

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC,
Petitioner
v.

REALTIME ADAPTIVE STREAMING LLC,
Patent Owner.

Case IPR2019-01036
Patent 9,578,298 B2

Before, GREGG I. ANDERSON, GARTH D. BAER, and
KAMRAN JIVANI, *Administrative Patent Judges*.

ANDERSON, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

In this *inter partes* review under 35 U.S.C. § 314, Google LLC (“Petitioner”) filed a Petition (Paper 2, “Pet.”) pursuant to 35 U.S.C. §§ 311–19 to institute an *inter partes* review of claims 1–4, 7–11, and 13 (“challenged claims”) of U.S. Patent 9,578,298 (Ex. 1001, the “’298 patent”).¹ Realtime Adaptive Streaming LLC (“Patent Owner”) filed a Preliminary Response (Paper 6). We instituted an *inter partes* review of all challenged claims (Paper 9, “Inst. Dec.”). After institution, Patent Owner filed a Patent Owner Response (Paper 16, “PO Resp.”), Petitioner filed a Reply (Paper 21, “Reply”), and Patent Owner filed a Sur-reply (Paper 28, “Sur-reply”). An oral hearing was held on August 12, 2020, and a transcript made of record (Paper 31, “Tr.”).

The Petition is supported by the Declaration of Benjamin Bross (Ex. 1002, “Bross Declaration”). The Reply is supported by the Rebuttal Declaration of Benjamin Bross (Ex. 1015, “Bross Reply Declaration”). The deposition of Mr. Bross was taken by Patent Owner after the Bross Reply Declaration (Ex. 2005). The Response is supported by the Declaration of Kenneth A. Zeger, Ph.D. in Support of Patent Owner’s Response (Ex. 2002, “Zeger Declaration”). The deposition of Dr. Zeger was taken by Petitioner after the Zeger Declaration (Ex. 1014).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is entered pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

¹ The ’298 patent’s earliest filing date is June 27, 2011, claiming priority to an Italian application filed June 28, 2010. Ex. 1001, code (22), (30). The prior art references relied on were either filed or published prior to the foreign priority date. *See* Section I.D below. Patent Owner does not dispute that the references relied on are prior art.

For the reasons discussed below, Petitioner has shown by a preponderance of the evidence that claims 1–4, 7–11, and 13 of the '298 patent are unpatentable.

A. Related Matters

The parties advise us that the '298 patent is the subject of fourteen (14) pending civil actions, including *Realtime Adaptive Streaming LLC v. Google LLC et al.*, No. 2:18- cv-03629 (C.D. Cal.) (“District Court Lawsuit”) where Petitioner is the accused infringer. Pet. 1–3; *see also* Paper 4 (Patent Owner’s identification of five (5) other cases that may be affected by the outcome here). Petitioner further advises us of *Netflix, Inc. v. Realtime Adaptive Streaming LLC*, IPR2018-01227 (“’1227 IPR”), which also challenges the '298 patent.² Pet. 3.

B. Technology and the '298 Patent

The '298 patent relates to “a method for decoding a stereoscopic digital video stream, i.e. a video stream which, when appropriately processed in a visualization device, produces sequences of images which are perceived as being three-dimensional by a viewer.” Ex. 1001, 1:7–12.

1. Technology

Stereoscopic video involves displaying two independent video streams, one for each eye, which the human brain perceives as a three-dimensional object. Ex. 1001, 1:27–31. However, production of video in high-definition (1920 x 1080 pixels) may make it impossible to handle and

² In our final written decision for the '1227 IPR, we found no claims unpatentable. '1227 IPR, Paper 39.

transfer two video streams shot from different points of view. *Id.* at 1:38–41, 1:56–57. It is therefore necessary to “reduce the bit-rate required for content transfer and fruition.” *Id.* at 1:45–47.

One known method for reducing the bit rate is to use a left and right (L and R) channel, each channel “with a horizontal resolution equal to half the resolution of a high-definition frame.” *Id.* at 1:56–62. Thus, a single high-definition stream transports two video channels. *Id.* at 1:63–64. When the stream is decoded, “the two half-frames are then separated and brought back to the 16/9 format by applying suitable interpolation techniques.” *Id.* at 1:65–67.

2. '298 Patent (*Ex. 1001*)

The '298 patent describes and claims

a decoding method that allows extracting a 2D-compatible (2D) video signal from a stereoscopic digital video stream and, in particular, a method for decoding a 2D-compatible stereoscopic digital video stream based on the use of composite frames which is applicable whatever the method employed for packing the right and left images within said composite frames.

Ex. 1001, 3:3–10.

The video stream includes metadata, which describes a frame packing format description. *Id.* at 4:17–19. Frame packing includes different techniques developed for packing two images composing the stereoscopic view into a single frame, e.g., side-by-side or top-bottom format. *Id.* at 1:53–55, 4:50–57, Figs. 1a, 1b, 2a, 2b. Based on the frame packing description, a decoder determines “the region occupied by one of the two stereoscopic images . . . and then cuts that region to send it to the 2D visualization apparatus.” *Id.* at 4:19–22. “This determination may be

obtained either explicitly or implicitly starting from the metadata.” *Id.* at 4:23–24.

In explicit mode, the geometry of the frame packing, e.g., side-by-side or top-bottom (*see* Figures 1a and 1b respectively), is described in the metadata, for example by “expressly stating the coordinates of the vertices of the areas occupied by each stereoscopic image.” Ex. 1001, 4:25–28. “In implicit mode, instead, only the frame packing type (e.g. side-by-side) is stated in the metadata, said indication being sufficient for the decoder to determine such areas.” *Id.* at 4:29–31.

The decoder has software components which implement algorithms “necessary for obtaining one of the two images that make up the stereoscopic video depending on the frame packing format in use.” *Id.* at 4:46–49. Upon receipt of “an explicit description of the frame packing format (e.g. the format of FIG. 1c), then the decoder 212 will select the information necessary for cutting one of the two component images from the frames of the stereoscopic video stream.” *Id.* at 4:61–65.

C. Illustrative Claim

Claims 1 and 11 are independent and respectively relate to a method for processing a video stream and a video processing device for processing video streams of digital images. Challenged claims 2 through 4 and 7 through 10 depend directly from claim 1. Claim 13 depends from claim 11.

Claim 1 is reproduced below as illustrative.

[1.a]³ A method for processing a video stream of digital

³ We adopt the format applied by Petitioner where each limitation is identified by the claim number followed by a small case letter. For example, the preamble is 1.a and the following limitation is 1.b. *See, e.g.*, Pet. 23, 27.

images, the method comprising the steps of:

- [1.b] receiving the video stream which comprises at least one composite frame (FC), each composite frame containing a pair of stereoscopic digital images (L,R) according to a predetermined frame packing format;
- [1.c] generating an output video stream which can be reproduced on a visualization apparatus,
- [1.d] receiving metadata which determine an area occupied by one of the two images within said composite frame (FC), said metadata indicating either a geometry of the frame packing format or a frame packing type of said composite frame (FC);
- [1.e] determining the area in the composite frame (FC) which is occupied by said one image of the stereoscopic pair within the composite frame based on said metadata;
- [1.f] decoding only that part of the composite frame (FC) which contains said one image to be displayed, and
- [1.g] generating an output frame containing said decoded image.

D. Asserted Prior Art and Grounds of Unpatentability

This proceeding relies on the following prior art references:

Suh (Ex. 1005): Suh et al., US 2010/0225645 A1, published Sept. 9, 2010;

Karppinen (Ex. 1006): Karppinen et al., US 2006/0015919 A1, Jan. 19, 2006;

Tian (Ex. 1007): Tian et al., US 9,036,714 B2, issued May 19, 2015, filed Jan. 26, 2010;

Naske (Ex. 1008): Naske et al., US 7,254,265 B2, issued Aug. 7,

2007; and

Butler-Smith (Ex. 1009): Butler-Smith et al., US 2005/0041736 A1, published Feb. 24, 2005.

Petitioner asserts the following grounds of unpatentability (Pet. 4–5):

Claim(s) Challenged	35 U.S.C. §⁴	References/Basis
1, 2, 4, 11	103(a)	Suh, Karppinen
3, 7, 8	103(a)	Suh, Karppinen, Tian
9, 10	103(a)	Suh, Karppinen, Butler-Smith, Tian
13	103(a)	Suh, Karppinen, Naske

Petitioner also relies on the Bross Declaration and Bross Reply Declaration (Exs. 1002, 1015). Patent Owner’s evidence includes the Zeger Declaration (Ex. 2001).

II. ANALYSIS

A. Level of Ordinary Skill in the Art

Petitioner alleges a person of ordinary skill in the art would have had a Bachelor’s degree in Electrical Engineering, Computer Science, or the equivalent thereof, and three or more years of

⁴ The Leahy-Smith America Invents Act (AIA), Pub. L. No. 112-29, 125 Stat. 284, 285–88 (2011), which revised 35 U.S.C. §§ 102 and 103, became effective March 16, 2013. The ’298 patent has an effective filing date of at least June 28, 2010 (*see* Section I, n.1 above), prior to the effective date of the AIA. Thus, the grounds asserted are under the pre-AIA version of 35 U.S.C. § 103.

experience in video and image coding technologies. Significantly more practical experience could also qualify one not having the aforementioned education as a person of ordinary skill in the art while, conversely, a higher level of education could offset a lesser amount of experience.

Pet. 6–7 (citing Ex. 1002 ¶¶ 5–18, 23–30; Mr. Bross’s Curriculum Vitae (Ex. 1003)) (internal citations omitted).

Patent Owner and its expert, Dr. Zeger, “agree with and adopt this level of skill.” PO Resp. 16 (citing Ex. 2001 ¶¶ 28–31). Patent Owner alleges the issues in this proceeding “do not depend on a particular level of skill.” *Id.* Accordingly, to the extent it is relevant here, we adopt Petitioner’s proposed level of ordinary skill for purposes of this Decision.

*B. Claim Construction*⁵

In an *inter partes* review for a petition filed on or after November 13, 2018, a claim “shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b).” *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (amending 37 C.F.R. § 42.100(b) effective November 13, 2018) (now codified at 37 C.F.R. § 42.100(b) (2019)). In applying this claim construction standard, we are guided by the principle that the words of a claim “are generally given their ordinary and customary meaning,” as understood by a person of ordinary skill in the art in question

⁵ The District Court preliminarily declined to construe any term of the ’298 patent. District Court Lawsuit, Dkt. 81, at 29–30 (July 18, 2019). We ordered the parties to keep us informed of significant developments in the District Court, specifically including claim interpretation. Inst. Dec. 41–42. No further developments have been reported.

at the time of the invention. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (*en banc*) (citation omitted). “In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17). There is a “heavy presumption,” however, that a claim term carries its ordinary and customary meaning. *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002) (citation omitted).

1. Prior Institution Constructions

In the Institution Decision, we advised the parties that we made the following preliminary constructions in the ’1227 IPR institution decision.

“composite frame” means “a frame containing a pair of stereoscopic images.”

“undivided” means “wholly contained within a determined area of the composite frame.”

Inst. Dec. 17 (citing ’1227 IPR, Paper 15, at 9–11). Neither of the above terms was disputed in either the ’1227 IPR final written decision or here. *See* ’1227 IPR, Paper 39, 8. We decline to construe these terms here because doing so is unnecessary to resolving the patentability challenges presented in this trial. *See, e.g., Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017); *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.”).

2. *Limitation 1.f “decoding only that part of the composite frame (FC) which contains said one image to be displayed”*

Although both parties initially contended no claim term requires express construction, the parties dispute the plain and ordinary meaning of “decoding” as it appears in limitation 1.f, “*decoding only that part of the composite frame (FC) which contains said one image to be displayed.*” See Pet. 22; PO Resp. 16–19; Pet. Reply 3–10; PO Sur-reply 1–12. Petitioner proposes that “decoding” would be understood by a person of ordinary skill in the art to mean “extracting or recovering left and right images from a composite frame.” Pet. Reply 9. Patent Owner argues “decoding” “means taking encoded data and restoring or reconstructing the unencoded data.” PO Resp. 19 (citing Ex. 2004 (A DICTIONARY OF COMPUTING (6th Ed. 2008)), 137, decoding: “The process of reconverting a coded message to the message from which it was encoded;” decoder: “An electronic device that is capable of accepting encoded data at its input and generating unencoded data at its output.”).

Petitioner’s proposal differs in that it “clarifie[s]” “that the video-encoded data is the composite frame, and the unencoded data is the left and the right images.” Tr. 10:8–15. Petitioner agrees with the dictionary definition cited by Patent Owner but contends it is too broad. *Id.* at 11:22–12:3. Petitioner also does not object to “restoring” in lieu of “extracting or recovering.” *Id.* at 12:18–19.

The meaning of “decoding” is relevant to the parties’ arguments made in connection with limitation 1.f, which relies on the combination of Suh and Karppinen. See Section II.C.2.c below. Generally, the issue is raised because Patent Owner disputes that Suh’s “3D FORMATTER 302” teaches

the “decoding” recitation of limitation 1.f. PO Resp. 25 (citing Ex. 1004,⁶ 53–54), 26–28 (citing Ex. 1005, Fig. 6), 33 (3D FORMATTER of Suh does not “decode” person of ordinary skill would not modify Suh’s 3D FORMATTER with Karppinen’s decoder); Sur-reply 12–17 (arguing several reasons Suh’s 3D FORMATTER does not decode).

Beyond the dictionary definition set forth above, with which both parties agree, we are not persuaded the meaning of “decoding” requires any additional limiting language, such as proposed by Petitioner. We determine that the plain and ordinary meaning of “decoding” is stated in the dictionary definition. Ex. 2004, 137. The issues of what the references teach regarding “decoding” are analyzed in connection with limitation 1.f. *See* Section II.C.2.c below.

C. Obviousness

All of the challenges to the ’298 patent are based on obviousness under 35 U.S.C. § 103(a). Pet. 4–5.

1. Legal Standard for Obviousness

A patent claim is invalid as obvious if the differences between the claimed subject matter and the prior art are “such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” 35 U.S.C. § 103(a).

The ultimate determination of obviousness is a question of law, but that determination is based on underlying factual findings. . . . The underlying factual findings include (1) “the scope and content of the prior art,” (2) “differences between the prior art and the claims at issue,” (3) “the level of ordinary skill in the

⁶ Prosecution history of the ’298 patent.

pertinent art,” and (4) the presence of secondary considerations of nonobviousness such “as commercial success, long felt but unsolved needs, failure of others,” and unexpected results.

In re Nuvasive, Inc., 842 F.3d 1376, 1381 (Fed. Cir. 2016) (citing *inter alia* *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966)).

“To satisfy its burden of proving obviousness, a petitioner cannot employ mere conclusory statements. The petitioner must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016). Furthermore, in assessing the prior art, the Board must consider whether a person of ordinary skill would have been motivated to combine the prior art to achieve the claimed invention. *Nuvasive*, 842 F.3d at 1381.

As the Federal Circuit found, in quoting from the Supreme Court’s decision in *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418–419 (2007),

“because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known,” “it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.”

Personal Web Technologies, LLC v. Apple, Inc., 848 F.3d 987, 991–992 (Fed. Cir. 2017).

2. Obviousness of Claims 1, 2, 4, and 11 over Suh and Karppinen

Petitioner alleges claims 1, 2, 4, and 11 would have been obvious over Suh and Karppinen. Pet. 4, 23–50. Petitioner also relies on the Bross Declaration. Ex. 1002 ¶¶ 69–116.

a. Suh (Ex. 1005)

Suh describes “a method and device for processing an image signal and, more particularly, to a receiving system for receiving and processing a 3-dimensional (3D) image signal and a method of processing data.”

Ex. 1005 ¶ 3. Suh’s “Background of the Invention” section explains that “[g]enerally, a 3-dimensional (3D) image (or stereoscopic image) is based upon the principle of stereoscopic vision of both human eyes.” *Id.* ¶ 5. In the context of the disclosed invention, Suh further explains that “[a] stereo image refers to a pair of left and right images acquired by photographing the same subject with a left-side camera and a right-side camera, wherein both cameras are spaced apart from one another at a predetermined distance.” *Id.* ¶ 36. Figure 1 of Suh is reproduced below.

FIG. 1

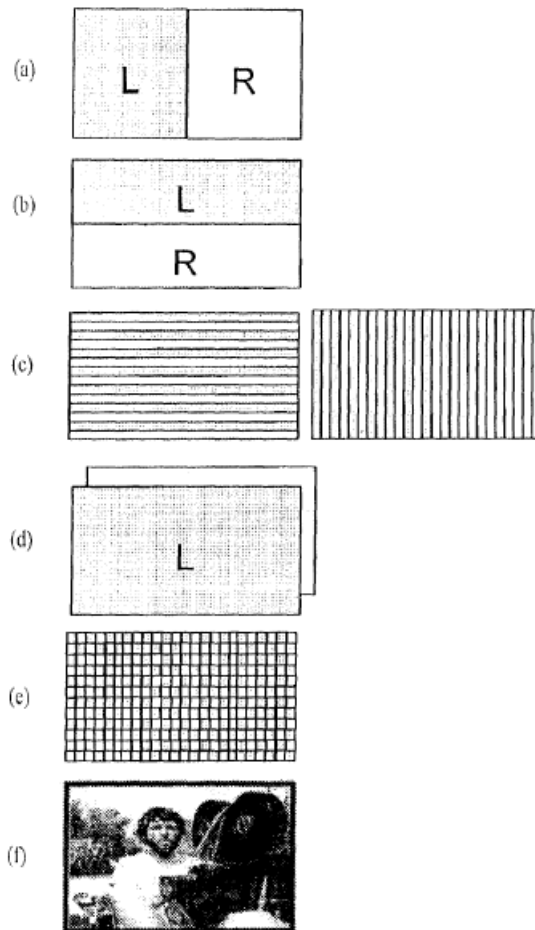


Fig. 1 illustrates examples of a single video stream format among transmission formats for 3D images.

Id. ¶¶ 17, 38. The transmission format refers to how a left and a right image are arranged in a single frame. *Id.* ¶¶ 37–38. Referring to Figure 1(a) above, “the sampled left image is positioned on the left side, and the sampled right image is positioned on the right side, thereby creating a single

stereo image.” *Id.* ¶ 40. A display device displays the decoded image either in a 2-dimensional (2D) or 3D format. *Id.* ¶ 92, Fig. 5.

Suh teaches that the 3D image may be recognized as such for processing by the receiving system. Ex. 1005 ¶ 31. An HDMI receiving unit 301 of the receiving system receives a “TMDS-encoded video stream” and “3D signaling data.” Ex. 1005 ¶¶ 110–111.

Figure 6 of Suh is reproduced below.

FIG. 6

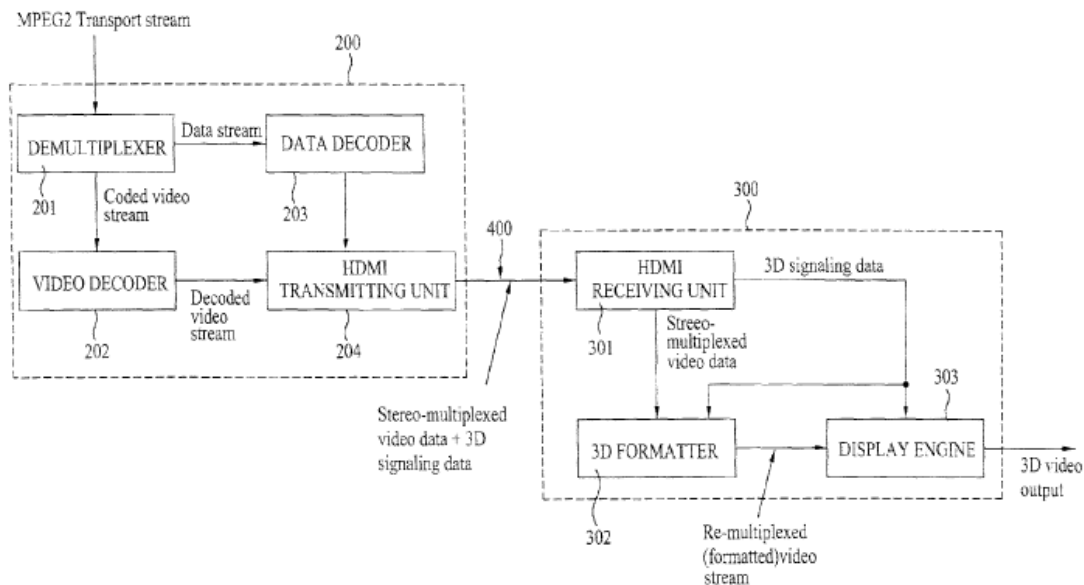


Fig. 6 is a block view of a decoding device and a display device being interconnected by an HDMI cable within the receiving system.

Id. ¶ 22. Still referring to Figure 6, video decoder 202 decodes the video stream using a video decoding algorithm like MPEG-2, thereby recovering the previously compressed video stream. *Id.* ¶ 106.

HDMI transmitting unit 204 uses transition minimized differential signaling interface–encoding (TMDS) to output TDMS-encoded video data. Ex. 1005 ¶¶ 110–111. The TMDS-encoded video stream may correspond to

a 3D or 2D image. *Id.* ¶ 142. The received TMDS-encoded video stream⁷ includes 3D images and a specified transmission format for the 3D images. *Id.*

The HDMI receiving unit 301 outputs the received video data and 3D signaling information to the 3D formatter 302. Ex. 1005 ¶ 142. The 3D formatter 302 refers to the 3D signaling information output from the HDMI receiving unit 301 in order to decode and re-format the video data for display. *Id.* ¶¶ 143–144. The display engine 303 displays the 3D image output from the 3D formatter 302 in accordance with its display mode. *Id.* ¶ 143.

b. Karppinen (Ex. 1006)

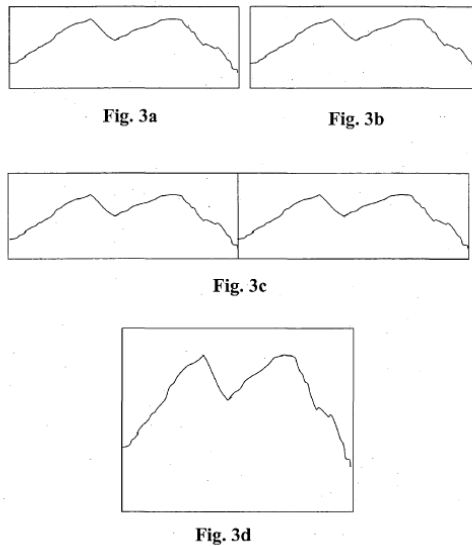
Karppinen describes “systems and methods for the coding and transfer of three-dimensional (3D) (or stereo-view) video for stereoscopic imaging.” Ex. 1006 ¶ 1. In particular, Karppinen teaches that

if a mobile device includes a 2D display, then only one of the left video stream or the right video stream may be decoded from the 3D video stream and shown on the 2D display. If both the left and right video frames have been sub-sampled, horizontal up-sampling of the video stream may be desirable prior to rendering on the 2D display.

Id. ¶ 48.

Figures 3a–3d are reproduced below.

⁷ We agree with Petitioner that paragraph 110 of Suh stating “TDMS-encoded video stream,” should be “TMDS-encoded video stream.” Pet. 13, n.5 (citing Ex. 1002 ¶ 43 n.5).



Figs. 3a–3d show various configurations in which video frames or pictures may be coded.

Ex. 1006 ¶ 31. The video streams, as shown in Figure 3c, may include two synchronized pictures from Figures 3a and 3b “grouped together to form a composite picture.” *Id.* Figure 3d shows the pictures of Figures 3a and 3b as an interlaced frame where the picture of Figure 3a is the top field and Figure 3b is the bottom field. *Id.* ¶ 32.

c. Claim 1

The evidence and argument of the parties regarding claim 1 are set out below.

- i. Disputed Limitation 1.f-“decoding only that part of the composite frame (FC) which contains said one image to be displayed.”*

Limitation 1.f is the only disputed limitation of independent claim 1. *See, e.g.*, PO Resp. 12–19 (arguing meaning of “decoding” portion of limitation 1.f), 22–33 (arguing neither Suh nor Karppinen teach limitation 1.f); Reply 3–10 (response to meaning of “decoding”), 10 (“sole dispute in this case involves limitation 1[f]”); Sur-reply 12–20 (arguing “Petitioner’s

Theory for Limitation 1[f] (‘decoding only that part of the composite frame . . .’)). Further, the hearing arguments were also limited to the meaning of “decoding” as contained in limitation 1.f, whether Suh or Karppinen taught limitation 1.f, and whether there was sufficient rationale or motivation to combine Karppinen with Suh. *See, e.g.*, Tr. 9:22–11:4, 17:1–10.

(a) Petitioner’s Evidence and Argument

Petitioner cites to the Bross Declaration to support its argument that the combination of Suh and Karppinen disclose limitation 1.f. Pet. 36 (citing Ex. 1002 ¶¶ 92–101). Petitioner references its showing regarding limitation 1.e below but acknowledges Suh does not disclose “decoding only that part of the composite frame (FC) which contains said one image to be displayed,” relying on the combination of Suh with Karppinen to teach limitation 1.f. *Id.* (citing Ex. 1002 ¶ 92).

Karppinen discloses that “if a mobile device includes a 2D display, then only one of the left video stream or the right video stream may be decoded from the 3D video stream.” Ex. 1006 ¶ 48. Based on the preceding, Petitioner argues that “Karppinen discloses decoding only the left or the right image in a 3D video data stream when only a 2D display is available for display of the video stream.” Pet. 38 (citing Ex. 1002 ¶ 96).

Petitioner argues a person of ordinary skill in the art would have been motivated to combine Karppinen with Suh because “of increasing efficiency in a scenario where a received 3D image is to be displayed as a two dimensional (2D) image.” Pet. 36–37 (citing Ex. 1002 ¶ 93) (emphasis omitted). Petitioner also argues both Karppinen and Suh relate to methods “for the coding and transmission of video data.” *Id.* at 37 (citing Ex. 1006,

Abstract, ¶ 3 (“[i]n typical 3D video generation, two separate video streams may be coded, one for the left eye and one for the right eye of the viewer”); Ex. 1002 ¶ 94). According to Petitioner, Suh discloses receiving a “TMDS-encoded video stream” and “3D signaling data.” *Id.* at 27 (citing Ex. 1005 ¶¶ 110–111, Fig. 6). Petitioner points out that both references process stereoscopic images. *Id.* at 38 (citing Ex. 1005 ¶ 92 (Suh displays the image in 2D or 3D)); Ex. 1006 ¶ 1 (Karppinen relates to “stereoscopic imaging” of 3D video).

Relying in part on the Bross Declaration, Petitioner argues that “for display of 2D images, both the left and right images do not need to be decoded because the display of a 2D image can be accomplished by displaying either one of the left and right images.” Pet. 39 (citing Ex. 1002 ¶ 99; Ex. 1008, 9:61–11:39) (when 3D image data has to be displayed on a 2D display, one of the left or right images can be discarded). Finally, Petitioner argues Karppinen confirms this because it states that “if a mobile device includes a 2D display, then **only one of the left video stream or the right video stream may be decoded** from the 3D video stream.” *Id.* (citing Ex. 1006 ¶ 48). Petitioner supplements the preceding argument by pointing out that “there would be no point to decoding both the left and the right images as only one image can be and needs to [be] displayed.” *Id.* at 39 (citing Ex. 1005 ¶ 144; Ex. 1002 ¶¶ 100–101; *ZUP, LLC v. Nash Mfg., Inc.*, 896 F.3d 1365, 1371 (Fed. Cir. 2018)). Petitioner concludes that a person of ordinary skill “would have found it obvious to modify Suh such that when a received 3D image is to be displayed as a 2D image, the 3D formatter 302 decodes only one of the left and right halves of the received composite frame

instead of decoding both halves.” *Id.* at 39–40 (citing Ex. 1005, ¶ 144; Ex. 1002 ¶ 100).

Petitioner cites to additional reasons that limitation 1.f would have been obvious to a person of ordinary skill, including efficiency associated with decoding only one image. Pet. 40 (citing Ex. 1002 ¶ 100). Petitioner argues decoding only one image avoids “a wasteful use of the available processing power.” *Id.* (citing Ex. 1002 ¶ 100). This increased efficiency is argued by Petitioner as motivation “to provide functionality in Suh based on Karppinen so that when a received 3D image is to be displayed as a 2D image, the 3D formatter will decode only one of the left and right halves of the received composite frame.” *Id.* (citing Ex. 1002 ¶ 100). Petitioner alleges the combination would therefore “have been nothing more than the combination of familiar techniques according to known methods that yields a predictable result (e.g., where a 3D image is displayed as a 2D image), and therefore, obvious.” *Id.* (citing *KSR*, 550 U.S. at 416).

(b) Patent Owner’s Evidence and Argument

Patent Owner opposes Petitioner’s case by arguing Suh decodes an entire video frame, and not just a part of the composite frame that is to be displayed, as claimed in limitation 1.f. PO Resp. 22, 28–29. The support for this position is based on the prosecution history and Patent Owner’s assertion that Suh’s 3D Formatter, as shown in Suh’s Figure 6 (Section II.C.2.a above) is not a decoder and a person of ordinary skill would not combine Karppinen with Suh. *Id.* at 22–27 (prosecution history), 33–37 (Karppinen does not modify Suh).

Prosecution History Argument

Patent Owner cites to a preliminary amendment to application claim 1 during prosecution (Ex. 1004), which deleted “extracting the image” and inserted “decoding only that part . . . which contains said one image to be displayed.”⁸ The prosecution history is intrinsic evidence relevant to claim construction. *See Phillips*, 415 F.3d at 1317. The insertion of “decoding” to what is now limitation 1.f is consistent with our determination that the ordinary meaning of “decoding” as set forth in the dictionary definition. *See* Section II.B.2 above; *see also* PO Resp. 9–10 (citing Ex. 1004, 280–284); Sur-reply 9–11.

Patent Owner also cites to the prosecution history to argue references considered during prosecution, Cho⁹ and Suh ’583,¹⁰ have similar disclosures to Suh. *See* PO Resp. 11–12 (discussing Cho), 13–15 (comparing Suh ’583 to Suh), 22–24 (“Suh is closely related to Suh ’583, a reference distinguished during prosecution.”). According to Patent Owner, Petitioner’s reliance on Suh’s disclosure in this proceeding is improper because of the arguments made during prosecution resulting in the allowance of claim 1 over Suh ’583. PO Resp. 25–28. More specifically, Patent Owner contends Suh’s formatter cannot meet the claimed “decoding only that part of the composite frame” because the prosecution history shows

⁸ Application claim 1 issued as claim 1 of the ’298 patent. With that understanding of the distinction, hereinafter we refer to “claim 1” as patent claim 1.

⁹ Cho (Ex. 2003, WO 2008/054100 A1, to Cho). *See* PO Resp. 11–12 (discussing Cho).

¹⁰ Suh ’583 (Ex. 2001, US 2012/0105583 A1, to Suh). *See id.* at 13–15 (discussing Suh ’583).

that Suh’s 3D Formatter is not a decoder and does not perform the recited “decoding” function. *Id.* at 25 (quoting Ex. 1004, 53–54).

Patent Owner acknowledges limitation 1.f is alleged to be taught by Karppinen. PO Resp. 28 (citing Pet. 36). Notwithstanding the preceding, Patent Owner argues:

Petitioner’s reliance on Suh’s 3D Formatter for limitation 1[f] reveals two significant errors. First, the 3D Formatter is not a decoder and does not perform decoding, as discussed above. Second, Suh’s video decoder is upstream from the 3D Formatter and decodes the entire frame.

Id.

Patent Owner’s argument is unpersuasive because it fails to address the obviousness theory advanced by Petitioner. Petitioner’s asserted ground relies on the combination of Suh and Karppinen, with Karppinen specifically cited as teaching limitation 1.f, not Suh. Pet. 36 (relying on Karppinen to teach limitation 1.f); Reply 19 (confirming Petitioner does not rely on Suh’s video decoder 202 for the claimed “decoding”).

Patent Owner suggests that an obviousness analysis requires consideration of Cho and Suh ’583 as part of “the scope and content of the prior art.” Sur-reply 13 n.4 (citing *Apple v. Samsung Elecs. Co., Ltd.*, 839 F.3d 1034, 1048 (Fed. Cir. 2016) (*en banc*)). However, Patent Owner does not explain why we should consider prior art that is not relied on for the obviousness challenge before us. The challenge here is based on Suh, not Cho or Suh ’583. Patent Owner fails to explain persuasively why its arguments regarding Cho and Suh ’583 should impact our determination of whether Karppinen teaches limitation 1.f. *See id.* at 12–20.

Suh and Karppinen Combination

We find that the combination of Suh and Karppinen is the ground asserted for unpatentability of claim 1. Pet. 23–41. Petitioner relies on Karppinen to teach limitation 1.f, not Suh. *See id.* at 36 (citing Ex. 1002 ¶¶ 92–101). As already discussed, Patent Owner does not provide any legal theory for why the teachings of Suh should be disregarded based on similarity to Cho, Suh ’583, or based on the prosecution history.

Patent Owner argues that the combination of Suh and Karppinen does not teach decoding just a part of the composite frame that is to be displayed, as claimed in limitation 1.f. PO Resp. 22, 28–29. To the extent a person of ordinary skill would have reason to combine Karppinen with Suh, we find that Suh’s 3D formatter is a decoder. In doing so, we apply the plain and ordinary meaning of decoding as reflected, for example, in A DICTIONARY OF COMPUTING (Exhibit 2004). *See* Section II.B.2 above.

Patent Owner’s argument that the prosecution history requires us to find that Suh’s 3D formatter does not “decod[e] only that part of the composite frame (FC) which contains one image to be displayed” is not persuasive, in part for reasons already discussed. *See* PO Resp. 22–28. Patent Owner alleges Petitioner’s theory of unpatentability requires that “the 3D formatter to decodes only one of the left and right images” of the composite frame. *Id.* at 33–34 (citing Pet. 39–40; quoting Ex. 1002 ¶¶ 100–101). According to Patent Owner, Petitioner’s theory is based on a “misunderstanding of the way Suh’s invention works.” *Id.* at 34. Patent Owner reasserts the argument that was asserted against Cho and Suh ’583 during prosecution, contending Suh’s 3D formatter is not a decoder because the video decoder of Suh has already decoded the video stream. *Id.* at 35.

As to combining Karppinen with Suh, Patent Owner again relies on its contention that Suh's video decoder has already decoded the video stream and therefor the "combination of Suh and Karppinen is nonfunctional and cannot be made to work as described." PO Resp. 36. Patent Owner alleges that even if Suh's 3D formatter "is left alone or somehow modified based on Karppinen, it would still be *functionally identical* to the downstream circuitry in Cho and Suh '583 that was distinguished during prosecution." *Id.* at 37.

Patent Owner further argues that the video decoder is the *only* decoding function disclosed by Suh and there would be "no efficiencies" to "re-decode" only one image of a composite frame. PO Resp. 38. Patent Owner argues "Suh contemplates a separate decoding device and display device (Suh at Figs. 5, 6) and that decoded data is sent to the HDMI transmitting unit before being sent to the HDMI receiving unit in the display device." *Id.* at 38–39.

We are not persuaded by Patent Owner's arguments that we should draw a distinction between decoding in the context of decompressing the video stream, as is done by the video decoder of Suh, and decoding the decompressed video into a composite frame having both left and right images, as is done by the 3D formatter. As Petitioner alleges, Suh's 3D formatter decodes in the same manner as decoder 212 of the '298 patent. Reply 12–13 (citing Ex. 1001, 4:17–22, 4:61–5:4). Petitioner alleges and we find Suh's 3D formatter "receives a composite frame and recovers the left and right images from the composite frame." *Id.* at 13 (citing Ex. 1005 ¶ 144 ("it can be determined that the uppermost pixel of the left-end portion within the received video data frame belongs to the left image . . .")); Ex.

1002 ¶¶ 91–92). Petitioner also alleges and we find that the frame packing format of Suh is “decoded” and, in the case of a side-by-side format, both a left and right image are “decoded” and recovered as the appropriate left or right image. *Id.* (citing Ex. 1005 ¶¶ 142–144; Ex. 1002 ¶¶ 91–92).

We adopt the following findings responsive to Patent Owner’s arguments. The video decoder 202 of Suh functions to decompress, which is a form of decoding, the previously compressed video bitstream. *See* Reply 14 (citing Ex. 1015 ¶ 15). Decompression is different from the recited “decoding,” which requires first reviewing metadata to unpack the composite frame into its component images and then displaying them, as discussed above. *Id.* at 14–17 (citing Ex. 1014, 97:11–22 (Zeger Deposition testimony that metadata relating to the composite frame format must be determined before decoding); Ex. 1005, ¶¶ 20, 75, 105, 109, Figs. 4, 6). The video decoder does not have the knowledge, i.e., metadata, to decode the composite frame but the 3D formatter does in that it “ultimately recovers the left and right images from the composite frame by decoding the applicable portions of the composite frame based on the received 3D signaling information.” *Id.* at 18 (citing Ex. 1005 ¶¶ 18, 110–111, 142–144; Ex. 1015 ¶ 18).

We agree with Petitioner that Suh decodes both halves of a left and right image of the composite frame but not only one, which is why Karppinen is added to the combination. Pet. 36 (citing Ex. 1005 ¶¶ 144, 76–78; Ex. 1002 ¶ 92). Petitioner states its argument as follows:

Suh does not disclose decoding only the part of the composite frame containing the left image or the part of the composite frame containing the right image and therefore, does not disclose “decoding **only** that part of the composite frame (FC) which contains said one image to be displayed” (emphasis added). . . .

However, a [person of ordinary skill] would have found it obvious to combine the teachings of Suh with Karppinen such that, under certain conditions, only the left-half or the right-half of a received 3D image is decoded.

Id. (citing Ex. 1002 ¶¶ 92–93). We agree with Petitioner’s argument.

For these reasons and in Section II.C.2.c.i(a), we find that a person of ordinary skill would have had motivation to combine Karppinen with Suh. *See* Pet. 38–40.

Karppinen Teachings

Patent Owner disputes that limitation 1.f is taught by Karppinen. PO Resp. 29–33. Patent Owner cites to paragraph 48 of Karppinen as the disclosure relied on to show only one of a left or right image of a composite frame. *Id.* at 30. Yet again, Patent Owner relies on the prosecution history. *Id.* In this case, Patent Owner cites arguments made about Cho as establishing conclusively that Karppinen is “unclear” and uses “‘decoding’ in a careless or ambiguous way.” *Id.* at 31 (citing Ex. 1004, 290). Patent Owner contends Karppinen does not clearly relate to a composite frames embodiment, as opposed to an embodiment teaching “interlaced” frames. *Id.* at 31–33 (citing Ex. 1006 ¶¶ 18–19). Thus, a person of ordinary skill would not “know the coordinates of a left or right image of a composite [sic] frame and decode only that image simply based on whether a 2D or 3D display is being used.” *Id.* at 32–33.

Petitioner argues “Karppinen’s paragraph 48 disclosure applies to both the interlacing and composite frame embodiments.” Reply 21 (citing Ex. 1006 ¶ 21). According to Petitioner, Karppinen explains that “[t]he plurality of video streams may be arranged as separate video streams, as a

composite video stream, or as an interlaced video stream.” *Id.* at 21–22 (quoting Ex. 1006 ¶ 6; *see also id.* ¶ 31 (explaining arrangement of “video streams” to form a “composite picture”), Fig. 3c, claims 1 and 18).

The Sur-reply repeats the same arguments made by Patent Owner in the Response. *See* Sur-reply 20–21. In sum, Patent Owner contends “[t]here [are] no locations, metadata, or other information in Karppinen that would allow” a person of ordinary skill to extract one image from a composite frame. *Id.* at 21.

As to whether paragraph 48 relates to the composite frame embodiment, we credit the Bross Reply Declaration testimony that “a person of ordinary skill would necessarily understand that this disclosure refers to both the composite and the interlacing embodiments because the paragraph does not restrict its applicability to either embodiment.” Ex. 1015 ¶ 22; Reply 21. To the contrary, we find the Zeger Declaration to be conclusory because it refers to other parts of Karppinen as teaching separately interlaced and composite frames. *See* Ex. 2002 ¶ 90 (citing Ex. 1006 ¶¶ 18–19). Paragraph 48 of Karppinen does not specify either embodiment and there is no evidence, beyond the conclusory testimony of Dr. Zeger, that the paragraph is limited to either the interlaced or composite embodiment rather than encompassing both. *See also* Ex. 1015 ¶ 20 (there is no basis for Zeger declaration testimony that paragraph 48 is limited to an interlacing arrangement (citing Ex. 2002 ¶¶ 90–92)). That Figures 3c and 3d, illustrate interlaced *and* composite frames respectively is evidence that, where not specified, Karppinen relates to both embodiments. *See* Section II.C.2.b above.

Conclusion on Limitation 1.f

Petitioner has shown by a preponderance of evidence that limitation 1.f is taught by the combination of Suh and Karppinen, which teaches for “a 2D display, then only one of the left video stream or the right video stream may be decoded from the 3D video stream” as taught by Karppinen. Pet. 39 (citing Ex. 1006 ¶ 48). We are persuaded that a person of ordinary skill would have combined the functionality of Suh and Karppinen and the combination would have had the predictable result of displaying a 3D image as a 2D image. *Id.* at 40 (citing *KSR*, 550 U.S. at 416).

ii. Petitioner’s Evidence and Argument Related to the Undisputed Limitations of Claim 1

Limitation 1.a, the preamble of claim 1, recites in pertinent part “[a] method for processing a video stream of digital images.” Petitioner cites to the Bross Declaration to support its argument that Suh discloses the preamble. Pet. 23 (citing Ex. 1002 ¶¶ 70–76).

Regardless of whether the preamble is limiting, Petitioner argues, Suh discloses “a receiving system that can recognize the reception of a 3D image and that can process the received 3D image.” Pet. 23 (quoting Ex. 1005 ¶ 31; *see also id.* ¶ 89 (listing components of Suh’s “3d imaging system”). Petitioner’s showing concludes that “Suh discloses an HDMI sink 300 that receives and processes a video stream of 3D images (‘method for processing a video stream of . . . images’).” *Id.* at 26 (citing Ex. 1002 ¶ 76). Petitioner equates the “TMDS-encoded video stream” with the recited “video stream of digital images.” *Id.* (citing Ex. 1002 ¶ 76); *id.* (citing Ex. 1005 ¶¶ 110–111, 142–143 (describing “TMDS-encoded video stream”)). Petitioner argues the “3D images included in the video stream are ‘digital’ images because . . .

they are transmitted from the HDMI source 200 to the HDMI sink 300 over HDMI, which is a “digital interface.” *Id.* (citing Ex. 1005 ¶¶ 99–101).

We find Petitioner has shown that the preamble 1.a is taught by Suh’s disclosure of combining multiple pictures into a single picture in a video stream and encoding and decoding. Patent Owner does not dispute Petitioner’s showing.

Limitation 1.b recites “receiving the video stream which comprises at least one composite frame (FC), each composite frame containing a pair of stereoscopic digital images (L,R) according to a predetermined frame packing format.” Petitioner cites to the Bross Declaration to support its argument Suh discloses limitation 1.b. Pet. 27 (citing Ex. 1002 ¶¶ 77–83).

Petitioner cites to Suh’s disclosure of receiving a “TMDS-encoded video stream” and “3D signaling data.” Pet. 27 (citing Ex. 1005 ¶¶ 110–111, Fig. 6 (identifying that the received video stream is a “stereo-multiplexed video data”)). For the left and right images (L,R) recitation, Petitioner cites to Suh’s description of “‘side-by-side format’ and ‘top/bottom format’ are formats for packing a left and a right image (i.e., ‘images acquired by photographing the same subject with a left-side camera and a right-side camera’) into a single frame/image.” *Id.* at 27–28 (citing Ex. 1005 ¶¶ 17, 36–38, Figs. 1(a) and 1(b) (showing respectively side-by-side and top-bottom “L” and “R” image formats)). Accordingly, Petitioner argues the disclosed left and right images are Suh further confirms that each of the left and right images is the recited composite frame “containing a pair of stereoscopic digital images (L,R).” *Id.* at 28–29 (citing Ex. 1002 ¶¶ 80–81; Ex. 1005 ¶ 36, *see also id.* ¶¶ 130–133 (“stereoscopic video format descriptor”)).

Petitioner argues Suh also discloses limitation 1.b's limitation reciting "each composite frame containing a pair of stereoscopic digital images (L,R) according to a predetermined frame packing format." Petitioner argues the side-by-side and top-bottom formats predetermined frame packing formats "because they are specified in the 3D signaling information received along with the TMDS-encoded video stream." Pet. 29 (citing Ex. 1005 ¶¶ 142, 144, *see also id.* ¶¶ 128–141 (the 3D signaling information is included in the 15th byte of the AVI InfoFrame packet and specifies the composition type)).

We find Petitioner has shown limitation 1.b is taught by Suh's disclosure of side-by-side and top-bottom "L" and "R" images packed into a composite frame. Patent Owner does not dispute Petitioner's showing.

Limitation 1.c recites "generating an output video stream which can be reproduced on a visualization apparatus." Petitioner cites to the Bross Declaration to support its argument that Suh discloses limitation 1.c. Pet. 30 (citing Ex. 1002 ¶¶ 84–85). Referring to Suh's Figure 6, Petitioner cites to the statement that "the 3D formatter 302 outputs a 'remultiplexed (formatted) video stream'" that generates "re-formatted video data [that] can fit the display format of the HDMI sink 300" for display. *Id.* (citing Ex. 1005 ¶¶ 103, 143).

We find Petitioner has shown limitation 1.c is taught by Suh's 3D formatter that fits video data into a display format for display. Patent Owner does not dispute Petitioner's showing.

Limitation 1.d recites "receiving metadata which determine an area occupied by one of the two images within said composite frame (FC), said metadata indicating either a geometry of the frame packing format or a frame packing type of said composite frame (FC)." Petitioner cites to the

Bross Declaration to support its argument Suh discloses limitation 1.d. Pet. 30 (citing Ex. 1002 ¶¶ 86–90). Petitioner relies on Suh’s teaching metadata is the 3D signaling information corresponds of the received video stream. Which signaling information “specifies arrangement of the left and the right images within each 3D image in the received video data.” *Id.* at 31 (citing Ex. 1005 ¶¶ 142, 144; Ex. 1002 ¶ 87; Ex. 1005).

With respect to the recitation “determin[ing] an area,” Petitioner argues that the transmission format of the 3D image as either a side-by-side or top-bottom format “indicat[es] either a geometry of the frame packing format or a frame packing type of said composite frame (FC).” Pet. 31–32 (citing Ex. 1005 ¶¶ 132–141, Fig. 11(b)–(e)). Petitioner’s argument includes, in part, that Suh also teaches “that the 3D formatter parses the 3D signal information to determine, *inter alia*, a transmission format for the 3D image and whether the uppermost pixel of the left-end portion of the frame belongs to the left or right image.” *Id.* at 34 (citing Ex. 1005 ¶ 142); *see id.* ¶¶ 144, 76–78, 137. Petitioner concludes by stating that “the 3D signaling information has information (‘metadata’)” and thus teaches limitation 1.d. *Id.* at 34–35 (citing Ex. 1002 ¶¶ 89–90).

We find Petitioner has shown limitation 1.d is taught by Suh’s teaching that the 3D signaling information is metadata that determines the geometry of one of the “L” or “R” images of a composite frame. Patent Owner does not dispute Petitioner’s showing.

Limitation 1.e recites “determining the area in the composite frame (FC) which is occupied by said one image of the stereoscopic pair within the composite frame based on said metadata.” Petitioner cites to the Bross Declaration to support its argument that Suh discloses limitation 1.e. Pet. 35

(citing Ex. 1002 ¶ 91). Referencing in part its showing with respect to limitation 1.d above, Petitioner argues Suh’s “3D formatter determines that a left-half of the received frame corresponds to the left image and the right-half of the received frame corresponds to the right image.” *Id.* (citing Ex. 1005 ¶¶ 144, 76–78).

We find Petitioner has shown limitation 1.e is taught by Suh’s teaching that a side-by-side transmission format includes a determination that uppermost pixel of the left-end portion within the frame belonging to the left image. Patent Owner does not dispute Petitioner’s showing.

Limitation 1.g recites “generating an output frame containing said decoded image.” Petitioner cites to the Bross Declaration to support its argument that the combination of Suh and Karppinen disclose limitation 1.g. Pet. 41 (citing Ex. 1002 ¶ 102). Petitioner argues that Suh discloses outputting and decoding left and right images of received video data. *Id.* (citing Ex. 1005 ¶¶ 143–144). As discussed in connection with limitation 1.g, the Suh and Karppinen combination teaches that only one of the left and right images. *Id.* (see discussion of limitation 1.f above).

We find Petitioner has shown limitation 1.g is taught by the combination of Suh and Karppinen. Patent Owner does not dispute Petitioner’s showing.

iii. Conclusion on Claim 1

In summary, Petitioner has shown by a preponderance of the evidence that claim 1 would have been obvious over the combination of Suh and Karppinen.

d. Claim 2

Claim 2 depends from claim 1 and recites “wherein in the said composite frame (FC) said one image of said pair of stereoscopic digital images (L,R.) is undivided.” We construed “undivided” in Section II.B.1 above to mean “wholly contained within a determined area of the composite frame.” Petitioner cites to the Bross Declaration to support its argument that the combination of Suh and Karppinen disclose claim 2. Pet. 41 (citing Ex. 1002 ¶ 103). Petitioner argues Suh’s left and right images are undivided because neither the left or right image in the side-by-side format is broken into parts. *Id.* at 42 (citing Ex. 1005 ¶ 40, Fig. 1(a)).

We find Petitioner has shown that claim 2 would have been obvious over the combination of Suh and Karppinen. Patent Owner does not dispute Petitioner’s showing.

e. Claim 4

Claim 4 depends from claim 1 and recites “wherein the metadata is positioned in the SEI messages of the H.264 standard.” Petitioner cites to the Bross Declaration to support its argument that the combination of Suh and Karppinen disclose claim 4. Pet. 42 (citing Ex. 1002 ¶¶ 104–109). Petitioner cites to Suh’s “stereoscopic video format descriptor” as the recited “metadata,” which is included in a program map table (PMT). *Id.* at 43 (citing Ex. 1005 ¶¶ 68, 109). However, Petitioner acknowledges the “metadata” is not explicitly disclosed by Suh as being “positioned in the SEI messages of the H.264 standard.” *Id.* (citing Ex. 1002 ¶ 106). Suh teaches that the PMT is in turn received as part of a received MPEG video stream. *Id.* (citing Ex. 1005 ¶¶ 104–109, 45).

Petitioner argues that the MPEG stream could be a video stream compliant with the H.264 standard. Pet. 43 (citing Ex. 1005 ¶ 106 (the video decoder may include “an MPEG-2 video decoding algorithm, an MPEG-4 video decoding algorithm, an H.264 decoding algorithm, an SVC decoding algorithm, a VC-1 decoding algorithm, and so on.”) (emphasis omitted)). Relying on the Bross Declaration, Petitioner argues “[i]t was well-known at the time of the invention that if a 3D video stream was encoded using the H.264 standard, the metadata regarding the composition of 3D images (e.g., frame packing information) could be specified in the SEI messages of the H.264 standard.” *Id.* at 43–44 (citing Ex. 1002 ¶ 107).

We find Petitioner has shown that claim 4 would have been obvious over the combination of Suh and Karppinen. Patent Owner does not dispute Petitioner’s showing.

f. Claim 11

Independent claim 11 is a device claim that parallels method claim 1. Save the required change from steps to structure, the claims are otherwise all but the same. Petitioner cites to the Bross Declaration to support its argument that the combination of Suh and Karppinen disclose claim 11. Petitioner’s showing for independent claim 11 follows closely that made for claim 1. Pet. 46–50 (citing Ex. 1002 ¶¶ 110–116).

For the same reasons we find claim 1 has been shown by a preponderance of the evidence to be unpatentable over Suh and Karppinen, Petitioner has also shown by a preponderance of the evidence that claim 11 would have been obvious over Suh and Karppinen.

3. *Obviousness of Claims 3, 7, and 8 over Suh, Karppinen, and Tian*

We have reviewed Petitioner’s showing as to dependent claims 3, 7, and 8. Pet. 50–58. Petitioner cites to the Cross Declaration to support its argument that the combination of Suh, Karppinen, and Tian disclose claims 3, 7, and 8. *Id.* (citing Ex. 1002 ¶¶ 118–132). Suh and Karppinen are discussed in Section II.C.2.a. and b above.

a. *Tian (Ex. 1007)*

Tian describes methods and systems for “access[ing] a video picture that includes multiple pictures combined into a single picture,” as well as “additional information indicating how the multiple pictures in the accessed video picture are combined.” Ex. 1007, Abstract.

Figure 24 of Tian is reproduced below.

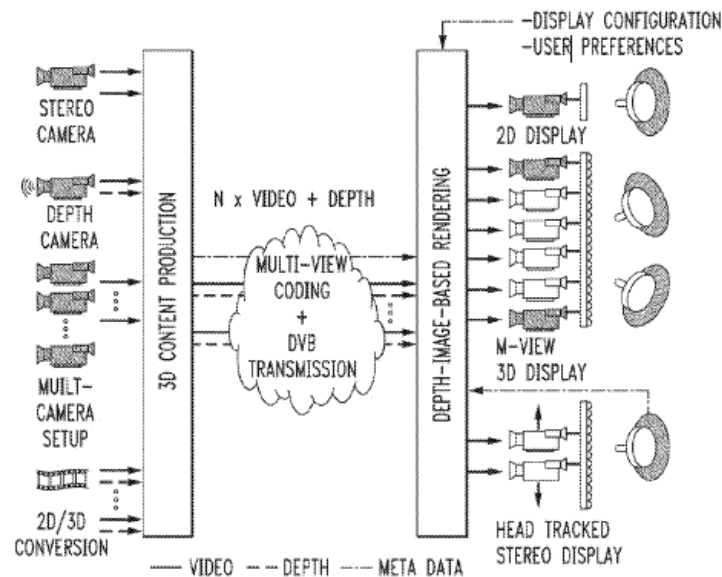


FIG. 24

Fig. 24 is a schematic drawing of a video system supporting the production and use of 3D images

Ex. 1007, 6:37–38. Figure 24 shows a content production side of the system which captures images by various means including stereo cameras. *Id.* at 6:38–40. For example, the system can capture left and right views of the same scene. *Id.* at 6:44, Fig. 25. The video image is processed and coded and the information can be “distributed, transmitted, and ultimately rendered.” *Id.* at 6:45–49. Meta-data is also generated with the video content which can be rendered in 2D display systems or 3D displays. *Id.* at 6:49–52.

Tian uses a “Supplemental Enhancement Information (SEI) message for signaling multi-view information in a MPEG-4 AVC Standard compatible bitstream where each picture includes sub-pictures which belong to a different view.” Ex. 1007, 7:40–44. A stated objective of Tian is to facilitate “the easy and convenient display of multi-view video streams on three-dimensional (3D) monitors which may use such a framework.” *Id.* at 7:44–47.

Tian discloses a “higher level syntax such as the SEI message” that “include[s] information about which of the plurality of spatial interleaving modes is attributable to the pictures that are tiled as the single picture.” Ex. 1007, 32:13–18. Tian also discloses the “the syntax is expanded to include relationship information about the content in the tiled pictures,” and “[r]elationship information can include a designation of the left and right pictures in a stereo image.” *Id.* at 32:20–24. Tian discloses “[t]he video picture is decoded to provide a decoded representation of at least one of the multiple pictures.” *Id.* at 2:49–50.

In its Background section, Tian discloses it was known that “H.264/AVC, though designed ostensibly for 2D video, can also be used to

transmit stereo contents by exploiting a frame-packing technique.”

Ex. 1007, 1:41–43. Tian also explains that it was well-known that “on the encoder side, two views or pictures are generally downsampled for packing into one single video frame, which is then supplied to a H.264/AVC encoder for output as a bitstream.” *Id.* at 1:44–47. Then, “on the decoder side, the bitstream is decoded and the recovered frame is then unpacked,” which “permits the extraction of the two original views from the recovered frame and generally involves an upsampling operation to restore the original size to each view so that the views can be rendered for display.” *Id.* at 1:47–52.

b. Claims 3, 7, and 8

Claim 3 depends from claim 1 and recites “wherein said metadata determines coordinates that describe an area occupied by said one image of said composite frame.” For the determination of “coordinates [that describe an] area” recitation, Petitioner argues Tian discloses “that the metadata states (and therefore, ‘determines’) coordinates of the areas enclosing each image (left and right) in the composite frame.” Pet. 51 (citing Ex. 1002 ¶ 119). Tian’s Table 4 is relied on for its description of metadata with coordinates including defining “a rectangle (i.e., an area) having coordinates [(0, 0), (320, 0), (0, 240), (320, 240)] within the frame and that encompasses the first view.” *Id.* at 52–53 (citing Ex. 1007, 28:59–67, Table 4).

Petitioner argues the reasons for making the combination include that, “like Suh and Karppinen, Tian discloses using metadata to describe packing of stereoscopic images.” Pet. 55 (citing Ex. 1007, 32:13–26). Further, a person of ordinary skill “would have been motivated to do so in order to expand the metadata supported by the Suh-Karppinen combination that define how multiple pictures are combined into a single picture.” *Id.* (citing

Ex. 1002 ¶ 126). Petitioner has sufficiently shown motivation to combine Tian with Suh and Karppinen.

We adopt Petitioner’s argument and evidence regarding claims 7 and 8. Pet. 57–58. Patent Owner does not dispute that Petitioner has shown that claims 3, 7, and 8 would have been obvious over Suh, Karppinen, and Tian. *See* PO Resp. 40.

c. Conclusion on Claims 3, 7, and 8

Petitioner has shown by a preponderance of the evidence that claims 3, 7, and 8 would have been obvious over the combination of Suh, Karppinen, and Tian.

4. Obviousness of Claims 9 and 10 over Suh, Karppinen, Butler-Smith, and Tian

We have reviewed Petitioner’s showing as to dependent claims 9 and 10. Pet. 58–68. Petitioner cites to the Bross Declaration to support its argument that the combination of Suh, Karppinen, Butler-Smith, and Tian disclose claims 9 and 10. *Id.* (citing Ex. 1002 ¶¶ 133–146). Suh, Karppinen, and Tian are discussed in Sections D.3.a and b and D.4.a above. Relying on its arguments regarding claim 1, Patent Owner does not otherwise dispute Petitioner’s showing. PO Resp. 40.

a. Butler-Smith (Ex. 1009)

Butler-Smith teaches a method for combining a dual stream of standard video “to occupy a single stream of standard video.” Ex. 1009 ¶ 2. Specifically, Butler-Smith teaches “tiling two lower resolution images frames into one higher resolution image frame, without loss of pixel data.” *Id.* ¶ 7. Two camera views are encoded for “Stereoscopic 3D applications.” *Id.* ¶ 8.

Butler-Smith discloses that the first video source or camera view with a frame resolution of 1280x720 pixels could be the “left-eye” of a Stereoscopic image pair. Ex. 1009 ¶ 14. The second video source with a frame resolution of 1280x720 pixels could be the “right-eye” view of a Stereoscopic image pair. *Id.* ¶ 15. The combined first and second video sources are combined or “tiled” as a frame having a resolution of 1920x1080 pixels, “which could constitute the Stereoscopic image pair.” *Id.* ¶ 17. Thus, tiling the two lower resolution image frames results in one higher resolution image frame. *Id.* ¶¶ 14–17, Fig. 3.

b. Claims 9 and 10

Claim 9 depends from claim 1 and recites “wherein said metadata determines coordinates of vertices of a plurality of polygons that enclose one image of the pair of stereoscopic digital images contained in the composite frame.” Petitioner cites to Butler-Smith’s teaching of a plurality of polygons where “tiling two lower resolution image frames (one corresponding to the left view and one corresponding to the right view), as shown in figures 1 and 2, into one higher resolution image frame (i.e., a ‘composite frame’) shown in figure 3.” Pet. 60–61 (citing Ex. 1009 ¶¶ 14–17).

The references all relate to processing stereoscopic images. Pet. 63 (citing Ex. 1002 ¶ 140). Petitioner cites to Butler-Smith’s several advantages over other packing formats as motivation for combining Butler-Smith with Suh and Karppinen. *Id.* at 61–64 (citing Ex. 1009 ¶¶ 8–10, 36–37; Ex. 1002 ¶¶ 138–143).

Tian is cited again for its teachings regarding polygon coordinates. Pet. 65–67. Petitioner states reasons why a person of ordinary skill would be

motivated to make the combination of Suh, Karppinen, and Butler-Smith. *Id.* at 67–68 (citing Ex. 1002 ¶¶ 145–146).

We adopt Petitioner’s argument and evidence regarding claim 10. Pet. 68. Patent Owner does not dispute that Petitioner has shown that claims 9 and 10 would have been obvious over Suh, Karppinen, Butler-Smith, and Tian. *See* PO Resp. 40.

c. Conclusion on Claims 9 and 10

Petitioner has shown by a preponderance of the evidence that claims 9 and 10 would have been obvious over the combination of Suh, Karppinen, Butler-Smith, and Tian.

5. Obviousness of Claim 13 over Suh, Karppinen, and Naske

We have reviewed Petitioner’s showing as to dependent claim 13. Pet. 68–70. Petitioner cites to the Bross Declaration to support its argument that the combination of Suh, Karppinen, and Naske disclose claim 13. *Id.* (citing Ex. 1002 ¶¶ 148–153). Suh and Karppinen are discussed in Sections D.3.a and b above.

a. Naske (Ex. 1008)

Naske teaches methods and devices for the generation of three-dimensional (“3D” and “2D”) from images. Ex. 1008, 11:21–26. Specifically, Naske teaches methods for the generation of 3D images from 2D images and 2D images from 3D images. *Id.* For example, a reduction unit converts 3D to 2D for display of 3D images in 2D format based upon the user’s selection of 2D display. *Id.* at 10:20–34.

b. Claim 13

Claim 13 depends from claim 11 and recites “wherein the decoding method is activated upon the user’s command.” Naske teaches a system for providing conversion to either 3D to 2D or 2D to 3D. Ex. 1008, 9:60–66, Fig. 5. Petitioner relies on this teaching and specifically notes that “a reduction unit 21 carries out the 3D to 2D conversion for display of 3D images in 2D format on the display 25 based upon the user’s selection of 2D display.” Pet. 69 (citing Ex. 1008, 10:20–34). Petitioner states reasons why a person of ordinary skill would be motivated to make the combination of Suh, Karppinen, and Naske. *Id.* at 69–70 (citing Ex. 1002 ¶¶ 152–153).

Patent Owner does not dispute that Petitioner has shown Suh, Karppinen, Butler-Smith, and Tian that claim 13 would have been obvious over Suh, Karppinen, and Naske. *See* PO Resp. 40.

c. Conclusion on Claim 13

Petitioner has shown by a preponderance of the evidence that claim 13 would have been obvious over the combination of Suh, Karppinen, and Tian.

III. CONCLUSION¹¹

In summary:

¹¹ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. *See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1, 2, 4, 11	103	Suh, Karppinen	1, 2, 4, 11	
3, 7, 8	103	Suh, Karppinen, Tian	3, 7, 8	
9, 10	103	Suh, Karppinen, Butler-Smith, Tian	9,10	
13		Suh, Karppinen, Naske	13	

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–4, 7–11, and 13 of the '298 patent are determined to be unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

IPR2019-01036
Patent 9,578,298 B2

For PETITIONER:

Naveen Modi
Joseph Palys
Chetan Bansal
Jason Heidemann
PAUL HASTINGS LLP
naveenmodi@paulhastings.com
josephpalys@paulhastings.com
chetanbansal@paulhastings.com
jasonheidemann@paulhastings.com

For PATENT OWNER:

Philip Wang
C. Jay Chung
Neil Rubin
Kent Shum
Reza Mirzaie
RUSS AUGUST & KABAT
pwang@raklaw.com
jchung@raklaw.com
nrubin@raklaw.com
kshum@raklaw.com
rmirzaie@raklaw.com