



# MQXF v LQS Magnet Design Stress Analysis under Quench

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## Aims:

Simulate the following steps on MQXF and LQS magnets and analyze radial, azimuthal, and equivalent (Von Mises) Stress throughout the respective coils:

- Step 1: Keys
- Step 2: Cool-Down (to 4.3 kelvin)
- Step 3: Electromagnetic Forces (Nominal Field from magnet input file)
- Step 4: Quench (heated to 150 kelvin, removed electromagnetic forces)

[For the stress plots, you can zoom in to see the color codes and stress numbers but for a rough idea, the numbers are summarized in the last slide and the colors follow the following pattern: For Eqv Stress, the red areas are the peak and the blue ones are minimum stress; For Sx and Sy, the blue areas are peaks and red ones are least stress.]

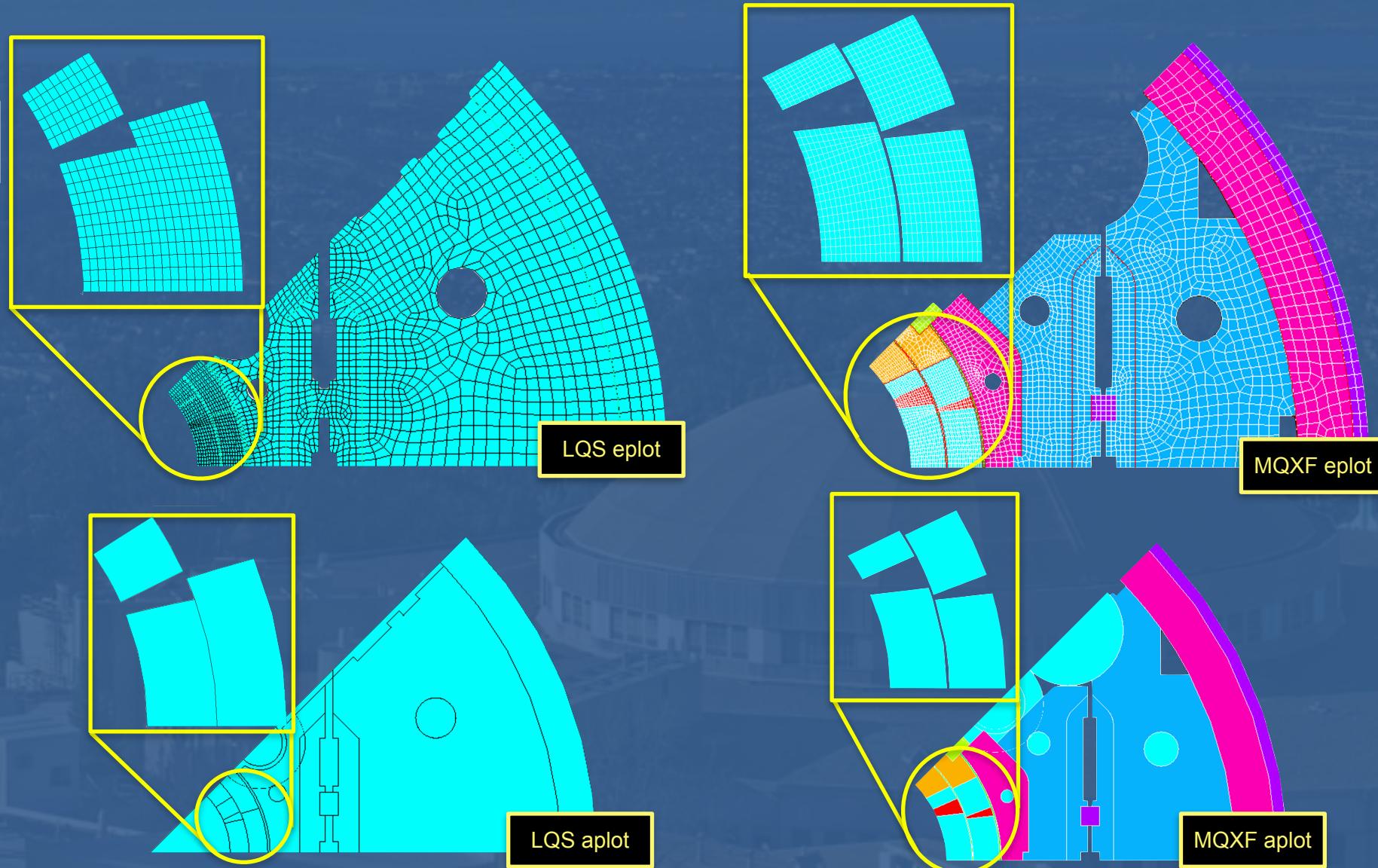


# BERKELEY LAB

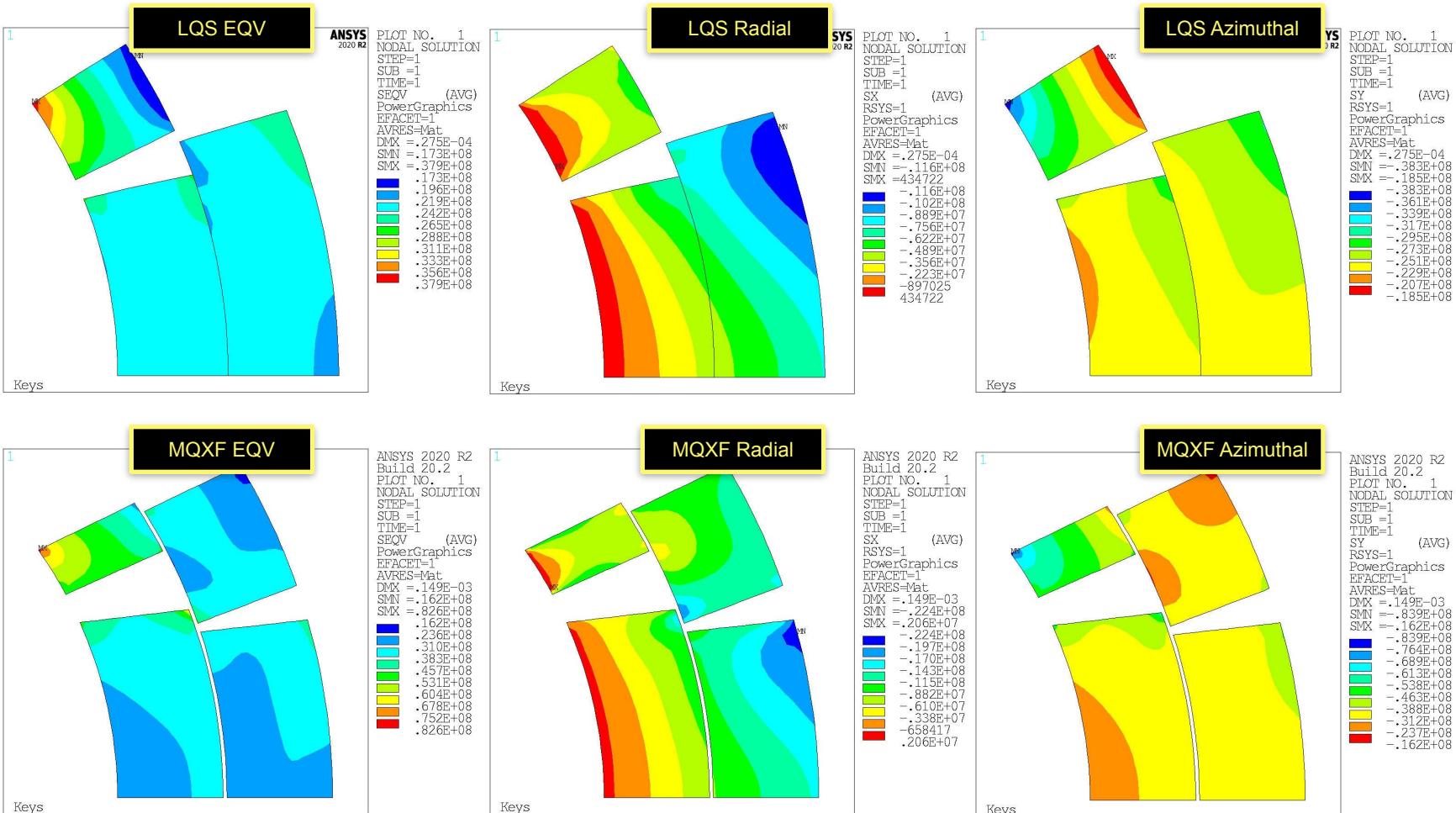
LAWRENCE BERKELEY NATIONAL LABORATORY



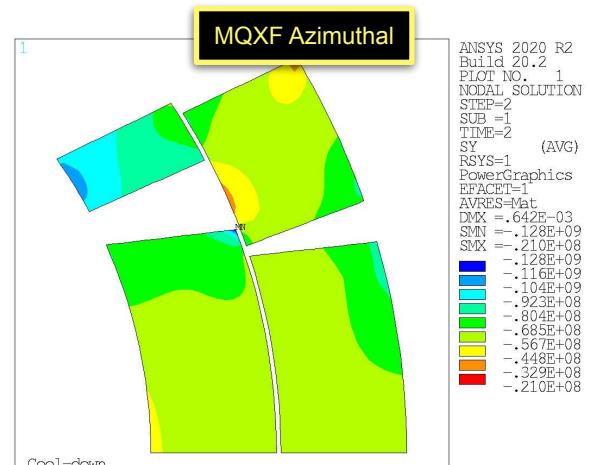
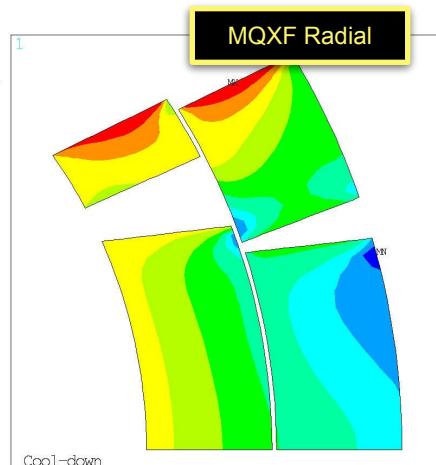
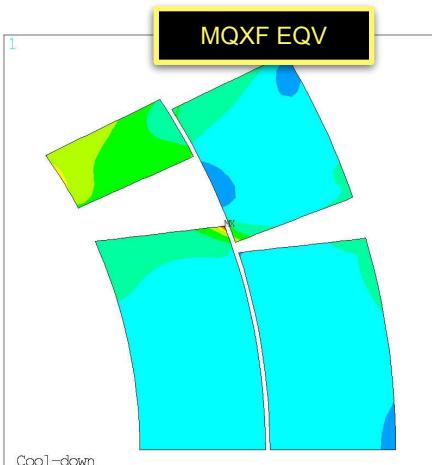
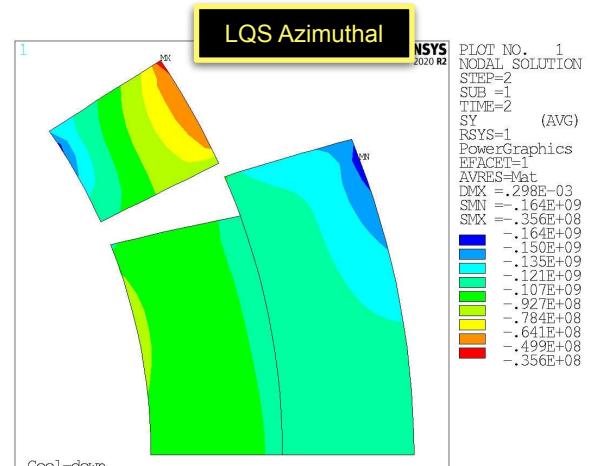
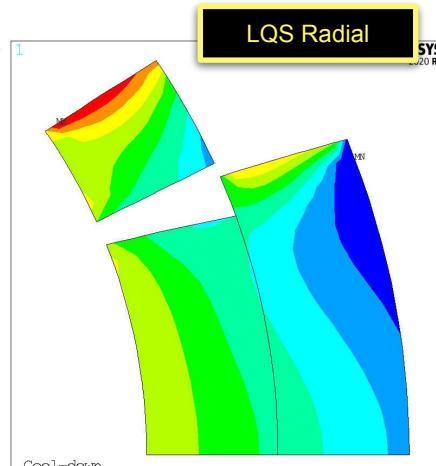
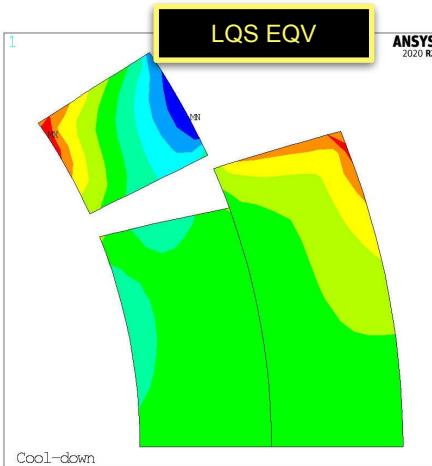
U.S. DEPARTMENT OF  
**ENERGY**



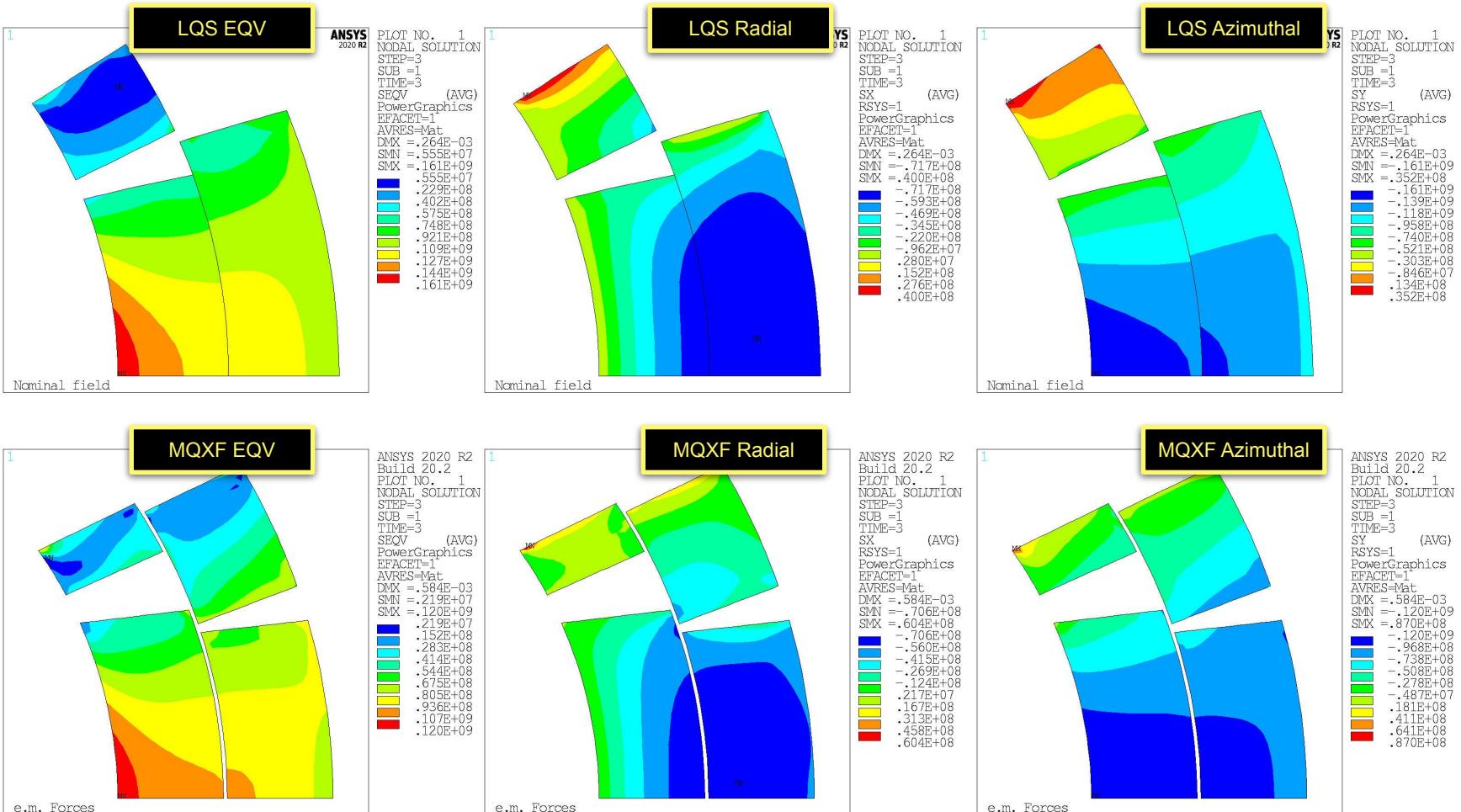
# Step 1 : Keys



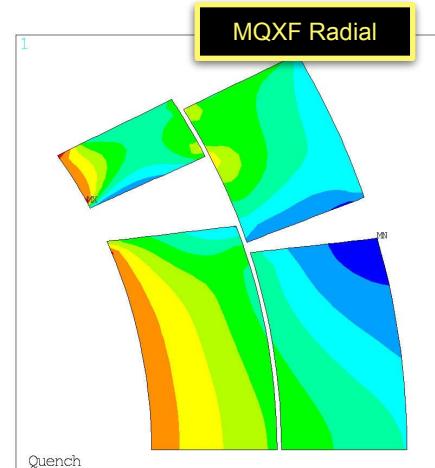
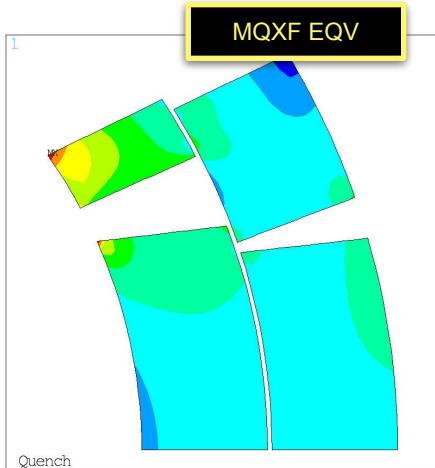
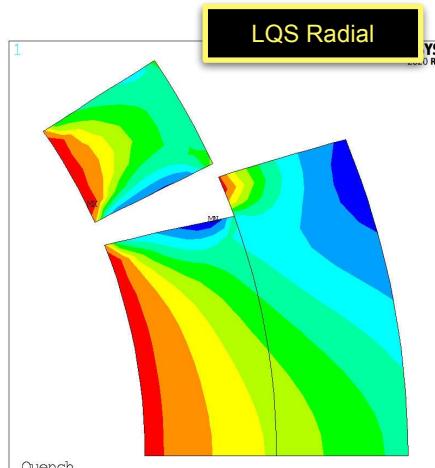
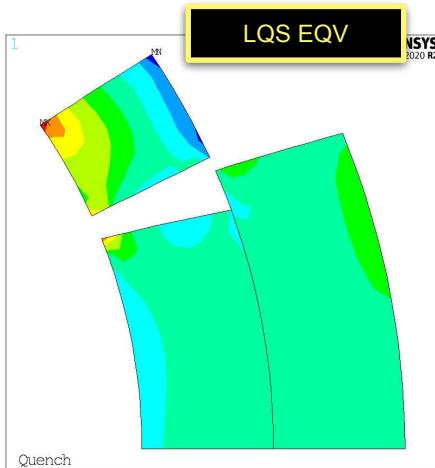
# Step 2 : Cool-Down



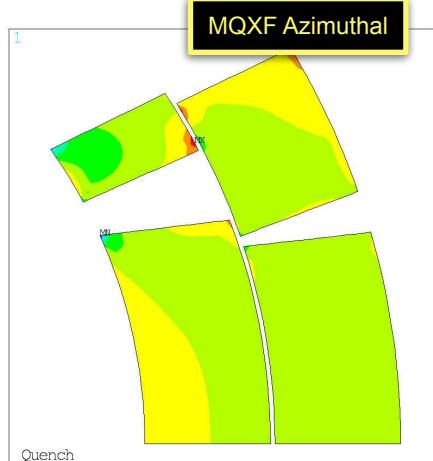
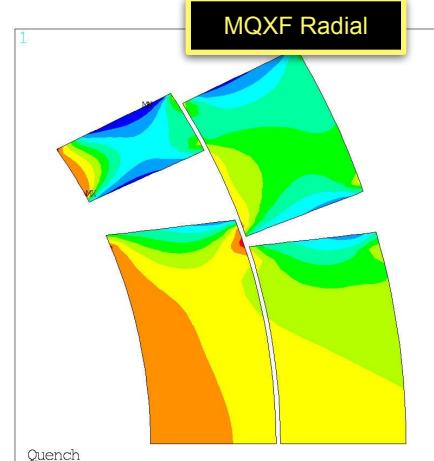
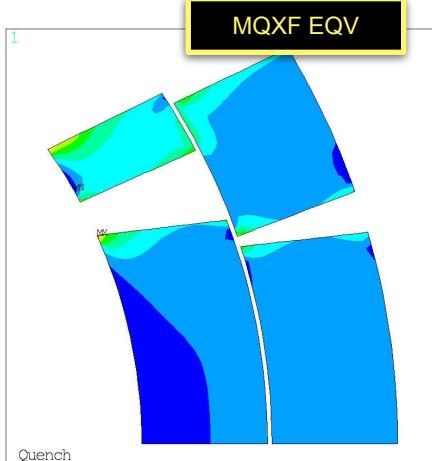
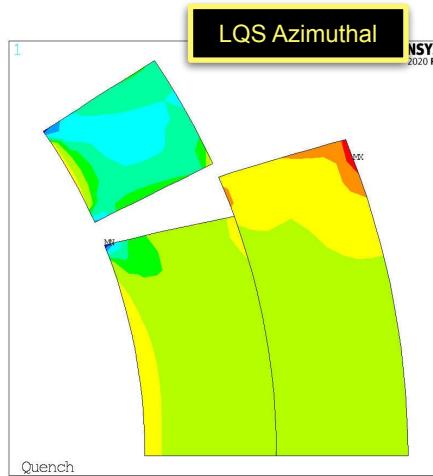
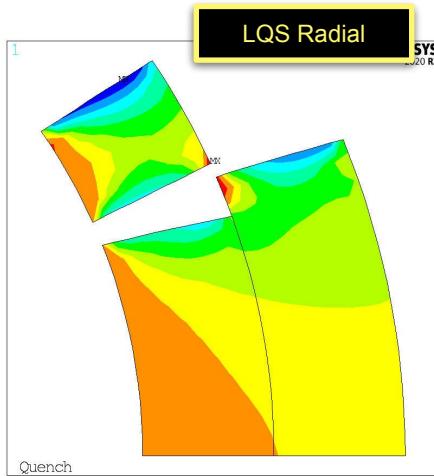
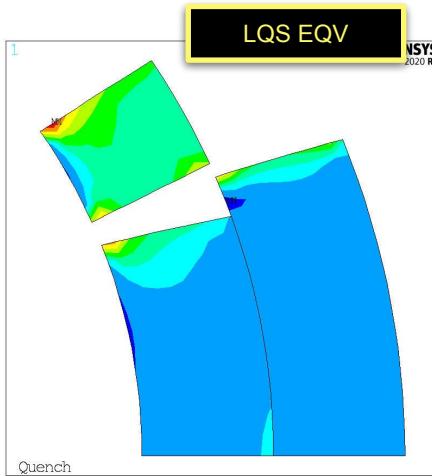
# Step 3 : EM Forces



# Step 4 : Quench



# Sub: Quench - Cool-Down



# Stress Peaks Summary

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Magnet Stress Profile (MPa)

Step/Magnet	LQS01			MQXF		
Stress	Seqv	Sxx	Syy	Seqv	Sxx	Syy
Keys	38	-12	-38	83	-22	-84
Cool-Down	154	-44	-164	153	-407	-128
EM Forces	161	-72	-161	120	-71	-120
Quench	206	-67	-210	180	-55	-184
Quench - CoolDown	99	-63	-80	108	-46	-108