IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re *Inter Partes* Review of:)
U.S. Patent No. 7,804,891)
Issued: Sep. 28, 2010)
Application No.: 10/594,985)
Filing Date: Mar. 30, 2005)

For: **Device and Method for Judging Communication Quality and Program Used for the Judgment**

PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,804,891

TABLE OF CONTENTS

TABLE OF AUTHORITIES

Page(s)

CASES

STATUTES

REGULATIONS

Exhibit List

Ex.	Description
1001	U.S. Patent No. 7,804,891
1002	Prosecution History of U.S. Patent No. 7,804,891
1003	Declaration and *Curriculum Vitae* of Harry Bims, Ph.D.
1004	EIA/TIA Interim Standard – Cellular System Dual-Mode Mobile Station – Base Station Compatibility Standard, IS-54-B, April 1992 ("IS-54-B")
1005	U.S. Patent No. 6,519,740 to Mårtensson ("Mårtensson")
1006	Ernest Nanjung Yeh, "Advanced Vocoder Idle Slot Exploitation for TIA IS-136 Standard," Massachusetts Institute of Technology, May 1998 ("Yeh")
1007	U.S. Patent No. 5,555,257 to Paul W. Dent ("Dent")
1008	U.S. Patent No. 5,255,343 to Huan-yu Su ("Su")
1009	Declaration and *Curriculum Vitae* of June Munford
1010	Plaintiff Advanced Coding Technologies, LLC's Preliminary Claim Constructions and Preliminary Identification of Extrinsic Evidence Pursuant to P.R. 4-2 and Appendix A
1011	"Communication Systems," Simon Haykin, 4th ed. (2001)
1012	U.S. Patent No. 5,471,655
1013	U.S. Patent No. 5,845,215
1014	GSM Arena BlackBerry 7230 Article
1015	CNET RIM BlackBerry 7230 (T-Mobile) Review
1016	Third Amended Docket Control Order

I. Introduction

Google LLC ("Petitioner" or "Google") hereby requests *inter partes* review of claims 1-9 (the "Challenged Claims") of U.S. Patent 7,804,891 (the "'891 patent") (Ex. 1001).

II. Identification of Challenges (37 C.F.R. § 42.104(b))

- Ground 1: Claims 1-9 are unpatentable under 35 U.S.C. § 103 over the combined teachings of IS-54-B (Ex. 1004), Dent (Ex. 1007), Yeh (Ex. 1006), and Mårtensson (Ex. 1005).
- Ground 2: Claims 1-9 are unpatentable under 35 U.S.C. § 103 over the combined teachings of IS-54-B, Dent, and Su (Ex. 1008).

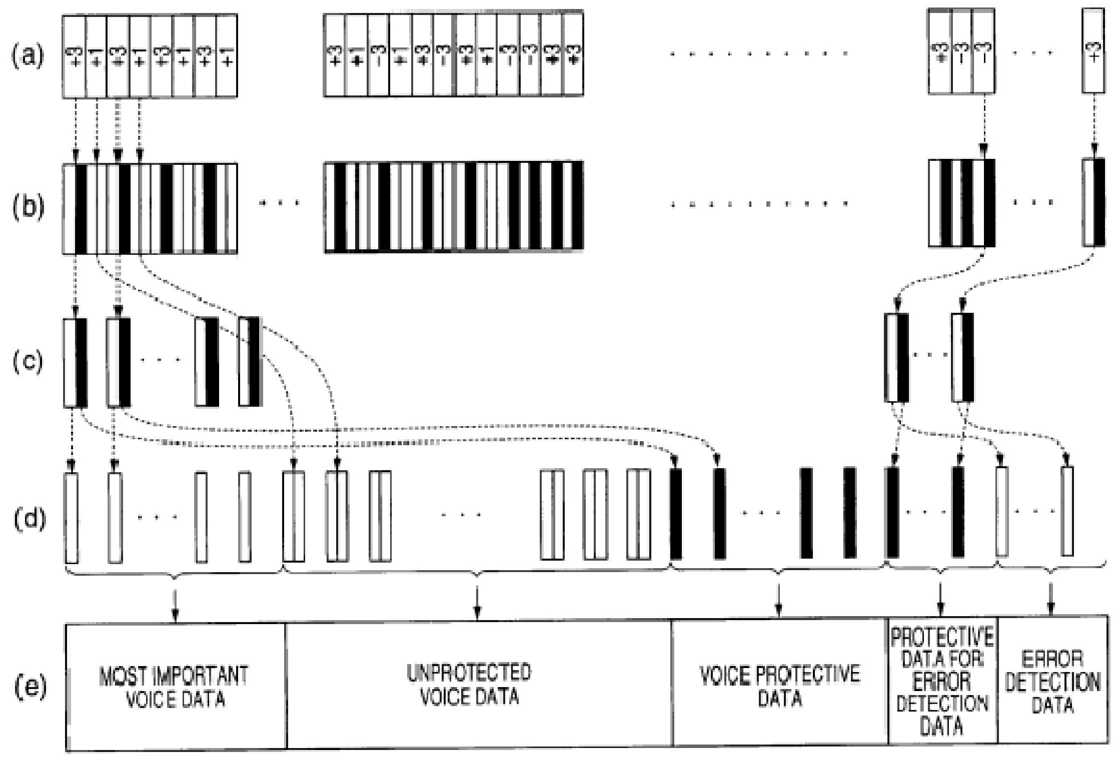
III. Background

A. The '891 Patent (Ex.1001)

The '891 patent "relates to a device and method for judging communication quality in a communication system, and a program for causing a computer to execute the judgment." Ex. 1001, 1:6-10. The '891 patent is "advantageously applicable to a wireless communication system" (*id.*, 15:28-32) and explains that bit errors in transmitted voice data may affect the quality of the reproduced voice data, and thus aims to accurately detect or correct the errors. *Id.*, 1:27-30. The '891 patent admits several known techniques for detecting errors, such as using cyclic redundancy checking ("CRC") and forward error correction ("FEC"). *Id.*, 1:31-2:17. However, as previous methods of "accurate judgment of the communication quality" were complex, the '891 patent purports to provide a method and system to "accurately or rapidly judg[e] the communication quality with a simple construction." *Id*., 2:7-53.

As relevant to the challenged claims, the '891 patent discloses a reception device R that includes transceivers and "a high frequency input unit R1, a demodulator unit R2, a symbol judgment unit R3, a deinterleaving process unit R4, a communication quality judgment unit R5, a voice data restoring unit R6, and voice output unit R7." *Id*., 8:54-61. The '891 patent explains that, "[b]ased on a[n] instantaneous value at a Nyquist point of each of baseband signals provided by the demodulator unit R2, the symbol judgment unit R3, as shown schematically in (a) and (b) of FIG. 7, judges the symbol represented by a symbol section containing the Nyquist point and, based on the judgment, reproduces data (FIG. 7 (b)) corresponding to the interleaved frame generated by the interleaving process unit T3 in the transmission device T. The reproduced data is then provided to the deinterleaving process unit R4." *Id*., 9:26-34. Figure 7 is shown below.

FIG. 7

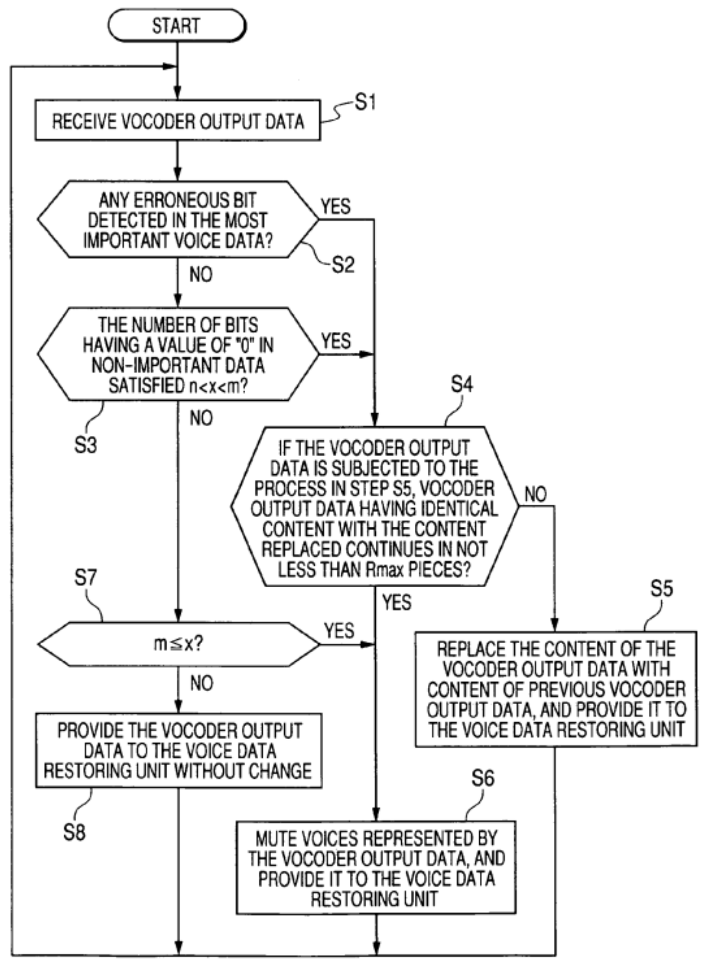


Id., FIG. 7.

The '891 patent further explains, after the "communication quality judgment unit R5 receives the data corresponding to the vocoder output data provided by the deinterleaving process unit R4" the unit R5 "performs a bad frame masking process on the data depending on the presence of an error in the most important voice data contained in the data and/or the number of abnormal bits contained in the protective data in the data, and provide it to the voice data restoring unit R6." *Id*., 10:45-54.

The bad frame masking process performed by the communication quality judgment unit R5 is shown in FIG. 8:

FIG. 8



Id., FIG. 8.

As the ’891 patent explains, the process in Figure 8 includes detecting whether an erroneous bit is included within important voice data, and when voice data does not need correction, it is provided without change (e.g., in step S8 of Figure 8). However, when voice data does require correction, the voice data may be muted or otherwise corrected before output to a vocoder (e.g., in step S5 or step S6 of Figure 8) as audible voice. *See id*., 10:45-12:10.

However, analyzed according to its priority date of March 31, 2004, the features recited in the challenged claims were all well-known, as shown below, by IS-54-B, Mårtensson, Yeh, and Dent, and other references, and would have been obvious to a POSITA. *See generally* Ex.1003. Thus, the challenged claims should not have been allowed.

B. Prosecution History

The application (U.S. Serial No. 10/594,985) resulting in the ’891 patent was filed on March 30, 2005, by Kabushiki Kaisha Kenwood. The ’891 patent claims foreign priority to JP2004-108399, filed March 31, 2004. For purposes of this proceeding, Petitioner applies March 31, 2004 as the Critical Date.

During prosecution of the application that resulted in the ’891 patent, the examiner issued one rejection, rejecting the independent claims (1, 9, and 10) and objecting to the dependent claims (2-8). Ex.1002, 579-589. Independent claims 1 and 9 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Minde (U.S. Patent 5,432,778) and Mårtensson (U.S. Patent 6,519,740), and independent claim 10 was rejected under as being unpatentable over Minde, Mårtensson, and Burkert (U.S. Patent 7,168,031). Ex.1002, 581-587. In response, the applicant did not present arguments against the rejections, but instead amended the independent claims to include the subject matter the examiner indicated as allowable in claim 2. Ex.1002, 599-604. The application was then allowed and issued as the ’891 patent.

C. Person of Ordinary Skill in the Art

A person of ordinary skill in the art (“POSITA”) relating to the subject matter of the ’891 patent as of the Critical Date would have had at least a bachelor’s degree in electrical engineering or computer engineering, and two years of work experience in the field of wireless communications. Lack of work experience can be remedied by additional education, and vice versa.

D. Claim Construction

The prior art relied on in this Petition discloses the subject matter of the challenged claims under any reasonable construction, including their plain meaning.[1] Certain claim terms contain “means for” language; accordingly, for

---

[1] Petitioner reserves the right to argue alternative constructions in other proceedings, and where such a defense is available, that the claims are indefinite. Petitioner does not concede that any term in the Challenged Claims meets the statutory requirements of 35 U.S.C. § 112, or that the Challenged Claims recite patentable subject matter under 35 U.S.C. § 101. Because “Petitioner is precluded from arguing that the claim [is] indefinite before the Board,” (*Hospira, Inc. et al. v. Amgen Inc*., IPR2021-00528, Paper 7 at 9 (Aug. 17, 2021)), Petitioner identifies

purposes of compliance with 37 C.F.R. § 42.104(b)(3), Petitioner identifies portions of the ’891 patent specification that purport to describe the structure, material, or acts corresponding to the “means” limitations of the challenged claims. Petitioner notes, however, that Patent Owner contends in district court that no claim term is subject to interpretation under 35 U.S.C. § 112 ¶ 6. Ex.1010, Appendix A, pp. 37-39.

1. “symbol judging means” (claims 1-7)

The functions for this term include: (1) obtaining a baseband signal representative of a sequence of multilevel symbols and (2) judging the symbol represented by the baseband signal. The corresponding structure for function (1) is a demodulator, and equivalents thereof. *See* Ex. 1001, 9:5-12 (“The demodulator unit R2 is composed of a well known detection circuit for detecting the frequency modulated waves . . . to restore the baseband signal to the symbol judgement unit .

---

structure for the purposes of this proceeding only. *See also Target Corp. v. Proxicom Wireless, LLC*, IPR2020-00904, Paper 11 at 12 (PTAB Nov. 10, 2020) (finding it permissible for petitioner to argue claims were taught by the prior art while simultaneously pursuing indefiniteness argument in district court); *see also Cambridge Mobile Telematics, Inc. v. Sfara, Inc.*, IPR2024-00952, Paper 12 at 8-9 (PTAB Dec. 13, 2024).

. . [and] may be composed of a process, a memory that stores a program executed by the processor, and the like."). For purposes of this proceeding, the corresponding structure for function (2) is a processor, a memory that stores a program executed by the processor, and the like in a receiver that judges the instantaneous value of the baseband signal at the Nyquist point against threshold values and determines a symbol value of the section depending on the result, and equivalents thereof. *See id.*, 9:13-10:4, 13:1-6, 14:30-43; *see also* Ex.1003, ¶41.

2. "communication quality judging means" (claims 1-7)

The function for this term includes: judging communication quality of a transmission channel over which the baseband signal has been transmitted, based on content of the symbol judged by the symbol judging means by identifying a number of redundant bits having a predetermined value or the number of redundant bits missing the predetermined value among the redundant bits contained in the symbol that contains a bit belonging to the protected portion. For purposes of this proceeding, the corresponding structure is a processor, a memory that stores a program executed by the processor, and the like that receives a bit string derived from symbols obtained from a demodulated signal and checks the value of bits and compares the number of bits having or missing a predetermined value to threshold values, and equivalents thereof. *See* Ex. 1001, 9:13-25, 10:45-54, 10:63-12:10; *see also id.*, 12:43-57, 13:1-6, FIG. 8; *see also* Ex.1003, ¶42.

3. "data changing means" (claims 1-7)

The function for this term is making a predetermined change to the data to be transmitted represented by the symbol used in the judgment. For purposes of this proceeding, the corresponding structure is a processor, a memory that stores a program executed by the processor, and the like for replacing data, muting data, substantially destroying data, and attenuating data, and equivalents thereof. *See id*., 9:13-25, 10:45-54, 11:7-12:19, 13:1-6, 13:32-14:2, FIG. 8; *see also* Ex.1003, ¶43.

For replacing data, "content of the vocoder output data received" is replaced "with content of previous vocoder output data that has been received immediately before the vocoder output data of interest." *Id*., 11:16-25; *see also id*., 11:59-67. For muting or substantially destroying data, the content is changed "such that it represents a silent state." *Id*., 11:26-34; *see also id*., 12:1-10. For attenuating, "the attenuation ratio applied to vocoder output data immediately before the vocoder output data whose gain is to be reduced, so that voices are reproduced in such a way that when vocoder output data having erroneous content continues, sound volume is reduced as the continuation becomes longer." *Id*., 13:32-47; *see also* Ex.1003, ¶43.

4. "means for externally obtaining a parameter" (claim 2)

The function for this term is externally obtaining a parameter that defines at least a portion of the condition. The condition is the predetermined condition recited in claim 1, whereby "if the communication quality judged by the communication quality judging means does not satisfy [the] predetermined condition," the data changing means makes a predetermined change to the data to be transmitted. Ex. 1001, claim 1. For purposes of this proceeding, the corresponding structure is a receiver compatible with a switch, keyboard, or other input devices for inputting parameters, and equivalents thereof. Ex. 1001, 14:3-16; *see also id*., 13:1-6; *see also* Ex.1003, ¶44.

IV. Ground 1: Claims 1-9 are unpatentable over IS-54-B, Dent, Yeh, and Mårtensson

The combination of IS-54-B, Dent, Yeh, and Mårtensson renders claims 1-9 obvious. Ex.1003, ¶¶102, 104.

A. Overview of the Prior Art

1. IS-54-B (Ex. 1004)

EIA/TIA Interim Standard IS-54-B ("IS-54-B") is § 102(b) prior art because it was published April 1992, more than one year before the '891 patent's earliest claimed priority date. IS-54-B is a printed publication. Ex.1003, ¶64; *see also* Ex.1012, 1:41-44 (cellular telephone patent issued in 1995 citing IS-54-B), Ex.1013, 1:22-42 (cellular telephone patent issued in 1998 citing IS-54-B).

IS-54-B is titled "Cellular System Dual-Mode Mobile Station – Base Station Compatibility Standard" and describes "a compatibility standard for cellular mobile telecommunications systems." Ex. 1004, i. Its purpose "is to ensure that a mobile station can obtain service in any cellular system manufactured according to this standard." *Id*.

As pertinent to this analysis, section 2 "comprises the fundamental signaling compatibility requirements of dual-mode mobile stations." *Id*., ii. In this section, the IS-54-B standard discloses mechanisms for obtaining a baseband signal, processing the signal, checking for transmission errors, and correcting data. *See, e.g., id*., 73-76. IS-54-B utilizes Viterbi convolutional decoding, a CRC check for errors, and a bad frame masking process to change data depending on whether errors are present. *Id*., 75-76.

Like the '891 patent, IS-54-B discloses a bad frame masking process for changing and attenuating data. IS-54-B's process is described as follows:

> The bad frame masking process is based on a 6 state machine. On every decode of a speech frame, the state machine can change state. State 0 occurs most often and implies that the CRC comparison was successful. State 6 implies that there were at least 6 consecutive frames which failed the CRC check. . . . States 1 and 2 are simple frame repeats. States 3, 4, and 5 repeat and attenuate the speech. State 6 completely mutes the speech.

Id., 74.

IS-54-B is analogous art to the '891 patent. The '891 patent is broadly related to "a device and method for judging communication quality in a communication system" (Ex. 1001, 1:6-10) and IS-54-B teaches a cellular communication system and procedures by which "channel quality measurements" may be identified. Ex. 1004, 1, 102-3. Thus, IS-54-B is within the field of endeavor of the ’891 patent. Ex.1003, ¶¶77-78.

2. Dent (Ex. 1007)

U.S. Patent 5,555,257 to Dent (“Dent”) is § 102(b) prior art because it was published September 10, 1996, more than one year before the ’891 patent’s earliest claimed priority date.

Dent relates to “a radio communication system and method for minimizing co-channel interference.” Ex. 1007, Abstract. Dent’s teachings include standard techniques for converting a baseband signal, demodulating it, and sampling at the Nyquist rate. *Id*., 15:32-42, FIGs. 13, 15.

Dent is analogous art to the ’891 patent. The ’891 patent is broadly related to “a device and method for judging communication quality in a communication system” which includes transmitting and receiving signals. Ex. 1001, 1:6-10. Dent teaches cellular communication system procedures that include transmitting and receiving signals, and specifically relates to “minimizing co-channel interference” (Ex. 1007, Abstract) and “correcting [] errors” (*id*., 16:51-58). Thus, Dent is within the field of endeavor of the ’891 patent. Ex.1003, ¶¶77, 79.

3. Yeh (Ex. 1006)

Advanced Vocoder Idle Slot Exploitation for TIA IS-136 Standard by Ernest Nanjung Yeh (“Yeh”) is § 102(b) prior art because it was published July 1998, more than one year before the ’891 patent’s earliest claimed priority date. Yeh is a printed publication. *See* Ex.1009; Ex.1003, ¶71.

Yeh introduces a modification of the IS-136 digital cellular standard, which is a later version to IS-54 B. IS-136 and Yeh’s teachings are backwards compatible with IS-54-B. Ex.1003, ¶¶71, 79. Yeh includes the goal of optimizations for “voice quality improvement.” Ex. 1006, at 7. In particular, Yeh introduces an “Advanced Vocoder Idle Slot Exploitation (ADVISE)” modification “in which base stations can transmit auxiliary coded (redundant) bits on otherwise unused time slots to assist certain subscriber units.” *Id*., 2. Yeh proposes a scheme that overlays existing IS-136 forward correction (FEC) design. *Id*.

In more detail, Yeh describes using a detection threshold to determine how to further process data. *Id*., 39-41. For example, Yeh uses “the Hamming distance metric [which] provides a higher detection rate and a lower false-alarm rate . . . [and] is computationally simple, and requires only minor modifications of [] existing firmware.” *Id*., 53.

Yeh is analogous art to the ’891 patent. The ’891 patent is broadly related to “a device and method for judging communication quality in a communication system” and Yeh teaches modifications to a digital communication standard relating to optimization and voice quality. Thus, Yeh is within the field of endeavor of the ’891 patent. Ex.1003, ¶¶77, 80.

4. Mårtensson (Ex. 1005)

U.S. Patent 6,519,740 to Mårtensson ("Mårtensson") is § 102(b) prior art because it was published February 11, 2003, more than one year before the '891 patent's earliest claimed priority date.

Mårtensson relates to a method for detecting bits in radio communications systems, particularly within the GSM mobile communications system. It teaches a method of improving the detection of bits "called pulse5 bits which are not protected with channel coding." Mårtensson Abstract. Mårtensson teaches that, in the enhanced full rate (EFS) transmission in GSM, these pulse5 bits are protected through repetition. *Id*. Mårtensson teaches that the GSM system utilizes a Viterbi equalizer which provides "soft values" of the bits in addition to the bits themselves. *Id*., 1:58-65. These "soft values" are a "measure of the reliability [of the bit] in the form of a probability that the bit is indeed equal to 0 or 1." *Id*., 1:62-63. Mårtensson's invention utilizes available soft information and uses it to improve accuracy in determining the value of the pulse5 bits over traditional majority decision methods. *Id*., 2:19-29, 2:58-67.

Mårtensson is analogous art to the '891 patent. The '891 patent is broadly related to "a device and method for judging communication quality in a communication system" and Mårtensson teaches methods for increasing the reliability for determining bit values. Thus, Mårtensson is within the field of endeavor of the ’891 patent. Ex.1003, ¶¶77, 81.

B. Motivation to Combine

1. Reasons to Incorporate Dent’s Teachings of Judging a Symbol as an Alternate to IS-54-B’s Teachings of Judging a Symbol

Modulation is a fundamental concept in the field of wireless communications and was well-known in the art well-before 2004. There are several different types of modulation schemes. Demodulating a carrier signal and determining what symbols were communicated using that signal are fundamental processes within those modulation schemes. Ex.1003, ¶¶45, 52-53, 82; *see also id.* ¶¶46-51.

To a POSITA, the modulation teachings of IS-54-B and Dent are substantively similar in that they teach modulation schemes for judging symbols. A POSITA reviewing IS-54-B’s quadrature phase shift keying (QPSK) modulation scheme using phase constellation implementation would have known of other references describing modulation schemes with additional details to achieve the same results of obtaining a signal and determining the symbols communicated using that signal. Ex.1003, ¶83; *see also id.*, ¶¶45-53.

A POSITA considering IS-54-B would have found it obvious to use the additional details in Dent’s disclosures to fill in gaps not expressly disclosed in IS-

54-B for obtaining a signal and determining the symbols communicated using that signal. For example, Dent expressly discloses using Nyquist principles in its symbol judgment, which was a known technique in the art for signal processing. Ex. 1007, 15:32-42. A POSITA would have been incentivized to use such techniques to improve accuracy; for example, Dent teaches that "[s]ampling at least at the Nyquist rate allows the signals to be faithfully reconstructed from the samples." *Id*. Additionally, a POSITA would have recognized that using Nyquist sampling as Dent discloses ensures system operability. *Id*.; Ex.1003, ¶¶48-49, 84-88.

Therefore, although a POSITA would understand IS-54-B to teach determining a symbol, as an additional teaching with further detail, a POSITA would have incorporated Dent's teachings of determining a symbol. Doing so would have been nothing more than the use of a known technique (Dent's teachings of using Nyquist principles in its symbol determination) to improve a similar method (IS-54-B's symbol judging) in the same way, and a POSITA would have had a reasonable expectation of success in doing so. Ex.1003, ¶89.

2. Reasons to Incorporate Yeh's Teachings of Using Thresholds

A POSITA considering Yeh would have been motivated to combine its teachings with IS-54-B. IS-54-B relies upon whether a CRC check flags an error to determine how to further process data. A POSITA would have been motivated to apply Yeh's use of thresholds to determine whether or not a predetermined condition was satisfied and how to further process data. Ex.1003, ¶90.

In particular, Yeh's use of thresholds would have allowed a POSITA more flexibility when determining what predetermined change to make to correct for errors in the data, according to how the judged communication quality falls within the thresholds. A POSITA considering Yeh would have been motivated to use its teachings because its "detection algorithm using dual-threshold-mode with the Hamming distance metric provides a higher detection rate and a lower false-alarm rate[,]" and is "computationally simple, and requires only minor modifications of the existing firmware." Ex. 1006, 53. Thus, a POSITA would have recognized an express teaching, suggestion, or motivation in Yeh to apply Yeh's use of thresholds as a predetermined condition for its simplicity, higher detection rate, lower false-alarm rate, and need for only minor modification. Ex.1003, ¶¶91-92.

The combination is an obvious combination of prior art elements according to known methods to yield predictable results. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007). IS-54-B is a TDMA mobile digital cellular standard. IS-136 is later version of that TDMA mobile digital cellular standard, upon which Yeh is intended to modify with backward compatibility in mind. Ex. 1006. 7, 9. Accordingly, incorporating Yeh's enhancements to IS-136, which is backwards-compatible with IS-54-B, would have been obvious to a POSITA, and a POSITA would have reasonably expected success in combining the teachings. Ex.1003, ¶93.

3. Reasons to Incorporate Mårtensson's Teachings of Judging Communication Quality of a Transmission Channel

Techniques for detecting transmission errors were well-known in the art before 2004. For example, IS-54-B assesses the channel quality using a state machine based on CRC checks. The "CRC comparison failure can occur because the data was corrupted by channel errors or because a FACCH message was transmitted in place of the speech data." Ex. 1004, 74. Mårtensson also discloses a CRC for error detection amongst bits. Ex. 1005, 1:25-34, 6:18-27 ("An 8-bit cyclic redundancy check (CRC) [] is used for error detection among the class 1*b* bits, while the other 8 bits [] are used to protect a group of class 2 bits known as pulse 5 bits."). Ex.1003, ¶¶54-59, 94.

Techniques for reliably detecting bits were also well-known in the art before 2004. For example, both the GSM system that Mårtensson improves upon, and the TDMA system IS-54-B covers, utilize Viterbi equalization for demodulating a trellis-coded signal. Ex. 1004, 74; Ex. 1005, 1:58-64, 5:11-27. A Viterbi equalizer provides "soft" information as a measure of reliability of each bit. Ex. 1005, 5:11-27. Mårtensson uses the probabilistic soft information about bits to better detect the value of the bit. The performance of probability and reliability of the soft values of the bits reflects the communication quality of the transmission channel. IS-54-B discloses that "[a]ny decoding technique for convolutional codes may be used[,]" including the use of Viterbi equalization to decode a trellis code. Ex.1003, ¶¶54-59, 95. A POSITA considering Mårtensson would have been motivated to combine Mårtensson with IS-54-B. IS-54-B teaches soft-input-hard-output Viterbi decoding (Ex. 1004, 74), and Mårtensson teaches using information available from the Viterbi equalizer to better determine the reliability of the pulse5 bits not protected by channel coding. Thus, the IS-54-B system already provides soft values from Viterbi decoding and a POSITA wanting to improve quality and reliability of the IS-54-B system and considering Mårtensson, would have applied Mårtensson's uses of the soft information to reliably detect bits in the IS-54-B system. Ex.1003, ¶¶54-59, 96.

The combination would have been obvious as nothing more than the use of a known technique (Mårtensson's bit detection disclosures) to improve similar devices in the same way (IS-54-B's TDMA wireless communication system). *KSR*, 550 U.S. at 417; *see* Ex.1003, ¶¶54-59, 97. Mårtensson discloses checking the value of individual bits and provides for "the detection of bits which are protected by repetition, and which, along with their repetitions, have soft values available which give a measurement of the reliability of their received values." Ex. 1005, 1:7-10. To a POSITA seeking to improve the communication quality assessment of IS-54-B's disclosures, Mårtensson provides additional details. A POSITA would have also had a reasonable expectation of success in combining the teachings because Viterbi decoding is a known technique and the soft information provided by the Viterbi decoder exists in the IS-54-B system. Ex. 1004, 74. And, as Mårtensson notes, its teachings may be used in broader applications beyond GSM. Ex. 1005, 3:1-3; Ex.1003, ¶¶54-59, 97.

4. Reasons to Incorporate Mårtensson's Teachings of Protecting Portions of Bit Strings Though Repetition

Protecting portions of bit strings was well-known in the art. A POSITA would have been familiar with providing portions of bit strings with various levels of protection in various ways, such as through channel coding or bit repetition. Ex.1003, ¶98; *see also id*., ¶¶54-63.

A POSITA considering Mårtensson would be motivated to incorporate its teachings because Mårtensson's teachings are directed to an improvement of protecting a bit portion not protected by channel coding, by adding protection to that portion that is a bit repetition of 1's in a manner that improves the reliability of bit detection. Ex. 1005, 6:18-7:20; *see also id*., 2:19-29; Ex.1003, ¶99.

A POSITA would have been motivated to incorporate Mårtensson's teachings of protected portions of bit strings protecting bits through the repetition of 1's in the lower bits of the symbol modulation to increase protection of bits to better judge and manage communication quality of the IS-54-B system because Mårtensson's invention relies on soft information from Viterbi equalization.

Although soft information is provided for in the IS-54-B system, it is not utilized, and Mårtensson's teachings provide a desirable use for such soft information (e.g., to improve performance and provide a measurement of reliability), and a POSITA would have expected success in the combination. *See* Ex. 1005, 2:58-67, 6:27-7:20; Ex.1003, ¶100.

C. Independent Claim 8

1. 8[pre] (*A communication quality judging method, the method comprising the steps of*) [2]

To the extent the preamble is limiting, IS-54-B discloses and renders obvious this limitation.

For example, IS-54-B discloses that "the mobile performs **signal quality measurements**,"[3] including "[c]hannel quality measurements" of "Bit Error Rate (BER) information" on "[t]he current forward traffic channel [which] is used to transmit information from the base station to the mobile during a call." Ex. 1004, 102; *see also id*., i, 1, 3, 103-06, 134, 137-43, 167-68, 198-99, 248-49; Ex.1003, ¶¶106-07.

Accordingly, IS-54-B discloses the preamble of claim 8: "*A communication quality judging method, the method comprising the steps of . . .*"

---

[2] Claim language is italicized for clarity throughout this Petition.

[3] Emphasis added unless otherwise noted.

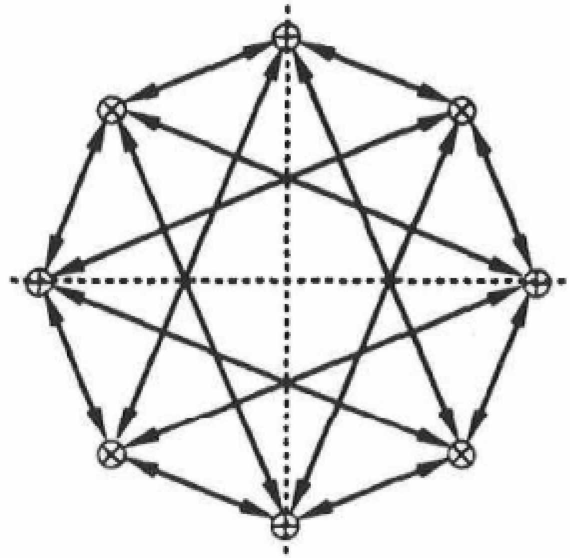
2. 8[a] (*obtaining a baseband signal representative of a sequence of multilevel symbols and judging the symbol represented by the baseband signal*)

IS-54-B discloses this limitation. To the extent Patent Owner contends IS-54-B does not disclose this limitation, Dent discloses this limitation. For example, IS-54-B discloses "demodulation signal processing" (Ex. 1004, 73) and Dent discloses "a voice channel processor [that] numerically performs demodulation of the signal and error correction decoding and transcoding of digitized voice[.]" Ex. 1007, 10:50-55; *see also* Ex. 1004, 7, 9-10, 7-25, 72; Ex. 1007, 15:5- 16:27; Ex.1003, ¶108.

First, as an initial matter, a POSITA would have understood "*obtaining a baseband signal representative of a sequence of multilevel symbols*" to correspond to demodulation, which was well-known in the art by 2004. *See, e.g.*, Ex. 1001, 9:5-12, 1:49-60 (acknowledging as AAPA that demodulating results in obtaining a baseband signal). Second, a POSITA would have understood a "multilevel symbol" as any symbol representing more than one bit, which was likewise well-known in the art by 2004. Third, a POSITA would understand "*judging the symbol represented by the baseband signal*" to include a process of comparing ideal or expected instantaneous values of the baseband signal to those values received in the signal, which was well-known in the art by 2004. Thus, this limitation claims elements well-known in the art by 2004. Ex.1003, ¶109; *see also id*. ¶¶45-53.

IS-54-B discloses "differentially encoded quadrature phase shift keying" which "is amenable to a number of different **demodulation techniques**" and where each symbol carries two bits of information, which discloses or at least renders obvious "*obtaining a baseband signal representative of a sequence of multilevel symbols*" as recited. Ex. 1004, 7, 73; *see also id*. 9-11, 15, 17-28. IS-54-B elaborates and further discloses a modulation scheme using "phase constellation" shown below in Figure 2-1. Ex. 1004, 19-20. The constellation points represent the ideal phases of constant amplitude transmitted and received symbols. The phase value of the received symbol can be compared to the ideal phase of the constellation point. If the detected symbol is shifted off one of those ideal constellation points, depending on the delta of the difference between the ideal and received phase, the symbol may be categorized as 00, 01, 10, or 11 ("*judging the symbol represented by the baseband signal"*). Ex.1003, ¶¶45-47, 50-53, 110.

Figure 2–1



To the extent Patent Owner argues IS-54-B does not teach "*judging*" as recited, Dent discloses details of "*judging the symbol represented by the baseband signal*", and specifically, discloses "baseband I and Q signals" ("*obtaining a baseband signal representative of a sequence of multilevel symbols*") that are "classified as lying nearest to one of the four values -3, -1, +1 or +3 arbitrary units, as indicated by a digital code 11, 10, 01 or 00" ("*judging the symbol represented by the baseband signal*"). Ex. 1007, 15:32-42. A POSITA would have used IS-54-B, or combined the teachings of IS-54-B and Dent in the alternative, for the reasons described above. *Supra*, § IV.B.1; Ex.1003, ¶111.

Accordingly, IS-54-B, or the combined teachings of IS-54-B and Dent, consistent with a POSITA's knowledge, discloses and renders obvious limitation

8[a]: "*obtaining a baseband signal representative of a sequence of multilevel symbols*" (e.g., demodulating a signal) "*and judging the symbol represented by the baseband signal*" (e.g., measuring the difference between an ideal value and a received value); Ex.1003, ¶112.

3. 8[b] (*judging communication quality of a transmission channel over which the baseband signal has been transmitted, based on content of the symbol judged in the symbol judging step*)

Mårtensson renders obvious this limitation. Ex.1003, ¶113.

Once the baseband signal is obtained by demodulation and its symbol judged for quality, as discussed above and as taught by IS-54-B and Dent, Mårtensson discloses judging communication quality based on the reliability of bits based on that symbol judgment. Ex.1003, ¶114.

In further detail, a POSITA would have recognized Mårtensson's judgment of the reliability of bits as reflective of the communication quality of the transmission channel. For example, Mårtensson identifies problems with communication quality of a transmission channel and discloses that "signals (e.g., data, speech) transmitted over this [radio] channel may be strongly distorted due to fading, for example, so that the transmitted bursts give rise to a distorted speech frame." Ex.1005, 5:3-10; Ex.1003, ¶115.

Like the teachings of IS-54-B and Dent, Mårtensson discloses that a receiver "converts a radio signal to a baseband signal" and "then sends this baseband signal to the equalizer [] where it is then demodulated." Ex. 1005, 5:11-16. Mårtensson expands on the teachings of IS-54-B and Dent and discloses thereafter obtaining soft information from the equalizer as "a measure of the reliability of each bit." Ex. 1005, 5:18-19. As Mårtensson explains, the soft value associated with a bit is "a measure of the reliability of the bit received. If the bit is received as a 1, for example, the soft value gives a measure of the probability that the bit is actually a 1." *Id*., 3:49-53. Mårtensson discloses that using soft information as part of the decision as to the value of the original bit is advantageous, as such use has shown an improved signal-to-noise ratio performance in bit detection. *Id*., 2:8-16, 4:19-30, 7:21-27, FIG. 8; Ex.1003, ¶116; *see also id*., ¶¶54-59. As Dr. Bims confirms, a POSITA would have recognized Mårtensson's description of measuring the reliability of each bit to correspond to "*judging communication quality of a transmission channel over which the baseband signal has been transmitted*" because the reliability of the received bits is directly related to the communication quality of the channel. Ex.1003, ¶116. A POSITA would have combined these teachings of Mårtensson for the reasons described above. *Supra*, § IV.B.3.

Accordingly, Mårtensson renders obvious limitation 8[b]: "*judging communication quality of a transmission channel over which the baseband signal has been transmitted, based on content of the symbol judged in the symbol judging* *step*" (e.g., Mårtensson discloses judging the reliability of obtained bits from a demodulated baseband signal as taught by IS-54-B). Ex.1003, ¶117.

4. 8[c] (*changing data if the communication quality judged in the communication quality judging step does not satisfy a predetermined condition, to make a predetermined change to the data to be transmitted represented by the symbol used in the judgment*)

The combined teachings of IS-54-B, Yeh, Dent, and Mårtensson render obvious this limitation. Ex.1003, ¶118.

IS-54-B discloses a "bad frame masking system" based on a "CRC comparison" which may detect "an error in the 12 most perceptually significant bits of the speech frame." Ex.1004, 75. IS-54-B discloses:

> The bad frame masking system is based on a 6 state machine. On every decode of a speech frame, the state machine can change state. State 0 occurs most often and implies that the CRC comparison was successful. State 6 implies that there were at least 6 consecutive frames which failed the CRC check. The action at each of these states varies as well. States 1 and 2 are simple frame repeats. States 3, 4 and 5 repeat and attenuate the speech. Speech 6 completely mutes the speech.

Id., 74. IS-54-B explains that states 0-5 "indicate[] how many consecutive frames had CRC comparison failures. For example, state 5 indicates 5 consecutive frames (including the current frame) have failed the comparison." *Id*., 75; Ex.1003, ¶119.

IS-54-B further explains that the action that follows the comparison depends on the state of the machine ("*make a predetermined change to the data to be transmitted*"). *Id*., 74-75. For example, in states 1 and 2 the data is "replaced with the corresponding values from the last frame that was in state 0," states 3, 4 and 5 "repeat and attenuate the speech," and state 6 "totally mute[es] the output speech." *Id*. 74-75 ("*changing data*"). Ex.1003, ¶120.

IS-54-B does not explicitly disclose the use of thresholds for purposes of determining whether to make a change, but this was a well-known technique in the wireless communication field (for example through the use of CRC checksum or hash function, to determine whether to perform error correction or Hamming code), and Yeh explicitly discloses comparing a value to a threshold to determine how to further process data ("*if the communication quality judged in the communication quality judging step does not satisfy a predetermined condition*"). Ex. 1006, Abstract. For example, Yeh discloses a "detection method" which is "based on the Hamming distance between the two sets of received bits. If the Hamming distance is smaller than a threshold, the detection method declares ADVISE to be present" and proceeds one way. *Id*. "Otherwise, the method declares ADVISE to be absent" and proceeds another way. *Id*. A POSITA would have combined these teachings of Yeh for the reasons described above. *Supra*, § IV.B.2; Ex.1003, ¶¶62-63, 121.

Accordingly, the combination of IS-54-B and Yeh renders obvious limitation 8[c]: "*changing data*" (e.g., IS-54-B's replacing, attenuating, or muting data) "*if the communication quality judged in the communication quality judging* *step does not satisfy a predetermined condition*" (e.g., Yeh's comparison of the Hamming distance to a threshold to determine how to further proceed), "*to make a predetermined change to the data to be transmitted represented by the symbol used in the judgment*" (e.g., IS-54-B's changing the data depending on the state of the state machine). Ex.1003, ¶122.

5. 8[d] (*wherein at least a portion of a bit string is distinguished as a protected portion, the bit string constituting data to be transmitted represented by the sequence of symbols, and at least a portion of the symbol that belongs to the sequence of symbols contains a bit belonging to the protected portion and a redundant bit having a predetermined value*)

Mårtensson discloses and renders obvious this limitation.[4] Ex.1003, ¶123.

As an initial matter, protecting a portion of a bit string by using redundant bits was well-known in the art by 2004. Ex.1003, ¶124. A bit is a binary digit with a value of either 0 or 1. *Id*. Protecting bits by dividing them into portions with various levels of protection was also well-known in the art by 2004. *Id*. Additionally, that a bit string constitutes data to be transmitted and represents a sequence of symbols was well-known by 2004. *Id.*

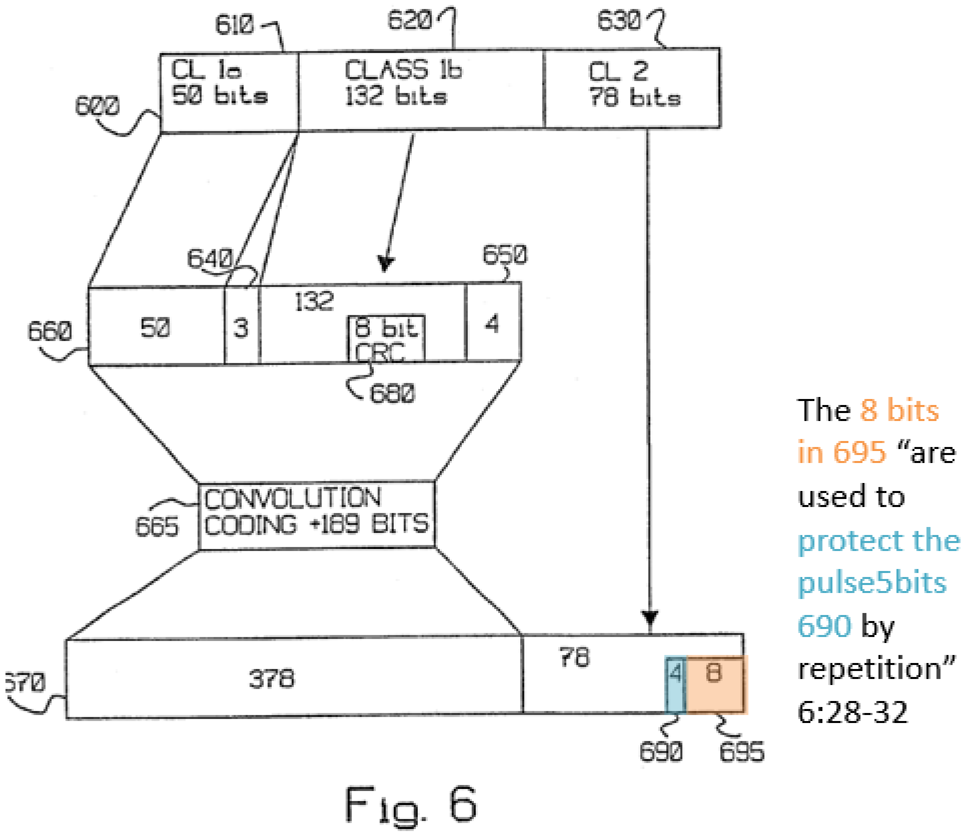
---

[4] During prosecution, the applicant did not dispute the examiner's rejection that this limitation is rendered obvious by Mårtensson. *See* Ex.1002, pp. 579-589, 605-606.

Consistent with this knowledge in the art, Mårtensson discloses a speech frame "divided into three blocks of bits, class 1*a*, class 1*b*, and class 2, according to their level of protection" ("*at least a portion of a bit string is distinguished as a protected portion*"). Ex. 1005, 1:18-21, 1:35-39. Mårtensson explains that class 1a bits "are most sensitive to transmission error and cause the most problematic consequences with regard to the intelligibility of the transmitted and decoded speech." *Id*. 5:58-61. For these bits, "error protection is performed with the aid of three parity bits 640 which are added to the 50 data bits as control bits." *Id*. 5:63-65. Mårtensson further explains that class 1b bits are protected by four "tail bits 650" and "are not equally as sensitive with regard to the intelligibility to transmission bit errors occurring as compared to the class 1*a* bits." *Id*. 5:66-6:3. Finally, the class 2 bits "are the bits least susceptible to error and are not protected at all-by additional bits, as in the case of class 1*a* and 1 *b*." *Id*. 6:7-9; Ex.1003, ¶125.

Mårtensson also discloses an "enhanced full rate (EFS) mode of transmission in GSM [where] there are used only 244 of the 260 bits available due to greater efficiency of the speech encoding method" which "leaves an additional 16 bits that can be used to protect the other 244 bits." Ex. 1005, 6:18-22. Thus, Mårtensson explains that "8 bits 695 are used to protect a group of class 2 bits known as pulse5 bits 690." *Id*. 6:22-26. Those 8 bits "are used to protect the pulse5 bits 690 by repetition 695." *Id*. 6:28-29; Ex.1003, ¶126.

Figure 6 shows the three classes of bits disclosed with various levels of protection:



Ex. 1005, FIG. 6 (annotated).

Mårtensson further discloses that "bits are protected by repetition of their values" ("*a redundant bit having a predetermined value*") and that the bit values (and the corresponding protection-repetition bit) "are equal to 0" or "are equal to 1." Ex. 1005, 3:46-47; 3:66-4:9. For example, Mårtensson teaches that "the bits among those bits to be protected whose values are equal to 0 are chosen. These will be the bits from the original bit and its repetitions." *Id*., 3:67-4:2. Thus, Mårtensson discloses "*at least a portion of the symbol that belongs to the sequence of symbols contains a bit belonging to the protected portion and a redundant bit having a predetermined value*." A POSITA would have combined these teachings of Mårtensson for the reasons described above. *Supra*, § IV.B.4; Ex.1003, ¶¶127-128.

Accordingly, Mårtensson discloses and renders obvious limitation 8[d]: "*wherein at least a portion of a bit string is distinguished as a protected portion, the bit string constituting data to be transmitted represented by the sequence of symbols, and at least a portion of the symbol that belongs to the sequence of symbols contains a bit belonging to the protected portion and a redundant bit having a predetermined value*" (e.g., Mårtensson discloses that "bits are protected by repetition of their values"); Ex.1003, ¶129.

6. 8[e] (***wherein, in the communication quality judging step, the number of redundant bits having the predetermined value or the number of redundant bits missing the predetermined value is identified among the redundant bits contained in the symbol that contains a bit belonging to the protected portion, and the***

***communication quality of the transmission channel is judged based on the identified result*)**

Mårtensson discloses and renders obvious this limitation.[5] Ex.1003, ¶130.

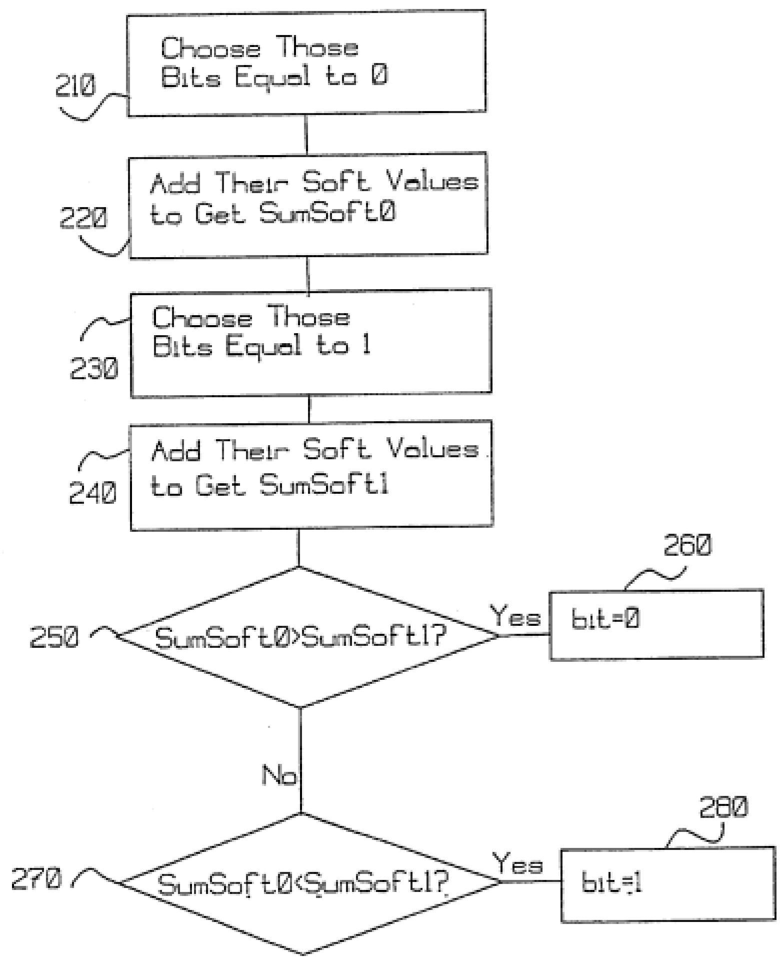
For example, Mårtensson discloses "detection of the value of a bit received in a communication system." Ex.1005, 3:43-45. Mårtensson discloses a method using a "pulse5 bit" that is "protected by repeating each pulse bit two times" *Id*. 1:38-39. Mårtensson further discloses a method using soft values for received bits which "are a measure of the reliability of the bit received. If the bit is received as a 1, for example, the soft value gives a measure of the probability that the bit is actually a 1." *Id*., 3:49-53. Ex.1003, ¶131.

As shown in Figure 2 below, Mårtensson discloses a method where "the bits among those bits to be protected whose values are equal to 0 are chosen. These will be the bits from the original bit and its repetitions." Ex.1005, 3:67-4:2. Then, "the soft values of these bits are added together" which results in "the sum of the soft values for all the bits equal to 0 among a given bit and its repetitions," called "SumSoft0." *Id*., 4:2-6. Next, "the bits from the original and its repetitions whose values are equal to 1" are chosen, "[t]hen the soft values of these bits are added

---

[5] During prosecution, the applicant did not dispute the examiner's rejection that this limitation is rendered obvious by Mårtensson. *See* Ex.1002, pp. 579-589, 605-606.

together" which results in "the sum of the soft values for all the bits equal to 1 among a given bit and its repetitions," called "SumSoft1." *Id.*, 4:7-13. Then, the values of SumSoft0 and SumSoft1 are compared. *Id.*, 4:14-30; Ex.1003, ¶132.



Ex.1005, FIG. 2.

Mårtensson's disclosure of adding "the soft values for all bits equal to 0 among a given bit and its repetitions" to yield the SumSoft0 value includes choosing redundant bits equal to 0 and adding the soft values for those redundant bits equal to 0. *Id*. 4:4-6. Additionally, Mårtensson's disclosure of adding "the soft values for all bits equal to 1 among a given bit and its repetitions" to yield the SumSoft1 value includes choosing redundant bits equal to 1 and adding the soft values for those redundant bits equal to 1. *Id*. 4:11-12. Thus, Mårtensson's disclosure discloses and renders obvious "*the number of redundant bits having the predetermined value or the number of redundant bits missing the predetermined value is identified among the redundant bits contained in the symbol that contains a bit belonging to the protected portion*." Ex.1003, ¶133.

Mårtensson discloses comparing the values for SumSoft0 and SumSoft1 (which use soft values, "a measure of the reliability of the bit received") to make a decision as to the value of the original bit. Ex.1005, 3:50-51, 4:19-30. Thus, Mårtensson discloses and renders obvious "*the communication quality of the transmission channel is judged based on the identified result*." Ex.1003, ¶134.

Additionally, Mårtensson further discloses that simulations show that the invention "improves the residual bit error for pulse5 bits (rber_ pulse5) performance between 3.4 and 4.6 dB." Ex.1005, 7:23-26. Mårtensson further discloses that its simulations have "shown an improved C/I and SNR [signal-to-noise ration] performance of approximately 4.5 dB in the detection of these pulse5 bits." *Id*. 2:14-16. Thus, Mårtensson further discloses and renders obvious "*the communication quality of the transmission channel is judged based on the* *identified result*." Ex.1003, ¶135. A POSITA would have combined these teachings of Mårtensson for the reasons described above. *Supra*, § IV.B.4.

Accordingly, Mårtensson discloses and renders obvious limitation 8[e]: "*wherein, in the communication quality judging step, the number of redundant bits having the predetermined value or the number of redundant bits missing the predetermined value is identified among the redundant bits contained in the symbol that contains a bit belonging to the protected portion*" (e.g., choosing the soft values of corresponding to redundant bits equal to 0 and equal to 1), "*and the communication quality of the transmission channel is judged based on the identified result*" (e.g., comparing SumSoft0 and SumSoft1 to make a decision as to the transmitted bit which has been simulated and demonstrated to improve signal-to-noise ratio performance). Ex.1003, ¶136.

D. Independent Claim 1

1. 1[pre] (*A communication quality judging device comprising*)

To the extent the preamble is limiting, IS-54-B discloses and renders obvious this limitation, because it teaches techniques to "ensure that a **mobile station** can obtain service in any cellular system manufactured according to this standard." Ex.1004, 1. Thus, IS-54-B's mobile stations disclose or at least render obvious a "*communication quality judging device*" as recited. Ex.1003, ¶¶137-38.

2. 1[a] (*a symbol judging means for obtaining a baseband signal representative of a sequence of multilevel symbols and judging the symbol represented by the baseband signal*)

As detailed above in the analysis of limitation 8[a], IS-54-B, or the combined teachings of IS-54-B and Dent, disclose and render obvious "*obtaining a baseband signal representative of a sequence of multilevel symbols and judging the symbol represented by the baseband signal*." Thus, the function of this limitation is rendered obvious by the prior art. Ex.1003, ¶139.

Further, IS-54-B and Dent disclose and render obvious the corresponding structure, or equivalents thereof. For example, IS-54-B discloses a "demodulator" (*see* Ex.1004, 19, 73) and Dent teaches components in FIGs. 13 and 15 that a POSITA would have recognized as equivalent to the structure of a processor in a receiver that judges an instantaneous value of the Nyquist point against threshold values and assigning a symbol to the section as identified in § III.D.1, *supra*. Ex.1003, ¶140; *see also* Ex.1007, 24:6-16, 27:30-62, FIGs. 9, 17, 18.

Accordingly, the combination renders obvious this limitation. Ex.1003, ¶141.

3. 1[b] (*a communication quality judging means for judging communication quality of a transmission channel over which the baseband signal has been transmitted, based on content of the symbol judged by the symbol judging means*)

As detailed above in the analysis of limitation 8[b], the teachings of Mårtensson render obvious "*judging communication quality of a transmission* *channel over which the baseband signal has been transmitted, based on content of the symbol judged in the symbol judging step*." Further, Mårtensson performs its judging by identifying a number of redundant bits having a predetermined value or the number of bits missing the predetermined value among the redundant bits contained in the symbol that contains a bit belonging to the protected portion. Thus, the function of this limitation is rendered obvious by the prior art. Ex.1003, ¶142.

Further, Mårtensson renders obvious the corresponding structure, or equivalents thereof. For example, Mårtensson discloses "equalizer 530" which a POSITA would have recognized as equivalent to the corresponding structure of a processor that checks the value of bits and compares the number of bits having or missing a predetermined value to threshold values as identified in § III.D.2, *supra*. Accordingly, the combination renders obvious this limitation. Ex.1003, ¶143.

4. 1[c] (*a data changing means for, if the communication quality judged by the communication quality judging means does not satisfy a predetermined condition, making a predetermined change to the data to be transmitted represented by the symbol used in the judgment*)

As detailed above in the analysis of limitation 8[c], the teachings of IS-54-B and Yeh render obvious "*if the communication quality judged by the communication quality judging means does not satisfy a predetermined condition, making a predetermined change to the data to be transmitted represented by the* *symbol used in the judgment*." Thus, the function of this limitation is rendered obvious by the prior art. Ex.1003, ¶144.

Further, IS-54-B discloses and renders obvious the corresponding structure, or equivalents thereof. For example, IS-54-B discloses a "bad frame masking system … based on a 6 state machine" which a POSITA would have understood to be implemented by a processor or similar circuitry within a cellular or mobile device, or a processor for replacing data, muting data, substantially destroying data, and attenuating data as identified in § III.D.3, *supra*; Ex.1003, ¶145.

Accordingly, the combination renders obvious this limitation. Ex.1003, ¶146.

5. 1[d] (*wherein at least a portion of a bit string is distinguished as a protected portion, the bit string constituting data to be transmitted represented by the sequence of symbols, and at least a portion of the symbol that belongs to the sequence of symbols contains a bit belonging to the protected portion and a redundant bit having a predetermined value*)

See supra, 8[d].

6. 1[e] (*wherein the communication quality judging means identifies the number of redundant bits having the predetermined value or the number of redundant bits missing the predetermined value among the redundant bits contained in the symbol that contains a bit belonging to the protected portion, and judges the communication quality of the transmission channel based on the identified result*)

See supra, 8[e].

E. Dependent Claims 2-7

1. Claim 2 (*The communication quality judging device according to claim 1, wherein the data changing means comprises means for externally obtaining a parameter that defines at least a portion of the condition.*)

IS-54-B renders obvious this limitation, as it teaches a mobile station, which is capable of obtaining parameters that define the condition recited in claim 1, and thus renders obvious the function and structure of this limitation. Ex.1004, 1; Ex.1003, ¶149.

Alternatively, IS-54-B renders obvious this limitation, as it teaches a mobile station, which a POSITA would have understood as having means (e.g., a receiver) for obtaining parameters via compatible input devices for inputting parameters (e.g., a keypad or external input device), and thus renders obvious the function and structure of this limitation. Ex.1004, 1; Ex.1003, ¶150.

2. Claim 3 (*The communication quality judging device according to claim 1 or 2, wherein the predetermined change includes a process of substantially destroying the data to be transmitted represented by the symbol used to judge that the communication quality does not satisfy a predetermined condition.*)

IS-54-B renders obvious this limitation, as it teaches "a bad frame masking system [that] is based on a 6 state machine." Ex.1004, 74-75. The bad frame masking process discloses inserting comfort noise in place of the speech signal in state 6, thereby "substantially destroying" the speech signal ("*the data to be* *transmitted represented by the symbol used to judge that the communication quality does not satisfy a predetermined condition*"). *Id*; Ex.1003, ¶¶151-153.

Accordingly, IS-54-B renders obvious claim 3: ". . . *wherein the predetermined change includes a process of substantially destroying the data to be transmitted represented by the symbol used to judge that the communication quality does not satisfy a predetermined condition*" (replacing the speech signal with comfort noise). Ex.1003, ¶154.

3. Claim 4 (*The communication quality judging device according to claim 1 or 2, wherein the predetermined change includes a process of replacing the data to be transmitted represented by the symbol used to judge that the communication quality does not satisfy a predetermined condition, with previous data represented by a symbol previously obtained by the symbol judging means.*)

IS-54-B renders obvious this limitation, as it teaches that in state 1 when "[a] CRC error has been detected in the frame[, t]he parameter values for R(0) and the LPC bits are replaced with the corresponding values from the last frame that was in state 0" when no CRC error was detected. Ex.1004, 75; Ex.1003, ¶¶155-157.

Accordingly, IS-54-B renders obvious claim 4: "*wherein the predetermined change includes a process of replacing the data to be transmitted represented by the symbol used to judge that the communication quality does not satisfy a predetermined condition, with previous data represented by a symbol previously* *obtained by the symbol judging means*" (state 1 repeats the information from state 0 where no CRC error was detected). Ex.1003, ¶158.

4. Claim 5 (*The communication quality judging device according to claim 4, wherein the predetermined change further includes a process of substantially destroying the data to be transmitted that follows last replaced data and that is represented by the symbol used to judge that the communication quality does not satisfy a predetermined condition, when more than a predetermined number of replaced data continues.*)

IS-54-B renders obvious this claim.

IS-54-B explains that "[o]n every decode of a speech frame, the state machine can change state." Ex.1004, 74. "State 6 implies that there were at least 6 consecutive frames which failed the CRC check" and thus "State 6 completely **mutes the speech**." *Id*. "Alternatively, comfort noise could be inserted in place of the speech signal" at state 6. *Id*. 75. Ex.1003, ¶¶159-62.

Accordingly, IS-54-B renders obvious claim 5: ". . . *wherein the predetermined change further includes a process of substantially destroying the data to be transmitted that follows last replaced data*" (IS-54-B's muting data if it reaches state 6) "*and that is represented by the symbol used to judge that the communication quality does not satisfy a predetermined condition, when more than a predetermined number of replaced data continues*" (when IS-54-B's state count reaches 6). Ex.1003, ¶163.

5. Claim 6[pre] (*The communication quality judging device according to claim 1 or 2, wherein the data to be transmitted is composed of data representative of strength of a variable, and*)

IS-54-B renders obvious this limitation. Ex.1003, ¶164.

IS-54-B discloses an energy value R(0) (a "***variable***") computed and encoded once per frame "reflecting the average signal energy in the input speech over a 20 msec. interval." Ex. 1004, 75-76; *see also id*., 33-34; Ex.1003, ¶165.

Accordingly, IS-54-B renders obvious "*wherein the data to be transmitted is composed of data representative of strength of a variable*." Ex.1003, ¶166.

6. Claim 6[a] (*the predetermined change includes an attenuating process of changing the data to be transmitted represented by the symbol used to judge that the communication quality does not satisfy a predetermined condition, to a data equivalent in which the variable represented by the data is attenuated*.)

IS-54-B renders obvious this claim. Ex.1003, ¶167.

IS-54-B discloses that states 3, 4, and 5 "attenuate the speech." Ex.1004, 74-75; Ex.1003, ¶¶168-70.

Accordingly, IS-54-B, consistent with a POSITA's knowledge, renders obvious limitation 6[a]: "*the predetermined change includes an attenuating process of changing the data to be transmitted represented by the symbol used to judge that the communication quality does not satisfy a predetermined condition,* *to a data equivalent in which the variable represented by the data is attenuated*" (e.g., IS-54-B's attenuating process in states 3-5). Ex.1003, ¶171.

7. Claim 7 (*The communication quality judging device according to claim 6, wherein, when first data, which is transmitted immediately before second data to be subjected to the attenuating process, has been subjected to the attenuating process, the attenuating process provided to the second data consists of a process of changing the second data to a data equivalent in which the variable represented by the second data is attenuated at an attenuation ratio larger than that for the variable represented by the first data.)*

IS-54-B renders obvious this claim. Ex.1003, ¶172.

IS-54-B discloses an attenuation process that increases the attenuation ratio as the state count increases. Ex.1004, 74-75. For example, in state 3 "the value of R(0) is modified. A 4dB attenuation is applied to the R(0) parameter, i.e., if R0 of the last state 0 frame is greater than 2, R0 is decremented by 2 and repeated at this lower level." Ex. 1004, 75. In state 4, "R(0) is again attenuated by 4 dB so now the level is as much as 8 dB from the original value of the R(0)." *Id*. In state 5, "R(0) is attenuated an additional 4 dB." *Id*.; Ex.1003, ¶173.

Accordingly, IS-54-B, consistent with a POSITA's knowledge, renders obvious claim 7: "*wherein, when first data, which is transmitted immediately before second data to be subjected to the attenuating process*" (e.g., IS-54-B's attenuation in state 5), "*has been subjected to the attenuating process,*" (e.g., IS-54-B's attenuation in state 4) "*the attenuating process provided to the second data* *consists of a process of changing the second data to a data equivalent in which the variable represented by the second data is attenuated at an attenuation ratio larger than that for the variable represented by the first data*" (e.g., IS-54-B's attenuation in state 5 is by "an additional 4 dB" from the attenuation in state 4). Ex.1003, ¶174.

F. Independent Claim 9

1. 9[pre] (*A computer program causing a computer to execute the steps of:*)

To the extent the preamble of claim 9 is limiting, the combination renders obvious a "*computer program*" as recited. For example, a POSITA would have recognized that the mobile stations described throughout IS-54-B are computing devices controlled, at least in part, by software, which therefore renders obvious a "*computer program*" as recited. Ex.1003, ¶¶175-76.

The remaining limitations of claim 9 are identically recited in claim 8, and accordingly, claim 9 is rendered obvious for the same reasons as set forth for claim 8. *See* § IV.C; Ex.1003, ¶177.

V. Ground 2: Claims 1-9 are unpatentable over IS-54-B, Dent, and Su

A. Overview of the Prior Art

1. Su (Ex. 1008)

U.S. Patent 5,255,343 to Su ("Su") is § 102(b) prior art because it was published October 19, 1993, more than one year before the '891 patent's earliest claimed priority date.

Su relates to an improvement in the "process for detection and masking of bad frames in a coded speech signal resulting from channel transmission errors." Su's invention is designed for compatibility with the IS-54-B digital cellular standard. Ex.1008, 1:34-37, 2:41-45, FIGs. 2a, 2b, 2c. Su's invention teaches an additional error checking technique beyond a CRC check called a maximum likelihood (ML) check. *Id*. 4:66-5:27; Ex.1003, ¶179.

Su is analogous art to the '891 patent. The '891 patent is broadly related to "a device and method for judging communication quality in a communication system" (Ex. 1001, 1:6-10) and Su teaches methods for better detecting errors in the transmission channel. *See, e.g.*, Ex.1008, 1:7-10. Thus, Su is within the field of endeavor of the '891 patent. Ex.1003, ¶180.

B. Motivation to Combine

A POSITA considering Su would have been motivated to combine it with IS-54-B. Su's disclosure is specifically intended to work with IS-54-B. Ex. 1008, 1:34-45, 2:41-44, 3:9-17, 3:29-4:65, 4:66-6:36, FIGs. 1, 2a, 2b, 2c, 3a, 3b, 3c. Su discloses that an "object of the present invention is to provide an **improved error detection and bad frame masking technique** which can be implemented with the requirements of the [IS-54-B] digital cellular standard." *Id*. 2:41-44; *see also id*. 1:34-45, 3:9-17, 3:29-4:65, 4:66-6:36, FIGs. 1, 2a, 2b, 2c, 3a, 3b, 3c. Su discloses that "bad frame detection" and "bad frame masking" are "fundamental functions" in digital cellular mobile systems (*id*. 1:13-27), and explains that, "[i]n order to improve regenerated speech quality, the [IS-54-B] standard bad frame masking technique has been modified so that erroneous parameters are not used to regenerate speech." *Id*. 5:28-33; *see also id*. 1:34-45, 2:41-44, 3:9-17, 3:29-4:65, 4:66-5:27, 5:34-6:36, FIGs. 1, 2a, 2b, 2c, 3a, 3b, 3c. Thus, Su proposes modifying the parameters used in IS-54B's bad frame masking process, so Su already proposes combining its invention with IS-54B's bad frame masking process and provides an explicit motivation or suggestion to do so (i.e., so that erroneous parameters are not used to regenerate speech). *See id*. 5:28-33; Ex.1003, ¶¶181-83.

A POSITA would have had a reasonable expectation of success in combining Su and IS-54-B. *Id*., ¶184. As discussed above, the outcome is predictable because it combines the predictable features of each reference together using known methods intended to be combined together. *Id*., ¶¶180-84.

The following discussion explains additional rationale for combining Su and IS-54-B to arrive at the claimed invention as relevant to individual limitations and claims. *Id*., ¶185.

1. Reasons to Incorporate Su's Teachings of Judging Communication Quality

Su discloses "a need for an improved bad frame detection and masking technique which will help in the avoidance of the explosion-like speech" and seeks to "provide an improved error detection and bad frame masking technique which provides smoother regenerated speech, improves intelligibility and the perceptual quality of speech." Ex.1008, 2:24-2:32. Su also aims to "provide an improved error detection technique so that errors occurring in the Class 1 bits, other than the most significant bits, can be taken into account." *Id*. 2:33-36; Ex.1003, ¶186.

A POSITA contemplating Su would combine it with the IS-54-B system to improve the communication quality of IS-54-B's TDMA System. Ex.1003, ¶187.

The combination is obvious as a combination of prior art elements according to known methods to yield predictable results. *KSR*, 550 U.S. at 416. As discussed above and below, the only difference between the claims and the prior art is the lack of actual combination of the recited elements in a single prior art reference. The combination uses known methods taught by each reference, including known protocols for transmitting and receiving data, known codecs for coding and decoding data, and known algorithms for protecting bits. IS-54-B and Su both perform bad frame detection and bad frame masking. The outcome is the predictable system combining the known functions of IS-54-B and Su. Ex.1003, ¶188.

The combination is also obvious as the use of a known technique (using Su's bad frame detection process) to improve similar devices (IS-54-B's bad frame masking process) in the same way. *KSR*, 550 U.S. at 417. IS-54-B discloses a bad frame detection process that is comparable to Su's bad frame detection process, but Su's is an improvement to detect more errors and improve communication quality. A POSITA would have applied these improvements to IS-54-B's system in the same way for the reasons discussed above, and the results would have been predictable as shown above. Ex.1003, ¶189.

A POSITA would have had a reasonable expectation of success in combining IS-54-B and Su. As discussed above, the outcome is predictable because it combines the known features of each reference together using known methods. Ex.1003, ¶190.

2. Reasons to Incorporate Su's Teachings of Using a Predetermined Condition

Su discloses "an additional error detection technique . . . based on a maximum likelihood (ML) check and is only used if the CRC check is successful." Ex.1008, 4:66-5:27. Su's ML check is an improvement for an additional level of detection of errors to improve communication quality. While IS-54-B's CRC check allows the system to check for errors, Su's ML check allows a POSITA to use a threshold to further change data differently depending on how the number of bit errors compare to that threshold. Ex.1004, 74-75; Ex.1008, 4:66-6:36. This would allow a POSITA more flexibility to determine what predetermined change to make to the data according to how the judged communication quality falls in comparison to the threshold. A POSITA would have been motivated to combine these teachings of Su for the same reasons as set forth above. Ex.1003, ¶191.

3. Reasons to Incorporate Su's Teachings of a Protected Portion

Protecting portions of bit strings was well-known in the art. Ex.1003, ¶¶60-61. A POSITA would have been familiar with providing portions of bit strings with various levels of protection in various ways, such as through convolutional coding, Reed-Solomon coding, or bit repetition. *See, e.g.,* Ex.1008, 1:28-30; *id*. 3:32-34. Ex.1003, ¶192.

To a POSITA, the protection teachings of IS-54-B and Su are substantively similar in that they both teach convolutional coding to protect bits. IS-54-B explains that "[t]he first step in the error correction process is the separation of the 159 bit speech coder frame's information into class 1 and class 2 bits. The class 1 bits represent that portion of the speech data stream to which the convolutional coding is applied." Ex.1004, 6. As IS-54-B further explains, channel coding includes "mechanisms for mitigation of channel errors. The first is to use a rate one-half convolutional code to protect the more vulnerable bits of the speech coder data stream . . . The third technique employs the use of a cyclic redundancy check over some of the most perceptually significant bits of the speech coder" which are later checked to see if they were received properly. *Id*. 59; Ex.1003, ¶193.

A POSITA reviewing IS-54-B would have known of other references describing bit protection with additional details to achieve the same results of processing a portion of a bit string as a protected portion. For example, Su discloses that "[i]n both the IS-54 and GSM standards, maximum likelihood convolutional decoding (Viterbi decoding) is employed to recover the protected bits in Group A and Group B bits." Ex.1008, 5:1-5. "Group A comprises the perceptually most significant bits protected by error detection as well as **protection bits**." *Id*. 3:32-34. Group B bits are covered by error correction which is "determined by the error protection techniques used" such as convolution coding. *Id*. 3:40-46, 1:28-33. A POSITA would have recognized that the Group A and Group B bits in class 1 of Su would fall within the class 1 bits of IS-54-B. Ex.1003, ¶194.

A POSITA considering IS-54-B would have found it obvious to use the additional details in Su's disclosures to fill in gaps not expressly disclosed in IS-54-B for distinguishing a portion of a bit string as a protected portion. Therefore, although a POSITA would understand IS-54-B to teach a protected portion, as an additional teaching with further detail about protected portions, a POSITA would have incorporated Su's teachings of Group A and Group B bits into IS-54-B. Doing so would have been nothing more than the use of a known technique (protecting Group A and Group B bits through convolutional coding) to improve a similar method (IS-54-B's convolutional coding) in the same way, and a POSITA would have had a reasonable expectation of success in doing so. *Id*., ¶195.

Further, in considering Su, a POSITA would have found it obvious to use Su's implementation of the Hamming distance metric in the decoding process to identify the number of bits having a predetermined value or the number of redundant bits missing the predetermined value. *Id*., ¶196.

IS-54-B teaches that convolutionally encoded data can be decoded using "[a]ny known decoding technique for convolutional codes" such as the "Viterbi algorithm in conjunction with the use of soft channel information." Ex.1004, 74. A POSITA would have been aware of several techniques and upon consideration of Su would have been motivated to use the Hamming distance metric disclosed in Su for decoding the protected portion because the Hamming distance metric is a straightforward and simple method for comparing bits and detecting bit errors. For example, Su teaches that "[w]hen a Viterbi algorithm is used with a hard channel information (hard decision, as in the IS-54 standard, the likelihood metric used is usually the [H]amming distance" and that the lower the Hamming distance, the lower the bit error rate. Ex.1008, 5:61-67, 5:2-18. A POSITA would have recognized that the Hamming distance implementation in Su for convolutional decoding could be implemented with the convolutional decoding of IS-54-B with the added benefit of simplicity and lower complexity implementation. Ex.1003, ¶¶197-198.

Therefore, although a POSITA would understand IS-54-B to teach convolutional decoding for soft values of the bits, for additional detail on how to simplify decoding, a POSITA would have incorporated Su's teachings of the Hamming distance metric for maximum likelihood convolutional decoding using hard values for the bits as well. Doing so would have been nothing more than the use of a known technique (comparing bits and checking for errors through the Hamming process) to improve a similar method (IS-54-B's convolutional coding), and a POSITA would have had a reasonable expectation of success in doing so. *Id*., ¶199.

C. Independent Claim 8

1. 8[pre] (*A communication quality judging method, the method comprising the steps of*)

See Section IV.D.1.

2. 8[a] (*obtaining a baseband signal representative of a sequence of multilevel symbols and judging the symbol represented by the baseband signal*)

See Section IV.D.2.

3. 8[b] (*judging communication quality of a transmission channel over which the baseband signal has been transmitted, based on content of the symbol judged in the symbol judging step*)

Su discloses and renders obvious this limitation. Ex.1003, ¶204.

Su discloses an improvement "for detection and masking of bad frames in a coded speech signal." Ex.1008, Abstract. Specifically, Su discloses an error detection uniquely "based on a maximum likelihood (ML) check and is only used if the CRC check is successful." *Id.*, 4:67-5:2; Ex.1003, ¶205.

Su discloses that "maximum likelihood convolutional decoding (Viterbi decoding) is employed to recover the protected bits in Group A and Group B bits. Statistically, the metric assigned to the final surviving path by Viterbi decoding represents a measure of confidence in the recovered bits. The higher the metric, the lower the estimated bit error rate (BER) for these bits." *Id.*, 5:2-11. A POSITA would have combined these teachings of Su for the reasons described above. *Supra*, § V.B.1; Ex.1003, ¶206.

Accordingly, Su discloses and renders obvious limitation 8[b]: "*judging communication quality of a transmission channel over which the baseband signal has been transmitted, based on content of the symbol judged in the symbol judging step*" (e.g., performing a maximum likelihood check on a speech signal to check for bit errors). Ex.1003, ¶207.

4. 8[c] (*changing data if the communication quality judged in the communication quality judging step does not satisfy a predetermined condition, to make a predetermined change to the data to be transmitted represented by the symbol used in the judgment*)

The combined teachings of IS-54-B and Su render obvious this limitation. *See* Section IV.D.4 concerning "*changing data . . . to make a predetermined change to the data to be transmitted represented by the symbol used in the judgment*." Ex.1003, ¶208.

Su teaches comparison against a threshold in describing a "metric to determine whether the group B bits are corrupted." Ex.1008, 5:9-12. In particular, Su teaches that "[f]rames are rejected if the CRC check fails or the ML threshold is exceeded." *Id*., 5:11-14. The ML threshold thus corresponds to a "*predetermined condition*" as recited. Ex.1003, ¶209.

In more detail as shown in FIGs. 3a and 3b below, Su discloses that "the BER of the 65 Group B bits 53 is verified against the ML threshold. If the ML check is OK, indicating a minimal number of errors, the 65 Group B bits 53 are accepted without modification." Ex.1008, 5:56-60. But, "[w]hen the distance is higher then [*sic*] [the Hamming distance threshold of] 19, the bits 53 are rejected. When the ML check 54 is not OK, the" data may be changed according to the teachings of IS-54-B. *Id*., 5:61-6:6. "By checking a finite ML threshold (e.g., 19), for a bad channel condition . . . the BER for accepted frame is reduced from 2% to 0.8%." *Id.*, 5:18-20; *see also id.*, 5:66-67; Ex.1003, ¶210.

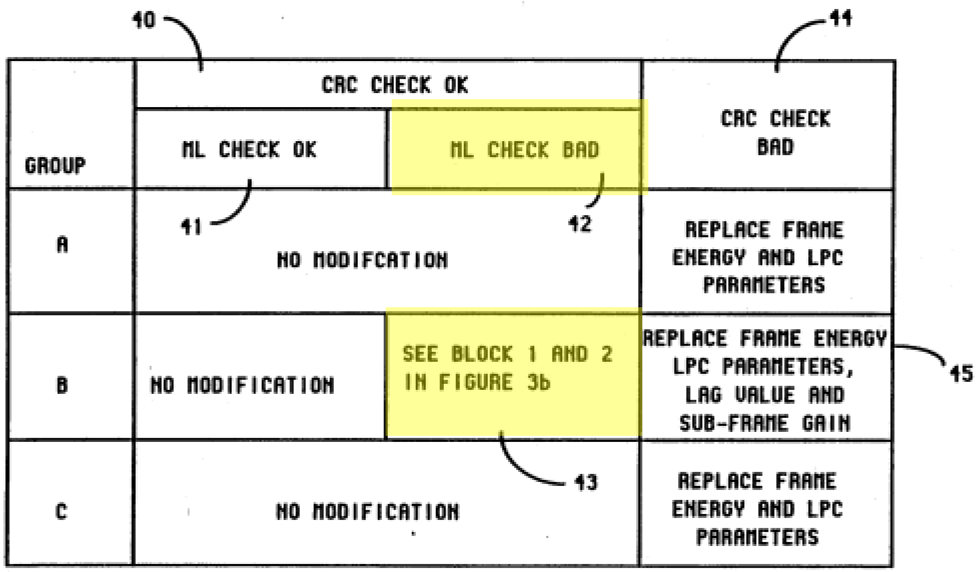


FIGURE 3a

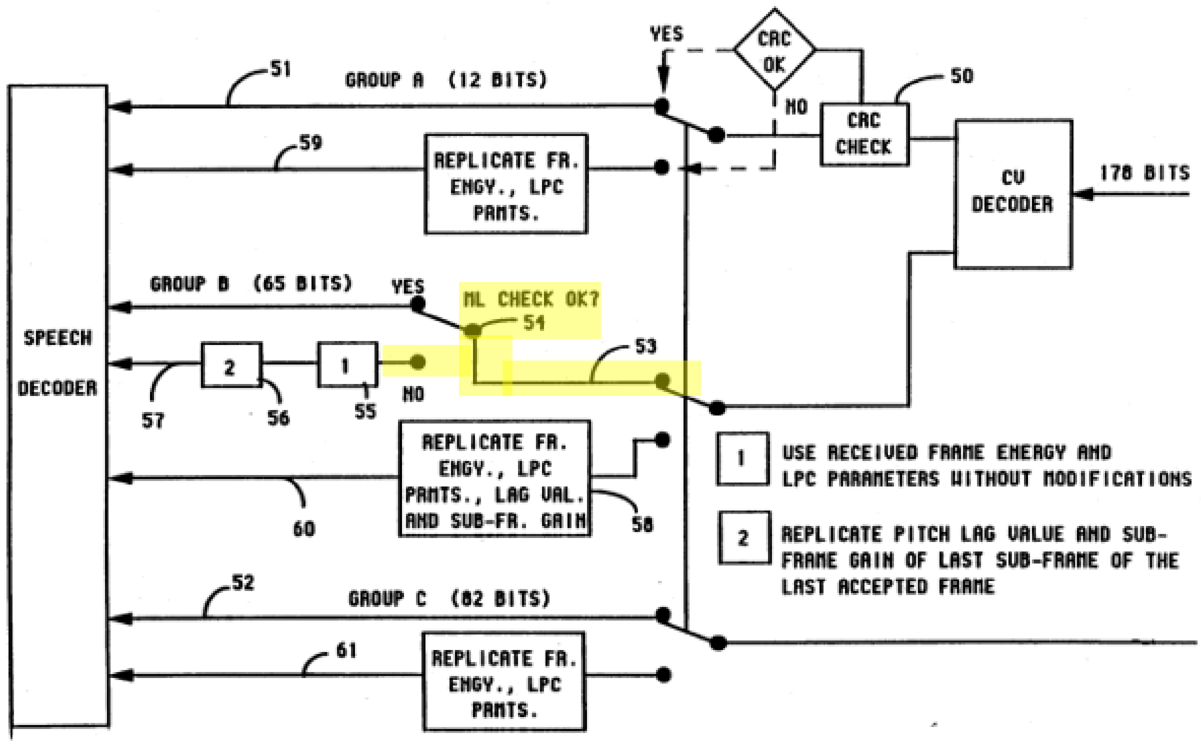


FIGURE 3b

Ex.1008, FIGs. 3a (annotated), 3b (annotated).

In light of the teachings of IS-54-B, this teaching of Su corresponds to "*if the communication quality judged in the communication quality judging step does not satisfy a predetermined condition*" because if the ML check (as determined by the ML threshold) indicates a minimal number of errors, data may not be changed as IS-54-B teaches; by contrast, if the ML check indicates more than the minimal number, data may be changed as IS-54-B teaches. Ex.1003, ¶211.

A POSITA would have combined these teachings of Su for the reasons described above. *Supra*, § V.B.II; Ex.1003, ¶212.

Accordingly, the combined teachings of IS-54-B and Su disclose and render obvious limitation 8[d]: "*changing data … to make a predetermined change to the data to be transmitted represented by the symbol used in the judgment*" (e.g., IS-54-B's replacing, attenuating, or muting data) "*if the communication quality judged in the communication quality judging step does not satisfy a predetermined condition,*" (e.g., Su's comparison against the ML threshold). Ex.1003, ¶213.

5. 8[d] (*wherein at least a portion of a bit string is distinguished as a protected portion, the bit string constituting data to be transmitted represented by the sequence of symbols, and at least a portion of the symbol that belongs to the sequence of symbols contains a bit belonging to the protected portion and a redundant bit having a predetermined value*)[6]

Su discloses and renders obvious this limitation. Ex.1003, ¶214.

As an initial matter, protecting a portion of a bit string by using redundant bits was well-known in the art by 2004. Ex.1003, ¶215. A bit is a binary digit with a value of either 0 or 1. *Id*. Protecting bits by dividing them into portions with various levels of protection was also well-known in the art by 2004. *Id*.

Indeed, these concepts were adopted and part of well-known standards before 2004. For example, Su discloses that "speech information bits in digital

---

[6] To the extent Patent Owner reads a "protected portion" to mean a string of bits having the value 1, such a "protected portion" is disclosed by Mårtensson. *Supra*, § IV.C.5.

cellular systems (**TIA-IS-54 and GSM**) are organized into three groups[.]" Ex.1008, 3:29-31. "Group A comprises the perceptually most significant bits protected by error detection as well as **protection bits**." *Id*., 3:32-34. "Group B comprises a larger group of perceptually significant bits covered by error correction only." *Id*., 3:40-41. "The error correction capability of the channel codec is determined by the error protection techniques used, (such as, convolutional coding or Reed-Solomon coding)." *Id*., 1:28-30. "Group C comprises a group of perceptually less significant bits that are not protected at all." *Id*., 3:47-48. Su discloses that "[a]n error protection technique [] is [] applied on the class 1 bits" which "is based on convolutional coding" and class 1 consists of the Group A and Group B bits. *Id*., 4:4-22. Su further discloses that "[i]n both IS-54 and GSM standards, maximum likelihood convolutional decoding (Viterbi decoding) is employed to recover the protected bits in Group A and Group B bits." *Id*., 5:1-5; Ex.1003, ¶216.

Su discloses that "maximum likelihood convolution decoding (Viterbi decoding) is employed to recover the protected bits in Group A and Group B bits" ("*at least a portion of a bit string is distinguished as a protected portion*"). Ex.1008, 5:3-5. Su further explains that a "7 bit CRC (Cyclic Redundancy Checking) 13 is used for the purpose of error detection" on the Group A bits. *Id*., 4:10-13. Su also discloses that the Hamming distance metric is used as part of the decoding process and "[t]he higher the metric, the lower the estimated bit error rate (BER) for these bits." *Id.*, 5:2-27. As Dr. Bims explains, calculating the Hamming distance involves using redundant bits, comparing bits, and detecting errors ("*and a redundant bit having a predetermined value*"). *Id.*, 5:2-68; Ex.1003, ¶217.

Accordingly, Su discloses and renders obvious limitation 8[d]: "*wherein at least a portion of a bit string is distinguished as a protected portion, the bit string constituting data to be transmitted represented by the sequence of symbols, and at least a portion of the symbol that belongs to the sequence of symbols contains a bit belonging to the protected portion*" (e.g., Su's Group A and Group B bits) "*and a redundant bit having a predetermined value*" (e.g., bits within Su's Group B). Ex.1003, ¶218.

6. 8[e] (*wherein, in the communication quality judging step, the number of redundant bits having the predetermined value or the number of redundant bits missing the predetermined value is identified among the redundant bits contained in the symbol that contains a bit belonging to the protected portion, and the communication quality of the transmission channel is judged based on the identified result*)

Su renders this limitation obvious. Ex.1003, ¶219.

As an initial matter, comparing bits to calculate a Hamming distance was well-known in the art by 2004. Calculating the Hamming distance is the minimum number of bits in two codewords that differ from each other, and involves a bitwise comparison and thus identifying "*the number of redundant bits having the* *predetermined value or the number of redundant bits missing the predetermined value is identified*" would have been known to a POSITA. Ex.1003, ¶220.

As detailed in the analysis of limitation 8[b], Su teaches judging the communication quality of the transmission channel. Further, Su discloses determining a threshold based on "a measure of confidence in the recovered bits" during the decoding process, which is then applied to determine whether Group B bits are corrupted. Ex.1008, 5:5-12. Su discloses using a Hamming distance metric as the maximum likelihood metric. *Id*., 5:61-63; *see also id*., 3:66-4:27. Su discloses that "[f]rames are rejected if the CRC check fails or the ML threshold is exceeded" *Id*., 5:13-14. "[T]he BER of the [] Group B bits [] is verified against the ML threshold. If the ML check is OK, indicating a minimal number of errors, the Group B bits [] are accepted without modification" ("*the communication quality of the transmission channel is judged based on the identified result*"). *Id*., 5:57-60. Ex.1003, ¶221.

As detailed in the analysis of limitation 8[d], bits within Su's Group A and Group B bits include "*redundant bits contained in the symbol that contains a bit belonging to the protected portion*." *Supra* § V.C.5; Ex.1003, ¶222.

Accordingly, Su discloses and renders obvious limitation 8[e]: "*wherein, in the communication quality judging step, the number of redundant bits having the predetermined value or the number of redundant bits missing the predetermined* *value*" (e.g., Su's Hamming distance metric) "*is identified among the redundant bits contained in the symbol that contains a bit belonging to the protected portion, and the communication quality of the transmission channel is judged based on the identified result*" (e.g., Su's comparing the bit error rate to a threshold to determine whether the bits should be accepted without modification). Ex.1003, ¶223.

D. Independent Claim 1

1. 1[pre] (*A communication quality judging device comprising*)

See supra, § IV.D.1.

2. 1[a] (*a symbol judging means for obtaining a baseband signal representative of a sequence of multilevel symbols and judging the symbol represented by the baseband signal*)

See supra, § IV.D.2.

3. 1[b] (*a communication quality judging means for judging communication quality of a transmission channel over which the baseband signal has been transmitted, based on content of the symbol judged by the symbol judging means*)

As detailed above in the analysis of limitation 8[b], the teachings of Su render obvious "*judging communication quality of a transmission channel over which the baseband signal has been transmitted, based on content of the symbol judged in the symbol judging step*." Thus, the function of this limitation is rendered obvious by the prior art. Ex.1003, ¶226.

Further, Su renders obvious the corresponding structure, or equivalents thereof. For example, Su discloses a "speech decoder" (Ex.1008, 3:20-22) which a

POSITA would have recognized as equivalent to the corresponding structure of a processor checking the value of bits and comparing the number of bits having or missing a predetermined value to threshold values as identified in § III.D.2, *supra*. *See also* Ex.1008, FIG. 3b, 1:13-33, 2:47-40, 4:46-65, 5:61-6:5, 6:25-36, claims 1-2; Ex.1003, ¶227.

Accordingly, the combination renders obvious this limitation. Ex.1003, ¶228.

4. 1[c] (*a data changing means for, if the communication quality judged by the communication quality judging means does not satisfy a predetermined condition, making a predetermined change to the data to be transmitted represented by the symbol used in the judgment*)

As detailed above in the analysis of limitation 8[c], the teachings of IS-54-B and Su render obvious "*if the communication quality judged by the communication quality judging means does not satisfy a predetermined condition, making a predetermined change to the data to be transmitted represented by the symbol used in the judgment*." Thus, the function of this limitation is rendered obvious by the prior art. Ex.1003, ¶229.

Further, IS-54-B and Su render obvious the corresponding structure, or equivalents thereof. For example, IS-54-B discloses a "bad frame masking system … based on a 6 state machine" which a POSITA would have understood to be implemented by a processor or similar circuitry within a cellular device, or a processor for replacing data, muting data, substantially destroying data, and attenuating data as identified in § III.D.3, *supra*. Likewise, Su discloses a "speech decoder" (Ex.1008, 3:20-22) which a POSITA would have recognized as equivalent to the corresponding structure for this limitation. *See also id*., FIG. 3b, 1:13-33, 2:47-40, 4:46-65, 5:61-6:5, 6:25-36, claims 1-2; Ex.1003, ¶230.

Accordingly, the combination renders obvious this limitation. Ex.1003, ¶231.

5. 1[d] (*wherein at least a portion of a bit string is distinguished as a protected portion, the bit string constituting data to be transmitted represented by the sequence of symbols, and at least a portion of the symbol that belongs to the sequence of symbols contains a bit belonging to the protected portion and a redundant bit having a predetermined value*)

See supra, 8[d].

6. 1[e] (*wherein the communication quality judging means identifies the number of redundant bits having the predetermined value or the number of redundant bits missing the predetermined value among the redundant bits contained in the symbol that contains a bit belonging to the protected portion, and judges the communication quality of the transmission channel based on the identified result*)

See supra, 8[e].

E. Dependent Claims 2-7

Dependent claims 2-7 are disclosed or rendered obvious by IS-54-B for the same reasons as detailed with respect to Ground 1. *See* §§ IV.E.1-7.

F. Independent Claim 9

See §§ IV.F (preamble), V.C (limitations).

VI. The Board Should Reach the Merits of this Petition

A. *Advanced Bionics* Favors Institution

This Petition presents new prior art and arguments for which the file history contains no indication the Office ever previously considered in connection with the ’891 patent. IS-54-B, Yeh, Dent, and Su are not identified on the face of the ’891 patent as having been cited by either the applicant or Examiner during original examination, and certainly were not applied in a rejection or identified in the Examiner’s reasons for allowance.

Because the ’891 patent’s original examination did not involve negotiation between the applicant and the Examiner regarding the prior art teachings applied in the Petition, this Petition’s art and arguments cannot be said to be the same as, or substantially similar to, the art or arguments previously presented to the Office in connection with the ’891 patent. Although the Examiner relied upon Mårtensson in rejecting the claims during prosecution, the applicant did not dispute that Mårtensson taught those limitations of the claims. And, to the extent file history contains any other prior art teachings or arguments cumulative to those presented in this Petition, the Examiner erred in not recognizing the significance of those teachings or arguments in relation to the unpatentability of claims 1-9. *Advanced*

Bionics LLC v. MED-EL Elektromedizinische Gerate GmbH, IPR2019-01469, Paper 6 (PTAB Feb. 13, 2020) (precedential) (citing *Becton, Dickinson and Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 (PTAB Dec. 15 2017) (precedential)). For example, the Examiner erred in not applying the teachings of IS-54-B, an international standard which was well-known to POSITAs and which shows that the limitations of the '891 patent's claims were well-known.

Accordingly, Petitioner submits that exercise of the Board's discretion under § 325(d) is unwarranted.

B. *General Plastic* Factors Favor Institution

General Plastic does not apply because no party has previously filed a petition directed to any claim of the '891 patent. *See General Plastic Industrial Co., Ltd. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19 (PTAB Sept. 6, 2017) (precedential).

C. *Fintiv* Factors Favor Institution

Discretionary denial under 35 U.S.C. §314(a) is not appropriate. Patent Owner filed its amended complaint in the District Court for the Eastern District of Texas asserting the '891 patent on August 2, 2024 and then filed an amended complaints on January 17, 2025.

The district court litigation is at an early stage. Under the current schedule, the claim construction hearing will not occur until September 16, 2025, and expert discovery will not close until November 18, 2025. Ex.1016, 4. The trial is not scheduled to begin until March 2, 2026. Ex.1016, 1. Further, this Petition challenges all claims of the '891 patent, while only claims 1-4, 6, and 8-9 will be addressed by the district court litigation; thus, this Petition will address the patentability of claims (i.e., claims 5 and 7) that the district court will not address, reducing any overlap between the proceedings. Finally, the merits of this petition are strong, as the prior art contains teachings that plainly render obvious all claims of the '891 patent.

Petitioner reserves the right to file an opposition to Patent Owner's discretionary arguments submitted pursuant to the Acting Director's Interim Processes for PTAB Workload Management of March 26, 2025.

VII. Mandatory Notices under 37 C.F.R. § 42.8

A. Real Parties-in-Interest

Google LLC is the petitioner and real party-in-interest. [7]

---

[7] Google LLC is a subsidiary of XXVI Holdings Inc., which is a subsidiary of Alphabet Inc. XXVI Holdings Inc. and Alphabet Inc. are not real parties-in-interest to this proceeding.

B. Related Matters

Advanced Coding Technologies LLC v. Google LLC, Case 2:24-cv-00353 (E.D.Tex.) and *Advanced Coding Technologies LLC v. Apple Inc.*, Case 2:24-cv-00572 (E.D.Tex.).

C. Grounds for Standing

Petitioner certifies that the '891 patent is available for *inter partes* review and that Google is not barred from requesting this proceeding.

D. Lead and Backup Counsel and Service Information

Pursuant to 37 C.F.R. §§ 42.8(b)(3), 42.8(b)(4), and 42.10(a), Google designates the following lead counsel:

- Raghav Bajaj (Reg. No. 66,630), raghav.bajaj@lw.com, Latham & Watkins LLP; 300 Colorado St. Suite 2400; Austin, TX 78701; 737.910.7370.

Google also designates the following backup counsel:

- Douglas E. Lumish (*pro hac vice* motion to be filed), doug.lumish@lw.com, Latham & Watkins LLP; 140 Scott Drive; Menlo Park, CA 94025; 650.463.2633.
- Patricia Young (*pro hac vice* motion to be filed), patricia.young@lw.com, Latham & Watkins LLP; 1271 Avenue of the Americas; New York, NY 10020; 212.906.1661.

- Linfong Tzeng (Reg. No. 65,140), linfong.tzeng@lw.com, Latham & Watkins LLP; 140 Scott Drive; Menlo Park, CA 94025; 650.463.3092
- Joseph H. Lee (*pro hac vice* motion to be filed), joseph.lee@lw.com, Latham & Watkins LLP; 650 Town Center Drive, 20th Floor; Costa Mesa, CA 92626-1925; 714.755.8046.

Pursuant to 37 C.F.R. § 42.10(b), a Power of Attorney from Google is attached. Google consents to electronic service.

E. Fee for *Inter Partes* Review

The Director is authorized to charge the fee specified by 37 C.F.R. § 42.15(a) to Deposit Account No. 506269.

VIII. Conclusion

For the reasons set forth above, Petitioner Google respectfully requests *inter partes* review of the challenged claims of the ’891 patent.

Respectfully submitted,

Dated: June 17, 2025

By: / Raghav Bajaj /

Raghav Bajaj (Reg. No. 66,630)
raghav.bajaj@lw.com
Latham & Watkins LLP
300 Colorado St., Suite 2400
Austin, TX 78701
Telephone: 737.910.7370
Fax: 737.910.7301

Counsel for Petitioner
Google LLC

CERTIFICATE OF COMPLIANCE WITH 37 C.F.R. § 42.24

I hereby certify that this Petition complies with the word count limitation of 37 C.F.R. § 42.24(a)(1)(i) because the Petition contains a total of 13,993 words calculated by Microsoft Word's word-count feature. This total excludes the cover page, signature block, and the parts of the Petition exempted by 37 C.F.R. § 42.24(a)(1).

By: / Raghav Bajaj /

Raghav Bajaj (Reg. No. 66,630)
raghav.bajaj@lw.com
Latham & Watkins LLP
300 Colorado St., Suite 2400
Austin, TX 78701
Telephone: 737.910.7370
Fax: 737.910.7301

Counsel for Petitioner
Google LLC

CERTIFICATE OF SERVICE

The undersigned certifies that a complete copy of this Petition for *Inter Partes* Review of U.S. Patent No. 7,804,891 and all Exhibits and other documents filed together with this Petition were served on the official correspondence address for the patent shown in Patent Center:

Robinson Intellectual Property Law Office, P.C.
3975 Fair Ridge Drive
Suite 20 North
Fairfax, VA 22033

via FEDERAL EXPRESS next business day delivery, on June 17, 2025.

By: / Raghav Bajaj /

Raghav Bajaj (Reg. No. 66,630)
raghav.bajaj@lw.com
Latham & Watkins LLP
300 Colorado St., Suite 2400
Austin, TX 78701
Telephone: 737.910.7370
Fax: 737.910.7301

Counsel for Petitioner
Google LLC