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ORIGINAL ARTICLE

Additional polarised standards in the fields of known bright standard stars

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Abstract We present the results based on broad-band (VRI) polarimetric observations of a number of stars that are present towards the fields of already known bright polarised standard stars namely BD+59° 389, HD 19820, and HD 25443. These three relatively bright stars were observed continuously for various observing programs using ARIES Imaging Polarimeter (AIMPOL) attached with 1-m Sampurnanand Telescope (ST) since 2006 to correct for any polarisation position angle offset. Since AIMPOL is an imaging polarimeter with a field-of-view of ∼8 arcmin diameter, we could get polarisation measurements of a number of relatively faint stars that are present within the field-of-view of the AIMPOL towards the above three bright polarised standards. Based on these compiled observations for a relatively long duration, we could examine the constancy of the degree of polarisation and position angles of them. With the help of some statistical tests, five stars in the field of BD+59° 389 and two stars in the field of HD 19820 have been identified as stars that could be used as additional polarised standard stars. Since these additional stars are relatively fainter than the known polarised standards, they could be observed with bigger aperture telescopes (like 2-m) without them getting saturated.

Keywords Polarisation: standards

1 Introduction

Measurement of the polarised state of radiation from the celestial sources play an important role either in its own right, or in combination with other observational tools to understand the behaviour of celestial sources. It is a tool to gain information on the geometry of astrophysical sources, and on the environments giving rise to polarised radiation. In fact, there are a number of astro-physical processes that could give rise to the polarisation of radiation (e.g. Han 2012).

One of the mechanisms that is of our interest is the interstellar polarisation. Background unpolarised starlight gets polarised while passing through the interstellar medium (ISM) due to the aligned, aspheric dust grains present there. The polarisation is produced because of the selective extinction suffered by the light as it passes through the aspheric dust grains that are aligned to the magnetic field present in ISM. Though the exact alignment mechanism is still unclear (Lazarian 2003; Roberge 2004; Cho and Lazarian 2005; Lazarian and Hoang 2007; Hoang and Lazarian 2009) the selective extinction due to aligned, aspherical dust grains would make the polarisation vectors to trace the direction of the plane-of-sky magnetic field of the ISM (e.g., Eswaraiah et al. 2011, 2012, 2013; Pandey et al. 2013; Soam et al. 2013). The contribution to the observed polarisation depends on the amount of dust grains with sizes comparable to the wavelength of the background starlight being observed (Goodman et al. 1995, 1996).

All polarimeters, whether for imaging or spectropolarimetry, uses a polarisation modulator followed by an analyser to convert any polarised component into a light intensity. The difference in the intensity of light measured by the detector at two predefined states of the modulator, divided by the total intensity provides the amount of polarisation. AIMPOL (Rautela et al. 2004) consists of an achromatic half-wave plate (HWP) modulator and a Wollaston prism beam-splitter used as an analyser. The dual-beam polarizing prism allows us to measure the polarisation by simultaneously imaging both orthogonal polarisation states on to the

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