Chapter 1—Introduction

1-A Welcome to Lidar Operator Training!

Your Instructor(s):

Name	*Phone*	*E-Mail*

Before class begins, your instructor(s) will familiarize you with the training facility. He/she will discuss the facility rules, break areas, and any other pertinent information, so you will be able to get the most from this training class.

1-B Course Overview and Information

Since its inception in the early 1980's, the California Highway Patrol (CHP) has continued to refine its radar speed enforcement program. Emerging technologies, such as moving mode radar and direction-sensing radar, have given officers a myriad of tools to use in the ongoing effort to reduce the Mileage Death Rate (MDR). Another important tool used to augment the use of radar is the Lidar Speed Measurement Device.

In this course, we will cover the history and application of lidar, the principles of lidar speed measurement, and the legal implications of deploying lidar as a speed measurement device. At the conclusion of this course, the student will be able to identify the specific lidar device used by the CHP and describe the components, features, and functions. The student will demonstrate the ability to set up, test, and operate the lidar device. The student will also be able to discuss statutory law, case law, and departmental policy with respect to the deployment of lidar.

This Lidar Operator Training Course is certified by the California Commission on Peace Officer Standards and Training (POST). The lesson plan is based, in part, on the Lidar Module of the National Highway Traffic Safety Administration's (NHTSA) Speed-Measuring Device Operator Training curriculum; the accepted standard throughout the country.

This class is eight (8) hours and will cover the following:

- ✓ Scientific Principles of Lidar
- ✓ Equipment Operation and Tactics
- ✓ Health and Safety Concerns
- ✓ Legal Considerations

All questions regarding this workbook should be directed to:

Radar/Lidar Training Unit
California Highway Patrol Academy
3500 Reed Avenue
West Sacramento, CA 95605
(916) 376-3200 (Public)
(916) 376-3333 (FAX)
RadarTraining@chp.ca.gov

POST Course Certification Number: 1270-23320-________

Chapter 2—Scientific Principles

(Radar Pre-Test; administer and discuss)

2-A Basic Principles and History

In July, 1960 Theodore H. Maiman announced the generation of a pulse of coherent red light by means of a ruby crystal. This was the first "laser."

- LASER is an acronym that stands for:

  Light
  Amplification by
  Stimulated
  Emission of
  Radiation

The term "lidar" is used when referring specifically to speed-measuring devices that employ laser and pulse timing technology. Lidar devices are designed to measure a target vehicle's speed using the light energy generated by a laser device.

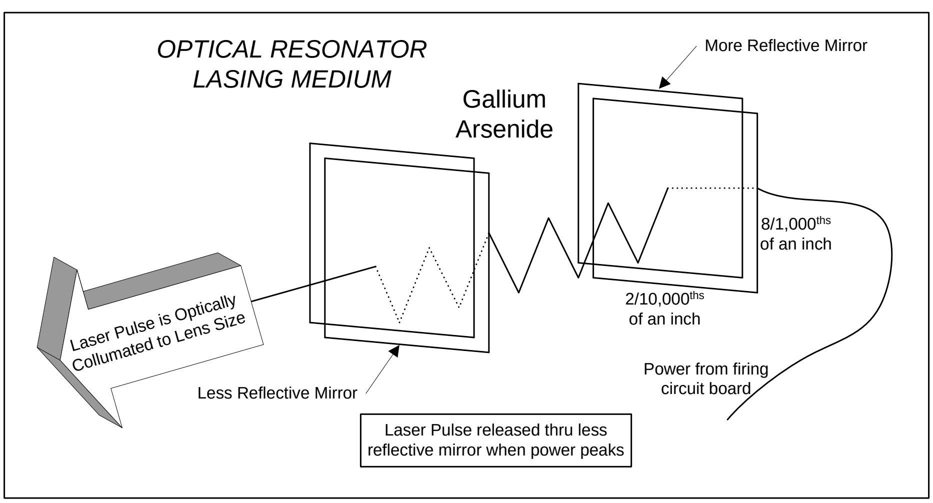
- LIDAR is an acronym that stands for:

  LIght
  Detection
  And
  Ranging

** There is no such thing as "LASER RADAR." The correct term is simply "LIDAR." **

2-A-1 Laser Energy

In its simplest form, laser energy is generated by energizing a piece of active material, known as the lasing medium, sandwiched between two mirrors. These mirrors and the lasing medium (Gallium Arsenide) form what is called an optical resonator.



The atoms of the lasing medium are put into an excited state by an external energy source (e.g., the power from a firing circuit board). Some of this energy is stored by the atoms. As the atoms become excited, they are stimulated to release the stored energy as light energy resulting in amplification of incoming light.

By positioning two mirrors of the optical resonator at a prescribed distance apart, a standing wave is formed by those waves bouncing between the mirrors and having the proper wavelength. Under these conditions, the light waves emitted are aligned in the same direction and tuned in frequency to increase the strength of the standing wave. One of the mirrors is designed (less reflective) to allow some of the amplified light to “escape” and pass from the optical resonator as a laser beam.

Lasers can be produced from many different materials (solids, liquids, and gases) and the design of the optical resonator and the method of exciting lasing mediums may vary. No matter what form the laser takes, the energy is generated by the same basic principle.

2-A-2 Types of Lasers

Typical Optical Resonator Device Types include:

- *Semi-Conductor Lasers*
    - Unlimited uses in high-technology applications such as fiber optic communications and lidar devices.
- *Gas Lasers*
    - Application is popular in the entertainment industry; movies, light shows, etc.
- *Chemical Lasers*
    - Military and inertial confinement fusion applications.
- *Excimer Lasers*
    - Used for surgical procedures within the medical field.
- *Free Electron Lasers*
    - These lasers develop powerful light sources for strategic defense, industry, and basic research.

2-A-3 Health Considerations

The laser used in lidar devices is considered a Class 1 device by the United States Food and Drug Administration (FDA). The implication is, based upon current medical knowledge, these devices are considered safe. *Irrespective of their designation as Class 1 devices and consideration as inherently eye-safe (3 hours of continuous exposure), reasonable precautions should be taken when using lidar devices:*

1. **Never** stare directly into the device lens.

2. **Never** stare directly into the device lens within 50 feet of the device while using binoculars, telescope, or other optical gain devices.

During normal operations, lidar devices are safe for human exposure. Lidar units typically emit less power and energy than:

- Television remotes;
- Flashlights;
- Laser-tag games.

2-A-4 How Lidar Works

Lidar units essentially rely on the following principles:

- The speed of light is known and constant
- A laser beam emitted from a laser generator is very narrow in width and will not spread significantly.
- A laser beam is emitted in a narrow frequency band.

Lidar uses the “time-of-flight” method of taking measurements to determine the target vehicle’s speed. This is accomplished through the use of a photo diode, a clock, and a computational device, in addition to the laser emitter.

The lidar unit emits a short burst of laser (approximately 60 pulses in $^1/_3$ of a second) toward an object with a reflective surface. The device then determines the length of time it takes for the beam to be reflected back to the photo diode.

Using the elapsed time between the emission of the laser beam and the subsequent return, along with the speed of light, the distance between the object and the lidar device is determined by a simple mathematical calculation. The speed of the target is then determined from successive time and range measurements.

The resulting speed is displayed by the lidar unit in either a positive or negative value (If the target is moving away, the value is negative. If the target is moving toward the instrument, the resulting value is positive).

2-A-5 Characteristics of a Lidar Signal

Lidar signals possess the same three distinguishable characteristics as other forms of electromagnetic wave energy (signal speed, wavelength, and frequency).

1. *Signal Speed—*

   The transmitted and reflected signal travels at a constant speed (speed of light = 186,282 miles per second).

2. *Wavelength—*

   Simply defined as the distance between the beginning of the peak to the end of the valley.

   The wavelength of a lidar signal is 904-905 nanometers (billionths of a meter).

3. *Frequency—*

   The frequency is measured in cycles per second, hertz per second, or waves per second. All of these terms mean exactly the same thing. (1 hertz = 1 cycle = 1 wave)

   - *Conventional radar frequency:*
     - X-Band – 10,525,000,000 (10.525 GHz)
     - K-Band – 24,150,000,000 (24.150 GHz)
     - Ka-Band – 33.4 to 36.0 GHz
   - *Lidar frequency:*
     - 330,000,000,000,000 (330 THz [terahertz])

2-A-6 Behaviors of a Lidar Signal

As with all electromagnetic energy, the lidar signal is infinite unless:

- ✓ Reflected;
- ✓ Refracted or;
- ✓ Absorbed.

a.) Reflected—When a portion of the transmitted signal is reflected, or bounced back, from the target vehicle.

i. The reflective capability of the lidar signal can be influenced by the color of the target vehicle.
   - Lighter colored vehicles reflect more of a signal than dark colored vehicles.
   - The hindered ability of dark colored vehicles to reflect the signal may be realized in form of reduced operational range.

b.) Refracted—The bending of a lidar signal as it passes through a translucent material.

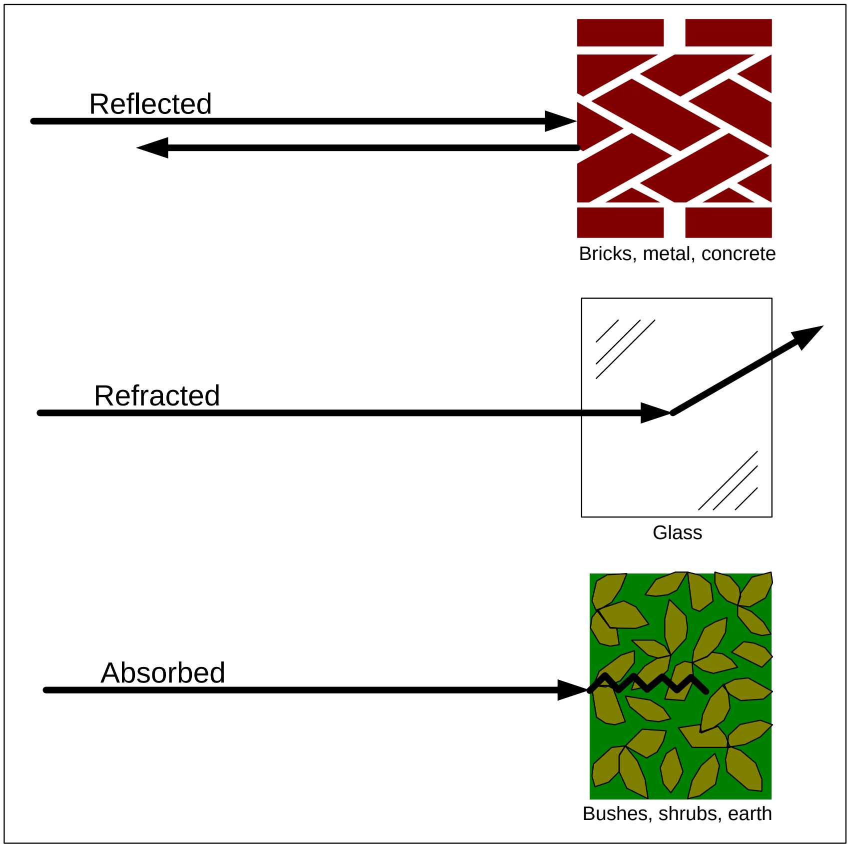
i. When the translucent material and the lens of the lidar unit are at 90 degrees, the displacement is slight.
   - Lidar should not be operated through glass that is not at a 90 degree angle.
   - Inclement weather (rain, fog, etc.) may cause the signal to be refracted (scattered) and reduce the operational range of the device.

c.) Absorbed—The signal may be absorbed by some materials or surfaces.

i. The amount of signal absorbed versus reflected can be impacted by the color of the target vehicle.

ii. The cleanliness of the target may affect the amount of energy absorbed/reflected.

- While range may be affected, there is **no** impact on operational accuracy.



2-A-7 Lidar vs. Other Speed Measurement Devices

Some of the qualities that typify lidar speed measurement devices include the following:

- *Technical Issues:*
  - Narrow beam width
  - Instant on/off
  - Receiver filters out all other signals
  - Infrared light not visible to drivers
  - Currently limited to stationary mode
- *Outside Interference:*
  - Less likely to be affected by outside interference
  - Not subject to moving mode errors (i.e., shadowing, batching, etc.)
  - May be subject to radio-frequency interference (RFI) and is equipped with an RFI indicator
  - Difficult/expensive to develop an effective jammer
- *Comparison of Beam Width:*
  - The narrow lidar beam width allows the instrument to be operated with pinpoint accuracy in selecting specific vehicles on a crowded roadway
  - The lidar beam is only 3 to 4 feet wide at 1,000 feet out compared to 210 feet for a typical radar unit (average radar beam width of 12^{o})

2-A-8 Lidar Interferences and Effects

The lidar operator should recognize and understand the various effects that may affect the lidar unit.

- *RADIO FREQUENCY INTERFERENCE (RFI)—*
  There are an ever-increasing number of radio frequency sources capable of generating signals which may interfere with the operation of lidar units. Generally speaking, these signals are very weak and are ignored in favor of the stronger signal reflected back to the lidar unit from the target vehicle.

  a.) Electrical Lines
  High voltage electrical lines, transformers, or sub-stations may produce RFI.

  To avoid/eliminate this, select an operational site that is free from this type of potential interference. Develop and maintain a valid and thorough tracking history.

  b.) Other Interference
  The patrol vehicle inherently contains several sources of potential RFI which may result in erroneous speed readings.

To avoid/eliminate this, avoid transmitting while in the process of using the lidar unit. Develop and maintain a valid and thorough tracking history.

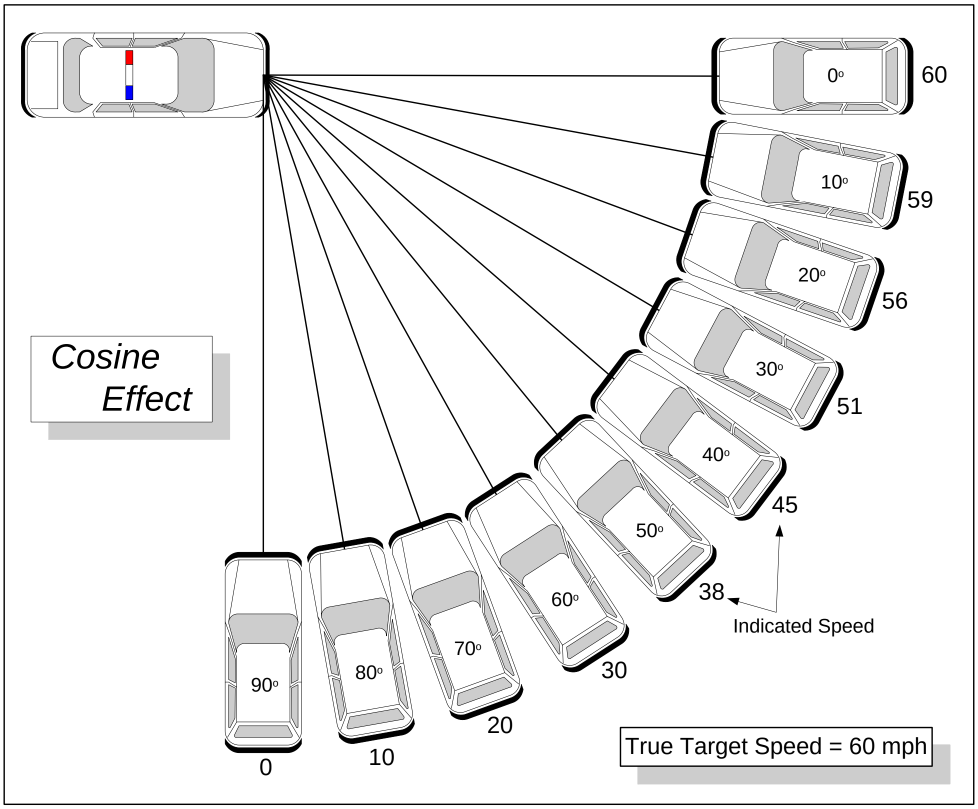
- *LOW VOLTAGE—*
  Should the lidar unit experience low voltage, it will become disabled in accordance with the manufacturer's specifications for that particular unit.

  When this occurs, the operator should check the power source of the unit. Absent any loose connection, depleted power source, or other identifiable solution, the unit should be turned in for service/repair.

- *PANNING—*
  As with radar, the "panning effect" may occur if the lidar unit is moved swiftly past a stationary object while transmitting. This may result in an error message.

- *COSINE ANGULAR EFFECT—*
  The true measure of a target's actual speed is obtained at 0^{o}. Due to safety considerations, however, this is not possible and, as a result, the target is offset from the lidar unit. At a significant distance away, this angle is negligible. As the target approaches, however, the angle gradually increases.

  The cosine effect does not become a factor until the angle reaches 10^{o} or more. Once the cosine angle increases beyond 10^{o}, the speed obtained by the lidar unit will *decrease*.



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Chapter 3—Operational Considerations of Lidar

3-A Pre-Operational Considerations

3-A-1 Inspection

Operational considerations for the deployment of lidar begin when the lidar operator removes the instrument from its storage case. The operator should be familiar with the user's manual and the device's components, features, and functions. The lidar unit should then be inspected for:

- External damage;
- Missing components, and;
- Any other damage or defects that may cause the lidar unit to fail or function improperly.

If *any* problems exist that may affect the operation of the lidar unit, the unit should be immediately removed from service until repaired.

3-A-2 Transportation

When transporting the lidar unit, the manufacturer's recommended procedures must be followed.

When not in use, the lidar unit shall be properly secured so as not to interfere with the patrol vehicle driver's field of vision, physical movement, or ability to quickly enter/exit the patrol vehicle.

For those who ride enforcement motorcycles, the same consideration shall be given to ensuring the lidar unit is secure, protected, and will not interfere with operation of the motorcycle or the rider's ability to quickly mount or dismount.

- An unsecured lidar unit, at a weight of 10 lbs, can contain 400 foot/pounds of energy in a crash of only 35 mph.

3-A-3 Pre/Post-Shift Calibration Checks

Departmental policy states, in essence, that all officers utilizing radar and/or lidar shall perform the required operational checks and test the calibration:

- Prior to beginning enforcement operations (i.e., beginning of shift) **and** at the conclusion of each shift.

1. Internal Accuracy Checks—
    a. Light Segment Test.
        i. The lidar operator shall perform the light segment test to ensure all the individual light segments are functioning properly.

b. Internal Circuit Test.

  ii. Simultaneously performed by the lidar unit micro-processor.
  iii. Each device is specific to the manufacturer, however, the units generally display a series of four dashes ("- - - -") following a series of four eights ("8 8 8 8").

** Should the unit fail any of the internal accuracy checks, it shall be immediately removed from service. **

2. <u>Sight Alignment Check</u>—

   a. Horizontal Sight Alignment.

      i. Check for proper sight alignment by utilizing a fixed object with no objects in the background (i.e., telephone/power pole, street sign, etc.).
      ii. A strong tone should be heard as the sight is swept across the object with the beam active. As the sight moves off of the object, the tone should subside.
      iii. Operator should obtain a range reading.

   b. Vertical Sight Alignment.

      i. Check for proper sight alignment by utilizing a fixed object with no objects in the background (i.e., telephone/power pole, street sign, etc.).
      ii. A strong tone should be heard as the sight is swept across the object from top to bottom. As with the horizontal alignment, the tone should subside as the sight moves off the object
      iii. Operator should obtain a range reading.

3. <u>Range Accuracy Check</u>—

   The lidar operator will check the accuracy of the device by sighting in on a fixed object from a point that has been pre-measured manually (i.e., roll meter, steel-tape, etc.).

   - This check is required at the beginning *and* end of each shift.
   - Tolerance is +/- one (1) foot.

   The standard measurements used by the Department are 150 and 175 feet.

4. Fixed Distance Zero Velocity Check—

    The Fixed Distance Zero Velocity Check (FDVC) checks the accuracy of the device by checking a known distance between two points; the point where the lidar operator is standing and a fixed marker. The FDVC is accomplished as follows:

    - Operator places the lidar sight on a fixed marker which has been pre-measured. The uniform standard is 175'.
    - A "0" miles per hour speed measurement should be displayed.
    - Pressing the speed/range button will switch to the range mode and will display the correct distance, +/- one foot.
    - A "0" miles per hour reading of a stationary object is identical in nature to an accurate speed reading of a moving vehicle at all speeds, therefore, calibration verification is complete.

5. Delta Distance Velocity Check—

    The Delta Distance Velocity Check (DDVC) will measure the difference between markers and convert this measurement to velocity. The DDVC is accomplished as follows:

    - Operator places the lidar sight on a fixed marker which has been pre-measured (175').
    - Operator then moves to the second fixed marker which has also been pre-measured (150').
    - The lidar unit calculates the speed/velocity based on the difference in marker distances.
    - Tolerance is +/- one (1) foot.

3-B Deployment Considerations

3-B-1 General Safety

When selecting a site for lidar deployment, the primary concern should be the safety of the operator, other officers, and the motoring public.

The focused goal of the lidar program is to improve traffic safety in an effort to reduce the MDR. *At no time should a lidar operator create an unwarranted situation that endangers the officer or the public for the sake of issuing a speeding citation.*

3-B-2 Specific Operational Considerations

Site Considerations—

The site selected must meet the following criteria to insure the safety of everyone involved:

- ✓ There must be enough space so as to keep the patrol vehicle, while stationary, from impeding the normal flow of traffic.
- ✓ The lidar operator must have sufficient visibility in order to monitor traffic and obtain a tracking history.
- ✓ The lidar operator and/or chase vehicles (if any) must be able to enter traffic safely.

In addition to the officer safety aspect of the site, the following factors should also be considered when selecting a site for enforcement:

- ✓ Traffic Collisions
- ✓ Excessive Speed
- ✓ Volume of Traffic Complaints
- ✓ Prevailing Locations (i.e., school zone, construction, etc.)
- ✓ Engineering & Traffic Survey, if required.

Roadway Considerations—

1. The lidar operator should avoid locations where excessive obstructions, such as curves and hills, provide insufficient visibility for monitoring traffic.
2. The lidar operator should also remain cognizant of the cosine effect when selecting a site that requires positioning the patrol vehicle a significant distance from the roadway.
3. The operator should select a site where the volume of traffic will not obstruct positive identification of the violator's vehicle.

Weather Considerations—

Inclement weather conditions (i.e., rain, fog, snow, etc.) may affect lidar operations by:

- ✓ Reducing the operational range of the lidar unit.
- ✓ Creating inherently dangerous conditions for the operation of patrol vehicles as officers attempt to overtake a potential violator.

3-B-3 Enforcement Issues

As with any enforcement action, should there be **any doubt** as to whether or not the perception of the violation is accurate, NO ENFORCEMENT ACTION SHOULD BE TAKEN!

1. Tracking History

   Any enforcement action resulting from a speed measurement device, whether radar or lidar, shall be supported by several vital elements referred to as a "tracking history."

   a. *Visual Estimation*—An estimation of the potential violator's speed must be made visually prior to, and independent of, any measurement made by the lidar device.
   b. *Sight Acquisition*—The lidar sight (viewfinder) must be placed directly on the reflective surface of the target vehicle.
   c. *Target Acquisition Tone*—A tone indicating the target vehicle has been acquired must be heard as the target vehicle is engaged.
   d. *Confirmation*—The reading obtained by the lidar unit must correlate to the estimated speed of the target vehicle.

2. Target Selection

   In order to ensure the optimum conditions for proper target acquisition, the following considerations should be made:

   a. *Monitor Traffic*—The operator should continuously monitor traffic to observe potential violators, maintaining a clear line of sight in doing so.
   b. *Conditions*—The operator should avoid using the lidar unit adverse visibility conditions, such as fog, etc.
   c. *Refraction*—The lidar unit should not be operated through the glass of the patrol vehicle as refraction may occur.
   d. *Long-Range Acquisition*—Akin to using a rifle, the lidar unit should not be used to acquire long-range targets unless the aid of a stabilizing support is used.

      Long-range target acquisition is <u>not</u> recommended as it tends to make a proper tracking history more difficult to support.

   The ability of a target vehicle to reflect an optical wavelength will affect the *range* of the lidar unit. **It will not affect the *accuracy* of a lidar unit.** As such, light colored and/or clean vehicles tend to reflect the lidar signal better than dark colored or dirty vehicles.

The following areas of a target vehicle provide the best reflective capability when attempting to obtain a lidar reading:

- Front license plate
- Headlights
- Front bumper

- Rear license plate
- Rear taillights, reflectors
- Rear bumper

NOTE: Receding vehicles provide a stronger reflective signal than approaching vehicles, usually providing twice the range.

3-B-4 Care and Handling

Periodic cleaning of the lidar unit may be necessary to keep the unit working properly.

- ✓ Should the lidar unit get wet, towel off any excess moisture and allow the unit to air dry at room temperature before securing the unit in a closed case.
- ✓ The external optical surfaces should be cleaned with a soft cloth designed to clean eyeglasses or a treated towelette, such as “SightSavers.”

  USE CARE WHEN CLEANING THE LENSES

  If the lenses become excessively scratched, the range of the lidar unit will be significantly reduced.

Chapter 4—Legal Considerations

4-A Laws Applicable to Lidar

4-A-1 Statutory Law

The only California Vehicle Code section that addresses the use of any device other than radar is §40802(c)(1):

> "…(T)he arresting officer has successfully completed a radar operator course of not less than 24 hours…and the course was approved and certified by (POST)…
>
> …When laser or any other electronic device is used…the arresting officer has successfully completed…an additional training course of not less than two hours approved and certified by (POST)…"

The same laws that apply to the use of radar also apply to the use of lidar. This includes speed trap prohibitions, speed trap evidence, punitive speed laws, and any section requiring an Engineering & Traffic Survey (ETS) when certain speed limits are established.

4-A-2 Fundamental Issues

Currently, there is very little case law regarding the use of lidar, although that is sure to change as the use of lidar becomes more prevalent.

In an effort to avoid many of the legal difficulties experienced early on with the use of radar, the same basic legal principles that apply to radar also apply to lidar. Over the years, courts have established specific guidelines for the use of speed measurement devices. It can be reasonably deduced that failure to comply with these guidelines will result in the court's reluctance, or outright refusal, to admit the use of lidar as evidence.

Operating Procedures—

1) Although each lidar unit make and model has its own operating characteristics, all devices have certain operating procedures in common.
2) Following the procedures specified by the manufacturer will ensure the unit is used where, when, and how it was designed, ensuring the evidence gathered is as accurate as possible.

Issues Affecting the Use of Lidar—

1) Lidar is used by law enforcement to acquire evidence. To be useful in the case, the evidence must be ruled admissible. For the evidence to be admissible there must be sufficient reason to believe it is valid.

2) The validity of lidar comes down to one basic question:

   "Is this measurement an accurate representation of the speed of the actual vehicle driven by the accused at the time of the alleged violation?"

   The term "accurate" is somewhat vague. Certainly the measurement could vary from the true speed of the accused within an accepted tolerance and still be considered "accurate." The measurement could even miss the mark by several miles per hour and still be accurate, so long as the error was in the favor of the violator.

3) The accuracy of lidar requires answering four specific questions:

   (a) How do we know that the operating principles of lidar are valid?
   (b) How do we know the lidar unit was working properly at the time of the alleged violation?
   (c) How do we know the operator has the necessary qualifications and performed properly at the time of the alleged violation?
   (d) How do we know the speed measurement came from the vehicle driven by the accused?

Ever since electronic devices were first used to measure speed and enforce traffic laws, questions have been raised in court. The courts have responded by handing down rulings which affect how the above four questions can be answered. Landmark rulings have made it simpler to introduce these electronic devices as evidence by imposing specific operating procedures that must be followed.

Judicial Notice—

As is the case with radar, the theory and scientific validity of lidar has been accepted through judicial notice. As such, the operator need not be able to explain the theory of lidar.

Testing Procedures—

The courts insist on evidence indicating a device was working properly at the time it was used. This is because a lidar unit, just like any other technological, scientific instrument is subject to breaking down.

The courts have taken judicial notice of the methods learned earlier as acceptable methods in determining whether a lidar unit was working properly.

The courts have long accepted the principle of "before and after" testing. This requires, at minimum, that a lidar unit be shown to be working properly both at the beginning and the end of the shift during which the speed measurement in question was obtained.

Establishing Competency—

The courts also insist that the operator give evidence to support the following:

1. The operator can establish that he/she was trained in the use of the specific device in question;
2. The operator followed established operating procedures for the specific device;
3. The operator performed and verified the required pre and post-operational accuracy checks;
4. The operator had an opinion as to the target vehicle's speed and that opinion was independent of the device in question;
5. The enforcement action resulted only after the operator's opinion was corroborated by the device and a clear-cut violation of applicable speed laws had taken place.

4-A-3 Case Law

Fleming v. Superior Court (1925), 196 Cal. 344—Supreme Court upheld the validity of the speed trap law. Officers should be in the open and their presence known.

People v. Beamer (1955), 130 Cal. App. 2d Supp. 874, [279 P.2d. 205]—Radar does not constitute a speed trap because it measures speed through space without reference to any part of the highway.

People v. Halapoff (1976), 60 Cal. App. 3d Supp. 1, [131 Cal. Rptr. 799]—The trial court, by way of taking judicial notice, could admit a certified copy of an ETS, provided the survey satisfied statutory requirements of admissibility. Also, the arresting officer could testify that he/she "calibrated" and tested the radar unit by turning a selector switch as directed and then determined whether the machine gave appropriate readings. This testimony was sufficient to make a prima facie showing that the machine was suitably functioning and, hence, to establish the accuracy of any radar reading.

People v. Miller (1979), 90 Cal. App. 3d Supp. 35, [153 Cal. Rptr. 192]—The court held that, where a speed limit in effect on a highway is not a prima facie speed limit, radar may be used irrespective of the existence of a requisite survey, so long as a prima facie speed is not introduced by the prosecution.

People v. Krueger, Pantos, Payne, et. Al. (1986), unpublished—The court took judicial notice of the scientific reliability and accuracy of radar. The court also found the admissibility of radar readings to be dependent on evidence that the radar operator was certified to use the equipment and was cognizant of error readings through an extensive training program. The court further held that one could be reasonably assured that an officer certified under the CHP training program, who utilizes radar in conformity with NHTSA standards, will operate radar devices error-free and with scientific reliability.

Honeycutt v. Commonwealth of Kentucky (1966), 406 S.W. 2d 421—This case established that the operator of a speed measuring device need not be able to explain the internal workings of the device and that knowledge of the scientific principle is irrelevant to the operation of the equipment.

The court also ruled that it is sufficient to have knowledge and training to properly:

- ✓ Set up the instrument;
- ✓ Test its accuracy;
- ✓ Operate/read the instrument to obtain a speed measurement.

The impact of this ruling on an officer’s testimony suggests that the officer must:

- ✓ Establish that he/she has the necessary qualifications and training to be a lidar operator;
- ✓ Establish that the instrument was set up properly and working normally;
- ✓ Establish that the lidar accuracy was verified in a manner prescribed by the manufacturer.

4-B In the Courtroom

4-B-1 Courtroom Testimony

The successful prosecution of any speeding violation requires that all elements of the offense be established. The operator must:

1) Prove that the accused was, in fact, the driver.
2) Establish that the vehicle in question was the vehicle from which the speed measurement was obtained.
3) Establish that the alleged violation took place where the public has right of vehicular access.
4) Identify the absolute and/or prima facie speed limit in force at the location in question.

If the offense is a violation of the absolute (maximum) speed law, it must be established that the vehicle was, in fact, exceeding the specified limit.

If the offense is a violation of the prima facie (basic) speed law, it must be established that the violator's speed was unreasonable and unsafe given the conditions at the time of the violation.

Remember—

1) The officer must describe the conditions and the actual/potential hazards;
2) If the prosecution offers lidar speed measurement as evidence of an offense, it must be proven that the lidar speed measurement was obtained in compliance with accepted operating procedures by establishing that:
   a.) The lidar unit was operating properly;
   b.) The accuracy was verified with an appropriate method both before and after shift;
   c.) The operator was properly qualified and trained;
   d.) There was a visual observation and initial estimate of the violation, independent of any reading by the lidar unit
   e.) The reading obtained by the lidar unit was reasonably close to the visual estimation.

4-B-2 Evidence Kits

The key to successfully prosecuting a case involving the use of lidar starts with being adequately prepared. As such, the following items must be available, should an officer be called to testify:

- ✓ CHP 195—Certificate of Attainment
  (**This includes both lidar ***and*** radar**)
- ✓ Lidar Operator's Manual
- ✓ Lidar Certification/Maintenance Records
- ✓ CHP 415—Daily Field Record

While the above list contains important items, it is not all inclusive. Officers are encouraged to add items they feel would be beneficial when testifying.

4-B-3 Citation Notes

In accordance with the CHP Enforcement Documents Manual (HPM 100.9, Ch.1, p. 1-20), officers are required to make notes on their green copy of the citation. At a minimum, these notes should contain the following information:

- ✓ Make, model, and serial number of lidar unit
- ✓ Last IACP lab certification
- ✓ Initial visual speed/distance estimate
- ✓ Lidar-confirmed speed
- ✓ Atmospheric conditions
- ✓ Traffic conditions
- ✓ Was the target vehicle the only one within the sight?

4-B-4 Sample Testimony

"On (date/time), I was working lidar speed enforcement at (location), in full uniform driving a marked CHP patrol vehicle.

On this date I observed (subject vehicle), approximately (distance) away, traveling (direction/location) at a high rate of speed. I estimated the vehicle's speed at (XX) miles per hour in a posted (speed limit) zone. Using (lidar unit make/model/serial number), I confirmed the vehicle's speed to be (speed measurement).

I made an enforcement stop on the vehicle at (location). [*Discuss the circumstances surrounding the contact with the violator, including anything pertinent that was said*]

Your honor, I have received a total of 54 hours of formal training in the use of radar; This POST-certified course included 24 hours of classroom training and 30 hours of field training. Additionally, I have received eight hours of POST-certified training in the use of the (make/model of lidar unit). I have been actively using both radar and lidar since (year of certification).

At the beginning of my shift, prior to issuing this citation on the date and time in question, I performed tests for accuracy in accordance with the manufacturer's specifications. I found the unit to be working properly at that time. I performed these same tests at the conclusion of my shift and found the unit to be working properly at that time, as well."

Chapter 5—Policies Applicable to Lidar

5-A Departmental Policy

5-A-1 HPM 100.4—Radar Enforcement Manual

Highway Patrol Manual (HPM) 100.4 is the primary CHP policy governing the use of both radar and lidar. It is important to remember that, in the context of this policy, the term “radar” is synonymous with the term “lidar.” That is to say, anywhere radar is referenced; one could simply interject lidar and be within departmental policy in its application. Some highlights of this policy include:

- Radar/lidar shall not be used on any freeway or state highway designated as an expressway, without prior approval from the Office of the Commissioner.
- Deployment must be consistent with an identified problem.
- Use on unauthorized roads is prohibited.
- Routine services cannot be neglected in favor of radar/lidar enforcement.
- HPM 100.68 must be followed regarding enforcement policies.
- The proper accuracy/calibration checks must be performed in accordance with the manufacturer’s specifications for the particular unit, as well as departmental policy.
- A visual estimation of the violator’s speed must be made prior to the use of the radar/lidar unit.
- A 30-day conditioning period is recommended upon initial implementation of radar/lidar enforcement.
    - Verbal warnings for other than egregious violations.
    - Other means of enforcement okay (i.e., pace, estimations, etc.)
    - PAO/media involvement, if practical.
- Radar/lidar operators should have access to a list of approved roadways.
- All radar/lidar units in need of repair shall be handled through the applicable coordinator (Area or Division).
- All radar/lidar units shall be calibrated by an independent testing laboratory (i.e., San Diego State University, IPTM University of Florida, etc.) at a minimum of 30 month intervals.

5-A-2 Lidar Certification Requirements

The lidar operator certification process consists of the following elements:

- The operator shall have already completed the radar certification process.
- The lidar course shall consist of the eight (8) hour, POST-certified course which includes:
  - A final exam to be passed with a minimum of 80% proficiency.
  - Practical application using a CHP 99A—Radar/Lidar Speed and Distance Determination Test. The student must complete five (5) stationary determinations within +/- 5 mph accuracy, in the presence of the instructor and/or aide.
- Once these requirements have been met, at the conclusion of the class, the student will be certified in the use of and authorized to deploy lidar.

5-A-3 Lidar Recertification Requirements

As with radar, lidar operators must be recertified once per calendar year. This is accomplished by completing a CHP 99A with determinations made within +/- 5 mph.

5-A-4 Completion of Lidar Citations

When issuing citations based on the use of lidar, the operator shall place the letter “L” in the Radar Unit/Patrol Vehicle No. box so as to indicate that a lidar unit was used to obtain the speed measurement.

Chapter 6—Lidar Operator Training, Practical Application

6-A Set-up and Preparation

6-A-1 Facilities and Environment

The area selected for practical application of the lessons learned in this course may be a controlled environment, such as a parking lot, test track, or military installation or the area may be a public roadway where public access is granted. In either case, the utmost concern must be for the safety of the students, instructor(s), and the motoring public.

In selecting an area, there are some obvious considerations to make:

1. Controlled Environment—
   - ✓ Target vehicles will need to be provided; preferably targets of various sizes, shapes, and colors.
   - ✓ The area will need to be adequate in size so as to allow for the estimation of varying speeds and distances.
2. Public Roadway—
   - ✓ The location must provide sufficient room for the safety of the students and instructor(s).
   - ✓ The impact on traffic should be thoroughly evaluated.
     - Consider there will likely be several plain-clothes students standing around pointing gun-shaped objects at passing vehicles.

For the accuracy tests, it is beneficial if the instructor takes steps to prepare prior to this aspect of the course:

1. Use a pre-designated area, perhaps one routinely used by certified operators to conduct these tests (i.e., Area office, etc.)
2. If a pre-designated area is unavailable, use a telephone or power pole (or similar item) and mark off 150’ and 175’ with a roll meter.
   - ✓ Lumber crayons, traffic cones, or similar items may be used to mark these spots on the pavement or asphalt.
     - If it is not your facility, avoid using permanent markers such as spray paint.

6-A-2 Lidar Unit Demonstration

The instructor(s) should attempt to have at least one of each make and model of lidar unit in use by the Department available for this practical demonstration.

It is also beneficial if, for the practical demonstration, there is a ratio of one instructor/aide (certified lidar operator) for every four students. This will allow each student an adequate opportunity to set-up and test the accuracy/DDVC of the lidar unit.

Remember, it is the task of the instructor(s) to monitor each student’s performance, provide necessary instruction and demonstration, and determine when each student has achieved the satisfactory level of skill proficiency.

6-A-3 Demonstration of Various Effects

The practical demonstration of the lidar unit is a good time to attempt to recreate various effects that may occur during operation. This exposure allows the operator to more readily identify when such effects occur in the field, thus better preparing the operator for testimony. The effects that should be demonstrated include:

- ✓ Beam Obstruction
- ✓ Cosine Effect;
- ✓ Panning (scanning) Effect
- ✓ RFI

Chapter 7—Lidar Operator Training Conclusion

7-A Final Certification Requirements

7-A-1 Final Exam

At the conclusion of the course, the final exam will be administered. In order to pass, students must attain a minimum score of 80%.

7-A-2 Issuance of Certificate

Once the final exam has been administered and the classroom portion of the training complete, each student must participate in the practical application of the lidar device. This practical application includes:

- Set-up, inspection, and pre/post-shift calibration checks.
- Completion of five (5) stationary determinations using a CHP 99A. These determinations must fall within +/- 5 mph to be valid.

This portion of the course takes place at the end of the training day and must be completed in order for the operator to become certified.