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SJC-11774

COMMONWEALTH vs. KIRK P. CAMBLIN.

Middlesex. February 5, 2015. - June 12, 2015.

Present: Gants, C.J., Spina, Cordy, Botsford, Duffly, Lenk,
& Hines, JJ.

Motor Vehicle, Operating under the influence. Evidence,
Breathalyzer test, Scientific test.

Complaint received and sworn to in the Ayer Division of the District Court Department on April 28, 2008.

A pretrial motion to exclude evidence as scientifically unreliable was considered by Mark A. Sullivan, J., and a motion for reconsideration was considered by him; and the case was tried before Peter J. Kilmartin, J.

The Supreme Judicial Court granted an application for direct appellate review.

John Fennel for the defendant.

Jamie Michael Charles, Assistant District Attorney, for the Commonwealth.

Evan M. Levow, of New Jersey, & Gregory D. Oberhauser, for DUI Defense Lawyers Association, amicus curiae, submitted a brief.

BOTSFORD, J. In 2013, the defendant, Kirk P. Camblin, was convicted in the District Court of operating a motor vehicle while under the influence of liquor (OUI) on theories that alcohol affected his ability to drive safely and that he operated the vehicle with a blood alcohol percentage of 0.08 or greater.¹ Before trial, he, along with sixty-one other defendants in other OUI cases pending in the District Court, moved to exclude admission of breath test evidence derived from the use of a particular model of breathalyzer, the Alcotest 7110 MK III-C (Alcotest), on the basis that errors in the Alcotest's source code as well as other deficiencies rendered the breath test results produced by the Alcotest unreliable. The judge specially assigned to these cases denied the motion without a hearing, evidentiary or otherwise. We conclude that because breath test evidence, at its core, is scientific evidence, the reliability of the Alcotest breath test result had to be established before evidence of it could be admitted, see Commonwealth v. Lanigan, 419 Mass. 15, 25-26 (1994), and, in this case, a hearing on and substantive consideration of the defendant's challenges to that reliability were required. Because no such hearing was held and the Alcotest breath test result of 0.16 was before the jury as evidence, we vacate the

¹ The defendant pleaded guilty to operating a motor vehicle while under the influence of intoxicating liquor (OUI), second or subsequent offense.

judge's order denying the motion to exclude the breathalyzer evidence, remand the case to the District Court for a hearing on that motion, and retain jurisdiction of the case.²

Facts. We recite the facts as the jury could have found them at trial. At approximately 3 A.M. on April 27, 2008, State police Trooper Mark Roy was driving on Route 495 southbound when he saw an automobile parked off the highway's breakdown lane. The defendant was standing outside the automobile and urinating. Roy stopped his cruiser behind the vehicle and approached the defendant. Once Roy was within five feet of him, Roy smelled an odor of alcohol. Roy then asked the defendant a series of questions; in response, the defendant stated that he was on his way home to Melrose from a bar in Worcester, and that he had drunk four or five beers at the bar. The defendant's speech was slurred. In response to Roy's repeated requests for his registration, the defendant handed Roy two stacks of papers from his glove compartment without attempting to find the registration within the stacks. Roy smelled alcohol each time the defendant moved his body to reach into the glove compartment. Ultimately, Roy found the defendant's registration in the stacks of papers.

² No hearing, evidentiary or otherwise, was held on the motion to exclude the breathalyzer evidence. Our review of the record on appeal suggests that an evidentiary hearing was likely necessary, but we leave this issue to be determined on remand.

Roy then asked the defendant to perform three field sobriety tests. The defendant performed each test poorly and, based on the these tests as well as the entirety of Roy's investigation of the defendant, Roy transported the defendant to the State police barracks in Leominster, where the defendant signed a consent form by which he agreed to submit to a breath test. Roy, who was certified to administer the breath test, instructed the defendant regarding how to perform the test and, after multiple unsuccessful attempts to give a breath sample, the defendant eventually breathed a sufficient sample into the breathalyzer that indicated his blood alcohol content (BAC)³ was 0.16.⁴

The State police used an Alcotest 7110 MK III-C breathalyzer, manufactured by Draeger Safety Diagnostics, Inc. (Draeger), to administer the breath test to the defendant.⁵ In February, 2008, approximately two months prior to the day of the

³ Breath alcohol concentration is used to measure blood alcohol content (BAC) based on "Henry's Law," which is a principle stating that, at equilibrium, the concentration of alcohol in an individual's blood is directly proportional to the concentration of alcohol in the individual's breath. See Commonwealth v. Smythe, 23 Mass. App. Ct. 348, 350 (1987).

⁴ State police Trooper Mark Roy testified at trial that there was no indication the breathalyzer machine was not working properly as he prepared the machine to administer the breath test to the defendant.

⁵ By the time of trial in 2013, the State police had discontinued use of the Alcotest 7110 MK III-C (Alcotest) breathalyzer.

defendant's arrest, the Commonwealth's office of alcohol testing (OAT) had certified the specific Alcotest machine used to administer the breath test to the defendant, and nine days before the defendant's breath test the State police trooper in charge of the machine had conducted a periodic test of the Alcotest machine that indicated it was producing accurate measurements. Furthermore, the Alcotest machine itself conducted an "air blank test" to air out the machine prior to and in between each of the defendant's attempts to provide a breath sample; these tests measured no alcohol content, as expected. The Alcotest also by itself ran a calibration test during the defendant's breath test. The test uses a solution with known alcohol content, and for a valid test result, the Alcotest was required to produce a reading between 0.14 and 0.16; the Alcotest's calibration reading of 0.15 fell within these parameters.⁶

Procedural background. On April 28, 2008, a complaint issued from the Ayer Division of the District Court Department (Ayer District Court) charging the defendant with operating a

⁶ The defendant's sole challenge on appeal is to the accuracy and reliability of the Alcotest's breath test result in his case. The defendant challenged the Alcotest's reliability in a pretrial motion in limine, but did not raise any specific issue about the reliability of the test at trial. He did, however, object to the admission of his breath test result and admission of a record of the periodic test of the Alcotest conducted days prior to his breath test.

motor vehicle with a percentage, by weight, of alcohol in his blood of 0.08 or greater, or while under the influence of intoxicating liquor, second offense, in violation of G. L. c. 90, § 24 (1) (a) (1). In August, 2008, a judge in the District Court allowed the defendant's motion for discovery from the Commonwealth of the Alcotest's source code⁷ and his motion for leave to issue a subpoena for the same.

After proceedings before a single justice of this court in a related case, Draeger disclosed the Alcotest's source code subject to a nondisclosure agreement. Since then, two experts retained by the defendant received and examined the Alcotest's source code.

In March, 2010, the Chief Justice of the District Court specially assigned to a judge of that court the defendant's case along with sixty-one other cases in which defendants charged with OUI challenged the reliability of the Alcotest's source code. Pursuant to her authority under G. L. c. 218, § 43A, the Chief Justice authorized the specially assigned judge "to conduct hearings or other proceedings arising in these cases," including hearings pertaining generally to the reliability of the Alcotest.

⁷ The source code is the code written to control the functioning of computer software.

In June, 2010, the defendants in the consolidated cases filed a joint motion in limine to exclude the Alcotest results in each defendant's case as scientifically unreliable under Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579 (1993), and Lanigan, 419 Mass. 15, and sought a hearing concerning the Alcotest's reliability in connection with the motion. The defendants filed expert affidavits and reports contending that the Alcotest's source code contained thousands of errors, some of which could result in the production of unreliable results. The defendants also asserted, through the supporting affidavits and motions they had filed, that the Alcotest's results are unreliable because the device does not test exclusively for ethanol, the calibration tests performed do not operate to validate the accuracy of the Alcotest, and the Alcotest is based on an obsolete understanding of respiratory physiology.⁸ In support of its opposition to the defendants' motion, the Commonwealth filed affidavits and reports concerning the Alcotest's functioning and ability to accurately measure BAC.

The motion judge denied the defendants' motion to exclude the Alcotest results as unreliable and declined to hold any

⁸ The defendant does not pursue on appeal the claim that the Alcotest relies on an outmoded understanding of respiratory physiology.

hearing on the motion, reasoning that a Daubert-Lanigan hearing⁹ is inapplicable to the admissibility of the Alcotest results because they are admissible by statute. See G. L. c. 90, §§ 24 (1) (e), 24K. The judge noted secondarily that, even if he were to consider the Alcotest's reliability, he was persuaded that a decision of the New Jersey Supreme Court, State v. Chun, 194 N.J. 54, cert. denied, 555 U.S. 825 (2008), effectively had concluded that the alleged defects in the Alcotest's source code did not render unreliable the Alcotest machines used in Massachusetts. The judge did not address the defendants' argument that the Alcotest produces unreliable results in light of its failure to test a subject's breath solely for ethanol. The defendants moved for reconsideration, arguing that the admission of the Alcotest results without a hearing violated their constitutional rights to due process. The judge denied this motion, reasoning that the issues raised by the defendants

⁹ A hearing pursuant to Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579 (1993), and Commonwealth v. Lanigan, 419 Mass. 15 (1994), focuses on whether "the process or theory underlying a scientific expert's opinion lacks reliability" such that the opinion "should not reach the trier of fact." Id. at 26. The "party seeking to introduce scientific evidence may lay an adequate foundation either by establishing general acceptance in the scientific community or by showing that the evidence is reliable or valid through an alternate means." Canavan's Case, 432 Mass. 304, 310 (2000). The Daubert inquiry, however, "applies not only to testimony based on 'scientific' knowledge, but also to testimony based on 'technical' and 'other specialized' knowledge." Kumho Tire Co., Ltd. v. Carmichael, 526 U.S. 137, 141 (1999).

went to the weight, rather than the admissibility, of the Alcotest breath test results. Thereafter, the defendants filed a petition pursuant to G. L. c. 211, § 3, challenging the denial of the motion to exclude the Alcotest results; a single justice of this court denied relief.

The defendant's case was tried in the Ayer District Court before a jury and a judge other than the motion judge. During the trial, the defense presented no evidence on the reliability of the Alcotest or its breath test results (see note 5, supra). The jury found the defendant guilty of operating a motor vehicle with a blood alcohol percentage of 0.08 or greater as well as of operating a motor vehicle while under the influence of liquor. See G. L. c. 90, § 24 (1) (a) (1).¹⁰ The defendant pleaded guilty to the second offense portion of the complaint, and thereafter was sentenced to six months in a house of correction, suspended until January, 2015. The defendant appealed, and we granted his application for direct appellate review.

Discussion. The defendant's overarching claim on appeal is that the motion judge abused his discretion, and committed an

¹⁰ General Laws c. 90, § 24 (1) (a) (1), first par., provides in relevant part: "Whoever, upon any way or in any place to which the public has a right of access, or upon any way or in any place to which members of the public have access as invitees or licensees, operates a motor vehicle with a percentage, by weight, of alcohol in their blood of eight one-hundredths or greater, or while under the influence of intoxicating liquor," shall be punished by a fine, imprisonment, or both.

error of law, by declining to hold a hearing on the reliability of the Alcotest. The defendant divides this argument into two parts. First, he argues that the Alcotest's design is not based on infrared technology and, therefore, that an Alcotest result is not admissible under G. L. c. 90, §§ 24 (1) (e) and 24K. We interpret his argument as asserting, at the very least, that a hearing was needed to determine the status of the Alcotest as an "infrared breath-testing device" as required by G. L. c. 90, § 24K. In the alternative, the defendant contends that even if the Alcotest is an infrared device such that its results are admissible by statute, the motion judge erred by failing to assess the Alcotest's reliability and admitting the defendant's Alcotest breath test result in evidence at trial because the Alcotest is a "new generation" breathalyzer using methods of measuring alcohol in a subject's breath different from previous machines that have been reviewed by our courts, and the Alcotest's flawed source code, its inability to test exclusively for ethanol, and the fact that its calibration test does not adequately measure the reliability of the device render the Alcotest unreliable.¹¹ Finally, the defendant claims that the admission of the (in his view) unreliable Alcotest result

¹¹ The defendant further argues that the New Jersey Supreme Court's decision in State v. Chun, 194 N.J. 54, cert. denied, 555 U.S. 825 (2008), did not address the flaws that he raises with respect to the Alcotest's reliability.

without an assessment of its reliability violated his right to due process under art. 12 of the Massachusetts Declaration of Rights and the Fourteenth Amendment to the United States Constitution. We agree with the defendant that his challenge is to a new breathalyzer technology and is not insulated from challenge on grounds of reliability by virtue of G. L. c. 90, §§ 24 (1) (e) and 24K. The defendant was entitled to raise a reliability challenge to the Alcotest, and in the circumstances of this case, was entitled to a so-called Daubert-Lanigan hearing with respect to at least some of the issues he raised.¹²

1. Statutory admissibility of Alcotest result. The defendant first contends that the motion judge erred by failing to hold a hearing on the Alcotest's reliability given that, he asserts, the Alcotest "is not an infrared breath test," and therefore is not admissible under the governing statutes.

General Laws c. 90, § 24 (1) (e), provides that in any OUI prosecution, "evidence of the percentage, by weight, of alcohol in the defendant's blood at the time of the alleged offense, as shown by . . . a chemical test or analysis of his breath, shall

¹² We find no merit in the Commonwealth's argument that the defendant failed to preserve his challenge to the Alcotest's reliability by neglecting to object to the admission of his Alcotest result or to raise the issue of the Alcotest's reliability at trial. As indicated previously, the defendant did object at trial to the admission of his Alcotest result, and he objected to the admission of a record of a periodic test of the Alcotest on the specific ground that the Alcotest result was unreliable.

be admissible and deemed relevant to the determination of the question of whether such defendant was at such time under the influence of intoxicating liquor." Despite this broad language, the relevant statutes condition the evidentiary admission of breath test results on satisfaction of certain requirements. Of relevance here is the requirement that a certified operator perform the breath test "using infrared breath-testing devices" according to methods approved by the Secretary of Public Safety (Secretary) in accordance with regulations promulgated by the Secretary. G. L. c. 90, § 24K.^{13,14}

¹³ General Laws c. 90, § 24K, provides in relevant part:

"Chemical analysis of the breath of a person charged with a violation of this chapter shall not be considered valid under the provisions of this chapter, unless such analysis has been performed by a certified operator, using infrared breath-testing devices according to methods approved by the secretary of public safety. The secretary of public safety shall promulgate rules and regulations regarding satisfactory methods, techniques and criteria for the conduct of such tests, and shall establish a statewide training and certification program for all operators of such devices and a periodic certification program for such breath testing devices; provided, however, that the secretary may terminate or revoke such certification at his discretion.

"Said regulations shall include, but shall not be limited to the following: (a) that the chemical analysis of the breath of a person charged be performed by a certified operator using a certified infrared breath-testing device in the following sequence: (1) one adequate breath sample analysis; (2) one calibration standard analysis; (3) a second adequate breath sample analysis; (b) that no person shall perform such a test unless certified by the secretary of public safety; (c) that no breath

Under these regulations, a breath test is admissible if, in addition to being conducted by a certified operator, it is administered using a "certified breath-testing device." 501 Code Mass. Regs. § 2.03 (2006).¹⁵ OAT is responsible for keeping a list of approved breath test devices, 501 Code Mass. Regs. § 2.38 (2006), and for certifying individual breath test devices annually. 501 Code Mass. Regs. §§ 2.39-2.40 (2006). The regulations specify that approved devices must appear on the National Highway Traffic Safety Administration (NHTSA) list of conforming products,¹⁶ 501 Code Mass. Regs. § 2.38, and reinforce that the device must use "infrared breath testing technology." 501 Code Mass. Regs. § 2.38(5).

testing device, mouthpiece or tube shall be cleaned with any substance containing alcohol."

¹⁴ There are other statutory conditions that must be satisfied for admission, set out in G. L. c. 90, § 24 (1) (e): a breath test may only be performed with the defendant's consent; the test results must be made available to the defendant at his or her request; and the defendant must be "afforded a reasonable opportunity, at his request and at his expense, to have another such test or analysis made by a person or physician selected by him." The defendant does not suggest that these conditions were not met in the present case.

¹⁵ We cite to the regulations as they appeared when the defendant's offense occurred. See 501 Code Mass. Regs. §§ 2.00 (2006).

¹⁶ The Alcotest appeared on this list at the time of the defendant's offense.

The Alcotest uses an infrared light source as well as a detector of infrared light to measure BAC.¹⁷ If a subject's breath containing alcohol enters the Alcotest's chamber, the alcohol molecules absorb some of the infrared light from the source and, consequently, this portion of the infrared light does not reach the detector. The Alcotest then determines the subject's BAC based on the amount of infrared light that reaches the detector as compared to the amount of such light originally emitted from the source. In addition to the infrared mechanism, however, the Alcotest contains a separate testing mechanism, an electrochemical fuel cell (fuel cell), that creates an electric current in the presence of alcohol.¹⁸ For the Alcotest to produce an actual breath test result, the infrared and fuel cell readings must be in "tight agreement" with one another; if the two readings are not in agreement, the test aborts. The

¹⁷ Infrared radiation comprises the portion of the electromagnetic spectrum that begins with wavelengths directly above the visible spectrum. Different molecules absorb infrared radiation differently. See Smythe, 23 Mass. App. Ct. at 350 n.1 (scientific basis "underlying infrared analysis of substances derives from" principle according to which "molecules absorb electromagnetic radiation, and only radiation of certain wavelengths will be absorbed by a molecule of any given compound").

¹⁸ Electrodes that comprise the electrochemical fuel cell (fuel cell) oxidize the alcohol in a subject's breath sample, creating an electric current. The fuel cell's sensors then measure the extent of the electric current, which is proportional to the sample's alcohol content.

defendant contends, therefore, that the Alcotest is not an "infrared breath-testing device" within the meaning of § 24K and the corresponding regulations because the infrared portion of the machine does not alone control whether the machine produces a valid measurement of BAC.

We disagree. Section 24K requires chemical analyses of breath to be performed using an infrared breath-testing device "according to methods approved by the" Secretary, as set out in the Secretary's regulations. As previously indicated, the regulations, in turn, require that any device be approved by NHTSA, which the Alcotest is, and use "infrared breath testing technology" to measure BAC, which the Alcotest does. That the Alcotest also employs the fuel cell to ensure the accuracy of the infrared measurement does not change the fact that it uses the required infrared technology.¹⁹ Moreover, in Massachusetts the Alcotest's infrared reading, rather than the fuel cell reading, is the only measurement used to report a subject's BAC when a valid test occurs. This aspect of the defendant's challenge to the Alcotest fails.

¹⁹ The defendant points to no statutory or regulatory requirement in effect at the time of his offense indicating that a breath test device was required exclusively to use infrared technology. In fact, two years after the defendant's arrest the Secretary of Public Safety clarified the infrared requirement by stating expressly that it does not bar the use of "complementary technologies" to safeguard the accuracy of testing. 501 Code Mass. Regs. § 2.05(4) (2010).

The motion judge concluded, and the Commonwealth argues here, that where a breath-testing device meets the requirements of §§ 24 (1) (e) and 24K, and applicable regulations, a Daubert-Lanigan inquiry into the reliability of the device is neither necessary nor appropriate because the Legislature has expressly deemed evidence of a breath test conducted through use of such a device admissible. The defendant contends, however, that even if his breath test result is deemed admissible under the statute, and even though the scientific principle underlying the breathalyzer's premise may be generally accepted,²⁰ the Alcotest presents a new methodology that is not immune from challenge as to the scientific and technological reliability of the process by which it measures and analyzes the quantity of alcohol in a person's breath and, as a consequence, the reliability of the breath test results that are offered in evidence. Accordingly, he argues, the judge erred in declining to conduct a hearing to assess the Alcotest's reliability.

The defendant's position has merit. It has long been the case that where "evidence produced by a scientific theory or

²⁰ The scientific principle underlying a breathalyzer, known as Henry's Law, is the following: "at any given temperature, the ratio between the concentration of alcohol in one's blood and that in the alveolar air in the lungs is a constant: 2,100:1." Smythe, 23 Mass. App. Ct. at 350 (citation omitted). See note 3, supra.

process"²¹ is at issue, the judge plays an important gatekeeper role to evaluate and decide on its reliability as a threshold matter of admissibility. See Lanigan, 419 Mass. at 25-26. See also Commonwealth v. Shanley, 455 Mass. 752, 761 (2010) ("the judge must make a preliminary assessment whether the theory or methodology underlying the proposed testimony is sufficiently reliable to reach the trier of fact"). The Alcotest is the first "dual-sensoric" breath test machine that analyzes a subject's breath by means of an infrared test and a fuel cell test, and neither this court nor the Appeals Court has considered the reliability of its source code. We recognize that the "Legislature doubtless has the power to prescribe the rules of evidence and the methods of proof to be employed in trials in court." Meunier's Case, 319 Mass. 421, 425 (1946). But the power to do so does not mean that the reliability of every type of evidence the Legislature may deem admissible, particularly in a criminal case, is automatically insulated from challenge and review on reliability grounds. Cf. Commonwealth v. Given, 441 Mass. 741, 742, 746-747 & n.9, cert. denied, 543 U.S. 948 (2004) (discussing admissibility, at commitment trial of person accused of being sexually dangerous, of police report -- made admissible by statute -- containing hearsay evidence of prior offense: "Unlike the confrontation clause, due process

²¹ Commonwealth v. Curnin, 409 Mass. 218, 222 (1991).

demands that evidence be reliable in substance, not that its reliability be evaluated in a particular manner. That the focus on reliability may not accommodate a simple, predictable, bright-line rule does not alter the fact that reliability, not cross-examination, is the due process touchstone" [quotations and citations omitted]).²² Indeed, this court has indicated just the opposite in a case that dealt with a different type of breathalyzer device.

In Commonwealth v. Neal, 392 Mass. 1, 14, 18-19 (1984), we held that the admissibility of test results, produced by a particular model of breathalyzer, the Smith & Wesson Model 900A, that had been discovered to be vulnerable to radio frequency interference (RFI) that could result in inaccurate readings, required "a demonstration to the judge of the accuracy of the

²² We disagree with the Commonwealth that the case of Commonwealth v. Bradway, 62 Mass. App. Ct. 280 (2004), should control the outcome here. That case considered whether a judge was required to conduct a Daubert-Lanigan analysis of the reliability of testimony to be presented by qualified examiners, whose reports of and testimony about their examination, diagnosis, and opinions of a person accused of being sexually dangerous are made admissible by statute. See Bradway, supra at 283-284, 286; G. L. c. 123A, § 14 (c). The Appeals Court concluded that requiring such a threshold judicial evaluation of the reliability of a qualified examiner's opinion testimony in every case would improperly "dismantle the statutory framework." Bradway, supra at 289. Opinion testimony by a trained psychiatrist or psychologist concerning his or her evaluation and diagnosis of an individual's mental state and possible sexual dangerousness is a type of evidence that is grounded in recognized theories and principles and has long been deemed admissible. See, e.g., id. at 288 n.12.

particular [breathalyzer] unit at the time the test was performed." The defendant in Neal did not challenge that the principles underlying breath testing machines were generally accepted by the scientific community, but instead argued that the discovery of that model's "susceptibility to RFI require[d] reconsideration of the admissibility of examination results" from the device. Id. at 17. Although § 24 (1) (e) at the time provided that breath test evidence was admissible and relevant to the issue of a defendant's operation of a motor vehicle while under the influence, see id. at 17 n.17, the court still directed that the Commonwealth must establish the reliability of the particular breath test in each case, in light of evidence that cast doubt on its accuracy. Id. at 18-19.²³

²³ The Commonwealth contends that Commonwealth v. Neal, 392 Mass. 1 (1984), is inapposite because it was decided before the enactment of G. L. c. 90, § 24K, and regulations related to the maintenance and certification of breathalyzers and the lack of oversight of the device forced the court in Neal to demand proof that a particular breathalyzer was functioning appropriately at the time of a defendant's breath test. The Commonwealth argues that by the time of the defendant's offense in this case, however, the statutory and regulatory framework ensured that the Alcotest's results were reliable. The argument is not persuasive. In its detailed consideration of the defendant's challenge to the scientific reliability of the breathalyzer at issue in Neal, the court never suggested that it was obliged to undertake this analysis of the merits of the challenge because the Legislature had failed to institute a certification and maintenance regime for such devices. Rather, the court's analysis was premised on the recognition that breath test evidence, admissible by statute, plays a significant role in a prosecution for operating a motor vehicle while under the influence of liquor, and due process principles require that a

The Chief Justice of the District Court assigned the defendant's case and others to the motion judge for resolution of common issues concerning at least the reliability of the Alcotest's source code, and specifically authorized the motion judge to conduct hearings to that end. As stated, we recognize "the reliability of the scientific principles underlying the use of breathalyzer evidence." Commonwealth v. Durning, 406 Mass. 485, 490 (1990). In the circumstances here, however, where the applicable statutes and regulations do not provide specific standards relating to the source code of breathalyzers,²⁴ and existing case law offers no guidance about the reliability of the Alcotest's methodology for measuring and analyzing the quantity of alcohol in a person's breath, the judge should have held a hearing to determine whether the source code and other challenged features of the Alcotest functioned in a manner that reliably produced accurate breath test results. See Shanley, 455 Mass. at 763 n.15 (although Daubert-Lanigan hearing "may not always be required where qualified expert testimony of the same

defendant have the opportunity to challenge its accuracy and scientific reliability. See id. at 8, 17-20. Here, none of the statutory or regulatory requirements that currently govern breath test results relates to the aspects of the Alcotest's design and operation that the defendant challenges.

²⁴ The National Highway Traffic Safety Administration (NHTSA), on whose list of conforming products the Alcotest was required to appear for use in Massachusetts, see 501 Code Mass. Regs. § 2.38 (2006), does not analyze a breathalyzer's source code when determining whether it conforms to NHTSA's standards.

type and offered for the same purpose has been accepted as reliable in the past in Massachusetts appellate cases," this court has "not 'grandfathered' any particular theories or methods for all time").²⁵

2. Reliability of Alcotest breath test results. Given the motion judge's disposition of the defendant's motion in limine, he did not consider on their merits the defendant's specific challenges to the Alcotest's reliability, supported by and described in the expert witness affidavits and articles submitted by the defendant in support of his motion. This was error. The defendant was entitled to have the merits of his challenges considered and the reliability of the Alcotest breath test result established before the evidence of that test result could be admitted in evidence against him. See Commonwealth v. Sands, 424 Mass. 184, 188 (1997).

The question remains whether, despite the fact that the motion judge did not consider the merits of the defendant's challenges, the present record clearly establishes the

²⁵ The judge's second reason for declining to hold a hearing was that the New Jersey Supreme Court, in Chun, 194 N.J. 54, already had considered and rejected a challenge to the reliability of the Alcotest. Although the court in Chun did address the reliability of the Alcotest and of its source code in particular, see id. at 75, 121-131, it did not address all of the challenges the defendant in this case raises to the Alcotest's reliability. For example, the court in Chun did not consider whether the Alcotest tests exclusively for ethanol or whether the Alcotest's calibration system fails to adequately measure the reliability of the device.

reliability of the Alcotest. We have carefully reviewed the defendant's submissions and the corresponding materials submitted by the Commonwealth in opposition to the defendant's motion in limine; we also have reviewed the New Jersey Supreme Court's decision in Chun, 194 N.J. 54. The review leads us to conclude that on the paper record before us, without a hearing, it is not possible to determine that the defendant's challenges have no substantial basis and do not implicate the reliability of the Alcotest breath test evidence. For this reason, we conclude that it is appropriate to vacate the judge's order denying the defendant's motion to exclude the Alcotest breath test evidence and remand this case to the District Court for the purpose of conducting such a hearing. Cf. Commonwealth v. A Juvenile, 381 Mass. 727, 729 (1980) (remanding case to Juvenile Court for hearing on admissibility, on reliability grounds, of hypnotically aided testimony).

On remand, a hearing on the Alcotest's reliability will be necessary. In that connection, we add the following comments.

a. The primary reliability challenge raised by the defendant below was to the Alcotest source code. In support of the motion in limine, the defendant retained a software engineer, Joel Cohen, to analyze the source code. As stated in his affidavit, Cohen used an "industry standard code analysis tool" referred to as LINT, which revealed more than 7,000 errors

and 3,000 warning signals upon scanning the Alcotest's source code. However, according to the report of Daniel Hestad, a source code analyst retained by the Commonwealth, scanning tools such as LINT, alone, are not conclusive as to errors within the source code because they are known to produce falsely positive results, and even a true error may not result in flawed software functionality due to the defect's location in the code. Hestad also noted that it is to be expected that a source code as extensive as the Alcotest's would contain defects and coding errors. Cohen's analysis focused on one particular category of significant error in the source code: uninitialized variables. Hestad agreed that the use of uninitialized variables in the Alcotest's source code was an "unsafe coding practice." He opined, however, that uninitialized variables did not appear in portions of the code that bear directly on the Alcotest's measurement of a subject's BAC, and that the Alcotest's requirement that a certified operator manually reset the device so as to remove values from previous tests suggests that it is "very unlikely" that an uninitialized variable would affect a BAC computation. It may be that Hestad's opinion -- and the fact that Cohen did not point to a specific instance in which an uninitialized variable or other error would, with any degree of certainty, cause an unreliable BAC measurement -- will carry the day, and result in the rejection of the defendant's challenge to

the Alcotest source code. See Neal, 392 Mass. at 21 (this court does "not require a demonstration of infallibility as a precondition to consideration of scientific evidence by a trier of fact"). But we are not able to assess the validity of the two experts' differing views on the basis of their competing affidavits alone, which underscores the value that a hearing would provide, and likely an evidentiary hearing.²⁶

b. The defendant also claims that the Alcotest is not capable of testing exclusively for ethanol, which would or might render its breath test results invalid. Donald J. Barry, Ph.D., an astronomer with a background in chemistry who was retained by the defendant, opined in an affidavit that the Alcotest is "sensitive" to the ethanol content of a subject's breath, but incapable of testing exclusively for ethanol. He reasoned that the design of the Alcotest's infrared mechanism, which operates at a 9.5 micron wavelength to absorb alcohol, may result in an inability to accurately measure compounds "which absorb

²⁶ A hearing pursuant to Daubert and Lanigan need not always be an evidentiary hearing. See Palandjian v. Foster, 446 Mass. 100, 111 (2006); Commonwealth v. Addy, 79 Mass. App. Ct. 835, 838 (2011). In a case where the documentary record, in conjunction with the arguments of the parties, allows for a reasoned determination of the evidence's reliability, an evidentiary hearing may not be necessary. Cf. Vassallo v. Baxter Healthcare Corp., 428 Mass. 1, 8-9, 12 (1998). As stated previously, our review of the affidavits and other materials in the record suggests that an evidentiary hearing is likely necessary in this case, but we leave the decision whether to hold one to the District Court judge on remand.

[infrared radiation] at 9.5 microns but not at adjacent wavelengths"; he notes that all "compounds with a carbon-oxygen bond display an infrared absorption in the 8-10 micron region" and, accordingly, methanol and ethanol absorb infrared radiation in this range, as do "acetone, acetic acid, acetaldehyde, ethyl acetate," and others. In short, Barry asserted, the Alcotest's infrared testing design "cannot be used to distinguish between a detection of ethanol and interfering substances," and that the Alcotest's fuel cell is incapable of measuring ethanol to the exclusion of interfering substances.

The Commonwealth counters that the applicable statutes and regulations do not explicitly require that a breathalyzer must test solely for ethanol. It is true that G. L. c. 90, § 24 (1) (e), deems generally admissible breath test evidence "of the percentage, by weight, of alcohol in the defendant's blood at the time of the alleged offense" (emphasis added). However, we are hard pressed to conclude that the Legislature intended breathalyzers to test for substances other than ethanol.

"Alcohol" is generally defined as "ethanol." See Webster's Third New International Dictionary 50 (2002) ("alcohol" is also called "ethanol"); American Heritage Dictionary of the English Language 41 (2006) (same). Cf. Commonwealth v. Smythe, 23 Mass. App. Ct. 348, 350 (1987) (describing different breathalyzer as being "designed to measure ethyl alcohol in the breath").

The Commonwealth also argues that the Alcotest does test exclusively for ethanol, but the evidence in the record is unconvincing on this front. The affidavit of Hansueli Ryser, a vice-president of Draeger, notes that infrared breathalyzers typically operate at wavelengths of 3.4 or 9.5 microns so that the radiation is absorbed by alcohol, and that the Alcotest's "9.5 micron wavelength is either non-susceptible to interfering substances or susceptible at only a fraction of what it is at 3.4 microns." Ryser then states:

"I agree that the [infrared] system, by itself, is not specific to ethanol. I also agree that the [fuel cell] is not specific to ethanol. However, the [Alcotest] is the only dual-sensoric breath testing device combining both analytical technologies in one instrument where both sensors analyze the same breath specimen. The [fuel cell] and [infrared] readings must be within tight agreement with each other. Otherwise the device flags the test as being tainted by an interfering substance and the test aborts. Thus, the [Alcotest] as a whole is ethanol specific."

The logical leap that Ryser makes from the infrared system and fuel cell each not testing specifically for ethanol to the system as a whole being ethanol-specific is confusing, to say the least. While there may be a reasonable scientific explanation for why Ryser's position is accurate, such an explanation is not apparent in the record. On remand, a judge should consider whether the Alcotest is sufficiently ethanol-specific such that its results are reliably untainted by interfering substances.

c. The defendant contends that the Alcotest's calibration testing mechanism does not indicate adequately the Alcotest's ability to measure accurately an actual subject's BAC. A report concerning the Alcotest's source code submitted as part of the defendant's evidentiary support for his motion in limine suggests that even though the Alcotest performs a calibration test against a solution with known alcohol content in the course of analyzing a subject's breath, such a calibration test does not assist in determining whether the Alcotest accurately assesses the subject's BAC because the Alcotest's source code "takes completely different paths (executes different instructions) for the calibration measurement than when it measures the subject's breath." This is of relevance because G. L. c. 90, § 24K, requires that a "'calibration standard analysis[]' be performed" prior to the administration of a breathalyzer test "in order for [the] test to be valid." Morris v. Commonwealth, 412 Mass. 861, 863 n.3 (1992). "These simulations, using solutions with a known alcohol content, are designed to test the accuracy of the breathalyzer unit." Id. The assertion in the defendant's report, which the Commonwealth did not rebut in its submission to the District Court or on appeal, suggests that the Alcotest's source code renders its calibration measurement ineffective to "test the accuracy" of

the Alcotest. Accordingly, this challenge must be resolved on remand.²⁷

Conclusion. The order denying the defendant's motion to exclude evidence of the defendant's Alcotest breath test result is vacated, and the case is remanded to the District Court for further proceedings consistent with this opinion. In particular, a judge of the District Court is to conduct a hearing on the defendant's motion to exclude, and is to file with this court the judge's findings and rulings based on that hearing within ninety days of the date of the rescript.

So ordered.

²⁷ The Commonwealth argues on appeal that testing of the Alcotest conducted by the Commonwealth's office of alcohol testing (OAT) in the course of this litigation establishes that the device accurately measures BAC. OAT's testing consisted primarily of the Alcotest analyzing samples with differing known alcohol content; a sequence consisted of "two breath samples and the analysis of a calibration standard." The results of the testing sequences of each sample of known alcohol content appear to show that the Alcotest accurately measured the calibration standard in each sequence while also generally measuring the alcohol content of each sample accurately. As part of the testing, OAT also dosed a volunteer with three alcoholic beverages, tested her BAC with the Alcotest and through a blood test, and found the results of each test to substantially agree (if anything, the breath test was lower). However, given the defendant's assertion that the Alcotest's source code renders its calibration test ineffective toward determining whether the Alcotest reliably measures a subject's BAC, we are reluctant to rely on OAT's testing to resolve the defendant's challenge regarding the calibration mechanism without a better understanding than the present record permits us to gain.