

How Far is Storm?

It is possible to estimate the distance of a thunderstorm (a place where the lightning strikes) with knowledge of the speed of light and sound. Once the lightning strikes during a thunderstorm, you just need to count the seconds until you hear the thunder.

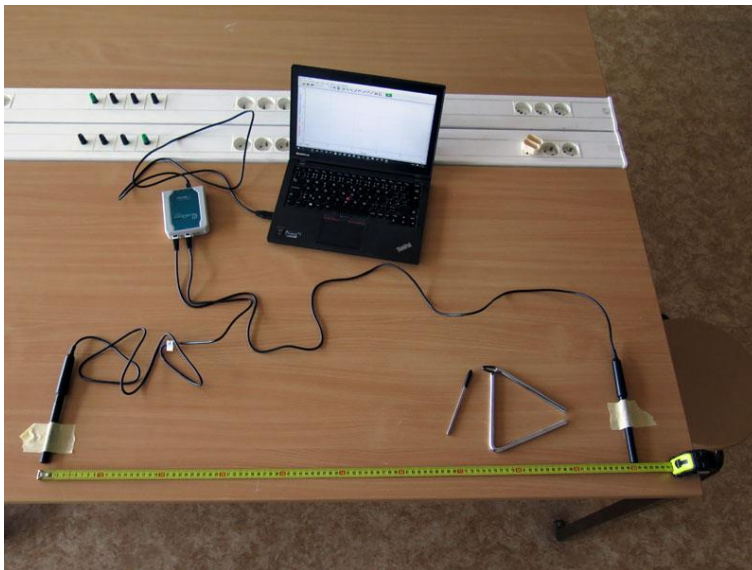
What you need

- 2 x [microphone MCA-BTA](#)
- 2 x [light sensor LS-BTA](#)
- data logger [LabQuest 2](#) or [LabQuest Mini](#) interface
- camera with a flash
- strong and sharp sound source (e.g. a triangle)
- tape measure to measure 100 cm

Execution

Sound measurement

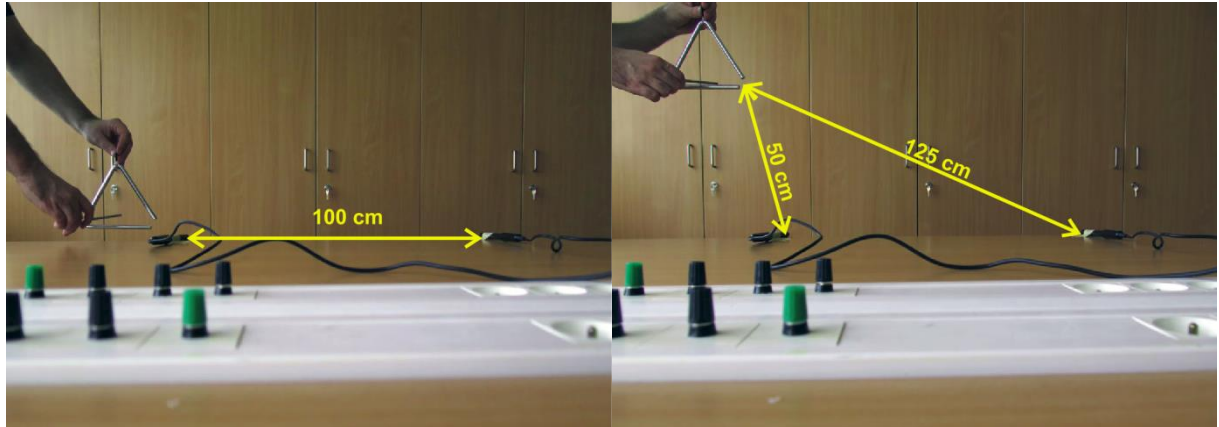
1. Attach the microphones on a table using tape with the distance between them being 100 cm (as shown in the figure).



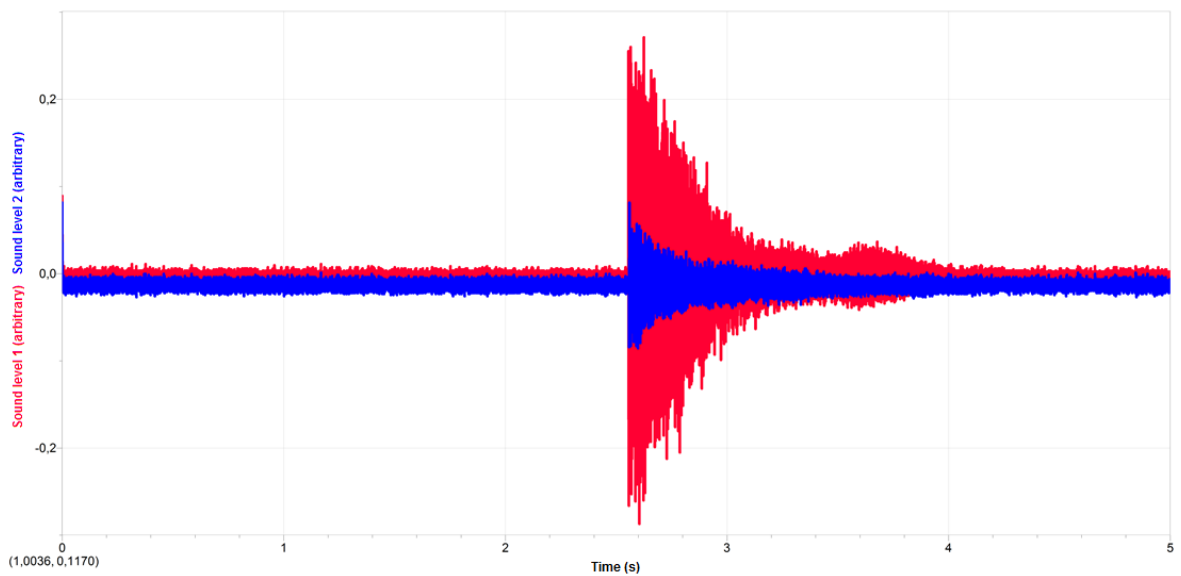
2. Connect both microphones to your computer using *LabQuest 2* or *LabQuest Mini*.
3. Launch the *Logger Lite* or *Logger Pro* computer programme.
4. Set the Duration to 5 seconds and Sampling rate to 10 000 Hz.



5. Start the measurement and strike the triangle near one of the microphones.

Note: it is necessary that the triangle and both microphones **lie in one line** so that the path difference between the first and the second microphone is 100 cm. The figures below show the correct arrangement on the left and incorrect arrangement on the right. In the second case, the path difference is in fact only 75 cm.

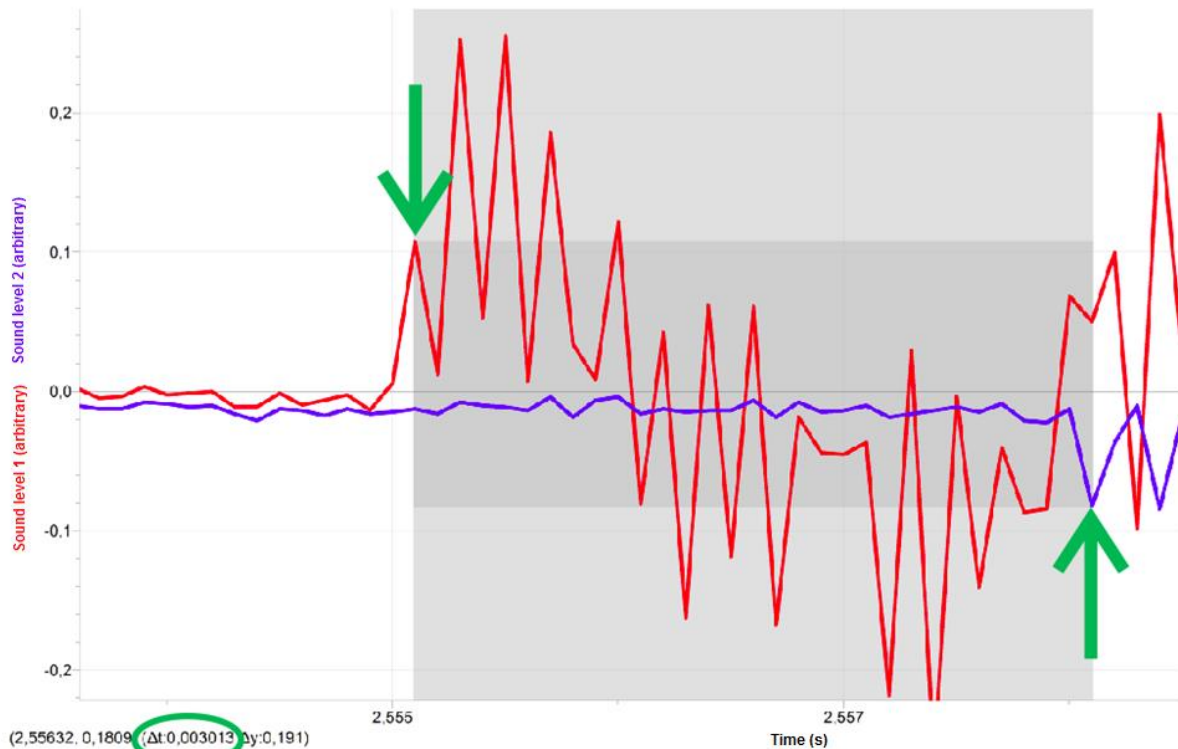


6. At first glance it would seem that the signals from the two microphones were captured at the same moment.



7. Select the relevant part of the graph and zoom in (in the menu *Analyse* → *Zoom Graph In*). In *Logger Pro* you can also use the icon .
8. Turn on the tool *Examine points* by clicking on the icon . Determine the time of the first peak of the red graph (first microphone) and of the blue graph (second microphone). From the time difference and the distance between the microphones calculate the speed of sound.

Logger Pro can simplify the process - just drag the cursor to mark the graph between the peaks of the graph and at the bottom left you can read the time difference value Δt .



9. In a similar way, perform the measurement of the speed of light, this time using two light sensors LS-BTA. Instead of a triangle, use a camera with a flash.
10. Now you can use the knowledge of the speed of sound and light to determine the approximate distance of the place where the lightning struck.