

Preventing Star Trailing when using Undriven Tripod Mounted Digital Cameras - Ball Park Exposure Times by Declination and Focal Length for Simple Stella Imaging

MJPorter

v0.6

Please read the notes at end of Table...

| Lens Focal Length (mm) | 15 | 30 | 50 | 70 | 90 | 110 | 130 | 150 | 170 | 190 | 210 | 220 | 240 | 260 | 280 | 300 |
|---|----------------|---------------|-----------------|--------------|--------------|-----------|-----------|----------|----------|----------|----------|---------|---------|---------|---------|---------------|
| Ratio 600/f | 40 | 20 | 12 | 9 | 7 | 5 | 5 | 4 | 4 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| Field of View - Full Frame Sensor | 100° x 77° | 62° x 44° | 40° x 27° | 29° x 19° | 23° x 15° | 19° x 12° | 16° x 11° | 14° x 9° | 12° x 8° | 11° x 7° | 10° x 7° | 9° x 6° | 9° x 6° | 8° x 5° | 7° x 5° | 7° x 5° |
| Field of View - APS-C Sensor | 73° x 53° | 41° x 28° | 25° x 17° | 18° x 12° | 14° x 9° | 12° x 8° | 10° x 7° | 9° x 6° | 8° x 5° | 7° x 4° | 6° x 4° | 6° x 4° | 5° x 4° | 5° x 3° | 5° x 3° | 4° x 3° |
| Declination in degrees | | | | | | | | | | | | | | | | |
| Exposures in Seconds | | | | | | | | | | | | | | | | |
| Actual exposure times in seconds Declination -15 to -5 Degrees | | | | | | 4 M42 | | | | | | | | | | |
| Estimated Max. Exp. Time in Secs. | 40 | 20 | 12 | 9 | 7 | 5 | 5 | 4 | 4 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| Actual exposure times in seconds Declination -5 to 5 degrees | | 20 Orion | 10 Orion | | | | | | | | | | | | | |
| Estimated Max. Exp. Time in Secs. | 33 | 17 | 10 | 7 | 6 | 5 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 |
| Actual exposure times in seconds Declination 5 to 15 degrees | | | | | | | | | | | | | | | | |
| Estimated Max. Exp. Time in Secs. | 40 | 20 | 12 | 9 | 7 | 5 | 5 | 4 | 4 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| Actual exposure times in seconds Declination 15-25 degrees | 30 Hercules | 10 Beehive | | | | | | | | | | | | | | |
| Estimated Max. Exp. Time in Secs. | 47 | 23 | 14 | 10 | 8 | 6 | 5 | 5 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 2 |
| Actual exposure times in seconds Declination 25-35 degrees | | | 8 Pleiades | 6 Neptune | | | | | | | | | | | | 2 Pleiades |
| Estimated Max. Exp. Time in Secs. | 60 | 30 | 18 | 13 | 10 | 8 | 7 | 6 | 5 | 5 | 4 | 4 | 4 | 3 | 3 | 3 |
| Actual exposure times in seconds Declination 35 to 45 degrees | 56 Cygnus | | | | | | | | | | | | | | | |
| Estimated Max. Exp. Time in Secs. | 77 | | 23 | 16 | 13 | 10 | 9 | 8 | 7 | 6 | 5 | 5 | 5 | 4 | 4 | 4 |
| Actual exposure times in seconds Declination 45 to 55 degrees | | 38 Perseus | 5 Perseus | | | | | | | | | | | | | |
| Estimated Max. Exp. Time in Secs. | 97 | 48 | 29 | 21 | 16 | 13 | 11 | 10 | 9 | 8 | 7 | 7 | 6 | 6 | 5 | 5 |
| Actual exposure times in seconds Declination 55 to 65 degrees | | | | | | | | | | | | | | | | |
| Estimated Max. Exp. Time in Secs. | 120 | 60 | 36 | 26 | 20 | 16 | 14 | 12 | 11 | 9 | 9 | 8 | 8 | 7 | 6 | 6 |
| Actual exposure times in seconds Declination 65 to 75 degrees | | | | | 30 Plough | | | | | | | | | | | |
| Estimated Max. Exp. Time in Secs. | 143 | 72 | 43 | 31 | 24 | 20 | 17 | 14 | 13 | 11 | 10 | 10 | 9 | 8 | 8 | 7 |
| Actual exposure times in seconds Declination 75 to 85 degrees | | | 40 Pole Area | | | | | | | | | | | | | |
| Estimated Max. Exp. Time in Secs. | 173 | 87 | 52 | 37 | 29 | 24 | 20 | 17 | 15 | 14 | 12 | 12 | 11 | 10 | 9 | 9 |

Notes

- Actual exposure times (in RED) are those which produced minimal trailing (or none) for me
- Estimated maximum exposure times for minimal trailing are shown in BLUE
- Best practice is to set a reasonable high ISO value (but not so high as to seriously effect image quality) and then to take a series of exposures varying the exposure time around the values above
- The above 'ball park' estimated maximum exposure values have been derived by taking some empirical values and some assumptions related to the relative 'slowing' across the field of view as declination increases towards the North Pole
- With modern digital cameras, rather than problems with 'trailing', exposures are often 'blown' by setting an excessively high ISO level or by light pollution
- What appears to be 'trailing' may, in fact, be caused by 'mirror flop' or leaving the 'antishake' on.
- If using the actual exposures shown in RED you may find that some of these are under the maximum exposure you can use before trailing becomes apparent
- Please note that, particularly at shorter focal lengths, camera fields of view will probably cover several declinations and not just those shown within a particular cell above
- Given the many variables involved in estimating exposure times, errors and omissions in the above are expected, however, the estimated values above are likely to be reasonably good starting points.