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Paper 11
Date: December 11, 2024

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AMAZON.COM, INC. and
AMAZON.COM SERVICES LLC,
Petitioner,

v.

NOKIA TECHNOLOGIES OY,
Patent Owner.

IPR2024-00847
Patent 7,532,808 B2

Before GREGG I. ANDERSON, STEVEN M. AMUNDSON, and JASON M. REPKO, *Administrative Patent Judges*.

AMUNDSON, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Amazon.com, Inc. and Amazon.com Services LLC (collectively "Petitioner") filed a Petition requesting an *inter partes* review of claims 1, 2, 6, 7, 9, 23–25, 28–30, 32, 34, 36, 39–41, 43, and 65 in U.S. Patent No. 7,532,808 B2 (Ex. 1001, "the '808 patent") under 35 U.S.C. §§ 311–319. Paper 3 ("Pet."). Nokia Technologies Oy ("Patent Owner") filed a Preliminary Response. Paper 10 ("Prelim. Resp."). No further briefing was requested or authorized.

Under 37 C.F.R. § 42.4(a), we have authority to determine whether to institute an *inter partes* review. We may institute an *inter partes* review only if "the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a) (2018). The "reasonable likelihood" standard is "a higher standard than mere notice pleading" but "lower than the 'preponderance' standard to prevail in a final written decision." *Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29 at 13 (PTAB Dec. 20, 2019) (precedential).

Based on the current record and for the reasons explained below, Petitioner has shown that there is a reasonable likelihood that it would prevail with respect to at least one of the challenged claims. Thus, we institute an *inter partes* review of claims 1, 2, 6, 7, 9, 23–25, 28–30, 32, 34, 36, 39–41, 43, and 65 in the '808 patent on all challenges included in the Petition.

II. BACKGROUND

A. Real Parties in Interest

Petitioner identifies the following entities as the real parties in interest: Amazon.com, Inc. and Amazon.com Services LLC. Pet. 76. Petitioner discloses Twitch Interactive, Inc. as "a potential real party in interest." *Id.* Patent Owner identifies itself as the sole real party in interest. Paper 5 (Patent Owner's Mandatory Notices Under 37 C.F.R. § 42.8(a)(2)), 2. The parties do not raise any issue about real parties in interest.

B. Related Matters

Petitioner and Patent Owner identify the following civil actions as related matters:

- *Nokia Technologies Oy et al. v. Apple Inc.*, No. 2-16-cv-01440 (E.D. Tex. filed Dec. 21, 2016);
- *Nokia Technologies Oy v. Lenovo Group Ltd. et al.*, No. 5-19-cv-00427 (E.D.N.C. filed Sept. 25, 2019);
- *Nokia Corp. et al. v. Amazon.com, Inc.*, No. 1:23-cv-01232 (D. Del. filed Oct. 27, 2023);
- *Nokia Technologies Oy v. Amazon.com, Inc. et al.*, No. 1:23-cv-01236 (D. Del. filed Oct. 31, 2023); and
- *Nokia Technologies Oy v. HP Inc.*, No. 1:23-cv-01237 (D. Del. filed Oct. 31, 2023).

Pet. 76; Paper 5, 2–3.

Petitioner and Patent Owner identify the following International Trade Commission (ITC) investigations as related matters:

- *Certain Electronic Devices, Including Computers, Tablet Computers, and Components and Modules Thereof*, Inv. No. 337-TA-1208 (ITC filed July 1, 2020); and

- *Certain Video Capable Electronic Devices, Including Computers, Streaming Devices, Televisions, Cameras, and Components and Modules Thereof*, Inv. No. 337-TA-1379 (ITC filed Oct. 31, 2023) (the "1379 Investigation").[1]

Pet. 76–77; Paper 5, 2.

Petitioner and Patent Owner identify the following Board proceeding as a related matter: *Amazon.com, Inc. et al. v. Nokia Technologies Oy*, IPR2024-00848 (Patent 7,532,808 B2). Paper 4, 1; Paper 5, 3.

C. The '808 Patent (Exhibit 1001)

The '808 patent, titled "Method for Coding Motion in a Video Sequence," issued on May 12, 2009, from U.S. patent application no. 10/390,549 ("the '549 application") filed on March 14, 2003. Ex. 1001, codes (22), (45), (54). The patent claims the benefit of priority to U.S. provisional application no. 60/365,072 ("the '072 provisional") filed on March 15, 2002. *Id.* at 1:4–5, code (60). The patent states that the invention "relates generally to communication systems and more particularly to motion compensation in video coding." *Id.* at 1:13–20.

The '808 patent explains that due to "the relatively fast frame display rate" in a video sequence, "images in consecutive frames tend to be quite similar and thus contain a considerable amount of redundant information." Ex. 1001, 1:19–22. For instance, "a typical scene may comprise some stationary elements, such as background scenery, and some moving areas." *Id.* at 1:22–24. Moreover, global motion, such as translation, panning, or

[1] Petitioner misidentifies the case number for the 1379 Investigation as "337-TA-1380." Pet. 77.

zooming, results in consecutive frames containing a considerable amount of redundant information. *See id.* at 1:26–31.

The ’808 patent notes that video compression methods rely on “reducing the redundant and perceptually irrelevant parts of video sequences,” e.g., by taking advantage of “the fact that objects appearing in one frame of a sequence are likely to appear in subsequent frames.” Ex. 1001, 2:36–38, 2:42–44. But sufficiently efficient video compression “cannot usually be achieved by simply reducing the various forms of redundancy in a given sequence of images.” *Id.* at 2:47–49. Thus, “most current video encoders also reduce the quality of those parts of the video sequence which are subjectively the least important.” *Id.* at 2:49–51.

The ’808 patent incorporates by reference a video coding recommendation “currently being developed” by the Joint Video Team (JVT) titled “Joint Model Number 1,” referred to as “JM1 of the JVT codec.” Ex. 1001, 10:27–39. JM1 of the JVT codec discloses assigning each macroblock of 16x16 pixels “a ‘coding mode’ depending on the characteristics of the macroblock and the motion in the video sequence.” *Id.* at 10:40–41, 10:47–50.

JM1 of the JVT codec provides seven coding modes “based on dividing a macroblock to be INTER coded into a number of sub-blocks, each comprising NxM pixels, and associating motion information with each of the NxM sub-blocks, not just with the macroblock as a whole.” Ex. 1001, 10:50–54; *see id.* at 12:26–38 (Table 3). JM1 of the JVT codec also provides an eighth coding mode “known as SKIP (or skip) mode.” *Id.* at 10:63–64; *see id.* at 12:26–38 (Table 3). “If this mode is assigned to a macroblock, this indicates that the macroblock is to be copied from the

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reference video frame without using motion compensated prediction." *Id.* at 10:64–67.

According to the '808 patent, "the approach adopted in JM1 of the JVT codec" rests on the erroneous assumption that "skip mode is always the most probable" for a macroblock. Ex. 1001, 12:41–43; *see id.* at 12:18–19. Contrary to that assumption, "[i]f the video sequence contains global motion (panning, zooming, etc.), skip mode is actually never used," and "compression efficiency is seriously degraded." *Id.* at 12:43–46.

The '808 patent discusses proposed solutions for "improving the coding efficiency of motion compensated prediction in the presence of global motion." Ex. 1001, 12:48–50; *see id.* at 12:50–13:44. Despite those proposed solutions, "there exists a significant unresolved technical problem relating to the coding of a digital video sequence in the presence of global motion, such as translation, panning or zooming of the camera." *Id.* at 13:45–49.

The '808 patent explains that "to overcome, or at least mitigate to a large extent the problems associated with the coding of global motion in prior art video coding systems, the present invention is based on a redefinition of the skip mode concept used in JM1 of the JVT codec." Ex. 1001, 14:14–18. "According to the invention, the coding modes used" correspond to "those provided by JM1 of the JVT codec" except that "the SKIP mode is redefined to allow representation of global and regional motion." *Id.* at 17:43–47; *see id.* at 14:23–29. "More specifically, the SKIP mode is modified in such a way that a zero (non-active) motion vector or a non-zero (active) motion vector is associated with each skip mode macroblock, depending on the characteristics of the motion in image

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segments surrounding the macroblock in question." *Id.* at 17:47–52; *see id.* at 14:23–29.

A skip mode macroblock associated with a zero (non-active) motion vector "is treated in the same way as a conventional skip mode macroblock and copied directly from the reference frame." Ex. 1001, 14:23–28; *see id.* at 14:42–48, 18:6–11. A skip mode macroblock associated with a non-zero (active) motion vector "is motion compensated." *Id.* at 15:63–66.

To determine "whether a zero or a non-zero skip mode motion vector should be used," an "encoder is arranged to analyze the motion of image segments (e.g. macroblocks and/or sub-blocks) surrounding the macroblock to be coded." Ex. 1001, 17:54–60; *see id.* at 14:29–32. "In particular, the continuity, velocity or deviation of motion in the surrounding macroblocks or sub-blocks can be analyzed." *Id.* at 14:35–37; *see id.* at 24:61–65.

If the encoder "determines that the surrounding region exhibits a certain type of motion, for example it has characteristics indicative of global or regional motion, it generates a non-zero valued skip mode motion vector representative of the motion." Ex. 1001, 17:60–64; *see id.* at 14:32–42, 18:1–6. But if the encoder determines that the region surrounding the current macroblock "does not exhibit global or regional motion, but instead has an insignificant level of motion, it generates a zero valued skip mode motion vector" that "causes a macroblock to be copied directly from the reference frame." *Id.* at 17:64–18:1, 18:6–11; *see id.* at 14:42–48.

Hence, "according to the invention, SKIP mode macroblocks can adapt to the motion in the region surrounding them, enabling global or regional motion to [be] taken account of in an efficient manner." Ex. 1001, 14:48–51; *see id.* at 15:2–7. Moreover, "a minimal amount of modification

is required to incorporate the method according to the invention into existing video coding systems that employ the concept of skip mode macroblocks." *Id.* at 15:11–14.

In "an advantageous embodiment of the invention, the surrounding macroblocks or sub-blocks whose motion is analysed are previously encoded macroblocks neighboring the macroblock to be coded." Ex. 1001, 14:52–55; *see id.* at 19:11–15. "This ensures that motion information relating to the region . . . surrounding a macroblock is available in the encoder (decoder) when a current macroblock is being encoded (decoded) and can be used directly to determine the motion vector to be assigned to the current macroblock." *Id.* at 14:55–60. With this approach, "the motion analysis of the surrounding region performed in the encoder" is "duplicated exactly in the decoder." *Id.* at 14:60–62; *see id.* at 19:15–17. Hence, "according to the invention, no additional information must be sent to the decoder in order to model global or regional motion." *Id.* at 14:62–64; *see id.* at 15:7–11, 19:17–20.

The ’808 patent’s Figure 8 (reproduced below) depicts the functional elements of a motion estimation block for generating skip mode motion vectors:

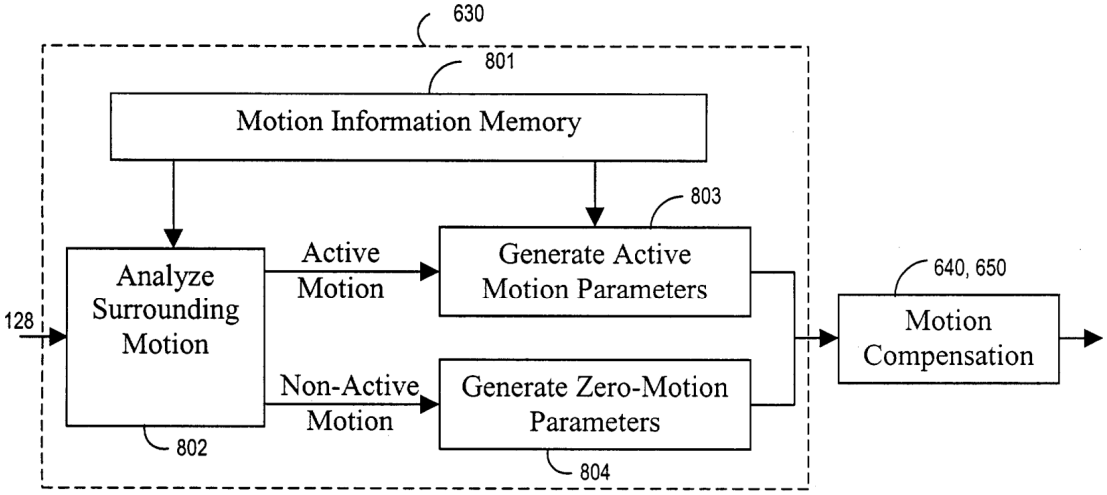

FIG. 8

Figure 8 illustrates motion estimation block 630 including “motion information memory 801, surrounding motion analysis block 802, active motion parameter generation block 803 and zero motion parameter generation block 804.” Ex. 1001, 18:28–33, Fig. 8. Motion estimation block 630 resides in both an encoder and a decoder. *See id.* at 15:44–46. More specifically, the ’808 patent explains that “the motion compensated prediction block 740 of decoder 700” in Figure 7 comprises “a motion information memory block 801, a surrounding motion analysis block 802, an active motion parameter generation block 803 and a zero motion parameter generation block 804 analogous to those provided in encoder 600” in Figure 6. *Id.* at 21:32–37, Figs. 6–7.

As Figure 8 shows, motion estimation block 630 “receives the blocks of luminance and chrominance values which make up the macroblock to be coded for use in motion estimation via line 128.” Ex. 1001, 17:24–26,

Figs. 6, 8. Then, surrounding motion analysis block 802 makes the "decision whether to generate a zero valued skip mode motion vector or a non-zero valued skip mode motion vector" by "analysing and classifying the motion of macroblocks or sub-blocks in a predefined region surrounding the macroblock to be coded using a predetermined analysis scheme." *Id.* at 18:34–40. To "perform the analysis, surrounding motion analysis block 802 retrieves motion information relating to the macroblocks and/or sub-blocks in the surrounding region from motion information memory 801." *Id.* at 18:40–43.

If surrounding motion analysis block 802 "determines that 'active motion' is present in the surrounding region, it sends an indication to that effect to active motion parameter generation block 803, which forms a non-zero valued skip mode motion vector representative of the motion in the surrounding region." Ex. 1001, 18:62–67, Fig. 8. Active motion parameter generation block 803 may retrieve "motion information relating to the surrounding macroblocks and/or sub-blocks from motion information memory 801" or receive this information from surrounding motion analysis block 802. *Id.* at 18:67–19:5.

If surrounding motion analysis block 802 "determines that 'non-active motion' is present in the surrounding region, it sends a corresponding indication to zero motion parameter generation block 804, which forms a zero valued skip mode motion vector." Ex. 1001, 19:6–10, Fig. 8.

After forming a skip mode motion vector, active motion parameter generation block 803 and zero motion parameter generation block 804 provide the skip mode motion vector to motion field coding block 640. *See* Ex. 1001, Fig. 8. Motion field coding block 640 uses "a motion model

comprising a set of basis functions and motion coefficients" to represent "the motion vector as a set of motion coefficient values." *See id.* at 7:60–67, 16:1–14, 16:48–51, Figs. 1, 6. Motion compensated prediction block 650 receives the motion coefficient values from motion field coding block 640 and then uses the motion coefficient values to generate "an array of predicted pixel values for each block of the current macroblock." *See id.* at 8:4–14, 16:1–14, 16:64–67, Figs. 1, 6.

The '808 patent discloses an embodiment with surrounding motion analysis block 802 "removed" and active motion parameter generation block 803 "activated for all the skip mode macroblocks." Ex. 1001, 24:42–45.

D. The Challenged Claims

In this proceeding, Petitioner challenges the following claims in the '808 patent:

- independent claim 1 for a "method of encoding a video sequence";
- claims 2, 6, 23–25, and 28–30 that depend directly from claim 1;
- independent claim 7 for a "method of decoding an encoded video sequence"; and
- claims 9, 32, 34, 36, 39–41, 43, and 65 that depend directly from claim 7.

Pet. 1–2, 15–75.

Claims 1 and 7 exemplify the challenged claims and read as follows (with bracketed letters added for reference purposes):[2]

[2] We use the same reference letters that Petitioner uses to identify the claim language. *See* Pet. v–vi (Listing of Challenged Claims).

1. [pre] A method of encoding a video sequence, the method comprising:

[a] assigning a skip coding mode to a first segment of a first frame of the sequence;

[b] assigning either a zero motion vector or a predicted non-zero motion vector for the skip coding mode for the first segment based at least in part on the motion information of a second segment neighboring the first segment; and

[c] forming a prediction for the first segment with respect to a reference frame based at least in part on the assigned motion vector for the skip coding mode, wherein the assigned motion vector is one of the zero motion vector and the predicted non-zero motion vector; and

[d] providing in an encoded bitstream an indication of the skip coding mode, wherein no further motion vector information for the first segment is coded in the encoded bitstream.

7. [pre] A method of decoding an encoded video sequence, the method comprising:

[a] receiving an indication of a skip coding mode for a first segment;

[b] assigning either a zero motion vector or a predicted non-zero motion vector for the skip coding mode for the first segment based at least in part on the motion information of a second segment neighboring the first segment; and

[c] forming a prediction for the first segment with respect to a reference frame based at least in part on the assigned motion vector for the skip coding mode, wherein the assigned motion vector is one of the zero motion vector and the predicted non-zero motion vector.

Ex. 1001, 25:11–27, 26:10–23.

E. The Asserted References

For its challenges, Petitioner relies on the following references:

Name	Reference	Exhibit
Karczewicz	WO 2001/11891 A1, published February 15, 2001 (based on an application filed August 10, 2000)	1006
Frojdh	US 2003/0123738 A1, published July 3, 2003 (based on an application filed November 27, 2002)	1007
H.263	ITU-T Recommendation H.263: Video Coding for Low Bit Rate Communication (February 1998)[3]	1009

Pet. 1–2, 15–75.

Petitioner asserts that:

(1) Karczewicz and H.263 qualify as prior art "under at least 35 U.S.C. § 102(b)"; and

(2) Frojdh qualifies as prior art "under at least 35 U.S.C. § 102(e)."

Pet. 1–2; *see* 35 U.S.C. § 102(b), (e) (2006).[4]

At this stage of the proceeding, Patent Owner disputes that Frojdh qualifies as prior art but does not dispute that Karczewicz and H.263 qualify

[3] The acronym "ITU" stands for "International Telecommunication Union." Ex. 1009, ii. The "ITU Telecommunication Standardization Sector (ITU-T)" is "a permanent organ of the ITU" and "responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis." *Id.*

[4] The Leahy-Smith America Invents Act ("AIA"), Pub. L. No. 112-29, 125 Stat. 284 (2011), amended 35 U.S.C. § 102 and § 103 effective March 16, 2013. Because the filing date of the challenged claims predates the AIA's amendments to § 102 and § 103, this decision refers to the pre-AIA versions of § 102 and § 103.

as prior art. *See, e.g.*, Prelim. Resp. 4, 24–27, 30–48; *see also infra* § III.E.2(c) (discussing whether Frojdh qualifies as prior art).

F. The Asserted Challenges to Patentability

Petitioner asserts the following challenges to patentability:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1, 2, 6, 7, 9, 23–25, 28–30, 32, 34, 36, 39–41, 43, 65	103(a)	Karczewicz
1, 2, 7, 23, 28–30, 34, 39–41, 65	103(a)	Frojdh
6, 9, 24, 25, 32, 36, 43	103(a)	Frojdh, H.263

Pet. 1–2, 15–75.

G. Testimonial Evidence

To support its challenges, Petitioner relies on the declaration of Joseph P. Havlicek, Ph.D. (Exhibit 1003). Dr. Havlicek states, "I have been retained on behalf of [Petitioner] to offer technical opinions related to" the '808 patent. Ex. 1003 ¶ 1. Dr. Havlicek explains that he received "a Bachelor of Science Degree in electrical engineering with minors in mathematics and computer science from Virginia Tech in 1986," "a Master of Science degree in electrical engineering from Virginia Tech in 1988," and "a Ph.D. in Electrical and Computer Engineering from the University of Texas at Austin in 1996." *Id.* ¶ 8.

Further, Petitioner relies on the declaration of June Ann Munford (Exhibit 1026) to establish the authenticity and public accessibility of H.263 before the '808 patent's effective filing date.

To support its positions, Patent Owner relies on the declaration of Michael T. Orchard, Ph.D. (Exhibit 2009). Dr. Orchard states, "I have been retained on behalf of [Patent Owner] and asked to provide opinions in respect of" this proceeding. Ex. 2009 ¶ 2. Dr. Orchard explains that he received a "Bachelor of Science in Electrical Engineering from San Diego State University in 1981," a "Master of Science in Electrical Engineering from San Diego State University" in 1986, a "Master of Arts in Electrical Engineering from Princeton University" in 1988, and a "Ph.D. in Electrical Engineering from Princeton University" in 1990. *Id.* ¶ 9.

III. PATENTABILITY ANALYSIS

A. Legal Principles: Obviousness

A patent may not be obtained "if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." 35 U.S.C. § 103(a) (2006). An obviousness analysis involves underlying factual inquiries including (1) the scope and content of the prior art; (2) differences between the claimed invention and the prior art; (3) the level of ordinary skill in the art; and (4) where in evidence, objective indicia of nonobviousness, such as commercial success, long-felt but unsolved needs, and failure of others.[5] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18, 35–36 (1966); *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1047–48 (Fed. Cir. 2016) (en banc). When evaluating a combination of references, an obviousness analysis should address "whether there was an apparent reason

[5] The parties do not address objective indicia of nonobviousness. *See, e.g.*, Pet. 15–75; Prelim. Resp. 30–48.

to combine the known elements in the fashion claimed by the patent at issue." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

We analyze the obviousness issues according to these principles.

B. Level of Ordinary Skill in the Art

Factors pertinent to determining the level of ordinary skill in the art include (1) the educational level of the inventor; (2) the type of problems encountered in the art; (3) prior-art solutions to those problems; (4) the rapidity with which innovations are made; (5) the sophistication of the technology; and (6) the educational level of workers active in the field. *Envtl. Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 696–97 (Fed. Cir. 1983). Not all factors may exist in every case, and one or more of these or other factors may predominate in a particular case. *Id.* These factors are not exhaustive, but merely a guide to determining the level of ordinary skill in the art. *Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007). Moreover, the prior art itself may reflect an appropriate skill level. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

Petitioner asserts that a person of ordinary skill in the art at the time of the alleged invention would have had "a (1) Bachelor's degree in Electrical Engineering, Computer Engineering, Computer Science, or a comparable field of study such as Physics, and (2) approximately 2–3 years of practical experience with video and/or image processing or coding." Pet. 11. Petitioner also asserts that "[m]ore education could substitute for experience, and vice-versa." *Id.* Dr. Havlicek's testimony supports Petitioner's assertions. *See* Ex. 1003 ¶¶ 23–24.

Patent Owner has applied Petitioner's description of an ordinarily skilled artisan because the Preliminary Response "does not depend on this

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skill level." Prelim. Resp. 27. Patent Owner "reserves the right to argue in favor of different level of skill should trial be instituted." *Id.*

Based on the current record and for purposes of this decision, we accept Petitioner's description of an ordinarily skilled artisan because it comports with the technology and claims of the '808 patent as well as the asserted references. *See* Ex. 1003 ¶ 24.

C. Claim Construction

We construe claim terms "using the same claim construction standard" that district courts use to construe claim terms in civil actions under 35 U.S.C. § 282(b). *See* 37 C.F.R. § 42.100(b) (2024). Under that standard, claim terms "are given their ordinary and customary meaning, which is the meaning the term would have to a person of ordinary skill in the art at the time of the invention." *Power Integrations, Inc. v. Fairchild Semiconductor Int'l, Inc.*, 904 F.3d 965, 971 (Fed. Cir. 2018) (citing *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc)). The meaning of claim terms may be determined by "look[ing] principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence." *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17).

Petitioner and Patent Owner agree that the term "skip coding mode" includes "a coding mode in which a zero (non-active) motion vector or a non-zero (active) motion vector is associated with each skip mode macroblock, depending on the characteristics of the motion in image segments surrounding the macroblock in question." Pet. 12–14; Prelim. Resp. 29. Petitioner and Patent Owner dispute whether the construction of

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"skip coding mode" should include the following additional language after the agreed-upon language: "and residual information can be provided for each skip mode macroblock." Pet. 12–14; Prelim. Resp. 28–29.

Based on lexicography in the '808 patent, the Administrative Law Judge (ALJ) in the 1379 Investigation construed the term "skip coding mode" to mean "a coding mode in which a zero (non-active) motion vector or a non-zero (active) motion vector is associated with each skip mode macroblock, depending on the characteristics of the motion in image segments surrounding the macroblock in question." Ex. 1022, 5–6, 10, 15 (quoting Ex. 1001, 17:48–52); *see* Ex. 1001, 17:45–52; Pet. 12–13; Prelim. Resp. 28. Regarding the additional language about "residual information" that Petitioner proposes, the ALJ explained that the specification-based construction "allows for both possibilities," i.e., "allows for both the presence and absence of residual information, consistent with the definition in the specification." Ex. 1022, 9–10; *see* Pet. 13.

Petitioner contends that the challenged claims "need no construction" because they are unpatentable "regardless of whether 'skip coding mode' allows for inclusion of residual information." Pet. 12.

Patent Owner contends that "no cited reference anticipates or renders obvious" the challenged claims regardless of whether "skip coding mode" allows for inclusion of residual information. *See* Prelim. Resp. 29–30.

Based on the current record, we agree with the parties that the term "skip coding mode" includes "a coding mode in which a zero (non-active) motion vector or a non-zero (active) motion vector is associated with each skip mode macroblock, depending on the characteristics of the motion in

image segments surrounding the macroblock in question." *See* Ex. 1001, 17:45–52; Ex. 1022, 5–10, 15; Pet. 12–14; Prelim. Resp. 29.

"[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy." *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999); *see Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). Based on the current record, we determine that no other claim term requires an explicit construction to decide whether Petitioner satisfies the "reasonable likelihood" standard for instituting trial.

D. Alleged Obviousness over Karczewicz: Claims 1, 2, 6, 7, 9, 23–25, 28–30, 32, 34, 36, 39–41, 43, and 65

Petitioner contends that claims 1, 2, 6, 7, 9, 23–25, 28–30, 32, 34, 36, 39–41, 43, and 65 are unpatentable under § 103(a) because the claims would have been obvious over Karczewicz. *See* Pet. 2, 15–36. Patent Owner disputes Petitioner's contentions. *See* Prelim. Resp. 2–3, 30–37.

Below, we provide an overview of Karczewicz. Then, we consider the obviousness issues. For the reasons explained below, Petitioner establishes sufficiently for purposes of institution that Karczewicz teaches the subject matter in claims 1, 2, 6, 7, 9, 23–25, 28–30, 32, 34, 36, 39–41, 43, and 65.

1. OVERVIEW OF KARCZEWICZ (EXHIBIT 1006)

Karczewicz is an international patent application publication titled "Apparatus and Method for Compressing a Motion Vector Field," filed on August 10, 2000, and published on February 15, 2001. Ex. 1006, codes (22), (43), (54). As one of three inventors, Karczewicz names Jani Lainema, i.e., the sole inventor named in the '808 patent. *Compare* Ex. 1001,

code (75), *with* Ex. 1006, code (72). Karczewicz states that the invention "relates to apparatus, and an associated method, for encoding, and decoding, a video sequence utilizing motion compensated prediction" where "[m]otion fields of a segment are predicted from adjacent segments of a video frame and by using orthogonal affine motion vector field models." Ex. 1006, 1:7–10; *see id.* at 10:7–9.[6]

Karczewicz explains that conventional techniques for encoding and decoding segments of a video frame take advantage of the "high degree of correlation between consecutive frames when trying to reduce the amount of information when transmitting a video sequence." Ex. 1006, 5:28–30. Karczewicz then describes conventional techniques for "motion predictive coding." *See id.* at 6:28–9:29.

Those conventional techniques include using a motion model that employs a set of basis functions to describe a motion vector field for a video frame. Ex. 1006, 8:20–25. In a motion model, "motion is represented as a sum involving the basis functions multiplied by certain coefficient values" determined "in such a way as to provide the best approximation of the motion vector field." *Id.* at 8:27–30. By using a motion model, "only the motion model coefficients must be transmitted to the decoder" because the basis functions are "chosen in advance" and "known to both the encoder and decoder." *Id.* at 9:2–7.

Additionally, when implementing a motion model, an encoder typically transmits to a decoder not only the motion model coefficients but

[6] For Exhibit 1006 (Karczewicz), we follow Petitioner's practice and cite to the page numbers appearing in the published application rather than the page numbers applied to the exhibit.

also a prediction error. Ex. 1006, 9:14–17, 9:25–27. The prediction error represents "the difference between the coded current frame and the original current frame." *Id.* at 9:23–25.

Karczewicz identifies a deficiency in "[m]any currently proposed video coding schemes that make use of motion predictive coding, and in particular the H.263 standard." Ex. 1006, 9:7–11. Specifically, those video coding schemes employ "a translational motion field model i.e. one whose basis functions can only represent straight line movement in the x and y (horizontal and vertical) directions" and cannot represent "rotations and skewing of picture elements that may occur between consecutive frames." *Id.* at 9:7–13; *see id.* at 10:27–29.

Karczewicz endeavors to address that deficiency by using an "affine" motion model capable of representing "[t]ypical natural motion, such as zooming, rotation, sheer, or translation." Ex. 1006, 10:23–27, 14:2–5. The affine motion model employs six orthogonal basis functions with six corresponding motion coefficients. *Id.* at 11:8, 14:5–7, 37:14–16. The basis functions "have low sensitivity to quantization of corresponding motion coefficients so that the coefficients are able to be represented with a small number of bits." *Id.* at 11:8–11. Because the basis functions are "known to (i.e. stored in) both encoder and decoder," the encoder needs to "transmit only the motion coefficients (or a subset thereof) to the decoder." *Id.* at 14:7–9.

In particular, a "motion vector field that describes the mapping of pixel values between the reference frame and the first segment of the current frame is determined." Ex. 1006, 13:29–14:1. Then, the affine motion model "is used to approximate that motion vector and to generate a set of motion

coefficients" based on the group of pixels residing in any region of the reference frame that provides the best match for the first segment. *Id.* at 14:1–2, 14:10–15. The "best match is determined by taking into account both a measure of image distortion and a measure of the amount of data required to achieve that level of distortion." *Id.* at 14:15–17.

Next, the affine motion model that provides "the best mapping between the reference frame and the second segment of the current frame is determined" using the previously described rate-distortion, best-match evaluation. Ex. 1006, 14:20–23. After that, the encoder "considers whether it is 'more efficient' to model the second segment in terms of the affine motion model previously determined for the first segment, rather than according to the newly determined affine motion coefficients for the second segment itself." *Id.* at 14:28–15:1.

Because "it is unlikely that the motion coefficients for the first segment are exactly identical to those that most accurately model the motion vector field of the second segment," a "projection is performed in order to map the motion field of the first segment into the second segment." Ex. 1006, 15:7–12. Then, "to avoid unacceptable distortion in the reconstructed image," the encoder performs "a comparison between the amount of data of required a) to transmit motion coefficient data determined specifically for the second segment and b) that required if the second segment's motion vector field is determined from a projection of the motion model of the first segment plus some 'refinement' information." *Id.* at 15:12–20; *see id.* at 14:12–15. This comparison amounts to "a trade-off between the amount of information to be transmitted and the amount of distortion allowed." *Id.* at 15:22–25. Where "zero refinement information

is required, the motion vector field of the second segment can be predicted purely on the basis of motion coefficients already stored in the decoder." *Id.* at 16:1–3.

Karczewicz defines the "prediction field" as "the motion field model predicted from the neighboring segment(s)" for a given segment. Ex. 1006, 16:20–21. Karczewicz defines the "refinement field" as "the difference between the prediction field and the motion field model determined specifically for" a given segment. *Id.* at 16:21–23. Thus, the sum of the prediction field and the refinement field equals the motion field model determined specifically for a given segment. *Id.* at 16:24–27, 25:5–12, 31:10–11.

Karczewicz discloses "several different ways in which a given segment can be coded" based on the previously described rate-distortion, best-match evaluation. Ex. 1006, 17:1–4. The various "coding options" or "coding modes" include the following:

- "[a] given segment can be represented as a sum of a prediction field and a refinement field";
- "[t]he segment may be represented as a prediction field only" that "may arise when the segment can be adequately represented in terms of the motion field of one or more of its previously coded neighbors and no refinement information is necessary, or in a case where the encoder has found it efficient to reduce the refinement field to zero";
- "[t]he segment in question may be coded using a motion model determined specifically for the segment using the reference frame" and "the prediction field is set to zero and the refinement field is set equal to the motion field model determined from the reference frame";

- "[t]he segment can also be coded by using a zero motion vector field, e.g., a copy from the reference frame"; and
- "the segment can be coded using intra coding in which no motion vector field is utilized."

Ex. 1006, 17:8–18, 31:22–25; *see id.* at 31:14–22, 55:5–23.

Karczewicz explains that two types of information "must be transmitted to the decoder" to "enable correct reconstruction of a given segment": (1) "selection information, enabling the decoder to select the correct neighboring segment(s) to use in prediction"; and (2) "motion coefficient information." Ex. 1006, 17:19–23. "Whenever a segment is coded using a prediction field, whether there is an associated refinement field or not, it is necessary to provide information about the neighboring segment(s) used in the prediction." *Id.* at 17:23–25. "It is not necessary to transmit any motion coefficient data because the motion field model(s) of the previously coded neighboring segment(s) are already known to (i.e., stored in) the decoder." *Id.* at 17:23–25.

In an exemplary embodiment, "one bit is sent to the decoder" to "signal whether the prediction field of a neighbor is used or not, but only in the case when there is at least one prediction neighbor candidate." Ex. 1006, 32:18–20.

In an exemplary embodiment, "the presence of motion coefficients in the bitstream is signaled by one bit whenever refinement or nonrefinement motion coefficients can be expected." Ex. 1006, 37:5–7. "This bit is referred to as a motion coefficient indicator (MCI)." *Id.* at 37:7–8. The "MCI bit alone" may signal an "all-zero pattern." *Id.* at 37:12–13.

2. Independent Claim 1

(a) Preamble 1pre

Claim 1 recites "[a] method of encoding a video sequence." Ex. 1001, 25:11.

Petitioner contends that Karczewicz teaches claim 1's preamble because Karczewicz discloses a "method, for encoding, and decoding, a video sequence utilizing motion compensated prediction." Pet. 17 (quoting Ex. 1006, 1:7–8).

At this stage of the proceeding, Patent Owner makes no arguments specific to claim 1's preamble. *See, e.g.*, Prelim. Resp. 2–3, 30–37. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

Generally, a preamble does not limit a claim. *Allen Eng'g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1346 (Fed. Cir. 2002). We need not decide whether claim 1's preamble limits the claim because, based on the current record and for the reasons stated by Petitioner and supported by Dr. Havlicek's testimony, Petitioner establishes sufficiently that Karczewicz teaches claim 1's preamble. *See* Pet. 17; Ex. 1003 ¶ 92.

(b) Limitation 1a

Claim 1 recites "assigning a skip coding mode to a first segment of a first frame of the sequence." Ex. 1001, 25:13–14 (limitation 1a).

(i) Petitioner's Contentions

Petitioner contends that Karczewicz teaches limitation 1a for several related reasons. *See* Pet. 17–24. First, Petitioner asserts that Karczewicz discloses several "different ways in which a given segment can be coded."

Id. at 17 (quoting Ex. 1006, 17:1–2). Petitioner asserts that an ordinarily skilled artisan would have understood these "different ways" as different coding modes. *Id.* (citing Ex. 1003 ¶¶ 96–98; Ex. 1006, 31:14–25, 54:12–28, 55:5–23).

Second, Petitioner asserts that Karczewicz "determines which mode to assign to a segment based on which is the most efficient" by "balanc[ing] the reduction in data coding against the potential quality loss of the coded video sequence." Pet. 18 (citing Ex. 1003 ¶ 97). According to Petitioner, Karczewicz's encoder "considers whether it is 'more efficient' to model the second segment in terms of the affine motion model previously determined for [a] first segment, rather than according to the newly determined affine motion coefficients for the second segment itself." *Id.* (alteration by Petitioner) (quoting Ex. 1006, 14:28–15:1).

Third, Petitioner asserts that Karczewicz discloses five coding modes as follows:

(1) a first mode where "[t]he segment may be represented as a prediction field only" that "may arise when the segment can be adequately represented in terms of the motion field of one or more of its previously coded neighbors and no refinement information is necessary, or in a case where the encoder has found it efficient to reduce the refinement field to zero";

(2) a second mode where "[t]he segment in question may be coded using a motion model determined specifically for the segment using the reference frame" and "the prediction field is set to zero and the refinement field is set equal to the motion field model determined from the reference frame";

(3) a third mode where "[a] given segment can be represented as a sum of a prediction field and a refinement field";

(4) a fourth mode where "[t]he segment can also be coded by using a zero motion vector field, e.g., a copy from the reference frame"; and

(5) a fifth mode where "the segment can be coded using intra coding in which no motion vector field is utilized."

Pet. 18–19 (alterations by Petitioner) (quoting Ex. 1006, 17:8–18, 31:22–25) (citing Ex. 1003 ¶¶ 99–103). According to Petitioner, each of the above "coding modes can send prediction error," i.e., "the difference between the motion compensated predicted frame—which uses the motion vector information chosen—and the current input video frame." *Id.* at 19 (citing Ex. 1003 ¶ 106; Ex. 1006, 20:21–29); *see id.* at 23 (citing Ex. 1003 ¶¶ 106–108, 114; Ex. 1006, 20:21–29).

Fourth, Petitioner asserts that "it would have been obvious, based on the teachings of Karczewicz, to indicate no prediction error will be sent if the prediction error is calculated to be zero." Pet. 20 (citing Ex. 1003 ¶¶ 107–108). According to Petitioner, Karczewicz discloses using a one-bit motion coefficient indicator (MCI) to "indicate all-zero refinement field coefficients, rather than coding the zeros themselves." *Id.* (citing Ex. 1003 ¶ 107; Ex. 1006, 14:12–17, 37:5–13).

Petitioner explains that an ordinarily skilled artisan "would have been motivated to apply the same principles to signal zero prediction error via a bit, rather than coding the zero prediction error itself" because doing so:

(1) "would have taken fewer bits without degrading video quality, and thus would have been more efficient";

(2) "would have been no more than use of a known technique (using a single bit to indicate an all-zero field) to improve a similar method (sending an all-zero prediction error) in the same way (efficiently indicating all zero values)"; and

(3) "would have been one of a limited number of choices (e.g., coding zero prediction error or indicating zero prediction error without coding it)."

Pet. 20–21 (citing Ex. 1003 ¶ 107).

Fifth, Petitioner asserts that the first mode where "[t]he segment may be represented as a prediction field only," i.e., "a non-zero motion vector associated with a neighboring segment," and the fourth mode where "[t]he segment can also be coded by using a zero motion vector field, e.g., a copy from the reference frame," collectively correspond to the claimed "skip coding mode." *See* Pet. 21–22 (citing Ex. 1001, 17:54–18:11; Ex. 1003 ¶ 110; Ex. 1006, 17:8–14, 31:22–24).

Sixth, Petitioner asserts that "Karczewicz's single indicator, the MCI, has a zero value only in the two modes comprising the functionality" of claim 1's "skip coding mode." Pet. 22; *see id.* at 22–23. Regarding a zero MCI bit, Petitioner explains that:

(1) when a segment is coded with a zero motion vector, "the MCI bit is zero because that indicates '[a]n all-zero pattern [of motion coefficients]'";

(2) when a segment is coded with just a prediction field, "the MCI bit is also zero because it indicates that there are no motion coefficients for the segment (i.e., no refinement field)."

Id. at 23 (alterations by Petitioner) (quoting Ex. 1006, 37:12) (citing Ex. 1003 ¶ 111; Ex. 1006, 37:5–8). Therefore, according to Petitioner, an ordinarily skilled artisan "would have understood that if a segment is coded

with a zero MCI bit, it is assigned a 'skip coding mode.'" *Id.* (citing Ex. 1003 ¶ 111).

Seventh, Petitioner asserts that an ordinarily skilled artisan would have understood that the decision to code a second segment with either a zero motion vector or a predicted non-zero motion vector "depends on the motion characteristics in the neighboring segment(s)" because Karczewicz discloses "determining the efficient coding mode by balancing distortion due to coding the second segment with reference to a neighboring segment against the amount of data required to transmit the second segment's motion vector information." Pet. 23–24 (citing Ex. 1003 ¶ 115; Ex. 1006, 15:15–20).

(ii) Patent Owner's Contentions

Patent Owner disputes that Karczewicz teaches limitation 1a. *See* Prelim. Resp. 2–3, 30–36. In particular, Patent Owner contends that "Karczewicz involves ways of signaling affine motion vector field coefficients and does not teach coding modes" according to the '808 patent. *Id.* at 30 (citing Ex. 2009 ¶ 70). Patent Owner contends that Karczewicz's encoder "either expressly signals affine motion coefficients or expressly tells the decoder from where to predict or copy those coefficients." *Id.* at 33 (citing Ex. 1006, 26:13–24).

Regarding the five coding modes Petitioner asserts that Karczewicz discloses, Patent Owner argues that "Karczewicz itself does not offer these 'coding modes' as fully specifying how a segment of a video frame is to be coded" and instead "offers information with respect to affine motion vector fields used in the coding of those segments." Prelim. Resp. 30–31 (citing Ex. 1006, 2:9–10, 15:2–5, 32:14–25). Patent Owner also argues that

"Karczewicz does not provide any coding mode as such" much less "a redefined skip coding mode that uses an analysis of the motion characteristics of surrounding image segments to determine whether the skip coding mode is to be interpreted as 'active' and 'non-active' for purposes of deciding how to generate a skip mode motion vector." *Id.* at 31–32 (citing Ex. 2009 ¶¶ 61–63).

Regarding Petitioner's assertion that Karczewicz "determines which mode to assign to a segment based on which is the most efficient" by "balanc[ing] the reduction in data coding against the potential quality loss of the coded video sequence," Patent Owner argues that Karczewicz's determination of "what motion vector fields to use in coding a segment is irrelevant to the question of whether Karczewicz teaches any 'coding modes' at all." Prelim. Resp. 36.

Regarding Petitioner's assertion about not sending a prediction error "if the prediction error is calculated to be zero," Patent Owner argues that "if the encoder did not send anything" for a zero prediction error, "the decoder would read the next bits that were sent (intended to represent some other variable) as an encoding of the prediction error, and the decoding would fail." Prelim. Resp. 32 (citing Pet. 20).

Regarding a zero MCI bit, Patent Owner contends that "it would not be necessary to set MCI to 0" if "the 'coding mode' that Petitioner contends would be obvious" to "create by combining different teachings of Karczewicz was really a 'coding mode.'" Prelim. Resp. 35. According to Patent Owner, Karczewicz "teaches away from triggering those functionalities automatically through the assignment of a 'coding mode.'" *Id.* (citing Ex. 2009 ¶ 67).

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Additionally, Patent Owner contends that Petitioner "conflates the *results* of the challenged claims (i.e., zero or non-zero-valued motion vectors) with the *processes* that led to those motion vectors" and "trivializes both the challenged claims and the field of video coding." Prelim. Resp. 32–33 (emphases by Patent Owner); *see id.* at 1–2.

Patent Owner also contends that Petitioner "offers no explanation for how it would even be possible to modify Karczewicz to" yield the "skip coding mode" required by limitation 1a. Prelim. Resp. 34.

(iii) Analysis

Based on the current record, Petitioner establishes sufficiently that Karczewicz teaches limitation 1a. *See* Pet. 17–24; Ex. 1003 ¶¶ 79, 93–115. As Petitioner asserts, Karczewicz discloses the following "coding options" or "coding modes" that collectively correspond to the claimed "skip coding mode":

(i) "[t]he segment may be represented as a prediction field only" that "may arise when the segment can be adequately represented in terms of the motion field of one or more of its previously coded neighbors and no refinement information is necessary, or in a case where the encoder has found it efficient to reduce the refinement field to zero"; and

(ii) "[t]he segment can also be coded by using a zero motion vector field, e.g., a copy from the reference frame."

Ex. 1006, 17:8, 17:10–14, 31:22–24, 55:18–23; *see* Ex. 1003 ¶¶ 79, 96–99, 102, 110, 112–113; Pet. 21–22. For each of these "coding options" or "coding modes," an encoder transmits no motion coefficients to a decoder and the MCI bit is zero, indicating the absence of motion coefficients. Ex. 1006, 17:8, 17:10–14, 31:22–24, 37:5–8, 37:12–13; *see* Ex. 1003 ¶ 111.

Karczewicz also discloses "assigning" these "coding options" or "coding modes" based on a rate-distortion, best-match evaluation as follows: "a comparison between the amount of data of required a) to transmit motion coefficient data determined specifically for the second segment and b) that required if the second segment's motion vector field is determined from a projection of the motion model of the first segment plus some 'refinement' information." Ex. 1006, 15:15–20; *see id.* at 14:12–17, 15:22–25, 17:2–4, 19:2–5; Ex. 1003 ¶ 97.

Based on the current record, an ordinarily skilled artisan would have found it obvious to combine these "coding options" or "coding modes" because the combination "minimizes the number of bits needed to encode the segment (e.g., utilizing the zero motion vector when appropriate, otherwise utilizing the prediction motion vector field, without refinement, when encoding motion information for the segment)." Ex. 1003 ¶ 112.

Further, as Petitioner asserts, "it would have been obvious, based on the teachings of Karczewicz, to indicate no prediction error will be sent if the prediction error is calculated to be zero." *See* Ex. 1003 ¶¶ 107–109; Pet. 20. "Doing so would have been no more than use of a known technique (using a single bit to indicate an all-zero field) to improve a similar method (sending an all-zero prediction error) in the same way (efficiently indicating all zero values)." Ex. 1003 ¶ 107.

Based on the current record, we disagree with Patent Owner that "Karczewicz does not provide any coding mode as such." *See* Prelim. Resp. 31–32. Karczewicz's claims 61, 64, and 65 expressly recite "coding modes," such as a "coding mode wherein said second neighboring segment is encoded using pixel values from said reference frame" for a macroblock

associated with a zero (non-active) motion vector. Ex. 1006, 54:12–28, 55:5–23; *see* Ex. 1001, 14:23–28; Ex. 1003 ¶¶ 96, 102.

As for Patent Owner's argument that Karczewicz's determination of "what motion vector fields to use in coding a segment is irrelevant to the question of whether Karczewicz teaches any 'coding modes' at all," that determination relates to the "assigning" required by limitation 1a. *See* Ex. 1003 ¶ 97; Ex. 1006, 14:12–17, 15:12–25; Prelim. Resp. 36.

As for Patent Owner's argument that "if the encoder did not send anything" for a zero prediction error, "the decoder would read the next bits that were sent (intended to represent some other variable) as an encoding of the prediction error, and the decoding would fail," Petitioner proposes sending something (not nothing) for a zero prediction error, i.e., using a single bit to signal an all-zero field. *See* Pet. 20; Prelim. Resp. 32; Ex. 1003 ¶ 107.

Patent Owner's contention that "it would not be necessary to set MCI to 0" if "the 'coding mode' that Petitioner contends would be obvious" to "create by combining different teachings of Karczewicz was really a 'coding mode'" rests on an incorrect premise. *See* Prelim. Resp. 35. Based on the current record, Karczewicz automatically sets MCI to 0 to signal the absence of motion coefficients. *See* Ex. 1006, 37:5–8, 37:12–13. Specifically, Karczewicz automatically sets MCI to 0 where a segment is either "represented as a prediction field only" or "coded by using a zero motion vector field" because there are no motion coefficients for the segment under those circumstances. Ex. 1003 ¶ 111; Ex. 1006, 37:12–13. Hence, based on the current record and contrary to Patent Owner's contention, Karczewicz

does not "teach[] away from triggering those functionalities automatically." *See* Prelim. Resp. 35.

Additionally, we disagree with Patent Owner that Petitioner "conflates the *results* of the challenged claims (i.e., zero or non-zero-valued motion vectors) with the *processes* that led to those motion vectors." *See* Prelim. Resp. 32. To establish unpatentability, Petitioner points to the process where Karczewicz's encoder "considers whether it is 'more efficient' to model the second segment in terms of the affine motion model previously determined for [a] first segment, rather than according to the newly determined affine motion coefficients for the second segment itself." Pet. 18 (alteration by Petitioner) (quoting Ex. 1006, 14:28–15:1).

As part of that process, Karczewicz's encoder analyzes whether "the segment can be adequately represented in terms of the motion field of one or more of its previously coded neighbors" and whether to "copy from the reference frame." Ex. 1006, 17:10–13, 31:22–24; *see* Ex. 1003 ¶¶ 79, 99, 102. Hence, Karczewicz's encoder considers "the characteristics of the motion in image segments surrounding the macroblock in question" as disclosed in the '808 patent. *See* Ex. 1001, 17:45–52.

We also disagree with Patent Owner that Petitioner "offers no explanation for how it would even be possible to modify Karczewicz to" yield the "skip coding mode" required by limitation 1a. *See* Prelim. Resp. 34. Petitioner explains that (1) "Karczewicz's single indicator, the MCI, has a zero value only in the two modes comprising the functionality" of claim 1's "skip coding mode" and (2) an ordinarily skilled artisan "would have understood a zero MCI bit indicates that a segment is assigned a 'skip coding mode.'" Pet. 22 (citing Ex. 1003 ¶ 111). Because a "person of

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ordinary skill is also a person of ordinary creativity, not an automaton," and because a zero MCI bit links "the two modes comprising the functionality" of claim 1's "skip coding mode," Petitioner demonstrates sufficiently on this record that a person of ordinary skill would have been able to fit those modes together. *See KSR*, 550 U.S. at 420–21; Ex. 1003 ¶ 111.

(c) Limitation 1b

Claim 1 recites "assigning either a zero motion vector or a predicted non-zero motion vector for the skip coding mode for the first segment based at least in part on the motion information of a second segment neighboring the first segment." Ex. 1001, 25:15–18 (limitation 1b).

Petitioner contends that Karczewicz teaches limitation 1b for three related reasons. *See* Pet. 24–25 (citing Ex. 1003 ¶¶ 116–120; Ex. 1006, 15:15–20, 25:14–17, 25:19–23, 31:16–24). First, Petitioner asserts that Karczewicz assigns a "skip coding mode" to a second segment "based on an efficiency determination" for the reasons discussed for limitation 1a. *Id.* at 24. Petitioner also asserts that the segment is assigned either "a prediction motion vector field 'extrapolated from a neighboring segment'" or a zero motion vector field, e.g., "a copy from the reference frame." *Id.* (quoting Ex. 1006, 31:17, 31:23–24).

Second, Petitioner asserts that the "assigning" in Karczewicz is "based at least in part on the motion information of a second segment neighboring the first segment" because Karczewicz discloses coding a segment with reference to the motion information of a neighboring, previously coded segment if "more efficient." Pet. 24 (citing Ex. 1003 ¶ 118; Ex. 1006, 15:15–20). According to Petitioner, "Karczewicz's efficiency determination weighs using motion coefficients from a neighboring, previously coded

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segment, against motion coefficients calculated for" the current segment. *Id.* at 24–25 (citing Ex. 1003 ¶ 118; Ex. 1006, 15:15–20).

Third, Petitioner asserts that Karczewicz discloses that a predicted non-zero motion vector is "based at least in part on the motion information of a second segment neighboring the first segment" because "Karczewicz's prediction motion vector field is 'extrapolated from a neighboring segment' or segments." Pet. 25 (quoting Ex. 1006, 31:17).

Patent Owner disputes that Karczewicz teaches limitation 1b because Patent Owner contends that (1) Karczewicz fails to teach the "skip coding mode" recited in limitation 1a and (2) "it is not possible that [Karczewicz] could meet the additional constraints of" limitation 1b. Prelim. Resp. 36–37; *see id.* at 2–3, 30–36.

Based on the current record and for the reasons stated by Petitioner and supported by Dr. Havlicek's testimony, Petitioner establishes sufficiently that Karczewicz teaches limitation 1b. *See* Pet. 24–25; Ex. 1003 ¶¶ 116–120. Based on the current record and for the reasons discussed above, we disagree with Patent Owner that Karczewicz fails to teach the "skip coding mode" recited in limitation 1a. *See supra* § III.D.2(b)(iii).

(d) <u>Limitation 1c</u>

Claim 1 recites "forming a prediction for the first segment with respect to a reference frame based at least in part on the assigned motion vector for the skip coding mode, wherein the assigned motion vector is one of the zero motion vector and the predicted non-zero motion vector." Ex. 1001, 25:19–23 (limitation 1c).

Petitioner contends that Karczewicz teaches limitation 1c because Karczewicz discloses that:

(1) "the compressed motion vectors and the reference frame are used to construct a prediction frame";

(2) the "prediction frame is a coded version of the current frame" calculated using "the motion vector field" and "the pixel values of the reference frame"; and

(3) "the encoder can try to predict the motion coefficients for a given segment using the motion field model for the segment above it or to the left."

Pet. 25–26 (quoting Ex. 1006, 16:16–18, 21:17–21).

Patent Owner disputes that Karczewicz teaches limitation 1c because Patent Owner contends that (1) Karczewicz fails to teach the "skip coding mode" recited in limitation 1a and (2) "it is not possible that [Karczewicz] could meet the additional constraints of" limitation 1c. Prelim. Resp. 36–37; *see id.* at 2–3, 30–36.

Based on the current record and for the reasons stated by Petitioner and supported by Dr. Havlicek's testimony, Petitioner establishes sufficiently that Karczewicz teaches limitation 1c. *See* Pet. 25–26; Ex. 1003 ¶¶ 121–122. Based on the current record and for the reasons discussed above, we disagree with Patent Owner that Karczewicz fails to teach the "skip coding mode" recited in limitation 1a. *See supra* § III.D.2(b)(iii).

(e) <u>Limitation 1d</u>

Claim 1 recites "providing in an encoded bitstream an indication of the skip coding mode, wherein no further motion vector information for the first segment is coded in the encoded bitstream." Ex. 1001, 25:24–27 (limitation 1d).

Petitioner contends that Karczewicz teaches limitation 1d because Karczewicz discloses that a zero MCI bit is coded only with a segment that is assigned a "skip coding mode" for the reasons discussed for limitation 1a.

Pet. 26. Further, Petitioner asserts that an ordinarily skilled artisan "would have understood coding a zero MCI bit for a segment" to be "providing in an encoded bitstream an indication of the skip coding mode." *Id.* (citing Ex. 1003 ¶ 124).

Petitioner also contends that Karczewicz discloses "one bit is sent to the decoder 14 to signal whether the prediction field of a neighbor is used or not, but only in the case when there is at least one prediction neighbor candidate." Pet. 26 (quoting Ex. 1006, 32:18–20).

Petitioner explains that Karczewicz teaches that "no further motion vector information for the first segment is coded in the encoded bitstream" because "neither the bit indicating whether a prediction motion vector field is used nor the information indicating which previously coded neighbor or neighbors to use for the prediction motion vector field" is "motion vector information." Pet. 26 (citing Ex. 1003 ¶¶ 125–126).

Patent Owner disputes that Karczewicz teaches limitation 1d because Patent Owner contends that (1) Karczewicz fails to teach the "skip coding mode" recited in limitation 1a and (2) "it is not possible that [Karczewicz] could meet the additional constraints of" limitation 1d. Prelim. Resp. 36–37; *see id.* at 2–3, 30–36.

Based on the current record and for the reasons stated by Petitioner and supported by Dr. Havlicek's testimony, Petitioner establishes sufficiently that Karczewicz teaches limitation 1d. *See* Pet. 26; Ex. 1003 ¶¶ 123–126. Based on the current record and for the reasons discussed above, we disagree with Patent Owner that Karczewicz fails to teach the "skip coding mode" recited in limitation 1a. *See supra* § III.D.2(b)(iii).

(f) Preliminary Conclusion About Obviousness/Nonobviousness

As discussed above, Petitioner's analysis addresses how Karczewicz teaches claim 1's subject matter. *See supra* §§ III.D.2(a)–(e). Hence, based on the current record, Petitioner demonstrates a reasonable likelihood of proving that claim 1 is unpatentable under § 103(a) because the claim would have been obvious over Karczewicz.

3. INDEPENDENT CLAIM 7

Petitioner contends that Karczewicz teaches claim 7's preamble because Karczewicz discloses a "method, for encoding, and decoding, a video sequence utilizing motion compensated prediction." Pet. 32–33 (quoting Ex. 1006, 1:7–8). Petitioner contends that Karczewicz teaches limitations 7a, 7b, and 7c for the reasons Petitioner contends that Karczewicz teaches limitations 1a, 1b, 1c, and 1d. *Id.* at 33.

Patent Owner disputes that Karczewicz teaches claim 7's subject matter for the reasons Patent Owner disputes that Karczewicz teaches claim 1's subject matter. *See* Prelim. Resp. 2–3, 30–37.

Based on the current record and for (1) the reasons stated by Petitioner and supported by Dr. Havlicek's testimony and (2) the reasons discussed above for claim 1, Petitioner establishes sufficiently for purposes of institution that Karczewicz teaches claim 7's subject matter. *See* Pet. 32–33; Ex. 1003 ¶¶ 141–144; *supra* §§ III.D.2(a)–(e). Hence, Petitioner demonstrates a reasonable likelihood of proving that claim 7 is unpatentable under § 103(a) because the claim would have been obvious over Karczewicz.

4. DEPENDENT CLAIMS 2, 6, 9, 23–25, 28–30, 32, 34, 36, 39–41, 43, AND 65

Claims 2, 6, 23–25, and 28–30 depend directly from claim 1. Ex. 1001, 25:28–30, 26:4–9, 28:53–29:12, 29:35–45. Claims 9, 32, 34, 36, 39–41, 43, and 65 depend directly from claim 7. *Id.* at 26:45–51, 29:65–30:3, 30:10–19, 30:31–38, 30:60–31:3, 31:24–32, 34:39–41.

For claims 2, 6, 9, 23–25, 28–30, 32, 34, 36, 39–41, 43, and 65, Petitioner provides an analysis how Karczewicz teaches the claimed subject matter. *See* Pet. 27–32, 34–36. Dr. Havlicek's testimony supports Petitioner's analysis. *See* Ex. 1003 ¶¶ 127–140, 145–153.

At this stage of the proceeding, Patent Owner makes no arguments specific to any of claims 2, 6, 9, 23–25, 28–30, 32, 34, 36, 39–41, 43, and 65. *See, e.g.*, Prelim. Resp. 2–3, 30–37.

Based on the current record and for the reasons stated by Petitioner and supported by Dr. Havlicek's testimony, Petitioner establishes sufficiently for purposes of institution that Karczewicz teaches the subject matter in claims 2, 6, 9, 23–25, 28–30, 32, 34, 36, 39–41, 43, and 65. *See* Pet. 27–32, 34–36; Ex. 1003 ¶¶ 127–140, 145–153. Hence, Petitioner demonstrates a reasonable likelihood of proving that claims 2, 6, 9, 23–25, 28–30, 32, 34, 36, 39–41, 43, and 65 are unpatentable under § 103(a) because the claims would have been obvious over Karczewicz.

E. Alleged Obviousness over Frojdh:
Claims 1, 2, 7, 23, 28–30, 34, 39–41, and 65

Petitioner contends that claims 1, 2, 7, 23, 28–30, 34, 39–41, and 65 are unpatentable under § 103(a) because the claims would have been obvious over Frojdh. *See* Pet. 2, 36–58. Patent Owner disputes Petitioner's contentions. *See* Prelim. Resp. 3–4, 37–47.

Below, we provide an overview of Frojdh and a discussion whether Frojdh qualifies as prior art. Then, we consider the obviousness issues. For the reasons explained below, Petitioner establishes sufficiently for purposes of institution that Frojdh teaches the subject matter in claims 1, 2, 7, 23, 28–30, 34, 39–41, and 65.

1. OVERVIEW OF FROJDH (EXHIBIT 1007)

Frojdh is a U.S. patent application publication titled "Global Motion Compensation for Video Pictures," filed on November 27, 2002, and published on July 3, 2003. Ex. 1007, codes (12), (22), (43), (54). Frojdh claims the benefit of priority to a provisional application ("the Frojdh provisional") filed on November 30, 2001. *Id.* ¶ 1, code (60). Frojdh incorporates by reference the Frojdh provisional. *Id.* ¶ 1. Frojdh states that the invention "generally pertains to a method for compression of video signal data" where "macroblocks are grouped into slices and global motion compensation information is transmitted with encoded slices." *Id.* ¶ 2.

Frojdh explains that in "the coding process temporal redundancy can be used by making so-called motion-compensated predictions, where regions of a video frame are predicted from similar regions of a previous frame." Ex. 1007 ¶ 4. Because "there may be parts of a frame that contain little or no change from corresponding parts of the previous frame," those "regions can thus be skipped or non-coded, in order to maximize compression efficiency." *Id.*

Frojdh also explains that if "many regions of a frame have similar motion, such as in a pan or zoom, further improvements in compression efficiency can result from coding a global motion separately, which then

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applies to all or some regions of the frame." Ex. 1007 ¶ 6. "This technique is often referred to as global motion compensation (GMC)." *Id.*

Frojdh describes problems that can result from "using global motion compensation for a video frame," such as "the loss of error resilience and flexibility caused by addressing entire frames." Ex. 1007 ¶ 20.

Frojdh endeavors to address those problems by "applying global motion compensation to frames" that have been segmented into slices and treating each slice as "a self-contained unit that does not use motion vectors from macroblocks outside itself for prediction." Ex. 1007 ¶ 21. "By coding global motion vectors for each slice, all motion vectors within the slice can be constructed or decoded in a self-contained manner." *Id.* Additionally, "the global motion vectors can be applied differently to each slice, or can be used to repeat global motion vectors referencing the entire frame." *Id.*

The "invention introduces a new mode for global motion compensation" called "Implicit Global Motion Compensation (IGMC)." Ex. 1007 ¶ 22, code (57). The IGMC mode "can be used as a tool in many coding scenarios" to "minimize the total number of bits needed for motion vectors." *Id.* ¶ 22. The IGMC mode "uses implicit motion vectors that are predicted" and "no explicit motion vector is sent" from an encoder to a decoder. *Id.* ¶¶ 22, 55. Instead, "the macroblock COPY (aka SKIP) mode is reinterpreted as" a coding mode "without coefficients or explicitly coded motion vectors." *Id.* ¶ 55.

In the IGMC mode, the "motion vector used for motion compensating the macroblock is predicted from neighboring blocks," i.e., from blocks "adjacent to or proximate to the particular image block." Ex. 1007 ¶ 55; *see id.* ¶ 23. "More specifically, in applying [the IGMC mode] to a particular

image block in the current frame, a collocated block in a previous frame, dislocated by a motion vector is copied from the previous frame." *Id.* ¶ 55. Thus, the IGMC mode "is used to copy pixels from a previous frame of a collocated block, dislocated by a motion vector that is predicted from neighboring image blocks of the current frame." *Id.* ¶ 23; *see id.* at code (57).

As a further feature of the IGMC mode, "a bitstream representing a coded image block can include a syntactic element which may be interpreted to indicate either the IGMC mode or the COPY mode." Ex. 1007 ¶ 56. A "switch between the IGMC and COPY modes may be signalled implicitly, by means of other code elements," or "may be signalled explicitly by a code word." *Id.*

2. Whether Petitioner Establishes a Reasonable Likelihood that Frojdh Qualifies as Prior Art

(a) General Principles

A provisional application for patent is a U.S. national application that may or may not include a claim. *See* 35 U.S.C. § 111(b). Depending on the disclosures in a provisional application, it may establish an early effective filing date for a later nonprovisional application. *See* 35 U.S.C. § 119(e)(1).

If a patent owner attempts to antedate a reference in an *inter partes* review, the patent owner bears the burden of producing evidence supporting an invention date before the reference's effective date. *See, e.g.*, *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1376 (Fed. Cir. 2016); *Dynamic Drinkware*, 800 F.3d at 1379–80. If a patent owner relies on an earlier application to antedate a reference, the patent owner must "show not only the existence of the earlier application, but why the written

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description in the earlier application supports the claim," i.e., "all the limitations" in the claim. *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1327 (Fed. Cir. 2008).

The analysis for the benefit of priority proceeds on a claim-by-claim basis. *See Lucent Techs., Inc. v. Gateway, Inc.*, 543 F.3d 710, 718 (Fed. Cir. 2008); *Waldemar Link, GmbH v. Osteonics Corp.*, 32 F.3d 556, 558 (Fed. Cir. 1994).

At the institution stage of an *inter partes* review, the statutory "reasonable likelihood" standard for institution applies to the issue whether a reference qualifies as prior art. *Cf. Hulu*, IPR2018-01039, Paper 29 at 12 (precedential) (citing 35 U.S.C. § 314(a)).

(b) Petitioner's Contentions

Petitioner contends that Frojdh's effective filing date for purposes of this proceeding is the Frojdh provisional's November 30, 2001, filing date because:

(1) Frojdh was "filed not later than 12 months after" the Frojdh provisional was filed;

(2) Frojdh specifically references the Frojdh provisional;

(3) the Frojdh provisional provides § 112 support for at least one claim in Frojdh, i.e., claim 15 in Frojdh; and

(4) the Frojdh provisional discloses the subject matter that Petitioner relies on in Frojdh to establish unpatentability of the challenged claims.

Pet. 37–38 (citing Ex. 1003 ¶¶ 219–223; Ex. 1007, code (60)); *see id.* at 2 n.2.

To show that the Frojdh provisional describes the subject matter relied upon as prior art in Frojdh, Petitioner provides the following table listing the

paragraphs in Frojdh that Petitioner relies upon and the pages in the Frojdh provisional with the corresponding disclosure:

Frojdh Paragraph	Supporting Frojdh Provisional Page Citations
[0002]	5–6
[0004]	5
[0006]	5–6
[0007]	6
[0009]	6
[0010]	6
[0011]	6–7
[0017]	8
[0022]	12–13
[0023]	6, 12–13
[0024]	11–12
[0047]	8–9
[0054]	12
[0055]	6, 12–13
[0056]	11–12

Pet. 38–39 (citing Ex. 1003 ¶¶ 222–223).

Petitioner contends that the effective filing date for the challenged claims is March 14, 2003, i.e., the ’549 application’s filing date, instead of March 15, 2002, i.e., the ’072 provisional’s filing date, because the ’072 provisional does not support several claim limitations. Pet. 3–4; *see id.* at 2 n.2. Therefore, according to Petitioner, Frojdh qualifies as prior art under § 102(e). *Id.* at 2.

Petitioner also contends that Frojdh still qualifies as prior art under § 102(e) if (1) both Frojdh and the challenged claims are “entitled to the priority dates of their respective provisionals” or (2) both Frojdh and the

challenged claims are not "entitled to the priority dates of their respective provisionals." Pet. 2 n.2.

(c) Patent Owner's Contentions

Patent Owner disputes that Frojdh's effective filing date for purposes of this proceeding is the Frojdh provisional's November 30, 2001, filing date. *See* Prelim. Resp. 4, 37–39. In particular, Patent Owner contends that Petitioner relies on Frojdh's paragraph 56 to establish unpatentability of the challenged claims and that the Frojdh provisional lacks a corresponding disclosure. *Id.* at 4, 38–39, 41–42.

Patent Owner notes that the '808 patent claims the benefit of priority to the '072 provisional's March 15, 2002, filing date. *See* Prelim. Resp. 18, 37 n.13.

(d) Analysis

The parties dispute the effective filing date for the challenged claims. *See* Pet. 2 n.2, 3–4; Prelim. Resp. 18, 37 n.13. Patent Owner relies on the '072 provisional to antedate Frojdh. Prelim. Resp. 37 & n.13. If a patent owner relies on an earlier application to antedate a reference, the patent owner must "show not only the existence of the earlier application, but why the written description in the earlier application supports the claim," i.e., "all the limitations" in the claim. *Tech. Licensing*, 545 F.3d at 1327.

Although Patent Owner notes that the '808 patent claims the benefit of priority to the '072 provisional's March 15, 2002, filing date, Patent Owner does not the show why the '072 provisional's written description supports any of the challenged claims. *See* Prelim. Resp. 12–24, 37–39, 37 n.13. Based on the current record, Patent Owner has not shouldered its burden to antedate Frojdh's November 27, 2002, filing date. *See id.*

Hence, based on the current record, Petitioner establishes a reasonable likelihood that Frojdh qualifies as prior art because Frojdh's November 27, 2002, filing date precedes the '549 application's March 14, 2003, filing date. *See* Ex. 1001, code (22); Ex. 1007, code (22).

3. INDEPENDENT CLAIM 1

(a) Preamble 1pre

Claim 1 recites "[a] method of encoding a video sequence." Ex. 1001, 25:11.

Petitioner contends that Frojdh teaches claim 1's preamble because Frojdh discloses "a method for compression of video signal data." Pet. 39 (quoting Ex. 1007 ¶ 2).

At this stage of the proceeding, Patent Owner makes no arguments specific to claim 1's preamble. *See, e.g.*, Prelim. Resp. 3–4, 40–47. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Generally, a preamble does not limit a claim. *Allen Eng'g*, 299 F.3d at 1346. We need not decide whether claim 1's preamble limits the claim because, based on the current record and for the reasons stated by Petitioner and supported by Dr. Havlicek's testimony, Petitioner establishes sufficiently that Frojdh teaches claim 1's preamble. *See* Pet. 39; Ex. 1003 ¶¶ 224–225.

(b) Limitation 1a

Claim 1 recites "assigning a skip coding mode to a first segment of a first frame of the sequence." Ex. 1001, 25:13–14 (limitation 1a).

(i) Petitioner's Contentions

Petitioner contends that Frojdh teaches limitation 1a for several related reasons. *See* Pet. 39–45. Specifically, Petitioner asserts that Frojdh discloses:

(1) a COPY mode used "[i]f the change from the reference macroblock to the current macroblock is small" where "the motion vector is always zero," i.e., a zero (non-active) motion vector;

(2) an implicit global motion compensation (IGMC) mode where "no explicit motion vector is sent" and the "motion vector is predicted from neighboring blocks in the current frame, that is, from blocks which are adjacent to or proximate to the particular image block."

Pet. 37, 40–41 (alteration by Petitioner) (quoting Ex. 1007 ¶¶ 11, 22, 55) (citing Ex. 1003 ¶¶ 231–233).

Regarding the COPY mode, Petitioner asserts that Frojdh "describes the copy operation performed during COPY mode as a skip, and alternatively describes COPY mode itself as SKIP mode." Pet. 40 (citing Ex. 1007 ¶¶ 47, 55).

Regarding the IGMC mode, Petitioner asserts that "the motion vector for a block is predicted from the neighboring blocks' motion vectors, and in contrast to COPY mode where the motion vector is always zero, the motion vector predicted using IGMC mode" may be a non-zero (active) motion vector. Pet. 41 (citing Ex. 1003 ¶¶ 234–236). Petitioner also asserts that the IGMC mode may predict a zero (non-active) motion vector because "calculating the motion vector for a macroblock based on the median of neighboring macroblocks' motion vectors" where the median equals zero results in a zero (non-active) motion vector. *Id.* at 42 (citing Ex. 1003

¶¶ 238–239); *see id.* at 44 (citing Ex. 1003 ¶ 242; Ex. 1007 ¶¶ 23, 55). Therefore, according to Petitioner, "Frojdh's IGMC mode teaches or suggests a coding mode in which a zero (non-active) motion vector or a nonzero (active) motion vector is associated with a macroblock." *Id.* at 43 (citing Ex. 1003 ¶ 239); *see id.* at 44 (citing Ex. 1003 ¶¶ 242–244).

Alternatively, Petitioner argues that if Frojdh's IGMC mode does not alone teach the claimed "skip coding mode," a coding mode comprising "both the IGMC mode and COPY (aka SKIP) mode" teaches the "skip coding mode." Pet. 43 (citing Ex. 1003 ¶ 240). Petitioner explains that (1) with global motion compensation (GMC) enabled, "either COPY mode or IGMC mode may be used," (2) COPY mode produces a zero (non-active) motion vector, and (3) IGMC mode produces either a zero (non-active) motion vector or a non-zero (active) motion vector. *Id.* (citing Ex. 1003 ¶ 241).

Further, Petitioner asserts that allowing either the COPY mode or the IGMC mode would have been obvious based on Frojdh's teachings about the COPY mode's advantages and the IGMC mode as a reinterpretation of the COPY mode. Pet. 43–44 (citing Ex. 1003 ¶ 241; Ex. 1007 ¶¶ 47, 55). Petitioner also asserts that "when IGMC operates as a reinterpretation of COPY mode," an ordinarily skilled artisan "would have understood it was beneficial to be able to still utilize COPY mode under GMC for the benefits it provides." *Id.* at 44 (citing Ex. 1003 ¶ 241).

Additionally, Petitioner asserts that Frojdh teaches "assigning a skip coding mode," e.g., the IGMC mode alone or the IGMC mode combined with the COPY mode, "to a first segment of a first frame" because Frojdh discloses:

(1) applying a coding mode "to a particular image block in the current frame"; and

(2) signaling the use of COPY when GMC is enabled.

Pet. 44–45 (quoting Ex. 1007 ¶ 55) (citing Ex. 1003 ¶¶ 245–246; Ex. 1007 ¶ 54).

(ii) Patent Owner's Contentions

Patent Owner disputes that Frojdh teaches limitation 1a. *See* Prelim. Resp. 3–4, 40–47. In particular, Patent Owner contends that Frojdh discloses "two different coding modes (COPY and IGMC)" and selecting between the two modes depending on "whether the GMC slice flag is on or off." *Id.* at 3–4, 40. Patent Owner also contends that:

(1) "[w]hen the GMC slice flag is on, a decoder knows that signaling conventionally used to indicate 'COPY' mode indicates IGMC mode";

(2) "[w]hen the GMC slice flag is off, a decoder will interpret the signaling used to indicate COPY mode as indicating COPY mode"; and

(3) "[n]o surrounding motion analysis is done in Frojdh."

Id. at 40–41.

Further, Patent Owner asserts that Frojdh differs from the '808 patent because a zero (non-active) motion vector according to the '808 patent "is not predicted, but is instead automatically generated to have zero-valued motion parameters in response to an classification of non-active motion after surrounding motion analysis." Prelim. Resp. 43 (emphasis omitted). Patent Owner asserts that the "fact that a predicted motion vector, in Frojdh, might happen to equal zero does not make the predicted motion vector a non-active motion vector that was generated after the surrounding motion analysis described in" the '808 patent." *Id.* According to Patent Owner, "Petitioner

conflates *results* with (claimed) *process*." *Id.* (emphases by Patent Owner); *see id.* at 1–2.

Additionally, Patent Owner asserts that the IGMC mode (1) "always uses motion vector predictions" and, therefore, (2) always produces non-zero (active) motion vectors "regardless of the characteristics of motion in any image segments surrounding a macroblock in question." Prelim. Resp. 43.

Regarding Petitioner's alternative argument about a coding mode comprising "both the IGMC mode and COPY (aka SKIP) mode" teaching the claimed "skip coding mode," Patent Owner contends that "GMC with IGMC and COPY" is "not possible." Prelim. Resp. 44; *see id.* at 44–45 (citing Ex. 2009 ¶ 78). Patent Owner explains that:

> (1) an encoder cannot signal the COPY mode if the GMC flag is on; and
>
> (2) an encoder cannot signal the IGMC mode if the GMC flag is off.

Id. at 44 (citing Ex. 1007 ¶ 55).

Further, Patent Owner asserts that "Frojdh signals a GMC flag at the slice level" and "Frojdh does not teach assigning motion vectors to slices." Prelim. Resp. 45, 47 (citing Ex. 2009 ¶ 79). Patent Owner also asserts that "the GMC mode in Frojdh requires including additional motion information with the 'first segment' slice," such as "a set of encoded global motion (GM) vectors." *Id.* at 45–46 (citing Ex. 1007 ¶¶ 24–25).

(iii) <u>Analysis</u>

Based on the current record, Petitioner establishes sufficiently that Frojdh teaches limitation 1a. *See* Pet. 39–43; Ex. 1003 ¶¶ 216–218, 226–239, 246. Specifically, Frojdh discloses an IGMC mode that "uses implicit motion vectors that are predicted" and "no explicit motion vector is

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sent" from an encoder to a decoder. Ex. 1007 ¶¶ 22, 55; *see* Ex. 1003 ¶¶ 216, 218, 234. Instead, "the macroblock COPY (aka SKIP) mode is reinterpreted as" a coding mode "without coefficients or explicitly coded motion vectors." Ex. 1007 ¶ 55; *see* Ex. 1003 ¶ 218.

In the IGMC mode, the "motion vector used for motion compensating the macroblock is predicted from neighboring blocks," i.e., from blocks "adjacent to or proximate to the particular image block." Ex. 1007 ¶ 55; *see id.* ¶ 23; Ex. 1003 ¶¶ 217, 235. "More specifically, in applying [the IGMC mode] to a particular image block in the current frame, a collocated block in a previous frame, dislocated by a motion vector is copied from the previous frame." Ex. 1007 ¶ 55; *see* Ex. 1003 ¶¶ 217, 235. Thus, the IGMC mode "is used to copy pixels from a previous frame of a collocated block, dislocated by a motion vector that is predicted from neighboring image blocks of the current frame." Ex. 1007 ¶ 23; *see id.* at code (57); Ex. 1003 ¶ 236.

From analyzing the neighboring image blocks of the current frame, the IGMC mode may predict either a zero (non-active) motion vector or a non-zero (active) motion vector for a particular image block. *See* Ex. 1003 ¶¶ 234–239; Ex. 1007 ¶¶ 23, 55. As Petitioner asserts, the IGMC mode may predict a zero (non-active) motion vector because "calculat[ing] the predicted motion vector based on the median of the neighboring macroblocks' motion vectors" where the median equals zero results in a zero (non-active) motion vector. Ex. 1003 ¶ 238; *see* Pet. 42. And Patent Owner admits that the IGMC mode may predict a non-zero (active) motion vector. *See* Prelim. Resp. 43. Accordingly, the IGMC mode corresponds to the claimed "skip coding mode." *See* Ex. 1003 ¶ 239.

Additionally, Frojdh discloses "assigning a skip coding mode to a first segment of a first frame" because Frojdh explains that "in applying [the IGMC mode] to a particular image block in the current frame, a collocated block in a previous frame, dislocated by a motion vector is copied from the previous frame." Ex. 1007 ¶ 55; *see* Ex. 1003 ¶¶ 217, 235, 246.

Based on the current record, we disagree with Patent Owner that the IGMC mode always produces non-zero (active) motion vectors "regardless of the characteristics of motion in any image segments surrounding a macroblock in question." *See* Prelim. Resp. 43. As discussed above in this section, the IGMC mode analyzes the motion characteristics of the blocks "adjacent to or proximate to the particular image block." Ex. 1007 ¶ 55; *see id.* ¶ 23; Ex. 1003 ¶¶ 217, 235. Where the median of the blocks "adjacent to or proximate to the particular image block" equals zero, the IGMC mode will predict a zero (non-active) motion vector because "calculat[ing] the predicted motion vector based on" a median that equals zero results in a zero (non-active) motion vector. Ex. 1003 ¶ 238. A "prior art product that sometimes, but not always, embodies a claimed method nonetheless teaches that aspect of the invention." *Hewlett-Packard Co. v. Mustek Sys., Inc.*, 340 F.3d 1314, 1326 (Fed. Cir. 2003).

We also disagree with Patent Owner that "Petitioner conflates *results* with (claimed) *process*." *See* Prelim. Resp. 43. To establish unpatentability, Petitioner points to the IGMC mode process where the "motion vector is predicted from neighboring blocks in the current frame," i.e., from blocks "adjacent to or proximate to the particular image block." Pet. 41 (quoting Ex. 1007 ¶ 55). Hence, that process considers "the characteristics of the

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motion in image segments surrounding the macroblock in question" as disclosed in the '808 patent. *See* Ex. 1001, 17:45–52.

Patent Owner's assertion that Frojdh differs from the '808 patent because a zero (non-active) motion vector according to the '808 patent "is not predicted, but is instead automatically generated to have zero-valued motion parameters in response to an classification of non-active motion after surrounding motion analysis" lacks merit. *See* Prelim. Resp. 43. Claim 1 does not require a zero (non-active) motion vector that has been "automatically generated." *See* Ex. 1001, 25:11–27.

Additionally, the '808 patent does not describe different processes for generating a zero (non-active) motion vector and a non-zero (active) motion vector. *See, e.g.*, Ex. 1001, 14:14–51, 17:43–19:10. Instead, the '808 patent discloses an embodiment with surrounding motion analysis block 802 "removed" and active motion parameter generation block 803 "activated for all the skip mode macroblocks," including macroblocks associated with a zero (non-active) motion vector and macroblocks associated with a non-zero (active) motion vector. *Id.* at 24:42–45.

Although the '808 patent discloses an embodiment where active motion parameter generation block 803 generates a non-zero (active) motion vector and zero motion parameter generation block 804 generates a zero (non-active) motion vector, the '808 patent does not specify the processes these blocks employ to produce motion vectors. Ex. 1001, 18:24–19:10, 24:61–65, Fig. 8.

Further, Frojdh's process for analyzing the neighboring image blocks of the current frame and predicting a motion vector does "automatically

generate" a motion vector, including at times a zero (non-active) motion vector. *See* Ex. 1003 ¶¶ 234–239; Ex. 1007 ¶¶ 23, 55.

Because the IGMC mode corresponds to the claimed "skip coding mode," we do not at this time reach Petitioner's alternative argument about a coding mode comprising "both the IGMC mode and COPY (aka SKIP) mode" teaching the claimed "skip coding mode." *See* Pet. 43–44.

(c) Limitation 1b

Claim 1 recites "assigning either a zero motion vector or a predicted non-zero motion vector for the skip coding mode for the first segment based at least in part on the motion information of a second segment neighboring the first segment." Ex. 1001, 25:15–18 (limitation 1b).

Petitioner contends that Frojdh teaches limitation 1b for two related reasons. *See* Pet. 45–47 (citing Ex. 1003 ¶¶ 247–253; Ex. 1007 ¶¶ 22, 55). First, Petitioner asserts that Frojdh teaches "assigning" a "skip coding mode" for a particular image block where the "skip coding mode" utilizes either a zero motion vector or a predicted non-zero motion vector "based on characteristics of the motion in image segments surrounding the segment in question" for the reasons discussed for limitation 1a. *Id.* at 45; *see supra* § III.E.3(b)(i).

Second, Petitioner asserts that Frojdh teaches "assigning" motion vectors in the IGMC mode "based at least in part on the motion information of a second segment neighboring the first segment" because:

(1) the motion vector in the IGMC mode "is predicted from neighboring blocks in the current frame, that is, from blocks which are adjacent to or proximate to the particular image block"; and

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(2) an ordinarily skilled artisan "would have understood neighboring block predictions encompass motion information."

Pet. 46–47 (quoting Ex. 1007 ¶ 55) (citing Ex. 1003 ¶ 253). Therefore, according to Petitioner, "Frojdh teaches or suggests the use of motion information in a neighboring segment both to predict a motion vector," e.g., a zero motion vector or a predicted non-zero motion vector, "as well to assign the predicted motion vector or alternative motion vector," e.g., a zero motion vector, depending on "how each performs coding a macroblock." *Id.* (citing Ex. 1003 ¶¶ 250–252).

Patent Owner disputes that Frojdh teaches limitation 1b because Patent Owner contends that (1) Frojdh fails to teach the "skip coding mode" recited in limitation 1a and (2) "it is not possible that [Frojdh] could meet the additional constraints of" limitation 1b. Prelim. Resp. 47; *see id.* at 3–4, 40–47. Additionally, Patent Owner disputes that Frojdh teaches limitation 1b under Petitioner's alternative argument about a coding mode comprising "both the IGMC mode and COPY (aka SKIP) mode" teaching the "skip coding mode." *See id.* at 45–47.

Based on the current record and for the reasons stated by Petitioner and supported by Dr. Havlicek's testimony, Petitioner establishes sufficiently that Frojdh teaches limitation 1b. *See* Pet. 45–47; Ex. 1003 ¶¶ 247–253. Based on the current record and for the reasons discussed above, we disagree with Patent Owner that Frojdh fails to teach the "skip coding mode" recited in limitation 1a. *See supra* § III.E.3(b)(iii).

(d) <u>Limitation 1c</u>

Claim 1 recites "forming a prediction for the first segment with respect to a reference frame based at least in part on the assigned motion

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vector for the skip coding mode, wherein the assigned motion vector is one of the zero motion vector and the predicted non-zero motion vector." Ex. 1001, 25:19–23 (limitation 1c).

Petitioner contends that Frojdh teaches limitation 1c because Frojdh discloses:

(1) "assigning an IGMC mode to a particular image block ('the first segment')"; and

(2) copying pixels "from a collocated image block, located in a frame before the current frame, that is dislocated based on a predicted motion vector," when the "IGMC mode is used for the particular image block ('the first segment')."

Pet. 48 (citing Ex. 1007 ¶¶ 23, 55).

Further, Petitioner asserts that "the assigned motion vector for the skip coding mode" is "one of" the zero motion vector and the predicted non-zero motion vector for the reasons discussed for limitation 1a. Pet. 48 (citing Ex. 1003 ¶¶ 255–257); *see supra* § III.E.3(b)(i).

Patent Owner disputes that Frojdh teaches limitation 1c because Patent Owner contends that (1) Frojdh fails to teach the "skip coding mode" recited in limitation 1a and (2) "it is not possible that [Frojdh] could meet the additional constraints of" limitation 1c. Prelim. Resp. 47; *see id.* at 3–4, 40–47.

Based on the current record and for the reasons stated by Petitioner and supported by Dr. Havlicek's testimony, Petitioner establishes sufficiently that Frojdh teaches limitation 1c. *See* Pet. 48; Ex. 1003 ¶¶ 254–257. Based on the current record and for the reasons discussed above, we disagree with Patent Owner that Frojdh fails to teach the "skip coding mode" recited in limitation 1a. *See supra* § III.E.3(b)(iii).

(e) Limitation 1d

Claim 1 recites "providing in an encoded bitstream an indication of the skip coding mode, wherein no further motion vector information for the first segment is coded in the encoded bitstream." Ex. 1001, 25:24–27 (limitation 1d).

Petitioner contends that Frojdh teaches limitation 1d because Frojdh discloses that "a bitstream representing a coded image block can include a syntactic element which may be interpreted to indicate either the IGMC mode or the COPY mode." Pet. 48–49 (quoting Ex. 1007 ¶ 56). Petitioner also contends that the "IGMC mode operates 'without coefficients or explicitly coded motion vectors,' and when IGMC is used, 'no explicit motion vector is sent with the encoded slice.'" *Id.* at 49 (quoting Ex. 1007 ¶ 55). According to Petitioner, "no explicit motion vector is included in the encoded bitstream" regardless of whether IGMC mode or COPY mode is used. *Id.* (citing Ex. 1003 ¶ 261).

Patent Owner disputes that Frojdh teaches limitation 1d because Patent Owner contends that (1) Frojdh fails to teach the "skip coding mode" recited in limitation 1a and (2) "it is not possible that [Frojdh] could meet the additional constraints of" limitation 1d. Prelim. Resp. 47; *see id.* at 3–4, 40–47. Additionally, Patent Owner disputes that Frojdh teaches limitation 1d under Petitioner's alternative argument about a coding mode comprising "both the IGMC mode and COPY (aka SKIP) mode" teaching the "skip coding mode." *See id.* at 45–46.

Based on the current record and for the reasons stated by Petitioner and supported by Dr. Havlicek's testimony, Petitioner establishes sufficiently that Frojdh teaches limitation 1d. *See* Pet. 48–49; Ex. 1003

¶¶ 258–261. Based on the current record and for the reasons discussed above, we disagree with Patent Owner that Frojdh fails to teach the "skip coding mode" recited in limitation 1a. *See supra* § III.E.3(b)(iii).

(f) Preliminary Conclusion About Obviousness/Nonobviousness

As discussed above, Petitioner's analysis addresses how Frojdh teaches claim 1's subject matter. *See supra* §§ III.E.3(a)–(e). Hence, based on the current record, Petitioner demonstrates a reasonable likelihood of proving that claim 1 is unpatentable under § 103(a) because the claim would have been obvious over Frojdh.

4. INDEPENDENT CLAIM 7

Petitioner contends that Frojdh teaches claim 7's preamble because Frojdh discloses (1) "a method for compression of video signal data . . . which employs global motion compensation" and (2) "[b]y using an already decoded frame (reconstructed frame) as reference," the results of motion compensation (e.g., motion vectors) can "inform [a] decoder how to spatially translate the corresponding regions of the reference frame in order to make a prediction for [a] macroblock under consideration." Pet. 55 (alterations by Petitioner) (quoting Ex. 1007 ¶¶ 2, 11). Petitioner contends that Frojdh teaches limitations 7a, 7b, and 7c for the reasons Petitioner contends that Frojdh teaches limitations 1a, 1b, 1c, and 1d. *Id.* at 56–57.

Patent Owner disputes that Frojdh teaches claim 7's subject matter for the reasons Patent Owner disputes that Frojdh teaches claim 1's subject matter. *See* Prelim. Resp. 3–4, 40–47.

Based on the current record and for (1) the reasons stated by Petitioner and supported by Dr. Havlicek's testimony and (2) the reasons discussed above for claim 1, Petitioner establishes sufficiently for purposes of

institution that Frojdh teaches claim 7's subject matter. *See* Pet. 55–57; Ex. 1003 ¶¶ 285–291; *supra* §§ III.E.3(a)–(e). Hence, Petitioner demonstrates a reasonable likelihood of proving that claim 7 is unpatentable under § 103(a) because the claim would have been obvious over Frojdh.

5. DEPENDENT CLAIMS 2, 23, 28–30, 34, 39–41, AND 65

Claims 2, 23–25, and 28–30 depend directly from claim 1. Ex. 1001, 25:28–30, 28:53–29:12, 29:35–45. Claims 34, 39–41, and 65 depend directly from claim 7. *Id.* at 30:10–19, 30:60–31:3, 34:39–41.

For claims 2, 23, 28–30, 34, 39–41, and 65, Petitioner provides an analysis how Frojdh teaches the claimed subject matter. *See* Pet. 49–54, 57–58. Dr. Havlicek's testimony supports Petitioner's analysis. *See* Ex. 1003 ¶¶ 262–284, 292–296.

At this stage of the proceeding, Patent Owner makes no arguments specific to any of claims 2, 23, 28–30, 34, 39–41, and 65. *See, e.g.*, Prelim. Resp. 3–4, 40–47.

Based on the current record and for the reasons stated by Petitioner and supported by Dr. Havlicek's testimony, Petitioner establishes sufficiently for purposes of institution that Frojdh teaches the subject matter in claims 2, 23, 28–30, 34, 39–41, and 65. *See* Pet. 49–54, 57–58; Ex. 1003 ¶¶ 262–284, 292–296. Hence, Petitioner demonstrates a reasonable likelihood of proving that claims 2, 23, 28–30, 34, 39–41, and 65 are unpatentable under § 103(a) because the claims would have been obvious over Frojdh.

F. Alleged Obviousness over Frojdh and H.263: Claims 6, 9, 24, 25, 32, 36, and 43

Claims 6, 24, and 25 depend directly from claim 1. Ex. 1001, 26:4–9, 28:63–29:12. Claims 9, 32, 36, and 43 depend directly from claim 7. *Id.* at 26:45–51, 29:65–30:3, 30:31–38, 31:24–32.

For claims 6, 9, 24, 25, 32, 36, and 43, Petitioner provides an analysis how the combined disclosures in Frojdh and H.263 teach the claimed subject matter. *See* Pet. 65–75. Further, Petitioner identifies reasons that would have prompted an ordinarily skilled artisan to combine Frojdh's teachings with H.263's teachings with a reasonable expectation of success in achieving the claimed subject matter. *See id.* at 61–64. Dr. Havlicek's testimony supports Petitioner's positions. *See* Ex. 1003 ¶¶ 303–337.

At this stage of the proceeding, Patent Owner makes no arguments specific to any of claims 6, 9, 24, 25, 32, 36, and 43. *See* Prelim. Resp. 48. Instead, Patent Owner asserts that the challenge based on Frojdh and H.263 "rises and falls" with the challenge based on Frojdh alone. *Id.*

Based on the current record and for the reasons stated by Petitioner and supported by Dr. Havlicek's testimony, Petitioner establishes sufficiently for purposes of institution that the combined disclosures in Frojdh and H.263 teach the subject matter in claims 6, 9, 24, 25, 32, 36, and 43. *See* Pet. 65–75; Ex. 1003 ¶¶ 311–337. Additionally, on this record, Petitioner establishes sufficiently that an ordinarily skilled artisan would have been motivated to combine Frojdh's teachings with H.263's teachings with a reasonable expectation of success in achieving the claimed subject matter. *See* Pet. 61–64; Ex. 1003 ¶¶ 303–310. Hence, Petitioner demonstrates a reasonable likelihood of proving that claims 6, 9, 24, 25, 32,

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36, and 43 are unpatentable under § 103(a) because the claims would have been obvious over Frojdh and H.263.

IV. CONCLUSION

Based on the arguments and evidence presented by the parties, we determine that there is a reasonable likelihood Petitioner would prevail with respect to at least one claim challenged in the Petition. Hence, we institute an *inter partes* review of all challenged claims on all challenges included in the Petition. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1355 (2018) (noting that the language of 35 U.S.C. § 314(b) "indicates a binary choice—either institute review or don't"); *PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1360 (Fed. Cir. 2018) (interpreting the statute as requiring "a simple yes-or-no institution choice respecting a petition, embracing all challenges included in the petition"); 37 C.F.R. § 42.108(a).

At this preliminary stage, we have not made a final determination about the patentability of any challenged claim, the construction of any claim term, phrase, or limitation, or any other legal or factual issue.

V. ORDER

Accordingly, it is

ORDERED that, according to 35 U.S.C. § 314(a), an *inter partes* review of claims 1, 2, 6, 7, 9, 23–25, 28–30, 32, 34, 36, 39–41, 43, and 65 in the '808 patent is instituted on all challenges included in the Petition; and

FURTHER ORDERED that, according to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial that commences on the entry date of this decision.

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