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Admitting Light Detection and Ranging (LIDAR) Evidence in Texas: A Call for Statewide Judicial Notice.

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ARTICLE

ADMITTING LIGHT DETECTION AND RANGING (LIDAR) EVIDENCE IN TEXAS: A CALL FOR STATEWIDE JUDICIAL NOTICE

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> *Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognized . . . .*[3]

I. INTRODUCTION

The reliability of LIDAR,[4] and any traffic enforcement technology for that matter, is generally questioned for one of two reasons: either the speeding charge itself is of such great importance to the defendant that he must challenge the technology, or the defendant was charged with a different, more serious crime because of the traffic stop, and the reliability of the speed measuring device gives him the opportunity to question the probable cause for the underlying stop.[5]

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3. Frye v. United States, 293 F. 1013, 1014 (D.C. Cir. 1923), *superseded by rule*, FED. R. EVID. 702, *as recognized in* Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579 (1993).

4. LIDAR "stands for Light Detection and Ranging." Carl Fors, *Going to Court in Radar and Laser Trials*, POLICE J., Summer 2010, at 79, 80. LIDAR is based on laser technology in which laser guns are used to measure the speed of moving vehicles. *See "Lidar" Speed Detection Devices Held Admissible*, DAILY WASH. L. REP., June 26, 2008, at 1365, 1367 (describing how LIDAR works).

5. *See, e.g.*, Gutierrez v. State, 327 S.W.3d 257, 262–63 (Tex. App.—San Antonio 2010, no pet.) (citing Texas v. Brown, 460 U.S. 730, 742 (1983); Beck v. Ohio, 379 U.S. 89, 91 (1964)) (holding, in a driving while intoxicated case, that reasonable suspicion for the underlying stop existed because of the speed measured on the officer's radar device).

Both of these types of cases will generally play out as follows: a motorist drives at a speed of seventy miles per hour in a fifty-mile-per-hour zone. A police officer, parked just over the crest of a hill, stands outside of his vehicle. The officer has a Kustom Pro Laser III laser speed detection gun.[6] The device has a viewing window similar to a 35-mm camera, except that in the middle of the gun's viewing window is a red dot.[7] When the motorist comes over the hill, he is passing cars in the left lane, and the officer puts the motorist's front bumper in the crosshair and pulls the trigger.[8] The gun shoots an invisible laser pulse at the vehicle, which bounces off the license plate and returns to the gun.[9] The officer hears a loud beep, and, in a fraction of a second, the gun's internal computer determines how many feet per second the vehicle was traveling. It then converts this measurement to miles per hour, and when the officer looks at the red LED display on the back of the gun, it reads, "70." The officer notes the make and model of the vehicle and notices its brake lights come on as it passes the police car. The officer then safely catches up to the speeder and issues him a citation for exceeding the posted speed limit. This will serve as prima facie evidence that the driver was traveling at an unsafe speed.[10]

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6. Established in 1965, Kustom Signals, Inc. "designs, manufactures and markets traffic speed radar, lidar, in-car video systems and mobile roadside speed monitoring trailers." *About Us*, KUSTOM SIGNALS, INC., http://www.kustomsignals.com/about.asp (last visited May 12, 2011).

7. *See generally* Hall v. State, 297 S.W.3d 294, 296 (Tex. Crim. App. 2009) (referencing an officer's testimony discussing the use of a radar device).

8. *See "Lidar" Speed Detection Devices Held Admissible*, DAILY WASH. L. REP., June 26, 2008, at 1365, 1368 (noting that an expert witness testified that "[u]sers of the ProLaser III are instructed to aim the reticule at a flat, vertical surface of a car, such as the front or rear bumper").

9. *E.g.*, *id.* at 1367 ("For speed detection, shots of a laser beam are repeated hundreds of times. When each laser pulse hits the moving target, a portion is reflected back and detected by the device.").

10. *See* TEX. TRANSP. CODE ANN. § 545.351 (West 1999) ("An operator may not drive at a speed greater than is reasonable and prudent under the circumstances then existing."); *id.* § 545.352(a) (West 1999) ("A speed in excess of the limits established [in the Transportation Code] is prima facie evidence that the speed is not reasonable and prudent and that the speed is unlawful."); *see also* CAL. VEH. CODE §§ 22350–22352 (West 2010) (requiring speeds to be "reasonable or prudent" and designating the posted speed limits to be prima facie evidence of the reasonable and prudent speed for the specific road); N.Y. VEH. & TRAF. LAW § 1180(a) (McKinney 2010) ("No person shall drive a vehicle at a speed greater than is reasonable and prudent under the conditions and having regard to the actual and potential hazards then existing.").

The first family of these types of cases revolves around the impact of the ticket itself. When the motorist—e.g., a truck driver by trade—comes to the municipal court to take care of his ticket, he learns that his Commercial Driver's License (CDL) makes him ineligible for any kind of deferred disposition.[11] To make matters worse, his employer's insurance company will no longer cover him if he gets another ticket on his record; therefore, getting a conviction means more than just a fine—he could lose his livelihood.[12] In these cases, because there is no jail time possible for the offense, the court will not appoint an attorney for the motorist.[13] Appearing pro se, the defendant nonetheless files a motion to suppress the evidence obtained from the laser gun. These cases are particularly troubling for the city prosecutor who then becomes faced with the daunting task of determining the reliability of this evidence—which may cost hundreds or thousands of dollars by the hearing's conclusion—for a conviction on a $150 ticket.[14]

The second family of these types of cases revolves around other crimes that are discovered only because of the stop.[15] For example, during the stop, the officer gains additional probable cause to allow a search of the vehicle and discovers drugs or other illegal contraband in the vehicle.[16] In these cases, the defendant will normally have a competent attorney who will move to

11. *See* TEX. CODE CRIM. PROC. ANN. art. 45.0511(s) (West 1999) (excepting a person who holds a commercial driver's license from the otherwise available option of having a charge for a moving violation dismissed upon completion of a driver safety course).

12. *See* State v. Bartholomae, No. 2111423 (Mun. Ct., Nueces County, Tex. June 2009) (unpublished decision; citation from trial notes of author Ryan V. Cox) (taking judicial notice of the reliability of LIDAR under these exact facts).

13. *Cf.* TEX. CODE CRIM. PROC. ANN. art. 1.051 (West 2007) ("An indigent defendant is entitled to have an attorney appointed to represent him in any adversary judicial proceeding *that may result in punishment by confinement* . . . ." (emphasis added)).

14. For information on Texas traffic penalties and fines, see TEX. TRANSP. CODE ANN. §§ 542.401–.406 (West 1999, West Supp. 2010), which defines the range of fines for traffic violations to be between $1–$200 with the additional possibility of court costs and late-payment penalties.

15. *See, e.g.*, Hurd v. State, No. 14-05-01092-CR, 2007 LEXIS 3767, at *1–3 (Tex. App.—Houston [14th Dist.] 2007, pet. ref'd) (mem. op.) (discussing a motion to suppress radar evidence in a case in which the defendant was found to possess marijuana following a speeding stop).

16. *See id.* (deciding a case in which marijuana was found after the defendant was stopped for speeding).

suppress the LIDAR evidence in an effort to establish that there was no probable cause for the stop, and thereby to suppress all of the other evidence obtained as "fruits of the poisonous tree."[17]

Assuming the jurisdiction has not settled the issue of the reliability of evidence obtained from LIDAR technology, the court must require the prosecutor to present expert testimony to show the reliability of the evidence.[18]

In its 2009 decision in *Hall v. State*,[19] the Texas Court of Criminal Appeals failed to hold this evidence reliable, [20] thereby preventing all lower courts from taking judicial notice. Like Texas, most states have yet to hand down a statewide ruling on the issue of the reliability of LIDAR evidence, despite the fact that it has been proven reliable in dozens of American courts.[21] A ruling on the reliability of LIDAR by Texas's highest criminal court would undoubtedly have nationwide implications, not just concerning LIDAR, but it would also affect other scientific-evidence suppression hearings based on Federal Rule of Evidence 702 or its state counterparts.

In Part II, this Article discusses LIDAR technology, its history, development, and current usage, beginning with its relationship to traditional radar. In Part III, this Article looks at both Texas and Federal Rule of Evidence 702 and discusses how they must be interpreted in light of the Texas Court of Criminal Appeals's ruling in *Kelly v. State*[22] and the United States Supreme Court's ruling in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*,[23] among

17. *See generally In re* H.V., 252 S.W.3d 319, 327 & n.58 (Tex. 2008) (citing Wong Sun v. United States, 371 U.S. 471, 487 (1963); Kothe v. State, 152 S.W.3d 54, 60 (Tex. Crim. App. 2004)) (discussing the exclusionary rule and suppression motions based on the "fruit of the poisonous tree" doctrine).

18. *See* Hall v. State, 264 S.W.3d 346, 348–49 (Tex. App.—Waco 2008) ("The proponent of scientific evidence bears the burden of proving its reliability by clear and convincing evidence."), *aff'd*, 297 S.W.3d 294 (Tex. Crim. App. 2009).

19. Hall v. State, 297 S.W.3d 294 (Tex. Crim. App. 2009).

20. *See id.* at 298 ("Our holding today is limited to the facts of this case. It is likely that in some future case, it will become necessary for a court to decide what quantum or quality of information is necessary [to] establish the reliability (i.e., reasonable trustworthiness) of LIDAR technology for measuring speed when a defendant challenges the reliability of that information to defeat probable cause at a pretrial suppression hearing.").

21. *See infra*, Part IV(B) (discussing the courts that have addressed the reliability of LIDAR evidence).

22. Kelly v. State, 824 S.W.2d 568 (Tex. Crim. App. 1992).

23. Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579 (1993).

other landmark cases. In Part IV, this Article looks at the legislative history, statutes, and precedent concerning the use of LIDAR in law enforcement nationwide, and discusses the use of judicial notice as a way to avoid full-blown gatekeeping hearings. Part V discusses Texas precedent: how the Texas Court of Criminal Appeals came to address the issue in *Hall*, and what the court did and did not decide. Part VI concludes the Article by discussing the implications of the *Hall* decision in future Rule 702 challenges. This Part also calls for statewide judicial notice—not just in Texas, but in all states—and, further, offers some guidance to assist municipal court and county prosecutors in handling LIDAR cases in the interim.

II. RADAR AND LIDAR: HISTORY, DEVELOPMENT, AND CURRENT USE

A. *Radar*

The letters in "radar" stand for "Radio Detection and Ranging."[24] Radar works on the principle of bouncing radio waves at the speed of light—186,282.4 miles per second—off of a reflective object at a specific frequency.[25] If the reflective object is moving, the radio waves return at a different frequency than that at which they were transmitted, and this difference is called Doppler Shift, or the Doppler Effect.[26] The radar gun's computer

24. *Hall*, 264 S.W.3d at 349 n.1.

25. Greg Koran, *Radar v. Lidar: Which Will Work Best for You?*, POLICEONE.COM (Oct. 27, 2005), http://www.policeone.com/columnists/lom/articles/120325-radar-vs-lidar-which-will-work-best-for-you/. *See generally* Grady J. Koch, *Doppler Lidar Observations of an Atmospheric Thermal Providing Lift to Soaring Ospreys*, NASA, http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20080015449_2008014386.pdf (last visited May 12, 2011) ("Doppler lidar is analogous to Doppler radar with the main distinction being the wavelength of the probing pulses—radar operates at long radio wavelengths while lidar operates at short infrared wavelength[s]. An important difference between radar and lidar is that radar is effective for larger targets . . . while lidar is effective for very small targets . . . .").

26. *See* People v. Ferency, 351 N.W.2d 225, 230 n.1 (Mich. Ct. App. 1984) ("Radar speed-measuring devices operate on the well-known Doppler principle, which relates the frequency shifts in reflected radiation to the relative velocity between the reflecting object and the observer."); N. Seddon & T. Bearpark, *Observation of the Inverse Doppler Effect*, 302 SCI. 1537, 1537 (2003) ("The Doppler effect is the well-known phenomenon by which the frequency of a wave is shifted according to the relative velocity of the source and the observer. Our conventional understanding of the Doppler [E]ffect, from the schoolroom to everyday experience of passing vehicles, is that increased frequencies are

tabulates the speed based on the difference in transmitted and returned frequency. Frequencies used by law enforcement for radar guns are established and maintained by the Federal Communications Commission (FCC).[27] Frequencies presently used by radar guns are: X band at 10.525 GHz, K band at 24.150 GHz, and Ka band at 33.4–36 GHz.[28] One GHz is equal to one billion cycles per second—meaning that X band, for example, sends 10,525,000,000 radio microwaves per second, which then bounce back to the detection unit. States and municipalities do not determine radar gun frequencies; they simply purchase equipment that is built to operate at the specific frequencies dictated by FCC regulations.

Radar experimentation began as early as the 1860s when British physicist James Clark Maxwell "predicted the existence of electromagnetic waves that travel at the speed of light."[29] In 1887, Heinrich R. Hertz proved Maxwell correct by producing radio waves and then "demonstrat[ing] that such electromagnetic waves could be reflected from solid objects."[30] In 1925, two Americans, Gregory Breit and Merle A. Tuve, "bounced short radio pulses off the ionosphere" and measured the time of return.[31] In 1935, Scottish physicist Robert A. Watson-Watt was the first to develop a speed-detection device similar to that which law enforcement uses today.[32] Watson-Watt's "studies were refined by British scientists during 1935," at which time airplanes could be located

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measured when a source and observer approach each other. Applications of the effect are widely established and include radar, laser vibrometry, blood flow measurement, and the search for new astronomical objects." (citations omitted)).

27. *See generally* 47 C.F.R. § 2.102(a) (2008) (noting that "frequencies to all stations and classes of stations and the licensing and authorizing of the use of all such frequencies between 9 kHz and 275 GHz" are subject to designation by the FCC).

28. *See Ferency*, 351 N.W.2d at 230 n.1 ("Existing radar devices transmit a continuous signal at either 10.525 GHz in the X band or 24.15 GHz in the K band, and they analyze the reflected signal for frequency shifts that indicate the speed of vehicles in the path of the beam. Each mile per hour of target speed produces a frequency shift of 31.4 Hz with the X-band frequency or 72.0 Hz with the K-band frequency."); *see also* 47 C.F.R. § 2.106 (displaying, in table form, all bandwidths and their legally allowable uses).

29. LES LANGFORD, UNDERSTANDING POLICE TRAFFIC RADAR & LIDAR 44 (rev. ed. 1998).

30. *Id.*

31. *Id.*

32. *See id.* (stating that Watson-Watt "experiment[ed] with radio echoes to detect airplanes and ships").

from a distance of seventeen miles.[33] By 1936 "American army and navy engineers discovered they could detect aircraft at distances of more than a hundred miles when they used long enough radio wavelengths."[34] It was not until World War II, however, that radar really began to see large-scale use, as it was seen primarily as a military technology.[35] In fact, the radar used to detect the Japanese Zeros attacking Pearl Harbor on December 7, 1941, used the same radar principles as the common radar gun used by law enforcement today.[36]

The first true radar gun used in law enforcement was pioneered by Decatur Electronics, Inc. in Decatur, Illinois during the 1950s.[37] The nation's first speed limit was enacted in 1901 in Hartford, Connecticut, requiring drivers to act in a reasonable and prudent manner under existing conditions;[38] however, enforcing this restriction without reliable evidence of speed proved difficult. Definite speed limits were relatively slow to develop, and it was not until the 1940s—the same time that radar was seeing widespread use—that a standard national speed limit of 35 m.p.h. was established.[39] Even still, the State of Montana had no interstate speed limit until 1998.[40] Both Texas and Utah currently have 80 m.p.h. speed limits on some rural sections of highway, but nationwide highway speed limits generally range from 60 to 70

33. *Id.*

34. John H. Lienhard, *Engines of Our Ingenuity: No. 1364: Radar*, UNIV. OF HOUS., http://www.uh.edu/engines/epi1364.htm (last visited May 12, 2011).

35. *See generally* LES LANGFORD, UNDERSTANDING POLICE TRAFFIC RADAR & LIDAR 44 (rev. ed. 1998) (noting that several countries made advancements in radar technology during World War II).

36. *See generally* John H. Lienhard, *Engines of Our Ingenuity: No. 1364: Radar*, UNIV. OF HOUS., http://www.uh.edu/engines/epi1364.htm (last visited May 12, 2011) (discussing the mobile detection unit that detected the incoming Japanese planes).

37. *See* Carl Fors, *Going to Court in Radar and Laser Trials*, POLICE J., Summer 2010, at 79, 80 ("[T]he first radar ticket [was] issued by Officer Baldy of the Chicago Police Department in 1954 with a Decatur Electronics radar gun."); *About Decatur*, DECATUR ELECTRONICS, http://www.decaturelectronics.com/content/about-decatur (last visited May 21, 2011) (describing the history of Decatur Electronics, and noting that it is the "oldest manufacturer of police radar" in the United States).

38. LES LANGFORD, UNDERSTANDING POLICE TRAFFIC RADAR & LIDAR 20 (rev. ed. 1998).

39. *Id.*

40. *See* Keila Szpaller, *Under the Limit: Researcher Clocks Most Area Drivers Below 75 MPH*, GREAT FALLS TRIB., Aug. 22, 2006, at 1A (explaining that Montana adopted a posted speed limit of between 65 and 75 m.p.h. for interstate highways in 1999 to replace its former "'reasonable and prudent' speed limit").

m.p.h.[41] As automobile use and speed limits became more prevalent, radar technology was developed to keep pace with the new state laws and quickly became the standard technology used by law enforcement. The Texas courts, however, were slow to warm up to the new speed measuring technology, and have had a similar response to LIDAR today.[42] It was not until 1979, in *Masquelette v. State*,[43] that the Texas Court of Criminal Appeals upheld the reliability of radar and no longer required the State to offer expert testimony about its underlying scientific principles as long as the officer testified he was trained both to operate the radar set and test it for accuracy.[44]

There are four manufacturers of police radar guns in the United States: Applied Concepts, Inc.—Stalker Radar;[45] Decatur Electronics, Inc.;[46] Kustom Signals, Inc.;[47] and MPH Industries, Inc.[48]

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41. *See Speed Limits to Rise in Texas, Utah*, THENEWSPAPER.COM (May 5, 2008), http://www.thenewspaper.com/news/23/2356.asp (stating that Utah, along with Texas, has an 80 m.p.h. speed limit in some rural areas); *State Speed Limit Chart*, NAT'L MOTORISTS ASS'N, http://www.motorists.org/speed-limits/state-chart (last visited May 12, 2011) (indicating that the national average for highway speed limits is between 60 and 70 m.p.h.).

42. *See* Wilson v. State, 168 Tex. Crim. 439, 328 S.W.2d 311, 314 (1959) (reversing a speeding conviction and noting: "'This Court is anxious to move along with the progress of science, but we must zealously guard the accused and the public against the use of so-called scientific evidence which does not bear the stamp of approval of scientists generally'" (quoting Hill v. State, 158 Tex. Crim. 313, 256 S.W.2d 93, 96 (1953))).

43. Masquelette v. State, 579 S.W.2d 478 (Tex. Crim. App. [Panel Op.] 1979).

44. *Id.* at 481. For a thorough discussion of Texas's jurisprudential history regarding radar, along with a discussion of the concepts in this Article as they apply to radar specifically, see *Maysonet v. State*, 91 S.W.3d 365, 369–71 (Tex. App.—Texarkana 2002, pet. ref'd). *See generally* Joseph Gary Trichter & Joseph Patterson, *Police Radar 1980: Has the Black Box Lost Its Magic?*, 11 ST. MARY'S L.J. 829, 831 (1980) (examining "traffic radar units presently used by law enforcement agencies and analyz[ing] whether radar evidence should be judicially noticed by courts"); Louis C. Dujmich, Note, *Radar Speed Detection: Homing in on New Evidentiary Problems*, 48 FORDHAM L. REV. 1138, 1139 (1980) (discussing "technical and legal principles involved in use of police radar" and suggesting "standards for determining the admissibility and sufficiency of radar evidence").

45. *See generally Company Profile*, STALKER RADAR, http://www.stalkerradar.com/company_profile.shtml (last visited May 12, 2011) ("In 1989, Stalker Radar pioneered the use of digital signal processing (DSP) with Doppler speed radar with the revolutionary Stalker ATR Ka band police radar. Since the ATR radar, Stalker Radar has continued to lead the industry with the development of digital antenna communication, microstrip antenna design, double balanced mixers, and most recently, digital direction sensing Doppler radar.").

46. *See generally About Decatur*, DECATUR ELECTRONICS, http://www.decaturelectronics.com/content/about-decatur (last visited May 12, 2011) ("Founded in 1955, Decatur Electronics has consistently led the traffic enforcement industry with a focus on technological innovation.").

As it is used today, radar is either employed with the use of a radar gun,[49] or the radar unit is installed directly into the police car with the display appearing directly in the car's dashboard.[50] These in-car radar units, unlike radar guns, do not track individual cars but are usually designed to track the fastest moving object in its range.[51] For this reason, a law enforcement officer must not only see the speed detected on his gun or his dashboard but also must "track" the vehicle visually.[52] For example, if two vehicles are traveling side by side, the officer must visually determine which vehicle is traveling faster in order to determine which vehicle was actually traveling at the higher speed shown on his radar display.[53] This technology is still used by many jurisdictions despite the additional "tracking" requirement because, unlike laser technology, radar can be used continuously and can be effective while the law enforcement vehicle is moving.[54] The

47. *See About Us*, KUSTOM SIGNALS, INC., http://www.kustomsignals.com/about.asp (last visited May 12, 2011) (describing the company's history and products); *see also* E-mail from Kent Hayes, Senior Products Manager—Speed Products, Kustom Signals, Inc. to Ryan V. Cox (Oct. 4, 2010, 3:54 PM CST) (on file with author Ryan V. Cox) (noting that Kustom has been in continuous operation for over forty years).

48. *See generally Radar & Lidar Products*, MPH INDUSTRIES, http://www.mphindustries.com./radar_lidar.php (last visited May 12, 2011) (offering products for "law enforcement agencies, sports teams, DOT employees, the military, and airports").

49. *See, e.g., Genesis Handheld Directional*, DECATUR ELECTRONICS, http://www.decaturelectronics.com/content/genesis-handheld-directional (last visited May 12, 2011) (describing the handheld radar guns that it offers for sale).

50. *See, e.g., Dash Mounted Radar*, DECATUR ELECTRONICS, http://www.decaturelectronics.com/content/dash-mounted-radar (last visited May 12, 2011) (providing specifications and a description of Decatur's dashboard-mounted radar gun).

51. *Police Radar and Lidar Products: Ranger EZ*, MPH INDUSTRIES, http://www.mphindustries.com/radar_lidar.php (last visited May 12, 2011); *The Stalker DSR: VSS Option*, STALKER RADAR, http://www.stalkerradar.com/news060102.shtml (last visited May 12, 2011).

52. *See Police Radar and Lidar Products: Ranger EZ*, MPH INDUSTRIES, http://www.mphindustries.com/radar_lidar.php (last visited May 12, 2011) (indicating that their product now confirms an officer's visual observations by identifying the fastest target).

53. *See The Stalker DSR: VSS Option*, STALKER RADAR, http://www.stalkerradar.com/news060102.shtml (last visited May 12, 2011) (stating that "sometimes the radar just needs a little help" and that "it is up to the operator to make sure that the radar has made the correct decision on which signal" goes with the car they are tracking).

54. *See* Greg Koran, *Radar v. Lidar: Which Will Work Best for You?*, POLICEONE.COM (Oct. 27, 2005), http://www.policeone.com/columnists/lom/articles/120325-radar-vs-lidar-which-will-work-best-for-you ("In terms of enforcement, the ability of radar to operate in the moving mode is the most significant difference between the two technologies. Currently, lidar cannot operate while moving. No way around this one. If

International Association of Chiefs of Police (IACP) and the National Highway Traffic Safety Administration (NHTSA) test and approve radar guns according to United States Department of Transportation specifications.[55] The approved list of police radar guns appears in the "Conforming Product List" (CPL) maintained by the IACP.[56]

B. *Development and Methodology of LIDAR*

LIDAR has been used by law enforcement for over twenty years[57] and offers "improved range accuracy and resolution" compared to its traditional radar counterpart.[58] As opposed to radar, LIDAR allows an officer to target specific vehicles without the need to visually track the vehicle.[59] The IACP has listed approved LIDAR devices from five domestic companies in its CPL.[60] The history, science, and current applications of LIDAR technology are discussed in this subsection.

1. History

As previously noted, the acronym LIDAR "stands for Light

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you want to perform speed enforcement while driving around, radar is currently the only game in town other than the traditional (and generally less effective) pacing option.").

55. *See generally* U.S. DEP'T OF TRANSP. NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., SPEED-MEASURING DEVICE PERFORMANCE SPECIFICATIONS: ACROSS-THE-ROAD RADAR MODULE (2007), *available at* http://www.nhtsa.gov/DOT/NHTSA/Traffic%20Injury%20Control/Articles/Associated%20Files/810845.pdf (itemizing the specifications and testing that must be performed in order for a radar device to become approved by the NHTSA).

56. *See* INT'L ASS'N OF CHIEFS OF POLICE, CONFORMING PRODUCTS LIST (CPL): ENFORCEMENT TECHNOLOGY PROGRAM (Oct. 21, 2010), *available at* http://www.theiacp.org/LinkClick.aspx?fileticket=OCj4QtaxEHE%3d&tabid=245 (listing all approved radar models currently or previously in production).

57. E-mail from Kent Hayes, Senior Products Manager—Speed Products, Kustom Signals, Inc. to Ryan V. Cox (Oct. 4, 2010, 3:54 PM CST) (on file with author Ryan V. Cox).

58. KUSTOM SIGNALS, INC., PRO LASER III REFERENCE MANUAL 1, 2 (3 Rev. 1999) (on file with author Ryan V. Cox). *See generally* LES LANGFORD, UNDERSTANDING POLICE TRAFFIC RADAR & LIDAR 44, 140 (rev. ed. 1998) (describing the history of radar and laser technology).

59. KUSTOM SIGNALS, INC., PRO LASER III REFERENCE MANUAL 3 (3 Rev. 1999) (on file with author Ryan V. Cox).

60. *See* INT'L ASS'N OF CHIEFS OF POLICE, CONFORMING PRODUCT LIST (CPL): ENFORCEMENT TECHNOLOGY PROGRAM (Oct. 21, 2010), *available at* http://www.theiacp.org/LinkClick.aspx?fileticket=OCj4QtaxEHE%3d&tabid=245 (listing approved LIDAR models manufactured by: Applied Concepts, Inc.; DragonEye Technology, LLC; Kustom Signals, Inc.; Laser Atlanta, LLC; and Laser Technology, Inc.).

Detection and Ranging."[61] LIDAR is a laser technology, and, therefore, like other laser technologies, has developed primarily since the 1970s.[62] All laser technology, including LIDAR, measures distance, not speed.[63] In scientific terms, laser stands for "Light Amplification by Stimulated Emission of Radiation."[64] Since laser use in law enforcement began, the specific devices used by officers became known as LIDAR units. Laser was first theorized by Albert Einstein in 1917, designed by Gordon Gould in 1957, and finally developed by American physicist Theodore Maiman in 1960.[65] Laser for law enforcement use was developed by Laser Technology, Inc. (LTI), which applied for the first such patent in 1989.[66] In 1991, the 20/20 Marksman by LTI became the first laser offered for use in law enforcement speed detection.[67]

The principles behind laser technology are not new or novel: laser has been used by NASA and the Jet Propulsion Laboratory at the California Institute of Technology since the late 1960s, and has been used to make measurements for countless scientific purposes.[68]

2. Science

The same laser technology used in LIDAR traffic devices is used in many common household devices, including golf range finders, compact disk players, and supermarket scanners.[69] There

61. Carl Fors, *Going to Court in Radar and Laser Trials*, POLICE J., Summer 2010, at 79, 80.

62. *See "Lidar" Speed Detection Devices Held Admissible*, DAILY WASH. L. REP., June 26, 2008, at 1365, 1367 (stating that laser technology has been in use since the 1960s).

63. *See id.* (explaining that lasers take a distance measurement and the "change in distance of the target over time produces the speed reading").

64. LES LANGFORD, UNDERSTANDING POLICE TRAFFIC RADAR & LIDAR 140 (rev. ed. 1998).

65. *Id.*

66. *Id.*

67. *See generally* Carl Fors, *Court Acceptance of Radar and Laser Gun Speed Readings*, POLICE J., Fall 2008, at 71, 73 (stating that LTI received the first patent on this technology and that their product was at issue in the first significant case regarding a police laser gun in 1991).

68. *See, e.g.*, Richard S. Gross, *Laser Ranging Contributions to Monitoring and Interpreting Earth Orientation Changes*, 13TH INTERNATIONAL WORKSHOP ON LASER RANGING: PROCEEDINGS FROM THE SCIENCE SESSION, at 1 (2002) (on file with author Carl Fors) ("Laser ranging measurements to the Moon and artificial satellites of the Earth have been routinely made for more than three decades.").

69. *See "Lidar" Speed Detection Devices Held Admissible*, DAILY WASH. L. REP., June 26, 2008, at 1365, 1367 (noting that laser technology is used in compact disc players).

are two types of lasers, continuous wave and pulse wave[70]—police laser guns use pulse wave lasers.[71] Each manufacturer of police LIDAR technology uses different pulse rates, which range from 125 to 238 pulses of 904 nanometer infrared lasers per second being emitted from the laser gun.[72] The beam is invisible to the naked eye because it is outside the human spectrum of vision, which lies between 400 and 700 nanometers.[73]

A LIDAR unit operates by sending pulses of light toward a moving vehicle. "Because the speed of light is a known constant, the distance between the device and a target [vehicle] can be calculated by measuring the time it takes for the laser pulse to travel back to the receiver."[74] In effect, although LIDAR measures distance, we know the time between each pulse, and, therefore, when the laser determines the distance of an object, the simple formula for speed can be applied using the known variables of distance and time.[75] When a vehicle is in motion, both the distance and the time of the return signal will change and the computer in the LIDAR unit will display the speed on the laser gun in less than 1/3 second.[76] At least 60% of the laser's transmitted signal must be returned to the laser gun to obtain a speed/distance reading. Also, the surface must be reflective to obtain a reading; therefore, an officer generally aims at a reflective surface on the vehicle such as the license plate or headlight.[77]

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70. *Laser*, PCMAG.COM, http://www.pcmag.com/encyclopedia/ (search "laser") (last visited May 12, 2011).

71. *E.g.*, KUSTOM SIGNALS, INC., PRO LASER III REFERENCE MANUAL 3 (3 Rev. 1999) (on file with author Ryan V. Cox) (describing how the Pro Laser III operates).

72. *See id.* at 40 (providing the specifications for the Pro Laser III, one of several LIDAR units on the market).

73. *See "Lidar" Speed Detection Devices Held Admissible*, DAILY WASH. L. REP., June 26, 2008, at 1365, 1367 (indicating that lasers can be invisible to the human eye). *See generally What Wavelength Goes with a Color?*, ATMOSPHERIC SCIENCE DATA CTR. (last updated Sept. 28, 2007), http://eosweb.larc.nasa.gov/EDDOCS/Wavelengths_for_Colors.html (discussing the spectrum of visible light).

74. *"Lidar" Speed Detection Devices Held Admissible*, DAILY WASH. L. REP., June 26, 2008, at 1365, 1367.

75. The formula for speed is S=D/T (S is speed, D is distance, and T is time). *Speed Formula*, PHYSICS-FORMULAS.COM, http://physics-formulas.com/Speed_Formula.html (last visited May 12, 2011).

76. Carl Fors, *Court Acceptance of Radar and Laser Gun Speed Readings*, POLICE J., Fall 2008, at 71, 73.

77. *Cf.* Grady J. Koch, *Doppler Lidar Observations of an Atmospheric Thermal Providing Lift to Soaring Ospreys*, NASA, http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20080015449_2008014386.pdf (last visited May 12, 2011) ("Doppler lidar is an

LIDAR is very accurate and is capable of identifying one vehicle in a group—which radar cannot[78]—because the size of the laser's beam stays relatively small over increased distance.[79] A good analog for demonstrating this difference can be seen by pointing a laser beam and a flashlight (the radar in this analogy) at a wall in a dark room. As you move away from the wall, the flashlight's beam gets wider, while the laser's does not.

In the past, the officer had to be outside the vehicle to use a laser gun.[80] Presently, however, LIDAR guns are equipped with a feature for inclement weather, or "inc mode," allowing the officer to sit in the driver's seat and target vehicles through the windshield.[81] Inc mode allows the laser gun's computer to disregard all objects approximately 225 feet in front of the laser gun—including the windshield, snowflakes, rain, and overspray from vehicles.[82] Generally, it is advised by most manufacturers that an officer should not use laser readings past 1,000 feet for speeding infractions because the laser's three-milliradian beam at 1,000 feet is thirty-six inches wide and, due to operator handshake, it is possible, though not probable, that part of the laser's beam might strike an adjacent vehicle.[83]

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instrument in which pulses of light from a laser are transmitted to the atmosphere to be reflected from aerosols suspended in the atmosphere .... The distance from which the reflection occurs is calculated by relating the speed of light to the timing of the transmitted and received pulses.").

78. Lisa Solomon, *LIDAR: The Speed Enforcement Weapon of Choice*, OFFICER.COM (Nov. 11, 2006), http://www.officer.com/article/article.jsp?siteSection=20&id=33486 (quoting Carl Fors).

79. At 500 feet, a laser gun's beam width is a mere eighteen inches, while at the same distance a radar gun's beam is around 150 feet. *Id.* A laser's beam width is easily determined by multiplying the beam divergence at the antenna—three miliradians—by the distance in feet to the target. KUSTOM SIGNALS, INC., PRO LASER III REFERENCE MANUAL 40 (3 Rev. 1999) (on file with author Ryan V. Cox). Therefore, to determine the width of the beam at 1,000 feet, we would multiply .003 by 1,000 to find that the width at that distance equals three feet, or thirty-six inches.

80. KUSTOM SIGNALS, INC., PRO LASER III REFERENCE MANUAL 1 (3 Rev. 1999) (on file with author Ryan V. Cox).

81. *Id.*

82. *See id.* at 22 (explaining how the weather mode improves performance in poor weather conditions).

83. Carl Fors, *Court Acceptance of Radar and Laser Gun Speed Readings*, POLICE J., Fall 2008 at 71, 71–75; *see also* KUSTOM SIGNALS, INC., PRO LASER III REFERENCE MANUAL 40 (3 Rev. 1999) (on file with author Ryan V. Cox) (stating that the beam's width at 1,000 feet is less than three feet by three feet).

3. Application and Required Training

Before using any LIDAR unit, most jurisdictions require that its accuracy must be confirmed with tests performed by a trained officer before and after each outing.[84] Generally, the LIDAR units are tested at ranges of 50, 100, and 150 feet and are also tested at longer ranges to confirm the width of the beam at those distances.[85] According to the Kustom Signal's Pro Laser III operating manual, a commonly used LIDAR unit has a standard deviation of less than one mile per hour when the unit is functioning properly.[86] Unlike traditional radar, LIDAR allows law enforcement officers to target a specific vehicle in heavy traffic, eliminating any possible human error in determining which car is actually traveling at the recorded speed.[87] As we described in the introduction, however, LIDAR can only be used from a stationary point and can only target one vehicle at a time, whereas radar can measure speeds for multiple targets simultaneously and can be employed inside of a moving patrol car.[88] Just as they have for radar,[89] courts have continuously required officers to be

84. *See, e.g.*, State v. Assaye, 216 P.3d 1227, 1235 (Haw. 2009) (noting that the officer in that case conducted "four tests prior to his shift in order to determine whether the laser gun he was going to use . . . was 'functional and working properly.' These tests included the 'self-test,' the 'display test,' the 'scope alignment test,' and the 'delta distance test'").

85. *See, e.g.*, Carl Fors, *Going to Court in Radar and Laser Trials*, POLICE J., Summer 2010, at 79, 80 ("To protect the department and the citizen driver, there are prescribed set up and accuracy verification procedures detailed in the Operator Manual of each laser gun.... With laser, two daily test[s] are recommended prior to use."); *cf. Assaye*, 216 P.3d at 1235 (addressing the testing procedure used by the officer in the case). *See generally* KUSTOM SIGNALS, INC., PRO LASER III REFERENCE MANUAL 23–25 (3 Rev. 1999) (on file with author Ryan V. Cox) (providing testing procedures to ensure accuracy of the Pro Laser III).

86. *See* KUSTOM SIGNALS, INC., PRO LASER III REFERENCE MANUAL 40 (3 Rev. 1999) (on file with author Ryan V. Cox) (stating that the standard deviation for the speed display accuracy is plus or minus one mile per hour).

87. E-mail from Kent Hayes, Senior Products Manager—Speed Products, Kustom Signals, Inc. to Ryan V. Cox (Oct. 4, 2010, 3:54 PM CST) (on file with author Ryan V. Cox).

88. *See* KUSTOM SIGNALS, INC., PRO LASER III REFERENCE MANUAL 1 (3 Rev. 1999) (on file with author Ryan V. Cox) (explaining that when setting up, it is important to "select a location where minimum movement of the [unit] is required in order to keep it aimed on the desired target").

89. In *Honeycutt v. Commonwealth*—issued decades before the first patent was issued for the use of police laser guns—the Kentucky court laid out the guidelines that are generally applied to radar training and equipment nationwide. The court wrote:

> [T]he courts will *not* take judicial notice of the accuracy of the particular instrument employed on a specific occasion, but will treat, as sufficient evidence of

> accuracy, uncontested testimony that the instrument was tested within a few hours of its specific use, and found to be accurate, by use of a calibrated tuning fork and by a comparison with the speedometer of another vehicle driven through the radar field. . . .
>
> [I]t is sufficient to qualify the operator that he have such knowledge and training as enables him to properly set up, test, and read the instrument; it is not required that he understand the scientific principles of radar or be able to explain its internal workings; a few hours' instruction normally should be enough to qualify an operator.

Honeycutt v. Commonwealth, 408 S.W.2d 421, 422–23 (Ky. 1966) (citing State v. Tomanelli, 216 A.2d 625 (Conn. 1966); State v. Graham, 322 S.W.2d 188 (Mo. Ct. App. 1959); State v. Dantonio, 115 A.2d 35 (N.J. 1955)). The Kentucky court held that an officer must test the radar gun with calibrated tuning forks, have adequate training, complete a valid visual tracking history of the suspect vehicle, but need not understand or describe the physics involved in the internal workings of radar. *See id.* (discussing the requirements for admissibility of evidence from radar detectors); *see also* People v. Ferency, 351 N.W.2d 225, 232–33 (Mich. Ct. App. 1984) (maintaining the necessity of extensive operator training and recertification of the officer and equipment, but additionally holding that the officer must be able to determine the beam width of the radar at the time of the alleged infraction and if the identified vehicle was within this beam width at the time of the speed measurement).

Another radar case, *State v. Aquilera*, No. 711-1015, 48 Fla. Supp. 207 (Dade County Ct., Fla. May 7, 1979), commonly known as the Miami Radar Case, received considerable national and local media coverage in 1979. *See Ferency*, 351 N.W.2d at 231 (noting that "[c]riticism of radar inaccuracies peaked in Florida in 1979," and that in *Aquilera* the court eventually held that "'the reliability of the radar speed measuring devices as used in their present modes . . . has not been established beyond and to the exclusion of every reasonable doubt nor has it met the test of reasonable scientific certainty'" (quoting State v. Aquilera, 48 Fla. Supp. 207 (Dade County Ct., Fla. 1979))). *Aquilera* was pivotal in demanding specifications and operational accuracy of radar devices because of the concerns that the "radar may have delivered false readings" and that "[o]perator training was often inadequate and inappropriate." LES LANGFORD, UNDERSTANDING POLICE TRAFFIC RADAR & LIDAR 132 (rev. ed. 1998). In *Aquilera*, Judge Nesbitt took the radar gun in question out in the field for demonstration and observed it clock a palm tree at 86 m.p.h. with no vehicles visible. Carl Fors, *Court Acceptance of Radar and Laser Gun Speed Readings*, POLICE J., Fall 2008, at 71, 73. After seeing the radar gun clock the palm tree, he dismissed some eighty speeding citations. *Cf. Ferency*, 351 N.W.2d at 231 (stating that the court "excluded or suppressed the radar speed measuring device evidence in . . . 80 speeding violation cases" after finding that the readings were unreliable). Nesbitt's decision in *Aquilera* mandated laboratory testing of all radar devices used in speed enforcement by the National Bureau of Standards—now the National Institute of Standards and Technology (NIST)—for accuracy, and directed the International Association of Chiefs of Police to perform Critical Performance Testing of all radar devices and to develop the Conforming Product List (CPL), which lists devices that meet performance specifications. *See* LES LANGFORD, UNDERSTANDING POLICE TRAFFIC RADAR & LIDAR 132 (rev. ed. 1998) (noting the actions that resulted from Nesbitt's holding in *Aquilera*). The most important directive of the court was the establishment of an extensive radar training and recertification program for states and local jurisdictions. This mandate resulted in the National Highway Traffic Safety Administration's (NHTSA) development of a recommended operator training program of twenty-four hours of classroom exposure and sixteen hours of supervised field experience, including estimation

trained in the use of LIDAR and have required the individual units to be tested for accuracy in order for the speed measurement evidence to be introduced in a trial.[90] The training requirements for LIDAR were most clearly outlined by the Hawaii Supreme Court in *State v. Assaye*.[91] In the concurring opinion in *Assaye*, Judge Acoba called into question the training of the officer in the case, and additionally noted that, over the course of fifteen months, Officer Franks used his LIDAR gun daily but never once had it checked or inspected by an expert.[92] Instead, when it was not in use, it was placed in the saddlebag of his motorcycle without concern for the effect of temperature and humidity on the device.[93] The court held that police officers must demonstrate to the court's satisfaction that they are able to use a laser gun properly instead of merely stating at trial that they took a four-hour course to obtain a certificate.[94] Specifically, the Hawaii court held that the prosecution must meet the burden of showing that the

> officer is qualified by training and experience to operate the particular laser gun; namely, whether the nature and extent of an officer's training in the operation of a laser gun meets the requirements indicated by the manufacturer. Therefore, without a showing of the nature and extent of the "certifi[cation]," testimony showing merely that a user is "certified" to operate a laser gun

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of vehicle speeds for a valid visual tracking history. *Cf.* Carl Fors, *Court Acceptance of Radar and Laser Gun Speed Readings*, POLICE J., Fall 2008, at 71, 73–74 (listing NHTSA's recommendations); U.S. DEP'T OF TRANSP. NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., POLICE RADAR INSTRUCTOR TRAINING COURSE 5–10, *available at* http://isddc.dot.gov/OLPFiles/NHTSA/007825.pdf (last visited May 12, 2011) (explaining the administration of the Police Radar Instructor Training Course).

90. In *Sparks v. State*, Judge Florence applied the radar requirements from *Honeycutt* to LIDAR, stating:

> Testimony is admissible regarding the results of the ProLaser III device provided a trained operator establishes the proper foundation for the admissibility of the test results. It is not necessary for the operator of this speed detection device to understand the scientific or scientific operations of the device. As long as the operator properly operates and test the unit, his testimony alone may be the basis to admit the results since this Court has found the device to be scientifically reliable.

Sparks v. State, No. PD381435-1 (Mun. Ct., Tarrant County, Tex. May 21, 2004) (unpublished decision; citation and holding based on trial notes of author Carl Fors).

91. State v. Assaye, 216 P.3d 1227 (Haw. 2009).

92. *Id.* at 1240–41 (Acoba, J., concurring).

93. *Id.*

94. *Id.* at 1238.

through instruction given by a "certified" instructor is insufficient to prove that the user is qualified by training and experience to operate the laser gun.[95]

C. *Current Use of LIDAR in Law Enforcement*

Though not used exclusively, LIDAR speed detection devices are currently used for traffic enforcement all over the world, and nearly all Texas agencies have used this equipment at one time or another.[96] When we sought to verify the use of LIDAR in police departments across Texas, actual numbers of units in use were generally not available, but we found that every single department we contacted was currently using LIDAR equipment to some extent. These departments included Austin, Houston, Dallas, Fort Worth, San Antonio, El Paso, Waco, Corpus Christi, McAllen, Lubbock, San Marcos, New Braunfels, and Arlington.[97]

Within the Corpus Christi Police Department specifically, we found that before each LIDAR unit is received, it is tested by the manufacturer, issued a "Certificate of Accuracy and Calibration," sworn thereto by a technician licensed by the FCC, and notarized in the state of calibration. In addition to these formal standards,

95. *Id.* (citing State v. Ito, 978 P.2d 191, 210 (Haw. Ct. App. 1999)).

96. E-mail from Kent Hayes, Senior Products Manager—Speed Products, Kustom Signals, Inc. to Ryan V. Cox (Oct. 4, 2010, 3:54 PM CST) (on file with author Ryan V. Cox).

97. On a related concern, the Plano Police Department is currently seeking to use laser speed-detection devices that take photographs of the vehicle being tracked and record the speed measurement in a printout that can later be used during trial. Tex. Att'y Gen. Op. No. GA-0846 (2011). According to the Office of the Attorney of General of Texas, however, section 542.2035 of the Texas Transportation Code prohibits the use of such devices by law enforcement. *Id.*; *see also* TEX. TRANS. CODE ANN. § 542.2035 (West 2010) (requiring that "[a] municipality may not implement or operate an automated traffic control system with respect to a highway or street under its jurisdiction for the purpose of enforcing compliance with posted speed limits," and defining an "automated traffic control system" as "a photographic device, radar device, laser device, or other electrical or mechanical device" that is used to record speed or take photographs of the vehicle). After receiving the opinion of the attorney general on February 28, 2011, Representative Vicki Truitt introduced House Bill 2361 in the Texas House of Representatives on March 7, 2011 in order to amend or repeal that section of the Code and, as of this writing, the Bill is waiting for further action after being voted out of the House Committee on Urban Affairs. *See* Tex. H.B. 2361, 82d Leg., R.S. (2011), *available at* http://www.capitol.state.tx.us/BillLookup/History.aspx?LegSess=82R&Bill=HB2361 ("This section does not prohibit a municipality or county from using a device that records the speed of a motor vehicle and obtains photographs or other recorded images listed in Subsection (b)(2), or from relying on evidence obtained from using the device in the prosecution of a criminal offense . . . .").

the units are self-calibrating and are checked for accuracy by law enforcement officers—who have completed a training program in the use and maintenance of LIDAR—before each shift in which they are used. In some other jurisdictions, however, training and maintenance requirements are less rigid.[98]

III. THE COURTS' RELIABILITY TESTS FOR SCIENTIFIC EVIDENCE

Texas Rule of Evidence 702 provides that "[i]f scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education may testify thereto in the form of an opinion or otherwise."[99] The portion of the Rule that requires, in the case of LIDAR, that the scientific evidence must "assist the trier of fact" has forced the courts into making determinations on "helpfulness" to the fact-finder.[100] In this regard, the courts act as a gatekeeper—allowing the relevant evidence to be admitted while keeping out the unhelpful, and thereby, irrelevant evidence.[101] When confronted with this type of scientific evidence, the courts have established guidelines to determine whether that evidence should be admitted; the federal and Texas state courts have each done this independently, and these guidelines are discussed in this section.

A. *Federal Court Tests:* Frye *and* Daubert

In *Frye v. United States*,[102] the first true test for the

98. In June 2010, an investigative report focusing on constables in Harris County indicated that many of the constables had not received *any* training on the operation of their radar or LIDAR equipment. Stephen Dean, *Lax Training, Faulty Radars Found in Speed Traps*, CLICK2HOUSTON.COM (June 15, 2010, 6:59 AM), http://www.click2houston.com/news/23895948/detail.html. It further indicated that no daily accuracy checks were performed and, in many cases, the instruments' certifications and re-calibrations had not been kept up-to-date. *Id.*

99. TEX. R. EVID. 702.

100. *See, e.g.*, E.I. du Pont de Nemours & Co. v. Robinson, 923 S.W.2d 549, 556–57 (Tex. 1995) (holding that scientific evidence must be relevant and reliable to "assist the trier of fact," and acknowledging a trial court has discretion in considering the factors that are helpful in determining reliability).

101. *See* Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 597 (1993) (recognizing the judge's role as a "gatekeeper").

102. Frye v. United States, 293 F. 1013 (D.C. Cir. 1923), *superseded by rule*, FED. R. EVID. 702, *as recognized in* Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579 (1993).

admissibility of scientific evidence was spelled out.[103] In *Frye*, the D.C. Circuit was confronted with a defendant who sought to have his passing lie-detector test results admitted at his trial.[104] The defendant called the test's administrator as an expert witness to testify as to the validity of the test, but, on the Government's objection, the expert was not allowed to testify.[105] The court extrapolated what would be known as the "*Frye* Standard" for decades to come: "while courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs."[106] Or, in other words, the theory upon which an expert is called to testify is not admissible unless it is generally accepted in the scientific community.[107] In *Frye*, the court ultimately held that the lie-detector test did not meet this burden because it "ha[d] not yet gained [enough] ... standing and scientific recognition."[108] As the case law developed—eventually culminating in the United States Supreme Court's ruling in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*[109]—the *Frye* standard became just one of many factors used to determine the reliability of scientific theories offered by an expert witness.[110] One commentator, Simon Cole, has pointed out that a

> crucial distinction [between the two] is that *Frye*, unlike *Daubert*, posits a "deference model" for evaluating scientific evidence. Whereas *Daubert* asks the trial court itself to render a judgment as to whether the proffered evidence is reliable, *Frye* directs the court to defer to the judgment of the "relevant scientific community."

103. *See generally id.* at 1014 (stating that the evidence must be based on a "well-recognized scientific principle" that is generally accepted in the field).

104. *Id.* at 1013.

105. *Id.* at 1014.

106. *Id.*

107. *Frye*, 293 F. at 1014.

108. *Id.*

109. Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579 (1993).

110. *See Daubert*, 509 U.S. at 594 (citing United States v. Downing, 753 F.2d 1224, 1238 (3d Cir. 1985)) (noting that although general acceptance is not required, it can be an important factor in determining the admissibility of evidence); Ronald J. Allen, *Expertise and the* Daubert *Decision*, 84 J. CRIM. L. & CRIMINOLOGY 1157, 1164 (1994) ("The Court recognized that the *Frye* rule was dead, but it resurrected the rule immediately following the burial.").

> *Frye* . . . assumes that scientists themselves are the best judges of scientific claims. As such, a judge operating under *Frye* is not being asked to form an independent judgment of the reliability of the technique. Instead, the judge is being asked to engage in a sort of scientometric exercise in which she attempts to measure the acceptance of the technique among scientists.[111]

We should note, however, that "[a]lthough *Frye* was never explicitly adopted in Texas, the Texas Court of Criminal Appeals used the 'general acceptance' test on several occasions to review lower court decisions."[112]

In *Daubert*, the Supreme Court finally handed down a comprehensive framework for judging the reliability of scientific evidence.[113] The Court changed the focus of scientific evidence away from simply looking at whether a method is generally accepted in the scientific community to questioning the reliability—and thereby the relevance—of the evidence.[114] Essentially, the Court held that, the more reliable the underlying scientific theory, the more likely it is to be helpful to the fact-finder; therefore, if the theory is sufficiently unreliable, it will also be insufficiently helpful and will fail to meet the burden for admissibility under Rule 702.[115] The Court noted that the *Frye* standard had been superseded by the Federal Rules of Evidence,

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111. Simon A. Cole, *Out of the* Daubert *Fire and into the* Frye*ing Pan? Self-Validation, Meta-Expertise and the Admissibility of Latent Print Evidence in* Frye *Jurisdictions*, 9 MINN. J. L. SCI. & TECH. 453, 461–62 (2008) (citations omitted).

112. Maysonet v. State, 91 S.W.3d 365, 370 n.1 (Tex. App.—Texarkana 2002, pet. ref'd) (citing Zani v. State, 758 S.W.2d 233 (Tex. Crim. App. 1988); Reed v. State, 644 S.W.2d 479 (Tex. Crim. App. 1983); Cain v. State, 549 S.W.2d 707 (Tex. Crim. App. 1977); Romero v. State, 493 S.W.2d 206 (Tex. Crim. App. 1973)); *see also* Kelly v. State, 824 S.W.2d 568, 572 (Tex. Crim. App. 1992) ("Although this Court has never explicitly adopted the *Frye* test, on several occasions we have used a general acceptance test when reviewing lower court decisions regarding the admission of scientific evidence.").

113. *See Daubert*, 509 U.S. at 592 (finding scientific evidence reliable if the evidence assists the trier of fact with a fact in issue).

114. *See id.* at 592–93 ("Faced with a proffer of expert scientific testimony, then, the trial judge must determine at the outset, pursuant to Rule 104(a), whether the expert is proposing to testify to (1) scientific knowledge that (2) will assist the trier of fact to understand or determine a fact in issue. This entails a preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically valid and of whether that reasoning or methodology properly can be applied to the facts in issue." (citations omitted)).

115. *See id.* at 590–91 (providing a standard of reliability and assisting the trier of fact in determining the issue); *see also* FED. R. EVID. 702 (clarifying that the scientific knowledge should assist in the understanding of evidence or fact at issue).

which govern the admissibility of expert testimony and scientific evidence.[116] Including the *Frye* standard, the Supreme Court listed five factors for determining whether the underlying scientific theory is reliable: (1) whether the theory or technique in question "can be (and has been) tested"; (2) whether it "has been subjected to peer review and publication"; (3) its "known or potential rate of error"; (4) the "existence and maintenance of standards controlling ... [its] operation"; and (5) whether it is generally accepted in the relevant scientific community.[117]

These factors, however, are only tools to determine the reliability of the *method* used, not the reliability of any particular application of that method.[118] In other words, the reliability of an underlying scientific principle or theory is not determined by the results but by the methodology.[119] Therefore, two different experts could provide conflicting, yet equally reliable and relevant testimony. In the case of LIDAR, for example, if the technology and the scientific principles on which it is based are found to be reliable, courts can assume that the individual application of the technology is also reliable—at least reliable enough to be relevant under Rule 702.[120] This is not to say that any such evidence is dispositive, however, because the opponent of the evidence can always produce contradictory evidence to rebut or discredit the scientific evidence during the trial; it is only to say that the evidence should be admitted if it meets the test for reliability.

In *Daubert*, the Court also described the vehicle of judicial notice as a way in which full-blown gatekeeping hearings can be avoided.[121] If a higher court has found the proposed scientific evidence to be reliable, lower courts are bound to follow that

116. *Daubert*, 509 U.S. at 589; *see also* FED. R. EVID. 702 (excluding the elements of the *Frye* standard).

117. *Daubert*, 509 U.S. at 593–95. When applying *Daubert* in Texas, the courts have stressed the flexibility of the evidentiary rules. *See* Greg Thompson, *Setting the Stage:* Frye, Daubert, *and the States:* Daubert *and Beyond in the Texas Courts*, 9 KAN. J.L. & PUB. POL'Y 18, 19 (1999) ("In Texas, what you see in the decisions that are talking about applying *Daubert* is that it says it has to be flexible.").

118. *Daubert*, 509 U.S. at 592–93.

119. *Id.* at 595.

120. *Cf.* FED. R. EVID. 702 (identifying the elements for determining whether scientific evidence is reliable); *Daubert*, 509 U.S. at 594–95 (inquiring into the underlying scientific principles to determine reliability and relevance).

121. *See* Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 592 n.11 (1993) (explaining that scientific principles are subject to judicial notice).

determination by taking judicial notice.[122] "[T]heories that are so firmly established as to have attained the status of scientific law, such as the laws of thermodynamics, properly are subject to judicial notice under Federal Rule of Evidence 201."[123]

B. *Tests for Reliability in Texas: The* Kelly *Standard*

In *Kelly v. State*,[124] which came before the United States Supreme Court's ruling in *Daubert*, the Texas Court of Criminal Appeals stated:

> As a matter of common sense, evidence derived from a scientific theory, to be considered reliable, must satisfy three criteria in any particular case: (a) the underlying scientific theory must be valid; (b) the technique applying the theory must be valid; and (c) the technique must have been properly applied on the occasion in question.[125]

The court listed seven non-exhaustive factors for determining the reliability of scientific evidence, which were very similar to those that were later adopted in *Daubert*.[126] The factors included:

> (1) the extent to which the underlying scientific theory and technique are accepted as valid by the relevant scientific community, if such a community can be ascertained; (2) the qualifications of the expert(s) testifying; (3) the existence of literature supporting or rejecting the underlying scientific theory and technique; (4) the

122. *Cf. id.* (describing judicial notice generally).

123. *Id.*; *see also* TEX. R. EVID. 201(d) ("A court *shall* take judicial notice if requested by a party and supplied with the necessary information." (emphasis added)); TEX. R. EVID. 201(g) ("In civil cases, the court shall instruct the jury to accept as conclusive any fact judicially noticed. In criminal cases, the court shall instruct the jury that it may, but is not required to, accept as conclusive any fact judicially noticed."). The Texas courts have also described the use of judicial notice for scientific evidence. *See, e.g.*, Hernandez v. State, 116 S.W.3d 26, 28–29 (Tex. Crim. App. 2003) (per curiam) ("A party seeking to introduce evidence of a scientific principle need not always present expert testimony, treatises, or other scientific material to satisfy the *Kelly* test. It is only at the dawn of judicial consideration of a particular type of forensic scientific evidence that trial courts must conduct full-blown 'gatekeeping' hearings under *Kelly*. Once a scientific principle is generally accepted in the pertinent professional community and has been accepted in a sufficient number of trial courts through adversarial *Daubert/Kelly* hearings, subsequent courts may take judicial notice. . . .").

124. Kelly v. State, 824 S.W.2d 568 (Tex. Crim. App. 1992).

125. *Id.* at 573.

126. *Id.*; *see Daubert*, 509 U.S. 579, 593–95 (listing factors used to determine whether scientific evidence is reliable).

> potential rate of error of the technique; (5) the availability of other experts to test and evaluate the technique; (6) the clarity with which the underlying scientific theory and technique can be explained to the court; and (7) the experience and skill of the person(s) who applied the technique on the occasion in question.[127]

After addressing the burden of persuasion, the Texas Court of Criminal Appeals summarized its own opinion and additionally commented on the interplay between Rule 702 and the prejudicial effect limitations in Rule 403:

> [U]nder Rule 702 the proponent of novel scientific evidence must prove to the trial court, by clear and convincing evidence and outside the presence of the jury, that the proffered evidence is relevant. If the trial court is so persuaded, then the evidence should be admitted for the jury's consideration, unless the trial court determines that the probative value of the evidence is outweighed by some factor identified in Rule 403.[128]

The *Daubert* and *Kelly* Courts were looking to find only whether the underlying evidence was relevant.[129] To find relevance, they relied on finding the method that produced the

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127. *Kelly*, 824 S.W.2d at 573 (citing 3 J. WEINSTEIN & M. BERGER, WEINSTEIN'S EVIDENCE, ¶702[03] (1991)). The Texas Supreme Court has also adopted the factors for determining reliability in the civil context. E.I. du Pont de Nemours & Co. v. Robinson, 923 S.W.2d 549, 556 (Tex. 1995).

> In accordance with *Kelly* and *Daubert*, the *Robinson* court interpreted Texas Rule of Evidence 702 as requiring the proponent of expert testimony based on scientific, technical, or other specialized knowledge to demonstrate that the testimony is relevant in that it will help the trier of fact to understand the evidence or determine an issue presented in the case and that the testimony is based on a reliable foundation. The *Robinson* court described the scope of a judge's duty under the Texas Rules of Evidence by explaining that it is not the duty of the trial court judge to determine the truth or falsity of the expert's opinion, as the trier of fact remains the sole judge of credibility at trial, but rather only to make the initial determination as to whether the expert's opinion is relevant and reliable based upon the evidence presented by the proponent of the testimony. Therefore, it became clear after *Kelly* and *Robinson* that the Texas Rules of Evidence impose on state court judges a duty identical to that placed on federal district court judges to act as gatekeepers of the evidence and make preliminary determinations as to the reliability and relevancy of expert testimony offered under Rule 702.

Kevin Muenster, Note, *The Re-Lie-Ability of Polygraph Evidence: An Evaluation of Whether Texas's Per Se Rule Against the Admissibility of Polygraph Evidence Is Violative of the Texas Rules of Evidence*, 58 BAYLOR L. REV. 265, 278–79 (2006) (citing *E.I. du Pont de Nemours & Co.*, 923 S.W.2d at 556).

128. *Kelly*, 824 S.W.2d at 573.

129. *Daubert*, 509 U.S. at 594–95; *Kelly*, 824 S.W.2d at 573.

evidence to be reliable.[130] Therefore, a court cannot justifiably exclude LIDAR evidence as unreliable unless it believes that the evidence is *inherently* unreliable. In essence, a court does not need to find that the LIDAR reading at issue is correct; it only has to find that LIDAR itself is a convincingly reliable enough concept to be helpful to the fact-finder.[131] This type of relevance examination goes directly to the heart of the rules of evidence, which act as gatekeepers of evidence so "that the truth may be ascertained."[132]

IV. THE LAW ON LIDAR NATIONWIDE

Including in Texas, courts in at least seventeen states and the District of Columbia have now addressed the reliability, and, thereby, the relevance of LIDAR. Some of these states have determined the reliability by legislative process, while others have done so through their highest courts.[133] In many of these jurisdictions, however, only the lower courts have determined the reliability of LIDAR, offering little guidance to courts statewide.[134]

A. *Reliable by Statute*

In Georgia, the State Department of Public Safety compiled a list of laser speed detection devices that were approved by the Department, and the state legislature confirmed their reliability by enacting a statute that deferred to the Department for any determination of reliability.[135] When the Georgia courts were

130. *Daubert*, 509 U.S. at 594–95; *Kelly*, 824 S.W.2d at 573.

131. *See Daubert*, 509 U.S. at 594–95 (requiring scientific evidence assist the trier of fact).

132. TEX. R. EVID. 102.

133. *Compare* GA. CODE ANN. § 40-14-17 (2007) (establishing the reliability of LIDAR through statute), *with* Goldstein v. State, 664 A.2d 375, 381 (Md. 1995) (identifying LIDAR as reliable and recognizing agency certification as another means to ensure reliability).

134. The lower courts in Idaho, Illinois, New York, and Minnesota have upheld the admissibility of LIDAR evidence; their Supreme Courts have not addressed the issue. State v. Williamson, 166 P.3d 387, 391 (Idaho Ct. App. 2007); People v. Mann, 922 N.E.2d 533, 538 (Ill. App. Ct. 2010); State v. Ali, 679 N.W.2d 359, 364 (Minn. Ct. App. 2004); People v. Clemens, 642 N.Y.S.2d 760, 761 (Justice Ct., Columbia County, N.Y. 1995).

135. *See* GA. CODE ANN. § 40-14-17 ("Evidence of speed based on a speed detection device using the speed timing principle of laser which is of a model that has been approved by the Department of Public Safety shall be considered scientifically acceptable and

asked to limit the statute, they declined, giving great deference to the determinations made by the legislature and the Department of Public Safety.[136] The specific models approved by Georgia are the same models approved by the International Association of Chiefs of Police, and include all of the most popular models used in law enforcement.[137]

Similarly, the Virginia legislature has had a statute on the books for several years declaring LIDAR to be generally reliable and valid for law enforcement use in speed detection.[138] More recently, the legislatures in Maine,[139] Connecticut,[140] Minnesota,[141] North Carolina,[142] and Florida[143] have followed suit.

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reliable as a speed detection device and shall be admissible for all purposes in any court, judicial, or administrative proceedings in this state.").

136. *See* Chism v. State, 674 S.E.2d 328, 330 (Ga. Ct. App. 2009) ("The only foundation required for the entry of evidence of speed obtained by a laser detection device is the certified copy of the DPS's list of approved laser speed detection devices, which was provided here." (citing *In re* B.D.S., 603 S.E.2d 488 (Ga. Ct. App. 2004))).

137. *See* GA. CODE ANN. § 40-14-17 (deferring to the Department of Public Safety's approval of certain speed-detecting devices); *Conforming Product List (CPL): Enforcement Technology Program*, INT'L ASS'N OF CHIEFS OF POLICE, 1 (Oct. 21, 2010), http://www.theiacp.org/LinkClick.aspx?fileticket=OCj4QtaxEHE%3d&tabid=245 (listing all approved LIDAR models currently or previously in production); *see also* U.S. DEP'T OF TRANSP. NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., SPEED-MEASURING DEVICE: PERFORMANCE SPECIFICATIONS: LIDAR MODULE 1.1 (June 2004), *available at* http://www.nhtsa.gov/people/injury/speedmgmt/speed_lidar_module/images/SpeedMeasuringDevicePerform.pdf (itemizing the specifications and testing that must be performed in order for a LIDAR device to become approved by the NHTSA).

138. *See* VA. CODE ANN. § 46.2-882 (2005) ("The speed of any motor vehicle may be determined by the use of . . . a laser speed determination device . . . . The results of such determinations shall be accepted as prima facie evidence of the speed of such motor vehicle in any court or legal proceeding where the speed of the motor vehicle is at issue.").

139. *See* ME. REV. STAT. ANN. tit. 29-A, § 2075(4) (1996) (stating that readings from "[a]n electronic device that measures speed by radiomicrowaves, laser or otherwise" "must be accepted as prima facie evidence of the speed of a motor vehicle in a criminal or traffic infraction proceeding").

140. *See* CONN. GEN. STAT. ANN. § 14-219c (West 2010) ("A prima facie presumption of accuracy sufficient to support a conviction . . . will be accorded to a radar, speed monitoring laser, vascar device or any other speed monitoring device approved by the Commissioner of Public Safety . . . .").

141. *See* MINN. STAT. ANN. § 169.14(10)(a) (West 2010) ("In any prosecution in which the rate of speed of a motor vehicle is relevant, evidence of the speed as indicated on radar or other speed-measuring device is admissible in evidence . . . .").

142. *See* N.C. GEN. STAT. ANN. § 8-50.2(a) (West 2010) ("The results of the use of radio microwave, laser, or other speed-measuring instruments shall be admissible as evidence of the speed of an object in any criminal or civil proceeding for the purpose of corroborating the opinion of a person as to the speed of an object based upon the visual observation of the object by such person.").

For nearly two decades, the lower courts in Ohio have taken judicial notice of the reliability of LIDAR evidence.[144] In 2010, however, the Ohio Supreme Court, in *City of Barberton v. Jenney*,[145] held that "[a] police officer's unaided visual estimation of a vehicle's speed is sufficient evidence to support a conviction for speeding,"[146] seemingly discounting the importance of speed-measuring devices. This holding was immediately addressed in the Ohio legislature, where legislation in the house and senate is currently pending to "prohibit a person from being arrested, charged, or convicted for speeding . . . based on a peace officer's unaided visual estimation of the speed of a motor vehicle."[147] This seems to be an indication that the Ohio legislature may be moving towards a more visible acceptance of speed-measuring devices.

B. *Reliable in the Courts*[148]

The Maryland Supreme Court has held LIDAR evidence to be reliable since 1995, noting that LIDAR was based on generally

143. *See* FLA. STAT. ANN. § 316.1906(1)(e) (West 2006) (defining "radar" as "law enforcement speed radar, any laser-based or microwave-based speed-measurement system employed by a law enforcement agency to detect the speed of motorists" and declaring it inadmissible, unless training and other evidence is proven during the trial).

144. *See, e.g.*, City of Columbus v. Barton, 733 N.E.2d 326, 327 (Mun. Ct., Franklin County, Ohio Sept. 16, 1994) ("The laser speed detector is reliable and accurate as a scientific measure of the speed of a moving object, which can be used by law enforcement personnel to measure vehicle speed, provided that the device is used in accordance with certain procedures delineated by the manufacturer."); Ohio v. McGuire, 92-TRD-6962S-SHER (Mun. Ct., Troy County, Ohio June 16, 1992) (unpublished decision; citation based on trial notes of author Carl Fors) (upholding specifically the Kustom Pro Laser model LIDAR unit); City of Dayton v. Kane, (Mun. Ct., Dayton County, Ohio Sept. 23, 1991) (unpublished decision; citation based on trial notes of author Carl Fors) (admitting LIDAR evidence over defendant's motion to suppress); *see also Judicial Notice and Laser Case Law of Laser Gun Use*, RADAR & LASER SPEED ENFORCEMENT EXPERT WITNESS, http://www.speedlabs.com/expert-witness.html (last visited May 12, 2011) (discussing case law regarding laser gun use).

145. City of Barberton v. Jenney, 929 N.E.2d 1047 (Ohio 2010).

146. *Id.* at 1053.

147. S.B. 280, 128th Gen. Assemb., Reg. Sess. (Ohio 2010); H.B. 16, 129th Gen. Assemb., Reg. Sess. (Ohio 2011).

148. Because the vast majority of municipal courts in Texas and throughout the country are not courts of record, many of the municipal court cases cited in this subsection are without published opinion or of record whatsoever. In those instances, all citations and discussions of their holdings are made from the either the authors' personal notes, documents related to involvement in those cases, or to secondary sources.

accepted scientific principles.[149] The court wrote that, "the trial court made an extensive investigation into the reliability of the laser speed measurements [in which it] found that the use of lasers to measure speed is generally accepted in the relevant scientific community."[150] The Maryland Supreme Court agreed with the trial court and held that "laser speed measurements may be admitted into evidence in judicial proceedings in the State of Maryland."[151]

In 1998, the reliability of LIDAR evidence came to the New Jersey Superior Court, and the court asked the State to conduct exhaustive experiments demonstrating the reliability of LIDAR.[152] The court found from the testimony that LIDAR was able to adequately distinguish between different cars traveling close to each other, and that there were "only 16 cases out of 1,908 in which the speed measurement produced by the laser speed detector exceeded the measurement produced by the comparison device [radar] by more than one mile per hour. That amounts to 0.8%."[153] The court also noted "that the speed measurement produced by the laser speed detector only once exceeded by more than one mile per hour the measurement produced by the track timer and never exceeded by more than one mile per hour the measurement produced by" other speed-detection devices.[154] Ultimately, the judge stated:

> I am satisfied from the totality of the evidence presented . . . that the laser speed detector produces reasonably uniform and reasonably reliable measurements of the speed of motor vehicles under conditions likely to be present on New Jersey highways when the detector is used for law enforcement purposes. The error trapping programs and mechanisms built into the detector are fully adequate to prevent unreliable speed measurements . . . .[155]

149. Goldstein v. State, 664 A.2d 375, 381 (Md. 1995).
150. *Id.*
151. *Id.*
152. *In re* Admissibility of Motor Vehicle Speed Readings Produced by the LTI Marksman 20-20 Laser Speed Detection Sys., 714 A.2d 381, 391 (N.J. Super. Ct. Law Div. 1998).
153. *Id.*
154. *Id.*
155. *Id.*

The superior court's decision and the exhaustive testing and analysis done by the State were later affirmed by the New Jersey Court of Appeals.[156]

After the comprehensive evaluation by the New Jersey Court, courts in more than half-a-dozen other states have taken judicial notice or held their own reliability hearings regarding LIDAR, including Colorado,[157] Hawaii,[158] Minnesota,[159] Idaho,[160] Wisconsin,[161] Alaska,[162] Illinois,[163] New York,[164] and Oregon.[165]

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156. *See* State v. Abeskaron, 740 A.2d 690, 694 (N.J. Super. Ct. App. Div. 1999) ("[O]ur thorough review of the record in light of the arguments presented satisfies us that Judge Stanton appropriately found in *Laser II* that, subject to the listed restrictions, the subject laser detector was an appropriate tool in measuring speed."). *See generally In re Admissibility of Motor Vehicle Speed Readings*, 714 A.2d at 384–91 (discussing, in detail, the extensive testing that was conducted by the State).

157. *See* People v. Guyton, No. 832331 (Mun. Ct., Boulder County, Colo. Nov. 27, 2000), *available at* http://www.bouldercolorado.gov/files/Municipal_Court/Standing%20Orders/4.pdf ("With regard to the . . . general acceptance in the scientific community of laser/lidar to determine vehicular speed, this court is satisfied beyond a reasonable doubt that laser/lidar is so accepted and takes judicial notice of that fact.").

158. *See* State v. Assaye, 216 P.3d 1227, 1237 (Haw. 2009) ("To reiterate, this court has said that '[t]he accuracy of a particular radar unit can be established by showing that the operator tested the device in accordance with accepted procedures to determine that the unit was functioning properly and that the operator was qualified by training and experience to operate the unit.' [This analysis was extended] in *Tailo* to apply to the accuracy of a speed reading given by a particular laser gun." (citation omitted) (quoting State v. Tailo, 779 P.2d 11, 13 (Haw. 1989))); State v. Stoa, 145 P.3d 803, 811 (Haw. Ct. App. 2006) (conducting a thorough review of out-of-state precedent, and noting that the court was going to "join the other states that have taken judicial notice of the scientific acceptance of the accuracy and reliability of laser speed-measuring devices"), *overruled on other grounds by Assaye*, 216 P.3d at 1235.

159. *See* State v. Ali, 679 N.W.2d 359, 364 (Minn. Ct. App. 2004) ("[S]o long as there is adequate evidence that a laser-based speed-measuring device used to support a conviction has been tested for accuracy and that officers using the device have been trained in its use, a district court does not abuse its discretion by taking judicial notice of the device's general reliability . . . .").

160. *See* State v. Williamson, 166 P.3d 387, 391 (Idaho Ct. App. 2007) ("We hold that laser speed detection devices are generally reliable and their results may be admitted into evidence in Idaho courts.").

161. *See "Lidar" Speed Detection Devices Held Admissible*, DAILY WASH. L. REP., June 26, 2008, at 1365, 1374 n.8 (citing City of Stoughton v. Storey, No. 021933 (Mun. Ct., Stoughton County, Wis. Jan. 17, 2003)) (granting the LIDAR device a prima facie presumption of accuracy).

162. Samples v. Municipality of Anchorage, 163 P.3d 967, 972 (Alaska Ct. App. 2007) (noting that "[m]any courts have recognized the general reliability of laser speed-detection devices and have deemed their results admissible in court," and upholding the trial court's use of judicial notice to avoid a full-blown *Daubert* analysis).

163. *See* People v. Mann, 922 N.E.2d 533, 538 (Ill. App. Ct. 2010) ("In our view . . . the use of LIDAR to measure the speed of moving vehicles is based on generally accepted

In 2008, a decade after the New Jersey court's hearings, the D.C. Superior Court held its own full-blown gatekeeping hearing.[166]

> The Court conducted an extensive four-day *Frye* [*Daubert*] hearing . . . [in which it] considered such issues as the basic science of laser technology, the technical methodology of, and theoretical challenges to, the reliability of radar guns . . . including the possibility of other "pulses" in the vicinity of use, difficulties in target identification, possible errors caused by vehicle license plates, windshield glass, shape, and color, and potential malfunction of the device. The Court also took judicial notice of at least six scientific publications on the subject in various journals of interest, together with two police-related studies in Florida, one New Jersey [study], and one independent study in Florida on this and similar radar devices, all of which met the standards set forth by [the] National Highway Safety Administration . . . .[167]

Based on all this evidence and expert witnesses on each side of the case, the court upheld the use of LIDAR evidence and noted that there was not one single court that had conducted full-blown hearings on the issue that had found LIDAR to be unreliable, while more than a dozen jurisdictions had decided to the contrary.[168]

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scientific principles."). *But see* People v. Canulli, 792 N.E.2d 438, 445 (Ill. App. Ct. 2003) (holding it erroneous to admit LIDAR results without a *Frye* hearing).

164. *See* People v. Clemens, 642 N.Y.S.2d 760, 761 (Justice Ct., Columbia County, N.Y. 1995) ("The Court found that the People have proven through the expert testimony of Dr. Daniel Gezari that the Laser 20-20 is an extremely reliable device to measure velocity and is accepted within the scientific community.").

165. City of Wilsonville v. Korotin (Mun. Ct., Wilsonville County, Or. Oct. 19, 2007) (unpublished decision; citation based on trial notes of author Carl Fors) (holding that the scientific principle of light beam pulses of radiation used to measure the speed of a moving vehicle is admissible without the requirement of supporting expert testimony); *see also Judicial Notice and Laser Case Law of Laser Gun Use*, RADAR & LASER SPEED ENFORCEMENT EXPERT WITNESS, http://www.speedlabs.com/expert-witness.html (last visited May 12, 2011) (stating that the court in *Korotin* held that supporting expert testimony is not required to admit LIDAR evidence).

166. *See generally "Lidar" Speed Detection Devices Held Admissible*, DAILY WASH. L. REP., June 26, 2008, at 1365 (citing District of Columbia v. Chatilovicz, No. 2006-CTF-2633 (D.C. Super. Ct. June 12, 2008)) (discussing the court's use of the *Frye* hearing).

167. *Id.*

168. *See id.* at 1373 (summarizing the court's finding regarding the reliability of laser speed devices).

V. TEXAS JURISPRUDENCE AND *HALL V. STATE*

In Texas, at least two courts have conducted full-blown *Kelly* hearings and have determined that LIDAR evidence is sufficiently reliable to be presented at trial. First, in *State v. Levinson*,[169] a municipal court in Harris County held a *Kelly* hearing in 1999 and found that all requirements set out by the Texas Court of Criminal Appeals were unquestionably met by LIDAR technology, and it admitted the evidence at trial.[170] Second, in *State v. Sparks*,[171] a Tarrant County court also held that LIDAR met all the requirements of *Kelly*, and that the speed measurement of the Kustom Pro Laser III device was admissible and scientifically reliable. The court found that the State of Texas had provided clear and convincing evidence that (1) the underlying scientific theory of the LIDAR was valid, (2) the technique used by the Pro Laser III applying LIDAR was valid, and (3) the technique was properly applied on the occasion in question.[172] The *Sparks* court found the proper foundation existed for admitting the Pro Laser III results at trial.[173] Additionally, in *State v. Bartholomae*,[174] the Municipal Court in Nueces County—though it did not conduct a full *Kelly* hearing—took judicial notice of LIDAR's reliability.[175]

However, *Hall* was the first time the Texas appellate courts commented on the reliability of LIDAR under the various Rule 702 application guidelines.[176] In *Hall*, the defendant was charged with driving while intoxicated after he was pulled over for a speeding violation.[177] "Hall filed a pretrial suppression motion

169. State v. Levinson, No. 05341010-4-1 (Mun. Ct. No. 12, Harris County, Tex. July 7, 1999).

170. *Id.*

171. State v. Sparks, PD381435-1 (Mun. Ct., Tarrant County, Tex. May 21, 2004); *see also "Lidar" Speed Detection Devices Held Admissible*, DAILY WASH. L. REP., June 26, 2008, at 1365, 1367, 1374–75 n.10 (citing *Sparks*, PD381435-1) (discussing the holding in *Sparks*).

172. *Sparks*, PD381435-1 (holding recorded in the trial notes of author Carl Fors).

173. *Id.* (holding recorded in the trial notes of author Carl Fors).

174. State v. Bartholomae, No. 2111423 (Mun. Ct., Nueces County, Tex. June 2009) (unpublished decision; citation from trial notes of author Ryan V. Cox).

175. *Id.*

176. *See* Hall v. State, 264 S.W.3d 346, 348–49 (Tex. App.—Waco 2008) ("Scientific evidence must be helpful to the trier of fact to be admissible under Rule of Evidence 702 . . . ." (citing Emerson v. State, 880 S.W.2d 759, 763 (Tex. Crim. App. 1994); State v. Rudd, 255 S.W.3d 293, 301 (Tex. App.—Waco 2008, pet. ref'd))), *aff'd*, 297 S.W.3d 294 (Tex. Crim. App. 2009).

177. *Id.* at 348.

alleging that the traffic stop was made without probable cause or reasonable suspicion[, and,] [a]t the suppression hearing, he explained that he was challenging the reliability of the LIDAR technology[,] which served as the basis for the stop."[178] The trial court denied Hall's pretrial suppression motion, and the jury convicted him on the charges.[179] After discussing the general rules for the admissibility of scientific evidence, the Waco Court of Appeals explained judicial notice in Texas:

> "A party seeking to introduce evidence of a scientific principle need not always present expert testimony, treatises, or other scientific material to satisfy the *Kelly* test. It is only at the dawn of judicial consideration of a particular type of forensic scientific evidence that trial courts must conduct full-blown "gatekeeping" hearings under *Kelly*. Once a scientific principle is generally accepted in the pertinent professional community and has been accepted in a sufficient number of trial courts through adversarial *Daubert/Kelly* hearings, subsequent courts may take judicial notice of the scientific validity (or invalidity) of that scientific theory based upon the process, materials, and evidence produced in those prior hearings.
>
> Similarly, once some courts have, through a *Daubert/Kelly* "gatekeeping" hearing, determined the scientific reliability and validity of a specific methodology to implement or test the particular scientific theory, other courts may take judicial notice of the reliability (or unreliability) of that particular methodology.
>
> Trial courts are not required to re-invent the scientific wheel in every trial. However, some trial court must actually examine and assess the reliability of the particular scientific wheel before other courts may ride along behind. Some court, somewhere, has to conduct an adversarial gatekeeping hearing to determine the reliability of the given scientific theory and its methodology."[180]

Despite the "[s]ome court, somewhere" language quoted by the court, it nevertheless refused to take judicial notice of the out-of-state precedent in which courts across the country had conducted full-blown gatekeeping hearings.[181] Essentially, the prosecution

178. *Id.*

179. *Id.* at 348, 350.

180. *Id.* at 349 (quoting Hernandez v. State, 116 S.W.3d 26, 28–29 (Tex. Crim. App. 2003) (per curiam)).

181. *See Hall*, 264 S.W.3d at 350 ("The parties have not cited and our research has not disclosed any Texas authorities confirming the reliability or admissibility of LIDAR

failed to even ask for judicial notice at the trial court—much less present any evidence in a *Kelly* type hearing—and the Waco Court sustained Hall's issue because "'judicial notice on appeal cannot serve as the sole source of support for a bare trial court record concerning scientific reliability.'"[182] The court, therefore, never answered the question of whether LIDAR was actually reliable, instead finding that the record was insufficient.[183]

The State appealed to the Texas Court of Criminal Appeals,[184] which agreed with the Waco Court that some evidence would have to be presented at the trial court level to lay the foundation for LIDAR evidence to be admitted.[185] In his concurrence, Judge Price expounded on the supposedly mysterious and untested nature of LIDAR:

> Suppose [the officer] had testified that he believed the appellant was speeding only because a blue cube on [his] dashboard had indicated so. Without knowing any more about the blue cube, a rational fact finder (here, the trial court as arbiter of pre-trial suppression issues) would have no way to conclude that [the officer's] belief was a reasonable one . . . .
>
> I do not see how LIDAR technology is (at the present time, at least) any different than my hypothetical blue cube. Common sense and experience tell us nothing about LIDAR, and I am aware of no court in Texas (and the State cites none) that has recognized the technology.[186]

In effect, the court clearly did not decide whether LIDAR was in fact reliable and whether the lower courts should take judicial notice of its reliability. Faced with a similarly bare record, a New Jersey court recognized the importance of the issue and made findings on LIDAR technology in an opinion that would border on

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technology. Therefore, we hold that LIDAR technology is novel scientific evidence which may be admissible only after its reliability has been judicially determined in a full-blown gatekeeping hearing under *Kelly*." (internal quotations omitted)).

182. *Id.* at 350 (quoting *Hernandez*, 116 S.W.3d at 30–32).

183. *See id.* ("The authorities cited by the State on appeal which support the reliability of this technology may be beneficial in resolving this issue, but they must be first presented to the trial court in a *Kelly* gatekeeping hearing." (citing *Hernandez*, 116 S.W.3d at 30–32)).

184. Hall v. State, 297 S.W.3d 294 (Tex. Crim. App. 2009).

185. *See id.* at 298 ("[T]he court of appeals correctly held that the trial judge abused his discretion when denying Hall's suppression motion because there was no evidence that LIDAR technology, as used in this case, supplied probable cause for the stop.").

186. *Id.* at 300–01 (Price, J., concurring).

advisory.[187] In *State v. Abeskaron*,[188] the court stated:

> We are aware that courts should not render advisory opinions or exercise jurisdiction in the abstract. Due to the procedural issues regarding what is the record in this appeal we might thus decline to entertain the issue of the use of LTI Marksman results. Nonetheless, it is clear that even when a case becomes moot, where the issue is of significant public importance and likely to recur our courts have considered such matters.[189]

The court went on to hold that, so long as the unit is appropriately used, laser detectors are an "appropriate tool [for] . . . measuring speed."[190] Unfortunately, the court did not choose to follow this approach in *Hall*, and Texas prosecutors continue to face the daunting prospect of presenting expert testimony in every single speeding case in which a LIDAR speed-detecting device was used.

VI. CONCLUSION: THE FUTURE OF TRAFFIC ENFORCEMENT TECHNOLOGY

What does *Hall* mean for the future of LIDAR jurisprudence? The answer is: very little, which is precisely the problem with the court's opinion. Despite being given the opportunity to generate judicial economy in traffic ticket cases, the court failed to seize it. Apparently, in order for the high court to actually address the issue, the prosecution would have to put on some evidence at the trial court level. The problem with this is that once evidence is offered, the reliability of LIDAR becomes so obvious that it would hardly ever be challenged—essentially preventing the Court of Criminal Appeals from ever making a statewide decision on LIDAR. This problem is compounded by the fact that any gatekeeping hearings will generally occur in a municipal court—a court that does not publish opinions nor even maintain a record in many cases—making it even more difficult for other trial courts to take judicial notice.[191] Given its next opportunity, we believe that

187. *See generally* State v. Abeskaron, 740 A.2d 690 (N.J. Super. Ct. App. Div. 1999) (addressing the admissibility of readings from the LTI Marksman 20-20, a laser speed reading unit).

188. State v. Abeskaron, 740 A.2d 690 (N.J. Super. Ct. App. Div. 1999).

189. *Id.* at 694 (citations omitted).

190. *Id.*

191. *Cf.* TEX. GOV'T CODE ANN. § 30.00003 (West Supp. 2010) (noting that a

the court should address the reliability of LIDAR for no other reason than to prevent the continuous re-litigation of a proven technology's merit. There is no doubt that laser speed measurement systems are based on solid scientific principles. Though judicial notice would eliminate costly delays in the judicial process and the necessity of continuous expenditures for court appearances and expert witnesses, because of *Hall*, it seems likely that Texas will only be able to resolve the issue through the legislative process.

In the meantime, however, prosecutors can do several things in order to save resources when attempting to have LIDAR evidence admitted over a defendant's motion to suppress. First, prosecutors must make sure that all officers using the technology have been properly trained—without training, judicial notice will not save the admissibility of the evidence. Second, prosecutors should make sure that all maintenance records are being maintained by the law enforcement agencies; not doing so opens the door to reliability challenges. Finally, when the prosecution seeks to avoid calling an expert witness, asking the trial court itself to take judicial notice is generally met with positive results. The trial judge generally likes to hear that he is "'not required to re-invent the scientific wheel in every trial.'"[192] Moreover, out-of-state precedent and the small number of Texas cases cited in this Article will sometimes be sufficient to allow judicial notice.[193] If, however, judicial notice is not taken, the prosecutor must be certain to build the record for appeal so that whether or not an expert is employed, the Texas high court can properly address the actual reliability of LIDAR.

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municipality *may*, but is not *required* to create municipal courts of record, and may maintain courts that are not of record under chapter 29 of the Government Code).

192. Hall v. State, 264 S.W.3d 346, 349 (Tex. App.—Waco 2008) (quoting Hernandez v. State, 116 S.W.3d 26, 28–29 (Tex. Crim. App. 2003) (per curiam)), *aff'd*, 297 S.W.3d 294 (Tex. Crim. App. 2009).

193. *E.g.*, State v. Bartholomae, No. 2111423 (Mun. Ct., Nueces County, Tex. June 2009) (unpublished decision; citation and holding from trial notes of author Ryan V. Cox) (taking judicial notice of the reliability of LIDAR based on the precedent cited in this Article).