

PIXEL INSERTION TUBE

DECEMBER 13, 2000

MECHANICS MEETING

ON BEHALF OF MANY COLLABORATORS

OVERVIEW

- **INSERTION SCHEME**

- QUICK SUMMARY—SEE FULL PRESENTATION OF SCHEME ON EDMS IN THIS MEETING NODE

- **SERVICE BREAKS AND ENVELOPES**

- SERVICE BREAKS AS REQUIRED BY THE INSTALLATION SCENARIO
- ENVELOPE CRITICAL AREAS

- **SUPPORT TUBE LAYOUT, FUNCTION AND SUPPORT**

- TUBE REQUIREMENTS DOCUMENT AVAILABLE SOON IN DRAFT FORM
- TUBE IN THREE PARTS (BARREL AND TWO FORWARDS)
- INSTALLATION RAILS
- SUPPORT OF CYLINDER AND DETECTOR

FULLY INSERTABLE PIXEL SYSTEM

- **CLAM SHELL NOT NECESSARY IF BEAM PIPE IS NOT CONTIGUOUS**
 - SHORT ACCESS CONFIGURATION DOES NOT ALLOW INTRODUCTION OF ANYTHING AS LARGE AS A FULL PIXEL SYSTEM TO THE ACCESS VOLUME
 - DURING LONG ACCESS CONFIGURATION LIQUID ARGON END CAP IS PULLED BACK AND OFF-AXIS ALONG WITH ITS BEAM PIPE SECTION
- **CLAM SHELLING OF B-LAYER IS ONLY NECESSARY TO CLEAR BEAM PIPE FLANGE**
 - SAME B-LAYER DESIGN/DIMENSION AND SIMILAR SUPPORT SCHEME
- **KEEP FUNCTIONAL FRAME ELEMENTS INTACT**
 - GLOBAL SUPPORT FRAME IS NOT CLAM-SHELLED
 - STAVES AND BARRELS SAME IN DESIGN BUT SMALLER
 - B-LAYER IS THE SAME
- **HOWEVER: DISKS AND FRAME CHANGE PARAMETRICALLY**

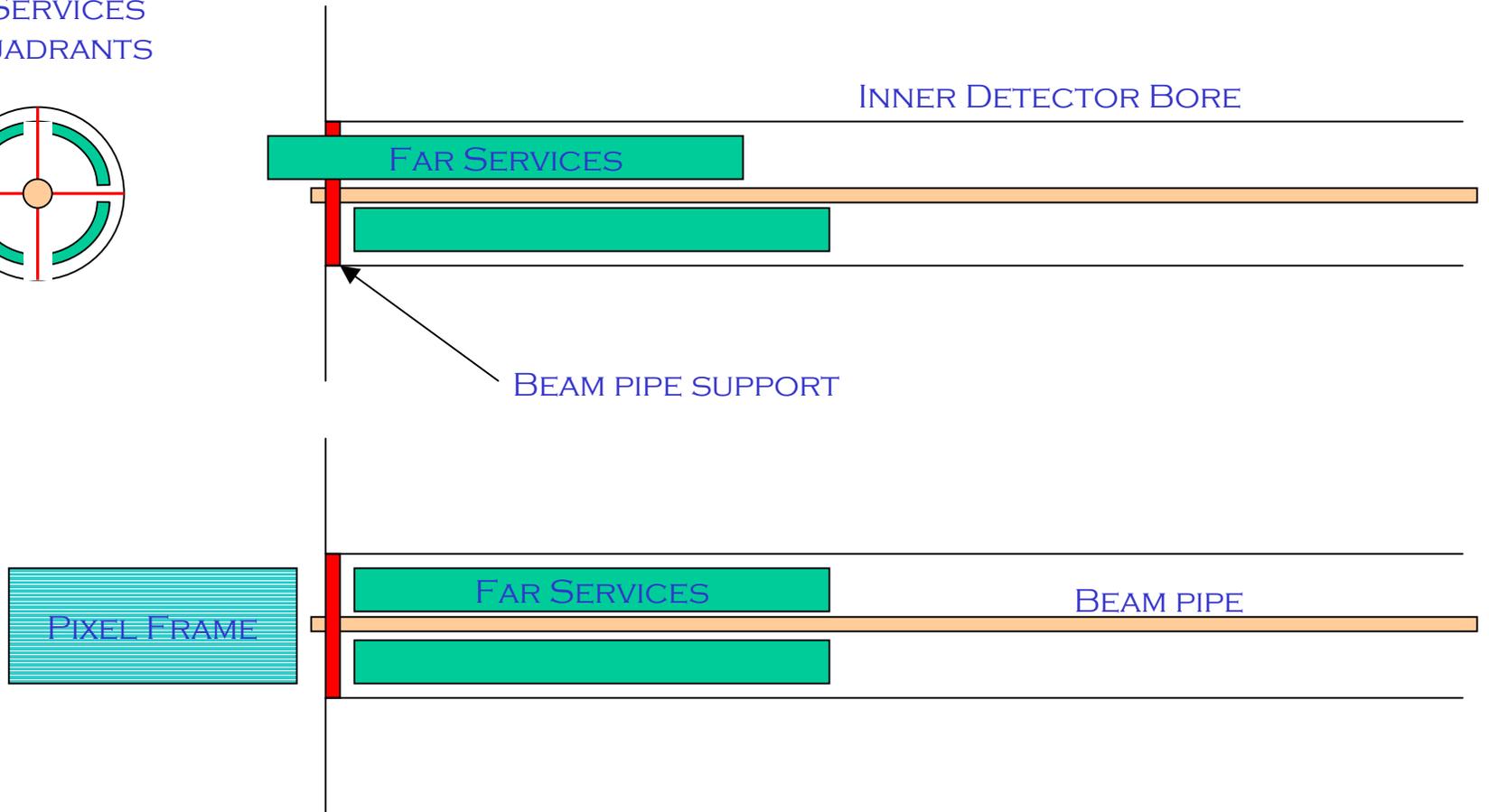
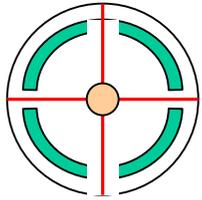
INSERTION SEQUENCE

- **ATLAS ARGON ENDCAP IS NOT PRESENT**
- **FAR SIDE SERVICES ARE INTRODUCED IN QUARTERS**
- **PIXEL DETECTOR IS BROUGHT UP TO END OF BORE**
- **BEAMPIPE AUXILIARY SUPPORT IS INTRODUCED THROUGH PIXELS AND THE SUPPORT WIRES ARE REMOVED**
- **FAR SIDE SERVICES ARE TERMINATED TO PIXEL DETECTOR AND PIXEL FRAME IS INSERTED INTO BORE**
- **VERTICAL SUPPORT WIRES ARE RE ATTACHED**
- **PIXEL DETECTOR IS PUSHED 1.2M INTO BORE OF ID, AND B-LAYER TOOLING IS INTRODUCED AS PER CURRENT B-LAYER INSTALLATION**
- **B-LAYER IS PASSED AROUND SUPPORTS AND CLAM SHELLLED AROUND BEAMPIPE**
- **B-LAYER IS INSERTED INTO PIXEL DETECTOR ON THE BASELINE RAIL SYSTEM**
- **THE PIXEL DETECTOR WITH B-LAYER IS PULLED BACK TO THE END FACE TO ALLOW NEAR SIDE TERMINATION OF BOTH PIXEL AND B-LAYER SERVICES**
- **PIXEL DETECTOR AND ITS SERVICES (NEAR AND FAR) WITH B-LAYER IS PUSHED INTO POSITION**
- **SERVICES ARE TERMINATED TO THE SERVICE RUNS TO PP2**

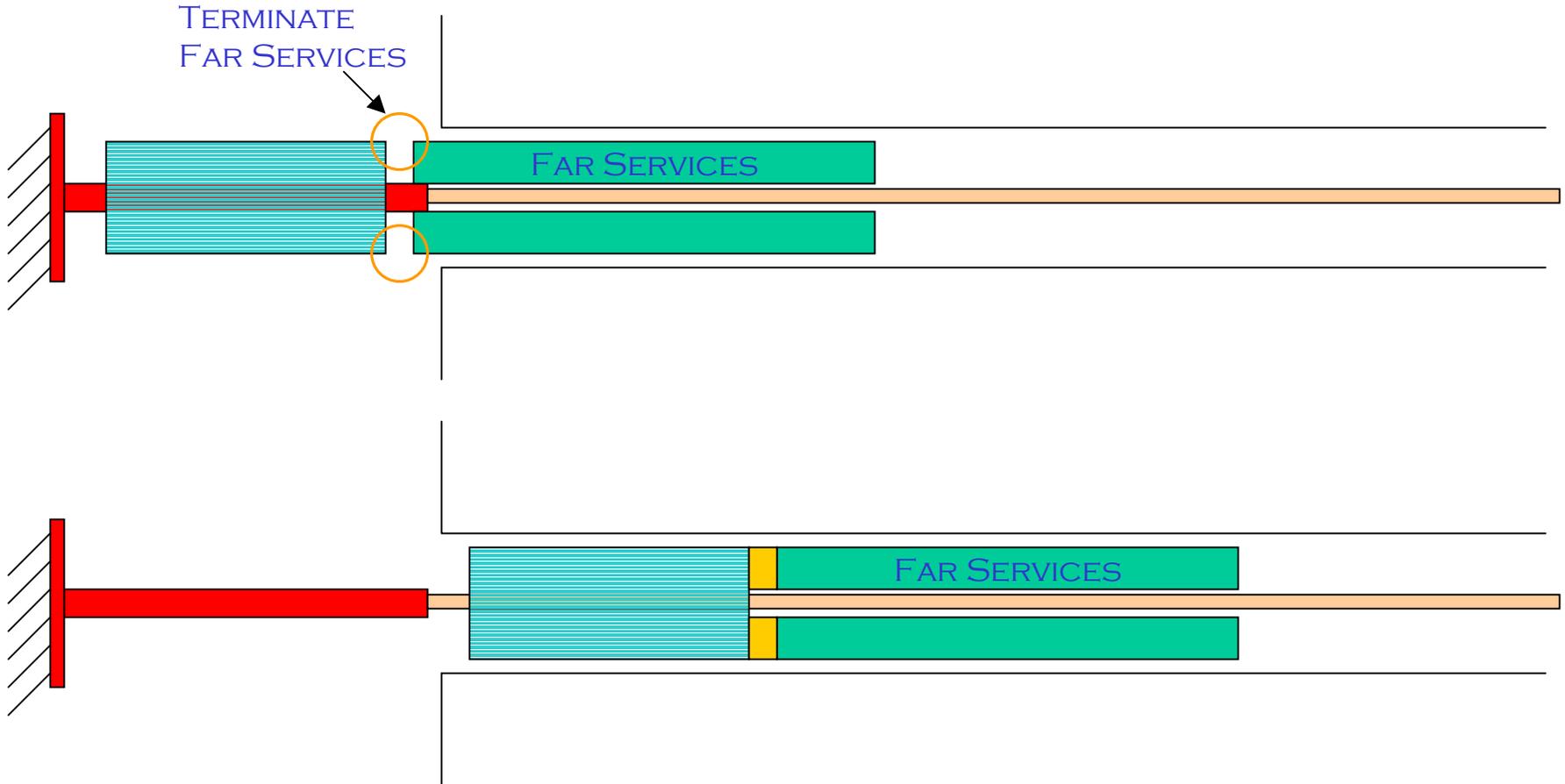
PIXEL DETECTOR

FAR SERVICES ARE INSERTED

FAR SERVICES
IN QUADRANTS

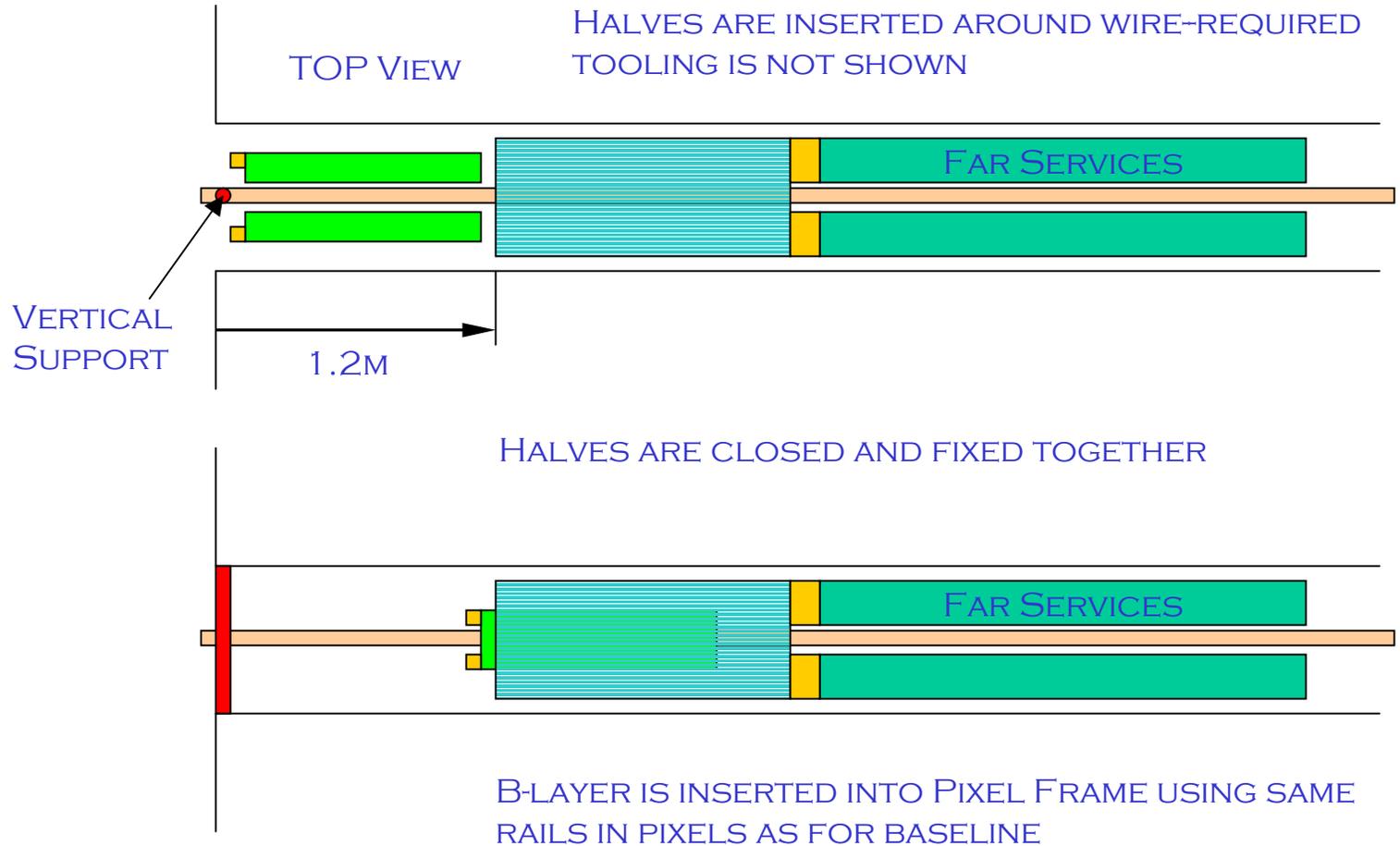


FAR SERVICES TERMINATED PIXELS INSERTED



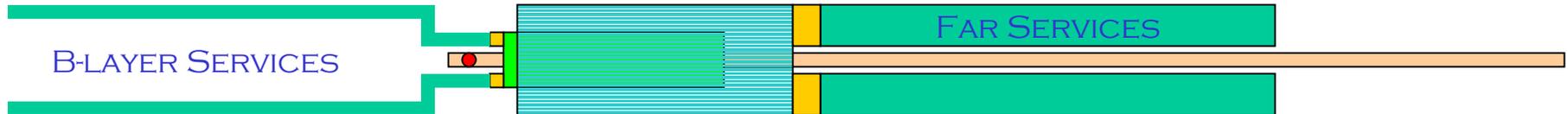
PIXEL DETECTOR

B-LAYER CLAM SHELLLED AND INSERTED

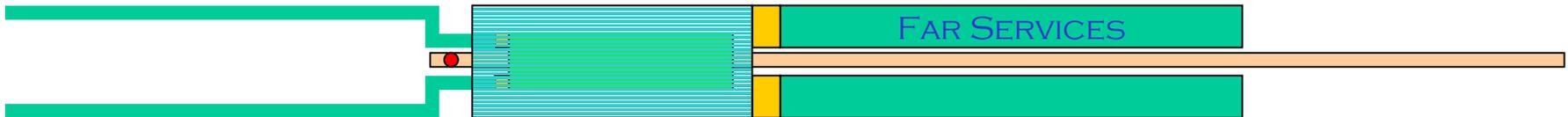


B-LAYER INSTALLATION FINISH

TO TERMINATE THE SERVICES TO THE B-LAYER, AND THE REST OF THE DETECTOR, THE DETECTOR MUST BE WITHDRAWN TO GAIN ACCESS

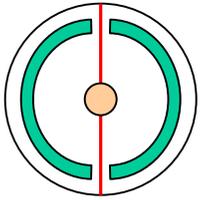


B-LAYER SERVICES ARE TERMINATED FIRST AS THEY WILL BE OBSCURED BY THE REST OF THE PIXEL SERVICES

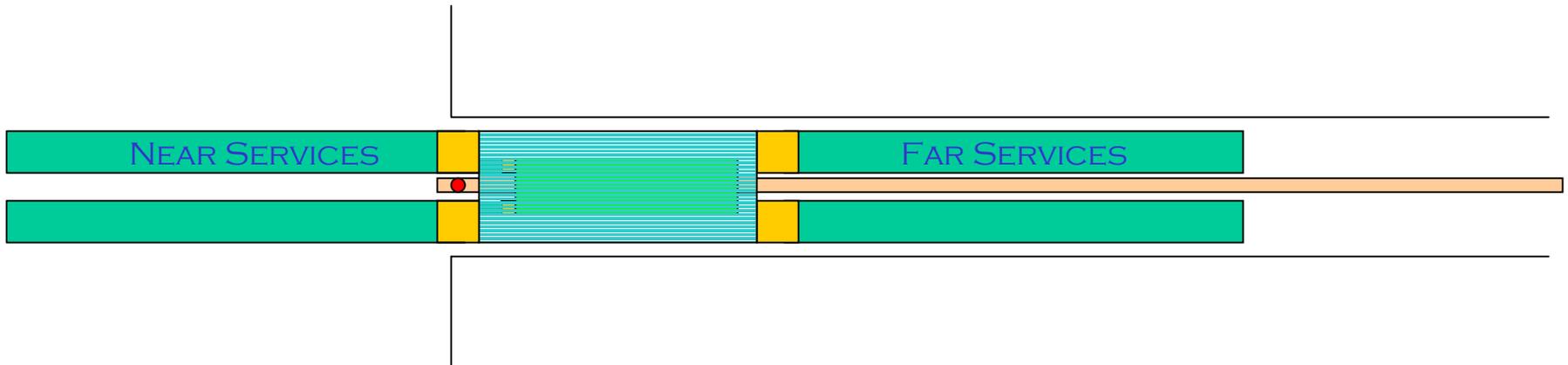


THE B-LAYER IS THEN PUSHED INTO THE FRAME INTO ITS FINAL POSITION. DEPENDING ON THE LENGTH OF THE PIGTAILS ON THE B-LAYER, THIS STEP MAY BE AVOIDED

PIXEL NEAR SIDE SERVICE TERMINATION

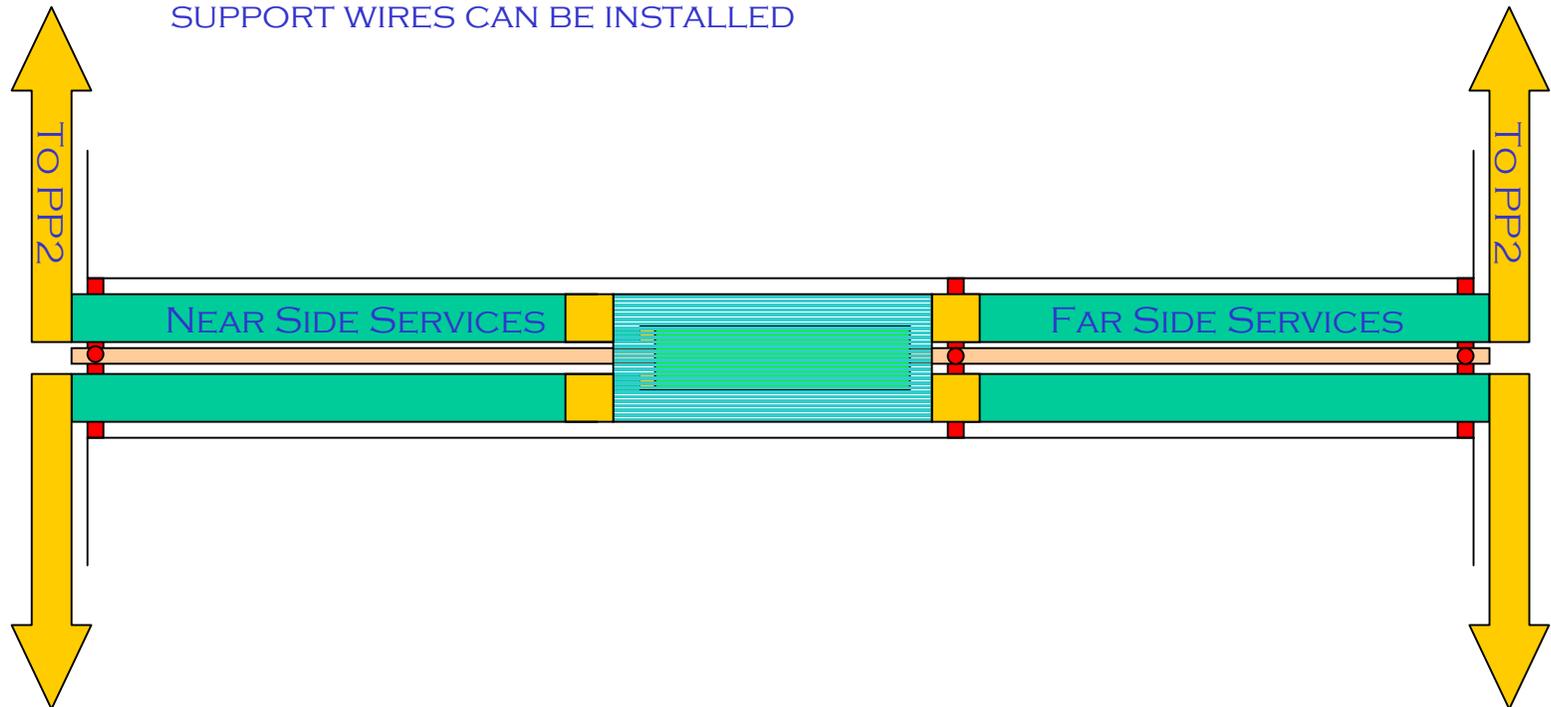


THE NEAR SIDE SERVICES—BOTH B-LAYER AND THE REMAINDER OF PIXEL SERVICES NEED NOT BE SPLIT INTO QUARTERS. DURING INSTALLATION, THERE IS ONLY ONE VERTICAL SUPPORT WIRE OBSTRUCTING THE PATH



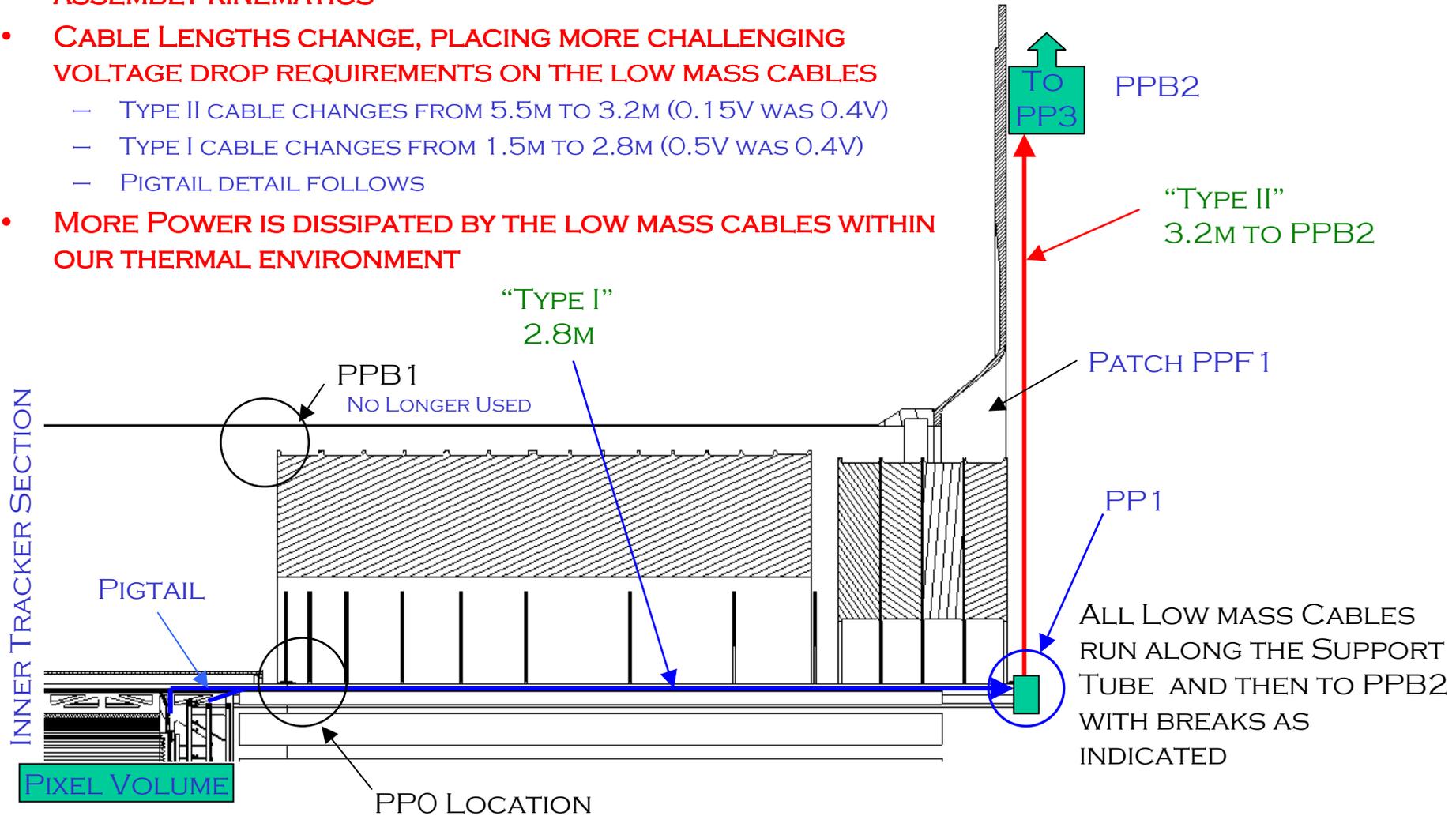
PIXELS IN INSTALLED POSITION

AFTER TERMINATING THE NEAR SIDE SERVICES THE DETECTOR CAN BE INSERTED FULLY. THE SERVICES TO PP2 CAN BE TERMINATED AND IF DESIRED, ON THE NEAR SIDE, THE HORIZONTAL BEAM PIPE SUPPORT WIRES CAN BE INSTALLED



SERVICE BREAKS FOR INSTALLATION

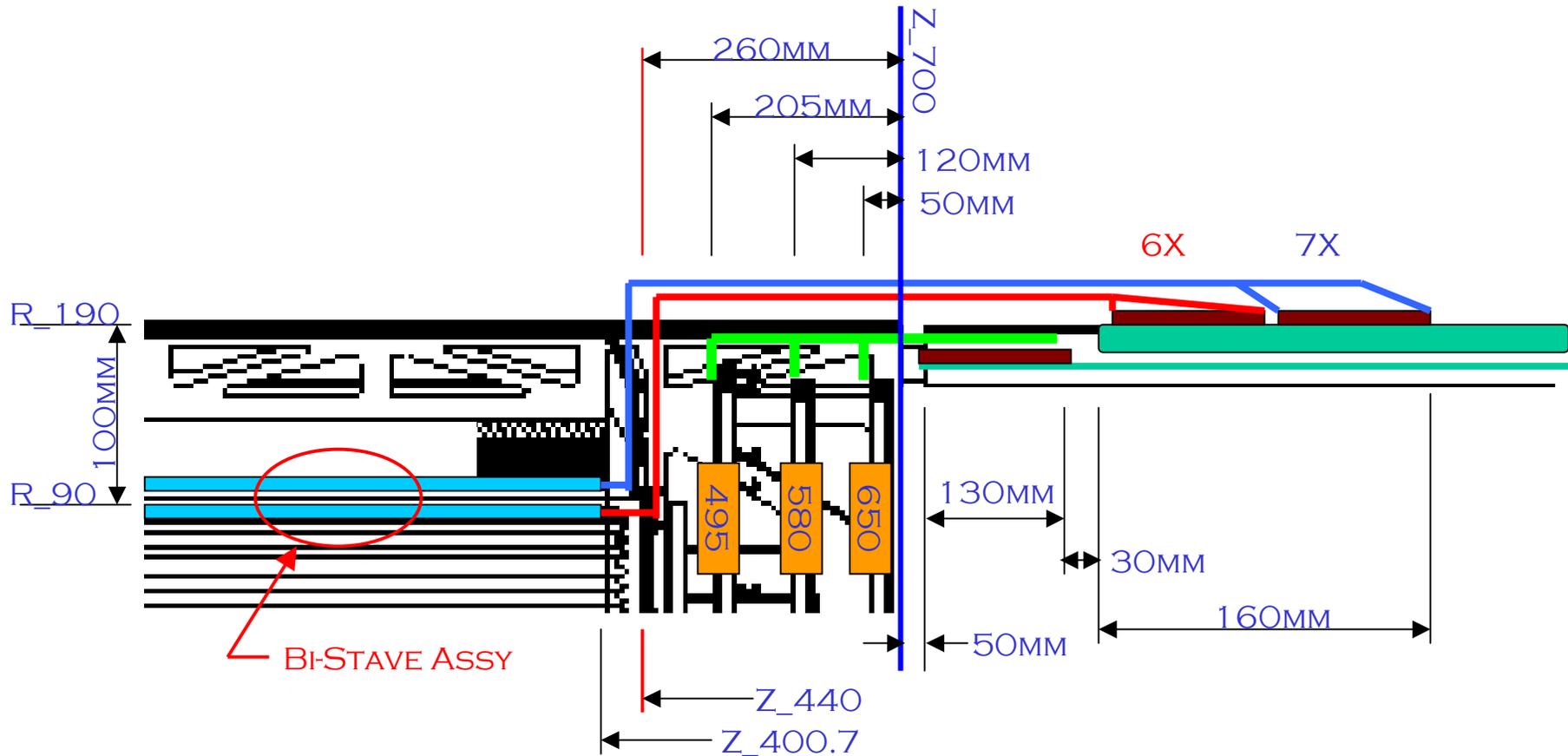
- BREAKS AT INDICATED LOCATIONS ARE NECESSARY FOR THE ASSEMBLY KINEMATICS
- CABLE LENGTHS CHANGE, PLACING MORE CHALLENGING VOLTAGE DROP REQUIREMENTS ON THE LOW MASS CABLES
 - TYPE II CABLE CHANGES FROM 5.5M TO 3.2M (0.15V WAS 0.4V)
 - TYPE I CABLE CHANGES FROM 1.5M TO 2.8M (0.5V WAS 0.4V)
 - PIGTAIL DETAIL FOLLOWS
- MORE POWER IS DISSIPATED BY THE LOW MASS CABLES WITHIN OUR THERMAL ENVIRONMENT



ALL LOW MASS CABLES RUN ALONG THE SUPPORT TUBE AND THEN TO PPB2 WITH BREAKS AS INDICATED

PIXEL DETECTOR

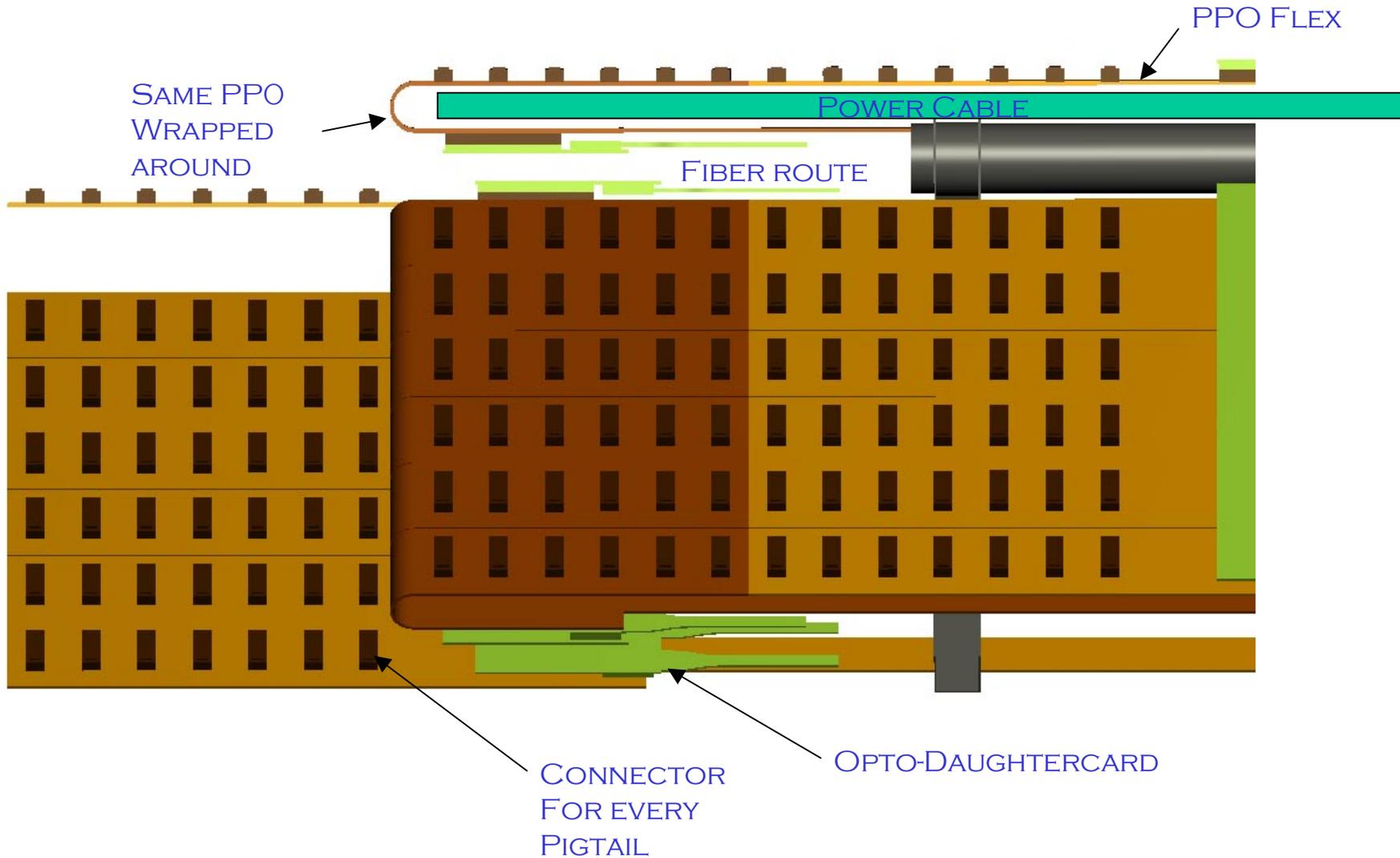
PIGTAIL LENGTHS



- **STAVE PIGTAIL MAXIMUM LENGTH IS 1.17M (770MM BEYOND END OF STAVE)**
 - VOLTAGE DROP ALONG STAVE IS NOW 0.5V WITH THE REMAINING 770MM TAKING 0.15V
- **DISK PIGTAIL MAXIMUM LENGTH IS 460MM**
 - KEEP 0.2V DROP
- **RADIUS OF PP0 IS APPROXIMATELY 180MM**

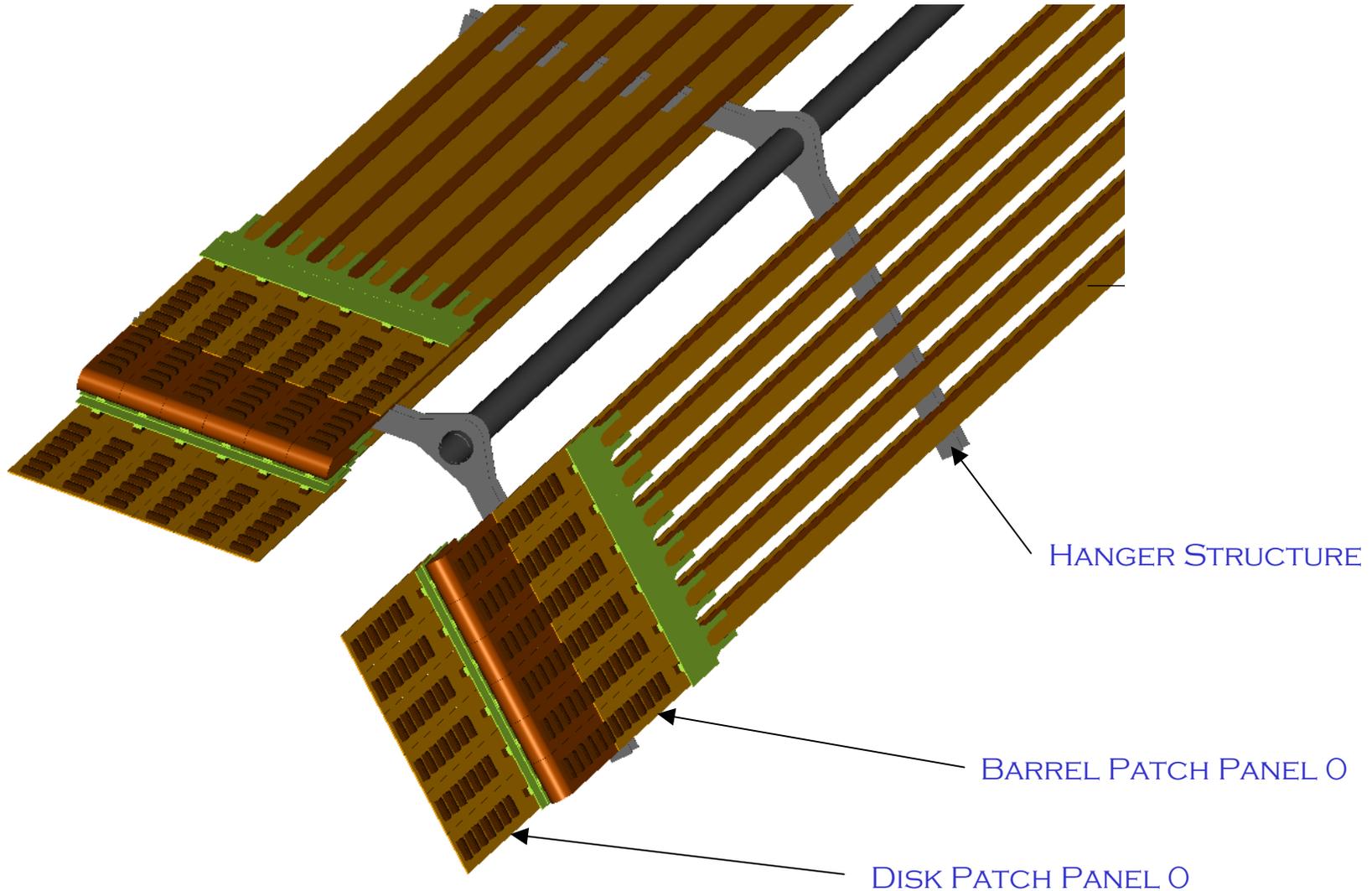
PIXEL DETECTOR

PPO ARRAY ON SERVICE MECHANICAL SUPPORT



PIXEL DETECTOR

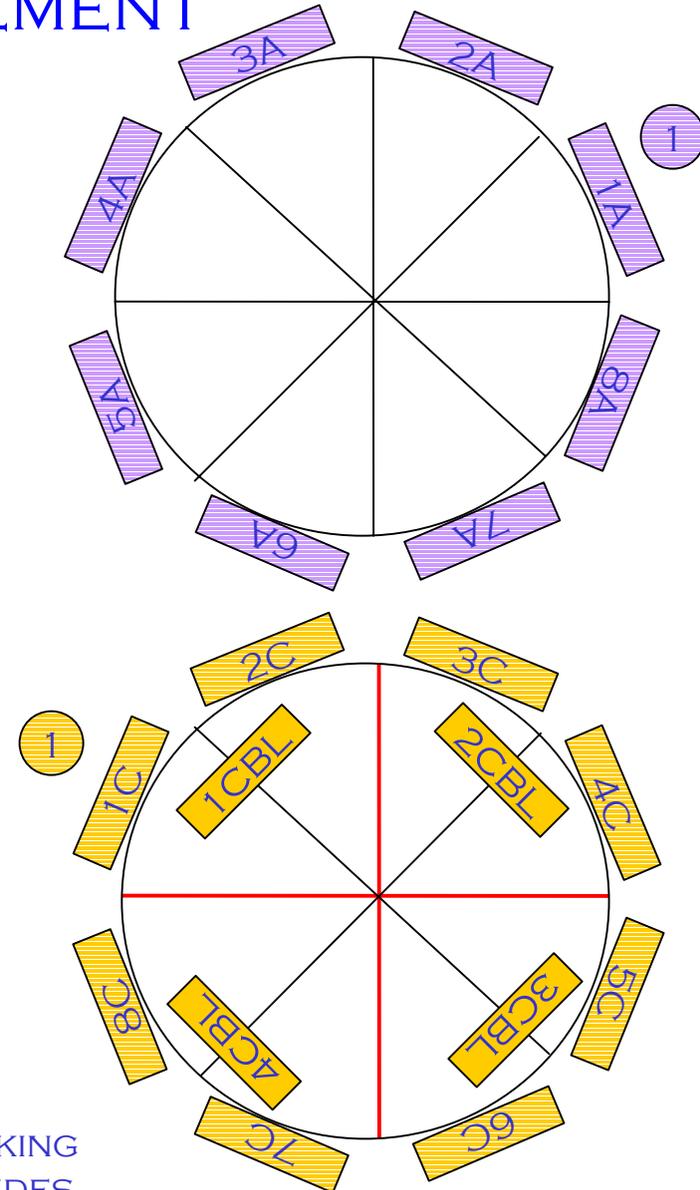
SERVICES MECHANICAL SUPPORT



PIXEL DETECTOR

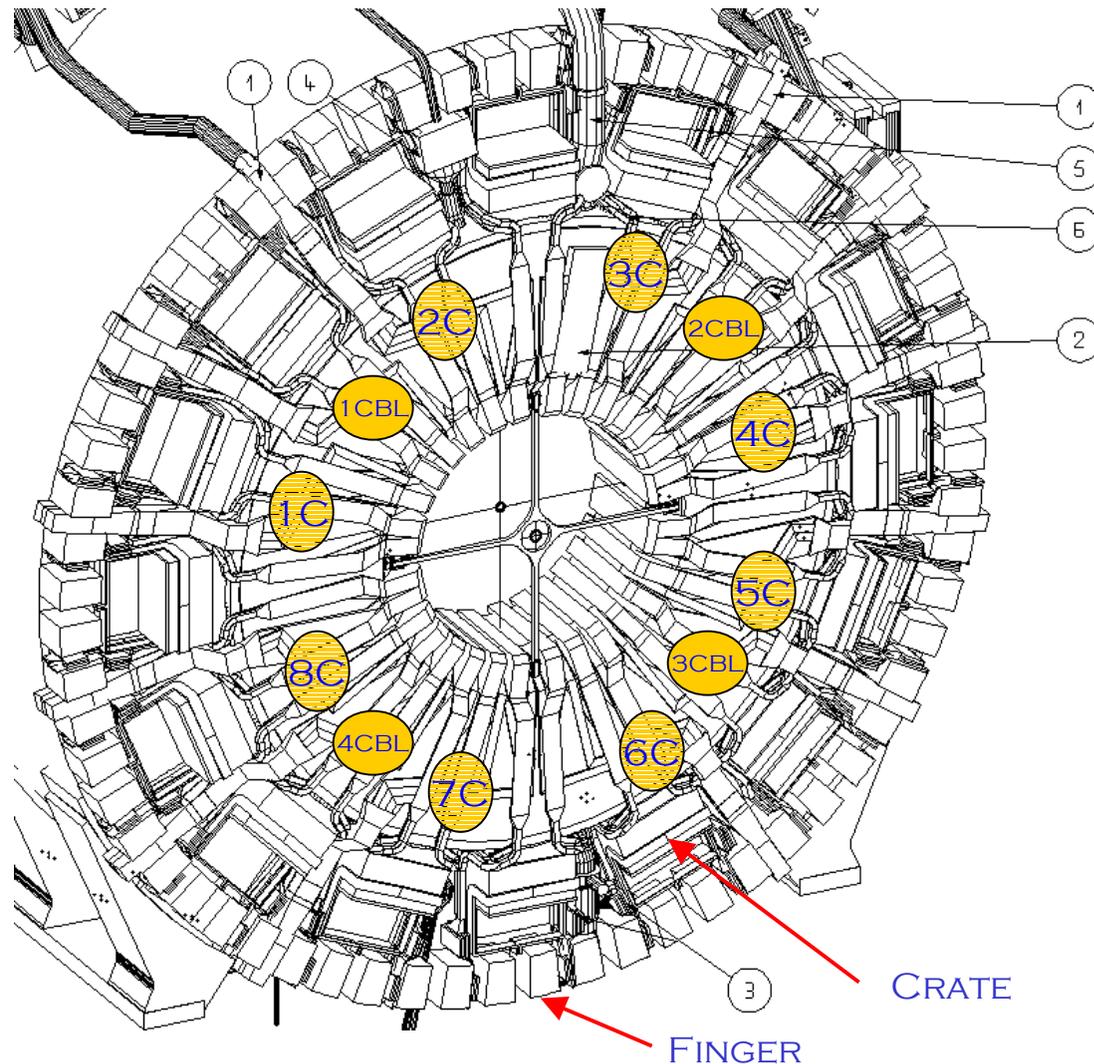
SERVICE ARRANGEMENT

	Patch Panel Octant Name	Barrel Layers 1&2	Disk	Tube Total	6-Module Bundle	7-Module Bundles	Bundle Total	Staves Served	Sectors Served
Side A	1A	3	2	5	(3+6)=9	6	15	12	3
	2A	3	1	4	(3+6)=9	6	15	12	3
	3A	3	2	5	(3+5)=8	5	13	10	3
	4A	3	1	4	(3+6)=9	6	15	12	3
	5A	3	2	5	(3+6)=9	6	15	12	3
	6A	2	1	3	(3+5)=8	5	13	10	3
	7A	3	2	5	(3+6)=9	6	15	12	3
	8A	3	1	4	(3+6)=9	6	15	12	3
Side C	1C	3	1	4	(3+5)=8	6	15	10	3
	2C	3	2	5	(3+6)=9	6	15	12	3
	3C	2	1	3	(3+6)=9	5	13	12	3
	4C	3	2	5	(3+6)=9	6	15	12	3
	5C	3	1	4	(3+6)=9	6	15	12	3
	6C	3	2	5	(3+5)=8	5	13	10	3
	7C	3	1	4	(3+6)=9	6	15	12	3
	8C	3	2	5	(3+6)=9	6	15	12	3
Side C B-Layer	1CBL			2	4	4	8	4	
	2CBL			3	6	6	12	6	
	3CBL			3	6	6	12	6	
	4CBL			3	6	6	12	6	



NUMBERING SCHEME FOR EACH SIDE LOOKING AT IP FROM THAT SIDE—POSITION# COINCIDES PHYSICALLY ACROSS ATLAS.

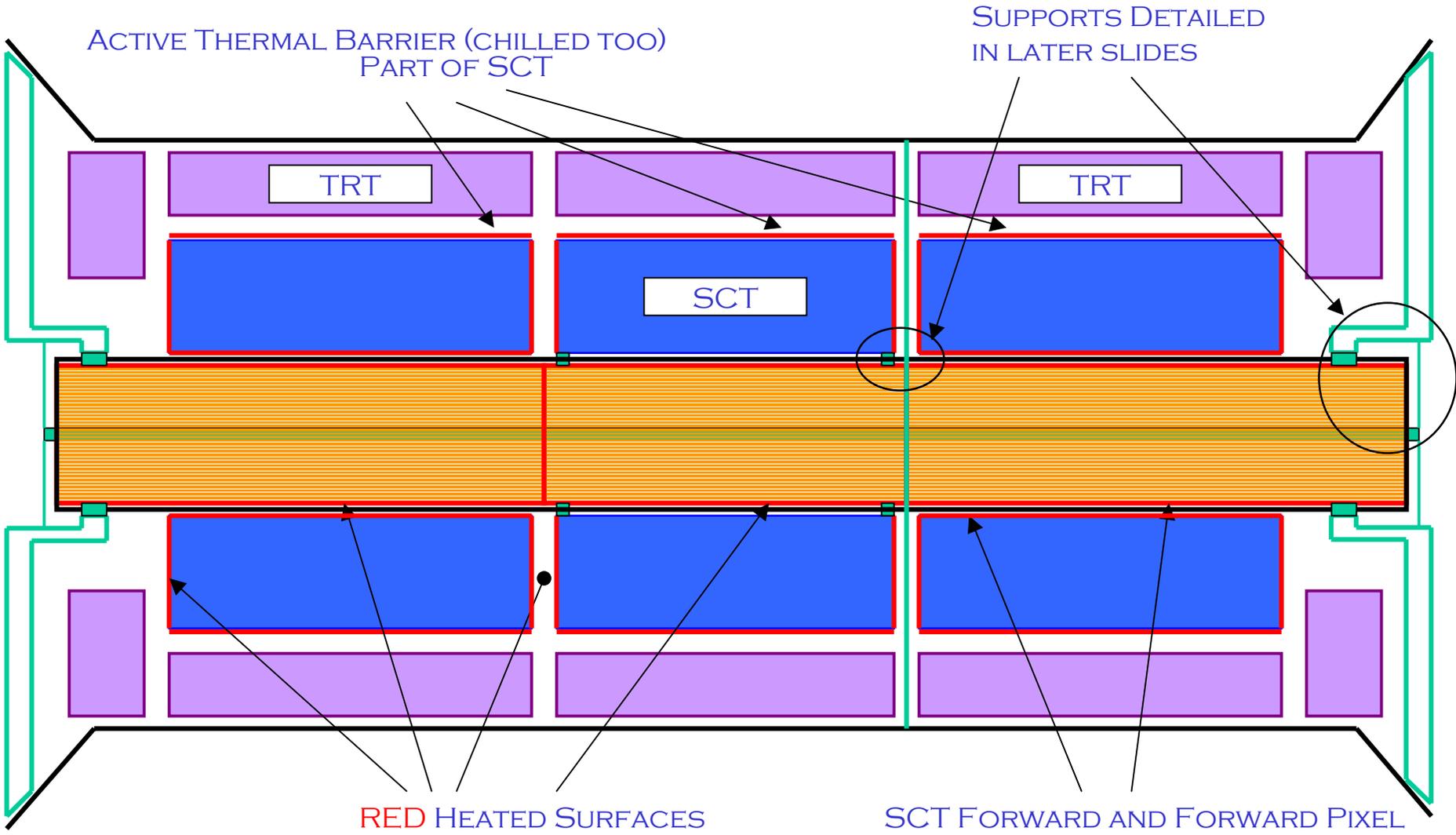
SERVICES THROUGH PP2 REGION



- **TYPES II & III CABLES ROUTED ON CRYOSTAT FACE**
- **CRITICAL AREA LEAVING PP2 FOR PP3 BETWEEN CRATES AND FINGERS (TYPE III)**
- **MODEL AT CERN BEING POPULATED WITH PIXEL SERVICES—NEED TO UPDATE WITH NEW SERVICE COUNT**
- **ENGINEERS AT CERN WORKING TO RESOLVE AS QUICKLY AS POSSIBLE**
- **NEW SERVICE PACKAGING CONCEPTS NEED TO BE DEVELOPED FROM END OF SUPPORT TUBE UP TO PP2**

PIXEL DETECTOR

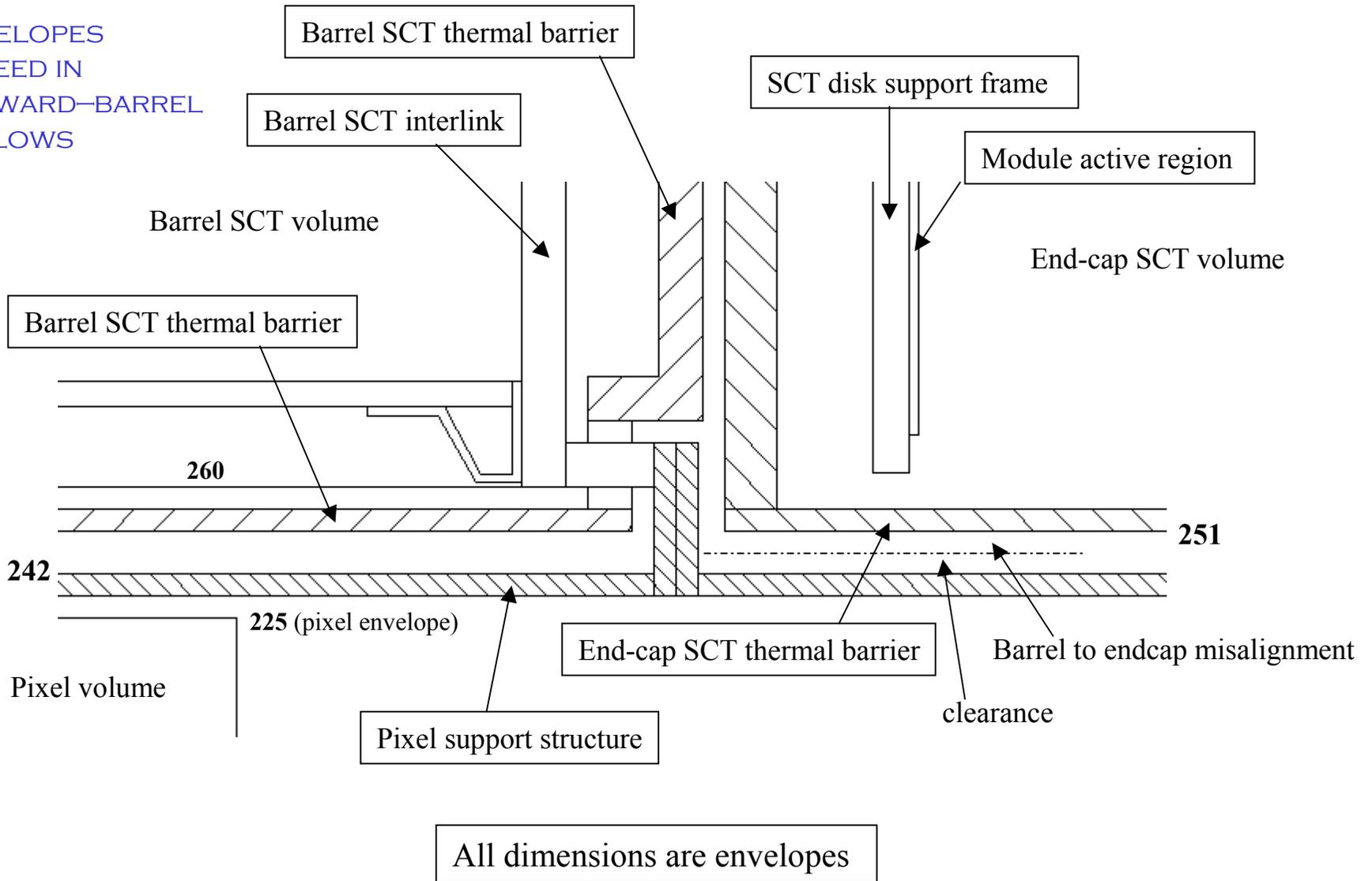
PIXEL SUPPORT TUBE



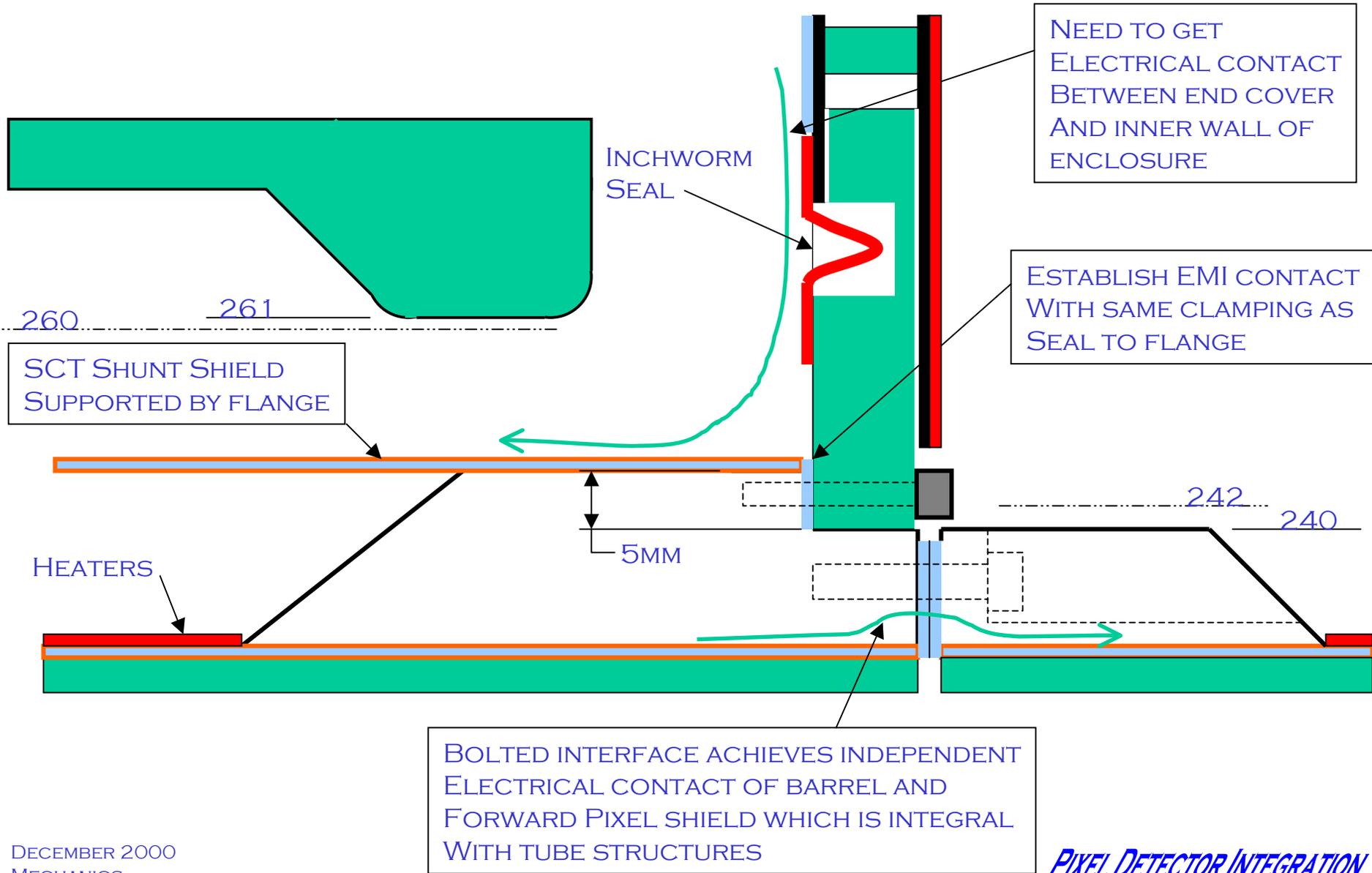
RED HEATED SURFACES

SCT FORWARD AND FORWARD PIXEL TUBE INDEPENDENTLY HEATED

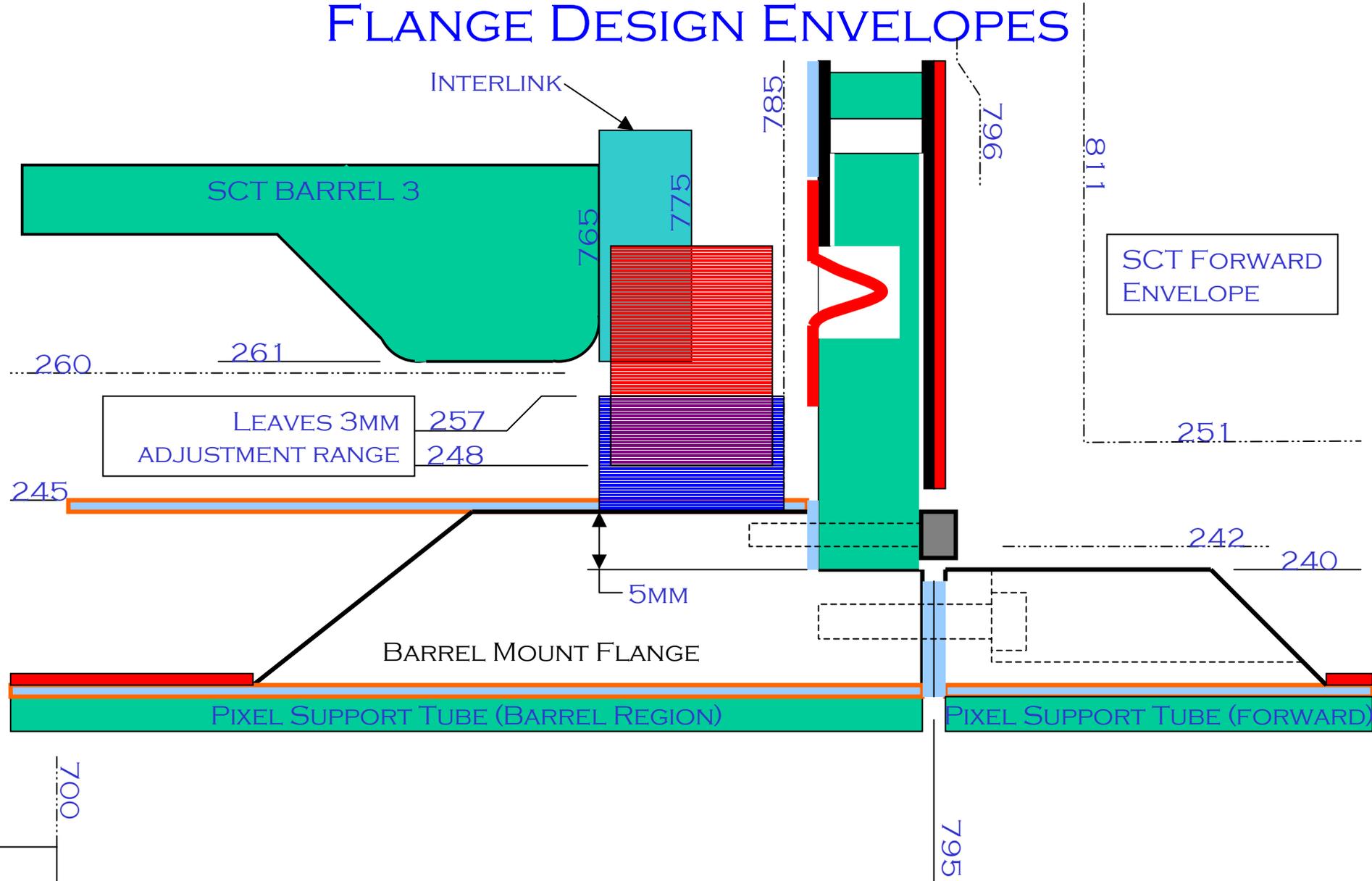
ENVELOPES
AGREED IN
FORWARD-BARREL
FOLLOWS



PIXEL DETECTOR FLANGE AREA

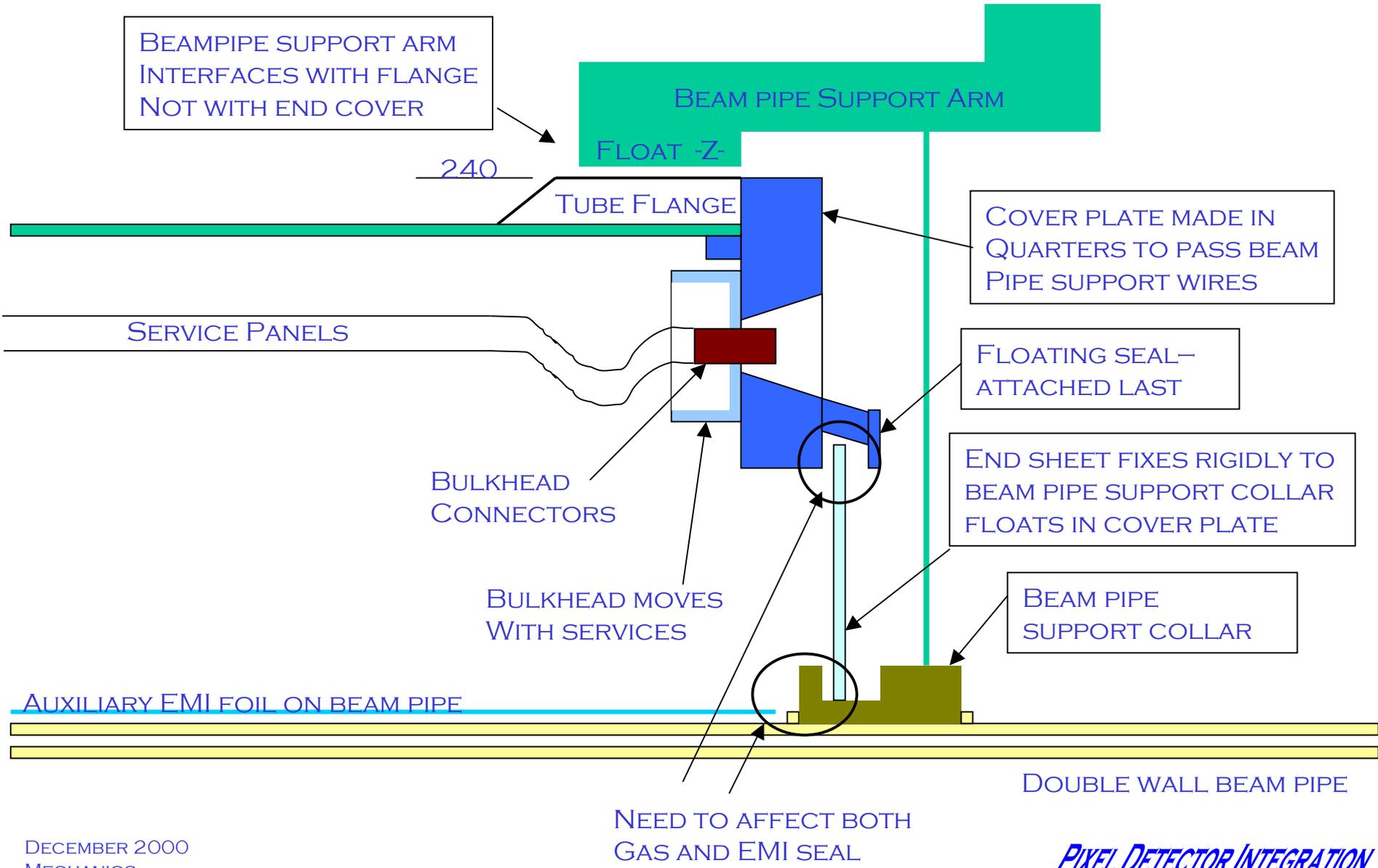


FLANGE DESIGN ENVELOPES



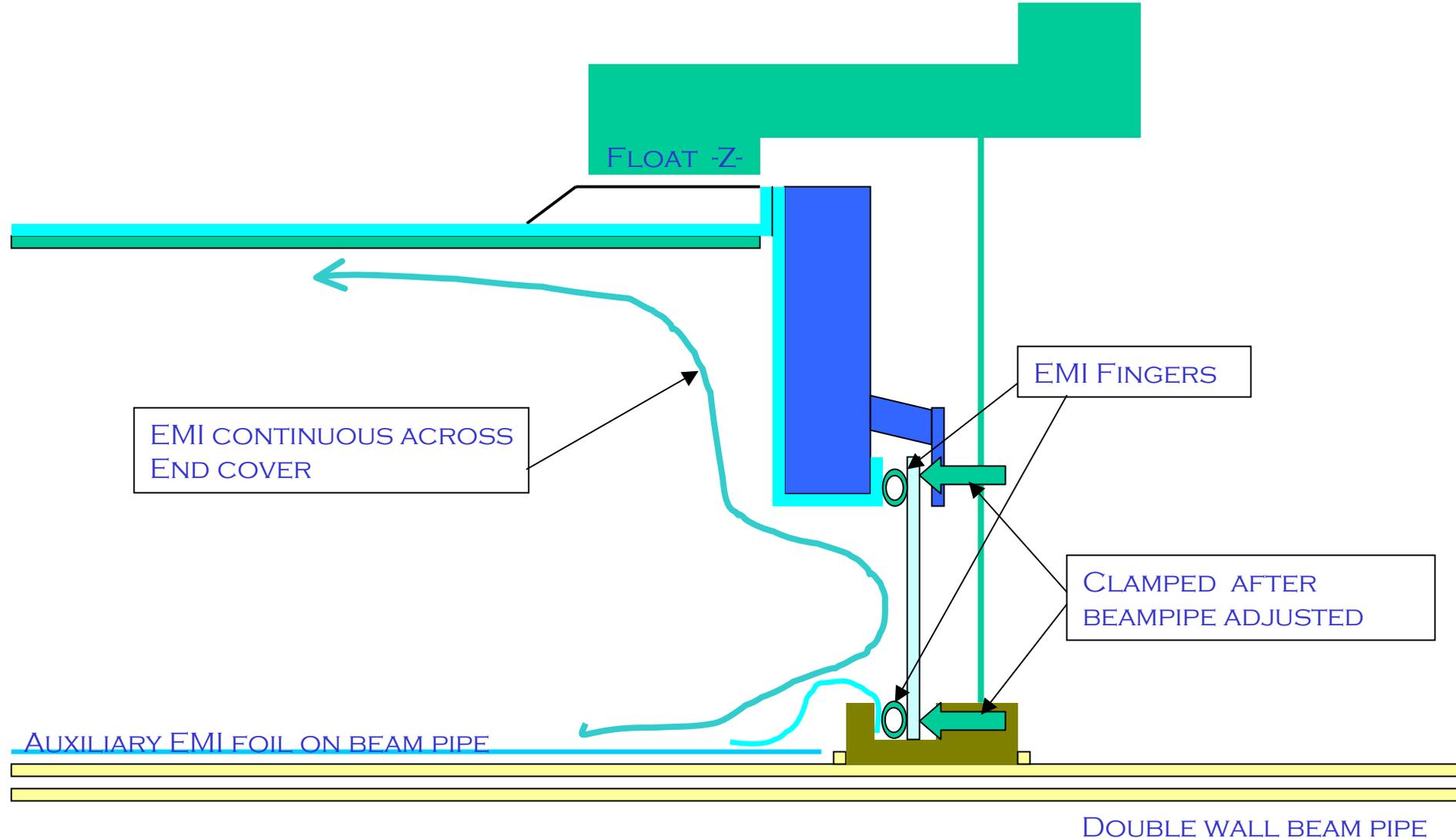
PIXEL DETECTOR

SUPPORT TUBE END SUPPORT AND PENETRATION

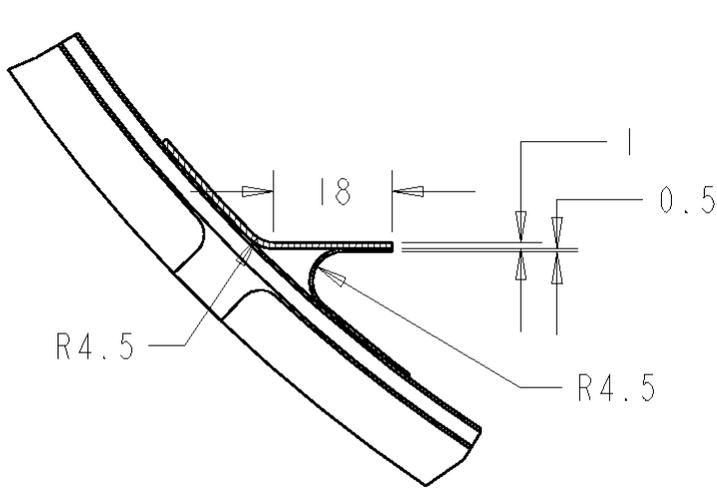


PIXEL DETECTOR

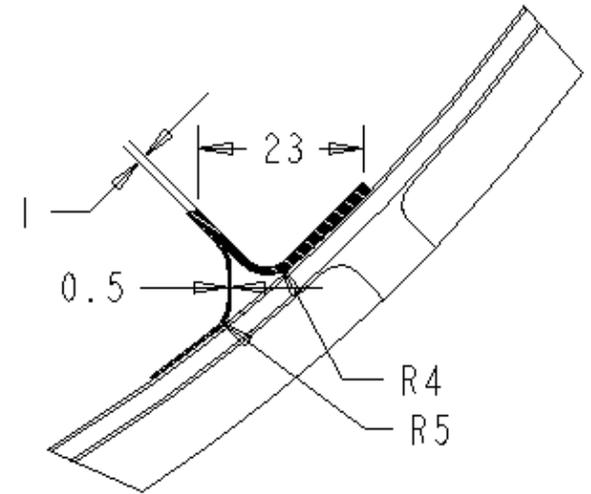
SUPPORT TUBE END EMI CONTINUITY



PIXEL DETECTOR RAIL DESIGN



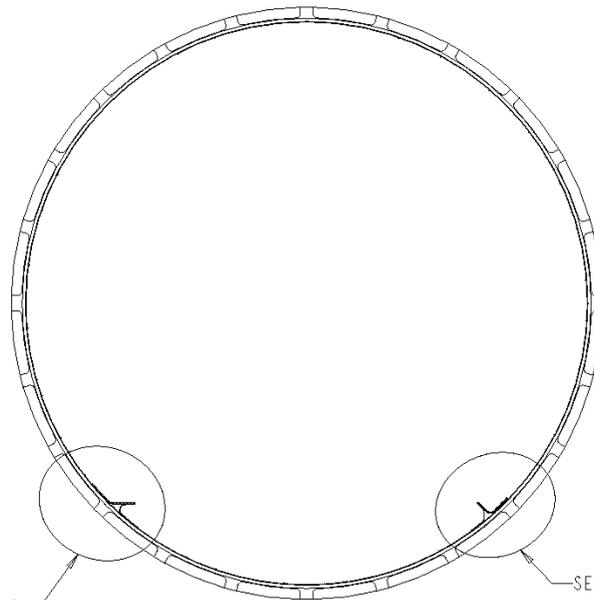
DETAIL 1



DETAIL 2

VEE AND FLAT RAILS WERE CHOSEN TO PROVIDE PSEUDO-KINEMATIC SUPPORT FOR THE DETECTOR DURING DELIVERY TO THE SUPPORT POINTS

RAILS ARE USED ONLY FOR DELIVERY, NOT SUPPORT

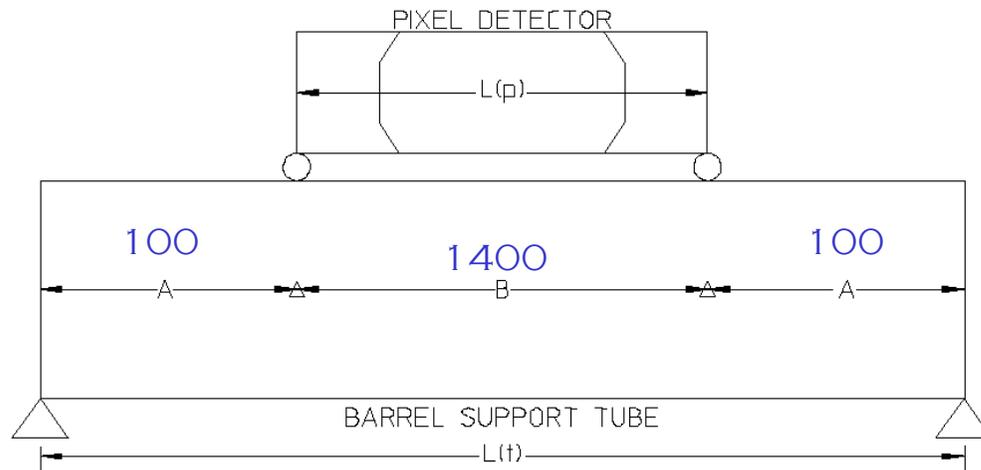
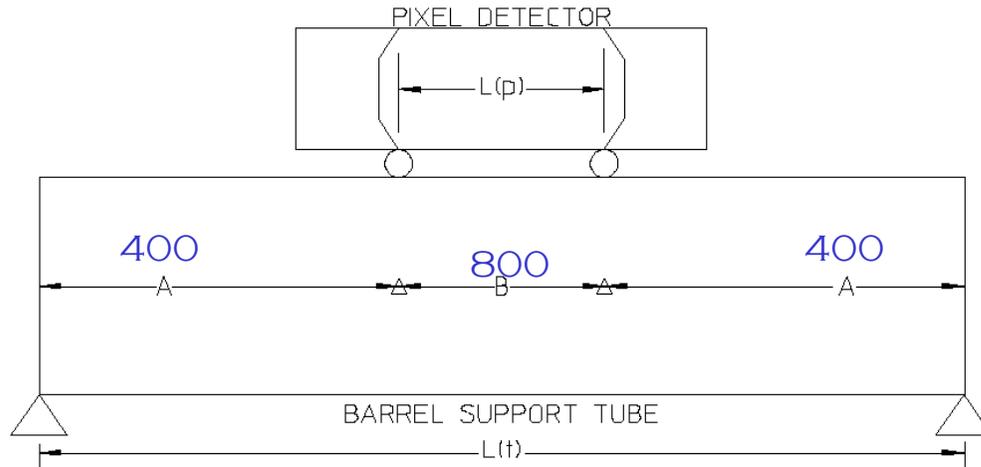


SECTION A-A
SCALE 0.375

USING HIGH STRENGTH FIBER, IT IS POSSIBLE TO MAKE RAILS AS LAMINATES AS OPPOSED TO MONOLITHIC STRUCTURES SAVING MATERIAL AND MATCHING CTE OF SHELL BETTER

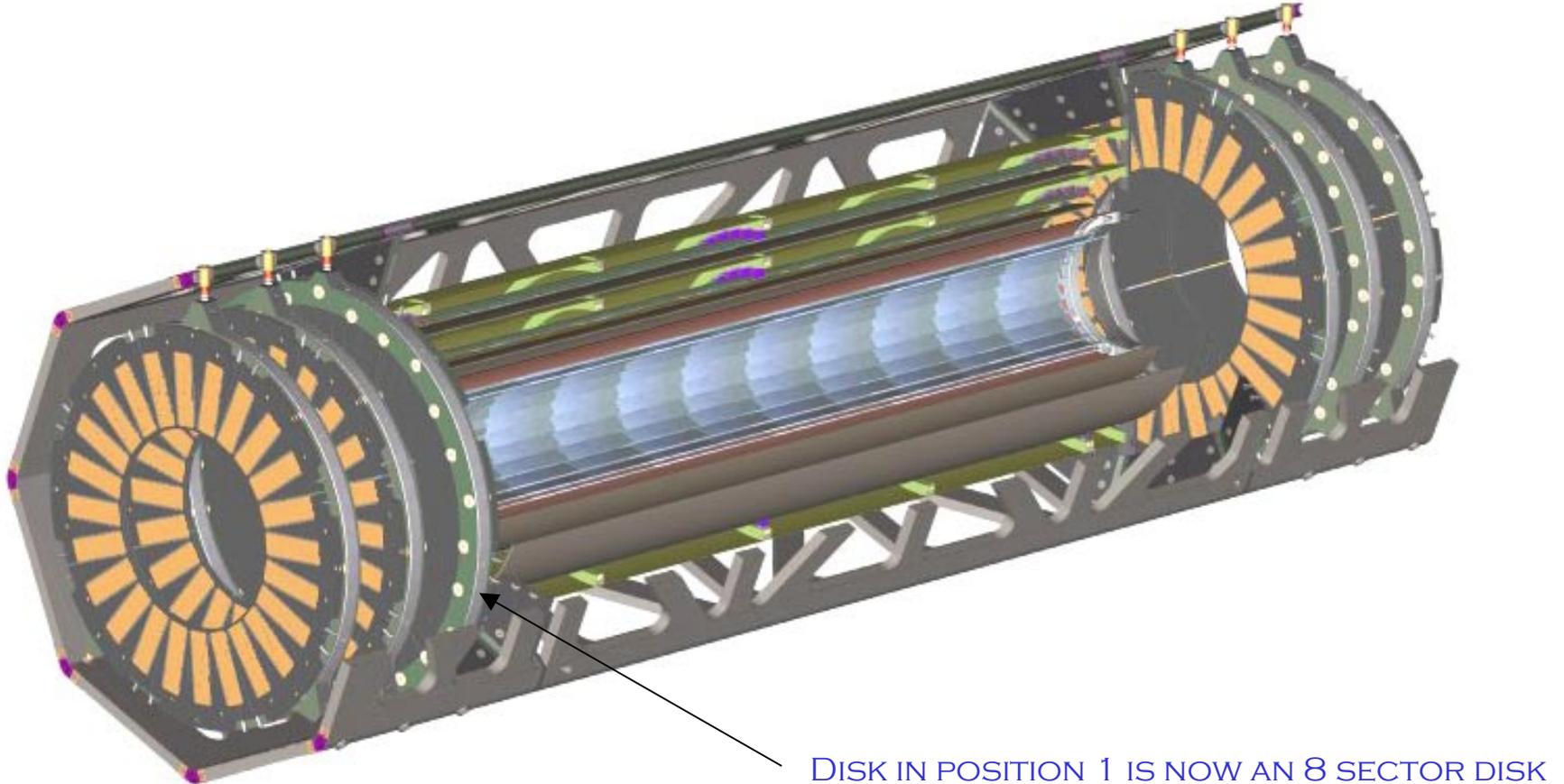
PIXEL DETECTOR

DETECTOR SUPPORT



- **LOOK TO TAKE ADVANTAGE OF INCREASED MOMENT OF INERTIA OF SUPPORT TUBE**
- **PRELIMINARY CALCULATIONS INDICATE THAT IT MAY BE ATTRACTIVE TO SUPPORT THE DETECTOR AT THE END-CONES AS OPPOSED TO THE END OF THE FRAME**
- **POTENTIAL TO SAVE MATERIAL IF END-PLATE STIFFENER IS NOT NEEDED**
- **CALCULATIONS ARE STILL VERY PRELIMINARY—RADIAL STIFFNESS OF END-CONES NOT KNOWN**
- **NEED TO BACK UP BEAM-THEORY WITH MORE COMPLEX MODELS OF ACTUAL STRUCTURES**

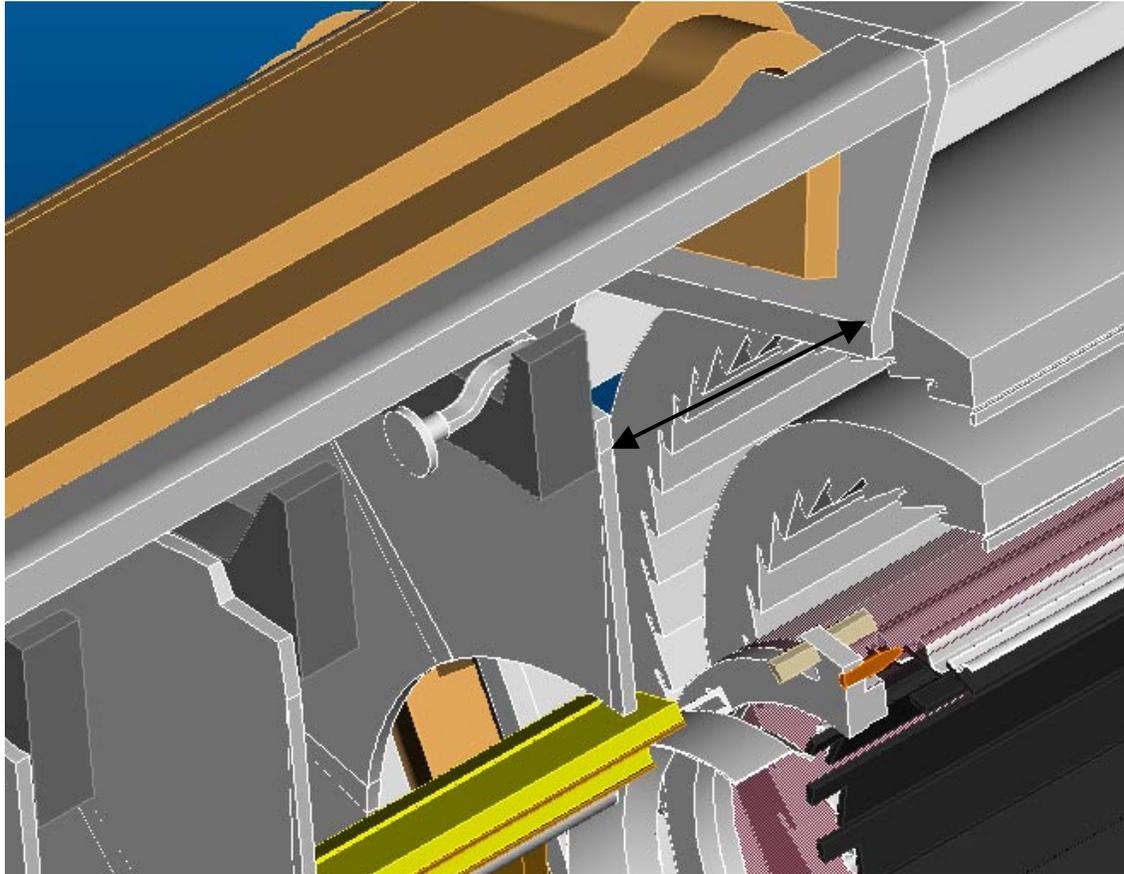
GLOBAL SUPPORT FRAME RESIZING



- **FRAME MODEL RESIZED FOR “NEW” LAYOUT ~5WKS AGO**
- **SINCE THEN HAVE DROPPED OPTION FOR 9-SECTOR DISK IN POSITION 1 DUE TO ENVELOPE CONFLICT WITH SCT FORWARD**
- **WILL REDUCE FRAME FURTHER –WORKING FROM DISK RING OUTWARD TO SEE IF MORE IS POSSIBLE (5MM MINIMUM)**

PIXEL DETECTOR

FINAL FRAME SIZE



- **DISK 1 SERVICES MUST PASS AROUND A REVERSED DISK**
- **DISK RING IS BEING RESIZED BY HYTEC**
- **DISK SERVICE ROUTES WORKED OUT SIMULTANEOUSLY**
- **HYTEC WILL RESIZE FRAME AGAIN AFTER RING AND SERVICE ROUTES AVAILABLE WITHIN**
- **BARREL SERVICES DEFINE OUTER ENVELOPE AND FIRST DISK**
- **INCREASED LENGTH OF PIGTAILS WITH CHALLENGING VOLTAGE DROPS—NEED CROSS-SECTIONS AS SOON AS POSSIBLE**

BARREL SERVICES ARE A MAJOR PART OF THE ENVELOPE DEFINITION.

SUPPORT TUBE IS PROCEEDING WITH SOME MARGIN ON SPACE, BUT PROJECT CAN'T TOLERATE BIG SURPRISES

RECENT DEVELOPMENTS AND CONCLUSIONS

- **SCT COMMUNITY HAS MOVED FORWARD WITH IDEA TO CUT 13MM FROM THEIR W12 WAFER (INNERMOST ON DISK)**
- **MEETINGS HAVE BEEN HELD TO PUSH ALONG THIS EFFORT, FIRM AGREEMENTS ARE IN PLACE**
- **MAJOR DESIGN EFFORT TO TOOK PLACE IN NOVEMBER AT RAL IN CONJUNCTION WITH SCT ENGINEERS**
- **MAJOR GOAL ACHIEVED TO LEAVE RAL WITH AGREED ENVELOPES OF INSTALLATION STRUCTURES, THERMAL BARRIERS, AND PIXEL SUPPORT**
- **SEEK APPROVAL FOR ABOVE AT NEXT IDSG**
- **THIS IS STILL A MAJOR UNDERTAKING AND RELIES ON A FIRM MANDATE FROM THE ID COMMUNITY**