Near Electronics Cooling Requirements

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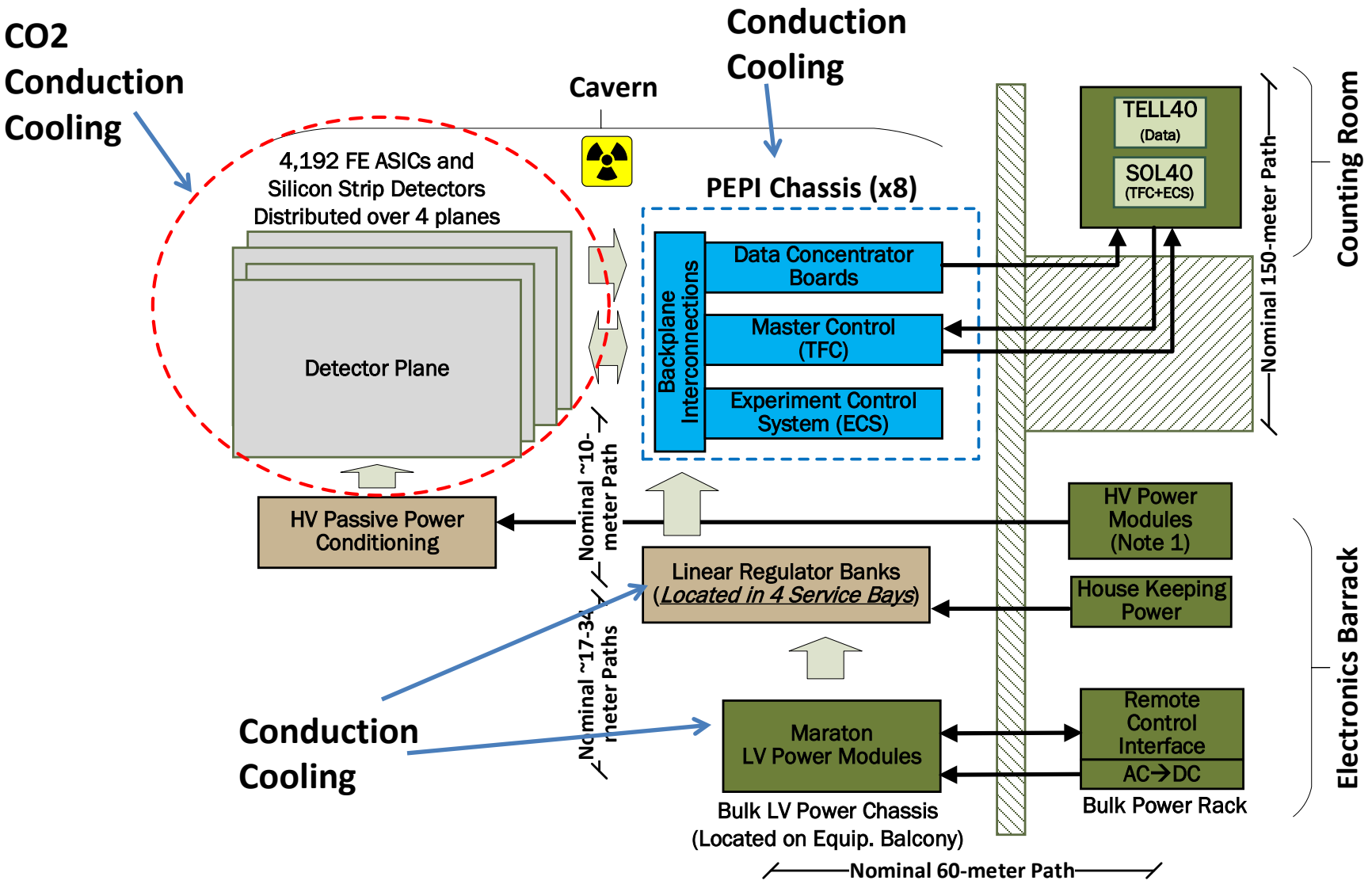
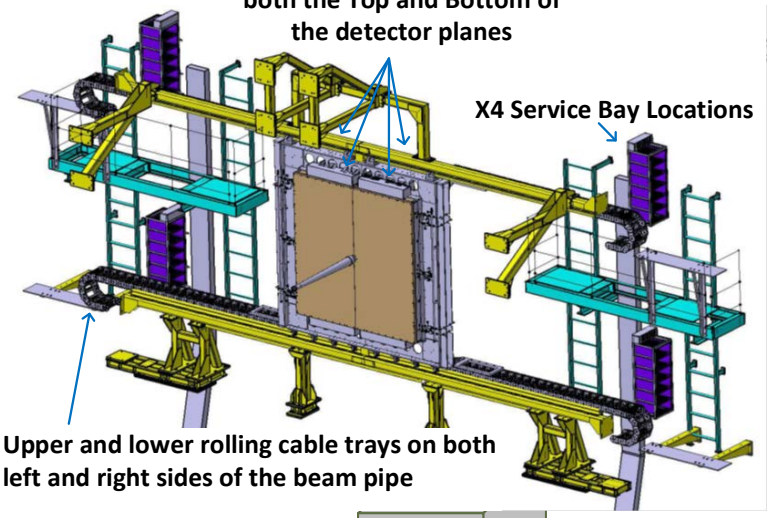
Outline

- System Block Diagram
- Physical Layout Concepts
- Thermal Loads
- PEPI Chassis Conduction Cooling Implementation

UT Electronics Block Diagram



Cavern Electronics and Support Subsystems



Maraton LV Modules
x12 Chassis

Nominal 50-Meter Path

Optical Fiber Patch Panel

1,488 Optical Fibers

Detector Safety System (DSS)

Independent Cable Set(s)

Water-Based Cooling System

To PEPI Chassis (x8)

To Service Bay Chassis (x4)

SERVICE BAY CHASSIS Upper Left
SBC-UL

SERVICE BAY CHASSIS Upper Right
SBC-UR

SERVICE BAY CHASSIS Lower Left
SBC-LL

SERVICE BAY CHASSIS Lower Right
SBC-LR

Service Bay-to-PEPI Cables
Nominal 10-meter paths (x4)

UL PEPI Station 1
UR PEPI Station 1
UL PEPI Station 0
UR PEPI Station 0
LL PEPI Station 0
LR PEPI Station 0
UTaX
UTaU
UTbV
UTbX

Power Rollup Summary

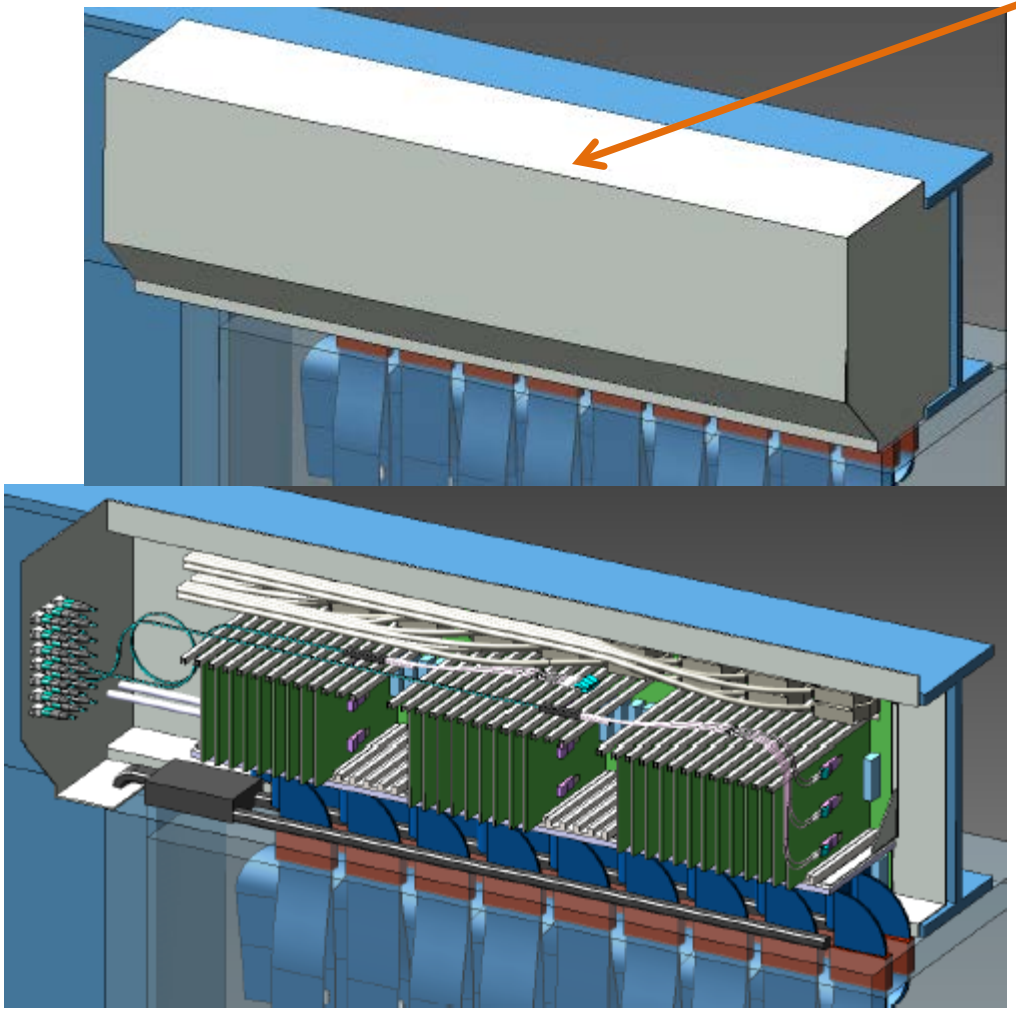
SubAssy	Thermal loads (Watts)
SBC-UL	**2908.6**
SBC-UR	**2908.6**
SBC-LL	**2908.6**
SBC-LR	**2908.6**
SBC Totals	**11634.3**
cable SBC-UL	**499.6**
cable SBC-UR	**499.6**
cable SBC-LR	**499.6**
cable SBC-LL	**499.6**
Total Cable: SBC-->PEPI	**1998.2**
Station 0, UL PEPI	**499.3**
Station 1, UL PEPI	**551.0**
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**

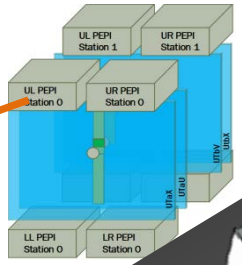
~ 2900 Watts thermal load *per* SBC

~ 500 Watts (W.C.) thermal load per cable tray is spread over the 10 meter runs

~ 500 – 550 Watts thermal load per PEPI Chassis

PEPI Chassis Conceptual Design

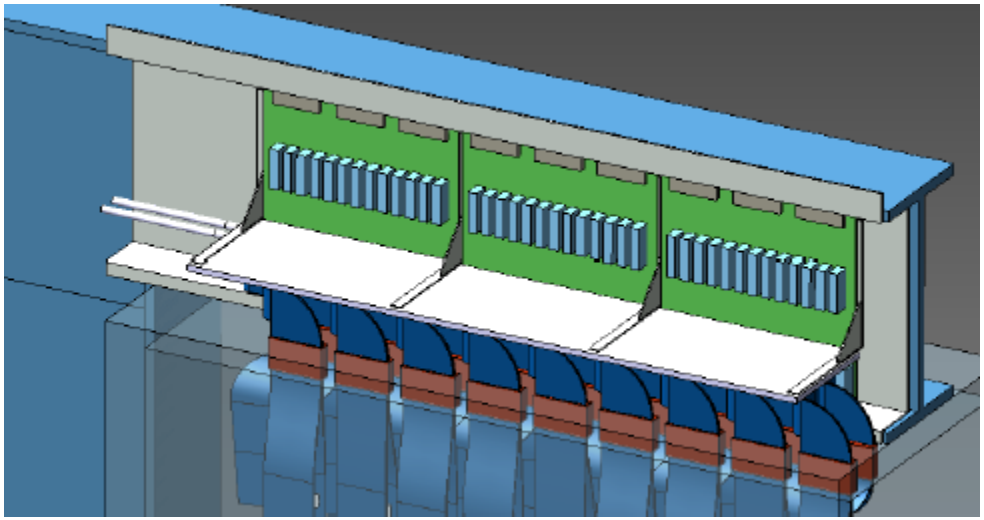


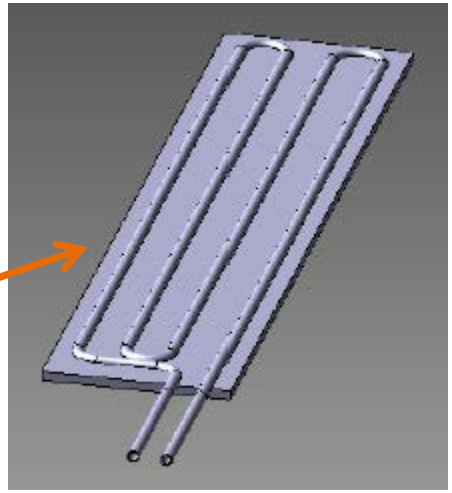


Chassis End Cap for Connectors and Coolant

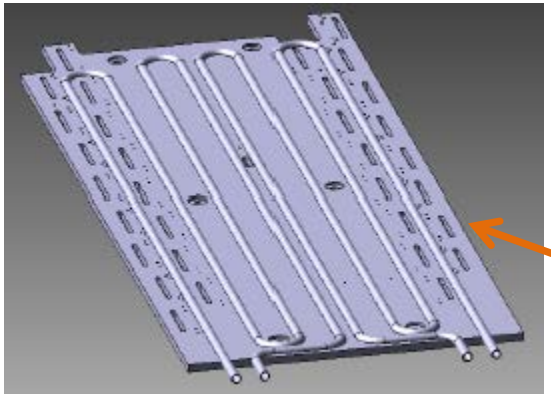
Dry Gas Inlet for Condensation Prevention

PEPI Chassis
Conduction Cooling Concepts



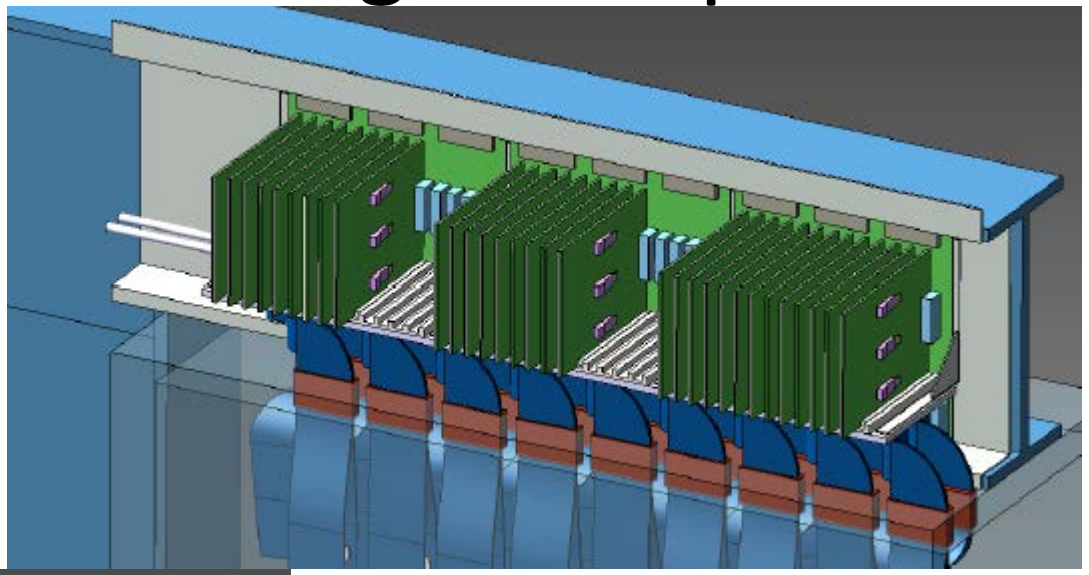


UT cooling plate
modeled after TT plate

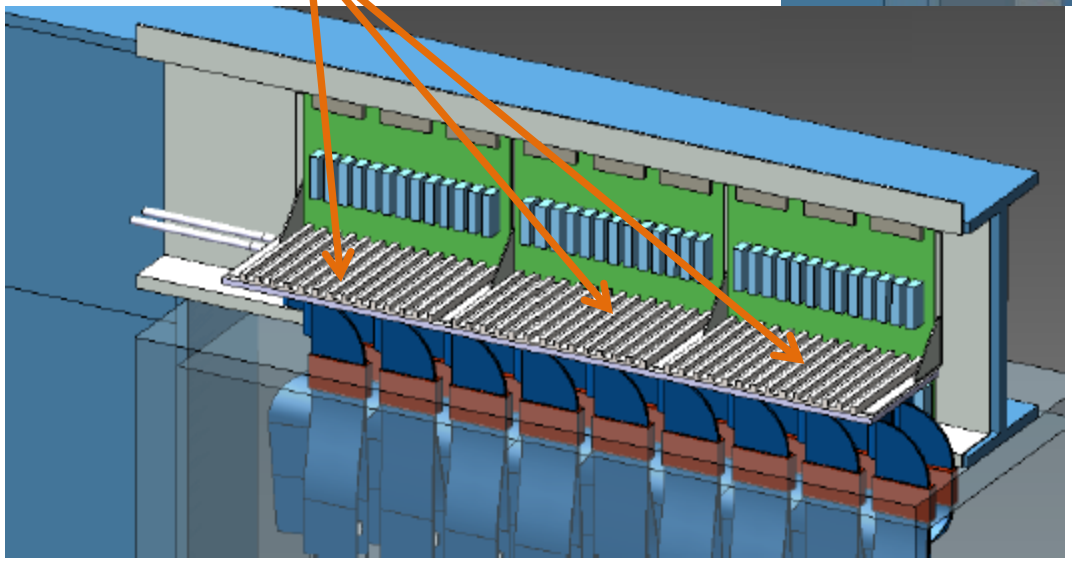


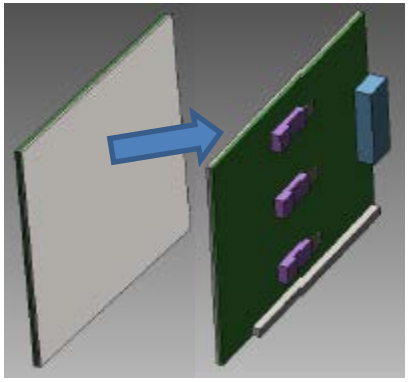
TT cooling plate for one
detector quadrant

Board Level Conduction Cooling Concept



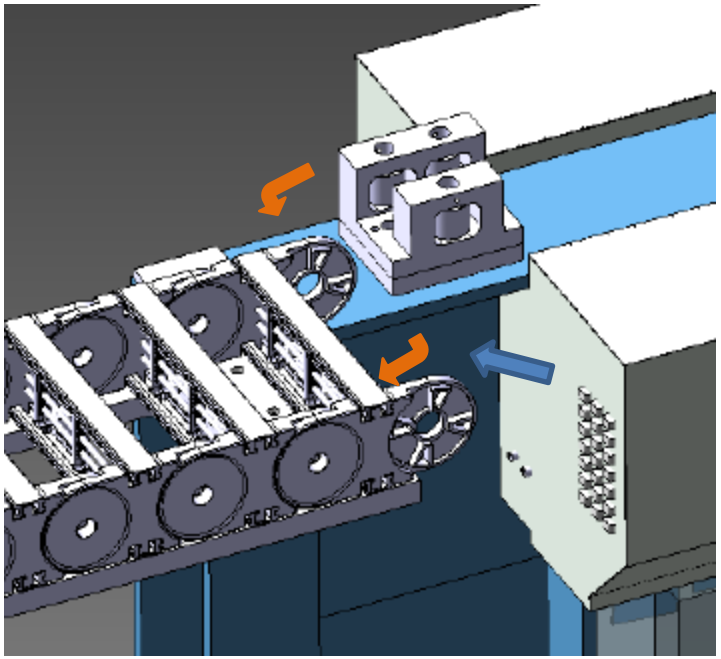
wedge lock plates mounted onto cooling plate, one for each backplane





Boards Mounted to Thermal Conduction Plates as needed

Cable Tray Access



- One Cable Tray Shared by Two PEPI Chassis
- Access for down-stream PEPI is direct
- Access for up-stream PEPI is through the Frame

Summary

- Near Electronics Thermal Load Estimates Complete
  - ~ 550 Watts Max *per* PEPI chassis
  - ~ 2900 Watts thermal load *per* SBC
- Detector Planes use CO2 system
- 4 Service Bays and 8 PEPI chassis use conduction cooling
  - – Coolant type TBD