

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ROKU, INC.,
Petitioner

v.

DOLBY INTERNATIONAL AB,
Patent Owner

Case IPR2024-01354
Patent 6,339,757

PATENT OWNER'S PRELIMINARY RESPONSE

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EXHIBITS

Exhibit 2001	U.S. Patent 6,339,757 to Teh et al. (“the ’757 patent”)
Exhibit 2002	Declaration and Curriculum Vitae of Dr. Chris Kyriakakis
Exhibit 2003	U.S. Patent No. 5,185,800 to Mahieux (“Mahieux”)
Exhibit 2004	U.S. Patent No. 5,109,417 to Fielder et al. (“Fielder”)
Exhibit 2005	U.S. Patent No. 5,241,603 to Akagiri et al. (“Akagiri”)
Exhibit 2006	U.S. Patent No. 4,896,362 to Veldhuis et al. (“Veldhuis”)
Exhibit 2007	U.S. Patent No. 4,677,671 to Galand et al. (“Galand”)
Exhibit 2008	U.S. Patent No. 5,579,431 to Reaves (“Reaves”)
Exhibit 2009	U.S. Patent No. 5,105,463 to Veldhuis et al. (“Veldhuis’463”)
Exhibit 2010	European Patent Publication No. 0145788A1 to Akagiri (“Akagiri’788”)
Exhibit 2011	European Patent Publication No. 0525809A2 to Akagiri (“Akagiri’809”)
Exhibit 2012	File History of the ‘757 patent
Exhibit 2013	Complaint for Patent Infringement in <i>Dolby Laboratories Licensing Corporation et al v. Roku, Inc.</i> , 5:24-cv-04660 (N.D. Cal. Aug. 1, 2024)

I. INTRODUCTION

The Board should deny institution of *inter partes* review (“IPR”) of U.S. Patent No. 6,339,757 (“the ’757 patent”) because the Petition fails to show a reasonable likelihood of unpatentability. Exhibit 2002, ¶20.

In particular, with respect to Grounds 1 and 2, the Petition fails to establish that its proposed combinations of Mahieux, Fielder, and Akagari describe (i) “a step for counting a number of available frequency-units by using the representative, based on psychoacoustic criteria” and (ii) “a first bit allocation step for determining an initial bit allocation for each of said available frequency-units by using an approximate mathematical model using said counted number of available frequency-units,” as recited in claim 1. *Id.*

Further, with respect to Grounds 3 and 4, the Petition fails to establish that its proposed combinations of Veldhuis, Galand, and Reaves describe (i) “a step for counting a number of available frequency-units by using the representative, based on psychoacoustic criteria” and (ii) “a first bit allocation step for determining an initial bit allocation for each of said available frequency-units by using an approximate mathematical model using said counted number of available frequency-units,” as recited in claim 1. *Id.*

Accordingly, the Board should deny institution of all grounds advanced in the Petition because the information presented therein and accompanying evidence

do not establish a reasonable likelihood that Petitioner will prevail.

II. SUMMARY OF THE '757 PATENT

The '757 patent is directed to “the efficient information coding of digital audio signals for transmission or digital storage media,” including “a quantization method using an efficient bit allocation method for information coding.” Exhibit 2001, 1:7-10; Exhibit 2002, ¶¶38-56.

In particular, the '757 patent describes “a dynamic bit allocation procedure that is adapted to the human auditory system and yet with a low level of complexity so that high audio quality can be achieved while at the same time meeting the low cost target.” Exhibit 2001, 2:41-45; Exhibit 2002, ¶39. An example of this procedure is shown in FIG. 1.

F i g . 1

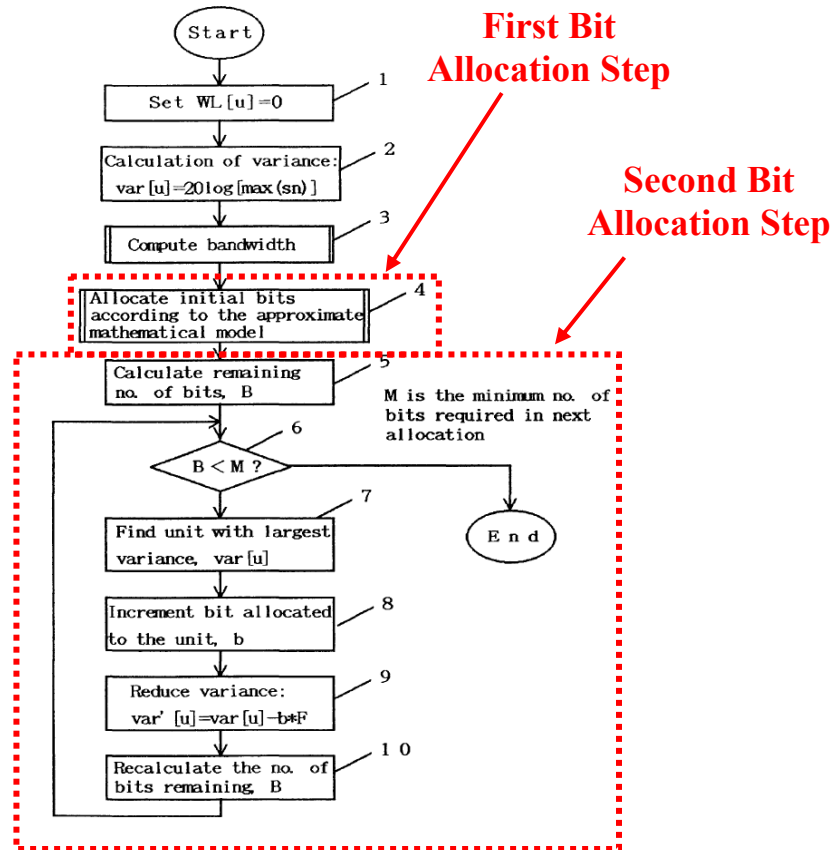


Exhibit 2001, FIG. 1 (annotated)¹

According to this dynamic bit allocation procedure, bits for quantizing and coding information regarding an audio signal are allocated according to at least two different and distinct bit allocation steps:

¹ Annotations to the figures throughout Patent Owner's Preliminary Response are shown in color.

(i) a *first* bit allocation step in which bits are initially allocated to “frequency-units” that can be heard by humans (also referred to as “valid” or “available” frequency-units) based on an approximate mathematical model (*see, e.g.,* FIG. 1, operation 4), and

(ii) a *second* bit allocation step in which additional bits are subsequently allocated to frequency-units, focusing on available frequency-units, based on psychoacoustic criteria (*see, e.g.,* FIG. 1, operations 5-10). Exhibit 2002, ¶40.

Specifically, according to the dynamic bit allocation procedure, a system obtains an audio signal, and transforms the audio signal using a modified discrete cosine transform (MDCT) process into several spectral lines that span the frequency range of the signal. Exhibit 2001, 4:21-24; Exhibit 2002, ¶41. Each spectral line represents the contents of the audio according to a specific frequency. For example, the frequency of the spectral lines corresponds to the frequency of a particular modified cosine basis function, and the amplitude of the spectral line corresponds to the amplitude or power of the audio signal at that frequency (*e.g.,* a coefficient of the modified cosine basis function). Exhibit 2002, ¶41.

Further, the system divides the frequency interval spanning the spectral lines into several groups, also referred to as “frequency-units” or “units.” Exhibit 2001, 4:21-24; Exhibit 2002, ¶42. An example of this process is shown in FIG. 6, in which a frequency interval spanning 256 spectral lines of the transformed audio

signal are divided into 26 different “frequency-units.” Exhibit 2002, ¶42.

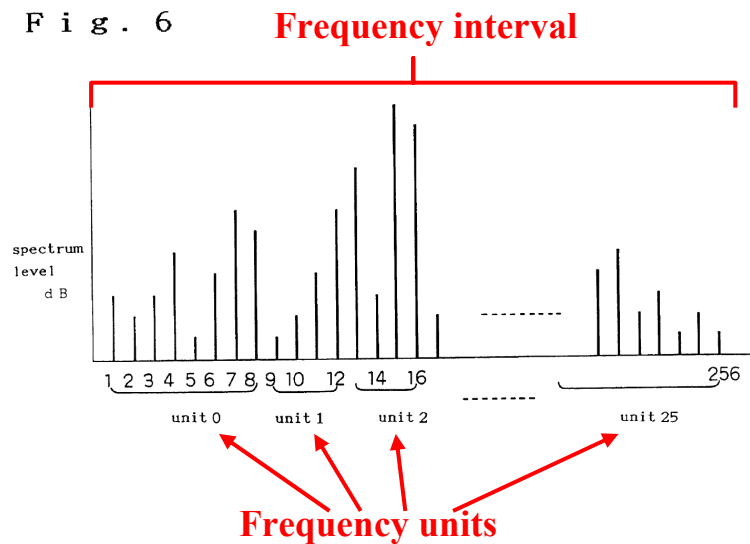


Exhibit 2001, FIG. 6 (annotated)

The system dynamically allocates bits for representing the spectral lines of each of the frequency-units according to a multi-step process. Exhibit 2002, ¶¶43-47.

First, the system initially sets the bit allocation for each of the frequency-units to zero (e.g., by setting a variable “WL[u]” to zero, where “WL” represents the number of bits allocated to a frequency-unit “u”). Exhibit 2001, 3:47-49, 7:7-8, FIG 1 (operation 1); Exhibit 2002, ¶44.

Further, the system determines a “representative” for each of the frequency-units. Exhibit 2001, 3:50-59, FIG 1 (operation 2); Exhibit 2002, ¶45. In some implementations, a representative of a frequency-unit includes a “variance” of the

frequency-unit, which can be calculated by determining at least one of (i) “the maximum spectral sample amplitude in the unit” or (ii) “an average of the spectral components within the unit.” Exhibit 2001, 3:50-59 (emphasis added); Exhibit 2002, ¶45.

Further, the system determines a bandwidth of transmission for the audio signal (*see, e.g.*, Exhibit 2001, 3:59-60, 4:29-48, FIG. 1 (operation 3)), an example process of which is described with reference to FIG. 2. Exhibit 2002, ¶46.

Specifically, referring to FIG. 2, the system initially sets a bandwidth counter to zero (*see, e.g.*, Exhibit 2001, 4:34-35, FIG. 2 (operation 31)), and selectively increases the bandwidth counter when each of the frequency-units meets certain criteria with respect to a “threshold” corresponding to the limits of human hearing (*see, e.g.*, Exhibit 2001, 4:35-48, FIG. 2 (operations 32-36)); Exhibit 2002, ¶46.

F i g . 2

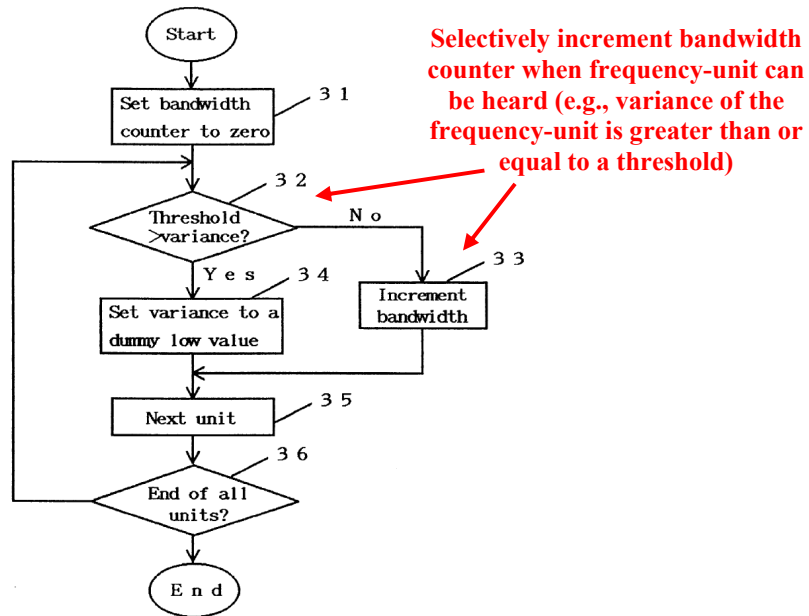


Exhibit 2001, FIG. 2 (annotated)

In particular, the system iterates through each of the frequency-units, and selectively increases the bandwidth counter when the representative (e.g., variance) of the frequency-unit is greater than or equal to the threshold, indicating that the contents of the audio signal in that frequency-unit can be heard by a human. *See, e.g.,* Exhibit 2001, 4:35-42, FIG. 2 (operations 32 and 33); Exhibit 2002, ¶47. Alternatively, the system maintains the bandwidth counter when the representative (e.g., variance) of the frequency-unit is less than the threshold, indicating that the contents of the audio signal in that frequency-unit cannot be heard by a human (e.g., because the contents of that frequency-unit are below the threshold of hearing). *See, e.g.,* Exhibit 2001, 4:43-45, FIG. 2 (operations 34 and 35); Exhibit

2002, ¶47. In this manner, the system counts how many frequency-units are available for bit allocation (e.g., frequency-units that can be heard by a human) to facilitate bit allocation amongst those frequency-units.

In particular, the system performs a first bit allocation step in which bits are allocated to frequency-units based on an approximate mathematical model. *See, e.g.,* Exhibit 2001, 3:60-62, 4:49-5:18, FIG. 1 (operation 4); Exhibit 2002, ¶48. An example mathematical model is represented by equation (1):

$$WL[u] = \frac{\text{var}[u]}{F} - \frac{1}{NF} \sum_{u=0}^N \text{var}[u] + \frac{Ba}{AN} \quad \text{equation (1)}$$

WL[u]: number of bits allocated to unit u
var[u]: variance of unit u
F: psychoacoustic weighting factor (a constant)
N: Number of valid units
Ba: Number of bits set aside for initial allocation
A: Approximate average number of spectral samples in a unit

Exhibit 1, Equation (1) (annotated)

According to this relationship, “N” represents the counted “[n]umber of valid units” (corresponding to the number of frequency-units that can be heard by a human, and thus are available for bit allocation). Exhibit 2001, 4:62-5:8; Exhibit 2002, ¶49. This value is expressly used to determine how many bits “WL[u]” to allocate to each of the frequency-units “u,” by virtue of its inclusion in equation (1). Exhibit 2002, ¶49.

Intuitively, equation (1) represents:

- (i) determining a default initial number of bits to allocate to each available (i.e., valid) frequency-unit (represented by the third term, blue), and
- (ii) modifying the initial number of bits that are actually allocated to each of the available frequency-units based on whether the variance of the frequency-unit (red) exceeds the average variance across all of frequency-units (green), normalized by a “psychoacoustic weighting factor,” F. Exhibit 2002, ¶50.

Notably, the system does not initially allocate any bits to frequency-units that cannot be heard by a human (e.g., frequency-units that are below the threshold of hearing and thus not “available” for bit allocation), as determined by the bandwidth counting operations described with respect to FIG. 2. Exhibit 2002, ¶51.

The system subsequently performs a second bit allocation step in which additional bits are allocated to the available frequency-units based on psychoacoustic criteria. *See, e.g.*, Exhibit 2001, 3:62-67, FIG. 1 (operations 5-10); Exhibit 2002, ¶52.

Specifically, the system iteratively allocates the bits left over after the first bit allocation (e.g., calculated by operation 5, which is subsequent to operation 4 of FIG. 1) by identifying the frequency-unit having the highest variance, and (i) increasing the bit allocation to that frequency-unit by “b,” and (ii) reducing the

variance of that frequency-unit by $b * F$ (e.g., such that the frequency-unit is less likely to be allocated additional bits in the next iteration). Exhibit 2001, 4:1-13, FIG. 1 (operations 7-9) Exhibit 2002, ¶53. The amount that the variance is reduced depends on “F” (described as a “psychoacoustic weighting factor”). Exhibit 2001, 4:12-14; Exhibit 2002, ¶53.

This second bit allocation step is iteratively repeated until the number of remaining bits B is less than the minimum number of bits required in the next bit allocation (e.g., indicating that there are an insufficient number of bits remaining to perform any further bit allocations). Exhibit 2001, 4:1-17, FIG. 1 (operation 6); Exhibit 2002, ¶54.

III. LEVEL OF ORDINARY SKILL IN THE ART

The Petition proposes that a POSITA in the field of the '757 patent “would have had a Bachelor of Science (BS) degree in Computer Science, Computer Engineering, Electrical Engineering, or an equivalent field, as well as at least 2-3 years of academic or industry experience in the fields of audio encoding, analog-to-digital signal conversion, or digital signal processing.” Pet., Section III (citing EX1003, ¶¶19-24). For purposes of this preliminary response, Patent Owner does not challenge that definition.

IV. CLAIM CONSTRUCTION

All claim terms should be construed according to the *Phillips* standard.

Phillips v. AWH Corp., 415 F.3d 1303 (Fed. Cir. 2005); 37 C.F.R. §42.100. Unlike the broadest reasonable interpretation standard, the *Phillips* standard seeks “the correct construction—the construction that most accurately delineates the scope of the claim[ed] invention.” *PPC Broadband, Inc. v. Corning Optical Comm’ns RF, LLC*, 815 F.3d 734, 740-42 (Fed. Cir. 2016). The *Phillips* standard focuses “on how the patentee used the claim term in the claims, specification, and prosecution history.” *Phillips*, 415 F.3d at 1321. As such, a claim construction analysis begins by considering the language of the claims themselves. *Id.* at 1314. Additionally, “claims must be read in view of the specification, of which they are a part.” *Id.* at 1315 (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 978 (1995) (en banc) (quotation marks omitted)). The specification is the “single best guide to the meaning of a disputed term,” *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed.Cir.1996), and “is, thus, the primary basis for construing the claims.” *Phillips*, 415 F.3d at 1315 (citation and quotation marks omitted). In addition to consulting the specification, a proper claim construction “should also consider the patent’s prosecution history.” *Id.* at 1317.

V. THE PETITION FAILS TO SHOW A REASONABLE LIKELIHOOD THAT THE CHALLENGED CLAIMS OF THE ’757 PATENT ARE ANTICIPATED OR OBVIOUS

The Board may grant a petition for *inter partes* review only where “the information presented in the petition ... shows that there is a reasonable likelihood

that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. §314(a); 37 C.F.R. §42.108(c). Petitioners bear the burden of showing that this statutory threshold has been met. *See* Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,756 (Aug. 14, 2012). Critically, Petitioners must fulfill this burden based on “information presented in the petition” (35 U.S.C. §314(a)), and the law forbids Petitioners from subsequently adding theories/arguments that should have been part of their initial Petition. *Intelligent Bio-Systems, Inc. v. Illumina Cambridge, Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016) (citing to 35 U.S.C. § 312) (“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.’”); *see also* *Cuozzo Speed Techs., LLC v. Lee*, 136 S.Ct. 2131, 2154 (2016) (Alito, J. concurring in part and dissenting in part) (“Thus, if a petition fails to state its challenge with particularity—or if the Patent Office institutes review on claims or grounds not raised in the petition—the patent owner is forced to shoot into the dark. The potential for unfairness is obvious.”). As shown below, the Petition has not established that the challenged claims are anticipated or obvious, and the Board should decline to institute review of the ’757 patent.

A. Grounds 1 and 2

The Petition alleges that (i) claims 1-3, 6-7, 10-11, 14, and 16 are obvious in

view of Mahieux and Fielder (Ground 1), and (ii) claims 1-17 are obvious in view of Mahieux, Fielder, and Akagiri (Ground 2). Pet, Sections VI-VII.

However, these invalidity grounds fail to establish that the challenged claims are obvious for at least the following reasons. Exhibit 2002, ¶¶58-115.

1. Ground 1 Fails Because Mahieux-Fielder Does Not Disclose “a Step For Counting a Number of Available Frequency-Units by Using the Representative, Based on Psychoacoustic Criteria,” as Required by the Challenged Claims

Claim 1 recites “a step for counting a number of available frequency-units by using the representative, based on psychoacoustic criteria.” The Petition alleges that Mahieux discloses and/or renders obvious this feature, relying on various operations described in Mahieux. Pet., Section VI.D.4. However, none of these operations amounts to *counting a number of available frequency-units*, as recited in claim 1. Exhibit 2002, ¶¶74-96.

In particular, the Petition alleges that Mahieux’s “*frequency bands*” correspond to the claimed “frequency-units.” Pet., 21 (first full paragraph) (“The resulting output [in Mahieux] is a frequency ‘spectrum’ (claimed ‘frequency interval’) that is ‘cut up’ or ‘divided’ ‘into *frequency bands*’ (claimed ‘*frequency-units*’),” original emphasis modified). See also Exhibit 2003, FIG. 5; Exhibit 2002, ¶75.

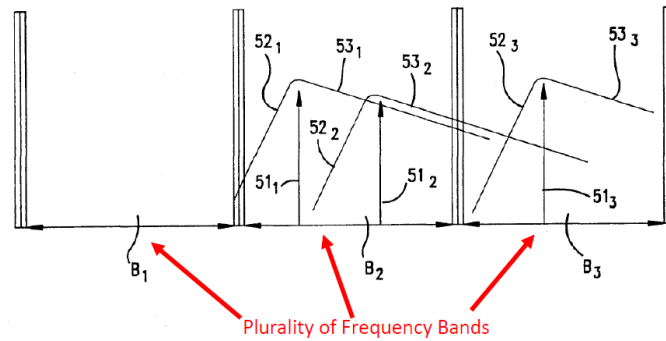


FIG.5

Exhibit 2003, FIG. 5 (as annotated in Pet., 22)

Further, the Petition alleges that Mahieux’s frequency bands are “*available*” if they are “*audible* and, thus, ... are available for bit allocation” (e.g., if the frequency bands have a “power” that is greater than a “masking threshold corresponding to the human auditory system”). Pet, 24 (first full paragraph to second full paragraph) (emphasis added); Exhibit 2002, ¶76.

However, under the Petition’s construction, Mahieux fails to disclose or render obvious *counting* the number of Mahieux’s “frequency bands” that are audible (*i.e.*, the purported “available frequency-units”). Exhibit 2002, ¶¶77-96.

Specifically, in Mahieux’s system, each “frequency band” includes *several spectral lines*, which are understood to represent the contribution of each spectral component within the frequency band to the overall audio signal. Exhibit 2003, 7:6-15; Exhibit 2002, ¶78. *See also* Exhibit 2003, FIG. 5 (depicting example frequency bands B₁, B₂, and B₃, where frequency bands B₂ and B₃ include

respective representative spectral lines 51_1 , 51_2 , and 51_3 , the amplitudes of which are represented by respective coefficients). Further, Mahieux's system compares *each of the spectral components' coefficients* to a threshold value (represented by the lines 52_1 - 52_3 and 53_1 - 53_3 in FIG. 5) in order to determine which *individual spectral components* are audible. Exhibit 2003, 7:3-8:9 ("As shown in FIG. 5, it would appear that, for each line 51 transmitted, the lines that are beneath a line 52 of -25 dB per critical band upstream of the line and beneath a line 53 of -10 dB per downstream critical band, are inaudible."); Exhibit 2002, ¶79.

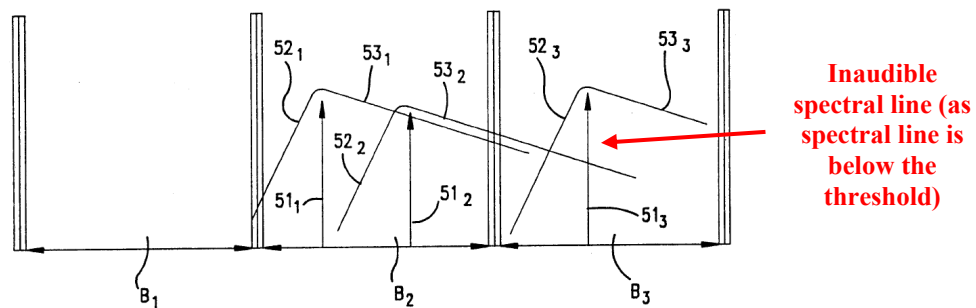


FIG.5

Exhibit 2003, FIG. 5 (annotated)

That is, in making this comparison, Mahieux's system does not determine whether a "frequency band" as a whole is audible (i.e., allegedly "available"), but rather whether each of several constituent spectral components within the frequency bands are individually audible. Exhibit 2002, ¶80.

For instance, in the illustrative example shown below, (i) the frequency band

B_2 has one non-zero coefficient (represented by a line that extends above the lines 52 and 53) and four zero coefficients (represented by triangles on the x-axis), and (ii) the frequency band B_3 has three non-zero coefficients and two zero coefficients. Exhibit 2002, ¶81. In this case, Mahieux's system would simply determine that the frequency band B_2 has one non-zero coefficient, and separately determine that the frequency band B_3 has three non-zero coefficients (as shown on the left). Exhibit 2002, ¶81. This is not the equivalent of determining the total number of the sub-bands B_1 - B_3 that are audible (e.g., two total sub-bands, B_2 and B_3) (as shown in the right). Exhibit 2002, ¶81.

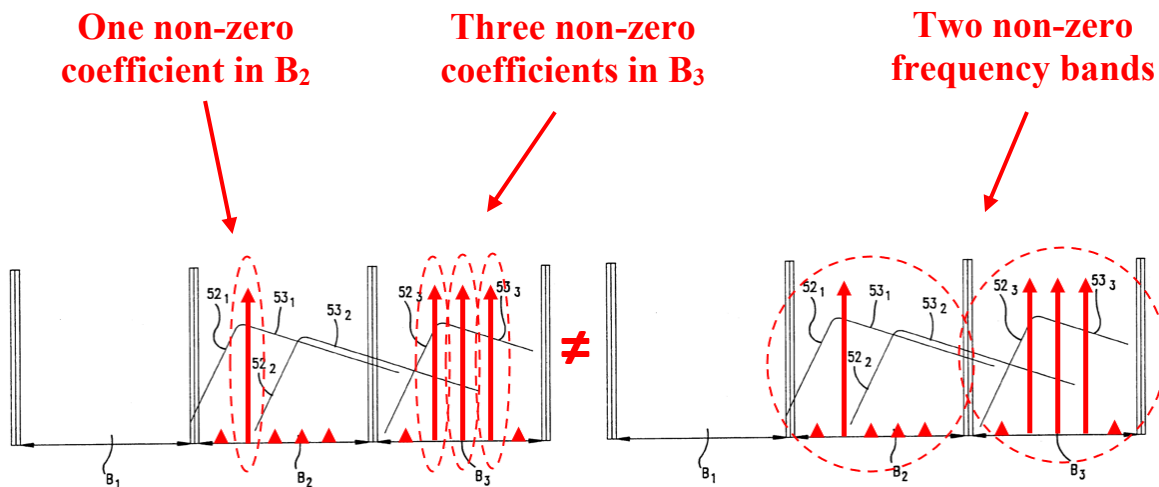


Exhibit 2003, FIG. 5 (revised and annotated)

As such, by making this comparison, Mahieux's system does not determine "available *frequency-units*" at all (e.g., the "available" ones of frequency bands B_1 , B_2 , and B_3 alleged to be the "frequency-units"). Exhibit 2002, ¶82. Instead, at

best, Mahieux’s system merely determines *spectral components* of the frequency-units that are individually “available” (e.g., the “available” ones of spectral lines 51₁, 51₂, and 51₃ within each of the frequency bands B₁, B₂, and B₃). Exhibit 2002, ¶82. Indeed, as discussed in further detail below, this individual spectral component-based approach is critical to Mahieux’s system, as Mahieux’s system specifically relies upon the number of audible *spectral components* in each frequency band in order to select from among several sets of quantizers for quantizing coefficients in that particular frequency band. Exhibit 2003, 11:39-62; Exhibit 2002, ¶82.

Further, even if Mahieux’s system were to positively determine which frequency bands were audible (i.e., allegedly having one or more spectral components that exceed a threshold value), Mahieux’s system still would not *count* the number of such audible frequency bands. Exhibit 2002, ¶83. For example, with respect to limitation [1D] of claim 1², the Petition appears to

² Petitioner identifies limitation [1D] of claim 1 as “a first bit allocation step for determining an initial bit allocation for each of said available frequency-units by

contend that the function “ $\alpha(k)$ ” represents the claimed “count,” as it purportedly “accounts for ‘the number of non-zero coefficients.’” Pet., 29 (first full paragraph); Exhibit 2002, ¶83. However, this function merely represents the number of constituent “non-zero *coefficients*” in a particular frequency band (e.g., representing respective *individual spectral components* of the frequency band), and not the number of “non-zero” *frequency bands* as a whole (e.g., among all of the frequency bands in the spectrum). Exhibit 2003, 12:22-29; Exhibit 2002, ¶83. For example, Mahieux describes that the value of the function “ $\alpha(k)$ ” is simply selected from a table of five pre-determined values, depending on the “number of non-zero coefficients.” Exhibit 2003, 12:22-29. Exhibit 2002, ¶84. Thus, at best, Mahieux merely describes determining a number of *spectral components* of one of Mahieux’s “frequency-units,” (i.e., one of frequency bands B_1 , B_2 , B_3) that are individually “available,” rather than determining that a particular alleged “frequency-unit” (i.e., a particular band B_1 , B_2 , B_3) as a whole is “available.” Exhibit 2002, ¶84.

using an approximate mathematical model using said counted number of available frequency-units.”

Further, in connection with limitation [1D], the Petition appears to contend that the function “ $\beta(k)$ ” also represents the claimed “count,” as it purportedly “ensures that bits are allocated to ‘zones of the spectrum that contain peaks’ (that have non-zero coefficients).” Pet., (first full paragraph). However, “ $\beta(k)$ ” merely depends on a variable γ representing a “spectral spread” of a frequency band, and does not pertain at all to generating or otherwise using a *count* of a number of Mahieux’s audible frequency bands. Exhibit 2003, 12:29-56; Exhibit 2002, ¶85.

For example, Mahieux describes that the variable γ is calculated according to the following equation:

$$\gamma = (1/N) \cdot \sum_{k=0}^{N-1} 10 \cdot \log_{10}(y^2(k)) - 10 \cdot \log_{10}\left((1/N) \sum_{k=0}^{N-1} y^2(k)\right)$$

Exhibit 2003, 12:35-42

Based on description elsewhere in Mahieux, the function “ $y(k)$ ” represents the coefficients of the signal that are to be quantized, and the parameter “ N ” represents the number of samples per temporal block. See, e.g., Exhibit 2003, 5:45-55, 5:62-64; Exhibit 2002, ¶¶86-87. Neither “ $y(k)$ ” nor “ N ” is a count of a number of Mahieux’s audible frequency bands and, therefore, neither is a count of “available frequency units” as alleged in the Petition. Exhibit 2002, ¶87.

Further, a POSITA also would not have found it obvious to modify

Mahieux's system to count audible frequency bands (i.e., instead of audible spectral components of those frequency bands), as this count would not have served any purpose in Mahieux's system. Exhibit 2002, ¶88. As noted above, Mahieux's system counts the number of audible *spectral components* in each frequency band in order to select from among several sets of quantizers for quantizing coefficients in that particular frequency band. Exhibit 2003, 11:39-62; Exhibit 2002, ¶88. For example, as shown in Mahieux's FIG. 6, Mahieux's system includes five sets of quantizers 61₁-61₅, each corresponding to a different number of "non-zero coefficients" ("N_{si(j)}") within a band ("j"):

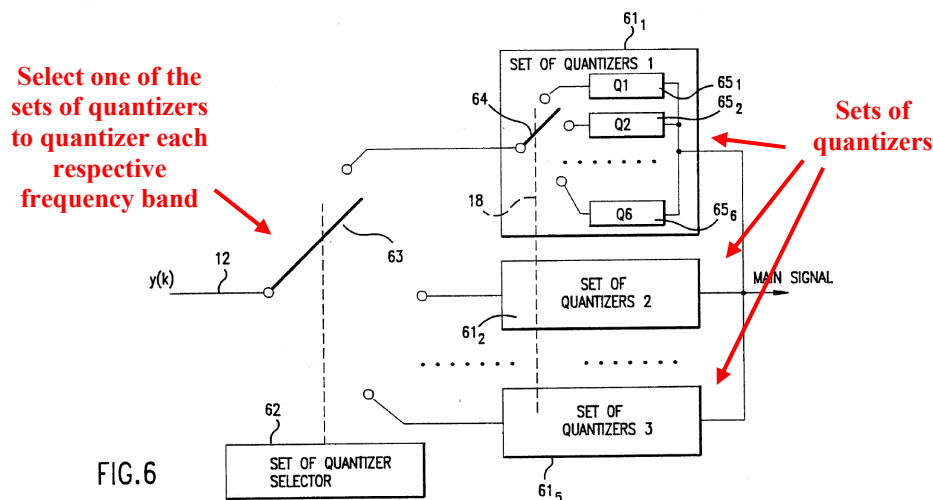


Exhibit 2003, FIG. 6 (annotated)

According to the invention, and so as to optimize the coding system, several sets of quantizers are available, as a function of N_{si(j)}. FIG. 6 shows the functional diagram of the module for selecting the quantizer to be used.

For example, in the following configuration, five sets 61₁ to 61₅ of quantizers are available. A module 62 for testing the value $N_{si}(j)=1$ controls a selector 63 according to the following criteria:

the first set for bands having one non-zero coefficient: $N_{si}(j)=1$

the second set for: $N_{si}(j)=6$

the third set for: $6 > N_{si}(j) > 2$

the fourth set for: $10 > N_{si}(j) > 5$

the fifth set for: $N_{si}(j) > 9$.

In each case, optimum quantizers for a number of bits varying, for example, between 1 and 6 bits, has been computed. A second selector 64 enables a choice to be made, in each set of quantizers 65₁ to 65₆, of the optimal quantizer as a function of the number of bits R 18. Thus, the optimization of the choice of the quantizer is achieved as a function of the number of coefficients to be quantized and the number of bits allocated by the bit allocation module.

Exhibit 2003, 11:39-62.

That is, Mahieux specifically counts the number of non-zero coefficients in each frequency band in order to determine how to allocate bits *within that frequency band* (i.e., on a frequency-band-by-frequency-band basis). Exhibit 2002, ¶89. This makes intuitive sense, as a frequency band having a single non-zero coefficient can be quantized by allocating a relatively large number of bits to that single non-zero coefficient, whereas a frequency band having a large number of non-zero coefficients would require that fewer bits be allocated to each non-zero

coefficient in order to ensure that each audible portion of the frequency band is represented. Exhibit 2002, ¶89. The function $\alpha(k)$ accounts for this property (e.g., by selecting a performance factor corresponding to the number of non-zero coefficients). Exhibit 2002, ¶89.

As an example, if the frequency band B_2 were to have one non-zero coefficient, Mahieux's system would select the first set of quantizers to quantize coefficients in that frequency band. Exhibit 2003, 11:39-62 ("the first set [of quantizers] for bands having one non-zero coefficient: $N_{si}(j)=1$ "); Exhibit 2002, ¶¶90-91. Further, if the frequency band B_3 were to have three non-zero coefficients, Mahieux's system would select the third set of quantizers to quantize coefficients in that frequency band. Exhibit 2003, 11:39-62 ("the third set for: $6 > N_{si}(j) > 2$ "); Exhibit 2002, ¶¶90-91.

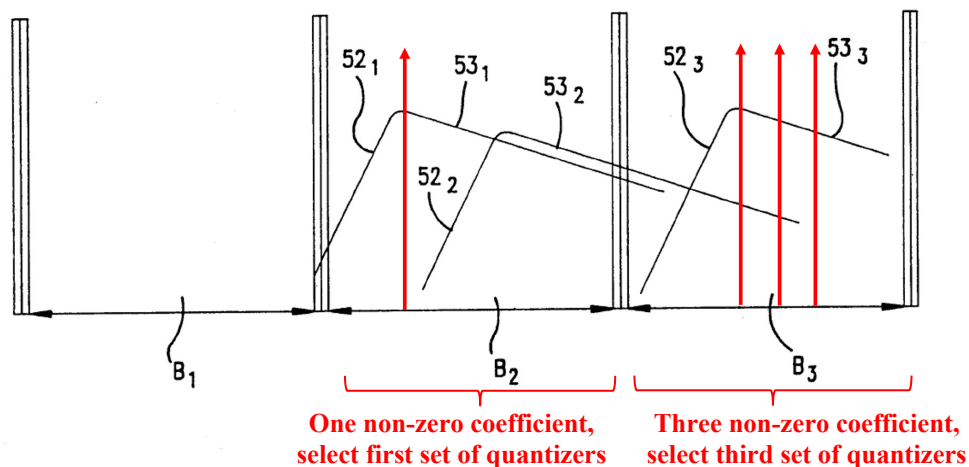


FIG.5

Exhibit 2003, FIG. 5 (revised and annotated)

It would not have made sense to modify Mahieux's system to instead count the number of audible frequency bands (e.g., the number of audible frequency bands B₁-B₃), as such a count would play no role in Mahieux's bit allocation. Exhibit 2002, ¶92. Indeed, as Mahieux's bit allocation focuses on the number of non-zero coefficients in each individual frequency band in isolation and without regard to the aggregate number of total audible frequency bands of the overall spectrum, generating an aggregate number of total audible frequency bands (e.g., by counting) serves no purpose in Mahieux's allocation scheme. Exhibit 2002, ¶92. Further given Mahieux's focus on allocating bits to frequency coefficients in individual frequency bands in isolation from other bands, a POSITA would fail to find any use for such an aggregate number or count. Exhibit 2002, ¶92.

To cure Mahieux's deficiencies, the Petition additionally refers to Fielder as purportedly "iterating through all frequency sub-bands to determine transform coefficients." Pet, 27 (first full paragraph) to 28 (first paragraph). However, even if Fielder's "iterating" process could be incorporated into Mahieux's system, at best, the Mahieux-Fielder system would simply "iterat[e] through *all* frequency sub-bands to determine transform coefficients," as alleged in Pet., 27 (first full paragraph, emphasis added). Exhibit 2002, ¶93. That is, the Mahieux-Fielder system still would not specifically count the number of Mahieux's "frequency bands" that are *audible* (i.e., the purported "available frequency-units"). Exhibit

2002, ¶93.

Further, the count of the number of audible frequency bands does not play any role in Fielder's bit allocation. Exhibit 2002, ¶¶94-95. Instead, Fielder's bit allocation focuses on assigning bits to (i) transform coefficients that have previously been assigned bits, and (ii) transform coefficients that are adjacent to those that have been previously assigned bits. Exhibit 2004, 23:13-29; Exhibit 2002, ¶¶94-95. *See also* Exhibit 2004, 23:30-25:13, FIG. 8. Thus, generating an aggregate number of total audible frequency bands (e.g., by counting) serves no purpose in Fielder's bit allocation scheme, and correspondingly would not have provided any motivation to utilize such information in Mahieux's system. Exhibit 2002, ¶¶94-95.

In sum, for at least the reasons discussed above, the Petition has failed to demonstrate that Mahieux discloses or renders obvious "a step for counting a number of available frequency-units by using the representative, based on psychoacoustic criteria," either individually or in combination with Fielder. Exhibit 2002, ¶96.

2. Ground 1 Fails Because Mahieux-Fielder Does Not Disclose "a First Bit Allocation Step for Determining an Initial Bit Allocation For Each of Said Available Frequency-Units By Using an Approximate Mathematical Model Using Said Counted Number of Available Frequency-Units," as Required by the Challenged Claims

Claim 1 additionally recites "a first bit allocation step for determining an

initial bit allocation for each of said available frequency-units by using an approximate mathematical model using said counted number of available frequency-units.” The Petition alleges that Mahieux discloses and/or renders obvious this feature, relying on various operations described in Mahieux. Pet., Section VI.D.5. However, none of these operations amounts to ***determining an initial bit allocation for each of said available frequency-units by using an approximate mathematical model using said counted number of available frequency-units***, as recited in claim 1. Exhibit 2002, ¶¶97-112.

As discussed in Section V.A.1, Mahieux-Fielder does not disclose or render obvious “counting a number of available frequency-units,” as recited in claim 1. Accordingly, Mahieux-Fielder also does not disclose or render obvious using such a “count” at all, much less specifically “determining an initial bit allocation for each of said available frequency-units by using an approximate mathematical model ***using said counted number of available frequency-units***,” as recited in claim 1. Exhibit 2002, ¶98.

In particular, the Petition contends that Mahieux’s system allocates bits according to a ratio “ $\alpha(k) \cdot \beta(k) \cdot \sigma^2(k) / S(k)$,” and that such a ratio amounts to a “mathematical model.” Pet., 29 (first full paragraph) to 30 (first paragraph). However, to the extent that this ratio is a “mathematical model” (which Patent Owner does not concede), this ratio nevertheless does not use a count of Mahieux’s

audible frequency bands (i.e., the alleged “available frequency-units”). Exhibit 2002, ¶¶99 For instance, Mahieux defines each of the functions and/or variables in the aforementioned ratio as follows:

(i) $S(k)$:

The allocation of the bits includes a module for computing the masking threshold $S(k)$ (this computation is similar to the one performed for the detection of the masked lines) and a module 72 for quantizing the ratio $\alpha(k) \cdot \beta(k) \cdot \sigma^2(k) / S(k)$ comparable to the one described by Yannick Mahieux in the article, "Transform Coding of Audio Signals Using Correlation Between Successive Transform Blocks" (Acts of the ICASSP Congress, Glasgow, 1989).

Exhibit 2003, 12:3-11.

(ii) $\sigma^2(k)$:

$\sigma^2(k)$ is the square of the spectrum descriptor, extended to all the coefficients $y(k)$ of the band. It concerns the essential element of the ratio to be quantized. Since the coefficients are coded with different sets of quantizers (according to $N_{si}(j)$), it is necessary to include the relative performance values of each set of quantizers in the allocation of the bits, according to the work by Jayant and Noll, *Digital Coding of Waveforms* (Prentice Hall Signal Processing Series, 1984).

Exhibit 2003, 12:12-21.

(iii) $\alpha(k)$:

The function $\alpha(k)$ is equal to the performance factor of the quantizer to be used for the coefficient $y(k)$. A table 73 includes, for example, five values of $\alpha(k)$ computed beforehand. This table is addressed by the number of non-zero coefficients. Taking account of the real performance values of the sets of quantizers enables a very appreciable improvement in the quality of the coding.

Exhibit 2003, 12:22-29.

(iv) $\beta(k)$:

The module 74 for computing the function $\beta(k)$, for its part, takes account of the spectral spread γ , also according to Jayant and Noll. This function indicates whether the spectrum is concentrated or not, and is computed at the coder by:

$$\gamma = (1/N) \cdot \sum_{k=0}^{N-1} 10 \cdot \log_{10}(y^2(k)) - 10 \cdot \log_{10} \left((1/N) \sum_{k=0}^{N-1} y^2(k) \right)$$

For the allocation of the bits, γ is computed in four frequency bands of equal width. These four values are transmitted to the decoder by means of a uniform quantization on 6 bits.

In each of these four frequency bands, the function $\beta(k)$ is computed according to the value of γ by means of a non-linear function. The role of $\beta(k)$ is to force the allocation of the bits to grant a greater number of bits to the zones of the spectrum that contain peaks. Indeed, the coefficients $y(k)$ corresponding to the pure sounds contained in the signal should be coded with higher precision, the masking threshold

then having a level, as compared with that of the signal, that is lower than in the case of a noise spectrum.

Exhibit 2003, 12:47-56.

None of these functions and/or variables is or otherwise uses a count of a number of Mahieux's audible frequency bands (i.e., the alleged "available frequency-units"). Exhibit 2002, ¶¶100-101. Indeed, as discussed in Section V.A.1, although the Petition specifically contends that the functions " $\alpha(k)$ " and/or " $\beta(k)$ " represents the claimed "count," neither of these functions represents the counted number of available frequency bands in Mahieux. Exhibit 2002, ¶101.

For example, as discussed in Section V.A.1, the function " $\alpha(k)$ " merely represents the number of constituent non-zero *coefficients* in a particular frequency band, and not the number of "non-zero" *frequency bands* as a whole. Exhibit 2003, 12:22-29; Exhibit 2002, ¶102. For example, Mahieux describes that the value of the function " $\alpha(k)$ " is simply selected from a table of five pre-determined values, depending on the "number of non-zero coefficients." Exhibit 2003, 12:22-29. Thus, at best, " $\alpha(k)$ " merely represents the number of *spectral components* that are individually "available" in each of the frequency-units, rather the number of frequency-units as a whole that are "available." Exhibit 2002, ¶102.

Moreover, as also discussed in Section V.A.1, the function " $\beta(k)$ " merely depends on a variable γ representing a "spectral spread" of a frequency band, and

does not pertain at all to generating or otherwise using a **count** of a number of Mahieux's audible frequency bands. Exhibit 2002, ¶103. For example, as discussed in Section, V.A.1, Mahieux describes that the variable γ is calculated according to the following equation:

$$\gamma = (1/N) \cdot \sum_{k=0}^{N-1} 10 \cdot \log_{10}(y^2(k)) - 10 \cdot \log_{10}\left((1/N) \sum_{k=0}^{N-1} y^2(k)\right)$$

Exhibit 2003, 12:35-42

The function “ $y(k)$ ” appears to represent the coefficients of the signal that are to be quantized and the parameter “ N ” appears to represent the number of samples per temporal block, neither of which is a count of a number of Mahieux's audible frequency bands. *See, e.g.*, Exhibit 2003, 5:45-55, 5:62-64. Neither “ $y(k)$ ” nor “ N .” Exhibit 2003, 12:29-56; Exhibit 2002, ¶104. Notably, the Petition does not assert that either of the functions $\sigma^2(k)$ or $S(k)$ represents the counted number of available frequency bands in Mahieux. Exhibit 2002, ¶105.

Moreover, as also discussed in Section V.A.1, it would not have made sense to modify Mahieux's system to instead allocate based on the count of the number of audible frequency bands, as doing so would be contrary to Mahieux's technique of assigning bits to individual frequency bands in isolation and without regard to the aggregate number of total audible frequency bands of the overall spectrum.

Exhibit 2002, ¶106. Indeed, Mahieux’s system is configured to specifically count the number of non-zero coefficients in each frequency band in order to determine how to allocate bits *within that frequency band* (i.e., on a frequency-band-by-frequency-band basis), such that different numbers of bits can be allocated to each frequency band depending on the characteristics of that frequency band in isolation. Exhibit 2003, 11:39-62; Exhibit 2002, ¶106. Allocating based on the count of the number of audible frequency bands would serve no purpose in Mahieux’s system. Exhibit 2002, ¶106.

Fielder does not cure Mahieux’s deficiencies. Exhibit 2002, ¶107. For example, as discussed in Section V.A.1, although the Petition refers to Fielder as purportedly “iterating through all frequency sub-bands to determine transform coefficients,” incorporating Fielder’s process into Mahieux’s system would, at best, result in a system that simply “iterat[es] through *all* frequency sub-bands to determine transform coefficients,” as alleged by in Pet., 27 (first full paragraph, emphasis added). Exhibit 2002, ¶¶107-108. That is, the Mahieux-Fielder system still would not specifically count the number of Mahieux’s “frequency bands” that are *audible* (i.e., the purported “available frequency-units”), much less allocate based on such a count. Exhibit 2002, ¶¶107-108.

Further, the count of the number of audible frequency bands does not play any role in Fielder’s bit allocation. Exhibit 2002, ¶¶109-111. Instead, Fielder’s bit

allocation focuses on assigning bits to (i) transform coefficients that have previously been assigned bits, and (ii) transform coefficients that are adjacent to those that have been previously assigned bits. Exhibit 2004, 23:13-29; Exhibit 2002, ¶¶109-111. *See also* Exhibit 2004, 23:30-25:13, FIG. 8. Thus, generating an aggregate number of total audible frequency bands (e.g., by counting) serves no purpose in Fielder's bit allocation scheme, and correspondingly would not have provided any motivation to utilize such information in Mahieux's system in order to allocate bits. Exhibit 2002, ¶¶109-111.

In sum, for at least the reasons discussed above, the Petition has failed to demonstrate that Mahieux discloses or renders obvious "a first bit allocation step for determining an initial bit allocation for each of said available frequency-units by using an approximate mathematical model using said counted number of available frequency-units," either individually or in combination with Fielder. Exhibit 2002, ¶112.

3. Ground 2 Fails for the Same Reasons as for Ground 1

The Petition contends that claims 1-17 are rendered obvious by Mahieux-Fielder, as modified by Akagari. Pet., Section VII.

With respect to claim 1, the Petition contends that Akagari provides additional disclosure regarding the claimed "representative." Pet., Section VII (e.g., Section VII.E, alleging that "[g]iven that Akagari discloses the representative

in claims 4 and 5, it also discloses the representative in independent claim 1”).

However, Akagiri was not relied upon with respect to at least (i) “a step for counting a number of available frequency-units by using the representative, based on psychoacoustic criteria” and (ii) “a first bit allocation step for determining an initial bit allocation for each of said available frequency-units by using an approximate mathematical model using said counted number of available frequency-units,” as recited in claim 1.

Accordingly, Ground 2 also does not render obvious claim 1 or its respective dependent claims 1-17. Exhibit 2002, ¶¶113-115.

B. Grounds 3 and 4

The Petition alleges that (i) claims 1-3, 6-7, 10-11, 14, and 16 are obvious in view of Veldhuis and Galand (Ground 3), and (ii) claims 1-17 are obvious in view of Veldhuis, Galand, and Reaves (Ground 4). Pet, Sections VIII-IX.

However, these invalidity grounds fail to establish that the challenged claims are obvious for at least the following reasons. Exhibit 2002, ¶¶116-159.

1. Ground 3 Fails Because Veldhuis-Galand Does Not Disclose “a Step For Counting a Number of Available Frequency-Units by Using the Representative, Based on Psychoacoustic Criteria,” as Required by the Challenged Claims

Claim 1 recites “a step for counting a number of available frequency-units by using the representative, based on psychoacoustic criteria.” The Petition alleges

that Veldhuis discloses and/or renders obvious this feature, relying on various operations described in Veldhuis. Pet., Section VIII.D.4. However, none of these operations amounts to *counting a number of available frequency-units*, as recited in claim 1. Exhibit 2002, ¶¶128-146.

According to the Petition, Veldhuis describes a coder that “divides the ... signal band of 0-22.05 kHz” “into a number of $P=26$ subbands,” and “further samples each subband in ‘a time interval corresponding with one block of $M=32$.’” Pet., 55 (second full paragraph), quoting EX1008, 5:53-59, 9:67-10:13. In particular, the Petition contends that “[e]ach of these *blocks* ($p;m$) represents the claimed ‘frequency-unit.’” Pet., 55 (second full paragraph, emphasis added). Each of Veldhuis’s “blocks” is a sub-band signal (i.e., time-domain signals) that is obtained by filtering the audio signal by a filter bank. Exhibit 2006, 5:53-68; Exhibit 2002, ¶129.

Further, the Petition alleges that Veldhuis’s blocks are “available” if they “can be heard and thus are available for bit allocation” (e.g., if a characteristic parameter $G(p;m)$ of the block is greater than a threshold $T(p)$, indicating that the block has a “power” that is greater than a “masking threshold corresponding to the human auditory system”). Pet., 57 (fourth full paragraph) to 58 (second full paragraph). The Petition also contends that “[b]y determining which signal blocks can be heard and thus are available for bit allocation (those having $C(p;m)$ values

equal to 1), Veldhuis “counts” such blocks.” Pet. 58 (second full paragraph); Exhibit 2002, ¶130.

However, even under the Petition’s construction, Veldhuis fails to describe **counting** the number of Veldhuis’s “blocks” that can be heard (i.e., the purported “available frequency-units”). Exhibit 2002, ¶¶131-146.

As a preliminary matter, the Petition notes that during prosecution of the ’757 patent, the Board of Patent Appeals and Interference (BPAI) found that Veldhuis ’463—a divisional application of Veldhuis with substantively the same disclosure as Veldhuis—failed to disclose “counting” the “available frequency-units.” Exhibit 2012, 259. *See generally* Exhibit 2009. However, the Petition contends that “nothing in the claims requires actively counting by, for example, incrementing a counter.” Pet., 58 (third full paragraph) to 59 (first paragraph).

The Petition’s characterization of the claim is not well taken. Exhibit 2002, ¶¶1332-133. Although the claims do not expressly require actively counting by incrementing a bandwidth counter (e.g., as described in the specification of the ’757 patent), claim 1 nevertheless positively recites a “step for counting a number of available frequency-units.” Further, as discussed in Section V.B.2 with respect to limitation [1D] of claim 1, the claims expressly recite that this “counted number” is used to perform additional operations (i.e., performing “a first bit allocation step for determining an initial bit allocation for each of said available

frequency-units”). The Petition’s apparent position that “counting” is not required is nothing more than an attempt to remove a positive limitation that is integral to claimed subject matter. Exhibit 2002, ¶133.

Further, the Petition’s allegations that “the BPAI failed to consider Veldhuis’s [’463] entire disclosure” (and by virtue, Veldhuis’s disclosure) in finding that Veldhuis ’463 failed to disclose performing such a “count” is not well founded, as the Petition has misrepresented the disclosure in Veldhuis ’463 (and correspondingly the disclosure in Veldhuis). Exhibit 2002, ¶134.

In general, Veldhuis describes a system for coding audio signals using pulse coding modulation (PCM) in which the system receives a time-domain digital audio signal, splits the signal into 26 different time-domain sub-band signals (e.g., using a filter bank), and quantizes the samples of each of the sub-band signals using an adaptive quantization technique. Exhibit 2006, 5:53-68; Exhibit 2002, ¶135.

Veldhuis’s system quantizes samples differently depending on the sub-band of the sample. Exhibit 2006, 9:44-11:13; Exhibit 2002, ¶136. For example, for a first subset of the sub-band signals (i.e., sub-band signals 1-12), Veldhuis’s system quantizes the samples by allocating bits according to a table (see FIG. 3) specifying a fixed quantization level for each of the sub-bands and a corresponding number of bits. Exhibit 2006, 9:60-66; Exhibit 2002, ¶136.

p	f _{co} [H z]		W(p) [H z]	L(p)	B(p)
1	0	86	86	25	4.64
2	86	172	86	25	4.64
3	172	258	86	25	4.64
4	258	345	86	25	4.64
5	345	517	172	25	4.64
6	517	689	172	25	4.64
7	689	861	172	25	4.64
8	861	1034	172	25	4.64
9	1034	1206	172	25	4.64
10	1206	1378	172	25	4.64
11	1378	1550	172	25	4.64
12	1550	1723	172	25	4.64
13	1723	2067	345	25	4.64
14	2067	2412	345	19	4.25
15	2412	2756	345	13	3.70
16	2756	3101	345	9	3.17
17	3101	3445	345	7	2.81
18	3445	4134	689	7	2.81
19	4134	4823	689	7	2.81
20	4823	5513	689	7	2.81
21	5513	6891	1378	7	2.81
22	6891	8269	1378	5	2.32
23	8269	11025	2756	3	1.58
24	11025	13781	2756	3	1.58
25	13781	16538	2756	3	1.58
26	16538	22050	5513	3	1.58

EXHIBIT 2004, FIG. 3 (annotated)

For a second subset of the sub-band signals (i.e., sub-band signals 13-26), Veldhuis's system quantizes the samples by initially allocating bits according to the same table (see FIG. 3). Exhibit 2006, 9:67-10:14; 10:31-35; Exhibit 2002, ¶137. However, the system adaptively reallocates bits for some blocks in certain sub-bands, depending on whether a “characteristic parameter” $G(p,m)$ for each block m in a certain sub-band p (indicating the signal level of the block in the sub-band) exceeds a threshold value $T(p)$ representing the range of human hearing for this sub-band p . Exhibit 2006, 9:67-12:59; Exhibit 2002, ¶137.

As an example, when the characteristic parameter $G(p,m)$ for a block m in

the sub-band p is *less* than a threshold value $T(p)$ (indicating that the samples within that block and sub-band *cannot be heard*), the system *zeros out* the bit allocation for the block m in the sub-band p and adds the bits to a sum of bits “S” (representing the number of saved bits for reallocation). Exhibit 2006, 11:14-49, 12:6-25; Exhibit 2002, ¶138. *See also* Exhibit 2006, FIG. 8 (operations 8-5 and 8-6), whereby when a binary comparator signal “C” for a block “m” in subband “p” is zero (indicating that the block is less than a threshold value and cannot be heard), the number of bits “B” allocated to that block is set to zero. The sum of bits “S” are subsequently reallocated to other sub-bands (e.g., a block m in a different sub-band). Exhibit 2006, 12:25-59; Exhibit 2002, ¶138.

Conversely, when the characteristic parameter $G(p,m)$ for a block m in the sub-band p *exceeds* the threshold value (indicating that the samples within that block and sub-band *can be heard*), the system maintains the bit allocation for the block m in the sub-band p . Exhibit 2006, 11:67-12:7; Exhibit 2002, ¶139. *See also* Exhibit 2006, FIG. 8 (operation 8-5), whereby when a binary comparator signal “C” for a block “m” in subband “p” is not zero (indicating that the block is greater than or equal to a threshold value and can be heard), the number of bits “B” allocated to that block is not changed. Exhibit 2002, ¶139.

That is, Veldhuis selectively increments a “*sum of saved bits S*,” which is not the number of blocks that can be heard by a human (i.e., the alleged “available

frequency-units”). Exhibit 2002, ¶140. Instead, as shown in column B(p) of the table in FIG. 3, the number of bits that are allocated to each block (and potentially reallocated to other blocks) are different respective decimal values that obfuscate the number of blocks that can or cannot be heard. Exhibit 2002, ¶140. Further, the number of bits in the table are pre-determined, and do not depend on the number of blocks that are audible. Exhibit 2002, ¶140.

Further, Veldhuis increments the “sum of saved bits S” only when blocks *cannot be heard* by a human, in order to determine how many bits that were to be allocated to that block can be reallocated to other blocks instead (i.e., blocks that can be heard). Exhibit 2002, ¶141. Thus, even if “the sum of saved bits S” were somehow alleged to inform a “count” of “frequency-units” (which Patent Owner does not concede), at best Veldhuis would describe the *very opposite* of that required by claim (i.e., counting a number of *unavailable* frequency-units, rather than available frequency-units) because the sum of “S” depends from unavailable/inaudible blocks, rather than available/audible blocks. Exhibit 2002, ¶141.

Further, it would not have been obvious to modify Veldhuis’s system to count the number of blocks that can be heard by a human instead (i.e., the alleged “available frequency-units”) because such a parameter would not serve any purpose in Veldhuis’s system. Exhibit 2002, ¶142. Indeed, Veldhuis’s system

does not reallocate bits from any blocks that can be heard, but rather maintains the number of allocated bits for those blocks, and in some cases selectively allocates one or more additional bits to those blocks from blocks that cannot be heard.

Exhibit 2006, 11:67-12:7; Exhibit 2002, ¶142. As Veldhuis does not reallocate any bits from audible blocks and merely allocates one or more additional bits to the audible blocks depending on the number of inaudible blocks, , the specific number of **audible** blocks that exist is irrelevant to Veldhuis's system. Exhibit 2002, ¶142. As such, in Veldhuis's system, tracking the number of blocks that are audible to a human would be entirely superfluous. Exhibit 2002, ¶142.

Alternatively, the Petition alleges that Galand also describes "counting" available frequency-units, and cites to a portion in Galand describing "useful sub-bands." Pet., 60 (second full paragraph) to 61 (first full paragraph). However, for at least the following reasons, Galand's "useful" sub-bands are not analogous to Veldhuis's audible blocks (i.e., the alleged "available frequency-units") and thus would not have motivated a POSITA to modify Veldhuis's system to count such blocks. Exhibit 2002, ¶¶143-145.

As an initial matter, Galand does not expressly describe what a "useful sub-band" entails. Exhibit 2002, ¶144. However, Galand refers to dividing a frequency range into eight sub-bands, and considering a fixed number of sub-bands 2-7 only. *See, e.g.*, Exhibit 2007, 4:33-38 (emphasis added):

FIG. 2 schematically shows sub-band coder 22 which is provided with filter set (FB) 30 which receives samples X_n . This filter set divides the pass band of the residual base-band signal into eight adjacent sub-bands 1-8. Only sub-bands 2 to 7 are kept for the needs of the invention.

See also Exhibit 2007, FIG. 2 (depicting that the output of the filter set “FB” only includes sub-bands 2-7). Further, Galand does not expressly describe that “useful” sub-bands are sub-bands that can be heard, and that any remaining sub-bands cannot be heard (as the Petition appears to imply). Exhibit 2002, ¶144. Thus, Galand’s “useful” sub-bands are not analogous to Veldhuis’s audible “blocks” and are not interchangeable with one another. Exhibit 2002, ¶144.

Further, even ignoring this distinction, Galand does not describe counting Galand’s “useful” sub-bands “by using the representative,” as required by [1C]. Exhibit 2002, ¶145. For instance, in Galand, the “useful sub-bands” appears to refer to a ***pre-determined*** set of sub-bands (i.e., sub-bands 2-7) that will be processed by the system. Exhibit 2007, 4:33-38; Exhibit 2002, ¶145. As these sub-bands are predetermined in some undisclosed way, Galand fails to disclose that these sub-bands are determined, identified, or counted by using a “representative” of each of the sub-bands, much less using the “characteristic parameter $G(p;m)$ ” or equivalent thereof that was identified by the Petition in its mapping. Exhibit 2002, ¶145. As such, even if Galand were to describe counting

“available frequency-units,” Galand still would not teach doing so based specifically on a representative of those frequency-units, as recited in claim 1. Exhibit 2002, ¶145.

In sum, for at least the reasons discussed above, the Petition has failed to demonstrate that Veldhuis discloses or renders obvious “a step for counting a number of available frequency-units by using the representative, based on psychoacoustic criteria,” either individually or in combination with Galand. Exhibit 2002, ¶146.

2. Ground 3 Fails Because Veldhuis-Galand Does Not Disclose “a First Bit Allocation Step For Determining an Initial Bit Allocation For Each of Said Available Frequency-Units by Using an Approximate Mathematical Model Using Said Counted Number of Available Frequency-Units,” as Required by the Challenged Claims

Claim 1 additionally recites “a first bit allocation step for determining an initial bit allocation for each of said available frequency-units by using an approximate mathematical model using said counted number of available frequency-units.” The Petition alleges that Veldhuis discloses and/or renders obvious this feature, relying on various operations described in Veldhuis. Pet., Section VIII.D.5. However, none of these operations amounts to ***determining an initial bit allocation for each of said available frequency-units by using an approximate mathematical model using said counted number of available frequency-units***, as recited in claim 1. Exhibit 2002, ¶¶147-155.

As discussed in Section V.B.1, Veldhuis-Galand does not disclose or render obvious “counting a number of available frequency-units,” as recited in claim 1. Exhibit 2002, ¶148. Accordingly, Veldhuis-Galand also does not disclose or render obvious using such a “count” at all, much less specifically “determining an initial bit allocation for each of said available frequency-units by using an approximate mathematical model *using said counted number of available frequency-units*,” as recited in claim 1. Exhibit 2002, ¶148. Indeed, the Petition contends that Veldhuis describes the claimed “first bit-allocation step,” as Veldhuis describes a process in which “bits $B(p)$ are allocated to blocks that can be heard (those having $C(p;m)=1$), while no bits are allocated to blocks that cannot be heard (those having $C(p;m)=0$).” Pet, 61 (third full paragraph). However, even if this operation in Veldhuis were to be considered a “first bit allocation step,” as the Petition appears to contend, Veldhuis’s operation is not performed “using an approximate mathematical model.” Pet. 62, (first full paragraph, conceding that “Veldhuis does not expressly disclose how the $L(p)$ values (and thus the $B(p)$ values) are determined”); Exhibit 2002, ¶148.

To remedy this deficiency, the Petition relies on Galand’s teachings, contending that the Veldhuis-Galand system would allocate bits according to the following equation described in Galand:

$$n(i) = \frac{1}{p} \left[M - \sum_{j=2}^7 \log_2 \tilde{C}_{(j)} \right] + \log_2 \tilde{C}_{(i)}$$

Exhibit 2007, 5:1-5. In doing so, the Petition appears to contend that the value “p = 6” amounts to the claimed “counted number of available frequency-units,” and as such the equation represents “an approximate mathematical model using said counted number of available frequency-units.” Pet., 62 (first full paragraph) to 63 (first full paragraph); Exhibit 2002, ¶149.

However, the Petition’s characterization of Galand is inconsistent with Galand’s disclosure. Exhibit 2002, ¶150. As discussed in Section V.B.1, claim 1 requires that the “counted number of available frequency-units” (e.g., that are used to “determine[e] an initial bit allocation for each of said available frequency-units”) is determined “by using the representative” of each frequency-unit. Exhibit 2002, ¶150. In contrast, Galand describes dividing a frequency range into eight sub-bands, and considering a *fixed number* of sub-bands 2-7 only, resulting in a total of *6 subbands* (i.e., corresponding to “p = 6” in the equation above). Exhibit 2007, 4:33-38; Exhibit 2002, ¶150.. That is, these sub-bands are a *pre-determined* set of sub-bands (i.e., sub-bands 2-7) that will be processed by the system. Exhibit 2002, ¶150. As these sub-bands are predetermined in some undisclosed way, Galand fails to disclose that these sub-bands are determined, identified, or counted

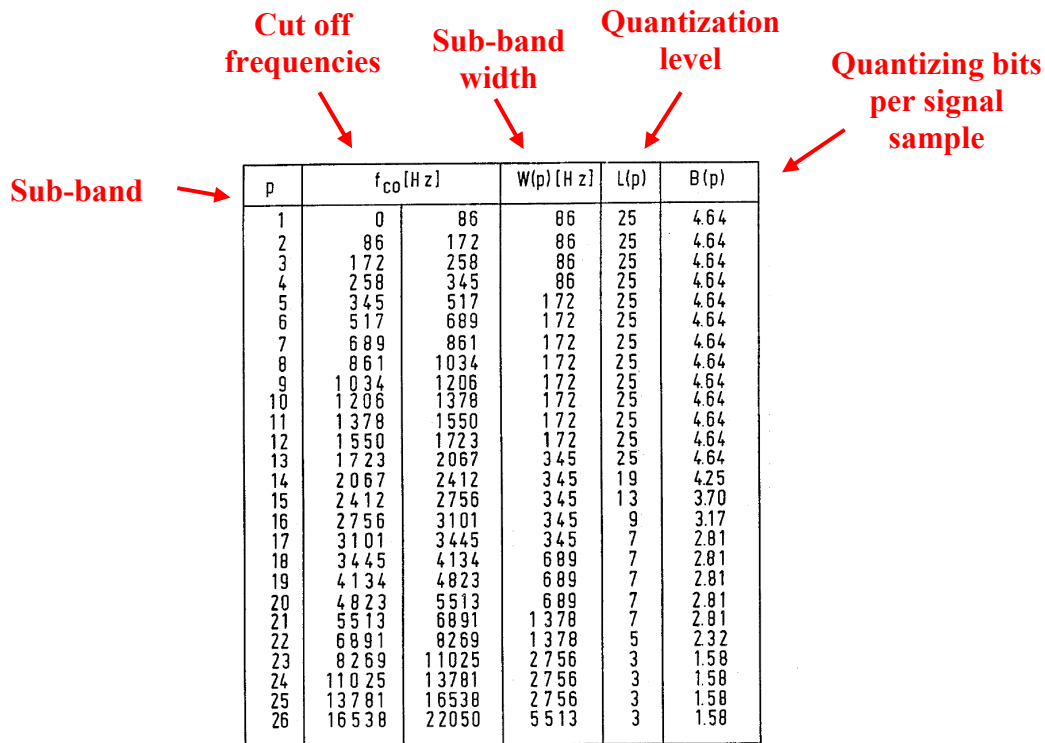
by using a “representative” of each of the sub-bands, as required by claim 1.

Exhibit 2002, ¶150. Further, there is no indication in Galand that these sub-bands are specifically those that can be heard by a human (i.e., the alleged criteria for determining whether a frequency-unit is “available”). Exhibit 2002, ¶150. Indeed, Galand’s system also selects the same six sub-bands by default, seemingly without considering the actual contents of the specific audio signals—and their sub-band signals—that are input into the system. Exhibit 2002, ¶150.

Further, even if Galand’s deficiencies were to be ignored, there nevertheless would not have been any expectation of success in using Galand’s equation in Veldhuis’s system in the manner set forth by the Petition, as such a modification would be contrary to Veldhuis’s multi-step dynamic bit allocation process. Exhibit 2002, ¶¶151-153.

As discussed above, Veldhuis’s system quantizes the samples by initially allocating bits according to a table (*see* FIG. 3). Exhibit 2006, 9:67-10:14, 10:31-35, FIG. 3. However, the system subsequently adaptively reallocates bits for some blocks in certain sub-bands, depending on whether the block can be heard. That is, Veldhuis’s system requires that bits be *initially allocated to each of the blocks* (e.g., regardless of whether they can be heard or not), such that some of those bits (e.g., those allocated to inaudible blocks) can be *subsequently reallocated* to other blocks. Exhibit 2002, ¶152. This is reflected in the table shown in Veldhuis’s

FIG. 3, which indicates the initial allocation of bits to each and every sub-band, regardless of whether the blocks in that sub-band can be heard. Exhibit 2002, ¶153.



p	f _{co} [Hz]		W(p) [Hz]	L(p)	B(p)
1	0	86	86	25	4.64
2	86	172	86	25	4.64
3	172	258	86	25	4.64
4	258	345	86	25	4.64
5	345	517	172	25	4.64
6	517	689	172	25	4.64
7	689	861	172	25	4.64
8	861	1034	172	25	4.64
9	1034	1206	172	25	4.64
10	1206	1378	172	25	4.64
11	1378	1550	172	25	4.64
12	1550	1723	172	25	4.64
13	1723	2067	345	25	4.64
14	2067	2412	345	19	4.25
15	2412	2756	345	13	3.70
16	2756	3101	345	9	3.17
17	3101	3445	345	7	2.81
18	3445	4134	689	7	2.81
19	4134	4823	689	7	2.81
20	4823	5513	689	7	2.81
21	5513	6891	1378	7	2.81
22	6891	8269	1378	5	2.32
23	8269	11025	2756	3	1.58
24	11025	13781	2756	3	1.58
25	13781	16538	2756	3	1.58
26	16538	22050	5513	3	1.58

EXHIBIT 2004, FIG. 3 (annotated)

In contrast, Galand's equation is used to determine how many bits M are distributed among six pre-determined sub-bands (i.e., $p = 6$) in a single allocation step. Exhibit 2007, 4:64-7; Exhibit 2002, ¶154. If Galand's equation were to be modified to replace the pre-determined value of " p " with the number of Veldhuis's block that can be heard (i.e., a dynamically changing value, depending on the contents of the audio signal), at best, the equation would determine how many bits

M are distributed among *audible blocks only*. Exhibit 2002, ¶154. That is, all of Veldhuis's bits would be allocated in a *single step* (i.e., to the audible blocks only in accordance with Galand's modified equation), and there would be no remaining bits to reallocate in Veldhuis's subsequent reallocation step, thus rendering Veldhuis's subsequent reallocation step, which Petitioner relies on for the recited "second bit allocation step," entirely superfluous. Exhibit 2002, ¶154.

Further, making such a substitution also would be contrary to Galand's teaching. In particular, this substitution would prevent bits from being distributed across the fixed number of frequency sub-bands that are retained by a filter bank (i.e., the very purpose of the Galand's equation), as that fixed number would no longer be represented in the equation at all. Exhibit 2002, ¶155. For example, in Galand's equation, the term " $1/p$ " is used to distribute bits across a fixed number of sub-bands (i.e., by allocating to each sub-band " i " one-sixth of a particular number of bits, as adjusted by a term " $\log_2 \hat{C}(i)$ "). Exhibit 2002, ¶155. By substituting the term " $1/p$ " with another term, the equation would no longer account for the specific six fixed sub-bands identified as Galand as being "useful," and thus would fail to effectively distribute bits among them as taught by Galand. Exhibit 2002, ¶155.

In sum, for at least the reasons discussed above, the Petition has failed to demonstrate that Veldhuis-Galand discloses or renders obvious "a first bit

allocation step for determining an initial bit allocation for each of said available frequency-units by using an approximate mathematical model using said counted number of available frequency-units.” Exhibit 2002, ¶156.

3. Ground 4 Fails for the Same Reasons as for Ground 3

The Petition contends that claims 1-17 are rendered obvious by Veldhuis-Galand, as modified by Reaves. Pet., Section IX.

With respect to claim 1, the Petition contends that Reaves provides additional disclosure regarding the claimed “representative.” Pet., Section IX (e.g., Section IX.E, alleging that “given that Reaves discloses the representative in claims 4-5, it also discloses the representative in independent claim 1”). However, Reaves was not relied upon with respect to at least (i) “a step for counting a number of available frequency-units by using the representative, based on psychoacoustic criteria” and (ii) “a first bit allocation step for determining an initial bit allocation for each of said available frequency-units by using an approximate mathematical model using said counted number of available frequency-units,” as recited in claim 1.

Accordingly, Ground 4 also does not render obvious claim 1 or its respective dependent claims 1-17. Exhibit 2002, ¶¶157-159.

VI. CONCLUSION

For the foregoing reasons, Patent Owner respectfully requests that the Board

deny institution of Grounds 1-4 of the Petition, and thus decline to institute *inter partes* review of any claim of the '757 Patent.

Respectfully submitted,

Date: 1-9-25

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CERTIFICATION UNDER 37 C.F.R. §42.24(d)

Under the provisions of 37 C.F.R. §42.24(d), the undersigned hereby certifies that the word count for the foregoing Patent Owner's Preliminary Response to Petition totals 9,236, which is less than the 14,000 allowed under C.F.R. §42.24(b)(1).

Respectfully submitted,

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§42.6(e), the undersigned certifies that on January 9, 2025, a complete and entire copy of this Patent Owner's Preliminary Response with supporting exhibits were provided via email to Petitioner by serving the correspondence email address of record as follows:

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