The Assembled Solar Eclipse Package (ASEP) in Bangka Indonesia during the total solar eclipse on March 9, 2016

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Abstract. The Assembled Solar Eclipse Package (ASEP) is not only an integrated apparatus constructed to obtain imaging data during solar eclipse, but also it involved sky brightness and live streaming requirement. Main four parts of ASEP are composed by two imaging data recorders, one high definition video streaming camera, and a sky quality meter instrument (SQM) linked by a personal computer and motorized mounting. The parts are common instruments which are used for education or personal use. The first part is used to capture corona and prominence image during totality. For the second part, video is powerful data in order to educate public through web streaming lively. The last part, SQM is used to confirm our imaging data during obscuration. The perfect prominence picture was obtained by one of the data capture using William-Optics F=388mm with Nikon DSLR D3100. In addition, the diamond ring and corona were recorded by the second imaging tool using Sky Watcher F=910mm with Canon DSLR 60D. The third instrument is the Sony HXR MC5 streaming set to be able to broadcast to public domain area via official website. From the SQM, the value of the darkness during totality is quiet similar as a dawn condition. Finally, ASEP was entirely successful and be able to fulfil our competency as educational researcher in university.

1. Introduction

Total Solar Eclipse (TSE) has become a magnet for all people, especially for researchers. Not only the beauty of a rare phenomenon and fascinating but also the amount of information that can be extracted related to science. Moreover TSE March 9, 2016 was occurred in Indonesia, was strong circulated by TV and social media. The formation of a national committee of a total solar eclipse in 2016 became an important part in the success of the moment of the eclipse this time, learning from the experience of 1983. TSE committee was able to become a center of information to the public and reporters so that the moment TSE can be enjoyed.

Universitas Pendidikan Indonesia, one of the leading universities in Indonesia, under department of Earth and Space Laboratory, has participated actively to oberseve 9 March TSE. Following [1, 2, 3, 4] about solar eclipse instrument and scientific observations, and solar photographic techniques and image processing, also in order to fulfill Tridharma of university (eduction, research, and community service),

we created a package of a total solar eclipse observation assembly consisting of four instruments commonly used by individuals, schools or clubs. We give a name The Assembled Solar Eclipse Package (ASEP), an integrated apparatus constructed to satisfy in getting imaging data during solar eclipse and also it involved sky brightness and live streaming requirement.

2. Methods

The ASEP instruments are Sky Watcher Telescope F 910 mm, William Optics Telescopes F 388 mm, Video Camera Sony HCR MC5, and Sky Quality Meter (SQM) linked by a Laptop and motorized mounting.

Figure 1. The ASEP controled by three persons, the first person controlled the Mounting Vixen Spinx and SkyWatcher 910mm + Canon 60D, the second person controlled William Optics + Nikon D3300 and SQM, and the third person controlled Sony HCR MC5 and release-installing the Filter ND5.

The role of both telescopes is to acquire the image of a great total solar eclipse, SkyWatcher telescope was running on video mode when it would enter the second contact and after the third contact. The William Optics telescope was used on image mode. Data from both telescopes are a learning media in education.

Sky Quality Meter instruments that was stored at the upper end of tube Skywatcher, was to investigate sky brightness during the daytime when the total solar eclipse occurred. Video cameras Sony HCR MC5 were attached to Sky Watcher telescope for video capture and were broadcasted live via the portal Ministry of Communications and Information Technology Republic Indonesia and www.gerhana-indonesia.id so they can be seen by the public, this is a form of community service.

3. Result and discussion

The parts from William Optics F=388 mm with Nikon DSLR D3300 captured TSE with resolution 300 dpi, 24 bit, ISO 100 and with a different exposure time because no detector can satisfactorily cover whole brigthness range on single image [2]. At exposure time 1/2500 sec we got the briliant reddish prominence (validate with Solar Dinamic Observatory) [5] and at exposure time 1/100 sec we could see the crown majesty of corona. So after combined two image in different exposure time with software Photomatix Pro Ver.5 [6] we obtained prominence and corona at the one single image.

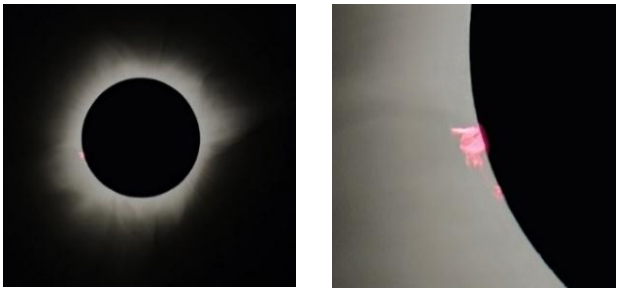

Figure 2. Image data from William Optics F=388mm

SkyWatcher F=910 mm with Canon DSLR 60D was used to record the zoom of TSE. With resolution frame 1920 x 1088 and frame rate 25 frames/second. The video was taken at Sport Mode, to track the Sun. So the image a little bit over exposure for the corona. But, fortunately we can see "The Diamond Ring" before and after totality. Size of the diamond before totality was smaller because of the cloudy weather.

Figure 3. Video capture from SkyWatcher F=910mm

The sky brightness could not be determined at the beginning of the eclipse due to the high intensity of the sky i.e., too high for SQM to be functioned normally. So we installed ND5 filter to provide two functions, the first is to avoid the sensor to be damaged due to continue pointing to the Sun and it can reduce the intensity of incoming light so that it can be read by SQM. We released ND5 filter before the second contact and re-instaled it after the third contact. The sky brightness when maximun totality is 12.21 mag/arcsec^2. It means that the darkness of the totality of the eclipse this time is roughly similar to a half hour after sunset or before sunrise [7]. We can see the "valley" at a temperature (figure 4), this means that there is an influence when the moon covered the solar disc. The decline begins at 7:11:22 until 7:43:11 local time. Temperature decreased gradually to 1.3 ^{o}C and then rise over time.

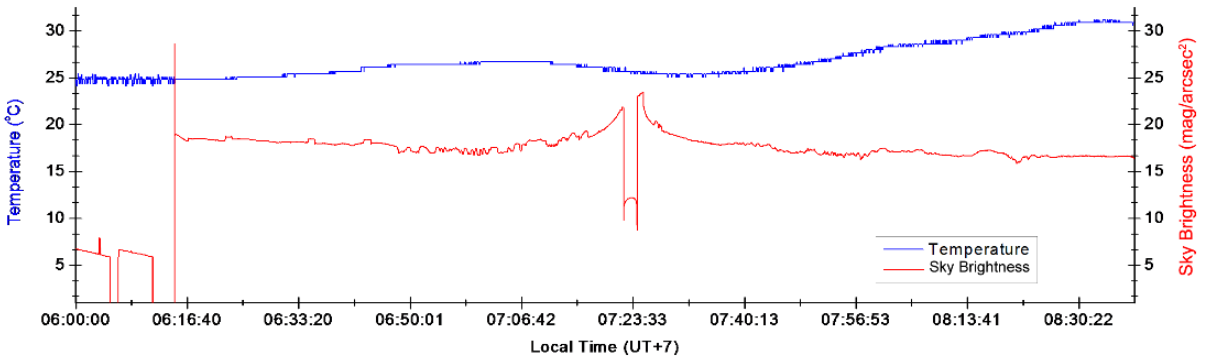

Figure 4. Graphics from Sky Quality Meter

Video streaming of the eclipse can be accessed at http://gerhana-indonesia.id/id/live-streaming/. Initially the process stream has no problem, but after 45 minutes there was a problem on the Internet

because too many people accessed the internet in these locations. But all the data stored on the internal hard drive. After process of editing, the video was uploaded on Youtube to be accessed by the public.

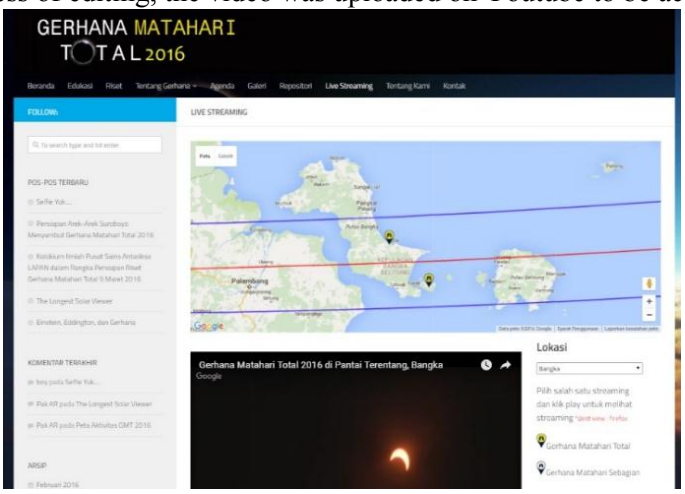

Figure 5. Live Streaming at website http://gerhana-indonesia.id/id/live-streaming

4. Conclusions

Finally, The ASEP was able to fulfill our competency as educational researcher in university. For education and teaching, picture and video will be a learning media for the phenomenon of eclipse and the subject of literacy in earth and space science. For research and development, sky brightness data from this eclipse can be advanced research material for the next eclipse. For public services, via video streaming we want to give confidence to enjoy the eclipse and not to scare of it. The results obtained from The ASEP can be seen on Youtube Channel "Laboratorium Bumi & Antariksa" (link Video : https://youtu.be/iri-wqy_PSo).

References

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