

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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UNIFIED PATENTS, LLC,  
Petitioner,

v.

ELECTRONICS AND TELECOMMUNICATIONS RESEARCH  
INSTITUTE AND HANBAT NATIONAL UNIVERSITY INDUSTRY-  
ACADEMIC COOPERATION FOUNDATION,  
Patent Owner.

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PGR2022-00060  
Patent 11,212,553 B2

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Before NATHAN A. ENGELS, KARA L. SZPONDOWSKI,  
and SCOTT B. HOWARD, *Administrative Patent Judges*.

SZPONDOWSKI, *Administrative Patent Judge*.

DECISION  
Granting Institution of Post-Grant Review  
35 U.S.C. § 324

## I. INTRODUCTION

Unified Patents, LLC (“Petitioner”) filed a Petition (Paper 2, “Pet.”) to institute post-grant review of claims 1, 2, and 5 of U.S. Patent No. 11,212,553 B2 (“the ’553 patent”). Electronics and Telecommunications Research Institute (“ETRI”) and Hanbat National University Industry-Academic Cooperation Foundation (“HBNU”) (collectively “Patent Owner”) filed a Preliminary Response (Paper 7, “Prelim. Resp.”).

Institution of post-grant review is authorized when “the information presented in the petition . . . , if such information is not rebutted, would demonstrate that it is more likely than not that at least 1 of the claims challenged in the petition is unpatentable.” 35 U.S.C. § 324(a) (2018). “When instituting post-grant review, the Board will authorize the review to proceed on all of the challenged claims and on all grounds of unpatentability asserted for each claim.” 37 C.F.R. §42.208(a) (2022). Based on the current record, and for the reasons explained below, we determine that Petitioner has demonstrated that it is more likely than not that it will prevail with respect to at least one challenged claim. Accordingly, we institute post-grant review as to the challenged claims and grounds raised in the Petition.

## II. BACKGROUND

### A. *Real Parties in Interest*

Petitioner identifies itself as the real party in interest. Pet. 1. Patent Owner identifies ETRI, HBNU, and Access Advance LLC as real parties in interest. Paper 4, 1.

*B. Related Proceedings*

Patent Owner identifies U.S. Patent Application No. 17/529,757 as pending and a continuation of the application that led to the '553 patent. Paper 4, 1.

*C. The '553 Patent*

The '553 patent is titled “Bidirectional Intra Prediction Method and Apparatus” and is generally directed to a video decoding and encoding method and apparatus that uses bidirectional intra-prediction. Ex. 1001, code (54), 1:6–10.

The '553 patent explains that an image encoding/decoding apparatus may use inter-prediction or intra-prediction technology to perform encoding/decoding on a high-resolution and high-definition image. *Id.* at 1:30–33. “Inter-prediction technology may be technology for predicting the value of a pixel included in a target picture using temporally previous pictures and/or temporally subsequent pictures,” and “[i]ntra-prediction technology may be technology for predicting the value of a pixel included in a target picture using information about pixels in the target picture.” *Id.* at 1:34–39.

An encoding apparatus may perform encoding on an image using an intra-prediction mode and may generate and output a bitstream with information about the encoding, including the intra-prediction mode used. *Id.* at 13:45–52, Fig. 1. The decoding apparatus receives the bitstream output from the encoding apparatus and decodes the bitstream in the intra-prediction mode to generate a decoded or reconstructed image. *Id.* at 18:25–34, Fig. 2.

Figure 35, reproduced below, shows a flowchart of a target block prediction method using a bitstream.

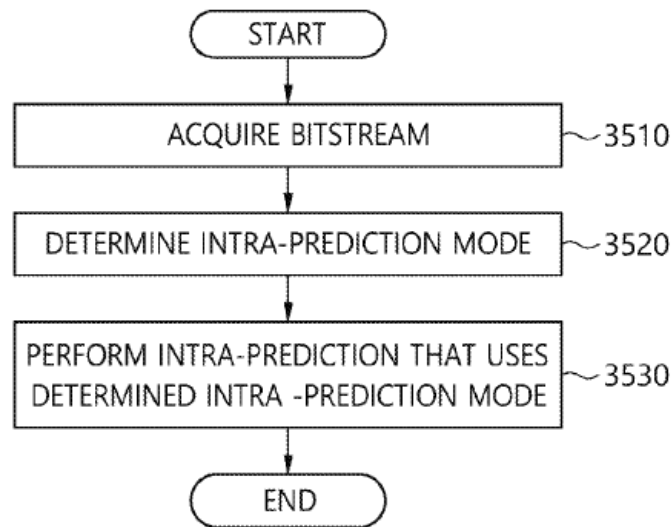


**FIG. 35**

Figure 35, above, shows a target block prediction method using a bitstream that may be performed by a decoding apparatus. *Id.* at 80:20–26. Steps shown are acquire bitstream 3510, determine intra-prediction mode 3520, and perform intra-prediction that uses determined intra-prediction mode 3530.

At step 3510, the bitstream, which may include information about the encoded target block, may be received from an encoding apparatus. *Id.* at 80:27–31. The bitstream may also include prediction information, which may be information for bidirectional intra-prediction and/or intra-prediction using a remaining mode. *Id.* at 80:36–42. The “prediction information may include 1) a unidirectional/bidirectional classification indicator, 2) an intra-prediction mode indicator, 3) a weight for a reference pixel, 4) an MPM usage indicator, 5) an MPM indicator, 6) a predefined angle” for bidirectional intra-prediction. *Id.* at 80:43–47. MPM is “Most Probable

Mode,” which is “an intra-prediction mode having a high probability of being used for intra prediction for a target block.” *Id.* at 12:47–49. The MPM usage indicator “may indicate whether an MPM usage mode is to be used for prediction for a target block. The MPM usage mode may be a mode in which the MPM to be used for intra prediction for the target block is determined using the MPM list.” *Id.* at 13:17–21. The MPM indicator “may indicate an MPM to be used for intra prediction for a target block among one or more MPMs in the MPM list. For example, the MPM indicator may be an index for the MPM list.” *Id.* at 13:4–7. The MPM list “may be a list including one or more MPMs.” *Id.* at 13:1–2.

At step 3520, the processing unit of the decoding apparatus “may determine an intra-prediction mode to be applied to decoding of the target block.” *Id.* at 80:59–61. Step 3520 corresponds to steps 3010, 3020, 3030, 3040, and 3050 of Figure 30, and steps 3110, 3120, 3130, 3140, and 3150 of Figure 31. *Id.* at 80:63–67.

Figure 30, which depicts a flowchart of the determination of an intra-prediction mode using a remaining mode, is reproduced below:

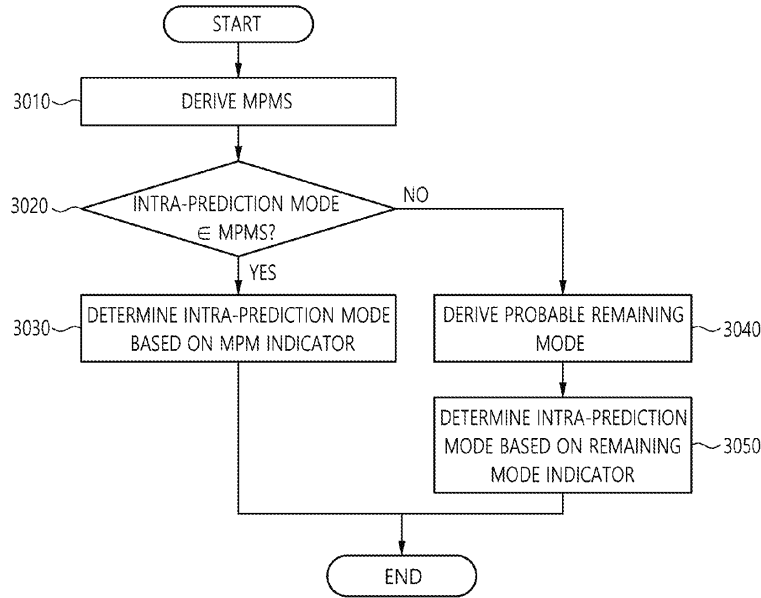


**FIG. 30**

Figure 30, above, depicts a flowchart of the determination of an intra-prediction mode using a remaining mode, and shows steps 3010 derive MPMS, step 3020 determine whether intra-prediction mode target is one of the MPMS, step 3030 determine intra-prediction mode based on MPM indicator, step 3040 derive probable remaining mode, and step 3050 determine intra-prediction mode based on remaining mode indicator.

“When the intra-prediction mode of a target block is determined, the likelihood that a specific intra-prediction mode will be used for intra-prediction of the target block may be high or low depending on the coding parameter related to the target block.” *Id.* at 69:27–30. “In consideration of this likelihood, an MPM list may be used.” *Id.* at 69:31–32. “The remaining modes may be the remaining intra-prediction modes other than MPMS in the MPM list. In other words, the remaining modes may be the remaining intra-prediction modes after one or more MPMS in the MPM list are excluded from all intra-prediction modes.” *Id.* at 69:33–37. “The remaining modes having a high probably of being used for intra-prediction of the target block”

are the first remaining mode set, and may be referred to as a probable remaining mode. *Id.* at 69:42–45. The remaining modes which are not included in the first remaining mode set are the second remaining mode set. *Id.* at 69:51–55. “A remaining mode indicator may indicate the remaining mode to be used for intra-prediction of the target block, among the remaining modes.” *Id.* at 69:56–61.

At step 3020, “the processing unit may determine, using an MPM usage indicator, whether the intra-prediction mode of the target block is one of MPMs.” *Id.* at 70:4–6. “If it is determined that the intra-prediction mode of the target block is one of the MPMs, step 3030 is performed.” *Id.* at 70:19–21. “If it is determined that the intra-prediction mode of the target block is not one of the MPMs, step 3040 may be performed.” *Id.* at 70:22–24.

In step 3030, the processing unit “may determine the MPM indicated by the MPM indicator, among the one or more MPMs in the MPM list, to be the intra-prediction mode of the target block.” *Id.* at 70:30–32.

In step 3040, “[t]he processing unit may derive one or more probable remaining nodes in a probable remaining mode list for the target block.” *Id.* at 70:37–39.

In step 3050, “[t]he processing unit may determine a probable remaining mode indicated by the remaining mode indicator, among one or more probable remaining modes in the probable remaining mode list, to be the intra-prediction mode of the target block.” *Id.* at 70:45–49. “If it is determined that the intra-prediction mode of the target block is not one of the probable remaining modes, the process may be terminated, and additional intra-prediction that uses neither an MPM nor a probable remaining mode may be processed.” *Id.* at 72:27–34.

Figure 31, reproduced below, depicts a flowchart illustrating the derivation of an MPM after determination of whether an MPM is used, and the determination of an intra-prediction mode using a remaining mode.

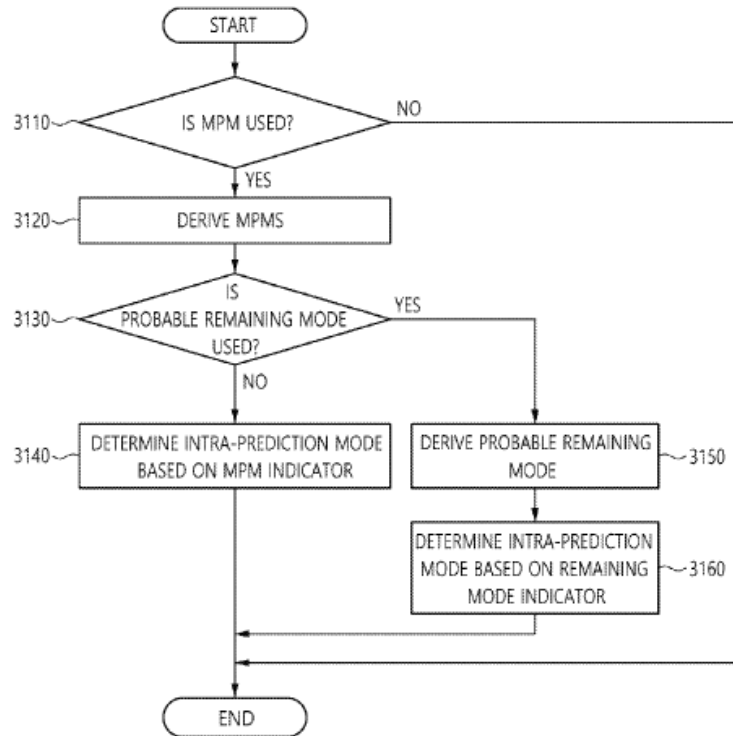


**FIG. 31**

Figure 31, above, depicts a flowchart illustrating the derivation of an MPM after determination of whether an MPM is used, and the determination of an intra-prediction mode using a remaining mode. Figure 31 shows step 3110 is MPM used, step 3120 derive MPMS, step 3130 is probable remaining mode used, step 3140 determine intra-prediction mode based on MPM indicator, step 3150 derive probable remaining mode, and step 3160 determine intra-prediction mode based on remaining mode indicator.

At step 3110, “the processing unit may determine whether an MPM is used to perform intra-prediction for a target block.” *Id.* at 70:62–64. “[T]he fact that an MPM is used to perform intra-prediction for the target block may

mean 1) the case where the intra-prediction mode of the target block is one of MPMs and 2) the case where the intra-prediction mode of the target block is one of the remaining modes and an MPM list is used for the remaining mode.” *Id.* at 70:65–71:3. “The processing unit may determine, using an MPM usage indicator, whether an MPM is used to perform intra-prediction for the target block.” *Id.* at 71:4–6. “The processing unit may determine, using an MPM indicator, whether an MPM is used to perform intra-prediction for the target block.” *Id.* at 71:18–20. “If it is determined that an MPM is used to perform intra-prediction for the target block, step 3120 may be performed.” *Id.* at 71:28–30. “If it is determined that an MPM is not used to perform intra-prediction of the target block, the process may be terminated, and intra-prediction based on an additional scheme may be performed.” *Id.* at 71:32–35.

At step 3120, “the processing unit may derive one or more MPMs for the target block.” *Id.* at 71:36–37.

At step 3130, “the processing unit may determine whether a probable remaining mode is used to perform intra-prediction for the target block.” *Id.* at 71:40–42. “Alternatively, the processing unit may determine which one of an MPM and a probable remaining mode is used to perform intra-prediction for the target block.” *Id.* at 71:43–45.

Step 3140 corresponds to step 3030, step 3150 corresponds to step 3040, and step 3160 corresponds to step 3050, which were described above. *Id.* at 72:4–14.

Returning to Figure 35, in step 3530, the processing unit of the decoding apparatus “may perform intra-prediction for the target block that uses the information about the encoded target block and the determined intra-prediction mode.” *Id.* at 81:9–12.

*D. Illustrative Claims*

Challenged claims 1 and 5 are independent. Ex. 1001, 82:19–47, 83:34–84:35. Independent claim 1 is representative, and reproduced below with brackets indicating Petitioner’s identifiers.

1. [1.0] A decoding method using a bitstream, comprising:

[1.1] determining an intra prediction mode for a target block;  
and

[1.2] performing an intra prediction for the target block, [1.3] wherein the intra prediction for the target block is performed using at least one first intra prediction mode in a case that a first indicator decoded from the bitstream indicates that the at least one first intra prediction mode is used for the intra prediction for the target block,

[1.4.1] an intra prediction mode in a list comprising one or more second intra prediction modes [1.4.2] is used for the intra prediction for the target block in a case that [i] the first indicator indicates that the at least one first intra prediction mode is not used for the intra prediction for the target block and [ii] a second indicator decoded from the bitstream indicates that the list is used for the intra prediction for the target block, [1.5] the at least one first intra prediction mode is not comprised in the list,

[1.6] an intra prediction mode of one or more third intra prediction modes is used for the intra prediction for the target block in a case that [i] the first indicator indicates that the at least one first intra prediction mode is not used for the intra prediction for the target block and [ii] the second indicator indicates that the list is not used for the intra prediction for the target block, and

[1.7] the one or more third intra prediction modes don't include any one of the at least one first intra prediction mode and the one or more second intra prediction modes.

Ex. 1001, 82:19–47.

*E. Prior Art and Asserted Grounds of Unpatentability*

Petitioner challenges the patentability of claims 1, 2, and 5 of the '553 patent on the following grounds (Pet. 4):

| Claims Challenged | 35 U.S.C. §      | References                                   |
|-------------------|------------------|----------------------------------------------|
| 1, 2, 5           | 103 <sup>1</sup> | Chuang, <sup>2</sup> Karczewicz <sup>3</sup> |

Petitioner also filed the Declaration of Dr. Immanuel Freedman in support of the Petition. Ex. 1003.

III. ANALYSIS

*A. Eligibility for Post-Grant Review*

The post-grant review provisions apply to a patent that contains a claim with an effective filing date on or after March 16, 2013. AIA § 6(f)(2)(A). A petition for post-grant review must be filed within nine months of the date of the grant of the patent or of the issuance of a reissue patent, as the case may be. 35 U.S.C. § 321(c). Petitioner must certify that these requirements are satisfied. 37 C.F.R. § 42.204(a).

The '553 patent is a U.S. national phase of PCT Application No. PCT/KR2018/014847, which was filed on November 28, 2018, and claims an earliest effective date of November 28, 2017. Ex. 1001, codes (22), (86). The '553 patent issued on December 28, 2021, and the Petition was filed on

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<sup>1</sup> The application resulting in the '553 patent claims an earliest effective filing date of November 28, 2017, and, thus, is subject to the Leahy-Smith American Invents Act, Pub. L. No. 112–29, 125 Stat. 284 (2011) (“AIA”).

<sup>2</sup> Chuang et al., US Patent Pub. No. 2014/0086323 A1, published Mar. 27, 2014 (Ex. 1005).

<sup>3</sup> Karczewicz et al., US Patent Pub. No. 2012/0177118 A1, published July 12, 2012 (Ex. 1006).

September 28, 2022, within nine months of issuance. Ex. 1001, code (45); Pet. 90–92. Thus, the ’553 patent is eligible for post-grant review. *See* Pet. 3–4.

*B. Obviousness: Legal Standards*

A claim is unpatentable for obviousness if, to one of ordinary skill in the pertinent art, “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007) (quoting 35 U.S.C. § 103(a)). The question of obviousness is resolved on the basis of underlying factual determinations, including “the scope and content of the prior art”; “differences between the prior art and the claims at issue”; and “the level of ordinary skill in the pertinent art.” *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). Additionally, secondary considerations, such as “commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy.” *Id.*

A patent claim “is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *KSR*, 550 U.S. at 418. Rather, an obviousness determination requires finding “both ‘that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so.’” *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367–68 (Fed. Cir. 2016) (citation omitted); *see also KSR*, 550 U.S. at

418 (for an obviousness analysis, “it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements [in the way the claimed] new invention does”).

Further, an assertion of obviousness “cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR*, 550 U.S. at 418 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)); accord *In re NuVasive, Inc.*, 842 F.3d 1376, 1383 (Fed. Cir. 2016) (stating that “conclusory statements” amount to an “insufficient articulation [] of motivation to combine”; “instead, the finding must be supported by a ‘reasoned explanation’” (citation omitted)); *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016) (“To satisfy its burden of proving obviousness, a petitioner cannot employ mere conclusory statements. The petitioner must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.”).

The motivation to combine must be “accompanied by a reasonable expectation of achieving what is claimed in the patent-at-issue.” *Intelligent Bio-Sys*, 821 F.3d at 1367. “The reasonable expectation of success requirement refers to the likelihood of success in combining references to meet the limitations of the claimed invention.” *Id.*

### C. *Level of Skill in the Art*

Petitioner asserts that a person of ordinary skill in the art “would have had a bachelor’s degree in electrical or computer engineering, or a closely related scientific field such as physics or computer science, and two years of work experience with video compression. A lack of experience can be remedied with additional education (e.g., a Master’s degree), and likewise,

less education can be remedied with additional work experience (e.g., 4–5 years).” Pet. 15 (citing Ex. 1003 ¶¶ 53–57).

Patent Owner agrees with Petitioner’s definition of a person of ordinary skill in the art for purposes of the Preliminary Response. Prelim. Resp. 9.

On this record, the level of ordinary skill is neither in dispute nor dispositive of any challenge. For purposes of this Decision, we apply Petitioner’s proposed level of skill in the art.

#### *D. Claim Construction*

We construe each claim “in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent,” the same standard used to construe the claim in a civil action. 37 C.F.R. § 42.200(b).

Petitioner contends that no claim term requires construction beyond its ordinary meaning. Pet. 16.

Patent Owner contends that the term “first indicator,” recited in claims 1 and 5, requires construction. Prelim. Resp. 6–9. According to Patent Owner, “the claimed first indicator must indicate whether a particular intra prediction mode(s) (**‘the at least one first intra prediction mode’**) is used to intra predict the target block.” *Id.* at 6. According to Patent Owner, this interpretation mirrors the surrounding claim language. *Id.* at 7 (citing claim 1, “the intra prediction for the target block is performed **using at least one first intra prediction mode**,” where the “first indicator . . . indicates that **the** at least one first intra prediction mode is used for the intra prediction for the target block”). Patent Owner argues that “[t]he first indicator is indicative with respect to a particular intra prediction mode(s).” *Id.* at 7–8.

Citing to the Specification, Patent Owner contends that the '553 patent distinguishes an “MPM indicator” as “indicat[ing] an MPM to be used for intra prediction for a target block among one or more MPMs,” where the MPM “is an intra prediction mode,” as opposed to an “MPM usage or ‘use indicator’ that ‘indicate[s] whether an MPM usage mode is to be used for prediction for a target block.’” *Id.* at 8 (citing Ex. 1001, 12:47–49, 13:4–6, 13:17–19). According to Patent Owner, “[w]hile the former, corresponding to the language of the claimed ‘first indicator,’ indicates that a particular intra prediction mode is used, the latter indicates whether a usage mode or ‘MPM list’ – NOT an intra prediction mode—is to be used for subsequently determining the intra prediction mode of the target block.” *Id.* (citing Ex. 1001, 13:19–21). Patent Owner contends that “[t]he claims similarly distinguish between these two types of indicators, specifying the first indicator in relation to a particular mode(s) and the second indicator in relation to a list.” *Id.* Patent Owner, therefore, contends that per the plain and ordinary meaning, the “first indicator” is “an indicator of whether a *particular* intra prediction mode(s) is used to intra predict the target block.” *Id.* at 9 (emphasis added).

Patent Owner’s proposed construction essentially tracks the claim language, but also adds the word “particular.” We agree with Patent Owner that “the at least one first intra prediction mode” refers to the same “at least one first intra prediction mode” recited earlier in the limitation (*see* Prelim. Resp. 7), however, on this record, and at this stage of the proceeding, we decline to import the word “particular” in the claim language, as Patent Owner proposes. *See, e.g., SuperGuide Corp. v. DirecTV Enterprises, Inc.*, 358 F.3d 870, 875 (Fed Cir. 2004) (“Though understanding the claim language may be aided by explanations contained in the written description,

it is important not to import into a claim limitations that are not a part of the claim.”).

Although the Specification describes several indicators, such as the “MPM indicator” and “MPM usage indicator,” as discussed by Patent Owner,<sup>4</sup> the claim term “first indicator” is broader, and does not recite a specific indicator other than as described in the claim language itself, i.e., “indicates that the at least one first intra prediction mode is used for the intra prediction for the target block.”

Patent Owner contends that the “first indicator” corresponds to the “MPM indicator,” and Petitioner contends that the “first indicator” corresponds to the “MPM usage indicator.” *See* Prelim. Resp. 8; Pet. 11.<sup>5</sup> We note that in the accompanying description of Figure 31, the ’553 patent describes the functionality of the “MPM usage indicator” and the “MPM indicator” using identical language. For example, the Specification states “[t]he processing unit may determine, using an MPM usage indicator, whether an MPM is used to perform intra-prediction for the target block.” Ex. 1001, 71:4–6. The Specification then describes the MPM indicator in the same way, stating “[t]he processing unit may determine, using an MPM

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<sup>4</sup> The Specification also discloses a “remaining mode indicator” and a “remaining mode usage indicator.” *See, e.g.*, Ex. 1001, 69:56–58 (“A remaining mode indicator may indicate the remaining mode to be used for intra-prediction of the target block, among the remaining modes.”), 72:16–19 (“the processing unit may determine, using a remaining mode usage indicator, whether the intra-prediction mode of the target block is one of probable remaining modes”).

<sup>5</sup> There also appears to be some dispute as to whether Figure 30 or an alternative embodiment of Figure 31 more accurately depicts the embodiment claimed. For example, Petitioner appears to rely on Figure 30, (*see, e.g.*, Pet. 10–14), and Patent Owner appears to rely on an alternative embodiment of Figure 31 (*see, e.g.*, Prelim. Resp. 2–4).

indicator, whether an MPM is used to perform intra-prediction for the target block.” *Id.* at 71:18–20. This language is similar to the claim language, and seems to indicate at least some similarities between these two indicators in this embodiment. However, this differs from the accompanying description of the functionality of these two indicators in Figure 30, which describes that “[t]he processing unit may determine, using an MPM usage indicator, whether the intra-prediction mode of the target block is one of MPMs” and “[t]he processing unit may determine the MPM indicated by the MPM indicator, among the one or more MPMs in the MPM list, to be the intra-prediction mode of the target block.” *Id.* at 70:4–7, 30–32.

Because the claim language does not recite a specific type of indicator, i.e., an “MPM indicator,” “MPM usage indicator,” or even one of the other indicators described in the Specification, we need not determine, at this time and on the current record, to which indicator the “first indicator” may be referring, or even if it may refer to any of them. Moreover, although the “second indicator” explicitly recites “a list” comprising “intra prediction modes,” we are not persuaded, on this record, that the “first indicator” precludes the “at least one intra prediction mode” from being in a list. *See Crystal Semiconductor Corp. v. TriTech Microelectronics Intern., Inc.*, 246 F.3d 1336, 1348 (Fed. Cir. 2001) (“the use of ‘comprising’ creates a presumption that the body of the claim is open . . . [and] that the recited elements are only part of the device, that the claim does not exclude additional, unrecited elements.”). The Specification describes each of the “MPM indicator,” “MPM usage indicator,” and “remaining mode indicator” as being at least associated with a list. *See* Ex. 1001, 13:6–7, 13–16 (“For example, the MPM indicator may be an index for the MPM list . . . As the MPM indicator is signaled, the decoding apparatus may determine the MPM

to be used for intra prediction for the target block among the MPMs in the MPM list.”), 19–21 (“The MPM usage mode may be a mode in which the MPM to be used for intra prediction for the target block is determined using the MPM list”), 70:45–51 (“[t]he processing unit may determine a probable remaining mode indicated by the probable remaining mode indicator, among one or more probable remaining modes in the probable remaining mode list, to be the intra-prediction mode of the target block . . . the remaining mode indicator may be the index of the probable remaining mode list”).

The claim language defines the bounds of claim scope. *Bell Communications Research, Inc. v. Vitalink Communications Corp.*, 55 F.3d 615, 619–20 (Fed. Cir. 1995) (“First, and most importantly, the language of the claim defines the scope of the protected invention.”). We, therefore, find it germane to focus on the claim language itself. We interpret the claim language to have its plain and ordinary meaning, i.e., the “first indicator . . . indicates that the at least one first intra prediction mode is used for the intra prediction for the target block.” We, therefore, determine that, at this stage of the proceeding, no express construction beyond the plain language of the claim is necessary to resolve any controversy in this proceeding to determine whether to institute post-grant review. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

We emphasize that this determination is based on the current record and is preliminary. We encourage the parties to further develop these arguments at trial.

*E. Obviousness Over Chuang and Karczewicz*

Petitioner challenges claims 1, 2, and 5 over Chuang and Karczewicz. Pet. 16–87. For the reasons explained below, we are persuaded that Petitioner has demonstrated that it is more likely than not that it will prevail with respect to at least one challenged claim.

*1. Chuang (Exhibit 1005)*

Chuang is titled “Method and Apparatus for Coding of Intra Prediction Mode” and relates to “configur[ing] the intra prediction mode candidates into multi-level MPM sets, which comprise at least a first-level MPM set and a second-level MPM set.” Ex. 1005, codes (54), (57). Chuang explains that in High-Efficiency Video Coding, “multiple intra prediction modes are used to exploit spatial features and the number of intra prediction modes depends on the block size of a Prediction Unit (PU).” *Id.* ¶ 3. “When the intra prediction mode of the current PU (ModeC) is coded, the mode of the left PU (ModeL) and the mode of the above PU (ModeA) are used to generate the most probable mode (MPM) for the current PU.” *Id.* ¶ 4.

“[M]ultiple MPMs are selected based on intra modes of neighboring PUs” and “are classified into different sets for different levels of MPM coding.” *Id.* ¶ 26. “The remaining modes that are not selected as MPMs” can be coded by a different method. *Id.*

Figure 4, reproduced below, depicts an exemplary flow chart corresponding to two-level MPM coding.

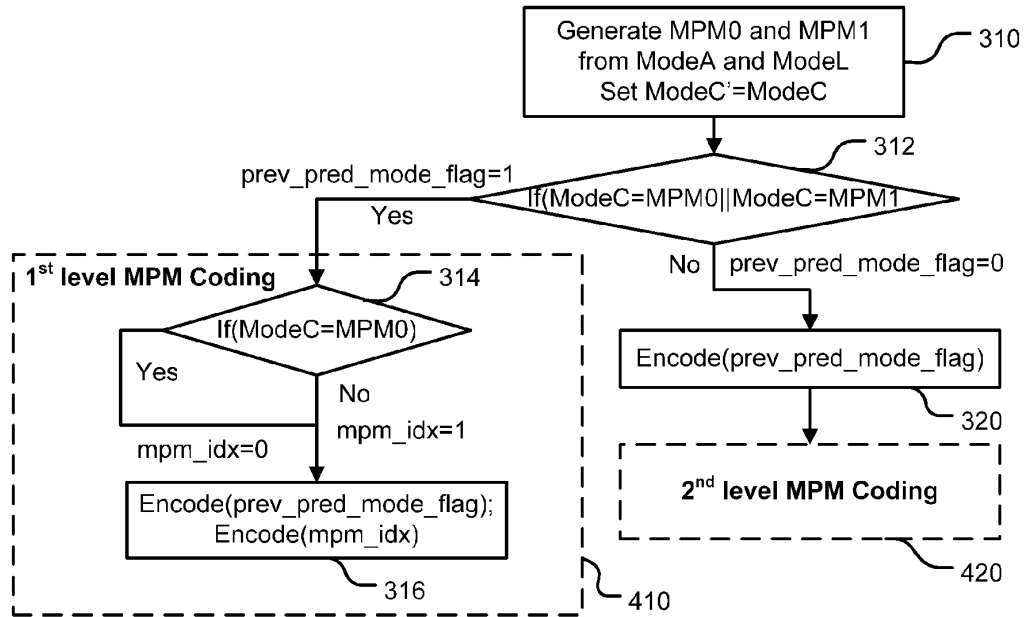


**Fig. 4**

Figure 4, above, shows an exemplary flow chart that classifies MPMs into two levels. “When the intra prediction mode of current PU (ModeC) is coded, the mode of the left PU (ModeL) and the mode of the above PU (ModeA) are used to generate the MPMs, i.e., MPM0 and MPM1, for ModeC.” *Id.* ¶ 27. If ModeC is equal to MPM0 or MPM1 (step 312), a flag ( $prev\_pred\_mode\_flag$ ) is set to 1 and the 1<sup>st</sup> level MPM coding is adopted, and an index ( $mpm\_idx$ ) is utilized to indicate whether ModeC is equal to MPM0 or MPM1. *Id.* ¶ 5, 27.

If ModeC is not equal to MPM0 or MPM1 (step 312), the flag ( $prev\_pred\_mode\_flag$ ) is set to 0, and the 2<sup>nd</sup> level MPM coding is adopted. *Id.* In the 2<sup>nd</sup> level MPM coding, the three most probable remaining modes (MPRM) of ModeA  $\{A_1, A_2, A_3\}$  and ModeL  $\{L_1, L_2, L_3\}$  are selected from predefined tables according to ModeA and ModeL. *Id.* ¶ 28. These six modes are merged into an initial  $MPRM_{init}$  list in an interleaving manner,

then redundant modes are removed, modes equal to ModeA or ModeL are also removed, and the resulting MPRM list is called  $MPRM_{reduced}$ . *Id.* “If ModeA is equal to ModeL, the  $MPRM_{final}$  is equal to  $\{A_1, A_2, A_3\}$ .” *Id.* “Otherwise if ModeL or Mode A is equal to 0, the  $MPRM_{final}$  is equal to  $\{A_1, A_2, A_3\}$  or  $\{L_1, L_2, L_3\}$  respectively.” *Id.* “Otherwise, the first three modes in  $MPRM_{reduced}$  are extracted as  $MPRM_{final}$ .” *Id.* “After  $MPRM_{final}$  is determined, ModeA and ModeL is added to  $MPRM_{final}$ ,” and various processing is performed to determine if ModeC is equal to one of the modes in  $MPRM_{final}$ . *Id.* ¶ 29; see Fig. 5.

Figure 6, reproduced below, illustrates an example of evaluating the intra prediction mode using 2-level MPM sets, where the first-level MPM set is used in the first intra prediction mode evaluation and the second-level MPM set is used in the second intra prediction mode evaluation. *Id.* ¶ 33.

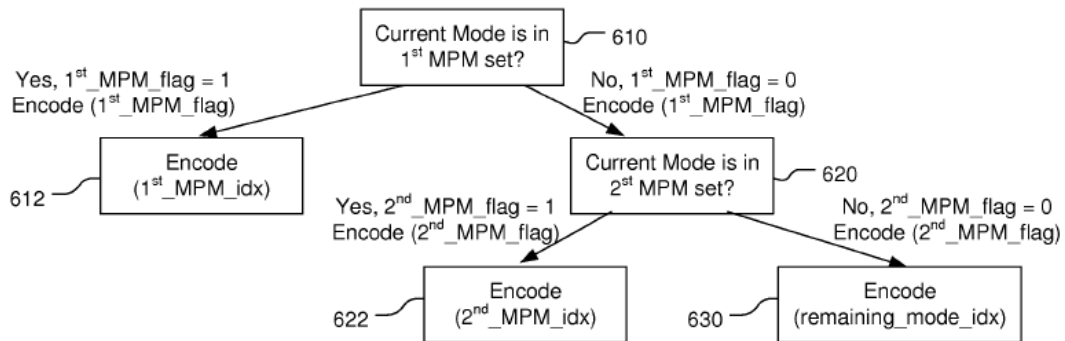


**Fig. 6**

Figure 6, above, shows an example of a more general coding structure of 2-level MPM coding than that shown in Figure 4. *Id.* ¶ 32. In step 610, the current intra prediction mode is evaluated against the first-level MPM set. *Id.* If it is in the first set, i.e., result is “Yes”, a flag is transmitted to indicate this (1<sup>st</sup>\_MPM\_flag = 1), and an index is transmitted to identify the index

(1<sup>st</sup>\_MPM\_idx), as shown in step 612. *Id.* If the current intra prediction mode is not in the first-level MPM set, i.e., result is “No,” a flag is transmitted to indicate this (1<sup>st</sup>\_MPM\_flag = 0), and the current intra prediction mode is evaluated against the second-level MPM set, as shown in step 620. *Id.* If it is in the second set, i.e., result is “Yes,” a flag is transmitted to indicate this (2<sup>nd</sup>\_MPM\_flag = 1), and an index is transmitted to identify the index (2<sup>nd</sup>\_MPM\_idx), as shown in step 622. *Id.* If the current intra prediction mode is not in the second-level MPM set, i.e., result is “No,” a flag is transmitted to indicate this (2<sup>nd</sup>\_MPM\_flag = 0), and the and an index is transmitted to identify the index (remaining\_mode\_idx), as shown in step 630. *Id.*

Figure 11, reproduced below, shows a flowchart corresponding to decoding intra prediction mode using multi-level MPM sets.

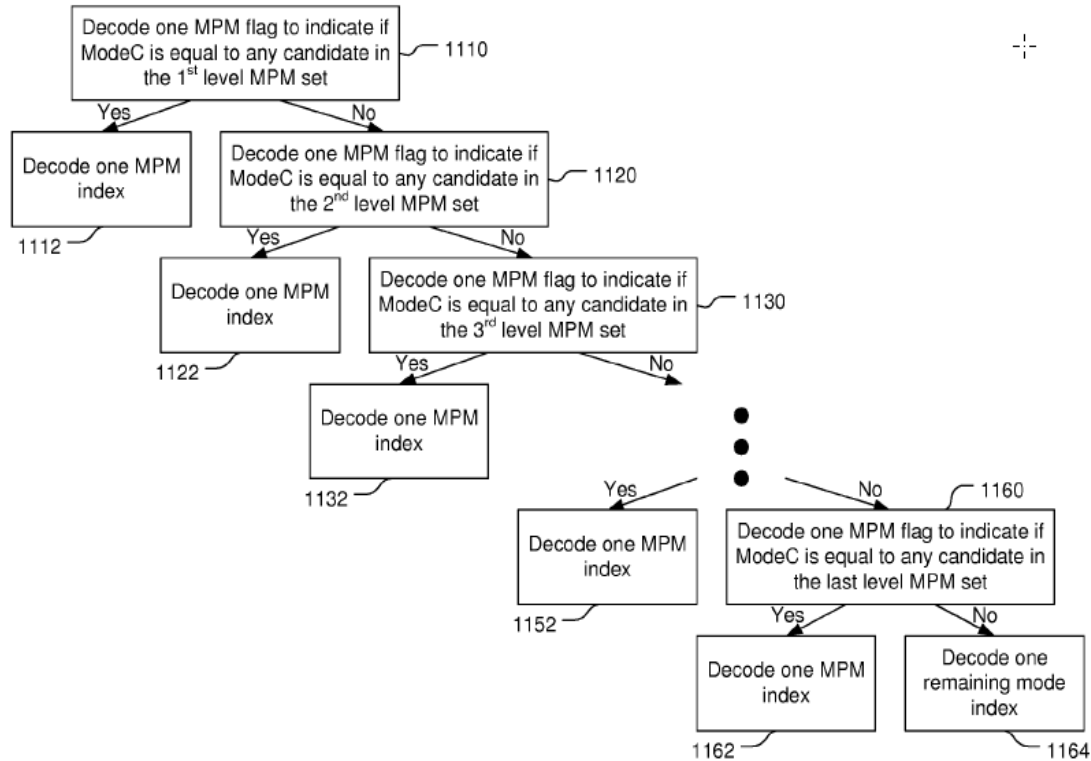


**Fig. 11**

Figure 11, above, shows a decoding process that “decodes an MPM flag that indicates whether ModeC is equal to a candidate in one of the multi-level MPM sets successively as shown in steps 1110 through 1164.” Ex. 1005 ¶ 37. In step 1110, “an MPM flag is decoded to determine whether ModeC is equal to any candidate in the 1<sup>st</sup> level MPM set.” *Id.* “If the MPM flag indicates that ModeC is equal to a candidate in the 1<sup>st</sup> level MPM set, an MPM Index is decoded to identify which of the candidate in the 1<sup>st</sup> level MPM set is equal to ModeC as shown in step 1112.” *Id.* “If the MPM flag indicates that ModeC is not equal to any candidate in the current level MPM set, the MPM decoding process moves to the next level as shown in step 1120.” *Id.* “The decoding process is iterated until the last level.” *Id.* “For the last level decoding in step 1160, the MPM flag for the last level MPMP set is decoded.” *Id.* “If the MPM flag indicates that ModeC is equal to one

candidate in the last level MPM set, the decoding process decodes an MPM index to determine which candidate in the last level MPM set is equal to ModeC as shown in step 1162.” *Id.* “Otherwise, the decoding process decode a remaining mode index that indicates which of the remaining modes is equal to ModeC as shown in step 1164.” *Id.*

## 2. *Karczewicz (Exhibit 1006)*

Karczewicz is titled “Indicating Intra-Prediction Mode Selection for Video Coding Using CABAC<sup>6</sup>” and relates to signaling coding characteristics for coded video data. Ex. 1006, code (54), ¶ 2.

Figure 8, reproduced below, depicts a flowchart illustrating an example method for intra-prediction decoding a block of video data.

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<sup>6</sup> CABAC refers to context-based adaptive binary arithmetic coding. Ex. 1006, code (57).

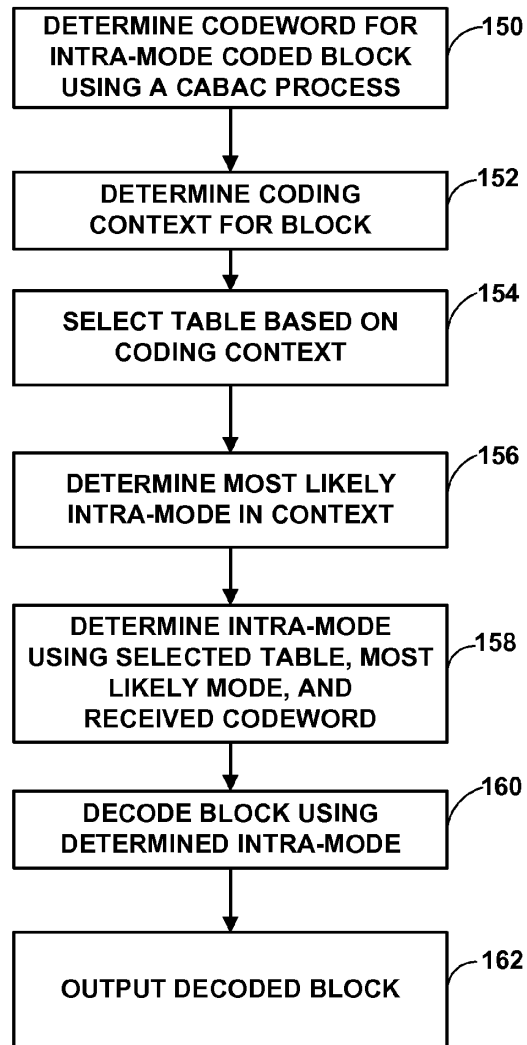


**FIG. 8**

Figure 8, above, depicts a flowchart illustrating an example method for intra-prediction decoding a block of video data that includes step 150 determine codeword for intra-mode coded block using a CABAC process, step 152

determine coding context for block, step 154 select table based on coding context, step 156 determine most likely intra-mode in context, step 158 determine intra-mode using selected table, most likely mode, and received codeword, step 160 decode block using determined-intra-mode, and step 182 output decoded block.

As shown in Figure 8, Karczewicz describes that the video decoder may “determine an actual intra-prediction mode to use to decode the block using the selected codeword table, the most probable intra-prediction mode(s), and the received codeword,” and then “use the determined intra-prediction mode to decode the block.” *Id.* ¶¶ 181, 182. The video decoder “may output the decoded block (162) which may include either or both of sending the decoded video block to a display device for display (e.g., via a frame buffer), and storing a copy of the decoded block in a reference frame buffer for use as a reference block when decoding subsequent blocks of video data, e.g., in temporally separate frames or slices.” *Id.* ¶ 182.

### 3. *Independent Claim 1*

Petitioner contends that Chuang and Karczewicz, alone or in combination, teach each limitation of independent claim 1. Pet. 29–71. In support, Petitioner identifies certain passages and figures in the references and explains their significance with respect to the corresponding claim limitation. *Id.* Petitioner also provides reasons, supported by the testimony of Dr. Freedman, why it would have been obvious to one of ordinary skill in the art to combine Chuang and Karczewicz. *Id.* at 25–29 (citing Ex. 1003 ¶¶ 80–86).

*a) [1.0] A decoding method using a bitstream, comprising:*

Petitioner contends Chuang teaches this limitation. Pet. 29–30 (citing Ex. 1005 ¶¶ 3, 10, 26; Ex. 1003 ¶¶ 88–90). For example, Petitioner cites to paragraph 10 of Chuang, which states “[a] method and apparatus for intra prediction mode encoding or decoding based on multi-level most probable mode (MPM) sets” and paragraph 3 of Chuang, which states “in order for a decoder to operate according to the luma intra prediction mode selected by the encoder, the luma intra prediction mode information has to be incorporated in the bitstream.” *Id.*

Patent Owner does not specifically respond to these arguments. *See* Prelim. Resp. Based on our review and consideration of the current record, we determine that Petitioner has sufficiently shown that Chuang teaches the preamble for purposes of institution.<sup>7</sup>

*b) [1.1] determining an intra prediction mode for a target block; and*

Petitioner contends Chuang teaches this limitation. Pet. 30–32 (citing Ex. 1005 ¶¶ 3, 10, 26, 35, 37; Ex. 1003 ¶¶ 91–94). For example, Petitioner cites to paragraph 10 of Chuang, which states that “decoding of a current intra prediction mode corresponding to a current block is performed according to multi-level MPM sets,” and contends that Chuang’s “current block” corresponds to the claimed “target block.” Pet. 30–31 (citing Ex. 1003 ¶ 92). Petitioner further contends that “Chuang teaches ‘a **method** and apparatus for **intra prediction mode...decoding** based on multi-level most

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<sup>7</sup> Neither party argues whether the preamble limits claim 1. Although we find that the evidence supports that the prior art teaches the preamble, we make no determination at this stage of the proceeding whether the preamble of claim 1 is limiting.

probable (MPM) sets’ that is specifically directed to the step of determining an intra-prediction mode in a decoding process.” Pet. 31 (citing Ex. 1005 ¶ 10; Ex. 1003 ¶ 93).

Patent Owner does not specifically respond to these arguments. *See* Prelim. Resp. Based on our review and consideration of the current record, we determine that Petitioner has sufficiently shown that Chuang teaches limitation [1.1] for purposes of institution.

*c) [1.2] performing an intra prediction for the target block,*

Petitioner contends that Chuang in combination with Karczewicz teaches this limitation. Pet. 32–34 (citing Ex. 1005 ¶¶ 3, 10, 12, 26, 32, 35, 37, Fig. 6; Ex. 1006 ¶¶ 31, 178–182, Fig. 8; Ex. 1003 ¶¶ 95–114).

Petitioner contends that “[t]he purpose of determining the mode is to enable performing intra-prediction for the target block, so Chuang discloses, or at least renders obvious,” to a person of ordinary skill in the art, “that intra-prediction should be performed.” Pet. 32 (citing Ex. 1005 ¶ 26). However, Petitioner contends, “to the extent further disclosure is required” a person of ordinary skill in the art “would have been motivated to modify Chuang to perform intra-prediction to decode a block of video data as taught by Karczewicz using the intra-prediction mode determined in Chuang.” *Id.* (citing Ex. 1003 ¶ 97; Ex. 1005 ¶¶ 10, 35, 37; Ex. 1006 ¶ 182, Fig. 8). Petitioner contends that Karczewicz discloses determining an intra-prediction mode to use in decoding, and further that its video decoder “may ‘use the determined intra-prediction mode to decode the block.’” *Id.* at 33 (citing Ex. 1006 ¶ 182; Ex. 1003 ¶ 99); *see* Ex. 1006, step 160 of Figure 8.

Petitioner contends that a person of ordinary skill in the art “would have understood that Chuang’s determined intra-prediction mode would be used for performing intra-prediction of the target block being decoded, as taught by Karczewicz.” Pet. 25–26 (citing Ex. 1003 ¶¶ 80–81). Petitioner contends that a person of ordinary skill in the art “would have been motivated to modify Chuang to perform intra-prediction to decode a block of video as taught by Karczewicz using the intra-prediction mode determined in Chuang.” *Id.* at 27 (citing Ex. 1003 ¶ 83; Ex. 1005 ¶¶ 10, 37; Ex. 1006 ¶ 182). Petitioner contends that a person of ordinary skill in the art “would have been motivated to make this modification because it would have been the combination of prior art elements (determining an intra-prediction mode using multi-level MPM sets, as taught by Chuang, combined with decoding a block of video data using a determined intra-prediction mode, as taught by Karczewicz) according to known methods (decoding a block using an intra-prediction mode) to yield the predictable result of decoding blocks in an encoded bitstream using an intra-prediction mode determined by the decoder.” *Id.* at 27–28. Petitioner asserts that “Karczewicz provides an express teaching, suggestion, or motivation to perform intra-prediction to decode a block of video data, as shown in step 160 of Figure 8 . . . after an intra prediction mode has been determined in step 158 for the target block.” *Id.* at 28 (citing Ex. 1006 ¶ 81). Petitioner further contends that a person of ordinary skill in the art “would have had a reasonable expectation of success in modifying Chuang to perform intra-prediction based on the intra-prediction mode determined . . . [because] [d]ecoding a block of video data using a determined intra-prediction mode was well-known in the art as taught by Karczewicz, and Chuang specifically contemplates a decoder using its method to determine eh intra-prediction mode using multi-level

MPM sets so that decoding can be performed.” *Id.* at 28–29 (citing Ex. 1005 ¶ 10, 26, 37; Ex. 1006 ¶ 182).

Patent Owner does not specifically respond to these arguments. *See* Prelim. Resp. Based on our review and consideration of the current record, we determine that Petitioner has sufficiently shown that Chuang combined with Karczewicz teaches limitation [1.2] for purposes of institution, and that Petitioner has provided a sufficient motivation to combine the references.

*d) [1.3] wherein the intra prediction for the target block is performed using at least one first intra prediction mode in a case that a first indicator decoded from the bitstream indicates that the at least one first intra prediction mode is used for the intra prediction for the target block,*

Petitioner contends that Chuang in combination with Karczewicz teaches this limitation. Pet. 34–43 (citing Ex. 1005 ¶¶ 3, 10, 12, 26, 32, 37, Fig. 6, Fig. 11; Ex. 1003 ¶¶ 101–111).

Petitioner contends Chuang’s Mode in 1<sup>st</sup> Level MPM set teaches the claimed *first intra prediction mode* and Chuang’s MPM flag for the 1<sup>st</sup> level MPM set, e.g., 1<sup>st</sup>\_MPM\_flag, teaches the claimed *first indicator*. Pet. 35–36. Petitioner’s annotated Figure 11 is reproduced below:

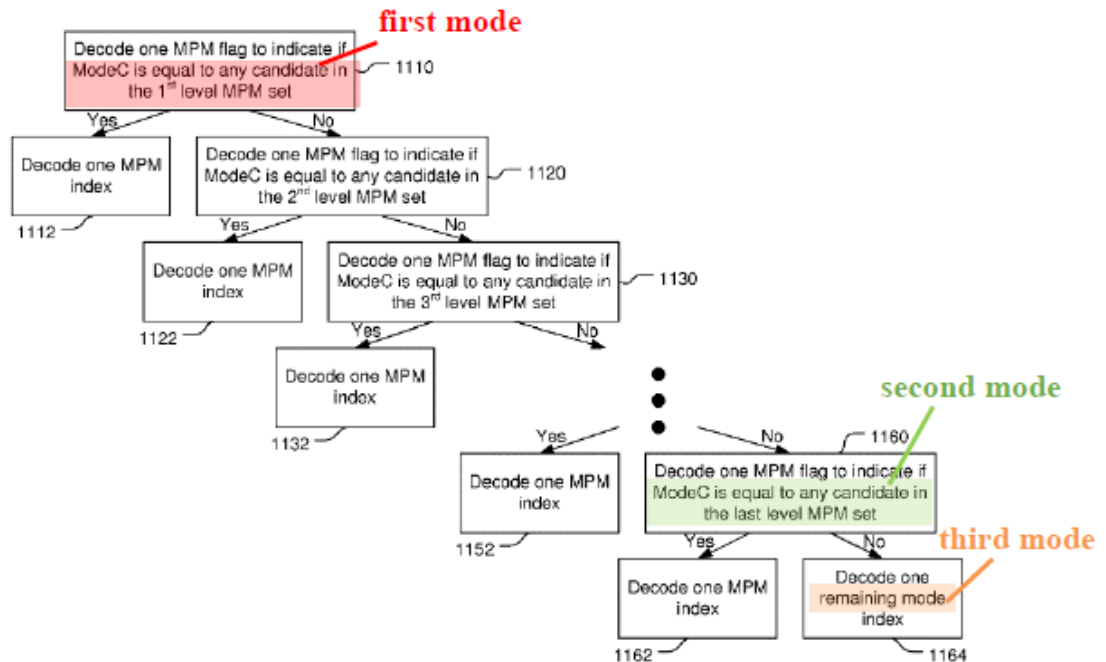


**Fig. 11**

EX1005, Fig. 11 (annotated); EX1003, ¶102.

Figure 11, above, is a Petitioner annotated version of Figure 11 of Chuang that identifies first mode at block 1110 (decode one MPM flag to indicate if ModeC is equal to any candidate in the 1<sup>st</sup> level MPM set), second mode at block 1160 (decode one MPM flag to indicate if ModeC is equal to any candidate in the last level MPM set), and third mode at block 1164 (decode one remaining mode index). Pet. 36.

Petitioner provides another annotated Figure 11, reproduced below:

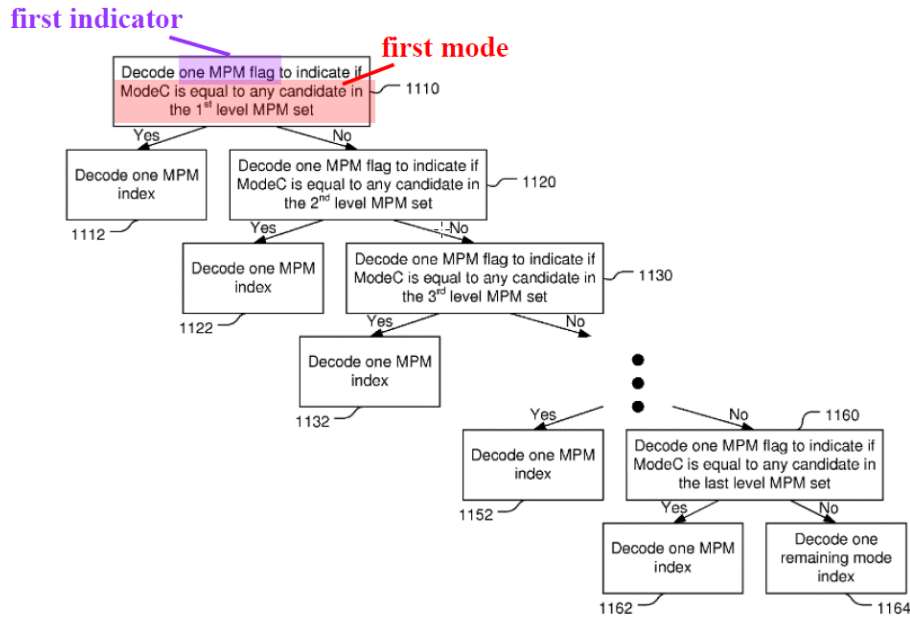


**Fig. 11**

EX1005, Fig. 11 (annotated); EX1003, ¶107.

Figure 11, above, is a second Petitioner annotated version of Figure 11 of Chuang that also annotates block 1110, indicating in purple that the “first indicator” is “one MPM flag” and indicating in red that the “first mode” is “ModeC is equal to any candidate in the 1<sup>st</sup> level MPM set.” See Pet. 40.

Petitioner contends that “Chuang teaches that one flag, 1<sup>st</sup>\_MPM\_flag, is encoded in the bitstream as a 0 or 1 to indicate that the current mode, the intra-prediction mode to be used to decode the current block of video data, is in the 1<sup>st</sup> MPM set.” Pet. 38 (citing Ex. 1005, Fig. 6, ¶ 32; Ex. 1003 ¶ 106). Petitioner contends that the first MPM flag “indicates whether or not the intra-prediction mode of the current block, ModeC, is one of the most probable modes in the 1<sup>st</sup> level MPM set.” *Id.* at 39 (citing Ex. 1005, Fig. 11, ¶ 37). According to Petitioner, “MPM flags are used to indicate which of the MPM sets the current mode, ModeC, can be found in.” *Id.* at 40 (citing Ex. 1005, Fig. 11, ¶ 37).

Referencing Figure 6, Petitioner argues that “a first MPM flag (*first indicator*) will signal a ‘1’ to indicate that a mode in the 1<sup>st</sup> level MPM set (*first intra prediction mode*) is used, or signal a ‘0’ to indicate that a mode in the 1<sup>st</sup> level MPM set is not used.” *Id.* at 40–41 (citing Ex. 1005, Fig. 6, ¶ 32). Petitioner further contends that, in response, “the decoder will decode an index value to identify which of the modes in the 1<sup>st</sup> level MPM set is to be used and then decode the current block using the corresponding mode from the 1<sup>st</sup> level MPM set (*first intra prediction mode*). *Id.* at 42–43 (citing Ex. 1005 ¶¶ 32, 37; Ex. 1003 ¶ 110).

Petitioner provides the following chart (Pet. 42) explaining how Chuang’s first and second MPM flags, and modes in the 1<sup>st</sup> and 2<sup>nd</sup> level MPM sets, and remaining mode, teach the limitations [1.3], [1.4], and [1.6]:

| <b>Claim 1 Intra-Prediction Modes</b>                  | <b>Chuang’s First MPM Flag (<i>first indicator</i>)</b> | <b>Chuang’s Second MPM Flag (<i>second indicator</i>)</b> | <b>Chuang’s Intra-Prediction Mode</b> |
|--------------------------------------------------------|---------------------------------------------------------|-----------------------------------------------------------|---------------------------------------|
| <i>First intra prediction mode</i><br>(element [1.3])  | 1                                                       | N/A                                                       | Mode in 1 <sup>st</sup> level MPM set |
| <i>Second intra prediction mode</i><br>(element [1.4]) | 0                                                       | 1                                                         | Mode in 2 <sup>nd</sup> level MPM set |
| <i>Third intra prediction mode</i><br>(element [1.6])  | 0                                                       | 0                                                         | Remaining mode                        |

The table above is a Petitioner-generated table having four columns (Claim 1 Intra-Prediction Modes, Chuang’s First MPM Flag (*first indicator*), Chuang’s Second MPM Flag (*second indicator*), and Chuang’s Intra-Prediction Mode). The first row, corresponding to claim element [1.3]), indicates that when Chuang’s first and second MPM flags, respectively, are

1 and not applicable, Chuang's intra-prediction mode is a mode in a 1<sup>st</sup> level MPM set. The second row, corresponding to claim element [1.4], indicates that when Chuang's first and second MPM flags are 0 and 1, respectively, Chuang's intra-prediction mode is a mode in a 2<sup>nd</sup> level MPM set. The third and final row, corresponding to claim element [1.6], indicates that when Chuang's first and second MPM flags are 0 and 0, respectively, Chuang's intra-prediction mode is a remaining mode.

Petitioner, therefore, contends that "Chuang in view of Karczewicz renders obvious *the intra prediction for the target block is performed using at least one first intra prediction mode* (mode in the 1<sup>st</sup> level MPM set) *in a case that a first indicator* (MPM flag for the 1<sup>st</sup> level MPM set, i.e., 1<sup>st</sup>\_MPM\_flag) *decoded from the bitstream indicates that the at least one first intra prediction mode is used for the intra prediction for the target block* (MPM flag indicates that ModeC is equal to one candidate in the 1<sup>st</sup> level MPM set)." Pet. 36 (citing Ex. 1003 ¶ 103).

Patent Owner argues that Chuang in view of Karczewicz "does not disclose the claimed first indicator indicative of whether a particular intra prediction mode(s) is used to intra predict a target block," which, according to Patent Owner, is required by the plain language of the claims. Prelim. Resp. 9. Patent Owner argues that Chuang's MPM flag "does not indicate that a particular intra prediction mode is used to intra predict the target (or current) block," but, rather, "indicates a set of 'candidate' modes, without indicating the particular mode within the set that 'is used for the intra prediction for the target block.'" *Id.* at 10. Patent Owner argues that "[a] different indicator ('MPM index') must be decoded to determine whether a particular intra prediction mode is used for the intra prediction." *Id.* (citing Ex. 1005 ¶ 37).

Patent Owner's arguments do not undermine Petitioner's showing. Patent Owner's arguments are based on its proposed claim construction, which we decline to adopt, as discussed above in Section III.D. That is, Patent Owner contends that Chuang does not disclose whether a particular intra prediction mode(s) is used to intra predict a target block. However, as discussed above, we do not adopt Patent Owner's proposed construction on the current record. Under the plain meaning of the claim language, Petitioner has sufficiently established that Chuang teaches this limitation, that is, *the intra prediction for the target block is performed using at least one first intra prediction mode (mode in the 1<sup>st</sup> level MPM set) in a case that a first indicator (MPM flag for the 1<sup>st</sup> level MPM set, i.e., 1<sup>st</sup>\_MPM\_flag) decoded from the bitstream indicates that the at least one first intra prediction mode is used for the intra prediction for the target block* (MPM flag indicates that ModeC is equal to one candidate in the 1<sup>st</sup> level MPM set). In other words, Chuang's MPM flag for the 1<sup>st</sup> level set indicates that one candidate mode in the 1<sup>st</sup> level MPM set is used for intra prediction of the target block.<sup>8</sup> For purposes of institution, this showing by Petitioner is sufficient. Moreover, on this record, we are not persuaded that Chuang does not teach the limitation because the MPM index must be decoded to determine the specific intra prediction mode.

Based on our review and consideration of the current record, we determine that Petitioner has sufficiently shown that Chuang teaches limitation [1.3] for purposes of institution.

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<sup>8</sup> Even under Patent Owner's proposed construction, Chuang's disclosure that one candidate mode in the 1<sup>st</sup> level MPM set is used for intra prediction in the target block may teach a *particular* intra prediction mode(s) (i.e., one of the candidate modes) is used to intra predict the target block.

e) [1.4.1] *an intra prediction mode in a list comprising one or more second intra prediction modes*

Petitioner contends that Chuang in combination with Karczewicz teaches this limitation. Pet. 43–49 (citing Ex. 1005 ¶¶ 10, 12, 26–29, 32, Fig. 6, Fig. 11; Ex. 1003 ¶¶ 113–119).

Petitioner contends Chuang’s Mode in 2<sup>nd</sup> Level MPM set teaches the claimed *second intra prediction mode* and that “Chuang discloses, or at least renders obvious, *an intra prediction mode in a list comprising one or more second intra prediction modes* because Chuang teaches most probable modes presented in a 2<sup>nd</sup> level MPM set.” Pet. 43–44 (citing Ex. 1003 ¶¶ 13–14). According to Petitioner, Chuang classifies MPMs into different sets, and the MPM sets may include multiple intra prediction mode candidates. *Id.* at 44 (citing Ex. 1005 ¶¶ 10, 12, 26). Therefore, Petitioner contends, “the candidate modes in the second level MPM set disclose the *second intra prediction modes*.” *Id.* at 44 (citing Ex. 1003 ¶ 114).

Referencing Figure 6, Petitioner contends that Chuang’s 2<sup>nd</sup> Level MPM set corresponds to the claimed *list*, and referencing Figure 11, Petitioner contends that Chuang’s last level MPM set in step 1160 corresponds to the claimed *list* “because Chuang teaches presenting intra-prediction modes in a list.” *Id.* at 45 (citing Ex. 1003 ¶ 115); *see also id.* at 45–47. Petitioner, therefore, contends that “Chuang discloses, or at least renders obvious, *an intra prediction mode in a list* (2<sup>nd</sup> level MPM set) *comprising one or more second intra prediction modes* (modes in 2<sup>nd</sup> level MPM set).” Pet. 49 (citing Ex. 1003 ¶ 119).

Patent Owner does not specifically respond to these arguments. *See generally* Prelim. Resp. Based on our review and consideration of the

current record, we determine that Petitioner has sufficiently shown that Chuang teaches limitation [1.4.1] for purposes of institution.

*f) [1.4.2] is used for the intra prediction for the target block in a case that [i] the first indicator indicates that the at least one first intra prediction mode is not used for the intra prediction for the target block and [ii] a second indicator decoded from the bitstream indicates that the list is used for the intra prediction for the target block,*

Petitioner contends that Chuang teaches this limitation. Pet. 49–58 (citing Ex. 1005 ¶¶ 10, 12, 26, 32, 37, Fig. 6, Fig. 11; Ex. 1003 ¶¶ 120–128).

Petitioner contends that Chuang teaches that *the first indicator indicates that the at least one first intra prediction mode is not used* because Chuang teaches a first step where the first MPM flag (*first indicator*) indicates that the current intra-prediction mode, ModeC, of the current block (*target block*) is not a candidate mode (*first intra prediction mode*) in the 1<sup>st</sup> level MPM set. Pet. 49–50 (citing Ex. 1005 ¶ 37; Ex. 1003 ¶ 122, Fig. 11). Petitioner also identifies the example shown in Figure 6 of Chuang, where a first MPM flag (*first indicator*) will signal a ‘0’ to indicate that a mode in the 1<sup>st</sup> level MPM set (*first intra prediction mode*) is not used.” *Id.* at 50–51 (citing Ex. 1005 ¶ 32, Fig. 6; Ex. 1003 ¶ 123).

Petitioner contends that Chuang teaches *the second indicator decoded from the bitstream* because Chuang teaches that one MPM flag (*second indicator*) coded in the bitstream indicates to the video decoder that the intra-prediction mode of the current block is equal to one of the candidate modes in the 2<sup>nd</sup> level MPM set (*list of second intra prediction modes*). *Id.* at 52 (citing Ex. 1005 ¶ 12, 37, Fig. 6; Ex. 1003 ¶ 124). Petitioner also identifies the example shown in Figure 6 of Chuang, where 2<sup>nd</sup>\_MPM\_flag is encoded in the bitstream as 0 or 1 to indicate that the current mode of the

current block to be decoded is in the 2<sup>nd</sup> MPM set. *Id.* at 52–53 (citing Ex. 1005 ¶ 32, Fig. 6; Ex. 1003 ¶ 124).

Petitioner contends that Chuang teaches that *the second indicator decoded from the bitstream indicates that the list is used for the for the intra prediction of the target block* because Chuang teaches a second step during which a second MPM flag (*second indicator*) indicates whether or not the 2<sup>nd</sup> level MPM set (*list of second intra prediction modes*) is used for the intra prediction mode of the current block. *Id.* at 53–54 (citing Ex. 1005 ¶ 37, Fig. 11; Ex. 1003 ¶ 125); *see also id.* at 55–57 (citing Ex. 1005 ¶¶ 26, 32, 37). Petitioner also identifies the example shown in Figure 6 of Chuang, where a second MPM flag (*second indicator*) will signal a ‘1’ to indicate that a mode in the 2<sup>nd</sup> level MPM set is used, and then the decoder will decode an index value to identify which of the modes in the 2<sup>nd</sup> level MPM set is to be used and then decode the current block using the corresponding mode from the 2<sup>nd</sup> level MPM set (*second prediction mode*). *Id.* at 56–57 (citing Ex. 1005 ¶¶ 32, 37, Figs. 6, 11; Ex. 1003 ¶ 127).

Petitioner, therefore, contends that Chuang teaches “*an intra prediction mode (mode from 2<sup>nd</sup> level MPM set corresponding to MPM index in step 1152 of Figure 11) in a list (2<sup>nd</sup> level MPM set) comprising one or more second intra prediction modes (candidate modes in 2<sup>nd</sup> level MPM set) is used for the intra prediction for the target block in a case that [i] the first indicator indicates that the at least one first intra prediction mode is not used for the intra prediction for the target block (first MPM flag signals ‘0’) and [ii] a second indicator (second MPM flag) decoded from the bitstream indicates that the list is used for the intra prediction for the target block (second MPM flag signals ‘1’).*” *Id.* at 57 (citing Ex. 1003 ¶ 128).

Patent Owner does not specifically respond to these arguments. *See* Prelim. Resp. Based on our review and consideration of the current record, we determine that Petitioner has sufficiently shown that Chuang teaches limitation [1.4.2] for purposes of institution.

*g) [1.5] the at least one first intra prediction mode is not comprised in the list,*

Petitioner contends that Chuang teaches this limitation. Pet. 58–59 (citing Ex. 1005 ¶¶ 10, 12, 26, 32, 37, Fig. 6, Fig. 11; Ex. 1003 ¶¶ 130–132). Petitioner reiterates its contentions as to limitations [1.3], [1.4.1], and [1.4.2], and further contends that “mode candidate(s) in the 1<sup>st</sup> level MPM set (*first intra prediction mode*) cannot be in the 2<sup>nd</sup> level MPM set because Chuang’s decoding method would not work as intended—that is, the most probable modes would not be split into *different* sets, nor would the decoding process iterate.” *Id.* at 59. Therefore, Petitioner contends that Chuang teaches the at least one first intra prediction mode (mode from a 1<sup>st</sup> MPM level set) is not comprised in the list (2<sup>nd</sup> level MPM set). *Id.* at 59 (citing Ex. 1003 ¶ 132).

Patent Owner does not specifically respond to these arguments. *See generally* Prelim. Resp. Based on our review and consideration of the current record, we determine that Petitioner has sufficiently shown that Chuang teaches limitation [1.5] for purposes of institution.

*h) [1.6] an intra prediction mode of one or more third intra prediction modes is used for the intra prediction for the target block in a case that [i] the first indicator indicates that the at least one first intra prediction mode is not used for the intra prediction for the target block and [ii] the second*

*indicator indicates that the list is not used for the intra prediction for the target block, and*

Petitioner contends that Chuang teaches this limitation. Pet. 60–65 (citing Ex. 1005 ¶¶ 10, 12, 26, 32, 37, Fig. 6, Fig. 11; Ex. 1003 ¶¶ 134–).

Petitioner reiterates its contentions as to limitations [1.3], [1.4.1], and [1.4.2], and further contends that the *third intra prediction mode* corresponds to a remaining mode in Chuang. Pet. 66. Petitioner contends that [1.6][i] is taught for the same reasons as [1.4.2][i], discussed above. *Id.* at 60–61.

Petitioner contends that Chuang teaches that *the second indicator indicates that the list is not used for the intra prediction for the target block* because Chuang teaches a second step where the second MPM flag (*second indicator*) indicates whether or not the last (i.e., 2<sup>nd</sup>) level MPM set (*list of second intra prediction modes*) is used for intra-prediction of the current block (*target block*). *Id.* at 61 (citing Ex. 1005 ¶ 37; Ex. 1003 ¶ 136, Fig. 11). Petitioner also identifies the example shown in Figure 6 of Chuang, where a second MPM flag (*second indicator*) will signal a ‘0’ to indicate that a mode in the 2<sup>st</sup> level MPM set (*list of second intra prediction modes*) is not used. *Id.* at 62–63 (citing Ex. 1005 ¶ 37, Fig. 6; Ex. 1003 ¶ 136).

Petitioner further contends that Chuang uses a remaining mode (*third intra prediction mode*) to decode the block after (1) a first step in which the first MPM flag (*first indicator*) indicates that the 1<sup>st</sup> MPM set is not used, followed by (2) a second step in which a second MPM flag (*second indicator*) indicates that the current intra prediction mode is not a mode from a 2<sup>nd</sup> MPM set (*list of second intra prediction mode*). *Id.* at 63–64 (citing Ex. 1005 ¶¶ 32, 37; Ex. 1003 ¶ 137). Referring to Figures 6 and 11, Petitioner contends that after the second MPM flag (*second indicator*) indicates that a mode in the 2<sup>nd</sup> level MPM set is not used by signaling “0,

Chuang teaches that the decoder will decode an index to identify which of the remaining modes is to be used and then decode the current block using the remaining mode (*third intra prediction mode*). *Id.* at 64–65 (citing Ex. 1005 ¶ 32, 37, Figs. 6, 11; Ex. 1003 ¶ 138).

Petitioner therefore contends that Chuang teaches “*an intra prediction mode of one or more third intra prediction modes (remaining modes corresponding to remaining mode index in step 1164 of Figure 11) is used for the intra prediction for the target block in a case that [i] the first indicator indicates that the at least one first intra prediction mode is not used for the intra prediction for the target block (first MPM flag signals ‘0’) and [ii] the second indicator (second MPM flag) indicates that the list is not used for the intra prediction for the target block (second MPM flag signals ‘0’).*” *Id.* at 65 (citing Ex. 1003 ¶ 139).

Patent Owner does not specifically respond to these arguments. *See* Prelim. Resp. Based on our review and consideration of the current record, we determine that Petitioner has sufficiently shown that Chuang teaches limitation [1.6] for purposes of institution.

*i) [1.7] the one or more third intra prediction modes don't include any one of the at least one first intra prediction mode and the one or more second intra prediction modes.*

Petitioner contends that Chuang teaches this limitation. Pet. 65–69 (citing Ex. 1005 ¶¶ 12, 32, 37, Fig. 6, Fig. 11; Ex. 1003 ¶¶ 140–145).

Petitioner reiterates its contentions as to limitations [1.3] and [1.6], and further contends that Chuang teaches “remaining modes that are not selected as MPMs,” where the remaining modes “can be coded by n-bit fixed length binarization.” Pet. 68 (citing Ex. 1005 ¶ 26). Referring to Figure 11, Petitioner contends that if the current mode is not an MPM determined

through previous steps, then the mode is decoded as a remaining mode corresponding to the remaining mode index. *Id.* at 68–69 (citing Ex. 1005 ¶ 37, Fig. 11; Ex. 1003 ¶ 144).

Petitioner therefore contends that Chuang teaches “*the one or more third intra prediction modes (remaining modes) don't include any one of the at least one first intra prediction mode (modes in the 1<sup>st</sup> MPM level set) and the one or more second intra prediction modes (modes in the last (i.e., 2<sup>nd</sup>) MPM level set).*” Pet. 69 (Ex. 1003 ¶¶ 144–145).

Patent Owner does not specifically respond to these arguments. *See* Prelim. Resp. Based on our review and consideration of the current record, we determine that Petitioner has sufficiently shown that Chuang teaches limitation [1.7] for purposes of institution.

*j) Conclusion for Independent Claim 1*

For the foregoing reasons, Petitioner has demonstrated that it is more likely than not that it will prevail in showing that independent claim 1 is unpatentable over Chuang and Karczewicz.

*4. Independent Claim 5 and Dependent Claim 2*

Petitioner, relying in part on its contentions as to independent claim 1, contends that Chuang and Karczewicz teach each limitation of independent claim 5, which recites similar limitations to those in claim 1, and dependent claim 2. Pet. 70–87. In support, where appropriate, Petitioner identifies certain passages and figures in the references and explains their significance with respect to the corresponding claim limitation. *Id.*

Patent Owner does not separately argue claims 2 or 5. *Prelim. Resp.* We have reviewed Petitioner’s contentions for claims 2 and 5, and for the reasons discussed above with regard to claim 1, and because Petitioner

sufficiently shows that Chuang and Karczewicz teach the additional elements recited in claims 2 and 5, we find that Petitioner has sufficiently shown, for purposes of institution, that the combination of Chuang and Karczewicz teach each of the limitations in those claims. *See* Pet. 70–87.

Accordingly, Petitioner has demonstrated that it is more likely than not that it will prevail in showing that independent claim 5 and dependent claim 2 are unpatentable over Chuang and Karczewicz.

#### IV. CONCLUSION

For the foregoing reasons, we determine that the information presented in the Petition and Preliminary Response establishes that it is more likely than not that Petitioner will prevail with respect to at least one challenged claim of the '553 patent. At this stage of the proceeding, we have not made a final determination with respect to the patentability of any of the challenged claims or the construction of any claim term.

#### V. ORDER

Accordingly, it is

ORDERED that pursuant to 35 U.S.C. § 324, post-grant review is instituted as to all challenged claims and on all grounds raised in the Petition; and

FURTHER ORDERED that post-grant review is commenced on the entry date of this Order, and pursuant to 35 U.S.C. § 324(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial.

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PETITIONER:

Raghav Bajaj  
Jonathan R. Bowser  
Destiny L. Stephenson  
Angela M. Oliver  
HAYNES AND BOONE, LLP  
raghav.bajaj.ipr@haynesboone.com  
jon.bowser.ipr@haynesboone.com  
lyric.stephenson.ipr@haynesboone.com  
angela.oliver.ipr@haynesboone.com

Jessica L.A. Marks  
Roshan Mansinghani  
UNIFIED PATENTS, LLC  
roshan@unifiedpatents.com  
jessica@unifiedpatents.com

PATENT OWNER:

Fadi Kiblawi  
William H. Mandir  
John F. Rabena  
Peter S. Park  
L. Roman Rachuba  
Soumya Panda  
SUGHRUE MION, PLLC  
fkiblawi@sughrue.com  
wmandir@sughrue.com  
jrabena@sughrue.com  
ppark@sughrue.com  
spanda@sughrue.com

lb