

Solar Eclipse

August 21, 2017

Re-Create the Eddington Experiment



29 May 1919

How does the universe work? In 1919, the Eddington Experiment allowed scientists to test predictions of Einstein's General Theory of relativity. Today, NASA continues to use the physics of general relativity to allow spacecraft to arrive at distant planets and for earth-orbiting satellites to communicate with ground-based researchers, among many other things.

Equipment Suggestions in Brief:

	Set Up A:	Set Up B:
Telescope	Tele Vue NP101is	Takahashi FSQ 106-ED4 refractor
Camera	Monochrome Microline 8 MPixel 8051 CCD camera	QSI-683wsg-8 CCD Camera
Mount	Software Bisque MyT Paramount	Astro-Physics 1100GTO mount

For more info, see page 2 or visit:
<http://bit.ly/EddingtonExperiment>
Or contact Rachel Freed at:
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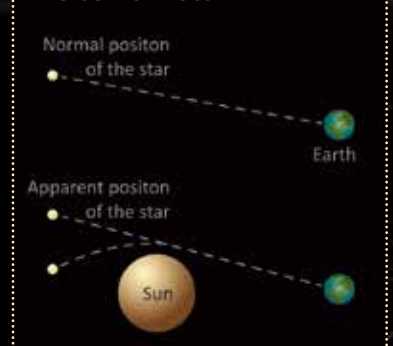
Total Solar Eclipse - 1919



Fully eclipsed sun showing "diamond ring" effect



Deflection of star light by the sun's mass



Eddington Experiment Suggested Equipment

Are you interested
in replicating the Eddington
Experiment which has not been done with
ground-based optical telescopes since 1973?
Do you have similar equipment?

Set Up A

Telescope

Tele Vue NP101is:

1. Portable
2. 101 mm aperture large enough to capture 10th mag stars with 1 second exposure
3. Diffraction limit = 1.3 arcsec at 630 nm (expected daytime seeing - 2.5 arcsecond)
4. Short focal length = 540 mm - allows wide FOV with medium format camera
5. Image plane is flat and color-free
6. No central obscuration or spider to add scatter
7. Optical distortion ray trace calculations in red light amounted to only 0.01% at 1.2°



Camera

Monochrome Microline 8 MPixel 8051 CCD camera:

1. From Finger Lakes Instrumentation
2. Interline CCD sensor required so no mechanical shutter was needed
3. Pixels are 5.5 microns wide, perfect match for NP101is's focal length (540 mm)
4. 2° wide FOV
5. Stars near the Sun during totality have a small mag range (7.4-9.5) so dynamic range is not critical
6. Digitizes at 12 MHz; digitizing a full frame takes only 0.7 sec
 - a. Exposure range from 0.2 seconds to 1 second
 - b. 50 1-second images can be saved during the eclipse
7. Cooled to reduce readout noise
8. Mounted with a T-mount flange that mates directly with the 2.4" diameter Tele Vue focuser



Mount

Software Bisque MyT Paramount:

1. The periodic error, after correction, is sub-arcsecond, necessary for high quality images.
2. Must be polar aligned



NEVER look directly at the un-eclipsed or partially eclipsed sun. Use special-purpose solar filter.

Set Up B

Telescope

Takahashi FSQ 106-ED4 refractor:

1. Portable
2. 101 mm aperture large enough to capture 10th mag stars with 1 second exposure
3. Diffraction limit = 1.3 arcsec – approx. same as Setup #A
4. Short focal length = 530 mm
5. Image plane is flat and color-free
6. No central obscuration or spider to add scatter



Camera

QSI-683wsg-8 CCD Camera:

1. From Quantum Scientific Imaging Corp.
2. 8.3 megapixel Kodak Enhanced Response full-frame CCD image sensor with microlens technology
3. 8.3 mp Kodak KAF-8300 sensor
4. 5.3 micron pixels
5. USB 2.0 High Speed 16-bit output
6. 8MHz Read Rate
7. Cooled to reduce readout noise



Mount

Astro-Physics 1100GTO mount:

1. The periodic error, after correction, is sub-arcsecond, necessary for high quality images.
2. Must be polar aligned



Need help with this set up? Contact Greg Kinne: Greg@calypsos.net