

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DISH NETWORK CORPORATION, DISH NETWORK L.L.C., DISH
NETWORK SERVICE L.L.C., and DISH NETWORK CALIFORNIA
SERVICE CORPORATION
Petitioners,

v.

ENTROPIC COMMUNICATIONS, LLC,
Patent Owner.

CASE: IPR2024-00555
U.S. PATENT NO. 8,320,566

PATENT OWNER'S PRELIMINARY RESPONSE

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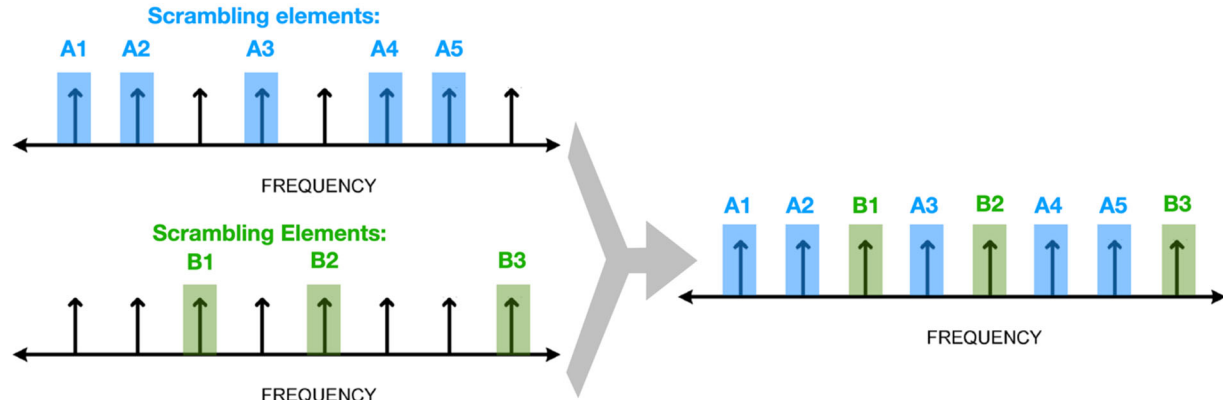
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I. INTRODUCTION

Patent Owner, Entropic Communications, LLC (“Entropic”), submits this Patent Owner Preliminary Response (“POPR”) pursuant to 37 C.F.R. § 42.107(a) to the *Inter Partes* Review (“IPR”) petition (“Petition”) filed by Dish Network L.L.C., Dish Network Corporation, Dish Network Service, L.L.C., and Dish Network California Service Corporation (collectively, “Petitioner” or “Dish”) for Claims 1-6, and 12 of U.S. Patent 8,320,566 (the “’566 Patent”). The Board should deny institution.

The ’566 Patent claims a method that makes use of a pseudorandom noise (“PN”) sequence on an Orthogonal Frequency Division Multiple Access (OFDMA) network. OFDMA allows (and expects) multiple transmitters to simultaneously transmit, albeit at different frequencies, such that a single receiver will see all of the transmissions at once, as though sent by a single transmitter: *See infra* Section II.A. For example, consider the below annotated version of Figure 6 which shows how the OFDMA transmissions (on the left) of two transmitting devices (Device A and Device B) will be seen by a receiver (on the right):



In an OFDMA system, different transmitters will transmit on different frequencies at the same time, resulting in a plurality of carrier frequencies arriving at the same receiving device at the same time. Despite the receiver viewing the transmissions as coming from one transmitter, there are in fact multiple different devices transmitting simultaneously. This type of synchronous signaling is the heart of OFDMA.

The '566 Patent is the first to recognize a consequence of this arrangement when signal scrambling is introduced—the need for particular coordination across a plurality of OFDMA devices as it relates to which transmitting device will use which subcarrier, and what scrambling elements will be applied to those carriers. This is of particular importance in an OFDMA network, where subcarriers are often reallocated to different transmitters with high frequency.

Each transmitting device applies a constellation scrambling to each subcarrier it uses to send its data, this scrambling constellation will vary from one subcarrier to

the next. That is, each transmitter applies a “sequence” of scrambling code elements to its subcarriers. The ’566 Patent recognizes advantages can be gained if each transmitter is *coordinated*, so that instead of each transmitter using its own personal scrambling sequence (thereby requiring the receiver to keep track of a different sequence for each transmitter), all transmitters in the ’566 Patent’s invention instead utilize a master scrambling sequence. To accomplish this, a common pseudorandom noise (“PN”) sequence is shared across the plurality of network devices—a common mapping for all devices to use. During a given transmit time interval, each device is allocated subcarriers for that device’s use (and that assignment may change for future transmit intervals). Each device fetches from the common sequence the elements applicable for the subcarriers it has been assigned, and each applies the scrambling elements faithfully to the subcarriers that device will use to transmit. *See infra* Section II.A. This ensures coordinated action—the net result of all the different device transmissions will be each element of the common PN sequence (S(1), S(2), S(3) S(4), S(5), S(6), S(7), S(8)) applied to the appropriate subcarrier, as though there were only a single transmitter operating as shown in Figure 6 of the ’566 Patent:

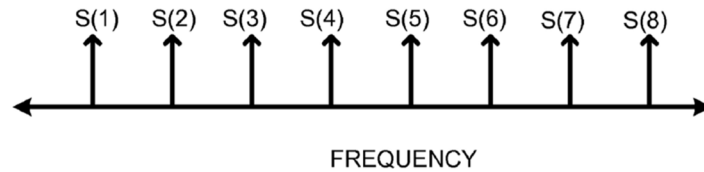


Fig. 6

None of the prior art references discloses implementing any PN sequence in an OFDMA communications network, let alone this specific type. In fact, both grounds of the Petition are built upon similarly flawed logic that is fundamentally based on reconstruction of prior art references using the '566 Patent as a roadmap.

First, for each ground, the Petition begins with a state of the art (as of the filing date of the '566 Patent) OFDMA reference. For Ground 1 the Petition relies on *Cleveland*¹; for Ground 2 the Petition relies on nearly identical disclosure from *Scheim*² (jointly, the "Allocation References"). The Allocation References, while both disclosing OFDMA techniques, are directed to a different problem than the '566 Patent. The Allocation References describe cellular systems concerned with

¹ Pub. No. US 2008/0112359 (Ex. 1006).

² Pub. No. US 2008/0233966 (Ex. 1017).

interference between different cells³ (or intercell interference) caused by reuse of cell resources. Ex. 1006, [0042] (“The pseudorandom permutation provides an interference averaging effect further reducing the adverse effects of cell to cell interference.”); Ex. 1017, [0037] (“resources allocated in a specific cell may cause interference to other cell transmissions... The interference is created due to the ‘reuse principal’”).

The Allocation References describe pseudorandom allocation of *network resources* (see Ex. 1006, [0042]; Ex. 1017, [0109]), to reduce intercell interference. *Cleveland* randomly allocates subcarriers. Ex. 1006, [0042]. *Scheim* is slightly more sophisticated, in that it randomly allocates subcarriers, but also randomly allocates time slots and antenna usage in its MIMO teachings. Ex. 1017, [0033], [0128]. The Allocation References are concerned with the allocation of network resources across devices on the network, and are, correspondingly, not concerned with the *contents* of subcarriers (or any pseudorandom transformations applied therein).

Second, the Petition seeks to introduce secondary references to each primary

³ In the Allocation References, a cell is the area served by a base station and includes all user equipment (UEs) in communication with the base station. See Ex. 1006, Fig. 1, Ex. 1017, Cl. 1.

reference. These secondary references account for scrambling contents of subcarriers in an OFDM network, where, unlike the present invention, only a single transmitter is ever sending data at a time. This is the Petition's unaddressed downfall. The Petition identifies no reference that teaches any scrambling across multiple transmitters, and no reference that provides any suggestion of the necessary coordination across those transmitters. These failings are the core of the problem identified, and solution proposed, by the '566 Patent.

Instead, the Petition relies on these single transmitter references and baselessly concludes that the claimed subject matter is obvious. In Ground 1 the Petition relies on *Hayashino*⁴ as its secondary reference, for Ground 2 the Petition relies on *Tzannes*⁵ (these references are jointly the "Scrambling References"). The Scrambling References are *single* transmitter systems. Ex. 1007, 12:22-27; Ex. 1009, 3:38-41. The Scrambling References do not take into consideration any *coordination* that the inventors of the '566 Patent recognized is needed among transmitters, nor do the Scrambling References relate to the intercell interference problem discussed in the Allocation References.

Third, the Petition, attempts to reconstruct the system claimed in the '566

⁴ US 5,682,376 (Ex. 1007)

⁵ US 6,961,369 (Ex. 1009)

Patent by combining one of the Allocation References (which are agnostic towards the contents of subcarriers) with one of the Scrambling References (which provide for only one transmitter). However, both grounds are flawed for at least the following reasons:

1) Neither the Allocation References nor the Scrambling References provide for the very coordination between the multiple transmitters on the OFDMA network described in the '566 Patent.

2) Neither the Allocation References nor the Scrambling References enable operation on an OFDMA network by relating elements of the PN sequence to each subcarrier allocated across transmitting network devices, and skipping elements that correspond to subcarriers not assigned to that transmitter.

3) By failing to recognize the issues associated with having multiple transmitters in an OFDMAA network, the Petition cannot establish that any combination of an Allocation Reference with a Scrambling Reference would have been made with any expectation of success.

4) While the Allocation References provide for systems of reducing intercell interference through random allocation of resources,

the Scrambling References provide no means of reducing intercell interference. The Petition erroneously attempts to equate concerns associated with reducing intercell interference with the solutions proposed years earlier in the Scrambling References, references that provide solutions solely for the structure of a single transmitter on a single network. The Scrambling References do not contemplate the overlap of different networks (i.e., cells), because such a teaching makes no sense in a single transmitter network. Instead, the Petition's proffered "motivations" appeal to generic improvements (like efficiency) or unsupported relationships between the technologies (relating peak-to-average-power ratio (PAR) to intercell interference). Similarly, Petitioner's Expert provides no explanation, technical detail, or citations, to support his baseless (and false) conclusory statement that "a POSITA looking to further improve the performance of [an intracell] network would look to [a Scrambling Reference] to reduce PAR." These concepts are wholly unrelated, and Dr. Williams unsupported conclusion does not and cannot carry the weight Petitioner ascribes it. As such, the Petition fails to establish that any POSITA would have any motivation to combine an Allocation Reference with a Scrambling

Reference, as they address unrelated problems to each other and the '566 Patent. Accordingly, both Ground 1 and Ground 2 fail to render obvious Claim 1 because both fail to teach or suggest each element of the claimed subject matter, and the Petition fails to establish any motivation to combine the respective Allocation Reference and Scrambling Reference of each Ground.

Furthermore, it is well established that if the prior art does not render the independent claim unpatentable, it cannot render any corresponding dependent claim unpatentable. *See Hartness Int'l Inc. v. Simplimatic Eng'g Co.*, 819 F.2d 1100, 1108 (Fed. Cir. 1987). Accordingly, Petitioner also has failed to establish dependent Claims 2-6 and 12 as obvious, and the entirety of Grounds 1 and 2 should be rejected.

II. SUMMARY OF THE '566 PATENT

A. Overview of the '566 Patent

The '566 Patent is directed to allowing multiple transmitting network devices to transmit to a single receiving network device using OFDMA on the physical resource. Ex. 1001, 2:18-22. The total transmission that arrives at the receiver is the summation of the transmissions from each device, as the devices transmit simultaneously, albeit on different frequencies (subcarriers). *Id.*, 2:36-41. Each transmitter may scramble its transmissions using a code, such as a PN sequence. *Id.*,

6:11-21. Each subcarrier may be scrambled differently, with different portions of the PN sequence applied to different subcarriers. *Id.*, 6:63-66.

The '566 Patent seeks to *coordinate* the transmitters, to ensure that the total combined transmission arriving at the receiver appears *as if* it were sent by a single transmitter. *Id.*, 2:25-29. This means that the received signal should appear as if generated by a single transmitter scrambled using a single PN sequence across all subcarriers. *Id.* This way, the receiving network device may utilize a single PN sequence generator for descrambling the incoming signal rather than relying on a different sequence for each transmitting network device. *Id.*, 6:22-66, 7:11-14, Fig. 5, Fig. 8. This system designed in accordance with the '566 Patent is able to reduce the Reservation Request (RR) period through use of OFDMA, while still benefiting from scrambling the transmissions of each transmitting network device. *Id.*, 5:29-33, 6:11-21.

The '566 Patent recognizes that to achieve this property, the transmitters must coordinate. Each transmitter is provided with the overall PN sequence (that the receiver expects to see). *Id.*, 6:23-30, 7:16-18. Each transmitter is configured to select parts of the overall PN code to use depending upon which particular subcarriers that transmitter will utilize at a given moment. *Id.*, 6:38-46. Because all the transmitters will be working from a common mapping of the PN code across

subcarriers, they will collectively produce a signal that appears *as if* it were sent by a single transmitter using the same PN sequence to descramble the signal. *Id.*, 2:22-29.

Stepping back, the '566 Patent was filed when advances in processing power and low-power consumption technologies led to the proliferation of communications capabilities in various products. *Id.*, 1:28-31. This proliferation led to an increased demand for the ability to interconnect these products in a home network. *Id.*, 1:36-40. In an example home environment, typical devices may include set top boxes 111, TVs 110, desktop computer systems 117 and peripherals (e.g., printers), and laptop computers 118:

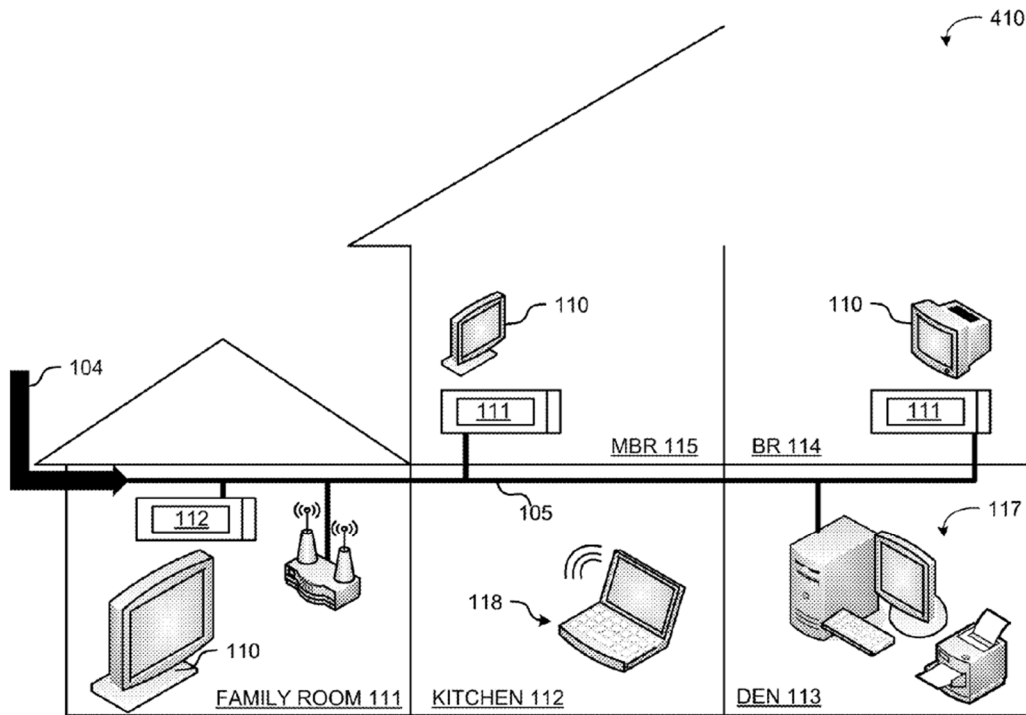


Fig. 1

Id., 3:61-4:5, Fig. 1. A typical on-premises environment may employ a mesh topology where there is a common source of broadband data (e.g., the main cable feed), but content can be shared between devices within the on-premises network. *Id.*, 1:53-58. Upon initialization, a MoCA network automatically selects a network coordinator (NC) which schedules times when communications occur over the network. *Id.*, 4:35-39. The communication of a packet of information in the form of a media access packets (MAPs) is sent to the NC during each “MAP cycle”. *Id.*, 4:40-43.

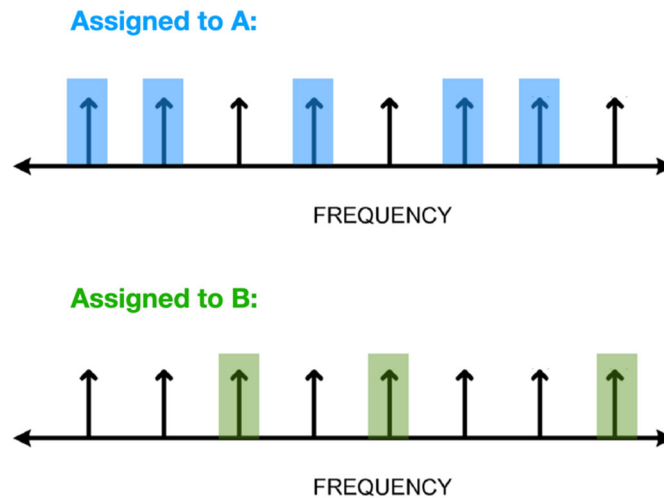
To address this growing demand, the MoCA standard was developed to provide a protocol for distributing digital entertainment over the available bandwidth on coaxial cables in households and offices for cable or satellite TV services. *Id.*, 1:59-66. Still, challenges remained regarding the management of multiple communications from various devices across a limited channel. *Id.*, 2:4-7. For example, to adequately allocate the schedule and network bandwidth, network devices transmit a RR to the NC. *Id.*, 4:42-46. However, as the number of network devices grows, so does the number of the RRs sent on the network, which thereby increase the length of time needed to receive them. *Id.*, 4:46-51.

The '566 Patent makes use of OFDMA communications to reduce the RR period of a MAP cycle to free up time for other network communications by allowing multiple devices to communicate RRs simultaneously. *Id.*, 5:6-10, 5:29-33. In OFDMA communications, a frequency band that includes a plurality of subcarriers is provided for use. *Id.*, 4:61-66. A portion of the subcarriers may be unavailable, while another portion may be assigned to different transmitting devices on the communications network. *Id.*, 4:66-5:9.

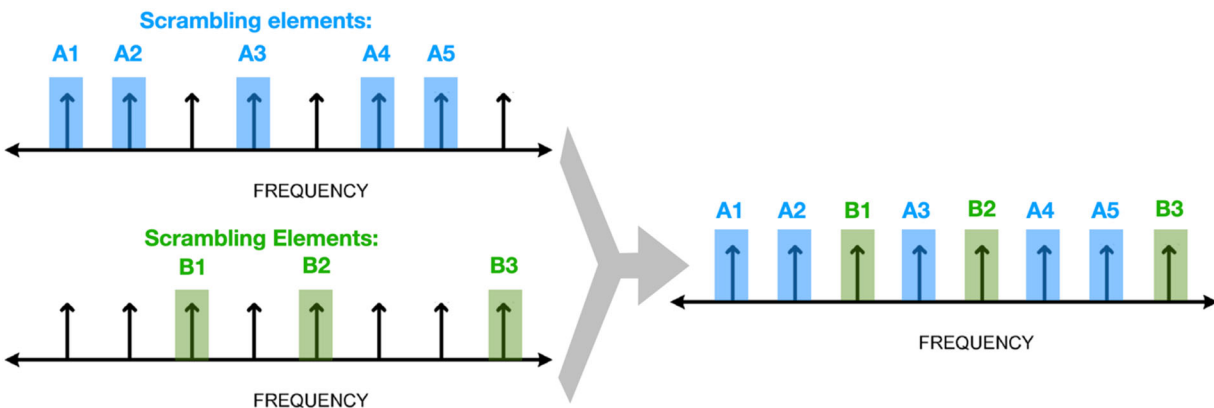
For example, in a given frequency band, a first device (Device A) may be allocated one portion of the available subcarriers. The remaining subcarriers will be unavailable to Device A. Concurrently, a different portion of available subcarriers

may be allocated to a device node (Device B), and all other subcarriers will be unavailable to Device B. Because these transmitters are all sending transmissions at the same time, the received signal is the summation of everything transmitted. To the receiver, the received signal therefore receives a plurality of subcarriers, each subcarrier able to be populated by the transmissions of multiple or different transmitting devices.

Each transmitter is expected to apply a scrambling to each subcarrier, which the '566 Patent expects will vary from one subcarrier to the next. The set of scrambling being applied to each subcarrier forms a sequence. The '566 Patent recognizes a need for coordination among the various transmitters, to optimize properties of the composite received signal. If each transmitter is acting independently, it will apply its own scrambling sequence to its own subcarriers. For example, using Figure 6 of the '566 Patent as a template and annotating, assume Device A and Device B are assigned subcarriers as follows (for use during a given transmit time interval):



Operating independently, each transmitter will assign scrambling elements to its subcarriers independently, resulting in the right image being received at the receiving device:



The receiver will receive the summation of these transmissions as illustrated on the right, meaning the receiver will see a transmission with a scrambling sequence intermixed with elements (A1, A2, B1, A3, B2, A4, A5, B3). This sequence may

lack various desirable properties. For example, the sequence may not be sufficiently random, or indeed if Device A and Device B are applying the same sequence ($A1=B1$, $A2=B2$, etc.) the received signal will have multiple subcarriers scrambled with the same sequence elements. Alternatively, if Device A and Device B apply different sequences, the receiver must maintain multiple different sequences, one per device, to unscramble the various signals the receiver receives.

The '566 Patent recognizes this issue and discloses a way to coordinate the transmitter sequences. A single PN scrambling sequence is chosen for use across the transmitters, a selection made by the receiver. A given transmitter will proceed to use, for each subcarrier it will transmit, the sequence element from the common sequence that corresponds to that assigned subcarrier. Ex. 1001, Fig. 5; 6:33-62. The net result is illustrated by the '566 Patent in Figure 6, where each subcarrier of the received signal will be scrambled in an ordered pattern of the common sequence, S1, S2, S3, S4, S5, S6, S7, S8:

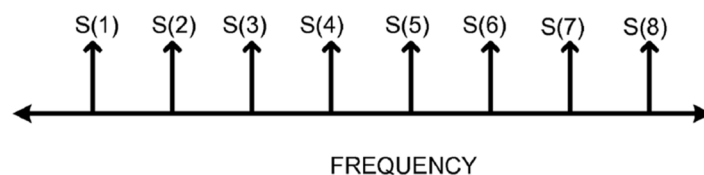


Fig. 6

Id., 7:4-10. Because each transmitter uses the common sequence, the result of Figure 6 is achieved regardless of how many transmitters are involved. Thus, “the receiving network device sees the transmitted payload as if it were sent by a single transmitter, and it can use a single sequence generator to descramble the received symbols.” *Id.*, 7:11-14. In turn, this allows receivers to avoid the need to maintain multiple sequence generators to descramble communications from each transmitting device. *Id.*, 7:43-48.

While the issue has been illustrated during one transmit time interval or time “slot,” in OFDMA it is expected that subcarrier assignments will change (often rapidly). In such an OFDMA system without coordination, the receiving device is confronted with ever-changing sequences of scrambling codes as the portions sent by each transmitter (and even which transmitters are involved) changes. Common management of the PN sequences allows for a receiver to avoid such hassles as well, because the common sequence will prevail no matter who is transmitting or which subcarriers they are using.

The claims at issue are directed at the coordination concept, as embodied in, for example, claim aspects 1(b) and 1(e) of independent Claim 1 of the '566 Patent. Consider first claim aspect 1(b):

- b) providing *a corresponding element* of a pseudorandom noise sequence *for each subcarrier* of the set of available subcarriers; ...⁶

The PN sequence generator outputs a PN sequence that is provided to each network device that will simultaneously transmit during the OFDMA communication period. *Id.*, 6:17-27. Additionally, each subcarrier for OFDMA communications is indexed according to a shared indexing scheme. *Id.*, 6:30-33. This allows for each network device to utilize the element of the PN sequence that corresponds to the appropriate subcarrier that the network device was allocated for OFDMA communications.

For example, a network device transmitting on the first subcarrier will be the only device to use the first element of the common PN sequence, and the network device transmitting on the second subcarrier will be the only device to use the second element of the common PN sequence, and so on. *Id.*, 6:66-7:4. Accordingly, the receiving network device need only maintain one sequence generator to descramble communications from all transmitting devices. *Id.*, 7:43-47.

This is consistent with the manner in which the PN sequence is applied to each subcarrier. Consider claim aspect 1(e):

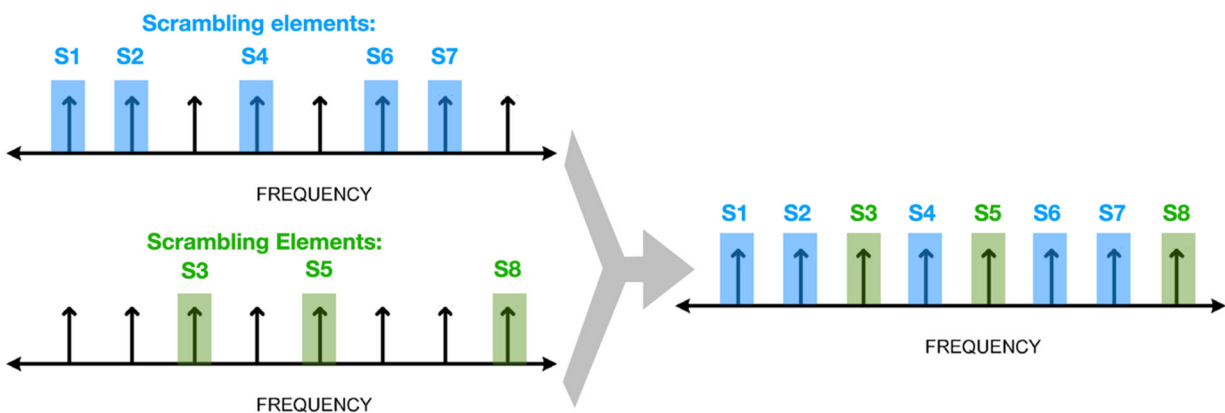
- e) the transmitting network device performing a predetermined transformation on a quadrature amplitude modulated symbol *using the*

⁶ All emphasis added unless otherwise noted.

element of the pseudorandom noise sequence corresponding to the used subcarrier; ...

As noted, a predetermined transformation on the modulated symbols is performed using the element of the PN sequence that corresponds to the specific used subcarrier. This is possible because the subcarriers have been indexed with a shared index, which allows the subcarriers to be allocated to different nodes on the network and still have corresponding elements of the common PN sequence appropriately applied. *Id.*, 6:30-33.

Returning to earlier illustrations, the claimed process applied to exemplary transmitters A and B would command each to select from the common sequence elements corresponding to the assigned subcarriers:



Each transmitter uses only the appropriate elements of the sequence—i.e., the elements corresponding to each subcarrier (S1 to subcarrier 1, S2 to subcarrier 2, etc.). The individual sequence applied by each transmitter is not itself contiguously

ordered, but the sum *total* of the transmissions produces the perfectly ordered scrambling sequence that is desirable for the receiver. This is the result of the claimed coordination.

Figure 5 of the '566 Patent provides further details regarding an example of the process:

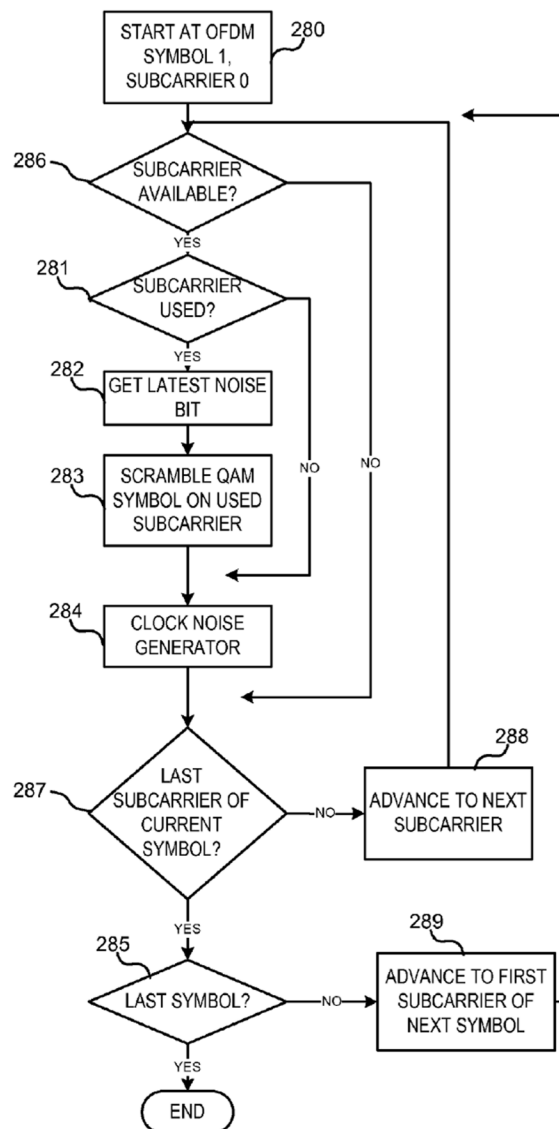


Fig. 5

First, an orthogonal frequency division multiplexing (“OFDM”) symbol and subcarriers are provided (step 280), and a subcarrier is inspected to determine if the subcarrier is available for OFDMA communications (Step 286). *Id.*, 6:33-38. Then, the system determines if the subcarrier is used by the transmitting network device (Step 281). *Id.*, 6:38-41. If the subcarrier is used, then the node will obtain the latest element of the pseudorandom sequence (Step 282) and scramble the QAM symbol on the used subcarrier (Step 283) using that latest element of the pseudorandom sequence. *Id.*, 6:43-46. Regardless of whether the subcarrier is used by the transmitting network device, the system clocks the noise generator to advance the pseudorandom sequence to the next element (Step 284). *Id.*, 6:46-49. If the subcarrier was not available (step 286), then the system proceeds directly to Step 287. At Step 287, the system then determines if the subcarrier is the last subcarrier. *Id.*, 6:49-51. If the subcarrier is not the last subcarrier, the process begins with the next subcarrier and symbol (Step 288), repeating at Step 286. If the subcarrier is the last subcarrier, then all symbols of the message have been scrambled and the method ends. *Id.*, 6:61-62.

Each transmitter follows this process. *Id.*, 6:63-66. At the receiver, the various transmitted signals are simultaneously received, and thus the summation of those signals is “seen” by the receiver. The claimed process ensures coordination,

so that the receiving network device can receive the transmitted payload as if it were all sent by a single transmitter with one pseudorandom sequence generators and can descramble the received symbol instead of requiring the receiving network device to maintain multiple sequence generators to descramble communications from each transmitting device. *Id.*, 7:11-16, 7:43-47.

After completing the process, the receiving device has accurately descrambled the received OFDMA communications from the plurality of transmitting devices and avoids the requirement that the receiving network device maintains multiple sequence generators. *Id.*, 7:39-48.

B. Prosecution History of '566 Patent

During prosecution, Applicant explained to the Examiner that at least the limitation of a “transmitting network device performing a predetermined transformation on a quadrature amplitude modulated symbol *using the element of a pseudorandom noise sequence corresponding to the used subcarrier*” was not found in the prior art. Ex. 1005, 95. The Examiner agreed and withdrew the rejection. *Id.*, 81. The Examiner issued a notice of allowance on July 24, 2012. *Id.*, 27.

C. Claim Construction

The Petition was filed after November 13, 2018, and, as such, the proper claim construction standard to be applied is articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc), in accordance with its regulation, 37 C.F.R. § 42.100(b). *Apple Inc. v. Firstface Co.*, No. 2021-1001, 2021 WL 4156323, at *1 n.1 (Fed. Cir. Sept. 13, 2021). Petitioner did not offer any specific construction for any of the claim terms.

III. THE PETITION FAILS TO SHOW THAT THERE IS A REASONABLE LIKELIHOOD THAT THE PETITIONER WILL PREVAIL ON A SINGLE CLAIM

A. Overview: Ground 1 and 2 Fail to Establish Obviousness of Any Claim

“An obviousness determination generally requires [1] a finding that all claimed limitations are disclosed in the prior art, and [2] that a person of ordinary skill in the art would have been motivated to combine or modify the teachings in the prior art” *Univ. of Strathclyde v. Clear-Vu Lighting LLC*, 17 F.4th 155, 160 (Fed. Cir. 2021) (citations omitted).

The Petition provides two substantially identical grounds of unpatentability, a combination of an Allocation Reference with a Scrambling Reference; both Grounds fail for similar reasons tied to a fundamental misunderstanding of the art and the claims. The '566 Patent describes an OFDMA network that utilizes a common PN

sequence, and recognizes specific procedures required to synchronize and coordinate the operation of the PN sequence across multiple subcarriers allocated to different nodes. The Petition fails to recognize or consider such a coordinating process, and instead relies on references that disclose either an OFDMA network or a PN sequence, but not both. Most importantly, nothing in the prior art recognizes or suggests the use of a common PN sequence to allow the receiving device to treat all incoming signals as if they came from the same transmitter. Both Grounds 1 and 2 rely upon an Allocation Reference (*Cleveland* or *Scheim* respectively) that discloses an OFDMA system and the allocation of carriers within that system, but neither Allocation Reference are relied upon to allege obviousness of the PN sequence aspects of the claim. Both Grounds 1 and 2 then turn to a Scrambling Reference (*Hayashino* or *Tzannes* respectively) that disclose a single transmitter utilizing a subcarrier scrambling procedure that may rely on a PN sequence, but not on an OFDMA network, and never using a common PN sequence across various transmitters.

At bottom, the Petition cannot identify, in any reference, the coordination critical to the OFDMA network of the '566 Patent. In a remarkable example of reconstruction with hindsight, the Petition instead takes an Allocation Reference, references that do not discuss PN sequences for scrambling, adds a Scrambling

Reference that fails to teach any OFDMA, but instead applies PN in single-transmitter systems, and baselessly concludes that such a combination makes obvious the specific coordination of PN sequences across transmitting devices claimed by the '566 Patent. There is no motivation to combine such a combination in the prior art and Petitioner is simply using teachings from the '566 Patent to provide a roadmap.

In summary, the Petition fails to (1) identify any system in the prior art that discloses or renders obvious an OFDMA system that makes use of a PN sequence with appropriate synchronization or coordination, and (2) prove a person of ordinary skill in the art would have been motivated to combine or modify the teachings in the prior art with routine and predictable engineering.

B. Ground 1A: The Petitioner Fails to Establish that Claim 1 Would Have Been Obvious Over *Cleveland* and *Hayashino* and the General Knowledge of a POSITA

Ground 1A alleges that Claim 1 is obvious over the first combination of an Allocation Reference with a Scrambling Reference: *Cleveland* and *Hayashino*. Ground 1A fails for two reasons: (1) the combination fails to disclose the claimed subject matter; and (2) the proffered motivation to combine is insufficient.

The proposed combination fails to accurately disclose aspects of the claimed method. *Cleveland* is silent with regard to a PN sequence as described in the '566

Patent. Instead, the Petition relies on *Hayashino*, which fails to disclose the PN sequence as claimed. *Hayashino* discloses a single transmitter on an OFDM network that includes a scrambling procedure that is unique to the channel across which its signal travels. OFDM is not the same as OFDMA^A. OFDM—Orthogonal Frequency Division Multiplexing—refers to the architecture using a plurality of frequencies called subcarriers, to carry information. *E.g.*, Ex. 1001, 4:6-9. OFDMA is built upon OFDM, but adds the concept of Multiple Access—Orthogonal Frequency Division Multiple Access. In OFDMA, subsets of available subcarriers are assigned to different network nodes, which “may then communicate simultaneously on their assigned subcarriers.” *Id.*, 5:6-10. Thus, while OFDM expects only a single point-to-point communication at any given time, OFDMA^A provides Multiple Access to multiple devices at the same time, by allocating subcarriers for simultaneous use.

These differences manifest themselves in the fact that *Hayashino*’s OFDM features cannot be adapted for use in *Cleveland*’s OFDMA network without (at least) paying the price of scrapping the scrambling procedure *Hayashino* relies upon (as discussed in greater detail in Section III.B.1.a). Further, *Hayashino* multiplies ***all subcarriers*** of an OFDM transmission by the ***same*** element of a PN sequence— D_0 —rather than the claimed method where corresponding elements of a master PN

sequence are applied to corresponding available and in-use subcarriers. *See e.g.*, Ex. 1007, 12:43-48. Thereby the combination fails to disclose all aspects of Claim 1.

Furthermore, a POSITA would not be motivated to arrive at the proposed combination based on the teachings of *Cleveland* and *Hayashino*. The offered motivation to combine fails to recognize and account for the difficulty implementing a PN sequence on an OFDMA network—where multiple transmitters are simultaneously transmitting. It is insufficient to appeal broadly to the nature of OFDM systems without considering how the teachings of *Hayashino* are altered or rendered inoperable in the OFDMA structure of *Cleveland*. Instead of considering or addressing this challenge, the Petition broadly categorizes issues found in all networking fields to reconstruct the claimed method through impermissible hindsight, thereby failing to address the subject matter that the examiner recognized distinguished the '566 Patent from the prior art.

1. The Proposed Combination of *Cleveland* and *Hayashino* Fails to Teach All Aspects of the Claims

The combination of *Cleveland* and *Hayashino* fails to disclose all aspects of Claim 1 of the '566 Patent. The combination does not disclose the claimed usage of a PN sequence, nor the coordination of the application of the PN sequence to *corresponding* used subcarriers of the transmitting network devices.

- a. The Petition fails to identify any teaching that renders obvious the PN sequence of the '566 Patent

The *Cleveland-Hayashino* combination fails to render obvious the PN sequence as claimed. *Hayashino*'s specific pattern generator is not implemented as claimed in the '566 Patent. In *Hayashino*, the pattern generator does not provide ***any corresponding element*** of the alleged PN sequence ***for each subcarrier*** of the set of available subcarriers, nor does it suggest using a corresponding element for the given subcarrier. In other words, *Hayashino*'s implementation fails to coordinate the PN sequence among multiple transmitting network devices.

- i. The Petition fails to identify any prior art that teaches “providing a **corresponding element** of a PN sequence **for each subcarrier** of the set of available subcarriers”

As indicated in the Challenged Claims, the various elements of the PN sequence correspond to each subcarrier of the set of available subcarriers and are used to perform a predetermined transformation on the used subcarriers that have been allocated to the plurality of transmitting network devices. Ex. 1001, Cl. 1.

The architecture of *Hayashino* sends an OFDM signal that communicates one-to-one, *i.e.*, at any given point in time the entire OFDM bandwidth is dedicated to a ***single*** transmitter and a single receiver. Ex. 1007, Abstract; Petition, 25 (“Hayashino discloses **a transmitting network device** in its network.”). *Hayashino*

never considers any coordination among different transmitting devices because it fails to contemplate more than a single transmitting device. As a natural consequence of this single transmitting device system, *Hayashino* does not take the further step of accounting for any coordination of subcarriers across ***different*** transmitting devices. *Hayashino* does not disclose multiple transmitters being allocated subcarriers, and the Petition acknowledges as much in failing to provide a single citation to *Hayashino* with respect to claim element 1[c]. See Petition, 31-32.

The teachings of *Cleveland* cannot remedy *Hayashino*'s deficiency because *Cleveland* lacks any discussion of elements of a scrambling sequence or how to use them. In *Cleveland* the concern is how subcarriers are assigned: which transmitters are assigned what frequency carriers. See Ex. 1006, [0042]. *Cleveland* assigns subcarriers by a pseudorandom permutation process rather than in blocks or ordered groupings. *Id.* Any and all discussion of "pseudorandomness" in *Cleveland* relates to the ***allocation*** of subcarriers themselves and has nothing to do with scrambling codes applied ***to the contents of*** subcarriers. *Id.* *Cleveland* nowhere discusses a pseudorandom "transformation o[f] a quadrature amplitude modulated symbol." Ex. 1001, Cl. 1.

While *Cleveland* would turn up in a word search for "pseudorandom," it has no relevant disclosure to the claimed process. Notably the Petition does not rely on

Cleveland for disclosure of providing a corresponding element of a pseudorandom noise sequence in 1[b]. *See* Petition, 26-31.

Further, to the extent *Hayashino* discloses a PN sequence of any type, the disclosure is insufficient to render obvious the claims. *Hayashino* does not disclose that any sequence includes any distinct elements that could ***correspond*** to the used subcarriers. *Hayashino* describes a memory that holds an output of a specific pattern generator, the complex signal group D_0 . Ex. 1007, 12:27-31. When the input data D_m is input into the *Hayashino* system, each symbol interval is complex-multiplied by the same value, D_0 . Ex. 1007, 12:43-48. (“A complex multiplier 13 complex-multiplies data D_m of ***each symbol interval by data [D₀]*** on the frequency axis every time data D_m is inputted for forming the data D'_m ($D'_m = D_m \times D_0$), thereby randomizing mutual phases of respective carrier modulation signals included in a carrier modulation signal group to specific patterns.”). There is no disclosure regarding what the complex signal group D_0 is composed of. There is no discussion of linking any part or element of D_0 to a corresponding subcarrier. There is certainly no discussion of any coordination—which again makes sense because as a basic OFDM system *Hayashino* lacks multiple simultaneous transmitters to be concerned about.

- ii. The Petition fails to allege an obviousness theory for the claimed “performing a predetermined

transformation on a quadrature amplitude modulated symbol using the **element of the pseudorandom noise sequence corresponding to the used subcarrier**”

As *Hayashino* is deficient with respect to the corresponding element of the PN sequence, *Hayashino* also does not teach or render obvious “the transmitting network device performing a predetermined transformation on a quadrature amplitude modulated symbol using *the element of the Pseudorandom Noise sequence corresponding to the used subcarrier*[.]” Ex. 1001, Cl. 1.

Hayashino does not coordinate the application of the same PN sequences across the subcarriers that have been allocated across different transmitting devices. Similar with claim element 1[b], the Petition does not rely on *Cleveland* for the disclosure of providing and using the pseudorandom sequence as claimed. In fact, the Petition acknowledges that *Hayashino* does not disclose all of 1[e]’s aspects, yet the Petition fails to provide a single citation to *Cleveland* to address these shortcomings of *Hayashino* regarding this element. See Petition, 40 (“*Hayashino* discloses [1e] through using pseudo-random sequences to vary carrier signal phase (with *Cleveland* disclosing the remainder of the element). DISH-1004, ¶¶137-142; DISH-1007, 12:27-48, FIG. 9.”). Accordingly, the Petition’s articulated combination of *Cleveland-Hayashino* fails to disclose all claim requirements in the prior art.

2. The Petition Provides Insufficient Basis to Combine the Cited
References to Arrive at the Claimed Invention

The Petition attempts to reconstruct the claimed invention through the use of impermissible hindsight, as shown by the insufficient and conclusory motivation to combine. In doing so, the Petition fails to consider practical complications in combining *Cleveland* and *Hayashino*.

a. The Proposed *Cleveland-Hayashino* Combination is Not
Routine or Predictable

The implementation of *Hayashino*'s PN generator into the OFDMA system of *Cleveland* is not a routine or predictable exercise. Given the difference in modulation technique, a POSITA would not be able to predictably combine the specific pattern generator of *Hayashino* into *Cleveland*'s system as alleged in the Petition. See Petition, 20-21. Further, even if the combination was possible, it would not result in the claimed method.

Implementation of *Hayashino* into *Cleveland* requires more than routine and predictable engineering. *Hayashino* is an OFDM system where one transmitting device communicates with one receiving device at a time, across the entire bandwidth. See e.g., Ex. 1007, Abstract. To accomplish this communication, *Hayashino* describes the use of a PN sequence to vary the phase of the signal sent

from the transmitter. *Id.*, 12:31-38. The receiver, using the PN sequence from the transmitter, descrambles the signal. *Id.*, 13:35-54.

Meanwhile, the '566 Patent is an OFDMA architecture. *See*, Ex. 1001, Cl. 1 (“A method for communications transmission using orthogonal frequency division multiple access”). Thus, the proposed *Cleveland-Hayashino* combination would have to be stitched together into an OFDMA system to meet the claim elements. The Petition relies on expert testimony that the implementation of *Hayashino*’s specific pattern generator is predictable, routine engineering. *See*, Petition, 20-21; Ex. 1004, ¶ 92. The Petition and expert make a generic argument regarding OFDM and OFDMA architectures (Petition, 19) without considering the functionality of the specific pattern generator of *Hayashino* and the issues inherent in trying to transfer such functionality into an OFDMA system. Dr. Williams simply explains that both references discuss QAM (Ex. 1004, ¶ 90), and Dr. Williams constructs a diagram (*id.*, ¶ 91) with conclusory allegations about its success (*id.*, ¶ 92). He then concludes that there would not be substantial changes to *Cleveland* (*id.*, ¶ 93). This ignores the fundamental gap that exists in Dr. Williams’ and the Petition’s analysis: The '566 Patent is the first to contemplate the use of a common PN sequence across multiple transmitting nodes in an OFDMA network to allow the receiving node to perceive the incoming signal as if it were sent from a common transmitter. This fundamental

departure from the prior art's transmitters each using their own PN sequence generators in uncoordinated fashion shows the non-obvious advancement that is the '566 Patent. As such, the Petition's attempt to simply integrate the specific pattern generator of the *Hayashino* system into the OFDMA communications system of *Cleveland* would prove untenable.

The pattern generator of *Hayashino* is not configured to synchronize or coordinate its application to different subcarriers allocated to different nodes or transmitters of the communication network. In contrast, the system described in the '566 Patent enables operation on an OFDMA network by relating elements of the PN sequence to each subcarrier allocated across transmitting network devices. *See* Ex. 1001, Cl. 1; *supra* Section II.A.

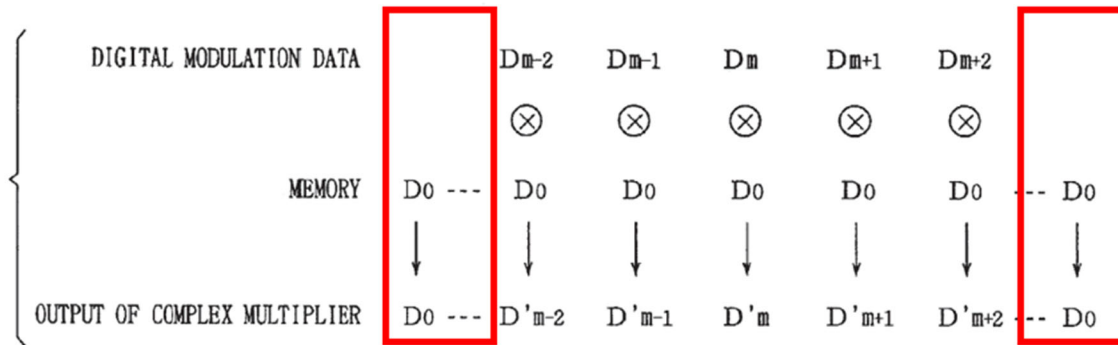
The PN generator of *Hayashino* operates in an OFDM system, so *Hayashino* does not consider coordinating its application to subcarriers that have been allocated to different nodes. Even if *Hayashino* taught a corresponding element of a PN sequence (*see supra* Section III.B.1.a), it does not teach how to apply this in an OFDMA context where used subcarriers are allocated to different nodes based on frequency as well as time. Attempting to transfer selected teachings from *Hayashino* into an OFDMA system (which seems to be all *Cleveland* is really used for by the

Petition) presents technical problems the POSITA would not find obvious to solve without the '566 Patent's identifications.

First, because there is no concept of coordination in either reference, each transmitter of the *Cleveland-Hayashino* combination would apply *Hayashino's* "phase shifts" based on the same PN sequence to each of their allocated subcarriers. However, the combination fails to provide a mechanism by which the receiver can sort out which sequence element is applied to which subcarrier. Neither the Petition nor its expert Dr. Williams consider or discuss this fatal shortcoming.

Second, the proposed combination does not account for when a transmitter encounters subcarriers that the specific transmitter has not been assigned. *Hayashino* never confronts this problem because it does not exist in *Hayashino's* OFDM architecture with only one transmitter. *Hayashino* does not suggest a transmitter designed to skip over an element of the pseudorandom sequence that corresponds to a subcarrier **not** assigned to that transmitter. Instead, *Hayashino* always uses the sequence element. *Hayashino* complex-multiplies subcarriers by D_0 irrespective of whether the subcarrier is **used** as claimed. For example, (annotated) Figure 11 of *Hayashino* above shows that the complex multiplier outputs D_0 even when there is **no** digital modulation data.

FIG. 11



Ex. 1007, Fig. 11 (annotations added).

If the subcarrier is unoccupied by data, *Hayashino's* complex multiplier nevertheless uses and outputs sequence element D_0 . See Ex. 1007, Fig. 11; 13:8-9 (“Further, the complex multiplier 13 periodically outputs **only** the data D_0 .”). The combination with *Cleveland* does not cure the problem—the combination does not provide **corresponding** elements of a PN sequence.

The situation is worse, however, because *Hayashino's* configuration to output sequence element D_0 even in an unoccupied subcarrier produces an inoperable combination. In an OFDMA arrangement subcarriers not used by transmitter A may very well be assigned to transmitter B or C or D. If transmitter A sends D_0 on subcarriers that are not allocated to transmitter A, that transmission will overlap with the legitimate transmission at that frequency by another transmitter. The collision at the receiver will create serious interference issues at the receiver. Thus,

Hayashino's disclosed operation is ***incompatible*** with a multipoint-to-point network (note that *Hayashino*'s behavior is perfectly functional in *Hayashino* itself because an unused subcarrier will never be assigned to another transmitter, since there are ***no other*** transmitters). The Petition fails to recognize and reconcile this incompatible difference, or ignored it, and this deficiency of the combination of the Scrambling Reference's use of a PN sequence in a multi-transmitter system is fatal to the Petition.

In summary, implementing the teachings of *Hayashino* into *Cleveland*'s OFDMA architecture presents substantial operational problems that the Petition fails to confront.

b. The Petition's Proffered Motivation to Combine is Insufficient.

The Petition fails to provide an adequate basis to combine *Cleveland* and *Hayashino*. Rather than indicating any actual rational basis as to why a POSITA ***would*** be motivated to combine the cited references, the Petition (1) appeals broadly to general desires and problems known in telecommunication systems, and incorrectly alleges that it would be obvious to combine *Cleveland* and *Hayashino* as analogous art that face similar problems; (2) incorrectly alleges that *Hayashino*'s implementation into *Cleveland* simplifies function already found in *Cleveland*; and

(3) inconsistently describes the combination such that it is unclear what the combination actually includes.

First, the Petition broadly alleges a POSITA would be motivated to arrive at the proposed combination because the proposed combination would improve the power efficiency and interference experienced by the system. This entirely generic argument is insufficient. *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016) (conclusory motivations to combine are insufficient). The Petition’s reliance on broad, generic problems or objectives in the field, to reconstruct the claimed invention is impermissible. In *Johns Manville Corporation, v. Knauf Insulation, Inc.*, the Board stated when denying institution that “[d]emonstrating that a reference is analogous art or relevant to the field of endeavor of the challenged patent is not sufficient to establish that one of ordinary skill would have had reason to combine its teachings with other prior art in the manner set forth in the claim.” Case No. IPR2018-00827, Paper 9 at 17 (PTAB October 16, 2018) (informative, designated Dec. 11, 2019) (citing *Securus Techs., Inc. v. Global Tel*Link Corp.*, 701 F. App’x 971, 977 (Fed. Cir. 2017)). In *Securus Techs.*, the Federal Circuit held that the Board correctly found that the proposed rationale to combine the asserted art was “simply too conclusory.” 701 F. App’x at 976. This holding was based on Securus “assert[ing], without more, that because [the references] were drawn from the same

general field of art, the skilled artisan would have turned to them to solve the problems identified” in the challenged patent. *Securus Techs.*, 701 F. App’x at 976-77 (citing *Microsoft Corp. v. Enfish, LLC*, 662 F. App’x 981, 990 (Fed. Cir. 2016)). The Federal Circuit criticized relying solely on the same field of endeavor, stating “[s]uch short-cut logic would lead to the conclusion that any and all combinations of elements known in this broad field would automatically be obvious, without the need for any further analysis. The Board, therefore, properly rejected Securus’ assertion of obviousness.” *Securus Techs.*, 701 F. App’x at 977.

The Petition relies on *Cleveland* and *Hayashino* being analogous art to allege a motivation to combine. For example, the Petition relies on “interference” and “power concentration” as alleged motivations to combine, both phenomena generic to disclosures of analogous art. Petition, 16 (“*Cleveland* and *Hayashino* are analogous art to the ’566 patent because they are from the same field of endeavor—multiplex communication in networks using orthogonal techniques—and because both references are reasonably pertinent to the problems that the ’566 patent’s inventors faced, e.g., interference in OFDM/OFDMA systems.”), 17 (“A POSITA seeking to improve *Cleveland*’s base OFDMA system would have looked to references, like *Hayashino*, that teach methods to reduce multidevice interference and thus lowers power concentration.”).

Further, Petitioner mischaracterizes *Hayashino* as concerned with multidevice interference, when *Hayashino* describes an OFDM system where only one transmitter is sending to one receiver at a time. *Compare* Petition, 17 (“like *Hayashino*, that teach methods to reduce multidevice interference”), Ex. 1007, 2:23-27 (“The so-called multipath is caused on the transmission path. Therefore, the receiver receives direct waves of OFDM signal transmitted from the transmitter and reflected waves which are time-delayed from the direct waves in superposition.”). *Hayashino* does not disclose any multi-device interference, and the Petition’s statements are further evidence of the hindsight-driven lens through which it views the prior art. This factually incorrect proffered motivation cannot be legally sufficient.

Moreover, interference is such a universal problem that it was incumbent upon the Petition to explain why *Hayashino*—as opposed to thousands of other OFDM references—would be combined with *Cleveland*. Any number of apparatuses or systems may be used to reduce interference in a telecommunication system. The Petition provides no other motivation for why a POSITA would implement *Hayashino* to remedy the general telecommunication problem of interference (not at all tied to the intercell interference *Cleveland* is directed to). This is further

problematic given the Petition's failure to recognize the difficulties involved in implementing *Hayashino* into an OFDMA context as described in Section III.B.2.a.

Second, a POSITA would not be motivated to implement the specific pattern generator of *Hayashino* into the *Cleveland* system. While the two references might both appear in a word search for the '566 Patent's claim term "pseudorandom," the references deploy "pseudorandom" to entirely different portions of their systems. *See supra* Section III.B.1.a.i. *Cleveland* discloses ***allocating subcarriers*** to subchannels in a pseudorandom fashion. Ex. 1006, [0042]. The Petition asserts that a POSITA would simply discard *Cleveland's* subcarrier assignment in favor of *Hayashino's* phase-shifting of the symbols inside the subcarriers, apparently on no more basis than both involving pseudorandomness. *See*, Petition, 17 ("Similarly, a POSITA looking to simplify *Cleveland's* pseudorandom sub-channel assignment algorithm would have realized that the benefits of using *Hayashino's* approach in lieu of selecting each sub-channel in a pseudorandom manner as *Cleveland* does.").

The Patent Owner will now explain what the Petition avoided. *Hayashino* is a one-transmitter to one-receiver (at a time) system. *See* Ex. 1007, 12:22-27, 13:35-40. It is concerned with the properties of the data transmitted inside the subcarriers. *See id.*, 12:43-48. *Hayashino* relies on randomness so that the resulting signal groups have signal phases that are mutually randomized even if they were originally

in phase with one another. Ex. 1007, 12:67-13:6. Any structure in the data inside the subcarriers is randomized. There is not a concern with any interference from other transmitters, because there are no other transmitters.

In contrast, *Cleveland* is a cellular system, where there are other transmitters, and their interference is of prime concern. See Ex. 1006, [0042] (“This allocation of sub-carriers to sub-channels in a pseudorandom fashion is done... [to reduce] the adverse effects of cell to cell interference.”). In *Cleveland*’s cellular art, sub-channels are formed from groupings of physical subcarriers. *Id.*, [0041]. Near the edges of cells, where signals overlap from different base stations, *Cleveland* is concerned that similar sub-channels will interfere because they reside on the same physical subcarriers. See *id.*, [0042] (“for example the sub-carriers in sub-channel 1 in cell 1 will be different than the sub-carriers in sub-channel 1 in cell 2”). *Cleveland* addresses the problem by ensuring that neighboring cells do not use the same subcarrier groupings. *Id.* Randomness is a good way to ensure differences, and therefore *Cleveland* assigns subcarriers to groupings (logical channels) with a pseudorandom assignment technique. *Id.* Neighboring cells thereby end up with different subcarrier assignments for their logical groupings, mitigating intercell interference.

Cleveland therefore is altering the assignment of subcarrier frequencies to avoid collisions. *Hayashino*, in contrast, has no concept of collisions with other transmitters and is simply altering the phase of the symbols inside subcarriers. *Hayashino*'s randomness has nothing to do with subcarrier assignment. "Simplifying" *Cleveland*'s random assignment—*i.e.* replacing it with *Hayashino* (Petition, 17)—would do ***nothing at all*** to address *Cleveland*'s concerns. Neighboring cells would be right back where they started, with the risk of utilizing the same subcarriers and corresponding interference. Shifting around the phase of the contents of the subcarriers, as *Hayashino* does, simply doesn't address the same problem at all.

The Petition's conclusory and inconsistent arguments illustrate an apparent and high degree of reliance on hindsight and the '566 Patent to reconstruct the claimed invention. Given these flawed arguments, a POSITA simply would not be motivated to combine the cited references.

3. The Petition Fails to Establish that Claims 2 and 3 Would have
 Been Obvious Over *Cleveland* and *Hayashino*

Dependent Claims 2 and 3 depend from independent Claim 1, so the entirety of Ground 1A should be rejected.

C. Ground 1B, 1C, and 1D: The Petition Fails to Establish that Claims 4-6, and 12 Would have Been Obvious Over Any Combination of Cleveland, Hayashino, Mutagi, Ting, and Ohana

The Petition does not rely on *Mutagi*, *Ting*, or *Ohana* to illustrate a motivation to combine *Cleveland* and *Hayashino* or for any of the elements discussed above. Accordingly, the inclusion of the additional references does not cure the above identified deficiencies of Ground 1A nor provide teachings that would render any claims dependent Claims 4-6, and 12 obvious.

D. Ground 2A: The Petitioner Fails to Establish that Claim 1 Would Have Been Obvious *Scheim* and *Tzannes* and the General Knowledge of a POSITA

Ground 2A alleges that Claim 1 is obvious over the second combination of an Allocation Reference with a Scrambling Reference: *Scheim* and *Tzannes*. Ground 2A fails for the same two reasons: (1) the combination fails to disclose the claimed subject matter; and (2) the proffered motivation to combine is insufficient.

Scheim, like *Cleveland*, does not teach or disclose any aspects of the claim relating to a PN sequence for phase-shifting, and instead entirely focuses on a generic OFDMA network.

The Petition then relies on *Tzannes*, much in the same way it relied on *Hayashino* in Ground 1. *Tzannes*, similar to *Hayashino*, fails to take into account aspects necessary to synchronize or coordinate the transmitting network devices to enable use of a single PN sequence across all transmitting devices, to allow the

receiving device to process incoming signals as if they were all transmitted by a single device.

For very similar reasons as with the first combination, the Petition's allegations regarding combination of this Allocation Reference and Scrambling Reference similarly fail.

1. The Proposed Combination of *Scheim* and *Tzannes* Fails to Teach All Aspects of Claim 1

The combination of *Scheim* and *Tzannes* fails to disclose all aspects of Claim 1 of the '566 Patent. The combination does not disclose the claimed usage of a PN sequence, or the coordination of the application of the PN sequence to ***corresponding*** used subcarriers allocated to transmitting network devices.

- a. The Petition fails to identify any teaching that renders obvious the PN sequence of the '566 Patent

The *Scheim-Tzannes* combination fails to make obvious the PN sequences claimed in the '566 Patent. The phase scrambler of *Tzannes* does not include a PN sequence that includes elements corresponding to each subcarrier of a set of available subcarriers nor does it use a corresponding element of any PN sequence on the used subcarrier as claimed in the '566 Patent.

- i. The Petition fails to teach “providing a **corresponding element** of a pseudorandom noise sequence for each subcarrier of the set of available subcarriers”

Tzannes does not teach or render obvious providing a corresponding element of a PN sequence for each subcarrier. Note that the Petition completely omits the term *corresponding* from this portion of its analysis. *See*, Petition, 72 (“[Tzannes] thus provides *elements* of a PN sequence to each subcarrier.”). As claimed and noted previously in III.B.1.a, the elements of the PN sequence correspond to each subcarrier of the set of available subcarriers that are allocated across the plurality of transmitting network devices. *See* Ex. 1001, Cl. 1. This allows the different subcarriers to have different elements of the PN sequence assigned to them across all transmitters.

In a multipoint-to-point system (like OFDMA), different subcarriers can be allocated to different nodes. The ’566 Patent provides a method to coordinate the application of a single common PN sequence across subcarriers while still allowing accurate unscrambling, as claimed by a “corresponding element of a pseudorandom noise sequence,” and “using the element of the pseudorandom noise sequence corresponding to the used subcarrier” in performing a predetermined transformation when each subcarrier has been allocated to “each of the transmitting network devices.” *See* Ex. 1001, Cl. 1; *see also* Ex. 1001, Fig. 5, Fig. 7.

Like *Hayashino*, *Tzannes* does not coordinate among transmitting network devices. Unlike the ’566 Patent, and also like *Hayashino*, *Tzannes* describes one-to-

one communication between a single transmitter to a single receiver. *Compare* Ex. 1001, Cl. 1 (“...providing a plurality of transmitting network devices...”); Ex. 1009, 3:38-41 (“The communication channel 18 provides a downstream transmission path from *the* DMT transmitter to *the* remote receiver 34, and an upstream transmission path from the remote transmitter 30 to the DMT receiver 26.”). This is consistent with DMT mode in *Tzannes*, which is configured to include a single transmitter and single receiver. *See*, Ex. 1009, 3:31-36.

Tzannes does not disclose the necessary coordination required across two or more transmitting network devices. At best, *Tzannes* describes a phase scrambler that computes and applies a phase shift for all carrier signals of *a single transmitter*. Ex. 1009, 3:38-41, 4:52-57. The *Tzannes* system fails to recognize any need to account for the assignment of subcarrier on multiple different transmitting devices because it discloses only a single transmitter. *See* Ex. 1009, 3:38-41. Accordingly, *Tzannes* fails to teach “providing an element of a pseudorandom noise sequence for each subcarrier of the set of available subcarriers.”

The teachings of *Scheim* do not remedy *Tzannes*’s insufficiency as *Scheim* is silent as to elements of a PN sequence. *Scheim* describes a mechanism that is suitable for resource allocation in OFDMA communications. Ex. 1017, [0085]. *Scheim*’s allocation scheme functions to reduce intercell interference by

randomizing the indices used to allocate resources in each cell. *Id.*, [0105]. *Scheim*'s system includes a resource allocation or permutation process that is regular or random (i.e., pseudorandom) that provides a large set of randomized patterns that have a low cross correlation with one another. *Id.*, [0109]. *Scheim* is unrelated and silent with respect to a pseudorandom random noise sequence, pseudorandom elements, or corresponding elements of a PN sequence. The Petition does not rely on *Scheim* for 1[b]. See Petition, 71-76.

Notwithstanding the fact that *Tzannes* fails to adequately disclose the corresponding elements of the PN sequence in relation to multiple transmitting network devices, the Petition also mischaracterizes *Tzannes* in asserting that it relies on components of a PN sequence. The phase scrambler of *Tzannes* performs a phase shift based on a value, where the value may be from multiple different predefined parameters, including a pseudorandom number generator. Ex. 1009, 4:52-63. Using this value, the phase scrambler solves equations to compute a phase shift for the carrier signal. *Id.*, 5:1-4. This is not a PN sequence with separate elements, nor an element of the PN sequence, as is required by the '566 Patent. *Id.*, 5:27-29. Accordingly, *Tzannes* is insufficient in its disclosure with respect to aspects of the PN sequence and fails to render such claim elements obvious.

- ii. The Petition fails to teach “performing a predetermine transformation on a quadrature

amplitude modulated symbol using the **element of the pseudorandom noise sequence corresponding** to the used subcarrier”

As *Tzannes* does not adequately disclose the corresponding element of the PN sequence, it cannot disclose “using the element of the PN sequence corresponding to the used subcarriers” described in 1[e]. So, *Tzannes* does not adequately disclose 1[e] at least with respect to coordinating across multiple transmitting devices, and the Petition does not rely on *Scheim* with respect to these elements. See Petition, 71-74, 81-85.

The Petition itself acknowledges that *Tzannes* is insufficient with respect to 1[e]. See Petition, 81 (“*Tzannes* discloses [1e] through using pseudo-random sequences to scramble carrier signal phase (with *Scheim* disclosing the remainder of the element).”). Still, the Petition makes no reference to *Scheim* with respect to the PN sequence related elements of Claim 1. See Petition, 81-85 (Failing to cite to *Scheim*).

Accordingly, the *Scheim-Tzannes* combination fails to disclose all claim aspects in the prior art.

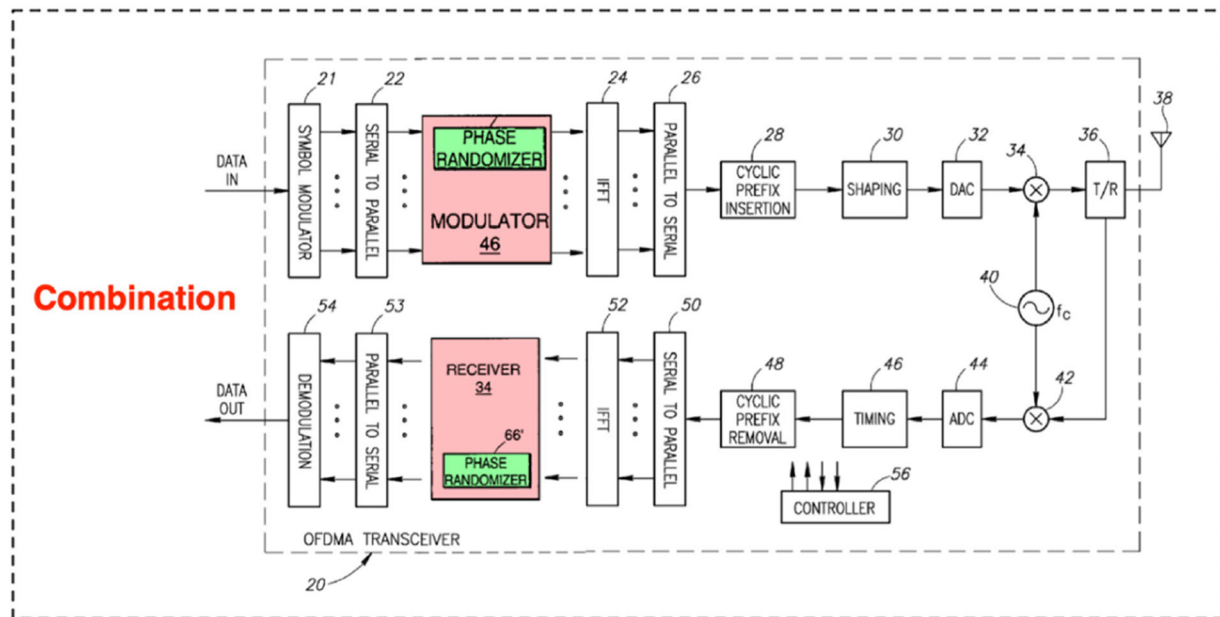
2. The Petition Provides Insufficient Basis to Combine the Cited References to Arrive at the Claimed Invention

The Petition attempts to reconstruct the claimed invention through impermissible hindsight, as shown by the proposed combination’s disjointed

structure and failure to consider practical complications in combining *Scheim* and *Tzannes*. Additionally, a POSITA would not be motivated to combine *Scheim* and *Tzannes*.

a. The *Scheim-Tzannes* Combination is Not Routine or Predictable

First, the Petition proposes a disjointed and flawed structure. The Petition asserts that implementing the teachings of *Tzannes*'s phase-randomizing technique and accompany circuitry into *Scheim*'s OFDMA transceiver would have been an exercise of ordinary skill, and the Petition relies upon the following annotated figure of the proposed combination to support such a conclusion:



TZANNES, FIG. 1; SCHEIM, FIG. 2; COMBINATION

Petition, 66-67, 74-75 (regarding 1[b]); 82-84 (regarding 1[e]). However, such combination is fundamentally flawed, as it contains two modulators on the transmission side, and two demodulators on the receiving side, without any explanation for why this function would be duplicated.

Figure 2 of *Scheim* is a block diagram of a conventional OFDMA transceiver which includes a Symbol Modulator 21 and Demodulator 54. Ex. 1017, [0018]. In *Tzannes*, the Phase Randomizers 66 are incorporated into its Modulator 46 and Receiver 34. Ex. 1009, 3:52-63. The receiver of *Tzannes* includes components for demodulation. *Id.*, 4:27-31. The system proposed by the Petition is incoherent on its face as it appears to rely on the use of two modulations and two demodulators. A POSITA would not be motivated to combine these two systems when the resulting system has an unworkable structure. The Petition provides no alternatives for incorporation *Tzannes* into the *Scheim* system.

Second, *Tzannes* is directed towards a digital subscriber line (DSL) communication system that uses discrete multitone (DMT) transmissions. Ex. 1009, 3:24-28. While *Tzannes* indicates that principles may be applicable to other types of multicarrier modulation, like OFDM, *Tzannes* does not disclose whether any alterations to the system disclosed are necessary to enable its adaptation. *See id.*, 3:31-37. Further, *Tzannes* is completely silent with regard to OFDMA.

Further, as noted in III.B.2.a, even assuming moving a system from DMT to OFDM is simple or routine, additional modifications are necessary to ensure that the transmission is usable after applying any kind of predetermined transformation.

The '566 Patent relies on subcarrier indexing to enable different nodes on the network while still having the corresponding element of the PN sequence applied as also discussed above in II.A. The '566 Patent employs this process to ensure that two different network devices will not scramble a symbol using the same pseudorandom sequence element. Ex. 1001, 6:63-66. Similarly, it ensures that the receiving network device can see the transmitted payload as if it were all sent by a single transmitter and can descramble the received symbols. *Id.*, 7:11-15.

Tzannes applies in a one-to-one network. See Ex. 1009, Fig. 1. The transmitter controls generation of the phase shifts, which is why the random values input into *Tzannes*'s equations must be sent to the remote receiver over the communication channel to enable decoding the received transmission. Ex. 1009, 5:59-67. *Tzannes* provides no mechanism to ensure the same pseudorandom sequence can be used by multiple transmitters, because there is only one transmitter. And even assuming a plurality of transmitters *arguendo*, there is no mechanism to map the phase shifts to certain subcarriers, nor a mechanism to ensure each transmitter uses only the correct, corresponding shift for a subcarrier.

So, like with Ground 1, a *Scheim-Tzannes* combination presents technical problems the POSITA would not find obvious to solve. First, there is no mechanism to coordinate the phase shifts in either reference. The transmitter of *Tzannes* generates the values used to phase shift the carrier signals, and communicates these values directly to the receiver, or relies on the receiver to independently derive the same phase shift value. Ex. 1009, 5:17-28. When multiple transmitters of the *Scheim-Tzannes* combination apply the phase shifts to each of the allocated subcarriers, the receiver does not have a mechanism to determine which subcarriers is associated with each phase shift value.

Second, the proposed combination does not provide for transmitters designed to skip elements of the pseudorandom sequence that corresponded to subcarriers *not* assigned to that transmitter. As *Tzannes* provides for only one transmitter, it would have no reason to design transmitters with this functionality. As *Scheim* does not describe scrambling or phase shifting, it would not remedy the shortcomings of *Tzannes* in the context of the combination.

Accordingly, the implementation of *Tzannes* into *Scheim* would not be routine and would not result in a predictable solution that embodies the claimed system. The combination leaves the POSITA without recognition of the coordination problem, nor any solution to it.

b. The Petition Provides Insufficient Motivation to Combine the Cited Reference

A POSITA would not be motivated to combine the network provided in *Scheim* with the phase shifting techniques of *Tzannes*. Even if a POSITA would understand that peak-to-average power ratio (PAR) decreases by decreasing intercell interference as alleged by the Petition (*see* Petition, 65), a POSITA would not consider implementing any teachings of *Tzannes* into *Scheim*.

First, the Petition attempts to manufacture a linkage between *Scheim* and *Tzannes* that simply does not exist. The Petition and Petitioner's Expert assert, without support or any technical discussion, a relationship between intercell interference and PAR. *Id.*, 65; Ex. 1004, ¶ 208 (Petitioner's expert alleging that "[a] POSITA would have understood that PAR increases as intercell interference increases."). *Scheim* is directed towards reducing intercell interference on a cellular system. Ex. 1017, [0041]. *Scheim*'s disclosure does not discuss reducing PAR as a challenge or a reason behind its architecture. The Petition invents an equivalence between intercell interference and PAR as a reason to motivate the *Scheim-Tzannes* combination. *See*, Petition, 65. But *Scheim* itself does not recognize such equivalence (nor does *Cleveland*, which like *Scheim* is concerned with intercell interference yet does not make the "obvious" assertion this also addresses PAR).

Beyond reducing PAR, the Petition appeals to generalized and conclusory motivations such as efficiency.

Most egregiously, Petitioner's expert fails to identify any reference, or advance any argument regarding his conclusion. *See* Ex. 1004, ¶¶ 206, 208. The alleged relationship between intercell interference and PAR is the lynchpin of the Petition's combination of these two references, and there simply is no relationship between them. PAR stems from a signal's interference with itself, whereas intercell interference relates to interference between signals from different cells. Dr. Williams' conclusory "motivation" is not only unsupported, it is incorrect.

Second, both provide for different solutions to different problems, and there is no motivation for a POSITA to even look to *Tzannes* to improve *Scheim*. In fact, this combination (in the same way as Ground 1) is constructed based on two references that include "pseudorandom" aspects, but these aspects are deployed in entirely unrelated ways, and are only related insofar as they include the word "pseudorandom", albeit to accomplish different goals and using different pseudorandom elements. *Scheim* describes a resource allocation mechanism used to reduce intercell interference by randomizing the intercell interference experienced in each cell. Ex. 1017, [0083]. The resource allocation mechanism randomly spreads subcarriers in each cell, resulting in a statistical-like intercell interference

behavior. *Id.* (“The mechanism effectively randomly spreads the resources in each cell which results in statistical-like intercell interference behavior.”), [0032] (“In the frequency domain, a single subcarrier defines a resource element.”). The allocation mechanism obtains “a large set of randomized patterns having a low cross correlation with each other.” *Id.*, [0109]. This mechanism is used to reduce or obviate the need for frequency planning between cells, which can be complex and costly in some systems with respect to computing resources. *Id.*, [0037], [0041].

In contrast, *Tzannes* discloses a phase shift procedure that is performed on each carrier signal. Ex. 1009, 2:34-36. This phase shifts, combined with the phase characteristics of the carrier signal, results in a substantially scrambled carrier signal. *Id.*, 2:37-40. The phase shifters are used to increase the randomness of the signal, as carrier signals that are not random can greatly increase PAR. *Id.*, 2:10-11. Reducing the PAR in *Tzannes*’s one-to-one system is important to decrease the total power consumption and component linearity requirements of the system. *Id.*, 2:4-9.

Tzannes and *Scheim* provide very different solutions used to address different problems, so a POSITA would not even look to *Tzannes* to improve *Scheim*. Accordingly, a POSITA would not be motivated to make the proposed combination.

3. The Petition Fails to Establish that Claims 2 and 3 Would have Been Obvious Over *Scheim* and *Tzannes*

Dependent Claims 2 and 3 depend from independent Claim 1, so the entirety of Ground 2A should be rejected.

E. Ground 2B, 2C, and 2D: The Petition Fails to Establish that Claims 4-6, and 12 Would have Been Obvious Over Any Combination of *Scheim*, *Tzannes*, *Mutagi*, *Ting*, and *Ohana*

As described above, the Petition fails to articulate a motivation to combine *Scheim* and *Tzannes*. The Petition does not rely on *Mutagi*, *Ting*, or *Ohana* to illustrate a motivation to combine *Scheim* and *Tzannes* or for any of the elements discussed above. Accordingly, the inclusion of the additional references does not cure the above identified deficiencies of Ground 2A nor provide teachings that would render dependent Claims 4-6, and 12 obvious.

IV. CONCLUSION

All grounds of the Petition fail for a multitude of reasons. As the Petition fails to show that there is a reasonable likelihood that the Petition will prevail on a single claim, institution should be denied under 35 U.S.C. § 314(a).

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Respectfully submitted,

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Certification of Word Count Under 37 C.F.R. § 42.24(d)

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CERTIFICATE OF SERVICE

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