PHYTO-PAM

1. PHYTO-PAM

2.

3.

4.

3

5. 11 V

12

6.

7. - PHYTO-ED “ ” “ ”

“ ” “ ”

8. PhytoWin Config “

/PhytoPamFolder/Data_ED ”

9. PHYTO-ED LED

10.

1 PhytoWin

2 1-2 ml

3 Gain

4 Settings Meas. Freq. 2 Channels

SAT-Pulse Fv/Fm Y Fv/Fm

5 Settings Meas. Freq. 32 Channels

Chl[MF32] a

6 Light Curve Start

7

8 Report File/Save Report

PHYTO-PAM

[illegible] PHYTO-PAM [illegible] 16 [illegible] PHYTO-PAM [illegible] 1Å [illegible] × 2Å [illegible] × 3Å [illegible] 4Å [illegible] Ä

[illegible] PHYTO-PAM [illegible] PHYTO-PAM [illegible]

1. PHYTO-PAM [illegible]

- PHYTO-PAM [illegible]
- [illegible]
- [illegible]
- [illegible] 3 [illegible] Ä
- [illegible] 11 V [illegible] 12 [illegible]
- [illegible]
- [illegible] PHYTO-ED [illegible]

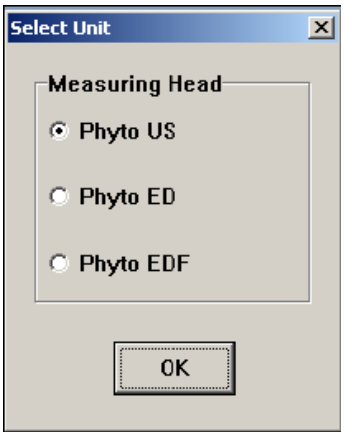
- PhytoWin ECÊ Config ,G,X[Ê M6 /PhytoPamFolder/Data_ED
- PHYTO-ED ,XÜuÄ LEDÊXM2ÊDE6ÊW,XÊÉÓ
- ÊN9ÊÄ

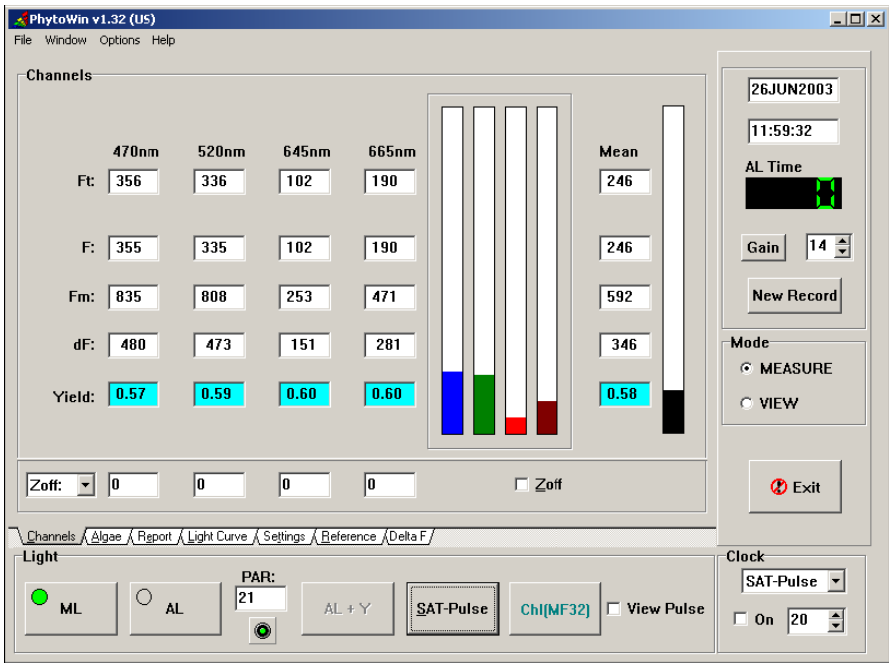
2. PHYTO-PAM

2.1

PhytoWin ECÊÉÄÊÑÉ,X PHYTO-ED

PHYTO-ED & OK GÊÊM6Ä





2.2

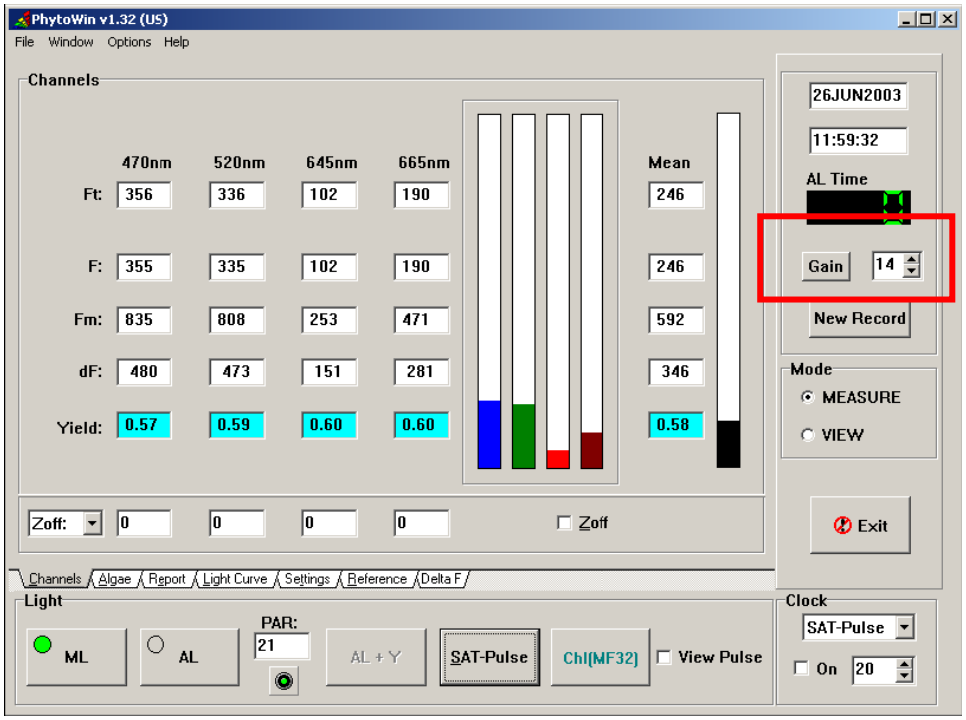
O PHYTO-ED X4v8F v&KX,

2 ml

x

M6 Gain vÅ 8V Gain ,XP

? Gain ,XD Gain L! 1



Ö

- Zoff
- 300 µg/L SE-
  300 µg/L

2.3

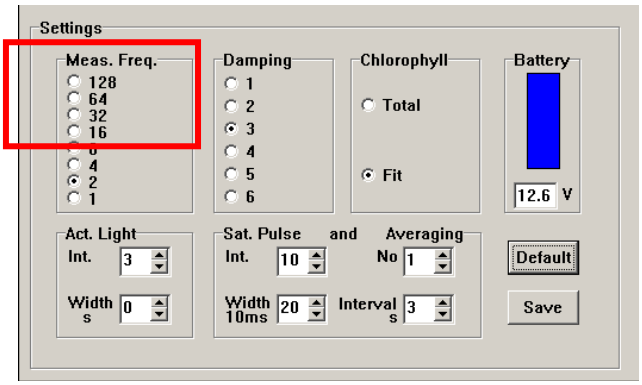
PHYTO-PAM ,X€ÑO_Ö 1ÅÊÍ 2ÅÜ 3ÅÊÍ

2.3.1-2.3.3 8VYÄ

2.3.1

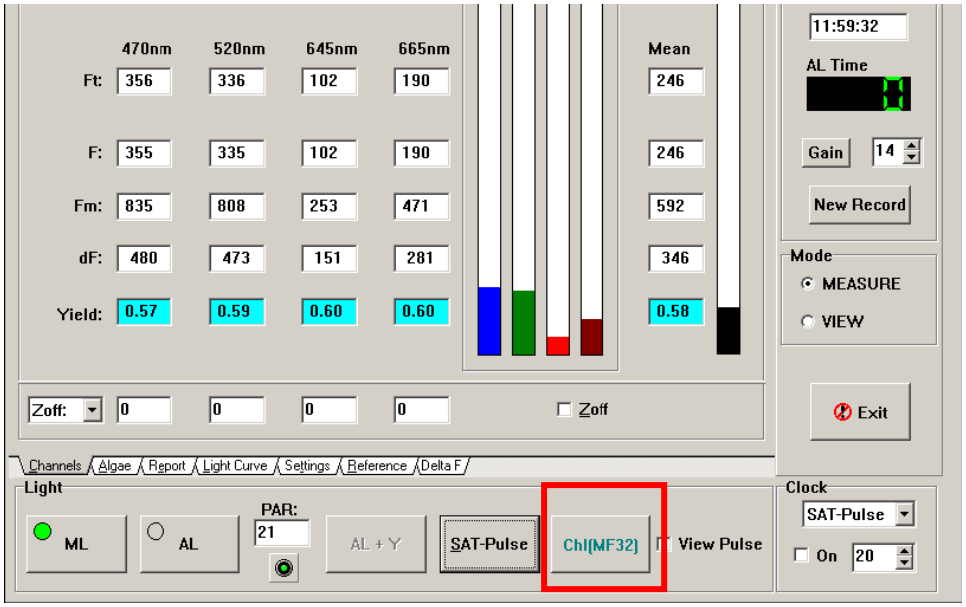
OE9 Settings 0Ì Meas. Freq.A5Ì 32ÅvÅ Ä4EpÅÊÍ

€,XNe]Ä



Chl[MF32]ÅvÅYECÊDÊÍ Report [

Â



€Ê Report 0Ì File/Save Report]DB

2.3.2 [illegible]

[illegible]

◆ [illegible]

[illegible]

[illegible]

[illegible]

◆ [illegible]

[illegible] Fm [illegible] Fv/Fm [illegible].

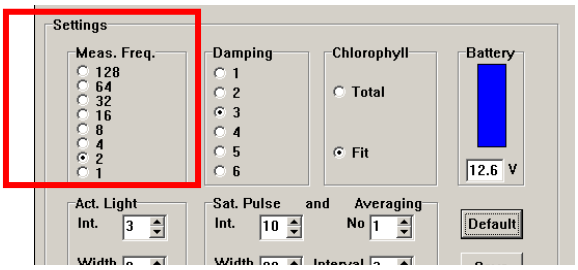
[illegible] Fm [illegible] 5-10

[illegible]

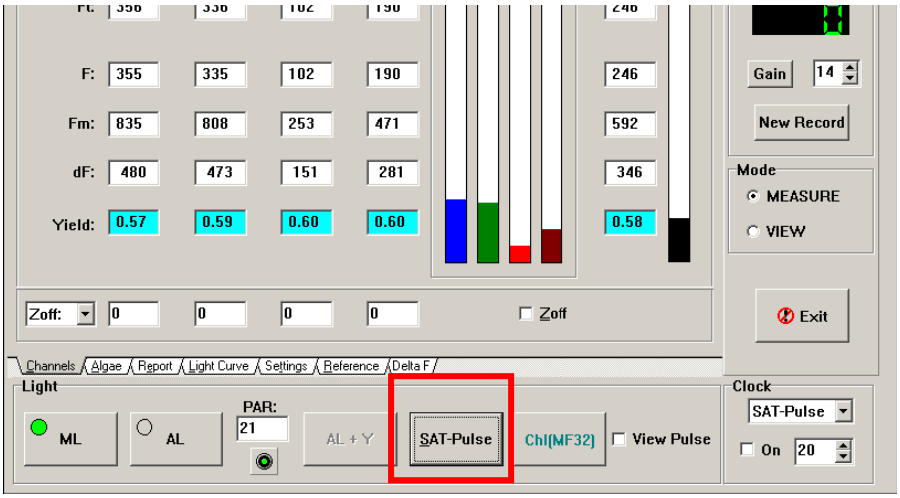
2.3.2.1 Fv/Fm [illegible]

[illegible] 2.2 [illegible] Settings [illegible] Meas. Freq. [illegible] 1 ê 2

[illegible]



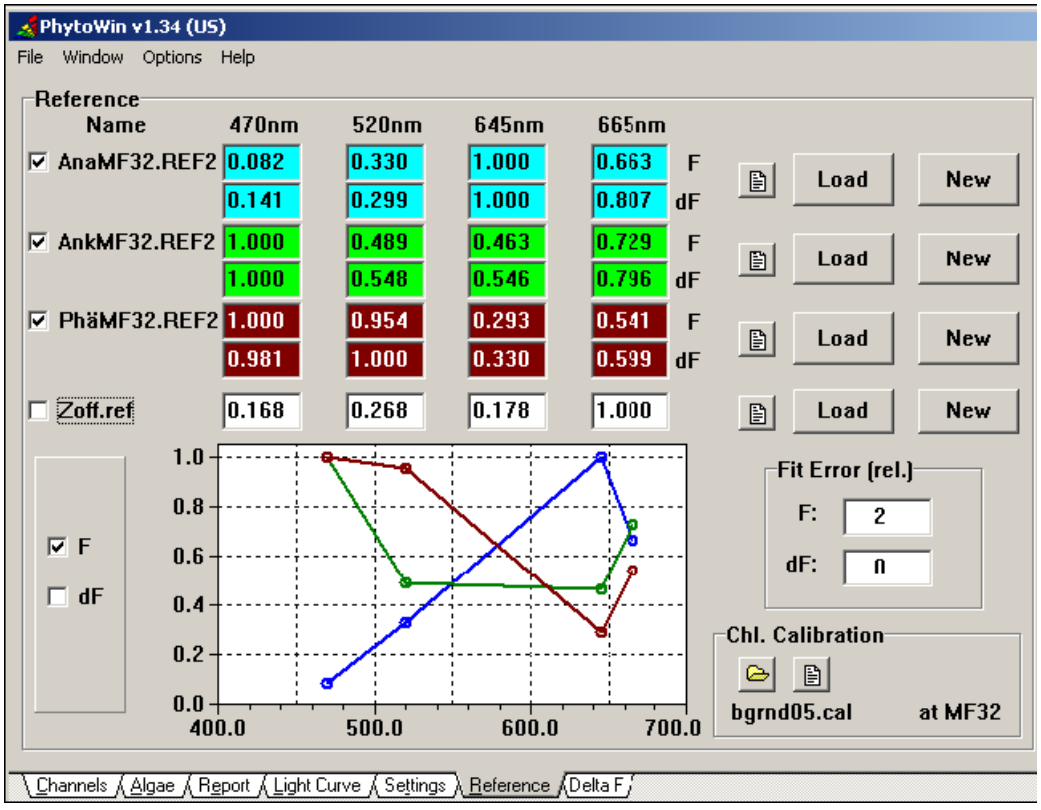
[illegible] **SAT-Pulse** [illegible] Yield Fv/Fm



2.5

PHYTO-PAM Reference Spectrum

- 2 ml
- Gain
- Reference New



Reference Load .ref .ref2

2.6

File / Save Report

View Mode

Report

File / Export Report

.CSV

EXCEL

PHYTO-PAM

View Mode

Reference

Load

Report

PHYTO-PAM

a

a

3

PHYTO-PAM

a

PHYTO-PAM

20 ml

2 ml

1-2

a

a

PHYTO-PAM

4 PHYTO-PAM [illegible]

PHYTO-PAM [illegible]

,Xh[illegible]

Vp[illegible] a [illegible] PHYTO-PAM ,X[illegible]

- 1T[illegible] 20 /[illegible]
- [illegible]
- [illegible] a D[illegible] /[illegible] a D[illegible]

  [illegible]

  /[illegible] PHYTO-PAM [illegible]KSC_[illegible]NX[illegible]
- [illegible]

  [illegible]

Vp4[illegible]

- [illegible] Fv/Fm [illegible]

  4[illegible]KS5[illegible] Fv/Fm 6[illegible]
- [illegible]

  [illegible] a [illegible]

  [illegible]

  2O,X[illegible]O,X[illegible]KS[illegible] [illegible]

  P[illegible]
- [illegible] PHYTO-PAM [illegible] /[illegible]

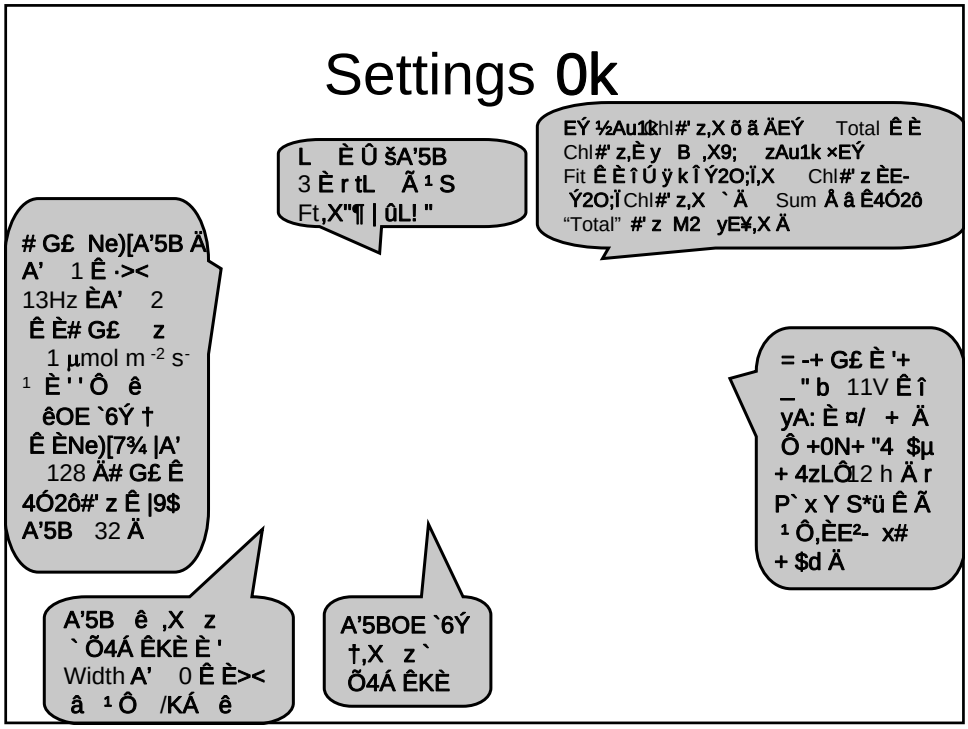
  [illegible]O2O5xE[illegible]

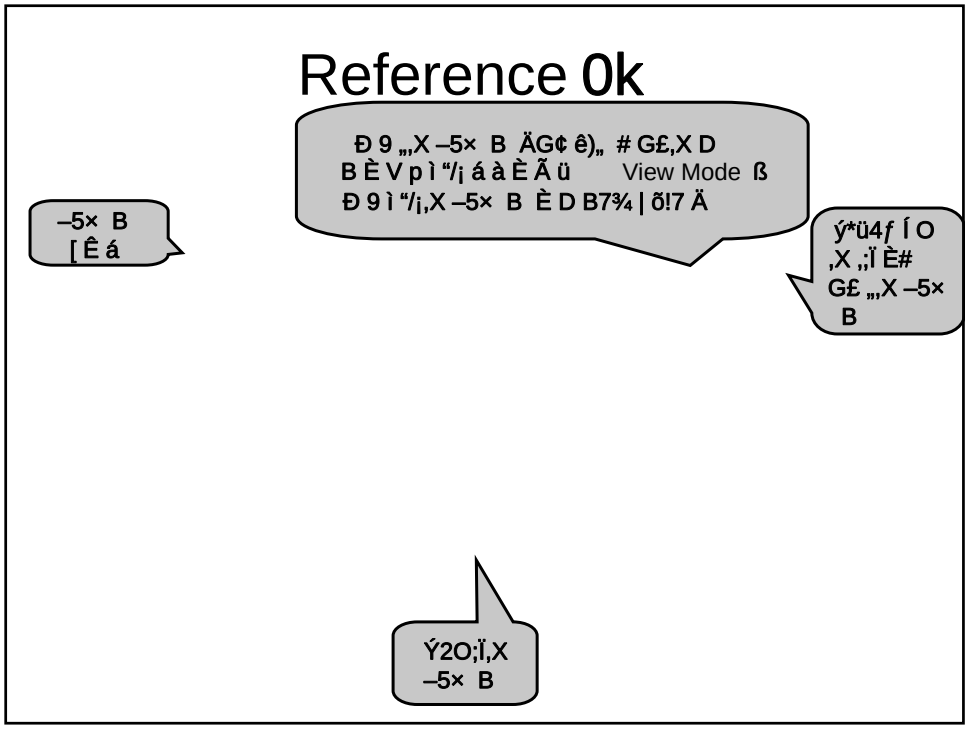
  [illegible] Zhang et al, 2008[illegible]

  PHYTO-PAM [illegible] a [illegible]

  [illegible]O5x[illegible]O,X[illegible]

  ,X5[illegible]


Settings 0k
L È Û šA'5B
3 È r tL Ã ¹ S
Ft,X"¶ | ûL! "
EÝ ½Au1k hl#' z,X õ ã ÄEÝ Total Ê È
Chl#' z,È y B ,X9; zAu1k ×EÝ
Fit Ê È î Ú ÿ k Î Ý2O;Ï,X Chl#' z ÈE-
Ý2O;Ï Chl#' z,X ` Ä Sum Å â Ê4Ó2ô
"Total" #' z M2 yE¥,X Ä
G£ Ne)[A'5B Ä
A' 1 Ê ·><
13Hz ÈA' 2
Ê È# G£ z
1 µmol m -2 s-
¹ È ' ' Ô ê
êOE `6Ý †
Ê ÈNe)[7¾ |A'
128 Ä# G£ Ê
4Ó2ô#' z Ê |9$
A'5B 32 Ä
= -+ G£ È '+
_ " b 11V Ê î
yA: È ¤/ + Ä
Ô +0N+ "4 $µ
+ 4zLÔ12 h Ä r
P` x Y S*ü Ê Ã
¹ Ô,ÈE²- x#
+ $d Ä
A'5B ê ,X z
` Õ4Á ÊKÈ È '
Width A' 0 Ê È><
â ¹ Ô /KÁ ê
A'5BOE `6Ý
†,X z `
Õ4Á ÊKÈ


Reference 0k
Ð 9 „,X –5× B ÄG¢ ê)„ # G£,X D
B È V p ì "/¡ á à È Ã ü View Mode ß
Ð 9 ì "/¡,X –5× B È D B7¾ | õ!7 Ä
–5× B
[Ê á
ý*ü4ƒ Í O
,X ,;Ï È#
G£ „,X –5×
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Ý2O;Ï,X
–5× B

Reference 0k

/ F,X
–5× B

/ dF,X
–5× B

F ` dF,X
–5× B

Reference Spectra ` Excitation Spectra KÈ,XE@ 6

- Reference Spectra ÄRS Å Ö5×<% Z!£ Ä PHYTO-PAM,X%" ¥- "#) Ä PHYTO-US Ã PHYTO-ED ê PHYTO-EDF Å,X ¾ <AÃ Â È ¾ EÖ Ü b Ô Ä ¾ <
- Excitation Spectra ÄES Å Ö Ú!£ Ä ¾ <7¾ D•,XAÃ Â#\ ] â Ä ¢ Reference Spectra Å k Î,XEî*ü _ Spectra È Ã ü ê+ 8× È Y E •
- RS ES Ö Ú ¢!£ Ä PHYTO-PAM k 9,X RS E@ 6 ä Ã ¹ E •,X ES
- ES RS Ö ¢ ª Ø9‹ k,X ESE@ 6 äEÖ Ü b7¾ Å ,XPHYTO-PAM,XRS

Delta F0k

- *ü b# G£ b Ü 0*ü# û Ý G,X Active Chl
- Active Chl á ™ â Ê4Ó2ô,X4± Í#' z Ý G ÈE¬ â •,X Ü 0*ü# û Ý G

Zealquest WALZ

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WALZ

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021-51556111 Email walz@zealquest.com

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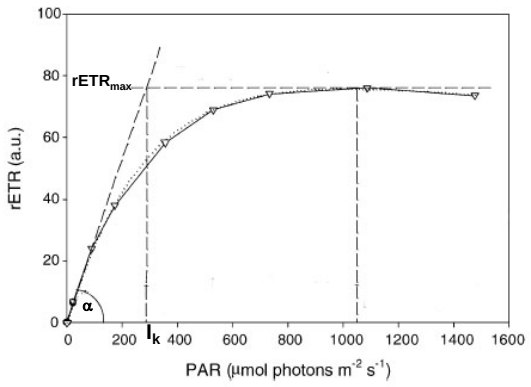
rETR PAR

10 s

Rapid Light Curves



Zealquest **WALZ**

- **$P=Pm\ (1-e^{-\alpha\ PAR/Pm})\ e^{-\beta\ PAR/Pm}$**

  Platt et al, J. Mar. Res., 1980, 38: 687-701

- **$P=Pm\ \tanh(\alpha\ PAR/Pm)$**

  Jassby & Platt, Limnol. Oceanogr., 1976, 21: 540-547

- **$P=Pm \cdot \alpha \cdot PAR/\sqrt{Pm^2+(\alpha \cdot PAR)^2}$**

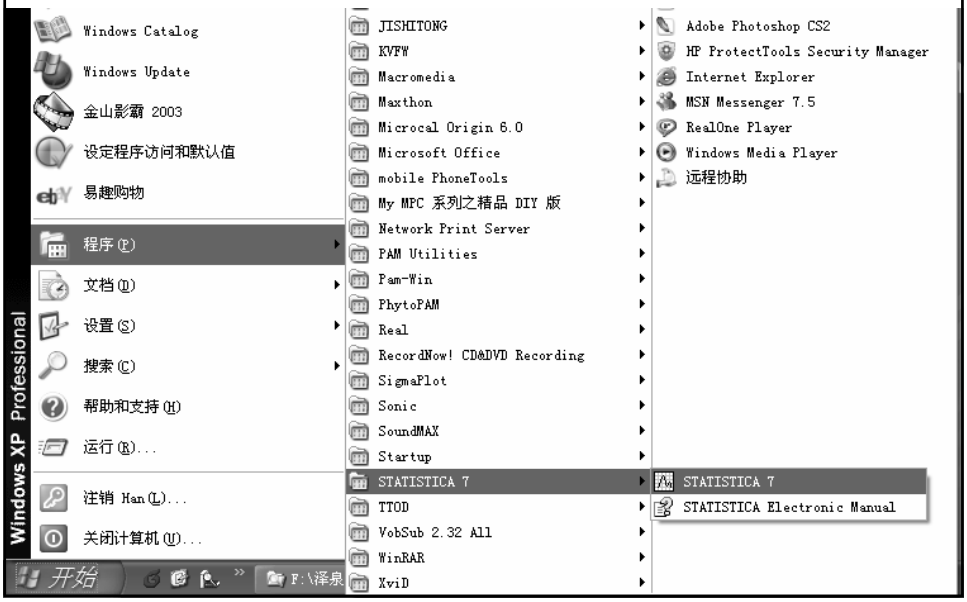
  Smith, PNAS, 1936, 22: 504-511

Zealquest **WALZ**

- **P** **rETR**
- **P_m:** **$rETR_{max}$**
- α
- β
- **$I_k=P_m/\alpha$**

Zealquest WALZ

Statistica



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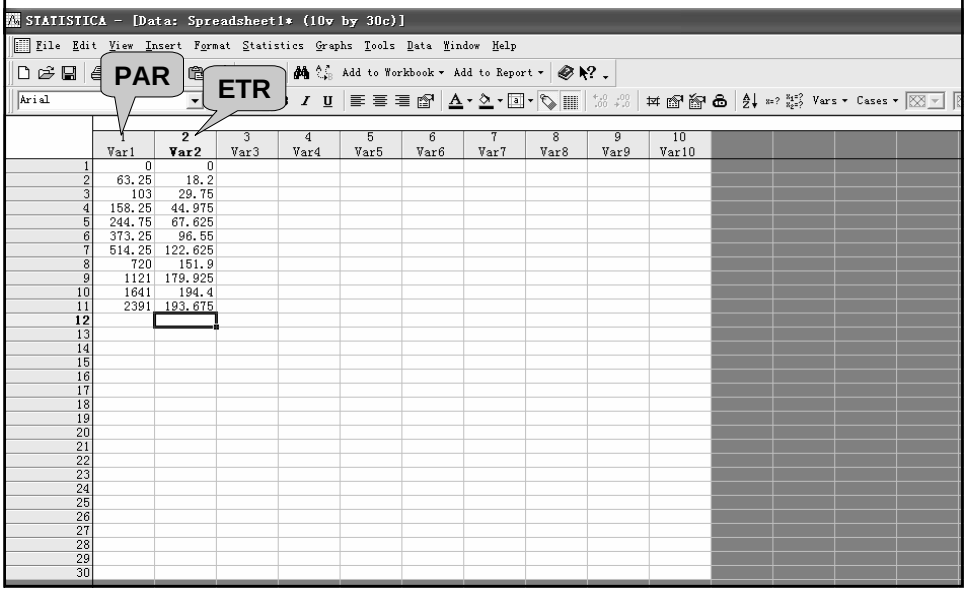

	1 Var1	2 Var2	3 Var3	4 Var4	5 Var5	6 Var6	7 Var7	8 Var8	9 Var9	10 Var10
1	0	0								
2	63.25	18.2								
3	103	29.75								
4	158.25	44.975								
5	244.75	67.625								
6	373.25	96.55								
7	514.25	122.625								
8	720	151.9								
9	1121	179.925								
10	1641	194.4								
11	2391	193.675								
12										
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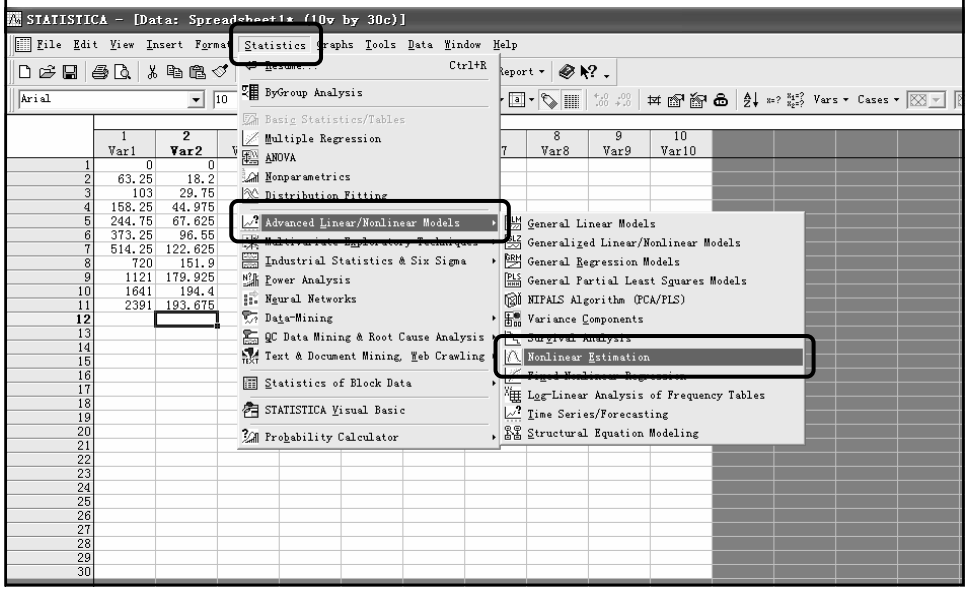
Zealquest **WALZ**



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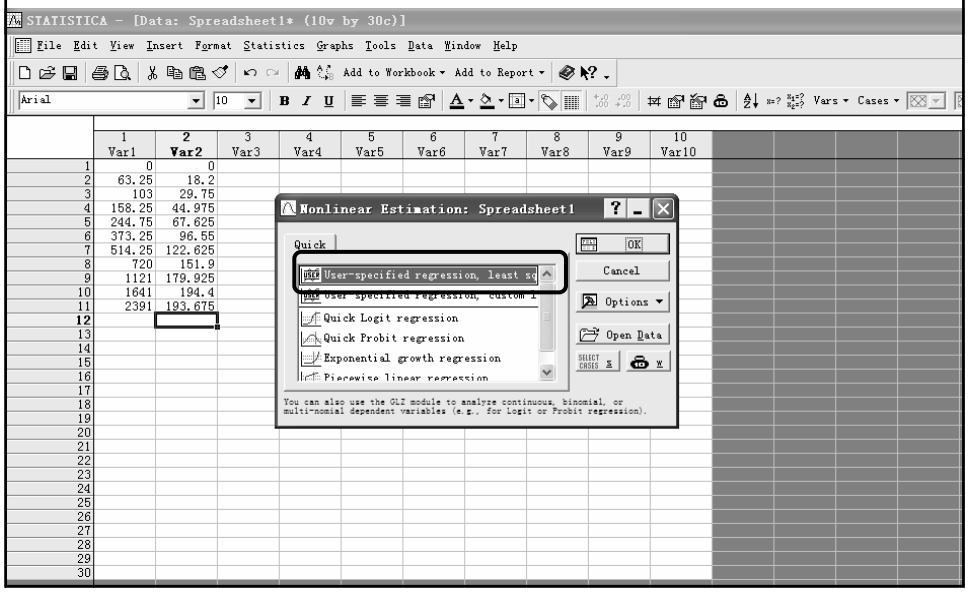

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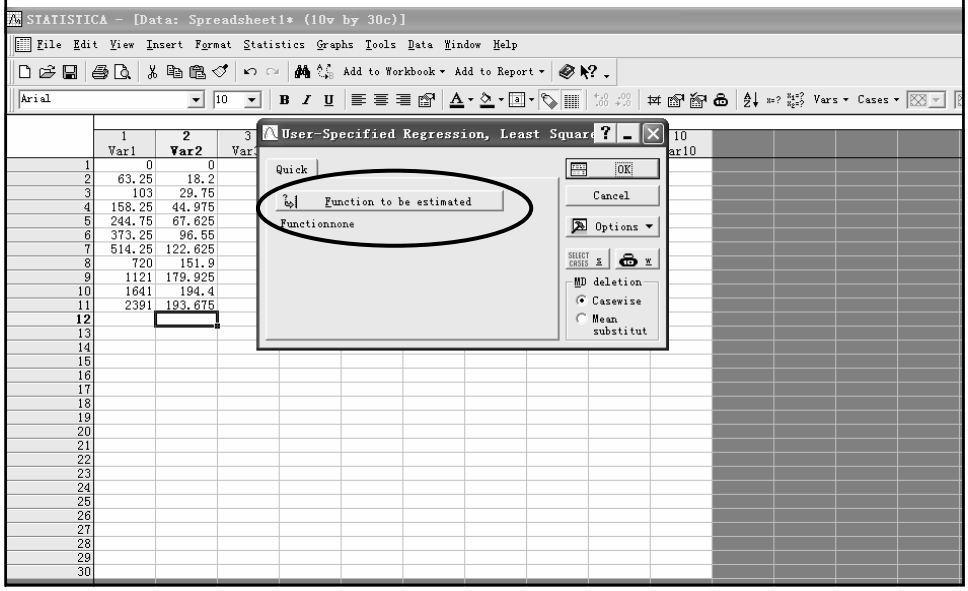

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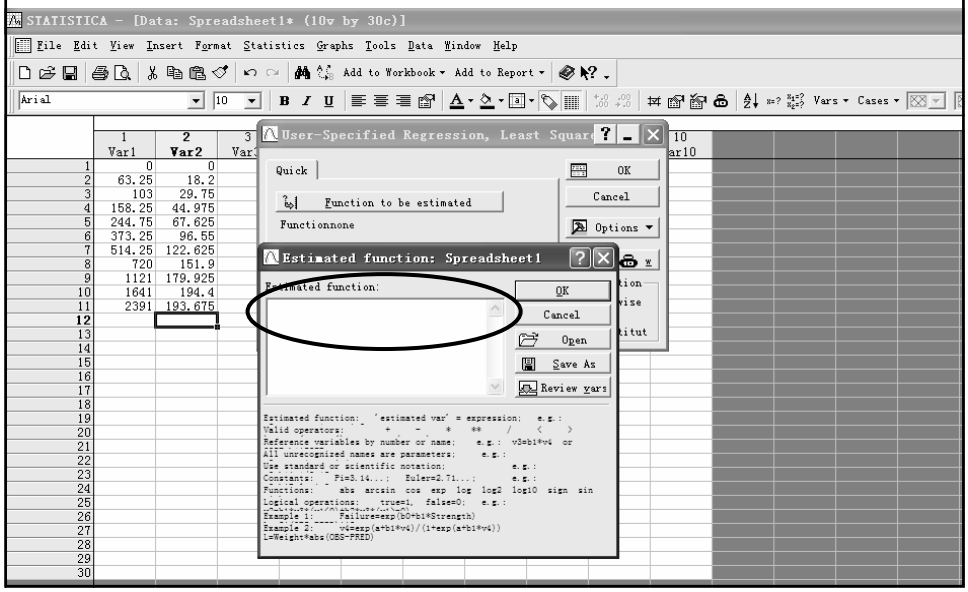

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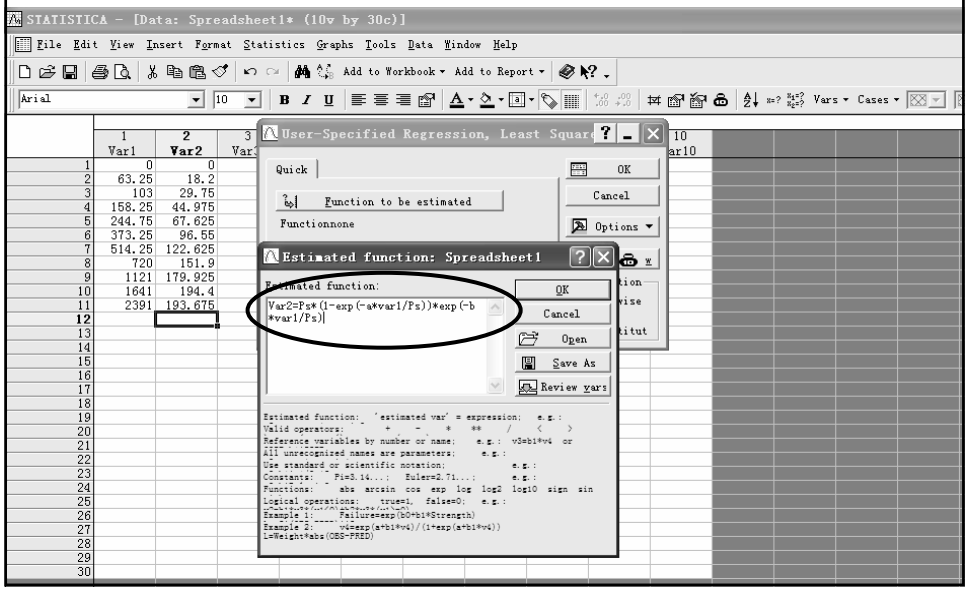

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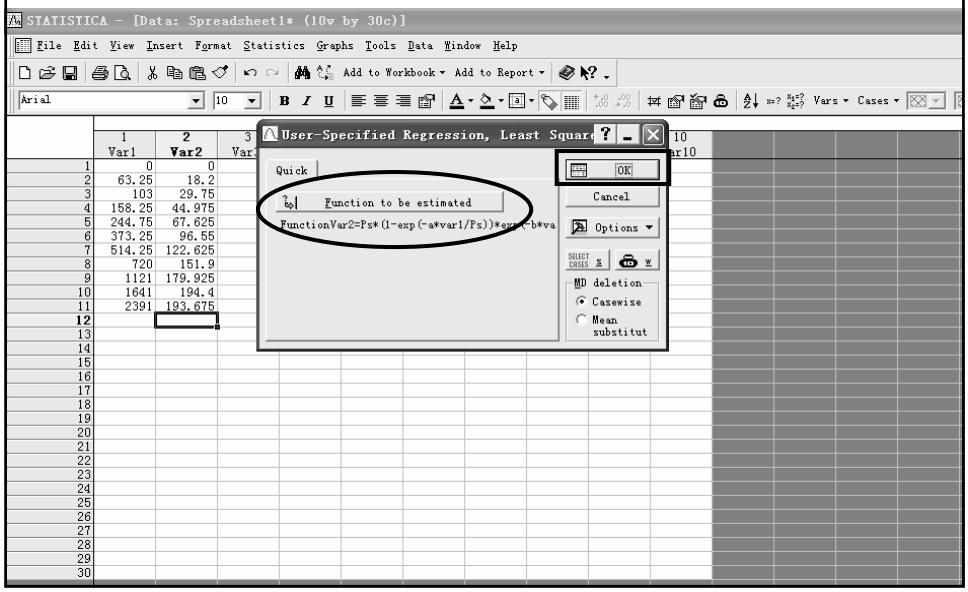

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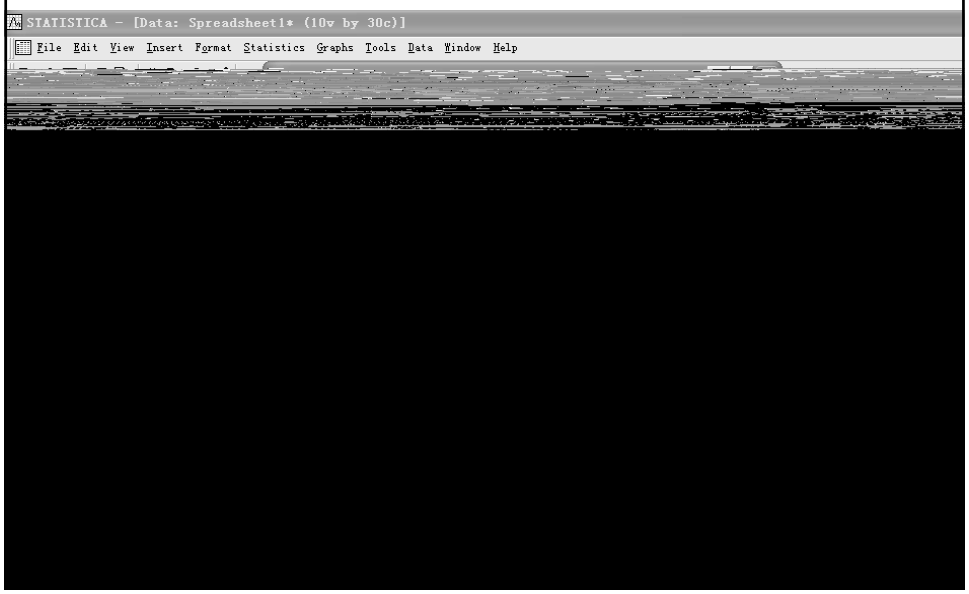

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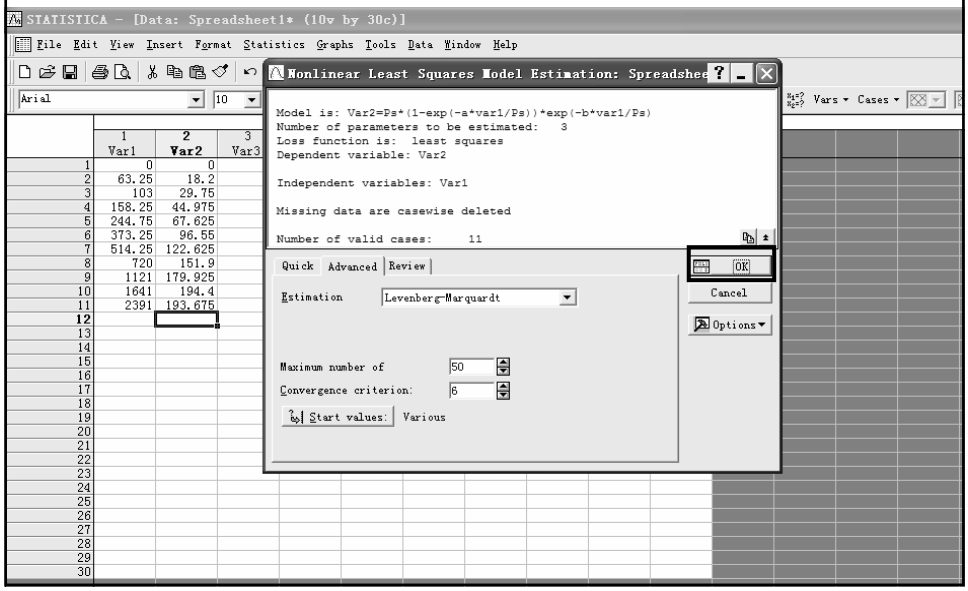

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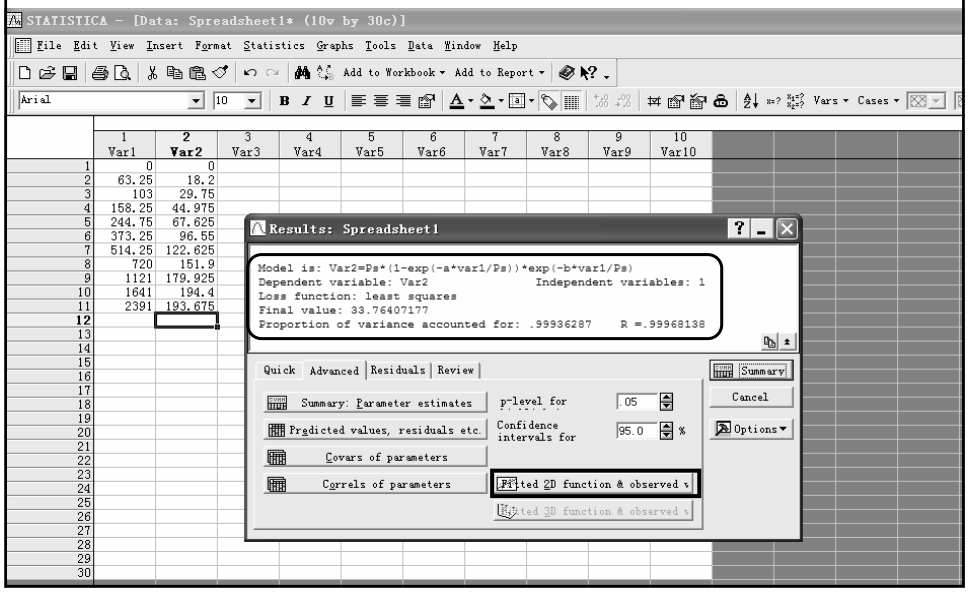

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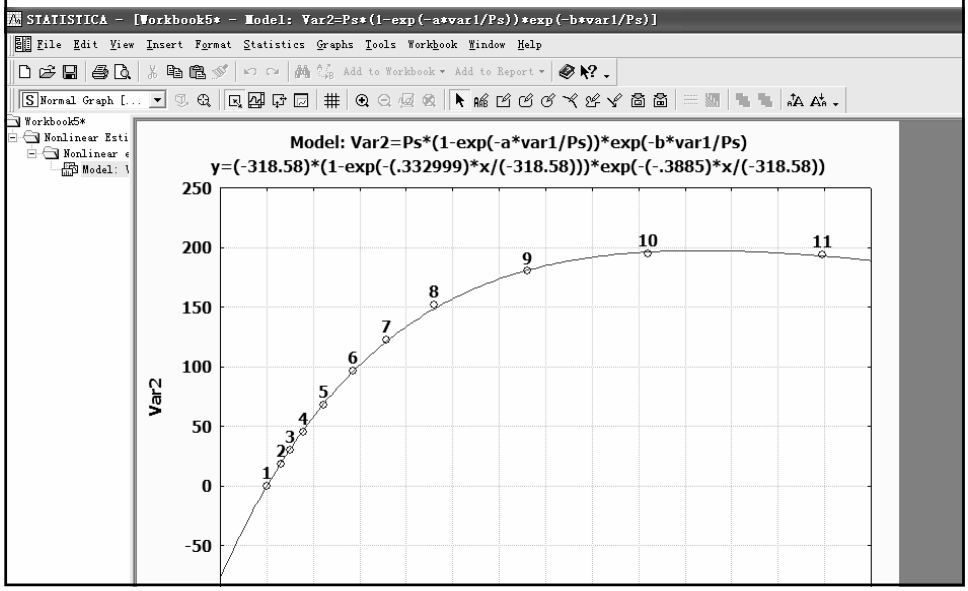

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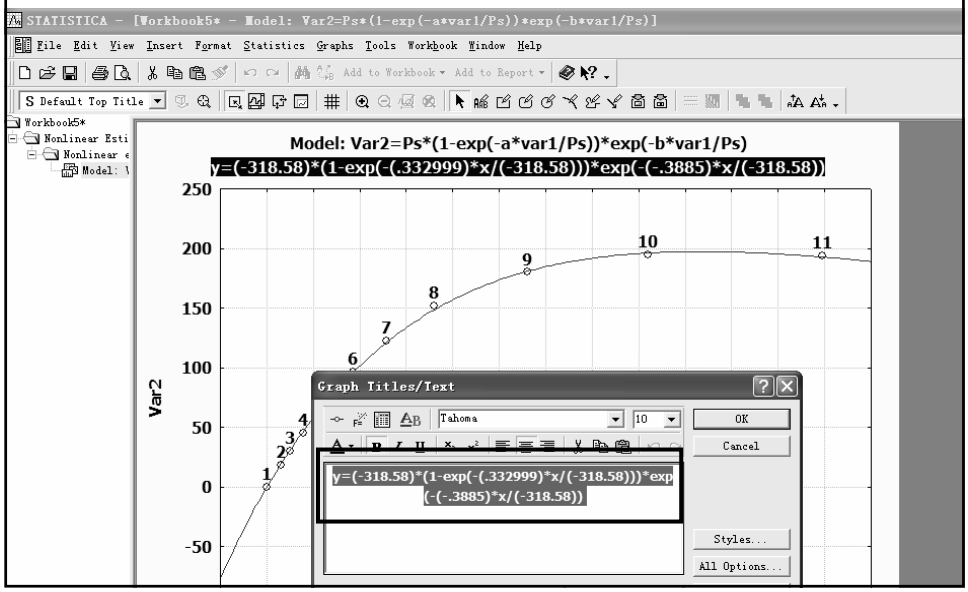

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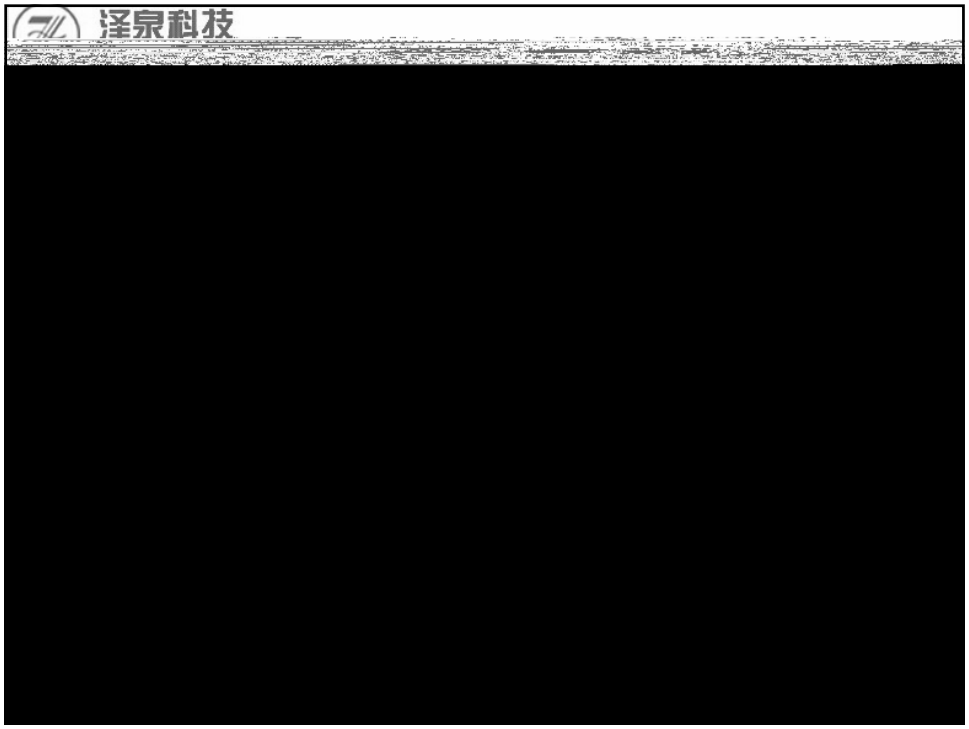

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walz@zealquest.com