

CORRECTIONS TO AN IONIZATION EQUILIBRIUM CALCULATION

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SRL Internal Report #93
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ABSTRACT

A recently published ionization equilibrium calculation contains several apparent typographical errors in a table of ionization and recombination rate coefficients. These errors have been corrected and the authors' equilibrium calculations repeated with the corrected coefficient values. Tables of charge state distributions and mean charges for elements with $6 \leq Z \leq 30$ at several temperatures in the $10^6 - 10^7$ °K range are presented.

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A recently published paper (Shull, J. M. and van Steenberg, M. 1982, "The Ionization Equilibrium of Astrophysically Abundant Elements", *Ap. J. Suppl.* **48**, 95, hereafter SV) carries out ionization equilibrium calculations for the elements C, N, O, Ne, Mg, Si, S, Ar, Ca, Fe and Ni. Distributions of the ionic charge state Q are obtained for these elements for temperatures in the $10^4 - 10^9$ °K range. The ionization and recombination rate coefficients used to generate these results are also tabulated in the paper and were derived by fits to measured cross sections and other atomic data, interpolating along isoelectronic sequences to elements not measured. While the coefficients for the different charge states of a given element may vary discontinuously with Q on account of electron shell effects, the variation within an isoelectronic sequence should be smooth since the electronic configuration is the same and only the nuclear charge differs. This is acknowledged by SV and the suggestion is made that the reported charge state distribution results may be extended to other less abundant elements by interpolating the rate coefficients.

However, although the published coefficients generally do vary smoothly within an isosequence, close inspection reveals several isolated cases where a particular coefficient differs significantly from its expected value based on the trend within its isosequence. These anomalies appear to be typographical in origin; they seem randomly distributed, and the difference between the quoted and expected values usually appears to be exactly one or more orders of magnitude, suggesting a typographical error in the exponent of 10. (Typographical errors in the mantissa are also possible, but harder to identify since the effect of the error would be smaller and more difficult to define precisely.)

The errors do not appear to be a result of the publication process, since the charge state distributions presented later in the paper are consistent with the published coefficients and not with the inferred correct values. Since the differences are significant in certain temperature ranges for the elements affected, as well as for the elements derived from these by interpolation, it is

necessary to correct the coefficient errors and repeat the equilibrium calculations with the corrected values.

In the accompanying figures (pp. 4 - 59), the rate coefficients listed in Table 2 of SV are plotted for individual isoelectronic sequences. These coefficients are used by SV in the rate formulas for collisional ionization C_i and radiative and dielectronic recombination α_r and α_d :

$$C_i = A_{col} T^{1/2} (1 + 0.1T/T_{col})^{-1} \exp(-T_{col}/T) \quad (1)$$

$$\alpha_r = A_{rad} (T/10^4 K)^{-X_{rad}} \quad (2)$$

$$\alpha_d = A_{di} T^{-B/2} \exp(-T_0/T) [1 + B_{di} \exp(-T_1/T)] \quad (3)$$

Inspection of the figures clearly indicates the following apparent errors:

Ion	Coeff.	SV Value	Comment	Page
Si9	A_{di}	4.25e-01	exponent should be -02	33
Si11	A_{rad}	1.20e-11	exponent should be -10	18
Ca11	A_{rad}	6.51e-13	exponent should be -11	20
Fe15	A_{col}	1.62e-14	exponent should be -13	6
Fe16	T_0	8.18e+05	exponent should be +06	48
Fe24	T_1	1.17e+06	exponent should be +07	53

In addition the following are candidates for possible errors, but the evidence is weaker on account of a weaker trend in the isosequence due to fewer or highly scattered data points, or because the magnitude of the possible error is smaller:

Ion	Coeff.	SV Value	Comment	Page
Ne8	A_{di}	2.52e-01	duplicates A_{di} for Mg10; should be $\sim 1.7e-01$	32
Ne8	T_0	1.40e+07	duplicates T_0 for Mg10; should be $\sim 1.0e+07$	46
Ne9	A_{di}	1.44e-01	duplicates A_{di} for Mg11; should be $\sim 1.0e-01$	32
Ne9	T_0	1.50e+07	duplicates T_0 for Mg11; should be $\sim 1.0e+07$	46
Si3	A_{di}	5.03e-01	exponent should be -03	34
Ca9	A_{di}	4.02e-01	exponent should be -02	34

For brevity, we use the charge state notation Fe16 \equiv FeXVI \equiv Fe⁺¹⁶.

The coefficients X_{rad} and B_{di} , and sometimes T_1 , show a great deal of scatter with Z in the isoelectronic sequences, either because of scatter in the measured atomic parameters or because the functional forms of Eqs. (2) and (3) are such that the fit is relatively insensitive to the values of these parameters. In either case the best-fit values have a substantial random component without

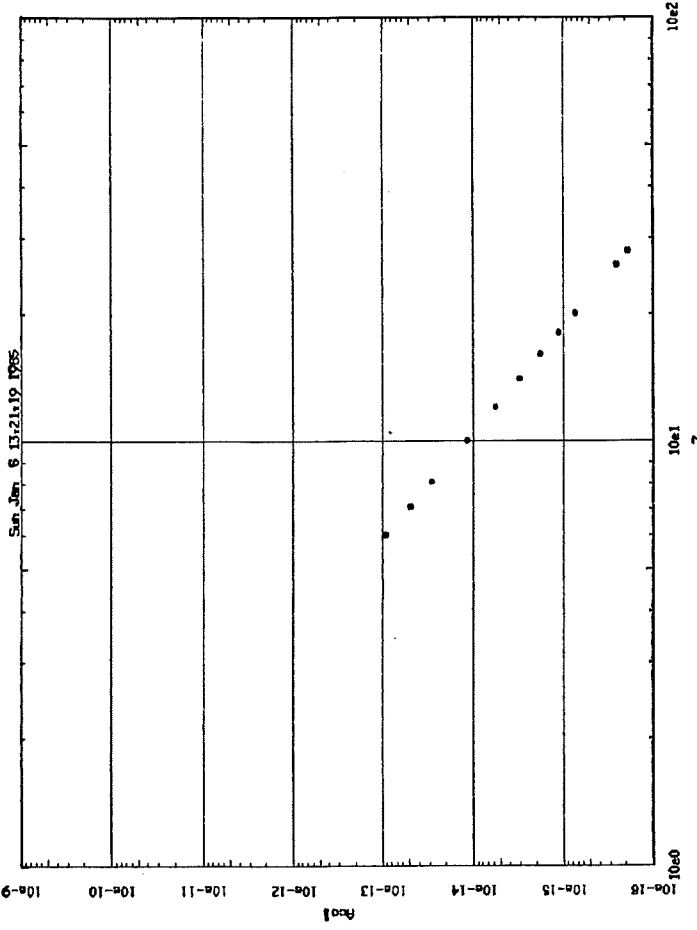
physical significance. This makes it impossible to confidently identify possible typographical errors, but also means that any such errors present are probably inconsequential.

Errors in SV of a factor of $Z^{0.452}$ in the values of A_{rad} for all of the single-electron states were acknowledged in a published erratum (*Ap. J. Suppl.* **49**, 351, 1982 June); these are unrelated to the errors considered here.

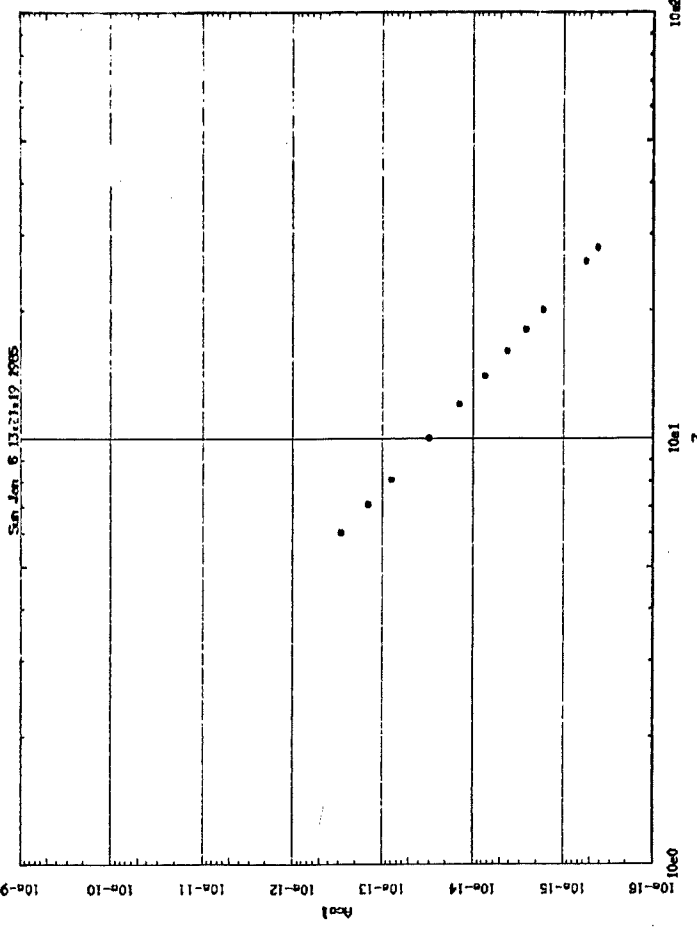
Using Eqs. (1) through (3) and the inferred corrections to the coefficients, the SV equilibrium calculations were repeated for $\log_{10}(T^{\circ}K) = 6.0$ to 7.0 in increments of 0.1 , encompassing the temperature range of the solar corona. Only the "highly probable" errors (the first group listed above) and the published errata were corrected. Coefficient interpolation was used to obtain the charge state distributions of all elements with $6 \leq Z \leq 30$; this was done both by interpolating the values of the parameters (A_{col} , T_{col} , etc.) to be substituted into Eqs. (1 - 3), and also by substituting the endpoint values of the parameters into Eqs. (1 - 3) and interpolating C_i , α_r and α_d directly. These results are tabulated on pages 60 - 70. As was done in SV, each charge state present to more than one part in 10^6 is shown with the negative \log_{10} of its fraction of the total population of the element. As a check, the calculations were repeated using the SV coefficients without correction; this essentially reproduced the results in Table 3 of SV.

From the charge state distribution, a mean charge $\langle Q \rangle$ was calculated for each element and temperature. These results appear on pages 71 - 73. This procedure was also carried out using the uncorrected SV coefficients; for purposes of comparison both sets of results are included here. Since in general only a limited range of charge states of an element are major components of the total population at any given temperature, the effect of the errors on the mean charge is restricted to those ranges of temperature where the affected states are significant contributors; at these temperatures the shift in $\langle Q \rangle$ can be substantial. For example, although the $\langle Q \rangle$ of Fe is not changed appreciably at $\log_{10}(T) = 6.2$ or 7.0 , it is increased by more than 12 percent (from 14.1 to 15.9) at $\log_{10}(T) = 6.6$ when the errors are corrected (see figure on page 74). Of the four coefficient errors noted for Fe, the two responsible for this particular shift are A_{col} for Fe15 ($Q = 14$) and T_0 for Fe16 ($Q = 15$). These same errors can account for much of the difference seen between SV and earlier ionization calculations (e.g., Jordan 1969) in the temperature of peak abundance of the ionization states of Fe (Table 4 of SV).

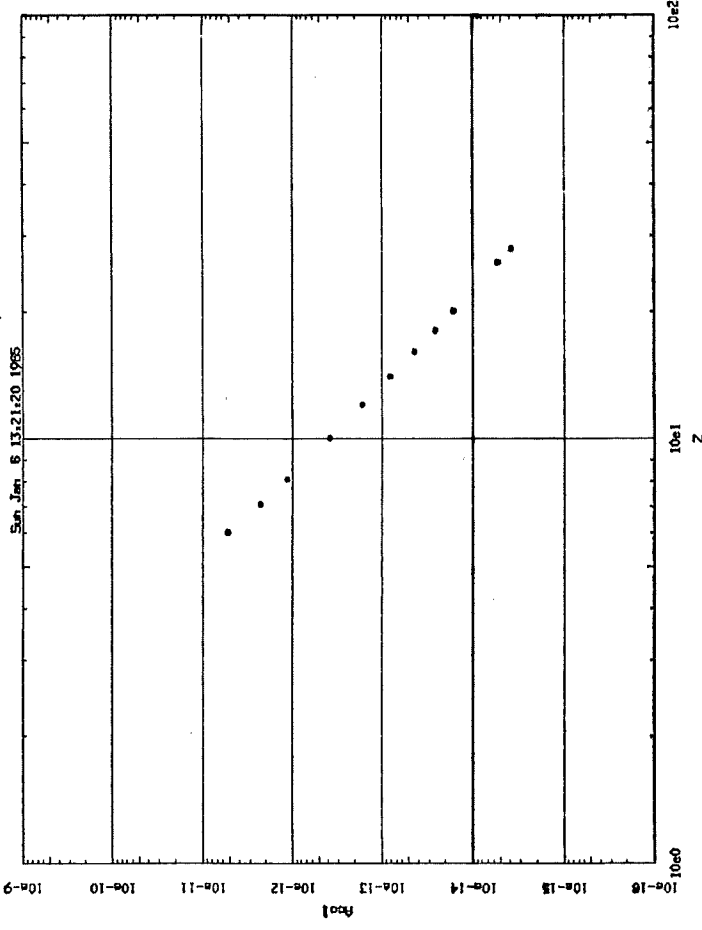
Acol vs. Z for Z - Q = 1



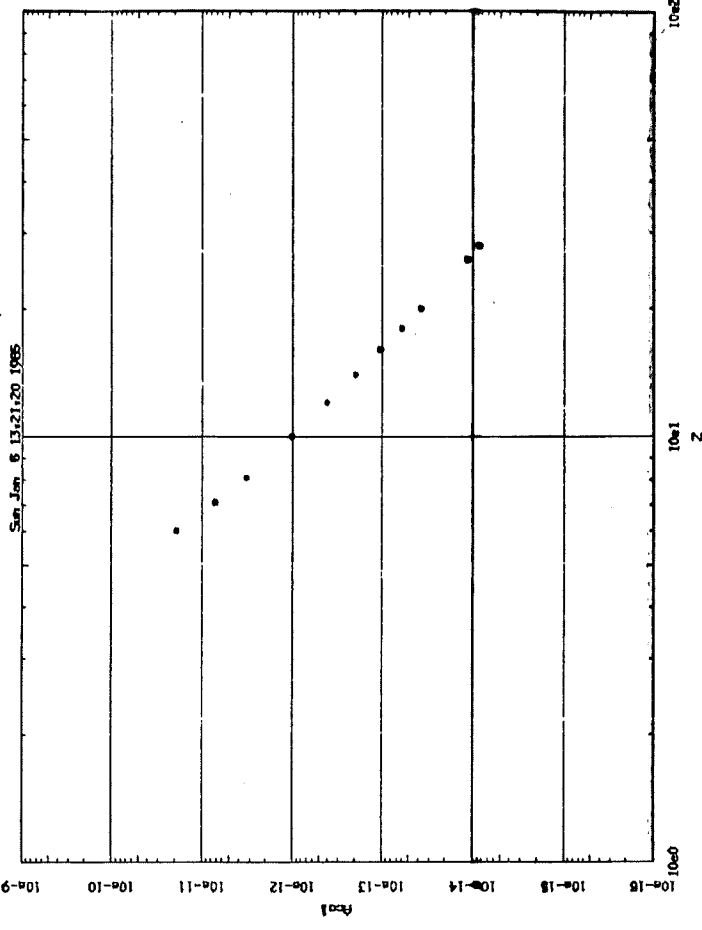
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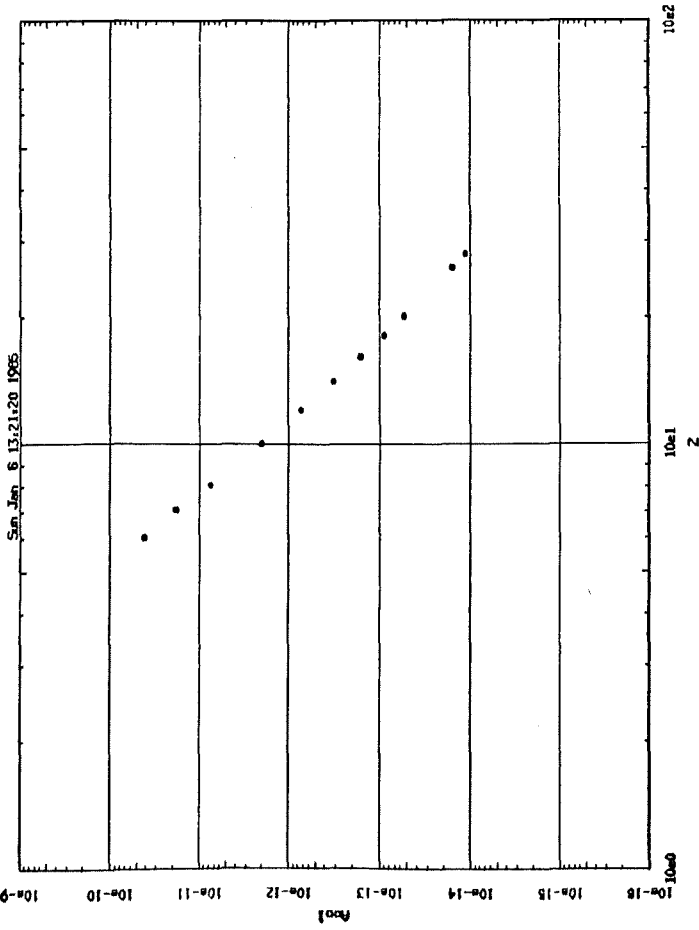
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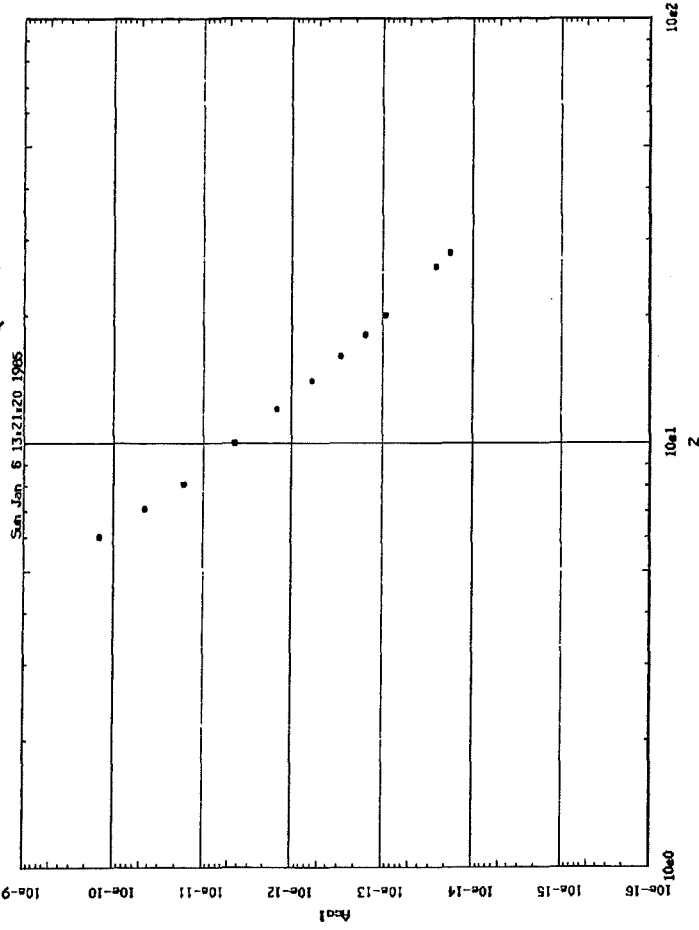
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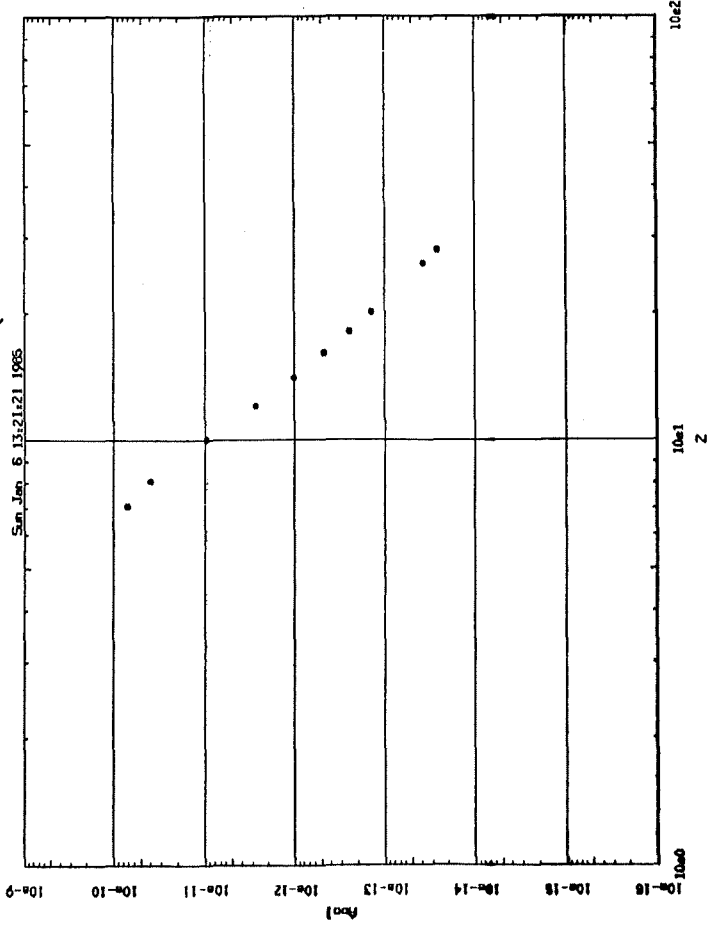
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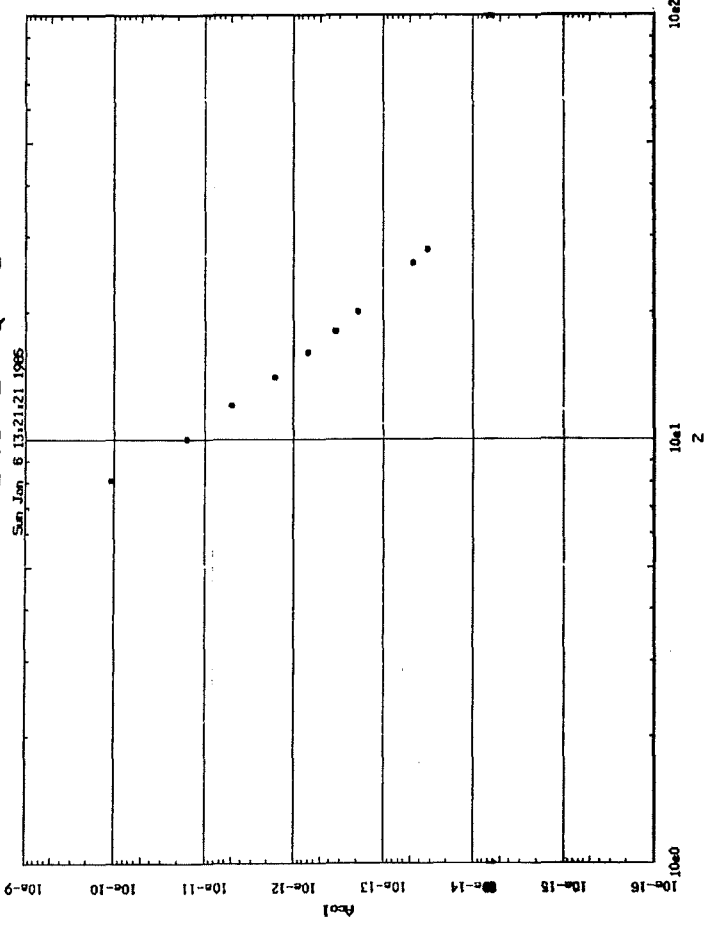
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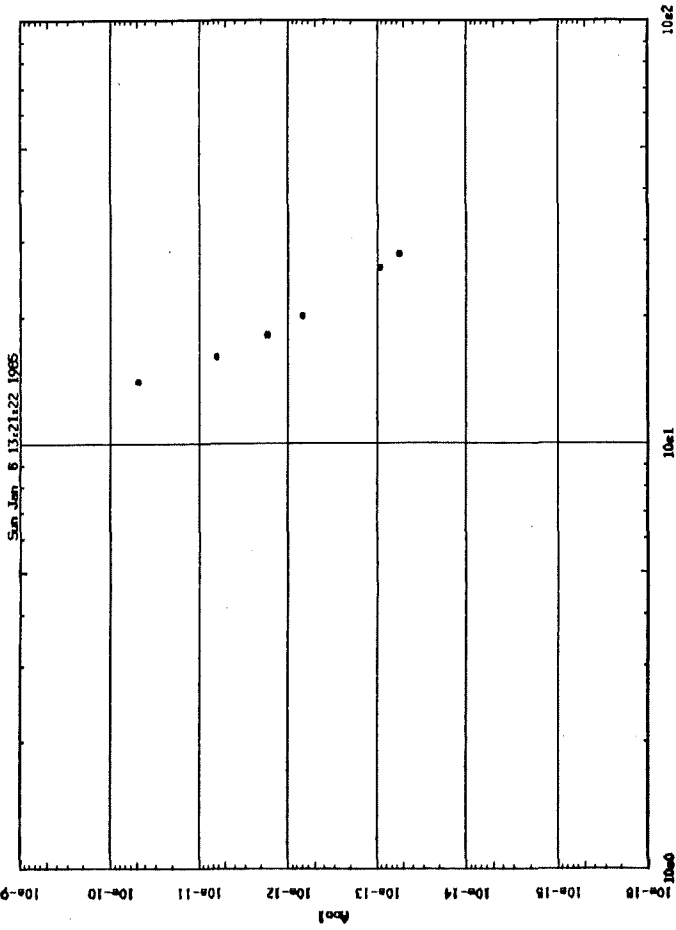
Acol vs. Z for Z - Q = 7



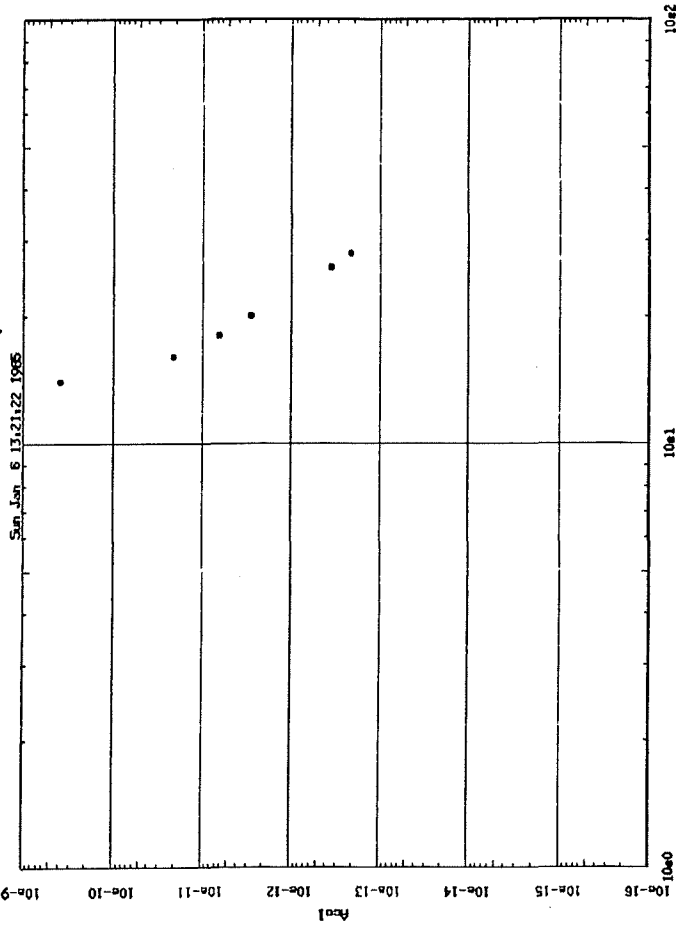
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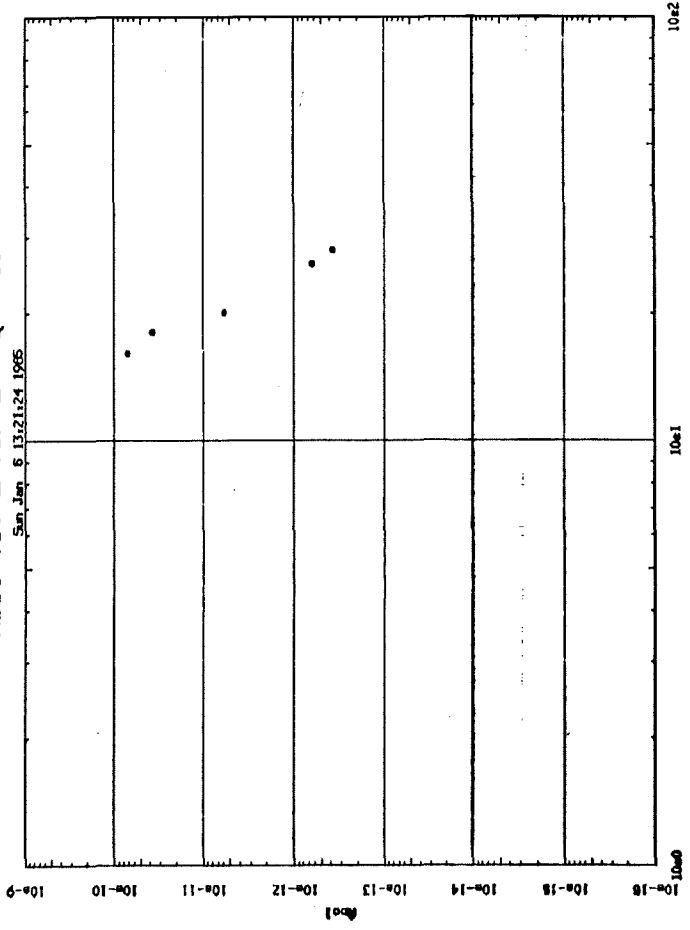
Aco1 vs. Z for Z - Q = 13



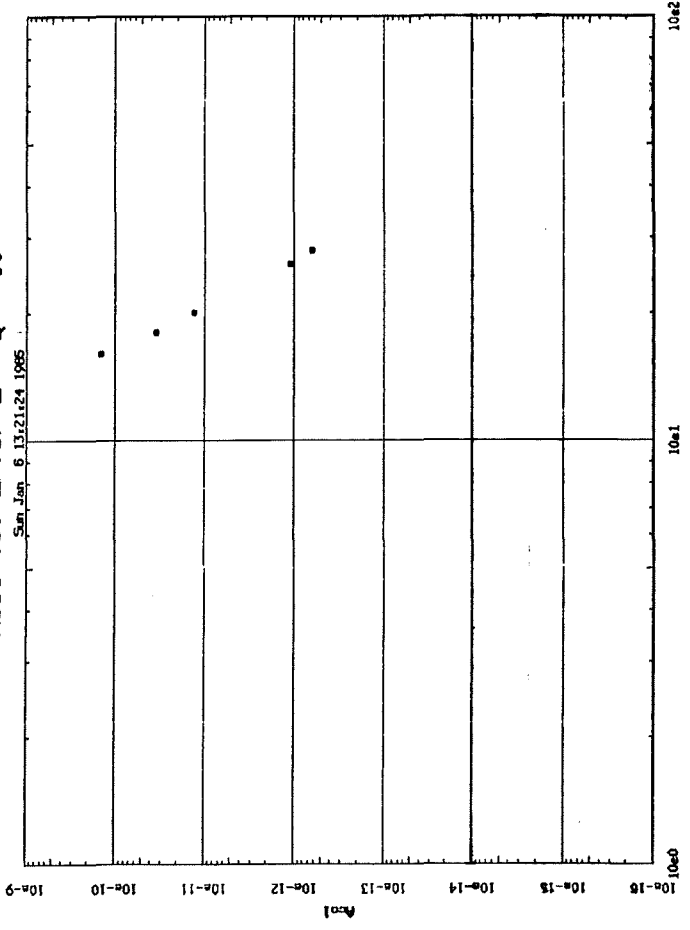
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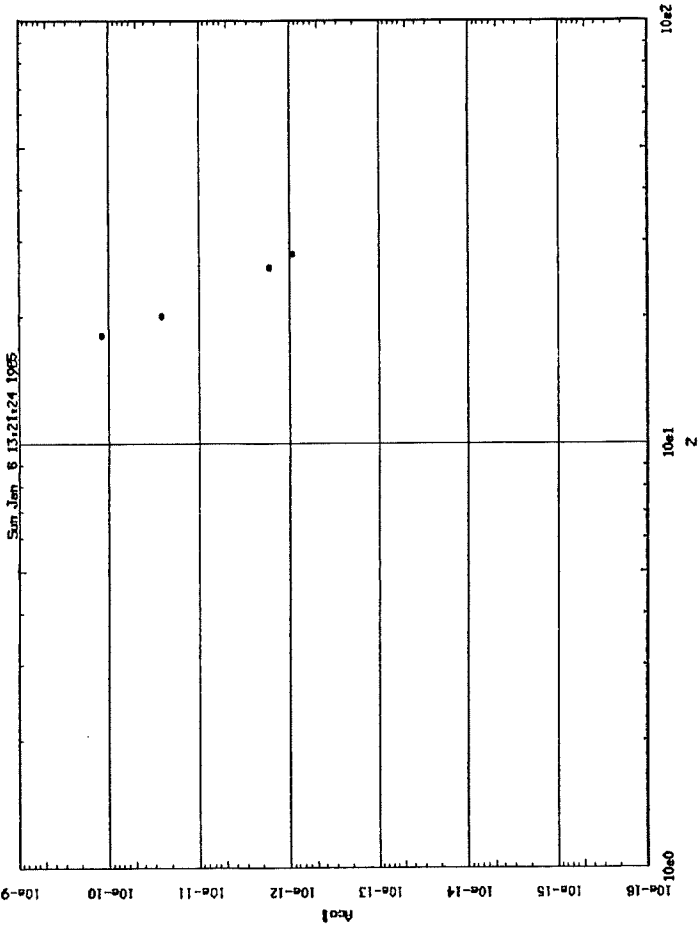
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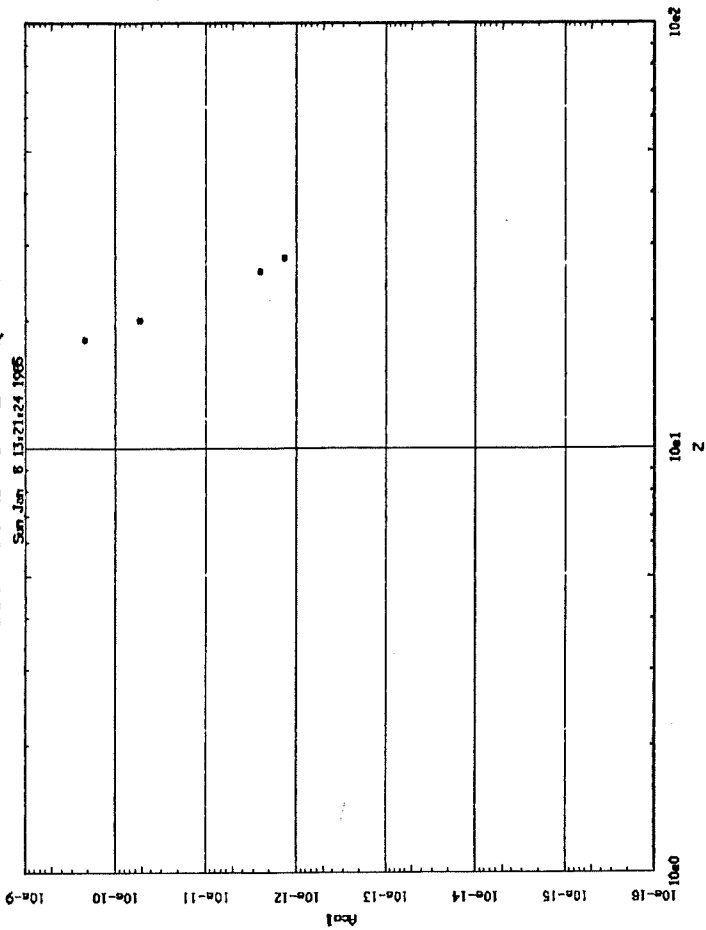
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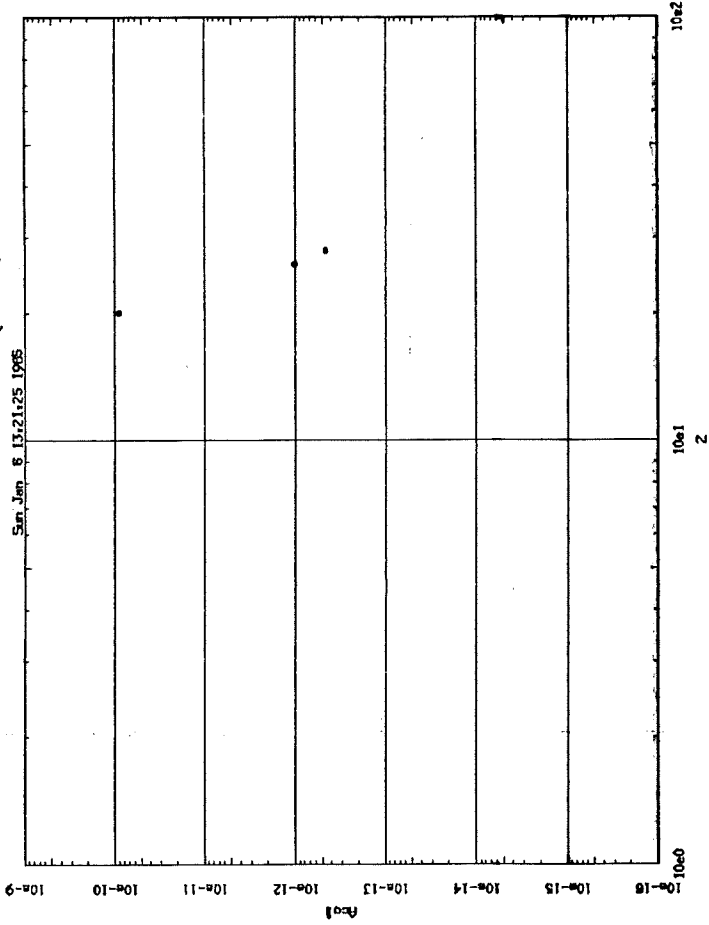
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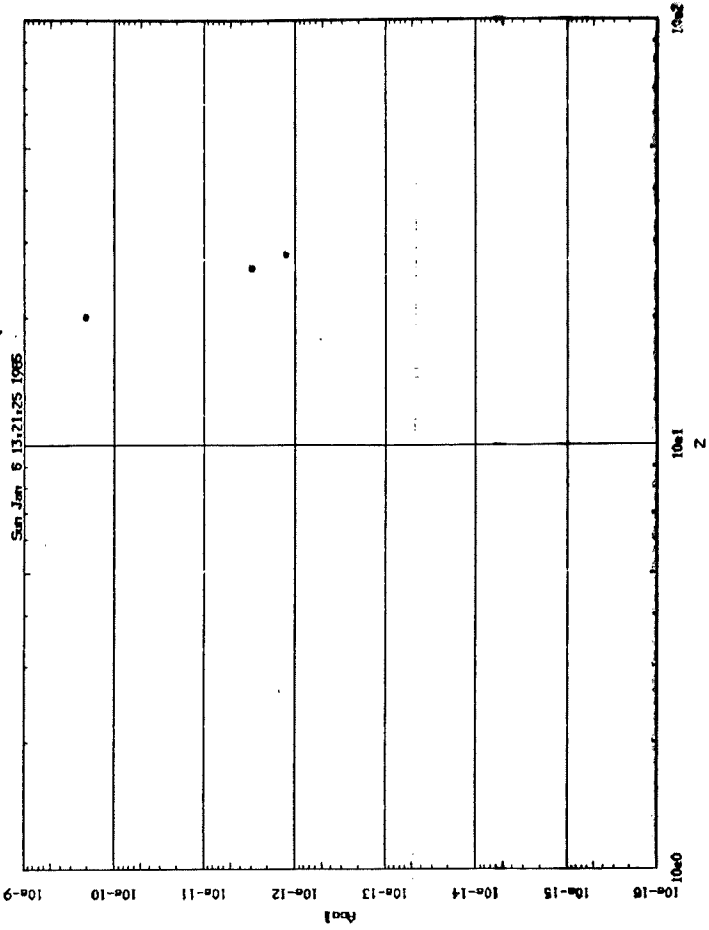
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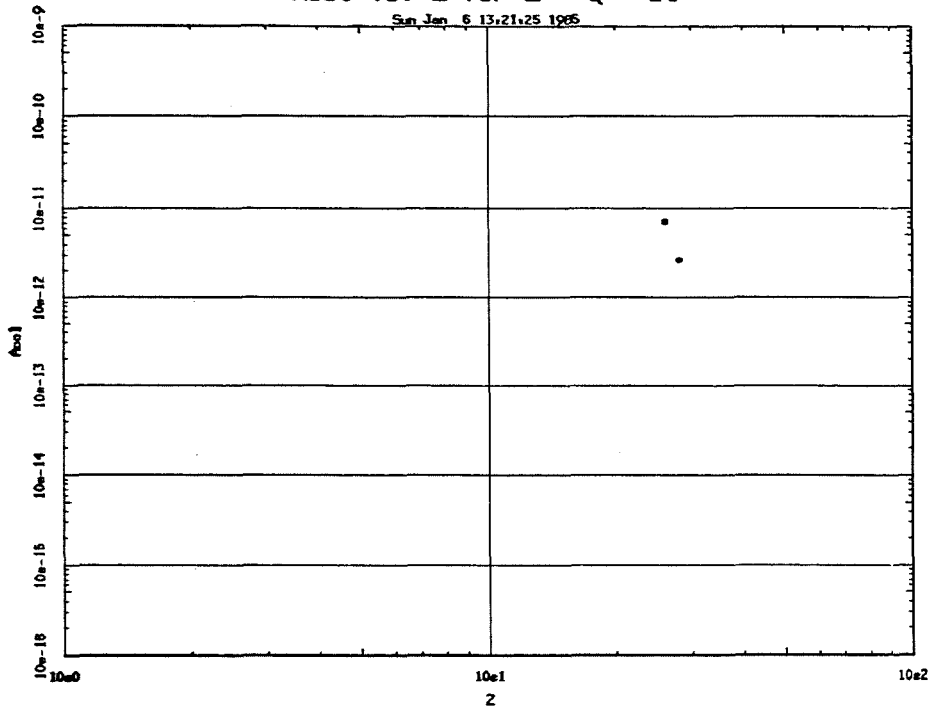


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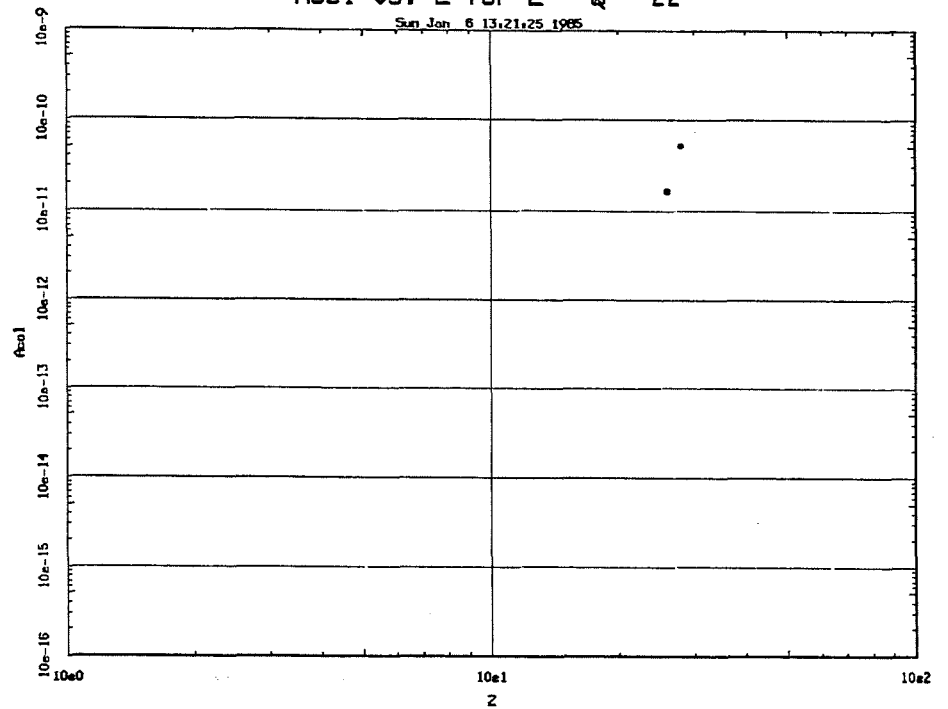
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Sun Jan 6 13:21:25 1985



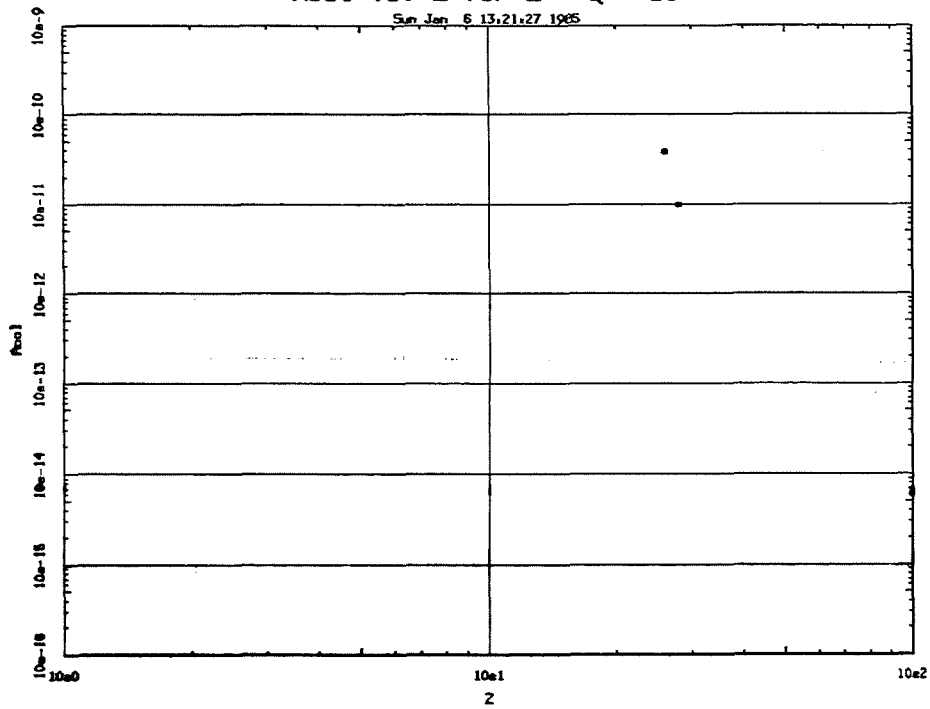
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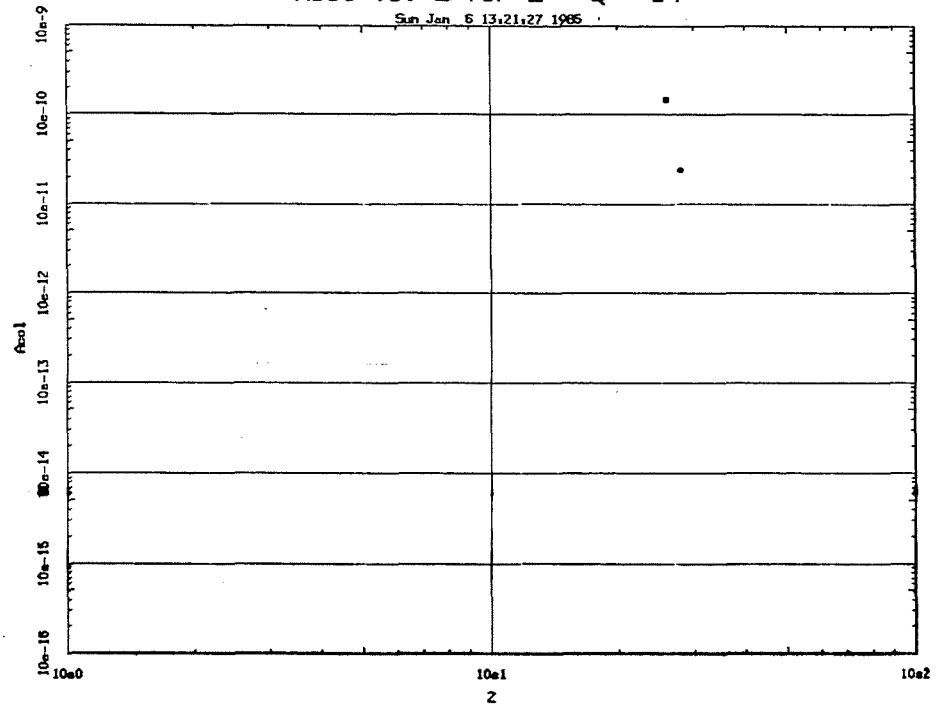
Acol vs. Z for Z - Q = 23

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Acol vs. Z for Z - Q = 24

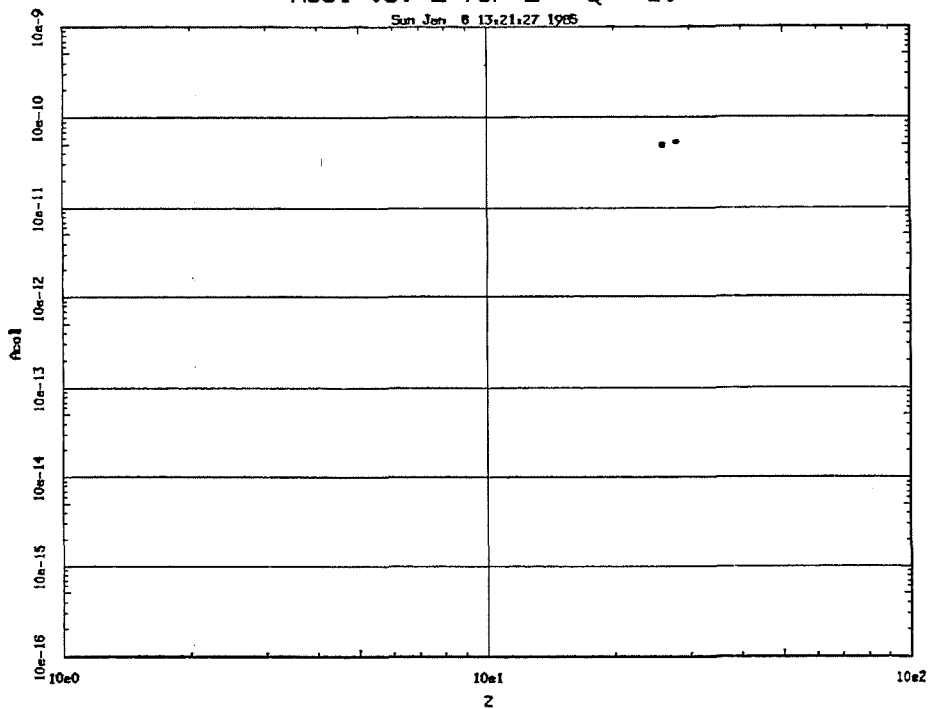
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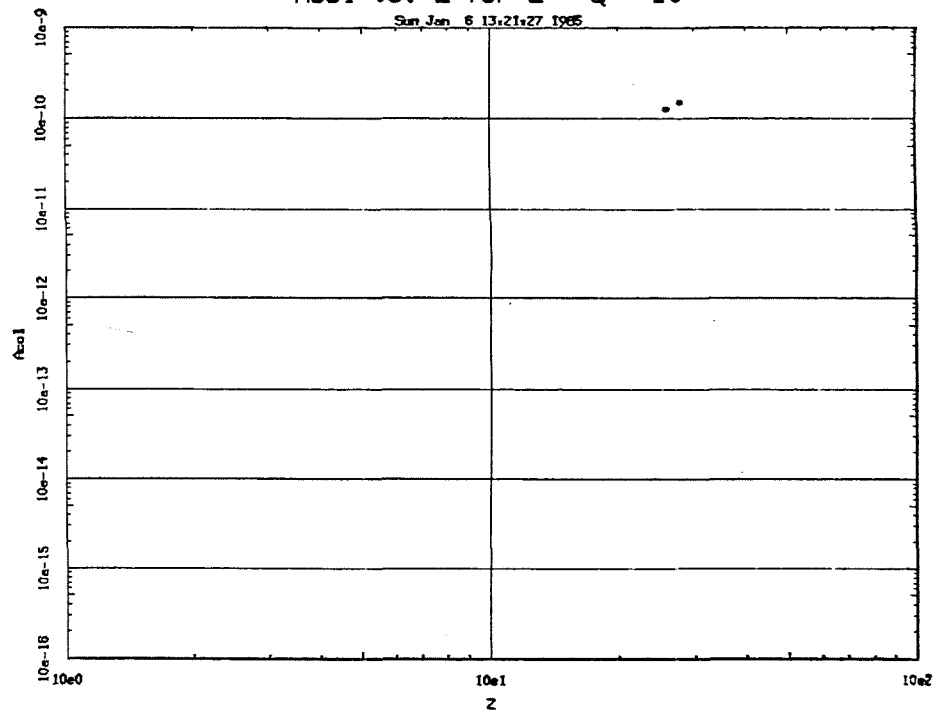
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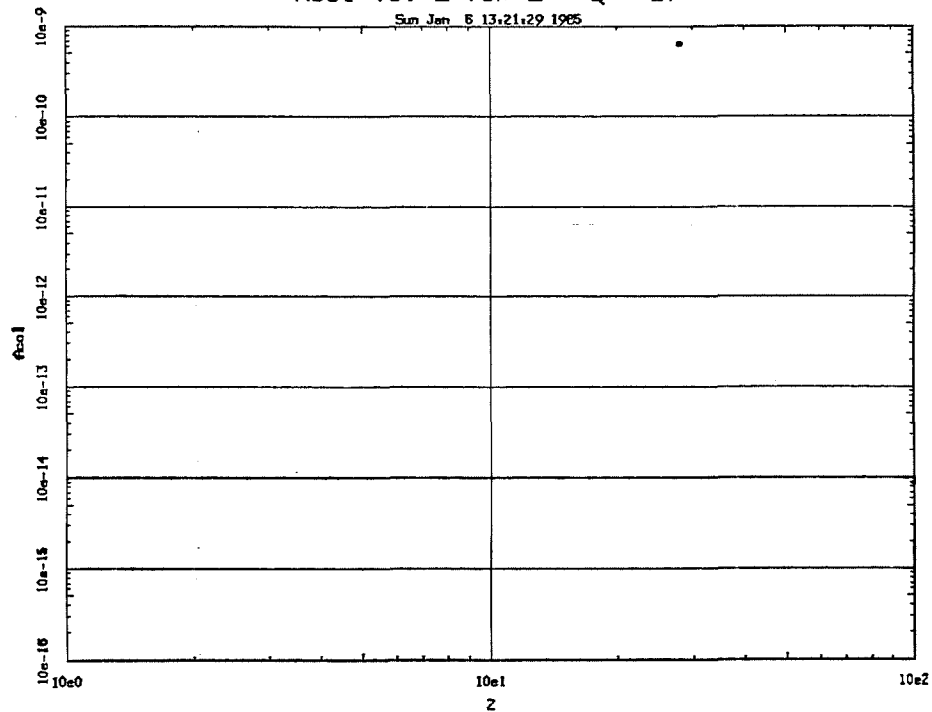
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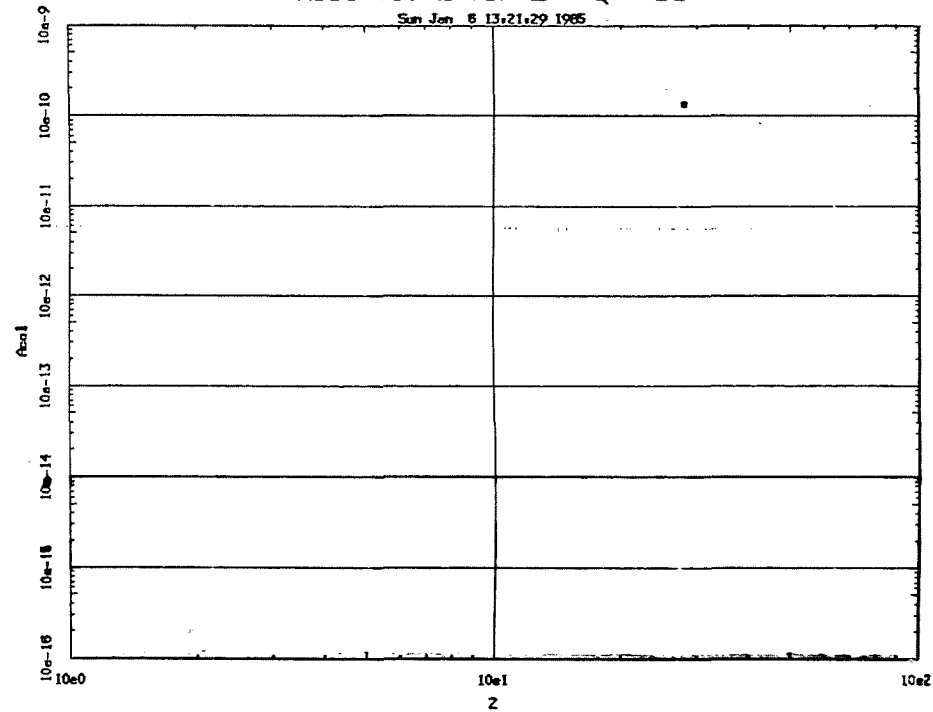
Acol vs. Z for Z - Q = 27

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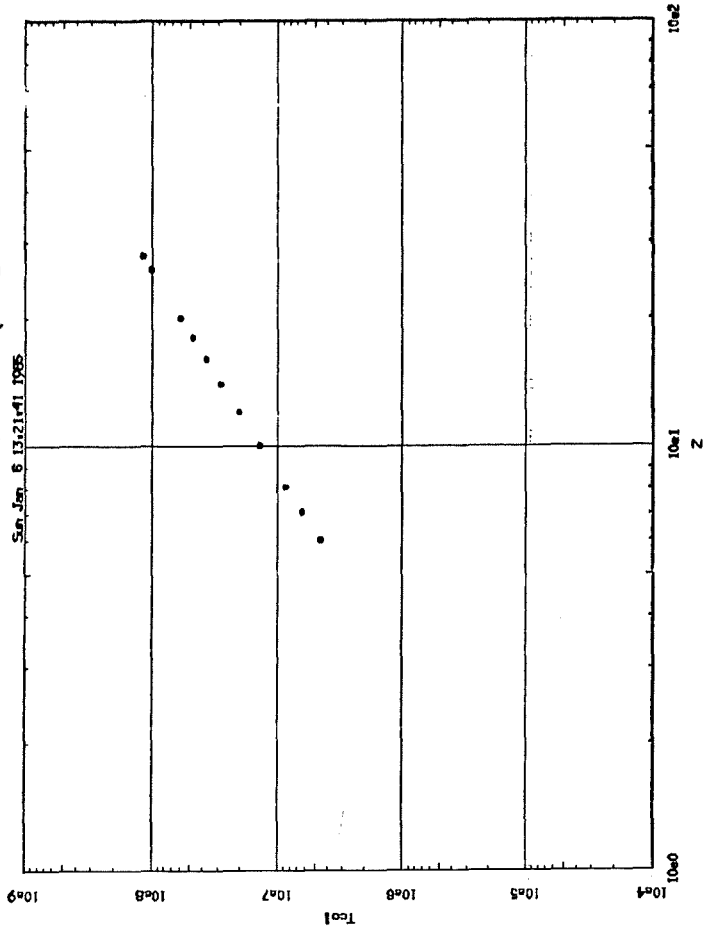


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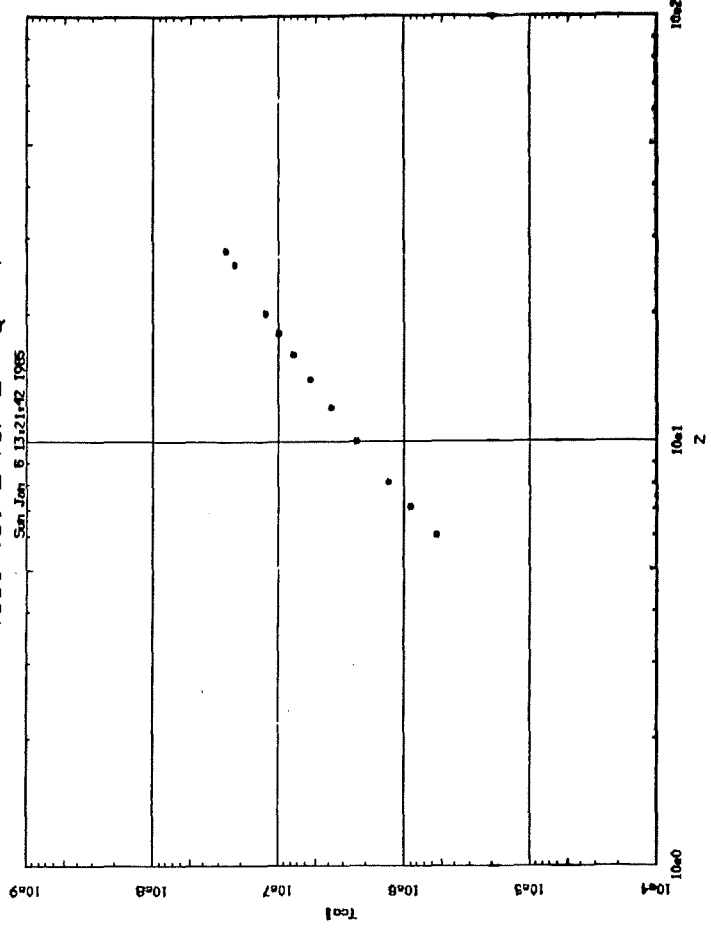
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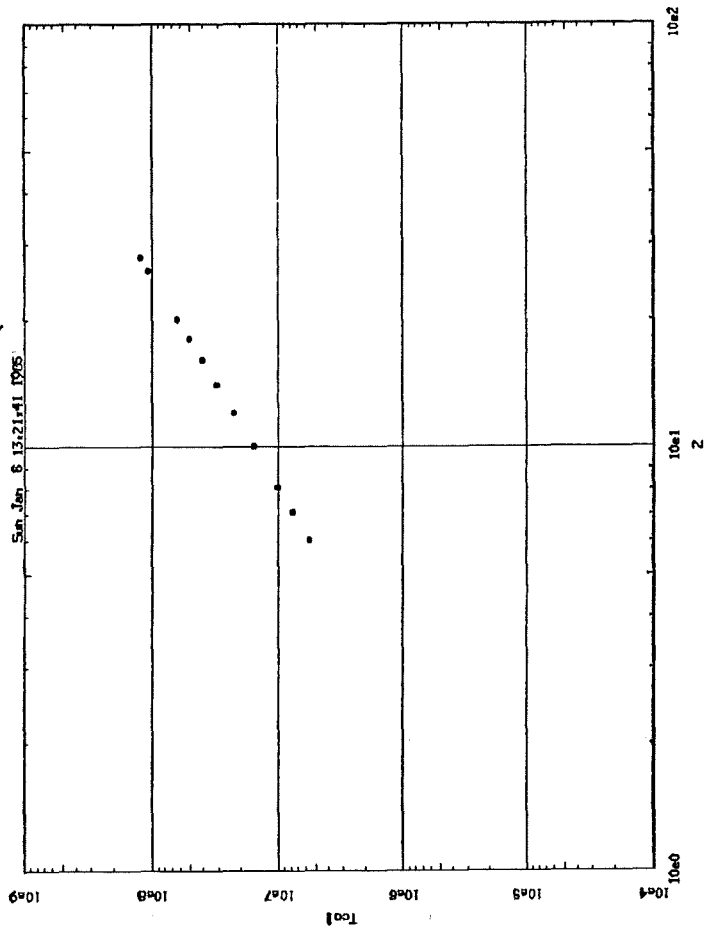
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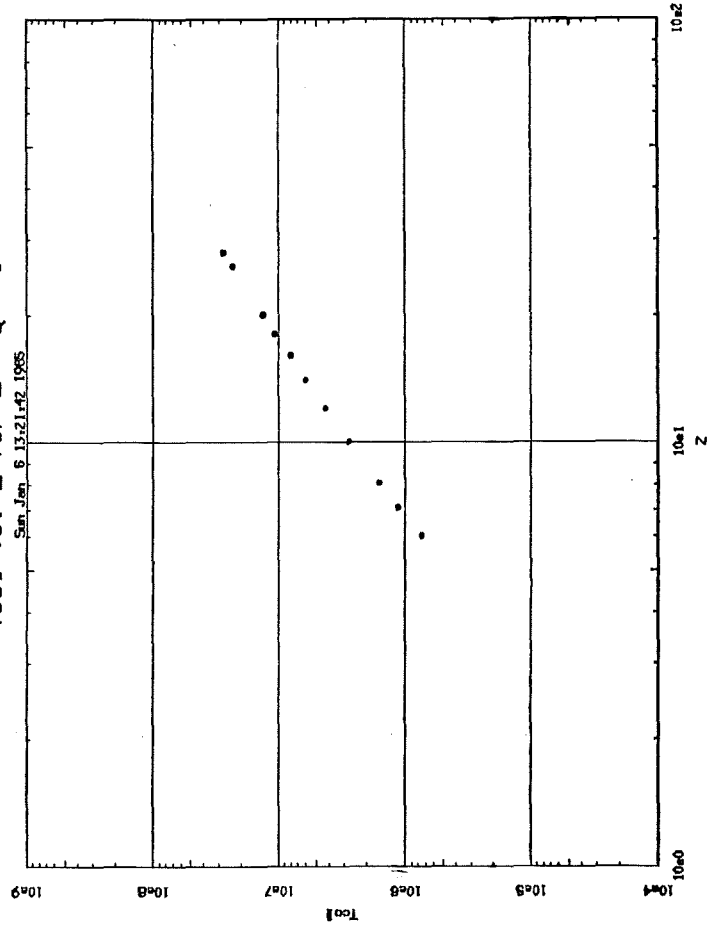
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Tcol vs. Z for Z - Q = 1

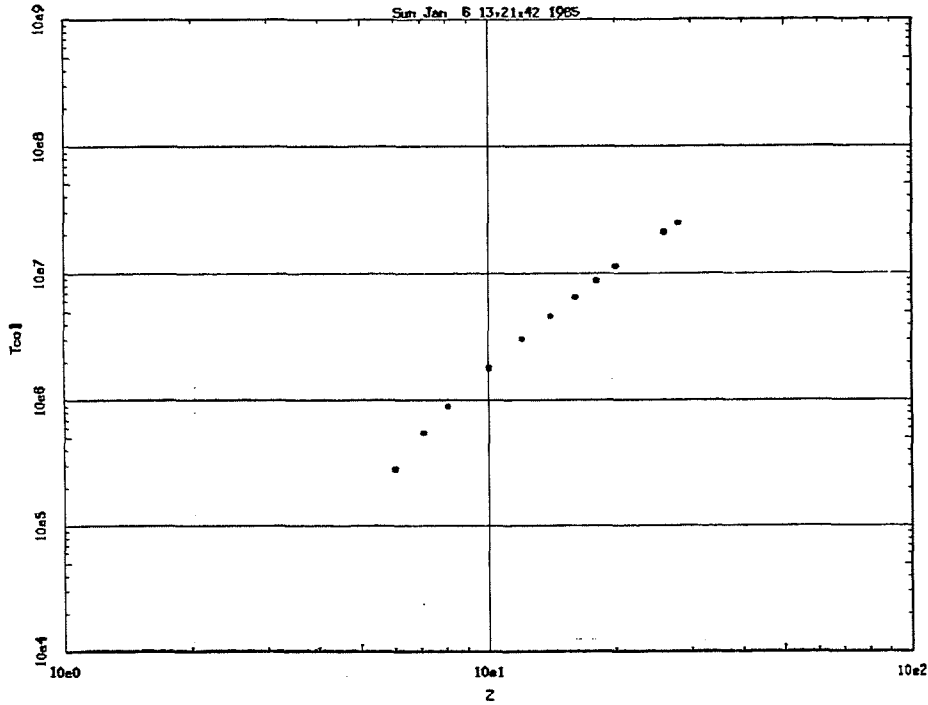


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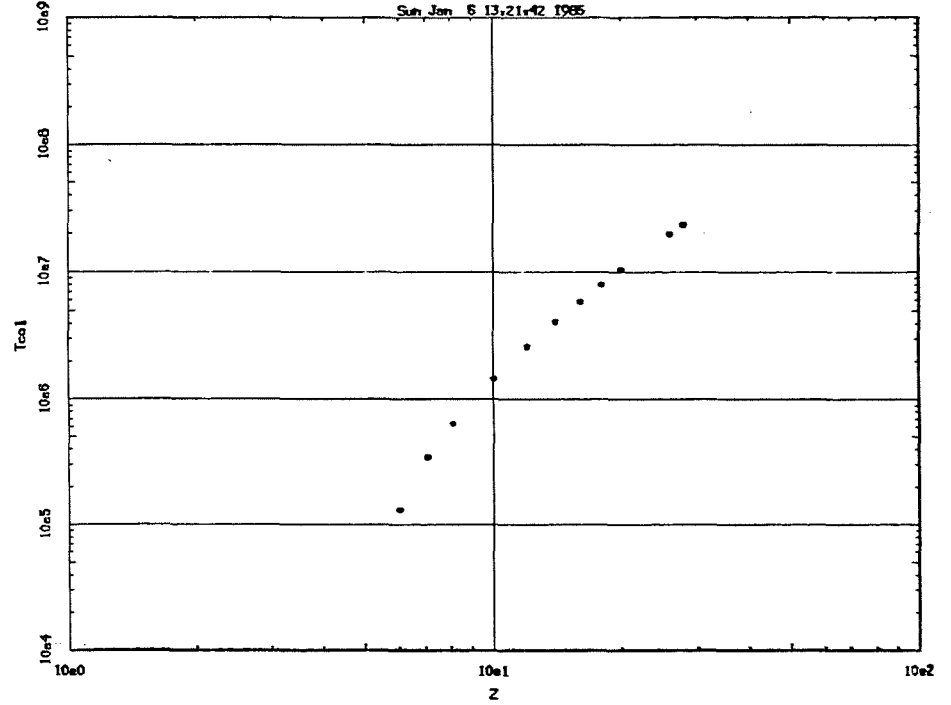
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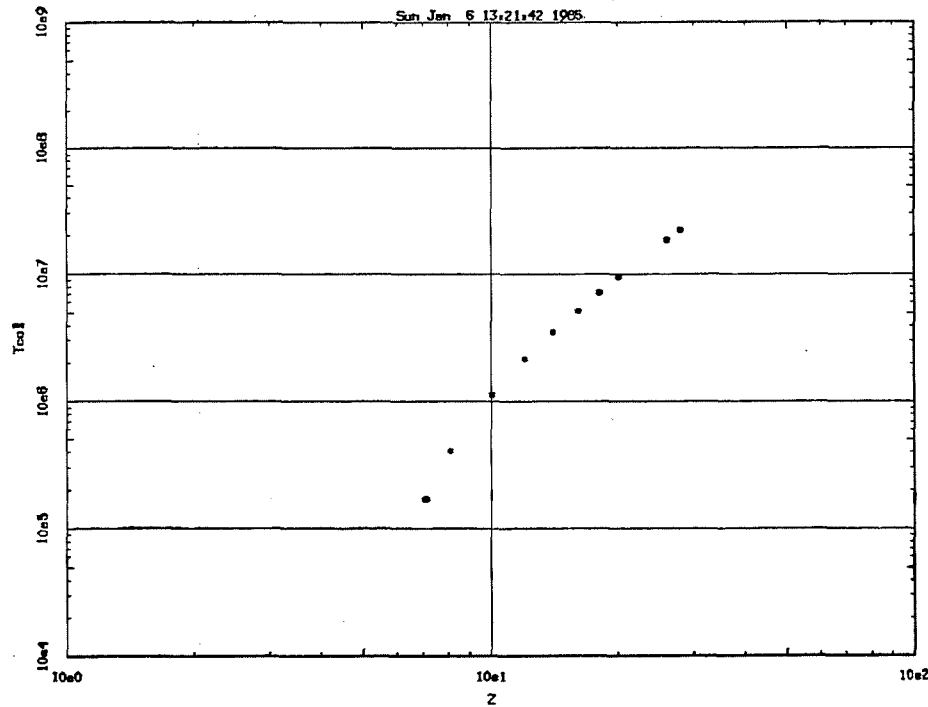
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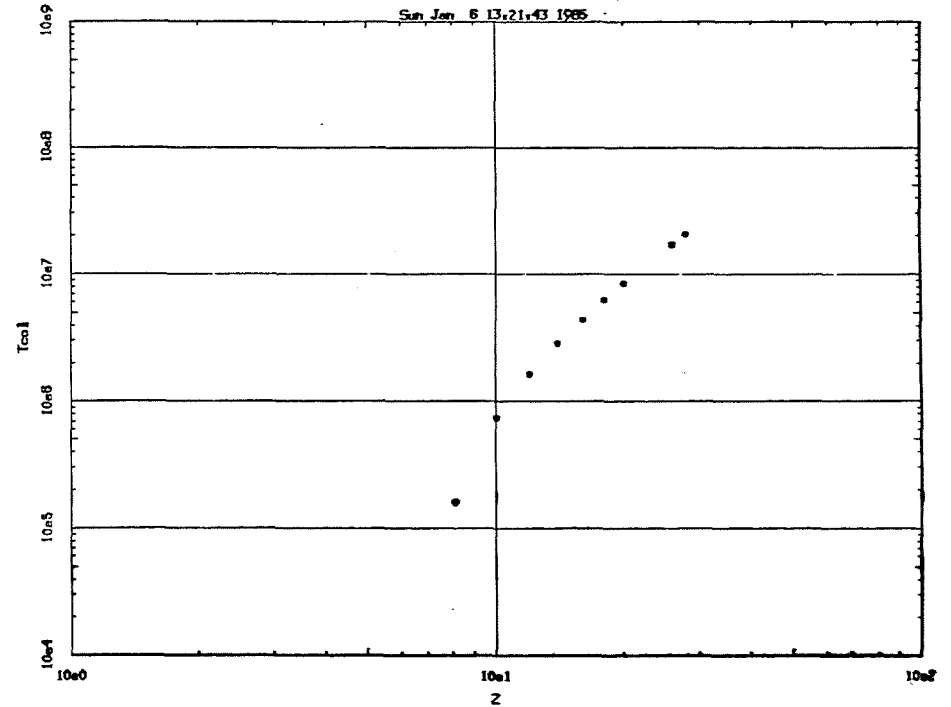
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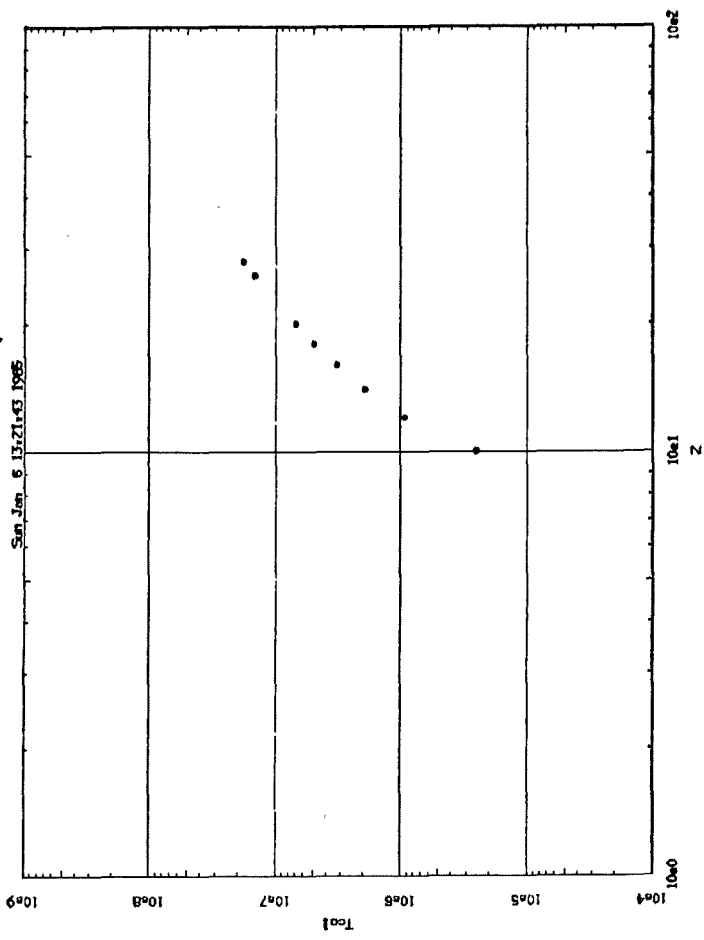


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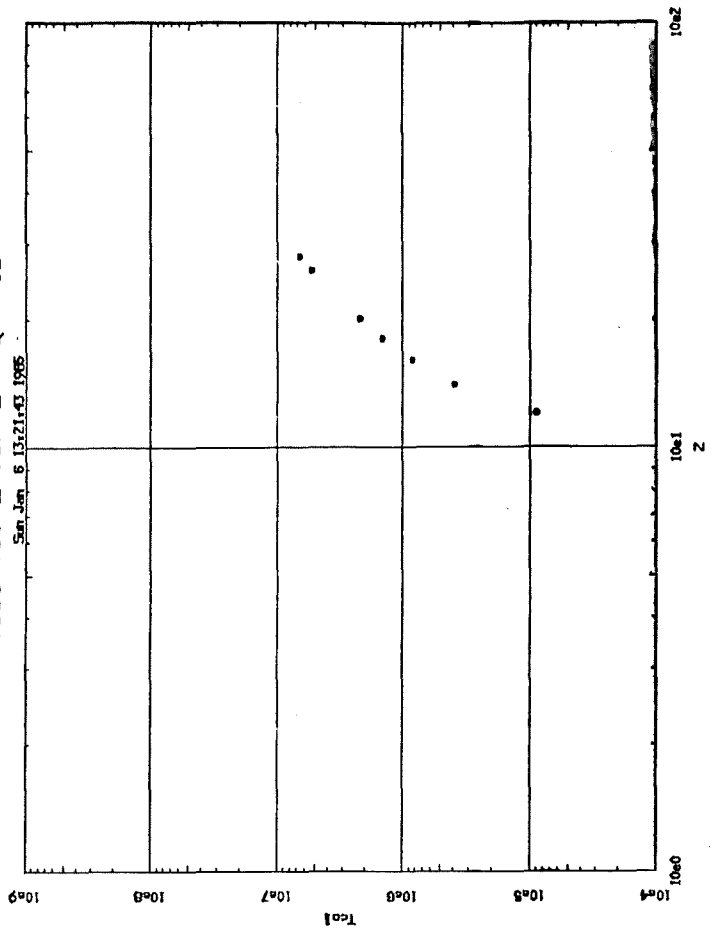
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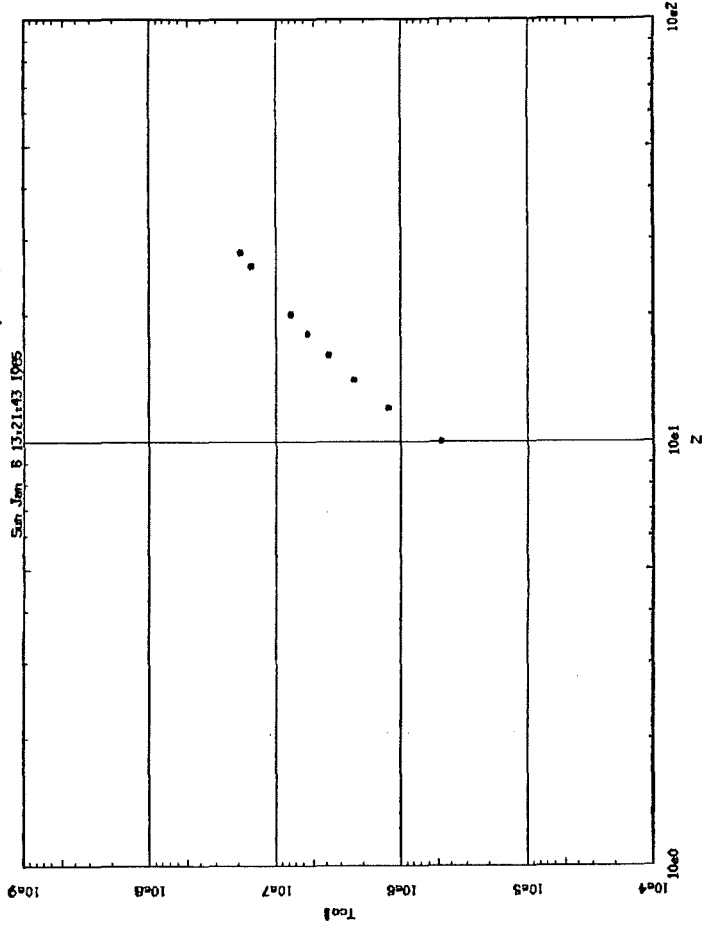
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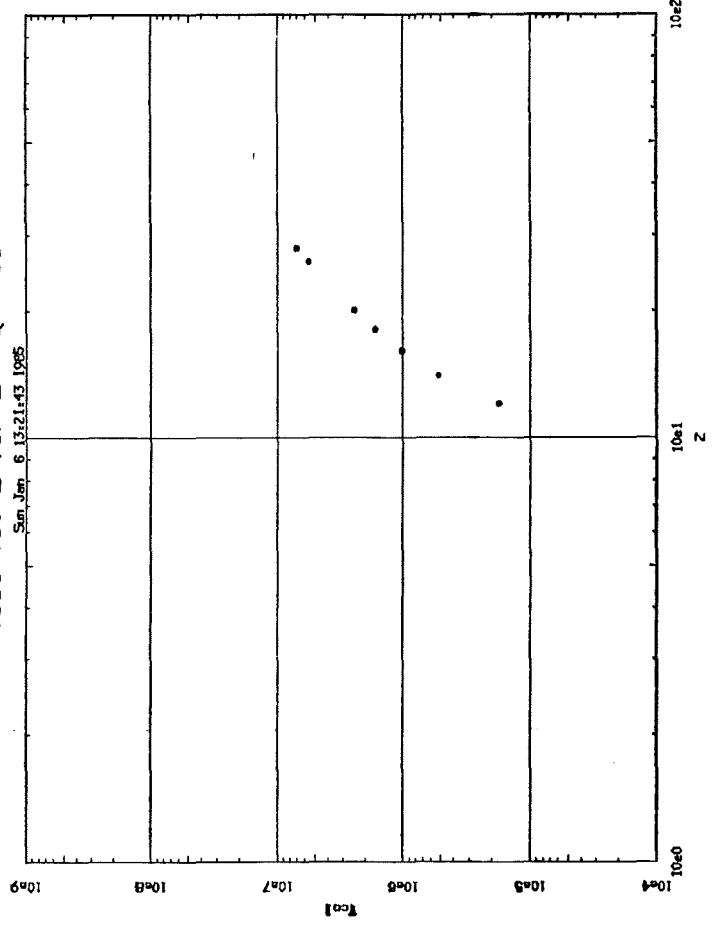
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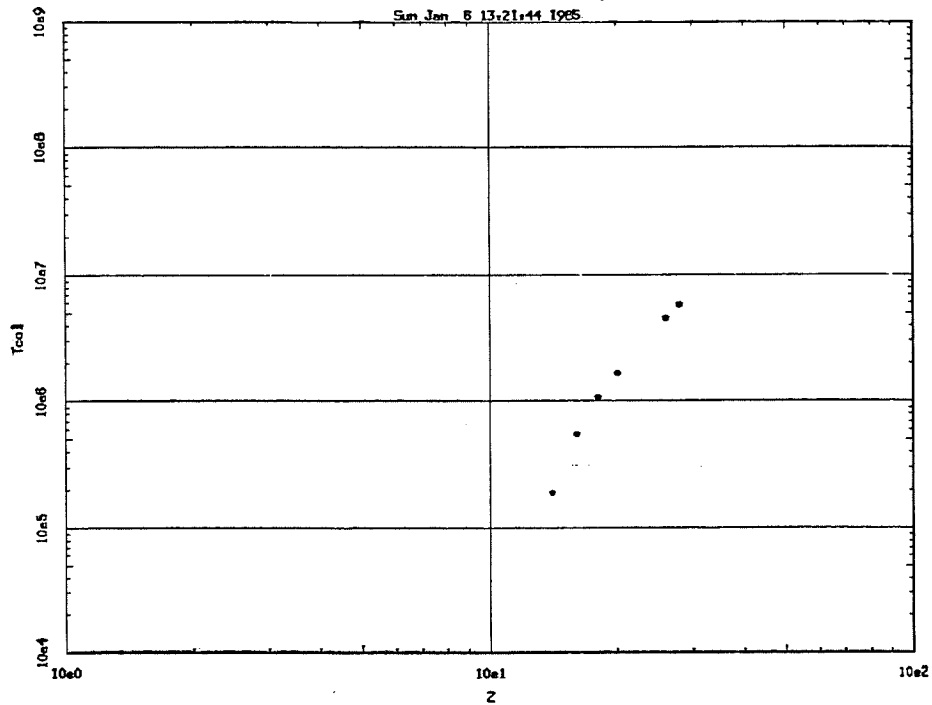


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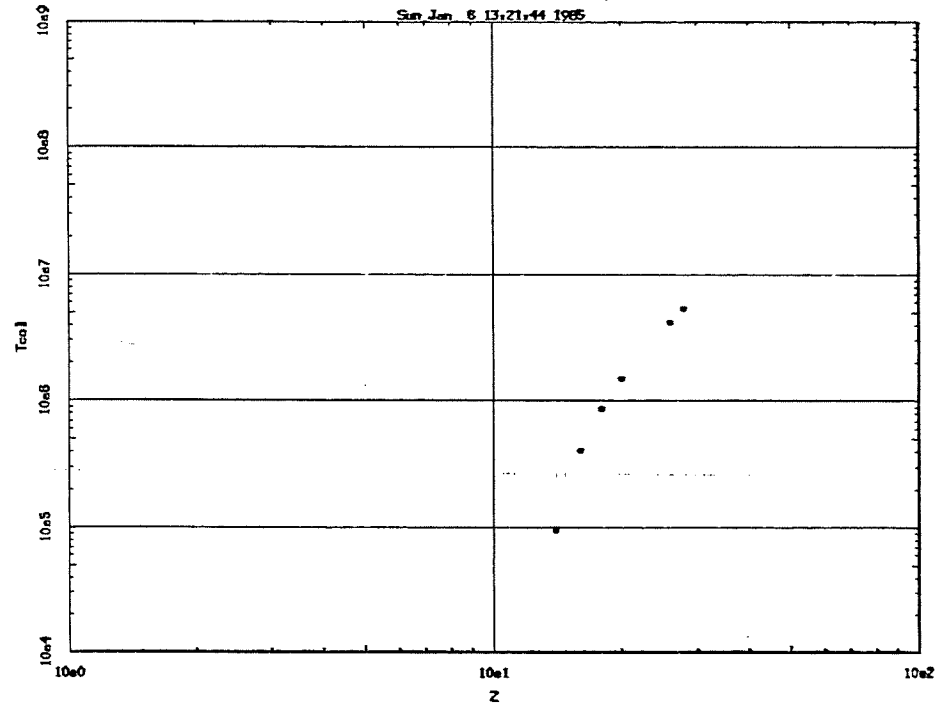
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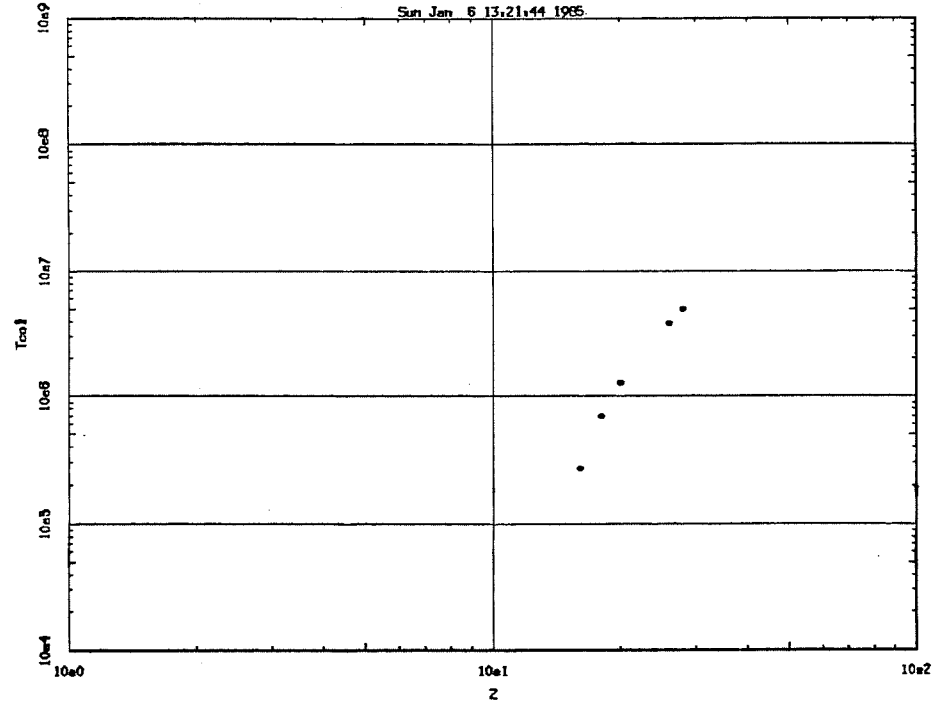
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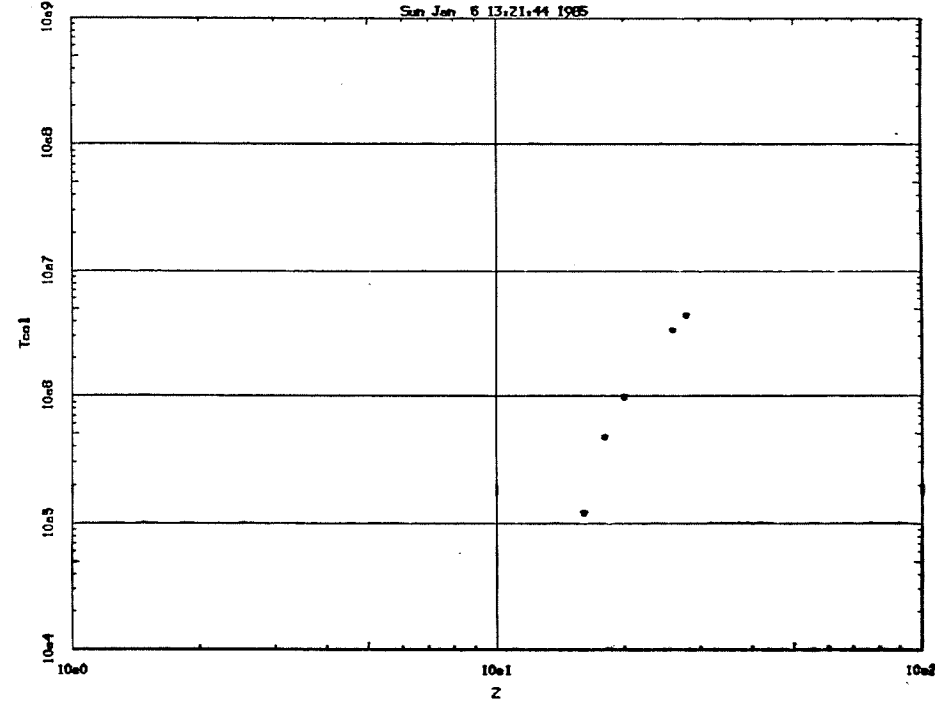
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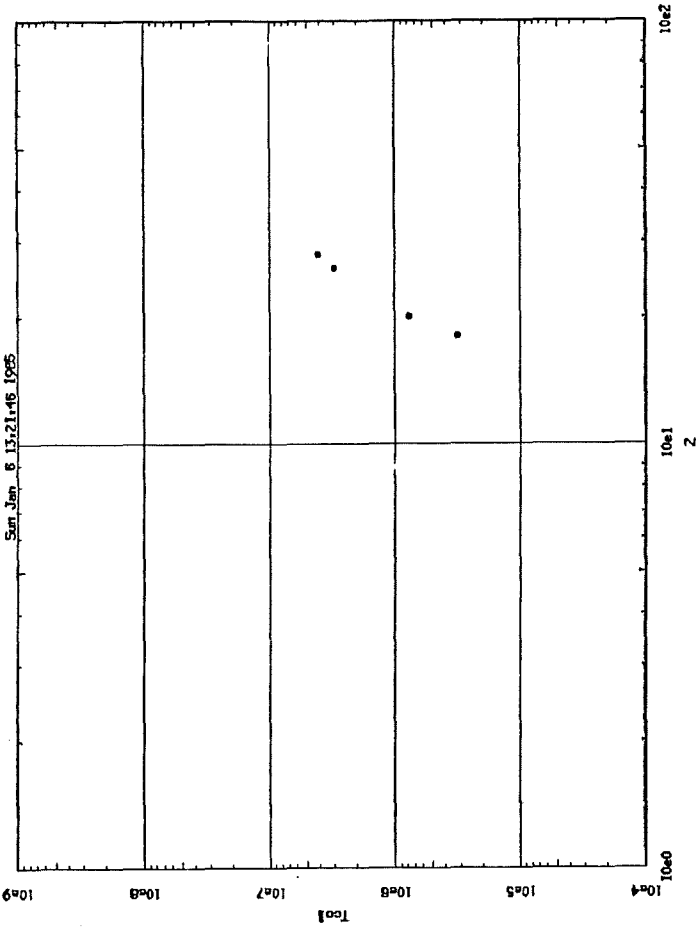


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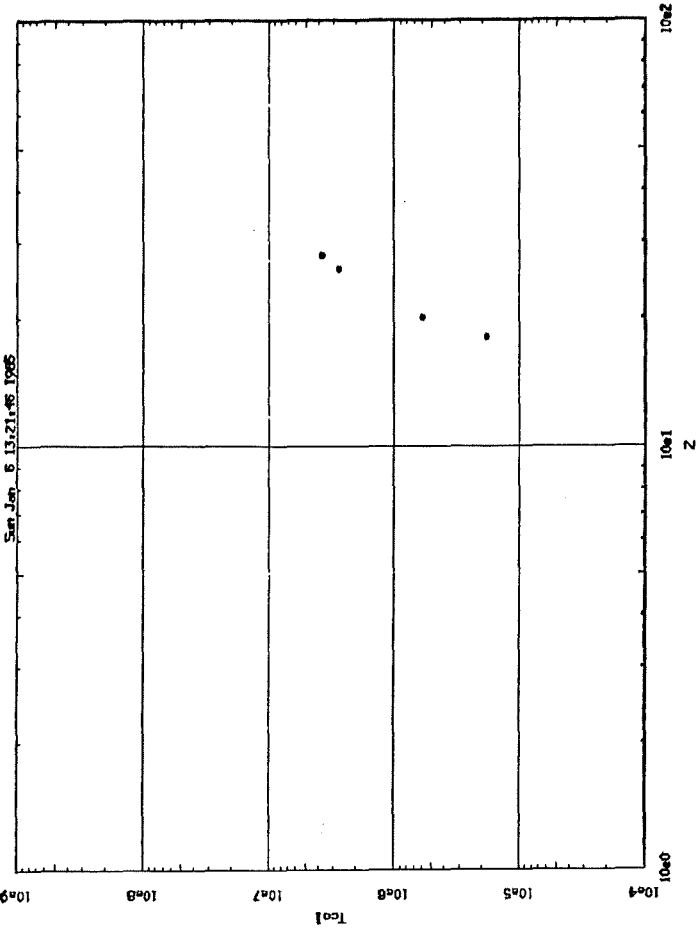
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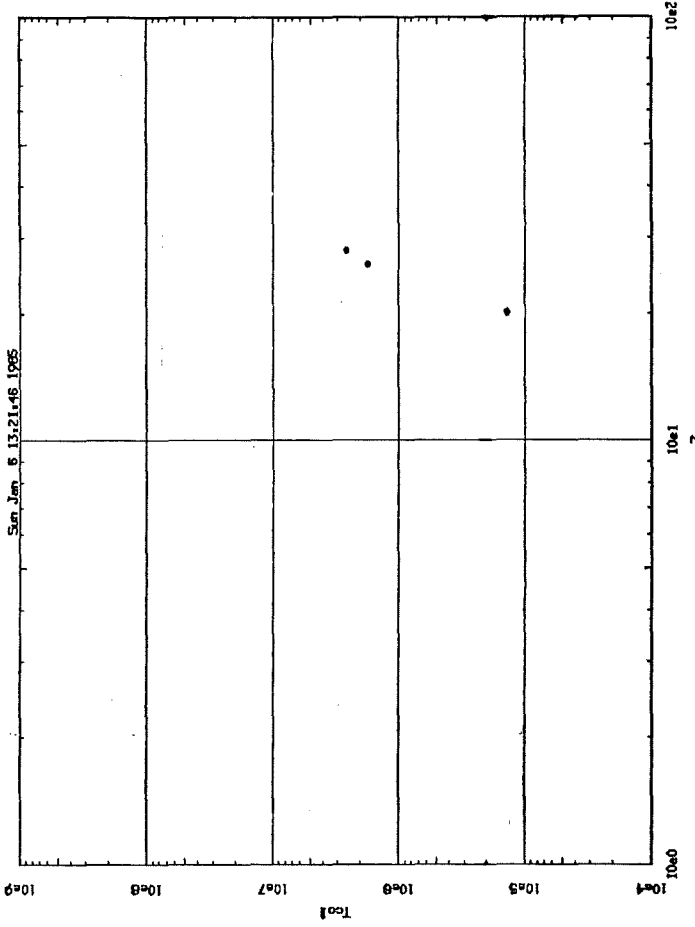
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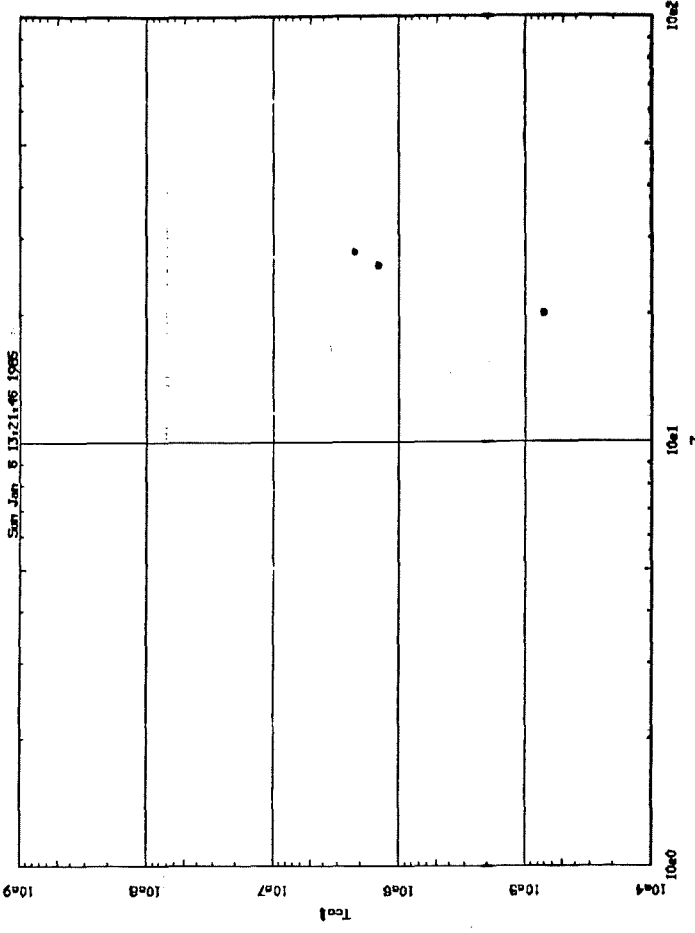
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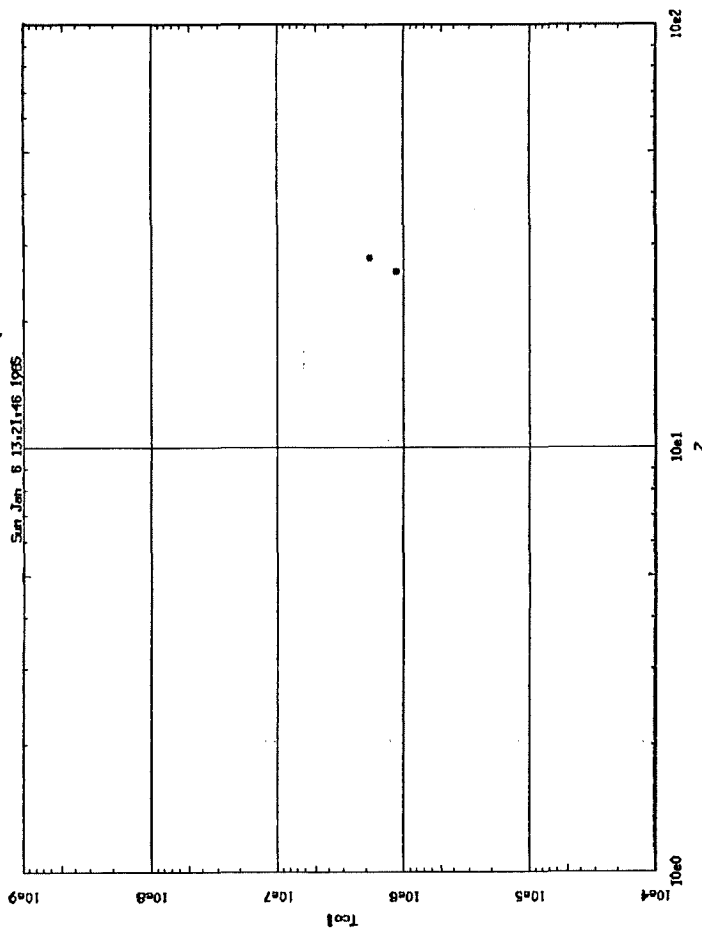
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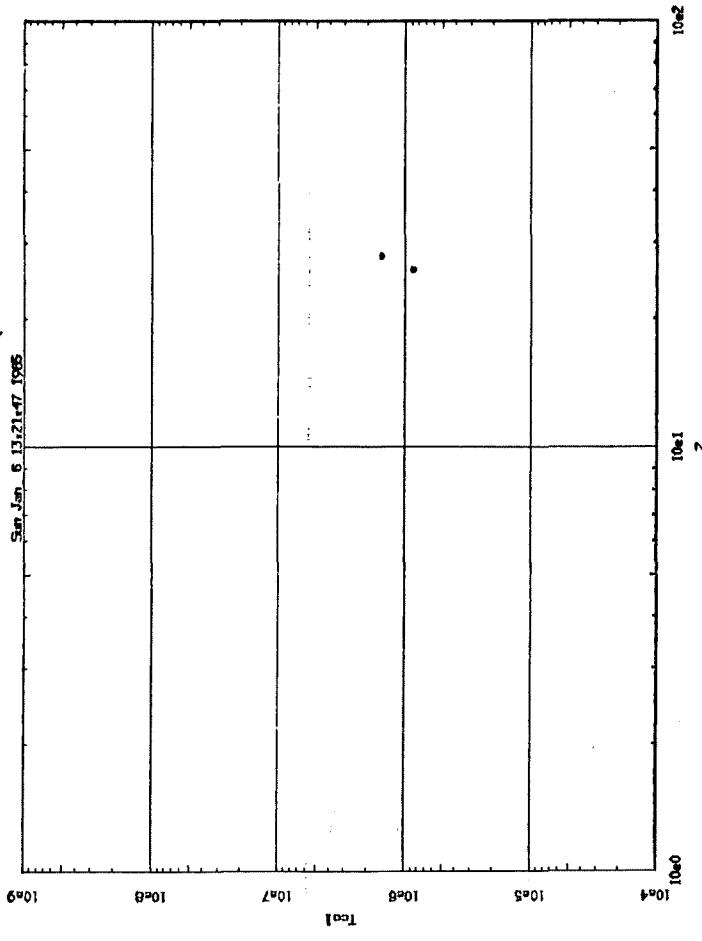
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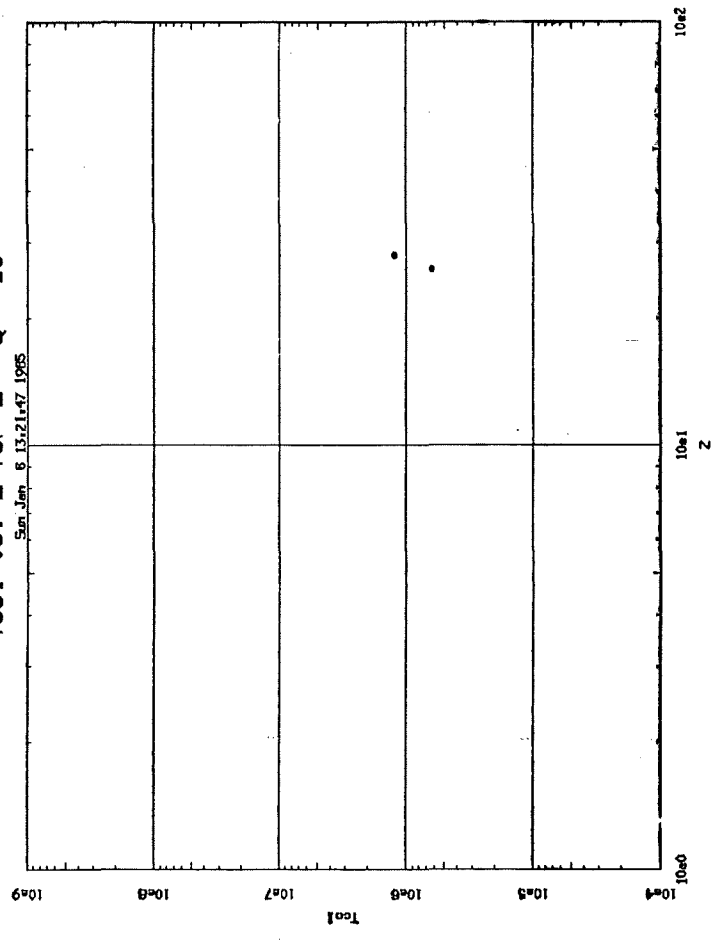
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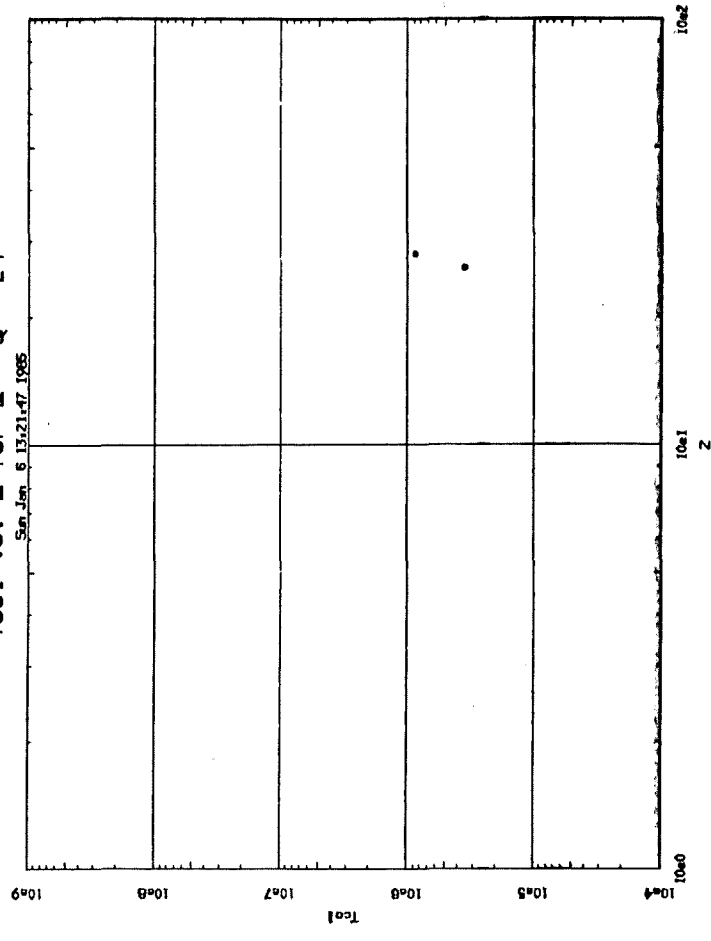
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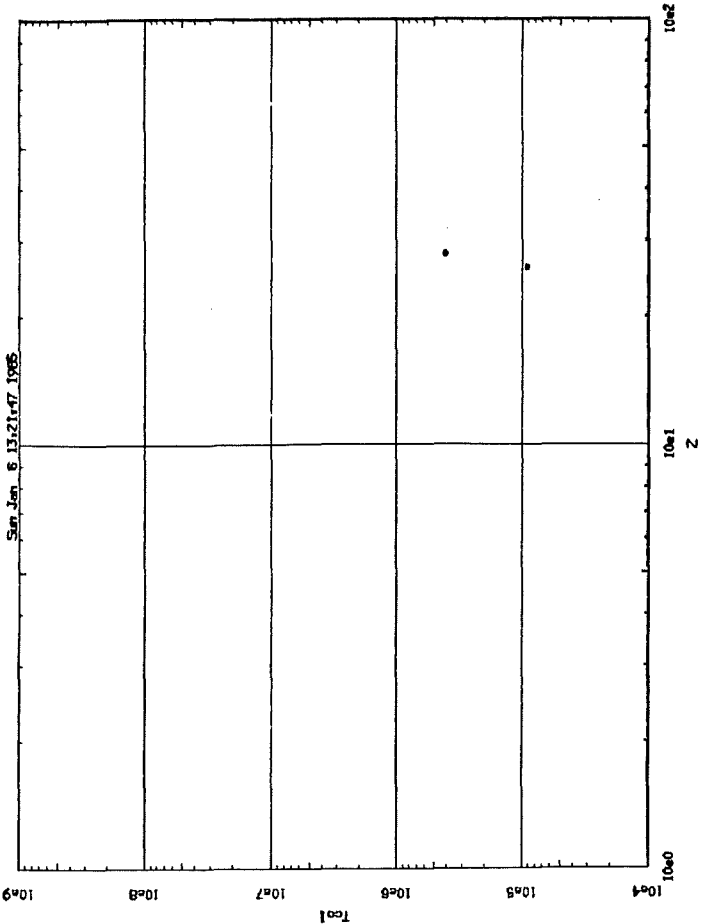
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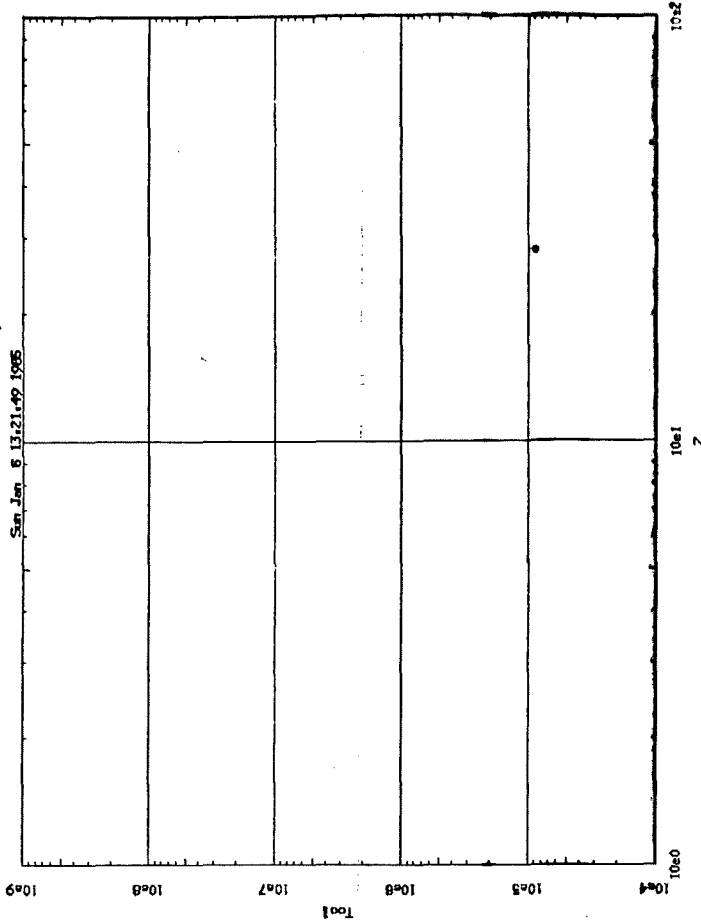
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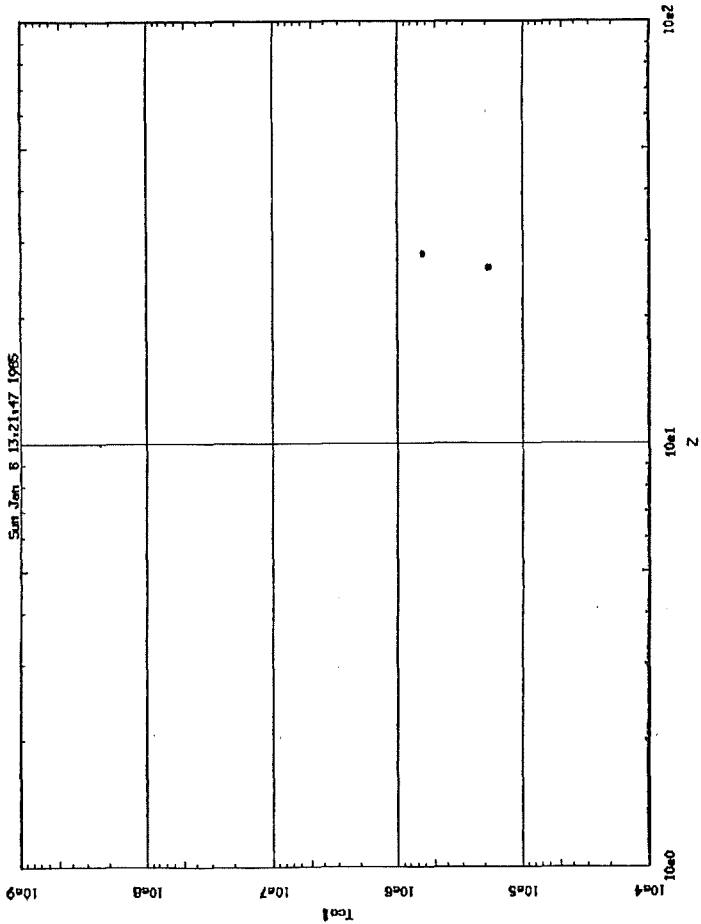
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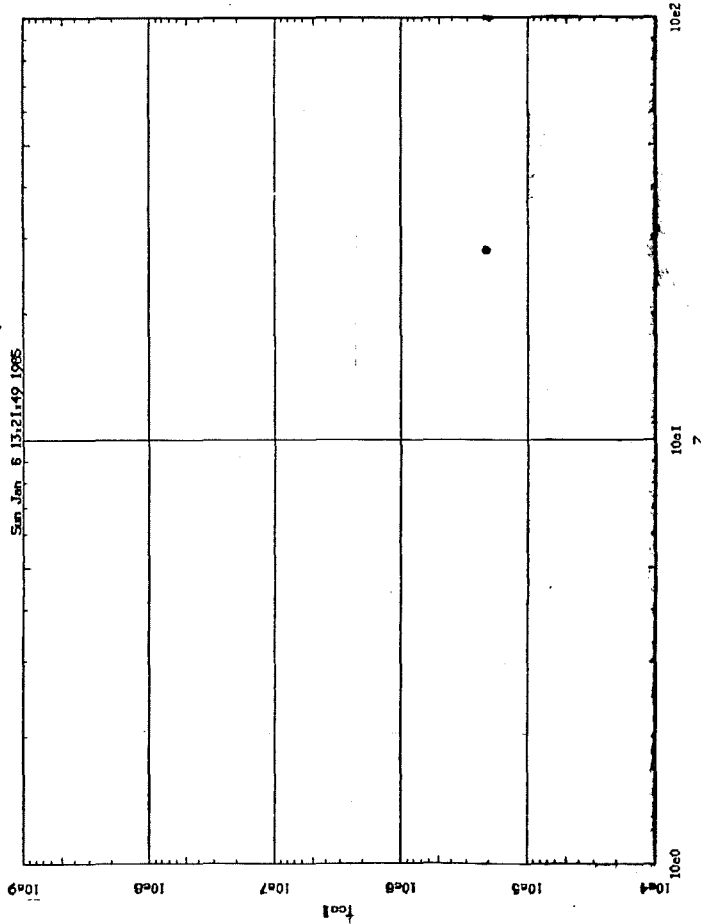
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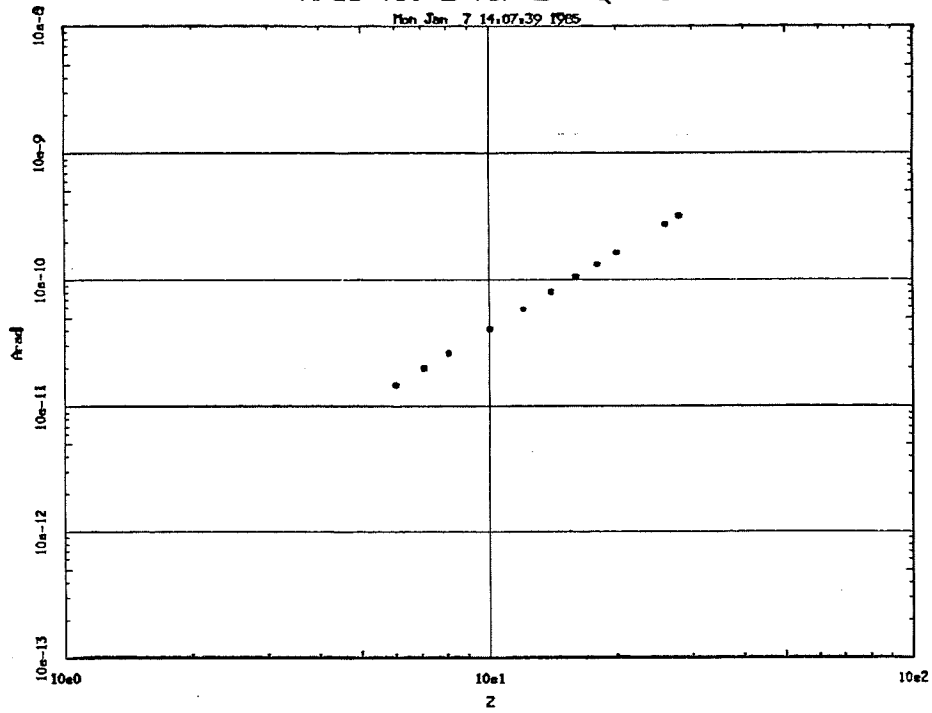


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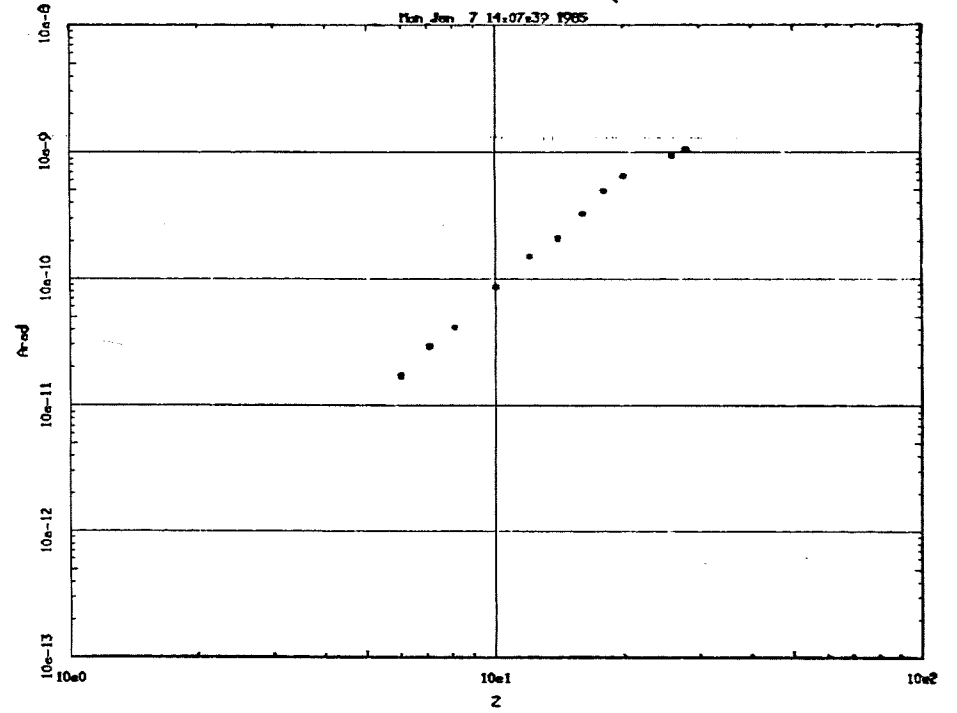
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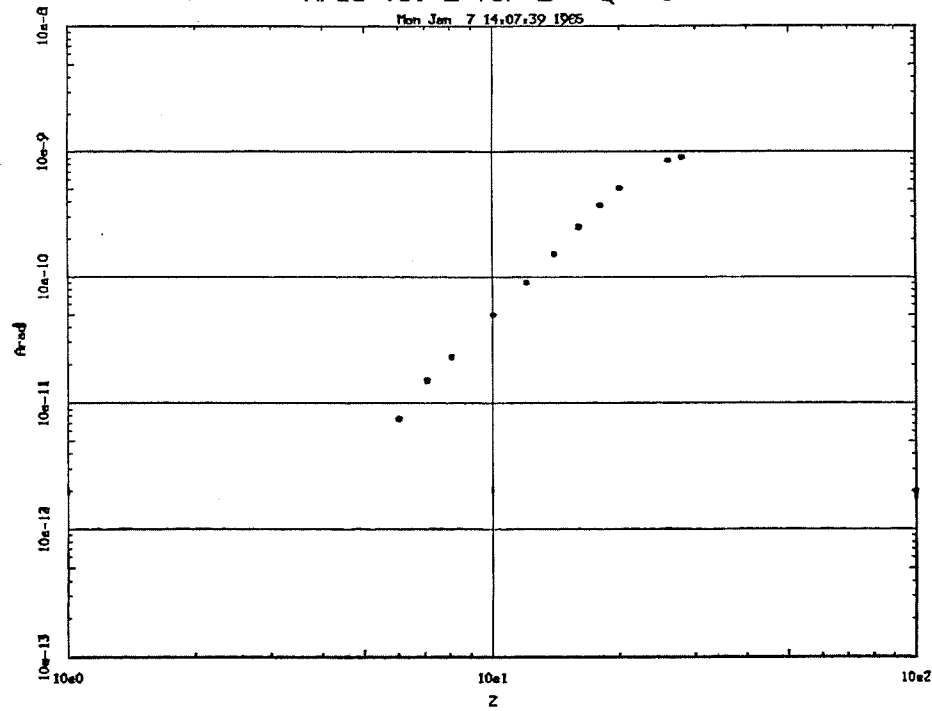
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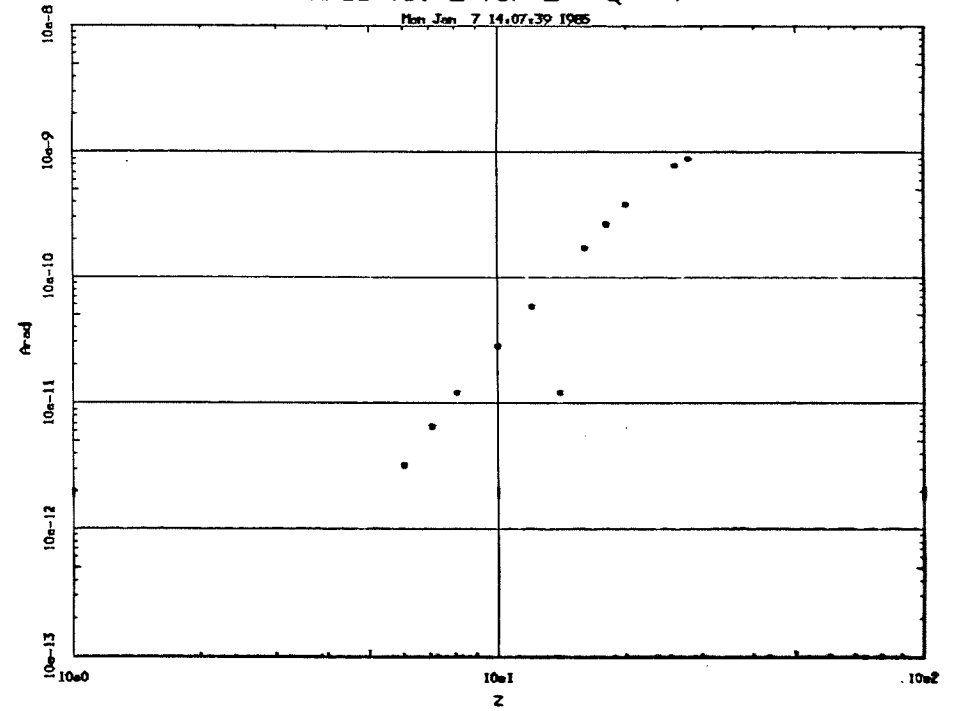
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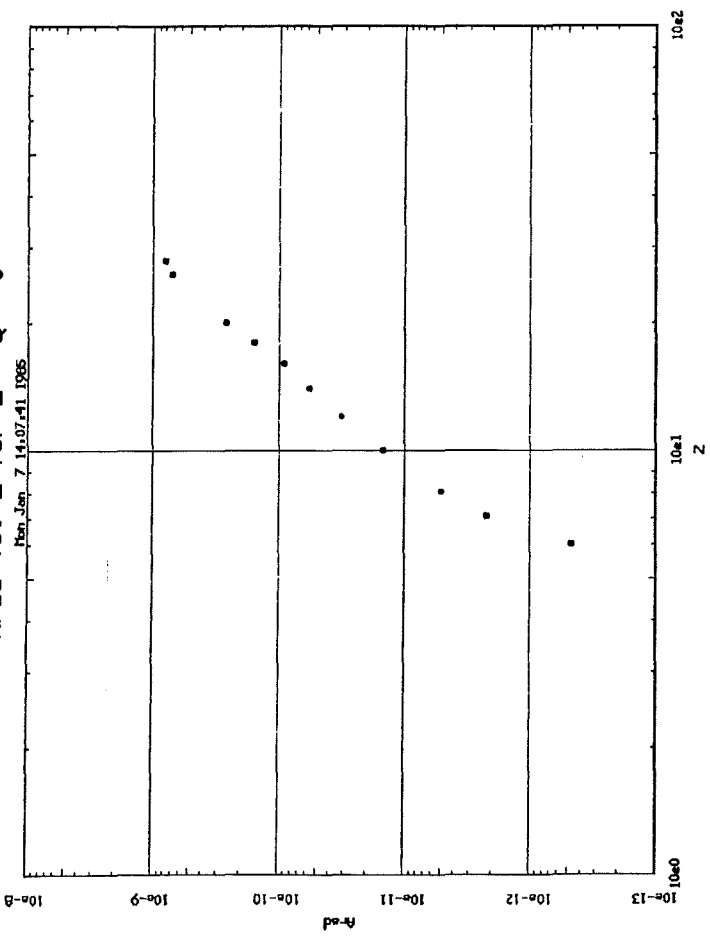


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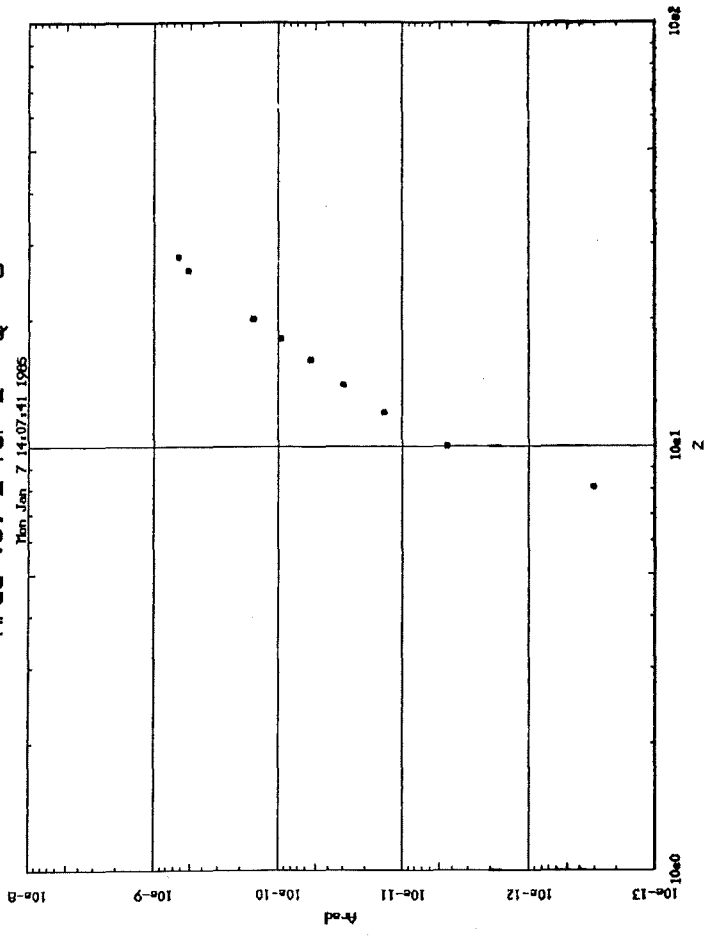
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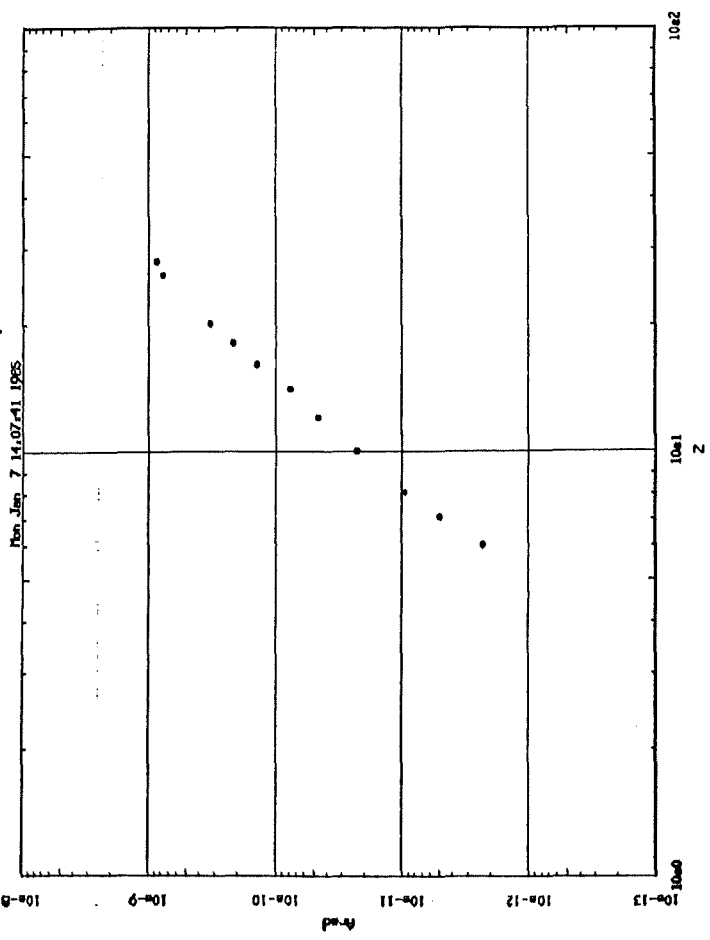
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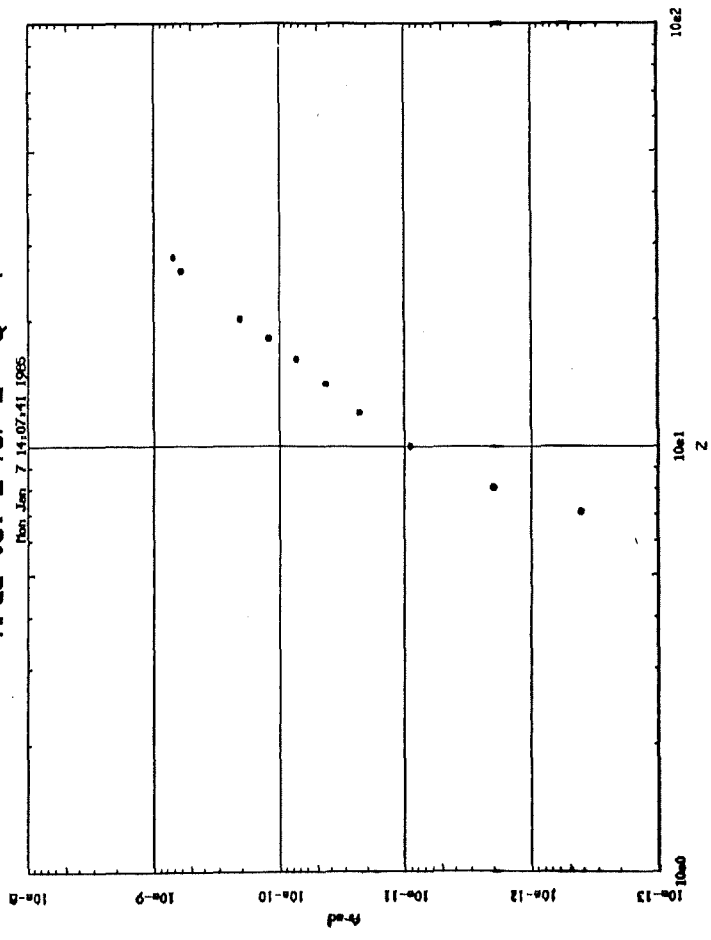
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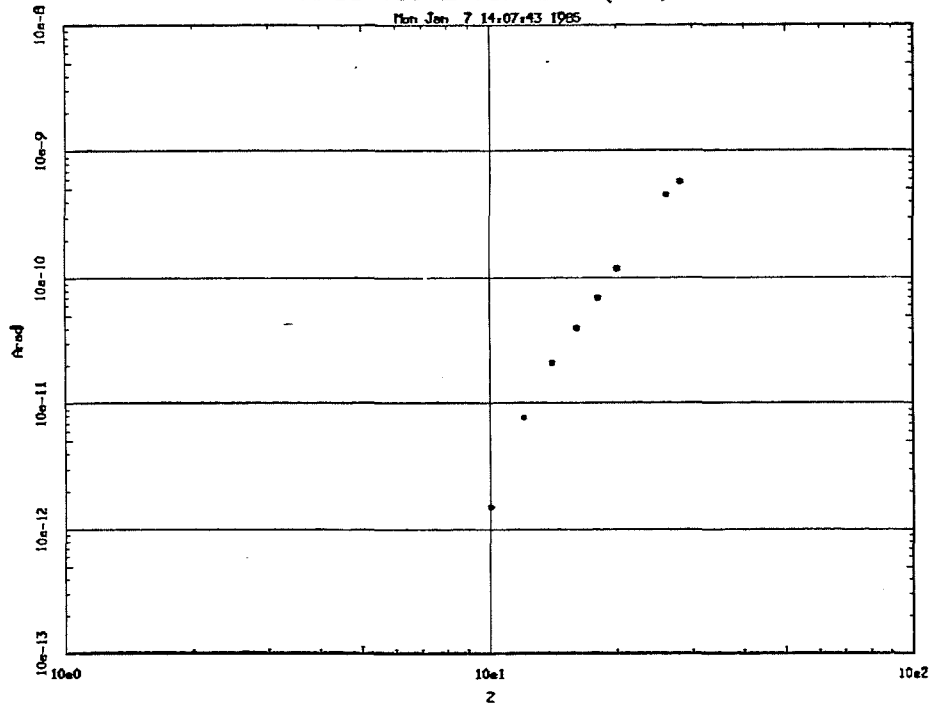


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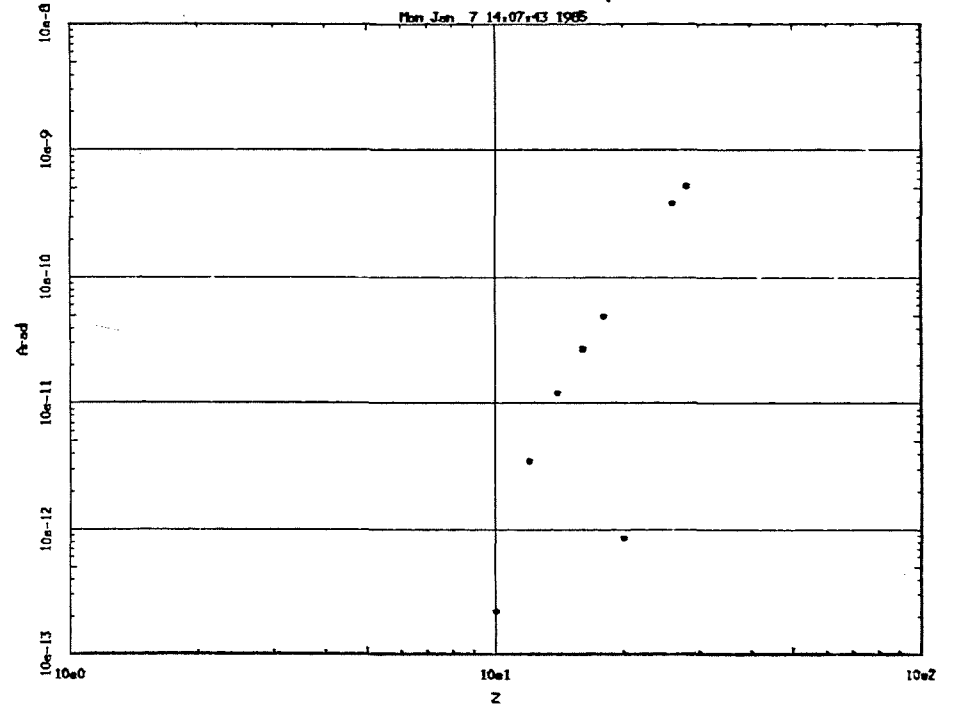
Arad vs. Z for Z - Q = 9

Mon Jan 7 14:07:43 1985



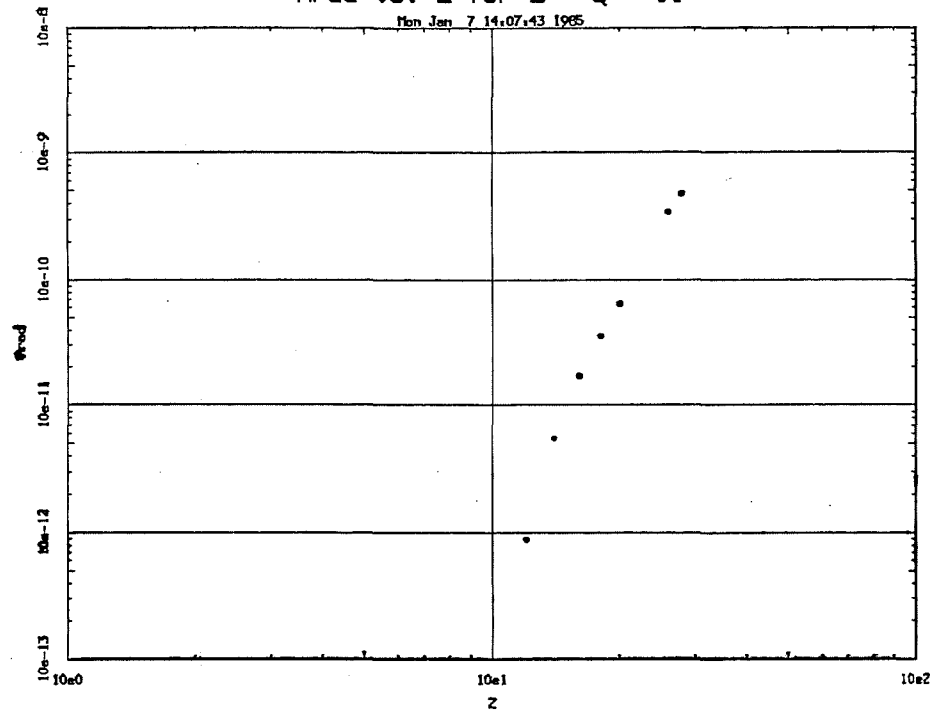
Arad vs. Z for Z - Q = 10

Mon Jan 7 14:07:43 1985



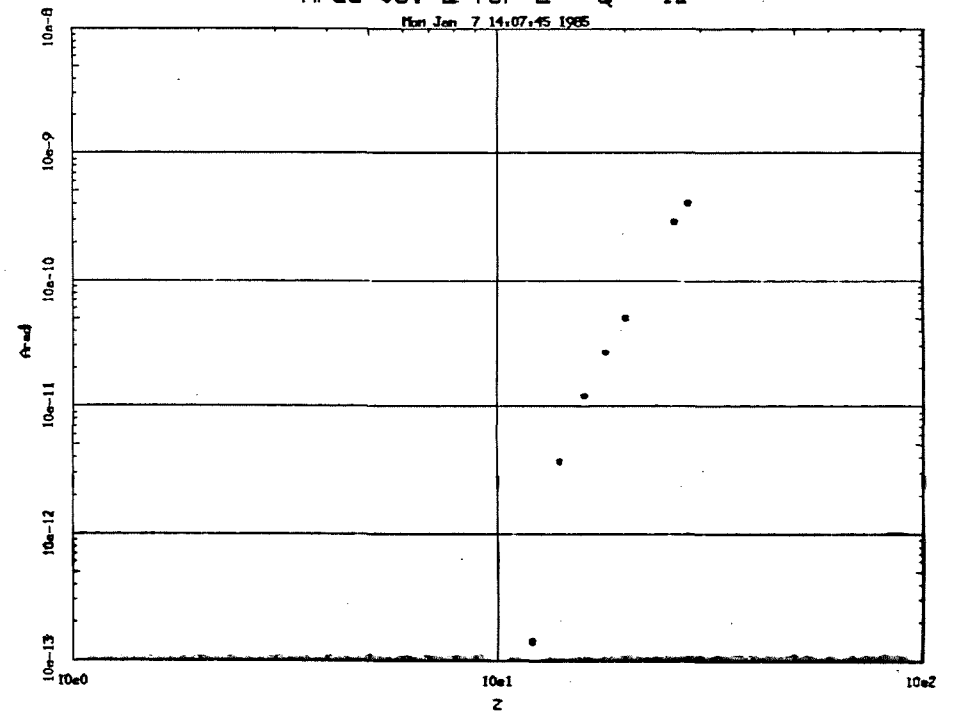
Arad vs. Z for Z - Q = 11

Mon Jan 7 14:07:43 1985



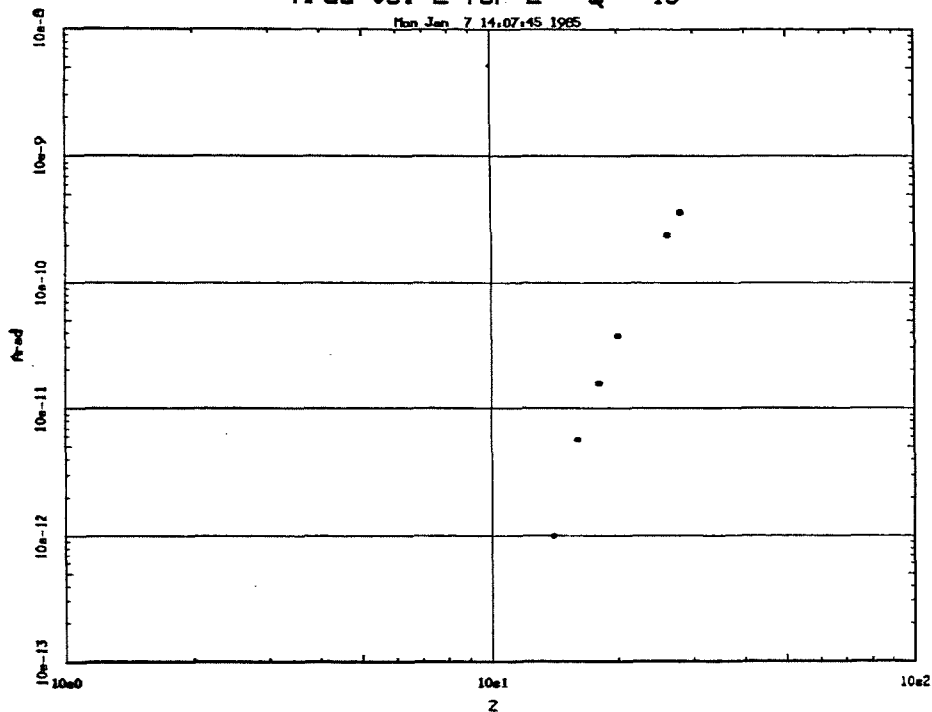
Arad vs. Z for Z - Q = 12

Mon Jan 7 14:07:45 1985



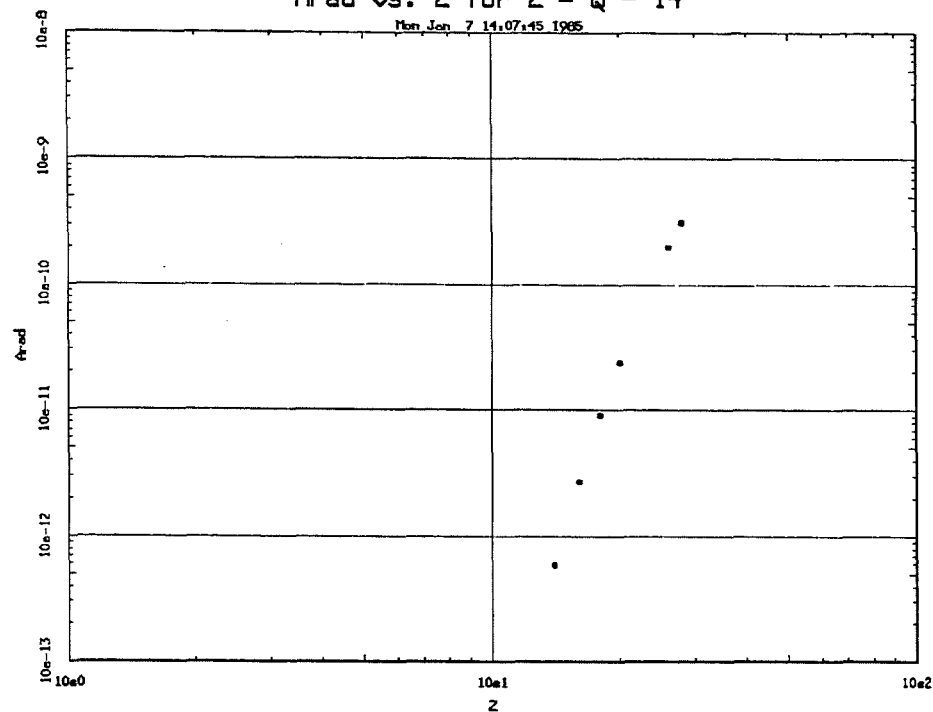
Arad vs. Z for Z - Q = 13

Mon Jan 7 14:07:45 1965



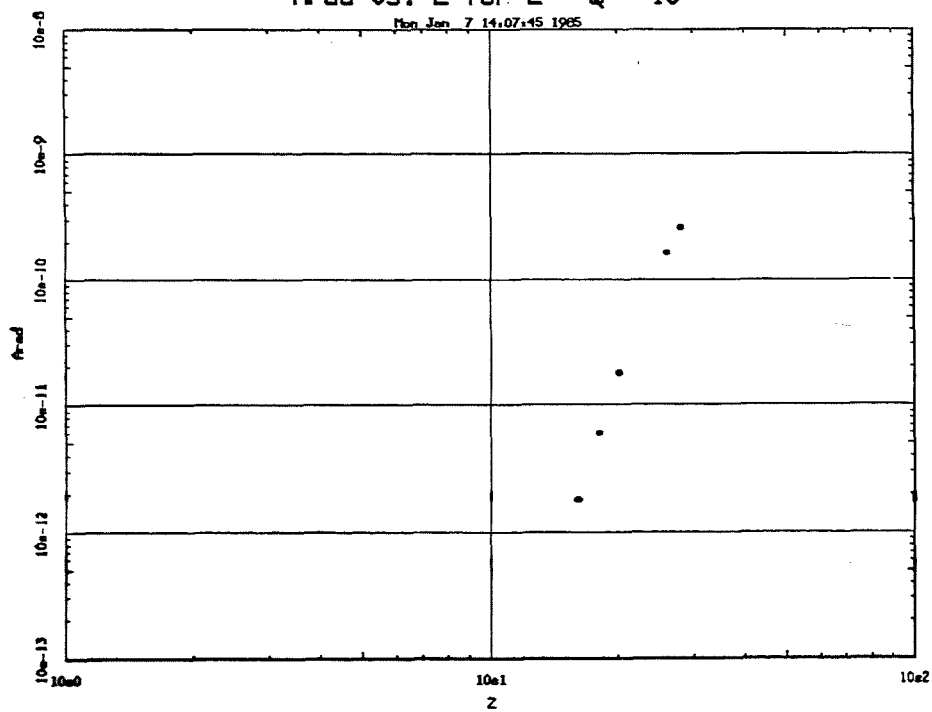
Arad vs. Z for Z - Q = 14

Mon Jan 7 14:07:45 1965



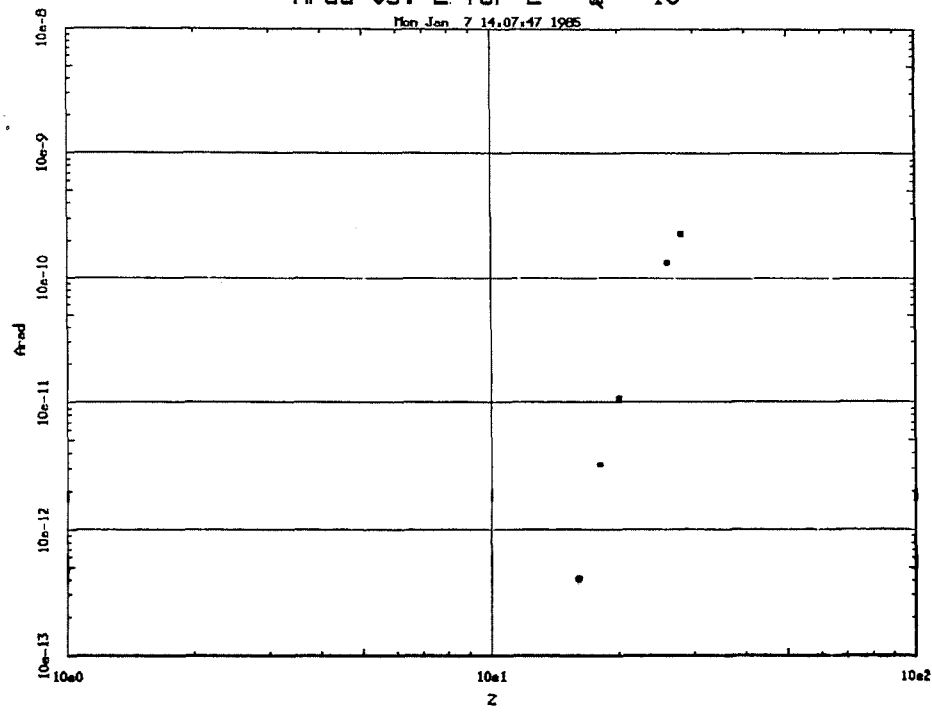
Arad vs. Z for Z - Q = 15

Mon Jan 7 14:07:45 1965

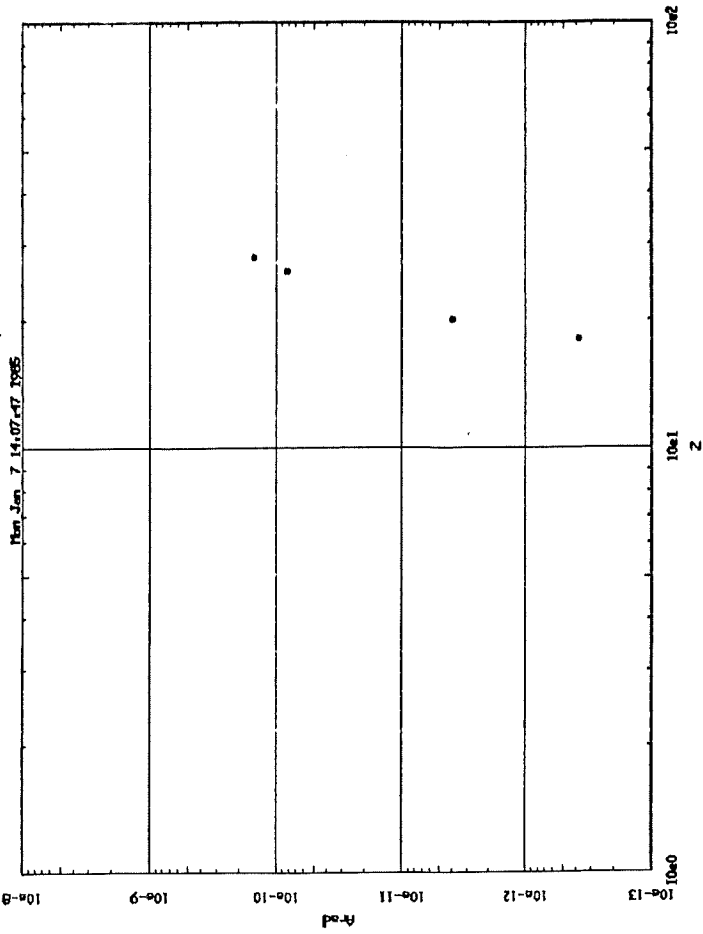


Arad vs. Z for Z - Q = 16

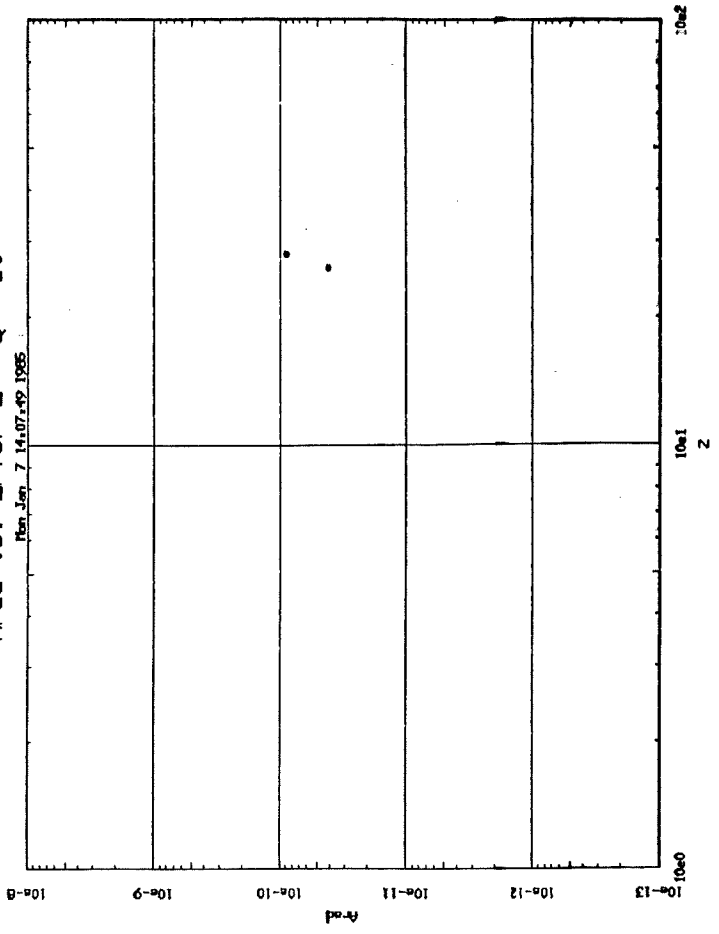
Mon Jan 7 14:07:47 1965



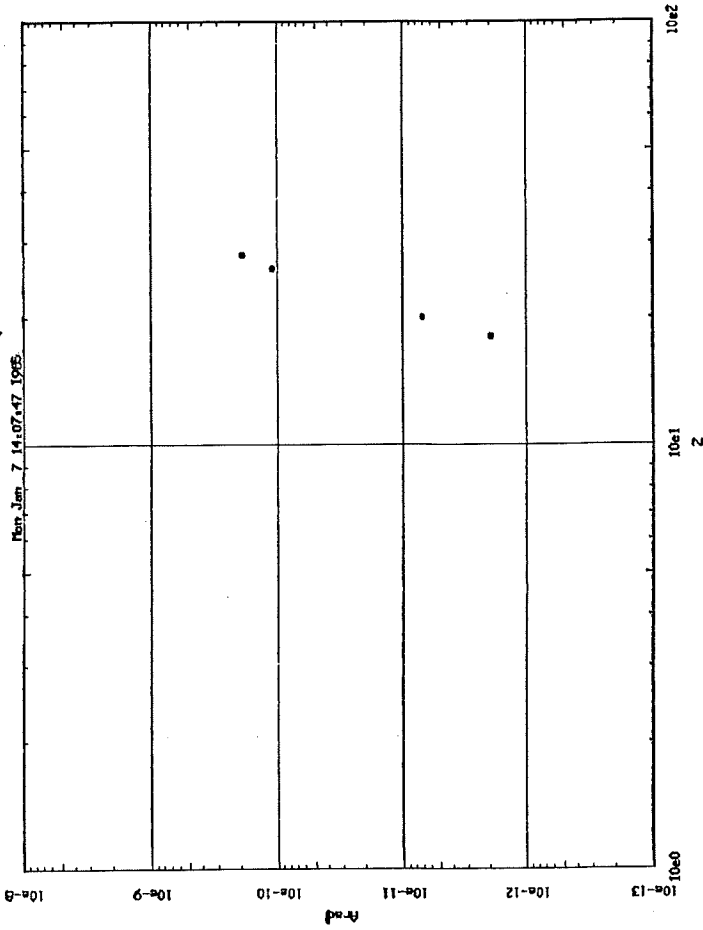
Arad vs. Z for Z - Q = 18



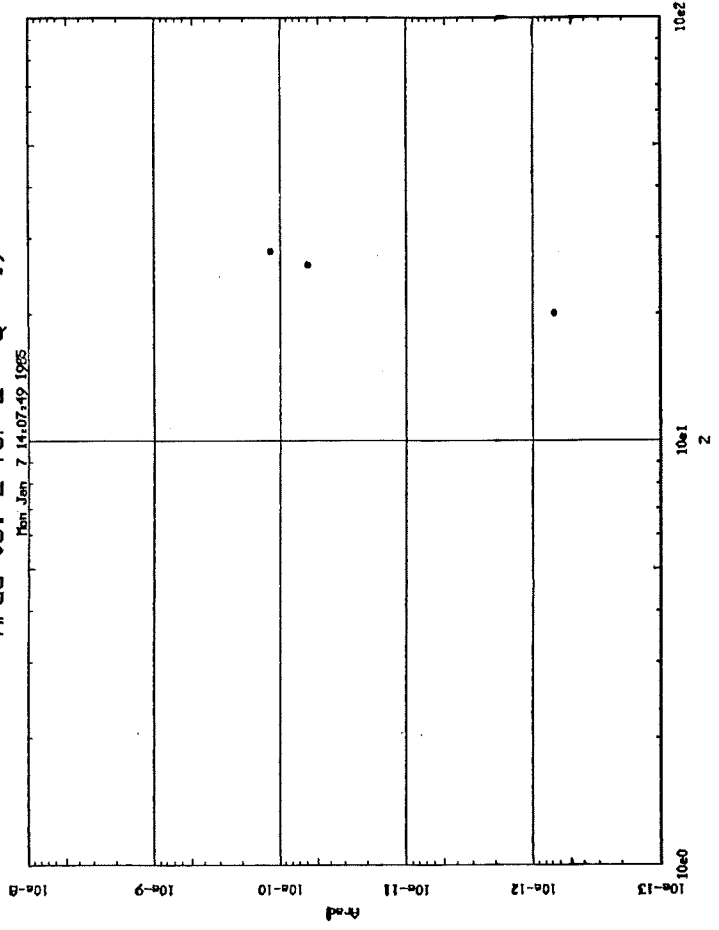
Arad vs. Z for Z - Q = 20



Arad vs. Z for Z - Q = 17

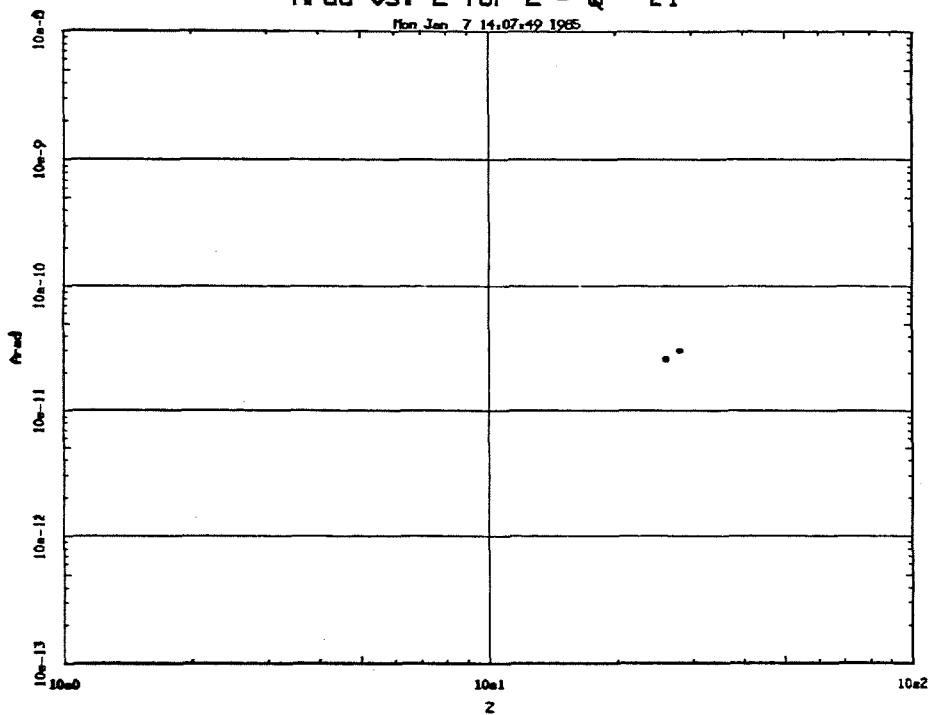


Arad vs. Z for Z - Q = 19



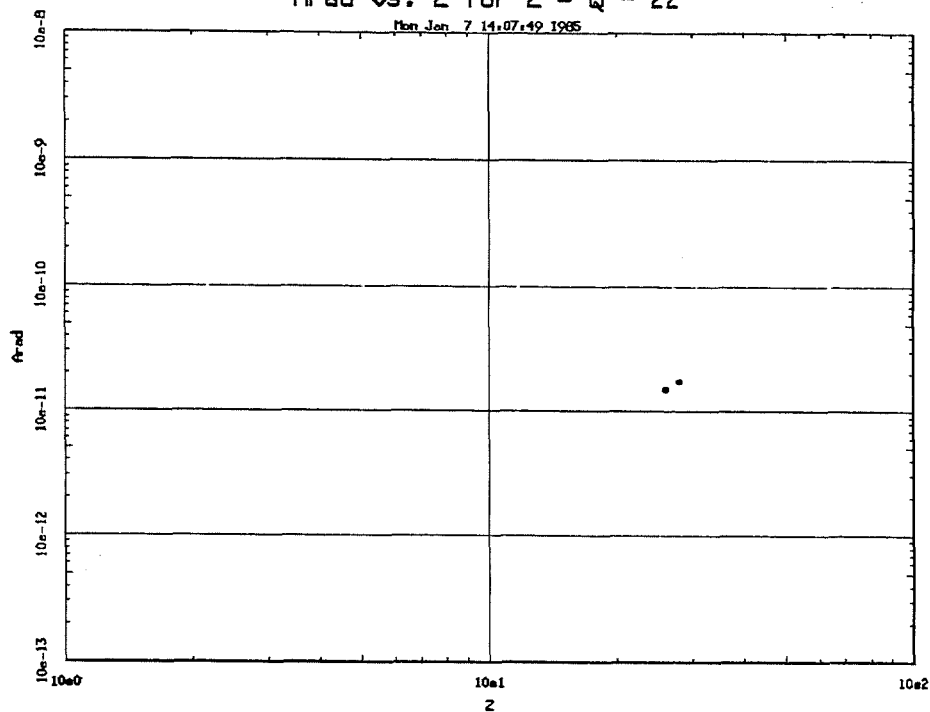
Arad vs. Z for Z - Q = 21

Mon Jan 7 14:07:49 1985



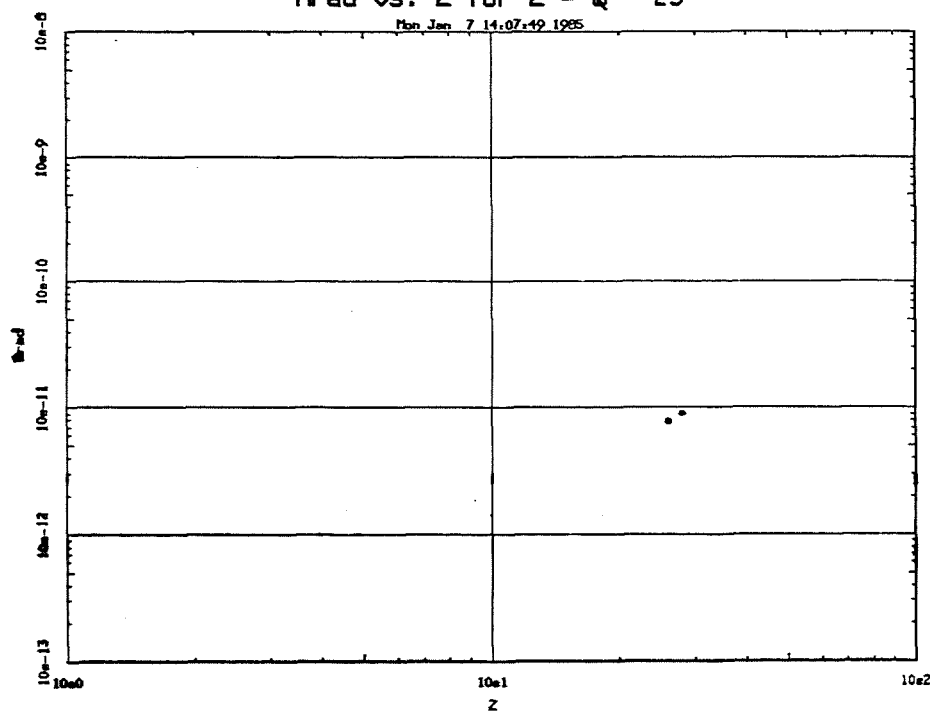
Arad vs. Z for Z - Q = 22

Mon Jan 7 14:07:49 1985



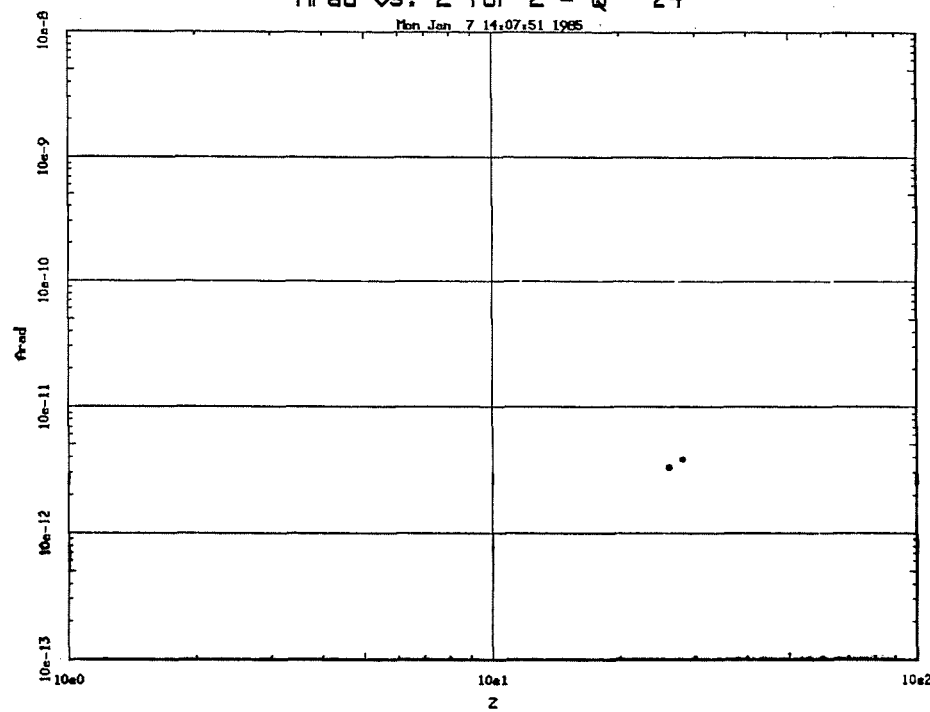
Arad vs. Z for Z - Q = 23

Mon Jan 7 14:07:49 1985



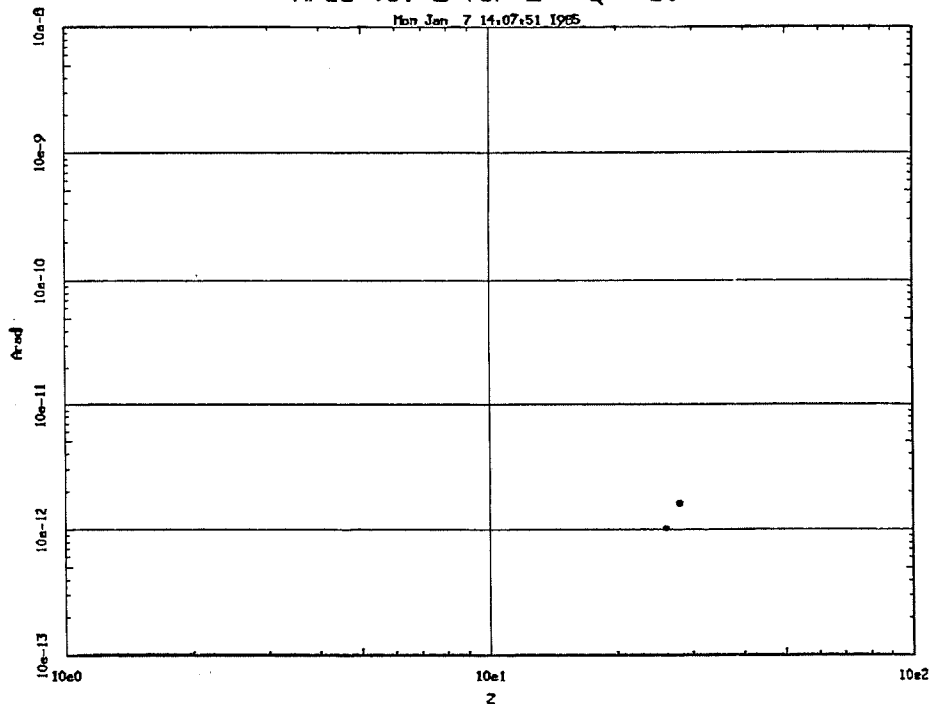
Arad vs. Z for Z - Q = 24

Mon Jan 7 14:07:51 1985



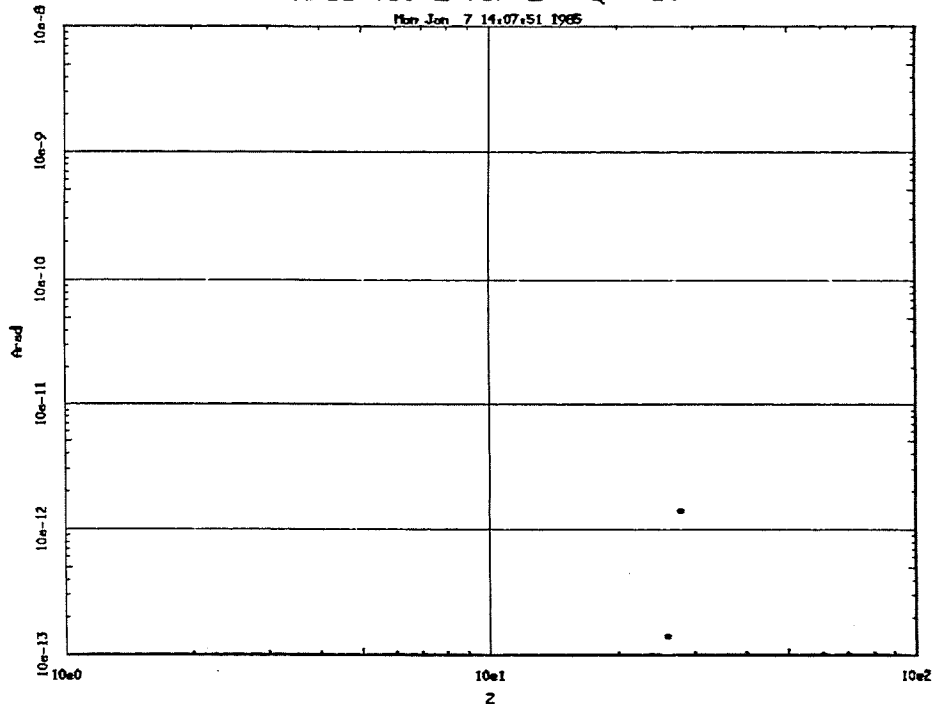
Arad vs. Z for Z - Q = 25

Mon Jan 7 14:07:51 1965



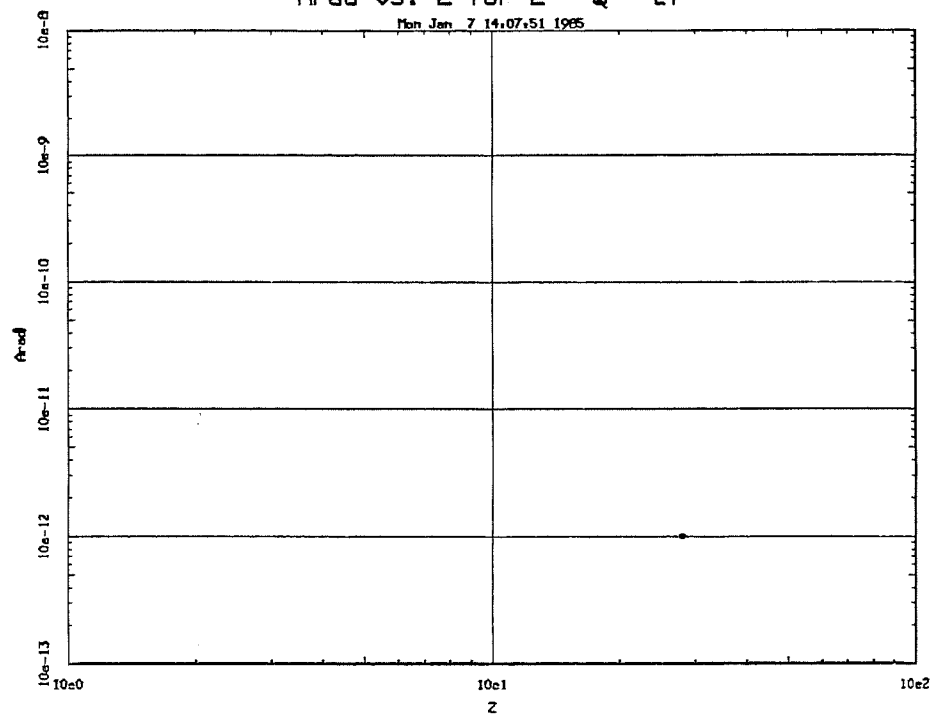
Arad vs. Z for Z - Q = 26

Mon Jan 7 14:07:51 1965



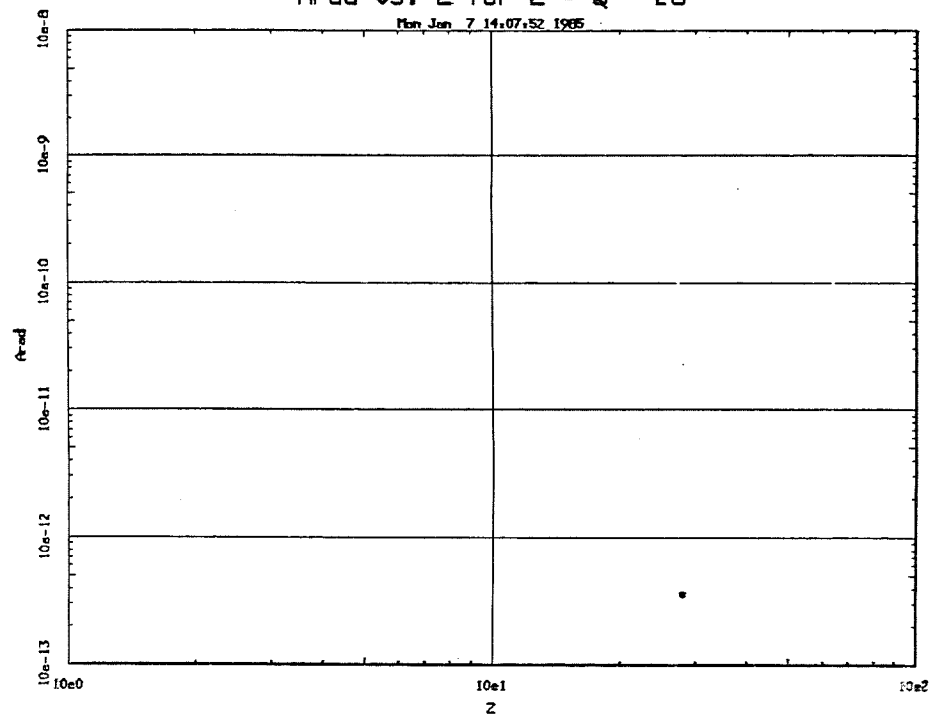
Arad vs. Z for Z - Q = 27

Mon Jan 7 14:07:51 1965



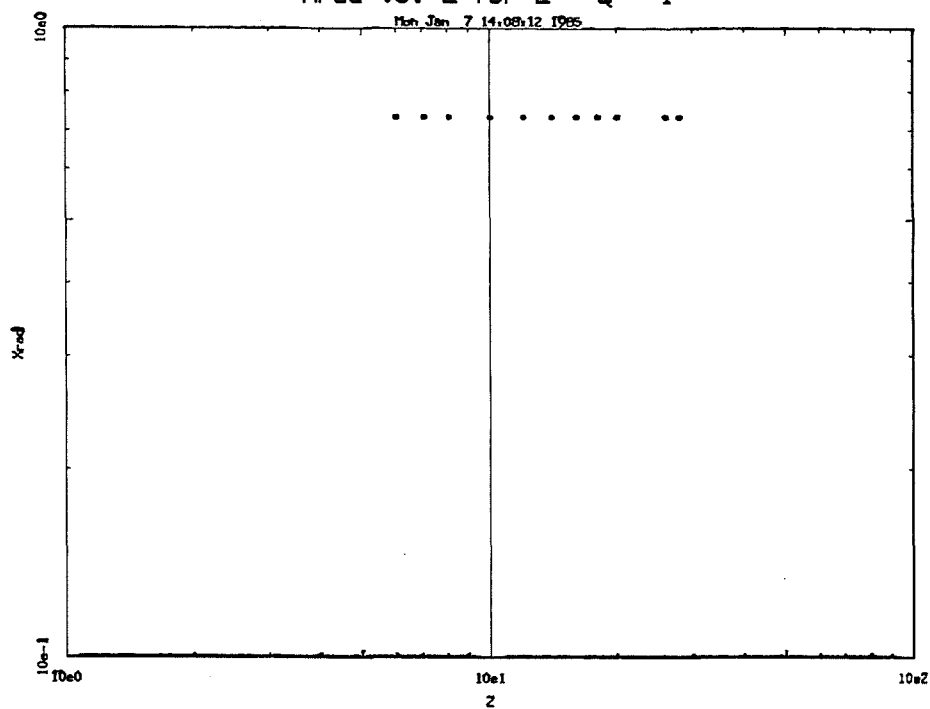
Arad vs. Z for Z - Q = 28

Mon Jan 7 14:07:52 1965



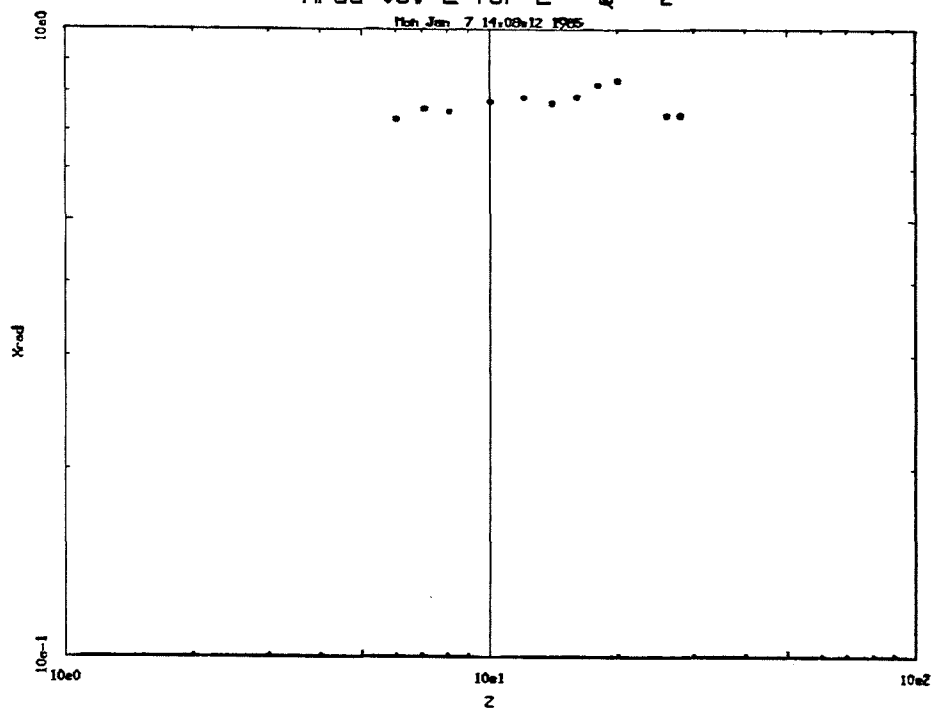
Xrad vs. Z for Z - Q = 1

Mon Jan 7 14:08:12 1965



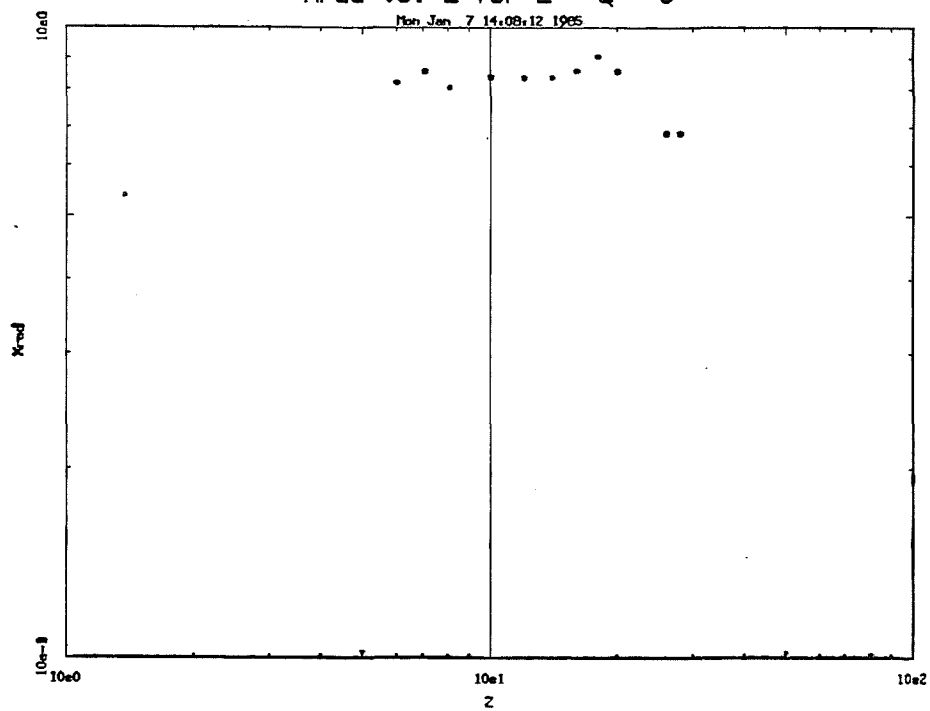
Xrad vs. Z for Z - Q = 2

Mon Jan 7 14:08:12 1965



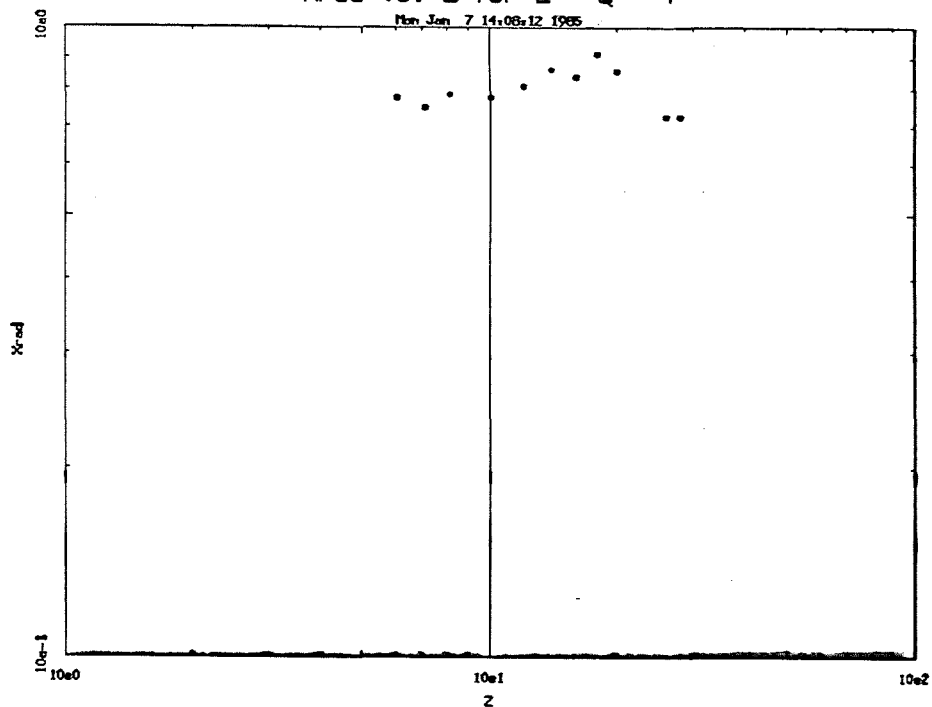
Xrad vs. Z for Z - Q = 3

Mon Jan 7 14:08:12 1965



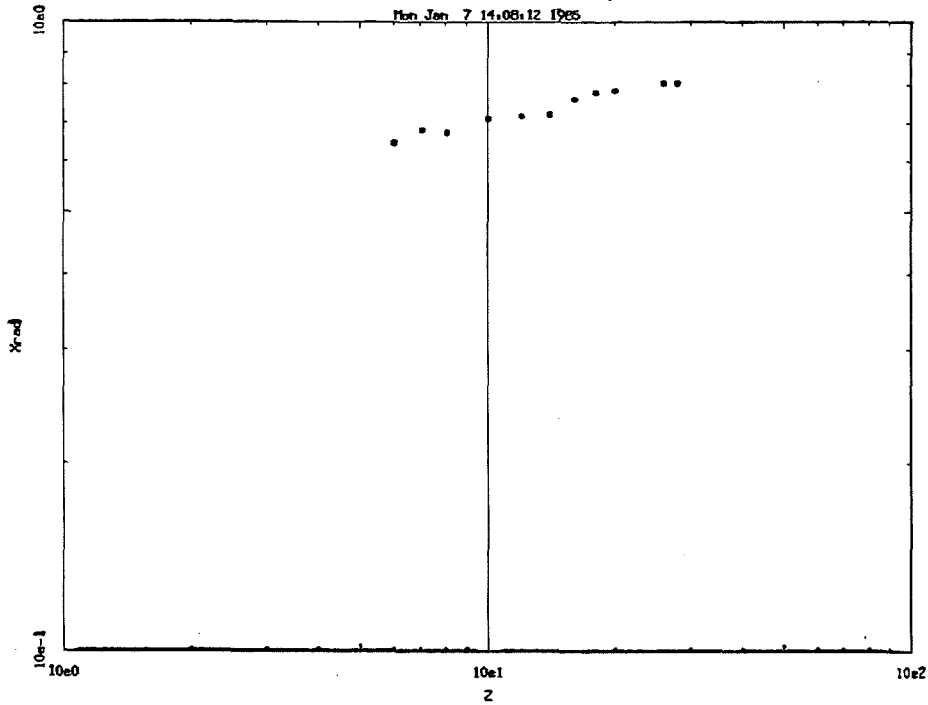
Xrad vs. Z for Z - Q = 4

Mon Jan 7 14:08:12 1965



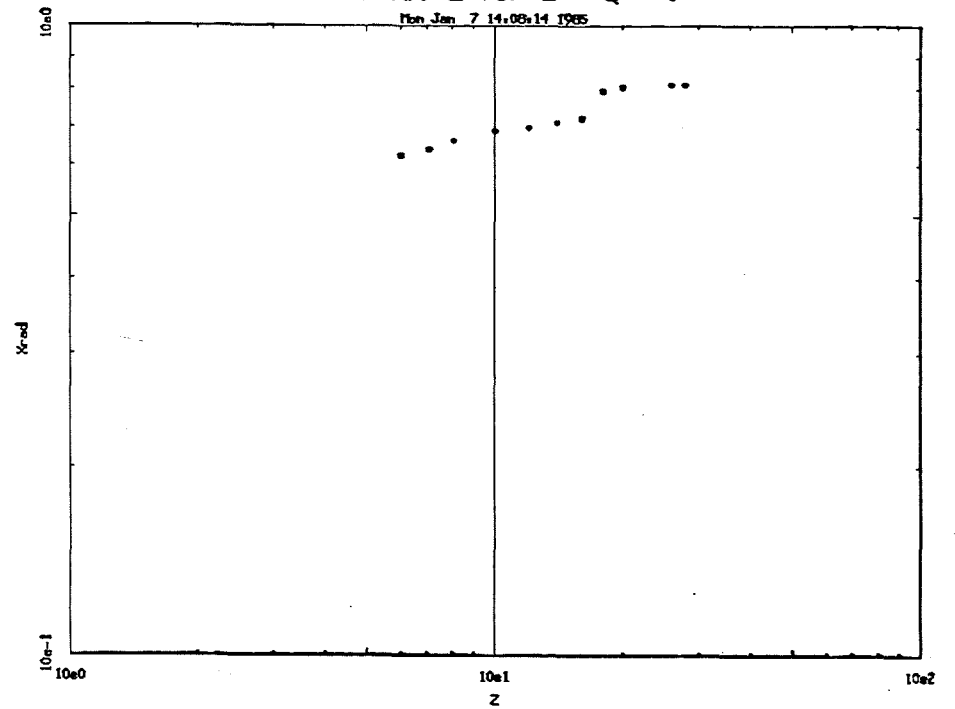
Xrad vs. Z for Z - Q = 5

Mon Jan 7 14:08:12 1965



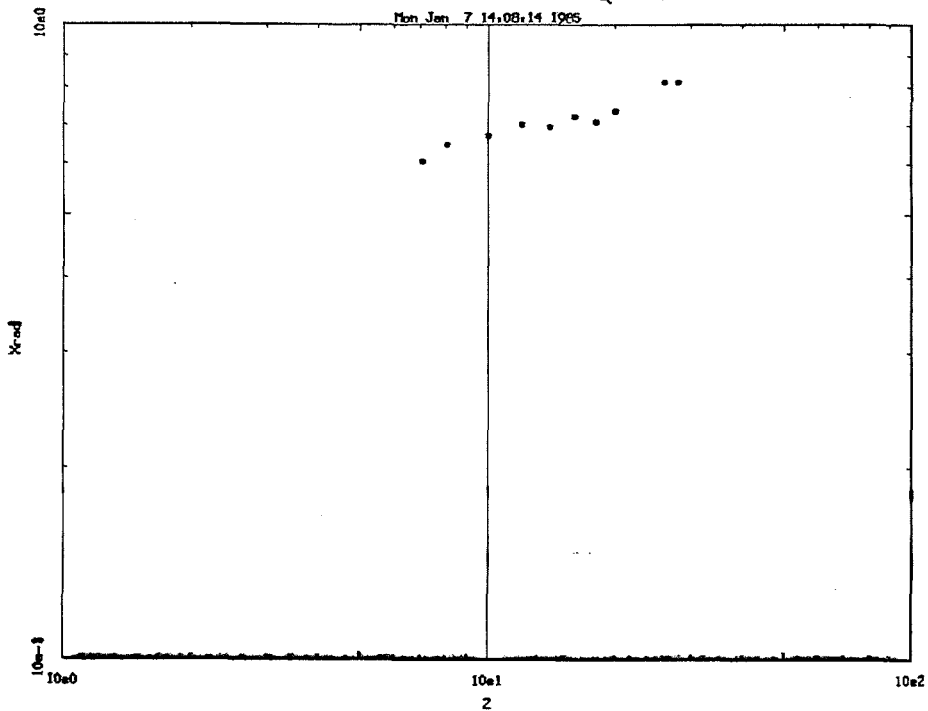
Xrad vs. Z for Z - Q = 6

Mon Jan 7 14:08:14 1965



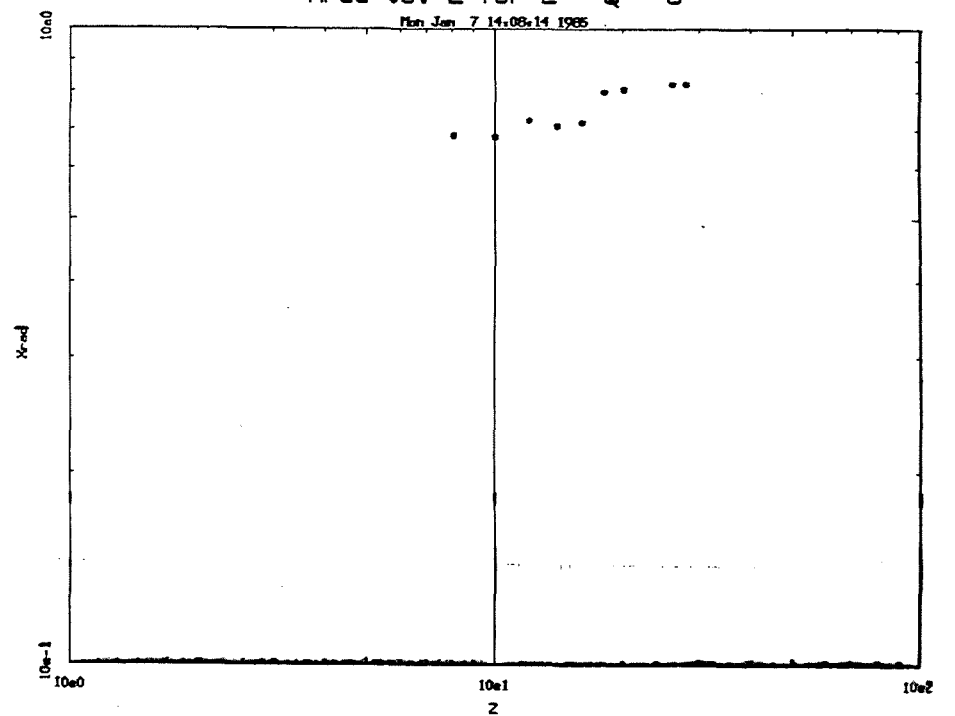
Xrad vs. Z for Z - Q = 7

Mon Jan 7 14:08:14 1965



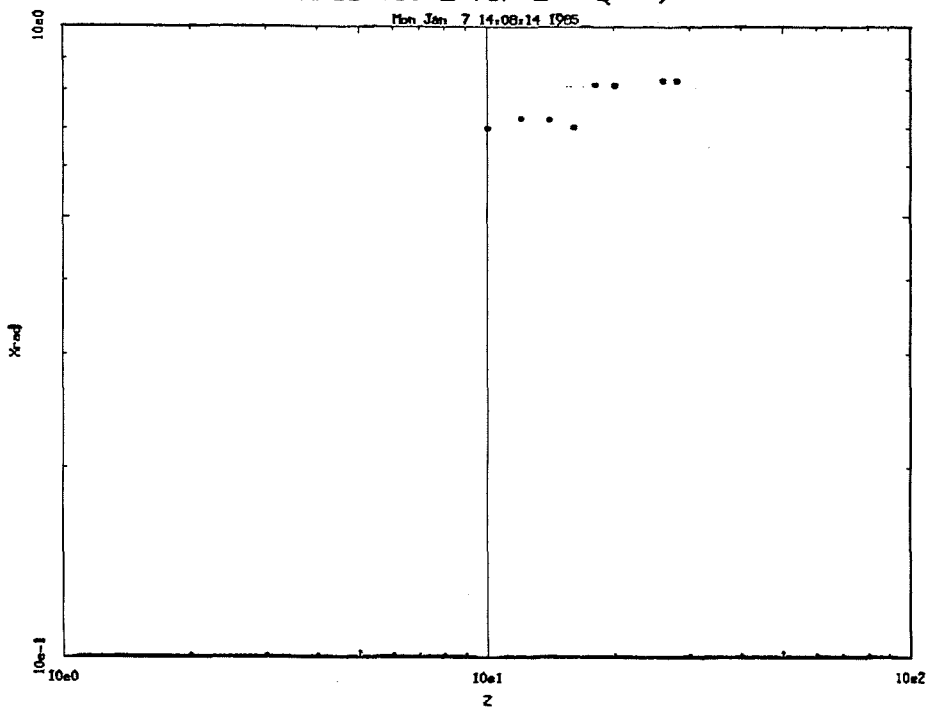
Xrad vs. Z for Z - Q = 8

Mon Jan 7 14:08:14 1965



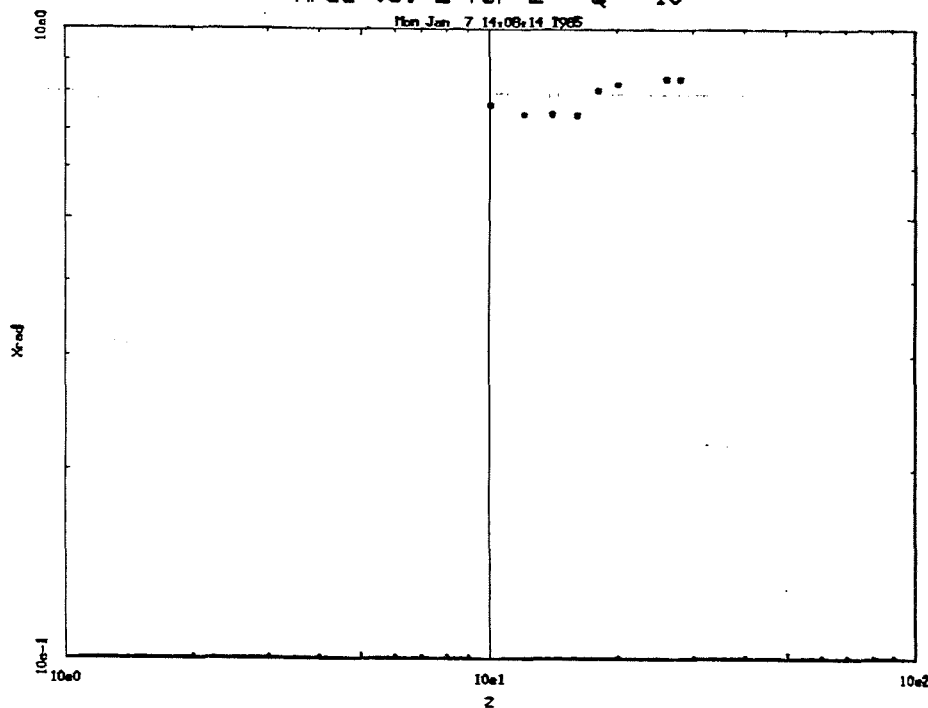
Xrad vs. Z for Z - Q = 9

Mon Jan 7 14:08:14 1985



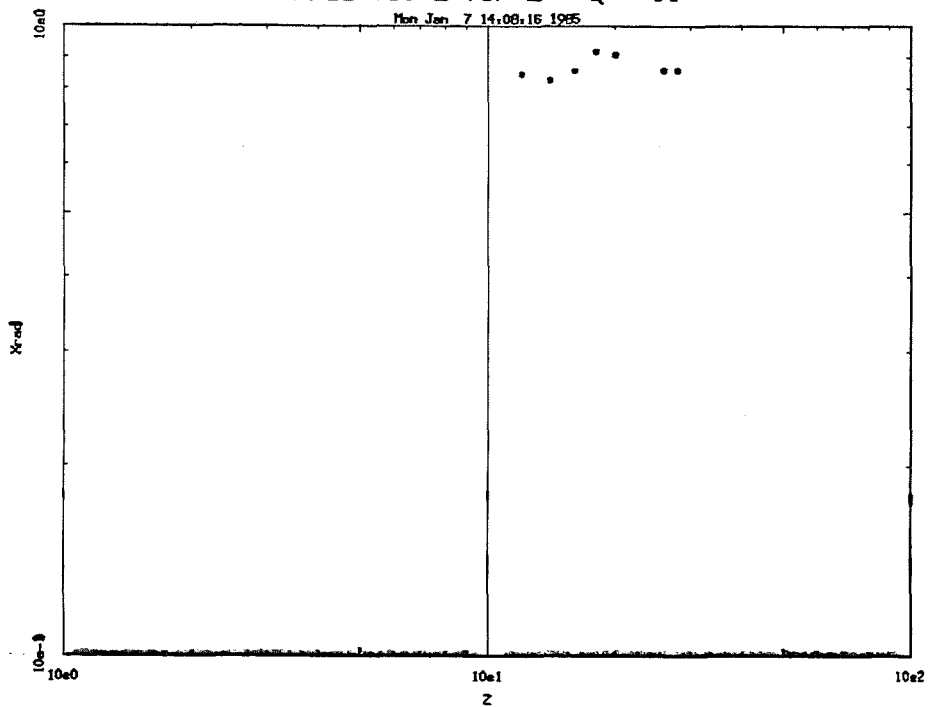
Xrad vs. Z for Z - Q = 10

Mon Jan 7 14:08:14 1985



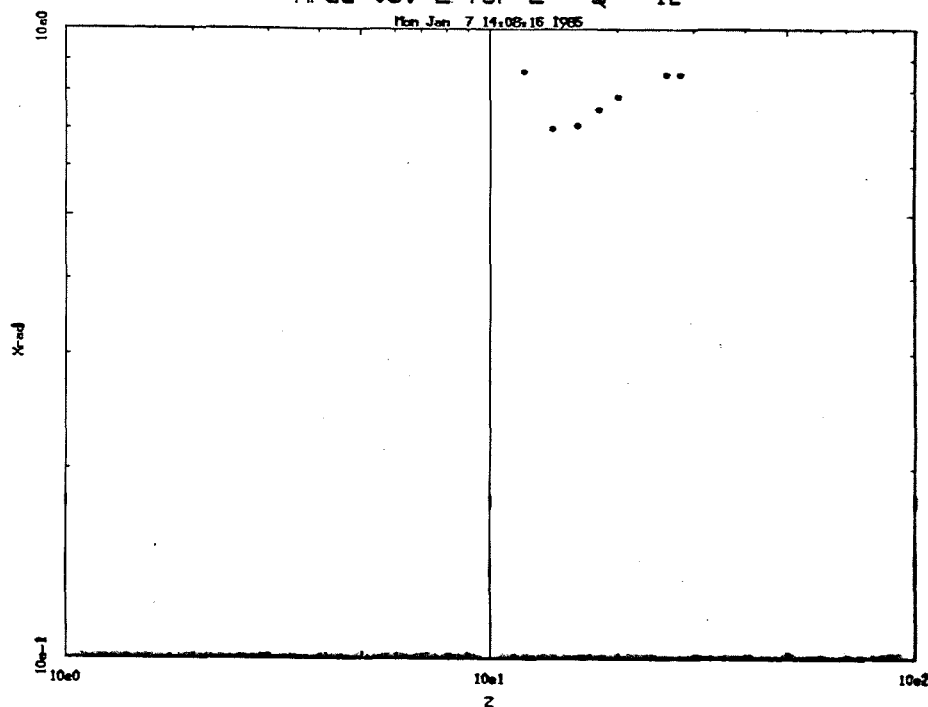
Xrad vs. Z for Z - Q = 11

Mon Jan 7 14:08:16 1985



Xrad vs. Z for Z - Q = 12

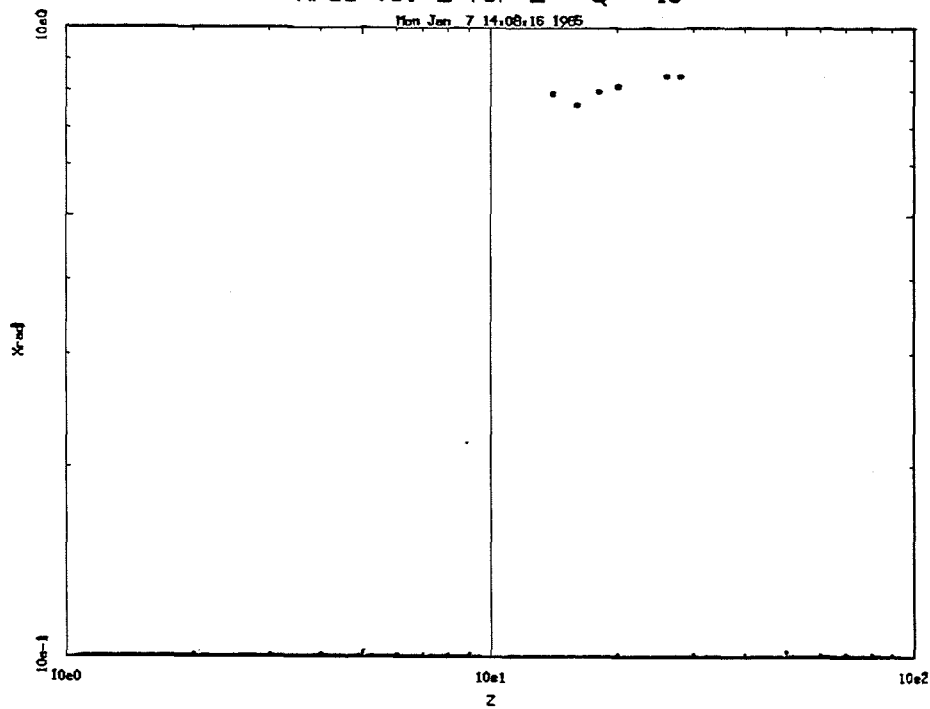
Mon Jan 7 14:08:16 1985



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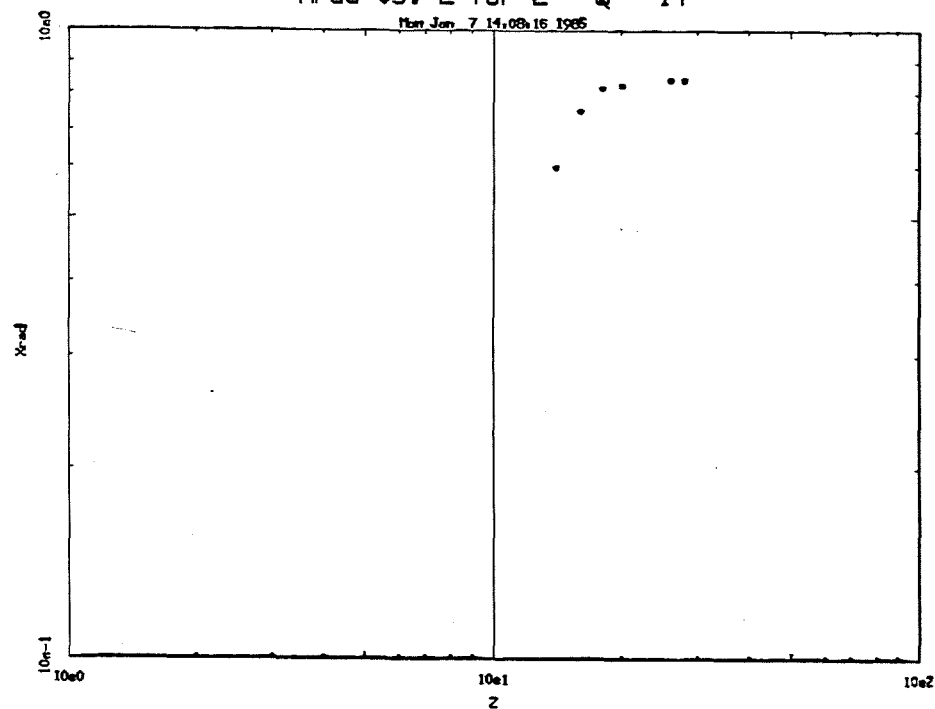
Xrad vs. Z for Z - Q = 13

Mon Jan 7 14:08:16 1965



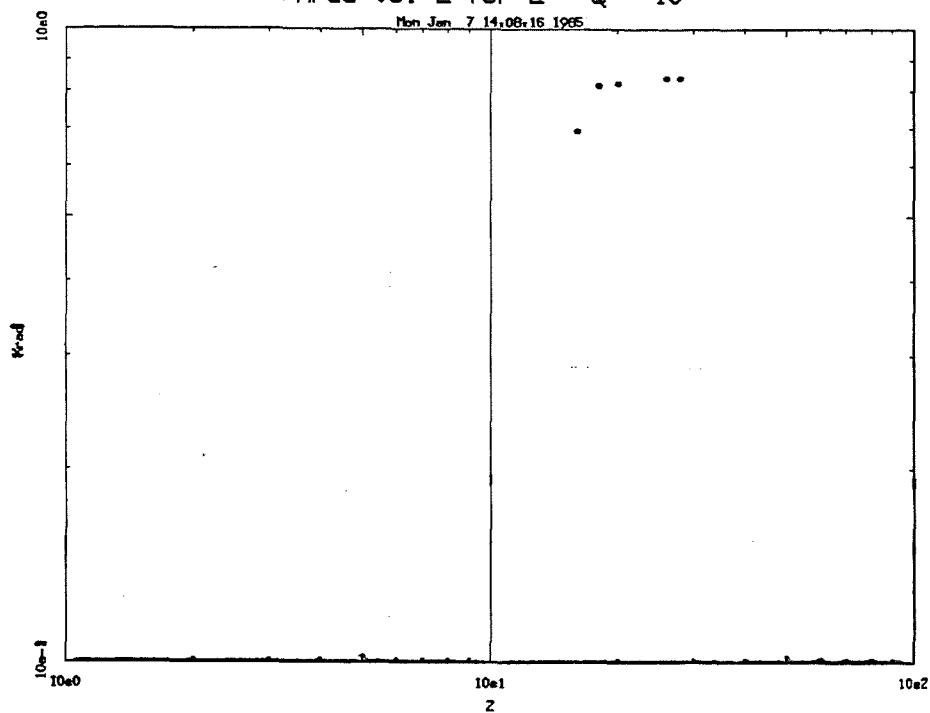
Xrad vs. Z for Z - Q = 14

Mon Jan 7 14:08:16 1965



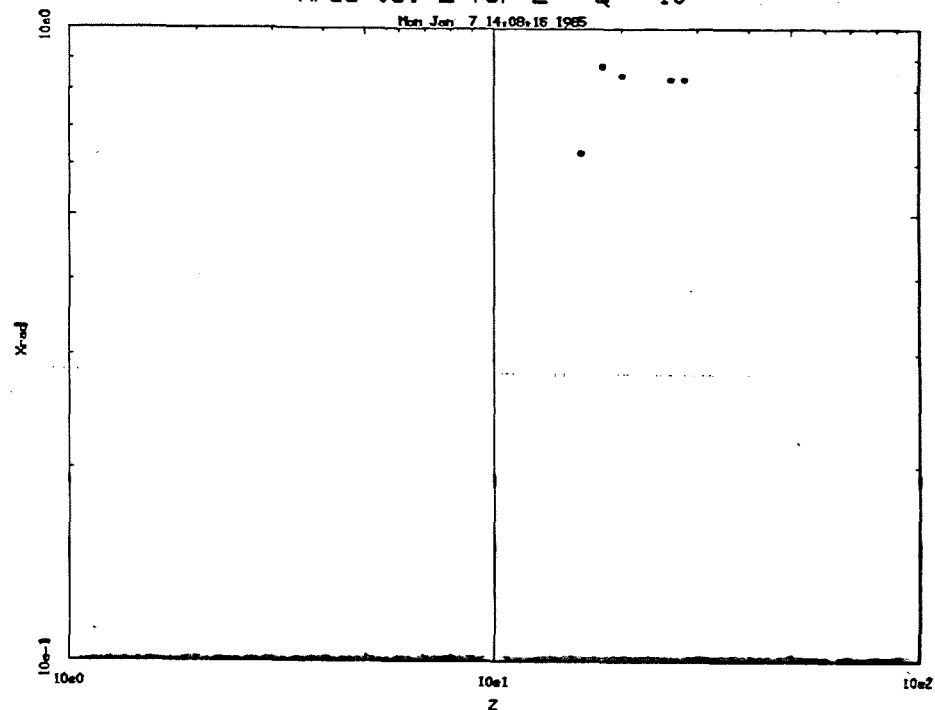
Xrad vs. Z for Z - Q = 15

Mon Jan 7 14:08:16 1965



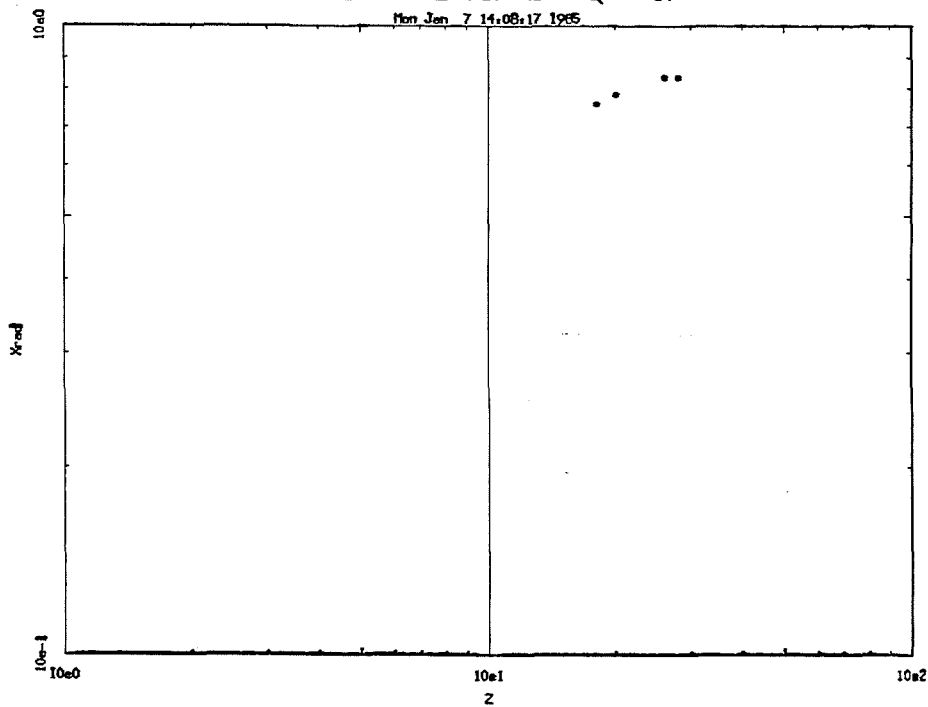
Xrad vs. Z for Z - Q = 16

Mon Jan 7 14:08:16 1965



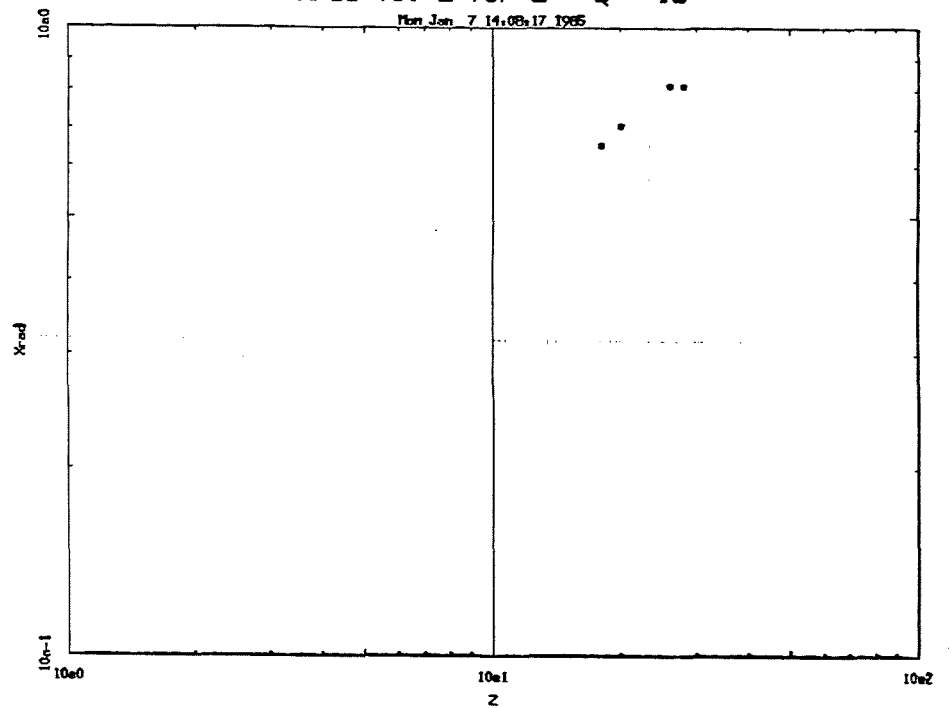
Xrad vs. Z for Z - Q = 17

Mon Jan 7 14:08:17 1965



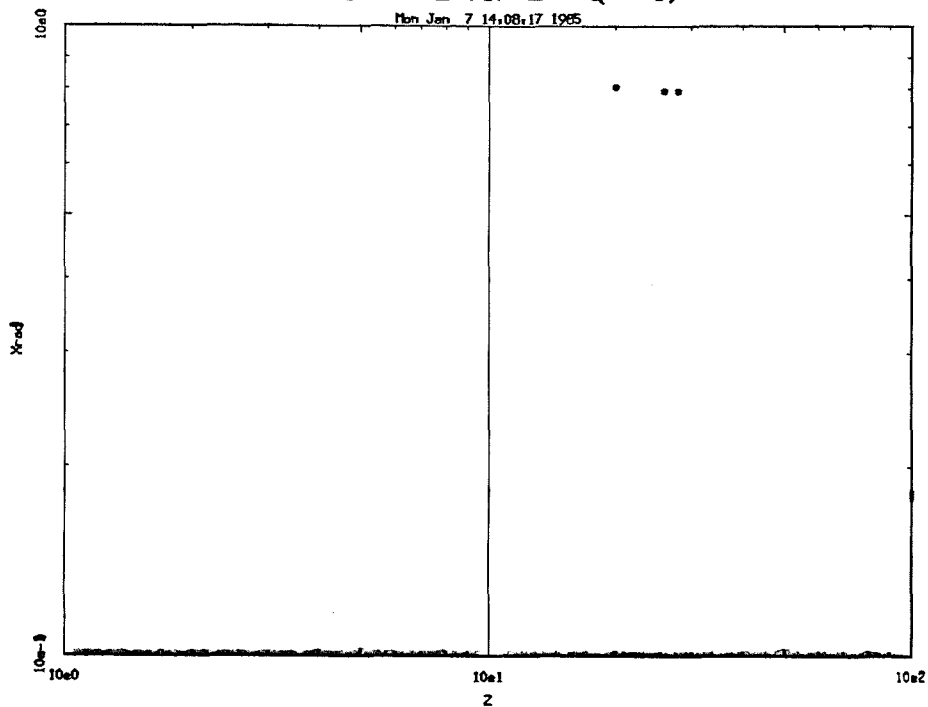
Xrad vs. Z for Z - Q = 18

Mon Jan 7 14:08:17 1965



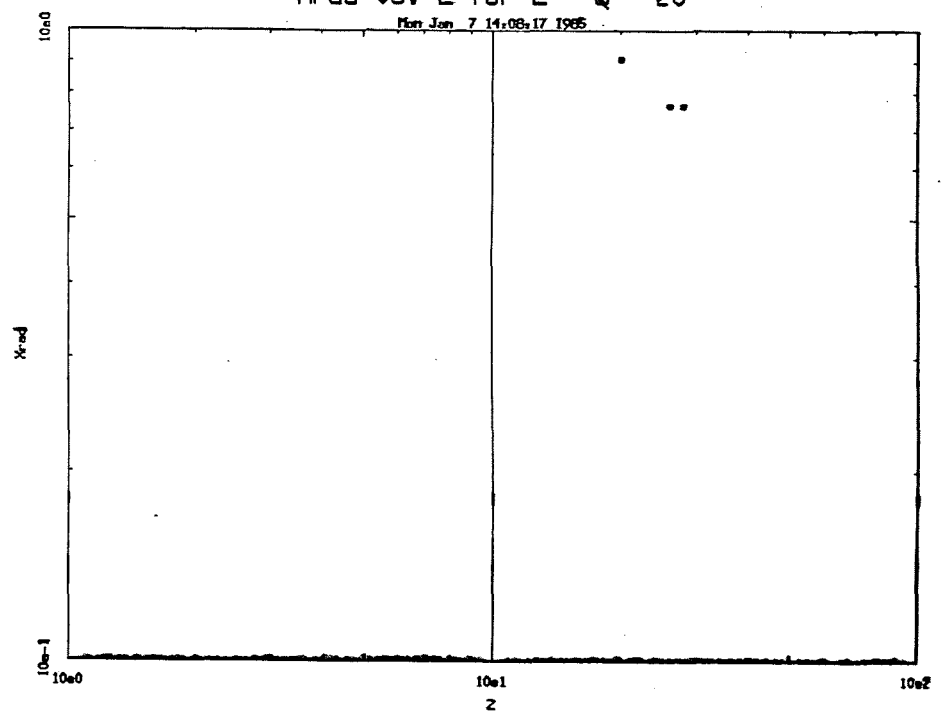
Xrad vs. Z for Z - Q = 19

Mon Jan 7 14:08:17 1965



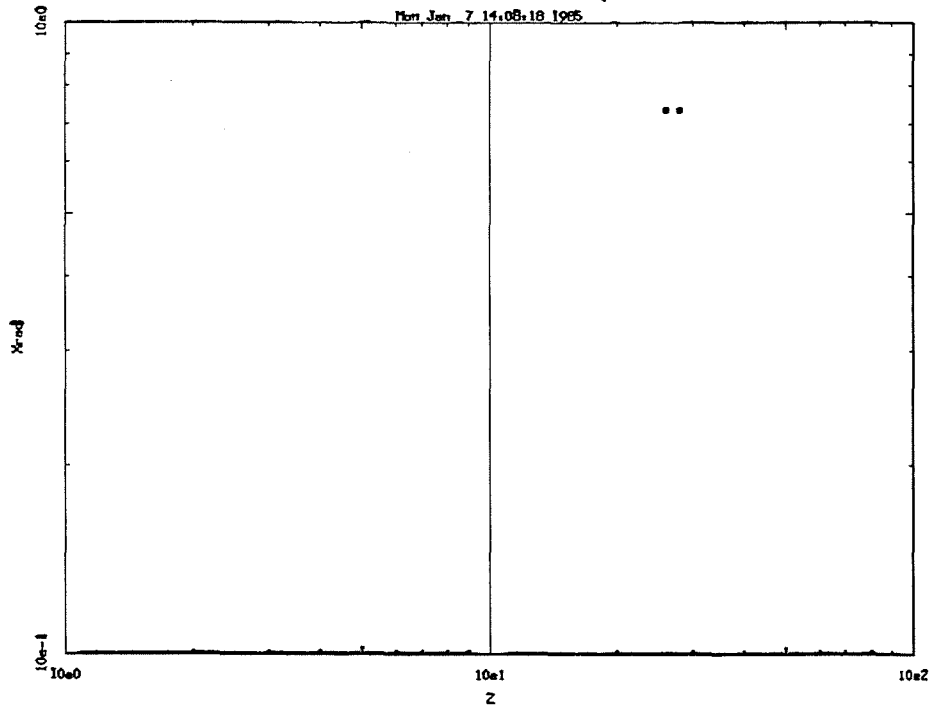
Xrad vs. Z for Z - Q = 20

Mon Jan 7 14:08:17 1965



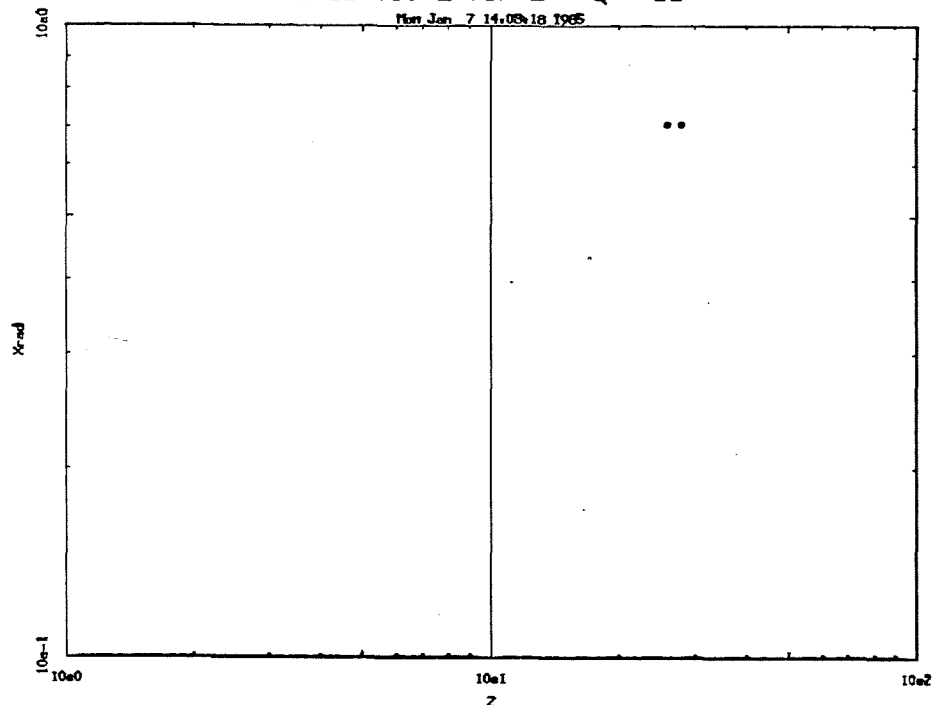
Xrad vs. Z for Z - Q = 21

Mon Jan 7 14:08:18 1985



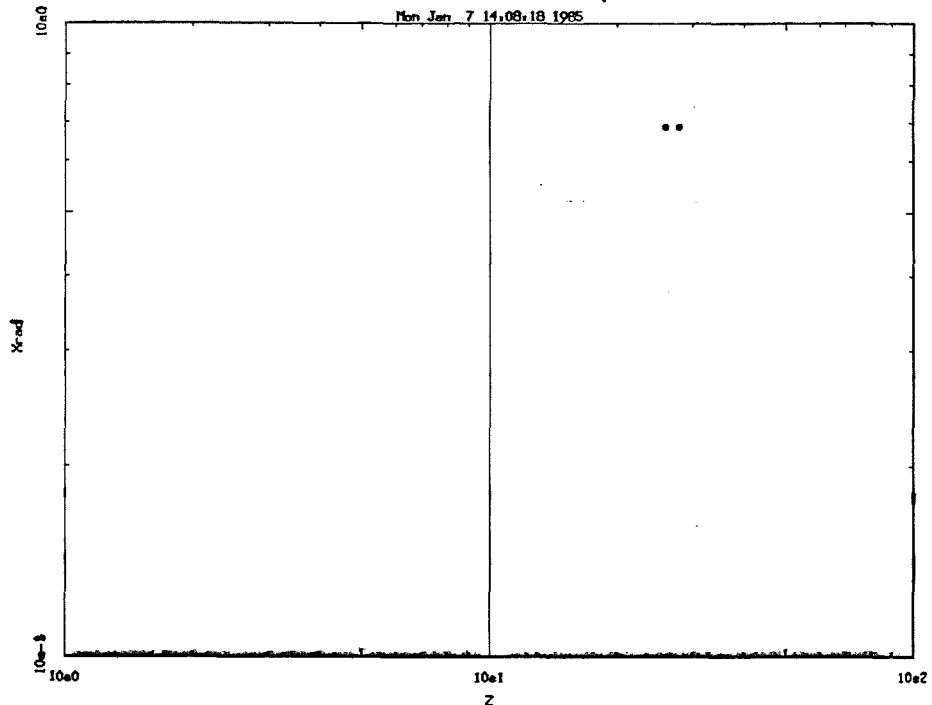
Xrad vs. Z for Z - Q = 22

Mon Jan 7 14:08:18 1985



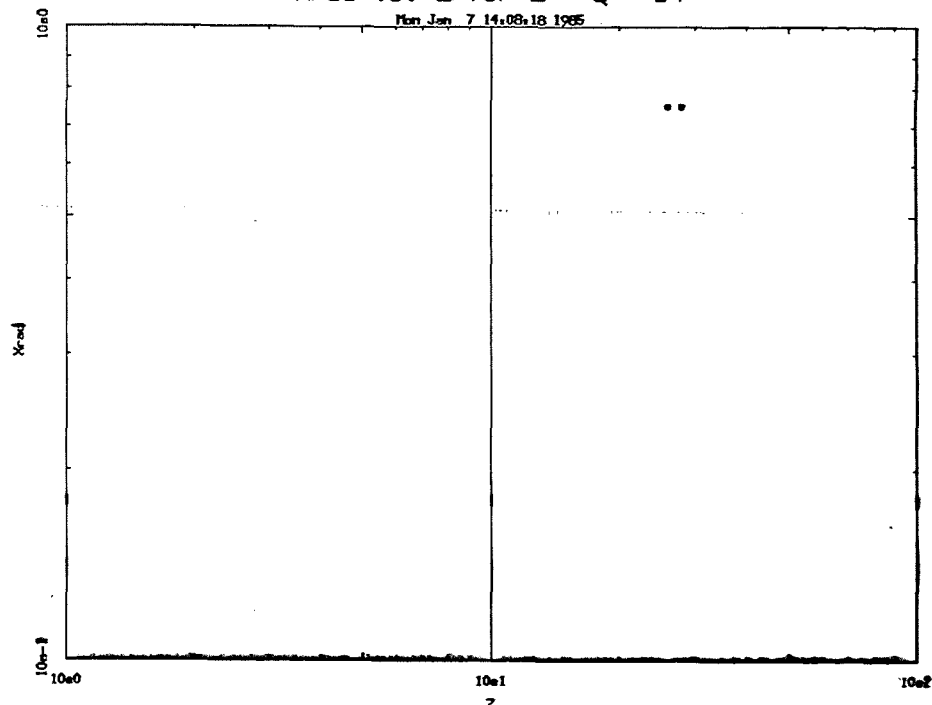
Xrad vs. Z for Z - Q = 23

Mon Jan 7 14:08:18 1985



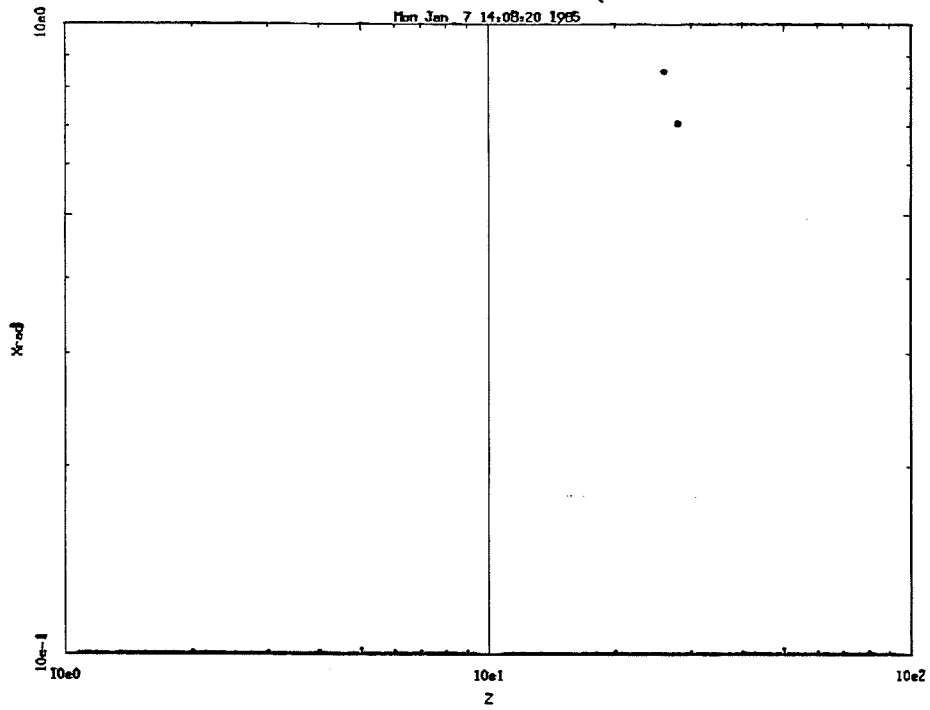
Xrad vs. Z for Z - Q = 24

Mon Jan 7 14:08:18 1985



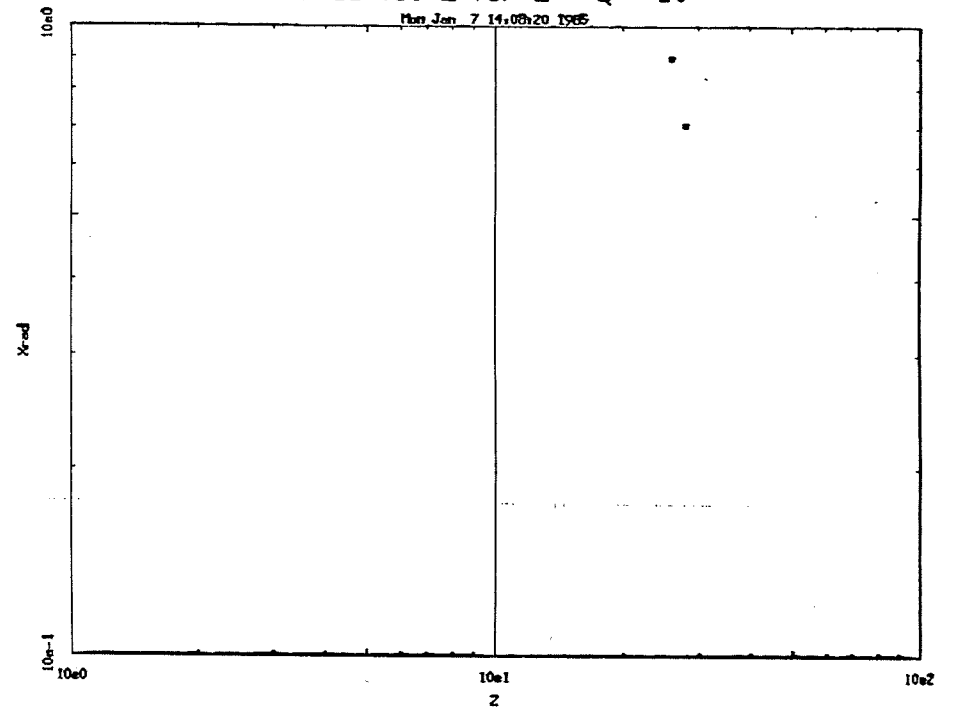
Xrad vs. Z for Z - Q = 25

Mon Jan 7 14:08:20 1965



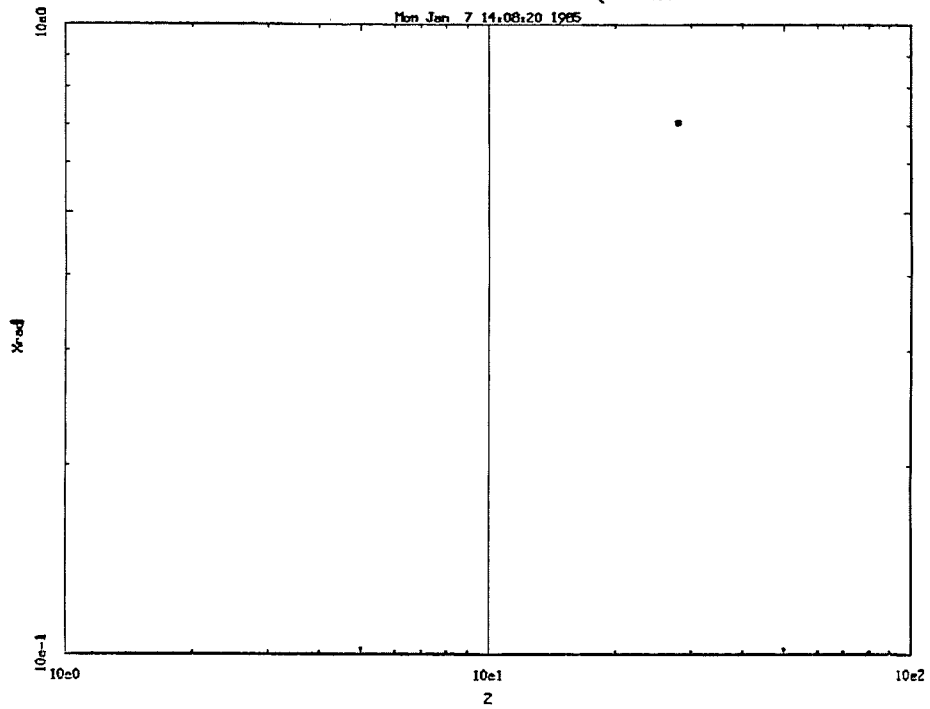
Xrad vs. Z for Z - Q = 26

Mon Jan 7 14:08:20 1965



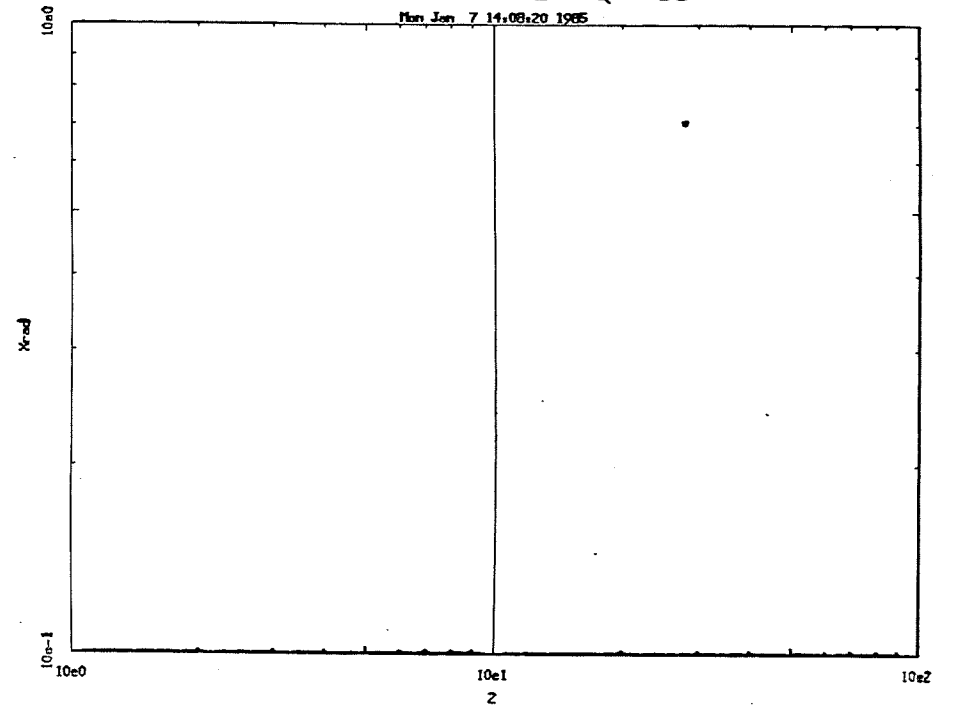
Xrad vs. Z for Z - Q = 27

Mon Jan 7 14:08:20 1965

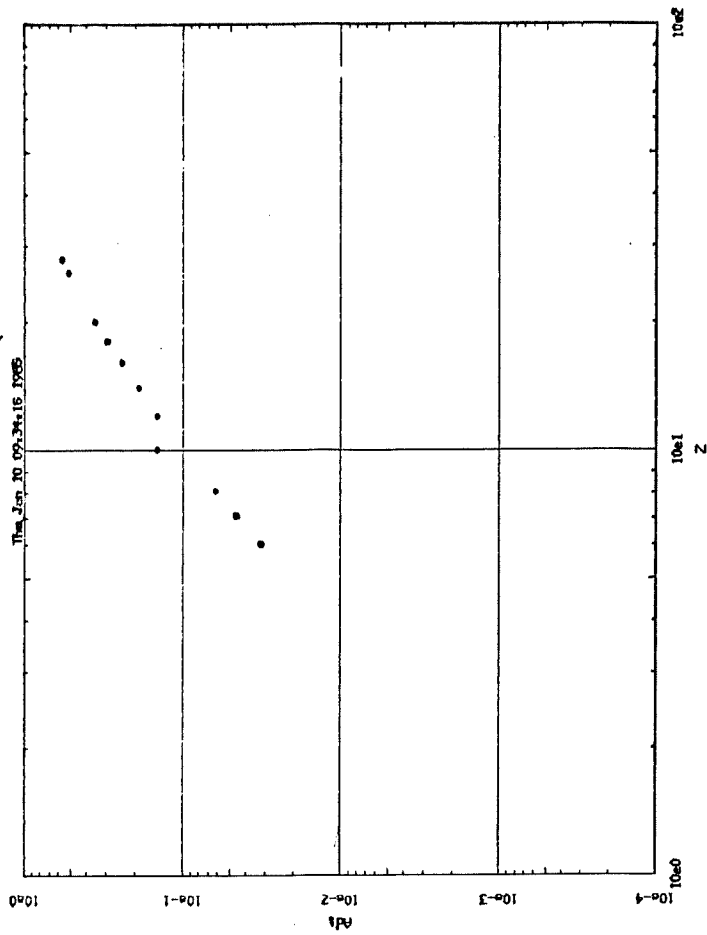


Xrad vs. Z for Z - Q = 28

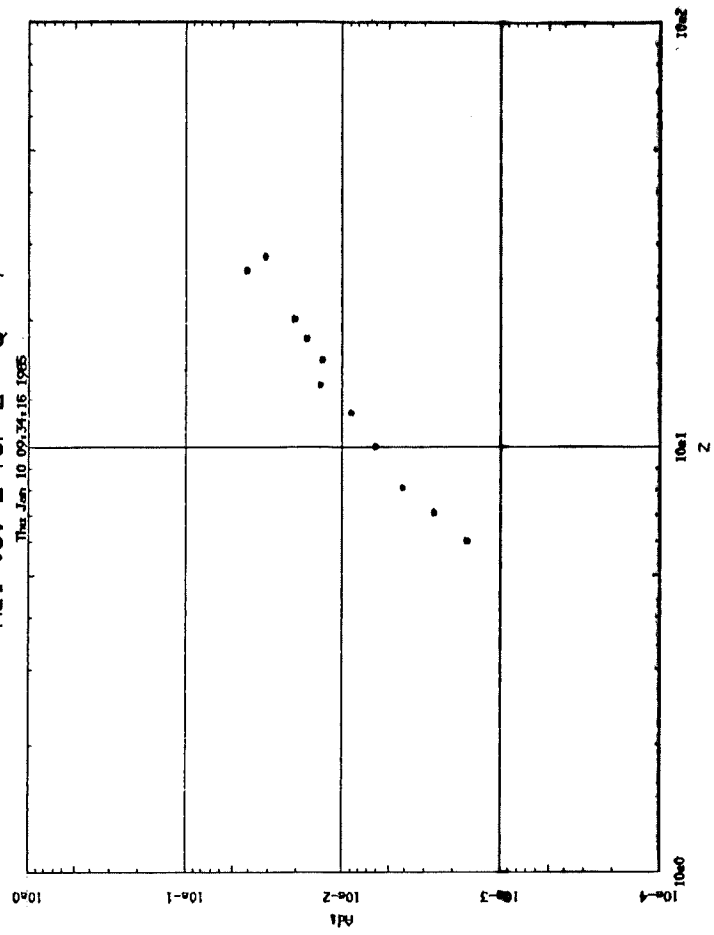
Mon Jan 7 14:08:20 1965



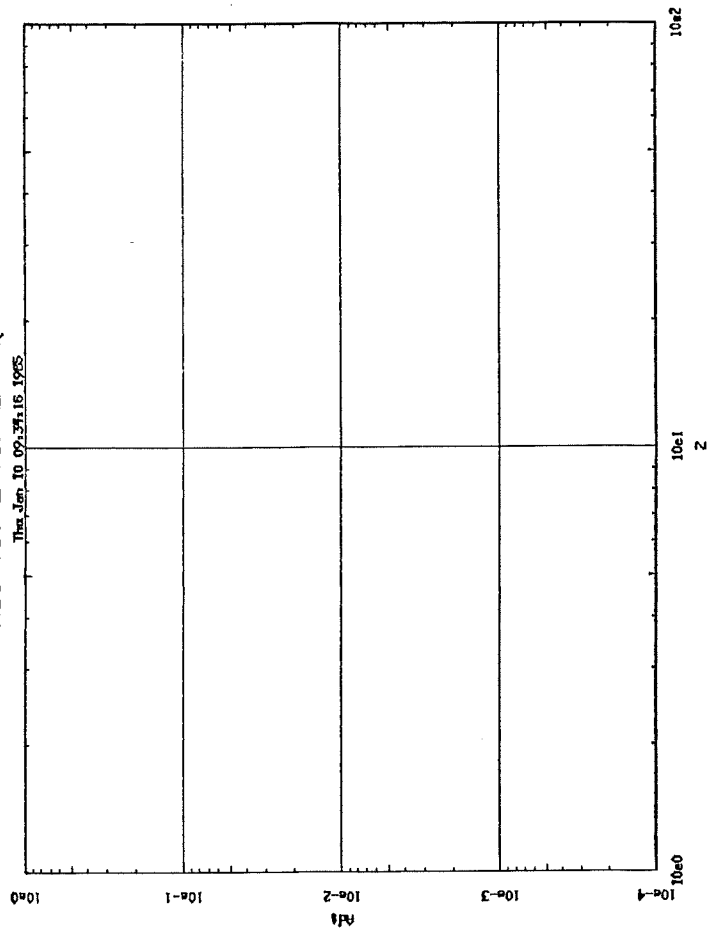
Adi vs. Z for Z - Q = 2



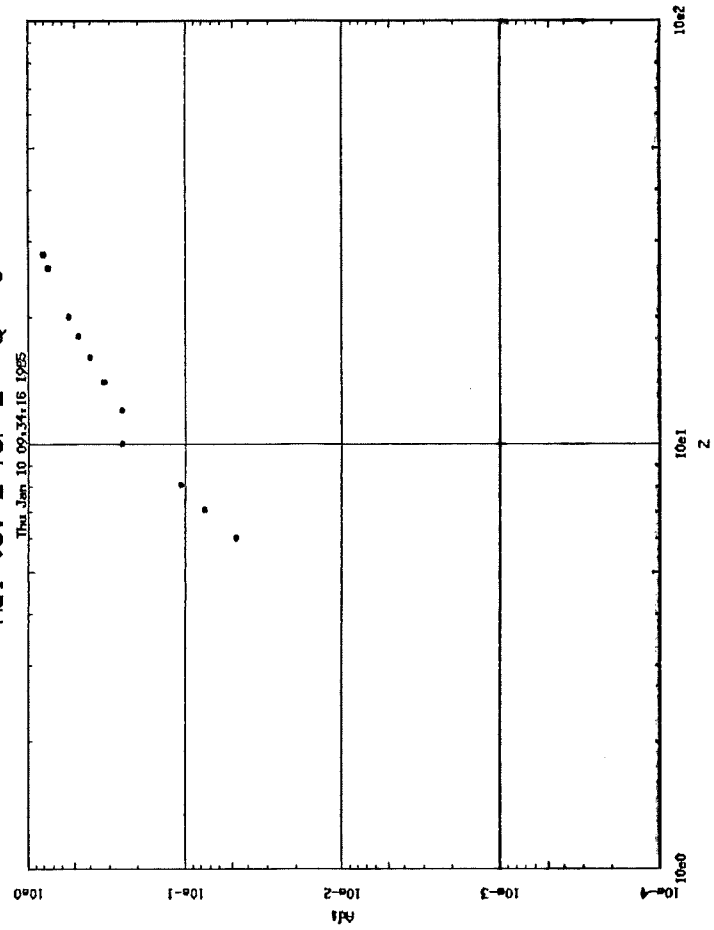
Adi vs. Z for Z - Q = 4



Adi vs. Z for Z - Q = 1

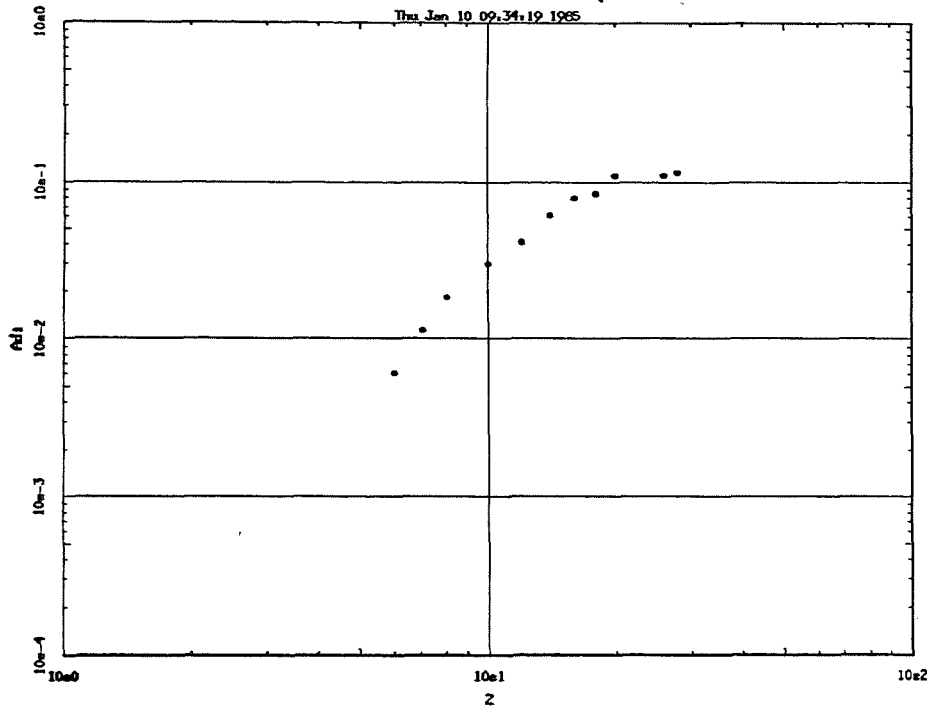


Adi vs. Z for Z - Q = 3



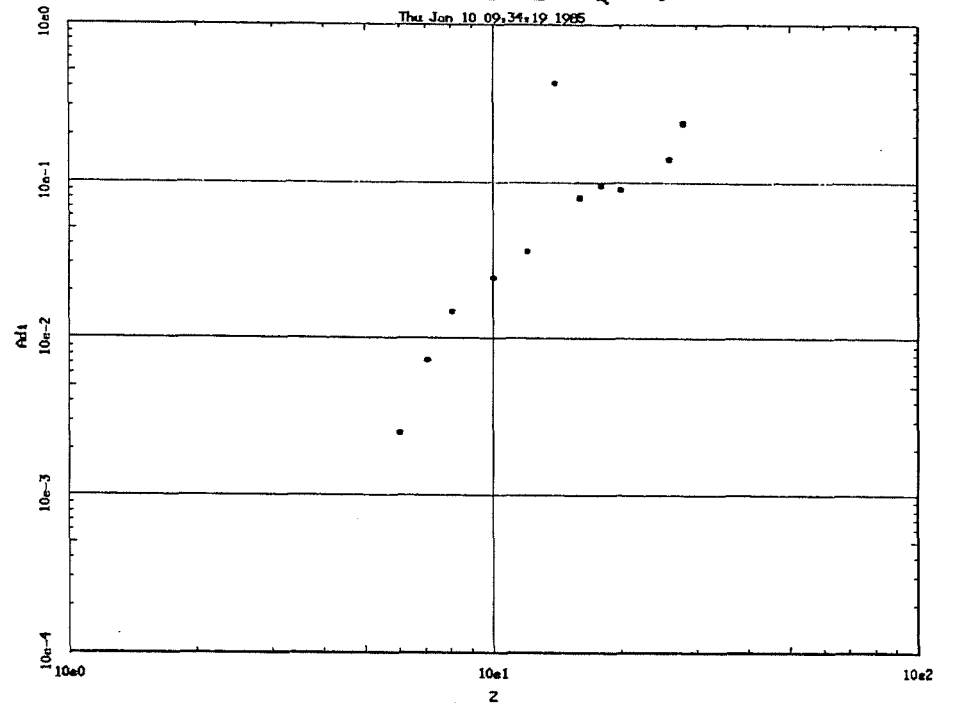
Adi vs. Z for Z - Q = 5

Thu Jan 10 09:34:19 1985



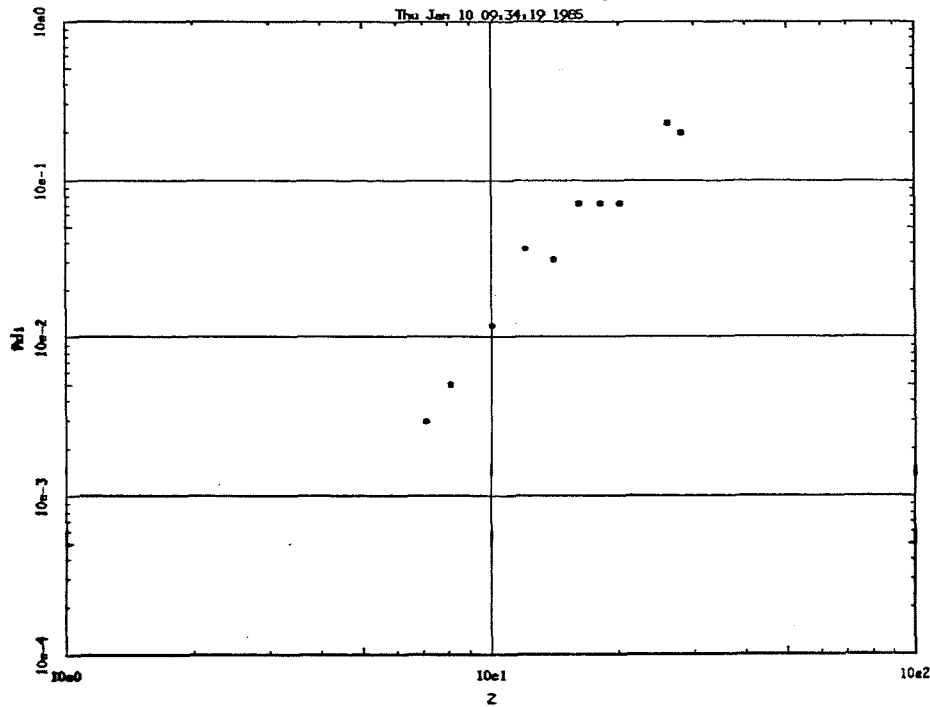
Adi vs. Z for Z - Q = 6

Thu Jan 10 09:34:19 1985



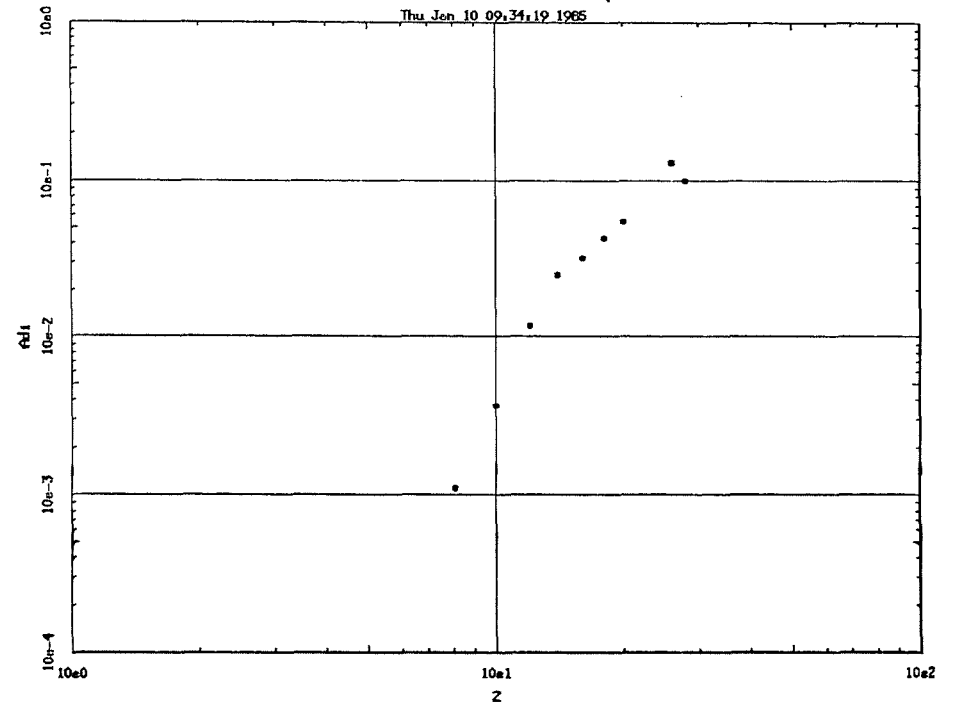
Adi vs. Z for Z - Q = 7

Thu Jan 10 09:34:19 1985



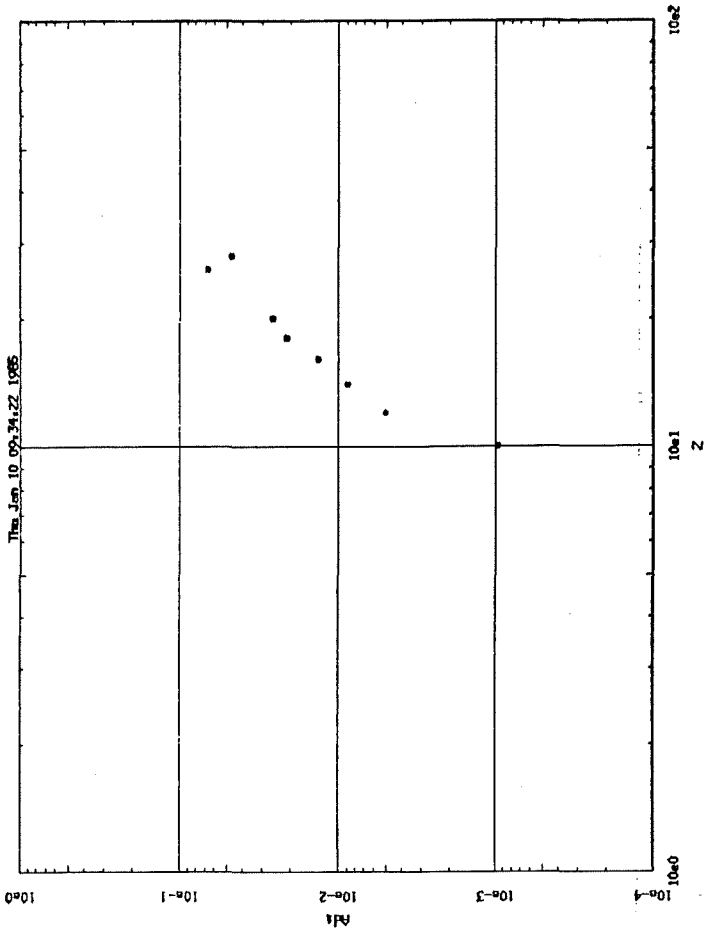
Adi vs. Z for Z - Q = 8

Thu Jan 10 09:34:19 1985

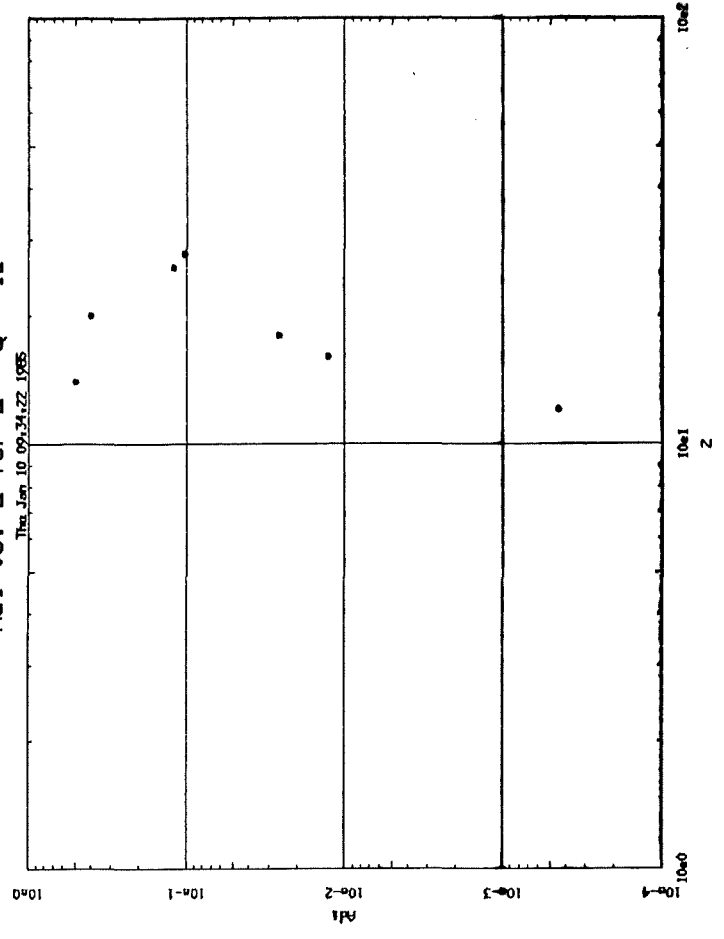


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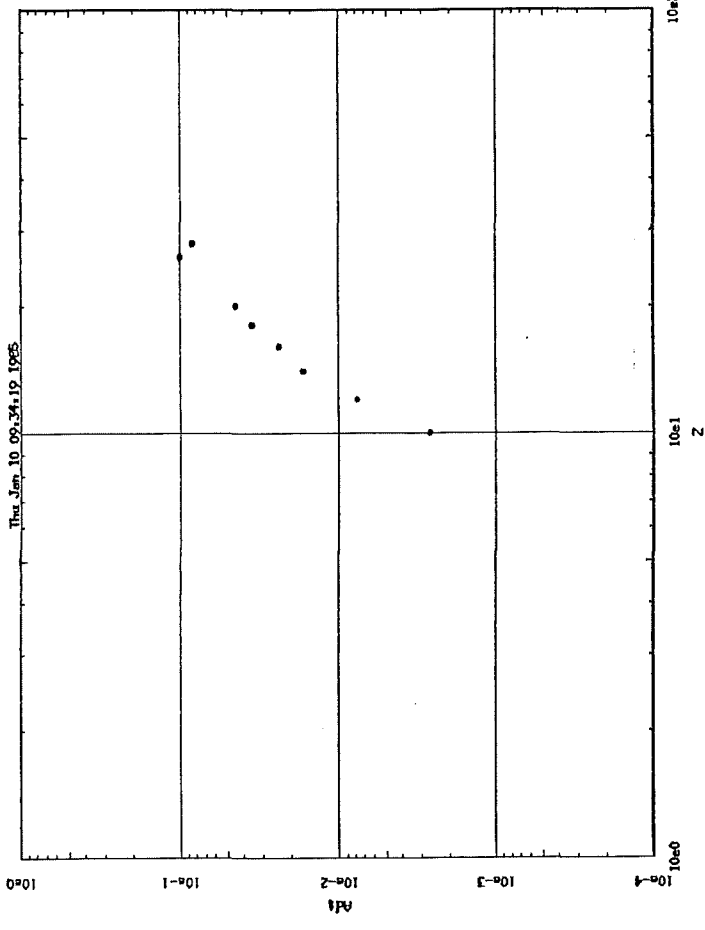
Adi vs. Z for Z - Q = 10



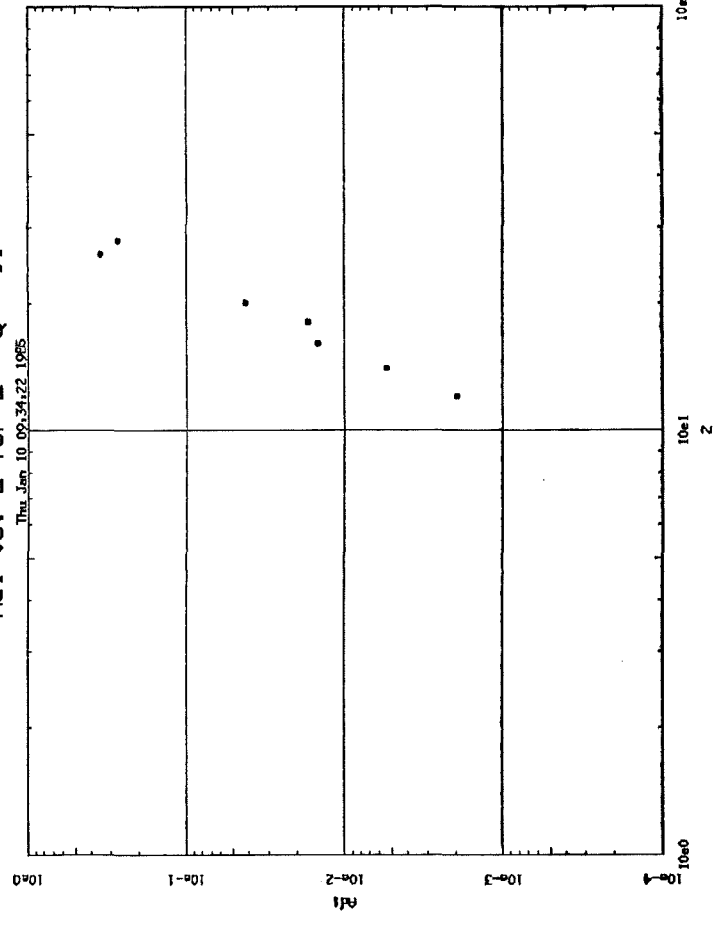
Adi vs. Z for Z - Q = 12



Adi vs. Z for Z - Q = 9

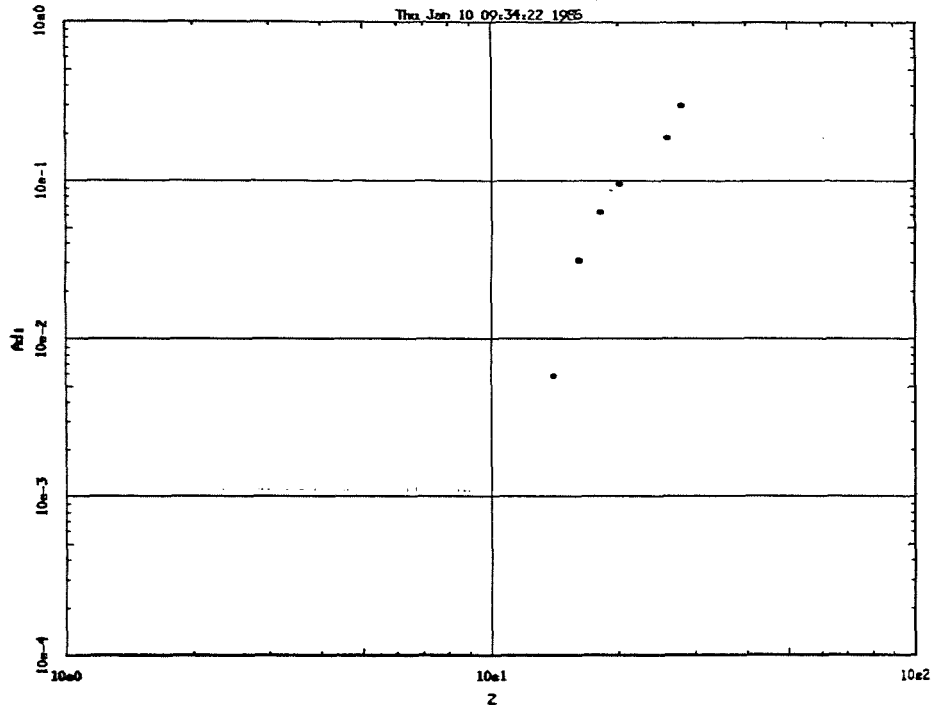


Adi vs. Z for Z - Q = 11



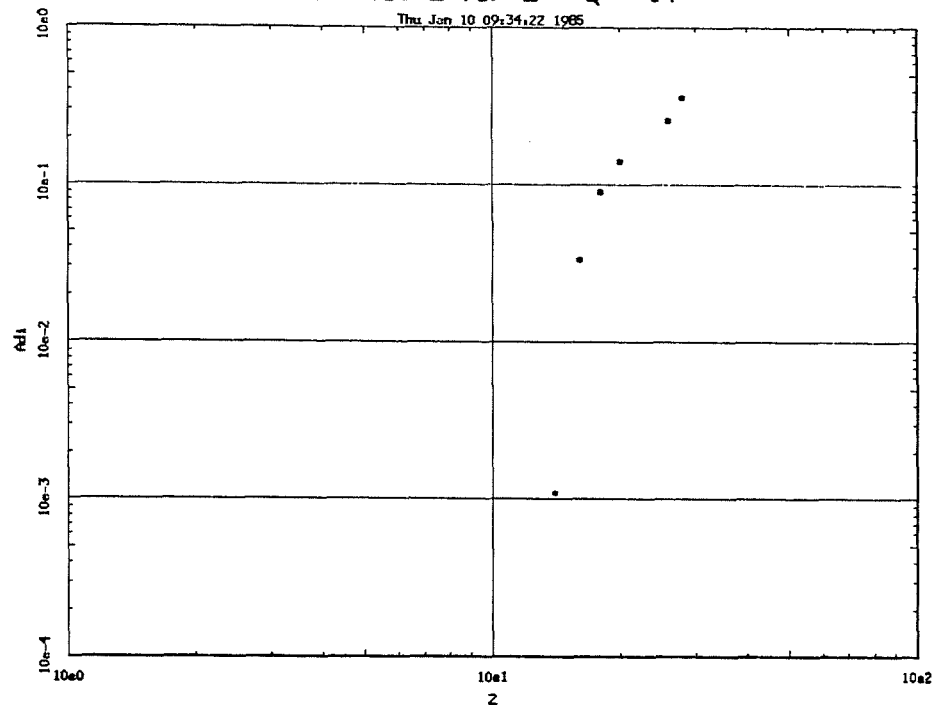
Adi vs. Z for Z - Q = 13

Thu Jan 10 09:34:22 1985



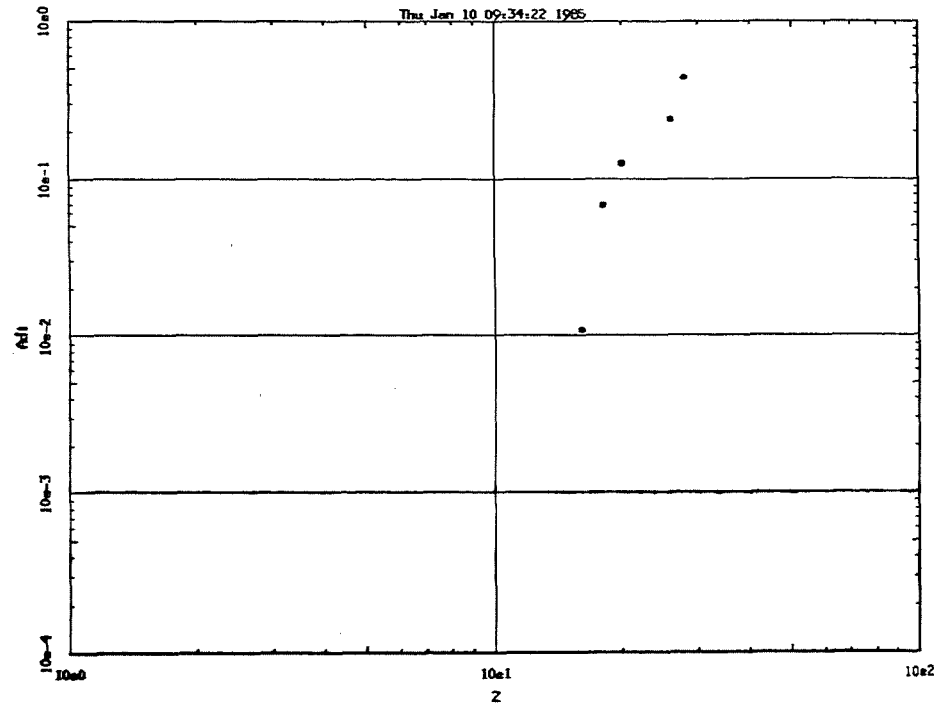
Adi vs. Z for Z - Q = 14

Thu Jan 10 09:34:22 1985



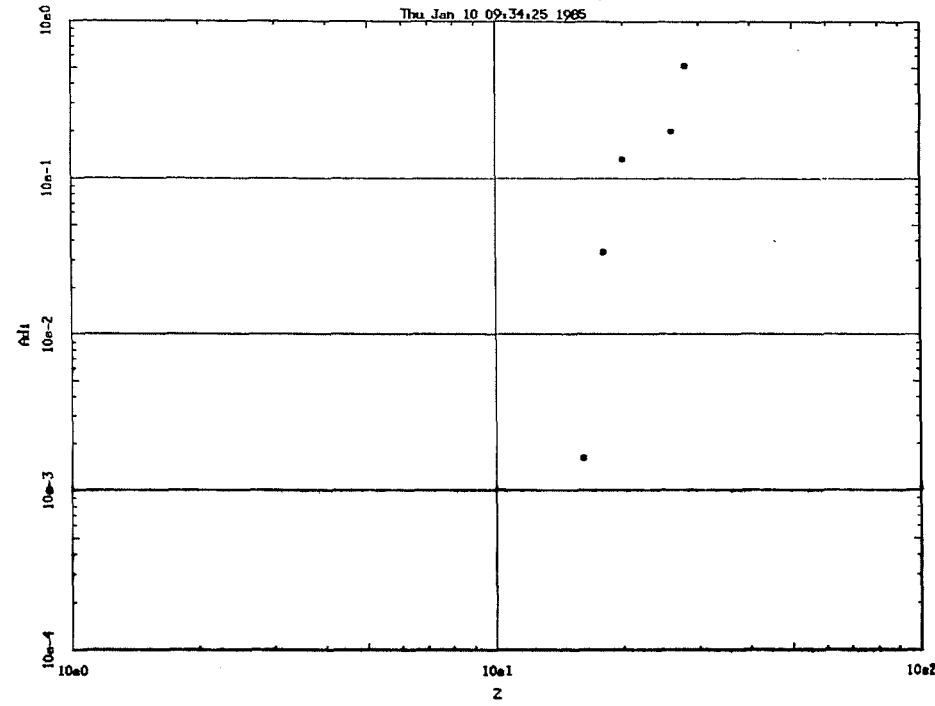
Adi vs. Z for Z - Q = 15

Thu Jan 10 09:34:22 1985

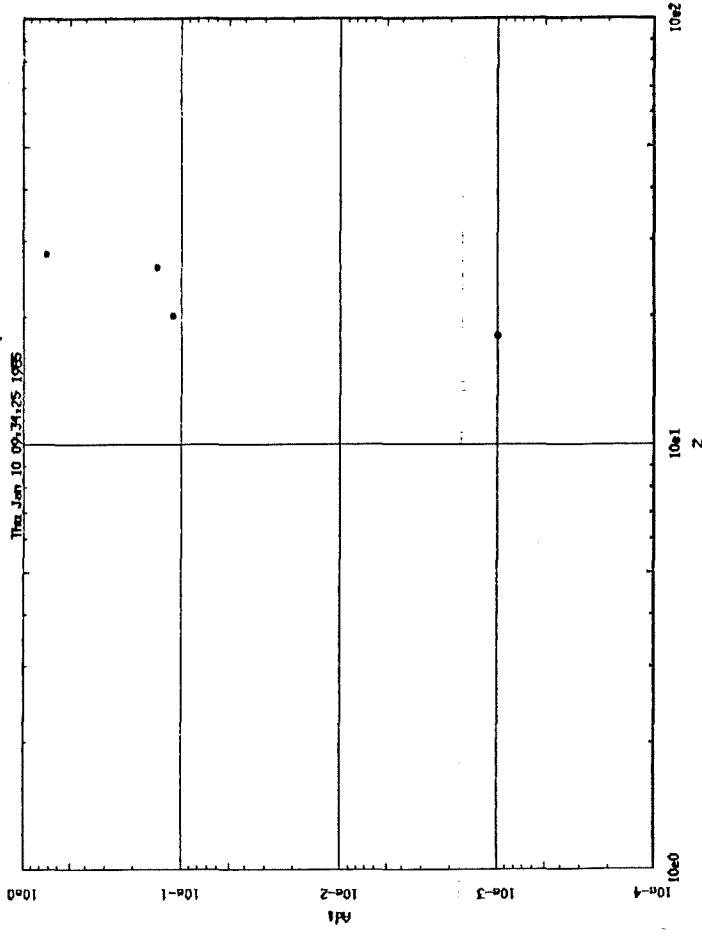


Adi vs. Z for Z - Q = 16

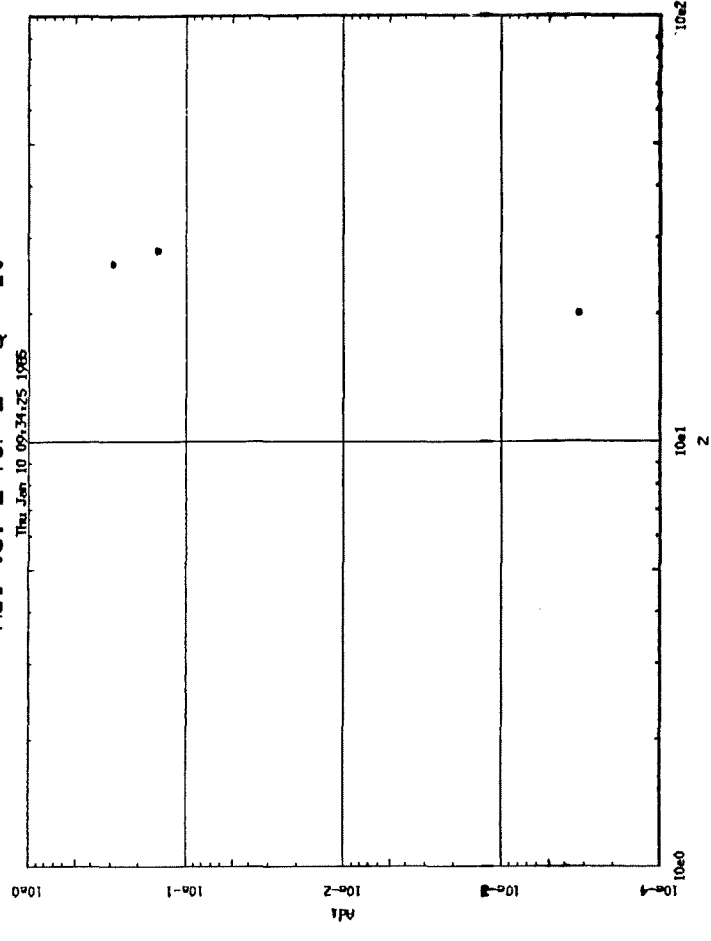
Thu Jan 10 09:34:25 1985



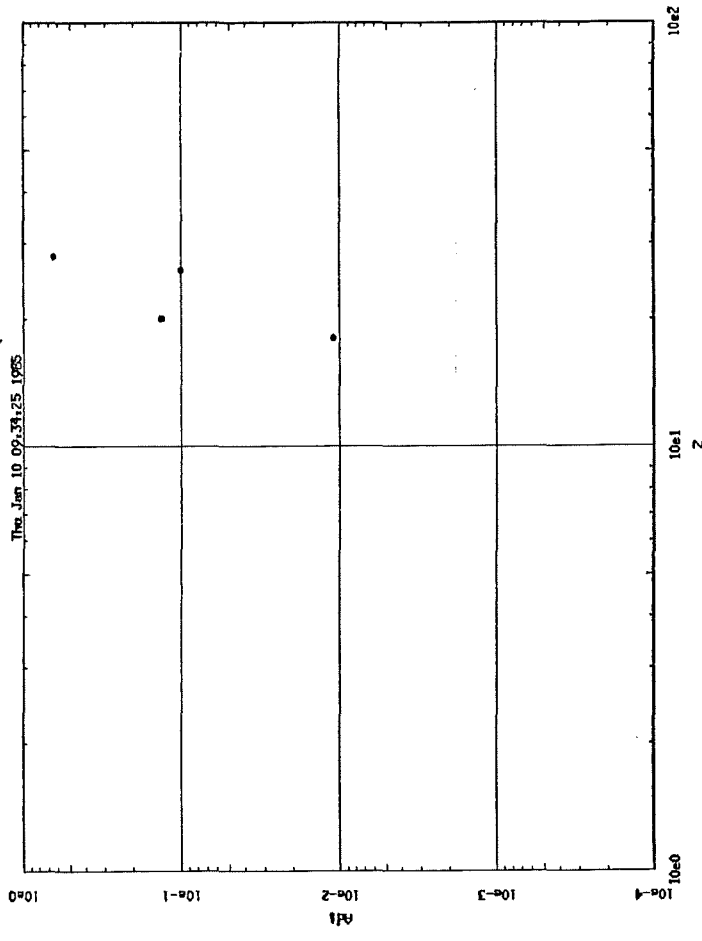
Adi vs. Z for Z - Q = 18



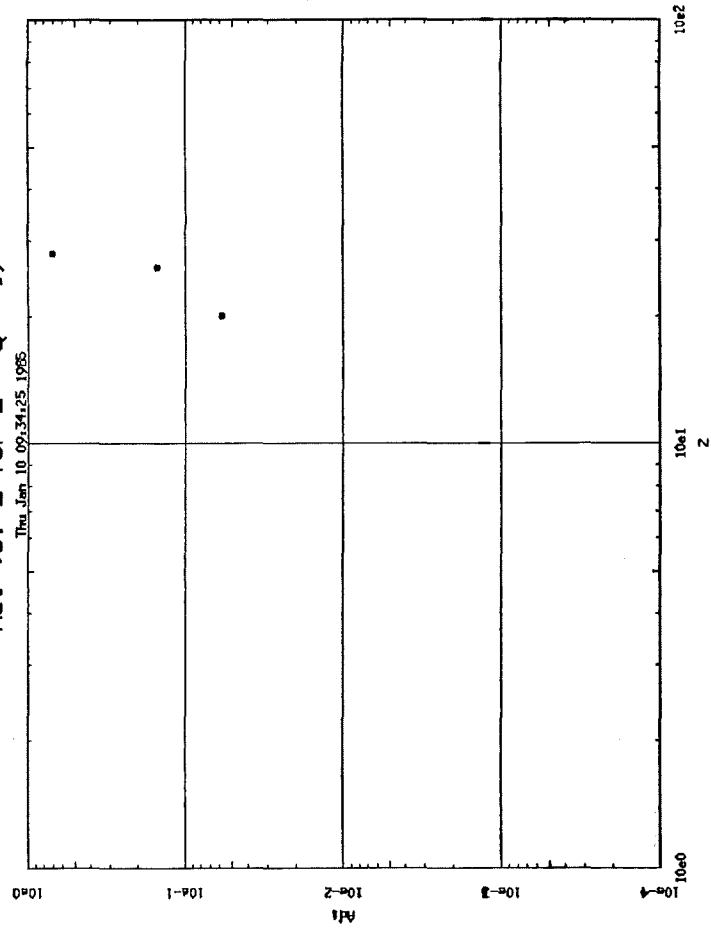
Adi vs. Z for Z - Q = 20



Adi vs. Z for Z - Q = 17

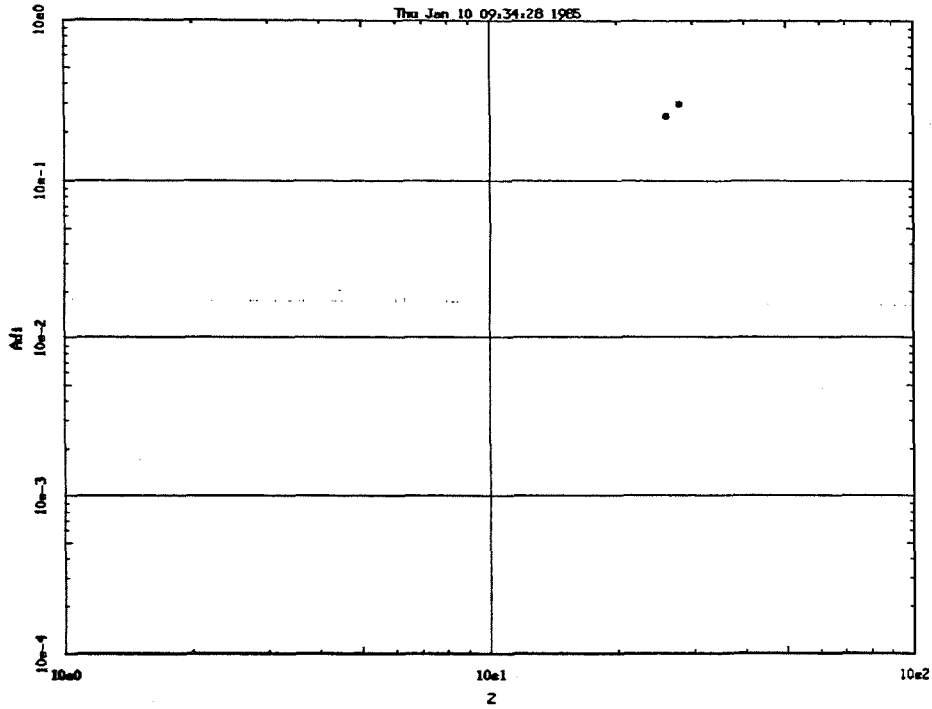


Adi vs. Z for Z - Q = 19



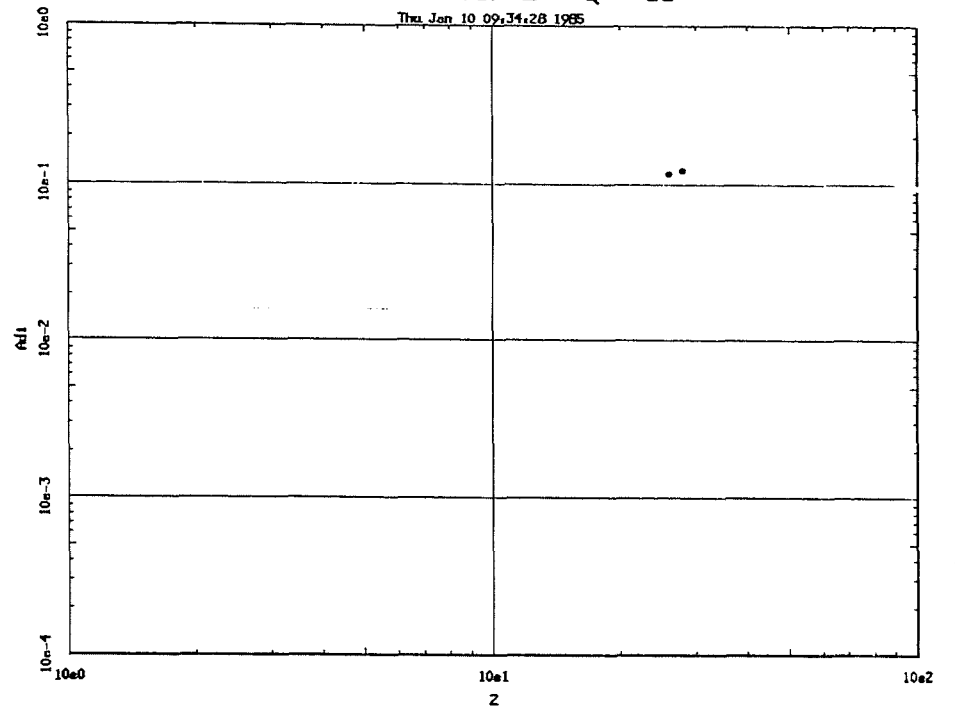
Adi vs. Z for Z - Q = 21

Thu Jan 10 09:34:28 1985



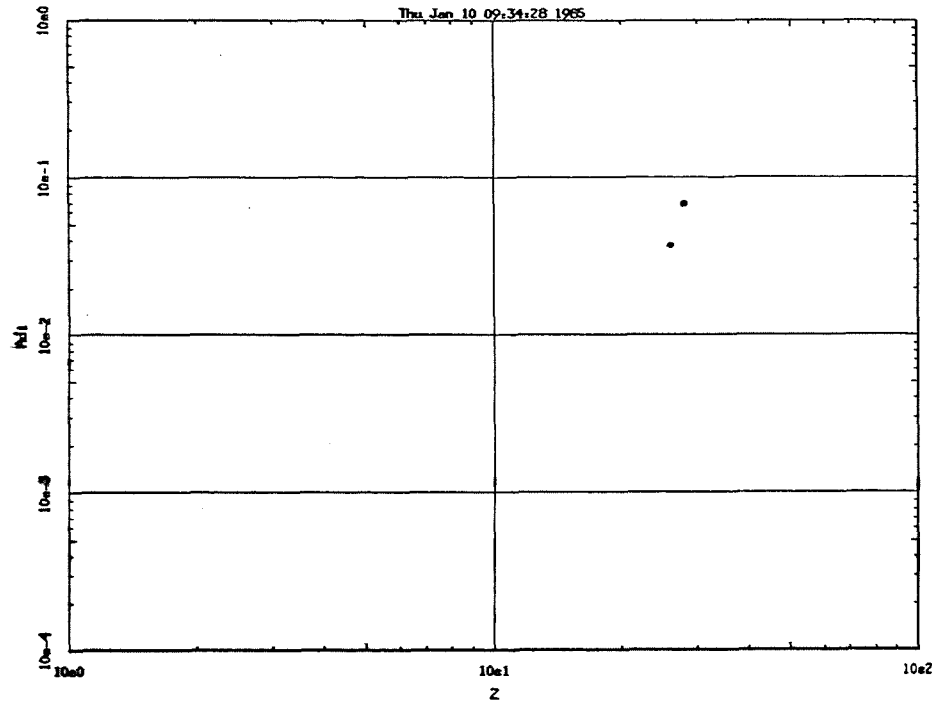
Adi vs. Z for Z - Q = 22

Thu Jan 10 09:34:28 1985



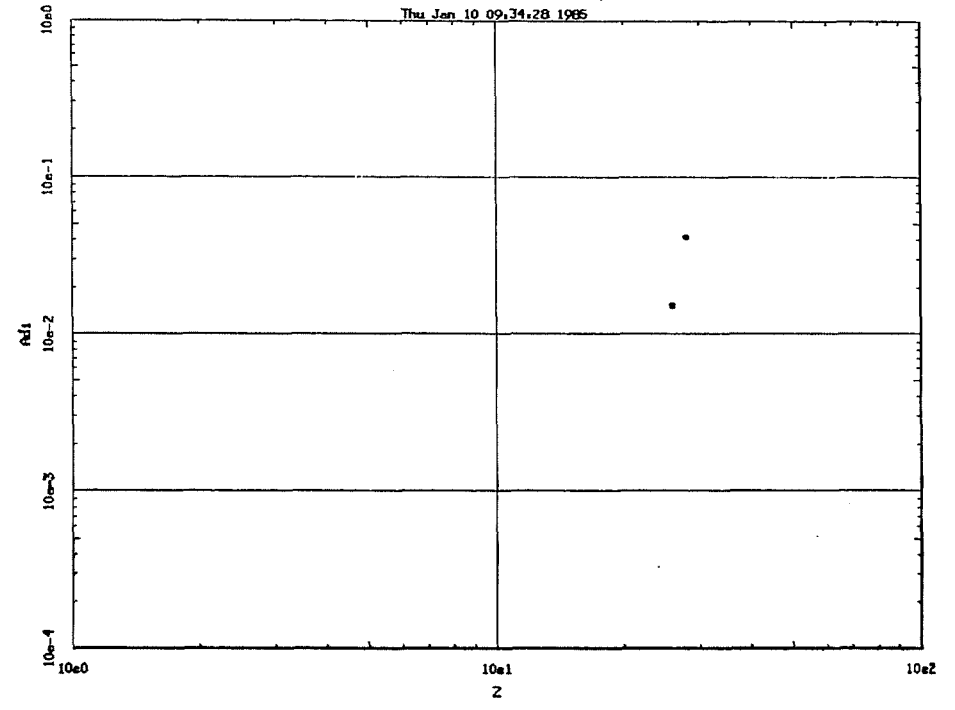
Adi vs. Z for Z - Q = 23

Thu Jan 10 09:34:28 1985



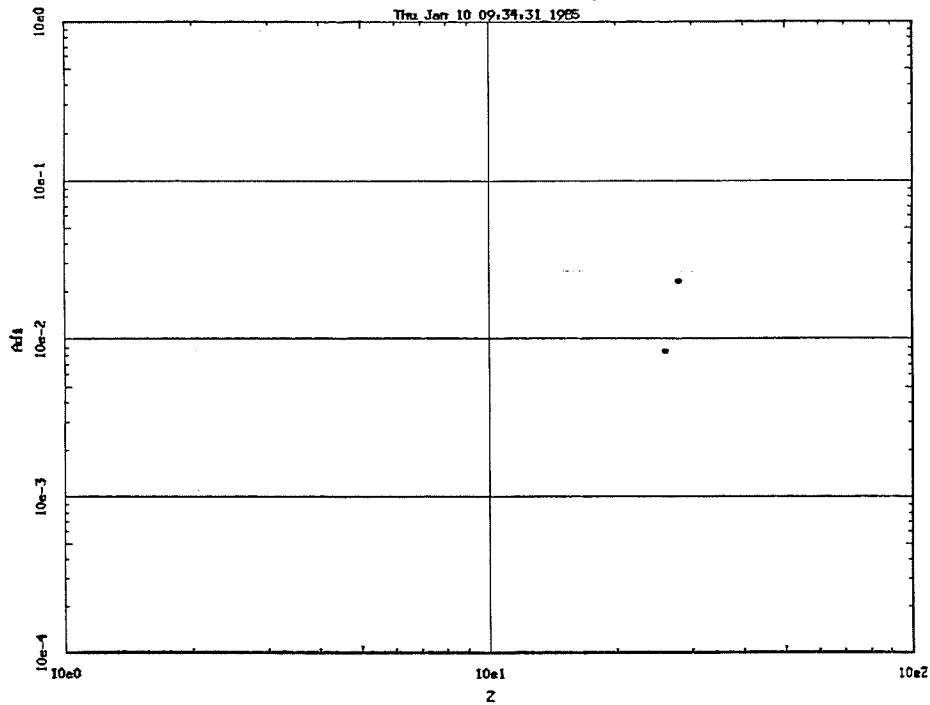
Adi vs. Z for Z - Q = 24

Thu Jan 10 09:34:28 1985



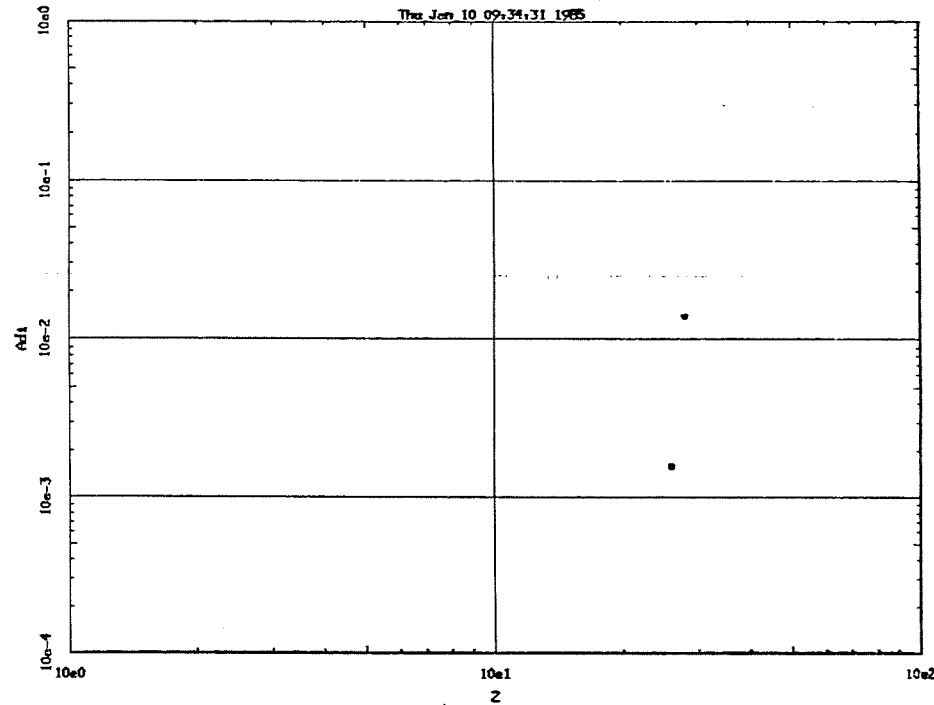
Adi vs. Z for Z - Q = 25

Thu Jan 10 09:34:31 1985



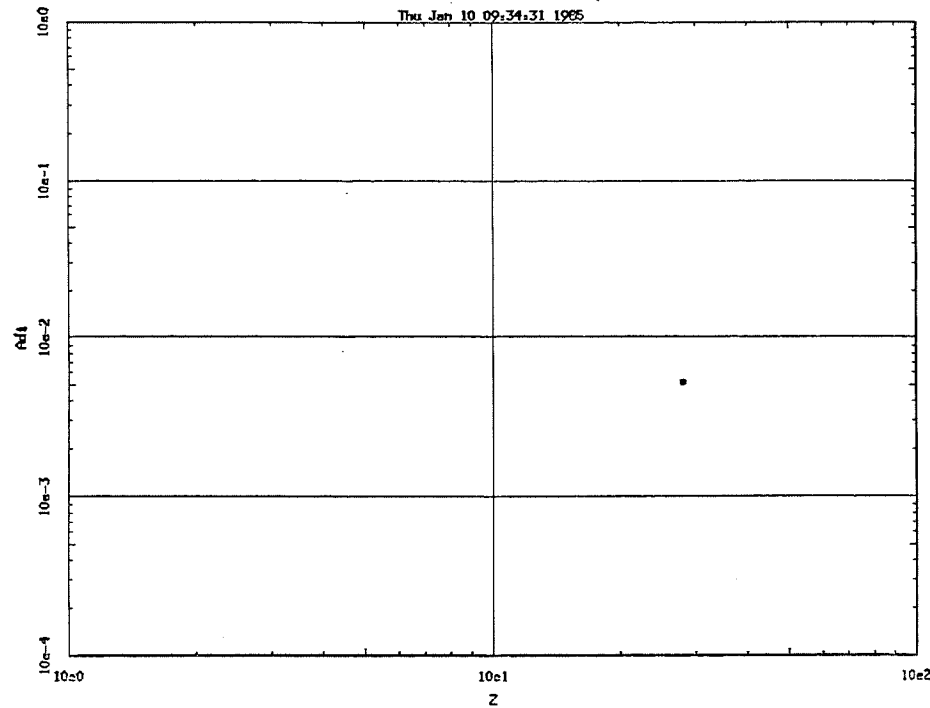
Adi vs. Z for Z - Q = 26

Thu Jan 10 09:34:31 1985



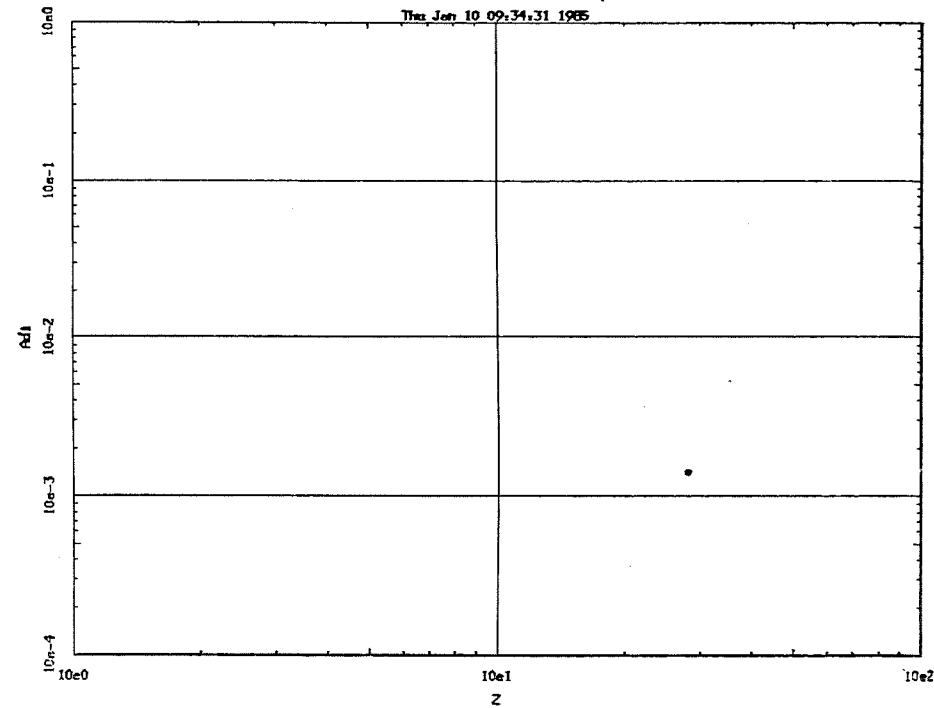
Adi vs. Z for Z - Q = 27

Thu Jan 10 09:34:31 1985

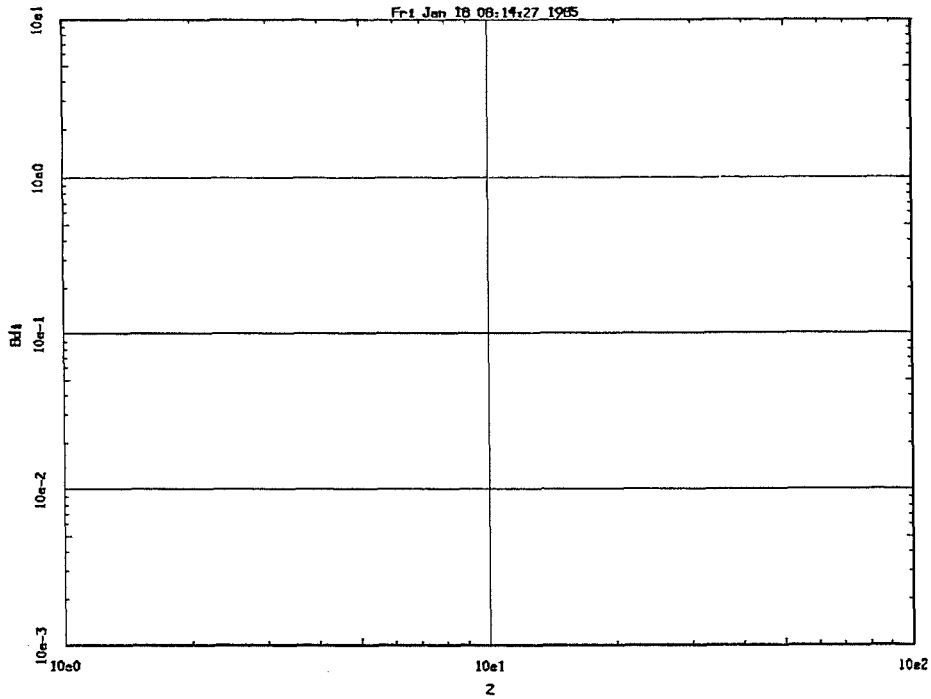


Adi vs. Z for Z - Q = 28

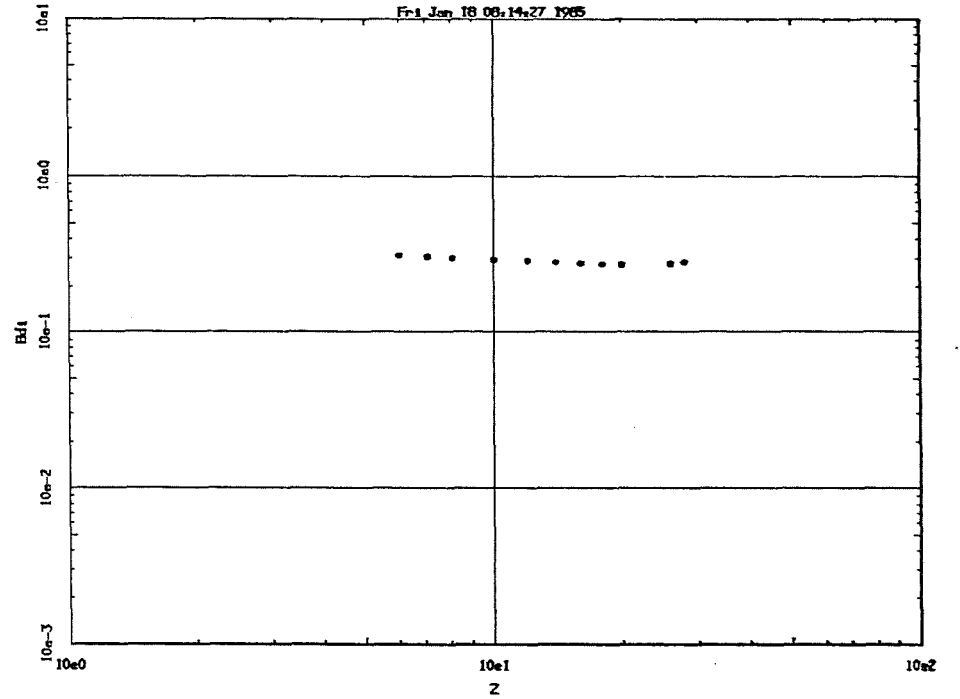
Thu Jan 10 09:34:31 1985



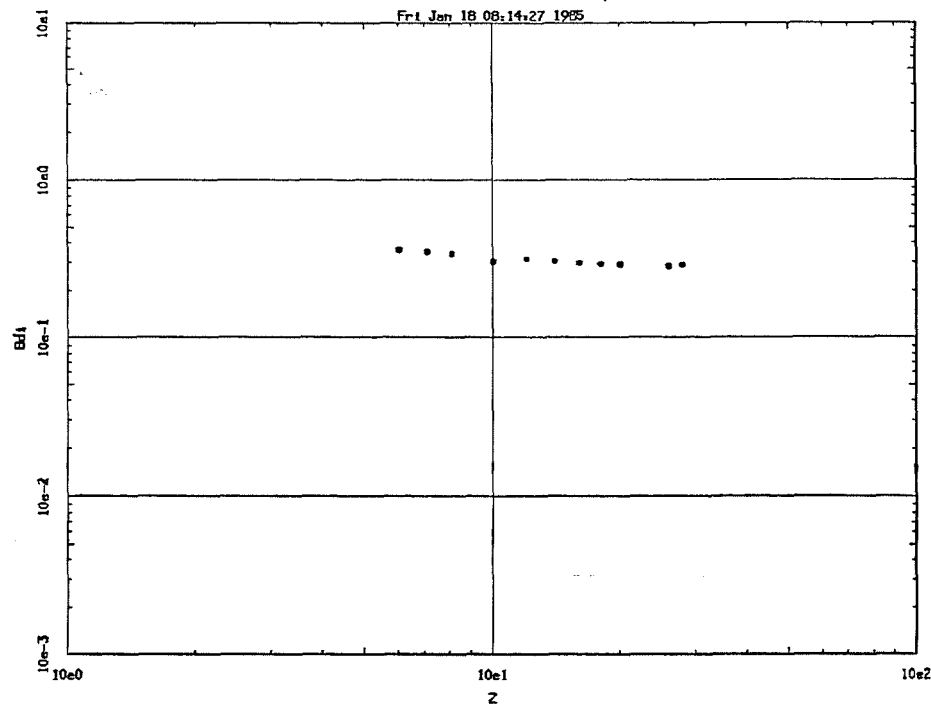
Bdi vs. Z for Z - Q = 1



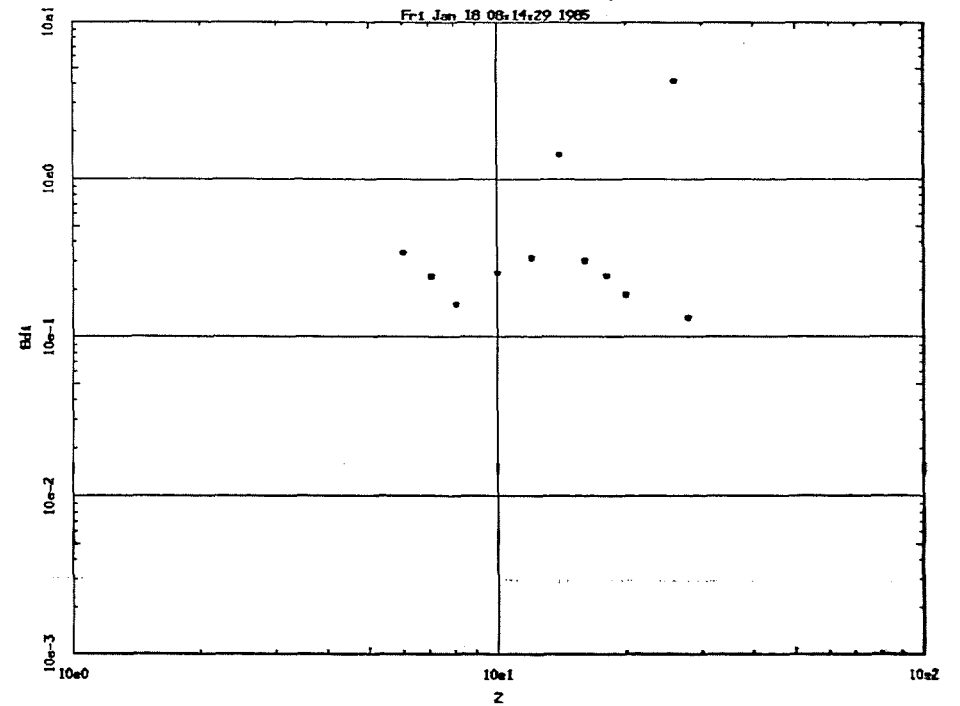
Bdi vs. Z for Z - Q = 2



Bdi vs. Z for Z - Q = 3

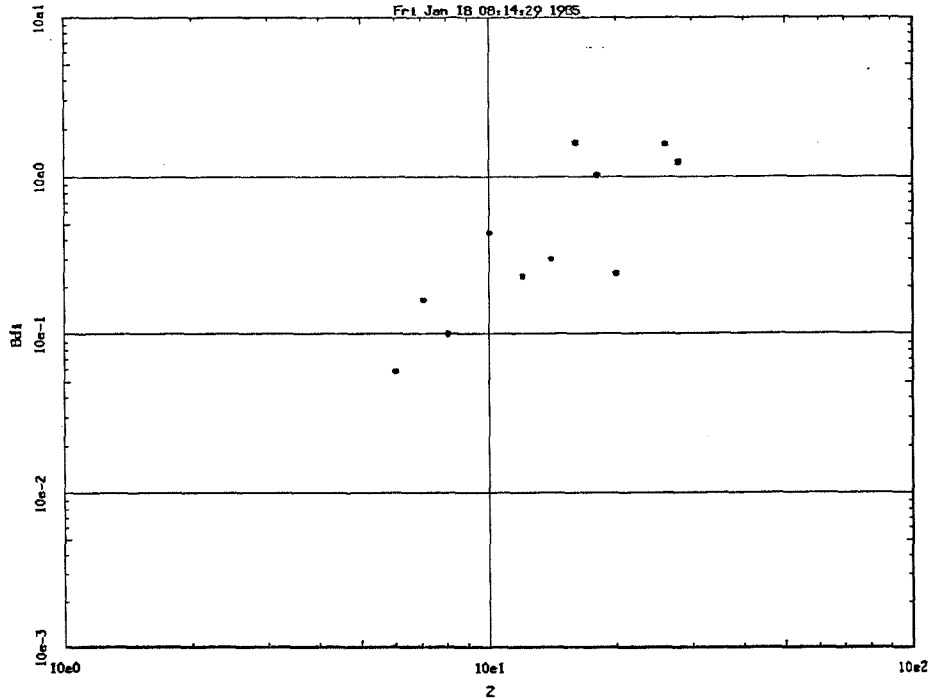


Bdi vs. Z for Z - Q = 4



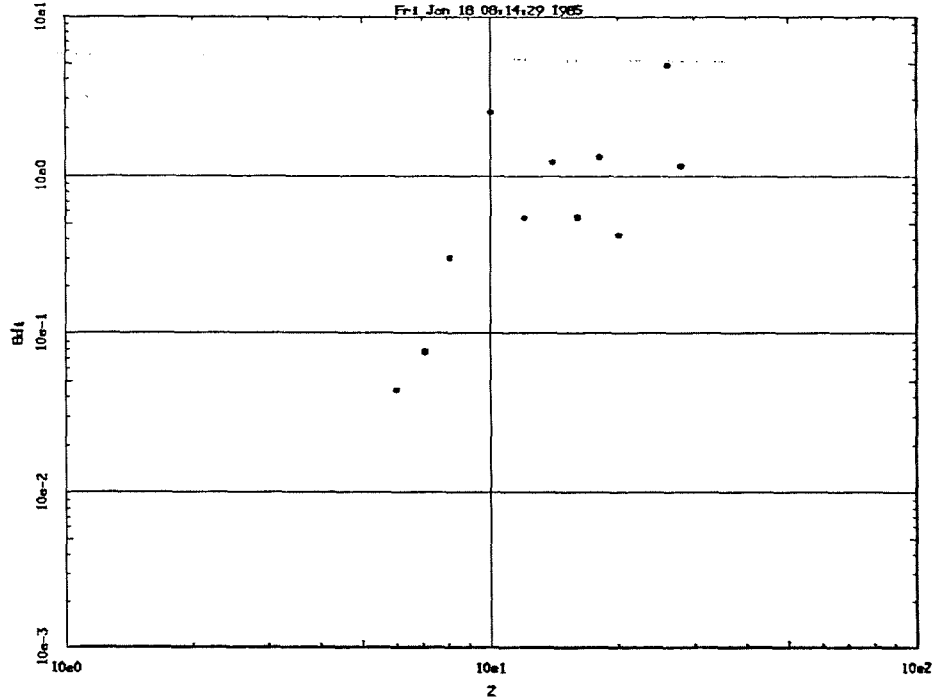
Bdi vs. Z for Z - Q = 5

Fri, Jan 18 08:14:29 1985



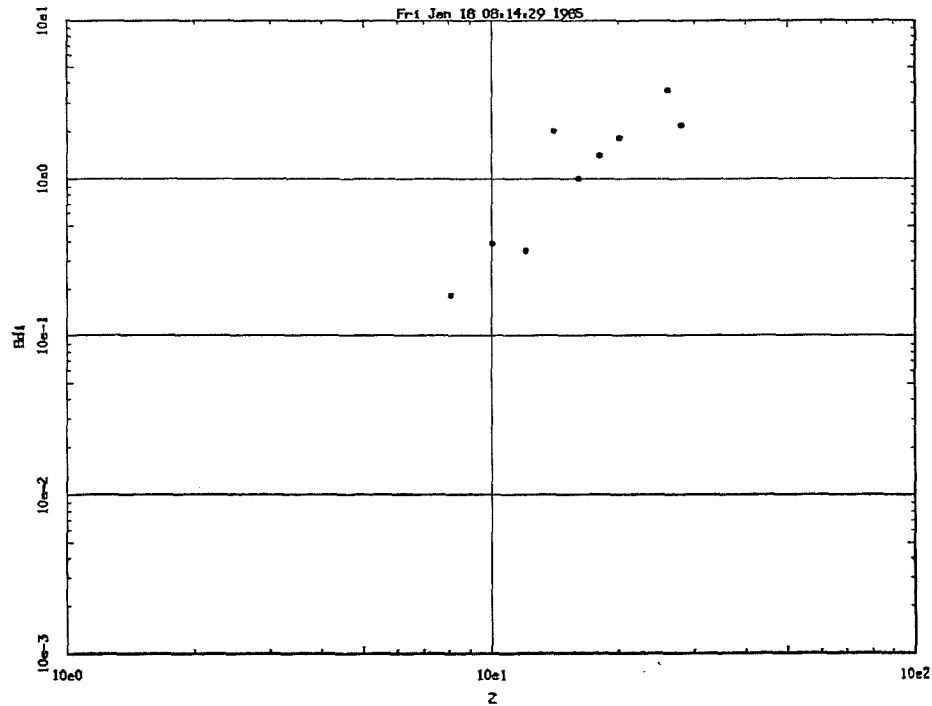
Bdi vs. Z for Z - Q = 6

Fri, Jan 18 08:14:29 1985



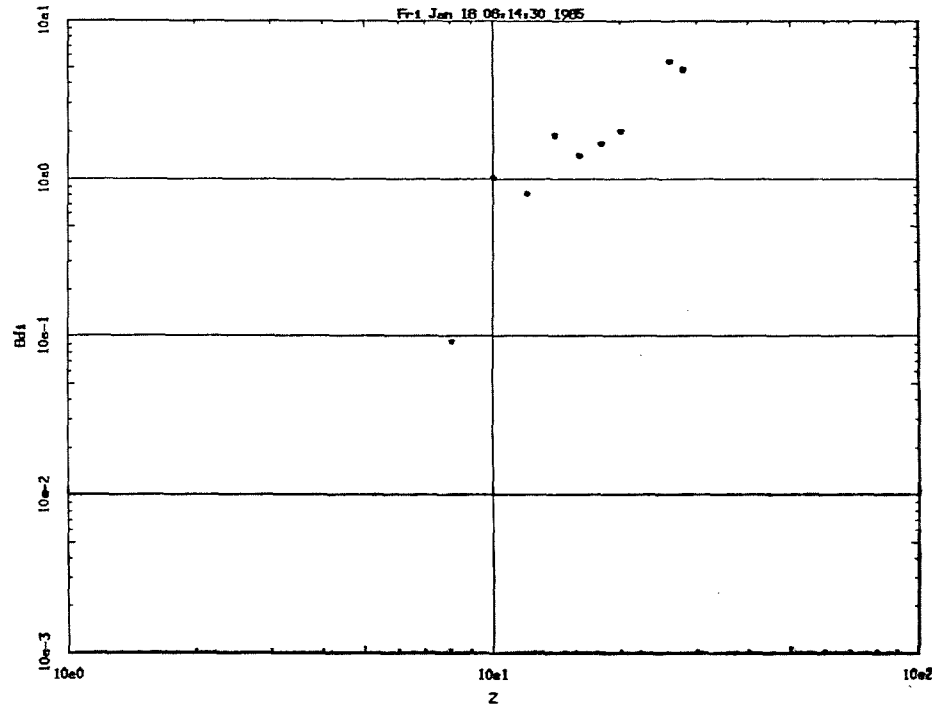
Bdi vs. Z for Z - Q = 7

Fri, Jan 18 08:14:29 1985

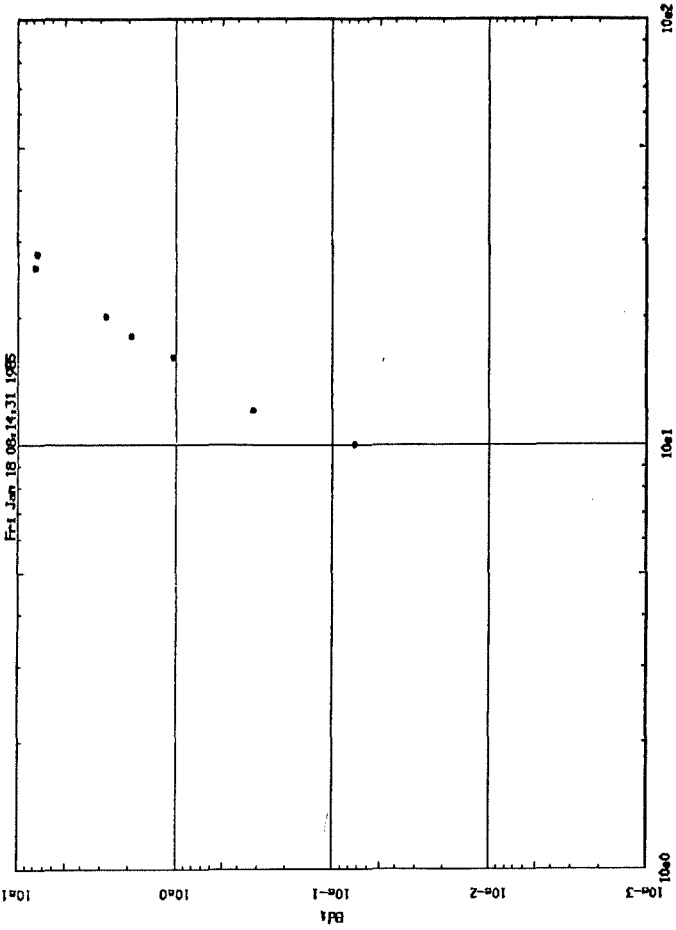


Bdi vs. Z for Z - Q = 8

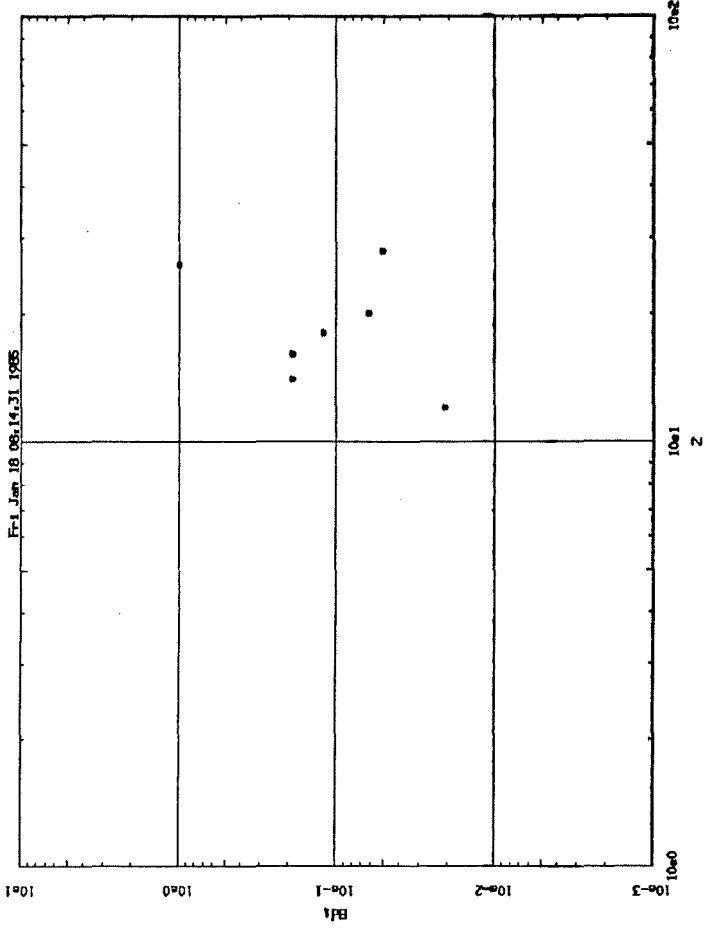
Fri, Jan 18 08:14:30 1985



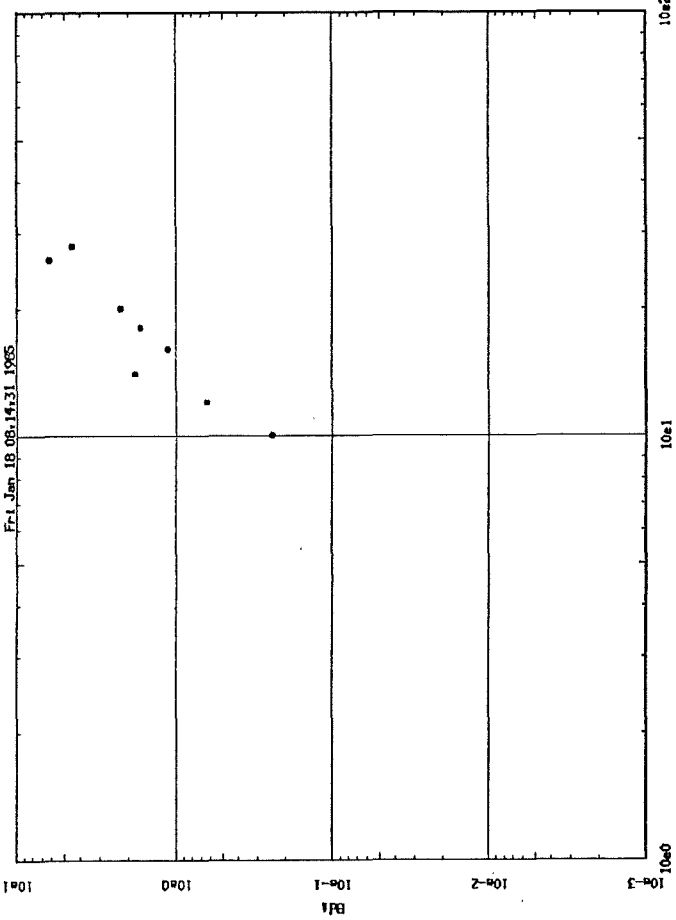
Bd1 vs. Z for Z - Q = 10



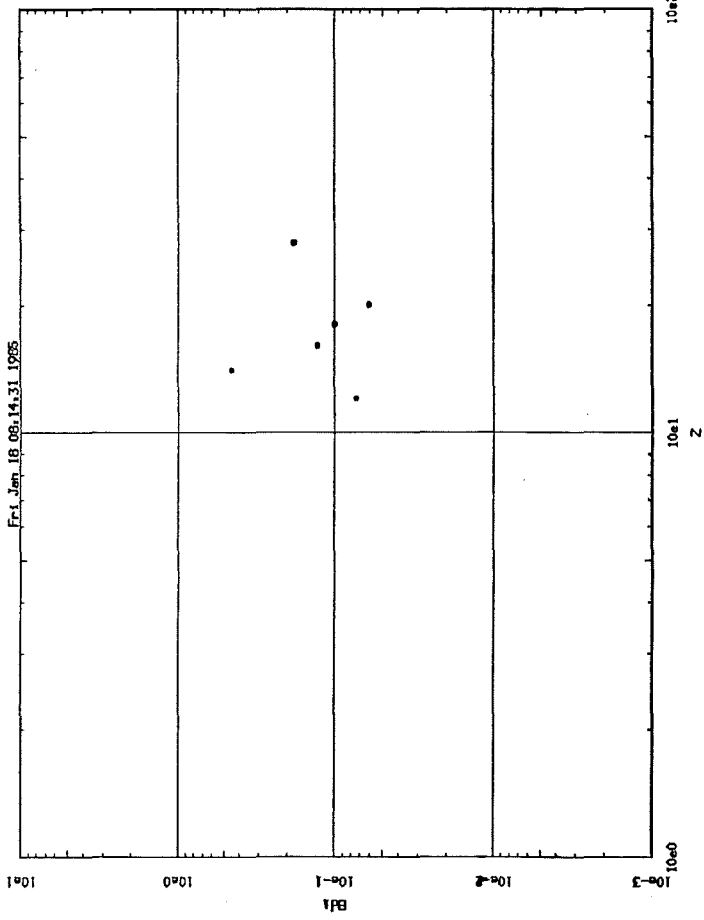
Bd1 vs. Z for Z - Q = 12



Bd1 vs. Z for Z - Q = 9

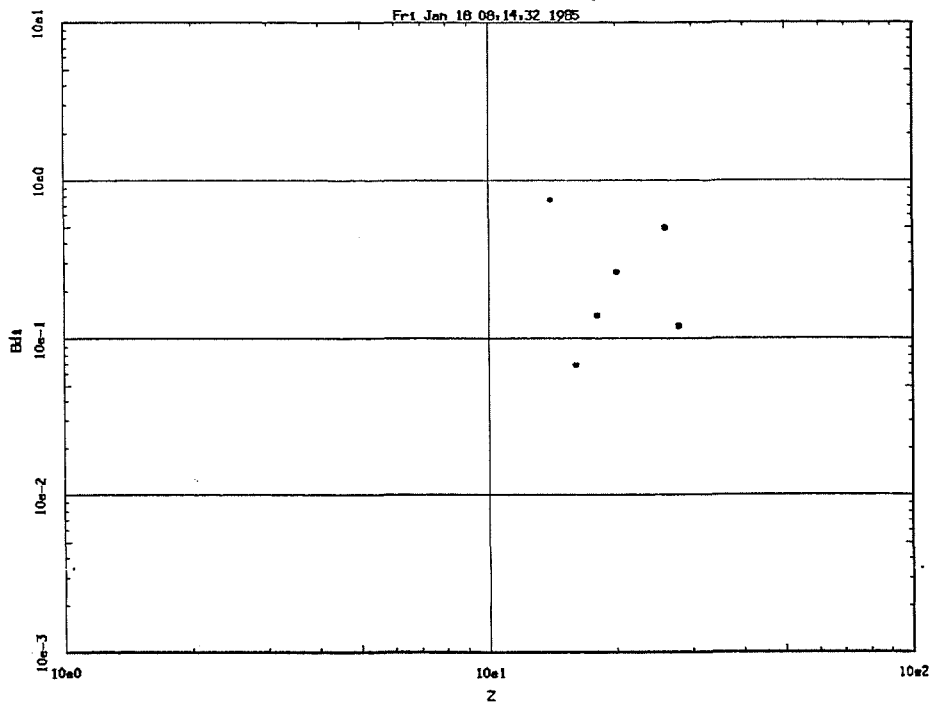


Bd1 vs. Z for Z - Q = 11



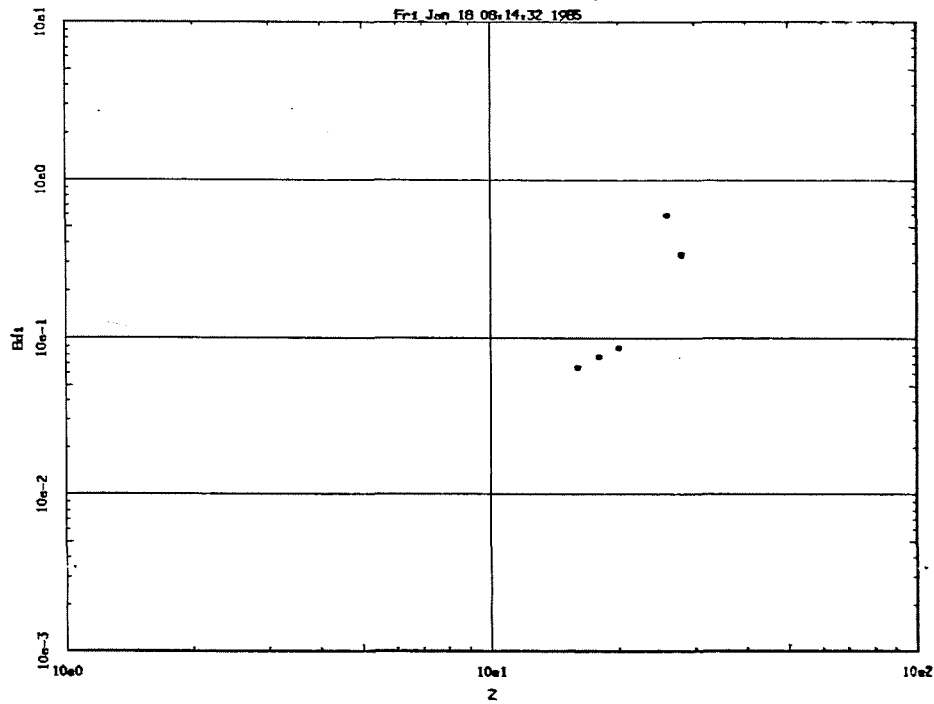
Bdi vs. Z for Z - Q = 13

Fri Jan 18 08:14:32 1985



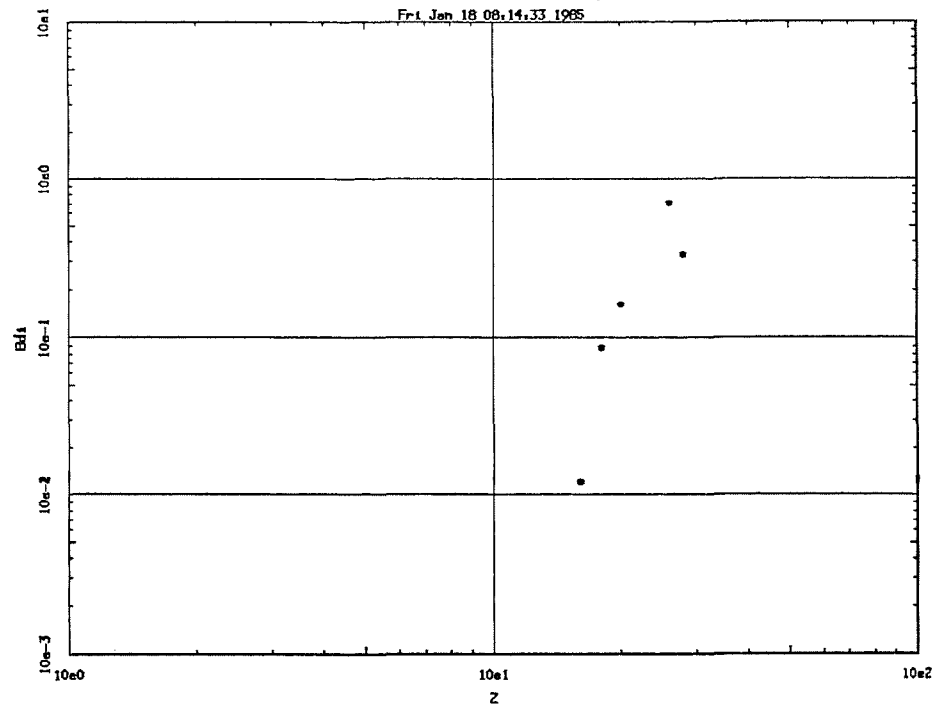
Bdi vs. Z for Z - Q = 14

Fri Jan 18 08:14:32 1985



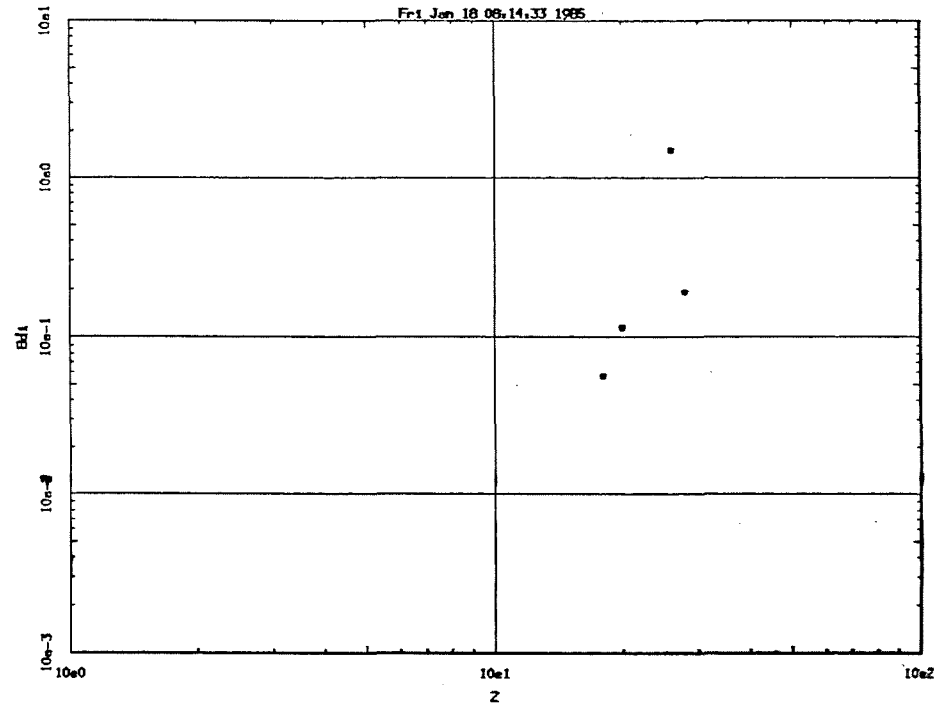
Bdi vs. Z for Z - Q = 15

Fri Jan 18 08:14:33 1985



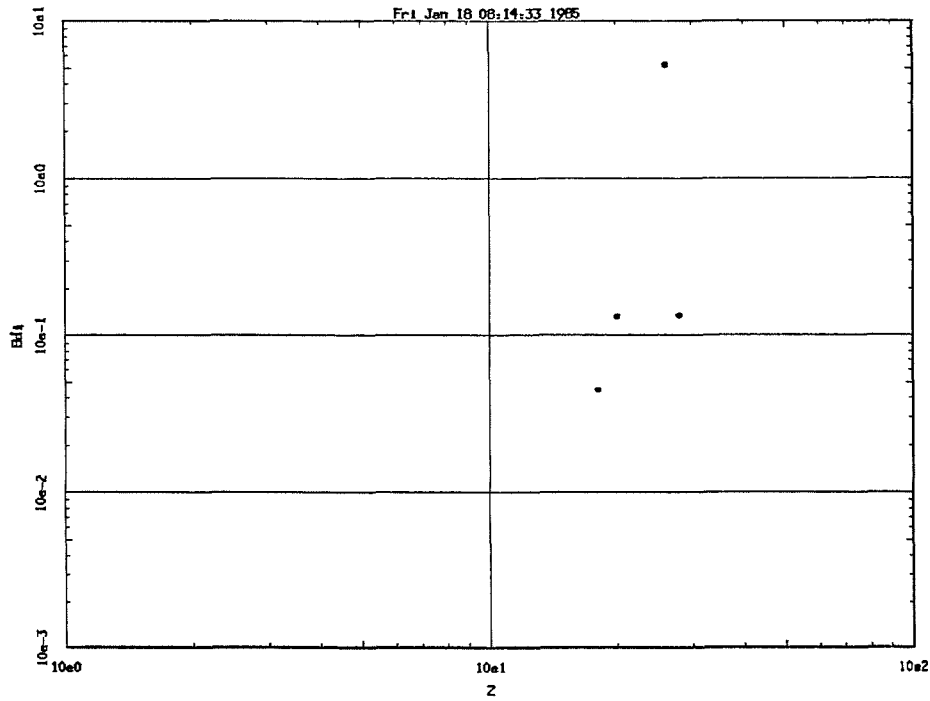
Bdi vs. Z for Z - Q = 16

Fri Jan 18 08:14:33 1985



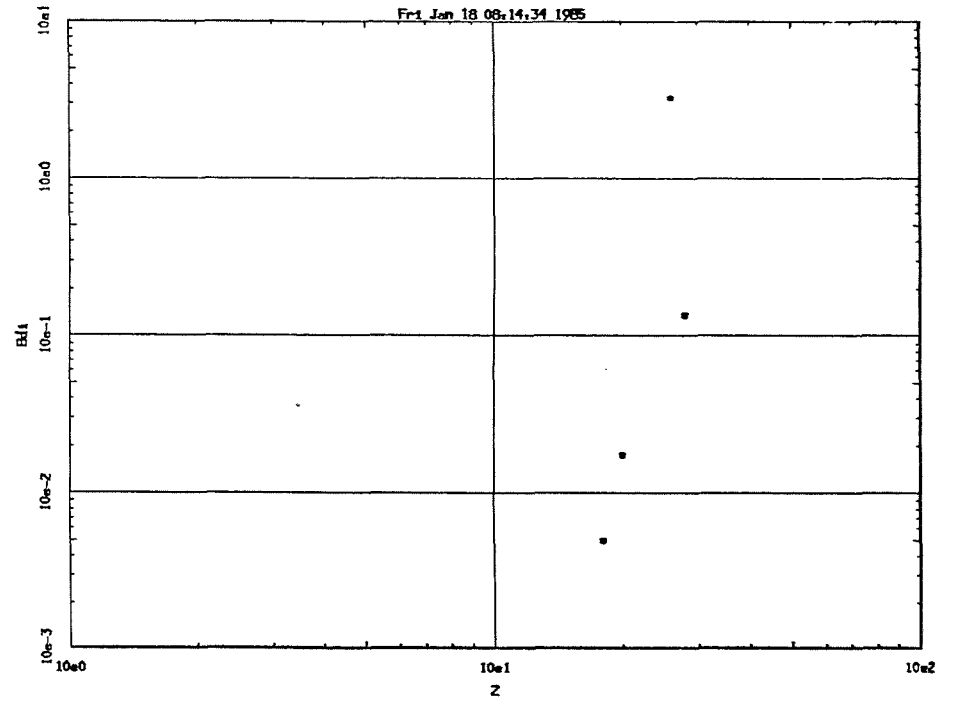
Bdi vs. Z for Z - Q = 17

Fri Jan 18 08:14:33 1985



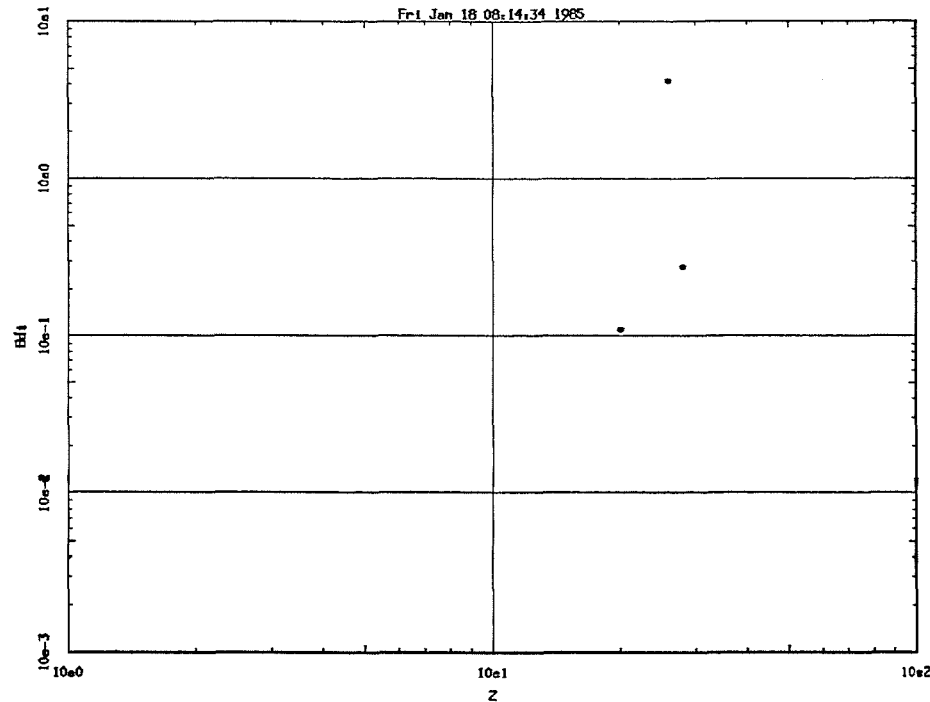
Bdi vs. Z for Z - Q = 18

Fri Jan 18 08:14:34 1985



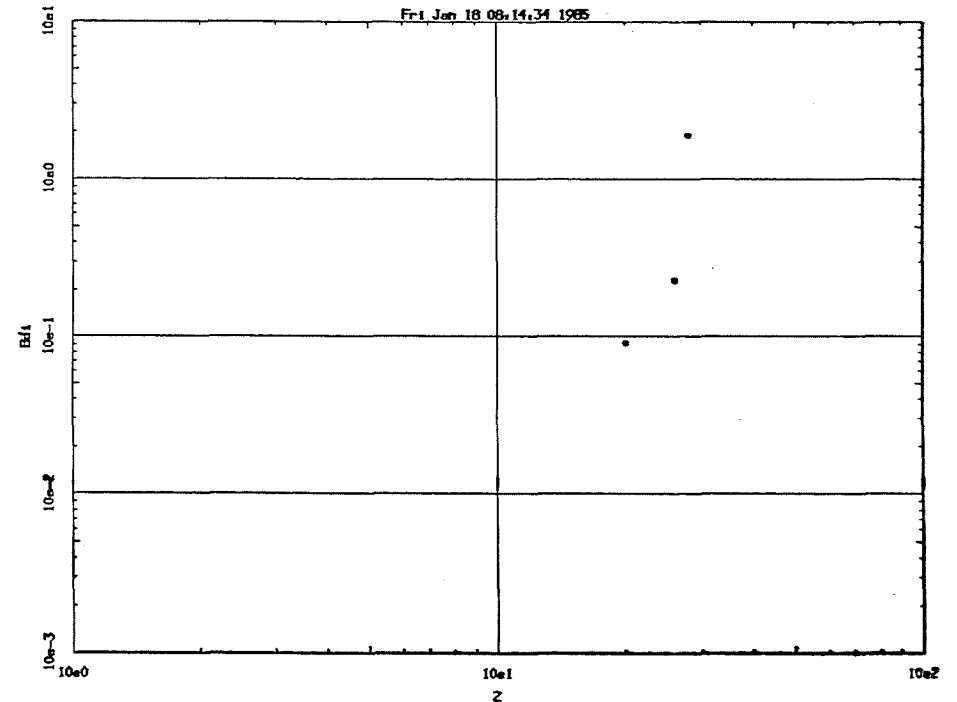
Bdi vs. Z for Z - Q = 19

Fri Jan 18 08:14:34 1985



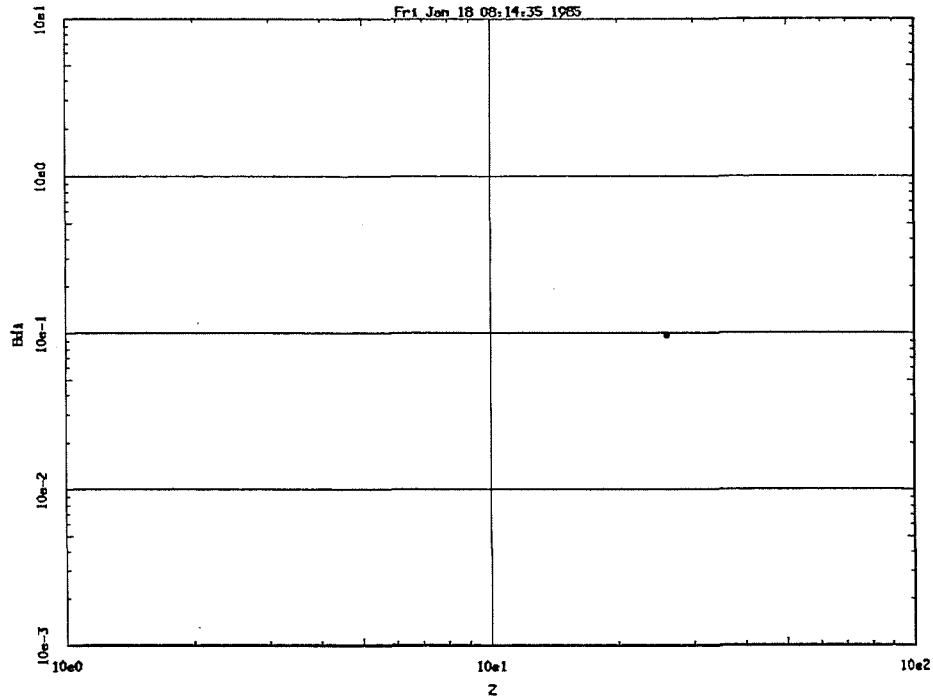
Bdi vs. Z for Z - Q = 20

Fri Jan 18 08:14:34 1985



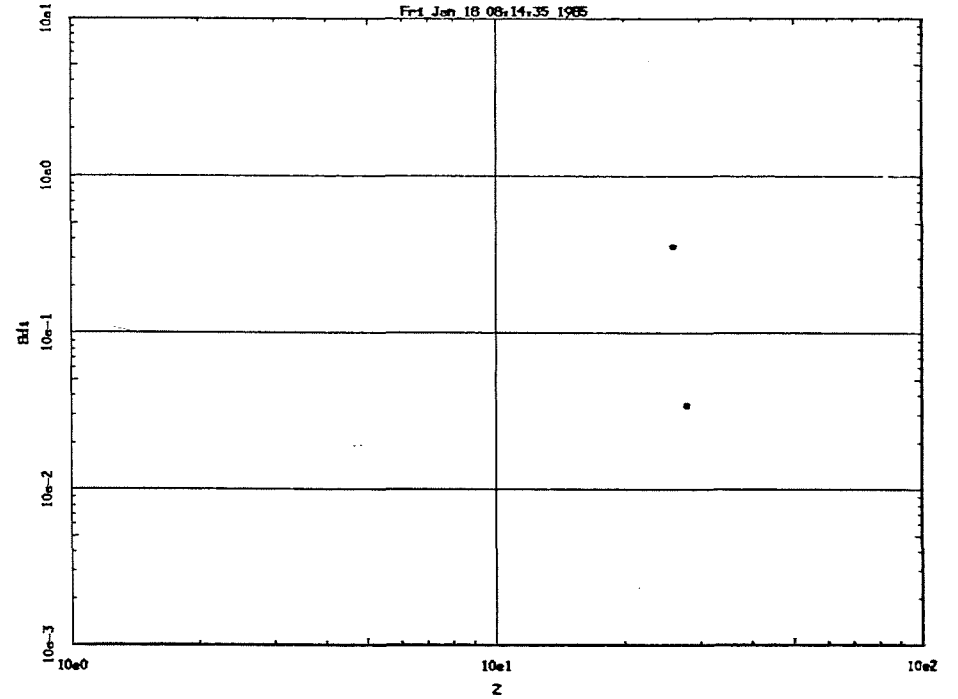
Bdi vs. Z for Z - Q = 21

Fri Jan 18 08:14:35 1985



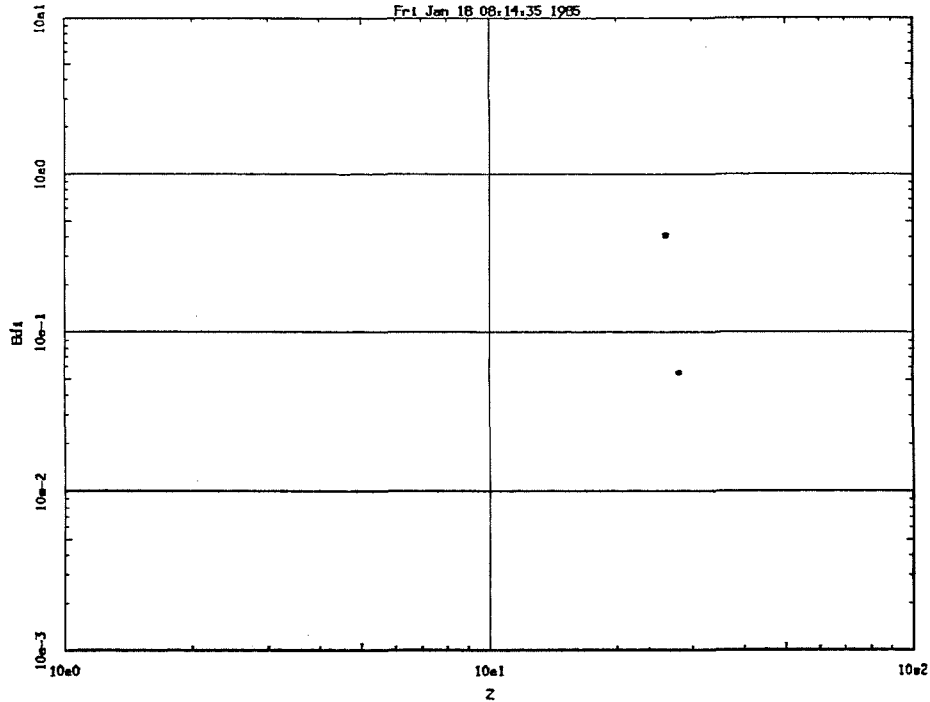
Bdi vs. Z for Z - Q = 22

Fri Jan 18 08:14:35 1985



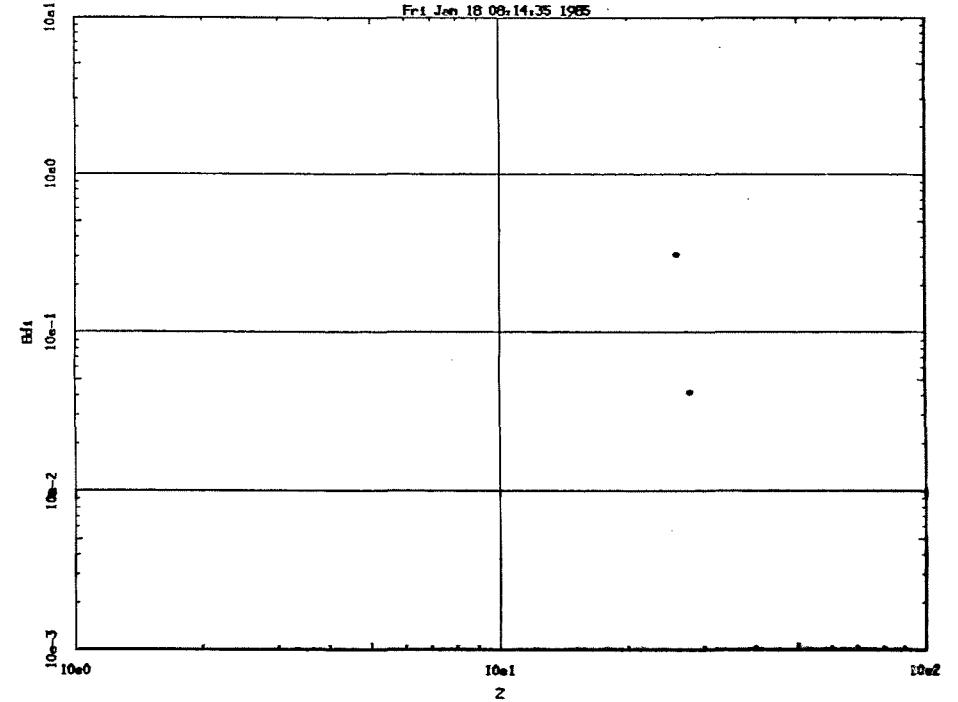
Bdi vs. Z for Z - Q = 23

Fri Jan 18 08:14:35 1985

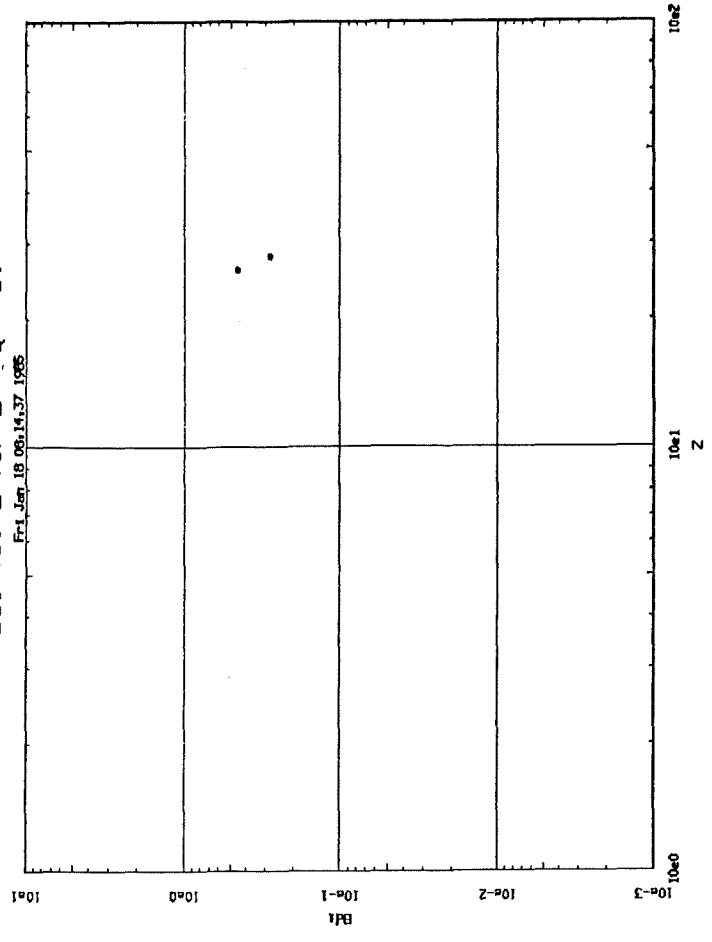


Bdi vs. Z for Z - Q = 24

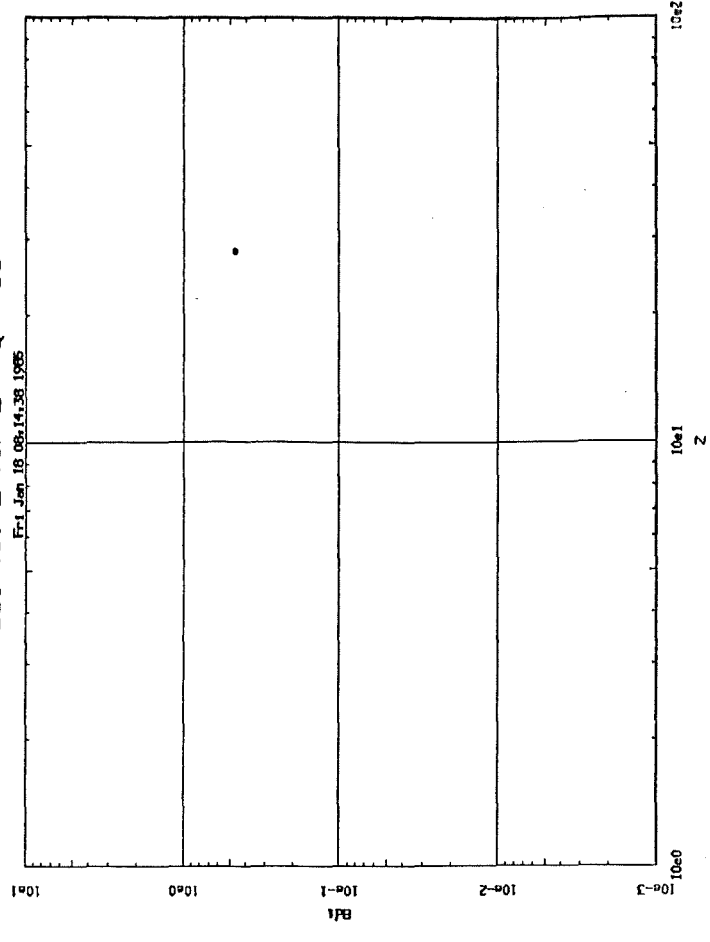
Fri Jan 18 08:14:35 1985



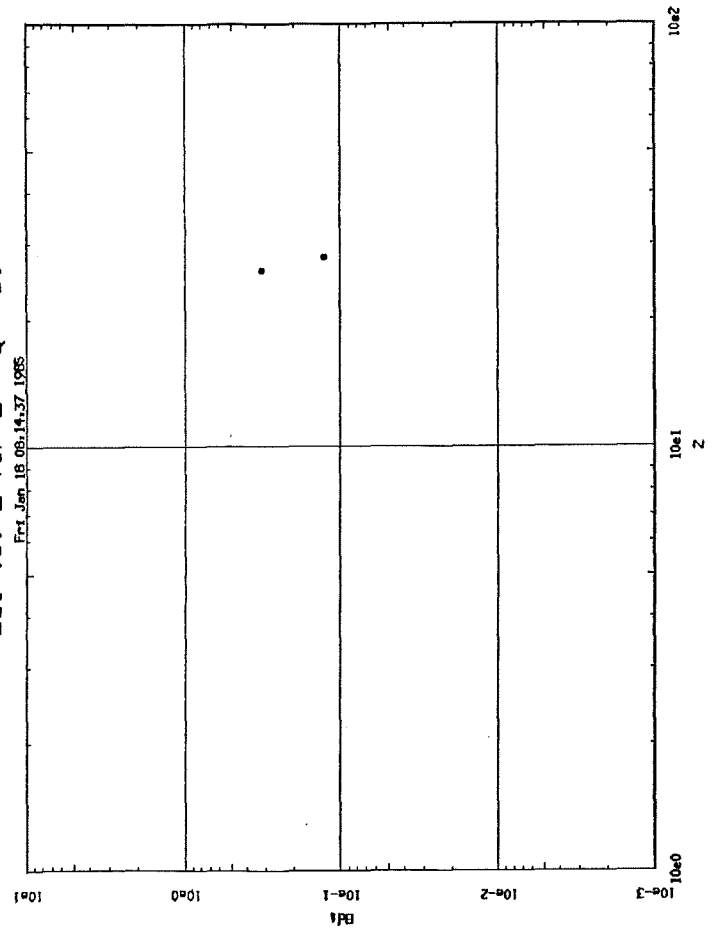
Bd1 vs. Z for Z - Q = 26



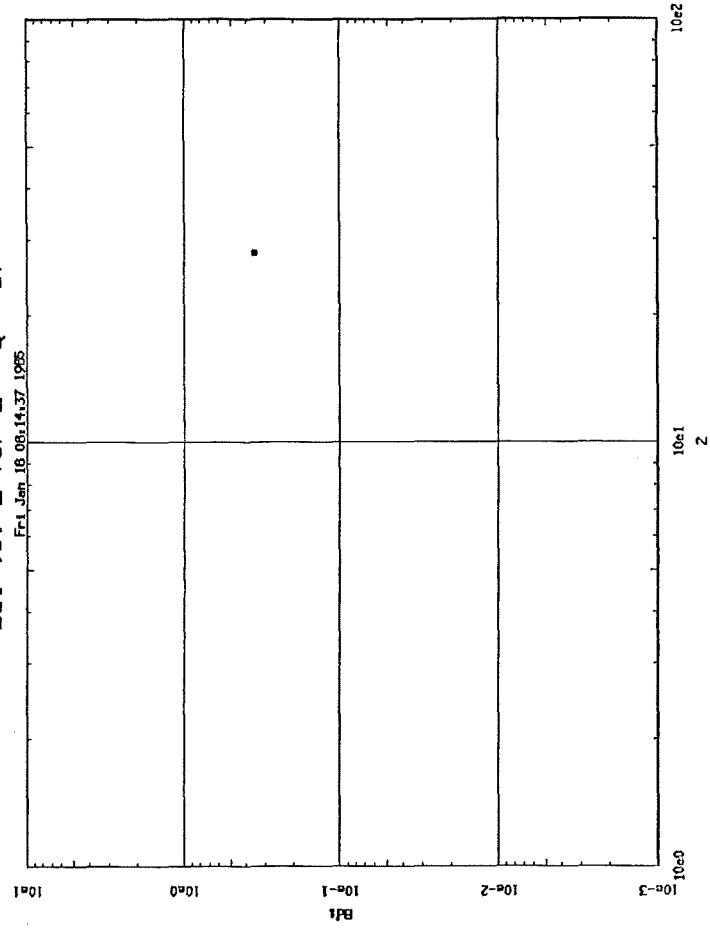
Bd1 vs. Z for Z - Q = 28



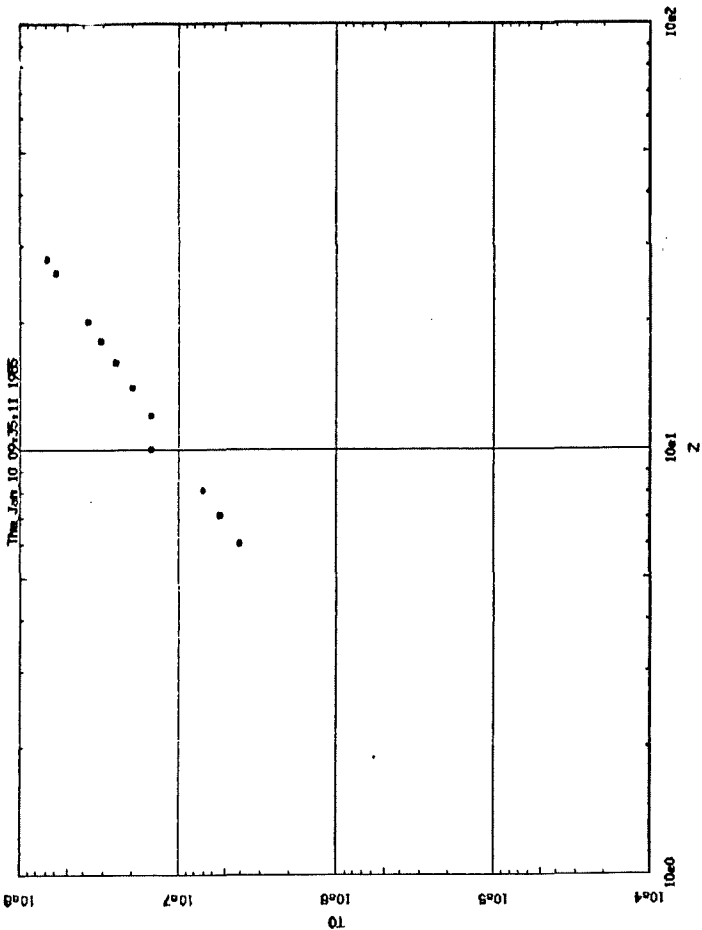
Bd1 vs. Z for Z - Q = 25



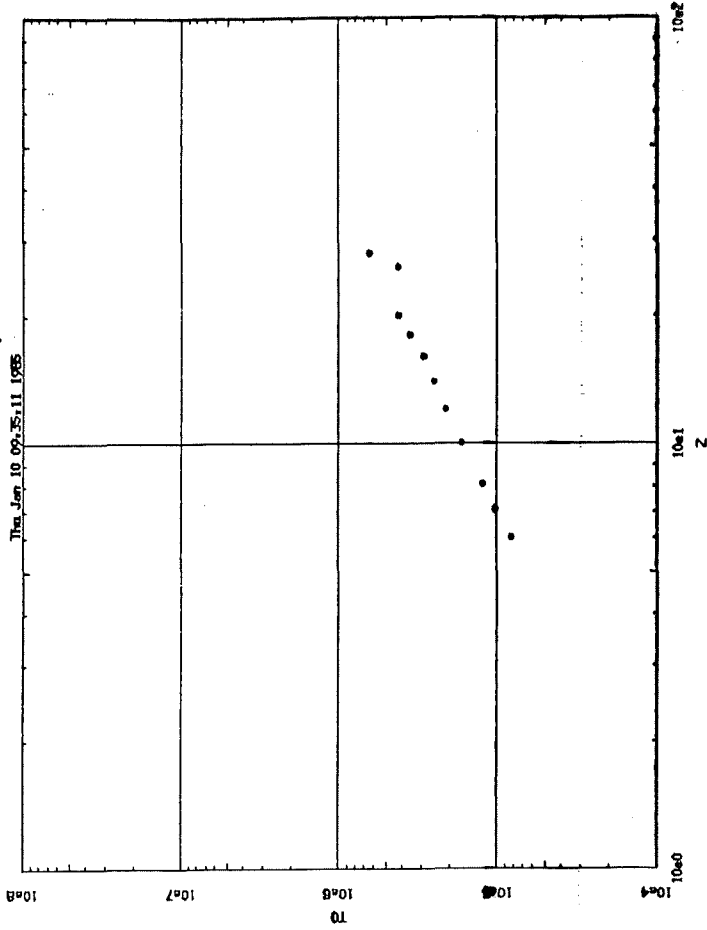
Bd1 vs. Z for Z - Q = 27



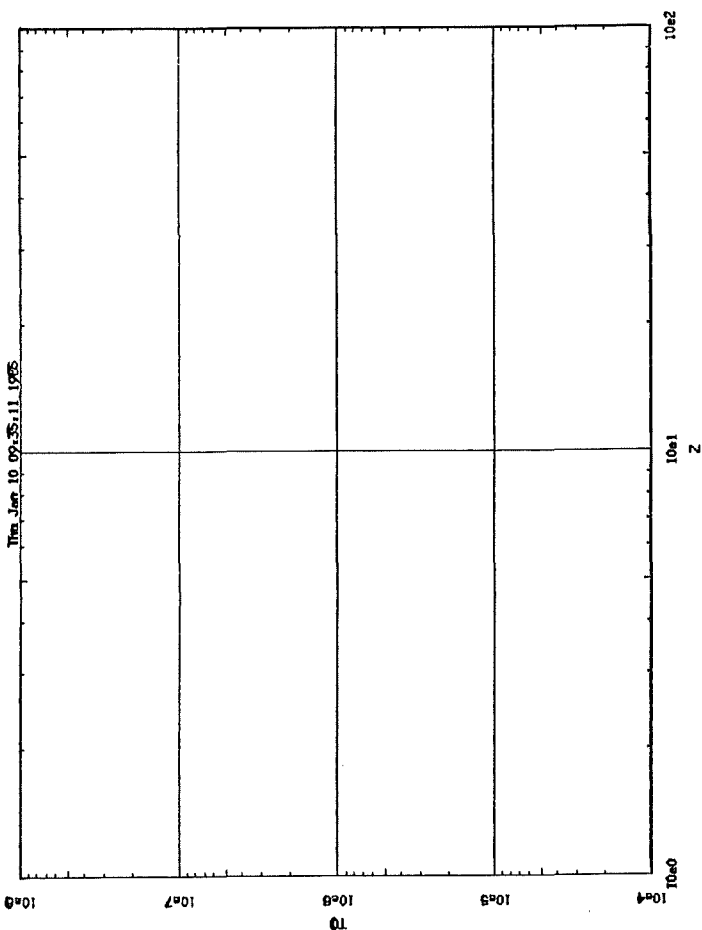
T0 vs. Z for Z - Q = 2



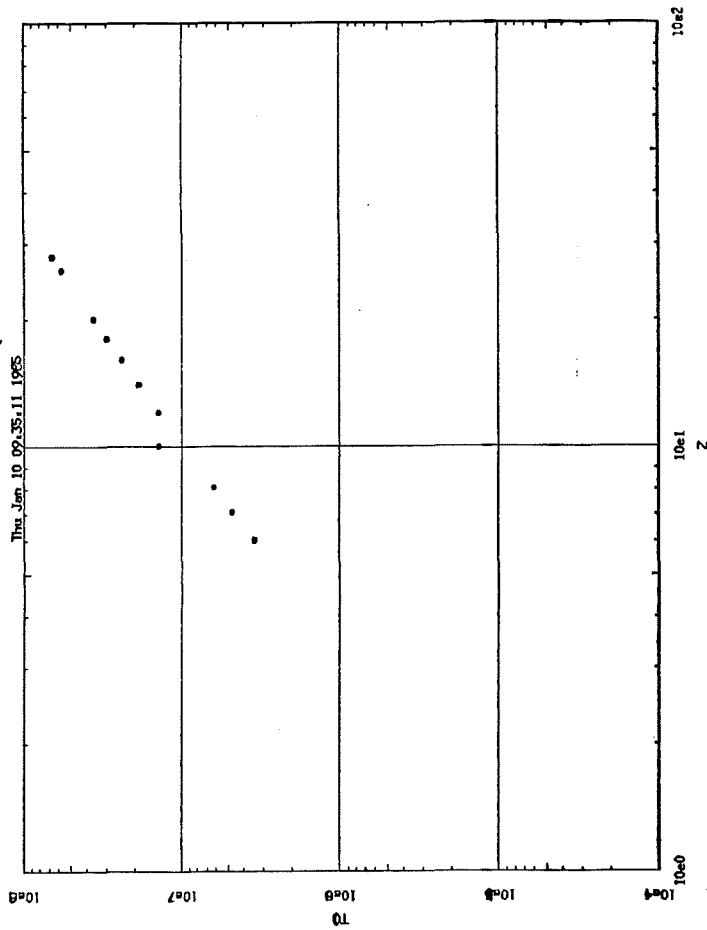
T0 vs. Z for Z - Q = 4



T0 vs. Z for Z - Q = 1

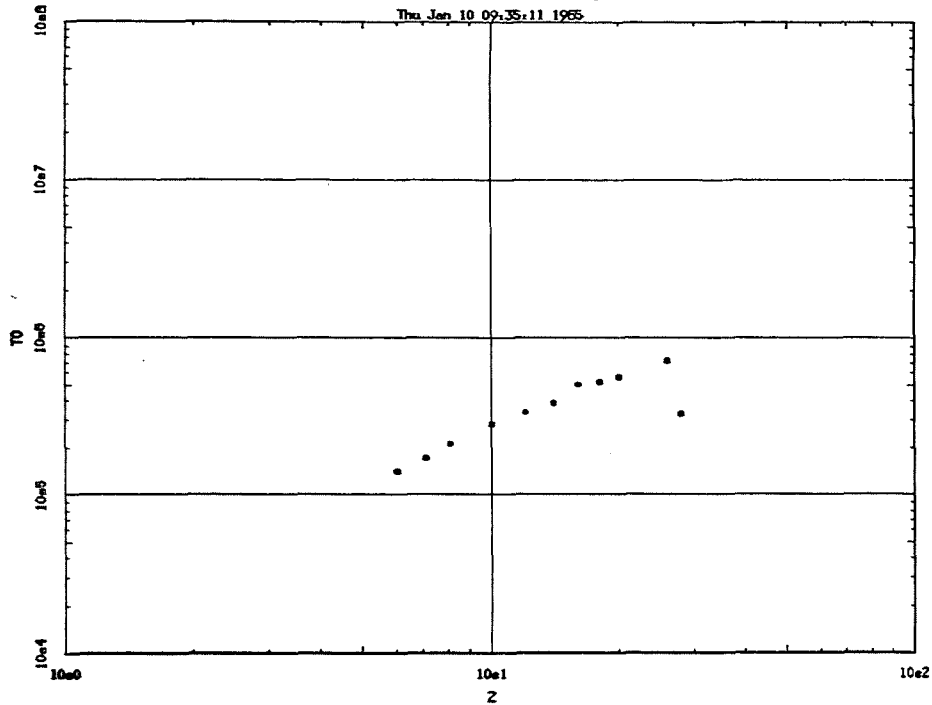


T0 vs. Z for Z - Q = 3



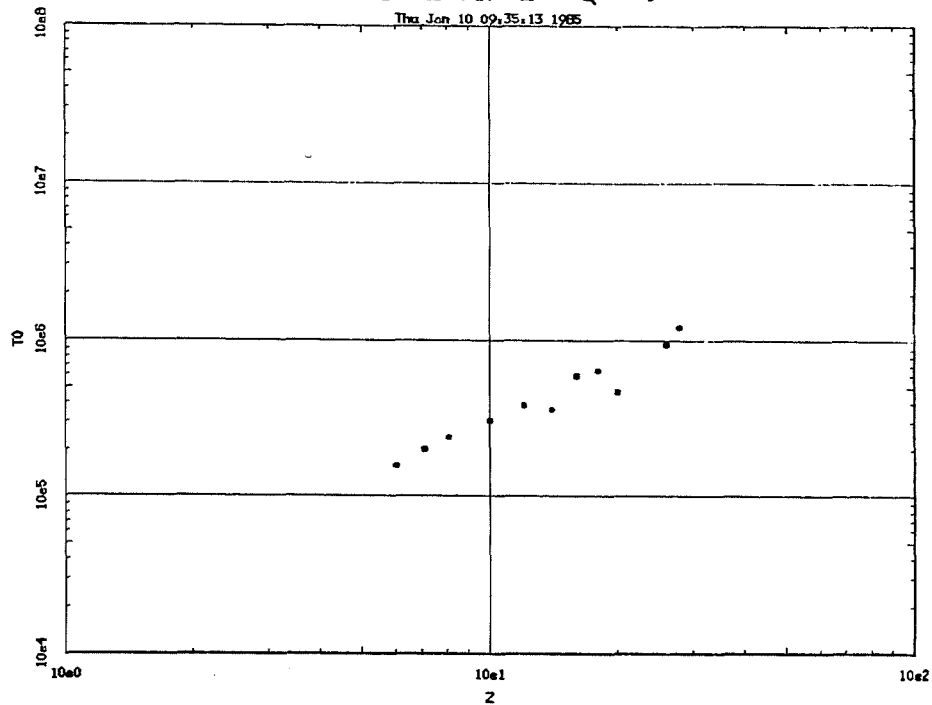
T0 vs. Z for Z - Q = 5

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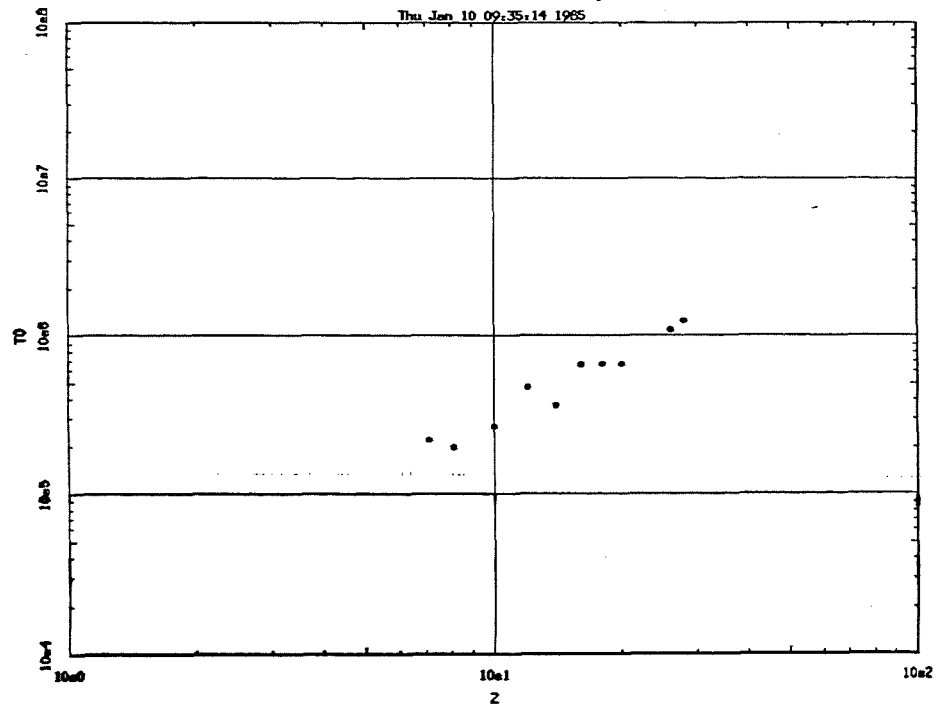
T0 vs. Z for Z - Q = 6

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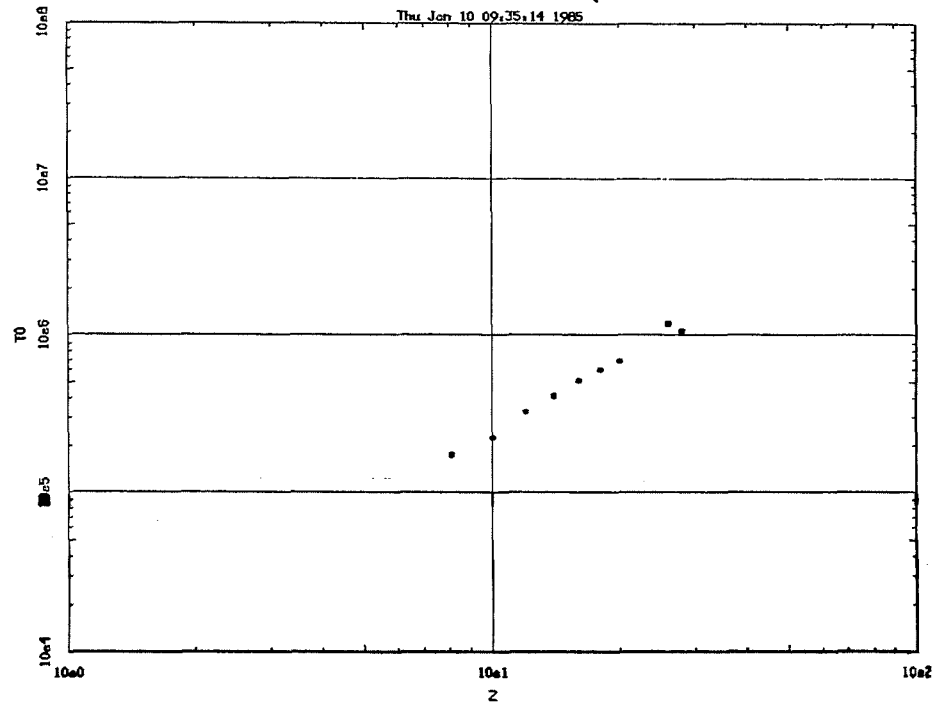
T0 vs. Z for Z - Q = 7

Thu Jan 10 09:35:14 1965

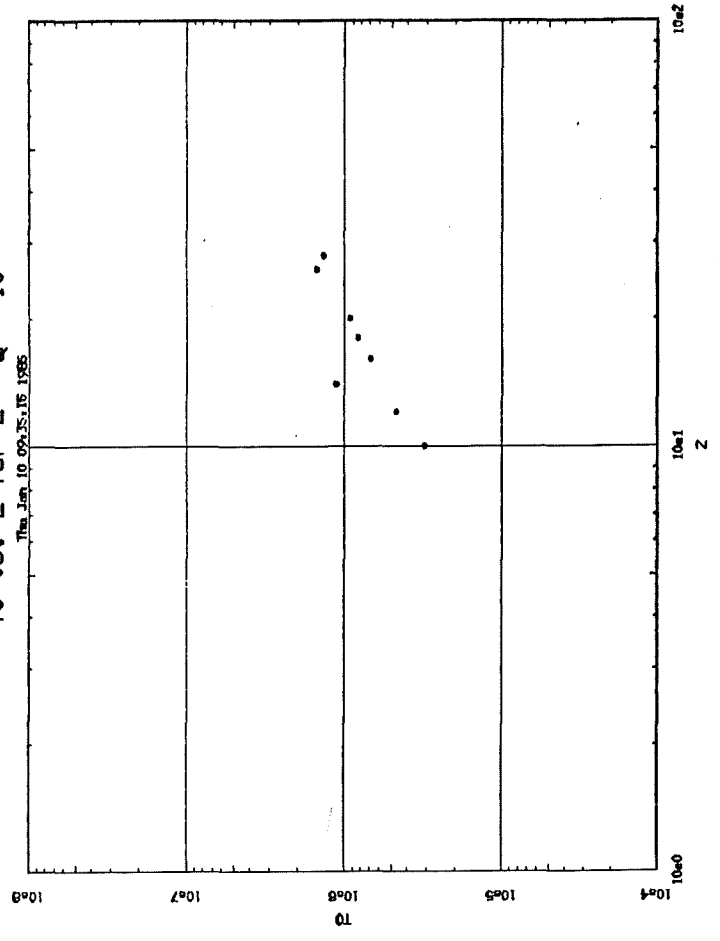


T0 vs. Z for Z - Q = 8

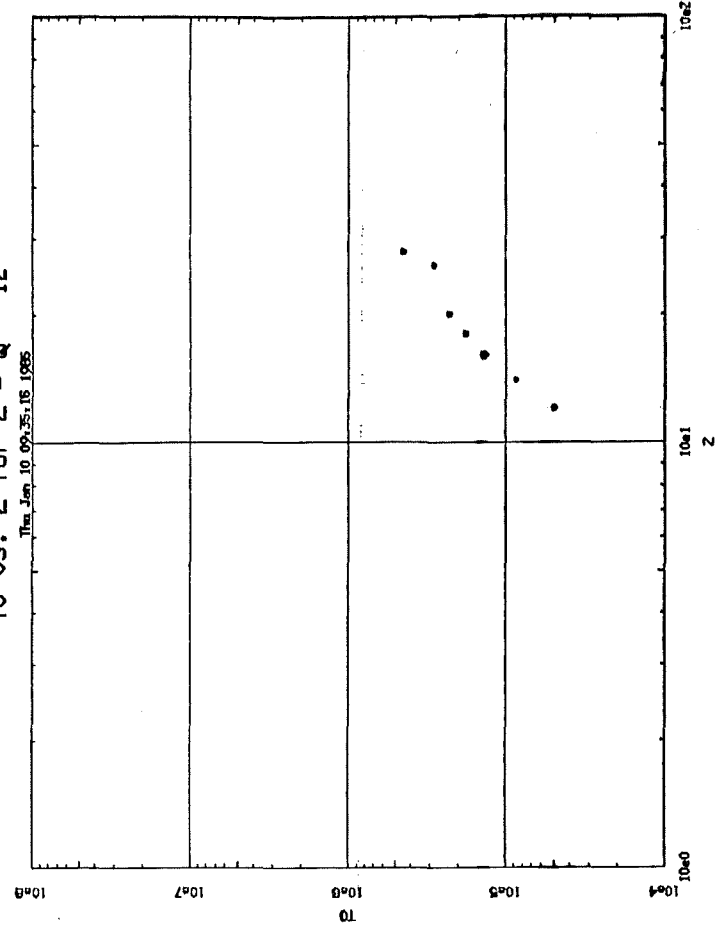
Thu Jan 10 09:35:14 1965



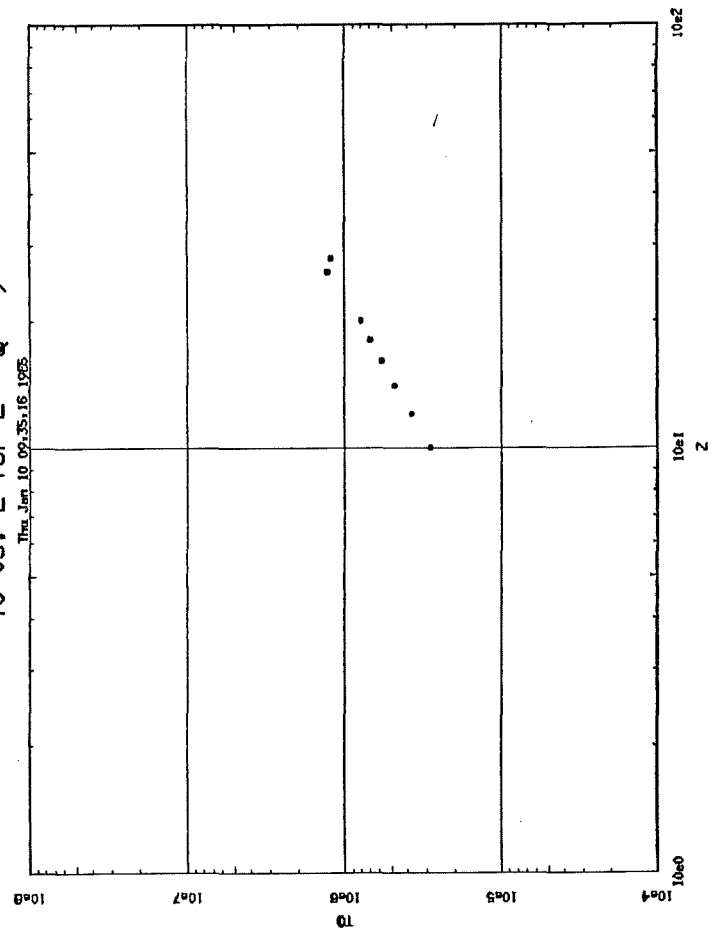
T0 vs. Z for Z - Q = 10



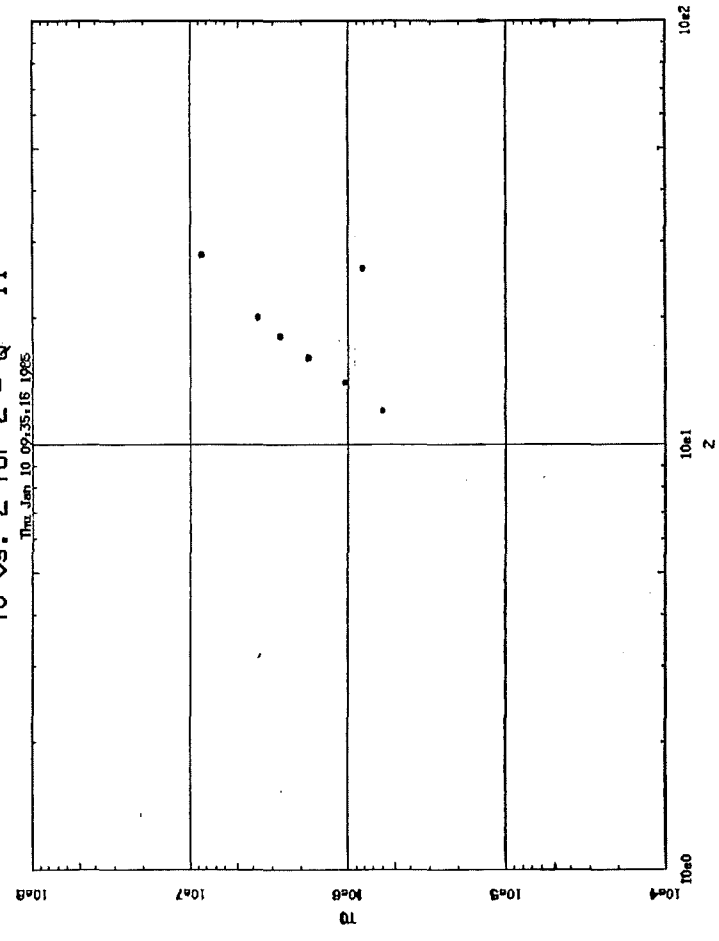
T0 vs. Z for Z - Q = 12



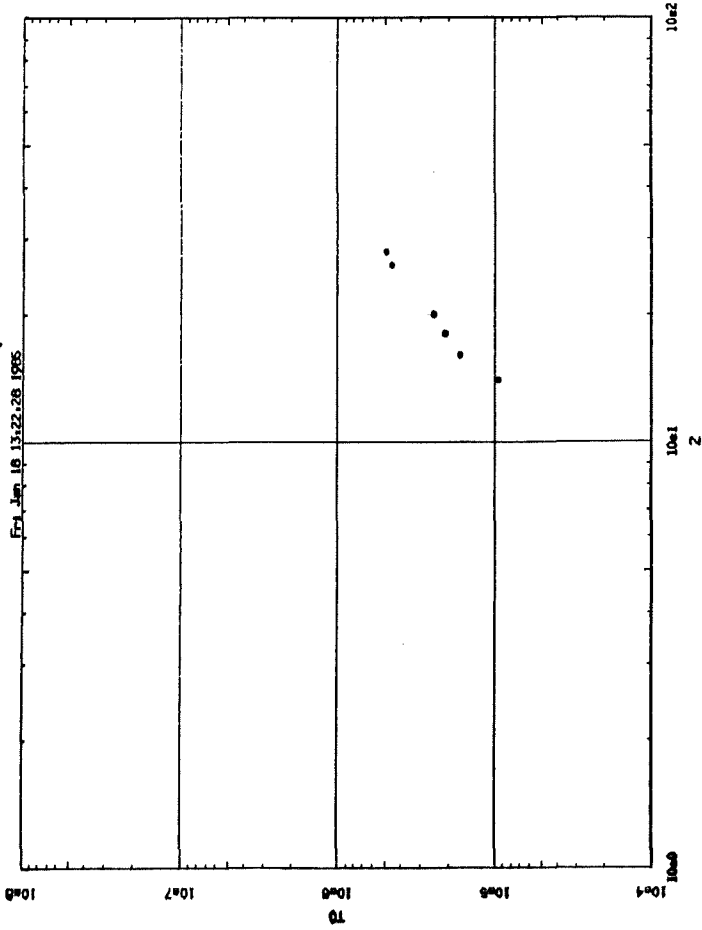
T0 vs. Z for Z - Q = 9



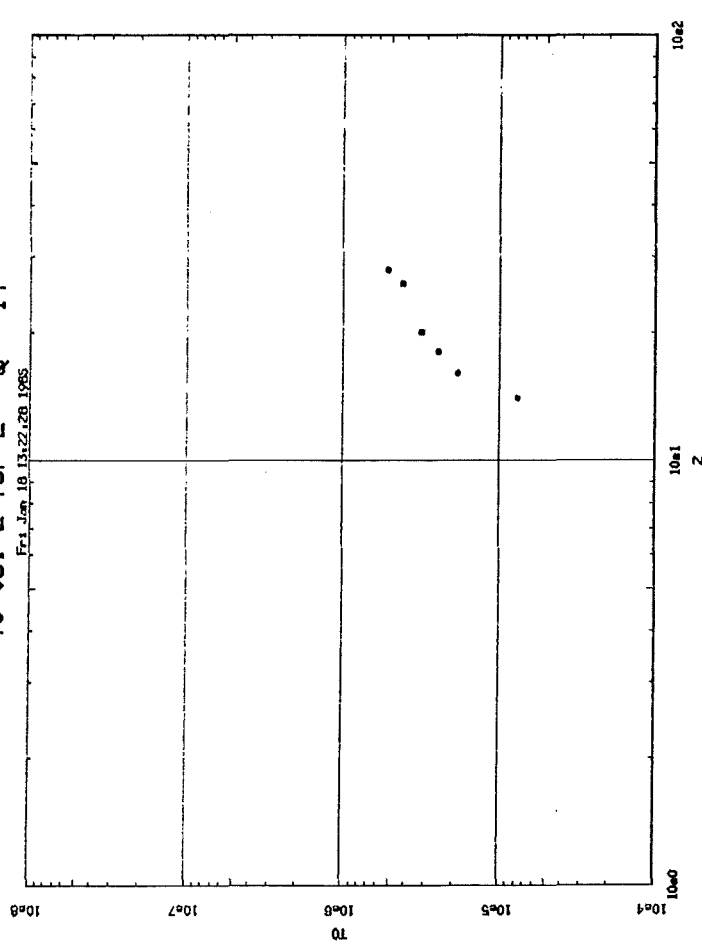
T0 vs. Z for Z - Q = 11



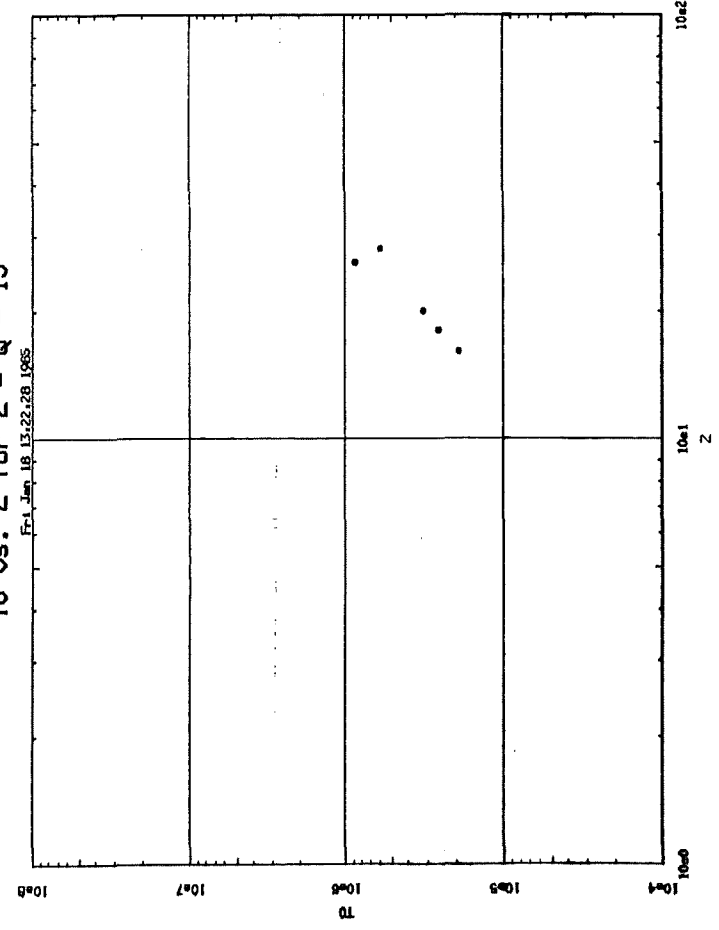
T0 vs. Z for Z - Q = 13



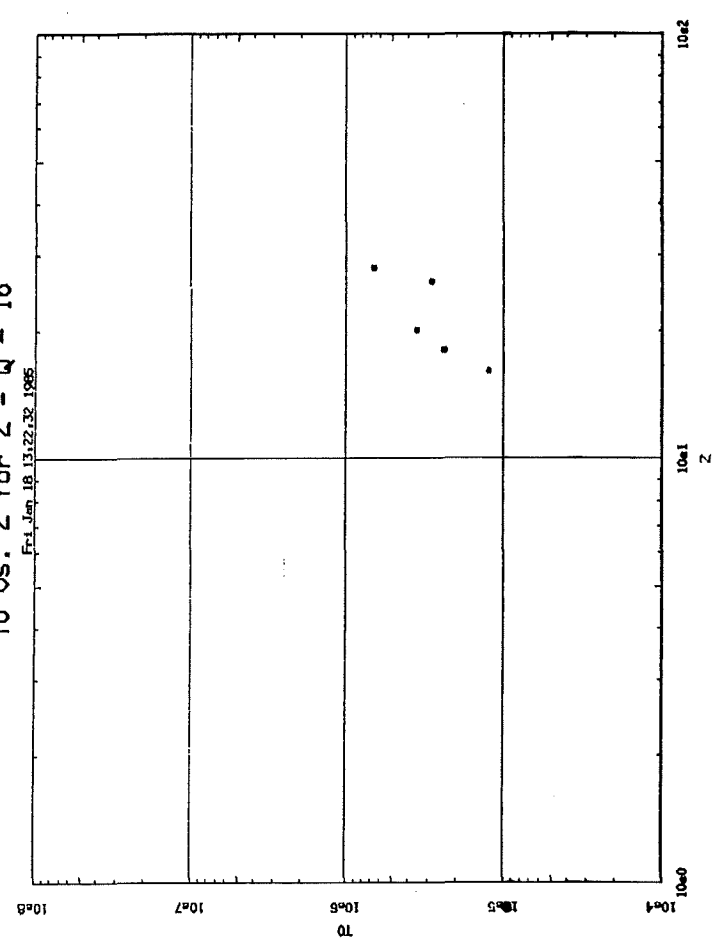
T0 vs. Z for Z - Q = 14



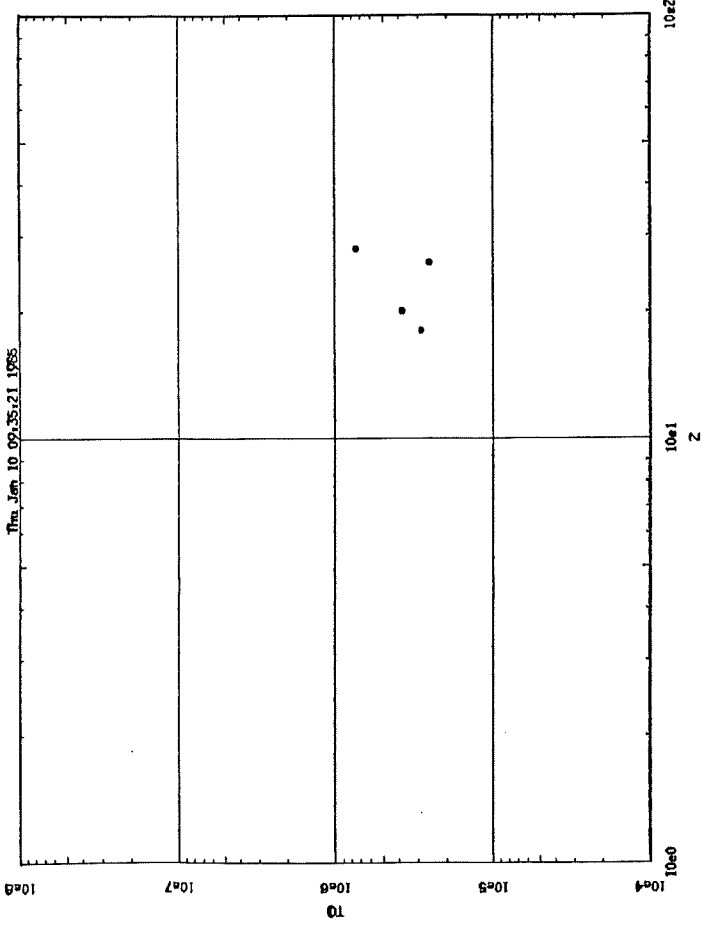
T0 vs. Z for Z - Q = 15



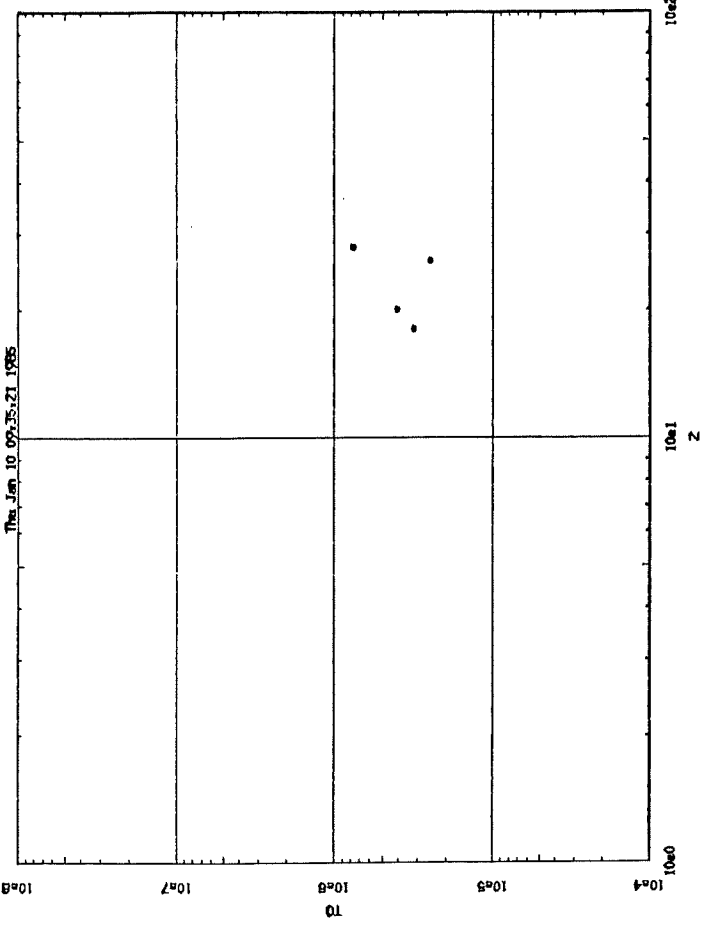
T0 vs. Z for Z - Q = 16



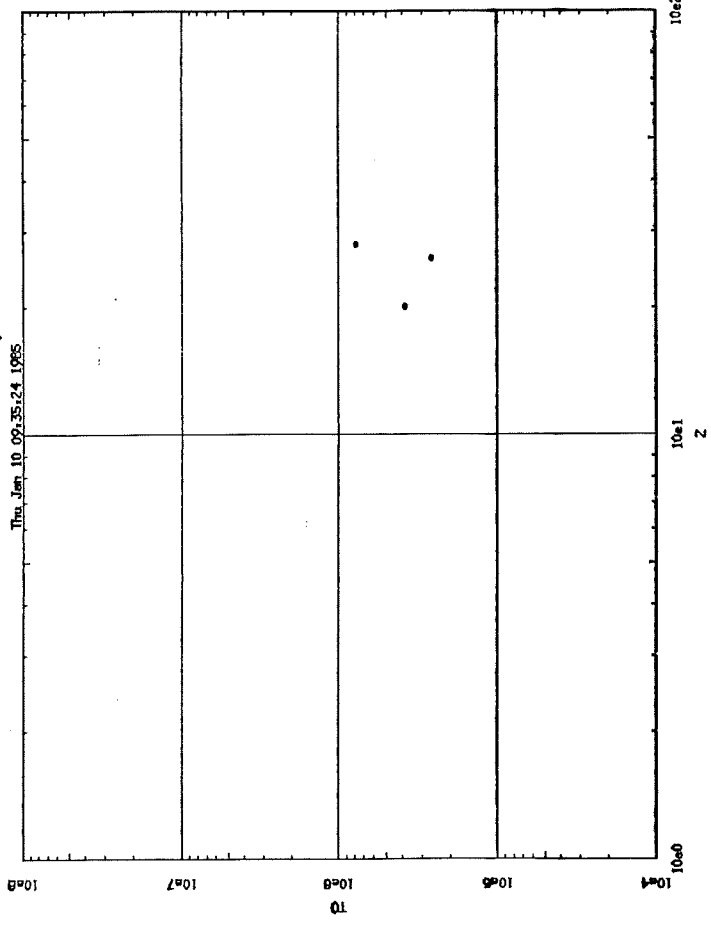
T0 vs. Z for Z - Q = 17



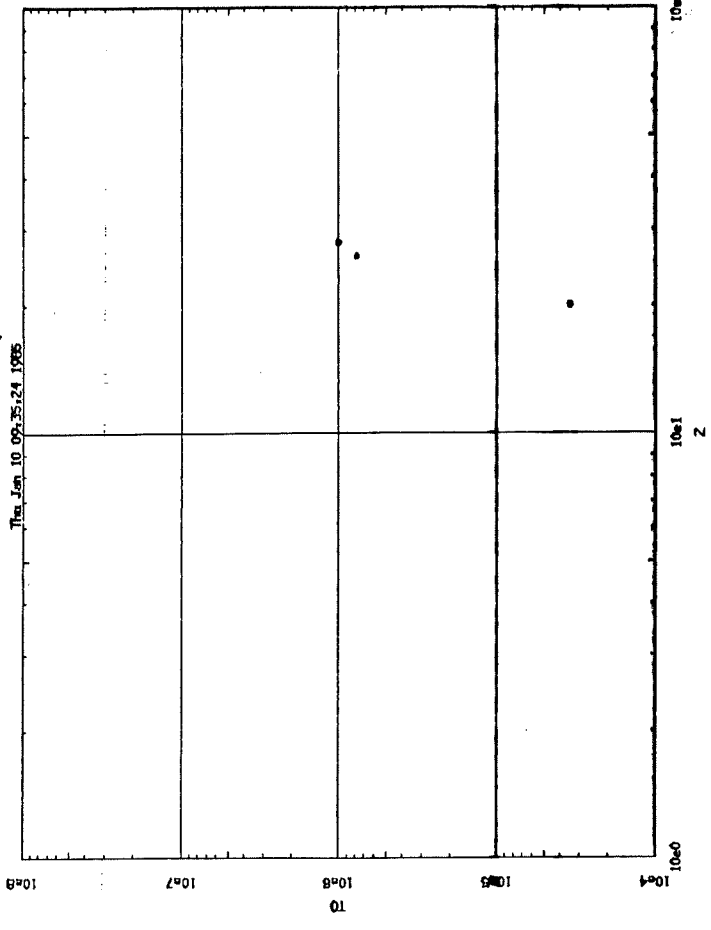
T0 vs. Z for Z - Q = 18



T0 vs. Z for Z - Q = 19

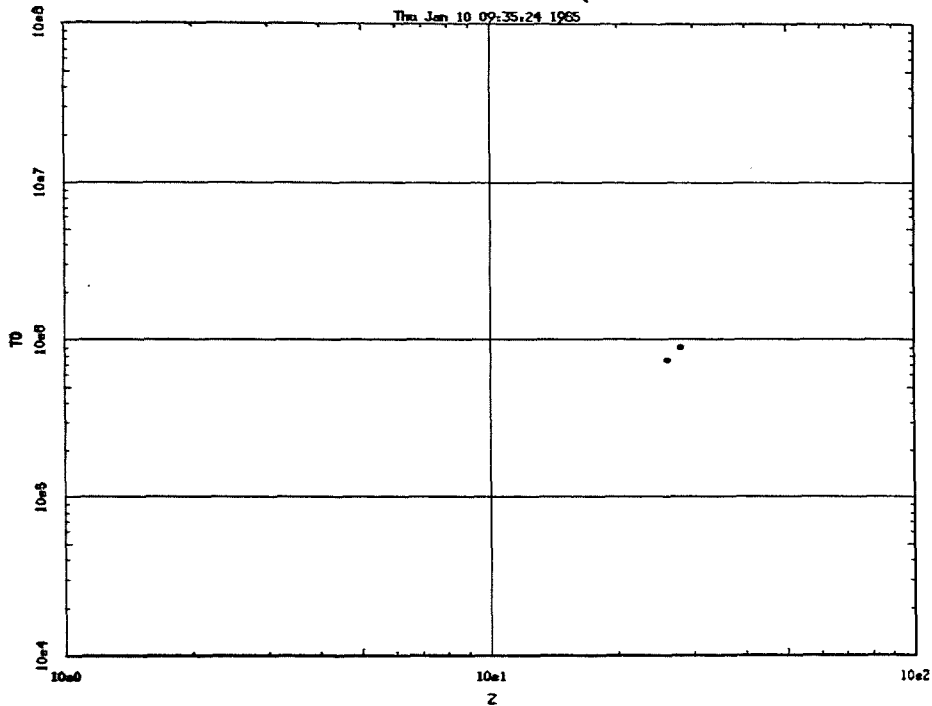


T0 vs. Z for Z - Q = 20



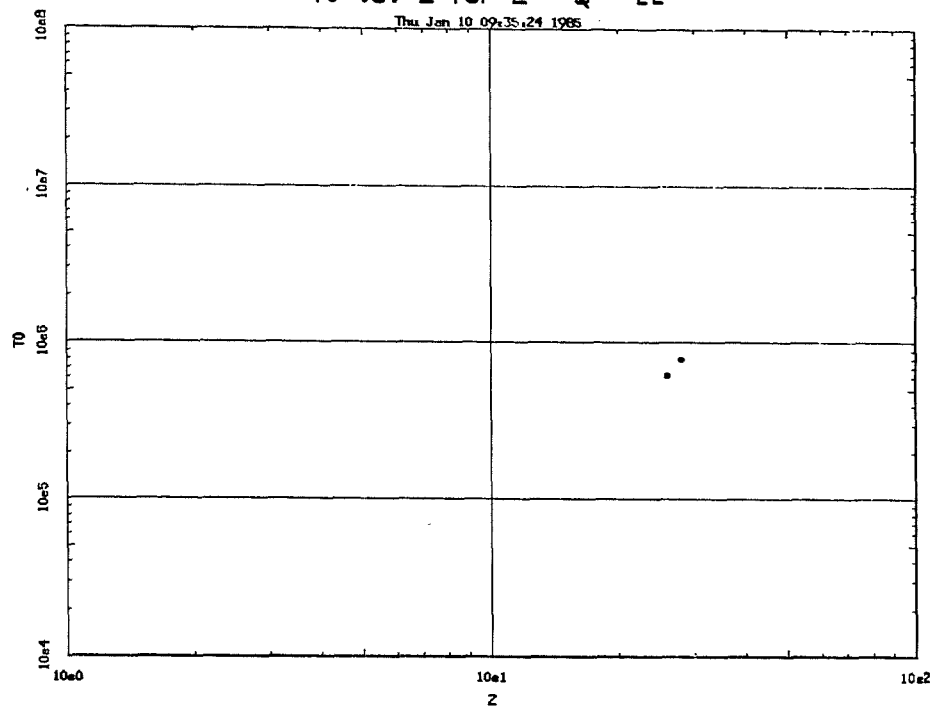
T0 vs. Z for Z - Q = 21

Thu Jan 10 09:35:24 1985



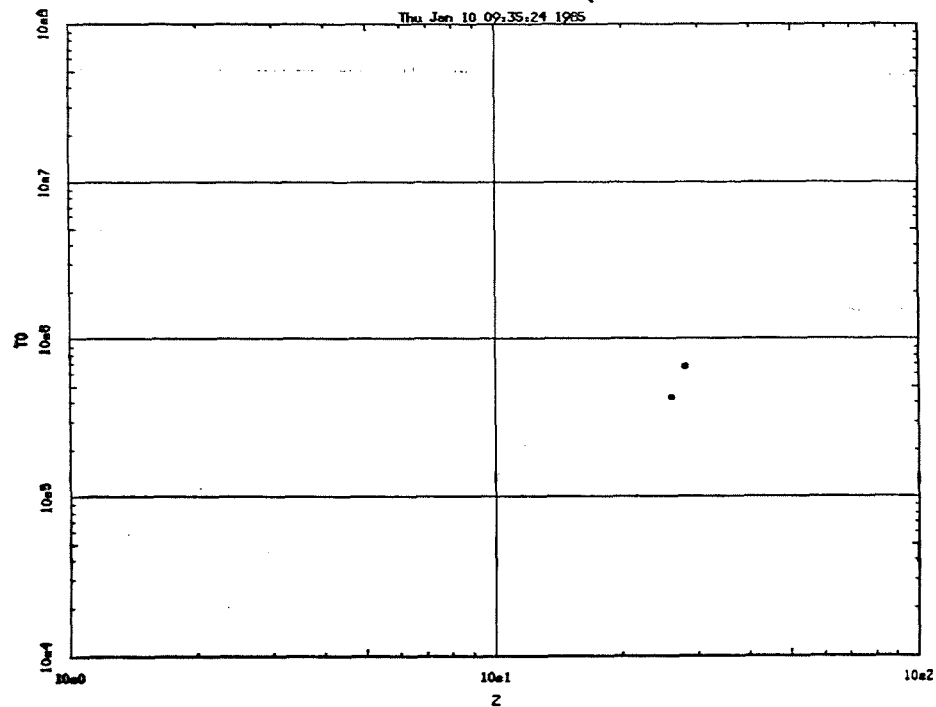
T0 vs. Z for Z - Q = 22

Thu Jan 10 09:35:24 1985



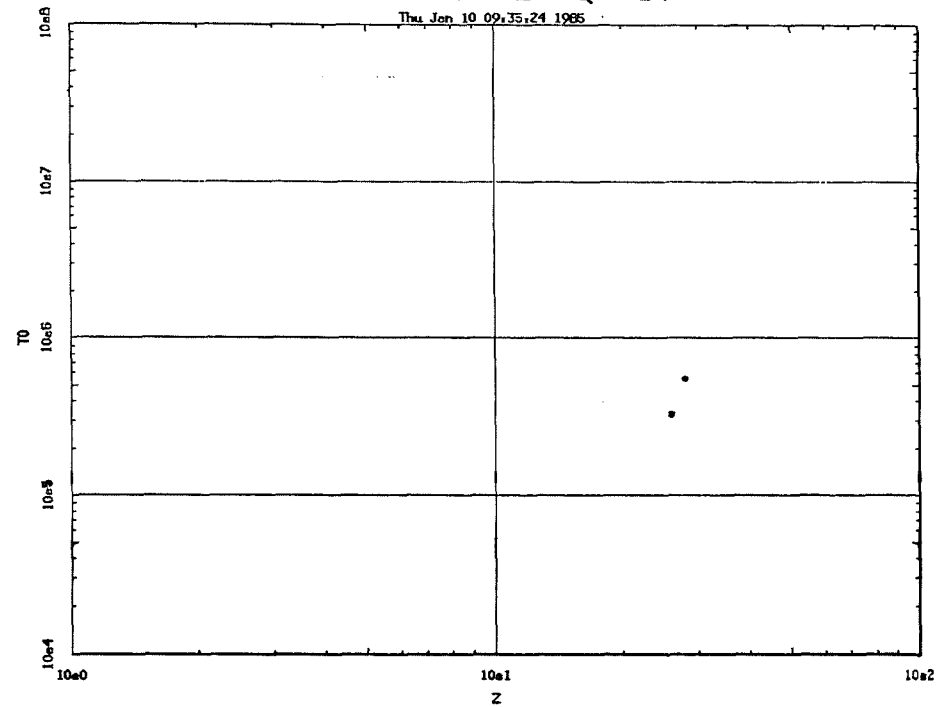
T0 vs. Z for Z - Q = 23

Thu Jan 10 09:35:24 1985

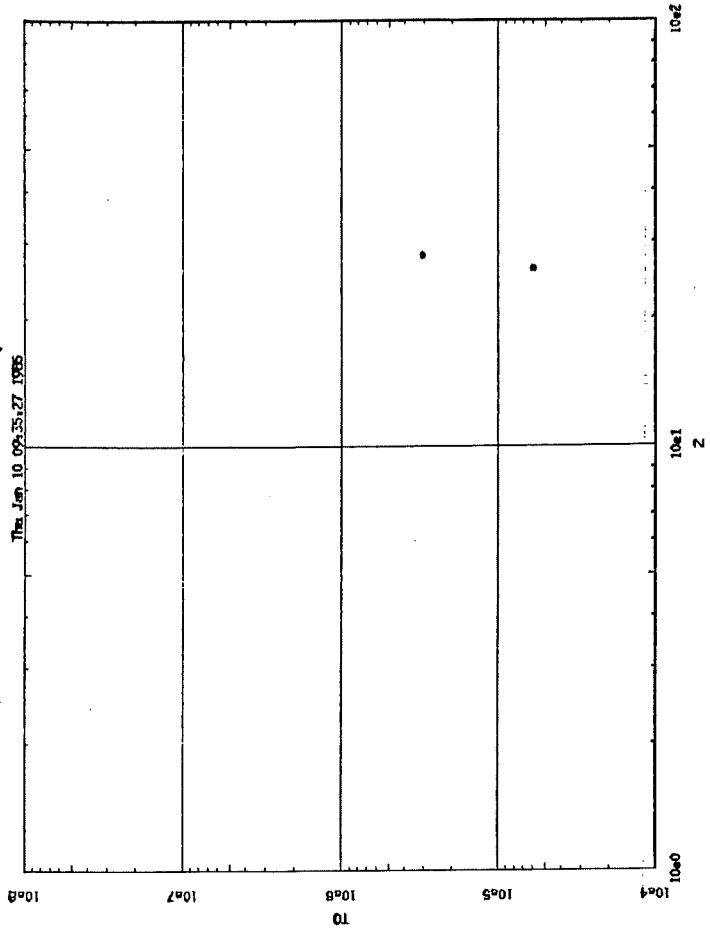


T0 vs. Z for Z - Q = 24

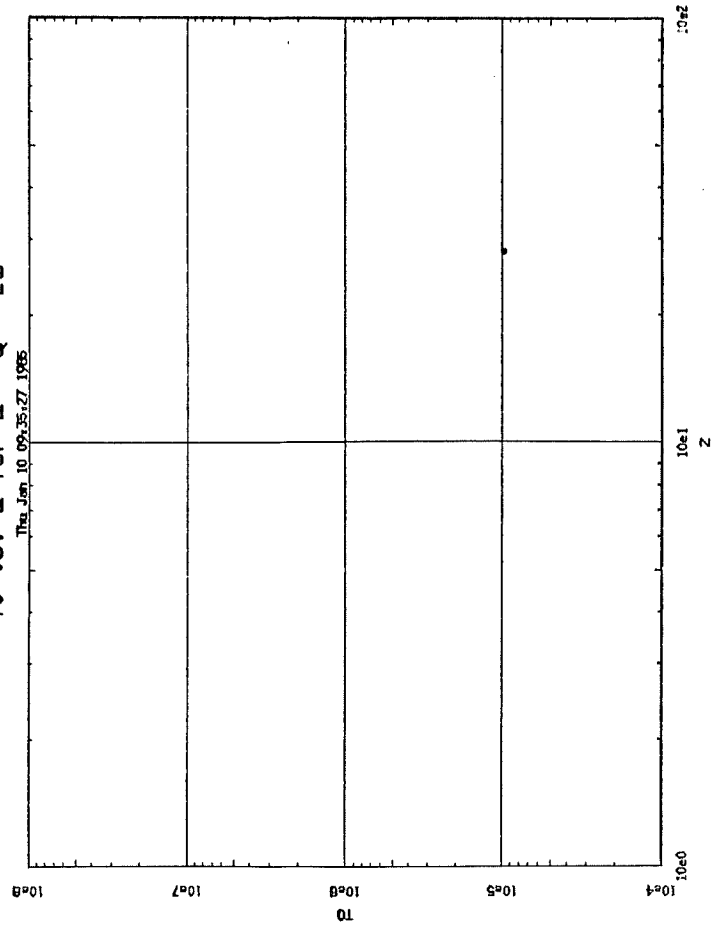
Thu Jan 10 09:35:24 1985



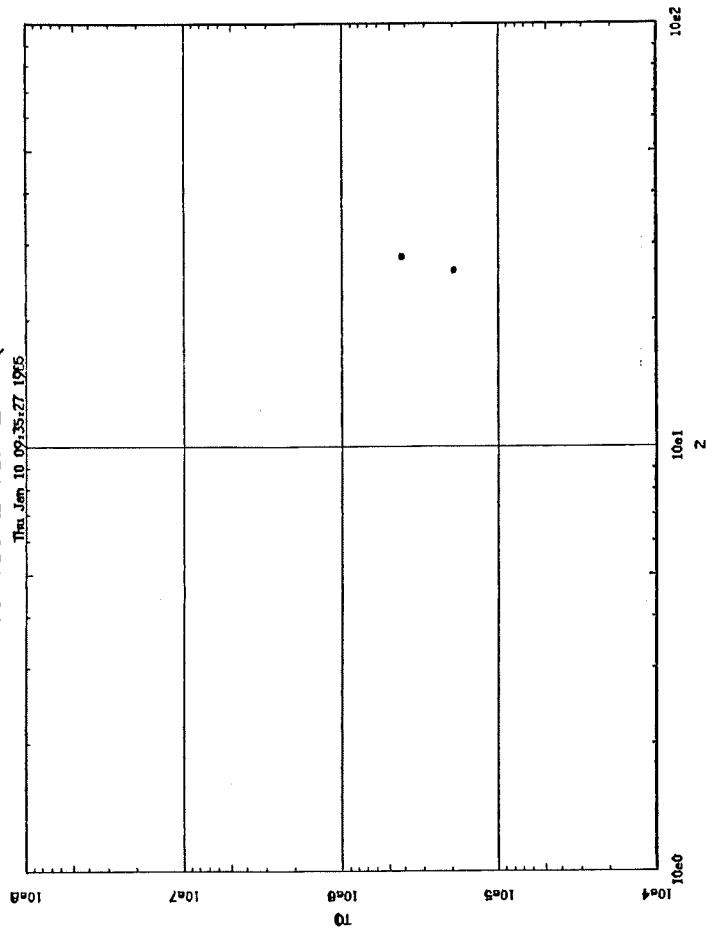
T0 vs. Z for Z - Q = 26



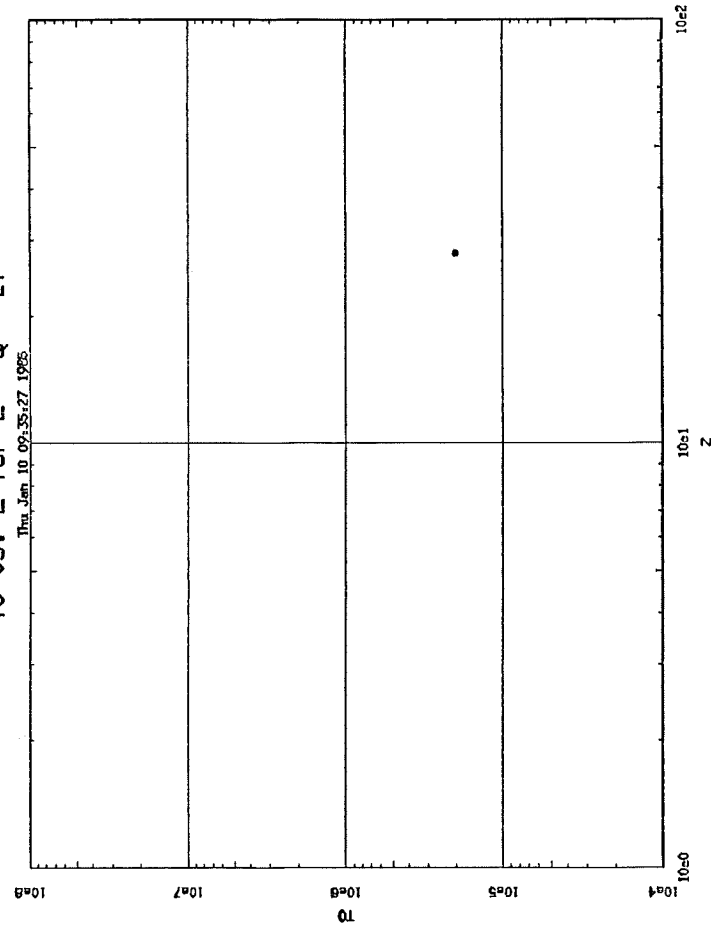
T0 vs. Z for Z - Q = 28



T0 vs. Z for Z - Q = 25

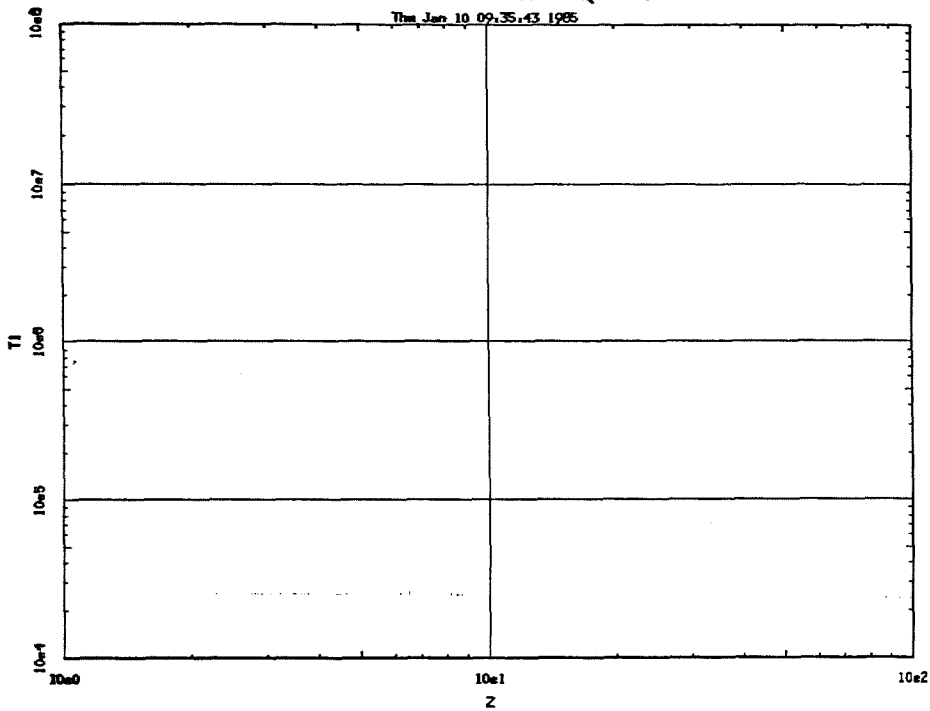


T0 vs. Z for Z - Q = 27



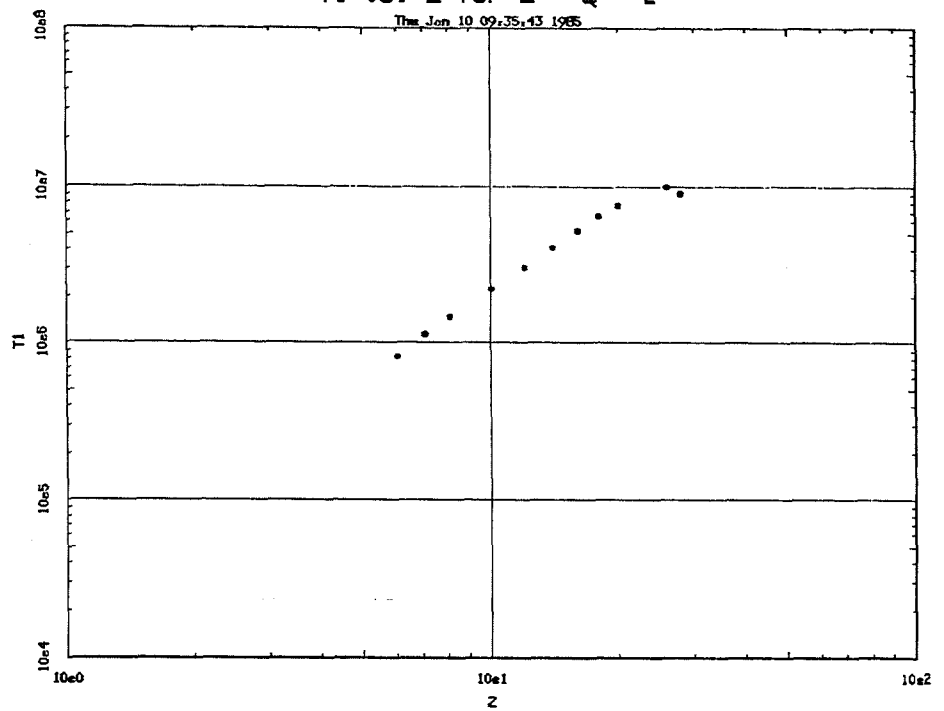
T1 vs. Z for Z - Q = 1

Thu Jan 10 09:35:43 1965



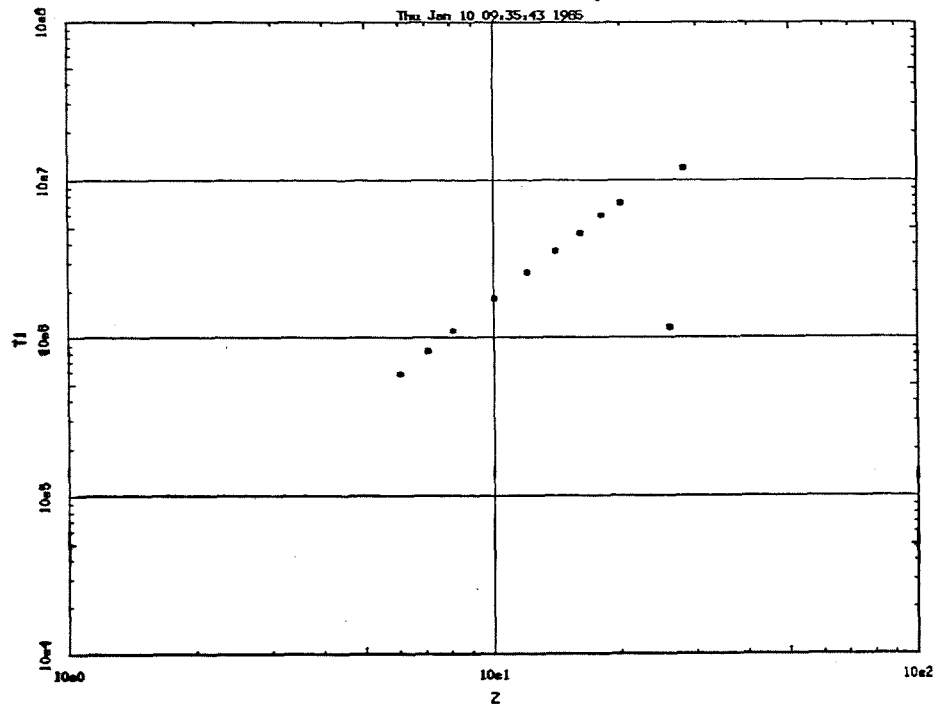
T1 vs. Z for Z - Q = 2

Thu Jan 10 09:35:43 1965



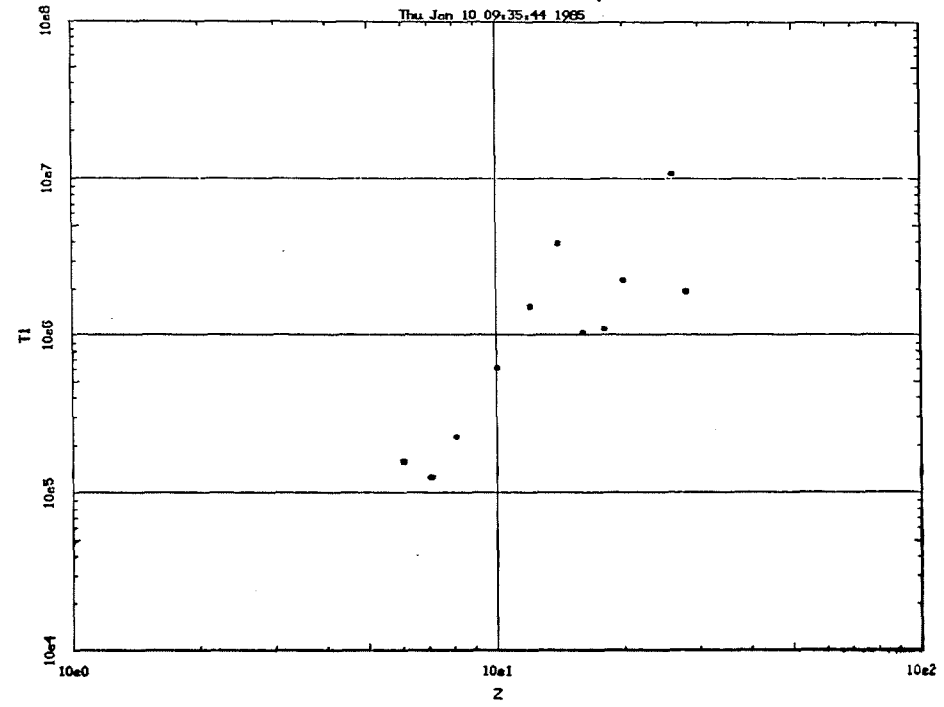
T1 vs. Z for Z - Q = 3

Thu Jan 10 09:35:43 1965



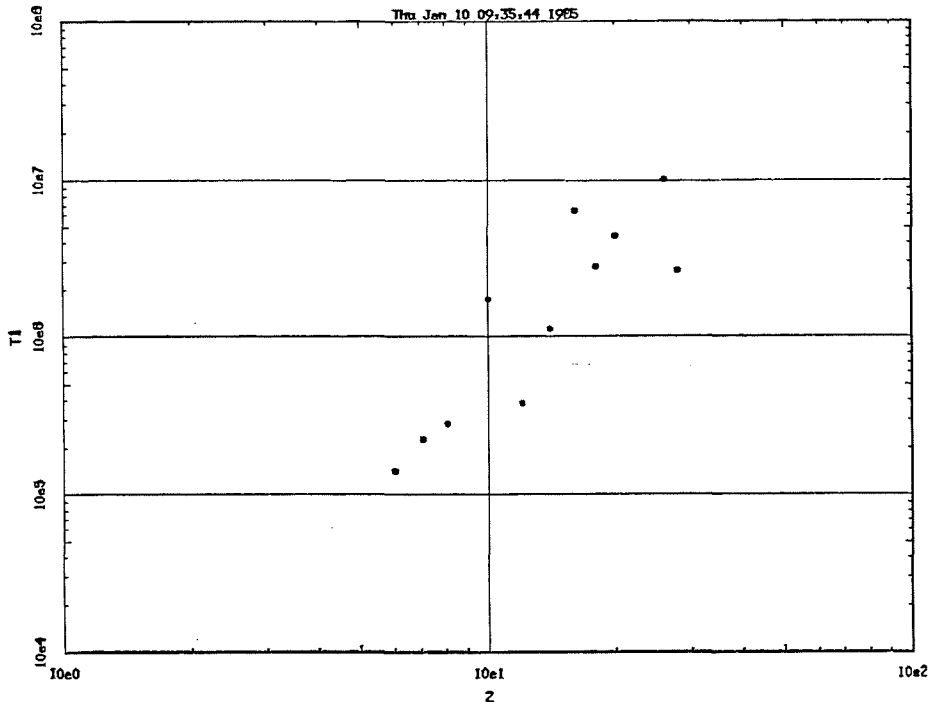
T1 vs. Z for Z - Q = 4

Thu Jan 10 09:35:44 1965



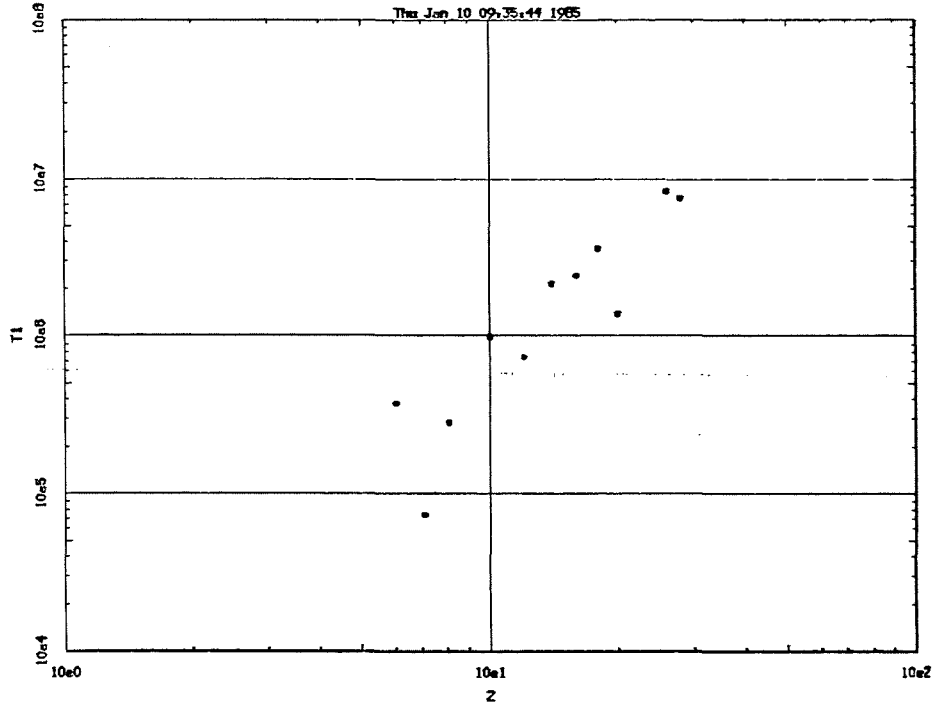
T1 vs. Z for Z - Q = 5

Thu Jan 10 09:35:44 1985



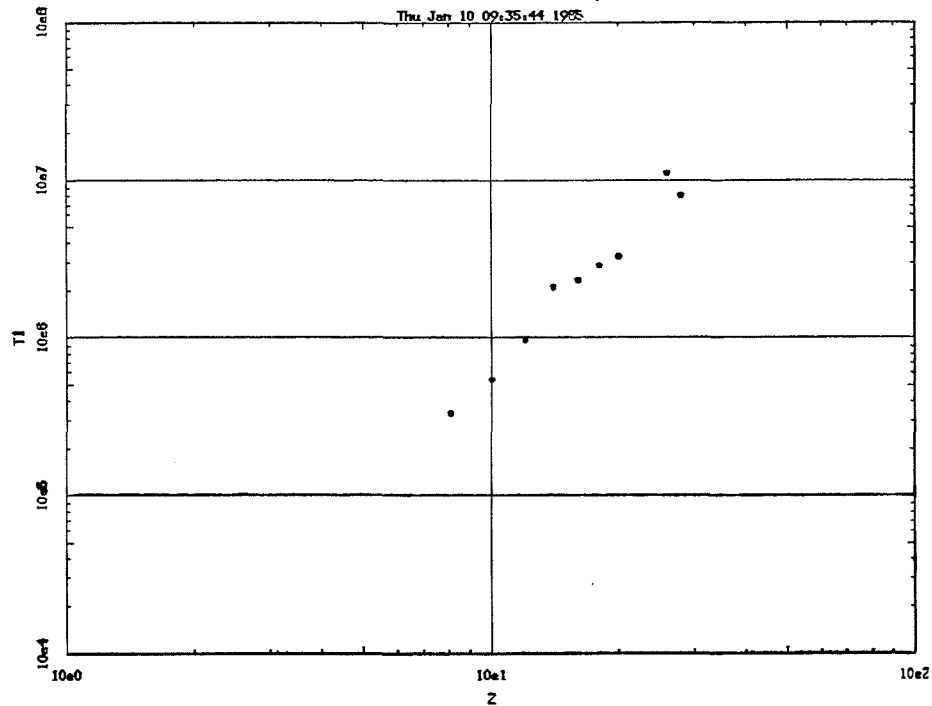
T1 vs. Z for Z - Q = 6

Thu Jan 10 09:35:44 1985



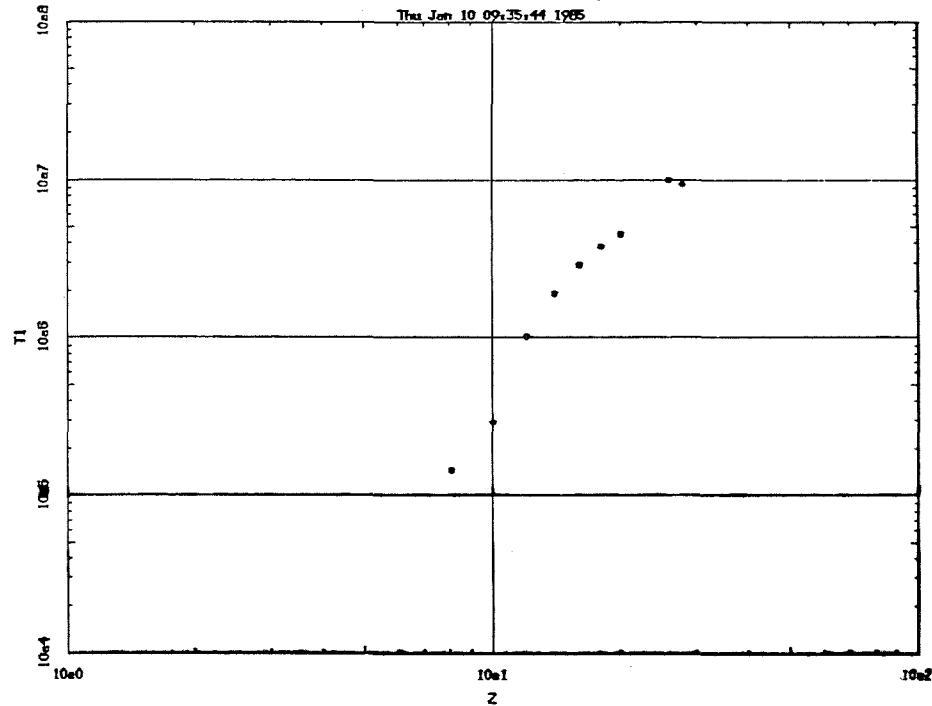
T1 vs. Z for Z - Q = 7

Thu Jan 10 09:35:44 1985

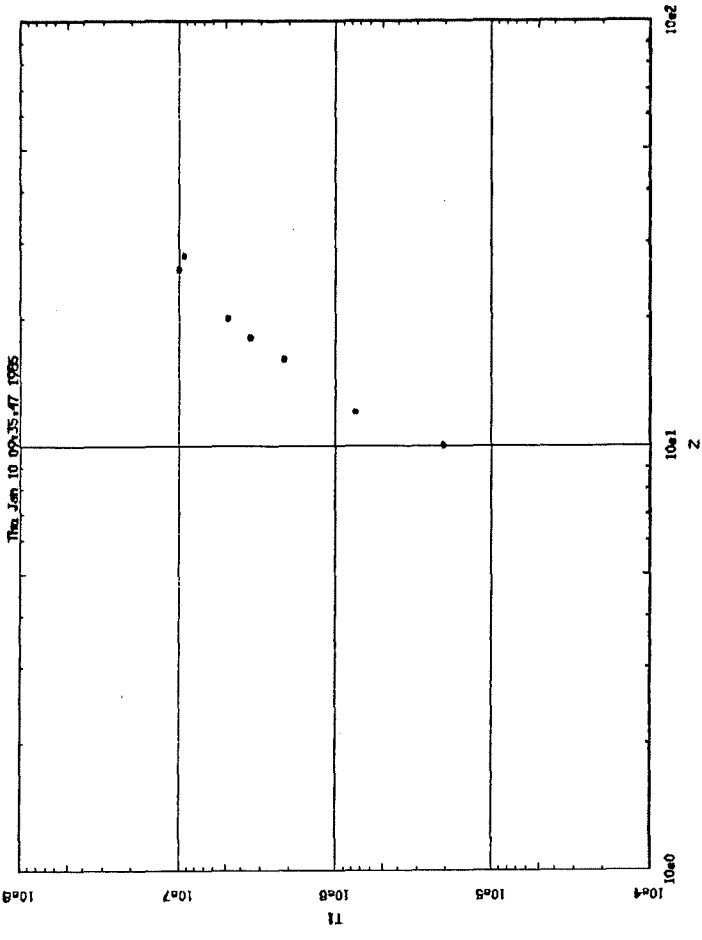


T1 vs. Z for Z - Q = 8

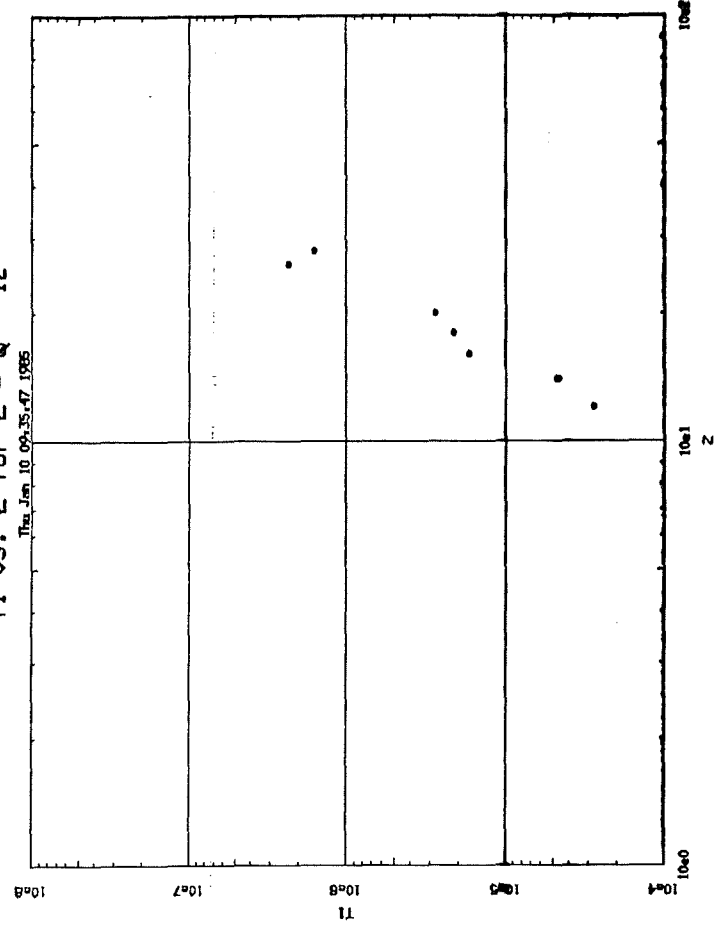
Thu Jan 10 09:35:44 1985



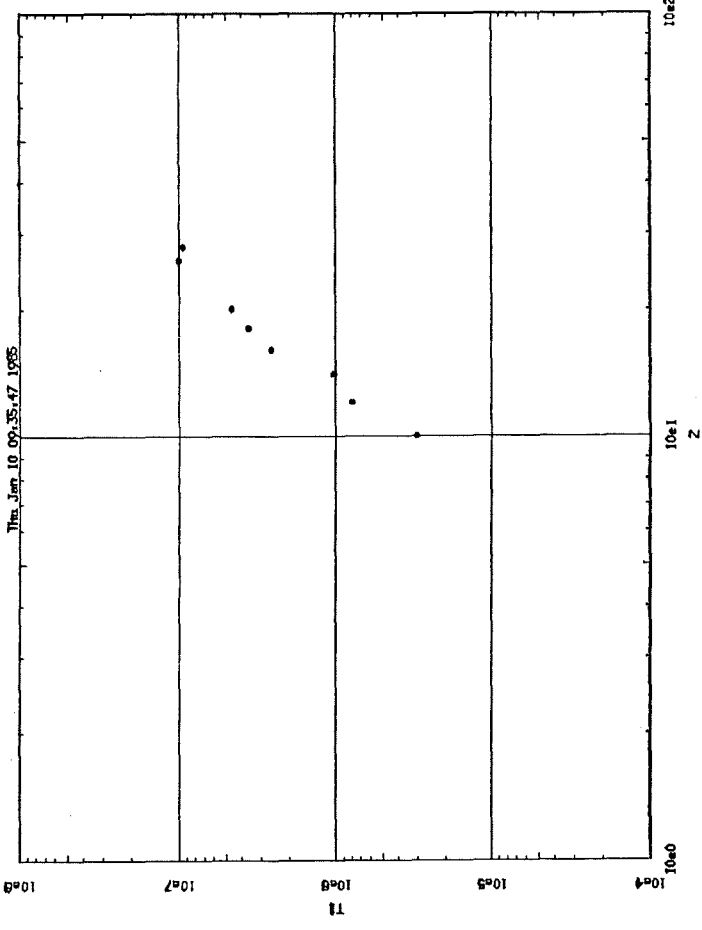
T1 vs. Z for Z - Q = 10



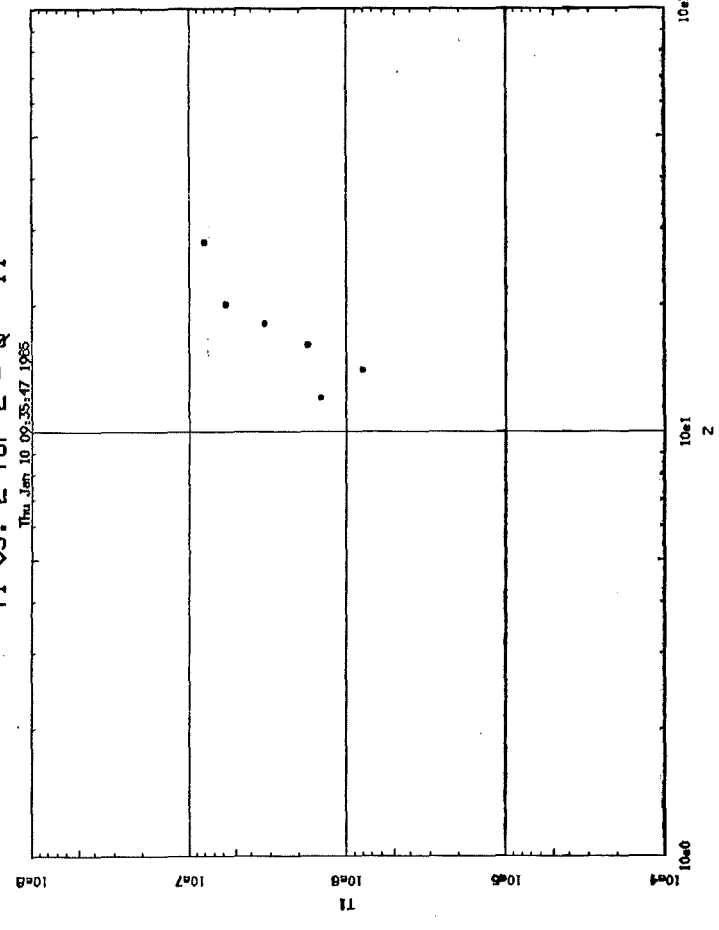
T1 vs. Z for Z - Q = 12



T1 vs. Z for Z - Q = 9

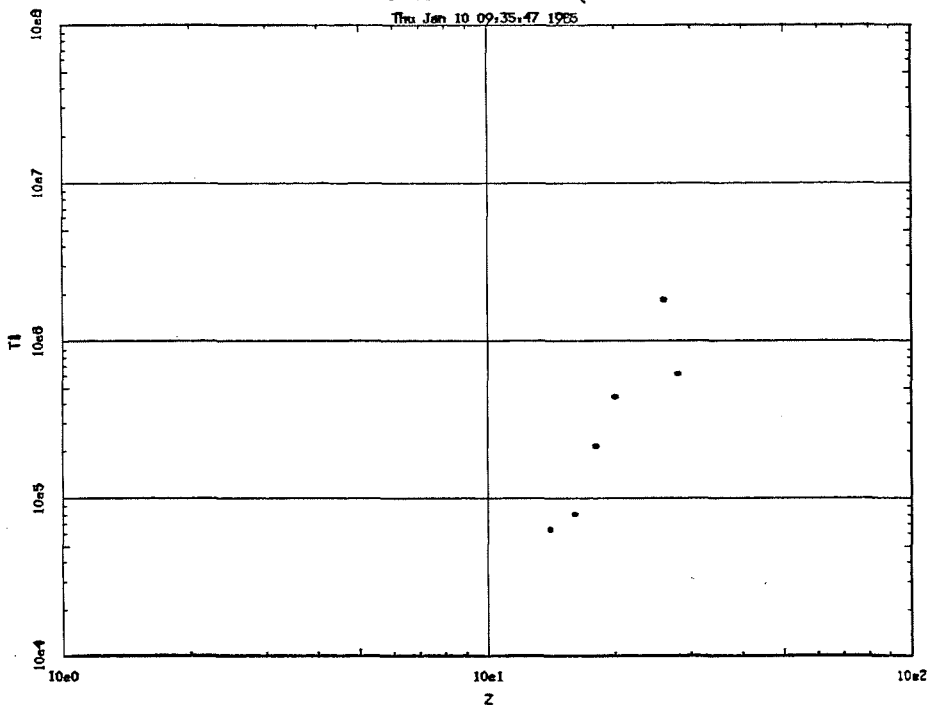


T1 vs. Z for Z - Q = 11



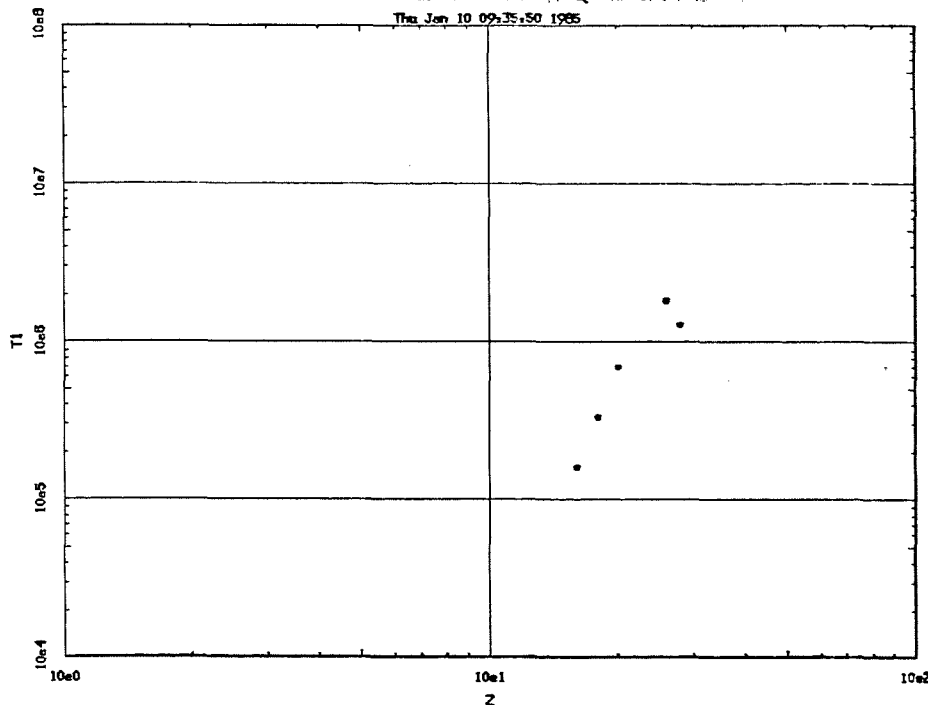
T1 vs. Z for Z - Q = 13

Thu Jan 10 09:35:47 1985



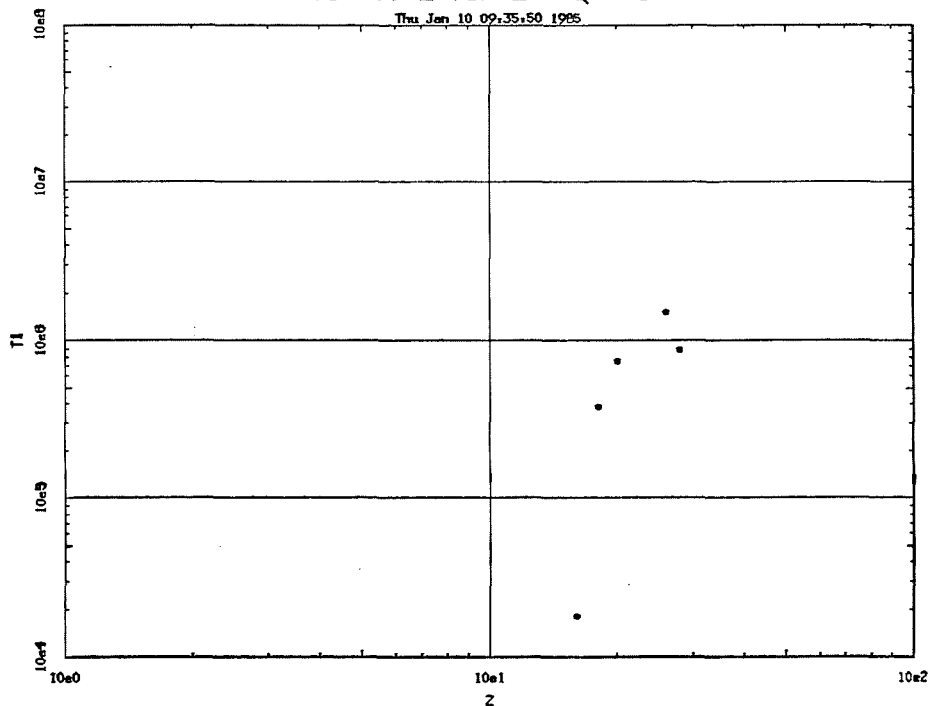
T1 vs. Z for Z - Q = 14

Thu Jan 10 09:35:50 1985



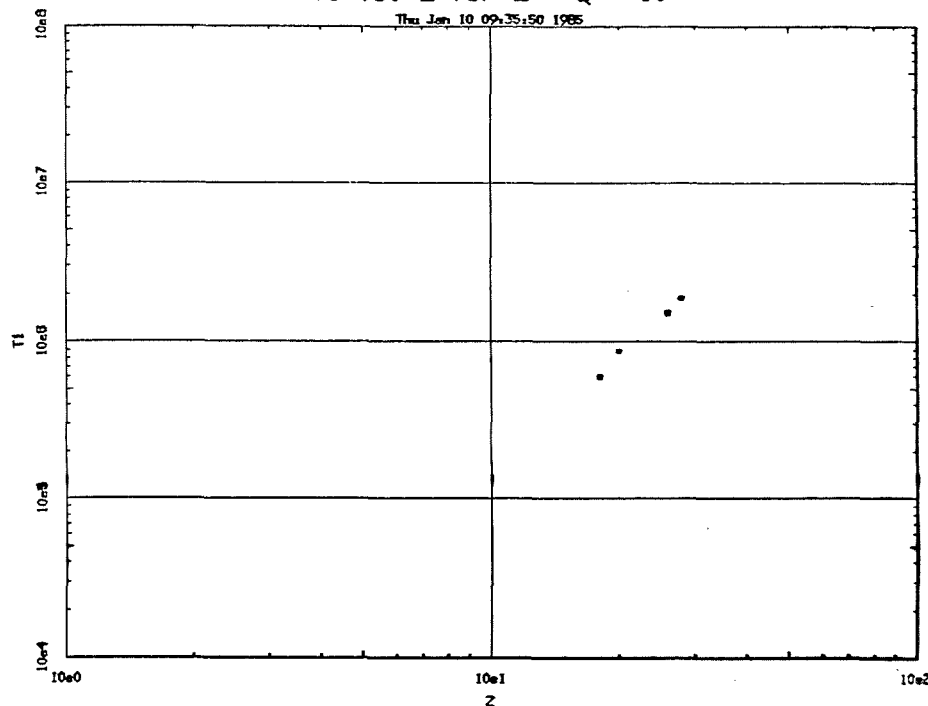
T1 vs. Z for Z - Q = 15

Thu Jan 10 09:35:50 1985



T1 vs. Z for Z - Q = 16

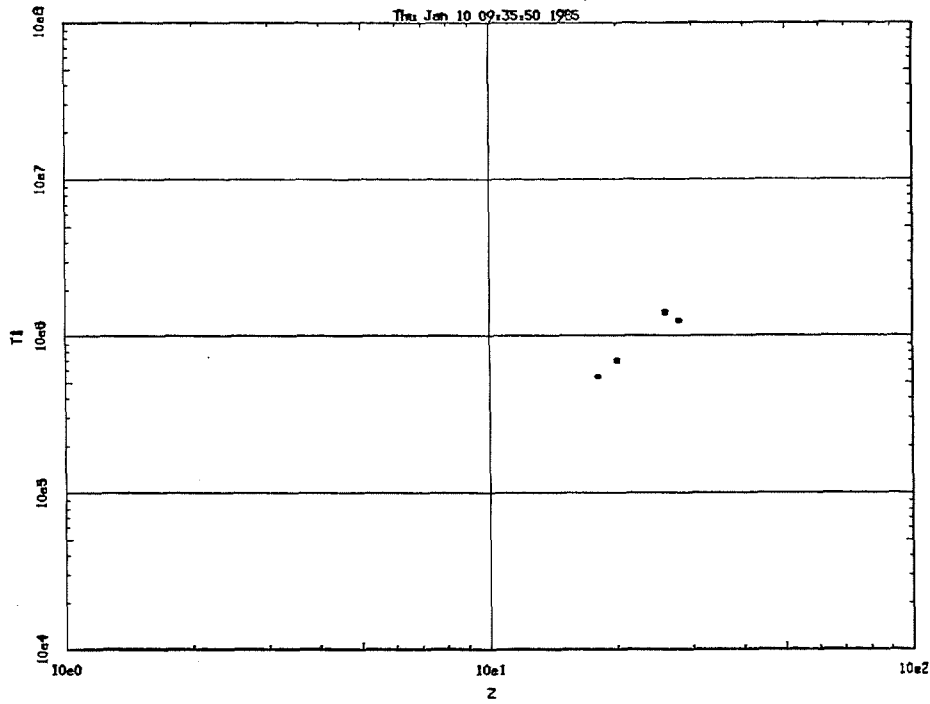
Thu Jan 10 09:35:50 1985



95.

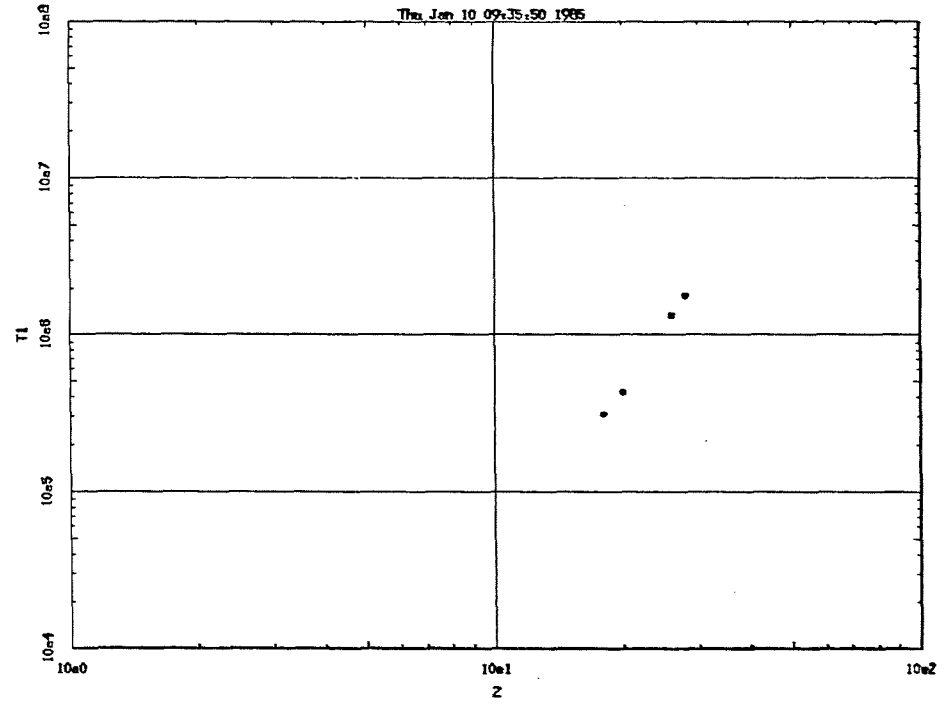
T1 vs. Z for Z - Q = 17

Thu Jan 10 09:35:50 1985



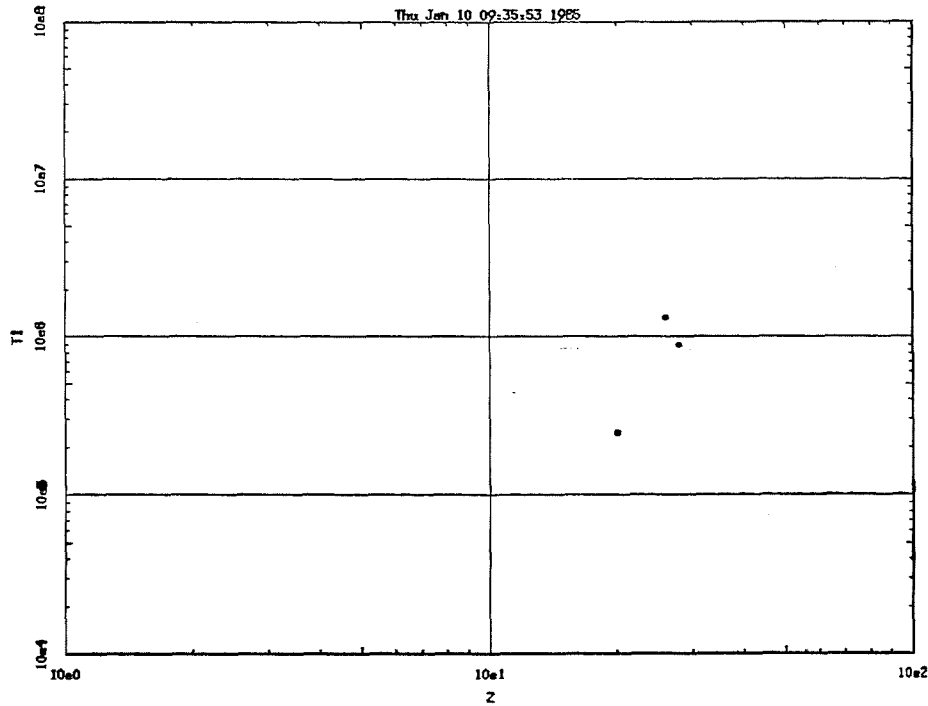
T1 vs. Z for Z - Q = 18

Thu Jan 10 09:35:50 1985



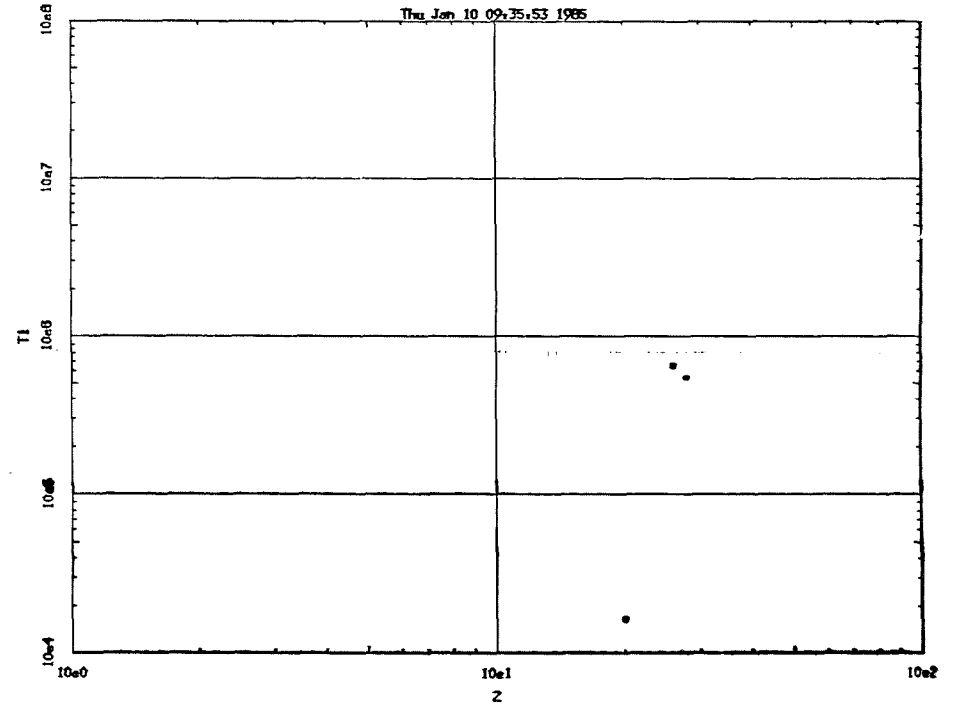
T1 vs. Z for Z - Q = 19

Thu Jan 10 09:35:53 1985



T1 vs. Z for Z - Q = 20

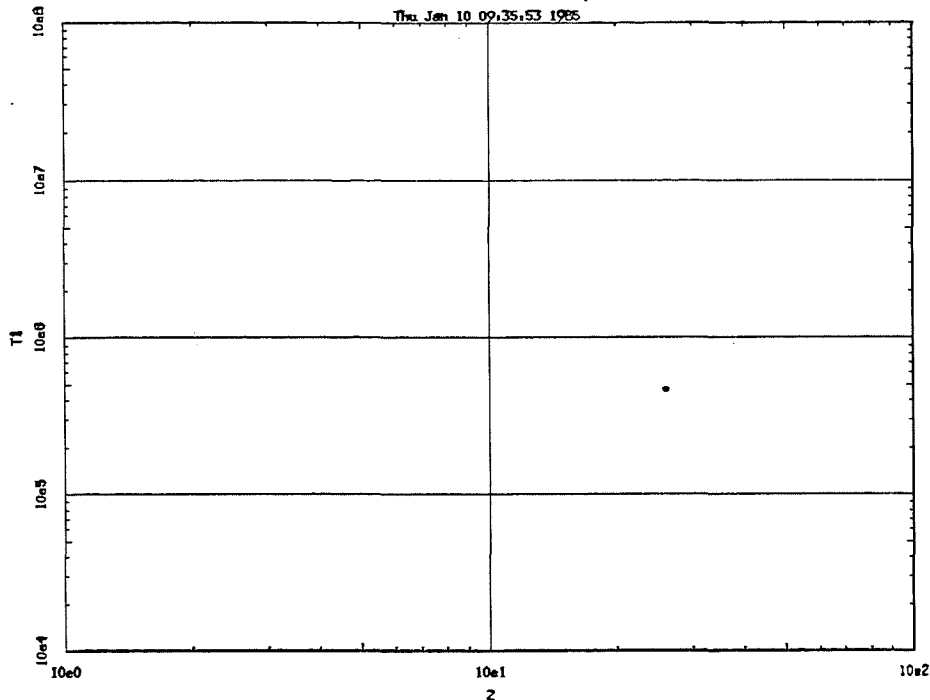
Thu Jan 10 09:35:53 1985



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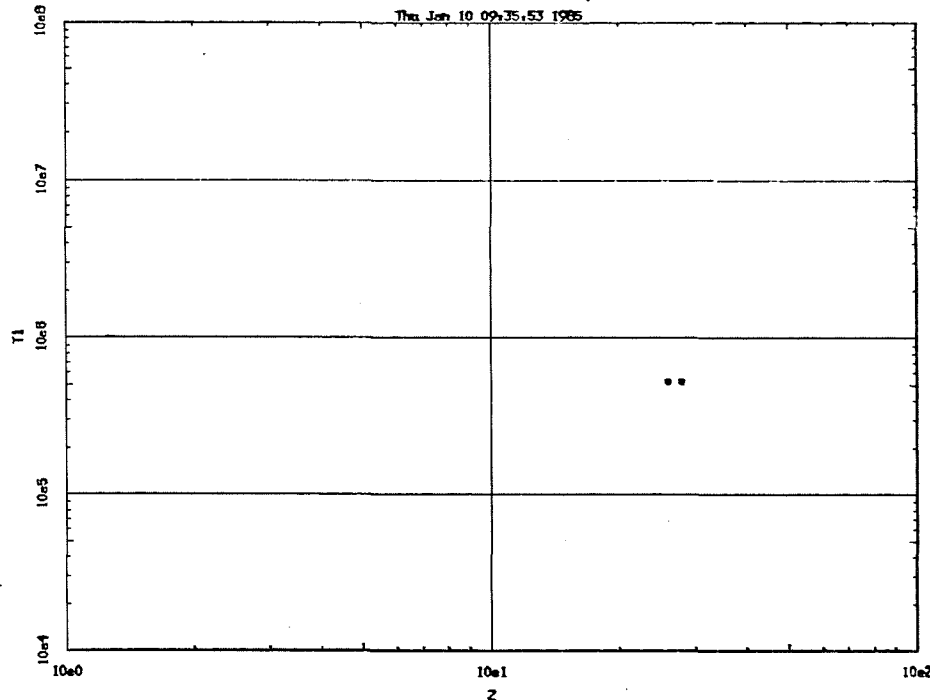
T1 vs. Z for Z - Q = 21

Thu Jan 10 09:35:53 1985



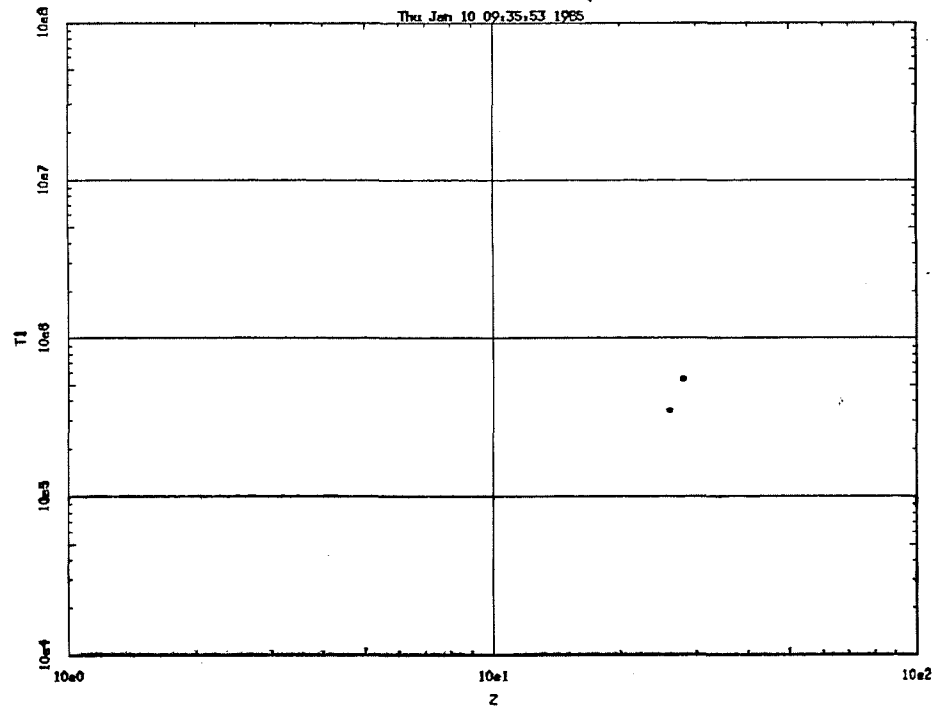
T1 vs. Z for Z - Q = 22

Thu Jan 10 09:35:53 1985



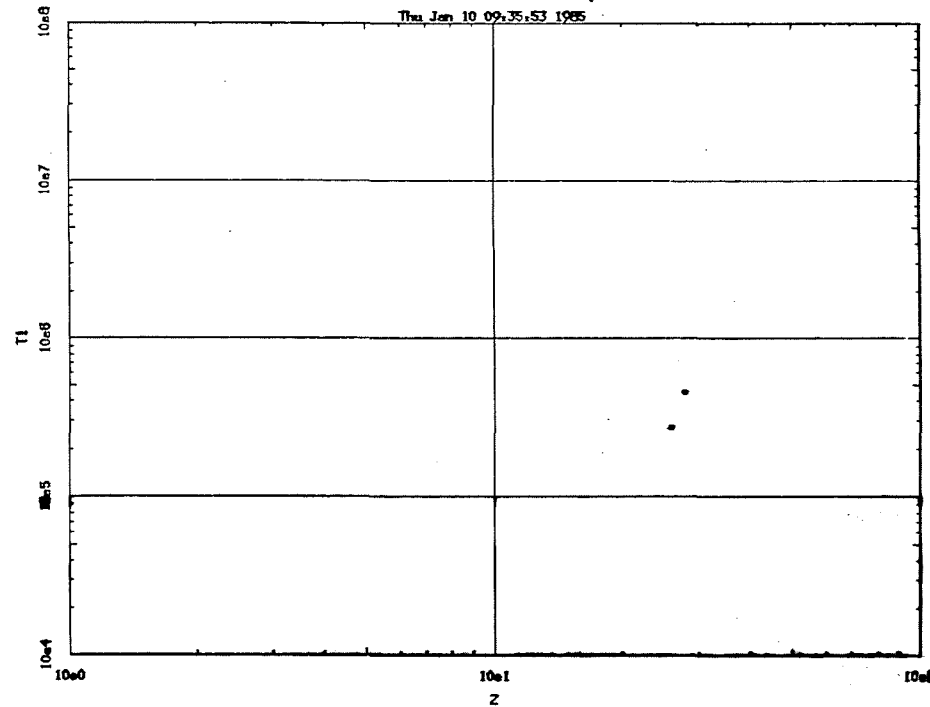
T1 vs. Z for Z - Q = 23

Thu Jan 10 09:35:53 1985



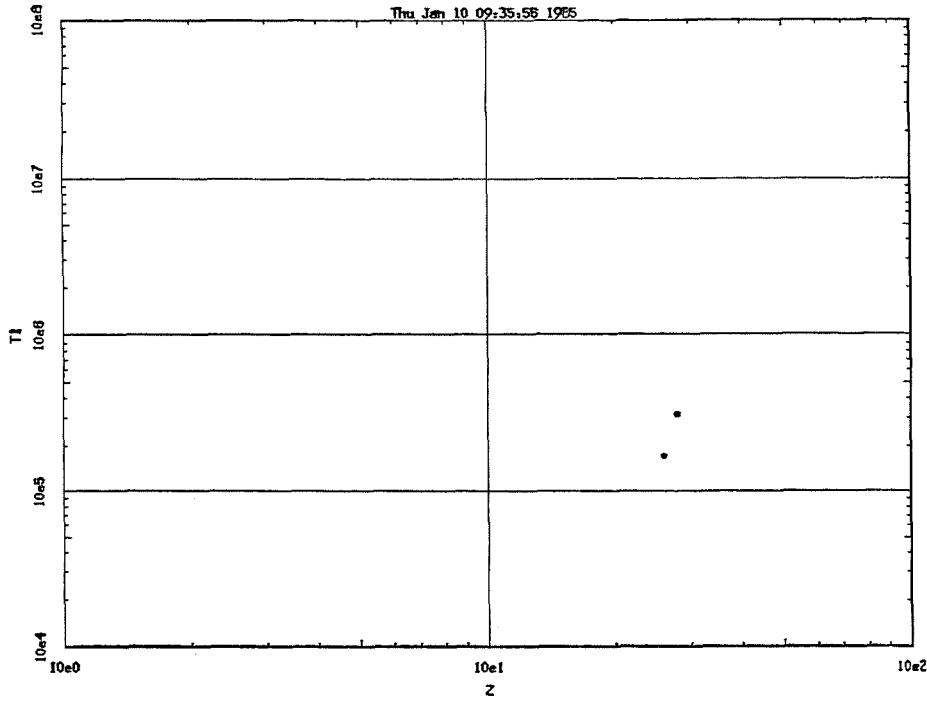
T1 vs. Z for Z - Q = 24

Thu Jan 10 09:35:53 1985



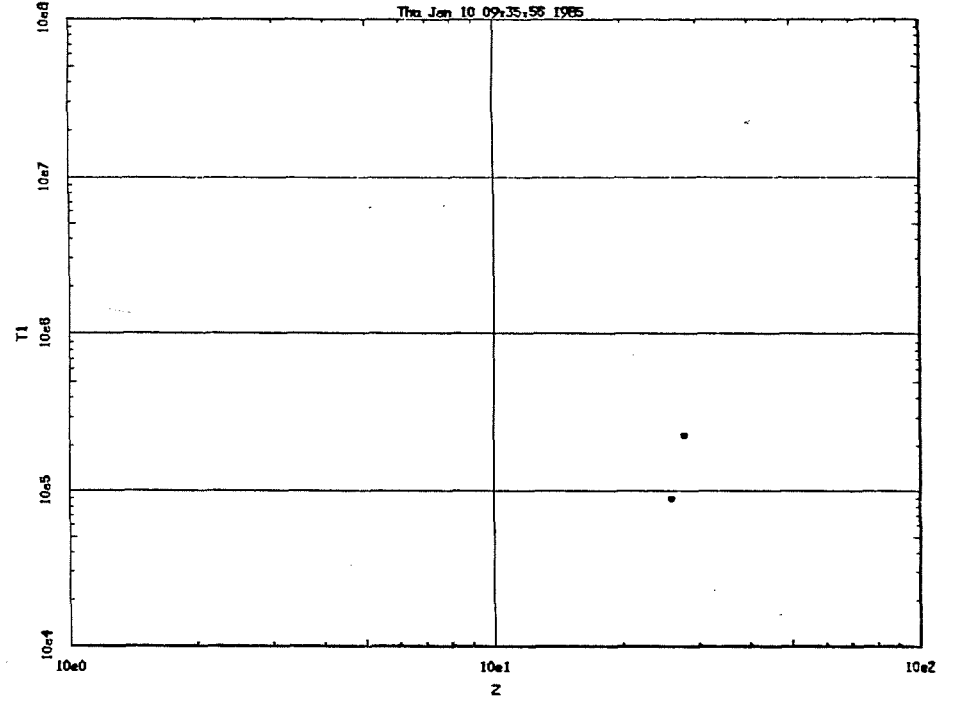
T1 vs. Z for Z - Q = 25

Thu Jan 10 09:35:56 1985



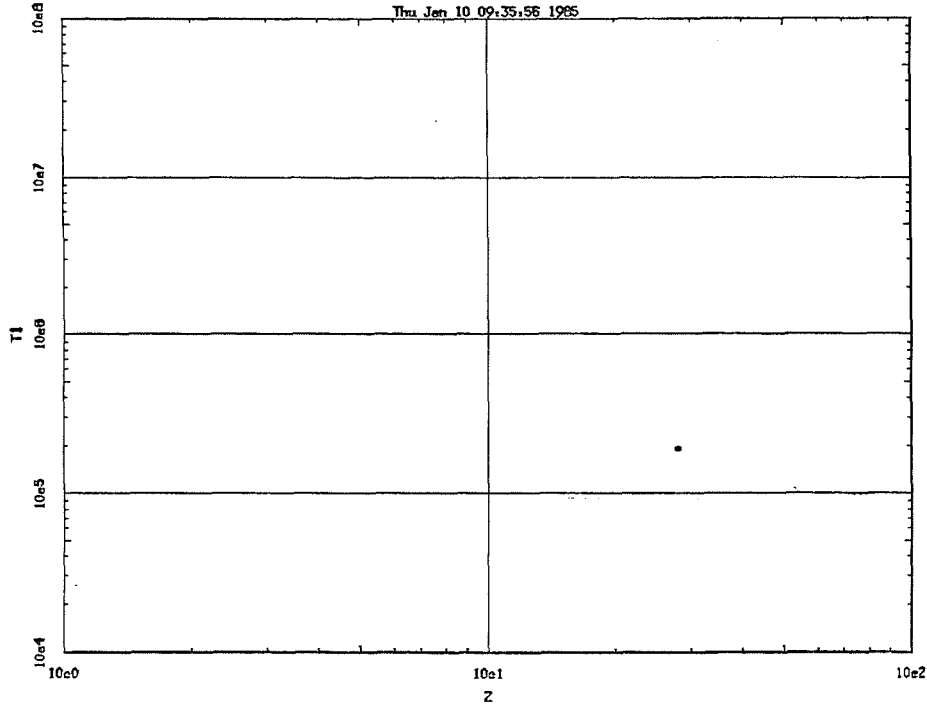
T1 vs. Z for Z - Q = 26

Thu Jan 10 09:35:56 1985



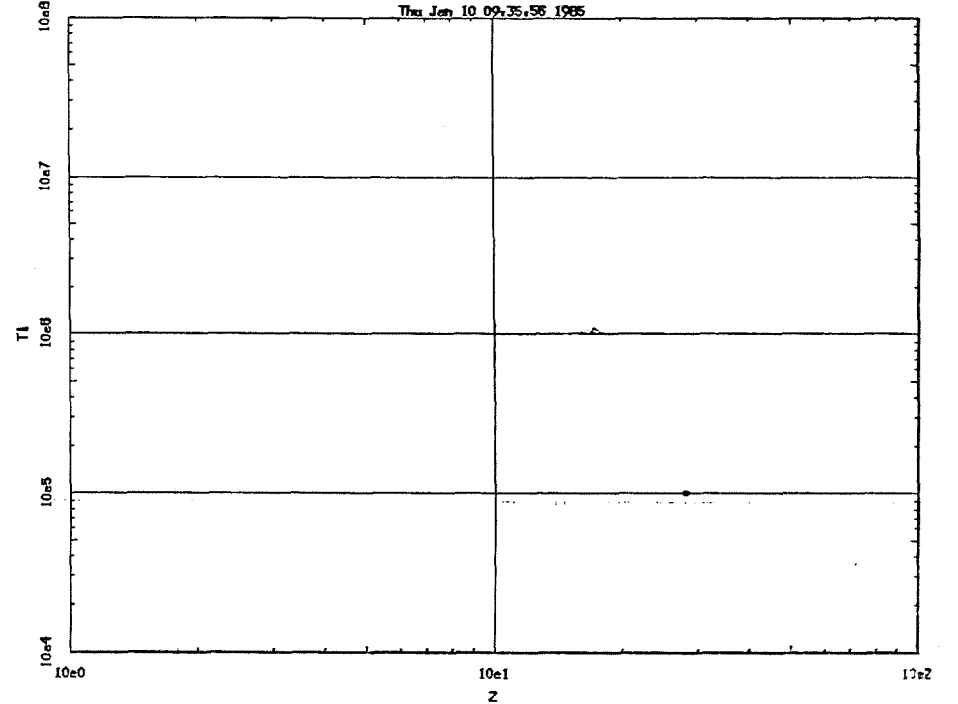
T1 vs. Z for Z - Q = 27

Thu Jan 10 09:35:56 1985



T1 vs. Z for Z - Q = 28

Thu Jan 10 09:35:56 1985



Z = 5

Q	-log[N(Q)/N]	
3	3.65	3.65
4	0.60	0.60
5	0.23	0.23
6	0.81	0.81

Z = 7

Q	-log[N(Q)/N]	
3	5.82	5.82
4	2.89	2.89
5	0.08	0.08
6	0.77	0.77
7	2.67	2.67

Z = 8

Q	-log[N(Q)/N]	
4	4.71	4.71
5	2.44	2.44
6	0.01	0.01
7	1.98	1.98
8	5.29	5.29

Z = 9

Q	-log[N(Q)/N]	
4	5.40	5.31
5	3.72	3.66
6	1.99	1.96
7	0.00	0.01
8	3.32	3.46

Z = 10

Q	-log[N(Q)/N]	
4	5.00	5.00
5	3.56	3.56
6	2.48	2.48
7	1.35	1.35
8	0.02	0.02
9	4.97	4.97

Z = 11

Q	-log[N(Q)/N]	
4	4.74	4.57
5	2.99	2.85
6	1.96	1.88
7	1.42	1.36
8	0.83	0.80
9	0.10	0.11

Z = 12

Q	-log[N(Q)/N]	
4	4.07	4.07
5	2.17	2.17
6	1.12	1.12
7	0.62	0.62
8	0.66	0.66
9	0.67	0.67
10	0.61	0.61

Z = 13

Q	-log[N(Q)/N]	
4	4.13	4.02
5	2.27	2.20
6	0.98	0.94
7	0.42	0.41
8	0.42	0.43
9	1.02	1.06
10	1.61	1.69
11	2.17	2.28

Z = 14

Q	-log[N(Q)/N]	
4	4.46	4.46
5	2.14	2.14
6	1.03	1.03
7	0.41	0.41
8	0.40	0.40
9	0.96	0.96
10	2.17	2.17
11	3.41	3.41
12	4.66	4.66

Z = 15

Q	-log[N(Q)/N]	
4	5.47	5.40
5	2.74	2.67
6	1.15	1.08
7	0.47	0.45
8	0.34	0.36
9	0.91	0.96
10	2.05	2.13
11	3.50	3.91
12	5.61	5.75

Z = 16

Q	-log[N(Q)/N]	
4	5.96	5.96
5	3.69	3.69
6	1.36	1.36
7	0.48	0.48
8	0.35	0.35
9	0.78	0.78
10	2.00	2.00
11	3.78	3.78

Z = 17

Q	-log[N(Q)/N]	
4	6.05	5.97
5	4.52	4.47
6	2.72	2.68
7	0.60	0.57
8	0.28	0.28
9	0.70	0.73
10	1.68	1.76
11	3.44	3.55
12	5.01	5.95

Z = 18

Q	-log[N(Q)/N]	
4	5.85	5.85
5	4.33	4.33
6	3.36	3.36
7	2.06	2.06
8	0.20	0.20
9	0.49	0.49
10	1.54	1.54
11	3.15	3.15
12	5.52	5.52

Z = 19

Q	-log[N(Q)/N]	
4	5.58	5.50
5	3.73	3.67
6	2.57	2.53
7	2.00	1.97
8	1.58	1.57
9	0.08	0.07
10	0.93	0.97
11	2.56	2.62
12	4.77	4.88

Z = 20

Q	-log[N(Q)/N]	
4	4.56	4.56
5	2.90	2.90
6	1.71	1.71
7	0.95	0.95
8	0.80	0.80
9	1.31	1.31
10	0.19	0.19
11	1.69	1.69
12	3.96	3.96

Z = 21

Q	-log[N(Q)/N]	
4	4.93	4.54
5	3.18	2.90
6	1.83	1.64
7	0.93	0.81
8	0.49	0.44
9	0.65	0.67
10	1.36	1.45
11	0.57	0.69
12	2.62	2.90
13	5.46	5.91

Z = 22

Q	-log[N(Q)/N]	
4	5.39	4.65
5	3.53	3.00
6	2.09	1.76
7	1.03	0.80
8	0.50	0.42
9	0.39	0.44
10	0.69	1.05
11	1.01	2.09
12	1.39	1.76
13	4.05	4.68

Z = 23

Q	-log[N(Q)/N]	
4	5.52	4.46
5	3.81	3.03
6	2.34	1.82
7	1.26	0.98
8	0.62	0.52
9	0.37	0.40
10	0.62	0.80
11	1.48	1.79
12	2.66	3.10
13	2.64	3.21
14	5.98	6.86

Z = 24

Q	-log[N(Q)/N]	
4	5.88	4.85
5	3.52	2.63
6	2.35	1.74
7	1.33	0.97
8	0.66	0.53
9	0.43	0.47
10	0.54	0.70
11	1.19	1.48
12	2.44	2.86
13	3.89	4.44
14	4.84	5.02

Z = 25

Q	-log[N(Q)/N]	
3	6.31	5.96
4	4.73	4.22
5	3.20	2.65
6	1.67	1.23
7	1.13	0.86
8	0.62	0.53
9	0.43	0.49
10	0.66	0.83
11	1.17	1.42
12	2.25	2.59
13	3.92	4.36
14	5.69	6.20

Z = 26

Q	-log[N(Q)/N]	
4	4.20	4.20
5	2.29	2.29
6	1.07	1.07
7	0.44	0.44
8	0.60	0.60
9	0.71	0.71
10	1.07	1.07
11	1.81	1.81
12	2.76	2.76
13	4.32	4.32

$\log_{10}(\tau) = 6.0$

Z = 27

Q	-log[N(Q)/N]	
4	6.01	5.86
5	3.67	3.55
6	1.54	1.46
7	0.67	0.61
8	0.26	0.27
9	0.82	0.87
10	1.32	1.44
11	2.07	2.28
12	3.21	3.44
13	4.70	4.94

Z = 28

Q	-log[N(Q)/N]	
5	5.03	5.03
6	3.17	3.17
7	0.90	0.90
8	0.40	0.40
9	0.37	0.37
10	1.40	1.40
11	2.43	2.43
12	3.75	3.75
13	5.34	5.34

Z = 29

Q	-log[N(Q)/N]	
5	5.90	6.34
6	4.06	4.37
7	2.75	2.95
8	0.40	0.50
9	0.34	0.36
10	0.84	0.63
11	2.34	2.09
12	3.88	3.58
13	5.77	5.38

Z = 30

Q	-log[N(Q)/N]	
6	4.17	5.22
7	3.17	3.85
8	2.49	2.88
9	0.15	0.25
10	0.58	0.47
11	1.75	1.04
12	3.62	2.94
13	5.53	4.89

$$\log_{10}(\tau) = 6.1$$

Z = 6

Q	-log[N(Q)/N]	
3	4.09	4.09
4	1.09	1.09
5	0.86	0.86
6	0.81	0.81

Z = 13

Q	-log[N(Q)/N]	
4	5.70	5.57
5	3.55	3.46
6	1.94	1.87
7	1.69	0.96
8	0.57	0.54
9	0.67	0.67
10	0.70	0.72
11	0.68	0.73

Z = 18

Q	-log[N(Q)/N]	
5	5.40	5.40
6	4.16	4.16
7	2.56	2.56
8	0.54	0.54
9	0.30	0.30
10	0.73	0.73
11	1.66	1.66
12	3.27	3.27
13	5.45	5.45

Z = 23

Q	-log[N(Q)/N]	
4	7.06	5.97
5	5.17	4.35
6	3.43	2.86
7	2.07	1.73
8	1.11	0.93
9	0.53	0.45
10	0.41	0.44
11	0.86	1.01
12	1.57	1.82
13	1.19	1.51
14	3.53	4.10

Z = 27

Q	-log[N(Q)/N]	
5	4.56	4.39
6	2.20	2.07
7	1.08	0.96
8	0.41	0.36
9	0.65	0.66
10	0.73	0.82
11	1.03	1.23
12	1.69	1.91
13	2.67	2.90
14	4.06	4.31

Z = 7

Q	-log[N(Q)/N]	
4	3.01	3.01
5	0.26	0.26
6	0.38	0.38
7	1.47	1.47

Z = 14

Q	-log[N(Q)/N]	
4	5.86	5.86
5	3.28	3.28
6	1.84	1.84
7	0.85	0.85
8	0.40	0.40
9	0.46	0.46
10	1.11	1.11
11	1.70	1.70
12	2.28	2.28

Z = 19

Q	-log[N(Q)/N]	
5	4.93	4.87
6	3.51	3.46
7	2.64	2.61
8	1.90	1.88
9	0.22	0.21
10	0.46	0.48
11	1.39	1.43
12	2.83	2.90
13	4.95	5.05

Z = 24

Q	-log[N(Q)/N]	
5	4.88	3.94
6	3.51	2.82
7	2.18	1.75
8	1.21	0.99
9	0.63	0.56
10	0.39	0.40
11	0.62	0.75
12	1.42	1.66
13	2.37	2.70
14	2.37	2.78
15	5.34	5.98

Z = 28

Q	-log[N(Q)/N]	
5	5.99	5.99
6	3.89	3.89
7	1.36	1.36
8	0.58	0.58
9	0.26	0.26
10	0.95	0.95
11	1.52	1.52
12	2.35	2.35
13	3.41	3.41
14	4.88	4.88

Z = 8

Q	-log[N(Q)/N]	
4	5.09	5.09
5	2.53	2.53
6	0.63	0.63
7	1.17	1.17
8	3.45	3.45

Z = 15

Q	-log[N(Q)/N]	
5	3.92	3.86
6	2.61	1.93
7	0.95	0.91
8	0.38	0.37
9	0.45	0.47
10	1.01	1.06
11	2.13	2.19
12	3.21	3.29
13	4.32	4.43

Z = 20

Q	-log[N(Q)/N]	
5	4.27	4.27
6	2.80	2.80
7	1.75	1.75
8	1.29	1.29
9	1.43	1.43
10	0.12	0.12
11	0.89	0.89
12	2.37	2.37
13	4.39	4.39

Z = 25

Q	-log[N(Q)/N]	
4	6.23	5.63
5	4.50	3.86
6	2.75	2.21
7	1.98	1.61
8	1.15	0.94
9	0.62	0.56
10	0.46	0.49
11	0.58	0.67
12	1.19	1.36
13	2.38	2.62
14	3.59	3.89
15	4.02	4.38

Z = 29

Q	-log[N(Q)/N]	
6	4.94	5.27
7	3.35	3.59
8	0.71	0.85
9	0.33	0.40
10	0.51	0.37
11	1.66	1.44
12	2.72	2.43
13	4.11	3.67
14	5.60	5.12

Z = 9

Q	-log[N(Q)/N]	
5	4.32	4.29
6	2.26	2.26
7	0.60	0.60
8	2.23	2.33
9	5.70	5.91

Z = 16

Q	-log[N(Q)/N]	
5	4.78	4.78
6	2.32	2.32
7	1.04	1.04
8	0.45	0.45
9	0.36	0.36
10	1.00	1.00
11	2.13	2.13
12	3.75	3.75
13	5.37	5.37

Z = 21

Q	-log[N(Q)/N]	
5	4.63	4.33
6	3.02	2.80
7	1.83	1.67
8	1.07	0.96
9	0.39	0.84
10	1.20	1.21
11	0.17	0.20
12	1.42	1.58
13	3.39	3.66
14	5.90	6.31

Z = 26

Q	-log[N(Q)/N]	
4	5.35	5.35
5	3.24	3.24
6	1.80	1.80
7	0.92	0.92
8	0.83	0.83
9	0.58	0.58
10	0.57	0.57
11	0.87	0.87
12	1.38	1.38
13	2.42	2.42
14	4.02	4.02
15	5.52	5.52

Z = 30

Q	-log[N(Q)/N]	
6	5.31	6.32
7	4.00	4.70
8	3.00	3.43
9	0.30	0.49
10	0.36	0.37
11	1.18	0.63
12	2.71	2.09
13	4.18	3.48
14	6.04	5.15

Z = 11

Q	-log[N(Q)/N]	
5	4.47	4.35
6	3.14	3.07
7	2.22	2.17
8	1.20	1.17
9	0.63	0.63
10	4.91	5.02

Z = 17

Q	-log[N(Q)/N]	
5	5.59	5.52
6	3.52	3.47
7	1.27	1.22
8	0.48	0.46
9	0.37	0.38
10	0.76	0.80
11	1.86	1.92
12	3.49	3.58
13	5.63	5.75

Z = 22

Q	-log[N(Q)/N]	
5	4.90	4.32
6	3.21	2.81
7	1.91	1.64
8	1.02	0.83
9	0.56	0.48
10	0.69	0.70
11	1.19	1.29
12	0.47	0.62
13	2.24	2.60
14	4.72	5.30

Z = 12

Q	-log[N(Q)/N]	
5	3.86	3.86
6	2.48	2.48
7	1.59	1.59
8	1.21	1.21
9	0.71	0.71
10	0.15	0.15

Z = 6

Q	-log[N(Q)/N]	
3	4.69	4.69
4	1.70	1.70
5	0.68	0.68
6	0.11	0.11

Z = 7

Q	-log[N(Q)/N]	
4	3.28	3.28
5	0.58	0.58
6	0.27	0.27
7	0.69	0.69

Z = 8

Q	-log[N(Q)/N]	
4	5.43	5.43
5	2.69	2.69
6	0.12	0.12
7	0.62	0.62
8	2.97	2.97

Z = 9

Q	-log[N(Q)/N]	
5	4.79	4.80
6	2.43	2.47
7	0.02	0.02
8	1.37	1.44
9	3.82	3.98

Z = 10

Q	-log[N(Q)/N]	
5	5.56	5.56
6	3.87	3.87
7	2.03	2.03
8	0.01	0.01
9	2.48	2.48

Z = 11

Q	-log[N(Q)/N]	
5	5.81	5.71
6	4.19	4.14
7	2.95	2.91
8	1.54	1.52
9	0.91	0.91
10	3.57	3.65

Z = 12

Q	-log[N(Q)/N]	
5	5.65	5.65
6	3.96	3.96
7	2.74	2.74
8	1.97	1.97
9	1.04	1.04
10	0.95	0.95
11	4.85	4.85

Z = 13

Q	-log[N(Q)/N]	
5	5.45	5.35
6	3.54	3.46
7	2.27	2.21
8	1.46	1.42
9	1.14	1.11
10	0.68	0.67
11	0.17	0.18

Z = 14

Q	-log[N(Q)/N]	
5	4.77	4.77
6	3.03	3.03
7	1.72	1.72
8	0.90	0.90
9	0.53	0.53
10	0.69	0.69
11	0.74	0.74
12	0.75	0.75

Z = 15

Q	-log[N(Q)/N]	
5	5.33	5.27
6	3.13	3.04
7	1.73	1.67
8	0.78	0.75
9	0.42	0.42
10	0.50	0.52
11	1.03	1.10
12	1.55	1.58
13	2.93	2.98

Z = 16

Q	-log[N(Q)/N]	
6	3.50	3.50
7	1.87	1.87
8	0.88	0.88
9	0.35	0.35
10	0.50	0.50
11	1.08	1.08
12	2.09	2.09
13	3.00	3.00
14	3.99	3.99

Z = 17

Q	-log[N(Q)/N]	
6	4.60	4.55
7	2.21	2.16
8	1.03	1.00
9	0.47	0.46
10	0.37	0.38
11	0.91	0.94
12	1.92	1.97
13	3.28	3.46
14	4.74	4.84

Z = 18

Q	-log[N(Q)/N]	
6	5.21	5.21
7	3.24	3.24
8	1.18	1.18
9	0.48	0.48
10	0.39	0.39
11	0.75	0.75
12	1.74	1.74
13	3.23	3.23
14	5.18	5.18

Z = 19

Q	-log[N(Q)/N]	
6	4.60	4.55
7	3.47	3.43
8	2.42	2.40
9	0.59	0.57
10	0.31	0.31
11	0.66	0.68
12	1.46	1.51
13	2.87	2.94
14	4.82	4.90

Z = 20

Q	-log[N(Q)/N]	
5	5.72	5.72
6	4.00	4.00
7	2.68	2.68
8	1.93	1.93
9	1.74	1.74
10	0.26	0.26
11	0.44	0.44
12	1.26	1.26
13	2.56	2.56
14	4.44	4.44

Z = 21

Q	-log[N(Q)/N]	
5	6.25	5.98
6	4.40	4.19
7	2.94	2.78
8	1.89	1.78
9	1.41	1.34
10	1.36	1.34
11	0.15	0.13
12	0.74	0.83
13	1.97	2.16
14	3.69	3.98

Z = 22

Q	-log[N(Q)/N]	
6	4.69	4.27
7	3.13	2.83
8	1.96	1.72
9	1.19	1.04
10	0.99	0.91
11	1.10	1.11
12	0.17	0.19
13	1.20	1.39
14	2.89	3.25
15	5.06	5.59

Z = 23

Q	-log[N(Q)/N]	
5	6.84	5.96
6	4.85	4.22
7	3.23	2.81
8	1.99	1.71
9	1.11	0.91
10	0.64	0.55
11	0.74	0.73
12	1.04	1.12
13	0.49	0.52
14	1.92	2.23
15	4.09	4.60

Z = 24

Q	-log[N(Q)/N]	
5	6.44	5.46
6	4.88	4.15
7	3.28	2.79
8	2.33	1.75
9	1.14	0.99
10	0.57	0.49
11	0.43	0.45
12	0.85	0.95
13	1.35	1.53
14	1.03	1.25
15	3.08	3.49
16	5.79	6.38

Z = 25

Q	-log[N(Q)/N]	
5	6.04	5.37
6	4.08	3.50
7	3.10	2.67
8	1.97	1.71
9	1.15	1.02
10	0.64	0.60
11	0.41	0.41
12	0.62	0.69
13	1.38	1.50
14	2.10	2.28
15	2.15	2.35
16	4.78	5.11

Z = 26

Q	-log[N(Q)/N]	
5	4.61	4.61
6	2.96	2.96
7	1.84	1.84
8	1.50	1.50
9	0.94	0.94
10	0.60	0.60
11	0.53	0.53
12	0.65	0.65
13	1.24	1.24
14	2.37	2.37
15	3.34	3.34
16	3.78	3.78

log₁₀(T) = 6.2

Z = 27

Q	-log[N(Q)/N]	
5	5.81	5.52
6	3.23	2.98
7	1.87	1.63
8	0.96	0.78
9	0.92	0.80
10	0.63	0.69
11	0.54	0.63
12	0.76	0.90
13	1.30	1.44
14	2.21	2.36
15	3.69	3.84
16	4.83	5.01
17	5.58	5.77

Z = 28

Q	-log[N(Q)/N]	
6	4.73	4.73
7	1.95	1.95
8	0.91	0.91
9	0.33	0.33
10	0.70	0.70
11	0.87	0.87
12	1.27	1.27
13	1.83	1.83
14	2.85	2.85
15	4.09	4.09
16	5.93	5.93

Z = 29

Q	-log[N(Q)/N]	
6	5.87	6.24
7	4.03	4.31
8	1.11	1.31
9	0.43	0.57
10	0.33	0.27
11	1.15	0.98
12	1.81	1.52
13	2.75	2.29
14	3.76	3.24
15	5.18	4.63

Z = 30

Q	-log[N(Q)/N]	
7	4.86	5.61
8	3.57	4.07
9	0.55	0.84
10	0.27	0.49
11	0.76	0.38
12	2.00	1.44
13	3.26	2.35
14	4.59	3.49
15	5.89	4.77

62

$$\log_{10}(\tau) = 6.3$$

Z = 6

Q	-log[N(Q)/N]	
3	5.33	5.33
4	2.32	2.32
5	1.05	1.05
6	0.04	0.04

Z = 7

Q	-log[N(Q)/N]	
4	3.75	3.75
5	1.06	1.06
6	0.41	0.41
7	0.28	0.28

Z = 8

Q	-log[N(Q)/N]	
4	5.36	5.36
5	2.78	2.78
6	0.33	0.33
7	0.35	0.35
8	1.10	1.10

Z = 9

Q	-log[N(Q)/N]	
5	5.17	5.21
6	2.54	2.60
7	0.68	0.68
8	0.75	0.79
9	2.37	2.47

Z = 10

Q	-log[N(Q)/N]	
6	4.42	4.42
7	2.27	2.27
8	0.01	0.01
9	1.59	1.59
10	4.21	4.21

Z = 11

Q	-log[N(Q)/N]	
6	5.11	5.07
7	3.57	3.53
8	1.82	1.81
9	0.01	0.01
10	2.49	2.56

Z = 12

Q	-log[N(Q)/N]	
6	5.31	5.31
7	3.78	3.78
8	2.66	2.66
9	1.36	1.36
10	0.33	0.33
11	0.35	0.35

Z = 13

Q	-log[N(Q)/N]	
6	5.27	5.20
7	3.69	3.65
8	2.55	2.51
9	1.85	1.82
10	0.98	0.96
11	0.06	0.06
12	4.60	4.68

Z = 14

Q	-log[N(Q)/N]	
6	4.82	4.82
7	3.22	3.22
8	2.07	2.07
9	1.33	1.33
10	1.06	1.06
11	0.65	0.65
12	0.20	0.20
13	5.90	5.90

Z = 15

Q	-log[N(Q)/N]	
6	4.66	4.57
7	2.96	2.90
8	1.68	1.64
9	0.95	0.93
10	0.61	0.62
11	0.73	0.73
12	0.68	0.68
13	0.64	0.65

Z = 16

Q	-log[N(Q)/N]	
6	4.91	4.91
7	2.97	2.97
8	1.63	1.63
9	0.72	0.72
10	0.45	0.45
11	0.55	0.55
12	1.04	1.04
13	1.37	1.37
14	1.77	1.77

Z = 17

Q	-log[N(Q)/N]	
6	5.92	5.87
7	3.49	3.24
8	1.87	1.83
9	0.93	0.90
10	0.40	0.39
11	0.47	0.48
12	0.96	0.96
13	1.37	1.37
14	2.00	2.02
15	3.22	3.22

Z = 18

Q	-log[N(Q)/N]	
7	4.41	4.41
8	2.11	2.11
9	1.02	1.02
10	0.50	0.50
11	0.38	0.38
12	0.84	0.84
13	1.75	1.75
14	3.07	3.07
15	4.20	4.20
16	5.47	5.47

Z = 19

Q	-log[N(Q)/N]	
6	5.93	5.87
7	4.55	4.51
8	3.23	3.19
9	1.25	1.22
10	0.54	0.52
11	0.40	0.40
12	0.66	0.68
13	1.49	1.53
14	2.78	2.82
15	4.47	4.55

Z = 20

Q	-log[N(Q)/N]	
6	5.36	5.36
7	3.78	3.78
8	2.77	2.77
9	2.28	2.28
10	0.65	0.65
11	0.33	0.33
12	0.61	0.61
13	1.30	1.30
14	2.53	2.53
15	4.22	4.22

Z = 21

Q	-log[N(Q)/N]	
6	5.37	5.66
7	4.17	4.00
8	2.84	2.72
9	2.08	1.99
10	1.71	1.67
11	0.34	0.30
12	0.39	0.42
13	1.02	1.13
14	2.08	2.27
15	3.69	3.97
16	5.76	6.10

Z = 22

Q	-log[N(Q)/N]	
6	5.32	5.32
7	4.12	4.12
8	2.83	2.83
9	2.07	2.07
10	1.70	1.70
11	0.37	0.37
12	0.40	0.40
13	1.00	1.00
14	2.00	2.00
15	3.69	3.69
16	5.76	5.76

12	0.19	0.16
13	0.62	0.72
14	1.64	1.88
15	3.10	3.46
16	5.11	5.62

Z = 23

Q	-log[N(Q)/N]	
6	6.60	5.96
7	4.74	4.30
8	3.24	2.93
9	2.07	1.84
10	1.30	1.15
11	1.03	1.00
12	1.01	1.01
13	0.18	0.19
14	1.03	1.19
15	2.46	2.78
16	4.34	4.82

Z = 24

Q	-log[N(Q)/N]	
6	6.59	5.80
7	4.74	4.20
8	3.24	2.89
9	2.06	1.83
10	1.19	1.03
11	0.73	0.64
12	0.30	0.78
13	0.91	0.96
14	2.06	2.43
15	1.66	1.88
16	3.35	3.91
17	5.89	6.39

Z = 25

Q	-log[N(Q)/N]	
6	5.66	5.04
7	4.47	4.01
8	3.08	2.78
9	1.93	1.81
10	1.17	1.07
11	0.61	0.56
12	0.47	0.47
13	0.85	0.89
14	1.16	1.25
15	0.92	1.02
16	2.71	2.91
17	5.09	5.39

Z = 26

Q	-log[N(Q)/N]	
6	4.45	4.45
7	3.17	3.11
8	2.03	2.03
9	1.30	1.30
10	1.07	1.07
11	0.40	0.40
12	0.40	0.40
13	1.00	1.00
14	2.00	2.00
15	3.69	3.69
16	5.76	5.76

15	1.88	1.88
16	1.97	1.97
17	4.31	4.31

Z = 27

Q	-log[N(Q)/N]	
6	4.72	4.35
7	3.14	2.77
8	2.00	1.69
9	1.69	1.45
10	1.07	0.93
11	0.63	0.62
12	0.48	0.52
13	0.63	0.68
14	1.12	1.17
15	2.14	2.20
16	2.78	2.87
17	3.13	3.23
18	5.88	5.99

Z = 28

Q	-log[N(Q)/N]	
6	5.86	5.86
7	2.85	2.85
8	1.56	1.56
9	0.74	0.74
10	0.82	0.82
11	0.64	0.64
12	0.65	0.65
13	0.66	0.66
14	1.39	1.39
15	2.18	2.18
16	3.52	3.52
17	4.34	4.34
18	4.97	4.97

Z = 29

Q	-log[N(Q)/N]	
7	4.79	5.15
8	1.61	1.90
9	0.66	0.99
10	0.30	0.34
11	0.82	0.73
12	1.12	0.88
13	1.67	1.22
14	2.25	1.73
15	3.18	2.65
16	4.28	3.72
17	5.97	5.88

Z = 30

Q	-log[N(Q)/N]	
7	5.75	5.75
8	4.10	4.10
9	2.85	2.85
10	2.00	2.00
11	1.30	1.30
12	1.00	1.00
13	1.00	1.00
14	2.00	2.00
15	3.69	3.69
16	5.76	5.76

63

$$\log_{10}(\tau) = 6.4$$

Z = 6

Q	-log[N(Q)/N]	
3	5.96	5.96
4	2.89	2.89
5	1.49	1.49
6	0.92	0.92

Z = 7

Q	-log[N(Q)/N]	
4	4.34	4.34
5	1.63	1.63
6	0.71	0.71
7	0.11	0.11

Z = 8

Q	-log[N(Q)/N]	
5	3.12	3.12
6	0.67	0.67
7	0.32	0.32
8	0.50	0.50

Z = 9

Q	-log[N(Q)/N]	
6	5.56	5.62
7	2.68	2.75
8	0.26	0.25
9	0.40	0.41
9	1.33	1.39

Z = 10

Q	-log[N(Q)/N]	
6	4.86	4.86
7	2.44	2.44
8	0.06	0.06
9	0.91	0.91
10	2.70	2.70

Z = 11

Q	-log[N(Q)/N]	
6	5.87	5.84
7	4.06	4.03
8	2.01	2.00
9	0.01	0.01
10	1.64	1.69
11	4.22	4.33

Z = 12

Q	-log[N(Q)/N]	
7	4.65	4.65
8	3.23	3.23
9	1.59	1.59
10	0.01	0.01
11	2.52	2.52

Z = 13

Q	-log[N(Q)/N]	
7	4.99	4.95
8	3.55	3.51

Z = 9

9	2.50	2.48
10	1.27	1.26
11	0.03	0.03
12	3.38	3.43

Z = 14

Q	-log[N(Q)/N]	
7	4.87	4.87
8	3.43	3.43
9	2.36	2.36
10	1.72	1.72
11	0.91	0.91
12	0.07	0.07
13	4.38	4.38

Z = 15

Q	-log[N(Q)/N]	
7	4.77	4.72
8	3.20	3.17
9	2.14	2.13
10	1.44	1.44
11	1.15	1.14
12	0.66	0.65
13	0.18	0.18
14	5.42	5.48

Z = 16

Q	-log[N(Q)/N]	
7	4.57	4.57
8	2.93	2.93
9	1.69	1.69
10	1.05	1.05
11	0.74	0.74
12	0.79	0.79
13	0.62	0.62
14	0.52	0.52

Z = 17

Q	-log[N(Q)/N]	
7	4.84	4.79
8	3.01	2.97
9	1.73	1.70
10	0.83	0.81
11	0.50	0.49
12	0.54	0.55
13	0.95	0.96
14	1.11	1.14
15	1.38	1.42

Z = 18

Q	-log[N(Q)/N]	
7	5.74	5.74
8	3.29	3.29
9	1.87	1.87
10	0.98	0.98
11	0.44	0.44
12	0.45	0.45
13	0.87	0.87
14	1.65	1.65
15	2.18	2.18
16	2.83	2.83

Z = 19

Q	-log[N(Q)/N]	
7	5.91	5.86
8	4.33	4.29
9	2.21	2.17
10	1.12	1.10
11	0.57	0.56
12	0.38	0.39
13	0.71	0.73
14	1.45	1.47
15	2.54	2.59
16	3.45	3.51
17	4.55	4.63

Z = 20

Q	-log[N(Q)/N]	
7	5.14	5.14
8	3.97	3.87
9	3.11	3.11
10	1.32	1.32
11	0.59	0.59
12	0.41	0.41
13	0.60	0.60
14	1.28	1.28
15	2.35	2.35
16	3.81	3.81
17	5.13	5.13

Z = 21

Q	-log[N(Q)/N]	
7	5.56	5.38
8	3.99	3.85
9	2.97	2.86
10	2.31	2.24
11	0.78	0.71
12	0.38	0.36
13	0.51	0.55
14	1.03	1.13
15	2.04	2.21
16	3.45	3.65
17	5.21	5.48

Z = 22

Q	-log[N(Q)/N]	
7	6.01	5.71
8	4.32	4.08
9	3.01	2.82
10	2.23	2.10
11	1.70	1.63
12	0.43	0.36
13	0.36	0.39
14	0.84	0.96
15	1.79	1.92
16	3.07	3.40
17	4.82	5.22

Z = 23

Q	-log[N(Q)/N]	
7	6.37	5.95
8	4.62	4.32
9	3.20	2.96
10	2.15	1.98
11	1.64	1.53
12	1.24	1.20
13	0.24	0.20
14	0.54	0.62
15	1.87	1.57
16	2.60	2.92
17	4.35	4.79

Z = 24

Q	-log[N(Q)/N]	
7	6.50	5.95
8	4.75	4.39
9	3.32	3.07
10	2.18	1.99
11	1.41	1.29
12	1.17	1.10
13	0.93	0.93
14	0.20	0.20
15	0.89	1.00
16	2.11	2.33
17	3.73	4.06
18	5.89	6.34

Z = 25

Q	-log[N(Q)/N]	
7	6.21	5.72
8	4.56	4.24
9	3.21	3.01
10	2.12	1.99
11	1.28	1.18
12	0.81	0.76
13	0.36	0.34
14	0.80	0.82
15	0.34	0.37
16	1.46	1.56
17	3.10	3.27
18	5.15	5.39

Z = 26

Q	-log[N(Q)/N]	
7	4.69	4.69
8	3.92	3.92
9	2.80	2.80
10	1.90	1.90
11	1.18	1.18
12	0.65	0.65
13	0.51	0.51
14	0.86	0.86
15	1.00	1.00
16	0.84	0.84
17	2.41	2.41
18	4.51	4.51

Z = 27

Q	-log[N(Q)/N]	
7	4.75	4.32
8	3.39	3.02
9	2.83	2.54
10	1.91	1.73
11	1.16	1.11
12	0.68	0.68
13	0.49	0.49
14	0.60	0.61
15	1.23	1.24
16	1.43	1.48
17	1.47	1.53
18	3.39	3.46
19	5.83	5.91

Z = 28

Q	-log[N(Q)/N]	
7	4.26	4.26
8	2.74	2.74
9	1.69	1.69
10	1.50	1.50
11	0.99	0.99
12	0.67	0.67
13	0.51	0.51
14	0.67	0.67
15	1.05	1.05
16	1.96	1.96
17	2.32	2.32
18	2.58	2.58
19	4.87	4.87

Z = 29

Q	-log[N(Q)/N]	
7	5.73	6.32
8	2.31	2.33
9	1.11	1.58
10	0.50	0.78
11	0.75	0.88
12	0.71	0.68
13	0.91	0.65
14	1.11	0.77
15	1.63	1.26
16	2.29	1.90
17	3.52	3.10
18	4.06	3.58
19	4.58	4.08

Z = 30

Q	-log[N(Q)/N]	
8	4.87	5.65
9	1.29	1.89
10	0.43	0.91
11	0.36	0.36
12	1.04	0.75
13	1.44	0.86
14	2.14	1.12
15	2.70	1.52
16	3.59	2.36
17	4.56	3.26
18	6.12	4.73
19	6.22	5.26

$$\log_{10}(T) = 6.5$$

Z = 6

Q	-log[N(Q)/N]	
4	3.42	3.42
5	1.71	1.71
6	0.91	0.91

Z = 7

Q	-log[N(Q)/N]	
4	4.97	4.97
5	2.21	2.21
6	1.94	1.94
7	0.94	0.94

Z = 8

Q	-log[N(Q)/N]	
5	3.63	3.63
6	1.16	1.16
7	0.51	0.51
8	0.21	0.21

Z = 9

Q	-log[N(Q)/N]	
6	2.94	3.01
7	0.55	0.54
8	0.39	0.29
9	0.66	0.70

Z = 10

Q	-log[N(Q)/N]	
6	5.26	5.26
7	2.58	2.58
8	0.19	0.19
9	0.48	0.48
10	1.59	1.59

Z = 11

Q	-log[N(Q)/N]	
7	4.44	4.41
8	2.12	2.10
9	0.95	0.95
10	1.99	1.94
11	2.79	2.87

Z = 12

Q	-log[N(Q)/N]	
7	5.37	5.37
8	3.67	3.67
9	1.73	1.73
10	0.92	0.92
11	1.71	1.71
12	4.27	4.27

Z = 13

Q	-log[N(Q)/N]	
8	4.39	4.36
9	3.04	3.02
10	1.48	1.48
11	0.92	0.92
12	2.41	2.45
13	5.71	5.79

Z = 14

Q	-log[N(Q)/N]	
8	4.67	4.67
9	3.30	3.30
10	2.33	2.33
11	1.18	1.18
12	0.93	0.93
13	3.22	3.22

Z = 15

Q	-log[N(Q)/N]	
8	4.82	4.79
9	3.46	3.45
10	2.43	2.43
11	1.79	1.78
12	0.91	0.90
13	0.97	0.97
14	4.03	4.07

Z = 16

Q	-log[N(Q)/N]	
8	4.77	4.77
9	3.23	3.23
10	2.26	2.26
11	1.59	1.59
12	1.26	1.26
13	0.66	0.66
14	0.16	0.16
15	4.98	4.98

Z = 17

Q	-log[N(Q)/N]	
8	4.73	4.68
9	3.15	3.11
10	1.93	1.90
11	1.24	1.22
12	0.89	0.88
13	0.89	0.88
14	0.58	0.58
15	0.39	0.40

Z = 18

Q	-log[N(Q)/N]	
8	4.78	4.78
9	3.97	3.97
10	1.85	1.85
11	0.96	0.96
12	0.58	0.58
13	0.57	0.57
14	0.99	0.99
15	0.99	0.99
16	1.94	1.94

Z = 19

Q	-log[N(Q)/N]	
8	5.71	5.67
9	3.43	3.40
10	2.93	2.90
11	1.12	1.10
12	0.55	0.54
13	0.45	0.45
14	0.71	0.71
15	1.29	1.22
16	1.64	1.68
17	2.18	2.24

Z = 20

Q	-log[N(Q)/N]	
8	5.26	5.26
9	4.24	4.24
10	2.30	2.30
11	1.22	1.22
12	0.65	0.65
13	0.41	0.41
14	0.62	0.62
15	1.15	1.15
16	2.95	2.95
17	2.77	2.77
18	3.74	3.74

Z = 21

Q	-log[N(Q)/N]	
8	5.39	5.24
9	4.13	3.99
10	3.20	3.10
11	1.52	1.42
12	0.73	0.68
13	0.45	0.44
14	0.50	0.54
15	1.92	1.99
16	1.85	1.96
17	3.01	3.17
18	4.98	4.28
19	5.42	5.67

Z = 22

Q	-log[N(Q)/N]	
8	5.76	5.49
9	4.19	3.99
10	3.16	3.00
11	2.35	2.24
12	0.92	0.81
13	0.44	0.41
14	0.46	0.50
15	0.83	0.94
16	1.66	1.84
17	2.81	3.64
18	4.25	4.56
19	5.69	6.67

Z = 23

Q	-log[N(Q)/N]	
8	6.13	5.82
9	4.47	4.21

10	3.16	2.97
11	2.33	2.23
12	1.63	1.61
13	0.52	0.44
14	0.37	0.38
15	0.71	0.80
16	1.49	1.58
17	2.56	2.82
18	4.04	4.35
19	5.79	6.20

Z = 24

Q	-log[N(Q)/N]	
9	4.79	4.45
10	3.31	3.11
11	2.27	2.13
12	1.75	1.65
13	1.19	1.16
14	0.29	0.26
15	0.49	0.53
16	1.17	1.29
17	2.20	2.41
18	3.71	4.00
19	5.33	5.96

Z = 25

Q	-log[N(Q)/N]	
8	6.31	5.99
9	4.73	4.51
10	3.38	3.23
11	2.26	2.15
12	1.51	1.44
13	1.25	1.21
14	0.86	0.86
15	0.23	0.22
16	0.79	0.84
17	1.83	1.94
18	3.23	3.39
19	5.11	5.33

Z = 26

Q	-log[N(Q)/N]	
8	5.67	5.67
9	4.30	4.30
10	3.15	3.15
11	2.16	2.16
12	1.34	1.34
13	0.89	0.89
14	0.92	0.92
15	0.71	0.71
16	0.35	0.35
17	1.31	1.31
18	2.74	2.74
19	4.53	4.53

Z = 27

Q	-log[N(Q)/N]	
8	5.18	4.77
9	4.39	4.06
10	3.20	2.98
11	2.16	2.08

12	1.38	1.35
13	0.87	0.84
14	0.65	0.63
15	0.93	0.91
16	0.75	0.78
17	0.55	0.58
18	1.79	1.83
19	3.50	3.56
20	5.38	5.64

Z = 28

Q	-log[N(Q)/N]	
8	4.39	4.39
9	3.12	3.12
10	2.68	2.68
11	1.88	1.88
12	1.25	1.25
13	0.77	0.77
14	0.58	0.58
15	0.60	0.60
16	1.14	1.14
17	1.99	1.99
18	1.97	1.97
19	2.62	2.62
20	4.64	4.64

Z = 29

Q	-log[N(Q)/N]	
8	3.49	4.32
9	2.95	2.83
10	1.29	1.80
11	1.20	1.63
12	0.86	1.11
13	0.75	0.75
14	0.61	0.52
15	0.75	0.64
16	1.03	0.90
17	1.85	1.69
18	1.96	1.74
19	2.15	1.91
20	4.94	3.77

Z = 30

Q	-log[N(Q)/N]	
8	5.66	6.99
9	1.83	2.89
10	0.79	1.66
11	0.38	0.68
12	0.81	0.98
13	0.92	0.74
14	1.39	0.64
15	1.52	0.67
16	2.99	1.10
17	2.55	1.59
18	3.68	2.64
19	3.98	2.80
20	4.40	3.18
21	6.67	5.35

$$\log_{10}(T) = 6.6$$

Z = 6

Q	-log ₁₀ [N(Q)/N]	
4	3.99	3.99
5	1.99	1.99
6	0.99	0.99

Z = 7

Q	-log ₁₀ [N(Q)/N]	
4	5.59	5.59
5	2.75	2.75
6	1.35	1.35
7	0.92	0.92

Z = 8

Q	-log ₁₀ [N(Q)/N]	
5	4.23	4.23
6	1.71	1.71
7	0.79	0.79
8	0.99	0.99

Z = 9

Q	-log ₁₀ [N(Q)/N]	
7	0.96	0.96
8	0.41	0.39
9	0.39	0.31

Z = 10

Q	-log ₁₀ [N(Q)/N]	
6	5.70	5.70
7	2.79	2.79
8	0.43	0.43
9	0.31	0.31
10	0.85	0.85

Z = 11

Q	-log ₁₀ [N(Q)/N]	
7	4.89	4.77
8	2.23	2.21
9	0.15	0.14
10	0.58	0.69
11	1.71	1.77

Z = 12

Q	-log ₁₀ [N(Q)/N]	
7	5.99	5.99
8	4.03	4.03
9	1.82	1.82
10	0.04	0.04
11	1.10	1.10
12	2.90	2.90

Z = 13

Q	-log ₁₀ [N(Q)/N]	
8	5.99	5.07
9	3.46	3.45
10	1.62	1.61
11	0.92	0.92
12	1.65	1.68
13	4.08	4.14

Z = 14

Q	-log ₁₀ [N(Q)/N]	
8	5.74	5.74
9	4.11	4.11
10	2.83	2.83
11	1.38	1.38
12	0.92	0.92
13	2.31	2.31
14	5.44	5.44

Z = 15

Q	-log ₁₀ [N(Q)/N]	
9	4.65	4.64
10	3.32	3.33
11	2.38	2.37
12	1.15	1.15
13	0.93	0.93
14	2.96	3.00

Z = 16

Q	-log ₁₀ [N(Q)/N]	
9	4.79	4.79
10	3.52	3.52
11	2.53	2.53
12	1.88	1.88
13	0.90	0.90
14	0.67	0.67
15	3.71	3.71

Z = 17

Q	-log ₁₀ [N(Q)/N]	
9	5.00	4.96
10	3.49	3.45
11	2.48	2.46
12	1.79	1.77
13	1.42	1.41
14	0.70	0.70
15	0.13	0.13
16	4.46	4.49

Z = 18

Q	-log ₁₀ [N(Q)/N]	
9	4.91	4.91
10	3.39	3.39
11	2.19	2.19
12	1.47	1.47
13	1.09	1.09
14	1.02	1.02
15	0.58	0.58
16	0.28	0.28
17	5.36	5.36

Z = 19

Q	-log ₁₀ [N(Q)/N]	
9	5.10	5.05
10	3.41	3.36
11	2.19	2.15
12	1.28	1.25
13	0.81	0.79
14	0.65	0.63
15	0.79	0.80
16	0.66	0.68
17	0.73	0.76

Z = 20

Q	-log ₁₀ [N(Q)/N]	
9	5.71	5.71
10	3.61	3.61
11	2.22	2.22
12	1.31	1.31
13	0.71	0.71
14	0.52	0.52
15	0.59	0.59
16	1.00	1.00
17	1.21	1.21
18	1.66	1.66

Z = 21

Q	-log ₁₀ [N(Q)/N]	
9	5.57	5.43
10	4.39	4.29
11	2.55	2.45
12	1.44	1.37
13	0.79	0.75
14	0.46	0.45
15	0.55	0.56
16	0.89	0.93
17	1.54	1.62
18	2.06	2.18
19	2.86	3.01

Z = 22

Q	-log ₁₀ [N(Q)/N]	
9	5.63	5.41
10	4.36	4.18
11	3.28	3.15
12	1.79	1.57
13	0.87	0.80
14	0.51	0.48
15	0.46	0.48
16	0.83	0.90
17	1.46	1.57
18	2.36	2.53
19	3.21	3.44
20	4.36	4.65

Z = 23

Q	-log ₁₀ [N(Q)/N]	
9	5.92	5.65
10	4.37	4.16
11	3.34	3.17
12	2.37	2.27

Z = 24

Q	-log ₁₀ [N(Q)/N]	
13	1.05	0.95
14	0.52	0.48
15	0.45	0.47
16	0.69	0.77
17	1.36	1.49
18	2.29	2.46
19	3.45	3.70
20	4.65	4.96

Z = 24

Q	-log ₁₀ [N(Q)/N]	
9	6.22	5.96
10	4.58	4.37
11	3.29	3.13
12	2.50	2.38
13	1.67	1.61
14	0.60	0.54
15	0.39	0.38
16	0.62	0.67
17	1.17	1.28
18	2.14	2.31
19	3.39	3.58
20	4.83	5.09

Z = 25

Q	-log ₁₀ [N(Q)/N]	
10	4.75	4.69
11	3.39	3.27
12	2.37	2.29
13	1.84	1.78
14	1.15	1.13
15	0.35	0.32
16	0.46	0.48
17	1.01	1.07
18	1.83	1.98
19	3.18	3.31
20	4.74	4.88

Z = 26

Q	-log ₁₀ [N(Q)/N]	
10	4.64	4.64
11	3.40	3.40
12	2.32	2.32
13	1.59	1.59
14	1.32	1.32
15	0.80	0.80
16	0.26	0.26
17	0.73	0.73
18	1.62	1.62
19	2.83	2.83
20	4.47	4.47

Z = 27

Q	-log ₁₀ [N(Q)/N]	
9	6.36	5.99
10	4.91	4.66
11	3.61	3.50
12	2.55	2.50
13	1.76	1.70
14	1.23	1.19
15	1.19	1.15

Z = 28

Q	-log ₁₀ [N(Q)/N]	
16	0.67	0.68
17	0.28	0.28
18	0.97	0.99
19	2.09	2.12
20	3.54	3.57
21	5.42	5.46

Z = 28

Q	-log ₁₀ [N(Q)/N]	
9	5.09	5.09
10	4.42	4.42
11	3.34	3.34
12	2.43	2.43
13	1.66	1.66
14	1.16	1.16
15	0.86	0.86
16	1.05	1.05
17	0.64	0.64
18	0.39	0.39
19	1.35	1.35
20	2.72	2.72
21	4.41	4.41

Z = 29

Q	-log ₁₀ [N(Q)/N]	
3	5.37	6.37
9	3.69	4.66
10	2.63	3.41
11	2.38	2.99
12	1.77	2.18
13	1.36	1.51
14	0.92	0.98
15	0.72	0.76
16	0.65	0.68
17	1.11	1.10
18	0.85	0.77
19	0.77	0.68
20	2.90	1.89
21	3.64	3.50
22	5.62	5.44

Z = 30

Q	-log ₁₀ [N(Q)/N]	
9	2.71	4.51
10	1.34	3.04
11	0.77	2.93
12	0.98	1.86
13	0.91	1.31
14	0.91	0.88
15	0.80	0.58
16	0.93	0.65
17	1.11	0.79
18	1.85	1.45
19	1.75	1.21
20	1.86	1.29
21	3.41	2.76
22	5.35	4.62

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$$\log_{10}(\tau) = 6.7$$

Z = 6

Q	-log[N(Q)/N]	
4	4.34	4.34
5	2.23	2.23
6	0.00	0.00

Z = 14

Q	-log[N(Q)/N]	
9	4.78	4.78
10	3.23	3.23
11	1.51	1.51
12	0.03	0.03
13	1.60	1.60
14	3.91	3.91

Z = 20

Q	-log[N(Q)/N]	
10	5.46	5.46
11	3.80	3.80
12	2.53	2.53
13	1.66	1.66
14	1.11	1.11
15	0.78	0.78
16	0.77	0.77
17	0.54	0.54
18	0.57	0.57
19	5.72	5.72

Z = 24

Q	-log[N(Q)/N]	
10	6.06	5.93
11	4.52	4.35
12	3.30	3.35
13	2.39	2.31
14	1.17	1.09
15	0.61	0.57
16	0.46	0.46
17	0.60	0.65
18	1.13	1.20
19	1.83	1.98
20	2.79	2.95
21	3.80	4.00
22	5.14	5.39

Z = 7

Q	-log[N(Q)/N]	
5	3.25	3.25
6	1.63	1.63
7	0.01	0.01

Z = 15

Q	-log[N(Q)/N]	
9	5.68	5.67
10	4.09	4.09
11	2.85	2.85
12	1.82	1.82
13	0.83	0.83
14	2.13	2.15
15	5.01	5.07

Z = 21

Q	-log[N(Q)/N]	
10	5.93	5.86
11	3.93	3.87
12	2.53	2.49
13	1.62	1.55
14	0.95	0.90
15	0.66	0.63
16	0.53	0.57
17	0.78	0.81
18	0.84	0.89
19	1.18	1.26

Z = 25

Q	-log[N(Q)/N]	
11	4.67	4.54
12	3.39	3.30
13	2.61	2.54
14	1.64	1.61
15	0.68	0.65
16	0.42	0.42
17	0.57	0.59
18	1.00	1.05
19	1.81	1.88
20	2.85	2.94
21	4.03	4.15
22	5.38	5.52

Z = 28

Q	-log[N(Q)/N]	
11	5.17	5.17
12	3.99	3.99
13	2.95	2.95
14	2.17	2.17
15	1.57	1.57
16	1.46	1.46
17	0.73	0.73
18	0.27	0.27
19	0.74	0.74
20	1.57	1.57
21	2.70	2.70
22	4.24	4.24

Z = 8

Q	-log[N(Q)/N]	
5	4.84	4.84
6	2.25	2.25
7	1.09	1.09
8	0.04	0.04

Z = 16

Q	-log[N(Q)/N]	
10	4.65	4.65
11	3.36	3.36
12	2.42	2.42
13	1.11	1.11
14	0.04	0.04
15	2.73	2.73

Z = 22

Q	-log[N(Q)/N]	
10	5.36	5.66
11	4.54	4.40
12	2.80	2.66
13	1.67	1.56
14	0.97	0.90
15	0.56	0.53
16	0.53	0.54
17	0.72	0.76
18	1.15	1.24
19	1.51	1.64
20	2.17	2.35

Z = 26

Q	-log[N(Q)/N]	
11	4.76	4.76
12	3.44	3.44
13	2.44	2.44
14	1.90	1.90
15	1.10	1.10
16	0.40	0.40
17	0.45	0.45
18	0.90	0.90
19	1.64	1.64
20	2.75	2.75
21	4.03	4.08
22	5.54	5.54

Z = 29

Q	-log[N(Q)/N]	
10	4.72	5.62
11	4.25	4.96
12	3.38	3.88
13	2.70	2.93
14	1.98	2.11
15	1.48	1.58
16	1.10	1.19
17	1.23	1.29
18	0.63	0.62
19	0.32	0.30
20	1.02	0.98
21	2.97	2.91
22	3.43	3.35
23	5.19	5.10

Z = 9

Q	-log[N(Q)/N]	
6	3.87	3.92
7	1.45	1.45
8	0.65	0.63
9	0.13	0.14

Z = 17

Q	-log[N(Q)/N]	
10	4.99	4.96
11	3.70	3.68
12	2.69	2.68
13	2.01	2.00
14	0.93	0.93
15	0.06	0.06
16	3.32	3.25

Z = 23

Q	-log[N(Q)/N]	
10	5.84	5.62
11	4.58	4.39
12	3.35	3.23
13	1.87	1.75
14	1.02	0.94
15	0.59	0.56
16	0.45	0.46
17	0.70	0.75
18	1.17	1.24
19	1.83	1.97
20	2.80	2.70
21	3.50	3.74

Z = 27

Q	-log[N(Q)/N]	
11	5.21	5.10
12	3.90	3.84
13	2.84	2.78
14	2.04	1.99
15	1.71	1.66
16	0.89	0.89
17	0.31	0.31
18	0.56	0.56
19	1.19	1.20
20	2.12	2.14
21	3.43	3.46
22	5.00	5.04

Z = 30

Q	-log[N(Q)/N]	
9	4.52	6.83
10	2.92	5.14
11	2.12	3.91
12	2.10	3.49
13	1.68	2.66
14	1.51	1.93
15	1.12	1.33
16	0.92	1.07
17	0.77	0.88
18	1.16	1.20
19	0.72	0.61
20	0.56	0.44
21	1.52	1.83
22	2.82	2.57
23	4.43	4.12

Z = 10

Q	-log[N(Q)/N]	
7	3.12	3.12
8	0.79	0.79
9	0.35	0.35
10	0.41	0.41

Z = 18

Q	-log[N(Q)/N]	
10	5.23	5.23
11	3.74	3.74
12	2.71	2.71
13	2.01	2.01
14	1.58	1.58
15	0.75	0.75
16	0.11	0.11
17	3.99	3.99

Z = 11

Q	-log[N(Q)/N]	
7	5.22	5.19
8	2.42	2.40
9	0.34	0.32
10	0.37	0.38
11	0.96	0.99

Z = 19

Q	-log[N(Q)/N]	
10	5.38	5.32
11	3.83	3.83
12	2.67	2.62
13	1.87	1.83
14	1.34	1.31
15	1.10	1.09
16	0.55	0.55
17	0.24	0.24
18	4.73	4.76

Z = 12

Q	-log[N(Q)/N]	
8	4.39	4.39
9	1.93	1.93
10	0.12	0.12
11	0.68	0.68
12	1.84	1.84

Z = 13

Q	-log[N(Q)/N]	
8	5.70	5.68
9	3.81	3.80
10	1.71	1.71
11	0.05	0.05
12	1.03	1.10
13	2.79	2.84

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$\log_{10}(\tau) = 6.8$

Z = 6		
Q	$-\log\{N(Q)/N\}$	
4	4.75	4.75
5	2.44	2.44
6	0.00	0.00
Z = 7		
Q	$-\log\{N(Q)/N\}$	
5	3.71	3.71
6	1.88	1.88
7	0.01	0.01
Z = 8		
Q	$-\log\{N(Q)/N\}$	
5	5.44	5.44
6	2.75	2.75
7	1.37	1.37
8	0.02	0.02
Z = 9		
Q	$-\log\{N(Q)/N\}$	
6	4.43	4.47
7	1.96	1.96
8	0.92	0.90
9	0.06	0.06
Z = 10		
Q	$-\log\{N(Q)/N\}$	
7	3.56	3.56
8	1.22	1.22
9	0.52	0.52
10	0.19	0.19
Z = 11		
Q	$-\log\{N(Q)/N\}$	
7	5.76	5.73
8	2.75	2.72
9	0.65	0.62
10	0.35	0.35
11	0.43	0.50
Z = 12		
Q	$-\log\{N(Q)/N\}$	
8	4.82	4.82
9	2.13	2.13
10	0.27	0.27
11	0.43	0.43
12	1.07	1.07
Z = 13		
Q	$-\log\{N(Q)/N\}$	
9	4.18	4.17
10	1.84	1.84
11	0.12	0.12
12	0.68	0.69
13	1.79	1.83

Z = 14		
Q	$-\log\{N(Q)/N\}$	
9	5.39	5.39
10	3.58	3.58
11	1.61	1.61
12	0.05	0.05
13	1.06	1.06
14	2.70	2.70
Z = 15		
Q	$-\log\{N(Q)/N\}$	
10	4.74	4.74
11	3.25	3.24
12	1.44	1.44
13	0.03	0.03
14	1.48	1.50
15	3.61	3.65
Z = 16		
Q	$-\log\{N(Q)/N\}$	
10	5.62	5.62
11	4.07	4.07
12	2.87	2.87
13	1.27	1.27
14	0.03	0.03
15	1.97	1.97
16	4.64	4.64
Z = 17		
Q	$-\log\{N(Q)/N\}$	
11	4.77	4.75
12	3.48	3.48
13	2.52	2.51
14	1.12	1.12
15	0.04	0.04
16	2.44	2.46
17	5.63	5.67
Z = 18		
Q	$-\log\{N(Q)/N\}$	
11	5.19	5.19
12	3.87	3.87
13	2.88	2.88
14	2.14	2.14
15	0.96	0.96
16	0.06	0.06
17	2.97	2.97
Z = 19		
Q	$-\log\{N(Q)/N\}$	
11	5.66	5.61
12	4.17	4.12
13	3.08	3.04
14	2.22	2.19
15	1.64	1.63
16	0.73	0.73
17	0.10	0.11
18	3.52	3.55

Z = 20		
Q	$-\log\{N(Q)/N\}$	
11	5.78	5.78
12	4.30	4.30
13	3.08	3.08
14	2.22	2.22
15	1.53	1.53
16	1.15	1.15
17	0.54	0.54
18	0.22	0.22
19	4.19	4.19
Z = 21		
Q	$-\log\{N(Q)/N\}$	
11	5.96	5.82
12	4.29	4.17
13	3.95	2.95
14	2.07	1.99
15	1.45	1.38
16	1.00	0.95
17	0.82	0.80
18	0.47	0.48
19	0.44	0.46
20	4.94	5.06
Z = 22		
Q	$-\log\{N(Q)/N\}$	
12	4.36	4.19
13	2.96	2.82
14	1.97	1.85
15	1.24	1.15
16	0.87	0.80
17	0.66	0.63
18	0.68	0.69
19	0.62	0.68
20	0.88	0.96
21	5.96	6.20
Z = 23		
Q	$-\log\{N(Q)/N\}$	
11	6.15	5.94
12	4.69	4.55
13	3.95	2.91
14	1.91	1.81
15	1.18	1.10
16	0.70	0.66
17	0.58	0.56
18	0.64	0.66
19	0.88	0.94
20	1.11	1.22
21	1.67	1.82

Z = 24		
Q	$-\log\{N(Q)/N\}$	
11	6.02	5.84
12	4.76	4.61
13	3.42	3.32
14	2.04	1.94
15	1.17	1.11
16	0.70	0.67
17	0.49	0.49
18	0.62	0.64
19	0.96	1.00
20	1.41	1.50
21	1.95	2.08
22	2.83	2.99
Z = 25		
Q	$-\log\{N(Q)/N\}$	
12	4.64	4.54
13	3.62	3.53
14	2.40	2.36
15	1.28	1.23
16	0.70	0.67
17	0.50	0.49
18	0.56	0.57
19	0.95	0.98
20	1.56	1.60
21	2.25	2.32
22	3.11	3.20
23	4.31	4.43
Z = 26		
Q	$-\log\{N(Q)/N\}$	
12	4.70	4.70
13	3.46	3.46
14	2.68	2.68
15	1.61	1.61
16	0.75	0.75
17	0.46	0.46
18	0.54	0.54
19	0.88	0.88
20	1.55	1.55
21	2.43	2.43
22	3.37	3.37
23	4.55	4.55
Z = 27		
Q	$-\log\{N(Q)/N\}$	
12	5.38	5.30
13	4.07	4.00
14	3.01	2.95
15	2.41	2.36
16	1.31	1.31
17	0.56	0.55
18	0.43	0.43
19	0.66	0.66
20	1.15	1.16
21	1.99	2.00
22	3.04	3.08
23	4.27	4.30
24	5.62	5.65

Z = 28		
Q	$-\log\{N(Q)/N\}$	
12	5.68	5.68
13	4.39	4.39
14	3.34	3.34
15	2.47	2.47
16	2.08	2.08
17	1.06	1.06
18	0.42	0.42
19	0.47	0.47
20	0.85	0.85
21	1.52	1.52
22	2.53	2.53
23	3.81	3.81
24	5.30	5.30
Z = 29		
Q	$-\log\{N(Q)/N\}$	
12	5.26	5.79
13	4.34	4.58
14	3.35	3.50
15	2.57	2.70
16	1.91	2.02
17	1.75	1.83
18	0.85	0.85
19	0.83	0.83
20	0.57	0.56
21	1.14	1.11
22	1.99	1.94
23	3.19	3.13
24	4.73	4.61
Z = 30		
Q	$-\log\{N(Q)/N\}$	
10	5.30	7.70
11	4.29	6.26
12	4.05	5.60
13	3.39	4.51
14	2.97	3.50
15	2.32	2.63
16	1.81	2.08
17	1.37	1.59
18	1.45	1.59
19	0.69	0.69
20	0.31	0.30
21	0.77	0.71
22	1.54	1.43
23	2.59	2.44
24	3.99	3.81
25	5.83	5.49

$$\log_{10}(T) = 6.9$$

Z = 6

Q	-log[F(Q)/F]	
4	5.13	5.13
5	2.63	2.63
6	0.99	0.99

Z = 7

Q	-log[F(Q)/F]	
5	4.13	4.13
6	2.10	2.10
7	0.99	0.99

Z = 8

Q	-log[F(Q)/F]	
6	3.22	3.22
7	1.62	1.62
8	0.91	0.91

Z = 9

Q	-log[F(Q)/F]	
6	4.98	5.01
7	2.44	2.44
8	1.19	1.17
9	0.93	0.93

Z = 10

Q	-log[F(Q)/F]	
7	4.95	4.95
8	1.69	1.69
9	0.77	0.77
10	0.99	0.99

Z = 11

Q	-log[F(Q)/F]	
8	3.20	3.17
9	1.95	1.93
10	0.49	0.48
11	0.23	0.24

Z = 12

Q	-log[F(Q)/F]	
8	5.35	5.35
9	2.46	2.46
10	0.54	0.54
11	0.36	0.36
12	0.56	0.56

Z = 13

Q	-log[F(Q)/F]	
9	4.61	4.59
10	2.95	2.94
11	0.27	0.26
12	0.44	0.44
13	1.06	1.08

Z = 14

Q	-log[F(Q)/F]	
9	5.99	5.99
10	3.95	3.95
11	1.75	1.75
12	0.12	0.12
13	0.68	0.68
14	1.76	1.76

Z = 15

Q	-log[F(Q)/F]	
10	5.34	5.34
11	3.61	3.60
12	1.56	1.56
13	0.06	0.06
14	0.98	1.00
15	2.50	2.53

Z = 16

Q	-log[F(Q)/F]	
11	4.68	4.68
12	3.25	3.25
13	1.39	1.39
14	0.94	0.94
15	1.37	1.37
16	3.35	3.35

Z = 17

Q	-log[F(Q)/F]	
11	5.71	5.69
12	4.16	4.16
13	2.94	2.93
14	1.26	1.26
15	0.93	0.93
16	1.75	1.76
17	4.17	4.20

Z = 18

Q	-log[F(Q)/F]	
12	4.90	4.90
13	3.63	3.63
14	2.61	2.61
15	1.12	1.12
16	0.94	0.94
17	2.18	2.18
18	5.98	5.98

Z = 19

Q	-log[F(Q)/F]	
12	5.55	5.59
13	4.18	4.15
14	3.94	3.91
15	2.15	2.14
16	0.92	0.92
17	0.06	0.06
18	2.62	2.63
19	5.98	6.61

Z = 20

Q	-log[F(Q)/F]	
12	6.00	6.00
13	4.51	4.51
14	3.36	3.36
15	2.35	2.35
16	1.66	1.66
17	0.71	0.71
18	0.11	0.11
19	3.12	3.12

Z = 21

Q	-log[F(Q)/F]	
13	4.71	4.61
14	3.46	3.37
15	2.54	2.47
16	1.76	1.71
17	1.24	1.21
18	0.55	0.54
19	0.29	0.29
20	3.66	3.74

Z = 22

Q	-log[F(Q)/F]	
13	4.72	4.55
14	3.45	3.31
15	2.44	2.32
16	1.76	1.65
17	1.21	1.14
18	0.87	0.84
19	0.45	0.46
20	0.37	0.39
21	4.31	4.47

Z = 23

Q	-log[F(Q)/F]	
13	4.72	4.54
14	3.32	3.17
15	2.31	2.18
16	1.54	1.44
17	1.10	1.01
18	0.89	0.75
19	0.66	0.65
20	0.51	0.53
21	0.71	0.77
22	5.17	5.38

Z = 24

Q	-log[F(Q)/F]	
13	4.84	4.72
14	3.30	3.18
15	2.17	2.07
16	1.62	1.52
17	0.88	0.84
18	0.68	0.65
19	0.64	0.63
20	0.71	0.74
21	0.85	0.92
22	1.33	1.42

Z = 25

Q	-log[F(Q)/F]	
13	4.92	4.83
14	3.47	3.42
15	2.19	2.13
16	1.33	1.29
17	0.82	0.80
18	0.55	0.55
19	0.60	0.60
20	0.82	0.83
21	1.10	1.14
22	1.54	1.60
23	2.32	2.40

Z = 26

Q	-log[F(Q)/F]	
13	4.72	4.72
14	3.70	3.70
15	2.39	2.39
16	1.37	1.37
17	0.78	0.78
18	0.54	0.54
19	0.54	0.54
20	0.83	0.83
21	1.32	1.32
22	1.83	1.83
23	2.57	2.57
24	3.66	3.66

Z = 27

Q	-log[F(Q)/F]	
13	5.50	5.43
14	4.20	4.13
15	3.36	3.30
16	2.00	2.00
17	1.08	1.07
18	0.63	0.62
19	0.50	0.50
20	0.62	0.63
21	1.05	1.06
22	1.67	1.70
23	2.43	2.45
24	3.30	3.33
25	4.58	4.62

Z = 28

Q	-log[F(Q)/F]	
13	5.99	5.99
14	4.69	4.69
15	3.58	3.58
16	2.93	2.93
17	1.65	1.65
18	0.82	0.82
19	0.51	0.51
20	0.52	0.52
21	0.78	0.78
22	1.35	1.35
23	2.16	2.16
24	3.14	3.14
25	4.18	4.18
26	5.67	5.67

Z = 29

Q	-log[F(Q)/F]	
14	4.89	5.04
15	3.85	3.98
16	2.92	3.04
17	2.49	2.58
18	1.32	1.34
19	0.60	0.62
20	0.46	0.46
21	0.62	0.60
22	1.03	1.01
23	1.76	1.72
24	2.78	2.68
25	3.98	3.90
26	5.22	5.12

69

$$\log_{10}(\tau) = 7.0$$

Z = 6

Q	-log[N(Q)/N]	
4	5.48	5.48
5	2.80	2.80
6	0.00	0.00

Z = 7

Q	-log[N(Q)/N]	
5	4.53	4.53
6	2.30	2.30
7	0.00	0.00

Z = 8

Q	-log[N(Q)/N]	
6	3.65	3.65
7	1.84	1.84
8	0.01	0.01

Z = 9

Q	-log[N(Q)/N]	
6	5.52	5.54
7	2.89	2.89
8	1.43	1.42
9	0.02	0.02

Z = 10

Q	-log[N(Q)/N]	
7	4.55	4.55
8	2.14	2.14
9	1.02	1.02
10	0.05	0.05

Z = 11

Q	-log[N(Q)/N]	
8	3.72	3.69
9	1.51	1.49
10	0.70	0.69
11	0.11	0.12

Z = 12

Q	-log[N(Q)/N]	
9	2.92	2.92
10	0.92	0.92
11	0.45	0.45
12	0.28	0.28

Z = 13

Q	-log[N(Q)/N]	
9	5.14	5.12
10	2.37	2.37
11	0.52	0.51
12	0.37	0.37
13	0.57	0.59

Z = 14

Q	-log[N(Q)/N]	
10	4.38	4.38
11	1.96	1.96
12	0.26	0.26
13	0.45	0.45
14	1.06	1.06

Z = 15

Q	-log[N(Q)/N]	
10	5.95	5.93
11	3.99	3.98
12	1.71	1.71
13	0.14	0.14
14	0.64	0.64
15	1.63	1.65

Z = 16

Q	-log[N(Q)/N]	
11	5.26	5.26
12	3.61	3.61
13	1.51	1.51
14	0.07	0.07
15	0.92	0.92
16	2.32	2.32

Z = 17

Q	-log[N(Q)/N]	
12	4.77	4.77
13	3.31	3.30
14	1.37	1.37
15	0.05	0.05
16	1.22	1.23
17	3.00	3.03

Z = 18

Q	-log[N(Q)/N]	
12	5.80	5.80
13	4.29	4.29
14	3.00	3.00
15	1.25	1.25
16	0.04	0.04
17	1.56	1.56
18	3.76	3.76

Z = 19

Q	-log[N(Q)/N]	
13	5.16	5.13
14	3.74	3.72
15	2.58	2.58
16	1.07	1.07
17	0.05	0.05
18	1.91	1.92
19	4.51	4.53

Z = 20

Q	-log[N(Q)/N]	
13	5.81	5.81
14	4.41	4.41
15	3.11	3.11
16	2.12	2.12
17	0.88	0.88
18	0.07	0.07
19	2.31	2.31
20	5.33	5.33

Z = 21

Q	-log[N(Q)/N]	
14	4.79	4.71
15	3.61	3.53
16	2.53	2.48
17	1.70	1.67
18	0.71	0.70
19	0.11	0.11
20	2.73	2.79

Z = 22

Q	-log[N(Q)/N]	
14	5.03	4.89
15	3.76	3.63
16	2.80	2.68
17	1.94	1.86
18	1.29	1.25
19	0.55	0.54
20	0.19	0.19
21	3.22	3.33

Z = 23

Q	-log[N(Q)/N]	
14	5.05	4.88
15	3.78	3.63
16	2.74	2.61
17	2.00	1.89
18	1.39	1.31
19	0.92	0.88
20	0.44	0.44
21	0.33	0.35
22	3.80	3.94

Z = 24

Q	-log[N(Q)/N]	
14	5.01	4.86
15	3.64	3.51
16	2.61	2.50
17	1.81	1.72
18	1.30	1.22
19	0.94	0.89
20	0.66	0.64
21	0.45	0.48
22	0.61	0.65
23	4.55	4.69

Z = 25

Q	-log[N(Q)/N]	
14	4.97	4.90
15	3.52	3.45
16	2.41	2.35
17	1.63	1.58
18	1.07	1.04
19	0.80	0.77
20	0.69	0.67
21	0.61	0.62
22	0.69	0.72
23	1.12	1.16
24	5.55	5.66

Z = 26

Q	-log[N(Q)/N]	
14	5.05	5.05
15	3.52	3.52
16	2.33	2.33
17	1.48	1.48
18	0.95	0.95
19	0.65	0.65
20	0.61	0.61
21	0.75	0.75
22	0.88	0.88
23	1.25	1.25
24	1.96	1.96

Z = 27

Q	-log[N(Q)/N]	
14	5.68	5.61
15	4.61	4.55
16	3.02	3.01
17	1.92	1.91
18	1.18	1.17
19	0.75	0.74
20	0.55	0.55
21	0.62	0.62
22	0.86	0.88
23	1.21	1.22
24	1.67	1.70
25	2.36	2.79

Z = 28

Q	-log[N(Q)/N]	
15	4.97	4.97
16	4.08	4.08
17	2.55	2.55
18	1.55	1.55
19	0.93	0.93
20	0.61	0.61
21	0.52	0.52
22	0.71	0.71
23	1.10	1.10
24	1.64	1.64
25	2.25	2.25
26	3.32	3.32

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log10(T deg K) = 6.0

Z	uncorrected		corrected	
	interp. coeffs.	interp. rates	interp. coeffs.	interp. rates
	<Q>	<Q>	<Q>	<Q>
6	5.035	5.035	4.907	4.907
7	5.178	5.178	5.173	5.173
8	6.007	6.007	6.007	6.007
9	6.990	6.989	6.990	6.989
10	7.948	7.948	7.948	7.948
11	8.737	8.709	8.737	8.709
12	8.287	8.287	8.287	8.287
13	7.165	7.120	7.558	7.500
14	7.351	7.351	7.531	7.531
15	7.644	7.583	7.659	7.595
16	7.769	7.769	7.769	7.769
17	7.989	7.947	7.989	7.947
18	8.374	8.374	8.374	8.374
19	9.033	9.069	9.067	9.053
20	9.239	9.239	9.232	9.232
21	8.508	8.359	8.991	8.694
22	8.637	8.411	8.779	8.476
23	8.942	8.684	8.955	8.630
24	9.096	8.694	9.097	8.694
25	8.920	8.478	8.920	8.478
26	7.865	7.865	7.865	7.865
27	7.999	7.938	7.999	7.938
28	8.396	8.396	8.396	8.396
29	8.756	8.938	8.756	8.938
30	9.294	9.526	9.294	9.526

log10(T deg K) = 6.1

Z	uncorrected		corrected	
	interp. coeffs.	interp. rates	interp. coeffs.	interp. rates
	<Q>	<Q>	<Q>	<Q>
6	5.629	5.629	5.404	5.404
7	5.557	5.557	5.488	5.488
8	6.067	6.067	6.066	6.066
9	7.000	6.999	7.000	6.999
10	7.930	7.930	7.930	7.930
11	8.922	8.916	8.922	8.916
12	9.592	9.592	9.592	9.592
13	8.777	8.662	9.112	9.017
14	7.819	7.819	8.411	8.411
15	8.319	8.277	8.443	8.390
16	8.562	8.562	8.562	8.562
17	8.761	8.716	8.761	8.716
18	8.940	8.940	8.940	8.940
19	9.447	9.424	9.414	9.392
20	9.961	9.961	9.937	9.937
21	9.810	9.688	10.401	10.255
22	9.398	9.268	10.260	9.842
23	9.662	9.437	9.913	9.567
24	9.944	9.680	9.971	9.693
25	9.980	9.764	9.989	9.703
26	9.242	9.242	9.242	9.242
27	8.866	8.633	8.866	8.633
28	8.838	8.838	8.838	8.838
29	9.162	9.367	9.162	9.367
30	9.571	9.928	9.571	9.928

log10(T deg K) = 6.2

Z	uncorrected		corrected	
	interp. coeffs.	interp. rates	interp. coeffs.	interp. rates
	<Q>	<Q>	<Q>	<Q>
6	5.874	5.874	5.753	5.753
7	6.176	6.176	5.942	5.942
8	6.277	6.277	6.253	6.253
9	7.040	7.033	7.040	7.033
10	7.994	7.994	7.994	7.994
11	8.969	8.967	8.969	8.967
12	9.882	9.882	9.882	9.882
13	10.511	10.478	10.519	10.489
14	8.879	8.879	9.929	9.929
15	9.004	8.965	9.399	9.349
16	9.354	9.354	9.354	9.354
17	9.668	9.570	9.668	9.570
18	9.748	9.748	9.748	9.748
19	10.059	10.028	10.029	9.997
20	10.477	10.477	10.431	10.431
21	10.841	10.766	11.039	10.968
22	10.496	10.321	11.539	11.358
23	10.372	10.191	11.506	11.109
24	10.684	10.503	11.068	10.752
25	10.923	10.758	10.972	10.791
26	10.715	10.715	10.718	10.718
27	10.430	10.050	10.430	10.050
28	9.545	9.545	9.545	9.545
29	9.581	9.814	9.581	9.814
30	9.912	10.861	9.912	10.861

log10(T deg K) = 6.3

Z	uncorrected		corrected	
	interp. coeffs.	interp. rates	interp. coeffs.	interp. rates
	<Q>	<Q>	<Q>	<Q>
6	5.954	5.954	5.902	5.902
7	6.677	6.677	6.439	6.439
8	6.759	6.759	6.605	6.605
9	7.197	7.178	7.184	7.168
10	8.021	8.021	8.021	8.021
11	8.988	8.987	8.988	8.987
12	9.952	9.952	9.952	9.952
13	10.861	10.855	10.857	10.851
14	11.263	11.263	11.428	11.423
15	10.768	10.724	11.134	11.102
16	10.419	10.419	10.419	10.419
17	10.468	10.434	10.468	10.434
18	10.655	10.655	10.655	10.655
19	10.893	10.860	10.882	10.848
20	11.151	11.151	11.114	11.114
21	11.580	11.488	11.587	11.497
22	11.722	11.575	12.146	12.038
23	11.339	11.159	12.653	12.492
24	11.372	11.233	12.718	12.431
25	11.695	11.591	12.235	12.033
26	11.852	11.852	11.934	11.934
27	11.895	11.699	11.903	11.706
28	11.051	11.051	11.051	11.051
29	10.127	10.563	10.127	10.563
30	10.283	10.824	10.283	10.824

log₁₀(T deg K) = 6.4

Z	uncorrected		corrected	
	interp. coeffs.	interp. rates	interp. coeffs.	interp. rates
	<Q>	<Q>	<Q>	<Q>
6	5.931	5.931	5.958	5.958
7	6.834	6.834	6.758	6.758
8	7.394	7.394	7.098	7.098
9	7.599	7.569	7.489	7.471
10	8.130	8.130	8.123	8.123
11	9.013	9.010	9.013	9.010
12	9.976	9.976	9.976	9.976
13	10.941	10.939	10.940	10.938
14	11.824	11.824	11.825	11.825
15	12.491	12.483	12.498	12.490
16	12.410	12.410	12.410	12.410
17	11.724	11.672	11.724	11.672
18	11.591	11.591	11.591	11.591
19	11.836	11.807	11.834	11.805
20	12.029	12.029	12.017	12.017
21	12.368	12.262	12.345	12.235
22	12.690	12.541	12.753	12.617
23	12.648	12.461	13.255	13.140
24	12.259	12.112	13.740	13.632
25	12.373	12.297	13.880	13.744
26	12.686	12.686	13.392	13.392
27	13.025	12.970	13.227	13.143
28	12.857	12.857	12.857	12.857
29	11.305	12.239	11.303	12.234
30	10.722	11.680	10.722	11.680

log₁₀(T deg K) = 6.5

Z	uncorrected		corrected	
	interp. coeffs.	interp. rates	interp. coeffs.	interp. rates
	<Q>	<Q>	<Q>	<Q>
6	5.991	5.991	5.980	5.980
7	6.954	6.954	6.897	6.897
8	7.771	7.771	7.549	7.549
9	8.217	8.166	7.930	7.910
10	8.449	8.449	8.376	8.376
11	9.102	9.091	9.096	9.086
12	10.001	10.001	10.000	10.000
13	10.969	10.969	10.969	10.968
14	11.925	11.925	11.924	11.924
15	12.837	12.835	12.832	12.829
16	13.568	13.563	13.568	13.568
17	13.806	13.767	13.800	13.767
18	13.118	13.118	13.118	13.118
19	12.930	12.893	12.930	12.893
20	13.054	13.054	13.052	13.052
21	13.310	13.209	13.302	13.199
22	13.591	13.440	13.580	13.427
23	13.813	13.646	13.925	13.783
24	13.607	13.432	14.365	14.268
25	13.263	13.119	14.027	14.765
26	13.365	13.365	15.011	15.011
27	14.106	14.132	15.140	15.033
28	14.662	14.662	14.662	14.662
29	13.809	14.524	13.552	14.200
30	11.519	13.713	11.500	13.583

log₁₀(T deg K) = 6.6

Z	uncorrected		corrected	
	interp. coeffs.	interp. rates	interp. coeffs.	interp. rates
	<Q>	<Q>	<Q>	<Q>
6	5.995	5.995	5.989	5.989
7	6.930	6.930	6.952	6.952
8	7.912	7.912	7.799	7.799
9	8.673	8.657	8.393	8.374
10	9.022	9.022	8.770	8.770
11	9.359	9.333	9.297	9.278
12	10.071	10.071	10.066	10.066
13	10.998	10.996	10.993	10.996
14	11.960	11.960	11.960	11.960
15	12.922	12.921	12.920	12.919
16	13.837	13.837	13.837	13.837
17	14.663	14.655	14.663	14.655
18	15.133	15.133	15.133	15.133
19	14.870	14.798	14.870	14.798
20	14.422	14.422	14.422	14.422
21	14.430	14.338	14.429	14.336
22	14.600	14.465	14.594	14.458
23	14.817	14.669	14.817	14.668
24	14.937	14.792	15.096	14.982
25	14.561	14.449	15.468	15.412
26	14.138	14.138	15.838	15.838
27	15.388	15.520	16.521	16.477
28	16.815	16.815	16.815	16.815
29	17.671	17.732	16.246	16.585
30	15.419	17.997	13.795	15.857

log₁₀(T deg K) = 6.7

Z	uncorrected		corrected	
	interp. coeffs.	interp. rates	interp. coeffs.	interp. rates
	<Q>	<Q>	<Q>	<Q>
6	5.997	5.997	5.994	5.994
7	6.990	6.990	6.976	6.976
8	7.962	7.962	7.907	7.907
9	8.869	8.863	8.705	8.693
10	9.543	9.543	9.221	9.221
11	9.835	9.845	9.645	9.617
12	10.278	10.278	10.227	10.227
13	11.074	11.069	11.067	11.063
14	11.994	11.994	11.993	11.993
15	12.958	12.957	12.957	12.956
16	13.916	13.916	13.916	13.916
17	14.858	14.856	14.858	14.856
18	15.731	15.731	15.731	15.731
19	16.360	16.339	16.360	16.339
20	16.431	16.431	16.431	16.431
21	16.124	15.983	16.124	15.988
22	15.891	15.744	15.890	15.743
23	15.911	15.781	15.908	15.776
24	16.043	15.923	16.052	15.939
25	16.044	15.956	16.260	16.196
26	15.464	15.464	16.560	16.560
27	16.659	16.786	17.228	17.211
28	17.873	17.873	17.873	17.873
29	18.910	18.829	18.325	18.440
30	19.617	19.710	17.858	18.625

log10(T deg K) = 6.8

Z	uncorrected		corrected	
	interp. coeffs.	interp. rates	interp. coeffs.	interp. rates
	<Q>	<Q>	<Q>	<Q>
6	5.998	5.998	5.996	5.996
7	6.994	6.994	6.987	6.987
8	7.981	7.981	7.953	7.953
9	8.943	8.940	8.858	8.853
10	9.808	9.808	9.581	9.581
11	10.450	10.423	10.098	10.070
12	10.751	10.751	10.532	10.532
13	11.268	11.275	11.228	11.219
14	12.075	12.075	12.066	12.066
15	12.998	12.997	12.997	12.995
16	13.954	13.954	13.954	13.954
17	14.921	14.920	14.921	14.920
18	15.873	15.873	15.873	15.873
19	16.749	16.745	16.749	16.745
20	17.454	17.454	17.454	17.454
21	17.869	17.792	17.869	17.793
22	17.791	17.601	17.791	17.601
23	17.440	17.265	17.440	17.264
24	17.264	17.156	17.262	17.154
25	17.270	17.206	17.290	17.230
26	17.108	17.108	17.415	17.415
27	17.820	17.866	18.005	17.991
28	18.611	18.611	18.611	18.611
29	19.428	19.377	19.220	19.262
30	20.167	20.169	19.738	19.901

log10(T deg K) = 6.9

Z	uncorrected		corrected	
	interp. coeffs.	interp. rates	interp. coeffs.	interp. rates
	<Q>	<Q>	<Q>	<Q>
6	5.999	5.999	5.998	5.998
7	6.997	6.997	6.992	6.992
8	7.990	7.990	7.975	7.975
9	8.972	8.971	8.928	8.925
10	9.914	9.914	9.787	9.787
11	10.765	10.754	10.496	10.478
12	11.345	11.345	10.975	10.975
13	11.763	11.741	11.529	11.515
14	12.295	12.295	12.227	12.227
15	13.096	13.092	13.082	13.078
16	14.004	14.004	14.001	14.001
17	14.961	14.960	14.960	14.959
18	15.926	15.926	15.926	15.926
19	16.866	16.865	16.866	16.865
20	17.747	17.747	17.747	17.747
21	18.534	18.514	18.534	18.514
22	19.103	19.026	19.104	19.027
23	19.273	19.112	19.273	19.112
24	19.000	18.845	19.000	18.845
25	18.662	18.595	18.662	18.595
26	18.500	18.500	18.540	18.540
27	19.025	19.020	19.060	19.043
28	19.593	19.593	19.592	19.593
29	20.204	20.203	20.127	20.168

log10(T deg K) = 7.0

Z	uncorrected		corrected	
	interp. coeffs.	interp. rates	interp. coeffs.	interp. rates
	<Q>	<Q>	<Q>	<Q>
6	5.999	5.999	5.998	5.998
7	6.998	6.998	6.995	6.995
8	7.994	7.994	7.985	7.985
9	8.985	8.984	8.960	8.959
10	9.958	9.958	9.889	9.889
11	10.895	10.891	10.738	10.730
12	11.714	11.714	11.402	11.402
13	12.343	12.325	11.959	11.944
14	12.768	12.768	12.521	12.521
15	13.351	13.341	13.258	13.252
16	14.121	14.121	14.098	14.098
17	15.025	15.023	15.020	15.018
18	15.970	15.970	15.969	15.969
19	16.922	16.922	16.922	16.922
20	17.855	17.855	17.855	17.855
21	18.754	18.749	18.755	18.750
22	19.570	19.549	19.572	19.550
23	20.222	20.165	20.224	20.166
24	20.566	20.465	20.568	20.466
25	20.465	20.379	20.465	20.379
26	20.079	20.079	20.081	20.081
27	20.445	20.417	20.448	20.419
28	20.873	20.873	20.873	20.873

Effect of Rate-Coefficient Corrections on
Shull & van Steenberg (1982) Calculation of Mean α for Fe

