



國立臺灣師範大學
National Taiwan Normal University

數據處理 與 SciDAVis軟體教學

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2017/03/03 授課

表格

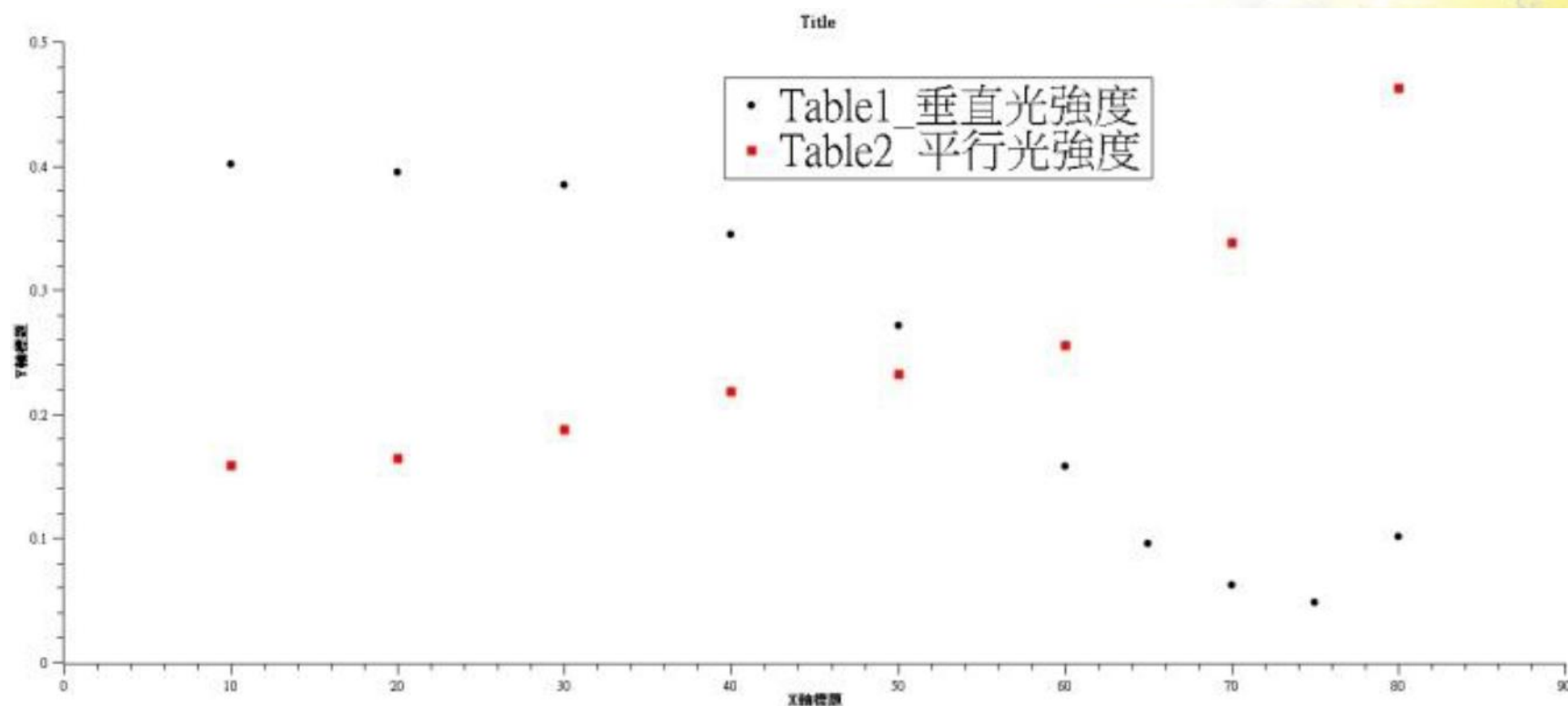
- 每個代號需要有說明，
- 要有表的編號，
- 要有表的說明。

θ	10°	20°	30°	40°
R_s	0.250	0.258	0.278	0.326
R_p	0.247	0.243	0.227	0.216
θ	50°	60°	70°	80°
R_s	0.402	0.498	0.594	0.717
R_p	0.179	0.120	0.071	0.143



繪製數據圖

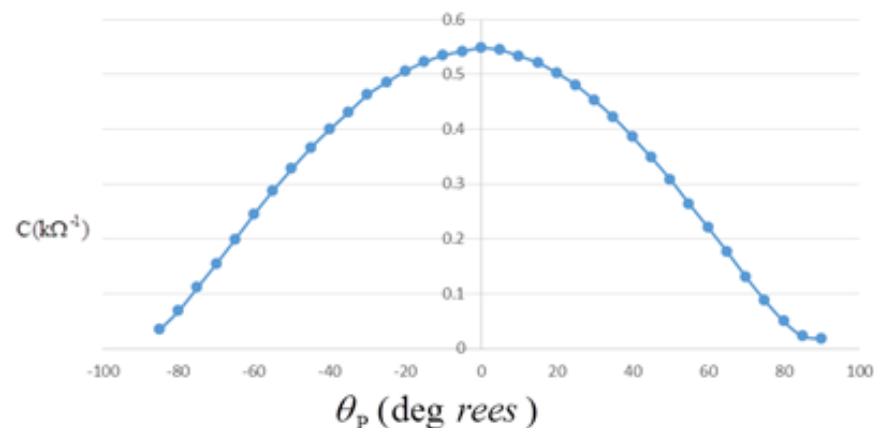
- 每個軸需要物理量有說明，
- 要有圖的編號，
- 要有圖的說明。



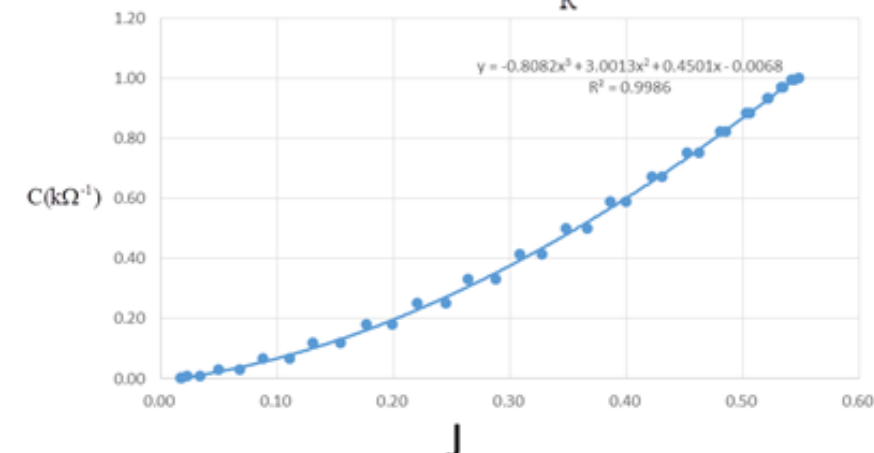
下表為 θ_p 對應 PC 電阻 R 的數據表，並計算 $J = \cos^2 \theta_p$

θ_p (deg)	R (k Ω)	C (k Ω^{-1})	J
-90.0	58.50	0.02	0
-85.0	29.30	0.03	0.008
-80.0	14.62	0.07	0.03
-75.0	9.00	0.11	0.067
-70.0	6.47	0.15	0.117
-65.0	5.02	0.20	0.179
-60.0	4.08	0.25	0.25
-55.0	3.47	0.29	0.329
-50.0	3.05	0.33	0.413
-45.0	2.73	0.37	0.5
-40.0	2.50	0.40	0.587
-35.0	2.32	0.43	0.671
-30.0	2.16	0.46	0.75
-25.0	2.06	0.49	0.821
-20.0	1.98	0.51	0.883
-15.0	1.91	0.52	0.933
-10.0	1.87	0.53	0.97
-5.0	1.85	0.54	0.992
0.0	1.83	0.55	1
5.0	1.84	0.54	0.992
10.0	1.87	0.53	0.97
15.0	1.92	0.52	0.933
20.0	1.99	0.50	0.883
25.0	2.08	0.48	0.821
30.0	2.21	0.45	0.75
35.0	2.37	0.42	0.671
40.0	2.59	0.39	0.587
45.0	2.87	0.35	0.5
50.0	3.24	0.31	0.413
55.0	3.79	0.26	0.329
60.0	4.53	0.22	0.25
65.0	5.65	0.18	0.179
70.0	7.66	0.13	0.117
75.0	11.37	0.09	0.067
80.0	20.20	0.05	0.03
85.0	44.40	0.02	0.008
90.0	55.40	0.02	0

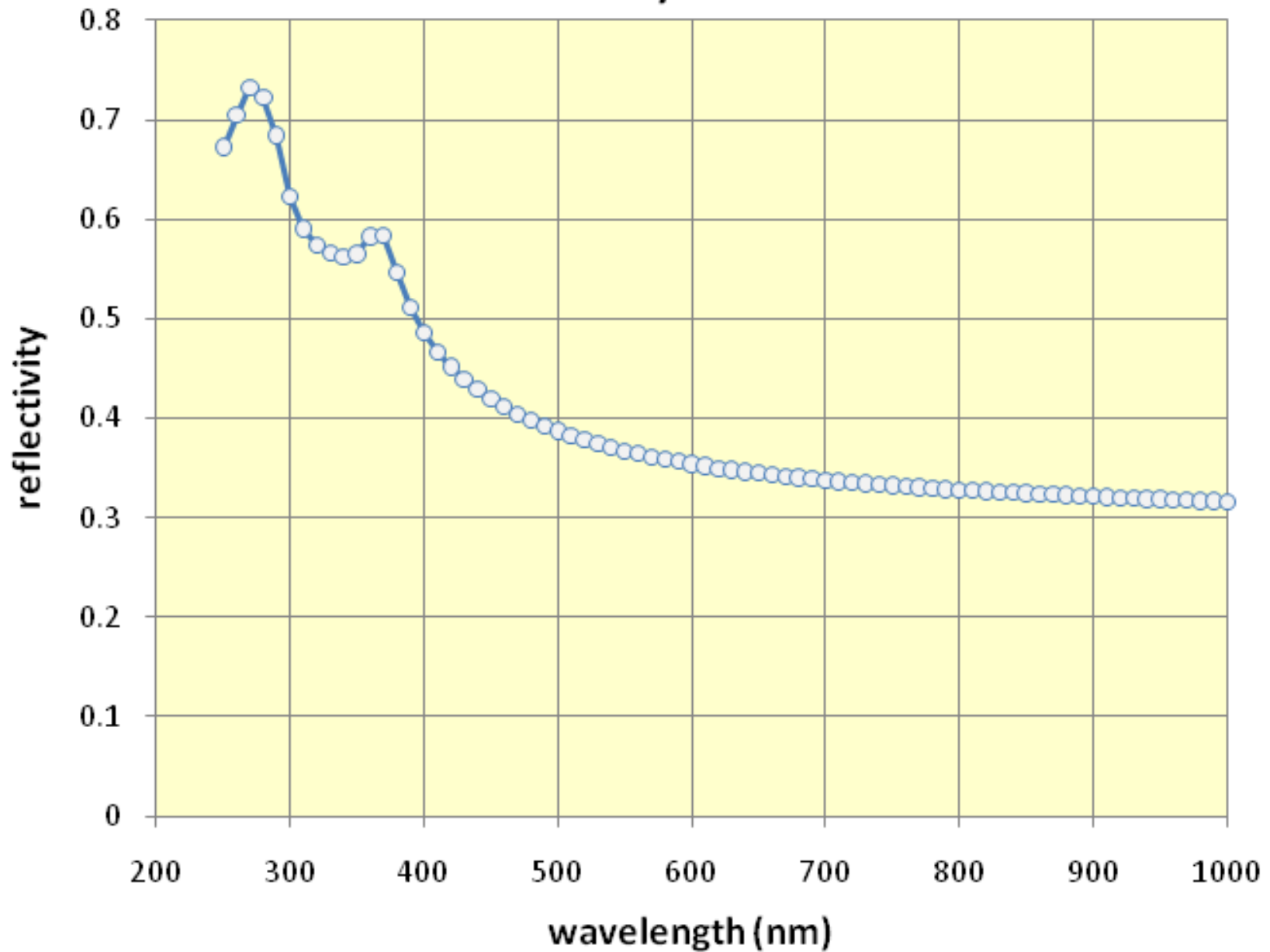
偏振片 p_1 和 p_2 的的偏振軸夾角與 pc 電阻倒數的關係



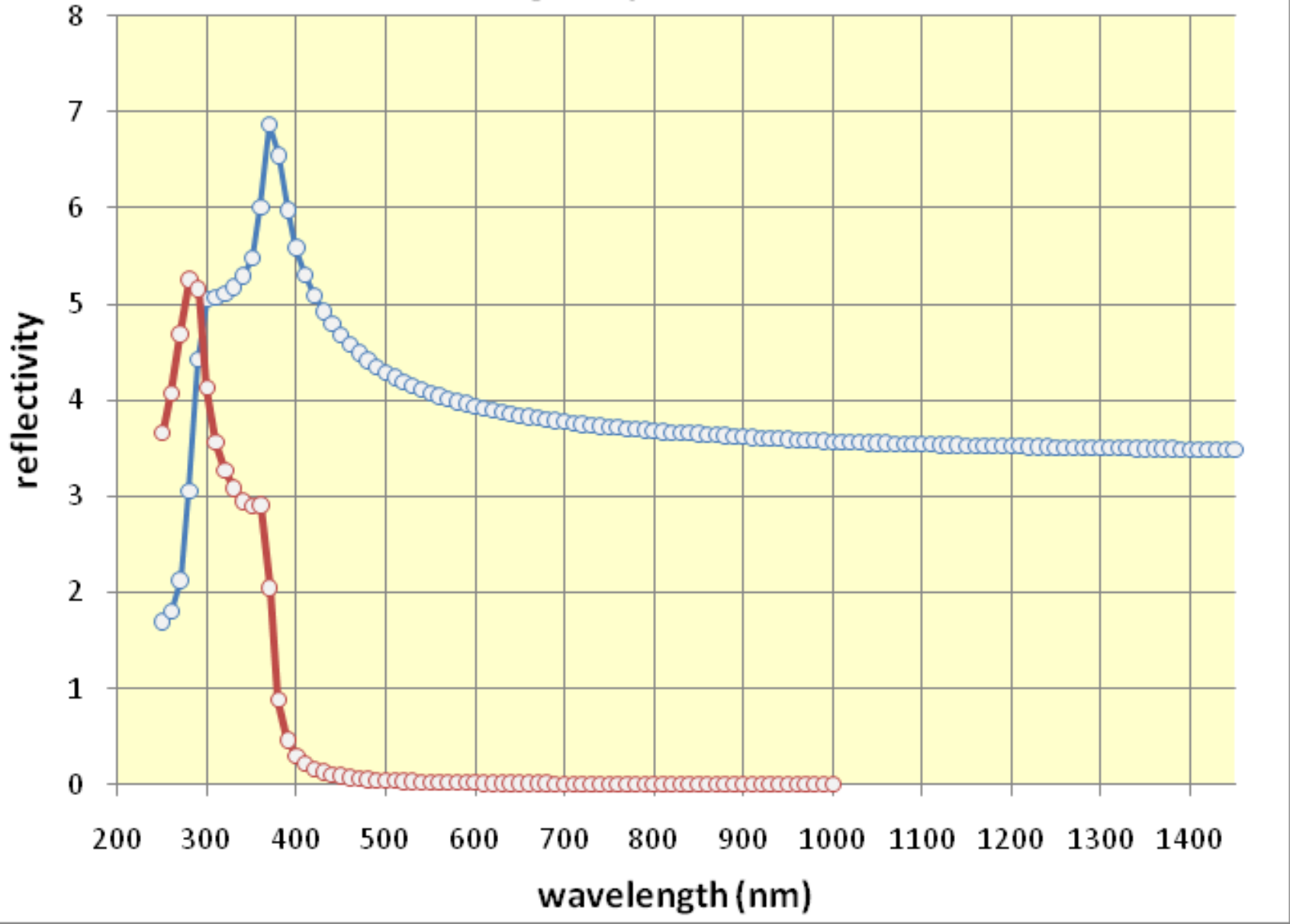
$\cos^2 \theta_p$ 對電導率 $C = \frac{1}{R}$ 作圖



Reflectivity of Silicon



real and imaginary refractive index of silicon



方格紙試作

簧片

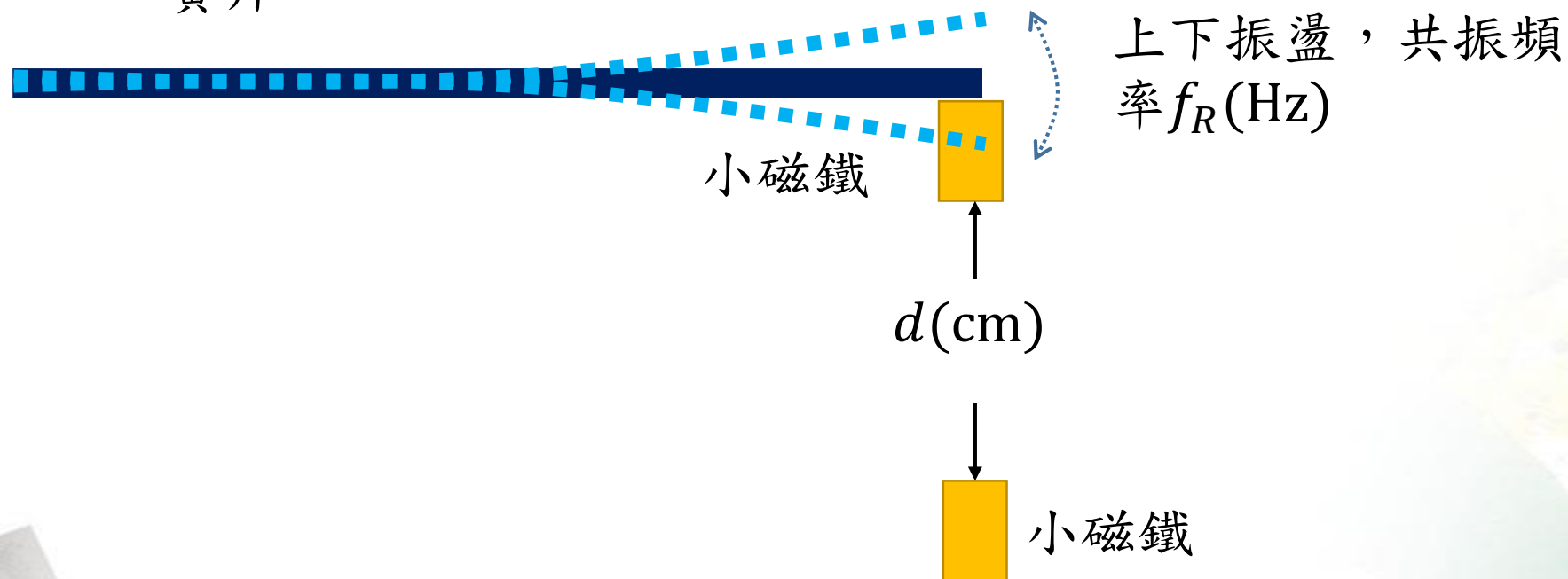


圖1. 簧片共振頻率受兩磁鐵間距改變，及磁力改變，而產生變化之實驗示意圖。

兩磁鐵間垂直距離
 $d(\text{cm})$

共振頻率 $f_R(\text{Hz})$

1.85

26.67

1.75

26.68

1.65

26.70

1.55

26.73

1.45

26.77

1.35

26.84

1.25

26.89

1.15

26.96

1.05

27.14

0.95

27.35

0.85

27.67

0.75

28.15

0.65

28.81

0.55

29.75



- 練習一：將表一的數據繪圖，即共振頻率 f_R 對距離 d 作圖。
- 練習二：已知簧片的自然共振頻率為 $f_0 = 26.5\text{Hz}$ ，假設 $f_R - f_0 \propto d^n$ ，求 n 的數值。(註：說明有兩種方式，用全對數方格紙，或計算對數值後座圖。)



Scientific Data Analysis and Visualization

- SciDAVis

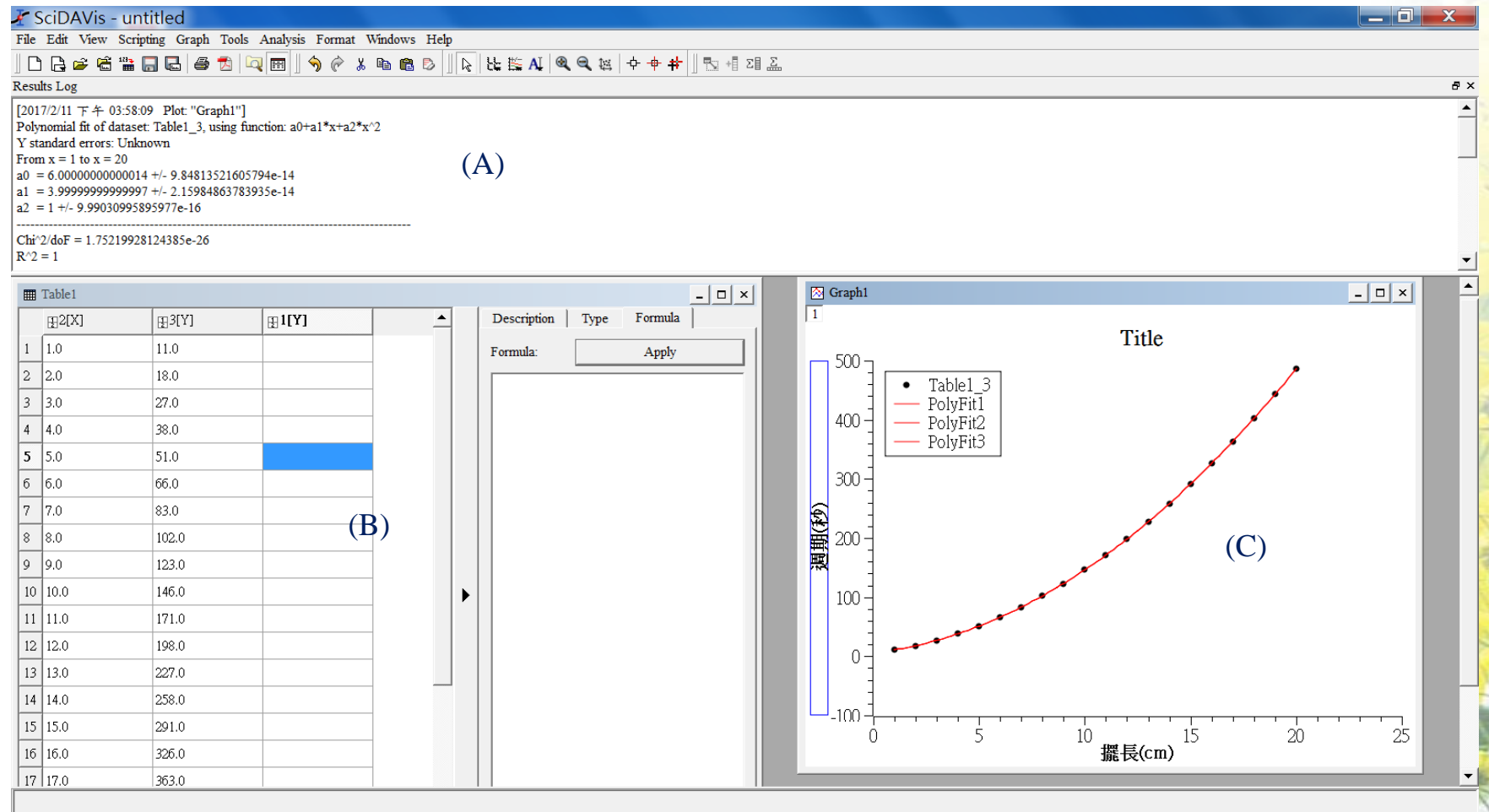
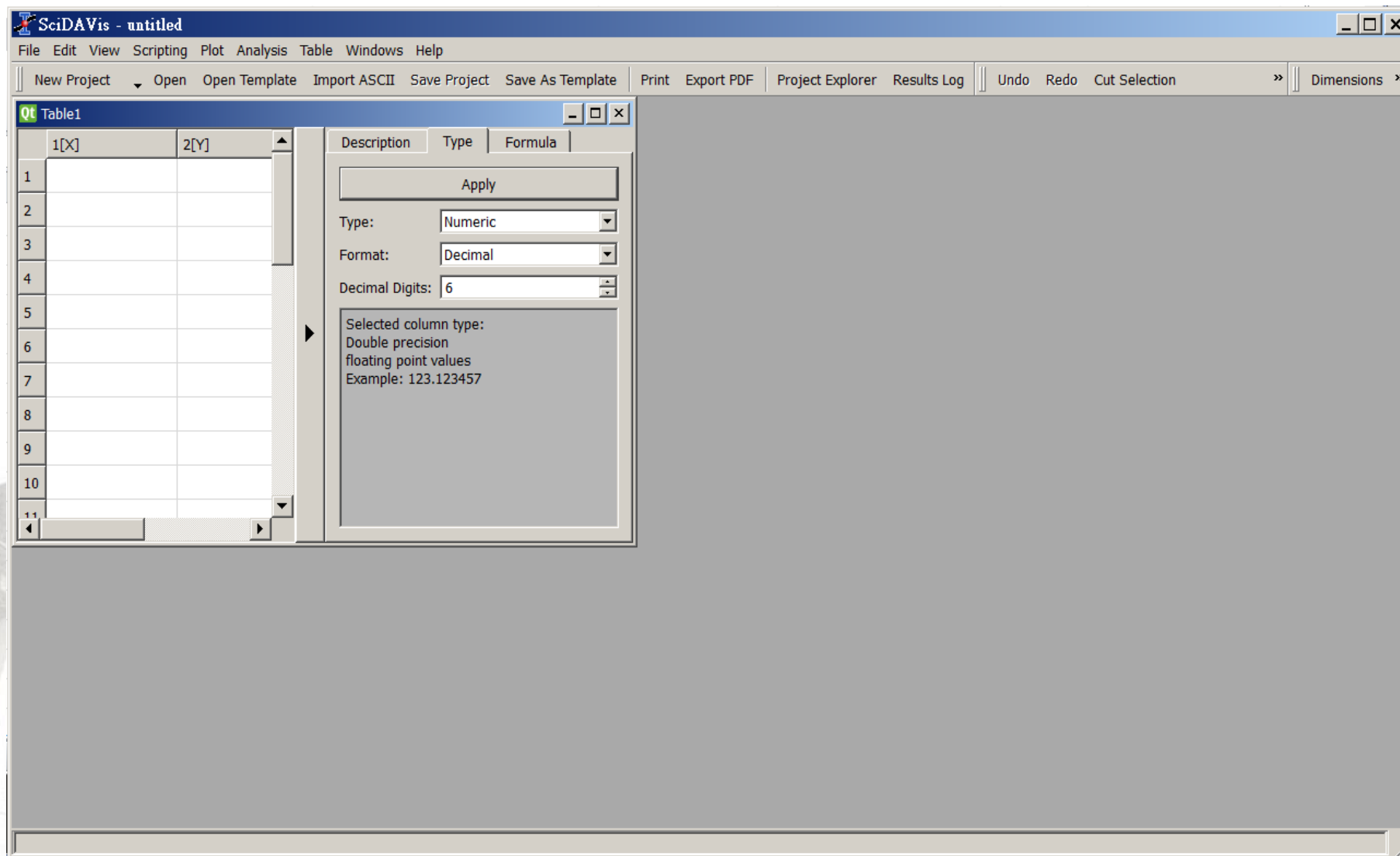


圖2：典型的SciDAVis版面，(A)為Result Log是數據分析得結果區，(B)為數據表格(表上方顯示Table)，而(C)為數據繪圖(圖上方顯示Graph)。

起始畫面



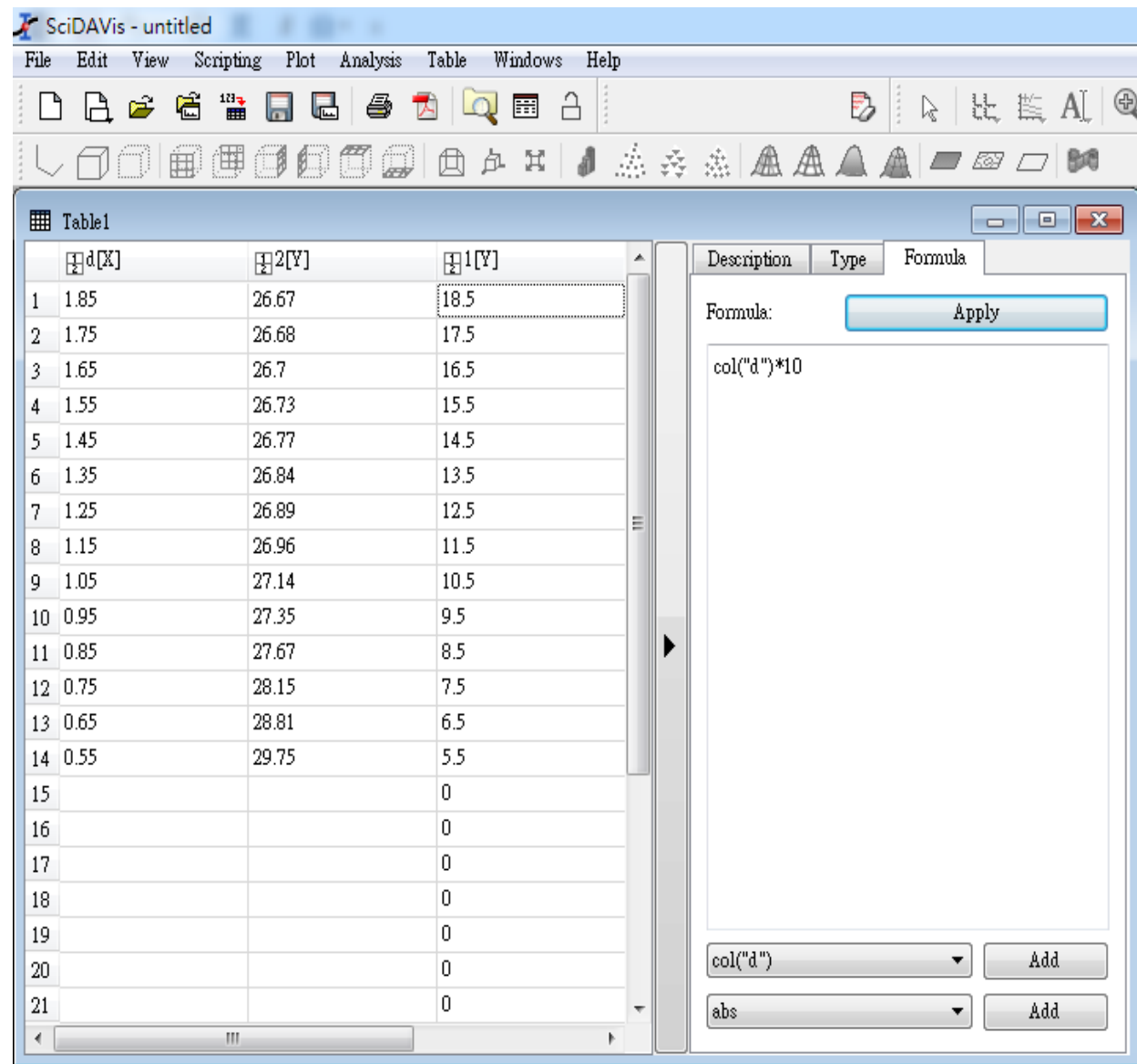
定義數據欄位

The screenshot shows the SciDAVis software interface. The main window displays a table named 'Table1' with two columns: '磁鐵間距Ed (cm)[X]' and '2[Y]'. The table contains 22 rows of data. To the right of the table is a configuration panel with tabs for 'Description', 'Type', and 'Formula'. The 'Description' tab is active, showing a text input field for 'Name' containing '磁鐵間距Ed (cm)' and a 'Comment' field. An 'Apply' button is visible above the input fields.

	磁鐵間距Ed (cm)[X]	2[Y]
1	1.85	26.67
2	1.75	26.68
3	1.65	26.7
4	1.55	26.73
5	1.45	26.77
6	1.35	26.84
7	1.25	26.89
8	1.15	26.96
9	1.05	27.14
10	0.95	27.35
11	0.85	27.67
12	0.75	28.15
13	0.65	28.81
14	0.55	29.75
15		
16		
17		
18		
19		
20		
21		
22		

圖4. 利用Table1左邊的Description、TYPE和Formula輸入數據的物理量、有效位數，或是用相關公式產生與1[X]欄位的相關數值。

FORMULA的功用



The screenshot shows the SciDAVis software interface. The main window displays a table with three columns: d[X], 2[Y], and 1[Y]. The data in the 1[Y] column is calculated as 10 times the value in the d[X] column. A 'Formula' dialog box is open on the right, showing the formula `col("d")*10` and an 'Apply' button. Below the formula input, there are two dropdown menus: one for 'col("d")' and one for 'abs', each with an 'Add' button.

	d[X]	2[Y]	1[Y]
1	1.85	26.67	18.5
2	1.75	26.68	17.5
3	1.65	26.7	16.5
4	1.55	26.73	15.5
5	1.45	26.77	14.5
6	1.35	26.84	13.5
7	1.25	26.89	12.5
8	1.15	26.96	11.5
9	1.05	27.14	10.5
10	0.95	27.35	9.5
11	0.85	27.67	8.5
12	0.75	28.15	7.5
13	0.65	28.81	6.5
14	0.55	29.75	5.5
15			0
16			0
17			0
18			0
19			0
20			0
21			0

圖5. 當1[X]欄位數據已經輸入，可利用Formula產生相關數值。圖中顯示將d[X]欄位的數值乘以10倍。



繪圖

SciDAVis - untitled

File Edit View Scripting Plot Analysis Table Windows Help

Table1

	d[X]	f[Y]	Description	Type
1	1.85	26.67		
2	1.75			
3	1.65			
4	1.55			
5	1.45			
6	1.35			
7	1.25			
8	1.15			
9	1.05			
10	0.95			
11	0.85			
12	0.75			
13	0.65			
14	0.55			
15				
16				
17				
18				
19				
20				
21				
22				

Plot

- Line
- Scatter
- Line + Symbol
- Special Line/Symbol
- Vertical Bars
- Horizontal Bars
- Area
- Pie
- Vectors XYXY
- Vectors XYAM
- Statistical Graphs
- Panel
- 3D Plot

Fill Selection with

- Cut
- Copy
- Paste
- Clear
- Normalize Selection
- f(x) Assign Formula Alt+Q
- Recalculate Ctrl+Return
- Show Comments
- Hide Controls F12
- Formula Edit Mode
- Select All
- Clear Table
- TeX Export to TeX...
- Add Column
- Go to Cell Ctrl+Alt+G

SciDAVis - untitled

File Edit View Scripting Plot Analysis Table Windows Help

Table1

	d[X]	f[Y]	Description	Type
1	1.85	26.67		
2	1.75			
3	1.65			
4	1.55			
5	1.45			
6	1.35			
7	1.25			
8	1.15			
9	1.05			
10	0.95			
11	0.85			
12	0.75			
13	0.65	26.67		
14	0.55	29.75		
15				
16				
17				
18				

Plot

- Line
- Scatter
- Line + Symbol
- Special Line/Symbol
- Vertical Bars
- Horizontal Bars
- Area
- Pie
- Vectors XYXY
- Vectors XYAM
- Statistical Graphs
- Panel
- 3D Plot

Description | Type | Formula

Apply

Name: 2

Comment:

2D圖形

The screenshot displays the SciDAVis interface with the following components:

- SciDAVis - untitled** window with a menu bar (File, Edit, View, Scripting, Graph, Tools, Analysis, Format, Windows, Help) and a toolbar.
- Text options** dialog box: Text Color (dark blue), Font (Font button), Alignment (Center), and buttons for OK, Apply, and Cancel. A rich text toolbar includes symbols for subscript, superscript, Greek letters, and mathematical operators.
- Plot details** dialog box: A tree view showing **Graph3** > **Layer1** > **Table1: d(X),f(Y)**. The **Plot type** is set to **Scatter**. Buttons for **Worksheet**, **OK**, **Cancel**, **Apply**, and **Plot Associations...** are visible.
- Graph3** window: A scatter plot titled "Title" with "X Axis Title" on the x-axis and values from 26.5 to 30 on the y-axis. A legend indicates the data series is **Table1_2**.

X Axis Title	Y Axis Value
0.65	28.8
0.75	28.2
0.85	27.7
0.95	27.4
1.05	27.2
1.15	27.0
1.25	26.9
1.35	26.8
1.45	26.7
1.55	26.6
1.65	26.6
1.75	26.6
1.85	26.6

圖格式化

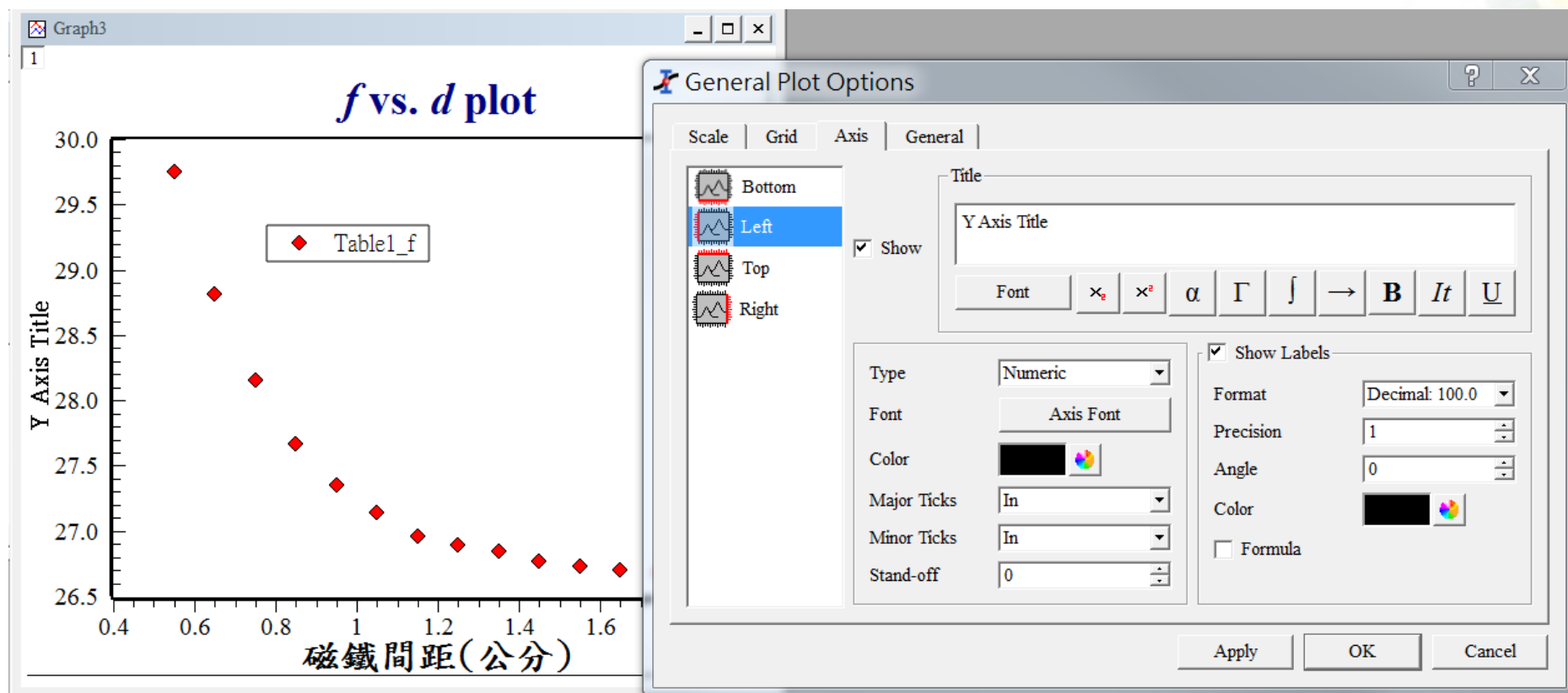
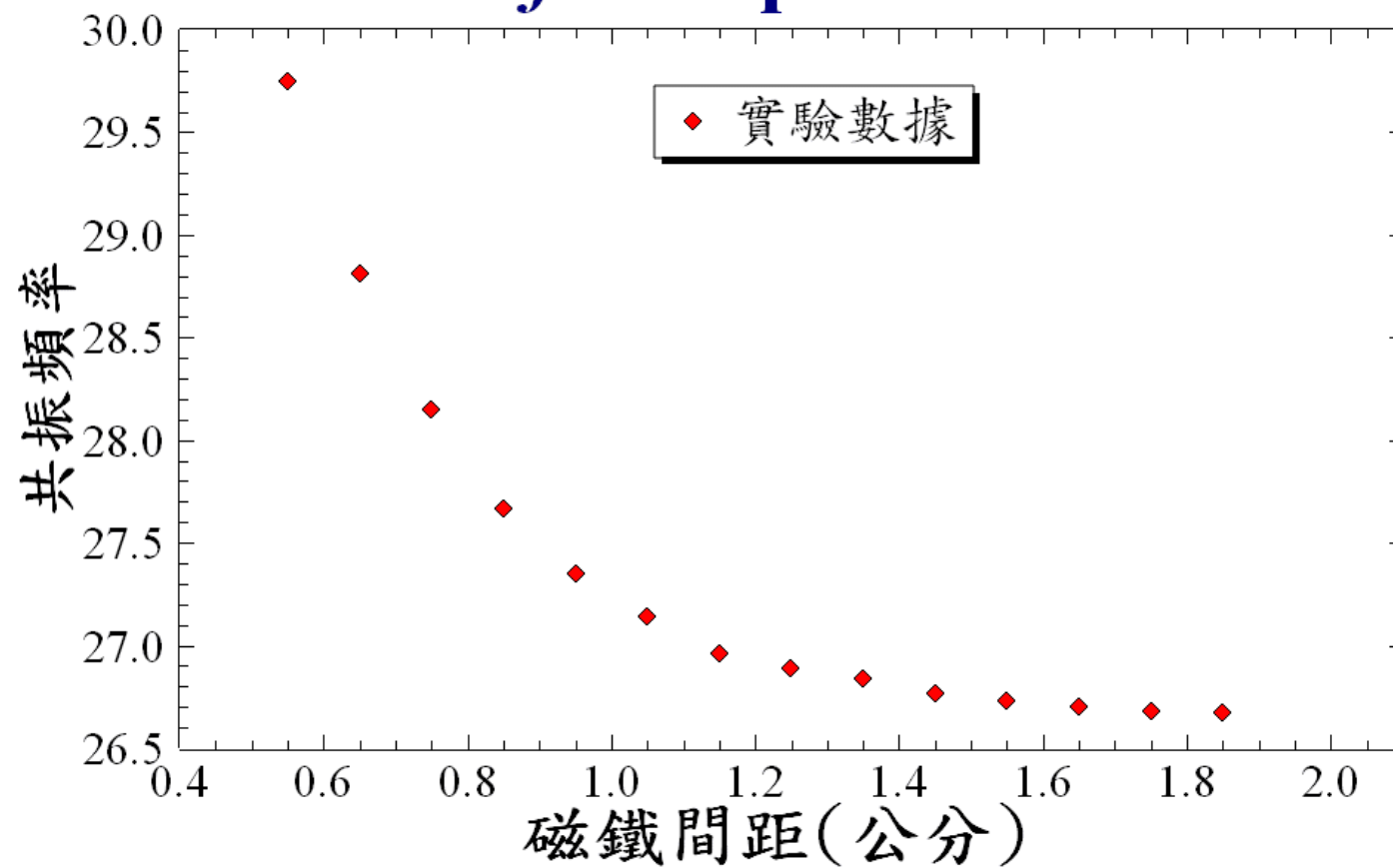


圖9. 用滑鼠連續兩次點選座標軸，可以改變數據圖顯示的範圍(Scale)，加上格線(Grid)、更改字型、大小等功能。



輸出圖檔

f vs. d plot



雙層圖檔

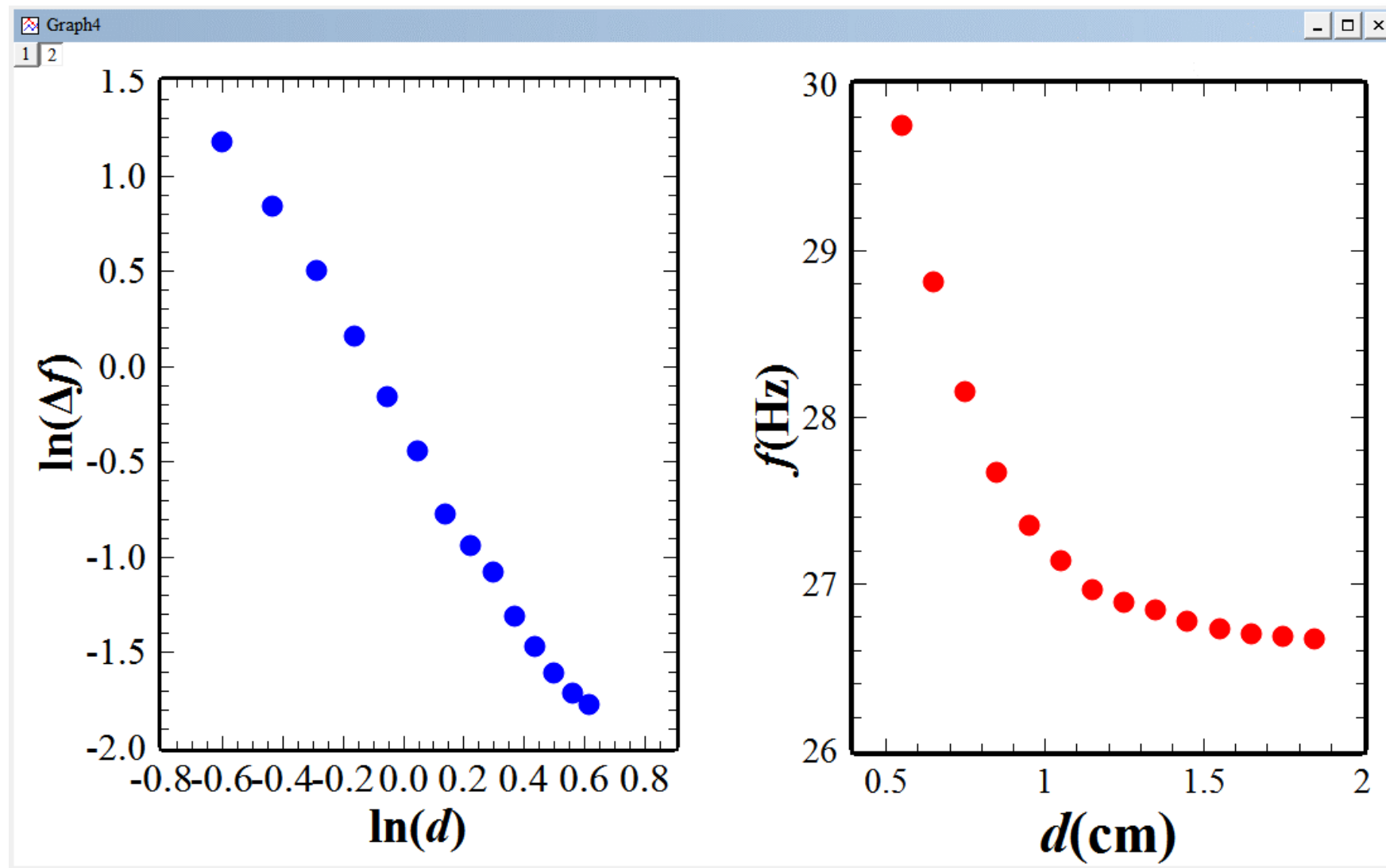
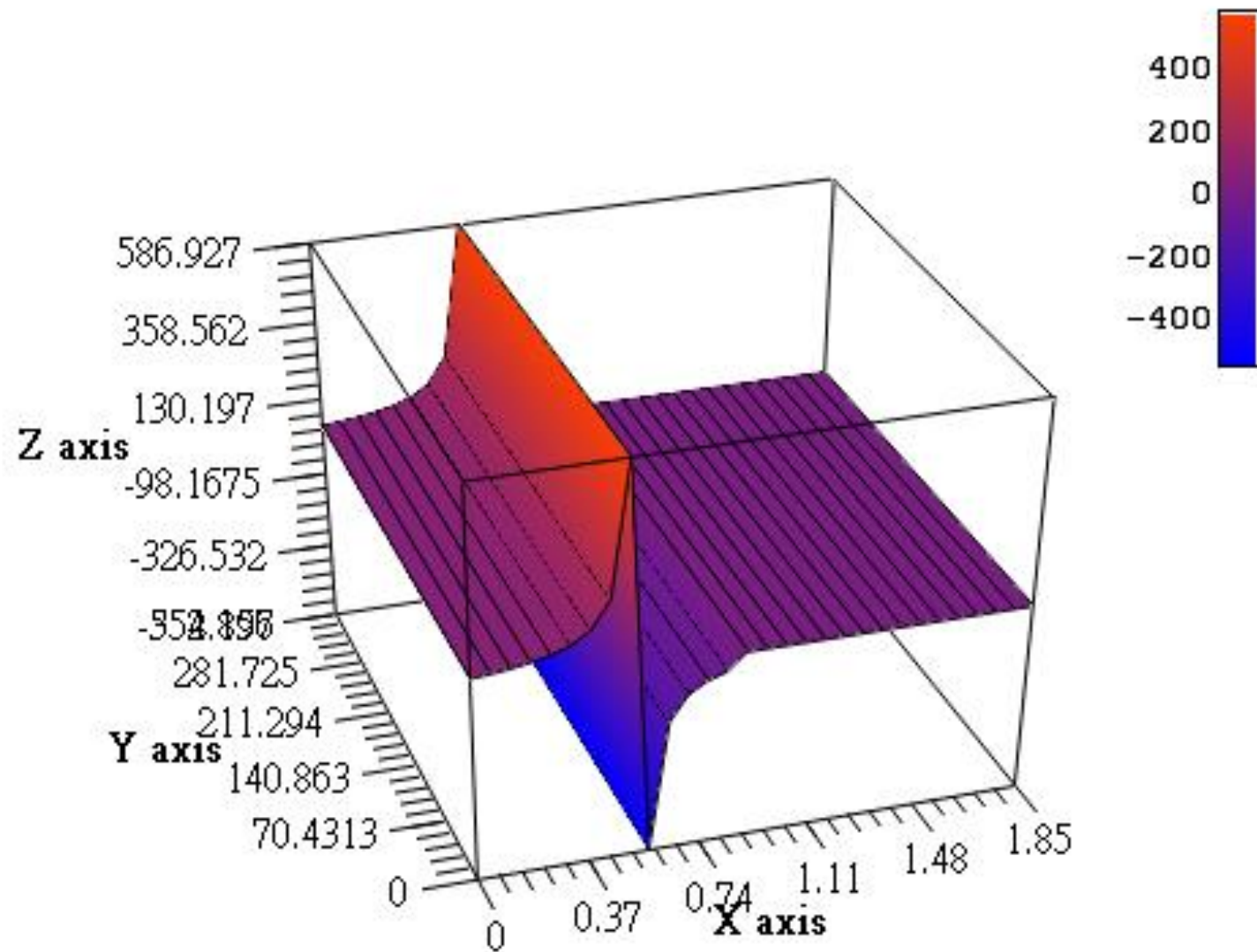


圖11. 雙層數據顯示圖。



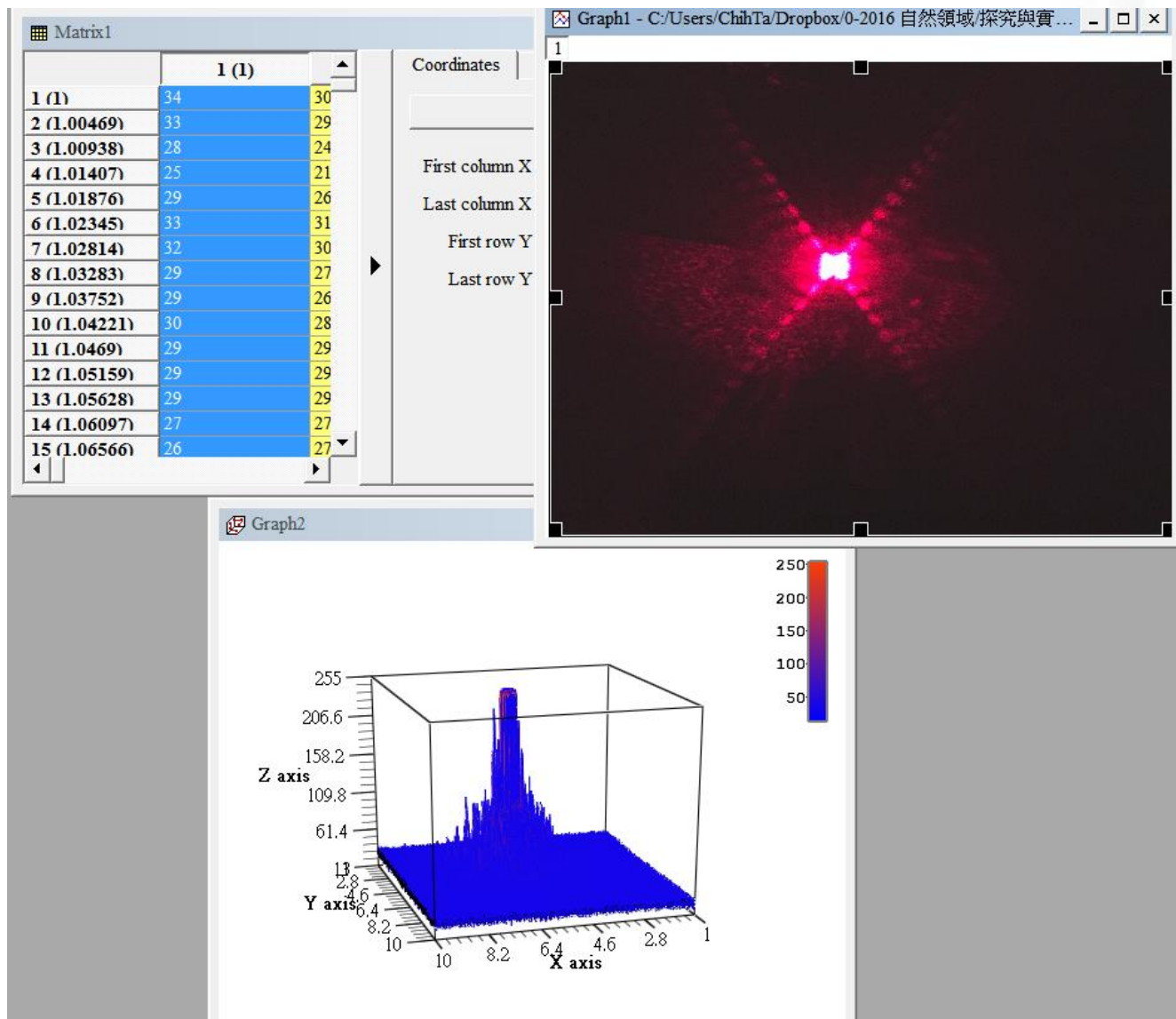
3D圖形

- 以 $Z = f(X, Y)$ 的函數方式繪出3D數據圖



輸入圖片檔

- 輸入圖形檔案，轉換成強度為Z軸，繪製出3D立體圖。



數據擬合

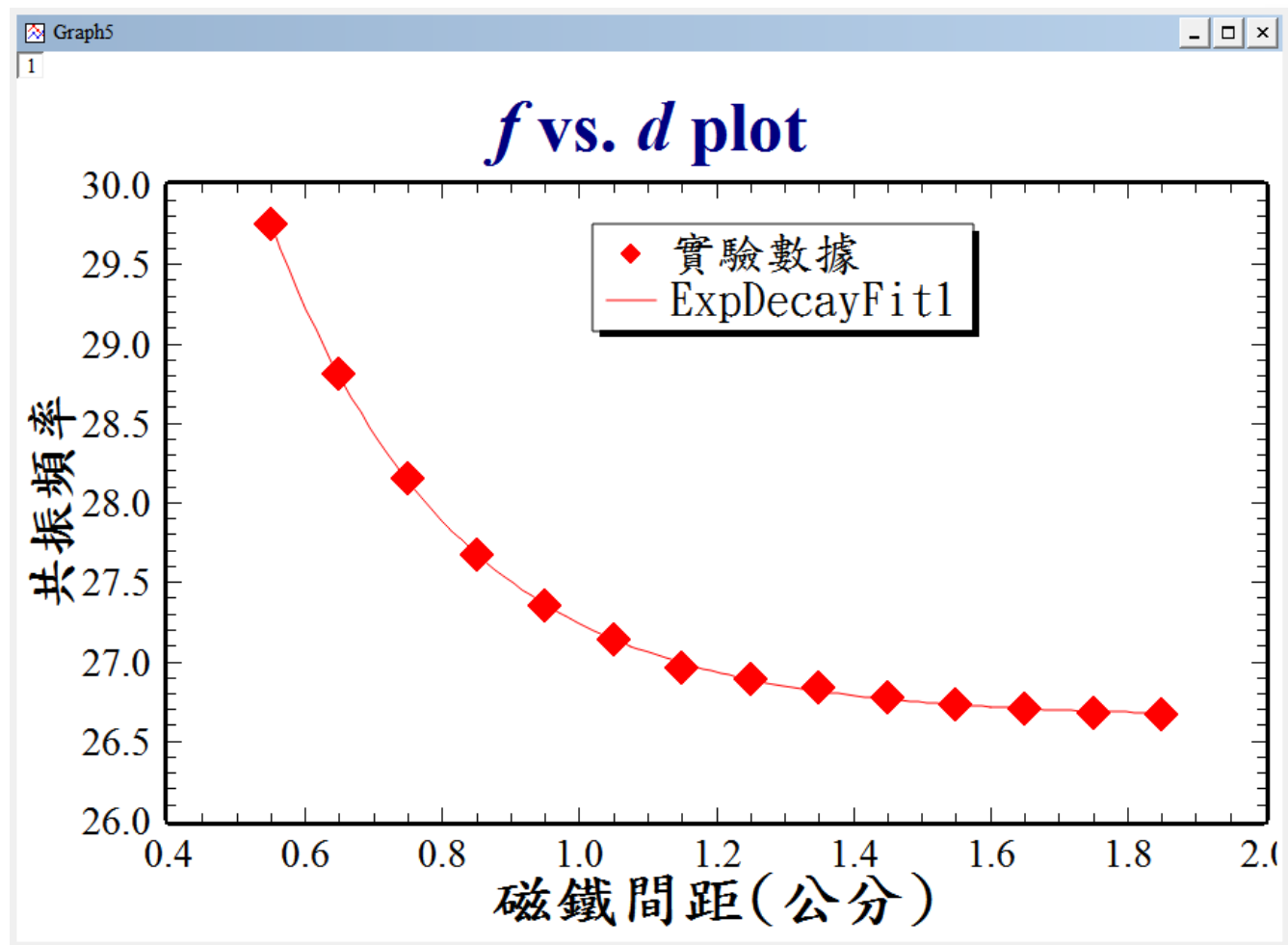
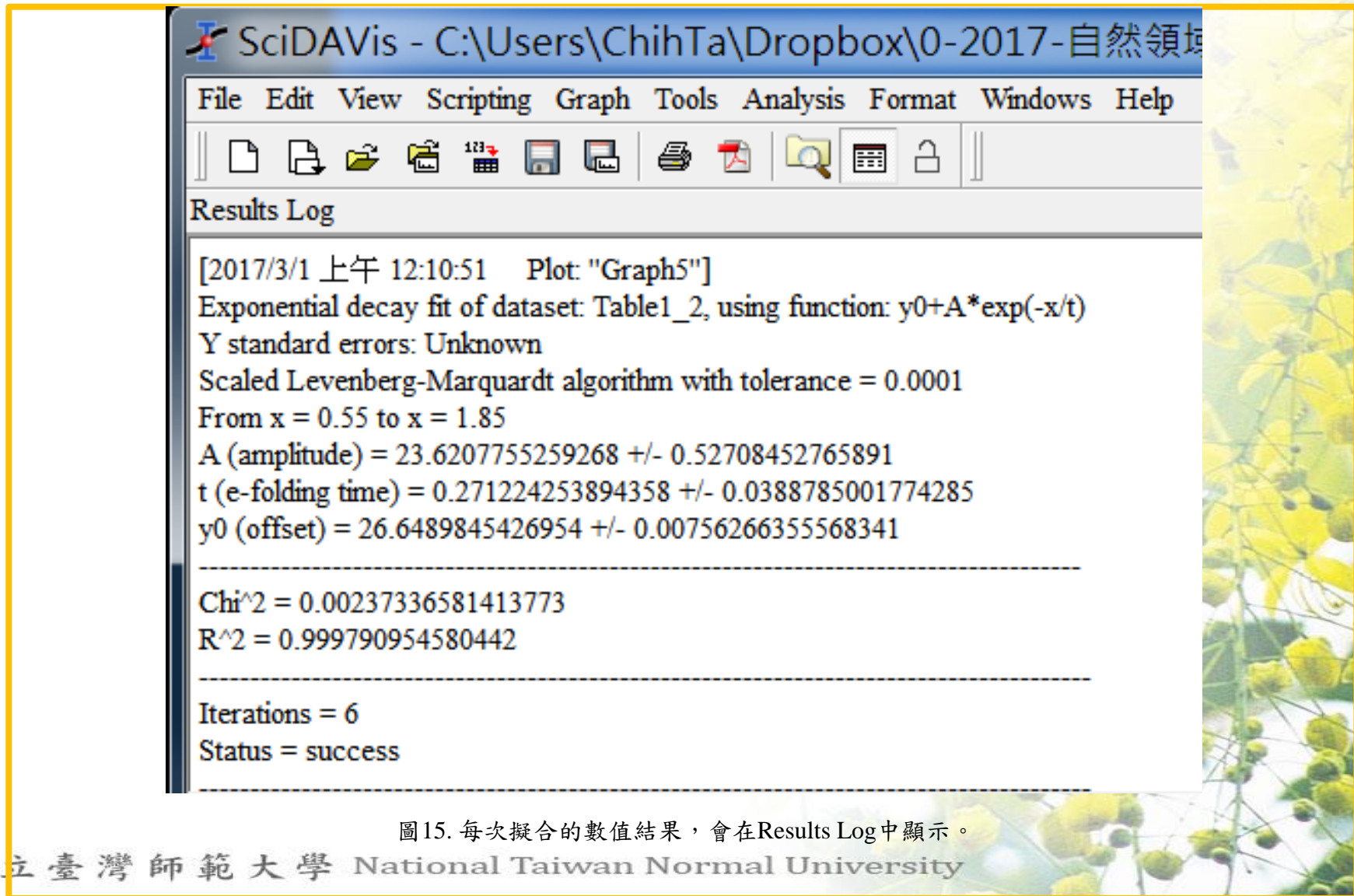


圖14. 顯示出圖10的數據擬合結果。



擬合結果



The screenshot shows the SciDAVis application window. The title bar reads "SciDAVis - C:\Users\ChihTa\Dropbox\0-2017-自然領域". The menu bar includes "File", "Edit", "View", "Scripting", "Graph", "Tools", "Analysis", "Format", "Windows", and "Help". The toolbar contains icons for file operations and analysis. The "Results Log" window is open, displaying the following text:

```
[2017/3/1 上午 12:10:51 Plot: "Graph5"]  
Exponential decay fit of dataset: Table1_2, using function:  $y_0 + A \cdot \exp(-x/t)$   
Y standard errors: Unknown  
Scaled Levenberg-Marquardt algorithm with tolerance = 0.0001  
From x = 0.55 to x = 1.85  
A (amplitude) = 23.6207755259268 +/- 0.52708452765891  
t (e-folding time) = 0.271224253894358 +/- 0.0388785001774285  
y0 (offset) = 26.6489845426954 +/- 0.00756266355568341  
-----  
Chi^2 = 0.00237336581413773  
R^2 = 0.999790954580442  
-----  
Iterations = 6  
Status = success
```

圖15. 每次擬合的數值結果，會在Results Log中顯示。

