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Design of Gridded-Tube Structures for the 201.25 MHz RF Cavity

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Design considerations

- Design variables:

  Tube outer diameter, wall thickness

  Geometrical configuration:

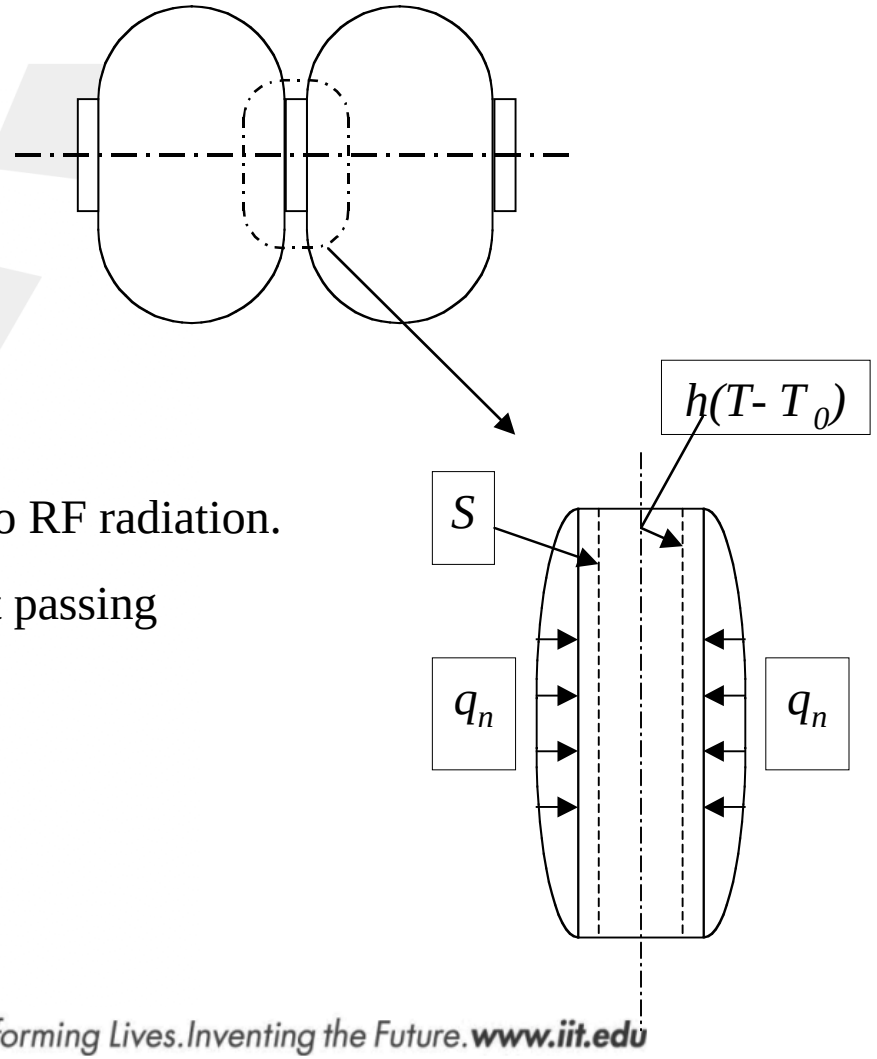
  - Grid spacing between tubes
  - Gap between tubes

  Type of coolant flowing inside the tubes and flow rate

- Design objective:

  Select design variables to keep stresses/out-of-plane deflection within the acceptable limits

Heat transfer considerations



Heating of aluminum tubes due to RF radiation.

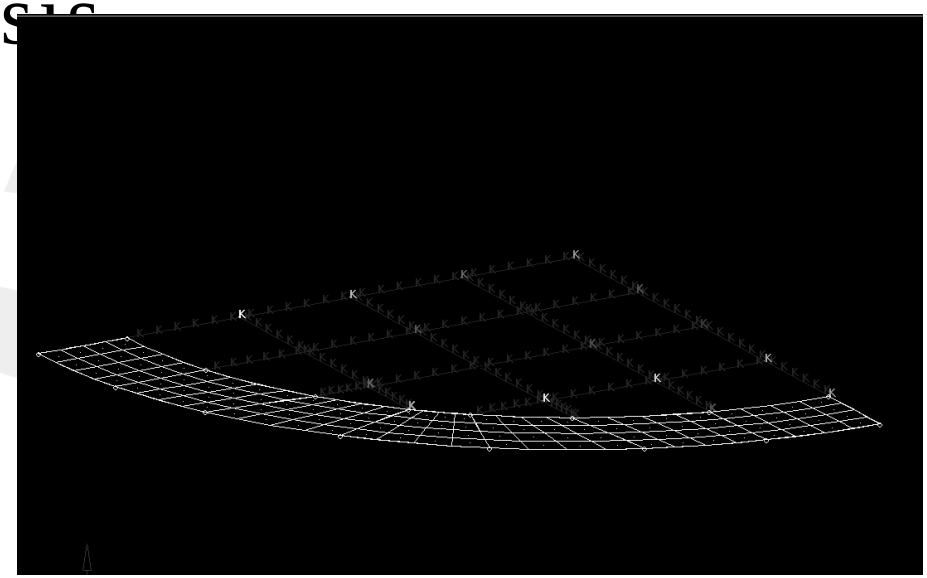
Forced convection due to coolant passing through the tubes.

Thermal stress analysis

- Structural finite element model

  Beam elements to model the tubes

  Shell elements to model the ring structure



- Mechanical properties and dimensions:

***E* (GPa)**	***v***	$\alpha \ \frac{\times 10^{-6}}{^{\circ}C}$
68	0.33	24

Ro (in)	***t (in)***	***D (in)***
0.75	0.001	16.55

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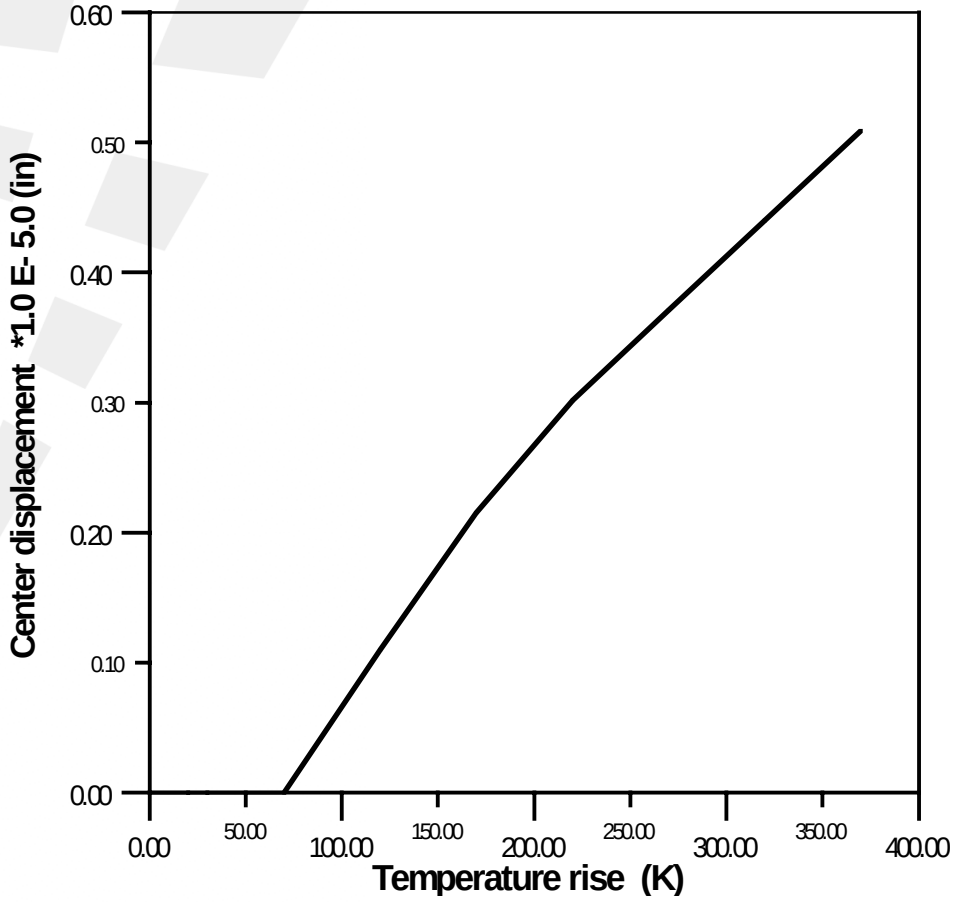
Gridded-tube structure subjected to unifor temperature increase

- ABAQUS
- Thermal buckling occurs at a temperature rise of 69 K



Present focus

Complete heat transfer analysis (collaboration with R. Rimmer)

Perform thermal stress analysis

Selection of design variables