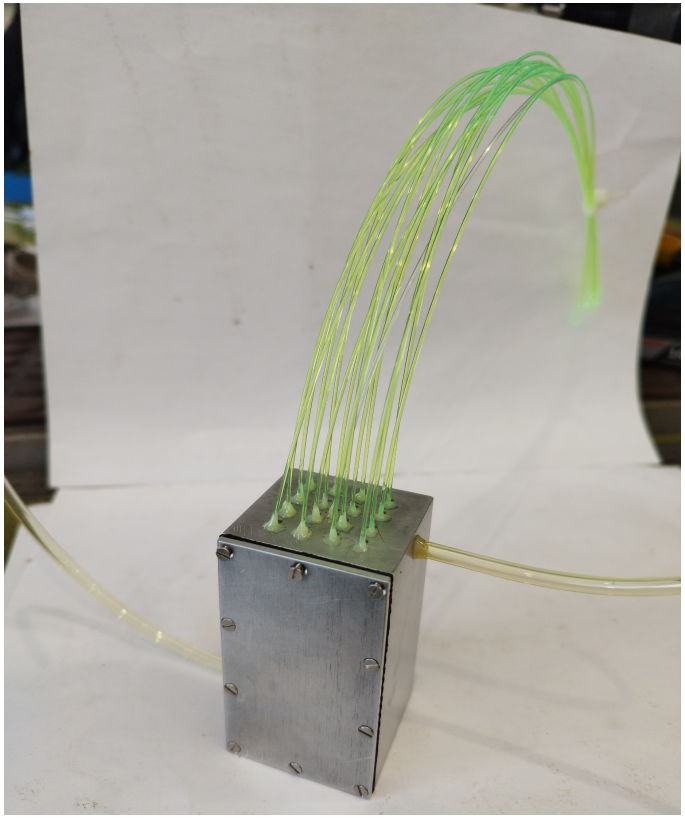
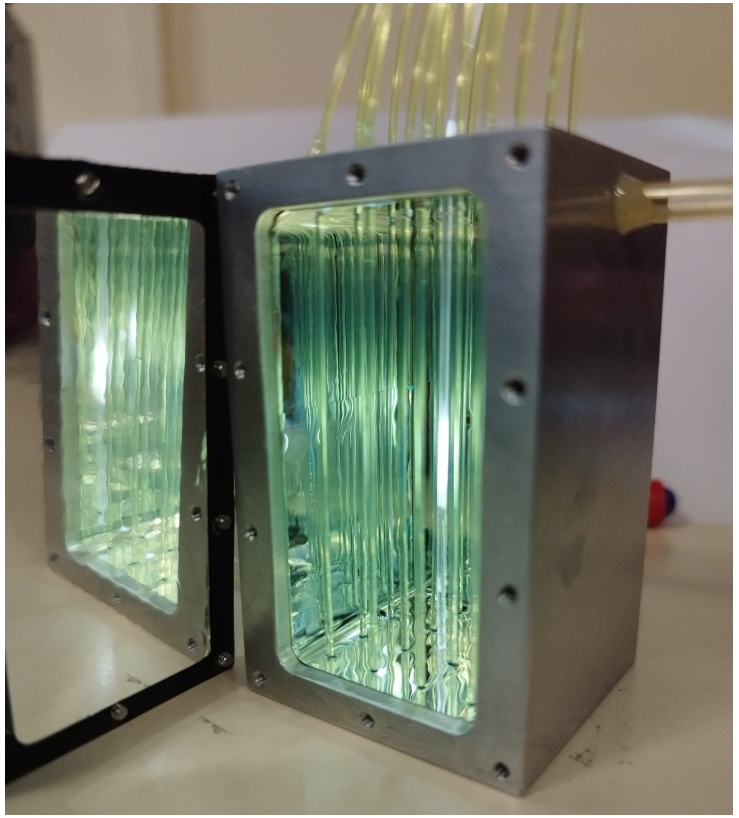
GRAiNITA test bench updates (GRAiNITA meeting April 19th, 2024)

In the beginning of this week we got the new TROLL-3 (green Y-11 WLS fibers) for testing the $CaWO_4$ scintillation grains

Voilà:





LED tests for TROLL-3 (Y-11)

Empty TROLL-3 (Y-11) 16.04.2024				
blue LED 2.4V, 1000 events				
16ch WaveC, count gate 12.5 mks				
1	2	3	4	
66.7	88	65.2	65.8	A
42.3	73.3	103.4	60.8	B
51.8	82.3	97.3	64.8	C
72.8	47.3	65.5	15.9	D
1063.2				
Sum corners	Sum 4 central	Centrality	Sum "right" part/ Sum "left" part (assymetry)	
197	356.3	33.50%	1.03	
171.9				
146.2				
191.8				

$CaWO_4$ grains dry 17.04.2024				
blue LED 2.4V, 1000 events				
TROLL-3 (Y-11), 16ch WaveC, count gate 12.5 mks				
1	2	3	4	
23.1	44.3	32	24.6	A
18.2	84.6	122.8	29.8	B
22.3	86.3	107.9	29.9	C
25.1	23.7	29.8	7.7	D
712.1				
Sum corners	Sum 4 central	Centrality	Sum "right" part/ Sum "left" part (assymetry)	
85.6	401.6	54.60%	1.17	
71.1				
67.4				
86.4				

Ratio of the phe registered "$CaWO_4$ grains/empty TROLL-3"=67%

Non-uniformity of the WLS fibers efficiency -> defects and cracks??

For the future: before the installation into the detector all WLS fibers should be checked carefully -> we need to develop some technique…

For comparison:

LED tests for TROLL-2 (O-2(300))

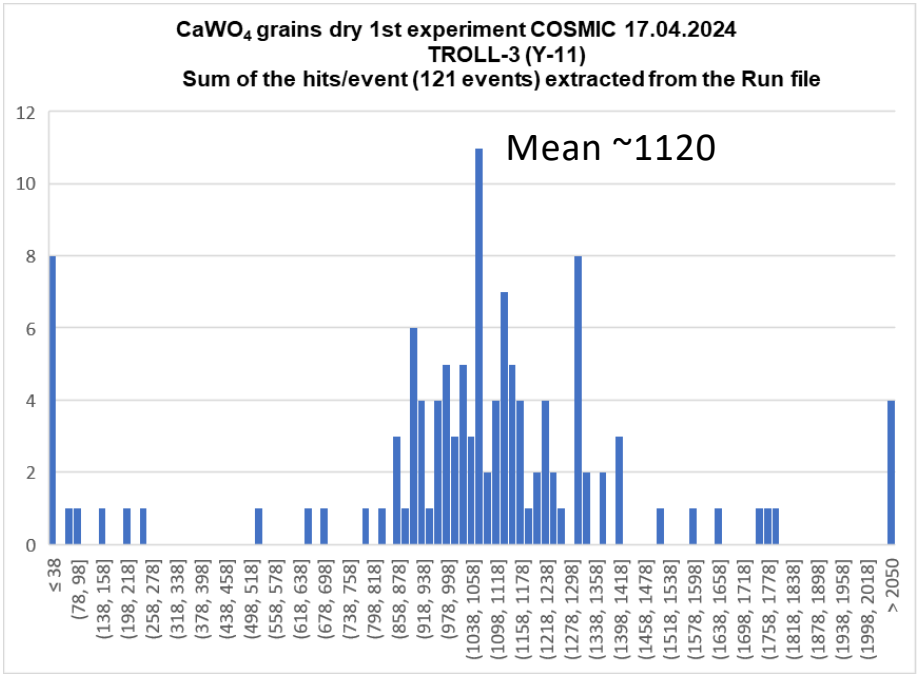
Empty TROLL-2 (O-2(300)) 12.04.2024				
green LED 2.3V, 1000 events				
16ch WaveC, count gate 25 mks				
1	2	3	4	
118.6	135.2	128.7	132	A
151	170.5	184.4	135.6	B
139.7	150.5	173.2	152	C
114.2	136.3	131.8	124.9	D
2278.6				
Sum corners	Sum 4 central	Centrality	Sum "right" part/ Sum "left" part (assymetry)	
404.8	678.6	29.80%	1.04	
390.2				
408.7				
396.3				

$ZnWO_4$ grains dry 12.04.2024				
green LED 2.3V, 1000 events				
TROLL-2 (O-2(300)), 16ch WaveC, count gate 25 mks				
1	2	3	4	
14.1	51.5	54.5	18.7	A
23.7	212.5	257.9	30.3	B
22.8	187.9	249.5	33.6	C
12.7	45.4	66.7	21.4	D
1303.2				
Sum corners	Sum 4 central	Centrality	Sum "right" part/ Sum "left" part (assymetry)	
89.3	907.8	69.60%	1.28	
80.9				
121.7				
103.5				

Ratio of the phe registered "$ZnWO_4$ grains/empty TROLL-2"=57%

Cosmic test for $CaWO_4$ grains in TROLL-3 (Y-11)

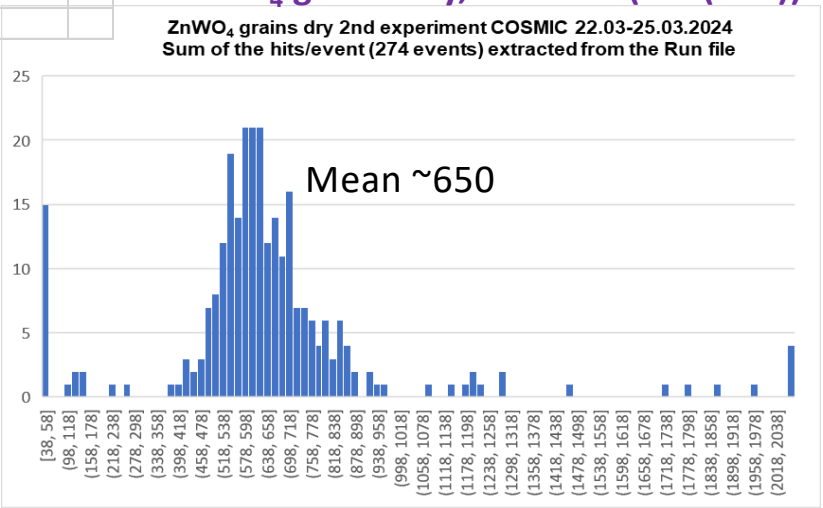
$CaWO_4$ grains dry, TROLL-3 (Y-11), *preliminary results, acquisition is ongoing*



COSMIC $CaWO_4$ dry, 17-18.04.2024				
121 events (preliminary)				
16ch WaveC, Troll-3				
Hits (average for 121 events from the Run file)				
1	2	3	4	
36.1	66.5	41.8	41.3	A
19.2	105.7	162.6	66.8	B
31.9	118.1	142.3	66.4	C
41.4	45.8	64.2	13.4	D
1063.5				
Sum corners	Sum 4 central	Centrality	Sum "right" part/ Sum "left" part (assymetry)	
121.8	528.7		1.29	
119.1				
144				
149.9				

For comparison:

$ZnWO_4$ grains dry, TROLL-2 (O-2(300))



The N_{phe} registered for $CaWO_4$ in TROLL-3 (Y-11) is about 1.7 times higher compare to the N_{phe} registered for $ZnWO_4$ in TROLL-2 (O-2(300))

CaWO4 pro and con

- The number of photoelectrons about x1.7
- The integration time 12.5 vs 25 microsecond
- The Y11 WLS fiber as a longer absorption length => better uniformity
- Grains can be produced by flux method as ZnWO4

- But the density is 6.06 vs 7.62 for ZnWO4 😕