TECHNICAL INFORMATION

LASER DOPPLER VELOCITY METER

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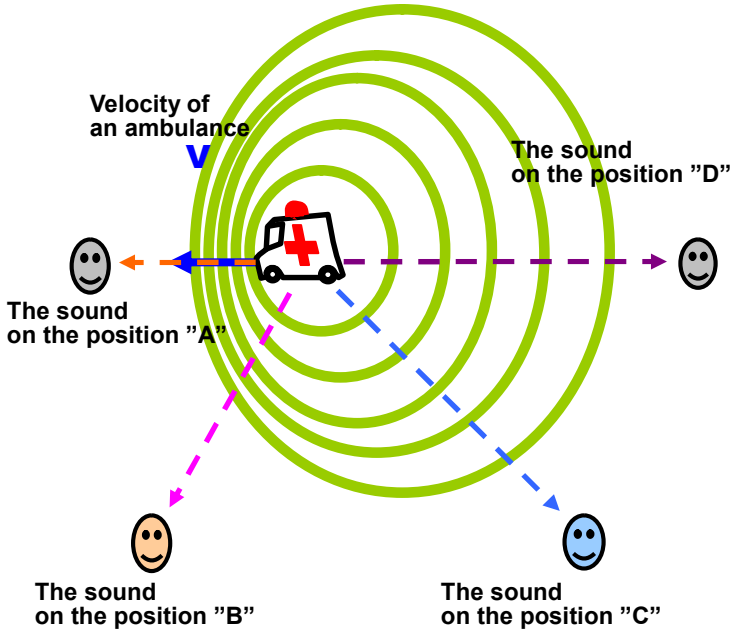
What is the Doppler effect?

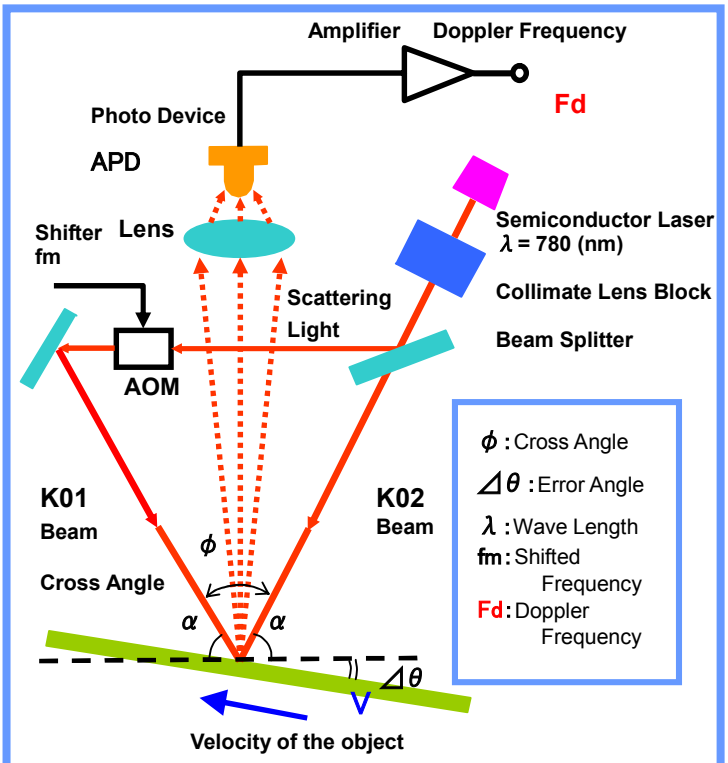


The Doppler effect means the phenomenon in which the wavelength (frequency) of the wave which a watcher measures differs compared with it in a generation source, when the velocity difference relative between the generation source of a wave (sound, light, and electric wave) and a watcher has arisen.

For example, as shown in the left figure, in the front of a generation source, the number of the waves which arrive within a fixed time increases the frequency of the generation source which is moving -- on the other hand behind a generation source, the number of the waves which arrive within fixed time decreases.

It was named by the physicist "**Doppler, Johan Christian (1803 to 1853)**" of Austria who studied this effect, and this phenomenon was found by him first in 1842.

The composition and the measurement principle of the Laser Doppler sensor.



$$Fd = fm \pm \frac{2V}{\lambda} \sin\frac{\phi}{2} \cos\Delta\theta$$

The basic composition of Laser Doppler sensor puts two irradiation light on a front [of the advance direction of object], and back side, and has the form where scattering light reflected from object, respectively is received in one optical receptor. In this scattering light, the velocity information on a measured object is contained in the form of wavelength change of light. Although the dispersion light from each irradiation light is changing in the direction where wavelength becomes short in a front side, and the direction which becomes long in a back side, it carried out heterodyne detection of the difference of the mutual wavelength, and has detected velocity.

K01, **K02** are vectors **fD1**,**fD2** are frequency differences between irradiation lights and reflection light.

fD1 = V · (K- K01)
fD2 = V · (K+ K02) can be shown as above.

When **K01**, **K02** are received on an optical receptor, **fD1- fD2** is a "beat frequency" from the measured object.
fD = | fD1-fD2| = V · (K01+ K02)

Above shows vector K will loose which shows a direction of receptor and **fD** is created by the direction of the irradiation lights and the moving object. This composition is called "Differential composition" .
The velocity of object V can be created by Doppler frequency **fD.**