

# **Nonlinear calibration of vector magnetograms by the video vector magnetograph at huairou**

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In this paper we compare the results of the two different calibration methods applied to FeI  $\lambda 5324.19 \text{ \AA}$  line for deriving the photospheric vector magnetogram. One method ignores the calibration coefficients dependence on inclination angle. The other method is a multi-iteration improved nonlinear calibration technique developed by Hagyard and Kineke which shows the polarization signals depending on both field strength and inclination angle. We compare the relationship between solar magnetic field and stokes parameters, we find that the circular polarization  $V$  is approximately linearly proportional to the strength of the line-of-sight field within the longitudinal field strength 1000 Gauss. But for the transverse field the linearity relationship takes place the relative minor scope. As compared with the conventional method, the improved calibration method solves the nonlinearity between the polarization signals and the longitudinal field (or the transverse field). From the numerical test and the Skumanich(1992)'s dipole fields calculation, the results show that the FeI  $\lambda 5324.19 \text{ \AA}$  line has better linear property compared with FeI  $\lambda 6302.5 \text{ \AA}$  line.