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HIGH ALTITUDE OBSERVATORY
of the
University of Colorado

Solar Research Memorandum No. 63

Subject: First Coronal Observations with the K-coronameter.

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I. Introduction.

During the week beginning Monday, March 12, the sky was clear in Boulder for four days, March 12, 15, 16, 18, and the K-coronameter was in a state to be given operational tests. There were actually only three days of observations as the wind was so strong and so gusty on the 16th that it was impossible to guide the instrument reliably. This memo is simply to report on the first observations successfully obtained with the coronameter.

II. Procedure used.

As the instrument is not yet calibrated, we were able to record only the relative intensity of the K-corona as a function of the heliographic position angle around the limb.

Also at the present time of the year, the sun in Boulder is not very high above the horizon, its height being less than 50° . Due to that fact, the sky in the vicinity of the sun shows simultaneously two types of polarization: the fraction of the sky light due to the direct scattering (Rayleigh and Mie scatterings) of sun light is radially polarized with respect to the sun, the fraction of the sky light due to multiple scattering is for reasons of symmetry horizontally polarized. ~~During the scanning this~~ last component gives a sinusoidal signal of period two minutes. A scan far from the limb, at $1 R_\odot$ or more, permits a precise measurement of that signal and thus removes it from the data obtained closer to the limb.

III. Observations.

On March 12, the first day of observation, we restricted the measurements to the vicinity of the limb. The diagram of figure 1 shows the intensity of the corrected polarized light at a distance from the limb of about $0.1 R_\odot$. One recognizes two strong minima at the poles of the sun and four maxima, North-East, North-West, South-East, South-West corresponding to the north and south spot belts. The diagram shows the general shape of the K-corona observed at eclipses so there is little doubt that we are observing the K-corona effectively.

For comparison, the dotted curve indicates the intensity of the green coronal line, $\lambda 5303\text{\AA}$, measured the same day at Sacramento Peak. The positions of the principal maxima and minima coincide.

On March 15, we measured again the intensity of the K-corona at the same distance from the limb. The results plotted in Figure 2 show again two minima at the poles. The position and the relative intensity of the maxima are changed. There were no coronal observations at Clinax and Sacramento Peak on that day for comparison.

On the same day we extended the measurements further from the limb. With increasing the distance from the limb the record show a continuous transition between the coronal signal at the limb and the signal due to the horizontally polarized sky far from the limb. It is easy to determine the position of the maxima of intensity on these records up to a distance from the limb of $0.5R_{\odot}$. The South-West maximum, which was not the strongest close to the limb, was still very easily recognizable at $0.6R_{\odot}$ and could very likely have been detected further.

IV. Acknowledgments

We give our heartiest thanks to all those many members of the IAO staff who have had a part in building the coronameter.

We also thank Dr. Horace W. Babcock for suggesting the use of an ADP cell in the analyzing device.

End of Memo

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Solid curve
Dotted curve

K-corona
green line

Boulder
Sac. Peak

March 12, 1956

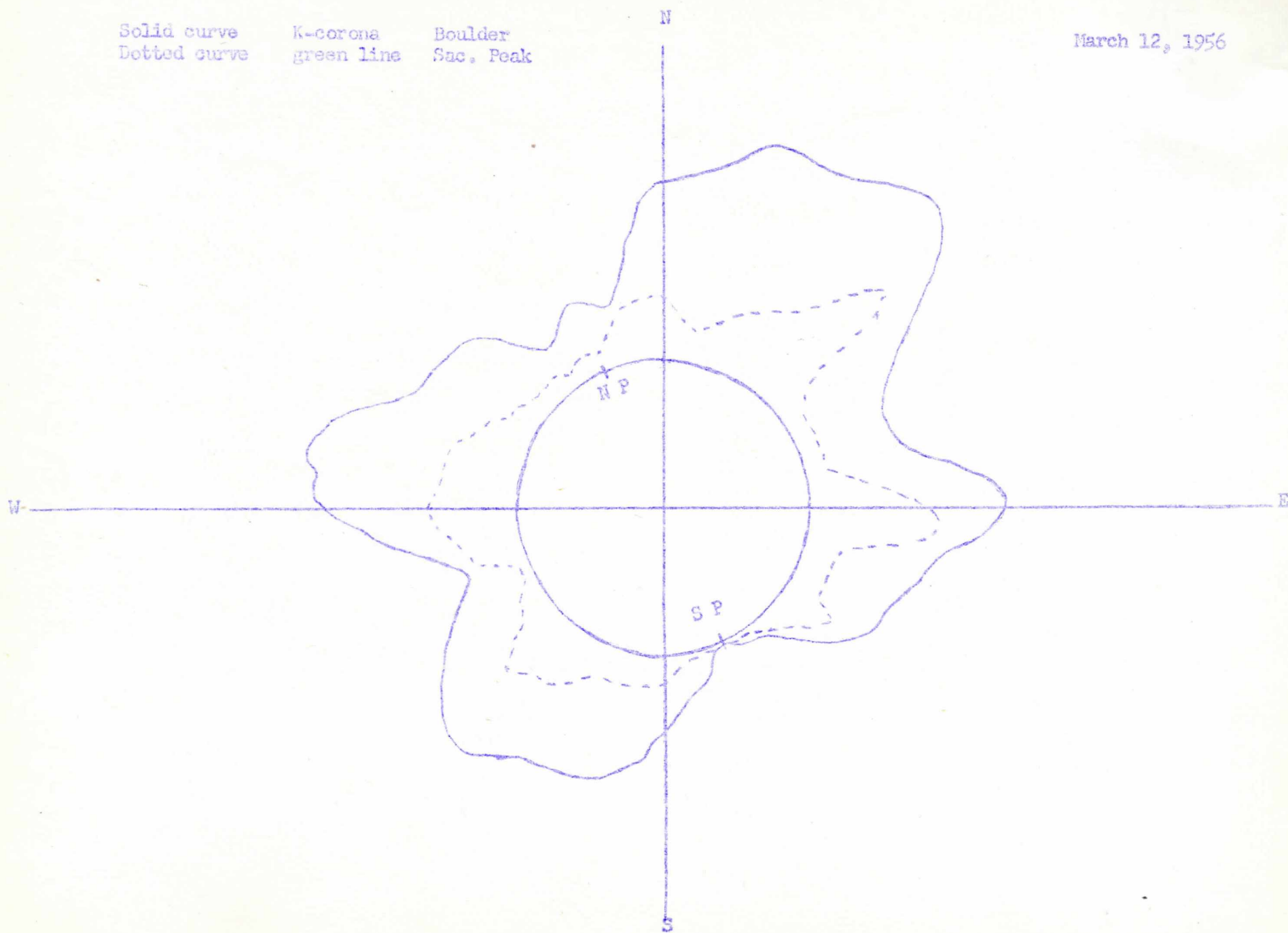
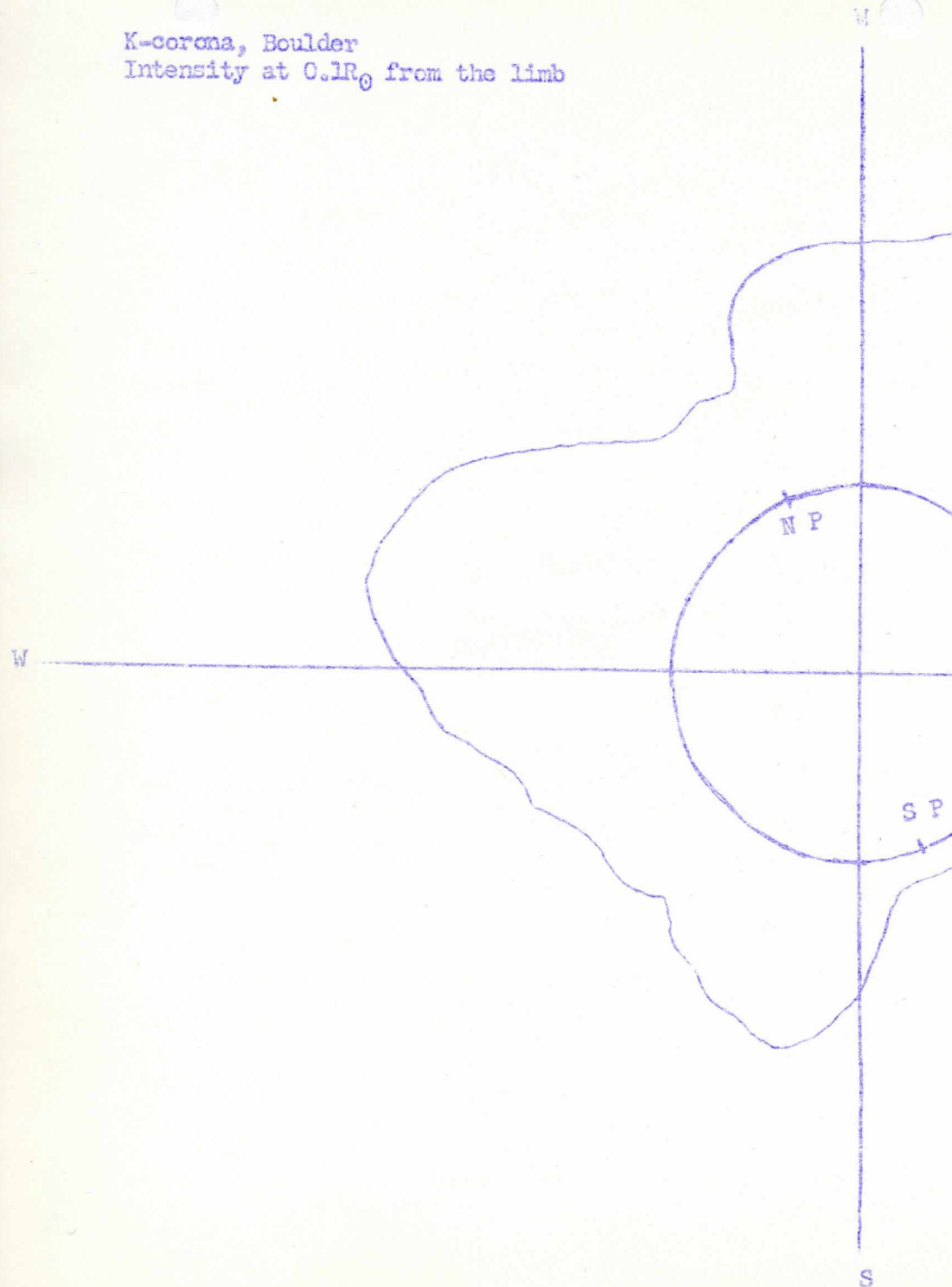


Figure 1

K-corona, Boulder
Intensity at $0.1R_{\odot}$ from the limb



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Figure 2

March 15, 1956

