

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORPORATION,
Petitioner,

v.

TELEFONAKTIEBOLAGET LM ERICSSON,
Patent Owner.

IPR2024-01009
Patent 10,142,659 B2

Before PATRICK R. SCANLON, NATHAN A. ENGELS, and
STEVEN M. AMUNDSON, *Administrative Patent Judges*.

SCANLON, *Administrative Patent Judge*.

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

I. INTRODUCTION

Intel Corporation (“Petitioner”) filed a Petition (Paper 2, “Pet.”) requesting an *inter partes* review of claims 1–7 and 10–12 of U.S. Patent No. 10,142,659 B2 (Ex. 1001, “the ’659 patent”). Telefonaktiebolaget LM Ericsson (“Patent Owner”) filed a Preliminary Response (Paper 6, “Prelim. Resp.”).

We have authority to determine whether to institute an *inter partes* review. *See* 35 U.S.C. § 314 (2018); 37 C.F.R. § 42.4(a) (2023). To institute an *inter partes* review, we must determine that the information presented in the Petition shows “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). For the reasons set forth below, we determine that Petitioner has not demonstrated a reasonable likelihood that it would prevail with respect to at least one challenged claim. Accordingly, we do not institute an *inter partes* review of the challenged claims on the grounds set forth in the Petition.

II. BACKGROUND

A. *Real Parties in Interest*

Petitioner identifies itself, Lenovo (United States), Inc., Lenovo (Shanghai) Electronics Technology Co. Ltd., Lenovo Beijing, Ltd., Lenovo PC HK Limited, Lenovo Group, Ltd., and Lenovo Information Products (Shenzhen) Co., Ltd. as real parties in interest. Pet. 83. Patent Owner identifies itself as the real party in interest. Paper 5, 1.

B. *Related Matters*

The parties indicate that the ’659 patent was at issue in the following matters:

Telefonaktiebolaget LM Ericsson v. Lenovo (United States), Inc., No. 5:23-CV-00714 (EDNC); and

Certain Electronic Computing Devices, and Components and Modules Thereof, Inv. No. 337-TA-1387 (ITC).

Pet. 83, Paper 5, 1.

C. The '659 Patent

The '659 patent, titled “Deblocking Filtering,” issued November 27, 2018, with claims 1–18. Ex. 1001, codes (54), (45), 23:55–28:66. The '659 patent relates to deblocking filtering for reducing blocking artifacts at block boundaries. *Id.* at 1:21–22. Deblocking filters are used in video coding standards to combat blocking artifacts that arise because the original video frames are split into blocks which are processed relatively independently. *Id.* at 1:26–29.

Figure 2A of the '659 patent is reproduced below.

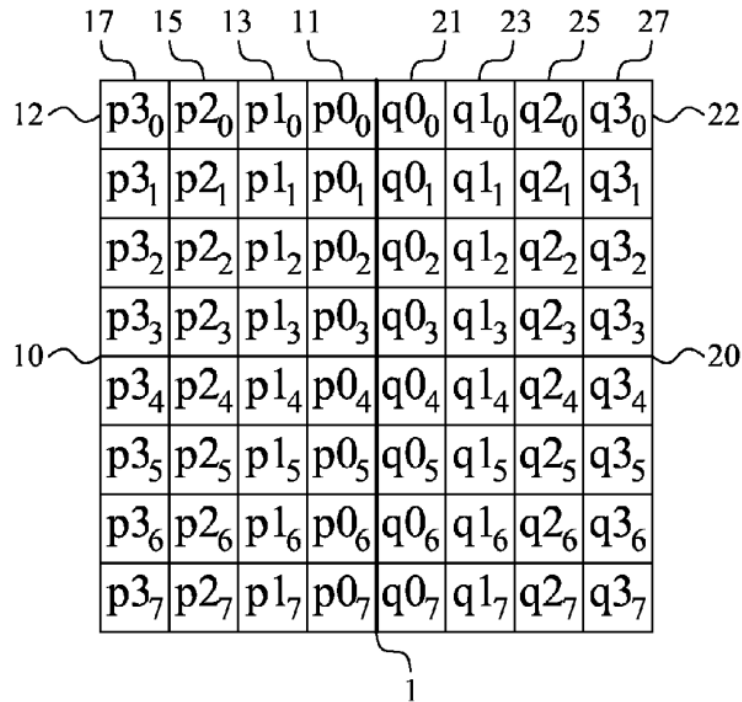


Fig. 2A

Figure 2A shows an embodiment of neighboring blocks and a block boundary over which deblocking filtering can be applied. Ex. 1001, 8:17–19. Neighboring blocks 10, 20 are arranged side by side at boundary 1. *Id.* at 9:46–49. Block 10 includes first line 12 of pixels 11, 13, 15, 17 in which pixel 11 is the closest to block boundary 1, pixel 13 is the next closet to boundary 1, and pixel 15 is the second next closet to boundary 1. *Id.* at 9:63–10:9. Neighboring block 20 includes a corresponding line of pixels 21, 23, 25, 27. *Id.*

Figure 1 of the '659 patent is reproduced below.

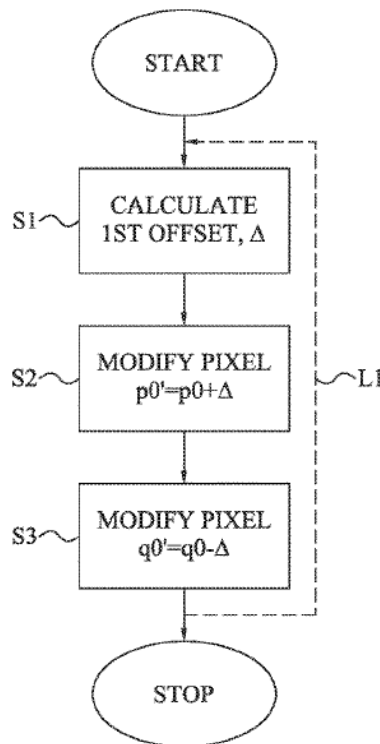


Fig. 1

Figure 1 is a flow diagram depicting a method of reducing blocking artifacts. Ex. 1001, 8:15–17. The method starts at step S1 where a first offset is calculated based on $(9x(q_0-p_0)-3x(q_1-p_1))/16|$, where p_0 denotes a pixel

value of pixel 11, p_1 denotes a pixel value of pixel 13, q_0 denotes a pixel value of pixel 21, and q_1 denotes a pixel value of pixel 23. *Id.* at 9:65–10:9.

Next, at step S2, pixel value p_0 (pixel 11) is modified by adding the first offset, and, at step S3, pixel value q_0 (pixel 21) is modified by subtracting the first offset. *Id.* at 10:37–49.

D. Challenged Claims

As noted above, Petitioner challenges claims 1–7 and 10–12 of the '659 patent. Claims 1 and 10 are independent. Claim 1, reproduced below with Petitioner's bracketed annotations inserted, is illustrative.

1. 1[pre] A method of reducing blocking artifacts at a block boundary between a block of multiple pixels and a neighboring block of multiple pixels in a video frame, said method comprises:
 - 1[a] calculating a first offset to be equal to $(9 \times (q_0 - p_0) - 3 \times (q_1 - p_1) + 8) \gg 4$, wherein $\gg$ denotes a right shift operation, p_0 denotes a pixel value of a pixel closest to said block boundary in a line of pixels in said block, wherein said line of pixels is perpendicular to said block boundary, p_1 denotes a pixel value of a pixel next closest to said block boundary in said line of pixels, q_0 denotes a pixel value of a pixel closest to said block boundary in a corresponding line of pixels in said neighboring block, wherein said corresponding line of pixels is perpendicular to said block boundary and q_1 denotes a pixel value of a pixel next closest to said block boundary in said corresponding line of pixels;
 - 1[b] modifying said pixel value p_0 of said pixel closest to said block boundary in said line of pixels by adding said first offset to said pixel value p_0 of said pixel closest to said block boundary in said line of pixels to form a modified pixel value p_0' of said pixel closest to said block boundary in said line of pixels; and
 - 1[c] modifying said pixel value q_0 of said pixel closest to said block boundary in said corresponding line of pixels by subtracting said first offset from said pixel value q_0 of said

pixel closest to said block boundary in said corresponding line of pixels to form a modified pixel value q_0' of said pixel closest to said block boundary in said corresponding line of pixels.

Ex. 1001, 23:55–24:17; Pet. xvii (showing Petitioner’s bracketed annotations).

E. Asserted Grounds of Unpatentability

Petitioner contends that the challenged claims are unpatentable based on the following grounds:

Claim(s) Challenged	35 U.S.C. §¹	References/Basis
1–7, 10–12	103(a)	Fu ² as evidenced by List, ³ Bjontegaard, ⁴ B205, ⁵ B118 ⁶
1–7, 10–12	103(a)	Bjontegaard as evidenced by Bjontegaard’s Code, ⁷ B118, Fu, List, B205

¹ For purposes of this Decision, we assume the challenged claims have an effective filing date prior to March 16, 2013, the effective date of the relevant aspects of the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), and we apply the pre-AIA version of 35 U.S.C. § 103.

² WO 2009/033390 A1, published Mar. 19, 2009 (Ex. 1021; Ex. 1022 (certified English translation)).

³ Peter List et al., *Adaptive Deblocking Filter*, published July 2003 (Ex. 1024).

⁴ Gisle Bjontegaard et al., *Definition of the new coding elements from Telenor*, Q15-J-28, published May 9, 2000 (Ex. 1009).

⁵ JCT-VC, *Test Model under Consideration*, published July 2010 (Ex. 1018).

⁶ JVT, *Working Draft Number 2, Revision 2 (WD-2)*, JVT-B118r2, published Mar. 15, 2002 (Ex. 1023).

⁷ Gisle Bjontegaard et al., *Software Including Proposed New H.26L Coding Elements from Telenor*, Q15-J-29, published May 9, 2000 (Exs. 1010–1015).

Pet. 4. Petitioner relies on the Declaration of Dan Schonfeld, Ph.D. (Ex. 1003) in support of its arguments. Patent Owner relies on the Declaration of Dr. Iain Richardson (Ex. 2001) in support of its arguments.

III. ANALYSIS

A. Level of Ordinary Skill in the Art

In determining whether an invention would have been obvious at the time it was made, 35 U.S.C. § 103 requires us to resolve the level of ordinary skill in the pertinent art at the time of the invention. *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966). The person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention. *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). Factors that may be considered in determining the level of ordinary skill in the art include, but are not limited to, the types of problems encountered in the art, the sophistication of the technology, and educational level of active workers in the field. *Id.* In a given case, one or more factors may predominate. *Id.*

Petitioner contends that a person having ordinary skill in the art (“POSITA”) “would have had a bachelor’s degree in electrical engineering, computer science, or a similar field and two to three years of experience in the design and development of relevant multimedia processing, such as video and/or image coding or compression.” Pet. 11–12 (citing Ex. 1003 ¶¶ 226–228). Petitioner adds that “[a]dvanced graduate studies with coursework and/or research focusing on topics of video encoding and decoding could substitute for work experience in the field.” *Id.* at 12 (citing Ex. 1003 ¶ 227).

Patent Owner contends that a POSITA “would have had a bachelor’s degree in electrical engineering, computer engineering, or a related field,

with approximately two years of experience in video decoding or encoding technologies.” Prelim. Resp. 25 (citing Ex. 2001 ¶ 36).

Although not identical, the parties’ definitions are substantially similar. Accordingly, for purposes of this Decision, we determine that no express finding is necessary, and that the level of ordinary skill in the art is reflected by the prior art of record. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). We note, however, that our obviousness analysis in this Decision would not differ if we adopted either Petitioner’s or Patent Owner’s definition.

B. Claim Construction

In *inter partes* reviews, the Board interprets claim language using the district-court-type standard, as described in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). *See* 37 C.F.R. § 42.100(b). Under that standard, we generally give claim terms their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art at the time of the invention, in light of the language of the claims, the specification, and the prosecution history. *See Phillips*, 415 F.3d at 1313–14. Although extrinsic evidence, when available, may also be useful when construing claim terms under this standard, extrinsic evidence should be considered in the context of the intrinsic evidence. *See id.* at 1317–19.

Petitioner contends that the challenged claims do not need construction to demonstrate unpatentability. Pet. 12. Petitioner, however, notes that the parties in the ITC proceeding identified above dispute the extent that the preamble of claim 10 is limiting. *Id.* (citing Ex. 1026, 7). Petitioner indicates that its asserted prior art discloses the entire preamble of claim 10. *Id.*

Patent Owner argues that “Petitioner and Patent Owner agree that claim construction is not necessary to resolve the merits of this Petition,” and “[n]one of the Asserted Grounds anticipate or render obvious the Challenged Claims under any construction.” Prelim. Resp. 26.

On the present record, we do not discern a need to construe explicitly any claim language because doing so would have no effect on our analyses below of Petitioner’s asserted grounds and will not assist in resolving the present controversy between the parties. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’”) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

C. Ground 1: Asserted Obviousness Based on Fu

Petitioner challenges claims 1–7 and 10–12 as unpatentable under 35 U.S.C. § 103(a) over Fu as evidenced by List, Bjontegaard, B205, and B118. Pet. 13–55. Patent Owner provides arguments addressing this asserted ground of unpatentability. Prelim. Resp. 26–47.

1. Fu (Ex. 1022)

Fu “relates to the field of image processing, and particularly to a method and device for acquiring block boundary strength and reducing block distortion.” Ex. 1022, 1:12–13. Fu discloses a method for reducing block distortion in which the first step is to determine the “flatness” of an image region where the block boundary is located. *Id.* at 2:1–3. Next, Fu determines the filtering strength of the block boundary based on the flatness. *Id.* at 4:2–3. The next step is to filter pixels on both sides of the block boundary according to the flatness of non-zero filtering strengths. *Id.* at 4:19–20.

Fu describes multiple filtering processes, one of which filters pixels p_0 , q_0 using the following equations:

$$\text{delta} = \text{Clip3}(-C, C, (((3 * (q_0 - p_0) + 1 * (p_1 - q_1) + 4) >> 3)))$$

$$P_0 = \text{Clip1}(p_0 + \text{delta})$$

$$Q_0 = \text{Clip1}(q_0 - \text{delta})$$

Id. at 8:3–9.

2. Independent Claim 1

Petitioner contends that Fu, as evidenced by List, Bjontegaard, B205, and B118, discloses the limitations of independent claim 1. We focus our analysis on limitation 1[a] because it is dispositive with respect to this ground. Regarding this limitation, Petitioner argues that Fu discloses calculating a first offset, delta, and applying the calculated offset to original pixel values p_0 , q_0 using the following equations:

$$\text{delta} = \text{Clip3}(-C, C, ((3 * (q_0 - p_0) + 1 * (p_1 - q_1) + 4) >> 3))$$

$$P_0 = \text{Clip1}(p_0 + \text{delta})$$

$$Q_0 = \text{Clip1}(q_0 - \text{delta})$$

Pet. 23 (citing Ex. 1022, 8:3–11; Ex. 1003 ¶¶ 251–253). Next, asserting that one of ordinary skill in the art would have understood that the right shift operation $>>n$ is a hardware alternative to division by 2^n , Petitioner argues that Fu's offset equation can be rewritten as:

$$\text{delta} = \text{Clip3}(-C, C, ((6 * (q_0 - p_0) + 2 * (p_1 - q_1) + 8) >> 4))$$

Id. at 23–24 (citing Ex. 1003 ¶¶ 254–256). Petitioner then provides a table, reproduced below, comparing Fu's first offset (without the clipping function) and the first offset recited in limitation 1[a].

Reference	First Offset Expression
'659 Patent	$(9(q_0 - p_0) - 3(q_1 - p_1) + 8) \gg 4$
Fu	$(6(q_0 - p_0) - 2(q_1 - p_1) + 8) \gg 4$

Id. at 24–25.

Next, Petitioner asserts that one of ordinary skill in the art “would have recognized that the coefficient applied to each set of pixels is a known result-effective variable that can be optimized through routine experimentation.” *Id.* at 25 (citing Ex. 1003 ¶ 263). Petitioner, however, does not explain adequately why the claimed coefficients (expressed as exact numerical values rather than ranges of values) would have been recognized as result-effective variables. Petitioner also does not explain adequately how the claimed coefficients would have been achievable through routine experimentation. As such, Petitioner’s conclusory assertion that the coefficients would have been recognized to be result-effective variables does not satisfy Petitioner’s burden to demonstrate unpatentability. *See Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (“In an IPR, the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.”) (citing 35 U.S.C. § 312(a)(3); *see also Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016) (“It is of the utmost importance that petitioners in the IPR proceedings adhere to the requirement that the initial petition identify ‘with particularity’ the ‘evidence that supports the grounds for the challenge to each claim.’”) (quoting 35 U.S.C. § 312(a)(3)).

Dr. Schonfeld’s testimony cited by Petitioner does not rectify this problem. *See* Ex. 1003 ¶ 263. Dr. Schonfeld does not actually state that the

coefficients are result-effective variables,⁸ but identifies the coefficients, as well as the number of pixel differences, as “variables” that “were known to control the frequency response of the filter, or, in other words, how much particular frequencies would be filtered,” as allegedly shown by Gonzalez.⁹ *Id.* (citing Ex. 1020, 153, 273). But Dr. Schonfeld does not explain adequately how the cited portions of Gonzalez disclose that the coefficients were known to control the frequency response in a deblocking filter. Indeed, the cited portions of Gonzalez do not appear to discuss determining offsets for deblocking filtering or the coefficients used in an equation for determining offset. *See* Ex. 1020, 153, 273. Accordingly, this testimony is entitled to little weight because Dr. Schonfeld fails to provide a sufficient underlying basis for his opinion. *See* 37 C.F.R. § 42.65(a) (“Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.”); *see also Nobel Biocare Services AG v. Instradent USA, Inc.*, 903 F.3d 1365, 1382 (Fed. Cir. 2018) (explaining that the Board can reject arguments based on expert testimony that lacks specificity or detail).

⁸ In another paragraph of his Declaration, Dr. Schonfeld testifies that he would disagree with the argument that “the coefficients for the offset equations or number of pixels used were not recognized as result-effective variables.” Ex. 1003 ¶ 290. The Petition, however, does not cite this paragraph to support the assertion that the coefficients are result-effective variables. Furthermore, Dr. Schonfeld testifies that “[b]ased on my understanding of the art, these equations were routinely experimented with based on trial-and-error testing to produce a result,” but fails to provide a sufficient underlying basis for his understanding that “trial-and-error testing” was routinely used to experiment on offset equations.

⁹ Rafael Gonzalez, *Digital Image Processing* (3d ed.), published 2008 (Ex. 1020).

In addition, we disagree with Petitioner's assertion that "[t]he '659 Patent provides no indication that the coefficients of its first offset are critical or produce unexpected results compared to those used in prior art expressions." *See* Pet. 25. On the contrary, the '659 patent describes the High Efficiency Video Coding ("HEVC") deblocking filter. Ex. 1001, 2:18–3:33. According to the '659 patent, the HEVC draft describes performing "weak" filtering by computing an offset, Δ , using the following equation:

$$\Delta = \text{Clip}(-t_C, t_C, ((13 \times (q_{0_i} - p_{0_i}) + 4 \times (q_{1_i} - p_{1_i}) - 5 \times (q_{2_i} - p_{2_i}) + 16) >> 5))$$

Id. at 2:58–67. Regarding this technique, the '659 patent states:

One problem with the deblocking in HEVC is that the weak filter does not have good low-pass characteristics. One can see that the first and the second pixels from the block border are modified by adding or subtracting Δ and $\Delta/2$ respectively. Such a filter cannot remove high frequencies that can appear near the block border and cannot remove ringing. Moreover, the frequency characteristics of the filter in HEVC show slight amplifications of higher frequencies when filtering the second pixel (p_{1_i} and q_{1_i}) from the block boundary, which can result in worse rate-distortion (RD) performance of the coder. Moreover, the offset for pixel p_{1_i} is equal in magnitude to the offset of pixel q_{1_i} although the structure of the signal can be different on different sides of the block boundary. Therefore, the HEVC filter does not adapt well to the local structure of the side of the block boundary.

Id. at 3:18–33. The '659 patent then states "there is a need for an efficient deblocking filter that can be used to reduce blocking artifacts at block boundaries and that does not have the above mentioned drawbacks." *Id.* at 3:34–36.

This indicates that the '659 patent disclosed its specific offset equation to overcome the perceived drawbacks of the HEVC equation, thus demonstrating at least some criticality to the specific coefficients of its first

offset equation over a prior offset equation of similar format but having different coefficients.

Petitioner’s table comparing the ’659 patent’s offset equation to various prior art equations, reproduced below, also does not help establish that the coefficients are result-effective variables.

’659 Patent	$\frac{9(q_0 - p_0) - 3(q_1 - p_1)}{16}$
Fu	$\frac{6(q_0 - p_0) - 2(q_1 - p_1)}{16}$
H.264, List	$\frac{8(q_0 - p_0) - 2(q_1 - p_1)}{16}$
B118	$\frac{8(q_0 - p_0) - 2(q_1 - p_1)}{16}$
Bjontegaard	$\frac{8(q_0 - p_0) - 3(q_1 - p_1)}{16}$
VCEG-M21	$\frac{8(q_0 - p_0) - 2.5(q_1 - p_1)}{16}$
Bjontegaard ’048	$\frac{8(q_0 - p_0) + 4(q_1 - p_1) - 4(q_2 - p_2)}{16}$
B205	$\frac{7.5(q_0 - p_0) + 2(q_1 - p_1) - 2.5(q_2 - p_2)}{16}$

Pet. 26. At most, this table shows that different researchers proposed different offset equations that followed a similar pattern. We are not persuaded on the record before us that the table is sufficient to establish that the coefficients are result-effective variables. Furthermore, we note that the equations in the table require assuming rounding to the nearest integer, an assumption neither the Petition nor Dr. Schonfeld adequately explains or justifies. *See* Pet. 26 n.7; Ex. 1003 ¶¶ 263–273.

We are also not persuaded by Petitioner’s argument that one of ordinary skill in the art would have further understood that “several design constraints,” none of which appear to be disclosed by the prior art, limited the first offset filter design. *See* Pet. 27–29 (citing Ex. 1003 ¶¶ 274–280). Instead, we agree with Patent Owner’s argument that the design constraints are not supported and are based on impermissible hindsight. *See* Prelim.

Resp. 40–41. And while these design constraints may be useful in optimizing the coefficients, *if the coefficients were result-effective variables*, they do not establish that the coefficients are indeed result-effective variables.

For the foregoing reasons, we are not persuaded on the record before us that Petitioner has met its burden of showing that the coefficients are result-effective variables, which is the linchpin of Petitioner’s obviousness analysis.

Although we have determined that Petitioner does not show sufficiently that the coefficients are result-effective variables, we also question whether the coefficients, which are expressed as exact numerical values rather than ranges of values, should even be considered as result-effective variables. Most typically, the result-effective variable doctrine applies where a claim recites a range of one or more properties. *See e.g., In re Aller*, 220 F.2d 454, 456 (CCPA 1955) (“Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.”); *In re Applied Materials, Inc.*, 692 F.3d 1289, 1295 (Fed. Cir. 2012) (The “general conditions” of a claim may be disclosed when the prior art discloses “values overlapping the claimed ranges.”). Indeed, the Board decisions cited by Petitioner all relate to claims that recite ranges for one or more properties. *Sony Corp. v. Fujifilm Corp.*, IPR2017-00800, Paper 14 at 4 (PTAB Aug. 18, 2017) (claiming ranges for pit depth, minimum recording bit length, and surface roughness); *Google LLC v. Singular Comput. LLC*, IPR2021-00165, Paper 57 at 5–6 (PTAB May 11, 2022) (claiming a range of input signals for a low precision high dynamic range execution unit); *LG Elecs. Inc. v. Immervision, Inc.*, IPR2020-00195,

Paper 6 at 5 (PTAB May 13, 2020) (claiming a range of deviation for a panoramic objective lens).

In this case, rather than reciting a range for a property (such as the ranges of sulphuric acid concentration and temperature in *Aller*, or the ranges of groove depth, width, and pitch in *Applied Materials*), claim 1 recites an equation having coefficients expressed as exact numerical values. Unlike recitation of a range, claiming exact numerical coefficients does not suggest that the coefficients might be variable. The nature of the claimed offset equation, as well as the offset equations of Fu and the other cited references, is that changing the numerical coefficients will alter the resulting calculation. This is a fundamental nature of all equations that include numerical coefficients and should not be the basis for asserting that the coefficients are result-effective variables. Petitioner has not directed us to any authority in which exact numerical coefficients in a claimed equation have been determined to be result-effective variables.

For the above reasons, Petitioner fails to persuade us that Fu, as evidenced by List, Bjontegaard, B205, and B118, discloses limitation 1[a]. Therefore, we determine Petitioner has not met its burden to show a reasonable likelihood it would prevail with respect to the contention that claim 1 is unpatentable over Fu as evidenced by List, Bjontegaard, B205, and B118.

3. *Independent Claim 10*

Claim 10 recites the same equation for calculating the first offset that is recited in limitation 1[a]. Ex. 1001, 26:27–40. For this limitation of claim 10, Petitioner relies on the same arguments made in connection with limitation 1[a]. Pet. 54. Thus, Petitioner's challenge to claim 10 is based on the same deficient assertions regarding Fu, as evidenced by List,

Bjontegaard, B205, and B118, as discussed above in the analysis of the challenge to independent claim 1. For these same reasons, we find that Petitioner has not met its burden to show a reasonable likelihood that claim 10 is unpatentable over Fu as evidenced by List, Bjontegaard, B205, and B118.

4. Dependent Claims 2–7, 11, and 12

Claims 2–7 depend from claim 1 and, thus, contain all the limitations of claim 1, and claims 11 and 12 depend from claim 10 and, thus, contain all the limitations of claim 10. Petitioner’s challenges to dependent claims 2–7, 11, and 12 do not overcome the deficiencies discussed above with respect to the challenge to independent claims 1 and 10. *See* Pet. 32–50, 54–55. Accordingly, for the same reasons discussed above in connection with claims 1 and 10, we find Petitioner has not met its burden to show a reasonable likelihood that claims 2–7, 11, and 12 are unpatentable over Fu as evidenced by List, Bjontegaard, B205, and B118.

D. Ground 2: Asserted Obviousness Based on Bjontegaard

Petitioner challenges claims 1–7 and 10–12 as unpatentable under 35 U.S.C. § 103(a) over Bjontegaard as evidenced by Bjontegaard’s Code, B118, Fu, List, and B205. Pet. 55–81. Patent Owner provides arguments addressing this asserted ground of unpatentability. Prelim. Resp. 47–61.

1. Bjontegaard (Ex. 1009)

Bjontegaard is a coding model proposal submitted by Telenor Broadband Services to the ITU Video Coding Experts Group. Pet. 55; Prelim. Resp. 11 (citing Ex. 1009); Ex. 1009, 1. Bjontegaard describes a deblocking filter (§ 4.5) that filters pixels a, b, c, d, e, f, g, h belonging to two neighboring blocks 1, 2, with a block boundary between pixels d and e. *Id.* at 19. Bjontegaard includes a filtering process in which pixels c, d, e, f

may be modified. *Id.* The following parameters are calculated as part of the filtering process:

$$S0 = \mathbf{abs}(4(c-f)+12(e-d)) + \mathbf{abs}(9(c-d-e+f))$$

$$S0_1 = 12\mathbf{abs}(a-2b+c)$$

$$S1_1 = \mathbf{abs}(4(a-d)+12(c-b)) + \mathbf{abs}(9(a-b-c+d))$$

$$S0_2 = 12\mathbf{abs}(e-2f+g)$$

$$S1_2 = \mathbf{abs}(4(e-h)+12(g-f)) + \mathbf{abs}(9(e-f-g+h))$$

Id. Bjontegaard also describes determining overall activity, $Act_{overall}$, as being equal to $(3-i)$, where i is the smallest number such that

$S0 < Lim(qp) \times 2^i$. *Id.* $Lim(qp)$ is obtained from a table defining threshold values for the filtering process depending on qp , the quantization parameter.

Id. Bjontegaard also determines activity on each side of the block boundary, Act_1 and Act_2 . *Id.* Act_1 is determined by the following steps:

Act_1 is initially set to 1

If $S0_1 < Lim(qp)$, Act_1 is incremented by 1

If $S1_1 < Lim(qp)$, Act_1 is incremented by 1

Id. Bjontegaard indicates that “[t]he same procedure is made for Act_2 .” *Id.*

Finally, Bjontegaard calculates two more values: $Act_{11} = \min(Act_{overall}, Act_1)$ and $Act_{22} = \min(Act_{overall}, Act_2)$. *Id.*

Next, Bjontegaard describes the following process for modification of edge pixels d , e :

$$\text{Act}_{\text{edge}} = (\text{Act}_{11} + \text{Act}_{22})/2$$

$$\text{Clip}_{\text{edge}} = (\text{Clip}(\text{qp}, \text{Strength}_1) + \text{Clip}(\text{qp}, \text{Strength}_2) + \text{Act}_1 + \text{Act}_2 - 2)/2$$

Initially set Diff = 0

$$\text{If } \text{Act}_{\text{edge}} \text{ equals 1 or 2: } \quad \text{Diff} = (3(c - f) - 8(d - e))/16$$

$$\text{If } \text{Act}_{\text{edge}} \text{ equals 3: } \quad \text{Diff} = (b + c - 8(d - e) - f - g)/16$$

$$\text{Diff} = \max(-\text{Clip}_{\text{edge}}, \min(\text{Clip}_{\text{edge}}, \text{Diff}))$$

$$\text{d}_{\text{modified}} = d + \text{Diff} \text{ (clipped to stay in the range 0-255)}$$

$$\text{e}_{\text{modified}} = e - \text{Diff} \text{ (clipped to stay in the range 0-255)}$$

Id. at 20. Bjontegaard describes the following process for modification of pixel c:

Initially set Diff = 0

$$\text{If } \text{Act}_{11} \text{ equals 2: } \quad \text{Diff} = 5(b - 2c + d)/16$$

$$\text{If } \text{Act}_{11} \text{ equals 3: } \quad \text{Diff} = 3(a + b - 4c + d + e)/16$$

$$\text{Diff} = \max(-\text{Clip}(\text{qp}, \text{Strength}_1), \min(\text{Clip}(\text{qp}, \text{Strength}_1), \text{Diff}))$$

$$\text{c}_{\text{modified}} = c + \text{Diff} \text{ (clipped to stay in the range 0-255)}$$

Id. Bjontegaard describes a similar process for modification of pixel f. *Id.*

2. Independent Claim 1

Petitioner contends that Bjontegaard, as evidenced by Bjontegaard's Code, B118, Fu, List, and B205, discloses the limitations of independent claim 1. Pet. 18–24. For limitation 1[a], Petitioner argues that Bjontegaard discloses an equation for calculating a first offset, Diff, that can be rewritten as follows:

$$\text{Diff} = (8 \times (q_0 - p_0) - 3 \times (q_1 - p_1) + 8) \gg 4)$$

Pet. 59–61 (citing Ex. 1009, 19–20; Ex. 1003 ¶¶ 470–485). Petitioner then provides a table, reproduced below, comparing Bjontegaard’s first offset (without the clipping function) and the first offset recited in limitation 1[a].

Reference	First Offset Expression
’659 Patent	$(9 \times (q_0 - p_0) - 3 \times (q_1 - p_1) + 8) \gg 4$
Bjontegaard	$(8 \times (q_0 - p_0) - 3 \times (q_1 - p_1) + 8) \gg 4$

Id. at 62. Petitioner contends that the two equations differ only with respect to the coefficient applied to the first pixel difference, $(q_0 - p_0)$, and “modifying such a result-effective variable would have been well within the routine skill of a POSITA,” for the reasons asserted in connection with Ground 1. *Id.* (citing Pet. § VIII.A.5.b; Ex. 1003 ¶¶ 488–490).

As discussed above, however, we are not persuaded on the record before us that Petitioner has met its burden of showing that the coefficients are result-effective variables. *See supra* § III.C.2. Accordingly, for this reason, we determine Petitioner has not met its burden to show a reasonable likelihood it would prevail with respect to the contention that claim 1 is unpatentable over Bjontegaard as evidenced by Bjontegaard’s Code, B118, Fu, List, and B205.

3. *Independent Claim 10*

As noted above, claim 10 recites the same equation for calculating the first offset that is recited in limitation 1[a]. Ex. 1001, 26:27–40. For this limitation of claim 10, Petitioner relies on the same arguments made in connection with limitation 1[a]. Pet. 80. Thus, Petitioner’s challenge to claim 10 is based on the same deficient assertions regarding Bjontegaard, as evidenced by Bjontegaard’s Code, B118, Fu, List, and B205, as discussed

above in the analysis of the challenge to independent claim 1. For these same reasons, we find that Petitioner has not met its burden to show a reasonable likelihood that claim 10 is unpatentable over Bjontegaard as evidenced by Bjontegaard's Code, B118, Fu, List, and B205.

4. *Dependent Claims 2–7, 11, and 12*

Claims 2–7 depend from claim 1 and, thus, contain all the limitations of claim 1, and claims 11 and 12 depend from claim 10 and, thus, contain all the limitations of claim 10. Petitioner's challenges to dependent claims 2–7, 11, and 12 do not overcome the deficiencies discussed above with respect to the challenge to independent claims 1 and 10. *See* Pet. 63–81. Accordingly, for the same reasons discussed above in connection with claims 1 and 10, we find Petitioner has not met its burden to show a reasonable likelihood that claims 2–7, 11, and 12 are unpatentable over Bjontegaard as evidenced by Bjontegaard's Code, B118, Fu, List, and B205.

IV. CONCLUSION

For the foregoing reasons, we do not institute *inter partes* review.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that the Petition is *denied* as to all challenged claims of the '659 patent; and

FURTHER ORDERED that no *inter partes* review is instituted.

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Patent 10,142,659 B2
FOR PETITIONER:

Jessica Kaiser
Vinay Sathe
Matthew Lembo
Ruben Kendrick
Anna Onley
Louis Yang
kaiser-ptab@perkinscoie.com
sathe-ptab@perkinscoie.com
lembo-ptab@perkinscoie.com
kendrick-ptab@perkinscoie.com
onley-ptab@perkinscoie.com
yang-ptab@perkinscoie.com

FOR PATENT OWNER:

David Frist
John Haynes
Christopher Douglas
Stephen Lareau
david.frist@alston.com
john.haynes@alston.com
christopher.douglas@alston.com
stephen.lareau@alston.com