

## Lidar – basic package

### Guide with lesson plans

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## LIDAR – basic package

Guide with lesson plans

<b>Title</b>	<b>LIDAR</b>
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<b>Students' age</b>	12+
<b>Level of education or type of school</b>	Lower Secondary School
<b>School subject</b>	Physics, Mathematics
<b>Short description of content</b>	
<p>The Light Detection and Ranging (LIDAR) instrument to measure the parameters needed to understand physics and chemistry in the atmosphere.</p> <p>By analogy with common things, we will understand two important parts in the operation of the Lidar, measuring the distance and measuring the density of what is being measured. For ozone, for example, density is the number of molecules contained in the atmosphere at an altitude (distance from the ground) <math>z</math>.</p> <p>The Lidar, in English Light Detection and Ranging makes it possible to measure many things in the atmosphere of the Earth but also of other planets: the ozone, the temperature, the dust, the clouds etc. One emits towards the sky a radius Green (or blue, or red or invisible to the eye) and we look at the amount of light that is diffused through the atmosphere. In this way, several properties are deduced at each altitude, following a measurement principle that we will describe in this tutorial.</p> <p><b>Objectives</b></p> <p>By analogy with common things, we will understand two important parts in the operation of the lidar, the measurement of the distance and the measurement of the density of what is measured. For ozone, for example, density is the number of</p>	

molecules contained in the atmosphere at an altitude (distance from the ground)  $z$ .

The Lidar, in English Light ... makes it possible to measure many things in the atmosphere of the Earth but also of other planets: ozone, temperature, dust, clouds etc. A green ray is emitted to the sky Or blue, or red or invisible to the eye) and one looks at the amount of light that is reflected by the atmosphere. In this way several properties are deduced at each altitude, following a principle of measurement which we will describe in the second part.

### Concept and learning outcomes

#### The student knows:

- Notions of Atmosphere properties
- Notions of light processes
- Notions of atmospheric particules and clouds

#### The student understands:

- Variables like density
- Molecules
- Speed and temperature

#### The student can:

- Understand the principle of the Lidar
- Understand what is measured with a Lidar and how

### Elements of educational package (created in ERIS)

1-Guide	Guide for Teachers
2-Presentation	File pptx
<a href="#">2a-Lidar movie</a>	Movie based on presentation
3-Lidar.doc	Text for this tutorial
4-Kahoot_answers	Answer to the questionnaire (see 5-)
5-Kahoot	<a href="https://play.kahoot.it/#/?quizId=4fd027ff-b197-4cab-afe7-3d0698edc88f">https://play.kahoot.it/#/?quizId=4fd027ff-b197-4cab-afe7-3d0698edc88f</a>
6-Lidar.mp4	Movie showing the Lidar at OHP in function, <a href="https://www.youtube.com/watch?v=qw1dfKzje-c">https://www.youtube.com/watch?v=qw1dfKzje-c</a>

## Lesson 1

### Subject: LIDAR

Lesson plan for "LIDAR – basic package"

To conduct the lesson, it will be necessary to provide:

- a multimedia projector for presentation, a computer for groups of 2-3 students;
- No printing for the student all necessary documents are in the package and can be viewed on the computer;
- A laser pointer;
- A rag and natural dust (chalk board type);
- A vaporizer with water;
- Internet Link (kahoot)

<https://play.kahoot.it/#/?quizId=4fd027ff-b197-4cab-afe7-3d0698edc88f>

#### Lesson goals:

The general aim and the detailed objectives are consistent with the objectives of the "Lidar" educational package.

We propose to follow indications of file 2-

#### Lesson :

1. Start of the lesson, organizational activities, attendance list check.
2. Start ppt file of the presentation 2-
3. During the presentation indications are provided in ppt file to show the movies 6 (on YouTube)
4. Kahoot if internet available, or file 5- (answers for the teacher in file 4)
5. If enough time or home work, exercises of the file 3-Lidar.doc to be explained by the teacher