

# LICAAStroCalc Light Pollution: Theory, Modelling and Measurements. 2017. Cellers



www.carlostapia.es

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LICA AstroCalc is a free software to determine parameters for telescopes, astrometry calculations, filter transmission, CCD and DSLR quantum efficiency, photometry parameters and light pollution parameters. It was first developed to compare the transmission of filters used by amateur astronomers.

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for Light Pollution research as the calculations of parameters related to the effects of different lamps in circadian rythms and photsynthesis indexes. This software can be run both in Windows and MacOS and can be downloaded at:

#### The version presented now includes some features oriented

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About LICA-AstroCalc Astronomy Calculator	Astrometry Calculator Filters	CCDs & DSLR Photometry	Light	
Telescope	Eyepieces	CCD	Planetary	
Diameter (mm)Working f number (f:)1029.80Focal (mm)Effective focal10001000Barlow/reducerVisual limit magnitude1.00X13.318Tube length (mm)Depth of focus (mm)9000.2603Thermal sensitivity (°C)AbsoluteRelative to selected CCD12.5227.922	SelectedExplore Scientific 20 - 100°Focal (mm)DesignBarrel (inch)209/62AFOV (°)Field stop (mm)Weight (g)10034.9968Focal (mm)MagnificationEye relief (mm)05014.5AFOV (°)Real FOV14.5Visual limitExit pupil (mm)14.3882.04	Selected menu   Sony A7S II     Pixel size (µm)   Number of pixels     8.40   4240   ×   2832     Pixel size (µm)   Number of pixels     1.00   1   ×   1     Binning   Sensor size (mm)   35.616   ×   23.789     Field of View   2.137   ×   1.427   Degrees	Mars Km/pixel 657.942 Maximum exposure time 87.037 Seconds Jupiter Km/pixel 5282.044 Maximum exposure time 420.144 Seconds	
Star testing	Wavelength	Resolution	Km/pixel 10727.885	
Minimum pinhole distance (m) 1.424 Maximum size of pinhole (mm) 0.019	Wavelength (nm)	With CCD Difraction limited Rayleigh criterion Arcsec/pixel 1.37	Maximum exposure time 1043.651 Seconds	
Effective focal from image     Real size object (arcsec)   Image (pixels)   Focal (mm)     30   375   21657.8	Star trails Star declination (°) Exposure time (s) 89 6.618	1.7326 Dawes limit   1.7526 1.15   Pixel size for oversampling (µm) Abbe limit   5.11 6.64   Sparrow criterion 1.05	Perigee 2993.763 Apogee 3416.283	

EXAMPLE 1. Calculator of parameters from telescopes.Can be done calculations covering from true focal, thermal sensitivity of aluminum setup, to diffraction criterias, more than 800 eyepieces and more than 200 CCD and DSLR cameras.

About LICA-AstroCalc	Astronomy Calculator	Astrometry Calculator	Filters	CCDs & DSLR	Photometry	Light
QE CCDs + Filter	Espectral Response DSLR + Fi	Iter Relation CCDs/Sensors				
Camera 1						- 1



EXAMPLE 2. Plotting some filters from our database. There are more than150 astronomical filters used by amateur astronomers. They were characterised at LICA-UCM laboratory in an optical bench which include a calibrated photodiode.

About LICA-AstroCalc	Astronomy Calculator	Astrometry Calculato	try Calculator Filters			CCDs & DSLR		Photometry	Light	
Lamps	Custom lamp	Lamps comparison Lamps		layleigh	Light pollution simulator		or Screens (phone, tablet, pc)			
										-1



EXAMPLE 3. CCD Quantum efficiency convolved with astronomical filters. The software include the quantum efficiency of the most common CCD sensor and photodiodes. The convolution present the final efficiency of any setup where is involved CCD and astronomical filters.





EXAMPLE 4: Calculation of parameters and indexes of a LED lamp. The database includes more than 50 different lamps covering from common HPS, to Metal Halide and super warm LED. The equations are taken from Aubé, M.\* for melathonin and McCamy\*\* for CCT. \*Aubé M.; Roby J.; Kocifaj M. (july 2013) "Evaluating potential spectral impacts of various artificial lights on melatonin suppression, photosynthesis, and star visibility."





EXAMPLE 5: You can use your own spectra Besides the internal database of lamps spectra, you can read your favourite spectrum.

EXAMPLE 6: Mobile phone screen spectra We have measured the spectra of some mobile screens. The database includes almost all the available screens of mobiles: AMOLED, IPS-LED, IGZO and salt based like the iPhone.

## Ask me for more features that you wish to be included