

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORPORATION,
Petitioner

v.

TELEFONAKTIEBOLAGET LM ERICSSON,
Patent Owner.

IPR2024-01009

U.S. Patent No. 10,142,659

PETITIONER'S REQUEST FOR DIRECTOR REVIEW

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I. INTRODUCTION

The Board’s Institution Decision is contrary to precedent in its result-effective variable analysis. Specifically, the Board found that making the most minor adjustments to prior-art coefficients in nearly identical mathematical “filter” equations as the one claimed—including changing a coefficient by as little as $1/16^{\text{th}}$ —was non-obvious because the coefficients were not shown to be result-effective variables. The Board made this determination despite there being no dispute that the coefficients affect the equation’s output (the filter’s “frequency response”), and that those in the art had been experimenting with different coefficients for years. Indeed, Patent Owner (“PO”) never argued the coefficients were not result-effective variables; only the Board did, departing from the parties’ arguments to deny institution. The Board then compounded its error by applying a heightened evidentiary standard for obviousness that required *express* teachings, and engaging in a facially incorrect “unexpected results” analysis that did not compare the claims to the closest prior art. This decision should not stand; the Director should step in and initiate institution, or at a minimum vacate with instructions to apply the correct legal standard.

Pursuant to 37 C.F.R. § 42.71(d), Petitioner requests director review of the Board’s denial of institution in IPR2024-01009 (Paper 7, Dec. 18, 2024).

II. LEGAL STANDARD

A party may seek Director Review of an institution decision. 37 C.F.R. § 42.75; *Duration Media LLC v. Rich Media Club LLC*, IPR2023-00953, Paper 78, 8-13 (Dec. 12, 2024). The Director may vacate for further consideration, (*see id.*, 12-13), or reverse the Board outright and initiate institution, (*see, e.g., Prime Time Toys LLC v. Spin Master, Inc.*, IPR2023-01339, Paper 12, 21 (July 9, 2024)).

III. FACTUAL BACKGROUND

A. The Petition’s Challenge

Petitioner filed an IPR challenging the validity of U.S. Patent No. 10,142,659 (“the ’659 Patent”). Paper 2 (“Pet.”). The sole limitation relevant to the present request is the coefficients in a claimed “deblocking filter” equation for a video codec.

Digital videos are often encoded and compressed by splitting up a video-image into smaller “blocks” and encoding each block separately. Pet. 4. But when the video-image is later reconstructed from the compressed data, it may appear “blocky” or “pixelated.” *Id.*, 5. A deblocking filter reduces these artifacts by blurring the boundaries between “blocks” in the video-image:



Id.; Ex-1052, 1372; Ex-1001, 1:26-32. The deblocking filter uses an equation that takes pixel values (numbers representing each pixel’s color) near the boundaries of each block and calculates how much to “offset” (i.e., change) the pixel values to smooth out the transition between blocks. Pet. 5-7. The deblocking filter’s “offset” equation can generally be written in two mathematically equivalent forms: (1) a “bit-shift” form (indicated by “>>”) or; (2) a more-traditional division form, as shown using the equation of the challenged independent claims below:

Bit-Shift Form	Division Form
$(\textcolor{red}{9}(q_0 - p_0) - \textcolor{green}{3}(q_1 - p_1)) + 8 \gg 4$	$\frac{\textcolor{red}{9}(q_0 - p_0) - \textcolor{green}{3}(q_1 - p_1)}{16}$

Ex-1001, 12:24, 12:50-63; Pet. 9, 26. The notations p_0 , p_1 , q_0 , and q_1 represent pixel values from two neighboring blocks (a “p” and a “q” block), with the number representing the pixel’s distance from the boundary. *See* Pet. 7-8; Ex-1001, Fig. 2A.

Petitioner presented two grounds that taught two similar deblocking-filter offset equations, which have been rewritten without any mathematical difference to be in the same form and use the same pixel notations as the ’659 Patent:

Ground	Reference	Form	Equation
1	Fu	Bit-Shift	$(\textcolor{red}{6}(q_0 - p_0) - \textcolor{green}{2}(q_1 - p_1)) + 8 \gg 4$
		Division	$\frac{\textcolor{red}{6}(q_0 - p_0) - \textcolor{green}{2}(q_1 - p_1)}{16}$
2	Bjontegaard	Bit-Shift	$(\textcolor{red}{8}(q_0 - p_0) - \textcolor{green}{3}(q_1 - p_1)) + 8 \gg 4$
		Division	$\frac{\textcolor{red}{8}(q_0 - p_0) - \textcolor{green}{3}(q_1 - p_1)}{16}$

Pet. 23-26, 62; Ex-1003, ¶¶252-56, 267, 272; *see also id.*, ¶¶78-85 (describing conversion). Petitioner contended that, despite having slightly different numerical coefficients (6 and -2 (Fu) or 8 and -3 (Bjontegaard), rather than 9 and -3 as claimed)—which are mere fractions because each coefficient is also divided by 16¹ as shown above and below—a POSITA would have found the claimed equation obvious because the coefficients are a result-effective variable. *See* Pet. 25-31, 62. Specifically, the coefficients dictate how much pixels near the block boundary are “offset” (or modified), and thus alter the filter’s “frequency-response.” *Id.*, 7-8, 26-27, 30-31; Ex-1003, ¶¶51-64, 263, 275; Ex-1020, 153, 273; Ex-1072, 7.

Despite being in a niche field with little high-level, explanatory literature, Petitioner supported its result-effective variable analysis by identifying numerous prior-art references that all taught similar equations that differed as to two variables: (1) the exact coefficients in the equation; and (2) the number of pixel values input into the equation (some equations used 4 pixels, and others took 6 pixels):

¹ E.g., the claimed coefficients of 9/16 and -3/16 compared to 6/16 and -2/16 (Fu) or 8/16 and -3/16 (Bjontegaard).

'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; Ex-1003, ¶¶251-72. Petitioner's expert—who has decades of experience in signal processing and video codecs, (Ex-1003, ¶¶7-20)—explained these equations were typically arrived at through trial-and-error, POSITAs would have recognized (and the equations reflected) limitations as to what coefficients to use, and pointed to a textbook (Gonzalez) and other prior art describing how the coefficients impacted “frequency response” by weighing pixel values differently to alter their frequency (how much pixel values changed from one pixel to the next), (*id.*, ¶¶274-82; *see also id.*, ¶¶54-64; Pet. 26-29; Ex-1020, 153, 273; Ex-1072, 7). Petitioner's expert also provided examples of how the coefficients changed how much pixel values were modified. Ex-1003, ¶282; Pet. 30. Petitioner also demonstrated the claimed coefficients produced no unexpected results. Ex-1003, ¶¶262, 281-88; Pet. 25, 30-31.

B. PO's Preliminary Response

PO did not argue the coefficients of the deblocking-filter equations were not result-effective variables. To the contrary, PO acknowledged that, for 20 years, “the industry was constantly researching deblocking filter designs that would better balance the need to eliminate blocking artifacts from images while reducing complexity.” Paper 6 (“POPR”), 10, 34; *see also id.* at 35 (arguing that changing the coefficients “lead[s] to fundamentally different filters”).

Instead, PO contended the coefficients could be modified in too many ways, and any one modification “would [not] yield predictable results.” POPR, 29, 33-36, 53-56. PO also argued the prior-art equations were not directed to the same (unclaimed) filtering behavior as the claimed equation, and that Petitioner identified no express motivation to modify the coefficients. *Id.*, 29-31, 51-53. PO further argued the claimed equation’s filter behavior produced an “unexpected result”—preserving certain image features while blurring others (even though Fu had this same behavior, Ex-1003, ¶262)—distinguishing it over the prior art. POPR, 23, 55.

C. The Board's Denial of Institution

The Board declined to institute trial because, in its view, “Petitioner...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.” Paper 7 (“DI”), 11 (emphasis added). It reached this conclusion despite

also finding “that changing the numerical coefficients *will alter the resulting calculation*”—its frequency response. *Id.*, 16 (emphasis added). The Board reasoned, however, that the numerous prior-art equations Petitioner identified merely “show[] that different researchers proposed different offset equations that followed a similar pattern,” but were not “sufficient to establish that the coefficients are result-effective variables.” *Id.*, 14.² Indeed, as a final aside, the Board “question[ed] whether the coefficients, which are expressed as exact numerical values rather than ranges of values, should even be considered as result-effective variables,” and that the cases Petitioner cited all disclosed ranges. *Id.*, 15-16.

The Board faulted Petitioner’s expert for not expressly reciting the legal phrase “result-effective variable” when conducting his analysis, and for relying on a textbook explaining overarching image-filtering principles, that did not “discuss determining offsets for deblocking filters or the coefficients used in an equation for determining offset.” *Id.*, 11-12. The Board found, even if the coefficients were

² The Board also took issue with assuming the equation’s division form is rounded as insufficiently explained. DI, 14. But Petitioner’s expert *had* explained that, because the bit-shift form *always* rounds to an integer, rounding of the division form is assumed for equivalency (Ex-1003, ¶¶83-85; Pet. 9, 23-24), and pixel values are also integers (thus requiring rounding), (*see, e.g.*, Ex-1003, ¶¶47-48).

result-effective, the claimed coefficients were seemingly critical because the '659 Patent self-described them as an improvement over a *different* equation proposed for a draft standard, which PO did not argue was the closest prior art. *Id.*, 13-14.

IV. ARGUMENT

At base, the Board fundamentally misunderstood the result-effective variable analysis, making a series of errors that undermine its entire institution decision. The Board's errors can be traced to its decision to depart from the arguments the parties made and *sua sponte* forge its own path to deny institution. The Board then ignored clear precedent, raised arguments PO never made nor to which Petitioner had the opportunity to respond, demanded express teachings from the prior art that no authority supports, and ultimately rested its decision on facially contradictory factfinding. The Director should correct the Board's mistakes and initiate institution, or alternatively vacate with instructions to apply the correct analysis.

Obviousness is supposed to be analyzed under "an expansive and flexible approach." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 415 (2007). To provide such flexibility and preclude patents from issuing over minor optimizations that may not be found *expressly* in the prior art, the Federal Circuit has set forth a "decades-old legal principle that '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.'" *Pfizer Inc. v. Sanofi Pasteur Inc.*, SK, 94 F.4th 1341, 1347 (Fed.

Cir. 2024) (quoting *In re Aller*, 220 F.2d 454, 456 (CCPA 1955) (emphasis added)); *E.I. DuPont de Nemours & Co. v. Synvina C.V.*, 904 F.3d 996, 1006 (Fed. Cir. 2018) (collecting cases). In such instances, it is “[t]he normal desire of scientists or artisans to improve upon what is already generally known [that] provides the motivation” to modify the prior art. *In re Peterson*, 315 F.3d 1325, 1330 (Fed. Cir. 2003). To that end, when the prior art recognizes a parameter as “result-effective,” its optimization is “normally obvious.” *Pfizer*, 94 F.4th at 1348 (marks omitted).

Critically, the bar to establish a result-effective variable is low. All that is required is “[a] recognition in the prior art that a property is affected by the variable.” *In re Applied Materials, Inc.*, 692 F.3d 1289, 1297 (Fed. Cir. 2012). Indeed, in 2018, the Federal Circuit noted it had “located no case where this court relied on a variable *not being result-effective* in an obviousness analysis.” *Synvina*, 904 F.3d at 1009.

Here, the numerical coefficients in a deblocking-filter offset equation are indisputably a result-effective variable that affects how much pixels are modified (the frequency response of the filter). Both parties recognized that changing coefficients would change the equation’s output. Pet., 26–27 (Petitioner identifying prior-art equations with different coefficients, explaining how changing the coefficients changed the filter results); POPR 6, 10, 34–35 (PO acknowledging 20 years of experimentation with different equations and that changing the coefficients “lead[s] to fundamentally different filters”). Nor was there any dispute that those in

the art appreciated that the coefficients were variables subject to change, because both parties acknowledged those in the art *were actively changing them*. See, e.g., Pet., 26-27; Ex-1003, ¶¶251-72; POPR 9-10, 34-35.³

Indeed, the Board recognized that “changing the numerical coefficients *will alter the resulting calculation*,” (DI, 16 (emphasis added)), and that those in the art were experimenting with this variable, (*id.*, 14 (noting “that different researchers proposed different offset equations that followed a similar pattern”). On this factfinding alone, the Board should have only concluded that the coefficients were result-effective variables, *Applied Materials*, 692 F.3d at 1295; its conclusion that Petitioner failed to meet its burden is irreconcilable with its own factfinding, (DI, 11). Rather than accept an undisputed issue and evaluate the arguments the parties actually made, the Board *sua sponte* demanded more, without saying exactly what.

The Board appears to have been led astray by the mistaken view that a result-effective variable analysis requires that the claims and/or prior art disclose the variable-at-issue as a set of ranges. See DI, 11 (“Petitioner...does not explain

³ PO instead argued the case fell within recognized patentability *exceptions* when a result-effective variable exists: “teaching away, unexpected results, or some other evidence of nonobviousness.” *Synvina*, 904 F.3d at 1011; see POPR, 29, 33-36, 53-56 (unpredictability); *id.*, 23, 55 (unexpected results).

adequately why the claimed coefficients (*expressed as exact numerical values rather than ranges of values*) would have been recognized as result-effective variables.”),
15 (“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.”). The Board did not afford Petitioner the opportunity to address this *sua sponte* question, but the Federal Circuit (and other panels of the Board) has.

The Federal Circuit has long held that “discovery of an optimum *value* of a result effective variable...is ordinarily within the skill of the art” *In re Boesch*, 617 F.2d 272, 276 (CCPA 1980). And more recently, in *Pfizer*, the Federal Circuit rejected a patent owner’s arguments that the “‘result-effective variable doctrine’ ... is only appropriate in circumstances where there is actual overlap between a range in the prior art and a claimed range.” *Pfizer*, 94 F.4th at 1347. Although the claims in *Pfizer* recited a range, the Federal Circuit clarified more generally that the result-effective variable analysis is merely an offshoot of the “routine optimization” analysis, and may apply in any circumstance in which a “gap [between the claims and prior art] includes a parameter not necessarily disclosed in the prior art.” *Id.*, 1348. There, the Federal Circuit affirmed a Board panel’s finding that claims to a composition’s weight were obvious result-effective variables even though the art did not disclose *any* weight for the claimed composition (let alone a range), but instead taught weights only of related compositions. *Id.*, 1347-48.

Indeed, while lacking *Pfizer's* explication, both the Federal Circuit and numerous Board panels have found a result-effective variable in circumstances in which either the claims or prior art (or both) did not involve ranges (based on *Aller* and its progeny). *See, e.g., Iron Grip Barbell Co. v. USA Sports, Inc.*, 392 F.3d 1317, 1322 (Fed. Cir. 2004) (finding claims to a weight plate with three handles an obvious optimization in view of the “range” established by the prior art, collectively, that disclosed one, two, and four handles, individually, citing *Aller*); *Galderma Lab's, L.P. v. Tolmar, Inc.*, 737 F.3d 731, 736 (Fed. Cir. 2013) (finding a single weight-percent value of a drug component an obvious optimization, citing *Aller*); *Sealed Air Corp. v. Ranpak Corp.*, IPR2020-01249, Paper 22, 39–40 (Jan. 12, 2022) (finding claims to specific weight values of kraft paper an obvious optimization); *Infineon Techs. AG v. Feinics Amatech Teoranta*, IPR2022-00650, Paper 31, 42–43, 49 (Sept. 1, 2023) (finding a claimed component with “a pitch which is different than” another component an obvious optimization). That the claimed equation here recites only numerical values for the coefficients (9 and -3) rather than ranges is therefore irrelevant to whether the analysis applies.

The Board also appeared to suggest a result-effective variable requires an *express* prior-art explanation as to how the variable affects a result in the same context as the claimed invention. Despite acknowledging that the coefficients *would* affect the result without such evidence (DI, 16), the Board discredited Petitioner's

expert's reliance on a textbook that described general image-filtering principles because it did not "discuss determining offsets for deblocking filtering or the coefficients used in an equation for determining offset," (*id.*, 12). This is too high a burden and unsupported by any authority.

Neither the result-effective variable analysis nor obviousness more generally demands an express teaching of modifying the variable in the exact same context as the claimed invention. *See, e.g., Synvina*, 904 F.3d at 1009 ("DuPont needed to show that it was recognized in the prior art, *either expressly or implicitly*, that the claimed oxidation reaction was affected by reaction temperature and PO₂.... [E]ach reference...expressly disclosed appropriate or preferred temperatures and air pressures for the reaction, *indicating that persons of ordinary skill understood that the reaction was affected by temperature and pressure.*" (emphasis added)); *Iron Grip*, 392 F.3d at 1322 (finding implicit disclosure of a range in the prior art based on individual values in separate references); *see also Ruiz v. A.B. Chance Co.*, 357 F.3d 1270, 1276 (Fed. Cir. 2004) (finding claims obvious even though the prior art "does not feature an express written teaching in the art to make [the proffered] combination"); *In re Fournet*, 357 F.2d 392, 394 (CCPA 1966) (considering "both the general and specific teachings of the prior art" to find claims obvious). Nor must the prior art "provide the exact method of optimization for the variable to be result-effective." *Applied Materials*, 692 F.3d at 1297.

But, regardless, Petitioner had met its burden because, like *Synvina* and *Iron Grip*, Petitioner identified prior art that disclosed preferred deblocking-filter coefficients all operating within the general ranges of 6 to 8 for the first coefficient, and -2 to -4 for the second, thus “indicating that persons of ordinary skill understood that [the deblocking filter output] was affected by [these coefficients.]” *Synvina*, 904 F.3d at 1009; Pet., 26-27, 29-30; Ex-1003, ¶¶251-72, 281-83. Moreover, as Petitioner’s expert explained, those in the art would have known that the coefficients impacted the frequency response of filters based on general image-filtering principles. *See, e.g.*, Ex-1003, ¶275. Although the Board implied that such principles are inapposite unless *expressly* presented in the context of a deblocking filter, such a requirement finds no support in the law. *Synvina*, 904 F.3d at 1009; *Iron Grip*, 392 F.3d at 1322; *Ruiz*, 357 F.3d at 1276; *Fournet*, 357 F.2d at 394. Petitioner did more than meet its burden to demonstrate the existence of a result-effective variable.

But the Board’s errors did not end there. Even when assuming the result-effective variable analysis applied, the Board found unexpected results by applying the wrong legal test. To demonstrate unexpected results, the results must be shown to be unexpected compared with the closest prior art. *Janssen Pharms., Inc. v. Teva Pharms. USA, Inc.*, 97 F.4th 915, 933-34 (Fed. Cir. 2024). The Board did not make the correct comparison, or one that either Petitioner or PO advanced. *See, e.g.*, Pet. 25, 30-31, 61-62; Ex-1003, ¶¶282, 489 (comparing to Fu and Bjontegaard). The

Board instead *sua sponte* compared the claimed equation to one then-proposed for an industry standard and described in the '659 Patent, accepting as fact the purported advancements the '659 Patent described. (DI, 13-14). But that equation used a different number of pixels (6) and *three* different coefficients (**13**, **4**, **-5**); neither PO nor the Board contended the draft standard was the closest prior art. *Cf.* POPR, 20.

Unexpected results also require a difference “in kind and not merely in degree.” *Applied Materials*, 692 F.3d at 1297. Petitioner presented evidence the Board did not address, in which *the standards body* itself tested and found *negligible differences* between deblocking filters that used different equations with different coefficients. *See, e.g.*, Ex-1003, ¶¶285-88; Pet. 30-31. The standards body stated that PO’s deblocking filter was selected due to a minor (1.2%) increase in efficiency for a reason *unrelated to the claimed equation’s coefficients*. Ex-1003, ¶287.

V. CONCLUSION

The Board got the obviousness analysis wrong by imposing a heightened evidentiary requirement for both the result-effective variable analysis and obviousness more generally, and making irreconcilable findings under the proper legal standard. And even when it assumed the result-effective variable analysis applied, it further erred by making the wrong comparison for unexpected results. The Board’s decision should be reversed and institution granted, or, at a minimum, vacated with instruction to apply the correct legal standards.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that on January 17, 2025 true and correct copies of the foregoing **PETITIONER’S REQUEST FOR DIRECTOR REVIEW** was served via electronic mail upon the following counsel of record for Patent Owner:

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