

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

Petitioners

v.

NOKIA TECHNOLOGIES OY,

Patent Owner.

IPR2024-00691

U.S. Patent No. 8,050,321

PETITIONERS' REPLY TO PATENT OWNER'S RESPONSE

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U.S. Patent & Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

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PETITIONERS' EXHIBIT LIST

Exhibit	Reference
1001	U.S. Patent No. 8,050,321
1002	U.S. Patent No. 8,050,321 File History
1003	Declaration of Dr. Joseph Havlicek
1004	Curriculum Vitae of Dr. Joseph Havlicek
1005	ISO/IEC 11172-2 (1st ed.) Information technology - Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s - Part 2: Video ("MPEG-1")
1006	U.S. Patent No. 6,912,351 ("Kim")
1007	CL480PC MPEG-1 System Decoder Specification, <i>available at</i> https://web.archive.org/web/19970128081644/http://www.c-cube.com/prdctlst/cl480pc.pdf .
1008	U.S. Patent No. 7,263,270
1009	Ruby B. Lee et al., <i>Real-Time Software MPEG Video Decoder on Multimedia-Enhanced PA 7100LC Processors</i> , Hewlett-Packard J., Apr. 1995, <i>available at</i> https://archive.org/details/Hewlett-Packard_Journal_Vol._46_No._2_1995-04_Hewlett-Packard
1010	Ketan Patel, et al., <i>Performance of a Software MPEG Video Decoder</i> , Multimedia '93: Proceedings of the First ACM Int'l Conf. on Multimedia, August 2-6, 1993
1011	Original Complaint, <i>Nokia Techs. Oy v. Amazon.com, Inc.</i> , No. 1:23-cv-01236 (D. Del. Oct. 31, 2023), ECF No. 1.
1012	First Amended Complaint, <i>Nokia Corp. v. Amazon.com, Inc.</i> , No. 1:23-cv-01232 (D. Del. Oct. 31, 2023), ECF No. 5.
1013	Declaration of June Ann Munford
1014	U.S. Patent No. 7,894,521
1015	U.S. Patent No. 5,786,858 ("Yagasaki")
1016	Conference Call Transcript dated July 16, 2024
1017	Deposition Transcript of Dr. Iain Richardson

I. INTRODUCTION

Patent Owner’s Response (“POR”) largely rehashes the same arguments from Patent Owner’s Preliminary Response (“POPR”)—arguments this Panel has already considered and rejected—and is unavailing for the same reasons. Additionally, the POR advances new claim constructions under the guise of a “plain and ordinary meaning” that are incorrect, contrary to the intrinsic record, and are nevertheless disclosed in the prior art. For example, PO argues the “indication” requires a “confirmation” but only supports its construction with a syntax element from an H.264 standard document published years after the priority date of the ’321 patent. The POR further mischaracterizes Petitioner’s obviousness arguments and relies upon unduly narrow interpretations of prior art disclosures. For example, PO argues Kim’s logical address cannot be decoded because Kim discusses an *example* where a physical address is used to search an optical medium. These misguided arguments should be rejected, and the Challenged Claims should be cancelled.

II. MPEG-1 RENDERS THE CHALLENGED CLAIMS OBVIOUS

PO does not dispute that MPEG-1 discloses or suggests 8[pre] and 8[c]. PO only argues that MPEG-1 does not meet limitations 8[a], 8[b], or 8[d] (and their claim 10 and 11 counterparts). But PO’s challenge mistakenly relies on the concept of random access that appears nowhere in the Challenged Claims and fails to meaningfully refute that the exemplary closed GOP discussed in the Petition, in

combination with the knowledge of a POSITA, renders the Challenged Claims obvious.¹

A. The Challenged Claims Do Not Concern Random Access

The '321 patent concerns encoding/decoding video sequences comprising image frames arranged in independent groups. (EX1001, Abstract.) The POR focuses on the '321 patent's discussion of a "scalable coding hierarchy," which PO describes as allowing for random access in video coding. (POR, 7-8, 11-13.) PO relies heavily upon this concept of random access to distinguish the Challenged Claims from the prior art. (*E.g., id.*, 13, 20, 37-40.) But nowhere does PO identify limitations from the Challenged Claims directed to random access—nor can it. (POR, *passim*.) The Challenged Claims are directed to grouping and numbering image frames, not random access. (EX1003, ¶52.) Generally, the Challenged Claims recite an independent video sequence that is decoded along with each frame's identifier value, starting with a first frame (identified by an *indication*), and where the identifier value for the first frame is reset. Nowhere do the claims require a decoder that supports random access.

¹ PO argues that Ground 3 in the Petition fails for the same reasons as Ground 1. (POR, 68.) Petitioner does not separately address Ground 3.

PO's focus on random access ignores a fundamental legal principle—teachings of the prior art (understood by a POSITA) must be compared to the patent's claims, not just to concepts described in the specification. *Medichem, S.A. v. Rolabo, S.L.*, 353 F.3d 928, 933 (Fed. Cir. 2003) (invalidity analysis requires comparison of the claim to prior art).

B. PO's Attempts To Distinguish MPEG-1 Based On Random Access Lack Connection To The Challenged Claims

PO attempts to distinguish MPEG-1 based on random access without grounding its challenge in the claim language. For example, PO attempts to distinguish MPEG-1 from limitation 8[a] by pointing to one exemplary bitstream in MPEG-1 (below) where the `closed_gop` flag (the *indication*) is not decoded if the I-picture with a Temporal Reference of 8 (blue) is the first image frame decoded. (POR, 37-40.)

Example (c) in display order	B	~~I~~	B	B	B	B	P	B	I	B	B	I	I
	0	1	2	3	4	5	6	7	8	9	10	11	12
Example (c) in coded order	~~I~~	B	P	B	B	B	B	I	B	I	B	B	I
	1	0	6	2	3	4	5	8	7	11	9	10	12

(EX1005, 87.²) But PO does not dispute that MPEG-1 discloses another exemplary bitstream where the `closed_gop` flag is decoded before the I-picture with a Temporal Reference of zero.

² Images annotated unless otherwise noted.

Example (a) in display order	I 0	B 1	P 2	B 3	P 4
Example (a) in decoding order	I 0	P 2	B 1	P 4	B 3

(EX1005, 87; *see* EX1017, 218:11-219:15 (agreeing the I-frame is first in decoding and display order and has a temporal reference of zero).) PO identifies nothing in the Challenged Claims that requires covering both scenarios—PO’s reliance on random access does not distinguish MPEG-1 from the Challenged Claims.

C. The POR Ignores MPEG-1’s Exemplary Closed GOP

An independent sequence of image frames was well-known before the ’321 patent—a group of pictures (“GOP”), that can be open or closed, was disclosed in MPEG-1 nearly a decade beforehand. (EX1003, ¶42; Pet., 14-15.) MPEG-1 identified multiple examples of a closed GOP. (Pet., 16-17; EX1005, 85.)

Petitioner points to one such “exemplary closed GOP” that invalidates the Challenged Claims. (Pet., 16-17.) That exemplary closed GOP begins with an I-picture in decoding order (EX1005, 84 (“*Property 1*. A group of pictures, in bitstream order, must start with an I-picture...”)) and display order. (*Id.* “*Property 2*. Another property of a group of pictures is that it must begin, in display order, with

an I or a B-picture....”).³ Any B-pictures that precede I-pictures may be omitted to ensure that the GOP is closed. (*Id.*, 85 (“One way to do this is to omit any B-pictures preceding the first I-picture.”).) Consequently, it is undisputed that the first picture in this exemplary closed GOP (in both decoding and display order) will be an I-picture with a Temporal Reference of zero (Pet., 17; EX1003, ¶78; ID, 19-20; EX1017, 218:11-219:15), shown below:

Example (a) in display order	I	B	P	B	P
	0	1	2	3	4
Example (a) in decoding order	I	P	B	P	B
	0	2	1	4	3

(EX1005, 87.)

The POR—like the POPR—ignores this exemplary closed GOP and instead argues that Petitioner did not “consider a decoder for MPEG-1 for everything it teaches.” (POR, 42; EX2004, ¶125; EX1017, 245:21-246:14.) PO dismisses Petitioner’s arguments because they rely on a “partially constructed MPEG-1 decoder.” (POR, 49.) The POR, however, fails to respond to the Petitioner’s position, and only two of PO’s arguments even implicate Petitioner’s exemplary closed GOP: (1) that the closed_gop flag does not “indicate” any image frame and

³ PO’s expert agrees MPEG-1 discloses these two properties. (EX1017, 204:19-205:5, 206:2-6.)

(2) that the decoder does not reset the identifier value. As addressed below, both are wrong. PO's other challenges to MPEG-1 rely upon disclosures that relate to *other* closed GOPs. (*E.g., id.*, 37-40, 52-53.) For example, PO's argument that MPEG-1 does not disclose limitation 8[b] ignores Petitioner's exemplary closed GOP and, thus, does not need to be considered by the Board. (*Id.*, 45-49; EX1017, 249:9-16 (admitting his analysis for limitation 8[b] does not consider MPEG-1 Figure D19(a) (an exemplary closed GOP)).) PO's arguments, even if accepted, miss the mark because prior art can still render a claim obvious if it only sometimes—but not always—embodies a Challenged Claim. *Hewlett-Packard Co. v. Mustek Sys., Inc.*, 340 F.3d 1314, 1326 (Fed. Cir. 2003).

D. Limitation 8[a]: MPEG-1 Discloses An “Indication”

1. The Closed_GOP Flag Is An Indication

MPEG-1 teaches or suggests the closed_gop flag is the “indication” of limitation 8[a].⁴ It is undisputed that the closed_gop flag—in the GOP header preceding the first image frame—indicates whether the GOP is open or closed. (Pet., 22; POR, 32.) When the closed_gop flag specifies the GOP is closed, it is also undisputed that the image frame decoded after the closed_gop flag is an I-frame that

⁴ Petitioner, like PO, addresses claim 8 because the limitations of claims 8, 10 and 11 are similar. (*E.g., POR*, 30-31.)

is the first image frame in decoding order. (Pet., 21-23; EX1003, ¶¶88-94; POR, 33; EX1017, 227:16-228:7.) It should therefore be further undisputed that the closed_gop flag indicates that the next image frame decoded is the first image frame in decoding order of the independent sequence.⁵

PO argues the closed_gop flag is not an “indication” for two reasons: (1) it does “not[]confirm the presence of any image frame to a decoder,” and (2) it does not indicate which image frame is first. (POR, 32.) Both arguments fail because they ignore Petitioner’s exemplary closed GOP and improperly seek to add requirements not found in limitation 8[a].

First, PO asserts that the closed_gop flag is only an indication of whether the GOP is open or closed,⁶ not of a particular image frame. (POR, 32.) According to PO, because the closed_gop flag is in the GOP header, it is a syntax element that

⁵ PO does not dispute that a closed GOP is an “independent sequence.” (EX1017, 181:11-182:1.)

⁶ Petitioner agrees that the closed_gop flag also indicates whether the GOP is open or closed, but limitation 8[a] does not require that the indication serve only one purpose. (ID, 27-28; EX1001, 23:51-24:2.)

only applies to the entire GOP (compared to picture layer syntax that applies to a specific picture).⁷ (POR, 32-33.) The layers of syntax disclosed in MPEG-1 are:

0.5 Structure of the coded video bitstream

This part of ISO/IEC 11172 specifies a syntax for a coded video bitstream. This syntax contains six layers, each of which either supports a signal processing or a system function:

Layers of the syntax	Function
Sequence layer	Random access unit: context
Group of pictures layer	Random access unit: video
Picture layer	Primary coding unit
Slice layer	Resynchronization unit
Macroblock layer	Motion compensation unit
Block layer	DCT unit

(EX1005, 16.) The Board should reject PO's argument for the same reasons it rejected this argument in the POPR: namely, the closed_gop flag in the exemplary closed GOP indicates that the next image frame decoded is the first one in decoding order of the independent sequence. (ID, 27.) Limitation 8[a] does not require that the "indication" identify a particular image frame, only that it identifies "at least one image frame" that is the first image frame in decoding order. (*Id.*, 27-28.)

PO attempts to dodge the Board's previous rejection by relying on a new claim construction submitted under the guise of alleged plain-and-ordinary meaning—according to PO, the indication must "confirm" or "inform a decoder of something

⁷ PO made this same argument in its POPR, which the Board rejected. (ID, 26-28.)

It is undisputed that limitation 8[a], unlike claim 9, does not require the indication to be in a specific syntax layer. (EX1017, 184:9-11.)

with certainty.” (POR, 34, 40; EX2004, ¶¶102-03.) This new “confirmation” requirement finds no support in the ’321 patent.

Tellingly, PO cites no intrinsic evidence to support its construction. (*See* POR, 34-37; EX2004, ¶¶102-10; EX1017, 231:21-232:6.) Instead, PO relies solely on its expert’s opinion and his analogy to a syntax element described in a document published years after the ’321 patent’s priority date and, as discussed below, does not support PO’s position. (POR, 34-37.) PO’s construction takes “indication” as it would be understood by a POSITA (e.g., to show that something is there, (EX2005, 79:15-80:12, 84:19-85:4)) and adds a conclusiveness requirement that is not discussed in the ’321 patent specification and is inconsistent with the language of limitation 8[a], which does not require the “indication” to confirm or inform a decoder of anything with certainty. Limitation 8[a] only requires an indication “of at least one image frame” (i.e., something showing that at least one image frame, including the first image frame in decoding order, is present). (EX1001, 23:51-24:2; EX2005, 77:20-80:12, 83:10-85:4, 87:18-88:22.) The `closed_gop` satisfies the “indication” requirement because, after the decoded `closed_gop` flag signals that the exemplary closed GOP is closed, it indicates that the next image frame is an I-picture that is the first frame in decoding order of the independent sequence. (Pet., 22-23; EX1003, ¶¶93-94; EX1017, 227:16-228:7 (agreeing the first image frame in decoding order after the `closed_gop` flag is an I-frame).)

But even considering PO’s argument, the closed_gop flag confirms to the decoder that the next image frame decoded will be the first image frame in decoding order in the exemplary closed GOP. (Pet., 16-18, 22-23; ID, 27-28.) After decoding the closed_gop flag in the header of the exemplary closed GOP, the decoder recognizes that the next image frame it receives will be an I-picture that is the first image frame in decoding order of the independent sequence, as shown in MPEG-1 Example D.19(a) below.

Example (a) in display order	I 0	B 1	P 2	B 3	P 4
Example (a) in decoding order	I 0	P 2	B 1	P 4	B 3

(EX1005, 87.) It is irrelevant that, as PO notes, start codes from lower syntax layers⁸ will be decoded between the closed_gop flag and first image frame (POR, 33). Limitation 8[a] indisputably does not require decoding the “indication” immediately before the first image frame. (EX1017, 184:3-16.)

⁸ PO argues that Petitioner’s interpretation of the closed_gop flag would render additional syntax (e.g., the picture layer) superfluous. (POR, 33.) But limitation 8[a] does not require the “indication” to operate in isolation—additional syntax can provide information about the first image frame.

PO attempts to bolster its construction of “indication” by providing an example of a “NAL unit” from H.264, but that standard was published years after the ’321 patent’s 2002 priority date (POR, 34-37; EX2006 (dated March 2005)) and should be disregarded as not contemporaneous. *Brookhill-Wilk 1, LLC v. Intuitive Surgical, Inc.*, 334 F.3d 1294, 1299 (Fed. Cir. 2003) (refusing to consider extrinsic evidence not contemporary to the asserted patent). PO also does not attempt to tie its discussion of a NAL unit to a concept that existed as of the ’321 patent’s priority date.⁹ Furthermore, PO’s discussion of a NAL unit is incomplete because, as illustrated below, in many instances, the NAL unit is “unspecified” or “may be discarded by decoders without affecting the decoding process.” (EX2006, 57-58.) PO does not explain how a NAL unit of 0 “confirms” anything when the resulting syntax structure is “Unspecified.”

⁹ PO’s expert could not recall a NAL unit disclosed in MPEG-1. (EX1017, 303:3-4.)

Table 7-1 – NAL unit type codes

nal_unit_type	Content of NAL unit and RBSP syntax structure	C
0	Unspecified	
1	Coded slice of a non-IDR picture slice_layer_without_partitioning_rbsp()	2, 3, 4
2	Coded slice data partition A slice_data_partition_a_layer_rbsp()	2
3	Coded slice data partition B slice_data_partition_b_layer_rbsp()	3
4	Coded slice data partition C slice_data_partition_c_layer_rbsp()	4
5	Coded slice of an IDR picture slice_layer_without_partitioning_rbsp()	2, 3
6	Supplemental enhancement information (SEI) sei_rbsp()	5
7	Sequence parameter set seq_parameter_set_rbsp()	0
8	Picture parameter set pic_parameter_set_rbsp()	1
9	Access unit delimiter access_unit_delimiter_rbsp()	6
10	End of sequence end_of_seq_rbsp()	7
11	End of stream end_of_stream_rbsp()	8
12	Filler data filler_data_rbsp()	9
13	Sequence parameter set extension seq_parameter_set_extension_rbsp()	10
14..18	Reserved	
19	Coded slice of an auxiliary coded picture without partitioning slice_layer_without_partitioning_rbsp()	2, 3, 4
20..23	Reserved	
24..31	Unspecified	

(EX2006, 57.) Nor does PO explain how a NAL unit of 13-19 (which may be discarded by the decoder, as stated below) “confirms” anything for the decoder.

NAL units having nal_unit_type equal to 13 and 19 may be discarded by decoders without affecting the decoding process for NAL units having nal_unit_type not equal to 13 or 19 and without affecting conformance to this Recommendation | International Standard.

NAL units that use nal_unit_type equal to 0 or in the range of 24..31, inclusive, shall not affect the decoding process specified in this Recommendation | International Standard.

NOTE 2 – NAL unit types 0 and 24..31 may be used as determined by the application. No decoding process for these values of nal_unit_type is specified in this Recommendation | International Standard.

Decoders shall ignore (remove from the bitstream and discard) the contents of all NAL units that use reserved values of nal_unit_type.

NOTE 3 – This requirement allows future definition of compatible extensions to this Recommendation | International Standard.

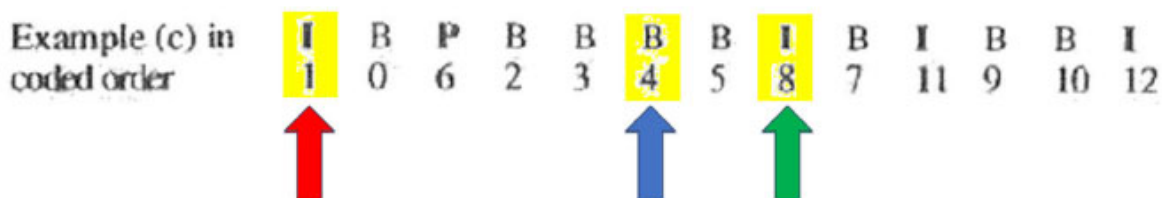
(*Id.*) PO’s reliance upon the H.264 NAL unit is misplaced and unhelpful.

Second, PO argues the closed_gop flag only indicates whether the GOP is closed and cannot indicate the first image frame in decoding order. (POR, 37.) The closed_gop flag therefore, according to PO, does not support random access because it cannot indicate an “initiation picture” of a GOP where decoding can begin. (*Id.*) PO’s argument, however, improperly imports disclosure that purportedly discusses random access from the specification into the claims. *Falana v. Kent State Univ.*, 669 F.3d 1349, 1354-55 (Fed. Cir. 2012) (“[T]his court has cautioned against limiting the claimed invention to preferred embodiments or specific examples in the specification.”).¹⁰

PO also argues that three of the five factors Petitioner presented to support its argument regarding the closed_gop flag are premised on incorrect interpretations of

¹⁰ PO’s expert has been retained in numerous patent litigations but did not understand the concept of importing a limitation from the specification into a claim. (EX1017, 90:18-91:7.)

MPEG-1. (POR, 37-40; ID, 27 ((1) GOP header precedes first image frame in decoding order; (3) closed_gop flag is decoded before first image frame in decoding order; (5) closed_gop flag indicates next image frame decoded is first image frame in decoding order).) Importantly, PO admits that factor 3 “may be true in some circumstances.” (POR, 39.) And PO’s expert admitted that factors 1, 3, and 5 could be true if decoding started at the GOP header. (EX1017, 243:5-244:21.) Should the Board consider PO’s argument, however, PO once again ignores the exemplary closed GOP addressed in the Petition. Specifically, PO’s disagreement with factors 1, 3, and 5 relies on one hypothetical example where the user initiates playback in the middle of a video sequence (green arrow). (POR, 37-40, 46-47.)



(EX2004, ¶133.) In this example—which, as discussed above, is ***not*** the example on which the Petition relies—PO argues the closed_gop flag is not decoded because the decoder would discard all bits until a start code identifying the I-picture indicated by a green arrow is reached. (*Id.*) But whether PO can conceive of an example that arguably does not practice the Challenged Claims is not the obviousness test, particularly where, as here, Petitioner has pointed to an exemplary closed GOP that

does practice the claim by decoding the closed_gop flag before the I-picture (*first image frame in decoding order*).

Example (a) in display order	I	B	P	B	P
	0	1	2	3	4
Example (a) in decoding order	I	P	B	P	B
	0	2	1	4	3

(EX1005, 87, 120; Pet., 22-23; EX1003, ¶¶88-94.)



(EX1005, 87.) If there are two closed GOPs in a row with a similar decoding order (above, example (a) repeated), a decoder that starts decoding in the middle of one video sequence would still render limitation 8[a] obvious. Specifically, if a user selects frame B3 (blue arrow) as the playback point, the decoder will continue until it reaches the next independent GOP (sequence after the purple divider). The closed_gop flag for that independent sequence would be decoded before frame I0 (green arrow), which is the first frame in decoding order for that sequence. (*E.g.*, EX1003, ¶¶76-79.) This example from MPEG-1 satisfies limitation 8[a]. *Unwired Planet, LLC v. Google Inc.*, 841 F.3d 995, 1002 (Fed. Cir. 2016). PO's alternative example bitstream is a red herring.

2. The Temporal Reference Is, Alternatively, An Indication

PO also disagrees that a Temporal Reference of zero is the recited “indication.” (POR, 41.) Specifically, PO argues that a Temporal Reference of zero indicates the first picture in display order, not necessarily in decoding order. (*Id.*) PO again ignores Petitioner’s exemplary closed GOP, where an I-picture is the first image frame in both decoding and display order and, therefore, has a Temporal Reference of zero. (Pet., 17; EX1003, ¶78.)

Example (a) in display order	I	B	P	B	P
	0	1	2	3	4
Example (a) in decoding order	I	P	B	P	B
	0	2	1	4	3

(EX1005, 87.)

PO also argues that Petitioner “did not consider a decoder for MPEG-1 for everything it teaches.” (POR, 42.) But Petitioner’s obviousness analysis relies on an exemplary closed GOP explicitly disclosed in MPEG-1, and every example disclosed in MPEG-1 is not required to satisfy the Challenged Claims to render them obvious. Petitioner’s exemplary closed GOP has an I-picture as the first picture in both display and decoding order with a Temporal Reference of zero, which meets limitation 8[a]. (ID, 28-29.) Even PO’s expert agrees that Petitioner’s exemplary closed GOP, above, includes an I-frame with a temporal reference of zero that is first in both display and decoding order. (EX1017, 218:11-21.)

E. Limitation 8[b]: MPEG-1 Starts Decoding The Video Sequence From The First Image Frame

MPEG-1 teaches starting decoding of a video sequence from the first image frame of a closed GOP, where a decoder discards all bits until it finds the beginning of a closed GOP. (Pet., 24-25; EX1003, ¶¶99-102.) PO nevertheless argues that MPEG-1 does not disclose limitation 8[b] because, in one example, the decoder could start from an I-picture in the middle of a video sequence.¹¹ (POR, 45-47.) PO’s argument relies on a single example bitstream from MPEG-1 and PO’s contention that Petitioner cannot rely on a “partially constructed” MPEG-1 decoder. PO does not consider Petitioner’s exemplary closed GOP in its analysis of limitation 8[b]. (POR, 45-49; EX1017, 249:9-16.)

Notably, PO cites no authority to support its contention. While a prior art reference should be considered for all that it teaches, if it sometimes, but not always, embodies a claim, it nonetheless teaches that claim. *Bell Commc’ns Rsch., Inc. v. Vitalink Commc’ns Corp.*, 55 F.3d 615, 622-23 (Fed. Cir. 1995). PO’s discussion of one unhelpful example—Figure D.19(c)—ignores this well-established principal

¹¹ PO argues that none of the start codes in MPEG-1 are first image frames of independent sequences but instead identify “some of the layers in the coding syntax.” (POR, 47.) This argument is irrelevant because it does not address Petitioner’s exemplary closed GOP.

and should be rejected. (ID, 36 (agreeing that an MPEG-1 example teaching a claim limitation is sufficient).)

F. Limitation 8[d]: MPEG-1 Teaches or Suggests The Decoder Resets The Identifier

The Petition shows the MPEG-1 exemplary closed GOP that begins with an I-picture assigned a Temporal Reference of zero, and for each GOP, is “reset to zero.” (Pet., 27-28; EX1003, ¶¶108-11; EX1005, 44, 87.) PO presents three incorrect arguments in response: (1) the encoder, not the decoder, resets the identifier; (2) Petitioner only argues that the identifier for a subsequent video sequence is reset; and (3) MPEG-1 does not always require that an I-picture (*the first image frame in decoding order*) have a Temporal Reference of zero. (POR, 50-53.)

Regarding argument (1), PO does not dispute that the Temporal Reference is reset for the first image frame of each independent sequence. (POR, 50-51; EX1017, 249:17-250:2.) PO further acknowledges that the encoder informs the decoder of the value of the Temporal Reference for each frame (including the *first image frame in decoding order*). (POR, 51; EX2004, ¶141; EX1017, 250:12-20, 254:1-7.) It is undisputed that MPEG-1’s Temporal Reference is a syntax value that is included in the bitstream. (EX1017, 151:3-11.) And PO’s expert admitted that he could not imagine a scenario where an MPEG-1 compliant decoder would change the value of a syntax element set by an MPEG-1 compliant encoder. (*Id.*, 57:11-17, 65:1-66:1.) If the decoder receives and decodes the value of a Temporal Reference for the first

image frame and cannot change the value of that syntax element, it would have been obvious to a POSITA that an MPEG-1 decoder resets¹² the Temporal Reference to zero when it decodes the first image frame in decoding order of the exemplary closed GOP. (Pet., 28; EX1003, ¶109; ID, 34.) If a decoder was able to change a Temporal Reference value, it would not be able to correctly determine display order. (EX2005, 75:7-76:5.)

By way of analogy, Person A could tell Person B that (i) today is the start of a new month, and (ii) the date is the first. Alternatively, Person A could just tell Person B that today is the start of a new month, and Person B could deduce that today is the first. Applying the analogy here, Petitioner and PO agree that the encoder (a) indicates the start of a new independent sequence to the decoder and (b) resets the identifier value to zero. (Pet., 27-28; POR, 50-51.) It would have been obvious to a POSITA that when encoder indicates the start of a new independent

¹² One way to “reset” the Temporal Reference value would be to store the decoded image frame data, including the Temporal Reference, and overwrite that data, thereby resetting it, when a new first image frame is decoded. PO’s expert agreed that MPEG-1 discloses storing a reference picture, where the new reference picture (here an I-frame with a Temporal Reference of zero) replaces the oldest stored reference picture. (EX1017, 162:5-163:22.)

sequence to the decoder (i.e., says today is the start of a new month), the decoder can determine that the Temporal Reference of the first image frame should be reset to zero (i.e., independently determine that today is the first). (Pet., 27-28; EX1003, ¶¶109-10.)

Regarding argument (2), PO misunderstands the Petition. Petitioner demonstrated that the Temporal Reference for every exemplary closed GOP in MPEG-1 is reset to zero. (Pet., 28; EX1003, ¶109.) This would be true not only for the Temporal Reference of the current video sequence, but also for every exemplary closed GOP. (Pet., 28.) Petitioner's argument is not limited to resetting the Temporal Reference for the subsequent video sequence.

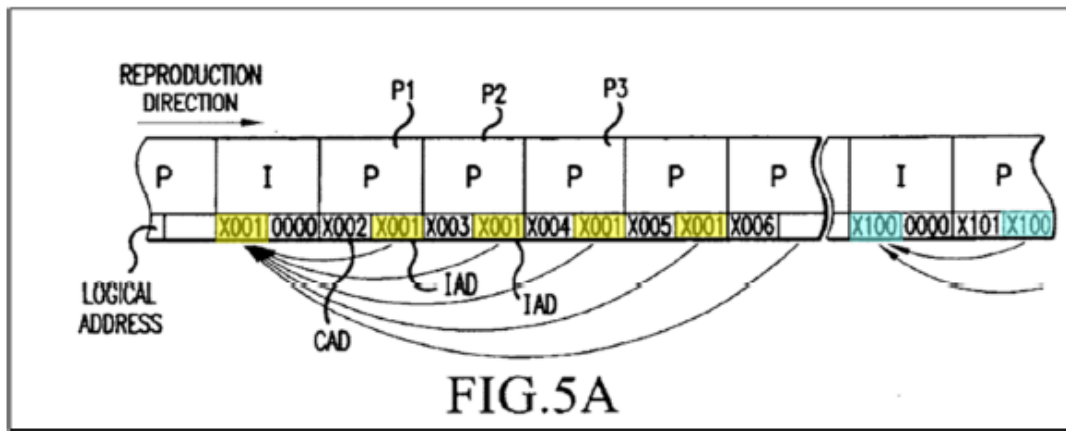
Finally, in argument (3), PO again ignores Petitioner's exemplary closed GOP, which has an I-picture as the first image frame in decoding order, where the I-picture has a Temporal Reference of zero. The Board should reject this argument for the reasons discussed above. (Section II.C; ID, 36 (rejecting same argument made in POPR).)

III. KIM RENDERS THE CHALLENGED CLAIMS OBVIOUS

PO challenges whether Kim's disclosure renders limitations 8[a], 8[b], 8[c], and 8[d] obvious (and their counterparts in claims 10 and 11). PO's challenge fails for the reasons discussed below.

A. Limitation 8[a]: For Both “Paths” Of Kim, The Indication Is Decoded

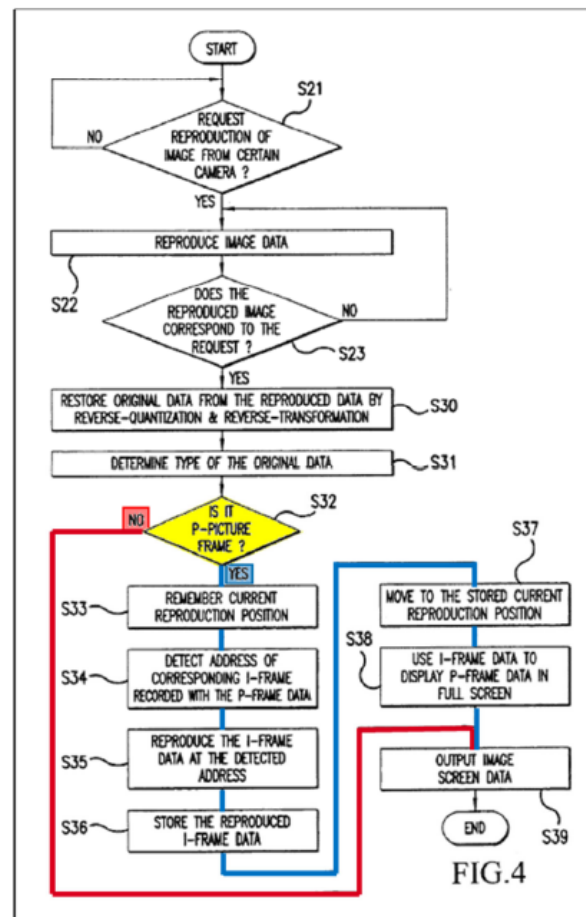
Kim teaches that an IAD of 0000 is an indication of the first image frame in decoding order of the independent sequence, Figure 5A below, which a POSITA would understand is decoded. (Pet., 46-47; EX1003, ¶¶151-54; ID, 58.)



(EX1006, Fig. 5A.) PO disagrees for three reasons: (1) if a P-picture (not an I-picture) is selected first, it does not have an IAD of 0000 but is the first image frame in decoding order; (2) if an I-picture is selected first, the IAD is not decoded; and (3) Kim’s optical medium is searched using a physical address, not the logical address. (POR, 56-59.) These arguments rely on a new construction of “decoding,” while ignoring the teachings of Kim.

1. If The User Selects a P-picture, The I-picture Is The First Image Frame In Decoding Order

As shown below, Kim teaches two paths for decoding a requested image frame, depending on whether the user requests an I-picture (red path) or P-picture (blue path).¹³



(EX1006, Fig. 4.)

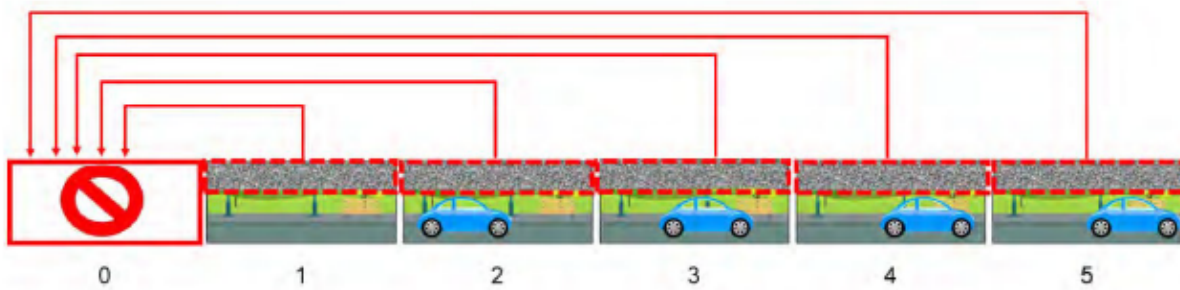
¹³ The path for both pictures is the same until step S32.

If a P-picture is selected, PO points to step S23 in Figure 4 and argues that some elements of the P-picture are decoded first, so an IAD of 0000 cannot indicate the first image frame in decoding order (i.e., an I-picture). (POR, 56-57.) PO's argument appears to be based on a construction for "decoding order" that focuses on where the decoder *starts* decoding image frames (which may not complete due to reference frame dependency) rather than the order in which the decoder completely *decodes* image frames. (POR, 57.) PO's construction is incorrect.

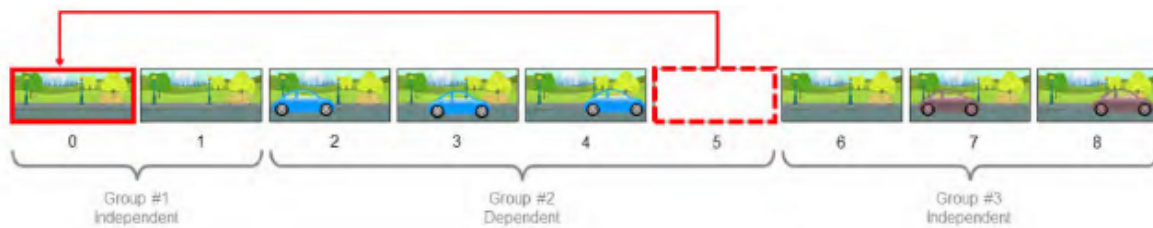
Kim describes I-pictures and P-pictures like those in MPEG-1, where P-pictures are coded using motion compensation from a frame decoded before the P-picture. (EX1006, 4:15-21; Pet. 12, 39; EX1003, ¶¶139-40; EX1005, 71.) Otherwise, the P-picture cannot be fully decoded. (EX1003, ¶161.)¹⁴

PO's expert's discussion of temporal redundancy illustrates why Kim's I-picture is the first image frame in decoding order, even if the user selects a P-picture. Specifically, in the sequence below, the top of picture 1 is predicted from picture 0.

¹⁴ The '321 patent recognizes that a dependent frame (e.g., a P-picture) cannot be decoded correctly if the frame on which it depends is not decoded first. (EX1001, 2:31-33.)



(EX2004, ¶48.) In other words, picture 1, like a P-picture, is predicted from picture 0 (a reference picture, e.g., I-picture). Picture 1 cannot be successfully decoded if picture 0 is unavailable. (EX1017, 125:22-126:19.)



(EX2004, ¶49.)

As another example, PO's expert explains that, considering the sequence above, for an error-free display, picture 0 must be decoded before picture 5. (EX1017, 130:12-131:20.) If an MPEG-1 decoder attempted to decode picture 5 without picture 0 it would be “working beyond” MPEG-1. (EX1017, 131:21-132:16.) A POSITA, in view of Kim's reference to MPEG-1, would understand that picture 0 must be before picture 5 in decoding order. (EX1003, ¶¶160-61; EX2005, 22:12-23:8.)

Referring back to Kim’s path for decoding a user-selected P-picture (blue path above), the controller gathers image data that is transmitted to the decoder. (Pet., 51-52; EX1003, ¶¶160-61.) The I-picture on which the P-picture depends is located and decoded. (Pet., 51; EX1006, 5:41-52.) Only after the I-picture is decoded can the P-picture be fully decoded by decoder 111 in step S38.¹⁵ (Pet. 51-52, EX1003, ¶¶160-61; EX1006, 5:55-65.)

PO disputes that an I-picture with an IAD of 0000 is decoded first because Kim’s decoder “*starts* decoding” the user-selected P-picture, not the I-picture on which it depends. (POR, 57.) PO departs from the plain and ordinary meaning of “decoding order” (or its synonym, bitstream order (EX1003, ¶69)) as understood by a POSITA, which is “the order which the decoder requires them to decode the bitstream.” (EX1005, 71; Pet., 12-13; EX1003, ¶¶67-69; EX1017, 131:20-132:16 (“MPEG-1 specifies a certain decoding order” and “to satisfy those orders, certain

¹⁵ PO’s expert appeared not to consider step S38 and testified that he would have to “work[] through [this disclosure]” to understand why Kim’s P-picture data would need to be reverse-transformed and reverse-quantized by decoder 111. (EX1017, 269:11-271:3.) PO’s expert thought Kim’s reference to decoder 111 at step S30 was “really clear” (*Id.*, 266:4-267:9) but did not “understand what Kim is talking about” when referencing decoding at step S38 (*Id.*, 269:18-270:4).

things have to be decoded in certain order before certain pictures can be displayed”).) Kim requires that the I-picture be decoded before the P-picture that depends on it, even if decoding the P-picture starts but cannot successfully finish. (Pet. 51-52; EX1003, ¶¶160-61.) A POSITA would have understood that the I-picture is the first image frame in decoding order, even when a P-picture is selected. (*Id.*) And a POSITA would have understood that, in the process flow for decoding a P-picture, the decoder decodes the IAD value 0000 (*indication*) when it decodes the I-picture on which the P-picture depends. (Pet., 47; EX1003, ¶¶152-54; ID, 58.)

2. The IAD Of 0000 Is Decoded

If the user requests an I-picture, PO does not dispute that it would be the first image frame in decoding order. But PO disputes whether the IAD is decoded—an argument the Board already rejected. (POR, 57-58; ID, 58.) Specifically, the POR asserts that only after the decoder reproduces the requested image data does it look at what “type” the original data is, and at this time, the decoder would not need to determine the type of data (I- or P-) to begin decoding. (POR, 57-58.) PO misunderstands Kim’s teachings.

In steps S21/S22, the user requests image data from a certain camera, and Kim’s controller causes the reproducing unit to reproduce the image data. (EX1006, 5:12-17, Fig. 4; ID, 48-49.) At step S23, Kim verifies that the reproducing unit pulled data from the correct camera. (EX1006, 5:19-26; ID, 49.) Contrary to PO’s

contention, Kim's decoder does not know whether the frame is an I-picture or P-picture. Not until step S30, where the image data is transmitted to the decoder, does the decoder know whether the frame is an I-picture or P-picture. If the image data identifies an I-picture (*first image frame in decoding order*), the IAD of 0000 is decoded. (Pet., 46-47; EX1003, ¶¶152-54; ID, 58.) As discussed above, if a P-picture is selected, the IAD of the I-picture it depends on is still decoded.

3. Kim's Logical Address Is Decoded

Regardless of what image frame is selected, PO argues that Kim discloses searching an optical medium using a physical address, not the logical address that includes the IAD. (POR, 58-59.) PO relies on Dr. Havlicek's deposition testimony for support. (POR, 59.) But Dr. Havlicek did not testify that a physical address is the only way to search physical media or that the logical address is not decoded. (EX2005, 55:16-56:4.) Dr. Havlicek testified that Kim "must decode the logical address" before it can populate the physical address's data structure. (*Id.*, 53:1-20.) Kim teaches a POSITA that the IAD/CAD are decoded to populate the data structure shown in Kim's Figure 6. (*Id.*, 34:4-35:11, 37:3-38:15, 53:22-55:10, EX1003, ¶¶152-54; ID, 55-58.)

B. Limitation 8[b]: For Both "Paths", The First Image Frame In Decoding Order Is Decoded First

Kim starts decoding the video sequence from the first image frame, and regardless of the path taken in Figure 4 (red or blue), the I-picture (*first image frame*)

is decoded to start decoding the video sequence. (Pet., 50-53; EX1003, ¶¶158-61.) PO disagrees that Kim's P-picture path teaches limitation 8[b] because the decoder starts decoding the P-picture before it decodes the I-picture it depends on. (POR, 60-61.) As discussed above, Kim teaches that an I-picture is the first frame in decoding order, even if the user selects a P-picture.

PO also disagrees that Kim's I-picture path teaches limitation 8[b] for two reasons: (1) if the user selects an I-picture, no sequence is decoded; and (2) if Kim only decoded I-pictures, the IAD would not be unique. (POR, 62; EX2004, ¶¶170-71; EX1017, 292:10-293:7.) Both arguments ignore Petitioner's obviousness position. Petitioner does not rely upon a decoder from Kim that decodes only I-pictures. For example, the Petition points to Figure 5A, which shows a sequence of one I-picture followed by P-pictures.

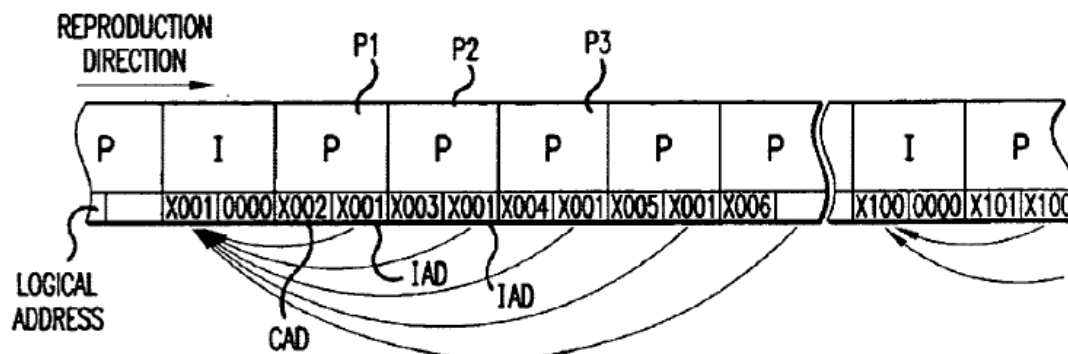


FIG.5A

(EX1006, Fig. 5A.) If a user selected the I-picture, followed by P-pictures, Kim's decoder would start decoding the video sequence in Figure 5A with the first image frame (the I-picture) as recited in limitation 8[b]. (Pet., 48-51.)

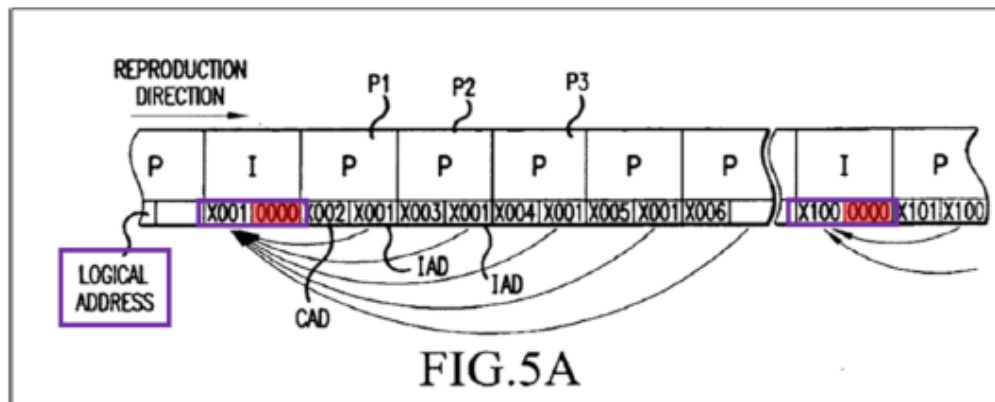
C. Limitation 8[c]: IAD/CAD Of Kim's Logical Address Is An Identifier Value Decoded According To A Numbering Scheme

Kim's logical addresses, the IAD and CAD (combined to form *identifier value*), follow a numbering scheme. (Pet., 53-55; EX1003, ¶¶166-68.) PO does not dispute this. (POR, 63-65.) And a POSITA would have understood those logical addresses are decoded. (Pet., 54-55; EX1003, ¶¶167-68; EX2005, 53:3-55:10; ID, 60-61.) According to PO, however, Kim decodes *physical* addresses, not logical ones.¹⁶ (POR, 63-65.) PO relies on an example discussed in Kim to support its argument. (*Id.*; EX1006, 5:41-44.) PO's citation to an example discussed in Kim does not refute or address Petitioner's obviousness argument. (Section III.A.3.)

¹⁶ PO's argument that Kim's physical address does not follow a numbering scheme (POR, 64-65) is another red herring. Petitioner relies upon Kim's logical addresses as the "identifier values" in 8[c]. (Pet., 53-55.)

D. Limitation 8[d]: Kim Teaches The Decoder Resets The Identifier Value Of The First Image Frame

Kim's decoder resets the identifier value of the first image frame in decoding order. As shown in Figure 5A below, the IAD of each logical address is reset to zero for each I-picture (*first image frame*). (Pet., 55-56; EX1003, ¶169; ID, 63.)

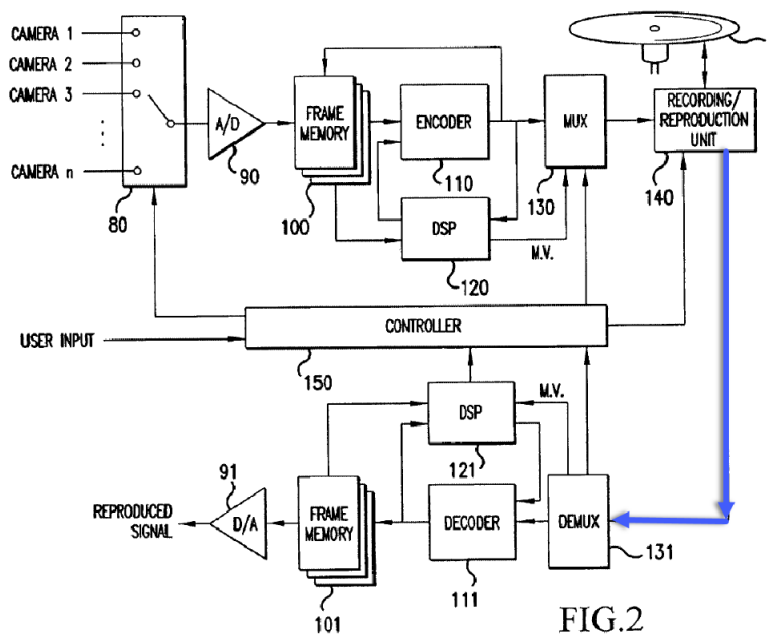


(EX1006, Figure 5A.) PO argues that Kim: (1) only discloses that its encoder resets the identifier value; and (2) does not teach that its reproducing method resets the IAD. (POR, 65-68.) Both arguments are wrong.

For argument (1), Petitioner agrees that the MUX of Kim's encoder outputs the address data of I- and P-pictures in the bitstream. (EX1006, 4:38-42.) Kim's discussion of its encoder does not preclude a POSITA's understanding that Kim's decoder resets the IAD for each I-picture (*first image frame*). (ID, 63.) Kim teaches that the bitstream transmitted to recording/reproducing unit 140 has a logical data structure shown in Figure 5A. (EX1006, 4:46-48.) As PO acknowledges, Kim refers

to decoding image data as “reproducing.” (POR, 67.) Figure 5A supports that Kim’s decoder resets the IAD. (Pet., 55-56; EX1003, ¶¶169, 173; ID, 63.)

Argument (2) is just a restatement of argument (1) but relies on Kim’s description of Figure 5A to assert that it only concerns the logical structure of Kim’s bitstream during encoding. (POR, 67-68). Kim, however, describes that its decoder receives data from recording/reproducing unit 140 (blue path below). (EX1006, 3:15-18.) It follows that Kim’s decoder receives a bitstream with the same logical structure produced during Kim’s encoding process. (Pet., 48-49; EX1003, ¶157.)



(EX1006, Fig. 2.) PO’s reliance on the Kim’s brief description of Figure 5A does not contradict what Kim teaches a POSITA—that the IAD is reset by the decoder.

IV. CONCLUSION

The Board should find Petitioner has proven claims 8-11 of the '321 patent are unpatentable.

Dated: March 26, 2025

Respectfully submitted,

/ Jessica Kaiser /

Jessica Kaiser

Reg. No. 58,937

Attorney for Petitioners

Perkins Coie LLP

1900 Sixteenth Street, Ste. 1400

Denver, CO 80202-5255

CERTIFICATE OF WORD COUNT

I hereby certify that the foregoing PETITIONER’S REPLY includes 5,597 words (as calculated by Microsoft Word), excluding those in a table of contents; a table of authorities; a listing of facts that are admitted, denied, or cannot be admitted or denied; a certificate of service or word count; or an appendix of exhibits. Accordingly, this Reply is under the word count limit of 5,600 words.

Dated: March 26, 2025

Respectfully submitted,

/ Jessica Kaiser /

Jessica Kaiser

Reg. No. 58,937

Attorney for Petitioners

Perkins Coie LLP

1900 Sixteenth Street, Ste. 1400

Denver, CO 80202-5255

CERTIFICATE OF SERVICE

I hereby certify that on March 26, 2025 true and correct copies of the foregoing
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Dated: March 26, 2025

Respectfully submitted,

/ Jessica Kaiser /

Jessica Kaiser

Reg. No. 58,937

Perkins Coie LLP

1900 Sixteenth Street, Ste. 1400

Denver, CO 80202-5255