

ETC-42, a VO compliant Exposure Time calculator

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Abstract

We developed at CeSAM (Centre de données Astrophysiques de Marseille) from LAM a new Virtual Observatory compliant Exposure Time Calculator. This new ETC has been designed in order to facilitate the integration of new sites, instruments and sources by the user. It is no more instrument dedicated but is based on generic XML data for multi projects implementation (EUCLID, EELTs, OPTIMOS) covering a wide wavelength range (from NIR, to UV).

This poster focus on the spectroscopic aspects of the tool and defines the infrastructure of the application. It also focus on the interoperability of the tool and will show the added value for the end users.

CeSAM

The "Centre de données Astrophysiques de Marseille" (CeSAM) from "Laboratoire Astrophysique de Marseille" (LAM) has been set up to provide access to quality controlled data via web based applications, tools, pipelines developments and VO compliant applications to astrophysical community. Please refer Poster P013 (this meeting).

ETC-42

• Yet Another Exposure Time Calculator (ETC)

ESA, ESO and other specific Instrument Centers have developed their own ETC in order to provide simulation of instrument performances. Often, ETCs are independent and outputs are different even for the same queries. We compared several ETCs and computation steps (Surace et al., in prep) and defined independent computation steps needed in any ETCs whatever the project is (EUCLID, ISTOS, EELT, ...)

• Why another ETC.

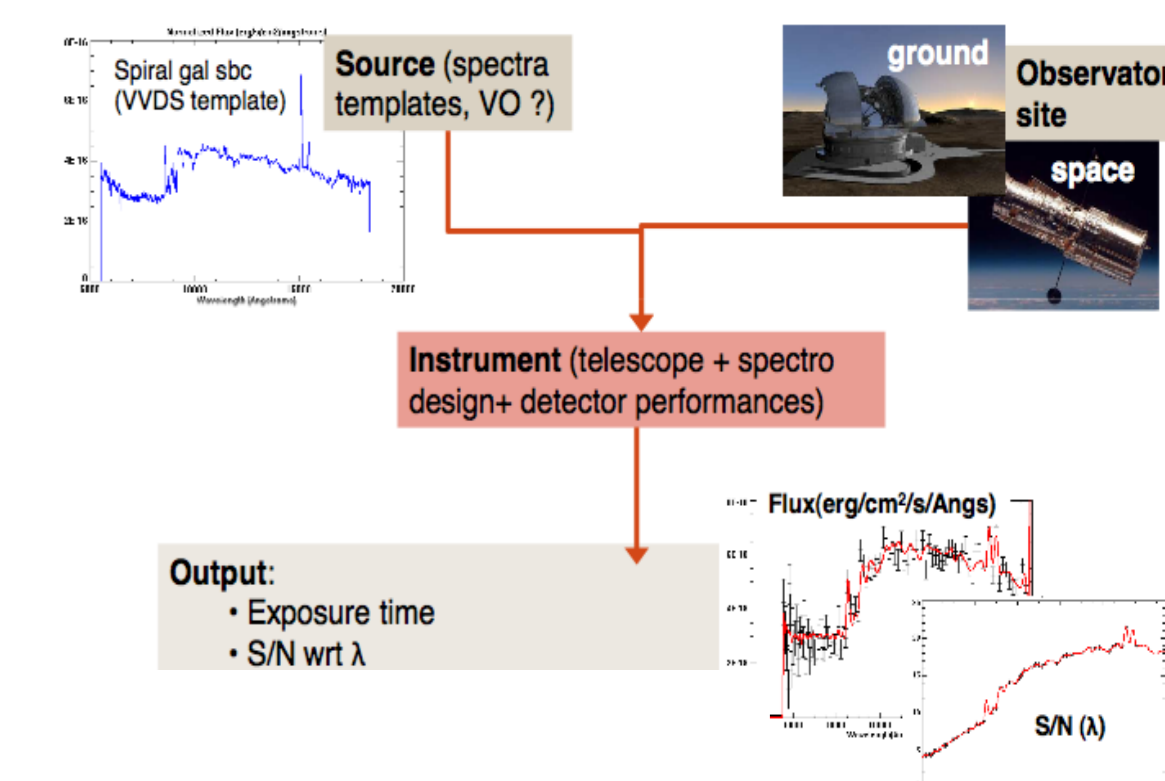
Most ETCs are black boxes and it is not possible to include easily some instrument modification and artefacts or sources. We decided to build up an «open» ETC that will be usable by the standard astronomical community and by instrument specialists. This ETC is open enough to include any new site, instrument, target, and operation mode without any coding experience. It is generic enough to be adaptable to any new project.

• The Goal.

As any ETC, the goal is to estimate the exposure time needed with respect to source, site, instrument and observations parameters specifications. Signal to noise ratio, total integration time, observation time specifications, noise components, signal outputs are the standard outputs of the ETC.

• A bit of history

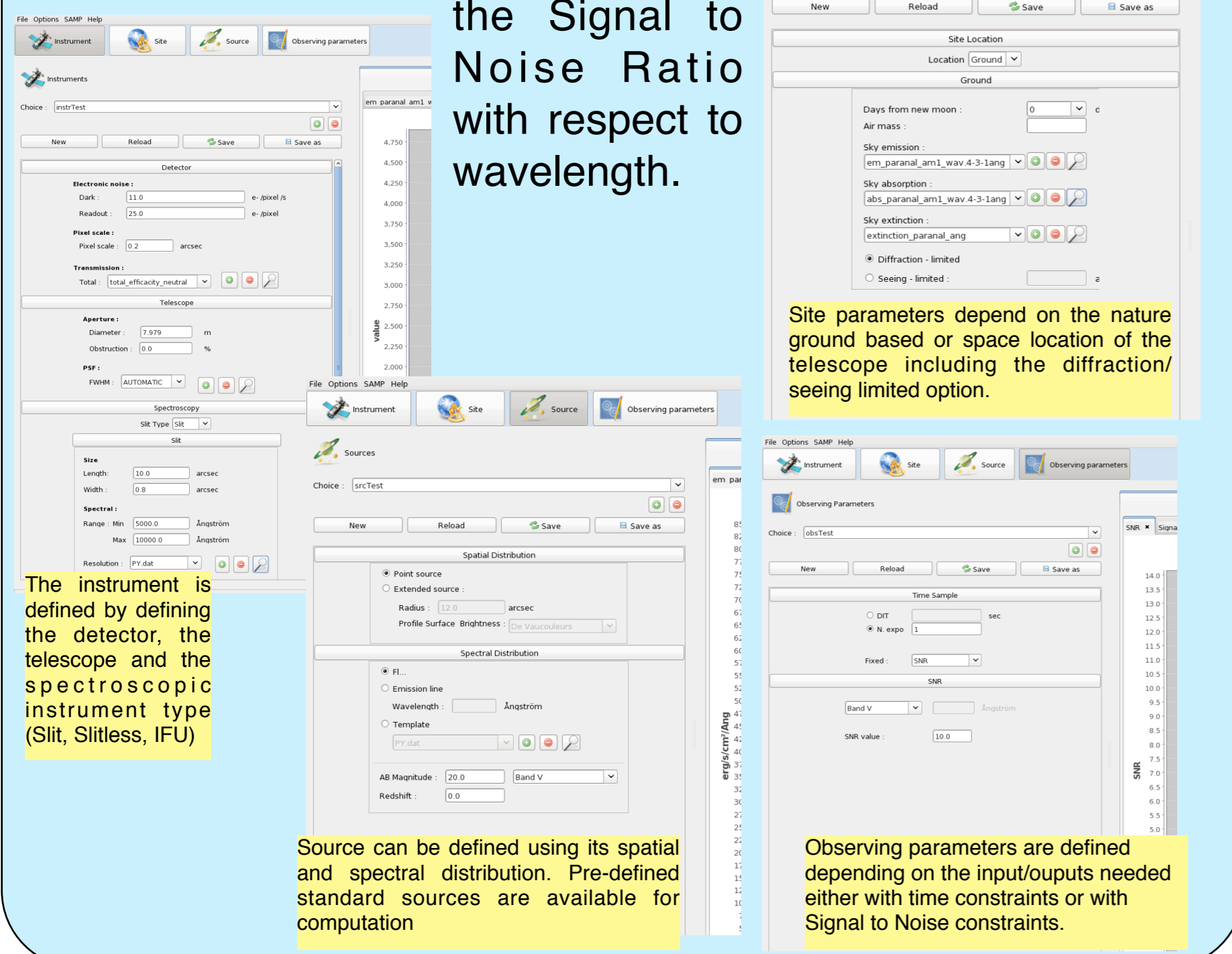
Developed initially for SNAP in IDL command line (M.H. Aumenier), ported as widget IDL program (M.H. Aumenier, P.Y. Chabaud), it has been ported as a generic JAVA applet/standalone product (CeSAM team)



Technical aspects

Panels

All 4 panels allow to enter data specifications for the computation of the Signal to Noise Ratio with respect to wavelength.



The instrument is defined by defining the detector, the telescope and the spectroscopic instrument type (Slit, Slitless, IFU)

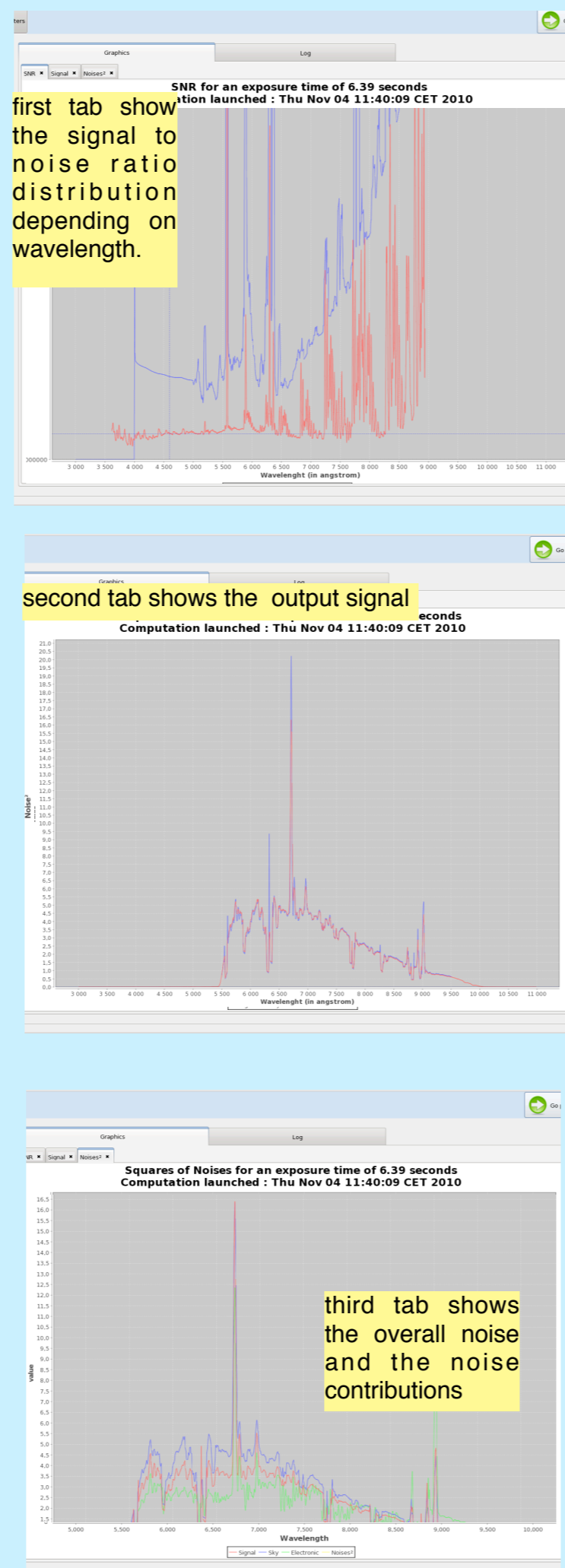
Source can be defined using its spatial and spectral distribution. Pre-defined standard sources are available for computation

Site parameters depend on the nature ground based or space location of the telescope including the diffraction/seeing limited option.

Observing parameters are defined depending on the input/outputs needed either with time constraints or with Signal to Noise constraints.

Computation process - Display

After the computation is launched, results are displayed in the plot window. Results are displayed under tabs with respectively the signal to noise ratio distribution, the output signal and the noise contributions.



The plot window is based on the JFreeChart component (see ref) which has been extended with specific drag and drop functionalities.

Curves can be over-plotted from one tab to another by drag and drop the curve legend on the destination tab.

Colours, line-styles, interfaces types, zoom in and out facilities can be modified as proposed by default by JFreeChart

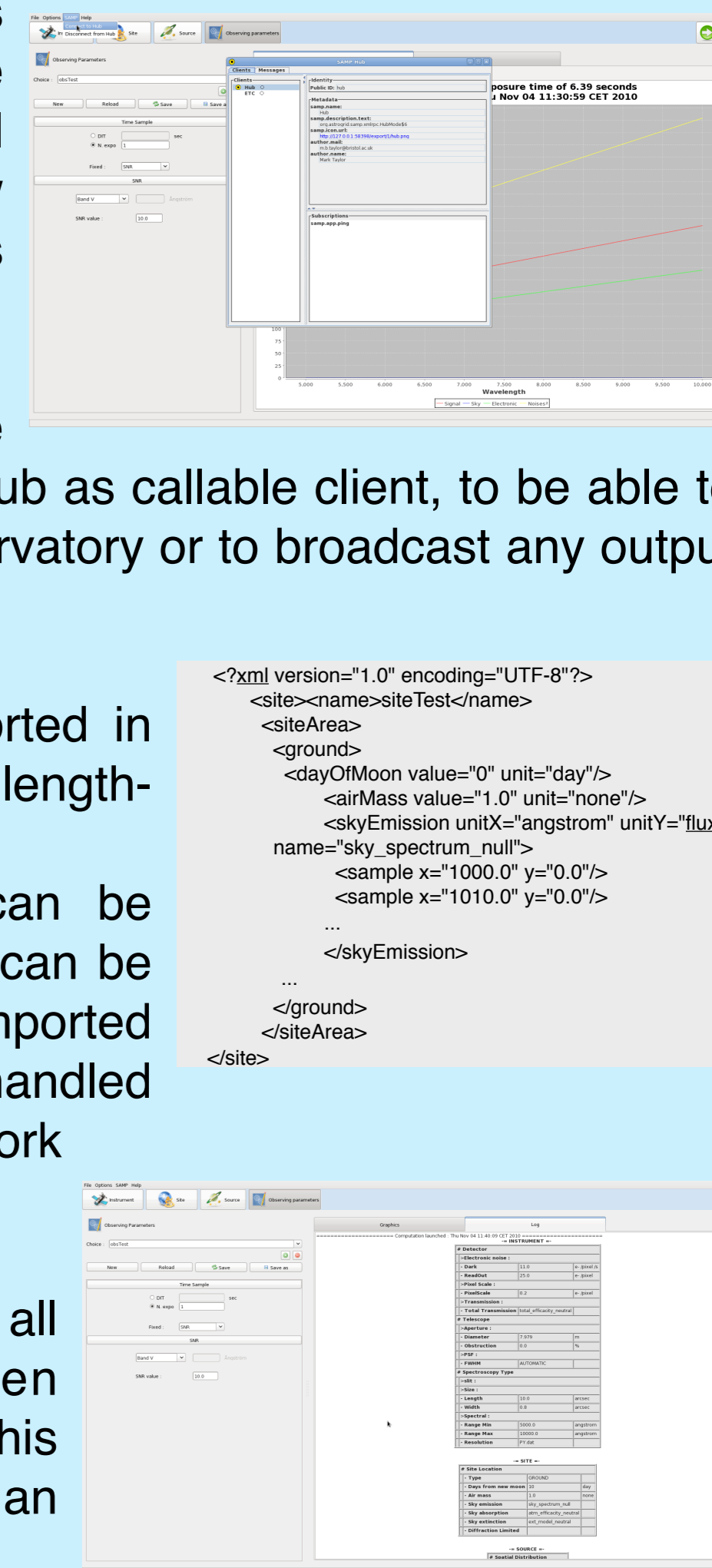
Input - Output - Interoperability

The ETC is open to the Virtual Observatory standards and is able to import a Spectrum into its Source panel, implying a close connection to some spectral tool like VOSpec or Specview for example. Unit Translations are also implemented.

The SAMP menu allows the user to connect to any SAMP hub as callable client, to be able to grab data from the Virtual Observatory or to broadcast any output signal as VOTable.

Each output can also be exported in ASCII format (tabulated wavelength-value data) Sites, Sources, Instruments can be exported as an XML file which can be passed to another user to be imported in the software. Sessions are handled also to export and save any work in progress.

ETC-42 provides also a log of all computations that have been launched during a session. This log can also be exported as an ASCII file.



```
<?xml version="1.0" encoding="UTF-8"?>
<siteArea>
  <name>siteTest</name>
  <ground>
    <dayOfMoon value="0" unit="day"/>
    <airMass value="1.0" unit="none"/>
    <skyEmission unit="angstrom" unit="flux" name="sky_spectrum null"/>
    <sample x="1000.0" y="0.0"/>
    <sample x="1010.0" y="0.0"/>
    <skyEmission>
  </ground>
</siteArea>
</site>
```

• Development

JAVA Application

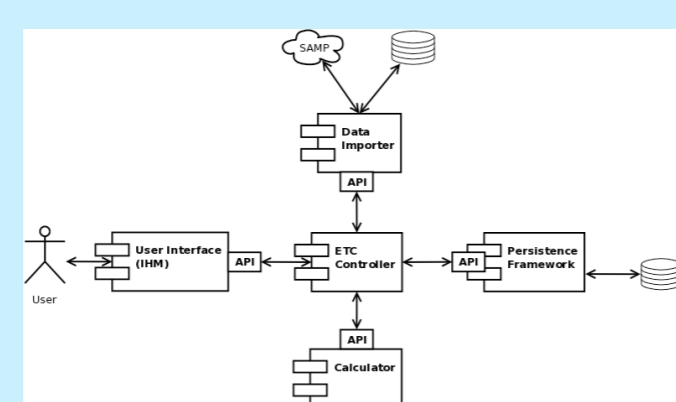
• embedded libraries :

JSamp, JFreeChart, XMLBeans

• Deployment :

Java webStart, Download

• Tested on Windows, Linux, Mac



Conclusion and perspectives

- We are providing to the community a generic ETC. New instrument, site or source can be easily imported into this ETC throughout . Tests with other ETC compatibilities and functional improvements are undergoing. These developments include :
 - Adaptative Optics module is under development with people from LAM and ONERA
 - Direct - Images computation
 - Full Spectroscopy (IFU, slitless)
 - Fabry-Perot
 - Images as output (simulation)
 - Up to you...
- Add new libraries (sky, site ...)
- want to be 42β testers (using real data), please, contact us (delivery by december 2010)

References & Special thanks

- This work has been performed thanks to M.H. Aumenier, V. Renault, L. Bouguerra, S. Peze, B. Epinat, B. Meneux and several scientists S. Basa, D. Burgarella, J.G. Cuby, A. Ealet, O. Lefevre, B. Milliard.
- JFREECHART : <http://www.jfree.org/jfreechart/>
 ETC-ISAAC Newton : <http://catserver.ing.iac.es/signal/>
 ETC- ESO : <http://www.eso.org/observing/etc/>
 ETC NOAO-IRAF <http://www.noao.edu/gateway/ccdtime/>
 WPCF2 : <http://www.stsci.edu/hst/wfpc2/software/wfpc2-etc.html>
 VISTA : <http://www.ast.cam.ac.uk/vdfs/etc>
 ...
- ETC-42 : The ultimate answer - Life Universe and Everything - H2G2 - D. Adams**

