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Unveiling the host extinction of type Ia supernovae with the NOTCam instrument at Nordic Observatory Telescope

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Type Ia supernovae (SNe Ia) are among the best standard candles for obtaining an accurate measurement of the Hubble constant (H_0) in late times and can help us shed light on the apparent discrepancy with the estimated value in the opposite edge of the universe, early times. This may indicate additional new physics beyond the standard cosmological model or significant systematic errors in the local measurement that need to be accounted for.

We propose to use the NOTCam instrument mounted on the 2.5 m telescope in the NOT to obtain near-infrared (NIR) photometry of nearby ($z < 0.06$) type SNe co-observed in optical bands by the Observatorio de Sierra Nevada (OSN) within the “SN2 Project”. The main goal of the project is to build a statistically significant and homogeneous photometric sample of about 70 type Ia SNe for which we have spectroscopic data for their host galaxies. With 2-3 epochs of each SN Ia NIR observations between the peak brightness peak and 20-30 days after the maximum, we can cover the secondary peak of SN. By including the NIR light curves (LCs) of the SNe we can obtain accurate values with the SNooPy (SuperNovae in Object-Oriented Python) LC fitter of the decline-rate parameter $\Delta m_{15(B)}$ and the main luminosity SN parameters. Furthermore, we can determine the extinction curves of the host galaxies for each SN Ia, which is of paramount importance to unravel possible systematics related to their physical properties.

The proposed NIR observations and the optical data obtained through the SN2 project allow us to constrain the main physical properties of the type Ia SNe and provide accurate systematics in its luminosity measurements, which will contribute to understanding the origin of the “constant of Hubble”.

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