

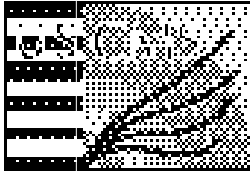


EMU Review at FNAL

EMU Integration

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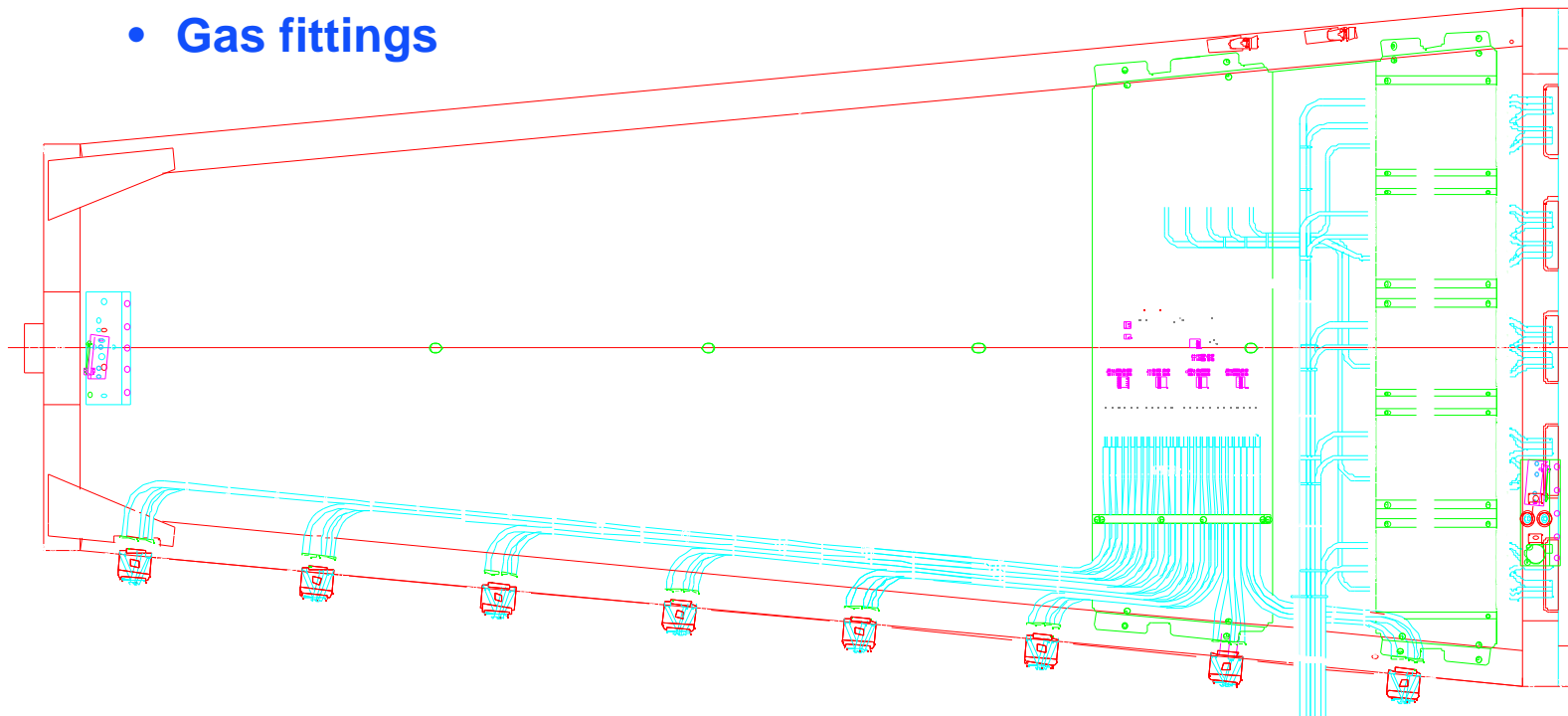
On-Chamber Systems

Infrastructure:

- Mechanical Support
- Cooling
- Cabling
- HV connectors
- Gas fittings

Electronics:

- CFEBs
- ALCT
- Low Voltage Distribution
- Alignment

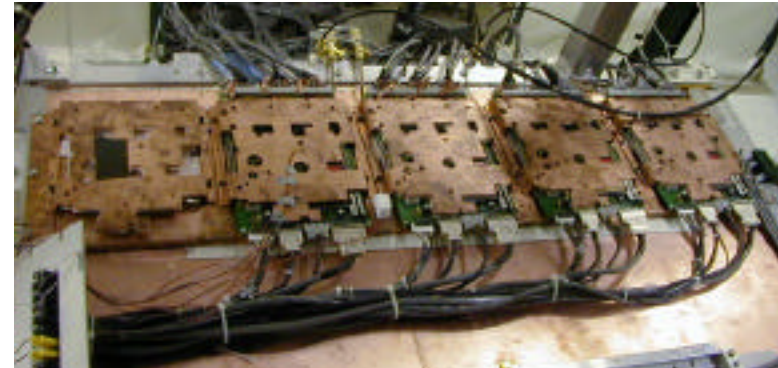
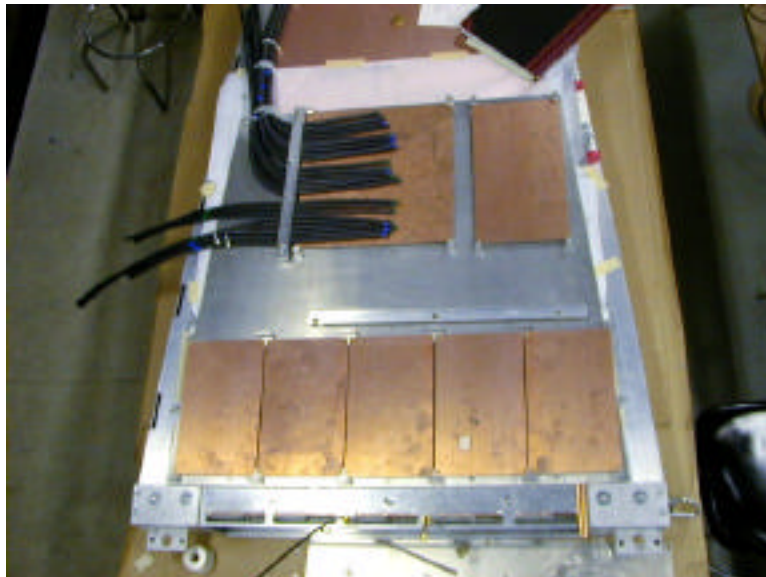




Cooling & Mechanical Support

Prototype cooling system

- Water-cooled plate
- Conductive cooling of electronics through compliant thermal gasket
- Layered construction
- Shown mounted on ME1/2



- Based on earlier CFEB cooling plate design
- Cooling system tested, meets maximum chip temperature requirements
- Next:
 - Construction of monolithic cooling plate for ME234/2
 - Full system test, including ALCT & LV distribution board

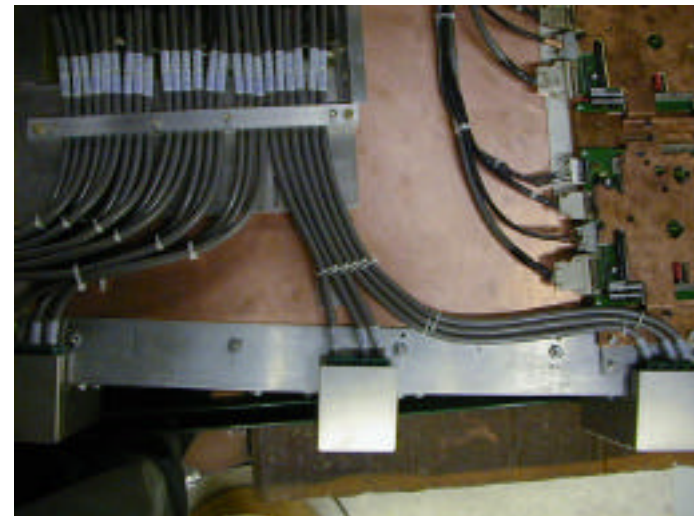


AFEB-ALCT Cable Harness



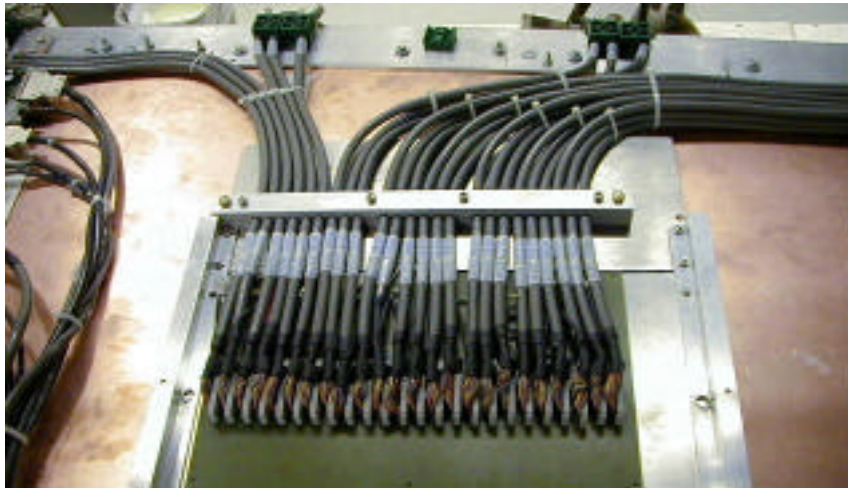
Developed a rigid, self-supporting cable harness

- Assemblies are fabricated using forming templates, cable ties
- Fabrication may be outsourced
- Installed on chamber as assembled components



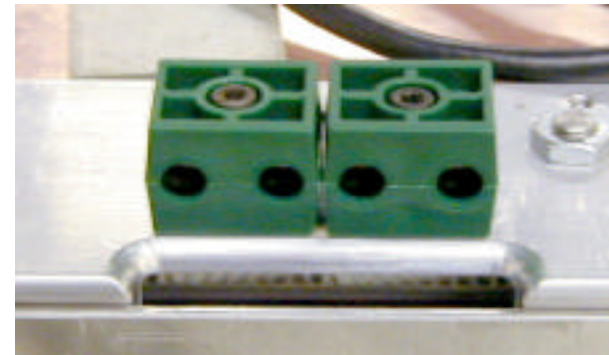


Cable Mounting



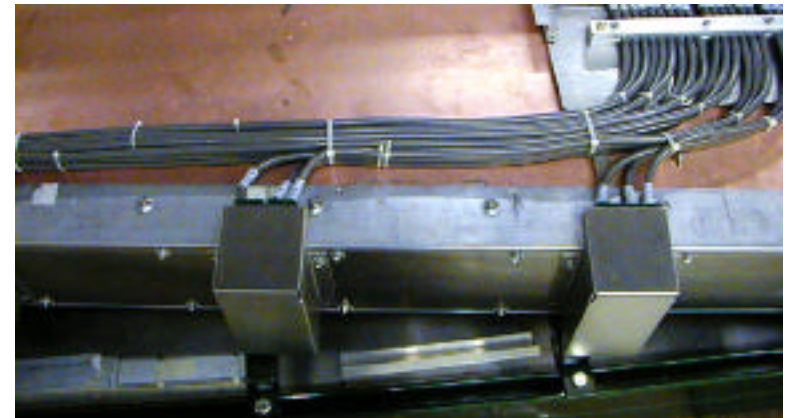
Anode cable harness fixed in place by strain reliefs

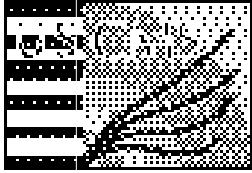
- AFEB side uses simple commercial block fastener
- ALCT strain relief also functions as stiffener
- Planar cable layout provides low profile and visual validation of correct cable routing



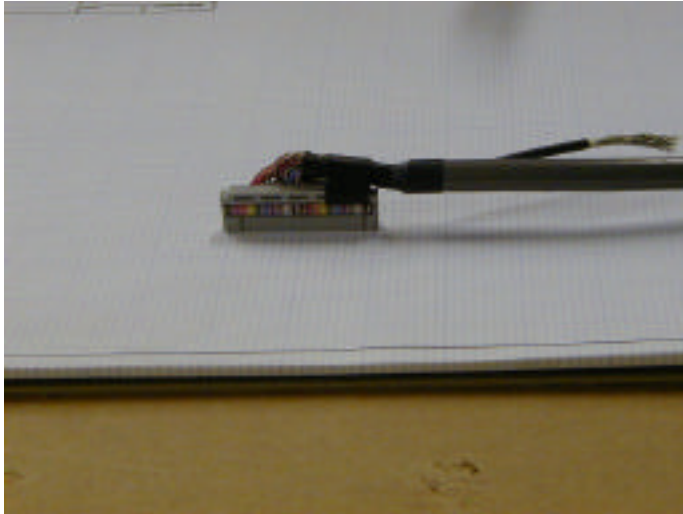
AFEB cover boxes

- Provide mechanical support for AFEBs as well as protection and EMI shielding



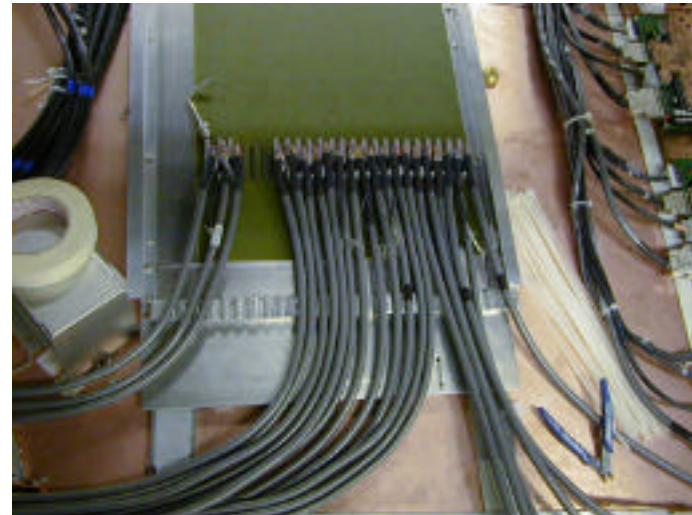


Anode cables...



Cables use tubing threaded under cable strain relief to hold exposed cable in place

Design provides improved clearance between neighbors, addresses integration concerns

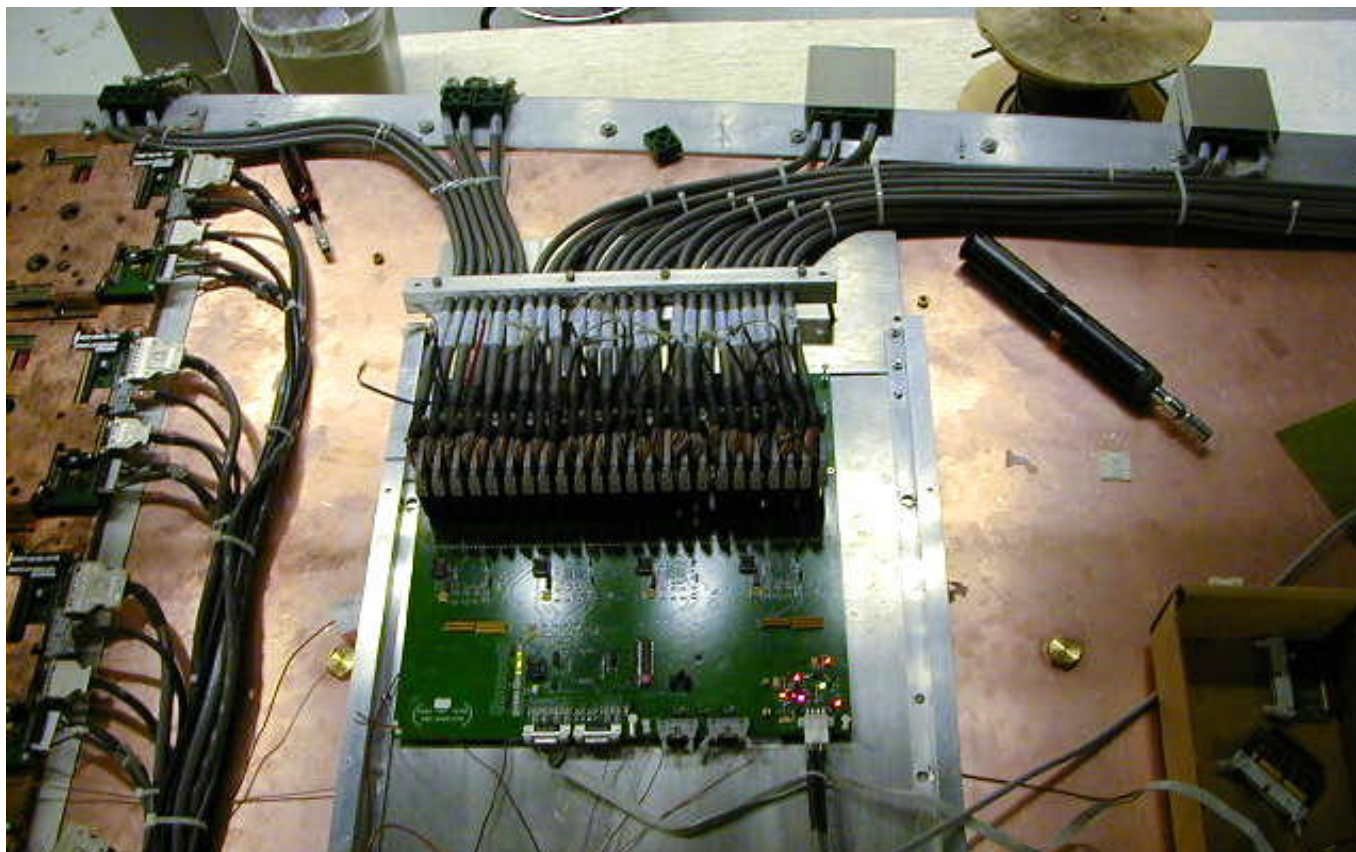




ALCT Delivery

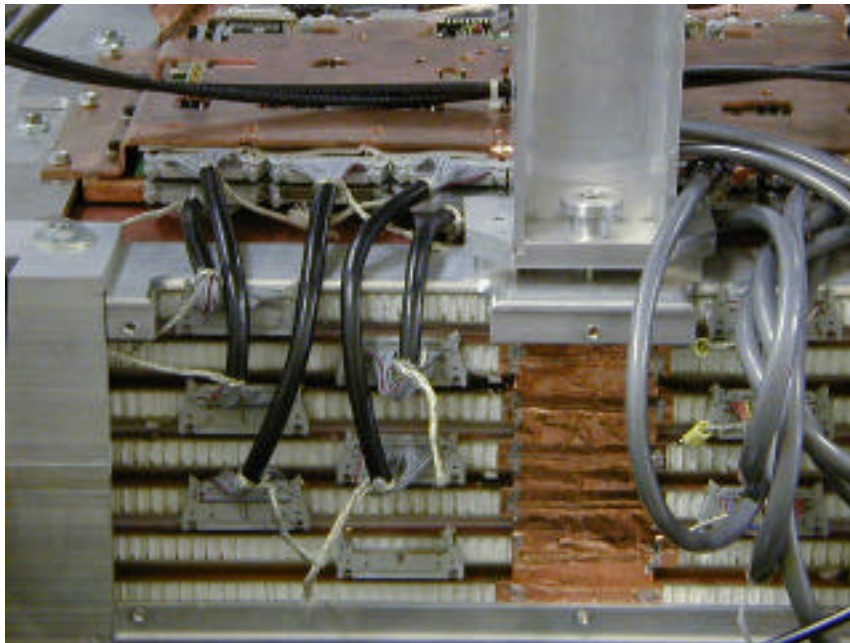
ALCT delivered to Lab 7

- Uses temporary receiver boards on input connectors
- Power dissipation less than recent estimate





Cathode Cables

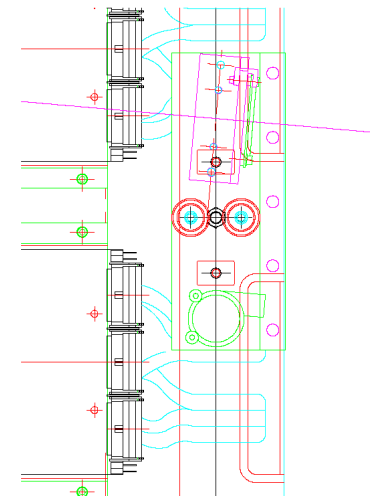


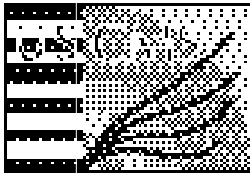
Cables are flat ribbon cable in round shielded jackets

- Lengths are finalized
- Shield ground connection on CFEB side is finalized

Cable routing and clearances have been confirmed

- Cables lie reasonably flat with respect to chamber frame
- Cables clear alignment towers in both high and low configurations





Cathode Cable Grounding

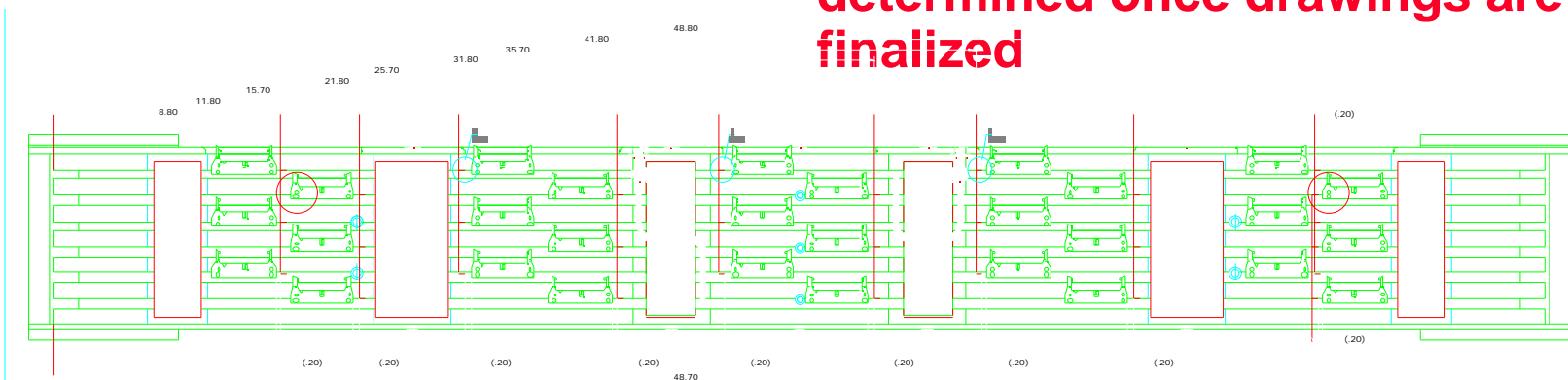
CFEB input cable shields must provide low-inductance ground path between chamber ground, CFEBs.

- Will use spade lug terminations on both sides of shield
- Need to define positions of spade lugs on chamber panels for installation during panel production

Chamber ground lug positions finalized for ME234/2, ME2/1, ME3/1, ME4/1 and ME1/2

- All anode panels have identical lug placement
- All inner cathode panels have identical lug placement
- Upper cathode has different pattern, but this panel is already one of a kind

Lug positions for ME1/3 to be determined once drawings are finalized

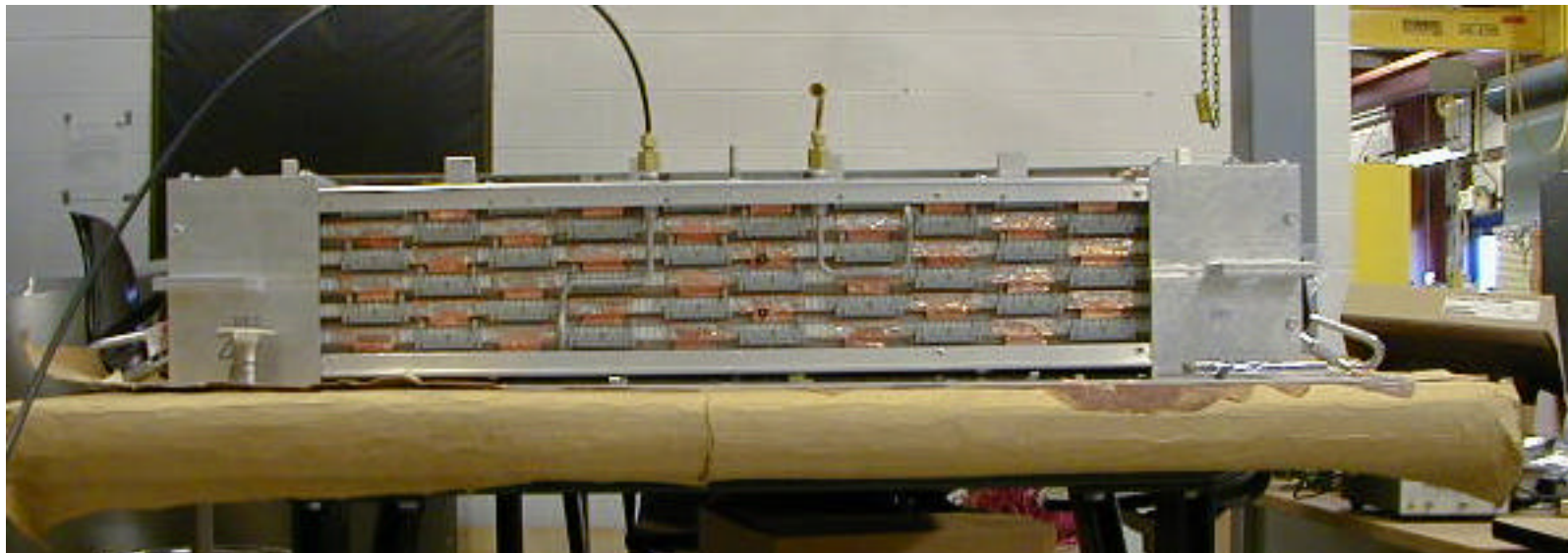




Ground lugs for ME1/2

ME1/2 is the most difficult case

- High connector density
- Complex ground foils
- Interference with upper mounting rail
- Interference with connector latches

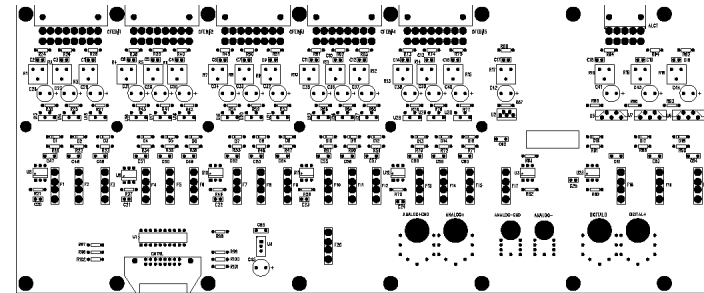




Low Voltage Distribution

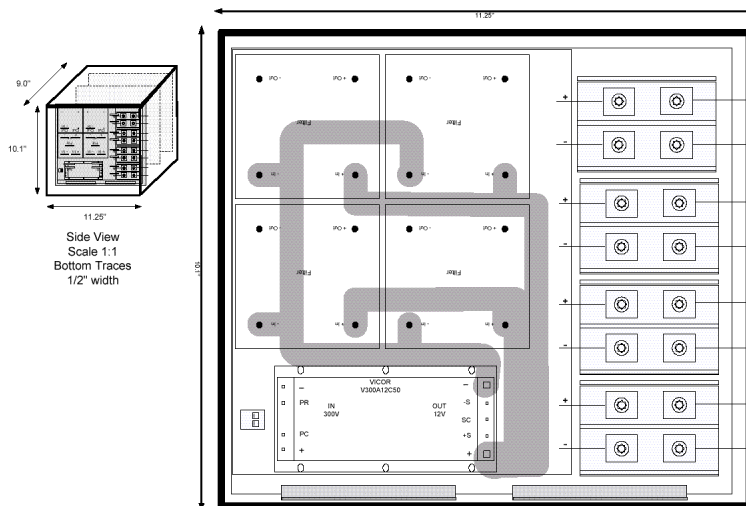
Based on DC-DC converters

- Power supplies mounted on edge of iron
- Enclosed in magnetically shielded boxes
- Input is 300 VDC
- Output cables routed to on-chamber LV distribution boards



LV distribution board

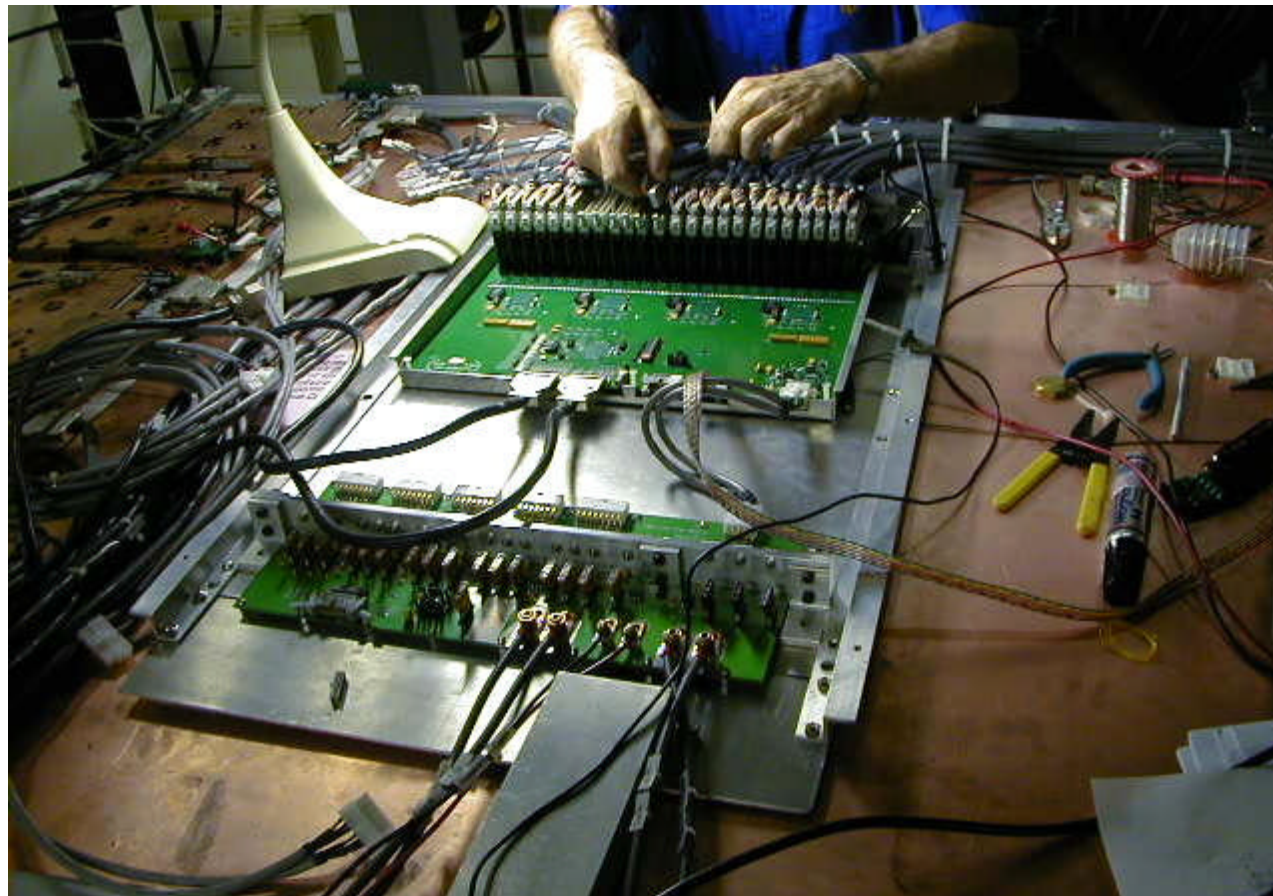
- Provides additional regulation and filtering
- Provides overcurrent protection
- Uses radiation-resistant low-dropout regulators
- Provides LV power for 5 CFEBs and 1 ALCT
- Total on-chamber dissipation ~100 W





LVDB Installation

- All on-chamber electronics installed on P2", powered through Vicor DC-DC converters

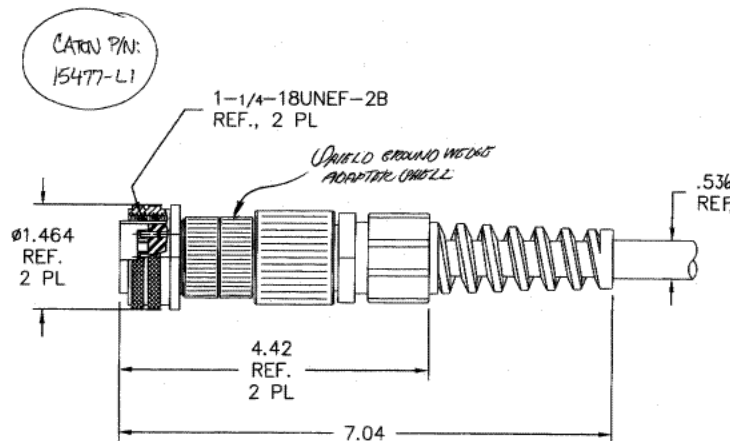




HV Connectors

CSC chambers require 18 or 30 channels of HV

Caton developed 19-pin connectors for CMS



- Use 1 19-pin connector for 18-channel CSCs
- Use 1 19-pin & 1 13-pin connector for 30-channel CSCs
- Military style, robust strain relief
- All connectors potted and tested by Caton

Will use 19-channel and 13-channel HV cable





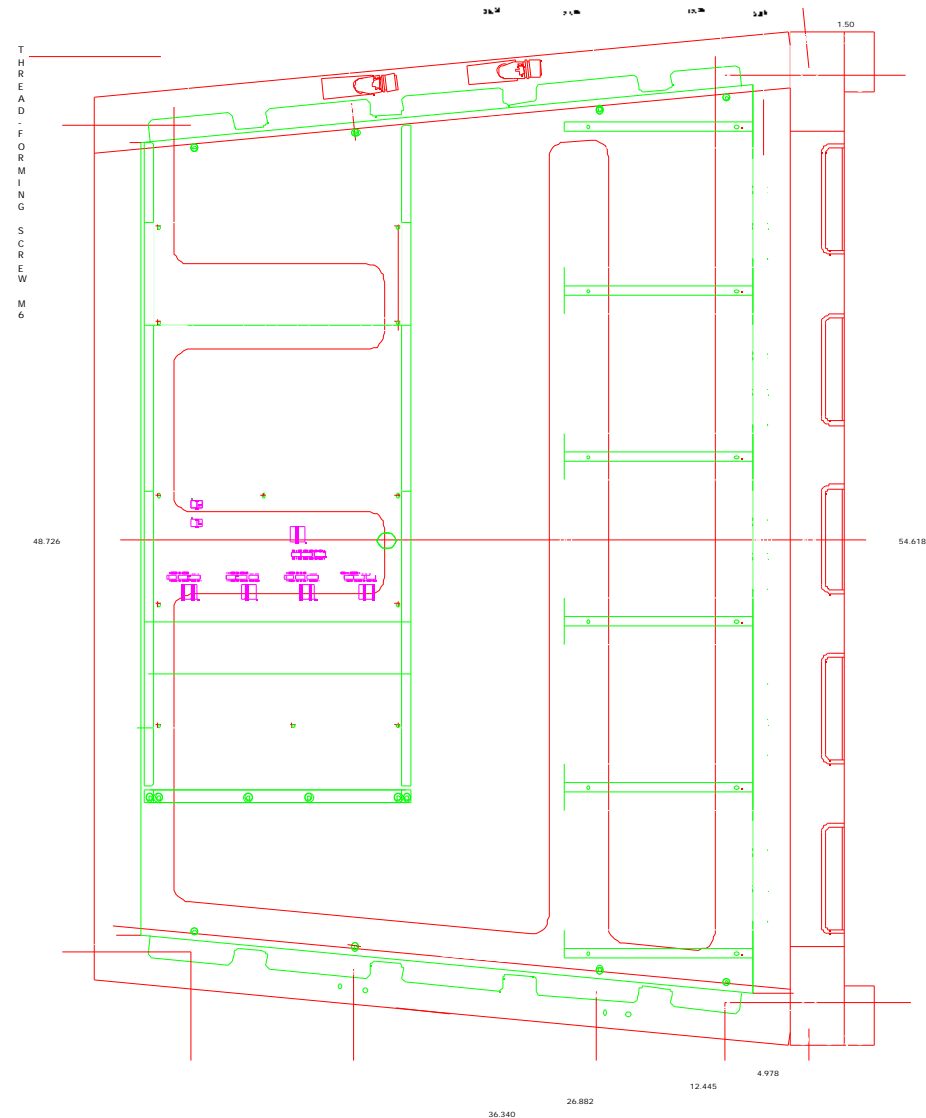
Interface issues ..

Resolved issues:

- HV connector placement
- HV connector design
- Cathode ground lugs
- Anode covers
- Anode cable strain reliefs
- Alignment tower cable clearances
- Cathode cable routing
- AFEB mechanical support
- AFEB grounding
- On-chamber mechanical support, frame fasteners
- Cooling system design

Unresolved:

- ??





Schedule @ Lab 7

24 Apr 00 - 28 Apr 00

- Electronics testing- ALCT, AFEBs, CFEBs

01 May 00- 05 May 00

- Anode cabling, cover design, materials procurement

08 May 00- 12 May 00

- Cooling system fabrication
- Chamber frame machining

15 May 00- 19 May 00

- Cooling system tests
- Chamber frame delivery

22 May 00- 26 May 00

- Preparation for chamber replacement
- ME234/2-001 retrofitting



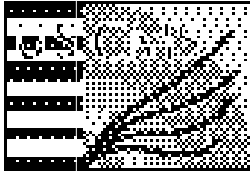
Integration tasks:

AFEBs:

- Finalize cabling design under anode covers
- Finalize cable routing on top of chamber
- Install foam pads / evaluate prototype
- Perform complete noise / threshold studies

ALCT:

- Decide board stiffener issue
- Finalize Lemo placement
- Minimize input cable connector heights
- Decide input ground lug question
- Finalize output cable design



Integration tasks II

CFEBs:

- Design handles for cable withdrawal
- Validate input cabling scheme
- Perform noise studies with baseline grounding scheme
- Perform SIP validation study
- Finalize output cable design

Cooling:

- Finalize choice of tube fitting
- Finalize tube routing between chambers
- Assemble monolithic cooling plate prototype
- Assemble chamber heat shield
- Perform isolated cooling system test



Integration tasks III

LVDB:

- Heat sink modifications for use with C-channel
- LVDB testing under full load
- Unify Vicor supplies, replace Lab 7 system

Cabling:

- Duplicate anode wiring harness for UF
- Duplicate LVDB wiring harness for UF

Mechanical:

- Fabricate spacer plates for ME234/2 cooler
- Design/fabricate CFEB cover plates
- Design/fabricate ALCT/LVDB cover plates



What do we need?

- **People:**

- Engineers: V. Razmyslovich, F. Feyzi
- Fabricators: D. Northacker, TD Technicians
- Electronics: N. Bondar, N. Terentyev, P.Robl, J. Hoffman
- Cooling: A. Vassilyev, other?

- **Closing the loop ...**

J. Kubic	B. Bylsma	F. Feyzi, K. Kriesel,
V.Sedov	J. Gu	P. Robl, J. Hoffman
L. Gorn	N. Chester	V. Razmyslovich
S. Dolinsky	G. Apollinari	S. Lusin

- **Action:**

- Cannot do with fewer people
- Need on-site presence of experts
- Need to communicate by exchanging drawings