Thermal simulations H0/H- dump

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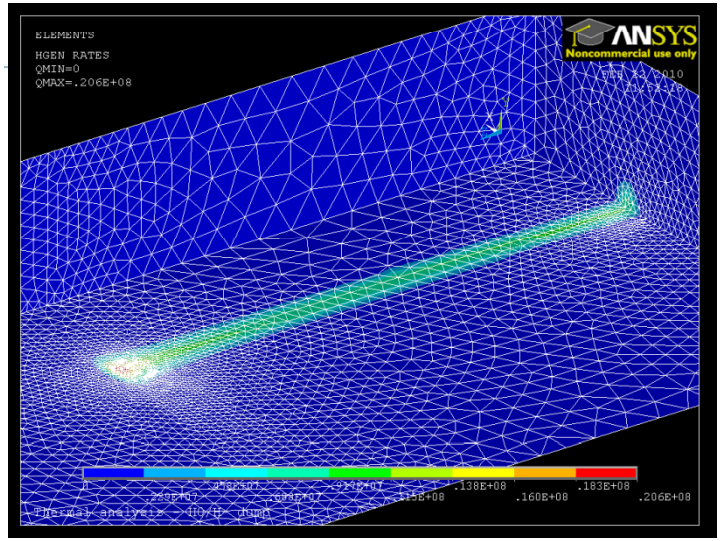
Energy deposition

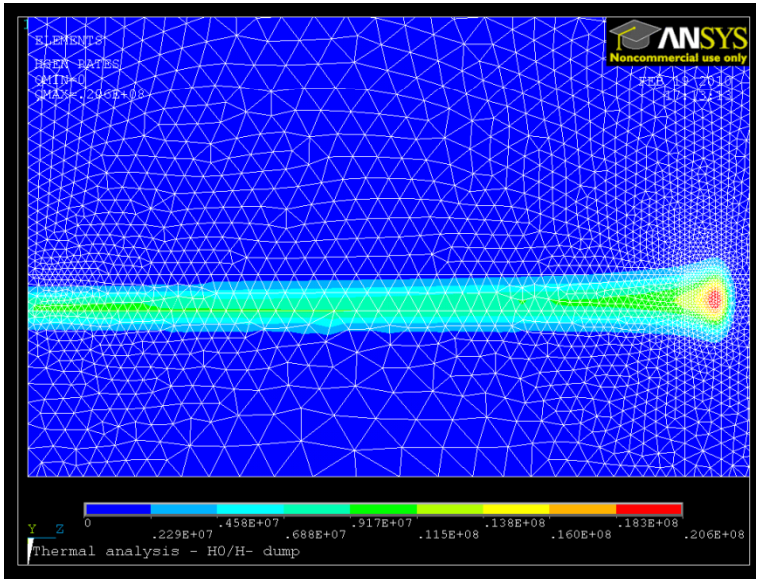
- Fluka simulation results under approval before publication
  - Beams profile:
    - Gaussian, σH = 0.2 cm, σV = 0.3 cm



- ANSYS thermal analysis
  - Energy deposition from FLUKA (GeV/p.cm3)
  - Check: Total power deposited in half volume

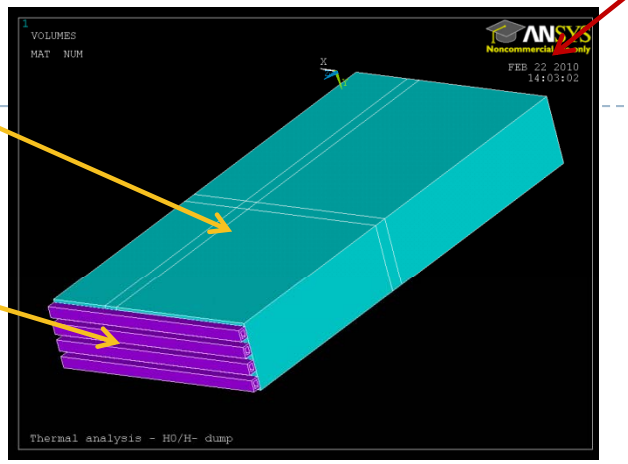
$$P(W) = \sum_i q_i(W/m3) \cdot v_i(m3)$$

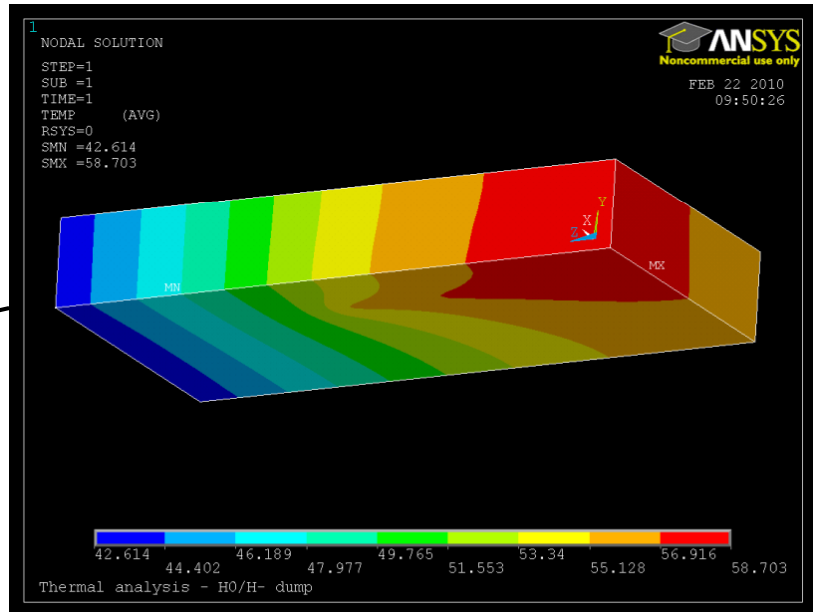
    - 90% stripping efficiency => P=0.3376E2 W
    - 98% stripping efficiency => P=0.6752E1 W
      - 3.5-5% error in the energy deposition



Thermal analysis

- Material core:
  - graphite (1.75g/cm3)
- Basic water cooling @ downstream surface
- Steady state simulation (Tref=20C)
  - 90% stripping efficiency
    - 2.77E12 p/s => Tmax=~59C
  - 98% stripping efficiency
    - 5.55E11 p/s => Tmax=~28C





Conclusions

- With a degrading foil (90% strip. eff.) => $\Delta T < 39C$ (steady state)
- During "normal" operation (98% strip. eff.) => $\Delta T < 8C$ (steady state)
  - The temperature increase will not have a major impact in vacuum, but a bake out prior to operation will probably be needed in this part of the line (to be checked)
- The build up in the transient is very soft (34.2C after 20 pulses)
- The thermo mechanical behavior during normal operation is not a critical issue but…
  - A precise dynamic analysis has to be performed in case of failure (400us) – (supporting conditions to be checked)