FROM TEACHERS FOR TEACHERS

TECHNOLOGIES IN STEM EDUCATION

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Transmission of Audio Information Using a Laser Pointer

Creating and research a device for transmitting audio information using a laser

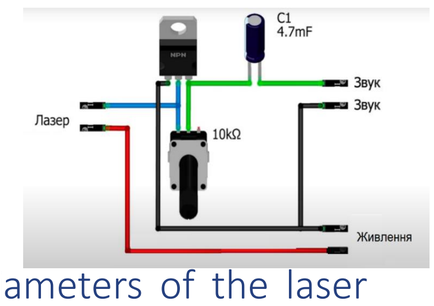
It is impossible to imagine our life without communication. The most developed technology of that kind is a laser communication, created in the USA. Due to the low power of the pointer it is defined as the safest for human health. Our teaching technique solves some communication problems between buildings where it is impossible to lay a cable. To test the laser connection, a device has been made that will transmit audio information by the laser beam. The students can investigate the transmission of sound through the green laser pointer. The experiments had been performed in light and dark times of the day and in different weather conditions(cloudy, clear, fog and rain).

This project requires:

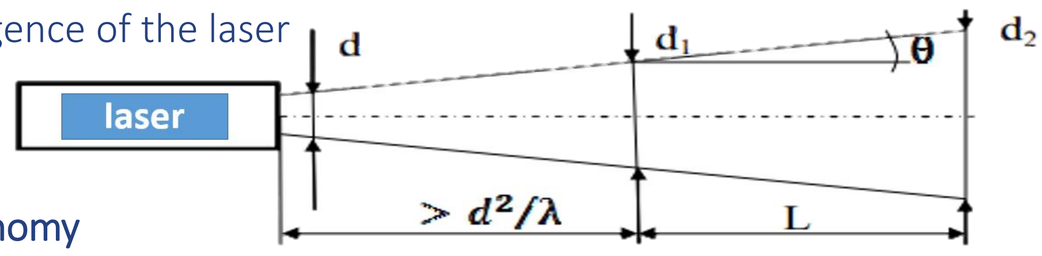
- laser (green 303, 100 mW)
- sound source (mobile phone)
- power supplies (batteries 18650 Li-ion Samsung 2600mAh ICR18650-26J M - 4 pcs)
- step-up voltage converter (DC-DC MT3608);
- capacitor (3.3 µF 50V)
- transistor (bipolar KT805)
- potentiometer (10 kOhm - 1 piece)
- photocell (3W solar panel)
- sound amplifier (on the TDA7297 chip with volume control)
- speaker

Stages of research of the device for transmission of sound information by means of a laser according to educational disciplines

- **Circuitry**
  students assembled a transmitter and a receiver according to the scheme



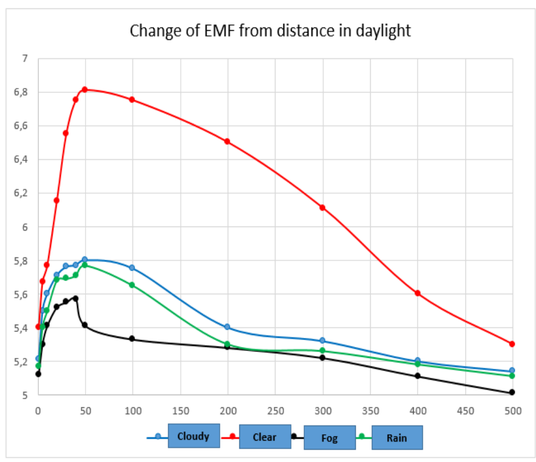
- **Maths**
  students measure the values of the diameters of the laser beam at a distance of up to 500 m and calculate the divergence of the laser

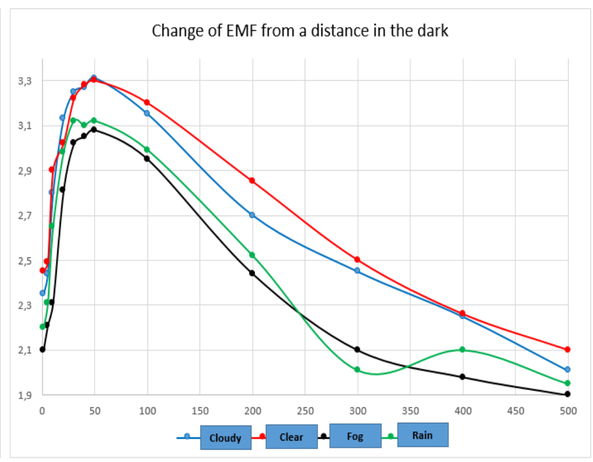


- **Astronomy**
  students explore the use of laser communications in space and create Power Point presentations. They calculate how long it takes for a signal from Earth to reach Mars

- **Physics**
  students measure the produced EMF with a photocell in light and dark times of the day and write data in the table

- **Computer science**
  students create graphs of EMF dependences on the distance from transmitter to receiver using EXCEL





CONCLUSION

- this project combines lots of STEM subjects
- it is a low cost project
- it can be used at any secondary schools at the lessons and beyond
- it improves students knowledge and increases the cognitive interest to learn STEM subjects
- it motivates students to do hands-on experiments themselves

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