

**THE GEOLOGY OF THE SOUTH-WEST
PORTION OF MT. BISCHOFF**

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THE GEOLOGY OF THE SOUTH-WEST PORTION OF MT. BISCHOFFIntroduction

This report summarises geological mapping of the south-west slopes of Mt. Bischoff carried out during April, 1965. The work is intended as an amplification of the reconnaissance mapping of Anderson and Hopwood (1961) and the regional mapping of Glasson (1964).

The area west of the open cut is extensively faulted with, in many instances, mineralisation of the fault zone. This augers well for the possibility of a large replacement body in the dolomite horizon. Unfortunately these same faults produce considerable problems of stratigraphic correlation. The area has been divided structurally into 16 sub-areas, and a review of the geology of each sub-area follows.

Discussion of the Geology

Sub-Area 1.

Sub-area 1 is bounded on the western side by a mineralised fault running along the course of No. 3 Drive and on the eastern side by the open cut. The sub-area includes Thompson's Workings. The structure of the sub-area is basically a sheet dipping south-eastwards, but the presence of folds with an axis plunging at 17° to 200° is revealed by the stereogram. Although the stereogram is

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slightly inhomogeneous, the above interpretation is fairly safe. The area cannot be subdivided into more homogeneous areas.

If the stratigraphy is continuous across the area then the sequence to the west is beneath the black shales of Thompson's Workings. However Anderson and Hopwood (1961) proposed the existence of a fault striking N.N.E. between co-ordinates 1300 W. and 1700 W. This fault has not been accurately located during this survey, but its existence in this general area may still be demanded by stratigraphic reasoning.

If the black shales of Thompson's Workings are to be correlated with the Black Shales Unit above the dolomite in the open cut then the dolomite should outcrop along the western margin of the black shales. No such outcrops occur. It is unlikely that the dolomite could have "lensed out", considering its substantial thickness in the open cut a few hundred feet to the east. The correlation above demands a fault bounding the black shale outcrops and this fault, agreeing at one point with a mapped fault is tentatively placed on the map.

Two other possibilities can be considered. If the black shales (Thompson's Workings) are lower than the dolomite then the dolomite should outcrop south of Thompson's Workings towards Waratah. An extensive search has failed to reveal any trace of the dolomite in

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this area and the possibility is also rejected by Glasson (1964). A third possibility is that the Black Shales (Thompson's) are much higher in the sequence than any unit encountered by Anderson and Hopwood (1961).

No. 3 Drive is located on a mineralised fault dipping 50° - 60° to 270° - 280° . The fault surface is slightly variable in orientation, and "splinter" faults are numerous. The throw of the fault is unknown, but it appears to be downthrown to the west. The area to the west of No. 3 Drive along the Silver Cliff Road is homogeneously folded about an axis plunging 5° - 227° . Several small folds on this axis occur west of the Adit, but west of the 2600 W. co-ordinate the dips are uniformly west or N-W.

This agrees with the general structure found in No. 5 and 6 Drives. The stereogram for No. 5 Drive, beyond the porphyry, reveals an almost homogeneous sheet dipping northwards at 30° - 40° . The stereogram for measurements beyond the porphyry in No. 6 Drive has been prepared from areas unaffected by megascopic folds. The stereogram suggests a sheet dipping northwards and westwards that is gently folded about an axis plunging at 30° - 310° .

The orientation of drill hole B2 is shown on the stereogram for No. 6 Adit (Sub-area VI). The angle between the poles to bedding and the drill hole varies from 20° - 70° with the maximum number at 30° - 40° . This is consistent with the angles between bedding and the

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core axis recorded in the drill log of B2 (the latter angle is the complement of the angle recorded on the stereogram). It should also be noted that the general dip in the road way from No. 3 and No. 6 Adits is at a low angle to the north or west.

Two quartzite units outcrop in the general area of No. 6 Adit. Dips measured only on the quartzite unit (to avoid the rather intense mesoscopic folding in the shales of this area) are distributed about a fold plunging at 20° to 328° . The fold is very open and corresponds only to a weak flexure in a sheet dipping predominantly north-westwards. Anomalous dips, inconsistent with this fold axis are located on the northern margin of the quartzite where it crosses No. 6 Drive. However these dips are part of a zone of intense mesoscopic folding of the shales, and it appears that the quartzite contact has also been affected by these folds. More uniform dips 100-200 feet north of the quartzite, are compatible with the quartzite fold axis at the entrance to the Drive.

The significance of the zone of "contorted rocks" is not apparent. A similar zone (possibly the same zone) crosses the road west of No. 6 Adit. Minor folds in this zone have a fairly consistent axial plane. Zones of intense folding accompany some of the faults in the open cut.

The exact stratigraphic position of the quartzite units at No. 6

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Adit is difficult to determine. A mineralised fault runs N-S along co-ordinate 2850 W. The fault dips steeply (85°) west. The mineralisation includes pyrites, galena, sphalerite and stibnite. With such a steep dip the fault is almost certainly normal with the downthrow block to the west. This fault, if projected northwards passes almost exactly through the drill chamber in No. 6 Adit, but there is no evidence in No. 6 Drive, or the first cross-cut west of the presence of the fault. The situation is complicated by the possible presence of a second fault. A mineralised fault dipping at 60° - 046° crosses the haulage way between No. 6 and No. 9 Adits. This fault is also mineralised (mainly pyrites) and is apparently the fault in No. 9 Drive described by McIntosh-Read (1922). (The fault was explored for some distance in No. 9 workings but failed to yield valuable tin). This fault is downthrown to the north, and if projected south-eastwards intersects the 2850 W. fault near the haulage way from No. 4 to No. 9 Adit. This fault has not been specifically located in the latter area, but lack of outcrop may be a determining factor.

However the more or less uniformly dipping quartzite units probably extend out along the ridge east of No. 6 Adit and swing back into the valley containing the No. 4 - No. 9 haulage way, to intersect the haulage way about 150 feet N.E. of peg F/430. This

point appears to be the base of one of the quartzite units. Quartzites outcrop on the ridge east of the No. 4 - No. 9 haulage-way. The base of these quartzites is approximately 25 feet lower than the base of the quartzites on the haulage-way, so that the combined effect of the two faults may be negligible. Both quartzites dip uniformly to the north-east.

One stratigraphic difficulty exists in this correlation. The quartzite in Sub-area 1 is reasonably homogeneous with only minor white shale partings. The two quartzite units at No. 6 Adit consists of two distinct units separated by white shales and some black shales. This may be explained in terms of a facies variation, particularly when the inconsistent nature of the quartzites in the open cut areas is recalled.

The block to the south and west of the two faults discussed above contains an abundance of black shales. Stratigraphically these are certainly equivalent to the black shales at Thompson's Workings. Sub-area IX, is folded homogeneously about an axis plunging at 20° to 066° . Dips in the upper part of this Sub-area are continuous in general trend with those of sub-area VIII, although the total geometry of Sub-area VIII is a fold plunging at 20° to 005° . Dips in the upper portion of Sub-area IX are uniformly N.N.W.

The fault separating these two Sub-areas has not been located on

the road between No. 6 and No. 9 Adits. Scattered quartzite rubble (no definite outcrop) on the main ridge west of No. 6 Adit (between pegs F/503 and F/504) again tend to confirm the small displacement of this fault.

Sub-area X, along the roadway and the water race to the south-east of No. 9 Adit is homogeneously folded about an axis plunging at 20° to 050° . It is difficult however to understand the stratigraphic sequence in this area, and its structural relationship to Sub-areas IX and XV, unless another fault running generally N.N.E. passes to the east of No. 9 Adit.

Summary of Structure and Stratigraphy

The probable stratigraphic column for the area is;

- (6) White clay shales with only minor quartzite
- (5) Quartzite unit
- (4) White clay shales (with black shale partings)
- (3) Quartzite
- (2) Thin quartzites and white shales
- (1) Black Shales

As previously mentioned there is only one quartzite unit within Sub-area 1. The possibility does exist that the second quartzite unit is not revealed, or that there is a facies variation across the area. In this connection, there appears, although the identification is marred by silicification, to be quartzite on the foot wall of some of the inclined stopes in No. 3 Drive. Thicknesses are appended to the east-west cross-section.

The overall structure of the area is revealed by the east-west cross section. The structure is a broad anticline similar to that in the open cut. There is a reversal in the general plunge of the structure across the roadway to the Wheal Workings. To the north the structures plunge to the south-west. South of the road the plunge changes to the northwards. It is this plunge reversal, combined with the topography that brings the black shales to the surface on the south-west portion of the area.

Conclusions

In selecting possible drill sites to locate the dolomite, a site close to a fault is to be favoured. This follows from the conclusions of Reid (1922) - reaffirmed by Anderson and Hopwood (1962) - that the dolomite is preferentially mineralised in the vicinity of faults. Three areas will be discussed as choices for drill sites, although only the first of these is to be recommended at the minute. The additional sites should be considered for future exploration if the results of the first hole are encouraging.

The most obvious area is near the No. 6 Adit. A drill hole oriented at 60° to 148° is nearly normal to the axis of the slight warp in the quartzite and the average dip of bedding within this area.

The drill can be located on, or near peg F/28 (survey line of H. Fraser), situated about 45 feet from the rock portal of the No. 6 Drive (edge of the railway). The co-ordinates of this peg are 3378 W., 1231 N.

A second possible site is on the haulage ramp between No. 6 and No. 9 Adits, below the mineralised fault. If the black shales of this area are the same as those above the dolomite unit in the open cut, then a drill at this locality should reach the dolomite in a minimum distance. However a suitable stratigraphic marker

necessary to prove that the area is a nearly homogeneously dipping sheet - the structure suggested by the general trend of the dips - is lacking. This difficulty can be partially resolved by extrapolation of the structure of the Sub-areas to the north across the fault. Also the preparation of a drill site in this area will involve considerable work.

However, if the results of the first drill hole warrant further exploration, a drill hole plunging at 60° to 135° , on the haulage way at a point (3444 W., 895 N) should be strongly considered. A target depth for this hole can be fixed when the thickness of the black shales in the first hole is accurately determined. The unit above the dolomite in the open cut is 200 to 240 feet thick so that a target depth close to this value is indicated.

A possible third site is located within Sub-area 1 on the Wheel Tramway. A drill oriented at 45° to 285° is roughly normal to the general dip of the major quartzite unit in this area. A suggested site for the drill is at co-ordinates (1846 W, 777 N.)¹. No difficulties should be encountered in preparing a site, but an adjustment of a few feet will not make any significant difference. A target depth for this hole should be determined after a study of the results of Drill Holes 1 and 2. This hole is situated at a stratigraphic level very similar to hole 1, so that a depth of the same order necessary to penetrate the black shales, is recommended.

(1) Marked by square yellow peg, numbered E8.

D.E. Anderson.

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SUMMARY OF SUB-AREA DATA (BEDDING).

	<u>Fold Axis.</u>
I. Area north and east of No. 3 adit. Inhomogeneous with dips mainly to the east (100-130°).	17-200
II. Readings in No. 3 adit; inhomogeneous dips from (090-180°).	None.
III. West of No. 3 adit along road to Wheal Mine (Data from Anderson and Hopwood, 1961)	6-217
IV. Dips in No. 4 drive up to point of collapse.	20-175
V. No. 5 drive. Maximum. Dips 30-40° to 360°	No fold.
VI. No. 6 drive. Includes only dips in areas of no visible mesoscopic folding.	30-310
VII. Quartzite unit at No. 6 adit. Dips measured only on quartzite.	20-328
VIII. On haulage-way No. 6-No. 9 adits, from dump of No. 6 drive to mineralised fault (exposed in costean).	200-005
IX. From fault (above) to dam below No. 9 adit, including creek from No. 6 - No. 9 adits.	20-066
X. Roadway from No. 9 adit to Waratah and water race parallel to road.	20-050
XI. Roadway from No. 3 - No. 6 adits. From pegs WB I to WB 8. General Dips to 250-360°	Inhomog.
XII. WB 8 to WB 9.	20-320
XIII. Old Silver Cliff Track.	20-050
Haulage-way No. 4 to No. 9 adits. General dips from (040-140°).	Inhomog.
XIV. From No. 4 to Peg F/430	Inhomog.
XV. Area S.W. of Peg F/430	10-024

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AXES. No. 6

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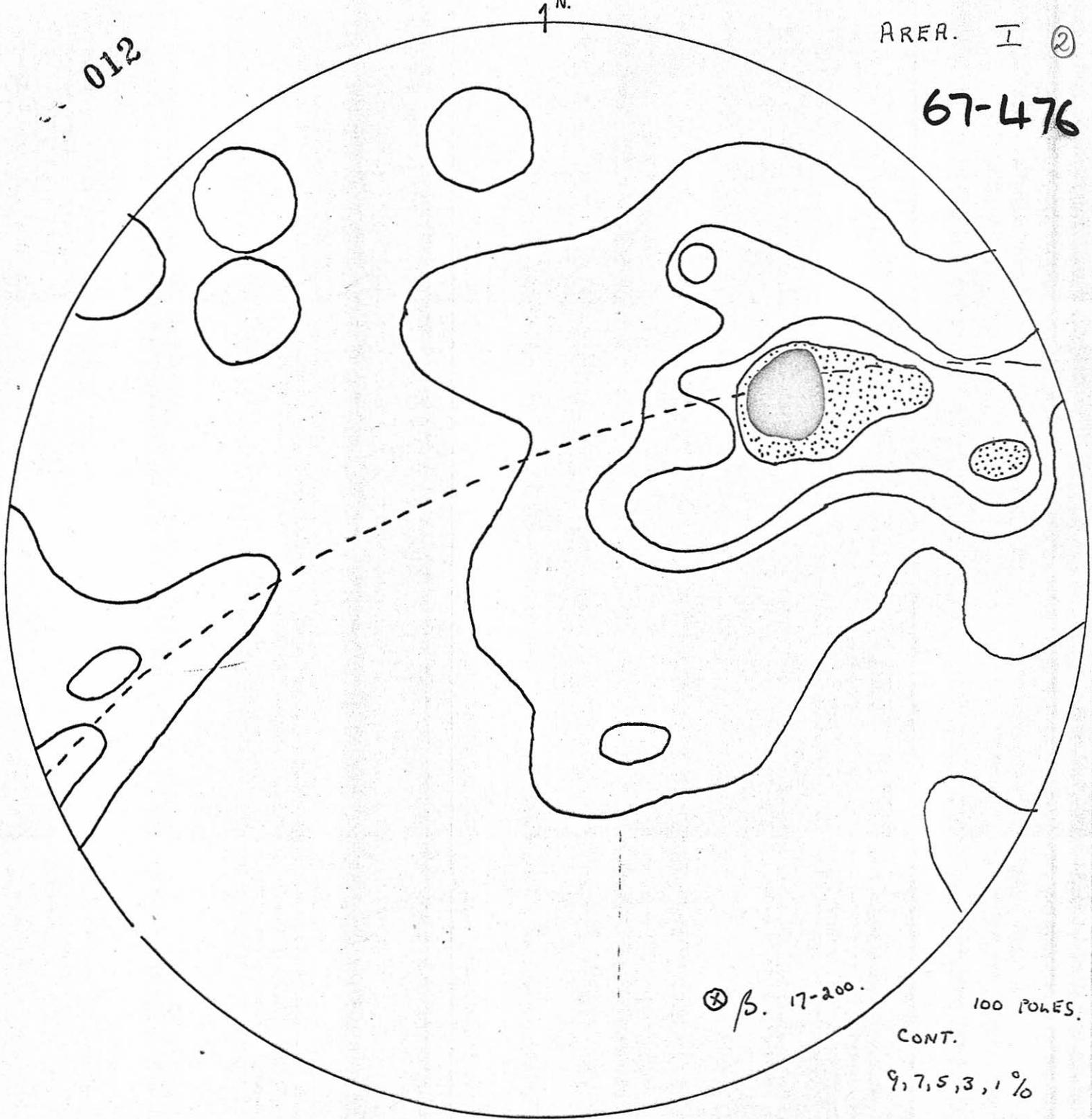
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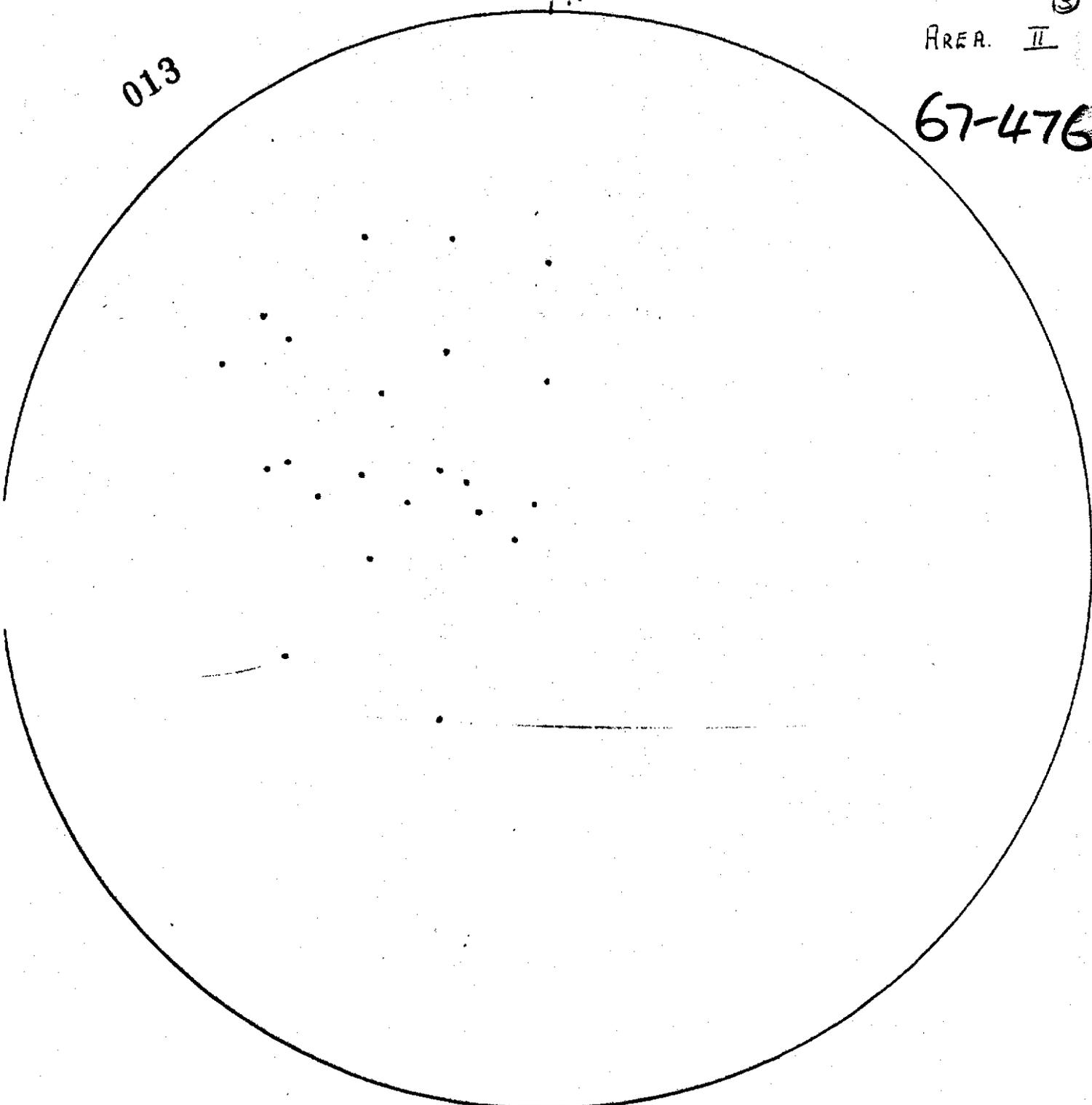
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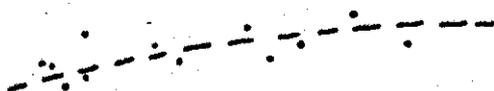
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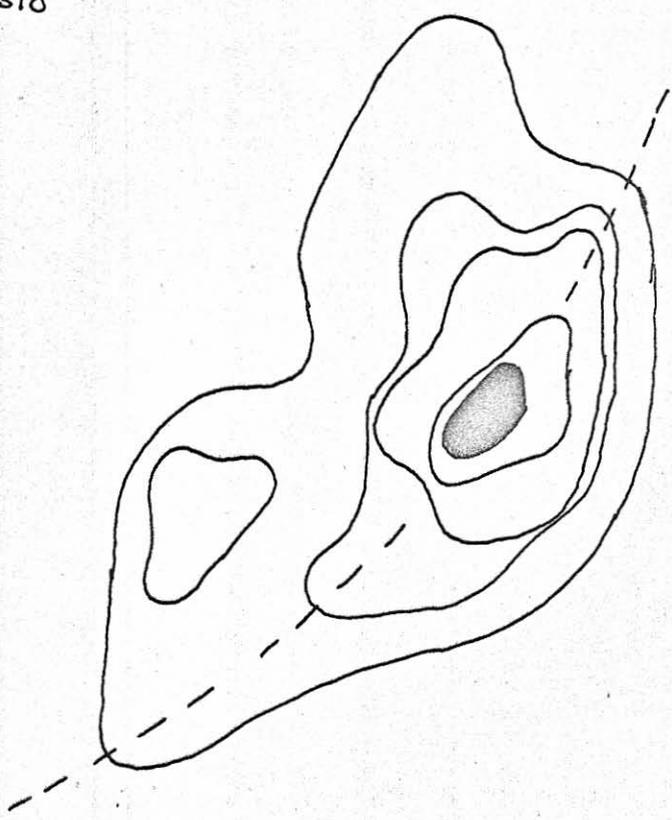
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$\beta = 30 - 310$



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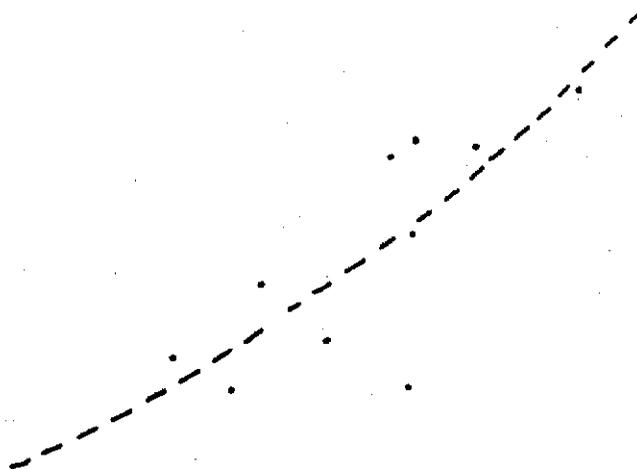
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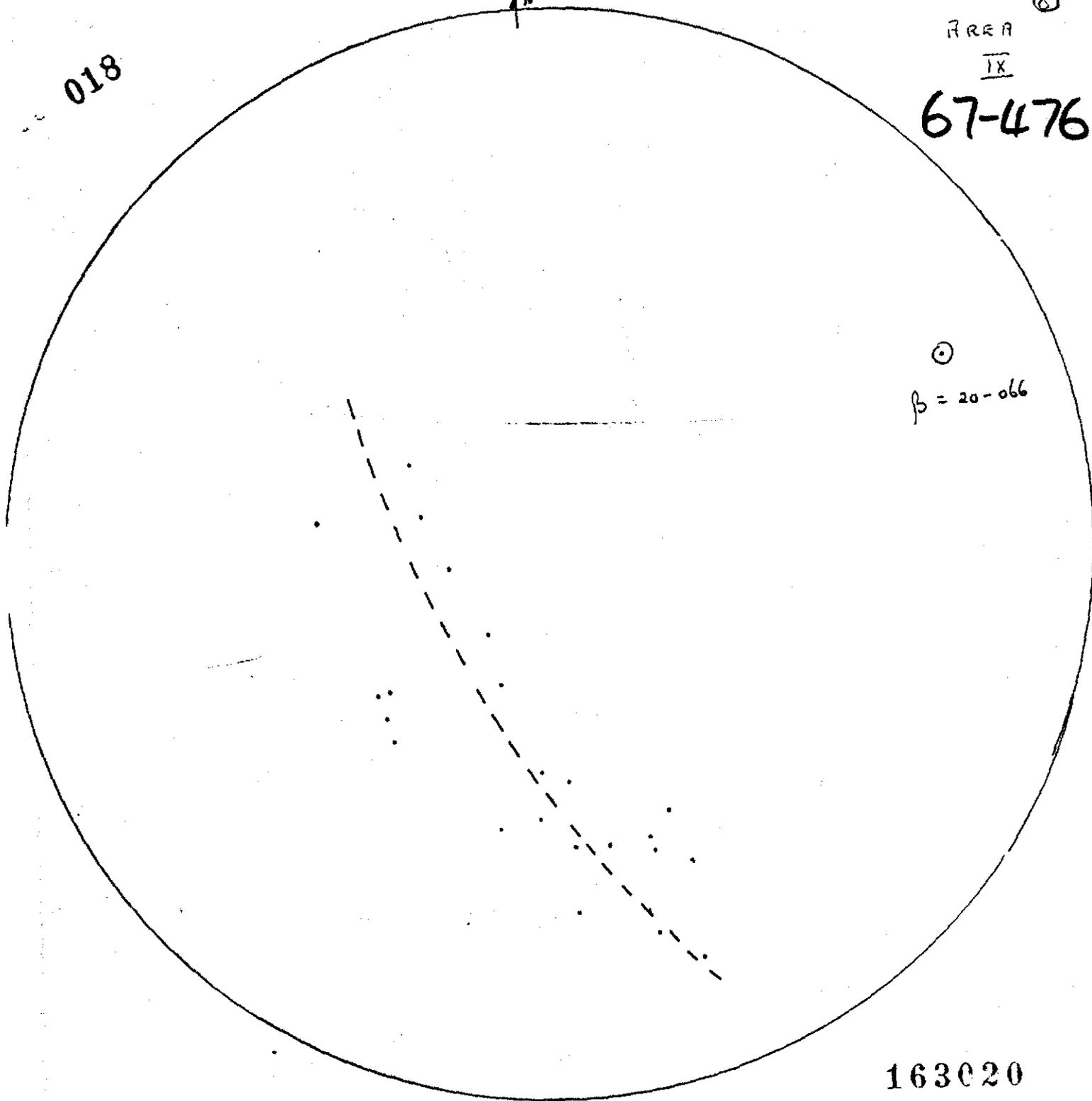
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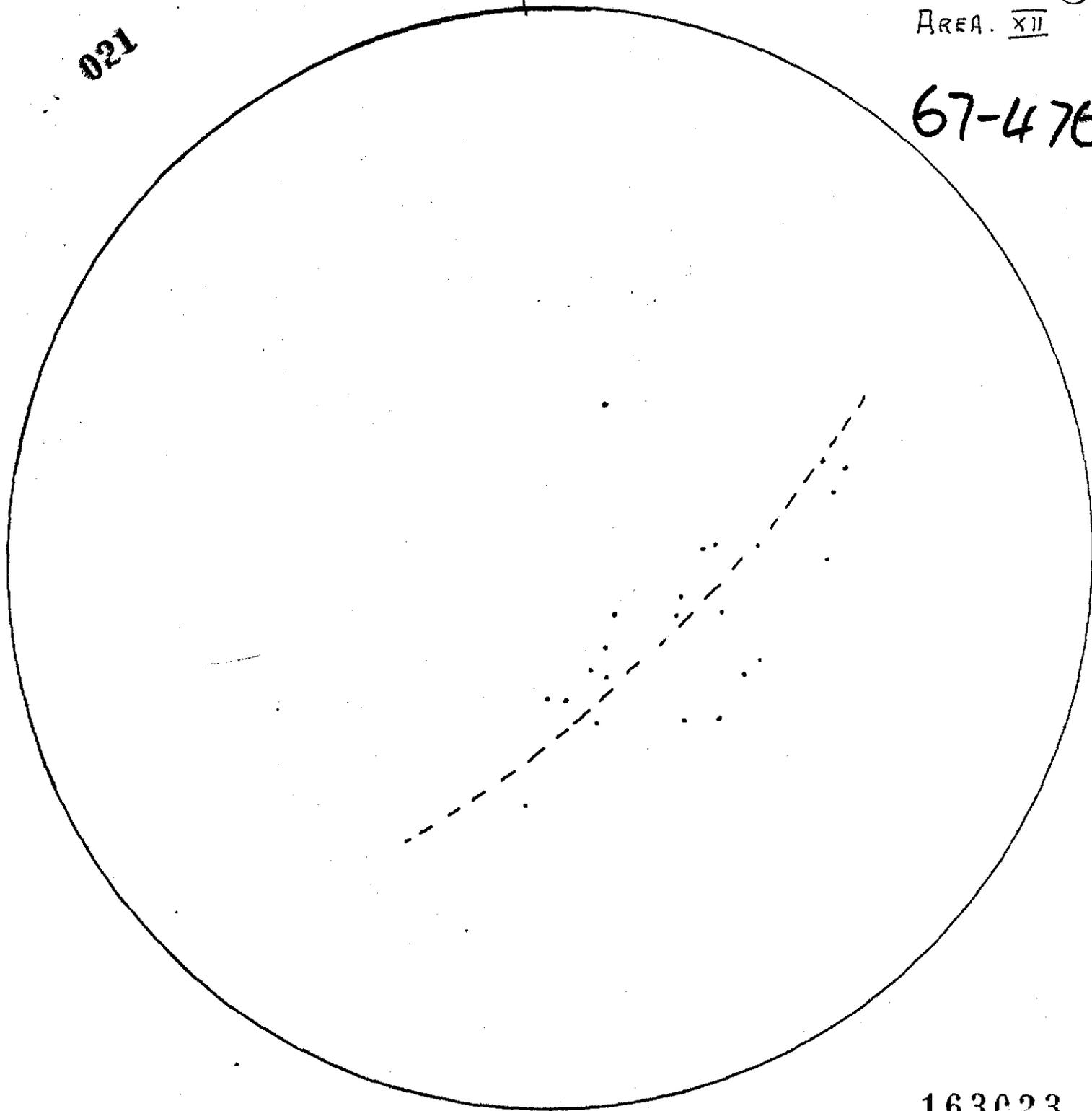
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AREA. XII ⁽¹¹⁾

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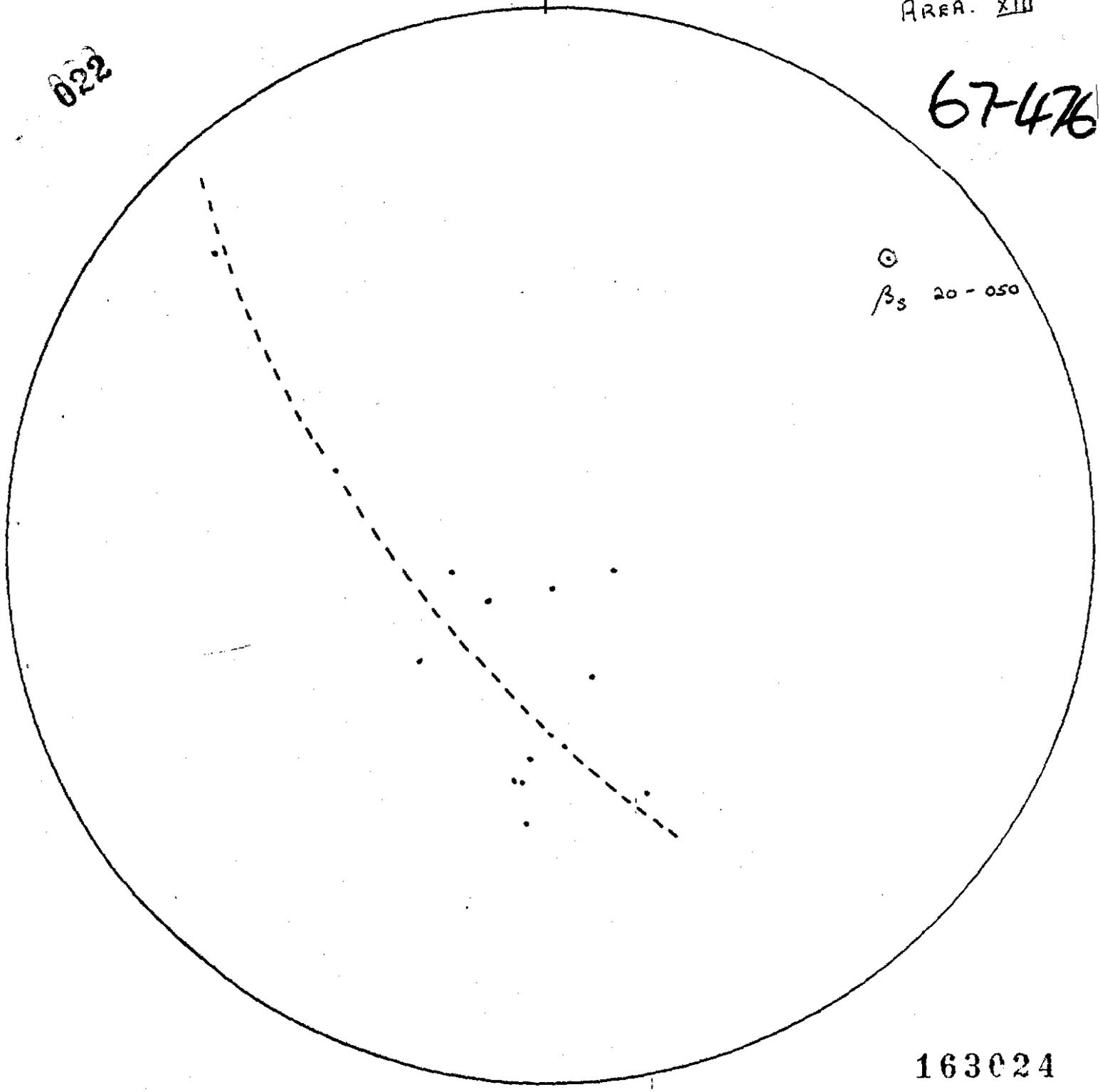
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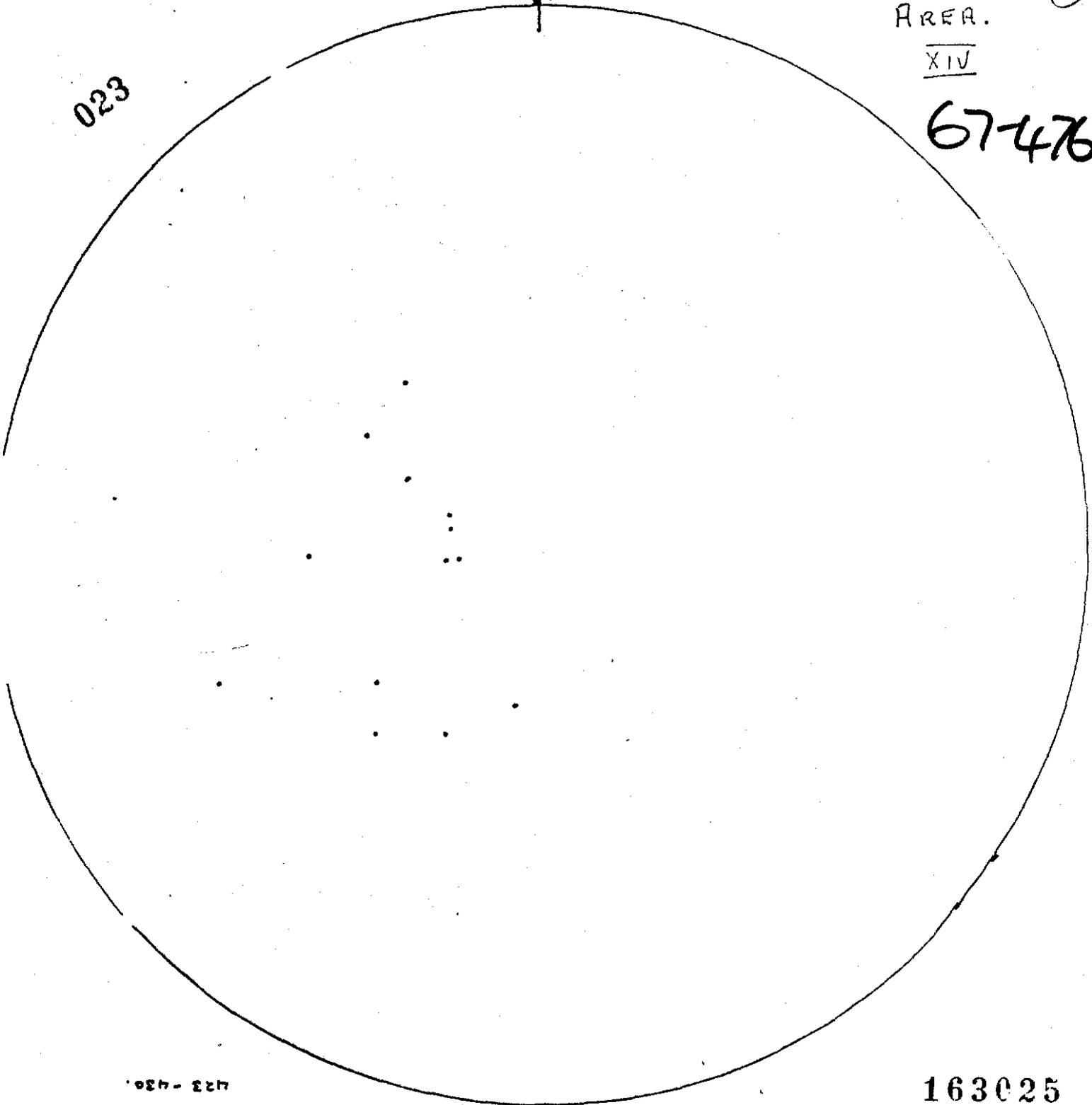
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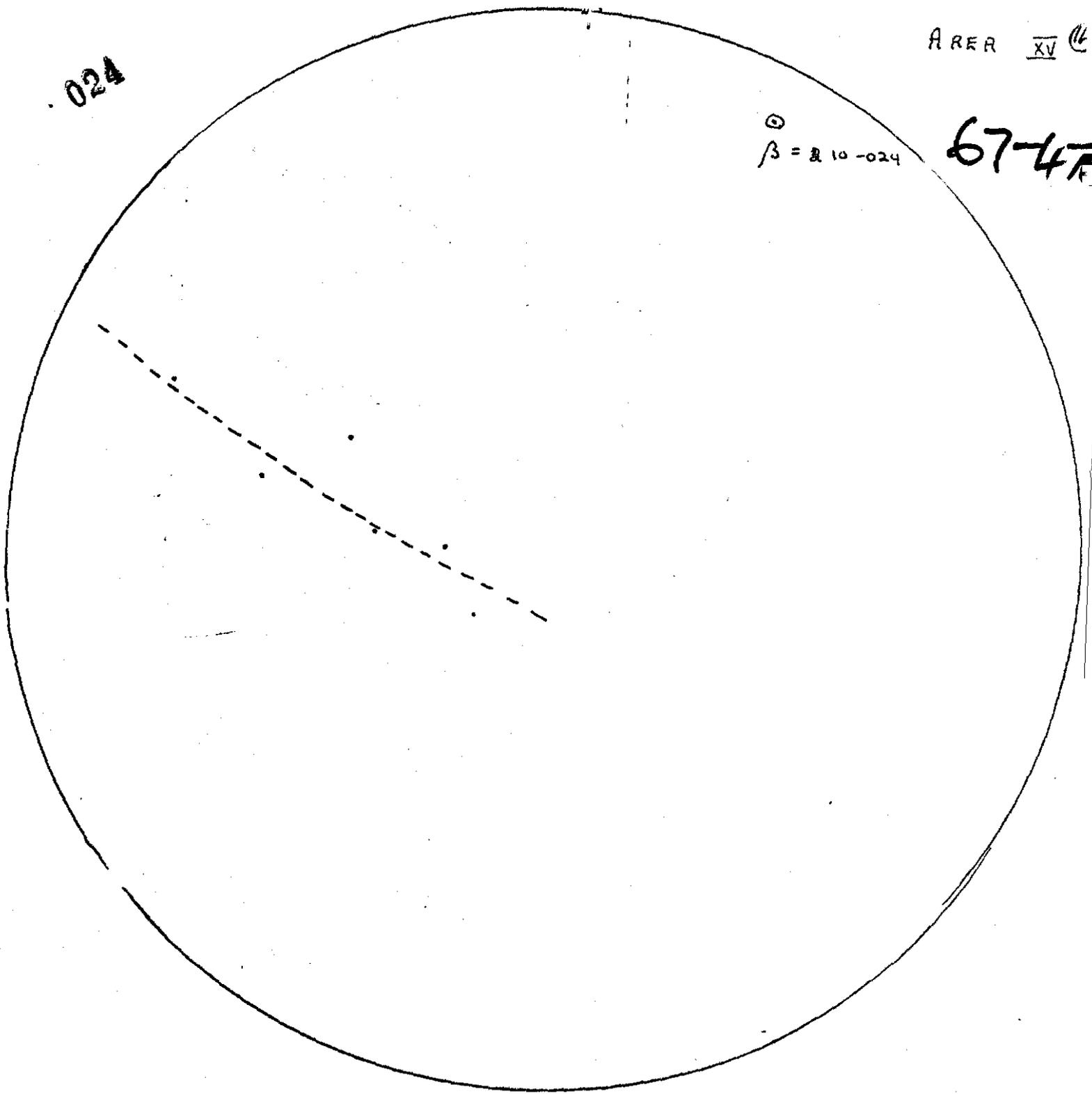
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AREA XV (4)

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 $\beta = 2 \cdot 10^{-024}$

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