

High Speed Solar Imaging with Basler ace GigE Camera



155 mm Telescope with Basler ace GigE Camera

Customer

Jean Pierre Brahic is a top European solar imager. He lives in Uzès, France and studies the sunlight in a special spectral region known as the Hydrogen $H\alpha$ band. This region is a very narrow (<0.7 Angstrom) part of the sun's chromosphere emission in the red part of the spectrum at 656.3 nm. The chromosphere displays bright regions known as plages and dark areas called filaments. Filaments, which are jets of plasma, are the same thing as solar prominences, but are on the solar disk itself. These features change their shape very quickly, and a prominence can evolve dramatically in a few minutes time. A prominence's birth is a cataclysmic event called a solar flare. On the 1st of May 2011, Jean Pierre captured a very impressive video of a solar flare that lasted 20 minutes.

Application

Within the last few years, amateur planetary, solar, and lunar imaging has advanced in giant steps thanks to huge progress in image processing and CCD sensors. Sony's EXview HAD sensors are the latest improvement, and they exhibit twice as much sensitivity in the red and near IR spectrum as standard sensors. Amateurs have developed an imaging technique - also used by professional observatories - called "lucky imaging". The technique is based on capturing high speed video to

get thousands of images in a short amount of time and then combining the images to dramatically improve the signal-to-noise ratio (SNR). This increases the efficiency of subsequent image enhancement algorithms. Lucky imaging, for instance, allows the reduction of atmospheric turbulences that can distort the images. Actually some images taken by amateurs are among the best pictures taken from earth.

Solution and Benefits

Jean Pierre is using a Basler ace GigE camera (acA1300-30gm) that contains a very efficient 1.3 megapixel Sony ICX445 sensor with a 50% quantum efficiency at 656 nm. He uses the camera with a 155 mm Astro-Physics refractor modified to use an $H\alpha$ -etalon. The camera is driven by the astronomy version of Genika software from Airylab and delivers video files for further processing. This amateur imager states: "The GigE interface on Basler ace cameras can deliver over 80 MB/s of highly-dynamic, 12 bit images that are almost completely free of noise. Nevertheless, the camera is affordable, even for an amateur with a limited budget."

Lucky imaging requires capturing many images in a limited amount of time, and Basler's ace GigE cameras offer the high frame rate necessary to apply the technique. The details on the sun evolve quickly, therefore the time available to capture images is limited.



Image of a Solar Prominence – Earth Image Gives the Scale

Basler's ace GigE cameras are also very sensitive, an especially valuable feature for planetary imaging. Their combination of speed and sensitivity freezes the turbulence as much as possible and delivers pictures free of noise or other patterns and with a good dynamic range. The Basler ace I 300-30gm incorporates the new monochrome EXview sensor with especially high sensitivity at 656 nm.

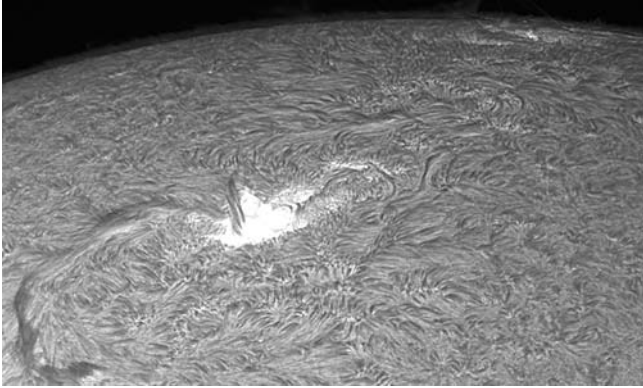


Image of a Flare Birth

Technologies Used

- Basler ace GigE camera (acA1 300-30gm) with EXview sensor
- Astro-Physics 155 mm telescope equipped with an internal H α filter that has a spectral bandwidth of about 0.7 Angstrom (FWHM)
- Software for high speed recording of raw frames: Genika Astro by Airylab (32 fps at 12 bits)
- Avistack 1.81 image processing software and Registax 6 for wavelets

More Information

<http://jp-brahic.chez-alice.fr/>

http://airylab.net/index.php?option=com_content&view=article&id=50&Itemid=68



Basler AG

Germany, Headquarters

Phone +49 4102 463 500

Fax +49 4102 463 599

bc.sales.europe@baslerweb.com

www.baslerweb.com

USA

Phone +1 610 280 0171

Fax +1 610 280 7608

bc.sales.usa@baslerweb.com

Asia

Phone +65 6425 0472

Fax +65 6425 0473

bc.sales.asia@baslerweb.com

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