HCAL RBX for HB, HE, and HO
Status and Planning

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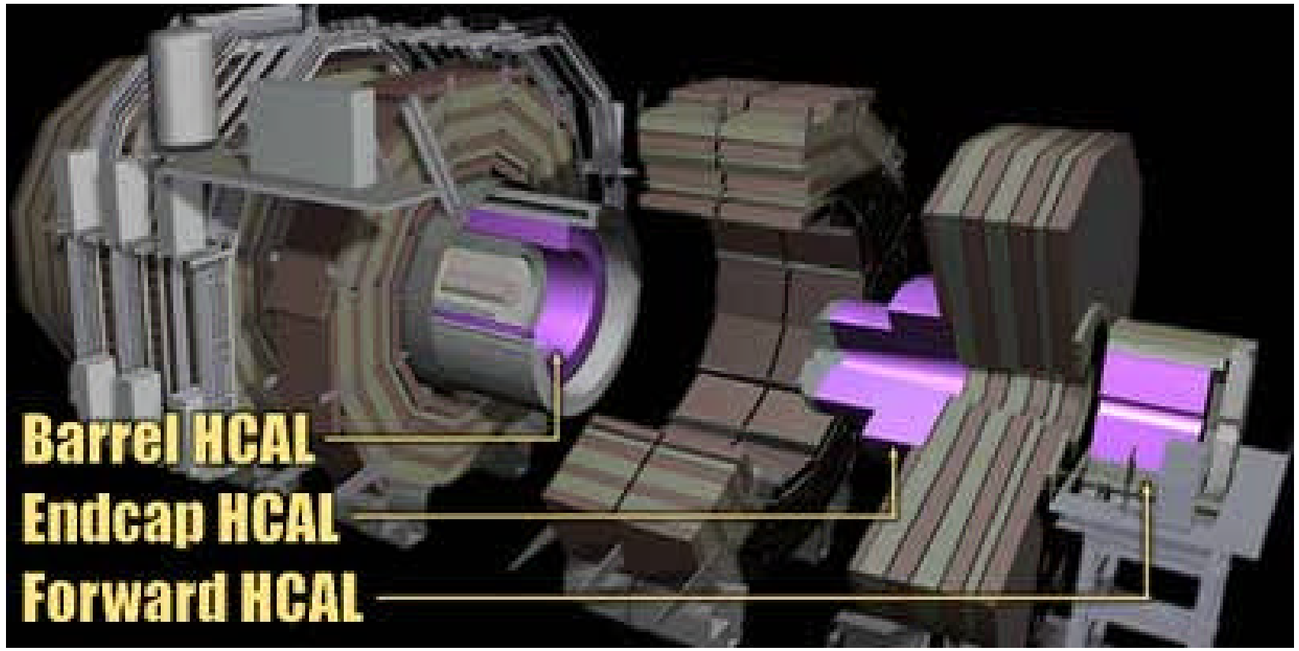
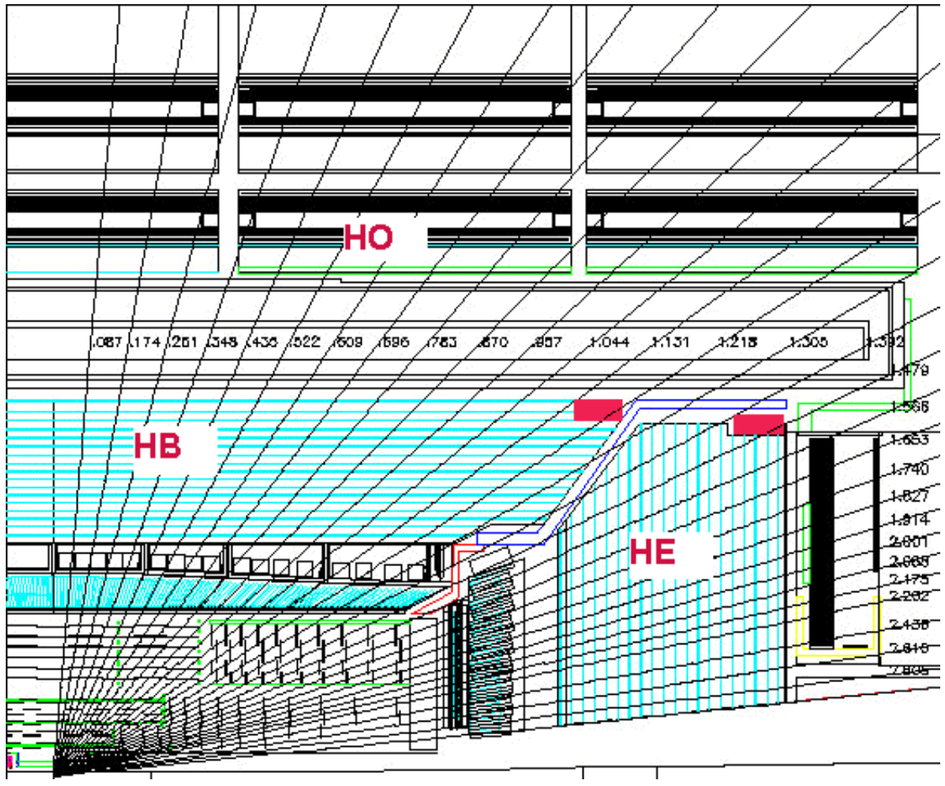
HCAL Subsystem Locations



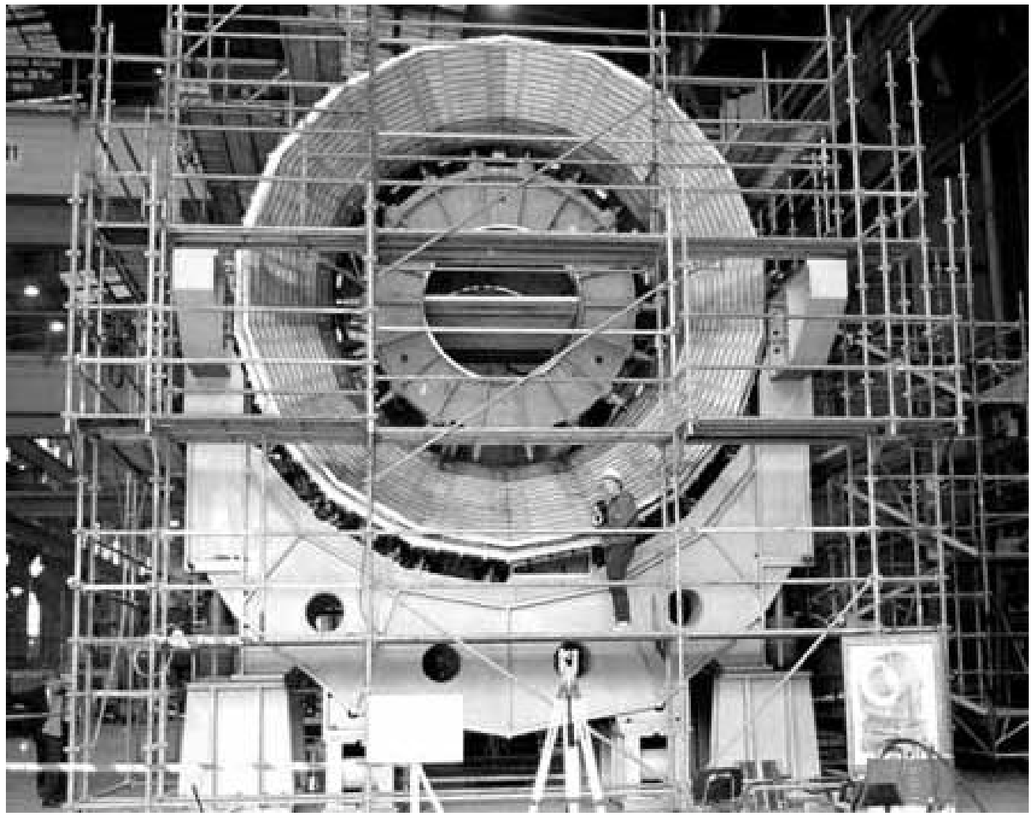
Overview of RBX Placement



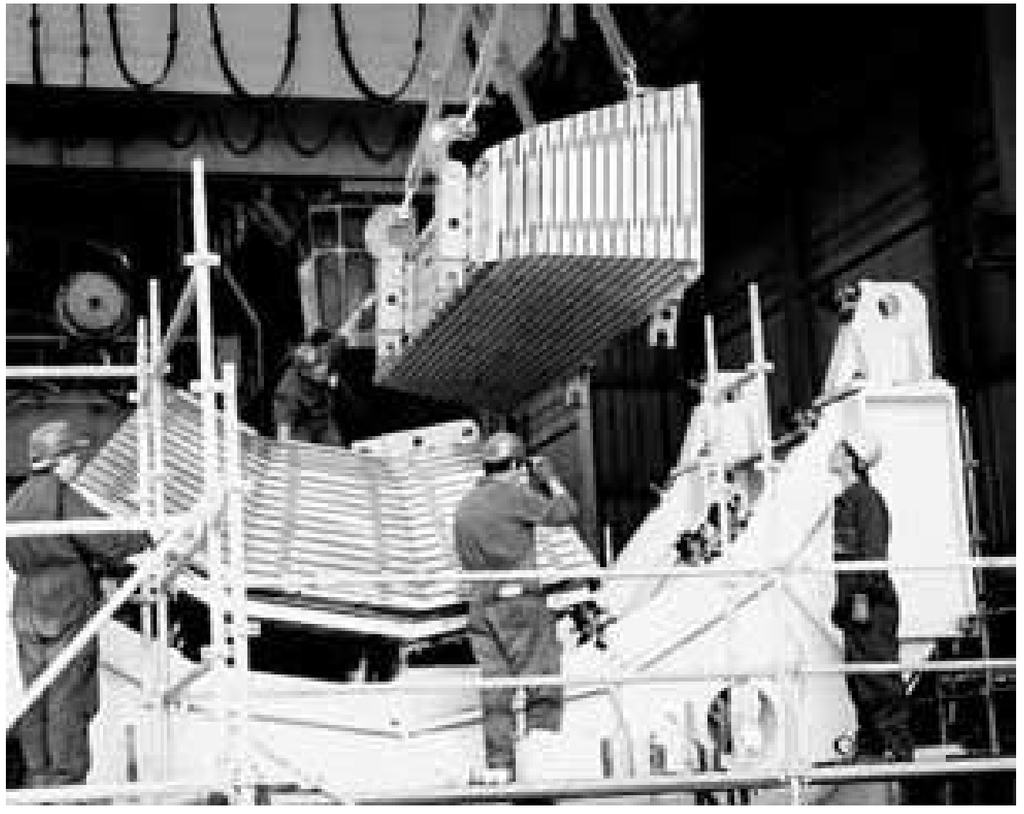
RBX contents for all subsystems

- All components reside in an enclosure/shell which acts as mechanical enclosure and distribution point for services.
- All components are modular – and can be inserted and removed as units.
  - RM-19 (HB, HE, and HO subsystems)
  - RM-73 (HB and HE only)
  - Calibration Module
  - CCM (Clock and Control Module)
  - HV/BV termination
  - LV termination
  - Water cooling
  - Gas manifold for nitrogen inerting of ODU/RM

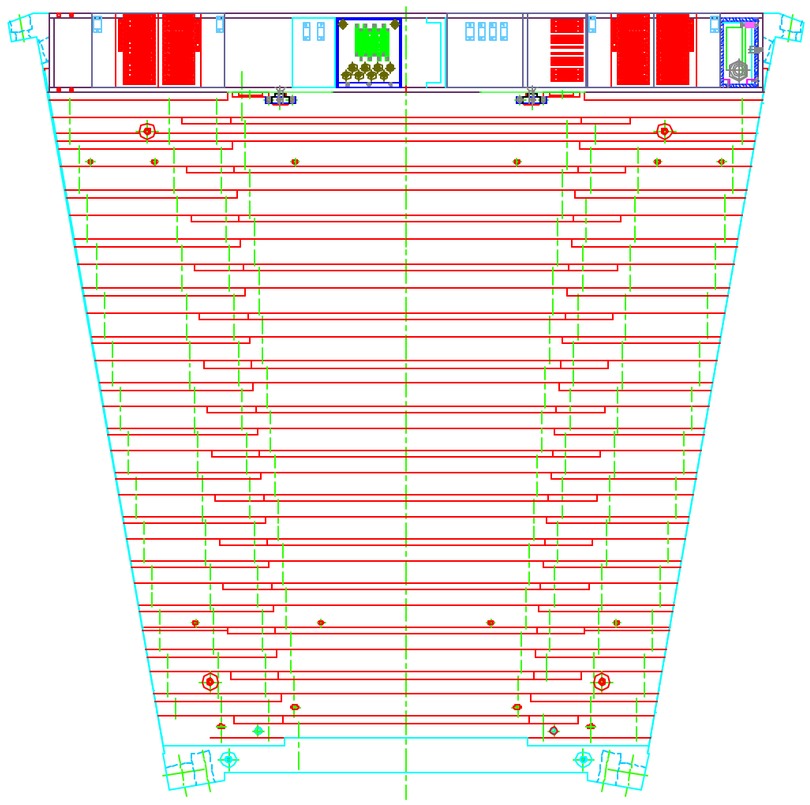
Assembly of HB- in Spain



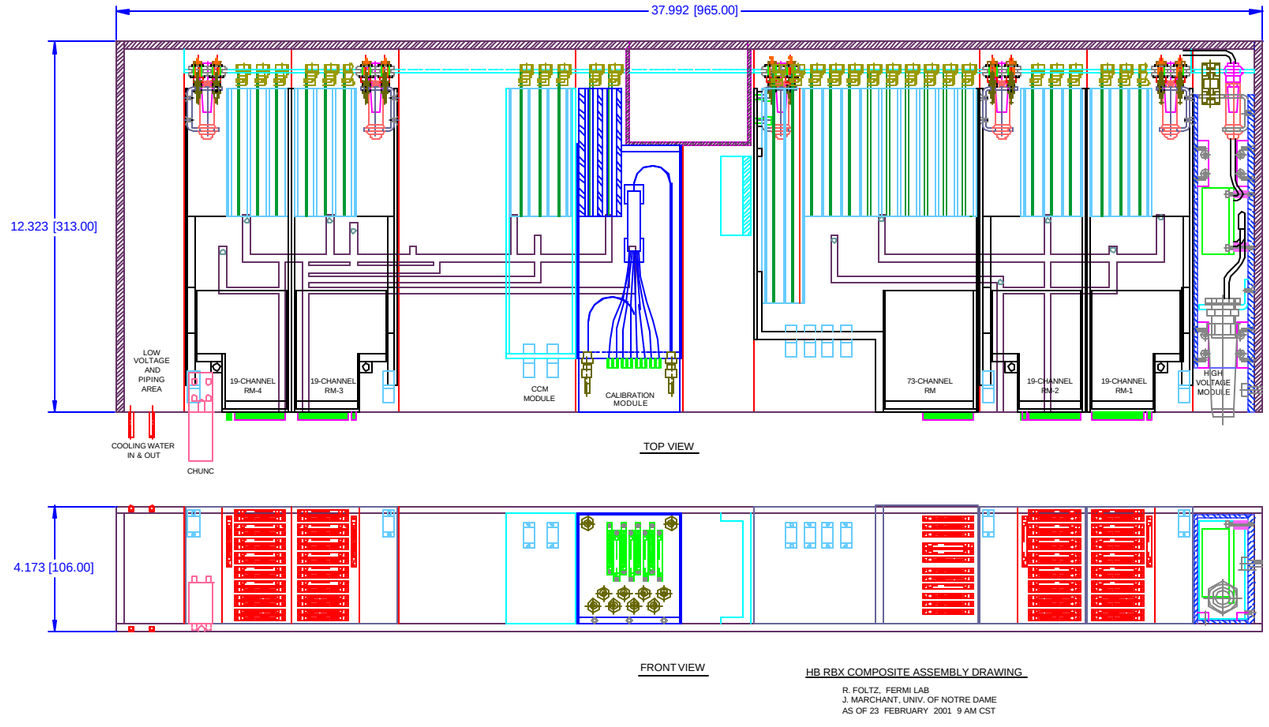
HB- Wedge being loaded on cradle



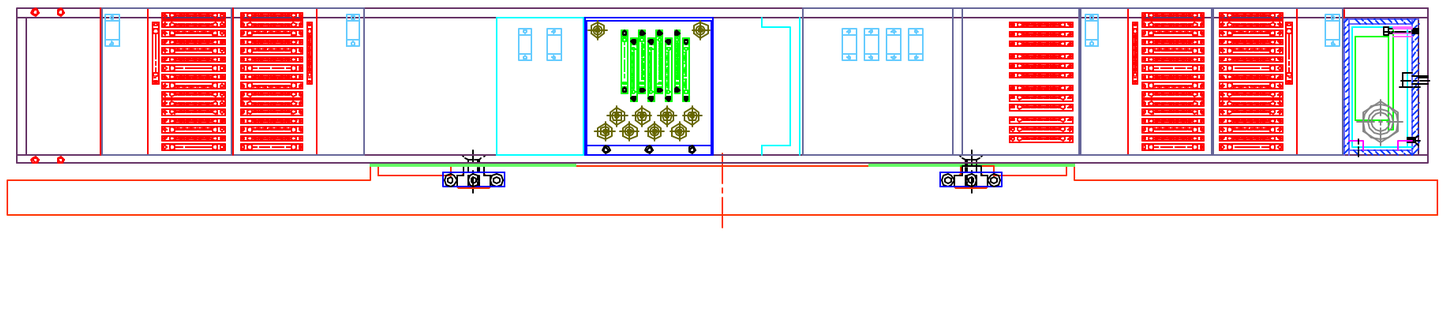
HB RBX mounting on Wedge



HB RBX (rϕ,z) view and (rϕ,r) view



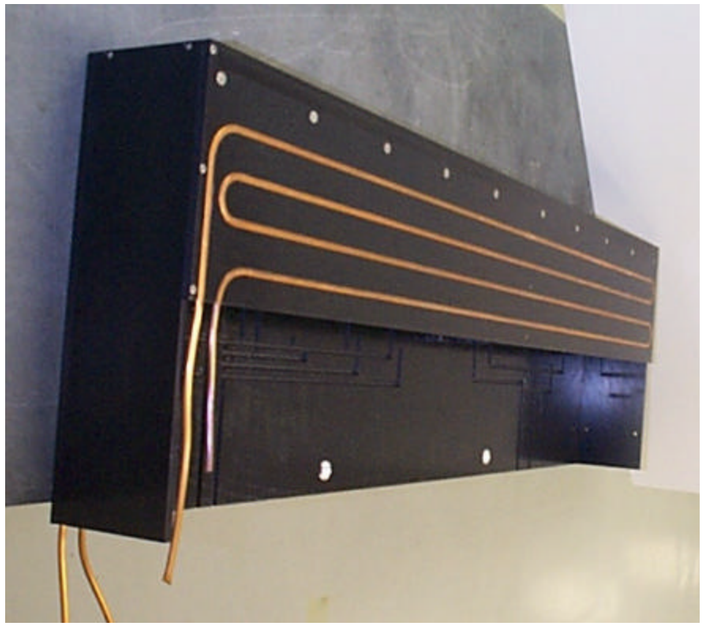
HB RBX Front Face



Topics

- Overview of RBX Design and Placement
  - HB RBX
  - HE RBX
  - HO RBX
- Services and Access
- Planning and Schedule

Cooling Routing on RBX enclosure outer surface



HB RBX Issues

- Design: compact and limited space
- Status: advanced, ready for production
- Integration: careful interaction with Tracker and ECAL services and panels required.
- Challenge: accessibility of modules, particularly the RM-73.
- Schedule: Testing of Megatiles in Building 186, May 2001. Mounting of RBX on HB- wedges Summer 2001 in building 186.

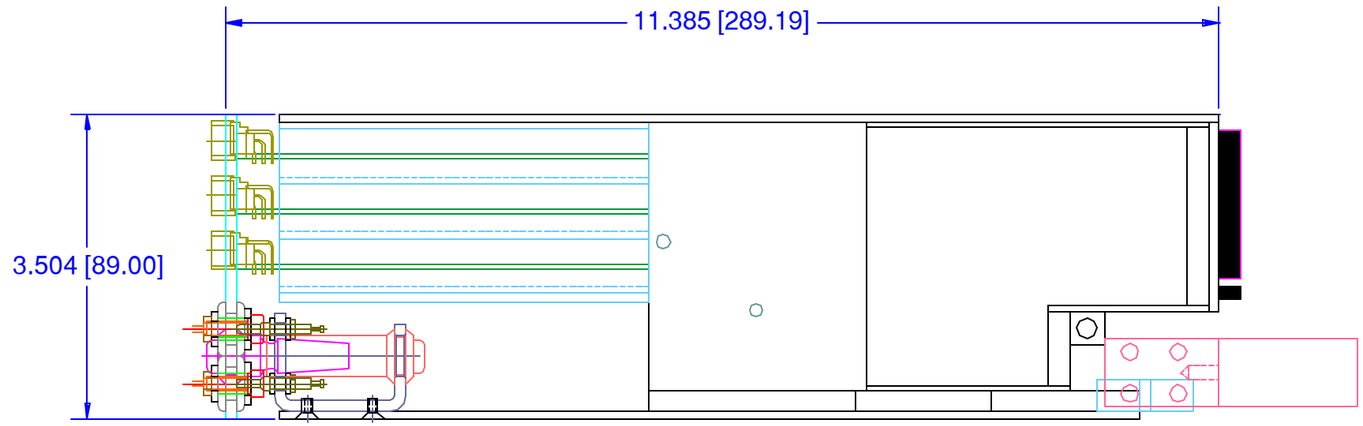
HB RBX Assembly

Full RBX with 19 ch RMs

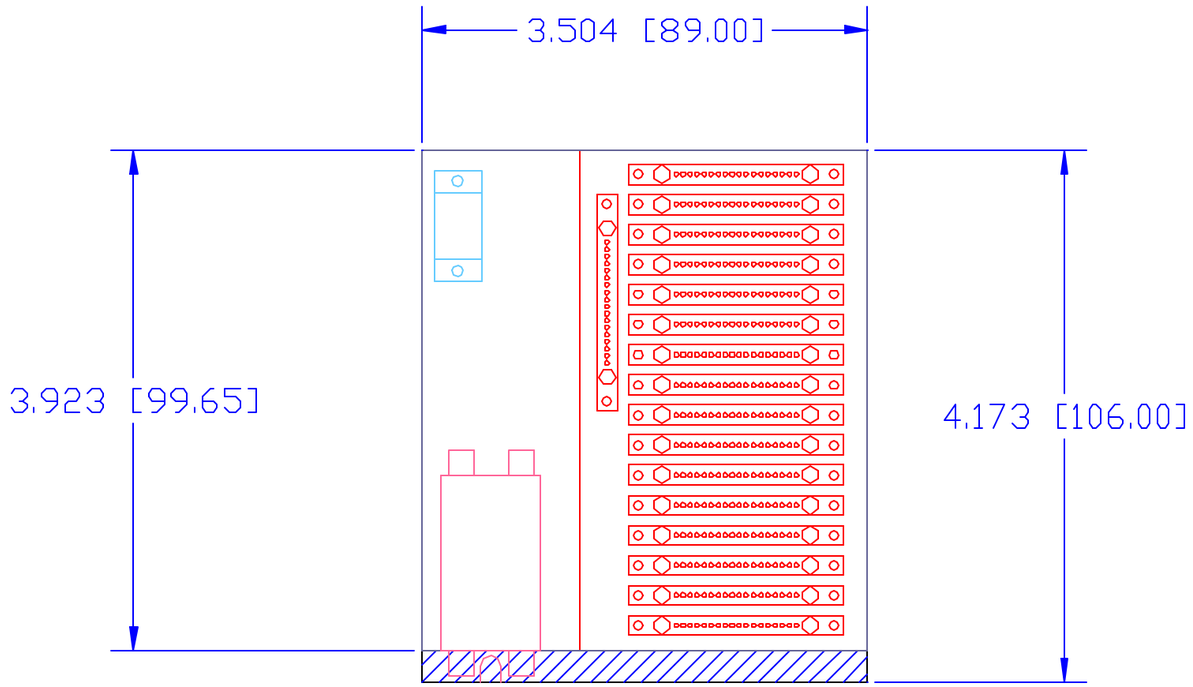
RBX Interior -- HV distributor and backplane

HB RBX Module Routing Channels

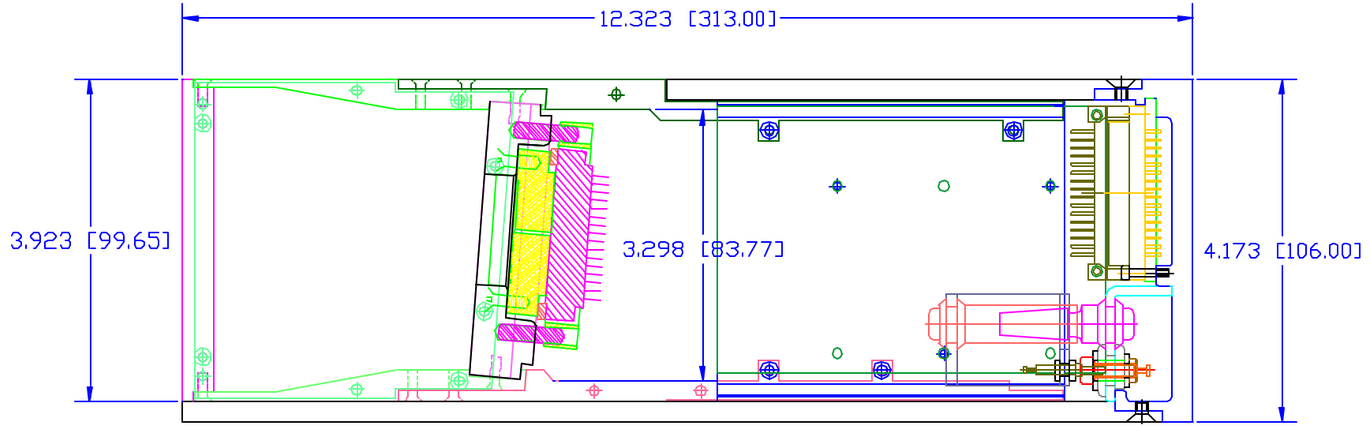
RM-19 QIE Top View

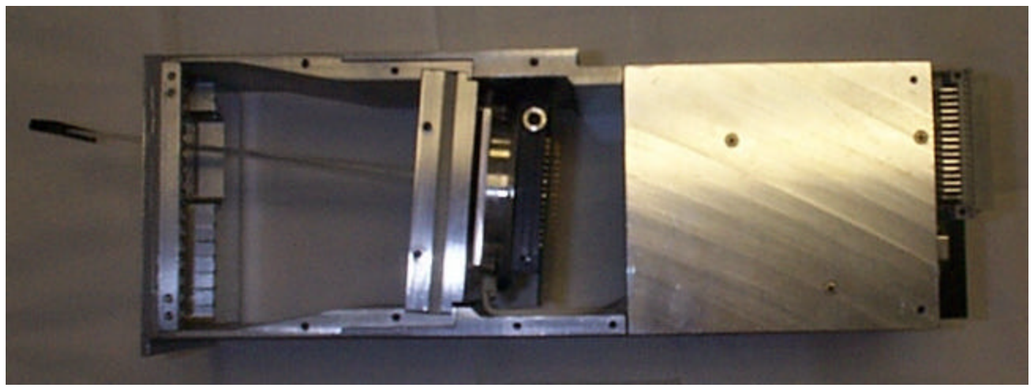


RM-19 QIE Front Face

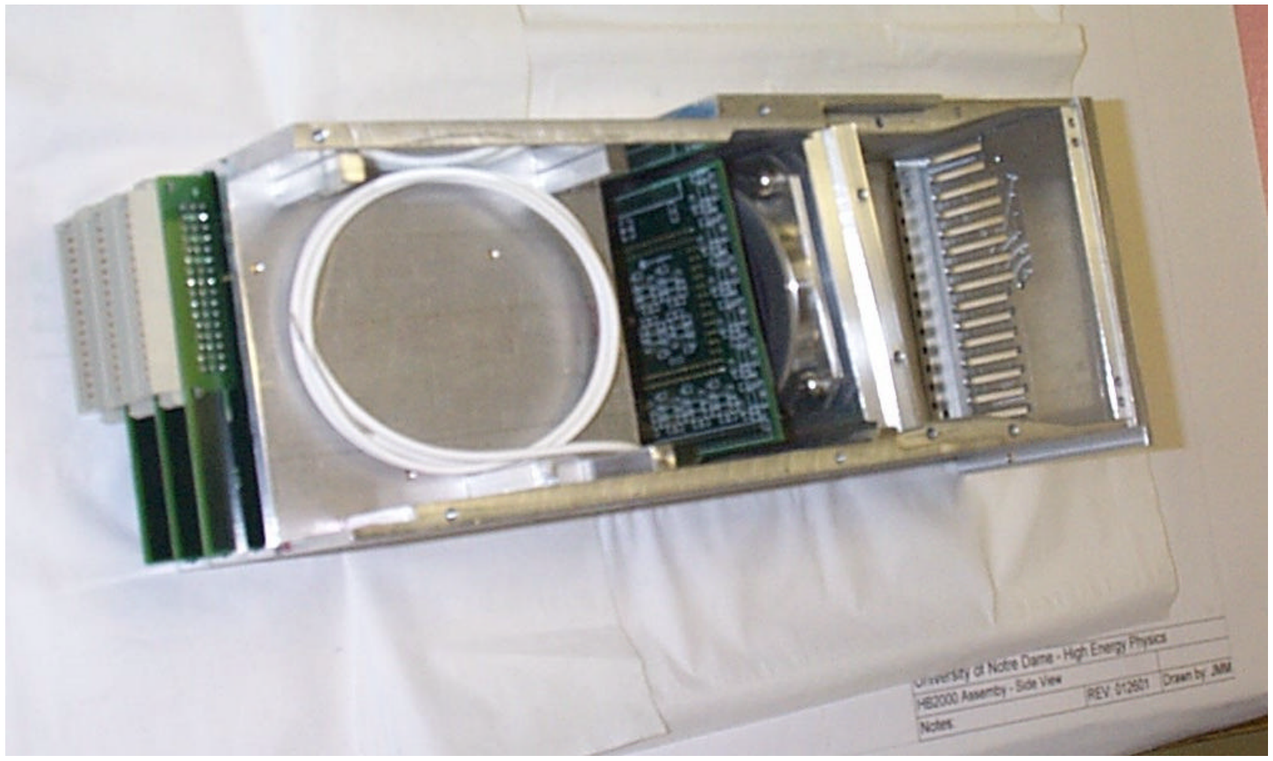


Readout Module for 19-channel HPD
RM19



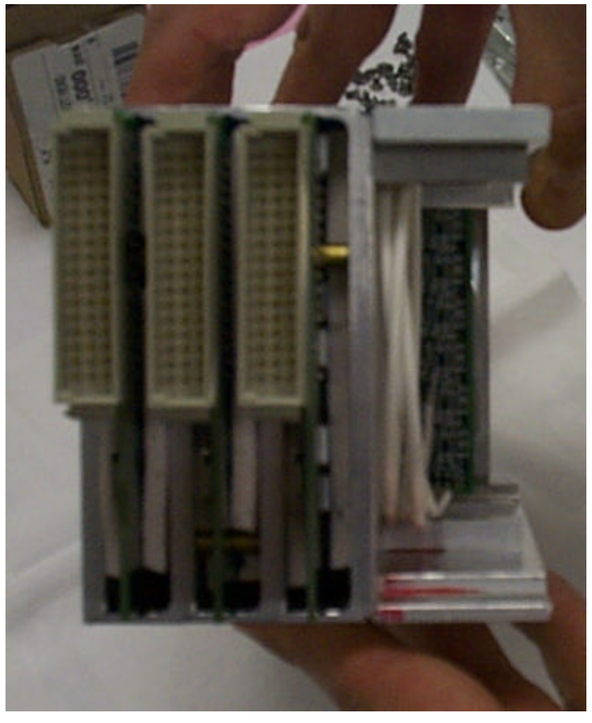


RM19 Sidewall removed

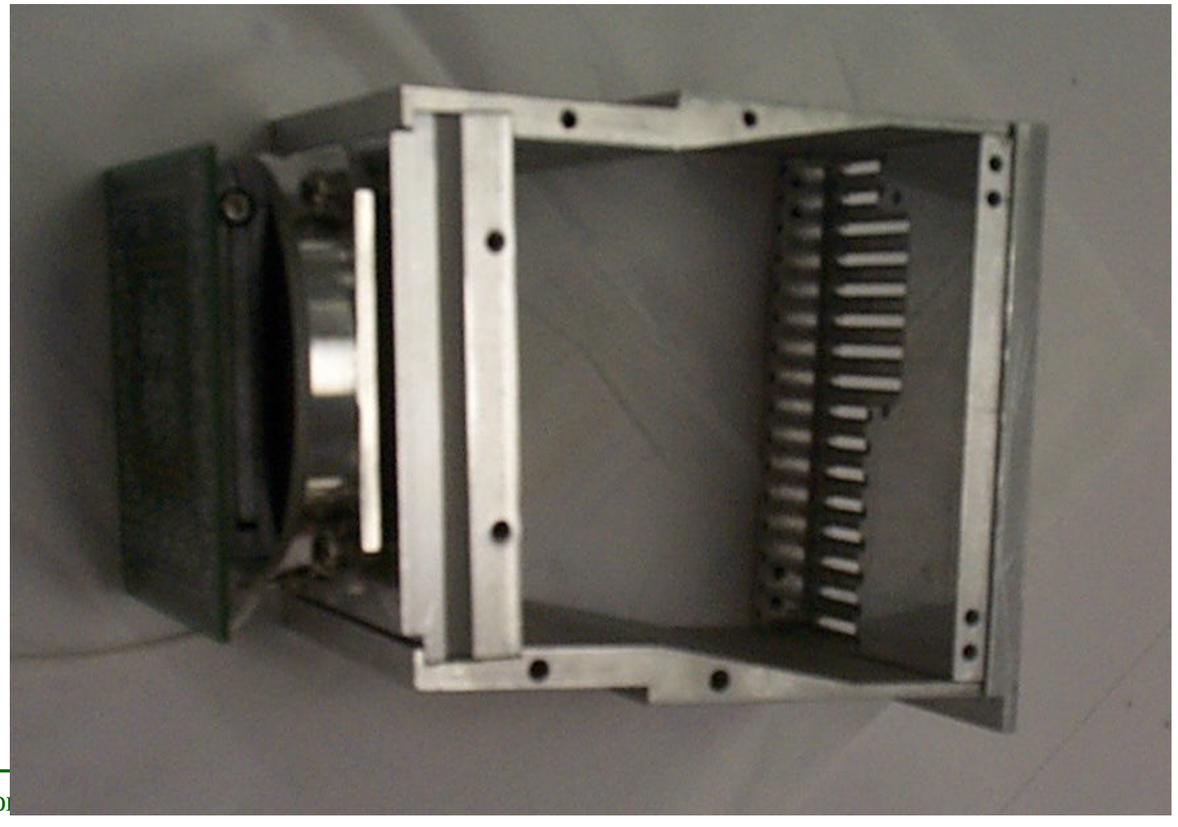


HB RBX Electrical

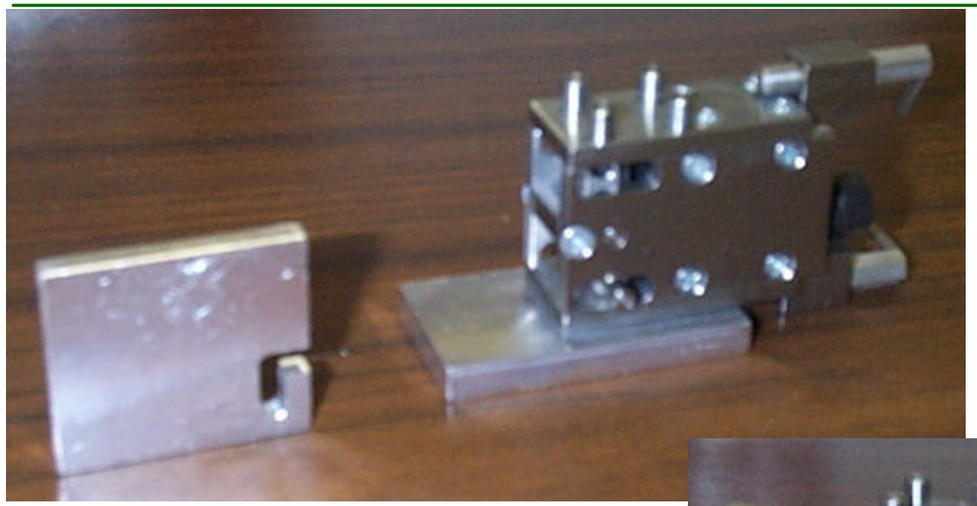
RM19 Rear and Front Views

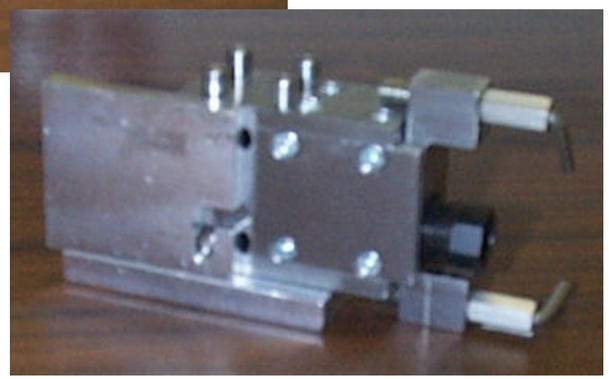


ODU showing patch panel, cookie support plate, HPD, ZIF socket and interface card

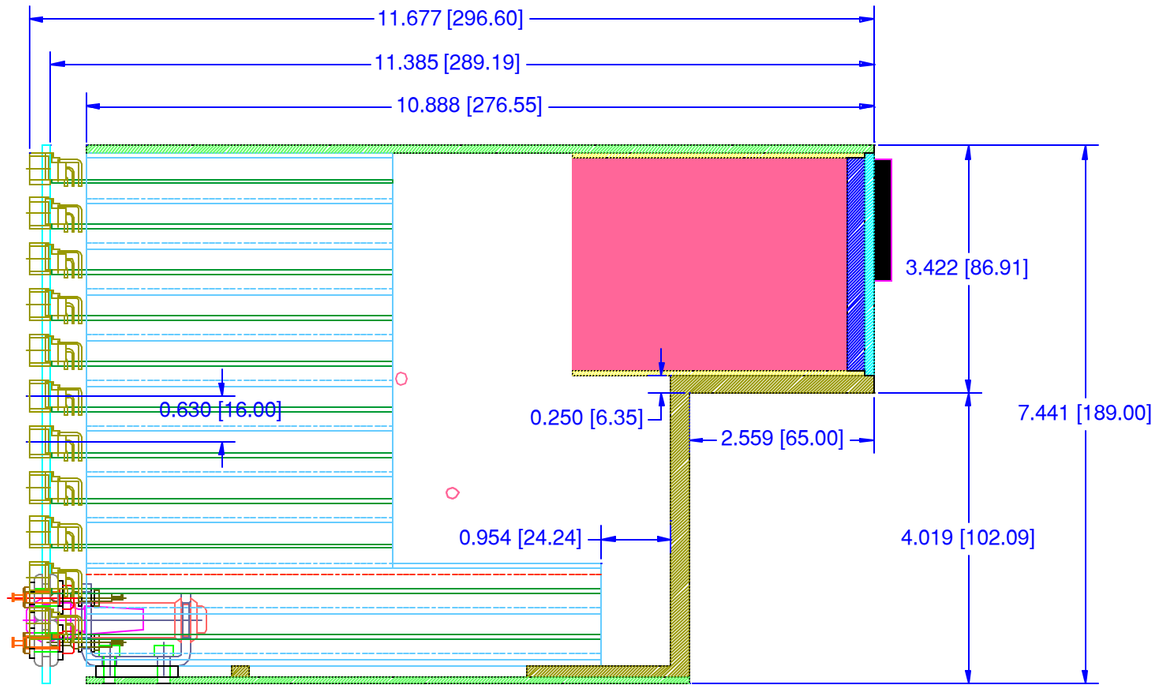


Module Extractor (CHUNC)





RM-73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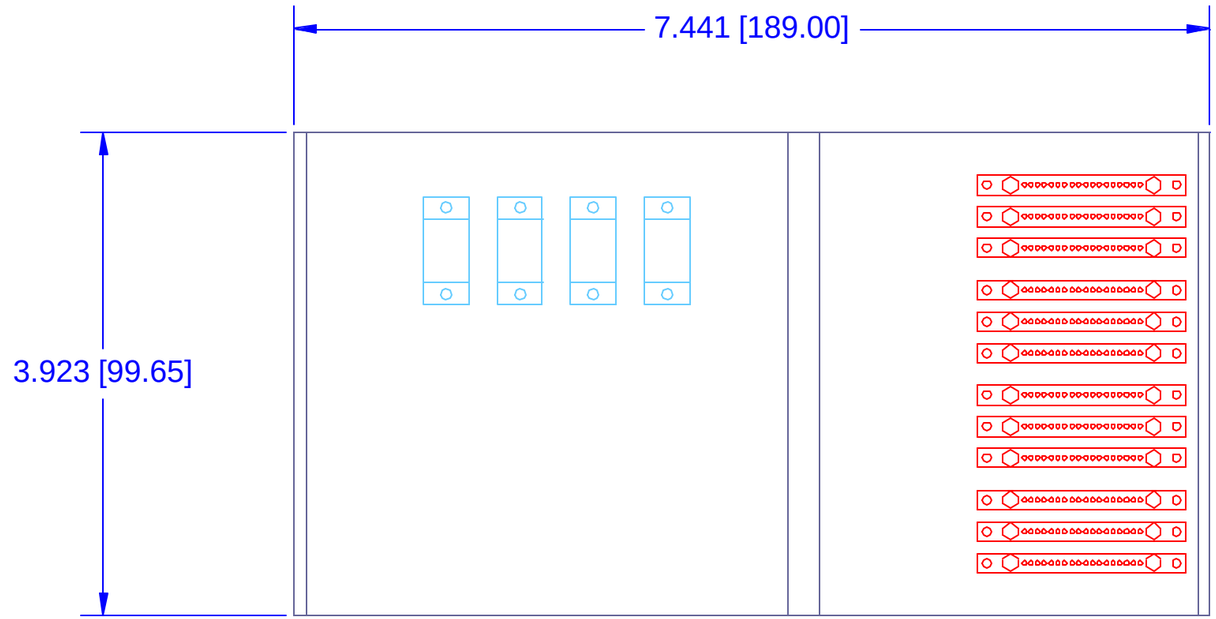
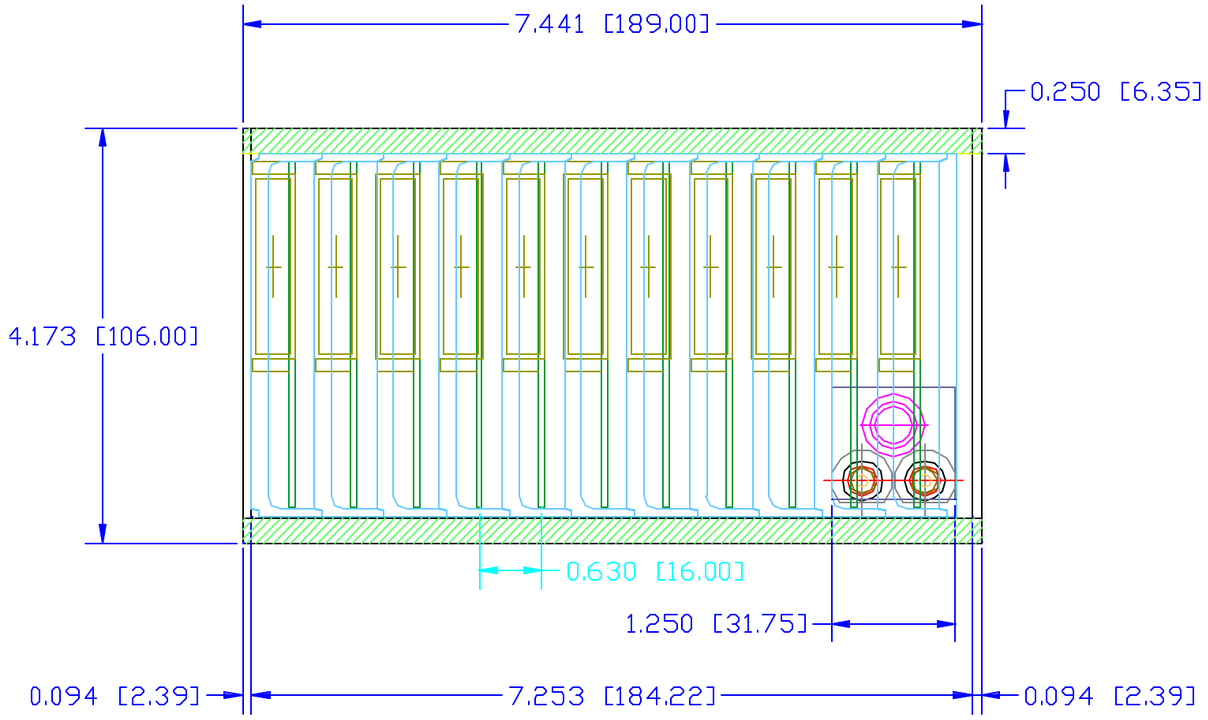
11.385 [289.19]
10.888 [276.55]
3.422 [86.91]
0.630 [16.00]
0.250 [6.35]
2.559 [65.00]
7.441 [189.00]
0.954 [24.24]
4.019 [102.09]

RM-73 Front Face



RM-73 Rear View



HB Mapping Example
QIE Cards to Megatiles

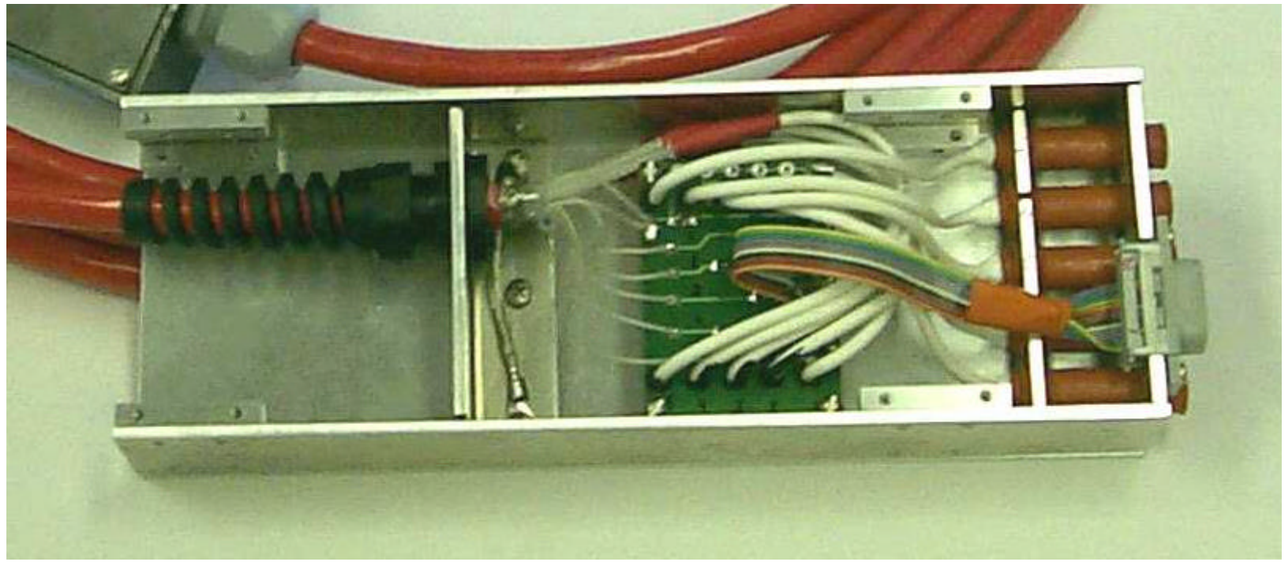
Tower	PIN	RO Card	Tower	PIN	RO Card	Tower	PIN	RO Card
16	A13	3	16	A8	2	15	A4	1
15	C15	3	14	B12	2	13	B5	1
12	C2	3	11	L16	2	10	L15	1
9	G2	3	8	G1	2	7	P15	1
6	R12	3	5	R5	2	4	P2	1
3	T13	3	2	T8	2	1	T4	1

19.4	19.3	19.2	19.1
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15
16	16	16	16
15	15	15	15
16	16	16	16

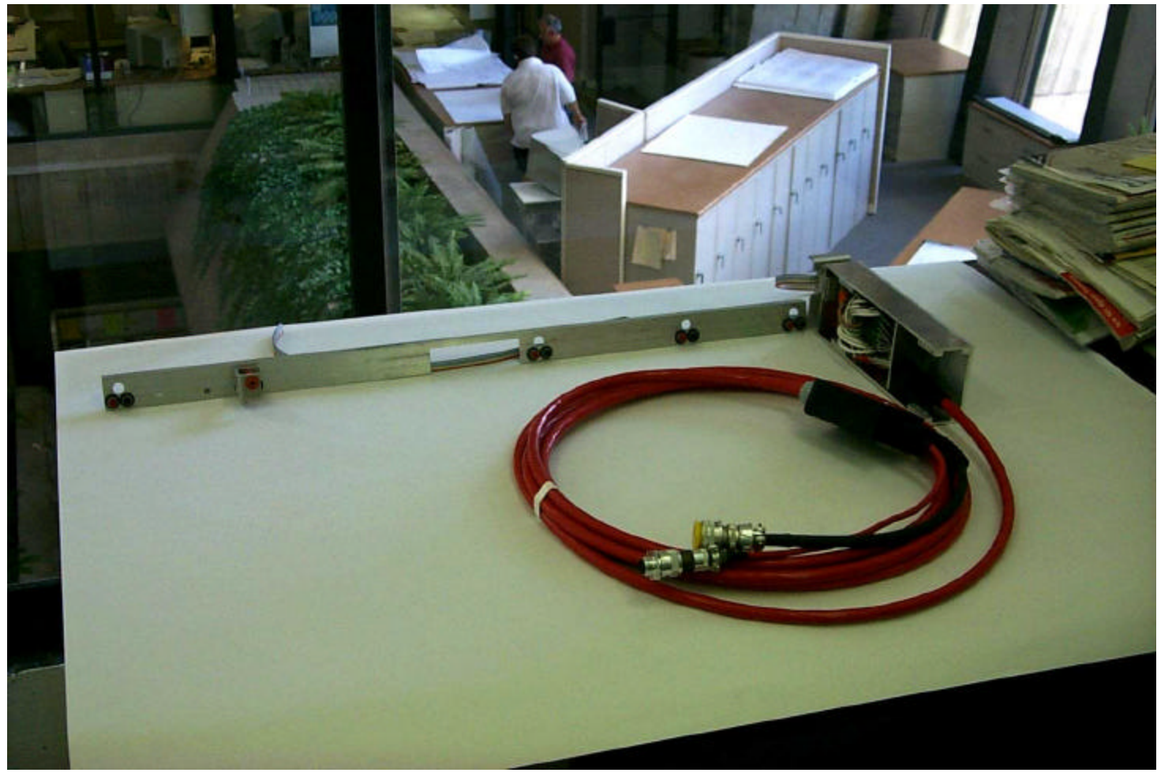
RBX Services

- Water for cooling in/out
- Nitrogen gas for ODU/RM inerting in only
- HV/BV + termination
- LV
- Optical signals QIE out
- CCM and slow controls
- Laser calibration signals

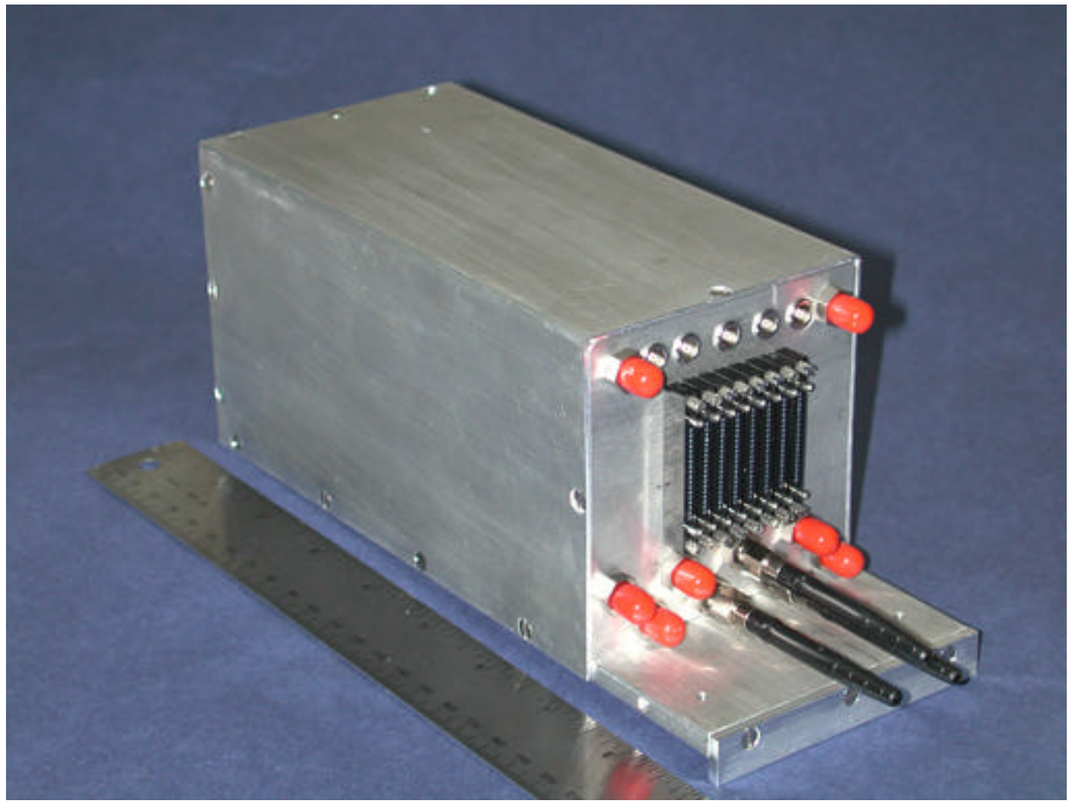
HV/BV Cable Termination



HV/BV Distributor



Calibration Module



General Comment about RBX and Components

- The structures are modular. This allows us to gain in the schedule, as assembly, Q/C and testing can be “factorized”.
- RBX enclosures can be built, tested and mounted, independent of components which can be added later.
- RM can be fabricated mechanically. ODU can be fabricated. Electronics and HPDs can be incorporated when available.

Additionals

- Copper fittings and jumper between roof and floor water cooling pipes
- Gas manifold
- LV module
- CCM
- CHUNC
- RM pinning
- Front protection cover Status of Costing Status of Costing panels
- RM-19 (QIE) and RM-73
- Retrofit of holes in RBX flooring for mounts

HB RBX Production Status

- HB PPP-1
  - At CERN in mockup at Prevessin Site.
- HB PPP-2
  - At Fermilab for electrical integration and 186 testing
- HB PPP-3
  - At Notre Dame for thermal tests and 186 testing
- HB PPP-4
  - Under fabrication at an outside vendor and assembled at Mississippi. Production drawing test bed.
- HB RBX production begins April 2001

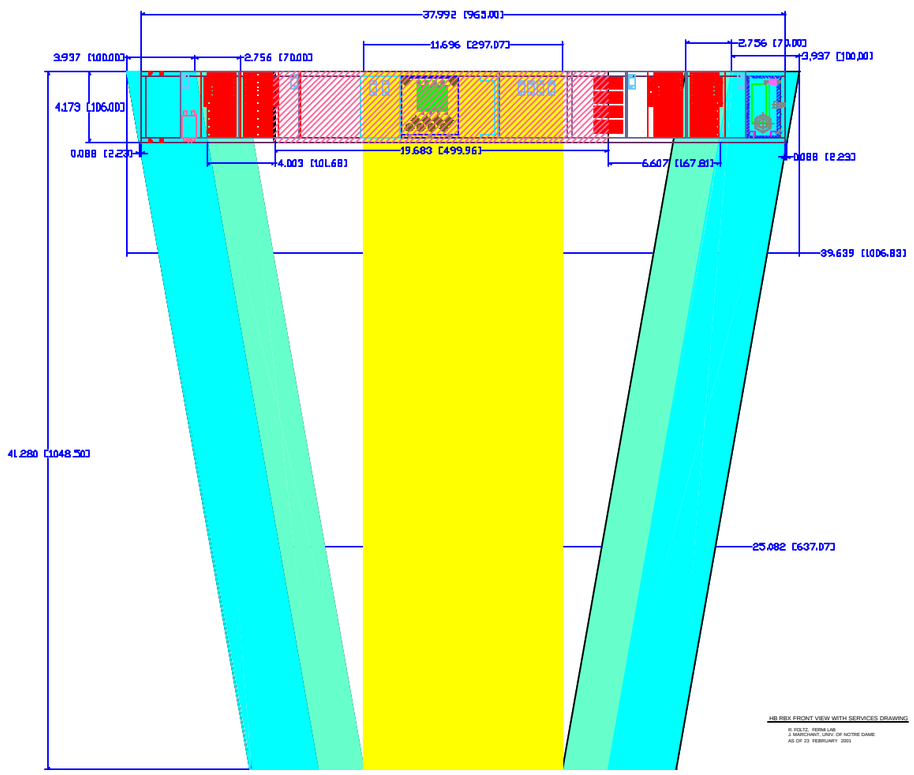
HB access/serviceability issues

- RM-19
  - Removal of optical cable protective covers
  - Removal of optical cables, calibration cables
  - Removal of any blocking services/cables
  - Direct extraction using CHUNC
- RM-73, CCM and Calibration Modules
  - Similar to above, except RM-19s must be removed first.
  - Removal of any blocking services/cables.
  - Extraction using CHUNC

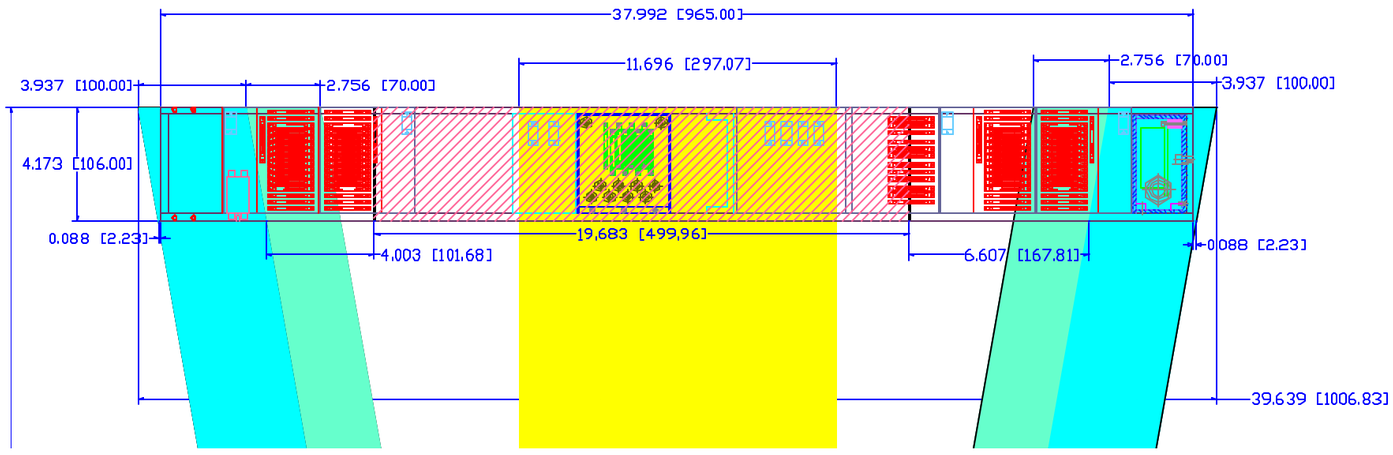
HB access/serviceability issues

- HV/VB termination and LV termination
  - Removal of RM-19
  - Extraction using CHUNC
  - Service in situ
- HV/VB backplane, electrical backplane
  - Removal of all RM, CCM and Calib Module
  - Removal of HV/BV and LV terminations
  - Full extraction

Service Paths + Panels



Servicing View



HB Mockup in Lab 5 at Fermilab

Mockup at Fermilab


Polystyrene Insulation

HB RBX

Extracting ODU 19.2

View of Mockup: edge of wedge

View behind ECAL cooling conduits

HB RBX environs
(lateral shift of TK patch panel)

HB RBX

Extracting ODU 19.4

HB RBX

Extracting ODU 19.2

HB RBX with TK patch panel

no clearance for ODU-73

HB RBX

Extracting ODU 19.1

HB RBX

ODU 73 clearance issues

HB RBX

ODU 73 clearance problems

Suggestion
to allow ODU 73 access

Accessibility Issues

- All optical cables for RM-19 visible and accessible in an unobstructed manner for visibility and access to mounting screws.
- Same requested for RM-73, but may not be possible.
- Use of compact extraction tool CHUNC to remove and reinsert modules
- Use of floor tracking to assure proper module insertion at odd angles.
- Mockup studies, Fermilab Lab 5 and Prevessin.

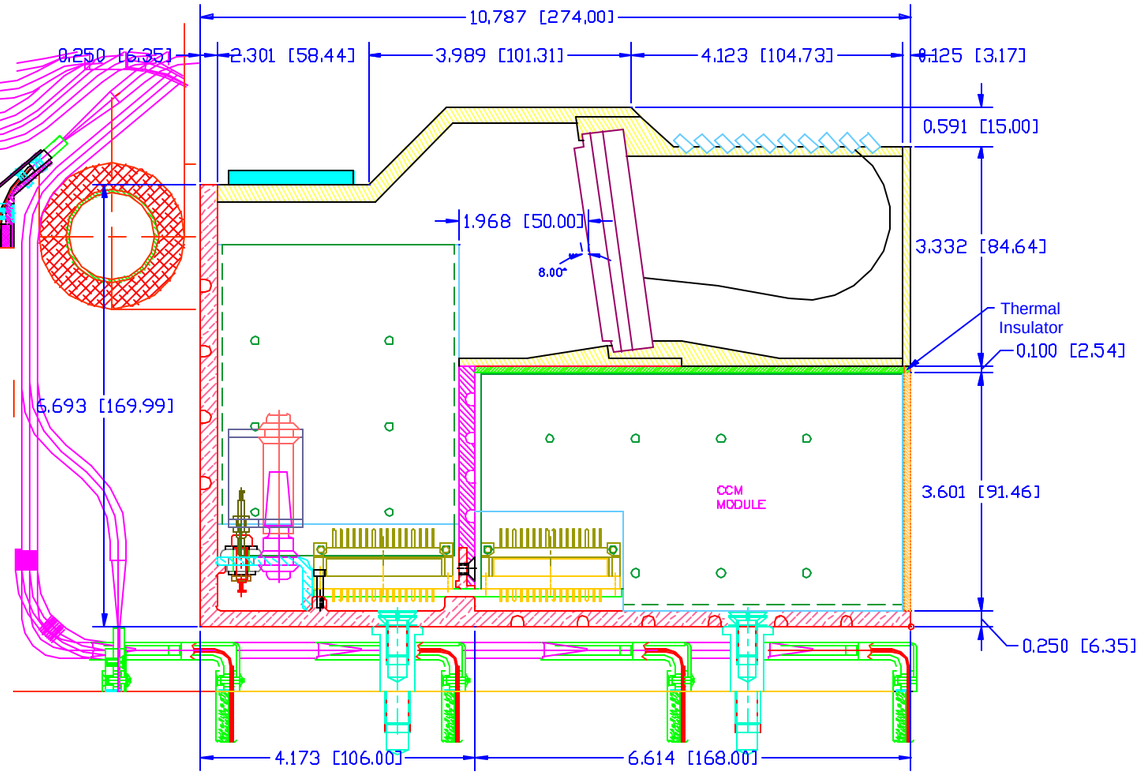
HE RBX Issues

- Design: laterally compact, but good access in principle
- Status: enclosure design quite advanced
- Integration: careful interaction with Preshower (SE) and ECAL (EE) services.
- Challenge: cooling issues and ODU fiber routing.
- Schedule: PPP in June 2001

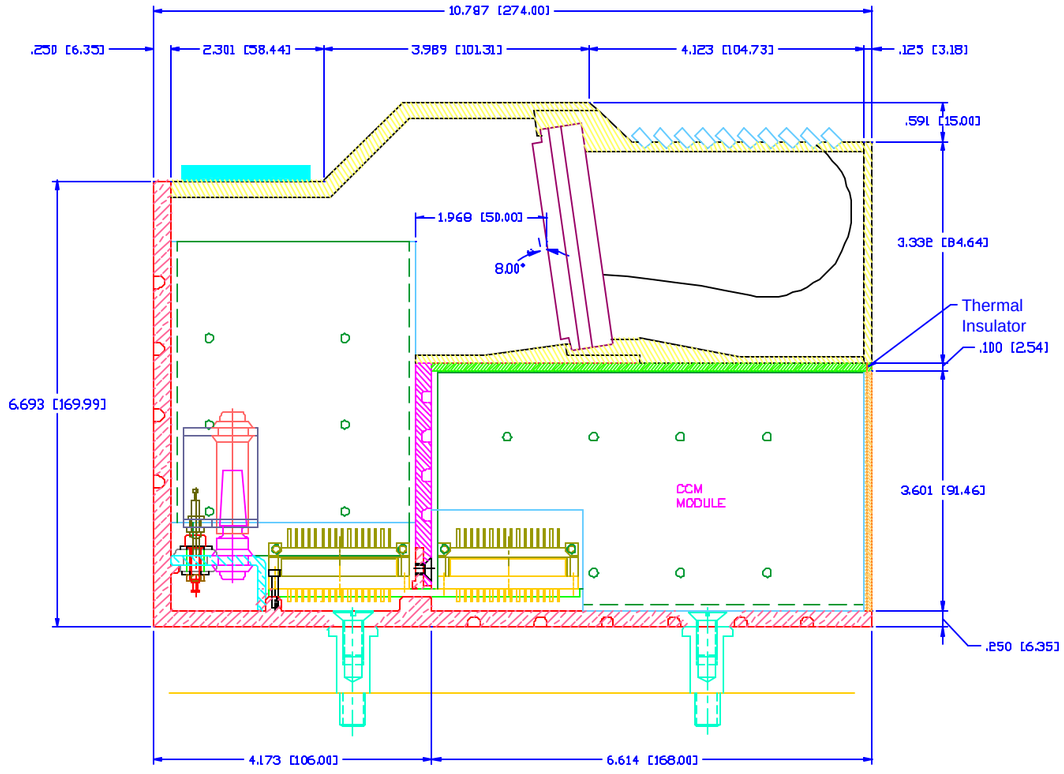
HE RBX Status

- Drawings in progress
- Builds as much as possible upon the design of HB where possible.
- Layout of various internal modules in progress
- ODU in mockup phase

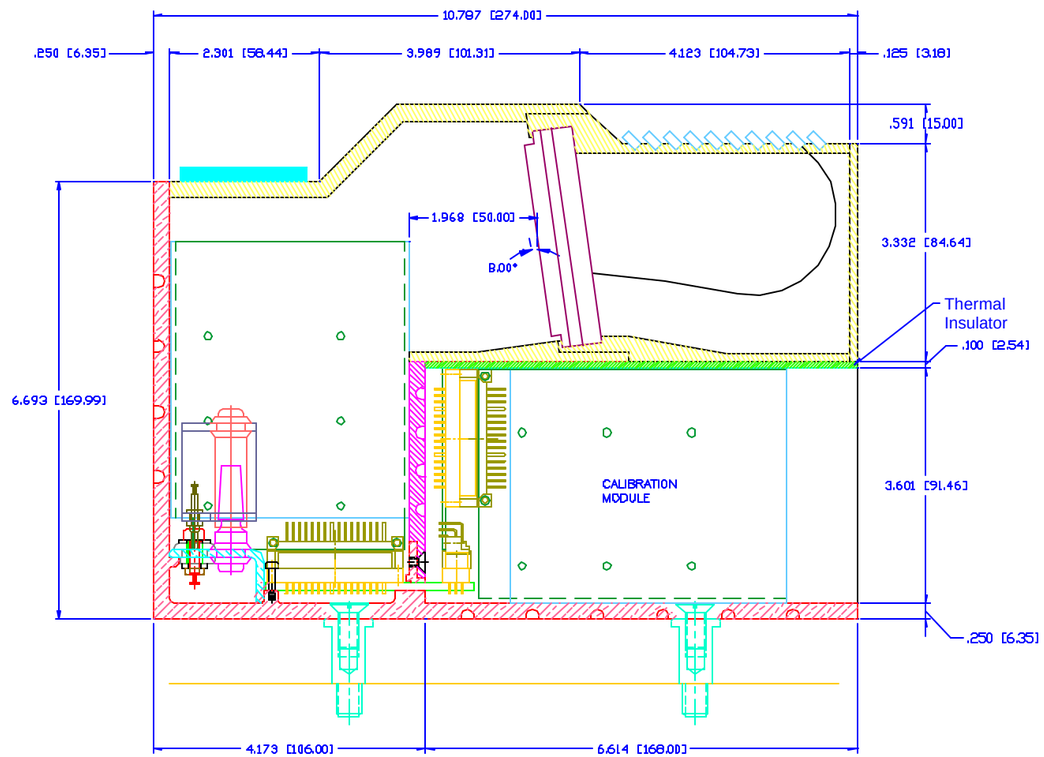
HE RBX (r,z) view



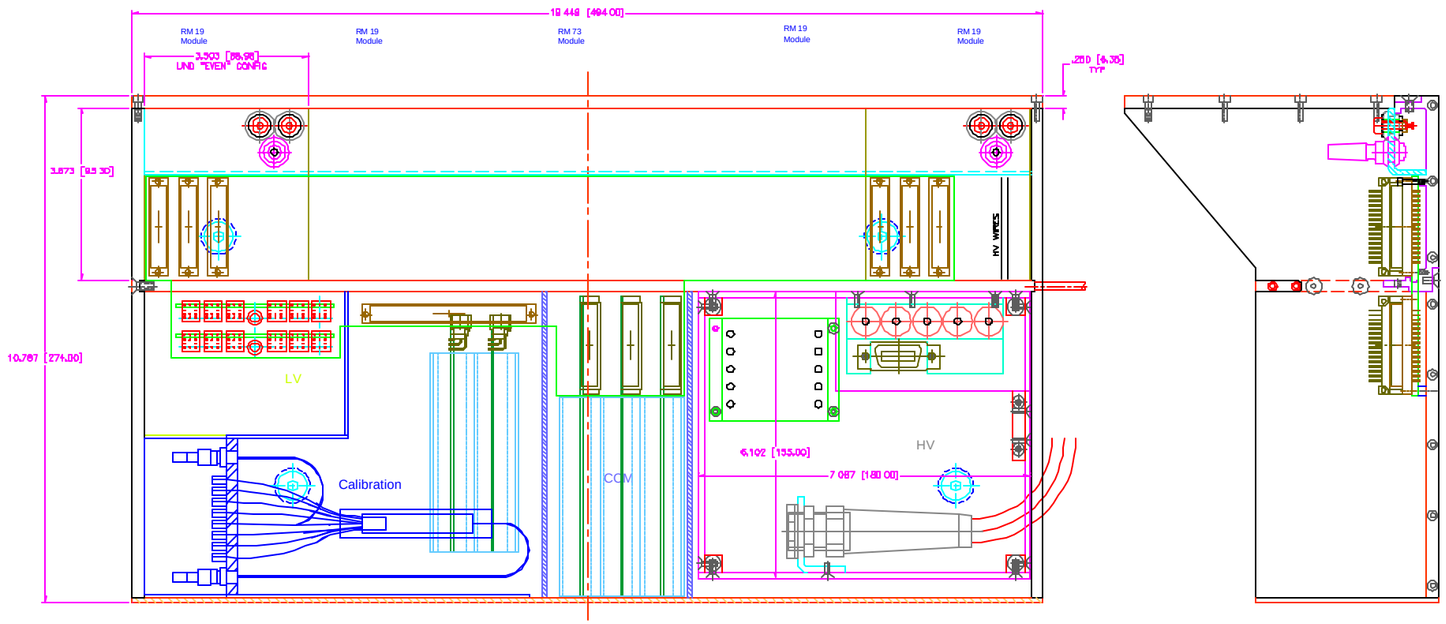
HE RBX (z,r) view
Section through CCM



HE RBX (z,r) view
Section through Calib Module



HE RBX (rϕ,z) view



HO RBX Issues

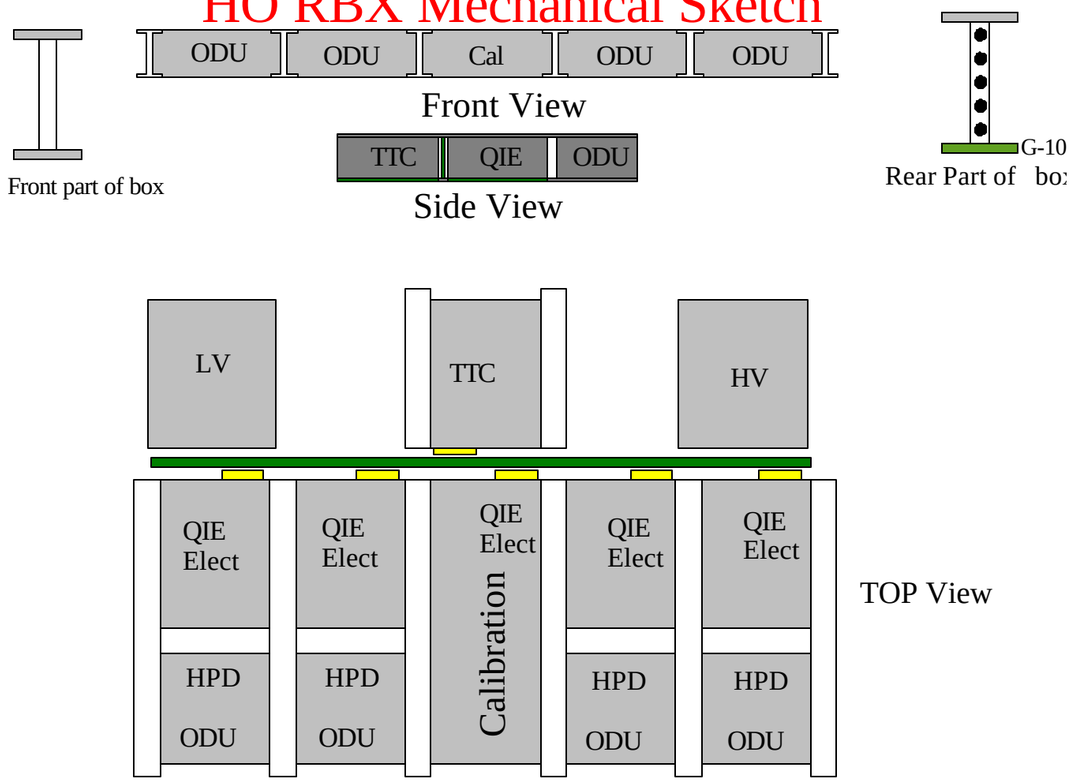
- Design: vertically very compact. Resides within muon absorber which provides for magnetic "focussing" for HPD, and shortened optical cables from HO megatiles.
- Status: enclosure in design, but not advanced
- Integration: careful interaction with muon chamber systems.
- Challenge: ODU/HPD cookie placement, servicing, and optical cable routing to megatiles.
- Schedule: PPP in winter 2001

HO RBX Status

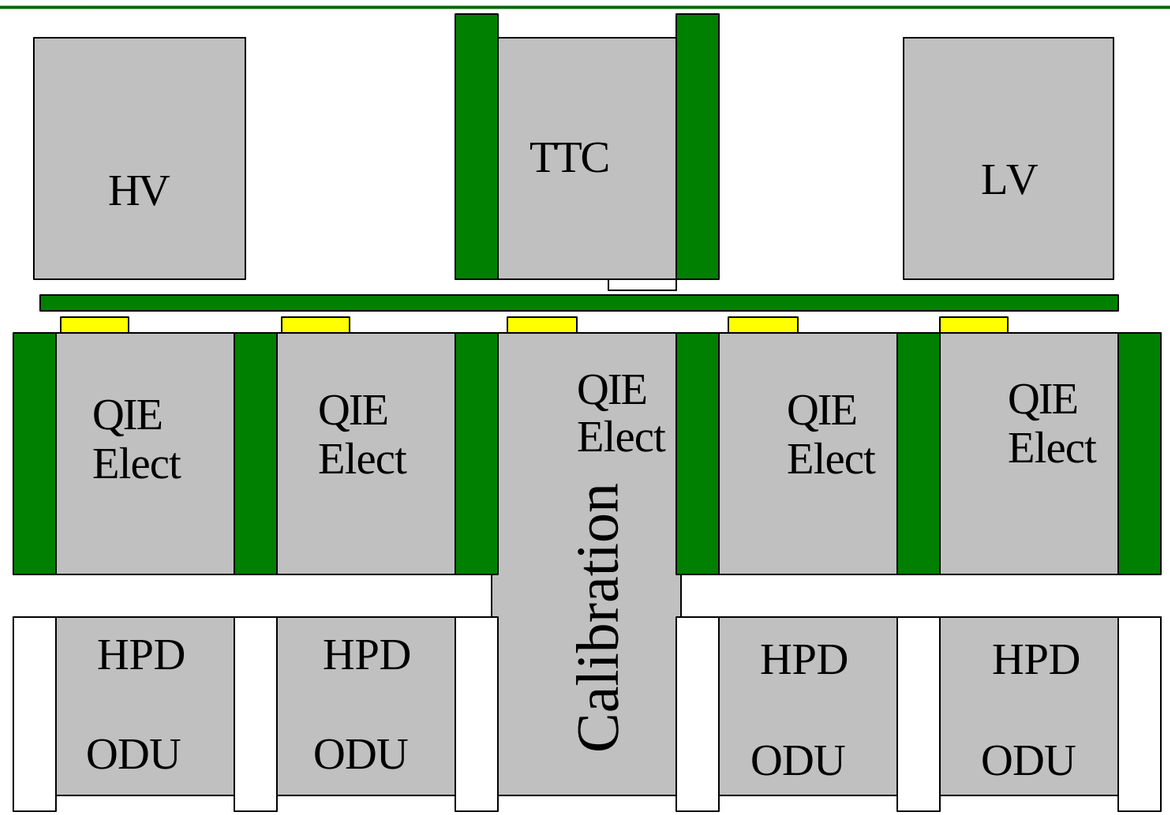
- Drawings in formative stage
- Awaiting final results from study of magnetic field situation
  - Appears that a solution is possible with RBX located at the large z ends of the muon wheels.

HO RBX Concept

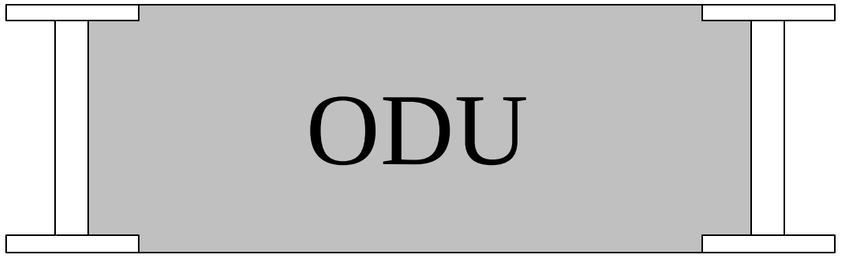
HO RBX Mechanical Sketch

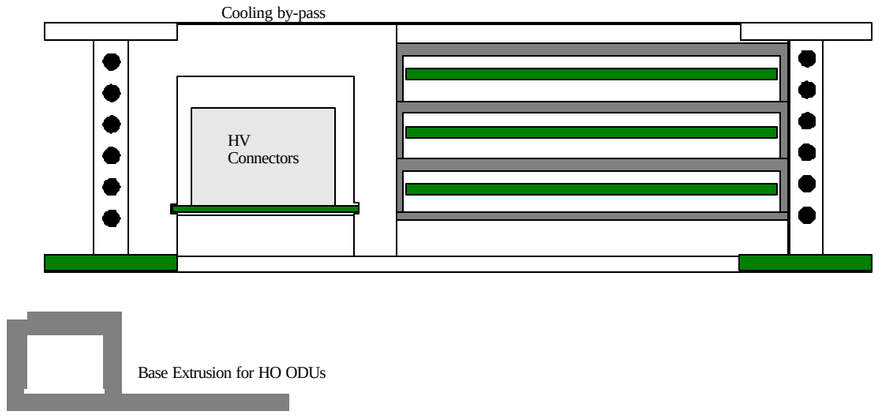


HO (rϕ,z) Schematic

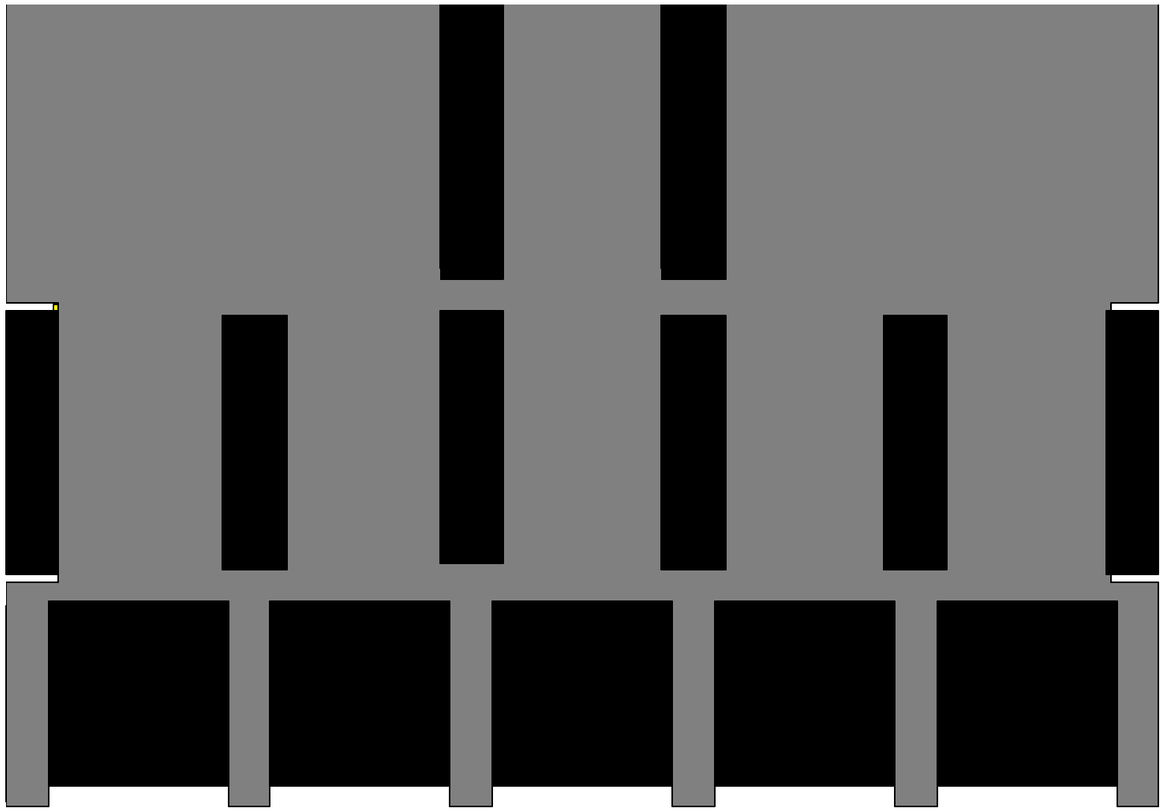


HO RM schematic



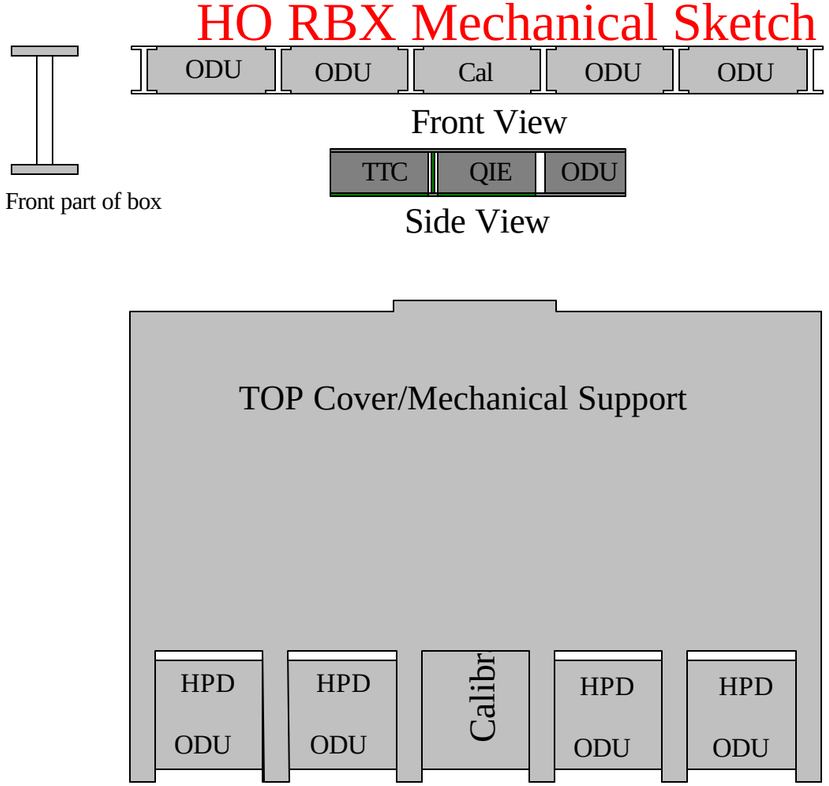


HO RBX Mechanical: Bottom Coverplate



HO Mechanical: Top Coverplate

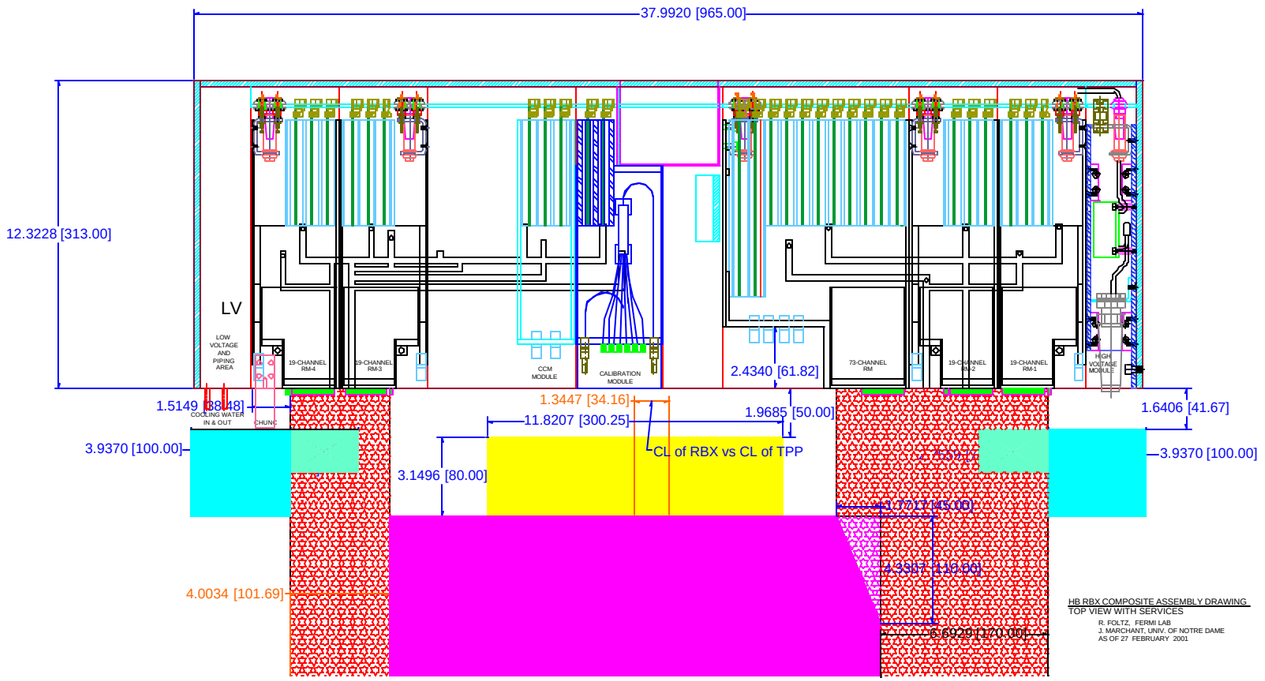
HO RBX Mechanical Sketch



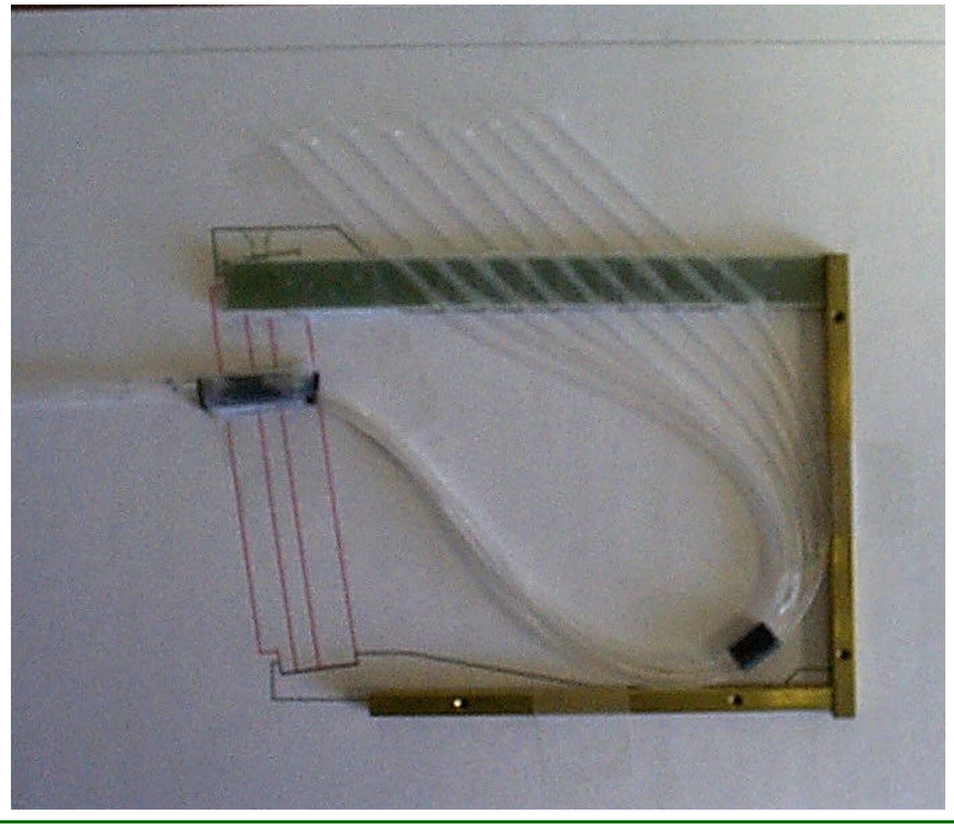
Request of CMS

- Approval of HB RBX design and agreement that HB RBX production can begin.
- Approval of design concept of HE RBX and that once full drawing set is available, that production can begin of the HE RBX.
- Approval of design concept and placement of HO RBX within iron of the Muon Wheels.

HB RBX Accessing Issues



HE ODU Fiber Mockup



HE ODU fiber routing test