Solar and lunar eclipses with an extensive light source

Principle and equipment

Principle

Demonstrate how solar and lunar eclipses can occur.

Equipment

Position No.	Material	Order No.	Quantity
1	Demo Physics board with stand	02150-00	1
2	PHYWE Multitap transformer, DC: 2/4/6/8/10/12 V, 5 A / AC: 2/4/6/8/10/12/14 V, 5 A	13533-93	1
3	Lamp,halogen,mag.held,12V/50W	08270-20	1
4	Light box 12V/20W,w.magn.base	09804-00	1
5	Model earth/moon, magnet held	08270-07	1

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Set-up and procedure

- Using the magnet-held lamp and the light box two divergent light beams which cross each other can be produced.
- Place the earth model so that the tip of the umbral cone is sufficiently far from the edge of the magnetic optics panel.
- Move the moon model around its model earth orbit and observe the shadows.

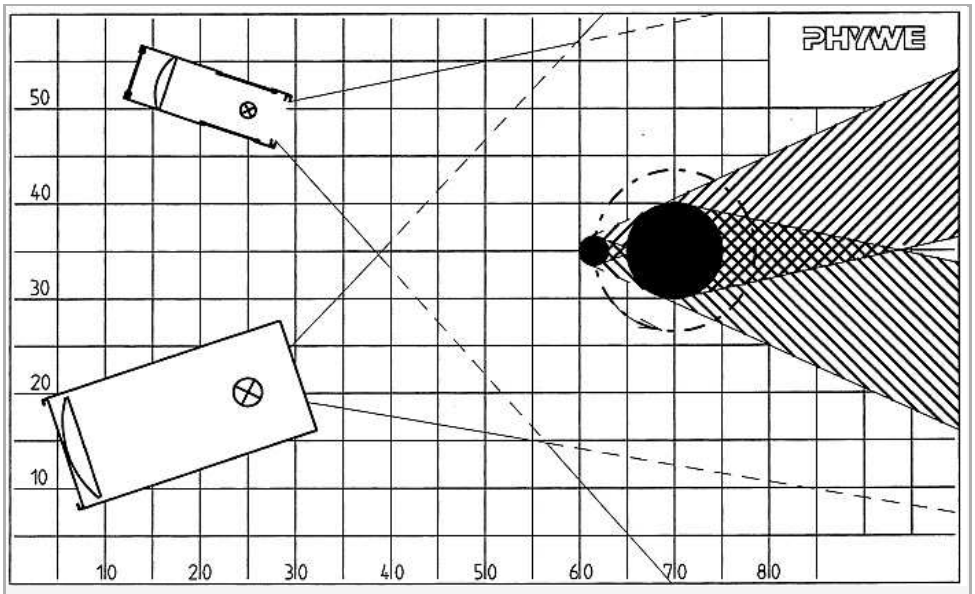

Fig. 1: Projection of the "moon's" shadow onto the "earth"

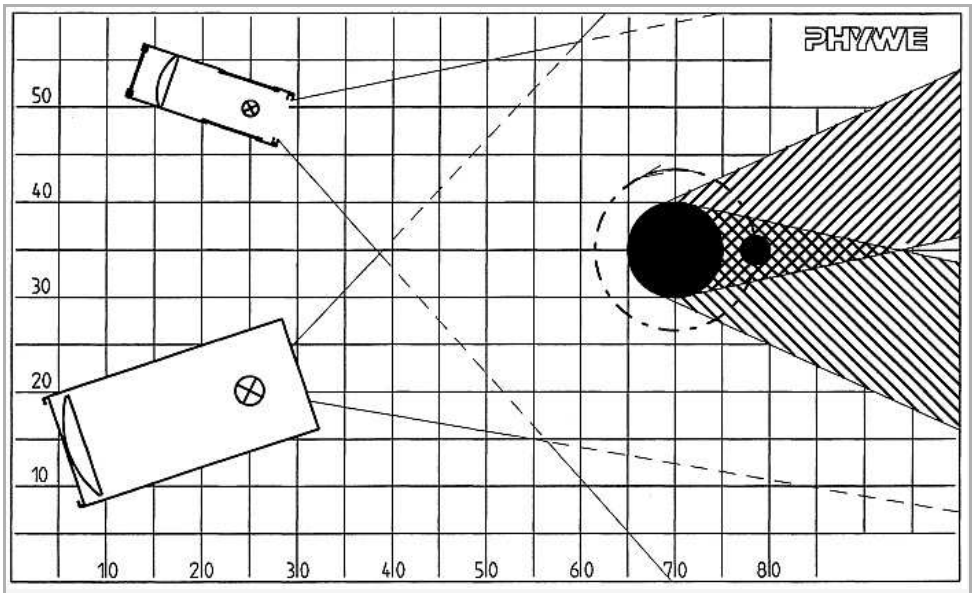

Fig. 2: Projection of the "earth's" shadow onto the "moon"

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Observation and evaluation

Observation

If the moon model is between the light sources and the earth model, it throws an umbral shadow onto the earth model (solar eclipse).If the model earth is between the light sources and the moon model, it throws an umbra shadow onto the moon model (lunar eclipse). (The two light sources represent the outer edges of the solar light source and thus form a model of the sun.)

Evaluation

In a solar eclipse the moon is between the sun and the earth. From the part of the earth's surface onto which the moons umbra falls, the sun is not visible. In this region there is (near) darkness. In a lunar eclipse the earth is between the sun and the moon. She projects her umbra onto the moon, which can thus no longer be seen from the earth.

Remark
The advantage of this more elaborate experimental arrangement compared to the experiment with only a point light source is that both umbra and penumbra are produced. The model's umbra tapers to a point, which better represents reality (cone of shadow behind the earth or the moon, respectively). If the observations of the penumbra's are included in the discussion, partial solar and lunar eclipses can also be discussed in this experiment.

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