UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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LENOVO (UNITED STATES) INC. and

MOTOROLA MOBILITY LLC,

Petitioners,

v.

COLLISION COMMUNICATIONS, INC.,

Patent Owner.

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Case No. IPR2025-00927

U.S. Patent No. 7,593,492

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**PATENT OWNER'S PRELIMINARY RESPONSE PURSUANT TO 37 C.F.R. § 42.107(a)**

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*Williamson v. Citrix Online, LLC*,
792 F.3d 1339 (Fed. Cir. 2015) .....19, 20, 21

## TABLE OF EXHIBITS

| Exhibit | Description |
|---|---|
| 2001 | Declaration of Dr. Giuseppe Caire |
| 2002 | CV of Dr. Giuseppe Caire |
| 2003 | U. Madhow, *Fundamentals of Digital Communication*, Cambridge University Press 2008 |
| 2004 | R.G. Gallager, *Principles of Digital Communication*, Cambridge University Press 2008 |
| 2005 | *Collision Communications, Inc., v. Lenovo Group Ltd.*, No. 23-cv-00594 (E.D. Tex.), (Dkt 90) Joint Claim Construction Chart |
| 2101 | Docket Control Order (Dkt 44) (August 5, 2024) from Case No. 2:23-cv-00594 |
| 2102 | First Amended Docket Control Order (Dkt 73) (April 23, 2025) from Case No. 2:23-cv-00594 |
| 2103 | Docket Navigator Motion to Stay Pending Inter Partes Review |
| 2104 | March 31, 2025 Federal District Court Case Management Statistics |
| 2105 | *Collision Communications, Inc. v. Lenovo Group Limited*, No. 23-cv-00594 (E.D. Tex.) Docket |
| 2106 | Guidance on USPTO's Recission of 'Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation'" (the "Guidance Memo") |
| 2107 | Order Focusing Patent Claim and Prior Art to Reduce Costs (Dkt 78) (May 28, 2025) from Case No. 2:23-cv-00594 |

## I. Summary

The challenged inventions of the ’492 Patent were developed in conjunction with the U.S. government and concern improved systems and methods for processing signals received in a wireless communications system. Specifically, the patent and the challenged claims concern improved systems and methods for selecting a “multi-user detector” (MUD) used to distinguish and process different signals sent on the same wireless channel by multiple users.

The PTAB recently denied Samsung’s IPR Petition against the ’492 Patent, and the PTAB should likewise deny this follow-on Petition because it too fails to establish the required likelihood of success for any challenged claim.

Over one year and a half ago, Patent Owner Collision filed patent infringement complaints against several defendants, including one against Samsung and another against Petitioners’ parent company Lenovo Group Ltd. (who Petitioners admit is a real party-in-interest in this Petition), alleging that products manufactured by Petitioners Lenovo (United States) and Motorola infringe a number of patents, including the challenged ’492 Patent.

Samsung subsequently filed IPR petitions against each of Collision’s asserted patents, including one against the ’492 Patent. The PTAB denied all those petitions, including denying Samsung ‘492 Patent petition on the merits on

February 7, 2025. *See, e.g.*, *Samsung v. Collision*, IPR2024-01247, Paper No. 14, at 16-21 (PTAB 2025).

Then—with the PTAB's institution denial and analysis in hand—Petitioners prepared and filed this Petition two months later. But even with the benefit of that denial and analysis, this latest Petition still cannot establish the required likelihood of success, as it suffers from the same fatal flaws as Samsung's original petition.

Confusingly (perhaps intentionally), the Petition's grounds simultaneously challenge two very different types of claims: system claims 1-3, 5-13, 15-16 on the one hand; and method claim 17 on the other. The Petition fails against both claim sets.

***Claims 1-3, 5-13, 15-16:*** Each of these claims recites a "multi-user detector decision unit." Ground 1A relies solely on *Wang* as allegedly disclosing this required limitation, while Ground 1B relies solely on *Sampath* and Grounds 2A and 2B rely solely on *Liu*.

But the Petition identifies no such "multi-user detector decision unit" in *Wang*, *Sampath*, or *Liu*. It is undisputed that "multi-user detector decision unit" is a means-plus-function limitation and should be construed as the patent's disclosed MUD decision unit 220 (or decision logic 520) configured to perform one or more of the several decision algorithms described in the '492 patent. However, none of the references describe the purported "multi-user detector decision unit" as

configured to perform any of these algorithms, as required by the agreed construction, and the Petition does not even attempt to identify any such algorithms.

Instead, the Petition takes the same approach that the PTAB rightly rejected in Samsung's prior petition against the '492 Patent: the Petition merely identifies in an asserted reference some common buzzwords (such as eigenvector or SINR) from a claimed algorithm, but does not identify in the reference that algorithm's actual required steps. *See Samsung v. Collision*, IPR2024-01247, Paper No. 14 at 16-21 (PTAB 2025).

For this failure alone, the Petition does not establish the required likelihood of success for any of claims 1-3, 5-13, and 15-16.

***Claim 17:*** The Petition treats claim 17 as an afterthought, consistently citing back to and relying (sometimes exclusively) on its prior assertions and arguments concerning the other challenged claims. But this makes no sense and cannot satisfy Petitioners' burden because independent claim 17 is a method claim that is materially distinct from the other claims challenged by the Petition.

For example, unlike the previously addressed claims, claim 17 is a method that repeatedly reassesses which MUD is most appropriate for a signal, dividing a received signal into small windows of data and, for each such window, making an

independent determination as to which MUD is most appropriate for processing that particular subset of signal data.

This is not taught in any of the asserted references, and the Petition does not and cannot assert otherwise. Indeed, to the extent any asserted reference even concerns selecting a MUD for a signal—and many do not—that reference teaches **away** from these requirements, teaching that a MUD should be chosen just once for a signal, rather than repeatedly reassessing and selecting which MUD is most appropriate to process the signal, as required by claim 17.

Accordingly, the Petition also fails to establish the required reasonable likelihood of success for challenged claim 17.

## II. Wireless Communication Background

The challenged claims generally concern the processing of wireless signals. More specifically, the claims are directed to improved systems and methods for selecting in real time which of a plurality of available multi-user detection algorithms should be used to process a particular received signal, so that each signal is processed using the appropriate available multi-user detection algorithm.

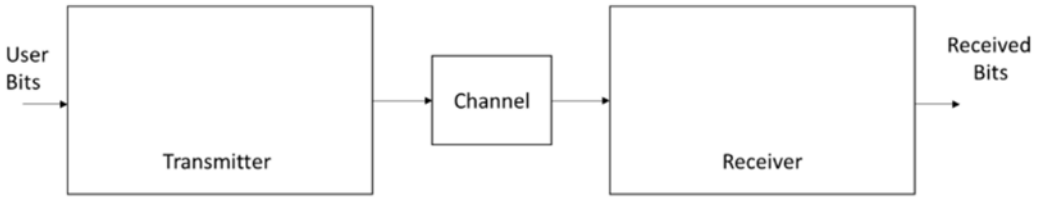
To provide context for the claimed subject matter and Lenovo's Petition, the following brief background addresses the following topics:

- wireless channels;
- detectors;

- multi-user detection algorithms; and
- prior art approaches to selecting multi-user detection algorithms.

### A. Wireless Channels

A wireless communications system typically includes a transmitter that sends information to a receiver over a wireless channel. (EX2001 at ¶15; EX2003 at 2-4; EX2004 at 1-5, 95, 181-183, 208-209).




As illustrated in the above overview, information in the form of bits (sequences of 0s and 1s) is input to the transmitter, which first converts those bits into a high-frequency wave signal and then transmits that signal over the wireless channel to the receiver. (EX2001 at ¶16; EX2003 at 2-4; EX2004 at 1-5, 95, 181-183, 208-209).

This wireless channel is the medium through which the signal is transmitted. (EX2001 at ¶17). For example, in a wireless cell phone communication, the channel could be affected by the relay towers used to transmit the waves and the physical spaces between those towers, including all buildings and other surfaces that may reflect, refract, or absorb parts of the travelling waves. (EX2001 at ¶17).

By the channel's very nature, as the electromagnetic wave signal passes through the channel, noise is introduced and information can be lost or corrupted. (EX2001 at ¶18; EX2003 at 2-4; EX2004 at 1-5, 95, 181-183, 208-209).

Thus, when a receiver receives the electromagnetic signal and attempts to convert it back into bits, the noise must be accounted for and can affect the accuracy of the conversion and reproduction of the original signal. (EX2001 at ¶19; EX2003 at 2-4; EX2004 at 1-5, 95, 181-183, 208-209).

**B. Detectors**

Each receiver includes a "detector" that tries to recover the desired transmitted signal. A detector can fall into two categories: (1) single-user detectors or (2) multi-user detectors. (EX2001 at ¶20).

Regardless of the number of users or interferers, the goal of a single-user detector is to recover the signal from only a single user. Accordingly, instead of attempting to recover all signals from all users, a single-user detector uses an algorithm that focuses on the signal from just one user and treats all other user signals as noise. (EX1001 at 2:43-47 and 3:1-6; EX2001 at ¶21).

In contrast, the goal of a multi-user detector is to recover signals from two or more users. Thus, instead of treating and discarding the other user's signals as noise, a multi-user detector uses an algorithm designed to detect each such signal. (EX1001 at 4:4-23; EX2001 at ¶22).

### C. Multi-User Detection Algorithms

The algorithm that a multi-user detector uses to recover multiple user signals is called a "multi-user detection" (MUD) algorithm. (EX2001 at ¶23). There are numerous kinds of MUD algorithms, each resulting in a different kind of multi-user detector. (EX2001 at ¶23). Exemplary algorithms include the Maximum Likelihood Sequence Estimation algorithm, Minimum Mean Square Error algorithm, Decorrelator algorithm, reduced state Viterbi, matched filter, Fano algorithm, zero-forcing block linear, and sphere decoder. (EX2001 at ¶23).

But MUDs are not all created equal – an algorithm that might successfully recover signals in one circumstance may fail in another. (EX2001 at ¶24). Moreover, a MUD may be able to successfully recover signals in a particular circumstance but would also unnecessarily expend excessive computational resources. (EX2001 at ¶24). Thus, even where two algorithms could both succeed in various circumstances, how efficiently each can do so might differ from circumstance—one might be more efficient in one environment, while another is more efficient in a different environment. (EX2001 at ¶24).

Thus, MUD algorithms and detectors are not a one-size-fits-all proposition. (EX2001 at ¶25). In a superior system, the right MUD out of many is chosen for the right circumstance. (EX2001 at ¶25). Which MUD algorithm is the right one will depend on the current conditions and the amount of complexity needed for

success. (EX2001 at ¶25). Improperly selecting a MUD that will not succeed under the present conditions will result in a defective system; improperly selecting one that can succeed but is not the most efficient available for the current conditions will result in an inferior system. (EX2001 at ¶25).

## III. The Challenged '492 Patent

The '492 patent's claimed subject matter allows for a system that switches back and forth between the MUD algorithm most appropriate for each changing circumstance.

The '492 patent discloses and claims **specific improved** systems and methods for selecting among a plurality of MUD algorithms, systems and methods that the Petition does not prove are disclosed in the asserted references.

Among these specific improvements are:

(1) a "multi-user detector decision unit" comprising either a MUD decision unit 220 or a decision logic unit 520 running one of several specific disclosed selection algorithms for selecting among a plurality of MUDs; and

(2) dividing a received signal into small windows of data and, for each window, selecting the MUD most appropriate to process that particular window.

### A. "Multi-User Detector Decision Unit"

The '492 patent does not generically disclose selecting from a plurality of MUDs the one best suited for the current processing conditions, but instead chooses a specific system and method for making that selection. Part of this system is the disclosed "multi-user detector decision unit," which the patent describes as selecting from a plurality of MUDs and "represent[ing] one of the inventive aspects of the present invention." (EX1001 at 13:33-34).

The '492 patent describes this "multi-user detector decision unit" as MUD decision unit 220 (or, alternatively, decision logic unit 520) executing one of several specific disclosed selection algorithms for selecting among a plurality of MUDs. (EX2001 at ¶29). Unlike the prior art algorithms used to select a MUD, these disclosed algorithms are based on different information or an expansive amount of granular data points instead of a few limited generalized data points. (EX2001 at ¶29).

As a result, where the prior art would often result in the selection of a MUD more complex than necessary for the present conditions, the '492 patent's "multi-user detector decision unit" is able to identify that a lower complexity detector is still the most appropriate detector in those same conditions. (EX2001 at ¶30). In other words, where the simple prior art approach defaults to a high complexity detector when the considered generalized criteria (rightly or wrongly) indicates a

channel having a significant amount of noise and interference, the novel decision unit disclosed in the ’492 patent uses different information or an expansive amount of granular data points to identify when, in those same exact conditions, a lower complexity MUD is still the most appropriate MUD. (EX2001 at ¶30).

The ’492 patent discloses several different algorithms for achieving these improved results, where each algorithm can be based on data points concerning granular aspects of the channel. Some exemplary algorithms disclosed in the ’492 patent are highlighted below:

**BER/User Algorithm:** In one disclosed MUD selection algorithm, the expected Bit Error Rate (BER) of each channel user is calculated for every available MUD. Which MUD to use is then selected based on these expansive calculations and data points:

> If any of the users have an expected BER that is acceptable, or above a threshold, for any of the lower complexity MUD techniques, then use the lowest complexity MUD possible that meets that criteria. As users are [thus processed and removed,] the expected BER of the remaining users changes. If none of the users … have an expected BER below the threshold for any of the lower complexity MUD techniques then the highest complexity MUD technique should be used.

(EX1001 at 13:63-14:6, 20:43-49).

**SINR/Symbol Algorithm:** A wireless signal comprises a series of many “symbols,” where each symbol represents one or several bits. In another algorithm,

the signal to interference plus noise ratio (SINR) is calculated for every symbol received via the channel and those ratios are used to select the appropriate MUD. "If the SINR for any symbols is above a threshold set for a specific lower complexity MUD technique, then use that technique. If none of the SINR values are above any of the lower complexity MUD thresholds then use the highest complexity MUD." (EX1001 at 14:19-24).

**Filtered SINR/Symbol Algorithm:** Similarly, another selection algorithm calculates the expected SINR value for each symbol after filtering with one of the lower complexity MUDs. If any of the post filtering SINR values are above a threshold for a specific lower complexity MUD, that MUD can be used. If none of the post filtering SINR values are above any of the available lower complexity MUD thresholds, then the highest complexity MUD is used. (EX1001 at 14:26-32).

**Detected Amount/Symbol Algorithm:** Another symbol-based algorithm focuses on the number of detected symbols. In this algorithm, a threshold of symbols is set for each possible MUD, and the lowest complexity MUD whose threshold exceeds the detected number of symbols is selected and used. (EX1001 at 13:39-55).

**Correlation Matrix Ratio/User Algorithm:** In the wireless context, a user "correlation matrix" is a table depicting the amount of correlation (similarity)

between each possible pair of user signals. A fifth MUD decision algorithm looks at the correlation matrix between the users, and ratios calculated therefrom, to determine which MUD or MUDs to use:

> [L]ook at the correlation matrix between the users and compar[e] each diagonal term to the sum of the off diagonal terms. If the ratio for a certain number of users is greater than a certain threshold then a lower complexity MUD can be used. If the ratio is below that threshold then a higher complexity can be used.

(EX1001 at 13:55-62).

**Correlation Matrix Eigenvalues Algorithm:** To analyze the complex detailed information included in the above-described user correlation matrix, another algorithm performs an eigen decomposition on that matrix to represent its information using eigenvalues and eigenvectors. The algorithm then considers all of the eigenvalues (and their associated eigenvectors) to select the appropriate MUD:

> If the first N eigenvalues are very close to one another and the eigenvectors associated with those eigenvalues all have the same N entries terms then use a lower complexity MUD. If there are any other regions of the eigenvalues that are basically equal and the eigenvalues have the same dominant terms or if there is any one eigenvector that has a dominant term and its eigenvector is above the noise floor then use a lower complexity MUD. If the eigenvalues and eigenvectors of the correlation matrix do not have these characteristics then use the highest complexity MUD.

(EX1001 at 14:7-18).

The specification also provides some other criteria, for example, computational complexity, number of bits, and number of users. (EX1001 at 14:34-36).

Each of these algorithms has a common thread—instead of looking at just a few select representative or averaged pieces of data concerning the channel, it considers characteristics of a complete set of granular data such as, for example, information concerning all of the subject users or symbols. (EX2001 at ¶39). By digging deep in this manner, the disclosed and claimed "multi-user detector decision unit" succeeds where prior art approaches fail, selecting the appropriate MUD that achieves an optimal balance between complexity and performance. (EX1001 at 14:48-55; EX2001 at ¶39).

### B. Dividing A Received Signal Into Windows Of Data And Selecting The MUD Most Appropriate To Process That Particular Window

Another improvement identified and claimed in the '492 patent is dividing a received signal into small windows containing a limited amount of transmitted symbols/bits and, for each window, selecting the MUD most appropriate to process that particular window.

The '492 patent describes that in this improvement, the received signal is broken into numerous subparts, called "windows": "The received signals are split into a plurality of window . . . , wherein the windows are subsets of the total

received signals." (EX1001 at 18:52-54). "[T]he processing window is at least as wide as any single block of data;" typically in a small channel, each window will be around three symbols in length, while each can be longer for larger channels. (EX1001 at 17:24-57).

The patent further describes that when each window is processed, a new MUD selection occurs so that instead of using the same MUD for the entire signal, each subpart of the signal (window) is processed by a MUD selected as optimal for that particular window:

- "the MUD processing is performed for all of the symbols of a given window , . . before decoding the results and then moving to the next window;"
- "based upon the decision logic, the MUD is chosen . . . for the particular window of data;"
- "an independent decision is made about which MUD technique to use for every window."

(EX1001 at 17:63 - 18:7).

## IV. Claims 1-3, 5-13, 15-16: No Grounds Establish The Required Likelihood Of Success

All of the Grounds challenge independent claim 1 (and its dependent claims 2-3, 5-9) and independent claim 10 (and its dependent claims 13, and 15-16), or some subset thereof:[1]

[1] Three of the Grounds also challenge independent claim 17. These challenges are addressed separately below.

| Ground | References | Basis | Challenged Claims |
|---|---|---|---|
| 1A | *McElwain, Wang* | § 103 | **1-3, 5-13, 15, 16,** 17 |
| 1B | *McElwain, Sampath* | § 103 | **1-3, 5-13, 15, 16,** 17 |
| 2A | *Mills, Liu* | § 103 | **1-3, 5-13, 15, 16,** 17 |
| 2B | *Mills, Liu, Sampath* | § 103 | **10-13, 15, 16** |

Each of these claims recites the inventive "multi-user detector decision unit" discussed above. Ground 1A relies solely on *Wang* as allegedly disclosing this required limitation, while Ground 1B relies solely on *Sampath* and Grounds 2A and 2B rely solely on *Liu*.

But the Petition identifies no such "multi-user detector decision unit" in *Wang*, *Sampath*, or *Liu*. It is undisputed that "multi-user detector decision unit" is a means-plus-function limitation and should be construed as the patent's disclosed MUD decision unit 220 (or decision logic 520) configured to perform one or more of the several decision algorithms described in the '492 patent. However, none of the references describe the purported "multi-user detector decision unit" as configured to perform any of these algorithms, as required by the agreed construction, and the Petition does not even attempt to identify any such algorithms.

Instead, the Petition takes the same approach that the PTAB rightly rejected in Samsung's prior petition against the '492 Patent: the Petition merely identifies in an asserted reference some common buzzwords (such as eigenvector or SINR) from a claimed algorithm, but does not identify in the reference that algorithm's

actual required steps. *See Samsung v. Collision*, IPR2024-01247, Paper No. 14, at 16-21 (PTAB 2025).

For this failure alone, the Petition does not establish the required likelihood of success for any of claims 1-3, 5-13, and 15-16.

### A. The Claimed "Multi-User Detector Decision Unit"

#### 1. Challenged Claims 1-3, 5-13, And 15-16 Require A "Multi-User Detector Decision Unit"

Each challenged claim 1-3, 5-13, and 15-16 requires a "multi-user detection decision unit." For example, this limitation is present and highlighted in the following exemplary claim 1:

> 1. A hybrid Multi-User Detector System for processing received signals, comprising:
>
> a parameter estimator coupled to said received signals providing receive data information;
>
> **a multi-user detection decision unit** coupled to said parameter estimator and said received signals;
>
> at least two multi-user detectors coupled to said parameter estimator and said multi-user detector decision unit, **said multi-user detector decision unit using decision criteria to determine a selected multi-user detector**, wherein said selected multi-user detector outputs a plurality of information streams, one stream corresponding to each of said received signals; and
>
> a bank of decoders coupled to said plurality of information streams, wherein said decoders output a plurality of improved information streams.

(EX1001 at claim 1; *see also* claim 10 at 24:15-18).

### 2. The Agreed Construction Of "Multi-User Detector Decision Unit"

Petitioners agree that the claimed "multi-user detector decision unit" is a means-plus-function term, where the claimed function is "using decision criteria to determine a selected multi-user detector," and the corresponding structure is "MUD decision unit 220 (or decision logic 520) configured to perform one or more algorithms described at 8:12-18, 13:35-14:40, 15:3-21, 19:43-48, 19:56-62, and 20:41-49; and equivalents thereof." The identified algorithms are the several selection algorithms identified in the '492 patent, some of which are discussed above, including:

- BER/User Algorithm;
- SINR/Symbol Algorithm;
- Filtered SINR/Symbol Algorithm;
- Detected Amount/Symbol Algorithm;
- Correlation Matrix Ratio/User Algorithm;
- Correlation Matrix Eigenvalues Algorithm;
- Computational Complexity Algorithm;
- Number of Bits Algorithm; and
- Number of Users Algorithm.

(EX1001 at 8:12-18, 13:35-14:40, 15:3-21, 19:43-48, 19:56-62, and 20:41-49).

Patent Owner Collison previously asserted the ’492 Patent in the District Court for the Eastern District of Texas. In that litigation, the Eastern District of Texas District Court adopted this same construction. (EX1100 at 73-74).

Since then, PTAB also adopted this same construction when denying institution of an earlier Petition against the ’492 Patent, identifying the corresponding structure as:

> a MUD decision unit 220 (or, alternatively, decision logic unit 520) configured to perform one or more of the several decision algorithms (e.g., BER/User, SINR/Symbol, Filtered SINR/Symbol, Detected Amount/Symbol, Correlation Matrix Ratio/User Algorithm, Correlation Matrix Eigenvalues, Computational Complexity, Number of Bits, Number of Users, and other algorithms) disclosed at 8:12-18, 13:35-14:40, 15:3-21, 19:43-48, 19:56-62, and 20:41-49 of the ’492 Patent.

*See Samsung v. Collision*, IPR2024-01247, Paper No. 14, at 12 (PTAB 2025).

And although Petitioner did not adopt or propose this construction in the Petition, their parent company, Lenovo Group has since agreed to the construction in the Parallel District Court Litigation, submitting a Joint Claim Construction Statement to the Court identifying the following correct construction:
the claimed function is “using decision criteria to determine a selected multi-user detector,” and the corresponding structure is “MUD decision unit 220 (or decision

logic 520) configured to perform one or more algorithms described at 8:12-18, 13:35-14:40, 15:3-21, 19:43-48, 19:56-62, and 20:41-49; and equivalents thereof."

> This term is subject to 35 U.S.C. ¶ 6. The claimed function is "using decision criteria to determine a selected multi-user detector," and the corresponding structure is "MUD decision unit 220 (or decision logic 520) configured to perform one or more algorithms described at 8:12-18, 13:35-14:40, 15:3-21, 19:43-48, 19:56-62, and 20:41-49; and equivalents thereof."

(EX2005 at 27-28).

And (as the following analysis confirms) this agreed construction is correct and should—again—be adopted by PTAB.

**a. The Claimed "Multi-User Detector Decision Unit" Is Means-Plus-Function Limitation**

The Federal Circuit's *Williamson* decision sets forth the test for determining whether the claimed "multi-user detector decision unit" is a means-plus-function limitation: even absent the word "means," a claim term will be construed as a means-plus function limitation where "the claim fails to 'recite sufficiently definite structure' or else recites 'function without reciting sufficient structure for performing that function.'" *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1348 (Fed. Cir. 2015) (relevant portion decided *en banc*) (internal citation omitted).

The Eastern District of Texas District Court determined that the claimed "multi-user detector decision unit" is a means-plus-function limitation despite not literally using the word "means" because the claims do not recite sufficiently definite—or any—structure for this limitation. The Court held that "the word 'unit' as used in the term here at issue is a nonce word that can be 'tantamount to using the word means.'" (EX1100 at 69) (citing *Williamson*, 792 F.3d at 1350). As the *Williamson* court explained about the similarly generic "module": it "does not provide any indication of structure because it sets forth the same block recitation for providing the same specified function as if the term 'means' had been used." *Williamson*, 792 F.3d at 1351.

Because the Eastern District of Texas District Court determined that the unit in "multi-user detector decision unit" is a nonce word imparting no definite structure, the Court identified that the "issue, then, is whether the phrase 'multi-user detector decision' imparts structural meaning to the word 'unit.'" (EX1100 at 69). But this phrase just further describes what the "unit" does—it makes a decision about a multi-user detector—not what the structure actually is. Accordingly, the Court found that "the presence of these particular terms does not provide any structural significance to the term '[unit]' in this case." (EX1100 at 69) (citing *Williamson*, 792 F.3d at 1351).

Petitioner does not dispute or argue otherwise, neither alleging or providing any evidence that a POSITA would understand that the phrase "multi-user detector decision unit" refers to any definite structure for performing the claimed function. Accordingly, PTAB should, consistent with its prior construction, follow the Court's lead: "This 'unit' term is thus not directed to any particular class of structures but rather to anything that performs the claimed function. The Court therefore finds that the presumption against means-plus-function has been rebutted … ." (EX1100 at 72).

**b. The Corresponding Structure Requires One Of The Disclosed Selection Algorithms**

Correctly construed, a mean-plus-function limitation covers the corresponding structures disclosed in the specification for performing the claimed functions, and equivalents thereof. (*Williamson*, 792 F.3d at 1351). A structure disclosed in the specification is a corresponding structure if the specification links or associates the structure to the function recited in the claim. (*Id.* at 1352). As the parties agree, as the PTAB and Eastern District of Texas District Court previously found, and as discussed and established above, the '492 Patent describes the structures for performing the multi-user detector decision unit's claimed functions (selecting a MUD based on a decision criteria or threshold) is a MUD decision unit 220 (or, alternatively, decision logic unit 520) configured to

perform one or more of the several decision algorithms, e.g., the BER/User, SINR/Symbol, Filtered SINR/Symbol, Detected Amount/Symbol, Correlation Matrix Ratio/User, Correlation Matrix Eigenvalues, Computational Complexity, Number of Bits, Number of Users, and other algorithms disclosed at 8:12-18, 13:35-14:40, 15:3-21, 19:43-48, 19:56-62, and 20:41-49. *See Samsung v. Collision*, IPR2024-01247, Paper No. 14, at 12 (PTAB 2025).

This is consistent with the prior and agreed construction, which state (at least in part) that the "corresponding structure is 'MUD decision unit 220 (or decision logic 520) configured to perform one or more algorithms described at 8:12-18, 13:35-14:40, 15:3-21, 19:43-48, 19:56-62, and 20:41-49; and equivalents thereof.'"

The Petition does not dispute that these are the correct corresponding structures, challenge the Eastern District of Texas District Court's or PTAB's prior analysis on this issue, or propose any additional or alternative corresponding structures for the claimed "multi-user detector decision unit."

### B. None Of The Asserted Grounds Establish A Reasonable Likelihood Of Success Concerning The Claimed "Multi-User Detector Decision Unit"

#### 1. Ground 1A: The Petition Does not Establish That *Wang* Discloses the Claimed "multi-user detector decision unit"

Ground 1A challenges claims 1-3, 5-13, and 15-16 as obvious in light of *McElwain* combined with *Wang*. (Pet. at 13-36). Ground 1A relies solely on *Wang*

as allegedly disclosing the claimed "multi-user detector decision unit" required in each of these claims. (*e.g.*, Pet. at 15-20).

According to the Petition, the alleged *Wang* "multi-user detector decision unit" meets the agreed construction because Wang describes that unit as performing one of the algorithms from that construction, namely the '492 Patent's Correlation Matrix Eigenvalues Algorithm. (*e.g.*, Pet. at 17). But the Petition identifies no such description in *Wang*. It cannot because that algorithm requires steps not described or performed in *Wang* at all, much less by the alleged *Wang* "multi-user detector decision unit."

The '492 Patent's Correlation Matrix Eigenvalues Algorithm performs an eigen decomposition on a user correlation matrix to represent its information using eigenvalues and eigenvectors. (EX2001 at ¶50). The algorithm then considers all of the eigenvalues (and their associated eigenvectors) above a noise floor to select the appropriate MUD:

> The decision can be made by taking the eigendecomposition of the correlation matrix and **looking at all the eigenvalues that are above the noise floor**. **If the first N eigenvalues are very close to one another** and **the eigenvectors associated with those eigenvalues all have the same N entries terms** then use a lower complexity MUD. If there are any other regions of the eigenvalues that are basically equal and the eigenvalues have the same dominant terms or if there is any one eigenvector that has a dominant term and its eigenvector is above the noise floor then use a lower complexity MUD. If the eigenvalues and eigenvectors of the correlation matrix do not have these characteristics then use the highest complexity MUD.

(EX1001 at 14:7-18; EX2001 at ¶50).

Based on this disclosure, the Correlation Matrix Eigenvalues Algorithm requires doing at least the following to select a MUD:

- looking at all the eigenvalues that are above the noise floor;
- evaluating whether the first N eigenvalues are very close to one another;
- evaluating the eigenvectors associated with those eigenvalues; and
- evaluating if those eigenvectors all have the same N entries terms.

(EX2001 at ¶51).

But the Petition does not identify **any** of these required steps for the alleged *Wang* "multi-user detector decision unit," much less **all** of them. Instead, the Petition tries to rely on the fact *Wang* mentions eigenvalues and eigenvectors, ignoring that *Wang* does not describe using those eigenvalues or eigenvectors to perform any of these required steps. (EX2001 at ¶51). For any and all of these missing algorithm steps, Ground 1A fails for claims 1-3, 5-13, and 15-16.

**a. The Petition fails to show that *Wang* discloses "looking at all the eigenvalues that are above the noise floor" for selecting a MUD**

The '492 Patent's Correlation Matrix Eigenvalues Algorithm for selecting a MUD includes the step of "looking at **all** the eigenvalues that are above the noise floor." (EX1001 at 14:7-18). The Petition identifies no such step in *Wang*. At

best, the Petition alleges that Wang describes looking at **some** of the eigenvalues that are above the noise floor to select the appropriate MUD. (EX2001 at ¶53).

The Petition equates "noise power ($\sigma_N^2$)" with "noise floor." (Pet. at 18-19; EX2001 at ¶54). But the Petition does not—and could not reasonably—assert that *Wang* teaches looking at all the eigenvalues that are above the "noise power ($\sigma_N^2$)" to select the appropriate MUD. To the contrary, the Petition establishes that *Wang* does not perform this step.

Instead, as the Petition describes, Wang uses only some of the eigenvalues above the "noise power ($\sigma_N^2$)" to select the appropriate MUD. (Pet. at 19-20; EX2001 at ¶55). The Petition and *Wang* call this subset of eigenvalues above the "noise power ($\sigma_N^2$)" the "effective eigenvalues." (Pet. at 19-20; EX1005 16:7-8; EX2001 at ¶55).

*Wang* explains that the "effective eigenvalues" are those eigenvalues that are above a threshold higher than "noise power ($\sigma_N^2$)", namely the threshold of $\sigma_N^2 + \delta_\lambda$. (EX1005 16:7-8; EX2001 at ¶56). As a result, only eigenvalues greater than the sum of a noise power $\sigma_N^2$ plus a specific parameter $\delta_\lambda$ are considered for MUD selection in *Wang*. Thus, even following the Petition's logic, *Wang* does not consider eigenvalues failing to satisfy $\sigma_N^2 + \delta_\lambda$ for MUD selection, even if they are above a noise power $\sigma_N^2$. (EX1005 16:7-8; EX2001 at ¶56). As such, the effective

eigenvalues used for selecting a MUD in *Wang* are not inclusive of **all** eigenvalues above a noise power $\sigma_N^2$.

The Petition simply ignores this fatal difference between *Wang* and the '492 Patent's Correlation Matrix Eigenvalues Algorithm. For this reason alone, Ground 1A fails for claims 1-3, 5-13, and 15-16.

**b. The Petition fails to show that *Wang* describes evaluating "if the first N eigenvalues are very close to one another"**

The '492 Patent's Correlation Matrix Eigenvalues Algorithm for selecting a MUD looks at all of the eigenvalues above a noise floor to, among other things, evaluate "if the first N eigenvalues [of all the eigenvalues above the noise floor] are very close to one another." (EX1001 at 14:7-18; EX2001 at ¶58). Because *Wang* does not look at all of the eigenvalues above the noise floor to select a MUD, it necessarily does not describe this evaluation of those eigenvalues.

But even aside from this threshold failing, the Petition does not even attempt to identify any determination of "[i]f the first N eigenvalues are very close to one another." Although the Petition at first acknowledges this is a required step of the Correlation Matrix Eigenvalues Algorithm (Pet. at 17), it never again mentions the step in its *Wang* analysis and never asserts—much less proves—that *Wang* describes evaluating "[i]f the first N eigenvalues are very close to one another" to select a MUD. (*e.g.*, Pet. at 18-21; EX2001 at ¶59).

The Petition's total failure on this admittedly required algorithm step is another independent reasons Ground 1A fails for claims 1-3, 5-13, and 15-16.

### c. The Petition fails to show that *Wang* evaluates "eigenvectors" to select a MUD

The '492 Patent's Correlation Matrix Eigenvalues Algorithm considers "the eigenvectors associated with those eigenvalues" to select the appropriate MUD. (EX1001 at 14:7-18; EX2001 at ¶60). But the Petition fails to show that *Wang* considers eigenvectors at all when selecting a MUD.

At best, the Petition explains that *Wang* identifies eigenvectors and that one or more eigenvalues are calculated with respect to each eigenvector. (Pet at 18; EX2001 at ¶61). But the Petition completely overlooks that the eigenvectors in *Wang* are in no way considered to select a MUD.

To the contrary, *Wang* is clear that its MUD selection criteria is limited to the channel type, and the channel type is determined based on "the number of effective eigenvalues and the in-band power spectrum deviation." (EX1005 at 10:21-11:2; 16:14-16; EX2001 at ¶62). Wang does not describe using eigenvectors as required by the Correlation Matrix Eigenvalues Algorithm, and this is another independent reason why *Wang* fails to describe the claimed "multiuser detector decision unit."

**d. The Petition fails to show that *Wang* evaluates whether "eigenvectors associated with those eigenvalues all have the same N entries terms"**

To select a MUD, the '492 Patent's Correlation Matrix Eigenvalues Algorithm also evaluates "if … the eigenvectors associated with those eigenvalues all have the same N entries terms." (EX1001 at 14:7-18; EX2001 at ¶63). Because Wang does not use eigenvectors in any manner to select a MUD, it necessarily does not select a MUD by specifically evaluating "if … the eigenvectors associated with those eigenvalues all have the same N entries terms."

But even if the Petition could show eigenvectors are required for the MUD selection process in *Wang* (it cannot), the Petition does not even attempt to identify the specific step of evaluating if "eigenvectors associated with those eigenvalues all have the same N entries terms" in *Wang*. Instead, the Petition again acknowledges this is a required step of the Correlation Matrix Eigenvalues Algorithm (Pet. at 17), but then never again mentions the step in its *Wang* analysis and never asserts—much less proves—that *Wang* describes evaluating "[i]f … eigenvectors associated with those eigenvalues all have the same N entries terms" to select a MUD. (*e.g.*, Pet. at 18-21; EX2001 at ¶64).

The Petition's total failure on this admittedly required algorithm step is another independent reasons Ground 1A fails for claims 1-3, 5-13, and 15-16.

### 2. Ground 1B: The Petition Does not Establish That *Sampath* Discloses the Claimed "multi-user detector decision unit"

Ground 1B challenges claims 1-3, 5-13, and 15-16 as obvious in light of *McElwain* combined with *Sampath*. (Pet. at 39-52). Ground 1B relies solely on *Sampath* as allegedly disclosing the claimed "multi-user detector decision unit" required in each of these claims. (*e.g.*, Pet. at 42-47).

According to the Petition, the alleged *Sampath* "multi-user detector decision unit" meets the agreed construction because *Sampath* describes that unit as performing one of the algorithms from that construction, namely the '492 Patent's SINR/Symbol Algorithm. (*e.g.*, Pet. at 45-46). But the Petition identifies no such description in *Sampath*. It cannot because that algorithm requires steps not described or performed in *Sampath* at all, much less by the alleged *Sampath* "multi-user detector decision unit."

In the '492 Patent's SINR/Symbol Algorithm, the signal to interference plus noise ratio (SINR) is calculated for each and every symbol received via the channel, and those symbol SINRs are then compared to different thresholds to select the appropriate MUD:

> The decision can be made by **calculating the signal to interference plus noise ratio (SINR) for each symbol**. **If the SINR for any symbols is above a threshold set for a specific lower complexity MUD technique** then use that technique. **If none of the SINR values are above any of the lower complexity MUD thresholds** then use the highest complexity MUD.

(EX1001 at 14:19-24; EX2001 at ¶74).

Based on this disclosure, the SINR/Symbol Algorithm requires doing at least the following to select a MUD:

- calculating the SINR for each symbol received via the channel;
- evaluating if the SINR for any of those symbols is above a threshold set for a specific lower complexity MUD technique; and
- evaluating if none of SINR for any of those symbols is above any of the lower complexity MUD thresholds.

But the Petition does not identify **any** of these required steps for the alleged *Sampath* "multi-user detector decision unit," much less **all** of them. Instead, the Petition tries to rely on the fact *Sampath* mentions the term "SINR," ignoring that *Sampath* does not describe calculating or evaluating any SINR as required in these steps. For any and all of these missing algorithm steps, Ground 1B fails for claims 1-3, 5-13, and 15-16.

(As an aside, Ground 1B also is wholly unsupported by the Petitioners' submitted expert declaration. As discussed above and previously noted by the PTAB in its rejection of the Samsung petition against the '492 Patent, two of the disclosed algorithms for the claimed "multi-user detector decision unit" involve SINR: (1) the SINR/Symbol Algorithm and (2) the Filtered SINR/Symbol Algorithm. Tellingly, although the Petition's Ground 1B attempts to establish that

Sampath discloses the SINR/Symbol Algorithm, Ground 1B cites to (irrelevant and incorrect) expert opinion concerning the **other** SINR algorithm, the Filtered SINR/Symbol Algorithm. (*See* Pet. 44-47, citing to EX1003 at ¶166- ¶174).)

**a. The Petition fails to show that *Sampath* discloses "calculating the signal to interference plus noise ratio (SINR) for each symbol" to select a MUD**

The '492 Patent's SINR/Symbol Algorithm selects a MUD by, among other steps, "calculating the signal to interference plus noise ratio (SINR) **for each symbol**" received via the channel. (EX1001 at 14:19-24; EX2001 at ¶77). But *Sampath* does not describe calculating a SINR for **any** symbol, much less **each** symbol.

Indeed, the *Sampath* patent application publication's written description does not mention an SINR at all; *Sampath* only mentions a "signal to interference-plus-noise ratio (SINR)" in its claims 9, 14, and 24. (EX1006 at claims 9, 14, 24; EX2001 at ¶78). And nowhere does *Sampath* describe calculating the SINR for a symbol. (EX1006 at claims 9, 14, 24; EX2001 at ¶78).

Accordingly, although the Petition acknowledges that "calculating the signal to interference plus noise ratio (SINR) **for each symbol**" is a required step of the SINR/Symbol Algorithm (Pet. at 45), it does not—and cannot reasonably—assert that *Sampath* calculates the SINR for **any** symbol, much less **each** symbol. (*e.g.*, Pet. at 45-47; EX2001 at ¶79). Instead, the Petition merely alleges that in *Sampath*

"the demodulator selector 316 uses a SINR threshold for a first demodulator and a SINR threshold for a second demodulator to choose between selecting the first demodulator or the second demodulator for processing received signals." (Pet. at 46). Thus, although the Petition interprets the *Sampath* SINR claims as disclosing SINR thresholds, the Petition never even asserts, much less proves, that *Sampath* describes calculating the SINR of each (or any) symbol. (EX2001 at ¶79).

Because the Petition wholly fails to identify in *Sampath* this required step of the SINR/Symbol Algorithm, Ground 1B fails to show that *Sampath* discloses the claimed "multi-user detector decision unit" and fails for each of claims 1-3, 5-13, and 15-16.

**b. The Petition fails to show the MUD selection criteria in *Sampath* considers "the SINR for any symbols is above a threshold set for a specific lower complexity MUD technique" or "whether none of the SINR values are above any of the lower complexity MUD thresholds"**

In the '492 Patent's SINR/Symbol Algorithm, once the SINRs of each symbol are calculated, the algorithm (1) evaluates if the SINR for any of those symbols is above a threshold set for a specific lower complexity MUD technique; and (2) if none of SINR for any of those symbols is above any of the lower complexity MUD thresholds:

> The decision can be made by **calculating the signal to interference plus noise ratio (SINR) for each symbol**. **If the SINR for any symbols is**

> **above a threshold set for a specific lower complexity MUD technique** then use that technique. **If none of the SINR values are above any of the lower complexity MUD thresholds** then use the highest complexity MUD.

(EX1001 at 14:19-24; EX2001 at ¶80).

Because *Sampath* does not disclose calculating the SINR for each received symbol, *Sampath* necessarily does not describe comparing those (missing) symbol SINRs to these thresholds.

And the Petition does not assert otherwise. Instead, the Petition merely conclusorily asserts (without any basis) that *Sampath* uses two "SINR thresholds" to choose between two demodulators. (Pet. at 46). Sampath in fact mentions no such SINR thresholds, but even this unsupported assertion is not what is required by the '492 Patent's SINR/Symbol Algorithm. (EX2001 at ¶82). For example, unlike in the '492 Patent's SINR/Symbol Algorithm, the Petition does not and cannot assert that *Sampath* describes that:

- the SINRs for **each symbol** are compared to the thresholds;
- a specific lower complexity MUD technique is selected if just **any SINR** (much less required "SINR for any symbol") "**is above** a threshold set for [that] specific lower complexity MUD technique;" and

- the highest complexity MUD technique is used if "**none** of the [symbol's] SINR values **are above** any of the lower threshold complexity thresholds.

(EX1001 at 14:19-24; Pet. at 46-47; EX2001 at ¶82).

The Petition cannot identify in *Sampath* any of these detailed steps (either for the required symbol SINRs or even for SINRs in general) because *Sampath* includes no such details. Instead, at best, the short *Sampath* claims that mention SINR disclose that SINR is used as a metric for choosing between a first or second demodulator. (EX1006 at claims 9, 14, 24; Pet. at 46-47; EX2001 at ¶83). For example, Sampath published claims 8 and 9 read as follows:

> 8. The multiple-input receiver as recited in claim 1, wherein the decision logic is configured to choose based upon a metric.
>
> 9. The multiple-input receiver as recited in claim 8, wherein the metric is a signal to interference-plus-noise ratio (SINR) for the first or second demodulator.

(EX1006 at claims 8, 9; EX2001 at ¶83).

But this mere mention of SINR says nothing about **how** SINR is used as metric and certainly do not describe any of the foregoing **specific ways** to use **symbol** SINRs to select a particular MUD technique. (EX2001 at ¶84).

For each of these additional independent reasons, the Petition does not establish a reasonable likelihood of proving that Sampath discloses the

SINR/Symbol Algorithm of the claimed "multi-user detector decision unit," and Ground 1B fails for each of claims 1-3, 5-13, and 15-16.

### 3. Grounds 2A & 2B: The Petition Does not Establish That *Liu* Discloses the Claimed "multi-user detector decision unit"

Ground 2A challenge claims 1-3, 5-13, and 15-16 as obvious in light of *Mills* combined with *Liu*, while Ground 2B challenges claims 10-13, 15, and 16 as obvious in light of *Mills* combined with *Liu* and *Sampath*. (Pet. at 53-78, 82-85). Each of Grounds 2A and 2B relies solely on *Liu* as allegedly disclosing the claimed "multi-user detector decision unit" required by these challenged claims. (*e.g.*, Pet. at 59-65, 83).

According to the Petition, the alleged *Liu* "multi-user detector decision unit" meets the agreed construction because *Liu* describes that unit as performing one of the algorithms from that construction, namely the '492 Patent's BER/User Algorithm. (*e.g.*, Pet. at 60). But the Petition identifies no such description in *Liu*. It cannot because that algorithm requires steps not described or performed in *Liu* at all, much less by the alleged *Liu* "multi-user detector decision unit."

In the '492 Patent's BER/User Algorithm, the expected Bit Error Rate (BER) of each channel user is calculated for every available lower complexity MUD. Which MUD to use is then selected based on these expansive calculations and data points:

> The decision can be made by **calculating the expected bit error rate (BER) of each user based on all the lower complexity MUD techniques**. **If any of the users have an expected BER that is acceptable, or above a threshold, for any of the lower complexity MUD techniques**, then use the lowest complexity MUD possible that meets that criteria. As users are [thus processed and removed,] the expected BER of the remaining users changes. **If none of the users … have an expected BER below the threshold for any of the lower complexity MUD techniques** then the highest complexity MUD technique should be used.

(EX1001 at 13:63-14:6, 20:43-49; EX2001 at ¶91).

Based on this disclosure, the BER/User Algorithm requires doing at least the following to select a MUD:

- calculating the expected bit error rate (BER) of each user;
- calculating each user's expected BER based on all the lower complexity MUD techniques; and
- comparing the calculated expected BER of each user to the (BER) thresholds for the lower complexity MUD techniques. (EX2001 at ¶92).

But the Petition does not identify **any** of these required steps for the alleged *Liu* "multi-user detector decision unit," much less **all** of them. Instead, the Petition tries to rely on the fact *Liu* includes a single mention of an "acceptable error rate," ignoring that *Liu* does not describe calculating an expected BER for every user,

calculating the user expected BERs based on all the lower complexity MUD techniques, or comparing those expected BERS to thresholds for the lower MUD techniques, as required in these steps. (EX2001 at ¶93). For any and all of these missing algorithm steps, Ground 2A and 2B fail for claims 1-3, 5-13, and 15-16.

**a. The Petition fails to show that *Liu* discloses "calculating the expected bit error rate (BER) of each user"**

The '492 Patent's BER/User Algorithm selects a MUD by, among other steps, "calculating the expected bit error rate (BER) of each user." (*e.g.*, EX1001 at 13:63-14:6). *Liu* does not describe this step, and the Petition does not identify any such description.

Instead, the Petition repeatedly points to and relies on a single reference in *Liu* to an "acceptable error rate":

> However, if linear multi-user decoder 406 cannot satisfactorily decode the intended signal, such as failing to provide a threshold SNR strength and/or other threshold factors, resulting in **an unacceptable error rate or other performance**, non-linear multi-user decoder 407 is preferably used for decoding.

(EX1008 at ¶ 29; Pet. at 62-64).

This passage does not describe calculating an **expected** bit error rate, and it certainly does not describe or suggest "calculating the **expected** bit error rate (BER) **of each user**." (EX2001 at ¶95).

Indeed, Liu's system actually precludes performing this required step. *Liu* describes ignoring or filtering out signals that have a strength below a given strength threshold. (EX1008 ¶ 29; EX2001 at ¶96). By filtering out or otherwise ignoring signals based on the strength of the signal's preamble, *Liu* cannot calculate the expected BER of **each user**. (EX2001 at ¶96).

For these reasons alone, the Petition's conclusory assertion that Liu somehow describes "an algorithm that is the same as" the '492 Patent's BER/User Algorithm is wholly baseless. There is thus no reasonable likelihood that Grounds 2A and 2B can establish that Liu teaches the "multi-user detector decision unit."

**b. The Petition fails to show that *Liu* discloses calculating each user's expected BER "based on all the lower complexity MUD techniques"**

The '492 Patent's BER/User Algorithm requires not only calculating each user's expected BER, but doing so based on all the lower complexity MUD techniques: "calculating the expected bit error rate (BER) of each user based on all the lower complexity MUD techniques." (*e.g.*, EX1001 at 13:63-14:6; EX2001 at ¶98). *Liu* does not describe this step.

First, because *Liu* does not disclose "calculating the expected bit error rate (BER) of each user," it necessarily does not disclose "calculating the expected bit error rate (BER) of each user **based on all the lower complexity MUD techniques**." (EX2001 at ¶199).

Second, even focusing on Liu's single general reference to "an unacceptable error rate," Liu does not describe calculating that that unacceptable error rate—which again, is not an expected BER for each user—based on all the lower complexity MUD techniques. (*See, e.g.*, EX1008 at ¶ 29; EX2001 at ¶100).

And the Petition does not assert otherwise. Although the Petition at first acknowledges this is a required step of the BER/User Algorithm (Pet. at 60), it never again mentions the step in its *Liu* analysis and never asserts—much less proves—that *Liu* describes calculating the expected bit error rate (BER) of each user "**based on all the lower complexity MUD techniques**." (*e.g.*, Pet. at 61-64; EX2001 at ¶101).

The Petition's total failure on this admittedly required algorithm step is another independent reasons Grounds 2A and 2B fail.

**c. The Petition fails to show that *Liu* discloses comparing the calculated expected BER of each user to the (BER) thresholds for the lower complexity MUD techniques to see if they are above those thresholds**

After calculating the expected bit error rate (BER) of each user based on all the lower complexity MUD techniques, the '492 Patent's BER/User Algorithm requires comparing the calculated expected BER of each user to the (BER) thresholds for the lower complexity MUD techniques to see if they are above those thresholds (i.e., acceptable):

> The decision can be made by calculating the expected bit error rate (BER) of each user based on all the lower complexity MUD techniques. **If any of the users have an expected BER that is acceptable, or above a threshold, for any of the lower complexity MUD techniques**, then use the lowest complexity MUD possible that meets that criteria. As users are [thus processed and removed,] the expected BER of the remaining users changes. **If none of the users … have an expected BER below the threshold for any of the lower complexity MUD techniques** then the highest complexity MUD technique should be used.

(EX1001 at 13:63-14:6, 20:43-49; EX2001 at ¶102).

*Liu* is completely silent on these required steps. First, because Liu does not describe calculating the expected bit error rate (BER) of each user based on all the lower complexity MUD techniques, it necessarily cannot and does not describe comparing those (missing) calculations to the required thresholds. (EX2001 at ¶103).

Second, even focusing on Liu's single general reference to "an unacceptable error rate," Liu does not describe comparing that that unacceptable error rate—which again, is not an expected BER for each user based on all the lower complexity MUD techniques —to thresholds for the lower complexity MUD techniques. (*See, e.g.*, EX1008 at ¶ 29; EX2001 at ¶104). Not only does *Liu*

describe no such comparisons, but the only thresholds identified in the Petition are not thresholds for the lower complexity MUD techniques:

> However, if linear multi-user decoder 406 cannot satisfactorily decode the intended signal, such as failing to provide **a threshold SNR strength and/or other threshold factors**, resulting in an unacceptable error rate or other performance, non-linear multi-user decoder 407 is preferably used for decoding.

(EX1008 at ¶ 29; Pet. at 62-64; EX2001 at ¶104). The only mentioned threshold is a SNR threshold and "other" unidentified thresholds. (EX2001 at ¶105).

These additional missing steps from the '492 Patent's BER/User Algorithm are additional independent reasons that Grounds 2A and 2B fail.

## V. Claim 17: No Grounds Establish The Required Likelihood Of Success

Grounds 1A, 1B, and 2A additionally challenge independent claim 17:

| Ground | References | Basis | Challenged Claims |
|---|---|---|---|
| 1A | *McElwain, Wang* | § 103 | 1-3, 5-13, 15, 16, **17** |
| 1B | *McElwain, Sampath* | § 103 | 1-3, 5-13, 15, 16, **17** |
| 2A | *Mills, Liu* | § 103 | 1-3, 5-13, 15, 16, **17** |
| 2B | *Mills, Liu, Sampath* | § 103 | 10-13, 15, 16 |

Samsung's prior IPR Petition against the '492 Patent similarly challenged claim 17 and its dependent claim 18. The PTAB denied that Petition, concluding that because the Petition did not establish a reasonable likelihood of success

against claims 1-16, it would be inefficient to consider the remaining claims 17 and 18:

> This leaves a single independent claim (claim 17) and a single dependent claim (claim 18) remaining for consideration. Even were we to conclude that Petitioner had established a reasonable likelihood of success as to claims 17 and 18, **this would leave at most two claims subject to a single ground** upon which a showing had been made, out of eighteen challenged claims Based on the particular circumstances of this case, **it would be inefficient for the Board to expend resources on a full review of all eighteen challenged claims**, where Petitioner has failed to establish even a reasonable likelihood of success as to the vast majority of those claims. Accordingly, **we need not, and do not, take any position as to Petition's showing on Ground 2 but instead exercise our discretion to review**.

(IPR2024-01247, Paper 14 at 22). Here, as established above, the Petition does not establish a reasonable likelihood for any of the other challenged claims, leaving only claim 17 for further consideration.

And as with the other challenged claims, the Petition again fails to establish a reasonable likelihood of success for challenged claim 17. The Petition treats claim 17 as an afterthought, consistently citing back to and relying (sometimes exclusively) on its prior assertions and arguments concerning the other challenged claims. But this makes no sense and cannot satisfy Petitioners' burden because

independent claim 17 is a method claim that is materially distinct from the other claims challenged by the Petition.

For example, as shown below, unlike the previously addressed claims, claim 17 is a method that repeatedly reassesses which MUD is most appropriate for a signal, dividing a received signal into small windows of data and, for each such window, making an independent determination as to which MUD is most appropriate for processing that particular subset of data from the signal:

> 17. A method for processing signals from multiple users with raw digitized data, comprising:
>
> performing a parameter estimation of said raw digitized data;
>
> **grabbing a window of bits from said raw digitized data**;
>
> subtracting any known bits from said window of bits;
>
> **selecting a multi-user detector**;
>
> estimating unknown bits from said window of bits using said multi-user detector;
>
> incrementing to a next window of bits;
>
> **repeating said steps of** subtracting, **selecting**, estimating, and incrementing until there are no more windows and outputting a set of symbol estimates.

(EX1001 at claim 17; EX2001 at ¶67).

This is not taught in any of the asserted art, and the Petition does not and cannot assert otherwise. For this reason alone, Grounds 1A, 1B, and 2A each additional fail for challenged claim 17.

### A. Ground 1A – Claim 17: Neither *McElwain* Nor *Wang* Describe The Iterative MUD Selection Limitations Of Claim 17

Ground 1A asserts that *McElwain* and *Wang* make claim 17 obvious. (Pet. at 36-39). But neither *McElwain* nor *Wang*, alone or in combination, describes repeatedly selecting a MUD most appropriate to process a particular window of bits.

*McElwain* does not and cannot teach this requirement because it does not describe selecting a MUD at all. (EX2001 at ¶69). The Petition does not assert otherwise. (*e.g.*, Pet. at 37-39).

*Wang* likewise does not teach the requirement, and again, the Petition does not and cannot assert otherwise. (*e.g.*, Pet. at 37-39). Even presuming that *Wang* teaches selecting a MUD as the Petition asserts (Pet. at 39), there is no suggestion in *Wang* to repeatedly select a MUD most appropriate to process a particular window, and the Petition does not assert or try to identify any such teaching in *Wang*. (Pet. at 39; EX2001 at ¶70). It cannot because *Wang* describes selecting a MUD algorithm based on channel type **once** and using the selected MUD

algorithm to process **all data** for a signal. (EX1005 7:26-8:3, 9:3-6, 9:25-30, 10:18-21, 14:12-15:16; EX2001 at ¶70).

And combining the references as the Petition baselessly proposes cannot save this Ground because the limitations missing from **both** references will still be missing when they are combined. Modifying *McElwain*, which the Petition admits does not select any MUD, with *Wang's* MUD selection, which only selects a MUD once for a signal based on the channel type and processes the signal with the selected MUD algorithm, does not teach or result in a system that repeatedly selects a MUD most appropriate to process a particular window, as required by claim 17. (EX2001 at ¶71).

The Petition asserts that "because *McElwain* discloses an iterative process for identifying hard outputs is performed for a current data block," the combination of *McElwain* and *Wang* would repeat the steps of subtracting, selecting, estimating, and incrementing. Pet. at 39. But *McElwain* allegedly teaching an iterative process for select **other** functions does not teach using an iterative process for selecting a MUD, and certainly does not teach the **specific** iterative process for selecting MUDs required by claim 17. (EX2001 at ¶72). The mere presence of an iteration in *McElwain* would not suggest to a POSITA to select a MUD at each iteration, particularly where *Wang* teaches selecting a MUD based on channel type, which would be determined **once** for a given received signal and therefor not change

between iterations. (EX2001 at ¶72). In other words, *Wang* teaches selection of a MUD once and there is no reason to make that decision a second time for a given signal because the outcome of that decision would not change. (EX2001 at ¶72).

The Petition ignores this as well as the substantial differences between claims 1 and 17 and, as a result, fails to establish a reasonable likelihood of prevailing on Ground 1A with respect to claim 17.

### B. Ground 1B – Claim 17: Neither *McElwain* nor *Sampath* Describe The Iterative MUD Selection Limitations Of Claim 17

Ground 1B asserts that the *McElwain* and *Sampath* make obvious claim 17. (Pet. at 52). But neither *McElwain* nor *Sampath*, alone or in combination, describes repeatedly selecting a MUD most appropriate to process a particular window of bits.

The Petition does not even attempt to map this element to these references or a combination thereof—Ground 1B includes no analysis at all, and instead solely comprises references to prior assertions concerning **a different ground** (the *McElwain-Wang* combination of Ground 1A). But not only does that prior ground fail for the reasons described above, but merely referring to a different prior art combination does not meet the Petitioner's burden to show a reasonable likelihood of prevailing.

The Petition does not even attempt to map the *McElwain-Sampath* combination to claim 17 because it cannot. *Sampath* describes decision logic configured to choose a first demodulator or a second demodulator and that the decision logic can choose based on a metric that includes SINR. (EX1006 claims 1, 8, 9; EX2001 at ¶88). Nowhere does *Sampath* suggest repeatedly selecting a demodulator for a signal. Instead, *Sampath* teaches selecting a demodulator to pass the entire signal to for processing and, once a decision is made, does not revisit that decision for a given signal. (EX1006 ¶ 39, 41; EX2001 at ¶88).

The mere presence of iteration in *McElwain* would not suggest to a POSITA to select a MUD at each iteration, particularly where *Sampath* teaches selecting a demodulator once for a given set of signals. In other words, *Sampath* teaches selection of a demodulator once and there is no reason to make that decision a second time for a given signal because the outcome of that decision would not change. (EX2001 at ¶89).

The Petition ignores this as well as the substantial differences between claims 1 and 17 and, as a result, fails to establish a reasonable likelihood of prevailing on Ground 1B with respect to claim 17.

### C. Ground 2A – Claim 17: Neither *Mills* nor *Liu* Describe The Iterative MUD Selection Limitations Of Claim 17

Ground 2A asserts that *Mills* and *Liu* make claim 17 obvious. (Pet. at 78-81). But neither *Mills* nor *Liu*, alone or in combination, describes repeatedly selecting a MUD most appropriate to process a particular window of bits.

*Mills* does not and cannot teach this requirement because it does not describe selecting a MUD at all. (EX2001 at ¶109). The Petition does not assert otherwise. (*e.g.*, Pet. at 59, 80).

*Liu* likewise does not teach the requirement, and again, the Petition does not and cannot assert otherwise. (*e.g.*, Pet. at 78-81). Even presuming that *Liu* teaches selecting a decoder as the Petition asserts (Pet. at 39), there is no suggestion in *Liu* to repeatedly select a MUD most appropriate to process a particular window, and the Petition does not assert or identify any such teaching in *Liu* does. (*e.g.*, Pet. at 78-81; EX2001 at ¶110). It cannot because *Liu* describes selecting a decoder **once** based on the strength of a signal's preamble, which does not vary. (EX1008 ¶ 29; EX2001 at ¶110).

And combining the references as the Petition baselessly proposes cannot save this Ground because the limitations missing from **both** references will still be missing when they are combined. Modifying *Mills*, which the Petition admits does not select any MUD, with *Liu*'s decoder election, which only selects a

decoder once for a signal based on preamble strength, does not teach or result in a system that repeatedly selects a MUD most appropriate to process a particular window, as required by claim 17. (EX2001 at ¶111).

The Petition asserts that "because *Mills* explains that the iterative process proceeds to the next block of received data bits, repeating the process" the combination of *Mills* and *Liu* would repeat the steps of subtracting, selecting, estimating, and incrementing. (Pet. at 81). But *Mills* allegedly teaching an iterative process for selecting **other** functions does not teach using an iterative process for selecting a MUD, and certainly does not teach the **specific** iterative process for selecting MUDs required by claim 17. (EX2001 at ¶112). The mere presence of an iteration in *Mills* would not suggest to a POSITA to select a MUD at each iteration, particularly where *Liu* teaches selecting a detector based on preamble strength, which would be determined once for a given signal and consequently not change between iterations. In other words, *Liu* teaches selection of a detector once and there is no reason to make that decision a second time for a given signal because the outcome of that decision would not change. (EX2001 at ¶112).

The Petition ignores this as well as the substantial differences between claims 1 and 17 and, as a result, fails to establish a reasonable likelihood of prevailing on Ground 2A with respect to claim 17.

## VI. Conclusion

For the foregoing reasons, the Board should deny institution of the Petition.

Dated: August 25, 2025

Respectfully submitted,

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## CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. §42.24(d), Patent Owner hereby certifies, in reliance on the word count of the word-processing system (Microsoft Office Word 2010) used to prepare this preliminary response, that the number of words in this paper is 10,565. This word count excludes the tables of contents, tables of authorities, certificate of word count, certificate of service, and table of exhibits.

Dated: August 25, 2025

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## CERTIFICATE OF SERVICE

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