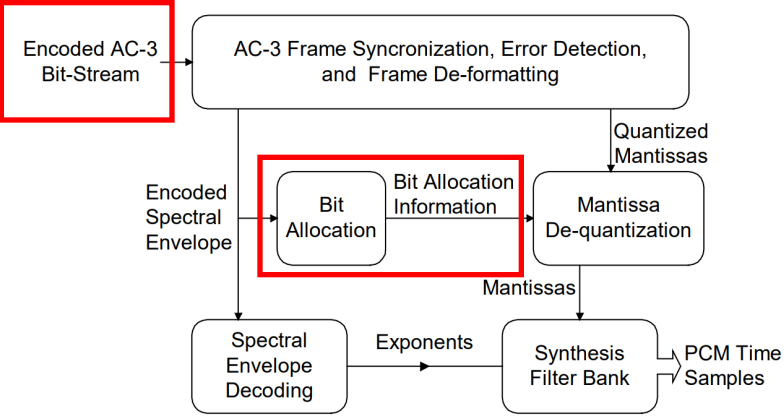


EXHIBIT B

Claim Chart for U.S. Pat. No. 6,339,757 and Dolby Digital (ATSC Doc. A/52:2018)

U.S. Pat. No. 6,339,757	ATSC Doc. A/52:2018
757 PATENT CLAIM 1	
1. A method of determining a bit allocation for a quantization of digital audio signals having spectral and temporal structure wherein the digital audio signals are obtained by buffering audio signals in frames and decomposing the digital signals into spectral components,	“The decoding process is basically the inverse of the encoding process. ... The <u>bit allocation routine is run</u> and the results used to <u>unpack and de-quantize</u> the mantissas.” Section 2.3 (“Decoding”).  Figure 2.3 The AC-3 decoder. “All mantissas are <u>quantized</u> to a fixed level of precision indicated by the corresponding bap.” Section 7.3 (“Quantization and Decoding of Mantissas”). “The first step in the encoding process is to transform the representation of audio from a sequence of PCM <u>time samples</u> into a sequence of blocks of frequency coefficients. This is done in the analysis filter bank. Overlapping blocks of 512 <u>time samples</u> are multiplied by a <u>time window</u> and transformed into the frequency domain. ... The <u>spectral envelope</u> and the coarsely quantized mantissas for 6 audio blocks (1,536 audio samples) are formatted into an AC-3 syncframe.” Section 2.2 (“Encoding”). “The encoded AC-3 data may be input to the decoder as a continuous data stream at the nominal bit-rate, or chunks of data may be burst into the decoder at a high rate with a low duty cycle. ... The AC-3 decoder input <u>buffer</u> may be smaller in size if the decoder can request bursts of data on an as-needed basis. However, the <u>external buffer memory</u> may be larger in this case.” Section 6.1.1.1. “The first step in the encoding process is to transform the representation of audio from a sequence of PCM time samples into a sequence of blocks of <u>frequency coefficients</u>.” Section 2.2 (“Encoding”). See also Figure 6.1 (“Flow diagram of the decoding process”) and the “Bit Allocation” block.

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which comprises the steps of:	
a step for dividing at least one frequency interval into a plurality of frequency-units;	“The estimated noise level threshold is computed over <u>50 bands of non-uniform bandwidth</u> (an approximate 1/6 octave scale). ... The required bit allocation for each mantissa is established by performing a table look-up based upon the difference between the input signal power spectral density (PSD) evaluated on a fine-grain uniform frequency scale, and the estimated noise level threshold evaluated on the coarse-grain (banded) frequency scale.” Section 7.2.1.
a step for obtaining a representative of each frequency-unit obtained;	“This step of the algorithm integrates fine-grain psd values within each of a multiplicity of 1/6th octave bands. ... The integration of psd values in each band is performed with log-addition.” Section 7.2.2.3.
a step for counting a number of available frequency-units by using the representative, based on psychoacoustic criteria;	“The bit allocation contains a parametric model of human hearing for estimating a noise level threshold, expressed as a function of frequency, which separates audible from inaudible spectral components.” Section 7.2.1. “The excitation function is computed by applying the prototype masking curve selected by the encoder (and transmitted to the decoder) to the integrated PSD spectrum (bndpsd[]). The result of this computation is then offset downward in amplitude by the fgain and sgain parameters, which are also obtained from the bit stream.” Section 7.2.2.4. The pseudo code of Section 7.2.2.4 illustrates the computation of the excitation function in the AC-3 Standard, which includes counting a number of available frequency-units (“bin”) using the representative (“bndpsd[]”), based on psychoacoustic criteria (the prototype masking curve).
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; and	“The bit allocation contains a parametric <u>model</u> of human hearing for estimating a noise level threshold, expressed as a function of frequency, which separates audible from inaudible spectral components.” Section 7.2.1. Section 7.2.2.5, “Compute Masking Curve,” describes how to combine the excitation function with a mathematical representation of the human hearing threshold. This is a “mathematical model” that uses “said counted number of available frequency-units,” as described above with reference to the “counting” element. Starting with a lowest frequency band, the masking curve is computed for each frequency band by taking the larger of the excitation function value and the human hearing threshold value. The pseudo code in Section 7.2.2.5 outlines the process of computing the masking curve from the excitation function value and the human hearing threshold value. In the pseudo code, mask[bin] corresponds to the value of the masking curve for each frequency band.

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	The patent describes the “mathematical model” as “approximate mathematical model which considers the in-band masking effect of the signal.” ’757 patent at 2:53-54. Accordingly, the mathematical model clearly and unambiguously corresponds to the prototype masking curve described in the AC-3 Standard. “The bit allocation pointer array (bap[]) is computed in this step..” Section 7.2.2.7.
a second bit allocation step for determining further bit allocation for each of said available frequency-units based on psychoacoustic criteria.	“The sum of all channel mantissa allocations in one syncframe is constrained by the encoder to be less than or equal to the total number of mantissa bits available for that syncframe. The encoder accomplishes this by iterating on the values of csnroffst and fsnroffst (or cplfsnroffst or lfefsnroffst for the coupling and low frequency effects channels) to obtain an appropriate result.” Section 7.2.2.7. Thus, the second bit allocation step may represent the application of the snroffset parameters to the initial allocation determined by the masking curve. Alternatively, the second bit allocation step may represent the application of delta bit allocation: “The dba information which modifies the decoder bit allocation is transmitted as side information. The allocation modifications occur in the form of adjustments to the default masking curve computed in the decoder. Adjustments can be made in multiples of ± 6 dB. On the average, a masking curve adjustment of -6 dB corresponds to an increase of 1 bit of resolution for all the mantissas in the affected 1/6th octave band. The following code indicates, for a single channel, how the modification is performed.” Section 7.2.2.6. Thus, this claim element reads on the AC-3 Standard in at least two ways. Under a first reading, the second bit allocation step represents the allocation of the snroffset parameter as described in Section 7.2.2.7. Under a second reading, the second bit allocation step represents the delta bit allocation of Section 7.2.2.6. Both are “based on psychoacoustic criteria” in that the bit allocation routine assigns more bits to those bands with perceptually relevant information based on the calculated masking curve, which is based on the hearing threshold.

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757 PATENT CLAIM 2	
2. Method according to claim 1, wherein said mathematical model is derived from an in-band masking effect such that an error spectrum will follow more closely to the original signal spectrum.	The AC-3 (Dolby Digital) standard uses the in-band masking effect as part of its audio compression technique to improve compression efficiency. Its “parametric model” for bit allocation is expressed as a function of frequency and is adjusted by a masking curve. “The bit allocation routine analyzes the spectral envelope of the audio signal being coded with respect to <u>masking effects</u> to determine the number of bits to assign to each transform coefficient mantissa.” Section 7.2.1. “The bit allocation contains a parametric <u>model</u> of human hearing for estimating a noise level threshold, expressed as a function of frequency, which separates audible from inaudible spectral components. Various parameters of the hearing model can be adjusted by the encoder depending upon signal characteristics. For example, a <u>prototype masking curve</u> is defined in terms of two piecewise continuous line segments, each with its own slope and y-axis intercept.” <i>Id.</i> Section 7.2.2.5, “Compute Masking Curve,” describes how to combine the excitation function with a mathematical representation of the human hearing threshold. The computed masking curve is a “mathematical model.” Starting with a lowest frequency band, the masking curve is computed for each frequency band by taking the larger of the excitation function value and the human hearing threshold value. The pseudo code in Section 7.2.2.5 outlines the process of computing the masking curve from the excitation function value and the human hearing threshold value. In the pseudo code, mask[bin] corresponds to the value of the masking curve for each frequency band. Section 7.2.2.6, “Apply Delta Bit Allocation,” describes “a means for the encoder to transmit side information to the decoder which directly increases or decreases the masking curve obtained by the parametric routine.” The optional delta bit allocation (dba) information modifies the masking curve in multiples of ± 6 dB. “On the average, a masking curve adjustment of -6 dB corresponds to an increase of 1 bit of resolution for all the mantissas in the affected 1/6th octave band.” The AC-3 standard computes and modifies the masking curve to ensure that the error spectrum aligns with the masked regions of the original signal, minimizing the perceptual impact of any introduced noise during compression process.

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757 PATENT CLAIM 3	
3. Method according to claim 2, wherein each frequency-unit is represented by a single spectral component.	The AC-3 standard defines quantized frequency coefficients for audio information in different bands (frequency-units). “The actual audio information conveyed by the AC-3 bit stream consists of the <u>quantized frequency coefficients</u>. The coefficients are delivered in floating point form, with each coefficient consisting of an exponent and a mantissa.” Section 7.1.1.1. “An AC-3 audio block contains two types of fields with exponent information. The first type defines the exponent coding strategy for each channel, and the second type contains the actual coded exponents for channels requiring new exponents.” <i>Id.</i> “The estimated noise level threshold is computed over <u>50 bands of non-uniform bandwidth</u> (an approximate 1/6 octave scale). ... The required bit allocation for each mantissa is established by performing a table look-up based upon the difference between the input signal power spectral density (PSD) evaluated on a fine-grain uniform frequency scale, and the estimated noise level threshold evaluated on the coarse-grain (banded) frequency scale.” Section 7.2.1. “The bit allocation contains a parametric model of human hearing for estimating a noise level threshold, expressed as a function of frequency, which separates audible from inaudible spectral components.” Section 7.2.1. “The excitation function is computed by applying the prototype masking curve selected by the encoder (and transmitted to the decoder) to the integrated PSD spectrum (bndpsd[]). The result of this computation is then offset downward in amplitude by the fgain and sgain parameters, which are also obtained from the bit stream.” Section 7.2.2.4. The pseudo code of Section 7.2.2.4 illustrates the computation of the excitation function in the AC-3 Standard, which includes counting a number of available frequency-units (“bin”) using the representative (“bndpsd[]”), based on psychoacoustic criteria (the prototype masking curve). As shown in the for-loop of the pseudo code, the value of “bin” starts from 2 and increases by 1 in each iteration. The representative “bndpsd[bin]” indicates a <u>single spectral component</u> with a <u>specific frequency-unit</u> “bin.”