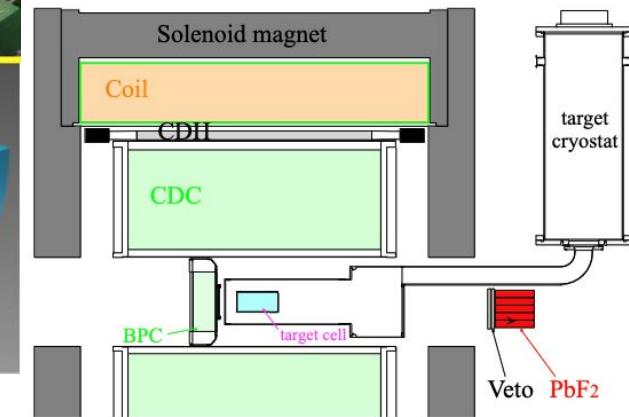
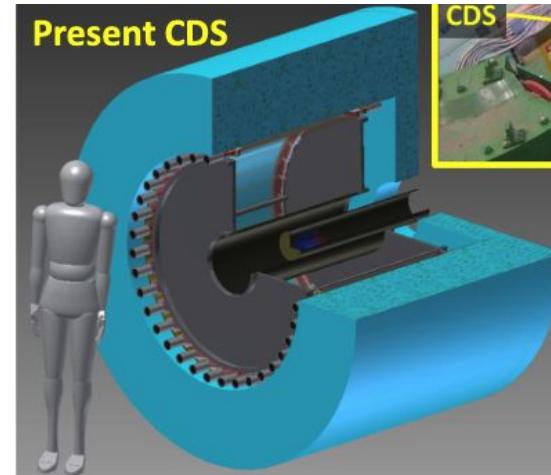
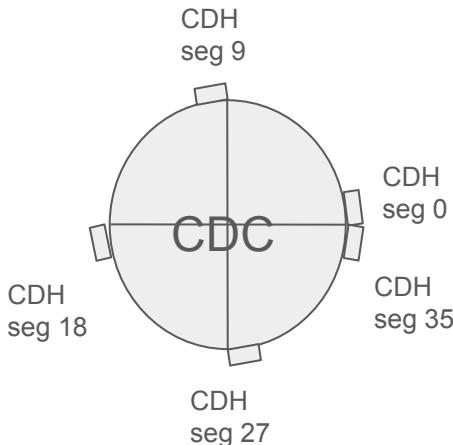


# weekly meeting

## J-PARC E80

- CDC very rough Layer Efficiency using ArCO<sub>2</sub> / cosmic data in Dec. 2023

2024/7/13 Yuto Kimura, RARiS, J-PARC E80



# CDH

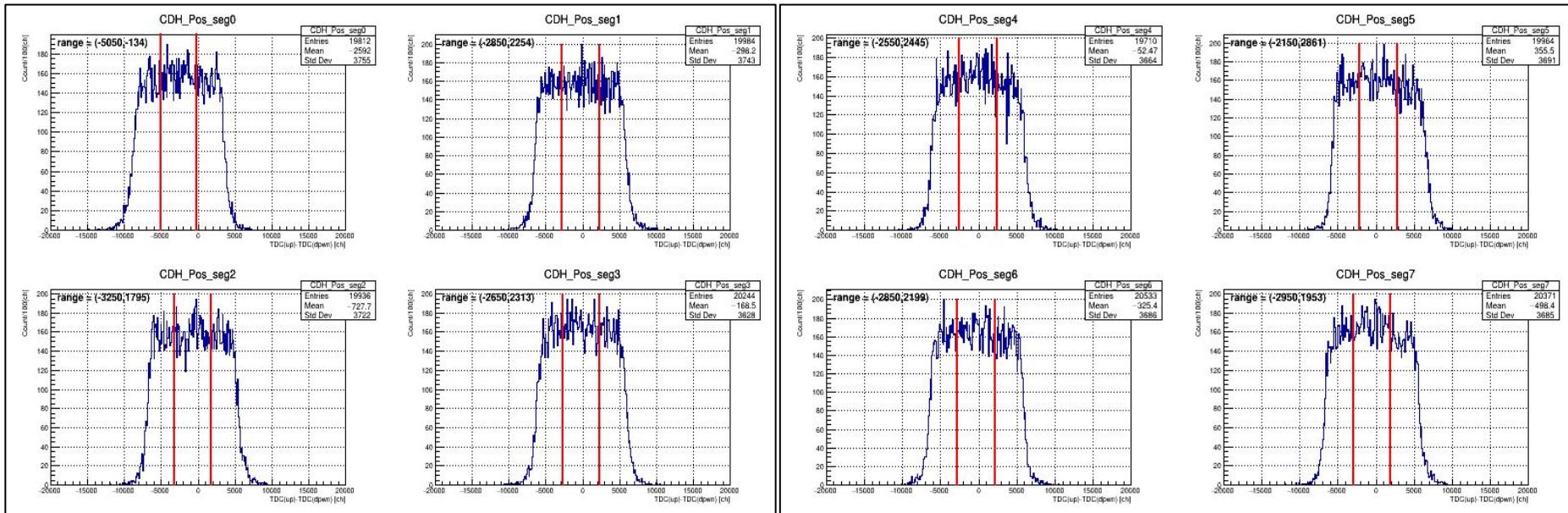
Decided denominator of Layer Efficiency

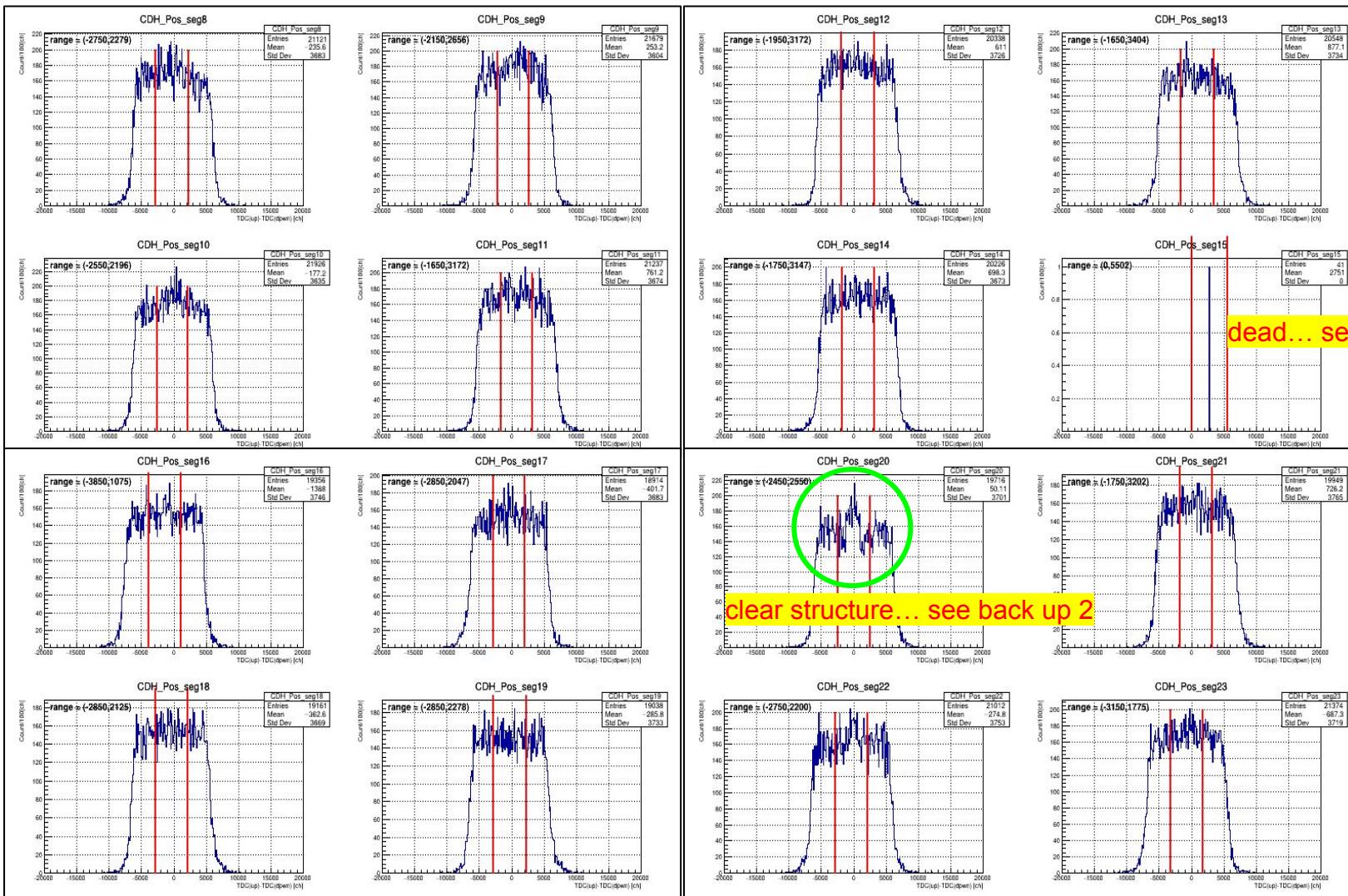
in this report

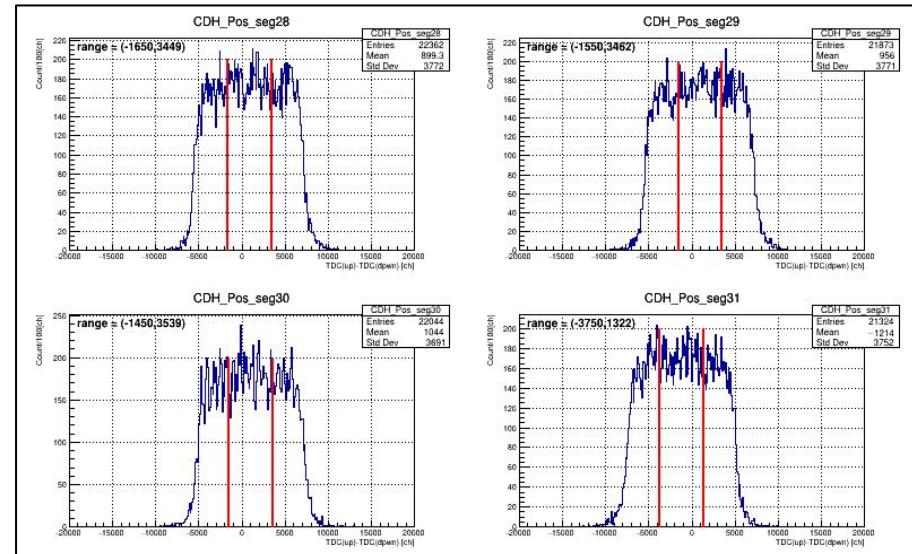
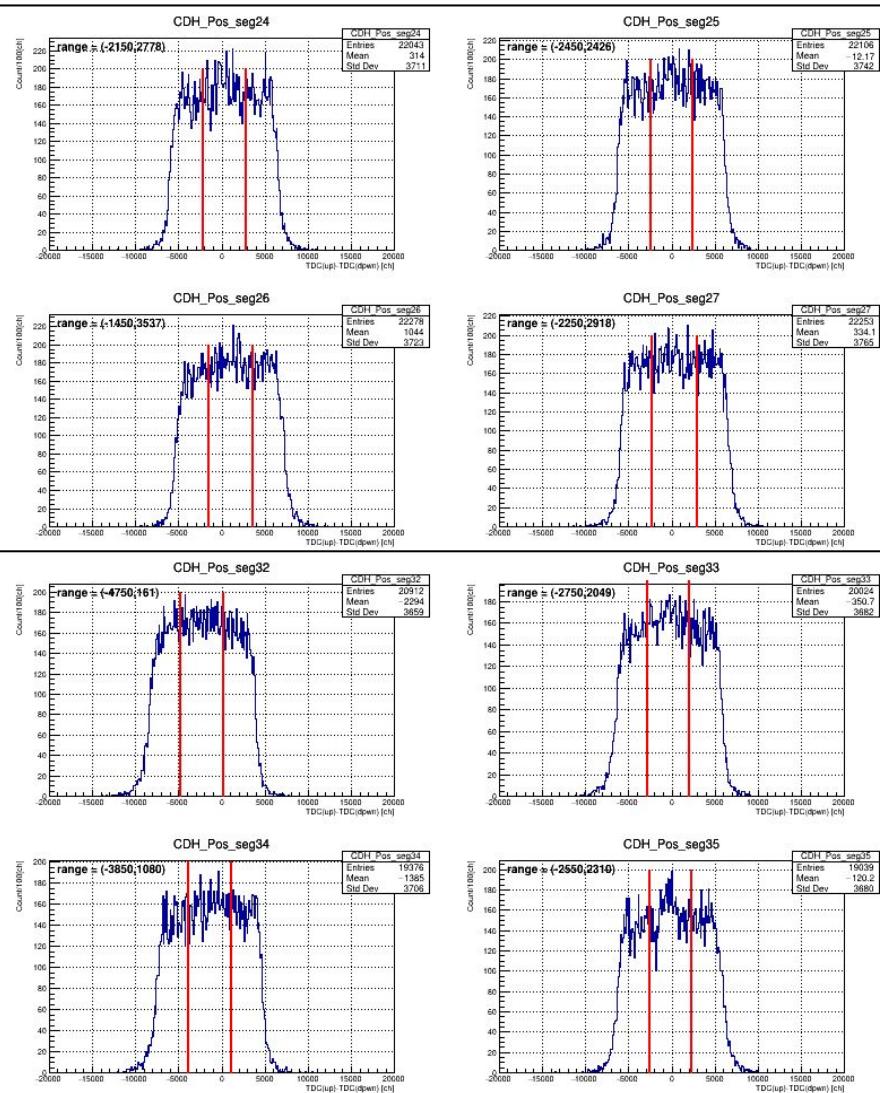
Data directory: /group/had/knucl/e15/detector_data/CDCArCO2_2023Dec										
runNo	CDCHV	events	duration	date	start time	end time	Logbook, No	Logbook page	comment	
1	2350	44675	0:08:39	2023/12/4	19:32:38	19:41:17	E73, #5	146		
2	2350	116628	0:22:19	2023/12/5	11:16:42	11:39:01	E73, #5	147		
3	2300	232570	0:44:21	2023/12/5	11:42:43	12:27:04	E73, #5	147		
4	2250	317053	1:00:23	2023/12/5	12:30:14	13:30:37	E73, #5	147		
5	2200	315685	0:59:56	2023/12/5	13:32:34	14:32:30	E73, #5	147		
6	1900	1036	0:00:20	2023/12/5	14:33:23	14:33:43	E73, #5	147	junk	
7	1900	31064	0:48:57	2023/12/5	14:35:41	15:24:38	E73, #5	147	From this run, only CDH 8-11, 26-29 HV on	
8	2000	44973	1:10:48	2023/12/5	15:26:08	16:36:56	E73, #5	148		
9	2100	266	1:44:56	2023/12/5	16:38:33	18:23:29	E73, #5	148	junk	
10	2100	0	0:00:20	2023/12/5	18:23:33	18:23:53	E73, #5	148	junk	
11	2100	0	0:00:25	2023/12/5	18:24:11	18:24:36	E73, #5	148	junk	
12	2100	12239	0:19:31	2023/12/5	18:24:59	18:44:30	E73, #5	148		
23	2150	33398	0:52:35	2023/12/8	11:20:36	12:13:11	E73, #5	150		
24	2400	119987	3:10:16	2023/12/8	13:36:33	16:46:49	E73, #5	150		

HV [V]	# of run	# of events
1900	7	31064
2000	8	44973
2100	12	12239
2150	23	33398
2200	5	315685
2250	4	317053
2300	3	232570
2350	2	116628
2400	24	119987

- ArCO<sub>2</sub> Run4, cosmic, w/o mag, ~300,000 events
- CDH Hit Position Range determination
  - TDC(up) - TDC(down) (**extracted first hits only**)
  - rejected 0.6 × total events (0.3 both side)
- A structure was found in several segments.



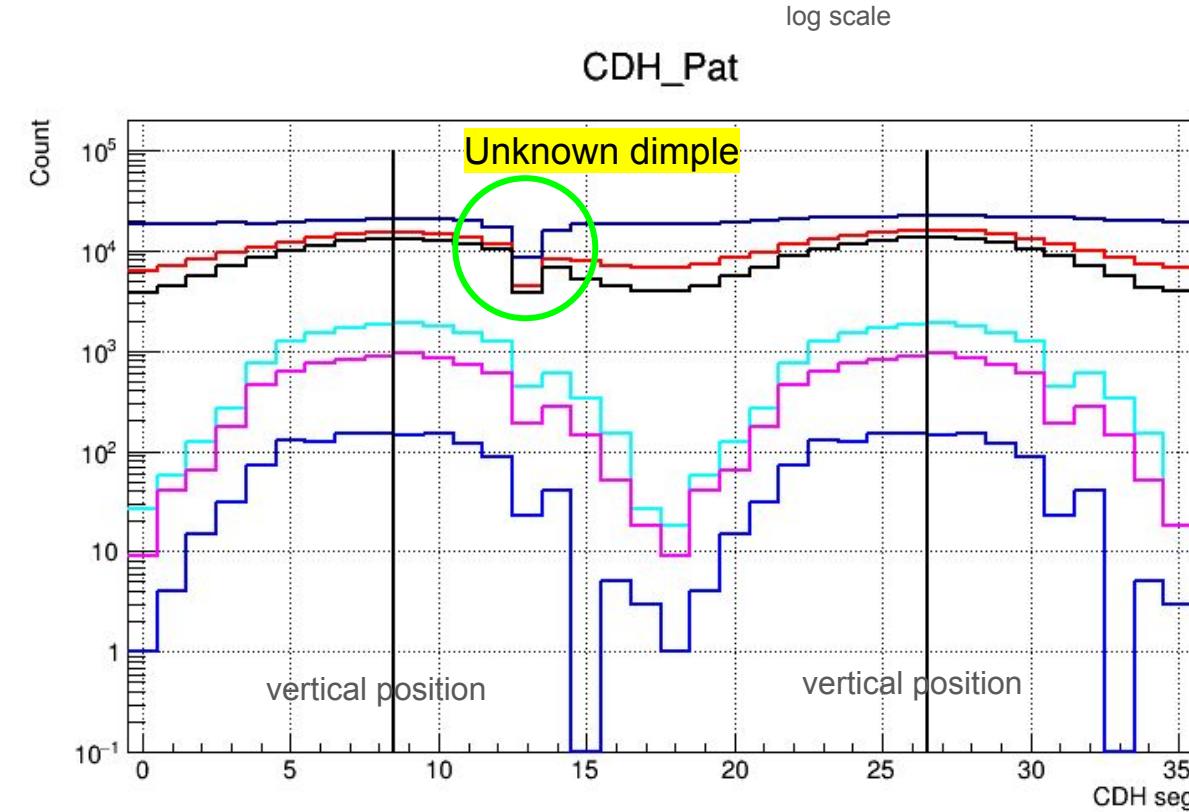
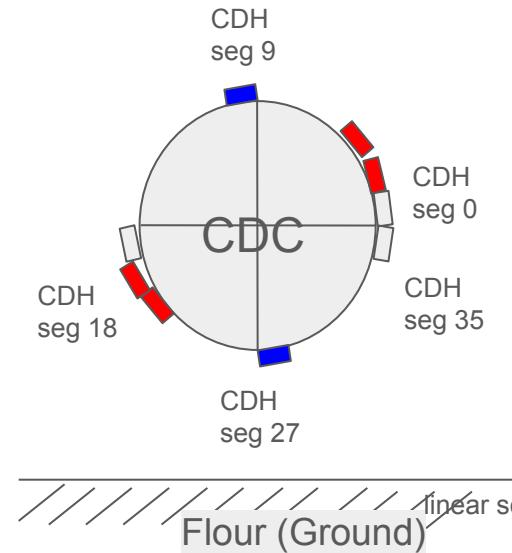




- ArCO<sub>2</sub> Run4, cosmic, w/o mag, ~300,000 events
- CDH HitPat,
  - Blue: raw, Red: mul==2, Black: mul==2&&not Next Seg, Cyan: mul==2&&level2, Magenta: mul==2&&level1, Blue: mul==2&&level1&&poscut
  - Not cutting off by ADC nor TDC values

rough layer efficiency

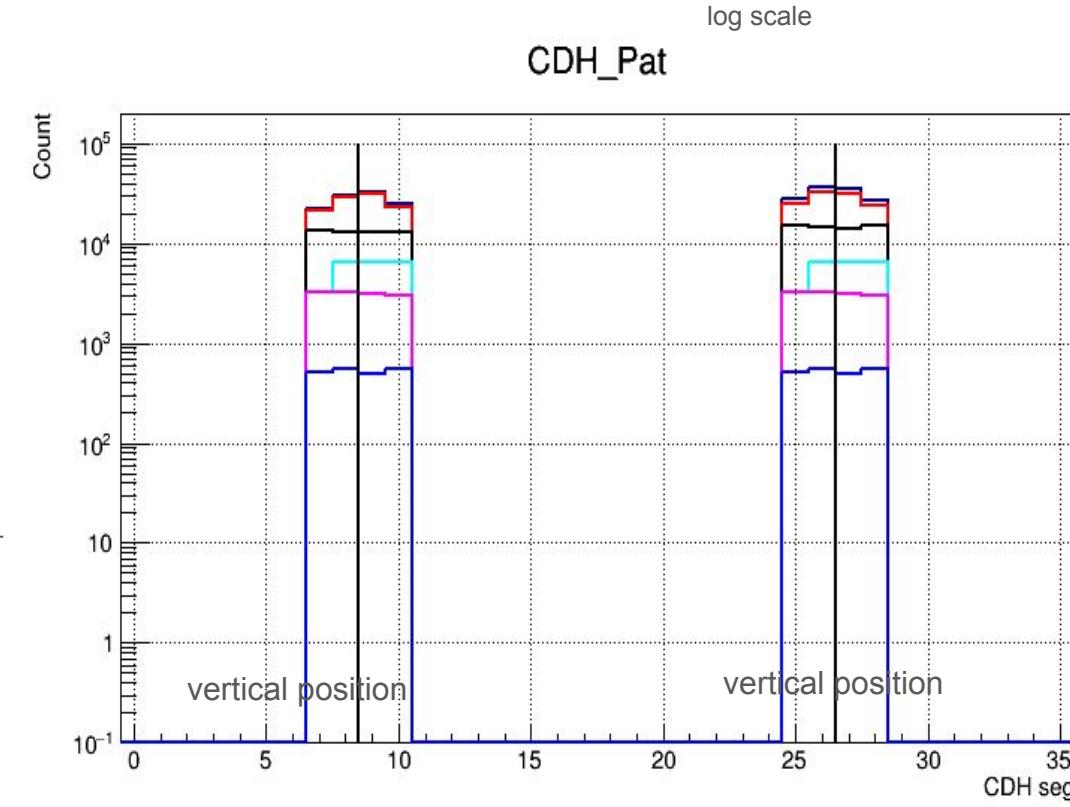
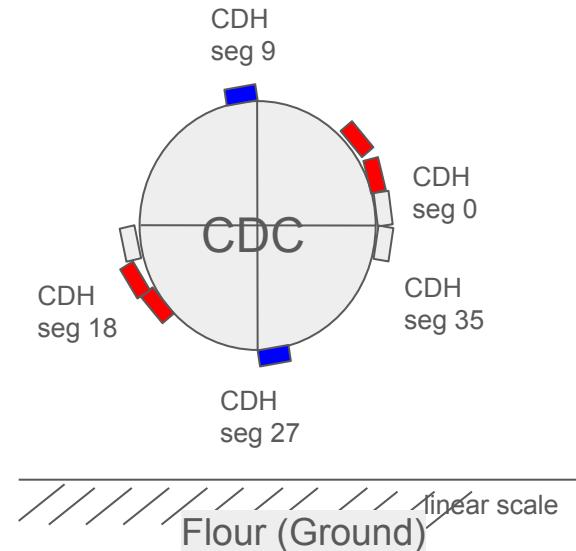
examples of level2 and level1

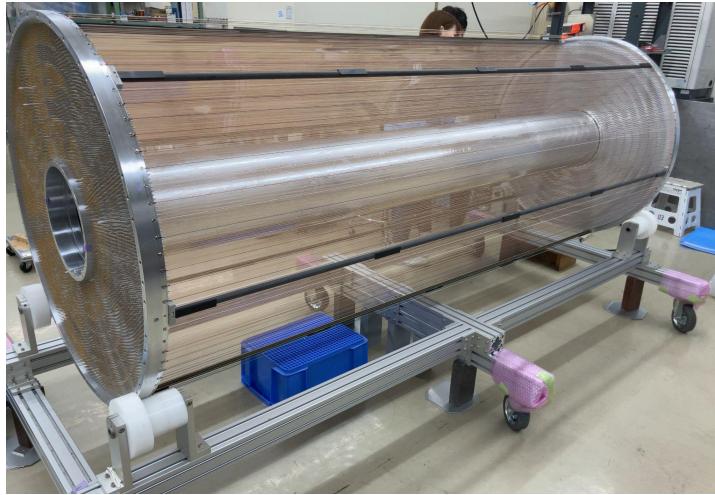


- ArCO<sub>2</sub> Run24, cosmic, w/o mag, ~120,000 events
- CDH HitPat,
  - Blue: raw, Red: mul==2, Black: mul==2&&not Next Seg, Cyan: mul==2&&level2, Magenta: mul==2&&level1, Blue: mul==2&&level1&&poscut
  - Not cutting off by ADC nor TDC values

rough layer efficiency

examples of level2 and level1





# CDC

Decided numerator of Layer Efficiency

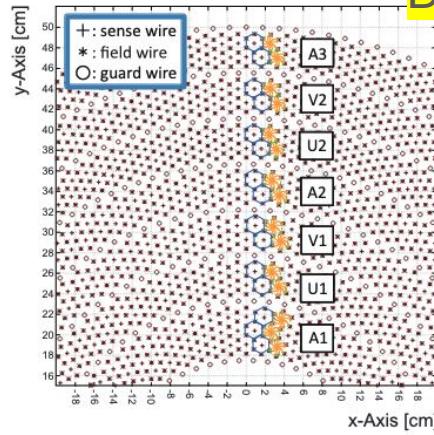
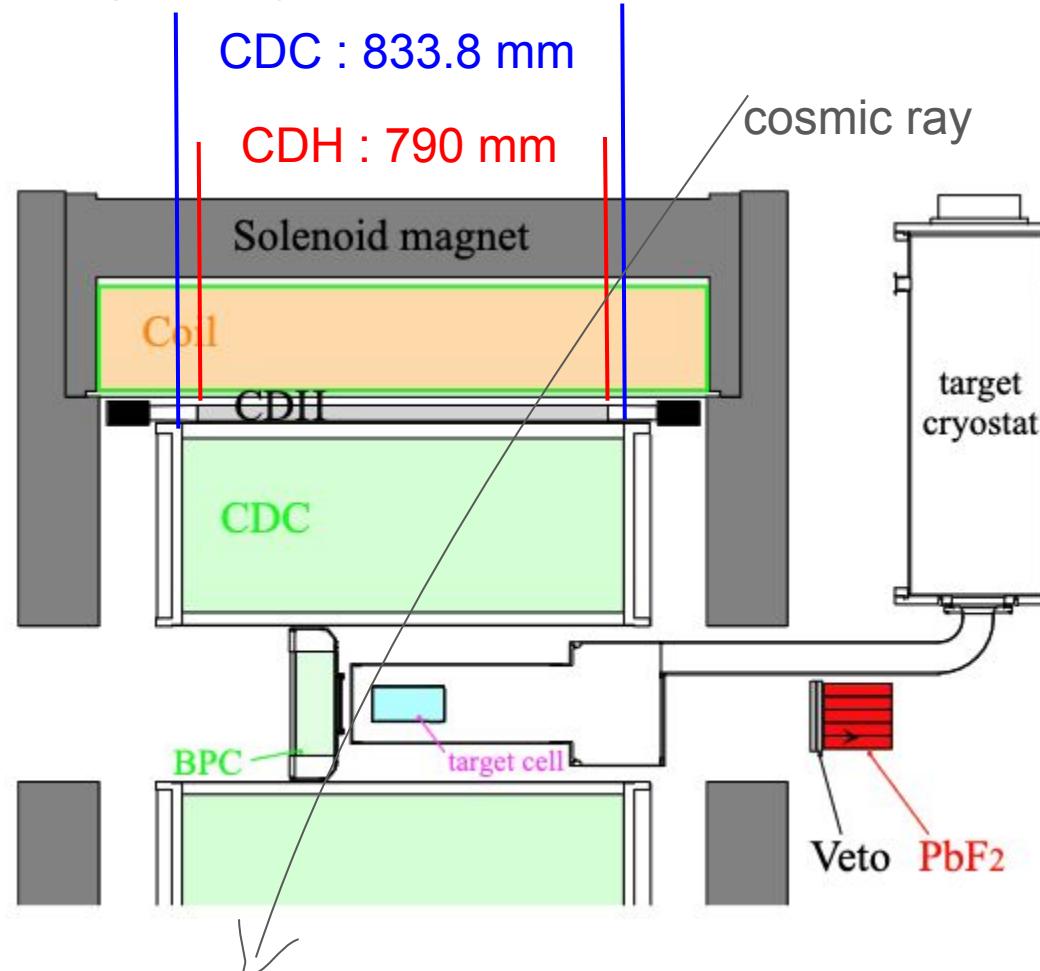


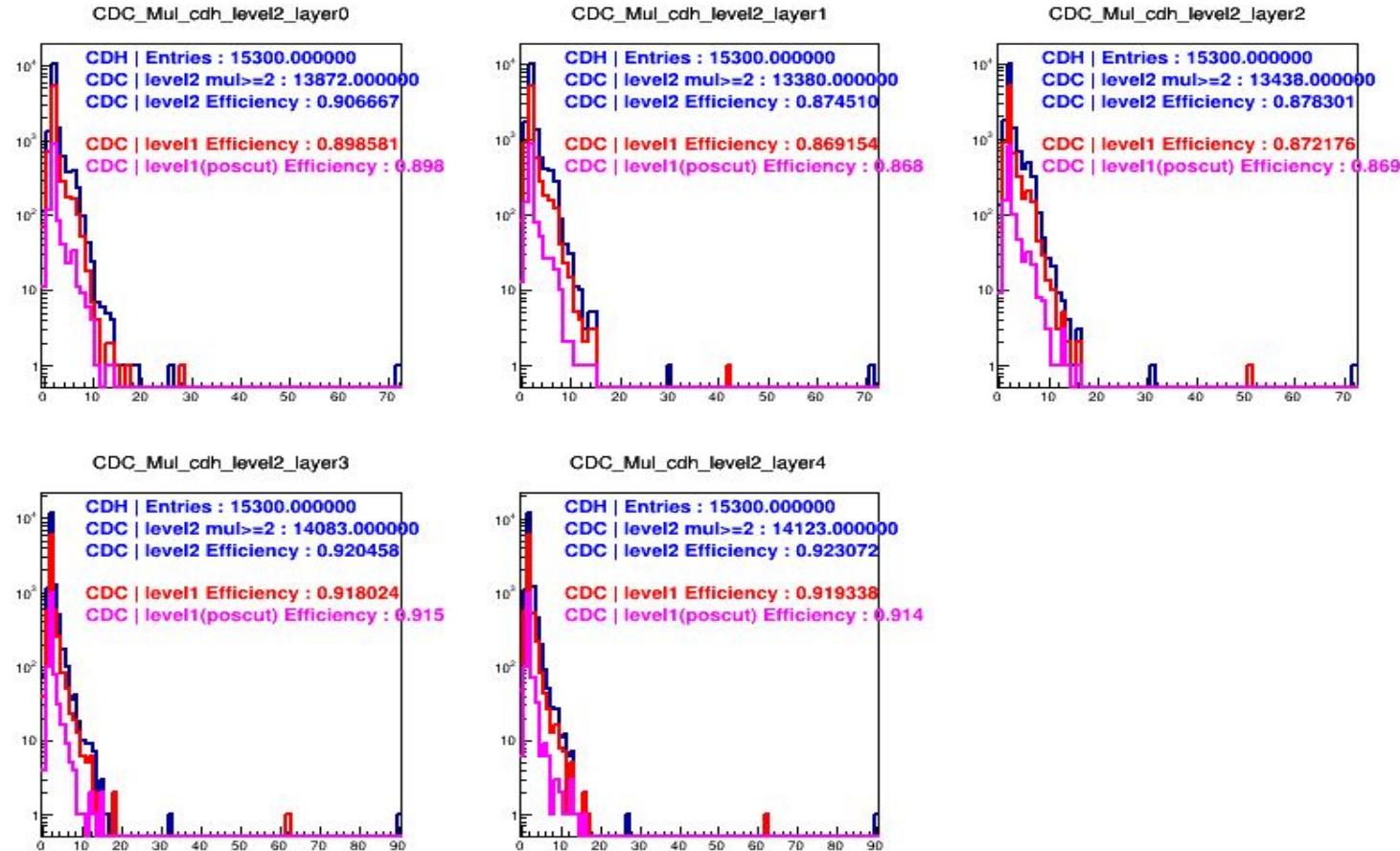
Figure 46: Cell structure of the CDC.

Super-layer	layer	Wire direction	Radius (mm)	Cell width (degree)	Cell width (mm)	Stereo angle (degree)	Signal channels per layer
A1	1	X	190.5		16.7	0	
	2	X'	204.0	5.00	17.8	0	72
	3	X	217.5		19.0	0	
U1	4	U	248.5	4.00	17.3	-2.27	
	5	U'	262.0		18.3	-2.39	90
V1	6	V	293.0		18.4	2.42	
	7	V'	306.5	3.60	19.3	2.53	100
A2	8	X	337.5		17.7	0	
	9	X'	351.0	3.00	18.4	0	120
U2	10	U	382.0	2.40	16.0	-2.82	
	11	U'	395.5		16.6	-2.92	150
V2	12	V	426.5		16.7	2.96	
	13	V'	440.0	2.25	17.3	3.05	160
A3	14	X	471.0	2.00	16.4	0	
	15	X'	484.5		16.9	0	180

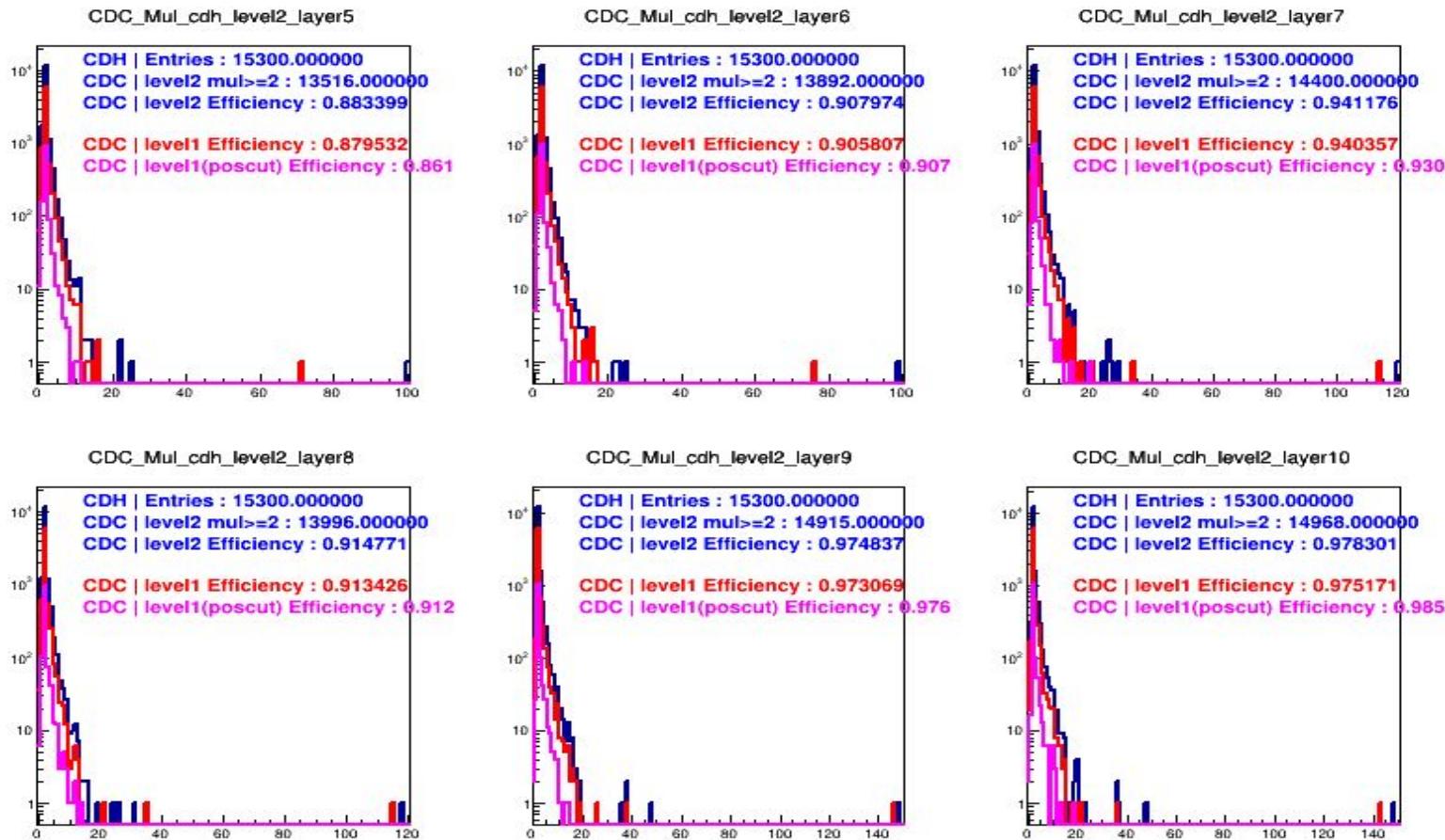
Not need to limit the hit range of CDH, for deriving CDC layer efficiency,  
but cutted off CDH edge events just in case (like p.8)



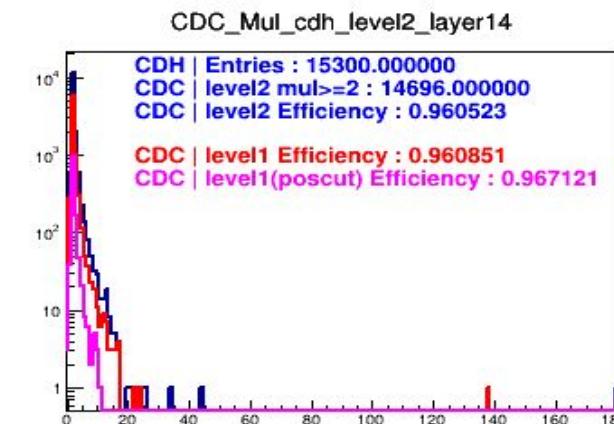
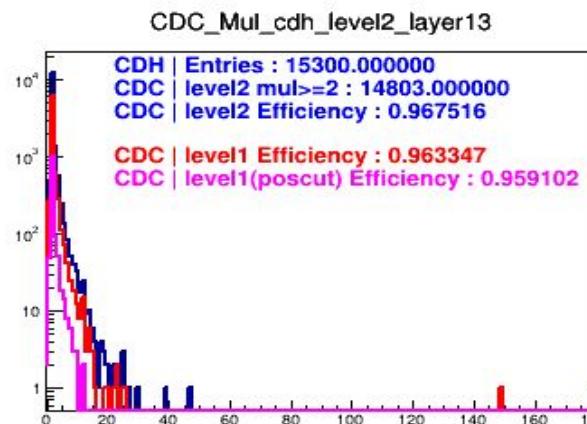
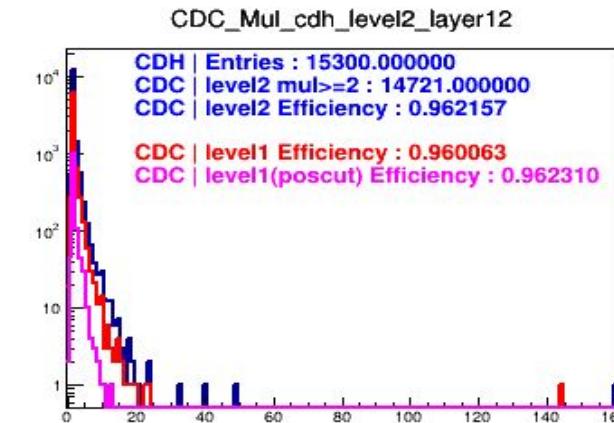
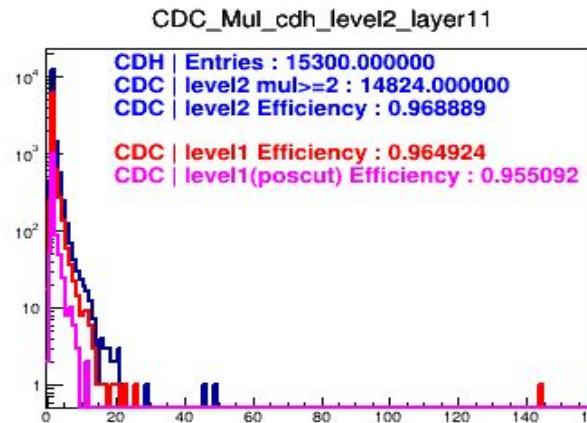
- ArCO<sub>2</sub> Run4, cosmic, w/o mag, ~300,000 events
- multiplicity for each layer
- rough layer efficiency = “mul >= 2” / “entries”



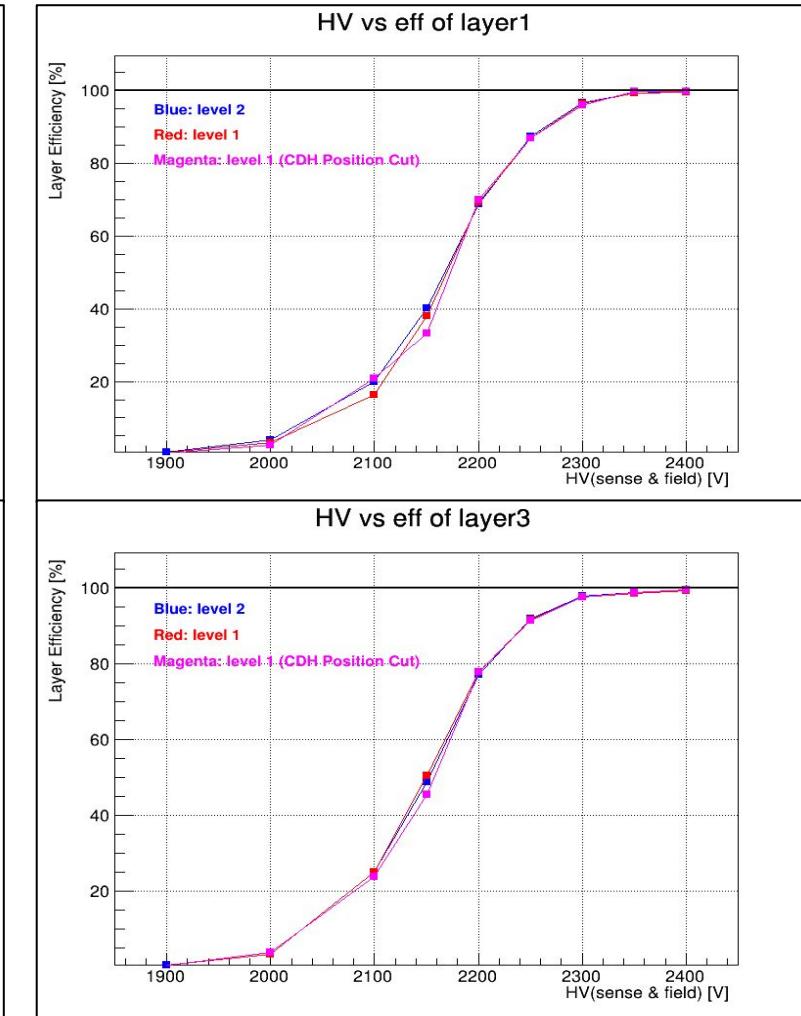
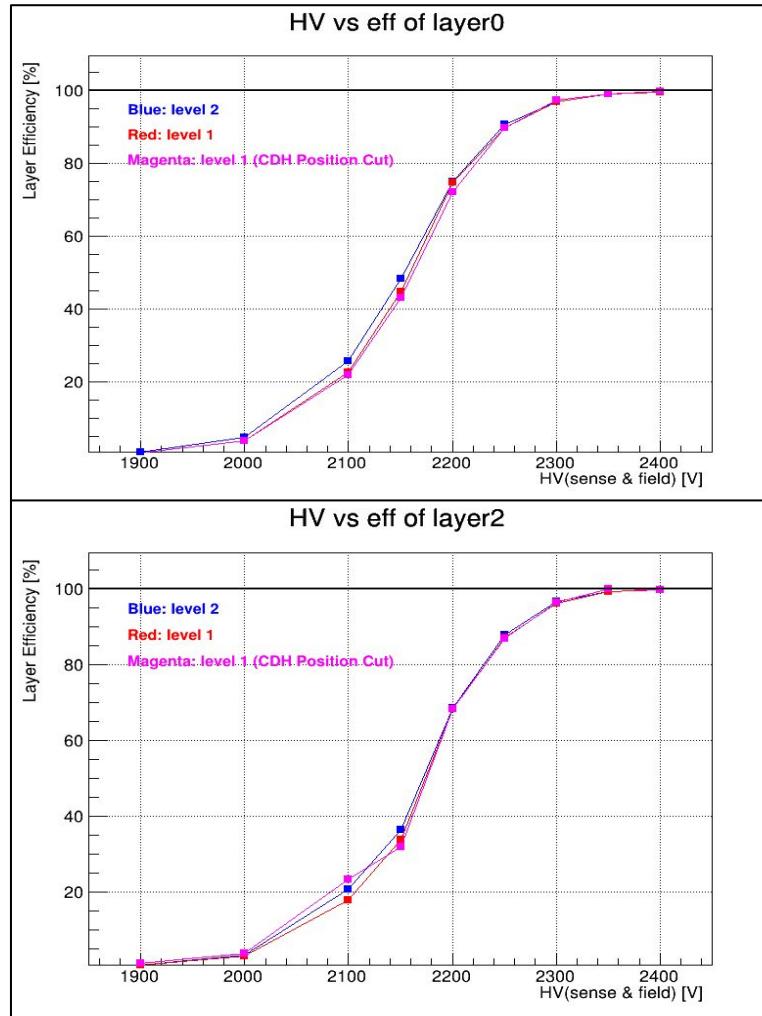
- ArCO<sub>2</sub> Run4, cosmic, w/o mag, ~300,000 events
- multiplicity for each layer
- rough layer efficiency = “mul >= 2” / “entries”



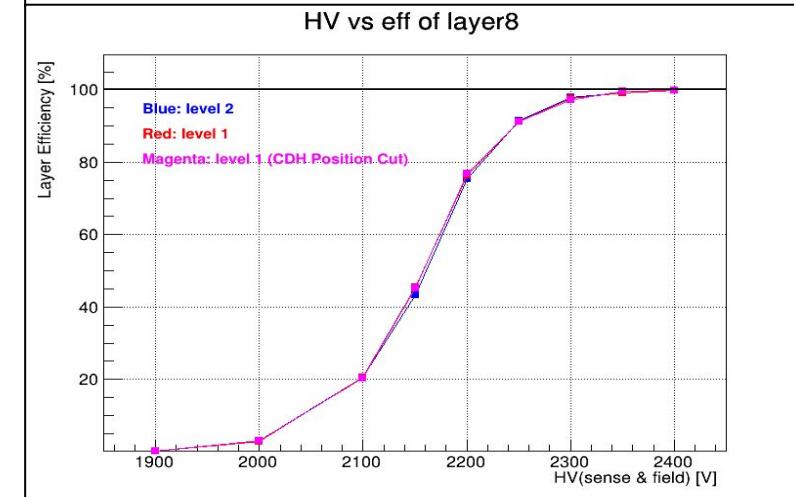
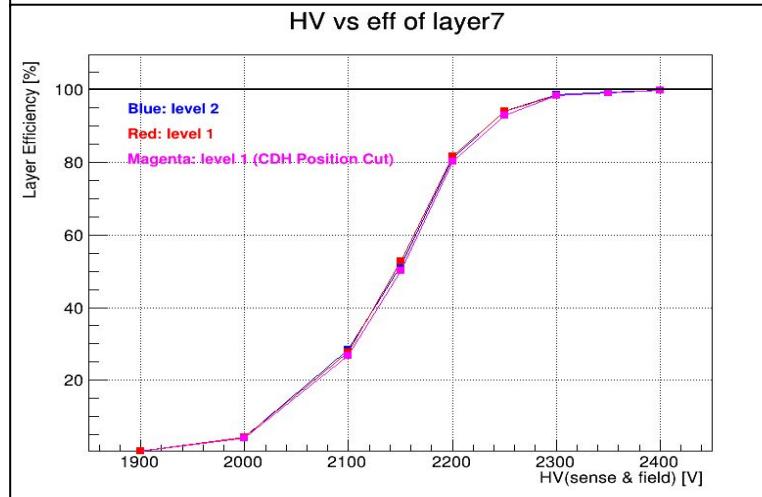
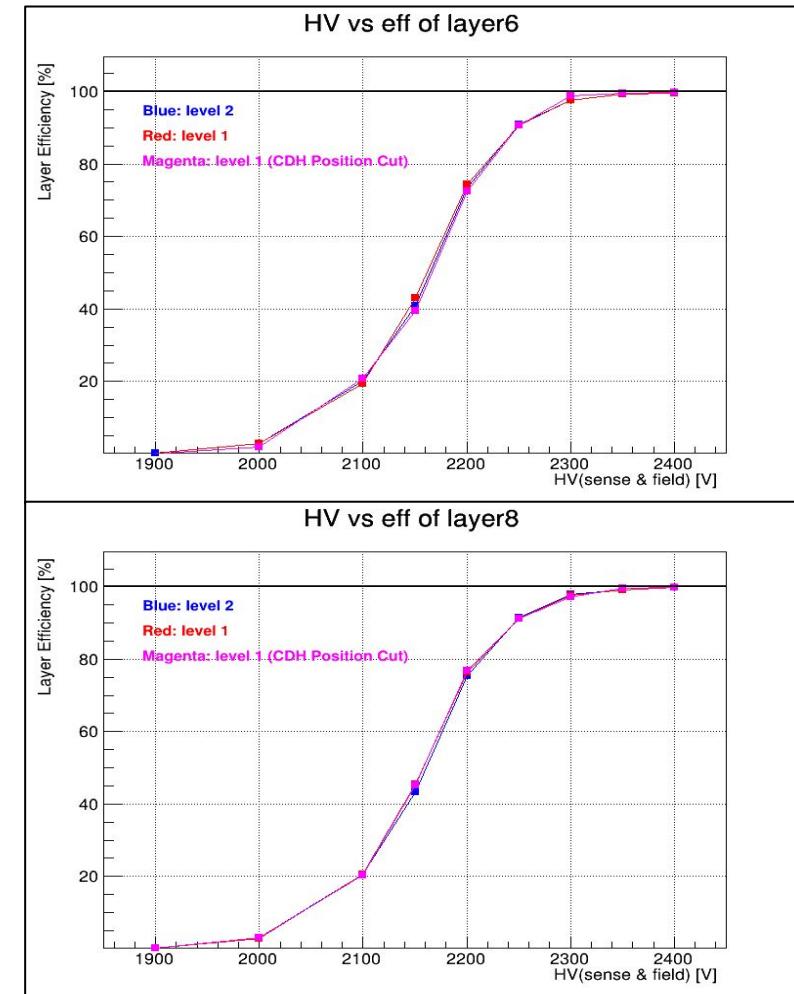
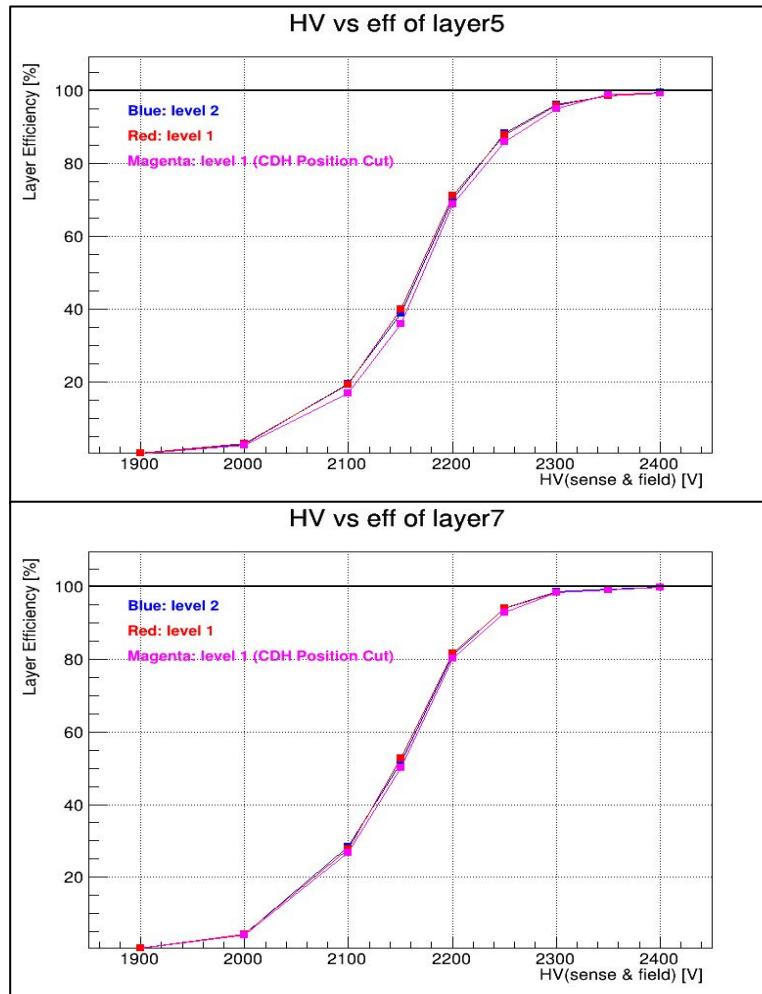
- ArCO<sub>2</sub> Run4, cosmic, w/o mag, ~300,000 events
- multiplicity for each layer
- rough layer efficiency = “mul >= 2” / “entries”



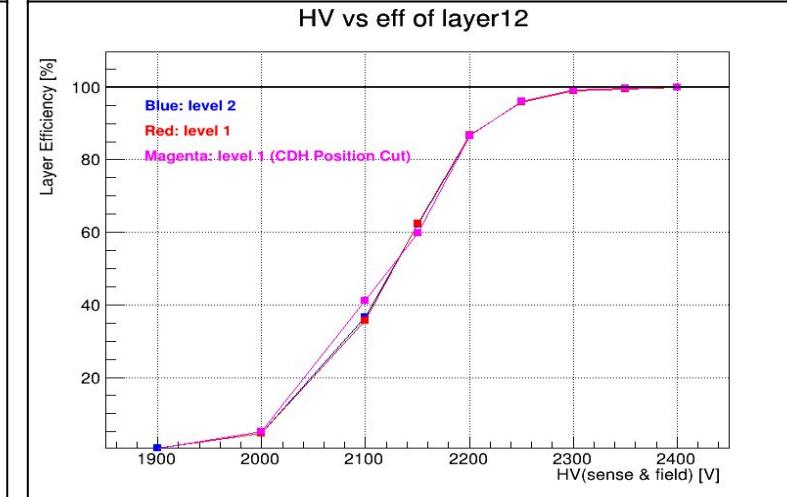
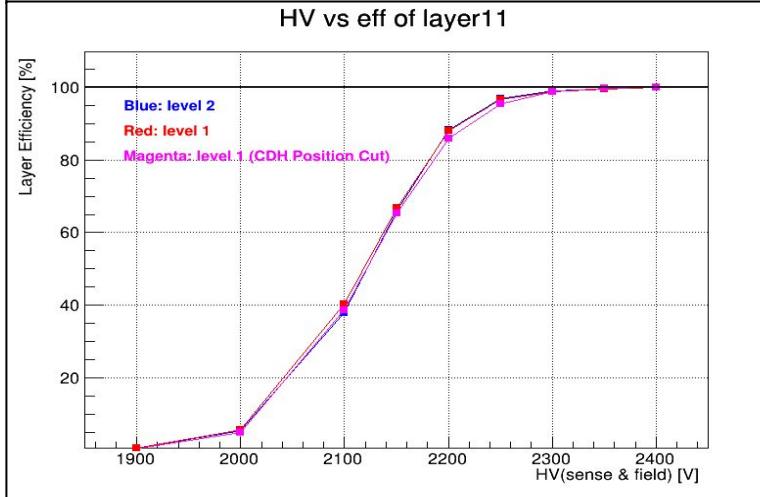
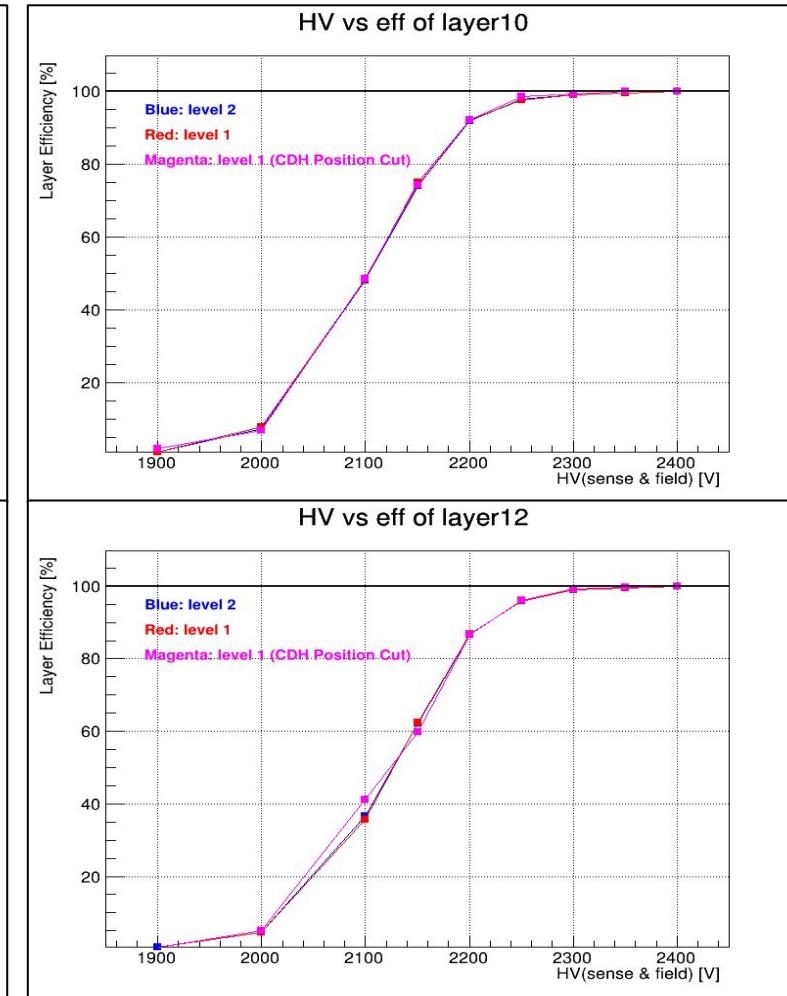
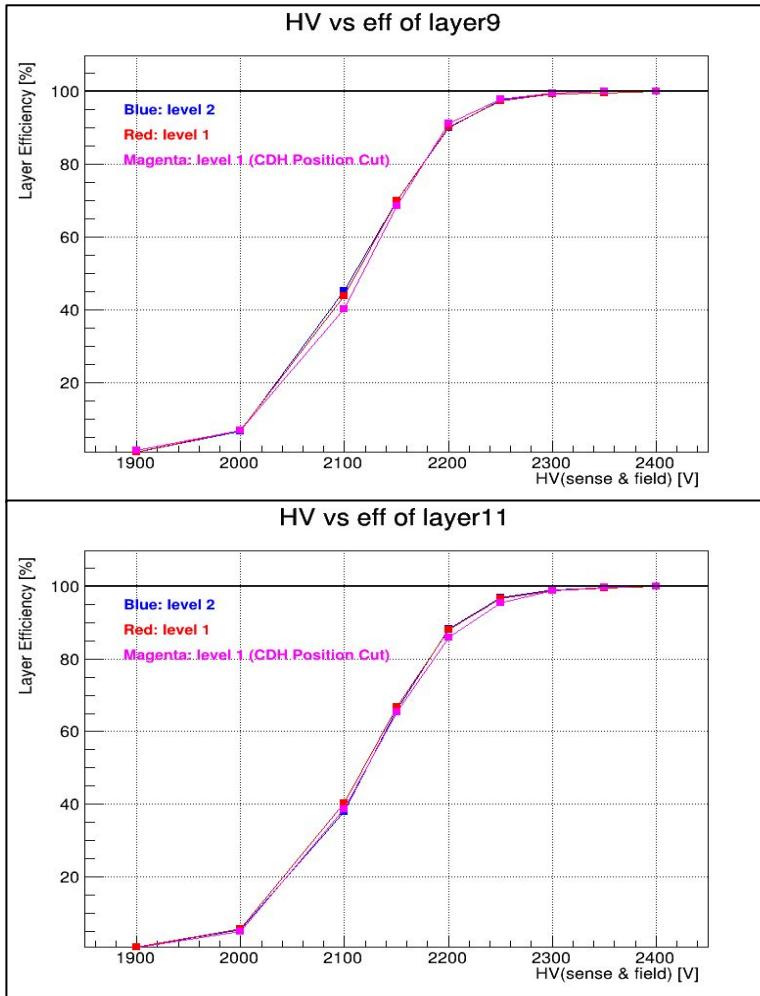
- ArCO<sub>2</sub> Run2~24, cosmic, w/o mag
- HV vs rough layer efficiency, for each layer



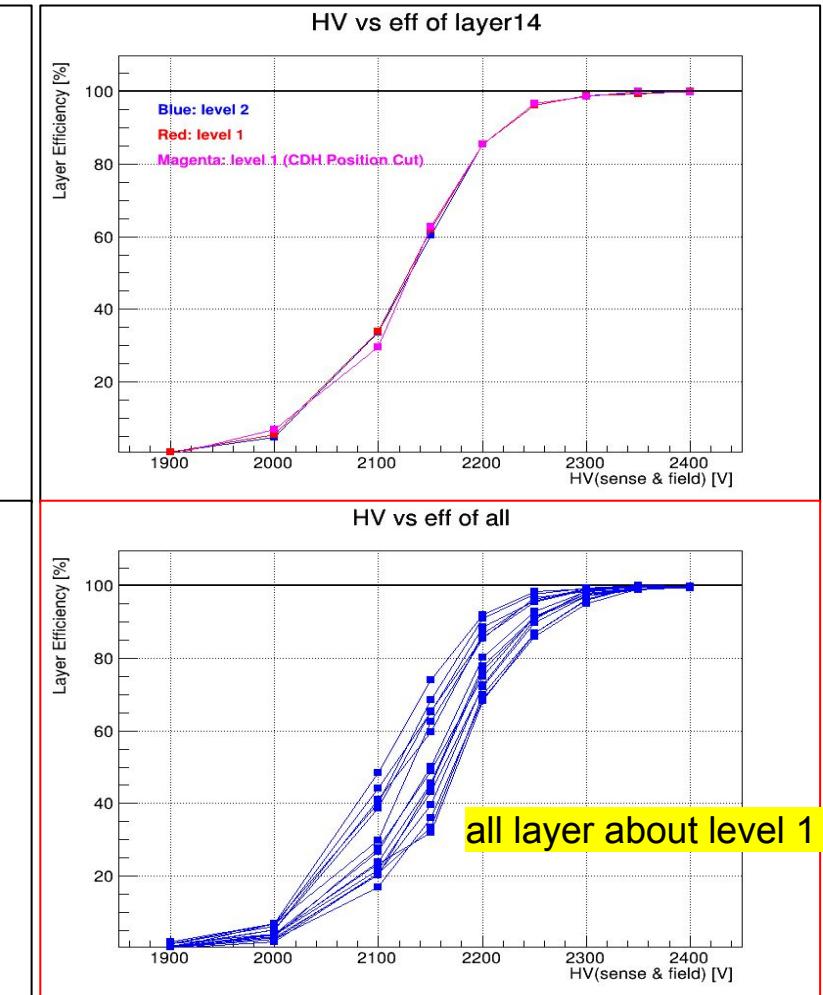
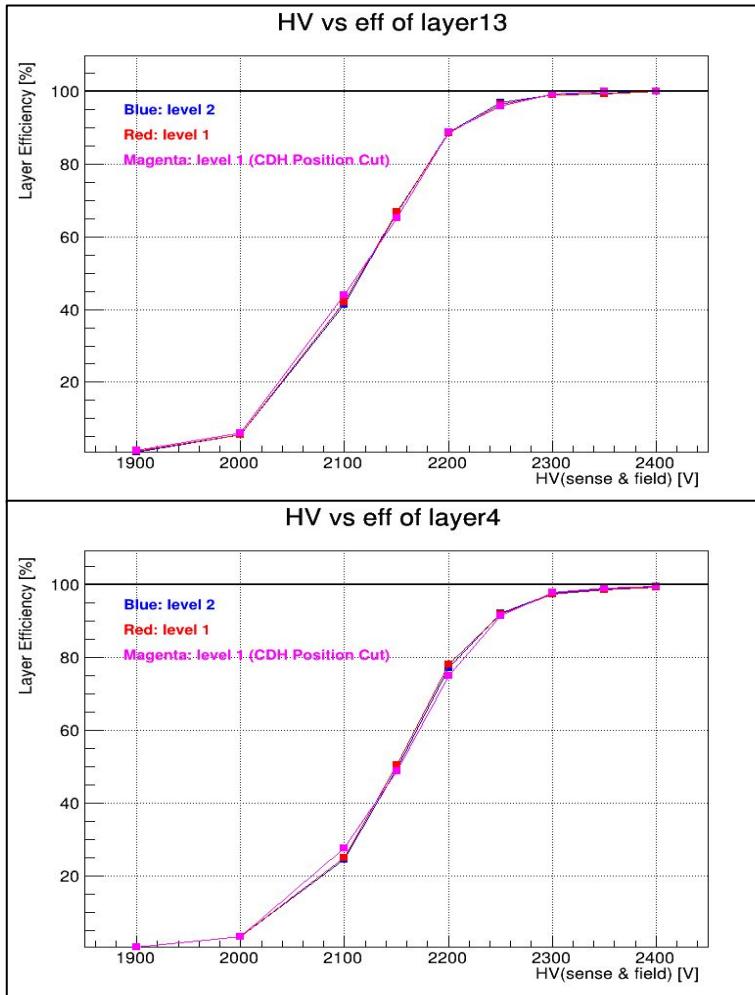
- ArCO<sub>2</sub> Run2~24, cosmic, w/o mag
- HV vs rough layer efficiency, for each layer



- ArCO<sub>2</sub> Run2~24, cosmic, w/o mag
- HV vs rough layer efficiency, for each layer



- ArCO<sub>2</sub> Run2~24, cosmic, w/o mag
- HV vs rough layer efficiency, for each layer



## Summary

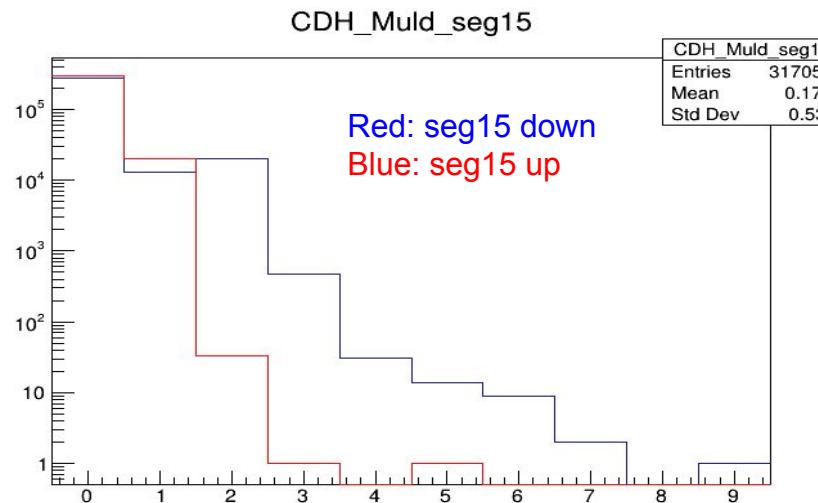
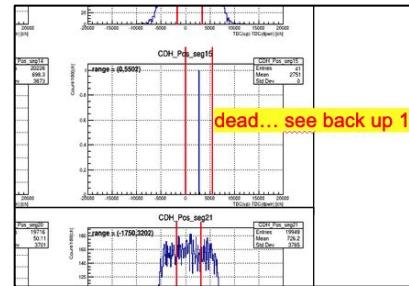
- could see efficiency curve → succeeded to take data
- for all layers, rough eff ~ 0% by 1900V, then goes to ~100% around 2350 ~ 2400V
- when overwriting efficiency curves of all, could see some difference of them between 2000~2300V
- not evaluate these errors yet, → maybe not need to do it yet

## Suggetion

- want to take data as intervals of measured points are more narrow
  - 25V interval for each measured point
  - can store 1,000,000 events within 3~4 hours
  - 4 points / a day
  - 24 points (1900V ~ 2400V) / 6 days

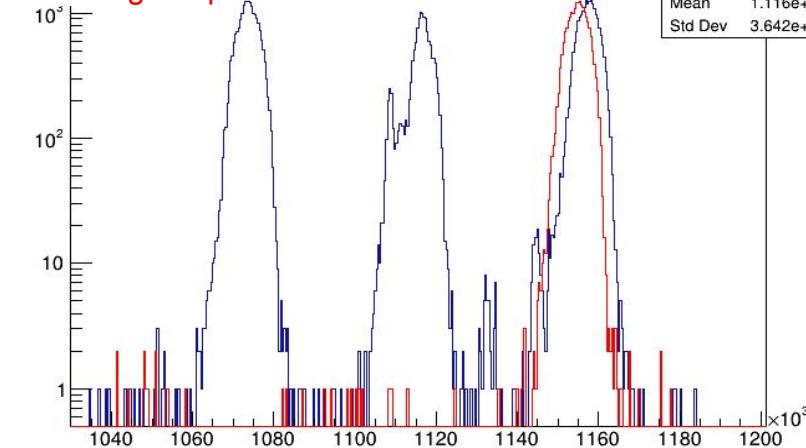
# Back Up 1

- ArCO2 Run4, cosmic, w/o mag
- Somehow Mul\_d is too high...
- TDC\_d has three peaks...
- I don't understand what happened at all.



CDH\_TDCd\_seg15

Red: seg15 down  
Blue: seg15 up

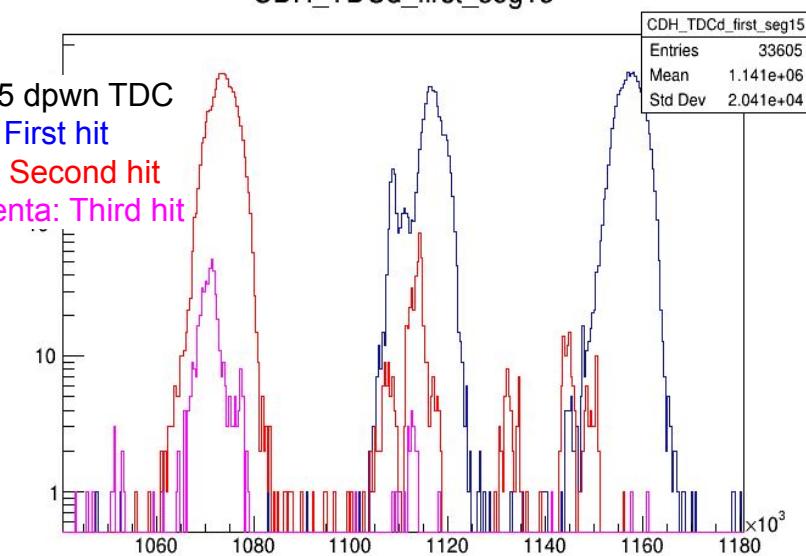


seg15 dpwn TDC

Red: First hit

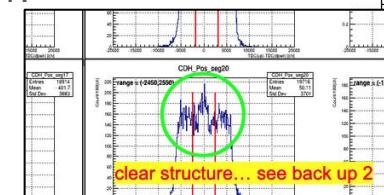
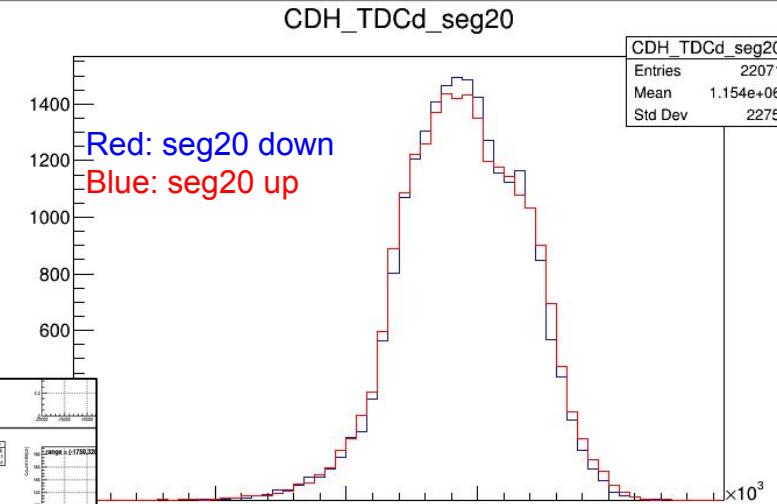
Blue: Second hit

Magenta: Third hit

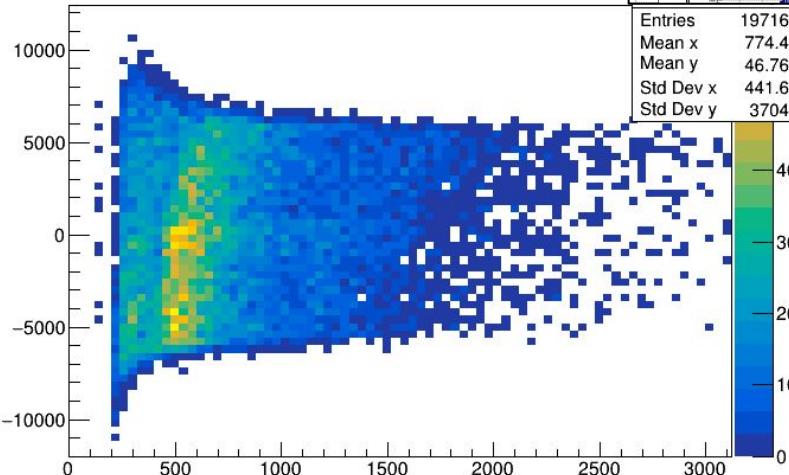


## Back Up 2

- ArCO<sub>2</sub> Run4, cosmic, w/o mag
- Unknown structure exists in CDH position.
- TDC up and down exactly overlap.
- Could not see any specific correlation between Pos and ADC.
- Why has this structure been born?



CDH\_Pos\_ADCu\_seg20



CDH\_Pos\_ADCd\_seg20

