

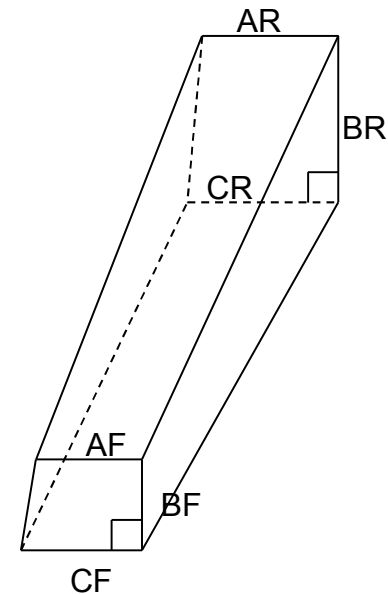
Light Yield Uniformity Measurements of PWO Crystals

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- Per-Erik Tegnér
- Panda Collaboration Meeting March 2-6, 2009 at GSI

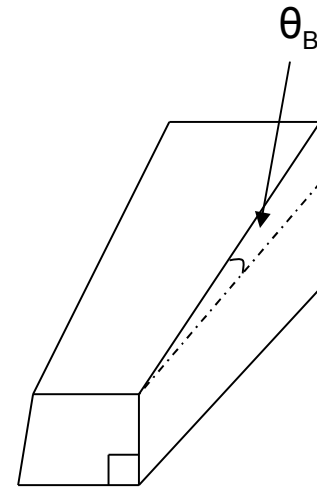


Lead Tungsten PbWO_4 Crystals

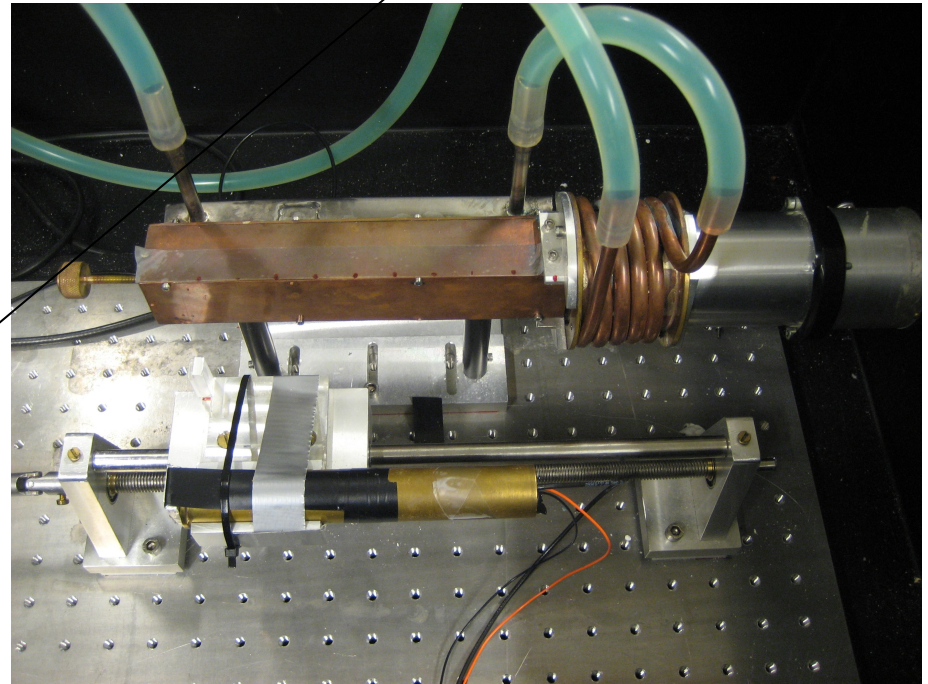
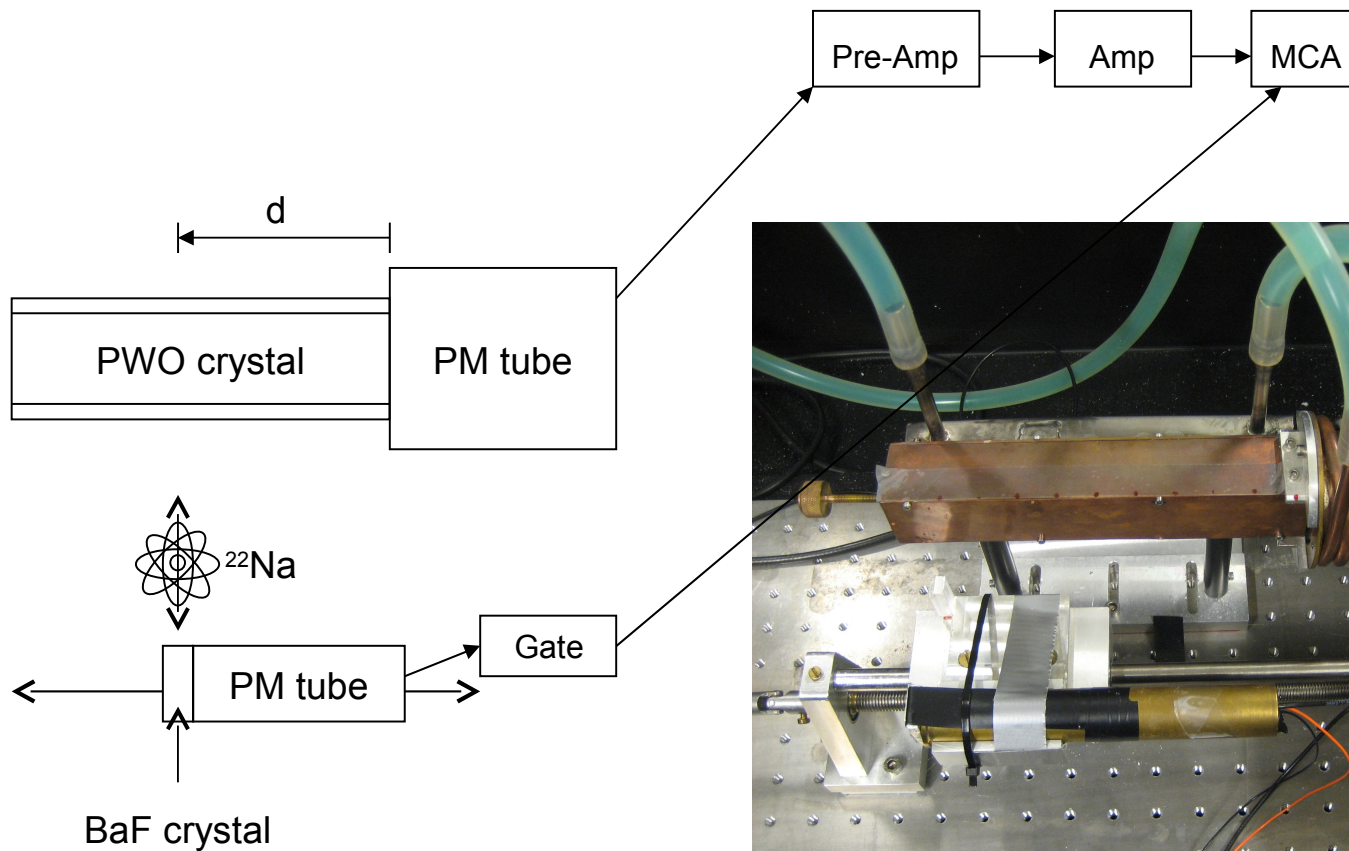
- 11 crystals of different shapes for the barrel.
- From Bogoroditsk, Russia.
- All of type Left.
- All have one 90° angle on front side.
- Wrapped with VM2000.
- Measured at $T = 5^\circ\text{C}$.



Type	Volume [cm ³]	θ_B [°]	θ_A [°]	θ_C [°]
1	126.86	2.1	2.2	2.2
2	126.56	2.1	2.1	2.2
3	125.79	2.1	2.1	2.1
4	120.85	1.7	1.9	2.0
5	119.69	1.7	1.8	1.8
6	118.35	1.7	1.6	1.6
7	112.90	1.2	1.4	1.5
8	111.75	1.2	1.3	1.3
9	110.52	1.2	1.1	1.2
10	107.01	0.9	1.0	1.0
11	106.25	0.9	0.9	0.9

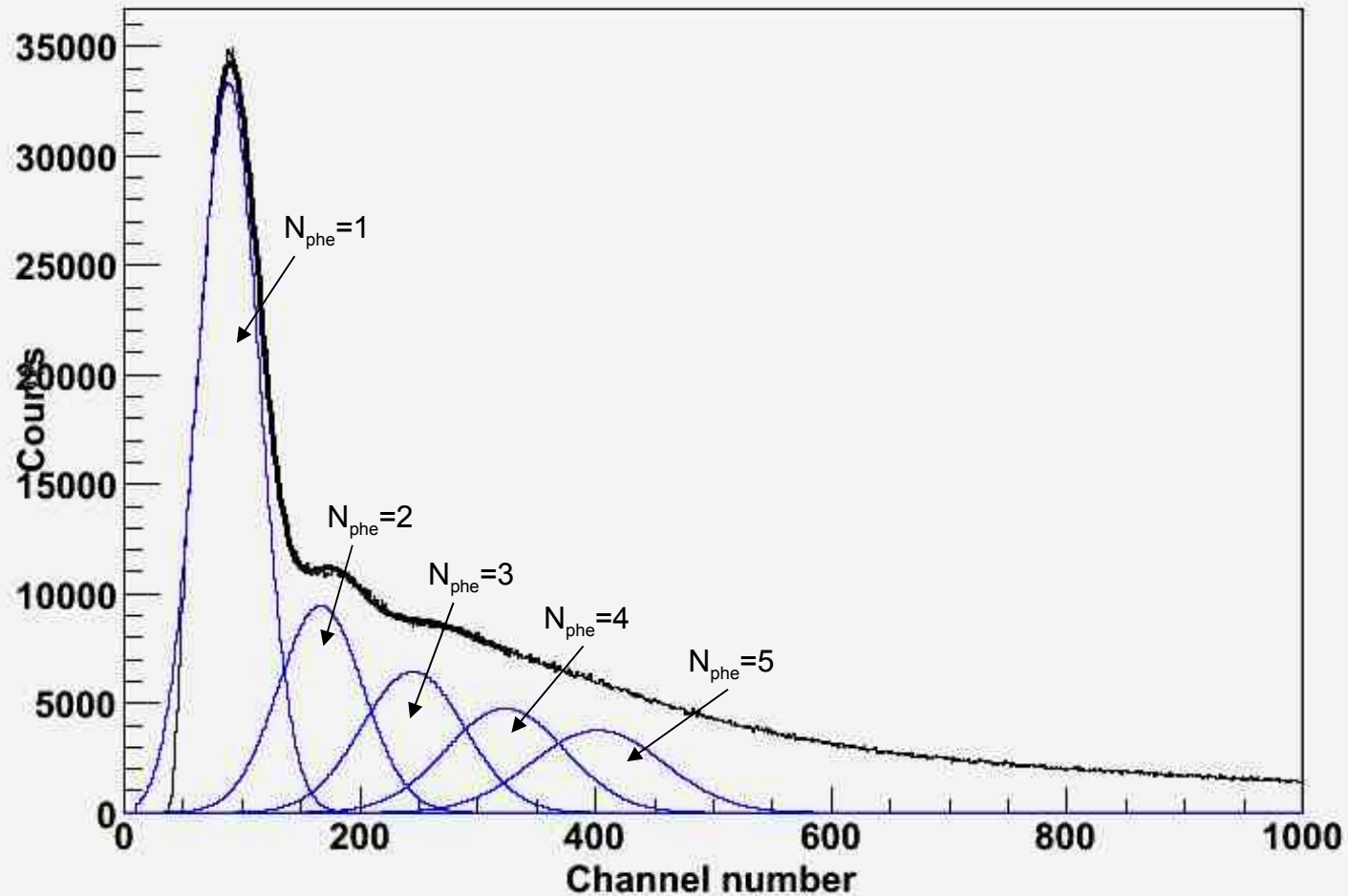


Experimental setup



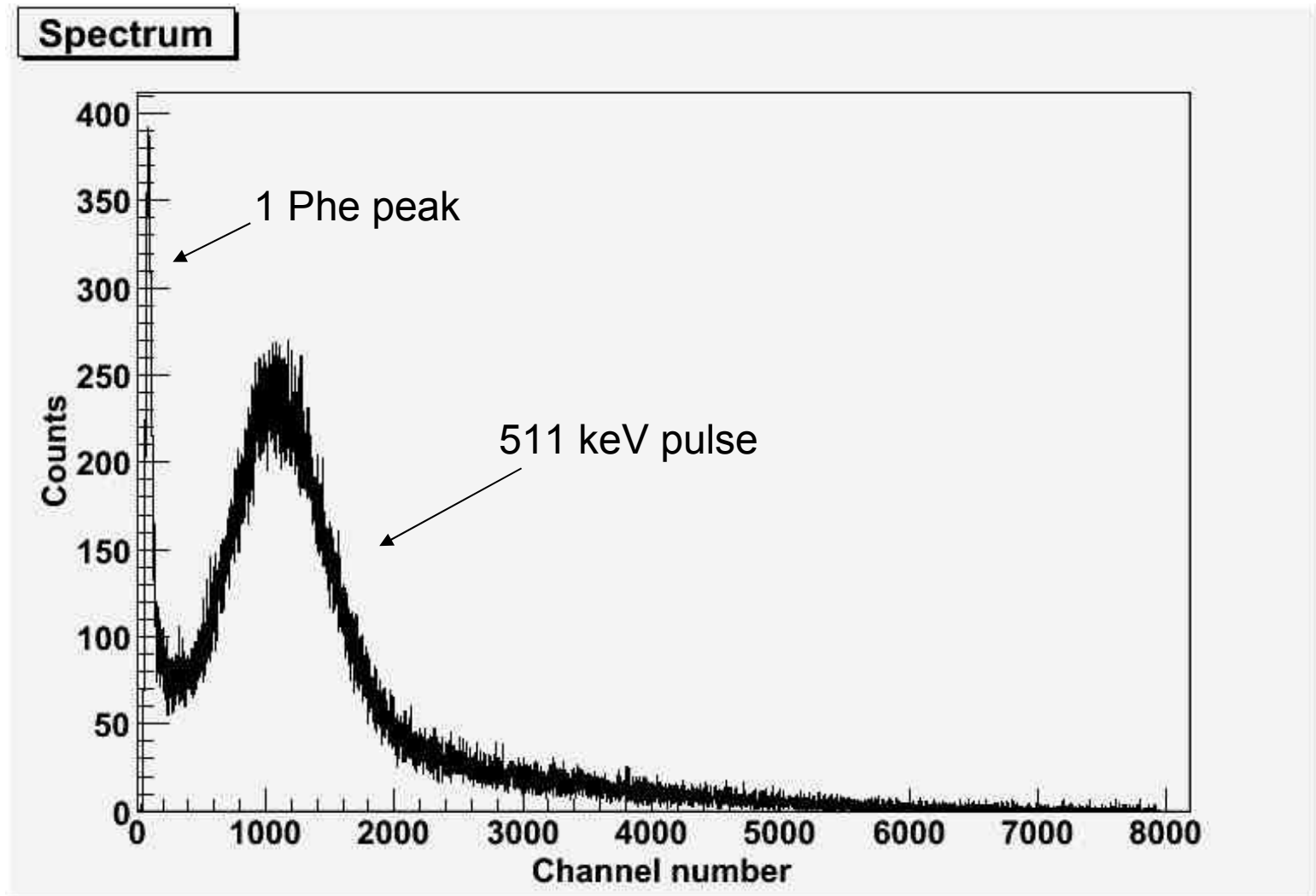
Pulse height spectrum for calibration

Fit with Phe peaks



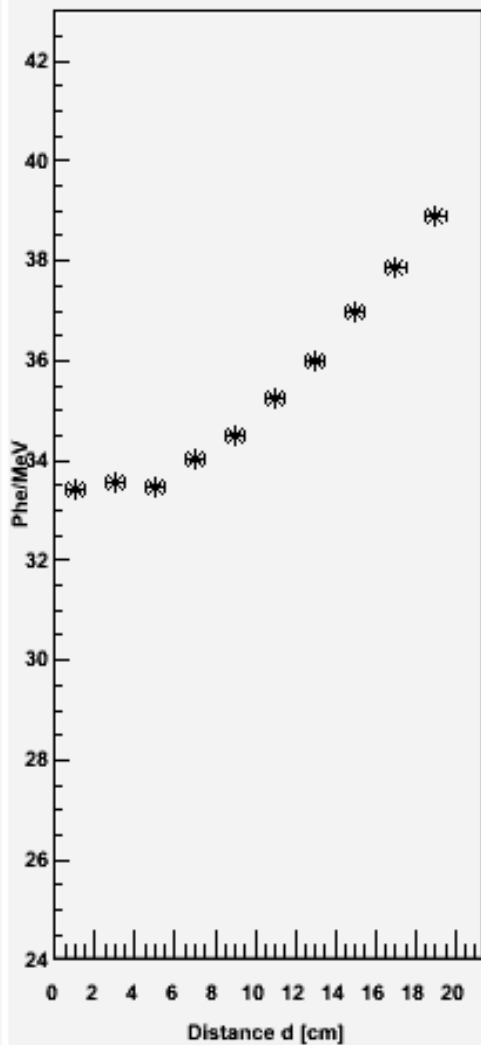
$$k = a + b \cdot N_{\text{phe}}$$

Typical pulse height spectrum for 511 keV photon

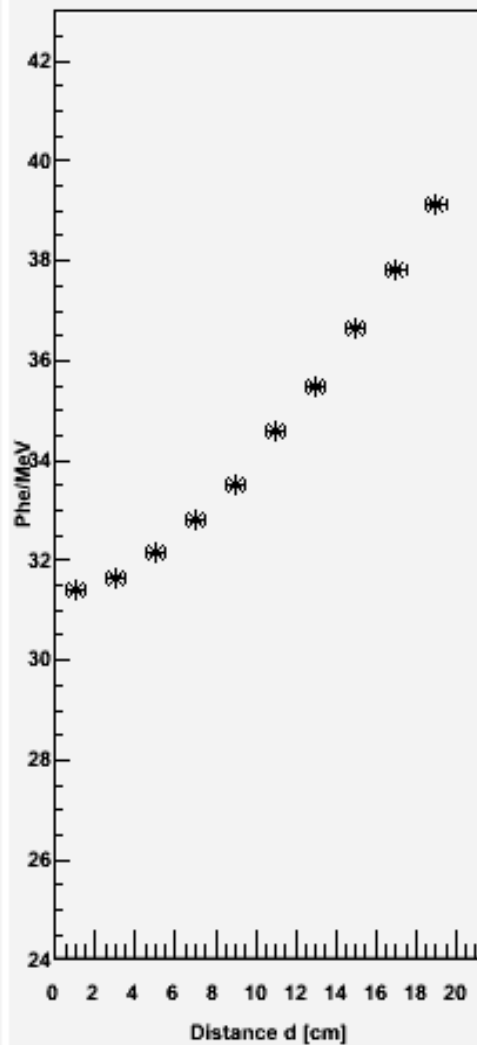


$$k = a + b \cdot N_{\text{phe}}$$

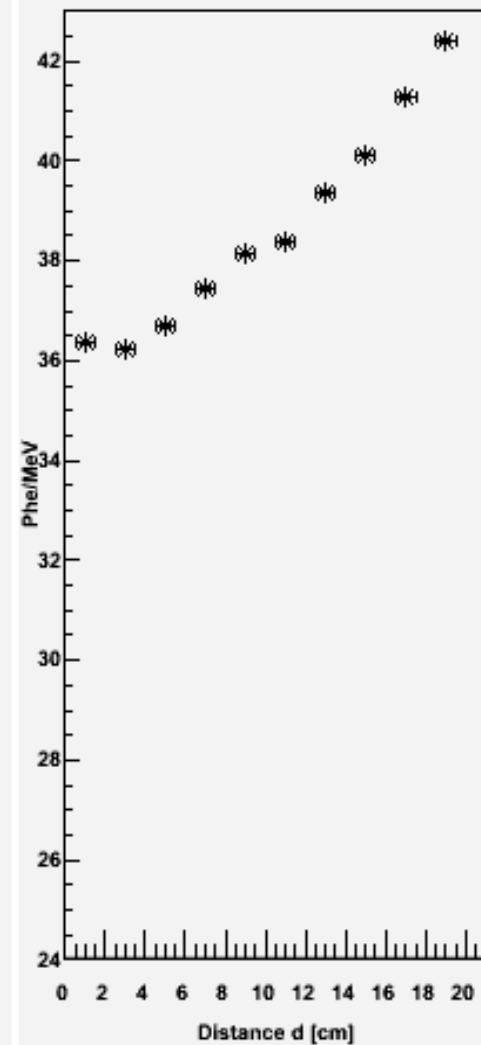
Type 1



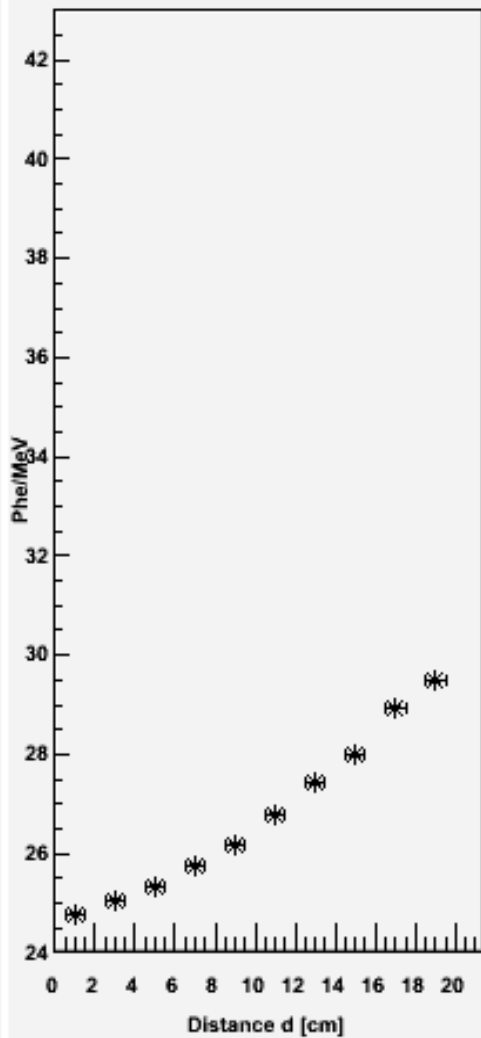
Type 2



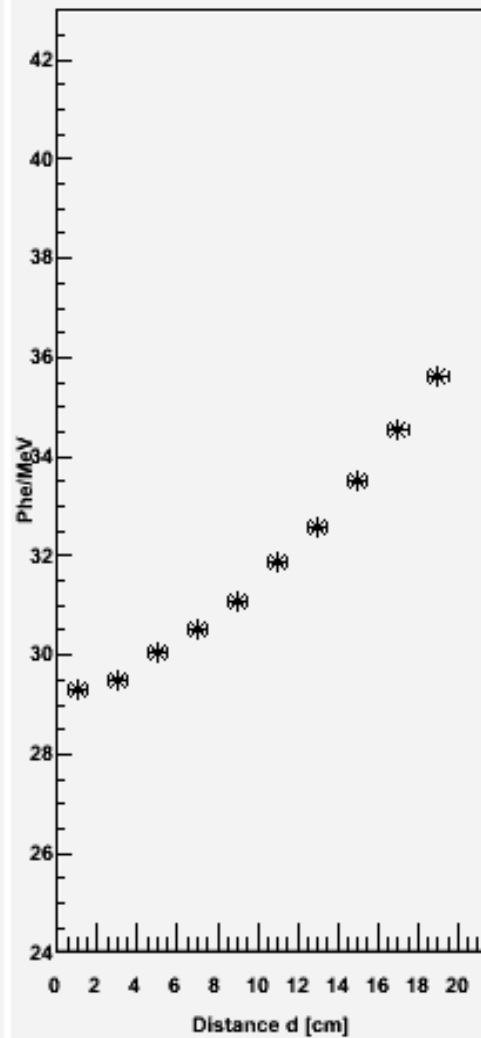
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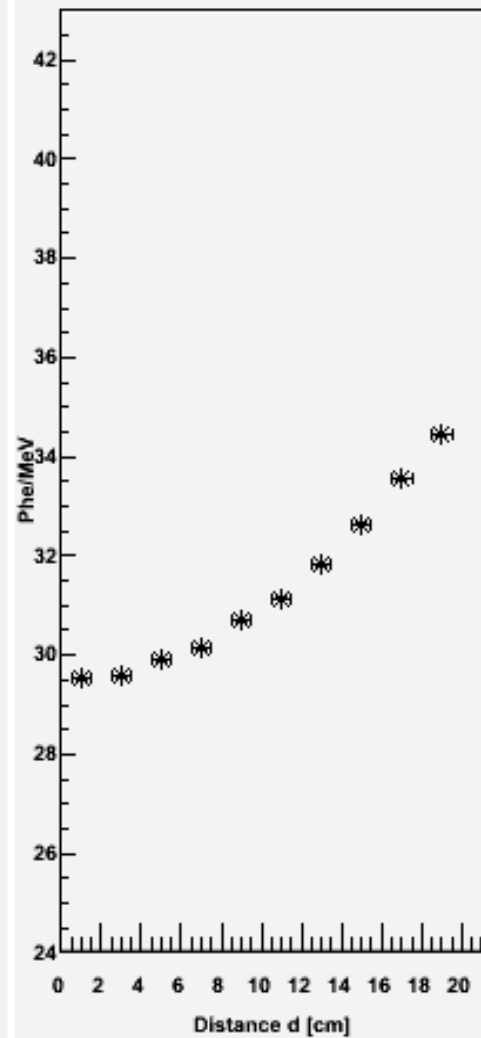
Type 4



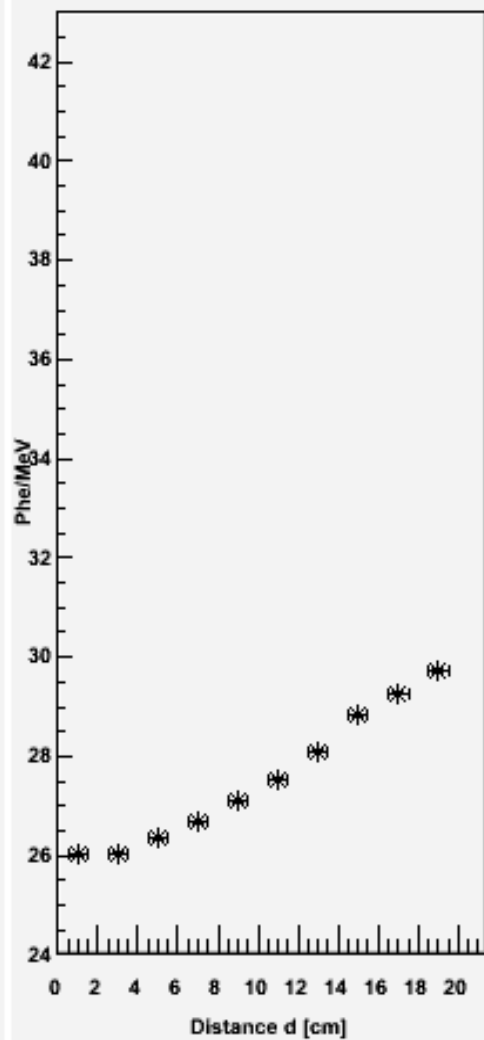
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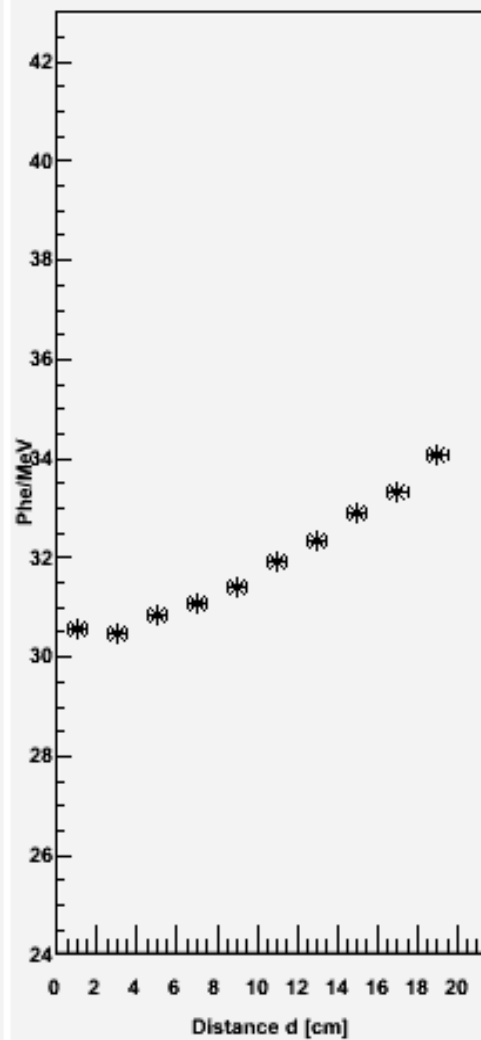
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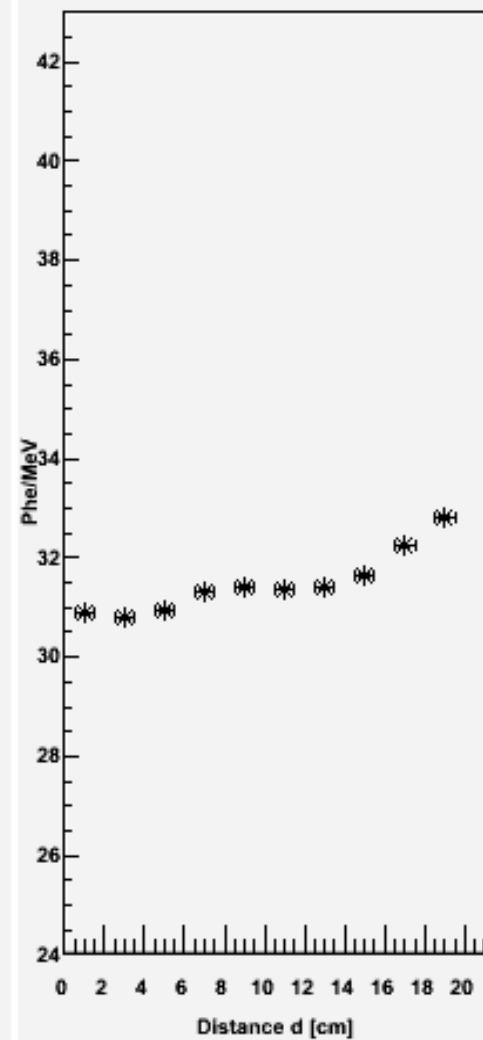
Type 7



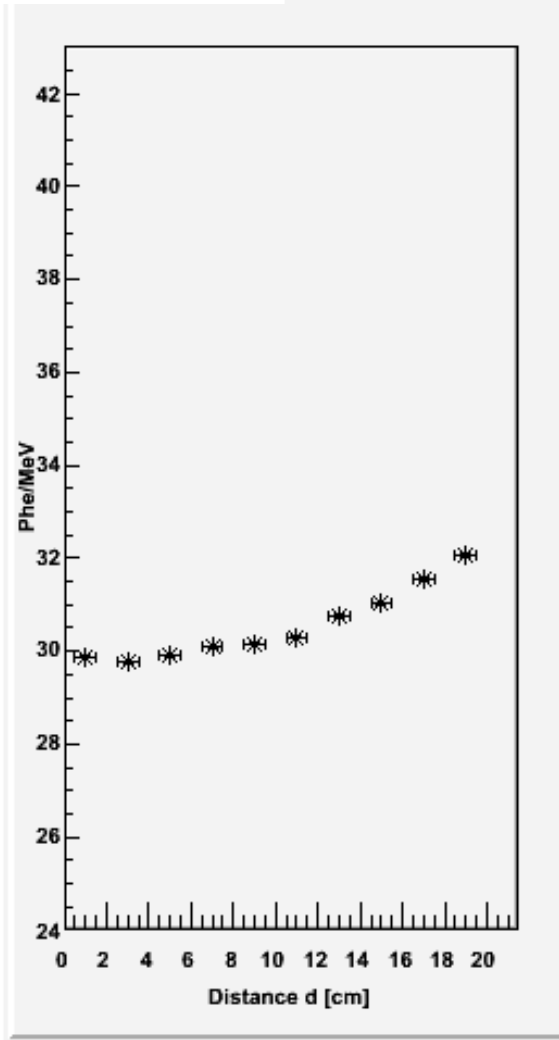
Type 8



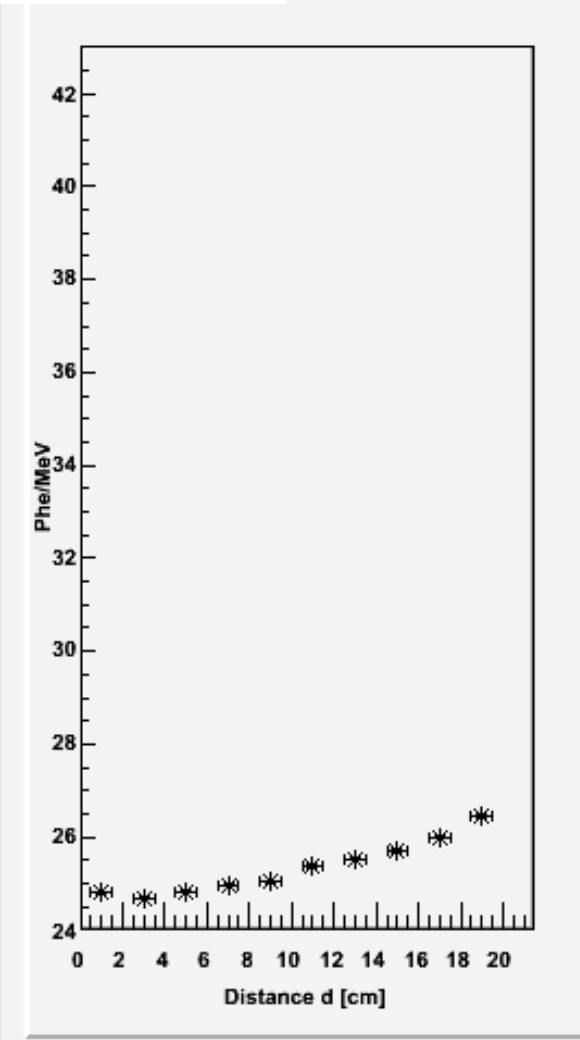
Type 9



Type 10



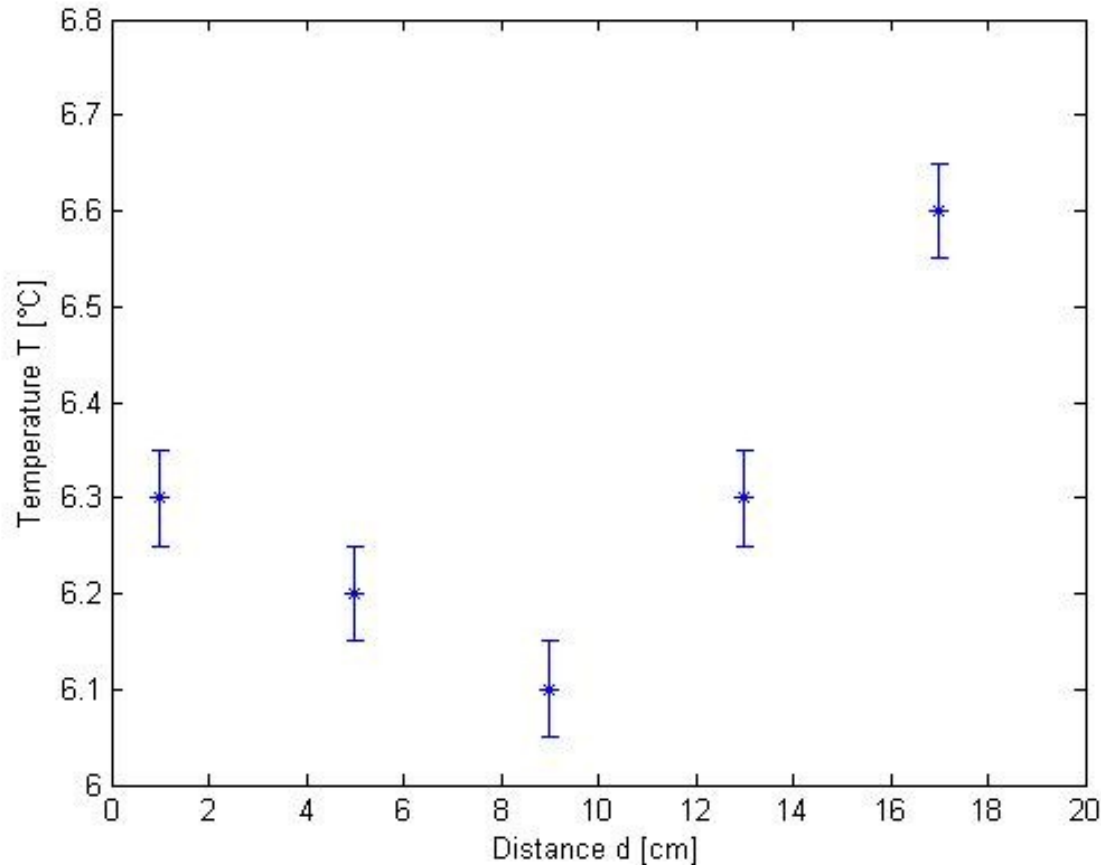
Type 11



Summary

Type	Volume [cm ³]	θ_B [°]	θ_A [°]	θ_C [°]	Mean Value of phe/MeV	Nonuniformity Rel. Std %
1	126.86	2.1	2.2	2.2	35.4	5.6
2	126.56	2.1	2.1	2.2	34.5	7.8
3	125.79	2.1	2.1	2.1	38.6	5.4
4	120.85	1.7	1.9	2.0	26.8	6.1
5	119.69	1.7	1.8	1.8	31.9	6.8
6	118.35	1.7	1.6	1.6	31.3	5.5
7	112.90	1.2	1.4	1.5	27.6	4.9
8	111.75	1.2	1.3	1.3	31.9	3.9
9	110.52	1.2	1.1	1.2	31.5	2.0
10	107.01	0.9	1.0	1.0	30.5	2.6
11	106.25	0.9	0.9	0.9	25.3	2.3
Front end cap crystal			0.5		21.5	0.9

Temperature varies along the crystal



Difference between 1°C is 2.2% shift in 511 keV pulse

Difference between wrapping - Crystal 4

