Eclipse 2015

RADIO SOCIETY OF GREAT BRITAIN RADIO PROPAGATION EXPERIMENT ON MARCH 20

How you can take part in a scientific experiment

On Friday March 20 a partial solar eclipse will be visible from the UK. The path of totality will pass north of the UK, but we will experience up to 89% totality (depending upon where you live).

This is a great opportunity to try a simple experiment to see how the sun's ultra violet output affects our ionosphere, which alters how some radio waves are propagated around the world.

By using just a portable medium wave radio you may be able to see this effect for yourself. Want to take part? Read on!

The sun's effect on the ionosphere

The sun's ultra-violet (UV) output has a profound effect on the upper reaches of the earth's atmosphere.

At altitudes higher than about 50-100km the sun's UV energy ionises the atoms and molecules of the rarified gases that make up what we call the ionosphere.

The high-energy UV photons knock electrons out of their atoms, predominantly nitrogen and oxygen, leaving charged particles or ions.

These ions can be found in a number of distinct regions or layers and have the ability to reflect or absorb radio waves, depending on the amount of ionisation and the frequency of the wave.

The lowest region is called the D layer and is very effective at absorbing medium wave transmissions at about 1 MHz during the day, when it is exposed to the sun.

At night the ions and electrons recombine and the layer vanishes.

If we listen for a medium wave (MW) radio station more than 250-300 miles away during the day we may not hear it – it is too far away for its ground wave signal to reach us, and any sky wave signal is absorbed by the D layer.

But at night its sky wave signals are not absorbed as there is no D layer.

They are free to be reflected back to earth from the higher E layer, which is weaker than it is during the day, but still exists.

This is why you can hear distant medium wave stations on a radio at night time, but you can't hear them during the day.

But what about during a partial solar eclipse?

On the morning of Friday March 20 2015 the D layer above the UK may not be as strong, and you may be able to hear distant stations that would otherwise be inaudible.

To be honest, we don't really know just how the partial eclipse will affect MW radio propagation, which is why we need your help.

With a simple portable medium wave radio you can help RSGB by conducting an experiment at the time of the eclipse.

The information will also be shared with the Rutherford Appleton Laboratory. Go to page two to find out how you can take part.

Find out more about amateur radio at www.rsgb.org

What is a solar eclipse?

A partial solar eclipse. Image: Wikimedia.

A solar eclipse occurs when the moon moves between the earth and the sun, casting a shadow on the earth's surface.

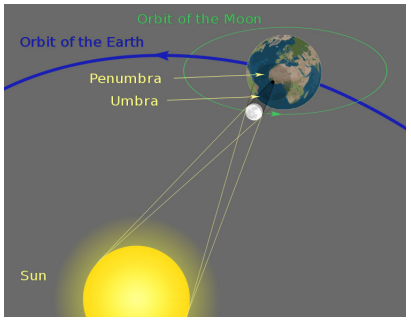
With a partial solar eclipse it looks like a "bite" has been taken out of the sun as the moon obscures part of the sun's disk.

Note: you should never look directly at the sun without suitable eye protection.

A partial eclipse is observed from Earth when it is in the Moon's outer shadow or 'penumbra'.

This is what we will experience in the UK on Friday March 20 2015 – the path of totality will pass north of the UK, over the Faroe Islands.

You can find out more at **www.solareclipse2015.org.uk**



How an eclipse occurs. Image: Wikimedia.

The experiment - what you need to do

The aim of the experiment
To see how a partial solar eclipse might affect long distance medium wave (MW) reception in the UK.

The equipment
You will need a portable medium wave radio, or car radio, with a digital frequency display.

You then need to find a suitable medium wave station for the experiment. It has to be a station that is far enough away that you cannot normally hear it during the day, but is audible at night.

Ideally, you need to pick one at least 250-300 miles from your location.

Here is a list of suggested stations:

BBC Radio Wales 882 kHz (transmitter: Washford Somerset).

BBC Radio Scotland 810 kHz (transmitters: Burghead/Westerglen).

Smooth Radio 1332 kHz (transmitter: Peterborough).

Nostalgia (Netherlands) 747 kHz (transmitter: Zeewolde).

We suggest spending a day or two in advance of the eclipse seeing if you can hear one of the stations at night, but not during the day.

As a tip, try to choose the station furthest away from you. You might have to rotate the radio for maximum signal strength.

On the day – Friday March 20

The partial eclipse starts in the Midlands at about 08:25 GMT and ends at 10:41 GMT. Maximum eclipse will be at about 09:30 GMT.

The exact times will vary depending upon your location.

We suggest monitoring your chosen station from about 08.15 to 11:30 GMT.

If possible, record the audio during whole period so that you can review it later. It might be worth announcing the time on the recording at regular intervals too so that you have a reference.

Or make a separate note of any effect you see and the elapsed time since you started the recording.

From a scientific perspective it might be a good idea to make a similar recording of the frequency between 08:15 and 11:30 GMT the previous day for reference purposes.

What we want to know

When you have completed the experiment, send an e-mail to the project coordinator Steve Nichols at **psc.chairman@rsgb.org.uk** with the following information:

1. Your name/school name.
2. Your nearest town and postcode.
3. The type of radio receiver you used.
4. The station you listened for and its frequency.
5. Then answer the questions: Were you able to hear the station at night from your location?
6. Were you able to hear the station at the begining of your test?
7. Were you able to hear the station during the eclipse period?
8. If you could, at what time was it loudest and when did it vanish?

Feel free to add any other comments if you wish.

The results of the experiment will be collated and appear in *RadCom*, the Radio Society of Great Britain's monthly journal.

All participants will receive a complimentary PDF copy of the feature when it is produced.

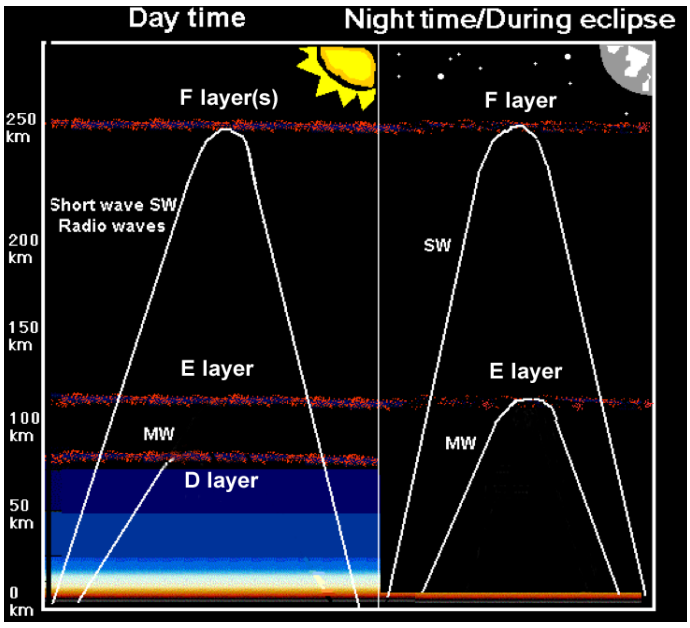
You can find out more about the RSGB at **www.rsgb.org**

Taking the experiment further

If you are a radio amateur, short wave listener or have more advanced equipment you might want to take the experiment a little further.

Here are some ideas:

- If you have a software defined radio (SDR) you might want to note the signal strength of your chosen station in dBm every five minutes. You could then graph the results.
- You could connect the audio output of your receiver to your computer sound card and use SpectrumLab or similar software to log the audio output strength every minute. This could then be graphed. Note: you must turn off the receiver's automatic gain control (AGC) to get meaningful results.
- Don't forget to repeat the experiment at the same time the day before so that you can make a comparison.
- If you log the same signal for all 24 hours of March 20 you could compare the received signal strength during the night and during the eclipse period and see if there is a difference.
- Radio clubs could make this a project with members logging different stations. You could also monitor other signals during the period, including signals on VLF, LF, the amateur or short wave broadcast bands. For example, Iceland has two long wave stations on 189 and 207 kHz.



How medium wave (MF, 300 kHz to 3 MHz) and short wave (SW, 3-30 MHz) radio waves can be reflected/refracted from the different layers of the ionosphere during the day and during an eclipse or at night.

If you have any questions about the experiment, contact Steve Nichols G0KYA, the project coordinator at psc.chairman@rsgb.org.uk