

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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UNIFIED PATENTS INC.,  
Petitioner,

v.

VELOS MEDIA, LLC,  
Patent Owner.

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IPR2019-00763  
Patent 10,110,898 B2

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Before JENNIFER S. BISK, MONICA S. ULLAGADDI, and  
AARON W. MOORE, *Administrative Patent Judges*.

ULLAGADDI, *Administrative Patent Judge*.

JUDGMENT

Final Written Decision

Determining All of the Challenged Claims to be Unpatentable  
*35 U.S.C. § 318(a)*

## I. INTRODUCTION

Unified Patents Inc.<sup>1</sup> (“Petitioner”) requested an *inter partes* review of claims 1, 3–5, 7, and 8 (the “challenged claims”) of U.S. Patent No. 10,110,898 B2 (Ex. 1001, “the ’898 patent”). Paper 2 (“Petition” or “Pet.”). Velos Media, LLC (“Patent Owner”) filed a Preliminary Response. Paper 7 (“Prelim. Resp.”). Pursuant to Board authorization, Petitioner filed a Reply (Paper 9, “Prelim. Reply”) to Patent Owner’s Preliminary Response and Patent Owner filed a Sur-Reply (Paper 10, “Prelim. Sur-Reply”).

On October 1, 2019, we entered a Decision on Institution (“Institution Decision” or “Inst. Dec.,” Paper 11) instituting an *inter partes* review as to all of the challenged claims on all of the grounds set forth in the Petition.

After institution of trial, Patent Owner filed a Patent Owner Response (“PO Resp.,” Paper 26), to which Petitioner filed a Reply (“Pet. Reply,” Paper 31).<sup>2</sup> Patent Owner filed a Sur-reply (“Sur-Reply,” Paper 33).<sup>3</sup> A hearing was held on July 8, 2020. The transcript of the hearing has been entered into the record. Paper 46 (“Transcript” or “Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This final written decision is issued pursuant to 35 U.S.C. § 318(a). As explained below, we conclude Petitioner has shown by a preponderance of the evidence that claims 1, 3–5, 7, and 8 of the ’898 patent are unpatentable.

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<sup>1</sup> Petitioner has informed us that Unified Patents Inc. has changed its name to Unified Patents, LLC. Paper 25.

<sup>2</sup> Ex. 1044 is the redacted version of the Patent Owner’s Response. Ex. 1054 is the redacted version of the Petitioner’s Reply.

<sup>3</sup> Ex. 1055 is the redacted version of Patent Owner’s Sur-Reply.

## II. BACKGROUND

### A. *Related Proceedings*

Petitioner and Patent Owner indicate that the '898 patent is not asserted in any related district court proceedings. Paper 4, 2; Pet. 57. Petitioner indicates that the application underlying the '898 patent “claims the benefit of the filing date of U.S. Patent Application No. 13/744,759,” and that “there are three currently pending applications that claim the benefit of the filing date of [that] common parent [No. 13/744,759] to the '898 patent: U.S. Patent Application Nos. 15/253,035; 16/111,961; and 16/239,010.” Pet. 57.

Although Patent Owner stated, in its Preliminary Response, that “Petitioner has filed a total of thirteen requests for IPR against Velos patents,” specifically, IPR2019-00194, IPR2019-00635, IPR2019-00660, IPR2019-00670, IPR2019-00707, IPR2019-00710, IPR2019-00720, IPR2019-00749, IPR2019-00757, IPR2019-00763, IPR2019-00806, IPR2019-00883, and IPR2019-01130, other than the instant proceeding, none of these proceedings appear to concern either the '898 patent or a patent related to the '898 patent. Prelim. Resp. 2 n.1.

### B. *The '898 Patent (Ex. 1001)*

The '898 patent concerns extending chroma quantization parameters to have, for example, the same range as luma quantization parameters (e.g., 0 to 51). Ex. 1001, code (57). The '898 patent discloses that, “[p]reviously, values of Chroma QP [quantization parameters] only extended up to 39.” *Id.* The '898 patent discloses determining the chroma quantization parameters based on luma quantization parameters and picture level chroma offsets. *Id.* More particularly, the '898 patent discloses two equations for determining

quantization parameters for chroma components Cb and Cr, respectively, using picture-level offsets. *Id.* at 5:8–10. These equations, labeled equations (1) and (2), are reproduced below:

$$QP_{Cb} = \text{Clip}(0, 51, QP_Y + Cb\_QP\_offset)$$

$$QP_{Cr} = \text{Clip}(0, 51, QP_Y + Cr\_QP\_offset)$$

Equations 1 and 2 above determine the two respective quantization parameters between 0 and 51, based on luma quantization parameter,  $QP_Y$  and  $Cb\_QP\_offset$  or  $Cr\_QP\_offset$ , which are the two chroma QP offset parameters. *Id.* at 5:11–19. The '898 patent further discloses equations for calculating the same quantization parameters using slice-level offsets. *Id.* at 5:33–37 (Eqns. 3 and 4).

#### *C. Challenged Claims*

Challenged claims 1 and 5 are independent. Challenged claims 3, 4, 7, and 8 depend therefrom. Independent claim 1 is illustrative and reproduced below.

1. A decoding apparatus, comprising:  
circuitry configured to:
  - set a first chroma quantization parameter (QP) included in a chroma QP range from 0 to 51 equal to a luma QP range, based on a parameter including a picture level chroma QP offset added to a luma QP; and
  - inverse quantize quantization data that is decoded from a bit stream, based on the first chroma QP.

Ex. 1001, 8:44–51.

#### *D. Proposed Grounds of Unpatentability*

Petitioner supports the following challenges with the First and Second Declarations of Dr. Joseph P. Havlicek (Exs. 1002, 1047).

| Reference(s)                                                                                                                          | Basis <sup>4</sup> | Claims Challenged |
|---------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------|
| <i>Advanced Video Coding for Generic Audiovisual Services</i> , ITU-T <sup>5</sup> Recommendation H.264 (11/2007) (Ex. 1004, “H.264”) | § 103              | 1, 3–5, 7, and 8  |
| H.264 in view of U.S. Patent Application Publication No. 2006/0018559 A1 to Kim et al. (Ex. 1006, “Kim”)                              | § 103              | 1, 3–5, 7, and 8  |

Patent Owner disputes Petitioner’s challenges and relies on the Declaration of Iain Richardson (Ex. 2009).

### III. ANALYSIS

#### A. *Principles of Law*

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the subject matter sought to be patented 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 skill in the art; and (4) objective evidence of nonobviousness,

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<sup>4</sup> Because the application leading to the ’898 patent claims an effective filing date before March 16, 2013, patentability is governed by the version of 35 U.S.C. § 103 preceding the Leahy-Smith America Invents Act (“AIA”), Pub L. No. 112–29, 125 Stat. 284 (2011). *See* Ex. 1001, code (22), (60), (63).

<sup>5</sup> ITU-T stands for International Telecommunication Union Telecommunication Standardization Sector.

i.e., secondary considerations. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). The burden of persuasion never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (citing *Tech. Licensing Corp. Videotek, Inc.*, 545 F.3d 1316, 1326–27 (Fed. Cir. 2008)) (discussing the burden of proof in an *inter partes* review). Furthermore, Petitioner cannot satisfy its burden of proving obviousness by employing “mere conclusory statements.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

Thus, to prevail in an *inter partes* review, Petitioner must explain how the proposed combinations of prior art would have rendered the challenged claims unpatentable. We analyze the challenges presented in the Petition in accordance with the above-stated principles.

#### *B. Claim Construction*

For *inter partes* reviews filed on or after November 13, 2018, we apply the same claim construction standard used by Article III federal courts and the ITC, both of which follow *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc), and its progeny. *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51340, 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)). Because the instant Petition was filed on March 6, 2019, we apply that standard here. Accordingly, we construe each challenged claim of the '898 patent to generally have “the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” 37 C.F.R. § 42.100(b).

Petitioner does not propose a construction for any claim term. Pet. 18 (“Petitioner submits that no claim term or phrase in the challenged claims requires an express construction,” and “[t]herefore, the analysis presented in this Petition applies the plain and ordinary meaning of the claim language as it would have been understood by a POSA [Person of Ordinary Skill in the Art].”).

In its Preliminary Response, Patent Owner proposed to construe the phrase “a chroma QP range from 0 to 51 equal to a luma QP range” recited in claims 1 and 5 as “a chroma QP range including values 0 to 51, said chroma QP range being equal to a luma QP range including values 0 to 51.” Prelim. Resp. 17–18. Patent Owner supported its proposal by arguing that “the parameter required by the challenged claims must have a range from 0 to 51 under *a particular set of conditions*.” *Id.* at 16 (emphasis added).

Patent Owner now contends that its “reference to ‘a single set of conditions’ in the [Patent Owner’s Preliminary Response] did not capture the reason that a ‘range’ in the context of the claims of the '898 Patent cannot be satisfied by aggregating separate, discrete sets of ‘permissible values.’” PO Resp. 18. Patent Owner also contends “that the plain and ordinary meaning of the claim language applies and that a POSITA would

understand the meaning of the phrase ‘a chroma QP range from 0 to 51 equal to a luma QP range’ in the context of the challenged claims.” *Id.* at 21. Patent Owner explains that “a disjoint ‘range’ cannot satisfy the claim language because the claims apply at the ‘picture level.’” *Id.* at 18. More particularly, Patent Owner argues

Because there is never a chroma QP in *H.264* that has a lower bound of 0 and an upper bound of 51 *at any single point in the decoding process or in any single picture*, there is (1) no chroma quantization parameter with a range of 0–51. Additionally, because chroma QP *always* saturates at a reduced range compared to luma QP in *H.264*, there is (2) *never* a chroma QP that has a range equal to a luma QP range. Finally, because Petitioner relies on aggregated sets of “permissible values” for the chroma QP range in the Petition, there cannot be a chroma QP with a range of 0–51 that can be (3) used to inverse quantize quantization data. To inverse quantize quantization data, such as a coded block, it is necessary to determine (set) a chroma QP that has a minimum and maximum permissible value at the point of determining/setting the chroma QP.

*Id.* at 19 (citing Ex. 2009 ¶ 98).

We preliminarily construed “a chroma QP range from 0 to 51 equal to luma QP range” to mean that a chroma QP can take on values between 0 and 51 and a luma QP can take on values between 0 and 51. Inst. Dec. 8. We maintain that construction for the following reasons. In the Institution Decision, we determined that “[n]either claim 1 nor claim 5 requires calculating or setting a full range of values, 0 to 51, for a chroma QP” and “neither claim 1 nor claim 5 requires that the values 0 to 51 in the chroma QP range be obtainable under a single set of conditions.” *Id.* at 7. Patent Owner’s arguments do not persuade us to deviate from our preliminary conclusion. We now conclude that, contrary to Patent Owner’s arguments,

neither claim 1 nor claim 5 is limited to setting a chroma QP or inverse quantizing at “a single point,” at a “picture level,” or within a “single picture.” *See* PO Resp. 18–19.

None of Patent Owner’s arguments point to language in the Specification of the ’898 patent that specifically defines the claimed “range,” or any other portion of claim 1 or 5, as requiring a full complement of contiguous integer values starting at 0 and ending at 51, or as limited to being obtained under a single set of conditions. Patent Owner’s arguments likewise do not point us to any extrinsic or intrinsic evidence that supports the requirement that setting a chroma QP or inverse quantizing occurs at a single point, at a picture level, or within a single picture. *See generally* PO Resp. Patent Owner’s argument is, in effect, that if we do not construe the claims as it urges, the invention of the ’898 patent will not be captured. Although we interpret the claims in light of the specification, we do not import limitations from the specification into the claims to cover the invention or to make it operable.

As Petitioner argued before institution (*see* Prelim. Reply 2–3), “the ’898 patent supports the converse proposition—namely, that obtaining all of the values, 0 to 51, in the chroma QP range requires differing sets of conditions.” In its post-institution Reply, Petitioner supports this argument with the diagram reproduced below, which depicts the range of integer values for the chroma quantization parameter that is obtainable for each distinct value of picture level chroma QP offset. Pet. Reply 3 (citing Ex. 1047 ¶ 12); *see* Ex. 1047 ¶ 13.

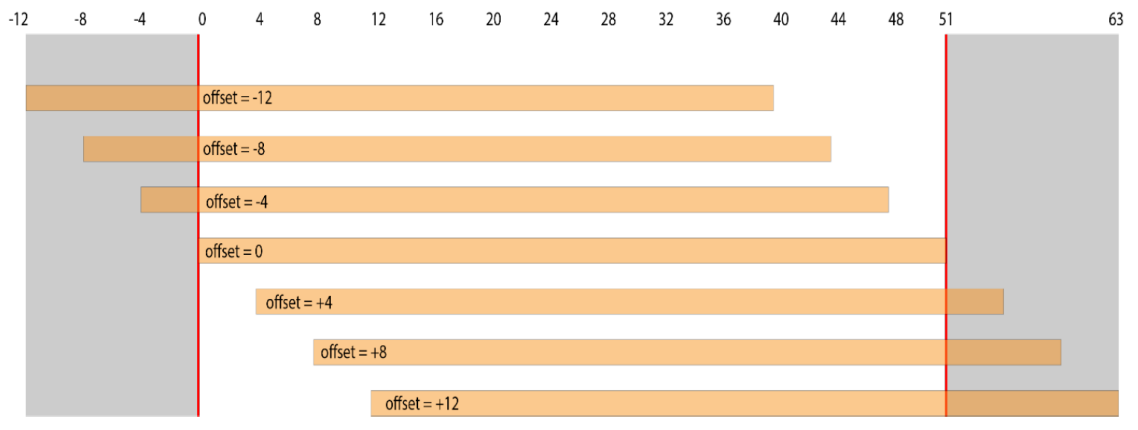


Diagram from Petitioner's Reply and Dr. Havlicek's Second Declaration depicting the range of chroma quantization parameters that can be obtained for each value of picture level chroma QP offset. Pet. Reply 3.

In Petitioner's diagram, the orange bars represent contiguous ranges of integer values for chroma quantization parameters, either  $QP_{Cb}$  or  $QP_{Cr}$ . *Id.* The orange bars differ for each value of picture level chroma QP offset and are "clipped" in the gray portions of the diagram. *Id.* According to Petitioner, "the red lines show the clipping in equations (1) [ $QP_{Cb} = Clip(0, 51, QP_Y + Cb\_QP\_offset)$ ] and (2) [ $QP_{Cr} = Clip(0, 51, QP_Y + Cr\_QP\_offset)$ ] of the '898 patent." *Id.*; see Ex. 1001, 5:8–10 (Eqns. 1 and 2). Clipped values in the gray portions of the diagram are not part of the obtainable ranges, and therefore not representative of values that may be taken by the chroma quantization parameters for that particular value of picture level chroma QP offset.

As can be seen from Petitioner's diagram, *only one* value for picture level chroma QP offset, 0, produces a contiguous range of integer values between 0 and 51 for the chroma quantization parameter. Pet. Reply 3.

Patent Owner argues that, contrary to Petitioner’s argument, “the ’898 Patent does not ‘claim[] embodiments in which a non-zero offset is added to QP<sub>Y</sub> to obtain the chroma QP.’” Sur-Reply 12 (quoting Pet. Reply 4). Patent Owner contends that “[e]ven if Petitioner is correct that Patent Owner’s claim construction would require an offset of zero to achieve the range specified in the claim (0–51), such a zero offset is still included in the embodiments disclosed in the specification and does not offend *Vitronics*.” *Id.* at 13 (citing *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582–83 (Fed. Cir. 1996)). We understand Patent Owner to take the position, for the first time in its post-institution Sur-Reply, that a *contiguous* “chroma QP range from 0 to 51” can be achieved if the claimed picture level chroma QP offset is set to zero. See Sur-Reply 13. Patent Owner argues that, “[g]iven *the other requirements in the claim*, the offset that satisfies the claim language happens to be 0,” and “[t]here is nothing improper about excluding other disclosed but *unclaimed* embodiments.” *Id.*

None of Patent Owner’s arguments persuade us that the claim language requires limiting the claimed “picture level chroma qp offset” to zero. Accordingly, we are not persuaded to exclude embodiments disclosed in the ’898 patent in which “picture level chroma qp offset” takes on non-zero values. Stated differently, we conclude that the claims also encompass a “picture level chroma qp offset” that is non-zero. As Petitioner’s diagram shows, when the “picture level chroma qp offset” is non-zero, a contiguous “chroma qp range from 0 to 51” cannot be obtained, and as such, Patent Owner’s arguments urging us to adopt its construction are neither consistent with nor supported by the Specification of the ’898 patent. For these reasons, we maintain our conclusion that the above-quoted claim limitation

does not require that each value in the chroma QP range be obtainable using a single or common set of conditions, nor does it require calculating each value in the chroma QP range. Our preliminary construction, which we maintain here, is consistent with the Specification, which discloses that, “[t]he quantization parameters (QP) for Chroma are extended up to and more preferably *to the same range as Luma QP (e.g., 0 to 51).*” Ex. 1001 at code (57) (emphasis added).

*C. Level of Ordinary Skill in Art*

We review the grounds of unpatentability in view of the understanding of a person of ordinary skill in the art at the time of the invention. *Graham*, 383 U.S. at 17. Petitioner contends that the ordinarily skilled artisan would have had at least

[A] bachelor’s degree in electrical engineering or a closely related scientific field, such as physics, computer science, or computer engineering, or similar advanced post-graduate education in this area, with two years of experience with video processing systems. Ex. 1002, ¶ 28. A person with less education but more relevant practical experience, depending on the nature of that experience and degree of exposure to video compression algorithms, could also qualify as a person of ordinary skill in the field of the ’898 patent . . . A POSA would have been familiar with ubiquitous video coding standards, such as those developed by the Motion Pictures Expert Group (“MPEG”) and those adopted by the International Telecommunications Union (“ITU”). Ex. 1002, ¶ 29.

Pet. 17–18. Patent Owner does not propose a definition for the level of ordinary skill in the art. *See generally* PO. Resp.

We determine that the level of ordinary skill proposed by Petitioner is consistent with the ’898 patent and the asserted prior art, and we adopt that definition. We note, however, the conclusions and findings rendered in this

decision do not turn on selecting the particular level of ordinary skill in the art that Petitioner proposes.

*D. Obviousness over H.264*

Petitioner contends that claims 1, 3–5, 7, and 8 are unpatentable under 35 U.S.C. § 103 as obvious over H.264. Pet. 14–59. We are persuaded that the evidence, including Dr. Havlicek’s testimony, supports Petitioner’s arguments. Petitioner thus establishes that these claims are unpatentable as obvious over H.264 by a preponderance of the evidence.

*1. Overview of H.264 (Ex. 1004)*

H.264 is a compression standard for high-definition digital video that is also known as MPEG-4 Part 10 or Advanced Video Coding (MPEG-4 AVC). H.264 discloses a derivation process for chroma quantization parameters. Ex. 1004, 198.<sup>6</sup> “The value of  $QP_C$  for a chroma component is determined from the current value of  $QP_Y$  and the value of `chroma_qp_index_offset` (for Cb) or `second_chroma_qp_index_offset` (for Cr).” *Id.*

*2. H.264 Printed Publication Status*

Petitioner contends that H.264 “was publicly accessible no later than May 29, 2008,” and supports this contention with the Declaration of Dr. Wenger. Pet. 19 (citing Ex. 1015 ¶¶ 20, 24). Petitioner further contends that Dr. Wenger’s testimony shows that “the November 2007 version of H.264 was approved in November 2007 and made widely available shortly thereafter,” and that the ordinarily skilled artisan “would have known that approved H.264 editions were posted on the ITU-T website

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<sup>6</sup> With respect to Exhibit 1004, we refer to page numbers added by Petitioner on the bottom right side, not the internal document page numbers.

(<https://www.itu.int/rec/T-REC-H.264/en>) without restriction on access and were thus publicly available as of the date of posting.” *Id.* (citing Ex. 1015 ¶¶ 16–19, 23, 24; Ex. 1016). Petitioner contends that “[t]he dates of posting shown on the ITU-T website are reliable and consistent with the experience of a member of the working group responsible for drafting the standard,” and that “[t]he ITU-T website would have been well-known to a POSA, and includes a listing of ITU-T standards that can be easily accessed using only the standard number, without any restriction on access.” *Id.* at 20 (citing Ex. 1015 ¶¶ 22, 24; Ex. 1017).

Patent Owner does not contest Petitioner’s assertion regarding the printed publication status of H.264. *See generally* PO. Resp. We are persuaded that H.264 was publicly accessible, that the ordinarily skilled artisan would have been aware of how to access it, and, thus, that it constitutes a prior art printed publication.

3. *Independent Claim 1*

*[Preamble] “A decoding apparatus, comprising:  
circuitry configured to . . . ”*

Claim 1 recites “[a] decoding apparatus, comprising: circuitry configured to” perform the functions recited in claim 1. Petitioner contends

H.264 defines a “decoder” as “[a]n embodiment of a decoding process,” and a “decoding process” as a process that is specified in the standard that “reads a bitstream and derives decoded pictures from it.” . . . A POSA would have understood from these disclosures, as well as the techniques set forth in H.264 more generally, that a decoder was an apparatus, and thus contemplated a decoder as the equipment for performing the decoding processes defined by H.264.

Pet. 34 (citing Ex. 1004, 29). Petitioner further contends that “an H-264-compliant decoder implementing H.264 needs to be able to decode any

permissible bit stream received according to the syntax defined by the standard,” and that, because Petitioner shows that the parameters as claimed are representative of parameters and permissible values for these parameters disclosed by H.264, an H.264-compliant decoder must have circuitry configured to decode the permissible values in H.264-compliant bit streams. *Id.* at 49.

Petitioner also contends a “POSA would have been motivated to implement H.264 in a decoder and its attendant circuitry either based on the teachings of H.264 alone or in view of Kim.” *Id.* at 47 (citing Ex. 1002 ¶¶ 97, 135, 136). We discuss the combination over H.264 and Kim below. Petitioner argues that “[a] POSA would have . . . plainly expected to succeed in creating a circuit configured to implement the claimed functionality because it is required by the standard.” *Id.* at 49 (citing Ex. 1002 ¶ 136; *ParkerVision, Inc. v. Qualcomm Inc.*, 903 F.3d 1354, 1362 (Fed. Cir. 2018)).

Having reviewed Petitioner’s arguments and the cited evidence of record, we are persuaded that the ordinarily skilled artisan would have known that H.264 would be implemented in a decoder apparatus with the appropriate circuitry and, thus, that H.264 teaches the “circuitry” recited in the preamble.<sup>7</sup>

*[element A] “set[ting] a first chroma quantization parameter (QP) included in a chroma QP range from 0 to 51 equal to a luma QP range”*

Claim 1 recites “set[ting] a first chroma quantization parameter (QP) included in a chroma QP range from 0 to 51 equal to a luma QP range.”

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<sup>7</sup> We need not determine whether the preamble is limiting because Petitioner has shown that the recitation in the preamble is satisfied by the prior art.

Petitioner contends H.264's teaching of  $QP'_C$  corresponds to the claimed "first chroma quantization parameter (QP)":

$$QP'_C = QP_C + QpBdOffset_C.$$

Pet. 36 (citing Ex. 1004, 198 (Eqn. 8-318)). Petitioner asserts that "[t]he variable  $QP_C$  that is a part of  $QP'_C$  is determined 'for each chroma component Cb and Cr,'" and that " $QpBdOffset_C$ —another component of  $QP'_C$ —is defined in H.264 as the 'chroma quantisation parameter range offset.'" *Id.* (citing Ex. 1004, 90, 198; Ex. 1002 ¶¶ 101, 102). According to Petitioner, H.264 discloses that "[t]he value of  $QP_C$  for each chroma component is determined as specified in Table 8-15 based on the index denoted as  $qP_I$ ." *Id.* at 37 (quoting Ex. 1004, 198). Table 8-15 of H.264 is reproduced below.

Table 8-15 – Specification of  $QP_C$  as a function of  $qP_I$

|        |         |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|--------|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| $qP_I$ | <30     | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
| $QP_C$ | $=qP_I$ | 29 | 30 | 31 | 32 | 32 | 33 | 34 | 34 | 35 | 35 | 36 | 36 | 37 | 37 | 37 | 38 | 38 | 38 | 39 | 39 | 39 | 39 |

Table 8-15 illustrates values  $QP_C$  can take that are determined as a function  $qP_I$ . Ex. 1004, 198.

Petitioner explains that  $qP_I$  values, in turn, are calculated using the following equation:

$$qP_I = Clip3(-QpBdOffset_C, 51, QP_Y + qP_{Offset}).$$

*Id.* at 38 (citing Ex. 1004, 198 (Eqn. 8-317)). According to Petitioner, Table 8-15, reproduced above, illustrates that "when  $qP_I$  is at its maximum of 51,  $QP_C$  has a value of 39," and thus, "the range of permissible  $QP_C$  values is from  $-QpBdOffset_C$  to 39." *Id.* (citing Ex. 1004, 198 (Table 8-15); Ex. 1002 ¶¶ 105, 106).

Based on determining the range of permissible  $QP_C$  values, Petitioner derives a range of permissible  $QP'_C$  values, which Petitioner contends

teaches “set[ting] a first chroma quantization parameter,” as claimed. *Id.* Petitioner’s annotations to Equation 8-318 of H.264, reproduced below, illustrate how a lower bound and upper bound for the range are derived.

$$\begin{array}{c}
 \text{largest possible } QP_c \rightarrow QP'_c = 39 + QpBdOffset_c \\
 \begin{array}{c} \boxed{QP_c} \\ QP'_c = \boxed{QP_c} + QpBdOffset_c \end{array} \\
 \text{smallest possible } QP_c \rightarrow QP'_c = -QpBdOffset_c + QpBdOffset_c = 0
 \end{array}$$

Equation 8-318 of H.264 with Petitioner’s annotations illustrates a range for  $QP_c$ , and consequently,  $QP'_c$ .

With respect to  $QpBdOffset_c$ , Petitioner contends that it “is defined in H.264 as the ‘chroma quantisation parameter range offset,’ and it is specified as” follows:

$$QpBdoffset_c = 6 * (bit_{depth_{chroma\_minus8}} + residual_{colour_{transform\_flag}}).$$

*Id.* at 39 (citing Ex. 1004, 90 (Eqn. 7-5)). According to H.264, the value of  $bit\_depth\_chroma\_minus8$  “shall be in the range of 0 to 6, inclusive” and according to Petitioner “POSAs were aware that the  $residual\_colour\_transform\_flag$  can assume a value of zero.” *Id.* (citing-in-part Ex. 1002 ¶¶ 101, 107, n.7; Ex. 1004, 90). Petitioner explains that

When the residual transformation is not performed (and thus  $residual\_colour\_transform\_flag = 0$ ),  $QpBdOffset_c$  is any one of 0, 6, 12, 18, 24, 30, or 36. Ex. 1002, ¶¶ 107–108. The H.264 standard thus taught an implementation in which the value of  $QpBdOffset_c$  is 12. Ex. 1002, ¶¶ 107, 108.

When the  $QpBdOffset_C$  is set to 12 (and recalling that the maximum value of  $QP_C$  is 39), the highest value for  $QP'_C$  is 51 as shown in the equation below:

$$QP'_C = QP_C + QpBdOffset_C = 39 + 12 = 51.$$

*Id.* at 40 (Ex. 1004, 118 (Eqn. 7–36), 198). Based on the foregoing, Petitioner contends that “H.264 teaches a ‘first chroma quantization parameter’—i.e.,  $QP'_C$ —that is ‘included in a chroma QP range from 0 to 51’ as required by claim 1.” *Id.* (citing Ex. 1002 ¶¶ 109, 110, 129).

Using similar equations, Petitioner derives permissible values of  $QP'_Y$  in its range, which Petitioner contends corresponds to the claimed “luma QP range.” *See id.* at 40–42. Based on these derivations, Petitioner contends that H.264 discloses “a luma QP range (for  $QP'_Y$ ) of 0-51 that is equal to the chroma QP range (for  $QP'_C$ ), which is also 0-51.” *Id.* at 42. Petitioner contends that

Because a luma bit depth of 8 and a chroma bit depth of 10 represent standard-compliant bit depths . . . the decoder must have circuitry configured to decode such a stream . . . Nonetheless, even if it were required to set the chroma and luma bit depths to be 10 and 8, respectively, thus leading to both the  $QP'_C$  and  $QP'_Y$  values being in the range of 0-51 to meet this claim, it would have been obvious to a POSA to do so . . . The range of permissible bit depths under H.264 for chroma and luma is between 8 and 14 because  $BitDepth_C$  and  $BitDepth_Y$  are defined as 8 plus some number between 0 and 6 . . . This is a limited number of possibilities . . . H.264 teaches at least one example in which “different components, e.g., Y and Cb, need not have the same bit depth,” . . . A POSA would have had good reason to pursue these known options among the finite number of predictable solutions[.]

*Id.* at 42–44 (internal citations omitted).

a) *Patent Owner's Contentions*

Patent Owner presents several arguments disputing Petitioner's showing for this claim limitation. PO Resp. 53. *First*, that Petitioner's challenge improperly relies on "an intermediate value [ $QP'_C$ ] in between the actual chroma quantization parameter [ $QP_C$ ] . . . and the quantization step in H.264." *Id.* *Second*, that Petitioner's challenge improperly "calculates  $QP'_C$  using a chroma bit depth of 10 (while calculating a luma QP range using a bit depth of 8, despite Petitioner's expert's acknowledgement that he is unaware of any coding device in the world that works that way)." *Id.* *Third*, that Petitioner's challenge improperly "aggregates discrete sets of 'permissible values' for the alleged chroma quantization parameter to obtain a lower bound (which would appear in one picture using one offset) and an upper bound (which would appear in a different picture using a different offset), despite the absence of any support for this in the '898 Patent specification." *Id.* *Fourth*, that Petitioner's challenge "ignores the fact that the approach taken in the Petition does not even solve the extended-range problem the '898 Patent addresses." *Id.*

b) *Petitioner's Responsive Contentions*

With respect to Patent Owner's *first* contention, that Petitioner improperly relies on  $QP'_C$  instead of  $QP_C$  as teaching the claimed "first chroma quantization parameter," Petitioner responds that objective evidence such as Kim discloses that a quantization parameter of a chrominance component is calculated as follows:  $QP'_C = QP_C + QpBdOffsetc$ . Pet. Reply 8 (citing Ex. 1006 ¶ 14). Petitioner further notes that Kim's equation is "the same equation that defines  $QP'_C$  in H.264" and "H.264 itself refers to  $QP'_{Cr}$  and  $QP'_{Cb}$  as 'chroma quantisation parameters.'" *Id.* (citing Ex. 1004,

198 (Eqn. 8-318), 472 (section G.8.5.1)). According to Petitioner, “this evidence shows that those in the field described parameters as chroma quantization parameters even if they are expressed with the variables  $QP'_C$ ,  $QP'_{Cr}$ ,  $QP'_{Cb}$ ,  $Qp'_{Cb}$ , or  $Qp'_{Cr}$ .” *Id.* at 8–9.

c) *Discussion*

We are persuaded that the cited portions of H.264 and Kim each individually support Petitioner’s position that not only  $QP_C$ , but also  $QP'_C$ , would have been understood by the ordinarily skilled artisan to disclose a “first chroma quantization parameter” as recited in independent claim 1. Patent Owner’s argument that, by “adding  $QpBdOffset_C$  to  $QP_C$ ,  $QP'_C$  can only *shift the  $QP$  range* of H.264 (0–39, as in Table 8-15) up or down; it cannot ‘extend’ it to a wider range” further supports Petitioner’s position that  $QP'_C$  is a chroma quantization parameter. *See* PO Resp. 37 (citing Ex. 2009 ¶ 125; Ex. 1004, 198 (Eqn. 8-318)) (emphasis added). This is because adding  $QpBdOffset_C$  to  $QP_C$  merely shifts the chroma quantization parameter value to a different value represented by  $QP'_C$ —it does not change what that value represents. Thus, we find that Patent Owner’s characterization of  $QP'_C$  as an intermediate value that is “derived from and related to  $QP_C$ ,” but “not itself the chroma quantization parameter described in the ’898 Patent and defined in H.264” is insufficiently supported. PO Resp. 37. Rather, we find persuasive Petitioner’s argument that, “. . .  $QP_C$  is used to calculate  $QP'_C$ , the value of which is used in the scaling operations,” and thus, “. . .  $QP_C$  is even further removed from the inverse quantization step than  $QP'_C$ ,” which undermines Patent Owner’s distinction of  $QP'_C$  as merely an intermediate value. Pet. Reply 9.

With respect to Patent Owner's *second* contention, that a chroma bit depth used to calculate the claimed "chroma QP range" is different from the luma bit depth used to calculate "luma QP range," Petitioner responds that H.264 expressly discloses a finite number of options—values between 8 and 14 for each of chroma bit depth and luma bit depth—making the selection of a chroma bit depth of 10 and a luma bit depth of 8 predictable. See Tr. 16:9–13. According to Petitioner, a decoder that implements the H.264 standard must be able to handle the bit depth values enumerated in the H.264 standard. See *id.* at 16:13–15; see Pet. Reply 13 (citing Ex. 1001, claims 1, 5). Petitioner further takes the position that the chroma bit depth need not have the same value as the luma bit depth. Dr. Havlicek supports this position with his testimony that the ordinarily skilled artisan would have known

[T]hat the H.264 standard specifically contemplates digital video wherein the luma and chroma components have different bit depths for at least two reasons: first, the standard defines separate sequence-level parameters `bit_depth_luma_minus8` and `bit_depth_chroma_minus8` to specify the bit depths of the luma and chroma components individually; second, the standard teaches at least one example in which "different components, e.g., Y and Cb, need not have the same bit depth."

[A] POSA would have found that there are only a limited number of potential bit depths supported by H.264. In fact, as I have outlined above in connection with my summary of relevant aspects of H.264, the permissible bit depths for both luma and chroma range from 8 to 14 in H.264. Moreover, as I have also explained above, H.264 specifically contemplates cases where the luma and chroma bit depths are different. Setting the chroma bit depth to be 10 and the luma bit depth to be 8, thus leading to the  $QP'_C$  value and the  $QP'_Y$  value both being in the range of 0–51, is expressly contemplated by the standard's limited permissible configurations.

Ex. 1002 ¶¶ 130, 137 (citing Ex. 1004, 62, 89, 90, 96).

We are not persuaded by Patent Owner’s argument that Petitioner’s selection of particular values for bit depth, in order to obtain a chroma QP range of 0–51 as claimed, constitutes hindsight. We credit the testimony of Dr. Havlicek, which supports the finding that an H.264-compliant decoding apparatus implemented in software and the attendant circuitry as set forth in Petitioner’s challenge would have been understood to be capable of handling permissible values specifically contemplated by and disclosed in the H.264 standard, as well as handling various combinations of these values (e.g., a chroma bit depth of 10 and a luma bit depth of 8). *See id.* Irrespective of whether it would have been unlikely to come across a bit stream having a chroma bit depth of 10 and a luma bit depth of 8, as Patent Owner contends (*see* PO Resp. n.3), Petitioner shows sufficiently that an H.264-compliant decoding apparatus and decoding method would have been able to handle these particular selections for bit depth.

With respect to Patent Owner’s *third* contention, that Petitioner’s challenge obtains the claimed “chroma QP range from 0 to 51” with discrete sets that use different picture offsets, Patent Owner specifically takes issue with Petitioner’s proposed range of chroma quantization parameters being “ . . . defined by *multiple* chroma quantization parameters and multiple picture level offsets—in multiple pictures.” PO Resp. 40. According to Patent Owner, Dr. Richardson supports its interpretation of the claims for the following reasons: first, the recitation of a “picture level chroma QP offset” indicates that the claims refer to *a single picture*, second, the recitation of “setting a first chroma quantization parameter that is within a range of 0–51,” means “the parameter (which is a single, or ‘first’ parameter) must have

a range of 0–51 (i.e., must be capable of taking any value between 0 and 51) *when it is set (i.e., at a particular point in time in a single picture),*” and third, “the claims recite dequantizing data using the chroma quantization parameter QP” where “data must be coded transform coefficient data *within one or more blocks of a picture.*” PO Resp. 40–41 (citing Ex. 2009 ¶¶ 129–30) (emphases added).

Dr. Richardson’s testimony does not persuade us to adopt Patent Owner’s claim construction because: (1) the mere use of the term “a picture level QP offset” in the claims does not limit the claims to a single picture or a single picture level offset in a single picture; (2) nothing in the claims requires the claimed “first chroma quantization parameter” to be capable of assuming every value in the range of 0 to 51 when it is set or at a particular point in time in a single picture, particularly because the claim does not require setting the chroma quantization parameter *range*; and (3) even if data that is inverse quantized using the claimed “first chroma quantization parameter” comes from one or more blocks of a single picture, that still would not limit how the chroma quantization parameter range of 0 to 51 is calculated or determined, nor would it require that the single, first chroma quantization parameter be able to assume every value from 0 to 51 at the time of inverse quantization (see Pet. Reply 6).

As we preliminarily concluded in our Institution Decision, and as we conclude in this decision (*supra* § III.B), claim 1 does not require calculating the entire range, 0 to 51, of chroma quantization parameters under a common set of conditions (i.e., using the same parameter values of  $QpBdOffset_C$  and  $qP_{Offset}$  for calculating each value in the range). As we explained in our Institution Decision, “Patent Owner’s arguments, in effect,

propose to construe the claims to exclude a ‘piecewise’ function for determining a range of chroma quantization parameters.” Inst. Dec. 16. But neither the claims nor the specification guides us to so limit the scope of independent claim 1.

With respect to Patent Owner’s *fourth* contention, that Petitioner’s challenge “does not even solve the extended-range problem the ’898 Patent addresses,” Petitioner’s evidence need only be tied to the scope of the claimed invention, which may be broader than the objectives or approaches disclosed in the ’898 patent. In this proceeding, the claims are not so limited as to achieving the purpose, objective, or approach of the ’898 patent and, as such, we are not persuaded by Patent Owner’s fourth contention.

Having reviewed the arguments and cited evidence of record, we are persuaded that H.264 teaches this claim limitation.

*[Element B] “based on a parameter including a picture level chroma QP offset added to a luma QP”*

Claim 1 further recites “set[ing] a first chroma quantization parameter . . . based on a parameter including a picture level chroma QP offset added to a luma QP.” Reproduced below is Equation 8-317 from H.264, which calculates  $qP_I$ , as annotated by Petitioner.

$$qP_I = \text{Clip3}(-QpBdOffset_c, 51, QP_Y + qP_{offset})$$

Petitioner’s annotated version of Equation 8-317  
that calculates  $qP_I$ .

Petitioner contends that “[t]he index parameter ( $qP_I$ ) includes a picture level chroma QP offset ( $qP_{offset}$ ) and a luma QP ( $QP_Y$ ),” and that “ $qP_{offset}$  (which is different than  $QpBdOffset_C$  because it is not dependent on the bit depth) is specified as one of two values, depending on whether the chroma component under consideration is a Cb or a Cr component.” Pet. 45–46 (citing Ex. 1004, 198 (Eqns. 8-315, 8-316)). Petitioner further contends that

$qP_{offset}$  is a “picture level chroma QP offset” because (1)  $chroma\_qp\_index\_offset$  and  $second\_chroma\_qp\_offset$  are both defined to be part of the picture parameter set (PPS) in H.264, (2) it corresponds to the chroma components (e.g., Cr or Cb), . . . and (3) the  $qP_{offset}$  takes the same “picture level” form as described in the ’898 patent itself, which teaches adding luma QP, “then picture level chroma QP offsets” (for Cb and Cr), and then slice-level chroma QP offsets, Ex. 1001, 5:24-37.

*Id.* at 46 (see Ex. 1002, ¶ 115; Ex. 1004, 64, 198). Petitioner explains that

$QP'_C$  is based on  $QP_C$ , and  $QP_C$  is based on  $qP_I$  (Table 8-15).  $QP'_C$  is “based on”  $qP_I$  because to calculate  $QP'_C$ , you must first sum  $QP_Y$  and  $qP_{offset}$  to get  $qP_I$ , thus  $QP'_C$  is based on this sum. And,  $qP_I$  is a “parameter” that includes “a picture level chroma QP offset added to a luma QP,” as required by claim 1.

*Id.* (citing Ex. 1002, ¶ 131; Ex. 1004, 198 (Eqn. 8-318)).

*c) Patent Owner’s Contentions*

Patent Owner disputes Petitioner’s challenge as pointing to “different parameters to define the two references to ‘luma QP’ in the claims.” PO Resp. 53. Specifically, Patent Owner takes issue with Petitioner’s reliance on “ $QP'_Y$  when defining the ‘luma QP range,’” in light of Petitioner’s reliance “on  $QP_Y$  when arguing that H.264 discloses ‘a picture level chroma QP offset added to a luma QP.’” *Id.* at 50. According to Patent Owner, “[t]he problem with Petitioner’s reliance on  $QP'_Y$  when calculating the alleged ‘range’ of luma QP is that a picture level chroma QP offset is never

added to  $QP'_Y$  in H.264.” *Id.* at 51. Patent Owner argues that, instead, “Petitioner argues that H.264 discloses ‘a parameter including a picture level chroma QP offset added to a luma QP,’ it relies on  $QP_Y$  (not  $QP'_Y$ ) as the ‘luma QP.’” *Id.* (citing Pet. 31).

*d) Petitioner’s Responsive Contention*

According to Petitioner, “[b]ecause both  $QP'_Y$  and  $QP_Y$  can range from 0 to 51 in the example provided in the Petition, even if the claim required ‘a luma QP’ to be in ‘a luma QP range,’ the value for  $QP_Y$  is within the range of values that  $QP'_Y$  can take on and thus meets the claim.” Pet. Reply 15.

*d) Discussion*

Petitioner has the better position. Much like the relationship between  $QP'_C$  and  $QP_C$  discussed above with respect to the preceding limitation, *Element A*,  $QP'_Y$  and  $QP_Y$  are related by an offset:  $QP'_Y = QP_Y + QpBdOffset_Y$ . Pet. 29 (citing Ex. 1004, 118 (Eq. 7-36)). We similarly find that adding  $QpBdOffset_Y$  to  $QP_Y$  merely shifts the luma quantization parameter value to a different value represented by  $QP'_Y$ —it does not change what that value represents. That  $QP_Y$  takes on a value within the range of values  $QP'_Y$ , as Petitioner contends, is sufficient to meet the claim limitation. Based on the entirety of the record, we are persuaded that Petitioner’s identification of permissible values of  $QP'_Y$  as teaching the claimed “luma QP range” is consistent with Petitioner’s identification of  $QP_Y$  as teaching the claimed “luma QP.”

Having reviewed the arguments and cited evidence of record, we are persuaded that H.264 teaches this claim limitation.

*[Element C] “inverse quantize quantization data that is decoded from a bit stream, based on the first chroma QP.”*

Claim 1 recites “inverse quantiz[ing] quantization data that is decoded from a bit stream, based on the first chroma QP.” Petitioner explains that, “[i]n the context of H.264, the process of inverse quantization is known as ‘scaling.’” Pet. 46. Petitioner further explains that “[f]or the purposes of the disclosed inverse quantization process, the variable ‘qP’ is ‘set equal to . . . QP’<sub>C</sub>.” *Id.* at 47 (citing Ex. 1004, 201). According to Petitioner,

[T]he mathematics of inverse quantization of quantization data decoded from a bitstream is described in section 8.5.10.2, where the variable qP (i.e., the first chroma QP’<sub>C</sub>) is an input into that process and that value is used to calculate the scaled—or inverse quantized values—using different equations depending on the ChromaArrayType.

*Id.* (citing Ex. 1004, 202 (Eqns. 8-332 to -335); Ex. 1002 ¶ 133).

*e) Patent Owner’s Contention*

Patent Owner argues that Petitioner’s showing “ignores the fact that the extended-range chroma QP is used to inverse quantize quantization data.” PO Resp. 53. In its Sur-Reply, Patent Owner acknowledges that “only a single value is used in the [claimed inverse quantization] process,” but characterizes Petitioner as “agree[ing] that the antecedent basis for that value is the chroma QP that was ‘set’ at the beginning of the claim, within a range of 0–51.” Sur-Reply 14.

*f) Petitioner’s Responsive Contention*

Petitioner responds that “[s]ince only one value is used for inverse quantization nothing in the claim language requires that single value be able to assume every integer value from 0 to 51 at the time of inverse quantization.” Pet. Reply 6.

*f) Discussion*

We are persuaded by Petitioner's argument and further determine that Patent Owner's arguments implicitly construe claim 1 to require setting every value in the chroma QP range from 0 to 51, not setting a first chroma QP to have a value that is *included* in a chroma QP range, as claimed. This implicit construction is not supported by the intrinsic or extrinsic record.

Having reviewed Petitioner's arguments and the cited evidence of record, we are persuaded that H.264 teaches this claim limitation and that Petitioner establishes that claim 1 is unpatentable as obvious over H.264 by a preponderance of the evidence.<sup>8</sup>

*4. Independent Claim 5*

Petitioner relies on the same analysis for its challenges to claims 1 and 5, which have similar limitations. Pet. 50. Patent Owner addresses both claims 1 and 5 together. See PO Resp. 32–54. For reasons substantially similar to those set forth above in Section III.D.3, we are persuaded that Petitioner establishes that claim 5 is unpatentable as obvious in view of H.264 by a preponderance of the evidence.

*5. Dependent Claims 3, 4, 7, and 8*

We have reviewed Petitioner's arguments and evidence concerning claims 3, 4, 7, and 8 and are persuaded that Petitioner establishes that these claims are unpatentable as obvious in view of the H.264 standard by a preponderance of the evidence for the reasons that follow. See Pet. 50–56. Patent Owner does not present separate arguments for claims 3, 4, 7, and 8.

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<sup>8</sup> Neither party presents evidence of objective considerations of nonobviousness at this stage of the proceeding.

See PO Resp. 17 (“Velos addresses only independent Claims 1 and 5 in this Response, as the dependent claims are necessarily valid in light of Petitioner’s failure to prove Claims 1 and 5 obvious.”) (citing *In re Fine*, 837 F.2d 1071, 1076 (Fed. Cir. 1988)).

Claim 3 recites, *inter alia*, “wherein the circuitry is further configured to: set a second chroma QP for a first chroma component based on a first value of the parameter; and set a third chroma QP for a second chroma component based on a second value of the parameter.” Claim 7 recites, *inter alia*, “setting a second chroma QP for a first chroma component based on a first value of the parameter; and setting a third chroma QP for a second chroma component based on a value of the parameter.” We interpret “a value of the parameter” in the latter clause of claim 7 as distinct from “a first value of the parameter” in the former clause of claim 7 as is consistent with claim 3.

With respect to these claims, Petitioner contends that “[i]n H.264, the two chroma components in H.264 are Cb and Cr,” either of which corresponds to the first chroma component recited in claims 3 and 7. Pet. 52 (citing Ex. 1002 ¶¶ 140, 156). According to Petitioner, “[a] POSA would have understood that when decoding using H.264, the chroma QP values may be calculated for each macroblock.” *Id.* at 51 (citing Ex. 1002 ¶ 117 (citing Ex. 1004, 0118)). More particularly, Petitioner contends that “chroma quantization parameter  $QP'_C$  may be set to different values for different macroblocks within a single picture because  $QP'_C$  depends on  $QP_Y$  through the parameter  $qPI$  and can vary per macroblock.” *Id.* at 52 (citing Ex. 1002 ¶ 117); see also *id.* at 51 (citing Ex. 1004, 118 (Eqn. 7–35)); *id.* at

52–54 (citing Ex. 1004, 198 (Eqns. 8–315, 3–316, 8–317, 8–318, Table 8–15)). Petitioner contends

Therefore, the claimed “a first value of the parameter” is taught or at least rendered obvious by H.264 in that H.264 teaches calculating a first value of qPI using the qPoffset for Cb. And the claimed “second chroma QP” is taught or at least rendered obvious by H.264 when it teaches calculating  $QP'_C$  for Cb using this first value of qPI for a particular macroblock, which is different from the macroblock for which the “first chroma quantization parameter” (QP) was set as discussed above.

\* \* \* \*

[T]he claimed “a second value of the parameter” is taught or at least rendered obvious by H.264 in that H.264 teaches calculating a first value of qPI using the qPoffset for Cr. And the claimed “third chroma QP” is taught or at least rendered obvious by H.264 when it teaches calculating  $QP'_C$  for Cr using this first value of qPI for a particular macroblock, which is different from the macroblock for which the “first chroma quantization parameter (QP)” was set as discussed above.

*Id.* at 53–55 (citing Ex. 1002 ¶¶ 117, 143, 156). We have reviewed the cited portions of H.264 and find that they sufficiently support Petitioner’s argument that  $QP'_C$  is calculated for first and second chroma components, Cb and Cr. We further find sufficiently supported Petitioner’s argument that the ordinarily skilled artisan would have understood that  $QP'_C$  varies based on the particular macroblock for which it is calculated because  $QP'_C$  is calculated based on qPI, which is calculated based on  $QP_Y$ , which is in turn calculated based on  $QP_{Y,PREV}$ , the luma quantization parameter “. . . of the previous macroblock in decoding order in the current slice.” Ex. 1004, 118 (Eqn 7–35). Accordingly, we conclude that Petitioner establishes that

claims 3 and 7 are obvious in view H.264, by a preponderance of the evidence.

Claim 4 recites, *inter alia*, “wherein the circuitry is further configured to decode the bit stream to generate the quantization data.” Claim 8 recites, *inter alia*, “decoding the bit stream to generate the quantization data.” With respect to these claims, Petitioner contends

In H.264, a “bistream” refers to either a “NAL unit stream” or a “byte stream,” both of which are also defined by H.264. . . . A “NAL unit stream” is a “sequence of NAL units.”. . . “NAL units” indicate the type of data to follow and bytes of data. . . . The process of decoding NAL units is described in section 8.1 of H.264. . . . These processes extract “the RBSP”—or the “raw byte sequence payload”—from NAL units. *Id.* The raw bytes associated with encoded picture data can reflect quantized data associated with the luma or chroma components of the image (depending on the encoding mode and whether all components are present in the bitstream).. . . Therefore, the decoding processes described in section 8 of the H.264 standard teach decoding the bit stream to generate the quantization data,” which is simply the data upon which H.264 will perform a scaling (inverse quantization) operation.

Pet. 56 (citing Ex. 1002 ¶¶ 145–146, 157; Ex. 1004, 27, 31, 125.). We have reviewed the cited portions of H.264, Dr. Havlicek’s testimony, and Petitioner’s arguments and conclude that Petitioner establishes that claims 4 and 8 are obvious in view H.264, by a preponderance of the evidence.

*E. Obviousness over H.264 and Kim*

Petitioner contends that claims 1, 3–5, 7, and 8 are unpatentable under 35 U.S.C. § 103 as obvious over H.264 and Kim. *Id.* at 34–56. We are persuaded that the evidence, including Dr. Havlicek’s testimony, supports Petitioner’s arguments. Petitioner thus establishes that these claims are

unpatentable as obvious in view of the H.264 standard and Kim by a preponderance of the evidence.

1. *Overview of Kim (Ex. 1006)*

Kim concerns “[a] method and an apparatus for transforming/inverse transforming and quantizing/dequantizing a color image[.]” Ex. 1006 at code (57). Kim further discloses calculating chrominance quantization parameters. *See, e.g., id.* ¶ 14.

2. *Independent Claim 1*

Petitioner contends “Kim teaches ‘an apparatus for decoding a color image,’ that includes a number of components such as an ‘entropy decoder’ a ‘dequantizer,’ and ‘a frequency inverse transformer.’” Pet. 35 (citing Ex. 1006 ¶¶ 22, 23, 25, 71–74, Fig. 15; Ex. 1002 ¶ 127). Petitioner also contends that Kim “further teaches that the disclosed methods for decoding color images can be implemented on computer-readable media designed to be executed by a ‘computer system,’ which a POSA would have understood to include ‘circuitry’ that is ‘configured’ to perform the decoding processes described therein.” *Id.* (citing-in-part Ex. 1006 ¶ 90). Petitioner further relies on Kim to explain how a “residual\_colour\_transform\_flag is set to zero, for example, when a residual transformation is not performed on the chroma coefficients.” *Id.* at 39–40 (citing Ex. 1006 ¶¶ 14, 21).

Patent Owner does not present any substantive contentions with respect to this ground, except that Kim does not cure the deficiencies of H.264. *See* PO Resp. 54.

Paragraph 90 of Kim does not exist—we understand Petitioner’s citation to this paragraph to be a typographical error—paragraph 79 of Kim, however, discloses that its invention “can also be embodied as computer

readable codes on a computer-readable storage medium,” which “is any data storage device that can store data which can be thereafter read by a computer system.” We are persuaded that paragraph 79 of Kim provides sufficient support for Petitioner’s contention that the combination of H.264 and Kim teaches or suggests “[a] decoding apparatus, comprising: circuitry configured to” perform the functions recited in claim 1. As to the remainder of the limitations recited in claim 1, Petitioner’s analysis is the same as set forth above with respect to the challenge applying H.264 alone. *See* Pet. 34–56. Our analysis, therefore, is substantially similar to the analysis set forth above with respect to the challenge applying H.264 alone. *See supra* III.F.3.

*Rationale for Combining H.264 and Kim*

According to Petitioner, “[a] POSA would have been motivated to implement H.264 in a decoder and its attendant circuitry either based on the teachings of H.264 alone *or in view of Kim*.” Pet. 47 (citing Ex. 1002 ¶¶ 97, 135, 136) (emphasis added). In support of its rationale for combining H.264 and Kim, Petitioner argues that (1) Kim describes the same processes as H.264 for quantizing and inverse quantizing color images, and moreover, Kim’s quantization process uses the same equations as disclosed in H.264; (2) “[b]ecause H.264 describes the processes to be implemented in a standards-compliant decoder, a POSA would have been led to examine prior art references that relate to such decoders to see aspects of hardware implementations and structures of those decoders, such as those taught by Kim.” *Id.* at 48 (citing-in-part Ex. 1002 ¶ 136).

Patent Owner does not present any substantive contentions with respect to Petitioner’s rationale for combining or otherwise for this ground, except that Kim does not cure the deficiencies of H.264. *See* PO Resp. 54.

We are persuaded that Petitioner's stated rationale for combining H.264 and Kim is supported by sufficient rational underpinning. We have reviewed Petitioner's arguments and evidence concerning claim 1 and we are persuaded that Petitioner establishes that claim 1 is unpatentable obvious in view of H.264 and Kim by a preponderance of the evidence.

3. *Independent Claim 5*

Petitioner relies on the same analysis for its challenges to claims 1 and 5. Pet. 50. For reasons substantially similar to those set forth above in Section III.E.2, we are persuaded that Petitioner establishes that claim 5 is unpatentable as obvious over the combination of H.264 and Kim by a preponderance of the evidence.

4. *Dependent Claims 3, 4, 7, and 8*

As to dependent claims 3, 4, 7, and 8, Petitioner's analysis is the same as set forth above with respect to the challenge applying H.264 alone. See Pet. 34–56. Patent Owner does not present separate arguments for claims 3, 4, 7, and 8. See PO Resp. 17. Our analysis, therefore, is substantially similar to the analysis set forth above with respect to the challenge applying H.264 alone. See *supra* III.D.5. We have reviewed Petitioner's arguments and evidence concerning claims 3, 4, 7, and 8 and are persuaded that Petitioner establishes that these claims are unpatentable as obvious over the combination of H.264 and Kim by a preponderance of the evidence. See Pet. 50–56.

F. *Real Party in Interest Arguments*

Patent Owner argues that we should dismiss the Petition because it does not name all real parties in interest. PO Resp. 2–3, 56–61. Patent Owner identifies several business entities that have paid membership fees to

Petitioner and asserts that those entities should have been named as real parties in interest. *Id.* at 56–58.

Petitioner challenges Patent Owner’s assertions, arguing that Unified Patents Inc. is the sole real party in interest. Pet. Reply 15–24. Petitioner cites evidence that it alone controls this proceeding and does not communicate with its members about potential validity challenges before filing IPRs. *Id.* at 18–19 (citing Ex. 2152, 10–11; Ex. 2138, 31:25–33:2, 222:16–223:4).<sup>9</sup> Petitioner avers that it searched for and could not identify any communications with its members regarding the ’898 patent or this proceeding other than public announcements. *Id.* at 19–20 (citing Ex. 2013; Ex. 2161, 68:22–69:9<sup>10</sup>). Petitioner further points out that no alleged unnamed real party in interest would be subject to a time bar under 35 U.S.C. § 315(b). *Id.* at 20.

Based on the foregoing facts, we 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.

Patent Owner does not allege that inclusion of the business entities it identifies as real parties in interest would have barred the Petition under 35 U.S.C. § 315. Aside from a bar defense, under the Board’s precedential

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<sup>9</sup> Ex. 2152 does not have a corresponding redacted version. Ex. 2138 is redacted as Ex. 1040.

<sup>10</sup> Ex. 2161 is redacted as Ex. 1043.

decision in *Lumentum Holdings, Inc. v. Capella Photonics, Inc.*, our jurisdiction to consider a petition does not require a “correct” identification of all real parties in interest in a petition. Case IPR2015- 00739, slip op. at 6 (PTAB March 4, 2016) (Paper 38) (precedential); *see also Blue Coat Sys., Inc. v. Finjan, Inc.*, Case IPR2016-01444, slip op. 10 (PTAB July 18, 2017) (Paper 11) (“Evidence [of failure to identify all real parties in interest] is, at best, suggestive of an issue that is not jurisdictional.”). We understand that on a more fully developed record, the business entities may, in fact, be shown to be estopped, but we leave that determination for when it arises. We conclude that membership in a technology zone is, without more, insufficient to establish that an entity is a real party in interest.

#### *G. Constitutionality Arguments*

Patent Owner asserts that the “Board lacks the authority to issue a Final Written Decision in this proceeding because the Administrative Patent Judges (‘APJs’) are principal officers of the United States that must be appointed by the President and confirmed by the Senate.” PO Resp. 54. 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 55.

We decline to consider Patent Owner’s constitutional challenge as the issue has been addressed by the Federal Circuit. *See Arthrex*, 941 F.3d at 1328.

#### IV. SUMMARY

We determine that Petitioner establishes, by a preponderance of the evidence, that claims 1, 3–5, 7, and 8 are unpatentable as obvious over

H.264 alone and that claims 1, 3–5, 7, and 8 are unpatentable as obvious over the combination of H.264 and Kim.

| <b>Claims</b>              | <b>35<br/>U.S.C.<br/>§</b> | <b>Reference(s)/<br/>Basis</b> | <b>Claims Shown<br/>Unpatentable</b> | <b>Claims Not<br/>Shown<br/>Unpatentable</b> |
|----------------------------|----------------------------|--------------------------------|--------------------------------------|----------------------------------------------|
| 1, 3–5, 7, 8               | 103                        | H.264                          | 1, 3–5, 7, 8                         |                                              |
| 1, 3–5, 7, 8               | 103                        | H.264 and<br>Kim               | 1, 3–5, 7, 8                         |                                              |
| <b>Overall<br/>Outcome</b> |                            |                                | 1, 3–5, 7, 8                         |                                              |

#### V. ORDER

It is, therefore,

ORDERED that:

claims 1, 3–5, 7, and 8 are unpatentable under 35 U.S.C. § 103 as obvious over H.264; and

claims 1, 3–5, 7, and 8 are unpatentable under 35 U.S.C. § 103 as obvious over H.264 and Kim.

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