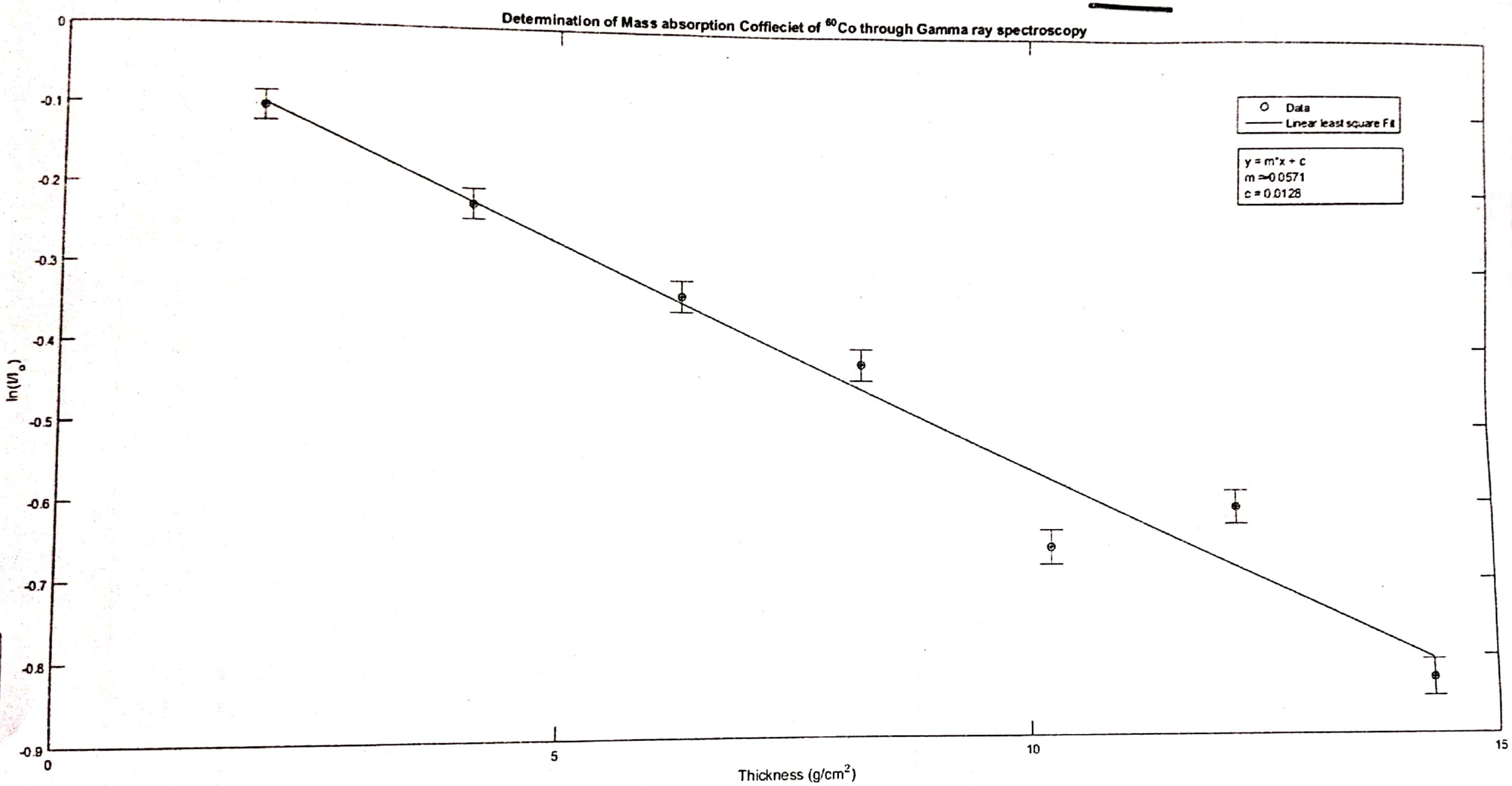
Gamma Ray Spectroscopy Ch4:



$\mu = 0.0571$ cm²/g as it should be.

theoretical value ⇐

⇒ 0.056 cm²/g.

$\mu = 0.057 \pm 0.026$ cm²/g

⇒ 0.06 ± 0.03 cm²/g.

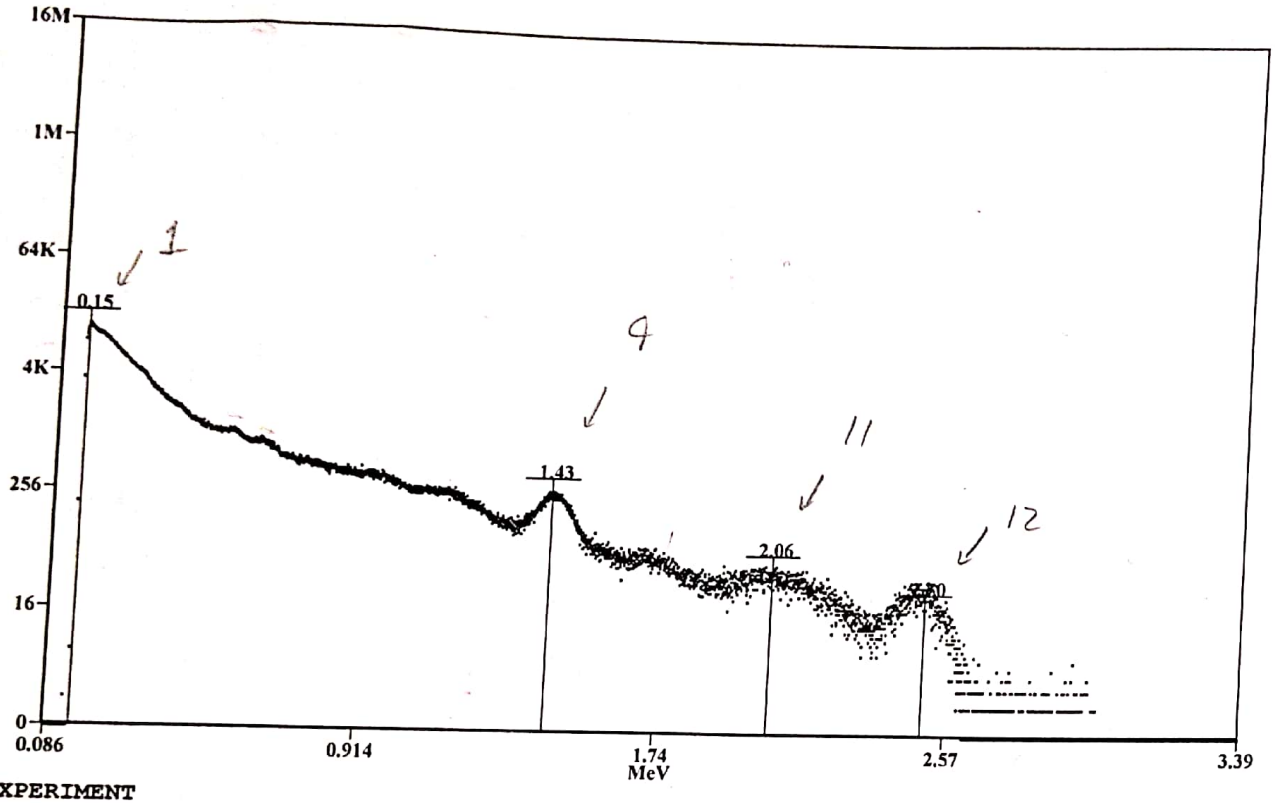
S.No	d_1 (mm)	d_2 (mm)	d_3 (mm)	d_4 (mm)	d_mean (mm)	sigma_data (mm)	sigma_mean (mm)
1	1.73	1.79	1.75	1.76	1.7575	0.169727723	0.196996193
2	1.72	2	1.9	1.81	1.8575	0.060991803	0.117132404
3	1.84	2.05	1.92	1.83	1.91	0.247674181	0.267100168
4	1.66	1.72	1.68	1.69	1.6875	0.517204022	0.526782688
5	1.96	1.87	1.58	1.82	1.8075	0.717317921	0.724254789
6	1.75	1.67	1.74	1.9	1.765	0.94790163	0.953161844
7	1.78	1.84	1.83	1.88	1.8325	1.155625372	1.159943964

N(net)	N(gross)	N(background)	sigma_Nnet	A = Nnet/N_not	sigma_A	Y= lnA	sigma_Y
5395	7990	2595	73.45066371	0.90066778	0.016905266	-0.104618813	0.018769702
4790	7213	2423	69.20982589	0.79966611	0.015500186	-0.223561001	0.019383322
4280	6603	2323	65.42170894	0.714524207	0.014301015	-0.336138403	0.020014739
3927	5919	1992	62.66578014	0.655592654	0.013461095	-0.422215637	0.020532711
3100	5350	2250	55.67764363	0.517529215	0.01145045	-0.658689301	0.022125224
3265	4823	1558	57.14017851	0.545075125	0.011857403	-0.606831649	0.021753704
2615	4433	1818	51.1370707	0.436560935	0.010232248	-0.828827315	0.023438304

↓ cm ↓ mm

Pb Sheets	T = total Thick	sigma_T	x (g/cm2)
1	0.17575	0.196996193	1.993005
2	0.3615	0.229188787	4.09941
3	0.5525	0.351951701	6.26535
4	0.72125	0.633537686	8.178975
5	0.902	0.962244771	10.22868
6	1.0785	1.354412234	12.23019
7	1.26175	1.783228112	14.308245

N_not	Sigma_N_not
5990	77.39509028



EXPERIMENT

Spectrum Name:
Description:
Student ID:
Detector:
Comments:
Start Time: November 05, 2019, 03:38:59
End Time: November 06, 2019, 10:07:49

SET UP

Acquisition Mode: PHA Pre-Amp
Conversion Gain: 4096 Coarse Gain: 8
Upper Discriminator: 3 MeV
Live Time: 109699.12 Real Time: 109729.36

High Voltage: 750
Fine Gain: 1.00
Upper Discriminator: 0 MeV
Percent Dead: 0.02

REGIONS OF INTEREST

Peak Start	Peak End	Gross	Net	Energy	FWHM

Gamma Ray Spectroscopy Background

Peak	1	2	3	4	5	6
Channel no.	85					
Known Energy (MeV)	0.094816	0.239816	0.300716	0.357266	0.605216	0.670466
Source		214 Pb	214 Pb	214 Pb	214 Bi	137 Cs
Observed Energy (MeV)	0·15					
Difference	0·06					
Percentage Error	40					

Peak	7	8	9	10	11	12
Channel no.			1671		2449	2496
Known Energy (MeV)	0.935816	1.131566	1.459266	1.750716	2.117566	2.572866
Source	214 Bi	214 Bi	40 K	214 Bi	214 Bi	208 Tl
Observed Energy (MeV)			1·43		2.06	2.509
Difference			0·029		0·06	0·06
Percentage Error			2·1		2·9	2·4

Other peaks are not full recognisable & peak finder can however still be used to estimate them -

Uncertainty in m of our fit (see last page)

$$A = \begin{bmatrix} \sum_i \frac{1}{\alpha_i^2} & \sum_i \frac{x_i}{\alpha_i^2} \\ \sum_i \frac{x_i^2}{\alpha_i^2} & \sum_i \frac{x_i^2}{\alpha_i^2} \end{bmatrix}$$

Sum $(x_i / \alpha_i^2$

sum$[x_i/(\alpha_i^2)]$

$$C = A^{-1}$$

C_{11} = uncertainty in m -

$$C = \begin{bmatrix} 0.6766 & -0.1293 \\ -0.1293 & 0.0333 \end{bmatrix} \times 10^{-3}$$