

Analysis of the BGO data

Data taken beginning of 2024

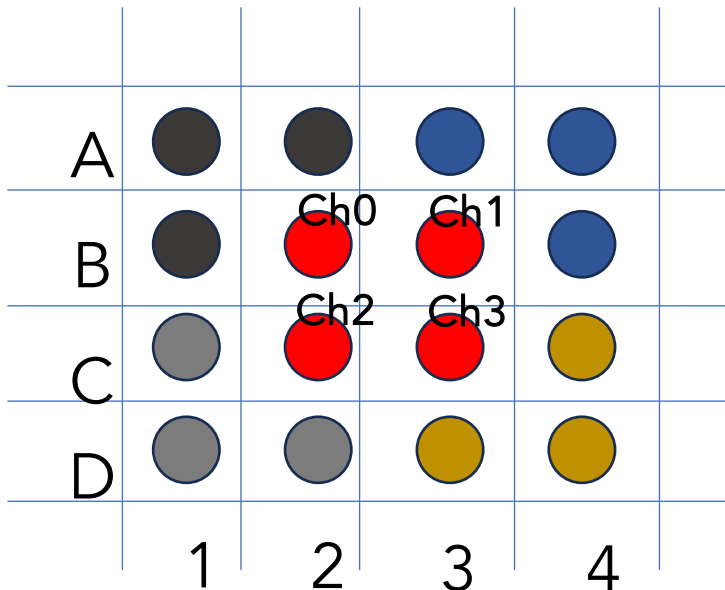
Ianina Jacques Giulia and MH

Context

Data taking using the 16 fibers TROLL-2 (O-2(3000) WLS fibers) readout in a OR-mode
Standard WaveCatcher code

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=== Individual per channel: ChannelNb EventID MeasuredBaseline[Volts] Amplitude[Volts] Charge[pC] LeadingEdgeTime[ns] TrailingEdgeTime[ns] RateCounter[Hz]===
=== Event 1 UnixTime = 1706195850.596 date = 2024.1.25 time = 16h.17m.30s.596ms == TDC = 1400804624 == Nb of channels = 8 ===
0 1 -0.000117 -0.042142 -91.995 189.653 191.524 197077.59
1 1 0.002251 -0.076414 -212.441 150.696 156.956 11803.89
2 1 0.000456 -0.021712 -37.989 138.956 140.756 612396.56
3 1 -0.000223 -0.027242 -58.232 369.866 371.356 103816.84
4 1 0.003487 -0.023039 -70.062 169.753 179.522 19021.69
5 1 -0.032393 -0.047663 -108.281 140.739 162.421 0.00
6 1 0.003561 -0.013195 -34.848 202.768 208.003 41630.77
7 1 -0.000578 -0.028148 -54.262 159.901 182.994 766383.62
  
```



Contrary to the ZnWO4 case, we are not counting the NPhe
→ NPhe estimated through the charge

→ NPhe = -charge/3. [calibration obtained from RMS/Signal]

$$\text{Sum} = \sum_{i=0}^7 Ch_i$$

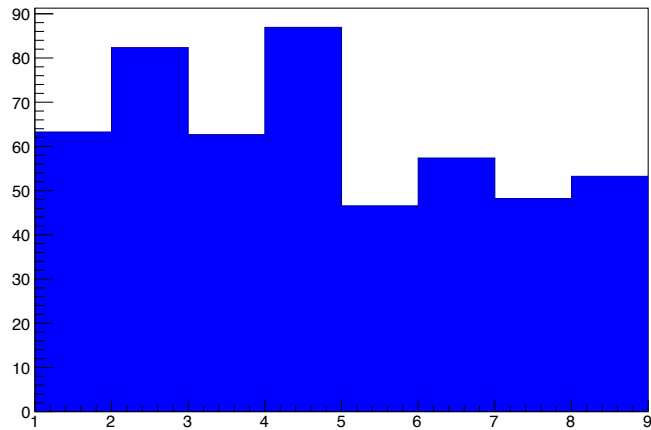
$$\text{Centrality} = \frac{4 \text{ central channels}}{\text{Sum}}$$

LED data taken after each cosmic run

BGO Dry

$-\langle Q \rangle / 3$

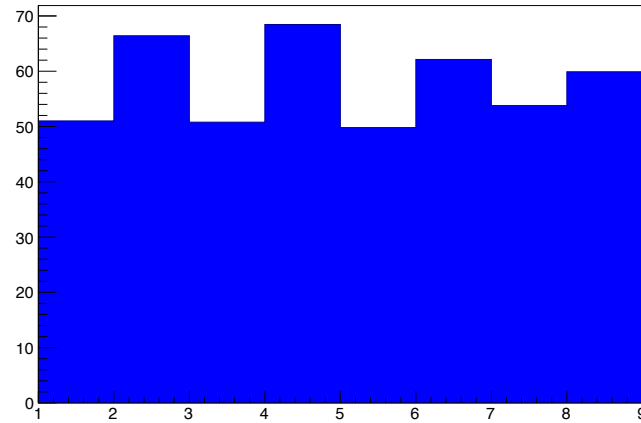
Run_BGO_dry_LED3.0V_after_cosmic_1_29_2024 signal map



BGO Water

$-\langle Q \rangle / 3$

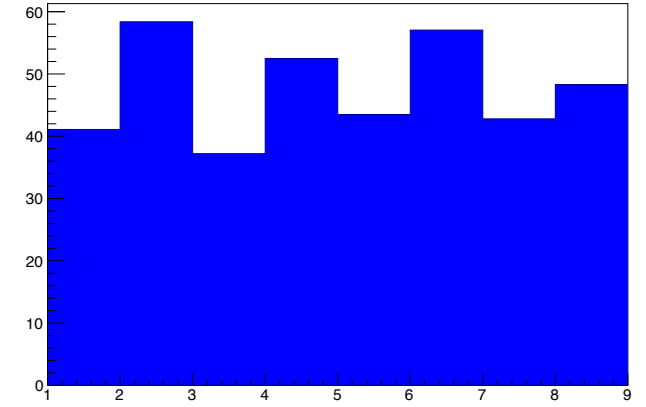
Run_BGO_water_LED3.0V_after_cosmic_2_5_2024 signal map



BGO EGL

$-\langle Q \rangle / 3$

Run_BGO_EGL_LED3.0V_after cosmic_2_12_2024 signal map

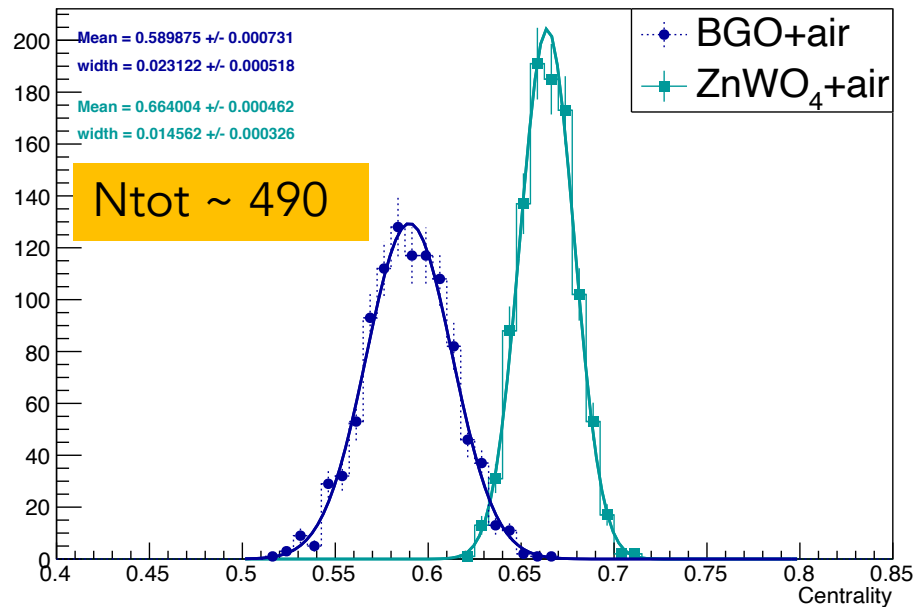


Some different distribution for the dry run

LED data and centrality

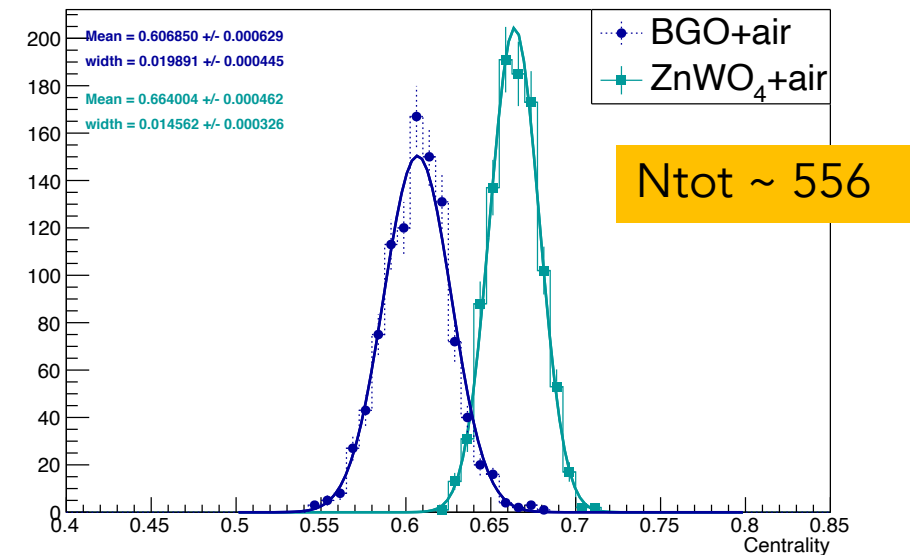
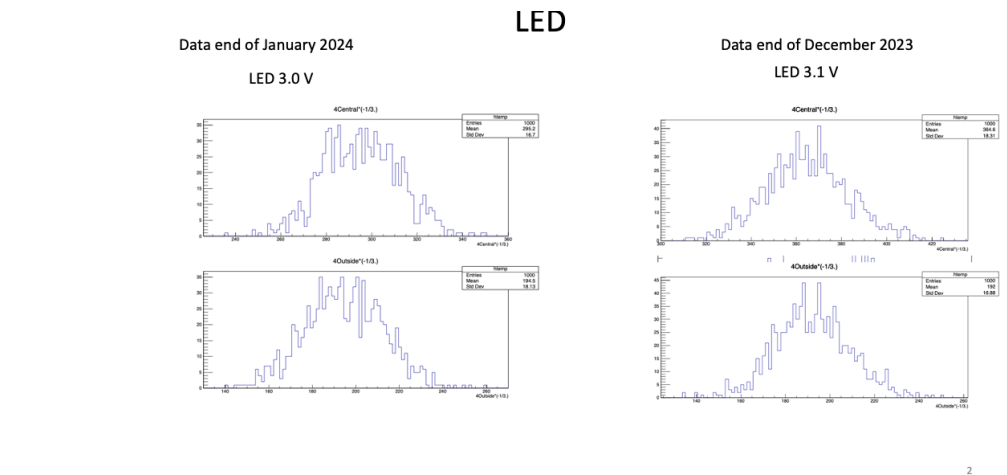
Run_BG0_dry_LED3.0V_after_cosmic_1_29_2024.txt

Run_LED2.3V_ZW0_dry_8_9_2023.root



Data end of January 2024
sigma_c = 2.2%

$$\sigma_c = \sqrt{\frac{C \times (1 - C)}{N_{tot}}}$$



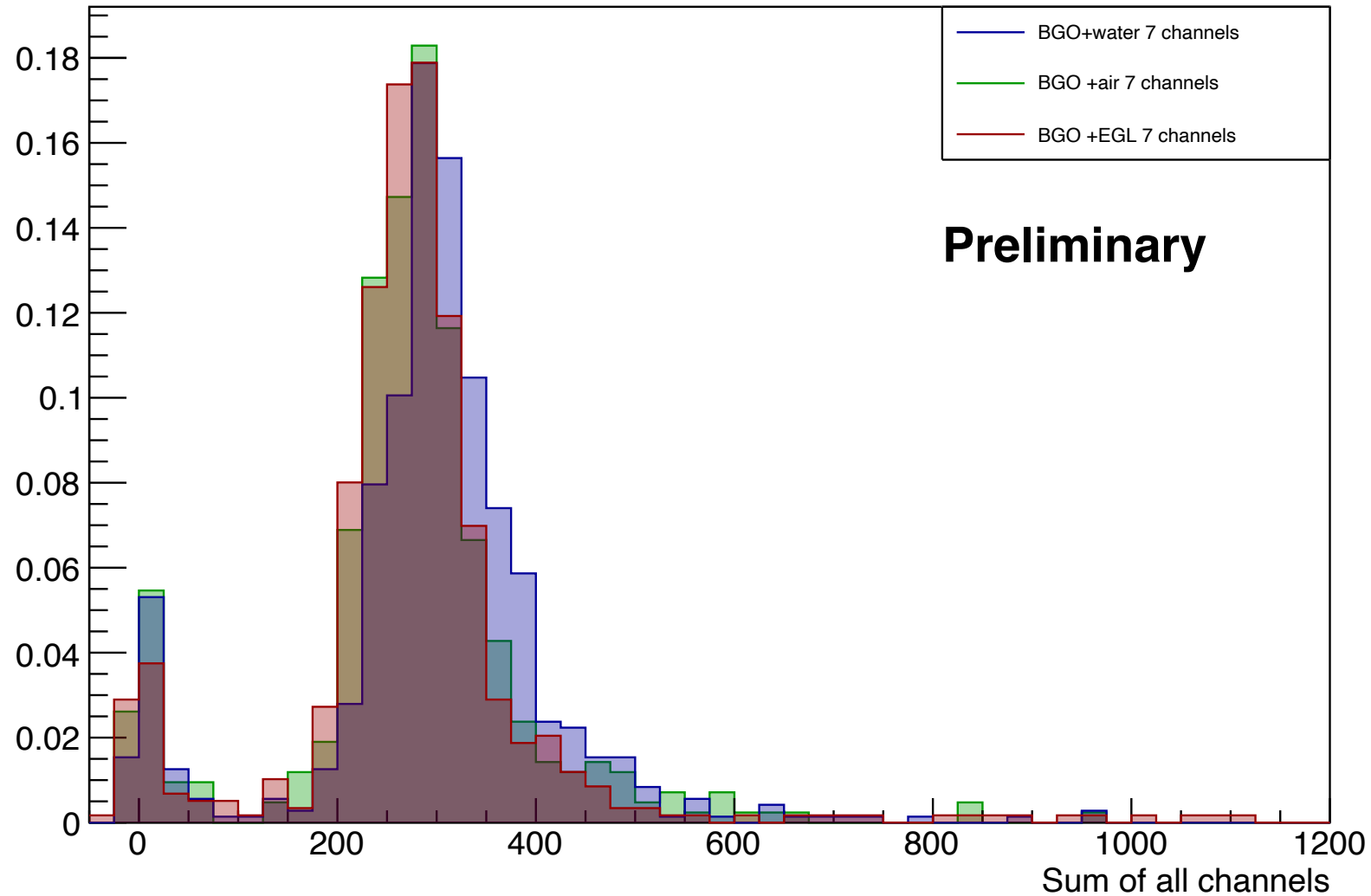
Data end of December 2023
sigma_c = 2.1%

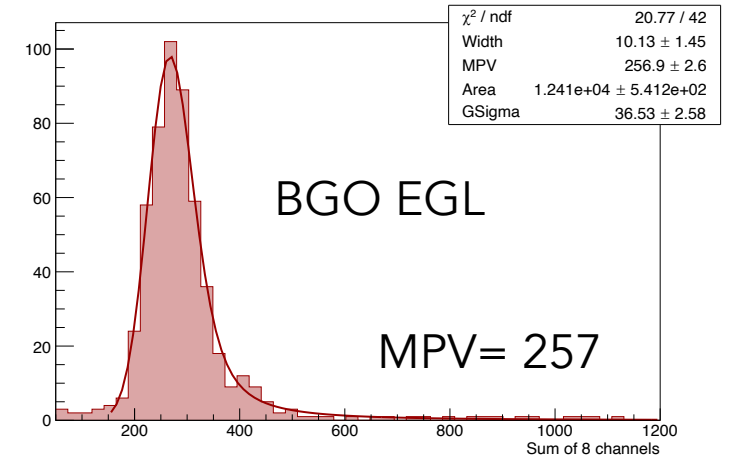
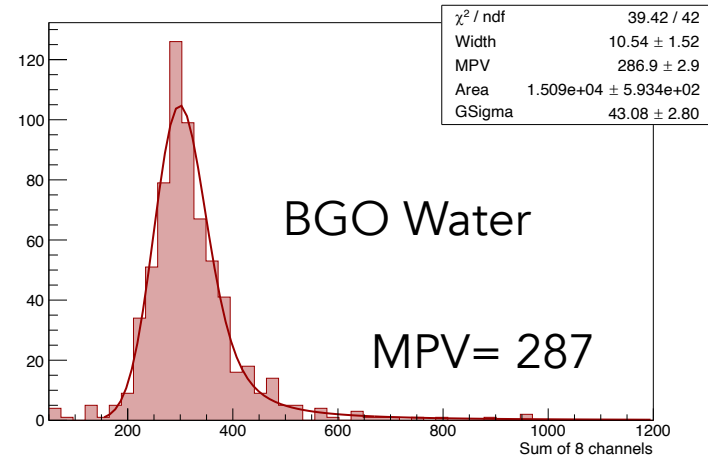
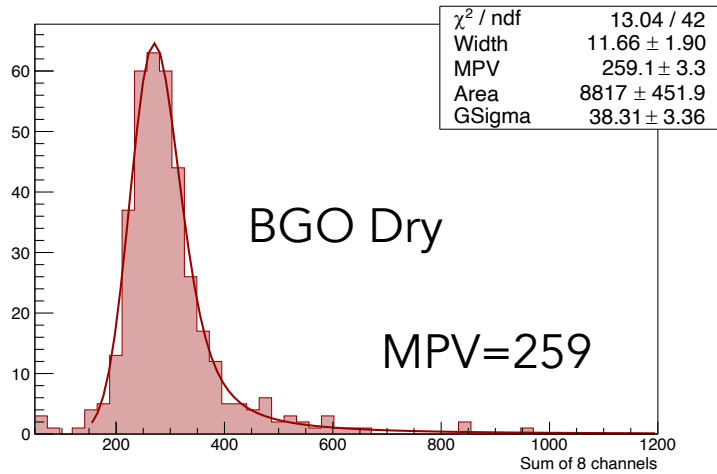
Cosmics

Run_BGO_water_COSMIC_Feb_2024.root

Run_BGO_dry_COSMIC_1_25_2024.root

Run_BGO_EGL_COSMIC_2_7_2024.root



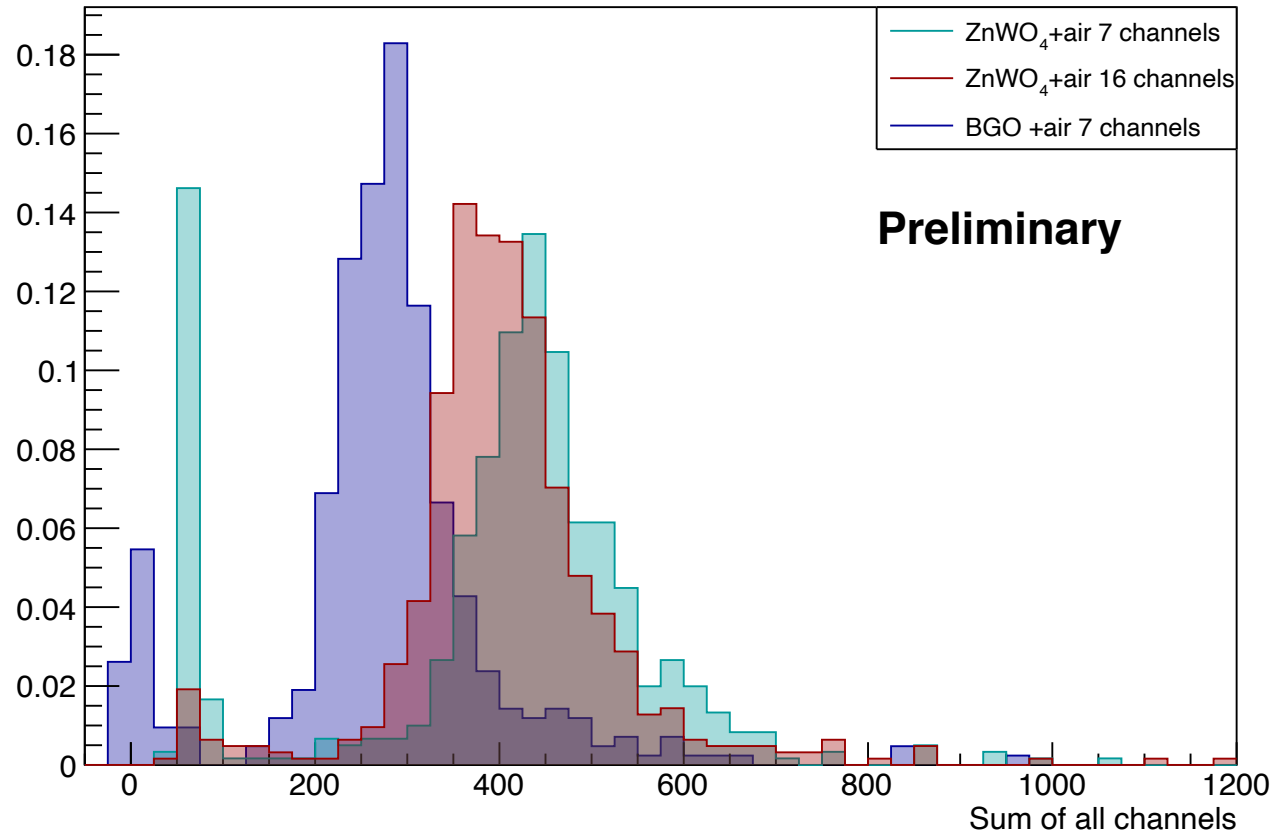


10% increase of signal with water sigma slightly higher but not significant (?)

EGL does not bring anything ...

Run_BGO_dry_COSMIC_1_25_2024.txt

Run_Cosmic_ZWO_dry_Or_10_17_2023.root



ZnWO₄ Sum = Sum (Ch_i, i = 0,7) or Sum (Ch_i, i = 0,15)
BGO Sum = -(Sum(Q_Ch_i i= 0,7)/3.

Small gain with water (10%) : the BGO gains obtained from the milling technique (so breaking) → non regular shape
→ probably less light trapping

→ Since adding the liquid is expected to reduce the light trapping the gain is smaller with BGO than with ZnWO₄ where light trapping is larger so the gain

Test of the hypothesis with BGO grains, PMT and Am241 source
with/without optical grease ($n=1.47$)

Light output from the BGO grains increases by about 15% when we use the grease
which indicates that there is some light trapping ?

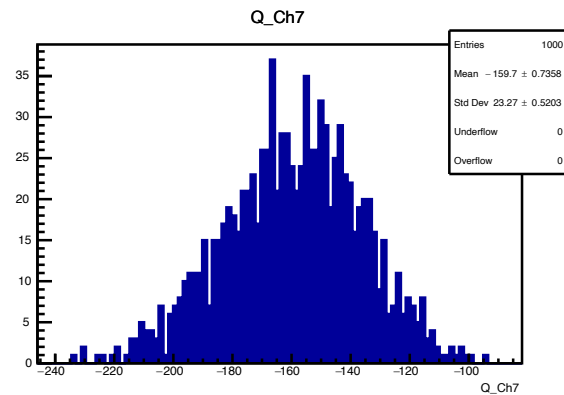
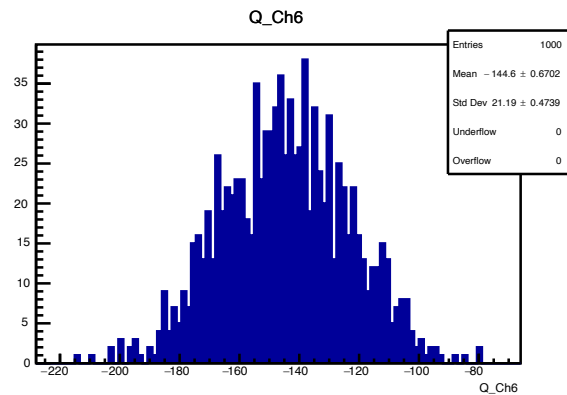
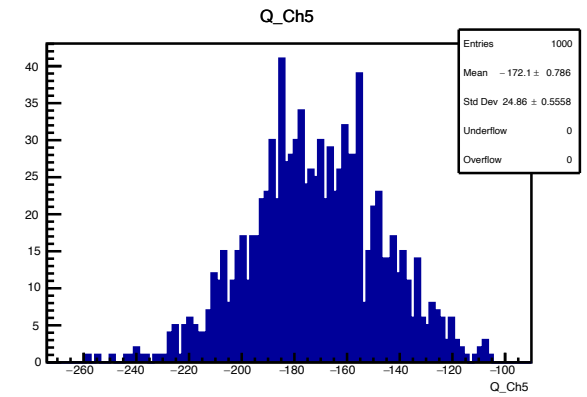
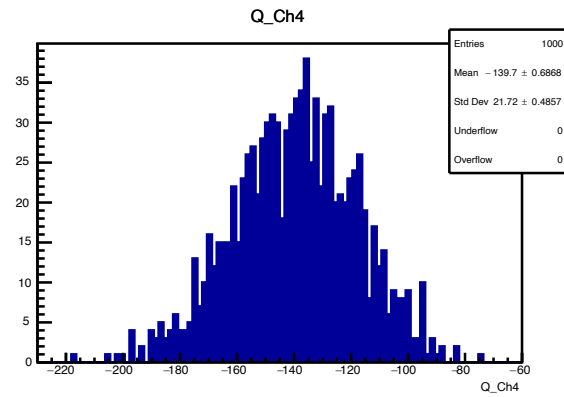
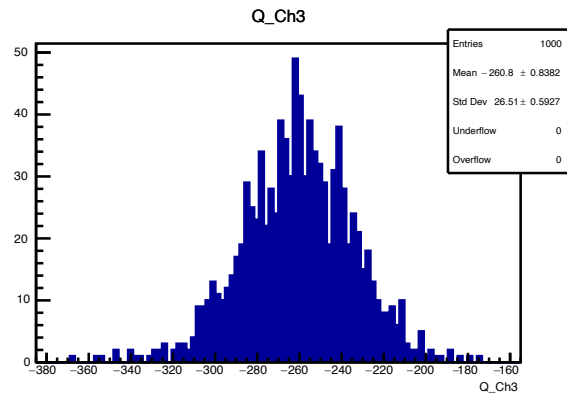
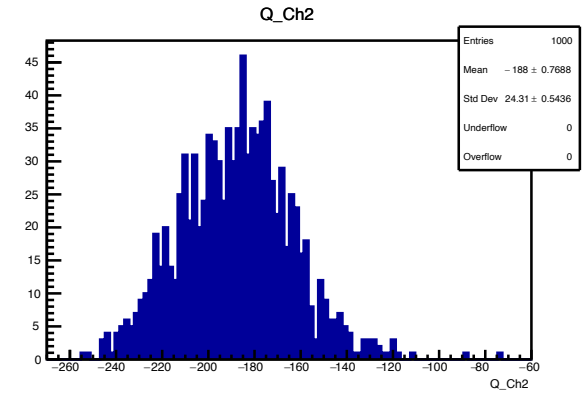
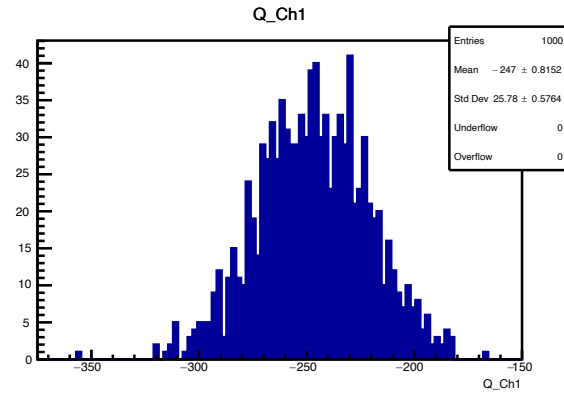
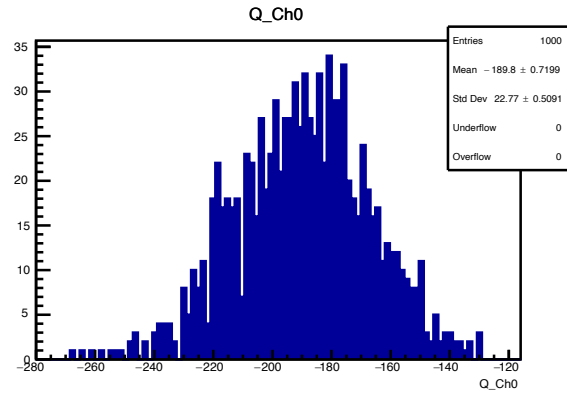
(so contradiction with the nearly no increase of the addition of liquids (water or EGL)

Summary and questions

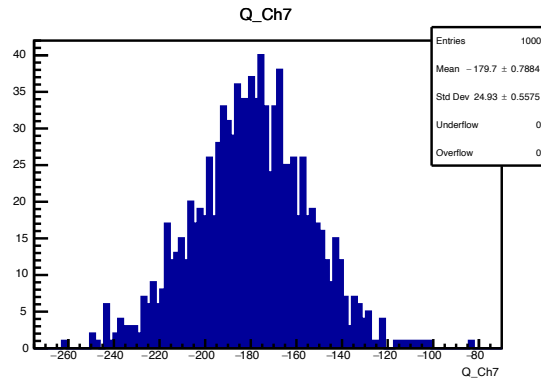
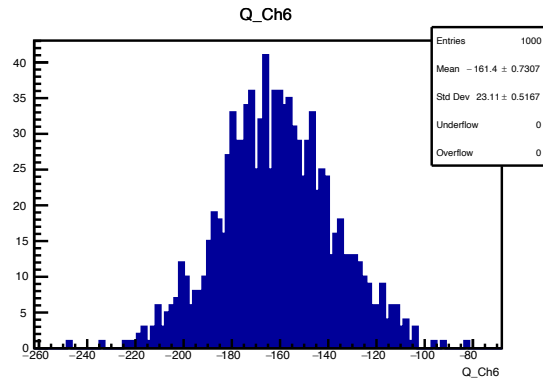
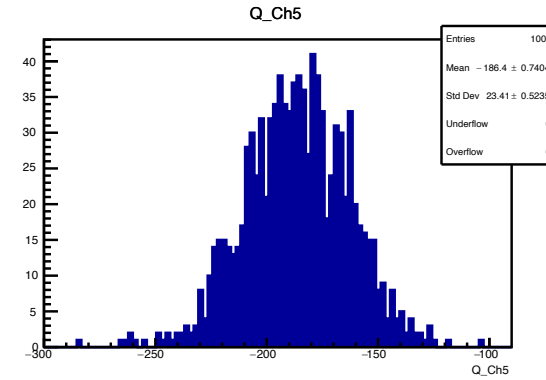
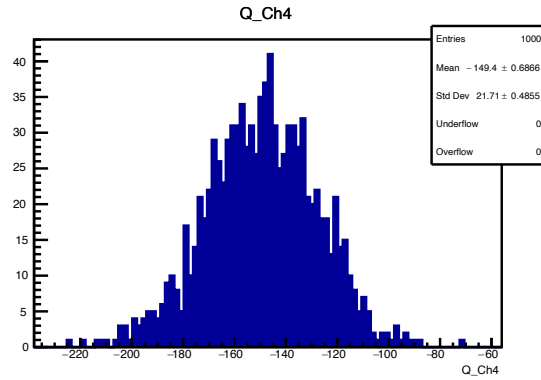
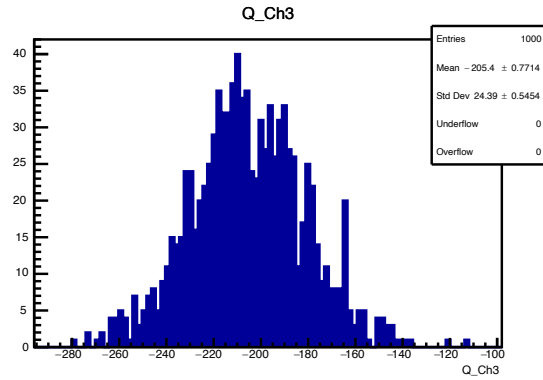
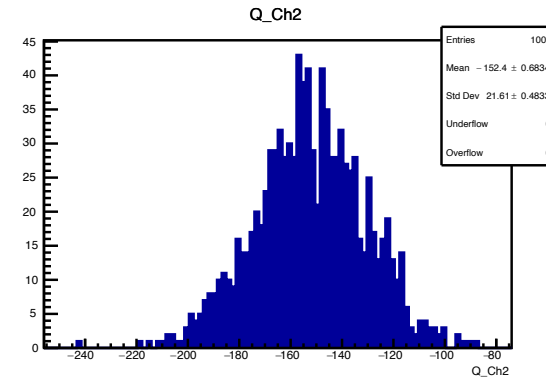
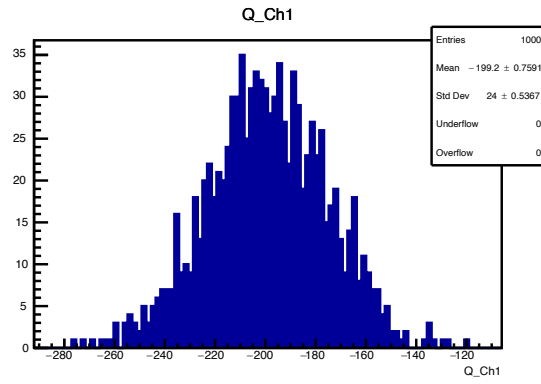
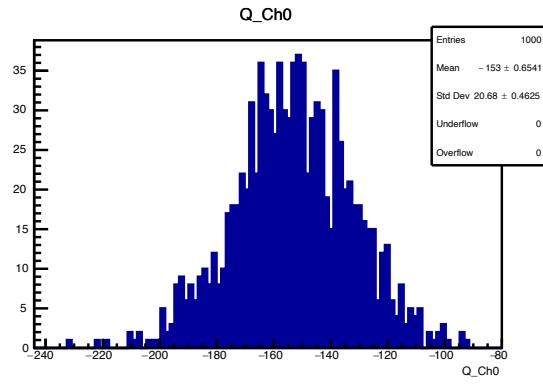
- Not fully clear picture
- Why is the LED map asymmetric nearby the dry run ? (can we trust the result of the dry run ?)
- Seems that adding water or EGL does not change the result ... while the test with grease would indicate it should slightly .. but can it be the dry run which is not correct ?
- The way the BGO grains are obtained is not the same as the ZnWO₄ ... and the NPhe in the case of BGO may not be 100% exact.
- Try to redo ZnWO₄ with this Troll2 ?

backup slides

BGO Dry



BGO Water



BGO EGL

