

Organizing Professional & Amateur Collaboration for Spectroscopic work



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Abstract: following the path of variable stars or minor planets observers, amateur spectroscopists are organizing themselves so they can contribute to professional astronomy work.

This poster presents the work done within AUDE association to design, manufacture and distribute Lhires III high resolution ($R > 17000$) Littrow spectrograph that fits common amateur telescopes and CCD cameras.

It also reviews how the communication is being organized through ARAS distribution lists (Spectro-L), forums, and workshops to develop and promote spectroscopic work among amateurs.

Last but not least, it introduces the Be Stars Spectra (BeSS) Virtual Observatory compatible database and its application around the monitoring of Be stars in association with COROT satellite.

Organizing communication

After Oleron, we also structured the communication between professional and amateur astronomers through internet tools:

- ARAS home page (portal): <http://astrosurf.com/aras/>
- Spectro-L email list: <http://groups.yahoo.com/group/spectro-l/>
- Forum: <http://valerie.desnoux.free.fr/forum/>

Another CNRS school occurred in 2006 at La Rochelle. AUDE organized practical spectroscopy camp at Observatory of Haute Provence (OHP) in 2004 and 2005.



One of the issue faced with amateur spectra is a disparity in file format and several places (web pages) to access them. To solve this, the GEPI developed a database for Be Star Spectra (BeSS) jointly with amateur astronomers and defined a standard FITS spectra file format. Today, four common software used by amateurs is compatible with this standard: IRIS, AudeLA, PRISM, VisualSpec.

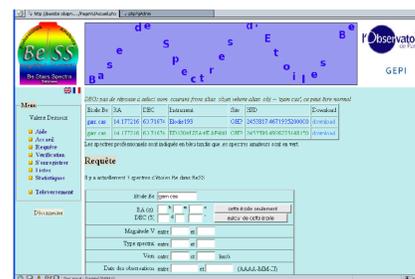
Objective of the BeSS database are:

- Centralize available spectra
- Standardize spectra file (format, content)
- Archive with easy access (internet download)
- Make all spectra available
- Multi-criteria search (Virtual Observatory compatible)



The BeSS database is located in Meudon observatory, runs on a AMD Athlon 64 3700+ processor, 250GB/400GB/400GB hard drives (+400GB for backup), under Linux Debian operating system, Apache server, PostgreSQL database, php programming.

It is developed and managed by Malek Mekkas, Coralie Neiner, Bertrand de Batz, Christophe Martayan, François Cochard, and Valérie Desnoux. Developed jointly, the database will be used jointly by professionals and amateurs.



Introduction

For more than a century, amateur astronomers are contributing to professional work. End of the 19th century, Seth C. Chandler, Edwin F. Sawyer or Paul S. Yeendell for exemple made large contribution on variable stars while remaining independant amateurs.

Variable star section of the British Astronomical Association (BAA) was created in 1895; American Association of Variable Star Observers (AAVSO) in 1911; «Association Française d'Observateurs d'Etoiles Variables» (AFOEV) in 1921. Variable stars is an area where amateurs have been contributed a lot and still do with more than 900000 measures from 740 observers from 43 countries in year 2004-2005 for the AAVSO alone.

More recently, with the development of CCD cameras, amateurs have also contributed to asteroidal work. Photometric lightcurves are published in an exponential way and more than 25% are done by amateurs. Occultations, astrometrics measures, and even few minor planet discoveries are covered today by amateurs astronomers.

A recent governmental study in France identified 250 fixed observatories including 15 telescopes larger than 0.6m, a growing number over the years.

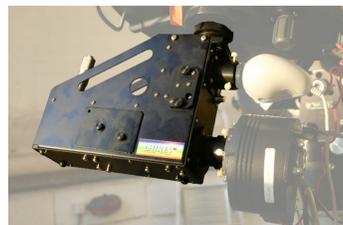
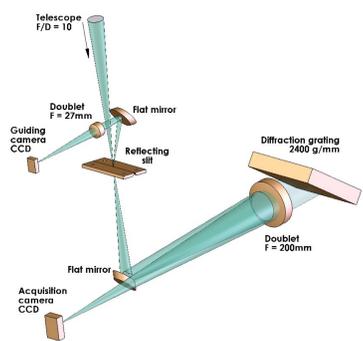
But quick search of published papers on ADS indicates that only 3% of amateur contribution is in spectroscopy, far from professional astronomers published paper ratio.

Amateur spectroscopy is evolving nowadays thanks to new high performance equipment, organized communication, and common projects with professional astronomers.

Lhires III: high resolution spectrograph for amateurs

During 2003, at the 8th astrophysic school organized by CNRS, it became obvious that the few existing spectrographs available commercially to the amateurs didn't have enough resolution.

We worked within AUDE (Association des Utilisateurs de Détecteurs Electroniques) to design a high resolution spectrograph. We used a Littrow design to allow a compact equipment, optimized for 8" f/10 telescope which is most common configuration for the amateurs.



Lhires III has been proposed in kit in a subscription we organized through AUDE. We delivered in May 2006 75 kits to 14 different countries. Spectrograph is now manufactured and distributed by Shelyak Instruments (<http://www.shelyak.com>).

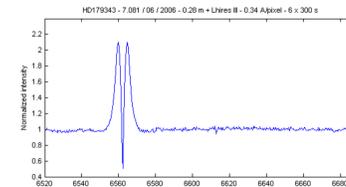
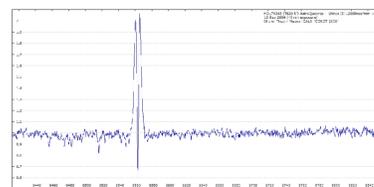
Resolution of the Lhires III is 17000, weight is 1.7kg and wide range of CCD camera is supported (even a visual mode and SLR digital camera for educational purpose). With 9 μ m pixel camera, its inverse dispersion is 0.011nm/pixel around H α . The 2400 lines/mm grating can be changed easily for lower resolution work (down to 600 resolution). It also has a mirror slit for guiding.

Projects

On top of educational projects that can be conducted to promote spectroscopy and increase public interest in science, our goal is to increase number of amateur contribution to professional astronomy.

Availability of Lhires III high resolution spectrograph, processing softwares and internet communication tools will help amateurs to record spectra of Be stars that will be monitored by COROT satellite. Objective is to see if the same pulsations will be observed in spectroscopy and photometry and if H α line profile and pulsations are correlated.

Be stars COROT targets are 6-9 magnitude and accessible to amateur telescope (0.3m to 0.8m aperture) with Lhires III and 1200 lines/mm grating. Several tests have been successfully done at Pic du Midi (AT60) and Pic de Château-Renard (AstroQueyras) observatories.



Amateur contribution to COROT Be stars project is structured around:

- H α spectra once a week
- Continuous H α monitoring in case of ourburst
- Intensive monitoring for two weeks

Other scientific projects are conducted with such high resolution spectrograph: novae, massive hot stars activity monitoring, Herbig Ae stars, overall Be stars monitoring, etc... Others can be proposed and submitted through ARAS portal: <http://astrosurf.com/aras/>