

Barrel slice assembly

-Present status and ongoing preparations-

Markus Moritz, 2nd Physics Institute

PANDA CM, Nov. 2016



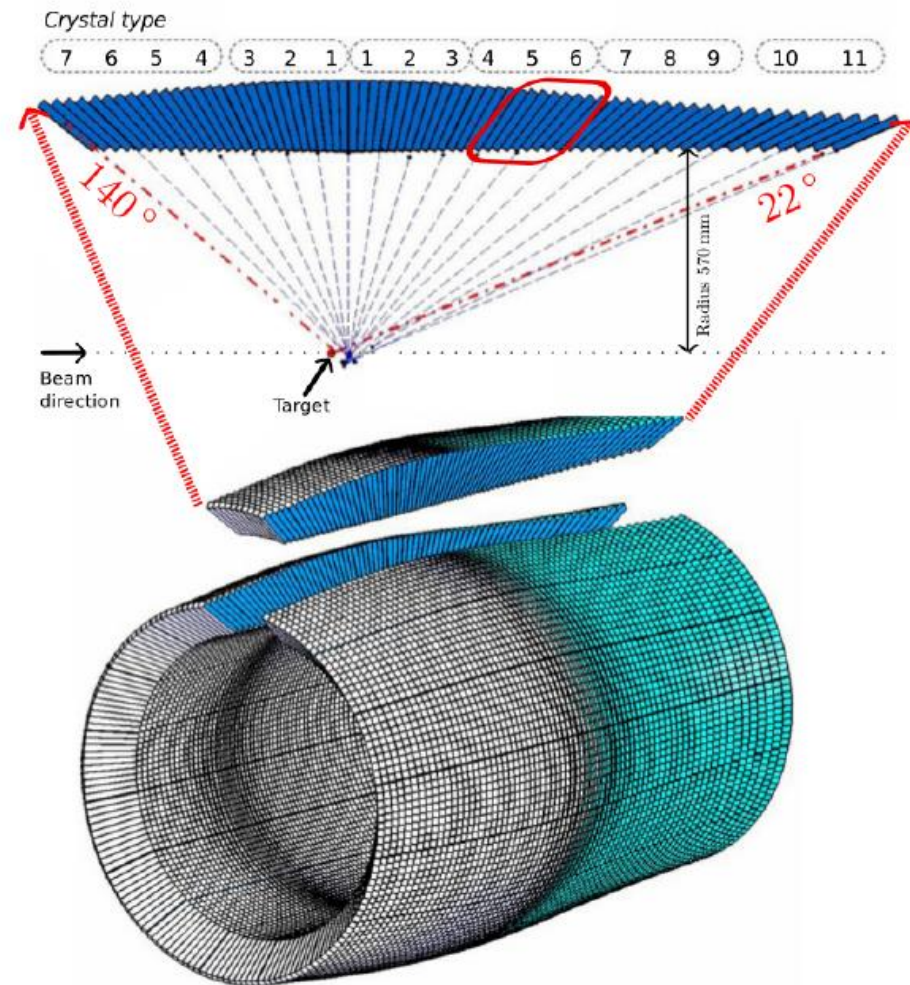
Outline

- **Module Assembly**
- **Slice Coordinate System**
- **Slice Assembly Workspace & Tools**
- **Light Pulser Fiber Coupling**
- **APD Irradiation Setup**
- **APD Status 1st Slice**

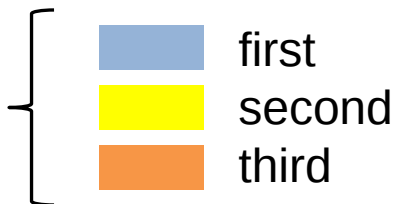
•Envisaged milestone:

Assembly of 1st full Barrel EMC Slice

- 710 crystals in 11 different geometries.
- 1420 matched APDs after 1st screening, irradiation, 2nd screening.
- 710 APFEL ASICs
- 360 left and 360 right handed APFEL-ASIC flex PCBs
- 4500 m of signal cables.
- Cooling
- Capsules, Foils, ...

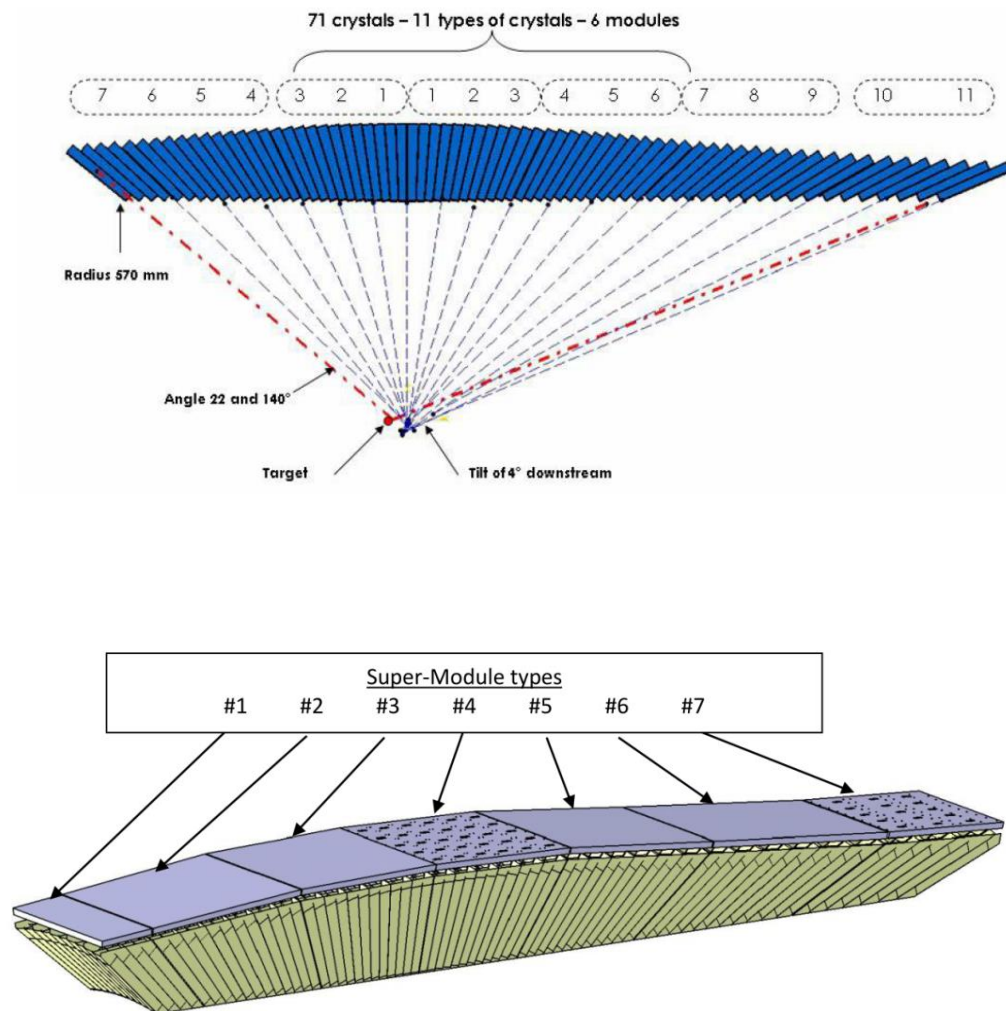


3 sessions for
module assembly



Super Mod.	Type of Mod	Assembly Date
1	7 (-)	CW 41
2	6 (-)	CW 3
	5 (-)	CW 3
	4 (-)	CW 3
3	3 (-)	CW 48
	2 (-)	CW 48
	1 (-)	CW 48
4	1 (+)	CW 48
	2 (+)	CW 48
	3 (+)	CW 48
5	4 (+)	CW 41
	5 (+)	CW 41
	6 (+)	CW 41
6	7(+)	CW 3
	8(+)	CW 3
	9 (+)	CW 3
7	10 (+)	CW 41
	11 (+)	CW 41

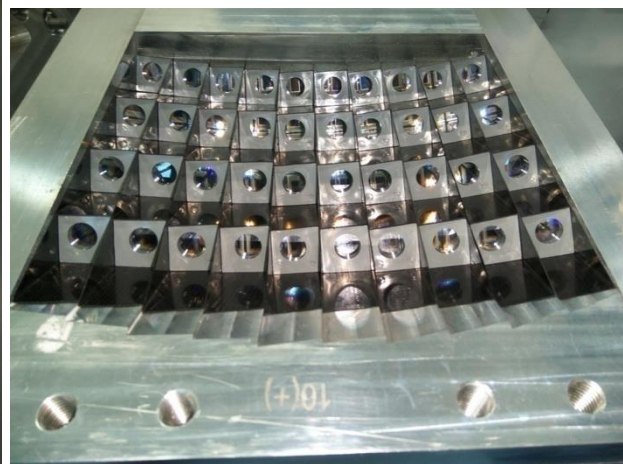
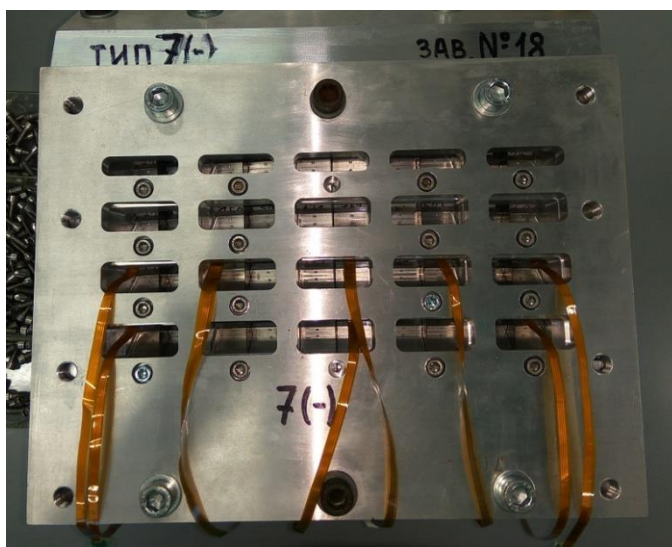
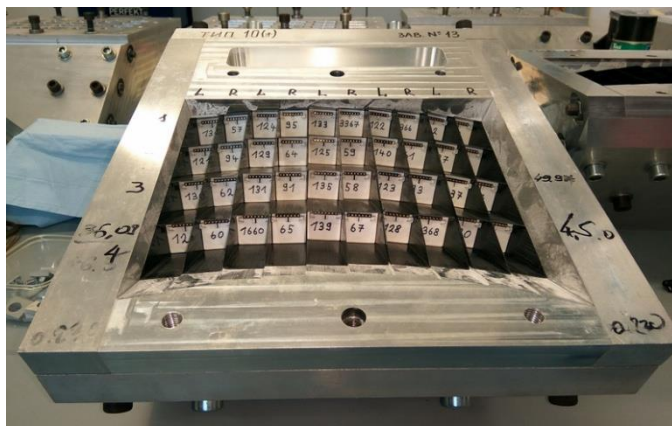
1 session for supermodule & slice
assembly



GOOD NEWS: WE HAVE STARTED TO ASSEMBLY THE 1ST SLICE!!!

second session should
be finished today

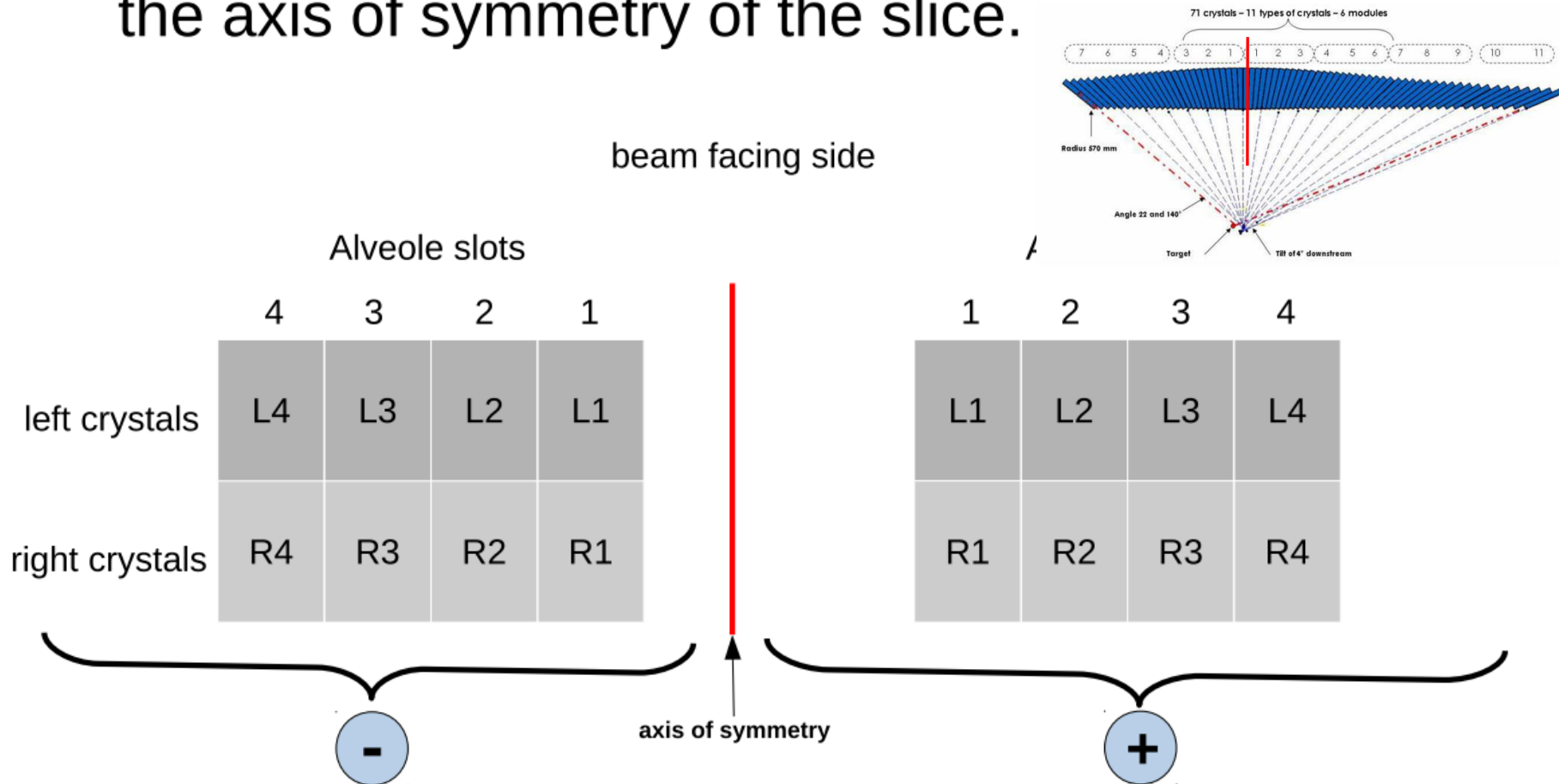
2/3 of all modules are
assembled



CW	Remarks	Shifted due to APD throughput		CW	Remarks
30				30	
31				31	
32				32	
33				33	
34				34	
35				35	
36				36	
37				37	
38				38	
39				39	
40				40	
41	1 st session			41	1 st session
42				42	
43				43	
44				44	
45	2 nd session			45	
46				46	
47				47	
48				48	2 nd session
now 49	3 rd session			now 49	
50				50	
51				51	
52				52	
- proposal last cm-				1	
				2	
				3	3 rd session ?
				4	
				5	
				6	
				7	

Awaiting feedback from PSL

- Crystal position on alveole is axial symmetric to the axis of symmetry of the slice.



- | | | SM1 | | SM2 | | SM3 | | super modules | | | | SM5 | | SM6 | | SM7 | | | | |
|---|---|-----|-----|-----|-----|-----|-----|---------------|--------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|---|
| | | 7me | 6me | 5me | 4me | 3me | 2me | 1me | 1pe | 2pe | 3pe | 4pe | 5pe | 6pe | 7pe | 8pe | 9pe | 10pe | 11pe | |
| L | R | 7me | 6me | 5me | 4me | 3me | 2me | 1me | 1pe | 2pe | 3pe | 4pe | 5pe | 6pe | 7pe | 8pe | 9pe | 10pe | 11pe | e |
| L | R | 7md | 6md | 5md | 4md | 3md | 2md | 1md | 1pd | 2pd | 3pd | 4pd | 5pd | 6pd | 7pd | 8pd | 9pd | 10pd | 11pd | d |
| L | R | 7mc | 6mc | 5mc | 4mc | 3mc | 2mc | 1mc | 1pc | 2pc | 3pc | 4pc | 5pc | 6pc | 7pc | 8pc | 9pc | 10pc | 11pc | c |
| L | R | 7mb | 6mb | 5mb | 4mb | 3mb | 2mb | 1mb | 1pb | 2pb | 3pb | 4pb | 5pb | 6pb | 7pb | 8pb | 9pb | 10pb | 11pb | b |
| L | R | 7ma | 6ma | 5ma | 4ma | 3ma | 2ma | 1ma | 1pa | 2pa | 3pa | 4pa | 5pa | 6pa | 7pa | 8pa | 9pa | 10pa | 11pa | a |
| | | 7m | 6m | 5m | 4m | 3m | 2m | 1m | 1p | 2p | 3p | 4p | 5p | 6p | 7p | 8p | 9p | 10p | 11p | |
| | | | | | | | | | alveole type | | | | | | | | | | | |
-
- The diagram illustrates the alveolar tract with a central axis of symmetry. A blue arrow labeled $\bar{p}$ indicates the direction of air flow from the mouth towards the alveoli. The alveoli are arranged in a series of modules (SM1 to SM7) and are labeled with their respective types (e, d, c, b, a) and positions (L, R). The alveoli are numbered 1 to 11 for each module. The alveoli are arranged in a series of modules (SM1 to SM7) and are labeled with their respective types (e, d, c, b, a) and positions (L, R). The alveoli are numbered 1 to 11 for each module.

Sensor distribution over alveole types marked red

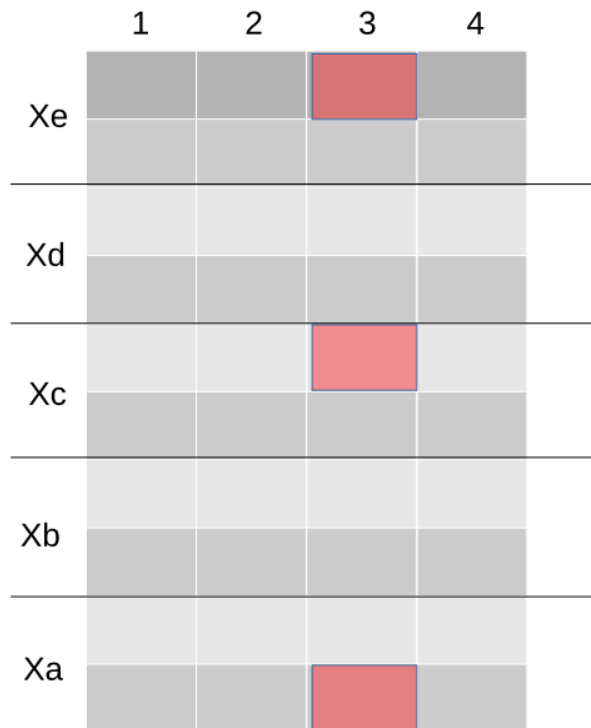
		super modules																			
		SM1	SM2		SM3			SM4			SM5			SM6		SM7					
crystal shape left/right	L	7me	6me	5me	4me	3me	2me	1me	1pe	2pe	3pe	4pe	5pe	6pe	7pe	8pe	9pe	10pe	11pe	e	
	R																				
	L	7md	6md	5md	4md	3md	2md	1md	1pd	2pd	3pd	4pd	5pd	6pd	7pd	8pd	9pd	10pd	11pd	d	
	R																				
	L	7mc	6mc	5mc	4mc	3mc	2mc	1mc	1pc	2pc	3pc	4pc	5pc	6pc	7pc	8pc	9pc	10pc	11pc	c	
	R																				
	L	7mb	6mb	5mb	4mb	3mb	2mb	1mb	1pb	2pb	3pb	4pb	5pb	6pb	7pb	8pb	9pb	10pb	11pb	b	
	R																				
	L	7ma	6ma	5ma	4ma	3ma	2ma	1ma	1pa	2pa	3pa	4pa	5pa	6pa	7pa	8pa	9pa	10pa	11pa	a	
	R																				
		7m	6m	5m	4m	3m	2m	1m	1p	2p	3p	4p	5p	6p	7p	8p	9p	10p	11p		
		alveole type																			

$\bar{p}$

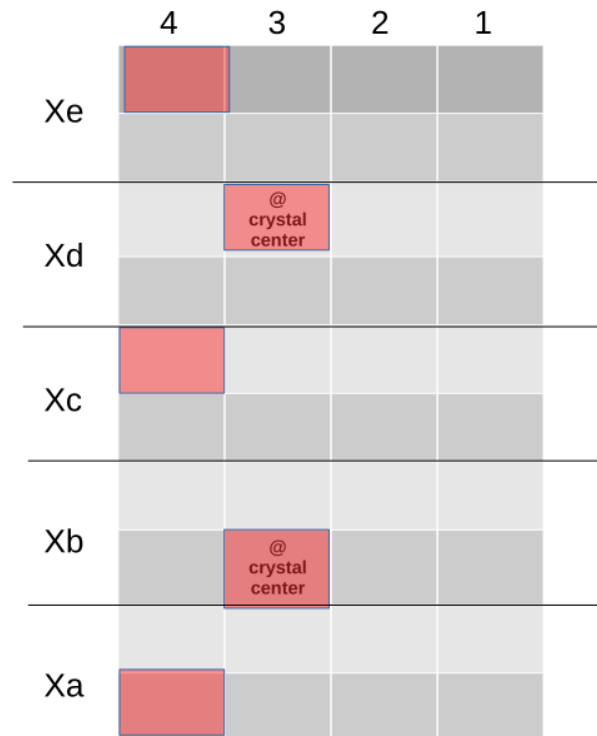
alveole position

Sensor distribution within each previously marked alveole type

- Sensor near beam-facing side



- Sensor near non beam-facing side



Sensor distribution coordinates

- **Sensor near beam facing side**
 - Xe-L3
 - Xc-L3
 - Xa-R3
- **Sensor near non beam facing side**
 - Xe-L4
 - Xc-L4
 - Xa-R4
- **Sensor in the middle of both sides**
 - Xb-L3
 - Xd-R3

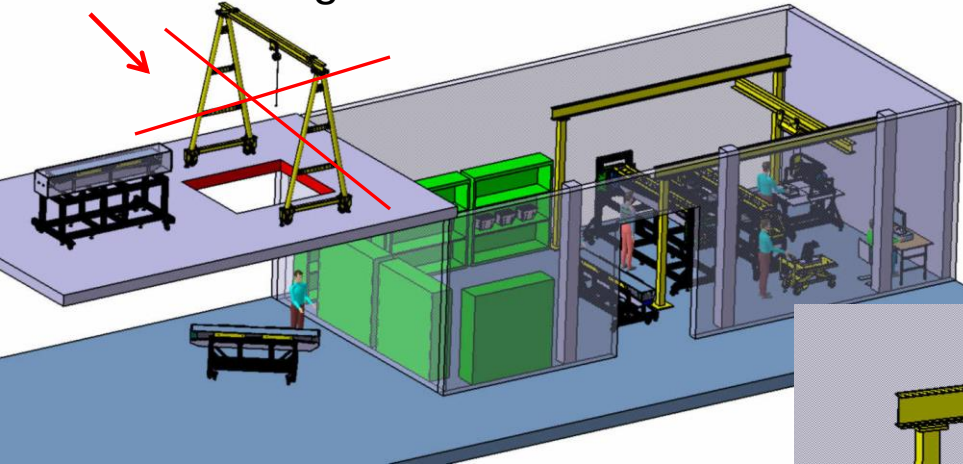
with X: 7m, 5m, 3m, 1m, 2p, 4p, 6p, 8p, 11p

Slice Assembly Workspace & Tools

-final layout assembly room-

12

Here: 2t bridge crane

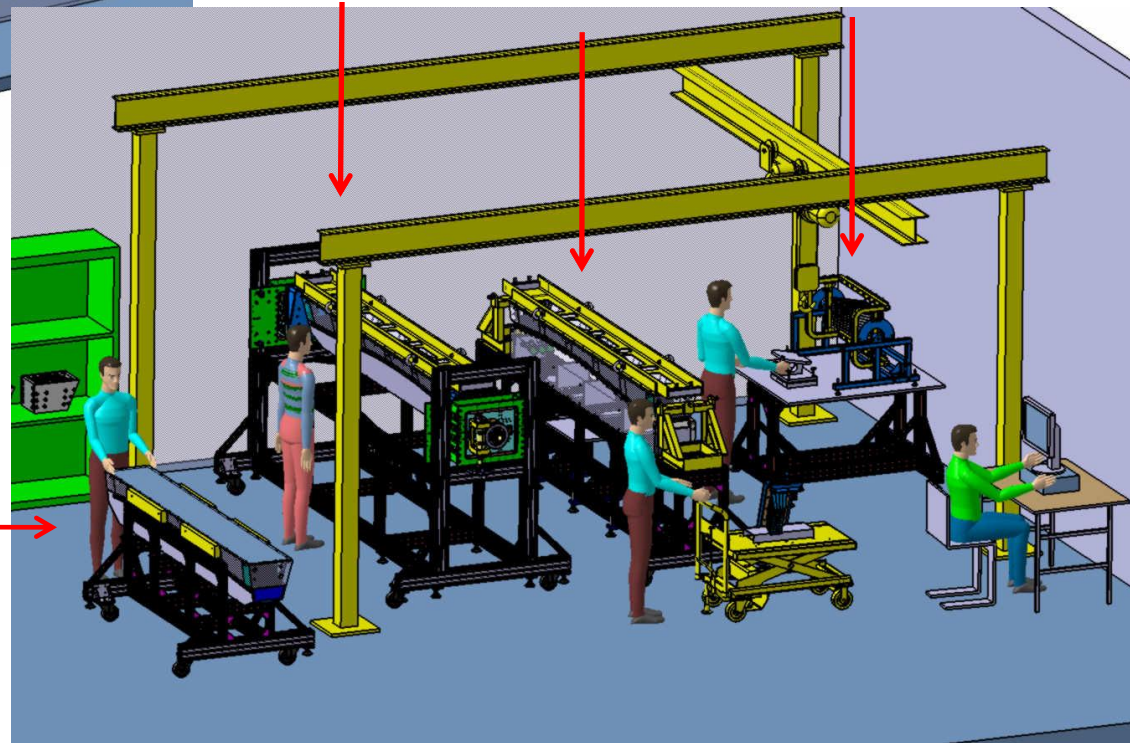


Slice test
turning device

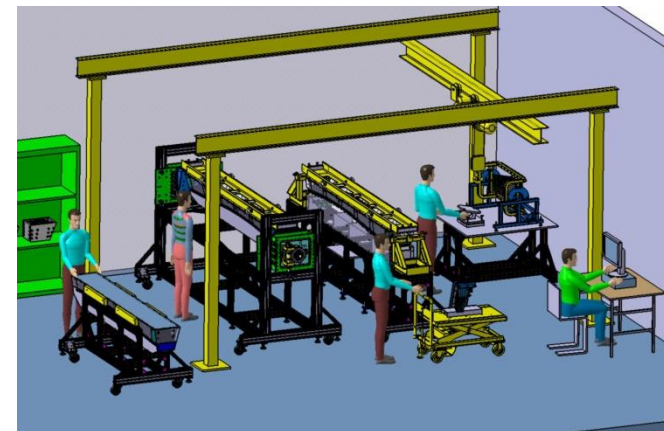
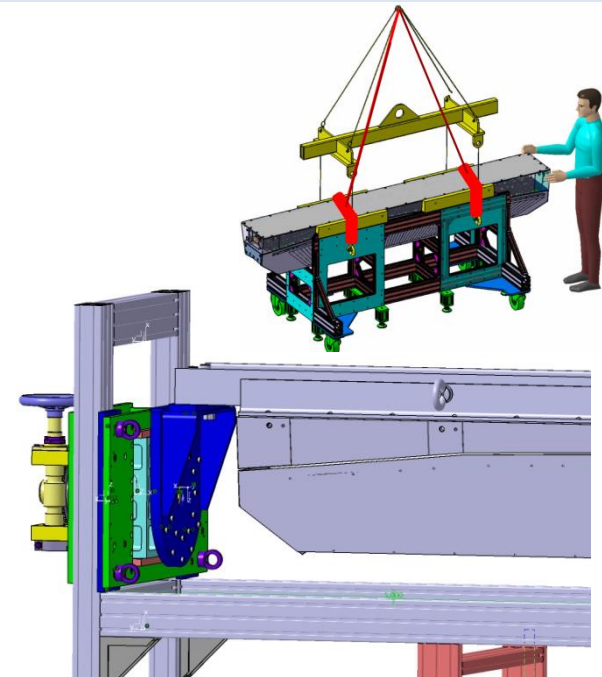
Slice
assembly

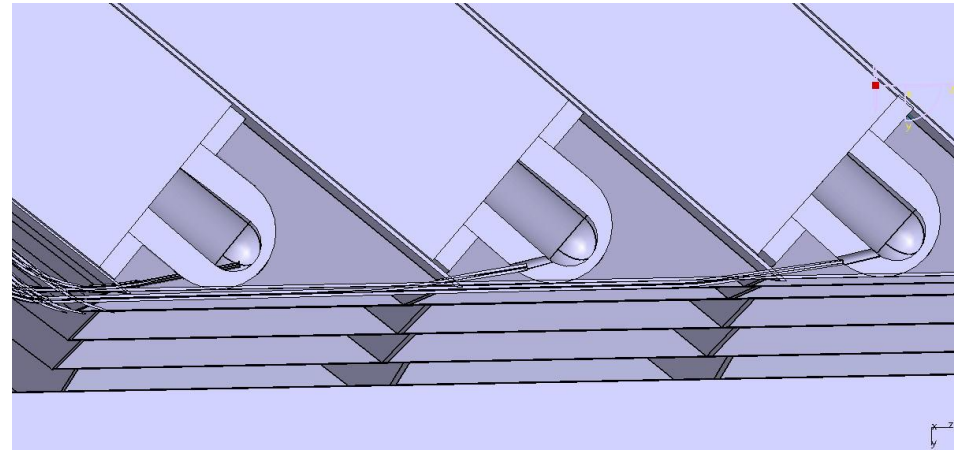
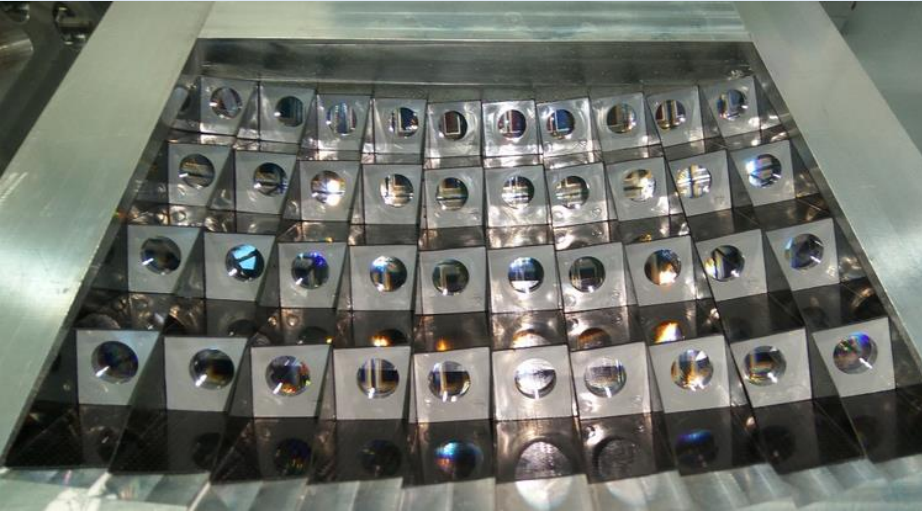
Supermodule
assembly

transportation & lifting unit

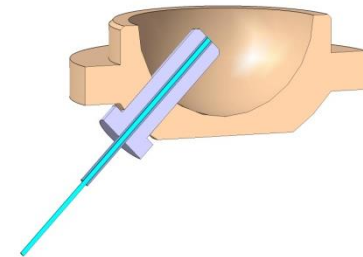
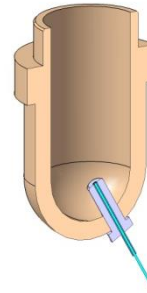
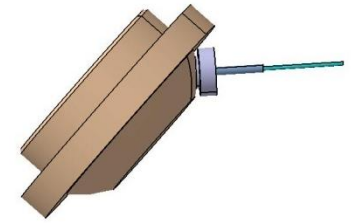
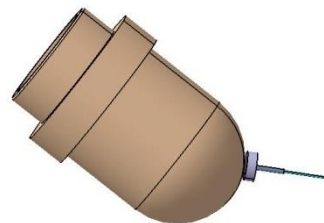


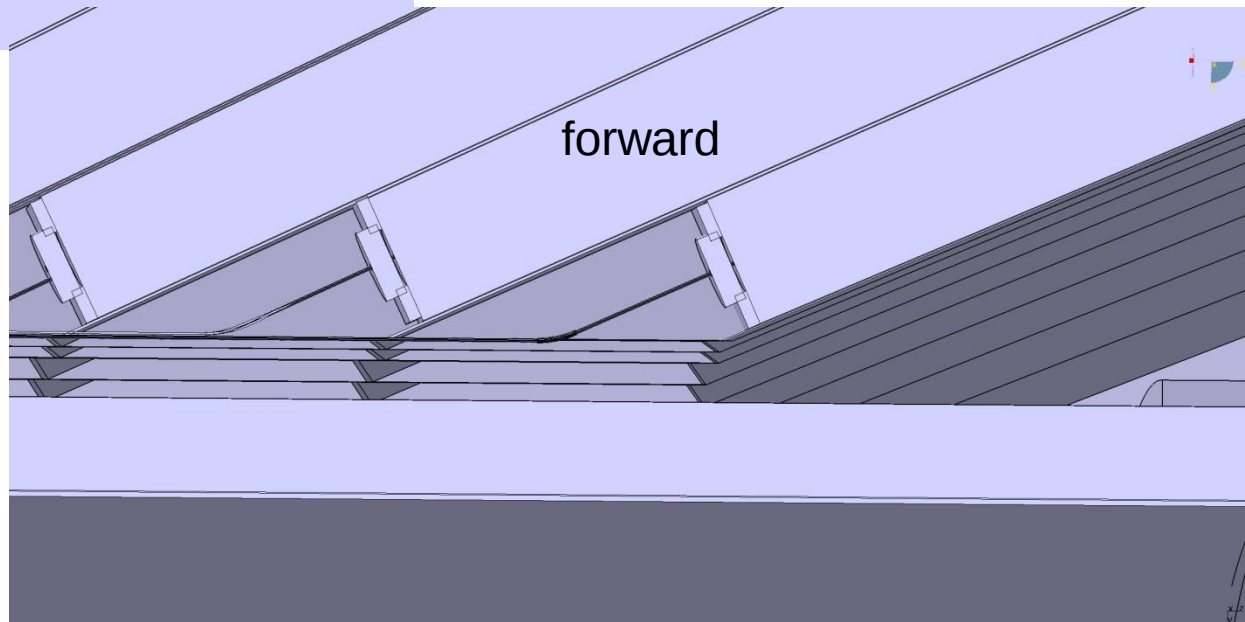
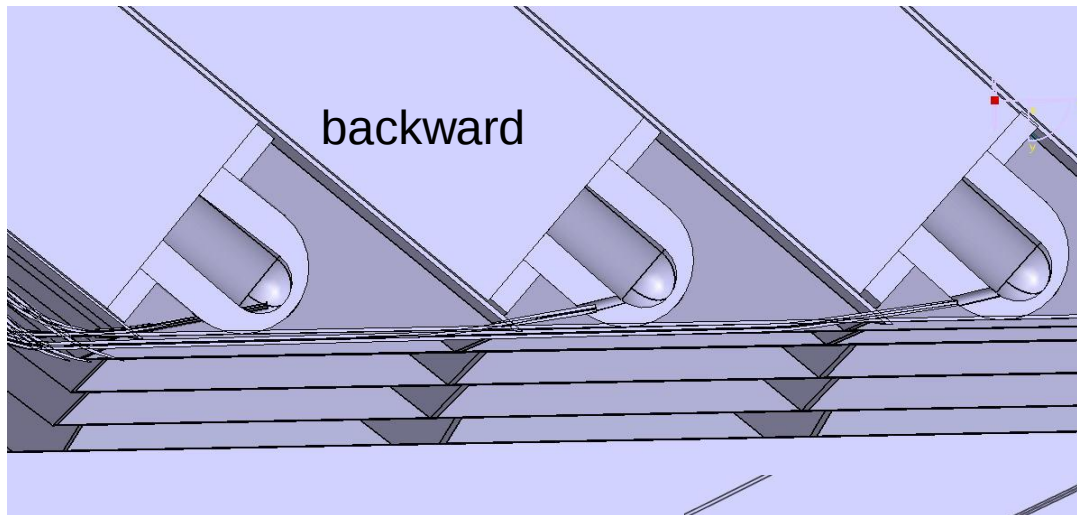
- Design of all assembly devices are ready and all parts were ordered except:
 - Lugs fitting for transportation device
 - Intermediate plates for turning device
 - They were discussed last week, drawings will be created soon.
- Delivery of the crane delayed to cw 50 due to delivery difficulties.





- Different length for different positions
- Prototypes will be ordered next week
- Inside coating with high reflective material
- Different coatings will be tested:
 - Titanium dioxide
 - Barium sulfate
 - Aluminium
 -





- Bochum HV control Software EPICS was installed last week by Tobias Triffterer.
- Previous Software causes several problems, for example:
 - USB-CAN converter produced a lot of error messages.
 - Channels stopped randomly voltage ramp up
 - Several Software crashes
- With the new Software and Andrea it was figured out:
 - Some channels had (have) a short circuit
 - Some channels had (have) a loose contact
 - Some channels were (are) wrong wired.
- **The Problems will be fixed together with Andrea in the next few days.**

- Exact 20°C
- Before irradiation:
 - electric contact checked individual
 - Dark current measurement
- Irradiate with 30 Gy and individual bias for gain 100.
- After irradiation:
 - Dark current measurement
 - Shipping to PSL



detector_gridselector.php?continue=overview

RUB » Physics » The Faculty » Chairs and Working Groups » EP1 » PANDA FEMC Production Database

PRODUCTION DB

- Main Page
- Alveoles
- Units
- Detectors
- VPTT
- Caps
- Subdetectors
 - Lot 06 07 08 09
 - 12 13 14 15
 - 16 17 18 19
 - 20 21 22 23
 - G0
- Temperature Sensors

WORKFLOW

- Combine APDs
- Assemble Unit
- Assign Unit
- Find Unit
- Upload VPTT magnet results

APD IRRADIATION

- Grid Overview
- Enter irradiation data
- Enter annealing data
- Shipment GSI ↔ Gießen/Bochum

PANDA HOMEPAGE

SELECT APD GRID TO DISPLAY

Information: If the information about a grid is incomplete, it may show up several times.

GRIDS AWAITING IRRADIATION

There are no APD grids in this category.

GRIDS READY FOR SHIPPING FOR ANNEALING/ANALYSIS AFTER IRRADIATION

There are no APD grids in this category.

GRIDS AWAITING ANNEALING

301	302	303	304	306	308	311	312	313	314
315	317	318	319	320	335	337	344	348	438
444									

GRIDS UNDER ANALYSIS AFTER IRRADIATION/ANNEALING

207								549	
-----	--	--	--	--	--	--	--	-----	--

GRIDS READY FOR ASSEMBLY

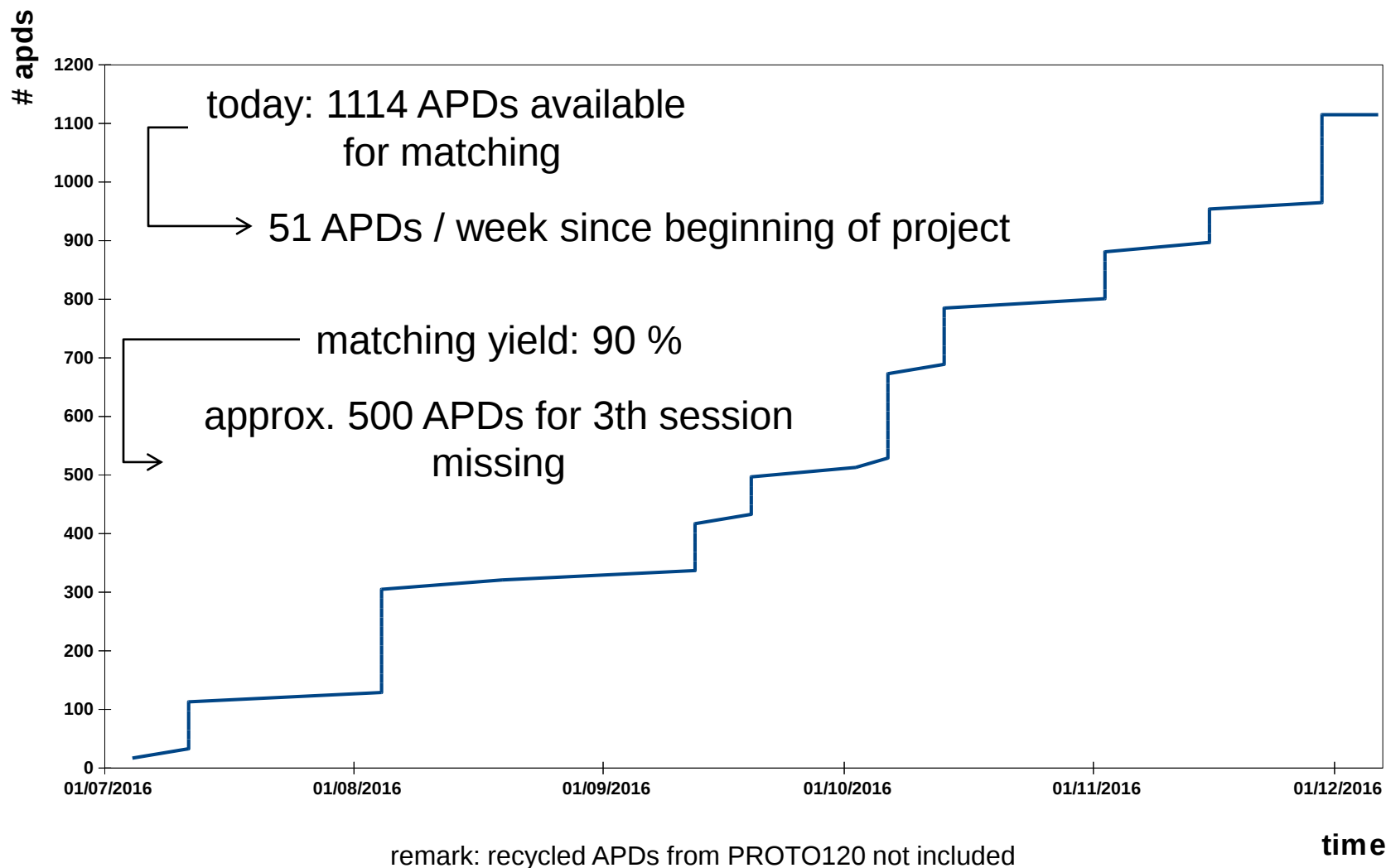
44	47	49	50	55	67	73	94	104	116
128	139	150	175	190	192	195	208	209	210
215	219	220	221	222	223	224	225	228	230
267	268	271	277	287	295	298	301	302	303
304	308	310	311	320	325	331	335	345	351
361	370	371	390	398	438	444	446	456	468
491	519	532	546	559	634	694			

GRIDS NOT YET DELIVERED FOR IRRADIATION

48	214	250	251	252	253	254	255	256	257
258	259	260	261	262	263	264	265	266	269
270	272	273	274	275	276	278	279	280	281
282	283	284	285	286	288	289	290	291	292
293	294	296	297	299	300	305	307	309	316
321	322	323	324	326	327	328	329	330	332
333	334	336	338	339	340	341	342	343	346
347	349	350	352	353	354	355	356	357	358
359	360	362	363	364	365	366	367	368	369
372	373	374	375	376	377	378	379	380	381
382	383	384	385	386	387	388	389	391	392
393	394	395	396	397	399	400	401	402	403
404	405	406	407	408	409	410	411	412	413
414	415	416	417	418	419	420	421	423	424
425	426	427	428	429	430	431	434	438	

23 Grids irradiated, waiting for 2nd screening

1114 APDs ready



	2016							2017					
	6	7	8	9	10	11	12	1	2	3	4	5	6
crystal tests													
APDs (2000 pcs)													
irradiation	400/week												
2 nd screening	150/week												
matching													
reflective foil production													
capsule production													
detector assembly		40/week											
ASIC PCBs (710 pcs)													
PCB production							11 weeks lead time						
mounting/bonding			8 weeks										
testing				90/week									
module assembly													
Backplane PCB (180 pcs)													
design													
testing	testing of prototypes + rad hardness of components												
production													
testing							20/week						
signal cables (890 pcs)													
ordering													
tayloring													
mounting on connector PCBs				38/week									
slice assembly													
module placement													
BPL mounting													
cable routing													
SC & DAQ													
cooling													
installation of Bo cooling													
test with slice													

- **Module assembly:**
 - 2/3 of all modules already assembled
 - APD throughput delayed the module assembly schedule.
 - Still 500 APDs needed.
- **Slice assembly:**
 - Workspace and Tools will be ready for slice assembly before Christmas
 - Fiber coupling will be tested soon
 - Delivery date of needed ASICs and flex PCBs so far unknown
 - Cooling concept has to be developed

	2016							2017					
	6	7	8	9	10	11	12	1	2	3	4	5	6
crystal tests													
APDs (2000 pcs)													
irradiation	400/week												
2 nd screening	150/week												
matching													
reflective foil production													
capsule production													
detector assembly		40/week											
ASIC PCBs (710 pcs)													
PCB production	1 month + order + vacation time												
mounting/bonding			8 weeks										
testing				90/week									
module assembly													
Backplane PCB (180 pcs)													
design													
testing	testing of prototypes + rad hardness of components												
production													
testing							20/week						
signal cables (890 pcs)													
ordering													
tayloring													
mounting on connector PCBs				38/week									
slice assembly													
module placement													
BPL mounting													
cable routing													
SC & DAQ													
cooling													
installation of Bo cooling													
test with slice													

		pairing APDS						Workplan (glueing APDS, wrapping crystals with foil, capsules)											foils on front inserts						
		APDs ready	Crystal	APDs left for matching	Expected APD pairs in total (dV<=0,2 & dM/dV<=0,2)	Needed APD pairs in total	Difference expected – needed (dV<= 0,2 & dM/dV<=0,2)	crystals											sum per week	foils on front inserts					
								type1 (need:80)	type2 (need:80)	type3 (need:80)	type4 (need:80)	type5 (need:80)	Type6 (need:80)	type7 (need:80)	type8 (need:40)	type9 (need:40)	type10 (need:40)	type11 (need:30)		type 1	type 2	type 3	type 4		
CW	Remarks																								
30		96	0	96	43	0	43												0						
31		299	0	299	135	0	135												0						
32		299	0	299	135	0	135												0						
33		299	0	299	135	0	135												0						
34		299	0	299	135	0	135												0						
35		299	#	259	135	20	115												20						
36		299	#	179	135	60	75											30	10						
37		399	#	119	180	140	40											40							
38		503	#	63	226	220	6				30	40	10					10							
39		509	#	49	229	230	-1				10														
40		678	#	218	305	230	75	buffer											0						
41	1 st session	678	#	218	305	230	75	buffer											0						
42		774	#	314	348	230	118	buffer											0		120	40	70		
43		774	#	314	348	230	118												0						
44		894	#	274	402	310	92	80											80						
45		894	#	114	402	390	12		40	40									80						
46		974	#	434	438	390	48												0						
47		1094	#	554	492	390	102												0	240					
48	2 nd session	1114	#	574	501	390	111												0						
49		1114	#	174	501	470	31				40	40		40	40				80						
50		1234	#	134	555	550	5							40	40				80						
51		1354	#	254	609	550	59												0						
52		1354	#	254	609	550	59												0						
1		1354	#	254	609	550	59												0						
2		1354	#	94	609	630	-21								40	40			80	120	120				
3	3 rd session ?																								
4																									
5																									
6																									
7																									
8																									
9																									
10																									
11																									
12																									
13																									
14																									
15																									
16																									
17																									
18																									
19																									
20																									
21																									
Proto120								0	40	40															
sum:								80	80	80	80	80	80	80	40	40	40	30		240	240	160	70		
																		710					710		