Issues related to the ring heaters

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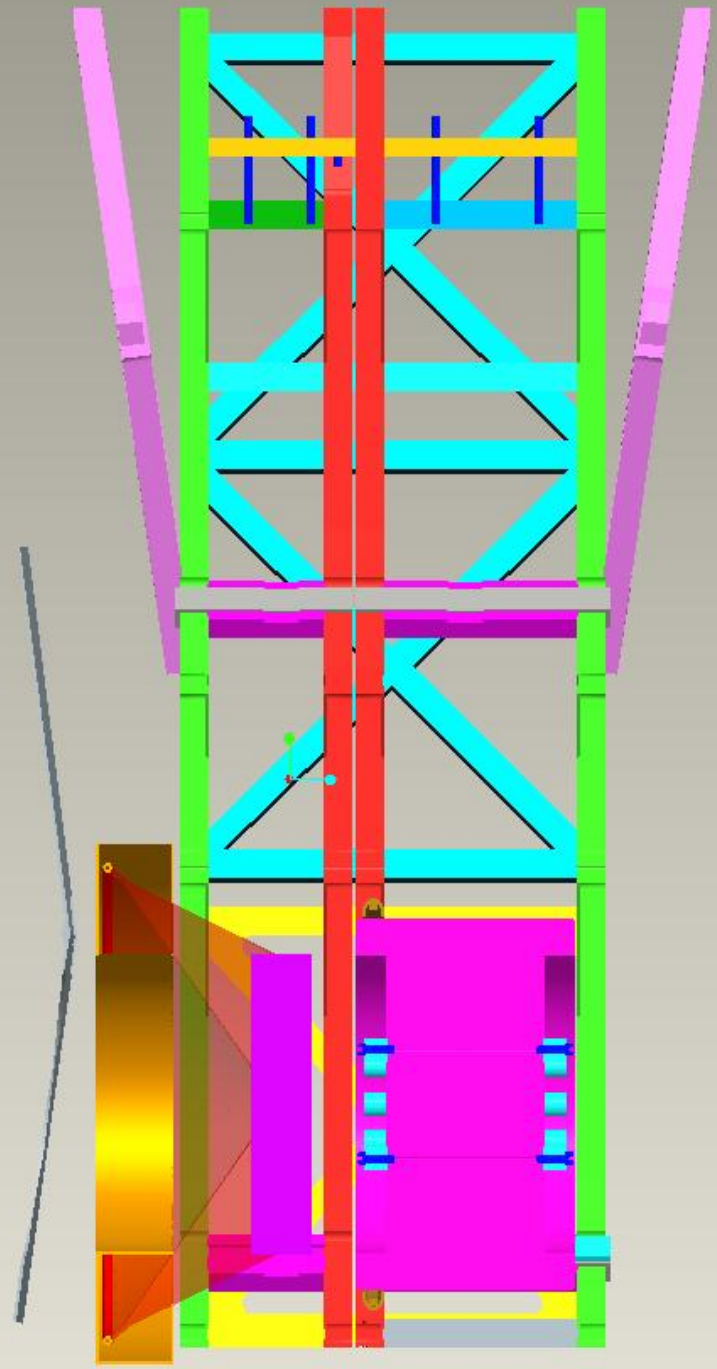
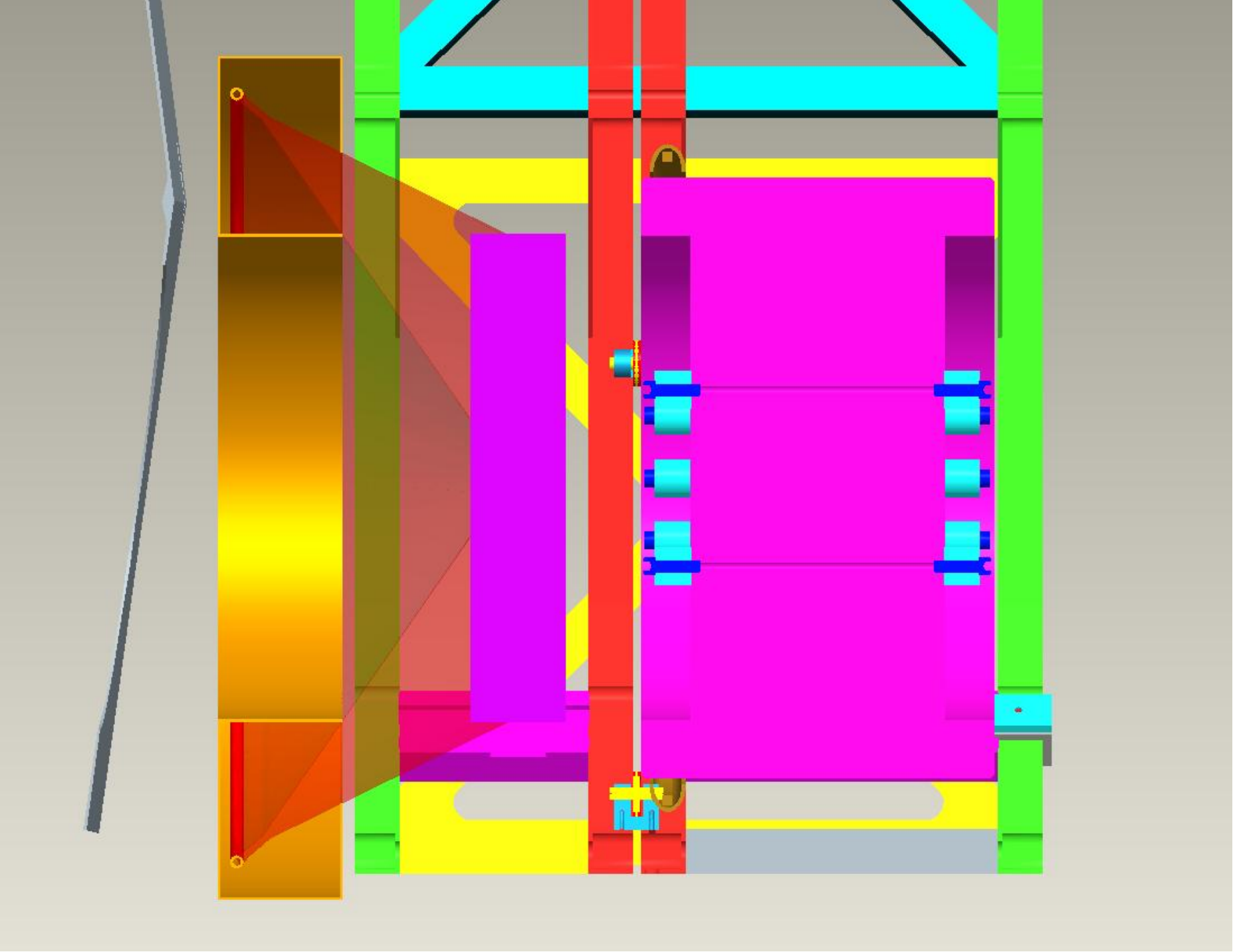
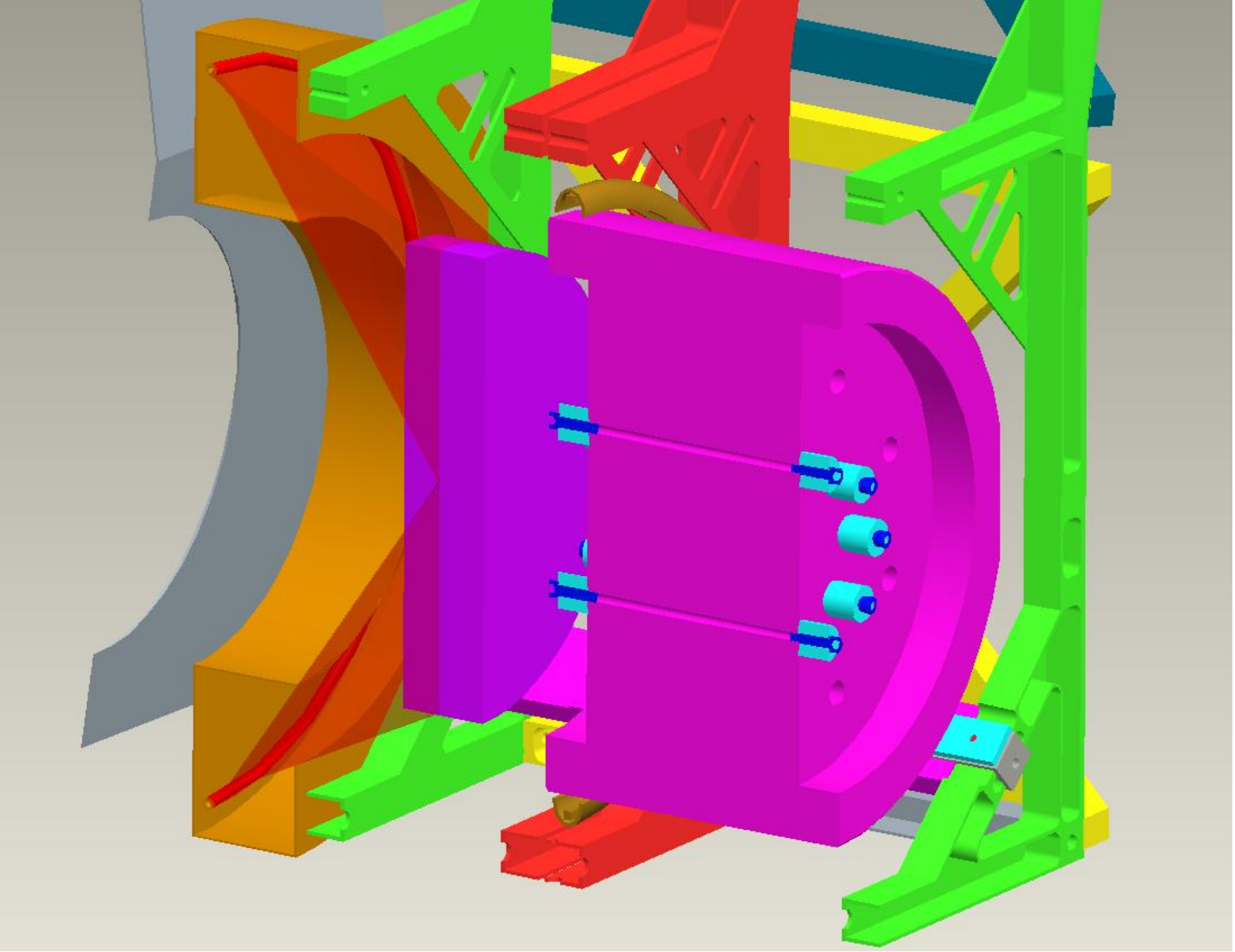
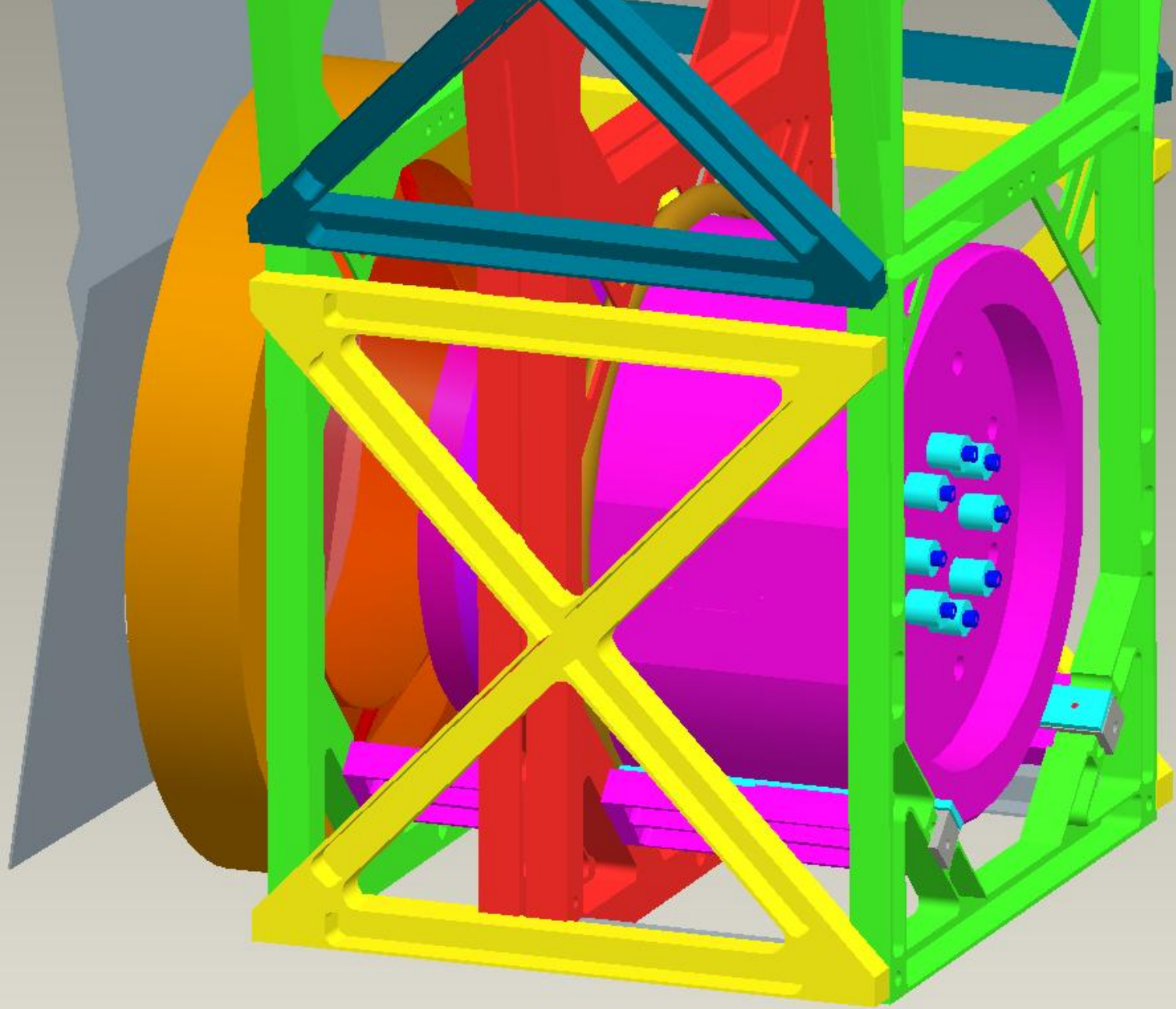
LIGO-G060109-00-K









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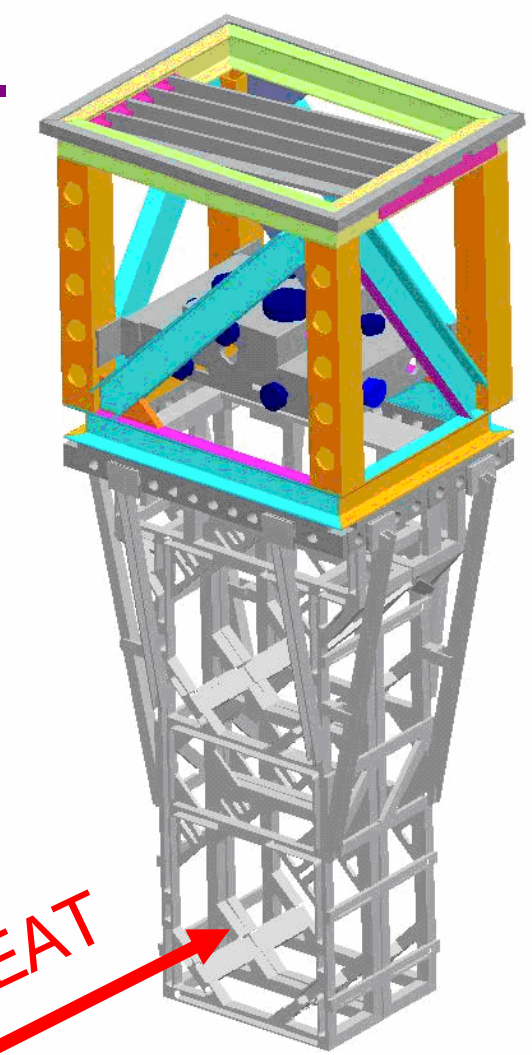
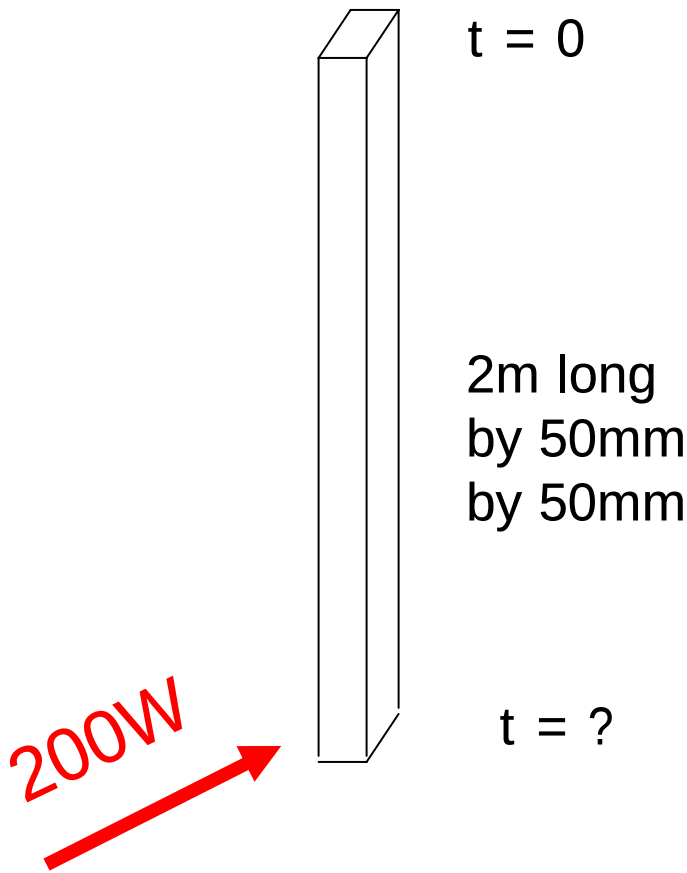
Effect of heating from heaters

- A VERY SIMPLE worst-case model
- Simplify the suspension to a single bar…


HEAT


200W
t = 0
2m long
by 50mm
by 50mm
t = ?

Heat conduction

- Simple analysis of conduction only

$$t = \frac{Ql}{ka} = \frac{200 \times 2}{170 \times .05 \times .05} \approx \frac{2}{0.05 \times 0.05} = \frac{40}{.05} \approx 1000\mathrm{C}\,(!)$$

- So a simple worst-case analysis shows there is something to worry about.
  - Need to focus much more on just how much heat will really be dumped to structure
  - And how hot may the structure safely get?
  - Expansion in 2m is about 40 microns per degree; .4mm for 10C

General comments

- CP ring heater can be supported by wires
  - Needs damper to structure
  - Heating of structure an issue
- TM ring heater will fit in structure
  - Mass and heating of structure are issues
- Internal resonances of baffles may be an issue
  - We will fit them just as shown to the noise prototype