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Comments

THE FOURTH AMENDMENT AND NEW TECHNOLOGIES: THE CONSTITUTIONALITY OF THERMAL IMAGING

I. INTRODUCTION

Over the past decade, both federal and state law enforcement officials have increasingly employed thermal imagers to detect the indoor cultivation of marijuana.¹ A thermal imager, which detects infrared radiation,

1. See Christopher Slobogin, *Technologically-Assisted Physical Surveillance: The American Bar Association's Tentative Draft Standards*, 10 HARV. J.L. & TECH. 383, 447 (1997) (stating that thermal imaging "permits law enforcement officials to identify heat sources within a building, and thus, facilitates location of drug laboratories or in-house marijuana farms"); see also Thomas B. Kearns, Note, *Technology and the Right to Privacy: The Convergence of Surveillance and Information Privacy Concerns*, 7 WM. & MARY BILL RTS. J. 975, 986 (1999) (noting that thermal imaging can be used to detect excessive "waste heat" that could signify illegal activity such as indoor marijuana cultivation); Scott J. Smith, Note, *Thermal Surveillance and the Extraordinary Device Exception: Re-Defining the Scope of the Katz Analysis*, 30 VAL. U. L. REV. 1071, 1071 n.4 (1996) (stating that "[t]hermal imagery has emerged across the country as the government's most recent weapon in its war on drugs"); Thomas D. Colbridge, *Thermal Imaging: Much Heat but Little Light*, FBI L. ENFORCEMENT BULL., Dec. 1997, at 19 (noting that although thermal imaging technology is not new, law enforcement has only recently employed use of device).

The Drug Enforcement Administration's *Domestic Cannabis Eradication/Suppression Program Final Report* states that during 1990, thermal imaging was utilized in numerous locations throughout the United States to support justification of a probable cause conclusion and in numerous search warrant affidavits. See DRUG ENFORCEMENT ADMINISTRATION, U.S. DEP'T OF JUSTICE, 1990 DOMESTIC CANNABIS ERADICATION/SUPPRESSION PROGRAM 29 (1990) (discussing fact that thermal detection of indoor cannabis plant cultivation was increasing). Furthermore, the Drug Enforcement Administration ("DEA") has noted that both the DEA (visited Mar. 13, 2000) and cooperating agencies are adapting to the increased indoor cultivation of marijuana by employing advanced technologies to build effective cases against indoor growers. See DRUG ENFORCEMENT ADMIN., U.S. DEP'T OF JUSTICE, DEA BRIEFING BOOK 58-83 (Oct. 1999) [hereinafter DEA BRIEFING BOOK], available at <http://www.usdoj.gov/dea/briefingbook/page16-31.htm#marijuana> (reporting on DEA's efforts to curb use of illegal drugs).

According to the United States Department of Justice ("DOJ"), marijuana is the most commonly used illicit drug in America today. See *id.* at 16-31 (describing prevalence of usage of marijuana). The term "marijuana" refers to the leaves and flowering tops of the cannabis plant. See *id.* Marijuana is a tobacco-like substance produced by drying the leaves and flowering tops of the cannabis plant, and its potency varies depending on the source and selection of plant materials used. See *id.* DOJ further notes that sinsemilla, which is derived from the unpollinated female cannabis plant, and hashish, the resinous material of the cannabis plant, are popular with users because of their high concentration of THC (delta-9-tetrahydrocannabinol), the chemical responsible for most of the psychoactive effects of the plant. See *id.* (discussing DOJ research on drug users).

aids in identifying heat emitted from buildings.² Law enforcement officials have used this technology to search private residences for an abnormal emission of heat, a common indicator of indoor marijuana cultivation.³ Although use of thermal imagers may aid law enforcement, the constitutionality of employing this new technology must be considered.⁴ Many courts have addressed whether the use of such a device by the government constitutes a search under the Fourth Amendment to the

The trend toward the indoor cultivation of marijuana stems from effective efforts by law enforcement officials to curb outdoor cultivation. *See id.* (discussing findings of DEA BRIEFING BOOK). The DEA BRIEFING BOOK also notes that indoor cultivation permits year-round production and ranges from several plants grown in a closet, to thousands of plants grown in elaborate, specially constructed greenhouses. *See id.* The DEA estimates that indoor growers cultivated eighty-nine plants each on average, and in 1998, law enforcement officials seized 2616 indoor operations. *See id.* Because indoor cultivation provides a controlled environment, “[r]ates of vegetation, growth, and maturation are enhanced by special fertilizers, plant hormones, steroids, insecticides, and genetic engineering.” *Id.* Additionally, in 1998, the DEA identified California, Florida, Oregon, Alaska and Kentucky as the five leading states for indoor growing activity. *See id.*

2. *See* T. Wade McKnight, Comment, *Passive, Sensory-Enhanced Searches: Shifting the Fourth Amendment “Reasonableness” Burden*, 59 LA. L. REV. 1243, 1249 (1999) (explaining how thermal imagers operate); *see also* United States v. Ishmael, 48 F.3d 850, 851-52 (5th Cir. 1995) (same); LaFollette v. Commonwealth, 915 S.W.2d 747, 748-49 (Ky. 1996) (same). Essentially, a thermal imager detects differences in the temperature of the atmosphere. *See Ishmael*, 48 F.3d at 851 (noting that “thermal imager detects differences in surface temperature of targeted objects and displays those differences through a viewfinder in varying shades of white and gray”). The differences in temperature are displayed through a viewfinder. *See LaFollette*, 915 S.W.2d at 748-49 (stating that device “displays the differences in temperature through a viewfinder in varying shades of color”). The device records its readings on a standard videocassette recorder tape. *See Ishmael*, 48 F.3d at 852 (recognizing that device can record readings on standard videocassette).

In *LaFollette*, the Kentucky Supreme Court explained how the police use this device to detect marijuana cultivation:

[A] structure being used for the purpose of cultivating marijuana under artificial lighting would produce and show a significant amount of heat due to the large amounts of heat [that] grow-lights or artificial lights generate [T]his heat would also cause the structure to register as warmer on the FLIR than similar types of structures without any internal sources of heat.

LaFollette, 915 S.W.2d at 749 (quoting *United States v. Penny-Feeney*, 773 F. Supp. 220, 224 (D. Haw. 1991)).

3. *See* Erik G. Luna, *Sovereignty and Suspicion*, 48 DUKE L.J. 787, 867 (1999) (stating that “[f]or a number of years, the government has utilized ‘thermal imagers’ to search private residences for illegal drug cultivation”). The Montana Supreme Court, in *State v. Siegal*, noted that “[i]ndoor marijuana growing operations utilize incandescent heat lamps to mimic the sun’s radiation.” 934 P.2d 176, 180 (Mont. 1997), *overruled on other grounds*, *State v. Kuneff*, 970 P.2d 556 (Mont. 1998). The *Siegal* court also noted that “[w]hile structures concealing this sort of activity may appear no different to the naked eye than other structures, indoor marijuana growing operations typically generate substantial amounts of heat and, hence, infrared radiation, which, with the proper technology, can be detected from outside the structure.” *Id.*

4. *See* Colbridge, *supra* note 1, at 18 (noting that “unlike criminals, police officers must act within the confines of their federal and state constitutions”).

United States Constitution.⁵ An examination of these cases reveals a divergence of opinion on whether law enforcement's use of a thermal imager is constitutional.⁶ Because of this split of authority, the United States Supreme Court has granted certiorari to a case dealing with this issue.⁷

This Comment examines the various views on the constitutionality of thermal image searches and also offers a proposal for resolving the constitutional issues raised by law enforcement's use of thermal imagers. Part II briefly describes how thermal imaging technology operates and the constitutional framework for analyzing law enforcement's use of this device.⁸ Part III outlines the majority and minority views on the constitutionality of

5. See generally *United States v. Kyllo*, 190 F.3d 1041 (9th Cir. 1999) (holding that use of thermal imaging does not constitute search), *cert. granted*, 2000 WL 267066 (U.S. Sept. 26, 2000) (No. 99-8508); *United States v. Robinson*, 62 F.3d 1325, 1332 (11th Cir. 1995) (same); *Ishmael*, 48 F.3d at 857 (same); *United States v. Myers*, 46 F.3d 668, 670 (7th Cir. 1995) (same); *United States v. Pinson*, 24 F.3d 1056, 1059 (8th Cir. 1994) (same). *But see* *United States v. Cusumano*, 67 F.3d 1497, 1510 (10th Cir. 1995) (holding that use of thermal imaging constitutes search), *vacated on other grounds*, 83 F.3d 1247 (10th Cir. 1996).

State courts are also divided on this issue. Compare *People v. Deutsch*, 44 Cal. App. 4th 1224, 1227 (1996) (holding that warrantless use of thermal image was unconstitutional search under Fourth Amendment), *Commonwealth v. Gindlesperger*, 743 A.2d 898, 906 (Pa. 1999) (same), *State v. Young*, 867 P.2d 593, 601 (Wash. 1994) (holding infrared surveillance is search under United States and Washington constitutions), *with* *State v. Cramer*, 851 P.2d 147, 150 (Ariz. Ct. App. 1992) (same), *LaFollette*, 915 S.W.2d at 750 (same), *State v. Niel*, 671 So. 2d 1111, 1112 (La. Ct. App. 1996) (holding thermal imaging is not search under Fourth Amendment), and *State v. McKee*, 510 N.W.2d 807, 810 (Wis. Ct. App. 1993) (same).

The use of thermal imaging by the government has also engendered debate among scholars. See Melinda Foster, Note, *State v. Young: A Cool View Toward Infrared Thermal-Detection Devices*, 30 GONZ. L. REV. 135, 154-61 (1994) (discussing constitutionality of thermal imaging); Lisa Tuenge Hale, Comment, *United States v. Ford: The Eleventh Circuit Permits Unrestricted Police Use of Thermal Surveillance on Private Property Without a Warrant*, 29 GA. L. REV. 819, 837-45 (1995) (same); Susan Moore, Note, *Does Heat Emanate Beyond the Threshold?: Home Infrared Emissions, Remote Sensing, and the Fourth Amendment Threshold*, 70 CHI.-KENT L. REV. 803, 843-52 (1994) (same); Lynne M. Pochurek, Note, *From the Battlefield to the Homefront: Infrared Surveillance and the War on Drugs Place Privacy Under Siege*, 7 ST. THOMAS L. REV. 137, 165-67 (1994) (same); Daniel J. Polatsek, Note, *Thermal Imaging and the Fourth Amendment: Pushing the Katz Test Towards Terminal Velocity*, 13 J. MARSHALL J. COMPUTER & INFO. L. 453, 476-78 (1995) (same); Tracy M. White, Note, *The Heat Is On: The Warrantless Use of Infrared Surveillance to Detect Indoor Marijuana Cultivation*, 27 ARIZ. ST. L.J. 295, 300-08 (1995) (same); Mindy G. Wilson, Note, *The Prewarrant Use of Thermal Imagery: Has This Technological Advance in the War Against Drugs Come at the Expense of Fourth Amendment Protections Against Unreasonable Searches?*, 83 KY. L.J. 891, 899-910 (1994-95) (same).

6. See Luna, *supra* note 3, at 867 (stating that federal courts have been unable to reach consensus regarding constitutionality of thermal imaging searches).

7. See *Kyllo*, 190 F.3d at 1041 (considering constitutionality of use of thermal imaging by law enforcement).

8. For a discussion on thermal imaging technology and how courts have analyzed the technology under the *Katz* test, see *infra* notes 12-35 and accompanying text.

thermal imaging and the rationales supporting each view.⁹ Part IV analyzes the approaches taken by various courts and proposes alternative modes of analysis.¹⁰ Lastly, Part V concludes with a proposal for how the Supreme Court can resolve this issue.¹¹

II. THERMAL IMAGING AND THE FOURTH AMENDMENT

A. *What Is a Thermal Imager?*

Prior to engaging in an analysis of the Fourth Amendment issues arising from the use of thermal imaging by the government, a brief description of the technology is necessary to fully grasp its constitutional implications.¹² A thermal imager detects infrared emissions emanating from an object.¹³ The imager then converts the heat into a color image, usually in the form of a black and white, two-dimensional picture.¹⁴ As the amount of heat increases, the object becomes increasingly white; conversely, a cooler object will appear darker.¹⁵ The device does not measure the actual temperature of the object, but rather, it measures the object's temperature relative to its environment.¹⁶ Activities that generate a signif-

9. For a discussion on the majority and minority views on the constitutionality of thermal imaging, see *infra* notes 36-132 and accompanying text.

10. For a critique of the majority view and a proposed alternative scheme of analysis, see *infra* notes 133-97 and accompanying text.

11. For a concluding thought on resolving this legal controversy, see *infra* notes 199-202 and accompanying text.

12. See Smith, *supra* note 1, at 1077-85 (describing thermal imaging technology); Lisa J. Steele, *Waste Heat and Garbage: The Legalization of Warrantless Infrared Searches*, 29 CRIM. L. BULL. 19, 24-25 (1993) (same). Prior to any discussion concerning the constitutionality of government action, an understanding of the government's action and the devices it uses is necessary. See, e.g., Luna, *supra* note 3, at 864-71 (describing in detail government actions that impact search and seizure law).

13. See Smith, *supra* note 1, at 1079 (stating that thermal imagers detect infrared emissions from objects). An infrared emission is one of several forms of energy, such as radio waves, microwaves, heat, visible light, ultraviolet light, X-rays and gamma rays. See Steele, *supra* note 12, at 24 (noting that "infrared emissions form part of the infrared spectrum"). Thus, infrared radiation is one of many forms of energy in the infrared spectrum. See *id.* (discussing nature of infrared emissions). Infrared radiation is invisible to the human eye. See *id.* (same).

14. See M. Annette Lanning, *Thermal Surveillance: Do Infrared Eyes in the Sky Violate the Fourth Amendment?*, 52 WASH. & LEE L. REV. 1771, 1773-74 (1995) (stating that thermal imagers produce black and white images, denoting warm and cool areas). But see FLIR Systems, *Vision: New Breakthroughs in Imaging Systems*, available at <http://www.flir.com/thermography/resources/gallery/index.htm/lang> (last visited Feb. 9, 2000) (displaying color image capabilities of FLIR model).

15. See McKnight, *supra* note 2, at 1249 (stating that thermal imager provides visual image of objects that are warmer or cooler in shades of black and white).

16. See Colbridge, *supra* note 1, at 18 (stating thermal imager converts invisible infrared radiation emitted from object and converts its readings into two-dimensional, black and white image); see also Lanning, *supra* note 14, at 1773 (describing how FLIR operates). Relative to the ambient environment, a hotter object appears whiter, and conversely, a cooler object appears blacker. See Lanning, *supra* note 14, at 1773.

icant amount of heat produce a detectable “heat signature” that a thermal imager may be able to depict as distinct images under certain conditions.¹⁷ A thermal imager neither enhances nor amplifies the infrared spectrum, but instead solely detects heat, which is a portion of the infrared spectrum.¹⁸

One popular form of thermal imaging is a Forward Looking Infrared Device, or “FLIR.”¹⁹ Some FLIRs are sensitive enough to identify the heat generated by a heartbeat.²⁰ FLIRs can detect the presence of a person behind a wall or curtain and, in effect, determine the state of affairs within a structure.²¹ FLIRs are employed in a variety of ways outside law enforcement, including military and scientific research.²²

17. See Jonathan Todd Laba, Comment, *If You Can't Stand the Heat, Get Out of the Drug Business: Thermal Imagers, Emerging Technologies, and the Fourth Amendment*, 84 CAL. L. REV. 1437, 1466 (1996) (discussing thermal imaging technology). In *United States v. Cusumano*, Judge McKay's dissent noted that military thermal imagers have the capability to depict distinct images, and recognized that it is “only a matter of time before such capabilities trickle down to law enforcement.” 83 F.3d at 1247, 1257 n.12 (10th Cir. 1996) (McKay, J., dissenting in part and concurring in part).

18. See Matthew L. Zabel, Comment, *A High-Tech Assault on the Castle: Warrantless Thermal Surveillance of Private Residences and the Fourth Amendment*, 90 NW. U. L. REV. 267, 280 n.100 (1995) (stating that thermal imagers only detect heat).

19. See Raytheon Systems Company, *The Avenger FLIR Receiver Is Reliable, Affordable, and Easy to Maintain*, available at http://www.ueci.com/rsc/ses/spr/spr_afl/spr_afl.htm (last visited Feb. 9, 2000) (providing information on FLIR technology); see also Lanning, *supra* note 14, at 1772-73 (noting that “[p]olice departments across the country commonly employ the infrared scanner, or Forward Looking Infrared Device (FLIR)”).

The FLIR detects and tracks targets through infrared light rays. See Raytheon Systems Company, *supra* (detailing capabilities of FLIR). Raytheon Systems' website states:

The Avenger Forward-Looking Infrared (FLIR) Receiving Set consists of a FLIR receiver and a display unit. The receiver is a passive, serial scanned, infrared imaging system operating in the 8–12 μ spectral region. The display unit contains all controls required to operate the receiver and presents the operator with a real-time thermal image of the target scene.

Id.

20. See Laba, *supra* note 17, at 1466-67 (noting sensitivity of FLIRs). FLIRs have been used to determine whether rooms in a building were occupied. See *id.* One commentator noted that during the siege of the Branch Davidian complex in Waco, Texas, the FBI used FLIRs to determine whether specific rooms were occupied. See *id.*

21. See *State v. Young*, 867 P.2d 593, 598 (Wash. 1994) (noting that with this device, officer was able to see through walls of home); see also Laba, *supra* note 17, at 1465-67 (examining assumption that FLIRs are non-intrusive technologies).

22. See Steele, *supra* note 12, at 25 (detailing other non-law enforcement uses of thermal imaging technology). Within the scientific community, oceanographers and geologists have used thermal imaging technology. See *id.* (relating different uses of thermal imagers). Utility companies have also used thermal imaging technology to identify overloaded wires and insulators. See *id.*

B. *The Constitutional Framework*

The Fourth Amendment to the United States Constitution provides for “[t]he right of the people to be secure in their persons, houses, papers, and effects against unreasonable searches and seizures.”²³ The Fourth Amendment issue raised by thermal imaging technology is whether law enforcement’s use of the device constitutes a search within the meaning of the Fourth Amendment.²⁴ If a thermal image scan is not a search, then there are no constitutional concerns under the Fourth Amendment.²⁵ If a thermal image scan constitutes a search, then law enforcement officials must abide by Fourth Amendment constraints.²⁶ Thus, determining that a thermal image scan constitutes a search requires law enforcement officials to obtain a warrant or to establish an exception to the Constitution’s warrant requirement.²⁷

23. U.S. CONST. amend. IV.

24. See Smith, *supra* note 1, at 1074-75 (detailing consequences of whether use of thermal imaging constitutes search under Fourth Amendment); see also Anthony G. Amsterdam, *Perspectives on the Fourth Amendment*, 58 MINN. L. REV. 349, 388 (1974) (stating that “[t]o label any police activity a ‘search’ . . . within the ambit of the [Fourth] [A]mendment is to impose [the reasonableness] restrictions upon it”); Bruce G. Berner, *The Supreme Court and the Fall of the Fourth Amendment*, 25 VAL. U. L. REV. 383, 386 (1991) (discussing findings in *Katz*); Lewis R. Katz, *In Search of a Fourth Amendment for the Twenty-First Century*, 65 IND. L.J. 549, 555 (1990) (arguing for recognition of new class of searches called “intrusions” with differing standards of reasonableness); Wayne R. LaFave, *The Fourth Amendment: “Second to None in the Bill of Rights”*, 75 ILL. B.J. 424, 427 (1987) (stating that for Fourth Amendment to apply, “the police conduct in question must constitute either a ‘search’ or a ‘seizure’ as those terms are used in the Fourth Amendment”).

25. See Katz, *supra* note 24, at 554-55 (detailing consequences if conduct is determined not to be search). According to Katz, “[o]nly searches and seizures are limited by the reasonableness standard. All other police activities—*i.e.*, those contacts that are not searches or seizures—may be conducted free of the limitations imposed by the amendment.” *Id.* at 555; accord *Welsh v. Wisconsin*, 466 U.S. 740, 748-49 (1984) (holding that searches and seizures inside private residence without warrant are presumptively unreasonable absent exigent circumstances (citations omitted) (quotations omitted)). The United States Supreme Court has also held that without a warrant, law enforcement cannot obtain information that it could not otherwise legally obtain. See *United States v. Karo*, 468 U.S. 705, 715 (1984) (stating that “[t]he monitoring of an electronic device . . . does reveal a critical fact about the interior of the premises that the government is extremely interested in knowing and that it could not have otherwise obtained without a warrant”).

26. See Katz, *supra* note 24, at 554 (stating consequences if conduct is determined to be search). According to Katz, “[w]hen that threshold inquiry is answered affirmatively [that yes, there is a search], the fact that [F]ourth [A]mendment coverage attaches does not, itself, prohibit police intrusion. It merely means that the police conduct is subject to the amendment’s reasonableness command.” *Id.* at 556.

27. See *California v. Carney*, 471 U.S. 386, 390-91 (1985) (stating Fourth Amendment generally requires police to secure warrant before conducting search). There are exceptions to the general rule that a warrant must be secured before a search is undertaken. See, *e.g.*, *Illinois v. LaFayette*, 462 U.S. 640, 643 (1983) (noting that inventory search constitutes well-defined exception to warrant

In *Katz v. United States*,²⁸ the United States Supreme Court set forth the test used to determine whether the Fourth Amendment applies to certain police activities.²⁹ The Court established the “reasonable expectation of privacy test” to determine whether an activity is a search under the Fourth Amendment.³⁰ In his concurrence, Justice Harlan described a two-part test that first examines whether the individual under surveillance had a subjective expectation of privacy, and second, whether that expectation is objectively reasonable.³¹

When applying the *Katz* test to surveillance technologies, such as a thermal imager, both prongs of the reasonable expectation of privacy test require a thorough review.³² The subjective prong of the test examines the behavior and the measures taken by an individual that indicate an actual expectation of privacy.³³ Under the objective prong, “[t]he test of

requirement); *Carroll v. United States*, 267 U.S. 132, 153-54 (1925) (recognizing automobile exception to warrant requirement).

28. 389 U.S. 347 (1967).

29. *See id.* at 360-61 (Harlan, J., concurring) (describing Fourth Amendment test). In his concurrence, Justice Harlan elaborated the *Katz* expectation of privacy test in language that has “often been relied upon by lower courts in interpreting and applying *Katz*.” WAYNE R. LAFAVE & JEROLD H. ISRAEL, *CRIMINAL PROCEDURE* § 3.2, at 51 (2d ed. 1999). Justice Harlan stated:

My understanding of the rule that has emerged from prior decisions is that there is a twofold requirement, first that a person have exhibited an actual (subjective) expectation of privacy and, second, that the expectation be one that society is prepared to recognize as “reasonable.” Thus a man’s home is, for most purposes, a place where he expects privacy, but objects, activities, or statements that he exposes to the “plain view” of outsiders are not “protected” because no intention to keep them to himself has been exhibited. On the other hand, conversations in the open would not be protected against being overheard, for the expectation of privacy under the circumstances would be unreasonable.

Katz, 389 U.S. at 361 (Harlan, J., concurring).

30. *See* Kearns, *supra* note 1, at 985 (noting that Supreme Court in *Katz* replaced trespass doctrine with “reasonable expectation of privacy” standard for determining when search has occurred under Fourth Amendment).

31. *See Katz*, 389 U.S. at 361 (Harlan, J., concurring) (discussing privacy test). Under the *Katz* Court’s formulation, the analysis shifted from a focus on constitutionally protected areas, such as individuals and houses, to whether there was a reasonable expectation of privacy. *See* LAFAVE & ISRAEL, *supra* note 29, § 3.2, at 49-54 (noting analysis of *Katz* test). *Compare* *Schmerber v. California*, 384 U.S. 757, 767 (1966) (discussing Fourth Amendment protections to involuntary taking of blood), *and* *Clinton v. Virginia*, 377 U.S. 158 (1964) (providing Fourth Amendment protection to home), *with Katz*, 389 U.S. at 361 (finding expectation of privacy in public phone booth). Thus, the new standard no longer requires a physical intrusion into a constitutionally protected place. *See* Kearns, *supra* note 1, at 985 (discussing privacy expectation standards). The Court made “clear that the reach of that [Fourth] Amendment cannot turn upon the presence or absence of a physical intrusion into any given enclosure.” *Katz*, 389 U.S. at 353.

32. *See* Kearns, *supra* note 1, at 985 (discussing application of reasonable expectation of privacy test to surveillance technology).

33. *See id.* (discussing factors examined in determining subjective expectation of privacy). Several cases have discussed this issue. For example, in *California v. Ciraolo*, the defendant harvested marijuana in his backyard. *See* 476 U.S. 207, 210

legitimacy is not whether the individual chooses to conceal assertedly 'private' activity, but 'whether the government's intrusion infringes upon the personal and societal values protected by the Fourth Amendment.'³⁴ Although the reasonable expectation of privacy test is well-established law, its application to new technologies, like thermal imaging, poses vexing legal questions with which courts are currently struggling.³⁵

III. THERMAL IMAGING AND FOURTH AMENDMENT SEARCHES

In light of this background framework, courts throughout the United States have discussed whether law enforcement's use of a thermal imager constitutes a search within the meaning of the Fourth Amendment.³⁶ A majority of courts that have considered the issue have held that a thermal image scan is not a search.³⁷ Several courts, however, have concluded that law enforcement's use of a thermal imager is a search.³⁸

(1986) (stating facts of case). Because the defendant's property had a large fence around it, the police surveyed his property from an airplane. *See id.* Although the Court held that the defendant's expectation of privacy was not objectively reasonable, it noted that the defendant's efforts to erect a ten-foot-tall fence manifested a subjective expectation of privacy. *See id.* at 211 (discussing holding).

34. *Ciraolo*, 476 U.S. at 212 (discussing second prong of reasonable expectation of privacy test (quoting *Oliver v. United States*, 466 U.S. 170, 182-83 (1984))). If the court determines that an individual had a subjective expectation of privacy, then the court will examine whether that expectation is one which society recognizes as reasonable. *See Katz*, 389 U.S. at 361 (Harlan, J., concurring) (describing privacy expectation standards).

35. *See McKnight*, *supra* note 2, at 1247 (noting two-pronged test proposed by Justice Harlan has been starting point for Fourth Amendment analysis for over thirty years).

36. *See, e.g., United States v. Kyllo*, 190 F.3d 1041, 1045-47 (9th Cir. 1999), *cert. granted*, 2000 WL 267066 (U.S. Sept. 26, 2000) (No. 99-8508) (applying *Katz* search and seizure analysis). Courts deciding the constitutionality of a search consistently employ Justice Harlan's test in deciding this issue. *See Mark D. Kiser, Comment, Constitutional Law: Fourth Amendment Searches and Seizures and Thermal Imaging*, 51 FLA. L. REV. 723, 725 (1999) (noting that Justice Harlan's concurrence in *Katz* provided two-part test which became "the modern framework in which courts analyze Fourth Amendment search and seizure issues").

37. *See Kyllo*, 190 F.3d at 1046 (holding thermal imaging is not search); *United States v. Ishmael*, 48 F.3d 850, 853 (5th Cir. 1995) (same); *United States v. Myers*, 46 F.3d 668, 670 (7th Cir. 1995) (same); *United States v. Pinson*, 24 F.3d 1056, 1058 (8th Cir. 1994) (same); *United States v. Robertson*, 39 F.3d 891, 894 (8th Cir. 1994) (same); *United States v. Ford*, 34 F.3d 992, 997 (11th Cir. 1994) (same); *United States v. Deaner*, CR-92-0090-01, 1992 WL 209966, at *1 (M.D. Pa. July 27, 1992) (same), *aff'd*, 1 F.3d 192 (3d Cir. 1993); *United States v. Penny-Feeney*, 773 F. Supp. 220, 228 (D. Haw. 1991) (same); *State v. Cramer*, 851 P.2d 147, 150 (Ariz. Ct. App. 1992) (same); *LaFollette v. Commonwealth*, 915 S.W.2d 747, 750 (Ky. 1996) (same); *State v. Niel*, 671 So. 2d 1111, 1112 (La. Ct. App. 1996) (same); *State v. McKee*, 510 N.W.2d 807, 810 (Wis. Ct. App. 1993) (same).

38. *See United States v. Cusumano*, 67 F.3d 1497, 1510 (10th Cir. 1995) (holding that thermal imaging is search), *vacated on other grounds*, 83 F.3d 1247 (10th Cir. 1996); *People v. Deutsch*, 44 Cal. App. 4th 1224, 1232 (1996) (same); *State v. Siegal*, 934 P.2d 176, 180 (Mont. 1997) (holding thermal imager is search under Montana's constitution), *rev'd on other grounds*, *State v. Kuneff*, 970 P.2d 556 (Mont.

A. *The Majority View*

The United States Courts of Appeals for the Fifth, Seventh, Eighth, Ninth and Eleventh Circuits have held that a thermal image scan does not constitute a search within the meaning of the Fourth Amendment.³⁹ Several state courts have held similarly.⁴⁰

Majority-view courts rely on several different rationales.⁴¹ One rationale posits that thermal imaging is non-intrusive and, therefore, not a search.⁴² Another rationale analogizes thermal imaging to canine sniffs.⁴³ Still other courts reason that because thermal imaging detects heat emitted from a source, thermal imagers should be compared to cases involving the legal status of garbage placed on the curb for collection.⁴⁴ A discussion of cases involving thermal imaging illustrates how majority-view courts determine that thermal image scans do not present constitutional violations.⁴⁵

1. *Thermal Imaging as a Non-Intrusive Technology*

Many courts have reasoned that thermal imaging is not a search within the meaning of the Fourth Amendment because the device “does not intrude in any way into the privacy and sanctity of a home.”⁴⁶ The

1998); *Commonwealth v. Gindlesperger*, 743 A.2d 898, 898 (Pa. 1999) (holding thermal imaging is search); *State v. Young*, 867 P.2d 593, 601, 604 (Wash. 1994) (same).

39. See *Kyllo*, 190 F.3d at 1047 (holding thermal imaging does not constitute search); *Ishmael*, 48 F.3d at 852 (same); *Myers*, 46 F.3d at 670 (same); *Robertson*, 39 F.3d at 894 (same); *Ford*, 34 F.3d at 997 (same); *Pinson*, 24 F.3d at 1058 (same).

40. See *Deaner*, 1992 WL 209966, at *6 (holding thermal image scan not Fourth Amendment search); *Cramer*, 851 P.2d at 150 (same); *Niel*, 671 So. 2d at 1112 (same); *McKee*, 510 N.W.2d at 810 (same).

41. See *Laba*, *supra* note 17, at 1465-69 (detailing arguments used by majority-view courts).

42. See *id.* at 1465-66 (discussing assumption that thermal imaging is non-intrusive technology).

43. See *id.* at 1468-69 (discussing dog sniff analogy); *Lanning*, *supra* note 14, at 1798-1802 (same).

44. See *Laba*, *supra* note 17, at 1467-68 (discussing waste heat analogy); *Lanning*, *supra* note 14, at 1796-98 (same).

45. For a discussion of cases holding that thermal imaging does not constitute a violation of the Fourth Amendment, see *infra* notes 98-132 and accompanying text.

46. *United States v. Myers*, 46 F.3d 668, 670 (7th Cir. 1995) (explaining that although thermal image scan violated defendant's subjective expectation of privacy, society does not recognize this expectation as reasonable); see also *United States v. Kyllo*, 190 F.3d 1041, 1046-47 (9th Cir. 1999), *cert. granted*, 2000 WL 267066 (U.S. Sept. 26, 2000) (No. 99-8508) (same); *United States v. Ishmael*, 48 F.3d 850, 855-56 (5th Cir. 1995) (noting that although defendant exhibited subjective expectation of privacy, society does not recognize this expectation as reasonable).

Several courts and commentators disagree. See *Commonwealth v. Gindlesperger*, 743 A.2d 898, 905-06 (Pa. 1999) (rejecting analogy to dog-sniff searches and finding use of thermal imager without warrant violated Fourth Amendment

United States Court of Appeals for the Eleventh Circuit, in *United States v. Ford*,⁴⁷ observed that the thermal imager used by police in that case appeared to be of “such low resolution as to render it incapable of revealing the intimacy of detail and activity protected by the Fourth Amendment.”⁴⁸ Likewise, the United States Court of Appeals for the Eighth Circuit, in *United States v. Pinson*,⁴⁹ posited that the detection of heat emanating from a home was not an intrusion into the home because no intimate details of the home were observed and because there was no invasion of privacy.⁵⁰ The United States Court of Appeals for the Ninth Circuit, in *United States*

under *Katz* analysis); see also Kearns, *supra* note 1, at 987-98 (discussing how thermal imaging infringes on individual’s right to privacy). These courts and commentators argue that thermal imaging permits the government to observe activities within the home. See Kearns, *supra* note 1, at 987 (considering controversy over intrusion of thermal imaging). The Washington Supreme Court provided examples of how thermal imaging intrudes into a citizen’s privacy. See *State v. Young*, 867 P.2d 593, 599 (Wash. 1994) (stating that device “invaded the home in the sense the device was able to gather information about the interior of the defendant’s home that could not be obtained by naked eye observations”).

47. 34 F.3d 992 (11th Cir. 1994).

48. *Id.* at 996. In *Ford*, agents of the Florida Department of Law Enforcement (“FDLE”) used a thermal imager to scan a mobile home in Venus, Florida. See *id.* at 993. Ford owned the mobile home, which was located on land leased by Ford. See *id.* Based on information that Ford and a cohort were growing marijuana inside the mobile home, FDLE agents and other law enforcement officers covertly approached the structure late at night. See *id.* The officers entered over a locked gate and traveled a quarter of a mile onto the leased property. See *id.* They established surveillance in thick foliage approximately thirty-five to forty-five yards from the mobile home. See *id.*

One agent viewed the mobile home through a thermal imager. See *id.* The agent determined that the mobile home was emitting an inordinate amount of heat through its floor and walls. See *id.* With this finding the FDLE obtained a search warrant for the mobile home. See *id.* The agents’ search revealed a hydroponics laboratory and over 400 marijuana plants. See *id.* To secure his privacy, Ford had boarded the mobile home’s windows behind curtains. See *id.* Ford had also punched holes in the floor of the mobile home and installed a blower to vent the excess heat generated by the artificial lights. See *id.* Ford was arrested and charged with conspiracy to possess marijuana with intent to distribute, in violation of Chapter 21 U.S.C. § 846, and for possession of marijuana with intent to distribute, in violation of Chapter 21 U.S.C. § 841(a)(1). See *id.*

Ford moved to suppress evidence seized from the mobile home prior to trial. See *id.* (discussing defendant’s motion). Ford challenged the FDLE’s warrantless use of a thermal imager “arguing that [it] constituted an impermissible search under the Fourth Amendment.” *Id.* Based on a magistrate’s recommendation, the United States District Court for the Southern District of Florida denied Ford’s suppression motion because the thermal image scan did not constitute a search violative of the Fourth Amendment. See *id.* The court reasoned that Ford did not have a reasonable expectation of privacy in heat escaping from his mobile home. See *id.* The United States Court of Appeals for the Eleventh Circuit agreed with the district court and found that a thermal image scan did not constitute a search under the Fourth Amendment. See *id.*

49. 24 F.3d 1056 (8th Cir. 1994).

50. See *id.* at 1058 (stating that thermal imager did not violate privacy). In *Pinson*, a law enforcement search of Pinson’s home revealed an indoor marijuana growing operation. See *id.* at 1057. The affidavit in support of the search warrant

v. Kyllo,⁵¹ trivialized the nature of the police conduct when it stated, “[t]he scan merely indicated amorphous ‘hot spots’ on the roof and exterior wall and not the detailed images of private activity that [defendant] suggests the technology could expose.”⁵²

included results from a thermal image scan, which indicated an excessive amount of heat coming from the roof and a skylight of the residence. *See id.*

On appeal, Pinson argued that “the use of a thermal imager to detect the heat emanating from his home without first obtaining a warrant constituted an unreasonable search and seizure in violation of the Fourth Amendment.” *Id.* at 1058. The Eighth Circuit rejected Pinson’s contention holding that a thermal image scan was not a Fourth Amendment search. *See id.* at 1059.

51. 190 F.3d 1041 (9th Cir. 1999), *cert. granted*, 2000 WL 267066 (U.S. Sept. 26, 2000) (No. 99-8508).

52. *Id.* at 1047. In *Kyllo*, an agent of the United States Bureau of Land Management investigated Kyllo for a possible conspiracy to grow and distribute marijuana. *See id.* at 1043. Oregon law enforcement officials informed the Bureau that Kyllo and Luanne, his wife, resided in an apartment complex where other suspects resided. *See id.* The law enforcement officials also informed the Bureau that Luanne had been arrested the month before for delivery and possession of a controlled substance and that Kyllo had once told a police informant that he and Luanne could supply marijuana. *See id.* The investigators subpoenaed Kyllo’s utility records. *See id.* Kyllo’s electrical usage was abnormally high, indicating a possible indoor marijuana growing operation. *See id.*

A member of the Oregon National Guard examined Kyllo’s residence with a thermal imager. *See id.* at 1044. The Bureau concluded that there was high heat loss emanating from the roof of Kyllo’s home above the garage and from one wall. *See id.* Kyllo’s house also “showed much warmer” than the other homes. *See id.* This information was interpreted as further evidence of marijuana production, “inferring that the high levels of heat emission indicated the presence of high intensity lights used to grow marijuana indoors.” *Id.*

A warrant was issued to search Kyllo’s home. *See id.* The search revealed an indoor marijuana cultivation operation with more than 100 plants. *See id.* Marijuana, weapons and drug paraphernalia were seized. *See id.* Kyllo was indicted for manufacturing marijuana. *See id.*

The United States District Court for the District of Oregon denied Kyllo’s motion to suppress the seized evidence, following a hearing. *See id.* Kyllo entered a conditional guilty plea and was sentenced to a prison term of sixty-three months. *See id.* Kyllo then appealed the denial of the suppression motion, challenging several portions of the affidavit as well as the warrantless thermal imager scan. *See id.*

A panel of the United States Court of Appeals for the Ninth Circuit found that although the portion of the officer’s affidavit discussing Kyllo’s energy usage was false and misleading, the false statements were not knowingly or recklessly made. *See United States v. Kyllo*, 37 F.3d 526, 529 (9th Cir. 1994) (discussing reasoning of court). Although the court concluded it was proper for the magistrate judge to consider that portion of the affidavit in determining probable cause to issue the search warrant, the panel remanded the case for an evidentiary hearing on the intrusiveness and capabilities of the thermal imager. *See id.* at 531 (noting procedural history).

Following a hearing on remand, the district court concluded that an omission from the affidavit was misleading, but was not knowingly false or made in reckless disregard for the truth. *See United States v. Kyllo*, No. Cr. 92-51-FR, 1996 WL 125594, *5 (D. Or. Mar. 15, 1996) (stating holding). The district court concluded that no warrant was required before the thermal scan. *See id.* at *2. The district court therefore found probable cause to issue the warrant and denied the motion to suppress. *See id.* at *5 (noting procedural history). Kyllo subsequently appealed the district court’s opinion to the Ninth Circuit, which held that a thermal image

Overall, the Eighth, Ninth and Eleventh Circuits' decisions indicate that a significant factor in holding that thermal imaging is not a Fourth Amendment search rests on the notion that the technology does not reveal details that society recognizes as private and worthy of Fourth Amendment protection.⁵³

2. *Analogy to Canine Sniff*

In addition to reasoning that thermal imagers are a non-intrusive technology, courts have also analogized the use of thermal image scans to law enforcement officers' use of trained dogs to detect illegal drugs.⁵⁴ In *United States v. Place*,⁵⁵ the United States Supreme Court upheld the warrantless use of trained drug dogs to detect contraband in a passenger's luggage at an airport.⁵⁶ The Court held that a trained dog's sniff is not a search because it is minimally intrusive.⁵⁷ A United States Court of Appeals for the Ninth Circuit decision, in *United States v. Solis*,⁵⁸ represents another influential decision regarding canine sniffs.⁵⁹ In *Solis*, Customs officers used trained dogs to verify the presence of marijuana inside a suspect's trailer.⁶⁰ In its holding, the Ninth Circuit reasoned that a canine

scan is not a search under the Fourth Amendment. *See Kylo*, 190 F.3d at 1047 (stating holding).

53. *See Kylo*, 190 F.3d at 1046 (noting that whether technology has been used to aid permissible observation or to perform impermissible warrantless search depends on whether technology reveals intimate details).

54. *See id.* (comparing thermal imaging to canine sniff); *Pinson*, 24 F.3d at 1058 (same); *United States v. Deaner*, No. 92-0090-01, 1992 WL 209966, at *4 (M.D. Pa. 1992) (same); *LaFollette v. Commonwealth*, 915 S.W.2d 747, 750 (Ky. 1996) (same); *State v. Niel*, 671 So. 2d 1111, 1111-12 (La. Ct. App. 1996) (same); *State v. McKee*, 510 N.W.2d 807, 809 (Wis. Ct. App. 1993) (same).

55. 462 U.S. 696 (1983).

56. *See id.* at 707 (holding canine sniff does not offend Fourth Amendment).

57. *See id.* (reasoning that canine sniff is minimally intrusive). The Court stated:

A "canine sniff" by a well trained narcotics detection dog . . . does not expose noncontraband items that otherwise would remain hidden from public view, as does, for example, an officer's rummaging through the content of the luggage. Thus, the manner in which information is obtained through this investigative technique is much less intrusive than a typical physical search. Moreover, the sniff discloses only the presence or absence of narcotics, a contraband item. Thus, despite the fact that the sniff tells the authorities something about the contents of the luggage, the information obtained is limited. This limited disclosure also ensures that the owner of the property is not subjected to the embarrassment and inconvenience entailed in less discriminate and more intrusive investigative methods.

Id.

58. 536 F.2d 880 (9th Cir. 1976).

59. *See id.* at 883 (holding canine sniff not search under Fourth Amendment).

60. *See id.* at 881 (detailing investigation and adjudication of defendant). In *Solis*, an unreliable informant told a government drug agent that there was a white semi-trailer parked at the rear of a gasoline station with about one ton of marijuana inside. *See id.* The informant also stated that the trailer was distinguishable

sniff did not constitute a search because “[n]o sophisticated mechanical or electronic devices were used [and the] . . . investigation was not indiscriminate but solely directed to the particular contraband.”⁶¹

Many majority-view courts have relied upon the reasoning in canine sniff cases to determine thermal image scans are not searches.⁶² In *United States v. Pinson*,⁶³ the United States Court of Appeals for the Eighth Circuit found the use of thermal imagers analogous to the warrantless use of police dogs that are trained to sniff and identify illegal drugs.⁶⁴ The *Pinson* court reasoned that “[j]ust as odor escapes a compartment or building and is detected by the sense-enhancing instrument of a canine sniff, so also does heat escape a home and is detected by the sense-enhancing [thermal imager].”⁶⁵ Likewise, in *State v. Niel*,⁶⁶ the Louisiana Court of

by its paper license plate and by white powder on the outside of its rear doors. *See id.* The informant further stated that on at least seven occasions he had assisted a “John Solis” (the defendant) in the unloading of large quantities of white-powder-covered marijuana bricks from similar trailers. *See id.* Based on the informant’s tip, the drug agent proceeded to the designated gas station and found a white semi-trailer with a paper license plate and the trailer appeared to have white talcum powder on its rear doors. *See id.*

The drug agent relayed what he had learned to Customs. *See id.* Consequently, two Customs officers took specially trained drug dogs across public property to the trailer. *See id.* Each dog indicated that marijuana was located inside the trailer. *See id.* The dogs noticed the odor of the marijuana, one from as far away as twenty-five yards. *See id.* Each confirmed the reaction within one foot of the trailer. *See id.*

On the basis of the dogs’ reaction toward the trailer, a magistrate issued a search warrant for the trailer. *See id.* The trailer was searched and a large amount of marijuana was found. *See id.* Subsequently, Solis was indicted for three violations of Chapter 21 U.S.C. § 841(a)(1) for the possession with intent to distribute marijuana and the distribution of marijuana. *See id.* Solis made a pretrial motion to suppress the use of the marijuana as evidence against him. *See id.* None of the conclusions presented at the hearing were disputed by the parties. *See id.* The conclusions included testimony that Blue and Baron, the retrievers used as drug detection dogs, were extremely reliable. *See id.* The government conceded that prior to the use of the dogs no probable cause existed for a warrant to search the trailer. *See id.*

The United States District Court for the Central District of California filed a memorandum and order granting the suppression motion. *See id.* The court reasoned that the warrantless detection of the marijuana by the dogs constituted an unlawful search under the Fourth Amendment and that the subsequent search of the trailer was unlawful because the warrant authorizing it had been issued on the basis of evidence that was the fruit of the earlier illegal search. *See id.* The United States Court of Appeals for the Ninth Circuit held that the use of the dogs here did not constitute a search under the Fourth Amendment. *See id.*

61. *Id.* at 882-83 (holding canine sniff not search under Fourth Amendment).

62. *See United States v. Pinson*, 24 F.3d 1056, 1058 (8th Cir. 1994) (comparing thermal image scan to canine sniff); *State v. Niel*, 671 So. 2d 1111, 1112 (La. Ct. App. 1996) (same).

63. 24 F.3d 1056 (8th Cir. 1994).

64. *See id.* at 1058 (8th Cir. 1994) (concluding that thermal image scan is not search under Fourth Amendment).

65. *Id.* at 1058.

66. 671 So. 2d 1111 (La. Ct. App. 1996).

Appeals argued that because Louisiana state courts had held that non-intrusive canine sniffs do not violate the Fourth Amendment, thermal image scans do not present Fourth Amendment concerns.⁶⁷

These majority-view courts reason that thermal imaging technology simply detects heat escaping from a home.⁶⁸ As a result, the thermal imager serves as the functional equivalent to a trained police dog.⁶⁹ Consequently, majority-view courts hold that if a canine sniff is constitutional, then a thermal image scan also does not violate the Fourth Amendment.⁷⁰

3. *Analogy to Discarded Garbage*

Another line of reasoning that courts often follow is that a thermal image scan detects waste heat.⁷¹ By characterizing the heat emitted from a home as waste, the courts assert that cases involving discarded garbage provide controlling legal authority on this issue.⁷² In *California v. Greenwood*,⁷³ the United States Supreme Court held that a warrantless garbage inspection by police does not violate the Fourth Amendment.⁷⁴ In *Green-*

67. *See id.* at 1111-12 (holding thermal image scan is not search under Fourth Amendment). In *Niel*, the Louisiana Court of Appeals considered whether a thermal imaging scan was a search under the Fourth Amendment to the United States Constitution. *See id.* The case was heard on appeal from a denial of the defendant's application for post-conviction relief. *See id.*

The court denied the defendant's appeal on two grounds. *See id.* First, there were factors, in addition to the evidence of abnormally high readings from the thermal imager, that contributed to a finding of probable cause. *See id.* Second, the thermal image scan was not an illegal search. *See id.* (stating thermal imager did not reveal intimate details of home). The court determined that a thermal image scan was constitutional because cases involving police use of trained drug dogs did not present any constitutional concerns in Louisiana. *See id.* ("[A]s in cases where Louisiana courts have approved the use of drug detection dogs, the utilization of a [thermal imaging] device was nonintrusive.").

68. *See Pinson*, 24 F.3d at 1058 (comparing thermal imaging to canine sniffs); *see also* *United States v. Killo*, 190 F.3d 1041, 1046 (9th Cir. 1999), *cert. granted*, 2000 WL 267066 (U.S. Sept. 26, 2000) (No. 99-8508) (stating that thermal image scan simply "indicated that seemingly anomalous waste heat was radiating from the outside surface of the home, much like a trained police dog would be used to indicate that an object was emitting the odor of illicit drugs").

69. *See Pinson*, 24 F.3d at 1058 (finding thermal imaging device analogous to drug detection dogs) (citing *United States v. Place*, 462 U.S. 696, 707 (1983)).

70. *Compare id.* (holding use of thermal imaging device analogous to use of drug detection dogs), *and Niel*, 671 So. 2d at 1111-12 (holding that thermal imager scan is comparable to canine sniff), *with Place*, 462 U.S. at 707 (stating that canine sniff is *sui generis*).

71. *See McKnight*, *supra* note 2, at 1255-56 (discussing cases which employ waste heat theory).

72. *See United States v. Myers*, 46 F.3d 668, 670 (7th Cir. 1995) (comparing waste heat to discarded garbage); *United States v. Ford*, 34 F.3d 992, 996 (11th Cir. 1994) (same); *Pinson*, 24 F.3d at 1058 (same).

73. 486 U.S. 35 (1988).

74. *See id.* at 40-41 (holding no Fourth Amendment violation where police rummaged through discarded garbage). The Court held that the seizure of Greenwood's garbage bags left at the curb would be a Fourth Amendment violation "only if respondents manifested a subjective expectation of privacy in their

wood, the police used evidence discovered in Greenwood's garbage to obtain a search warrant for his home.⁷⁵ The Court reasoned that constitutional protection does not arise "unless society is prepared to accept that expectation as objectively reasonable."⁷⁶ Because the Court found that society does not recognize a legitimate expectation of privacy in garbage exposed to the public, garbage is not afforded constitutional protection under the Fourth Amendment.⁷⁷

In *United States v. Ford*,⁷⁸ the Eleventh Circuit relied on precedent that held an individual did not have a reasonable expectation of privacy in garbage intentionally exposed to the public.⁷⁹ Similarly, in *United States v. Myers*,⁸⁰ the United States Court of Appeals for the Ninth Circuit reasoned that just as society is unwilling to recognize a reasonable expectation of privacy in garbage left by the curbside and in smoke rising from a chim-

garbage that society accepts as objectively reasonable." *Id.* at 39. Greenwood did not disagree with that standard, but he asserted that he did have an expectation of privacy in his trash. *See id.* His trash, he explained, was only temporarily at the curb and would be deposited at the garbage dump with little likelihood that it would be inspected by anyone. *See id.* The Court accepted the personal privacy expectation of Greenwood under those circumstances, as well as Greenwood's belief that his trash would not become known to the police or the public. *See id.* (noting Greenwood's expectation of privacy in his trash).

The Court, however, imposed an important condition on that privacy expectation if Fourth Amendment protection was to be justified. *See id.* at 39-40 (recognizing limits on expectation of privacy). The Court explained that constitutional protection does not arise "unless society is prepared to accept that expectation as objectively reasonable." *Id.* The Court concluded that Greenwood exposed his garbage to the public sufficiently to defeat his Fourth Amendment claim. *See id.* at 40. The Court notes in support of its conclusion that curbside trash is readily accessible to animals, children, scavengers, snoops and other members of the public. *See id.* Furthermore, the Court noted that the trash was put at the curb for "the express purpose of conveying it to a third party, the trash collector, who might himself have sorted through . . . [Greenwood's] trash or permitted others, such as the police, to do so." *Id.* The Court held that Greenwood did not have a reasonable expectation of privacy in the incriminating evidence he discarded in his trash. *See id.* at 41. That trash was therefore not subject to Fourth Amendment protection. *See id.* at 40 (holding Greenwood's exposure of trash to public defeated Fourth Amendment claim).

75. *See id.* at 38 (stating facts of *Greenwood*). In *Greenwood*, the defendant had placed his trash at curbside for collection. *See id.* at 37. A trash collector picked up the trash and turned the bags over to the police. *See id.* A search of the bags revealed evidence of drug activity, which officers used to secure a warrant to search the defendant's home. *See id.* at 37-38. The search produced cocaine and hashish. *See id.* at 38.

76. *See id.* at 39-40 (stating that in addition to Greenwood's subjective expectation of privacy, society must recognize expectation of privacy in discarded trash to implicate Fourth Amendment protection).

77. *See id.* at 41-42 (stating that society does not recognize expectation of privacy in discarded trash).

78. 34 F.3d 992 (11th Cir. 1994).

79. *See id.* at 996-97 (citing United States Supreme Court precedent as basis for holding that there is no reasonable expectation of privacy in heat emitted from home).

80. 46 F.3d 668 (7th Cir. 1995).

ney, society is also unwilling to recognize an expectation of privacy in the waste heat emitted from a home.⁸¹

These majority-view courts have characterized Greenwood's discarded garbage as legally equivalent to waste heat emitted as a result of indoor marijuana cultivation.⁸² This argument rests on the fact that marijuana growers often intentionally vent excess heat outside their homes using fans and air conditioning units.⁸³ Because society does not recognize as reasonable an individual's expectation of privacy in garbage voluntarily exposed to the public, a thermal imager detection of heat waste is not subject to Fourth Amendment scrutiny.⁸⁴

4. *Plain-View Analogy*

Several majority-view courts have reasoned that when law enforcement officers use a thermal imager to measure the heat emanating from a home, they are merely detecting that which is in plain view.⁸⁵ Although

81. *See id.* at 670 (holding thermal image scan is not search under Fourth Amendment). In *Myers*, the Indiana State Police set up an undercover business designed to attract and identify marijuana growers. *See id.* at 668. The business sold indoor gardening products used by marijuana growers. *See id.* Dale E. Myers attracted the investigators' attention because he inquired about other technology used by marijuana growers. *See id.* Based on these events, the police decided to investigate Myers further. *See id.* The police focused on Myers' electrical usage because indoor cultivation of marijuana requires high-voltage indoor lighting. *See id.* The investigation by the police revealed that Myers' electrical usage was unusually high in non-summer months. *See id.* The police also conducted surveillance of Myers' home and discovered that Myers had not left any garbage out for three weeks. *See id.* The police believed that Myers did not leave any garbage at the curbside because he was disposing of marijuana clippings. *See id.* at 668-69.

In light of this evidence, the police also performed thermal imaging scanning of Myers' residence. *See id.* The scan performed on Myers' residence revealed inordinate amounts of heat, indicating the use of indoor lights associated with marijuana cultivation. *See id.* Based on the results from the thermal imaging and the other evidence gathered up to that point, the police obtained a search warrant for Myers' home. *See id.* The search of Myers' residence uncovered growing and processed marijuana plants and various items of growing equipment. *See id.* Subsequently, Myers was indicted for manufacturing marijuana and possessing marijuana with intent to distribute. *See id.*

Myers moved to suppress the evidence obtained during this search, claiming that the warrant was invalid because it was issued based on the results of an unconstitutional thermal imaging scan. *See id.* The United States District Court for the Southern District of Indiana denied Myers' motion to suppress. *See id.* (ruling on motion to suppress). Myers then pleaded guilty and appealed his motion to suppress to the United States Court of Appeals for the Seventh Circuit. *See id.* (noting disposition of case).

82. *See, e.g.,* United States v. Pinson, 24 F.3d 1056, 1058-59 (8th Cir. 1994) (comparing waste heat to discarded garbage); *Ford*, 34 F.3d at 997 (same).

83. *See, e.g.,* Pinson, 24 F.3d at 1057-58 (discussing how defendants vented excess heat to maintain proper growing temperature).

84. *See Myers*, 46 F.3d at 670 (holding thermal image scan not search under Fourth Amendment).

85. *See Ford*, 34 F.3d at 996-98 (applying plain-view doctrine to thermal imaging); United States v. Deaner, No. 92-0090-01, 1992 WL 209966, at *4 (M.D. Pa.

this doctrine has traditionally been limited to situations where officers discover something in plain view, visually, with their natural senses, courts have extended the doctrine to thermal imaging cases involving heat, a medium which is not detected visually.⁸⁶

These majority-view courts have compared the use of a thermal imager to an aerial-mapping camera.⁸⁷ In *United States v. Dow Chemical Co.*,⁸⁸ the United States Supreme Court held that a government agency's aerial photographs of an industrial plant taken with a highly sophisticated mapping camera located in navigable airspace did not violate the Fourth Amendment.⁸⁹ In *Dow Chemical*, the Court reasoned that no search oc-

July 27, 1992) (same) (citing court's reasoning found in *United States v. Solis*, 563 F.2d 880, 882-83 (9th Cir. 1976)), *aff'd*, 1 F.3d 192 (3d Cir. 1993).

86. See *Florida v. Riley*, 488 U.S. 445, 450-52 (1989) (holding that law enforcement officers did not "search" defendant's greenhouse, which was missing ceiling panel, when they flew over structure and observed marijuana growing operation because this activity was subject to observation by general flying public); *California v. Greenwood*, 486 U.S. 35, 40-42 (1988) (holding that defendant did not have reasonable expectation of privacy in curbside garbage left for pickup because he risked exposing contents of garbage to snoops, animals and mischievous children); *California v. Ciraolo*, 476 U.S. 207, 213-14 (1986) (holding that because defendant risked exposing his marijuana garden to general flying public, police officers were not "searching" when they flew over his property and observed growing crops); *United States v. Knotts*, 460 U.S. 276, 281-82 (1983) (ruling that defendant traveling in automobile had no expectation of privacy in his movements because he voluntarily conveyed his movements to anyone who wanted to look); *Smith v. Maryland*, 442 U.S. 735, 742-44 (1979) (holding that defendant relinquished his expectation of privacy in telephone numbers when he dialed by risking their exposure to telephone company).

87. See, e.g., *Ford*, 34 F.3d at 996-97 (discussing Court's decision in *Dow*). The court in *Ford* compared the FLIR to an aerial mapping camera used to photograph a manufacturing facility. See *id.* at 996. The *Ford* court stated that the thermal images, like the photographs taken by the mapping camera, did not penetrate any walls and were incapable of "revealing the intimacy of detail and activity protected by the Fourth Amendment." *Id.* The court also discussed the principles set forth in *Florida v. Riley*. See *id.* (stating aerial photography did not reveal intimate details of home (citing *Riley*, 488 U.S. at 449 (holding that what officers observe from legal vantage point will not amount to Fourth Amendment search))).

88. 476 U.S. 207 (1986).

89. See *id.* at 239 (stating facts of *Dow Chemical*). In *Dow Chemical*, the Court considered whether the EPA's aerial photography of Dow's plant with a mapmaking camera mounted on an airplane flying within navigable airspace was a search in violation of the Fourth Amendment. See *id.* at 229 (describing facts of case). Dow contended that the photographs violated the Fourth Amendment because the EPA took photographs of the "industrial curtilage," and Dow had a reasonable expectation of privacy in that area. See *id.* at 232-33. Dow conceded that photographs taken from a nearby hillside, or naked-eye observation from a simple fly-over, would be permissible under the Fourth Amendment. See *id.* at 234.

The Court first addressed Dow's contention that the "industrial curtilage" around Dow's plant commanded the same constitutional protection as the curtilage of a private home. See *id.* at 235 (considering whether industrial curtilage is protected under the Fourth Amendment). Dow contended that the Court should regard Dow's 2000-acre plant as industrial curtilage because Dow took all reasonable precautions to prevent access from the ground level. See *id.* at 236 (stating Dow argued that he barred access on ground level). The Court concluded that the

curred because the equipment, although enhanced to some degree, was generally available to the public, and the flight was conducted in navigable airspace.⁹⁰ The Court noted, however, that to “hear and record confidential discussions of chemical formulae or other trade secrets would raise very different and far more serious questions.”⁹¹

Several majority-view courts have applied the *Dow Chemical* Court’s holding that a thermal image scan is not a search under the Fourth Amendment.⁹² For example, in *United States v. Ishmael*,⁹³ the United States Court of Appeals for the Fifth Circuit held that a thermal image scan did not constitute a search under the Fourth Amendment because the device was used in an open field and, thus, officers were entitled to observe the defendant’s building.⁹⁴ The Fifth Circuit rejected the notion that a ther-

plant area fell somewhere between “open fields” and curtilage with regard to the privacy interest, the Court would accord the plant area. *See id.* at 236-37. The Court noted that the government’s surveillance of private property with highly sophisticated devices might be constitutionally prohibited, but concluded that the mapmaking camera that the EPA used did not supply sufficient detail to raise constitutional concerns. *See id.* at 238-39 (stating photos did not reveal intimate details, thus they did not violate Fourth Amendment). Because the plant area did not command as high a privacy interest as a curtilage, and the mapmaking camera did not reveal too much intimate detail, the Court concluded that Dow did not have a reasonable expectation of privacy in protecting the plant area from aerial photographs of this type. *See id.* at 235-39 (noting that if photos had revealed intimate details there would be Fourth Amendment protection).

Justice Powell noted that the majority did not explicitly follow the *Katz* analysis. *See id.* at 244, 247 (Powell, J., concurring in part and dissenting in part) (stating that Court does not reject *Katz* standard). Justice Powell then applied the *Katz* test. *See id.* at 247-52 (analyzing case using *Katz*). Justice Powell first concluded that trade secret laws indicated that society will accept as reasonable Dow’s privacy interest in its open air plant area. *See id.* at 248-49 (concluding that as long as Dow attempts to protect trade secrets, law will recognize expectation of privacy as reasonable). Justice Powell rejected the majority’s reliance on the “open fields” doctrine. *See id.* at 250 (stating that open fields doctrine is not relevant). Justice Powell also criticized the majority’s opinion for relying on the trespass doctrine that *Katz* repudiated. *See id.* at 252 (disapproving of trespass theory). Because the photographs infringed on Dow’s expectation of privacy that society has recognized as legitimate, the EPA’s taking of photographs without a warrant violated the Fourth Amendment. *See id.* (stating majority’s decision was consistent with Fourth Amendment).

90. *See id.* at 238 (holding aerial mapping not search under Fourth Amendment).

91. *Id.* at 239.

92. *See, e.g., United States v. Ishmael*, 48 F.3d 850, 856 (5th Cir. 1995) (holding thermal image scan is not search under Fourth Amendment).

93. 48 F.3d 850 (5th Cir. 1995).

94. *See id.* at 856-57 (stating that when thermal imager is used in open field there is no Fourth Amendment violation). In *Ishmael*, a confidential source informed Paul Black, a DEA officer, that he had delivered numerous truckloads of concrete re-mix to the Ishmael’s secluded, rural property in Nacogdoches County, Texas in the summer of 1992. *See id.* at 851. Rohn Ishmael took measures to conceal the need for the concrete by manually mixing the concrete near the source’s truck and then driving the concrete to another location on the property. *See id.*

mal imager is the functional equivalent of an X-ray machine that allows

After a hiatus in the investigation, Black resumed his investigation in August of 1993. *See id.* (stating facts of case). He and three other officers returned to the property and observed about sixty empty bags of cement, a dump truck and a concrete re-mixer. *See id.* The next day, Black discovered Rohn Ishmael's criminal record included a conviction for the cultivation of marijuana. *See id.* Black surveyed the Ishmaels' property by air and observed a mobile home and a large steel building separated by 200 to 300 yards. *See id.* Black discovered that the Ishmaels had built a structure beneath the steel building. *See id.* The substructure was wired for electricity and was being fed water from a nearby pond by way of exposed rubber tubes and a water pump. *See id.* The substructure also had an exhaust fan, which was continuously running. *See id.* Black also observed a nearby pallet containing 100 five-gallon plastic buckets. *See id.* Suspecting that the Ishmaels were cultivating marijuana in the structure beneath the steel building, DEA officers boarded a helicopter with a thermal imager and flew over the Ishmaels' property at approximately 500 to 1000 feet. *See id.*

The DEA's scan of the Ishmaels' property showed that, although the water entering the substructure was noticeably cool, the water exiting it was emitting a substantial amount of heat. *See id.* at 852. The recording also showed that the ground adjacent to the substructure was much warmer than the ground further from the substructure. *See id.* The Ishmaels' telephone records indicated that the Ishmaels had made numerous calls to various horticulture shops, two of which appeared on a narcotics intelligence computer base as suppliers for marijuana cultivators. *See id.* Black also subpoenaed the Ishmaels' electrical utility records, which showed that the substructure's power usage was extremely high and far exceeded the mobile home's power usage. *See id.*

In September, 1993, Black used a hand-held thermal imager which made similar findings. *See id.* (stating facts of case). DEA thermographers concluded that the Ishmaels were illegally cultivating marijuana. *See id.* Based on this information Black obtained a warrant to search the steel building and its substructure on the Ishmaels' property. *See id.* The officers executed the warrant and found 770 marijuana plants and several firearms. *See id.*

In October, 1993, the Ishmaels were indicted. *See id.* (discussing facts of case). They later moved to suppress the evidence obtained pursuant to the search warrant, arguing that the readings from the thermal imager constituted an unconstitutional search and that, without those readings, the DEA did not have probable cause to obtain a warrant. *See id.*

The United States District Court for the Eastern District of Texas granted the motion to suppress in February, 1994. *See United States v. Ishmael*, 843 F. Supp. 205, 205 (E.D. Tex. 1994). In particular, the court rejected the plain-view argument on the ground that the heat emissions would not be in plain view without the use of the thermal imager. *See id.* at 212 (noting thermal images were not in plain view). Thus, the district court concluded that the use of the thermal imager constituted a search proscribed by the Fourth Amendment. *See id.* (recognizing that search offended Fourth Amendment because heat was not in plain view). Next, the court proceeded to determine whether the remaining evidence amounted to probable cause. *See id.* at 213-14. The court noted that the DEA had no direct evidence of illegal activity taking place on the Ishmaels' property. *See id.* The court stated, "The evidence of their activity was consistent with developing a new patented strain of African violets, and innumerable other perfectly legal activities." *Id.* at 214. On this basis, the court concluded that a judge would not find that probable cause existed for issuing a warrant, and it therefore granted the Ishmaels' motion to suppress. *See id.* The government appealed the district court's holdings to the Fifth Circuit. *See Ishmael*, 48 F.3d at 852 (addressing district court's decision).

the police to see inside a structure.⁹⁵ The court instead asserted that as long as the law enforcement agents were lawfully present on Ishmael's property, the use of the thermal imager did not constitute a Fourth Amendment violation.⁹⁶

Although majority-view courts have compared thermal image scans to other constitutionally permissible police conduct, the variety of approaches taken by majority-view courts underscores the challenge of analyzing new technologies in accordance with old legal frameworks.⁹⁷

B. *The Minority View*

Despite the majority view, several courts have determined that thermal imaging constitutes a search under the Fourth Amendment.⁹⁸ These courts focus on the intrusive nature of this technology.⁹⁹ Minority-view courts also focus on the individual's expectation of privacy in the activities conducted within the home, rather than on the expectation of privacy in the heat emitted from the residence.¹⁰⁰ The analysis concentrates on the

95. See *Ishmael*, 48 F.3d at 856 (discussing defendant's argument that thermal image scan constitutes search under Fourth Amendment). The court responded that a thermal imager presents "no greater intrusion on one's property than a precise mapping camera, an electric beeper or a pen register," which have all passed constitutional muster. *Id.*

96. See *id.* at 856-57 (arguing that law enforcement officials were lawfully present and use of thermal imager did not alter conclusion that search did not violate Fourth Amendment). The district court, in *Ishmael*, characterized that structure as a business and, therefore, the Fifth Circuit was bound by the district court's factual conclusion. See *id.* (stating that Fifth Circuit could only review for clear error). As a result, the officers were entitled to go as "close to the structure as necessary to look inside without physically entering." *Id.* at 857 (quoting *United States v. Pace*, 955 F.2d 270, 276 (5th Cir. 1992)). Because there was no recognized concept of business curtilage, the Ishmaels could not assert that the police failed to conduct the thermal image scan in an open field. See *id.* (finding use of thermal image scan was constitutional).

97. See McKnight, *supra* note 2, at 1259 (noting that courts are straining to put "square peg in a circle" by employing various analogies).

98. See *United States v. Cusumano*, 67 F.3d 1497, 1506 (10th Cir. 1995) (holding thermal image scan constitutes search), *vacated on other grounds*, 83 F.3d 1247 (10th Cir. 1996); *Commonwealth v. Gindlesperger*, 743 A.2d 898, 906 (Pa. 1999) (same); *State v. Siegal*, 934 P.2d 176, 180 (Mont. 1997) (same), *rev'd on other grounds*, *State v. Kuneff*, 970 F.2d 556 (Mont. 1998); *State v. Young*, 867 P.2d at 601, 604 (Wash. 1994) (same); *State v. Deutsch*, 44 Cal. App. 4th at 1224, 1232 (1994) (same).

99. See *Gindlesperger*, 743 A.2d at 901-02 (stating that thermal imagers reveal intimate details within home).

100. See generally *Cusumano*, 67 F.3d at 1501 (stating that expectation of privacy is in activities that produce heat signature that thermal imager can detect); *Gindlesperger*, 743 A.2d at 903 (same); *Young*, 867 P.2d at 604 (same); *Deutsch*, 44 Cal. App. 4th at 1236 (same). Minority-view courts prefer to analogize a thermal imager to a beeper that is used to track the movements of a suspect. See, e.g., *Gindlesperger*, 743 A.2d at 905-06 (comparing thermal imager to beeper).

indoor activities that generate heat.¹⁰¹ In particular, the analysis focuses on the indoor activities that create the heat signature detected by a thermal imager.¹⁰² A minority-view analysis contrasts with the analysis of some of the majority courts, which center their analyses on the heat escaping from the home.¹⁰³

The Pennsylvania Supreme Court, in *Commonwealth v. Gindlesperger*,¹⁰⁴ reiterated the guiding principle for minority-view courts when it asserted, "Courts that have . . . found the use of thermal imaging devices to be constitutionally repugnant have done so based upon the conclusion that these devices do, in fact, reveal intimate details occurring within the sanctity of the home, the place deserving the utmost protection pursuant to the Fourth Amendment."¹⁰⁵

101. See Colbridge, *supra* note 1, at 21-23 (identifying heat source as focus of analysis).

102. For a discussion of thermal imaging and how the technology works, see *supra* notes 12-22 and accompanying text. As the *Cusumano* court argued, the image created by the thermal imager can be detailed enough to depict the activities within the home. See *Cusumano*, 67 F.3d at 1501 (distinguishing between waste heat and heat signature). The *Cusumano* court further argued that focusing on the waste heat rather than the heat signature ignores the purpose of the device. See *id.* (rejecting waste heat principle). In particular, the court stated "[u]nder optimal conditions—viewing through an open window into a darkened room, for example—the imager . . . might well be able to resolve these heat signatures into somewhat indistinct images." *Id.* The court in *Young* also noted a thermal imager's capacity. See *Young*, 867 P.2d at 595 (noting imager detects surface temperature differences). A thermal imager, it was argued, could detect a human form through a curtained window under certain circumstances. See *id.* (remarking that imager could detect person through window if he or she leaned against curtain).

103. See *United States v. Myers*, 46 F.3d 668, 669 (7th Cir. 1995) (examining defendant's expectation of privacy in heat emitted from home); *United States v. Ford*, 34 F.3d 992, 995 (11th Cir. 1994) (same); *United States v. Pinson*, 24 F.3d 1056, 1058 (8th Cir. 1994) (same).

104. 743 A.2d 898 (Pa. 1999).

105. *Id.* at 901-02. In *Gindlesperger*, the Pennsylvania Supreme Court held that a thermal image scan constituted a search under the Fourth Amendment. See *id.* at 906. In 1994, police officers entered the basement area of Gregory Gindlesperger's residence pursuant to a search warrant and seized approximately twenty-one marijuana plants. See *id.* at 898. Probable cause for the search was based on information provided by a confidential informant that marijuana was being cultivated. See *id.* at 898-99. The police confirmed this information through a thermal imager scan. See *id.* at 899. The search warrant was based, in part, on the fact that "[t]his heat source would be consistent with the heat source coming from the artificial lighting used in the growing of marijuana." *Id.* Gindlesperger's home was then searched and police found artificial lighting equipment as well as marijuana plants in the basement. See *id.* He was arrested and charged with various violations of Pennsylvania's drug laws. See *id.* Gindlesperger was found guilty of all the charges against him, and on appeal, the Superior Court of Pennsylvania reversed the trial court's order denying Gindlesperger's suppression motion. See *id.*

Although Gindlesperger asserted a state constitutional challenge to law enforcement's warrantless use of a thermal imager to scan his residence, the court concluded that such use violated the Fourth Amendment. See *id.* at 906 n.3. Thus, the court did not address Gindlesperger's state constitutional claim. See *id.* (stating state constitutional claim not at issue). The court concluded that it only needed to

Similarly, in *State v. Young*,¹⁰⁶ the Washington Supreme Court held that a thermal image scan constitutes a violation of the Fourth Amendment.¹⁰⁷ The *Young* court rejected the garbage and canine sniff analogies.¹⁰⁸ The court noted that a thermal image scan cannot be compared to discarded garbage.¹⁰⁹ Unlike when a person discards garbage, a person does not foresee other people using sophisticated instruments to detect waste heat.¹¹⁰ The court noted that a thermal imager “produces an image of the interior of the home that otherwise is protected by the home’s walls . . . [this] allows the government to intrude into the defendant’s home and gather information about what occurs there.”¹¹¹ According to the court, “[i]t is this reasonable expectation of privacy in the home that is violated by warrantless infrared surveillance, not the expectation of privacy in ‘heat waste’” as majority-view courts assert.¹¹²

Likewise, the Washington Supreme Court found the canine sniff analogy unconvincing.¹¹³ The court held that canine sniffs could not be compared to thermal image scans in that canine sniffs are unique because they detect the existence or non-existence of illegal drugs.¹¹⁴ Even if appropriate, the court reasoned that “the use of a trained dog to sniff for narcotics outside the defendant’s apartment door constituted a search” that violated the Fourth Amendment.¹¹⁵ In rejecting the analogies posited by other

address whether the conduct violated the Fourth Amendment because if the conduct violates the United States Constitution, such conduct would violate Pennsylvania’s version of the Fourth Amendment. *See id.*

106. 867 P.2d 593 (Wash. 1994).

107. *See id.* at 601 (holding thermal image scan violated Fourth Amendment). The precedential value of the court’s opinion is limited because the court did not reach the issue whether the thermal image scan constituted a violation of the Fourth Amendment. *See id.* (stating surveillance violates Art. 1, § 7 of Constitution, therefore court did not address possible violation of Fourth Amendment). The court only addressed the Fourth Amendment in order to “provid[e] guidance to other courts on the subject of sense-enhanced surveillance of a home” *Id.*

108. *See id.* at 601-03 (discussing thermal image scans).

109. *See id.* at 602-03 (discussing garbage analogy).

110. *See id.* at 603 (arguing garbage analogy fails when applied to thermal imagers).

111. *Id.*

112. *Id.*

113. *See id.* (discussing garbage analogy).

114. *See id.* (citing *United States v. Place*, 462 U.S. 696, 707 (1983)).

115. *Id.* at 603 (holding that canine sniffs of private residences constitute Fourth Amendment search). The Washington State Supreme Court relied on *United States v. Thomas*, in which the court noted that:

[w]ith a trained dog police may obtain information about what is inside a dwelling that they could not derive from the use of their own senses. Consequently, the officers’ use of a dog is not a mere improvement of their sense of smell, as ordinary eyeglasses improve vision, but is a significant enhancement accomplished by a different, and far superior, sensory instrument.

757 F.2d 1359, 1367 (2d Cir. 1985).

Based on this reasoning, the Second Circuit found that the defendant “had a legitimate expectation that the contents of his closed apartment would remain pri-

courts, the Washington Supreme Court shifted the analysis away from an individual's expectation of privacy in heat and placed the focus on an individual's expectation of privacy in the home.¹¹⁶

Additionally, in *United States v. Cusumano*,¹¹⁷ and *People v. Deutsch*,¹¹⁸ the courts held that thermal imaging was intrusive and violative of the Fourth Amendment.¹¹⁹ The United States Court of Appeals for the Tenth Circuit in *Cusumano* directly challenged the reasoning employed by majority-view courts when it declared, "Our fellow circuits [have] . . . misapprehended the most pernicious of the device's capabilities [A] thermal imager intrudes upon the privacy of the home . . . because the interpretation of that data allows the government to monitor those domestic activities that generate a significant amount of heat."¹²⁰ Thus, according to the Tenth Circuit, a thermal image scan "strips the sanctuary of the home of one vital dimension of its security: the 'right to be let alone' from the arbitrary and discretionary monitoring of our actions by government officials."¹²¹ In *Deutsch*, the California Court of Appeals agreed with the Tenth Circuit's rationale.¹²² The court noted that "[p]recisely because the thermal imager is indiscriminate in registering sources of heat it is an intrusive tool, which tells much about the activities inside the home which may be quite unrelated to any illicit activity."¹²³

As a result of this perspective, minority-view courts apply a fundamentally different analysis under the reasonable expectation of privacy test than majority-view courts.¹²⁴ Minority-view courts understand the privacy

vate [Thus,] because of [the] defendant[']s heightened expectation of privacy inside his dwelling, the canine sniff at his door constituted a search." *Id.*

116. See *Young*, 867 P.2d at 604 (stating that courts treat searches and seizures in public places differently than searches and seizures occurring in home).

117. 67 F.3d 1497 (10th Cir. 1995), *rev'd on other grounds*, 83 F.3d 1247 (10th Cir. 1996).

118. 44 Cal. App. 4th 1224, 1227 (1996).

119. See *Cusumano*, 67 F.3d at 1506 (finding thermal imaging technology intrusive). Although a Tenth Circuit panel in *Cusumano* found that the warrantless use of a thermal imager violated the Fourth Amendment, the court sitting en banc vacated the decision and decided the case without reaching the constitutional issue. See *Cusumano*, 83 F.3d 1247, 1250 (10th Cir. 1996). Nevertheless, one commentator has described the Tenth Circuit's opinion as "[t]he most exhaustive and compelling analysis" of the issue. WAYNE LAFAYE, SEARCH & SEIZURE § 2.2 (3d ed. 1999).

120. *Cusumano*, 67 F.3d at 1504.

121. *Id.* (citing *Olmsstead v. United States*, 277 U.S. 438, 478 (1928) (Brandeis, J., dissenting)).

122. See *Deutsch*, 44 Cal. App. 4th at 1229 (analyzing *Cusumano*).

123. *Id.* at 1231.

124. See generally *United States v. Field*, 855 F. Supp. 1518 (W.D. Wis. 1994) (holding that thermal image scan constitutes search under Fourth Amendment); *People v. Deutsch*, 44 Cal. App. 4th 1224 (1996) (same). Both *Gindlesperger* and *Young* relied on arguments also presented in both *Field* and *Deutsch*. See *Field*, 855 F. Supp. at 1518-19 (discussing arguments raised by government that thermal imager is no more intrusive than dog sniff); *Deutsch*, 44 Cal. App. 4th at 1228-31 (addressing argument over intrusiveness of thermal imaging).

issue to be whether the individual subject to the thermal image scan had a legitimate expectation of privacy in the heat generating activities within the home.¹²⁵ By focusing on the home, these courts uniformly find both that individuals have an actual expectation of privacy in the home and that society recognizes this expectation as reasonable.¹²⁶

In contrast to majority-view courts, minority-view courts analogize a thermal imager to a beeper used to track the movements of a suspect.¹²⁷ In *United States v. Karo*,¹²⁸ the United States Supreme Court considered “whether the monitoring of a beeper in a private residence, a location not open to visual surveillance, violates the Fourth Amendment rights of those who have a justifiable interest in the privacy of the residence.”¹²⁹ The Court held that use of the electronic device without a warrant violated the Fourth Amendment.¹³⁰ More importantly, the Court asserted that use of the beeper, although less intrusive than a full blown search, nevertheless “reveal[ed] a critical fact about the interior of the premises that the Government is extremely interested in knowing and that it could not have otherwise obtained without a warrant.”¹³¹

Accordingly, courts that focus on the reasonable expectation of privacy in heat generating activities in the home determine that a thermal image scan constitutes a Fourth Amendment search.¹³²

125. See *Commonwealth v. Gindlesperger*, 743 A.2d 898, 903 (Pa. 1999) (holding “that the proper focus of our inquiry should be on whether Appellee was able to demonstrate a legitimate expectation of privacy in the heat-generating activities occurring within his home”).

126. See *Payton v. New York*, 445 U.S. 573, 575 (1980) (prohibiting police from making warrantless and nonconsensual entry into suspect’s home in order to make arrest). In *Payton*, the United States Supreme Court asserted that courts must treat searches of the home differently than searches in public places. See *id.* at 587 (delineating difference in treatment of search of home and search in public). Additionally, the Court in *Silverman v. United States* recognized a person’s right to retreat into his or her home to be free from unreasonable government intrusion. See 365 U.S. 505, 511 (1961) (discussing person’s protections in his or her home). The Court in *United States v. Karo* also recognized that there is a subjective and objective expectation of privacy in the home. See 468 U.S. at 714 (acknowledging expectations of privacy in home). The Court said that:

At the risk of belaboring the obvious, private residences are places in which the individual normally expects privacy free from government intrusion not authorized by a warrant, and that expectation is plainly one that society is prepared to recognize as justifiable.

Id. Based on these decisions, the Supreme Court has recognized that the home deserves more, if not the most, Fourth Amendment protections.

127. See *Gindlesperger*, 743 A.2d at 906 (finding analogy of thermal imager to beeper used in *Karo* applicable); *Young*, 867 P.2d at 602 (same).

128. 468 U.S. 705 (1984).

129. *Id.* at 714.

130. See *id.* at 715 (stating holding).

131. *Id.* (holding that use of electronic beeper violated Fourth Amendment); see also *Gindlesperger*, 743 A.2d at 906 (same).

132. See *Gindlesperger*, 743 A.2d at 898 (examining defendant’s expectation of privacy in activities within home). See generally *Young*, 867 P.2d 593, 604 (Wash. 1994) (same); *State v. Deutsch*, 44 Cal. App. 4th 1224, 1232 (1994) (same).

IV. ANALYSIS

A. *Critique of Majority-View Analogies*

Many majority-view courts analogize the use of thermal imagers to other kinds of law enforcement activities that have been upheld as constitutional.¹³³ Majority-view courts assert that thermal imaging is not a search because it is non-intrusive.¹³⁴ Also, majority-view courts have based their decisions on cases involving canine sniffs, discarded garbage and the plain-view doctrine.¹³⁵ An analysis of the majority-view courts' decisions reveals concerns about the applicability of majority-view analogies to thermal image scans.

1. *Thermal Imaging Is an Intrusive Technology*

Courts concluding that a thermal imager does not intrude into the privacy and sanctity of a home fail to address several shortcomings of this approach.¹³⁶ Primarily, a thermal imager can, under certain circumstances, detect the presence of an individual standing in a window where the blinds are drawn or behind a wall where the wood is thin.¹³⁷ Furthermore, an assertion that a thermal imager does not detect activities within a home belies the very purpose of the device.¹³⁸ On the contrary, thermal imagers have been known to produce clear images that reveal exact details.¹³⁹ For example, thermal imagers can detect the contours of an individual's body.¹⁴⁰ Finally, thermal imagers can also detect body heat

133. For a discussion of analogies drawn by majority-view courts, see *supra* notes 46-97 and accompanying text.

134. For a discussion of thermal imaging as a non-intrusive technology, see *supra* notes 46-53 and accompanying text.

135. For a discussion comparing thermal imaging to canine sniffs, garbage and objects in plain-view, see *supra* notes 54-97 and accompanying text.

136. See *United States v. Cusumano*, 67 F.3d 1497, 1501 (10th Cir. 1995) (stating that majority-view court misapprehended most intrusive capabilities of device where machine intrudes upon privacy of home because data allows government to monitor domestic activities that generate significant amount of heat), *rev'd on other grounds*, 83 F.3d 1247 (10th Cir. 1996).

137. See *Laba*, *supra* note 17, at 1465 n.170 (citing *Young*, 867 P.2d at 594).

138. See *generally* *United States v. Field*, 855 F. Supp. 1518, 1531 (W.D. Wis. 1994) (noting that thermal imagers can detect tear ducts on face); *State v. Young*, 867 P.2d 593, 595 (Wash. 1994) (noting that thermal imagers can detect "a human form through an open [curtained] window when the person is leaning against [the] curtain" or when person is leaning against plywood door).

139. See *Lanning*, *supra* note 14, at 1773 (describing capabilities of FLIR technology).

140. See *Charles Stanley, Infrared Tool Helps Cops Stay Out of Dark*, CHI. TRIB., July 26, 1994, at 3 (stating FLIRs revealed detailed image of eyeglasses and facial hair). Some FLIR are sensitive enough to detect a heartbeat. See *Laba*, *supra* note 17, at 1465 (discussing potential sensitivity of FLIR).

through a thin partition.¹⁴¹ Thus, the capabilities of this technology indicate that more intimate details than waste heat can be detected.¹⁴²

When analyzing the capabilities of thermal imaging, majority-view courts improperly focus on waste heat and an individual's expectation of privacy in waste heat.¹⁴³ Rather, these courts should appreciate the degree to which thermal imaging goes beyond a simple detection of heat.¹⁴⁴ Such a consideration would move these courts toward providing greater Fourth Amendment protections in this area.¹⁴⁵

2. *Canine Sniffs Are Distinguishable from Thermal Image Scans*

The majority-view's reliance on the analogy of a thermal imager to a canine sniff is flawed for several reasons.¹⁴⁶ A primary flaw is that a canine sniff only detects the existence of narcotics.¹⁴⁷ A canine sniff is limited, but a thermal image scan detects all sources of heat, both legal and illegal.¹⁴⁸ Furthermore, even if the canine sniff analogy were valid, canine sniffs have been considered searches when conducted at an individual's home.¹⁴⁹ In these circumstances, a thermal image scan of a private resi-

141. See Lanning, *supra* note 14, at 1773 (describing thermal imaging technology).

142. For a discussion of the capabilities of thermal imagers, see *supra* notes 12-22 and accompanying text.

143. See McKnight, *supra* note 2, at 1254 (noting that court holding thermal image scan is search finds that proper focus is on heat generating activities that occur within home, rather than heat escaping from home).

144. See *id.* (stating that true worth of thermal imager to government is predicated upon translation of heat reading into information about activities within home that generated heat).

145. See *United States v. Ishmael*, 48 F.3d 850, 855 (5th Cir. 1995) (stating that "more sophisticated forms of technology increase the likelihood that their warrantless use will constitute an unreasonable intrusion").

146. For a discussion of the majority-view's analogy of thermal imaging to canine sniffs, see *supra* notes 54-70 and accompanying text.

147. See *United States v. Place*, 462 U.S. 696, 707 (1983) (stating that canine sniff reveals only presence or absence of drugs). As one commentator has noted, a canine sniff is limited in its capacity to search, whereas a "FLIR scan . . . reveal[s] information about the house and its occupants that is not illegal." Lanning, *supra* note 14, at 1801. A trained canine reacts only to the presence or absence of drugs, while a FLIR reveals any source of heat. See Steele, *supra* note 12, at 31 (comparing abilities of trained dog versus FLIR). Because there is nothing inherently illegal about anomalous sources of heat, law enforcement should not be able to infer the occurrence of illegal activity. See *id.* (suggesting limitations on inferences drawn from detected heat).

148. See *Place*, 462 U.S. at 707 (stating that canine sniff is uniquely limited). The court in *Place* discussed canine sniffs as an investigatory tool for law enforcement and noted that there is "no other investigative procedure that is so limited both in the manner in which the information is obtained and in the content of the information revealed by the procedure." *Id.*

149. See *State v. Young*, 867 P.2d 593, 603-04 (Wash. 1994) (stating that even if canine sniff analogy was valid, *Place* and *Solis* are distinguishable). The court relied on the reasoning in *United States v. Thomas*. See 757 F.2d 1359 (2d Cir. 1985). In *Thomas*, the United States Court of Appeals for the Second Circuit held that the

dence must be considered a Fourth Amendment search.¹⁵⁰ Considering the heightened expectation of privacy in the home and the uncertain nature of thermal imaging technology, the canine analogy presents serious concerns.¹⁵¹

3. *Waste Heat Is Distinguishable from Discarded Trash*

The analogy that thermal imaging detects waste heat, which, like garbage, is undeserving of constitutional protection, also presents concerns.¹⁵² The *Greenwood* Court posited that, when an individual places garbage at the curb, there is a foreseeable risk that others could rummage through the trash.¹⁵³ An individual, however, cannot realistically expect others to use sophisticated technology to detect the waste heat emanating from his or her home.¹⁵⁴

The Supreme Court in *Greenwood* reasoned that if an individual is concerned about privacy in his or her garbage, he or she may simply avoid placing private information in the garbage.¹⁵⁵ Alternatively, the only way to avoid the risk of intrusion in the case of a thermal imager would be to turn off all heat sources in the home.¹⁵⁶ In addition, one could not stand near an open window or any part of the home constructed of thin mate-

use of a trained dog to sniff for narcotics outside the defendant's apartment door constituted a search that, absent a warrant, violated the Fourth Amendment. *See id.* at 1367 (holding canine sniff constituted search). The *Thomas* court attached significance both to the method of sensory enhancement and to the fact that a private residence was at issue. *See id.* at 1367-68 (emphasizing that canine sense of smell is significant enhancement of officer's ability to detect drugs).

The Washington Supreme Court in *Young* found the reasoning in *Thomas* compelling and stated that "[t]he *Thomas* court correctly recognized that when a private dwelling is the object of a search, and the means used reveal more than what a person can be said to knowingly expose, the protections of the Fourth Amendment are triggered." *Young*, 867 P.2d at 604. The *Young* court maintained that, based on this analysis, "[w]hen the police use sense-enhancing devices to obtain information from someone's home that could not be obtained by unaided observation of the exterior, they should have a search warrant." *Id.* (citing *United States v. Karo*, 468 U.S. 705, 714 (1984)).

150. *See Thomas*, 757 F.2d at 1367 (holding use of trained dog to sniff for narcotics outside defendant's apartment door constituted search).

151. *See Karo*, 468 U.S. at 714 (holding home has higher expectation of privacy); *Payton v. New York*, 445 U.S. 573, 575 (1980) (same).

152. For a discussion of the majority-view's analogy of waste heat to garbage discarded outside a person's home, see *supra* notes 71-84 and accompanying text.

153. *See California v. Greenwood*, 486 U.S. 35, 40-42 (1988) (holding that defendant did not have reasonable expectation of privacy in curbside garbage left for pickup because he risked exposing contents of garbage to snoops, animals and mischievous children).

154. *See id.* (discussing risks involved when discarding garbage).

155. *See id.* (discussing rationale behind holding no expectation of privacy in discarded garbage).

156. *See State v. Young*, 867 P.2d 593, 603 (Wash. 1994) (discussing discarded garbage analogy).

rial, such as plywood, because a thermal imager could detect the individual's presence.¹⁵⁷

The Washington Supreme Court, in *Young*,¹⁵⁸ identified another problem with the garbage analogy.¹⁵⁹ The court noted that a more important distinction between discarded garbage and the images produced by a thermal imager is that the only value of the waste heat is the information that it discloses about the interior of the home.¹⁶⁰ A thermal imager, the court concluded, "allows the government to intrude into the defendant's home and gather information about what occurs there."¹⁶¹ The minority-view analysis, unlike the majority-view approach, requires exploration of the exact nature of thermal imaging as well as the extent to which it goes beyond the mere detection of excess heat.¹⁶²

4. *Waste Heat Is Not in Plain View*

Many majority-view courts often look to plain-view cases to justify holding that a thermal image scan is not a search within the meaning of the Fourth Amendment.¹⁶³ The plain-view analogy, however, is misguided because thermal heat emissions are invisible to the naked eye and can be detected only through the use of highly sophisticated technology.¹⁶⁴ The plain-view doctrine is based on an officer's ability to observe something without the aid of technological enhancements.¹⁶⁵

157. *See id.* (explaining capabilities of thermal imagers).

158. For a further discussion of *Young*, see *supra* notes 159-62 and accompanying text.

159. *See id.* at 602-03 (criticizing majority-view's comparison of thermal imaging to discarded garbage).

160. *See id.* at 603 (discussing thermal imager's ability to reveal nature of activities within home).

161. *See id.* (determining extent to which thermal imager reveals nature of activities within home).

162. *See id.* at 603-04 (distinguishing waste heat from trash). Because the infrared device produces a heat signature, the thermal imager allows the government to peer into and gather information about what occurs in the defendant's home. *See id.* (explaining monitoring capabilities of thermal imager). Examining the cases from this perspective would surely yield a different result. As the Supreme Court noted in *Karo*, a resident has a reasonable expectation of privacy in their home, "a location not open to visual surveillance . . ." *United States v. Karo*, 468 U.S. 705, 714 (1984). It is this reasonable expectation of privacy in the home that is violated by warrantless infrared surveillance, not the expectation of privacy in waste heat. *See id.* (clarifying that reasonable expectation is in privacy of home).

163. For a discussion of majority-view cases applying the plain-view doctrine, see *infra* notes 85-97 and accompanying text.

164. *See United States v. Field*, 855 F. Supp. 1518, 1522 (W.D. Wis. 1994). The FLIR's outstanding characteristic is that it collects energy that cannot otherwise be detected by humans and transforms that energy into a visual image, which can be viewed by the thermographer. *See id.* (discussing FLIR technology). The screen displays the actual objects being detected, but with less definition than a standard television. *See id.* (same).

165. *See Katz v. United States*, 389 U.S. 347, 351 (1967) (stating that Fourth Amendment "protects people, not places"); *see also Oliver v. Thorton*, 466 U.S. 170,

B. *The Majority View and Advanced Surveillance Technologies*

The majority-view's flawed perspective will allow law enforcement officers to use more sophisticated technologies free from constitutional restraints.¹⁶⁶ Focusing on the privacy interest in heat emission rather than the extent to which a technology can detect activities within a home weakens Fourth Amendment protections for the individual.¹⁶⁷

In *Katz*, the Supreme Court held that the Fourth Amendment "protects people not places."¹⁶⁸ In accordance with this holding, the Court rejected the notion that an actual physical invasion must occur in order for police investigation to constitute a search.¹⁶⁹ The Tenth Circuit in *Cusumano* noted that the Supreme Court in *Katz* did not "dwell upon these

183 (1984) (holding that police officers had not performed a Fourth Amendment search when they entered defendant's open fields without search warrant and discovered marijuana).

In *Oliver*, narcotics agents received a tip that Mr. Oliver was growing marijuana on his farm. *See id.* at 173 (stating facts). Without a warrant, the agents entered Oliver's land by driving past Oliver's home to a locked gate marked with a sign reading "No Trespassing." *See id.* at 173 n.1. The agents walked around the gate and searched Oliver's land, eventually finding a field of marijuana about one mile from his home. *See id.* at 173.

The Court held that any privately-owned property outside of the home and the yard is an "open field" for purposes of the Fourth Amendment and is not entitled to protection, including a heavily forested area. *See id.* at 180 n.11. The Court stated that "the government's intrusion upon the open fields is not one of those 'unreasonable searches' proscribed by the text of the Fourth Amendment." *Id.* at 177. The Court construed the text of the Fourth Amendment strictly and argued that the Fourth Amendment seeks to protect people in their "persons, houses, papers, and effects, [but] is not extended to the open fields." *Id.* at 176.

166. *See United States v. Cusumano*, 67 F.3d 1497, 1501 n.5 (10th Cir. 1995) ("The infrared targeting devices employed by the military are apparently now sophisticated enough to perform this feat [to resolve these heat signatures into somewhat indistinct images]. It seems only a matter of time before such capabilities trickle down to law enforcement."), *vacated on other grounds*, 83 F.3d 1247 (10th Cir. 1996).

167. *See id.* at 1500 (noting misplaced focus of majority-view approach on whether thermal image scans constitute searches under Fourth Amendment). The *Cusumano* court's approach underscores how the majority-view analysis endangers Fourth Amendment protections. *See id.* (emphasizing that all activities in the home warrant Fourth Amendment protections). A focus on an individual's privacy interest in heat emitted will never result in finding that a thermal image scan is a search. *See id.* at 1501 (reasoning that proper focus is not on privacy interest in heat). As majority-view courts make clear, there is no expectation of privacy in heat emitted from a home; however, this approach "ignore[s] both the purpose of the device and the manner in which it operates." *Id.* If these courts examined expectations of privacy in the activities that generate a significant amount of heat detectable by a thermal imager, they would likely reconsider the holding that a thermal image scan is not a search. *See id.* (opining that applying Fourth Amendment principles to heat generating activities inside home could alter majority-view courts' holdings).

168. *Katz*, 389 U.S. at 351-52 (discussing contours of Fourth Amendment protections).

169. *See id.* at 352 (rejecting notion that physical trespass is required to maintain violation of Fourth Amendment).

physical minutiae, but, rather, recognized that the Fourth Amendment broadly protects from government intrusion that which a person reasonably seeks to keep private.”¹⁷⁰ Thus, the holding in *Katz* did not turn on the means by which the government obtained Mr. Katz’s secrets, but rather the measure of his expectation of privacy.¹⁷¹ It is important to note, in conjunction with the minority view, that the Court in *Katz* placed no constitutional significance on the notion “that the inevitable physical manifestations of protected activity extended into a public area.”¹⁷²

Thus, although the majority-view courts claim to follow *Katz*’s holding, their misguided analysis runs roughshod over the very sources of privacy that these courts have recognized the Fourth Amendment protects.¹⁷³ The majority view incorrectly focuses on the passive nature of thermal imaging technology.¹⁷⁴ Although thermal imagers are passive because they measure only temperature differences in the surrounding environment, they are important to law enforcement because they detect many activities within a structure.¹⁷⁵ The technology creates black, white and gray images that serve as proxies for actual activity within a structure, and thus, can monitor the activities within a home.¹⁷⁶

C. A Flexible Fourth Amendment Analysis to Deal with New Technologies

As technology improves and costs in technologies related to thermal imagers drop, more local law enforcement agencies will have an opportu-

170. *Cusumano*, 67 F.3d at 1501 (discussing Court’s decision in *Katz*).

171. *See id.* (noting that for *Katz* Court, attempt to breach privacy reasonably afforded by walls of phone booth itself sufficed to implicate Fourth Amendment).

172. *Id.* at 1502.

173. *See id.* (“We trust that the government would, in most instances, employ a [thermal imager] with discretion; nonetheless, the very existence of such discretion would run afoul of the Constitution.”).

174. *See Commonwealth v. Gindlesperger*, 743 A.2d 898, 901 (Pa. 1999) (noting that relevant focus is not on whether device is passive, but rather what data device records).

175. *See id.* at 902-03 (“The utility of the machine depends therefore not on the inevitable and ubiquitous phenomenon of heat loss but on the presence of distinguishable heat signatures inside the structure.” (quoting *Cusumano*, 67 F.3d at 1501)).

176. *See Cusumano*, 67 F.3d at 1501 (discussing capabilities of thermal image scan). The Tenth Circuit explained that a thermal imager identifies only hot spots on a wall . . . [and] it is the existence of these distinct interior sources that the device indirectly recognizes . . . and records. While heat lost by a building is data of some limited value, the true worth of the device—the very reason the government turned the imager on the home of the Defendants—is predicated upon the translation of these thermal records into intelligible (albeit speculative) information about the activities that generate the observed heat. The utility of the machine depends therefore not on the inevitable and ubiquitous phenomenon of heat loss but on the presence of distinguishable heat signatures inside the structure.

Id.

nity to buy and use sophisticated surveillance devices.¹⁷⁷ The armed forces currently use highly sophisticated thermal imagers, and it is only a matter of time before they are used by local law enforcement.¹⁷⁸

The vast majority of courts that have considered whether a thermal image scan is a search within the meaning of the Fourth Amendment have concluded that it is not a search.¹⁷⁹ The analysis used by these courts, however, threatens an individual's right to privacy.¹⁸⁰ For example, in *United States v. Kyllo*,¹⁸¹ the Ninth Circuit stated that the issue went to the level of government intrusion on activities in the home, where individuals expect privacy, rather than a measurement of heat emissions radiating from the home.¹⁸² By focusing on heat emissions, rather than the monitoring of activities inside the home, majority-view courts leave open the possibility that other more intrusive technologies may pass constitutional muster.¹⁸³

177. See Anne Lamoy, *Generosity of Donor Helps KCK Fire Department*, KAN. CITY STAR, Jan. 15, 2000, at B2 (noting that FLIRs cost about \$20,000). A price quoted in January 2000, for example, is \$5,000 less than the cost of a FLIR as little as six months earlier. See Tim Hrenchir, *Fund-Raiser Aims to Save Helicopters*, TOPEKA CAP. J., Aug. 28, 1999 (stating price of thermal imager).

178. See FLIR Systems, *FLIR Systems Awarded \$17.0 Million in U.S. Navy, Marine Corps Contracts* at <http://www.flir.com/news/newsitem.htm?id=af192363-A1E1-11D3-8A2A00104BCE5660/lang> (last visited Feb. 9, 2000) (detailing NAVY contract to provide thermal imager). FLIR Systems, Inc., designs and manufactures thermal imaging equipment. See *id.* (stating manufacturer name). In August 1999, FLIR announced that it had been awarded a multi-million dollar contract by the U.S. Navy to supply sixty-one thermal imaging systems, referred to as MarFLIR, for its maritime applications. See *id.* (outlining details of government contract). The Navy contracted for up to eighty-five systems over five years. See *id.* (noting amount of systems produced for government).

Many other industries have found thermal imaging useful. See McKnight, *supra* note 2, at 1249-50 (discussing various industries relying on thermal imaging technology). An example of a non-military use of thermal imaging is maintenance of equipment to aid in the discovery of a major electrical fault or design defect in a product. See FLIR Systems, *Imaging Radiometry Provides Valuable Diagnostics* at <http://www.flir.com/news/thermography/index.htm> (visited Feb. 9, 2000) (detailing non-military use of thermal imaging technology). Thermal imaging also provides helpful long-range detection, effective support and added safety during interception and arrest in connection with border control activities. See FLIR Systems, *Border Patrol* at <http://www.flir.com/ground/applications/application.htm?id=1A6D04A4-9D04-11D3-9DC80050040C5701/lang> (visited Feb. 9, 2000) (explaining utility of thermal imaging technology in patrolling borders).

179. For a discussion of cases holding that a thermal image scan is not a search, see *supra* notes 40-97 and accompanying text.

180. See John Gibeauit, *High Tech Heat Seeking: Warrantless Use of Detection Device Splits Appeals Courts*, 84 A.B.A. J. 34, 34 (1998) (stating that currently used analogies are inapplicable to new technologies).

181. 190 F.3d 1041 (9th Cir. 1999), *cert. granted*, 2000 WL 267066 (U.S. Sept. 26, 2000) (No. 99-8508).

182. See *id.* at 1046 (stating issue involved in case).

183. See *Commonwealth v. Gindlesperger*, 743 A.2d 898, 905 (Pa. 1999) (citing expectation of privacy in heat generating activities as basis for holding that thermal image scan is search under Fourth Amendment).

The answer to this conundrum requires a fresh perspective on Fourth Amendment analysis concerning new thermal imaging technologies.¹⁸⁴ Although many academics raise important criticism concerning the reasoning used by some courts, the response need not be that all uses of thermal imagers be deemed searches under the Fourth Amendment.¹⁸⁵

A more reasonable approach to this issue would employ a sliding scale analysis of thermal imaging technology.¹⁸⁶ The more sophisticated the technology, the greater the Fourth Amendment protections should be.¹⁸⁷ In short, a party objecting to a thermal image scan would need to demonstrate that the scan revealed details of activity within the home.¹⁸⁸ This showing could be performed at a hearing where testimony concern-

184. See Gibeauit, *supra* note 180, at 34 (discussing thermal imaging). One commentator has suggested a new Fourth Amendment jurisprudence which keeps pace with innovative technologies. See *id.* (discussing alternative jurisprudence). He stated:

More and more, police are using high-tech snooping to catch crooks, terrorists, polluters and others. And as usual, technological innovations outpace growth in the law, so courts more often than not resort to outdated analogies and off-the-mark reasoning to deal with newfangled problems. Things can only get muddier.

Id.

185. See FLIR Systems, Inc., *Latest News*, at <http://www.flir.com/index.htm/sf=1/lang> (visited Feb. 9, 2000) (noting usefulness of FLIR applications that do not impact individual's privacy rights).

Thermal imagers provide helpful assistance in fields other than law enforcement. See *id.* In fact, FLIR Systems promotes its technology as useful in primarily outdoor applications. See *id.* In particular, FLIR Systems notes that FLIR technology is effective in ground and aerial reconnaissance, firefighting and industrial applications. See *id.*

186. See Slobogin, *supra* note 1, at 386 (stating current law is ill-equipped to handle issues raised by new technology). In an effort to address this concern, the American Bar Association established the Task Force on Technology and Law Enforcement to review the Association's standards for electronic surveillance and other advanced investigatory tools. See *id.* at 387 (discussing origin and task of reviewing body).

187. See, e.g., *Dow Chemical Co. v. United States*, 476 U.S. 227, 236 (1986) (holding that use of camera in area "falling somewhere between 'open fields' and curtilage" did not intrude upon Dow's reasonable expectations of privacy).

The Court in *Florida v. Riley* also noted that the intimacy of detail was relevant for Fourth Amendment purposes but that no search occurred where a police officer in a helicopter circled twice over an enclosed greenhouse at a height of 400 feet and observed through openings in the roof what he thought was marijuana. See *Riley*, 488 U.S. 445, 450 (1989) (stating that police had not executed Fourth Amendment search when viewing greenhouse from helicopter). The Court stated that not every "inspection of the curtilage of a house from an aircraft will . . . pass muster under the Fourth Amendment simply because the plane is within the navigable airspace specified by law," but because no intimate details connected with the use of the home or curtilage were observed, there was no Fourth Amendment violation. *Id.* at 451.

188. See *United States v. Depew*, 210 F.3d 1061, 1061 (9th Cir. 2000) (stating requisite proof needed to show in order to establish Fourth Amendment violation).

ing the thermal imager's capabilities could be heard.¹⁸⁹ Thermal imagers demonstrated to detect excess heat emanating from a specific place in a home, rather than the details inside an individual's home, would require reasonable suspicion, and in cases of thermal images which only detect excess heat generally, no search warrant would be needed when intrusion is minimal.¹⁹⁰ The American Bar Association, for example, notes that "the availability and sophistication of the surveillance technology" and "the extent to which the surveillance technology enhances the law enforcement officer's natural senses" are relevant factors in determining the extent of necessary regulation of devices like thermal imagers.¹⁹¹

As thermal imagers improve in resolution, the reasonable expectation of privacy analysis would focus on individuals' expectations of privacy in their homes rather than in the expectation of privacy in the excess heat emitted from their homes.¹⁹² Accordingly, the police would be required

189. See *United States v. Elkins*, 95 F. Supp. 2d 796, 796 (W.D. Tenn. 2000) (stating that testimonial evidence presented at hearing indicated capabilities of thermal imager).

190. See ABA STANDARDS FOR CRIMINAL JUSTICE ELECTRONIC SURVEILLANCE: TECHNOLOGICALLY-ASSISTED PHYSICAL SURVEILLANCE, Standard 2-9.6(a)(ii)-(iii) (3d ed. 1999) ["ABA DRAFT STANDARDS"] (detailing proposed legal standards to deal with new technologies).

The officer stopping a citizen must be able to articulate something more than an "inchoate and unparticularized suspicion or 'hunch.'" *Terry v. Ohio*, 392 U.S. 1, 27 (1968). The Fourth Amendment requires some minimal level of objective justification for making the stop. See *INS v. Delgado*, 466 U.S. 210, 217 (1984) (stating that level of suspicion is considerably less than proof of wrongdoing by preponderance of evidence).

In *Terry*, the Court recognized that the police must be free to pursue what it termed a "legitimate investigative function." *Terry*, 392 U.S. at 22. Under *Terry*'s two-prong analysis, courts must determine "whether the officer's action was justified at its inception, and whether the action taken was reasonably related in scope to the circumstances which justified the interference in the first place." *Id.* at 20. To satisfy the first prong, "the police officer must be able to point to specific and articulable facts which, taken together with rational inferences from those facts, reasonably warrant that intrusion." *United States v. Kimball*, 25 F.3d 1, 6 (1st Cir. 1994) (quoting *Terry*, 392 U.S. at 21). An examination of the totality of the circumstances satisfies the second prong. See *United States v. Cruz*, 156 F.3d 22, 26 (1st Cir. 1998) (discussing factors indicating reasonableness of stop and frisk).

191. See ABA DRAFT STANDARDS §§ 2-6.1(c)(i)(D)-(E) (listing factors relevant to regulating use of surveillance technology).

192. See *Illinois v. Gates*, 462 U.S. 213 (1983) (holding that Fourth Amendment focuses on whether individual has reasonable expectation of privacy in location searched by police), *aff'd*, *State v. Velasco*, 728 A.2d 493 (1999). The Supreme Court has held that probable cause means that there is "a fair probability that contraband or evidence of a crime will be found," and the level of suspicion required for a *Terry* stop is obviously less demanding than for probable cause. *Id.* at 238. Reasonable suspicion is a less demanding standard than probable cause because it can be established with information that is different in quantity or content than that which is required to establish probable cause. See *id.* (discussing reasonable suspicion standard). Reasonable suspicion can arise from information that is less reliable than that required to show probable cause. See *Alabama v. White*, 496 U.S. 325, 329 (1990) (discussing situations where reasonable suspicion may legitimately arise).

to demonstrate reasonable suspicion or probable cause before using a thermal imager that might infringe on an individual's privacy.¹⁹³

Presently, only cases involving basic thermal imaging technology have been litigated.¹⁹⁴ A majority of courts have concluded that this form of thermal imaging poses minimal threats to the guarantees of the Fourth Amendment.¹⁹⁵ As one commentator suggests, however, when technology changes, the current mode of analysis may no longer be appropriate for advanced technologies.¹⁹⁶ Based on this observation, courts should attempt to refine their analyses, rather than prevent law enforcement from using an effective weapon in the war on drugs.¹⁹⁷

V. CONCLUSION

Although current thermal imaging technology may be of "such low resolution as to render it incapable of revealing the intimacy of detail and activity protected by the Fourth Amendment," future technological developments may challenge that assertion.¹⁹⁸ As one court noted, the nature of technology is to improve and progress.¹⁹⁹ Although most courts agree that current thermal imaging technology poses no constitutional threat, the type of analysis chosen by the majority of courts will likely muddy Fourth Amendment jurisprudence with the advent of more sophisticated technologies.²⁰⁰ Based on these issues, courts that have held that thermal

193. See McKnight, *supra* note 2, at 1265 (exploring *Terry* analysis as applied to thermal imaging).

194. See Gibeauit, *supra* note 180, at 34 (stating that current cases deal with thermal imagers that detect heat coming from structures and convert heat into unclear visual images that distinguish warmer areas from cooler ones).

195. For a discussion of majority-view cases, see *supra* notes 41-97 and accompanying text.

196. See Gibeauit, *supra* note 180, at 34 (discussing current Fourth Amendment analysis). Although not yet litigated, local law enforcement will surely be able to acquire more sophisticated devices, "such as super-high-resolution satellite photography and other tools that enable law enforcement to peer into areas beyond the reach of the human eye." *Id.* The Montana Supreme Court also discussed the limits of the current thermal imaging technology. See *State v. Siegal*, 934 P.2d 176, 181 (Mont. 1997) (examining developments in thermal imaging technology), *rev'd on other grounds*, *State v. Kuneff*, 970 P.2d 556 (Mont. 1998). The *Siegel* court noted that "[at] present, thermal imagers do not 'see through walls' or produce a distinct image of a person, object or activity within a structure, unless, for example, a person has his body pressed against a window." *Id.*, 934 P.2d at 181. Therefore, current thermal imagers can reveal only that a structure is emitting heat and determine the relative quantity of heat being produced. See *id.* (suggesting that heat detecting abilities of thermal imagers are limited).

197. See FLIR Systems, *Thermography*, at <http://www.flir.com/thermography/products/thermacampm695/index.htm> (visited Oct. 21, 2000) (discussing potential and effectiveness of thermal imagers).

198. See *United States v. Ford*, 34 F.3d 992, 996 (11th Cir. 1994) (noting capabilities of military's thermal imagers).

199. See *United States v. Cusumano*, 67 F.3d 1497, 1504 (10th Cir. 1995) (discussing thermal imaging technology).

200. See *id.* at 1508 (discussing implication of majority-view rationale).

image scans are not searches invite “reevaluation of these issues at some indeterminate time in the future,” and allow “the privacy of the home to hinge upon the outcome of a technological race.”²⁰¹ Because of these concerns, the United States Supreme Court will resolve this issue in the 2000-01 term.²⁰² The Court’s opinion hopefully will put to rest this issue and strengthen Fourth Amendment protections for citizens’ privacy that is threatened by thermal imaging.

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201. *Id.* at 1504 (explaining consequences of majority-view analysis).

202. *See* *United States v. Kyllo*, 190 F.3d 1041 (9th Cir. 1999), *cert. granted*, 2000 WL 267066 (U.S. Sept. 26, 2000) (No. 99-8508) (considering issue of whether use of thermal imager by law enforcement officers constitutes Fourth Amendment search).

