

Telescope Astrophotography and Deep-Sky Observation: A Reproducible Capture and Calibration Note

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Layout demonstration — sample record, not a published paper.

Abstract

What does a deep-sky capture have to record before someone else can repeat it? This note writes acquisition, calibration and stacking as a checklist a reader can audit, and shows with placeholder data how signal-to-noise should be reported against integration time.

Keywords: astrophotography; deep-sky imaging; calibration frames; reproducibility

1 Introduction

An astrophograph is a measurement that happens to be beautiful. The beauty is why the picture is published and the measurement is why it can be checked, and the two do not require the same discipline from the person writing it down.

This note treats the capture as a protocol. Location, optics, sensor, exposure and calibration are recorded before the first stacked frame is mentioned, because a result that cannot be re-acquired is an illustration rather than evidence.

The numbers below are placeholders used to demonstrate the shape of the report. No object, instrument or observing run is claimed.

2 Acquisition as a protocol

The protocol is short and unglamorous: fix the optics, fix the sensor settings, fix the pointing, then vary only the integration time. Anything that changes between sub-frames belongs in the record, not in the caption.

- Optics, focal length and sensor model with gain and offset.
- Mount, guiding error and the interval between sub-frames.
- Sky conditions and the moon phase for each session.

Writing these three lines costs a minute and answers most of the questions a reader would otherwise have to email about.

3 Calibration frames as bookkeeping

Calibration frames do not improve a picture; they make a claim about what the sensor added. Each frame type removes one term, and the table keeps the terms separate so a missing type is visible as a missing term rather than as a disappointing image.

Frame	Removes	Count
dark	thermal current	[n]
flat	optical vignetting	[n]
bias	readout offset	[n]

Table 1: Calibration frames and the term each one removes. Placeholder counts.



Figure 1: Placeholder signal-to-noise against integration time. Values demonstrate layout only.

The count column is deliberately a slot. A finished note would report the counts it used, because the ratio between light and calibration frames is one of the quiet variables that changes the result.

4 Reporting a stack

A stacked image is usually reported as total integration time alone, which hides the fact that the curve flattens. Figure 1 reports placeholder data the way a measurement would: one value per integration time, with the shape of the curve visible.

The flattening is the point. Doubling the exposure is worth describing as a measured change rather than as an achievement, which is also the sentence that keeps the discussion honest about why the run stopped when it did.

5 What a finished paper adds

A completed note would publish the raw sub-frames, the calibration masters and the stacking script next to the text. The image is the summary; the files are the record.

References

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- [3] Berry, R., and Burnell, J. (2005). *The Handbook of Astronomical Image Processing* (2nd ed.). Willmann-Bell.