

PRL TECHNICAL NOTE

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A SOFTWARE PACKAGE ON
PLOTTING WITH PLOT -10

By

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A SOFTWARE PACKAGE ON PLOTTING WITH PLOT-10

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ABSTRACT

This software package enables users to plot different types of graphs using PLOT-10 graphic package. It can be used for plotting Linear, Log-Linear, Log-Log, and Histogram with various line patterns and markers. Optionally, points can be joined with line without smoothing. The package permits users to draw a number of plots on the same axes or different axes on the same page. It allows different plots to be displayed either with various line patterns or with various marker or markers, joining each other by fixed line patterns. This package can be called directly in user's program. Alternatively, user can use main program containing this subroutine. Main program is also available in conversational mode to facilitate on the usage of this package. This package is developed in FORTRAN on DEC-1091 system at PRL.

1. Introduction:

This software package is developed to plot different types of graphs using PLOT-10 graphic package. It is tested on Tektronics graphic unit whose device number is 4012 and option number is 1, which can be described as (4012, 1).

This package makes use of Graphic Display unit (G.D.U.) as plotting unit. The display surface size is 131.2 and 100 G.D.U. on X-axis and Y-axis respectively. This package is developed in FORTRAN language. Two main programs have been developed to draw general purpose plotting by using this package as sample programs. The package can be used to plot single or multiple plot on the same axes or different axes on same page.

1.1 Types of Plots:

The package can be used to draw the following types of plots:

- (a) Linear
- (b) Log-Linear
- (c) Log-Log
- (d) Histogram

(a) Linear: User can draw either single or multiple plots on the same axes or different axes or without axes; or with grid. Points can be joined without smoothing if required. Points can be displayed by various markers, which can be joined by continuous line if required. Divisions on both the axes and format of scaling are done with the help of supplied arguments NXD, IDX, IWX, NYD, IDY, IWY.

(b) Log-Linear: User can avail of all the facilities as described in section (a) except grid. User can have

any no. of cycles according to the requirement. In case of Log scale, minimum and maximum of world co-ordinates must be given in the power of ten. No. of divisions and format of scaling on both the axes are decided by routine itself. In case of log scale, user has to supply zero value to the arguments NYD, IDY, IWY.

(c) Log-Log: User can avail of all the facilities as described in section (b). User can have log scale on both the axes for any no. of cycles. Routine decides divisions and format of scaling for both a the axes. User has to supply zero value to the arguments NYD, IDY, IWY, NXD, IDX, IWX.

(d) Histogram: User can draw Histogram or curve in shape of Histogram. The points are joined without smoothing. User can have multiple Histogram on same axes or different axes on same page.

1.2 Salient Features of Package:

1. Scaling: Scaling is done with the help of minimum and maximum of screen co-ordinates as well as world co-ordinates. Maximum and Minimum of world co-ordinates can be supplied by user or generated by routine itself. Divisions and format of scaling on both the axes are done according to users requirement by supplying its corresponding arguments. Scaling is available either with axis or without

axis or with grid. In case of Log scaling, Divisions and format of scaling on either axis are decided by routine itself. The package will decide the margin between axes and Label as well as Heading.

2. Line-Pattern: The package offers various types of Line patterns. It can be changed according to user's requirement. Besides, it changes automatically for more than one curves on same axes or different axes to be plotted. Default line pattern number is zero. Appendix B gives various line patterns and associated number.

3. Marker: The package offers various types of markers. It can be changed according to user's requirement. Also, it changes automatically for more than one curves on same axes or different axes to be plotted. Default marker is zero. Appendix A gives various types of markers and associated number.

4. Nature of Plotting:

The following types of plotting are possible:

- (a) Joining points smoothly by various line patterns. User can join points without smoothing if required.
- (b) Displaying points by various markers.
- (c) Displaying points by various markers and joining them by default pattern.

5. Smoothing:
User has option to draw the plot without smoothing.
6. Heading:
User can display Heading of length 60 characters on the top of the graph.
7. Label:
User can display Label along both the axes of length 60 characters.
8. Identifiers:
Normally, user would like to identify curves, if there are more than one curves on same axes. The package provided facility to identify them anywhere in the graph either by various line pattern or marker supplied by user along with identification for the particular curve. The position of the identifiers is decided by (XCOR, YCOR). Identifier is defined by the TITLE array.
9. The sample main programs have been developed to facilitate the general types of plotting.
10. User can use this subroutine named, GRAPH, according to his requirement independently.

2. SAMPLE PROGRAMS:

The following two sample programs have been developed by using this package:

- (a) Main program
- (b) Main program in conversational mode.

2.1 Main Program:

The name of main program file is MAIN. FOR. This program requires two data file namely:

XY . DAT &
CTRL . DAT

XY . DAT FILE: This data file contains two records:

1st Record - No. of points, heading (or identifier in case of more than one curve).

READ N, HEAD (or TITLE (I))

2nd Record - Input X, Y data array in pair.

CTRL . DAT File :-

This data file contains maximum 18 records:

1st Record - Object time format for the 1st record of XY . DAT File of length 80 CHARACTERS.

2nd Record - Object time format for the 2nd record of XY . DAT File of length 80 CHARACTERS.

3rd Record - VXMIN, VXMAX, YMIN, YMAX Minimum and Maximum of Screen Co-ordinates.

- 4th Record - WXMIN, WXMAX, WYMIN, WYMAX Minimum and
Maximum of World Co-ordinates.
- 5th Record - CHRX
Label along X-axis of length 60 Characters.
- 6th Record - CHRY
Label along Y-axis of length 60 Characters.
- 7th Record - MARK, IPAT
Marker , Line Pattern
- 8th Record - LNPT
Nature of Plotting
- 9th Record - NPLT
No. of Plots
- 10th Record - X SIZE, Y SIZE
Scaling Factor
- 11th Record - Log
Types of Plot
- 12th Record - NXD, IDX , IWY, NYD, IDY, IWY
Divisions and Format of scaling along
X & Y axes respectively.
- 13th Record - IPLCH
Plotting characteristics
- 14th Record - X COR, Y COR
Co-ordinates for the position of identifier.

15th Record - IDNT

Control variable for identification.

16th Record - MXMN

Control variable for finding Maximum and Minimum of world co-ordinates.

17th Record - HEAD

Heading in case of more than one curve otherwise omit this record.

18th Record - QXMIN, QXMAX, QYMIN, QYMAX

Screen co-ordinates.

This record is required if IPLCH = 2, otherwise omit it.

In the 16th record, it is advisable to supply zero value to the variable MXMN, in case of more than one curves on same axes or different axes. Details of above arguments are given in documentation.

2.2 Main Program in Conversational Mode:

User has option to use main program in conversational mode. In this mode, user requires to create XY.DAT data file, which is already defined in Section 2.1. The details of input parameters are displayed on graphic terminal while running executable form of the Program. The name of this main program is CONVERS. FOR.

3. Documentation of the Program:

This section contains general description of Program.

3.1 Definition of the Program:

SUBROUTINE GRAPH (X,Y,N, VXMIN, VXMAX, YMIN, VYMAX, WXMIN, WXMAX, WYMIN, WYMAX, CHRX, CHRY, HEAD, IPAT, MARK, NXD, IDX, IWY, NYD, IDY, IWY, LNPT, NPLT, ICNT, IPLCH, XSIZE, YSIZE, LOG, IDNT, XCOR, YCOR, TITLE, MXMN).

3.2 Parameters of the Program:

X, Y : (REAL, ARRAY, INCOMING, INTACT)

These arrays represent abscissa and ordinate of the graph respectively.

N : (INTEGER, SCALAR, IN-COMING, INTACT)

Indicates no. of points of input data array.

VXMIN, VXMAX, YMIN, VYMAX : (REAL, SCALAR, INCOMING, INTACT)

These are screen co-ordinates which represent minimum and maximum along X & Y axes respectively.

WXMIN, WXMAX, WYMIN, WYMAX : (REAL, SCALAR, INCOMING, INTACT)

These are world co-ordinates which represent minimum and maximum along X & Y axes respectively.

DEFA
CHRX, CHRY : (CHARACTER * 60, SCALAR, INCOMING, INTACT)

These are the labels along X-axis and Y-axis respectively.

HEAD : (CHARACTER * 60, SCALAR, IN-COMING, INTACT)

This indicates heading of plot.

IPAT : (INTEGER, SCALAR, INCOMING, DESTROYED)

This indicates pattern of dashed-line.

The pattern changes automatically to the next if no. of plots are more than one on same or different axes. Default pattern number is zero. ($0 \leq \text{IPAT} \leq 9$).

MARK : (INTEGER, SCALAR, INCOMING, DESTROYED)

This indicates the marker. It changes automatically, if no. of plots are more than one on same or different axes.

Default marker number is zero

($0 \leq \text{MARK} \leq 15$).

NXD, IDX, IWX : (INTEGER, SCALAR, INCOMING, INTACT)

These help in formating scaling on
X-axis.

6 NXD -- No. of division
IDX -- Width after decimal
IWX -- Total width including decimal.

NYD, IDY, IWY : (INTEGER, SCALAR, INCOMING, INTACT)

These help in formating scaling on
Y-axis.

NYD -- No. of division
IDY -- Width after decimal
IWY -- Total width including decimal

LNPT : (INTEGER, SCALAR, INCOMING, INTACT)

This decides following type of curves.

LNPT = 0, Points are joined with
continuous line.

LNPT = 1, Points are displayed by
marker

LNPT = 2, Points are displayed by
marker joining them with
continuous line.

NPLT : (INTEGER, SCALAR, INCOMING, INTACT)

Represent no. of plots on same or
different axes.

ICNT : (INTEGER, SCALAR, INCOMING, DESTROYED)
This variable is used as a counter,
for counting no. of plots.

IPLCH : (INTEGER, SCALAR, INCOMING, INTACT)
This represents various types of plots
as follows:

IPLCH = 0 , Plotting is done with scaling.

IPLCH = 1 , Plotting is done without
scaling.

IPLCH = 2 , Plotting is done with scal-
ing and without heading.

IPLCH = 3 , Plotting is done with scal-
ing and without label (CHRX)
along X-axis.

IPLCH = 4 , Plotting is done with scal-
ing as well as grid.

IPLCH = 5 , Plotting is done in the
form of step with scaling.
It is useful in drawing
Histogram. Points are joined
without smoothing.

IPLCH = 6 , Plotting is done with scaling
and without smoothing.

- XSIZE, YSIZE** : (REAL, SCALAR, INCOMING, INTACT)
These arguments are useful in compressing or expanding the plot.
XSIZE & YSIZE = 1 means no effect on plot.
- LOG** : (INTEGER, SCALAR, INCOMING, INTACT)
This indicates nature of plot
LOG = 0 , Linear Plot
= 1 , Log-Linear Plot
= 2 , Log-Log Plot
- IDNT** : (INTEGER, SCALAR, INCOMING, INTACT)
This variable decides identification for different curves
IDNT = 0 , Without identification
IDNT = 1 , With identification
- XCOR, YCOR** : (REAL, SCALAR, INCOMING, INTACT)
These co-ordinates represent the position of identification.
- TITLE** : (CHARACTER * 60, ARRAY, INCOMING, INTACT)
This array denotes description of the identification for different curves.
- MXMN** : (INTEGER, SCALAR, INCOMING, INTACT)
This is useful in deciding maximum & minimum value of X and Y array with the help of program or supplied by user.
MXMN = 0 , Supplied by user
MXMN = 1 , With the help of Program.

4. Acknowledgement:

We are thankful to Dr. S.K. Alurkar and Dr. P.V. Kulkarni for encouragement in preparing this note. Thanks are also due to Dr. D.R. Kulkarni for the special guidance in developing this package. Thanks are also due to Mr. D. Stephen for neat typing of the manuscript.

5. References:

- Manual - PLOT-10 Intractive graphic library
D.R. Kulkarni - Introduction to IGL (PLOT-10)
Package and its usage.

Appendix A

Marker Signs and their associated numbers

Given below is the list of marker signs and their associated numbers.

<u>Marker</u>		<u>Marker No.</u>
•	(dot)	0
□	(square)	1
○	(octagon)	2
△	(triangle)	3
+	(plus)	4
◇	(diamond)	5
⊠	(square-cross)	6
⋈	(lozenge)	7
⊞	(octagon-cross)	8
⊕	(square-plus)	9
▽	(nabla, delta)	10
☆	(star)	11
✱	(asterisk)	12
⌘	(x-cross)	13
↑	(up arrow)	14
↓	(down arrow)	15

Appendix B

Given below is the list of various dash patterns and the corresponding associated numbers.

<u>Pattern No.</u>	<u>Dashed-line pattern</u>
0	_____ (default)
1 (Dotted line)
2	- . - . - . - . - . - . - . - .
3	-----
4	-----
5
6	-----
7	-----
8	-----
9

Appendix - C

Control data files and its associated graphs are given.

Control Data Files:

```
PLOT -1      Linear plot without scaling
              (I3,1X,A)
              ((F6.2,1X,F6.2))
              0.,130.,0.,100.
              0.,100.,0.,100.
              ' '
              ' '
              0,0
              0
              1
              1.,1.
              0
              0,0,0,0,0,0
              1
              0.,0.
              0
              0
```

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PLOT - 2

Linear plot (smooth curve)

(I3,1X,A)

(10(F7.2,1X,F6.4))

0.,130.,0.,100.

400.,1100.,0.,1.0

'

PRESSURE (In Millibars)'

'

PHOTONS (Counts / Secs)'

0,0

0

1

1.,1.

0

4,0,5,5,1,3

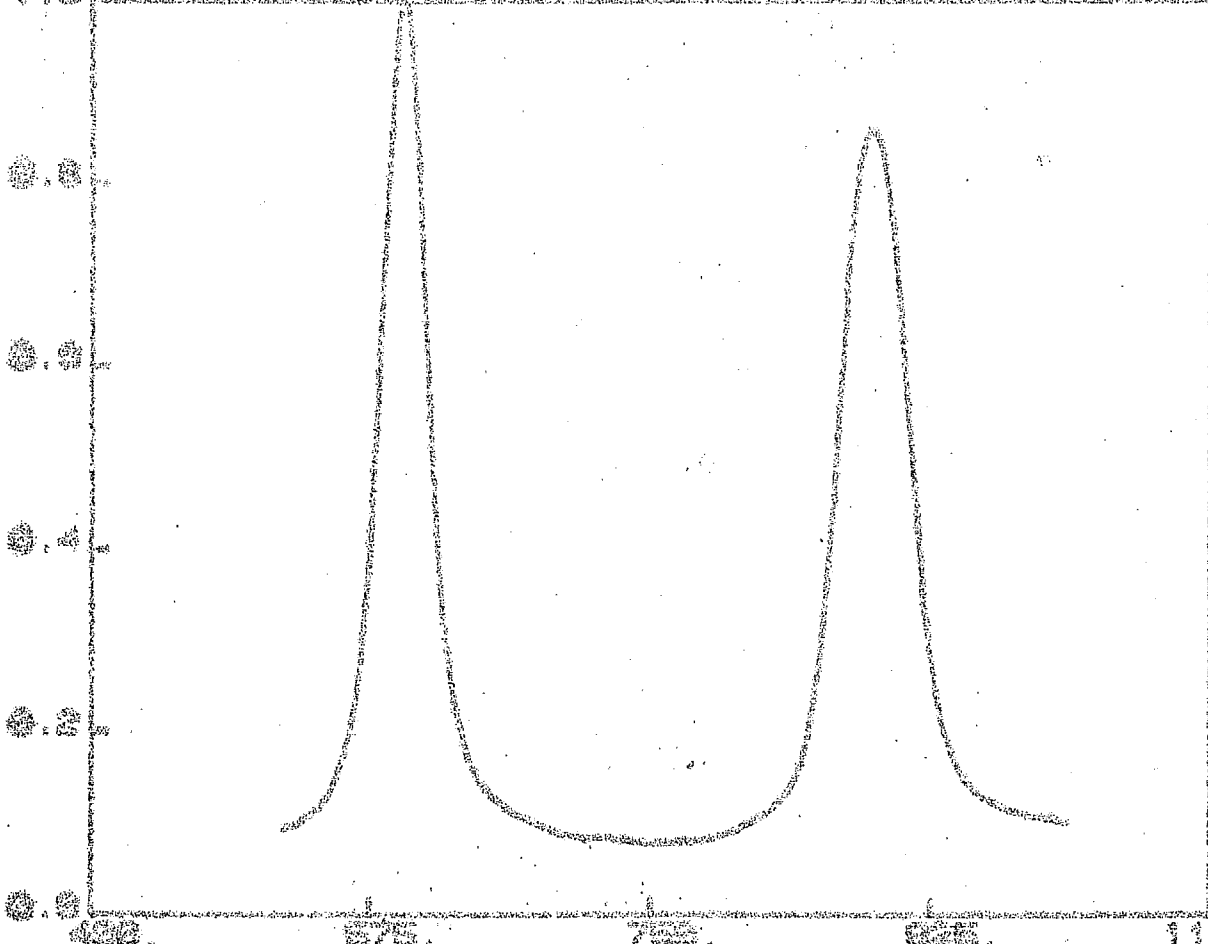
0

0.,0.

0

0

THE STATE OF TEXAS



ATTEST

PLOT - 3

Linear plot (2 smooth curves)

(I3, 1X,A)

(10(F.2, 1X,F6.4))

0., 130., 0., 100.

400., 1100., 0., 1.0

'

PRESSURE (In Millibars)'

'

PHOTONS (Counts / Secs)'

0,0

0

2

1., 1.

0

4, 0, 5, 5, 1, 3

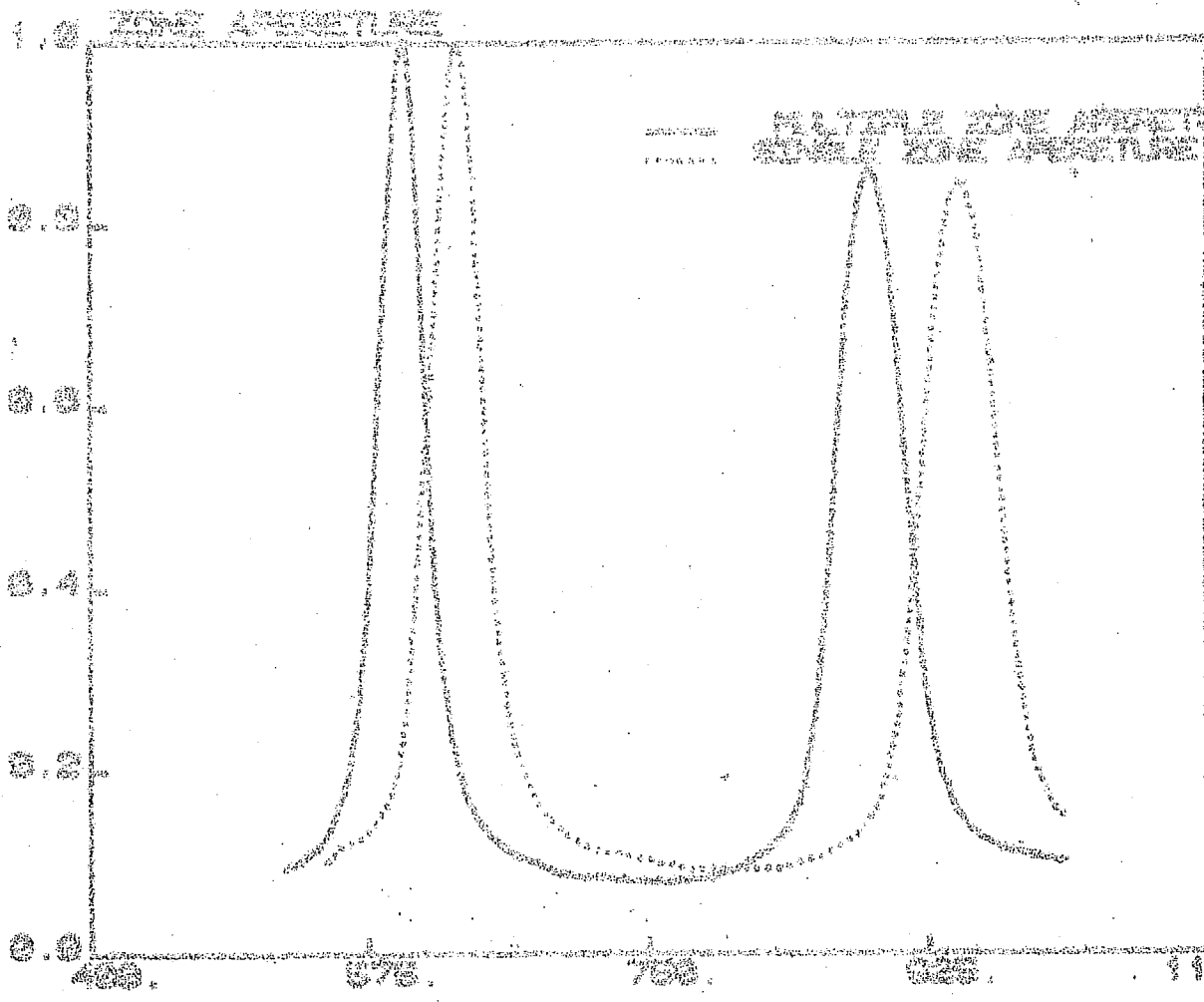
0

600., 0.9

1

0

'ZONE APERTURE'



Technical drawing or diagram showing a rectangular frame with a wavy internal structure.

PLOT - 4

Linear Plot (2 curves with marker only)

(13,1X,A)

(10(F7.2,1X,F6.4))

0.,130.,0.,100.

400.,1100.,0.,1.0

' PRESSURE (In Millibars)'

' PHOTONS (Counts / Secs)'

0,0

1

2

1.,1.

0

4,0,5,5,1,3

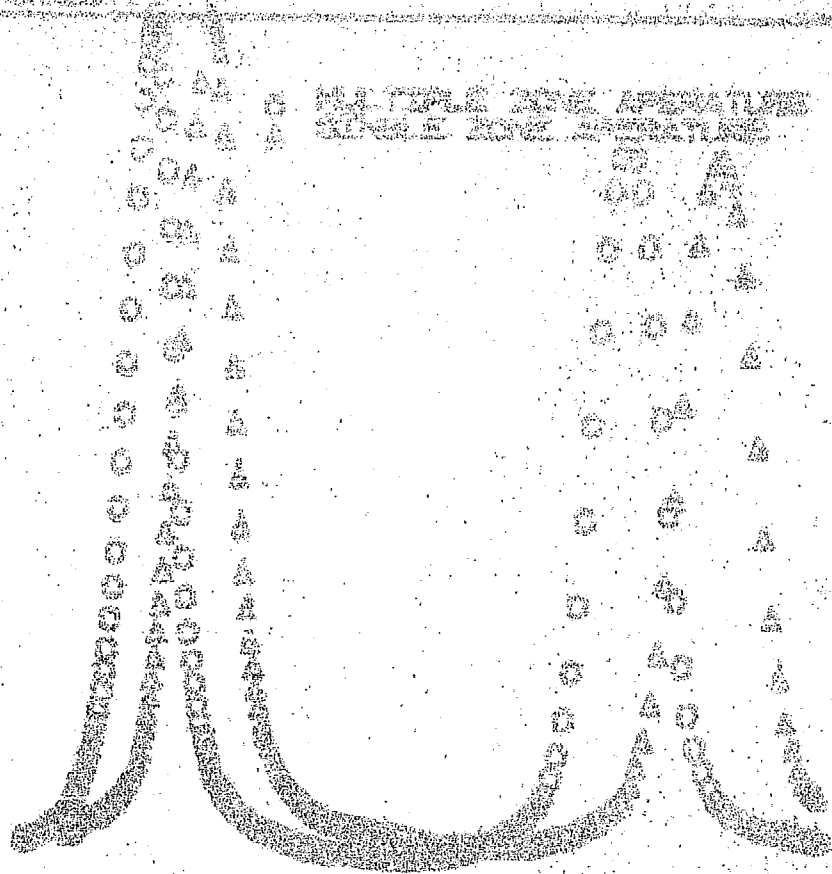
0

600.,0.9

1

0

' APERTURES'



0.5

0.7

1.0

1.5

Wavelength (microns)

PLOT - 5

Linear plot (2 curves with marker
joining each other by continuous line)

(I3,1X,A)

(10(F7.2,1X,F6.4))

0.,130.,0.,100.

400.,1100.,0.,1.0

' PRESSURE (In Millibars)'

' PHOTONS (Counts / Secs)'

0,0

2

2

1.,1.

0

4,0,5,5,1,3

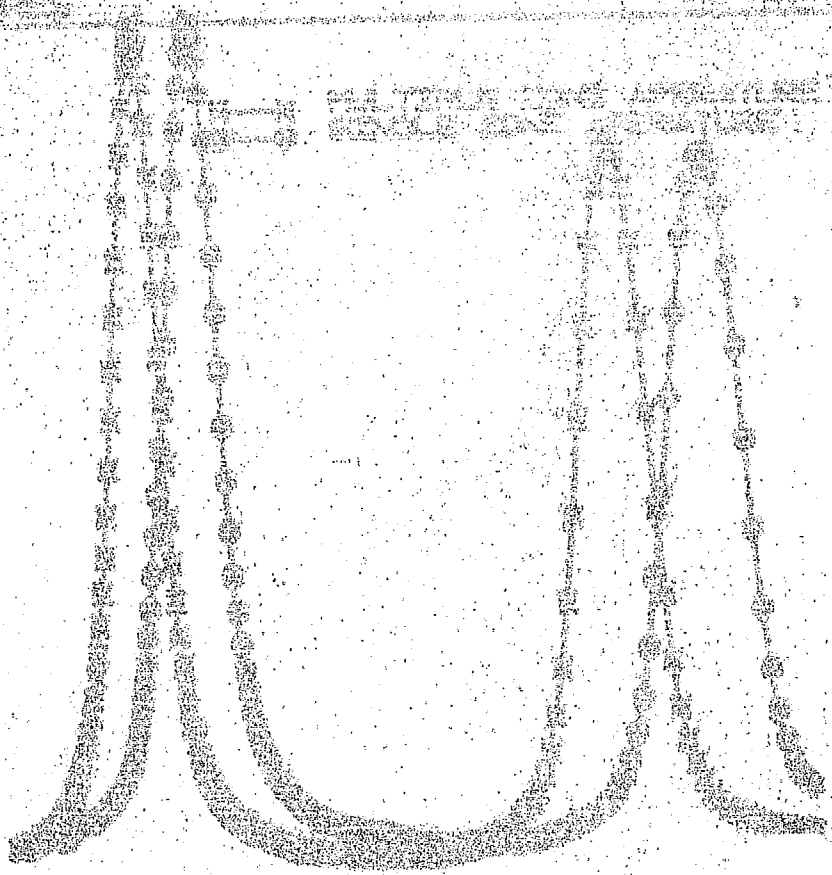
0

600.,0.9

1

0

' APERTURE'



RESEARCH IN CULTURE

PLOT - 6

HISTOGRAM

(I3,1X,A)

((F5.2,1X,F5.2))

0.,130.,0.,100.

10.,65.,0.,105.

' X-AXIS'

' Y-AXIS'

0,0

0

1

1.,1.

0

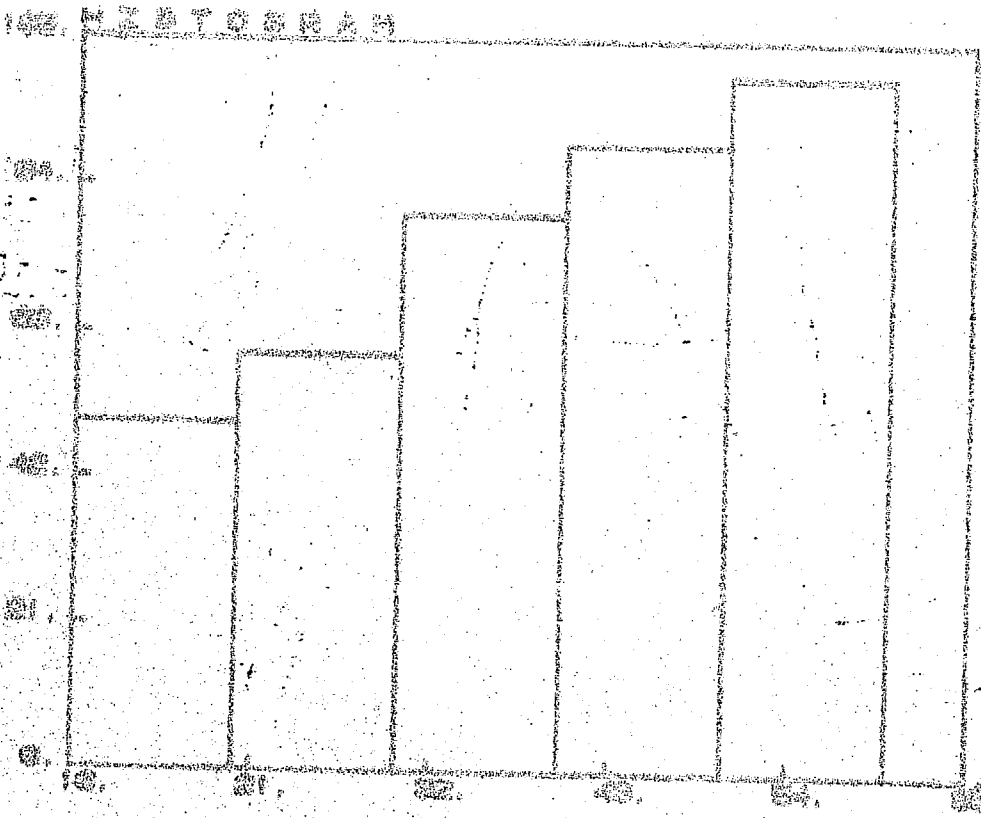
5,0,3,5,0,3

5

0.,0.

0

0



PLOT - 7

HISTOGRAM (WITH 0.5 SIZE)

(I3,1X,A)

((F5.2,1X,F5.2))

0.,130.,0.,100.

10.,65.,0.,105.

' X-AXIS'

' Y-AXIS'

0,0

0

1

0.5,0.5

0

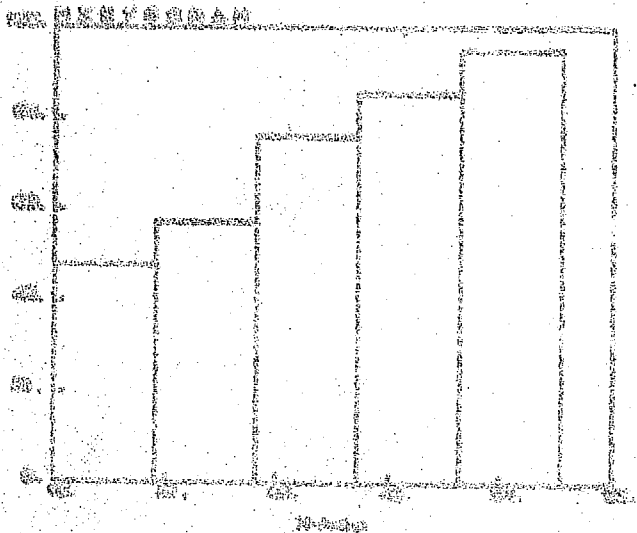
5,0,3,5,0,3

5

0.,0.

0

0



PLOT - 8

Log-Linear (Smooth curve)

(I3,1X,A)

(10(E13.6))

0.,130.,0.,100.

1.,1000.,1.,100000.

'

NUMBER'

'

EXPONENT'

0,0

0

1

1.,1.

1

4,0,5,0,0,0

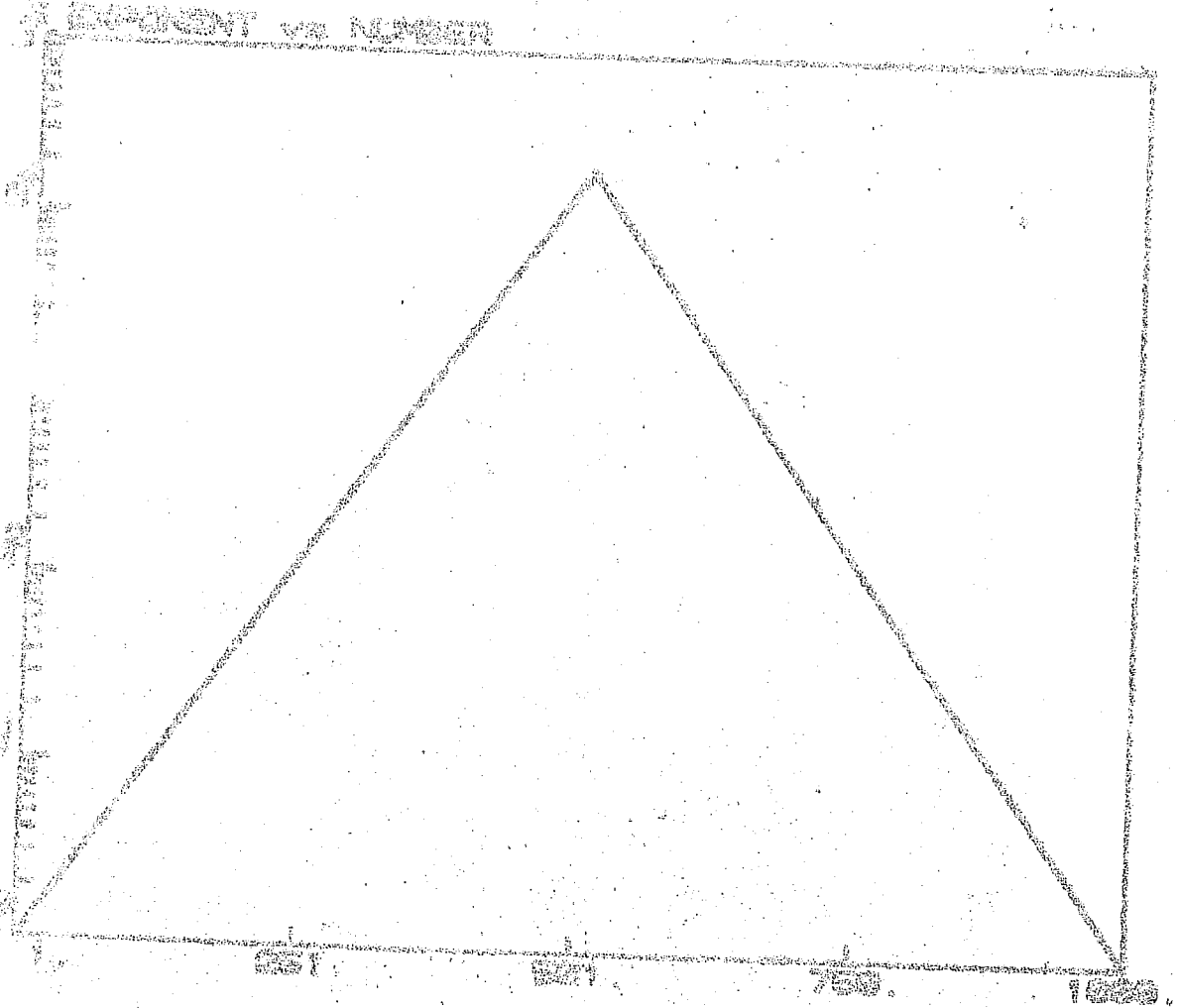
0

0.,0.

0

0

REPORT ON THE



REPORT

PLOT - 9

Log-Linear (2 SMOOTH CURVES)

(I3, 1X, A)

(10(E13.6))

0., 130., 0., 100.

1., 1000., 1., 100000.

' NUMBER'

' EXPONENT'

0,0

0.

2

1., 1.

1

4,0,5,0,0,0

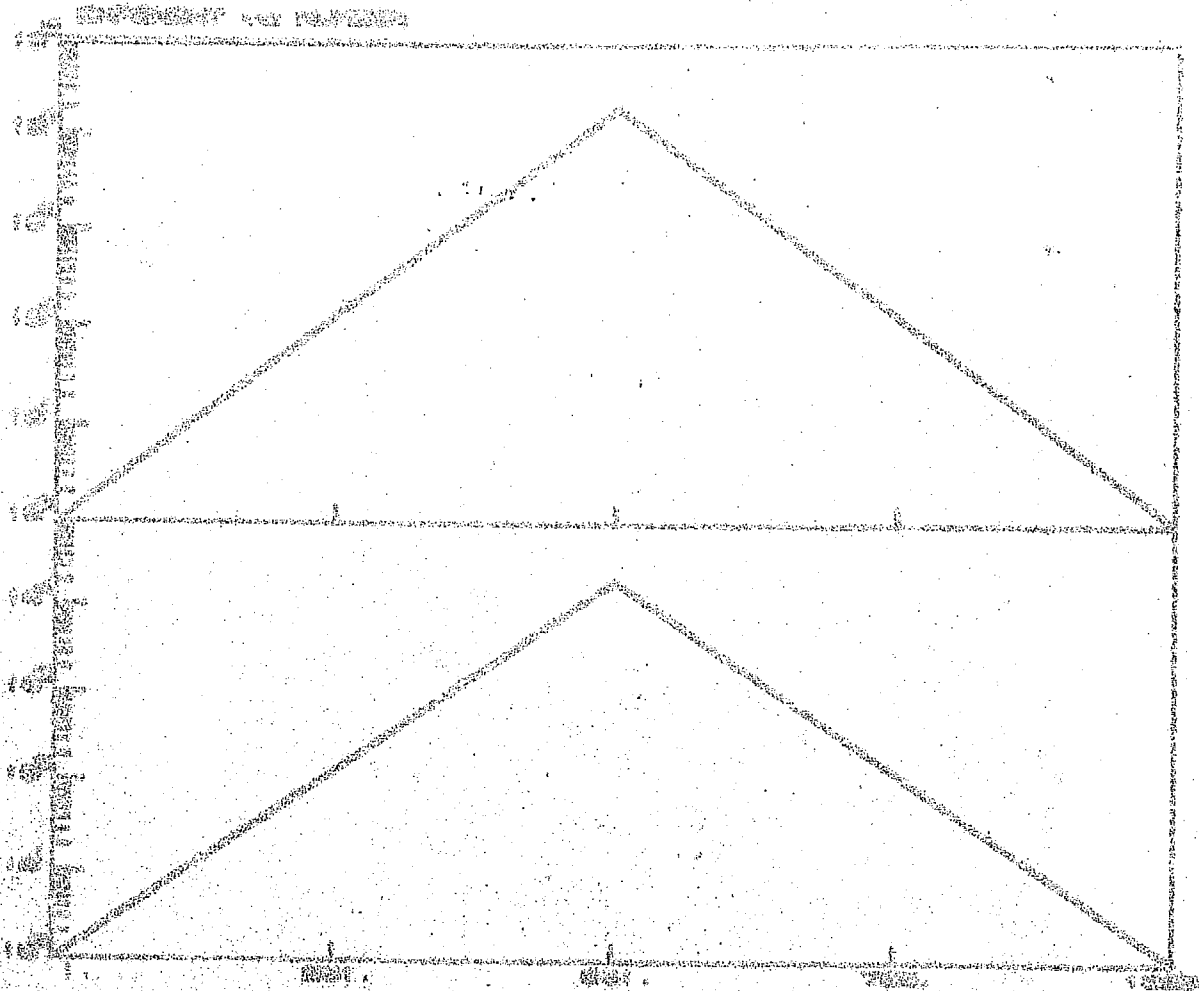
0

600., 10000.

1

0

'EXPONENT VS NUMBER'



THE DRAWING

PLOT -10

Log-Linear (2 plots one over other)

(I3,1X,A)

(10(E13.6))

0.,130.,0.,50.

1.,1000.,1.,100000.

' NUMBER'

' EXPONENT'

0,0

0

1

1.,1.

1

4,0,5,0,0,0

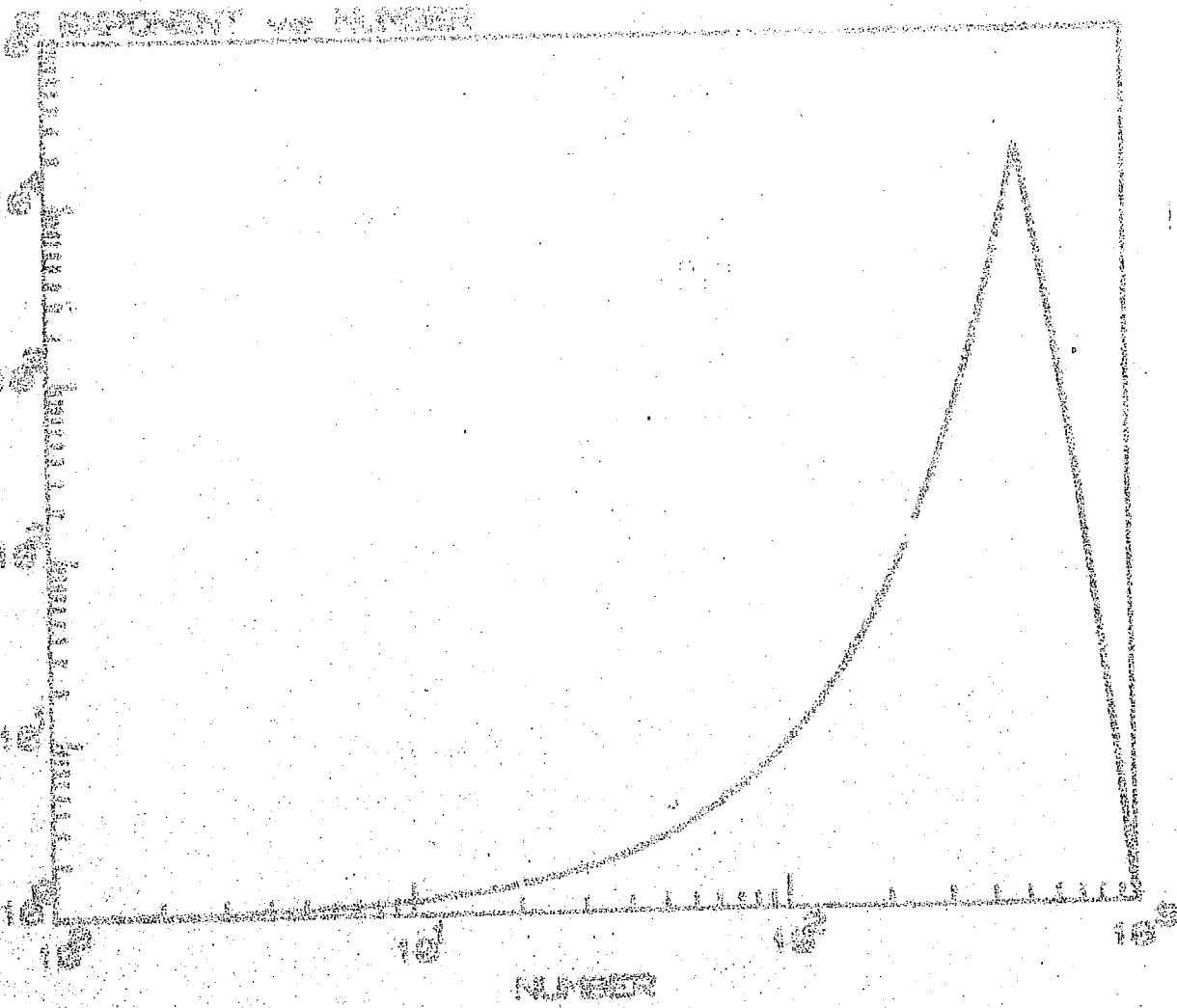
2

0.,0.

0

0

0.,130.,50.,100.



PLOT - 12

Log-Log (2 smooth curves)

(I3,1X,A)

(10(E13.6))

0.,130.,0.,100.

1.,1000.,1.,100000.

'

NUMBER'

'

EXPONENT'

0,0

0

2

1.,1.

2

0,0,0,0,0,0

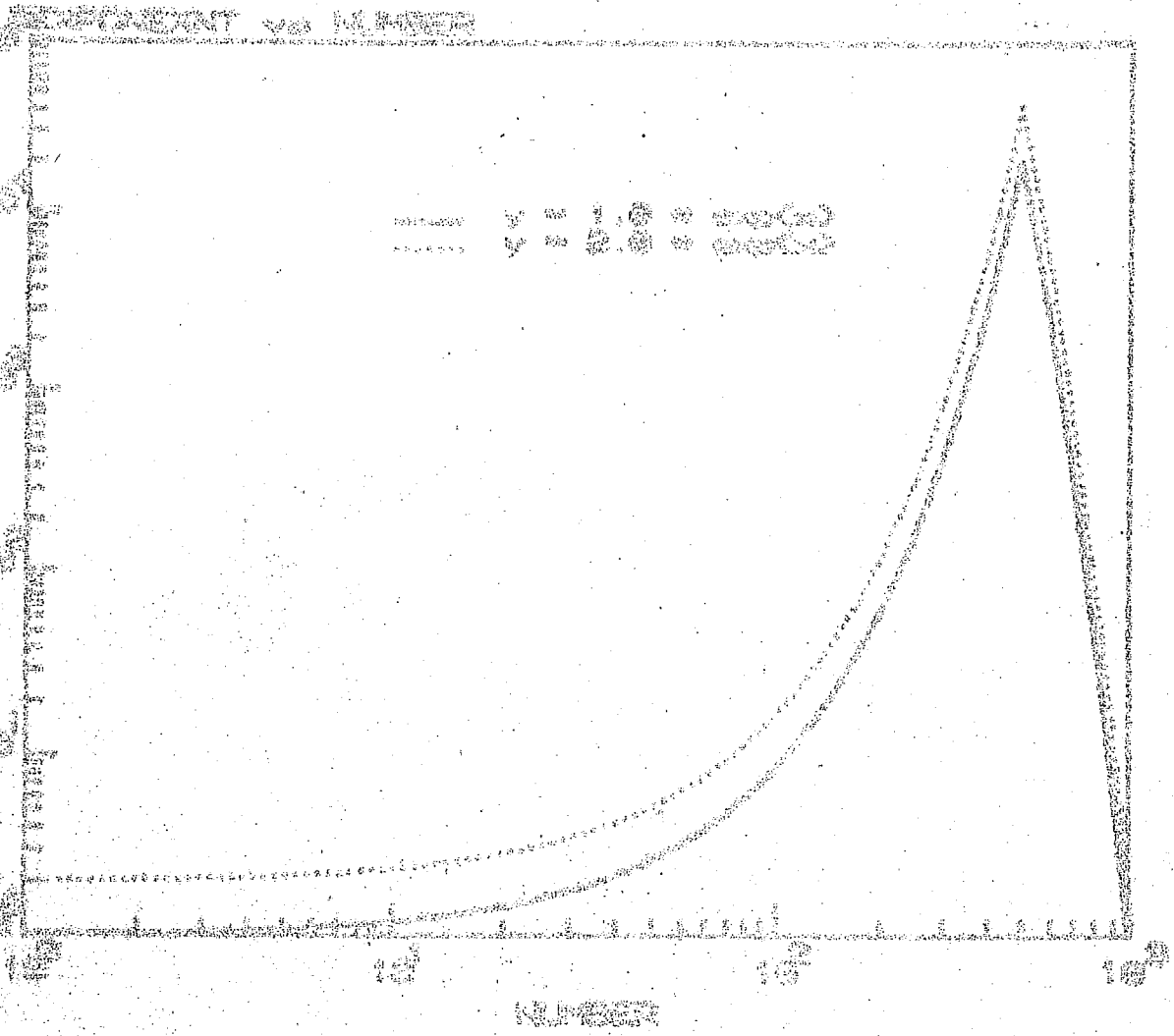
0

10.,10000.

1

0

'EXPONENT VS NUMBER'



PLOT - 13 Log-Log (2 plots one over other)

(I3,1X,A)

(10(E13.6))

0.,130.,0.,50.

1.,1000.,1.,100000.

'

NUMBER'

'

EXPONENT'

0,0

0

1

1.,1.

2

0,0,0,0,0,0

2

0.,0.

0

0

0.,130.,50.,100.

