

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS AMERICA, INC. and
SAMSUNG ELECTRONICS CO., LTD.,
Petitioner,

v.

COLLISION COMMUNICATIONS, INC.,
Patent Owner.

IPR2024-01249
Patent 6,947,505 B2

Before NEIL T. POWELL, CHARLES J. BOUDREAU, and
DONALD E. DAYBELL, Administrative Patent Judges.

BOUDREAU, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Samsung Electronics America, Inc. and Samsung Electronics Co., Ltd. (collectively, “Petitioner”) filed a Petition requesting *inter partes* review of claims 1, 3–5, and 7–9 (“the challenged claims”) of U.S. Patent No. 6,947,505 B2 (Ex. 1001, “the ’505 patent”). Paper 1 (“Pet.”). Petitioner filed a declaration of Paul S. Min, Ph.D. (Ex. 1003) in support of the Petition. Collision Communications, Inc. (“Patent Owner”) filed a Preliminary Response. Paper 7 (“Prelim. Resp.”). Patent Owner filed a declaration of Giuseppe Caire (Ex. 2001) in support of the Preliminary Response.

We have authority to determine whether to institute an *inter partes* review. *See* 35 U.S.C. § 314 (2018); 37 C.F.R. § 42.4(a) (2024). We may not institute an *inter partes* review “unless . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a).

Upon consideration of the arguments and evidence presented, we determine that Petitioner has not established a reasonable likelihood that it would prevail with respect to either ground asserted in the Petition. We therefore deny institution of *inter partes* review.

II. BACKGROUND

A. *Real Parties in Interest*

The parties identify themselves as the real parties in interest. Pet. 80; Paper 5, 2 (Patent Owner’s Mandatory Notices).

B. *Related Matter*

The parties indicate that the ’505 patent is involved in *Collision Communications, Inc. v. Samsung Electronics Co.*, No. 2:23-cv-587 (E.D. Tex.). Pet. 80; Paper 5, 2; Paper 11, 2 (Patent Owner’s Updated Mandatory

Notices). Patent Owner additionally identifies the following as proceedings that “may affect or be affected by a decision in this proceeding”:

Collision Communications, Inc. v. Nokia Networks & Solutions Oy,
No. 2:21-cv-000308 (E.D. Tex.);

Collision Communications, Inc. v. Lenovo Group Limited, No. 2:23-
cv-00594 (E.D. Tex.);

Collision Communications, Inc. v. Telefonaktiebolaget LM Ericsson,
2:21-cv-00327 (E.D. Tex.);

Petition for *Inter Partes* Review of U.S. Patent No. 9,814,071,
Ericsson Inc. et al. v. Collision Communications, Inc., IPR2022-
01233 (PTAB July 20, 2022);

Petition for *Inter Partes* Review of U.S. Patent No. 7,593,492,
Samsung Electronics America, Inc. et al. v. Collision
Communications, Inc., IPR2024-01247 (PTAB August 1, 2024);

Petition for *Inter Partes* Review of U.S. Patent No. 9,814,071,
Samsung Electronics America, Inc. et al. v. Collision
Communications, Inc., IPR2024-01248 (PTAB August 2, 2024);

Petition for *Inter Partes* Review of U.S. Patent No. 8,089,946,
Samsung Electronics America, Inc. et al. v. Collision
Communications, Inc., IPR2024-01250 (PTAB August 2, 2024);

Petition for *Inter Partes* Review of U.S. Patent No. 7,463,703,
Samsung Electronics America, Inc. et al. v. Collision
Communications, Inc., IPR2024-01500 (PTAB September 30,
2024);

Petition for *Inter Partes* Review of U.S. Patent No. 7,920,651,
Samsung Electronics America, Inc. et al. v. Collision
Communications, Inc., IPR2025-00011 (PTAB October 2, 2024);

Petition for *Inter Partes* Review of U.S. Patent No. 8,089,946, *Lenovo*
(United States) Inc. et al. v. Collision Communications, Inc.,
IPR2025-00284 (PTAB December 12, 2024);

Petition for *Inter Partes* Review of U.S. Patent No. 6,947,505, *Lenovo (United States) Inc. et al. v. Collision Communications, Inc.*, IPR2025-00285 (PTAB December 12, 2024);

Petition for *Inter Partes* Review of U.S. Patent No. 9,814,071, *Intel Corporation et al. v. Collision Communications, Inc.*, IPR2025-00301 (PTAB December 12, 2024);

Petition for *Inter Partes* Review of U.S. Patent No. 7,920,651, *Intel Corporation et al. v. Collision Communications, Inc.*, IPR2025-00302 (PTAB December 12, 2024); and

Petition for *Inter Partes* Review of U.S. Patent No. 7,463,703, *Intel Corporation et al. v. Collision Communications, Inc.*, IPR2025-00303 (PTAB December 12, 2024).

Paper 11, 2–4. Of the identified petitions, only that in IPR2025-00285, filed by Lenovo (United States), Inc. and Motorola Mobility LLC with a motion for joinder to the instant proceeding, involves the ’505 patent. *See* IPR2025-00285, Papers 2, 3.

C. The ’505 Patent

The ’505 patent, titled “System for Parameter Estimation and Tracking of Interfering Digitally Modulated Signals,” is directed to a parameter estimation unit in a multi-user detection (“MUD”) system for use in separating interfering signals in a telecommunications system. Ex. 1001, codes (54), (57), 1:9–12.

By way of background, the ’505 patent explains that parameter estimation units are used to derive channel parameters that uniquely distinguish the characteristics of individual signals in the presence of interfering signals existing in the same communications bandwidth and at the same instant in time. Ex. 1001, 1:19–24. According to the ’505 patent, such parameters “are required by any signal separation system for highly loaded or overloaded systems of users” and “in general include for each

signal the channel transfer function comprised of the received power, the phase of the oscillator which generated each received signal, the timing offset relative to the base station clock, any frequency offset of the carrier, and the structure of the multipath replicas.” *Id.* at 1:24–31. The ’505 patent further explains, however, that parameters such as the received power of the signals, oscillator phase, and timing offset vary substantially from burst to burst, making parameter estimation somewhat difficult, and that changes in carrier frequency, due for example to Doppler shifts, renders signal separation “increasingly difficult in the changing environment where a number of mobile users are trying to communicate with a base station on the same channel.” *Id.* at 1:33–45.

With reference to a previously described parameter estimation method that utilized a serial approach to generation of parameter estimation values, the ’505 patent explains that such method “overlooks the dynamic nature of the communications environment” and that

while such a system is able to extract the various parameters of the simultaneously-occurring signals in a quite robust fashion, there remains nonetheless certain times when due to the serial nature of the calculation, there are blanks or blackout periods at which time some of the simultaneously-occurring signals are being ignored or are not being tracked.

Ex. 1001, 1:46–57. Thus, the ’505 patent explains, “in many multi-user configurations such as with air interfaces including GSM, other TDMA systems and CDMA systems, power level adjustments are made as often as 800 times a second,” such that “a parameter estimation at one particular point in time is invalid if for no other reason than the power level is changed at the handset.” *Id.* at 1:63–2:2. “For multi-user detection systems, there is therefore a need to be able to dynamically adapt to the changing signals

occasioned by the fact that the mobile users are in fact mobile and to the fact that the power adjustment for each of the mobile terminals is adjusted by the base station, sometimes on a burst by burst basis.” *Id.* at 1:58–63.

To address the identified issues, the ’505 patent provides that, in the subject parameter estimation unit, initial estimates are made of various parameters utilizing the interference-free received signal on the acquisition channel and the usual traffic channel training sequences which are transmitted to identify each mobile user and to set up timing for the burst transmission from the mobile phone. Ex. 1001, 2:8–17. “Thereafter, when a first user or corner exists and is assigned a particular traffic channel, initial parameter values from the acquisition channel are utilized in the tracking of the channel transfer function, including power, multipath structure, timing offset and frequency of this first corner or first signal in the traffic channel.” *Id.* at 2:17–22.

Thereafter, when a second interfering signal exists on the traffic channel, the system recreates the training sequence portion of every signal on the traffic channel prior to the last signal entering, and subtracts this from the training signal portion of the received signal to provide an interference-free signal from which to calculate estimates of the parameters for a newcomer to the channel. The above utilizes the training signal portions of the received signals. What this does in essence is to single out the signal of the newcomer.

Id. at 2:23–31.

Figure 1 of the '505 patent, reproduced below, is illustrative of the disclosed parameter estimation.

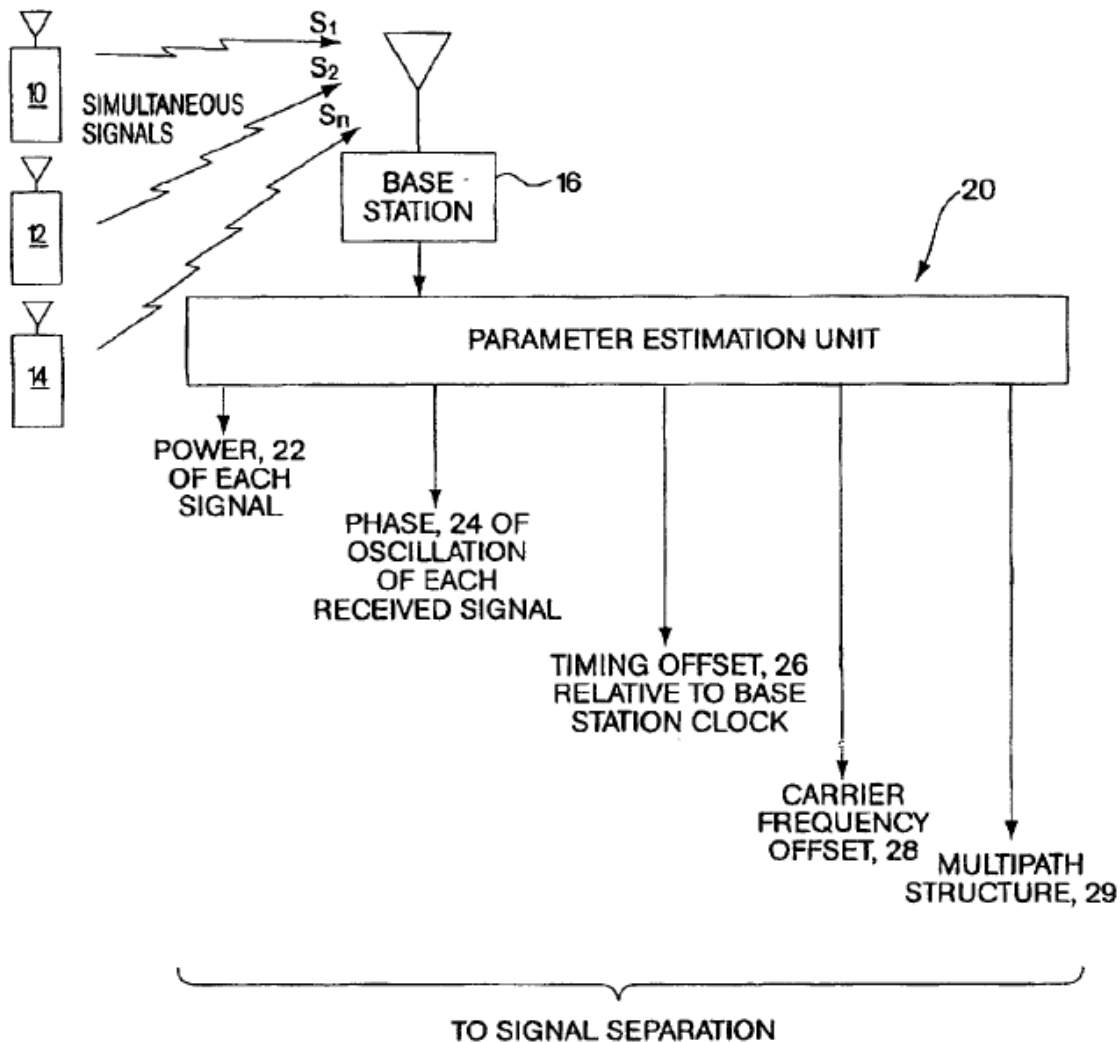


Fig. 1

Figure 1 is a “diagrammatic representation of the utilization of parameter estimation in the signal separation process in which the parameter estimation provides parameter values respectively for received power, phase, timing offset and carrier frequency offset.” Ex. 1001, 4:28–32. In Figure 1, wireless transceivers 10, 12, 14 communicate with base station 16, with signals S_1 , S_2 , S_n from transceivers 10, 12, 14, respectively, existing

simultaneously on the same traffic channel. *Id.* at 4:49–53. Thus, simultaneous signals are arriving at base station 16 and must be separated in order to be intelligible. *Id.* at 5:10–12. According to the '505 patent, “[s]uch systems are called overloaded multiple access systems and require for signal separation certain parameters of each of the signals which distinguish them.” *Id.* at 5:12–15. Due “to the lack of reliable robust signal separation devices, partly due to a lack of a reliable robust parameter estimation device able to estimate and track signal parameters when the signals are interfering with one another,” however, the '505 patent explains, “overloaded systems are not among those [that were] in operation” at the time of the invention. *Id.* at 5:15–20.

With reference again to Figure 1, parameter estimation unit 20 is thus illustrated to provide the channel transfer function for each of the interfering users at its output. Ex. 1001, 5:21–23. Specifically, parameter estimation unit 20 provides, at its output, for each of the interfering users, received power 22, phase 24 of the oscillator for each of the transmitted signals, timing offset 26 relative to the base station clock and transmission distance, carrier frequency offset 28, and multipath structure 29. *Id.* at 5:28–33. Each of signals $S_1, S_2, S_3, \dots S_n$ is thus identified in real time as to its parameters, and the parameters, when identified, are utilized in the signal separation process. *Id.* at 5:33–36.

Figure 2 of the '505 patent is reproduced below.

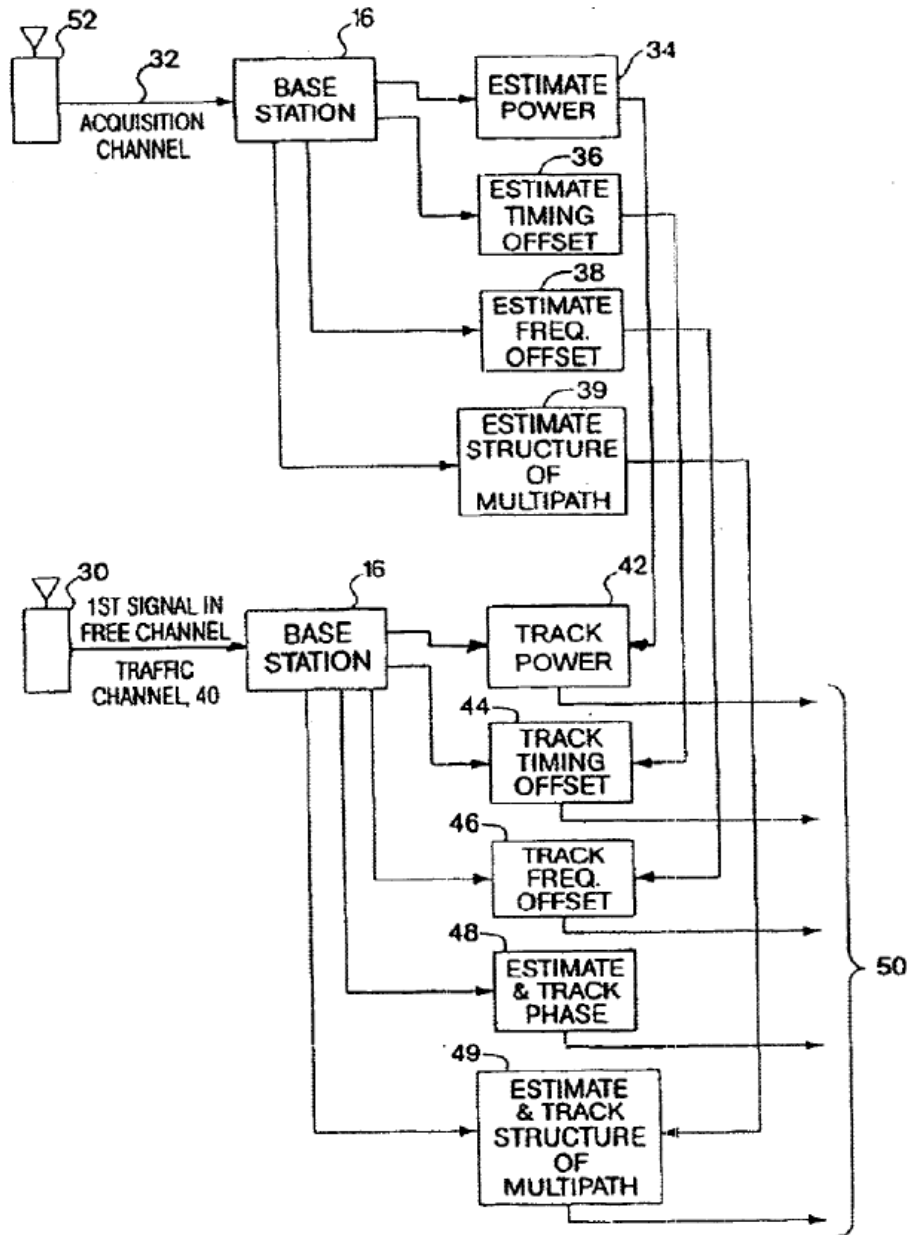


Fig. 2

Figure 2 is “a block diagram illustrating the first step in the generation of parameter estimation values through the utilization of signals in the acquisition channel and then from the first signal in the corresponding traffic channel.” Ex. 1001, 4:34–37. As depicted in Figure 2, wireless transceiver

30¹ communicates with base station 16 over acquisition channel 32. *Id.* at 5:55–60. Base station 16 “provides an initial set of estimates of estimated power 34, timing offset 36, frequency offset 38, and multipath structure 39 for the first wireless user which seeks to communicate with the base station.” *Id.* After communicating over acquisition channel 32, transceiver 30 is assigned to traffic channel 40. *Id.* at 5:64–66. The first signal that exists in the assigned traffic channel and is received by base station 16 has its power, timing offset, carrier frequency offset, and multipath structure tracked using the initial values generated by analysis of the signal in the acquisition channel. *Id.* at 5:66–6:4. Those initial values are applied to power tracking algorithm 42, timing offset tracking algorithm 44, frequency tracking algorithm 46, and multipath structure tracking algorithm 49, the outputs of which are parameters corresponding to the tracking of the particular signal. *Id.* at 6:4–8. Also included is unit 48, which estimates and tracks the relative phase of the first signal of traffic channel 40. *Id.* at 6:9–10. The outputs of algorithms 42, 44, 46, 49 and unit 48 correspond to the parameter values for the first signal in the channel and are collectively designated as element 50 in Figure 2. *Id.* at 6:11–22.

¹ We note that transceiver 30 appears to be mislabeled as “52” in Figure 2.

Figure 3 of the '505 patent is reproduced below.

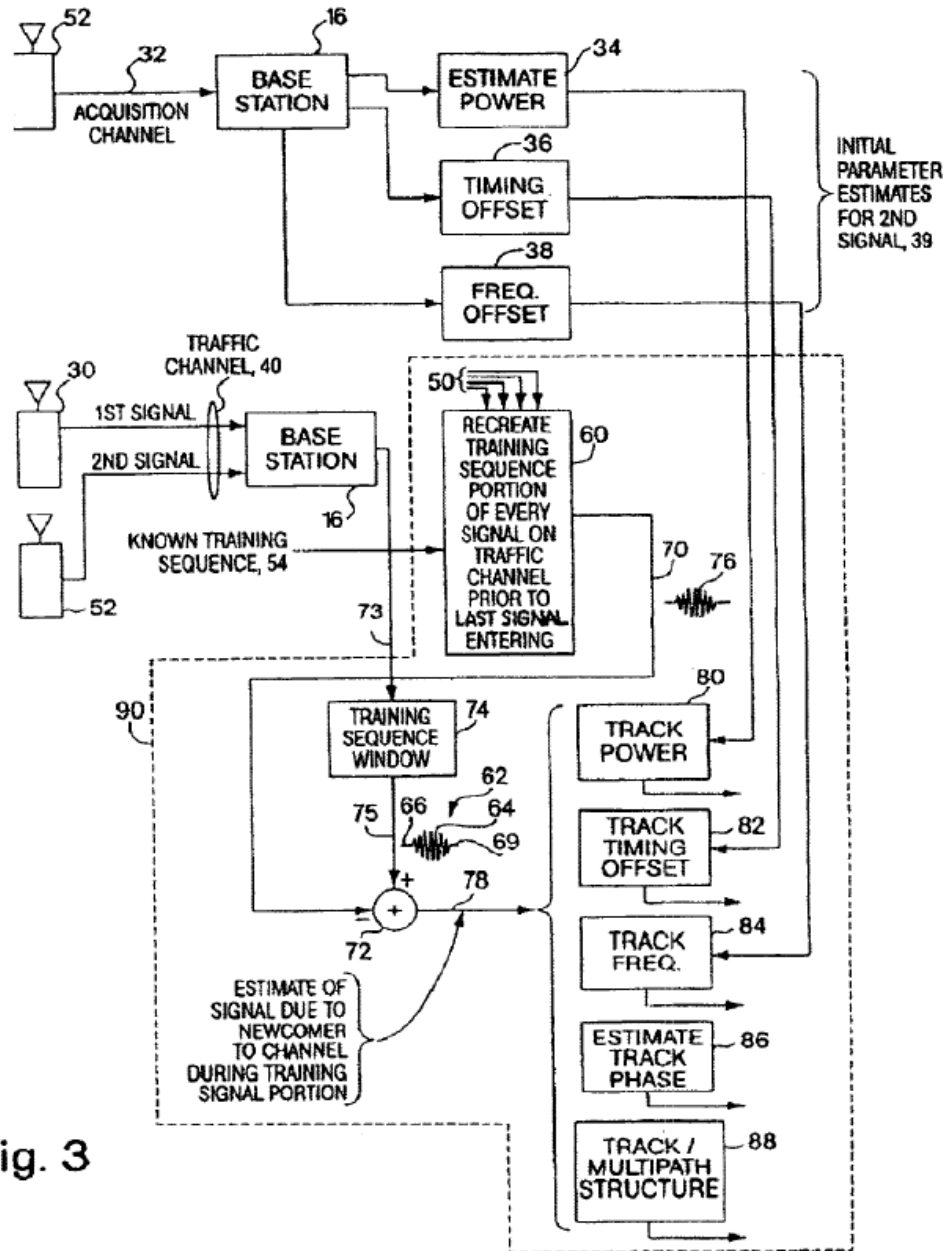


Fig. 3

Figure 3 is “a block diagram of the operation of the subject system in which a second interfering signal is assigned to the same traffic channel,” wherein “the subject system utilizes the recreation of the training sequence portion of every signal on the traffic channel prior to the last signal entering and subtracts this from the training sequences.” Ex. 1001, 4:38–43. The system shown in Figure 3 includes base station 16, first wireless transmitter 30,

acquisition channel 32, traffic channel 40, second wireless transmitter 52, and parameter tracking unit 90, where parameter tracking unit 90 in turn includes training sequence recreation unit 60, line 70, summing junction 72, training sequence windowing unit 74, unit 75, and summing junction output 78. *See id.* at 6:39–7:29.

With reference to Figure 3, in operation, wireless transmitter 30 communicates with base station 16 over traffic channel 40, and current estimates of power, timing offset, frequency offset, phase, and multipath structure corresponding to the received signal due to transmitter 30 are tracked and are available over line 50. *Ex. 1001*, 6:24–28. Second wireless transmitter 52 simultaneously communicates with base station 16. *Id.* at 6:28–30. Training sequences assigned to the two wireless transceivers are stored as training protocol 54 in base station 16. *Id.* at 6:31–35. From the training sequences and their analysis, the '505 patent explains, one can isolate the second signal in order to provide its particular parameter estimates. *Id.* at 6:35–7:45.

Figure 4 of the '505 patent is reproduced below.

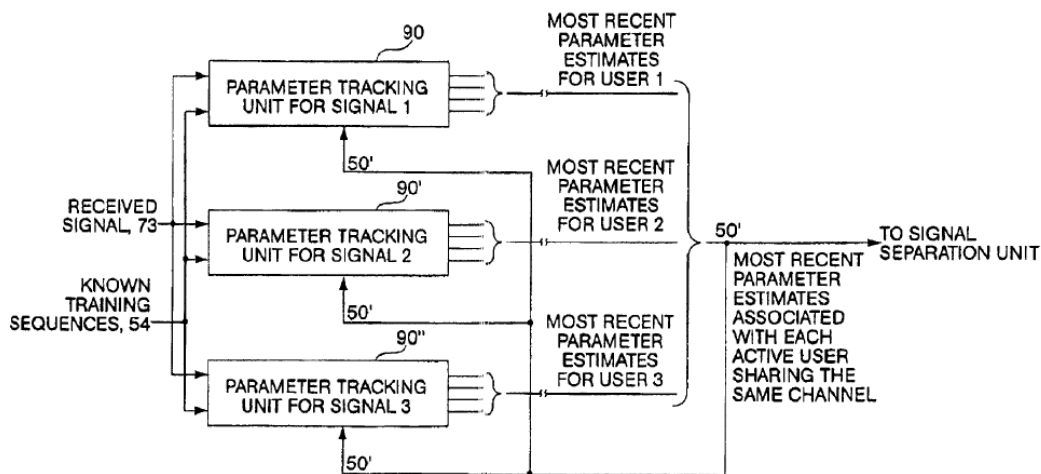


Fig. 4

Figure 4 is “a block diagram of a parallel tracking scheme for more than one interfering signal in a steady state where no users have dropped in or out of a channel.” Ex. 1001, 4:44–46. With reference to Figure 4, the ’505 patent explains that “the parameter tracking unit of FIG. 3, which include[s] all of the elements and dotted box 90, [is] duplicated as 90, 90' and 90'.” *Id.* at 7:56–59. “[A]ssuming that the training sequences are known for [interfering] signals and one has initial estimates of all of the signal parameters . . . , then these parameters can be updated by recalculating parameters associated with the first signal by using the information available from the second and third signals.” *Id.* at 7:46–54. More particularly, according to the ’505 patent, “assuming one wishes to update the parameters for the first signal, then the outputs of parameter tracking unit 90' and parameter tracking unit 90" are fed back to parameter tracking unit 90 so as to be able to recreate Signal 2 and Signal 3 and then strip them away from the received signal.” *Id.* at 7:60–65. “As described above for the parameter estimation of the newcomer, tracking unit 90 temporarily treats Signal 1 as if it is the newcomer to create an estimate of the received signal that would have been due to the transmission of Transmitter 1,” and “[h]aving thus calculated an interference free signal, the parameter estimates are calculated again as shown in FIG. 3 and averaged with older parameter estimates for this user as described in the FIG. 3 discussion.” *Id.* at 7:65–8:6. Further, according to the ’505 patent, “[w]hile the above has indicated a serial processing scheme, . . . all of the parallel parameter tracking can in fact be done in a parallel manner, as FIG. 4 indicates.” *Id.* at 8:10–13.

D. Illustrative Claim

Of the challenged claims, claims 1 and 9 are independent. Claim 1, reproduced below, is illustrative of the claimed subject matter.

1. In a multi-user detection system in which interfering signals are purposely allowed to exist, a parameter estimation unit for use in conjunction with a signal separation unit, in which each received signal has associated channel transfer functions, comprising:

a signal processor for determining said channel transfer functions for each received signal; and,

means coupled to said channel transfer function determining signal processor for providing uninterrupted estimates of the channel transfer function parameters on a real-time basis by first deriving the estimated channel transfer function for each of said interfering signals.

Ex. 1001, 12:41–53.

E. Asserted Grounds of Unpatentability

Petitioner asserts that the challenged claims are unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. §²	Reference(s)/Basis
1, 3–5, 7–9	103(a)	Hottinen, ³ Lilleberg ⁴
1, 3–5, 7–9	103(a)	Zimmerman, ⁵ Lilleberg

Pet. 6.

² The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), amended 35 U.S.C. §§ 102 and 103, effective March 16, 2013. Because the filing date of the application for the ’505 patent was before that date, we refer to the pre-AIA version of sections 102 and 103.

³ Hottinen et al., US 5,995,499, issued November 30, 1999 (Ex. 1004).

⁴ Lilleberg et al., US 5,905,946, issued May 18, 1999 (Ex. 1006).

⁵ Zimmerman et al., WO 94/00918, published January 6, 1994 (Ex. 1005).

III. ANALYSIS

A. *Legal Standards*

A patent claim is unpatentable under 35 U.S.C. § 103 if “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved based on underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when presented, objective evidence of obviousness or nonobviousness, i.e., secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3)); *see also Intelligent Bio-Sys.*, 821 F.3d at 1369. Therefore, to prevail in an *inter partes* review, Petitioner must explain how the proposed combinations of prior art would have rendered the challenged claims unpatentable. At this preliminary stage, we determine whether the information presented in the Petition shows there is a reasonable likelihood that Petitioner would prevail in establishing that at least one of the challenged claims would have been obvious over the proposed combinations of prior art. *See* 35 U.S.C. § 314(a).

B. *Level of Ordinary Skill in the Art*

Determining whether an invention would have been obvious under 35 U.S.C. § 103 requires resolving the level of ordinary skill in the pertinent

art at the time the invention was made. *Graham*, 383 U.S. at 17. The person of ordinary skill in the art is a hypothetical person who knows the relevant art. *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). Factors in determining the level of ordinary skill in the art include the types of problems encountered in the art, the sophistication of the technology, and educational level of active workers in the field. *Id.* One or more factors may predominate. *Id.*

Petitioner contends that a person of ordinary skill in the art “at the time of the ’505 patent had at least a bachelor’s in EE/CE/CS, physics, or equivalent, and two years of experience with cellular telecommunications, radio-access network architectures, protocols and signal propagation,” where “[m]ore education can supplement practical experience and vice versa.” Pet. 6 (citing Ex. 1003 ¶¶ 51–55).

Patent Owner does not comment on Petitioner’s formulation or offer any competing formulation in its Preliminary Response. *See generally* Prelim. Resp.

We find Petitioner’s proposal to be consistent with the evidence of record, including the asserted prior art and the ’505 patent, and accordingly, we adopt Petitioner’s proposed definition of the level of ordinary skill in the art for purposes of this Decision.

C. Claim Construction

In an *inter partes* review, we apply the same claim construction standard as would be used by a district court to construe a claim in a civil action involving the validity or infringement of a patent. 37 C.F.R. § 42.100(b). Under that standard, claim terms are given their ordinary and customary meaning, as would have been understood by a person of ordinary skill in the art at the time of the invention, in light of the language of the

claims, the specification, and the prosecution history of record. *Id.*; *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–19 (Fed. Cir. 2005) (en banc); *Thorner v. Sony Comput. Entm’t Am. LLC*, 669 F.3d 1362, 1365–66 (Fed. Cir. 2012).

Petitioner addresses two claim phrases, discussed in turn below, and contends that all other claim terms “should carry their ‘ordinary and customary meaning.’” Pet. 13–14.

1. *“a parameter estimation unit for use in conjunction with a signal separation unit, in which each received signal has associated channel transfer functions”*

The preamble of claim 1 recites, in part, “a parameter estimation unit for use in conjunction with a signal separation unit, in which each received signal has associated channel transfer functions.” Ex. 1001, 12:42–45. The preamble of independent claim 9 similarly recites “a parameter estimation unit for use in conjunction with a signal separation unit for estimating channel transfer function parameters from channel transfer functions.” *Id.* at 14:4–7. Petitioner, however, contends that “this claim term is **not** part of the preamble” and that “the preamble is [only] ‘In a multi-user detection system in which interfering signals are purposely allowed to exist.’” Pet. 14. Regardless, Petitioner further contends, to the extent there is any argument that that recitation is part of the preamble, “it is limiting at least because it provides antecedent basis to the ‘parameter estimation unit’ and ‘associated channel transfer functions’ terms that are used in the remainder of the body of the claims and is ‘essential to understanding the structural limitations’ of the parameter estimation unit.” *Id.* Apart from arguing that the recited “parameter estimation unit” is limiting, Petitioner does not propose any

construction of that term or argue that a formal construction is needed. *See id.*

Patent Owner does not respond to Petitioner’s contentions and also does not argue that any construction is necessary for the parameter estimation unit. *See generally* Prelim. Resp.

As reproduced in Section II.D. above, the preamble of claim 1, in its entirety, recites, “In a multi-user detection system in which interfering signals are purposely allowed to exist, a parameter estimation unit for use in conjunction with a signal separation unit, in which each received signal has associated channel transfer functions.” Ex. 1001, 12:41–45. The preamble of claim 9 is similar. *Id.* at 14:3–7 (reciting “In a multi-user detection system in which interfering signals are purposely allowed to exist, a parameter estimation unit for use in conjunction with a signal separation unit for estimating channel transfer function parameters from channel transfer functions”). The body of each claim recites the elements of the recited “parameter estimation unit,” namely, “a signal processor for determining said channel transfer functions for each received signal” and “means . . . for providing uninterrupted estimates of the channel transfer function parameters on a real-time basis” The phrase “In a multi-user detection system in which interfering signals are purposely allowed to exist” provides additional context for the environment in which the parameter estimation unit is intended to operate. Whether the preamble is limiting is a question that we do not need to decide here, however. Only those claim terms that are in controversy need to be construed, and only to the extent necessary to resolve the controversy. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019). Because Patent Owner does not dispute Petitioner’s contentions with respect to the preamble recitations, and our decision herein

does not turn on whether the preamble of claims 1 and 9 are limiting, we need not reach a determination with regard to that question.

2. “means coupled to said channel transfer function determining signal processor for providing uninterrupted estimates of the channel transfer function parameters on a real time basis.”

As reproduced in Section II.D. above, claim 1 recites “means coupled to said channel transfer function determining signal processor for providing uninterrupted estimates of the channel transfer function parameters on a real time basis.” Ex. 1001, 12:48–51. Independent claim 9 includes the same recitation. *Id.* at 14:9–12.

A claim limitation using the phrase “means for” creates a rebuttable presumption that the drafter intended to invoke 35 U.S.C. § 112 ¶ 6.⁶ See *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1348 (Fed. Cir. 2015). Section 112 ¶ 6 provides that:

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

When construing a means-plus-function limitation under § 112 ¶ 6, it is necessary first to identify the claimed function, and then to look to the specification to identify the corresponding structure for that function. *In re Aoyama*, 656 F.3d 1293, 1296–97 (Fed. Cir. 2011); *Cardiac Pacemakers, Inc. v. St. Jude Med., Inc.*, 296 F.3d 1106, 1119 (Fed. Cir. 2002). Under that second step, “structure disclosed in the specification is corresponding

⁶ Section 4(c) of the Leahy-Smith America Invents Act (AIA) re-designated 35 U.S.C. § 112 ¶ 6, as 35 U.S.C. § 112(f). Because the ’676 patent has a filing date before September 16, 2012 (effective date of the statute), we refer to the pre-AIA version of 35 U.S.C. § 112.

structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim.” *Med. Instrumentation & Diagnostics Corp. v. Elekta AB*, 344 F.3d 1205, 1210 (Fed. Cir. 2003). Our Rules specifically require that the petition identify the corresponding structure in proposing a construction for a means-plus-function claim limitation. 37 C.F.R. § 42.104(b)(3). “This inquiry is undertaken from the perspective of a person of ordinary skill in the art.” *Cardiac Pacemakers*, 296 F.3d at 1113.

Consistent with the principles set forth above, Petitioner argues that the recited “means coupled to said channel transfer function determining signal processor for providing uninterrupted estimates of the channel transfer function parameters on a real time basis” “is written in means-plus-function (MPF) format and should be construed pursuant to 35 U.S.C. §112 ¶6.” Pet. 15. According to Petitioner, for purposes of the Petition, “[t]he function of this MPF term is ‘providing uninterrupted estimates of the channel transfer function parameters on a real-time basis,’ and “[t]he structure of this MPF term is ‘parameter tracking unit and equivalents thereof.’” *Id.* at 15–22 (citing Ex. 1001, 5:20–40, 6:9–23, 7:45–8:40, Figs. 1–4; Ex. 1003 ¶¶ 59–62). Petitioner further argues that this “is the same construction asserted by Patent Owner in the district court litigation.” *Id.* at 15 (citing Ex. 1009, 23 (Preliminary Infringement Contentions, *Collision Commc'ns, Inc. v. Samsung Elecs. Co.*, 2-23-cv-00587 (E.D. Tex.))).

Patent Owner agrees with Petitioner that the recited means should be construed as a means-plus-function limitation under 35 U.S.C. § 112 ¶ 6 and further agrees with Petitioner’s identification of the function and corresponding structure. Prelim. Resp. 19–21.

On the record before us, we, too, agree. The function identified by Petitioner (“providing uninterrupted estimates of the channel transfer function parameters on a real-time basis”) is recited verbatim in claims 1 and 9 themselves, and the structure identified by Petitioner (“parameter tracking unit”) is expressly illustrated in Figures 3 and 4 and described in the corresponding disclosure of the ’505 patent specification in connection with that function. *See, e.g.*, Ex. 1001, 7:46–8:38 (referring to “the parameter tracking unit of FIG. 3, which include[s] all the elements and dotted box 90, . . . duplicated [in Fig. 4] as 90, 90' and 90'''” and describing both serial and parallel updating schemes for parameter estimation using the same). Accordingly, we construe the recited “means coupled to said channel transfer function determining signal processor for providing uninterrupted estimates of the channel transfer function parameters on a real time basis” as “parameter tracking unit 90 and equivalents thereof.”

D. Alleged Obviousness over Hottinen and Lilleberg or Zimmerman and Lilleberg

Petitioner alleges claims 1, 3–5, and 7–9 of the ’505 patent would have been obvious over either the combination of Hottinen and Lilleberg or the combination of Zimmerman and Lilleberg. Pet. 26–77. Patent Owner contends in response that Petitioner fails to identify in the asserted prior art the “parameter tracking unit” that Petitioner concedes corresponds to the “means . . . for providing uninterrupted estimates of the channel transfer function parameters on a real-time basis” or any equivalent thereof. Prelim. Resp. 1–2, 24–25. Having considered the arguments and evidence before us, we determine, for the reasons explained below, that Petitioner has not established a reasonable likelihood of prevailing with respect to any of the challenged claims on either asserted ground of unpatentability.

1. Overview of Hottinen

Hottinen, titled “Signal Detection in a TDMA System,” describes a signal detection method in a TDMA mobile system and receivers implementing the method. Ex. 1004, codes (54), (57), 2:45–3:23. In the described method, “a primary signal and at least one interfering co-channel signal are received on the same TDMA channel, said signals having different but known training sequences and having different multipath propagation and thus different transmission channels on the radio path.” *Id.* at 1:9–15, 2:48–54. According to Hottinen, the described receiver is arranged to receive such signals and “comprises a channel estimator, arranged to determine the transmission channel estimates of the primary signal and the at least one interfering co-channel signal by means of the training sequences, and a detecting section, detecting the primary signal by utilizing the transmission channel estimates of both the primary signal and the at least one interfering co-channel signal.” *Id.* at 2:61–3:7.

Figure 1A of Hottinen is reproduced below:

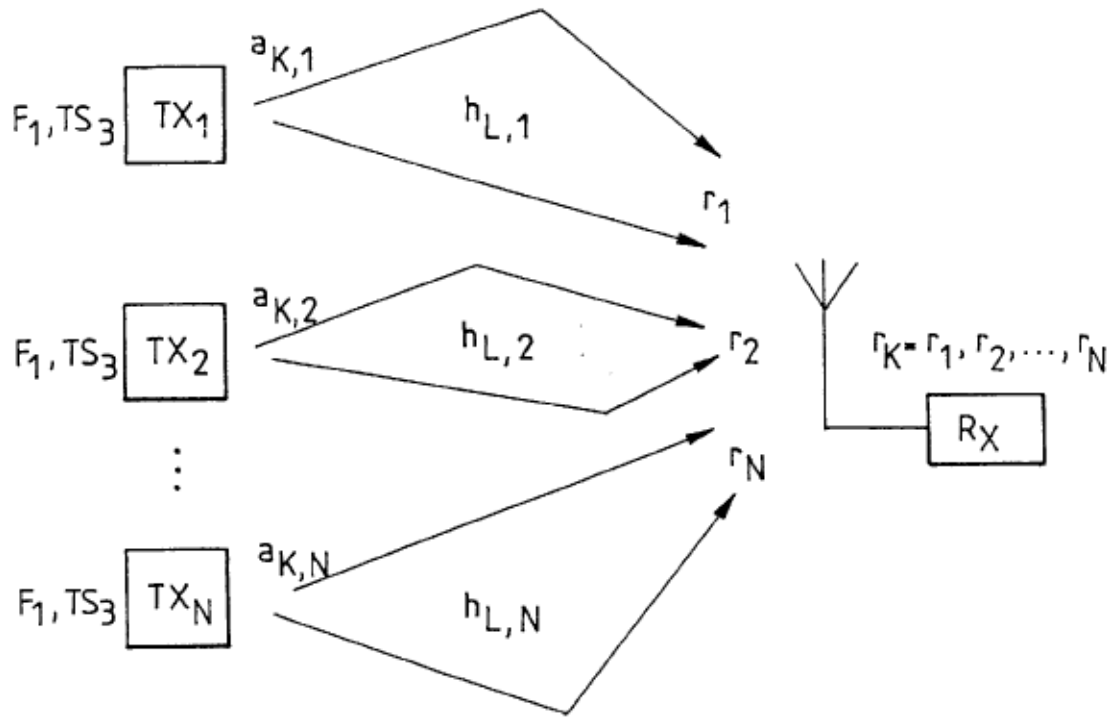


FIG. 1A

Figure 1A illustrates “an interference limited TDMA system of [Hottinen’s] invention having several concurrent co-channel users.” Ex. 1004, 4:41–42. In Figure 1A, transmitters $TX_1, TX_2, \dots, TX_N$, are shown to all transmit at the same frequency F_1 and in the same time slot TS_3 . *Id.* at 4:43–45.

Hottinen explains,

Each transmitter transmits, within the time slot, a short modulated radio-frequency signal, i.e. a burst, which contains a signal sequence (a bit pattern) $a_{k,1}, a_{k,2}, \dots, a_{k,N}$ to be transmitted. In a manner typical of radio systems, the propagation of the transmitted burst is usually multipath propagation, which means that a signal travels from a transmitter to a receiver R_X along several different paths while reflecting from different obstacles, such as buildings, whereby the signal sequence arriving at the receiver R_X consists of several signal components arriving with different delays. In a mobile system, each co-channel signal has

dedicated, different multipath propagation, which can be represented by a multipath channel which has a certain impulse response and which provides a unique wave form coding for the signal. The signal sequences $a_{k,1} \dots a_{k,N}$ transmitted in FIG. 1A travel through multipath channels $h_{L,1} \dots h_{L,N}$, respectively, whereby wave form coded signals $r_1 \dots r_N$ are received in the receiver Rx, the signals summing up to a sum signal r_k . The present invention utilizes the wave form coding provided by different multipath channels in cancelling co-channel interference.

Id. at 4:45–65.

Figure 2, reproduced below, is “a simplified block diagram of the receiver according to the preferred embodiment of [Hottinen’s] invention.”

Ex. 1004, 5:36–37.

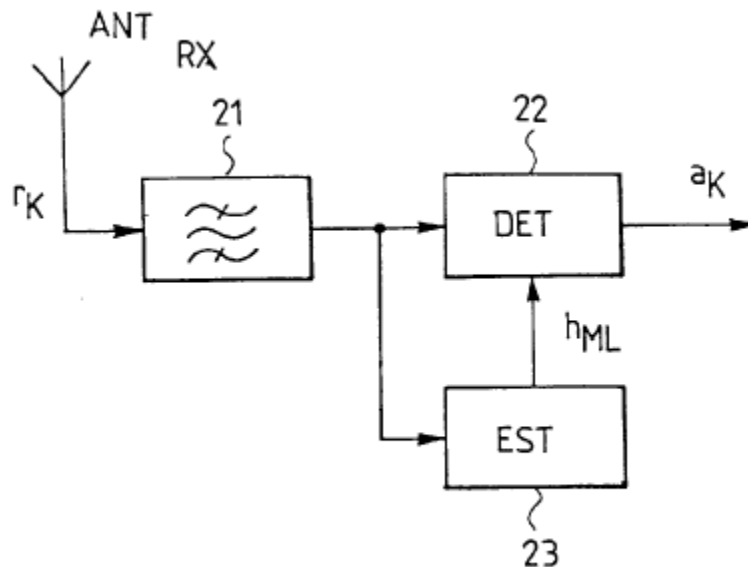


FIG. 2

Figure 2 depicts antenna ANT_{RX} , bandpass filter 21, detector 22 (DET), and channel estimator 23 (EST). *Id.* at 5:46–50.⁷ With reference to Figure 2,

⁷ Hottinen explains that Figure 2 “contains only the blocks essential for describing the invention” and that “it will be apparent to one skilled in the art that a conventional TDMA receiver also comprises many other functions

Hottinen explains, sum signal r_K received in antenna ANT_{RX} is filtered by bandpass filter 21, which separates the frequencies external to the receiving band. *Id.* at 5:46–49. The bandpass filtered signal is then applied to detector 22 and channel estimator 23. *Id.* at 49–50. According to Hottinen, channel estimator 23 “provides the channel estimates h_{ML} , of the co-channel signals, which channel estimates the detector 22, preferably a Viterbi detector, uses for detecting the primary signal.” *Id.* at 5:50–54.

2. Overview of Lilleberg

Lilleberg, titled “Method for Estimating a Channel and a Receiver,” describes “[a] method for estimating a channel in a receiver of a cellular radio system in which the received signal is subjected to elimination of multiple access interference.” Ex. 1006, code (54), 1:8–11. “The method of the invention can be generally applied in any cellular radio system in which elimination of multiple access interference is applied,” and “it is particularly suited for use in a cellular radio system utilizing the CDMA multiple access method.” *Id.* at 1:12–16. In the prior art, according to Lilleberg, channel estimation and elimination of interference were “considered as mutually independent solutions,” and “[d]ue to this, the estimation results have been based on a signal that comprises interfering signals from a plural number of users, and so the estimation results are not ideal.” *Id.* at 2:7–12. The object of Lilleberg’s invention is, accordingly, to provide a method of estimating a channel in which elimination of multiple access interference is taken into account. *Id.* at 2:15–17. According to Lilleberg, that object “is achieved with a method . . . characterized in that the channel estimation is based on a

and structures the detailed description of which is not necessary in this context.” *Id.* at 5:38–42.

signal that has undergone elimination of multiple access interference.” *Id.* at 2:18–21. In one embodiment, “channel parameters are estimated both before and after interference is eliminated,” such that “channel estimates computed from the interference-free signal can be supplied as feedback to a first estimator, where they can be utilized.” *Id.* at 2:38–42.

Further, Lilleberg states, “[t]he invention also relates to a receiver in a cellular radio system, the receiver comprising means for eliminating multiple access interference from the received signal” and “characterized by comprising means for computing channel estimates from a signal that has undergone elimination of multiple access interference.” Ex. 1006, 2:22–27. Figure 2 of Lilleberg, reproduced below, illustrates such a receiver.

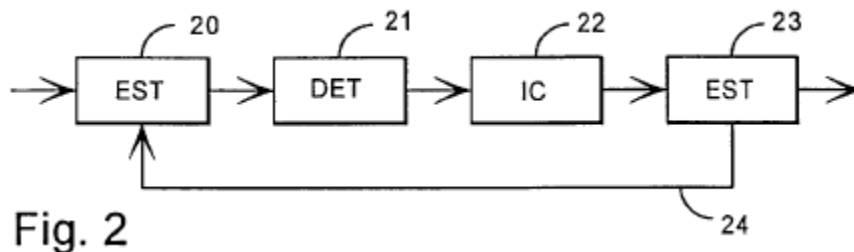


Figure 2 “is a block diagram illustrating the essential parts of the general structure of a receiver according to one advantageous embodiment of the method of [Lilleberg’s] invention.” *Id.* at 3:19–21. With reference to Figure 2, “[t]he receiver comprises first estimation means 20 whose transmission is a received and digitalized signal and where preliminary channel estimation is conducted by a known estimation method.” *Id.* at 3:21–25. “The features of the channel that are estimated are usually the complex amplitude and the delay.” *Id.* at 3:25–26. The receiver further comprises “detection means 21, in which preliminary symbol estimates are computed for the received transmission,” “means 22 for eliminating interference from the received signal by a known interference elimination

method,” and “second estimation means 23, in which channel parameters of the interference-free signal are estimated, whereby more accurate estimates are obtained than in the first estimation means, which conduct the preliminary estimation.” *Id.* at 3:27–36. As also shown in Figure 2, Lilleberg further contemplates that “it is also possible to utilize feedback 24 from the second estimation means 23 to the first estimation means 20,” such that “[e]stimation results obtained from the second estimation means can thus be utilized when preliminary estimates are computed, e.g. by supplying the channel parameters obtained from the second estimation means concerning sample b_n to the first estimation means as default values for computing preliminary channel parameters for the next sample b_{n+1} .” *Id.* at 3:39–47.

3. Overview of Zimmerman

Zimmerman, titled “Method and Apparatus for Interference Cancellation in a Multiple Access Communication Receiver,” describes a “multiaccess communication system for cellular telephony, portable telephones, mobile radio communications, broadcast radio and television, wireless communication networks and the like, including planned use of interference cancelling receiving methods and apparatus which permit multiple users to share the same or overlapping frequency assignments.” Ex. 1005, codes (54), (57). More particularly, Zimmerman states,

the present invention provides a new and improved multiaccess communication system embodying novel methods and apparatus for extracting a selected signal from a larger family of such signals having some relationship to the selected signal and overlapping predictable electrical characteristics wherein a desired signal to be received is selected from the family of signals, an estimate is made of the magnitude of at least one predetermined electrical parameter in the remaining unselected

signals of the family which would normally interfere with the selected signal, and the estimate is used to substantially cancel the unselected signals and facilitate enhanced reception of the desired signal. In this way, any signal in the family of signals may be designated as the desired signal to be received to thereby increase system quality, capacity and availability to an increased number of users. Hence, what would normally be interference is selectively harnessed to increase the availability of overlapping signals to multiple users.

Id. at 6.⁸ Figure 1 of Zimmerman is reproduced below.

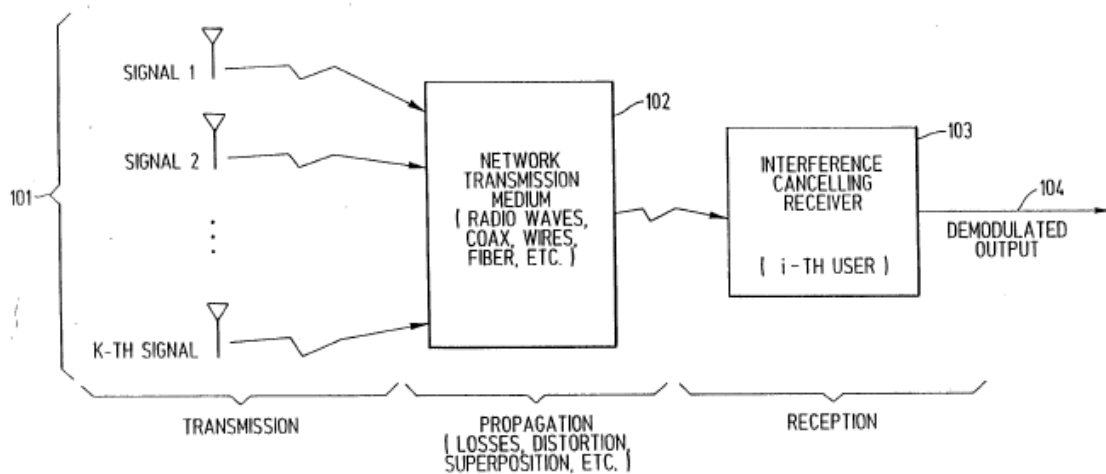


FIG. 1

Figure 1 is “an overall system block diagram of a network system incorporating features of [Zimmerman’s] invention to achieve increased capacity,” including “by planned use of interference cancelling receivers to receive each user’s desired signal in the presence of interference.” *Id.* at 9, 14. By way of example, Zimmerman provides, with reference to Figure 1, “a plurality of antennas 101 propagate corresponding signals (Signal 1, Signal 2 . . . Signal K) via any suitable network transmission medium 102,”

⁸ Following Petitioner’s usage, we cite the original page numbers at the top of Zimmerman’s pages rather than the page numbers added by Petitioner in the lower right corner of the pages.

and “[t]he resultant signals are received by an interference cancelling receiver 103, or a plurality of such receivers and demodulated output for a selected signal is available on line 104 for the i th user in a family of multiple users.” *Id.* at 14.

4. Discussion

As set forth in the claim construction section above, both of the challenged independent claims recite “means coupled to said channel transfer function determining signal processor for providing uninterrupted estimates of the channel transfer function parameters on a real-time basis,” and we agree with Petitioner’s identification of the corresponding function (i.e., “providing uninterrupted estimates of the channel transfer function parameters on a real-time basis”) and corresponding structure (i.e., the ’505 patent’s “parameter tracking unit”) pursuant to 35 U.S.C. § 112 ¶ 6. *See* Ex. 1001, 7:46–8:10, 12:48–51, 14:9–12, Figs. 3, 4; Pet. 14–22, 36–37, 61–62.

In its discussion of the asserted ground based on Hottinen and Lilleberg, Petitioner argues that Hottinen discloses the function of “providing uninterrupted estimates of the channel transfer function parameters on a real-time basis,” alleging that “it is constantly ‘determining a transmission channel estimate of the at least one interfering co-channel signal’ so every ‘received signal is continuously cleaned.’” Pet. 37 (quoting Ex. 1004, 3:15–17, 9:53–54) (citing Ex. 1003 ¶¶ 92–97; Ex. 1004, 3:8–23, 9:46–57). Petitioner further alleges, “Hottinen discloses ‘the parameters of the channel or the estimates thereof are known’ as the ‘multipath channels provide a memory which can be advantageously utilized in the detection process’ (*i.e.*, ‘parameter tracking unit’)” and that “Hottinen discloses a memory for storing the channel parameters and uses these stored parameters

in providing estimates,” which, according to Petitioner, a person of ordinary skill in the art would understand to mean that Hottinen tracks the parameters. *Id.* at 37–38 (emphasis omitted) (citing Ex. 1003 ¶ 95; Ex. 1004, 5:23–33). Still further, Petitioner asserts that Hottinen “also discloses that the memory for storing the channel parameters is coupled to the signal processor.” *Id.* at 38 (citing Ex. 1003 ¶ 95; Ex. 1004, 5:23–35). Petitioner alleges this to be “the same structure as the claimed parameter tracking unit as it is a memory with stored parameters for estimates.” *Id.* (citing Ex. 1003 ¶ 95). Nonetheless, Petitioner concedes that Hottinen “does not expressly disclose the implementation detail regarding the structure of the parameter tracker used by the multi-user detector to achieve real-time estimation and tracking,” and Petitioner relies on Lilleberg as allegedly “disclos[ing] a parameter tracking unit for channel estimation where the parameter tracking unit outputs ‘amplitude and the delay’ as well as ‘phases,’ ‘power,’ frequency and multipath structure.” *Id.* (citing Ex. 1003 ¶ 96; Ex. 1006, 2:1–6, 3:19–47). With reference to Figure 2 of Lilleberg (*see supra* Section III.D.2), Petitioner contends that “Lilleberg discloses that the channel parameter estimates from EST 23 are fed back to EST 20 to be tracked and used for the further channel parameter estimates.” *Id.* (citing Ex. 1003 ¶ 96).

In its discussion of the asserted ground based on Zimmerman and Lilleberg, Petitioner similarly argues that Zimmerman discloses an interference estimate function performed uninterruptedly, contending that “Zimmerman discloses [that] using the known signal parameters as the ‘[e]stimation of the amplitudes of the received signals in [its] interference cancelling receivers is, in fact, a way of estimating the channel propagation loss of each signal’” and citing disclosure in Zimmerman of a “self-

bootstrapping, continuous” mode of operation. Pet. 62 (quoting Ex. 1005, 21,⁹ 25) (citing Ex. 1003 ¶¶ 152–155). Petitioner further alleges that “Zimmerman discloses ‘estimation techniques could be used in a tracking mode, where the estimate is updated over time using previous estimates’ and implementing it using a ‘LMS-type amplitude-tracking loops to the CCPLL interference canceller’ to perform ‘adaptive noise-cancelling.’ (*i.e.*, ‘parameter tracking unit’).” *Id.* at 62–63 (emphasis omitted) (citing Ex. 1003 ¶ 153; Ex. 1005, 21, 24). Still further, Petitioner asserts that Zimmerman “also discloses that the tracking loop is coupled to the signal processor, as the signal processor accesses the tracking loop and previous estimates so ‘the estimate is updated over time using previous estimates.” *Id.* at 63 (citing Ex. 1003 ¶ 153; Ex. 1005, 21, 55). Petitioner alleges this to be “the same structure as the claimed parameter tracking unit as it is a parameter tracker with stored parameters for estimates.” *Id.* (citing Ex. 1003 ¶ 153). Nonetheless, Petitioner concedes that Zimmerman “does not expressly disclose the implementation detail regarding the structure of the parameter tracker used by the multi-user detector to achieve real-time estimation and tracking,” and, as in its arguments with respect to the ground based on Hottinen and Lilleberg, Petitioner relies on Lilleberg as allegedly supplying such details. *Id.* (citing Ex. 1003 ¶ 154; Ex. 1006, 2:1–6, 3:19–47, Fig. 2).

Patent Owner responds that despite Petitioner’s contention that the corresponding structure for recited means is the “parameter tracking unit” described in the ’505 patent, “the Petition does not even attempt to identify the disclosed and admittedly required ‘parameter tracking unit,’” which

⁹ Petitioner mistakenly cites page 19 of Zimmerman as the quotation source.

“includ[es] . . . that unit’s . . . averaging, Training Sequence Recreation Unit 60, Training Sequence Windowing Unit 74, and Summing Junction 72.” Prelim. Resp. 17 (citing Pet. 20–21). More particularly, Patent Owner argues, “the Petition simply asserts that *Lilleberg* discloses the ‘parameter tracking unit’ described in the ’505 patent, without saying or showing how.” *Id.* at 18, 24 (citing Pet. 38, 63; Ex. 2001, 65). For example, according to Patent Owner, “although the Petition admits that the ’505 patent describes the ‘parameter tracking unit’ as including and requiring its Training Sequence Recreation Unit 60, Training Sequence Windowing Unit 74, and Summing Junction 72,” the Petition “does not allege that any of these components—much less all of them—are disclosed in *Lilleberg*” and cannot do so “because *Lilleberg* is silent to such features; indeed, *Lilleberg* does not even mention training sequences.” *Id.* at 18, 24 (citing Pet. 28, 63; Ex. 2001, 66). Likewise, Patent Owner further contends, “although the ’505 patent describes the disclosed ‘parameter tracking unit’ as averaging parameter estimates in real time—and the Petition cites to that description as describing the claimed parameter tracking unit—the Petition does not even allege, much less prove that the purported *Lilleberg* parameter tracking unit features such averaging.” *Id.* at 18, 24–25 (citing Pet. 38, 63; Ex. 2001, 67).

We agree with Patent Owner that Petitioner has not sufficiently demonstrated that either the combination of Hottinen and *Lilleberg* or the combination of Zimmerman and *Lilleberg* teaches or suggests the parameter tracking unit of the ’505 patent or an equivalent thereof. First, as Patent Owner points out, the ’505 patent expressly states that the parameter tracking unit “include[s] all of the elements and dotted box 90,” and hence includes, *inter alia*, training sequence recreation unit 60, summing

junction 72, and training sequence window unit 74, none of which Petitioner shows to be present in Hottinen, Zimmerman, Lilleberg, or any combination thereof. *See* Ex. 1001, 6:39–7:59. The '505 patent explains the importance of each of these elements in the performance of the claimed function of providing uninterrupted estimates of the channel transfer function parameters on a real-time basis. *See, e.g., id.* at 6:39–65 (“As illustrated at 60, a unit is provided which recreates the training sequence portions of every signal on the traffic channel prior to the last signal entering the traffic channel, using the most recent parameter estimates 50. . . . Unit 60 has knowledge of the timing offsets of all established users and uses this to ensure that the signal sent out over line 70 is perfectly aligned with the measured signals discussed below.”), 6:66–7:12 (“The signal received and measured at the base station 16 which consists of the aggregate of each of the established signals plus the signal due to the newcomer assigned to the same traffic channel 40 is passed over line 73 to windowing unit 74. The function of windowing unit 74 is illustrated diagrammatically at 62 in which the received signal coinciding with the training sequence 64 is allowed to exist, whereas the received signal to either side of the training sequence is nulled or zeroed out . . . [T]he output of windowing unit 74 is applied to a summing junction 72 as illustrated over unit 75.”), 7:16–30 (“It is the purpose of th[e] summing junction to be able to recreate training sequence portion of every signal communicating on channel 40 prior to the last signal entering from the training sequence portion of the received signal and subtract it away from the received signal that includes all of those estimated plus the signal due to the newcomer. The output 78 of the summing junction is an estimate of the received signal due only to the newcomer to the channel during the training signal portion. This singles out an interference-free

signal for the newcomer such that tracking of power at 80, timing offset at 82, frequency offset 84, carrier phase at 86 and other parameters such as multipath structure 88 can be done in the manner described above for the first signal on the traffic channel.”).

Second, we also agree with Patent Owner that the ’505 patent describes parameter tracking unit 90 as averaging the currently determined parameter estimate with older parameter estimates and that such averaging is a necessary part of the corresponding structure. *See* Prelim. Resp. 23–24 (“The claimed function does not merely recite providing estimates of the channel transfer function parameters, it recites ‘providing uninterrupted estimates of the channel transfer function parameters on a real time basis.’ The foregoing ‘averaging’ is how the patent describes the parameter tracking unit providing uninterrupted estimates of the channel transfer function parameters on a real-time basis, and this requirement cannot be read out of the claimed function or its identified corresponding structure.”) (quoting Ex. 1001, 8:2–6 (“Having thus calculated an interference free signal, the parameter estimates are calculated again as shown in FIG. 3 and averaged with older parameter estimates for this user as described in the FIG. 3 discussion above.”)) (citing Ex. 1001, 7:45–8:40; Pet. 20–22). As Patent Owner further argues, however, Petitioner does not identify disclosure of the described averaging or its equivalent in the cited prior art. *See id.* at 24–25 (citing Pet. 28, 63; Ex. 2001, 67).

Because Petitioner does not identify any teaching or suggestion of essential elements of the structure corresponding to the recited means—or equivalents thereof—in the asserted prior art, we conclude that Petitioner’s showing is insufficient to establish a reasonable likelihood that it would

prevail in showing the unpatentability of either claim 1 or claim 9 or of dependent claims 2–8.

IV. DISCRETIONARY DENIAL

Patent Owner asserts that the Board should exercise its discretion to deny institution of *inter partes* review under 35 U.S.C. § 314(a). *See* Prelim. Resp. 25–31. Because we deny institution on the merits of Petitioner’s challenges to patentability, we need not address Patent Owner’s arguments urging denial of institution under § 314(a).

V. CONCLUSION

After considering the evidence and arguments presented in the Petition and the Preliminary Response, we determine that Petitioner does not demonstrate a reasonable likelihood of prevailing with respect to any of the challenged claims, and thus, we do not institute an *inter partes* review.

VI. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that the Petition is *denied* as to all challenged claims, and no trial is instituted.

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Patent 6,947,505 B2

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