

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FLIR Systems, Inc.,

Petitioner,

v.

Leak Surveys, Inc.,

Patent Owner.

IPR No. IPR2014-00411

U.S. Patent No. 8,426,813

**PETITION FOR *INTER PARTES* REVIEW
UNDER 35 U.S.C. § 311 & 37 C.F.R. 42.101**

Pursuant to 35 U.S.C. § 311 and 37 C.F.R. § 42.100, the undersigned, on behalf of and acting in a representative capacity for petitioner, FLIR Systems, Inc. (“Petitioner” and real party in interest), hereby petitions for *inter partes* review of claims 1-58 of U.S. Pat. No. 8,426,813 (“the 813 patent”), issued to Leak Surveys, Inc. (“Patent Owner”).

TABLE OF CONTENTS

I.	MANDATORY NOTICES UNDER 37 C.F.R. § 42.8(A)(1)	1
II.	REQUIREMENTS FOR <i>INTER PARTES</i> REVIEW	1
	A. GROUND FOR STANDING.....	1
	B. IDENTIFICATION OF CHALLENGE.....	2
III.	INTRODUCTION	2
IV.	CLAIMS FOR WHICH <i>INTER PARTES</i> REVIEW IS REQUESTED.....	8
	A. Statutory Grounds of Challenge.....	8
	B. How the Construed Claims Are Unpatentable Under the Statutory Grounds Identified in Paragraph (b)(2) of 37 C.F.R. § 42.104	10
	C. Supporting Evidence Relied Upon to Support the Challenge.....	11
V.	RELEVANT INFORMATION CONCERNING THE 813 PATENT	11
	A. Person of Ordinary Skill in the Art	11
	B. Claim Construction	12
VI.	THERE IS A REASONABLE LIKELIHOOD THAT CLAIMS 1-58 ARE UNPATENTABLE.....	16
	A. Claims 1-3, 6, 10, 12-15, 18, 21, 23, 33, 35, 37, 45-46, 48, and 51 Are Unpatentable Under 35 U.S.C. § 102(b) as Anticipated By Kulp	16
	1. Kulp Discloses the Claimed System for Producing a Visible Image of a Leak.....	16
	2. Claim Chart.....	17
	B. Claims 25-32, 34, and 38-44 Are Unpatentable Under 35 U.S.C. § 103(a) as Being Obvious Over Kulp in View of Spectrogon.....	24

C.	Claims 24, 36, and 57 Are Unpatentable Under 35 U.S.C. § 103(a) as Being Obvious Over Kulp Further in View of OCLI.....	31
D.	Claims 1-4, 6, 8-22, 31, 37-40, 42-56, and 58 Are Unpatentable Under 35 U.S.C. § 103(a) as Being Obvious Over the Merlin Brochure in View of Strachan.....	34
	1. The Combination of the Merlin Brochure with Strachan Discloses All of the Limitations of the Claimed System.....	35
	2. Claim Chart	41
E.	Claims 5 and 7 are Unpatentable Under 35 U.S.C. § 103(a) as Being Obvious Over the Merlin Brochure in View of Strachan, in Further View of Piety.....	54
F.	Secondary Considerations	56
	1. Despite any Allegations of Objective Indicia, the Challenged Patent Claims Would Have Been Obvious.....	56
	2. Commercial Success	57
	3. Long Felt Need and Failure of Others	58
VII.	CONCLUSION.....	60

EXHIBIT LIST

Exhibit No.	Exhibit Description
Exhibit 1001	U.S. Patent No. 8,426,813
Exhibit 1002	U.S. Patent No. 8,193,496 prosecution history, as obtained from PAIR
Exhibit 1003	U.S. Provisional Application No. 60/477,994, filed June 11, 2003
Exhibit 1004	U.S. Provisional Application No. 60/482,070, filed June 23, 2003
Exhibit 1005	U.S. Provisional Application No. 60/540,679, filed January 30, 2004
Exhibit 1006	Declaration of Jonas Sandsten
Exhibit 1007	Merlin Brochure published January 2002 (“Merlin Brochure”)
Exhibit 1008	Strachan, D.C. et al., “ <i>Imaging of Hydrocarbon Vapours and Gases by Infrared Thermography</i> ,” J. Phys. E: Sci. Instrum., Vol. 18, 492-498 (1985) (“Strachan”)
Exhibit 1009	Smith et al., “ <i>Gas Detection Using a High Quantum Efficiency, 2-D IR InSb Staring Array</i> ,” Proc. SPIE 2552, Infrared Technology XXI, 677 (1995) (“Smith”)
Exhibit 1010	Kanagawa et al., “ <i>Flammable Imaging System Using Infrared Absorption</i> ,” Int’l Gas Research Conference, pp. 539-548 (1995) (“Kanagawa”)
Exhibit 1011	Indigo Systems Corporation, “Merlin-MID, InSb MWIR Camera, User’s Guide,” Version 1.10, 414-0001-10 (DATE) (“Merlin User’s Guide”)
Exhibit 1012	Kulp et al., “ <i>Remote Imaging of Controlled Gas Releases using Active and Passive Infrared Imaging Systems</i> ,” 3061 SPIE 269 (1997) (“Kulp”)
Exhibit 1013	Althouse et al., “ <i>Chemical Vapor Detection with a Multispectral Thermal Imager</i> ,” 30 Optical Engineering 1725 (Nov. 1991) (“Althouse”)
Exhibit 1014	Optical Coating Laboratory, Inc., Spectraband Linear Variable Filters, <i>Stock Products Catalog</i> , vol. 5 (1994) (“OCLI”)
Exhibit 1015	U.S. Patent No. 8,426,813 prosecution history, as obtained

Petition for *Inter Partes* Review of U.S. Pat. No. 8,426,813

Exhibit No.	Exhibit Description
	from PAIR
Exhibit 1016	Declaration of Roy D. Malmberg
Exhibit 1017	Spectrogon Catalog of Bandpass Filters (http://www.spectrogon.com/bandpass.html), dated October 6, 2001 (“Spectrogon”)
Exhibit 1018	U.S. Patent No. 5,386,117, issued January 31, 1995 to Piety et al. (“Piety”)
Exhibit 1019	Sandsten et al., “ <i>Real-Time Gas-Correlation Imaging Employing Thermal Background Radiation</i> ,” 6 Optics Express 92 (2000) (“Sandsten”)
Exhibit 1020	Spectrogon: Request for Quotation – Filter Specification (http://www.spectrogon.com/filterquote.html), dated December 5, 2001 (“Spectrogon Filter Quotation”)
Exhibit 1021	Sandsten et al., "Gas imaging by infrared gas-correlation spectrometry," <i>Opt. Lett.</i> , Vol. 21, pp. 1945-1947 (1996) (“Sandsten 1996”)

I. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8(A)(1)

Real Party-in-Interest: FLIR Systems, Inc.

Related Matters: 1) *Leak Surveys, Inc. v. FLIR Systems, Inc.*, Civil Action No. 3:13-cv-02897-L (N.D. Tex. July 25, 2013); 2) *Inter Partes* Review of U.S. Patent No. 8,193,496, to which the 813 patent claims priority, filed concurrently with this Petition (Case No. IPR2014-00434).

Counsel and Service Information:

Lead Counsel: Joseph F. Hetz, Reg. No. 41,070 (jhetz@brinksgilson.com)

Back-up Counsel:

Rickard K. DeMille, Reg. No. 58,471 (rdemille@brinksgilson.com);

Ralph J. Gabric, Reg. No. 34,167 (rgabric@brinksgilson.com)

Postal and Hand-Delivery Address:

Brinks Gilson and Lione, NBC Tower, Suite 3600, 455 North Cityfront
Plaza Drive, Chicago, IL 60611-5599; Telephone: (312) 321-4200; Fax:
(312) 321-4299

II. REQUIREMENTS FOR *INTER PARTES* REVIEW

As set forth below and pursuant to 37 C.F.R. § 42.104, each requirement for *inter partes* review of the 813 patent is satisfied.

A. GROUND FOR STANDING

Pursuant to 37 C.F.R. § 42.104(a), Petitioner hereby certifies that the 813 patent is available for *inter partes* review and that the Petitioner is not barred or

estopped from requesting *inter partes* review challenging the claims of the 813 patent on the grounds identified herein.

B. IDENTIFICATION OF CHALLENGE

Pursuant to 37 C.F.R. § 42.104(b), the precise relief requested by Petitioner is that the Patent Trial and Appeal Board review and invalidate claims 1-58.

III. INTRODUCTION

The 813 patent claims a system for producing a visible image of a chemical leak using a passive infrared camera equipped with a cold filter. The infrared camera is “passive” because it senses the infrared radiation from matter without having to emit an infrared beam itself.

As a brief background to the relevant technology, all matter above absolute zero emits infrared radiation. And just as certain chemicals absorb or reflect certain colors (or wavelengths) of visible light, certain chemicals absorb certain wavelengths of infrared radiation. In both cases, the absorption characteristics are known and largely dependent upon a chemical’s molecular composition. An absorption spectrum chart for a particular chemical shows what percentage of radiation it absorbs at the various wavelengths along the spectrum.

Thus, an infrared camera can be used to identify where a particular chemical may be blocking out (i.e., absorbing) a certain band of infrared rays. Because the technology is not quite as advanced as that for visible cameras, the infrared

cameras provide a much more vivid picture when focused on a narrow band of wavelengths.

Chemical leaks might be particularly important in an industrial setting, especially when they are not easily detectable by human observation. An infrared camera focusing on the band of wavelengths particular to the chemicals of interest could detect leaks and exhaust outlets with better accuracy. The narrower focus actually mitigates for some of the complications that arise as temperatures vary throughout the day.

As the value of the technology is readily apparent, it is not surprising that the field is already well traversed. For example, the Kulp reference (published 1997), discussed in more detail below, was not cited during original prosecution of the 813 patent or its parent, yet it discloses the claimed camera system years before the earliest potential priority date of the 813 patent (June 11, 2003). As such, this Petition will demonstrate that the claimed camera system was not new, and, therefore, is not patentable. In addition, the Strachan reference (1985), also not cited during original prosecution of the 813 patent or its parent, shows that the claimed camera system was obvious over Petitioner's own Merlin-MID camera. That is, the claimed camera system is nothing more than Petitioner's own Merlin-

MID camera¹ equipped with a known filter selected from a well-known catalog of filters, as taught by Strachan.² Fitting the Merlin-MID camera with a custom filter was well known and routinely done, and selecting a particular filter out of a catalog involved nothing more than the common practice disclosed in Strachan of looking

¹ The Merlin-MID camera itself cannot be used as prior art in this petition because *inter partes* reviews must be limited to patents and printed publications. However, the Merlin brochure published in 2002 (Ex. 1007) discloses most of the key details of the Merlin-MID camera that were adapted into limitations of the 813 patent claims.

² Indeed, of the provisional application to the 813 patent includes the admission that the prior art Merlin-MID passive infrared camera from Indigo Systems is a preferred embodiment of the claimed camera: “I contacted Indigo Systems of California and I ordered a 3.38 micron filter and a 3-5 micron camera. . . . The Indigo Systems infrared camera is named the Merlin™” (Ex. 1003, pp. 1-2). The 813 patent also includes the admission: “A preferred infrared camera system 22, for example, for use in an embodiment of the present invention is a Merlin™ mid-wavelength infrared (MWIR) high-performance camera available from Indigo Systems, Inc. in California” (Ex. 1001, 6:19-23). Petitioner, FLIR Systems, Inc., acquired Indigo Systems in 2004.

up which filter covers the known absorption bands of the chemicals of interest (e.g., hydrocarbon gases). Further, Strachan taught that using a passive infrared camera with a custom filter selected to detect a chemical leak was well known. As such, this Petition will also demonstrate that the claimed camera system was obvious and, therefore, not patentable.

Strachan and Kulp also refute two arguments that the Patent Owner³ repeatedly argued in the parent application to gain allowance. First, throughout prosecution of the parent 496 patent,⁴ the Patent Owner argued that his selection of a particular different filter was inventive. Specifically, he argued that a single bandpass filter *wide enough to detect more than one gas*, but narrow enough to provide a visible image of the gas, was inventive because some prior art gas leak detection cameras required multiple filters to detect more than one gas. For example, the 813 patent refers to a single filter centered at about 3.38 μm (Ex.

³ Because Mr. David Furry, the person listed as inventor on the 813 patent, assigned his rights to the patent eventually to Leak Surveys, Inc. sometime before the patent's issuance, this Petition may use the term "Patent Owner" to refer to Mr. Furry himself.

⁴ The 813 patent claims priority to, and recites similar claims as, U.S. Patent No. 8,193,496 ("the parent 496 patent").

1001, 22:58-59) for detecting multiple gases, whereas Patent Owner argued that the applied prior art used very narrow bandpass filters that can only detect a single gas, which meant that different filters were required for detecting different gases. (Ex. 1002, pp. 00416-17, 00441, 00443).

However, Strachan and Kulp each teach what the Patent Owner argued was missing in the prior art. Namely, Strachan and Kulp each discloses a passive infrared camera with a single narrow bandpass filter that is *wide enough to detect multiple chemicals*, while still being narrow enough to provide a visible image of the detected chemical(s).⁵ Specifically, Kulp discloses a filter with a bandpass between about 10300 nm and about 10870 nm that is within the absorption band of more than one chemical.

Strachan discloses a narrow bandpass filter centered at about 3.4 μm with a passband that is wide enough to detect methane, ethane, and propane. (Ex. 1008, p. 493, column 2). Strachan stated that, in choosing this filter, he made use of well-known catalogs of infrared absorption spectra of chemicals showing that the absorption spectra of the majority of hydrocarbon gases are between 3.3 μm and

⁵ Other prior art that was not of record also shows the use of a passive infrared camera with a filter covering the absorption bands of more than one chemical in the context of detecting gas leaks. (Ex. 1006, ¶¶ 30-32).

3.5 μm . (Ex. 1008, p. 493, column 2). Filters in this range were well known at the time, and the Patent Owner admitted that a filter in this range was widely available at the time from numerous manufacturers.⁶ Thus, Strachan shows that there was nothing inventive about the Patent Owner's selection of a filter centered at 3.38 μm , let alone a filter with a width of at least 200 nm, as claimed in Claim 1

As discussed in more detail below, Petitioner believes that the prior art cited in this Petition not only recites all of the elements of the claimed camera, but also rebuts the reasons for allowance proffered by the Patent Owner during the prosecutions of the 813 patent and the original application of the parent 496 patent. Again, the claimed camera system is anticipated by the camera system disclosed in Kulp, which fully anticipates a substantial portion of the 813 patent claims. In addition, because of the 813 patent's overwhelming 57 dependent claims (most dependent directly from claim 1), a few additional prior art references are discussed in this Petition to show that the minor claim limitations of those

⁶ "A preferred bandpass filter providing such performance characteristics [full width at half maximum of 64.4 nm with a center wavelength of 3.38 nm] may be obtained from Spectrogon US, Inc. in New Jersey, for example. . . . There are many different optical bandpass filters available from numerous manufacturers." (Ex. 1001, 8:12-21).

dependent claims would have been obvious to a person of ordinary skill in the art. Furthermore, the claimed camera system is nothing more than Petitioner's own Merlin-MID camera, as disclosed in the Merlin Brochure, equipped with a known filter selected to detect a chemical leak. Thus, Petitioner asserts that there is a reasonable likelihood that the Petitioner will prevail in its challenge of patentability for at least one of claims 1-58 of the 813 patent. Therefore, Petitioner respectfully requests institution of an *inter partes* review of the 813 patent, and for judgment against claims 1-58 as unpatentable under 35 U.S.C. §§ 102 and/or 103.

IV. CLAIMS FOR WHICH *INTER PARTES* REVIEW IS REQUESTED

Petitioner requests *inter partes* review of claims 1-58 of the 813 patent.

A. Statutory Grounds of Challenge

The PTAB applies U.S. law in conducting an *inter partes* review. 35 U.S.C. §§ 311-319. Unpatentability is proven by a preponderance of the evidence. 35 U.S.C. § 316. *Inter partes* review of the 813 patent is requested in view of the following references: Kulp, Merlin Brochure, Strachan, Spectrogon, Piety, Sandsten, and OCLI. Each one of the publications listed above was published more than one year before the earliest possible priority date for the 813 patent, i.e.,

the June 11, 2003 effective filing date of the 813 patent.⁷ In particular, the Merlin Brochure was published January 2002 (*see* Ex. 1016, ¶ 6), and Strachan and Kulp were published in 1985 and 1997, respectively. The Spectrogon and OCLI catalogs were published in 2001 and 1994, respectively. Piety issued as a U.S. patent on January 31, 1995.

Claims 1-3, 6, 10, 12-15, 18, 21, 23, 33, 35, 37, 45-46, 48, and 51 are unpatentable under 35 U.S.C. § 102(b) as being anticipated by Kulp.

Claims 25-32, 34, and 38-44 are unpatentable under 35 U.S.C. § 103(a) as being obvious over Kulp in view of Spectrogon.

Claims 24, 36, and 57 are unpatentable under 35 U.S.C. § 103(a) as being obvious over Kulp in view of OCLI.

Claims 1-4, 6, 8-22, 31, 37-40, 42-56, and 58 are unpatentable under 35 U.S.C. § 103(a) as being obvious over the Merlin Brochure in view of Strachan.

Claims 5 and 7 patent are unpatentable under 35 U.S.C. § 103(a) as being obvious over the Merlin Brochure in view of Strachan, further in view of Piety.

The grounds of unpatentability presented herein based on anticipation (Kulp) and obviousness (Merlin Brochure and Strachan) are not redundant. As a first

⁷ Petitioner in no way concedes that any of the patent claims of the 813 patent are entitled to the June 11, 2003 priority date.

matter, these two grounds address different statutory grounds of unpatentability (102 and 103) based on entirely different art. Additionally, while each ground of unpatentability applies to some common claims, such as claim 1, each ground of unpatentability applies to different sets of dependent claims. Indeed, the 813 patent recites several dependent claims directed to specific embodiments having different filter configurations. For many of those embodiments, only one of the Kulp or the combined Merlin Brochure-Strachan prior art applies. This also shows that the only independent claim (claim 1) encompasses a set of embodiments (based on the various claimed filter configurations) not covered by Kulp alone, or by the combination of Merlin Brochure-Strachan alone. In other words, during the course of this proceeding, if instituted, the Patent Owner could amend the claims to be limited to one of these claimed embodiments that is not covered by one of the Kulp or Merlin Brochure-Strachan grounds. The grounds based on Kulp and the combination of the Merlin Brochure-Strachan are both needed to cover all of the embodiments encompassed by claim 1 and, accordingly, are not redundant.

B. How the Construed Claims Are Unpatentable Under the Statutory Grounds Identified in Paragraph (b)(2) of 37 C.F.R. § 42.104

An explanation of how claims 1-58 are unpatentable under the statutory grounds identified above, including the identification of where each element of the

claim is found in the prior art patents or printed publications, is provided in Section VI, below.

C. Supporting Evidence Relied Upon to Support the Challenge

The supporting evidence relied upon to support the challenge, including the Declarations of Dr. Jonas Sandsten and of Roy D. Malmberg, and the relevance of the evidence to the challenge raised is provided below.

V. RELEVANT INFORMATION CONCERNING THE 813 PATENT

A. Person of Ordinary Skill in the Art

A person of ordinary skill in the art is a hypothetical person who is presumed to know the relevant prior art. Factors that guide the determination of level of ordinary skill in the art may include: (1) type of problems encountered in the art; (2) prior art solutions to those problems; (3) sophistication of the technology; and (4) educational level of active workers in the field. (Ex. 1006, ¶¶ 15, 17). A person of ordinary skill in the art for the 813 patent would have had: (1) at least four years of educational training in fields of engineering or physics, plus at least two years of experience in fields of design, development, engineering or teaching of imaging chemical gases using passive infrared systems; or (2) at least two years of educational training in fields of engineering or physics plus at least four years of experience in fields of design, development, engineering or teaching of imaging chemical gases using passive infrared systems. (Ex. 1006, ¶¶ 16-17).

B. Claim Construction

Pursuant to 37 C.F.R. § 42.100(b), in the present proceeding, a claim in an unexpired patent is to be given its broadest reasonable construction in light of the specification in which it appears. *Garmin Int'l, Inc. et al. v. Cuozzo Speed Technologies LLC*, Case IPR2012-00001, Final Written Decision, Paper 59, p. 8 (P.T.A.B. November 13, 2013). The discussion below provides construction of certain terms of the 813 patent claims. Petitioner's construction of claim terms is not binding upon Petitioner in any litigation related to the 813 patent. Petitioner submits, for the purposes of this *inter partes* review only, that the claim terms not specifically addressed in this section take on their ordinary and customary meaning that the terms would have to one of ordinary skill in the art in view of the specification of the 813 patent.

a. "leak"

Petitioner submits that under the broadest reasonable construction, as applied to the claims of the 813 patent, a "leak" should be defined as any chemical emission, be it (a) an unwanted (or "fugitive") chemical emission or (b) a known ("non-fugitive") chemical emission, such as a chemical gas emission from an exhaust outlet of an airplane, car, or other vehicle, or a chemical gas emission from a smokestack or flare. (Ex. 1006, ¶ 38).

The 813 patent specification supports the interpretation that “leak” refers to a fugitive chemical gas emission. (*See* Ex. 1001, 1:33-43). For example, the 813 patent discusses finding and fixing gas leaks (*Id.*, at 1:33-37; 18:10-12), which refers to unwanted, fugitive emissions. (Ex. 1006, ¶ 39).

The 813 patent specification and prosecution history of the parent application also support the interpretation that “leak” refers to a non-fugitive gas emission. Claim 1 of the 813 patent recites a “leak” of one or more chemicals emanating from a component. (Ex. 1001, 28:44-46). Furthermore, the 813 patent specification specifically lists, among other things, an “exhaust outlet” and a “flare” as an example of a “component” to which are subject to a “leak.” (*Id.*, at 12:22). Accordingly, a gas emission from an exhaust outlet or from a component on a vehicle is a “leak,” as that term is used in the 813 patent. (Ex. 1006, ¶ 40).

In addition, during original prosecution of the parent application, which recited similar claim limitations, the Examiner rejected claims related to visually detecting a “gas leak” based on prior art related to detecting hydrocarbon emissions emanating as intended from a smokestack. (Ex. 1002, p. 00319). Patent Owner disputed the Examiner’s rejection on multiple grounds but never disputed the Examiner’s application of smokestack emissions to gas leaks. (*See Id.*, at pp. 00416-419). In other words, the Examiner applied prior art related to “wanted” or

“known” emissions, i.e., smokestack emissions, and Patent Owner did not dispute the Examiner on that ground.

In summary, a “leak” in the 813 patent should be defined as referring either to an unwanted (fugitive) chemical emission or to a known (non-fugitive) chemical emission emanating from a component, such as from an exhaust outlet, component of a vehicle, flare, or smokestack. (Ex. 1006, ¶ 41).

b. “variable ambient conditions of the area around the leak”

The claims recite “a processor that can process a signal representing the filtered infrared image captured by the infrared sensor device to produce a visible image of the chemical emanating from the component under variable ambient conditions of the area around the leak.”⁸ (Ex. 1001, 28:63-67) (emphasis added).

Petitioner submits that “variable ambient conditions of the area around the leak” means “any change in the environmental conditions, e.g., temperature, of the area around the leak.” (Ex. 1006, ¶ 42).

⁸ The term “variable ambient conditions” was added by amendment during prosecution of the parent 496 patent. (Ex. 1002, Reply to Office Action dated January 4, 2008). Patent Owner argued that this new claim term was supported by the portions of the specification related to, *inter alia*, using the camera at different locations at a plant. (*Id.*, at Corrected Appeal Brief dated September 29, 2008).

While the term “variable ambient conditions” is not defined in the specification of the 813 patent, Petitioner’s proposed construction is supported by the term’s plain and ordinary meaning. According to its plain and ordinary meaning, “ambient conditions” refers to the environmental conditions, e.g., temperature, the area around an item or place. (Ex. 1006, ¶ 43). Thus, “ambient conditions of the area around the leak” refers to the environmental conditions, e.g., temperature, of the area around the leak. (*Id.*). “Variable” means “changing,” according to its ordinary meaning. (*Id.*). Thus, “variable ambient conditions of the area around the leak” refer to “changing environmental conditions, e.g., changing temperature, of the area around the leak.”⁹ (*Id.*).

With respect to the claimed variable, or changing, ambient conditions, the specification of the 813 patent does not define or disclose what magnitude of environmental change constitutes a “variable ambient condition.” Accordingly, under the broadest reasonable construction, as applied to the claims of the 813 patent, *any* change in the environmental conditions of the area surrounding the gas

⁹ Petitioner’s construction is supported by the Board’s Decision during original prosecution of the parent 496 patent dated August 2, 2011, which characterized “different temperatures” as “variable ambient conditions.” (Ex. 1002, p. 00798).

leak, e.g., a temperature change of one degree constitutes “variable ambient conditions.” (*Id.*, at ¶ 44).

For the foregoing reasons, Petitioner submits that “variable ambient conditions of the area around the leak” should be construed as “any change in the environmental conditions, e.g., temperature, of the area around the gas leak.”

VI. THERE IS A REASONABLE LIKELIHOOD THAT CLAIMS 1-58 ARE UNPATENTABLE

A. Claims 1-3, 6, 10, 12-15, 18, 21, 23, 33, 35, 37, 45-46, 48, and 51 Are Unpatentable Under 35 U.S.C. § 102(b) as Anticipated By Kulp

1. Kulp Discloses the Claimed System for Producing a Visible Image of a Leak

Kulp discloses gas leak detection using a passive infrared camera that anticipates claims 1-3, 6, 10, 12-15, 18, 21, 23, 33, 35, 37, 45-46, 48, and 51. In particular, Kulp discloses using a camera equipped with a narrow bandpass cold filter to detect sulfur hexafluoride (SF₆) gas. (Ex. 1012, p. 270). Figure 2 of Kulp shows that the cold filter has an aggregate passband of about 570 nm between wavenumber 920 (about 10870 nm) and wavenumber 970 (about 10300 nm), which meets the claim limitation requiring a passband that is at least about 100 nm. The absorption band of other gases in addition to SF₆ falls well within the bandpass

disclosed by Kulp. (Ex. 1006, ¶ 53; *see also* Ex. 1019, p. 102).¹⁰ Accordingly, Kulp inherently discloses a cold filter with an aggregate bandpass that is within the absorption band of more than one chemical. (Ex. 1006, ¶¶ 53-54 n. 3).

In addition, Figure 9 of Kulp shows that the Ga:Si passive infrared camera provides a visible image of the SF₆ gas at different times of day, or at different temperatures, i.e., at variable ambient conditions. (Ex. 1012, p. 277). While Kulp does not expressly mention a “refrigeration portion,” Kulp discloses a cold filter and a detector array that is cooled to 20K, which means that a refrigeration portion is necessarily present to cool the filter and array. (Ex. 1006, ¶¶ 55-56).

2. Claim Chart

The following claim chart further demonstrates that Kulp discloses each limitation of claims 1-3, 6, 10, 12-15, 18, 21, 23, 33, 35, 37, 45-46, 48, and 51.

Claims 1-3, 6, 10, 12-15, 18, 21, 23, 33, 35, 37, 45-46, 48, and 51	Kulp (Ex. 1012)
1. A system for producing a visible image of a leak of any one or more chemicals of a group of chemicals, the leak emanating from a component, including:	Kulp discloses the use of a passive infrared camera to detect gas leaks. (Kulp, p. 269)

¹⁰ Sandsten (Ex. 1019) is relied on to show an inherent characteristic of Kulp. *See* M.P.E.P. § 2131.01.III. In other words, Sandsten shows that the absorption band of NH₃ is inherently within the passband of the cold filter disclosed in Kulp. (Ex. 1006, ¶ 53-54 n. 3).

Claims 1-3, 6, 10, 12-15, 18, 21, 23, 33, 35, 37, 45-46, 48, and 51	Kulp (Ex. 1012)
a passive infrared camera system including:	Kulp discloses use of a passive infrared camera. (Kulp, p. 270).
a lens assembly including a lens;	Kulp discloses use of a passive infrared camera that includes an f/2 germanium lens. (Kulp, p. 270).
a refrigerated portion including an interior;	Kulp discloses use of a cooled filter, as well as a 20 K operating temperature of the Ga:Si focal plane array (FPA). (Kulp, pp. 270-71, Table 1). ¹¹
an infrared sensor device located in the interior of the refrigerated portion;	Kulp discloses a 128 x 128 Ga:Si detector array. (Kulp, p. 271, Table 1). The detector array is located in the interior of the refrigerated portion because Kulp discloses that the detector array is cooled to 20K. (Kulp, p. 271, Table 1).
a single filter configuration located in the interior of the refrigerated portion and including an optical bandpass filter fixed along an optical path between the lens assembly and the infrared sensor device;	Kulp discloses a single filter configuration that includes at least one fixed, and cooled, optical filter. (Kulp, p. 270). ¹²
a refrigeration system that can cool the interior of the refrigerated portion;	Kulp discloses use of a cooled filter, as well as a 20 K operating temperature of the Ga:Si focal plane

¹¹ A refrigeration portion is therefore necessarily present in Kulp. (Ex. 1006, ¶ 56).

¹² The filter is located in the interior of the refrigerated portion between the lens and detector array because the filter in Kulp is a cooled filter. (Ex. 1006, pp. 21-22).

Claims 1-3, 6, 10, 12-15, 18, 21, 23, 33, 35, 37, 45-46, 48, and 51	Kulp (Ex. 1012)
	array (FPA). (Kulp, pp. 270-71, Table 1). ¹³
wherein at least part of the pass band for the single filter configuration is within an absorption band for each of the chemicals; and	Kulp discloses an aggregate passband that is within the absorption band of more than one chemical, including SF ₆ (Kulp, p. 271; Fig. 2) and Ammonia (Ex. 1019, p. 102, Fig. 12).
wherein the aggregate pass band for the single filter configuration is at least about 100 nm; and	Kulp discloses a single filter configuration with an aggregate bandpass that is between wavenumber 970 (about 10300 nm) and wavenumber 920 (about 10870 nm). (Kulp, p. 271; Fig. 2). Thus, the aggregate passband disclosed in Kulp is about 570 nm, which greater than 100 nm.
a processor that can process a signal representing the filtered infrared image captured by the infrared sensor device to produce a visible image of the chemical emanating from the component under variable ambient conditions of the area around the leak.	Kulp shows in Fig. 9 a visible image of the SF ₆ gas produced using the Ga:Si-based camera with a cold filter. (Kulp, pp. 270, 277; Fig. 9). ¹⁴ Further, Kulp, Fig. 9, shows that the Ga:Si camera provides a visible image of the SF ₆ gas at different times of day, or at different temperatures, i.e., at variable ambient conditions. (Kulp, p. 277).

¹³ A refrigeration system that cools the filter and the FPA is necessarily present in Kulp. (Ex. 1006, p. 22).

¹⁴ Kulp necessarily includes a processor associated with the camera that produced the visible image. (Ex. 1006, p. 22).

Claims 1-3, 6, 10, 12-15, 18, 21, 23, 33, 35, 37, 45-46, 48, and 51	Kulp (Ex. 1012)
2. The system of claim 1, further including a recording device that can record the visible image of the leaking chemical.	Kulp discloses recording the visible image on a SVHS tape. (Kulp, p. 275).
3. The system of claim 2, wherein the recorded visible image can be viewed at a time other than when recorded.	Kulp discloses recording the visible image on a SVHS tape (Kulp, p. 275), the recording being viewable at a time other than when recorded.
6. The system of claim 1, wherein the passive infrared camera system further includes a display screen that can display the visible image of the leaking chemical.	Kulp , Figure 9, shows images produced by the passive infrared camera disclosed in Kulp. (Kulp, p. 277). ¹⁵
10. The system of claim 1, wherein the refrigerated portion is defined by a Dewar container.	Kulp discloses a camera system with a cooled filter and cooled detector array. (Kulp, pp. 270-71). ¹⁶
12. The system of claim 1, wherein the refrigeration system can cool the interior of the refrigerated section to a temperature below about 100 K.	Kulp discloses a refrigeration system adapted to cool the Ga:Si infrared sensor device and the cold filter to 20 K. (Kulp, p. 271, Table 1).
13. The system of claim 1, wherein the processor can process the filtered infrared image captured by the infrared sensor device to produce a visible image of more than one chemical.	Kulp discloses a filter that has a passband wide enough to cover the absorption band of more than one chemical (e.g., SF ₆ and NH ₃). (Kulp, p. 270; Ex. 1019, p. 102). Kulp discloses a processor capable of processing the filtered image to produce a visible image of more than one chemical.

¹⁵ Kulp necessarily discloses a screen that “can display” those images shown in Figure 9. (Ex. 1006, p. 23).

¹⁶ A refrigerated portion is necessarily present in Kulp to cool the filter and array. (Ex. 1006, ¶ 56). The refrigerated portion would have included a Dewar. (*Id.*).

Claims 1-3, 6, 10, 12-15, 18, 21, 23, 33, 35, 37, 45-46, 48, and 51	Kulp (Ex. 1012)
14. The system of claim 1, wherein the infrared sensor device captures multiple images and the processor can process the multiple images to produce a visible video of the leak.	Kulp discloses recording the visible image on a SVHS tape, which is for video playback. (Kulp, p. 275). ¹⁷
15. The system of claim 1, wherein, in use, the infrared sensor device receives a filtered infrared image from the single filter configuration and converts the filtered image to an electrical signal representing the filtered infrared image.	Kulp discloses an infrared sensor device (Ga:Si focal plane array). (Kulp, p. 270). ¹⁸
18. The system of claim 1, wherein the image can be processed in real time.	Kulp discloses that the passive infrared imager allows real-time video imaging of gas emissions. (Kulp, p. 269, Abstract).
21. The system of claim 1, wherein the any one or more chemicals includes one or more substances selected from the group consisting of refrigerant; fuel; water vapor; methane; ethane; propane; butane; hexane; ethylene; propylene; o-xylene; toluene; benzene; acetylene; alcohol; ethanol; methanol; xylene; benzene; formaldehyde; 1,2 butadiene; 1,3 butadiene; butadiene; acetone; gasoline; diesel fuel; petroleum; petrochemicals; petroleum by-product; volatile organic compound; volatile inorganic compound; crude oil products;	Kulp discloses detecting SF ₆ gas, which is a refrigerant. (Kulp, p. 270).

¹⁷ Accordingly, Kulp necessarily discloses a processor that is capable of processing multiple images to produce a visible video of the leak. (Ex. 1006, pp. 23-24).

¹⁸ It would have been well known that a focal plane array converts a received infrared image to an electrical signal. (Ex. 1006, p. 24).

Claims 1-3, 6, 10, 12-15, 18, 21, 23, 33, 35, 37, 45-46, 48, and 51	Kulp (Ex. 1012)
crude oil by-products; a hydrocarbon; and compounds and combinations thereof.	
23. The system of claim 1, wherein the aggregate pass band for the single filter configuration is at least about 200 nm.	Kulp discloses a single filter configuration with an aggregate passband that is between wavenumber 970 (about 10300 nm) and wavenumber 920 (about 10870 nm). (Kulp, p. 271; Fig. 2). Thus, the aggregate passband disclosed in Kulp is about 570 nm, which greater than 200 nm.
33. The system of claim 1, wherein the pass band for the filter configuration is located between about 9000 nm and about 12000 nm.	Kulp discloses a single filter configuration with a passband that is between wavenumber 970 (about 10300 nm) and wavenumber 920 (about 10870 nm). (Kulp, p. 271; Fig. 2). Thus, the passband of the filter disclosed in Kulp is between about 9000 nm and 12000 nm.
35. The system of claim 1, wherein the pass band for the filter configuration is located between about 10000 nm and about 11500 nm.	Kulp discloses a single filter configuration with a passband that is between wavenumber 970 (about 10300 nm) and wavenumber 920 (about 10870 nm). (Kulp, p. 271; Fig. 2). Thus, the passband of the filter disclosed in Kulp is between about 10000 nm and 11500 nm.
37. The system of claim 1, wherein the pass band for the filter configuration has a full width at half maximum transmittance that is less than about 600 nm.	Kulp discloses a single filter configuration with an aggregate passband that is between wavenumber 970 (about 10300 nm) and wavenumber 920 (about 10870 nm). (Kulp, p. 271; Fig. 2). Thus, the aggregate passband disclosed in

Claims 1-3, 6, 10, 12-15, 18, 21, 23, 33, 35, 37, 45-46, 48, and 51	Kulp (Ex. 1012)
	Kulp has a full width at half maximum transmittance ¹⁹ that is about 570 nm, which less than about 600 nm.
45. The system of claim 1, wherein the aggregate pass band for the filter configuration includes a full width at half maximum transmittance that is less than about 600 nm.	Kulp discloses a single filter configuration with an aggregate passband that is between wavenumber 970 (about 10300 nm) and wavenumber 920 (about 10870 nm). (Kulp, p. 271; Fig. 2). Thus, the aggregate passband disclosed in Kulp is about 570 nm, which less than about 600 nm.
46. The system of claim 1, wherein the center wavelength of the pass band for the filter configuration is within an absorption band for one of the chemicals.	Kulp discloses a filter configuration with an aggregate passband that is within the absorption band of SF ₆ . (Kulp, p. 271; Fig. 2). ²⁰
48. The system of claim 1, wherein the absorption band of one of the chemicals	Kulp discloses a filter configuration with an aggregate passband that is

¹⁹ Roughly, using a transmittance curve, the full width at half maximum transmittance is calculated by: (1) determining the transmittance value at the peak of the transmittance curve, (2) following the curve to determine the two points that the curve measures one-half of that transmittance value, and (3) calculating the difference between the wavelength readings at those two points.

²⁰ Thus, the center wavelength of the passband for the filter is within the absorption band of SF₆. (Ex. 1006, pp. 25-26).

Claims 1-3, 6, 10, 12-15, 18, 21, 23, 33, 35, 37, 45-46, 48, and 51	Kulp (Ex. 1012)
includes a peak and the pass band for the filter configuration is centered at or close to the peak.	within the absorption band of SF ₆ . (Kulp, p. 271; Fig. 2). ²¹
51. The system of claim 1, wherein the passive infrared camera system is attached to or supported by a movable vehicle selected from the group consisting of a motorcycle, a car, a truck, a bicycle, a boat, a ship, a personal watercraft, a rotary wing vehicle, an airplane, a powered paraglider, an ultralight aircraft, a powered glider, a glider, a balloon, a blimp, a remotely controlled vehicle, an unmanned aerial vehicle, a satellite, and combinations thereof.	Kulp discloses mounting a passive infrared imager on a mobile vehicle. (Kulp, p. 275).

B. Claims 25-32, 34, and 38-44 Are Unpatentable Under 35 U.S.C. § 103(a) as Being Obvious Over Kulp in View of Spectrogon

Section VI.A, *supra*, demonstrates that claim 1 is anticipated by Kulp.

Claims 25-32, 34, and 38-44 each depend from claim 1 and recite various replacement filter characteristics. Spectrogon shows a catalog of replacement filters that were known at the time of the alleged invention, including filters that match the filter characteristics recited in each of claims 25-32, 34, and 38-44.

²¹ It was well known that the absorption band of a chemical includes a peak. (Ex. 1006, p. 26). Kulp discloses detection of SF₆, thus the center wavelength of the passband for the filter in Kulp is at least close to the peak of SF₆. (*Id.*).

Kulp, modified in view of Spectrogon to include one of the disclosed filters, teaches each limitation added by claims 25-32, 34, and 38-44.

It would have been obvious to modify Kulp to select a prior art filter from the Spectrogon catalog having a bandwidth that is within the absorption band of a target chemical because it would have been combining prior art elements (e.g. the passive infrared camera of Kulp with the known filter of Spectrogon) according to known methods²² to yield predictable results.

For example, claim 25 recites a filter configuration that has a center wavelength located between about 3340 nm and 3440 nm. It was well known that a filter centered in this range would allow detection of many hydrocarbon gases. (See Ex. 1008, p. 493, column 1; Ex. 1006, ¶ 60). Accordingly, combining the passive infrared camera of Kulp with a filter in Spectrogon that has a center

²² See, e.g., Ex. 1016, Malmberg Decl. ¶ 9 (showing that it was well known in the art to provide a passive infrared camera with a custom filter selected based on the absorption characteristics of what the customer desired to detect); Ex. 1014, p. 4 (referring to manufacturing filters to meet customer specifications); Ex. 1020 (which shows an order form through which a customer provides custom specifications for a desired filter).

wavelength located between about 3340 nm and about 3440 nm would yield the predictable result of detecting hydrocarbon gases. (*Id.*).

In selecting the appropriate filter, one of ordinary skill in the art would have recognized, and taken into account, that the center wavelength of a filter tested at room temperature could shift down by about 2%, or less, if cooled to the operating temperature of the camera in Kulp. (Ex. 1006, ¶ 60 n. 5). Accordingly, Petitioner addresses both possibilities (i.e., a shift, or no shift, in wavelength) in this Section. Whatever the particular shift, if any, the Spectrogon catalog discloses filters one of ordinary skill in the art would have known and been motivated to choose from based on what was desired to be detected. (*Id.*).

For example, without a shift in the center wavelength, the BP-3420-200-D filter (Ex. 1017, p. 5), with a center wavelength of 3420 nm meets the limitations added by claim 25 of a center wavelength located between about 3340 nm and about 3440 nm. Alternatively, accounting for a possible 2% down shift due to cooling, the BP-3450-100-D filter (*Id.*), with a center wavelength of 3450 nm shifted down to about 3381 nm, meets the limitations added by claim 25. Accordingly, combining the passive infrared camera of Kulp with the BP-3420-200-D filter disclosed in Spectrogon, or alternatively the BP-3450-100-D filter accounting for a 2% down shift, would yield the predictable result of detecting hydrocarbon gases. (Ex. 1006, p. 30).

Another reason it would have been obvious to modify Kulp with a prior art filter from the Spectrogon catalog is because the combination would have been a simple substitution of one known element (i.e., the cold filter in the Kulp camera) for another known element (i.e., the filter disclosed in the Spectrogon catalog) to obtain predictable results; namely, detecting a target gas whose absorption band falls within the passband of the selected filter. (Ex. 1006, ¶ 61). Furthermore, substituting the bandpass filter of Kulp for another bandpass filter disclosed in the Spectrogon catalog would have been an obvious design choice to one of ordinary skill in the art to detect a target gas. (*Id.*, at ¶ 62). Accordingly, substituting the filter of Kulp for one of the filters identified in the below claim chart to produce a passive infrared camera with a spectral range selected based on one or more target gases would have been an obvious modification to one of ordinary skill in the art.

The following claim chart specifically identifies known filters disclosed by Spectrogon that teach the claim limitations added by claims 25-32, 34, and 38-44. For the reasons discussed above and further supported by the following chart, claims 25-32, 34, and 38-44 would have been obvious over the combination of Kulp with Spectrogon.

As noted above, the center wavelength of a filter tested at room temperature could shift down by about 2%, or less, if cooled to the operating temperature of the

camera in Kulp. The claim chart below identifies filters for both possibilities (i.e., a shift, or no shift, in wavelength) that meet the claim limitation.

Claims 25-32, 34, 38-44	Spectrogon (Ex. 1017)
25. The system of claim 1, wherein the pass band for the filter configuration has a center wavelength located between about 3340 nm and about 3440 nm.	The BP-3420-200-D ²³ filter (Spectrogon, p. 5) has a center wavelength (CWL) at 3420 nm, which is between about 3340 nm and about 3440 nm. Alternatively, the BP-3450-100-D filter (<i>Id.</i>) has a CWL at 3450 nm, which, if shifted down by 2% in a cooled camera to about 3381 nm, is also between about 3340 nm and about 3440 nm.
26. The system of claim 1, wherein the pass band for the filter configuration has a center wavelength located between about 3360 nm and about 3380 nm.	The BP-3350-200-D filter (<i>Id.</i>) has a CWL at 3350 nm, which is between <i>about</i> 3360 and <i>about</i> 3380 nm. Alternatively, the BP-3450-100-D filter (<i>Id.</i>) has a CWL at 3450 nm, which, if shifted down by 2% in a cooled camera to about 3381 nm, is between <i>about</i> 3360 and <i>about</i> 3380 nm.
27. The system of claim 1, wherein the pass band for the filter configuration is located between about 2900 nm and	The BP-3050-200-D filter (<i>Id.</i> , at p. 4) has a passband located between <i>about</i> 2900 nm and <i>about</i> 3200 nm. ²⁴

²³ The filter BP-3420-200-D denotes a bandpass filter with a center wavelength (CWL) at 3420 nm, and with a full width at half maximum transmittance (HW) of 200 nm. (*See* Ex. 1017, p. 1).

²⁴ “In the case where the claimed ranges ‘overlap or lie inside ranges disclosed by the prior art’ a *prima facie* case of obviousness exists.” M.P.E.P. 2144.05 (citations omitted).

Claims 25-32, 34, 38-44	Spectrogon (Ex. 1017)
about 3200 nm.	Alternatively, the BP-3150-145-D filter (<i>Id.</i>) has a CWL at 3150 nm and a passband that, if shifted down by 2% (about 63 nm) in a cooled camera, is between <i>about</i> 2900 nm and <i>about</i> 3200 nm.
28. The system of claim 1, wherein the pass band for the filter configuration is located between about 3100 nm and about 3500 nm.	The BP-3330-150-D filter (<i>Id.</i> , at p. 5) has a CWL at 3330 nm and a passband located between <i>about</i> 3100 nm and <i>about</i> 3500 nm, even taking into account a 2% down shift of about 66.6 nm in a cooled camera.
29. The system of claim 1, wherein the pass band for the filter configuration is located between about 3100 nm and about 3500 nm.	The BP-3330-150-D filter (<i>Id.</i>) has a CWL at 3330 nm and a passband located between <i>about</i> 3100 nm and <i>about</i> 3500 nm, even taking into account a 2% down shift of about 66.6 nm in a cooled camera.
30. The system of claim 1, wherein the pass band for the filter configuration is located between about 3200 nm and about 3500 nm.	The BP-3330-150-D filter (<i>Id.</i>) has a CWL at 3330 nm and a passband located between <i>about</i> 3200 nm and <i>about</i> 3500 nm, even taking into account a 2% down shift of about 66.6 nm in a cooled camera.
31. The system of claim 1, wherein the pass band for the filter configuration is located between about 3300 nm and about 3500 nm.	The BP-3420-130-D filter (<i>Id.</i>) has a CWL at 3420 nm and a passband located between <i>about</i> 3300 nm and <i>about</i> 3500 nm, even taking into account a 2% down shift of about 68.4 nm in a cooled camera.
32. The system of claim 1, wherein the pass band for the filter configuration is located between about 3200 nm and about 3400 nm.	The BP-3330-150-D filter (<i>Id.</i>) has a CWL at 3330 nm and a passband located between <i>about</i> 3200 nm and <i>about</i> 3400 nm, even taking into account a 2% down shift of about 66.6 nm in a cooled camera.
34. The system of claim 1, wherein the pass band for the filter configuration is located between about 10400 and 10700 nm.	The NB-10350-460-F filter (<i>Id.</i> , p. 7) has a passband centered at 10350 nm and located between <i>about</i> 10400 and 10700 nm. Alternatively, the BP-10600-240-F filter (<i>Id.</i> at, p. 7) has a CWL at 10600 nm and a passband that, if shifted down by 2% (about 212 nm), is located between <i>about</i> 10400 and 10700 nm.
38. The system of claim 1,	The BP-3330-150-D filter (<i>Id.</i> , at p. 5) has full

Claims 25-32, 34, 38-44	Spectrogon (Ex. 1017)
<p>wherein the pass band for the filter configuration has a full width at half maximum transmittance that is less than about 400 nm.</p>	<p>width at half maximum transmittance (HW) of 150 nm, which is less than 400 nm, whether or not the CWL of 3330 nm is shifted down by 2%.</p>
<p>39. The system of claim 1, wherein the pass band for the filter configuration is located between about 3250 nm and about 3510 nm with a full width at half maximum less than about 250 nm.</p>	<p>The BP-3330-150-D filter (<i>Id.</i>) has a CWL at 3330 nm and a passband located between <i>about</i> 3250 nm and <i>about</i> 3510 nm, even taking into account a 2% down shift of about 66.6 nm in a cooled camera, as well as a full width at half maximum transmittance (HW) of 150 nm, which is less than 250 nm.</p>
<p>40. The system of claim 1, wherein the pass band for the filter configuration is located between about 3200 nm and about 3580 nm with a full width at half maximum less than about 350 nm.</p>	<p>The BP-3330-150-D filter (<i>Id.</i>) has a CWL at 3330 nm and a passband located between <i>about</i> 3200 nm and <i>about</i> 3580 nm, even taking into account a 2% down shift of about 66.6 nm in a cooled camera, as well as a full width at half maximum transmittance (HW) of 150 nm, which is less than 250 nm.</p>
<p>41. The system of claim 1, wherein the pass band for the filter configuration is located between about 7600 nm and about 7800 nm.</p>	<p>The NB-7625-160-E filter (<i>Id.</i>, at p. 6) has a passband centered at 7625 nm and located between <i>about</i> 7600 nm and <i>about</i> 7800 nm.</p> <p>Alternatively, the NB-7800-170-E filter (<i>Id.</i>) has a CWL at 7800 nm and a passband that, if shifted down by 2% (about 156 nm) in a cooled camera, is between <i>about</i> 7600 nm and <i>about</i> 7800 nm.</p>
<p>42. The system of claim 1, wherein the pass band for the filter configuration is located between about 3200 nm and about 3500 nm with a full width at half maximum less than about 300 nm.</p>	<p>The BP-3330-150-D filter (<i>Id.</i>, p. 5) has a CWL at 3330 nm and a passband located between <i>about</i> 3200 nm and <i>about</i> 3500 nm, even taking into account a 2% down shift of about 66.6 nm in a cooled camera, as well as a full width at half maximum transmittance (HW) of 150 nm, which is less than 300 nm.</p>
<p>43. The system of claim 1, wherein the pass band for the filter configuration is located between about 3200 nm and about 3600 nm with a full</p>	<p>The BP-3450-100-D filter (<i>Id.</i>) has a CWL at 3450 nm and a passband located between <i>about</i> 3200 nm and <i>about</i> 3600 nm, even taking into account a 2% down shift of about 69 nm in a cooled camera, as well as a full width at half</p>

Claims 25-32, 34, 38-44	Spectrogon (Ex. 1017)
width at half maximum less than about 400 nm.	maximum transmittance (HW) of 100 nm, which is less than 400 nm.
44. The system of claim 1, wherein the filter configuration allows a transmittance greater than about 70% at the center wavelength of the pass band.	Spectrogon discloses filters that allow transmittance greater than about 70% at the center wavelength. (Spectrogon, p. 1).

C. Claims 24, 36, and 57 Are Unpatentable Under 35 U.S.C. § 103(a) as Being Obvious Over Kulp Further in View of OCLI.

Section VI.A, *supra*, demonstrates that claim 1 is anticipated by Kulp.

Claim 24 depends from claim 1 and recites that “the pass band for the filter configuration has a center wavelength located between about 3375 nm and about 3385 nm.” Claim 36 depends from claim 1 and recites that “the pass band for the filter configuration is located between about 10500 nm and about 10600 nm.”

Claim 57 depends from claim 1 and recites that “the optical bandpass filter includes a silicon dioxide substrate.” The combined teachings of Kulp with OCLI disclose the limitations added by claims 24, 36, and 57.

The Optical Coating Laboratory, Inc. (“OCLI”) products catalog discloses a catalog of optical filters. With respect to claim 24, the OCLI discloses the N03387-6X filter (Ex. 1014, p. 35) having a center wavelength at 3387 nm, which is *about* 3385 nm. It was well known in the art that a filter centered between about 3375 nm and about 3385 nm corresponds to the absorption band of hydrocarbon

gases. (Ex. 1006, ¶ 66, *see also* Ex. 1008, p. 493). Furthermore, the need to detect hydrocarbon gases in the industrial environment was well known. (*Id.*).

Accordingly, even if the 3387 nm filter of the OCLI is not interpreted to be between about 3375 nm and about 3385 nm, the claimed filter nonetheless would have been an obvious to one of ordinary skill in the art. In particular, to detect hydrocarbon gas leaks, which was a known use for passive infrared cameras as noted above, selection of a filter between about 3375 nm and about 3385 nm would have been obvious as a matter of design choice. (Ex. 1006, ¶ 66).

With respect to claim 36, the OCLI discloses the N10593-9 filter (Ex. 1014, p. 41) having a center wavelength at 10593 nm and a bandwidth of about 520 nm. The N10593-9 filter is between *about* 10500 nm and *about* 10600 nm. Furthermore, it was well known in the art that a filter passband centered between *about* 10500 nm and *about* 10600 nm corresponds to the absorption band of water vapor and carbon dioxide, among other gases. (Ex. 1006, ¶ 67).²⁵ Replacing the filter in Kulp with the N10593-9 filter of the OCLI would have been an obvious design choice to one of ordinary skill in the art selecting a filter for a camera to be used for the detection of water vapor and carbon dioxide. (*Id.*). Furthermore, for

²⁵ Furthermore, OCLI discloses custom filters tested at 77 K according to customer specifications, i.e., cold filters. (Ex. 1014, p. 53).

the reasons discussed above with respect to the Spectrogon catalog, it would have been obvious to modify Kulp with the prior art filter from the OCLI because the combination would have been a simple substitution of a one known element (i.e., the cold filter in the Kulp camera selected to target SF₆) for another known filter disclosed in the Spectrogon catalog to obtain predictable results; namely detecting a target gas whose absorption band falls within the passband of the selected filter. (*Id.*).

With respect to claim 57, the OCLI discloses infrared filters that include a silicon substrate. (Ex. 1014, p. 54). For the reasons discussed above with respect to the Spectrogon catalog, it would have been obvious to modify Kulp to select a known filter from the OCLI catalog having a bandwidth that is within the absorption band of a target chemical because it would have been combining prior art elements (e.g. the passive infrared camera of Kulp with the known filter of Spectrogon) according to known methods to yield predictable results. (Ex. 1006, ¶ 68).

Accordingly, claims 24, 36, and 57 are obvious over the combination of Kulp and OCLI.

D. Claims 1-4, 6, 8-22, 31, 37-40, 42-56, and 58 Are Unpatentable Under 35 U.S.C. § 103(a) as Being Obvious Over the Merlin Brochure²⁶ in View of Strachan

The claims are directed to a system including a passive infrared camera and a processor for producing a visible image of a chemical leak. For the reasons discussed below, it would have been obvious to one of ordinary skill in the art to combine the Merlin Brochure with Strachan to yield the claimed camera. In short, the claimed camera is nothing more than the result of equipping Petitioner's own Merlin-MID camera disclosed in the Merlin Brochure with a custom filter selected to detect a gas leak.

Strachan teaches that selecting a custom filter that covers the absorption bands of gases of interest and using a camera equipped with such a filter to detect gas leaks was common practice. So, one skilled in the art would have been motivated to follow this common practice to fit the Merlin-MID camera with a custom filter selected to detect a gas leak because, *inter alia*, it amounts to the combination of known elements to yield predictable results, and it would have been an obvious design choice to one skilled in the art to replace the standard 3-5 μm filter with a narrower filter that covers hydrocarbon gases of interest, such as methane, ethane, propane or *n*-butane.

²⁶ The Merlin Brochure, published January 2002, (*see* Ex. 1016, ¶ 6).

1. The Combination of the Merlin Brochure with Strachan Discloses All of the Limitations of the Claimed System

The Merlin Brochure discloses a mid-wavelength (MWIR) infrared camera (“Merlin-MID”) that includes an infrared sensor device (InSb focal plane array) and a standard 3-5 μm bandpass cold filter within a refrigeration portion defined by the interior of a Dewar flask. (Ex. 1007, Chart on p. 6; *see also* Ex. 1011, p. 1). Furthermore, the Merlin-MID includes a refrigeration system (a closed-cycle Stirling cryocooler) that cools the refrigeration portion of the Merlin-MID. (*Id.*).

Accordingly, the Merlin Brochure discloses a passive infrared camera that meets most of the limitations of the claimed camera. Indeed, the inventor of the 813 patent admitted that in developing the claimed invention, he used the Merlin camera:

- “I contacted Indigo Systems of California and I ordered a 3.38 micron filter and a 3-5 micron camera. . . . The Indigo Systems infrared camera is named the Merlin™.” (Ex. 1003, pp. 1-2).
- “A preferred infrared camera system 22, for example, for use in an embodiment of the present invention is a Merlin™ mid-wavelength infrared (MWIR) high-performance camera available from Indigo Systems, Inc. in California.” (Ex. 1001, 6:19-23).

As to the other limitations of the claims, the 813 patent suggests that it could be difficult to visually detect a gas leak using the standard 3-5 μm filter of the Merlin camera (*See* Ex. 1001, 1:62-64) and that “an infrared camera that images a

broad range of infrared wavelengths (e.g., 3-5 microns) typically will not be useful in detecting small leaks.”²⁷ (*Id.*). Petitioner notes that neither the clarity of the image, nor the size of the leak, is a limitation of the claims, nor do the claims specify how much narrower the filter needs to be than 3-5 μm in order to provide a “clearer” image or be able to detect “small” leaks. Nevertheless, for the reasons discussed below, it would have been obvious to one of ordinary skill in the art to replace the standard 3-5 μm filter in the Merlin-MID camera with a narrower filter, as taught by Strachan, to obtain a “clearer” image of the gases of interest.

Strachan (1985) discloses an infrared camera with a narrow bandpass filter centered at about 3.4 μm with a passband wide enough to detect leaks of multiple gases, including methane, ethane, and propane, while still being narrow enough to provide a visible image of the detected gas(es). (Ex. 1008, p. 493, column 2). Such filters were widely available from numerous manufacturers, as admitted by

²⁷ The claims recite a filter configuration having an aggregate passband that is at least about 200 nm (0.2 μm). The passband of the 3-5 μm filter of the Merlin-MID camera is at least about 200 nm. Further, the Merlin Brochure teaches the use of the camera to detect a chemical gas signature in aircraft exhaust (i.e., a “gas leak”).

the inventor,²⁸ and disclosed in Strachan. Strachan stated that, in choosing this filter, he made use of well-known catalogs of infrared absorption spectra of gases showing that the majority of hydrocarbon gases are between 3.3-3.5 μm . (Ex. 1008, p. 493, column 2). Accordingly, Strachan shows that at the time of the alleged invention, it was known in the art to select a filter that covers the absorption band of more than one gas of interest and to use the selected filter in a passive infrared camera to detect leaks of the gases of interest.²⁹ (Ex. 1006, ¶ 80).

As noted above, it would have been obvious to one of ordinary skill in the art to modify the Merlin-MID camera disclosed in the Merlin Brochure to include the narrower filter disclosed by Strachan to detect gas leaks of more than one chemical. Indeed, even if the standard 3-5 μm filter in the Merlin-MID camera

²⁸ “A preferred bandpass filter providing such performance characteristics [full width at half maximum of 64.4 nm with a center wavelength of 3.38 nm] may be obtained from Spectrogon US, Inc. in New Jersey, for example. . . . There are many different optical bandpass filters available from numerous manufacturers.” (Ex. 1001, 8:12-21).

²⁹ This teaching negates the reason for allowance that Patent Owner repeatedly made during original prosecution of the parent application; namely, that prior art passive infrared cameras required multiple filters to detect more than one gas.

exhibited the alleged deficiencies claimed by Patent Owner, replacing the 3-5 μm filter of the Merlin-MID camera disclosed in the Merlin Brochure with a filter having the characteristics of the 3.4 μm filter disclosed in Strachan would yield predictable results of detecting hydrocarbon gases.³⁰ (Ex. 1006, ¶ 81).

Furthermore, if one skilled in the art wanted to detect hydrocarbon gases, as Strachan did, it would have also been an obvious design choice to one skilled in

³⁰ While Figure 3 of Strachan does not show the filter inside the refrigeration system, Petitioner notes that Strachan is not relied upon for the disclosure of a cold filter but rather for a specific bandpass filter within the absorption band of multiple chemicals. In addition, as noted above the center wavelength of an un-cooled filter, such as the 3.4 μm -centered Strachan filters, if cooled to the operating temperature of the Merlin-MID camera (77 K), could shift down by about 2%, or less, i.e., by about 0.07 μm for a 3.4 μm filter. However, even accounting for such a shift when cooled, the passbands of the filters disclosed in Strachan would still be within the absorption band of the gases whose absorption spectra are shown in Figures 5-6. (Ex. 1006, ¶ 81 n. 11). That is, just as the 3.4 μm filter would detect methane, ethane, propane and n-butane when used outside the refrigeration system in Strachan, it would also detect those gases when used inside the refrigeration system in the Merlin-MID camera. (*Id.*).

the art to replace the standard 3-5 μm filter with a narrower filter that covers hydrocarbon gases of interest, such as methane, ethane, propane or *n*-butane. (*Id.*, at ¶ 82). One of ordinary skill in the art would have been motivated to make this obvious design choice for Merlin-MID camera to make a camera equipped with a filter selected to allow detection of hydrocarbon gases, as taught by Strachan, because “a major and continuing requirement within industry for instrumentation to monitor hydrocarbon gas.” (Ex. 1008, p. 492, column 1). For the reasons discussed above, modifying the Merlin-MID camera in view of Strachan would have been nothing more than using well-known information about infrared absorption spectra of gases to select an available filter covering the absorption bands of those gases.

The claims also recite that a processor that can produce a visible image of the leak under “variable ambient conditions” of the area around the leak. The Merlin-MID camera included signal processing electronics (a processor) that produced analog and video signals. (Ex. 1011, p. 1).³¹ The Merlin-MID was sensitive to temperature changes, so the Merlin-MID camera can detect chemical

³¹ In the alternative, the Merlin Brochure discloses a Talon[®] Data Acquisition system (a processor) in communication with, but separate from, the Merlin-MID to provide a visible image of the detected chemical gas signature. (Ex. 1007, p. 4).


gas signatures at different temperatures. (Ex. 1007, p. 3). Further, one of ordinary skill in the art would understand that the Merlin-MID camera can detect chemical gas signatures in aircraft exhaust at different temperatures. (Ex. 1006, ¶ 75). In other words, the Merlin Brochure discloses a camera system that can produce a visible image of a detected gas at various ambient conditions.³² (*Id.*). Further, Strachan discloses gas detection cameras for use in industrial settings, which involve detecting gas leaks at variable ambient conditions. (Ex. 1008, p. 492). So, contrary to the assertions of the Patent Owner during prosecution, passive infrared cameras with a single filter configuration and that operated under variable ambient conditions did exist and, in fact, were well known for detecting gas leaks.

For the foregoing reasons, claims 1-4, 6, 8-22, 31, 37-40, 42-56, and 58 are obvious over the combination of the Merlin-MID camera disclosed by the Merlin Brochure, modified in view of Strachan to include a filter centered at about 3.4 μm to detect hydrocarbon gases.

³² Furthermore, and as noted previously, the inventor has already admitted that the Merlin camera is an embodiment of the claimed invention. In other words, the inventor admitted that the Merlin camera produces a visible image of a detected gas at variable ambient conditions.

2. Claim Chart

The chart below shows that the combination of Strachan with the Merlin Brochure discloses each limitation of claims 1-4, 6, 8-22, 31, 37-40, 42-56, and 58.

Claims 1-4, 6, 8-22, 31, 37-40, 42-56, and 58	Merlin Brochure (Ex. 1007) in view of Strachan (Ex. 1008)
1. A system for producing a visible image of a leak of any one or more chemicals of a group of chemicals, the leak emanating from a component, including:	<p>Merlin Brochure discloses a system for detecting chemical gas signatures in aircraft exhaust of any one or more chemicals of a group of chemicals using the Merlin-MID camera. (Merlin Brochure, p. 3).</p> <p>Strachan discloses detecting hydrocarbon gas leaks using an infrared imaging technique. (Abstract).</p>
a passive infrared camera system including:	<p>Merlin Brochure discloses the Merlin-MID camera, which was a passive infrared camera. (See Ex. 1007, pp. 1, 6).³³</p>
a lens assembly including a lens;	<p>Merlin Brochure discloses a camera with a lens. (Merlin Brochure, p. 3).</p> 
a refrigerated portion including an interior;	<p>Merlin Brochure discloses that the Merlin-MID includes a refrigerated portion. (Merlin Brochure, Chart on p. 6).</p>
an infrared sensor device located	<p>Merlin Brochure discloses that the Merlin-</p>

³³ Further, one skilled in the art would have recognized that the Merlin-MID camera is a passive infrared camera. (See Ex. 1006, p. 44).

Claims 1-4, 6, 8-22, 31, 37-40, 42-56, and 58	Merlin Brochure (Ex. 1007) in view of Strachan (Ex. 1008)
in the interior of the refrigerated portion;	MID includes an Indium Antimonide (InSb) detector with an array of 320 x 246. (Merlin Brochure, Chart on p. 6).
a single filter configuration located in the interior of the refrigerated portion and including an optical bandpass filter fixed along an optical path between the lens assembly and the infrared sensor device;	Merlin Brochure discloses that the Merlin-MID includes at least one fixed optical bandpass filter (the 3-5 μm cold filter). (Merlin Brochure, Chart on p. 6). A fixed optical bandpass filter located along an optical path between a lens and infrared sensor device is necessarily present in the disclosure of the Merlin Brochure. ³⁴
a refrigeration system that can cool the interior of the refrigerated portion;	Merlin Brochure discloses that the Merlin-MID includes Stirling cryogenic cooling. (Merlin Brochure, p. 2; Chart on p. 6).
wherein at least part of the pass band for the single filter configuration is within an absorption band for each of the chemicals; and	Merlin Brochure discloses that one of the uses of the Merlin-MID camera is detecting chemical gas signatures in aircraft exhaust, i.e., chemical gas detection. (Merlin Brochure, p. 3).

³⁴ See page 51 of the Merlin User’s Guide (Ex. 1011), showing that the cold filter in the Merlin-MID is fixed inside the Dewar window at the aperture, i.e., between the lens and the infrared sensor device. The Merlin User’s Guide (Ex. 1011), which describes the same Merlin-MID camera disclosed in the Merlin Brochure, is relied upon in this Petition to show inherent characteristics of the Merlin-MID camera disclosed in Merlin Brochure. See M.P.E.P. § 2112; see, e.g., *In re Napier*, 55 F.3d 610, 613, 34 USPQ2d 1782, 1784 (Fed. Cir. 1995) (affirmed a 35 U.S.C. 103 rejection based in part on inherent disclosure in one of the references).

Claims 1-4, 6, 8-22, 31, 37-40, 42-56, and 58	Merlin Brochure (Ex. 1007) in view of Strachan (Ex. 1008)
	<p>Strachan discloses the absorption band for multiple hydrocarbon gases occurs between 3.3 and 3.5 μm. (Strachan, p. 493, column 1). Strachan further discloses a filter that can detect methane, ethane and propane. (Strachan, p. 493, column 2).</p>
<p>wherein the aggregate pass band for the single filter configuration is at least about 100 nm; and</p>	<p>Merlin Brochure discloses the Merlin-MID camera with a cold filter bandpass of 3-5 μm (Merlin Brochure, First Chart on p. 2), which is less than 200 nm.</p>
<p>a processor that can process a signal representing the filtered infrared image captured by the infrared sensor device to produce a visible image of the chemical emanating from the component under variable ambient conditions of the area around the leak.</p>	<p>Merlin Brochure discloses a processor because the Merlin Brochure discloses that the Merlin-MID camera outputs analog and digital video signals of the detected infrared image, (Merlin Brochure, p. 6), which means that a processor for producing the analog and digital video signals is necessarily present.³⁵</p> <p>In the alternative, Merlin Brochure discloses a Talon[®] Data Acquisition system (a processor) in communication with, but separate from, the Merlin-MID to provide a visible image of the detected chemical gas signature. (Merlin Brochure, p. 4).</p>

³⁵ The Merlin User's Guide (Ex. 1011) shows by disclosing a camera that produces analog and digital video signals, the Merlin Brochure inherently discloses a camera that includes signal processing electronics that electronically processes the filtered image received by the focal plane array. (See Ex. 1011, p. 1).

Claims 1-4, 6, 8-22, 31, 37-40, 42-56, and 58	Merlin Brochure (Ex. 1007) in view of Strachan (Ex. 1008)
2. The system of claim 1, further including a recording device that can record the visible image of the leaking chemical.	Merlin Brochure discloses recording a visual image using the Dynamic IR Option of the ThermaGRAM [®] system: “Dynamic IR option allows user to <i>record</i> and analyze sequences of images.” (See Merlin Brochure, p. 5) (emphasis added).
3. The system of claim 2, wherein the recorded visible image can be viewed at a time other than when recorded.	Merlin Brochure discloses recording a visual image using the Dynamic IR Option of the ThermaGRAM [®] system: “Dynamic IR option allows user to <i>record</i> and analyze sequences of images.” (See Merlin Brochure, p. 5) (emphasis added). ³⁶
4. The system of claim 2, wherein the recording device can record the visible image along with inspection information about the image selected from a group consisting of inspection location name, inspection location address, component name, component identification information, global positioning coordinates, a date, a time of day, an inspector's name, an inspection company's name, one or more camera system setting values, and combinations thereof.	Merlin Brochure discloses a ThermGRAM [®] system a Dynamic IR Option that records the visible image. Merlin Brochure also discloses an option that captures a live thermal image, plotted as Time versus Temperature graphs. “Once the data is plotted, you can extrapolate to determine temperatures at future (or past) times, using a choice of models.” (Merlin Brochure, p. 5). Merlin Brochure thus discloses recording the visible image along with inspection information including, at the very least, a time of day.
6. The system of claim 1, wherein the passive infrared camera system further includes a display screen that can display the visible image of the leaking chemical.	Merlin Brochure discloses a Talon [®] Data Acquisition system in communication with the Merlin-MID that includes a display screen (see below) to provide a visible image of the

³⁶ It would have been obvious to one of ordinary skill in the art that the recording can be viewed at a time other than when recorded. (Ex. 1006, p. 47).

Claims 1-4, 6, 8-22, 31, 37-40, 42-56, and 58	Merlin Brochure (Ex. 1007) in view of Strachan (Ex. 1008)
	detected gas. (Merlin Brochure, p. 4).
8. The system of claim 1, wherein the passive infrared camera system lens assembly includes more than one lens.	Merlin Brochure discloses a passive infrared camera system including a lens. (Ex. 1007, p. 3). ³⁷
9. The system of claim 1, wherein the passive infrared camera system lens assembly is removable.	Merlin Brochure discloses a passive infrared camera system including a lens. (Ex. 1007, p. 3). ³⁸
10. The system of claim 1, wherein the refrigerated portion is defined by a Dewar container.	Merlin Brochure discloses that the Merlin-MID includes a refrigerated portion. (Merlin Brochure, Chart on p. 6). The refrigerated portion of the Merlin-MID camera disclosed in the Merlin Brochure necessarily includes a Dewar flask. (<i>See</i> Ex. 1011, p. 1). ³⁹
11. The system of claim 1, wherein the refrigeration system includes a closed-cycle Stirling cryocooler.	Merlin Brochure discloses that the Merlin-MID includes Stirling cryogenic cooling. (Merlin Brochure, p. 2; Chart on p. 6).

³⁷ The Merlin-MID camera disclosed in the Merlin Brochure necessarily included more than one lens. (*See* Ex. 1011, p. 2, referring to the “f/2.3 MWIR lens(es)”).

³⁸ The Merlin-MID camera disclosed in the Merlin Brochure necessarily included a removable lens. (*See* Ex.1011, p. 37, referring to removal of the lens).

³⁹ “The dewar is designed to use a closed-cycle Stirling cryocooler to stabilize the temperature of the FPA.” (Ex. 1011, p. 1).

Claims 1-4, 6, 8-22, 31, 37-40, 42-56, and 58	Merlin Brochure (Ex. 1007) in view of Strachan (Ex. 1008)
12. The system of claim 1, wherein the refrigeration system can cool the interior of the refrigerated section to a temperature below about 100 K.	Merlin Brochure discloses a Stirling cryocooler. (Ex. 1007, p. 6). ⁴⁰
13. The system of claim 1, wherein the processor can process the filtered infrared image captured by the infrared sensor device to produce a visible image of more than one chemical.	<p>Merlin Brochure discloses a Talon[®] Data Acquisition system in communication with the Merlin-MID that includes a display screen (see below) to provide a visible image of the detected chemical gas signature. (Merlin Brochure, p. 4).</p> <p>Strachan discloses a filter “centered at approximately 3.4 μm,” which, as taught by Strachan, is used to detect multiple chemicals, e.g., ethane, propane and n-butane. (Strachan, p. 493, column 2; <i>see also</i> p. 494, Fig. 5).</p>
14. The system of claim 1, wherein the infrared sensor device captures multiple images and the processor can process the multiple images to produce a visible video of the leak.	Merlin Brochure discloses that the Merlin-MID camera outputs analog and digital video signals of the detected infrared image. (Ex. 1007, p. 6).
15. The system of claim 1,	Merlin Brochure discloses that the Merlin-

⁴⁰ The Merlin User’s Guide shows, pursuant to M.P.E.P. § 2112, that by disclosing a Stirling cryocooler, the Merlin Brochure inherently discloses a refrigeration system that cools infrared sensor device and filter to below 100 K: “The FPA is enclosed in an all-metal evacuated dewar assembly cooled by a closed-cycle Stirling cryocooler, and is thermally stabilized at a temperature of 77 K.”

Claims 1-4, 6, 8-22, 31, 37-40, 42-56, and 58	Merlin Brochure (Ex. 1007) in view of Strachan (Ex. 1008)
<p>wherein, in use, the infrared sensor device receives a filtered infrared image from the single filter configuration and converts the filtered image to an electrical signal representing the filtered infrared image.</p>	<p>MID includes an Indium Antimonide (InSb) detector with an array of 320 x 246. (Merlin Brochure, Chart on p. 6).⁴¹</p>
<p>16. The system of claim 1, wherein the processor is part of the passive infrared camera system.</p>	<p>Merlin Brochure discloses a processor that is part of the passive infrared camera (i.e., internal) because the Merlin Brochure discloses that the Merlin-MID camera outputs analog and digital video signals of the detected infrared image (Merlin Brochure, p. 6), which means that a processor for producing the analog and digital video signals is necessarily present.</p>
<p>17. The system of claim 1, wherein the processor is separate from the passive infrared camera system.</p>	<p>Merlin Brochure discloses a Talon[®] Data Acquisition system in communication with, but separate from, the Merlin-MID to provide a visible image of the detected chemical gas signature. (Merlin Brochure, p. 4).</p>
<p>18. The system of claim 1, wherein the image can be processed in real time.</p>	<p>Merlin Brochure also discloses ThermaGRAM[®], a real-time infrared imaging processing system that provides “high precision thermal image analysis.” (Merlin Brochure, p. 5). The ThermaGRAM[®] system receives and electronically processes the filtered image to produce the thermal image. (<i>Id.</i>).</p>
<p>19. The system of claim 1, further</p>	<p>Merlin Brochure discloses that the Merlin-</p>

⁴¹ It was well known that a focal plane array converts a received infrared image to an electrical signal. (Ex. 1006, p. 50).

Claims 1-4, 6, 8-22, 31, 37-40, 42-56, and 58	Merlin Brochure (Ex. 1007) in view of Strachan (Ex. 1008)
including a transmitter that can transmit the visible image to a location remote from the passive infrared camera system.	MID camera outputs (transmits) analog and digital video signals of the detected infrared image. (Merlin Brochure, p. 6). The outputted (transmitted) video signal is, by definition of “output”, transmitted to a location remote from the Merlin-MID camera.
20. The system of claim 18, wherein the transmitter can transmit the image using at least one of a cable, a wire, a wireless communication device, a network connection, the Internet, or combinations thereof.	Merlin Brochure discloses that the Merlin-MID camera outputs (transmits) analog and digital video signals of the detected infrared image. (Merlin Brochure, p. 6). ⁴²
21. The system of claim 1, wherein the any one or more chemicals includes one or more substances selected from the group consisting of refrigerant; fuel; water vapor; methane; ethane; propane; butane; hexane; ethylene; propylene; o-xylene; toluene; benzene; acetylene; alcohol; ethanol; methanol; xylene; benzene; formaldehyde; 1,2 butadiene; 1,3 butadiene; butadiene; acetone; gasoline; diesel fuel; petroleum; petrochemicals; petroleum by-	Merlin Brochure discloses that the Merlin-MID camera is for, among other things, detecting chemical gas signatures in the exhaust of aircraft (e.g., fuel, hydrocarbons, etc.). (Merlin Brochure, p. 3). Strachan discloses detecting propane, among other chemicals. (Strachan, p. 493).

⁴² Further, pages 44-45 of the Merlin User’s Guide (Ex. 1011) show the video output interfaces of the Merlin-MID camera. Accordingly, a transmitter (output interface) that transmits by cable is necessarily present in the Merlin-MID camera disclosed in the Merlin Brochure. (Ex. 1006, pp. 51-52).

Claims 1-4, 6, 8-22, 31, 37-40, 42-56, and 58	Merlin Brochure (Ex. 1007) in view of Strachan (Ex. 1008)
product; volatile organic compound; volatile inorganic compound; crude oil products; crude oil by-products; a hydrocarbon; and compounds and combinations thereof.	
22. The system of claim 1, wherein the filter configuration includes more than one filter.	The Dewar window of the Merlin-MID camera (see Ex. 1011, p. 3) and the standard 3-5 filter μm cold filter disposed in series with the Dewar window constitute a single filter configuration of more than one filter. ⁴³
31. The system of claim 1, wherein the pass band for the filter configuration is located between about 3300 nm and about 3500 nm.	Strachan discloses a filter with a bandpass centered at about 3.4 μm (i.e., 3400 nm) (Strachan, p. 493, column 2), and that is between 3.25 μm (3250 nm) and 3.50 μm (3500 nm). (See the 5% filter of Figure 4 from p. 493, which has a passband between 3.25 μm and 3.50 μm).
37. The system of claim 1, wherein the pass band for the filter configuration has a full width at half maximum transmittance that is less than	Strachan discloses a filter configuration comprising an aggregate bandpass with a full width at half maximum transmittance being less than about 600 nm (i.e, less than about 0.6 μm). As can be seen in Figure 4, at half

⁴³ Alternatively, it would have been an obvious design choice to use more than one filter (e.g., a low pass and high pass filter in series) in the Merlin-MID camera in order to customize the aggregate filters response to target chemicals sought to be detected. (Ex. 1006, pp. 52-53). Althouse (Exhibit 1013, p. 1727) also discloses using multiple filter patches based on the number of chemical vapors being detected.

Claims 1-4, 6, 8-22, 31, 37-40, 42-56, and 58	Merlin Brochure (Ex. 1007) in view of Strachan (Ex. 1008)
about 600 nm.	maximum transmittance, the 10% filter has a bandpass between approximately 3.2 μm and 3.7 μm (i.e., approximately 0.5 μm or 500 nm). The 5% filter has a bandpass at half maximum transmittance between approximately 3.3 μm and 3.5 μm (i.e., approximately 0.2 μm or 200 nm).
38. The system of claim 1, wherein the pass band for the filter configuration has a full width at half maximum transmittance that is less than about 400 nm.	Strachan discloses a filter configuration comprising an aggregate bandpass with a full width at half maximum transmittance being less than about 600 nm (i.e., less than about 0.6 μm). As can be seen in Figure 4, at half maximum transmittance, the 5% filter has a bandpass at half maximum transmittance between approximately 3.3 μm and 3.5 μm (i.e., approximately 0.2 μm or 200 nm).
39. The system of claim 1, wherein the pass band for the filter configuration is located between about 3250 nm and about 3510 nm with a full width at half maximum less than about 250 nm.	Strachan discloses a 5% filter (see Figure 4) with a bandpass centered at about 3.4 μm (i.e., 3400 nm), and that is between 3.25 μm (3250 nm) and 3.50 μm (3500 nm). (Strachan, p. 493, column 2). As can be seen in Figure 4, at half maximum transmittance, the 5% filter has a bandpass at half maximum transmittance between approximately 3.3 μm and 3.5 μm (i.e., approximately 0.2 μm or 200 nm).
40. The system of claim 1, wherein the pass band for the filter configuration is located between about 3200 nm and about 3580 nm with a full width at half maximum less than about 350 nm.	Strachan discloses a 5% filter (see Figure 4) with a bandpass centered at about 3.4 μm (i.e., 3400 nm), and that is between 3.25 μm (3250 nm) and 3.50 μm (3500 nm). (Strachan, p. 493, column 2). As can be seen in Figure 4, at half maximum transmittance, the 5% filter has a bandpass at half maximum transmittance between approximately 3.3 μm and 3.5 μm (i.e., approximately 0.2 μm or 200 nm).
42. The system of claim 1, wherein the pass band for the	Strachan discloses a 5% filter (see Figure 4) with a bandpass centered at about 3.4 μm (i.e.,

Claims 1-4, 6, 8-22, 31, 37-40, 42-56, and 58	Merlin Brochure (Ex. 1007) in view of Strachan (Ex. 1008)
<p>filter configuration is located between about 3200 nm and about 3500 nm with a full width at half maximum less than about 300 nm.</p>	<p>3400 nm), and that is between 3.25 μm (3250 nm) and 3.50 μm (3500 nm). (Strachan, p. 493, column 2). As can be seen in Figure 4, at half maximum transmittance, the 5% filter has a bandpass at half maximum transmittance between approximately 3.3 μm and 3.5 μm (i.e., approximately 0.2 μm or 200 nm).</p>
<p>43. The system of claim 1, wherein the pass band for the filter configuration is located between about 3200 nm and about 3600 nm with a full width at half maximum less than about 400 nm.</p>	<p>Strachan discloses a 5% filter (see Figure 4) with a bandpass centered at about 3.4 μm (i.e., 3400 nm), and that is between 3.25 μm (3250 nm) and 3.50 μm (3500 nm). (Strachan, p. 493, column 2). As can be seen in Figure 4, at half maximum transmittance, the 5% filter has a bandpass at half maximum transmittance between approximately 3.3 μm and 3.5 μm (i.e., approximately 0.2 μm or 200 nm).</p>
<p>45. The system of claim 1, wherein the aggregate pass band for the filter configuration includes a full width at half maximum transmittance that is less than about 600 nm.</p>	<p>Strachan discloses a filter configuration comprising an aggregate bandpass with a full width at half maximum transmittance being less than about 600 nm (i.e., less than about 0.6 μm). As can be seen in Figure 4, at half maximum transmittance, the 10% filter has a bandpass between approximately 3.2 μm and 3.7 μm (i.e., approximately 0.5 μm or 500 nm). The 5% filter has a bandpass at half maximum transmittance between approximately 3.3 μm and 3.5 μm (i.e., approximately 0.2 μm or 200 nm).</p>
<p>46. The system of claim 1, wherein the center wavelength of the pass band for the filter configuration is within an absorption band for one of the chemicals.</p>	<p>Strachan discloses a filter with a bandpass centered at about 3.4 μm (i.e., 3400 nm) (Strachan, p. 493, column 2), which as taught by Strachan is within the absorption band of many hydrocarbons. (Strachan, p. 493, column 1).</p>
<p>47. The system of claim 1, wherein the center wavelength of the pass band for the filter</p>	<p>Strachan discloses a filter with a bandpass centered at about 3.4 μm (i.e., 3400 nm)</p>

Claims 1-4, 6, 8-22, 31, 37-40, 42-56, and 58	Merlin Brochure (Ex. 1007) in view of Strachan (Ex. 1008)
configuration is outside an absorption band for one of the chemicals.	(Strachan, p. 493, column 2). Figures 5-6 shows the absorption bands of several chemicals. 3.4 μm is outside the absorption band of several of these chemicals, such as ammonia. (Strachan, p. 494).
48. The system of claim 1, wherein the absorption band of one of the chemicals includes a peak and the pass band for the filter configuration is centered at or close to the peak.	Strachan discloses a filter with a bandpass centered at about 3.4 μm (i.e., 3400 nm) (Strachan, p. 493, column 2), which, as taught by Strachan, is at or close to the peak of many hydrocarbons. (Strachan, p. 493, column 1).
49. The system of claim 1, wherein the absorption band of one of the chemicals includes a peak and the pass band for the filter configuration is not centered at or close to the peak.	Strachan discloses a filter with a bandpass centered at about 3.4 μm (i.e., 3400 nm) (Strachan, p. 493, column 2). Strachan shows that the passband for the 3.4 μm filter is not centered at or close to the peak of the absorption band of methane. (See Strachan, p. 494, Figure 5).
50. The system of claim 1, further including a computer programmed with image recognition software to analyze the image from the processor.	Merlin Brochure discloses the Talon [®] Data Acquisition system that acquires and analyzes images acquired by the Merlin-MID camera. (Merlin Brochure, p. 4).
51. The system of claim 1, wherein the passive infrared camera system is attached to or supported by a movable vehicle selected from the group consisting of a motorcycle, a car,	Merlin Brochure discloses a passive infrared camera system, the Merlin-MID, used to detect, among other things, chemical signatures in aircraft exhaust. (Ex. 1007, p. 3). ⁴⁴

⁴⁴ It would have been obvious to one of ordinary skill in the art to mount the Merlin-MID camera disclosed in the Merlin Brochure on a “land vehicle” (See Ex. 1011, p. 2), to aim the camera towards a component from a moving vehicle.

Claims 1-4, 6, 8-22, 31, 37-40, 42-56, and 58	Merlin Brochure (Ex. 1007) in view of Strachan (Ex. 1008)
a truck, a bicycle, a boat, a ship, a personal watercraft, a rotary wing vehicle, an airplane, a powered paraglider, an ultralight aircraft, a powered glider, a glider, a balloon, a blimp, a remotely controlled vehicle, an unmanned aerial vehicle, a satellite, and combinations thereof.	
52. The system of claim 1, wherein the passive infrared camera system is non-radiometric.	Merlin Brochure discloses the use of non-radiometric cameras. (Merlin Brochure, p. 2).
53. The system of claim 1, wherein the infrared sensor device includes an Indium Antimonide focal plane array of at least 81,920 sensor elements.	Merlin Brochure discloses that the Merlin-MID includes an Indium Antimonide (InSb) detector with an array of 320 x 246. (Merlin Brochure, Chart on p. 6). 320 x 246 equals 81,920 sensor elements.
54. The system of claim 1, wherein the passive infrared camera system is attached to a permanently installed mount.	Merlin Brochure discloses a passive infrared camera system. ⁴⁵
55. The system of claim 1, further including more than one passive	Merlin Brochure discloses a passive infrared camera system. ⁴⁶

⁴⁵ It would have been obvious to attach the Merlin-MID camera to a permanently installed mount to monitor a target area for an extended period of time. (Ex. 1006, p. 75).

Claims 1-4, 6, 8-22, 31, 37-40, 42-56, and 58	Merlin Brochure (Ex. 1007) in view of Strachan (Ex. 1008)
infrared camera system.	
56. The system of claim 55, wherein the passive infrared cameras are part of a network.	Merlin Brochure discloses the Talon [®] Data Acquisition system in communication with the Merlin-MID camera (Merlin Brochure, p. 4), forming a network.
58. The system of claim 1, wherein the refrigeration system includes a chamber adapted to retain liquid nitrogen.	Merlin Brochure discloses liquid nitrogen (LN2) as a cooling type for the Merlin-MID camera. (Merlin Brochure, p. 6). ⁴⁷

E. Claims 5 and 7 are Unpatentable Under 35 U.S.C. § 103(a) as Being Obvious Over the Merlin Brochure in View of Strachan, in Further View of Piety

Section VI.C, *supra*, demonstrates that claims 1 and 2 are obvious over the combined teachings of the Merlin Brochure and Strachan. Claim 5 depends from claims 1 and 2 and recites a voice recorder that can record voice notes along with the image. Claim 7, which depends from claim 1, recites that the passive infrared camera system is powered by a battery and is portable.

⁴⁶ It would have been obvious to use more than one passive infrared camera to detect multiple target areas at the same time, or to detect the same target area from multiple viewing angles at the same time. (Ex. 1006, p. 57).

⁴⁷ A chamber adapted to retain the liquid nitrogen is necessarily present in the Merlin-MID camera disclosed by the Merlin Brochure. (Ex. 1006, pp. 57-58).

Piety discloses a mobile infrared thermography unit that includes a data processing device operable to record user notes. (Ex. 1018, 14:18-22).

Accordingly, Piety discloses the limitation added by claim 5. With respect to claim 7, one of ordinary skill in the art would recognize that the Merlin-MID camera is also portable. (Ex. 1006, ¶ 88). However, the Merlin Brochure does not explicitly mention a battery. Piety discloses a mobile (i.e., portable) infrared thermography unit that included a battery 250. (Ex. 1018, 9:56-58;10:3-4).

As discussed above, it would have been obvious to one of ordinary skill in the art to modify the Merlin-MID camera disclosed in the Merlin Brochure in view of Strachan to produce a passive infrared camera with a filter selected based on the absorption spectra of hydrocarbon gases. It would have been obvious to modify the teachings of the Merlin Brochure and Strachan, in view of Piety, to include a voice recorder with the modified Merlin-MID camera because it would have been combining prior art elements (e.g. the passive infrared camera of Kulp with the known voice recording of Piety) to yield predictable results of allowing a user of the camera to record notes. (Ex. 1006, ¶ 89). In addition, it would have been obvious to modify the teachings of the Merlin Brochure and Strachan to include a battery with the portable Merlin-MID camera because it would have been combining prior art elements (e.g. the passive infrared camera of Kulp with the

known battery of Piety) to yield predictable results of allowing the camera to be carried around a plant or facility for longer periods of time. (*Id.*, at ¶ 90).

Accordingly, claims 5 and 7 are unpatentable under 35 U.S.C. § 103(a) as being obvious over the teachings of the Merlin Brochure in view of Strachan, further in view of Piety.

F. Secondary Considerations

1. Despite any Allegations of Objective Indicia, the Challenged Patent Claims Would Have Been Obvious

Where there is a strong showing of *prima facie* obviousness, the Federal Circuit has aptly noted that secondary considerations often fail to alter the preliminary conclusion of obviousness. *See, e.g., Leapfrog Enterprises Inc. v. Fisher-Price Inc.*, 485 F.3d 1157, 1162 (Fed. Cir. 2007); *Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1372 (Fed. Cir. 2007) (“[T]his secondary consideration does not overcome the strong showing of obviousness in this case”). That is precisely the case here. Indeed, the claimed camera system is nothing more than the result of using Petitioner’s own Merlin-MID camera with a custom filter selected from a well-known catalog of filters – something that was routinely done (*see* Ex. 1016, ¶ 9; *see also* Ex. 1020) to yield the predictable result of detecting gases of interest (*see* Ex. 1008, p. 493, column 1). Further, using a passive infrared camera, such as the Merlin-MID, with a custom filter to detect a gas leak was well known. (Ex. 1016, ¶ 6). Notwithstanding any alleged evidence of secondary considerations that

the Patent Owner may offer, it will not be enough to overcome the strong showing of *prima facie* obviousness presented in this Petition.

Nonetheless, the Patent Owner may attempt to avoid a finding of obviousness by asserting one or more of the same secondary considerations it alleged during the original prosecution of the parent application. (*See* Ex. 1002, pp. 00643-649). Any such evidence should meet the same fate that it met before the Examiner, who correctly noted that the Patent Owner failed to establish a nexus between the alleged secondary considerations and the claimed subject matter.⁴⁸ (*See Id.*, at pp. 00784-788).

2. Commercial Success

In particular, Patent Owner pointed to the alleged commercial success of FLIR's ThermaCAM[®] camera as evidence of alleged non-obviousness. (Ex. 1002, pp. 00643-646). However, the Examiner found that Patent Owner failed to establish a nexus between the alleged commercial success and the claimed limitations. In particular, the Examiner found that "the inventor's opinion as to a purchaser's reason for buying the product [was] insufficient to demonstrate a nexus

⁴⁸ On appeal, the Board did not address the Examiner's findings with respect to the secondary considerations raised by Patent Owner. (*See* Ex. 1002, pp. 00793-799).

between the sales and each of the different methods claimed.” (*Id.*, at p. 00784) (emphasis in original).

Moreover, even “a highly successful product alone [will] not overcome [a] strong showing of obviousness.” *Tokai Corp.*, 632 F.3d at 1370 (quoting *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 716 (Fed. Cir. 1991)). As discussed in this Petition, the combined teachings of the Merlin Brochure with Strachan present an overwhelmingly strong showing of *prima facie* obviousness. The Merlin Brochure itself discloses nearly all of the features of the claims. Selection of a particular filter tailored to one or more gases to be detected, as taught by Strachan, was a well-known technique implemented in passive infrared cameras for gas leak detection.⁴⁹ No amount of alleged commercial success can overcome the strong showing of obviousness here.

3. Long Felt Need and Failure of Others

The Patent Owner may also allege, as it did during original prosecution of the parent application, that the claimed invention met a long felt unmet need in the art. (*See* Ex. 1002, pp. 00646-649). Any factual evidence of long felt unmet need or failure of others must establish at least: (a) the need must have been persistent

⁴⁹ In addition to Strachan, see also Smith (Ex. 1009, p. 677); Kulp (Ex. 1012, pp. 269-70); Kanagawa (Ex. 1010, p. 1062-63, Figure 2).

and recognized by those of ordinary skill in the art; (b) the long-felt unmet need must not have been satisfied by another before the applicant's invention; and (c) the invention must in fact satisfy the long-felt need. MPEP § 716.04. The mere existence of a market demand or design need, or the simple passage of time without the claimed "invention," cannot, alone, constitute evidence of non-obviousness. *Hitachi Koki Co., Ltd. v. Doll*, 620 F. Supp. 2d 4, 30 (D.D.C. 2009) aff'd sub nom. *Hitachi Koki Co., Ltd. v. Kappos*, 397 F. App'x 660 (Fed. Cir. 2010).

The Federal Circuit usually treats long felt unmet need and failure of others together, as failure of others is often provided as evidence of long felt unmet need. To establish a long-felt need, the failure must be due to technical difficulties, as opposed to business or commercial reasons. *DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1372 (Fed. Cir. 2006).

The Examiner appropriately rejected the Patent Owner's allegations that the claimed invention addressed a long felt unmet need. As the Examiner correctly noted, prior to the Patent Owner's alleged invention, others had succeeded in providing a passive infrared camera for detecting gas leaks. There was no long felt need that had been unmet. (*See* Ex. 1002, pp. 00786-788). The Examiner was also unpersuaded by the Patent Owner's reliance on the lack of EPA regulations directed to optical gas imaging systems. (*Id.*, at p. 00786). As the Examiner

correctly noted, there is no connection between the regulatory landscape (which can be influenced by any number of factors) and the functionality (or lack thereof) of prior art gas imaging systems. (*Id.*).

Although the secondary considerations alleged during original prosecution are briefly mentioned above, Petitioner reserves the right to more fully address any evidence of secondary considerations that Patent Owner may assert in this proceeding. *See Amneal Pharmaceuticals, LLC v. Supernus Pharmaceuticals, Inc.*, IPR2013-00371, Decision on Request for Rehearing, Paper No. 24, p. 3 (P.T.A.B. January 22, 2014).

VII. CONCLUSION

Based on the above, there is a reasonable likelihood that Petitioner will prevail in its challenge of patentability for at least one of claims 1-58 of the 813 patent.

Dated: March 4, 2014 Respectfully submitted,

/Joseph F. Hetz/
Joseph F. Hetz (Reg. No. 41,070)
Rickard K. DeMille (Reg. No. 58,471)
Ralph J. Gabric (Reg. No. 34,167)
BRINKS GILSON & LIONE
NBC Tower, Suite 3600
455 North Cityfront Plaza Drive
Chicago, IL 60611-5599
Attorneys for Petitioner FLIR Systems, Inc.

CERTIFICATE OF SERVICE

I hereby certify that a true copy of the foregoing PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 8,426,813, as well as the accompanying Power of Attorney, and Exhibits 1001-1021, has been served in its entirety this 4th day of March, 2014 by Federal Express on:

Collin Rose
Chamberlain, Hrdlicka, White, Williams & Aughtry
P.C. 1200
Smith Street, 14th Floor
Houston TX 77002

Rajkumar Vinnakota
Skiermont Puckett LLP
2200 Ross Avenue, Suite 4800W
Dallas, TX 75201

/Rickard K. DeMille/
Joseph F. Hetz (Reg. No. 41,070)
Rickard K. DeMille (Reg. No. 58,471)
Ralph J. Gabric (Reg. No. 34,167)
BRINKS GILSON & LIONE
NBC Tower, Suite 3600
455 North Cityfront Plaza Drive
Chicago, IL 60611-5599
Attorneys for Petitioner FLIR Systems, Inc.