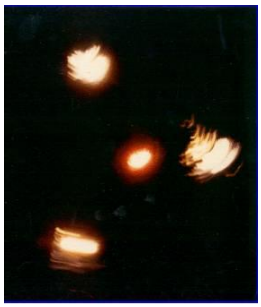
Using spectroscopy for the study of Unidentified Flying Objects

The physical reality of the UFO phenomenon is well established by a variety of visual observations, pictures, radar detections and even ground traces. There are however still a large amount of available data that can be used in order to reveal major science progress. To date a more precise and thorough study can and must be led - and every one can be part of it.

This is the picture of a UFO taken during the “Belgian wave” in 1989. This picture has been carefully analysed and no trace of forgery has been detected.



While this picture is of good quality and undoubtedly proves the reality of the phenomenon, it does not bring so much information about its nature.

A major data source would come from the accurate analysis of a spectrographic shot.

Spectroscopy principals

Spectroscopy is an observational technique well known since decades now mainly by astronomers, chemists and physicists. It has allowed the discovery of the cosmic expansion (known as the Hubble “red shift” law), stars velocity measurement and their chemical composition, mass, temperature, and many other physical parameters such as magnetic or electric fields…

Since the UFO phenomenon often appears as “night lights” in bright contrast over a dim night sky, the importance that spectroscopy could play in such circumstances is obvious. Collecting objects spectrums is indeed available to everyone, for a few dollars investment, a little bit of theory and some training.

How to get into the world of spectroscopy, how to extract physical and chemical characteristics of a body by analyzing its emitted light ?

By taking pictures of its spectrum !

There are two different ways of getting them :

1 - Using a prism: the phenomenon commonly occurs in nature when we observe a rainbow. Each wavelength is related to what we call “a colour”, the physiological translation of the photon’s energy received by the eye.

2 - Using a diffraction grating, a kind of translucent plastic film crossed by a high number of parallel thin lines. We definitively choose this solution, easy to carry in a camera case and always ready to use.

Diffraction grating caps

This is an example of a 500 lines per millimeters diffraction grating.

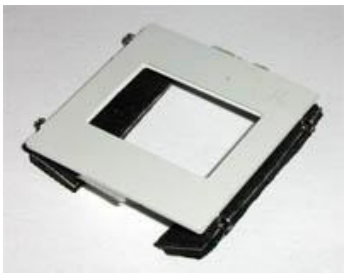
Beware :
The grating film is very fragile; do not touch it with fingers or you may damage it.

Always handle the grating by its frame, and store it away from high temperature and dampness.

The grating shall be placed in front of the camera lens and must be parallel to it.

Other mounting devices for diffraction grating are also available from UFO-Science:

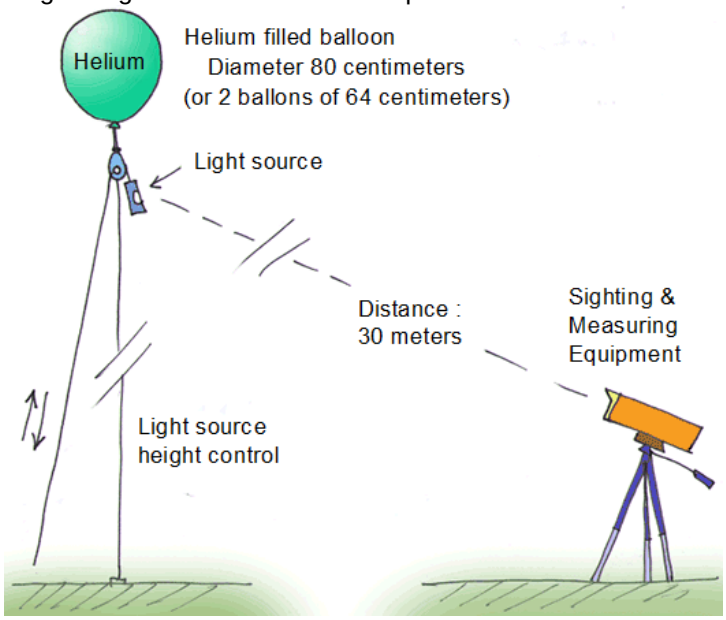
- Spectro GSM kit to mount the diffraction grating in a slide frame.



- Self-adhesive diffraction grating caps for mobile phones.

Real condition tests

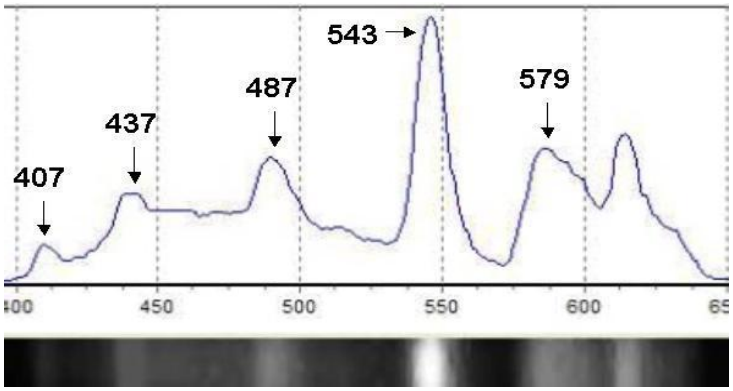
Let us imagine a very simple test installation : **a compact fluorescent lamp (CFL) tied to helium balloons**. Balloons altitude can be set with a single cable - at a distance of approximately 30 meters (~100 feet). Thanks to a pulley the height a light source installed in a pod can be controlled :



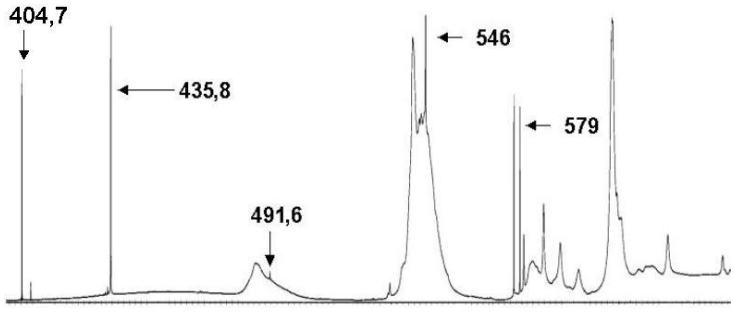
The flashlight fixed to the pod is an OSRAM Dulux Pocket (also known as Dulux Mini). The light lamp is a white LUMILUX (“cool white” T= 4000 K).

Short distance spectrum of the light source :

The analysis of spectral lines after calibration, using dedicated software, shows that the chemical composition is closed to mercury one (scale in nanometers).



Comparison against the official OSRAM lamp spectrum acquired with professional high precision equipment :



Mercury lines (cf wikipedia) :
404,7nm, 435,8 nm, 546,1nm, 577nm, 579,1 nm

Spectral lines explanations

Because of collisions with electrons supplied by an electric current, atoms of a gas contained in a lamp move from their ground state to various – but instable - excited states. After excitation when returning to ground state, photons of several wavelengths (ie: of several colors) are emitted by atoms. As emitted photon wavelengths are specific to each atom type, this “light signature” can be used to detect the related atom type.

Thus, position and distribution of spectral lines are used to get information about the gas composition. Spectral profiles are then analyzed with dedicated softwares. Some of these softwares are available for free and can be downloaded from the Internet.

Let us mention *Spectrace* available here for Windows :
http://perso.orange.fr/philippe.boeuf/robert/logiciels.htm

What kind of information can be obtained from a spectrum ?

- Chemical elements composing the emission source (emission or absorption lines).
- Source temperature (Planck curve - relative line intensity ratio).
- Magnetic fields (Zeeman effect).
- Object speed (Doppler effect)

What to do in case of atmospheric light phenomena

1 - Install the diffraction grating on your camera or imaging device.
2 - Take several pictures.
Try as far as possible to get both the spectrum and observed object on the same picture.
3 - Immediately after the phenomenon is over, take at least one picture of the sky background in the same direction than the phenomenon.
4 - Cautiously note observation time and location.
5 - Then, take one or two shots of a sodium (orange) or mercury (white) lamp, needed for calibration measurements (calibration shot). Use for example the streetlights.
Keep the same settings as for the pictures of the phenomenon.
6 - Backup all pictures as soon as possible: do not compress or edit them.

Get in touch with CIT UFO-Science

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Conclusion

Diffraction gratings commercially available can be easily used to build very low cost grating caps. Digital cameras of constantly increasing quality are also widely available to customers.
It is quite easy to train oneself to take spectrum pictures and use grating caps.
It can also be interesting to get trained to sky exploration in order to eliminate any confusion with astronomical or meteorological phenomena.
It is essential to spread this practice worldwide as a single high quality picture can be crucial.