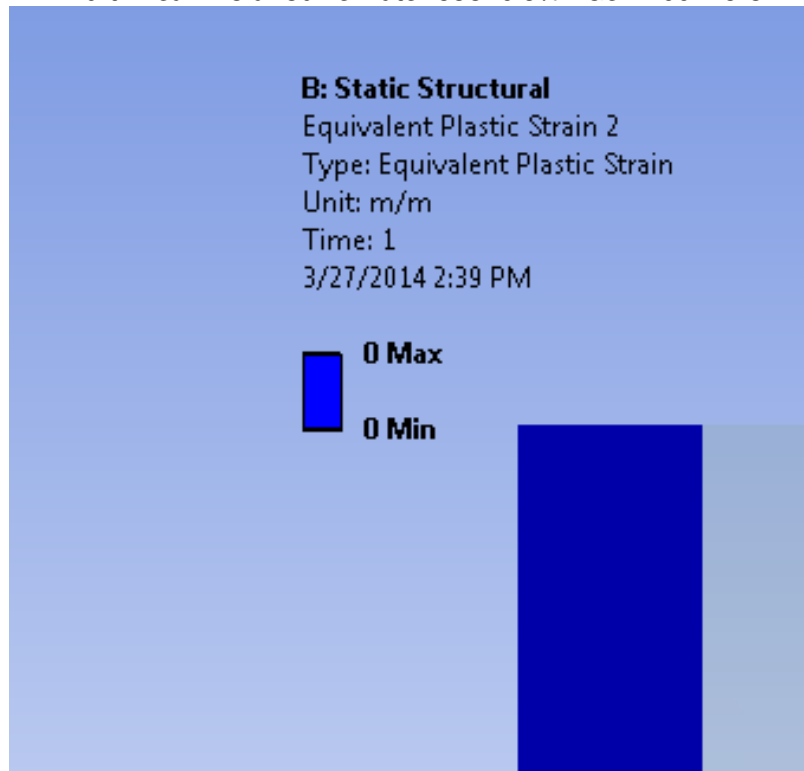


FIGURE 48

**Model (A4, B4) > Static Structural (B5) > Solution (B6) > Equivalent Plastic Strain 2 > 5052-O
multilinear- no anodize water cool-1%-1GeV-200micro**

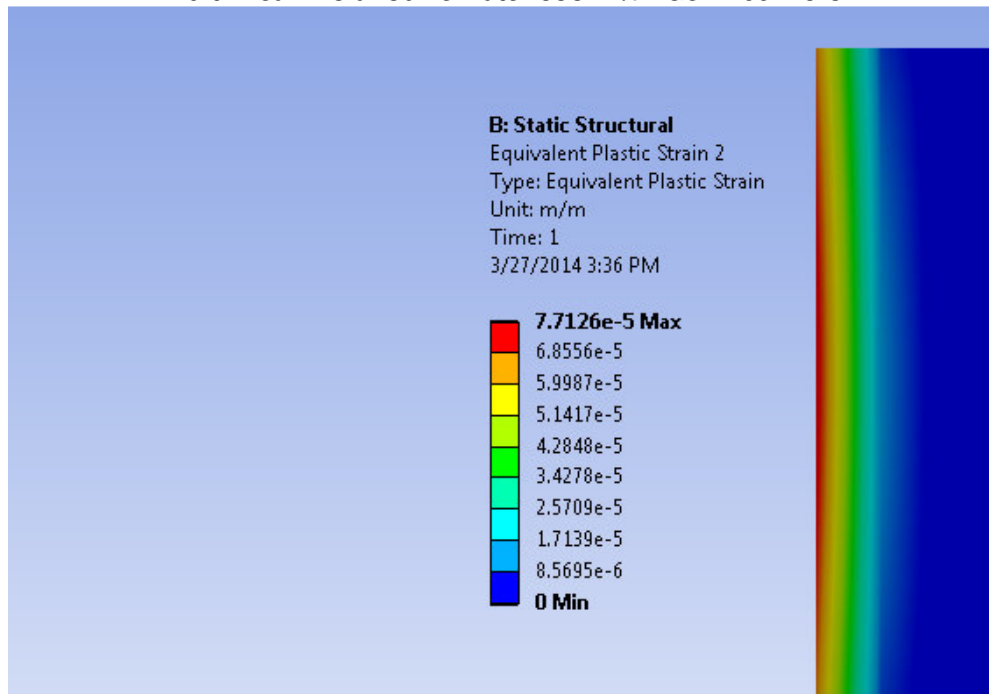


FIGURE 50

Model (A4, B4) > Static Structural (B5) > Solution (B6) > Equivalent Stress 3 > 5052-O multilinear-no anodize water cool-5%-1GeV-200micro

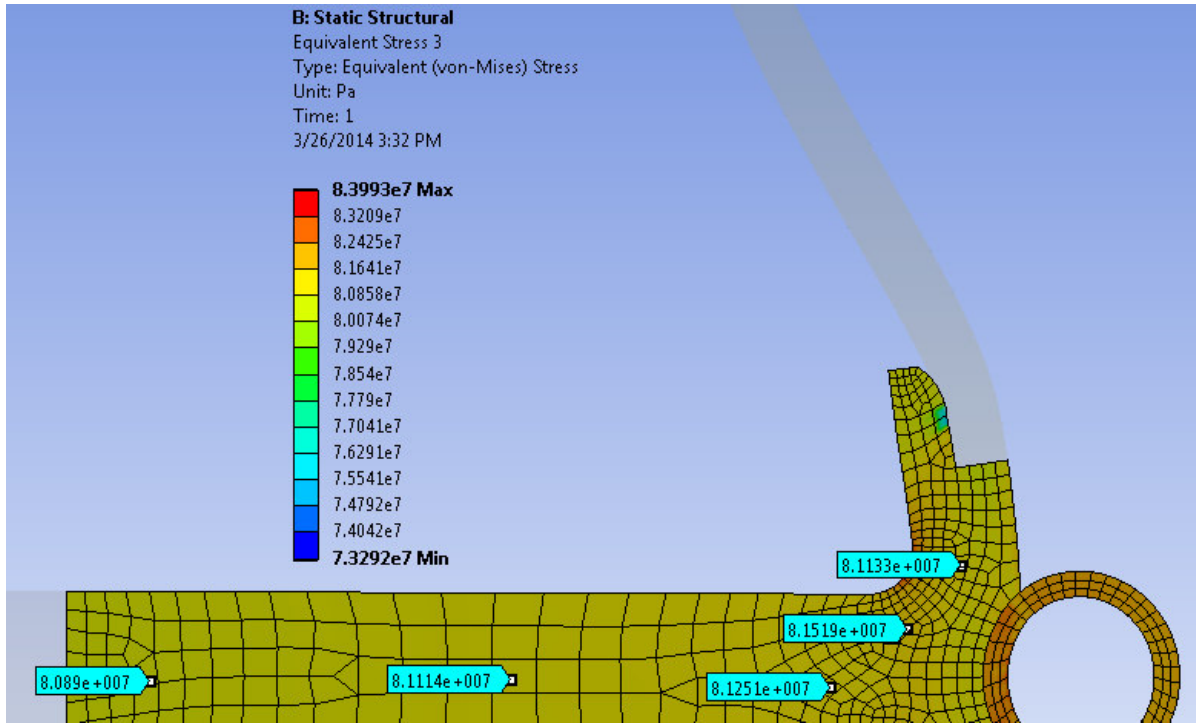


FIGURE 51

Model (A4, B4) > Static Structural (B5) > Solution (B6) > Equivalent Stress 3 > 5052-O multilinear-no anodize water cool-10%-1GeV-200micro

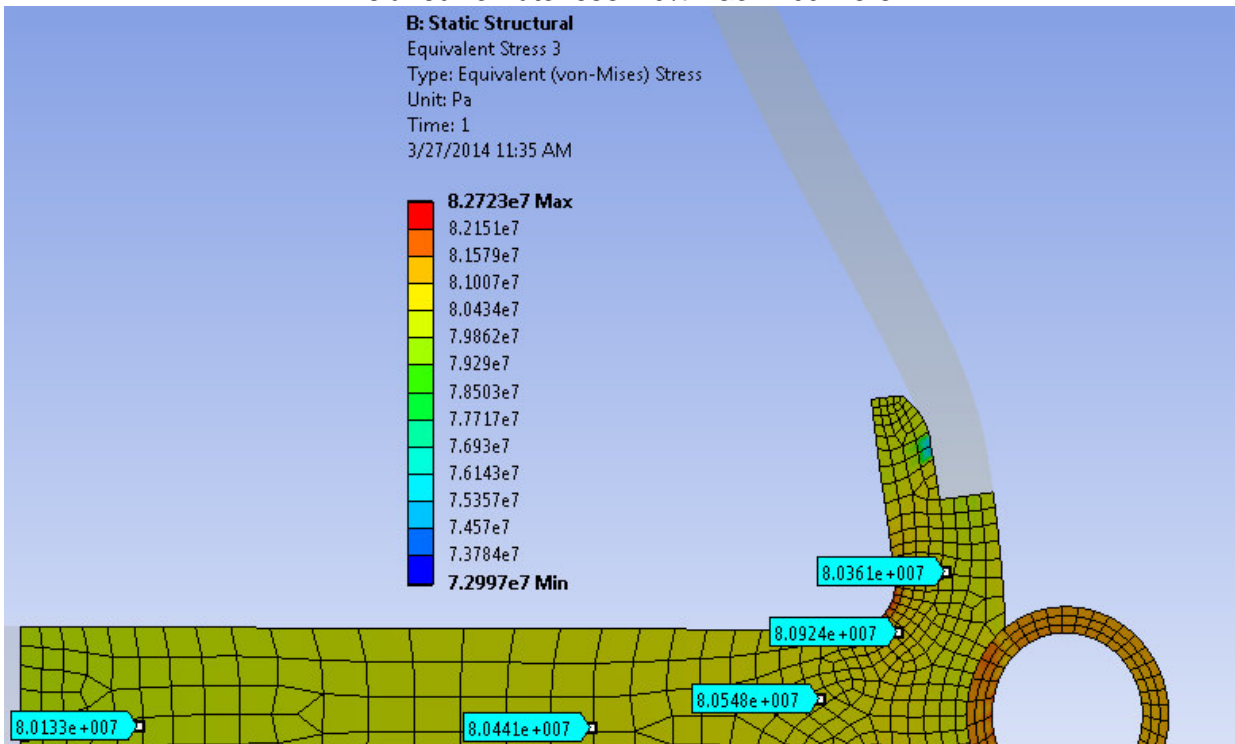


FIGURE 52

Model (A4, B4) > Static Structural (B5) > Solution (B6) > Equivalent Stress 3 > 5052-O multilinear-no anodize water cool-0.5%-1GeV-200micro

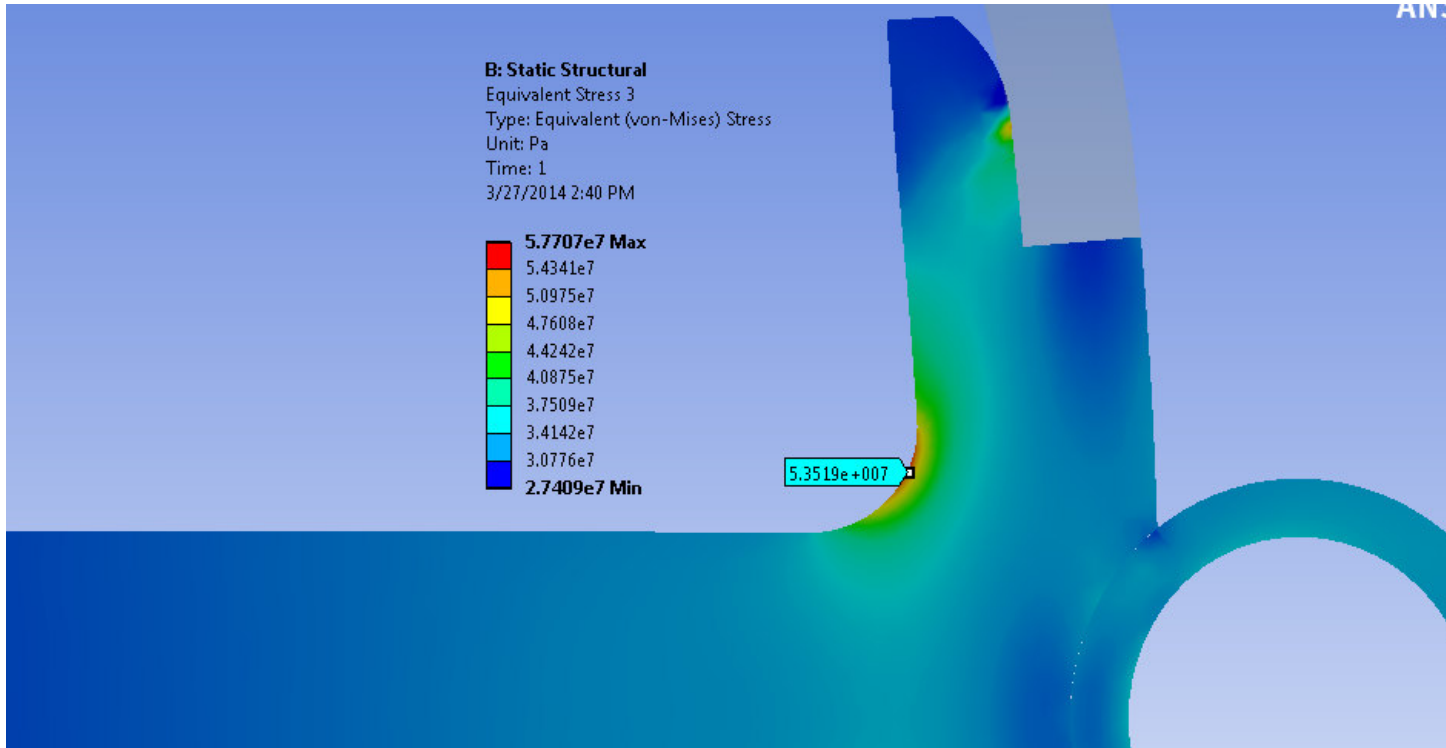


FIGURE 53

Model (A4, B4) > Static Structural (B5) > Solution (B6) > Equivalent Stress 3 > 5052-O multilinear-no anodize water cool-1%-1GeV-200micro

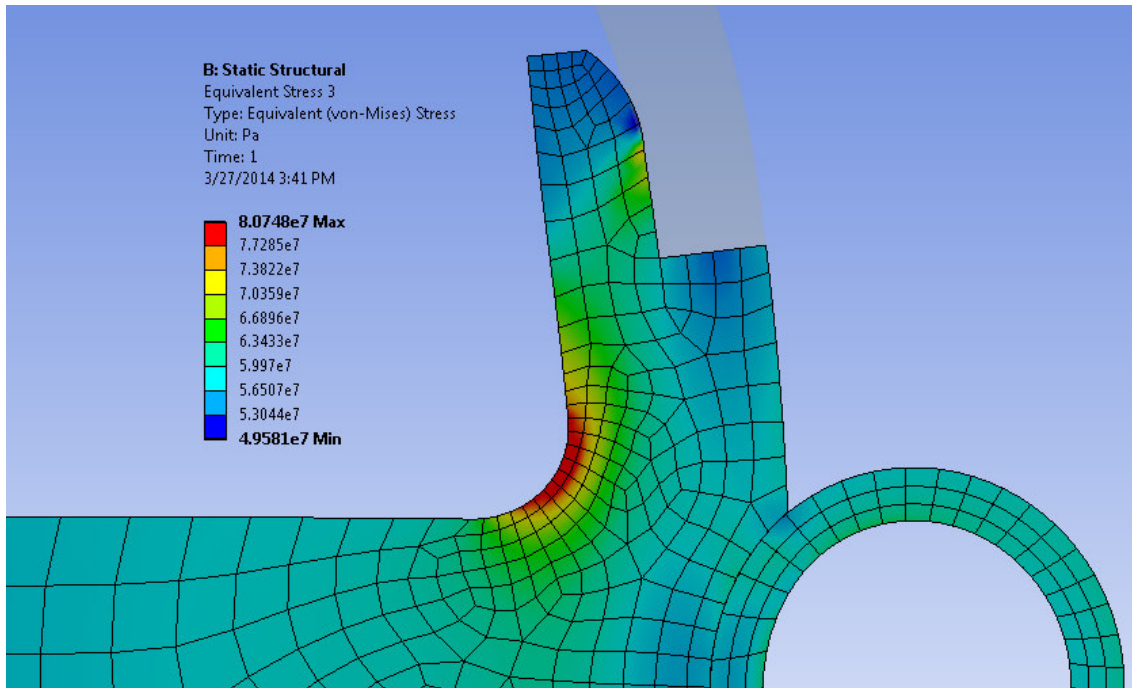


FIGURE 54
Model (A4, B4) > Static Structural (B5) > 5052-O yield stress plot

