

## Impact Flash Observing for Beginners

When meteoroids, whizzing through space at many km per sec fall into the Earth's atmosphere they produce shooting stars or fireballs.

However when the Moon gets in the way they do not burn up, but instead make a small crater, throw some ejecta about, and make a flash of light. Although the first two cannot be seen with Earth-based telescopes, it is sometime possible to see short (<0.1 sec) flashes of light against the Moon's night side.

We need your help to monitor the earthshine/night side of the Moon, with a camera, to hunt for these elusive impact flashes. The more observations we have of the same flash, the easier it will be to measure its position, and eventually locate the crater on the Moon using spacecraft images.

### How to observe:

- you can use any camera so long as the video is at least 10 frames per sec or faster, ideally 25-30 frames per sec, and 60 or more frames per sec would be really welcome
- you must be able to see the limb of the Moon in earthshine in one video frame – this helps us locate the coordinates of flashes
- please do not use lossy compression such as MPEG as this destroys important information .AVI, .SER formats are fine
- monochrome cameras are preferred to colour, but we will never say no to the latter
- if possible use a filter such as an IR,R,G,B filter (actually B may cut down your sensitivity a bit) but don't worry if you don't have a filter as white light can be effective too
- telescopes that follow the Moon in the sky are preferred to non-driven scopes. Though if you do have the latter you can still use it but will have to reset it on the Moon every minute to keep the earthshine in the field of view
- some observers have suggested keeping videos recordings short e.g. 5 min, just in case the computer crashes – if this happened during a 1 hour recording this would be bad as you might lose the whole video, but the loss of a single 5 min recording would be less problematic
- note that impact flashes are relatively rare – so you may expect to detect one per a few hours – though larger apertures and larger fields of view will increase detection rates
- some observers find that refractors maybe better as there is less glare than one gets from Newtonians – though its best to use whatever you have
- focal reducers can help increase the field of view and hence detection rates
- be careful – some cameras have memory on board, so frame rates will be fast initially, at least until the memory buffer fills up, then will drop dramatically – if your camera is like this, you may want to limit your observing time to avoid this
- if your camera is 12 or 16 bit, then try to record with this sensitivity setting as you will be able to detect fainter flashes

### Where to observe:

- get as much of the earthshine is as possible as this will increase your chances
- some meteor showers will be more likely on certain parts of the Moon than others – you will be told where to look on sites such as: <https://twitter.com/lunarnaut/> otherwise assume you are looking for sporadics and these can strike anywhere on the Moon
- try to avoid the dayside of the Moon coming into the field of view as the glare can become over-whelming and sunlit peaks can trigger false detections

### When to observe:

- basically any time from when you can see the thin crescent Moon up until 50% illuminated. Note that if you can still see earthshine at higher phases then you can still observe but the

area covered and glare start to become an issue. Maybe consider this if there is a really good meteor shower on

- a general rule of thumb is to avoid observing when the Moon is below 15 deg above the horizon as our atmosphere absorbs light more and lowers sensitivity. However you can ignore this rule if the crescent is very small or if earthshine is very clearly visible in the camera
- earthshine is not usually visible until about 10 min after the end of civil twilight from New Moon to just a few days past first quarter, or before 10 min before civil twilight starts from last quarter (or under good conditions a few days before) until to New Moon.
- do not attempt any observation if the Sun is above the horizon as its dangerous to point the scope accidentally at the Sun and anyway the sky is too bright at this stage
- a good website listing out times to look for impact flashes in earthshine is:  
[https://users.aber.ac.uk/atc/lunar\\_schedule.htm](https://users.aber.ac.uk/atc/lunar_schedule.htm)

#### How to report:

- whether you detect impact flashes or not, its really important that you email me "atc @ aber.ac.uk" the date and start and end UT of each recording – this lets us work out the flux or rate of impacts on the Moon. If you dop not know how to work out the date and UT just use your local date and time, and email me your nearest town and country and I'll figure it out.
  - it would be nice (but not essential) to know what areas of the Moon your camera was imaging – this could be included in an email as well as the size of the scope, camera used, frame rate etc.
  - you can use software such as ALFI (works with monochrome .AVI files only and you will need virtual dub – see: <https://users.aber.ac.uk/atc/alfi.htm> to download ALFI) to detect impact flashes automatically once you have recorded video. Note impact flash software is not perfect and may produce some false detections or occasionally miss real flashes so it's a good idea to run it through both ALFI and FDS – if you get a chance
  - or more the modern software such as FDS (Flash detection Software can be obtained from: <https://kryoneri.astro.noa.gr/en/flash-detection-software/> ) which can work in real time at the telescope or on recorded video + accept different formats of video, not just 8 bit AVI's. Note impact flash software is not perfect and may produce some false detections or occasionally miss real flashes so it's a good idea to run it through both ALFI and FDS – if you get a chance
  - please email any detections of flashes to me "atc @ aber.ac.uk" so that I can compare with other flashes seen by other observers to make sure that they are not cosmic rays – only send me images where the flashes occupy more than one frame as these are more likely to be real impact flashes than cosmic rays – though we cannot be sure for certain until its confirmed by another observer
  - sometimes you get false flash detection from sunlit mountain peaks or stars – these can be ignored
  - please do not delete you video for a few days in case we would like observers to check for flashes (manually) seen by other observers that were not detected when you used ALFI or FDS
- *Note a more detailed observers report form PDF will be made available later – for expert level observers*

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