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Paper 31
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,
Petitioner,

v.

IBEX PT HOLDINGS CO., LTD.,
Patent Owner.

Case IPR2018-00093
Patent 8,774,279 B2

Before LYNNE E. PETTIGREW, BARBARA A. PARVIS, and KIMBERLY McGRAW, *Administrative Patent Judges*.

PETTIGREW, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

In this *inter partes* review, instituted pursuant to 35 U.S.C. § 314, Samsung Electronics Co., Ltd. ("Petitioner") challenges claims 1–5 of U.S. Patent No. 8,774,279 B2 (Ex. 1001, "the '279 patent"), owned by Ibex PT Holdings Co., Ltd. ("Patent Owner"). This Final Written Decision is entered pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons discussed below, Petitioner has shown by a preponderance of the evidence that claims 1–5 of the '279 patent are unpatentable.

A. Procedural History

Petitioner filed a Petition for *inter partes* review of claims 1–5 of the '279 patent. Paper 1 ("Pet."). Patent Owner filed a Preliminary Response. Paper 5. Applying the standard set forth in 35 U.S.C. § 314(a), which requires demonstration of a reasonable likelihood that Petitioner would prevail with respect to at least one challenged claim, we instituted an *inter partes* review of all challenged claims on the sole unpatentability ground asserted in the Petition—obviousness under 35 U.S.C. § 103(a)[1] over the combination of WD5[2] and Lin.[3] Paper 6 ("Inst. Dec.").

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[1] The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA"), amended 35 U.S.C. §§ 102 and 103. Because the '279 patent has an effective filing date before September 16, 2012, the effective date of the applicable AIA amendments, we refer to the pre-AIA versions of §§ 102 and 103.

[2] Benjamin Bross et al., *WD5: Working Draft 5 of High-Efficiency Video Coding*, JCTVC-G1103 (version 3) (uploaded Dec. 30, 2011) (Ex. 1029) ("WD5").

[3] U.S. Patent Publ'n No. 2012/0236942 A1, published Sept. 20, 2012 (Ex. 1014) ("Lin").

Following institution, Patent Owner filed a Patent Owner Response (Paper 17, "PO Resp."), to which Petitioner filed a Reply (Paper 21, "Pet. Reply"). An oral hearing was held on January 15, 2019, and a copy of the hearing transcript has been entered into the record. Paper 30 ("Tr.").[4]

B. The '279 Patent

According to Petitioner and its declarant, Mr. Benjamin Bross, the '279 patent and the cited prior art generally relate to video coding technologies, and more particularly to a merge mode during video coding. Pet. 4 (citing Ex. 1002 ¶¶ 28–29). Petitioner asserts that the merge mode allows a current block in a picture to inherit motion information from spatially or temporally neighboring blocks, thereby reducing the amount of motion information to be coded for the current block. *Id.* at 4–5. Mr. Bross explains that it "is referred to as a merge mode because the current block and spatially or temporally neighboring block(s) form a merged region sharing the same motion information." Ex. 1002 ¶ 30.

The '279 patent states that the invention "relates to an apparatus for decoding motion information and, more particularly, to an apparatus for decoding motion information in merge mode for reconstructing motion information coded in merge mode." Ex. 1001, 1:14–17. According to the '279 patent, the motion information includes a reference picture index (indicating any one of previously coded and reconstructed pictures) and a motion vector. *Id.* at 2:64–67. In a method known as inter-prediction

[4] A consolidated hearing was held for IPR2018-00093 and IPR2018-00095, both involving the '279 patent, and IPR2018-00092 and IPR2018-00094, both involving U.S. Patent No. 9,025,668 B2, a continuation of the '279 patent.

coding, in which a current block is generated based on a block from a previous picture that is similar to the current block, motion information corresponding to the current block is transmitted. *Id.* at 1:23–31. The '279 patent alleges that "the amount of motion information to be transmitted (e.g., a motion vector and a reference picture index) is gradually increas[ing] . . . [and thus] there is a need for an apparatus capable of reducing the amount of motion information to be transmitted more effectively." *Id.* at 1:36–41.

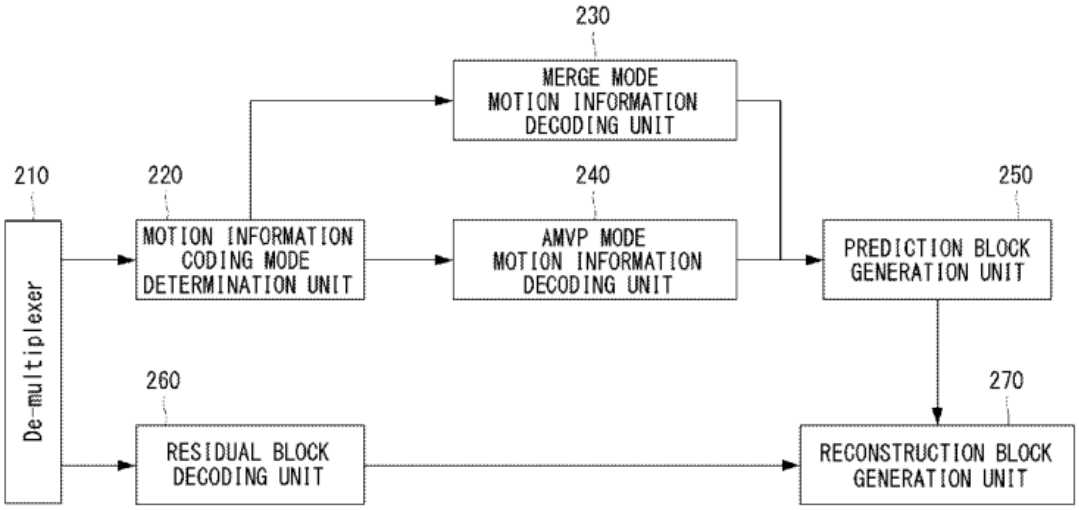
The '279 patent discloses encoding of motion information in merge mode:

> Merge mode is applied when a merge candidate having the same motion information as a current block is present. Merge mode is applied when a current block has a different size from a coding unit or when a residual signal is present if a current block has the same size as a coding unit.

Id. at 3:27–31. The alleged invention described in the '279 patent "provides an apparatus for decoding motion information in merge mode for effectively reconstructing motion information coded in merge mode." *Id.* at 1:47–49.

Figure 4, reproduced below, is a block diagram of an inter-prediction decoding apparatus disclosed in the ’279 patent:

FIG. 4



Id. at 2:35–36, 8:33–34. As shown in Figure 4 above, inter-prediction decoding apparatus 200 includes, among other things, merge mode motion information decoding unit 230, prediction block generation unit 250, and residual block decoding unit 260. *Id.* at 8:35–41.

The ’279 patent describes in detail three embodiments of merge mode motion information decoding unit 230. *Id.* at 2:37–45, 10:11–14:62, Figs. 5–7. Figure 5, illustrating the first embodiment, is reproduced below:

FIG. 5

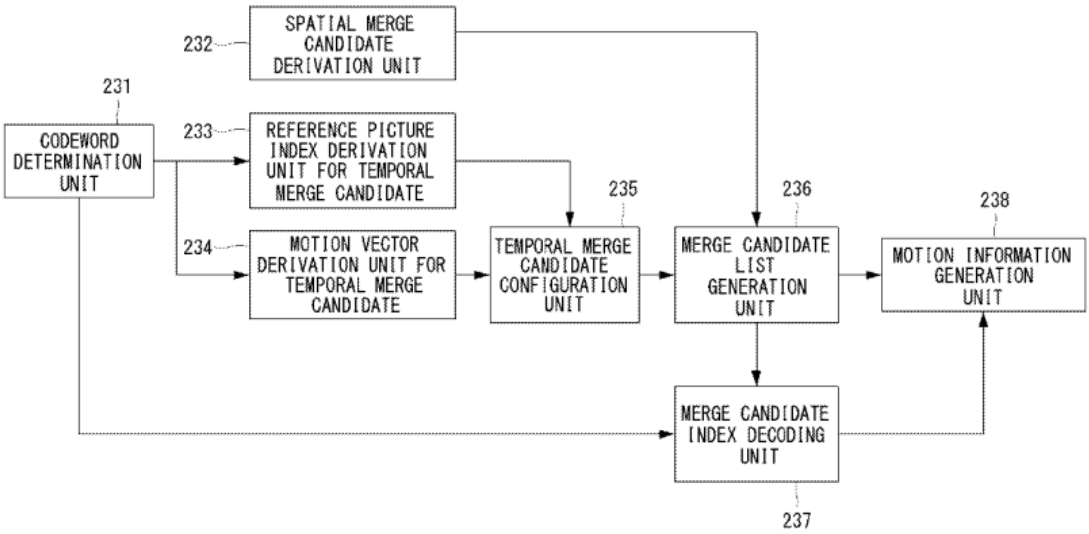


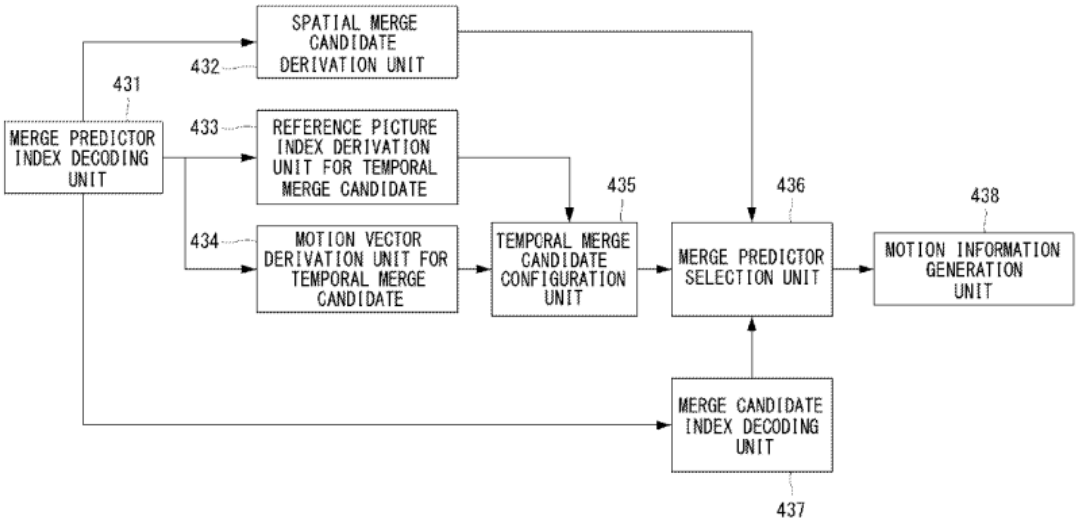
Figure 5 above is a block diagram of a first embodiment of merge mode motion information decoding unit 230. *Id.* at 2:37–39. This first embodiment includes, among other elements, spatial merge candidate derivation unit 232, which "sets valid motion information of a block that is adjacent to a current block as a spatial merge candidate." *Id.* at 10:38–11:15. It also includes reference picture index derivation unit 233 for obtaining the reference picture index of the temporal merge candidates of a current block. *Id.* at 11:16–54. In addition, it includes motion vector derivation unit 234, which determines a picture to which a temporal merge candidate belongs, obtains a temporal merge candidate block within the temporal merge candidate picture, and sets the motion vector of the temporal merge candidate as the motion vector of the selected temporal merge candidate prediction block. *Id.* at 11:55–12:36. Temporal merge candidate configuration unit 236 then determines a reference picture index obtained by reference picture index derivation unit 233 and a motion vector obtained by

motion vector derivation unit 234 as the reference picture index and motion vector, respectively, of a temporal merge candidate. *Id.* at 12:41–46.

The second embodiment of merge mode motion information decoding unit 230 includes several elements that operate in the same way as those in the first embodiment. *Id.* at 13:24–34, 14:1–6, Fig. 6 (blocks 332–335, 337).

Figure 7, illustrating the third embodiment of merge mode motion information decoding unit 230, is reproduced below:

FIG. 7



The third embodiment, shown in Figure 7 above, includes several elements that operate in the same way as those in the first or second embodiments. *Id.* at 14:15–23, Fig. 7 (blocks 431–436, 438).

C. Illustrative Claim

Petitioner challenges all claims (i.e., claims 1–5) of the '279 patent. Independent claim 1 is illustrative of the claimed subject matter:

1. An apparatus for decoding motion information in merge mode, comprising:

a merge predictor index decoding unit configured to reconstruct a merge predictor index of a current block using a received merge codeword;

a spatial merge candidate derivation unit configured to derive spatial merge candidates of the current block;

a temporal merge candidate configuration unit configured to generate a temporal merge candidate of the current block;

a merge candidate generation unit configured to generate one or more merge candidates when the number of valid merge candidates of the current block is smaller than a predetermined number;

a merge predictor selection unit configured to generate a merge candidate list using the merge candidates and select a merge predictor based on the merge predictor index;

a prediction block generating unit configured to generate a prediction block of the current block using motion information of the merge predictor; and

a residual block generating unit configured to perform an entropy-decoding process and an inverse-scanning process on residual signals to generate a quantized block, and to perform an inverse-quantizing process and an inverse-transforming process on the quantized block to generate a residual block,

wherein the temporal merge candidate configuration unit is configured to set a reference picture index of the temporal merge candidate as 0, and

wherein a motion vector of the temporal merge candidate is selected among motion vectors of a first merge candidate block and a second merge candidate block based on a position of the current block within a slice or a largest coding unit, and the motion vector of the second merge candidate block is selected as the motion vector of the temporal merge candidate if

> the current block is adjacent to a lower boundary of the largest coding unit.

Ex. 1001, 16:63–18:8.

D. Evidence

In support of its unpatentability contentions, Petitioner relies on declarations by Mr. Benjamin Bross (Exhibits 1002 and 1117) and Dr. Anthony Vetro (Exhibit 1035). Patent Owner cross-examined Mr. Bross via deposition. *See* Ex. 2008. In support of its Patent Owner Response, Patent Owner relies on a declaration by Dr. Borivoje Furht (Exhibit 2015). Petitioner cross-examined Dr. Furht via deposition. *See* Ex. 1132.

Much of the evidence filed by the parties relates to whether WD5 is a printed publication available as prior art to the '279 patent under 35 U.S.C. § 102(a). *See*, *e.g.*, Exs. 1041, 1058, 1065. On July 24, 2018, we granted Petitioner's motion to submit Exhibits 1117–1125 as supplemental information under 37 C.F.R. § 42.123(a).[5] Paper 14. Exhibit 1117 is a supplemental declaration by Mr. Bross that provides additional information regarding the public availability of WD5. Paper 10, 3–4. Exhibit 1118 allegedly is a printout of a webpage relating to the Joint Collaborative Team on Video Coding ("JCT-VC") meetings referred to in Mr. Bross's supplemental declaration and asserted to corroborate Mr. Bross's testimony regarding the search functionality of the JCT-VC site during the 2011–2012 timeframe. *Id.* at 4. Exhibits 1119–1125 are copies of documents asserted to relate to video coding and to reference JCT-VC documents, including

[5] Patent Owner filed objections to some of the evidence Petitioner submitted as supplemental information but did not preserve the objections by filing a motion to exclude pursuant to 37 C.F.R. § 42.64(c). *See* Paper 16.

working drafts such as Working Draft 5 of the High-Efficiency Video Coding ("HEVC") Standard in 2011–2012. *Id.* at 4–7.

E. Related Matters

We instituted a second *inter partes* review of claims 1–5 of the '279 patent based on another petition filed by Petitioner. *Samsung Elecs. Co. v. Ibex PT Holdings Co.*, Case IPR2018-00095 (PTAB May 3, 2018) (Paper 6). We issue our final written decision in that case concurrently with this decision.

We also instituted *inter partes* reviews of a continuation of the '279 patent—U.S. Patent No. 9,025,668 B2—based on petitions filed by Petitioner. *Samsung Elecs. Co. v. Ibex PT Holdings Co.*, Case IPR2018-00092 (PTAB May 9, 2018) (Paper 6); *Samsung Elecs. Co. v. Ibex PT Holdings Co.*, Case IPR2018-00094 (PTAB May 9, 2018) (Paper 6). Those reviews remain pending.

We recently issued final written decisions in two cases filed by Petitioner involving another related patent—U.S. Patent No. 8,654,855 B2 ("the '855 patent"). *Samsung Elecs. Co. v. Ibex PT Holdings Co.*, Case IPR2018-00011 (PTAB Apr. 10, 2019) (Paper 31); *Samsung Elecs. Co. v. Ibex PT Holdings Co.*, Case IPR2018-00012 (PTAB Apr. 10, 2019) (Paper 30). In IPR2018-00011, we determined that Petitioner had shown by a preponderance of the evidence that all claims of the '855 patent are unpatentable. In IPR2018-00012, we determined that Petitioner had not shown by a preponderance of the evidence that the claims of the '855 patent are unpatentable because Petitioner had not shown that an asserted prior art reference was a printed publication.

II. DISCUSSION

A. Legal Principles

To prevail on its challenge to Patent Owner's claims, Petitioner must demonstrate by a preponderance of the evidence that the claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). A claim is unpatentable for obviousness under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are "such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." *KSR Int'l Co. v. Teleflex Inc*., 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) when in evidence, objective indicia of non-obviousness (i.e., secondary considerations).[6] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

Petitioner contends that a person of ordinary skill in the art at the time of the alleged invention of the '279 patent

> would have had at least a B.S. degree in electrical engineering, or equivalent thereof, and at least three to four years of experience in the relevant field, which includes video coding technology, or an M.S. degree in electrical engineering and at least two to three years of experience with video coding

[6] The parties do not address secondary considerations, which therefore do not constitute part of our analysis.

> technology. More education can supplement practical experience.

Pet. 4 (citing Ex. 1002 ¶¶ 21–22). Patent Owner contends that a person of ordinary skill in the art would have had credentials that "reflect a practical understanding of the design considerations and challenges associated with the video coding technology at issue in the '279 patent," such as "an engineering degree and three or more years of actual industry experience." PO Resp. 19–20. The parties' proposals do not differ in any significant way. We adopt Petitioner's articulation of the level of ordinary skill in the art, which is supported explicitly by the testimony of Mr. Bross and is commensurate with the level of ordinary skill as reflected in the prior art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

C. Claim Construction

The '279 patent has not expired, and the Petition was filed prior to November 13, 2018. Therefore, we interpret terms of the challenged claims according to their broadest reasonable interpretation in light of the specification of the '279 patent. *See* 37 C.F.R. § 42.100(b) (2017); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard).[7] Consistent with the broadest reasonable construction, claim terms are presumed to have their ordinary and customary meaning as understood by a person of ordinary skill

[7] *See also* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340, 51,344 (Oct. 11, 2018) ("The Office will continue to apply the BRI standard for construing unexpired patent claims . . . in AIA proceedings where a petition was filed before the [November 13, 2018] effective date of the rule.").

in the art in the context of the entire patent disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

Petitioner identifies several limitations in claims 1, 2, and 4 of the '279 patent that each recite a "unit" for performing identified functions. Pet. 9–12. For example, claim 1 recites a "*merge predictor index decoding unit* configured to reconstruct a merge predictor index of a current block using a received merge codeword." Ex. 1001, 16:65–67 (emphasis added). Petitioner contends these limitations should be construed under 35 U.S.C. § 112, sixth paragraph.[8] Pet. 12–14. Patent Owner does not present any arguments regarding claim construction. *See generally* PO Resp.

We agree with Petitioner that the "unit" limitations identified in the Petition should be construed under 35 U.S.C. § 112, sixth paragraph. The term "unit" in the claims is analogous to the term "module" and other generic terms referred to as "nonce" words that can substitute for "means" in the context of § 112, sixth paragraph. *See Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1350 (Fed. Cir. 2015) (en banc in relevant part). Here, there is no evidence in the record that the "unit" terms recited in the claims have sufficiently definite meaning as the names for structures. *See id.* at 1348. Although there is a rebuttable presumption that a claim term lacking the word "means" does not invoke § 112, sixth paragraph, the presumption is overcome here because the claim terms fail to recite sufficiently definite

[8] Section 4(c) of the AIA re-designated 35 U.S.C. § 112, sixth paragraph, as 35 U.S.C. § 112(f). Because the '279 patent has an effective filing date before September 16, 2012 (the effective date of the relevant section of the AIA), we refer to § 112, sixth paragraph.

structure for performing the functions recited in the claim. *See id.* (citing *Watts v. XL Sys., Inc.*, 232 F.3d 877, 880 (Fed. Cir. 2000)).

A claim limitation that invokes § 112, sixth paragraph, is "construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof." 35 U.S.C. § 112, ¶ 6. Construction involves two steps—identifying the claimed function and determining what structure, if any, disclosed in the specification corresponds to the claimed function. *Williamson*, 792 F.3d at 1351 (citing *Noah Sys., Inc. v. Intuit Inc.*, 675 F.3d 1302, 1311 (Fed. Cir. 2012)). For a computer-implemented function other than a generic function such as processing, receiving, or storing, the corresponding structure is a special purpose computer or processor programmed to implement the algorithm for performing the function disclosed in the specification. *Aristocrat Techs. Austl. Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008). The algorithm may be expressed as a mathematical formula, in prose, as a flow chart, or in any other manner that provides sufficient structure. *Noah*, 675 F.3d at 1312.

The '279 patent does not explicitly state that the apparatus disclosed and claimed therein comprises a computer or processor. The specification, however, describes processes for coding and decoding motion information (i.e., data), thus suggesting manipulation of data by a computer or processor. *See* Ex. 1001, Abstract, 1:28–38. Moreover, similar descriptions of video coding technology at the time of the invention (e.g., in the asserted prior art) disclose coding and decoding processes to be implemented on a processor or computer. *See* Ex. 1029, 1 (§ 0.2)[9] (providing that use of the high-efficiency

[9] We cite the page numbers of the WD5 document itself, rather than the exhibit page numbers added by Petitioner.

video coding standard in WD5 "allows motion video to be manipulated *as a form of computer data*" (emphasis added)); Ex. 1014 ¶ 50 ("The invention may also involve a number of functions to be performed by a computer processor, a digital signal processor, a microprocessor, or field programmable gate array (FPGA). These processors can be configured to perform particular tasks . . . by executing machine-readable software code or firmware code . . . ."); *see also* Ex. 1002 ¶ 28 (Mr. Bross testifying that "[t]he '279 patent and the prior art . . . generally relate to video coding technologies"). Thus, based on the record before us, we are persuaded that a person of ordinary skill in the art would have understood that the written description of the '279 patent discloses coding and decoding processes to be implemented on a processor or computer. Therefore, we determine that the corresponding structure for each of the recited "unit" limitations is a processor programmed to implement the algorithm disclosed in the specification for performing the claimed functions. *See Aristocrat*, 521 F.3d at 1333.

A petition must "identify the specific portions of the specification that describe the structure, material, or acts corresponding to each claimed function" for claim terms to be construed under § 112, sixth paragraph. 37 C.F.R. § 42.104(b)(3). For purposes of this proceeding, Petitioner proposes a construction for several "unit" limitations in claims 1, 2, and 4, which we address below. Pet. 14–21. As noted above, Patent Owner does not propose constructions for any claim terms. *See generally* PO Resp.

1. "merge predictor index decoding unit"

The function to be performed by the "merge predictor index decoding unit" recited in claim 1 is "reconstruct[ing] a merge predictor index of a

current block using a received merge codeword." Ex. 1001, 16:65–67. We agree with Petitioner that the description of merge predictor index decoding unit 431 in Figure 7 of the '279 patent (which has the same operation as merge predictor index decoding unit 331) is the disclosed algorithm for performing the recited function. *See* Pet. 14–15 (citing Ex. 1001, 13:20–23, 14:10–23); Ex. 1001, 13:20–23 ("The merge predictor index decoding unit 331 reconstructs a merge predictor index, corresponding to a received merge predictor codeword, using a predetermined table corresponding to the number of merge candidates."). Therefore, we adopt Petitioner's proposed construction of this limitation as a processor programmed to implement the processes performed by merge predictor index decoding unit 431, or equivalents thereof.

2. "spatial merge candidate derivation unit"

The function to be performed by the "spatial merge candidate derivation unit" recited in claim 1 is "deriv[ing] spatial merge candidates of the current block." Ex. 1001, 17:1–2. We agree with Petitioner that the description of spatial merge candidate derivation unit 432 in the '279 patent (which has the same operation as spatial merge candidate derivation unit 232) is the disclosed algorithm for performing the recited function. *See* Pet. 15 (citing Ex. 1001, 10:38–11:14, 13:24–27, 14:10–23). We further agree with Petitioner that "the '279 patent describes optional processes that 'can be' carried out" by spatial merge candidate derivation unit 232. *Id.* (citing Ex. 1001, 10:38–11:14); *see* Ex. 1002 ¶ 73 (Mr. Bross testifying that "any one of these processes accomplishes the function of block 232, i.e., to derive spatial candidates"); Ex. 1001, 10:46–48 ("In this case, the block E can be used when one or more of the blocks A, B, C, and D are not valid.").

Therefore, we adopt Petitioner's proposed construction of this limitation as a processor programmed to implement at least one of the processes performed by spatial merge candidate derivation unit 432, or equivalents thereof.

3. "temporal merge candidate configuration unit"

The functions to be performed by the "temporal merge candidate configuration unit" recited in claims 1 and 2 are "[i] generat[ing] a temporal merge candidate of the current block" (claim 1), "[ii] set[ting] a reference picture index of the temporal merge candidate as 0" (claim 1), and "[iii] determin[ing] a temporal merge candidate picture and determin[ing] a temporal merge candidate block within the temporal merge candidate picture, in order to generate a motion vector of the temporal merge candidate" (claim 2). Ex. 1001, 17:3–5, 17:23–25, 18:10–14. We agree with Petitioner that the description of temporal merge candidate configuration unit 435 in the '279 patent (having the same operation as temporal merge candidate configuration unit 235) is the disclosed algorithm for function (i); the description of reference picture index derivation unit 433 (having the same operation as reference picture index derivation unit 233) is the disclosed algorithm for function (ii); and the description of motion vector derivation unit 434 (having the same operation as motion vector derivation unit 234) is the disclosed algorithm for function (iii). *See* Pet. 16–18 (citing Ex. 1001, 12:41–46 (function (i)), 11:16–54 (function (ii)), 11:55–12:36 (function (iii))); *see also* Ex. 1001, 12:41–46 ("The temporal merge candidate configuration unit 235 determines a reference picture index obtained by the reference picture index derivation unit 233 and a motion vector obtained by the motion vector derivation unit 234 as the reference picture index and the motion vector of a temporal merge candidate."),

11:21–22 ("In another embodiment [of reference picture index derivation unit 233], the reference picture index of the temporal merge candidate can be set to 0."), 11:55–12:36 ("The motion vector derivation unit 234 determines a . . . temporal merge candidate picture . . . , obtains a temporal merge candidate block within the temporal merge candidate picture . . . , and [sets] the motion vector of a temporal merge candidate . . . as the motion vector of the temporal merge candidate prediction block."). Therefore, we adopt Petitioner's proposed construction of this limitation as a processor programmed to implement the processes performed by temporal merge candidate configuration unit 435, reference picture index derivation unit 433, and motion vector derivation unit 434, or equivalents thereof.

4. "merge candidate generation unit"

The function to be performed by the "merge candidate generation unit" recited in claim 1 is "generat[ing] one or more merge candidates when the number of valid merge candidates of the current block is smaller than a predetermined number." Ex. 1001, 17:6–9. We agree with Petitioner that the description of merge candidate generation unit 437 in the '279 patent is the disclosed algorithm for performing the recited function. *See* Pet. 18–19 (citing Ex. 1001, 14:24–42).[10] We further agree with Petitioner that "[t]he '279 patent describes optional processes that 'can be' or 'may be' carried out" by merge candidate generation unit 437. *Id.* at 19 (citing Ex. 1001,

[10] Although block 437 in Figure 7 is labeled "merge candidate index decoding unit," we agree with Petitioner that a person of ordinary skill in the art "would have equated this block to a 'merge candidate generation unit' because the description of figure 7 consistently refers to block 437 as the 'merge candidate generation unit 437.'" Pet. 7 n.4 (citing Ex. 1001, 14:7–42; Ex. 1002 ¶ 27 n.3); *see also* Pet. 19 n.7 (citing *id.* at 7 n.4).

14:24–42); *see* Ex. 1002 ¶ 84 (Mr. Bross testifying that "any one of these processes accomplishes the function of merge candidate generation unit 437, i.e., to generate one or more merge candidates when the number of valid merge candidates of the current block is smaller than a predetermined number"); Ex. 1001, 14:24–28 ("The merge candidate generation unit 437 can generate a merge candidate when the number of merge candidates is smaller than a predetermined number. In this case, an added merge candidate can be generated by combining motion information of two valid merge candidates."). Therefore, we adopt Petitioner's proposed construction of this limitation as a processor programmed to implement at least one of the processes performed by merge candidate index decoding unit 437, or equivalents thereof.

5. "merge predictor selection unit"

The function to be performed by the "merge predictor selection unit" recited in claim 1 is "generat[ing] a merge candidate list using the merge candidates and select[ing] a merge predictor based on the merge predictor index." Ex. 1001, 17:10–13. We agree with Petitioner that the description of merge predictor selection unit 436 in the '279 patent is the disclosed algorithm for performing the recited function. *See* Pet. 19 (citing Ex. 1001, 14:43–62); Ex. 1001, 14:43–62 ("The merge predictor selection unit 436 obtains a list of merge candidates using a spatial merge candidate . . . , a temporal merge candidate . . . , and [other] merge candidates . . . . If a plurality of merge candidates has the same motion information . . . , a merge candidate having a lower order of priority is deleted from the list. . . . The merge predictor selection unit 436 selects a merge candidate . . . as the merge predictor of a current block."). Therefore, we adopt Petitioner's

proposed construction of this limitation as a processor programmed to implement the processes performed by merge predictor selection unit 436, or equivalents thereof.

6. "prediction block generating unit"

The functions to be performed by the "prediction block generating unit" recited in claims 1 and 4 are "[i] generat[ing] a prediction block of the current block using motion information of the merge predictor" (claim 1) and "[ii] generat[ing] a prediction pixel of luminance component using an 8-tap interpolation filter and generat[ing] a prediction pixel of chrominance component using a 4-tap interpolation filter" (claim 4). Ex. 1001, 17:14–16, 18:19–23. We agree with Petitioner that the description of prediction block generation unit 250 in the '279 patent is the disclosed algorithm for performing the recited functions. *See* Pet. 20 (citing Ex. 1001, 9:7–24); Ex. 1001, 9:7–11 ("The prediction block generation unit 250 generates the prediction block of the current block using motion information reconstructed by the merge mode motion information decoding unit 230 or the AMVP mode motion information decoding unit 240."), 9:20–24 ("In the case of a luminance pixel, a prediction pixel can be generated using an 8-tap interpolation filter. In the case of a chrominance pixel, a prediction pixel can be generated using a 4-tap interpolation filter."). Therefore, we adopt Petitioner's construction of this limitation as a processor programmed to implement the processes performed by prediction block generation unit 250, or equivalents thereof.

7. "residual block generating unit"

The functions to be performed by the "residual block generating unit" recited in claim 1 are "[i] perform[ing] an entropy-decoding process and an

inverse-scanning process on residual signals to generate a quantized block," and "perform[ing] [ii] an inverse-quantizing process and [iii] an inverse-transforming process on the quantized block to generate a residual block." Ex. 1001, 17:17–23. We agree with Petitioner that the description of residual block decoding unit 260 in the '279 patent is the disclosed algorithm for performing the recited functions. *See* Pet. 21 (citing Ex. 1001, 9:25–41 (function (i)), 9:42–44 (function (ii)), 10:4–6 (function (iii))); Ex. 1001, 9:25–29 ("The residual block decoding unit 260 performs entropy decoding on a residual signal [and] generates a two-dimensional quantized coefficient block by inversely scanning entropy-decoded coefficients."), 9:42–44 ("The residual block decoding unit 260 inversely quantizes a generated coefficient block using an inverse quantization matrix."), 10:4–6 ("The residual block decoding unit 260 reconstructs a residual block by inversely transforming the inversely quantized coefficient block."). For purposes of this decision, we adopt Petitioner's proposed construction of this limitation as a processor programmed to implement the processes performed by residual block decoding unit 260, or equivalents thereof.

D. Prior Art Status of WD5

WD5 is a document created by the JCT-VC, which, according to Petitioner and Mr. Bross, is an organization created in 2010 to develop a new generation HEVC standard (H.265) to replace the then-current H.264 standard. Pet. 24–25 (citing Ex. 1002 ¶ 198). Mr. Bross explains that the JCT-VC includes a group of video coding personnel from two parent organizations: ITU-T Study Group 16 (Video Coding Experts Group

(VCEG))[11] and ISO/IEC JTC 1/SC 29/WG 11 (Moving Picture Experts Group (MPEG))[12]. Ex. 1002 ¶ 198. On November 21–30, 2011, the JCT-VC held its seventh meeting in Geneva, Switzerland. Ex. 1002 ¶ 211; Ex. 1058, 1 (meeting report of the seventh meeting of the JCT-VC). The JCT-VC reportedly produced three "output documents" from this meeting, including "the HEVC Specification Working Draft 5 (WD5)." Ex. 1058, 1. The WD5 reference that Petitioner asserts in this proceeding (Exhibit 1029) is a version of WD5 that Petitioner states was published and publicly available at least on December 30, 2011. *See* Pet. 3; Ex. 1002 ¶ 212; Ex. 1065 (email announcing version 3 ("d2") of Working Draft 5 (JCTVC-G1103) is available for downloading). Mr. Bross testifies that "JCTVC-G1103 (version 3), *WD5*: Working Draft 5 of High-Efficiency Video Coding (*'WD5'*) (Ex. 1029) discloses the HEVC Standard specification under development (working draft) as of December 30, 2011" and that he was its lead author. Ex. 1002 ¶ 29.

A threshold issue in this proceeding is whether WD5 is a prior art printed publication under 35 U.S.C. § 102(a). *See* 35 U.S.C. § 311(b) ("A petitioner in an inter partes review may request to cancel as unpatentable 1

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[11] VCEG is Study Group 16 of ITU-T, the Telecommunication Standardization Sector of the International Telecommunication Union. Ex. 1002 ¶ 198 & n.36 (citing Exs. 1040–1044).

[12] MPEG is Working Group 11 (WG 11) of SC 29, a subcommittee under Joint Technical Committee (JTC) 1 of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). Ex. 1002 ¶ 198 & n.37 (citing Exs. 1045–1046, 1050). JCT 1 provides a standards development environment, and SC 29 develops standards for coding of audio, picture, multimedia, and hypermedia information. Ex. 1002 ¶ 198 n.37 (citing Exs. 1047–1049).

or more claims of a patent only on a ground that could be raised under section 102 or 103 and only on the basis of prior art consisting of patents or printed publications."). Patent Owner advances two arguments in an effort to disqualify WD5 as a prior art printed publication on which Petitioner may base an asserted ground of unpatentability. PO Resp. 10–44. First, Patent Owner contends that collateral estoppel (i.e., issue preclusion) bars Petitioner from asserting WD5 is a printed publication because the Board previously determined in another proceeding that Petitioner had not shown by a preponderance of the evidence that a different JCT-VC working draft of the HEVC standard was a printed publication. *Id.* at 10–19. Second, Patent Owner argues that the evidence of record submitted by Petitioner is insufficient to establish that WD5 is a printed publication. *Id.* at 20–44. For the reasons explained below, we determine that Petitioner has shown that WD5 is a printed publication that Petitioner is not precluded from asserting against the claims of the '279 patent.

1. Issue Preclusion

Patent Owner contends that Petitioner is collaterally estopped from asserting that WD5 is a printed publication because "the Board has already determined that this type of working draft document that may be posted on particular JCT-VC and/or MPEG websites is not prior art due to lack of public accessibility." PO Resp. 10–11. Specifically, Patent Owner cites the Board's final written decisions in *Samsung Electronics, Co. v. Infobridge Pte. Ltd.*, Case IPR2017-00099 (PTAB Apr. 23, 2018) (Paper 32) ("99 Final Dec."), and *Samsung Electronics, Co. v. Infobridge Pte. Ltd.*, Case IPR2017-00100 (PTAB Apr. 23, 2018) (Paper 30) ("100 Final Dec."). PO Resp. 11. The asserted grounds of unpatentability in these *Infobridge* cases

involved WD4, a JCT-VC working draft titled "WD4: Working Draft 4 of High-Efficiency Video Coding" and designated JCTVC-F803 (version 4). 99 Final Dec. 3; 100 Final Dec. 3; *see* Ex. 1005. In the *Infobridge* cases, the Board found that Samsung, the same entity as Petitioner here, failed to show by a preponderance of the evidence that WD4 was a prior art printed publication. 99 Final Dec. 26; 100 Final Dec. 27.[13]

The doctrine of issue preclusion, also known as collateral estoppel, precludes a party from relitigating an issue when:

> (1) a prior action presents [the] identical issue; (2) the prior action actually litigated and adjudged that issue; (3) the judgment in that prior action necessarily required determination of the identical issue; and (4) the prior action featured full representation of the estopped party.

VirnetX Inc. v. Apple, Inc., 909 F.3d 1375, 1377 (Fed. Cir. 2018) (quoting *Stephen Slesinger, Inc. v. Disney Enters., Inc.*, 702 F.3d 640, 644 (Fed. Cir. 2012)); *see In re Freeman*, 30 F.3d 1459, 1465 (Fed. Cir. 1994).[14] Patent Owner contends that the issue in this case—whether WD5 qualifies as a

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[13] The final written decisions in IPR2017-00099 and IPR2017-00100 are the subject of a pending appeal before the U.S. Court of Appeals for the Federal Circuit. *Samsung Elecs. Co. v. Infobridge Pte. Ltd.*, No. 2018-2007 (Fed. Cir.).

[14] We disagree with Patent Owner's position that the law of the Fourth Circuit applies to issue preclusion here because the Board is located in Virginia. *See* PO Resp. 14 (citing *Soverain Software LLC v. Victoria's Secret Direct Brand Mgmt., LLC*, 778 F.3d 1311, 1314 (Fed. Cir. 2015) (holding that the law of the regional circuit applies to the general procedural question of whether issue preclusion applies in an appeal from federal district court)). Because any appeal from a final written decision of the Board is within the Federal Circuit's exclusive jurisdiction, we apply Federal Circuit law to the issue preclusion question. *See In re Cypress Semiconductor Corp.*, 321 F. App'x 964, 966 (Fed. Cir. 2009).

printed publication—is identical to the issue decided in the *Infobridge* cases—whether WD4 qualifies as a printed publication. PO Resp. 15–16. In Patent Owner's view, WD5 and WD4 "are both JCT-VC working documents that were uploaded, indexed, and available in the same manner on the JCT-VC and MPEG document repositories and were available for download under the same conditions and limitations." *Id.* at 15. Further, Patent Owner asserts, "notifications of both working draft documents were sent via email to members of the JCT-VC organization using the JCT-VC reflector under identical circumstances." *Id.*

We are not persuaded the printed publication issue in this case is identical to the printed publication issue in the *Infobridge* cases for purposes of applying issue preclusion. WD4 is an output document of the sixth meeting of the JCT-VC that was held in Torino, Italy, on July 14–22, 2011, whereas WD5 is an output document of the seventh meeting of the JCT-VC that was held in Geneva on November 21–30, 2011. *Compare* Ex. 1005, i, *with* Ex. 1029, i. In the *Infobridge* cases, the evidence showed that WD4 was uploaded to the Torino meeting document register on the JCT-VC and MPEG document management sites on October 4, 2011, and Mr. Bross announced its availability via email on the same day to at least 254 individuals. *See* 99 Final Dec. 14. In contrast, Petitioner here alleges that WD5 was uploaded to the Geneva meeting document register on the JCT-VC and MPEG sites and disseminated to at least 284 individuals via email on December 30, 2011. Pet. 23–30; Ex. 1002 ¶¶ 211–212. Thus, the evidence shows that WD5 is a different document from WD4, generated at a different time as a result of a different JCT-VC meeting, uploaded to a

different portion of the JCT-VC and MPEG sites on a different date, and announced to a different number of people on a different date.

"The determination of whether a document is a 'printed publication' . . . 'involves a case-by-case inquiry into the facts and circumstances surrounding the reference's disclosure to members of the public.'" *Medtronic, Inc. v. Barry*, 891 F.3d 1368, 1380 (Fed. Cir. 2018) (quoting *In re Klopfenstein*, 380 F.3d 1345, 1350 (Fed. Cir. 2004)). Although similar procedures may have been followed in making various working drafts of the HEVC standard available, the evidence in this case regarding WD5 is sufficiently different from the evidence regarding WD4 considered in the *Infobridge* cases such that the "case-by-case inquiry" into the facts and circumstances surrounding the disclosure of WD5 is not "identical" to the printed publication issue previously decided by the Board. For at least this reason, the doctrine of issue preclusion does not bar Petitioner from asserting that WD5 is a printed publication under 35 U.S.C. § 102(a).

2. Printed Publication

Petitioner contends that WD5 qualifies as a printed publication under 35 U.S.C. §§ 102(a) and 311(b) for purposes of *inter partes* review because, inter alia, the document was disseminated to the JCT-VC community by email on December 30, 2011, prior to the January 20, 2012, effective filing

date of the claims of the '279 patent. Pet. 30–31; Pet. Reply 15–17. [15,16] Patent Owner disputes Petitioner's contention. PO Resp. 21–44.

As mentioned above, the determination whether a document is a printed publication under § 102(a) involves a case-by-case inquiry into the facts and circumstances surrounding the reference's disclosure to members of the public. *See Medtronic*, 891 F.3d at 1380; *Klopfenstein*, 380 F.3d at 1350. Petitioner has the burden to establish by a preponderance of the evidence that WD5 is a printed publication. *See Medtronic*, 891 F.3d at 1380; *In re Wyer*, 655 F.2d 221, 227 (CCPA 1981).

A document is considered a printed publication if it has been "disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence [could] locate it." *SRI Int'l, Inc. v. Internet Sec. Sys., Inc.*, 511 F.3d 1186, 1194 (Fed. Cir. 2008). A "printed publication need not be easily searchable after publication if it was sufficiently disseminated at the time of its publication." *Suffolk Techs., LLC v. AOL Inc.*, 752 F.3d 1358,

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[15] Petitioner asserts the earliest effective filing date of the claims of the '279 patent is January 20, 2012, the filing date of the '279 patent's parent application, PCT/KR2012/000523. Pet. 22–23; *see* Ex. 1001, [63]. Patent Owner does not argue that the claims are entitled to the earlier August 29, 2011, filing date of Korean Patent Application No. 10-2011-0086524, to which the '279 patent also claims priority. *See* Ex. 1001, [30], 1:4–8.

[16] Petitioner also argues that WD5 qualifies as a printed publication because it was publicly accessible on both the JCT-VC document management website and the MPEG website. Pet. 24–30. Because we find WD5 is a printed publication, as it was sufficiently disseminated to the relevant interested public, we do not opine on whether WD5 also qualifies as a printed publication because of its asserted public accessibility via the JCT-VC and MPEG websites.

1365 (Fed. Cir. 2014) (concluding that an electronic newsgroup post was sufficiently disseminated when the newsgroup was populated by those of ordinary skill in the art and "dialogue with the intended audience was the entire purpose of the newsgroup postings"). "Accessibility goes to the issue of whether interested members of the relevant public could obtain the information if they wanted to," and "there is no requirement to show that particular members of the public actually received the information." *Constant v. Advanced Micro-Devices, Inc.*, 848 F.2d 1560, 1569 (Fed. Cir. 1988).

Petitioner asserts WD5 is a printed publication because the reference was disseminated to at least 284 members of the JCT-VC community on December 30, 2011, when Mr. Bross sent an email to the JCT-VC reflector (an email listserv) announcing the completion of working draft WD5 and including a link for downloading the document. Pet. 30–31 (citing Ex. 1002 ¶ 211; Ex. 1065 (Mr. Bross's email announcement to the JCT-VC reflector with a link to the WD5 "Document Information" webpage on the JCT-VC site for downloading the document)). Patent Owner responds that WD5 is not a printed publication because there is no evidence that anyone other than JCT-VC members received the emails sent to the reflector. PO Resp. 38; *see also id.* at 37 (stating the email "did not disseminate the reference to persons of interest and skill in the art at large, but to those persons who opted into the listserv"); *id.* at 10 (stating "Petitioner has not provided evidence of efforts to apprise the public, including persons of ordinary skill in the art outside the JCT-VC and MPEG group working on another product or rival codec, of the WD5 reference").

We disagree with Patent Owner's argument. A document does not need to be disseminated to every person interested and skilled in the art to qualify as a printed publication. Patent Owner has admitted that members of the JCT-VC are persons interested and skilled in the art. *See* Tr. 88:20–89:2 (Q. "[D]o you agree that the people who received the email are members of the relevant public?" A. "I think it's very possible that they were POSAs within JCT-VC, sure."). We credit Mr. Bross's testimony that in 2011–2012 every JCT-VC member was subscribed to the JCT-VC reflector. Ex. 1002 ¶ 211. We also credit Mr. Bross's testimony that at least 284 JCT-VC members attended the seventh JCT-VC meeting in Geneva in November 2011 and, therefore, at least 284 JCT-VC members were subscribed to the JCT-VC reflector. *Id.*; *see also* Ex. 1058, 1, 302–305 (identifying the 284 participants of the seventh meeting of the JCT-VC and their associated companies or organizations, according to a sign-in sheet passed around during the meeting). We further credit Mr. Bross's testimony, based on his knowledge and recollection, that in 2011 the number of JCT-VC members and the number of people subscribed to the reflector was higher than 284. Ex. 1002 ¶¶ 211–212.

We also find that any member of the public could have subscribed to the JCT-VC listserv. We are persuaded by Mr. Bross's testimony that any person could subscribe to the JCT-VC reflector by requesting a subscription at the JCT-VC reflector management site and that, in practice, anyone with a valid email address requesting subscription typically was approved. Ex. 1002 ¶ 211; *see also* Ex. 1058, 2 (providing a link for subscription to the listserv); Ex. 2008, 83:23–84:3 (Mr. Bross stating "I have personal knowledge and recollection that people subscribed to that list from

academia, from companies have been approved as subscription request by the moderator").

Moreover, the evidence of record demonstrates that WD5 was disseminated without any requirement or expectation of confidentiality. For example, Mr. Bross's email to the reflector listserv does not indicate the email or its contents were confidential. *See* Ex. 1065. Additionally, the written general policy of JCT-VC was to make all output documents (e.g., WD5) accessible to the public. *See* Ex. 1041, 2 (stating that "to facilitate cross-organi[z]ational communication, all input and output documents of the JCT will be public"); *see also* Ex. 1002 ¶ 203 (Mr. Bross testifying that in the 2011–2012 timeframe, there were no restrictions for downloading documents uploaded on the JCT-VC website).

Patent Owner argues that the JCT-VC meetings required prior registration and restricted access to registrants and that Petitioner has not provided any evidence that anyone not already a member of the JCT-VC actually accessed WD5. PO Resp. 33–34, 38. We are not persuaded by these arguments, as they do not negate the fact that WD5 was disseminated at least to members of the JCT-VC, who are persons interested and ordinarily skilled in the relevant art, and that any member of the public could have requested and received access to the JCT-VC reflector that announced and provided a link to WD5 via email soon after the document was uploaded.

We also find that Exhibits 1119 and 1120 confirm that WD5 was disseminated to persons skilled and interested in the art without any expectation of confidentiality. The prosecution history (Ex. 1120) of U.S. Patent No. 8,693,793 (Ex. 1119, "the '793 patent") shows that WD5 was

cited and submitted to the USPTO on January 19, 2012, one day before the earliest filing date of the '279 patent asserted in the present proceeding. Ex. 1120, 105 (Information Disclosure Statement dated January 19, 2012, citing "JCTVC-G1103_d2, 'WD5: Working draft of High-Efficiency Video Coding,' Benjamin Bross [et al.], Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, 7th Meeting: Geneva, CH, 21–30 November, 2011"), 371–585; Ex. 1119, [56]. Petitioner asserts, and Patent Owner does not dispute, that the WD5 document submitted to the USPTO during prosecution of the '793 patent is the same WD5 document (Ex. 1029) at issue in the present proceeding. Paper 10, 5; *compare* Ex. 1120, 371–585, *with* Ex. 1029, 1–215. The '793 patent is assigned to Sharp Laboratories of America, Inc., which is a member of the JCT-VC, and one of its inventors attended the November 2001 meeting in Geneva. PO Resp. 35; Ex. 1058, 103, 104, 113, 304.

For the foregoing reasons, we find that Mr. Bross's email to the JCT-VC reflector identifying and providing a link to the WD5 reference, without any confidentiality restrictions, and received by the at least 284 JCT-VC members who attended the seventh JCT-VC meeting as well as any member of the public who had requested and received access to the listserv, constitutes sufficient dissemination to qualify WD5 as a printed publication. *See Mass. Inst. of Tech. v. AB Fortia*, 774 F.2d 1104, 1108–09 (Fed. Cir. 1985) (holding a paper orally presented at a scientific conference attended by between 50 and 500 cell culturists was a printed publication because "between 50 and 500 persons interested and of ordinary skill in the subject matter were actually told of the existence of the paper and informed of its contents by the oral presentation, and the document itself was actually

disseminated without restriction to at least six persons"). We therefore find Petitioner has shown by a preponderance of the evidence that WD5 is a printed publication.

E. Asserted Obviousness over WD5 and Lin

Petitioner contends that claims 1–5 of the '279 patent are unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of WD5 and Lin. Pet. 31–70. Relying on the testimony of Mr. Bross, Petitioner contends that the combined references teach or suggest the subject matter of the challenged claims and that a person having ordinary skill in the art would have combined the teachings of the references in the manner asserted. *Id.*; Ex. 1002 ¶¶ 96–196. In response, citing the testimony of Dr. Furht for support, Patent Owner argues that the combined references do not teach the last "wherein" limitation of claim 1. PO Resp. 47–53 (citing Ex. 2015 ¶¶ 41–54). Patent Owner also contends that Petitioner's position is inconsistent with a position taken in an earlier proceeding. *Id.* at 44–47.

We begin our analysis with an overview of WD5 and Lin. We then address Petitioner's contentions for each claim limitation and, where applicable, Patent Owner's responsive arguments.

1. Overview of WD5

WD5 describes a decoding process for motion information coded in inter-prediction mode. *See* Ex. 1029, 95–121 (§ 8.4). According to Petitioner, WD5 discloses "the prediction unit-based inter-picture prediction block merging concept," which allows deriving motion information—i.e., motion vectors, reference indices, and prediction list utilization flags—for a prediction unit (i.e., a current block) from similar information of spatial or

temporal neighboring prediction blocks. Pet. 8; Ex. 1002 ¶ 61 (citing, e.g., Ex. 1029, 98–101 (§ 8.4.2.1), 111–12 (§ 8.4.2.1.8)).

Petitioner's declarant, Mr. Bross, explains that the derivation process described in WD5 constructs a list of merging candidates, which indicate previously decoded spatial neighboring blocks and temporal neighboring blocks with respect to the prediction unit currently being decoded. Ex. 1002 ¶ 62 (citing Ex. 1029, 99–100 (§ 8.4.2.1.1, steps 1–4)). The motion vectors (mvL0 and mvL1), reference indices (refIdxL0 and refIdxL1), and prediction list utilization flags (predFlagL0 and predFlagL1) for the current block can be derived using the spatial neighboring block or temporal neighboring block indicated by the merging candidate. *Id.*; Ex. 1029, 99–100 (§ 8.4.2.1.1). Under this process, instead of explicitly signaling to the decoder the motion information (i.e., motion vectors, reference indices, and prediction list utilization flags) for the current prediction unit, the encoder only signals an index to a candidate in the list of merging candidates. Ex. 1002 ¶ 62 (citing Ex. 1029, 39 (§ 7.3.7)). Using this merge index, the decoder determines the specified merge candidate and sets the motion vectors, reference indices, and prediction list utilization flags of the specified merge candidate as the motion vectors, reference indices, and prediction list utilization flags of the current prediction unit. *Id.* (citing Ex. 1029, 101 (§ 8.4.2.1.1, step 9)).

Mr. Bross further explains that WD5 defines motion vectors, reference indices, and prediction list utilization flags in terms of two reference picture lists, LX, where X is 0 or 1. Ex. 1002 ¶ 63 (citing Ex. 1029, 98 (§ 8.4.2.1)). Prediction list utilization flag predFlagLX indicates whether list LX is used for prediction (e.g., predFlagL0=1

indicates list0 is used for prediction). *Id.* (citing Ex. 1029, 113 (§ 8.4.2.2)). For each reference picture list LX, WD5 defines three variables: predFlagLX, refIdxLX, and mvLX. *Id.* (citing Ex. 1029, 98 (§ 8.4.2.1)).

WD5 also defines five spatial merge candidate blocks and two temporal merge candidate blocks from which motion vectors, reference indices, and prediction list utilization flags can be derived. *See* Ex. 1002 ¶¶ 64–67. As Mr. Bross explains, Figure 8-3 of WD5, reproduced below, illustrates the five spatial merge candidate blocks:

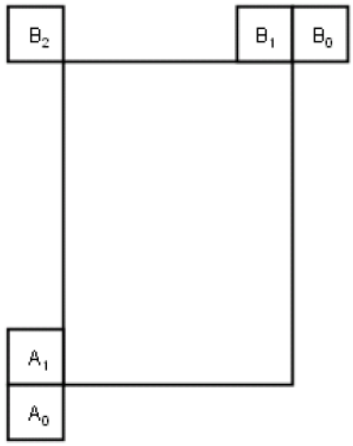


Figure 8-3 – Spatial motion vector neighbours

Id. ¶ 64 (citing Ex. 1029, 109). Figure 8-3 above identifies five spatial merge candidate blocks as A1 (left block), B1 (above block), B0 (above-right block), A0 (left-below block), and B2 (above-left block). *Id.* The two temporal merge candidate blocks are defined relative to the current block (prediction unit) in a co-located prediction unit in a co-located reference picture. *Id.* ¶ 67 (citing Ex. 1029, 111–12 (§ 8.4.2.1.8)).

2. Overview of Lin

Lin relates to HEVC development and discloses deriving temporal motion vector prediction candidates in a merge mode. Ex. 1014 ¶¶ 2, 4, 24,

25, 30, 38–41. Lin discloses that the decoding processes described therein "may be implemented in various hardware, software codes, or a combination of both," and more specifically may be "program codes to be executed on a Digital Signal Processor (DSP)" or may involve "functions to be performed by a computer processor, a digital signal processor, a microprocessor, or field programmable gate array (FPGA)." *Id.* ¶ 50.

3. Claim 1

Beginning with the preamble of claim 1, which recites an "apparatus for decoding motion information in merge mode," Petitioner contends that a person of ordinary skill in the art would have understood WD5 necessarily discloses an "apparatus" because WD5 states that its video decoding recommendations are designed to cover a broad range of applications, including Cable TV. Pet. 31–32 (citing Ex. 1029, 1 (§§ 0.2, 0.3)). Petitioner further contends that a person of ordinary skill in the art would have understood that WD5 discloses an apparatus for decoding motion vectors, reference indices, and prediction list utilization flags disclosed in merge mode, and that the motion vectors, reference indices, and prediction list utilization flags disclosed in WD5 are motion information like that recited in the claim. *Id.* at 32 (citing Ex. 1002 ¶ 100). Even if WD5 does not necessarily disclose an "apparatus," Petitioner contends it would have been obvious to implement WD5's decoding processes in a device such as a Cable TV device. *Id.* at 32–33 (citing Ex. 1002 ¶ 101). We agree with Petitioner's contentions, which Patent Owner does not address.

Similarly, in connection with the limitations of claim 1 construed under 35 U.S.C. § 112, sixth paragraph, Petitioner contends a person of ordinary skill in the art would have been motivated to implement the

processes of WD5 allegedly corresponding to the recited functions on a processor programmed to perform those processes. *Id.* at 36–37 (citing Ex. 1002 ¶ 113). Petitioner also relies on Lin, which, like WD5, is directed to development of the HEVC standard, and which discloses that its decoding processes may be implemented as functions performed by a computer processor. *Id.* at 38 (citing Ex. 1014 ¶¶ 4, 50). Based on the disclosures of WD5 and Lin, and the knowledge of a person of ordinary skill in the art at the time of the invention, Petitioner contends that an ordinarily skilled artisan would have implemented within WD5's Cable TV device or similar device a processor programmed to perform the processes in WD5 corresponding to the algorithms disclosed in the '279 patent for performing the claimed functions. *Id.* at 38 (citing Ex. 1002 ¶¶ 115–116), 42 (citing Ex. 1002 ¶¶ 129–130), 44 (citing Ex. 1002 ¶¶ 138–139), 46 (citing Ex. 1002 ¶¶ 144–145), 48 (citing Ex. 1002 ¶¶ 151–152), 51 (citing Ex. 1002 ¶¶ 156–157), 54 (citing Ex. 1002 ¶¶ 163–164), 56 (citing Ex. 1002 ¶ 168). We agree with Petitioner's analysis, which Patent Owner does not dispute.

Regarding the functions recited in the "unit" limitations construed under 35 U.S.C. § 112, sixth paragraph, Petitioner asserts that WD5 discloses the processes identified in the claim construction section above as the algorithms disclosed in the '279 patent for performing the claimed functions. Pet. 34–36, 38–56. Petitioner also contends that WD5 discloses the "wherein" limitation at the end of claim 1. *Id.* at 57–60. Relying on the testimony of Mr. Bross for support, Petitioner provides a detailed analysis of each limitation in the body of claim 1. *Id.* at 34–36, 38–60 (citing Ex. 1002 ¶¶ 102–173). We address each of these limitations below, including Patent Owner's arguments regarding the "wherein" limitation.

a. "merge predictor index decoding unit"

Petitioner asserts that WD5 discloses the processes performed by merge predictor index decoding unit 431 in the '279 patent for reconstructing a merge predictor index of a current block using a received merge codeword. Pet. 34–36. Merge predictor index decoding unit 431 in the '279 patent reconstructs a merge predictor index, corresponding to a received merge predictor codeword, using a predetermined table corresponding to the number of merge candidates. Ex. 1001, 13:20–23 (referring to merge predictor index decoding unit 331), 14:10–23 (stating that operation of merge predictor index decoding unit 431 is the same as that of merge predictor index decoding unit 331). For this process, Petitioner points to WD5's disclosure of reconstructing a merging candidate index (merge_idx), corresponding to a received bin string, using a predetermined table (unary binarization table 9-31) corresponding to the maximum number of merging candidates (MaxNumMergeCand). Pet. 34–36 (citing Ex. 1029, 23–24 (§ 7.2), 39 (§ 7.3.7), 60 (§ 7.4.3), 69 (§ 7.4.7), 153–54 (§ 9.2), 163–68 (§§ 9.2.2, 9.2.2.1, 9.2.2.2), 172 (§ 9.2.3); Ex. 1002 ¶¶ 103–111).

We agree with Petitioner's detailed analysis of this limitation, which Patent Owner does not dispute. *See id.*; Ex. 1002 ¶¶ 102–116. Accordingly, we find that the combination of WD5 and Lin teaches a processor programmed to implement the processes performed by block 431 in Figure 7 of the '279 patent, or equivalents thereof, and thus teaches a "merge predictor index decoding unit," as recited in claim 1.

b. "spatial merge candidate derivation unit"

Petitioner asserts that WD5 discloses at least one of the processes performed by spatial merge candidate derivation unit 432 in the '279 patent

for deriving spatial merge candidates of the current block. Pet. 38–41. Spatial merge candidate derivation unit 432 sets valid motion information of an adjacent block as a spatial merge candidate of the current block. Ex. 1001, 10:38–48 (referring to spatial merge candidate derivation unit 232), 13:24–27 (stating that operation of spatial merge candidate derivation unit 332 is the same as that of spatial merge candidate derivation unit 232), 14:10–23 (stating that operation of spatial merge candidate derivation unit 432 is the same as that of spatial merge candidate derivation unit 332). Petitioner contends that spatial merge candidate 432 in the '279 patent performs several optional processes and that WD5 discloses at least one of them. Pet. 15–16, 38–39. Specifically, Petitioner asserts that WD5 defines five spatial merge candidate blocks in Figure 8-3 (A_1, B_1, B_0, A_0, and B_2) in the same positions as the five spatial merge candidates disclosed in Figure 3 of the '279 patent (A, B, C, D, and E). *Id.* at 40. Figure 8-3 of WD5 and Figure 3 of the '279 patent are reproduced side-by-side below:

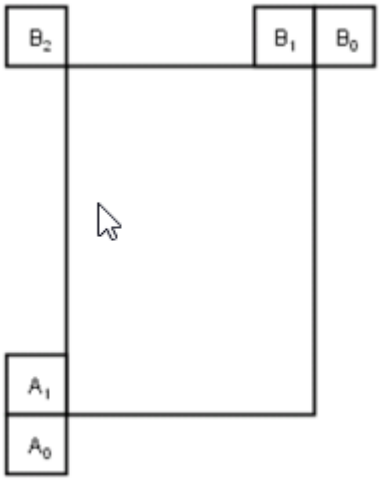


Figure 8-3 of WD5

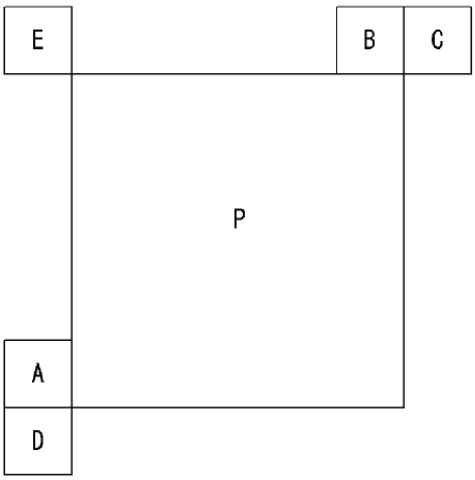


Figure 3 of the '279 patent

Ex. 1029, 109 (Fig. 8-3); Ex. 1001, Fig. 3. As Petitioner asserts, Figure 8-3 of WD5 and Figure 3 of the '279 patent above show the same five spatial merge candidates. Petitioner further contends that in both WD5 and the '279 patent, the motion information for the fifth block (B2 in WD5 or E in the '279 patent) is set as a spatial merge candidate when motion information of at least one of the other four blocks is not available (i.e., not valid). *Id.* at 39–41 (citing Ex. 1001, 10:38–48, Fig. 3; Ex. 1029, 99–101 (§ 8.4.2.1.1), 101–03 (§ 8.4.2.1.2), 109 (Fig. 8-3), 111–12 (§ 8.4.2.1.8); Ex. 1002 ¶¶ 118–128).

We agree with Petitioner's detailed analysis of this limitation, which Patent Owner does not dispute. *See id.* at 38–41; Ex. 1002 ¶¶ 117–130. Accordingly, we find that the combination of WD5 and Lin teaches a processor programmed to implement the processes performed by block 432 in Figure 7 of the '279 patent, or equivalents thereof, and thus teaches a "merge predictor index decoding unit," as recited in claim 1.

c. "temporal merge candidate configuration unit"

Petitioner asserts that WD5 discloses the processes corresponding to functions (i) and (ii) of the temporal merge candidate configuration unit identified in the claim construction section above. Pet. 43–44, 55–56; *see supra* Section II.C.3. For function (i), Petitioner asserts that WD5 discloses processes performed by temporal merge candidate configuration unit 435 in the '279 patent for generating a temporal merge candidate of the current block. Pet. 43–44. Specifically, Petitioner contends that WD5 discloses the process implemented by temporal merge candidate configuration unit 435 (which operates in the same way as temporal merge candidate configuration units 235 and 335)—determining an obtained reference picture index (e.g.,

refIdxLX of left block A1) and obtained motion vector (mvLXCol) as the reference picture index and motion vector of the temporal merging candidate (Col). *Id.* (citing Ex. 1001, 12:41–46; Ex. 1029, 100 (§ 8.4.2.1.1, steps 2–3), 112 (§ 8.4.2.1.8, equation (8-144)); Ex. 1002 ¶¶ 132–134, 136–137).

Regarding function (ii), Petitioner asserts that WD5 discloses the process performed by reference picture index derivation unit 433 (which operates in the same way as reference picture index derivation units 233 and 333)—setting the reference picture index (refIdxLX) of the temporal merge candidate to 0. *Id.* at 55–56 (citing Ex. 1001, 11:21–22; Ex. 1029, 100 (§ 8.4.2.1.1, step 2); Ex. 1002 ¶¶ 166–167).

We agree with Petitioner's detailed analysis, which Patent Owner does not dispute. *See id.* at 43–44, 55–56; Ex. 1002 ¶¶ 131–139, 165–168. Accordingly, we find that the combination of WD5 and Lin teaches a processor programmed to implement the processes performed by blocks 435 and 433 in Figure 7 of the '279 patent, or equivalents thereof, and thus teaches a "temporal merge candidate configuration unit," as recited in claim 1.

d. "merge candidate generation unit"

Merge candidate generation unit 437 in the '279 patent generates one or more merge candidates when the number of valid merge candidates of the current block is smaller than a predetermined number. Ex. 1001, 14:24–42. Petitioner contends that merge candidate generation unit 437 performs several optional processes and that WD5 discloses at least one of them. Pet. 19, 45. In particular, Petitioner contends that WD5 discloses generating an additional merge candidate ($combCand_k$ with k=0) when the number of valid spatial and temporal merge candidates (numOrigMergeCand) is less

than a predetermined number (MaxNumMergeCand). *Id.* at 45–46 (citing Ex. 1001, 14:24–28; Ex. 1029, 100 (§ 8.4.2.1.1, steps 6–7), 103–105 (§ 8.4.2.1.3); Ex. 1002 ¶¶ 141–143).

We agree with Petitioner's detailed analysis of this limitation, which Patent Owner does not dispute. *See id.*; Ex. 1002 ¶¶ 140–145. Accordingly, we find that the combination of WD5 and Lin teaches a processor programmed to implement the processes performed by block 437 in Figure 7 of the '279 patent, or equivalents thereof, and thus teaches a "merge candidate generation unit," as recited in claim 1.

e. "merge predictor selection unit"

Petitioner asserts that WD5 discloses the processes performed by merge predictor selection unit 436 in the '279 patent for generating a merge candidate list using the merge candidates and selecting a merge predictor based on the merge predictor index. Pet. 46–47. For instance, Petitioner asserts that WD5 discloses obtaining a list of merge candidates (mergeCandList) using the available spatial merge candidates (A_1, B_1, B_0, A_0, and B_2), temporal merge candidate (Col), and any additional merge candidate ($combCand_k$), removing candidates with a lower priority from the list if they have the same motion information as other merge candidates, and selecting a merge candidate N corresponding to the reconstructed merge predictor index (merge_idx). *Id.* at 46–47 (citing Ex. 1001, 14:43–62; Ex. 1029, 100–01 (§ 8.4.2.1.1); Ex. 1002 ¶¶ 147–150).

We agree with Petitioner's detailed analysis of this limitation, which Patent Owner does not dispute. *See id.* at 46–48; Ex. 1002 ¶¶ 146–152. Accordingly, we find that the combination of WD5 and Lin teaches a processor programmed to implement the processes performed by block 436

in Figure 7 of the ’279 patent, or equivalents thereof, and thus teaches a “merge predictor selection unit,” as recited in claim 1.

f. “prediction block generating unit”

Petitioner asserts that WD5 discloses the processes corresponding to function (i) identified in our claim construction of this limitation, that is, the processes performed by prediction block generation unit 250 in the ’279 patent for generating a prediction block of the current block using motion information of the merge predictor. Pet. 48–51; *see supra* Section II.C.6. In particular, Petitioner contends that WD5 discloses an algorithm including the following steps: (a) if a motion vector (mvLX) has an integer pixel unit (i.e., the fractional part is (0,0)), generating the prediction block ($predSamplesLX_L$) of the current block by copying a block (samples $A_{i,j}$ from the reference picture) corresponding to a position that is indicated by a motion vector within a picture (refPicLX) indicated by a reference picture index (refIdxLX); and (b) if a motion vector does not have an integer pixel unit (i.e., at least one component of the fractional part is not equal to 0), generating pixels of a prediction block (samples $a_{i,j}$–$r_{i,j}$) from integer pixels within a picture indicated by a reference picture index. Pet. 48–51 (citing Ex. 1001, 9:7–20; Ex. 1029, 113–14 (§ 8.4.2.2), 116 (§ 8.4.2.2.2); Ex. 1002 ¶¶ 153–155).

We agree with Petitioner’s detailed analysis of this limitation, which Patent Owner does not dispute. *See id.*; Ex. 1002 ¶¶ 153–157. Accordingly, we find that the combination of WD5 and Lin teaches a processor programmed to implement the processes performed by prediction block generation unit 250 in the ’279 patent for generating a prediction block of the current block using motion information of the merge predictor, or

equivalents thereof, thus satisfying the "prediction block generating unit" limitation of claim 1.

g. "residual block generating unit"

Petitioner asserts that WD5 discloses the processes performed by residual block decoding unit 260 in the '279 patent corresponding to functions (i)–(iii) of this limitation identified in the claim construction section above. Pet. 52–55; *see supra* Section II.C.7. For function (i), Petitioner asserts that WD5 discloses generating a two-dimensional quantized coefficient block (two-dimensional (nW)×(nH) array of quantized transform coefficients c_{ij}) by inversely scanning entropy-decoded coefficients (transCoeffLevel) using a diagonal raster inverse-scan method (scanIdx set to 3). Pet. 52–53 (citing Ex. 1001, 9:25–41; Ex. 1029, 121–24 (§§ 8.4.3, 8.4.3.1, 8.4.3.2), 125–26 (§§ 8.5.1–2); Ex. 1002 ¶ 160). Regarding function (ii), Petitioner contends that WD5 discloses inversely quantizing the two-dimensional (nW)×(nH) array c_{ij} using a quantization parameter (qP), resulting in a two-dimensional array of inverse quantized coefficients d_{ij}. *Id.* at 53 (citing Ex. 1001, 9:42–44; Ex. 1029, 125–26 (§§ 8.5.1, 8.5.3); Ex. 1002 ¶ 161). Finally, with respect to function (iii), Petitioner cites WD5's disclosure of inversely transforming the two-dimensional array of coefficients d_{ij} into a two-dimensional array of residual samples r. *Id.* at 54 (citing Ex. 1001, 10:4–6; Ex. 1029, 125–27 (§§ 8.5.1, 8.5.3); Ex. 1002 ¶ 162).

We agree with Petitioner's detailed analysis of this limitation, which Patent Owner does not dispute. *See id.* at 52–55; Ex. 1002 ¶¶ 158–164. Accordingly, we find that the combination of WD5 and Lin teaches a processor programmed to implement the processes performed by residual

block decoding unit 260 in the ’279 patent, or equivalents thereof, thus satisfying the “residual block decoding unit” limitation of claim 1.

h. “wherein” limitation

Petitioner relies on WD5 for teaching the last “wherein” limitation of claim 1. Pet. 57–60. Specifically, Petitioner refers to § 8.4.2.1.8 of WD5, which describes the derivation process for the temporal merge candidate motion vector. *See id.* (citing Ex. 1029, 111–12 (§ 8.4.2.1.8)). According to Petitioner and its declarant, Mr. Bross, WD5 discloses that a motion vector of the temporal merge candidate (Col) is selected from the motion vectors of a first merge candidate block (right-bottom candidate block inside the co-located reference picture (colPic)) and a second merge candidate block (center block inside the co-located reference picture) based on a position of the current block (i.e., current prediction unit) within a largest coding unit (LCU), and the motion vector of the second merge candidate block is selected if the current block is adjacent to a lower boundary of the largest coding unit, as recited in claim 1. *Id.* at 57 (citing Ex. 1029, 111–12 (§ 8.4.2.1.8); Ex. 1002 ¶¶ 169–173).

With support from Mr. Bross, the Petition explains in detail how WD5’s temporal merge candidate motion vector derivation process teaches the last “wherein” limitation of claim 1. *Id.* at 57–60; Ex. 1002 ¶¶ 169–173. The first candidate block is the prediction unit located at the right-bottom position of the current prediction unit but inside the co-located reference picture (colPic). Pet. 57–58; Ex. 1029, 111 (§ 8.4.2.1.8, step 1); Ex. 1002 ¶ 171. Petitioner and Mr. Bross explain that this first candidate is chosen if the co-located right-bottom prediction unit is located inside the same LCU line as the current prediction unit, i.e., its y component yPRb divided by the

LCU size (Log2MaxCuSize) is equal to the y component of the current prediction unit yP divided by the LCU size: "(yP>>Log2MaxCuSize) is equal to (yPRb>>Log2MaxCuSize)." Pet. 58; Ex. 1029, 111 (§ 8.4.2.1.8, step 1); Ex. 1002 ¶ 170–171.

The second candidate block in WD5 is the prediction unit located at the center position of the current prediction unit but inside the co-located reference picture (colPic). Pet. 58; Ex. 1029, 111 (§ 8.4.2.1.8, step 2); Ex. 1002 ¶ 172. Petitioner and Mr. Bross explain that this second candidate is chosen if the condition in § 8.4.2.1.8, step 1—(yP>>Log2MaxCuSize) is equal to (yPRb>>Log2MaxCuSize)—is false, i.e., the co-located right-bottom prediction unit is not inside the current LCU line, and "thus the current block is adjacent to a lower boundary of the largest coding unit." Pet. 58; Ex. 1029, 111 (§ 8.4.2.1.8, step 2); Ex. 1002 ¶ 172. The prediction unit is then defined as the prediction unit covering this center position, i.e., as Mr. Bross states, "the second candidate block is selected." Pet. 58; Ex. 1029, 111 (§ 8.4.2.1.8, step 2); Ex. 1002 ¶ 172; *see also* Pet. 58–60 (citing Ex. 1002 ¶ 173 (Mr. Bross providing further explanation of the temporal motion vector derivation process in WD5 with reference to an example, Demonstrative L)).

Patent Owner argues that Petitioner's position regarding the "wherein" limitation is inconsistent with Petitioner's interpretation of WD5

in a prior Korean invalidation proceeding. PO Resp. 45 (citing Ex. 2013).[17] According to Patent Owner, in that proceeding Petitioner asserted in a petition document that the same section of WD5 relied on here discloses a determination whether the first candidate block is "not available" according to a position of a current block. *Id.* (citing Ex. 2013, 6). Patent Owner submits that such a position "is not the same as the current allegation that the current block 'is adjacent to a lower boundary of the largest coding unit,'" and that Petitioner "is precluded from taking a position that is clearly contrary to its original position." *Id.* at 45–47 (citing *In re Omeprazole Patent Litig.*, 483 F.3d 1364, 1372–73 (Fed. Cir. 2007)).

We are not persuaded by Patent Owner's argument. First, as Petitioner points out, the record contains no evidence that the arguments in the petition from the Korean invalidation proceeding were made by Petitioner, as the excerpt does not indicate the parties involved. *See* Pet. Reply 24; Ex. 2013. In any event, we agree with Petitioner that there is no inconsistency. *See* Pet. Reply 25. The excerpt from the Korean proceeding petition cites § 8.4.2.1.8 of a document referred to as "Evidence A-13," which appears to be substantially similar to a portion of § 8.4.2.1.8 of WD5. *Compare* Ex. 2013, 2–4, *with* Ex. 1029, 111–12 (§ 8.4.2.1.8). According to the Korean petition document, § 8.4.2.1.8 of Evidence A-13 discloses that "if the first candidate block is not available according to a position . . . of a

[17] Exhibit 2013 is an English translation of several pages from a petition document for trial on invalidation in KR Invalidation Case No. 2017 3077. Exhibit 2014 allegedly is the original Korean language version of the same pages. We cite the page numbers of the English translation, rather than the exhibit page numbers added by Petitioner or the page numbers of the original Korean document.

current block, the first candidate block is not used . . . , and the second candidate block is determined as the temporal merge candidate block." Ex. 2013, 6. This argument is entirely consistent with Petitioner's position, supported by Mr. Bross's testimony, that the second candidate block is selected as the temporal merge candidate when the condition in step 1 of § 8.4.2.1.8 is false, indicating that the first candidate block is unavailable. *See* Pet. 58; Ex. 1002 ¶ 172; *see also* Pet. 59 ("In this case, . . . the motion vector of the second (center) candidate block is selected for the temporal merge candidate Col instead of the first (right-bottom) candidate block." (emphasis omitted) (citing Ex. 1029, 111 (§ 8.4.2.1.8, step 2)); Ex. 1002 ¶ 173 (same).

In the case before us, Petitioner and Mr. Bross further explain the circumstances when the condition of step 1 of § 8.4.2.1.8 of WD5 would be false and the first candidate block would be unavailable—i.e., when the co-located right-bottom prediction unit is outside the current LCU line, which occurs when "the current block is adjacent to a lower boundary of the largest coding unit," as recited in claim 1. *See* Pet. 58–59; Ex. 1002 ¶¶ 172–173; Pet. Reply 26. Based on the evidence of record, we agree with Petitioner that such additional explanation would have been unnecessary in the Korean proceeding because the claim at issue in the provided excerpt does not include a limitation regarding the lower boundary of the largest coding unit. *See* Pet. Reply 26 (citing Ex. 2013, 1–2). The presence in the Petition of an additional argument directed to the specific claim language involved in this case does not render Petitioner's position inconsistent with its alleged earlier position in the Korean invalidation proceeding.

Patent Owner also argues that WD5 does not teach "the motion vector of the second merge candidate block is selected . . . if the current block is adjacent to a lower boundary of the largest coding unit," as recited in claim 1. PO Resp. 49–53. Specifically, Patent Owner contends that WD5 must be interpreted in view of a JCT-VC input document considered at the Geneva meeting—JCTVC-G082, titled "Non-CE9: Modified H positions for memory bandwidth reduction in TMVP derivation." *Id.* at 50–52 (citing Ex. 2018). As shown on its first page, WD5 incorporated into Working Draft 5 of the HEVC standard proposals from various input documents, including JCTVC-G082. Ex. 1029, i ("Incorporated modified H and center TMVP positions (JCTVC-G082)"). Changes based on JCTVC-G082 are shown in purple font in § 8.4.2.1.8 of WD5. *See id.* at 111–12.

Relying on the testimony of Dr. Furht, Patent Owner asserts that Petitioner's interpretation of WD5 "does not match" the changes to WD5 based on JCTVC-G082. PO Resp. 51 (citing Ex. 2015 ¶¶ 42–54). Dr. Furht testifies that, in following the recommendation of JCTVC-G082, WD5 "replaces a C0 temporal merge candidate, which does not belong to the LCU, with another C0 temporal candidate, which is a closest one in the current LCU." Ex. 2015 ¶ 41 (citing Ex. 2018, Section 3 Algorithm Description, Figure 3); *see* PO Resp. 51. According to Dr. Furht, that process differs from the one recited in claim 1 of the '279 patent, which eliminates C0 (corresponding to the claimed first merge candidate block) and considers C1 (corresponding to the claimed second merge candidate block) as the temporal merge candidate if the current block is adjacent to a lower boundary of the largest coding unit. Ex. 2015 ¶¶ 44–45; *see* PO Resp. 52.

We agree with Petitioner that Dr. Furht's opinion, and thus Patent Owner's substantive argument, depend on the faulty premise that WD5 incorporates Figure 3 (also referred to as configuration 1) of JCTVC-G082. *See* Pet. Reply 2. The analysis of WD5 in Dr. Furht's declaration is based solely on the process shown in Figure 3 of JCTVC-G082. *See* Ex. 2015 ¶¶ 41–43, 45–49, 51 (explicitly citing and describing Figure 3 of JCTVC-G082). Dr. Furht confirmed on cross-examination that his declaration testimony considered only Figure 3 of JCTVC-G082. Ex. 1132, 25:6–27:15. As Petitioner points out, however, Dr. Furht's assertion that the "proposal [in Figure 3 of JCTVC-G082] was accepted and implemented in WD5 (i.e., WD5 uses the same procedure)" is factually incorrect. *See* Pet. Reply 2–3; Ex. 2015 ¶ 43. Rather, as noted in the meeting report of the seventh meeting of the JCT-VC in Geneva, WD5 adopted a different process proposed in JCTVC-G082—the one shown in Figure 4 (also referred to as configuration 2). Ex. 1058, 127 (providing that the decision was made to "[a]dopt configuration 2"); *see* Pet. Reply 3. Indeed, the text of § 8.4.2.1.8 in WD5 mirrors JCTVC-G082's proposed textual changes to the working draft based on configuration 2. *Compare* Ex. 2018, 10–12, *with* Ex. 1029, 111–12. When presented with the Geneva meeting report during his deposition, Dr. Furht admitted that WD5 incorporated configuration 2 (Figure 4), not configuration 1 (Figure 3). Ex. 1132, 75:7–12.

Because Dr. Furht's testimony that WD5 does not teach the features in the last "wherein" limitation of claim 1 is based entirely on his erroneous understanding that WD5 implements the process shown in Figure 3 of JCTVC-G082, we give his testimony little weight. And because Patent Owner's argument that WD5 does not teach this limitation relies exclusively

on Dr. Furht's testimony, it is similarly unpersuasive. Instead, we credit the undisputed testimony of Mr. Bross, which, as discussed above, provides a detailed analysis of how WD5 satisfies the last "wherein" limitation of claim 1. Having considered the parties' arguments and supporting evidence, we find Petitioner has demonstrated that WD5 teaches this limitation.

i. Conclusion

For the reasons discussed above, Petitioner has shown sufficiently that the combination of WD5 and Lin teaches or suggests all the limitations of claim 1 and has articulated a sufficient rationale for combining the teachings of the references. Accordingly, Petitioner has shown by a preponderance of the evidence that claim 1 would have been obvious over the combination of WD5 and Lin.

4. Claims 2–5

Claim 2 depends from claim 1 and further recites "the temporal merge candidate configuration unit determines a temporal merge candidate picture and determines a temporal merge candidate block within the temporal merge candidate picture, in order to generate a motion vector of the temporal merge candidate." Ex. 1001, 18:10–14. As explained in our claim construction section above, the disclosed structure for performing the claimed function is a processor programmed to implement the processes performed by motion vector derivation unit 434 in the '279 patent. *See supra* Section II.C.3 (function (iii)). Petitioner contends that WD5 discloses the three processes performed by motion vector derivation unit 434 (which operates in the same way as motion vector derivation unit 234)—(i) determining a temporal merge candidate (co-located reference picture colPic in WD5) to which the temporal merge candidate (co-located prediction unit colPu in WD5)

belongs; (ii) obtaining the temporal merge candidate block (colPu) within the temporal merge candidate picture (colPic); and (iii) setting the motion vector (mvCol) of a temporal merge candidate (Col) as the motion vector (mvLXCol) of the selected temporal merge candidate prediction block (colPu). Pet. 61–64 (citing Ex. 1001, 11:55–12:9, 12:33–36; Ex. 1029, 30–31 (§ 7.3.3), 100 (§ 8.4.2.1.1, step 3), 111–12 (§ 8.4.2.1.8); Ex. 1002 ¶¶ 174–184).

Claim 3 depends from claim 2 and further recites "wherein the temporal merge candidate block is a valid block retrieved when the first candidate block and the second candidate block are searched for in due order, depending on a position of the current block." Ex. 1001, 18:15–18. As explained above for the last "wherein" limitation of claim 1, WD5 discloses a first candidate block (right-bottom temporal merge candidate block) and a second candidate block (center temporal merge candidate block). *See* Pet. 65 (citing Ex. 1029, 111–12 (§ 8.4.2.1.8)). For claim 3, Petitioner relies on WD5 for disclosing that the right-bottom temporal merge candidate is checked first and the center temporal merge candidate is checked afterwards if the first candidate "is coded in an intra prediction mode" or is "unavailable" (i.e., they are searched in "due order"), and the temporal merge candidate selected depends on the position of the current block. *Id*. at 66 (citing Ex. 1029, 111 (§ 8.4.2.1.8, steps 1–3)); Ex. 1002 ¶ 187.

Claim 4 depends from claim 1 and further recites "wherein the prediction block generating unit generates a prediction pixel of luminance component using an 8-tap interpolation filter and generates a prediction pixel of chrominance component using a 4-tap interpolation filter."

Ex. 1001, 18:19–23. According to Petitioner, WD5 discloses that a prediction pixel of luminance component (or "luma sample") is assigned a sample value generated using an 8-tap interpolation filter depending on the fractional sample location. Pet. 67 (citing Ex. 1029, 115–16 (§ 8.4.2.2.2.1, Table 8-12); Ex. 1002 ¶ 189). Further, Petitioner asserts that WD5 discloses that a prediction pixel of chrominance component (or "chroma sample") is assigned a sample value generated using a 4-tap interpolation filter depending on the fractional sample location. *Id.* at 67–68 (citing Ex. 1029, 116–18 (§ 8.4.2.2.2.2, Table 8-13); Ex. 1002 ¶ 190).

Claim 5 depends from claim 1 and further recites "wherein a diagonal raster inverse scan is used during the inverse-scanning process." Ex. 1001, 18:24–25. For this limitation, Petitioner asserts that WD5 discloses generating a two-dimensional quantized coefficient block (two-dimensional (nW)×(nH) array of quantized transform coefficients c_{ij}) by inversely scanning entropy-decoded coefficients (one-dimensional list of quantized transform coefficients transCoeffLevel). Pet. 69 (citing Ex. 1029, 121–24 (§ 8.4.3), 125–26 (§ 8.5.1)); Ex. 1002 ¶ 193. Mr. Bross explains that the mapping is done using an inverse scan defined by ScanOrder with scanIdx set to 3, which WD5 specifies as a diagonal scan. Ex. 1002 ¶¶ 194–195 (citing Ex. 1029, 21 (§ 6.6)); *see* Pet. 69. Mr. Bross further explains that this mapping satisfies the definition of a "raster scan" set forth in WD5. Ex. 1002 ¶ 196 (citing Ex. 1029, 6 (§ 3.84)); *see* Pet. 70. Thus, according to Petitioner and Mr. Bross, the inverse-scanning process disclosed in WD5 uses a "diagonal raster inverse scan," as recited in claim 5. Pet. 70; Ex. 1002 ¶ 196.

Patent Owner does not dispute Petitioner's contentions regarding the additional limitations of claims 2–5. Having considered Petitioner's arguments and supporting evidence, including the testimony of Mr. Bross, we are persuaded by Petitioner's analysis of these claims. *See* Pet. 60–70; Ex. 1002 ¶¶ 174–196. Accordingly, we conclude that Petitioner has shown by a preponderance of the evidence that claims 2–5 would have been obvious over the combination of WD5 and Lin.

III. CONCLUSION

For the foregoing reasons, Petitioner has demonstrated by a preponderance of the evidence that claims 1–5 of the '279 patent are unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of WD5 and Lin.

IV. ORDER

Accordingly, it is:

ORDERED that claims 1–5 of U.S. Patent No. 8,774,279 B2 have been shown to be unpatentable; and

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

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