

# Introduction to the use of LiMovie for Analysis of Lunar Occultations

Occultation Workshop, NACAA, Melbourne, Friday 18 April 2014

*[If these notes are being used while viewing the Power Point presentation, use the pps mode(F5) and advance at each numbered bold header in the text. There are 21 frames altogether, but many include changes built in.]*

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This is an introduction to the use of Limovie for the analysis of Lunar occultations observed using video. It is intended for those with no experience with the software.

Limovie can be downloaded through the RASNZ Occultation Section website: <http://www.occultations.org.nz>. Work down to near the bottom of the yellow index on the left hand side. Or directly from: [http://www005.upp.sou-net.ne.jp/k\\_miyash/occ02/limovie\\_en.html](http://www005.upp.sou-net.ne.jp/k_miyash/occ02/limovie_en.html). A manual written by Dave Herald is also available.

## 1. Opening Screen of Limovie

NB does not normally have this text!!

### 1a. Click on Open AVI

Select your avi file and open it.

## 2. Example, the disappearance of R1429, observed 2013 June 14

The moon was 26% lit, the earth-lit limb and star, magnitude 6.8, are obvious.

Again the information in the green box has been added, it is not produced by Limovie. Also I am old-fashioned and use the original KIWI OSD insert times on the video. The IOTA-VTI is a little different.

The default measuring tool is at the top: Limovie measures the brightness of an object in the red circle. The background brightness is measured in the blue annulus. More about this later.

Below are some of the controls that are needed:

### 2a. Buttons to move through the video.

### 2b. Buttons to start and stop measurements.

Measurements can be stopped and restarted. It is also possible to take measures one frame at a time, advancing the video by 1 frame after each measure.

**2c. Star tracking controls:** initially set to “anchor” – only a limited degree of movement followed. More about this shortly.

**2d. Background area controls:** standard shown at present. This will be changed

**2e. Settings for the measuring tool.** Usually set by Limovie itself and depends on the image size.

## 3. Position the measuring tool on the star: Left click the star to place the tool on it.

Note the new box on the right hand side and the light distribution display it shows. Below it is a drop down box:

**3a. “select type of observed occultation”...:**

**3b. Get the drop down list ...,**

**3c. Select “Lunar Occultation <bright star – drift track>”** unless star is very faint. Drift track means Limovie will attempt to follow any movement of the star as the video runs. I have followed a near earth asteroid across the height of the video screen.

**4. New measurement tool:**

Making this selection produces a new measuring tool with the background area now two bars.

**4a. Form of background area** is now “meteor/lunar limb” corresponding to the new tool.

**4b. Also Star tracking** is now set to drift

Both these can be set manually if you want to.

But the measurement tool is set at an odd angle. The bars should be parallel to the limb. This can be rotated:

**4c. Click direction setting:**

The bars turn green and there is a green handle ...

**5. Rotate the measuring tool:**

Drag the handle round with the mouse: left click when bars are parallel to the moon’s limb. If it is near full moon and no limb visible, set parallel to lit terminator.

**6. Ready to start measurements.** Now with the bars parallel to the limb, Limovie is ready run through the .avi file and start making the measures.

On the left notice:

**6a. Frame number** indicated,.

**6b. So is the measured light intensity of the star** in the current frame

**6c. Before starting the measures I had advanced the video by 2 seconds.** You could start at the beginning of the video, but here the event is several seconds in, so I have advanced the video a bit. You would certainly want to do this if you started recording 10s of seconds before the event.

**6d. Click START** to start the measures

Limovie will now start measuring the light intensity in each frame. It will continue until STOP is pressed or until the end of the video. Normally no more than 5 seconds after the occultation is needed.

**7. The last frame with the star visible.**

Frame 160, at 6:47:10.208. Note the light level, 5843.8, and the display on the right giving a two dimensional plot

**8. Next frame, first one with the star occulted**

Frame 161, at 6:47:10.248 with the star image (almost) gone, the light level is now 230.7 and the plot almost flat.

**9. Final frame of video.** Frame 246 – you may have noticed the slight advance of the lunar limb

## 10. Data behind plot

Moving the plot display aside (or closing it) shows some of the data gathered by Limovie.

**10a. The last line shows the frame and light level as on the left.**

**10b. Click on GRAPH** to produce a light curve.

## 11. Resulting Light curve

The drop in intensity at occultation is obvious. This type of curve is typical of many disappearances.

**12. Left click a point** near the start of the actual occultation. The selected point turns red.

**12a. The frame number and the light intensity** of the point are shown on the bottom left of the graph. Frame 160 is the last frame with the star. ...

The video display shows the corresponding frame. Note the time displayed 6:47:10.208 – this is the mid time of the frame

IOTA-VTI is different, the first of the two 4 digit times is the decimal for the mid frame times

**13. Left click the first low point:** it now turns red.

**13a. Frame number and light intensity are again shown**

**13b. The video display advances by one frame.**

Time for this frame is 6:47:10.248

**13c. These times give a possible time for the event as 6:47:10.23 ± 0.02**

No more than 2 decimal places of a second are justified at 25 frames per second.

**14. If you want to keep your light curve you should add some identification.**

So Click on the “identification” button to add star and observer details.

**15. Adding Identification info:**

A new screen appears at the bottom. Information needs to be entered in the box on the lower right. I have cheated and show what needs to be entered already.

**15a. Check the date**

Limovie automatically enters the current date. This can be changed to the date of the event if needed. (You will get a “query” box if very different – just hit OK)

**15b. The star number** will need to be put in (and a brief comment if wanted).

**15c. And the observer’s name.** This can be saved for future automatic insertion by clicking on “Saveobserver name to .ini file”.

**15d. Click on “Apply”**

The identification information will appear at the top left. Close the lower box.

**16. Save the light curve**

At this point you may want to save the light curve.

**17. Any questions so far?**

**18. Getting more information from the light data and curve**

**18a. Select a mid point**

**18b. Click on Diffraction**

**19. Information panel appears**

**19 a. Twenty points before and after the event are selected (turn green)**

**19 b. Mean light levels are shown a little way down on the right.**

If wanted the range of the selected points, “before” and “after” can be varied using the keys below the “30” and “11”. Ignore the values under “step”, they are only used for double stars.

**19 c. Click on the magnitude calculation button**

**20 A new statistics screen appears** with more information, most of which we can ignore. The mean light levels are again shown this time with the standard deviations of the means and the number of points used to determine them.

**20 a. There is also some Noise to Signal data.**

For reporting the time of an occultation you may want to include the Signal to Noise.

**20 b. A value of this for the event** can be determined as the inverse of the bottom left figure for the “total event:”

**20 c. Select “Text with transparent background”** to add this data to the light curve.

**21. This places a copy of the data onto your light curve**

**21 a. Use the sliders to position the text.**

Close the data screen to return to show the full light curve screen.

Time to save your work again!

**22. Click on “Save image”** and you can do just that. Also you can

**22 a. Click on Copy to Clip Board**

Your light curve can be included with a report – mainly for use with double stars.

This only touches on some of the things Limovie can do, but I think it is quite sufficient for an introduction.