

United States District Court,
N.D. California, San Jose Division.

DOLBY LABORATORIES, INC. and Dolby Laboratories Licensing Corporation,
Plaintiffs.

v.

LUCENT TECHNOLOGIES INC. and Lucent Technologies Guardian I LLC,
Defendants.

No. C-01-20709 JF (RS)

Nov. 18, 2003.

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**ORDER CONSTRUING CLAIMS OF UNITED STATES PATENTS NO. 5,341,457 AND NO.
5,627,938**

[Docket No. 261]

JEREMY FOGEL, District Judge.

On October 15, 2003, the Court held a hearing for the purpose of construing disputed terms in the claims of United States Patents No. 5,341,457 ("the '457 patent") and No. 5,627,938 ("the '8 patent"). After consideration of the arguments and evidence presented by the parties and the relevant portions of the record, the Court construes the disputed terms as set forth below.

I. BACKGROUND

On May 31, 2002, Plaintiffs ("Dolby") filed suit against Defendants ("Lucent"), seeking declaratory relief under 28 U.S.C. s. 2201(a) and 2202 in the form of a judgment of invalidity and noninfringement of several of the claims of Lucent's '457 and '8 patents. Dolby alleges that Lucent has accused them of infringing the subject claims.

The patents describe systems and methods that may be used in compression and decompression of audio signals. For example, audio signals may be converted from analog to digital format. Such digitized versions usually require large amounts of data and thus a high bit rate for transmission. Compression of that data is necessary in order to transmit it over the Internet or store it without using prohibitive amounts of memory.

The invention uses knowledge of human auditory perception to code audio signals in a way that minimizes the bit rate required for data transmission or storage. It does this in two ways. First, it codes some audio data with less accuracy depending on the extent to which the signal is perceptible. Second, it may eliminate unnecessary or imperceptible data. In both approaches, the invention may reduce data corresponding to components of an auditory signal that are "masked" by other components of the signal.

The '457 patent, entitled "Perceptual Coding of Audio Signals," describes a storage medium and methods for compressing audio signals by reducing the amount of data that represents sounds that would be masked (or rendered minimally perceptible or imperceptible to the human ear) by other frequencies. Specifically, it describes a method for implementing a "noise masking threshold" that varies depending on the audio signal's "tonality value." Audio signals are characterized based on the extent to which they are composed of "noise-like" and "tone-like" qualities. A noise masking threshold is determined using the tonality value. Compression is achieved by retaining audio signals above that threshold and by using the threshold to determine the accuracy of the coding of those retained signals. Signals close to the threshold are coded with less accuracy (and, concomitantly, more quantizing noise) and signals farther above the threshold are coded with greater accuracy.

The '8 patent, entitled "Rate Loop Processor for Perceptual Encoder/Decoder," generally describes a similar method. However, it also includes a second basis for data reduction: the "absolute hearing threshold." This threshold is an empirically determined value below which certain sounds cannot be heard. Because such signals cannot be heard, data corresponding to them can be eliminated, thus reducing the digital information required to transmit or store the auditory signal. The '8 patent also claims an iterative process to reduce the required bit rate. The invention may repeat its compression computations until the bit rate used approaches the bit rate available, thus maximizing the quality of the signal while keeping the bit rate below an acceptable level. Finally, the '8 patent claims a decoder, which may convert the compressed data into a "time domain signal."

The '457 patent is a continuation of an application that was filed on December 30, 1988. The '457 patent issued with seventeen claims on August 23, 1994. The parties dispute the construction of numerous terms of independent claims 1, 10, and 17, as well as terms of dependent claims 5, 6, and 12. The '938 patent is a continuation of an application that was filed on March 2, 1992. The '8 patent issued with four claims on May 6, 1997. The '8 patent incorporated by reference the original application that resulted in the '457 patent. The parties dispute the construction of all of the claims.

II. APPLICABLE LAW

Claim construction is a question of law to be decided by the Court. *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed.Cir.1995), *aff'd*, 517 U.S. 370, 116 S.Ct. 1384, 134 L.Ed.2d 577 (1996). When assessing claim meaning the Court must ask what a person having ordinary skill in the art would understand the claim language to mean at the time of the invention. *DeMarini Sports, Inc. v. Worth, Inc.*, 239 F.3d 1314, 1324 (Fed.Cir.2001). The Court must look first to the intrinsic evidence of record: the patent claims, the specification, and, if in evidence, the prosecution history. *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed.Cir.1996). The general rule is that claim terms are to be given their ordinary and accustomed meaning. *Johnson Worldwide Associates v. Zebco Corp.*, 175 F.3d 985, 989 (Fed.Cir.1999). However, the patentee may choose to be its own lexicographer and may use terms in a manner other than their ordinary meaning so long as the special definition is stated clearly in the patent specification or file history. *Vitronics*, 90 F.3d at 1582. The specification acts as a dictionary when it expressly defines terms

used in the claims or when it defines terms by implication, and is considered to be "the single best guide to the meaning of a disputed term." *Id.*

In most situations, analysis of the intrinsic evidence will resolve any ambiguity regarding a disputed claim term. *Id.* at 1583. In such circumstances, the Court may not rely on extrinsic evidence. *Id.* However, where the intrinsic evidence is ambiguous as to a disputed term or the scope of the invention, the Court may turn to extrinsic evidence such as dictionaries, expert testimony, prior art, technical treatises, and inventor testimony. *Id.* at 1584. Such evidence may be used to help the Court understand the claims but may not be used to vary or contradict the claim language. *Id.*

As a general claim construction principle, limitations found only in the written description of the specification of a patent should not be imported or read into a claim. *In re Donaldson*, 16 F.3d 189, 195 (Fed.Cir.1994); *Laitram Corp. v. NEC Corp.*, 163 F.3d 1342, 1347 (Fed.Cir.1998). An exception applies if a claim is expressed in "means plus function" or "step plus function" format in accordance with 35 U.S.C. s. 112, para. 6, which states:

An element in a claim for a combination may be expressed as a means or a step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

35 U.S.C. s. 112, para. 6. The first step in construing a means-plus-function limitation is to identify the function of the limitation recited in the claim. *Texas Digital Systems, Inc. v. Telegenix, Inc.*, 308 F.3d 1193, 1208 (Fed.Cir.2002). The next step is to identify the corresponding structure set forth in the written description necessary to perform that function. *Id.* "Structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Id.* (quoting *B. Braun Med., Inc. v. Abbott Labs.*, 124 F.3d 1419, 1424 (Fed.Cir.1997)). Corresponding structure is limited to that necessary to perform the recited function, and its structural equivalents. *Micro Chemicals, Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1257-58 (Fed.Cir.1999).

In "the context of method claims, the use of the term 'steps for' signals the drafter's intent to invoke s. 112, paragraph 6." *Masco Corp. v. U.S.*, 303 F.3d 1316, 1326 (Fed.Cir.2002). However, the mere use of "steps for" language does not necessarily mean that s. 112, paragraph 6 applies. Moreover, 35 U.S.C. s. 112, para. 6 is "implicated only when steps *plus function* without acts are present." *O.I. Corp. v. Tekmar Co., Inc.*, 115 F.3d 1576, 1583 (Fed.Cir.1997). Thus, process or method claims consisting of steps do not implicate 35 U.S.C. s. 112, para. 6. As the Federal Circuit stated: "If we were to construe every process claim containing steps described by an 'ing' verb ... into a step-plus-function limitation, we would be limiting process claims in a manner never intended by Congress." *Id.*

III. DISCUSSION

A. Disputed terms of claim 1 of the '457 patent.

1. Disputed terms.

The text of Claim 1 is set forth below, with the disputed terms highlighted in bold type.

1. A method of processing an ordered time sequence of audio signals partitioned into a set of ordered blocks, each said block having a discrete frequency spectrum comprising a first **set of frequency coefficients**, the method comprising, for each of said blocks, the steps of:

(a) grouping said first **set of frequency coefficients** into at least one group, each group comprising at least one frequency coefficient;

(b) generating at least one **tonality value**, each group having an associated tonality value, said at least one **tonality value reflecting the degree to which said time sequence of audio signals comprises tone-like quality**;

(c) **generating at least one noise masking threshold**, each said at least one **noise masking threshold being based upon at least a portion of said at least one tonality value**; and

(d) **quantizing** at least one frequency coefficient in said at least one group, said quantizing **based upon** said at least one **noise masking threshold**.

2. Analysis.

a. "set of frequency coefficients"

Lucent asserts that this element should be construed as a "set of values that represent the frequency domain representation of the audio signal." Dolby argues that the correct construction is "a set of values obtained from an analysis filter bank that correspond to spectral components of the input signal." Lucent proposes a definition of "frequency coefficients," while Dolby seeks a construction that describes the method for obtaining such coefficients. Lucent would agree to the following version of Dolby's proposal: "set of values that correspond to spectral components of the input signal." Hearing, October 15, 2003, Slide Hall7.

The meaning of "frequency coefficient" is not clear from the claim language alone. The claim language indicates that the audio signals are divided into time increments, each of which is represented as a frequency spectrum comprising "frequency coefficients." However, the language never defines what "frequency coefficients" are. Frequency coefficients could be values that are measured at different frequencies, or they simply could be the frequency values themselves. If they are the former, the claim does not indicate what is measured at each frequency in the "frequency spectrum." The claim conceivably could include every possible measurement made at a frequency, or it could refer only to "power." Accordingly, the Court must look elsewhere to define this vague claim language.

The parties have not pointed to any intrinsic evidence that defines "coefficient." However, the parties have provided two dictionary definitions: (1) a constant factor of a product (for example, the "2" in the equation $2x=y$) or (2) a number that serves as a measure of some property or characteristic. *See Webster's Ninth New Collegiate Dictionary*. In the context of the subject patents, the latter definition is more appropriate for this element of claim 1. No part of the discussion of frequency coefficients includes "factors" or "division." Instead, "coefficient" refers to a component of the frequency spectrum. That is, "coefficient" is better understood as a measure of some property or characteristic of the audio signal at a particular frequency.

Dolby admits that frequency coefficients "correspond to spectral components of the input signal," while

Lucent contends that they "represent the frequency domain representation of the audio signal." While neither of these proposed constructions is entirely clear, both indicate that the frequency coefficients may vary according to time and frequency; that is, they are not the frequencies themselves. Both parties conceded as much in their presentations before the Court on October 15, 2003. Similarly, Lucent's expert witness, Dr. Nikil Jayant states: "Each of these values, or "coefficients," indicates the amplitude or intensity of the audio signal at a particular frequency." Kellman Decl., Ex. D, p. 4.

The claim language does not specify what exactly is measured at each unit of time and frequency. The Court must look to the specification to clarify this issue, without importing any additional limitations. Although the specification does not expressly define "frequency spectrum," it does state that at a discrete time point an audio signal is "fast-Fourier transformed in order to present it as a function of frequency." '457:3/3-4. The specification makes clear that the frequency spectrum is a "complex spectrum" that includes, but is not limited to, the power spectrum. '457:3/5-6 & 46-47. In light of the disclosure, a frequency spectrum is best interpreted as a representation of a set of properties or characteristics of an audio signal, which properties or characteristics correspond to discrete frequencies of that audio signal at a discrete point in time. "Frequency coefficient" thus must be a value that represents a property or characteristic of the frequency spectrum at a discrete range of frequencies. This reading is consistent with the plain meaning of the word "coefficient" as defined above.

There is no persuasive rationale for accepting Dolby's proposed construction. Nothing in the claim language or the specification points to the use of an "analysis filter bank." Dolby appears to find this proposed limitation in the '938 patent, but it provides no justification for looking to the '8 patent when construing this element of the '457 patent. There is no reason to import such language into the claim meaning, especially when it would result in additional limitations.

Accordingly, the Court construes "set of frequency coefficients" as a "set of values, each of which represents a property or characteristic of an audio signal at a discrete range of frequencies of that audio signal at a discrete point in time."

b. "tonality value"

Lucent proposes that the Court construe this term as a "value that reflects the degree of tone-like quality of the time sequence of audio signals and which varies with time." Dolby's proposed construction is an "index which measures the noise-like or tone-like nature of a signal derived from the Spectral Flatness Measure calculation described in the specification." Dolby thus asks the Court to include a limitation regarding the method by which a tonality value is obtained.

Lucent's proposed construction is the more appropriate of the two. It addresses the definition of "tonality value," not the method for obtaining such a value. The claim language itself indicates that tonality value reflects the tone-like quality of an audio signal, and the specification supports Lucent's view. For example, the inventors use the Spectral Flat Measure to "estimate the tonality of signals." '457:5/12-13. They also use the Spectral Flat Measure to "determine the noise-like or tone-like nature of the signal." '457:4/139-40. Thus, tonality of the signals is the tone-like or noise-like nature of the signal. The specification also describes different types of signals, which vary in their "tonality" according to the extent to which they are "tone-like." '457:5/12-13. It is appropriate to characterize a tonality value as a measure of a signal's tone-like or noise-like quality. FN1

Dolby's proposed construction would import inappropriate limitations into the subject claim. Nothing in the claim requires that the "tonality value" be obtained by a particular method. Although the patent specification describes the use of a "Spectral Flatness Measure" to derive the tonality value, such a limitation does not appear in the claim language. Moreover, Dolby's argument that "tonality value" is imprecise and conveys no clear meaning is incorrect. Dolby again focuses on *how* the tonality value is measured. For example, it cites its expert witness as saying "anything ... [can be] a measure of it." Responsive Brief, p. 6. However, when that same witness was asked "it's your understanding ... that the term 'tonality' is a clearly understood concept?," he stated: "The concept is clearly understood. I said at the beginning it's a degree to which something resembles a tone." Fisher Decl., Ex. D (Hall Depo. at 119:9-16).

Even if the method of measuring tonality value were considered part of the claim language, nothing in the specification requires limitation of the claim to the disclosed Spectral Flatness Measure method. Dolby points out that in some instances limitations from the specification may be imported into a claim. In such instances, the Court "looks to whether the specification refers to a limitation only as part of less than all possible embodiments or whether the specification read as a whole suggests that the very character of the invention requires the limitation be a part of every embodiment." *Alloc Inc. v. International Trade Commission*, 342 F.3d 1361, 1370 (Fed.Cir.2003). Where "the specification makes clear at various points that the claimed invention is narrower than the claim language might imply, it is entirely permissible and proper to limit the claim." *Id.* In this case, however, the specification does not make clear that the method used to measure "tonality value" is limited to the Spectral Flatness Measure. In fact, the specification anticipates other methods. For example, it states: "In practice, the use of the SFM to estimate the tonality of signals is useful." '457:5/12-13. Finally, as Dolby points out, an explicit reference for the "Spectral Flatness Measure" was omitted from the claim language during prosecution of the patent, and the Examiner specifically allowed more inclusive claim language that did not include a method, let alone a specific method. Lucent does note correctly that the Examiner allowed the final claim language in part because other claim language "stresses that ... tonality varies according to changes over time." Kellman Decl., Ex. E (Office Action, p. 1). Based on the foregoing discussion, the Court construes this element as the "value that reflects the tone-like or noise-like quality of an audio signal and which varies with time."

c. "tonality value reflecting the degree to which said time sequence of audio signals comprises tone-like quality"

In the parties' Joint Claim Construction Statement, Dolby asks the Court to construe this language as "either the tonality value increases as the time sequence of audio signals becomes more tone-like or, alternatively, the tonality value decreases as the time sequence of audio signals becomes more tone-like." However, in its Responsive Brief Dolby changes its proposal to: "a continuum such that either the tonality value increases as the time sequence of audio signals becomes more tone-like or, alternatively, the tonality value decreases as the time sequence of audio signals becomes more tone-like." As with the preceding element, Lucent proposes: "value that reflects the degree of tone-like quality of the time sequence of audio signals and which varies with time."

Lucent points out that the claim language does not require the tonality value to change with each change of tone-like quality. Rather, because the tonality value merely reflects tone-like quality, several values of tone-like quality could be represented by a constant tonality value. The claim language supports Lucent's argument. Rather than stating that tonality value must change with tone-like quality, it states that it reflects the tone-like quality degree. Although "degree" might more appropriately conjure up a continuum and not a binary measurement, "degree" in the claim refers to "tone-like quality" and not "tonality value." Thus, even

if the Court were to accept Dolby's argument regarding the meaning of degree, only the tone-like quality variable would be represented as a continuum. The "tonality value" could be a binary or some other type of reflection of the tone-like quality continuum. FN2

Accordingly, the Court construes this element as "value that reflects the degree of tone-like or noise-like quality of an audio signal and which varies with time."

d. "generating at least one tonality value, each group having an associated tonality value, said at least one tonality value reflecting the degree to which said time sequence of audio signals comprises tone-like quality"

Dolby asks the Court to construe this language as "generating at least one index which measures the noise-like or tone-like nature of a signal derived from the Spectral Flatness Measure calculation described in the specification, where the index increases as the time sequence of audio signals becomes more tone-like or, alternatively, the index decreases as the time sequence of audio signals becomes more tone-like." Lucent proposes: "generating one or more values that reflect the degree of tone-like quality of the time sequence of audio signals and which vary with time." The parties do not support their constructions in their papers.

The Court has construed "tonality value" and "tonality value reflecting the degree to which said time sequence of audio signals comprises tone-like quality" in the preceding sections of this Order. "Group" clearly refers to subpart (a) of claim 1, which claims grouping of frequency coefficients representing a portion or all of an audio signal. Accordingly, the Court construes this element as "generating, for each group of frequency coefficients representing a portion or all of an audio signal, at least one value that reflects the degree of tone-like or noise-like quality of the portion of the audio signal represented by that group of frequency coefficients and which varies with time." FN3

e. "noise masking threshold"

Other than indicating that "noise" is masked, the claim language of this clause provides little insight into the meaning of the term. The Court must consult the intrinsic and, if necessary, extrinsic evidence to clarify this ambiguous language. Lucent's proposed construction-"signal-dependent, perceptually-based auditory threshold that estimates the level below which signals will be perceptually masked"-suggests that any signal, not just noise, may be masked. However, neither the claim language nor the specification supports such a broad construction. The claim language indicates that "noise" is masked. Although the specification does mention "masking of signals by signals," '457:4/9, it does so in the context of masking in general rather than "noise masking" in particular. This element therefore must be limited to masking of noise, not masking of signals in general.

The claim language does not indicate clearly what "noise" is masked or even what "noise" means. The specification discusses masking of quantizing noise, describing the invention as a "technique for the masking of quantizing noise in the coding of audio signals." '457:abstract. It also indicates that a "signal-dependent threshold of masking" is the level below which "quantizing noise" is inaudible. '457:1/36-37. "Quantization noise" is "the inherent distortion introduced in the process of quantization." IEEE Standard Dictionary of Electrical and Electronics Terms, 2nd ed. In describing the psychoacoustic threshold, the specification refers to an article by one of the inventors. That article describes a process that "estimates a threshold that represents the maximum level of *injected* noise that will be inaudible when added to the input signal." Fisher Decl., Ex. DD, p. 2 (J.D. Johnston, "Transform Coding of Audio Signals Using Perceptual Noise Criteria," IEEE Journal of Selected Areas in Communications, Feb. 1988) (emphasis added). Lucent's

expert witness, Dr. Jayant, explains that the inventors used "the results from human auditory perception" to control and manage "the distortion introduced by the coding process so that it would be inaudible to most people. In other words the distortion would be 'masked' by the audio signal itself." Kellman Decl., Ex. D, p. 3 (Jayant Depo.). Dr. Jayant also states that the masking threshold is used "to estimate the amount of quantization noise that can be tolerated without perceived distortion," *id.* at 8, and that "[n]oise, in this case, refer[s] to the signal distortion caused in the compression process." Fisher Decl., Ex. F (Jayant Depo. at 46:3-4). Finally, Lucent noted at the hearing that the noise masking threshold "rules the quantization level," Hearing, October 15, 2003, Slide Hall38, and that "[q]uantization introduces noise into the signal and you try to quantize so that any resulting distortion in the signal for noise will be underneath the masking curve," Hearing, October 15, 2003, Transcript p. 15. In the context of the claim language itself (which states "noise masking threshold"), the specification, and this extrinsic evidence, the noise that is masked must be the quantizing noise, that is, the noise that is introduced (or "injected") by the coding (or compression) process.

The specification suggests that "masking" means "imperceptible to the human auditory system." It is clear that the purpose of the invention is to minimize perception of such noise by the human ear: "The primary goal ... is to implement the use of a coding threshold that is adjusted in a way that is responsive to the sensitivities of the human ear." '457:2/46-49. The specification also describes a method that uses "psychoacoustic processing" for determining the threshold. '457:1/35. The remainder of the specification describes the inventors' improvement, which is a new and different method for determining "a better psychoacoustic threshold." '457:1/48-49. Additionally, the evidence discussed in the prior paragraph relating to quantizing noise characterizes noise masking in terms of perceptibility of that noise by the human auditory system. The proper construction of this element thus is "a psychoacoustically derived estimated value below which quantizing noise is not perceived by the human auditory system." FN4

Lucent's proposal adds the limitation of signal dependency. However, nothing in the claim language refers to signal dependency. Although the inventors cite a reference that discusses a "signal-dependent threshold of masking," '457:1/36-37, neither the specification nor the claim indicates that the limitation of signal dependency should be read into the claim. While it might be true that the masking threshold necessarily varies according to the audio signal, Opening Brief, p. 11, the claim does not include such language.

Dolby proposes the following construction: "level that varies as a function of frequency across the bandwidth of a signal below which sounds are made inaudible or are 'masked' by louder spectral components in a signal." The Court will not read such limitations into the claim. Nothing in the claim language indicates that the noise masking threshold varies according to frequency. The specification describes both noise masking thresholds that vary across frequencies and those that are constant. *See* '457:5/55-60.

The Court construes "noise masking threshold" as "a psychoacoustically derived estimated value below which quantizing noise is not perceived by the human auditory system."

f. "generating at least one noise masking threshold"

Dolby asks the Court to construe this language as "generating at least one level that varies as a function of frequency across the bandwidth of a signal below which sounds are made inaudible or are 'masked' by louder spectral components in a signal." Lucent proposes: "generating one or more signal-dependent, perceptually-based auditory thresholds that estimate the level below which signals will be perceptually masked." The parties do not support their constructions in their papers. For the reasons stated in the analysis

supporting the Court's construction of the preceding element, the Court construes this element as "generating at least one psychoacoustically derived estimated value below which quantizing noise is not perceived by the human auditory system."

g. "being based upon"

Lucent asks the Court to construe this language as "using as a basis." Dolby does not propose a construction. Nothing in the specification imparts a special meaning to these words. The plain meaning of "based upon" is "having as its basis." For example, the verb form of "base" is "to place or establish on a base or basis; ground." Random House Dictionary of the English Language, 2nd ed., unabridged. "Basis" is defined as "anything upon which something is based; fundamental principle; groundwork," *id.*, and "something on which something else is established or based." Webster's Ninth New Collegiate Dictionary. The claim language and the specification support this construction. For example, it is clear that the noise masking threshold is determined, at least in part, by the tonality value. That is, tonality value is a component in the determination of the noise masking threshold; the tonality value forms a basis for the noise masking threshold. Accordingly, the Court construes this element as "having as its basis."

h. "noise masking threshold being based upon at least a portion of said at least one tonality value"

Dolby argues that, because the claim includes the language "being based upon," this is a step-plus-function claim pursuant to 35 U.S.C. s. 112, para. 6. This argument is without merit. Not only does the claim not use the language "steps for," but there is no indication that a function is described in terms of steps. 35 U.S.C. s. 112, para. 6 is "implicated only when steps *plus function* without acts are present." *O.I. Corp. v. Tekmar Co., Inc.*, 115 F.3d 1576, 1583 (Fed.Cir.1997). Instead, the claim language expressly limits "noise masking threshold" to a subset derived, at least in part, from a "tonality value." The Court will not limit this claim element to the embodiment described in the specification.

Moreover, the claim language fairly accurately captures the disclosed invention. The noise masking threshold is "based upon at least a portion of said at least one tonality value." The tonality value is the "value that reflects the tone-like or noise-like quality of an audio signal and which varies with time." For example, a disclosed noise masking threshold is comprised of two thresholds depending on whether the signal involves noise masking tone or tone masking noise. '457:4/29-41. Different formulas for determining the noise masking threshold are used for each. The extent to which a signal is noise-like or tone-like is reflected in its "tonality value." Thus, the noise masking threshold varies depending on tonality value.

The Court construes this element as "a psychoacoustically derived estimated value below which quantizing noise is not perceived by the human auditory system and which has as its basis at least one portion of said value that reflects the tone-like or noise-like quality of an audio signal and which varies with time."

i. "quantizing"

Lucent proposes: "representing a value between certain limits by a value chosen from a limited number of values selected to cover the range." Lucent bases its construction on the definition found in the McGraw-Hill Electronics Dictionary, 6th ed. Dolby proposes: "dividing a range of values into a finite number of subranges, each of which is represented by an assigned value within the subrange." It bases its construction on the IEEE Standard Dictionary of Electrical and Electronics Terms, 2nd ed. The parties seem to agree that the value that represents the quantized value must be from within the subrange that contains the quantized value; their only dispute concerns the clarity of the construction. Accordingly, the Court construes this

element as "dividing a range of values into a finite number of subranges, each subrange represented by an assigned value from within the subrange."

B. Disputed terms of claim 5 of the '457 patent.

1. Disputed elements.

The text of Claim 5 is set forth below, with the disputed terms highlighted in bold type. "5. The method of claim 1 wherein each said block is representable by a number of bits, said number of bits having a **predetermined range**, said **quantizing** is based on said number of bits."

2. Analysis.

a. "predetermined range"

Lucent proposes: "predefined limits." Dolby proposes: "the range is determined in advance but is otherwise unspecified." Dolby admits that "[n]othing about Claim 5 specifies the range to which the 'predetermined range' of bits must be confined, or states anything else about the range." Responsive Brief, p. 18. Thus, there is no additional limitation requiring further specification. The Court will not read an additional limitation into the claim and will construe the element as "predefined limit."

b. "quantizing"

For the reasons stated above with respect to claim 1, the Court construes this element as "dividing a range of values into a finite number of subranges, each subrange represented by an assigned value from within the subrange."

C. Disputed term of claim 6 of the '457 patent.

1. Disputed element.

The text of Claim 6 is set forth below, with the disputed terms highlighted in bold type.

6. The method of claim 5 wherein said step of quantizing said at least one frequency coefficient in said at least one group comprises quantizing all frequency coefficients in said first set of frequency coefficients and wherein said method further comprising, for each block, the steps of:

(a) generating an amount of bits needed to represent said first **set of frequency coefficients** in a quantized form;

(b) comparing said amount of bits to said number of bits;

(c) adjusting each said at least one noise masking threshold; and

(d) repeating set (d) of claim 1 and steps (a) through (c) until said amount of bits is within said predetermined range of said number of bits.

2. Analysis- "set of frequency coefficients"

For the reasons stated above with respect to claim 1, the Court construes this element as a "set of values, each of which represents a property or characteristic of an audio signal at a discrete range of frequencies of that audio signal at a discrete point in time."

D. Disputed terms of claim 10 of the '457 patent.

1. Disputed elements.

The text of Claim 10 is set forth below, with the disputed terms highlighted in bold type.

10. A storage medium manufactured in accordance with a process comprising the steps of:

(a) processing an ordered time sequence of audio signals partitioned into a set of ordered blocks, each said block having a discrete frequency spectrum comprising a first **set of frequency coefficients**; and

(b) for each of said blocks:

(1) grouping said first **set of frequency coefficients** into at least one group, each group comprising at least one frequency coefficient;

(2) **generating at least one tonality value, each group having an associated tonality value, said at least one tonality value reflecting the degree to which said time sequence of audio signals comprises tone-like quality;**

(3) **generating at least one noise masking threshold, each said at least one noise masking threshold being based upon at least one tonality value;**

(4) **quantizing** at least one frequency coefficient in said at least one group resulting in a set of quantized frequency coefficients, said quantizing **based upon** said at least one **noise masking threshold;**

(5) **applying a recording signal to said storage medium,** said recording signal comprising signals representing said set of quantized frequency coefficients; and

(6) **recording said recording signal onto said storage medium.**

2. Analysis.

a. "set of frequency coefficients"

For the reasons stated above with respect to claim 1, the Court construes this element as a "set of values, each of which represents a property or characteristic of an audio signal at a discrete range of frequencies of that audio signal at a discrete point in time."

b. "tonality value"

For the reasons stated above with respect to claim 1, the Court construes this element as the "value that reflects the tone-like or noise-like quality of an audio signal and which varies with time."

c. "tonality value reflecting the degree to which said time sequence of audio signals comprises tone-like quality"

For the reasons stated above with respect to claim 1, the Court construes this element as "value that reflects the degree of tone-like or noise-like quality of an audio signal and which varies with time."

d. "generating at least one tonality value, each group having an associated tonality value, said at least one tonality value reflecting the degree to which said time sequence of audio signals comprises tone-like quality"

For the reasons stated above with respect to claim 1, the Court construes this element as "generating for each group of frequency coefficients representing a portion or all of an audio signal at least one value that reflects the degree of tone-like or noise-like quality of the portion of the audio signal represented by that group of frequency coefficients and which varies with time."

e. "noise masking threshold"

For the reasons stated above with respect to claim 1, the Court construes this element as "a psychoacoustically derived estimated value below which quantizing noise is not perceived by the human auditory system."

f. "generating at least one noise masking threshold"

For the reasons stated above with respect to claim 1, the Court construes this element as "generating at least one psychoacoustically derived estimated value below which quantizing noise is not perceived by the human auditory system."

g. "being based upon"

For the reasons stated above with respect to claim 1, the Court construes this element as "having as its basis."

h. "noise masking threshold being based upon at least one tonality value"

For the reasons stated above with respect to claim 1, the Court construes this element as "a psychoacoustically derived estimated value below which quantizing noise is not perceived by the human auditory system and which has as its basis at least one portion of said value that reflects the tone-like or noise-like quality of an audio signal and which varies with time."

i. "quantizing"

For the reasons stated above with respect to claim 1, the Court construes this element as "dividing a range of values into a finite number of subranges, each subrange represented by an assigned value from within the subrange."

j. "applying a recording signal to said storage medium"

Lucent proposes: "adapting a recording signal for the purpose of recording the signal to a storage medium."
Dolby proposes: "putting a recording signal on said storage medium."

It is apparent from Exhibit H of Lucent's Declaration of Alan S. Kellman that the parties rely on different definitions of "apply." Lucent cites the second definition: "To put to or adapt for a special use[, for example:] applies all her money to her mortgage." American Heritage Dictionary of the English Language, 4th ed. Dolby's construction is captured in the first definition: "To bring into nearness or contact with something; put on, upon, or to." *Id.* The parties have not pointed to, and the Court has not found, any elucidating intrinsic evidence.

The Court does find, however, Dolby's construction more persuasive. "Applying" the recording signal is the process of transferring the signal to the storage medium. The claim language indicates that the signal is (1) applied to and then (2) recorded onto the storage medium. The plain meaning of the first step is that the signal is brought into contact with the storage medium. This interpretation is consistent with at least one plain meaning of "apply." For example, apply means "to bring into physical contact with or close proximity to" and "to place in contact with; lay or spread on." Random House Unabridged Dictionary, 2nd ed. In the context of this invention, bringing data representing an audio signal into physical contact with a storage medium means transferring the signal to the storage medium. Nothing in the claim or specification indicates that "applying" the recording signal includes a step of "adaptation." The Court construes this element as "transferring a recording signal to said storage medium."

k. "recording said recording signal onto said storage medium"

Lucent proposes: "setting down the recording signal on the storage medium for preservation." Dolby proposes: "fixing the recording signal onto the storage medium after it has been put on the medium." Lucent's proposal more accurately describes the preceding element. An appropriate construction results from a hybrid of the two proposals. The preceding element (applying) involves transfer of the signal to the storage medium such that it is in contact with it. The recording element involves fixing the signal onto the storage medium so that it is preserved. Accordingly, the Court construes this element as "fixing the recording signal onto the storage medium for preservation."

E. Disputed Term of Claim 12 of the '457 patent.

1. Disputed element.

The text of Claim 12 is set forth below, with the disputed terms highlighted in bold type. "12. The method of claim 10 wherein said storage medium is a **digital storage means.**"

2. Analysis- "digital storage means"

Lucent proposes: "any device that stores digital information." Dolby argues that, because it includes the word "means," this element invokes 35 U.S.C. s. 112, para. 6. However, a claim is not necessarily a means-plus-function claim simply because the word "means" is used. *Cole v. Kimberly-Clark Corp.*, 102 F.3d 524, 531 (Fed.Cir.1996). 35 U.S.C. s. 112, para. 6 applies only to an element that is "expressed as a means ... for performing a specified function without the recital of structure ... in support thereof," *id.*, and which does not "recite a definite structure which performs the described function," *Cole*, 102 F.3d at 531. This element does not claim a means for performing a function. Moreover, it recites a structure: the "digital storage means." Accordingly, the Court construes this element as "a device that stores digital information."

F. Disputed Terms of Claim 17 of the '457 patent.

1. Disputed elements.

The text of Claim 12 is set forth below, with the disputed terms highlighted in bold type.

17. A method for generating signals representing an ordered time sequence of audio signals partitioned into a set of ordered blocks, each said block having a discrete frequency spectrum comprising a first **set of frequency coefficients**, the method comprising, for each of said blocks, the steps of:

- (a) grouping said first **set of frequency coefficients** into a plurality of groups, each group in said plurality of groups representing a **critical band of frequencies** and comprising at least one frequency coefficient;
- (b) **generating a tonality value for each said group in said plurality of groups of frequency coefficients, said tonality values reflecting the degree to which said time sequence of audio signals comprises tone-like quality;**
- (c) **generating a noise masking threshold** for each said group in said plurality of groups of frequency coefficients, each said **noise masking threshold being based upon said tonality value for the respective group;** and
- (d) **quantizing** each frequency coefficient in said at least one frequency coefficient in each said group, said quantizing **being based upon said noise** masking threshold associated with said group and a predetermined number of bits.

2. Analysis.

a. "set of frequency coefficients"

For the reasons stated above with respect to claim 1, the Court construes this element as a "set of values, each of which represents a property or characteristic of an audio signal at a discrete range of frequencies of that audio signal at a discrete point in time."

b. "critical band of frequencies"

Lucent proposes: "frequency band within which the masking behavior of the human ear remains approximately constant." Dolby proposes: "frequency bands of varying width of the auditory spectrum where the masking behavior of the human ear remains approximately constant."

Evidently Dolby seeks to add a limitation constraining the width of the critical bands to "one Bark." However, Dolby's proposed construction does not include the term "Bark," nor is there any basis for adding either the desired or suggested limitation. The claim language says nothing about limiting a critical band to varying widths or the range of one Bark. Referring to the specification for clarification of "critical band," it is clear that a critical band is one "where the masking behavior of the human ear remains approximately constant." '457:3/18-19. While it is true that this same portion of the specification discusses the Bark Spectrum, the claim language need not be defined by reference to one particular type of critical band spectrum. The Court will not import additional limitations into the claim and will construe this element as "frequency band within which the masking behavior of the human ear remains approximately constant."

c. "tonality value"

For the reasons stated above with respect to claim 1, the Court construes this element as the "value that reflects the tone-like or noise-like quality of an audio signal and which varies with time."

d. "tonality values reflecting the degree to which said time sequence of audio signals comprises tone-like quality"

For the reasons stated above with respect to claim 1, the Court construes this element as "value that reflects the degree of tone-like or noise-like quality of an audio signal and which varies with time."

e. "generating a tonality value for each said group in said plurality of groups of frequency coefficients, said tonality values reflecting the degree to which said time sequence of audio signals comprises tone-like quality"

For the reasons stated above with respect to claim 1, the Court construes this element as "generating for each group of frequency coefficients representing a portion of an audio signal a value that reflects the degree of tone-like or noise-like quality of the portion of the audio signal represented by that group of frequency coefficients and which varies with time." The construction is changed slightly from that of claim 1 because this claim is limited to a plurality of groups.

f. "noise masking threshold"

For the reasons stated above with respect to claim 1, the Court construes this element as "a psychoacoustically derived estimated value below which quantizing noise is not perceived by the human auditory system."

g. "generating a noise masking threshold"

For the reasons stated above with respect to claim 1, the Court construes this element as "generating a psychoacoustically derived estimated value below which quantizing noise is not perceived by the human auditory system." The construction is changed slightly because this claim language is not limited to "at least one."

h. "being based upon"

For the reasons stated above with respect to claim 1, the Court construes this element as "having as its basis."

i. "noise masking threshold being based upon said tonality value for the respective group"

For the reasons stated above with respect to claim 1, the Court construes this element as "a psychoacoustically derived estimated value below which quantizing noise is not perceived by the human auditory system and which has as its basis said value that reflects the tone-like or noise-like quality of an audio signal for the respective group and which varies with time." The construction is changed slightly because this claim language is not limited to "at least one" and is limited to "the respective group." Both the plain meaning and the context of the claim language indicate that "the respective group" refers to the group of frequency coefficients for which the noise masking threshold was generated.

j. "quantizing"

For the reasons stated above with respect to claim 1, the Court construes this element as "dividing a range of values into a finite number of subranges, each subrange represented by an assigned value from within the subrange."

G. Disputed Terms of Claim 1 of the '938 patent.

1. Disputed elements.

The text of claim 1 is set forth below, with the disputed terms highlighted in bold type.

1. A method of coding an audio signal comprising:

(a) converting a time domain representation of the audio signal into a frequency domain representation of the audio signal, the frequency domain representation comprising a **set of frequency coefficients**;

(b) calculating a **masking threshold based upon the set of frequency coefficients**;

(c) **using a rate loop processor in an iterative fashion** to determine a **set of quantization step size coefficients** for use in encoding the **set of frequency coefficients**, said set of quantization step size coefficients **determined by using the masking threshold and an absolute hearing threshold**; and

(d) coding the **set of frequency coefficients based upon the set of quantization step size coefficients**.

2. Incorporation by reference.

Lucent supports its construction of the claims of the '8 patent by referring to both the '8 and '457 patents. Dolby argues that Lucent may not refer to the '457 patent because, at the time the '8 patent application was filed, the Manual of Patent Examining Procedure ("MPEP") prohibited incorporation by reference of a patent application, and the '457 patent had not issued and therefore remained an application. The MPEP at that time also prohibited incorporation by reference of a "U.S. patent or application which itself incorporates 'essential material' by reference." MPEP 608.01(p).

Lucent argues that the current version of the MPEP permits incorporation by reference of a "patent application publication" and that another court in this district has permitted incorporation by reference of a patent application as long as the Examiner had access to the co-pending application during prosecution. *Advanced Semiconductor Materials America, Inc. v. Applied Materials*, 922 F.Supp. 1439, 1449 (N.D.Cal.1996). The court noted in that case that the co-pending application issued, and thus became public, before issuance of the patent-in-suit. The crucial issue is whether a person having ordinary skill in the art would understand what the patent claims and describes. If the reference is available to the public and is referred to in the patent specification, then a person having ordinary skill in the art most likely would understand the claims and description.

Lucent's argument raises three questions. First, did the examiner have access to a co-pending application that indeed described the material that Lucent now claims is incorporated by reference? The '8 patent specification specifically incorporates by reference U.S. patent application Ser. No. 07/292,598. That application's specification appears to be identical to that of the '457 patent. *See* Fisher Decl., Ex. MM. Second, is the published '457 patent sufficient to describe the invention claimed in the '8 patent to a person

having ordinary skill in the art? The Court will consider this question with respect to each element below. Third, does the '457 patent incorporate *essential* material by reference? If so, does this fact preclude the '8 patent from incorporating the '457 patent by reference? Dolby does not describe what material was incorporated by reference, let alone how such material was essential. Accordingly, the Court will not prohibit, generally, reference to the '457 patent when construing the claims of the '8 patent.

3. Analysis.

a. "set of frequency coefficients"

Lucent and Dolby refer to their arguments as to this term in claim 1 of the '457 patent. (Lucent also points, without dispute by Dolby, to support in the '8 patent.) For the reasons stated above with respect to claim 1 of the '457 patent, the Court construes this element as a "set of values, each of which represents a property or characteristic of an audio signal at a discrete range of frequencies of that audio signal at a discrete point in time."

b. "masking threshold"

Lucent and Dolby refer to their arguments as to this element in claim 1 of the '457 patent. (Lucent again points, without dispute by Dolby, to support in the '8 patent.) Lucent treats the term "masking threshold" of the '8 patent in like manner as the term "noise masking threshold" of the '457 patent, and the '8 patent supports such an approach. The language of the '8 patent notes that it is "important that the coding techniques used to compress audio signals do not themselves introduce offensive components or artifacts." '938:2/25-27. It describes a perceptual coder that "introduc[es] noise associated with quantization of information bearing signals.... The goal is, of course, to introduce this noise in an imperceptible or benign way." '8:10/36-40. Finally, when describing how "to mask the quantization noise by the signal," '8:10/57, it discusses how "models produce an hypothetical masking threshold that rules the quantization level of each spectral component," '938:11/10-12. For these reasons and those stated above with respect to claim 1 of the '457 patent, the Court construes this element as "a psychoacoustically derived estimated value below which quantizing noise is not perceived by the human auditory system."

c. "based upon"

For the reasons stated above with respect to claim 1 of the '457 patent, the Court construes this element as "having as its basis."

d. "based upon the set of frequency coefficients"

Lucent and Dolby refer to their arguments regarding this element in claim 1 of the '457 patent. (Lucent also points to support in the '8 patent and Dolby does not dispute that support.) For the reasons stated above regarding claim 1 of the '457 patent, the Court construes this element as a "having as its basis a set of values, each of which represents a property or characteristic of an audio signal at a discrete range of frequencies of that audio signal at a discrete point in time."

e. "rate loop processor"

Lucent defines this element as a "processor (hardware and/or software) that operates to meet the required bit rate for a given application." Dolby proposes: "processor (hardware and/or software) that performs a process

in a loop to meet the required bit rate for a given application." Dolby thus seeks to add "performs a process in a loop" to Lucent's proposed construction. It points out that the claim language includes the word "loop." However, it goes even further in that it asks the Court to construe the loop itself as an iterative process. It refers to Webster's dictionary and expert testimony to support its contention that "loop" is an iterative process. Ultimately, Dolby seeks to impose a limitation whereby the rate loop processor must conduct at least two runs of processing, that is, it must repeat.

Lucent argues that the rate loop processor need not repeat a loop if its first round of computation concludes with a suitable result. It points to the '8 patent specification to support this construction. For example: "The quantizer/rate loop processor 206 used in the illustrative coder of FIG. 2 takes the outputs from the analysis bank and the perceptual model, and allocates bits, noise, and controls other system parameters so as to meet the required bit rate for the given application." '8:7/16-20. It appears from this description that "rate loop processor" need not perform its function by repeating its processing steps. Moreover, according to the plain meaning of "loop," even if a "loop" is performed, it need not be performed twice. Indeed, Dolby's expert witness, Dr. Brandenburg stated: "there may be rate loops where you go just once through." Fisher Decl., Ex. C (Brandenburg Depo. at 166:6-7). Accordingly, the Court construes this element as a "processor (hardware and/or software) that operates to meet the required bit rate for a given application."

f. "iterative fashion"

Lucent proposes: "the process of repeating a set of instructions a specified number of times or until a specific result is achieved." This proposal tracks, identically, a dictionary definition of "iteration." American Heritage Dictionary, 4th ed. Dolby proposes: "two or more times." Both proposals refer to the plain meaning of iteration and cite dictionaries. Lucent's definition includes Dolby's; the "process of repeating" necessarily implies "two or more times." Accordingly, the Court construes this element as "characterized by the process of repeating a set of instructions a specified number of times or until a specific result is achieved."

g. "using a rate loop processor in an iterative fashion"

Referring to the preceding two constructions, Lucent construes this combination as "the rate loop processor be operated iteratively until an acceptable bit rate is found." Lucent points to a preferred embodiment that does not require repetition. However, Lucent itself defined "iterative fashion" as including "repeating a set of instructions," Joint Claims Construction Brief, p. 15, and "iteration" as the "process of repeating a set of instructions," Brief, p. 23. The Court must adhere to the claim language if it is clear. Something is not repeated if it is performed only once. Accordingly, the Court construes this element as "using a processor (hardware and/or software), which operates to meet the required bit rate for a given application, to repeat a set of instructions a specified number of times or until a specific result is achieved." In other words, the loop performed by the rate loop processor may be performed repeatedly until a desired result is achieved.

h. "set of quantization step size coefficients"

This term does not appear in the '8 specification other than in the claims. Dolby asserts that the term is not known to those skilled in the art (although the term "quantization step size" is). Accordingly, Dolby argues that the term "quantization step size coefficient" should be limited to what is disclosed in the specification, which, according to Dolby, is an embodiment called the "utilized scale factor." In the parties' Joint Claim Construction Brief, Dolby proposes the following construction: "set of 'utilized scale factors' as described in the specification." Later, in its Responsive Brief, Dolby adds the relevant language from the specification to

its proposed construction. Responsive Brief, p. 25. Lucent argues that the language imported by Dolby describes just one embodiment of a method for obtaining the "quantization step size coefficient." Moreover, Lucent argues that "quantization step size" and "coefficient," individually, are well known terms. Lucent defines this element as a "set of values that determine the sizes of the steps between quantizer levels used for encoding."

Dolby impermissibly attempts to construe the term according to a method for obtaining the result that the term is intended to describe. In importing language from the specification, Dolby would require that the "quantization step size coefficient" be "iteratively derived by interpolating between a scale factor derived from a calculated threshold of hearing ... and a scale factor derived from the absolute threshold of hearing." '8:3/63-4/1. Nothing in the claim language indicates that this term must be defined according to one of the ways by which it is derived. "Quantization step size coefficient" (and "utilized scale factor" for that matter) may mean something independent from the method for deriving them. The element should be defined according to its identity and not by a method for deriving it.

Although the term "quantization step size coefficient" is not used in the specification, it is equivalent to "scale factor," which is described in the specification. Dolby agrees that the term is equivalent at least to "utilized scale factor," while Lucent argues that it is a factor used to multiply or divide the quantization step size, Reply Brief, p. 16. In the specification, "scale factors [are] used in quantizing the audio signal." '938:3/55-56. Indeed, "step size" and "scale factor" are closely related. For example: "The quantization process effects both spectral ... coefficients and scale factors. Spectral coefficients are clustered in bands, each band having *the same step size or scale factor*." '8:20/61-63 (emphasis added). The purpose of the invention is to maximize accuracy and minimize bit rate by setting the accuracy of quantizing. *See* '8:abstract; Fisher Decl., Ex. F (Jayant Depo. at 178:13-15). Quantizing accuracy is determined in part by a scale factor or step size. *Id.* "The present invention provides a mechanism for determining the scale factors to be used in quantizing the audio signal." '938:3/54-56. Thus, "quantization step size coefficient" and "scale factor" relate to a factor used in the quantizing process. Dr. Hall stated that he understood "quantization step size coefficients" to be "something that gets used in coders that has to do with quantization step sizes." Fisher Decl., Ex. D (Hall Depo. at 103:19-21). "Quantization step size" is a measure of the steps between quantization levels, and "quantization step size coefficient" (or "scale factor") is a factor that determines the "quantization step size."

Dolby's construction defines "set of quantization step size coefficients" according to only one specific embodiment in the specification. Nothing in the claim or the specification defines this element ("quantization step size coefficient") as being derived only from both masking and absolute hearing thresholds. Instead, the language imported by Dolby—"the utilized scale factor, is iteratively derived ... from a calculated threshold of hearing ... and the absolute threshold of hearing," '8:3/63-4:1—specifies that the utilized scale factor is obtained using those thresholds in that illustrative embodiment. The specification makes clear that "scale factors" can be derived in several different ways. For example, it describes quantizing by using a "factor (alpha) such that if all the initial thresholds are multiplied by this factor, the final total number of bits is smaller ... than the available number of bits." '8:21/14-16. Only if "at this point, neither the basic masking threshold nor absolute thresholds have provided an acceptable bit representation ..., an iterative procedure ... is employed to establish the interpolation factor[,] which is the "utilized scale factor." '8:21/44-48. Thus, several factors are used in this embodiment: (1) factors based solely on the individual thresholds and (2) the utilized scale factor, which is derived from a combination of the masking and absolute hearing thresholds. Finally, Lucent's expert, Dr. Jayant, states: "the patent in suit will not prevent you from making use of only the masking threshold" when determining the quantization step size.

Fisher Decl., Ex. F (Jayant Depo. at 188:6-7). Thus, the invention may use different types of scale factors to determine the level of quantization, that is, the sizes of the quantization steps.

The parties also make much of the addition of the word "coefficient" to "quantization step size." As noted above, Dolby asserts that the four-word term was unknown to a person having ordinary skill in the art, while the three-word term was well known. However, both parties define "coefficient" in this context as a factor by which something may be multiplied. Thus, the plain meaning of the four-word term is "a factor by which a quantization step size may be multiplied." Dolby argues that Lucent's expert witness, Dr. Jayant, acknowledged that "coefficient" was superfluous. However, a closer reading of his deposition suggests that Dr. Jayant views the *plural* "quantization step sizes" as equivalent to "quantization step size coefficient." This view is consistent with the use of this term in the specification and the claim. That is, each group of frequency coefficients has an individually determined "quantization step size." The scale factor or quantization step size coefficient determines the size of the steps. When there are multiple groups of frequency coefficients, there are multiple quantization step sizes and multiple quantization step size coefficients. Quantization step size thus may vary across groups of frequency coefficients by variable factors or coefficients.

Accordingly, looking to all of the evidence to provide insight into the meaning of the term "set of quantization step size coefficients," the Court construes this element as "set of factors, each of which is used to determine the size of the steps between quantization levels for discrete portions of the set of frequency coefficients."

i. "and"

Lucent proposes its plain meaning: "as well as." Dolby does not define this term independently. See below, Part III.G.3.k.

j. "absolute hearing threshold"

Lucent proposes: "threshold that approximates the quietest sounds that can be heard independent of the audio signal." Dolby proposes: "level that varies as a function of frequency which defines the lowest level of sound that can be heard; this threshold was standardized by the International Standards Organization."

Dolby disputes the use of the word "approximates," arguing that it is vague. It points to the specification, which describes the absolute hearing threshold as "the quietest sound that can be heard at the frequency corresponding to the scale factor." "8:22/56-58. Dolby claims that Lucent should have included "Absolute Hearing Threshold Tables" in the "8 specification and that without such tables the element is unclear to a person having ordinary skill in the art. Dolby therefore asks the Court to limit the claim to the threshold determined by the International Standards Organization.

Lucent argues that "[s]ince different people hear sounds differently, the 'absolute' hearing threshold is an estimate of the average human's hearing limits, based on years of auditory testing and research." Opening Brief, p. 26. Thus, the "absolute" hearing threshold is really an estimate. Use of the International Standards Organization is not described anywhere in the specification or prosecution history.

The Court construes "absolute hearing threshold" as "an estimate of the level at which the quietest sounds can be perceived by the human auditory system." Both parties admit that the thresholds discussed in the patents are estimates because no one can be certain that every possible person cannot hear such signals:

Lucent asks for a construction that includes the word "approximates," while Dolby asks for the inclusion of an empirically determined table. The specification supports the use of the word "estimate." For example, the '457 patent, whose application was incorporated by reference, describes one such method for estimating the level below which most people cannot hear. ' 457:5/44-46. Dolby also puts forth another such method arguing that it was meant to be in the "8 patent. Interpreting the claim according to the disclosure suggests that the claim language cannot mean the level below which every person cannot hear. Moreover, the Court's construction does not import unwarranted limitations into the claim, as would Dolby's proposal to limit the claim to one specific empirical measure of the level or Lucent's proposed language, "independent of the audio signal." Instead, it simply defines the term according to the meaning elucidated in the specification.

k. "determined by using the masking threshold and an absolute hearing threshold"

Lucent proposes: "determined by using the 'signal-dependent, perceptually-based auditory threshold that estimates the level below which signals will be perceptually masked' 'as well as' a 'threshold that approximates the quietest sounds that can be heard independent of the audio signal.'" Dolby proposes: "the set of quantization step size coefficients are determined by both a masking threshold and the absolute hearing threshold repeatedly within the claimed rate loop process."

Both Lucent and Dolby refer the Court to their proposed constructions of "noise masking threshold." The Court has construed "noise masking threshold" and "masking threshold" as "a psychoacoustically derived estimated value below which quantizing noise is not perceived by the human auditory system." The Court also has construed "absolute hearing threshold" as "an estimate of the level at which the quietest sounds can be perceived by the human auditory system." The Court construes the word "and" according to its plain meaning: "and" is a conjunction that signifies that both thresholds must be used. For example, in one embodiment, the specification describes the use of both thresholds in determining the utilized scale factor, which is one of the factors used to determine quantization step size. "8:22/39-67.

Nothing in the claim language of this element supports Dolby's proposed additional limitation: "repeatedly within the claimed rate loop process." Dolby evidently found this limitation from preceding language in the claim. The Court need not include such a limitation twice in the claim, especially when the latter term makes no reference to such a limitation. Although a rate loop processor is used "to determine a set of quantization step size coefficients" and the "quantization step size coefficients [are] determined by using the masking threshold and an absolute hearing threshold," nothing in the claim language indicates that one determinant must be performed by the other. The two determinants may be performed independently or in various orders.

Accordingly, the Court construes this element as "determined by using both of two thresholds: (1) a psychoacoustically derived estimated value below which quantizing noise is not perceived by the human auditory system and (2) an estimate of the level at which the quietest sounds can be perceived by the human auditory system."

H. Disputed terms of claim 2 of the '938 patent.

1. Disputed elements.

The text of claim 2 is set forth below, with the disputed terms highlighted in bold type. "2. The method of claim 1 wherein the **set of frequency coefficients** are **MDCT coefficients**."

2. Analysis.

a. "set of frequency coefficients"

Lucent and Dolby refer to their arguments as to this element in claim 1 of the '457 patent. For the reasons stated above with respect to claim 1 of the '457 patent, the Court construes this element as a "set of values, each of which represents a property or characteristic of an audio signal at a discrete range of frequencies of that audio signal at a discrete point in time."

b. "MDCT coefficients"

Lucent proposes: "modified discrete cosine transform coefficients." Dolby proposes: "coefficients generated by the modified discrete transform described in Princen & Bradley, 'Analysis/Synthesis Filter Bank Design Based on Time Domain Alias Cancellation,' IEEE Trans. ASSP, Vol. 34, No. 5, October 1986." In other words, Dolby looks to the specification for an exact embodiment, as if this were a means-plus-function claim. Lucent notes that it included this specific reference in the specification only as an example, and in fact preceded it with "e.g."

The Court adopts Lucent's proposal, because it simply defines the acronym used in the claim. No further limitations need be imposed for a person with ordinary skill in the art to understand the meaning of the claim.

I. Disputed Terms of Claim 3 of the '938 patent.

1. Disputed elements.

The text of claim 3 is set forth below, with the disputed terms highlighted in bold type. "3. The method of claim 1 wherein the **using the rate loop processor in the iterative fashion** is discontinued when a cost, measured by the number of bits necessary to code the **set of frequency coefficients**, is within a **predetermined range**."

2. Analysis.

a. "rate loop processor"

For the reasons stated above with respect to claim 1 of the '8 patent, the Court construes this element as "processor (hardware and/or software) that operates to meet the required bit rate for a given application."

b. "iterative fashion"

For the reasons stated above with respect to claim 1 of the '8 patent, the Court construes this element as "characterized by the process of repeating a set of instructions a specified number of times or until a specific result is achieved."

c. "using the rate loop processor in the iterative fashion"

For the reasons stated above with respect to claim 1 of the '8 patent, the Court construes this element as "using a processor (hardware and/or software), which operates to meet the required bit rate for a given application, to repeat a set of instructions a specified number of times or until a specific result is achieved."

d. "set of frequency coefficients"

For the reasons stated above with respect to claim 1 of the '457 patent, the Court construes this element as a "set of values, each of which represents a property or characteristic of an audio signal at a discrete range of frequencies of that audio signal at a discrete point in time."

e. "predetermined range"

Lucent proposes: "predefined limits." Dolby proposes: "the range is determined in advance but is otherwise unspecified." Dolby refers to its discussion of claim 5 of the '457 patent, and Lucent points to support in the '8 patent. For the reasons stated above with respect to claim 5 of the '457 patent, the Court construes this element as a "predefined limit."

J. Disputed terms of claim 4 of the '938 patent.

1. Disputed elements.

The text of claim 4 is set forth below, with the disputed terms highlighted in bold type.

4. A decoder for decoding a **set of frequency coefficients** representing an audio signal, the decoder comprising:

(a) **means for receiving the set of coefficients**, the **set of frequency coefficients** having been encoded by:

(1) converting a time domain representation of the audio signal into a frequency domain representation of the audio signal comprising the **set of frequency coefficients**;

(2) calculating a **masking threshold based upon the set of frequency coefficients**;

(3) **using a rate loop processor in an iterative fashion** to determine a **set of quantization step size coefficients** needed to encode the **set of frequency coefficients**, said set of quantization step size coefficients **determined by using the masking threshold and an absolute hearing threshold**; and

(4) coding the **set of frequency coefficients based upon the set of quantization step size coefficients**; and

(b) **means for converting the set of coefficients to a time domain signal.**

2. Analysis.

a. "set of frequency coefficients" or "set of coefficients"

For the reasons stated above with respect to claim 1 of the '457 patent, the Court construes this element as a "set of values, each of which represents a property or characteristic of an audio signal at a discrete range of frequencies of that audio signal at a discrete point in time."

b. "means for receiving the set of coefficients"

The parties agree that this element is drafted in means-plus-function format pursuant to 35 U.S.C. s. 112,

para. 6. The function of the means term is to receive the set of coefficients in claim 4. Dolby argues that the corresponding structure is "digital signal processor (DSP) hardware, such as the AT & T DSP16 or DSP32C, very large scale integration (VLSI) hardware, and hybrid DSP/VLSI hardware" as disclosed in the '8 specification. Lucent does not point to any other structure disclosed in the '8 patent, but instead relies on a structure disclosed in the '457 patent. Lucent argues that it may do so because the '457 patent was incorporated by reference into the '8 patent. Lucent proposes: "the elements of a decoder capable of receiving a set of frequency coefficients, whether implemented in hardware or software, including DSPs, ASICs, and/or native signal processors, and equivalents thereof."

The Federal Circuit, in *Atmel Corp. v. Information Storage Devices, Inc.*, 198 F.3d 1374 (Fed.Cir.1999), indicated that one may use sources that were incorporated by reference to define the disclosed structure of a means-plus-function claim if a person having ordinary skill in the art would do so. Nonetheless, "Paragraph 6 does not contemplate the kind of open-ended reference to extrinsic works that para. 1, the enablement provision, does." *Id.* at 1382. Thus, the '457 patent disclosure only can be used to help define the structure disclosed in the '8 patent if a person having ordinary skill in the art would use that disclosure to help define the structure. Moreover, to "incorporate material by reference, the host document must identify with detailed particularity what specific material it incorporates and clearly indicate where that material is found in the various documents." *Advanced Display Systems, Inc. v. Kent State University*, 212 F.3d 1272 (Fed.Cir.2000).

The portion of the '8 patent specification that refers to the decoder states: the "stereophonic decoder has a very simple structure as shown in Fig. 12." Figure 12 is a box diagram representing the technique. This portion of the specification describes "illustrative embodiments," which "may comprise digital signal processor (DSP) hardware, such as the AT & T DSP 16 or DSP32C, and software performing the operations discussed below of the present invention." '938:23/59-62. Although the patent discusses several operations, the only function claimed here is that of "receiving the set of coefficients." The '8 patent also discloses very large scale integration (VLSI) hardware embodiments and hybrid DSP/VLSI embodiments. These are the only structures described in the specification. Nothing in the specification indicates to a person having ordinary skill in the art that they should refer to the '457 patent to find the structure underlying this element. The disclosed structure is not ambiguous and the specification does not direct the reader to any portion of the '457 patent for incorporation of further structures. No reference to the '457 patent is required to understand the terms.

When the patent specification describes multiple embodiments each of those embodiments may be claimed pursuant to 35 U.S.C. s. 112, para. 6. *Serrano v. Telular Corp.*, 111 F.3d 1578, 1583 (Fed.Cir.1997). Accordingly, the Court construes this element as having the following structure: "digital signal processor (DSP) hardware, such as the AT & T DSP16 or DSP32C, very large scale integration (VLSI) hardware, or hybrid DSP/VLSI hardware, and software."

c. "masking threshold"

For the reasons stated above with respect to claim 1 of the '8 patent, the Court construes this element as "a psychoacoustically derived estimated value below which quantizing noise is not perceived by the human auditory system."

d. "based upon"

For the reasons stated above with respect to claim 1 of the '457 patent, the Court construes this element as

"having as its basis."

e. "based upon the set of frequency coefficients"

For the reasons stated above with respect to claim 1 of the '457 patent, the Court construes this element as a "having as its basis a set of values, each of which represents a property or characteristic of an audio signal at a discrete range of frequencies of that audio signal at a discrete point in time."

f. "rate loop processor"

For the reasons stated above with respect to claim 1 of the '8 patent, the Court construes this element as a "processor (hardware and/or software) that operates to meet the required bit rate for a given application."

g. "iterative fashion"

For the reasons stated above with respect to claim 1 of the '8 patent, the Court construes this element as "characterized by the process of repeating a set of instructions a specified number of times or until a specific result is achieved."

h. "using a rate loop processor in an iterative fashion"

For the reasons stated above with respect to claim 1 of the '8 patent, the Court construes this element as "using a processor (hardware and/or software), which operates to meet the required bit rate for a given application, to repeat a set of instructions a specified number of times or until a specific result is achieved."

i. "set of quantization step size coefficients"

For the reasons stated above with respect to claim 1 of the '8 patent, the Court construes this element as "set of factors, each of which is used to determine the size of the steps between quantization levels for discrete portions of the set of frequency coefficients."

j. "and"

For the reasons stated above with respect to claim 1 of the '8 patent, the Court construes this element as "a conjunction that signifies that both thresholds must be used."

k. "absolute hearing threshold"

For the reasons stated above with respect to claim 1 of the '8 patent, the Court construes this element as the "an estimate of the level at which the quietest sounds can be perceived by the human auditory system."

l. "determined by using the masking threshold and an absolute hearing threshold"

For the reasons stated above with respect to claim 1 of the '8 patent, the Court construes this element as "determined by using both of two thresholds: (1) a psychoacoustically derived estimated value below which quantizing noise is not perceived by the human auditory system and (2) an estimate of the level at which the quietest sounds can be perceived by the human auditory system."

m. "means for converting the set of coefficients to a time domain signal"

The parties agree that this element is drafted in means-plus-function format pursuant to 35 U.S.C. s. 112, para. 6. The function of the means term is to convert the set of coefficients to a time domain signal. As with the preceding means-plus-function element, Dolby argues that the corresponding structure is "digital signal processor (DSP) hardware, such as the AT & T DSP 16 or DSP32C, very large scale integration (VLSI) hardware, and hybrid DSP/VLSI hardware" as disclosed in the '8 specification. Lucent refers to the structure disclosed in Fig. 12 of the '8 patent, but it also relies on a structure disclosed in the '457 patent. Lucent argues that it may do so because the '457 patent was incorporated by reference into the '8 patent. Lucent proposes: "a decoder capable of converting a set of frequency coefficients into a time domain signal, whether implemented in hardware or software, including DSPs, ASICs, and/or native signal processors, and equivalents thereof."

Lucent and Dolby refer to their arguments as to this element discussed in Part III.J.2.b of this Order. For the reasons discussed previously, the Court declines to look for the structure in the '457 patent. Accordingly, the Court construes this element as having the following structure: "digital signal processor (DSP) hardware, such as the AT & T DSP16 or DSP32C, very large scale integration (VLSI) hardware, or hybrid DSP/VLSI hardware, and software."

IV. CONCLUSION

For the reasons discussed herein, the Court construes the disputed claim terms as set forth above.

IT IS SO ORDERED.

FN1. At oral argument, Lucent agreed that it would be proper to add the words "noise-like" to the construction of "tonality value."

FN2. In light of the clear claim language, and the Court's construction of "tonality value," the Court need not look to the specification. However, the Court notes that the specification describes a scheme whereby the tonality value does not change between tone-like quality values of -60dB to -75dB. '457:4/58-63.

FN3. See above Part III.A.2.a. for the definition of "frequency coefficient."

FN4. The term "estimated" is included to indicate that thresholds are derived empirically and there may be a small group of people who can perceive the auditory signal, even below the threshold. For example, the '457 patent discusses the "masking estimates" from various publications. '457:4/3-15.

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Dolby Laboratories, Inc. v. Lucent Technologies Inc.

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