

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 SUR-REPLY

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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 vided 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”)
Ex. 2019	Deposition Transcript of Scott Acton (March 4, 2025)
Ex. 2020	Deposition Transcript of June Ann Munford (February 20, 2025)

I. INTRODUCTION

Petitioner's Reply simply aggregates discrete teachings in newly submitted references and alleges that a specific combination of technologies—the combination first recognized and patented in the '249 Patent—is obvious. The Reply doubles-down on inaccurate interpretations of *Amit*, the primary reference for all four Grounds. *Amit* teaches that the operation mode (Single Home mode or Connected Home mode) is “determined according to the existence/not existence of the notch filter at the home entrance” which the Reply does not dispute. Ex. 1005, 7:12-14. The Reply argues the home is not disconnected from the regional network despite *Amit* teaching “[i]f the notch filter exists in the HomeCN, [it] is disconnected from the regional cable network[.]” *Id.*, 7:16-18. Further, the Reply not only continues reliance on non-analogous art, but also provides 14 new references, all purporting to teach disparate elements of the claims without any analysis rooted in the Grounds of the Petition.

II. LEVEL OF SKILL IN THE ART

The Reply improperly incorporates by reference a three page, eleven paragraph argument from Dr. Acton's supplemental declaration regarding the level of ordinary skill in this proceeding. Petitioner's Reply (Paper 27), 2 (citing Ex. 1030, ¶¶7-18) (“Reply”); 37 CFR § 42.6(a)(3). The Reply itself provides no basis to support an alternative level of skill in the art, but instead irrelevantly argues certain

techniques were independently known without regard to the '249 Patent. *Id.*, 1-3. A POSITA would have a bachelor's degree in electrical engineering, or a related field, and a minimum of two to three years of experience in development and design of broadband networks over coaxial cables. *See* Patent Owner Response (Paper 17), 5-6 ("POR"); Ex. 2007, ¶¶55-62. As Dr. Acton's opinions do not adequately consider the differences in mediums and network architecture, they should be afforded limited weight.

Even if the Reply's incorporation of Dr. Acton's opinions is proper, the opinion that "it makes little sense to limit the requirements of a POSITA" to include coaxial cable-based experience is without support, and completely at odds with the '249 Patent. Ex. 1030, ¶14. Even Dr. Acton agrees his proposed level of skill in the art is "unbelievably broad[.]" Ex. 2019, 36:4-6. Based on his definition, someone would be a POSITA without any experience with coaxial networks, despite the plain coaxial limitations of the '249 Patent. *Id.*, 33:16-34-17. Dr. Acton does not provide a single reference to the '249 Patent when opining on the level of skill in the art. Ex. 1030, ¶¶7-18. Indeed, his position is unsupported by the '249 Patent which includes numerous instances of specifically addressing coaxial networks. Ex. 1001, Title, Abstract, 1:20-24; 3:4-7; cls. 1 ("at least one signal splitter"), 5, 10.

Dr. Acton points to his experience of 10BASE5 to establish his experience with broadband coaxial networks. Ex. 1030, ¶15. However, Dr. Acton does not

dispute that the BASE in 10BASE5 is a reference to baseband, not broadband, networking. Ex. 2019, 15:5-17. This is further evidence of the Petition's and Reply's indiscriminate reliance on "communication techniques" to challenge the claims without consideration of the '249 Patent.

III. PATENT OWNER DOES NOT MISREAD *AMIT*'S TEACHINGS

The Reply incorrectly alleges Patent Owner misunderstands *Amit*, underscoring the fundamental flaws of the petitioned Grounds. Reply, 3. *Amit* plainly states that the operation mode of the HomeCN is determined by the existence or absence of a notch filter at a home entrance, and when the notch filter is present, the HomeCN is disconnected from the regional cable network. Ex. 1005, 7:12-14, 7:16-19. *Amit* provides no disclosure of a multicarrier modulation scheme. Ex. 1005.

A. *Amit* provides incompatible embodiments

Petitioner misinterprets *Amit* as teaching two modes of operation (the Connected Home mode and the Single Home mode) both including a notch filter in the Home network. Reply, 3-4. This interpretation ignores express teachings in *Amit* that the HomeCN system disclosed in *Amit* includes two mutually exclusive embodiments that "are determined according to the existence/not existence of the notch filter at the home entrance." Ex. 1005, 7:12-14.

Amit refers to its system as the Home Cable Network (HomeCN). Ex. 1005, 2:56-58. The HomeCN includes different embodiments, which *Amit* refers to as “modes”. HomeCN includes a Connected Home mode and a Single Home mode, two separate, incompatible embodiments. See POR, 10-13. The teachings of *Amit* cannot be relied on indiscriminately without consideration of the different embodiments in play, and why a POSITA would be motivated to combine them. *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 in the separate embodiments”).

The Single Home operation mode *requires* a notch filter and the Connected Home operation mode *requires* the absence of a notch filter. Ex. 1005, 7:25-35; Ex. 2007, ¶¶92-94, 131-135. Arguing *Amit*’s HomeCN operation mode is not determined according to “the existence/not existence of a notch filter at the home entrance” ignores *Amit*’s express teachings. Ex. 1005, 7:12-14.

Differentiation of *Amit*’s HomeCN operation mode based on the existence of the notch filter is consistent with the depiction of the HomeCN with an optional notch filter in Fig. 2, as the presence of the optional notch filter determines the operational mode. *Id.*, 7:12-14 (referencing the notch filter, 202). If both operation modes (Connected Home and Single Home) could utilize a notch filter, as the Reply

argues, the modes would not be “determined according to the existence/not existence of the notch filter at the home entrance,” as *Amit* states. *Id.*, 7:12-14.

Further, Petitioner is wrong that *Amit*’s two modes can be combined because the notch filter “does not disconnect the home altogether” from the regional network. Reply at 4-5. As *Amit* itself makes clear, the HomeCN is disconnected from the regional cable network in the Single Home mode while the Connected Home mode is only recommended if managed by the CMTS of the regional network. *Id.*, 7:16-19, 7:51-52; Ex. 2007, ¶93. The Reply’s argument that the Connected Home and Single Home embodiments are not incompatible is inconsistent with the plain language of *Amit*. Ex. 1005, 7:12-14.

Moreover, whether some part of “the home” unrelated to the HomeCN, such as a conventional cable TV connection, could remain connected to the regional network if the notch filter is present, has nothing to do with whether the network of *Amit*, the HomeCN, has the characteristics of the ’249 Patent. When in place, the notch filter blocks certain frequencies from entering or exiting the home, thereby preventing the home networking devices from communicating with anything outside the HomeCN (the home network). Ex. 1029, 170:16-18. When the HomeCN is disconnected from the regional network, control signals from the CMTS are blocked from entering the home, such that the HomeCN cannot rely on the CMTS to perform its network management functions. Ex. 1005, 8:47-49.

B. Amit only describes single carrier modulation.

Claims 1 and 5 require multicarrier modulation. Ex. 1001, cl.1; cl. 5; *see* POR, 56; Ex. 2007, ¶127; Ex. 2008, 51:19-52:5. The Reply appears to improperly conflate multichannel communication with multicarrier communications. Reply, 5. Multichannel communications are not multicarrier communications. Multichannel communications use different frequency channels as independent communication channels. Meanwhile, multicarrier communications uses multiple subcarrier to provide communications of a single channel. Ex. 1006, 28 (“the idea of using different frequencies to transmit information is not unique to DMT. Televisions and radio have readily employed such techniques. The difference here is that DMT has a ‘receiver’ tuned to all of the channels at once, whereas the others typically tune to only one channel.”). Petitioner’s expert agrees. Ex. 2019, 17:11-15.

Petitioner relies on use of FDM as evidence of multicarrier modulation alleging OFDM is based on FDM. Reply, 5. While OFDM builds on FDM, (because it adds orthogonality), FDM is not a type of multicarrier modulation. Ex. 1029, 156:24-157:1; Ex. 2007, ¶¶128-129. Importantly, FDM is not even possible in *Amit* when in single home operation mode. *See e.g.*, POR, 52; Ex. 1005, 8:45-46; Ex. 2007, ¶130. The Reply fails to point to a single known protocol mentioned in *Amit* that is a multicarrier modulation protocol and fails to allege, thereby seemingly

admitting that *Amit* does not teach frequency bins with more transmit bits which occupy parts of the channel where the signal to noise ratio (SNR) is high as with Claims 1 and 5. POR, 52, 56-57; Ex. 2007, ¶129; Ex. 1007, 9-10.

IV. ADSL/VDSL AND DSL-BOOK ARE NOT ANALOGOUS ART

Whether prior art is analogous is determined with “the foresight of a person of ordinary skill, not with the hindsight of the inventor’s successful achievement.” *See Sci. Plastic Prod., Inc. v. Biotage AB*, 766 F.3d 1355, 1359 (Fed. Cir. 2014). The Reply puts forward no legal evidence to support its contention that “PO’s assertion that ADSL/VDSL and DSL-Book are non-analogous art is belied by the ’249 Patent citing these references as pertinent.” Reply, 2-3. In fact, Petitioner’s continued reliance on the ’249 Patent’s citations illustrates Petitioner’s reliance on hindsight of the inventor’s successful achievement rather than the foresight of a POSITA. The fact that the inventor saw value in and cited nonanalogous references does not make the references analogous art.

A. Neither ADSL/VDSL or DSL-Book Fall in the Field of Endeavor of the ’249 Patent

The ’249 Patent’s technical field is local area broadband coaxial cable networks. Ex. 1001, Title. The Reply argues that this field is overly limited as the technical field section of the ’249 Patent states “broadband communication networks and specifically to network interface devices and network wiring” and proposes the

field of endeavor as “communication techniques for broadband networks.” Reply, 14 (citing Ex. 1001, 1:14-16).

However, the Petition confirmed that the proper field of endeavor of the ’249 Patent includes a coaxial limitation. Petition, 62 (“broadband **coaxial** networks and the techniques for communicating in such networks.”);¹ Ex. 1003, ¶252. The Reply relies on the ’249 Patent’s technical field section but proposes too broad of a field of endeavor. The Reply’s proposed field includes no reference to network interface devices nor network wiring described by the ’249 Patent and instead broadly includes technologies far afield of the ’249 Patent, like wireless communication networks (e.g., cellular networks).

Petitioner does not dispute the independent claims are limited to local coaxial networks. Ex. 1001, cls. 1, 5, 10; Ex. 2007, ¶¶61, 100, 103, 116-117, 118, 153. The additional disclosures of the ’249 Patent confirm this. Ex. 1001, 1:14-16; POR, 30 (citing Ex. 1001, Title, Abstract, 1:20-27, 1:39-41, 2:15-21, 3:64-4:8 Fig. 1, Fig. 2; Ex. 2007, ¶¶105-108, 152-153).

The Reply provides no argument why the field should not be limited to LANs. Reply 14-15. Indeed, to the extent relevant, the prior art addressed in the background section of the ’249 Patent quoted in the Reply relate to home network technologies,

¹ Emphasis is added unless otherwise noted.

or technologies traditionally used in LANs, like ethernet. *Id.* (citing Ex. 1001, 2:50-67).

Whether the '249 Patent's field of endeavor is taken to be broadband coaxial cable LANs, or just coaxial LANs, both ADSL/VDSL and DSL-Book are not of the same field of endeavor as the '249 Patent. DSL-Book discusses neither (1) coaxial networks or (2) LANs. Both books describe DSL technology that relates to networks that use twisted copper telephone lines, not cables. Ex. 2009, 27; Ex. 1006, 3-4. And DSL networks, such as those described in the books, are admittedly wide-area, long-range networks, not local networks or LANs. *Id.*

The brief mention of cable modems in the text of ADSL/VDSL is taken out of context and in no way supports a conclusion that ADSL/VDSL is in the field of coaxial networks. Ex. 1006, 15, Ex. 2017, 29 (citing same page of ADSL/VDSL). Indeed, ADSL/VDSL references "coax" in the context of a different technology that "traditionally has not been used" for the purposes to which DSL is put: "***the upstream direction from the subscriber back to the coax distribution point traditionally has not been used to transfer information*** and, in many areas, ***does not support transmission***. Reconditioning the infrastructure to support upstream transmission is costly and time consuming, and deployment in a geographical area cannot be done until the entire infrastructure in that area is upgraded." Ex. 2017, 29-30.

B. Neither ADSL/VDSL nor DSL-Book are Reasonably Pertinent to a Particular Problem Solved by the '249 Patent

The particular problem of the '249 Patent is clear: “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. This problem results from “the tap port isolation of splitters used in a typical cable TV distribution configuration” which “presents a problem to shared usage of the cable for a LAN system.” *Id.*, 2:39-41. The Reply does not dispute that ADSL/VDSL is not reasonably pertinent to this problem. Reply, 19-20.

The Reply relies on inapplicable quotes of DSL-Book, which do not support a conclusion that DSL-Book is pertinent to the problem the '249 Patent solves. *Id.*, 15-16. For example, the fact that “the usable bandwidth of a *twisted-pair telephone* subscriber loop is much wider than the voice band telephony channel,” and “the channel distortion is also much more severe for using the full available bandwidth” does not address the problem of terminal-to-terminal communication across splitters in a building, which the '249 Patent is directed to. *Id.*, 15 (citing Ex. 1008, 8).

The Reply presents no evidence that these isolated quotes are pertinent to the particular problem of the '249 Patent. Nor could they be. In the '249 Patent terminal devices are “cable converter boxes, televisions, and cable modems, generally referred to customer premise equipment.” Ex. 1001, 1:27-31. So, the '249 Patent's

reference to “the signal path for terminal-to-terminal communication in a coaxial cable wired building” refers to communications between devices in the same building as shown in Fig. 2. *Id.*, 3:4-7. The quoted portions of DSL-Book do not refer to a signal path of transmission in a building and they do not say anything about overcoming the obstacles to endpoint-to-endpoint communication posed by splitters with a network’s wiring. Ex. 1008, 8 (“telephone subscriber loop”). At best, they look to limit signal distortions on an entirely different type of network, which does not concern the tap port isolation associated with splitters. Ex. 1001, 2:39-41.

Notably, coaxial splitter and the splitters described in ADSL/VDSL and DSL-Book are fundamentally different. Coaxial splitters receive an input signal and provide two identical output signals that are transmitted to different branches of the network. Ex. 2019, 44:17-45:18. DSL splitters, with their associated filters, receive an input signal and separate the telephone spectrum from the data spectrum. *Id.*, 45:22-46:16, 47:16-48:5.

As ADSL/VDSL and DSL-Book do not fall in the same field of endeavor as the ’249 Patent and are not reasonably pertinent to the particular problem of the ’249 Patent, neither are analogous art.

V. THE PETITION FAILS TO ESTABLISH JACOBSEN IS PRIOR ART

The Reply improperly incorporates by reference seven pages of argument from Ms. Munford’s declaration. 37 CFR § 1.57. However, neither the Reply, nor

Ms. Munford, have any evidence that *a POSITA* would have been able to identify and locate *Jacobsen*. *Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1348 (Fed. Cir. 2016); POR, 24-27. Petitioner fails to rebut any argument in the POR, and the testimony of Ms. Munford confirms: (1) MARC records are editable and cannot be the basis of public availability in a library for a serial publication as a “MARC record does not tell us explicitly when a given issue of the periodical is made available” (Ex. 2020, 22:7-21, 25:23-26:7, 23:17-26:19); and (2) she did not, and cannot, offer an opinion from the perspective of a POSITA, as she is wholly unaware of what that means in this proceeding (*id.*, 10:5-8, 10:13-22). Finally, contrary to Petitioner’s argument, an awareness of Dr. Jacobsen the person does not establish that the specific reference Petitioner relies upon is prior art. Reply at 13.

Petitioner has not carried its burden on establishing *Jacobsen* as prior art.

VI. INDEPENDENT CLAIM 10

A. Ground 3

1. *Jacobsen’s teachings do not motivate adding equalization to Amit’s terminal devices.*

As noted in the ID, “Jacobsen teaches that multicarrier modulation performs better than single carrier modulation with equalization at least by some measure under some circumstances” and “[a]ccordingly... Petitioner has not shown a reasonable likelihood that claim 10 would have been obvious over the combination of Amit and Jacobsen.” ID, 38-39. The Reply does nothing to disturb this finding.

The very purpose of *Jacobsen* was to “present a comparison between the performance of single-carrier modulation with equalization and multicarrier modulation on simulated cable television (CATV) channels.” Ex. 1007, 8. *Jacobsen* teaches “discrete multitone modulation is more computationally efficient than single-carrier modulation with equalization for the transmission of digital data over CATV channels with rippled passbands.” *Id.*, 15. Based on the plain reading of *Jacobsen* a POSITA would not implement equalization because multitone modulation had better performance. Indeed, for single carrier modulation with equalization to achieve data rates of a multicarrier system “a receiver would need an equalizer with a **prohibitive** number of taps.” *Id.*, 14; Ex. 2019, 22:12-23:19.

Allegations that *Jacobsen* teaches or suggests using multicarrier modulation with equalization are not supported. *See* Ex. 1007, 10 (“no equalizer is required in the multicarrier receiver”). Although the Reply cites to a single, out-of-context footnote in *Jacobsen*, a prior art reference must be considered in its entirety. *Artic Cat Inc. v. Bombardier Rec. Prods.*, 876 F.3d 1350, 1360 (Fed. Cir. 2017) (“It is an error to fail to consider the entirety of the art”).

As discussed extensively above and in Patent Owner’s Response, (*see* 17-20), the purpose and findings of *Jacobsen* is that one would use multicarrier signals rather than single carrier with equalization. The footnote cited by Petitioner does not change this conclusion. Rather than suggest *Jacobsen* does not teach using

equalization to reduce the cyclic prefix length, *Jacobsen* explains that a detailed discussion of equalization is “beyond the scope of this paper.” Ex. 1007, fn. 4. Beyond this, *Jacobsen* merely notes the theoretical possibility that some systems “**could** use a smaller FFT size...by implementing a time-domain equalizer (TEQ)...in exchange for an **increase in system complexity**.” *Id.* There is no other discussion of using TEQ with a multicarrier system in *Jacobsen*, or any evidence that it would be preferred.

The Reply’s reliance on *Winner Int’l Royalty Corp.* proves Patent Owner’s point: as *Winner* explained, in the very footnote cited, “the benefits, both lost and gained, should be weighed against one another.” *Winner Int’l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349, n.8, (Fed. Cir. 2000) (affirming nonobvious decision because “the district court did not clearly err in finding that one of ordinary skill in the art would not have reasonably elected trading [one] benefit [for another].”). Here, as noted above, the analysis presented in *Jacobsen* performed this “weighing” and concluded that the use of equalization was not worth it.

Petitioner is also wrong to suggest that Patent Owner’s expert conceded that “a system designer would look to equalization in any network that is experiencing reflections.” Reply at 7. Patent Owner’s expert did not *disagree* that a designer may *look to* equalization in a network that is experiencing reflections when asked. Ex. 1029, 32:15-17, 33:3-25. This is, however, not a basis to go in a direction contrary

to *Jacobson's* actual findings. Neither Petitioner, Petitioner's expert, nor Mr. Bates dispute the findings of *Jacobsen*, that equalization with single carrier modulation was less efficient than multicarrier modulation. *Id.*, 204:10-11; Ex. 1030, ¶18; Reply, 25 (citing Ex. 1007, 13).

Further, Petitioner and its expert improperly rely on newly submitted Ex. 1032, *Czylwik*, which provides teachings inconsistent with Petitioner's selected reference *Jacobsen*. Reply, 7 (citing Ex. 1032 ¶¶16-24 ("The Czylwik paper proposed using frequency domain equalization with single carrier modulation and concluded that 'single carrier modulation with FDE and OFDM exhibit approximately the same complexity.'")).

Rather than substantiate a motivation to combine *Amit* and *Jacobsen*, references to *Czylwik*, as with many other references, shows, at most, that certain techniques were independently available, not that the claimed combination is obvious. Ex. 2019, 26:8-15 ("but what I would also say that you're talking about two conference papers out of a body of thousands of such papers, and there's so many different scenarios and so many different setups. Of course we could get into the weeds and figure out what's different about *Jacobsen* and what's different about *Czylwik*"). Reliance on *Czylwik* highlights Petitioner's reoccurring attempts to

allege certain techniques were *independently known*, not that the '249 Patent was *obvious*.²

2. A POSITA Would Not be Motivated to Modify *Amit* Based on Signal Interference

The Reply alleges that Patent Owner “cherry-picks statements from an embodiment that the Petition’s combination does not rely on.” Reply, 11. However, it is the Petition that cites to *Amit*’s section on the two-frequency mode and argues a POSITA would be motivated to modify *Amit* with *Jacobsen* because “there [allegedly] can be ‘houses where there is a problem with reflection.’” Petition, 63 (citing Ex. 1005, 20:42-43). The Petition’s reliance on this statement ignores its context, in which *Amit* concludes that the two-frequency mode is the solution to any ISI that may arise in the system: “Therefore this module [the transponder module in the two-frequency mode] can be inserted in houses where there is a problem with reflection.” Ex. 1005, 20:42-43. Petitioner cites to the *very reflection problem* the two-frequency mode solves and alleges both (1) that a POSITA would not use the two-frequency mode because it solves a *different reflection problem* (Reply, 11-

² *Czylwik* is also directed towards “broadband *mobile radio* applications” rather than a coaxial LAN, yet again an example of Petitioner’s attempt to paper the record with as many disparate teachings as possible. Ex. 1032, Abstract; Ex. 2019, 24:25-26:5.

13), and (2) that this problem would motivate an *Amit-Jacobsen* combination (Petition, 63 (citing Ex. 1005, 20:42-43). Apart from a generic reference to “different approach[es] to reflections,” Petitioner never explains why a POSITA would look to a solution other than the one specifically disclosed in *Amit* to address ISI caused by reflections. This is because it cannot: the two-frequency mode obviates a POSITA’s alleged motivation to rely on *Jacobson*.

The Reply cannot credibly argue that a POSITA would not consider the two-frequency mode because this mode “contains **no notch filter**” (Reply, 12 (emphasis in original)) while simultaneously relying on disclosures of the Connected Home which “does not require a Notch Filter.” Ex. 1005, 7:29-30. The two-frequency mode also relies on very similar principles of operation despite replacing the notch filter with a transponder module. Ex. 2007, ¶¶180-183. With the transponder, a terminal device transmits the upstream signal, the transponder receives the upstream signal and transmits a corresponding downstream signal on a different frequency, and the downstream signal is received by a second terminal device. Ex. 1005, 20:26-31; Ex. 2007, ¶98. Likewise, a signal from a device can be reflected by the notch and used as a main signal. Ex. 1005, 13:55-14:6. A POSITA would not be discouraged from using the transponder instead of, or in combination with, the notch filter. Petitioner’s expert himself does not agree with Petitioner that “a

POSITA...would not look to Amit’s ‘two-frequency mode,’” but instead states they could be implemented with the notch filter. *Cf.* Reply, 12; Ex. 2019, 44:8-14.

Further, the Reply argues that *Jacobsen* contradicts Patent Owner’s position regarding that devices within a building would not face the same levels of interference from external signal. Reply, 11. However, *Jacobsen* does not describe communications over a LAN, so reference to inference on devices described in *Jacobsen* are not indicative to performance of devices inside a building on *Amit*’s LAN. *See*, POR 20-21.

B. Ground 4

A POSITA would not be motivated to combine *Amit*, *Jacobsen* and DSL-Book at least for the reasons restated *supra* Section VI.A. The Reply also fails to explain why a POSITA would look to improve *Amit* and *Jacobsen*’s bit rate performance (Petition, 78) when DSL-Book provides lower bit rate performance (an un rebutted point from the POR). Ex. 2007, ¶¶219-221.

C. Ground 2

1. The Reply provides insufficient motivation to combine *Amit* and ADLS/VDSL

The Reply alleges that a POSITA would not consider using *Amit*’s two-frequency mode configuration but would instead incorporate a different and unrelated reference to address alleged reflection issues in *Amit*. Reply at 11-13, 20.

However, the Petition expressly relies on teachings from the two-frequency mode in its arguments for motivation to combine, and its arguments relating to Claim 10. Petition, 30, 51. For the reasons a POSITA would look to the two-frequency mode instead of modifications from *Jacobson* outlined *supra* Section VI.A.2, a POSITA would similarly not implement teachings from ADSL/VDSL to address the same, already solved “problem”.

2. ADSL/VDSL does not teach terminal device equalization

The Reply cites to a description of equalization with respect to *voice-band* modems in ADSL/VDSL, but references disclosure of a *DOCSIS cable* modem in *Amit*. Reply, 20-21 (citing Ex. 1005, 6:14-23; Ex. 1006, 48). Petitioner has not presented evidence that *Amit*’s terminal devices would be capable of equalization or that a POSITA would have modified those devices. *See* Ex. 1029, 201:6-9.

VII. DEPENDENT CLAIM 17

Claim 17 requires synchronization of at least one channel between terminal devices on a LAN using TDD by broadcasting a beacon message. For each Ground, the Reply either alleges that use of a beacon message “was known” in isolation to

any of the references used in the Ground,³ or relies on a use of pilot tones, a different technique used in a different protocol, without providing evidence to the Board or relying on the references used in Grounds 1-4.

A. Ground 3

Amit does not disclose use of TDD between terminal devices on a LAN (a fact the Reply does not dispute). Reply, 21-22. Instead, the Reply broadly draws upon use of **TDM** on a regional network (with no disclosure of a beacon message) and alleges that such teachings would be obvious without providing any motivation for why such teachings (even if sufficient) would be applied to a LAN. TDM does not anticipate TDD. TDD is a duplexing technique where two transmitters on a channel take turns communicating between each other, while TDM is a multiplexing technique where a channel is divided into multiple time slots (e.g., 24) where several parties can communicate simultaneously. Ex. 1029, 17:7-18:8, 88:4-25.

The Reply admits TDM does not anticipate TDD by distinguishing synchronization techniques of TDM and TDD referenced by PO's expert. Reply, 21 ("Indeed, Mr. Bates could not name an alternative synchronization scheme for

³ The Reply references Gibbs to allege prior use of a beacon message. Irrespective of whether such reliance is proper, Gibbs is not presented as an exhibit. Also, tellingly, Gibbs (U.S. Patent No. 5,889,765) does not include the word "beacon."

TDD—only T1 TDM.”). The Reply’s own differentiation of TDD and TDM is instructive. *See id.* Accordingly, there is no evidence that this limitation is taught by *Amit*.

B. Ground 4

Pilot tones are not beacon messages. Ex. 2007, ¶¶191-196, 224-227. The Reply does not dispute that a pilot tone is used to synchronize DMT communications, whereas the claimed beacon message is used to synchronize TDD communications. *See* Reply 22; Ex. 1008, 21-22; Ex. 1001, cl. 17. For this reason alone, the art of Ground 4 fails to render obvious claim 17. Ex. 1001, cl. 17.

Specifically, “[a] pilot tone is a dedicated subcarrier only for the purpose of timing recovery.” Ex. 1008, 22. This subcarrier is continuously transmitted during communications along with the other subcarriers or tones. *Id.*, 21. In contrast, a beacon message is not continuous, it is a discrete message that is “broadcast on the network.” Ex. 1001, 6:44-45. In addition to providing a common time reference to the users, a beacon message “can include other network management information.” *Id.*, 6:46-48. It is not “only for the purpose of timing recovery.” Ex. 1008, 22. Unlike a pilot tone which requires multicarrier DMT modulation (because it is a dedicated subcarrier) a beacon message may be used in single carrier communications. Ex. 2007, ¶227.

C. Ground 2

A pilot tone is not a beacon message. *Supra* Section VII.B The Reply also errs with respect to Ground 2 by relying on different telecommunication standards indiscriminately. Reply 23. SDMT is not described as performing synchronization through pilot tones (even if pilot tones were sufficient to render obvious beacon messages, which they are not). The only synchronization of SDMT described in ADSL/VDSL is use of a common clock. Ex. 1006, 86. There is no disclosure of use of pilot tones with SDMT in ADSL/VDSL. *Id.* There is nothing more than conclusory statements to support that a POSITA would understand that when “frame synchronization is much more difficult” that a pilot tone would be used. *Id.*; Ex. 1030, ¶¶51-52.

VIII. DEPENDENT CLAIMS 11-16

Claims 11-16 are not obvious for the same reasons described *supra* Section VII.

IX. CLAIM 1 AND 5

Claim 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. A system is unable to perform this limitation if it provides only single carrier modulation, because it does

not divide the channel into different “parts” where “more transmit bits... occupy parts of the channel.” *Id.*

A. Ground 3

Claims 1 and 5 both require “the terminal device providing frequency bins” in relation to SNR. As Petitioner’s expert admits, this process requires multicarrier modulation. Ex. 2007, 51:23-52:9. *Amit* only discloses single carrier modulation (*see supra* Section III.B) and fails to teach this limitation. The Reply’s argument that *Amit* provides frequency bins with more transmit bits where SNR is high is without evidence from *Amit*. Reply, 26. *Amit* also does not teach changing or adjusting the modulation scheme based on signal to noise ratio. *Cf.* Ex. 1005, 8:30-32 (“The modulation method *is* QPSK, QAM 16, QAM 64, or QAM 256 according to the channel conditions, and according to the equipment capabilities.”).

Jacobsen is also silent regarding a terminal device providing frequency bins. *Jacobsen* is an out-of-home system, so any bit allocation performed in *Jacobsen* would occur out of the home at either cable point of origin (v_i of *Jacobsen*) or at the localized CMTS or headend. Ex. 1006, Fig. 2; Ex. 2007, ¶¶208-210. *Jacobsen* does not identify or describe the functionality of the terminal devices as that term is used in the ’249 Patent.

Further, to import multicarrier capabilities into *Amit*, FFT/IFFT operation would be required, which would increase terminal device complexity. While the

Reply is correct that Mr. Bates considered if a typical end user would be capable of implementing the necessary changes to provide multicarrier modulation (Reply, 24-25), this is because the addition of the filter needed to enable in-home networking in *Amit* is specifically designed to be implemented by the end user. Ex. 1005, 13:34-36 (“Adding a filter at the flat/single user home entrance. The advantage of this method is the ability of the end user to add the filter by himself”); Ex. 1029, 162:6-20. If *Amit* were modified to use multicarrier signaling, as Mr. Bates noted, it would no longer be possible for the user to add the hardware needed to operate “by himself” because they would also have to add a chipset necessary to enable the FFT/IFFT operations onto each terminal device to support multicarrier operations.

Whether or not a laptop or computer can perform software simulations of FFT/IFFT computations has no bearing on whether a terminal device could use those calculations on signals actually transmitted. Ex. 1005, 1:18-26; Ex. 2007, ¶¶137-138; *see also*, Ex. 1029, 49:22-50:8 (explaining that “OFDM wasn’t used in DOCSIS until... DOCSIS 3.1 around 2013”). Such modifications would not align with *Amit*’s intended advantage that an end user could provide these simple modifications. Ex. 1005, 13:34-36; 18:32; 19:46.

Petitioner wrongly concludes that because *Jacobsen* found multicarrier modulation less complex than single-carrier modulation with equalization, that multicarrier modulation does not increase complexity. Reply, 24-25. However,

Amit's system is single-carrier and silent as to equalization, so such comparison is unpersuasive. Multicarrier modulation is more complex than single carrier modulation while still being less complex than single carrier modulation with equalization. Ex. 1007, 9 (“The penalty for the increased FFT/IFFT size is an increase in system complexity”); 15 (“discrete multitone modulation is more computationally efficient than single-carrier modulation *with equalization*”).

B. Grounds 1 and 2

Claims 1 and 5 are not obvious for the same reasons described *supra* Sections VI.C.1 and IX.A.

X. CLAIMS 2-4 AND 6-9

Claims 2 and 9 are not obvious for the same reasons described *supra* Sections VII and IX. Claims 3-4 and 6-8 are not obvious for the same reasons described *supra* Section IX.

XI. CONCLUSION

The patentability of all claims of the '249 Patent should be upheld.

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CERTIFICATE OF SERVICE

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