

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

COMCAST CABLE COMMUNICATIONS, LLC,
Petitioner,

v.

ENTROPIC COMMUNICATIONS, LLC,
Patent Owner.

Case IPR2024-00431
Patent 7,295,518 B1

**PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE
UNDER 37 C.F.R. § 42.23**

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<i>Winner Int’l Royalty Corp. v. Wang</i> , 202 F.3d 1340 (Fed. Cir. 2000).....	16

EXHIBITS

Previously Filed:

- Ex. 1001: U.S. Pat. No. 7,295,518 (“the ’518 patent”)
- Ex. 1002: Expert Declaration of James Bertonis
- Ex. 1003: *Reserved*
- Ex. 1004: Certified Prosecution History of the ’518 patent
- Ex. 1005: Certified Prosecution History of the U.S. Appl. No. 10/230,687 (“the ’687 application”)
- Ex. 1006: U.S. Pub. No. 2006/0218593 (“Afshary”)
- Ex. 1007: EP Pub. No. 1087586A2 (“Mirfakhraei”)
- Ex. 1008: U.S. Pub. No. 2001/0031016 (“Seagraves”)
- Ex. 1009: Bingham, John A.C., “Multicarrier Modulation for Data Transmission: An Idea Whose Time Has Come,” *IEEE Communication Magazine*, vol. 28, no. 5, pp. 5-14, May 1990 (“Bingham”)
- Ex. 1010: Jacobsen, Krista S., “Synchronized Discrete Multi-Tone (SDMT) Modulation for Cable Modems: Making the Most of the Scarce Reverse Channel Bandwidth,” IEEE, *WESCON/97 Conference Proceedings*, November 6, 1997 (“Jacobsen 97”)
- Ex. 1011: Wu, Yiyan et al., “Orthogonal Frequency division Multiplexing: A Multi-Carrier Modulation Scheme,” *IEEE Transactions on Consumer Electronics*, vol. 41, no. 3, August 1995 (“Wu”)
- Ex. 1012: U.S. Pat. No. 6,807,146 (“McFarland”)
- Ex. 1013: U.S. Pat. No. 6,456,653 (“Sayeed”)
- Ex. 1014: R. Baines, “Line Code Debates,” *Electronic Design*, vol. 45, no. 6, pp. 142-146, March 1997 (“Baines”)

- Ex. 1015: Esvelt, Mirfakhraei.B.P., “A multicarrier modem architecture for VDSL,” 1997 (“Esvelt”)
- Ex. 1016: U.S. Pat. No. 6,091,932 (“Langlais”)
- Ex. 1017: Sari, Hikmet, et al., “Extending the Capacity of Multiple Access Channels,” *IEEE communications Magazine*, vol. 38, no. 1, pp. 74-82, January 2000 (“Sari”)
- Ex. 1018: Jacobsen, Krista et al., “An Efficient Digital Modulation Scheme for Multimedia Transmission on the Cable Television Network,” *43rd Annual National Cable Television Association (NTCA) Convention and Exposition*, New Orleans, LA. 1994 (“Jacobsen 94”)
- Ex. 1019: Haykin, Simon, *Communication Systems*, 3rd ed., Wiley & Sons, 1994 (“Haykin”)
- Ex. 1020: Lathi, B.P., *Linear Systems and Signals*, Cambridge Press, 1992 (“Lathi”)
- Ex. 1021: Oppenheim, Alan V. *et al.*, *Discrete-Time Signal Processing*, Prentice Hall PTR, 1989 (“Oppenheim”)
- Ex. 1022: U.S. Patent No. 6,737,984 to Welles, II *et al.* (“Welles”)
- Ex. 1023: Couch II, Leon W., *Digital and Analog Communication Systems*, 4th ed., Macmillan Publishing Company, 1993 (“Couch”)
- Ex. 1024: Ciciora, Walter S. *Modern Cable Television Technology: Video, Voice, and Data Communications*. San Francisco, Calif: Morgan Kaufmann Publishers, 1999, Sections 4.1-4.3.3 (Chapter 4, pp. 161-192) (“Ciciora”)

Served (Not Filed):

- Ex. 1025: Expert Declaration of Sylvia Hall-Ellis, Ph.D

Filed Herewith:

- Ex. 1026: Transcript of January 15, 2025 deposition of Albert Garrett in *Dish Network, LLC et al. v. Entropic Communications, LLC*, IPR2024-00393 (USP 7,295,518)
- Ex. 1027: U.S. Pat. No. 6,091,932 (“Langlais”) (same as Ex. 1016)
- Ex. 1028: U.S. Pat. No. 5,959,967 (“Humphrey”)
- Ex. 1029: U.S. Pat. No. 6,438,174 (“Isaksson”)
- Ex. 1030: U.S. Pat. No. 6,259,746 (“Levin”)
- Ex. 1031: Rauschmayer, Dennis. J., *ADSL/VDSL Principles, A Practical and Precise Study of Asymmetric Digital Subscriber Lines and Very High Speed Digital Subscriber Lines*, Macmillan Technical Publishing, 1999 (Chapters 2, 8 and 9)
- Ex. 1032: Transcript of February 28, 2025 deposition of Albert Garrett in *Comcast Cable Communications, LLC v. Entropic Communications, LLC*, IPR2024-00431 (USP 7,295,518)
- Ex. 1033: Tanenbaum, Andrew S., *Computer Networks*, 3rd ed., Prentice Hall PTR, 1996, § 1.2 (pp. 7-16), § 2.2 (pp. 82-94), § 4.3 (pp. 275-304) (“Tanenbaum”)
- Ex. 1034: Brebner, Gordon, *Computers in Communication*, 1st ed., McGraw-Hill International (UK) Limited, 1997, Ch. 1 (pp. 1-34), Ch. 5 (pp. 138-167), Ch. 6 (pp. 168-221) (“Brebner”)
- Ex. 1035: Ciciora, Walter S. *Modern Cable Television Technology: Video, Voice, and Data Communications*. San Francisco, Calif: Morgan Kaufmann Publishers, 1999, § 9.2.3 (Chapter 9, pp. 386-88) (“Ciciora”)
- Ex. 1036: Reply Declaration of James G. Bertonis In Support of Petitioner’s Reply
- Ex. 1037: Entropic Communications, LLC’s Opening Claim Construction Brief, *Entropic Communications, LLC v. Dish Network Corp. et al.*, 2:23-cv-1043-JWH-KES (Lead Case), Document 559, filed December 13, 2024

I. INTRODUCTION

This is a clear-cut case of *prima-facie* obviousness with no secondary considerations alleged. Afshary discloses a network architecture essentially identical to that of the '518 patent, and, as recognized by the ID, discloses every limitation save those related to the use of bit-loaded multi-carrier modulation. But such bit-loaded multi-carrier modulation (including the use of probe messages) is taught by Mirfakhraei for the same purpose as the '518 patent—increasing transmission efficiencies in the face of channel impairments. Aside from claim 3, the POR concedes that the proposed combination meets the claim elements. Patent Owner (PO) instead alleges that a POSITA would not have combined Afshary with Mirfakhraei.

PO argues Mirfakhraei is non-analogous by attempting to narrow the field of the '518 patent to a “broadband,” “on-premise” and “local” coaxial cable network. PO further mischaracterizes Mirfakhraei as being limited to a twisted pair network to argue that the multi-carrier modulation techniques of Mirfakhraei could not be applied to Afshary. But, Mirfakhraei’s bit-loaded multi-carrier modulation would be understood by a POSITA to address channel impairments in various types of networks in the same way. Indeed, the Petition demonstrated that it was known to apply bit-loaded multi-carrier modulation in a coaxial cable network, and PO’s dumbed-down view of a POSITA should be rejected.

PO also alleges various technical difficulties in combining Afshary and Mirfakhraei, such as circuitry level modification of an ASIC and details in data package encapsulations. However, these are routine engineering tasks well within the skillset of a POSITA—details omitted from the ’518 patent itself.

A POSITA familiar with Afshary would consult Mirfakhraei and readily adopt modifications to Afshary to arrive at the claimed invention of ’518 patent, by replacing the single-carrier modulation in Afshary with bit-loaded multi-carrier modulation in accordance with the teachings of Mirfakhraei. This would improve signal transmission efficiency in face of known transmission impairments—a motivation that is apparent in both Afshary and Mirfakhraei.

II. MIRFAKHRAEI IS ANALOGOUS ART

Mirfakhraei is analogous art because it is both in the field of endeavor of the ’518 patent and pertinent to the problem addressed. *See In re Clay*, 966 F.2d 656, 658-59 (Fed. Cir. 1992) (only one of the two prongs need be met). Whether prior art is analogous is simply another way of asking “whether the art is ‘too remote to be treated as prior art.’” *Id.* at 658 (quoting *In re Sovish*, 769 F.2d 738, 741 (Fed. Cir. 1985)). *See also, Corephotonics, Ltd. v. Apple Inc.*, 84 F.4th 990, 1004 (Fed. Cir. 2023); *Netflix, Inc. v. DivX, LLC*, 80 F.4th 1352, 1359 (Fed. Cir. 2023). Mirfakhraei is not at all remote from the ’518 patent.

A. Mirfakhraei Is Within the Field of Endeavor of the '518 Patent

PO surmises a false dichotomy between the '518 patent's "on-premises local area broadband coaxial cable networks" and Mirfakhraei's "DSL connections over twisted pair." POR 16-18. However, as the ID found, even accepting PO's characterization of the '518 patent, Mirfakhraei shares a field of endeavor because it is not limited to "using telephone lines as the communication medium." *See* ID 20-21.

Mr. Bertonis explained that Mirfakhraei is in the field of network communication and is therefore analogous art. Ex. 1002, ¶88; Ex. 1036, ¶2. PO's challenge on the point is meritless. *See Corephotonics*, 84 F.4th at 1009-1010.

1. PO's narrow characterization of the field of endeavor is flawed

A patent's title, background, field of invention, and the claims of the subject patent can all provide evidence of the patent's relevant field. *Airbus S.A.S. v. Firepass Corp.*, 941 F.3d 1374, 1380-81, n.8 (Fed. Cir. 2019); *see also, In re Bigio*, 381 F.3d 1320, 1326 (Fed. Cir. 2004). "The field ... is not limited to the specific point of novelty, the narrowest possible conception of the field, or the particular focus within a given field." *Unwired Planet, LLC v. Google Inc.*, 841 F.3d 995, 1001 (Fed. Cir. 2016); *see also, Netflix* 80 F.4th at 1359.

Mr. Bertonis's characterization of the relevant field of endeavor as "network communications" complies with *Airbus*'s holistic approach. Ex. 1036, ¶3. The '518

patent's stated "Technical Field" is "broadband communication networks." Ex. 1001, 1:26-28. This includes, but is not limited to, "communications using coaxial cable building wiring." *Id.* The '518 patent's claims are broadly directed to "[a] data communication network" (claim 1) and a "network device" (claim 4), without any limitation as to "on-premises," "local area," or "broadband." Nor is any limitation to "on-premises" or "local area" reflected in the title of the '518 patent. Ex. 1036, ¶4. PO's own construction in district court did not limit the claims to "local area" or "on-premises". *See, e.g.*, Ex. 1037, pp. 17-20.

In *Unwired Planet*, both the patent and prior art related to interface design, but with different focuses: location-based interfaces versus GUI design generally. 841 F.3d at 1001-02. Yet, these two areas of focus were deemed to overlap within the broader field of interface design. *Id.* The facts here are at least as compelling. Both the '518 patent and *Mirfakhraei* are within the field of network communications, and each concerns the use of bit-loaded, multi-carrier transmissions for purposes of dealing with similar transmission channel impairments. Ex. 1036, ¶19. Their respective focuses differ only insofar as concerns the particular physical transmission media and network configurations. Ex. 1036, ¶¶20-22; *see also, Netflix*, 80 F.4th at 1359.

Likewise in *Bigio*, the court affirmed that hair-brushes and toothbrushes were in the same field of endeavor when it comes to the overall shape of bristle array, due

to the structural similarities between the two. *Bigio*, 381 F.3d at 1323, 1326. A “common sense” approach was taken, considering what an ordinarily skilled artisan would turn to for solution to the problem facing the inventor, including considering “the ‘circumstances’ of the application—the full disclosure.” *Bigio*, 381 F.3d at 1326; *see also*, *Airbus*, 941 F.3d at 1381-83.

Here, both knowledge demonstrated by particular prior art references and common sense dictate that a POSITA looking to solve the problem facing the ’518 patent inventors would turn to multi-carrier network prior art, including Mirfakhraei. Ex. 1036, ¶¶5-16. For instance, Exs. 1010 and 1018 (which Mr. Garrett did not consider—*see* Ex. 1032, 35:7-36:9) demonstrate the knowledge of a POSITA and support a broad field of endeavor encompassing Mirfakhraei. *Airbus*, 941 F.3d at 1381. Specifically, these references demonstrate that it was known in the art that discrete multi-tone (DMT) modulation and bit-loading was not limited to twisted pair and instead had useful application to coaxial cable networks. *See* Ex. 1010, title and *passim*; Ex. 1018, title and *passim*; Ex. 1036, ¶¶6, 8-10, 28. Moreover, contrary to Mr. Garrett’s understanding (Ex. 1032, 72:9-21), those references are not limited to a point-to-point network. *See, e.g.*, Ex. 1010, 379 (Summary) (discussing multipoint-to-point transmissions); Ex. 1018, 307 (describing two-way multipoint-to-point transmissions; Fig. 2); Ex. 1036, ¶7. A POSITA thus would not have

excluded from consideration Mirfakhraei's relevant teachings regarding bit-loaded multi-carrier (DMT) network techniques. Ex. 1036, ¶16.

Further, the '518 patent incorporates by reference multiple prior art references for details concerning multi-carrier modulation and bit-loading. Those references (none considered by Mr. Garrett—see Ex. 1032, 21:11-21, 25:2-11, 27:5-28:24, 30:9-15) disclose application of these techniques *in one or both of coaxial cable and twisted pair networks*, evidencing the recognized interrelatedness of, and cross-over of technologies between, those two applications. See Ex. 1036, ¶¶11-15 (discussing the references cited in Ex. 1001). This art reflects the circumstances of the application (*Bigio*, 381 F.3d at 1326) and evidences a field of endeavor encompassing Mirfakhraei.

PO contends that “transmitting and analyzing [of] probe messaging for adaptive bit loading” as applied to a broadband cable LAN was a patentable advance. POR 3. But PO cannot properly restrict the field of endeavor to this asserted patentable distinction so as to exclude Mirfakhraei. *Unwired Planet*, 841 F.3d at 1001 (field of endeavor not limited to specific point of novelty); *Netflix*, 80 F.4th at 1359.

2. Mirfakhraei is not limited to twisted pair

Mirfakhraei's disclosure extends beyond DSL connections over twisted pair. As the ID noted (at 21), Mirfakhraei states: “Although the invention has been

described with reference to particular embodiments, the description is only an example of the invention's application and should not be taken as a limitation." Ex. 1007, ¶36. Multiple other factors support that Mirfakhraei's field of endeavor is not limited to twisted pair, namely *its broad*:

- title: "[b]it loading process for multicarrier communications" (*Id.*, 1);
- field of invention: "relates to communications and communications systems ... that use multiple carrier frequencies for information transmissions" (*Id.*, ¶1); and
- claims, directed to "determining bit loadings for subchannels of a communication signal" (*Id.*, 7-9).

Ex. 1036, ¶17. Mirfakhraei's discussion of conventional telephone lines (among other topics) with respect to background art and preferred embodiments does not limit its field of endeavor, PO's arguments (POR 20) notwithstanding. Ex. 1036, ¶18. Twisted pair cabling is used as a physical medium for Ethernet, which is used for both LAN and WAN applications. Ex. 1031, 23-30, 253-256.

PO criticizes the Board's reliance on what it characterizes as "generic boilerplate," citing *Fromson v. Anitec Printing Plates*, 132 F.3d 1437, 1447 (Fed. Cir. 1997). POR 20-21. However, *Fromson* does not address the analogous art issue. *Fromson* merely held that a "boilerplate statement" in prior art indicating that

other “suitable liquids” may be used for the invention was insufficient to render specific electrolytes obvious. 132 F.3d at 1447.

Wang Labs. v. Toshiba Corp., 993 F.2d 858, 864-65 (Fed. Cir. 1993) (POR 22) is also clearly distinguishable. Procedurally, *Wang* upheld a jury verdict using a deferential standard inapplicable here. Factually, the prior art in *Wang* disclosed memory circuit modules of varying sizes that may be added or replaced, in contrast to the patent’s compact modular memories. It was not enough that both related to computer memory. *Id.* at 864. Here, Mirfakhraei is in same field of endeavor as the ’518 patent not only because both relate to networks, but also because each seeks to extend the usefulness of existing wiring for data networking. The differences between the two physical media do not establish different fields of endeavor, but rather overlapping areas of focus within the same broader field of endeavor, as in *Unwired Planet*. See, §II.A.1, *supra*; Ex. 1036, ¶¶20-22.

B. Mirfakhraei Is Reasonably Pertinent to the Problems That the ’518 Patent Addresses

“A reference is reasonably pertinent if, even though it may be in a different field from that of the inventor’s endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to an inventor’s attention in considering his problem.” *Clay*, 966 F.2d at 659. This is true, notwithstanding differences between the prior art and the patent. *Donner Tech. v. Pro Stage Gear*,

LLC, 979 F.3d 1353, 1361 (Fed. Cir. 2020) (citing *In re ICON Health and Fitness, Inc.*, 496 F.3d 1374, 1380 (Fed. Cir. 2007)).

Where similar problems are addressed in a reference and the patent, this “supports use of the reference in an obviousness rejection.” *Clay*, 966 F.2d at 659; *see also, Netflix*, 80 F.4th at 1361-62. Reasonable pertinence “ultimately rests on the extent to which the reference of interest and the claimed invention relate to a similar problem or purpose.” *Donner*, 979 F.3d at 1359. The ’518 patent and Mirfakhraei relate to highly similar problems or purposes.

The ID recognized that Mirfakhraei and the ’518 patent address the common problems of “variable attenuation across channel paths” and signal noise. ID 22. In response, PO contends that “[t]he ’518 patent specifically sets forth a solution unique to the coaxial environment.” POR 28-29. In reality, though, the solution—multi-carrier modulation with bit-loading—is agnostic to whether impairments are caused by coax splitters or other features. *See* Ex. 1001, 4:37-40, 4:42-46, 7:49-50, 8:9-12; Ex. 1036, ¶¶23-24.

Mirfakhraei also seeks to improve network communication efficiency in the face of similar channel impairments (including the same frequency-dependent attenuation faced by the ’518 patent), and it teaches the same solution—bit-loaded multi-carrier modulation. Ex. 1007, ¶¶3-4 (DMT used to increase data transmission rate), ¶14 (efficient operation through selection of optimal symbol sets), ¶¶34-35

(bandwidth and power optimization discussed); Ex. 1036, ¶¶23-24. The focus of the problem, commonly addressed by both the '518 patent and Mirfakhraei, is finding ways to most effectively deal with encountered transmission impairments, whatever their cause. Accordingly, Mirfakhraei would have commended itself to an inventor's attention in considering the problem addressed by the '518 patent.¹ *Clay*, 966 F.2d at 659.

PO's argument "effectively collapses the field-of-endeavor and reasonable-pertinence inquiries and ignores that the reasonable-pertinence analysis must be carried out through the lens of a PHOSITA who is considering turning to art outside her field of endeavor." *Donner*, 979 F.3d at 1360. PO seeks to exclude Mirfakhraei as analogous art under both the field of endeavor and reasonable pertinence prongs for essentially the same reason: that Mirfakhraei is allegedly focused on a twisted-pair telephone line rather than coaxial cable network. *See* POR 18-21, 24-29.

This argument fails because the reasonable pertinence analysis "must be carried out from the vantage point of a PHOSITA who is considering turning to the teachings of references outside her field of endeavor" and who would "not identify the problems so narrowly so as to rule out all such art." *Donner*, 979 F.3d at 1360.

¹ The references cited in Section II.A.1., *supra*, also support Mirfakhraei's reasonable pertinence. *See Airbus*, 941 F.3d at 1382-83.

As in *Donner*, here, PO's articulation of the problem to be solved by the '518 patent is conflated with the patent's field of endeavor so as to effectively exclude consideration of any references outside the alleged field. *Id.*

III. A POSITA WOULD HAVE COMBINED AFSHARY AND MIRFAKHRAEI

A. Afshary and Mirfakhraei Provide Ample Motivation to Combine

PO alleges that Afshary's network would not suffer from channel impairments based on Afshary's description of coaxial cables as "a very clear, clean medium." POR, 60. But this statement refers to the cables themselves, not Afshary's network. Ex. 1006, ¶24. A POSITA would have understood that Afshary's network includes components with imperfect connections and cabling that would introduce channel impairments, including at least frequency-dependent attenuation. *See, e.g.*, Ex. 1018, 305 (taps, amplifiers, and splitters cause reflections resulting in variations in the coaxial cable network's channel frequency response, consequently leading to ISI), 306 (interference also causes signal degradation); Ex. 1010, 374 (describing channel impairments including "spectral variability" and "spectral nulls"), 375 (describing impairments caused by changes in the channel frequency response or noise), Fig. 1; Ex. 1036, ¶25.

Mirfakhraei provides techniques to specifically address frequency-dependent attenuation as well as other impairments, as recognized by the ID. ID 22; Ex. 1007, ¶¶2, 6 (describing the challenges of "frequency dependent attenuation" mitigated by

bit-loaded multi-carrier modulation). A motivation to combine is explicit as Mirfakhraei describes a multi-carrier modulation technique designed to specifically address frequency-dependent attenuation that is not limited to any particular frequency range and is therefore suitable for a variety of networks.² See, e.g., Ex. 1010, 375 (DMT “alleviates[s] problems caused by changes in the channel frequency response or noise”), Ex. 1018, 306 (a “robust digital transmission technique” like DMT is needed “if reliable transmission is to be achieved”); Ex. 1036, ¶¶26-27.

Further, the motivation to make the Afshary-Mirfakhraei combination need not be what motivated the ’518 patent inventors. Neither Afshary nor Mirfakhraei need explicitly disclose an impairment problem caused by splitters. See, *Honeywell Int’l Inc. v. 3G Licensing, S.A.*, 124 F.4th 1345, 1353-54 (Fed. Cir. 2025)

² PO’s assertion (POR 51) “that there is no instance of any bit loading on a coaxial network in any reference in this proceeding” is plainly false, as demonstrated, e.g., by Exhibits 1010 and 1018. See Pet. 33, Ex. 1002, ¶127; see also, *supra* § III.A.1; Ex. 1010, 379; Ex. 1018, 306-07. These references (not considered by Mr. Garrett—Ex. 1032, 35-36) are evidence of the POSITA’s knowledge. *Randall Mfg. v. Rea*, 733 F.3d 1355, 1362-63 (Fed. Cir. 2013).

(“[r]equiring the motivation to modify to be same motivation as that of the patent inventor has no basis in obviousness doctrine.”).

B. Afshary Is Ready for Improvement with the Techniques of Mirfakhraei

PO alleges that Afshary’s modulation schemes (i.e., FSK, BPSK, and QPSK) are all *single-carrier* modulation schemes, allegedly indicating that Afshary chose against multicarrier modulation. POR 32-33. This is false. FSK, BPSK, and QPSK are compatible with a bit-loaded multi-carrier modulation scheme, wherein the bit-loading specifies a modulation/constellation order based on the data-carrying capacity of the communication channel. *See* Ex. 1002, ¶¶32-44; Ex. 1036, ¶29. Mr. Garrett admitted as much under cross-examination. Ex. 1032, 57:3-10.

If anything, Afshary’s multiple forms of modulation suggest a readiness for use with bit-loaded multi-carrier modulation as taught by Mirfakhraei. *See* Ex. 1002, ¶¶49-53 (e.g.: “It was also known to use these modulation techniques in conjunction with multi-carrier transmission schemes.”); Ex. 1036, ¶¶29-30. Afshary’s use of lower-orders of modulation (e.g., BPSK) reflects the limitations of its single-carrier scheme, in tension with Afshary’s desire for achieving high-speed data transmission. Ex. 1006, ¶¶4-6; Ex. 1036, ¶31. The latter makes Afshary ready for improvement with a mechanism that maximizes data transmission rate without compromising reliability—precisely what Mirfakhraei’s bit-loaded multi-carrier modulation provides. *See* Ex. 1010, 375 (“DMT can maximize the bit rate supported on any

channel ... As a result, the aggregate bit rate on the channel is generally higher than it would be using a single-carrier technique.”); Ex. 1036, ¶31. The combination thus constitutes nothing more than “mere application of a known technique [as taught by Mirfakhraei] to a piece of prior art ready for the improvement [Afshary].” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007).

C. Mirfakhraei’s Multi-carrier Modulation Benefits Afshary by Addressing a Known Problem

PO’s arguments contradict themselves. On one hand, PO asserts that Afshary does not suffer from channel impairments (POR 61-62), while on the other hand PO argues Afshary uses various mechanisms (*e.g.*, filters, error correction codes) to address its channel impairments. *See, e.g.*, POR 55, 58. In reality, Afshary’s network suffers from the same channel impairments as does the network of the ’518 patent. Ex. 1036, ¶46.

Moreover, the use of certain techniques in Afshary to improve reliability does not remove the motivation to also use Mirfakhraei’s bit-loaded multi-carrier modulation to further improve transmission robustness and efficiency. *See Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1380-81 (Fed. Cir. 2023) (“That [the two references] address the same problem and that [the second reference discloses] a known way to address that problem is precisely the reason that there’s a motivation to combine under KSR and our precedent.”). Communication systems typically employ multiple mechanisms to achieve an optimal result. Ex. 1036, ¶¶32-

33; *LBT IP I LLC v. Apple Inc.*, No. 2022-1613, 2023 U.S. App. LEXIS 14376, *18 (Fed. Cir. 2023) (holding that a power-saving mechanism from a secondary reference is not redundant in view of a power-saving mechanism in the primary reference because they conserve power in different ways). Indeed, Mirfakhraei teaches to use multicarrier modulation together with various filters and ECC codes. Ex. 1007, ¶¶17, 24. A POSITA would thus recognize that replacing Afshary's single-carrier modulation with Mirfakhraei's bit-loaded multi-carrier modulation is simply applying a known technique to address a known problem to yield a further expected benefit, *i.e.*, increased system efficiency and robustness. Ex. 1007, ¶14; *see also, id.*, ¶¶2, 4 (describing problems addressed). No such technique is already used in Afshary³ and therefore it is not redundant to any of the mechanisms Afshary already uses, unlike the situation in *Stryker Corp. v. Karl Storz Endoscopy-Am., Inc.*, IPR2015-00764, Paper 13 at 13 (PTAB Sept. 2, 2015) (cited by POR at 53); Ex. 1036, ¶¶34-35. Further, Afshary's filters at best only address reflections from LPF 18, not reflections from other sources. Ex. 1006, ¶42; Ex. 1036, ¶34.

³ PO alleges that Afshary teaches bit-loading (*see* POR 58-60), but Mr. Garrett admitted that Afshary discloses neither multi-carrier transmissions nor bit-loading. Ex. 1032, 40:9-16.

D. Mirfakhraei Does Not Frustrate Afshary's Goal of Cost-Saving

PO alleges that because Afshary describes its coaxial cable LAN as “cost effective,” a POSITA would not be motivated to add expensive components. POR, 31-35. Courts reject this type of economic argument as irrelevant; indeed, many obvious modifications have some cost that is outweighed by the known benefit. *See Orthopedic Equipment Co. v. United States*, 702 F.2d 1005, 1013 (Fed. Cir. 1983); *In re Farrenkopf*, 713 F.2d 714, 718 (Fed. Cir. 1983) (“[A]dditional expense ... would not discourage one of ordinary skill in the art from seeking the convenience expected therefrom.”).

The Board was correct in its initial determination that “Patent Owner’s arguments at most establish that a POSITA would have considered tradeoffs between cost and complexity and performance in making the combination.” ID 26. *See Winner Int’l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349, n.8 (Fed. Cir. 2000) (“[T]he fact that the motivating benefit comes at the expense of another benefit [] should not nullify its use as a basis to modify the disclosure of one reference with the teachings of another”); Ex. 1036, ¶¶36-38.

Moreover, PO’s assumption that Mirfakhraei’s bit-loaded multi-carrier approach would necessarily add cost and complexity is unfounded. Ex. 1036, ¶39. The “computational complexity of [a] multicarrier system [can be] significantly less

than that of [a] single-carrier system,” especially in networks that suffer from interference and/or reflections. Ex. 1018, 305-306; Ex. 1036, ¶39.

E. A POSITA WOULD HAVE KNOWN HOW TO IMPLEMENT THE COMBINATION OF AFSHARY AND MIRFAKHRAEI

1. Applying Mirfakhraei’s teachings to Afshary would yield an operable system for the same reasons the alleged invention is operable

PO asserts that applying Mirfakhraei to Afshary would yield an inoperable system. However, if this were true, then the ’518 patent itself would disclose an inoperable system, because Afshary discloses a coaxial cable LAN essentially identical to the ’518 patent’s LAN, and the bit-loaded multi-carrier modulation techniques of Mirfakhraei and the ’518 patent are fundamentally the same.⁴ Ex. 1036, ¶¶40-43. Below is a side-by-side comparison of the ’518 patent’s network and Afshary’s network. Just as in the ’518 patent, transmissions between client devices in Afshary’s network must traverse various coaxial cable segments and splitters. Ex. 1036, ¶¶41-42.

⁴ Mr. Garret admits that OFDM is a type of DMT, consistent with the ’518 patent’s equating of the two techniques. Ex. 1032, 17:15-23; Ex. 1001, 7:25-27.

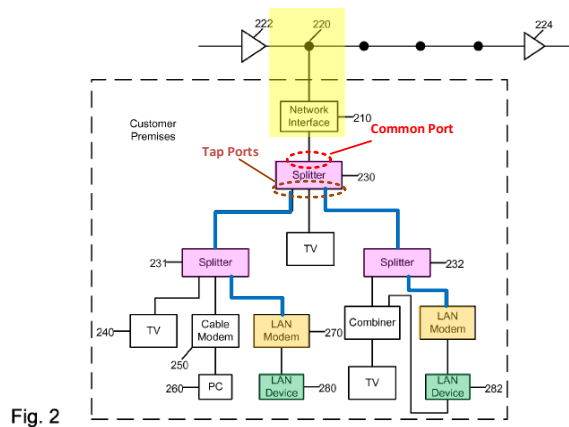


Fig. 2

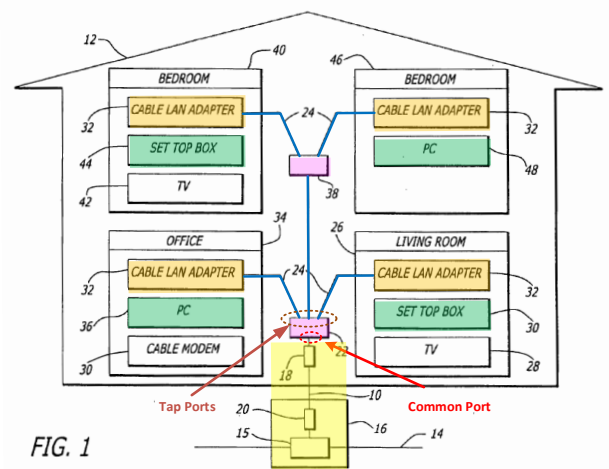


FIG. 1

'518 patent, Fig. 2 (left, annotated); Afshary, Fig. 1 (right, annotated)

2. Mirfakhraei's bit loading scheme is compatible with Afshary's network

PO's assertion that Mirfakhraei's bit loading scheme is incompatible with Afshary's network (POR 40-44) is based on two false assumptions that contradict what would be understood by a POSITA: (1) that an Afshary-Mirfakhraei adapter is only capable of transmitting the same data to all other adapters at the same time (a transmission approach characterized by Mr. Garrett as a broadcast signal); and (2) that transmissions on the Afshary-Mirfakhraei LAN would not include any mechanism to identify both the sender and recipient. Ex. 2001, ¶104 (explaining that the alleged problem only arises "while implementing a broadcast signal"); Ex. 1032, 59:24-68:17; Ex. 1036, ¶¶47-51. But Mr. Garrett admitted that Afshary is not limited to broadcast transmissions (Ex. 1032, 62:14-16), and he contradicted himself

regarding whether the alleged problem would exist in a non-broadcast scenario. Ex. 1032, 67:17-69:14; Ex. 1036, ¶47.

Additionally, it was well known to a POSITA that LANs, like Afshary's, employed addressing techniques to identify a message sender and message recipient to facilitate communications between two specific devices. Ex. 1034, 12-14, 150-151, 168-170, 184-186; Ex. 1033 7-10, 275-282; Ex. 1031, 253-263; Ex. 1036, ¶48. Mr. Garrett admitted the same—including for coaxial cable LANs specifically—and further stated that such addressing information would be included in LAN transmissions. Ex. 1032, 45:19-46:12. This is unsurprising, as Mr. Garrett's declaration further acknowledges that Afshary's network "transmits packets with defined headers and preambles to ensure signal transmissions can be reliably received and decoded," which is consistent with the use addressing techniques used by LANs. Ex. 2001, ¶123; POR 58; Ex. 1036, ¶49. Indeed, Afshary even states that a signal from a first adapter is transmitted to a "**designated** second adapter," which teaches to a POSITA that Afshary's LAN would operate in accordance with these well-known LAN messaging techniques for enabling communications between any two devices on the LAN. Ex. 1006, ¶41 (emphasis added); Ex. 1036, ¶49.

Accordingly, in Afshary-Mirfakhraei, a POSITA would have understood that:

(i) LAN messages would at least designate a sender and recipient such that a first

adapter would be capable of sending any message – including a handshake signal – to a particular second adapter and that other adapters receiving the message would simply ignore it; and (ii) the first adapter would be capable of determining that a responsive message to its handshake signal was sent by the second adapter as opposed to any other adapter. Ex. 1036, ¶50. In this manner, communications between any two adapters is provided and channel characteristic for each specific signal path would be determinable in Afshary-Mirfakhraei, grounded in the rudimentary known techniques for identifying message senders and recipients in a LAN. Ex. 1036, ¶¶47-51.

Notably, the '518 patent does not describe how to configure its probing messages to avoid this alleged problem, trusting that a POSITA would know how to implement probing messages in its LAN. Ex. 1032, 45:21-49:16; Ex. 1036, ¶44. *See Muniauction, Inc. v. Thomson Corp.*, 532 F.3d 1318, 1327 n.3 (Fed. Cir. 2008) (patentee's argument that a POSITA could not implement the combination was undermined by the lack of implementation description in the patent itself).

PO also alleges that Mirfakhraei's handshake process is incompatible with Afshary because it requires a dedicated connection between devices and because Afshary does not provide an alternative synchronization mechanism from TDMA for facilitating the handshake process. POR 39, 41-42; Ex. 2001, ¶¶98, 102, 104; Ex. 1032, 62:17-65:9. A POSITA would have understood that Afshary's use of

TDMA regulates access to the shared coaxial cable medium, in the same manner as the '518 patent's scheduler (also employing TDMA⁵). Ex. 1006, ¶34; Ex. 1001, 6:11-24, 9:42-49; Ex. 1032, 46:13-47:17, 48:4-49; Ex. 1036, ¶¶45, 52-53. The handshake process (or a probe signal itself) does not *require* a dedicated connection. Mirfakhraei describes, but is not limited to, a scenario where the communication medium is twisted-pair. Ex. 1036, ¶53; Ex. 1007, ¶15. And in incorporating Mirfakhraei's handshake process into Afshary's shared medium network, a POSITA would have understood that Mirfakhraei's handshake process is indeed not a substitute for TDMA but instead would operate within the TDMA scheme used by Afshary, enabling any two adapters to exchange probe messages and responses, just like any other type of message that could be exchanged by the adapters. Ex. 1036, ¶¶53-54.

3. A POSITA would have known how to implement Mirfakhraei's "Multi-Carrier Modulator and Multi-Carrier Demodulator" in Afshary's ASIC

PO alleges that a POSITA would not be motivated to modify Afshary with the teachings of Mirfakhraei because doing so "would fundamentally change the architecture of the ASIC in Afshary" and would be difficult. POR 36-40. But neither

⁵ Mr. Garrett agreed that the '518 patent's TDMA protocols were shared by Afshary. Ex. 1032, 45:2-18 (citing Ex. 1006, ¶34).

renders the combination nonobvious when, as here, the alleged modifications to Afshary's ASIC are well within the capabilities of a POSITA. Ex. 1036 ¶52. "The rationale of *KSR* does not support [the] theory that a person of ordinary skill can only perform combinations of a puzzle element A with a perfectly fitting puzzle element B." *ClassCo, Inc. v. Apple, Inc.*, 838 F.3d 1214, 1219 (Fed. Cir. 2016); *Facebook, Inc. v. Windy City Innovations, LLC*, 973 F. 3d, 1321, 1343 (Fed. Cir. 2020) (a POSITA can combine using creativity).

Each of the "additional improvements" that PO alleges to be required to modify Afshary with the teachings of Mirfakhraei (POR 36-40) are not found in the claims and are directed to features for which the '518 patent itself is silent on implementation details. Ex. 1036, ¶¶43-46, 56; *see Muniauction*, 532 F.3d at 1327 n.3. Further, PO and Mr. Garrett provide no evidence that such changes or additions are required. Regardless, they do not argue or provide any evidence that such changes are not within the capabilities of a POSITA or that a POSITA would not have a reasonable expectation of success in incorporating Mirfakhraei's techniques into Afshary's ASICs. POR 36-40; Ex. 2001, ¶¶88-100; Ex. 1036, ¶56.

In relation to PO's argument that Afshary must include Mirfakhraei's controller, Mr. Garrett admitted there was "[n]o reason why" additional functionality could not be incorporated into Afshary's ASIC based on Mirfakhraei's teachings. Ex. 1032, 59:6-16; POR 37-39. To the extent any changes to Afshary's ASIC would

be made to incorporate Mirfakhraei's teachings, a POSITA would have the skills to do so. Ex. 1036, ¶55; see *Allied Erecting and Dismantling Co. v. Genesis Attachments, LLC*, 825 F.3d 1373, 1381 (Fed. Cir. 2016) (obviousness does not require bodily incorporation of features). Further, the '518 patent fails to explicitly disclose a controller within its LAN device, let alone describe how such a controller would implement the bit-loading process in the '518 patent. *Muniauction*, 532 F.3d at 1327 n.3; Ex. 1036, ¶45.

4. PO's "distinct frequency bands" argument is meritless

Lastly, PO alleges that a POSITA would not combine Afshary and Mirfakhraei because they "function on intentionally distinct frequency bands." POR 36, 44. PO's arguments again are contrary to basic communication principles: a POSITA would have understood that Mirfakhraei's multi-carrier signals would be transmitted over Afshary's operating frequency range using Afshary's up-conversion and down-conversion techniques. Ex. 1006, ¶¶38-39, 41, Figs. 3-4; Ex. 1036, ¶¶57-59.

As explained in the Petition, and depicted in Figure 3, Afshary's RF & Mixed Signal section 100 includes components to translate modulated data from its Baseband section 90 to a 1300 MHz center frequency (**red**) while occupying a bandwidth of 5 MHz (**dark blue**). Pet. 31-32; Ex. 1006, ¶¶25, 38-39; Ex. 1036, ¶58. Afshary explains that by doing so, Afshary's cable LAN avoids lower frequencies

used by existing services. Pet. 54-56; Ex. 1006, Abstract, ¶¶2, 7, 12, 24-25, 39, Figs. 1, 3; Ex. 1036, ¶58. A POSITA incorporating Mirfakhraei's multi-carrier signaling would, as far as bandwidth is concerned, simply follow what Afshary already teaches—up-conversion of baseband signals to a desired operating frequency that avoids occupied lower frequencies. Ex. 1036, ¶¶57-59. PO's suggestion otherwise is just another attempt to impermissibly require bodily incorporation (here of Mirfakhraei's frequencies used for twisted pair) into Afshary.

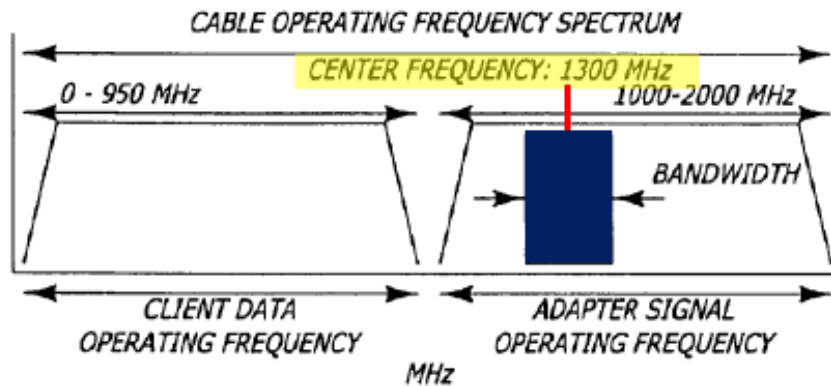


FIG. 3

Ex. 1006, Fig. 3 (annotated); Pet. 32

A POSITA would have understood that the multi-carrier signaling of Mirfakhraei would be up-converted to Afshary's operating frequency range just like Afshary's single carrier baseband signals. Ex. 1007, ¶¶4, 18-19; Ex. 1006, ¶¶24-25, 35-39; Ex. 1036, ¶¶57-59.

PO also argues, regarding claim 3, that Mirfakhraei is designed to work at lower frequency bands. POR 67-70. This ignores that a POSITA would have the

skill to modify Afshary's RF & Mixed Signal section 100 to up-convert a signal to virtually any carrier frequency and therefore frequency range. Ex. 1036, ¶¶60-61.

IV. MR. BERTONIS IS WELL QUALIFIED TO OPINE FROM THE PERSPECTIVE OF A POSITA

A. PO's Proposed Skill Level is Not Supported

PO's proposed skill level requires "at least two years of experience with coaxial cables," (POR 10) although the type of experience, or why it is necessary, is unclear. In short, PO provides no sound basis for rejecting Petitioner's level of skill. In any event, Mr. Bertonis's stated opinions would be the same under either level of skill. Ex. 1036, ¶62.

B. Mr. Bertonis is Well Qualified to Testify From the Perspective of a POSITA Under Either Skill Level

Mr. Bertonis's industry experience with coaxial cable and with multicarrier modulation is extensive. Ex. 1036, ¶¶62-63. His work on coaxial cable began in 1976 at Blonder-Tongue Laboratories, which includes "[c]able modulators," "traditional cable box[es]" and even "headend equipment that would go in the rack at the cable headend." Ex. 1002, A-3; Ex. 2002, 81:9-85:8; Ex. 1036, ¶62. PO characterizes Mr. Bertonis's expertise as being limited to wireless technology (POR 48-49), but ignores that he began to study the cable DOCSIS standard in 1999, that he "followed the development of DOCSIS fairly heavily ... [b]ecause it was important for how our product operated to be compliant with the DOCSIS standard," and that the

product he developed “was similar to a cable system.” Ex. 2002, 20:18-23:8; Ex. 1036, ¶62.

PO alleges that Mr. Bertonis’s opinions are biased due to past dealings with Comcast. POR 51. While Mr. Bertonis’s company ArcWave did sell its product to Comcast, that product was sold to Comcast around 2004 and was sold to essentially every major cable operator in the country. Ex. 2002, 26:17-30:4; Ex. 1036, ¶64. It defies belief that such a transaction over 21 years ago would influence Mr. Bertonis’s testimony.

Mr. Garrett, on the other hand, did not begin any industry experience with coaxial cable until almost 2008, almost 6 years *after* the relevant time period. Ex. 2001, ¶¶8-11, App. A, p. 81. He admitted he did not qualify as a POSITA in the relevant 2002 timeframe under his own standard, contrary to his declaration statement (Ex. 2001, ¶40). *See* Ex. 1032 at 12:6-13:9. Moreover, Mr. Garrett admitted to leaving the communications industry for the financial services industry over five years ago, in 2019 (contrary to the CV he appended to his declaration). Ex. 1032, 13:10-14:15. Thus, if either expert suffers from a lack of pertinent experience, it is Mr. Garrett.

V. CONCLUSION

For the reasons set forth above and in the Petition, all claims of the '518 patent are unpatentable for obviousness and should be canceled.

Respectfully submitted

Dated: March 12, 2025

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CERTIFICATION UNDER 37 C.F.R. § 42.24(d)

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petitioner's Reply totals 5593, which is less than the 5,600 allowed under 37 CFR § 42.24(c)(1), as counted by the Word Count feature of Microsoft Word. This total includes 5585 words as counted by the Word Count feature of Microsoft Word and 8 words used in annotations.

Pursuant to 37 C.F.R. § 42.24(a)(1), this count does not include the table of contents, the table of authorities, mandatory notices under § 42.8, the certificate of service, this certification of word count, the claims listing appendix, or appendix of exhibits.

Dated: March 12, 2025

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.105, I hereby certify that I caused a true and correct copy of this **PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE** **UNDER 37 C.F.R. § 42.23** in connection with IPR2024-00431 to be served via e-mail on March 12, 2025, in its entirety on the following counsel of record for Patent Owner:

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Dated: March 12, 2025

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