Review of Seismogram Microfilm Facilities used by the Division of Seismology and Geothermal Studies

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On September 29, 1977, Dr. Berry appointed a 3 person committee comprising of Dr. F. Kollar, Mr. A.J. Wickens and Mr. R.J. Halliday to examine the present and future status of microfilm facilities. He advised that conclusions arising from this review must be constrained by current fiscal budgets, requirements of Divisional Research Scientists and finally World Data Centre commitments.

This study is of particular significance now for 2 reasons. Firstly Seismogram Microfilming Services, NOAA (World Data Centre A) are changing from 70 mm chip to 105 mm microfiche photography using a Bell and Howell "Diplomat" 105 mm camera. Secondly the 35 mm Flo-Film Camera which has been used continuously for the last 18 years to photograph, exclusively, Canadian standard station seismograms at Central Microfilm Unit (CMU), Public Archives is obsolete. It is impossible to obtain spare parts for this camera and it can only be maintained in operating condition by special servicing and machining performed by Seismology Div. technicians. The CMU 35 mm Flat-Bed camera is currently used to photograph the flimsy regional station helicorder seismograms. In addition CMU has a 16 mm Flo-Film camera which could be used to photograph standard station seismograms.

Dr. Berry asked the study group to compare the four cameras with specific attention to cost and film quality and then make appropriate recommendations.

1. Bell and Howell "Diplomat" 105 mm Camera

With the exception of special hardware (platen, controls etc.) this camera is similar in appearance to CMU's 35 mm Flat-bed cameras. The Bell and Howell Diplomat 105 mm camera utilizes 105 mm wide film producing chips (microfiche) 148 mm long. With a camera reduction of 32x, 24 seismograms (4 columns of 6) can be recorded on each chip. Each seismogram image is 9 mm x 28 mm and a resolution of 160 lines per millimeter is possible. In comparison, the CMU 35 mm Flat-bed camera utilizes 35 mm roll film and with a camera reduction of 24.5, the seismogram image is 12 mm x 38 mm on the film with a line resolution of 88.

Photography time using the Bell and Howell Diplomat 105 mm camera is judged to be about three times as long as that of the current 35 mm Flo-Film camera. Since most of the microfilming charges to us are for operator time, the present (FY 78-79) twelve thousand dollar microfilm budget would more than double ($25K-$30K) if the Bell and Howell Diplomat 105 mm camera were used. This assumes that cost of film, developing and printing would be similar for the two cameras.

If the seismogram library began storing 105 x 148 mm microfiche chips, special care would be required in indexing to facilitate retrieval. Microfiche storage would however, require about 20 x less space than roll film storage. There are microfiche viewers available in the seismology Data Lab and in the Branch library. In order to view the image at life size it would be necessary to buy a viewer magnification 32x lens; the data lab

microfiche viewer lens is 48x. If a large microfiche seismogram library were produced, a new viewer would likely be required.

CMU are not in favour of photographing EMR seismograms on their one available Bell and Howell Diplomat 105 mm camera. It is set up primarily to photograph books and a special platen would have to be built for seismology and interchanged with the book photography platen. Moreover film tests would be required after every platen change. It would cost the Division $35,000 to purchase a new Bell and Howell Diplomat 105 mm camera for its exclusive use, but such a camera would be required for only one week per month - clearly not an economically attractive proposal.

2. 35 mm Flat-bed Camera

This method is currently used to photograph the flimsy regional station helicorder seismograms. The unit cost per seismogram is nearly double that of Flo-film photography due to slower speed. Moreover in order to get the whole 37 inch (length) seismogram in the field and in focus, 24.5 x reduction must be employed which results in only ½ of the 35 mm vertical field being used. Although the resultant line resolution is about 88, the seismic trace image isn't as sharp as the Flo-Film 35 since Flat-bed camera reduction (24.5x) is over twice that of Flo-Film 35 (10.6x).

3. 16 mm Flo-Film Camera

This camera is similar to 35 Flo-film except it has 26x reduction which again (as is the case with the Flat-bed 35mm) doesn't permit as sharp a viewing image as 35 Flo-film when projected in a viewer at or near life size.

A self-stacking pick-up tray suitable for 12" x 36" documents would have to be built on the 16mm Flo-Film camera should it be used for routine seismogram photography. Speed of photography on this camera is equivalent to the 35 mm Flo-Film, so overall costs would be similar.

4. The 35mm Flo-Film Camera

The operating 35mm Flo-Film camera has been in service since 1960 and has photographed 900,000 standard station seismograms in the ensuing 18 years. The camera became obsolete about 10 years ago (no more spare parts). At that time a spare camera was purchased for parts and 5 years later a second one was also purchased for the same purpose. Technicians from the Division have been able to keep the operational camera in good order but there is increasing need to machine parts and have special belts made. It requires about ½ man day every 3 months on site to maintain the camera and approximately the same time is required in the lab to machine required parts. Our technicians are quite confident that they can keep the camera operating satisfactorily for the foreseeable future utilizing parts from two spare cameras.

A suggestion has been made that the two spare cameras be made into one operational camera. Although this would, initially at least, always provide one spare camera when the other breaks down, one loses the "cannibalizing" feature.

Some film comparisons

Users of seismic microfilm in the Division of Seismology and Geothermal Studies were asked to compare 35mm film and 16mm film of the same seismogram from the two Flo-Film Cameras at CMU. There was practically unanimous preference for the 35mm film because of the sharper image. (It appears that the Diplomat microfiche camera produces the sharpest image of all, which permits a 32x reduction. This was estimated from sample microfiche from NOAA, not from a production run at CMU.)

- See attached table, p. 7, which compares line resolution of films from Cameras under review.

Recommendations

1. Our principal recommendation is that the Division continue the present procedures for microfilming Canadian seismograms. This provides 35mm roll negatives for Ottawa and Boulder and 35mm roll positives for PGC.

   This procedure can only continue as long as Division technicians can maintain the 35mm Flo-Film camera at CMU. We see no reason at this time to assume that the Division cannot continue this practice in the immediate future.

   NOAA will continue to accept our 35mm roll film and distribute copies on request. They have never been able to make full scale copies from this film and they will not be able to reformat it into microfiche. Nevertheless, all indications from NOAA are that they are pleased to have available

whatever we can provide.

2. We further recommend that Division staff keep abreast of microfilming technology in order that we can change our procedures at reasonable cost when this becomes necessary. This should include investigation of microfilm services provided by commercial firms and study of the DND microfilming establishment in the Queen's Printer Building in Hull.

R.J. Halliday

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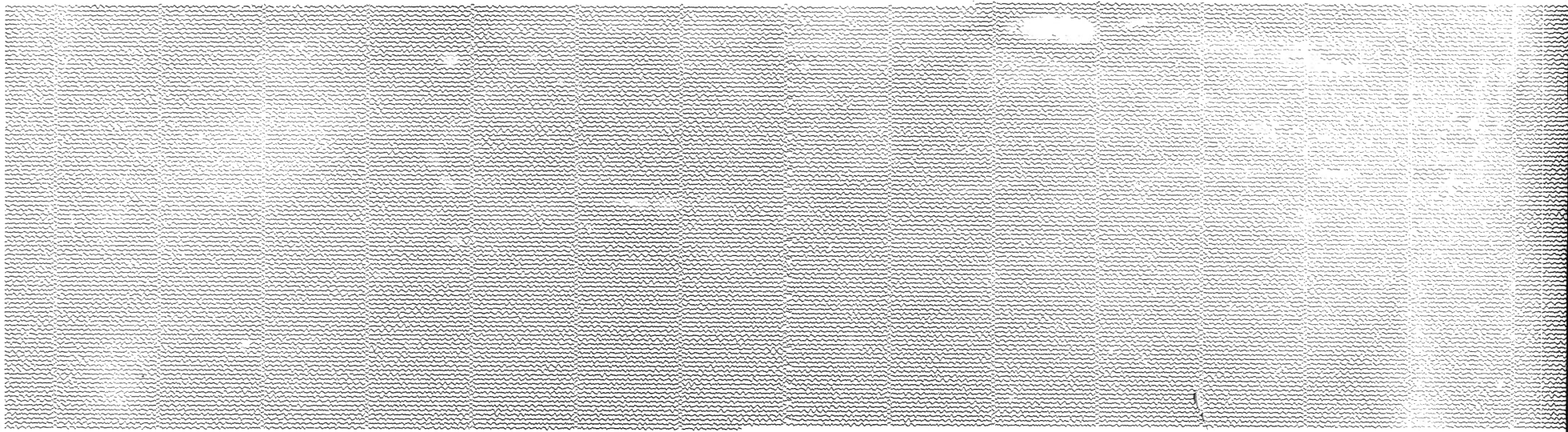
Attachment: Table - page 7

CAMERA	REDUCTION	RESOLUTION lines/mm ON TARGET	RESOLUTION lines/mm ON FILM	REMARKS
Bell-Howell "Diplomat" 105 mm with Adaptation	32x	5	160	- Claimed by NOAA
Diazo Copy - sent to Division	32x	4	128	- Measured by authors
35mm flo-film[1]	10.6x	8	85	- Present standard station records
35mm flat-bed[2]	24.5x	3.6	88	- Helicorder regional station records.
16mm flo-film[1]	26x	3.6	93	- Experimental negatives supplied by CMU
35mm flat-bed[2]	30x	4	120	- Experimental negatives supplied by CMU

1 - Flo-film camera resolution is less (than listed) in the direction of film movement.

2 - First entry represents routine photography while second entry represents careful tuning. Difference represents variation that can be expected in normal operation.



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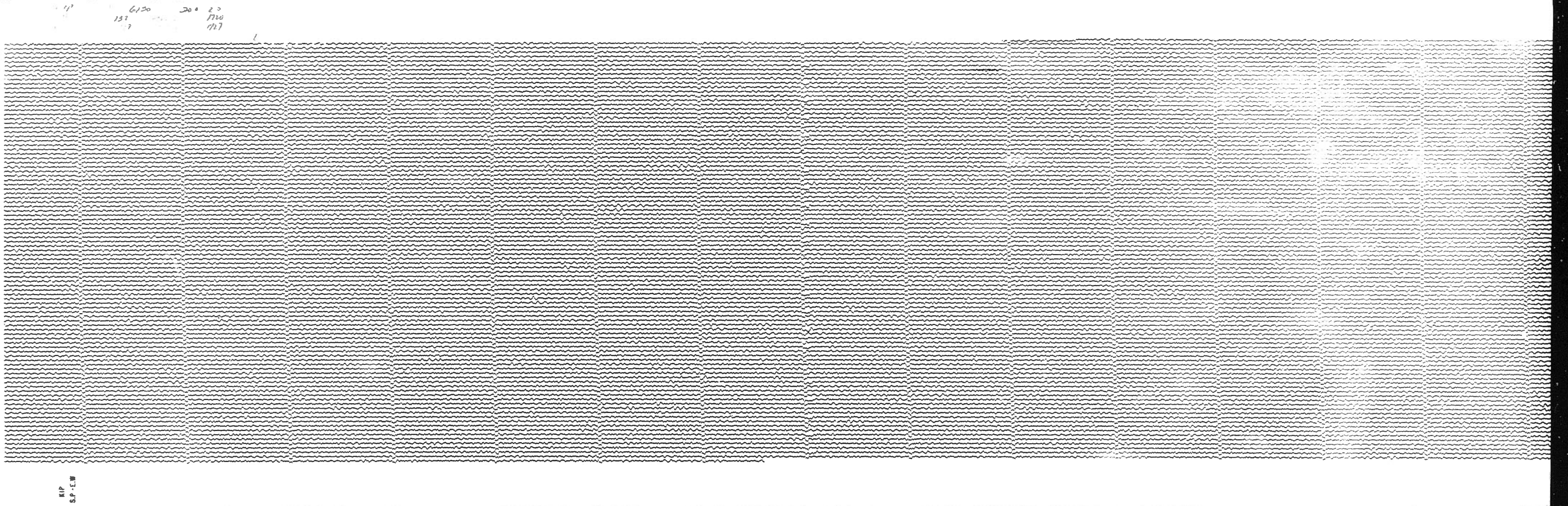
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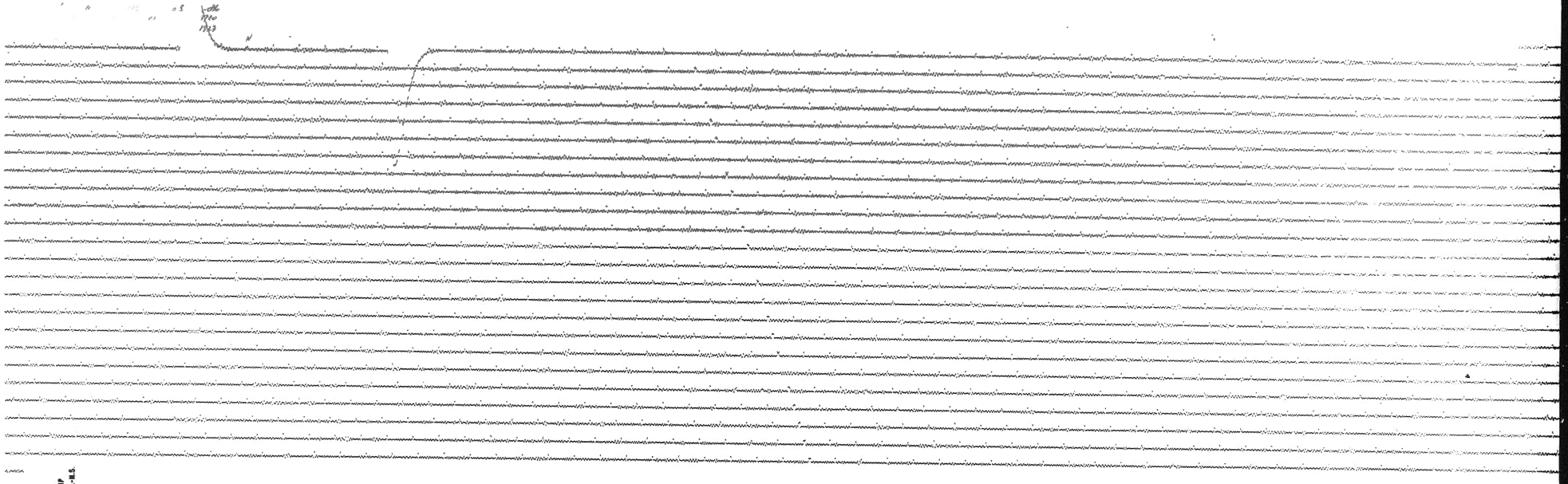

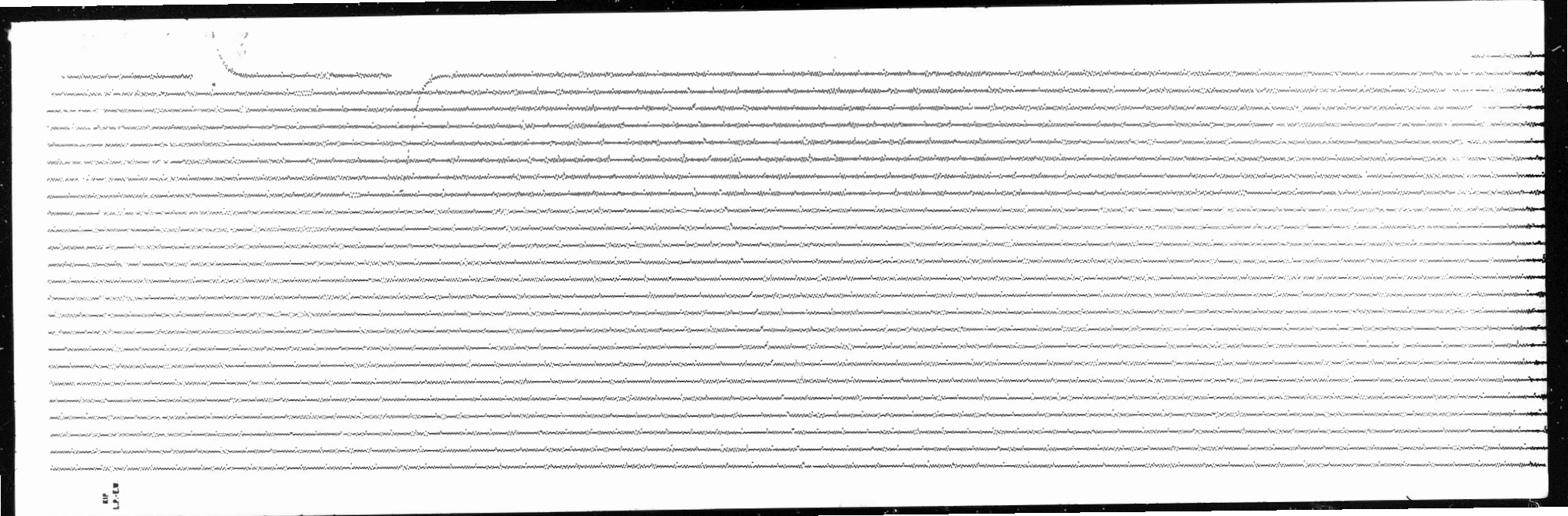

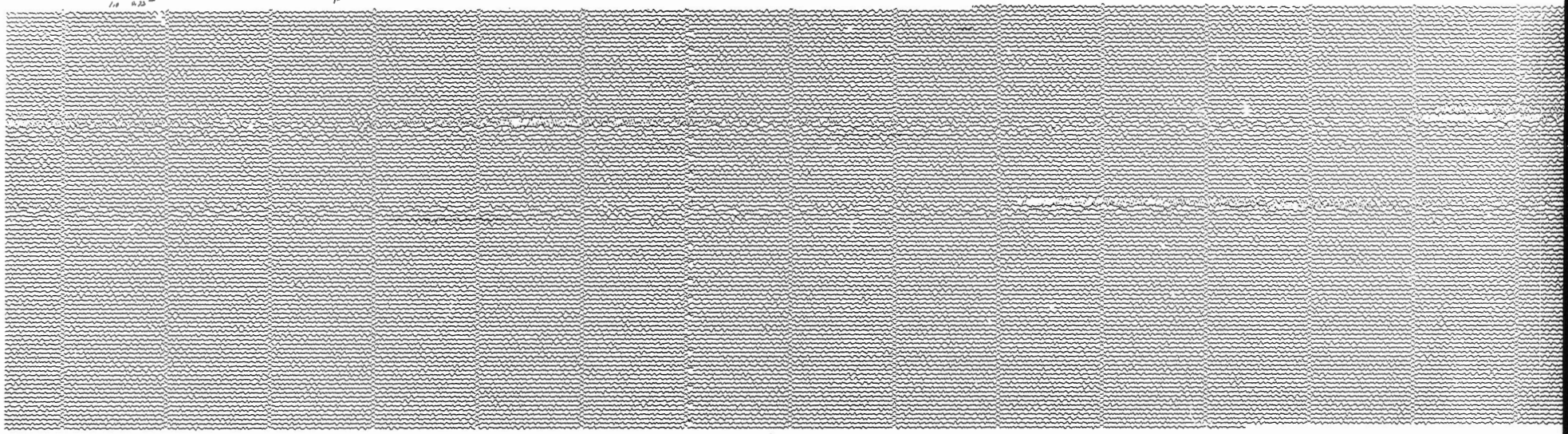

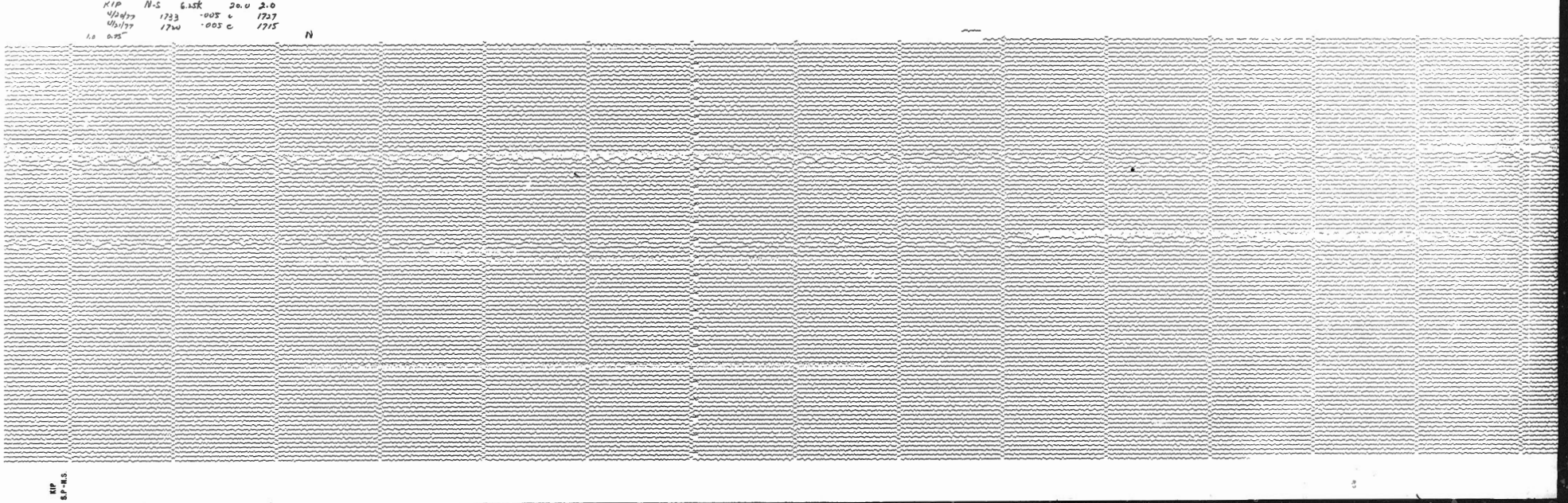
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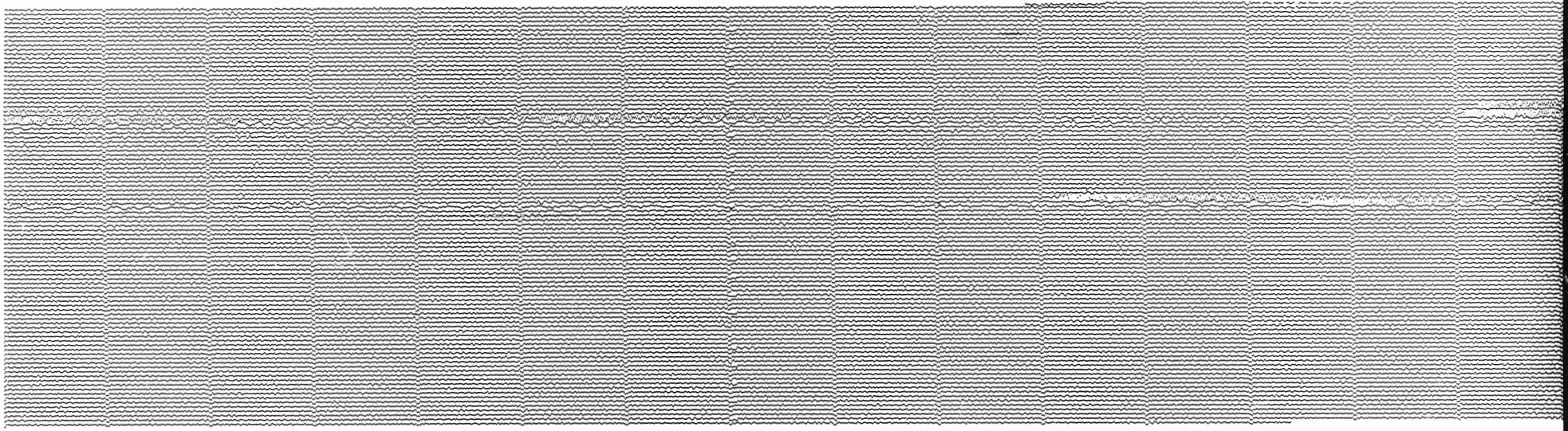
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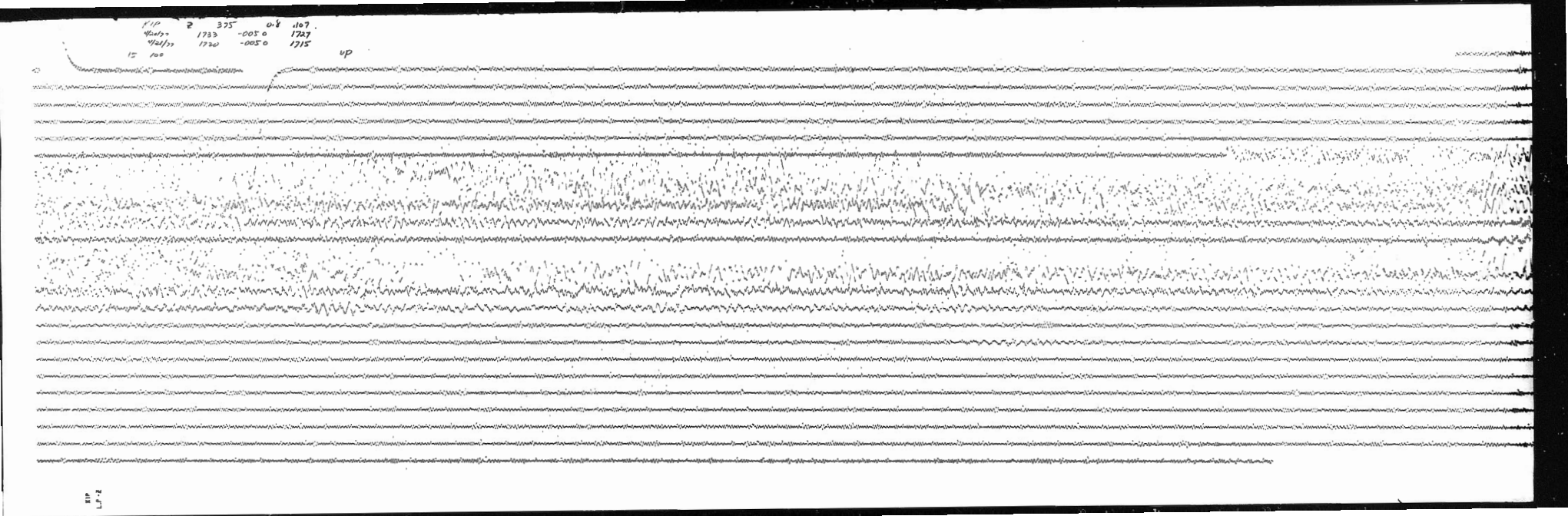
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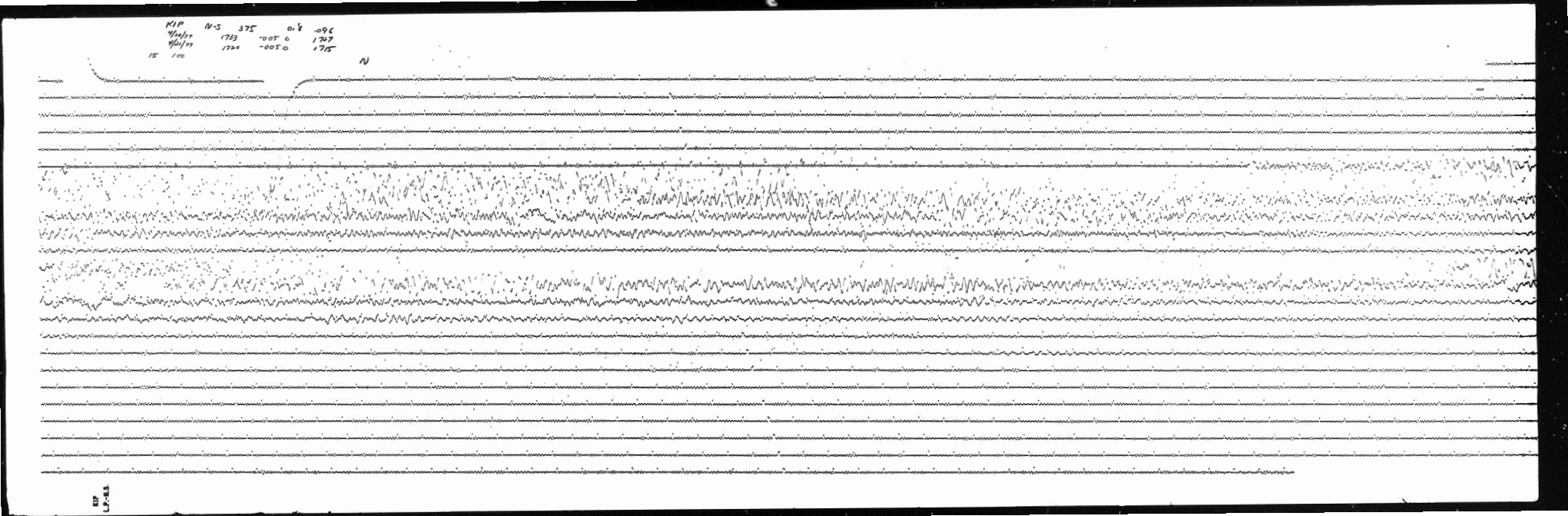
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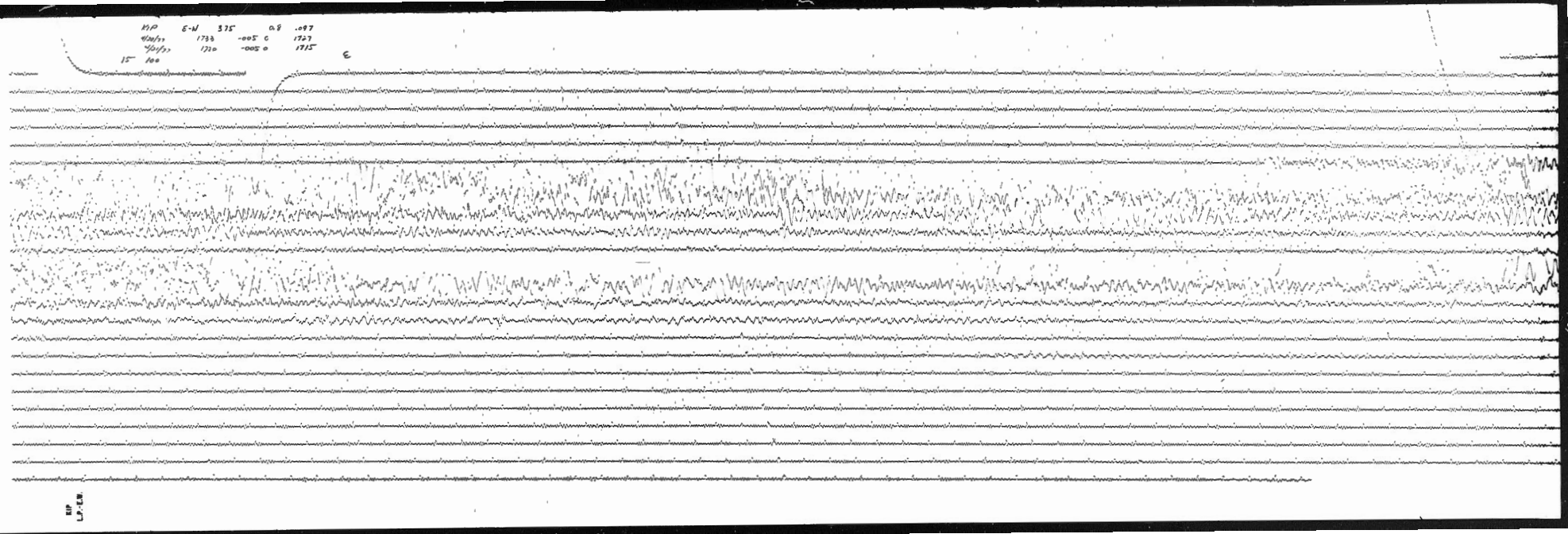
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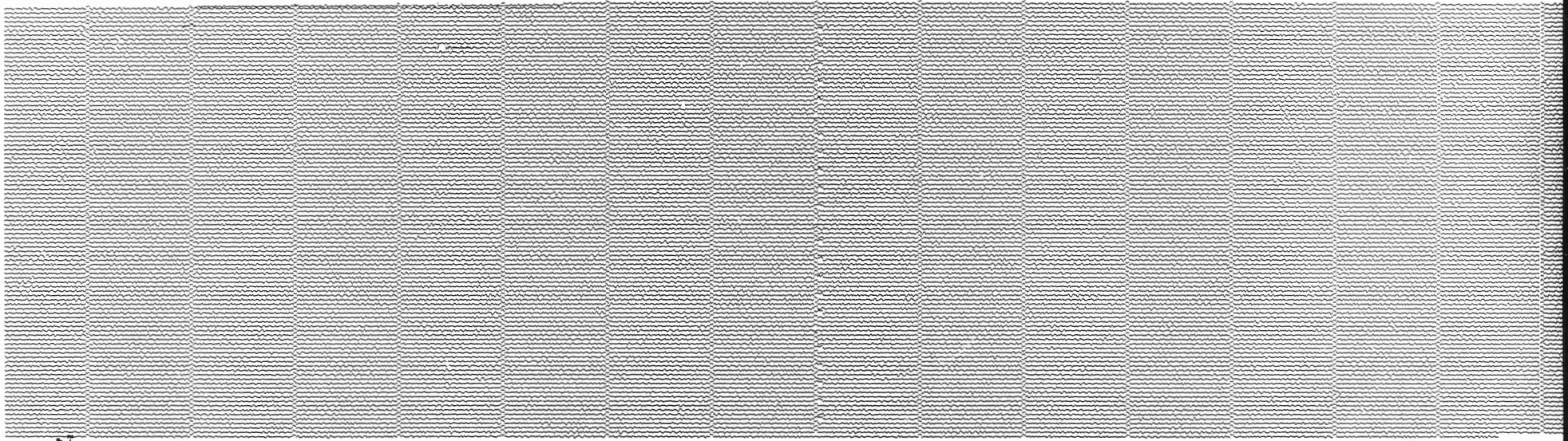

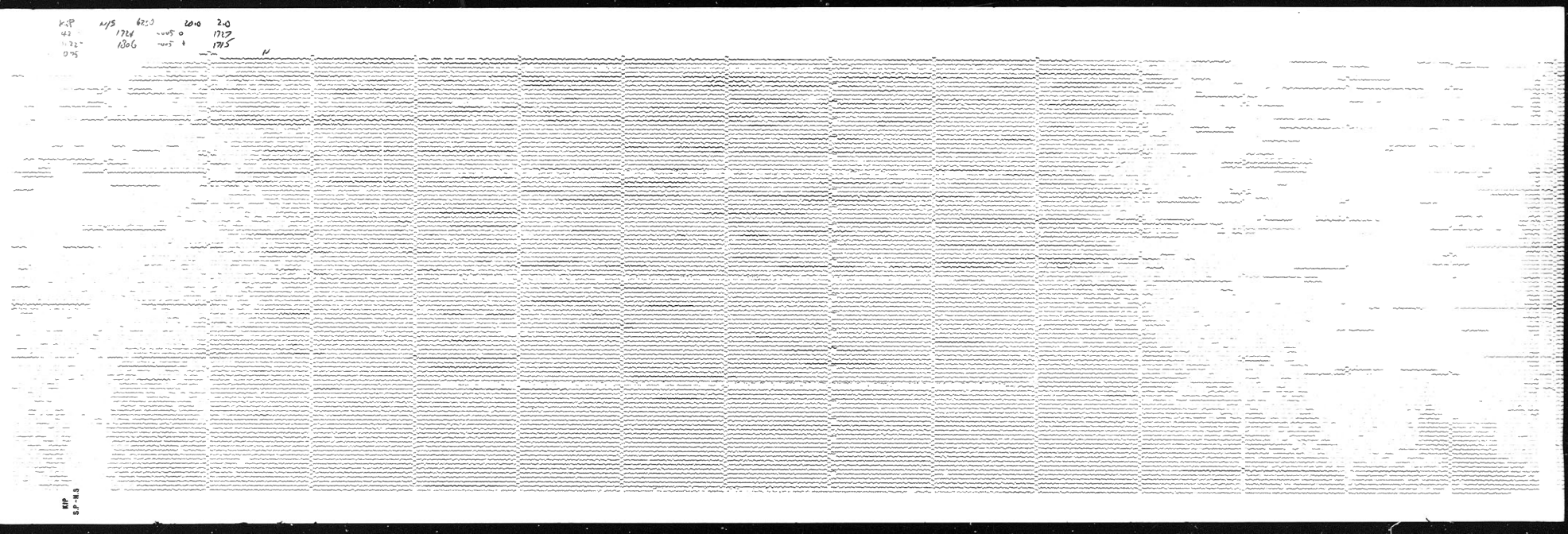
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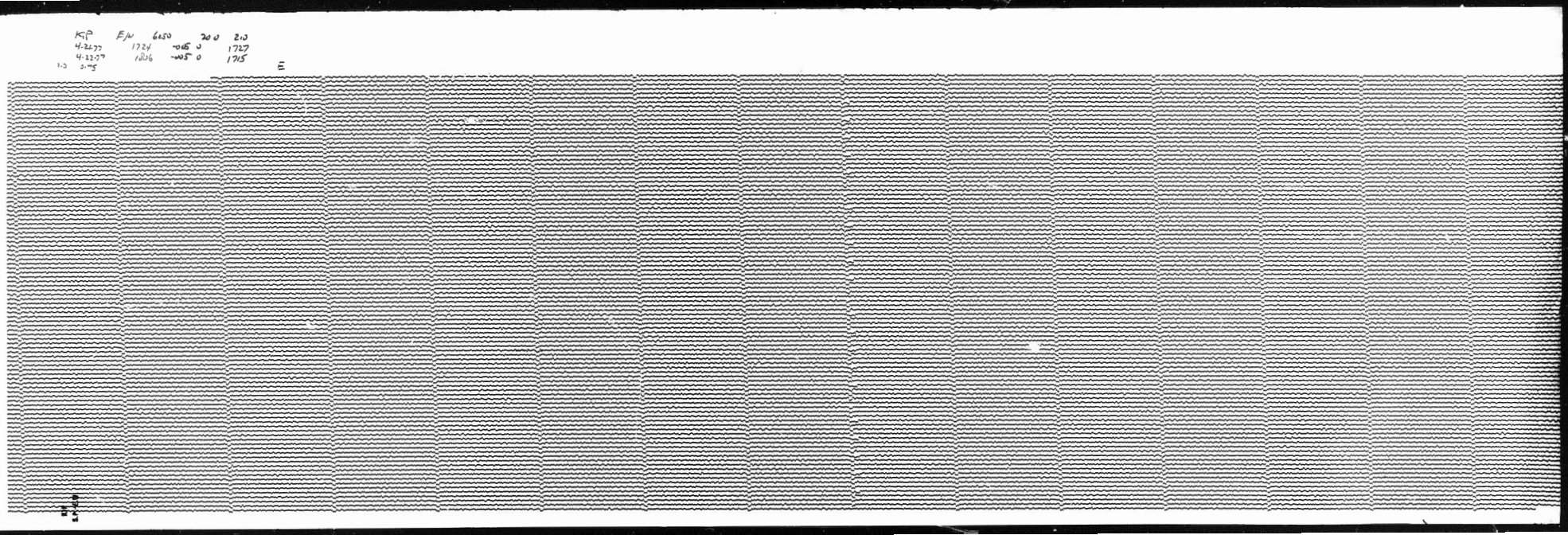

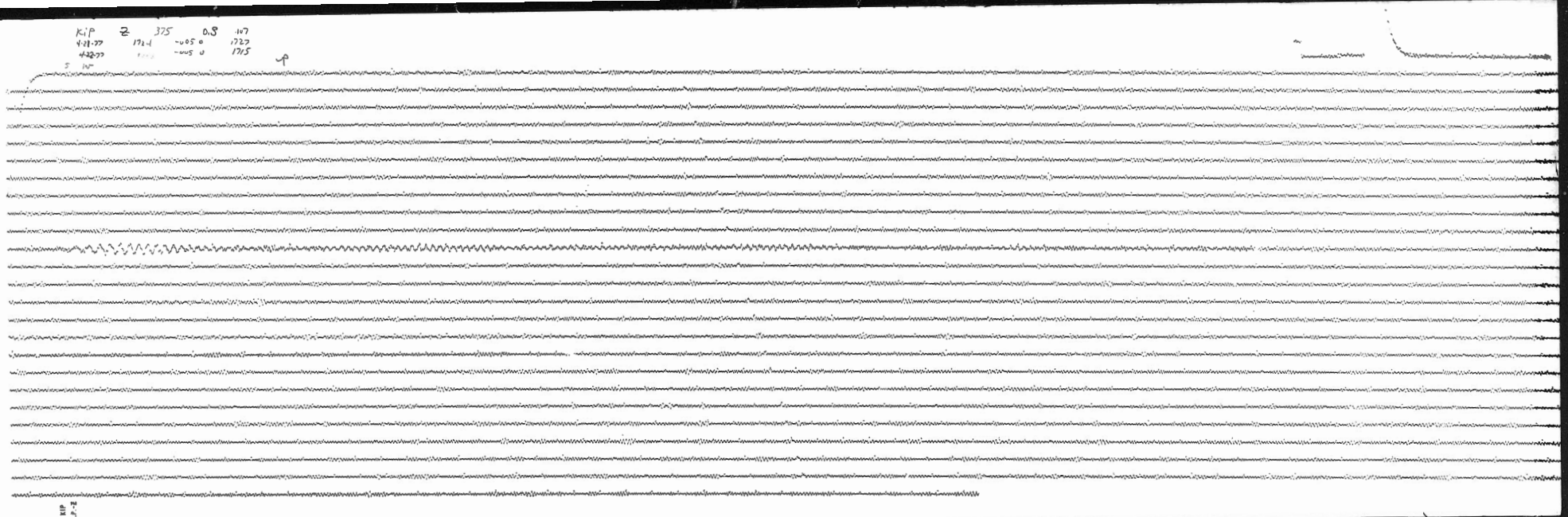
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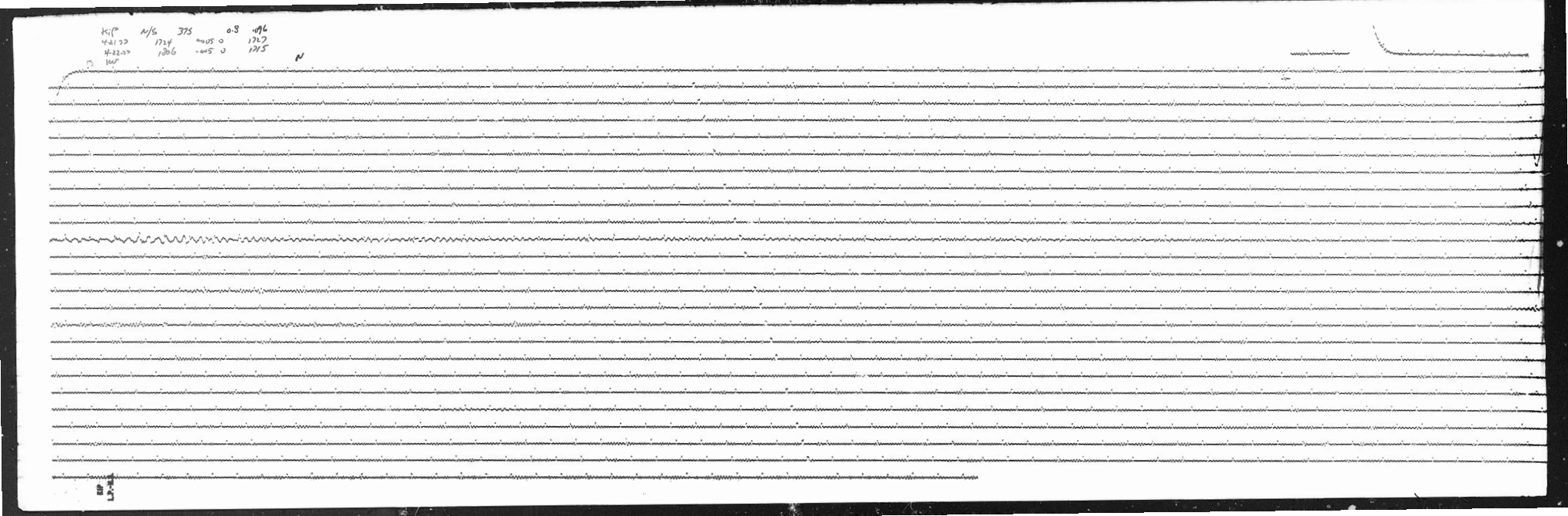
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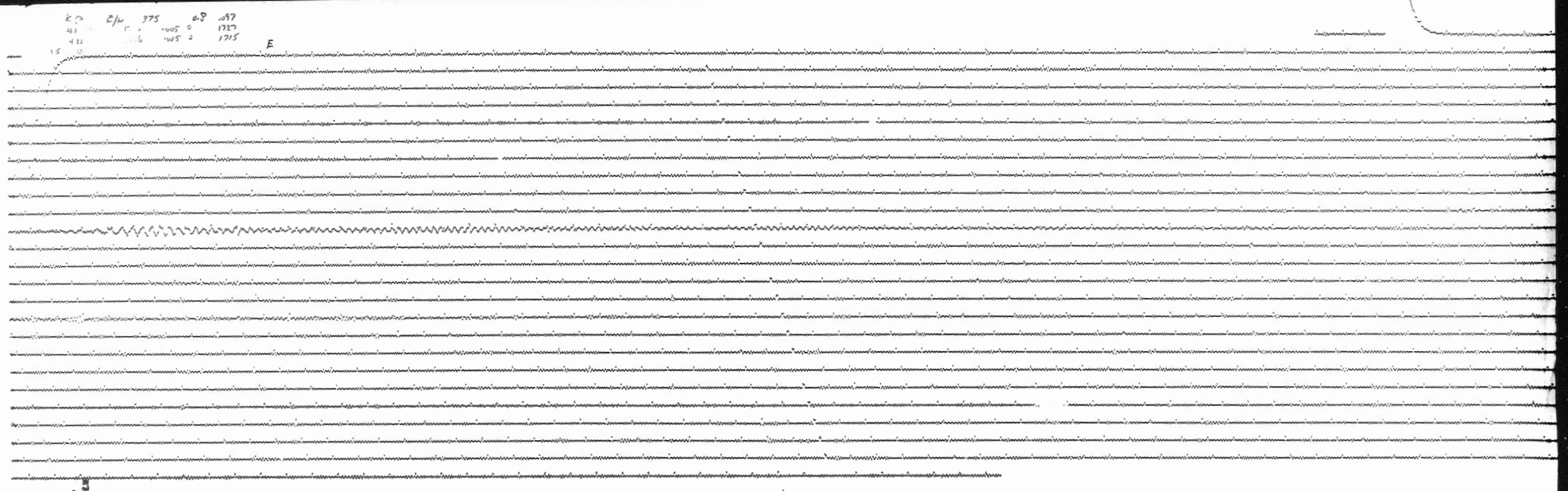

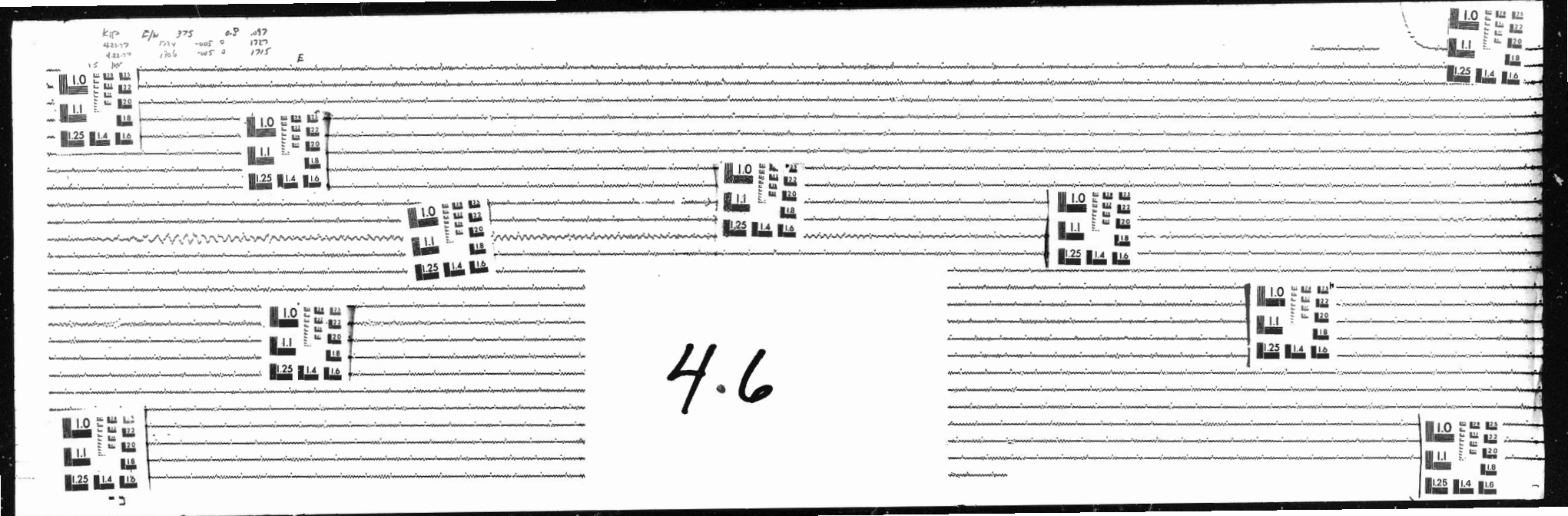
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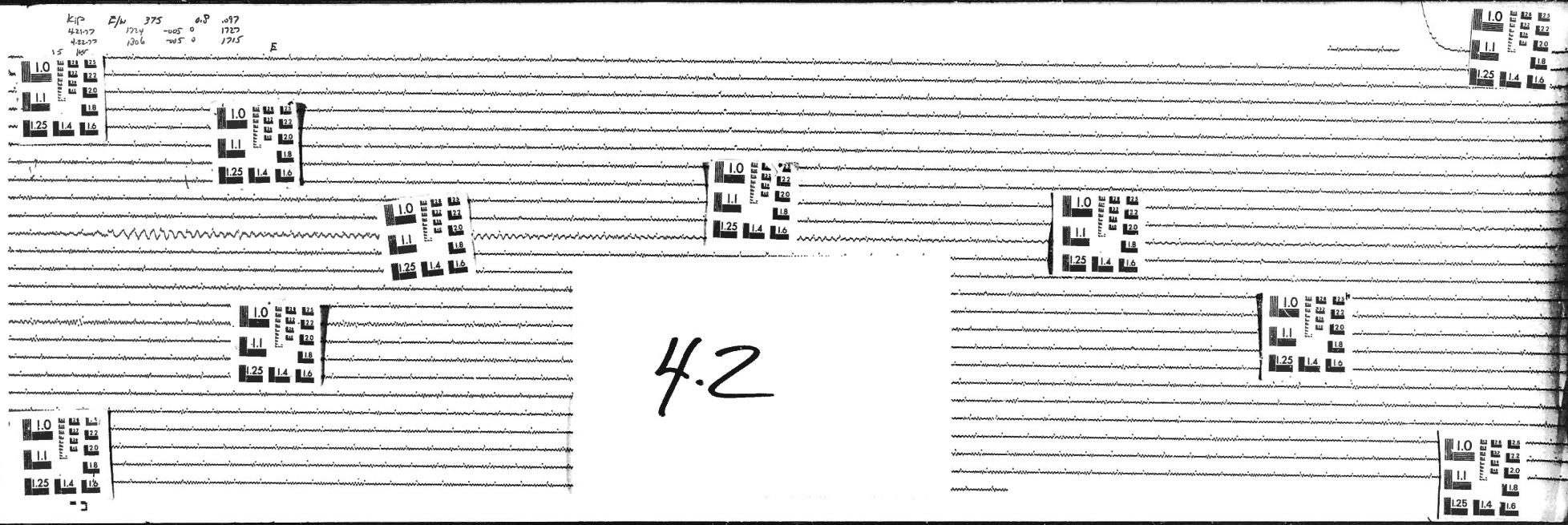
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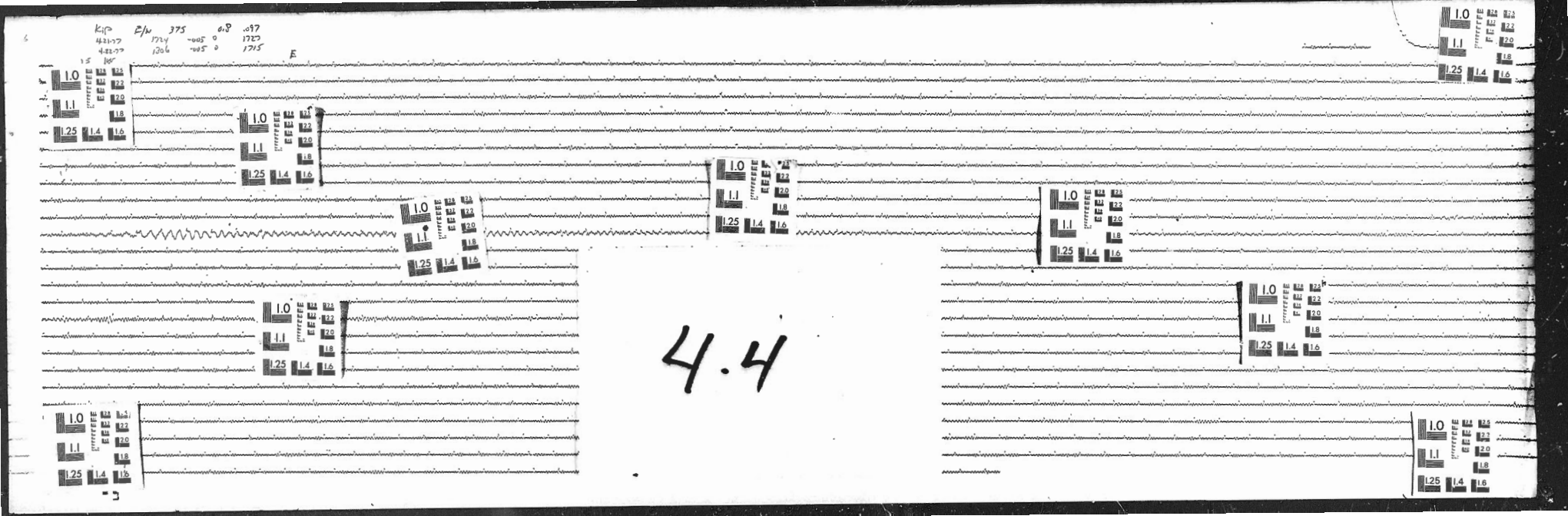
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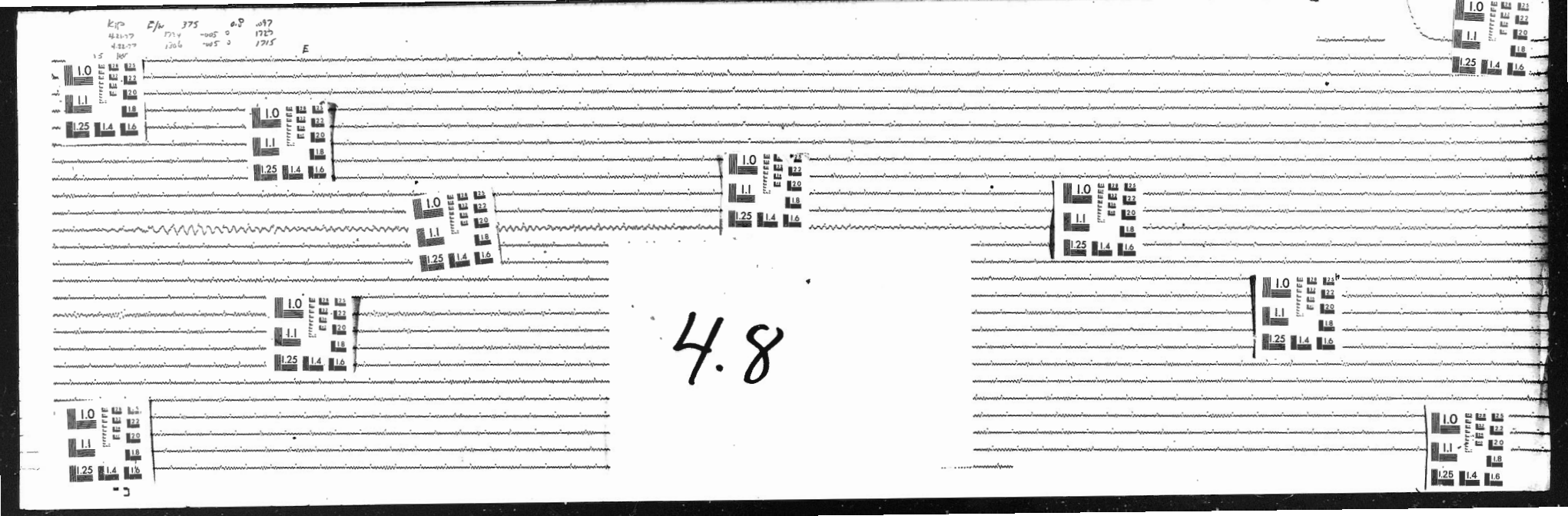
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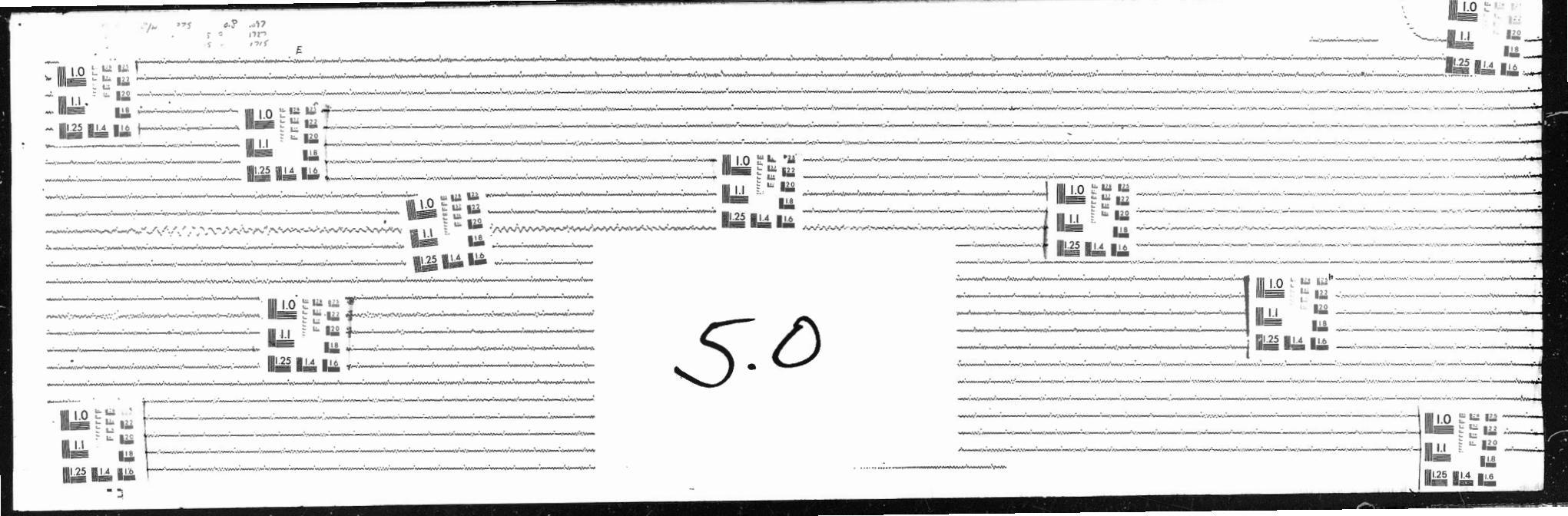
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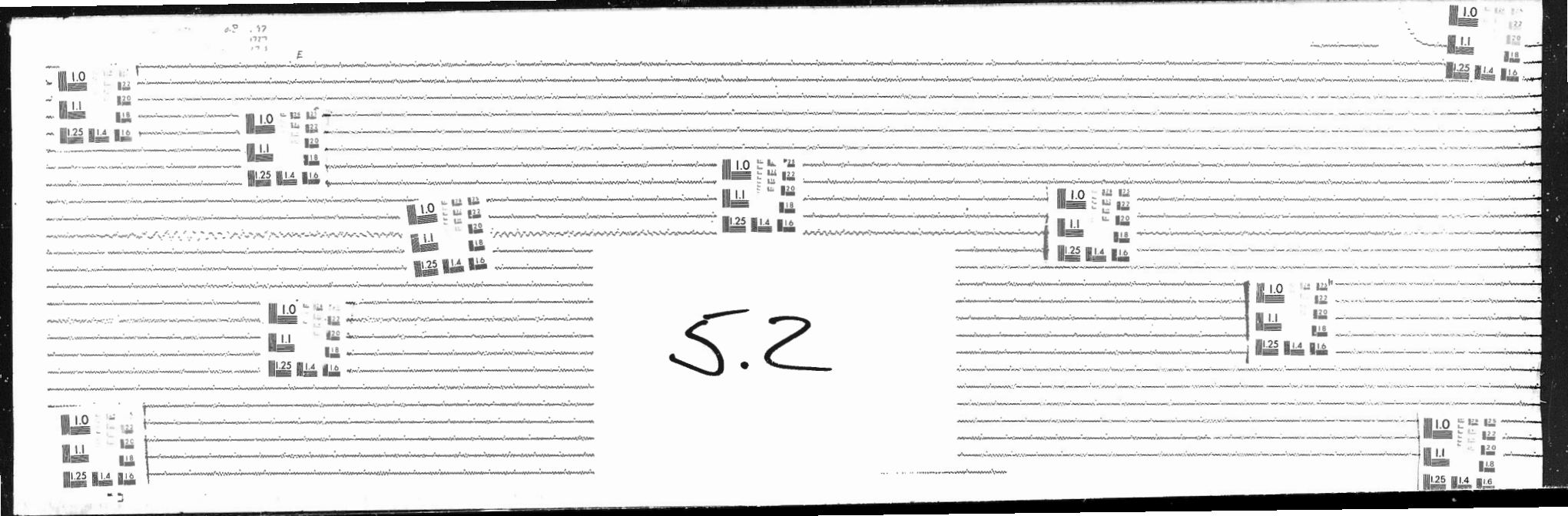
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