PEPI and Service Bay Cooling Requirements

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Near Electronics Cooling

- Baseline is chilled water-based coolant
- Two thermal load categories
  - 8 PEPI Chassis
  - 4 Service Bays
- Risk Mitigations
  - Continuous dry gas flow to prevent condensation
  - Robust pressure tests of heat exchangers and pipes to lower risk of leaks
  - Is Active Leak Detection Needed?

Power Rollup Summary

SubAssy	Thermal loads (Watts)
SBC-UL	**2908.6**
SBC-UR	**2908.6**
SBC-LL	**2908.6**
SBC-LR	**2908.6**
SBC Totals	**11634.3**
cable SBC-UL	**499.6**
cable SBC-UR	**499.6**
cable SBC-LR	**499.6**
cable SBC-LL	**499.6**
Total Cable: SBC-->PEPI	**1998.2**
Station 0, UL PEPI	**499.3**
Station 1, UL PEPI	**551.0**
Station 0, UR PEPI	**499.3**
Station 1, UR PEPI	**551.0**
Station 0, LR PEPI	**499.3**
Station 1, LR PEPI	**551.0**
Station 0, LL PEPI	**499.3**
Station 1, LL PEPI	**551.0**
Total x8 PEPI Chassis	**4201.0**
UTaX	**978.2**
UTaU	**978.2**
UTbX	**1088.6**
UTbV	**1088.6**
UT Planes	**4133.5**
TOTALS Input Power for all 4 SBCs (Watts):	**21967.0**
MARATON Output Power (Watts)	**26672.8**

~ 2900 Watts thermal load *per* SBC essentially reduces the net PEPI Chassis thermal load

~ 500 Watts thermal load per cable tray is spread over the 10 meter runs *

~ 500 – 550 Watts thermal load per PEPI Chassis (much easier to cool compared to ~ 2000 Watt PEPI if linear regulators were on-board)

* This is an estimated upper bound
- Longest cable now estimated at 7 meters maximum
- Selected copper wire sizes tending to be larger than identified minimums
- However, worse case currents for SALT ASICs not yet finalized

System Control and Interlocks

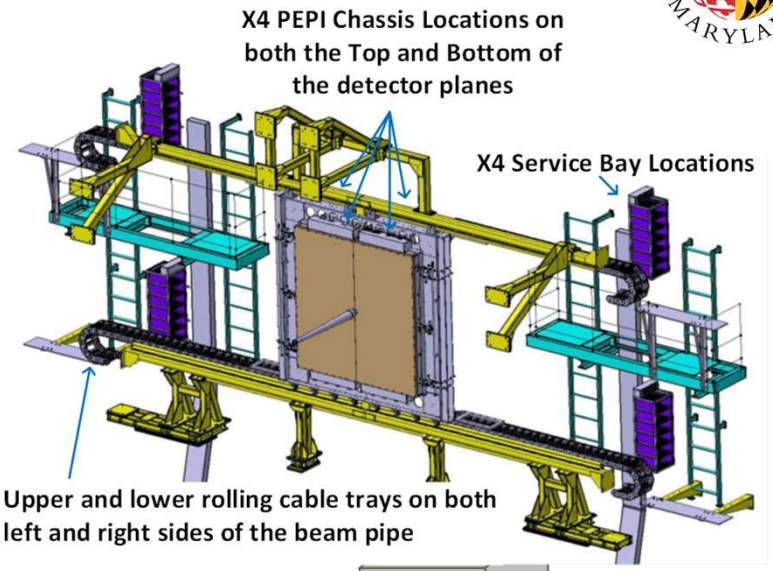
- System power and cooling controls must obviously be coordinated
- Two tiers of interlocks planned
  - CERN detector safety system
    - Harsh, uncontrolled pull-the-plug approach
  - SMCU
    - Power sequence controls
    - Checks key temperatures and coolant flows to implement a very *basic* local interlock
    - Controlled shutdown, when possible
- Items not yet defined
  - Key sensors
    - CO2 flow sensors
    - Coolant flow sensors
    - Humidity sensors
    - Leak sensors?
  - Operating conop for standard On/Off sequences
    - Turn on the PEPI chassis first?
      - After dry gas flows for tbd duration
      - Then water cooling started
      - Then PEPI boards powered
    - How is CO2 system started and stopped?
      - Are any special power sequences required to minimize thermal transients and ramp rates?
    - Power detector planes on/off by horizontal power groups or single full vertical staves?

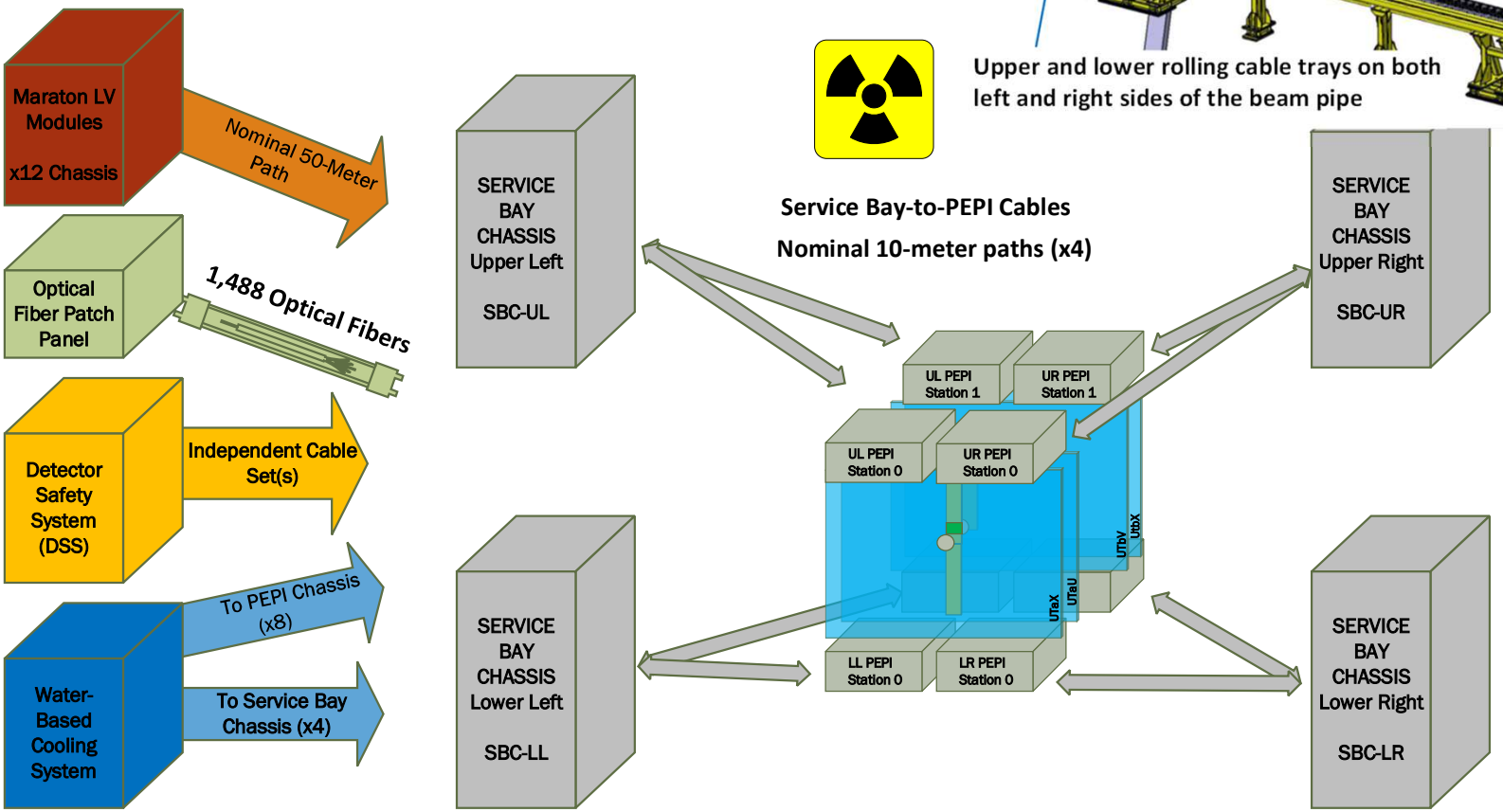
Summary

- Predicted thermal loads for PEPI and service bays have been tabulated
- SALT ASIC maximum current requirements not yet finalized
- Several open items exist
  - Identify some of the specific sensors
  - Coordinated cooling and power system requirements

BACKUP

Cavern Electronics and Support Subsystems





UT Electronics Block Diagram