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Meyrin, 18th December 1964

(Draft)

THE ANALYSIS OF "ONE PROTON" NEUTRINO ELASTIC EVENTS

In the analysis of this report, the neutrino spectrum and the cross section are taken exactly the same to what appeared in Phys. Letter (12, 281).

The events which passed the following tests were chosen.

1) $q^2 < q^2_{max} = 4 E^2_{\nu} (M + p_f) / (2 E_{\nu} + M - p_f)$

2) M^{*2} must lie in 0.880 ± 0.400 $(Gev)^2$

3) E_{vis} does not deviate from E_{cal} more than 2 standard deviations of its quoted error.

4) Not $P_x \leq 0.2$ when $E_{vis} \geq 0.5$

5) No "O.V." events.

The number of such events amounted to 78 events.

The first diagram shows an E_{vis} - histogram of one proton elastic events throughout the whole runs. The expected curve is fitted. Since we know that the Van der Meer estimation is consistent with the observed event rate except for below 400 Mev (Fig. 6 of above reference), the fit was made with a cut off at 400 Mev. X^2 - test up to 1.8 Gev assesses the probability of the deviation from the curve to be less than 3 o/o, if the deviation is only due to the statistical fluctuation.

Some time about a year ago it was suggested that among the neutrino events observed in 1963 the distribution of invariant mass made of μ-p system in a single proton elastic event has an indication of a peak at about 1.85 Gev.

As the scanning of ν spectrum calibration run goes on, the possibility of the parents spectrum having such structures that would cause a peaking in ν spectrum is becoming less likely.

Fig. 2 shows a histogram of c.m. energy of the μ-p system in question. The same histogram with 200 Mev intervals is shown in Fig. 3. Of the two, the dashed is the one whose interval was shifted by 100 Mev. The boxes with diagonal lines are the events balancing within the limit of 300 Mev/c.

For the solid histogram, X^2-test from 1.3 to 2.4 Gev gives less than 0.5 o/o probability for the statistical deviation. For the dashed, however, it is less than 1.5 o/o.

Some of the events in 1963 (events that lie between 1.7 and 1.9 Gev) were remeasured according to the 1964 data handling system. The remeasurement shifted four of the events in 1.8 Gev channel to 1.9 Gev channel and also caused some other minor moves of the boxes. (Fig. 4). (However, those are not the final remeasurements). If one takes the results of new measurements and sum to 1964 data, the histogram becomes as shown in Fig. 5 (X^2-test, $<$ 1 o/o for the solid, $<$ 0.2 o/o for the dashed). The same histogram but with 100 Mev intervals (Fig. 6) indicates a sharp peak, however, one should not expect a particular significance for this because one or two boxes could easily shift to neighbouring channels if further remeasurements were done.

For the moment, 95 o/o would be a reasonable guess as the estimate of non-statistical variation of the above peak, if the numbers for the flux and cross section as appeared in our last publication are truly fulfilled.

Although from the data and their analysis obtained so far any remarks on this problem should be expressed in a very conservative manner, in connection with future experiments of neutrino physics following things are suggested.

1) Verification for such fluctuation should be incorporated as one of the well prescribed programmes in the future experiment.

2) In order to do so, the improvement in measurement accuracies and data handling for the heavy liquid must be firstly looked into. Secondly the control of the experimental conditions for the whole period of experiments should be well monitored. Both require a long time plan and a well organised man-power. Apart from the hunt for the intermediate boson the precision is the main clue to break through this problem.

H. Yoshiki

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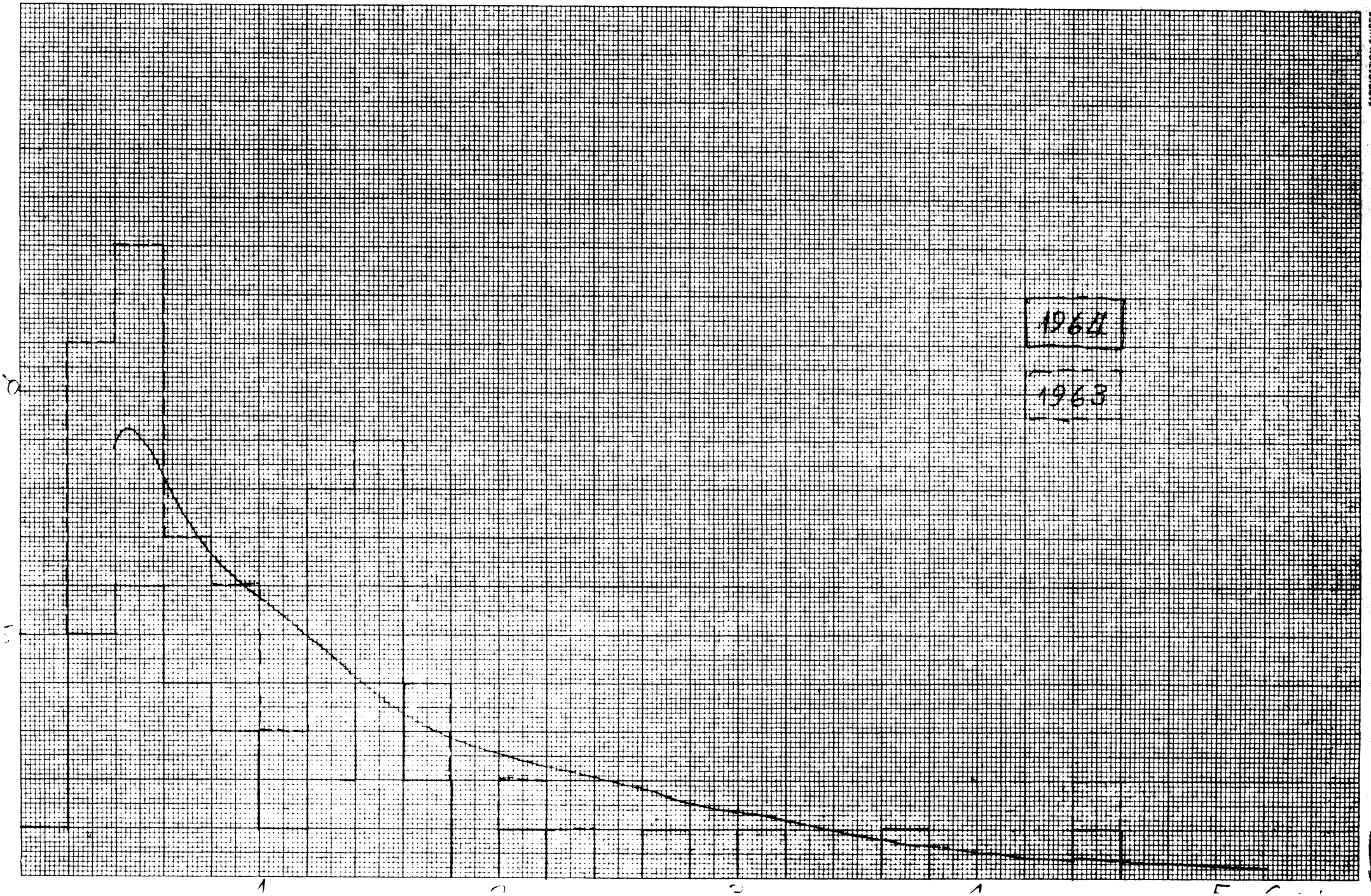
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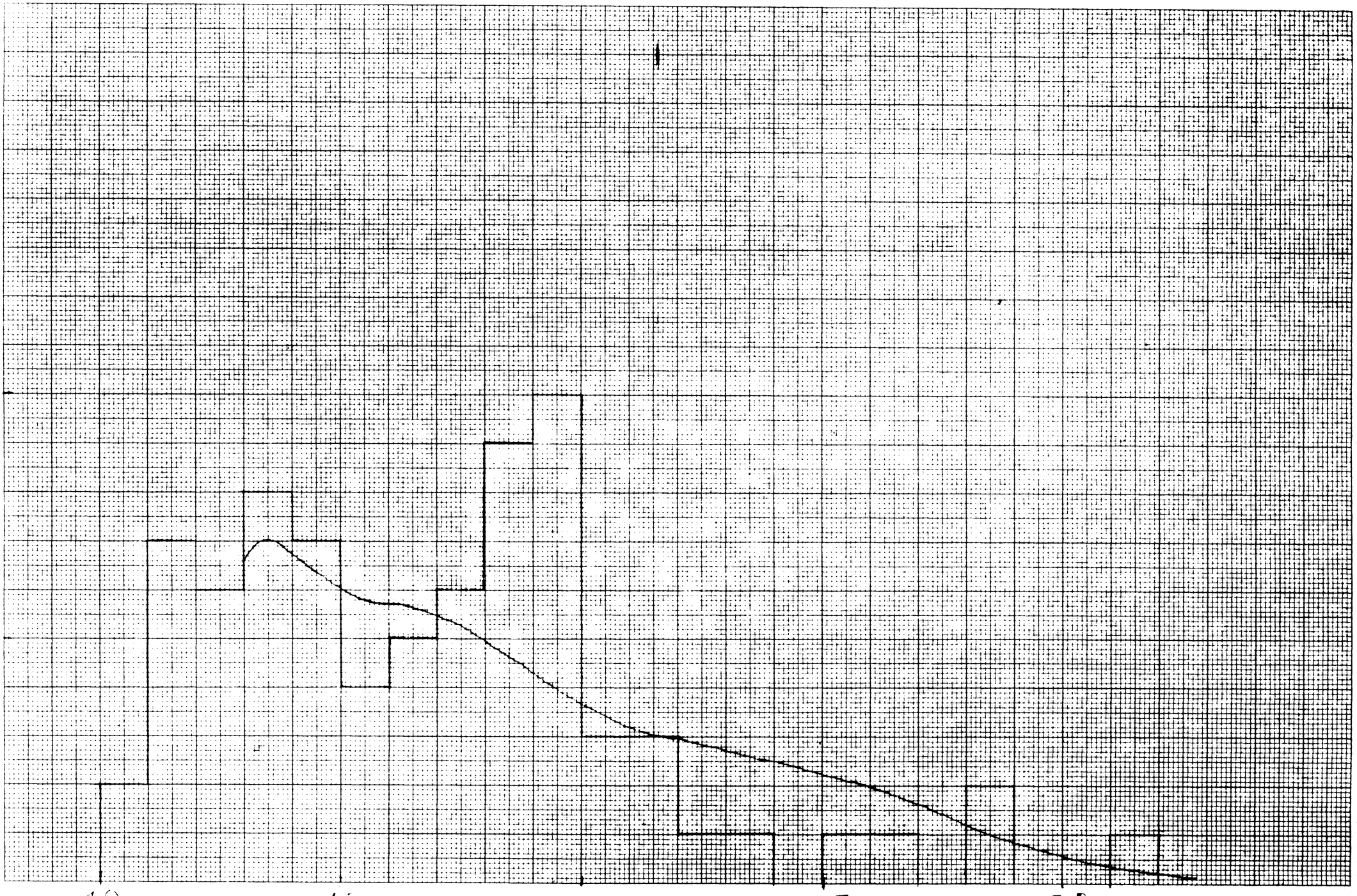

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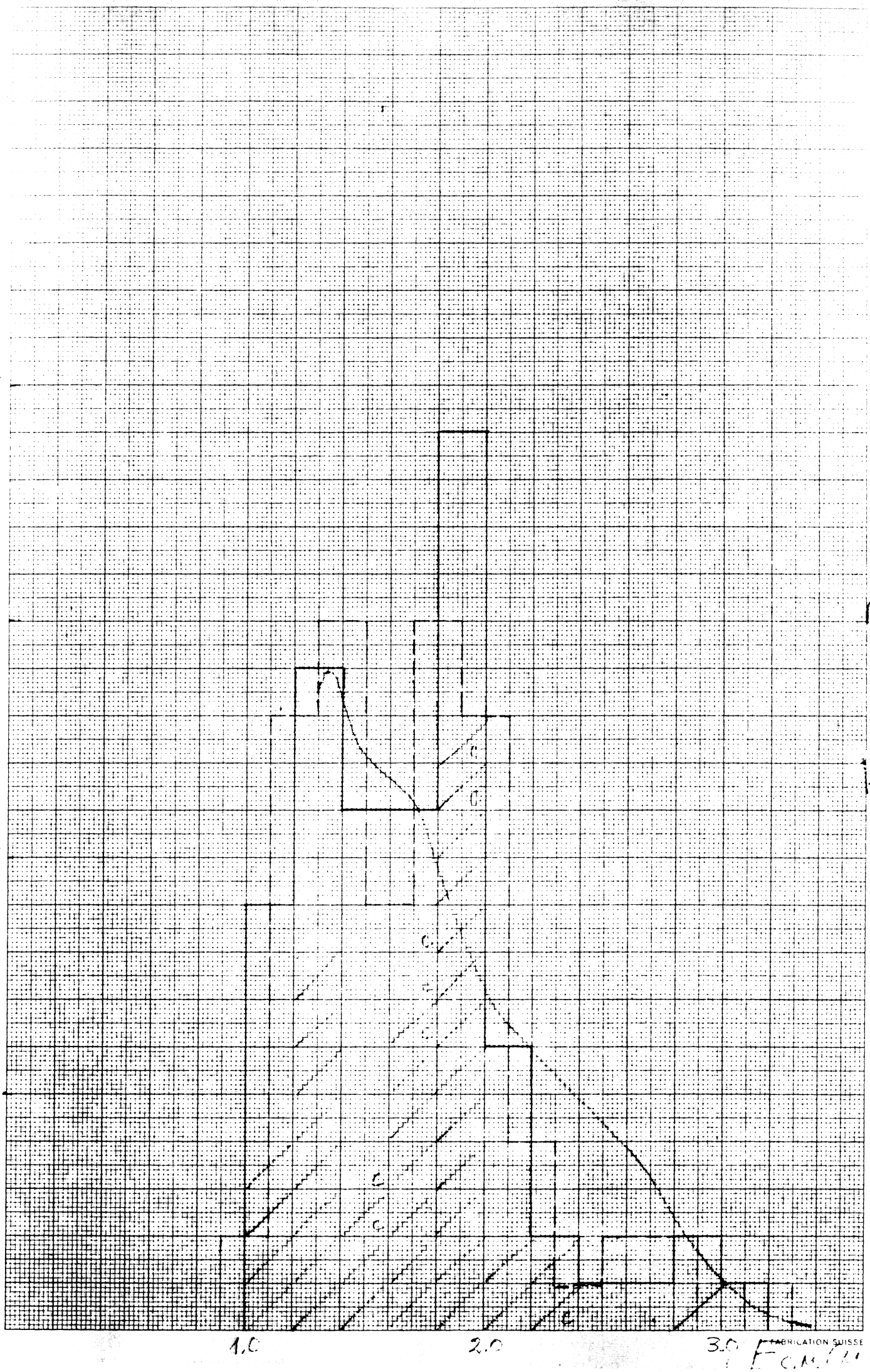
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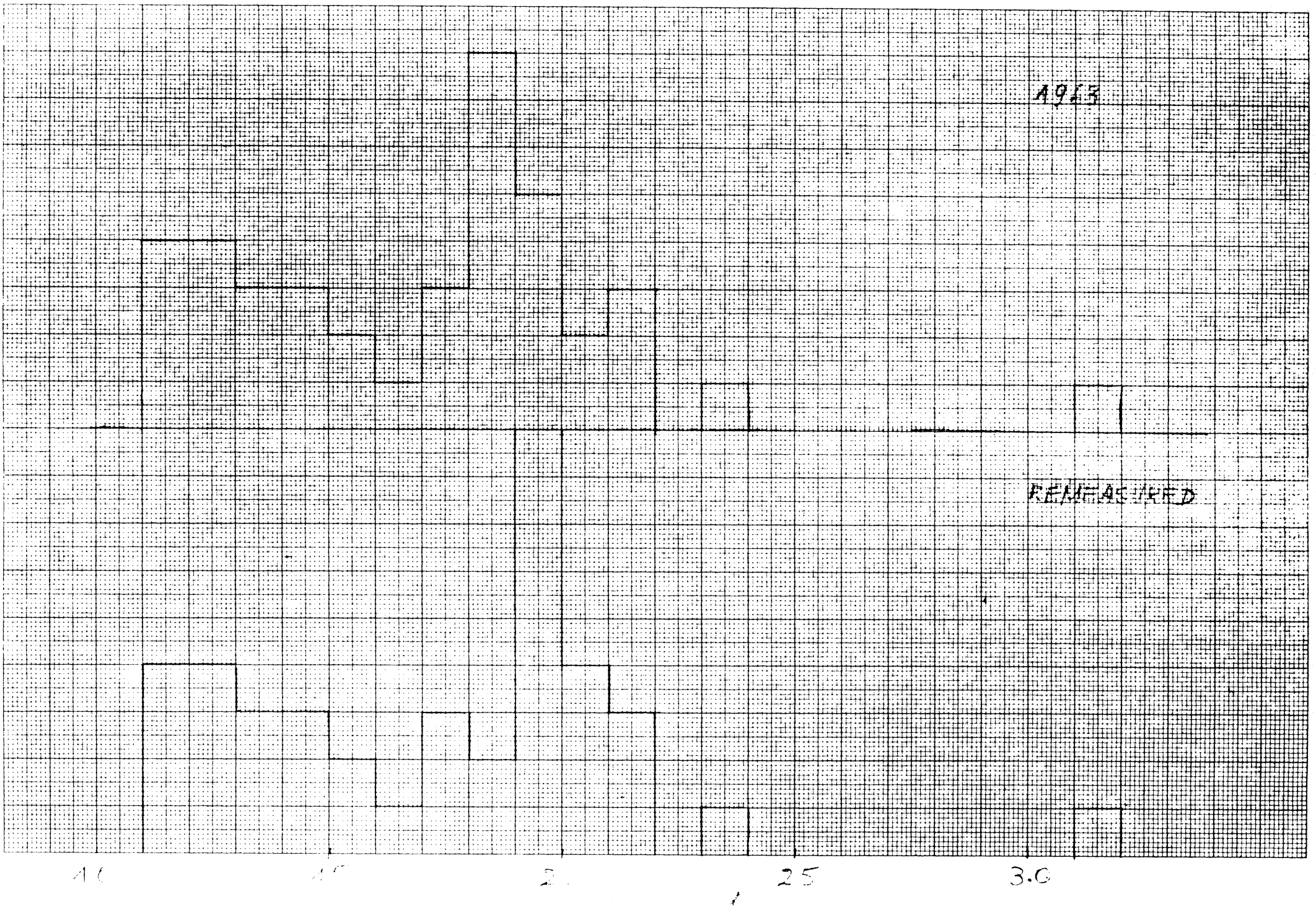
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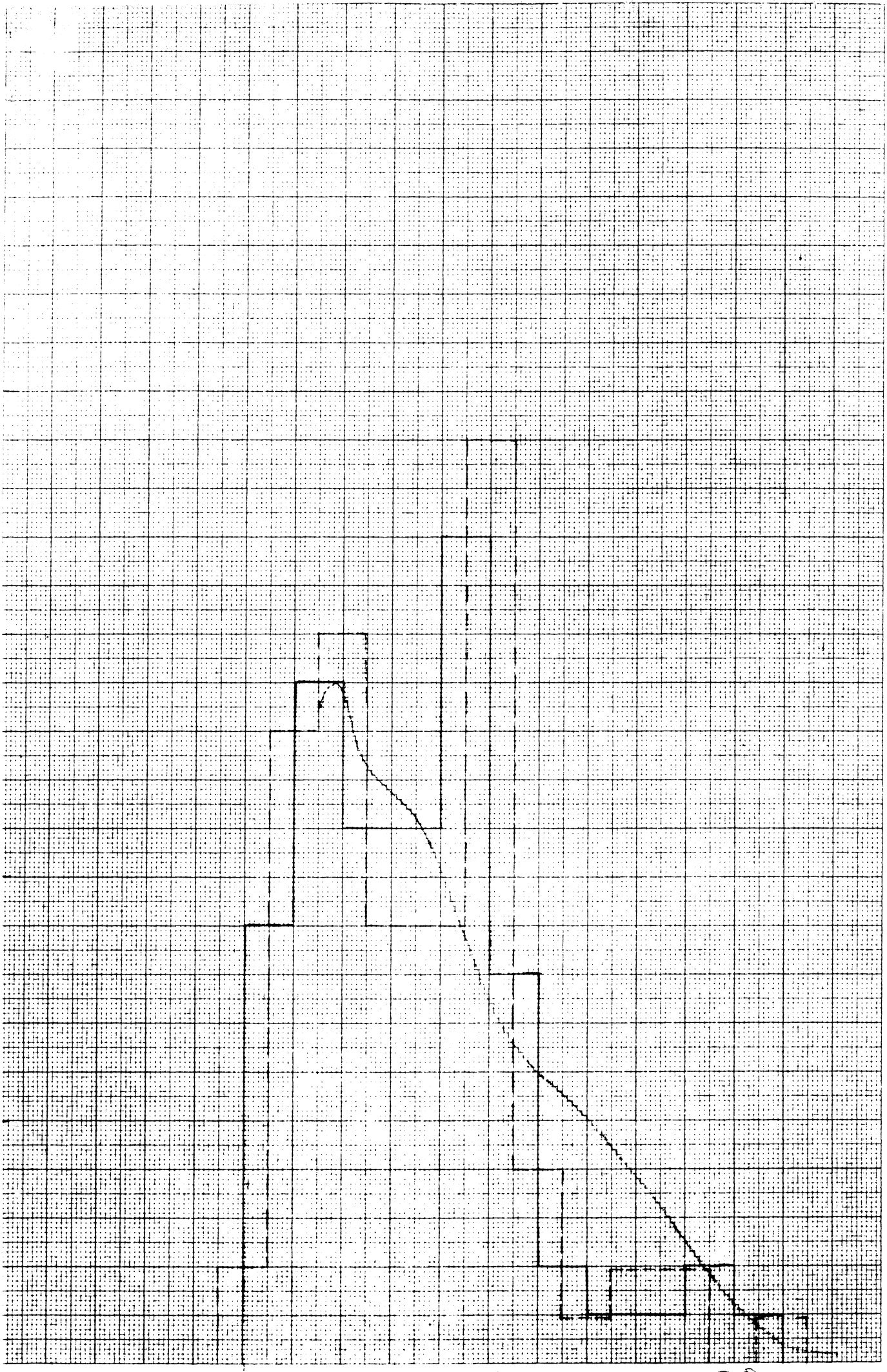
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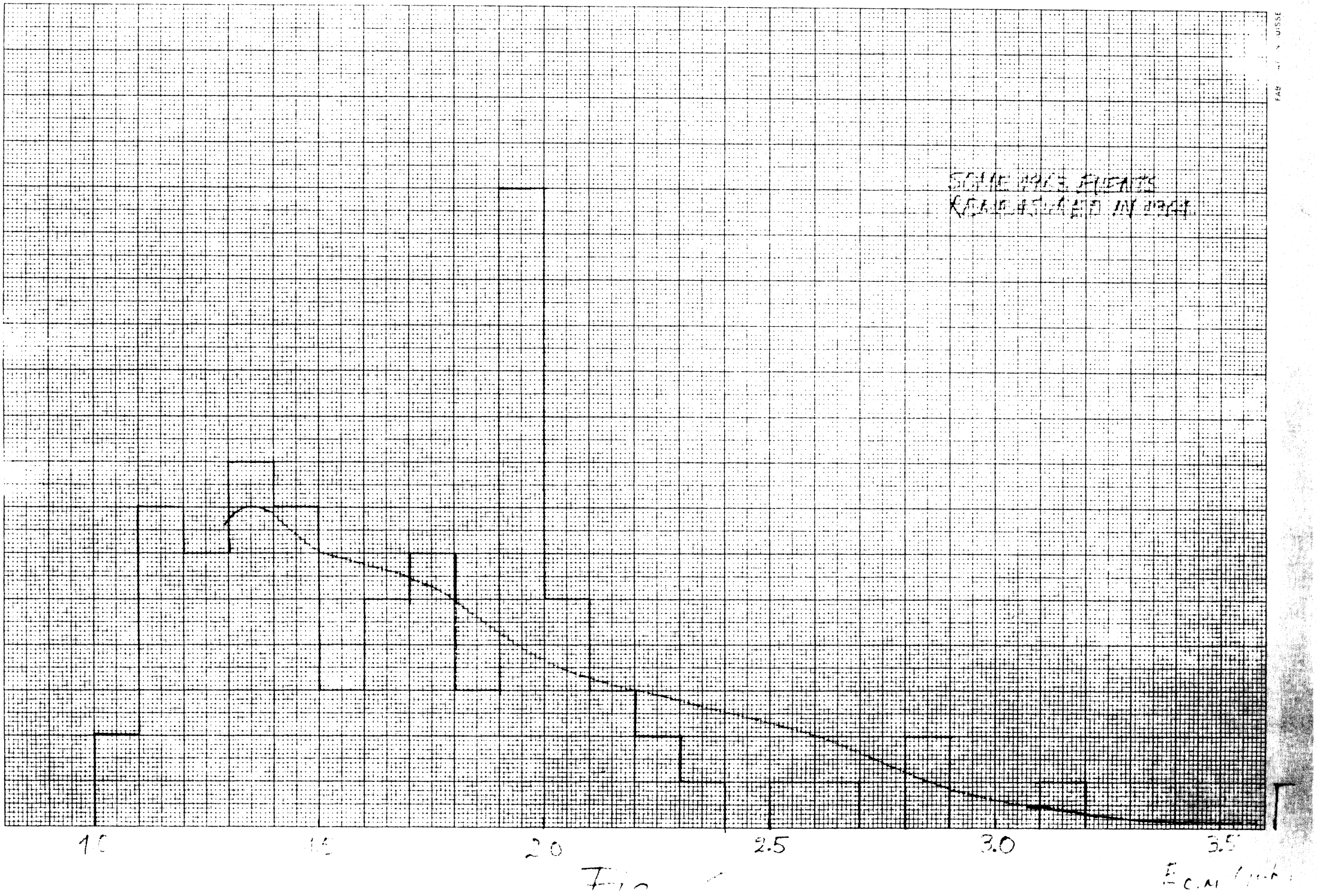
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