LHC Collimation Project

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MME Mechanical & Materials Engineering

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Thermal calculations on passive absorbers for IR7 magnets

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HiColDEM Meeting #18

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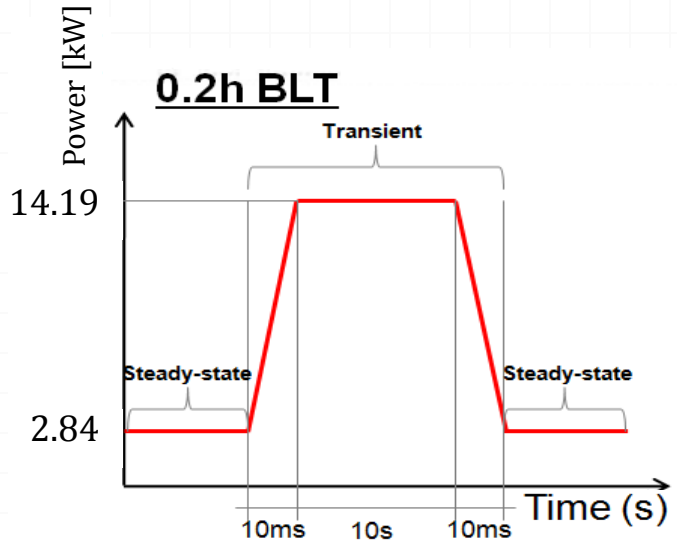
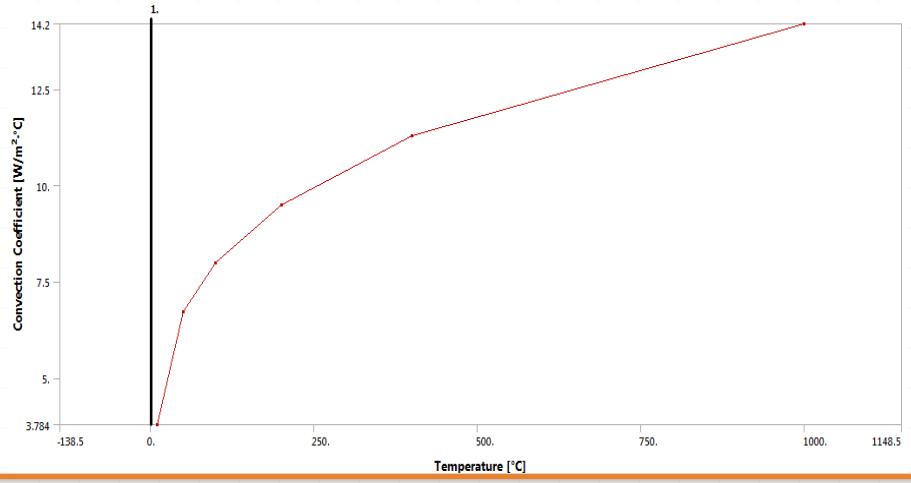
Outline

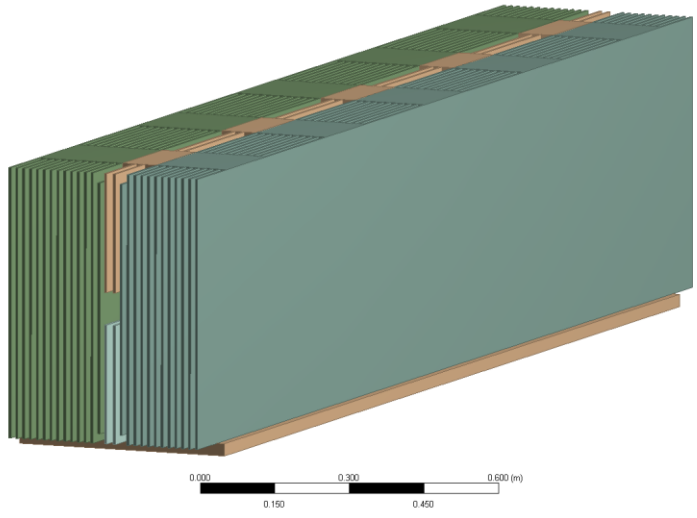
- Analysis description
- Results
  - **Case 1: Old results (1h BLT)**
  - **Case 2: New simulations (0.2h BLT)**
- Conclusion

Analysis Description

- 0.2h BLT scenario
- Hypotheses:
  - Losses: 8.8E11 p/s (for 10s)
  - Material: Cast Iron (k =52 $\frac{W}{m\,°C}$)
  - Beam pipe hosting section: 44 x 66 mm
  - Heating- jackets: 5 mm
  - BC: Nat. conv. on fins + ext. (A ~ 48 m^2)
    $\dot{q}_{air} = 8\,\frac{W}{m^2\,°C}$ @ T = 100 °C



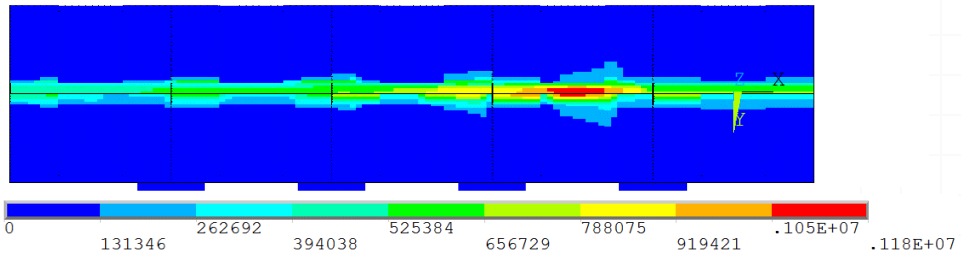


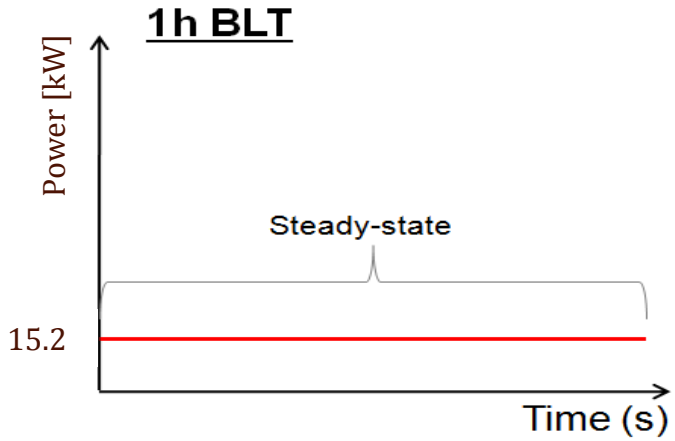


Results

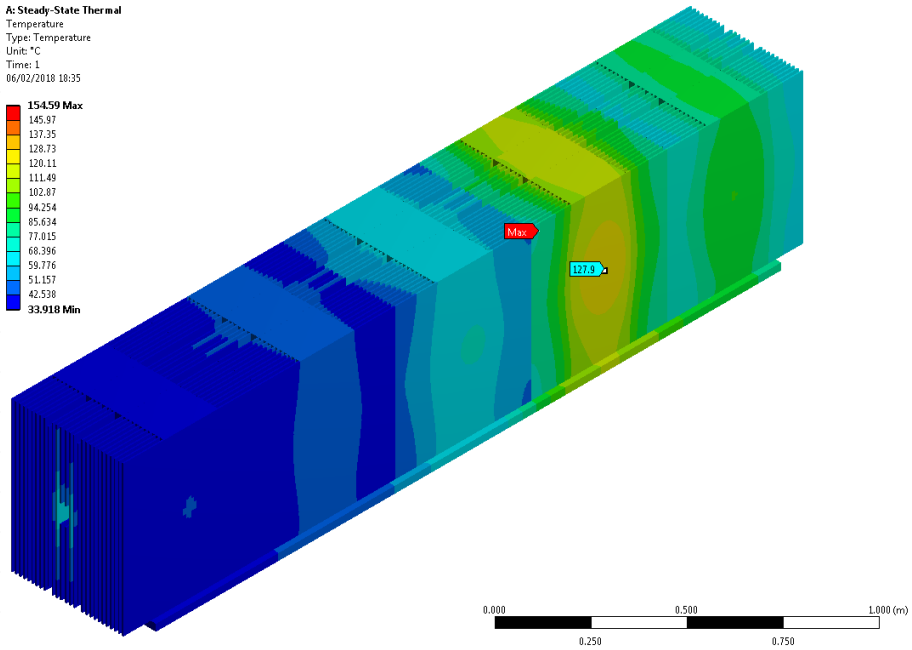
- **Case 1: Old Results (1h BLT with 7.9E11 p/s)**

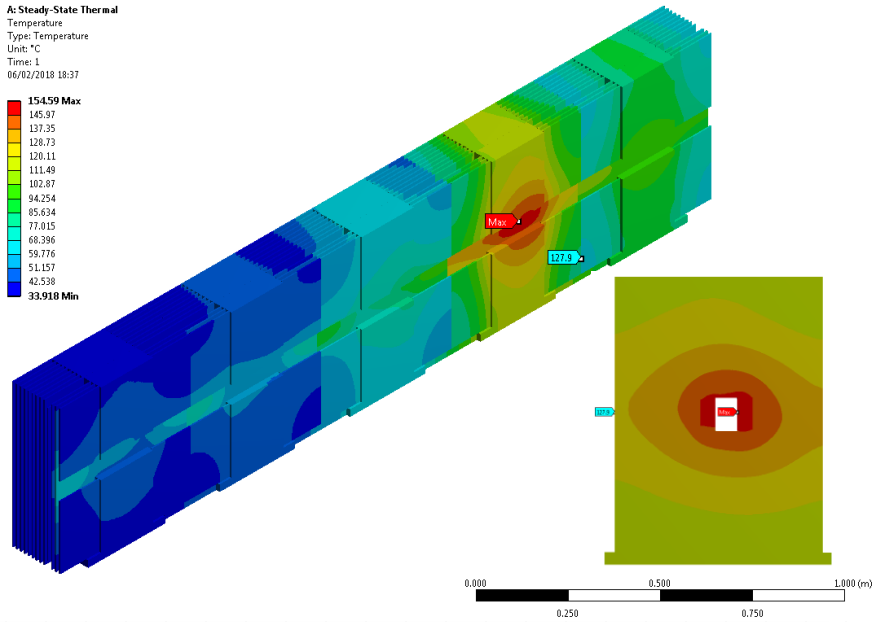
- **Heat deposition (Theory $P_{peak} = 1.18\ \text{E6}\ \frac{W}{m^3}$):**





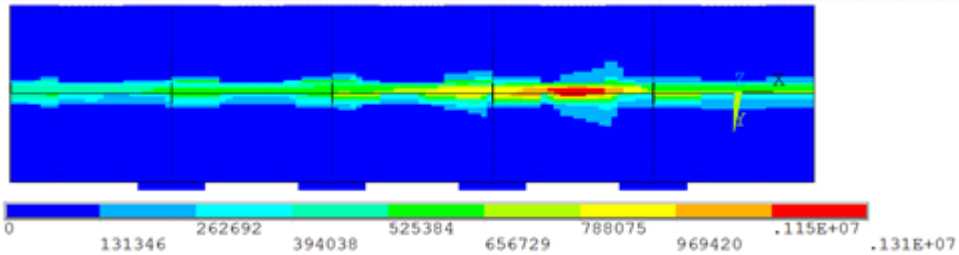
- **Temperature field ($T^{max}_{BULK} = 155\ °C, T^{max}_{SURF} = 128\ °C$)**

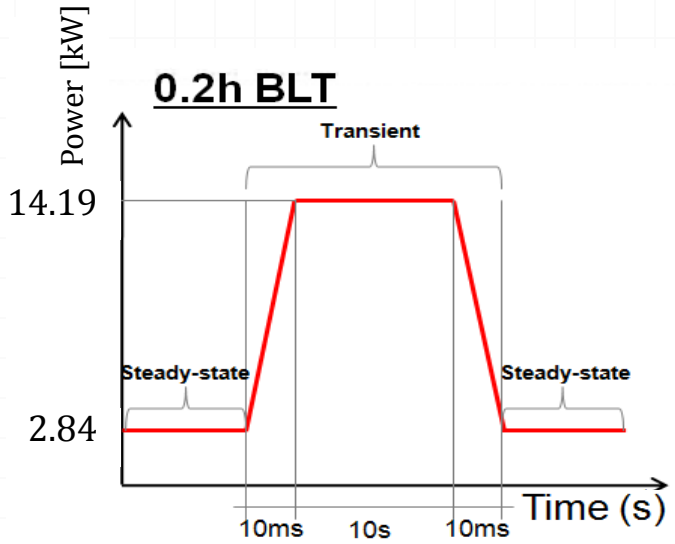




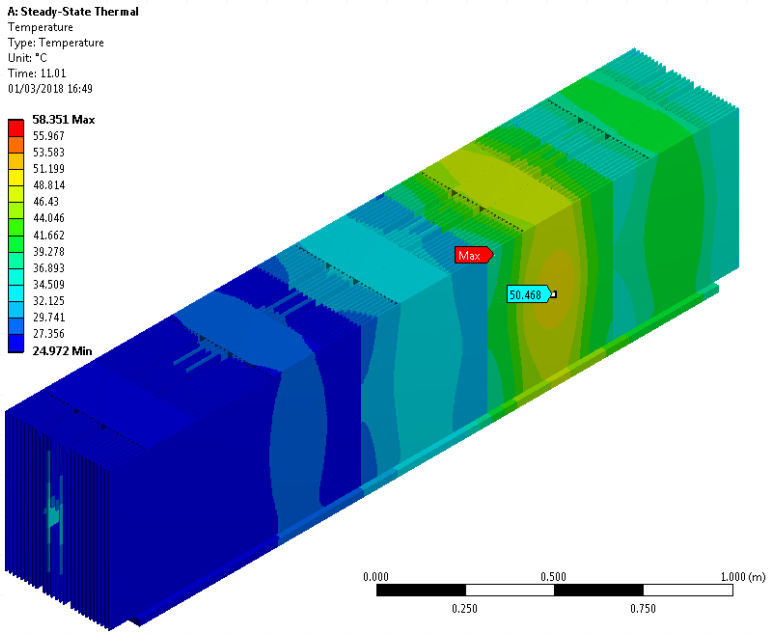
Results

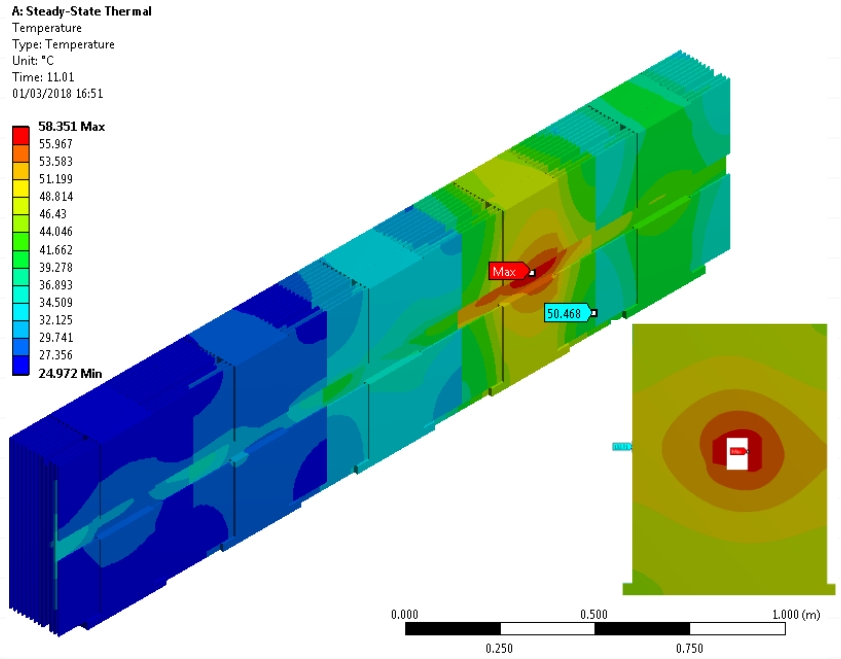
- **Case 2: New simulations (0.2h BLT)**
  - **Heat deposition (Theory $P_{peak} = 1.31$ E6 $\frac{W}{m^3}$):**



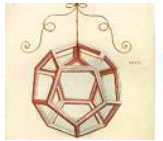


  - **Temperature field ($T^{max}_{BULK} = 58\ °C, T^{max}_{SURF} = 50\ °C$)**





Conclusions



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- **Material: Cast Iron**
- **Beam pipe hosting section: 44 x 66 mm**
- **Heating- jackets thickness: 5 mm**
- **Losses: 8.8E11 p/s**
- $P_{peak} = 1.31 \times 10^6 \frac{W}{m^3}$; $P_{tot} = 14.2\ kW$ (2.8 kW)
- $T_{BULK}^{max} = 58\ °C, T_{SURF}^{max} = 50\ °C$

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Thanks for your attention