In the United States Court of Federal Claims

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SCIENCE APPLICATIONS
INTERNATIONAL CORP.,

        Plaintiff,

        v.

THE UNITED STATES,

        Defendant,

        and

MICROSOFT CORPORATION,

        Intervenor-Defendant,

        and

L3 TECHNOLOGIES, INC.,

        Third-Party Defendant.

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No. 17-cv-825

Filed: August 6, 2021

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MEMORANDUM AND ORDER

This patent case involves complex subject matter, important, cutting-edge technology, and relates to several high-value contracts with the United States totaling billions of dollars. *See e.g.*, July 26, 2021 Hearing Transcript (ECF No. 191) at 8:7-17 (referencing $21.9 billion contract between the Government and Microsoft).[1] In 2017, Plaintiff Science Applications International Corp. (SAIC), filed its complaint alleging "that the United States infringed the SERVAL Patents by entering into contracts with Plaintiff's competitors for the manufacture and subsequent use of night vision goggle weapon systems with specialized heads up displays that allegedly use Plaintiff's patented technology." *Sci. Applications Int'l Corp. v. United States*, 148 Fed. Cl. 268, 269 (2020); Complaint (ECF No. 1) (Compl.) at ¶¶ 2, 37.

The patents at issue are U.S. Patent Nos. 7,787,012 (the '012 patent), 8,817,103 (the '103 patent), 9,229,230 (the '230 patent), and 9,618,752 (the '752 patent) (collectively, the Soldier Enhanced Rapid Engagement and Vision in Ambient Lighting or SERVAL[2] patents). *See* Compl. ¶¶ 1, 3.[3] Collectively, these patents include 91 total claims. *See* '012 patent at 9:62-12:3; '103

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[1] *See also* SAIC's June 1, 2021 Letter: Motion to Compel Government to Produce Documents under Court of Fed. Cl. R. 26 and 34 (Public Version) (ECF No. 185) at 2 (referencing a March 25, 2021 agreement between the Government and Microsoft under which the Government agreed to pay $21.9 billion for IVAS HUD devices); Plaintiff Science Applications International Corp.'s Claim Construction Brief (ECF No. 90) at 5-6 (referencing "contract awards to BAE Systems and DRS Technologies for not to exceed values of $444.8 million and $367 million, respectively," "a May 16, 2018 contract award to L3 Technologies, Inc. worth up to nearly $400 million, and a November 20, 2018 other transaction agreement with Microsoft worth up to nearly $500 million."); Defendant's Objections and Second Supplemental Responses to Plaintiff's Second Set of Interrogatories (7-9) (ECF No. 179-2) (SEALED) at 17-29.

[2] A serval is "a sub-Saharan African cat that is known to have the best kill rate in the wild cat family, including when hunting at night." Pl.'s Technology Tutorial Presentation at 29.

[3] The patents are available as attachments to SAIC's Opening Claim Construction Brief. Specifically, the '012 patent is Exhibit A (ECF No. 90-4); the '103 patent is Exhibit B (ECF No. 90-5); the '230 patent is Exhibit C (ECF No. 90-6); and the '752 patent is Exhibit D (ECF No. 90-7).

patent at 10:6-59; '230 patent at 24:24-30:42; '752 patent at 25:1-28:57. The parties seek construction on six terms found throughout each of the four asserted patents. This claim construction Memorandum and Order construes the disputed terms.

BACKGROUND

I. Technology Overview

Night vision goggles (NVGs) passively amplify miniscule amounts of ambient light, such as starlight, and enable a soldier to see obscured targets in the dark. '012 patent at 1:34-36. However, the process of acquiring and striking a target while using these goggles can be cumbersome. *Id.* at 1:32-33. When a soldier located a target, the soldier was forced to either (1) flip the goggles out of the way and reacquire the target with the sight on his weapon or (2) engage a laser illuminator on his weapon that followed the weapon's line of sight and thus indicated where the bullet would strike. *Id.* at 1:36-48. Both options came with their own drawbacks. If the soldier employed the first option, the soldier would lose valuable seconds removing his goggles and be forced to acquire the target using the weapon's narrower field of vision, which may be virtually impossible with a distant or moving target. *Id.* at 1:39-43. If the soldier employed the second option, the illuminator may have the unintended effect of giving away the soldier's position because the laser illuminator may be just as visible to an enemy as it is to the soldier. *Id.* at 1:44-1:57.

To alleviate these issues associated with acquiring targets using NVGs, U.S. military planners set out to develop technology that would combine images from a weapon sight and the NVG's visual field. *See* '012 patent at 1:59-2:27. According to the SERVAL patents, the prior art combined images from the field of view and the weapon sight but did not "register" the images.

Id. at 1:65-2:3. Instead, the patents assert that, under the prior art, the combined images were often "distinctly offset" with two distinct images of the same target appearing in different places. *Id.* at 2:13-2:15. This offset could confuse and disorient the soldier because the soldier could have difficulty determining the location of his weapon sight in relation to his night vision goggle field of view. *Id.* at 2:15-2:18.

To resolve these issues found in the prior art, Retired Brigadier General John Scales led a team of SAIC engineers in developing the technologies claimed in the four asserted patents, which form two interrelated patent families. *See* Compl. ¶ 1; *Sci. Applications Int'l Corp.*, 135 Fed. Cl. at 664. Each patent family is described below in turn.

1. First Patent Family ('012 and '103 Patents)

The First Patent Family consists of the '012 and '103 patents, which share a common specification.[4] The '012 patent is entitled "System and Method for Video Image Registration in a Heads Up Display." *See generally* '012 patent. The '012 patent was issued on August 31, 2010 from an application filed on December 2, 2004 that did not claim priority to any earlier-filed application. *Id*. On its face, the '012 patent identifies two inventors, John Richard Scales and Mark David Hose, and an assignee, Science Applications International Corporation of San Diego, California. *Id.* The '012 patent issued with nineteen total claims. *See* '012 patent at 9:62-12:3. Method claims 1 and 17 are the only independent claims. *Id*. at 9:63-12:3. Claim 1 of the '012 patent recites:

> **1.** A method of registering video images with an underlying visual field comprising the steps of:
> > (1) determining a source orientation of a video source providing a video feed containing data for a series of video images representing portions of a visual field;

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[4] Because the '012 and '103 patents share the same specification, this Memorandum and Order cites to only the '012 patent when referring to the specification for the First Patent Family.

(2) determining a display orientation of a transparent display overlaying the visual field, wherein the video source and the transparent display are independently movable about multiple axes; and

(3) displaying the video images in positions on the transparent display that overlay portions of the visual field represented by the displayed video images, wherein boundaries of the displayed video images are in registration with boundaries of portions of the visual field represented by the displayed video images.

Id. at 9:63-10:10.

Claim 17 of the '012 patent recites:

17. A method of registering video images with an underlying visual field comprising the steps of:

(1) determining a source orientation of a video source of a video feed;

(2) determining a display orientation of a transparent display overlaying the visual field;

(3) displaying a portion of the video feed in the transparent display;

(4) registering the portion of the video feed with the underlying visual field; and

(5) repositioning the portion of the video feed within the transparent display when the video source or transparent display moves.

Id. at 10:48-60. Claims 2-16 and 18-19 of the '012 patent depend ultimately on claim 1. *Id.* at 9:63- 12:3.

Like the '012 patent, the '103 patent is also entitled "System and Method for Video Image Registration in a Heads Up Display." *See generally* '103 patent. The '103 patent was issued on August 26, 2014 from a divisional application filed on July 26, 2010 that claims priority to the application filed on December 2, 2004, which issued as the '012 patent. *Id*. The '103 patent shares the same specification with the '012 patent. *Id*. On its face, the '103 patent identifies the same inventors and assignee as the '012 patent. *Id*. The '103 patent issued with twelve total claims; system claim 1, reproduced below, is the only independent claim. *Id.* at 10:7-59.

Claim 1 of the '103 patent recites:

1. A system comprising:
a video camera adapted to provide, in a video feed, data for

a series of video images representing portions of a visual field;
a first orientation sensor adapted to detect an orientation of the video camera;
a heads up display (HUD) adapted for viewing of the visual field by a user of the system wherein the HUD comprises a transparent display, and wherein the HUD and the video camera are independently movable about multiple axes;
a second orientation sensor adapted to detect an orientation of the HUD; and
a computer adapted to receive sensor data from the first and second orientation sensors, to receive the video feed from the video camera, and to display the video images, on the transpar[e]nt display and based on the received sensor data, in positions that overlay portions of the visual field represented by the displayed video images wherein boundaries of the displayed video images are in registration with boundaries of portions of the visual field represented by the displayed video images, and wherein the computer is adapted to
determine a source orientation of the video camera, and
determine a display orientation of the transparent display.

Id. at 10:7-31.

SAIC's asserted claim 1 of the '012 patent and asserted claim 1 of the '103 patent recite nearly identical steps, though the former is a method and the latter is a system. The First Patent Family summarizes their purported invention as "a method for aligning video images with an underlying visual field" by performing various steps. '012 patent at 2:31-37. Those steps are "determining a source orientation of a video source, determining a display orientation of a transparent display overlaying the visual field, and displaying video images in the transparent display," where the position of the video "images is based on the source orientation and the display orientation." *Id.* at 2:33-37. In other words, "[a] video camera is coupled with a heads up display, and a computer positions images from the video camera on the heads up display based on the relative orientations of the camera and the display." *Id.* at Abstract. "The video image, which may, for example, come from a weapon sight, is aligned within the heads up display. . . ." *Id.*

Figure 5, reproduced below, which appears on the front of the '012 and '103 patents, illustrates the described configuration. '012 patent at Fig. 5.
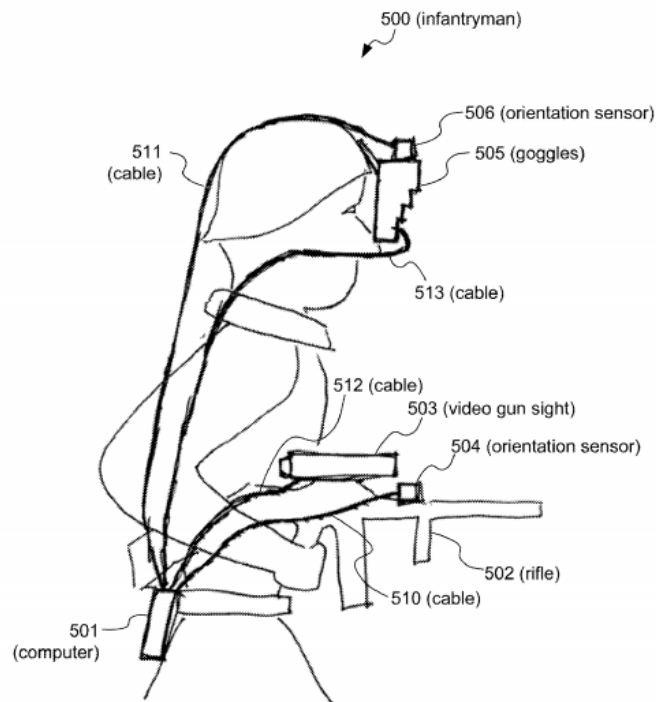

FIG. 5

The '012 and '103 patents admit that prior art methods and systems, including prior art night vision goggles (such as "Sensor Technology Systems' Model 2733 Low Profile Night Vision Goggle"), already "have the ability to port a video feed into a beam combiner, overlaying a video image from a video source mounted in the weapon sight onto the center of the visual field of the goggle." '012 patent at 1:65-2:3. Figure 1 of the '012 and '103 patents illustrate an example of the combined image generated by the prior art.

FIG. 1
(PRIOR ART)

In Figure 1, the '012 and '103 patents describe the problem with the prior art solution as "the video feed **102** remains stationary in the center of the visual field **101**, obscuring content in the center of the visual field . . . ." '012 patent at 2:10-13. According to the patents, the combined images in Figure 1,

> depict the same subjects, a group of soldiers accompanying an armored personnel carrier (APC). However, the video feed **102** remains stationary in the center of the visual field **101**, obscuring content in the center of the visual field, in this case the APC and a soldier. The two images are distinctly offset, with the two soldiers to the right of the APC being repeated in both images. This offset, with two distinct images of the same target appearing in different places in the field of view could confuse the soldier, causing a delay in engagement or a miss.

'012 patent at 2:9-18.

Under the First Patent Family, images from the weapon sight's video source and night vision goggles are "registered" using the relative orientations of the weapon's sight and the night vision goggles. *Id.* at Abstract, 2:4-7. Figure 4 illustrates the combined image using the invention.
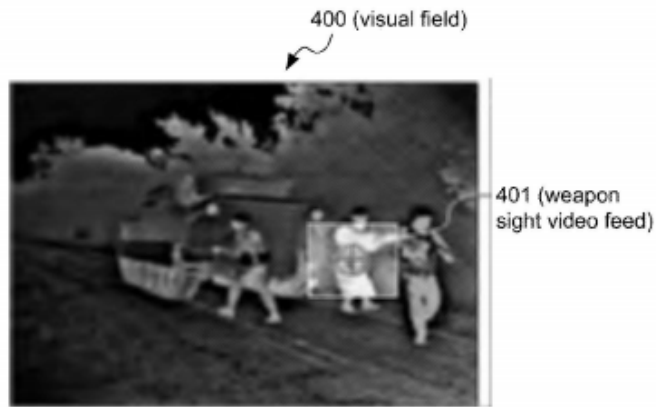
FIG. 4

In Figure 4, the visual field 400 is "the view through a soldier's night vision goggles or other (clear) goggles [that] is enhanced with the addition of a portion of the weapon sight video feed **401** through the use of a heads up display (HUD)." '012 patent at 3:57-61. "[T]he video feed **401** has been positioned over the portion of the visual field **400** based on the direction the video source is pointed." *Id.* at 3:64-66. "As the weapon moves, the video feed **401** is dynamically positioned within the visual field **400**." *Id.* at 3:67-4:1. A side-by-side comparison of Figures 1 and 4 illustrates the advancement over the prior art.
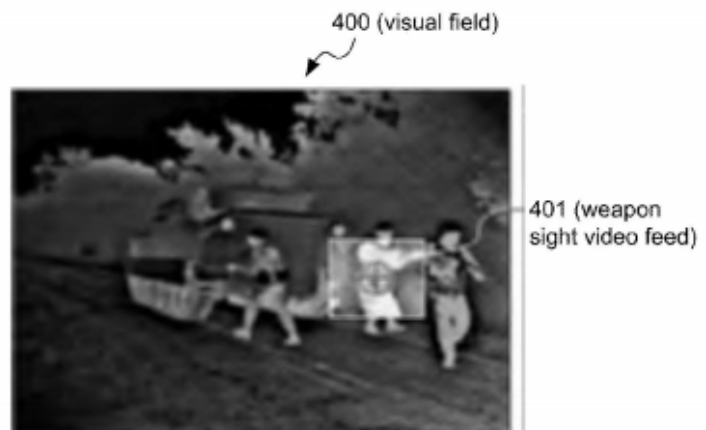

FIG. 1
(PRIOR ART)

FIG. 4

The '012 and '103 patents provide a single high-level flowchart, in Figure 8, which "demonstrates an illustrative embodiment of a method for registering a video image with an underlying visual field." '012 patent at 6:25-27.
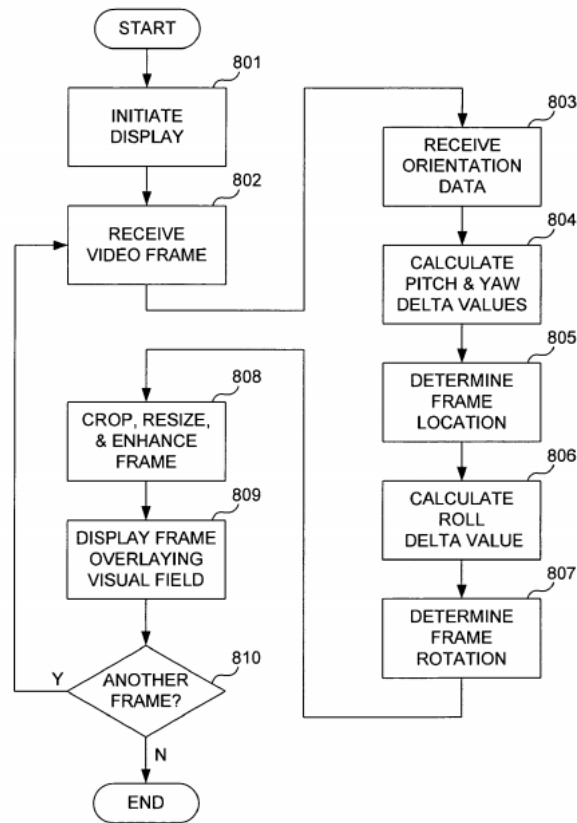

FIG. 8

In Figure 8, the relative orientation of the display and video source is used to determine the placement (e.g., X and Y position and rotation) of a video frame containing image data on the display. *Id.* at 6:25-27, 6:38-7:12. Specifically, Figure 8 explains that the invention registers the image by: (1) calculating pitch and yaw delta values (804), (2) determining frame location (805), (3) calculating the roll delta value (806), (4) determining frame rotation (807), and (5) cropping, resizing, and enhancing the frame (808). Next, "the processed video frame . . . may be displayed in a heads up display, as in step **809**." *Id.* at 7:16-17. As step 810 illustrates, "if another frame of

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video is set to be received (i.e., the display is still on), then the process repeats for each new frame, returning to step **802**." *Id.* at 7:30-33.

2. Second Patent Family ('230 and '752 Patents)

The Second Patent Family includes two patents that also share a common specification.[5] The '230 patent is entitled "System and Method for Video Image Registration and/or Providing Supplemental Data in a Heads Up Display." *See generally* '230 patent. The '230 patent was issued on January 5, 2016 from an application filed on February 28, 2007 that does not claim priority to any earlier-filed application. *Id.* On its face, the '230 patent identifies two inventors, John Richard Scales and Michael Harris Rodgers, and an assignee, Science Applications International Corporation of McLean, VA. *Id.* The '230 patent issued with forty-two total claims; claims 1, 15, and 29 are the only independent claims. *Id.* at 24:24-30:42.

Claim 1 of the '230 Patent recites:

1. A system, comprising:
a first video source configured to generate images representing portions of an external environment;
a second video source, movable independent of the first video source, configured to generate images representing portions of the external environment;
a video display; and
a controller coupled to the first and second video sources and to the display, wherein the controller is configured to
(a) receive video images from the first video source and from the second video source,
(b) receive motion data indicative of motion of the first and second video sources,
(c) identify, based on the received motion data, a part of a first video source image that potentially represents a portion of the external environment represented in a part of a second video source image;
(d) evaluate, based on a comparison of data from the first and second video source images, the identification performed in operation (c); and

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[5] Because the '230 and '752 patents share the same specification, this Memorandum and Order cites to only the '230 patent when referring to the specification for the Second Patent Family.

> (e) display at least a portion of the first video source
>   image and at least a portion of the second video source
>   image such that the second video source image por-
>   tion overlays a corresponding region of the first video
>   source image portion, wherein the corresponding
>   region represents a portion of the external environ-
>   ment represented in the second video source portion.

Id. at 24:25-51.

Claims 2-14 of the '230 patent depend ultimately on claim 1. *Id.* at 24:51-26:26.

Similarly, claim 15 of the '230 patent mirrors claim 1, except that it is a method claim rather than a system claim, and it recites:

> **15.** A method, comprising:
> (a) receiving video images from a first video source and
>   from a second video source representing portions of an
>   external environment;
> (b) receiving motion data indicative of motion of the first
>   and second video sources;
> (c) identifying, based on the received motion data, a part of
>   a first video source image that potentially represents a
>   portion of the external environment represented in a part
>   of a second video source image;
> (d) evaluating, based on a comparison of data from the first
>   and second video source images, the identification per-
>   formed in step (c); and
> (e) displaying at least a portion of the first video source
>   image and at least a portion of the second video source
>   image such that the second video source image portion
>   overlays a corresponding region of the first video source
>   image portion, wherein the corresponding region repre-
>   sents a portion of the external environment represented
>   in the second video source portion.

Id. at 26:27-47.

Claims 16-28 of the '230 patent depend ultimately on claim 15. *Id.* at 26:48-28:15.

Claim 29 of the '230 patent recites the same steps as claims 1 and 15, except it involves a "non-transitory machine-readable medium having machine-executable instructions for performing a method." It recites in full:

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29. A non-transitory machine-readable medium having
machine-executable instructions for performing a method,
comprising:
(a) receiving video images from a first video source
and from a second video source representing portions of an
external environment;
(b) receiving motion data indicative of motion of the first
and second video sources;
(c) identifying, based on the received motion data, a part of
a first video source image that potentially represents a
portion of the external environment represented in a part
of a second video source image;
(d) evaluating, based on a comparison of data from the first
and second video source images, the identification per-
formed in step (c); and
(e) displaying at least a portion of the first video source
image and at least a portion of the second video source
image such that the second video source image portion
overlays a corresponding region of the first video source
image portion, wherein the corresponding region repre-
sents a portion of the external environment represented
in the second video source portion.

Id. at 28:17-38.

Claims 30-42 of the '230 patent depend ultimately on claim 29. *Id.* at 28:39-30:42.

Like the '230 patent, the '752 patent is also entitled "System and Method for Video Image

Registration and/or Providing Supplemental Data in a Heads Up Display." *See generally* '752

patent. The '752 patent was issued on April 11, 2017 from a continuation application filed on

November 24, 2015 that claims priority to the application filed on February 28, 2007, which issued

as the '230 patent. *Id.* On its face, the '752 patent identifies the same inventors and assignee as

the '230 patent. *Id.* The '752 patent issued with eighteen total claims; claims 1, 7, and 13, all

reproduced below, are the only independent claims. *Id.* at 25:2-28:58. Claim 1 of the '752 patent

is a system claim and recites in full:

1. A system, comprising:
a first video source configured to generate video data
of images representing portions of an external environ-

ment within a field of view of the first video source;
a second video source configured to generate second
    video data of images representing portions of the
    external environment within a field of view of the
    second video source;
a video display; and
a controller in communication with the first and second
    video sources and the display and configured to per-
    form operations that include
    receiving the first video data, the second video data,
      first motion data corresponding to the first video
      source, and second motion data corresponding to the
      second video source,
    identifying, based on the received first motion data and
      the received second motion data, a region of a first
      image generable from the first video data for com-
      parison with a region of a second image generable
      from the second video data,
    comparing data corresponding to the identified region
      of the first image and data corresponding to the
      region of the second image,
    selecting, based on the comparing, a part of the first
      image and a part of the second image that represent
      the same portion of the external environment,
    displaying at least a portion of the first image and the
      selected part of the second image such that the
      selected part of the second image replaces the
      selected part of the first image and is in registration
      with regions of the first image surrounding the
      selected part of the first image.

Id. at 25:2-34. Claims 2-6 of the '752 patent depend ultimately on claim 1. *Id.* at 25:35-26:19.

Claim 7 of the '752 patent is a method claim and recites:

7. A method comprising:
receiving first video data of images representing portions
    of an external environment within a field of view of a
    first video source;
receiving second video data of images representing por-
    tions of the external environment within a field of view
    of a second video source;
receiving first motion data corresponding to the first video
    source and second motion data corresponding to the
    second video source;
identifying, based on the received first motion data and

the received second motion data, a region of a first
image generable from the first video data for compar-
ison with a region of a second image generable from the
second video data;

comparing data corresponding to the identified region of
the first image and data corresponding to the region of
the second image;

selecting, based on the comparing, a part of the first image
and a part of the second image that represent a same
portion of the external environment; and

displaying at least a portion of the first image and the
selected part of the second image such that the selected
part of the second image replaces the selected part of
the first image and is in registration with regions of the
first image surrounding the selected part of the first
image.

Id. at 26:19-26:45. Claims 8-12 of the '752 patent depend ultimately on claim 7. *Id.* at

26:48-27:30.

Claim 13 of the '752 patent involves a "non-transitory machine-readable medium

having machine executable instructions for performing a method" and recites in full:

13. A non-transitory machine-readable medium having
machine executable instructions for performing a method
comprising:

receiving first video data of images representing portions
of an external environment within a field of view of a
first video source;

receiving second video data of images representing por-
tions of the external environment within a field of view
of a second video source;

receiving first motion data corresponding to the first video
source and second motion data corresponding to the
second video source;

identifying, based on the received first motion data
and the received second motion data, a region of a first
image generable from the first video data for compari-
son with a region of a second image generable from the
second video data;

comparing data corresponding to the identified region of
the first image and data corresponding to the region of
the second image;

selecting, based on the comparing, a part of the first image
and a part of the second image that represent a same
portion of the external environment; and

displaying at least a portion of the first image and the
selected part of the second image such that the selected
part of the second image replaces the selected part of
the first image and is in registration with regions of the
first image surrounding the selected part of the first
image.

Id. at 27:31-59.

The '230 and '752 patents summarize their purported invention as "a computer receives images from two video sources[, where] [e]ach of those two video sources is movable independent of the other and generates images that represent a portion of an external environment within its field of view." '230 patent at 1:58-62. "Sensors coupled to the two video sources provide data to the computer that indicates the spatial orientations of those sources." *Id.* at 1:64-66. "Using the sensor data, the computer determines a location for placing a video image (or a portion thereof) from a second of the sources (e.g., a rifle-mounted source) in the video image from a first of the sources (e.g., a goggles-mounted source)." *Id.* at 1:66-2:3. After a location is determined from the sensor data, "the two images are displayed such that the second source image (or a portion of that image) overlays a corresponding portion of the first source image." *Id.* at 2:11-14.

The Second Patent Family incorporates by reference the '012 patent. *Id*. at 1:19-22. The '230 and '752 patents admit that prior art methods and systems include the '012 patent. *Id.* at 1:17-34. An important difference between the '012 patent family and the later '230 patent family is the manner in which the images from the weapon sight (first video source) and the night vision goggles (second video source) are aligned. *Markman* Hearing Tr. (ECF No. 159) at 23:20-25:7. The '012 patent family claims a system in which the images from two different sources are aligned using only orientation data. *See, e.g.*, '012 patent, claims 1, 17; '103 patent, claim 1. By the time

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the '230 patent was filed three years later, however, the named inventors had realized that use of orientation data alone may pose problems. '230 patent at 1:35-43 (identifying disadvantages of a system using only sensor data to match images). "For example, many low-cost [inertial measurement unit (IMU)] sensors experience bias drift over time" that "can result in relative orientation errors of several degrees per hour." '230 patent at 1:38-41. These errors require the user to periodically recalibrate the IMU sensors, and thus "can disrupt system operation." *Id.* at 1:42-44. Thus, the later filed '230 patent describes an improved, two-step alignment method. The '230 patent family first uses data from motion sensors to help align images from two different sources. *Id.* at 2:6-17. The '230 patent then performs a second step of comparing the content of the images themselves to evaluate whether the alignment is correct and to adjust the alignment as necessary. *Id.* at 2:6-17, Abstract ("The sensor-based location is checked (and possibly adjusted) based on a comparison of the images."). The purported invention of the '230 and '752 patents apparently minimizes the need for such manually initiated recalibration. *Id.* at 1:44-45, 2:14-16.

Figure 4 of the '230 patent is an example of a displayed image resulting from this two-step alignment process.
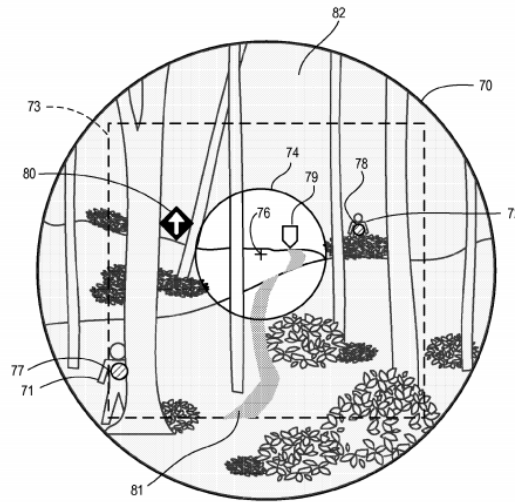
FIG. 4

To achieve the image in Figure 4, a computer receives video images from the weapon- and goggles-mounted sources and inertial data from the sensors. *Id.* at 6:54-60. The computer calculates a location for an image from the weapon-mounted source within an image from the goggles-mounted source using the inertial sensor data. *Id.* at 7:19-22. The sensor-based location is checked (and possibly adjusted) based on a comparison of the images. *Id.* at Abstract. "Figure 4 shows an example of a user display **70** provided by the goggles **11**." *Id.* at 6:54-55. "Located within the goggles['] [field of view] (and thus in [the] goggles image **82**) are numerous trees and bushes . . . as well as soldiers **71** (partially behind a tree in the lower left) and **72** (partially covered by foliage in the upper right)." *Id.* at 6:62-67. "The [heads up display] portion of [the] user display **70** is shown as a rectangular region **73** in the center portion of the goggles['] [field of view]." *Id.* at 7:3-5. "[O]verlaid on [the heads up display] **73** is a weapon view **74** corresponding to (and generated from) the scope image." *Id.* at 7:6-8. "[T]he location and rotation of [the] weapon view **74** within [the] user display **70** is determined by [the] computer **30** based on output from [the] sensors **13** and **18** and based on [a] comparison of the scope image with the goggles image." *Id.*

18

at 7:19-22. "As [the] rifle **19** is moved, scope images (or portions thereof) are dynamically positioned within [the] user display **70** so as to indicate where [the] scope **17** (and thus [the] rifle **19**) is pointing." *Id.* at 7:22-25.

The '230 and '752 patents provide a high-level flowchart in Figures 5A-5B, demonstrating the Second Patent Family's advancement. *Id.* at 2:48-49. Figures 5A-5B, reproduced below, "are a flow chart explaining the operation of [the] system **10**." *Id.* at 7:46-47. As shown below, initial calibration occurs at step 103 and recalibration, if necessary, occurs at step 117 "thereby correcting for bias drift and helping to maintain proper registration of the scope image within the goggles image." *Id.* at 7:61-64, 10:4-15.
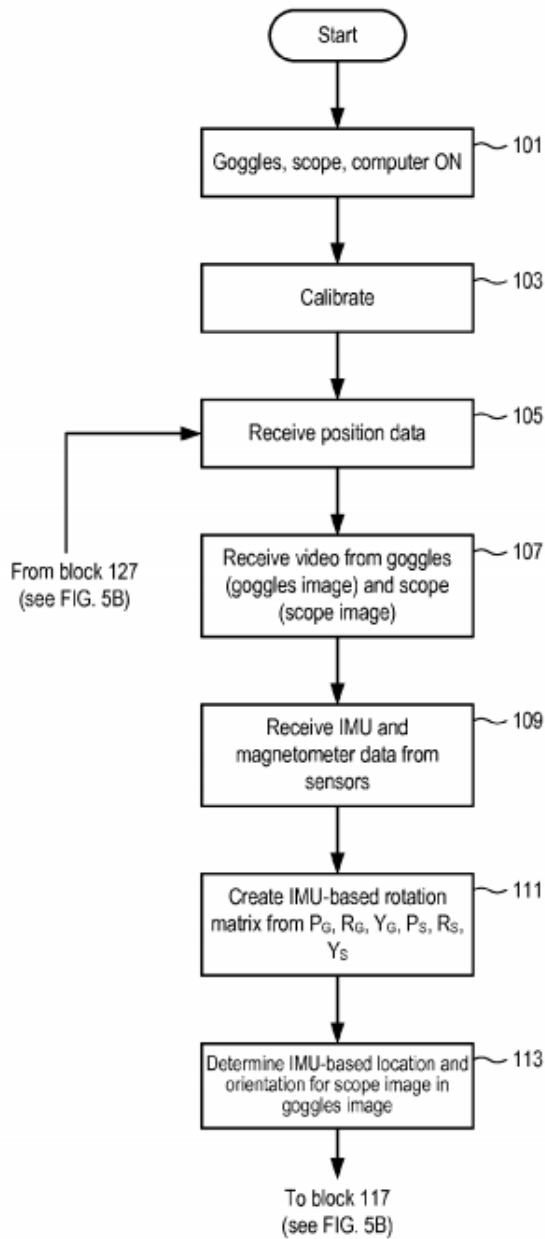
FIG. 5A

```
                    ( Start )
                        │
                        ▼
        ┌─────────────────────────────┐
        │ Goggles, scope, computer ON │──── 101
        └─────────────────────────────┘
                        │
                        ▼
        ┌─────────────────────────────┐
        │          Calibrate          │──── 103
        └─────────────────────────────┘
                        │
                        ▼
        ┌─────────────────────────────┐
        │    Receive position data    │──── 105
        └─────────────────────────────┘
                        │
                        ▼
        ┌─────────────────────────────┐
        │ Receive video from goggles  │──── 107
        │ (goggles image) and scope   │
        │      (scope image)          │
        └─────────────────────────────┘
                        │
                        ▼
        ┌─────────────────────────────┐
        │     Receive IMU and         │──── 109
        │  magnetometer data from     │
        │         sensors             │
        └─────────────────────────────┘
                        │
                        ▼
        ┌─────────────────────────────┐
        │  Create IMU-based rotation  │──── 111
        │ matrix from PG, RG, YG, PS, │
        │          RS, YS             │
        └─────────────────────────────┘
                        │
                        ▼
        ┌─────────────────────────────┐
        │ Determine IMU-based location│──── 113
        │  and orientation for scope  │
        │  image in goggles image     │
        └─────────────────────────────┘
```

From block 127
(see FIG. 5B)

To block 117
(see FIG. 5B)

FIG. 5A

FIG. 5B

From block 113
(see FIG. 5A)

```
        ┌─────────────────────────────┐
        │ Check IMU-based position and│──── 117
        │ recalibrate IMUs if necessary│
        └─────────────────────────────┘
                        │
                        ▼
        ┌─────────────────────────────┐
        │  Crop/resize/enhance scope  │──── 119
        │           image             │
        └─────────────────────────────┘
                        │
                        ▼
        ┌─────────────────────────────┐
        │  Overlay cropped/resized/   │──── 121
        │  enhanced scope image as    │
        │        weapon view          │
        └─────────────────────────────┘
                        │
                        ▼
        ┌─────────────────────────────┐
        │   Update tactical database  │──── 123
        └─────────────────────────────┘
                        │
                        ▼
        ┌─────────────────────────────┐
        │ Add icons and/or other graphics│── 125
        └─────────────────────────────┘
                        │
                        ▼
                   ◇ More ◇              127
        Yes ──────  images?
                        │ No
                        ▼
                    ( End )
```
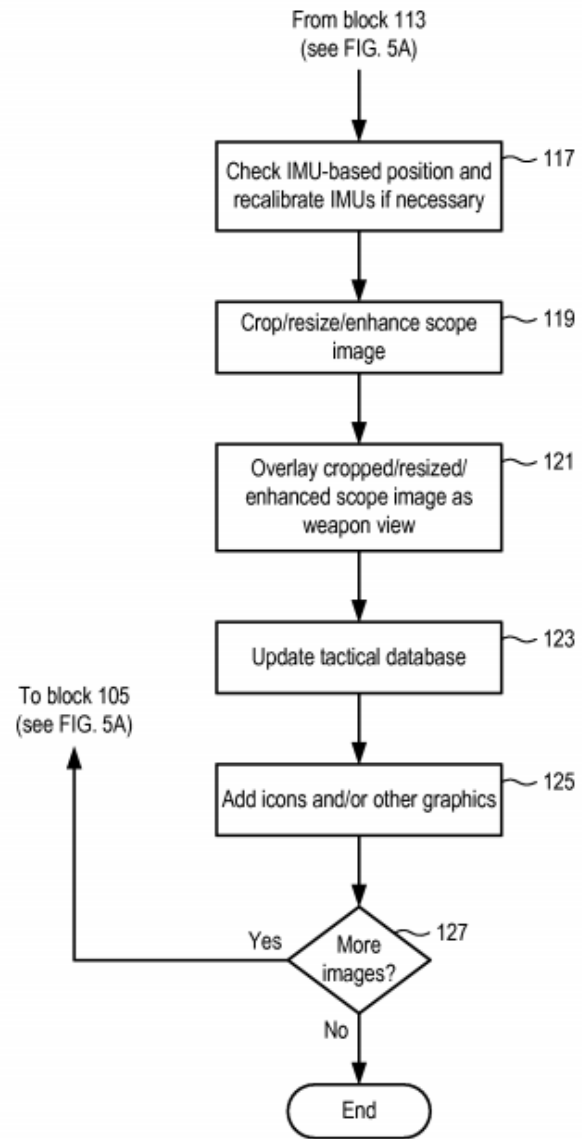
To block 105
(see FIG. 5A)

FIG. 5B

II. <u>Procedural History</u>

Familiarity with the background of this litigation is presumed. *See, e.g.*, *Sci. Applications Int'l Corp. v. United States*, No. 17-CV-825, 2021 WL 1568815, at *1 (Fed. Cl. Apr. 21, 2021) (denying Plaintiff's motion to strike Defendant's indefiniteness contentions but awarding fees for untimely assertion of indefiniteness contentions); *Sci. Applications Int'l Corp. v. United States*,

148 Fed. Cl. 268 (2020) (permitting Government's Rule 14(b) notice); *Sci. Applications Int'l Corp. v. United States*, 135 Fed. Cl. 661, 662 (2018) (denying Government's motion to dismiss). For ease of reference, the Court summarizes the litigation as follows.

On June 19, 2017, SAIC filed suit seeking compensation for the Government's alleged infringement of the asserted patents. *See generally* Compl. This suit was based on the United States' contract awards to BAE Systems and DRS Technologies for the development of technology which included the implementation of a Rapid Target Acquisition (RTA) feature relevant to Plaintiff's infringement claims. Compl. ¶¶ 3, 38.

On November 20, 2018, Microsoft entered into a contract with the United States to develop an Integrated Visual Augmentation System (IVAS), which Microsoft alleges includes implementation of an RTA feature relevant to Plaintiff's infringement claims. *See* Microsoft Motion to Intervene (ECF No. 59) at 1. Subsequently, Microsoft moved to intervene in this action "for the limited purpose of protecting its interests regarding the United States' defense that products incorporating [RTA] do not infringe the patents asserted in this matter by [Plaintiff]." Microsoft Motion to Intervene (ECF No. 59) at 1. On May 6, 2019, the Court granted Defendant-Intervenor Microsoft Corporation's unopposed motion to intervene in this action. *See* Order Granting Intervention (ECF No. 60).

On May 30, 2019, nearly two years after the inception of this suit, the Army entered into two separate other transaction agreements (OTAs) with L3 and Harris, each of which had a night vision technology division, to develop a prototype for an Enhanced Night Vision Goggle-Binocular (ENVG-B). *Sci. Applications Int'l Corp.*, 148 Fed. Cl. at 269-70. [6]

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[6] "L3 and Harris merged on June 29, 2019, approximately one month after the L3/Harris contracts were executed, creating a new entity known as L3Harris Technologies, Inc. . . . L3's legacy night vision division remained with the merged entity, and is now known as the Integrated Vision

On July 18, 2019, the period for claim construction discovery closed, and the parties jointly filed deposition transcripts of their respective claim construction experts. *See* Science Applications International Corporation's and the United States' Joint Submission of Claim Construction Experts' Deposition Testimony (ECF No. 79). On October 15, 2019, claim construction briefs were completed. *See* Defendant-Intervenor Microsoft Corporation's Opening Claim Construction Brief (ECF No. 87) (Microsoft's Opening Cl. Constr. Br.); Defendant Opening Claim Construction Brief (ECF No. 89) (Government's Opening Cl. Constr. Br.); Plaintiff Science Applications International Corp.'s Claim Construction Brief (ECF No. 90) (Pl.'s Opening Cl. Constr. Br.); Defendant-Intervenor Microsoft Corporation's Responsive Claim Construction Brief (ECF No. 95) (Microsoft's Responsive Cl. Constr. Br.); Plaintiff Science Applications International Corp.'s Responsive Claim Construction Brief (ECF No. 96) (Pl.'s Responsive Cl. Constr. Br.); Defendant United States' Responsive Claim Construction Brief (ECF No. 97) (Government's Responsive Cl. Constr. Br.).

After the parties completed claim construction briefing, Microsoft Corporation moved to stay this action pending a decision from the United States Patent Trial and Appeal Board (PTAB) concerning whether to institute *inter partes* review (IPR) of the patents-in-suit. *See* Microsoft's Motion to Stay Proceedings (ECF No. 92). On November 26, 2019, the prior judge overseeing this case, the Honorable Mary Ellen Coster Williams, granted a partial stay pending a decision by the PTAB on whether to institute *inter partes* review of the patents-in-suit. *See* Order for Partial Stay (ECF No. 102). On January 27, 2020, the PTAB issued a decision denying institution on

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Solutions Sector of L3 Technologies, Inc., which is a subsidiary of L3Harris Technologies, Inc. . . . Former Harris Corporation's legacy night vision technology division, which ultimately received one of the Army's two separate May 30, 2019 OTAs, was spun-off (for regulatory reasons) and purchased by Elbit Systems of America, LLC ('Elbit'), which is the U.S. subsidiary of Elbit Systems, Ltd." *Sci. Applications Int'l Corp.*, 148 Fed. Cl. at 270 n.1 (internal citation and quotation omitted).

each of Microsoft's five petitions for IPR. *Microsoft Corp. v. Sci. Applications Int'l Corp.*, No. IPR2019-01311, 2020 WL 572706, at *1 (P.T.A.B. Jan. 27, 2020).

"In November 2019, during the pendency of the stay, Defendant's counsel first learned from the Army of the May 2019 L3/Harris contracts, and that the prototypes required by the contracts may implicate the accused technology in this action." *Sci. Applications Int'l Corp.*, 148 Fed. Cl. at 270 (internal citations omitted). "On February 20, 2020, the Court lifted the stay, and six days later, on February 26, 2020, the Government notified SAIC that the Government intended to move to notify L3 and Harris pursuant to Rule 14(b)." *Id*.

On February 27, 2020, the Clerk of Court transferred this case to the undersigned judge. *See* Order Reassigning Case (ECF No. 112). On March 10, 2020, the Government moved for leave to notice L3 Technologies, Inc. and Harris Corporation under Rule 14(b) to potentially appear as third parties to this lawsuit; the Court granted the motion on May 12, 2020. *See Sci. Applications Int'l Corp.*, 148 Fed. Cl. at 273. That same day, this Court held a status conference during which it established a schedule for the proceedings in this case through claim construction. *See* May 12, 2020 Scheduling Order (ECF No. 121).

After the status conference, L3 intervened in this case. *See* June 17, 2020 Order (ECF No. 128); L3's Answer (ECF No. 131).[7] Subsequently, the Court permitted L3 to file a claim construction brief and permitted SAIC to respond. *See* September 4, 2020 Scheduling Order (ECF No. 141). In its opening claim construction brief, L3 proposed additional disputed terms and a new term construction. *See* L3's Opening Claim Construction Brief (ECF No. 148) (L3's Opening Cl. Constr. Br.).

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[7] Elbit Systems of America, LLC declined to intervene in this action. (ECF No. 135).

On November 20, 2020, SAIC filed its responsive supplemental claim construction brief addressing L3's arguments. *See* Plaintiff Science Applications International Corp.'s Responsive Claim Construction Brief to Third-party Defendant L3 Technolgies, [sic] Inc. (ECF No. 151) (Pl.'s Responsive Cl. Constr. Br. to L3) at 15-20.

At the conclusion of the parties' briefing, they had requested construction on the following ten (10) disputed terms or groups of terms:

1. "video camera;" "video source"

2. "external environment"

3. "video images" / "video source image" / "video data of images"

4. "orientation"

5. "motion data"

6. "based on a comparison"

7. "transparent display" / "HUD comprising a transparent display"

8. "overlay terms"

9. "registration" / "registering terms"; "Wherein the boundaries are in registration/registering the portion of the video feed with the underlying visual field"

10. "twist rotation"

See November 30, 2020 Joint Status Report (ECF No. 153) at 2-3.

On December 1, 2020, the Court held a pre-*Markman* Hearing status conference during which the Court encouraged the parties to narrow their disputes where possible. Pre-*Markman* Hearing Tr. at 21:1-23:25. Accordingly, on December 10, 2020, parties limited the terms in dispute to the following:

1. "video images" / "video source image" / "video data of images"

2. "transparent display" / "HUD comprising a transparent display"

3. "overlay terms"

4. "based on a comparison"

5. "motion data"

6. "registration" / "registering terms."

See December 10, 2020 Joint Status Report (ECF No. 157) at 2.

The Court held a *Markman* Hearing on December 15, 2020, which included the parties'

technology tutorials and arguments on (1) "video images" / "video source image" / "video data of

images," (2) "transparent display" / "HUD comprising a transparent display," (3) "motion data,"

(4) "registration" / "registering terms." *See generally Markman* Hearing Tr. The parties agreed

to rely on their briefs for the "overlay" and "based on a comparison" terms. *See* January 8, 2021

Joint Status Report (ECF No. 161).

APPLICABLE LEGAL STANDARDS

I. Claim Construction

"It is a bedrock principle of patent law that the claims of a patent define the invention to

which the patentee is entitled the right to exclude." *Phillips v. AWH Corp*., 415 F.3d 1303, 1312

(Fed. Cir. 2005) (en banc) (internal quotations and citations omitted). Claim construction is the

process of determining the meaning and scope of patent claims. *Markman v. Westview

Instruments, Inc*., 52 F.3d 967, 976 (Fed. Cir. 1995) (en banc), *aff'd*, 517 U.S. 370 (1996). "[T]he

words of a claim are generally given their ordinary and customary meaning," which is "the

meaning that the term would have to a person of ordinary skill in the art in question at the time of

the invention, i.e., as of the effective filing date of the patent application." *Phillips.,* 415 F.3d at

1312-13 (internal quotations and citations omitted).[8]

The analysis of any disputed claim terms begins with the intrinsic evidence of record, as

"intrinsic evidence is the most significant source of the legally operative meaning of disputed claim

language." *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996). "[T]he

claims themselves provide substantial guidance as to the meaning of particular claim terms."

Phillips., 415 F.3d at 1314 (internal quotation and citations omitted).

"[T]he person of ordinary skill in the art is deemed to read the claim term not only in the

context of the particular claim in which the disputed term appears, but in the context of the entire

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[8] The Government submits that the level of skill of a person of ordinary skill in the art for the First and Second Patent Family is a Bachelor of Science degree in Computer Science and 3 years of experience in programming video/graphics applications and computer vision, or alternatively, a Master of Science degree in Computer Science and 1 year of experience in programming video/graphics applications and computer vision. Neumann Decl. (ECF No. 66) ¶ 48. L3 agrees with the Government. Def. L3 Opening Cl. Constr. Br. at 2 n.1.

"SAIC submits that a person having ordinary skill in the art for the Asserted Patents possesses either: (1) a Bachelor's degree in computer science, computer engineering, electrical engineering, or systems engineering and at least 2 years of experience working with sensor (e.g., camera and orientation sensor) technology; or (2) a Master's degree in one of these disciplines and at least 1 year of work experience with the aforementioned sensor technology." Pl.'s Responsive Cl. Constr. Br. at 2 (citing Ex. L, Declaration of Dr. Gregory F. Welch ¶ 34)). SAIC notes that its definition "differs from the Government's (which requires a degree in Computer Science, excludes persons with engineering degrees, and focuses on experience in video graphics and computer vision rather on than on the camera and orientation sensor technology underlying the inventions)." *Id*. (internal citations omitted).

At the *Markman* Hearing, the parties agreed that the dispute regarding a person of ordinary skill in the art (POSITA) did not need to be decided to resolve the parties' disputes over Claim Construction. *Markman* Hearing Tr. at 60:16-61:7; *see also* Pl.'s Responsive Cl. Constr. Br. at 2. Because the parties have indicated that their dispute over the level of ordinary skill in the art does not affect this Court's construction of the disputed terms, this Court declines to articulate the level of a POSITA at this stage in the proceedings. *In re Fought*, 941 F.3d 1175, 1179 (Fed. Cir. 2019) ("Unless the patentee places the level of ordinary skill in the art in dispute and explains with particularity how the dispute would alter the outcome, neither the Board nor the examiner need articulate the level of ordinary skill in the art.").

patent, including the specification." *Id.* at 1313. "[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.'" *Id.* at 1315 (quoting *Vitronics*, 90 F.3d at 1582).

Notwithstanding the importance of a specification, limitations in the specification must not be read into the claims absent lexicography or disclaimer/disavowal. *Hill-Rom Services, Inc. v. Stryker Corp.*, 755 F.3d 1367, 1371 (Fed. Cir. 2014). The United States Court of Appeals for the Federal Circuit (Federal Circuit) has "expressly rejected the contention that if a patent describes only a single embodiment, the claims of the patent must be construed as being limited to that embodiment." *Phillips*, 415 F.3d at 1323 (internal citations omitted). Conversely, "an interpretation [which excludes a preferred embodiment] is rarely, if ever, correct and would require highly persuasive evidentiary support." *Vitronics*, 90 F.3d at 1583.

The prosecution history of a patent is also relevant intrinsic evidence. *Markman*, 52 F.3d at 980. Although "the prosecution history represents an ongoing negotiation between the PTO and the applicant, rather than the final product of that negotiation" and for this reason "often lacks the clarity of the specification," the prosecution history can nonetheless "often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be." *Phillips*, 415 F.3d at 1317 (citations omitted). "[A] patentee's statements during prosecution, whether relied on by the examiner or not, are relevant to claim interpretation." *Microsoft Corp. v. Multi-Tech Sys., Inc.*, 357 F.3d 1340, 1350 (Fed. Cir. 2004).

"Although [the Federal Circuit has] emphasized the importance of intrinsic evidence in claim construction, [it has] also authorized district courts to rely on extrinsic evidence, which 'consists of all evidence external to the patent and prosecution history, including expert and

inventor testimony, dictionaries, and learned treatises.'" *Phillips*, 415 F.3d at 1317 (citing *Markman*, 52 F.3d at 1583). While sometimes helpful, extrinsic evidence is "less significant than the intrinsic record in determining the legally operative meaning of claim language." *Id*. at 1317 (quoting *C.R. Bard, Inc. v. U.S. Surgical Corp*., 388 F.3d 858, 862 (Fed Cir. 2004)).

II. Definiteness

The Patent Act of 1952—which preceded the America Invents Act and, which the parties agree, is applicable to the patents at issue in this case—requires that "a specification 'conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.'" *Nautilus, Inc. v. Biosig Instruments, Inc*., 572 U.S. 898, 901 (2014) (quoting 35 U.S.C. § 112, ¶ 2 (2006 ed.) (emphasis omitted)).[9] The question of whether a claim is sufficiently definite under 35 U.S.C. § 112, ¶ 2, is closely related to the claim construction task because the decision depends on the ability of the court to interpret a claim. "If a claim is indefinite, the claim, by definition, cannot be construed." *Enzo Biochem, Inc. v. Applera Corp*., 599 F.3d 1325, 1332 (Fed. Cir. 2010). A claim fails to satisfy this statutory requirement and is thus invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, "fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus*, 572 U.S. at 901. However, "the certainty which the law requires in patents is not greater than is reasonable, having regard to their subject-matter." *Id*. at 910 (citing *Minerals Separation, Ltd. v. Hyde*, 242 U.S. 261, 270 (1916)). The definiteness standard must allow for "some modicum of uncertainty" to provide incentives for innovation but must also

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[9] Paragraph 2 of 35 U.S.C. § 112 was replaced with newly designated § 112(b) when § 4(c) of the America Invents Act (AIA), Pub. L. No. 112–29, took effect on September 16, 2012. Because the applications resulting in the patents at issue in this case were filed before that date, this Court will refer to the pre-AIA version of § 112. *Markman* Hearing Tr. at 98:9-15.

require "clear notice of what is claimed, thereby apprising the public of what is still open to them." *Id.* at 909 (internal quotation marks and citations omitted). It also serves as a "meaningful . . . check" against "foster[ing] [an] innovation-discouraging 'zone of uncertainty.'" *Id*. at 910-11 (quoting *United Carbon Co. v. Binney & Smith Co*., 317 U.S. 228, 236 (1942)).

Issued patents are presumed valid, and indefiniteness must be proven by clear and convincing evidence. *See Teva Pharm. USA, Inc. v. Sandoz, Inc*., 789 F.3d 1335, 1345 (Fed. Cir. 2015); *Microsoft Corp. v. i4i Ltd., P'ship*, 564 U.S. 91, 95 (2011); *see also* 35 U.S.C. § 282(a) ("The burden of establishing invalidity of a patent or any claim thereof shall rest on the party asserting such invalidity.").

I. "VIDEO IMAGES" / "VIDEO SOURCE IMAGE" / "VIDEO DATA OF IMAGES"

SAIC[10]	Government	Microsoft	L3
"Plain and ordinary meaning (e.g., electronic images and data)"	digital or analog video frames	digital or analog video frames	digital or analog video frames
Court's Construction: "digital, analog, or nonstandard video frames"			

Microsoft argues that the patents' specifications equate "video images" to "video frames," and accordingly urges the Court to construe "video image" as "digital or analog video frames." *See* Defendant-Intervenor Microsoft Corporation's Opening Claim Construction Brief (Microsoft's Opening Br.) (ECF No. 87) at 3-4; Defendant-Intervenor Microsoft Corporation's Responsive Claim Construction Brief (Microsoft's Responsive Br.) (ECF 95) at 1-2; *Markman* Hearing Tr. at 61:8-23. This proposed construction is, according to Microsoft, the plain and ordinary meaning of the terms as dictated by the patent specification. *See* Microsoft's Opening Br. at 3; Microsoft's Responsive Br. at 1-2. To support its proposed construction, Microsoft highlights that the First Patent Family uses "frame" or "video frame" interchangeably with "video

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[10] In its briefs, SAIC argued that the terms "'video images'/'video source image' mean [Images][An image] generated from visual information (e.g., visible light, ambient light, thermal/IR data, etc.) captured from a video source, depicting an external area or region in the video source's field of view." Pl. Opening Cl. Constr. Br. at 10 (brackets in original). SAIC's construction changed during the *Markman* Hearing; counsel for SAIC argued instead that the better construction was the term's plain and ordinary meaning. *Markman* Hearing Tr. at 51:20-52: 18. "If there's a construction -- which we don't even think there should be -- but if there is, it should be, just very simply, electronic images or electronic representations." *Markman* Hearing Tr. at 55:13-16. Plaintiff also stated that it would not object to defining "video images" as "digital or analog or nonstandard images and data." *Markman* Hearing Tr. at 88:2-12.

image." *See* Microsoft's Opening Br. at 4; *Markman* Hearing Tr. at 65:3-66:9. More concisely stated, Microsoft maintains that "frames are literally what defines what video is" regardless of "[w]hether it's analog or digital, [video] consists of a series of frames." *Markman* Hearing Tr. at 65:22-24.

The Government and L3 agreed with and adopted Microsoft's proposed construction. *See* Government Opening Cl. Constr. Br. at 42-43; Government's Responsive Cl. Constr. Br. at 1; L3's Opening Cl. Constr. Br. at 17-18. At the *Markman* Hearing, L3 added that the Defendants' proposed construction is further supported by the Second Patent Family's use of the term "i.e.," when discussing the two terms which, according to L3, indicates that the inventors equated the terms "image" with "frame." *See Markman* Hearing Tr. at 78:4-79:13.

SAIC contended for the first time during the *Markman* Hearing that the "video images" claim term should be construed as its plain and ordinary meaning, which SAIC states is "just electronic images or data." *Markman* Hearing Tr. at 51:20-53:5-19, 76:22-77:12. This construction differed from the construction SAIC offered in its briefs, which proposed construing the video image terms as "[Images][An image] generated from visual information (e.g., visible light, ambient light, thermal/IR data, etc.) captured from a video source, depicting an external area or region in the video source's field of view." *See* Pl.'s Claim Constr. Br. at 10; Pl.'s Responsive Claim Constr. Br. at 2-3 (brackets in original); Pl.'s Responsive Cl. Constr. Br. to L3 at 12. During the *Markman* Hearing, SAIC's counsel explained this shift in proposed construction by stating that both SAIC's original construction and their current construction are intended to combat a format limitation for video images. *Markman* Hearing Tr. at 52:10-55:20.

At the *Markman* Hearing, both parties made important concessions. First, SAIC acknowledged that its proposed construction does not include optical images. *Markman* Hearing

Tr. at 58:11-25. Second, Microsoft indicated that it would be satisfied with construing images as digital, analog, *or nonstandard* video frames to alleviate any of Plaintiff's concerns related to limiting video images to "digital or analog formats." *See Markman* Hearing Tr. at 72:17-22. Thus, at this stage in the proceedings, the primary difference between the parties' proposed constructions is Defendants' use of "frames," which Plaintiff argues improperly limits the scope of the term "video images." *Markman* Hearing Tr. at 58:4-10.

The Court agrees with Defendants' construction. The terms "video images" / "video source image" / "video data of images" appear in claims 1, 2, 6, 8, 9, 12, 14, 17, and 19 of the '012 patent; claims 1, 4, and 9 of the '103 patent; claims 1, 3, 4, 5, 7, 9, 10, 13, 15, 17, 18, 19, 21, 23, 24, 27, 29, 31, 32, 33, 35, 37, 38, and 41 of the '230 Patent; and claims 1, 2, 7, 8, 13, and 14 of the '752 patent. The parties appear to agree that the terms "video images" / "video source image" / "video data of images" should be construed consistently throughout both patent families. Pl.'s Opening Cl. Constr. Br. at 10, 13; Microsoft's Opening Br. at 3; Government's Opening Cl. Constr. Br. at 42-43; L3's Opening Cl. Constr. Br. at 17-18.

While the patents do not define the "video image" terms explicitly, the specifications do so implicitly through consistent use of comparative language to discuss image data from the first and second video sources. *See Irdeto Access, Inc. v. EchoStar Satellite Corp.*, 383 F.3d 1295, 1300 (Fed. Cir. 2004) ("Even when guidance is not provided in explicit definitional format, 'the specification may define claim terms by implication such that the meaning may be found in or ascertained by a reading of the patent documents.'" (quoting *Bell Atl. Network Servs., Inc. v. Covad Communications Group, Inc.*, 262 F.3d 1258, 1268 (Fed. Cir. 2001)); *Vitronics*, 90 F.3d at 1582 ("The specification acts as a dictionary when it expressly defines terms used in the claims or when it defines terms by implication.").

Throughout both patent families, the phrase "video images" is consistently equated with still video frames. The specification's description of Figure 8 of the '012 patent is illustrative. Figure 8 of the '012 patent, "demonstrates . . . a method for registering a video image with an underlying visual field." '012 patent at 6:25-27. The specification explains in detail how this image is received, processed, and displayed as a video frame. *Id.* at 6:25-33. The process for registration begins "at step **802**, a video frame is received for processing. The frame may be processed digitally, and if it is received in analog form may first need to be converted to a digital format for processing." *Id*. at 6:33-37. At the processing step, "the location of the processed frame within a heads up display is determined, as in step **805**." *Id.* at 6:50-51. Before displaying in the HUD, "the processed frame can be rotated for presentation within the heads up display, as in step **807**." *Id.* at 6:61-62. Additionally, after "the location and rotation of the processed frame within the display are determined, the frame may be cropped, discarding unneeded pixels, as in step **808**." *Id.* at 6:65-67. Next, the processed video frame "may be displayed in a heads up display, as in step **809**." *Id.* at 7:16-17. As step 810 illustrates, "if another frame of video is set to be received (i.e., the display is still on), then the process repeats for each new frame, returning to step **802**." *Id.* at 7:30-33.

It is evident that the language seamlessly transitions from video image to frames. In other words, Figure 8 makes clear that the thing being generated, processed, and displayed is referenced synonymously in the specification as being both images and video frames. For instance, in explaining step 808, the specification states:

> The frame may be resized in order to map the video information onto the pixels that will ultimately be used in a heads up display. This step may be necessary if the video images produced by a video source are larger than needed for display. For example, if a video image initially has a field of view of 8 degrees horizontal and 6 degrees vertical, it may be cropped down to 4 degrees horizontal and 3 degrees vertical, retaining the same center point. In this fashion, only a quarter of the image

is retained, but it constitutes the most relevant part of the image. Alternatively, the video frame may need to be magnified or compressed in order to adjust for differences in magnification between the visual field and the native video frame. In addition, the frame may be enhanced by adding a border around the frame so as to further distinguish it from the visual field for an observer.

Id. at 6:67-7:15.

In discussing resizing, the language of the specification demonstrates that the inventors understood that images were equivalent to frames. The specification for the First Patent Family begins with the general statement that "the frame" may need to be resized. *Id.* at 6:67-7:2. In the very next sentence, the specification states that "video images" may need to be resized if the video images are too large. *Id.* at 7:2-4. The specification then switches back to using the term "video frames" which it states may need to be resized if too small. *Id.* at 7:9-12. The specification makes a general statement that "the frame may be resized" then proceeds to discuss specifics of making a "video image" smaller through cropping and making a "video frame" larger through magnifying. *Id.* at 6:65-7:15. Plaintiff has not proffered any explanation for this interchangeable use. With no apparent explanation to the contrary, the plain implication of this interchangeable use is that the inventors view "video images" and "video frames" as the same object. *See Edwards Lifesciences LLC v. Cook Inc.*, 582 F.3d 1322, 1329 (Fed. Cir. 2009) (finding that the interchangeable use of the words "graft" and "intraluminal graft" is "akin to a definition equating the two").

The Second Patent Family, which shares a common inventor with the First Patent Family, is no different and thus provides further support for Defendants' construction. For instance, in describing Figures 6A through 6F of the '230 patent and explaining issues pertaining to parallax, the '230 Patent repeatedly uses the terms "video image" / "image" and "video frame" / "frame" interchangeably. '230 patent at 8:58-9:47. Figures 6A through 6F "illustrate positioning of one video image within another based on data from inertial measurement units." *Id.* at 2:50-53. For

example, Figure 6A shows the weapon and goggles pointing in the same direction, resulting in the image from the weapon's scope being placed directly in the middle of the image generated from the goggles, which is showcased in Figure 6B. *Id.* at Figs. 6A-B, 8:66-9:2. In Figure 6C, the rifle was yawed 8 degrees to the left of the goggles, which resulted in the scopes image being placed negative 8 degrees from the centerline of the HUD display, as seen in Figure 6D. *Id.* at Figs. 6C-D, 9:3-24. Similarly, in Figure 6E, the rifle has pitched upward 6 degrees, resulting in the rifle's image being shifted upward in relation to the center point generated by the goggles' image, as illustrated in Figure 6F. *Id.* at Fig. 6E-F, 9:25-30. In all the descriptions of these figures, the Second Patent Family uses the words "image" or "view;" however, when the patent family discusses parallax, the language seamlessly switches to the term "frame." *See, e.g.*, '230 patent at 8:58-9:47. For instance, the '230 patent states that when "processing a *video frame* from [the] scope **17** [of the rifle], the location where the *frame* is placed may be slightly off, and a displayed *frame* of video will not be aligned as perfectly as possible." *Id.* at 9:36-39. (emphasis added). Throughout this discussion, the '230 patent uses the terms "frame" and "image" consistently to reference to the thing being processed and displayed in the HUD. *See, e.g.*, '230 patent at 8:23-26, 8:58-9:47.

Perhaps the best example demonstrating that the patents use "video images" / "image" and "video frames" / "frames" interchangeably is contained in Figure 5A. Figure 5A through B comprise a high-level flow chart which explains one possible operation by which video images are registered. *Id.* at Fig. 5A, 7:46-8:57. In describing the step in Figure 5A where "video" is received from "goggles and scope," the specification states that, "[i]n block **107**, a computer receives data for a video frame (i.e., a scope image) from scope **17**." *Id.* at 8:23-26. In addition to interchangeable use of words, patents may also define terms by implication by using the phrase

"i.e." *See Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1373 (Fed. Cir. 2014) (noting that a phrase preceded by "i.e." may indicate that the inventor's intent to cast it as a definition); *Edwards Lifesciences LLC*, 582 F.3d at 1334 (Fed. Cir. 2009) (finding the use of "i.e." in the specification "signals an intent to define the word to which it refers . . ."); *but see Dealertrack, Inc. v. Huber*, 674 F.3d 1315, 1326 (Fed. Cir. 2012) (finding "i.e." to not be definitional where such a reading would exclude a preferred embodiment from the claim's scope or where a "contextual analysis" of the patent indicates that "i.e." is used in an exemplary rather than definitional way).

Here, the term "i.e." was used to equate "image" and "frame." The use of i.e. in Figure 5A is not merely incidental. The patents' use of "video frames" / "frames" as interchangeable with "video images" / "images" coupled with the use of "i.e." clearly indicate that "video frame" and "scope image" are intended to be used synonymously throughout the patents. *See OpenTV, Inc. v. Apple, Inc.*, 2015 WL 3544845, at *11 (N.D. Cal. June 5, 2015) (finding that specification's repeated and consistent usage of the term "redraw" as meaning "call low level graphics routine" in conjunction with the specification's use of "i.e." clearly indicated that the patent intended to define "redraw" as "call low level graphics routine").

Notwithstanding, the evidence contained within the specifications of the First and Second Patent Families, SAIC argues that the claimed "video images" are not equivalent to "video frames." Pl.'s Opening Cl. Constr. Br. at 10-14; Pl.'s Responsive Cl. Constr. Br. at 2-5; Pl.'s Supp. Cl. Constr. Br. (ECF No. 149) at 12. First, SAIC argues that Defendants' proposed construction would destroy the claims' distinction between partial frame display and complete frame display. Pl.'s Opening Cl. Constr. Br. at 12-13. Second, SAIC argues that its proposed construction is supported by the prosecution history. Pl.'s Opening Cl. Constr. Br. at 11-14.

Each of these contentions is without merit. First, SAIC's concern that Defendants' construction would destroy the claims' distinction between partial frame display and complete frame display is misplaced. By their plain language, the claims fall into two broad categories: (1) claims that state part of the video image may be displayed; (2) claims that state the whole image must be displayed. Notably, the claims that permit the display of part of the image say so expressly. *Compare* '230 patent, claim 15 ("A method comprising . . . (e) displaying *at least a portion* of the first video source image and *at least a portion* of the second video source image . . .") (emphasis added) *and* '752 patent, claim 7 ("A method comprising . . . displaying at least a portion of the first image and the selected part of the second image . . .") *with* '012 patent, claim 1 ("A method of registering video images with an underlying visual filed comprising the steps of: . . . (3) displaying the video images . . . on the transparent display . . .") *and* '103 patent, claim 1 ("A system comprising: . . . a computer adapted . . . to display the video images, on the transparant [sic] display . . ."). Defendants' proposed construction respects this distinction and gives meaning to this claim language. Construing "video images" to mean "digital, analog, or nonstandard video frames" permits partial frame display, and also allows for full frame display when the claims require full frame display.

By contrast, SAIC's proposed use of the term "electronic data" does not comport with the claim language or the specifications. First, claim construction "must give meaning to all the words in [the] claims." *Funai Elec. Co. v. Daewoo Elecs. Corp.*, 616 F.3d 1357, 1372 (Fed. Cir. 2010) (internal quotation marks omitted) (quoting *Exxon Chemical Patents, Inc. v. Lubrizol Corp.*, 64 F.3d 1553, 1557 (Fed. Cir. 1995)). Construing "video images" to encompass all types of electronic data would destroy the distinction between partial and whole display by importing the ability to represent only part of the frame into the definition of the term "video image." If this were the case,

every claim would allow for partial frame display, regardless of its actual language. SAIC's construction would render the claims' "at least a portion" language meaningless. Moreover, claim 1 of the '012 and '103 patents refer to the "boundaries of the displayed video images are in registration with boundaries of portions of the visual field represented by the displayed video images." '012 patent at 10:8-10; '103 patent at 10:26-28. The notion of boundaries within the claim supports Defendants' proposed construction because frames are inherently bound; whereas, electrical data is not. Therefore, Defendants' construction is more consistent with the claim language. *See Trustees of Columbia Univ. v. Symantec*, 811 F.3d 1359, 1366 (Fed. Cir. 2016) ("[T]he construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be, in the end, the correct construction." (internal quotation and citation omitted)).

Second, SAIC's construction would exclude "analog" images from the term video image because nothing in the patent indicates that analog images are "electrical data." For instance, the patents state that video feeds may be delivered in numerous formats, including standard formats, such as analog formats like NTSC or PAL, digital formats like MPEG, or any non-standard format. '012 patent at 4:43-46; '103 patent at 4:48-51; '230 patent at 4:6-9; '752 patent at 4:20-23. Frames received in an analog format may require conversion into a digital format for processing. '012 patent at 6:35-37; '103 patent at 6:41-43. This reference to conversion into a digital format indicates that the image being received may not always be "electronic." As SAIC's construction would exclude analog uses because it fails to recognize the conversion of analog data to a digital format, it would be improper to adopt its proposed construction. *See Vitronics*, 90 F.3d at 1583 ("[A]n interpretation [which excludes a preferred embodiment] is rarely, if ever, correct . . . ." (citations omitted)).

Finally, the prosecution history cited by SAIC does not support SAIC's proposed construction. During the prosecution of the '230 patent, examiners originally rejected claim 1 as unpatentable over the prior art, specifically Azuma's LCD display. Pl.'s Opening Cl. Constr. Br. Ex. E, '230 Patent File History, May 30, 2012 Appeal Br. (ECF No. 90-8) at 4. SAIC appealed the examiner's rejection arguing that Azuma does not teach the disputed limitation in claim 1 of the '230 patent; rather, SAIC argued that the '230 patent teaches that the "first video source [is] configured to generate images representing portions of an external environment." *Id.* at 7. To support its appeal, SAIC noted, *inter alia*, that Azuma focused on optical images while claim 1 of the '230 patent is related to an image from a camera. *Id*. at 8-9. On appeal, the Patent Trial and Appeal Board (PTAB) agreed with SAIC, reasoning that:

> Although Azuma's optical display may generate optical images, the disputed limitation of a video source, when read in light of the Specification, must generate video images, e.g., electrical signals or data. Therefore, it is insufficient that Azuma's display generates optical images; this fact, of itself, does not transform Azuma's display into a video source as required by claim 1. Furthermore, the Examiner has erred by relying on Azuma's single optical display to teach both the first video source and video display of claim 1.

Pl.'s Opening Cl. Constr. Br. Ex. F, '230 Patent File History, PTAB Decision on Appeal (ECF No. 90-9) at 5.

There is nothing cited in the '230 patent prosecution history that supports SAIC's assertion that Defendants' frame limitation is inappropriate. Instead, the cited prosecution history appears to be more focused on distinguishing optical images from video images; it says nothing concerning Defendant's proposed "frame" construction.

SAIC's reliance on the '012 patent file history is also without merit. During the prosecution of the '012 patent, the patent examiner originally rejected SAIC's claims based on a prior art night vision goggle operational summary from STS Sensor Technology Systems, (STS). Pl.'s Opening

Cl. Constr. Br. Ex. G, '012 Patent File History, July 24, 2009 ('012 Patent File History) (ECF No. 90-10) at 9-11. In response, SAIC discussed two combined images, provided below, generated by the STS reference, which are not in registration:
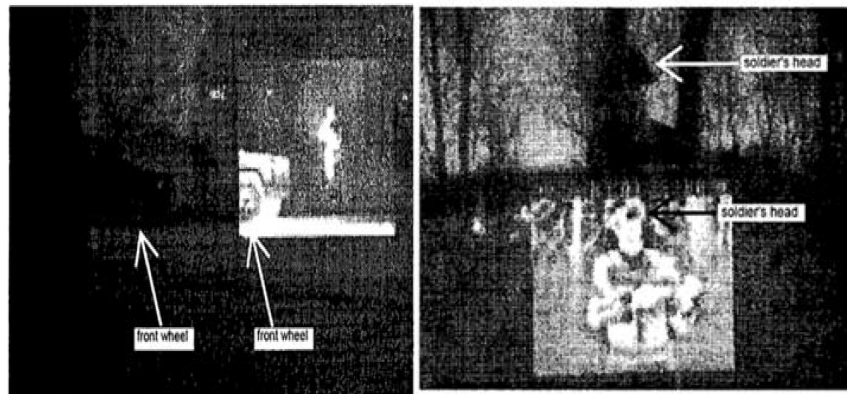
Id. SAIC explained to the examiner that the above-depicted video images were not in registration in part because "boundaries of the thermal [e.g., scope] image are substantially offset from (and not in registration with) the boundaries of the visual field portion." *Id.* at 11. These file history remarks relate to the topic of registration, not video images, and nothing in these remarks addresses the patent specification's use of the terms "video image" and "video frame" interchangeably.

Accordingly, this Court construes "video images" as "digital, analog, or nonstandard video frames."

II. TRANSPARENT DISPLAY

SAIC	Government	Microsoft	L3[11]
a display that has the effect of being transparent or translucent, allowing simultaneous viewing of the underlying visual field and other images or information	optical see-through display, or a display that allows some light to pass through it (i.e., is see-through) when powered off	N/A	a display that allows light from the visual field to pass through it
Court's Construction: "a display that has the effect of being transparent or translucent, allowing simultaneous viewing of the underlying visual field and other images or information"			

SAIC argues that in the context of the patents, the term "transparent display" should be construed as "a display that has the effect of being transparent or translucent, allowing simultaneous viewing of the underlying visual field and other images or information." Pl.'s Opening Cl. Constr. Br. at 34; Pl.'s Responsive Cl. Constr. Br. at 12-13; Pl.'s Supp. Cl. Constr. Br. at 7; Pl.'s Responsive Cl. Constr. Br. to L3 at 1. SAIC argues that its construction is supported by the specification which discloses "transparent display" in non-limiting terms and also includes examples of both optical see-through and video see-through/functionally see-through. Pl.'s Opening Cl. Constr. Br. at 36-37; Pl.'s Responsive Cl. Constr. Br. at 13-14; Pl.'s Supp. Cl. Constr. Br. at 7-8; Pl.'s Responsive Cl. Constr. to L3 at 2. Thus, according to SAIC, a person of ordinary

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[11] L3 offers a slightly different construction for '103 and '012 patents. For the '012 patent, L3 proposes construing "transparent display" as, "a display that allows light from the visual field to pass through it." L3 Opening Cl. Constr. Br. at 9. For the '103 patent, L3 proposes construing "transparent display" as, "a heads up display adapted for viewing of the visual field by a user of the system wherein the HUD comprises a display that allows light from the visual field to pass through it." *Id.* The difference in construction seems to account for claim 1 of the '012 patent being a method claim, and, claim 1 of the '103 patent being a system claim. However, L3's construction of "transparent display" is essentially a display that allows visual light to pass through it. For ease of reference, this Court refers only to L3's proposed '012 patent claim construction.

skill in the art would understand the term transparent display to include video-generated displays that have a transparent effect. Pl.'s Supp. Cl. Constr. Br. at 14-15.

The Government and L3 argue for a narrower interpretation of transparent display. The Government interprets transparent display to mean an "optical see-through display, or a display that allows some light to pass through it (i.e. is see-through) when powered-off." Government's Opening Cl. Constr. Br. at 20, 27-28; Government's Responsive Cl. Constr. Br. at 16, 20. Similarly, L3 interprets transparent display to mean "a display that allows light from the visual field to pass through it." L3's Opening Cl. Constr. Br. at 9; L3 Technologies, Inc.'s Responsive Claim Construction Brief (ECF No. 152) (L3's Responsive Cl. Constr. Br.) at 1. Though different, L3's construction agrees with the Government's construction in principle. The gravamen of both L3's and the Government's constructions is that transparent display is limited to an "optical see-through display." *See Markman* Hearing Tr. at 168:17-21 (L3), 188:22-190:22 (Government).

The parties' dispute therefore boils down to whether "transparent display" is limited to so-called "optical see-through displays" or whether the term encompasses so-called "video see-through displays." This Court agrees with SAIC's construction that "transparent display" encompasses "video see-through displays" because Defendants' proposals would exclude disclosed embodiments. *See Vitronics*, 90 F.3d at 1583-84. The term "transparent display" appears in the First Patent Family claims only. The term appears in claims 1, 10, 12, and 17-18 of the '012 patent, and claims 1 and 9 of the '103 patent. Nothing in the claim language limits transparent display to optical see-through. Claim 1, for example, does not contain any express limitation requiring the transparent display to operate only where light passes from the visual field through the display. The dependent claims likewise do not include any such requirement.

With no evidence restricting transparent displays to optical see-through displays in the claims themselves, both L3 and the Government rely heavily on Figure 6 of the '012 patent to support their constructions. L3's Opening Cl. Constr. Br. at 10-11; Government's Opening Cl. Constr. Br. at 22-23; L3's Responsive Cl. Constr. Br. at 5-7. Figure 6 is a block diagram depicting the heads-up display (HUD) and a video assembly, both of which capture a view of the visual field. '012 patent at Fig. 6. The HUD and video assembly are connected by sensors to a computer, and the computer is then connected to a beam combiner. *Id.* Finally, the figure depicts an arrow directly from the beam combiner to the viewer's eye. *Id.* The parties agree that this particular embodiment is optical see-through. *See* Government's Opening Cl. Constr. Br. at 26; L3's Opening Cl. Constr. Br. at 5, 10-11; *Markman* Hearing Tr. 198:19-25 (SAIC). Defendants contend that the invention is limited to this embodiment. They state that the description of Figure 6 limits the term transparent display to an optical see-through display. Government's Opening Cl. Constr. Br. at 24-26; L3's Responsive Cl. Constr. Br. at 5.

However, this Court cannot limit a transparent display to a single embodiment. *Verizon Servs. Corp. v. Vonage Holdings Corp.*, 503 F.3d 1295, 1305 (Fed. Cir. 2007). Moreover, "a claim interpretation that excludes a preferred embodiment from the scope of the claim is rarely, if ever, correct." *MBO Labs., Inc. v. Becton, Dickinson, & Co.*, 474 F.3d 1323, 1333 (Fed. Cir. 2007) (internal quotation and citation omitted); *EPOS Techs. Ltd. v. Pegasus Techs. Ltd.*, 766 F.3d 1338, 1347 (Fed. Cir. 2014) (holding that a claim construction is incorrect when it "reads out" preferred embodiments).

Importantly, the '012 patent expressly discloses two embodiments that use a video see-through display. First, the '012 patent expressly discloses an embodiment in which

> the image produced in the visual field of a display is captured by a second video
> camera. This second video feed or goggle image, along with the video images from

> the video source, are both fed into a computer for initial digital processing. . . . [T]he video image may be displayed in the heads up display alone, or the heads up display may be filled with the resultant combination of video image and goggle image.

'012 patent at 9:36-52.

At oral argument, L3 argued that this embodiment does not mean that the HUD can be functionally see-through because the specification discloses that the HUD will be filled with a single image. *Markman* Hearing Tr. at 179:4-181:19. This argument ignores the specification statement that the single, resultant image is created by combining the video image and the goggle image. '012 patent at 9:49-51. There is no reason why such an embodiment would arbitrarily exclude a video see-through display when the two-video system provides capability for a video see-through display. Indeed, if this embodiment required that the video image for a goggle image overlay an optically transparent display of that same goggle image, as L3 suggests, then such an embodiment would require that three images be aligned instead of two—which is something that the invention does not contemplate.

Second, the '012 patent also states that,

> [i]n other alternative embodiments, the heads up display need not be connected to the viewer, as through a pair of night vision goggles. . . . The current state of the art uses two screens, one for navigation and one for aiming the weapon. A robot operator uses one screen to drive the robot and acquire targets, then refers to an adjacent screen to aim and fire the weapon. Registering the weapon video image to the navigation screen in a manner similar to an infantryman garners similar advantages for the robot operator.

'012 patent at 5:23-25, 5:33-39. In such an embodiment, a robot is remote from its operator, who uses a navigation screen to control the robot. *Id.* The Government's and L3's proposals would exclude any variation of such an embodiment because light does not pass directly from the robot's visual field to the remote operator's display.

Considering the specification's disclosures, a POSITA (under either party's proposed standard) would understand that the inventions in the '012 and '103 patents use "transparent display" as encompassing "video see-through" displays. Such an interpretation would also be consistent with the inventions' intended purpose of displaying video images in registration with an underlying visual field. *See* '012 patent at Abstract, 1:6-9; 2:32-38; claims 1, 17.

Notwithstanding the evidence in the specification, the Government and L3 also argue that "during prosecution of the application issuing as the '103 patent, for purposes of allowance, the applicant authorized the following narrowing amendment to application claim 1, replacing (among other things) 'in the HUD' with 'on the transparent display[.]'" Government's Opening Cl. Constr. Br. at 24; L3's Opening Cl. Constr. Br. at 9 (both quoting Examiner's Amendment with Notice of Allowability (ECF No. 63-3) at 127-29). The Government's and L3's construction is supported by the '103 patent's prosecution history. Government's Opening Cl. Constr. Br. at 24-25; L3's Responsive Cl. Constr. Br. at 8-10. Defendants argue that by making this amendment, SAIC ceded from the claim scope a video see-through display. Government's Opening Cl. Constr. Br. at 24-25; *see also* L3's Opening Cl. Constr. Br. at 9-10.

However, Defendants fail to articulate how the amendment results in a clear disavowal. Nor could they. The law "requires that the alleged disavowing actions or statements made during prosecution be both clear and unmistakable." *Aylus Networks, Inc. v. Apple Inc.*, 856 F.3d 1353, 1359 (Fed. Cir. 2017) (internal citations omitted). Here, no evidence exists on the record showing why this amendment was made. While statements, including amendments, made during patent prosecution can amount to prosecution disclaimer, the disavowal must not be ambiguous. *See Avid Tech., Inc. v. Harmonic, Inc.*, 812 F.3d 1040, 1045 (Fed. Cir. 2016) ("Where the alleged disavowal is ambiguous, or even 'amenable to multiple reasonable interpretations,' [the Federal Circuit has]

declined to find prosecution disclaimer." (quoting *Cordis Corp. v. Medtronic AVE, Inc.*, 339 F.3d 1352, 1359 (Fed. Cir. 2003)) (citing *Omega Engineering, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1323-24 (Fed. Cir. 2003) (finding multiple reasonable interpretations of remarks made by the inventor in patent prosecution so disavowal did not occur)). Replacing "in the HUD" with "on the transparent display" alone says nothing about the scope of the term "transparent display." Simply put, the mere existence of an amendment does not demonstrate disavowal.

Indeed, a complete look at the prosecution history of the First Patent Family as a whole indicates that there was no intended and clear disavowal of video see-through displays. Other excerpts from the prosecution history of the '012 patent indicate that SAIC neither excluded a system that presented both the weapon sight image and the goggle image as video nor required light from the goggles' visual field to pass through the display. During prosecution, the examiner rejected claim 1 of the '012 patent application as obvious over the combination of (1) an operational summary for a pair of night vision goggles made by Sensor Technology Systems (STS) and (2) U.S. Patent No. 7,277,118 (Foote). Pl.'s Supp. Cl. Constr. Br., Ex. T, '012 FH, 09.04.2009 Final Rejection (ECF No. 149-3) at 3-4. To support his rejection, the examiner alleged that the combination of STS and Foote taught a multi-camera system providing video images. *Id.* at 4. This rejection indicates that the examiner viewed claim 1 of the '012 patent as encompassing multiple cameras. SAIC overcame this rejection, not by arguing that claim 1 employed only a single camera, but by arguing, *inter alia*, that "Foote's predication upon fixed cameras is contrary to (and fundamentally incompatible with) the recitation in claim 1 of the video source and the transparent display being independently movable about multiple axes." Pl.'s Supp. Cl. Constr. Br. Ex. U, '012 FH, 12.03.2009 Arguments (ECF No. 149-4) at 8-9; *see also* Pl.'s Supp. Cl. Constr. Br. Ex. V, 12.17.2009 Pre-Appeal Brief Request for Review (ECF No. 149-5) at 3. SAIC's

argument thus differentiated claim 1 from the examiner's asserted combination of STS and Foote because the transparent display was independently movable from the video source but did not disclaim using video system as the transparent display. Accordingly, the Court finds that the prosecution history does not evidence a clear disavowal of a video see-through transparent display.

Defendant's reliance on extrinsic evidence is also unavailing. Because the intrinsic record clearly contemplates "transparent displays" beyond optical see-through displays, this Court need not reference extrinsic evidence. *See Summit 6, LLC v. Samsung Elecs. Co., Ltd.*, 802 F.3d 1283, 1290 (Fed. Cir. 2015) ("Although courts are permitted to consider extrinsic evidence, like expert testimony, dictionaries, and treatises, such evidence is generally of less significance than the intrinsic record." (citing *Phillips*, 415 F.3d at 1317)). Furthermore, it is imperative that this Court put far less weight, if any, on extrinsic evidence to the extent it contradicts the intrinsic record. *See Immunex Corp. v. Sanofi-Aventis U.S. LLC*, 977 F.3d 1212, 1221-22 (Fed. Cir. 2020) (citing *Helmsderfer v. Bobrick Washroom Equip., Inc.*, 527 F.3d 1379, 1382 (Fed. Cir. 2008)) (holding that it would be incorrect "to allow the extrinsic evidence . . . to trump the persuasive intrinsic evidence").

Here, the Government and L3 cite to several dictionary definitions, testimony from Dr. Ronald Azuma, and prior art to support their constructions that would limit the transparent display to optical see-through displays. *See* Government's Opening Cl. Constr. Br. at 28; L3's Opening Cl. Constr. Br. at 13, 24; L3's Responsive Cl. Constr. Br. at 10-12. With respect to dictionaries, the Defendants rely on the following definitions:

(1) The Government uses Merriam-Webster's Collegiate Dictionary (11th ed.), which defines "transparent," in relevant parts, as "1a(1): having the property of transmitting light without appreciable scattering so that bodies lying beyond are

seen clearly" or "1b: fine or sheer enough to be seen through," "b: easily detected or seen through." Government's Opening Cl. Constr. Br. at 28 (citing SAIC's Motion to Substitute Exhibits Ex. A, Merriam-Webster's Collegiate Dictionary (11th ed. 2004) at 1330 (ECF No. 69-1) at 3).

(2) L3 uses Merriam Webster's Collegiate Dictionary (10th ed.), which defines "transparent" as "having the property of transmitting light without appreciable scattering so that bodies lying beyond are seen clearly." L3's Opening Cl. Constr. Br. Ex. 1 (Merriam-Webster's Collegiate Dictionary (10th ed. 2000) at 1251) (ECF No. 148-1) at 5.

(3) L3 also uses Wiley Electrical and Electronics Dictionary, which defines "transparent," in relevant part, as "1. A body, material or medium which freely passes radiant energy, such as light, or sound." L3's Opening Cl. Constr. Br. Ex. 6 (Wiley Electrical and Electronics Dictionary (2004) at 801-02) (ECF No. 148-1) at 26.

The Government and L3 also rely on the testimony of Dr. Azuma and on prior art to distinguish between optical see-through and video see-through heads up displays. *See* Government's Opening Cl. Constr. Br. at 26-27 (citing Joint Claim Construction Statement Exhibit 12, Chung, J.C., *et al.*, "Exploring Virtual Worlds with Head-Mounted Displays," appeared in Non-Holographic True 3-Dimensional Display Technologies, SPIE Proceedings, Vol. 1083, Los Angeles, CA, January 15-20, 1989 (ECF No. 64-12) at 5) (differentiating between "optical see-though HMD" and "opaque head-mounted display"); Pl.'s Responsive Cl. Constr. Br. Ex. S, Ronald Azuma Deposition Transcript (ECF No. 96-3) (Azuma Dep.) at 160:21-161:2 ("Q. . . . Would you consider a video see-through as it's used here in your dissertation -- excuse me.

Video see-through HMD, would you consider that to be a transparent display? A. I think we had that discussion already. Generally speaking, no, because if the power was cut, then the user would effectively be blinded.").

The dictionary definitions, Dr. Azuma's testimony, and the prior art referenced by Defendants are contrary to the intrinsic record and therefore fail to support Defendants' proposed construction. Even if these dictionaries, expert testimony, and prior art did establish that video-see-through displays are generally not considered "transparent," it would be of no moment; under *Phillips*, the plain meaning is not the meaning of the term in the abstract but is rather the plain meaning as understood by a POSITA after reading the patents. 415 F.3d at 1313 ("Importantly, the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification."). When a term as used in patent conflicts with the ordinary or conventional usage of that term, the patent's use of the term must prevail. For instance, in *Honeywell Int'l, Inc. v. Universal Avionics Sys. Corp.*, 493 F.3d 1358, 1361 (Fed. Cir. 2007), the Federal Circuit was tasked with interpreting the term "heading" in the context of aircraft navigation. There, the parties agreed that, in the context of aircraft navigation, "'[h]eading' ordinarily refers to the direction in which an object is pointing." *Id*. However, the Federal Circuit found that, based on a patent figure, "the patentees used the term 'heading' in a manner different from its ordinary meaning." *Id*. Relying on *Phillips*, the Federal Circuit held that "[w]hen a patentee defines a claim term, the patentee's definition governs, even if it is contrary to the conventional meaning of the term." *Id*. (citing *Phillips*, 415 F.3d at 1321). Here, the patents disclose embodiments that include both optical see-through and video see-through. *See* '012 patent at 5:44-6:2, 7:16-19; '103 patent at 5:49-6:7, 7:22-25. To the extent the cited dictionary

definitions, prior art references, and expert testimony contradict these disclosed embodiments, this Court cannot rely on such definitions, references, and testimony, and declines to do so. *See Immunex Corp. v. Sanofi-Aventis U.S. LLC*, 977 F.3d 1212, 1221-22 (Fed. Cir. 2020) (citing *Helmsderfer v. Bobrick Washroom Equip., Inc.*, 527 F.3d 1379, 1382 (Fed. Cir. 2008)) (holding that it would be incorrect "to allow the extrinsic evidence . . . to trump the persuasive intrinsic evidence").

For these reasons, this Court construes "transparent display" as "a display that has the effect of being transparent or translucent, allowing simultaneous viewing of the underlying visual field and other images or information."

III. <u>OVERLAY</u>

SAIC	Government	Microsoft	L3
Plain and ordinary meaning: e.g., Overlaying (plain and ordinary meaning): positioned over or upon. Overlay/overlays (plain and ordinary meaning): are over or upon/is over or upon	N/A	N/A	to place on top or in front of (e.g., superimpose)
Court's Construction: Plain and ordinary meaning, e.g., Overlaying: positioned over or upon. / Overlays/overlay: are over or upon/is over or upon.			

SAIC's and L3's proposed constructions of the terms "overlay," "overlays," and "overlaying" are remarkably similar, but are not identical. SAIC contends that the "overlay" terms are unambiguous because such terms are used in accordance with their plain and ordinary meaning

in the patents—"positioned over or upon" or "are over or upon/is over or upon." Pl.'s Supp. Cl. Constr. Br. at 16. SAIC further argues that L3's proposed construction "to place on top or in front of (e.g., superimpose)" as a synonym for "overlay" adds nothing of consequence to the term's meaning and would erroneously read limitations into the patent claims. *Id.* at 18 (citing *ActiveVideo Networks, Inc. v. Verizon Comm'ns, Inc.*, 694 F.3d 1312, 1324-25 (Fed. Cir. 2012)); Pl.'s Responsive Cl. Constr. Br. to L3 at 7. Essentially, SAIC urges the Court to adopt its proposed plain and ordinary meaning or construction of the term "overlay" because it "encompasses the full scope of the disclosed embodiments consistent with the inventions' purpose;" whereas, L3's proposed construction would inappropriately limit the scope of the patent claims at issue. Pl.'s Supp. Cl. Constr. Br. at18; Pl.'s Responsive Cl. Constr. Br. to L3 at 7-8.

L3 argues that "overlay" should be construed to mean "on top or in front of (e.g., superimposed)." L3's Responsive Cl. Constr. Br. at 14. L3's proposed construction imports a directional component into the definition of "overlay" that SAIC's construction does not require. *See* L3's Opening Cl. Constr. Br. at 5-8. L3 asserts this definition comports with how "overlaying" is described in the patents. L3's Responsive Cl. Constr. Br. at 14-15.

The parties appear to agree—and the Court concurs—the concept of "superimposing" is contained within the parties' respective claim constructions, which L3 and SAIC each contend encompass the "plain meaning" of the "overlay" terms. *See, e.g.*, L3's Opening Cl. Constr. Br. at 8-9; L3's Responsive Cl. Constr. Br. at 14-16; Pl.'s Cl. Constr. Presentation at 88 ("SAIC offered to construe this term as 'plain and ordinary meaning (e.g., superimpose)'"); L3's Cl. Constr. Presentation at 33 (noting SAIC's proposed stipulation encompasses "superimpose"). The parties' dispute appears instead to center around the importation of directional requirements into the "overlay."

The Court agrees with SAIC that overlay is not limited to placing one image "on top of" or "in front of" another. The overlay terms appear in claims 1 and 17 of the '012 patent; claim 1 of the '103 patent; and claims 1, 15, and 29 of the '230 patent. Claim 1 of the '012 patent recites a method of displaying video images overlaying portions of a visual field. '012 patent at 9:63-10:10. The '012 patent states:

> **1.** A method of registering video images with an underlying visual field comprising the steps of:
> (1) determining a source orientation of a video source providing a video feed containing data for a series of video images representing portions of a visual field;
> (2) determining a display orientation of a transparent display overlaying the visual field, wherein the video source and the transparent display are independently movable about multiple axes; and
> (3) displaying the video images in positions on the transparent display that overlay portions of the visual field represented by the displayed video images, wherein boundaries of the displayed video images are in registration with boundaries of portions of the visual field represented by the displayed video images.

Id.

In claim 1 of the '012 patent, "overlaying" is used to distinguish the transparent display from the "underlying visual field."[12] As used in claim 1, the terms "overlaying" and "underlying" describe the positions of the transparent display and the visual field relative to one another. However, nothing in claim 1 limits "overlaying" through an objective perspective outside both the transparent display and the visual field such that the overlaying image must always be viewed as "on top of" or "in front of" another image.

In the Second Patent Family, only the '230 patent uses the term overlay.[13] The '230 patent

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[12] Claim 1 of the '103 patent uses the term "overlay" consistent with the rest of the First Patent Family. *See* '103 patent at 10:20-29.

[13] The '752 patent uses the term "replace" rather than "overlay." However, at oral argument on the Government's motion to dismiss, SAIC's counsel noted that the terms serve a similar function.

uses "overlay" to describe how two video source images are displayed, rather than to distinguish

between the video feed and visual field as in the First Patent Family. Claim 1 of the '230 patent

is illustrative and recites in relevant part:

> (e) display at least a portion of the first video source image and at least a portion
> of the second video source image such that the second video source image
> portion overlays a corresponding region of the first video source image portion,
> wherein the corresponding region represents a portion of the external
> environment represented in the second video source portion.

'230 patent at 24:45-51.

Like the claims in the '012, '103, and '230 patents, the First Patent Family's specification,

which is incorporated by reference in '230 patent's specification, occasionally describes an image

as "in front of the visual field" when describing certain embodiments. '012 patent at 5:57-67;

7:21-24. However, nothing in the specifications indicate that "overlay" is necessarily limited to

placing an image in front of or on top of another. Therefore, the importation of such limitations

from the specification is impermissible. *See Phillips*, 415 F.3d at 1323.

Moreover, L3's construction would impermissibly exclude other embodiments. *See MBO

Labs.*, 474 F.3d at 1333 ("A claim interpretation that excludes a preferred embodiment from the

scope of the claim is rarely, if ever, correct." (internal quotation marks and citation omitted)). For

instance, the '012 patent specification references alternative embodiments where "the heads up

display may be filled with the resultant combination of the video image and the goggle image."

'012 patent at 9:37-51. L3's proposed limitation would exclude this embodiment because placing

one image in front of another requires that there be two distinct images that, when viewed from a

specific (though unidentified) perspective, are directionally related such that one is "on top or in

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Jan. 3, 2018 Oral Argument Tr. (ECF No. 18) at 68:4-17 ("[The '752 patent] talks about replacing an image with a portion of another – replace a portion of an image with a portion of another image. That's different. That's different language. It's a different process. It may get you to the same end, but you asked about the how, the how matters. Those are different hows, Your Honor.").

front of" the other. L3's Responsive Cl. Constr. Br. at 16. Specifically, L3's limiting definition would exclude such an embodiment from the scope of the patent claim because the HUD is "filled with" a single resultant image rather than one image positioned "on top or in front of" another. *See* '012 patent at 9:49-51.

Nor is L3's reliance on dictionary definitions persuasive. As noted, because the intrinsic record is clear that "overlay" is not limited to "in front of" or "on top of," this Court need not reference extrinsic evidence. *See Phillips*, 415 F.3d at 1317-18; *Summit 6, LLC*, 802 F.3d at 1290. However, to the extent extrinsic evidence is at all relevant, it supports a broader construction than L3 proposes.

To support its proposed construction, L3 relies on the following dictionary definitions of the term "overlay." L3's Opening Cl. Constr. Br. at 8-9.

(1) Merriam Webster's Collegiate Dictionary defines "overlay" as "to lay or spread over or across." L3's Opening Cl. Constr. Br. Ex. 1 (Merriam-Webster's Collegiate Dictionary (10th ed. 2000) at 827) at 4.

(2) New Penguin Dictionary of Computing (2001) defines "overlay" in the context of graphics as "superimpos[ing] one image over another." L3's Opening Cl. Constr. Br. Ex. 2 (New Penguin Dictionary of Computing (2001) at 352) (ECF No. 148-1) at 9.

(3) The New Oxford American Dictionary defines "overlay" as "lie on top of: a third screen which will overlay the others." L3's Opening Cl. Constr. Br. Ex. 3 (The New Oxford American Dictionary (2nd ed. 2005) at 1213) (ECF No. 148-1) at 13.

(4) Newton's Telecom Dictionary defines "overlay" as "The ability to superimpose

computer graphics over a live or recorded video signal and store the resulting

video image on videotape. It is often used to add titles to videotape." L3's

Opening Cl. Constr. Br. Ex. 5 (Newton's Telecom Dictionary (16th ed. 2000) at

622) (ECF No. 148-1) at 21.

In *Phillips*, the Federal Circuit explained that dictionaries may be useful in determining the

meaning of terms. 415 F.3d at 1318. Despite this allowable use of dictionary definitions, the

Federal Circuit has warned that courts should not rely on dictionary definitions that are "entirely

divorced from the context of the written description." *Id*. at 1321. The Federal Circuit thus

concluded that:

> [J]udges are free to consult dictionaries and technical treatises "at any time in order
> to better understand the underlying technology and may also rely on dictionary
> definitions when construing claim terms, so long as the dictionary definition does
> not contradict any definition found in or ascertained by a reading of the patent
> documents."

Id. at 1322-23 (quoting *Vitronics,* 90 F.3d at 1585 n.6). Here, the New Oxford American

Dictionary, which appears to be a general use dictionary, defines "overlay" as meaning to "lie on

top of: a third screen which will overlay the others." L3's Opening Cl. Constr. Br. Ex. 3 at 13. To

be sure, this definition supports L3's construction (and is encompassed by SAIC's construction)

and is consistent with some embodiments contained within the patents. '012 patent at 5:57-67;

7:21-24. However, the other dictionaries to which L3 cite do not support limiting the term

"overlay" as L3 suggests. Indeed, Newton's Telecom Dictionary and New Penguin Dictionary of

Computing, which are technical in nature, appear to undermine L3's proposed claim limitations.

Newton's Telecom Dictionary defines "overlay" as "[t]he ability to superimpose computer

graphics over a live or recorded video signal and store the resulting video image on videotape."

L3 Opening Cl. Constr. Br. Ex. 5 at 21. Similarly, New Penguin Dictionary of Computing defines "overlay" in the context of graphics as "superimpos[ing] one image over another." L3's Opening Cl. Constr. Br. Ex. 2 at 9. These definitions, consistent with the intrinsic evidence, do not require that an image is placed only "in front of" or "on top of" another. Newton's Telecom Dictionary's reference to a "resulting video image" is also consistent with the '012 patent specification's reference to a preferred embodiment which combines images from two video feeds into one resultant image using digital processing. *See* '012 patent at 9:37-51. Accordingly, SAIC's proposed construction is consistent with both the intrinsic and extrinsic evidence cited by L3.

For these reasons, this Court construes the "overlay" terms in accordance with their plain meaning as, "e.g., Overlaying: positioned over or upon." / " Overlay/overlays: are over or upon/is over or upon."

IV. "BASED ON A COMPARISON OF DATA FROM THE FIRST AND SECOND VIDEO SOURCE IMAGES"

SAIC	Government	Microsoft	L3
Plain and ordinary meaning	N/A	N/A	based on [a] ~~the~~ comparison of image data (e.g., content and contrast) from the first and second video source images
Court's Construction: "based on a comparison of image data (e.g., content and contrast) from the first and second video source images"			

In its most recent filing, L3 offers the construction "based on [a] ~~the~~ comparison of image data (*e.g.*, content and contrast) from the first and second video source images" for the "based on a comparison of data from the first and second video source images" term. L3's Responsive Cl.

Constr. Br. at 17 (brackets and strikethrough in original).[14] L3 argues that the context of the claims

and specification demonstrate that the "data" being compared is "image data (*e.g.,* content and

contrast)" and not "motion data" or "orientation data." L3's Opening Cl. Constr. Br. at 14-17. In

other words, L3's construction seeks to clarify "the actual content of the images – [sic] whether it

be their greyscale, contrast, PSR, or some similar measure—is what must be compared, not data

unrelated to the content of the images, such as the separately claimed motion/orientation data."

L3's Responsive Cl. Constr. Br. at 18.

SAIC argues that L3's proposed construction would unduly restrict the claims to less than

their full scope. Pl.'s Responsive Cl. Constr. Br. to L3. at 8. Specifically, SAIC contends that,

> [w]hile content and contrast are two types of data used when comparing data from a first and second sources of images as part of image registration, the express claim language—*i.e., data from the first and second video source images*—is straightforward and L3's proposal to rewrite it should be rejected.

Pl.'s Supp. Cl. Constr. Br. at 21-22 (emphasis in original).

This Court agrees with L3 that the "data" in the phrase "based on a comparison of data"

refers to "image data (e.g., content and contrast)." The language of the claims read in context of

the entire patent are of primary importance. *See Phillips*, 415 F.3d at 1312 (citing *Merrill v.*

Yeomans, 94 U.S. 568, 570 (1876)). Here, the language of the claims read in light of the

specification are clear. The '230 patent claims a process of registering images from two different

video sources through two different comparisons—the first being based on a comparison of motion

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[14] Initially, L3 proposed to construe "based on a comparison of data from the first and second video source images" as "based on the comparison of image data (e.g., content and contrast) from the first and second video source images." L3's Opening Cl. Construction Br. at 14. However, Plaintiff took issue with L3's initial construction language of "the comparison" as opposed to "a comparison" because it would allegedly introduce "an otherwise non-existent antecedent basis problem" to the claim language. Pl.'s Responsive Cl. Constr. Br. to L3 at 11. L3's revised, current construction uses "a" instead of "the" to avoid an antecedent basis issue. L3's Responsive Cl. Constr. Br. at 18.

data from the video source and the second being based on a comparison of the content of the images themselves. *See, e.g.*, '230 patent at Abstract.

The phrase "based on a comparison of data from the first and second video source images" is contained in step (d) of claims 1, 15, and 29 term of the '230 patent. The distinction between motion data and image data is illustrated by claim 1 of the '230 patent. In claim 1, the patentee outlines the invention as "[a] system, comprising: a first video source configured to generate images representing portions of an external environment [and] a second video source, movable independent of the first video source configured to generate images representing portions of the external environment . . . ." '230 patent at 24:25-30. These video sources are connected to a controller and video display "wherein the controller is configured to (a) receive video images from the first video source and from the second video source" then to "(b) receive motion data indicative of motion of the first and second video sources." *Id.* at 24:33-37. Once the controller receives motion and image data from the first and second video sources, it then "(c) identif[ies], based on the received motion data, a part of a first video source image that potentially represents a portion of the external environment represented in a part of a second video source image . . . ." *Id.* at 24:38-41. Crucially, the system then "(d) evaluate[s], based on a comparison of data from the first and second video source images, the identification performed in operation (c)." *Id.* at 24:42-44. Finally, the system,

> display[s] at least a portion of the first video source image and at least a portion of the second video source image such that the second video source image portion overlays a corresponding region of the first video source image portion, wherein the corresponding region represents a portion of the external environment represented in the second video source portion.

Id. at 24:45-51.

The structure of claim 1 and step (d)'s reference to "data from the first and second video source image" demonstrates that the data used to perform this evaluation is the data received from

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"video images" in step (a). Conversely, the data used to perform the evaluation in step (d) is not the "motion data" described in step (b), but rather is the data from the images received in step (a). *See Becton, Dickinson & Co. v. Tyco Healthcare Grp., LP*, 616 F.3d 1249, 1254 (Fed. Cir. 2010) ("Where a claim lists elements separately, the clear implication of the claim language is that those elements are distinct components of the patented invention." (internal quotations and citations omitted)).

Reading claim 1 in light of the invention's intended purpose along with the specification provides further support for L3's construction. The First Patent Family claims a system in which the images from two different sources are aligned using only orientation data. *See, e.g.*, '012 patent, claims 1, 17; '103 patent, claim 1. By the time the '230 patent was filed three years later, however, the named inventors had realized that use of orientation data alone may pose problems. '230 patent at 1:35-43 (identifying disadvantages of a system using only sensor data to match images). Thus, the later-filed '230 patent describes an improved two-step alignment method. This method first uses data from motion sensors to help align images from two different sources and then performs a second step of comparing the content of the images themselves; then, using that comparison to evaluate whether the alignment is correct, adjusts the alignment as necessary. *See, e.g.*, *id.* at Abstract ("The sensor-based location is checked (and possibly adjusted) based on a comparison of the images."); 2:57-62 ("FIGS. **8**A through **8**K illustrate checking and/or correcting an IMU-based position for one video image within another video image. FIGS. **9**A through **9**C illustrate correction of an IMU-based position calculation based on image comparison results."); 3:1-5 ("FIGS. **13**A and **13**B show a goggles images and scope image, respectively, used to describe an alternative image comparison algorithm. FIG. **14** is a flow chart for an alternative image comparison algorithm."); 7:19-22 ("As discussed below, the location and rotation of weapon view

74 within user display **70** is determined by computer **30** based on output from sensors **13** and **18** and based on comparison of the scope image with the goggles image."); 9:45-47 ("For larger distances, image comparison position calculations (described below) compensate for errors caused by parallax."); 10:5-16 ("In block **117**, the IMU-based calculation for position and rotation of weapon view **74** within display **70** is checked using an image-based method."). The '230 patent summary provides an overview of this two-step alignment process:

> Data from the two images are then compared in order to evaluate the location determined from the sensor data. The sensor-based location is either confirmed, or a new location is found based on additional image comparisons. Once a location is selected (either a confirmed sensor-based location or a location found using image comparison), the two images are displayed such that the second source image (or a portion of that image) overlays a corresponding portion of the first source image. Locations obtained using image comparisons are used to calibrate (adjust) the manner in which subsequent sensor-based locations are determined.

'230 patent at 2:6-17.

L3's proposed construction gives proper meaning to the '230 patent's alignment process by delineating the use of motion data for the first step of the alignment process and the use of image data for the second step.

In contrast, SAIC cannot cite to any intrinsic or extrinsic evidence to contradict L3's construction; instead, SAIC argues in conclusory fashion that the phrase "based on a comparison of data from the first and second video source images" needs no construction. Pl.'s Supp. Cl. Constr. Br. at 21-22. Indeed, the portions of the specification SAIC references appear to support L3's position that step (d) "evaluates" the accuracy of the initial alignment derived from motion data using the "content and contrast" of the images from the first and second video source. *See* '230 patent at 10:21-26 ("To address these concerns, the relative orientation of goggles **11** and scope **17** can be independently deduced by processing image data from image generator **57** and

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scope **17** if there is sufficient image content and contrast and if similar imaging technologies (e.g.

microbolometers, CCD, etc.) are used.").

Accordingly, the Court construes "based on a comparison of data from the first and second

video source images" to mean "based on the comparison of image data (e.g., content and contrast)

from the first and second video source images."

V. "MOTION DATA"

SAIC	Government	Microsoft	L3
"data indicative of motion, including at least orientation data"	Indefinite	N/A	Indefinite
Court's Construction: "data indicative of motion, including at least orientation data"			

The Government contends that the term "motion data" is a word or term with no established

meaning outside the patents. Government's Opening Cl. Constr. Br. at 15. Accordingly, the

Government argues that, because there is no definition or even mention of "motion data" in the

specification, a POSITA reviewing the specification and prosecution history at the time of the

invention would not be informed "with reasonable certainty" of the claimed invention's objective

scope. *Id.* at 18. Moreover, according to the Government, SAIC's construction of "motion data"

as "data indicative of motion, including at least orientation data" is circular because it includes

"data" and "motion" in the definition of "motion data," then unjustifiably adds "including at least

orientation data," opening the door for additional, undefined "data" to be swept up within the

scope. *Id.* at 17-19. The Government also contends that SAIC's proposed construction would be

repetitive and nonsensical because replacing "motion data" with SAIC's proposed construction (as

shown in underline) in claim 1, clause (b) of the '230 patent would read as follows: "(b) receive

data indicative of motion, including at least orientation data indicative of motion of the first and

second video sources." *Id.* at 16. The Government also relies on extrinsic evidence, particularly

the testimony of Ulrich Neumann, Ph.D., [15] Ronald Azuma, Ph.D.,[16] and Gregory Welch, Ph.D.,[17]

to support its assertion. *See id.* at 15-19.

SAIC argues that motion data is readily understandable from the context of the patents and

the surrounding claim language. Pl.'s Responsive Cl. Constr. Br. at 9. Additionally, SAIC argues

that its construction is consistent with extrinsic evidence. Specifically, SAIC points to Dr. Welch's

testimony that the patents teach utilization of orientation data to determine the location of the

weapon image within the goggles image. Pl.'s Responsive Cl. Constr. Br. at 10-11; *see also* Pl.'s

Opening Cl. Constr. Br. at 33-34.

The Court agrees with SAIC's construction and holds that "motion data," as used in the

patents, is not indefinite. The intrinsic evidence supports SAIC's construction. This term only

appears in the Second Patent Family claims, particularly claims 1-3, 5, 15, 17, 19, 29, 31, and 33

of the '230 patent, and claims 1-2, 7-8, and 13-14 of the '752 patent. Importantly, in the '230 and

'752 patents, this term appears for the first time in the claims and cannot be found anywhere in the

specification. The Government contends that "motion data" does not have a defined meaning

outside the patents, and thus the specification must define the term to provide reasonable certainty.

Government's Opening Cl. Constr. Br. at 15 (quoting citing *Acacia Media Techs. Corp. v. New*

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[15] Dr. Neumann is the Government's claim construction expert. Defendant's Disclosure of Claim Construction Expert (ECF No. 48).

[16] Dr. Azuma is a non-party, fact witness subpoenaed by the Government; however, the parties agree that he is also a "recognized pioneer and innovator in augmented reality." Azuma Dep. at 100:22-103:2, 136:5-8.

[17] Dr. Welch is SAIC's claim construction expert. Disclosure of Claim Construction Expert (ECF No. 49).

Destiny Internet Grp., 405 F. Supp. 2d 1127, 1136 (N.D. Cal. 2005)). The Government's reliance

on *Acacia* is misplaced. *Acacia* involved a patent for a data transmission system in which the

plaintiff sought to define a "sequence encoder" as a "time encoder" to avoid an indefiniteness

ruling. 405 F. Supp. 2d at 1134-36. While "time encoder" was used in one embodiment, the

district court found no evidence that this was to be the only embodiment. *Id.* at 1136. *Acacia* held

that,

> [i]f a patentee uses a broad undefined term (such as '[motion data]') in claiming an invention, when the validity of the patent is called into question in a legal proceeding, the owner of the patent cannot avoid invalidity by adopting a more limited definition (such as '[orientation data]'), unless that limitation can be fairly inferred from the specification.

Id. *Acacia* is simply inapposite to the current case. SAIC is not seeking to limit "motion data" to

"orientation data" but rather is arguing that orientation data is one type of data that must always

be included within "motion data," as that term is used within the patents. Pl.'s Cl. Constr. Br. at

32-33. More importantly, unlike the plaintiff in *Acacia* that sought to use an embodiment to limit

the scope of a claim, here, SAIC's construction can fairly be inferred from the specification.

The *Acacia* court acknowledged that not all undefined terms are indefinite. 405 F. Supp.

2d at 1136. As illustrated by the Federal Circuit's decisions in *Bancorp Servs., L.L.C. v. Hartford

Life Ins. Co.*, 359 F.3d 1367 (Fed. Cir. 2004) and *Network Commerce, Inc. v. Microsoft Corp.*, 422

F.3d 1353 (Fed. Cir. 2005), an undefined term with no specialized meaning in the field of the

invention is not indefinite where the meaning of the term is fairly inferred from the patent. In

Bancorp, the Federal Circuit addressed whether the phrase "surrender value protected investment

credits" in a patent that described a system for tracking the value of life insurance policies was

indefinite. 359 F.3d at 1372. The phrase was not defined in the patent and did not have an

established definition in the industry. *Id*. at 1372-73. However, the Federal Circuit held the term

was definite because (1) the phrase's component terms had "well-recognized meanings which

allow the reader to infer the meaning of the entire phrase with reasonable confidence," and (2) the meaning of the phrase was "fairly inferable" from the specification and the dependent claims. *Id*. at 1372-74. Likewise, in *Network Commerce*, the Federal Circuit held the term "download component" definite, despite being undefined, where the patents provided sufficient context as to how "download component" functioned in the claimed method. 422 F.3d at 1360-61.

Here, '230 patent claim 1 states that the system is comprised of "a controller coupled to the first and second video sources and to the display, wherein the controller is configured to . . . (b) receive motion data indicative of motion of the first and second video sources . . . ." '230 patent at 24:32-37. Step (b) of '230 claim 1 identifies motion data. '230 patent at 24:36-37. All subsequent uses of "motion data" are derived from how motion data is used in step (b). *See, e.g., Id.* at 24:38-41.

Step (c) of claim 1 continues that the controller will "identify, based on the received motion data, a part of a first video source image that potentially represents a portion of the external environment represented in a part of a second video source image." *Id.* at 24:38-41. Thus, step (c) of '230 claim 1 identifies how motion data is used.

Read in light of the specification, it is clear that, at minimum, the motion data in steps (b) and (c) of claim 1 must measure or account for the relative orientation or alignment of both video sources. As discussed *supra* Section IV, the Second Patent Family claims a system in which the images from two different sources are aligned using only orientation data. *See, e.g.,* '012 patent, claims 1, 17; '103 patent, claim 1. The '230 patent purports to correct errors associated with the First Patent Family by adding an additional "evaluation" step to "check" the alignment initially performed using orientation data. *See, e.g.,* ''230 patent at 24:42-44. Thus, claim 1 steps (b) and (c) are intended to incorporate the First Patent Family's use of orientation data. For instance, in

describing the First Patent Family, the Second Patent Family discloses that "[s]ensors coupled to the rifle and to the goggles provide data indicating movement of the goggles and rifle. [T]he sensor data is then used to determine the relative orientation of the two sources and calculate a location for the rifle image within the image seen through the goggles." '230 patent at 1:25-34. In summarizing the invention, the '230 patent uses almost identical language to describe the first step of Second Patent Family's two-step alignment process. The summary of invention states that "[i]n at least some embodiments . . . , [s]ensors coupled to the two video sources provide data to the computer that indicates the spatial orientations of those sources. Using the sensor data, the computer determines a location for placing a video image (or a portion thereof) from a second of the sources (e.g., a rifle-mounted source) in the video image from a first of the sources (e.g., a goggles mounted source)." '230 patent at 1:58-2:3.

It is evident that the Second Patent Family did not intend to disavow the First Family's use of orientation data, but rather sought to supplement the use of orientation data with an image check. This is further evidenced by the remainder of the specification, which is replete with references to sensors used to determine the orientation of the first and second video sources. *See, e.g.,* '230 patent at 1:64-66; 5:28-6:48; 8:21-10:15; 23:63-65; Fig. 3. Though other types of motion data, such as position data (*see, e.g.*, '230 patent at 5:60-6:4), are referenced, the consistent reference to orientation data in each embodiment provides a POSITA with reasonable certainty that motion data includes *at least* orientation data.

Defendant argues that SAIC's construction of "including orientation data" is not supported by intrinsic data because "when the inventors sought to use 'orientation data' or even 'position data' they did so expressly." Government's Opening Cl. Constr. Br. at 17-18. Therefore, the Government contends the inventors' omission of orientation data from the claims indicates that

the inventors intended to use motion data differently than SAIC proposes. *Id.* Additionally, the Government cites to a preferred embodiment which explains that ultra-wideband radios can be used rather than using separate orientation sensors. *Markman* Hearing Tr. at 139:22-140:24. Thus, according to the Government, "at least orientation data" would exclude this embodiment.

These arguments miss the point. SAIC is not arguing that orientation equals motion data. Motion data may include position data. *See, e.g.*, '230 patent at 8:21-28 ("After initial calibration, computer **30** receives position data for system **10** from GPS chipset **31** (FIG. **2**) and/or from data communication chipset **32** in block **105**."). However, SAIC's construction simply requires that orientation data be used. The embodiment's ultra-wideband radios section, cited by the Government, is not to the contrary. The specification consistently states that devices other than IMUs can be used to determine orientation. *See, e.g.*, '230 patent at 4:17-41. The embodiment does not state that orientation is not used; rather, it states that orientation data based on relative alignment of ultra-wideband radios can be used instead of IMUs. *Id.* Accordingly, contrary to the Government's arguments, SAIC's construction is consistent with the intrinsic evidence.

The Government relies on the testimony of, Drs. Neumann, Azuma, and Welch to support its assertion that "motion data" is indefinite. As explained below, the cited extrinsic evidence is consistent with SAIC's claim construction and does not amount to clear and convincing evidence of indefiniteness.

First, the Government relies on statements made by Dr. Azuma during his deposition that "motion data" is "not . . . a well-defined term in the field." Azuma Dep. at 126:20-127:12, 80:23-81:20. This statement standing alone does not amount to clear and convincing evidence that "motion data" as used in the patents is indefinite—primarily because, as the Government concedes, Dr. Azuma did not read the patents prior to his deposition. Azuma Dep. at 238:8-25 ("I have not

read the SAIC patents. . . . I am not familiar with those particular patents."). Moreover, when asked how Dr. Azuma used "motion data," Dr. Azuma's explanation comports with SAIC's proposed usage of the term. Specifically, Dr. Azuma stated that "motion data" includes, *inter alia*, orientation data. Azuma Dep. at 160:3-16. Thus, to the extent Dr. Azuma's testimony is at all relevant, it comports with SAIC's construction of motion data.

Next, the Government relies on a statement made by Dr. Welch during his deposition that SAIC's proposed construction is certainly "not elegant" when applied to the claims. Joint Submission of Cl. Constr. Experts, Ex. 2 Gregory Welch Deposition Transcript (Welch Dep.) (ECF No. 79-2) at 156:7-17. Again, this statement is not clear and convincing evidence of indefiniteness. Moreover, Dr. Welch ultimately opined that the asserted patents teach that sensor data indicating the movement of weapon and goggle components (i.e., data indicative of motion) includes orientation data and that this orientation data is used to determine a location of the weapon image within the goggles image. *See* Pl.'s Opening Cl. Constr. Br., Ex. L Declaration of Gregory Welch (Welch Decl.) (ECF No. 90-15) ¶ 63 (identifying patent disclosures in support of SAIC's construction of motion data).

Lastly, to support its position, the Government points to the following exchange between Dr. Neumann and Plaintiff's counsel during Dr. Neumann's deposition:

Q. So the original question where you asked me to point you to some pieces of the specification was would you agree that the specification of the '230 patent that we had marked as Exhibit 8 discloses use of a rotation data to indicate relative motion between the two – the two video sources.

A. Okay

Q. Would you agree with that?

A. The patent uses – the description uses specific terms like roll, pitch and yaw. Okay. Motion data can be many things. There are not just a single roll, pitch and yaw in this patent. There are multiples. There is a sub G. There's the sub S.

There's – there's no sub anything. There's just yaw and roll described. There are so many different types of data described that I think it adds to the confusion of what motion data means.

Q. Well – okay. So the sub G and the sub S refer – correlate to each of the video sources, I believe. Would you agree with that?

A. They – as I recall, they deal with the gun motion and the S was –

Q. The scope, I believe. Although I would have to –

A. See, I'm not sure anymore. But yes. There's two different things that are moving. So we have two different suffixes.

Q. Okay.

A. Then there's the data values from sensors indicate vertical rise pitch. So there's just – there's so many different types of motion data mentioned, things that could be motion data mentioned, which one – which one is it?

Q. Why couldn't it be any of those? Just – why is that a problem for you?

…

A. If you pick the wrong data, you may not be able to accomplish your purpose. It's really important in technical documents to be clear. This signal goes from here to here. You can't just say a signal goes from here to here. It could be any signal. Okay. When they say a motion data is used for this or for that, which data?

…

A. I mean, that the essence of – that's the essence of why I say it's indefinite. There is no definition.

Joint Submission of Cl. Constr. Experts, Ex. 2 Ulrich Neumann Deposition Transcript (Neumann Dep.) (ECF No. 97-1) at 219:10-221:9.

Dr. Neumann's testimony does not amount to clear and convincing evidence that the term "motion data" is indefinite. An expert may articulate the meaning of a term to a POSITA, but then the court must conduct a legal analysis to see if that same meaning fits with the term "in the context of the specific patent claim under review," because "experts may be examined to explain terms of art . . . but they cannot be used to prove the proper or legal construction of any instrument of

writing." *See Teva Pharms. USA, Inc. v. Sandoz, Inc.*, 574 U.S. 318, 331 (2015) (internal quotations and citations omitted). Although Dr. Neumann expressed concern that "motion data" may include data beyond orientation data, Dr. Neumann does not dispute that orientation data is subsumed within the broader category of motion data. He simply concluded that there are "so many different types of motion data mentioned [in the 230 patent's specification, i]f you pick the wrong data, you may not be able to accomplish your purpose." *See* Neumann Dep. at 220:14-23. It is well-established, however, that a term is not indefinite simply because it is broad. *See BASF Corp. v. Johnson Matthey Inc.*, 875 F.3d 1360, 1367 (Fed. Cir. 2017) ("But the inference of indefiniteness simply from the scope finding is legally incorrect: 'breadth is not indefiniteness.'" (quoting *SmithKline Beecham Corp. v. Apotex Corp.*, 403 F.3d 1331, 1341 (Fed. Cir. 2005))). As Dr. Neumann acknowledges, the specification explicitly discloses multiple types of motion data. Neumann Dep. at 219:10-221:9. Contrary to Dr. Neumann's assertions, these extensive disclosures are a source of guidance rather than confusion. A POSITA seeking to interpret the bounds of motion data need simply refer to the patent document, which consistently refers to "orientation data" about the first and second video source. Aside from the numerosity of examples of motion data and a lack of an explicit definition, Dr. Neumann was unable to articulate how the term motion data as used in the patent is indefinite. Instead, Dr. Neumann summarily concluded that "[i]f you pick the wrong data, you *may* not be able to accomplish your purpose." *See id.* at 221:22-23 (emphasis added). To prove indefiniteness by clear and convincing evidence, the Government must do more. *See Apple Inc. v. Samsung Elecs. Co.*, 786 F.3d 983, 1003 (Fed. Cir. 2015) (attempting to discredit the patentee's experts is not sufficient to find claim indefinite), *rev'd on separate grounds*, 137 S. Ct. 429 (2016), *remanded to* 678 Fed. App'x 1012 (2017); *Microsoft Corp. v. i4i Ltd. P'ship*, 564 U.S. 91, 104-05 (2011) (referencing many instances where the Court

has required a heightened standard of proof to overcome patent's presumption of validity).

In sum, Drs. Neumann, Azuma, and Welch were each able to identify orientation data as a component of "motion data." Accordingly, for the reasons stated above, the Court finds that the term "motion data" is definite, and its proper construction is "data indicative of motion, including at least orientation data."

VI. "IN REGISTRATION WITH" / "REGISTERING"

SAIC	Government	Microsoft	L3
"in proper alignment and position, so as to coincide and not be substantially offset"[18]	Indefinite	N/A	Indefinite
Court's Construction: Indefinite			

L3 and the Government argue that the registration terms "in registration with" and "registering" are indefinite because the terms are (1) subjective and the patents fail to disclose parameters for acceptable degrees of error or inform a POSITA *when* registration is achieved, and (2) the patents fail to disclose *how* registration is accomplished. Government's Opening Cl. Constr. Br. at 39-40; L3's Opening Cl. Constr. Br. at 22. The Government submits that, without such criteria, a POSITA reviewing the intrinsic record would not be able to determine the objective scope of the registration terms with reasonable certainty. Government's Responsive Cl. Constr. Br. at 24-25.

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[18] In the parties' Joint Claim Construction Statement, SAIC proposed the following construction:

SAIC argues that "registration" means "in proper alignment and position, so as to coincide and not be substantially offset." Pl.'s Opening Cl. Constr. Br. at 20, 30. SAIC further contends that "registration" is definite because the patents disclose examples of what is and what is not proper alignment to inform when registration is achieved. Pl.'s Opening Cl. Constr. Br. at 21-23 (citing '012 patent at 2:15-18, 3:24-4:6, 6:25-27, 6:38-7:12, Figs. 1, 4, and 8; '230 patent at 10:11-15; '012 Patent File History at 10-11). Additionally, the patents disclose exemplary methods for using orientation data to show how registration can be accomplished. Pl.'s Opening Cl. Constr. Br. at 21, 23 (citing '012 patent at Abstract, 2:30-38, 4:51-54, 6:38-45, 7:30-42, 8:5-48, Figs. 8, 9A-12B; '230 patent at Abstract, 3:46-50, 3:67-4:16, Figs. 6A-H).

This Court agrees with the Government and L3. Pursuant to statute, a specification must "conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention." 35 U.S.C. § 112(b). A claim fails to satisfy this statutory requirement and is thus invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, "fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus*, 572 U.S. at 901.

Here, the patents fail to provide objective criteria for a POSITA to determine with reasonable certainty when registration is accomplished. The intrinsic evidence does not contain any criteria or other description by which to measure or know when "wherein boundaries of the

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"in proper alignment and position, so as to coincide and not be substantially offset." Joint Cl. Constr. Statement, Ex. 1 Joint Cl. Constr. Chart (ECF No. 63-1) at 8. In its opening claim construction brief, SAIC substituted "substantially" with "distinctly" so that its proposed construction reads, "in proper alignment and position, so as to coincide and not be substantially (i.e., distinctly) offset. Pl.'s Opening Cl. Constr. Br. at 20. At oral argument, the Government stated that it believed that this change should not affect this Court's indefiniteness analysis. *Markman* Hearing Tr. at 230:23-231:7.

displayed images are in registration with boundaries of portions of the visual field represented by the displayed images." *See Berkheimer v. HP Inc.*, 881 F.3d 1360, 1364 (Fed. Cir. 2017) (finding the term "minimal redundancy" indefinite because the patent lacked objective boundaries). The First Patent Family does not define registration. Instead, it uses examples to disclose when registration is accomplished. For example, '012 Patent Figure 4 depicts an "image produced by an illustrative embodiment of the invention," in which images from a weapon sight feed are in proper position and alignment (i.e., coincide and are not distinctly offset) with images seen via a HUD. '012 patent at 3:56-57, Fig. 4. Conversely, in describing the prior art system of Figure 1, the specification discloses that "[b]oth images depict the same subjects, a group of soldiers accompanying an armored personnel carrier (APC)[,]" but "[t]he two images are distinctly offset, with . . . the same target appearing in different places in the field of view . . . ." *Id.* at 2:9-18.

The Second Patent Family incorporates the First Family's disclosure and consistently explains that "'registration' refers to positioning of a scope image (or portion of that scope image) within a goggles image so that the two images are properly aligned and positioned, and one image coincides with the other." '230 patent at 10:11-15.

Here, neither SAIC's cited examples, nor its proposed definition adequately inform a POSITA of the invention's metes and bounds with reasonable certainty. Registration depends on the perspective of a particular application or user, the method of registration used, and the needs and precision required by the particular use in which the user is engaged. *See* Neumann Dep. at 93:7-15; Welch Dep. at 203:22-212:16. At his deposition, Dr. Neumann explained that "in a nutshell" the field of registration involves computations designed to measure and address registration errors. Neumann Dep. at 93:22-94:7. In essence, Dr. Neumann testified, "registration" is a term of degree in that it is context-dependent and measurable. *See* Neumann Dep. at 86-87:4,

120:25-121:10. While terms of degree are not inherently indefinite, the patent must provide some objective criteria for a POSITA to determine the scope of the invention with reasonable certainty. *Interval Licensing LLC*, 766 F.3d at 1370-71 (citations omitted).

Neither the '230 patent's use of the terms "proper alignment" or "distinctly offset," nor SAIC's proposed construction of "substantially offset" provide a POSITA with objective criteria to determine whether "registration" is achieved. As explained by both SAIC's and the Government's experts, there are a wealth of registration techniques with different variations and parameters. Neumann Dep. at 120:25-129:16; *see also* Welch Dep. at 203:22-212:16. What is considered proper alignment using one measurement technique will not be considered proper alignment using another technique. *See* Neumann Dep. at 120:25-129:16; Welch Dep. at 203:22-212:16.

The First Patent Family does not disclose any registration technique or combination of techniques for measuring whether registration has been accomplished. Rather the patents rely on the high-level flow chart in Figure 8 and direct a POSITA to registration techniques that "are well known in the art." *See, e.g.*, '012 patent at 9:36-52 ("well known rigid or non-rigid image registration techniques . . . to register the images by, for example, finding common visual elements between them."); '012 patent at 6:62-64 ("Various algorithms for rotating an image by a certain number of degrees are well known in the art.").

The Second Patent Family includes similarly high-level flow charts. The flow chart in Figures 5A and 5B explain the registration process for the Second Patent Family. '230 patent at 7:46-11:29. As noted, registration is initially accomplished using motion data which is defined broadly as "including at least orientation data." *See supra* Section V: Motion Data. The alignment accomplished with motion data is then "evaluated" using image data and adjusted as needed before

it is displayed on the HUD. *Id.* at 11:30-49. The written description states that "[t]he steps shown in FIGS. **5**A and **5**B (and in other flow charts described below) can be reordered, combined, split, replaced, etc." *Id*. at 7:46-49. While the Second Patent Family references some of the metrics traditionally used to measure registration, these metrics must have objective bounds, and nothing in the patent explains when certain metrics would be used over others. *See, e.g.*, '230 patent at 10:48-11:30 (discussing the use of Brouwer's fixed point to check positioning of the images); *see also* Neumann Decl. ¶¶ 65-66. The Second Patent Family also implies that additional unnamed metrics may be used. For example, the '230 patent mentions that peak to sidelobe ratio (PSR) is one metric to determine registration, but also mentions that "numerous definitions of PSR are known in the art . . . ." '230 patent at 11:11-17. However, the '230 patent does not reference PSR or any other objective metric when defining "registration."

These high-level flow charts give very little guidance to a POSITA as to how registration is objectively measured. This lack of guidance prevents a POSITA from ascertaining the scope of registration with reasonable certainty because different registration methodologies involve different parameters for determining whether registration has been accomplished. *Ball Metal Beverage Container Corp. v. Crown Packaging Tech., Inc*., 838 F. App'x 538, 542-43 (Fed. Cir. 2020) ("Under our case law, then, a claim may be invalid as indefinite when (1) different known methods exist for calculating a claimed parameter, (2) nothing in the record suggests using one method in particular, and (3) application of the different methods result in materially different outcomes for the claim's scope such that a product or method may infringe the claim under one method but not infringe when employing another method. Such a claim lacks the required degree of precision 'to afford clear notice of what is claimed, thereby apprising the public of what is still open to them.'" (quoting *Nautilus*, 572 U.S. at 909)). Dr. Neumann opined that there are multiple

methods of "evaluation of registration error and a minimization process." Neumann Decl. ¶ 54.

"For example, cross-correlation measures, Fourier phase correlation, and point mapping are common registration metrics." *Id.* Dr. Welch also agreed that different image registration techniques will lead to different results. Specifically, Dr. Welch testified that:

> Q. Well, it's fair to say if you take the same pair of images and you register them using different transformation, you might get different results. Fair?
>
> A. Well, as I said earlier, a lot of different things will affect whether you get -- the results would be different or not. In fact, it seems highly unlikely that any two -- you know, it would be very small things that would vary that would give you different results.
>
> The transformations that I see here are no different than I think the transformations, at least some of these that were talked about in, I think the '012 patent where it said that these were common, when it was talking about rotations, image rotations. These are the sort of things I think is what was meant there.
>
> Q. Maybe I missed it, but so it's fair to say that using different transformations, you might get different results . . . for registration?
>
> A. You would get different results, and as I said earlier, I think -- I think you would likely get different results. As I said earlier, the differences would -- the impact of those differences or the importance of those differences would depend on the use case, the -- you know, the people who are developing the system.

Welch Dep. at 211:9-212:16.

In sum, testimony from both experts establishes that registration can be measured multiple ways and that different measuring techniques will yield different results in determining whether registration has occurred. Both experts also agreed that determining whether registration is achieved is dependent upon the application and the user's tolerance for registration errors. Nothing in the patent itself provides a POSITA with any objective measure as to the bounds of registration. Without any objective measure, a POSITA is left "to consult the unpredictable vagaries of any one person's opinion" to determine whether registration occurred. *Dow Chem. Co. v. Nova Chemicals Corp. (Canada)*, 803 F.3d 620, 635 (Fed. Cir. 2015) (internal quotations and citation omitted)

(holding term indefinite where invention did not disclose a method to determine whether a claim parameter was met).

Notwithstanding the patents' failure to provide an objective metric to this highly contextual term, SAIC argues that the patents provide reasonable certainty by disclosing examples of a registered image and an unregistered image. Pl.'s Opening Cl. Constr. Br. at 21.

This argument is without merit. While SAIC is correct in that a claim term can be rendered definite through the use of examples that provide points of comparison, those examples must provide some objective criteria by which a POSITA can determine the scope of a claim with reasonable certainty. *Sonix Tech. Co., Ltd. v. Publ'ns Int'l, Ltd.*, 844 F.3d 1370, 1379 (Fed. Cir. 2017) (holding "visually negligible" definite because examples in the specification provided objective criteria by which a POSITA could identify the scope of the invention with reasonable certainty); *Guangdong Alison Hi-Tech Co. v. Int'l Trade Comm'n*, 936 F.3d 1353, 1360–62 (Fed. Cir. 2019) (holding the term "lofty fibrous batting" definite where the specification provided seven detailed examples for comparison, and the parties' expert testimony supported the conclusion that a POSITA could objectively identify characteristics of the term); *One-E-Way, Inc. v. Int'l Trade Comm'n*, 859 F.3d 1059, 1066 (Fed. Cir. 2017) (finding "virtually free from interference" definite where statements in the specification and prosecution history indicated that the phrase meant "free from eavesdropping," which provided an objective standard to inform a POSITA of the scope of the invention with reasonable certainty). Indeed, the mere existence of examples in the written description will not always render a claim definite. *Sonix Tech.*, 844 F.3d at 1380.

As explained above, "registration" is understood on a continuum. *See* Neumann Dep. at 86:21-87:4, 120:25-124:3, 175:9-176:4, 181:5-8, 193:12-16. Here, the examples provided in the patents at issue do not provide objective criteria to inform a POSITA of the scope of registration.

The parties agree the patents do not claim perfect registration. *See* Welch Dep. at 165:24-166:25 ("There is no perfect registration."), 167:5-168:10 ("[P]erfect registration doesn't exist[,]" even in the context of the asserted patents), 169:8-25 ("[T]here's no system that is going to match every pixel in intensity pixel for pixel."). Outside of perfect registration, the concept of registration here is context dependent. Welch Dep. at 203:22-204:6. Because registration depends on context, there are no inherent objective parameters that a POSITA can use to determine the scope of the term. *See Interval Licensing LLC*, 766 F.3d at 1371-74. The patent, therefore, needs to provide some objective criteria for assessing an acceptable variance from perfect registration for a POSITA to determine the scope of the registration terms with reasonable certainty. *Id.*

The First Patent Family provides two examples, which are incorporated by reference in the Second Patent Family. '012 patent at Figs. 1, 4. In Figure 4 of the First Patent Family, the patents state that the images in that figure are registered but do not disclose any offset. *See* Welch Dep. at 165:24-166:25. In the counterexample taken from the prior art, Figure 1 illustrates a very significant offset, which the patents describe as not in registration. '012 patent at 2:4-28. The tremendous gap between these two examples creates a zone of uncertainty. *See Nautilus*, 572 U.S. at 909-10. With examples only providing boundaries at the extremes, a skilled artisan is left to wonder what other images could fall between these two figures and still be considered registered. *See, e.g.*, *Automated Pack'g Systems, Inc. v. Free Flow Pack'g Int'l, Inc.*, No. 18-CV-00356-EMC, 2018 WL 3659014, at *18 (N.D. Cal. Aug. 2, 2018) (finding examples of an inserting device that could not be as small as a needle, nor as big as a baseball bat, were too extreme to provide a POSITA with objective criteria to determine the scope of the patent claims); *Power Integrations, Inc. v. ON Semiconductor Corp.*, No. 16-CV-06371-BLF, 2018 WL 5603631, at *20 (N.D. Cal. Oct. 26, 2018) (holding the term "moderate power threshold value" indefinite where the patent

provided an extreme range of very low values to the maximum peak value).

The patents' disclosure of registration errors also does not provide the required "reasonable certainty." *See Nautilus*, 572 U.S. at 901. The patent specifications discuss parallax as a possible source of registration error. *See, e.g.*, '012 patent at 8:49-9:35. Specifically, the '012 patent mentions parallax "error of about 2.9 degrees in the placement of the video frame" when the target is at 10 meters and "is to some extent a non-issue [as t]he system proposed would likely be used for targets greater than 10 meters more often than not." *Id.* at 8:60-67. In its brief, SAIC contends that the '012 patent—and a similar discussion exists for the '230 patent—describing an error of 2.9 degrees at 10 meters and then fewer degrees at greater target distances is an example of criteria from which a POSITA can assess an acceptable degree of error, e.g., 2.9 degrees or less in the video frame. Pl.'s Opening Cl. Constr. Br. at 27; *see also* '012 patent at 8:49-64, '230 patent at 9:31-47. The problem with this argument is that the patent described an error of 2.9 degrees at 10 meters assuming the scope image and goggle image were "perfectly aligned," '012 patent at 8:52-53, which the parties' experts acknowledge is impossible. *See* Welch Dep. at 166:8 ("There is no perfect registration."); Neumann Dep. at 186:24-187:11 ("[I]t's fair to say there will be deviation, there will be error [in registration.]"). Thus, a POSITA could not rely on the disclosure of "2.9 degrees or less" as an objective criterion for when registration is achieved. *See* Neumann Decl. (ECF No. 66) ¶ 57 (explaining why the disclosure of parallax error does not provide "objective boundaries and a POSITA would not be able to discern [the registration terms] with reasonable certainty").

The lack of guidance provided by the examples in the patents is confirmed by the extrinsic evidence. Both SAIC's and the Government's experts were unable to identify objective criteria for determining registration. Dr. Neumann opined, "[t]he intrinsic evidence does not contain any

criteria or other description by which to measure or know when [the claim term] 'wherein the boundaries of the displayed images are in registration with boundaries of portions of the visual field represented by the displayed images.'" Neumann Decl. ¶ 53 (emphasis omitted). When discussing the patents' disclosure of registration errors, Dr. Neumann also opined that the registration of overlapping images is impacted by several issues, such as "photonic (intensity) variations and image acquisition . . . differences[,]" not just parallax. Neumann Decl. ¶ 54.

When SAIC's expert, Dr. Welch, was asked whether the patents provide any basis for determining what level of offset is acceptable, he stated, "[s]itting here right now, I don't recall that there's anywhere where the patents disclose something like acceptable offsets." Welch Dep. at 170:2-18. To put this comment in context, Dr. Welch came to this conclusion directly following a question about Figure 4 of the '012 patent. Specifically, Dr. Welch was asked "[s]o you can't estimate whether there's any offset between the two images that are allegedly registered in Figure 4 of the '012 patent; correct?" Welch Dep. at 169:8-11. Dr. Welch responded:

> A: I as a human would have to understand what we mean by offset, because there are who knows how many pixels in that inset region. There's a lot of information in the middle, and we'd have -- and around the boundaries, and we'd have to sort of agree on what's important or not important because there's no system that is going to match every pixel in intensity pixel for pixel. So we'd have to agree on what it means to be okay. What I'm saying is the patent teaches that this is what they mean by registration.

Welch Dep. at 169:13-25. The exchange demonstrates that Dr. Welch does not view Figures 1 and 4 as objective guidance to inform a POSITA of the objective boundaries of registration. Dr. Welch does not specifically reference the patents' disclosure of 2.9 degrees or less as an objective criterion for when registration is achieved in either his declaration or his deposition. In fact, in his declaration, Dr. Welch asserts that examples for addressing parallax and calibration methods are unnecessary for a POSITA to understand the patents' claims with reasonable certainty. Welch

Decl. ¶ 57. This assertion is inconsistent with Federal Circuit precedent.

The Federal Circuit's decision in *Berkheimer v. HP Inc.*, 881 F.3d 1360 (Fed. Cir. 2017) is instructive. In *Berkheimer*, the Federal Circuit held the use of "minimal redundancy" to be an indefinite term of degree for which there must be objective boundaries. *Id.* at 1364. The patent in *Berkheimer* related to digitally processing and achieving files in a digital asset management system, which eliminated redundancy of common text and graphical elements. *Id*. at 1362. Relying on intrinsic evidence as well as an expert declaration, the district court had found that minimal redundancy was "highly subjective" and would not provide a POSITA with objective criteria for when minimal redundancy was achieved. *Id.* at 1363. The Federal Circuit agreed. *Id.* The Federal Circuit first noted that the specification inconsistently described the invention. *Id.* at 1363-64. In certain places, the specification described the system as "minimizing redundant objects," while elsewhere it stated that redundancy was "eliminat[ed]." *Id.* at 1364. In the prosecution history, the inventor had stated that the claim at issue desired to eliminate redundancy but used the term "minimal" because eliminating redundancy was unlikely. *Id.* Moreover, the only example included in the specification exhibited no redundancy. *Id.* Accordingly, the Federal Circuit stated that "[t]he specification contains no point of comparison for skilled artisans to determine an objective boundary of 'minimal' when the archive includes some redundancies." *Id.* (citation and emphasis omitted). The Federal Circuit held that terms of degree require objective boundaries to inform a POSITA of the scope of the invention, and no objective boundary was provided where the invention failed to inform "*how much* is minimal." *Id*. (emphasis in original).

Here, like in *Berkheimer*, neither the disclosure of examples nor registration errors provide reasonable certainty of the bounds of registration. As was the case in *Berkheimer*, because perfect registration cannot be accomplished, the patents must disclose an acceptable level of "offset." The

examples here are too extreme to provide objective criteria to a POSITA; and, like *Berkheimer*, expert testimony supports this conclusion. Both experts agree that (1) registration is context dependent, (2) the patents do not claim perfect registration, and (3) the patents do not disclose an acceptable offset. Accordingly, for the reasons stated above, the Court holds the terms "in registration with" and "registering" to be indefinite, as no objective way exists to calculate *how much* offset is acceptable.

*****

CONCLUSION

For the foregoing reasons, the Court construes:

1. "video images" / "video source image" / "video data of images" as "digital, analog, or nonstandard video frames;"

2. "transparent display" as "a display that has the effect of being transparent or translucent, allowing simultaneous viewing of the underlying visual field and other images or information;"

3. "overlay" in accordance with its plain and ordinary meaning, "e.g., Overlaying: positioned over or upon. Overlay/overlays: are over or upon/is over or upon;"

4. "based on a comparison" as "based on a comparison of image data (e.g., content and contrast) from the first and second video source images;" and

5. "motion data" as "data indicative of motion, including at least orientation data."

Additionally, the Court holds the terms "in registration with" / "registering" indefinite.

The parties are **DIRECTED** to file a Joint Status Report by August 23, 2021, proposing a schedule for further proceedings.

IT IS SO ORDERED.

   s/ Eleni M. Roumel
ELENI M. ROUMEL
Judge

Dated: August 6, 2021
Washington, D.C.