

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

UNIFIED PATENTS INC.,
Petitioner

v.

VELOS MEDIA, LLC,
Patent Owner.

IPR2019-00635
Patent 8,767,824 B2

Before CHARLES J. BOUDREAU, JASON W. MELVIN,
and AARON W. MOORE, *Administrative Patent Judges*.

MOORE, *Administrative Patent Judge*.

JUDGMENT
FINAL WRITTEN DECISION
All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

TABLE OF CONTENTS

I.	INTRODUCTION.....	1
A.	Background	1
B.	Related Matters.....	1
C.	The '824 Patent.....	1
D.	The Challenged Claim.....	5
E.	Evidence Relied Upon.....	6
	1. Tu.....	6
	2. Zhao	8
	3. Fuldseth.....	9
	4. Huang.....	10
F.	Grounds of Unpatentability	11
II.	ANALYSIS.....	12
A.	Level of Ordinary Skill in the Art	12
B.	Claim Construction.....	12
	1. “location” and “location information”	14
	2. “frame of said video”.....	15
	3. “slice”.....	18
	4. “tile”	21
	5. “first information indicating whether location information . . . is transmitted”	22
C.	Obviousness	25
	1. Grounds Based on Tu.....	26
	a. The Combination	26
	b. Patent Owner Arguments	27
	i. “a frame of said video that includes at least one slice”	27

ii.	“first information indicating whether location information . . . is transmitted”.....	30
c.	Conclusion Regarding Tu and Zhao.....	31
2.	Grounds Based on Zhao.....	32
a.	Zhao Alone	32
b.	Zhao and Fuldseth	32
c.	Zhao and Huang	33
D.	Constitutionality	35
E.	Real Party in Interest.....	35
III.	CONCLUSION.....	37
IV.	ORDER	38

I. INTRODUCTION

A. *Background*

Unified Patents (“Petitioner”) filed a Petition for *inter partes* review of claim 1, the only claim, of U.S. Patent No. 8,767,824 B2 (Ex. 1001, “the ’824 patent”). Paper 3 (“Pet.”). Velos Media, LLC (“Patent Owner”) filed a Preliminary Response. Paper 7 (“Prelim. Resp.”).

On August 20, 2019, we instituted an *inter partes* review of claim 1. Paper 8 (“Decision”), 20. Patent Owner then filed a Patent Owner Response (Paper 20, “PO Resp.”), Petitioner filed a Reply (Paper 24, “Pet. Reply”), and Patent Owner filed a Sur-Reply (Paper 31, “PO Sur-Reply”). An oral hearing was held on May 19, 2019, and a transcript of the hearing is included in the record. Papers 43, 44 (“Tr.”).

The Board has jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

For the reasons that follow, we determine that Petitioner has shown by a preponderance of the evidence that claim 1 of the ’824 patent is unpatentable.

B. *Related Matters*

The parties do not identify any related matters. *See* Pet. 1; Patent Owner Mandatory Notices (Paper 5) 2.

C. *The ’824 Patent*

The ’824 patent is directed to “[a] method for decoding video [that] includes receiving a frame of the video that includes at least one slice and at least one tile.” Ex. 1001, Abstract. The patent describes the division of a frame of video into “macroblocks” and “slices.” For example, Figure 3,

reproduced below, illustrates the macroblocks of a frame divided into “three exemplary slices: a first slice denoted ‘SLICE #10’ **100**, a second slice denoted ‘SLICE #1’ **101** and a third slice denoted ‘SLICE #2’ **102**.”

Ex. 1001, 3:51–54.

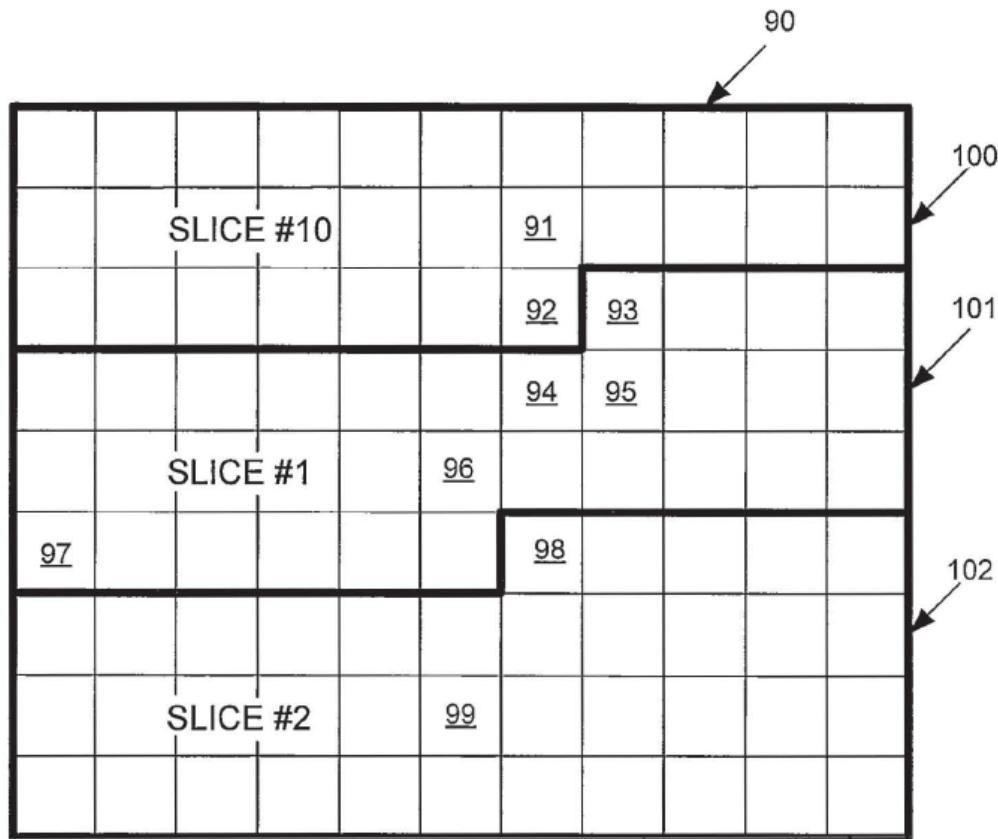


Figure 3 “illustrates an exemplary slice structure.” Ex. 1001, 1:51.

The patent explains that “[a]n H.264/AVC decoder may decode and reconstruct the three slices **100**, **101**, **102** in parallel.” *Id.* at 3:54–55.

The patent further explains that the slices shown above are called “reconstruction slices” and “may be self-contained in the respect that values of the samples in the area of the picture that the reconstruction slice represents may be correctly reconstructed without use of data from other

reconstruction slices.” *Id.* at 4:28–33. Additionally, “[a] reconstruction slice may be partitioned into more than one entropy slice, wherein an entropy slice may be self-contained in the respect that symbol values in the area of the picture that the entropy slice represents may be correctly entropy decoded without the use of data from other entropy slices.” *Id.* at 4:37–42.

The patent explains that slices are “computationally efficient” but not suitable to “highly efficient parallel encoding and decoding” and do not “tend to group smaller localized regions of the image together that are likely to have common characteristics highly suitable for coding efficiency.” Ex. 1001, 5:39–44. The inventors address those problems with “a tile technique” that “divides an image into a set of rectangular . . . regions” (*id.* at 5:50–51), as shown in Figure 7:

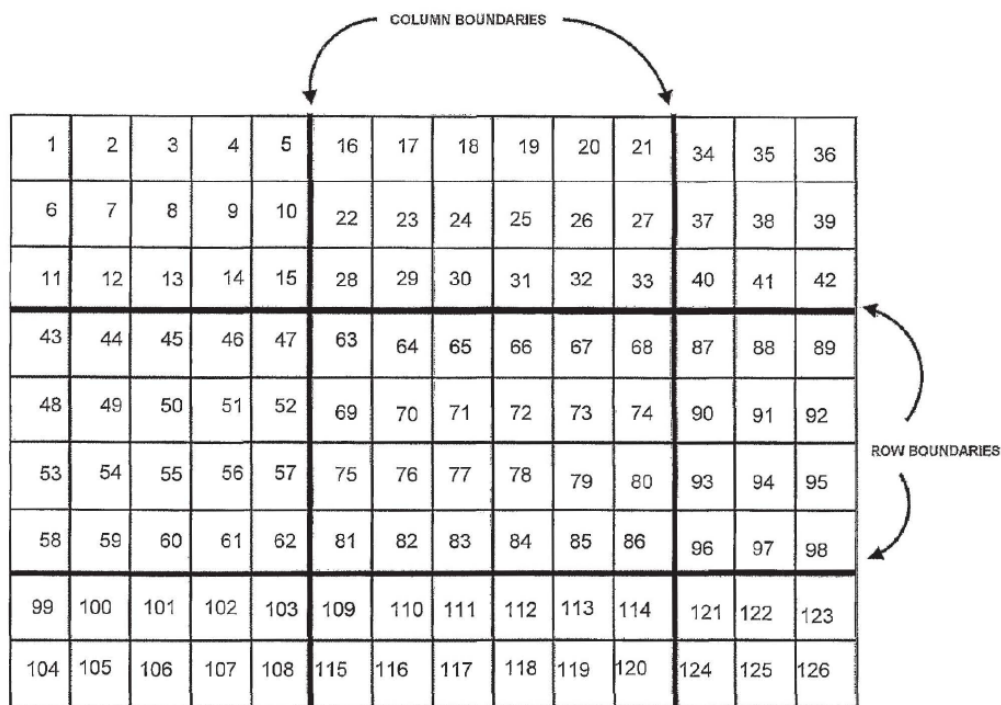


FIG. 7

Figure 7 “illustrates a frame with a slice and 9 tiles.” Ex. 1001, 1:56.

In Figure 7, nine tiles are divided by column and row boundaries, where “[t]he macroblocks . . . within each of the tiles are encoded and decoded in a raster scan order” and “[t]he arrangement of tiles are likewise encoded and decoded in a raster scan order.” Ex. 1001, 5:50–55. The patent also explains that “the frame may define one or more slices, such as the one slice illustrated in FIG. 7.” *Id.* at 5:57–58. Figure 7 thus shows a frame with nine tiles and a single slice.

Figure 8 of the ’824 patent, shown below with added color, depicts a tile embodiment that “divid[es] an image into a set of three rectangular columns.” Ex. 1001, 5:64–65.

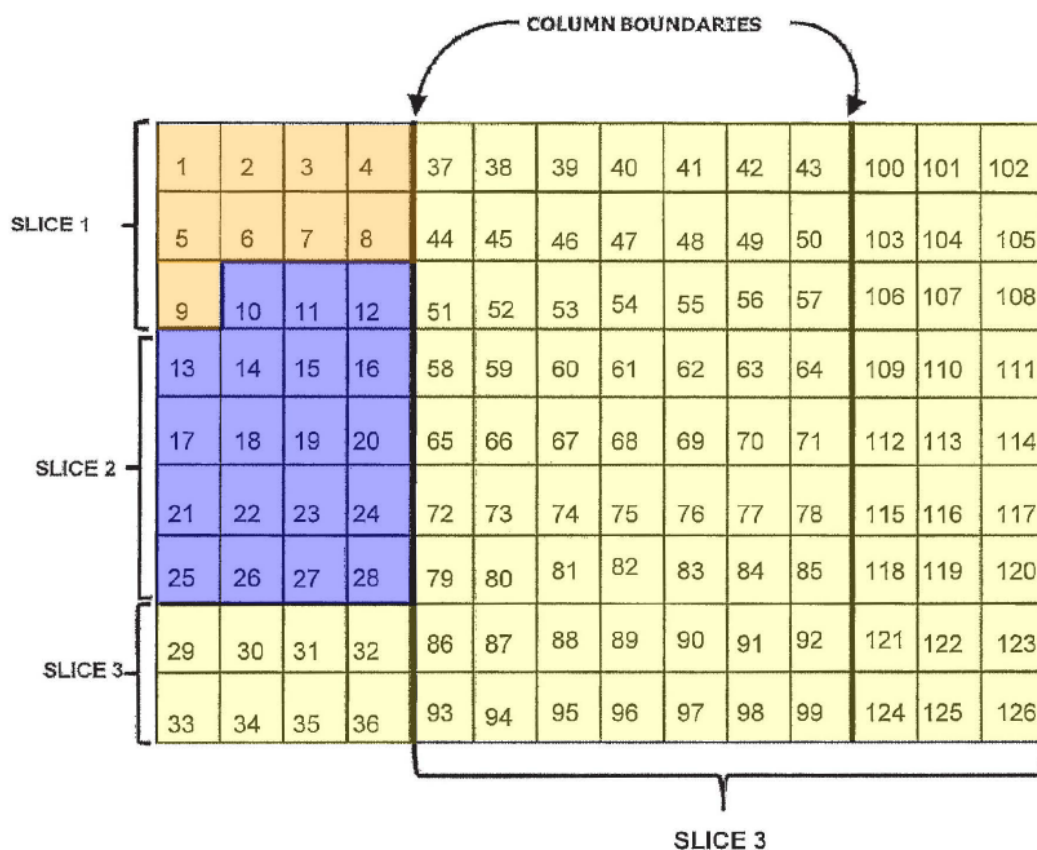


Figure 8 “illustrates a frame with three slices and 3 tiles.” Ex. 1001, 1:57.

The figure shows two (orange and blue) slices within the left tile, and a third (yellow) slice beginning in the left tile and including the middle and right tiles.

D. The Challenged Claim

The '824 patent has one claim:

1. A method for decoding video comprising:

- (a) receiving a frame of said video that includes at least one slice and at least one tile, where each of said at least one slice is decoded independently of another one of said at least one slice and includes said at least one tile, wherein said at least one tile is characterized that it is a rectangular region of said frame and includes coding units for said decoding arranged in a raster scan order;
- (b) receiving first information indicating whether location information of said at least one tile is transmitted within said at least one slice; and
- (c) receiving second information suitable for decoding said at least one tile, said second information including a location of said at least one tile.

Ex. 1001, 13:11–25.

The claim notably requires “receiving a frame of . . . video that includes at least one slice and at least one tile,” where “each of said at least one slice” (i) “is decoded independently of another one of said at least one slice” and (ii) “includes said at least one tile.” The Figure 7 embodiment has just one slice, not multiple slices that are “decoded independently,” and the Figure 8 embodiment shows three slices, two of which do not appear to “include” a tile.

E. Evidence Relied Upon

Petitioner relies on the following references:

Reference		Exhibit
Zhao	US 2009/0245349 A1	1003
Fuldseth	US 2012/0183074 A1	1004
Huang	US 2010/0135416 A1	1005
Tu	US 2007/0280345 A1	1006

Petitioner also relies on Declarations of Lina Karam, filed as Exhibits 1002 and 1037. Patent Owner relies on a Declaration of Iain Richardson, filed as Exhibit 2016.

1. Tu

Tu concerns a technique for “organizing a bitstream of compressed data that represents an image,” where “[t]he image may be partitioned into independently decodable regions.” Ex. 1006, Abstract. In particular, Tu describes how “macroblocks may be grouped into regular structures called tiles.” *Id.* ¶ 30. This is shown, for example, in Figure 2, below, in which “tile boundaries 208, 210, 212 and 214 divide the image 200 into eight tiles.” *Id.* ¶ 30.

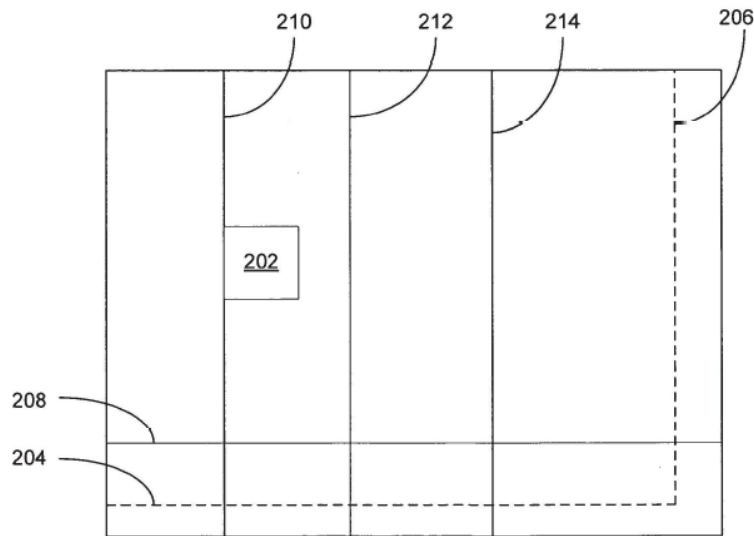


Figure 2 “is a block diagram illustrating an image that is partitioned.” Ex. 1006 ¶ 10.

Tu also describes “two fundamental modes of operation affecting the structure of the bitstream—a spatial mode and a frequency mode,” where “[a] one-bit signal in the image header 802 specifies which of the modes is used.” Ex. 1006 ¶ 53. “In both the modes, the bitstream is laid out as a header, followed by a sequence of tiles.” *Id.* ¶ 53.

Tu’s Figure 11, shown below, “illustrates the packetization and indexing of a bitstream 1100.” Ex. 1006 ¶ 60.

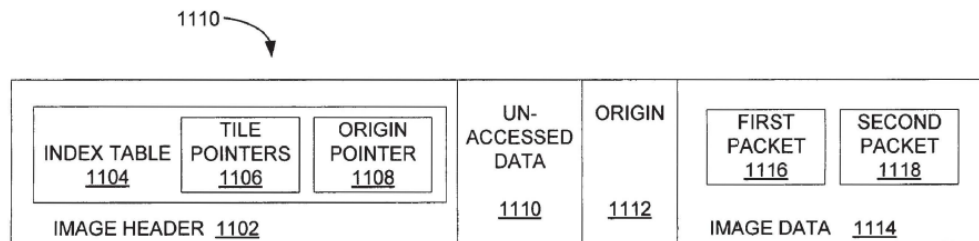


FIG. 11

Figure 11 “is a block diagram illustrating . . . packetization and indexing of a bitstream.” Ex. 1006 ¶ 19.

The bitstream “includes an image header 1102, which contains a variety of information needed to decode the bitstream,” including “a table of pointers referred to as an index table 1104.” *Id.* ¶ 60. Tu explains that “[t]he index table 1104 is optional if the number of tiles is one and the spatial mode is used”; “[o]therwise, the index table 1104 is mandatory.” *Id.* ¶ 61. The index table includes “a sequence of pointers known as tile pointers 1106” that “index from the origin 1112 and provide offsets from the origin 1112 to respective tiles.” *Id.* The bitstream 1100 also “includes image data 1114, which is organized in accordance with the . . . tiling” and “[e]ach tile in an image is placed in a separate data segment called packet.” *Id.* ¶ 62. In Figure 11, “the image data 1114 includes a first packet 1116, which contains data for a first tile” and “a second packet 1118, which contains data for a second tile.” *Id.*

2. Zhao

Zhao, which includes an inventor also named in the ’824 patent, “relate[s] to systems and methods for parallel video encoding and decoding,” and its Figure 5, reproduced below, “shows an exemplary video frame 110 comprising eleven macro blocks in the horizontal direction and nine macroblocks in the vertical direction.” Ex. 1003, Abstract, ¶ 44.

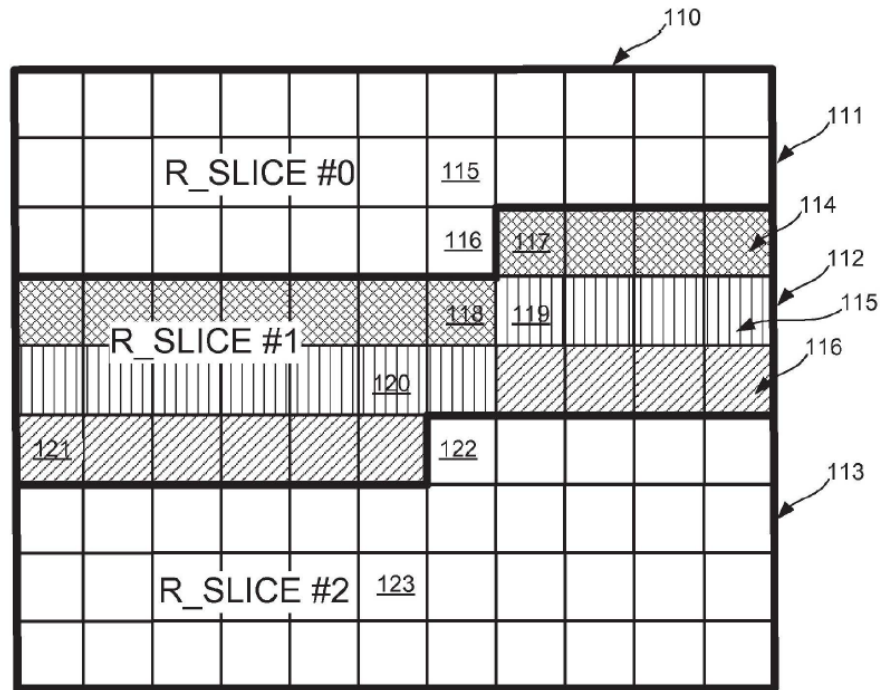


Figure 5 shows a picture partitioned into “reconstruction slice[s]” with a reconstruction slice “partitioned into more than one entropy slice.” Ex. 1003 ¶ 14.

This figure, which is similar to Figure 3 of the ’824 patent, shows “three exemplary reconstruction slices,” R_SLICE #0, R_SLICE #1, and R_SLICE #2. Ex. 1003 ¶ 44. It “further shows a partitioning of the second reconstruction slice . . . into three entropy slices,” denoted by different types of cross hatching and reference numbers 114, 115, and 116. *Id.*

Zhao and the ’824 patent thus both describe partitioning an image into reconstruction slices and partitioning the reconstruction slices into entropy slices. Zhao does not use the term “tiles.”

3. Fuldseth

Fuldseth “introduces the notion of ‘tiles’ to exploit the two dimensional dependencies between blocks while also supporting the exploitation of multiple processors, if available in the encoder, to

simultaneously perform encoding operations on multiple tiles.” Ex. 1004 ¶ 45. Figure 3a, reproduced below, “shows an arrangement of 2x3 tiles” where “[b]locks having a same letter belong to a common tile and therefore are best suitable for being processed with one processing core.” *Id.* ¶ 54.

A0	A1	A2	B0	B1	B2
A3	A4	A5	B3	B4	B5
C0	C1	C2	D6	D7	D8
C3	C4	C5	D0	D1	D2

Figure 3a “show[s] a layout relationship between encoder processing order and transmission order.” Ex. 1004 ¶ 40.

4. *Huang*

Huang describes the use of a “plurality of entropy slices with a causal criterion on processing order.” Ex. 1005 ¶ 26. Using a “causal criterion on processing order” means processing the macroblocks within an entropy slice in an order that is based on the shape of the macroblock. *See id.* ¶ 30. This is shown, for example, in Figure 3, reproduced below.

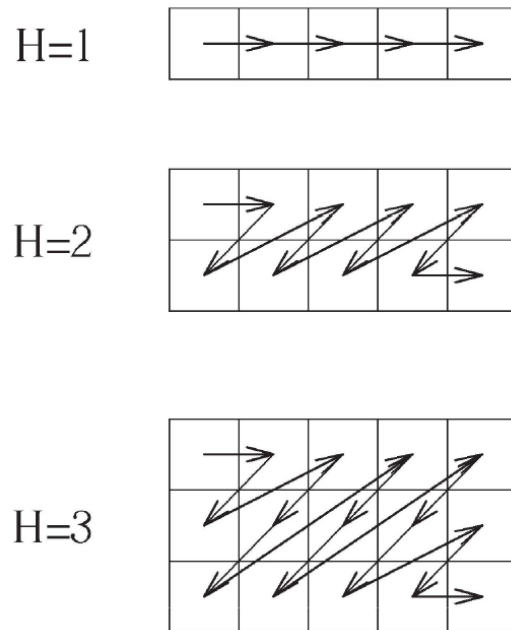


Figure 3 “illustrates exemplary processing orders of macroblocks (MBs) corresponding to different values of an entropy slice height.” Ex. 1005 ¶ 12.

As illustrated, a block that is one row high may be processed from left to right, and blocks that have more than one row may be processed in a zig-zag fashion. See Ex. 1005 ¶ 30. Huang also explains that although the “entropy slices are exactly one MB row or integer multiples of MB rows in [the] examples, they can contain fractional MB row.” *Id.* ¶ 37. In other words, Huang explains that its “causal criterion” technique can work with entropy slices of different shapes.

F. Grounds of Unpatentability

This trial was instituted on the following grounds:

Reference(s)/Basis	35 U.S.C. §	Claim(s) Challenged
Tu, Zhao	103	1
Zhao	103	1

Reference(s)/Basis	35 U.S.C. §	Claim(s) Challenged
Zhao, Fuldseth	103	1
Zhao, Huang	103	1

II. ANALYSIS

We discuss below the level of skill in the art, claim construction, and the patentability of claim 1.

A. *Level of Ordinary Skill in the Art*

Petitioner asserts that a person of ordinary skill in the art “would have had at least the equivalent of a Bachelor’s degree in electrical engineering, computer engineering, computer science, or a related subject and two or more years of experience in the field of video coding” and that “[l]ess work experience may be compensated by a higher level of education, such as a Master’s Degree, and vice versa.” Pet. 20 (citing Ex. 1002 ¶ 42).

The Preliminary Response did not address this issue, and we adopted Petitioner’s language at institution. *See* Dec. 7–8. The Patent Owner Response also does not address this issue, and we thus maintain the formulation we adopted at institution, which we find to be consistent with the disclosures of the prior art.

B. *Claim Construction*

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, 51,358 (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 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).

The Petition requested construction of “location information of said at least one tile” and “a location of said at least one tile,” and argued that the rest of the claim terms should be afforded “their plain and ordinary meaning.” Pet. 24. Patent Owner additionally seeks construction of “frame of said video,” “slice,” “tile,” and “first information.” See PO Resp. 20.

We discuss the terms in the order raised by the parties.¹

¹ In the Sur-Reply, Patent Owner argues that Petitioner “did not discharge its burden of construing disputed claim limitations” because Petitioner has “refus[ed] to take a definitive claim construction position” regarding a “frame of said video” and “slice.” PO Sur-Reply 1–2. We do not agree, because we find the Petition’s discussion of how the references meet these limitations and Petitioner’s response to Patent Owner’s claim construction arguments sufficient to understand Petitioner’s position.

1. *“location” and “location information”*

The Petition asserted that “[t]he appropriate construction of ‘location information of said at least one tile’ and ‘a location of said at least one tile’ in the context of the ’824 patent specification and claims, as well as any relevant extrinsic evidence, is ‘information that identifies a location of one or more tiles within a frame.’” Pet. 24. The Preliminary Response argued that we should instead construe these terms to mean “information that identifies a location of the starting byte of the coded tile in the bitstream.” Prelim. Resp. 17.

In the Institution Decision, we determined that “in the context of the claim, ‘location information’ refers to the location of a tile in the bitstream.” Decision 8. We did not adopt Petitioner’s suggestion that the location be one within a frame, and we did not adopt Patent Owner’s suggestion that we require the location to be that of the starting byte.

Petitioner does not dispute that the “location” is one in the bitstream, not the frame, but argues that there is no “justification for limiting ‘location information’ to the “starting byte of the coded tile,” particularly given that “the patent identifies aligning tiles to ‘bytes’ as an example and not as requirement.” Reply 8.

Patent Owner responds that the patent’s “disclosure only makes sense if the location in the bitstream indicates a starting location” because “[o]therwise, a decoder could not begin decoding multiple tiles in parallel.” Sur-Reply 18. Patent Owner argues that “[a] starting location facilitates parallel decoding because the starting location tells a decoder where to begin its decoding.” *Id.*

The remaining disputed issue with these constructions is whether the location must be that of the “starting byte,” and we conclude that Patent Owner has not made a sufficient showing to read that requirement into the claim. The portion of the patent cited by Patent Owner describes only that “a signal may be included in the bitstream identifying the location of tiles in the bit-stream.” Ex. 1001, 8:54–66. It says nothing about the locations being the locations of the “starting bytes.” Although the starting byte may be a way to identify the location of the tile, the patent does not describe that, and the record does not show that the only way to identify tile locations is by using starting bytes. We accordingly decline to narrow the construction of the “location” terms as urged by the Patent Owner and interpret these terms, as we did at institution, to refer to a location of a tile in the bitstream.

2. *“frame of said video”*

Patent Owner argues that “frame of said video” should be construed as follows: “All of the pixels that comprise an entire image of a video to be displayed, which is partitioned into one or more slices and/or one or more tiles. The frame’s coding characteristics are defined by data elements, such as a sequence parameter set and a picture parameter set.” PO Resp. 22.

Patent Owner’s construction is appropriate, it argues, because a person of ordinary skill in the art “would understand that a frame of video has a meaning distinct from a slice.” PO Resp. 21. Patent Owner argues that, in the H.264 coding scheme, the “decoder receives slices in the bitstream and inspects each slice’s header,” “[t]he frame_num parameter within a slice header informs the decoder which frame the slice belongs to,” and “[t]he slice header also contains a first_mb_in_slice parameter,” which

“informs the decoder of the X-Y position of a slice within a frame.” *Id.* at 21–22.

Petitioner responds that “what a frame is, versus how its characteristics may be encoded, are different,” and that H.264’s frame definition “never mentions parameter sets.” Pet. Reply 2. Petitioner argues that Patent Owner’s construction “renders claim language superfluous” because the claim “recites ‘a frame of said video that includes at least one slice and at least one tile,’ whereas [Patent Owner]’s construction of ‘frame’ requires a frame to be ‘partitioned into one or more slices and/or one or more tiles.’” Pet. Reply 3. Petitioner also argues that Patent Owner’s construction is “inconsistent with the claim language” because “when ‘and/or’ is interpreted as ‘or,’” the “construction is reduced to include either a slice or a tile, but not necessarily both,” whereas “claim 1 requires both a slice and a tile.” *Id.*

We find Patent Owner’s suggestion that the construction of “frame” should include “which is partitioned into one or more slices and/or one or more tiles” unnecessary in view of the rest of the claim language, which already recites that the frame “includes at least one slice and at least one tile.” *See* Ex. 1001, 13:13–14. Patent Owner does not adequately explain why the construction of “frame” should repeat this concept. And, as Petitioner observes, Patent Owner’s proposed language is inconsistent with this other part of the claim, which requires both a slice *and* a tile, not a slice *or* a tile. We see no reason why the term “frame” in the claim should be interpreted to include a slice *or* a tile when the rest of the claim makes clear that the claimed frame includes a slice *and* a tile.

We also find insufficient reason to add that “[t]he frame’s coding characteristics are defined by data elements, such as a sequence parameter set and a picture parameter set.” These features are coding details that the patent applicant elected to not claim, choosing instead to prosecute and obtain broader claims. It appears that these details are implemented in H.264 (*see* PO Resp. 21–22), but the claims are not limited to H.264.²

Because we find nothing in the specification, or elsewhere, to show that every frame in every coding method must include the specific parameters Patent Owner identifies, and because Patent Owner does not point us to a definition or any other clear indication in the patent or its file history of an intent to narrow the claim, we decline to read these limitations into the claims of the ’824 patent. *See Bradium Techs. LLC v. Iancu*, 923 F.3d 1032, 1049 (Fed. Cir. 2019) (“[I]t is long-settled that even though ‘claims must be read in light of the specification of which they are a part, it is improper to read limitations from the written description into a claim.’”) (quoting *Wenger Mfg., Inc. v. Coating Mach. Sys., Inc.*, 239 F.3d 1225, 1237 (Fed. Cir. 2001); *In re Cruciferous Sprout Litigation*, 301 F.3d 1343, 1348 (Fed. Cir. 2002) (“[I]nterpreting what is *meant* by a word *in* a claim ‘is not to be confused with adding an extraneous limitation appearing in the specification, which is improper.’”).

² *See* Ex. 1001, 2:4–8 (“While any video coder/decoder (codec) that uses entropy encoding/decoding may be accommodated by embodiments described herein, exemplary embodiments are described in relation to an H.264/AVC encoder and an H.264/AVC decoder merely for purposes of illustration.”); Tr. 23 (“[Q]: Are the claims limited to H.264? [Patent Owner Counsel]: I would not say that they’re limited to H.264.”).

Considering the claim as a whole, we conclude that the applicant included the coding details that were deemed necessary to secure allowance, and do not find a sufficient reason to now add more. In reaching that conclusion, we are guided by the fact that the concept described as the invention was the combination of prior art slices and prior art tiles in a single system (*see* Section I.C), so it is not surprising that the applicant sought the broadest possible claims covering the use of slices and tiles together.

We accordingly construe “frame of said video” to mean “all of the data comprising an entire image of a video to be displayed.”³

3. “*slice*”

Patent Owner argues that “a slice” is “a partition of a frame” and is “comprised of a slice header and slice data.” PO Resp. 22–23 (citing Ex. 1002 ¶ 16; Ex. 1001, 3:31–32, 4:55–5:5; 6:25–29; 6:44–55; 8:66–9:1). Patent Owner contends that the experts agree that a slice includes a slice header and slice data. *See id.* at 24 (citing Ex. 1002 ¶ 17; Ex. 2020, 22:16–20; Ex. 2019 ¶ 72; Ex. 1007, Fig. 6.5; Ex. 2016 ¶¶ 114–120). Patent Owner also argues that a slice “is independently decodable from other slices” and that “[t]o facilitate independent decodability, the Patent teaches that ‘the entropy coding state is reset at the start of each slice.’” PO Resp. 25 (citing Ex. 1001, 3:32–34; 4:28–44, 3:38–40; 6:36–40; Ex. 2016 ¶ 119). Patent Owner concludes that “slice” should be construed as: “A partition of a frame consisting of a slice header and consecutive macroblocks in raster

³ The “frame” that is received in claim 1 has been encoded and does not, strictly speaking, include “pixels.” *See* Ex. 1036, 55:8–56:7. We therefore use “data” instead of “pixels” for clarity. The substitution does not affect the prior art analysis.

scan order. The slice header includes data elements which enable the slice to be decoded independently of other slices. At the beginning of the decoding/reconstruction process for each slice, context models are initialized or reset.” PO Resp. 25.

Petitioner argues that “slice” does not require resetting or initializing “context models” and does not require a “slice header.” Pet. Reply 3–4.

We agree with Patent Owner that “slice” should be construed to mean a partition of a frame that consists of consecutive macroblocks in raster scan order. Nonetheless, we find the rest of Patent Owner’s proposed construction inappropriate, the fundamental problem being, again, that the applicant chose to pursue broad claims, and we do not see a reason to limit the claims to certain embodiments now.

It is true that the patent describes embodiments in which a slice includes a slice header that may include data elements that enable the slice to be decoded independently of other slices. *See* PO Resp. 23 (citing Ex. 1001, 4:55–5:5; 6:25–29; 6:44–55; 8:66–9:1). Those are just embodiments, however, and Patent Owner does identify any intrinsic evidence suggesting that the claims should be limited to those embodiments. We note that the claim already recites that “each of said at least one slice is decoded independently of another one of said at least one slice,” suggesting that the applicant intended to cover all methods in which slices were decoded independently, not just methods in which that was accomplished using information from a header.

Patent Owner points to declaration testimony of its expert, Dr. Richardson, and deposition testimony of Petitioner’s expert, Dr. Karam, in effort to support its argument about the header. *See* PO Resp. 24. We

have reviewed that material, but find that it does not justify the construction Patent Owner seeks because both experts are describing H.264 coding, not coding in general. *See* Ex. 2016 ¶¶ 114–120 (Dr. Richardson citing Ex. 1007, Fig. 6.5, showing an H.264 slice); Ex. 1002 ¶¶ 16–17 (Dr. Karam citing and describing a discussion of H.264 in Ex. 1007). The claims are not limited to H.264, and the cited testimony does not establish that all coding schemes using slices would require that the slice information be transmitted in individual slice headers rather than, for example, in a single header or other data element associated with the entire frame, or in some other way.

Patent Owner’s construction of “slice” also would require that “at the beginning of the decoding/reconstruction process for each slice, context models are initialized or reset.” We do not find this language appropriate because it too is an aspect of an embodiment that the applicant chose to not claim, and because the patent specifically describes it as something that “may” happen. *See* Ex. 1001, 3:38–40 (“In particular, the entropy coding state may be reset at the start of each slice.”). Patent Owner argues that “H.264 specifies that context models are reset at the start of decoding each slice” (PO Sur-Reply 9), but, again, the claim is not limited to H.264.

Although some, and perhaps many or even most, coding schemes employing slices would be implemented using a slice header, the ’824 patent applicant elected not to limit the claims to require a slice header, and we are unwilling to do that now. We accordingly construe “slice” to mean “a

partition of a frame consisting of consecutive macroblocks⁴ in raster scan order.” As noted above, the claim also tells us, separately, that each slice “is decoded independently of another one of said at least one slice and includes said at least one tile.”

4. “tile”

Patent Owner argues that “[a] tile’s rectangular region of a frame is a non-zero number of macroblocks that may be of an arbitrary height and width (i.e., an $N \times M$ -sized region)” and that the specification explains “that this rectangular region of macroblocks is defined by ‘any suitable number of column boundaries (e.g. 0 or more) and there may be any suitable number of row boundaries (e.g., 0 or more).’” PO Resp. 26 (citing Ex. 1001, 5:50–57). Patent Owner concludes that “tile” should be construed to mean: “A[n] $N \times M$ region of macroblocks in raster scan order defined by column and row boundaries.” PO Resp. 27.

Petitioner argues that the claim already provides a definition of tile—“a rectangular region of said frame [that] includes coding units for said decoding arranged in a raster scan order”—and that Patent Owner “fails to explain why a [person of ordinary skill in the art] would have looked further than the express definition in the claim.” Pet. Reply 4–5. Petitioner contends that the “ $N \times M$ region” of the construction corresponds to the already claimed “rectangular region,” and that the “macroblocks” of the

⁴ The claim also recites “coding units.” The relationship between a macroblock and a coding unit is not clear (*see* Ex. 1001, 5:51–53 (“The macro blocks (e.g., largest coding units) within each of the tiles are encoded and decoded in a raster scan order.”); *id.* at 8:6–7 (“First, check to see if the macroblock (e.g., coding unit) is the first macroblock in a tile.”), but the parties do not make that an issue, so neither will we.

construction correspond to the already claimed “coding units.” *Id.* at 5. Patent Owner reiterates that “tiles are defined by column and row boundaries, which give rise to important benefits over slices.” PO Sur-Reply 13.

We agree with Petitioner, because Patent Owner does not explain why we should add “NxM region” or “defined by column and row boundaries” to a claim that already recites “rectangular region,” or why we should add “macroblocks” to the definition of “tile” where the claim says that the tile includes “coding units.” We find that one of skill in the art would have understood a tile to be as already set out in the claim: “a rectangular region of said frame [that] includes coding units for said decoding arranged in a raster scan order.”

5. *“first information indicating whether location information . . . is transmitted”*

Patent Owner argues that “first information indicating whether location information . . . is transmitted” should be construed as “information sufficient to determine whether or not location information is transmitted.” PO Resp. 27.

Patent Owner contends that there is only one disclosed embodiment of this feature, the “‘tile_locations_flag’ syntax element used to inform a decoder that tile locations are transmitted in the bitstream.” PO Resp. 28. Patent Owner argues that a person of skill in the art “would understand that the tile_locations_flag is a Boolean value that is examined in a conditional ‘if’ statement” and that “the effect . . . is to inform the decoder whether or not tile locations are included in the bitstream, *i.e.*, the presence or absence

of tile locations, and to cause a particular action based on its value. PO Resp. 28–29 (citing Ex. 1001, 8:54–9:25; Ex. 2016 ¶ 125).

Patent Owner specifically argues that “[i]t would not be proper to construe ‘first information’ as indicating the presence, but not absence, of location information” because the “decoder must know whether or not such information is included, such that it can call other programming logic to process the location information in the event it is included,” and “if the decoder were not fully informed of the presence or absence of tile_locations, it would be unable to determine whether to continue to decode the tile_locations() syntax structure.” PO Resp. 29–30.

According to Patent Owner, its interpretation “is further compelled by Claim 1’s inclusion of the word ‘whether’” because “[t]he ordinary understanding of the word ‘whether’ in this context . . . requires that the ‘first information’ indicate to the decoder the presence, or absence, of the location information.” PO Resp. 30 (citing Ex. 2016 ¶ 131).

Patent Owner also objects to Petitioner’s attempt to read the “first information” on Tu’s “mode signal” because the mode signal “does not indicate the absence of alleged location information.” PO Resp. 30.

Petitioner responds that Patent Owner and its expert “fail to acknowledge a second (preferred) disclosed embodiment [of the ’824 patent]—the so-called ‘implicit’ technique” that “indicates whether location information is present (as the claim requires), but not whether location information is absent, as PO wrongly adds.” Pet. Reply 6 (citing Ex. 1001, 9:43–47, 9:59–60, 9:63–67, 10:16–17, Figs. 12A-B).

Patent Owner answers that “there is no support for Petitioner’s contention that the ’824 Patent discloses a second embodiment of first

information.” PO Sur-Reply 14. According to Patent Owner, “the lightweight_slice_flag relates to the contents of a header” and “could not possibly signal the presence of a tile header because [it] is a syntax element contained within the header.” *Id.* at 15. Patent Owner argues that “[b]y the time the decoder encounters the [flag], it is already within the header and is aware of its existence.” *Id.* at 17. Patent Owner also argues that “Petitioner has failed to explain how a tile header—the alleged location information—satisfies a proper construction of claim 1’s ‘location information,’ which the Board correctly construed as requiring ‘the location of a tile in the bitstream.’” *Id.*

This dispute evidently boils down to whether “whether” means “whether” or “whether or not.” We find nothing in the specification to indicate that the applicant engaged in lexicography regarding “whether,” and Patent Owner does not argue that “whether” has a unique meaning in the art of video coding. We, therefore, conclude that the term has its common meaning, which is reflected in the dictionary definition provided by Petitioner: “if it is or was true.” Ex. 1039, 4.

Patent Owner’s argument that we cannot rely on a dictionary definition that “contradicts the sole embodiment of first information” (PO Sur-Reply 17) is not persuasive because tile_locations_flag is simply one embodiment of the claimed “first information,” and Patent Owner does not direct us to anything suggesting that the applicant intended to limit the claims to that embodiment. And because we see no reason to limit the claim to the tile_locations_flag embodiment, we need not resolve the parties’ dispute about whether lightweight_slice_flag is an “implicit” embodiment

showing that “whether” means only “whether” in an affirmative sense, and not “whether or not.”

Additionally, although Patent Owner’s proposed construction substitutes “sufficient to determine” for the claim’s “indicating,” Patent Owner provides no evidence or argument regarding why that substitution should be made, or what difference it would make. We therefore decline to make that change as well.

We conclude that “first information indicating whether location information . . . is transmitted” should be construed as written: “first information indicating if it is or was true that location information . . . is transmitted.”

C. Obviousness

A claim is unpatentable under 35 U.S.C. § 103(a) 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. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) any secondary considerations, if in evidence.⁵ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

⁵ Patent Owner does not present any objective evidence of nonobviousness (i.e., secondary considerations) as to any of the challenged claims.

Petitioner alleges that claim 1 is unpatentable under 35 U.S.C. § 103(a) in view of Tu and/or the combination of Tu and Zhao. *See* Pet. 25–48. Petitioner also argues that the claim is unpatentable under 35 U.S.C. § 103(a) in view of Zhao, either alone or combined with Fuldseth or Huang. *See id.* at 25–53. We address Petitioner’s contentions in that order.

1. *Grounds Based on Tu*

a. *The Combination*

Petitioner argues that “[t]he ‘tiles’ of Tu correspond to the ‘tiles’ of the ’824 patent” and that “the ‘images’ of Tu correspond to the ‘slices’ of the ’824 patent,” as, “[f]or example, like the slices of the ’824 patent, each slice (image) of Tu includes one or more tiles.” Pet. 55; *see id.* at 57–59. Essentially, Petitioner is arguing that Tu’s Figure 2 corresponds to the single slice embodiment shown in Figure 3 of the ’824 patent, with one slice and a set of tiles.

Petitioner argues that, in Tu, “each of said at least one slice is decoded independently of another one of said at least one slice” because “[u]nder the condition where the ‘at least one slice’ is exactly one slice,” e.g., as shown in Tu’s Figure 2, “the term ‘where each of said at least one slice’ should be given no patentable weight because it is conditional on the frame including two or more slices.” Pet. 61 (citing *Ex Parte Schulhauser*, No. 2013-007847 (PTAB April 28, 2016) (precedential)). Alternatively, Petitioner argues that “under the condition where the claimed ‘at least one slice’ can be more than one slice[],” “Zhao discloses that ‘an input picture comprising a plurality of macroblocks may be partitioned into one or several slices.’” Pet. 59 (citing Ex. 1003 ¶ 31, emphasis omitted).

The tiles, according to Petitioner, are described in Tu as “rectangular regions” of the frame and include macroblocks, which are coding units for decoding that are arranged in a raster scan order. Pet. 63 (citing Ex. 1006 ¶¶ 33, 54).

Petitioner further argues that Tu includes “first information indicating whether location information of [a] tile is transmitted within said at least one slice” in its “mode signal” that “indicates whether tile pointers 1106 are mandatory or optional.” Pet. 63–65 (quoting Tu ¶ 61 (“tile pointers 1106 are ‘optional if the number of tiles is one and the spatial mode is used’ but otherwise are ‘mandatory’”)). And Petitioner argues that Tu includes “second information suitable for decoding” a tile that “includ[es] a location of said at least one tile” because its image headers include “tile pointers 1106” that “index from the origin 1112 and provide offsets from the origin 1112 to respective tiles.” Pet 65.

b. Patent Owner Arguments

i. “a frame of said video that includes at least one slice”

Patent Owner first argues that “Tu’s image does not satisfy the limitation ‘a frame of said video that includes at least one slice’” because “[t]he frame at issue is “a frame of [] video,” which is “partitioned into one or more slices” and “both experts agree that slices include a slice header and slice data.” PO Resp. 35. This argument is unavailing because it is based on Patent Owner’s proposed claim construction, which we do not adopt, for the reasons detailed above. *See* Section II.B.3.

Patent Owner further argues that “a ‘frame of said video,’ a ‘slice,’ and a ‘tile’ each have distinct meanings to a POSA” and “Tu’s disclosure of

a single image does not satisfy these constructions.” PO Resp. 36. We do not agree. The patent applicant chose to pursue, and received, broad claims, essentially corresponding to the level of detail provided in Figures 7 and 8 of the patent, and Figure 7 shows a single slice embodiment in which the frame and slice are coextensive. We find this in Tu, as the claim’s frame corresponds to Tu’s “image,” the claim’s “tiles” correspond to Tu’s “tiles,” and the claim’s slice corresponds to the set of macroblocks that make up Tu’s image, as in Figure 7. *See* Decision 15.

Patent Owner contends that we “seemingly modified Petitioner’s argument” regarding Tu because “the Petition does not allege Claim 1’s ‘at least one slice’ limitation ‘corresponds to the set of macroblocks that make up Tu’s image.’” PO Resp. 35. We again do not agree. The words may be different than those used in the Petition, but the substance is the same. *See, e.g.,* Pet. 53–55 (comparing Tu’s Figure 2 with Figure 7 of the ’824 patent), 58 (“A POSA would recognize that when the ‘at least one slice’ is exactly one slice, the image of Tu corresponds to both a video frame and a slice that occupies the entire frame.”).⁶ The parties agree that a slice is a set of macroblocks, so the single slice is the set of macroblocks that make up the entire frame.

Patent Owner also argues that “there is a meaningful difference between a frame of video partitioned into a single slice . . . versus a single image that does not contain any slice.” PO Resp. 37. According to Patent

⁶ We also do not agree with Patent Owner that Petitioner’s invalidity allegations regarding “slice” are “difficult to analyze.” PO Sur-Reply 20. The allegation is that the frame is the entire image and that, as in the single slice embodiment of the ’824 patent, the set of macroblocks corresponding to the image constitutes a single slice.

Owner, “[i]n the ‘one slice scenario,’ the single slice still includes a slice header and slice data” because “[t]he slice header carries valuable information that places the slice within the proper frame of a video sequence” and “[t]he header also carries information that allows the slice to be independently decodable.” *Id.* at 37–38 (citing Ex. 2016 ¶ 149). We find this argument unpersuasive because Patent Owner and its expert do not explain why a system that receives a single frame that includes a single slice would need to “place the slice within the proper frame,” or why a single slice that occupies an entire frame would need to “carr[y] information that allows the slice to be independently decodable.” Patent Owner’s expert does not identify any evidence to support the assertion that a system using just a single slice would need to include a slice header. *See id.* ¶¶ 148–149.

We recognize that some video coding methods may use slices that always include headers like Patent Owner describes. We conclude, however, that the claims of the ’824 patent were drafted broadly enough to encompass methods with single slices like that of the patent’s Figure 7, corresponding to the entire image, as in Tu, and as to be not limited by details of implementation beyond those already in the claim.⁷ Patent Owner has not identified a supportable construction of “slice” that would distinguish the claims over Tu.

⁷ We note that Patent Owner could have sought amendment of the claims in this proceeding to add limitations concerning the slice header, or to require more than one slice, but elected to not do that.

- ii. *“first information indicating whether location information . . . is transmitted”*

Patent Owner argues that Tu lacks “first information indicating whether location information . . . is transmitted.” PO Resp. 39. Specifically, Patent Owner argues that Tu’s mode signal “specifies which of the modes is used” but “does not correlate to the presence or absence of Tu’s tile pointers for both modes of operation.” *Id.* at 40. According to Patent Owner, “[k]nowing . . . Tu’s mode (or . . . Tu’s mode plus the number of tiles) does not inform the decoder in every case whether Tu’s tile pointers are present or absent,” and “[i]n the context of a decoder processing a bitstream of compressed video, this partial ‘knowledge’ is insufficient.” PO Resp. 45.

We do not agree with Patent Owner’s analysis. As Patent Owner acknowledges, the mode signal identifies which of the modes (spatial or frequency) is used, and, when the frequency mode is used, tile pointers are present. *See* PO Resp. 41; *see also* Pet. 64 (“[T]ile pointers 1106 are ‘optional if the number of tiles is one and the spatial mode is used’ but otherwise are ‘mandatory.’”). It follows that when the mode signal of Tu identifies the frequency mode, it is “indicating” that tile pointers are present. *See* Pet. Reply 12. This satisfies our construction of the term at issue because the mode signal reveals “if it is or was true” that the pointers are present.

We recognize that if the mode signal identifies the spatial mode, it is possible (i.e., when there is more than one tile) that the pointers are present even though the mode signal does not show for certain that they are. As Patent Owner argues, Tu’s mode “does not inform the decoder in every case whether Tu’s tile pointers are present or absent.” PO Resp. 45. The

reference does not have to meet the limitations at all times, however. *See Hewlett-Packard Co. v. Mustek Sys.*, 340 F.3d 1314, 1326 (Fed. Cir. 2003) (“Just as ‘an accused product that sometimes, but not always, embodies a claimed method nonetheless infringes,’ . . . a prior art product that sometimes, but not always, embodies a claimed method nonetheless teaches that aspect of the invention.”) (quoting *Bell Commc’ns Research, Inc. v. Vitalink Commc’ns Corp.*, 55 F.3d 615, 622–623 (Fed. Cir. 1995)). It is sufficient that Tu teaches a method that, as Patent Owner acknowledges, at least sometimes includes a mode signal indicating it is true that the location information is present.⁸

c. Conclusion Regarding Tu and Zhao

We find Patent Owner’s above arguments, which are largely based on reading limitations into the claims, unpersuasive, and conclude that Petitioner has established that claim 1 of the ’824 patent would have been obvious in view of Tu alone. *See Wasica Fin. GmbH v. Cont’l Auto. Sys., Inc.*, 853 F.3d 1272, 1278 n.3 (Fed. Cir. 2017) (noting the Board’s conclusion that a prior art reference rendered certain claims obvious “by virtue of its anticipation of them”).

However, as we did at institution, we agree with Patent Owner that Petitioner has not adequately established how one would have combined Tu and Zhao or articulated a sufficient motivation to do so. Petitioner still has not adequately explained how one would add a plurality of slices to Tu while

⁸ We find Patent Owner’s argument that Tu has “one embodiment” instead of two immaterial. The point is that Tu describes a system in which, at least sometimes, the mode signal indicates the presence of location information.

retaining Tu's tiles, does not show that adding slices to Tu's tiles would result in H.264 compliance, and does not show that the addition of parallel decoding would be a motivation to combine, because Tu already employs parallel decoding. *See* Decision 17.

2. *Grounds Based on Zhao*

a. *Zhao Alone*

For the Zhao grounds, Petitioner correlates the claimed "frame" to Zhao's "input picture" and the claimed "slices" to Zhao's reconstruction slices. *See* Pet. 32. Then, for the "tiles" that need be to be included in slices, Petitioner identifies Zhao's entropy slices. *Id.* However, as we observed in the Institution Decision, Zhao's entropy slices (like the reconstruction slices), are shown to be raster scan segments of the picture, none of which are "rectangular," as required by claim 1. *See* Decision 18.

Petitioner argues that "[a]lthough Zhao does not expressly disclose rectangular entropy slices, such entropy slices were well-known." Pet. Reply 13. Even if that were true, however, it does not show it would have been obvious to modify Zhao to use rectangular entropy slices. One cannot establish obviousness simply by alleging that elements of the claims were "well-known." *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (explaining that "a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art").

b. *Zhao and Fuldseth*

Petitioner alternatively argues that "rectangular entropy slices would have been obvious in view of *Fuldseth*." Reply 14. We addressed this

argument at institution, finding it unpersuasive because “Fuldseth, describes partitioning an entire image into rectangular *tiles*, like the tiles described in the ’824 patent” and that “Fuldseth does not describe the use of rectangular entropy *slices*.” Decision 18. We find that Petitioner still does not adequately explain how or why the benefits of using tiles described in Fuldseth would apply to entropy slices in Zhao. Petitioner cannot make prior art teachings about image tiles apply to entropy slices just by calling the entropy slices “tiles.”

c. Zhao and Huang

Petitioner alternatively combines Zhao and Huang, which, according to Petitioner, “discloses a frame of video that includes at least one tile (entropy slice), where the at least one tile explicitly has a rectangular shape.” Pet. 50.

Huang does describe that entropy slices can be rectangular. *See* Ex. 1005 ¶ 37 (“entropy slices are exactly one MB row or integer multiples of MB rows in [the] examples”). That leaves the question of whether one of skill in the art would have been motivated, in light of Huang, to make the non-rectangular entropy slices of Zhao rectangular.

The Petition argued that one would be motivated to combine “to exploit [] two dimensional dependencies between blocks” (as informed by Fuldseth) . . . and thereby “remove redundancies in the information to be transmitted.” Pet. 51. As noted above, however, Fuldseth describes the use of rectangular tiles, not rectangular entropy slices. We concluded at institution that Petitioner had not explained why the benefits associated with rectangular tiles would translate to rectangular entropy slices. That remains true. We also found it unclear how this benefit could be realized given that

Zhao's reconstruction slices are not rectangular. *See* Decision 20. Petitioner does not address that problem in the Reply.

The Petition also argued that a "POSA would have been motivated to combine Zhao and Huang because Huang expressly builds upon previous work on entropy slices published by the inventors of Zhao." Pet. 51–52. Specifically, Petitioner argues that one would have been motivated to combine Zhao and Huang "to solve the . . . problems [i.e., loss of compression efficiency, reduced memory access speed, and excessive power consumption]' associated with the Zhao inventors' implementation of entropy slices." Pet. 52 (quoting Ex. 1002 ¶ 114). Our review of the reference, however, reveals that Huang is describing its "causal criterion" technique, not rectangular entropy slices, as a solution to the identified problems. Because Huang explains that its causal criterion can be used with either rectangular or non-rectangular tiles, it does not appear to provide a reason to use one over the other, and thus does not provide a reason to modify Zhao to use rectangular entropy slices.

The Petition also argued that changing from a raster order entropy slice to a rectangular entropy slice would merely be a "design choice." We found that unlikely, given that Petitioner argues the change provides a functional advantage. Decision 21; *see, e.g., In re Gal*, 980 F.2d 717, 719 (Fed. Cir. 1992) (explaining that use of a different structure to achieve a different purpose was not an obvious design choice). Petitioner does not challenge that determination in the Reply.

For these reasons, we conclude that Petitioner has not established that Zhao, or the combination of Zhao and Fuldseth or Huang renders claim 1 obvious. We need not, and therefore do not, reach Patent Owner's

arguments about whether Zhao discloses “first information” or “location information.”

D. Constitutionality

Patent Owner asserts that the “Board lacks the authority to issue a Final Written Decision in this proceeding because [Administrative Patent Judges] are principal officers of the United States that must be appointed by the President and confirmed by the Senate.” PO Resp. 70. According to Patent Owner, the Federal Circuit’s decision in *Arthrex, Inc. v. Smith & Nephew, Inc.*, 941 F.3d 1320 (Fed. Cir. 2019), “did not actually fix the problem.” *Id.* at 71.

We, however, are bound by the Federal Circuit’s decision, which resolved this issue. *See Arthrex*, 941 F.3d at 1337 (“This as-applied severance . . . cures the constitutional violation.”). Accordingly, Patent Owner’s argument is not persuasive.

E. Real Party in Interest

Patent Owner argues that we should dismiss the Petition because it does not name all real parties in interest. *See* PO Resp. 72. Patent Owner identifies a number of companies that have paid membership fees to Petitioner and asserts that those companies should have been named as real parties in interest. *Id.*

Petitioner responds that Unified Patents Inc. is the sole real party in interest, citing evidence that it alone controls, directs, and funds this proceeding and that it does not communicate with its members about potential validity challenges before filing IPRs. *See* Pet. Reply 19–21 (citing Ex. 2161, 18:20–20:1, 74:10–78:1, 81:10–83:6, 93:5–17; Ex. 2152, 5, 10–

11; Ex. 2138, 31:25–33:2, 222:16–223:4; Ex. 1017, 3–7). Petitioner contends that it searched for and could not identify any communications with its members regarding the '824 patent or this proceeding other than public announcements. *See* Pet. Reply 21 (citing Ex. 2011; Ex. 2161, 68:22–69:9). Petitioner further points out that no alleged unnamed real party in interest would be subject to a time bar under § 315(b). Pet. Reply 21.

We have considered the parties' submissions and determine that Petitioner has adequately identified the real party in interest. Patent Owner has introduced no evidence specific to this proceeding that causes us to question Petitioner's identification, and has not identified an aspect of Petitioner's business structure that we view as showing the alleged unnamed real parties in interest are clear beneficiaries with respect to this proceeding that have a preexisting, established relationship with Petitioner. *See Ventex Co. v. Columbia Sportswear N. Am., Inc.*, IPR2017-00651, Paper 152, 6–11 (Jan. 24, 2019) (precedential).

III. CONCLUSION

Claim 1 has been shown to be unpatentable. The results are summarized below.

Claim	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1	103	Tu, Zhao	1	
1	103	Zhao		1
1	103	Zhao, Fuldseth		1
1	103	Zhao, Huang		1
Overall Outcome			1	

IV. ORDER

For the reasons given, it is:

ORDERED that claim 1 of U.S. Patent 8,767,824 B2 has been shown to be unpatentable;

FURTHER ORDERED that, because this is a Final Written Decision, the parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.⁹

⁹ 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. 16654 (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).

IPR2019-00635
Patent 8,767,824 B2

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