ETC-42 : Exposure Time Calculator : Evolution and new functionnalities

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http://projects.lam.fr/projects/etc

Abstract

We developed at CeSAM (Centre de donneeS Astrophysiques de Marseille) ETC-42, an Exposure Time Calculator compliant with Virtual Observatory standards. ETC-42 has been designed to facilitate the integration of new sites, instruments and sources by the user. It is not instrument-specific, but is based on generic XML input data. It is used in several project implementations (EUCLID, PFS, IRIS, WISH, EELTs ...) covering a wide wavelength range, from NIR to UV. The last release has been optimized to achieve gain of computation time. New functionalities for automatic input parameterization have been added to target specific instrumental configuration and to give an increased level of user-friendliness.

Furthermore its flexible design and support for plugins allow for easy insertion of new computation methods, anticipating for future technologies or instrumentation.

CeSAM

Laboratoire d'Astrophysique de Marseille (LAM) gathered their forces working in computing for Astrophysics in the Astrophysical Data Center of Marseille (Centre de données Astrophysique de Marseille -CeSAM). CeSAM is developping softwares, WEB based applications, databases, numerical simulations and Image processing modules. The developments are made with respect to the Virtual Observatory standard.

ETC-42

Most ETCs are black boxes with no possibility to easily include some instrument modification and artefacts or sources. Usually, ESA, ESO and other specific Instrument Centers have developed their own ETC in order to provide simulation of instrument performances. Most of the time, ETCs are independent and outputs are different one from each other, even for the same queries. Therefore, we decided to build up an «open» ETC that will be usable by standard astronomical community and by instrument specialists. It is generic enough to be adaptable to any new project : site, instrument, target and operation mode.

As any ETC, the goal is to estimate the exposure time needed with respect to source, site, instrument and observation parameters specifications. Standard outputs of the ETC include : signal to noise ratio, total integration time, observation time specifications, noise components.
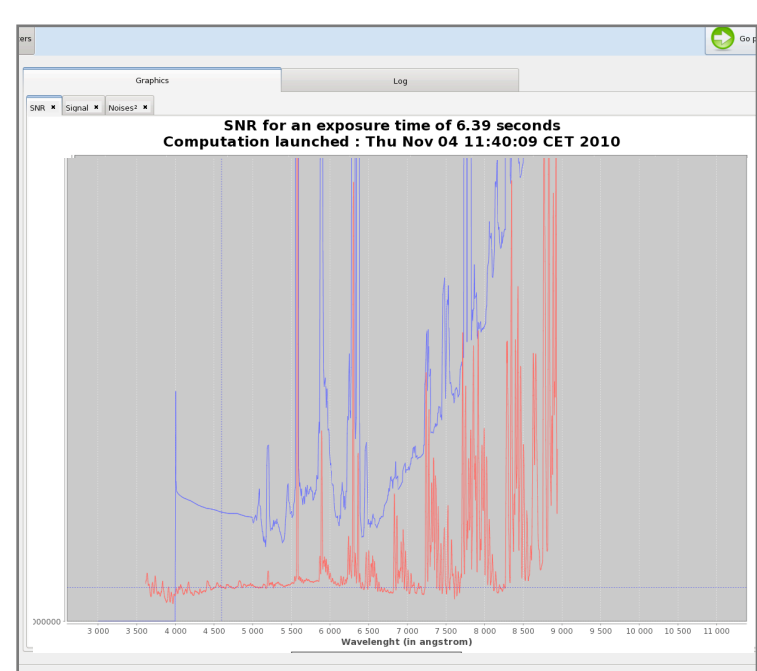
Technical aspects

Panel

All 4 panels :
- Instruments
- Sites
- Sources
- Observing parameters

allow to enter data specifications for the computation of the Signal Noise Ratio with respect to wavelength.
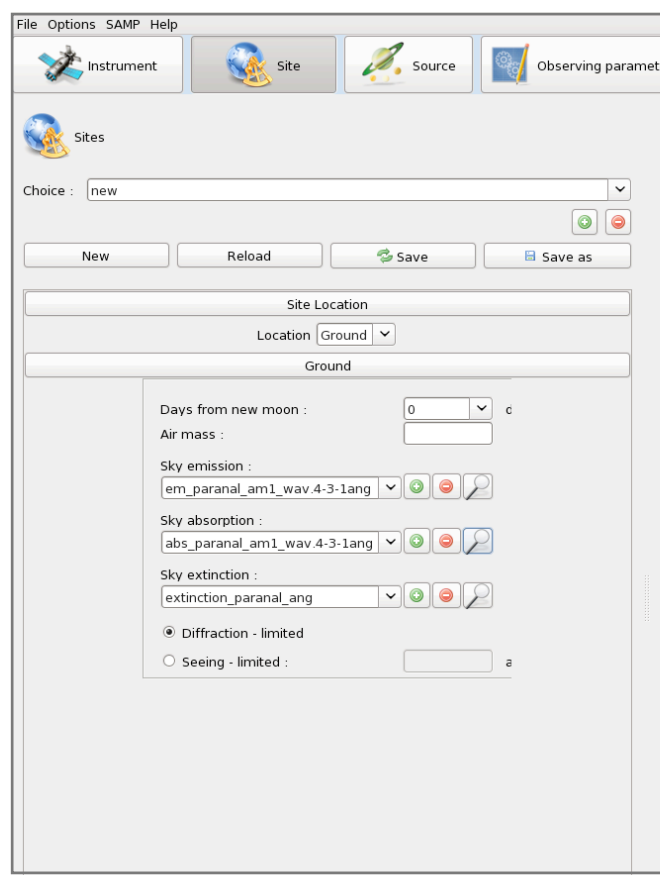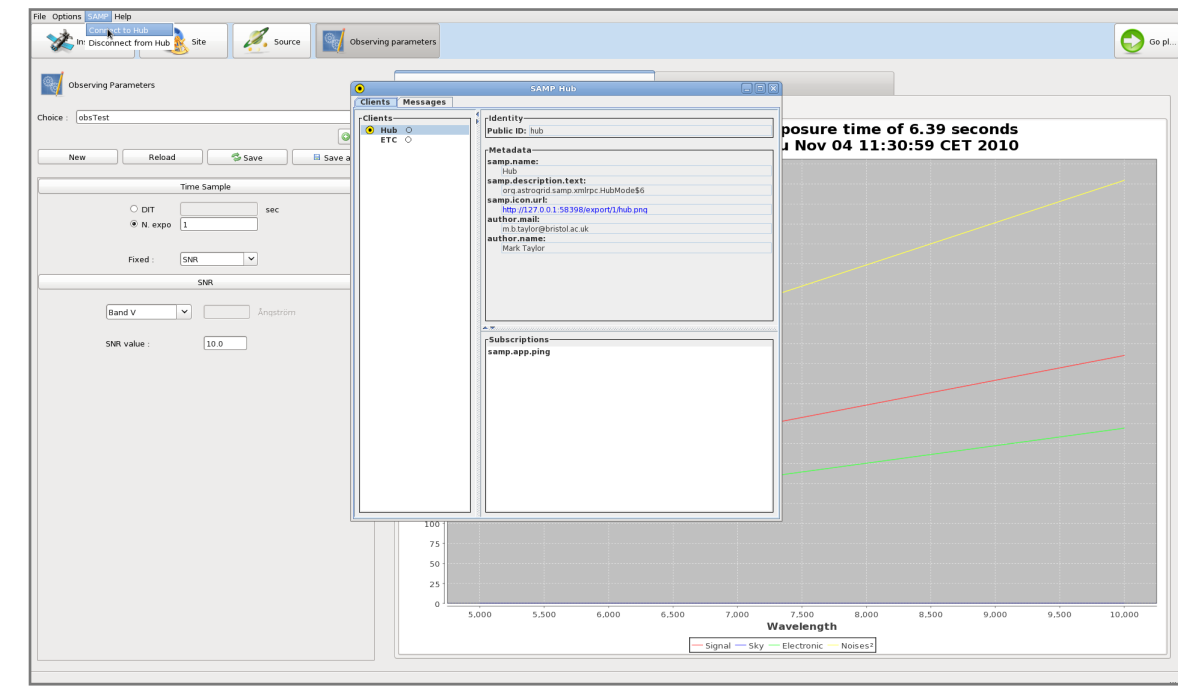
Computation process - Display

Results are displayed in the interactive plot window with respectively the signal to noise ratio distribution, the output signal and the noise contributions.

Input - Output - Interoperability

The ETC is open to the Virtual Observatory standards ansd is able to grab data or broadcast any output signals as VOTable.

- Development : JAVA Application
- Embedded libraries : JSamp, JFreeChart, XMLBeans
- Deployment : Java webStart, Download
- Tested on Windows, Linux, Mac

New functionalities

Fixtures

ETC-42 has released a new functionality to allow the user to have a dedicated ETC focused on one instrument, one site, with a specific choice of sources or observations parameters. This focused install is done from remote LAM server (http://projects.lam.fr/projects/etc) and can be installed from everywhere as a specific fixture.

Just launch the command line :

```
java –Detc.fixtures=«NameofFixture» –jar ETC.jar
```

A list of of fixtures can be available on the ETC site, it includes telescopes : EUCLID (NISP), IRIS, WISH, PFS and more to come.

Adaptative Optics

ETC-42 is able to deal with Adaptative Optics features. Indeed the PSF profile of the instrumental panel can be defined from the Strehl ratio combined to a Reference wavelength. ETC-42 will compute the corresponding PSF and will apply this PSF to the profile of the source.
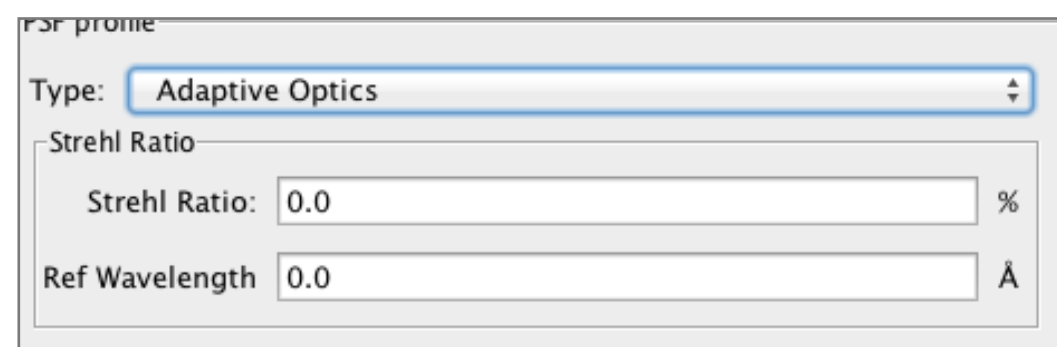
Fabry Perot
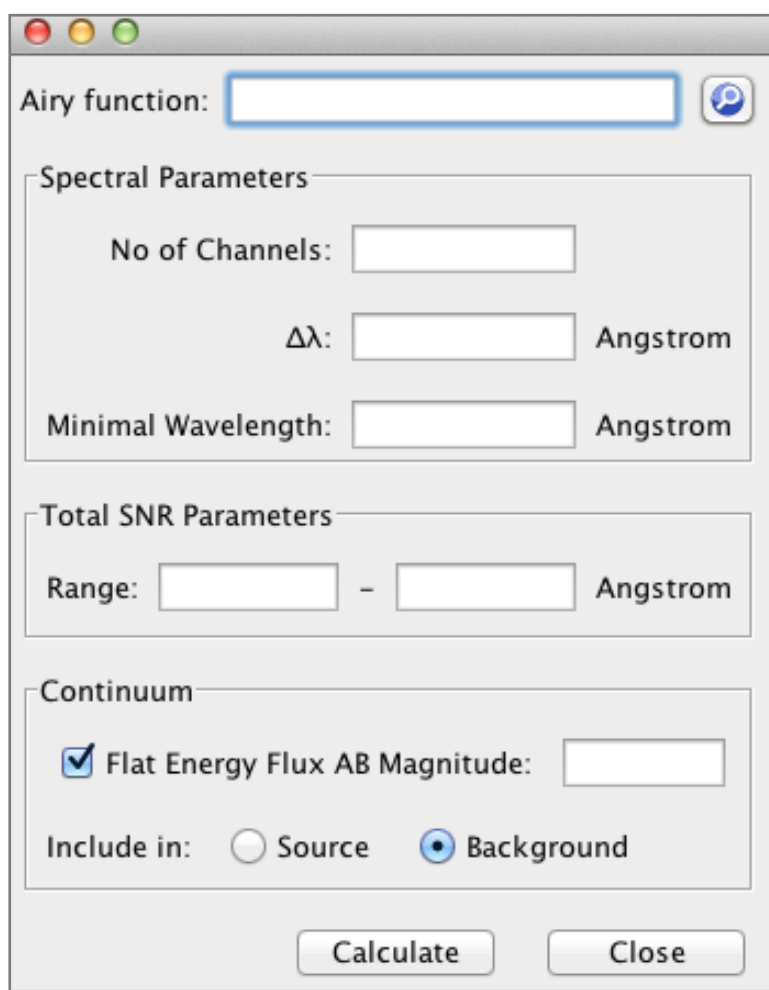
A new plugin has been developed to deal with Fabry Perot observations. This plugin allows to compute the signal to noise ratio of an observation on a tuneable wavelength interval. The plugin has specific inputs like the finesse, the wavelength range (or the number of channels combined with the wavelength bin in Å).

Transmission creator

A Transmission creator module has been added to the software to facilitate the creation of a new transmission curve of the instrument, using different shapes (continuous, band-pass or gaussian).
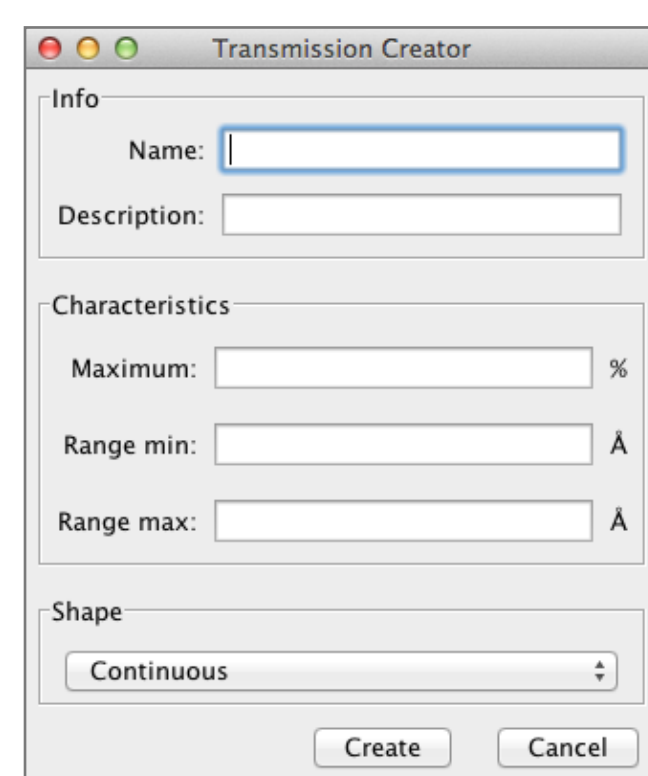
Sky Brightness builder
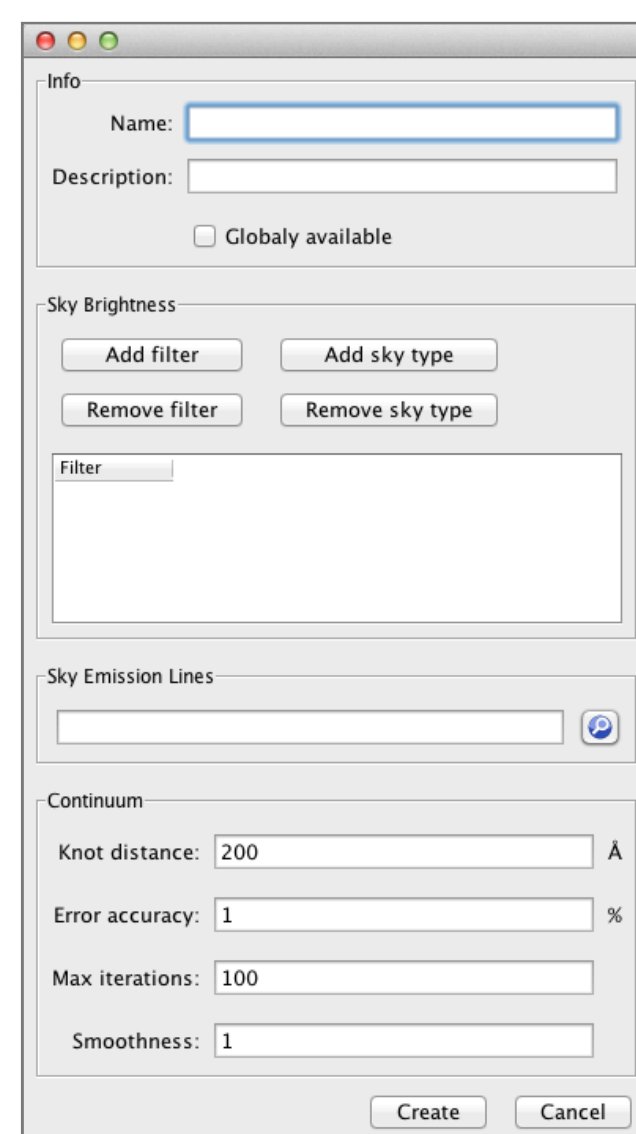
A new plugin to build a sky brightness depending on the phase of the moon has been integrated. It uses brightness tables to create the overall brightness of the sky. It includes the possibility to add filter measurements with errors and define several types of the sky (bright, grey, dark or any other label you might want to put).

VO Drag and Drop Facilities

A new Virtual Observatory Drag and Drop facility has also been included. Because it is so simple to drag and drop, we developed a library allowing drag and drop facilities for the VOTable data. This library is available on demand and will very soon be accessible at http://projects.lam.fr/ (stay connected).

Conclusion and perspectives

‣ We are providing to the community a generic ETC. New developments have been integrated in the last version of ETC including :

- Adaptative Optics module developed with people from LAM and ONERA
- Component creation tool for Transmission and Sky Brightness.
- Fabry-Perot plugin
- Fixtures facility

‣ Still to come

- Full Spectroscopy (IFU,slitless)
- Images as output (simulation)
- Up to you…

‣ Want to be 42β testers (using real data), please, contact us

References and Special thanks

- ETC-42 (…) ADASS XX : http://adsabs.harvard.edu/abs/2011ASPC..442..559S
- Fixtures : http://projects.lam.fr/projects/etc/wiki/Fixtures
- Contact : jean-charles.meunier@lam.fr
- ETC-42 : http://projects.lam.fr/projects/etc

ETC-42 : The ultimate answer - Life Universe and Everything - H2G2 - D. Adams

http://www.lam.fr/