

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

UNIFIED PATENTS, LLC,
Petitioner,

v.

SOVEREIGN PEAK VENTURES, LLC,
Patent Owner.

IPR2021-00705
Patent 9,042,457 B2

Before KEVIN F. TURNER, GARTH D. BAER, and JOHN R. KENNY,
Administrative Patent Judges.

KENNY, *Administrative Patent Judge.*

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

I. INTRODUCTION

Unified Patents, LLC (“Petitioner”) filed a Petition to institute an *inter partes* review of claims 7 and 8 (the “challenged claims”) of U.S. Patent No. 9,042,457 B2 (Ex. 1001, the “’457 patent,” “challenged patent”) pursuant to 35 U.S.C. § 311 *et seq.* Paper 2 (“Pet.”). Sovereign Peak Ventures, LLC (“Patent Owner”) waived the filing of a preliminary response. Paper 7.

On October 4, 2021, we instituted an *inter partes* review of all challenged claims. Paper 10. Patent Owner filed a Patent Owner Response (Paper 14, “PO Resp.”). Petitioner filed a Reply (Paper 20, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 22, “PO Sur-reply”).

We have jurisdiction under 35 U.S.C. § 6. For the reasons discussed below, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 7 and 8 are unpatentable.

A. Related Matters

The parties identify the following related district court litigations:

- (i) *Sovereign Peak Ventures, LLC v. LG Electronics, Inc.*, 2:20-cv-00107 (E.D. Tex.)¹; and
- (ii) *Sovereign Peak Ventures, LLC v. TCL Technology Group Corp.*, 2:21-cv-00007 (E.D. Tex.).

Pet. 68–69; Paper 4, 2.

B. Challenged Patent

The ’457 patent relates to “an image decoding apparatus, an image coding apparatus, an image decoding method, and an image coding method for decoding or coding video data.” Ex. 1001, 1:7–10. The ’457 patent’s image decoding apparatus:

¹ This case has terminated. Paper 4, 2.

decodes, in parallel, a coded stream having processing order dependency [and] includes: a slice data predecoding unit which predecodes, on a macroblock group basis, macroblock groups included in the coded stream to generate macroblock decoding information necessary for decoding other macroblock groups; and a first macroblock decoding unit and a second macroblock decoding unit each of which decodes a corresponding one of macro block groups included in the coded stream in parallel.

Ex. 1001, code (57). “Each of the macroblock decoding units, when decoding the corresponding one of macroblock groups, uses the macroblock decoding information that has been generated for the other macroblock group.” *Id.*

Figure 1 of the '457 patent is reproduced below:

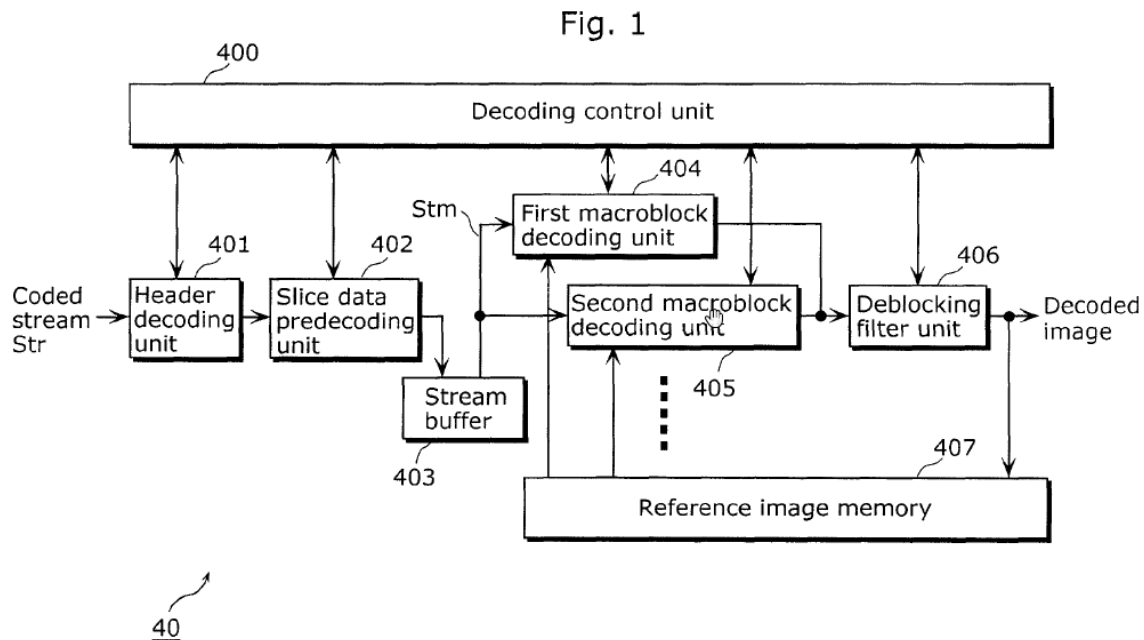


Figure 1 above is a block diagram of image decoding apparatus 40.

Ex. 1001, 6:66–67. “[I]mage decoding apparatus 40 includes: a decoding control unit 400; a header decoding unit 401; a slice data predecoding unit 402; a stream buffer 403; a first macro block decoding unit 404; a second macroblock decoding unit 405; deblocking filter unit 406; and a reference

image memory 407.” *Id.* at 7:1–6. The “slice data predecoding unit 402 obtains, from the header decoding unit 401, the coded stream Str in which the header is decoded, and decodes a parameter (a parameter for parallel processing) that is needed in advance for decoding, in parallel, a macro block included in the coded stream Str.” *Id.* at 7:16–20.

Figure 2 of the ’457 patent is reproduced below:

Fig. 2

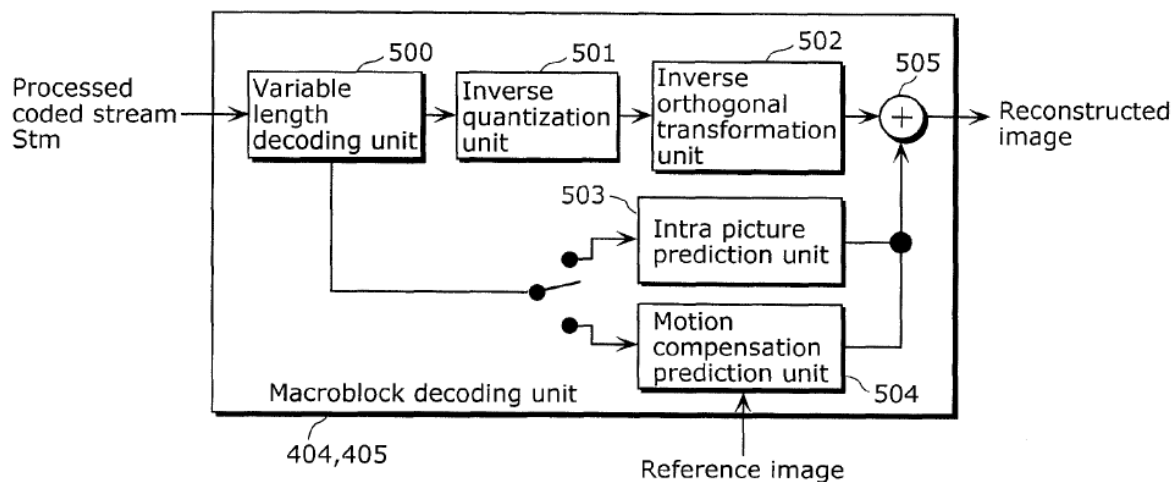


Figure 2 above is a block diagram of a macroblock decoding unit. Ex. 1001, 7:59. In Figure 1 above, “[t]he first macroblock decoding unit 404 and the second macroblock decoding unit 405 have the same structure.” *Id.* at 7:60–61. As shown in Figure 2 above, “each of the first macro block decoding unit 404 and the second macroblock decoding unit 405 includes: a variable length decoding unit 500; an inverse quantization unit 501; an inverse orthogonal transformation unit 502; an intra picture prediction unit 503; a motion compensation prediction unit 504; and an adding circuit 505.” *Id.* at 7:62–67.

The ’457 patent acknowledges that “new coding systems such as H.264/MPEG-4AVC (ISO/IEC14496-10) (hereinafter simply referred to as

‘H.264’^[2]) or VC-1 (SMPTE 421M) have come into use in recent years.”

Ex. 1001, 1:14–22. Figure 3 of the ’457 patent is reproduced below:

Fig. 3

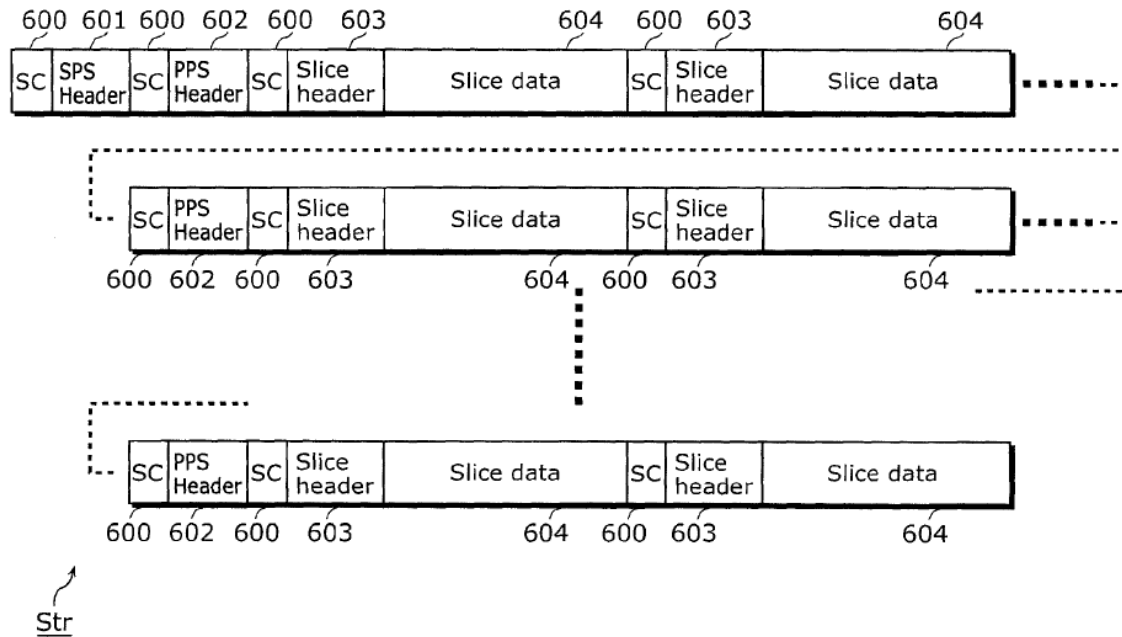


Figure 3 above is a structure diagram of a typical coded stream of the H.264 standard. *Id.* at 5:51–52. In Figure 3:

[a] sequence parameter set (SPS) header 601 is located at the beginning of the coded stream Str, and followed by a picture parameter set (PPS) header 602, a slice header 603, and slice data 604. A start code (SC) that is a delimiter of data is inserted into the beginning of the SPS header 601, the PPS header 602, and the slice header 603.

Id. at 8:35–40. “The slice data predecoding unit 402 performs variable length decoding on the macroblock layer data included in the slice data 604, thereby

² In this Decision, we use “H.264” by itself to refer to Exhibit 1006, as the Petition does. Pet. iii. We use the term “H.264 standard” to refer to the standard.

obtaining the parameter for parallel processing described above.” *Id.* at 8:52–55.

C. Challenged Claims

Petitioner challenges claims 7 and 8 (Pet. 5–6), which read:

7. [7.0]³ An image decoding method for decoding, using a processor, a coded stream generated by coding, on a block-by-block basis, a picture including blocks, said image decoding method comprising:

[7.1] performing, on a block group-by-block group basis, variable length decoding, and

[7.2] generating block decoding information using a result of the variable length decoding for each of a plurality of block groups which (i) contain blocks, (ii) are different from each other, and (iii) are included in the coded stream,

[7.3] the block decoding information for the block group being a parameter necessary for decoding another block group from among the plurality of block groups; and

[7.4] decoding, on a block-by-block basis using the block decoding information generated using the result of the variable length decoding performed in said performing, each of the plurality of block groups in parallel,

[7.5] wherein said decoding performed on the block-by-block basis on each of the plurality of block groups in parallel includes re-executing the variable length decoding on each of the plurality of block groups on which the variable length decoding has been performed in said performing to determine a prediction mode to be performed on the block group.

³ For ease of reference, the brackets contain Petitioner’s labels for the preamble of claim 7 and the limitations of claims 7 and 8. Pet. 14, 48.

8. The image decoding method according to claim 7, [8.1] wherein the block decoding information is generated to include at least a quantization parameter.

Ex. 1001, 30:13–37; Ex. 2003.⁴

D. Asserted Challenges to Patentability and Prior Art

Petitioner challenges claims 7 and 8 based on the grounds in the table below.

Ground	Claim(s) Challenged	35 U.S.C. §	References
1	7, 8	103(a) ⁵	Pearson ⁶ , H.264 ⁷
2	7	103(a)	Chen, ⁸ H.264

Pet. 4–5.

Petitioner submitted two declarations from its expert, Dr. Immanuel Freedman (Exs. 1003, 1023). Patent Owner did not submit a declaration from any expert in this proceeding. *See* Paper 26.

⁴ Claim 8 was corrected via a certification of correction. Ex. 2003.

⁵ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284 (2011), amended 35 U.S.C. § 103, effective March 16, 2013. Because the effective filing dates of the challenged claims are before this date, the pre-AIA version of § 103 applies.

⁶ US 7,983,343 B2 (“Pearson”) (Ex. 1005).

⁷ Advanced Video Coding (AVC) Standard, Rec. ITU-T H.264, 2nd ed. Mar. 2005 (“H.264”) (Ex. 1006).

⁸ Jian-Wen Chen and Youn-Long Lin, “A High-Performance Hardwired CABAC Decoder,” Published in 2007 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP '07) (2007), per <https://ieeexplore.ieee.org/document/4217339> (“Chen”) (Ex. 1007).

II. LEVEL OF SKILL AND CLAIM CONSTRUCTION

A. Level of Skill in the Art

To determine the level of an ordinarily skilled artisan, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (quotation omitted).

Petitioner, citing Dr. Freedman’s testimony, proposes that an ordinarily skilled artisan at the time of the invention would have had at least “(1) an undergraduate degree in electrical engineering or a closely related scientific field, such as physics, computer engineering, or computer science, or similar advanced post-graduate education in this area; and (2) two or more years of experience with video processing.” Pet. 19 (citing Ex. 1003 ¶¶ 38–40). Petitioner also argues that “[m]ore relevant experience could substitute for less education, and vice versa.” *Id.*

Patent Owner “mostly agrees with Petitioner’s position, but believes that the use of the terms “*at least*” and “*two or more years*” is inappropriate. PO Resp. 15 (first emphasis added). Patent Owner requests that we omit the above italicized terms from Petitioner’s proposed definition. *Id.* In its Reply, Petitioner does not object to Patent Owner’s proposed amendments to Petitioner’s definition of an ordinarily skilled artisan.

Upon review of the record, we agree with Petitioner’s proposed definition for the ordinary level of skill in the art with the modifications proposed by Patent Owner. We find that this modified definition is reasonable in light of the subject matter involved in the ’457 patent, and

adopt this modified definition. In other words, we find that an ordinarily skilled artisan at the time of the invention would have had (1) an undergraduate degree in electrical engineering or a closely related scientific field, such as physics, computer engineering, or computer science, or similar advanced post-graduate education in this area; and (2) two years of experience with video processing. Ex. 1003 ¶¶ 38–40. Further, we find that “[m]ore experience [could] substitut[e] for less education, and vice versa.” *Id.* ¶ 39.

B. Claim Construction

In an *inter partes* review proceeding based on a petition filed on or after November 13, 2018, a patent 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). 37 C.F.R. § 42.100(b) (2019). This rule adopts the same claim construction standard used by Article III federal courts, which follow *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc), and its progeny. Under this standard, the words of a claim are generally given their “ordinary and customary meaning,” which is the meaning a term would have to a person of ordinary skill at the time of the invention, in the context of the entire patent including the specification. *See id.* at 1312–13.

1. Block Decoding Information

In the Petition, Petitioner proposes that we construe the term “block decoding information” as “a parameter necessary for decoding other macroblock groups.” Pet. 20 (citing Ex. 1001, code (57), quoting Ex. 1003

¶¶ 31–35⁹). In its Response, Patent Owner argues that no construction of the term is needed because claim 7 defines “block decoding information” as “a parameter necessary for decoding another block group from among the plurality of block groups.” PO Resp. 11. In its Reply, Petitioner argues that there is no substantive difference between Petitioner’s proposed construction and the definition Patent Owner urges for the term. Pet. Reply 1–2. In the Sur-reply, Patent Owner reiterates that its definition for “block decoding information” is correct. Sur-reply 3–4.

We agree with Patent Owner that the term “block decoding information” does not require construction. Claim 7 recites that its “block decoding information” is “a parameter necessary for decoding another block group from among the plurality of macroblocks.” Ex. 1001, 30:13–33. Petitioner’s proposed construction adds the requirement that the “block decoding information” be “a parameter necessary for decoding other macroblock *groups*,” rather than just another block group. Pet. 20 (emphasis added). Petitioner provides no persuasive explanation of why “block decoding information” should have such an additional requirement. *Id.* The definition that Petitioner cites from the Specification for “block decoding information” has no such requirement. Ex. 1001, 3:17–19. Petitioner, in fact, acknowledges that the definition in the Specification does not require that “block decoding information” be “a parameter necessary for decoding other macroblocks” by arguing that “[t]he ’457 patent explicitly defines

⁹ Paragraph 33 of Exhibit 1003 indicates that the quoted language is also found in the abstract of the ’457 patent, but the full quoted phrase does not appear in that abstract. Ex. 1001, code (57).

‘block decoding information [as] being a parameter necessary for decoding an other [sic] block *group*.’” Pet. 20 (emphasis added).

The remainder of Petitioner’s construction for “block decoding information” by itself is already recited in claim 7 (i.e., a parameter necessary for decoding a macroblock). Thus, construing “block decoding information” to be “a parameter necessary for decoding a macroblock” is not necessary because claim 7 expressly recites that requirement. Further, we do not want to construe the term “block decoding information” in isolation in a manner that would render its express definition in claim 7 superfluous, as constructions that render claim language superfluous are highly disfavored. *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 801, 810 (Fed. Cir. 2021) (“It is highly disfavored to construe terms in a way that renders them void, meaningless, or superfluous.”) (quoting *Wasica Finance GmbH v. Continental Automotive Systems, Inc.*, 853 F.3d 1272, 1288 n.10 (Fed. Cir. 2017)).

Therefore, we determine that the term “block decoding information” in isolation does not require construction. Claim 7 properly defines the term.¹⁰

2. Block Group

Patent Owner proposes construing “block group” as “a row (or line) of macroblocks.” PO Resp. 12; Sur-reply 7. Petitioner proposes construing “block group” as “a plurality of macroblocks that may be allocated to a slice.” Pet. Reply 2. Petitioner, however, acknowledges that the Specification teaches that a macroblock line is a block group. *Id.* Further,

¹⁰ We note, however, that adopting Petitioner’s proposed construction would not affect our Decision. Petitioner has proven that the “block decoding information” in Pearson is a parameter necessary for decoding macroblock groups. See Pet. 39–41; Ex. 1003 ¶¶ 102–103; Ex. 1005, 2:49–54.

the Specification, in fact, teaches that a macroblock line is a block group. Ex. 1001, 8:1–7. In describing decoding unit 500, the Specification states that “[t]he variable length decoding unit 500 performs variable length decoding on a *block group including plural macroblocks (for example, a macroblock line)* to be decoded.” *Id.* (emphasis added). Further, Petitioner has not objected to characterizing a row as a block group. Pet. Reply 2–3. Thus, no party has expressed any objection to construing a block group as encompassing a row or line of macroblocks.

Petitioner, however, objects to limiting the term “block group” to a row or line of macroblocks. Pet. Reply 2–3. Petitioner argues that the term, if construed, should be construed more broadly. *Id.* Patent Owner disagrees. PO Resp. 12; Sur-reply 7. For purposes of this Decision, we do not need to determine whether a broader construction of “block group” is warranted or whether, in particular, Petitioner’s broader proposed construction is correct. Construing the term “block group” as encompassing the undisputed subject matter of a row or line of macroblocks is all that is needed to resolve the disputes in this case. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017); *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.”). Thus, we construe the term “block group” as encompassing a line or row of macroblocks.

3. *Decoding . . . Each of the Plurality of Block Groups in Parallel*

Patent Owner proposes construing the phrase “decoding . . . each of the plurality of block groups in parallel” as “decoding one of the block groups (from the plurality of block groups) in parallel with another one of the block

groups (from the plurality of block groups).” PO Resp. 13. Petitioner argues that this decoding phrase should be given its plain and ordinary meaning, but does not specify what that plain and ordinary meaning is. Pet. Reply 3. Further, Petitioner argues that the challenged claims are rendered unpatentable even with Patent Owner’s proposed construction. *Id.* At the hearing, Petitioner acknowledged that Patent Owner’s construction reflects the plain and ordinary meaning of the phrase “decoding . . . each of the plurality of block groups in parallel” and that Petitioner has no objection to us adopting Patent Owner’s proposed construction. Tr. 9:5–11:12. Upon reviewing the record, we adopt Patent Owner’s proposed construction for “decoding . . . each of the plurality of block groups in parallel.” *See* Ex. 1001, 9:8–31, Fig. 5 (404, 405, lines 1–4).

III. ANALYSIS OF ASSERTED GROUNDS

Petitioner must establish unpatentability by a preponderance of the evidence. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). “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”)). This burden 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. v. Videotek, Inc.*, 545 F.3d 1316, 1326–27 (Fed. Cir. 2008)) (discussing the burden of proof in *inter partes* review). As set forth below, we determine that Petitioner has met its burden of

proving, by a preponderance of the evidence, the unpatentability of the challenged claims.

A. Secondary Considerations

Neither party has argued that any secondary considerations or objective evidence of nonobviousness exist. Thus, we do not address secondary considerations or objective evidence of nonobviousness in this Decision.

B. Asserted Obviousness over Pearson and H.264

Petitioner asserts that claims 7 and 8 would have been obvious over Pearson and H.264. Pet. 5.

1. Pearson

Pearson discloses a method for decoding high definition video using context adaptive binary arithmetic decoding. Ex. 1005, 1:7–9. Pearson teaches that the H.264 standard “uses serial execution of arithmetic decodes, and a full syntax element decode,” which “limit CABAC [context adaptive binary arithmetic coding] decode rates by supporting lower profiles and/or constraining these limits within a proprietary framework.” *Id.* at 1:31–44, *see also id.* at 1:13–15. Pearson teaches a method of CABAC decoding that may “provide quicker access to data needed for context calculations by performing a partial decode of syntax elements” and “be speed-up [sic] due to the parallelism of arithmetic decode and next context calculation.” *Id.* at 1:59–2:10.

Figure 1 of Pearson is reproduced below:

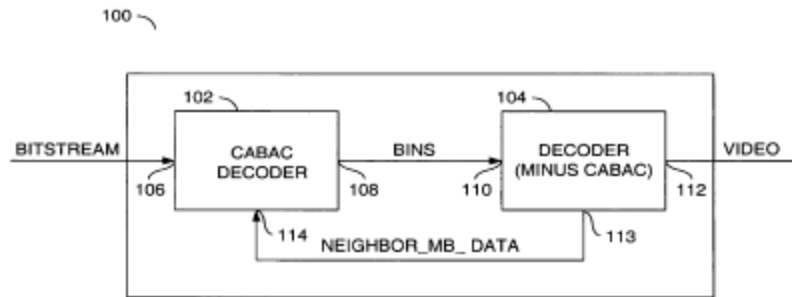


FIG. 1

Figure 1 above is a block diagram of system 100 with CABAC decoder 102 and decoder 104. Ex. 1005, 2:17–18. “CABAC decoder 102 may determine the context information to decode (with an integer) a bin before the decoder 104 decodes each bin (or binary information bit) over the signal BINS.” *Id.* at 2:46–49. “The context information may be derived from temporally previous and/or spatially adjacent data” and “may be decoded (i) within a current macroblock data and (ii) as a neighbor macroblock data (from macroblocks to the left, and above a current macroblock).” *Id.* at 2:49–54. Neighbor macroblock data may disclose items “defined by the H.264 Standard.” *Id.* at 2:54–63. CABAC decoder 102 pre-decodes certain of the bins in order to determine certain syntax elements that are required to decode the current macroblock group and the neighboring macroblock groups, including the necessary neighbor macroblock data (NEIGHBOR_MB_DATA), which can include syntax elements such as the quantization parameter (Mb_qp_delta). *Id.* at 2:32–42; 3:40–58.

The non-CABAC decoder 104 processes those pre-decoded syntax elements and then sends that data back to the CABAC decoder 102.

Ex. 1005, 2:32–42. CABAC decoder 102 then uses that pre-decoded neighbor data to derive the context information, which is used to decode the current and neighboring macroblocks that require such data. *Id.* at 2:49–54. “The CABAC decoder 102 may allow decoding (via the arithmetic decoder 128) and context calculation (via the bin state machine 122 and the context determination circuits 120 and 124) to occur in parallel.” *Id.* at 4:38–45.

2. H.264

H.264 is an advanced video coding standard for generic audiovisual services. *See* Ex. 1006, 1. In H.264, syntax elements are “represented in [a] bitstream” (*id.* § 3.149), and the decoding process “behaves according to the value of the syntax element” (*id.* § 5.8). H.264 describes an adaptive binary arithmetic decoding process, which is an entropy decoding process that derives the values of bins from a bitstream produced by an adaptive binary arithmetic encoding process. *Id.* § 3.3. H.264 describes a CABAC parsing process for slice data. *Id.* § 9.3.

Figure 9.1 of H.264 is reproduced below:

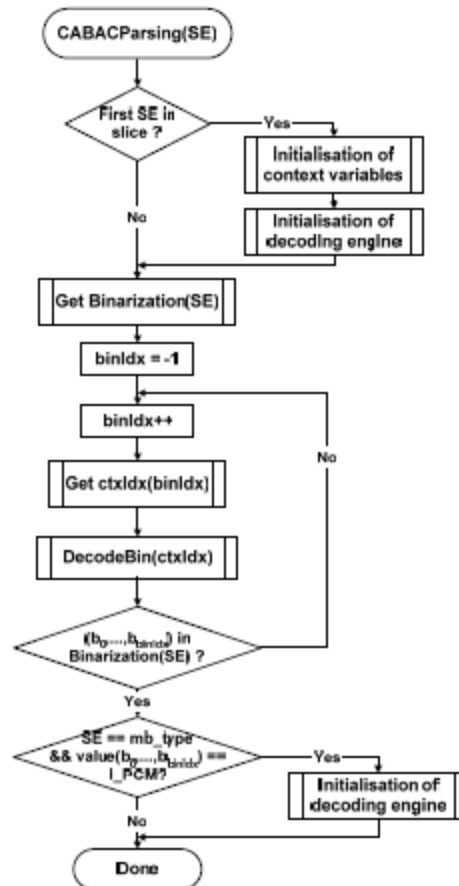


Figure 9-1 – Illustration of CABAC parsing process for a syntax element SE (informative)

Figure 9.1 above is an illustration of a CABAC parsing process for a syntax element. Ex. 1006 § 9.3.

3. Assertion of Analogous Art

Petitioner argues that Pearson and H.264 are analogous art because they are in the same field of endeavor as the '457 patent, which Petitioner describes as systems and methods of decoding video data. Pet. 26–27 (citing Ex. 1001, 1:7–10; Ex. 1005, 1:6–9, Ex. 1006 § 1; Ex. 1003 ¶ 83). Patent Owner does not dispute this assertion. After reviewing the record, we

determine that Petitioner has proven that Pearson and H.264 are analogous art.

4. Motivation to Combine

Petitioner argues that an ordinarily skilled artisan would have been motivated to incorporate H.264's teachings related to CABAC decoding into Pearson's decoding system. Pet. 28 (citing Ex. 1003 ¶ 85). Petitioner asserts that Pearson explicitly references "[t]he H.264 standard (or JVT-050 H.264/AVC standard, JVT-050 or more recently: ITU-T Rec H.264|ISO/IEC 14496-10 and all amendments, Current Revisions H.264(E))" and discusses its system as an improvement on "conventional H.254 video codec systems." *Id.* (quoting Ex. 1005, 1:13–44). Petitioner also asserts that H.264 states that it "specifies ITU-T Recommendation H.264 | ISO/IEC International Standard ISO/IEC 14496-10 video coding." *Id.* (quoting Ex. 1006 § 1).

Further, Petitioner argues that Pearson discloses that its CABAC decoder "may be an H.264 decoder." *Id.* (quoting Ex. 1005, 2:43–44, citing *id.* at 3:13–14). In addition, Petitioner argues Pearson references the neighborhood macroblock data as including items "[a]s defined by the H.264 Standard" and describes "pars[ing] the H.264 bin grammar of the bins as described in the H.264 standard." *Id.* (quoting Ex. 1005, 2:54–63, 3:40–47) (bracketed text added by Petitioner). Further, Petitioner contends that Pearson states that "the relevant portions of [the H.264 standard] are incorporated by reference." *Id.* (quoting Ex. 1005, 3:58–61) (bracketed text added by Petitioner). Petitioner concludes that Pearson provides a motivation to combine its teachings with H.264. *Id.* (citing Ex. 1003 ¶ 85).

Patent Owner does not dispute that an ordinarily skilled artisan would have been motivated to combine Pearson's and H.264's teachings. After

reviewing the record, we determine that Petitioner has proven that an ordinarily skilled artisan would have been motivated to combine Pearson's and H.264's teachings.

5. *Claim 7*

We address the preamble and all limitations of claim 7 below. The only disputed claim limitation, however, is limitation 7.4.

a. preamble

The preamble of claim 7 recites “[a]n image decoding method for decoding, using a processor, a coded stream generated by coding, on a block-by-block basis, a picture including blocks.” Petitioner argues that Pearson discloses, or at least renders obvious in view of H.264, the preamble. Pet. 29 (citing Ex. 1003 ¶¶ 86–88). Petitioner further asserts that Pearson discloses “a method and/or apparatus for implementing context adaptive binary arithmetic *decoding* for high definition video.” *Id.* (quoting Ex. 1005, 1:7–10) (some emphasis omitted). Petitioner argues that this *decoding* is done by multiple circuits, quoting the following disclosure from Pearson:

[t]he first circuit may be configured *to a video signal and macroblock data* in response to decoding one or more bins on a binary signal. The second circuit may be configured to, *in parallel (i) generate the binary signal in response to a bitstream signal* and an initial context information and (ii) calculate subsequent context information.

Id. (quoting Ex. 1007, code (57)) (emphases by Petitioner). Petitioner further asserts that Pearson teaches that the “present invention may be applied to a number of multiple *CPU* software implementations” and that “[a] *CPU* may perform each task in parallel.” *Id.* (quoting Ex. 1005, 5:50–52) (emphasis added).

Petitioner argues that Pearson discloses that its decoder “may be an H.264 decoder.” Pet. 28 (quoting Ex. 1005, 2:43–44). Petitioner further argues that, in light of this disclosure of H.264, it would have been obvious to use block-by-block decoding in Pearson. *Id.* at 30 (citing Ex. 1003 ¶ 87; Ex. 1008, 28). Petitioner argues that, therefore, Pearson in view of H.264 renders the preamble of claim 7 obvious. *Id.* at 31 (citing Ex. 1003 ¶¶ 86–88). Patent Owner provides no counterarguments for the preamble of claim 7.

After reviewing the record, we determine that Petitioner has proven that Pearson and H.264 suggest the preamble of claim 7.¹¹

b. [7.1] performing, on a block group-by-block group basis, variable length decoding

Petitioner argues that Pearson discloses, or renders obvious in view of H.264, limitation 7.1. Pet. 31 (citing Ex. 1003 ¶¶ 89–95). Petitioner asserts that Pearson discloses “a method and/or apparatus for implementing *context adaptive binary arithmetic decoding [i.e., CABAC]* for high definition video.” *Id.* (quoting Ex. 1005, 1:7–9) (bracketed text added by Petitioner) (emphasis by Petitioner). Petitioner further argues that an ordinarily skilled artisan would understand “performing on a block group-by-block group basis” to mean that the decoding is done on plural macroblocks, that may be allocated to a slice. *Id.* at 33 (citing Ex. 1003 ¶¶ 91–92).

Petitioner asserts that H.264 teaches that CABAC decoding systems decode on a block group-by-block group basis. Pet. 33 (citing Ex. 1003 ¶¶ 93–94). Petitioner further asserts that “H.264 discloses that CABAC

¹¹ For this reason, for this ground, we do not need to determine whether the preamble of claim 7 is limiting.

systems parse slices (that may include a plurality of macroblocks) for slice data.” *Id.* at 34 (citing Ex. 1006 ¶ 9.3, Fig. 9-1). Petitioner argues that, therefore, “the CABAC decoding process in Pearson performs decoding on macroblocks allocated to a slice before moving on to the next slice.” *Id.* (citing Ex. 1003 ¶¶ 89–94). Petitioner further argues that decoding on macroblocks allocated to a slice is decoding on a block group-by-block group basis and CABAC decoding is variable length decoding. *Id.* at 35 (citing Ex. 1003 ¶¶ 89–95). Patent Owner provides no counterarguments for limitation 7.1.

After reviewing the record, we determine that Petitioner has proven that Pearson and H.264 teach or suggest limitation 7.1.

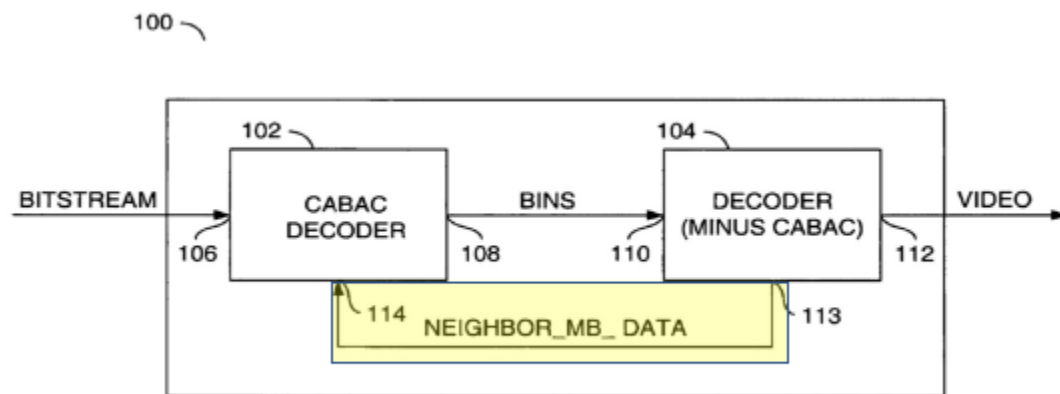
c. [7.2] generating block decoding information using a result of the variable length decoding for each of a plurality of block groups which (i) contain blocks, (ii) are different from each other, and (iii) are included in the coded stream

Petitioner argues that Pearson discloses, or renders obvious in view of H.264, limitation 7.2. Pet. 35 (citing Ex. 1003 ¶¶ 96–101). Petitioner argues that “in conventional H.264 CABAC systems, to determine context information ‘neighborhood information (both above and left) is needed from previously decoded syntax elements within either current or neighboring macroblocks (or neighboring macroblocks to the current macroblock).’” *Id.* (quoting Ex. 1005, 1:20–24) (emphasis by Petitioner). Petitioner further asserts that Pearson “discloses an H.264 CABAC system which provides such decoding in a way that ‘provide[s] quicker access to *data needed for context calculations by performing a partial decode of syntax elements* using a state machine’ and ‘achieve[s] speedup *without needing a full decode of a previous macroblock for neighbor context information.*’” *Id.* at 35–36

(quoting Ex. 1005, 1:59–2:9) (bracketed text added by Petitioner) (emphases by Petitioner).

Petitioner argues that Figure 1 of Pearson shows “the bitstream is received by the CABAC decoder 102 and the system pre-decodes certain syntax elements in the form of bins in order to determine the necessary block decoding information (e.g., neighbor macroblock data (NEIGHBOR_MB_DATA)).” Pet. 36 (citing Ex. 1005, 2:32–42, Fig. 1). Petitioner further asserts that those syntax elements are then processed by the non-CABAC portion of the decoder (104) and sent back to the CABAC decoder (102), where they are necessary for determining the context information needed for performing the full decode of the macroblock group. *Id.*

Petitioner provides the following annotated copy of Figure 1 of Pearson:



Pet. 36. In the above annotated copy of Figure 1, Petitioner highlights the arrow in Figure 1 labeled NEIGHBOR_MB_DATA that extends from output 113 of decoder 104 to input 114 of CABAC decoder 102. *Id.*; Ex. 1005, 2:32–42.

Petitioner argues that the NEIGHBOR_MB_DATA is the recited block decoding information. Pet. 36 (citing Ex. 1005, 2:32–42). Petitioner further asserts that Pearson teaches that “context information may be derived from temporally previous and/or spatially adjacent data. The context information may be decoded (i) within a current macroblock data and (ii) *as a neighbor macroblock data (from macroblocks to the left, and above a current macroblock).*” *Id.* at 37 (quoting Ex. 1005, 2:44–63) (emphasis by Petitioner). Petitioner further asserts that Pearson teaches decoding a plurality of block groups, because it discloses decoding both current macroblocks and neighboring macroblocks to the left and above. *Id.* Petitioner argues that an ordinarily skilled artisan would understand that a neighboring macroblock above a current macroblock may be in a different block group. *Id.* (citing Ex. 1003 ¶¶ 96–98).

Petitioner maps the recited variable length decoding to Pearson’s CABAC decoding. Pet. 38 (citing Ex. 1003 ¶¶ 96–99). Petitioner maps the recited plurality of block groups to the slices including current macroblocks and slices including neighboring macroblocks to the left and above. *Id.* (citing Ex. 1003 ¶¶ 96–99). Petitioner argues that Pearson’s bitstream coding frames that are partitioned into blocks and macroblocks contain blocks, are different from each other, and are included in a coded stream. *Id.* (citing Ex. 1003 ¶¶ 96–99). Patent Owner provides no counterarguments for limitation 7.2.

After reviewing the record, we determine that Petitioner has proven that Pearson and H.264 teach or suggest limitation 7.2.

d. [7.3] the block decoding information for the block group being a parameter necessary for decoding another block group from among the plurality of block groups

Petitioner argues that Pearson discloses, or renders obvious in view of H.264, limitation 7.3. Pet. 39 (citing Ex. 1003 ¶¶ 102–103). Petitioner asserts that Pearson’s neighborhood data is a parameter necessary for decoding another block group. *Id.* Petitioner further asserts that Pearson’s CABAC decoder uses the neighbor data it receives to derive the necessary context information, which is used to decode multiple macroblock groups, including the current and neighboring macroblocks that require such data. *Id.* at 40 (citing Ex. 1005, 2:49–54). Petitioner argues that the neighborhood data is necessary for determining the context information, and the context information is required for decoding another block group. *Id.* (citing Ex. 1003 ¶ 102). According to Petitioner, Pearson, thus discloses or renders obvious: “the block decoding information (e.g., neighborhood data) for the block group (e.g., slice containing prior macroblocks above and/or to the left) being a parameter necessary for decoding another block group from among the plurality of block groups (e.g., neighborhood data needed for decoding a slice containing the current macroblock).” *Id.* at 40–41 (citing Ex. 1003, ¶¶ 102–103) (emphasis omitted). Patent Owner provides no counterarguments for limitation 7.3.

After reviewing the record, we determine that Petitioner has proven that Pearson and H.264 teach or suggest limitation 7.3.

e. [7.4] decoding, on a block-by-block basis using the block decoding information generated using the result of the variable length decoding performed in said performing, each of the plurality of block groups in parallel

i. Parties' Arguments

Petitioner argues that Pearson discloses, or renders obvious in view of H.264, limitation 7.4. Pet. 41 (citing Ex. 1003 ¶¶ 104–108). Petitioner argues that Pearson discloses decoding each of its plurality of block groups on a block-by-block basis in parallel. *Id.* at 42. Petitioner further asserts that Pearson teaches that its CABAC decoding “performs context calculations in parallel with arithmetic decode.” *Id.* (quoting Ex. 1005, 1:59–2:10). Further, Petitioner argues that “[b]y pre-decoding certain syntax elements and using them to perform the full decode, Pearson’s CABAC decoder is able to perform decoding of multiple block groups in parallel without having to wait to obtain context information from neighboring macroblocks.” *Id.* at 44 (citing Ex. 1003 ¶ 106). Petitioner further contends that it would have been obvious to implement the decoding system of Pearson in which the decoding is done on a block-by-block basis, in view of the disclosures in H.264. *Id.* (citing Ex. 1003 ¶ 107).

Patent Owner argues that Pearson and H.264 do not teach or suggest decoding each of a plurality of blocks in parallel. PO Resp. 19. Patent Owner asserts that Pearson describes a system that is configured to decode a bitstream into a video. *Id.* Further, Patent Owner argues that, in Pearson, in decoding a macroblock, “neighborhood macroblock data (from macroblocks to the left, and above a current macroblock)” may form “context information” that is used to decode the current macroblock. *Id.* (quoting Ex. 1005, 2:51–

54). Patent Owner provides the following illustration of decoding macroblocks in Pearson:

MB _{1,1}	MB _{1,2}	MB _{1,3}	MB _{1,4}	MB _{1,5}	MB _{1,6}	MB _{1,7}	MB _{1,8}
MB _{2,1}	MB _{2,2}	MB _{2,3}	MB _{2,4}	MB _{2,5}	MB _{2,6}	MB _{2,7}	MB _{2,8}
MB _{3,1}	MB _{3,2}	MB _{3,3}	MB _{3,4}	MB _{3,5}	MB _{3,6}	MB _{3,7}	MB _{3,8}
MB _{4,1}	MB _{4,2}	MB _{4,3}	MB _{4,4}	MB _{4,5}	MB _{4,6}	MB _{4,7}	MB _{4,8}

In the above illustration (“Pearson Macroblock Illustration I”), Patent Owner indicates that the decoding of macroblock MB_{2,2} depends on information from macroblock MB_{1,2} (the macroblock above MB_{2,2}) and macroblock MB_{2,1} (the macroblock to the left of MB_{2,2}). *Id.* at 19–20.

Patent Owner further argues that, within the CABAC decoder 102 in Pearson, “decoding (via the arithmetic decoder 128) and context calculation (via the bin state machine 122 and the context determination circuits 120 and 124) ... [may] occur in parallel.” PO Resp. 20 (quoting Ex. 1005, 4:42–45). Patent Owner asserts that thus for the single CABAC decoder 102, it is the (i) arithmetic decoding operations and (ii) the context calculations that are performed in parallel. *Id.* at 21. Patent Owner asserts that context calculations provide information necessary to determine a binary information bit (BIN) from an encoded bitstream. *Id.* Patent Owner asserts that the BINs control the decoding of macroblocks to video, which is a process performed by decoder 104, not CABAC decoder 102. *Id.* Patent Owner argues that thus Pearson describes parallel operations relating to a single macroblock performed by CABAC decoder 102, not decoding parallel block groups in parallel. *Id.* at 21–22.

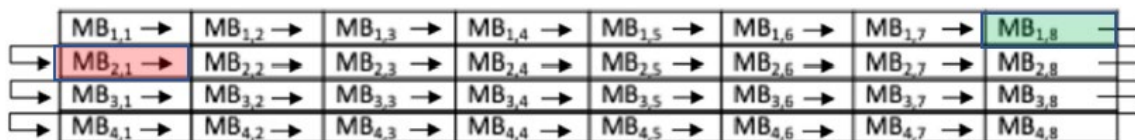
Patent Owner argues that Petitioner’s assertion that “neighborhood data, which can include items such as the quantization parameter (Mb_qp_delta) is used by the CABAC decoder to decode different

macroblock groups, including the current and neighboring macroblocks, in parallel” is unsupported by Pearson’s disclosure. PO Resp. 22 (quoting Pet. 43). Patent Owner argues that for Petitioner’s arguments to hold, (i) context determination circuit 120, bins state machine 122 and context determination circuit 124 would need to decode one macroblock group, while (ii) arithmetic decoder 128 is decoding another macroblock group because those are the components that the Petition cites as operating in parallel. *Id.* Patent Owner further argues that although the arithmetic decoder of CABAC decoder 102 operates on the bitstream, which has macroblocks, context determination circuit 120, bins state machine 122, and context determination circuit 124 do not receive the bitstream and thus do not decode any macroblock groups. *Id.* at 22–23.

In its Reply, Petitioner argues that Pearson discloses that arithmetic decoding operations and context calculations are performed in parallel. Pet. Reply 5. Petitioner asserts that, in Figure 1 of Pearson, the bitstream is received by CABAC decoder 102 and the system pre-decodes certain syntax elements in the form of bins to determine the necessary block decoding information. *Id.* at 7–8. Petitioner asserts that the syntax elements are then processed by the decoder minus CABAC portion of decoder 104 and sent back to CABAC decoder 102 where they are needed to perform a full decode of the macroblock groups. *Id.* at 8. Petitioner further argues that the neighborhood data received by context determination circuits 120 and 124 is a portion of the bitstream. *Id.*

Petitioner asserts that both the arithmetic decoder and the context determination circuits perform an essential step in the CABAC decoder’s process of decoding macroblocks. Pet. Reply 9. Petitioner asserts that an

ordinarily skilled artisan would have understood that CABAC decoding requires the steps of (1) selecting the context to apply to the bitstream and (2) applying the context to the bitstream. *Id.* Further, Petitioner asserts that Pearson discloses decoding the bitstream by selecting a context (the step performed by the context determination circuits 120, 124) and then applying it (the step performed by the arithmetic decoder 128). *Id.* Petitioner argues that, therefore, arithmetic decoding includes two steps and Pearson discloses that those steps are performed on each of the plurality of block groups in parallel. *Id.* Petitioner further argues that, with Patent Owner’s proposed construction of block group, Pearson decodes macroblocks in parallel because neighborhood information from above a macroblock is used to decode a macroblock. *Id.* at 10–12. Further, Petitioner asserts that when the arithmetic decoder is decoding the last macroblock in a row, the context determination circuit would necessarily be decoding the next macroblock group at the same time. *Id.* at 10–11. Petitioner asserts that Pearson explicitly touts “the parallelism of arithmetic decode and the next context calculation,” signifying that the context calculation is happening on the next macroblock and not the same macroblock that is being processed by the arithmetic decoder. *Id.* at 11. Petitioner modifies Patent Owner’s Pearson Macroblock Illustration I by changing its highlighting and arrows as shown below:



In the above illustration (“Pearson Macroblock Illustration II”), Petitioner highlights MB_{1,8} in green and MB_{2,1} in red. MB_{1,8} is the block on the top

right of the illustration. MB_{2,1} is the leftmost block of the second row of the illustration. *Id.* at 11. Petitioner argues that this illustration shows that Pearson's CABAC decoder's arithmetic decoder decodes MB_{1,8} while its context determination circuit decodes MB_{2,1}. *Id.* Petitioner asserts that Pearson's disclosure that "the parallelism of arithmetic decode and the next context calculation" refers to performing in parallel the context calculation on a macroblock that is different from the one being arithmetically decoded. *Id.* (emphasis omitted).

In its Sur-reply, Patent Owner argues that the decoding of macroblocks is performed by Pearson's decoder 104, not CABAC decoder 102. PO Sur-reply 12. Patent Owner further argues that context determination is not decoding. *Id.* at 13. Patent Owner also argues that the macroblocks above the macroblock currently decoded by the arithmetic decoder would have already been decoded. *Id.*

In addition, Patent Owner asserts that Petitioner, for the first time in its Reply, argues that Pearson discloses limitation 7.4 because (i) context information must be determined to decode a macroblock group and (ii) to determine context information: "neighborhood information (both above and left) is needed from previously decoded syntax elements." PO Sur-reply 12. Patent Owner contends that this argument by Petitioner is belated and should not be considered. *Id.*

ii. Analysis

We determine that Petitioner has proven that Pearson and H.264 teach or suggest limitation 7.4. We find the testimony on this issue by Dr. Freedman persuasive and are not persuaded by Patent Owner's counterarguments, which rely heavily on unsupported attorney argument.

a. Dr. Freedman's Testimony and the Record as a Whole Establish that Pearson and H.264 Teach or Suggest Limitation 7.4

We credit Dr. Freedman's testimony that Pearson and H.264 teach or suggest limitation 7.4. Ex. 1003 ¶¶ 104, 108; Ex. 1023 ¶¶ 8, 24. As set forth below, the record supports that testimony.

First, we credit Dr. Freedman's testimony that Pearson teaches "decoding . . . using the block decoding information generated using the result of variable length decoding performed in said performing." Ex. 1003 ¶ 104. In particular, Pearson discloses decoding with a CABAC decoder. Ex. 1005, 2:26–42, Fig. 1. CABAC decoding is variable length decoding, and neighborhood data generated from partial CABAC decoding is block decoding information. Ex. 1003 ¶¶ 89, 104, 108; Ex. 1023 ¶¶ 12, 24; Ex. 1001, 11:43–52 ("In the case where the variable length coding system is context-base adaptive binary arithmetic coding (CABAC) . . .").

Second, we credit Dr. Freedman's testimony that Pearson's CABAC decoder performs context calculations in parallel with arithmetic decoding. Ex. 1003 ¶ 105; Ex. 1023 ¶¶ 9, 17. This opinion is supported by the record. Pearson's Background of the Invention discloses the desirability of such parallel operations: "[i]t would be desirable to provide a method and/or apparatus that performs context calculations *in parallel* with arithmetic decoding operations." Ex. 1005, 1:45–47 (emphasis added). Further, Pearson's Summary of the Invention discloses performing such operations: "a context adaptive binary arithmetic that may (i) perform context calculations *in parallel* with arithmetic decode . . . (iv) be speed-up due to the *parallelism* of arithmetic decode and next context calculation." *Id.* at 1:59–2:2 (emphasis added).

In describing CABAC decoder 102, Pearson teaches parallel arithmetic decoding and context determinations: “CABAC decoder 102 may allow decoding (via the arithmetic decoder 128) and context calculation (via the bin state machine 122 and the context determination circuits 120 and 124) to occur *in parallel*.” *Id.* at 4:38–65 (emphasis added). Pearson further discloses: “[t]he decoder 102 may arithmetically decode *in parallel* to calculating context information while the decoder 104 decodes bins to generate the signals VIDEO and NEIGHBOR_MB_DATA.” *Id.* at 5:9–12 (emphasis added); *see also* Ex. 1003 ¶ 105. In addition, Patent Owner acknowledges that Pearson discloses parallel arithmetic decoding and context calculations: “For the single CABAC decoder 102, it is the (i) arithmetic decoding operations and (ii) the context calculations that are performed in parallel.” PO Resp. 21. Thus, we credit Dr. Freedman’s testimony that Pearson’s CABAC decoder performs context calculations in parallel with arithmetic decoding. Ex. 1003 ¶ 105; Ex. 1023 ¶¶ 9, 17.

Third, we credit Dr. Freedman’s testimony that both Pearson’s arithmetic decoding and context determination decode macroblocks and thus Pearson discloses parallel decoding of macroblocks. Ex. 1023 ¶¶ 11, 16, 19. As Dr. Freedman testified, Pearson’s context determination is an essential step of its CABAC decoding process, and the circuits performing this context determination are an essential part of CABAC decoder 102. *Id.* ¶¶ 16–18, 23; Ex. 1005, Fig. 2 (context determination circuits 120, 124). Richardson (Ex. 1008) supports this testimony, describing context model selection as being stage 2 of CABAC coding, which indicates that context determination

is decoding. Ex. 1008, 212–213¹²; Ex. 1023 ¶ 16. Further, Dr. Freedman testified that the NEIGHBOR_MB_DATA that is received by context determination circuits 120 and 124 is a portion of the bitstream containing macroblocks. Ex. 1023 ¶ 13. Figures 1 and 2 of Pearson support this testimony. Figure 1 shows the bitstream as an input to CABAC decoder 102, bins output from decoder 102 to decoder 104, and decoder 104 providing NEIGHBOR_MB_DATA as an input to CABAC decoder 102. Ex. 1005, Fig. 1. Figure 2 shows that the NEIGHBOR_MB_DATA is an input to context determination circuits 120 and 124. *Id.* at Fig. 2. Further, as shown in Figure 2, the bitstream with macroblocks is a direct input to Pearson's arithmetic decoder. *Id.* Thus, we credit Dr. Freedman's testimony that both Pearson's arithmetic decoding and context determination decode macroblocks and Pearson discloses parallel decoding of macroblocks. Ex. 1023 ¶¶ 11, 16, 19.

Fourth, we credit Dr. Freedman's testimony that Pearson, in view of H.264, suggests decoding on a block-by-block basis. Ex. 1003 ¶¶ 105–107. Pearson discloses that decoder 102 may be an H.264 decoder. Ex. 1005, 2:43–44. And the Background of the Invention for the '457 patent acknowledges that H.264 decoding is performed on a block-by-block basis. Ex. 1001, 1:23–26; *see also id.* at 1:19–22); Ex. 1003 ¶ 107.

Fifth, we credit Dr. Freedman's testimony that Pearson teaches or suggests parallel decoding of one macroblock by the arithmetic decoder while context decoding the next macroblock. Ex. 1023 ¶ 19. Pearson expressly discloses the “*parallelism* of arithmetic decode and *next* context

¹² We cite to the original page numbers for this exhibit.

calculation.” Ex. 1005, 1:59–2:2 (emphases added). With the suggestion of block-by-block decoding, the term “next” conveys to an ordinarily skilled artisan arithmetically decoding one macroblock while performing the context calculation on the *next* macroblock. Ex. 1023 ¶ 19.

Sixth, we credit Dr. Freedman’s testimony that, because the arithmetic decoder and context determination circuits in Pearson decode sequential macroblocks in parallel, the arithmetic decoder will decode the last macroblock in a row in parallel with the context decoding of the first macroblock in the next row. Ex. 1023 ¶ 19. For example, in Pearson Macroblock Illustration II, shown above, the arithmetic decoder will decode MB_{1,8} when the context determination circuit decodes MB_{2,1}. *Id.* This is supported by Pearson’s disclosure of the parallelism of the arithmetic decode and the next context calculation and the block by block basis of H264 decoding. Ex. 1005, 1:59–2:2; Ex. 1023 ¶ 19.

Seventh, we credit Dr. Freedman’s testimony that the parallel decoding of the last macroblock in a row in parallel with context determination circuits decoding the first macroblock in the next row constitutes parallel decoding of each of the block groups. Ex. 1023 ¶¶ 19–20. As set forth above, we construed block groups as encompassing a row or line of macroblocks. Thus, the parallel processing of the last macroblock in one line/row with the first macroblock of the next line/row is parallel processing of the two lines/rows and hence parallel processing of the two block groups. *Id.* Because each row has a first and last macroblock, each of the plurality of block groups (lines/rows) will be decoded in parallel. *Id.*

In sum, we credit Dr. Freedman’s testimony that Pearson and H.264 teach or suggest decoding, on a block-by-block basis using the block

decoding information generated using the result of the variable length decoding performed in said performing, each of the plurality of block groups in parallel. Ex. 1003 ¶¶ 104–108; Ex. 1023 ¶¶ 8–24.

*b. We Disagree with Patent Owner’s
Counterarguments that Petitioner Failed to Meet
Its Burden of Proof for Limitation 7.4*

As mentioned, Patent Owner provides counterarguments as to why Petitioner did not meet its burden of proof regarding limitation 7.4. We disagree with these counterarguments.

First, Patent Owner argues that Pearson’s disclosure of “decoding (via the arithmetic decoder 128) and context calculation (via the bin state machine 122 and the context determination circuits 120 and 124) ... [may] occur in parallel” only teaches or suggests decoding a single macroblock. PO Resp. 21–22. Patent Owner cites no expert testimony to support its argument that Pearson’s parallel operations relate only to a single macroblock. *Id.*¹³ Instead, Patent Owner relies on attorney argument, which is not evidence. *Icon Health & Fitness, Inc. v. Strava Inc.*, 849 F.3d 1034, 1046 (Fed. Cir. 2017) (“Attorney argument is not evidence or explanation in support of a conclusion.”); *Invitrogen Corp. v. Clontech Lab., Inc.*, 429 F.3d 1052, 1068 (Fed. Cir. 2005) (“Unsubstantiated attorney argument regarding the meaning of technical evidence is no substitute for competent, substantiated expert testimony.”). Further, we disagree with this attorney argument. Pearson expressly discloses the “*parallelism* of the arithmetic decode and *next* context

¹³ Patent Owner cites cross-examination testimony by Dr. Freedman to support the argument that BINS control the decoding of macroblocks to video. PO Resp. 21 (citing Ex. 2006, 19:22–20:7). That argument and testimony is addressed below.

calculation.” Ex. 1005, 1:59–2:2 (emphases added). With the suggestion of block by block decoding via H.264, the term “next” conveys to any ordinarily skilled artisan arithmetically decoding one macroblock while performing the context calculation on the *next* macroblock. Ex. 1023 ¶ 19.

Second, Patent Owner argues that the context calculation circuits in Pearson do not receive the bitstream and thus do not decode any macroblocks. PO Resp. 22–23; PO Sur-reply 12. Patent Owner notes that Figure 2 of Pearson does not show any direct connection between the bitstream and the context calculation circuits. PO Resp. 22. Patent Owner argues that, as a result, the context calculation circuits do not operate on the bitstream and do not decode any macroblocks. *Id.* at 22–23. We disagree because we credit Dr. Freedman’s testimony that the NEIGHBOR_MB_DATA that is received by context determination circuits 120 and 124 is a portion of the bitstream containing macroblocks. Ex. 1023 ¶ 13. Patent Owner, however, argues that Dr. Freedman testified that context determination does not constitute decoding of macroblocks. PO Sur-reply 12 (citing Ex. 2006 at 19:22–20:7); *see also* PO Resp. 21 (citing Ex. 2006, 19:22–20:7). We do not share Patent Owner’s interpretation of the cited cross-examination testimony, which reads:

Q. What are BINS in this context?

A. In this context, BINS are a term of art that refer to a binary encoding of the syntax elements that control the decoding of the macroblocks to video.

Q. And is it correct that the decoder 104 requires the BINS information in order to decode the macroblock data?

A. It’s required to decode it all the way to video, meaning to video samples that can be -- that can be displayed.

Ex. 2006, 19:22–20:7. This testimony indicates that BINS are required to decode macroblocks *all the way to video*. Limitation 7.4, however, does not require that the parallel decoding decode all the way to video. The limitation merely requires parallel decoding. Thus, the testimony that the context determination circuits do not decode macroblocks all the way to video does not mean that context determination circuits do not decode macroblocks.

Third, Patent Owner argues that the CABAC decoder (which contains the context determination circuits) does not decode macroblocks (according to Patent Owner, only decoder 104 decodes macroblocks). PO Resp. 23–24; PO Sur-reply 12. We disagree. Patent Owner relies on the following cross examination testimony by Dr. Freedman to support this argument: Ex. 2006, 18:10–19:8 (cited in PO Resp. 24).¹⁴ In the testimony preceding the cited cross examination testimony, Dr. Freedman testified that it is “not quite right” to refer to the function of the CABAC decoder as decoding macroblocks in the bitstream. That cross-examination testimony and some of the testimony cited by Patent Owner read:

Q. If I understand correctly, the function of the CABAC decoder is to decode macroblocks in the bitstream; is that right?

A. Not quite right.

Q. What is the function of the CABAC decoder?

A. Okay. The CABAC decoder parses slices that are composed of macroblocks. A macroblock is a type -- very specific type of block. The CABAC decoder obtains information from the bitstream about H.264 syntax elements that control the decoding, that in some sense are commands for the decoder. So this message

¹⁴ Petitioner also cites Dr. Freedman’s cross-examination testimony at Ex. 2006, 19:22–20:7 to support this proposition. PO Sur-reply 12. We addressed that cross-examination testimony above.

information, these syntax elements are decoded by the CABAC decoder, and that information is in turn used to provide the syntax elements to decode the macroblock data to decode video samples that can be displayed as video.

Ex. 2006, 18:4–22. Patent Owner suggests that the above testimony expresses an opinion that the CABAC decoder does not decode macroblocks. PO Resp. 23–24. Dr. Freedman’s use of the term “not quite right,” however, is ambiguous in this regard. Dr. Freedman did not affirmatively deny that the function of the CABAC decoder is to decode macroblocks—an affirmative denial would have clearly expressed an opinion that a CABAC decoder does not decode macroblocks. Dr. Freedman, however, also did not affirmatively state that the CABAC decoder decodes macroblocks. During the cited cross-examination testimony, Dr. Freedman was not asked to clarify his statement. Therefore, to resolve this ambiguity, we need to examine Dr. Freedman’s testimony as a whole, and that testimony as a whole indicates that Dr. Freedman’s opinion is that CABAC decoder 102 decodes macroblocks. During the same cross-examination, Dr. Freedman testified:

Q. And if I’ve understood you correctly earlier, you indicated that this CABAC decoder 102 operates in parallel; is that right?

A. Pearson discloses its parallel operation.

Q. What is the parallel operation you're referring to?

A. The parallel operation we’re discussing is the *CABAC decoding of macroblocks* in parallel.

Ex. 2006, 25:21–26:5 (emphasis added). Moreover, in his Reply Declaration, Dr. Freedman testifies: “[an ordinarily skilled artisan] would understand that both the arithmetic decoder and the context determination circuits are performing an essential step in the *CABAC decoder’s process of decoding*

macroblocks.” Ex. 1023 ¶ 16 (emphasis added). Dr. Freedman further testifies: “*CABAC decoding* includes two steps, and Pearson discloses that those steps are *performed on each of the plurality of block groups* in parallel.” *Id.* ¶ 17 (emphases added). In addition, in his original declaration, Dr. Freedman testifies that “data is fed back into the decoder (at 114) and used by the *CABAC decoder* to *decode* both the current *macroblock group* and the neighboring *macroblock groups.*” Ex. 1003 ¶ 106 (emphases added). Thus, in light of Dr. Freedman’s testimony as a whole, we do not interpret Dr. Freedman’s ambiguous cross examination statement that it is “[n]ot quite right” to refer to the CABAC decoder as decoding macroblocks as expressing an opinion that Pearson’s CABAC decoder 102 does not decode macroblocks. Further, as discussed above, we credit Dr. Freedman’s testimony that Pearson’s CABAC decoder decodes macroblocks. Ex. 1003 ¶ 106; Ex. 1023 ¶ 16.

Fourth, with Pearson Macroblock Illustration I, Patent Owner argues that Pearson does not decode block groups in parallel. PO Resp. 19–20. Patent Owner relies on attorney argument to support this assertion. *Id.* We disagree with this argument. Patent Owner may be correct that Pearson’s CABAC decoder would not decode, in parallel, two macroblocks where one is directly above the other in Pearson Macroblock Illustration I (e.g. MB_{1,8} and MB_{2,8}). PO Sur-reply 13. As discussed above, however, we credit Dr. Freedman’s testimony that, because the arithmetic decoder and context determination circuits in Pearson decode sequential macroblocks in parallel, the arithmetic decoder decodes the last macroblock in a row in parallel with the context decoding of the first macroblock in the next row (e.g., MB_{1,8} and MB_{2,8} are decoded in parallel). Ex. 1023 ¶ 19. Further, as illustrated by

Pearson Macroblock Illustration II, this results in decoding block groups (rows) in parallel. *Id.* (see arrows).

Fifth, Patent Owner argues that Petitioner should be precluded from relying on its argument that “context information must be determined to decode a macroblock group and to determine context information: ‘neighborhood information (both above and left) is needed from previously decoded syntax elements’” because the argument was belatedly presented in the Reply. PO Sur-reply 12. We disagree. In the Petition, Petitioner argues that Pearson teaches or suggests limitation 7.4 because macroblocks above and/or to the left of current macroblock are decoded in parallel:

Thus, Pearson discloses, or at least renders obvious in view of H.264, *decoding*, on a block-by-block basis using the block decoding information (e.g., neighborhood data) generated using the result of the variable length decoding (e.g., CABAC decoding) performed in said performing, each of the plurality of block groups (e.g., slices containing *the current macroblock and prior macroblocks above and/or to the left neighboring macroblocks*) *in parallel*.

Pet. 44 (emphasis altered); *see also* Pet. 43 (“This neighborhood data . . . is used by used by the CABAC decoder to *decode* different macroblock groups, including *the current and neighboring macroblocks, in parallel*.”) (emphases added). Further, Petitioner’s Reply arguments regarding decoding macroblocks above and to the left of a current macroblock are also responsive to Patent Owner’s proposed construction of a group of macroblocks as being limited to a row or line of macroblocks. PO Resp. 12. In particular, Petitioner in the Reply demonstrated that, even with Patent Owner’s proposed construction, Pearson teaches decoding groups of blocks in parallel because Pearson would decode the last block of a line/row in

parallel with the first group of the next line/row. Pet. Reply 11–12. Thus, Petitioner’s Reply argument properly responds to Patent Owner’s argument that, with Patent Owner’s proposed construction for “block group,” Pearson does not teach the requisite parallel decoding.

In conclusion, we disagree with Patent Owner’s counterarguments as to why Petitioner purportedly failed to meet its burden of proof for limitation 7.4.

c. Summary

In sum, we determine that Petitioner has proven, via Dr. Freedman’s testimony and the record as a whole, that Pearson and H.264 teach or suggest limitation 7.4.

f. [7.5] wherein said decoding performed on the block-by-block basis on each of the plurality of block groups in parallel includes re-executing the variable length decoding on each of the plurality of block groups on which the variable length decoding has been performed in said performing to determine a prediction mode to be performed on the block group

Petitioner argues that Pearson discloses, or renders obvious in view of H.264, limitation 7.5. Pet. 45 (citing Ex. 1003 ¶¶ 109–113). Petitioner asserts that Pearson discloses that its decoding includes re-executing the variable length decoding on each of the plurality of block groups. *Id.* Further, Petitioner asserts that “Pearson’s CABAC decoder (102) performs variable length decoding on a select group of syntax elements (e.g., neighborhood information) contained in the bitstream in order to obtain neighborhood information that can be used to determine the context data for a full-decode of the macroblocks in the bitstream.” *Id.* (citing Ex. 1005, 4:66–5:13, Fig. 1).

Petitioner asserts that the neighborhood information obtained in the pre-decoding step is then used by the CABAC decoder to determine context information, which is necessary to perform a full decode of the bitstream into bins that can be processed into video by the non-CABAC portions of the decoder. Pet. 46. Petitioner contends that an ordinarily skilled artisan would understand that this second decoding step re-executes variable length decoding on each of the plurality of block groups once it receives the neighborhood data necessary to decode the macroblocks in the bitstream. *Id.* (citing Ex. 1003 ¶¶ 109–110).

Petitioner asserts that this decoding in Pearson is done to determine a prediction mode. Pet. 46 (citing Ex. 1003 ¶ 111). Petitioner also argues that H.264 discloses that CABAC decoding systems, such as the one disclosed in Pearson, allow intra or inter prediction slices to be specified in which the prediction mode throughout the slice can be determined as intra or inter when the slice header is decoded. *Id.* at 47 (citing Ex. 1006 §§ 0.6, 8.3; Ex. 1003 ¶ 112). Patent Owner provides no counterarguments for limitation 7.5.

After reviewing the record, we determine that Petitioner has proven that Pearson and H.264 teach or suggest limitation 7.5.

g. Summary

In sum, we determine that Petitioner has proven, by a preponderance of the evidence, that claim 7 would have been obvious over the combination of Pearson and H.264.

6. Claim 8

Claim 8 depends from claim 7 and further recites: “wherein the block decoding information is generated to include at least a quantization parameter” (“limitation 8.1”). Ex. 1001, 39:34–37; Ex. 2003. Petitioner

argues that Pearson discloses, or renders obvious in view of H.264, limitation 8.1. Pet. 48 (citing Ex. 1003 ¶¶ 114–117). Petitioner asserts that “said precoding” in limitation 8.1 refers to the first variable length decoding referenced in claim 7. *Id.* Further, Petitioner argues that “Pearson discloses that the neighborhood data can be any of a variety of types of syntax elements, including, e.g., ‘Mb_qp_delta.’” *Id.* (quoting Ex. 1005, 3:46–57). Petitioner further argues that “Mb_qp_delta denotes a quantization parameter; specifically, it is a measure of the difference between initial value (SliceQP) and the quantization parameter of the currently decoded macroblock.” *Id.* at 48–49 (citing Ex. 1003 ¶ 116; Ex. 1001, 15:52–62). Patent Owner provides no counterarguments for limitation 8.1.

After reviewing the record, we determine that Petitioner has proven that Pearson and H.264 teach or suggest limitation 8.1. Thus, Petitioner has proven, by a preponderance of the evidence, that claim 8 would have been obvious over the combination of Pearson and H.264.

C. Asserted Obviousness over Chen and H.264

In light of our determination that Petitioner has proven that claims 7 and 8 are unpatentable over Pearson and H.264, we do not need to address Petitioner’s challenge to claim 7 as unpatentable over the combination of Chen and H.264. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding that a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”); *Bos. Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App’x 984, 990 (Fed. Cir. 2020) (non-precedential) (recognizing that the “Board need not address issues that are not necessary to the resolution of the proceeding” and, thus, agreeing that the Board has “discretion to decline

to decide additional instituted grounds once the petitioner has prevailed on all its challenged claims”).

IV. CONCLUSION

As set forth in the following table, Petitioner has proven, by a preponderance of the evidence, that all of the challenged claims are unpatentable:¹⁵

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
7, 8	103(a)	Pearson, H.264	7, 8	
7	103(a) ¹⁶	Chen, H.264		
Overall Outcome			7, 8	

V. ORDER

It is:

ORDERED that claims 7 and 8 of the ’457 patent are unpatentable under 35 U.S.C. § 103; and

¹⁵ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

¹⁶ Because we determined that Petitioner proved that claims 7 and 8 would have been obvious over Pearson and H.264, we do not need to address Petitioner’s challenge to claim 7 as obvious over Chen and H.264.

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

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