

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MEDIATEK, INC.,

Petitioners

v.

PARKERVISION, INC.,

Patent Owner.

IPR2024-00796

U.S. Patent No. 7,483,686

PETITIONERS' REPLY TO PATENT OWNER'S RESPONSE

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EX1004	U.S. Patent No. 6,600,726 (“Nevo”)
EX1005	Estabrook, “The Direct Conversion Receiver: Analysis and Design of the Front-End Components,” Aug. 1989 (“Estabrook-Thesis”)
EX1006	Avitabile <i>et al</i> , “S-band digital downconverter for radar applications based on a GaAs MMIC fast sample-and-hold,” IEE Proc.-Circuits Devices Syst., Vol. 143, No. 6, December 1996 (“Avitabile”)
EX1007	File History of U.S. Patent No. 7,483,686
EX1008	U.S. Patent No. 6,061,551
EX1009	Joint Claim Construction Chart, <i>ParkerVision v. MediaTek, Inc. et al.</i> , No. 6:23-cv-00375 (W.D. Tex. May 3, 2024), ECF No. 4o
EX1010	Final Written Decision, <i>Intel Corp. v. ParkerVision, Inc.</i> , IPR2021-00346, Paper 33 (PTAB June 30, 2022)
EX1011	U.S. Patent No. 8,190,108
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EX1015	<i>Sotera</i> Stipulation Letter dated May 21, 2024
EX1016	P. Estabrook and B. B. Lusignan, “A Mixer Computer-Aided Design Tool Based in the Time Domain,” IEEE Microwave Theory and Techniques Symposium, 1988, pages 1107-1110 (“Estabrook-1988”)
EX1017	P. Estabrook and B. B. Lusignan, “The Design of a Mobile Radio Receiver Using a Direct Conversion Architecture,” In Proc. of the

EXHIBIT No.	DESCRIPTION
	IEEE Vehicular Technology Conference, pages 63-72, May 1989 (“Estabrook-1989”)
EX1018	Declaration of June Munford
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EX1037	U.S. Patent No. 6,570,394
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EX1039	IEEE Std 802.11a-1999 (Supplement to IEEE Std 802.11-1999)
EX1040	Excerpts from P. Nahin, The Science of Radio (ISBN 1-56396-347-7) (1996), pgs. 36, 165, 182-184
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EX1042	Excerpts from Serway, Physics for Scientists and Engineers, 3 rd Ed. (ISBN 0-8493-3128-5) (1999).
EX1043	Excerpts from Davis, Operating Systems, A Systematic View (ISBN 0-201-11116-0) (1983)
EX1044	Bluetooth Spec. V. 1.0 B (1998)
EX1045	Appellant’s Brief, <i>ParkerVision Inc. v. Intel Corp.</i> , Case No. 2022-1548 (Fed. Cir. July 15, 2022)
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EX1051	Ricketts Deposition Transcript
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EX1053	U.S. Patent No. 6,266,518 (“518 Patent”)
EX1054	Weisskopf, “Subharmonic Sampling of Microwave Signal Processing Requirements,” <i>Microwave Journal</i> , May 1992, pp. 239-247
EX1055	Specification of the Bluetooth System, Vol. 1, v1.0 B, Dec. 1, 1999

EXHIBIT No.	DESCRIPTION
EX1056	National Instruments, Introduction to Bluetooth Device Testing, September 2016, https://download.ni.com/evaluation/rf/intro_to_bluetooth_test.pdf (last accessed May 28, 2025)
EX1057	ParkerVision Reply Claim Construction Brief, <i>ParkerVision, Inc. v. Intel Corp.</i> , No. 6:20-cv-00108-ADA, ECF No. 65 (W.D.Tex. Dec. 11, 2020)
EX1058	U.S. Patent No. 6,049,706
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EX1060	Sletten <i>et al.</i> , “Ultrawide-Band Radar Observations of Multipath Propagation over the Sea Surface,” <i>IEEE Transactions on Antennas and Propagation</i> , 44:5 (May 1996)
EX1061	Lord <i>et al.</i> , “Approaches to RF Interference Suppression for VHF/UHF Synthetic Aperture Radar,” <i>Proceedings of the 1998 South African Symposium on Communications and Signal Processing-COMSIG '98</i> , Rondebosch, South Africa, 1998, pp. 95-100
EX1062	Excerpts from Lee, <i>The Design of CMOS Radio-Frequency Integrated Circuits</i> , Cambridge University Press, 2 nd Ed. 2004
EX1063	Pun <i>et al.</i> , “Basic Principles and New Solutions for Analog Sampled-Data Image Rejection Mixers,” <i>1998 IEEE International Conference on Electronics, Circuits and Systems. Surfing the Waves of Science and Technology</i> , Lisboa, Portugal, 1998, pp. 165-168 vol.3
EX1064	Pache <i>et al.</i> , “An improved 3V 2GHz BICMOS Image Reject Mixer IC,” <i>Proceedings of the IEEE 1995 Custom Integrated Circuits Conference</i> , Santa Clara, CA, USA, 1995, pp. 95-98
EX1065	Google Scholar results, “sampling mixer”
EX1066	Google Patents results, “sampling mixer”

I. INTRODUCTION

Mediatek's Petition showed that neither "multi-platform" transceivers, nor frequency down-conversion systems that "sample" energy onto a storage device such as a capacitor, were novel as of the '686 Patent's priority date. Instead of refuting that showing, ParkerVision's Patent Owner Response ("POR," Paper 15) attempts to move the goalposts in two ways.

First, ParkerVision reads in numerous limitations that do not exist in the claims, then compares the asserted prior art to those extraneous limitations rather than the claim language. When the claims are given their plain and ordinary meaning, the down-conversion elements are taught by Avitabile and the Estabrook references, each of which teaches sampling a signal to transfer energy onto a capacitor, and generating a down-converted signal from that stored energy.

Second, ParkerVision argues Mediatek failed to show that Mediatek's prior art combination would meet purported requirements of certain communication standards. However, ParkerVision ignores clear disclosures of standards-compatible transceivers, the actual legal standard for obviousness, and the skill of a person of ordinary skill in the art (POSITA).

Accordingly, ParkerVision's arguments are unpersuasive, and the Board should cancel claims 1-20.

II. CLAIM CONSTRUCTION

A. “Energy Transfer Signal”

In related litigation, the parties agreed that “energy transfer signal” should be given its plain and ordinary meaning. EX1009, 2. Disregarding its agreement (since adopted by the District Court), ParkerVision now proposes a lengthy definition (“an independent control input of an energy transfer system having pulses with non-negligible apertures”) incorporating several new limitations. POR, 34-35. The District Court has already rejected two aspects of ParkerVision’s proposed construction— that the signal must be “[1] an independent control input of [2] an energy transfer system”— in the context of other elements. The other aspects of ParkerVision’s proposed construction also lack merit. EX1049, ¶¶18-34.

As the Petition noted (at 16-19), ParkerVision originally proposed the “*independent control input*” in its construction of “switch”; however, the PTAB rejected the same proposal for an identical limitation of a related patent. EX1010, 15-26.¹ The Federal Circuit summarily affirmed. EX1046. In the District Court case, the Magistrate Judge concluded that collateral estoppel applied, and likewise

¹ Although ParkerVision’s expert Dr. Ricketts cited that PTAB opinion (EX2006, ¶50), he ignored the discussion which rejected ParkerVision’s “independent control input” proposal. EX1051, 20:8-22.

omitted the “independent control input” from its construction of “switch.” EX1048, 22-24. ParkerVision did not object to that ruling, which the District Judge adopted. EX1052. ParkerVision failed to inform its expert Dr. Ricketts of that ruling, and he similarly ignored several other rulings from the district court, Board, and Federal Circuit concerning related claims or the ’686 Patent itself which are contrary to ParkerVision’s positions here. EX1051, 16:7-14, 17:25-19:14, 20:8-22, 21:11-17, 23:1-7; EX1009, ¶¶19-21.

ParkerVision cannot evade these rulings by (improperly) reading the same rejected limitation into a different claim term. The recited “switch” and “energy transfer signal” are inextricably linked. Claims 1 and 11 recite “a *switch* configured to operate according to *an energy transfer signal*,” and embodiments in the specification show the “energy transfer signal” as the input controlling the switch. *See, e.g.* EX1001, Fig. 51A; EX1009, ¶20.

Even if ParkerVision were not estopped, ParkerVision fails to show its proposed limitation is warranted. ParkerVision (POR, 35) cites several ’686 Patent figures and states in a conclusory manner that these figures support its construction. However, as the Board previously noted in rejecting a nearly identical ParkerVision argument, “a claim is not limited to the embodiments described in the specification unless the patentee has demonstrated a clear intention to limit the claim’s scope with words or expressions of manifest exclusion or restriction.” *Intel Corp. v.*

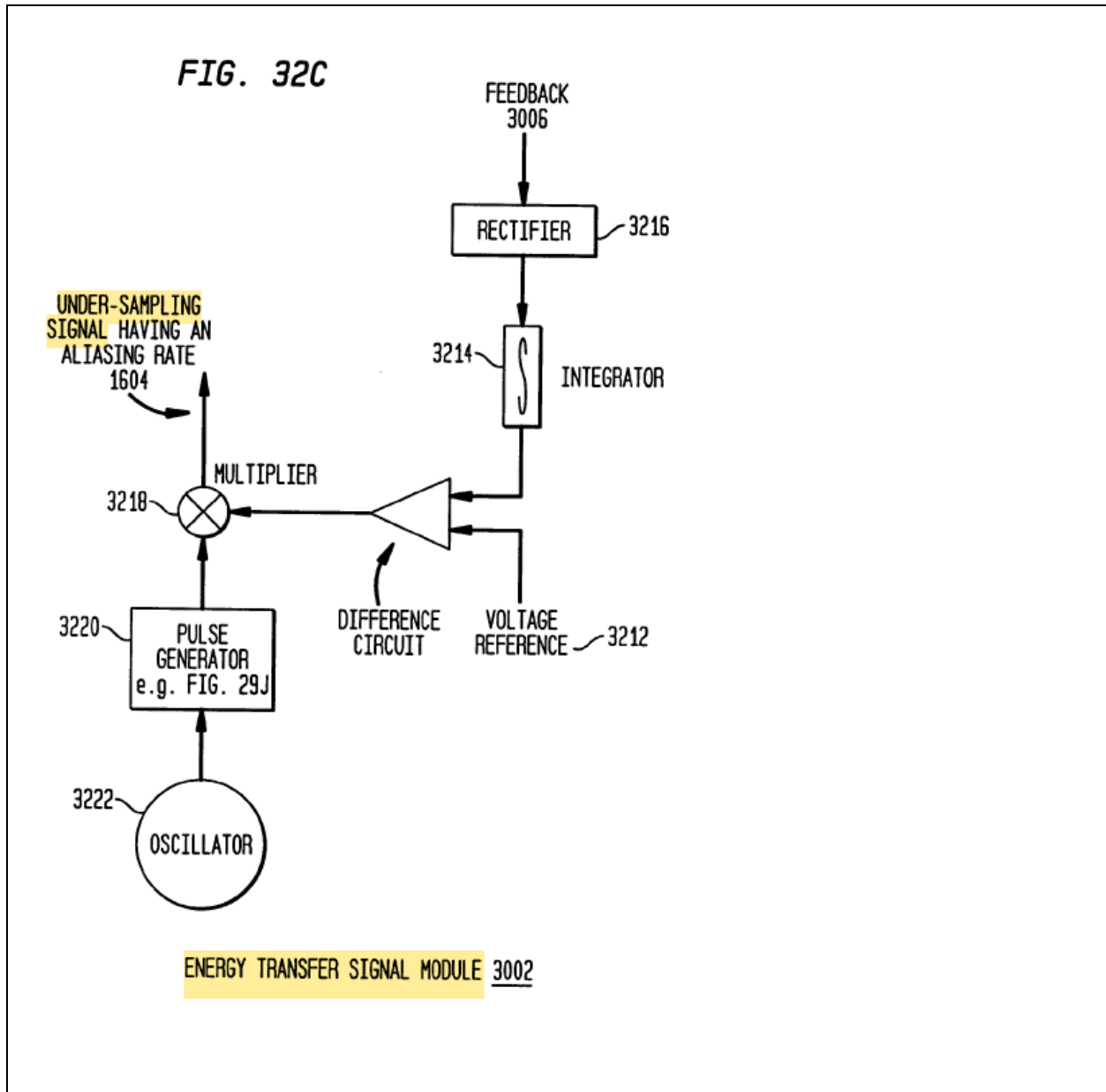
Parkervision, Inc., IPR2021-00346, Paper 33, 24 (June 30, 2022) (quoting *i4i Ltd. v. Microsoft Corp.*, 598 F.3d 831, 843–44 (Fed. Cir. 2010)). ParkerVision fails to explain how anything in its string cite indicates a “clear intention to limit the claim’s scope” to a phrase (“independent control input”) which does not appear in the ’686 Patent. EX1049, ¶32.

ParkerVision also asserts (POR, 36) that some embodiments “would not work” without the energy transfer signal being an “independent control input.” ParkerVision, however, merely cites conclusory expert testimony which parrots the attorney arguments in the POR *verbatim* without explanation. EX2006, ¶164-165. *See Geotab USA, Inc. v. Omega Pats., LLC*, IPR2023-00504, Paper 45, 29 (July 18, 2024) (affording little weight to testimony of expert who “either parrots Patent Owner’s attorney arguments or makes unadorned contrary statements without underlying support”); *Xerox Corp. v. Bytemark, Inc.*, IPR2022-0024, Paper 9, 14 (Aug. 24, 2022) (precedential); 37 C.F.R. §42.65(a). This testimony is not only unsupported but inaccurate and irrelevant. Even if an “independent control input” was necessary to *some embodiments*, it does not follow that it is necessary to the *claim*. ParkerVision fails to respond to the Petition’s showing that certain embodiments in the ’686 written description lack an independent control input. Petition, 16-18 (citing Figs. 47, 52C); EX1002, ¶¶78-80; EX1049, ¶32 (citing EX1008, Figs. 28C, 28D).

The District Court similarly rejected ParkerVision’s attempt to import an “*energy transfer system*” limitation into its construction of “storage module,” finding that the Federal Circuit’s construction of the same term in another related ParkerVision patent controlled. EX1048, 15-17 (citing *Parkervision, Inc. v. Vidal*, 88 F.4th 969, 976-77 (Fed. Cir. 2023)). That reasoning applies equally to ParkerVision’s current attempt to read the same limitation into the “energy transfer signal.” The Federal Circuit noted that “ParkerVision invites us to read into claim 3 an entire system (an energy transfer system) simply on the basis that claim 3 recites a single component (a storage element) that can be part of that system.” *Id.* at 977. The Federal Circuit rejected that argument, noting that ParkerVision’s cited examples “merely indicate that the term ‘storage element’ encompasses storage elements that are part of energy transfer systems, not that this term by itself necessarily invokes an entire energy transfer system.” *Id.* (citing *Thorner v. Sony Comput. Ent. Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012) (“It is not enough for a patentee to simply disclose a single embodiment or use a word in the same manner in all embodiments, the patentee must clearly express an intent to redefine the term.”)). The same reasoning applies here because ParkerVision again asks the Board to read in the same limitation based on embodiments which use an energy transfer signal in an energy transfer system. Just because those embodiments use an energy transfer signal in an energy transfer system does not mean the term “energy

transfer signal” by itself invokes an entire energy transfer system. EX1049, ¶¶25-27.

ParkerVision also argues (POR, 35) that the ’686 Patent “exclusively” reserves the “energy transfer signal” to an “energy transfer system,” while “under sampling signal” refers exclusively to sample-and-hold systems. But ParkerVision fails to cite any evidence of this purported black/white division, much less anything clearly expressing an intent to redefine the claim term. ParkerVision is also wrong that its patents define the two terms as mutually exclusive. The ’686 Patent never mentions an “under sampling signal,” while Fig. 32C of the incorporated ’551 Patent (EX1008) shows an “under sampling signal” as the output of an “energy transfer signal module.”



See also EX1008, Fig. 46D (“energy transfer signal” results in “under-sampling”); EX1049, ¶28. Further undermining ParkerVision’s position, in a case where the “under-sampling signal” was a claim term (unlike here), ParkerVision took the opposite position, namely, that the under-sampling signal was *not* limited to the types of “negligible” aperture signals that it associates with sample-and-hold systems. EX1049, ¶29; EX1057, 16-17. None of ParkerVision’s attempted

confusion shows “energy transfer signal” should be construed differently than its plain and ordinary meaning.

Furthermore, ParkerVision is also wrong that the “energy transfer signal” requires “pulses with non-negligible apertures.” ParkerVision cites a passage distinguishing embodiments with pulses having negligible apertures from those with non-negligible apertures, the latter of which is referred to as an “energy transfer signal.” EX1001, 13:13-31. However, this explanation merely clarifies that an energy transfer signal must close a switch for a sufficient aperture to transfer a non-negligible amount of energy. EX1049, ¶¶22-23. The “pulse” is the type of signal used in this embodiment, but nothing about that passage defines an “energy transfer signal” to require a “pulse.” *Id.*, ¶¶22-24. A POSITA would have understood that a signal can close a switch for a defined aperture regardless of whether it was a “pulse.” *Id.*, ¶24. And when ParkerVision wanted to limit its claims to “pulses,” it did so explicitly. For example, the ’551 Patent recites an “energy transfer signal” in claim 2, then further specifies it must be a “train of pulses” in claim 3. EX1008, 115:20-28.

For all of these reasons, the Board should give “energy transfer signal” its plain and ordinary meaning, as the parties agreed in the District Court. No additional construction is necessary. EX1009, ¶18.

B. “Sample”

Neither party initially proposed a construction for “sample,” which the parties agreed in the related litigation should be given its plain and ordinary meaning. EX1009, 2. However, ParkerVision’s POR arguments (at 74-77) suggest that construction may be needed. If necessary, “sample” should be construed as “reduce a continuous-time signal to a discrete-time signal.” ParkerVision agreed to construe the related term “sampling aperture” as “a period of time during which the claimed switch is in its closed (on) state, thereby reducing a continuous-time signal to a discrete-time signal” in district court litigation concerning related Patent No. 9,118,528. EX1050, 28. This definition is consistent with a POSITA’s understanding of the term. EX1002, ¶59; EX1049, ¶¶35-37; EX1038, 9; EX1051, 61:16-62:10.

C. Other terms

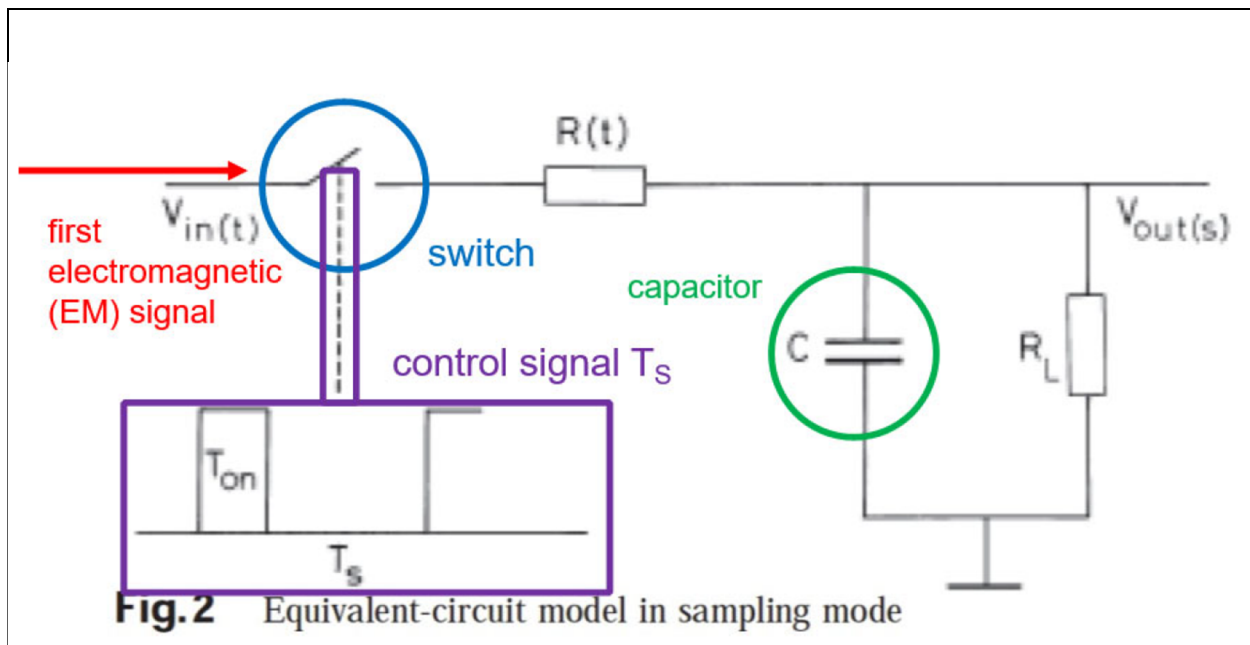
No other claim construction disputes require Board resolution for this IPR, since the claims are invalid over Petitioner’s cited art under their plain and ordinary meaning and the District Court’s constructions. EX1049, ¶¶38-43.

III. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. Ground 1: Nevo in view of Avitable

1. Avitable teaches “wherein a second EM signal is generated from said stored energy” in claim 11

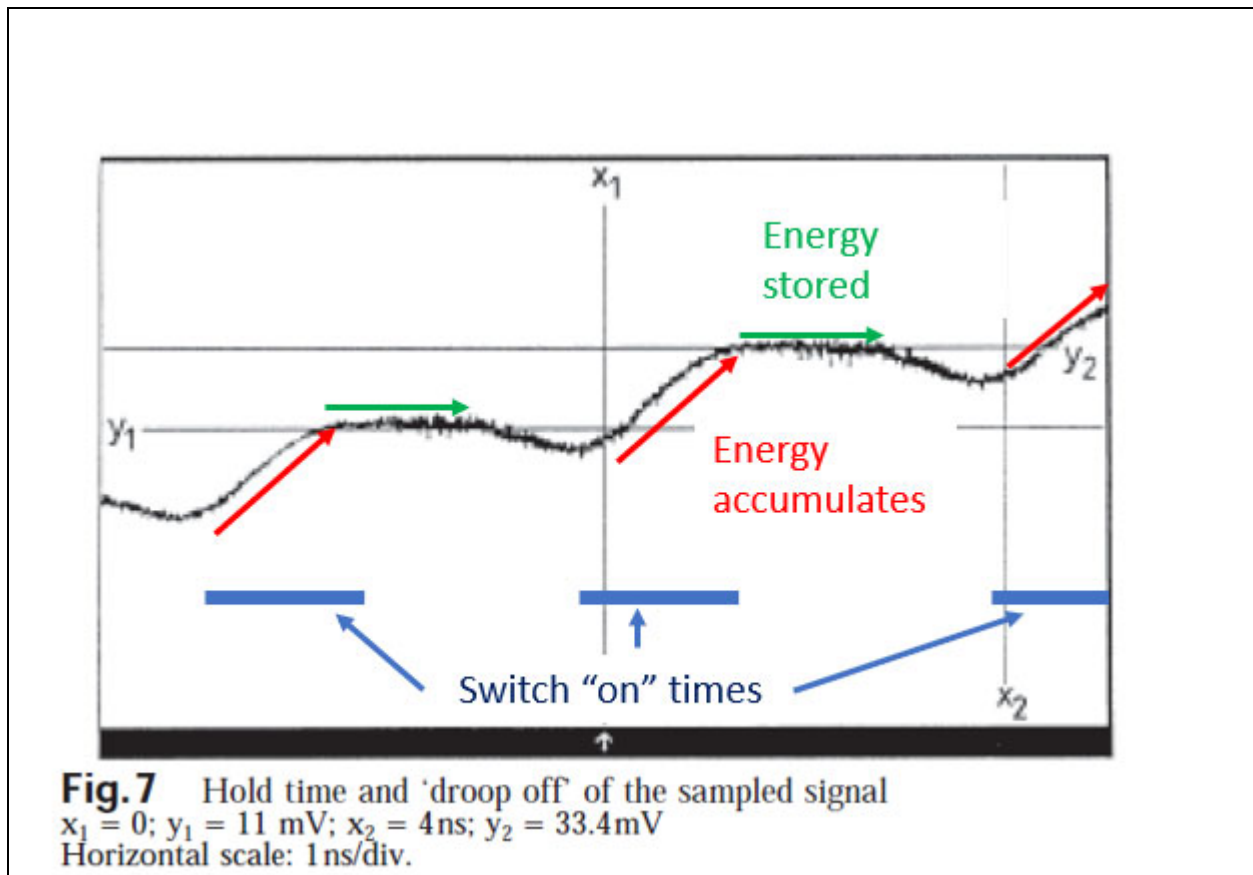
Avitable discloses this element because it teaches that energy is stored on a capacitor (“said stored energy”) and a second EM signal is generated from that stored energy. “Said stored energy” in claim 11 refers to energy stored on a storage module (11[FTM-2.1]). Avitable’s capacitor stores such energy. As the Petition explained (at 41-43), and ParkerVision does not dispute, Avitable teaches that when a switch (annotated blue in Fig. 2, below) is closed, current flows onto the capacitor C (green):



Capacitors store energy, which is related to the charge Q , voltage V , and capacitance C of the capacitor:

$$E_{cap} = \frac{QV}{2} = \frac{CV^2}{2} = \frac{Q^2}{2C}$$

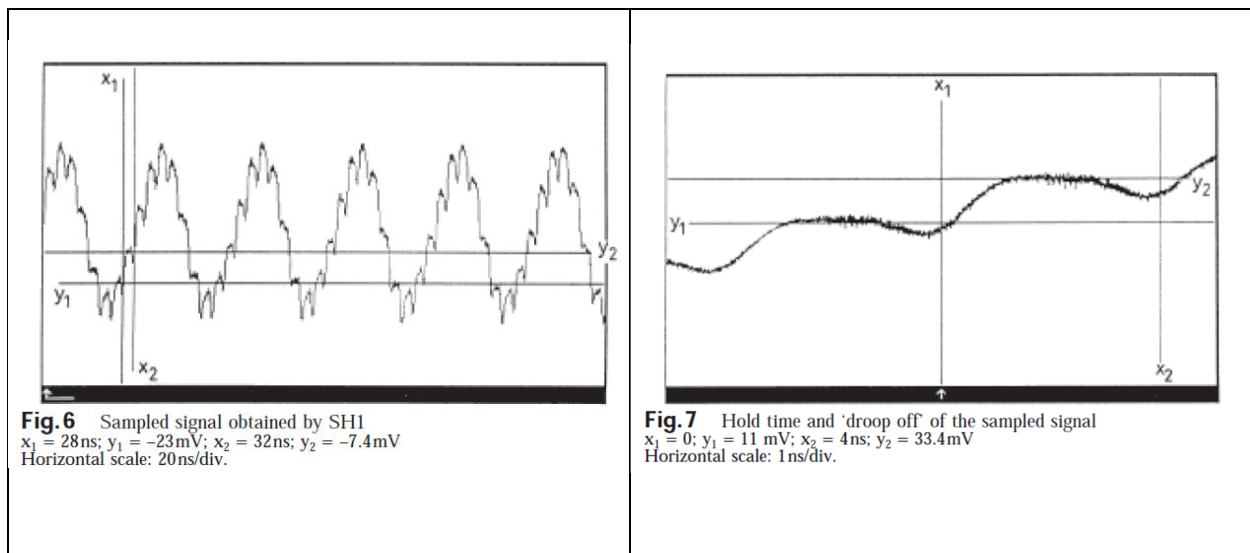
EX1049, ¶¶44-47. Therefore, as current flows into the capacitor, energy accumulates and the voltage increases. EX1051, 29:1-22; EX1049, ¶¶48-49. When Avitabile's switch is closed for a non-negligible interval, charge flows onto the capacitor and the capacitor stores that charge. EX1006, Fig7 (annotated):



ParkerVision's argument (POR, 56) that "[t]he voltage across the capacitor is not accumulated 'energy'" is contrary to the record and ignores basic physics.

Because energy stored by a capacitor is proportional to voltage squared, Avitabile stores energy to form a voltage. EX1049, ¶¶48-49. That energy storage is not instantaneous; rather, energy is stored over the non-negligible interval (a 40% duty cycle) during which the switch is closed. *Id.*, ¶48. The energy stored on the capacitor during that interval is distinguishable from noise and thus non-negligible. *Id.*

The second EM signal is then generated from the stored energy because the baseband waveform is created from the voltage on the capacitor generated by storing that energy. *Id.*, ¶¶50-51. Figs. 6 and 7 show the sampled signal generated from the stored energy at different time resolutions:



ParkerVision argues (POR, 58) that this element requires that “the sampled energy makes up/becomes part of the second signal,” but the plain language of claim 11 contains no such requirement. EX1049, ¶52. Nor does claim 11 require energy

to be provided to a “low impedance load.” POR 58. ParkerVision included such a limitation explicitly in claims of the grandparent ’551 Patent (EX1008, 115:56-59), yet omitted it in the ’686 Patent. EX1049, ¶53. Nor does claim 11 require the capacitor to discharge across the load or otherwise preclude holding a signal. POR 57; EX1049, ¶53. Claim 11 say nothing about what EM property the second EM signal must measure; *i.e.*, it does not exclude a voltage signal. POR 57-58. EX1049, ¶53. In summary, ParkerVision’s POR arguments for this element rely entirely on limitations absent from the claims. The only requirement actually in claim 11 is that the second EM signal be “generated from” stored energy in the capacitor. Avitabile satisfies this by storing energy in a capacitor to form a voltage, which the second EM signal is generated from. EX1049, ¶52. No more is required.

ParkerVision (POR, 55) also cites a reexamination decision on another patent, U.S. Patent No. 6,266,518 (“’518 Patent,” EX1053) to argue that the Examiner agreed with its view of Avitabile, but mischaracterizes that decision. The claims at issue of the ’518 Patent required “integrating the energy over the aperture periods,” which the Examiner interpreted as “(accumulating) energy over multiple aperture periods” (EX2009, 7), then “generating [a] second signal from the *integrated* energy,” not merely “stored” energy. The Examiner found the “integrating” step and the step of generating a second signal from “integrated” energy missing from Avitabile. However, the challenged ’686 Patent claims require neither “integrating”

nor generating a second signal from “integrated” energy. EX1049, ¶54; EX1051, 101:12-24. That reexamination, moreover, was an *ex parte* proceeding without the benefit of the evidence of record here.

Additionally, the Federal Circuit already rejected ParkerVision’s argument. In *ParkerVision, Inc. v. Qualcomm Inc.*, the court found claim 23 of the ’551 Patent invalid over a reference (Weisskopf, EX1054) which generated a lower frequency signal by measuring the voltage across a storage capacitor, just like Avitable. 621 Fed. Appx. 1009, 1019 (Fed. Cir. 2015) (“*ParkerVision 2015*”). That claim recited that the storage module (e.g., capacitor) “receives...energy transferred from a carrier signal” and “a lower frequency signal is generated from the transferred energy.” The court found that “the generating limitation does not require that the baseband signal be created by discharging energy from a storage device” and that Weisskopf’s voltage-sampling circuit accordingly satisfied the claim. *Id.* at 1011, 1020.

The scope of the “generating” element in the context of both claim 11 of the ’686 Patent and claim 23 of the ’551 Patent is substantially identical because both claims recite “generating” a second signal from energy transferred from a received signal to a storage element and stored on a storage element. EX1049, ¶¶55-56. Therefore, the Federal Circuit’s holding that the limitation does not exclude voltage-sampling systems controls (or should at least be highly persuasive) here. *See Ohio Willow Wood Co. v. Alps S., LLC*, 735 F.3d 1333, 1342 (Fed. Cir. 2013).

2. Avitable teaches an “energy transfer signal”

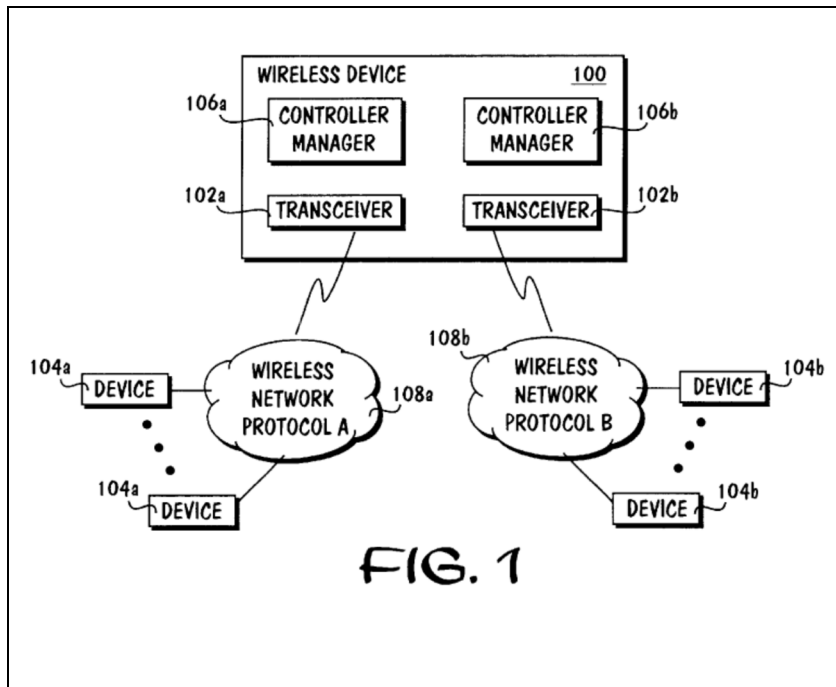
Avitable teaches an “energy transfer signal” because it teaches a signal which closes a switch for a non-negligible aperture, thus transferring energy from the first EM signal to a capacitor (storage module). Petition, 39-41; EX1002, ¶¶126-128; EX1049, ¶¶57-61. ParkerVision’s conclusory argument (POR, 58-59) does not compare the Nevo/Avitable combination to the actual claim language, but rather to its improper construction requiring an “energy transfer system.” Even if the claims required an “energy transfer system” (they do not), the combination teaches an “energy transfer system” because Avitable teaches a system which transfers energy from a sampled signal to a storage device (*i.e.*, the only transfer of energy required by the claims), which is then used to generate a second EM signal. Petition 38-39, 42-43; EX1002, ¶¶126-128, 138-139; EX1049, ¶¶62-63. ParkerVision does not dispute that Avitable teaches all other portions of its proposed construction.

ParkerVision’s assertion (POR, 58) that “the Federal Circuit specifically found that ParkerVision’s energy transfer (energy sampling) technology is different from voltage sampling” is misleading. ParkerVision quotes a background description of the technology in the Federal Circuit’s 2024 opinion rather than a discussion of a specific claim element, and that quoted portion merely quotes the *ParkerVision 2015* opinion. *ParkerVision, Inc. v. Qualcomm Inc.*, 116 F.4th 1345, 1349 (Fed. Cir. 2024) (quoting *ParkerVision 2015*, 621 Fed. Appx. at 1011). In

ParkerVision 2015, however, as discussed above, the Federal Circuit relied on a voltage-sampling reference (Weisskopf) to hold claims of the '551 invalid, which also included the same “energy transfer signal” element as claims 1 and 11 of the '686 Patent. EX1049, ¶¶64-66.

3. Nevo in view of Avitable teaches the “protocol/standard” elements (1[c], 11[1.3], 11[2-3])

Nevo teaches elements 11[1.3], 11[2-3], and 1[c] because it teaches a plurality of controller managers (“protocol/standard sub-modules”) 106a, 106b, each of which controls communication with a separate wireless network protocol (108a, 108b) via a separate transceiver (102a, 102b):



Petition 32-33, 45-47. *ParkerVision* does not dispute that *Nevo* teaches these elements, but attacks *Avitable* individually. But obviousness based on a

combination of references cannot be rebutted merely by attacking individual references. *Bradium Techs. LLC v. Iancu*, 923 F.3d 1032, 1050 (Fed. Cir. 2019) (citations omitted). ParkerVision merely argues (POR, 60) that there is insufficient evidence “that *Avitable*’s circuitry complies with or operates in conformance with any protocol/standard.” However, the “protocol” elements are taught by Nevo, which teaches a wireless device with separate modules and transceivers for communicating with different wireless network protocols. Petition, 32-33; EX1004, e.g. Fig. 1. The Petition’s proposed combination relies on Avitable for specific elements of the transceiver (down-conversion circuitry, i.e., “frequency translation module”), not the full circuit. Petition 36-45, EX1007, e.g. Figs 2, 4, 6-7. EX1049, ¶67.

It does not matter whether Avitable *alone* describes a complete standards-compliant transceiver. POR, 60. POSITAs would have assessed compliance with a wireless standard based on the performance of the overall device rather than looking only at a sub-element of the receiver circuitry. EX1049, ¶68. Features such as “protocol-specific modulation, error correction, and synchronization,” which are not recited by the claims, would be provided by other elements of a device, and would have been within a POSITA’s knowledge at the time of the alleged invention. EX1049, ¶¶69-70. Likewise, the performance characteristics that ParkerVision cites are characteristics of a full receiver circuit rather than a down-converter in isolation,

and would be achieved by other well-known circuitry such as filters before and/or after the mixer. EX1049, ¶71. A POSITA is “a person of ordinary creativity, not an automaton.” *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 421 (2007).

Moreover, the ’686 Patent *itself* does not disclose how to satisfy the various requirements that ParkerVision claims are missing from the Nevo/Avitable combination with respect to either Bluetooth or IEEE 802.11, including protocol-specific modulation, error correction, synchronization requirements, dynamic range, automatic gain control, sensitivity, and interference tolerance. EX1049, ¶72. The ’686 Patent lists both Bluetooth and IEEE 802.11 as examples of protocols (EX1001, 7:52-62), and some figures, e.g., Figs. 25A (below) and 43 simply represent a Bluetooth platform module or sub-module as a box:

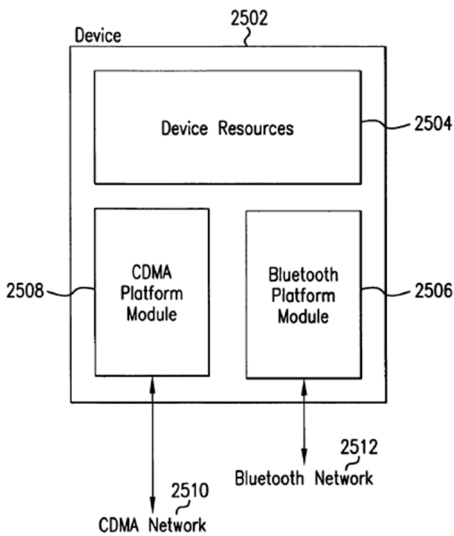


FIG.25A

See also id., Figs. 26B, 26C, 32, 37-44. The '686 Patent also briefly describes general features of protocols and standards, such as protocol stacks and architecture. *See, e.g.*, EX1001, 7:48-8:18, 37:40-38:10. None of these disclosures, nor any other reference to Bluetooth or IEEE 802.11 in the '686 Patent, describes how to physically incorporate the down-conversion circuit features into a circuit complying with the requirements of either Bluetooth or IEEE 802.11. Nor does the '686 Patent provide any test data or simulation showing that any embodiment, real or theoretical, meets either standard. EX1049, ¶¶74-76. The silence of the '686 Patent regarding the performance requirements of Bluetooth and IEEE 802.11 demonstrates that a POSITA would have known how to adapt a transceiver to meet those requirements. *See* MPEP §2141.03(I) (citing *Uber Techs., Inc. v. X One, Inc.*, 957 F.3d 1334, 1339 (Fed. Cir. 2020)); EX1049, ¶76.

ParkerVision’s remaining arguments are unavailing. Although ParkerVision argues that Avitable relates to Radar systems, Avitable is not so limited. Avitable’s first sentence (EX1006, 337) states that “[r]adar *and communications systems* often require complex waveform detection...,” and a POSITA would have recognized that the entire reference describes a down-conversion circuit applicable to both radar and communication systems. EX1049, ¶77. ParkerVision’s assertion that Radar systems provide “input signal levels [which] are typically high and stable” is wrong. POSITAs would have recognized that Radar systems are one of the most difficult and unpredictable environments in signal processing. *Id.* Dealing with “widely varying signal strengths” (which ParkerVision asserts is somehow a problem with Bluetooth and IEEE 802.11 but *not* Radar), including due to “multipath fading, attenuation, and interference” is a problem common to both Radar and communications systems. *Id.*; EX1059-1061.

ParkerVision’s arguments that its expert’s simulations of Estabrook show that Avitable would be incompatible with Bluetooth or IEEE 802.11 standards are unhelpful because ParkerVision provides no basis for applying those results from Estabrook to Avitable. EX1049, ¶78. The other reasons why those simulations fail to support ParkerVision’s arguments are discussed further in §III(B) regarding Estabrook.

4. A POSITA would have been motivated to combine Nevo and Avitable

As the Petition explained, Nevo teaches a transceiver operating at frequencies requiring down-conversion, which would have motivated a POSITA to look for a down-conversion circuit, which is provided by Avitable. Petition 25-26. ParkerVision does not dispute this motivation. Instead, ParkerVision regurgitates its standards-compliance arguments as a motivation-to-combine argument. However couched, these arguments fail.

ParkerVision’s arguments are wrong for the reasons discussed in §II((A)(3) and are irrelevant to the motivation to combine. “The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference.” *Allied Erecting & Dismantling Co. v. Genesis Attachments, LLC*, 825 F.3d 1373, 1381 (Fed. Cir. 2016) (quoting *In re Keller*, 642 F.2d 413, 425 (CCPA 1981)); *see also Uber*, 957 F.3d at 1341 (“whether one prior art reference can be incorporated into another is ‘basically irrelevant’”); *Facebook, Inc. v. Skky, LLC*, IPR2017-00687, Paper 21, 24 (July 19, 2018) (rejecting argument that Petitioner failed to show how digital signal processor and OFDM modulation could be incorporated into claimed “user device”).

ParkerVision makes the exact type of bodily-incorporation argument here that the Federal Circuit and the Board have repeatedly rejected. ParkerVision does not dispute that Nevo teaches separate Bluetooth and IEEE 802.11 modules, each of

which would necessarily include a transceiver with down-conversion capability, and that Avitable teaches an RF down-conversion circuit that operates in the correct frequency band. ParkerVision's remaining arguments (POR, 63-64) simply amount to assertions that Avitable's down-conversion circuitry either does not address alleged protocol requirements that would be met by other elements of a transceiver anyway, or performance requirements that would be met by a completed transceiver. Designing a complete transceiver compliant with Bluetooth and IEEE 802.11 protocols would have been well within the scope of a POSITA at the time; indeed, it would not make sense for the industry to develop protocols that the industry could not comply with. EX1049, ¶¶79-81. As ParkerVision admits (POR, 64), Avitable works for the function within such a circuit (frequency conversion) on which the Petition relies for that reference. EX1049, ¶77. Therefore, a POSITA would have been motivated to make the combination. EX1049, ¶81.

B. Ground 2: Young in view of Estabrook-Thesis

1. Estabrook-Thesis teaches “a switch configured to operate according to an energy transfer signal”

Estabrook-Thesis teaches this element because it teaches an independent local oscillator (ILO) which controls the activation of a diode switch, causing transfer of energy (including energy from RF input IRF) to a capacitor. Petition, 69-74; EX1005, Figs. 14(a), 16(b); EX1002, ¶¶244-254; EX1049, ¶¶83-84.

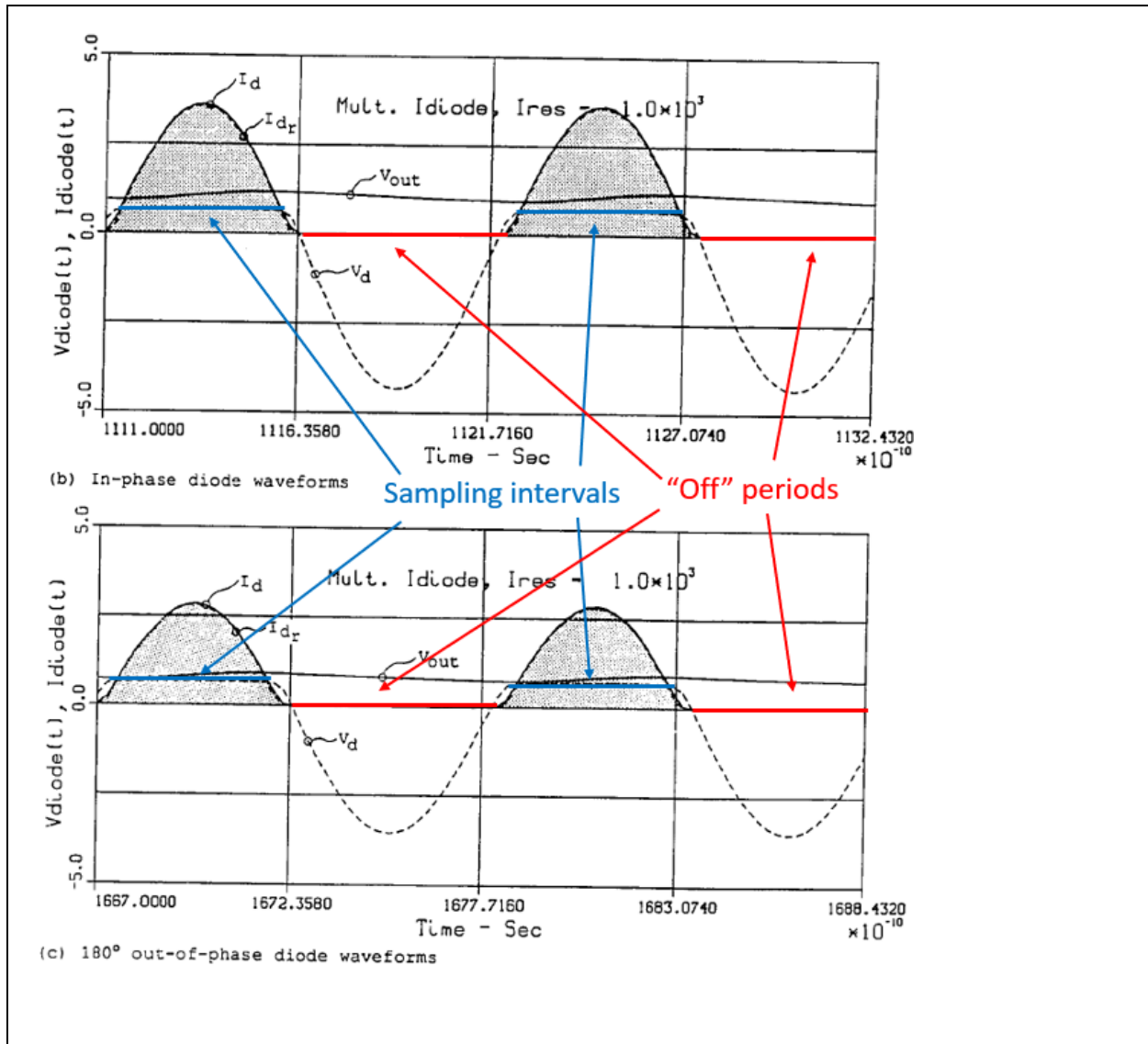
ParkerVision rebuts none of the discussion of this element in the Petition. Rather, ParkerVision again compares the prior art either to broad characterizations of its purported invention untethered to claim language or to additional limitations not present in the claims. POR, 69-74.

ParkerVision faults MediaTek for “fail[ing] to propose a construction for ‘energy transfer signal.’” POR, 70. Yet the parties agreed in litigation that term should be given its plain and ordinary meaning. EX1009, 2. ParkerVision does not dispute the Petition’s showing that Estabrook-Thesis’s ILO is a signal that causes the diode to transfer energy, and is thus an “energy transfer signal” according to the plain and ordinary meaning of the term. ParkerVision’s *entire* argument on this term depends on its new, narrow construction of this term, and thus its argument falls if the Board correctly rejects that belated construction. EX1049, ¶¶85-86

POR’s argument (POR, 72) that Estabrook-Thesis’s diode is “passively dictated” is irrelevant because nothing in the plain meaning of the term (or even ParkerVision’s construction) says anything about whether the conduction state of the diode is active or “passive.” Nor does the plain meaning of the term say anything about the relative configuration of the control signal, input signal, or switch. Accordingly, ParkerVision’s arguments (POR, 72) that the ILO and IRF signals are combined at the anode of the diode are irrelevant. EX1049, ¶87. While the term “energy transfer signal,” properly construed, does not require an “independent

control input,” Estabrook-Thesis’s ILO is “independent” even under that construction because it does not depend on the IRF or anything else. EX1049, ¶88. As the Petition explained, and ParkerVision does not rebut, the ILO is an independent control input because only the ILO has sufficient amplitude to activate the diode. Petition, 71-72; EX1005 Fig. 14; EX1002, ¶¶245, 247-249. Nothing in the plain meaning of the term or even in ParkerVision’s “independent” construction precludes the “energy transfer signal” from being connected to the same port of a diode as the input signal. EX1049, ¶88.

A POSITA would have understood Estabrook-Thesis teaches an “energy transfer signal” because its ILO transfers energy for a non-negligible aperture by closing the diode switch for approximately 50% of the duty cycle of the IRF. EX1049, ¶¶89-91. Figs. 16 (b-c) (annotated below) illustrate how Estabrook-Thesis’s ILO closes the diode switch for a defined sampling aperture or “on” time. The diode only conducts current (and therefore energy, shown by the shaded area) once the diode voltage V_D reaches a defined threshold (blue lines), at which point the diode will be “on” and the voltage remains constant until it the voltage drops below the threshold and the diode is “off” again.



When the voltage is below the threshold, the diode is “off” and the diode current I_D is zero (red lines); i.e., no non-negligible current or energy flows. Therefore, Estabrook-Thesis’s ILO signal creates discrete “on” (sampling) and “off” periods. EX1049, ¶¶90-91. A sinusoidal waveform applied to a diode creates discrete “on” and “off” periods with rapid transitions between them in the same manner as a square wave or “pulse.” *Id.*

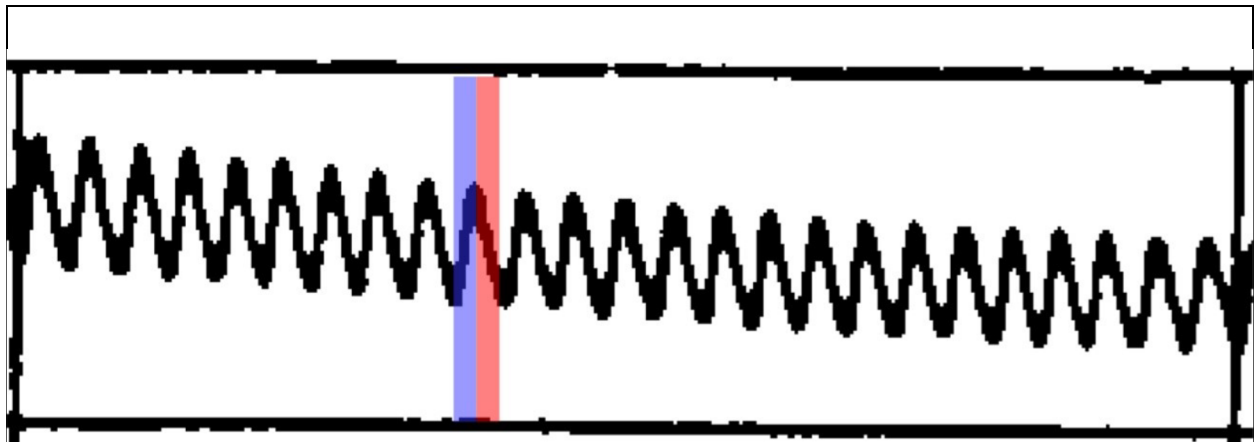
2. Estabrook-Thesis teaches a switch “configured to... sub-sample and transfer energy”

Estabrook-Thesis teaches that its diode switch “sub-samples” energy from a first EM signal because it closes (turns on) for a discrete interval, during which it transfers energy from the IRF (and ILO) and stores that energy in a capacitor. Petition, 72-75; EX1005, Figs. 16(b-c); EX1002, ¶¶250-257. ParkerVision fails to address this analysis directly. Although ParkerVision’s argument is difficult to follow, ParkerVision suggests repeatedly that Estabrook-Thesis does not teach sampling because Estabrook-Thesis’s diode does not “turn on and off in discrete intervals” to sample energy. POR, 76. Yet Estabrook teaches exactly that because its diode has distinct “on” intervals separated by “off” intervals where zero or negligible current flows. EX1005, Figs. 16(b-c) (annotated in §III(B)(1)); EX1049, ¶¶92-94. ParkerVision’s repeated assertions (POR 75-77) that Estabrook-Thesis’s diode is “continuously conducting” are accordingly contradicted by the reference itself. EX1049, ¶¶92-94.

While ParkerVision failed to explain the basis of these assertions in its POR, Dr. Ricketts suggested in deposition that this was due to alleged minimal current flowing during the “off” periods, although neither he nor ParkerVision provided any support for this. EX1051, 118:5-13. A POSITA would have understood that there is no forward voltage and thus no current when the ILO is negative. EX1049, ¶¶95-96. Even if there were some current during the “off” periods, it is negligible relative

to the much larger currents flowing during the “on” times, and would not impact the fact that the capacitor still discharges during the “off” periods. The diode still “samples” by only allowing non-negligible current flow during discrete “on” periods. EX1049, ¶¶97, 99.

Estabrook-Thesis’s diode “samples” under the plain and ordinary meaning of “sample,” and Petitioner’s proposed construction comports with that ordinary meaning and ParkerVision’s previous agreement. In Estabrook-Thesis, the diode takes a continuous signal including the IRF signal as its input and reduces that signal to a discrete-time output when the capacitor charges during the diode “on” times (annotated blue below) and discharges during the “off” times (red), as shown by the resulting waveform in Fig. 16(a):



EX1049, ¶98. ParkerVision also does not address the Petition’s showing (at 77-78) that the output of Estabrook-Thesis’s diode sampling is substantially identical to the

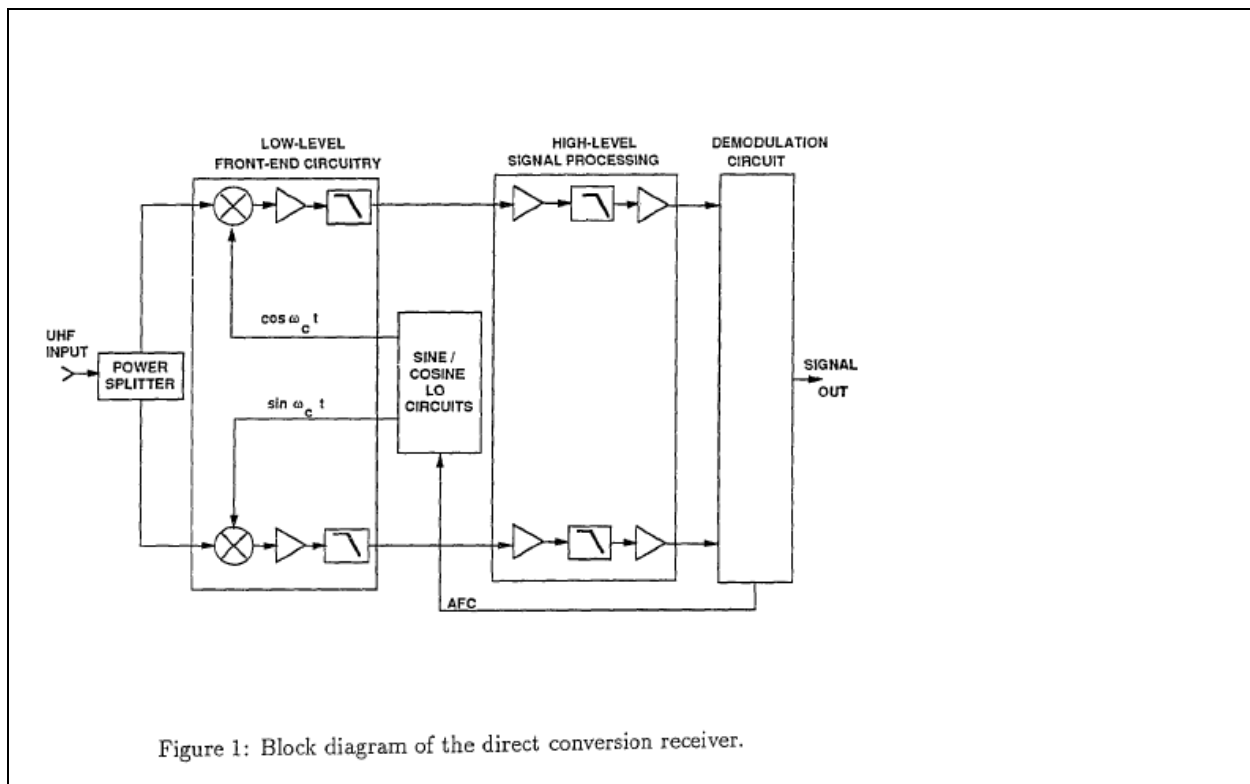
sampling system described in the incorporated '551 Patent at Fig. 57E. EX1002, ¶¶263-264.

ParkerVision's additional arguments that Estabrook-Thesis's diode operates on a "combined" signal rather than "independently" on the IRF signal are irrelevant because the claim language does not require the switch to sample energy exclusively from the first EM signal. As the Petition (at 74-75) and Dr. Larson (EX1002, ¶¶268-270) explained, and ParkerVision ignores, Estabrook-Thesis's diode samples and transfers energy including energy from the IRF, and that IRF energy causes the periodic variation in the output waveform used to generate the down-converted output. EX1049, ¶¶100-101.

**3. Young in view of Estabrook-Thesis teaches the
"protocol/standard" elements (1[c], 11[1.3], 11[2-3])**

Young teaches these elements because it teaches operating the transceivers and associated sub-modules of Radios A and B to send and receive using different protocols, such as Bluetooth and IEEE 802.11. Petition 82; Young, Abstract, 1:8-12, 1:29-43, 2:65-67, 10:31-37; EX1002, ¶¶271-272. ParkerVision ignores this evidence. ParkerVision instead repeats its Ground 1 protocol compliance arguments, which fail for the same reasons: ParkerVision ignores the correct legal standard for obviousness, ignores the ordinary skill of a POSITA to implement known protocols, and seeks to require a greater degree of disclosure from the prior art than from the '686 Patent itself. EX1049, ¶102.

Dr. Ricketts' simulations regarding Estabrook-Thesis do nothing to undermine Petitioner's showing. Dr. Ricketts fails to show how his simulations relate to any portion of any Bluetooth or IEEE 802.11 specification. Dr. Ricketts' assertion that Estabrook-Thesis "does not provide image rejection," based solely on simulating Estabrook-Thesis's single-ended mixer rather than the full receiver, is improper and wrong. Estabrook-Thesis's full receiver includes two mixers with offset sine/cosine local oscillators, which is a well-known structure that provides image rejection by causing the image frequencies on the offset channels to cancel each other out when the channels are combined:



EX1005, 25; EX1049, ¶¶107, 109-110; EX1062-1064.

Moreover, neither Dr. Ricketts' intermodulation or interference ratio simulations accurately simulates a Bluetooth test either. EX1049, ¶¶103-106. At his deposition, Dr. Ricketts would not say if he checked the Bluetooth specification when he performed his simulations. EX1051, 126:7-18. Dr. Ricketts' tests also simulated analog signals, not digital. EX1051, 129:2-7; EX1049, ¶¶112-114. The actual Bluetooth tests for both characteristics would test a receiver by setting up interfering channels with known power and determining the bit error rate for a received digital signal, but Dr. Ricketts simulated nothing even remotely like this. EX1049, ¶¶114-115; EX1055, 24-25; EX1056, 85-91. As with his faulty image rejection simulation, Dr. Ricketts simulated only the mixer in isolation. EX1051, 28:11, 123:4-15. However, the actual standard would test an entire receiver device, which would include additional known elements such as filters and the image-rejection architecture above to improve the signal quality. EX1049, ¶¶106, 108, 111.

ParkerVision's arguments therefore are irrelevant to the Petition's showing that a POSITA would have understood Young to teach a device with transceivers operating according to two separate protocols, and a POSITA would have been capable of designing a transceiver operating according to known protocols. EX1049, ¶115.

4. A POSITA would have been motivated to combine Young and Estabrook-Thesis

The Petition explained (at 61-62) that Young teaches receivers which include “down converter” blocks, but omits description of those blocks so that a POSITA would naturally need to look for a down-converter, while Estabrook-Thesis teaches a down-converter which provides efficiency advantages over traditional receivers. Young, Fig. 5; Estabrook-Thesis, Figs. 1, 14a; EX1002, ¶¶223-229. ParkerVision does not undermine this motivation, but instead regurgitates its arguments regarding protocol compliance in the guise of motivation to combine. These arguments fail for the reasons discussed previously in §§III.A.3, III.A.4, and III.B.3 above, including (1) that Young, like Nevo, teaches Bluetooth and IEEE 802.11-compliant devices and a POSITA would have known how to design such devices to protocol specifications, (2) the ’686 Patent itself does not describe the various requirements that ParkerVision asserts are missing regarding Bluetooth or IEEE 802.11, (3) Mediatek was not required to show that Estabrook-Thesis could be “bodily incorporated” into Young, and (4) Dr. Ricketts’ simulations of Estabrook-Thesis’s mixer in isolation are irrelevant to actual protocol requirements. EX1049, ¶¶116-117. Young teaches a device with Bluetooth and IEEE 802.11 transceivers; a POSITA would have known how to design such transceivers; and Estabrook-Thesis teaches a down-conversion circuit that performs the specific function needed in the combination, including for digitally modulated signals (*see, e.g.* Estabrook-Thesis,

33); therefore, a POSITA would have been motivated to look to Estabrook-Thesis to provide that function in the combination. EX1049, ¶117.

C. Ground 3: Young in view of Estabrook-1988 and Estabrook-1989

ParkerVision raises no separate arguments for Ground 3 beyond referencing its Ground 2 arguments. All challenged claims are thus invalid over Ground 3 for the same reasons.

D. Dependent claims 2-10 and 12-20

ParkerVision raises no separate arguments for the dependent claims. Those claims are invalid for the reasons explained in the Petition.

IV. CONCLUSION

Claims 1-20 of the '686 patent are unpatentable as obvious over the prior art.

Dated: July 3, 2025

Respectfully submitted,

/Jessica Kaiser /

Jessica Kaiser

Reg. No. 58,937

Attorney for Petitioners

Perkins Coie LLP

1900 Sixteenth Street, Ste. 1400

Denver, CO 80202-5255

CERTIFICATE OF WORD COUNT

I hereby certify that the foregoing **PETITIONERS' REPLY TO PATENT OWNER'S RESPONSE** includes 5,600 words (as calculated by Microsoft Word), excluding those in a table of contents; a table of authorities; a listing of facts that are admitted, denied, or cannot be admitted or denied; a certificate of service or word count; or an appendix of exhibits. Accordingly, this Reply is under the word count limit of 5,600 words.

Dated: July 3, 2025

Respectfully submitted,

/ Jessica Kaiser /

Jessica Kaiser

Reg. No. 58,937

Attorney for Petitioners

Perkins Coie LLP

1900 Sixteenth Street, Ste. 1400

Denver, CO 80202-5255

CERTIFICATE OF SERVICE

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1049-1066 was served via electronic mail upon the following counsel of record for
Patent Owner:

Jason S. Charkow - jason.s.charkow@gmail.com
Richard Juang - richard.juang@gmail.com
Chandran B. Iyer - cbiyer@daignaultiyer.com
Ronald M. Daignault - rdaignault@daignaultiyer.com
Stephanie Mandir - smandir@daignaultiyer.com
Scott Samay - ssamay@daignaultiyer.com
pvlit@daignaultiyer.com

Dated: July 3, 2025

Respectfully submitted,

/ Jessica Kaiser /

Jessica Kaiser

Reg. No. 58,937

Perkins Coie LLP

1900 Sixteenth Street, Ste. 1400

Denver, CO 80202-5255