

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DISH NETWORK L.L.C.,
Petitioner,

v.

ENTROPIC COMMUNICATIONS, LLC,
Patent Owner.

CASE: IPR2024-00373

U.S. PATENT NO. 7,594,249

PATENT OWNER'S RESPONSE

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Exhibits

Exhibit Number	Description
Ex. 2001	Unsubmitted Excerpts of Ex. 1006, Dennis J. Rauschmayer, <i>ADSL/VDSL Principles</i> , 1999 (“ADSL/VDSL”)
Ex. 2002	’249 Patent Reexamination File Wrapper of Application No. 90/019,247
Ex. 2003	U.S. Patent No. 6,795,450 to Mills
Ex. 2004	U.S. Patent Publication No. 2002/0069417 to Kliger
Ex. 2005	U.S. Patent No. 6,005,861 to Humpleman
Ex. 2006	Notice of Intent to Issue Ex Parte Reexamination Certification, Control No. 90/019,247 (May 31, 2024)
Ex. 2007	Declaration of Regis Bates
Ex. 2008	Deposition Transcript of Scott Acton (September 18, 2024)
Ex. 2009	Complete copy of Ex. 1008, Dr. Walter Y. Chen, <i>DSL Simulation Techniques and Standards Development for Digital Subscriber Line Systems</i> , 1998 (“DSL-book”)
Ex. 2010	Deposition Transcript of June Ann Munford (September 19, 2024)
Ex. 2011	Excerpts from Samuel H. Russ, <i>Signal Integrity Applied Electromagnetics and Professional Practice</i> (“Signal-Integrity”)
Ex. 2012	GNS Wireless, <i>Coaxial Cables</i> , https://www.gnswireless.com/product-category/products/coaxial-cables/ (last visited October 13, 2024) (“Coaxial-Products”)

Exhibit Number	Description
Ex. 2013	U.S. Patent No. 5,682,419 (“Grube”)
Ex. 2014	Sparklight Business, <i>Coaxial Cable vs. Twisted Pair</i> , https://business.sparklight.com/the-wire/tech-talk/business-internet/coaxial-cable-vs-twisted-pair (last visited October 13, 2024) (“Coaxial-vs-Twisted-Pair”)
Ex. 2015	E.P.O. Patent No. 1,065,855 (“Konschak”)
Ex. 2016	Voice and Data Communications Handbook, Fourth Edition McGraw Hill 2001, Regis (Bud) Bates and Donald Gregory (“Voice-and-Data”)
Ex. 2017	Second set of unsubmitted excerpts of Ex. 1006, Dennis J. Rauschmayer, <i>ADSL/VDSL Principles</i> , 1999 (“ADSL/VDSL”)
Ex. 2018	U.S. Pat. Pub. No. 2017/0180176 A1 (“Volkov”)

I. INTRODUCTION

U.S. Patent 7,594,249 (the “’249 Patent”) describes and claims a novel high-bandwidth network for communications between devices in a building using existing coaxial cable installations. The ’249 Patent recognized that existing coaxial cable within a building could support a high-bandwidth LAN network, and remedied pre-existing impediments to implementing such a network. These impediments arose from the coaxial splitters common to cabling deployments used to divide a signal from one input port (or common port, usually at building entry) to multiple output ports (or tap ports). Ex. 1001, 2:8-14; Ex. 2007, ¶¶64-65, 109.

The ’249 Patent, unlike the references relied upon in the Petition, recognized that improvements to terminal devices connecting as network nodes—such as multicarrier modulation and equalization—could overcome these impediments and allow for a high-bandwidth LAN using existing coaxial cabling. Ex. 1001, Cls. 1, 5, 10.

The Petition’s prior art falls into one of two buckets: 1) coaxial LAN references using simple low-cost terminal devices; or 2) wide-area-network (“WAN”) references.

The primary reference of the Petition, *Amit* describes two embodiments. The first is a network managed by a regional cable operator. The second, on which the Petition relies, is the Single Home embodiment, where each building’s local network

is severed from its regional network and provides for a simple LAN focused on low-cost LAN terminal devices. Although it recognizes some of the existing impediment (i.e., micro reflections) addressed by the '249 Patent, it provides a *fundamentally different solution* than the '249 Patent.

Because this solution is not that of the '249 Patent, the Petition ignores these teachings and looks to irrelevant wide-area DSL textbooks and a paper about a simulation of a wide-area coaxial network to “solve” the very problem *Amit* already addressed. The Petition’s WAN-based references address communications between on-premises units and either a cable head end/central office or DSL source. They do not address impairments in the *on-premises* cabling that restrict high-bandwidth communication between terminal devices in a building. Ex. 1001, 2:57-3:7. Further, the Petition proposes several modifications to *Amit* that would transform the network into a complex, expensive network inconsistent with *Amit*’s principals of operation.

II. THE '249 PATENT

A. Overview

The '249 Patent relates to broadband communications over a LAN on coaxial cable. Ex. 1001, 1:14-16, Title. The '249 Patent describes and claims the use of existing coaxial cable television wiring to create “coaxial cable based local area network[s],” within a building, and methods for device-to-device communication across those networks. *Id.*, 1:20-31; Ex. 2007, ¶63.

The claimed inventions allow terminal devices, such as cable converter boxes, televisions, cable modems, and other customer premise equipment (“CPE”) to transmit and receive high-bandwidth signals over the existing cable TV cabling of a premises. Ex. 1001, 1:24-33; Ex. 2007, ¶64.

To make such a network a reality, the ’249 Patent had to overcome several obstacles. Among other things, the coaxial TV installations used by the ’249 Patent include “signal splitters,” which include an input port and multiple output ports. Ex. 1001, 1:39-57. These splitters receive a signal from the input port and provide an identical lower-power signal to all output ports. *Id.*, 1:46-58; Ex. 2007, ¶64.

When signals travel downstream through these splitters, the signal loses strength (attenuates) as it is divided between the various output ports. Ex. 1001, 2:8-14; Ex. 2007, ¶65. Different types of splitters can provide for greater or less signal attenuation to the downstream devices. Ex. 1001, 2:8-14. Further, the splitters isolate the output ports from each other, such that any signal that might be sent “upstream” from a terminal device is impeded from coupling to the output port connected to another terminal device. *Id.*, 2:8-14; Ex. 2007, ¶65.

In traditional cable networks, this attenuation and isolation is not an issue, because “terminal devices do not communicate with each other, they only communicate through the [Point of Entry, or] POE with the cable head-end.” Ex. 1001, 2:15-18. But the ’249 Patent contemplates these devices using the existing

coaxial network to communicate with each other. *Id.* at Cl. 1. In this environment, the issues discussed above present a significant obstacle to communication from device to device.

One way the '249 Patent addresses this issue is by installing a frequency selective network interface devices into the network. *Id.*, 3:10-18; Ex. 2007, ¶¶66-67. By reflecting upstream signals back into the wiring as downstream signals, the network interface device creates a path for terminal devices to transmit to and receive from other terminal devices. Ex. 1001, 3:10-18. However, this architecture creates its own problems. For instance, in such a network, signals will reflect not only off the network interface but off the splitters, causing multiple reflections of each signal to propagate through the network. Ex. 2007, ¶68. This introduces what is known as “multipath,” where different reflected versions of the same signal arrive at a receiver via paths of different lengths and, thus, at different times, which results in intersymbol interference (“ISI”) between the different versions of the signal. Ex. 1001, 5:64-6:2. Left unchecked, this interference degrades the bit error rate (BER) performance of the communications channel and can render it unusable. *Id.*, 6:6-7.

The inventors of the '249 Patent were the first to recognize, and solve, the particular version of these issues present in a local broadband coaxial network. Ex. 2007, ¶73. For example, the inventors identified that ISI can be mitigated through certain modulation techniques or processing techniques such as

equalization. Ex. 1001, 6:4-48; Ex. 2007, ¶69. At the time the '249 Patent was filed, no one else had identified these issues or proposed the claimed solutions for a broadband local area network over coaxial cable. Ex. 2007, ¶69.

B. Level of Ordinary Skill in the Art

A POSITA would have a bachelor's degree in electrical engineering, or a related field, and at a minimum two to three years of experience in development and design of broadband networks over coaxial cables. Ex. 2007, ¶¶57-58. Experience with coaxial networking is central to the patent's field of work. *Id.*, ¶¶60-62. The title, claims, abstract, background, and detailed description all refer to coaxial cable. Ex. 1001, Cover, 1:20-23, 7:4-5, Cls. 5 and 10. While not expressly referenced in the summary of the invention, the use of terms such as "port-to-port isolation" in connection with "signal splitter/combiners" confirms that the summary of the invention section is referring to a coaxial network. *Id.*, 3:10-37; Ex. 2007, ¶61. Claim 1's use of a "signal splitter... having a common port and a plurality of tap ports" also confirms the coaxial network. Ex. 1001, Cl. 1; Ex. 2007, ¶61. The USPTO designated the '249 Patent itself as a Cable TV reference. Ex. 1001, Cover at 51 (H04N 7/18).

Additional professional experience could substitute for education, and additional education could substitute for professional experience. Ex. 2007, ¶58.

Patent Owner's expert, Regis Bates, qualifies to opine under both Petitioner's and Patent Owner's level of skill. *Id.*, ¶¶ 8-28, 74-89; *see generally*, Ex. 2016.

C. Dr. Acton's Opinions Are Not Persuasive

Dr. Acton's expertise is in image analysis and processing. He is not qualified to offer technical opinions on the references at issue in this IPR. *Supra*, Section II.B. His testimony at his deposition confirms as much. Lacking the necessary technical background to appreciate the details at issue, Dr. Acton fell victim to hindsight, using the teachings and disclosures of the '249 Patent itself to guide his analysis. Ex. 2008, 82:17-25, 98:25-99:4, 118:3-11. Considering his lack of expertise in the field of the '249 Patent, the Board should not afford Dr. Action's Declaration any credible weight.

First, Dr. Acton does not have the relevant technical experience with broadband coaxial cable networks to qualify as a POSITA. *Id.*, 18:21-23. Rather, his research is focused on the unrelated field of image analysis and processing. *Id.*, 12:3-13:17. When asked technical questions about physical networking mediums relevant to the Petition's arguments, Dr. Acton indicated that it was "outside of [his] expertise." *Id.*, 23:6-10, 23:11-14 (asking for clarification more than a minute after being asked the standard coaxial cables operating frequency); 33:16-34:2 (unable to answer question comparing ADSL and VDSL); 25:5-20. The lack of experience in the relevant subject matter supports discounting Dr. Acton's opinions.

Second, Dr. Acton did not consider the technical difference between actual operating twisted pair wiring and coaxial cable networks. Dr. Acton himself acknowledges differences between coaxial and twisted pair networks. *Id.*, 20:1-21:23. However, he opines from a purely theoretical context without considering how a physical medium could alter system operations. *Id.*, 118:15-119:17. Rather than considering the practical implementation of a network, Dr. Acton drew upon his experience teaching general digital signal processing classes, which are taught in terms of theory without any concern for the physical medium. *Id.*, 18:21-19:25, 56:5-9, 52:15-53:9.

Likewise, Dr. Acton repeatedly relies on the presence of QAM as an alleged motivation to combine and a reasonable expectation of success. Ex. 1003, ¶¶108-109, 122, 125, 259-260, 266-267, 270, 337, 350, 353; Ex. 2008, 58:20-23, 59:8-17, 73:5-74:4. However, QAM is used in many kinds of networks, including Wi-Fi and point-to-point networks. Ex. 2008, 60:12-23. QAM is such a wide-spread, generic technology that use of QAM in no way provides a motivation to combine teachings, nor is indicative of a reasonable expectation of success. Dr. Acton seized upon such a generic similarity, without considering principals of operation, such as physical medium, rendering his opinions unpersuasive. Ex. 2007, ¶¶59, 175. To Dr. Acton, the specific medium used to communicate is irrelevant, whereas in the contemporaneous art those differences were of primal importance.

Third, Dr. Acton’s decisions to ignore the technical differences between different communications media contaminates his opinions regarding analogous art, rendering them inconsistent and thus unreliable. For example, Dr. Acton’s declaration provides different fields of endeavor for the ’249 Patent in Ground 3 than in Grounds 1 and 2. Ex. 1003, ¶¶102 (“broadband networks, including the communications protocols used in such networks”) 252 (“broadband *coaxial* networks”), 331 (“communication techniques for use in broadband networks”). Because ADSL/VDSL and DSL-Book are not coaxial networks (*infra* Sections V.B.1 and V.C.1), they do not fall within the field of endeavor Dr. Acton states regarding Ground 3. *Id.*, ¶252. Dr. Acton’s inconsistent position on field of endeavor suggests he alters his position depending on the art utilized in each ground.

The same indiscriminate treatment of different communications media rendered Dr. Acton unable to describe how one might categorize which networks actually fall within his (overly broad) field of endeavor of broadband networks, suggesting the field is unbounded. Ex. 2008, 54:7-55:16.

Compounding the issue, in his deposition, Dr. Acton disagreed with his previously proposed field of endeavor (“broadband coaxial networks”) and instead proposed another, broader, alternative field of endeavor: “digital communications.” *Id.*, 106:25-107:1 (“I would characterize the field of Jacobsen as digital communications”), 107:7-15, 108:13-15. This is consistent with Dr. Acton’s lack of

experience with coaxial cable networking—Dr. Acton prefers discussing these fields from a digital communications *theory* perspective.

Regarding the pertinent problem addressed by the '249 Patent, Dr. Acton states with no evidence that each reference relates to “port-to-port isolation and providing a suitable signal path for terminal-to-terminal communication in a coaxial cable wired building.” Ex. 1003, ¶¶105, 253, 331. Dr. Acton’s opinions for analogous art are not according to his experience or understanding of the cited references, but instead based entirely on the '249 Patent itself. *Airbus S.A.S. v. Firepass Corp.*, 941 F.3d 1374, 1382 (Fed. Cir. 2019) (“[t]he pertinence of the reference... must be recognizable with the foresight of a person of ordinary skill, not with the hindsight of the inventor’s successful achievement.”); Ex. 2007, 57:6-8 (relying on references because they were cited in the '249 Patent).

Dr. Acton’s opinions do not draw upon relevant experience that aligns with that of a POSITA of the '249 Patent. *Supra*, Section II.B. Accordingly, his opinions should not be given evidentiary weight.

III. OVERVIEW OF THE PRIOR ART AND PETITIONER'S CHALLENGES

A. **The Petition posits combining a simple, in-home coaxial network comprising signal splitters, where the network severs external control signals (*Amit*), with wide-area networks**

Amit is the only reference identified by the Petition describing coaxial communications within a building. *Amit* refers to its system as the Home Cable Network (“HomeCN”), and discloses two different, incompatible architectures for implementing a cable-based network using wiring in a building. Ex. 1005, 2:44-48, 7:5-35; Ex. 2007, ¶¶92-95. These two operational modes are differentiated by the presence or absence of a notch filter located between the in-building wiring and the external wide-area cable network. Ex. 1005, 7:12-14; Ex. 2007, ¶95.

Amit’s first operational mode, Connected Home, exists when the notch filter is absent. Ex. 1005, 7:29-30. This mode establishes a network in a premises (e.g., a house or a dwelling) that is connected to and interoperates with the regional cable network. In this operational mode, signal management functions such as frequency allocation and timing are provided by the Cable Modem Termination System (CMTS), located at the cable operator’s headend. Ex. 1005, 8:45-9:8, 7:51-52; Ex. 2007, ¶94. *Amit* explains “the headend assigns *the* carrier frequency and bandwidth to each home network, and maximum power levels to each device on the home network.” Ex. 1005, 4:12-14. These management functions are centralized at the

CMTS to ensure interoperability across different local networks and to avoid signals from one home network interfering with signals from another. Ex. 2007, ¶93. This control adds complexity to the network, but offloads the complexity to the operator, thereby allowing the in-building implementation itself to remain simple and inexpensive. Ex. 1005, 7:19-22; Ex. 2007, ¶¶93-94.

Amit's second operation mode, Single Home, is an on-premises network, where the local network is “disconnected from the regional cable network.” Ex. 1005, 7:24-35. Here, the notch filter is present, which ensures the home is “disconnected from the regional cable network[.]” *Id.*, 7:16-19. This trade-off further simplifies home network operation, using fewer features and reducing the load on the network management system. *Id.*, 7:19-22, 7:65-8:3, 8:47-49. The operator infrastructure (e.g., CMTS) cannot provide management and control functionality to the home network in the Single Home mode because the notch filter blocks control from outside the premises. Ex. 2007, ¶94.

Despite the clear delineation in function between the two embodiments, the Petition alleges that “every embodiments’ terminal devices may communicate using reflections off devices, including the splitter or the notch filter.” Petition, 13, n.6. At no point does the Petition acknowledge that the notch filter it relies on is **only** present in the Single Home embodiment. The Petition’s reckless mischaracterization of *Amit* to the Board amplifies a fundamental flaw—the Petition

lacks arguments and evidence to explain why teachings related to the Connected Home embodiment would be relevant to the Single Home embodiment. *Intel Corp. v. Tel Innovations, Inc.*, IPR2019-01522, Paper 66 at 24-25 (PTAB March 9, 2021) (“It is not sufficient to demonstrate that each of the components... is known in the prior art; Petitioner must also explain *why* a POSITA *would* have combined the elements disclosed in the separate embodiments”).

Common to both of *Amit*’s embodiments is the use of only single carrier frequency communication for any given home network. Ex. 1005, 8:20-30 (indicating the RF channel spacing is the size of the frequency range in a Single Home operation mode); 8:44-45 (“a specific frequency for each home network.”); Ex. 2007, ¶¶96-97. *Amit* is completely silent regarding any multi-carrier technology.

The Petition further mischaracterizes *Amit* to allege a problem with ISI not present in *Amit*’s system. *Amit*’s Single Home embodiment identifies a unique approach to alleviate echo distortion (or echo reflection), which a POSITA would understand as ISI. Ex. 1005, 20:15-43. *Amit* describes the insertion of a separate transponder at or near the entry point to the home that changes the upstream carrier frequency to a different frequency for downstream communications, thereby eliminating any echo in the system. *Id.* Despite *Amit* providing a system which remedies all ISI, the Petition ignores *Amit*’s express teachings and attempts to

manufacture a motivation to implement teachings (like multicarrier modulation and equalization) from entirely different systems in Grounds 2-4.

B. ADSL/VDSL and DSL-Book

ADSL/VDSL summarizes a variety of DSL technologies and describes the “challenges and limits of [then-existing] DSL technologies” used to transmit data over twisted copper wires of analog landline telephony for wide-area networking. Ex. 1006, 4; Ex. 2007, ¶¶99-101. ADSL/VDSL describes that “new and exciting high-speed access technologies using ordinary telephone lines, are especially well suited for the access portion...of such a network.” Ex. 1006, 3. In doing so, it focuses on “two specific DSL technologies,” ADSL and VDSL, and “how networks are designed to use them.” *Id.*

Likewise, DSL-Book describes DSL lines used to provide signals from a Central Office (“CO”) to a cable subscriber’s home. Ex. 1008, 3, 10; Ex. 2007, ¶103. In other words, the DSL-Book addresses DSL technologies for communication between nodes *outside* of the home, over *copper twisted pair links*. Ex. 1008, 5. Neither ADSL/VDSL nor DSL-Book discuss cable networks or local, in-building networking, the use of any reflected signal, or how any signal splitter would impact communication transmissions. Ex. 2007, ¶¶100-101, 103, 114, 116-118.

C. Jacobsen

Jacobsen is a technical article describing a simulation analysis of wide-area networks. Specifically, *Jacobsen* compares “the performances of single-carrier modulation with equalization and multicarrier modulation” on cable channels outside the home, in the wide-area network of a cable operator. Ex. 1007, 8. It does not discuss local-area or in-home networks. *Jacobsen* fails to describe the use of any reflected signal or how any signal splitter would impact communication transmissions. Ex. 2007, ¶102. The Petition nevertheless invokes *Jacobsen* to rework *Amit*’s Single Home embodiment to add equalization. The Board’s Institution Decision noted the incongruity, finding that Petitioner’s proposed combination of *Amit* and *Jacobsen* failed to establish that the claims of the ’249 Patent directed to the use of equalization were obvious. Institution Decision (“ID”), 38-39.

Also of note is *Jacobsen*’s conclusion that its simulations show “good” data is still receivable ***without*** the need for equalization by sending data on multiple carrier frequencies. The ID concluded that reliance on *Jacobsen* to provide the equalization that *Jacobsen* itself discredits is improper. ID, 38-39.

IV. PATENT OWNER’S STRUCTURE

While the Petition challenges all claims of the ’249 Patent, only Claims 10, 13, and 17 are asserted in the underlying district court litigation. In the ID (Paper

9), the Board did not find that there was a reasonable likelihood of success regarding any of these claims. Paper 9, 38-39, 43. The Board did not reach Grounds 1 and 2, only evaluating Ground 3 and Ground 4. *Id.*, 18.

While adding multicarrier modulation and equalization techniques on different WAN networks that utilized twisted pair (known as POTS or Plain Old Telephone Service) was known, “the prejudice of hindsight bias” often overlooks that the “genius of invention is often a combination of known elements which in hindsight seems preordained.” *Power Integrations, Inc. v. Fairchild Semiconductor Int’l, Inc.*, 711 F.3d 1348, 1368 (Fed. Cir. 2013) (quoting *McGinley v. Franklin Sports, Inc.* 262 F.3d 1339, 1351 (Fed. Cir. 2001)).

Indeed, the Petition cites to signal processing techniques used on networks far afield of the ’249 Patent and attempts to implement them into *Amit*’s simple LAN without providing sufficient motivation. *Virtek v. Assembly Guidance*, 97 F.4th 882, 887 (Fed. Cir. 2024); *Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1068 (Fed. Cir. 2018) (reversing improper reliance on “what a skilled artisan would have been able to do, rather than what a skilled artisan would have been motivated to do at the time of the invention.”). This overly broad lens is exactly the type of hindsight that must be avoided. *McGinley*, 262 F.3d at 1351.

As Petitioner’s arguments regarding each claim fail for similar reasons, this Response addresses all the Grounds as applied to each independent claim, rather

than exhausting all arguments relating to each Ground in the order they appear. Because Claim 10 and its dependents are both the focus of the parties' parallel litigation and where the Board found no reasonable likelihood of unpatentability, Claim 10 is addressed first.

V. INDEPENDENT CLAIM 10

The ID correctly found the Petition failed to demonstrate Claim 10 (and its dependent claims) were obvious in Grounds 3 and 4 (ID, 32, 37-39) and declined to address Claim 10 regarding Ground 2. (Ground 1 does not challenge Claim 10.) The ID's decision regarding Grounds 3 and 4 remains correct, and Petitioner's arguments regarding Ground 2 fail for similar reasons.

A. Ground 3

Claim 10 requires "terminal devices perform equalization on the received signal that restores a flat frequency response to overcome communication channel impairments caused by the reflected signal." Ex. 1001, Cl. 10. *Amit* does not disclose terminal devices performing equalization. The Petition relies on *Jacobsen* to disclose equalization. Petition, 69-71. However, Petitioner's alleged combination of *Jacobsen* and *Amit* is flawed for multiple reasons.

First, *Jacobsen* teaches away from adding equalization to the teachings of *Amit*. *Jacobsen* compared single-carrier transmissions with equalization and multi-carrier transmissions without equalization and concluded that the multi-carrier

transmission *without equalization was preferred*. As the ID implicitly recognized, *Jacobsen* teaches a POSITA *not* to use an equalizer under the circumstances presented. Second, a POSITA would not look to *Jacobsen* to improve a LAN, because the type of interference *Jacobsen* is concerned with occurs in wide-area networks—the subject of *Jacobsen*—and is insignificant in the LAN context that *Amit* addresses. Third, due to the complexity involved in implementing teachings of *Jacobsen* into *Amit*, a POSITA would not be motivated to combine *Amit* and *Jacobsen* with a reasonable expectation of success. Accordingly, a POSITA would not be motivated to implement changes from *Amit* into *Jacobsen*.

1. *Jacobsen* would not be combined with *Amit* to add terminal-device equalization

The Petition is wrong to suggest that *Jacobsen*’s teaching of “equalization” is a reason to modify *Amit*. Petition, 66. *Jacobsen* expressly teaches away from using equalizers in a single-carrier system, such as that of *Amit*. Ex. 1007, 15. As the Board properly found, “Petitioner has not shown a reasonable likelihood that Claim 10 would have been obvious over the combination of *Amit* and *Jacobsen*” because “*Jacobsen* teaches that Multicarrier modulation performs better than single carrier modulation with equalization[.]” ID, 38-39.

Jacobsen “present[s] a comparison between the performance of single-carrier modulation with equalization and multicarrier modulation on simulated cable

television (CATV) channels.” Ex. 1007, 8. Crucially, the multicarrier system involved in this comparison did **not** include equalization. *Id.*, 10 (“no equalizer is required in the multicarrier receiver”). The results of this comparison found that “for a given data rate, the complexity of multicarrier is significantly lower than that of a single-carrier system” that included equalization. *Id.*

Jacobsen concluded the multi-carrier modulation without any equalization is preferable, as it is less complex than single-carrier modulation with equalization but performs similarly. Ex. 1007, 8 (abstract), 9; Ex. 2007, ¶199. Specifically, *Jacobsen* found a single-carrier system with equalization was 2.5 times more complex than a multi-carrier system at the same data rate. Ex. 1007, 13. *Jacobsen* delivered a direct conclusion: “no equalizer is required in the multicarrier receiver.” *Id.*, 10. *Jacobsen* would not logically have suggested adding equalization to a POSITA, because *Jacobsen* itself concluded that doing so was unnecessary.

Adding equalization to *Amit*’s single-carrier system would also have been contrary to *Amit*’s stated goal of being “simple,” particularly the Single Home embodiment which includes the “notch filter” upon which the Petition relies. Ex. 1005, 7:16-22, 18:32, 26:13-14. A POSITA would not have been motivated to add equalization to *Amit* for this reason as well. *Id.* Even if a POSITA did look to *Jacobsen* in an effort to improve *Amit*, *Jacobsen*’s analysis would lead a POSITA to implement a multi-carrier system without equalization, as this system is described

as significantly less complex than an equalization-based system. Ex. 1007, 15. There is no articulated basis to add the complexity associated with *Jacobsen*'s equalization to the teachings of *Amit*, especially in view of *Jacobsen*'s finding against doing so. Ex. 2007, ¶199.

The Petition's basis for including an equalizer is to overcome "sub-ideal channel conditions" caused by "intersymbol interference." Petition, 66. But *Amit*'s system already accounts for ISI using a different method that does not use an equalizer. *Infra* Section V.A.2. There is no reason to add an equalizer to *Amit* to "address" this already solved problem. As noted by the Board, relying on equalization as a reason to modify *Amit* with *Jacobsen* is incorrect.

The proposed combination of *Amit* and *Jacobsen* also fails because it ignores claim 10's requirement that equalization is performed by "terminal devices." Petition does ***not even mention*** "terminal devices" in its arguments on Claim 10, much less allege that terminal devices could perform equalization. Petition, 69-71. This is expected, as *Jacobsen* is silent regarding the operations of devices within a LAN network and instead is directed to a regional CATV network. Ex. 1007, 10. *Jacobsen*'s equalization is performed external to the terminal devices, by the CMTS. Ex. 2007, ¶200. Petitioner's arguments regarding why a POSITA would add equalization into *Amit* amount to nothing more than "equalization existed." That is a legally improper ground for a proposed obviousness combination. *Virtek*, 97 F.4th

at 887; *Polaris Indus.*, 882 F.3d at 1068 (reversing improper reliance on “what a skilled artisan would have been able to do, rather than what a skilled artisan would have been motivated to do[.]”).

2. *Jacobsen’s* WAN would not motivate any changes to *Amit’s* LAN

The Petition’s *Amit-Jacobsen* combination fails for another reason: a POSITA would not look to wide-area, regional communications networks to improve the **local** network relied on in *Amit*. As noted above, *Amit* describes two distinct modes or embodiments. Ex. 1005, 7:12-34; *supra* Section III.A. In the relied upon Single Home embodiment, a notch filter is installed at a home network’s entrance which disconnects the home network from the regional cable network. Ex. 1005, 7:15-19, 7:25-28; Petition, 10-11, 22-23, 47-48, 69, 82. Conversely, in the Connected Home embodiment, the home network is connected to a regional network with a more complex system architecture, including wider frequency operation and reuse, multiple bandwidths, and privacy, all managed by the CMTS/headend management system. Ex. 1005, 7:19-22, 7:29-35, 7:52-53, 8:47-49. These embodiments are mutually exclusive: *Amit* cannot operate in both without a physical change in the network hardware. *Id.*, 7:12-14 (“operation modes are determined according to the existence/not existence of notch filter at the home entrance”), 7:23-35; Ex. 2007, ¶131.

A POSITA would not have attempted to modify or improve *Amit*'s Single Home LAN based on *Jacobsen*'s teachings about ***regional networks***, (like ADSL/VDSL, and DSL-Book for Grounds 2 and 3). Ex. 1006, 6; Ex. 1007, 10; Ex. 2009, 15.¹ Wide-area networks face fundamentally different challenges than the LAN of *Amit*. For example, they face different amounts and sources of interference as discussed *infra* Section V.A.3.

Additionally, *Jacobsen*'s wide-area network does not even describe use of a reflected signal to communicate to different access points, which is the entire premise of operation of *Amit*'s network, as relied on by the Petition. Petition, 13; Ex. 1005, 14:2-5 (“When this reflection is higher than the signal we can use this reflection as our main signal.”); Ex. 2007, ¶201. Indeed, it would not make sense to use signal reflections (like in *Amit*) for communication in a wide-area network like the simulation of *Jacobsen* because the communications from one end point (house or building) to another would require the reflected signal to pass out of the building and into the network infrastructure over a much farther distance. Ex. 2007, ¶202. For these reasons alone, a POSITA would not look to modify *Amit* with teachings of the referenced regional networks.

¹ DSL-Book's and Signal Integrity's published pagination are used for Ex. 2009 and Ex. 2011 respectively.

3. *Amit* would not be modified due to concerns over interference in view of *Jacobsen*

Further, a POSITA would not look to reduce signal interference in *Amit* with *Jacobsen* (Petition, 63), as *Amit* already addresses this issue itself.

First, signal degradation due to interference from the external signals identified in *Jacobsen* is already mitigated in *Amit*'s LAN through its choice of operating frequency. Ex. 2007, ¶203. *Jacobsen* uses a “6-MHz slot from 30-36 MHz as [the] simulated channel,” consistent with most wide-area cable networks which use an upstream channel operating from 5 to 40 MHz. Ex. 1007, 10. *Jacobson* explores ways to avoid interference and signal degradation due to this channel's overlaps with ham radio frequencies. *Id.*, 8-9. However, *Amit*'s in-home network uses different frequency bands (900 to 960 MHz) that were intentionally selected to **avoid** external interference. Ex. 1005, 3:24-30, 8:20-30. This signal range does not overlap with the existing cable TV signals. *Id.* And because the ham-radio signals that *Jacobsen* addressed “vary from fewer than 100 Hz to several megahertz[,]” they do not overlap with, or interfere with, the band used on *Amit*'s LAN. Ex. 1007, 9.² Signal degradation due to interference from these signals would

² In fact, Petitioner points to *Amit*'s use of frequency **above** the cable TV band in their arguments for Claim 8. Petition, 58, 73. The arguments that a POSITA would

be, at best, a minimal concern. Ex. 2007, ¶¶204-205; Ex. 2008, 98:18-99:1. This negates Petitioner’s theory that a POSITA would combine *Amit* and *Jacobsen* to address external interference in *Amit*’s system. Petition, 63.

Additionally, communications within *Amit*’s Single Home embodiment occur entirely within a building. These channels would face significantly less interference from external signals. Ex. 2007, ¶206.

Second, *Amit*’s system addresses signal degradation from ISI, which the Petition cites as a motivation for a POSITA to modify *Amit*. *Amit*’s system includes a “dual frequency mode” (also referred to as the “two-frequency mode”) used to counteract “in-home echo[.]” Ex. 1005 8:4-12; Ex. 2007, ¶180. The “echo” refers to the problem of ISI caused by reflections that result from imperfections in a communication system. Ex. 2007, ¶181; Ex. 2008, 93:12-94:8, 118:3-14. *Amit*’s dual frequency mode ***eliminates*** the echo problem that exists in homes. Ex. 1005, 20:15-17; Ex. 2007, ¶¶181-183. *Amit* does so by using a transponder module added to the entrance where the cable network enters a home. Ex. 1005, 20:26-27. Signals

be motivated to implement teachings from *Jacobsen* into *Amit* due to “signal degradation in CATV networks... from other signals” when the combination occupies a different frequency band is driven by hindsight and inconsistent with *Amit*’s teachings and Petitioner’s arguments. Petition, 63.

from one of *Amit*'s terminal devices are initially transmitted on a first (upstream) frequency but are transferred by the transponder module to a second (downstream) frequency which is received by a second terminal device. *Id.*, 20:27-31. Any echoes of the upstream transmission are on a different frequency from, and cannot interfere with, the downstream transmission. *Id.* The second terminal device "receive[s] the signal with ***no echo***." *Id.*, 20:31. At his deposition, Dr. Acton admitted that "if you're transmitting on one band and listening on another, you don't have to worry about the echoes...interfering with the signal that's received." Ex. 2008, 70:16-19.

A POSITA would have ***no reason*** to look for other solutions for ISI other than the solution *Amit* already provides. Ex. 2007, ¶¶98, 207. While the Board determined a POSITA "would have understood that reflections must be managed appropriately on the networks[,] (ID, 24) the Petition fails to illustrate why a POSITA would be unsatisfied with the system already implemented in *Amit* and referenced in the Petition (which the ID does not address). Any argument to modify *Amit* with *Jacobsen* is based on hindsight, not motivation based on problems presented in these systems.

4. The Petition Fails to Establish *Jacobsen* Is Prior Art

- a. There is no evidence that a POSITA would have been able to identify *Jacobsen*

To establish that *Jacobsen* is prior art, the Petition relies solely on the testimony of June Munford. But Ms. Munford is not a member of the relevant group from whose perspective the public accessibility analysis is undertaken. *Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1348 (Fed. Cir. 2016) (explaining that prior art status is based on whether **POSITAs** can identify and locate the reference). Rather, Ms. Munford has specialized training in information science that a POSITA would not have and is thus able to locate materials that would be inaccessible to a POSITA. Ex. 2010, 11:4-7; Ex. 2008, 101:9-13; Ex. 2007, ¶197.

Ms. Munford's testimony does not, and cannot, establish that *Jacobsen* was “disseminated or otherwise made available to the extent that **persons interested and ordinarily skilled in the subject matter or art** exercising reasonable diligence can locate it,” as she is not a POSITA and does not offer opinions from such position. *Acceleration Bay, LLC v. Activision Blizzard Inc.*, 908 F.3d 765, 772 (Fed. Cir. 2018). A party seeking to introduce a reference “should produce sufficient proof of its dissemination or that it has otherwise been available and accessible to **persons concerned with the art** to which the document relates and thus most likely to avail themselves of its contents.” *In re Wyer*, 655 F.2d 221, 227 (CCPA 1981) (quoting *Philips Elec. & Pharm. Indus. Corp. v. Thermal & Elecs. Indus., Inc.*, 450 F.2d 1164, 1171 (3d Cir. 1971)). Ms. Munford's testimony does not, and cannot, meet that standard. *Acceleration Bay*, 908 F.3d at 772 ; Ex. 2010, 11:4-7. The Petition fails to

explain any basis as to why or how *Jacobsen* was “accessible to *persons concerned with the art* to which the document relates and *thus most likely to avail themselves of its contents.*” *Acceleration Bay*, 908 F.3d at 772.

Although Petitioner contends that its technical expert, Dr. Acton, is a POSITA, he did not provide any opinions relating to the public availability of *Jacobsen*. Moreover, Dr. Acton has never used the type of record Ms. Munford relied on—a MARC record—to identify any prior art reference. Ex. 2008, 101:9-13. There is no testimony that any POSITA would be familiar with or know how to use MARC records. *Id.*

Petitioner does not rely on any other theory to establish a POSITA would have been able to identify *Jacobsen* as a prior art reference. While indexing may not be the only way to establish a reference is prior art (*Voter Verified, Inc. v. Premier Election Sols., Inc.*, 698 F.3d 1374, 1380 (Fed. Cir. 2012)), it is the only theory advanced by the Petition. Petitioner has thus failed to establish *Jacobsen* was available to a POSITA or is prior art. Ex. 2007, ¶197; Ex. 2008, 101:9-13.

b. Petitioner’s MARC evidence does not establish when
Jacobsen was cataloged in any library

Petitioner relies solely on a form of indexing known as a MARC record to claim that *Jacobsen* was publicly available as of the priority date of the ’249 Patent. But there are a number of reasons why Petitioner’s reliance on a MARC record is

not reliable evidence of public availability.

First, MARC records may be edited after being generated. Ex. 2010, 16:13-74:4; 44:4-9. There is no way to tell whether the MARC record relied upon by Petitioner has ever been edited; and, as it is simply a text file, it cannot be authenticated by Ms. Munford (who did not create it).

Further, new releases of serial journals (like the collection containing *Jacobsen*) are appended to *existing* MARC records without any update indicating when a specific volume (i.e., the one containing *Jacobsen*) was actually received. *Id.*, 19:19-24. There is no evidence that the MARC record Ms. Munford identified was created when the version of the journal that includes *Jacobsen* was received. Ex. 1022 at 53 (entry 008 corresponding to a date (1995) that is different from the alleged date of *Jacobsen* (1994)), 55 (unknown creation date). As such, the creation of the MARC record is not evidence that the version of the journal containing *Jacobsen* was publicly available on the MARC record's creation date.

Absent an additional theory as to why *Jacobsen* constitutes prior art, the Petition's evidence is insufficient.

B. Ground 4

Ground 4 adds the “DSL-Book” to Ground 3's *Amit-Jacobsen* combination. But because the Petition does not rely on the DSL-book of Ground 4 to supply the equalization of Claim 10, and because Ground 3 is insufficient (*supra* Section V.A)

Ground 4 fails for the same reasons the Board found Ground 3 to fail. But Ground 4 also fails for several additional reasons.

1. DSL Book is not analogous art

The Petition fails to prove that DSL-Book is analogous art. “A reference qualifies as prior art for an obviousness determination . . . only when it is analogous to the claimed invention.” *In re Klein*, 647 F.3d 1343, 1348 (Fed. Cir. 2011). An obviousness ground that relies upon non-analogous art fails. *Id.*, at 1352.

“Petitioner bears the burden of showing by a preponderance of evidence that the asserted prior art references are analogous art[.]” *SCHOTT Gemtron Corp. v. SSW Holding Co., Inc.*, IPR2013-00358, Paper 106, 26 (PTAB Aug. 20, 2014). To be analogous, a reference must be either (1) from the same field of endeavor as the patent-at-issue, or (2) be reasonably pertinent to the particular problem with which the inventor of the challenged patent is involved. *In re Clay*, 966 F.2d 656, 658-59 (Fed. Cir. 1992).

Petitioner fails to prove that DSL-Book is analogous to the ’249 Patent under either prong. The ’249 Patent’s field is local area broadband coaxial cable networks, and DSL-Book’s description of simulation/implementation techniques and reference materials for the design and development of wide-area DSL systems is far afield from that. *Infra* Sections V.B.1.a. And whereas the ’249 Patent is directed towards addressing tap port-to-port isolation and providing a suitable signal path for

terminal-to-terminal communications in a coaxial cable wired building, DSL-Book is directed towards the communication of data from a cable office (“CO”) to a subscriber premises over copper telephone lines. *Infra* Section V.B.1.b. DSL-Book is entirely silent with regard to coaxial networks, or any of the coaxial specific problems addressed in the ’249 Patent.

- a. DSL-Book does not fall into the field of endeavor of the ’249 Patent

The ’249 Patent’s field of endeavor—as confirmed by its title, abstract, field of invention, figures, written description, and claims—is local area broadband coaxial cable networks. Ex. 2007, ¶¶151-153.

To discern the field of endeavor, the Federal Circuit has often looked to a patent’s “background of invention” and “field of the invention” sections. *In re Wood*, 599 F.2d 1032, 1036 (CCPA 1979) (determining field of endeavor based on “Background of Invention”); *Airbus*, 941 F.3d at 1381 n. 8 (Fed. Cir. 2019) (“[T]he specification of each reference includes a ‘Field of the Invention’ section that distinctly describes each applicable field of endeavor.”) A patent’s title, claim preamble, and function and structure of the claimed inventions may also bear upon the field of endeavor. *Id.*, at 1380-81 (affirming Board’s finding of field of endeavor based on “the title of the [] patent and the preamble of a ... claim”); *In re Bigio*, 381 F.3d 1320, 1326 (Fed. Cir. 2004).

Each of these traditional sources of identifying a field of endeavor confirms that the '249 Patent's field is local area broadband coaxial cable networks. Ex. 2007, ¶¶105-108, 152-153. The '249 Patent's title concerns "Network Interface Device and *Broadband Local Area Network Using Coaxial Cable*[" Ex. 1001, Title. The abstract notes "*A local area network uses coaxial cable wiring* for interconnection of terminal devices." *Id.*, Abstract. The Background of the '249 Patent similarly focuses on local area broadband coaxial cable networks. *Id.*, 1:20-27, 2:15-21, Fig. 1, Fig. 2. For example, the '249 Patent describes the architecture of local coaxial cable networks and "typical cable TV configuration for a home[" *Id.*, 1:20-27; 1:39-41. The Background further describes issues on traditional LAN systems regarding communication between terminal devices. *Id.*, 2:15-21. The '249 Patent also describes the way terminal devices can communicate on a cable-based LAN. *Id.*, 3:64-4:8; Ex. 2007, ¶152. This is consistent with claims of the '249 Patent, which refer to a "broadband local area network using coaxial cable building wiring" or to elements used in such networks, like "signal splitters." Ex. 1001, Cls. 1, 5; Ex. 2007, ¶153.

Conversely, DSL-Book's field of endeavor covers networks that are of a vastly different scale and use different physical media and architectures. Ex. 2007, ¶¶111-113. DSL-Book is related to "simulation/implementation techniques and reference materials for the design and development of DSL systems." Ex. 1008, 5; Ex. 2007,

¶213. These systems communicate data from a telephone company’s central office to many different subscriber premises over kilometers of twisted pair copper wires using a DSL protocol. Ex. 2009, 15; Ex. 2008, 79:16-80:2; Ex. 2007, ¶103. This network structure and architecture relies on fundamentally different technologies from a local network in a single building over coaxial cable. *Infra* Section V.B.2.a.

The Petition asserts that DSL-Book falls into the field of endeavor of “communication techniques for broadband networks.” Petition, 76. But this description of the field of endeavor is far too broad. In fact, Dr. Acton described broadband as a relative term and was unable to provide criteria regarding if a network is broadband or not. Ex. 2008, 54:8-57:5. Notably, the Petition elsewhere more narrowly defines the field of endeavor of the ’249 Patent as “broadband **coaxial** networks[,]” which DSL-Book would not fall within. Petition, 62.

The Petition’s approach of identifying overly-generic technological overlap (broadband communications technique) has long been rejected. Ex. 2008, 58:11-59:3 (“So you look for mentions of similar technology for, for example, Amit mentions both cable modems and DSL modems, DSL modems in his patent. And if one wanted to know more about DSL modulation, why not look at the DSL-Book.... Or more advanced versions, ADSL/VDSL-Book. So looking for the particular, looking at the problems, looking at the area.”). Under Federal Circuit precedent,

even art with substantial similarities and in the same technological area as the patent-at-issue may not be in the same field. *In re Clay*, 966 F.2d at 657-60.

Clay, the leading analogous art decision, is instructive. *Id.* There, a finding of analogous art was “clearly erroneous” where the patent-at-issue and the allegedly analogous art both related to gels used in the petroleum industry. *Id.* *Clay* confirms the impropriety of overly broad fields of endeavor, such as gels in the petroleum industry. *Id.* at 659 (one had a “field of endeavor [of a gel for] *storage* of refined liquid hydrocarbons” where the other had a “field of endeavor of [a gel for] the *extraction* of crude petroleum,” and finding them different); *Wang Labs., Inc. v. Toshiba Corp.*, 993 F.2d 858, 864-65 (Fed. Cir. 1993) (same analysis for electronics).

The art here more clearly falls in a different field from the '249 Patent than was the case in *Clay*'s petroleum gels. Accordingly, the '249 Patent (local area broadband coaxial cable networks) and DSL-Book (simulation/implementation techniques and reference materials for the design and development of DSL systems) do not share the same field of endeavor. Ex. 2007, ¶213.

b. DSL-Book is not reasonably pertinent to the particular problem of the '249 Problem

DSL-Book is also not analogous art under the second prong of the *Clay* test because it is not reasonably pertinent to the particular problem the inventors of the '249 Patent were trying to solve. The '249 Patent is directed to “the problem of tap

port-to-port isolation and providing a suitable signal path for terminal-to-terminal communication in a coaxial cable wired building.” Ex. 1001, 3:4-7; Ex. 2007, ¶¶110, 155. The ’249 Patent describes a network interface device located at an entry point of coaxial cabling within a building, which intentionally introduces a reflection into the wiring to provide a communication path in a system that otherwise has high isolation between terminal devices. Ex. 1001, 3:59-61; 3:65-4:6; Cl. 1; Cl. 5; Cl. 10.; Ex. 2007, ¶67. Petitioner does not dispute that this is the problem the ’249 Patent addresses. Petition, 29-30; Ex. 1003, ¶105.

DSL-Book is entirely silent with regard to terminal-to-terminal communication in a building, port-to-port isolation, or anything else relevant to the ’249 Patent’s problem. Petition, 77. Instead, the DSL-Book covers the development of DSL technologies to allow communication from a subscriber to a telco headend over a telephone wire. Ex. 2009, 15. There is no evidence that DSL-Book relates to anything reasonably pertinent to the problem of addressing port-to-port isolation between terminal devices and providing a suitable signal path on a LAN. Ex. 2007, ¶214; Ex. 2008, 81:11-83:9, 87:8-23.

In fact, the Petition alleges DSL-Book is pertinent to the ’249 Patent, but irrelevantly states DSL-Book recognizes “[t]he usable bandwidth of a *twisted-pair telephone subscriber loop* is much wider than the voice band telephone channel,” which is irrelevant to the ’249 Patent’s coaxial system. Petition, 77 (quoting Ex.

1008, 8). Not only is this irrelevant to the problem of the '249 Patent, but it is irrelevant to *Amit's* and *Jacobsen's* networks as well.

Dr. Acton's reliance on the '249 Patent's reference to DSL-Book is an attempt to reconstruct the '249 Patent using its specification as a roadmap. A reference's disclosure should be the ***primary focus*** in determining its field of endeavor. *Airbus*, 941 F.3d at 1380. Identification of the pertinent problem is based on the foresight of a POSITA, not the hindsight of an inventor's success. *Id.*, at 1382 (quoting *Sci. Plastic Prods., Inc. v. Biotage AB*, 766 F.3d 1355, 1359 (Fed. Cir. 2014)). The specification references DSL-Book (and ADSL/VDSL) not because they are analogous art but because part of the invention was taking a technology (OFDM) described in unrelated context (DSL) and using it in coaxial LANs. Ex. 2007, ¶150. Absent the '249 Patent's explicit reference, there would be no reason to look to the OFDM teachings. The Petition's reliance on the '249 Patent's own teachings to interpret DSL-Book (or ADSL/VDSL) as analogous is based on improper hindsight, not the relevant disclosure. Ex. 2008, 57:20-58:19.

Therefore, the Petition's Ground 4 fails at least because the DSL-Book is not within the field of endeavor nor addresses a pertinent problem to the '249 Patent.

2. A POSITA would not be motivated to add teachings from DSL-Book to *Amit* and *Jacobsen*

As noted above, Ground 3 is insufficient regarding Claim 10. For those reasons alone, Gound 4 also fails with respect to Claim 10 as DSL-Book is not used to address these shortcomings, and only adds further complexity. Ex. 2007, ¶¶215, 218. However, Ground 4 also fails because a POSITA would not have been motivated to combine DSL-Book with *Amit* or *Jacobsen*.

In the ID, the Board determined that Patent Owner's argument that DSL-Book was not compatible with *Amit* and *Jacobsen* had not been substantiated on the record to date. ID, 41. Patent Owner now provides additional evidence, including the declaration of Mr. Bates and deposition testimony from Petitioner's expert, Dr. Acton, to substantiate this argument.

a. DSL networks are fundamentally different than coaxial cable-based CATV networks

A coaxial cable network, as disclosed in *Amit*, and the twisted pair network of DSL-Book (and ADSL/VDSL for that matter) are fundamentally different networks with different modes of operation. Ex. 2007, ¶¶104-122, 216. Twisted pair cables include two unshielded (and thus inexpensive) copper wires that are twisted together. *Id.*, ¶¶111-112; Ex. 2008, 20:1-13; Ex. 2011, 121. One wire carries the signal, and the other wire carries the inverse of the signal. Ex. 2007, ¶112; Ex. 2008, 20:1-13. In contrast, a coaxial cable provides a single copper core with shielding whose

geometry is precisely controlled at manufacturing. Ex. 2007, ¶107; Ex. 2008, 21:13-24; Ex. 2011, 82. This shielding enables communications at much larger bandwidths. Ex. 2007, ¶107; Ex. 2012; Ex. 2014, 2. The shielding also ensures that coaxial cable is not as susceptible to external noise. Ex. 2007, ¶107.

These differences in physical medium result in significant differences in which communication techniques are appropriate for DSL and cable networks. As one example, DSL-Book confirms that, at the frequencies used by *Amit*'s cable network, significant signal attenuation occurs when using the DSL techniques it describes. Ex. 1008, 14 (indicating a signal attenuation of up to -140dB for frequencies lower than that of *Amit*); Ex. 2001, 10-11 (explaining that above 20 MHz, PSD (Power Spectral Density) drops off quickly); Ex. 2007, ¶113. DSL thus operates at much lower frequencies than the network of *Amit*. Ex. 1005, 8:20-30; Ex. 1008, 5; Ex. 2007, ¶120; Ex. 2014; Ex. 2011, 82.

Due to their significantly lower operating frequencies, twisted pair networks do not exhibit significant negative transmission-line effects, unlike with coaxial cable networks. Ex. 2007, ¶120; Ex. 2011, 94-96, 99-101. The lower transmission frequency of twisted pair wiring also means that twisted pair networks are unable to carry transmissions to multiple users, but instead only provide point-to-point communications. Ex. 2007, ¶113; Ex. 2013, 2:65-67, 3:10-12, 4:44-46.

Additionally, twisted pair wires are more susceptible to far-end reflected noise than coaxial cables. Ex. 2007, ¶¶121-122.

The Petition's arguments improperly rely on phantom "improvements" even where the proposed combination would actually result in a *lower* performance. For example, the Petition asserts "[a] POSITA would have been motivated to improve the bit rate of Amit-Jacobsen's network using DSL-Book's OFDM modulation." Petition, 78. However, a POSITA would have no reason to make such changes because DSL-Book's network exhibits *worse* bit rates than both *Amit* and *Jacobsen*. Ex. 2007, ¶¶162, 219.

In DSL-Book, ADSL transmission throughput was at a rate of 1.544 Mbps in the upstream direction and 16 to 64 kbps in the downstream direction. Ex. 1008, 10; Ex. 2007, ¶220; Ex. 1006, 14 (noting ADSL bit rates of 100-800 kbps upstream and 1-8 Mbps downstream). For carrier service (CSA) range, ADSL provides downstream transmission throughput of 6.176 Mbps. Ex. 1008, 12; Ex. 2007, 220. VDSL synchronous bit rates did not exceed 26 Mbps. Ex. 1006, 14, 17; Ex. 2007, ¶¶164, 220; Ex. 2008, 27:19-28:4.

In contrast, without any modifications, *on a single 6-MHz channel*, *Amit* provided up to 40 Mbps, while *Jacobsen* provided around 80 Mbps. Ex. 1005, 21:21-22; Ex. 1007, 10, 11; Ex. 2007, ¶¶163, 221. Coaxial networks at the time of filing were capable of implementing 125 6-Mhz channels. Ex. 2007, ¶¶163, 221.

Actual performance far exceeded the (inaccurate) coaxial throughputs (1 to 10 Mbps) stated in Dr. Acton's deposition. Ex. 2008, 25:5-20. In this regard, the Petition, and Dr. Acton's opinions regarding improving bit rate are contrary to the evidence. To state the obvious, a POSITA would not look to change *Amit* and *Jacobsen* to improve their bit rate with systems that provided **vastly worse** bit rates. Ex. 2007, ¶¶165, 221.

Further, a desire to improve bit rate or efficiency is the type of generic concern that exists across all systems and thus cannot be the basis for a valid motivation to combine. *ActiveVideo Networks, Inc. v. Verizon Commc'ns, Inc.*, 694 F.3d 1312, 1328 (Fed. Cir. 2012). Reliance on this type of generic basis to make a change to a system, and to a system that already professes to accomplish faster communications than the reference that provides the purported "improvement," is further evidence that Petitioner has simply used the '249 Patent's own disclosures as a roadmap to arrive at the challenged Claims. *TQ Delta, LLC v. Cisco Sys.*, 942 F.3d 1352, 1361 (Fed. Cir. 2019). The Petition's other "motivations" are likewise deficient.

The Petition relies on *Amit*'s lack of interference with VDSL as a basis to combine the two, but this would actually suggest the references should not be combined. Petition, 28-29, 76. *Amit*'s system does not interfere with VDSL simply because it operates on different frequencies and uses different carrier signals on a different medium. As such, *Amit* and DSL systems must be different to preserve the

lack of interference. Ex. 2007, ¶¶166, 222. These differences do not, as the Petition alleges, suggest any reason to combine the two teachings. In fact, *Amit* notes that a prior system called HomePNA *did* interfere with ADSL and VDSL protocols because it “*uses the same medium (phone line) and same frequencies.*” Ex. 1005, 19:18-22; Ex. 2007, ¶¶167, 222. A POSITA would not consider implementing teachings from DSL systems onto *Amit*’s coaxial network, when *Amit* teaches avoidance of DSL technologies and techniques to avoid interference. Ex. 2007, ¶¶167-168, 223. *Amit* provides for an alternative to HomePNA, a network that uses a different frequency band and medium. Ex. 1005, 19:7-22; Ex. 2007, ¶169.

The Petition’s allegations in this Ground are textbook hindsight: ignoring the actual teachings and technical requirements of the various references in favor of conclusory statements driven by a desire to find claimed concepts in the prior art. The POSITA would not have been motivated, in view of the DSL-Book (or ADSL/VDSL), to modify *Amit*. That the Petition suggests otherwise only confirms the Petition is driven by hindsight bias.

C. **Ground 2**

1. ADSL/VDSL is not analogous

For the same reasons the DSL-Book is not analogous art to the ’249 Patent, neither is the Petition’s second DSL-related reference, ADSL/VDSL. Like DSL-Book, ADSL/VDSL’s field of endeavor is not a local area broadband coaxial

network. Ex. 2007, ¶¶111-113, 154. Instead, ADSL/VDSL relates to transporting data over twisted-pair copper telephone wires between a central office and a subscriber location. Ex. 1006, 4, 6; Ex. 2007, ¶154; Ex. 2008, 31:15-32:5, 79:16-80:2. In this vein, ADSL/VDSL states “[t]his book presents in-depth discussions of ADSL and VDSL as well as how networks are designed to use them.” Ex. 1006, 3. The difference in network structure and architecture results in fundamental differences in the technologies that are appropriate for use in each type of network. *Supra* Section V.B.2.a.

The Petition asserts that ADSL/VDSL falls into the field of endeavor of “broadband networks, including the communications protocols of such networks” and “recognize[s] how LANs facilitate communications between nodes within the same building or residences[.]” Petition, 57. As an initial matter, this description of the field of endeavor being broadband networks is overly generic and thus inappropriate for evaluating whether ADSL/VDSL is analogous. Petition, 28. Indeed, the Petition’s articulation of the field of endeavor of the ’249 Patent for Ground 2 is inconsistent with its narrower description used in Ground 3. Petition, 62 (describing the field of endeavor for Ground 3 as “broadband **coaxial** networks”). Further, Dr. Acton himself described “broadband” as a relative term, and provided no meaningful criteria to determine if a network is broadband or not. Ex. 2008, 54:8-

57:5. The Petition’s basis to use a broad description of the ’249 Patent’s field of endeavor to transform ADSL/VDSL into analogous art should be rejected.

The Petition provides no basis to conclude that ADSL/VDSL is reasonably pertinent to the problem solved by the ’249 Patent (port-to-port isolation and providing a suitable signal path for communication between terminal devices in a coaxial cable wired building). ADSL/VDSL does not mention coaxial splitters and therefore provides no teachings relevant to port-to-port isolation. Ex. 2007, ¶¶116-118. Moreover ADSL/VDSL provides no relevant teachings directed towards “terminal-to-terminal communication in a coaxial cable wired building.” Ex. 2007, ¶157; Ex. 2008, 81:11-83:9; 87:8-23. The Petition relies on Dr. Acton’s declaration which notes that ADSL/VDSL recognizes channel and noise conditions change over time. Petition, 30; Ex. 1003, ¶105. But this description does not relate to the problem of port-to-port isolation and providing a suitable signal path for terminal-to-terminal communications. Ex. 2007, ¶156.

In reality, ADSL/VDSL addresses the problem that, despite a desire to implement improved technologies on twisted pair wires of a central office based telephone system, twisted pair wires were never designed to carry high bit rates. Ex. 1006., 6-7; Ex. 2007, ¶157. ADSL/VDSL attempts to solve this problem by providing highspeed access technologies on ordinary telephone lines used to deliver digital content to a home. Ex. 1006, 6; Ex. 2007, ¶157; Ex. 2008, 27:19-23. It was

not, and does not purport to be, directed to allowing communication between devices in a home or building.

Further, as discussed regarding DSL-Book, reference to the '249 Patent's citation to the ADSL/VDSL should not distract the Board from the fact that ADSL/VDSL is not analogous art. *Supra* Section V.B.1.b. Accordingly, Ground 2 fails at least because ADSL/VDSL is not analogous art to the '249 Patent.

2. A POSITA would not be motivated to combine ADSL/VDSL with *Amit*

The Amit-ADSL/VDSL combination is flawed because (1) a POSITA would not combine ADSL/VDSL with *Amit* because the two references involve fundamentally different networks that function in fundamentally different ways (*supra* Sections V.A.2 and V.B.2.a); and (2) a POSITA would have no motivation to incorporate ADSL/VDSL's supposed teaching of equalization into *Amit*, because *Amit* uses an alternative solution to resolve the issue equalization supposedly solves: ISI. *Supra* Section V.A.3. Ex. 2007, ¶¶160, 183, 185. Further, the Petition's stated motivations to combine are insufficient.

The Petition uses selective quotations from *Amit* to manufacture its supposed motivation to combine. For example, the Petition alleges that “there *can* be ‘houses where there is a problem with reflection,’” in the network described in *Amit* such that it allegedly would be obvious to correct those problems with techniques from

ADSL/VDSL. Petition, 30³ (citing Ex. 1005 2:51-53, 20:42-43). The Petition, however, truncates this sentence of *Amit*, which proposes a solution to the problem: “[t]herefore this [transponder] module can be inserted in houses where there is a problem with reflection.” Ex. 1005, 20:42-43. In other words, *Amit* discloses (and details) a module that *eliminates* problems caused by reflection, to the extent such problems exist in homes as noted in Section V.A.3. *Id.*, 19:65-20:43; *Samsung Electronics Co., Ltd. v. Dynamics Inc.*, No. 2021-2352, 2022 WL 3041158 at *4 (Fed. Cir. Aug. 2, 2022) (“[Petitioner] failed to explain why altering either [prior art reference] would improve the functionality over what is disclosed in each reference.”) (internal quotations omitted); *Polaris Indus.*, 391 F.3d at 1068-69 (holding that the Board erred in “focus[ing] on what a skilled artisan would have been *able* to do, rather than what a skilled artisan would have been *motivated* to do.” (citing *InTouch Techs., Inc. v. VGO Commc’ns, Inc.*, 751 F.3d 1327, 1352 (Fed. Cir. 2014))). Any “reflection” problems, to the extent problems, were already addressed by *Amit* and cannot be the basis for additional modification. Ex. 2007, ¶¶177-183.

³ This short citing also appears again at page 63 of the Petition when trying to justify the combination with *Jacobsen*. It similarly fails there.

Similarly, the Petition plucks-out isolated phrases to allege that a POSITA would be motivated to include equalization in *Amit* to efficiently use limited network resources. Petition, 32. For example, the Petition states:

“Amit explains that “frequency resources are limited,” and “[a]n important point is to define this protocol to use limited ‘cable’ resources,” including “limited US (up stream) frequencies” and the fact that, when using “higher frequencies,” “their distance is limited.”

Id. (citing Ex. 1005, 19:32-37). In actuality, the cited passage in *Amit* notes that its system “***should not use the limited US (up stream) frequencies.*** It can use some of the DS (down stream) frequencies or ***higher frequencies (even if their distance is limited).***” Ex. 1005, 19:32-37; Ex. 2007, ¶176. The Petition is thus illogically suggesting that a desire to do something that *Amit* specifically says “should not” be done would be a basis to modify *Amit*. Ex. 2007, ¶185.

Without such hindsight-based mischaracterizations, *Amit* does not suggest adding equalization or other methods to counteract reflections. Ex. 2007, ¶187. Accordingly, the Petition’s motivation to combine ADSL/VDSL with *Amit* is insufficient.

3. The Amit-ADSL/VDSL combination does not teach equalization at terminal devices

The Amit-ADSL/VDSL combination fails for another reason: even if made, it would result in a system where equalization is performed by a network element,

not the terminal device as required by claim 10. As with Ground 4 (*supra* Section V.A.1) the Petition does not explain why or if *Amit*'s terminal devices would even be capable of performing equalization (as is required by Claim 10). (The Petition cites to Ground 1, but Ground 1 of the Petition does not discuss equalization. Petition, 6-26, 51.)

Petitioner relies on the adaptive filters disclosed in ADSL/VDSL as teaching equalization in a terminal device. Petition, 50 (citing Ex. 1006, 48). However, these filters are not implemented in terminal devices, or any devices that *Amit*'s in-premise coaxial network use (which Petitioner identifies as the claimed "terminal devices"). Petitioner provides no basis to support the conclusion that ADSL/VDSL teaches equalization is or even could be performed by, or adaptive filters could be implemented into, any terminal devices. Ex. 2007, ¶186. In fact, CATV systems perform equalization by having the CMTS perform a pre-equalization on the transmission before it is sent to the receiver (e.g., a terminal device). *Id.* There is no evidence that one of *Amit*'s terminal devices would be capable of performing equalization without use of the CMTS. *Id.* The mere allegation that equalization existed in devices used to support a wide-area network at the time of filing does not suggest to a POSITA that a ***terminal device*** in a coaxial LAN could perform such equalization. *Virtek Vision*, 97 F.4th at 886; *Polaris Indus.*, 882 F.3d at 1068 (reversing improper reliance on "what a skilled artisan would have been ***able*** to do,

rather than what a skilled artisan would have been *motivated* to do at the time of the invention.”). *Amit* requires that its system not obsolete existing network devices, and there is no indication that existing terminal devices would be capable of this ADSL/VDSL equalization. Ex. 1005, 18:38-39.

So, the Petition fails to demonstrate that Claim 10 is unpatentable.

VI. DEPENDENT CLAIM 17

Grounds 2-4 were insufficient regarding Claim 10, from which Claim 17 depends, so each ground is also insufficient regarding Claim 17.

Claim 17 further requires the use of time division duplex (“TDD”) and that “the communications are synchronized by broadcasting a beacon message on the network.” Ex. 1001, Cl. 17. Each ground fails to disclose or render obvious this limitation.

A. Ground 3

The *Amit-Jacobsen* combination does not teach or render obvious using a TDD protocol wherein “the communications are synchronized by broadcasting a beacon message on the network.” *Jacobsen* does not disclose a time-based synchronization at all, and *Amit*’s disclosure of “synchronization” is insufficient. Ex. 2007, ¶211.

Amit does not disclose TDD, but rather time division multiplexing (TDM). Ex. 1005, 26:49-52; Ex. 2008, 48:2-7. *Amit*’s Single Home mode—which the

Petition is based on—cannot implement TDM-based communications. *Amit*'s discussion of TDM is regarding the allocation of channels across different home networks, not use of TDM in the home. Ex. 1005, 26:9-11. *Amit* teaches that “If the notch filter exists [] the HomeCN is disconnected from the regional cable network[.]” Ex. 1005, 7:16-19. Meanwhile, TDM “requires synchronization, therefore, it requires CMTS for synchronization.” *Id.*, 26:41-42. *Amit*'s Single Home network is disconnected from the only element that *Amit* discloses as providing the synchronization required to perform TDM (the CMTS). Ex. 2007, ¶145. Therefore, *Amit* does not *simultaneously* disclose a network with a filter (as each independent claim requires) and utilizes TDM. Ex. 2007, ¶95. So, *Amit* does not disclose the use of TDD as claimed.

Amit also does not teach or suggest broadcasting beacon messages. *Amit* notes that TDM requires synchronization by the CMTS but is silent regarding any kind of beacon message. Ex. 1005, 26:41-42. Petitioner argues that a beacon message would be inherent in *Amit*'s system, or that a POSITA would be motivated to include a beacon message, without identifying any disclosure in a reference of Ground 3. Petition, 26. But Petitioner is wrong. For example, TDM may be synchronized by using shared clocks rather than broadcasting a beacon message. Ex. 2007, ¶¶146-147. This confirms that the use of a beacon message is not inherent, and the Petition

presents no argument as to why a POSITA would have been motivated to use this mechanism of synchronization instead of other available choices.

Accordingly, this ground is insufficient regarding Claim 17.

B. Ground 4

As noted *supra* Section VI.A, neither *Amit* nor *Jacobsen* teach using a TDD protocol synchronized by broadcasting a beacon message. Ground 4’s addition of DSL-Book fails to remedy this insufficiency.

As previously noted, *Amit*’s single home embodiment is not capable of TDM or TDD, as the notch filter prevents communications on the LAN to the CMTS. *Supra* Section VI.A. And *Amit* itself indicates that synchronization of TDM must be performed by the CMTS. Ex. 1005, 26:41-42. There is nothing in ADSL/VDSL or the Petition which provides modifications to enable terminal devices in *Amit* to perform this synchronization without intervention from the CMTS.

Amit is also silent regarding the claimed beacon messages. *Supra* Section VI.A. Likewise, DSL-Book is silent regarding beacon messages. The Petition relies solely on DSL-Book’s “pilot tone” for this element. Petition, 85 (citing Ex. 1008, 21). However, these pilot tones do not suggest the claimed beacon messages. Ex. 2007, ¶¶191-192, 224-227.

As noted by Petitioner, a pilot tone “is a *subcarrier* dedicated only or the purpose of timing recovery.” Petition, 85 (quoting Ex. 1008, 22). The pilot tones

are used to synch DMT, and DMT is not necessary for a time-multiplexed, or TDD-based one (indeed, TDD protocols do not necessarily use or suggest the use of subcarriers). Ex. 2007, ¶¶192, 227.

Pilot tones synchronize the clock sources at either ends of a transmission path in DMT communications using a timing recovery circuit. Ex. 1008, 21; Ex. 2007, ¶226; Ex. 1006, 76. In contrast, beacon messages on coaxial cable networks are part of ranging protocols. Ex. 2007, ¶226. As pilot tones and beacon messages are utilized to synchronize different communications protocols differently, pilot tones do not render obvious beacon messages. *Id.*, ¶¶195, 225. Dr. Acton even admits that DMT protocols—which have pilot tones—do not involve using a beacon message. Ex. 2008, 46:25-47:7.

Accordingly, the combination does not reach or render obvious Claim 17.

C. Ground 2

The Amit-ADSL/VDSL combination does not teach or suggest the use of beacon messages as claimed in Claim 7 of the '249 Patent. Ex. 2007, ¶189.

As previously noted, *Amit's* Single Home embodiment is not capable of TDM or TDD. *Supra* Section VI.A; *Id.*, ¶190. There is nothing in ADSL/VDSL or the Petition which provides modifications to terminal devices in *Amit* enabling synchronization without the CMTS.

As described *supra* Section VI.B, pilot tones in DSL are not the same as beacon messages. Further, the Petition alleges pilot tones are associated with synchronous DMT (SDMT), in attempts to allege DMT is a type of TDD. Petition, 53 (“[t]he most popular TDD approach proposed for VDSL is the ***synchronous DMT approach (SDMT)***,”) (citing Ex. 1006, 86). But SDMT is not the same as the referenced DMT with pilot tones.

The discussion of DMT and pilot tones is of a separate protocol than SDMT. Ex. 2007, ¶193. Specifically, the Petition’s discussion of pilot tones cites to Chapter 7 of ADSL/VDSL on “ADSL modulation specifics” while SDMT is described in a different section regarding VDSL. Ex. 1006, 76, 86. SDMT is not synchronized by a pilot tone, instead, when all signals originate from a common optical network terminal (ONU), a common clock is used. Ex. 1006, 88; Ex. 2007, ¶194. When signals do not originate from a common ONU, synchronization is noted as much more difficult and not described in ADSL/VDSL. Ex. 1006, 88. Thus, in ADSL/VDSL, even assuming pilot tones were “beacon message” (which they are not), there is no disclosure of pilot tones being used in SDMT protocol that the Petition claims is a form of TDD. Normal DMT is not a type of TDD. Ex. 2007, ¶192. And, Dr. Acton even admits that DMT protocols do not involve using a beacon message. Ex. 2008, 46:25-47:7.

Accordingly, the Petition's arguments regarding Claims 2, 9, and 17, and all claims depending therein, fail.

VII. DEPENDENT CLAIMS 11-16

Claims 11-16 depend from Claim 10 and are patentable for the reasons set forth above in Section V.

VIII. INDEPENDENT CLAIMS 1 AND 5

Claims 1 and 5 require “at least one of the terminal devices providing frequency bins with more transmit bits which occupy parts of the channel where the signal to noise ratio (SNR) is high.” Ex. 1001, cls. 1, 5. To provide frequency bins requires multicarrier modulation so that those carriers that occupy parts of the channel where SNR is high can be assigned more transmit bits. Ex. 2007, ¶127; Ex. 2008, 51:19-52:5. Claim 5 expressly claims OFDM. Ex. 1001, cl. 5. If a system uses only a single carrier, it is not possible to provide “more transmit bits” in certain “parts of the channel” because the system does not divide the channel into “parts” in this way.

A. Ground 3

The *Amit-Jacobsen* combination would not be made for the reasons outlined in Section V.A. Further, a POSITA would not be motivated to implement multicarrier modulation into *Amit*, and even if they did, the *Amit-Jacobsen* combination does not disclose all limitations of Claims 1 and 5.

1. *Amit* is a single carrier reference

A POSITA would not be motivated to implement multicarrier modulation into *Amit* with a reasonable expectation of success.

It is undisputed that *Amit* does not disclose multicarrier modulation; rather, *Amit* uses a single carrier only. Ex. 1005, 8:30-32, 24:12-67. Ex. 2007, ¶128. This is true even in the Connected Home embodiment. Ex. 1005, 24:15-67 (describing FDM, TDM, and CDM); Ex. 2007, ¶128. It is thus undisputed that *Amit* itself does not disclose either the claimed “frequency bins” of claim 1 or the OFDM of claim 5.

Even when *Amit* discloses single carrier protocols that discuss channel allocations to different homes (FDM, TDM, or CDM), those apply only in the Connected Home embodiment. Ex. 1005, 8:45-49, 26:15-67 (Showing TDM and CDM require CMTS synchronization.). In fact, channels are only described as allocated to different home-networks, not devices on these home networks. *Id.*, 26:1-10.

The Single Home embodiment is incapable of channel allocation protocols, as it is not connected to the CMTS which provides frequency planning and synchronization. *Id.*, 7:16-17; Ex. 2007, ¶130. Further, the Single Home embodiment does not even provide enough bandwidth to accommodate more than one channel, instead, it uses a single frequency channel. Ex. 1005, 8:20-30

(indicating the Single Home operation mode has sufficient frequency range for one channel); Ex. 2007, ¶141.

A POSITA would not be motivated to add multicarrier modulation, as disclosed in *Jacobsen* (or DSL-Book or ADSL/VDSL), to *Amit*. Ex. 2007, ¶136. The Petition provides no evidence that *Amit*'s existing hardware (including the terminal devices, splitters and amplifiers of *Amit*'s already-in-place home network) would be compatible with a multicarrier system itself. *Id.*, ¶139. And it provides no evidence that replacing those systems would have been possible or practical, or maintained *Amit*'s principal goal of operation—providing a “simple” system. *Id.*, ¶140.

On the record presented before institution the Board found there was insufficient evidence that this complexity would outweigh motivations to modify *Amit*. ID, 22. However, as supported by Mr. Bates below, the additional complexity of modifying the hardware of each device in each home to support multicarrier modulation vastly outweighs any benefits that may exist (and which have not been quantified by Dr. Acton or Petitioner in any way). Ex. 2007, ¶¶137-143.

For example, the existing hardware in the Single Home mode was not even capable of basic FDM, which is much simpler than the OFDM required by claim 5. Ex. 1005, 8:47-49. To implement OFDM, additional hardware components would be required. Each terminal device in the network would need the ability to perform

inverse fast Fourier transformations (IFFT) and fast Fourier transformations (FFT) used to multiplex different carrier signals in OFDM. Ex. 1007, 9; Ex. 2007, ¶137. FFT/IFFT operations are highly complex and performing them in real-time on a high-bandwidth signal requires a significant increase in complexity for each terminal device, as taught by *Jacobsen*. Ex. 2007, ¶137; Ex. 1007, 9 (“The penalty for increased FFT/IFFT size is an increase in system complexity”). All frequency planning and synchronization would need to be performed by a terminal device as well, since the Single Home embodiment is disconnected from the regional network. Ex. 1005, 7:16-19. Each terminal device would therefore need to be upgraded or replaced with terminal devices with such functionality. Ex. 2007, ¶137. There is no evidence to support such modification was within the ability of a POSITA. *Id.*, ¶138. The POSITA has experience with coaxial cable networks. *Supra* Section II.B. DOCSIS is a fundamental standard for coaxial cable communications. *Amit* utilizes DOCSIS 1.1. Ex. 1005, 18:65-67, Fig. 18, Fig. 19. DOCSIS did not support OFDM communications until DOCSIS 3.1, in 2013. Ex. 2018, [0003]; Ex. 2007, ¶¶81-82. Such modifications are not consistent with *Amit*’s stated goal of simplicity and the level of skill in the art. Ex. 1005, 18:24-44.

Moreover, OFDM (which the Petition proposes to combine with *Amit*) existed long before *Amit* was filed; yet *Amit*’s goal of maintaining a simple system led it to reject this complicated technology (beyond a POSITA) in favor of simpler single-

carrier systems on already-present terminal devices in the coaxial home network. Ex. 1005, 7:16-22, 18:32, 26:13-14; Ex. 2007, ¶140. Indeed, a hallmark of *Amit* was to use “typical home coaxial cable infrastructure” without obsoleting existing devices. Ex. 1005, 5:51, 18:38-39. Accordingly, *Amit* intentionally selected a simpler approach.

Petitioner fails to acknowledge or consider some drawbacks, difficulties, and/or modifications necessary to implement multicarrier modulation. For instance, E.P. Patent No. 1,065,855 (“Konschak” (Ex. 2015)) illustrates specific timing difficulties in implementing OFDM communications at around the filing date of the ’249 Patent. Ex. 2015, ¶2; Ex. 2007, ¶142. This is just one example of how implementing OFDM techniques onto *Amit*’s LAN would be more complicated than the cursory alternations advocated by the Petition, confirming the Petition fails to sufficiently establish a reasonable expectation of success of the alleged combination. Ex. 1003, ¶¶267, 269 (Dr. Acton’s suggesting that implementing OFDM is “straightforward”); Ex. 2007, ¶143.

Amit’s simple Single Home embodiment operated on a LAN without multicarrier modulation and was intentionally designed for simple use of existing hardware. Given the substantiated challenges of introducing multicarrier modulation from regional network systems, the need to upgrade the existing hardware, and the conflict between the added complexity and *Amit*’s goal of

simplicity, a POSITA would not have been motivated to add multicarrier modulation with a reasonable expectation of success.

2. *Amit* does not teach all claim limitations

The Petition argues in Ground 1 (and references back for Grounds 2 and 3 (Petition, 36 and 67)) that *Amit* teaches a terminal device providing more transmit bits to parts of the channel where SNR is high. Ex. 1001, cls. 1, 5. The Petition addresses this element at pages 20-22, yet in these three pages, fails to identify *any* disclosure in *Amit* of SNR or signal-to-noise ratios, let alone the required claim limitation. Ex. 2007, ¶¶124-125.

Instead, the Petition simply identifies disclosure in *Amit* that states that a modulation method *is* selected (evidently because different modulation schemes can carry different numbers of bits per signal), without regard to how or why. Petition, 21-22 (citing Ex. 1005 at 8:30-39). The mere fact that *a single* modulation scheme is selected for the entire system based on channel conditions and equipment capabilities does not suggest the claimed limitation or that the system in *Amit* even has the capability of doing so. Ex. 2007, ¶126.

Indeed, while the use of different frequency bins requires use of multiple frequencies or carriers, *Amit*'s Single Home embodiment does not even provide for frequency planning or allocation. Complex allocation protocols, like FDM, TDD, or CDM are unavailable in the Single Home embodiment. Ex. 1005, 8:45-49, 26:14-

65. Even in the Connected Home embodiment, FDM is the only protocol described in *Amit* that performs frequency planning. *Id.*, 26:15-65. However, FDM does not vary the number of bits allocated to frequency bins according to *Jacobsen* and Dr. Acton. Ex. 1007, 9-10 (“In contrast to [FDM], multicarrier modulation does not constrain the number of bits per subchannel to be equal for all subchannels”); Ex. 2007, ¶129; Ex. 2008, 119:18-120:11.

3. *Jacobsen* does not cure the deficiency of *Amit*

Jacobsen is silent regarding a terminal device providing frequency bins, as claimed in the '249 Patent. Nothing in *Jacobsen* or the Petition would suggest implementing OFDM/DMT functionalities into a **terminal device** such that it could provide frequency bins. Ex. 2007, ¶¶209-210; Ex. 2008, 115:11-23. Instead, the Petition merely states “Thus, it would have been obvious for *Amit*’s terminal devices to provide frequency bins” without any support beyond *Jacobsen*’s cursory disclosure of multicarrier modulation. As *Jacobsen* is an out-of-home system, a POSITA would have understood that the bit allocation would occur out of the home at either the cable point of origin (v_i of *Jacobsen*) or a localized CMTS or headend. Nothing in *Jacobsen* suggests placing this functionality in a home a terminal device consistent with *Amit*, where the **CMTS** assigns frequency bands in FDM, not a terminal device on a LAN assigning OFDM frequency bins. Ex. 1005, 30:14-15; Ex. 2007, ¶210. Nothing in Dr. Acton’s declaration would suggest configuring

terminal devices to be capable of multicarrier functionality, let alone the complex bit allocation of the claims. Ex. 1003, ¶¶127-134.

Accordingly, the Petition’s argument regarding Claim 1 and 5, and all claims depending thereon fail.

B. Ground 2

Ground 2 fails as ADSL/VDSL is not analogous art, for the reasons outlined *supra* Section V.C and a POSITA would not be motivated to implement multicarrier modulation into *Amit* as described *supra* Section VIII.A.1.

Further, the Petition’s motivations to combine are insufficient. Specifically, the Petition alleges that a “POSITA would have been motivated to improve the bit rate of *Amit*’s network using ADSL/VDSL’s OFDM modulation, which builds upon the FDM and QAM modulation of *Amit*. Petition, 30. As noted above, *Amit*’s system already provided bit rates on a single channel ***greater than*** that of VDSL using OFDM as taught in ADSL/VDSL. *Supra* Section V.B.2.a.

Further, consistent with its attempts to supply a motivation to combine equalization, the Petition mischaracterizes *Amit* with truncated quotes. *Supra* Section V.C.2. The Petition alleges that “*Amit* teaches that the modulation method will change ‘according to the channel conditions.’” Petition, 30. But *Amit* never discloses ***changes*** of modulation method; only that a modulation method ***is*** QSPK, QAM 16, QAM 64 or QAM 256 according to channel conditions and equipment

capabilities. Ex. 1005, at 8:30-32; Ex. 2007, ¶172. This is entirely consistent with a system in which the modulation method is set once, based on static factors like quality and length of the connective cabling or the impact on the channel of connective elements like splitters. Ex. 2007, ¶173. The word “change” in the Petition, which is not part of the quote, is solely attorney characterization, a result of the Petition’s hindsight-driven analysis. Moreover, a POSITA would not look to ADSL/VDSL even if *Amit* described changing modulation schemes according to channel conditions because DSL’s networks face significantly different environments. *Id.*, ¶174.

Moreover, *Amit* provides no description how the modulation method is selected based on hardware capabilities and channel conditions. *Id.*, ¶172. *Amit*’s lack of clarity regarding the very element that the Petition recognizes as a shortcoming of *Amit* underscores the hindsight driven basis Petitioner’s arrive at to challenge each claim, especially given the Petition’s reliance on a fundamentally different system. *Supra*, V.B.2.a.

1. ADSL/VDSL does not disclose “at least one of the terminal devices providing frequency bins”

The Amit-ADSL/VDSL combination does not teach or render obvious “at least one terminal device providing frequency bins” as claimed in Claims 1 and 5. As noted *supra* Section VIII.A.1-VIII.A.2, a POSITA would not be motivated to

modify *Amit* to include multicarrier modulation and *Amit* fails to teach or suggest this limitation. Ex. 2007, ¶159.

ADSL/VDSL is also silent with respect to a terminal device providing frequency bins. Nothing in ADSL/VDSL or the Petition would suggest implementing OFDM/DMT functionalities into a *terminal device* to provide frequency bins. *Id.*, ¶188. This is expected, as ADSL/VDSL is not directed towards communications over a LAN and instead relies on far more complex, out of home equipment, to produce the transmission to the home. *Id.*

Based on *Amit*'s teachings, a POSITA would not be motivated to add OFDM functionality onto the terminal devices of *Amit*, as the Petition alleges. *Amit*'s terminal devices of the Single Home embodiment are not capable of assigning FDM frequency bins and thus could not support OFDM without some other unspecified changes. *Supra* Section VIII.A.3. Nothing in Dr. Acton's declaration would suggest altering or configuring terminal devices to be capable of such functionality in OFDM. Ex. 1003, ¶¶127-134. Further, *Amit*'s FDM frequency allocation process does not render Claim 1 (and similarly, Claim 5) obvious. *Infra* Section VIII.C.

Accordingly, the Petition's argument regarding Claim 1 and 5, and all claims depending therein fail.

C. Ground 1

As described *supra* Section VIII.A.1-VIII.A.2, Ground 1 fails. Ground 1 is also insufficient for the following reasons.

1. A POSITA would not have modified *Amit*

The Petition fails to provide any basis to suggest that a POSITA would have been motivated to add cost or complexity to the teachings of *Amit* by including an ability to provide frequency bins with more transmit bits where the SNR is high as required by Claim 1.

Amit does not describe providing frequency bins based on SNR. In an effort to remedy a lack of disclosure in *Amit*, the Petition alleges that the '249 Patent itself acknowledges it was known to allocate frequency bins with lower SNR to use lower-order constellations. Petition, 22. However, the '249 Patent's discussion of frequency allocation based on SNR is not from the background section where the patent discussed prior art (Ex. 1001, 8:22-29), but rather from the "Detailed Description of the Invention" of the '249 Patent, where the patent discusses the claimed invention.

This passage is not an admission that using OFDM/DMT in a broadband local area network using coaxial cable was known or obvious, but rather a recognition that these techniques existed in some other systems and could be applied in the context of the disclosed invention. There is no evidence in the Petition that, prior to the '249

Patent, these modulation techniques were used in a local-area coaxial network or a POSITA would have thought they could be. “The mere fact that these separate elements existed in the prior art does not provide a reason that a skilled artisan *would* have” arrived at the claimed network. *Virtek Vision*, 97 F.4th at 886; *Polaris Indus.*, 882 F.3d at 1068 (reversing improper reliance on “what a skilled artisan would have been able to do, rather than what a skilled artisan would have been motivated to do at the time of the invention.”). Further, *Amit* expressly states that “[t]he present invention presents a *low cost solution, which is very important* to enable a solution to the mass market” which a POSITA would not modify. Ex. 1005, 17:10-10,18:24-44.

2. The Petition relies on two incompatible embodiments of *Amit*

Amit’s two modes of operation are mutually exclusive, in that a home cannot operate in both without a physical change in hardware present in the network. *Supra* Sections III.A and V.A.2. The Petition relies on the existence of the notch filter in the Single Home embodiment. Petition, 10, 36, 67. However, the Petition simultaneously relies on (insufficient) teachings of the Connected Home embodiment, like frequency allocation. Petition, 21; Ex. 1005, 8:1-2 (“These components do not support frequency selection capability”); Ex. 2007, ¶¶132-135. At no point does the Petition even attempt to allege why these two incompatible

embodiments would or could somehow be combined. *Intel Corp.*, IPR2019-01522, Paper 66 at 24-25; *Virtek Vision*, 97 F.4th at 886. Accordingly, Ground 1 fails.

IX. CLAIMS 2 AND 9

Claims 2 and 9 depend from Claims 1 and 5 respectively, so each are patentable for the reasons set forth above in Section VIII and Section VI, Grounds 1-4.⁴

X. CLAIMS 3-4 AND 6-8

Claims 3-4 depend from Claim 1 and Claims 6-8 depend from Claim 5, each respective set of dependent claims are patentable for the reasons set forth above in Section VIII.

XI. CONCLUSION

For the reasons set forth above, the patentability of all claims of the '249 Patent should be upheld.

⁴ Patent Owner did not explicitly address Ground 1 regarding Claim 17. However, Petitioner relied only on *Amit* for Ground 3 Claim 17. Accordingly, Patent Owner's argument address the substance of Ground 1 regarding Claim 2.

Dated: November 1, 2024

Respectfully submitted,

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

The undersigned hereby certifies that the foregoing contains 13,976 words according to the word count of the word-processing software used to prepare the foregoing.

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CERTIFICATE OF SERVICE

I hereby certify that on November 1, 2024, a true and correct copy of the foregoing was caused to be served on the following counsel of record for Petitioner by electronic mail at the following addresses:

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