氫硼核融合實作
Practical course on proton-boron nuclear fusion

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2025 summer break

7/14(Mon.) – 7/18(Fri.) 14:00-17:40

Lecture 4

https://capst.ncku.edu.tw/PGS/index.php/teaching/

Final presentation

On Friday, 5 mins presentation for each person (20 %):

1. **How did you analyze the data.**
2. **The histogram table.**
3. **The histogram plot.**
4. **Provide the histogram table in excel.**

Final writing report (20 %):

1. 實驗設備之原理。
2. 數據分析原理說明。
3. 數據分析結果。
4. 討論。

若週四實驗課缺課，則報告為0分。

- **From the histogram plot and table:**
  - **If energy loss of the proton generated from the DD fusion is neglected, what is the energy of T and ^{3}He?**
  - **What's the peak energy of alphas from p-B fusion?**

Final presentation

- **Every student will analyze one set of p-B fusion data and D-D fusion data.**
  - **The data set is assigned to each student.**
  - **Data needs to be converted from psdata format to csv format.**
  - **Analyze the data. A excel file and a figure is generated.**
  - **Generate the histogram plot and table.**
    - **p-B fusion: 0~20, each bin has a width of 0.4, i.e., 50 bins.**
    - **DD fusion: 0~6, each bin has a width of 0.01, i.e., 600 bins.**
- **The analyzing program is provided. Student can pick either the matlab code or the python code to analyze the data.**

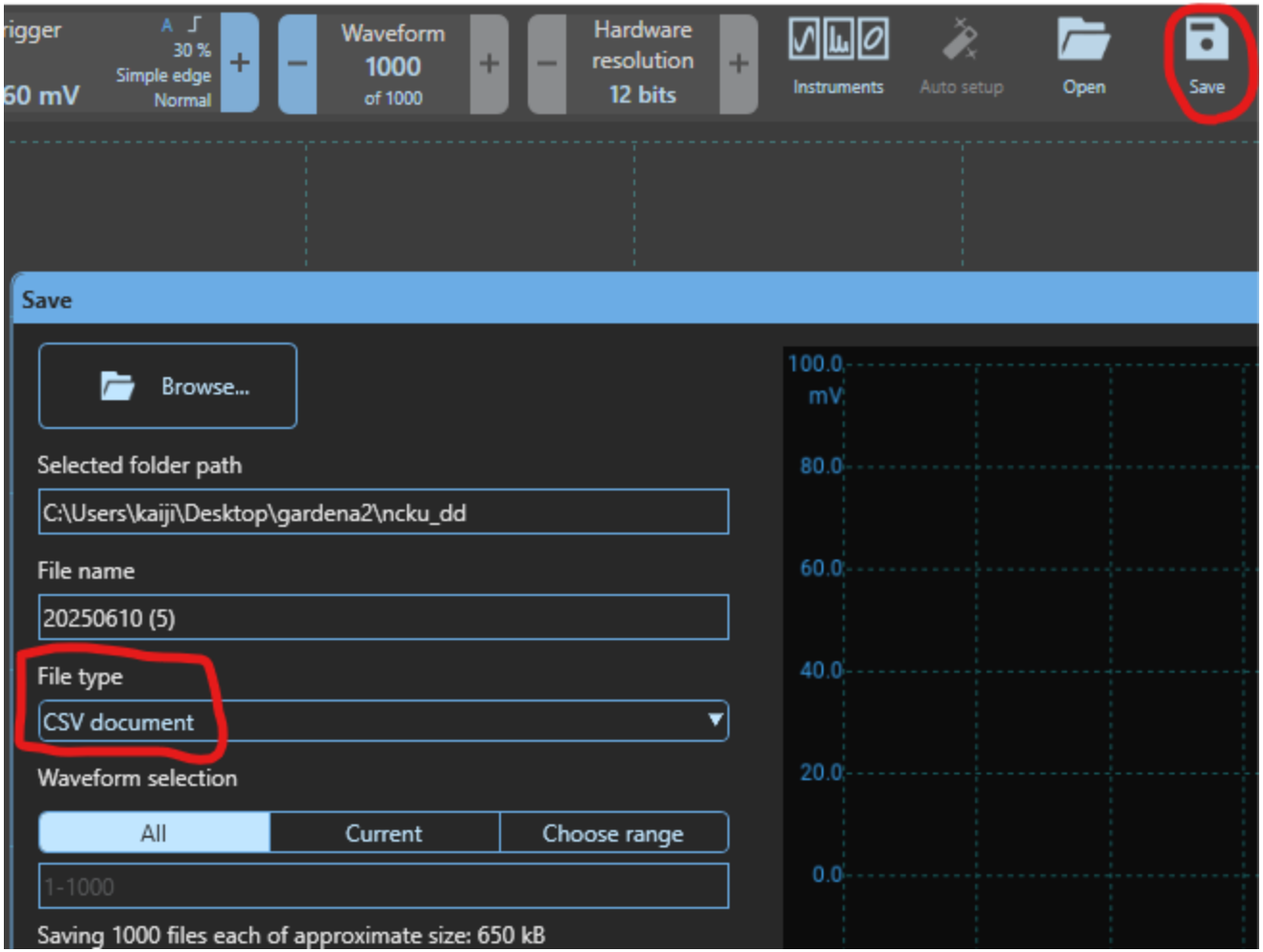
Provided programs

- The analyzing program is provided. Student can pick either the matlab code or the python code to analyze the data.
- The converting program “PicoScope_7_TandM_7.1.50.5777.exe” is provided.
- Table of assigned data set:

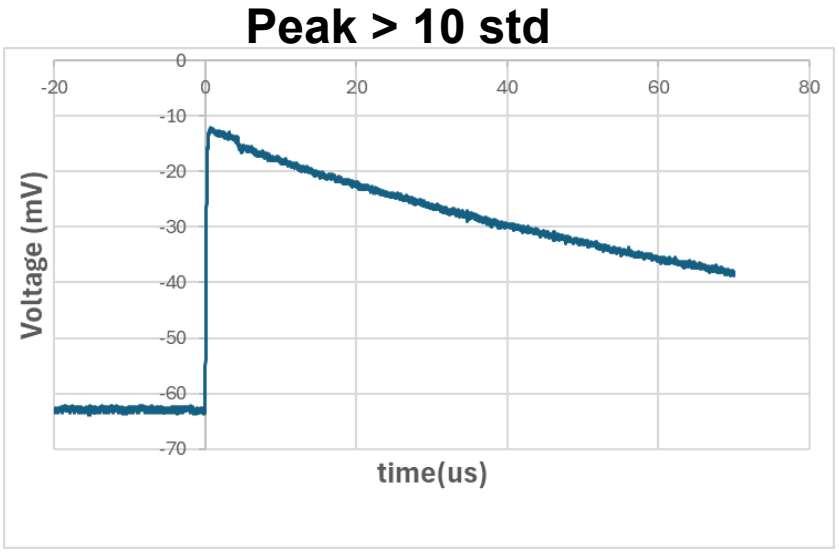
Students	p-B fusion	D-D fusion
陳崇文	75keV_30Hz_5pct(20)	20250610(20)
許哲瑜	75keV_30Hz_5pct(21)	20250610(21)
許源凱	75keV_30Hz_5pct(22)	20250610(22)
劉于華	75keV_30Hz_5pct(23)	20250610(23)
黃雅筠	75keV_30Hz_5pct(24)	20250610(24)
盧宣嘉	75keV_30Hz_5pct(25)	20250610(25)
廖奕涵	75keV_30Hz_5pct(26)	20250610(26)
關運澤	75keV_30Hz_5pct(27)	20250610(27)
葉柏廷	75keV_30Hz_5pct(28)	20250610(28)
賴資佳	75keV_30Hz_5pct(29)	20250610(29)
李政穎	75keV_30Hz_5pct(30)	20250610(30)

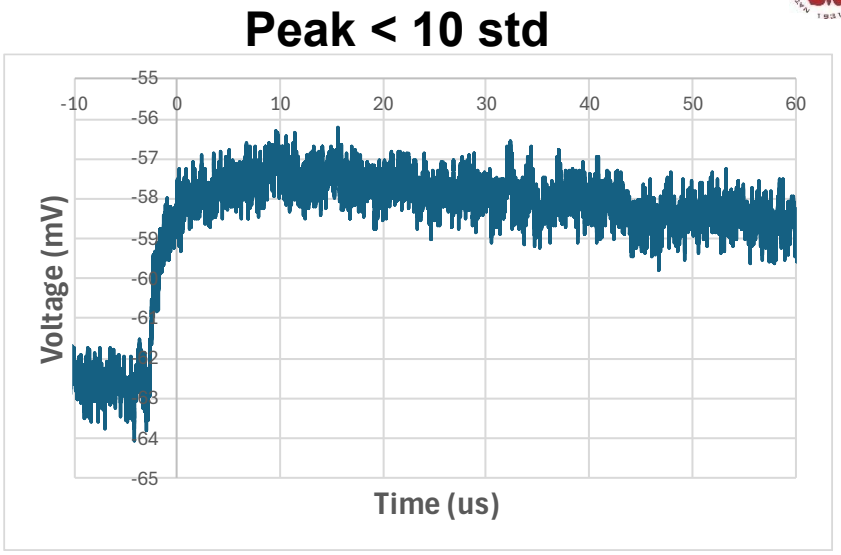
psdata is converted to csv using PicoScope program

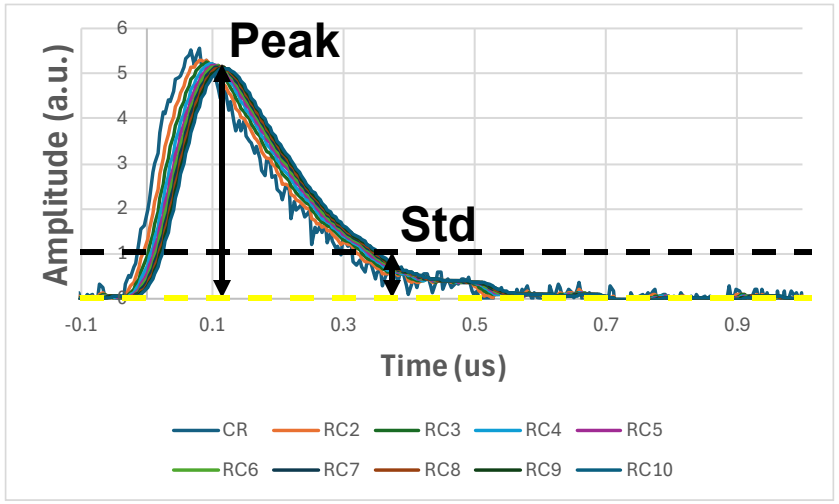
PicoScope_7_TandM_7.1.50.5777.exe

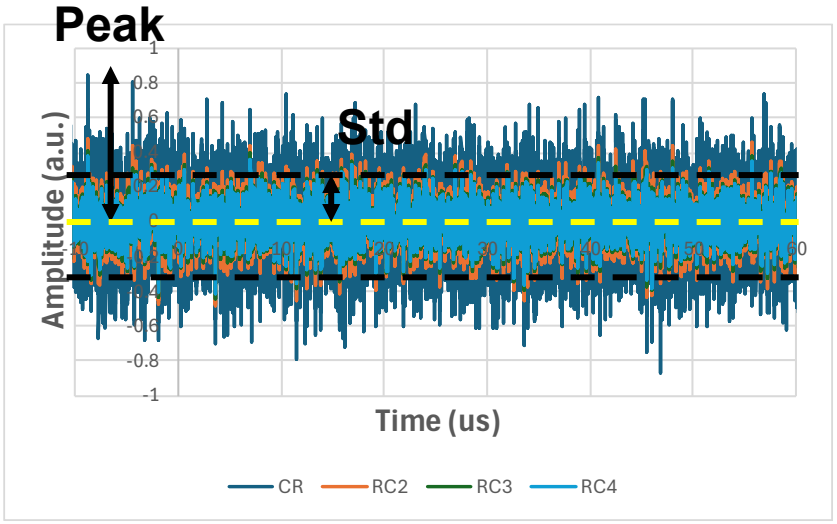


Data is saved when the peak is 10 times larger than the standard deviation

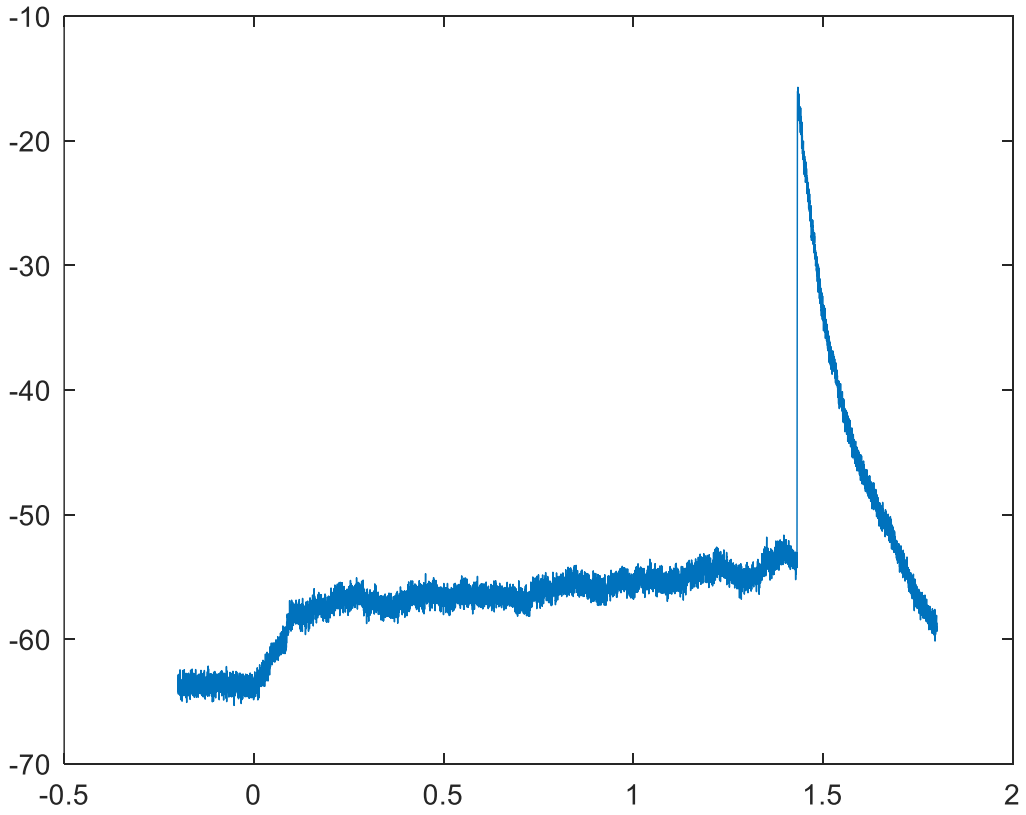




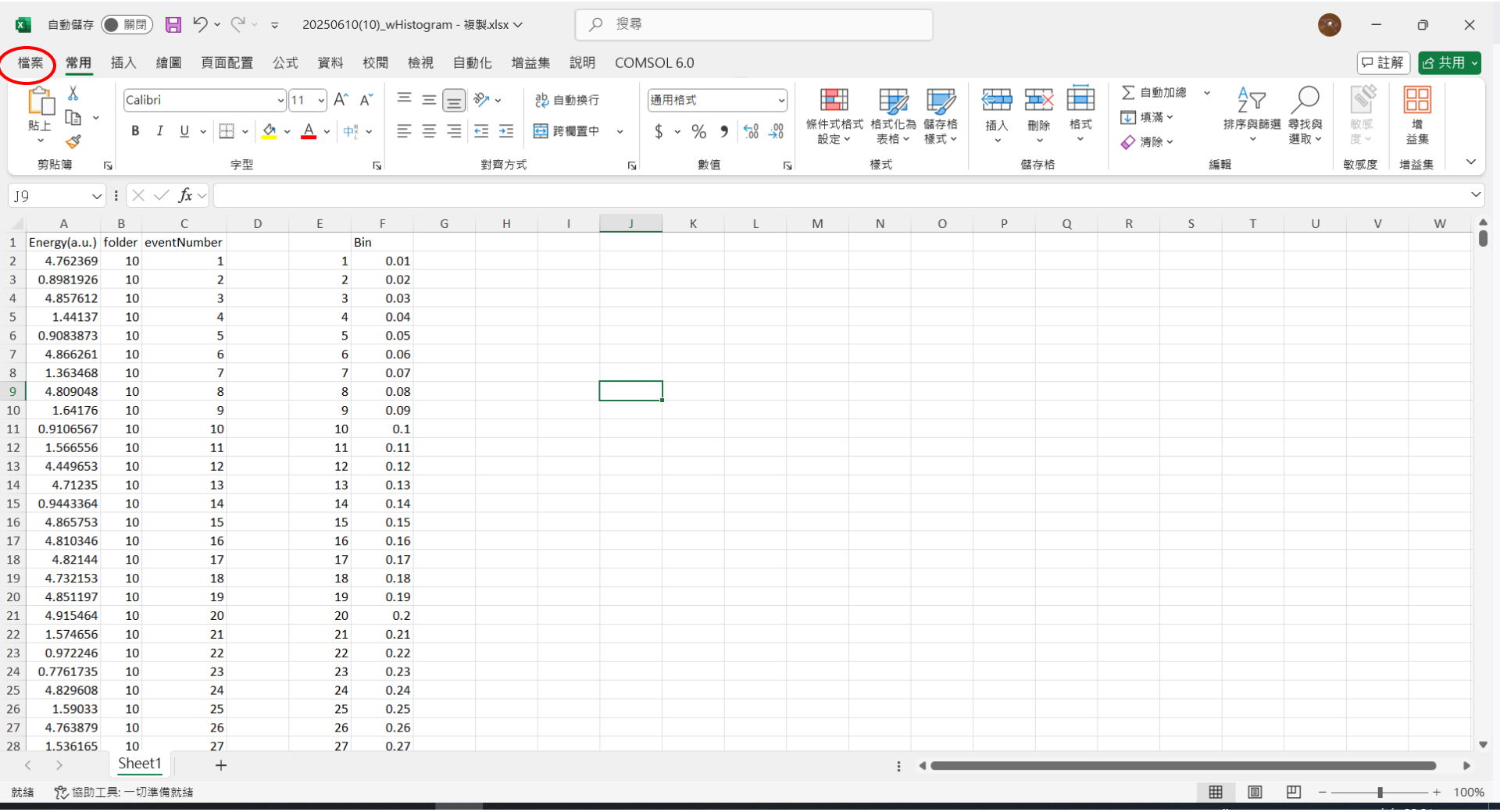




The signal may be mixed with the noise

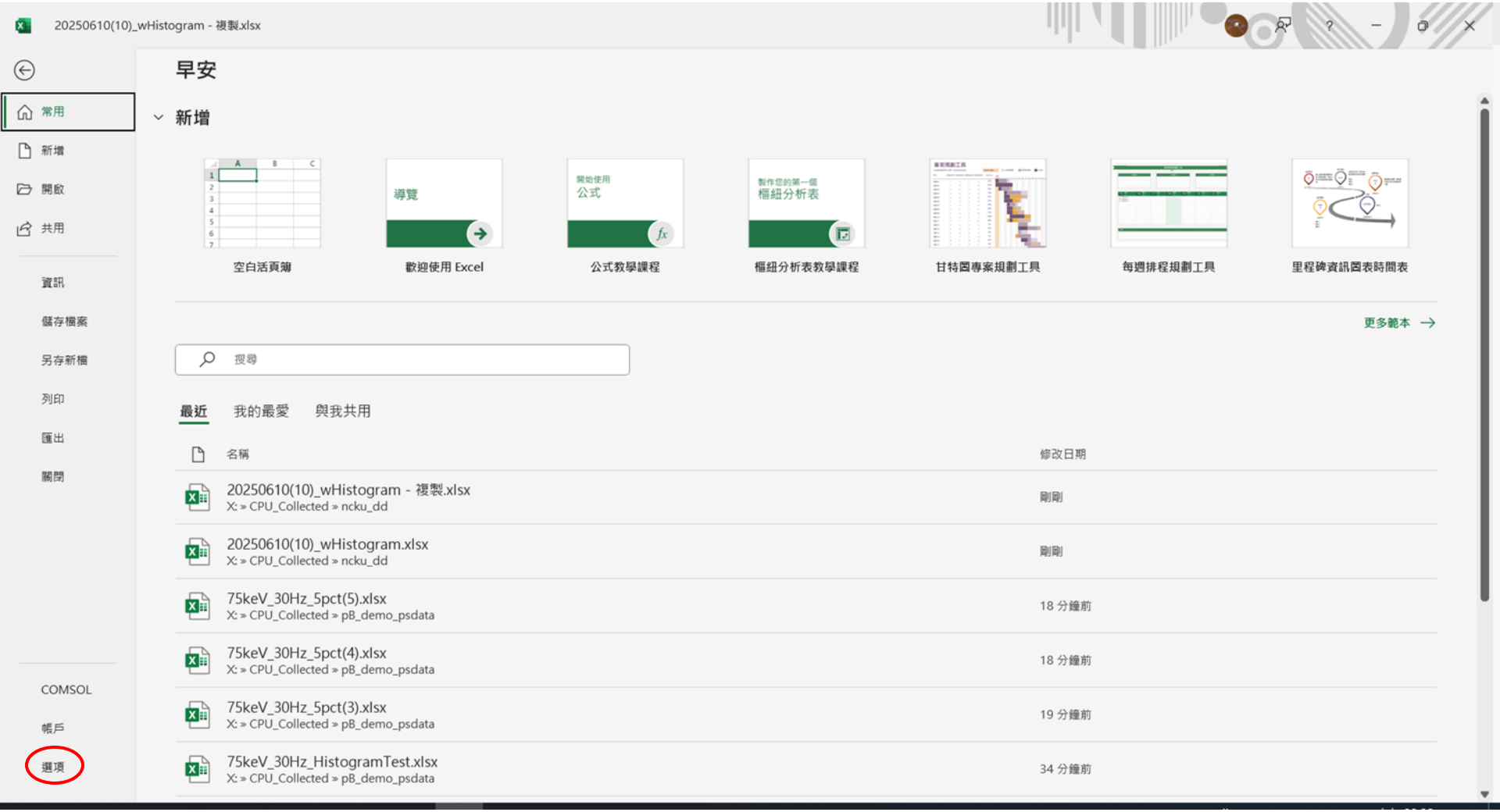


Generate histogram using excel - 1

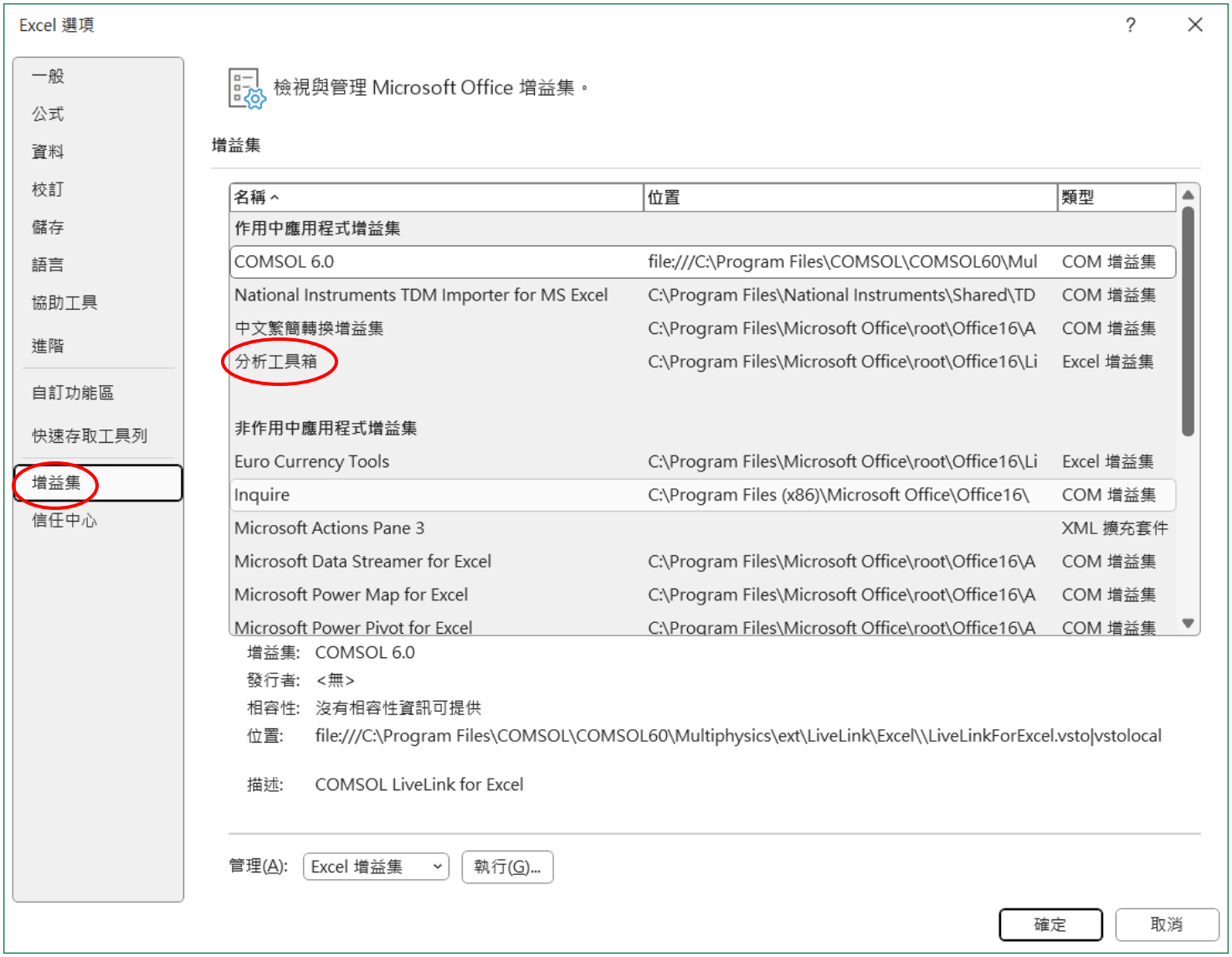


	A	B	C	D	E	F
1	Energy(a.u.)	folder	eventNumber			Bin
2	4.762369	10	1		1	0.01
3	0.8981926	10	2		2	0.02
4	4.857612	10	3		3	0.03
5	1.44137	10	4		4	0.04
6	0.9083873	10	5		5	0.05
7	4.866261	10	6		6	0.06
8	1.363468	10	7		7	0.07
9	4.809048	10	8		8	0.08
10	1.64176	10	9		9	0.09
11	0.9106567	10	10		10	0.1
12	1.566556	10	11		11	0.11
13	4.449653	10	12		12	0.12
14	4.71235	10	13		13	0.13
15	0.9443364	10	14		14	0.14
16	4.865753	10	15		15	0.15
17	4.810346	10	16		16	0.16
18	4.82144	10	17		17	0.17
19	4.732153	10	18		18	0.18
20	4.851197	10	19		19	0.19
21	4.915464	10	20		20	0.2
22	1.574656	10	21		21	0.21
23	0.972246	10	22		22	0.22
24	0.7761735	10	23		23	0.23
25	4.829608	10	24		24	0.24
26	1.59033	10	25		25	0.25
27	4.763879	10	26		26	0.26
28	1.536165	10	27		27	0.27

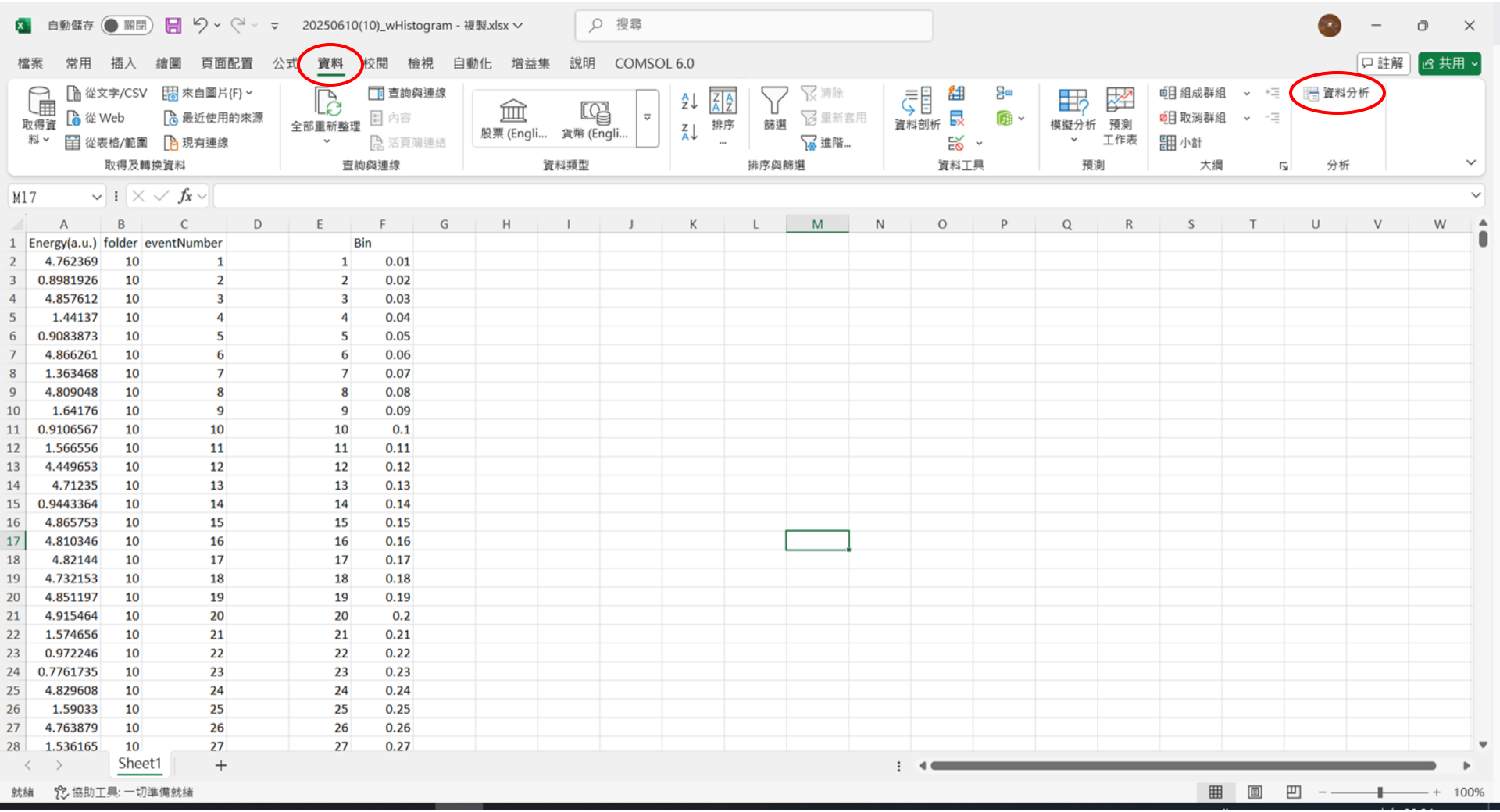
Generate histogram using excel - 2



Generate histogram using excel - 3

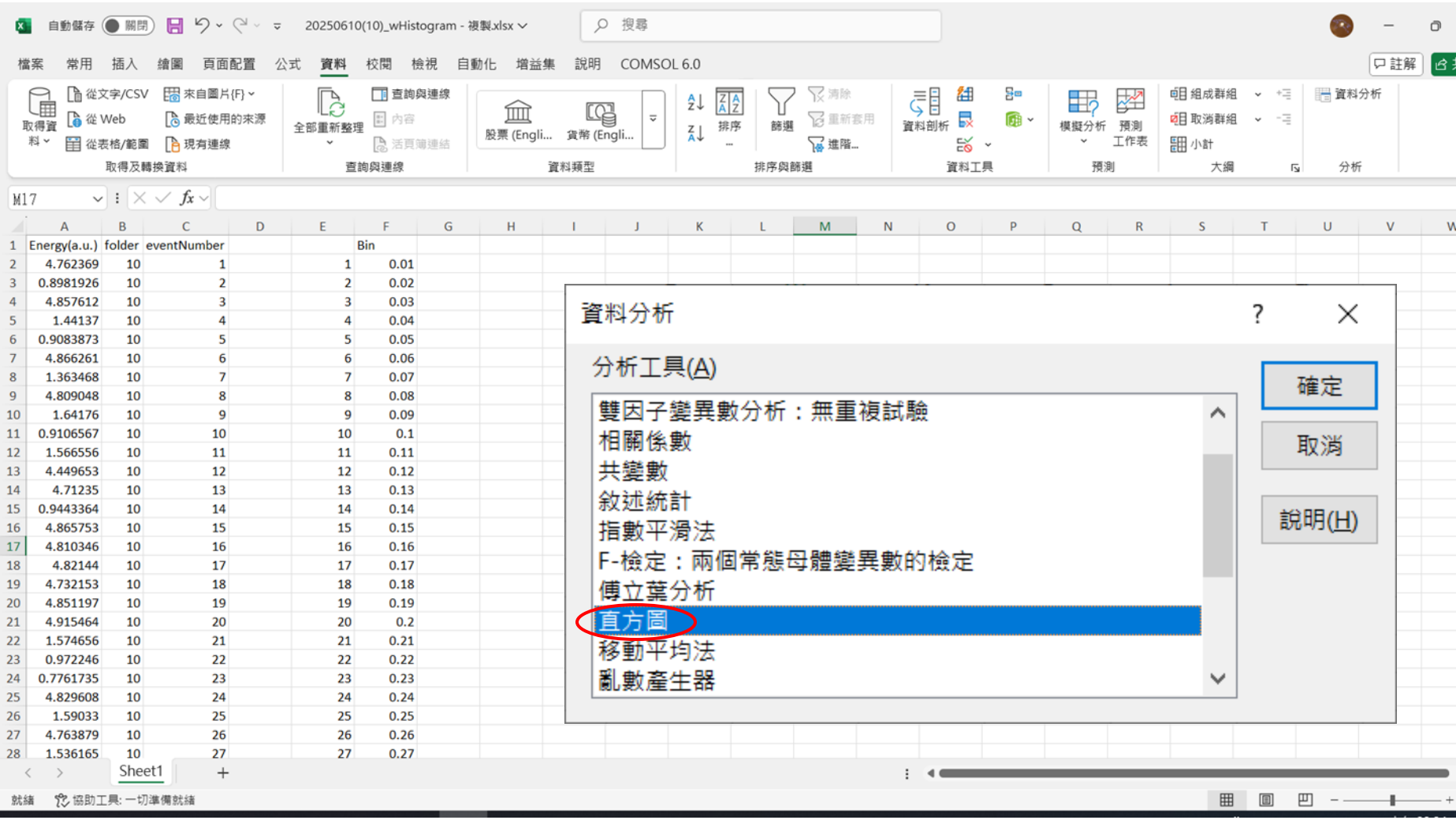


Generate histogram using excel - 4



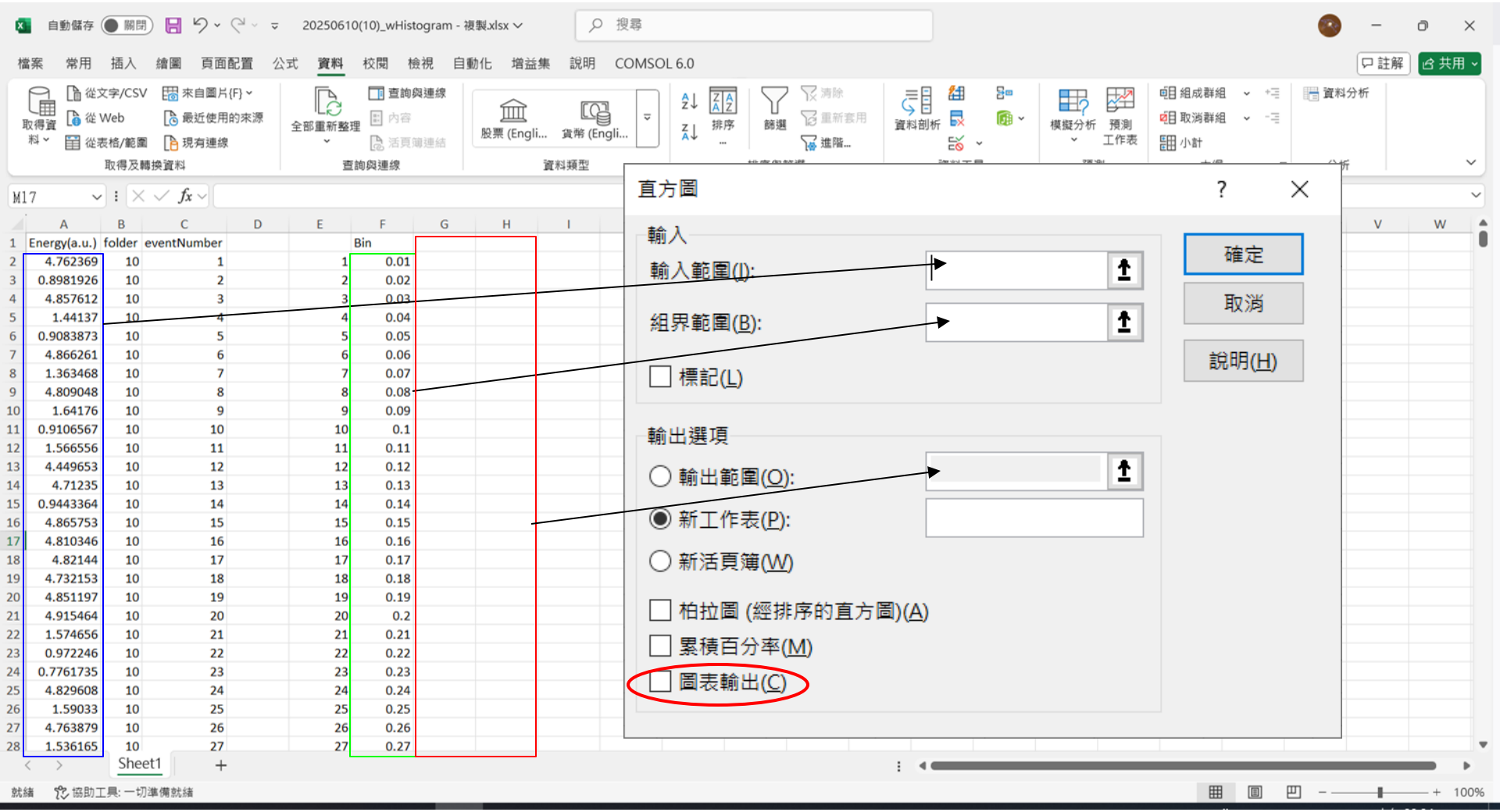
	A	B	C	D	E	F
1	Energy(a.u.)	folder	eventNumber			Bin
2	4.762369	10	1		1	0.01
3	0.8981926	10	2		2	0.02
4	4.857612	10	3		3	0.03
5	1.44137	10	4		4	0.04
6	0.9083873	10	5		5	0.05
7	4.866261	10	6		6	0.06
8	1.363468	10	7		7	0.07
9	4.809048	10	8		8	0.08
10	1.64176	10	9		9	0.09
11	0.9106567	10	10		10	0.1
12	1.566556	10	11		11	0.11
13	4.449653	10	12		12	0.12
14	4.71235	10	13		13	0.13
15	0.9443364	10	14		14	0.14
16	4.865753	10	15		15	0.15
17	4.810346	10	16		16	0.16
18	4.82144	10	17		17	0.17
19	4.732153	10	18		18	0.18
20	4.851197	10	19		19	0.19
21	4.915464	10	20		20	0.2
22	1.574656	10	21		21	0.21
23	0.972246	10	22		22	0.22
24	0.7761735	10	23		23	0.23
25	4.829608	10	24		24	0.24
26	1.59033	10	25		25	0.25
27	4.763879	10	26		26	0.26
28	1.536165	10	27		27	0.27

Generate histogram using excel - 5

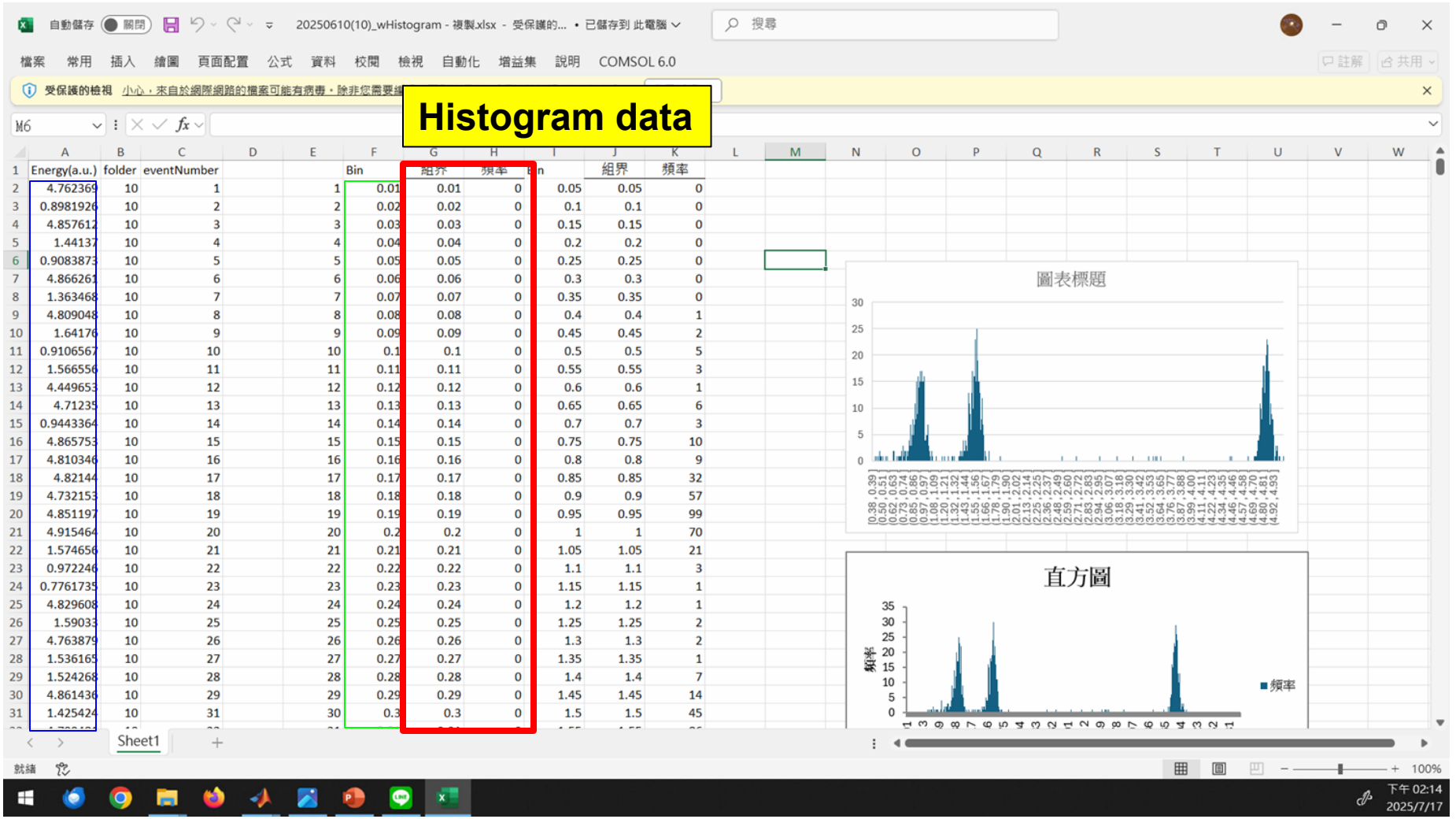


	A	B	C	E	F
1	Energy(a.u.)	folder	eventNumber		Bin
2	4.762369	10	1	1	0.01
3	0.8981926	10	2	2	0.02
4	4.857612	10	3	3	0.03
5	1.44137	10	4	4	0.04
6	0.9083873	10	5	5	0.05
7	4.866261	10	6	6	0.06
8	1.363468	10	7	7	0.07
9	4.809048	10	8	8	0.08
10	1.64176	10	9	9	0.09
11	0.9106567	10	10	10	0.1
12	1.566556	10	11	11	0.11
13	4.449653	10	12	12	0.12
14	4.71235	10	13	13	0.13
15	0.9443364	10	14	14	0.14
16	4.865753	10	15	15	0.15
17	4.810346	10	16	16	0.16
18	4.82144	10	17	17	0.17
19	4.732153	10	18	18	0.18
20	4.851197	10	19	19	0.19
21	4.915464	10	20	20	0.2
22	1.574656	10	21	21	0.21
23	0.972246	10	22	22	0.22
24	0.7761735	10	23	23	0.23
25	4.829608	10	24	24	0.24
26	1.59033	10	25	25	0.25
27	4.763879	10	26	26	0.26
28	1.536165	10	27	27	0.27

Generate histogram using excel - 6



Generate histogram using excel - 7



Energy(a.u.)	folder	eventNumber			Bin	組界	頻率		組界	頻率
4.762369	10	1	1		0.01	0.01	0	0.05	0.05	0
0.8981926	10	2	2		0.02	0.02	0	0.1	0.1	0
4.857612	10	3	3		0.03	0.03	0	0.15	0.15	0
1.44137	10	4	4		0.04	0.04	0	0.2	0.2	0
0.9083873	10	5	5		0.05	0.05	0	0.25	0.25	0
4.866261	10	6	6		0.06	0.06	0	0.3	0.3	0
1.363468	10	7	7		0.07	0.07	0	0.35	0.35	0
4.809048	10	8	8		0.08	0.08	0	0.4	0.4	1
1.64176	10	9	9		0.09	0.09	0	0.45	0.45	2
0.9106567	10	10	10		0.1	0.1	0	0.5	0.5	5
1.566556	10	11	11		0.11	0.11	0	0.55	0.55	3
4.449653	10	12	12		0.12	0.12	0	0.6	0.6	1
4.71235	10	13	13		0.13	0.13	0	0.65	0.65	6
0.9443364	10	14	14		0.14	0.14	0	0.7	0.7	3
4.865753	10	15	15		0.15	0.15	0	0.75	0.75	10
4.810346	10	16	16		0.16	0.16	0	0.8	0.8	9
4.82144	10	17	17		0.17	0.17	0	0.85	0.85	32
4.732153	10	18	18		0.18	0.18	0	0.9	0.9	57
4.851197	10	19	19		0.19	0.19	0	0.95	0.95	99
4.915464	10	20	20		0.2	0.2	0	1	1	70
1.574656	10	21	21		0.21	0.21	0	1.05	1.05	21
0.972246	10	22	22		0.22	0.22	0	1.1	1.1	3
0.7761735	10	23	23		0.23	0.23	0	1.15	1.15	1
4.829608	10	24	24		0.24	0.24	0	1.2	1.2	1
1.59033	10	25	25		0.25	0.25	0	1.25	1.25	2
4.763879	10	26	26		0.26	0.26	0	1.3	1.3	2
1.536165	10	27	27		0.27	0.27	0	1.35	1.35	1
1.524268	10	28	28		0.28	0.28	0	1.4	1.4	7
4.861436	10	29	29		0.29	0.29	0	1.45	1.45	14
1.425424	10	31	30		0.3	0.3	0	1.5	1.5	45